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OF
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FRANCISCANS to GIBSON

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ENCYCLOPÆDIA BRITANNICA

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FRANCISCANS (otherwise called Friars Minor, or Minorites; also the Seraphic Order; and in England Grey Friars, from the colour of the habit, which, however, is now brown rather than grey), a religious order founded by St Francis of Assisi (*q.v.*). It was in 1206 that St Francis left his father's house and devoted himself to a life of poverty and to the service of the poor, the sick and the lepers; and in 1209 that he felt the call to add preaching to his other ministrations, and to lead a life in the closest imitation of Christ's life. Within a few weeks disciples began to join themselves to him; the condition was that they should dispose of all their possessions. When their number was twelve Francis led the little flock to Rome to obtain the pope's sanction for their undertaking. Innocent III. received them kindly, but with some misgivings as to the feasibility of the proposed manner of life; these difficulties were overcome, and the pope accorded a provisional approval by word of mouth: they were to become clerics and to elect a superior. Francis was elected and made a promise of obedience to the pope, and the others promised obedience to Francis.

This formal inauguration of the institute was in 1209 or (as seems more probable) 1210. Francis and his associates were first known as "Penitents of Assisi," and then Francis chose the title of "Minors." On their return to Assisi they obtained from the Benedictine abbey on Mount Subasio the use of the little chapel of St Mary of the Angels, called the Portiuncula, in the plain below Assisi, which became the cradle and headquarters of the order. Around the Portiuncula they built themselves huts of branches and twigs, but they had no fixed abode; they wandered in pairs over the country, dressed in the ordinary clothes of the peasants, working in the fields to earn their daily bread, sleeping in barns or in the hedgerows or in the porches of the churches, mixing with the labourers and the poor, with the lepers and the outcasts, ever joyous—the "joculatores" or "jongleurs" of God—ever carrying out their mission of preaching to the lowly and to the wretched religion and repentance and the kingdom of God. The key-note of the movement was the imitation of the public life of Christ, especially the poverty of Christ. Francis and his disciples were to aim at possessing nothing, absolutely nothing, so far as was compatible with life; they were to earn their bread from day to day by the work of their hands, and only when they could not do so were they to beg; they were to make no provision for the morrow, lay by no store, accumulate no capital, possess no land; their clothes should be the poorest and their dwellings the meanest; they were forbidden to receive or to handle money. On the other hand they were bound only to the fast observed in those days by pious Christians, and were allowed to eat meat—the rule said they should eat whatever was set before them; no austerities were imposed, beyond those inseparable from the manner of life they lived.

Thus the institute in its original conception was quite different from the monastic institute, Benedictine or Canon Regular. It was a confraternity rather than an order, and there was no formal novitiate, no organization. But the number of brothers increased with extraordinary rapidity, and the field of work soon extended itself beyond the neighbourhood of Assisi and even beyond Umbria—within three or four years there were settlements in Perugia, Cortona, Pisa, Florence and elsewhere, and missions to the Saracens and Moors were attempted by Francis himself. About 1217 Franciscan missions set out for Germany, France, Spain, Hungary and the Holy Land; and in 1219 a number of provinces were formed, each governed by a provincial minister. These developments, whereby the little band of Umbrian apostles had grown into an institute spread all over Europe and even penetrating to the East, and numbering thousands of members, rendered impossible the continuance of the original free organization whereby Francis's word and example were the sufficient practical rule of life for all: it was necessary as a condition of efficiency and even of existence and permanence that some kind of organization should be provided. From an early date yearly meetings or chapters had been held at the Portiuncula, at first attended by the whole body of friars; but as the institute extended this became unworkable, and after 1219 the chapter consisted only of the officials, provincial ministers and others. During Francis's absence in the East (1219–1220) a deliberate movement was initiated by the two vicars whom he had left in charge of the order, towards assimilating it to the monastic orders. Francis hurried back, bringing with him Elias of Cortona, the provincial minister of Syria, and immediately summoned an extraordinary general chapter (September 1220). Before it met he had an interview on the situation with Cardinal Hugolino of Ostia (afterwards Gregory IX.), the great friend and supporter of both Francis and Dominic,

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and he went to Honorius III. at Orvieto and begged that Hugolino should be appointed the official protector of the order. The request was granted, and a bull was issued formally approving the order of Friars Minor, and decreeing that before admission every one must pass a year's novitiate, and that after profession it was not lawful to leave the order. By this bull the Friars Minor were constituted an order in the technical sense of the word. When the chapter assembled, Francis, no doubt from a genuine feeling that he was not able to govern a great world-wide order, practically abdicated the post of minister-general by appointing a vicar, and the policy of turning the Friars Minor into a great religious order was consistently pursued, especially by Elias, who a year later became Francis's vicar.

St Francis's attitude towards this change is of primary importance for the interpretation of Franciscan history. There can be little doubt that his affections never altered from his first love, and that he looked back regretfully on the "Umbrian idyll" that had passed away; on the other hand, there seems to be no reason for doubting that he saw that the methods of the early days were now no longer possible, and that he acquiesced in the inevitable. This seems to be Professor Goetz's view, who holds that Sabatier's picture of Francis's agonized sadness at witnessing the destruction of his great creation going on under his eyes, has no counterpart in fact, and who rejects the view that the changes were forced on Francis against his better judgment by Hugolino and Elias (see "Note on Sources" at end of article FRANCIS OF ASSISI; also ELIAS OF CORTONA); Goetz holds that the only conflict was the inevitable one between an unrealizable ideal and its practical working among average men. But there does seem to be evidence that Francis deplored the relaxation towards a departure from the severe simplicity of life and from the strict observance of poverty which he considered the ground-idea of his institute. In the final redaction of his Rule made in 1223 and in his Testament, made after it, he again clearly asserts his mind on these subjects, especially on poverty; and in the Testament he forbids any glosses in the interpretation of the Rule, declaring that it is to be taken simply as it stands. Sabatier's view as to the difference between the "First Rule" and that of 1223 is part of his general theory, and is, to say the least, a grave exaggeration. No doubt the First Rule, which is fully four times as long, gives a better picture of St Francis's mind and character; the later Rule has been formed from the earlier by the elimination of the frequent scripture texts and the edificatory element; but the greater portion of it stood almost verbally in the earlier.

On Francis's death in 1226 the government of the order rested in the hands of Elias until the chapter of 1227. At this chapter Elias was not elected minister-general; the building of the great basilica and monastery at Assisi was so manifest a violation of St Francis's ideas and precepts that it produced a reaction, and John Parenti became St Francis's first successor. He held fast to St Francis's ideas, but was not a strong man. At the chapter of 1230 a discussion arose concerning the binding force of St Francis's Testament, and the interpretation of certain portions of the Rule, especially concerning poverty, and it was determined to submit the questions to Pope Gregory IX., who had been St Francis's friend and had helped in the final redaction of the Rule. He issued a bull, *Quo elongati*, which declared that as the Testament had not received the sanction of the general chapter it was not binding on the order, and also allowed trustees to hold and administer money for the order. John Parenti and those who wished to maintain St Francis's institute intact were greatly disturbed by these relaxations; but a majority of the chapter of 1232, by a sort of *coup d'état*, proclaimed Elias minister-general, and John retired, though in those days the office was for life. Under Elias the order entered on a period of extraordinary extension and prosperity: the number of friars in all parts of the world increased wonderfully, new provinces were formed, new missions to the heathen organized, the Franciscans entered the universities and vied with the Dominicans as teachers of theology and canon law, and as a body they became influential in church and state. With all this side of Elias's policy the great bulk of the order sympathized; but his rule was despotic and tyrannical and his private life was lax—at least according to any Franciscan standard, for no charge of grave irregularity was ever brought against him. And so a widespread movement against his government arose, the backbone of which was the university elements at Paris and Oxford, and at a dramatic scene in a chapter held in the presence of Gregory IX. Elias was deposed (1239).

The story of these first years after St Francis's death is best told by Ed. Lempp, *Frère Elie de Cortone* (1901) (but see the warning at the end of the article ELIAS OF CORTONA).

At this time the Franciscans were divided into three parties: there were the Zealots, or Spirituals, who called for a literal observance of St Francis's Rule and Testament; they deplored all the developments since 1219, and protested against turning the institute into an order, the frequentation of the universities and the pursuit of learning; in a word, they wished to restore the life to what it had been during the first few years—the hermitages and the huts of twigs, and the care of the lepers and the nomadic preaching. The Zealots were few in number but of great consequence from the fact that to them belonged most of the first disciples and the most intimate companions of St Francis. They had been grievously persecuted under Elias—Br. Leo and others had been scourged, several had been imprisoned, one while trying to escape was accidentally killed, and Br. Bernard, the "first disciple," passed a year in hiding in the forests and mountains hunted like a wild beast. At the other extreme was a party of relaxation, that abandoned any serious effort to practise Franciscan poverty and simplicity of life. Between these two stood the great middle party of moderates, who desired indeed that the Franciscans should be really poor and simple in their manner of life, and really pious, but on the other hand approved of the development of the Order on the lines of other orders, of the acquisition of influence, of the cultivation of theology and other sciences, and of the frequenting of the universities.

The questions of principle at issue in these controversies is reasonably and clearly stated, from the modern Capuchin standpoint, in the "Introductory Essay" to *The Friars and how they came to England*, by Fr. Cuthbert (1903).

The moderate party was by far the largest, and embraced nearly all the friars of France, England and Germany. It was the Moderates and not the Zealots that brought about Elias's deposition, and the next general ministers belonged to this party. Further relaxations of the law of poverty, however, caused a reaction, and John of Parma, one of the Zealots, became minister-general, 1247–1257. Under him the more extreme of the Zealots took up and exaggerated the theories of the Eternal Gospel of the Calabrian Cistercian abbot Joachim of Fiore (Floris); some of their writings were condemned as heretical, and John of Parma, who was implicated in these apocalyptic tendencies, had to resign. He was succeeded by St Bonaventura (1257–1274), one of the best type of the middle party. He was a man of high character, a theologian, a mystic, a holy man and a strong ruler. He set himself with determination to effect a working compromise, and proceeded with firmness against the extremists on both sides. But controversy and recrimination and perseceution had stiffened the more ardent among the Zealots into obstinate fanatics—some of them threw themselves into a movement that may best be briefly described as a recrudescence of Montanism (see Émile Gebhart's *Italie mystique*, 1899, cc. v. and vi.), and developed into a number of sects, some on the fringe of Catholic Christianity and others beyond its pale. But the majority of the Zealot party, or Spirituals, did not go so far, and adopted as the principle of Franciscan poverty the formula "a poor and scanty use" (*usus pauper et tenuis*) of earthly goods, as opposed to the "moderate use" advocated by the less strict party. The question thus posed came before the Council of Vienne, 1312, and was determined, on the whole, decidedly in favour of the stricter view. Some of the French Zealots were not satisfied and formed a semi-schismatical body in Provence; twenty-five of them were tried before the Inquisition, and four were burned alive at Marseilles as obstinate heretics, 1318. After this the schism in the Order subsided. But the disintegrating forces produced by the Great Schism and by the other disorders of the 14th century caused among the Franciscans the same relaxations and corruptions, and also the same reactions and reform movements, as among the other orders.

The chief of these reforms was that of the Observants, which began at Foligno about 1370. The Observant reform was on the basis of the "poor and scanty use" of worldly goods, but it was organized as an order and its members freely pursued

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theological studies; thus it did not represent the position of the original Zealot party, nor was it the continuation of it. The Observant reform spread widely throughout Italy and into France, Spain and Germany. The great promoters of the movement were St Bernardine of Siena and St John Capistran. The council of Constance, 1415, allowed the French Observant friaries to be ruled by a vicar of their own, under the minister-general, and the same privilege was soon accorded to other countries. By the end of the middle ages the Observants had some 1400 houses divided into 50 provinces. This movement produced a "half-reform" among the Conventuals or friars of the mitigated observance; it also called forth a number of lesser imitations or congregations of strict observance.

After many attempts had been made to bring about a working union among the many observances, in 1517 Leo X. divided the Franciscan order into two distinct and independent bodies, each with its own minister-general, its own provinces and provincials and its own general chapter: (1) The Conventuals, who were authorized to use the various papal dispensations in regard to the observance of poverty, and were allowed to possess property and fixed income, corporately, like the monastic orders: (2) The Observants, who were bound to as close an observance of St Francis's Rule in regard to poverty and all else as was practically possible.

At this time a great number of the Conventuals went over to the Observants, who have ever since been by far the more numerous and influential branch of the order. Among the Observants in the course of the sixteenth century arose various reforms, each striving to approach more and more nearly to St Francis's ideal; the chief of these reforms were the Alcantarines in Spain (St Peter of Alcantara, St Teresa's friend, d. 1562), the Riformati in Italy and the Recollects in France: all of these were semi-independent congregations. The Capuchins (*q.v.*), established *c.* 1525, who claim to be the reform which approaches nearest in its conception to the original type, became a distinct order of Franciscans in 1619. Finally Leo XIII. grouped the Franciscans into three bodies or orders—the Conventuals; the Observants, embracing all branches of the strict observance, except the Capuchins; and the Capuchins—which together constitute the "First Order." For the "Second Order," or the nuns, see Clara, St, and Clares, Poor; and for the "Third Order" see Tertiaries. Many of the Tertiaries live a fully monastic life in community under the usual vows, and are formed into Congregations of Regular Tertiaries, both men and women. They have been and are still very numerous, and give themselves up to education, to the care of the sick and of orphans and to good works of all kinds.

No order has had so stormy an internal history as the Franciscans; yet in spite of all the troubles and dissensions and strivings that have marred Franciscan history, the Friars Minor of every kind have in each age faithfully and zealously carried on St Francis's great work of ministering to the spiritual needs of the poor. Always recruited in large measure from among the poor, they have ever been the order of the poor, and in their preaching and missions and ministrations they have ever laid themselves out to meet the needs of the poor. Another great work of the Franciscans throughout the whole course of their history has been their missions to the Mahommedans, both in western Asia and in North Africa, and to the heathens in China, Japan and India, and North and South America; a great number of the friars were martyred. The news of the martyrdom of five of his friars in Morocco was one of the joys of St Francis's closing years. Many of these missions exist to this day. In the Universities, too, the Franciscans made themselves felt alongside of the Dominicans, and created a rival school of theology, wherein, as contrasted with the Aristotelianism of the Dominican school, the Platonism of the early Christian doctors has been perpetuated.

The Franciscans came to England in 1224 and immediately made foundations in Canterbury, London and Oxford; by the middle of the century there were fifty friaries and over 1200 friars in England; at the Dissolution there were some 66 Franciscan friaries, whereof some six belonged to the Observants (for list see *Catholic Dictionary* and F. A. Gasquet's *English Monastic Life*, 1904). Though nearly all the English houses belonged to what has been called the "middle party," as a matter of fact they practised great poverty, and the commissioners of Henry VIII. often remark that the Franciscan Friary was the poorest of the religious houses of a town. The English province was one of the most remarkable in the order, especially in intellectual achievement; it produced Friar Roger Bacon, and, with the single exception of St Bonaventure, all the greatest doctors of the Franciscan theological school—Alexander Hales, Duns Scotus and Occam.

The Franciscans have always been the most numerous by far of the religious orders; it is estimated that about the period of the Reformation the Friars Minor must have numbered nearly 100,000. At the present day the statistics are roughly (including lay-brothers): Observants, 15,000, Conventuals, 1500; to these should be added 9500 Capuchins, making the total number of Franciscan friars about 26,000. There are various houses of Observants and Capuchins in England and Ireland; and the old Irish Conventuals survived the penal times and still exist.

There have been four Franciscan popes: Nicholas IV. (1288–1292), Sixtus IV. (1471–1484), Sixtus V. (1585–1590), Clement XIV. (1769–1774); the three last were Conventuals.

The great source for Franciscan history is Wadding's *Annales*; it has been many times continued, and now extends in 25 vols. fol. to the year 1622. The story is also told by Helyot, *Hist. des ordres religieux* (1714), vol. vii. Abridgments, with references to recent literature, will be found in Max Heimbucher, *Orden und Kongregationen* (1896), i. §§ 37-51; in Wetzer und Welte, *Kirchenlexicon* (2nd ed.), articles "Armut (III.)," "Franciscaner orden" (this article contains the best account of the inner history and the polity of the order up to 1886); in Herzog, *Realencyklopädie* (3rd ed.), articles "Franz von Assisi" (fullest references to literature up to 1899), "Fraticellen." Of modern critical studies on Franciscan origins, K. Müller's *Anfänge des Minoritenordens und der Busspruderschaften* (1885), and various articles by F. Ehrle in *Archiv für Litteratur- und Kirchengeschichte des Mittelalters* and *Zeitschrift für Katholische Theologie*, deserve special mention. Eccleston's charming chronicle of "The Coming of the Friars Minor into England" has been translated into English by the Capuchin Fr. Cuthbert, who has prefixed an Introductory Essay giving by far the best account in English of "the Spirit and Genius of the Franciscan Friars" (*The Friars and how they came to England*, 1903). Fuller information on the English Franciscans will be found in A. G. Little's *Grey Friars in Oxford* (Oxford Hist. Soc., 1892). (E. C. B.)

FRANCK. The name of Franck has been given indiscriminately but improperly to painters of the school of Antwerp who belong to the families of Francken (*q.v.*) and Vrancx (*q.v.*). One artist truly entitled to be called Franck is Gabriel, who entered the guild of Antwerp in 1605, became its president in 1636 and died in 1639. But his works cannot now be traced.

FRANCK, CÉSAR (1822–1890), French musical composer, a Belgian by birth, who came of German stock, was born at Liége on the 10th of December 1822. Though one of the most remarkable of modern composers, César Franck laboured for many years in comparative obscurity. After some preliminary studies at Liége he came to Paris in 1837 and entered the conservatoire. He at once obtained the first prize for piano, transposing a fugue at sight to the astonishment of the professors, for he was only fifteen. He won the prize for the organ in 1841, after which he settled down in the French capital as teacher of the piano. His earliest compositions date from this period, and include four trios for piano and strings, besides several piano pieces. *Ruth*, a biblical cantata was produced with success at the Conservatoire in 1846. An opera entitled *Le Valet de ferme* was written about this time, but has never been performed. For many years Franck led a retired life, devoting himself to teaching and to his duties as organist, first at Saint-Jean-Saint-François, then at Ste Clotilde, where he acquired a great reputation as an improviser. He also wrote a mass, heard in 1861, and a quantity of motets, organ pieces and other works of a religious character.

Franck was appointed professor of the organ at the Paris conservatoire, in succession to Benoist, his old master, in 1872, and the following year he was naturalized a Frenchman. Until then he was esteemed as a clever and conscientious musician,

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but he was now about to prove his title to something more. A revival of his early oratorio, *Ruth*, had brought his name again before the public, and this was followed by the production of *Rédemption*, a work for solo, chorus and orchestra, given under the direction of M. Colonne on the 10th of April 1873. The unconventionality of the music rather disconcerted the general public, but the work nevertheless made its mark, and Franck became the central figure of an enthusiastic circle of pupils and adherents whose devotion atoned for the comparative indifference of the masses. His creative power now manifested itself in a series of works of varied kinds, and the name of Franck began gradually to emerge from its obscurity. The following is an enumeration of his subsequent compositions: *Rebecca* (1881), a biblical idyll for solo, chorus and orchestra; *Les Béatitudes*, an oratorio composed between 1870 and 1880, perhaps his greatest work; the symphonic poems, *Les Éolides* (1876), *Le Chasseur maudit* (1883), *Les Djinns* (1884), for piano and orchestra; *Psyche* (1888), for orchestra and chorus; symphonic variations for piano and orchestra (1885); symphony in D (1889); quintet for piano and strings (1880); sonata for piano and violin (1886); string quartet (1889); prelude, choral and fugue for piano (1884); prelude, aria and finale for piano (1890); various songs, notably "La Procession" and "Les Cloches du Soir." Franck also composed two four-act operas, *Hulda* and *Ghisèlle*, both of which were produced at Monte Carlo after his death, which took place in Paris on the 8th of November 1890. The second of these was left by the master in an unfinished state, and the instrumentation was completed by several of his pupils.

César Franck's influence on younger French composers has been very great. Yet his music is German in character rather than French. A more sincere, modest, self-respecting composer probably never existed. In the centre of the brilliant French capital he was able to lead a laborious existence consecrated to his threefold career of organist, teacher and composer. He never sought to gain the suffrages of the public by unworthy concessions, but kept straight on his path, ever mindful of an ideal to be reached and never swerving therefrom. A statue was erected to the memory of César Franck in Paris on the 22nd of October 1904, the occasion producing a panegyric from Alfred Bruneau, in which he speaks of the composer's works as "cathedrals in sound."

FRANCK, or FRANK [latinized FRANCUS], **SEBASTIAN** (*c.* 1499–*c.* 1543), German freethinker, was born about 1499 at Donauwörth, whence he constantly styled himself Franck von Wörd. He entered the university of Ingoldstadt (March 26, 1515), and proceeded thence to the Dominican College, incorporated with the university, at Heidelberg. Here he met his subsequent antagonists, Bucer and Frecht, with whom he seems to have attended the Augsburg conference (October 1518) at which Luther declared himself a true son of the Church. He afterwards reckoned the Leipzig disputation (June-July 1519) and the burning of the papal bull (December 1520) as the beginning of the Reformation. Having taken priest's orders, he held in 1524 a cure in the neighbourhood of Augsburg, but soon (1525) went over to the Reformed party at Nuremberg and became preacher at Gustenfelden. His first work (finished September 1527) was a German translation with additions (1528) of the first part of the *Diallage*, or *Conciliatio locorum Scripturae*, directed against Sacramentarians and Anabaptists by Andrew Althamer, then deacon of St Sebald's at Nuremberg. On the 17th of March 1528 he married Ottilie Beham, a gifted lady, whose brothers, pupils of Albrecht Dürer, had got into trouble through Anabaptist leanings. In the same year he wrote a very popular treatise against drunkenness. In 1529 he produced a free version (*Klagbrief der armen Dürftigen in England*) of the famous *Supplycacyon of the Beggers*, written abroad (1528?) by Simon Fish. Franck, in his preface, says the original was in English; elsewhere he says it was in Latin; the theory that his German was really the original is unwarrantable. Advance in his religious ideas led him to seek the freer atmosphere of Strassburg in the autumn of 1529. To his translation (1530) of a Latin *Chronicle and Description* of Turkey, by a Transylvanian captive, which had been prefaced by Luther, he added an appendix holding up the Turks as in many respects an example to Christians, and presenting, in lieu of the restrictions of Lutheran, Zwinglian and Anabaptist sects, the vision of an invisible spiritual church, universal in its scope. To this ideal he remained faithful. At Strassburg began his intimacy with Caspar Schwenkfeld, a congenial spirit. Here, too, he published, in 1531, his most important work, the *Chronica, Zeitbuch und Geschichtsbibel*, largely a compilation on the basis of the Nuremberg Chronicle (1493), and in its treatment of social and religious questions connected with the Reformation, exhibiting a strong sympathy with heretics, and an unexampled fairness to all kinds of freedom in opinion. It is too much to call him "the first of German historians"; he is a forerunner of Gottfried Arnold, with more vigour and directness of purpose. Driven from Strassburg by the authorities, after a short imprisonment in December 1531, he tried to make a living in 1532 as a soapboiler at Esslingen, removing in 1533 for a better market to Ulm, where (October 28, 1534) he was admitted as a burgess.

His *Weltbuch*, a supplement to his *Chronica*, was printed at Tübingen in 1534; the publication, in the same year, of his *Paradoxa* at Ulm brought him into trouble with the authorities. An order for his banishment was withdrawn on his promise to submit future works for censure. Not interpreting this as applying to works printed outside Ulm, he published in 1538 at Augsburg his *Guldin Arch* (with pagan parallels to Christian sentiments) and at Frankfort his *Germaniae chronicon*, with the result that he had to leave Ulm in January 1539. He seems henceforth to have had no settled abode. At Basel he found work as a printer, and here, probably, it was that he died in the winter of 1542–1543. He had published in 1539 his *Kriegbüchlein des Friedens* (pseudonymous), his *Schrifftliche und ganz gründliche Auslegung des 64 Psalms*, and his *Das verbütschierte mit sieben Siegeln verschlossene Buch* (a biblical index, exhibiting the dissonance of Scripture); in 1541 his *Spruchwörter* (a collection of proverbs, several times reprinted with variations); in 1542 a new edition of his *Paradoxa*; and some smaller works.

Franck combined the humanist's passion for freedom with the mystic's devotion to the religion of the spirit. His breadth of human sympathy led him to positions which the comparative study of religions has made familiar, but for which his age was unprepared. Luther contemptuously dismissed him as a "devil's mouth." Pastor Frecht of Nuremberg pursued him with bitter zeal. But his courage did not fail him, and in his last year, in a public Latin letter, he exhorted his friend John Campanus to maintain freedom of thought in face of the charge of heresy.

See Hegler, in Hauck's *Realencyklopädie* (1899); C. A. Hase, *Sebastian Franck von Wörd* (1869); J. F. Smith, in *Theological Review* (April 1874); E. Tausch, *Sebastian Franck von Donauwörth und seine Lehrer* (1893). (A. Go.*)

FRANCKE, AUGUST HERMANN (1663–1727), German Protestant divine, was born on the 22nd of March 1663 at Lübeck. He was educated at the gymnasium in Gotha, and afterwards at the universities of Erfurt, Kiel, where he came under the influence of the pietist Christian Kortholt (1633–1694), and Leipzig. During his student career he made a special study of Hebrew and Greek; and in order to learn Hebrew more thoroughly, he for some time put himself under the instructions of Rabbi Ezra Edzardi at Hamburg. He graduated at Leipzig, where in 1685 he became a *Privatdozent*. A year later, by the help of his friend P. Anton, and with the approval and encouragement of P. J. Spener, he founded the Collegium Philobiblicum, at which a number of graduates were accustomed to meet for the systematic study of the Bible, philologically and practically. He next passed some months at Lüneburg as assistant or curate to the learned superintendent, C. H. Sandhagen (1630–1697), and there his religious life was remarkably quickened and deepened. On leaving Lüneburg he spent some time in Hamburg, where he became a teacher in a private school, and made the acquaintance of Nikolaus Lange (1659–1720). After a long visit to Spener,

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who was at that time a court preacher in Dresden, he returned to Leipzig in the spring of 1689, and began to give Bible lectures of an exegetical and practical kind, at the same time resuming the Collegium Philobiblicum of earlier days. He soon became popular as a lecturer; but the peculiarities of his teaching almost immediately aroused a violent opposition on the part of the university authorities; and before the end of the year he was interdicted from lecturing on the ground of his alleged pietism. Thus it was that Francke's name first came to be publicly associated with that of Spener, and with pietism. Prohibited from lecturing in Leipzig, Francke in 1690 found work at Erfurt as "deacon" of one of the city churches. Here his evangelistic fervour attracted multitudes to his preaching, including Roman Catholics, but at the same time excited the anger of his opponents; and the result of their opposition was that after a ministry of fifteen months he was commanded by the civil authorities (27th of September 1691) to leave Erfurt within forty-eight hours. The same year witnessed the expulsion of Spener from Dresden.

In December, through Spener's influence, Francke accepted an invitation to fill the chair of Greek and oriental languages in the new university of Halle, which was at that time being organized by the elector Frederick III. of Brandenburg; and at the same time, the chair having no salary attached to it, he was appointed pastor of Glaucha in the immediate neighbourhood of the town. He afterwards became professor of theology. Here, for the next thirty-six years, until his death on the 8th of June 1727, he continued to discharge the twofold office of pastor and professor with rare energy and success. At the very outset of his labours he had been profoundly impressed with a sense of his responsibility towards the numerous outcast children who were growing up around him in ignorance and crime. After a number of tentative plans, he resolved in 1695 to institute what is often called a "ragged school," supported by public charity. A single room was at first sufficient, but within a year it was found necessary to purchase a house, to which another was added in 1697. In 1698 there were 100 orphans under his charge to be clothed and fed, besides 500 children who were taught as day scholars. The schools grew in importance and are still known as the *Francke'sche Stiftungen*. The education given was strictly religious. Hebrew was included, while the Greek and Latin classics were neglected; the *Homilies* of Macarius took the place of Thucydides. The same principle was consistently applied in his university teaching. Even as professor of Greek he had given great prominence in his lectures to the study of the Scriptures; but he found a much more congenial sphere when, in 1698, he was appointed to the chair of theology. Yet his first courses of lectures in that department were readings and expositions of the Old and New Testament; and to this, as also to hermeneutics, he always attached special importance, believing that for theology a sound exegesis was the one indispensable requisite. "Theologus nascitur in scripturis," he used to say; but during his occupancy of the theological chair he lectured at various times upon other branches of theology also. Amongst his colleagues were Paul Anton (1661–1730), Joachim J. Breithaupt (1658–1732) and Joachim Lange (1670–1744),—men like-minded with himself. Through their influence upon the students, Halle became a centre from which pietism (*q.v.*) became very widely diffused over Germany.

His principal contributions to theological literature were: *Manuductio ad lectionem Scripturae Sacrae* (1693); *Praelectiones hermeneuticae* (1717); *Commentatio de scopo librorum Veteris et Novi Testamenti* (1724); and *Lectiones paraeneticae* (1726–1736). The *Manuductio* was translated into English in 1813, under the title *A Guide to the Reading and Study of the Holy Scriptures*. An account of his orphanage, entitled *Segensvolle Fussstapfen*, &c. (1709), which subsequently passed through several editions, has also been partially translated, under the title *The Footsteps of Divine Providence: or, The bountiful Hand of Heaven defraying the Expenses of Faith*. See H. E. F. Guericke's *A. H. Francke* (1827), which has been translated into English (*The Life of A. H. Francke*, 1837); Gustave Kramer's *Beitrage zur Geschichte A. H. Francke's* (1861), and *Neue Beitrage* (1875); A. Stein, *A. H. Francke* (3rd ed., 1894); article in Herzog-Hauck's *Realencyklopadie* (ed. 1899); Knuth, *Die Francke'schen Stiftungen* (2nd ed., 1903).

FRANCKEN. Eleven painters of this family cultivated their art in Antwerp during the 16th and 17th centuries. Several of these were related to each other, whilst many bore the same Christian name in succession. Hence unavoidable confusion in the subsequent classification of paintings not widely differing in style or execution. When Franz Francken the first found a rival in Franz Francken the second, he described himself as the "elder," in contradistinction to his son, who signed himself the "younger." But when Franz the second was threatened with competition from Franz the third, he took the name of "the elder," whilst Franz the third adopted that of Franz "the younger."

It is possible, though not by any means easy, to sift the works of these artists. The eldest of the Franckens, Nicholas of Herenthals, died at Antwerp in 1596, with nothing but the reputation of having been a painter. None of his works remain. He bequeathed his art to three children. Jerom Francken, the eldest son, after leaving his father's house, studied under Franz Floris, whom he afterwards served as an assistant, and wandered, about 1560, to Paris. In 1566 he was one of the masters employed to decorate the palace of Fontainebleau, and in 1574 he obtained the appointment of court painter from Henry III., who had just returned from Poland and visited Titian at Venice. In 1603, when Van Mander wrote his biography of Flemish artists, Jerom Francken was still in Paris living in the then aristocratic Faubourg St Germain. Among his earliest works we should distinguish a "Nativity" in the Dresden museum, executed in co-operation with Franz Floris. Another of his important pieces is the "Abdication of Charles V." in the Amsterdam museum. Equally interesting is a "Portrait of a Falconer," dated 1558, in the Brunswick gallery. In style these pieces all recall Franz Floris. Franz, the second son of Nicholas of Herenthals, is to be kept in memory as Franz Francken the first. He was born about 1544, matriculated at Antwerp in 1567, and died there in 1616. He, too, studied under Floris, and never settled abroad, or lost the hard and gaudy style which he inherited from his master. Several of his pictures are in the museum of Antwerp; one dated 1597 in the Dresden museum represents "Christ on the Road to Golgotha," and is signed by him as D. ō (Den ouden) F. Franck. Ambrose, the third son of Nicholas of Herenthals, has bequeathed to us more specimens of his skill than Jerom or Franz the first. He first started as a partner with Jerom at Fontainebleau, then he returned to Antwerp, where he passed for his gild in 1573, and he lived at Antwerp till 1618. His best works are the "Miracle of the Loaves and Fishes" and the "Martyrdom of St Crispin," both large and ambitious compositions in the Antwerp museum. In both these pieces a fair amount of power is displayed, but marred by want of atmosphere and shadow or by hardness of line and gaudiness of tone. There is not a trace in the three painters named of the influence of the revival which took place under the lead of Rubens. Franz Francken the first trained three sons to his profession, the eldest of whom, though he practised as a master of gild at Antwerp from 1600 to 1610, left no visible trace of his labours behind. Jerom the second took service with his uncle Ambrose. He was born in 1578, passed for his gild in 1607, and in 1620 produced that curious picture of "Horatius Codes defending the Sublician Bridge" which still hangs in the Antwerp museum. The third son of Franz Francken the first is Franz Francken the second, who signed himself in pictures till 1616 "the younger," from 1630 till his death "the elder." F. Francken. These pictures are usually of a small size, and are found in considerable numbers in continental collections. Franz Francken the second was born in 1581. In 1605 he entered the gild, of which he subsequently became the president, and in 1642 he died. His earliest composition is the "Crucifixion" in the Belvedere at Vienna, dated 1606. His latest compositions as "the younger" F. Francken are the "Adoration of the Virgin" (1616) in the gallery of Amsterdam, and the "Woman taken in Adultery" (1628) in Dresden. From 1616 to 1630 many of his pieces are signed F. Francken; then come the "Seven Works of Charity" (1630) at Munich, signed "the elder F. F.," the "Prodigal Son"

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(1633) at the Louvre, and other almost countless examples. It is in F. Francken the second's style that we first have evidence of the struggle which necessarily arose when the old customs, hardened by Van Orley and Floris, or Breughel and De Vos, were swept away by Rubens. But F. Francken the second, as before observed, always clung to small surfaces; and though he gained some of the freedom of the moderns, he lost but little of the dryness or gaudiness of the earlier Italo-Flemish revivalists. F. Francken the third, the last of his name who deserves to be recorded, passed in the Antwerp gild in 1639 and died at Antwerp in 1667. His practice was chiefly confined to adding figures to the architectural or landscape pieces of other artists. As Franz Pourbus sometimes put in the portrait figures for Franz Francken the second, so Franz Francken the third often introduced the necessary personages into the works of Pieter Neefs the younger (museums of St Petersburg, Dresden and the Hague). In a "Moses striking the Rock," dated 1654, of the Augsburg gallery, this last of the Franckens signs D. ō (Den ouden) F. Franck. In the pictures of this artist we most clearly discern the effects of Rubens's example.

FRANCO-GERMAN WAR (1870–1871). The victories of Prussia in 1866 over the Austrians and their German allies (see SEVEN WEEKS' WAR) rendered it evident to the statesmen and soldiers of France that a struggle between the two nations could only be a question of time. Army reforms were at once undertaken, and measures were initiated in France to place the armament and equipment of the troops on a level with the requirements of the times. The chassepot, a new breech-loading rifle, immensely superior to the Prussian needle-gun, was issued; the artillery trains were thoroughly overhauled, and a new machine-gun, the *mitrailleuse*, from which much was expected, introduced. Wide schemes of reorganization (due mainly to Marshal Niel) were set in motion, and, since these required time to mature, recourse was had to foreign alliances in the hope of delaying the impending rupture. In the first week of June 1870, General Lebrun, as a confidential agent of the emperor Napoleon III., was sent to Vienna to concert a plan of joint operations with Austria against Prussia. Italy was also to be included in the alliance, and it was agreed that in case of hostilities the French armies should concentrate in northern Bavaria, where the Austrians and Italians were to join them, and the whole immense army thus formed should march via Jena on Berlin. To what extent Austria and Italy committed themselves to this scheme remains uncertain, but that the emperor Napoleon believed in their *bona fides* is beyond doubt.

Whether the plan was betrayed to Prussia is also uncertain, and almost immaterial, for Moltke's plans were based on an accurate estimate of the time it would take Austria to mobilize and on the effect of a series of victories on French soil. At any rate Moltke was not taken into Bismarck's confidence in the affair of Ems in July 1870, and it is to be presumed that the chancellor had already satisfied himself that the schemes of operations prepared by the chief of the General Staff fully provided against all eventualities. These schemes were founded on Clausewitz's view of the objects to be pursued in a war against France—in the first place the defeat of the French field armies and in the second the occupation of Paris. On these lines plans for the strategic deployment of the Prussian army were prepared by the General Staff and kept up to date year by year as fresh circumstances (*e.g.* the co-operation of the minor German armies) arose and new means of communication came into existence. The campaign was actually opened on a revise of 1868–1869, to which was added, on the 6th of May 1870, a secret memorandum for the General Staff.

Under the German organization then existing the preliminary to all active operations was of necessity full and complete mobilization. Then followed transport by road and rail to the line selected for the "strategic deployment," and it was essential that no part of these operations should be disturbed by action on the part of the enemy. But no such delay imposed itself of necessity upon the French, and a vigorous offensive was so much in harmony with their traditions that the German plan had to be framed so as to meet such emergencies. On the whole, Moltke concluded that the enemy could not undertake this offensive before the eighth day after mobilization. At that date about five French army corps (150,000 men) could be collected near Metz, and two corps (70,000) near Strassburg; and as it was six days' march from Metz to the Rhine, no serious attack could be delivered before the fourteenth day, by which day it could be met by superior forces near Kirchheimbolanden. Since, however, the transport of the bulk of the Prussian forces could not begin till the ninth day, their ultimate line of detrainment need not be fixed until the French plans were disclosed, and, as it was important to strike at the earliest moment possible, the deployment was provisionally fixed to be beyond the Rhine on the line Wittlich-Neunkirchen-Landau. Of the thirteen North German corps three had to be left behind to guard the eastern frontier and the coast, one other, the VIII., was practically on the ground already and could concentrate by road, and the remaining nine were distributed to the nine through railway lines available. These ten corps were grouped in three armies, and as the French might violate Belgian neutrality or endeavour to break into southern Germany, two corps (Prussian Guard and Saxon XII. corps) were temporarily held back at a central position around Mainz, whence they could move rapidly up or down the Rhine valley. If Belgian neutrality remained unmolested, the reserve would join the III. army on the left wing, giving it a two to one superiority over its adversary; all three armies would then wheel to the right and combine in an effort to force the French army into a decisive battle on the Saar on or about the twenty-third day. As in this wheel the army on the right formed the pivot and was required only to stand fast, two corps only were allotted to it; two corps for the present formed the III. army, and the remaining five were assigned to the II. army in the centre.

Strategic deployment of the German armies.

When (16th-17th July) the South German states decided to throw in their lot with the rest, their three corps were allotted to the III. army, the Guards and Saxons to the II. army, whilst the three corps originally left behind were finally distributed one to each army, so that up to the investment of Metz the order of battle was as follows:

Headquarters:

The king of Prussia (General v. Moltke, chief of staff).

I. Army: General v. Steinmetz (C. of S., v. Sperling)
- (I. corps, v. Manteuffel)
- VII. " v. Zastrow
- VIII. " v. Goeben
- (1st) and 3rd cavalry divisions

Total . . 85,000

II. Army: Prince Frederick Charles (C. of S., v. Stiehle)
- Guard Pr. August of Württemberg
- (II. corps, v. Fransecky)
- III. " v. Alvensleben II.
- IV. " v. Alvensleben I.
- IX. " v. Manstein
- X. " v. Voigts-Rhetz
- XII. " (Saxons) crown prince of Saxony
- 5th and 6th cavalry divisions

Total . . 210,000

III. Army: crown prince of Prussia (C. of S., v. Blumenthal)
- V. corps, v. Kirchbach
- (VI.) " v. Tümpling
- XI. " v. Bose
- I. Bavarian, v. der Tann
- II. " v. Hartmann
- Württemberg div. } v. Werder
- Baden div. }
- (2nd) and 4th cavalry divisions

Total . . 180,000

Grand Total . . 475,000

(The units within brackets were those at first retained in Germany.)

On the French side no such plan of operations was in existence when on the night of the 15th of July *Krieg mobil* was telegraphed all over Prussia. An outline scheme had indeed been prepared as a basis for agreement with Austria and Italy, but practically no details were fixed, and the troops were without transport and supplies. Nevertheless, since speed was the essence of the contract, the troops

Positions of the French forces.

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were hurried up without waiting for their reserves, and delivered, as Moltke had foreseen, just where the lie of the railways and convenience of temporary supply dictated, and the Prussian Intelligence Department was able to inform Moltke on the 22nd of July (seventh day of mobilization) that the French stood from right to left in the following order, on or near the frontier:

1st corps	. .	Marshal MacMahon, duke of Magenta, Strassburg
5th corps	. .	General de Failly, Saargemund and Bitche
2nd corps	. .	General Frossard, St Avold
4th corps	. .	General de Ladmirault, Thionville
		With, behind them:
3rd corps	. .	Marshal Bazaine, Metz
Guard	. . .	General Bourbaki, Nancy
6th corps	. .	Marshal Canrobert, Châlons
7th corps	. .	General Félix Douay, Belfort

If therefore they began a forward movement on the 23rd (eighth day) the case foreseen by Moltke had arisen, and it became necessary to detrain the II. army upon the Rhine. Without waiting for further confirmation of this intelligence, Moltke, with the consent of the king, altered the arrangements accordingly, a decision which, though foreseen, exercised the gravest influence on the course of events. As it happened this decision was premature, for the French could not yet move. Supply trains had to be organized by requisition from the inhabitants, and even arms and ammunition procured for such reserves as had succeeded in joining. Nevertheless, by almost superhuman exertions on the part of the railways and administrative services, all essential deficiencies were made good, and by the 28th or July (13th day) the troops had received all that was absolutely indispensable and might well have been led against the enemy, who, thanks to Moltke's premature action, were for the moment at a very serious disadvantage. But the French generals were unequal to their responsibilities. It is now clear that, had the great Napoleon and his marshals been in command, they would have made light of the want of cooking pots, cholera belts, &c., and, by a series of rapid marches, would have concentrated odds of at least three to one upon the heads of the Prussian columns as they struggled through the defiles of the Hardt, and won a victory whose political results might well have proved decisive.

To meet this pressing danger, which came to his knowledge during the course of the 29th, Moltke sent a confidential staff officer, Colonel v. Verdy du Vernois, to the III. army to impress upon the crown prince the necessity of an immediate advance to distract the enemy's attention from the I. and II. armies; but, like the French generals, the crown prince pleaded that he could not move until his trains were complete. Fortunately for the Germans, the French intelligence service not only failed to inform the staff of this extraordinary opportunity, but it allowed itself to be hypnotized by the most amazing rumours. In imagination they saw armies of 100,000 men behind every forest, and, to guard against these dangers, the French troops were marched and counter-marched along the frontiers in the vain hope of discovering an ideal defensive position which should afford full scope to the power of their new weapons.

As these delays were exerting a most unfavourable effect on public opinion not only in France but throughout Europe, the emperor decided on the 1st of August to initiate a movement towards the Saar, chiefly as a guarantee of good faith to the Austrians and Italians.

On this day the French corps held the following positions from right to left:

1st corps	. .	Hagenau
2nd corps	. .	Forbach
3rd corps	. .	St Avold
4th corps	. .	Bouzonville
5th corps	. .	Bitche
6th corps	. .	Châlons
7th corps	. .	Belfort and Colmar
Guard	. . .	near Metz

The French 2nd corps was directed to advance on the following morning direct on Saarbrücken, supported on the flanks by two divisions from the 5th and 3rd corps. The order was duly carried out, and the Prussians (one battalion, two squadrons and a battery), seeing the overwhelming numbers opposed to them, fell back fighting and vanished to the northward, having given a very excellent example of steadiness and discipline to their enemy.[1]. The latter contented themselves by occupying Saarbrücken and its suburb St Johann, and here, as far as the troops were concerned, the incident closed. Its effect, however, proved far-reaching. The Prussian staff could not conceive that nothing lay behind this display of five whole divisions, and immediately took steps to meet the expected danger. In their excitement, although they had announced the beginning of the action to the king's headquarters at Mainz, they forgot to notify the close and its results, so that Moltke was not in possession of the facts till noon on the 3rd of August. Meanwhile, Steinmetz, left without instructions and fearing for the safety of the II. army, the heads of whose columns were still in the defiles of the Hardt, moved the I. army from the neighbourhood of Merzig obliquely to his left front, so as to strike the flank of the French army if it continued its march towards Kaiserslautern, in which direction it appeared to be heading.

Action of Saarbrücken.

Whilst this order was in process of execution, Moltke, aware that the II. army was behind time in its march, issued instructions to Steinmetz for the 4th of August which entailed a withdrawal to the rear, the idea being that both armies should, if the French advanced, fight a defensive battle in a selected position farther back. Steinmetz obeyed, though bitterly resenting the idea of retreat. This movement, further, drew his left across the roads reserved for the right column of the II. army, and on receipt of a peremptory order from Prince Frederick Charles to evacuate the road, Steinmetz telegraphed for instructions direct to the king, over Moltke's head. In reply he received a telegram from Moltke, ordering him to clear the road at once, and couched in terms which he considered as a severe reprimand. An explanatory letter, meant to soften the rebuke, was delayed in transmission and did not reach him till too late to modify the orders he had already issued. It must be remembered that Steinmetz at the front was in a better position to judge the apparent situation than was Moltke at Mainz, and that all through the day of the 5th of August he had received intelligence indicating a change of attitude in the French army.

Moltke, Prince Frederick Charles and Steinmetz.

The news of the German victory at Weissenburg on the 4th (see below) had in fact completely paralysed the French headquarters, and orders were issued by them during the course of the 5th to concentrate the whole army of the Rhine on the selected position of Cadenbronn. As a preliminary, Frossard's corps withdrew from Saarbrücken and began to entrench a position on the Spicheren heights, 3000 yds. to the southward. Steinmetz, therefore, being quite unaware of the scheme for a great battle on the Saar about the 12th of August, felt that the situation would best be met, and the letter of his instructions strictly obeyed, by moving his whole command forward to the line of the Saar, and orders to this effect were issued on the evening of the 5th. In pursuance of these orders, the advance guard of the 14th division (Lieutenant General von Kamcke) reached Saarbrücken about 9 A.M. on the 6th, where the Germans found to their amazement that the bridges were intact. To secure this advantage was the obvious duty of the commander on the spot, and he at once ordered his troops to occupy a line of low heights beyond the town to serve as a bridge-head. As the leading troops deployed on the heights Frossard's guns on the Spicheren Plateau opened fire, and the advanced guard battery replied. The sound of these guns unchained the whole fighting instinct carefully developed by a long course of Prussian manœuvre training. Everywhere generals and troops hurried towards the cannon thunder. Kameke, even more in the dark than Steinmetz as to Moltke's intentions and the strength of his adversaries, attacked at once, precisely as he would have done at manœuvres, and in half an hour his men were committed beyond recall. As each fresh unit reached the field it was hurried into action where its services

Battle of Spicheren.

[1] This was the celebrated "baptême de feu" of the prince imperial.

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were most needed, and each fresh general as he arrived took a new view of the combat and issued new orders. On the other side, Frossard, knowing the strength of his position, called on his neighbours for support, and determined to hold his ground. Victory seemed certain. There were sufficient troops within easy reach to have ensured a crushing numerical superiority. But the other generals had not been trained to mutual support, and thought only of their own immediate security, and their staffs were too inexperienced to act upon even good intentions; and, finding himself in the course of the afternoon left to his own devices, Frossard began gradually to withdraw, even before the pressure of the 13th German division on his left flank (about 8 P.M.) compelled his retirement. When darkness ended the battle the Prussians were scarcely aware of their victory. Steinmetz, who had reached the field about 6 P.M., rode back to his headquarters without issuing any orders, while the troops bivouacked where they stood, the units of three army corps being mixed up in almost inextricable confusion. But whereas out of 47,000 Prussians with 120 guns, who in the morning lay within striking distance of the enemy, no fewer than 27,000, with 78 guns were actually engaged; of the French, out of 64,000 with 210 guns only 24,000 with 90 guns took part in the action.

Meanwhile on the German left wing the III. army had begun its advance. Early on the 4th of August it crossed the frontier and fell upon a French detachment under Abel Douay, which had been placed near Weissenburg, partly to cover the Pigeonnier pass, but principally to consume the supplies accumulated in the little dismantled fortress, as these could not easily be moved. Against this force of under 4000 men of all arms, the Germans brought into action successively portions of three corps, in all over 25,000 men with 90 guns. After six hours' fighting, in which the Germans lost some 1500 men, the gallant remnant of the French withdrew deliberately and in good order, notwithstanding the death of their leader at the critical moment. The Germans were so elated by their victory over the enemy, whose strength they naturally overestimated, that they forgot to send cavalry in pursuit, and thus entirely lost touch with the enemy.

Action of Weissenburg.

Next day the advance was resumed, the two Bavarian corps moving via Mattstall through the foothills of the Vosges, the V. corps on their left towards Preuschdorf, and the XI. farther to the left again, through the wooded plain of the Rhine valley. The 4th cavalry division scouted in advance, and army headquarters moved to Sulz. About noon the advanced patrols discovered MacMahon's corps in position on the left bank of the Sauer (see WÖRTH: *Battle of*). As his army was dispersed over a wide area, the crown prince determined to devote the 6th to concentrating the troops, and, probably to avoid alarming the enemy, ordered the cavalry to stand fast.

At night the outposts of the I. Bavarians and V. corps on the Sauer saw the fires of the French encampment and heard the noise of railway traffic, and rightly conjectured the approach of reinforcements. MacMahon had in fact determined to stand in the very formidable position he had selected, and he counted on receiving support both from the 7th corps (two divisions of which were being railed up from Colmar) and from the 5th corps, which lay around Bitche. It was also quite possible, and the soundest strategy, to withdraw the bulk of the troops then facing the German I. and II. armies to his support, and these would reach him by the 8th. He was therefore justified in accepting battle, though it was to his interest to delay it as long as possible.

At dawn on the 6th of August the commander of the V. corps outposts noticed certain movements in the French lines, and to clear up the situation brought his guns into action. As at Spicheren, the sound of the guns set the whole machinery of battle in motion. The French artillery immediately accepted the Prussian challenge. The I. Bavarians, having been ordered to be ready to move if they heard artillery fire, immediately advanced against the French left, encountering presently such a stubborn resistance that parts of their line began to give way. The Prussians of the V. corps felt that they could not abandon their allies, and von Kirchbach, calling on the XI. corps for support, attacked with the troops at hand. When the crown prince tried to break off the fight it was too late. Both sides were feeding troops into the firing line, as and where they could lay hands on them. Up to 2 P.M. the French fairly held their own, but shortly afterwards their right yielded to the overwhelming pressure of the XI. corps, and by 3.30 it was in full retreat. The centre held on for another hour, but in its turn was compelled to yield, and by 4.30 all organized resistance was at an end. The débris of the French army was hotly pursued by the German divisional squadrons towards Reichshofen, where serious panic showed itself. When at this stage the supports sent by de Failly from Bitche came on the ground they saw the hopelessness of intervention, and retired whence they had come. Fortunately for the French, the German 4th cavalry division, on which the pursuit should have devolved, had been forgotten by the German staff, and did not reach the front before darkness fell. Out of a total of 82,000 within reach of the battlefield, the Germans succeeded in bringing into action 77,500. The French, who might have had 50,000 on the field, deployed only 37,000, and these suffered a collective loss of no less than 20,100; some regiments losing up to 90% and still retaining some semblance of discipline and order.

Battle of Wörth.

Under cover of darkness the remnants of the French army escaped. When at length the 4th cavalry division had succeeded in forcing a way through the confusion of the battlefield, all touch with the enemy had been lost, and being without firearms the troopers were checked by the French stragglers in the woods and the villages, and thus failed to establish the true line of retreat of the French. Ultimately the latter, having gained the railway near Lunéville, disappeared from the German front altogether, and all trace of them was lost until they were discovered, about the 26th of August, forming part of the army of Châlons, whither they had been conveyed by rail via Paris. This is a remarkable example of the strategical value of railways to an army operating in its own country.

In the absence of all resistance, the III. army now proceeded to carry out the original programme of marches laid down in Moltke's memorandum of the 6th of May, and marching on a broad front through a fertile district it reached the line of the Moselle in excellent order about the 17th of August, where it halted to await the result of the great battle of Gravelotte-St Privat.

We return now to the I. army at Saarbrücken. Its position on the morning of the 7th of August gave cause for the gravest anxiety. At daylight a dense fog lay over the country, and through the mist sounds of heavy firing came from the direction of Forbach, where French stragglers had rallied during the night. The confusion on the battlefield was appalling, and the troops in no condition to go forward. Except the 3rd, 5th and 6th cavalry divisions no closed troops were within a day's march; hence Steinmetz decided to spend the day in reorganizing his infantry, under cover of his available cavalry. But the German cavalry and staff were quite new to their task. The 6th cavalry division, which had bivouacked on the battlefield, sent on only one brigade towards Forbach, retaining the remainder in reserve. The 5th, thinking that the 6th had already undertaken all that was necessary, withdrew behind the Saar, and the 3rd, also behind the Saar, reported that the country in its front was unsuited to cavalry movements, and only sent out a few officers' patrols. These were well led, but were too few in number, and their reports were consequently unconvincing.

Movements on the Saar.

In the course of the day Steinmetz became very uneasy, and ultimately he decided to concentrate his army by retiring the VII. and VIII. corps behind the river on to the I. (which had arrived near Saarlouis), thus clearing the Saarbrücken-Metz road for the use of the II. army. But at this moment Prince Frederick Charles suddenly modified his views. During the 6th of August his scouts had reported considerable French forces near Bitche (these were the 5th, de Failly's corps), and early in the morning of the 7th he received a telegram from Moltke

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informing him that MacMahon's beaten army was retreating on the same place (the troops observed were in fact those which had marched to MacMahon's assistance). The prince forthwith deflected the march of the Guards, IV. and X. corps, towards Rohrbach, whilst the IX. and XII. closed up to supporting distance behind them. Thus, as Steinmetz moved away to the west and north, Frederick Charles was diverging to the south and east, and a great gap was opening in the very centre of the German front. This was closed only by the III. corps, still on the battle-field, and by portions of the X. near Saargemünd,[1] whilst within striking distance lay 130,000 French troops, prevented only by the incapacity of their chiefs from delivering a decisive counter-stroke.

Fortunately for the Prussians, Moltke at Mainz took a different view. Receiving absolutely no intelligence from the front during the 7th, he telegraphed orders to the I. and II. armies (10.25 P.M.) to halt on the 8th, and impressed on Steinmetz the necessity of employing his cavalry to clear up the situation. The I. army had already begun the marches ordered by Steinmetz. It was now led back practically to its old bivouacs amongst the unburied dead. Prince Frederick Charles only conformed to Moltke's order with the III. and X. corps; the remainder executed their concentration towards the south and east.

During the night of the 7th of August Moltke decided that the French army must be in retreat towards the Moselle and forthwith busied himself with the preparation of fresh tables of march for the two armies, his object being to swing up the left wing to outflank the enemy from the south. This work, and the transfer of headquarters to Homburg, needed time, hence no fresh orders were issued to either army, and neither commander would incur the responsibility of moving without any. The I. army therefore spent a fourth night in bivouac on the battle-field. But Constantin von Alvensleben, commanding the III. corps, a man of very different stamp from his colleagues, hearing at first hand that the French had evacuated St Avold, set his corps in motion early in the morning of the 10th August down the St Avold-Metz road, reached St Avold and obtained conclusive evidence that the French were retreating.

During the 9th the orders for the advance to the Moselle were issued. These were based, not on an exact knowledge of where the French army actually stood, but on the opinion Moltke had formed as to where it ought to have been on military grounds solely, overlooking the fact that the French staff were not free to form military decisions but were compelled to bow to political expediency.

Advance to the Moselle.

Actually on the 7th of August the emperor had decided to attack the Germans on the 8th with the whole Rhine Army, but this decision was upset by alarmist reports from the beaten army of MacMahon. He then decided to retreat to the Moselle, as Moltke had foreseen, and there to draw to himself the remnants of MacMahon's army (now near Lunéville). At the same time he assigned the executive command over the whole Rhine Army to Marshal Bazaine. This retreat was begun during the course of the 8th and 9th of August; but on the night of the 9th urgent telegrams from Paris induced the emperor to suspend the movement, and during the 10th the whole army took up a strong position on the French Nied.

Meanwhile the II. German army had received its orders to march in a line of army corps on a broad front in the general direction of Pont-à-Mousson, well to the south of Metz. The I. army was to follow by short marches in échelon on the right; only the III. corps was directed on Falkenberg, a day's march farther towards Metz along the St Avold-Metz road. The movement was begun on the 10th, and towards evening the French army was located on the right front of the III. corps. This entirely upset Moltke's hypothesis, and called for a complete modification of his plans, as the III. corps alone could not be expected to resist the impact of Bazaine's five corps. The III. corps therefore received orders to stand fast for the moment, and the remainder of the II. army was instructed to wheel to the right and concentrate for a great battle to the east of Metz on the 16th or 17th.

Before, however, these orders had been received the sudden retreat of the French completely changed the situation. The Germans therefore continued their movement towards the Moselle. On the 13th the French took up a fresh position 5 m. to the east of Metz, where they were located by the cavalry and the advanced guards of the I. army.

Again Moltke ordered the I. army to observe and hold the enemy, whilst the II. was to swing round to the north. The cavalry was to scout beyond the Moselle and intercept all communication with the heart of France (see Metz). By this time the whole German army had imbibed the idea that the French were in full retreat and endeavouring to evade a decisive struggle. When therefore during the morning of the 14th their outposts observed signs of retreat in the French position, their impatience could no longer be restrained; as at Wörth and Spicheren, an outpost commander brought up his guns, and at the sound of their fire, every unit within reach spontaneously got under arms (battle of Colombey-Borny). In a short time, with or without orders, the I., VII., VIII. and IX. corps were in full march to the battle-field. But the French too turned back to fight, and an obstinate engagement ensued, at the close of which the Germans barely held the ground and the French withdrew under cover of the Metz forts.

Battle of Colombey-Borny.

Still, though the fighting had been indecisive, the conviction of victory remained with the Germans, and the idea of a French retreat became an obsession. To this idea Moltke gave expression in his orders issued early on the 15th, in which he laid down that the "fruits of the victory" of the previous evening could only be reaped by a vigorous pursuit towards the passages of the Meuse, where it was hoped the French might yet be overtaken. This order, however, did not allow for the hopeless inability of the French staff to regulate the movement of congested masses of men, horses and vehicles, such as were now accumulated in the streets and environs of Metz. Whilst Bazaine had come to no definite decision whether to stand and fight or continue to retreat, and was merely drifting under the impressions of the moment, the Prussian leaders, in particular Prince Frederick Charles, saw in imagination the French columns in rapid orderly movement towards the west, and calculated that at best they could not be overtaken short of Verdun.

In this order of ideas the whole of the II. army, followed on its right rear by two-thirds of the I. army (the I. corps being detached to observe the eastern side of the fortress), were pushed on towards the Moselle, the cavalry far in advance towards the Meuse, whilst only the 5th cavalry division was ordered to scout towards the Metz-Verdun road, and even that was disseminated over far too wide an area.

Later in the day (15th) Frederick Charles sent orders to the III. corps, which was on the right flank of his long line of columns and approaching the Moselle at Corny and Novéant, to march via Gorze to Mars-la-Tour on the Metz-Verdun road; to the X. corps, strung out along the road from Thiaucourt to Pont-à-Mousson, to move to Jarny; and for the remainder to push on westward to seize the Meuse crossings. No definite information as to the French army reached him in time to modify these instructions.

Meanwhile the 5th (Rheinbaben's) cavalry division, at about 3 P.M. in the afternoon, had come into contact with the French cavalry in the vicinity of Mars-la-Tour, and gleaned intelligence enough to show that no French infantry had as yet reached Rezonville. The commander of the X. corps at Thiaucourt, informed of this, became anxious for the security of his flank during the next day's march and decided to push out a strong flanking detachment under von Caprivi, to support von Rheinbaben and maintain touch with the III. corps marching on his right rear.

Von Alvensleben, to whom the 6th cavalry division had meanwhile been assigned, seems to have received no local intelligence whatsoever; and at daybreak on the 16th he began his march

[1] The II. corps had not yet arrived from Germany.

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in two columns, by the 6th division on Mars-la-Tour, the 5th towards the Rezonville-Vionville plateau. And shortly after 9.15 A.M. he suddenly discovered the truth. The entire French army lay on his right flank, and his nearest supports were almost a day's march distant. In this crisis he made up his mind at once to attack with every available man, and to continue to attack, in the conviction that his audacity would serve to conceal his weakness. All day long, therefore, the Brandenburgers of the III. corps, supported ultimately by the X. corps and part of the IX., attacked again and again. The enemy was thrice their strength, but very differently led, and made no adequate use of his superiority (battle of Vionville-Mars-la Tour).

Battle of Vionville-Mars-la-Tour.

Meanwhile Prince Frederick Charles, at Pont-à-Mousson, was still confident in the French retreat to the Meuse, and had even issued orders for the 17th on that assumption. Firing had been heard since 9.15 A.M., and about noon Alvensleben's first report had reached him, but it was not till after 2 that he realized the situation. Then, mounting his horse, he covered the 15 m. to Flavigny over crowded and difficult roads within the hour, and on his arrival abundantly atoned for his strategic errors by his unconquerable determination and tactical skill. When darkness put a stop to the fighting, he considered the position. Cancelling all previous orders, he called all troops within reach to the battle-field and resigned himself to wait for them. The situation was indeed critical. The whole French army of five corps, only half of which had been engaged, lay in front of him. His own army lay scattered over an area of 30 m. by 20, and only some 20,000 fresh troops—of the IX. corps—could reach the field during the forenoon of the 17th. He did not then know that Moltke had already intervened and had ordered the VII., VIII. and II. corps[1] to his assistance. Daylight revealed the extreme exhaustion of both men and horses. The men lay around in hopeless confusion amongst the killed and wounded, each where sleep had overtaken him, and thus the extent of the actual losses, heavy enough, could not be estimated. Across the valley, bugle sounds revealed the French already alert, and presently a long line of skirmishers approached the Prussian position. But they halted just beyond rifle range, and it was soon evident that they were only intended to cover a further withdrawal. Presently came the welcome intelligence that the reinforcements were well on their way.

The 17th of August.

About noon the king and Moltke drove up to the ground, and there was an animated discussion as to what the French would do next. Aware of their withdrawal from his immediate front, Prince Frederick Charles reverted to his previous idea and insisted that they were in full retreat towards the north, and that their entrenchments near Point du Jour and St Hubert (see map in article METZ) were at most a rearguard position. Moltke was inclined to the same view, but considered the alternative possibility of a withdrawal towards Metz, and about 2 P.M. orders were issued to meet these divergent opinions. The whole army was to be drawn up at 6 A.M. on the 18th in an échelon facing north, so as to be ready for action in either direction. The king and Moltke then drove to Pont-à-Mousson, and the troops bivouacked in a state of readiness. The rest of the 17th was spent in restoring order in the shattered III. and X. corps, and by nightfall both corps were reported fit for action. Strangely enough, there were no organized cavalry reconnaissances, and no intelligence of importance was collected during the night of the 17th-18th.

Early on the 18th the troops began to move into position in the following order from left to right: XII. (Saxons), Guards, IX., VIII. and VII. The X. and III. were retained in reserve.

The idea of the French retreat was still uppermost in the prince's mind, and the whole army therefore moved north. But between 10 and 11 A.M. part of the truth—viz. that the French had their backs to Metz and stood in battle order from St Hubert northwards—became evident, and the II. army, pivoting on the I., wheeled to the right and moved eastward. Suddenly the IX. corps fell right on the centre of the French line (Amanvillers), and a most desperate encounter began, superior control, as before, ceasing after the guns had opened fire. Prince Frederick Charles, however, a little farther north, again asserted his tactical ability, and about 7 P.M. he brought into position no less than five army corps for the final attack. The sudden collapse of French resistance, due to the frontal attack of the Guards (St Privat) and the turning movement of the Saxons (Roncourt), rendered the use of this mass unnecessary, but the resolution to use it was there. On the German right (I. army), about Gravelotte, all superior leading ceased quite early in the afternoon, and at night the French still showed an unbroken front. Until midnight, when the prince's victory was reported, the suspense at headquarters was terrible. The I. army was exhausted, no steps had been taken to ensure support from the III. army, and the IV. corps (II. army) lay inactive 30 m. away.

Battle of Gravelotte-Saint Privat.

This seems a fitting place to discuss the much-disputed point of Bazaine's conduct in allowing himself to be driven back into Metz when fortune had thrown into his hands the great opportunity of the 16th and 17th of August. He had been appointed to command on the 10th, but the presence of the emperor, who only left the front early on the 16th, and their dislike of Bazaine, exercised a disturbing influence on the headquarters staff officers. During the retreat to Metz the marshal had satisfied himself as to the inability of his corps commanders to handle their troops, and also as to the ill-will of the staff. In the circumstances he felt that a battle in the open field could only end in disaster; and, since it was proved that the Germans could outmarch him, his army was sure to be overtaken and annihilated if he ventured beyond the shelter of the fortress. But near Metz he could at least inflict very severe punishment on his assailants, and in any case his presence in Metz would neutralize a far superior force of the enemy for weeks or months. What use the French government might choose to make of the breathing space thus secured was their business, not his; and subsequent events showed that, had they not forced MacMahon's hand, the existence of the latter's nucleus army of trained troops might have prevented the investment of Paris. Bazaine was condemned by court-martial after the war, but if the case were reheard to-day it is certain that no charge of treachery could be sustained.

Bazaine in Metz.

On the German side the victory at St Privat was at once followed up by the headquarters. Early on the 19th the investment of Bazaine's army in Metz was commenced. A new army, the Army of the Meuse (often called the IV.), was as soon as possible formed of all troops not required for the maintenance of the investment, and marched off under the command of the crown prince of Saxony to discover and destroy the remainder of the French field army, which at this moment was known to be at Châlons.

The operations which led to the capture of MacMahon's army in Sedan call for little explanation. Given seven corps, each capable of averaging 15 m. a day for a week in succession, opposed to four corps only, shaken by defeat and unable as a whole to cover more than 5 m. a day, the result could hardly be doubtful. But Moltke's method of conducting operations left his opponent many openings which could only be closed by excessive demands on the marching power of the men. Trusting only to his cavalry screen to secure information, he was always without any definite fixed point about which to manœuvre, for whilst the reports of the screen and orders based thereon were being transmitted, the enemy was free to move, and generally their movements were dictated by political expediency, not by calculable military motives.

Campaign of Sedan.

Thus whilst the German army, on a front of nearly 50 m., was marching due west on Paris, MacMahon, under political pressure, was moving parallel to them, but on a northerly route, to attempt the relief of Metz.

[1] Of the I. army the I. corps was retained on the east side of Metz. The II. corps belonged to the II. army, but had not yet reached the front.

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So unexpected was this move and so uncertain the information which called attention to it, that Moltke did not venture to change at once the direction of march of the whole army, but he directed the Army of the Meuse northward on Damvillers and ordered Prince Frederick Charles to detach two corps from the forces investing Metz to reinforce it. For the moment, therefore, MacMahon's move had succeeded, and the opportunity existed for Bazaine to break out. But at the critical moment the hopeless want of real efficiency in MacMahon's army compelled the latter so to delay his advance that it became evident to the Germans that there was no longer any necessity for the III. army to maintain the direction towards Paris, and that the probable point of contact between the Meuse army and the French lay nearer to the right wing of the III. army than to Prince Frederick Charles's investing force before Metz.

The detachment from the II. army was therefore countermanded, and the whole III. army changed front to the north, while the Meuse army headed the French off from the east. The latter came into contact with the head of the French columns, during the 29th, about Nouart, and on the 30th at Buzancy (battle of Beaumont); and the French, yielding to the force of numbers combined with superior moral, were driven northwestward upon Sedan (*q.v.*), right across the front of the III. army, which was now rapidly coming up from the south.

During the 31st the retreat practically became a rout, and the morning of the 1st of September found the French crowded around the little fortress of Sedan, with only one line of retreat to the north-west still open. By 11 A.M. the XI. corps (III. army) had already closed that line, and about noon the Saxons (Army of the Meuse) moving round between the town and the Belgian frontier joined hands with the XI., and the circle of investment was complete. The battle of Sedan was closed about 4.15 P.M. by the hoisting of the white flag. Terms were agreed upon during the night, and the whole French army, with the emperor, passed into captivity. (F. N. M.)

Later operations.

Thus in five weeks one of the French field armies was imprisoned in Metz, the other destroyed, and the Germans were free to march upon Paris. This seemed easy. There could be no organized opposition to their progress,[1] and Paris, if not so defenceless as in 1814, was more populous. Starvation was the best method of attacking an overcrowded fortress, and the Parisians were not thought to be proof against the deprivation of their accustomed luxuries. Even Moltke hoped that by the end of October he would be "shooting hares at Creisau," and with this confidence the German III. and IV. armies left the vicinity of Sedan on the 4th of September. The march called for no more than good staff arrangements, and the two armies arrived before Paris a fortnight later and gradually encircled the place—the III. army on the south, the IV. on the north side—in the last days of September. Headquarters were established at Versailles. Meanwhile the Third Empire had fallen, giving place on the 4th of September to a republican Government of National Defence, which made its appeal to, and evoked, the spirit of 1792. Henceforward the French nation, which had left the conduct of the war to the regular army and had been little more than an excited spectator, took the burden upon itself.

The regular army, indeed, still contained more than 500,000 men (chiefly recruits and reservists), and 50,000 sailors, marines, douaniers, &c., were also available. But the Garde Mobile, framed by Marshal Niel in 1868, doubled this figure, and the addition of the Garde Nationale, called into existence on the 15th of September, and including all able-bodied men of from 31 to 60 years of age, more than trebled it. The German staff had of course to reckon on the Garde Mobile, and did so beforehand, but they wholly underestimated both its effective members and its willingness, while, possessing themselves a system in which all the military elements of the German nation stood close behind the troops of the active army, they ignored the potentialities of the Garde Nationale.

Meanwhile, both as a contrast to the events that centred on Paris and because in point of time they were decided for the most part in the weeks immediately following Sedan, we must briefly allude to the sieges conducted by the Germans—Paris (*q.v.*), Metz (*q.v.*) and Belfort (*q.v.*) excepted. Old and ruined as many of them were, the French fortresses possessed considerable importance in the eyes of the Germans. Strassburg, in particular, the key of Alsace, the standing menace to South Germany and the most conspicuous of the spoils of Louis XIV.'s *Raubkriege*, was an obvious target. Operations were begun on the 9th of August, three days after Wörth, General v. Werder's corps (Baden troops and Prussian Landwehr) making the siege. The French commandant, General Uhrich, surrendered after a stubborn resistance on the 28th of September. Of the smaller fortresses many, being practically unarmed and without garrisons, capitulated at once. Toul, defended by Major Huck with 2000 mobiles, resisted for forty days, and drew upon itself the efforts of 13,000 men and 100 guns. Verdun, commanded by General Guérin de Waldersbach, held out till after the fall of Metz. Some of the fortresses lying to the north of the Prussian line of advance on Paris, *e.g.* Mézières, resisted up to January 1871, though of course this was very largely due to the diminution of pressure caused by the appearance of new French field armies in October. On the 9th of September a strange incident took place at the surrender of Laon. A powder magazine was blown up by the soldiers in charge and 300 French and a few German soldiers were killed by the explosion. But as the Germans advanced, their lines of communication were thoroughly organized, and the belt of country between Paris and the Prussian frontier subdued and garrisoned. Most of these fortresses were small town enceintes, dating from Vauban's time, and open, under the new conditions of warfare, to concentric bombardment from positions formerly out of range, upon which the besieger could place as many guns as he chose to employ. In addition they were usually deficient in armament and stores and garrisoned by newly-raised troops. Belfort, where the defenders strained every nerve to keep the besiegers out of bombarding range, and Paris formed the only exceptions to this general rule.

The "Defence Nationale."

The policy of the new French government was defined by Jules Favre on the 6th of September. "It is for the king of Prussia, who has declared that he is making war on the Empire and not on France, to stay his hand; we shall not cede an inch of our territory or a stone of our fortresses." These proud words, so often ridiculed as empty bombast, were the prelude of a national effort which re-established France in the eyes of Europe as a great power, even though provinces and fortresses were ceded in the peace that that effort proved unable to avert. They were translated into action by Léon Gambetta, who escaped from Paris in a balloon on the 7th of October, and established the headquarters of the defence at Tours, where already the "Delegation" of the central government—which had decided to remain in Paris—had concentrated the machinery of government. Thenceforward Gambetta and his principal assistant de Freycinet directed the whole war in the open country, co-ordinating it, as best they could with the precarious means of communication at their disposal, with Trochu's military operations in and round the capital. His critics—Gambetta's personality was such as to ensure him numerous enemies among the higher civil and military officials, over whom, in the interests of *La Patrie*, he rode rough-shod—have acknowledged the fact, which is patent enough in any case, that nothing but Gambetta's driving energy enabled France in a few weeks to create and to equip twelve army corps, representing thirty-six divisions (600,000 rifles and 1400 guns), after all her organized regular field troops had been destroyed or neutralized. But it is claimed that by undue interference with the generals at the front, by presuming to dictate their plans of campaign, and by forcing them to act when the troops were unready, Gambetta and de Freycinet nullified the efforts of themselves and the rest of the nation and subjected France

[1] The 13th corps (Vinoy), which had followed MacMahon's army at some distance, was not involved in the catastrophe of Sedan, and by good luck as well as good management evaded the German pursuit and returned safely to Paris.

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to a humiliating treaty of peace. We cannot here discuss the justice or injustice of such a general condemnation, or even whether in individual instances Gambetta trespassed too far into the special domain of the soldier. But even the brief narrative given below must at least suggest to the reader the existence amongst the generals and higher officials of a dead weight of passive resistance to the Delegation's orders, of unnecessary distrust of the qualities of the improvised troops, and above all of the utter fear of responsibility that twenty years of literal obedience had bred. The closest study of the war cannot lead to any other conclusion than this, that whether or not Gambetta as a strategist took the right course in general or in particular cases, no one else would have taken any course whatever.

On the approach of the enemy Paris hastened its preparations for defence to the utmost, while in the provinces, out of reach of the German cavalry, new army corps were rapidly organized out of the few constituted regular units not involved in the previous catastrophes, the depot troops and the mobile national guard. The first-fruits of these efforts were seen in Beauce, where early in October important masses of French troops prepared not only to bar the further progress of the invader but actually to relieve Paris. The so-called "fog of war"—the armed inhabitants, francs-tireurs, sedentary national guard and volunteers—prevented the German cavalry from venturing far out from the infantry camps around Paris, and behind this screen the new 15th army corps assembled on the Loire. But an untimely demonstration of force alarmed the Germans, all of whom, from Moltke downwards, had hitherto disbelieved in the existence of the French new formations, and the still unready 15th corps found itself the target of an expedition of the I. Bavarian corps, which drove the defenders out of Orleans after a sharp struggle, while at the same time another expedition swept the western part of Beauce, sacked Châteaudun as a punishment for its brave defence, and returned via Chartres, which was occupied.

After these events the French forces disappeared from German eyes for some weeks. D'Aurelle de Paladines, the commander of the "Army of the Loire" (15th and 16th corps), improvised a camp of instruction at Salbris in Sologne, several marches out of reach, and subjected his raw troops to a stern régime of drill and discipline. At the same time an "Army of the West" began to gather on the side of Le Mans. This army was almost imaginary, yet rumours of its existence and numbers led the German commanders into the gravest errors, for they soon came to suspect that the main army lay on that side and not on the Loire, and this mistaken impression governed the German dispositions up to the very eve of the decisive events around Orleans in December. Thus when at last D'Aurelle took the offensive from Tours (whither he had transported his forces, now 100,000 strong) against the position of the I. Bavarian corps near Orleans, he found his task easy. The Bavarians, outnumbered and unsupported, were defeated with heavy losses in the battle of Coulmiers (November 9), and, had it not been for the inexperience, want of combination, and other technical weaknesses of the French, they would have been annihilated. What the results of such a victory as Coulmiers might have been, had it been won by a fully organized, smoothly working army of the same strength, it is difficult to overestimate. As it was, the retirement of the Bavarians rang the alarm bell all along the line of the German positions, and that was all.

Then once again, instead of following up its success, the French army disappeared from view. The victory had emboldened the "fog of war" to make renewed efforts, and resistance to the pressure of the German cavalry grew day by day. The Bavarians were reinforced by two Prussian divisions and by all available cavalry commands, and constituted as an "army detachment" under the grand-duke Friedrich Franz of Mecklenburg-Schwerin to deal with the Army of the Loire, the strength of which was far from being accurately known. Meantime the capitulation of Metz on the 28th of October had set free the veterans of Prince Frederick Charles, the best troops in the German army, for field operations. The latter were at first misdirected to the upper Seine, and yet another opportunity arose for the French to raise the siege of Paris. But D'Aurelle utilized the time he had gained in strengthening the army and in imparting drill and discipline to the new units which gathered round the original nucleus of the 15th and 16th corps. All this was, however, unknown and even unsuspected at the German headquarters, and the invaders, feeling the approaching crisis, became more than uneasy as to their prospects of maintaining the siege of Paris.

The Orleans campaign.

At this moment, in the middle of November, the general situation was as follows: the German III. and Meuse armies, investing Paris, had had to throw off important detachments to protect the enterprise, which they had undertaken on the assumption that no further field armies of the enemy were to be encountered. The maintenance of their communications with Germany, relatively unimportant when the struggle took place in the circumstances of field warfare, had become supremely necessary, now that the army had come to a standstill and undertaken a great siege, which required heavy guns and constant replenishment of ammunition and stores. The rapidity of the German invasion had left no time for the proper organization and full garrisoning of these communications, which were now threatened, not merely by the Army of the Loire, but by other forces assembling on the lines protected by Langres and Belfort. The latter, under General Cambriels, were held in check and no more by the Baden troops and reserve units (XIV. German corps) under General Werder, and eventually without arousing attention they were able to send 40,000 men to the Army of the Loire. This army, still around Orleans, thus came to number perhaps 150,000 men, and opposed to it, about the 14th of November, the Germans had only the Army Detachment of about 40,000, the II. army being still distant. It was under these conditions that the famous Orleans campaign took place. After many vicissitudes of fortune, and with many misunderstandings between Prince Frederick Charles, Moltke and the grand-duke, the Germans were ultimately victorious, thanks principally to the brilliant fighting of the X. corps at Beaune-la-Rolande (28th of November), which was followed by the battle of Loigny-Poupry on the 2nd of December and the second capture of Orleans after heavy fighting on the 4th of December.

The result of the capture of Orleans was the severance of the two wings of the French army, henceforward commanded respectively by Chanzy and Bourbaki. The latter fell back at once and hastily, though not closely pursued, to Bourges. But Chanzy, opposing the Detachment between Beaugency and the Forest of Marchenoir, was of sterner metal, and in the five days' general engagement around Beaugency (December 7-11) the Germans gained little or no real advantage. Indeed their solitary material success, the capture of Beaugency, was due chiefly to the fact that the French there were subjected to conflicting orders from the military and the governmental authorities. Chanzy then abandoned little but the field of battle, and on the grand-duke's representations Prince Frederick Charles, leaving a mere screen to impose upon Bourbaki (who allowed himself to be deceived and remained inactive), hurried thither with the II. army. After that Chanzy was rapidly driven north-westward, though always presenting a stubborn front. The Delegation left Tours and betook itself to Bordeaux, whence it directed the government for the rest of the war. But all this continuous marching and fighting, and the growing severity of the weather, compelled Prince Frederick Charles to call a halt for a few days. About the 19th of December, therefore, the Germans (II. army and Detachment) were closed up in the region of Chartres, Orleans, Auxerre and Fontainebleau, Chanzy along the river Sarthe about Le Mans and Bourbaki still passive towards Bourges.

During this, as during other halts, the French government and its generals occupied themselves with fresh plans of campaign, the former with an eager desire for results, the latter (Chanzy excepted) with many misgivings. Ultimately, and

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fatally, it was decided that Bourbaki, whom nothing could move towards Orleans, should depart for the south-east, with a view to relieving Belfort and striking perpendicularly against the long line of the Germans' communications. This movement, bold to the point of extreme rashness judged by any theoretical rules of strategy, seems to have been suggested by de Freycinet. As the execution of it fell actually into incapable hands, it is difficult to judge what would have been the result had a Chanzy or a Faidherbe been in command of the French. At any rate it was vicious in so far as immediate advantages were sacrificed to hopes of ultimate success which Gambetta and de Freycinet did wrong to base on Bourbaki's powers of generalship. Late in December, for good or evil, Bourbaki marched off into Franche-Comté and ceased to be a factor in the Loire campaign. A mere calculation of time and space sufficed to show the German headquarters that the moment had arrived to demolish the stubborn Chanzy.

Prince Frederick Charles resumed the interrupted offensive, pushing westward with four corps and four cavalry divisions which converged on Le Mans. There on the 10th, 11th and 12th of January 1871 a stubbornly contested battle ended with the retreat of the French, who owed their defeat solely to the misbehaviour of the Breton mobiles. These, after deserting their post on the battlefield at a mere threat of the enemy's infantry, fled in disorder and infected with their terrors the men in the reserve camps of instruction, which broke up in turn. But Chanzy, resolute as ever, drew off his field army intact towards Laval, where a freshly raised corps joined him. The prince's army was far too exhausted to deliver another effective blow, and the main body of it gradually drew back into better quarters, while the grand duke departed for the north to aid in opposing Faidherbe. Some idea of the strain to which the invaders had been subjected may be gathered from the fact that army corps, originally 30,000 strong, were in some cases reduced to 10,000 and even fewer bayonets. And at this moment Bourbaki was at the head of 120,000 men! Indeed, so threatening seemed the situation on the Loire, though the French south of that river between Gien and Blois were mere isolated brigades, that the prince hurried back from Le Mans to Orleans to take personal command. A fresh French corps, bearing the number 25, and being the twenty-first actually raised during the war, appeared in the field towards Blois. Chanzy was again at the head of 136,000 men. He was about to take the offensive against the 40,000 Germans left near Le Mans when to his bitter disappointment he received the news of the armistice. "We have still France," he had said to his staff, undeterred by the news of the capitulation of Paris, but now he had to submit, for even if his improvised army was still cheerful, there were many significant tokens that the people at large had sunk into apathy and hoped to avoid worse terms of peace by discontinuing the contest at once.

Le Mans.

So ended the critical period of the "Défense nationale." It may be taken to have lasted from the day of Coulmiers to the last day of Le Mans, and its central point was the battle of Beaune-la-Rolande. Its characteristics were, on the German side, inadequacy of the system of strategy practised, which became palpable as soon as the organs of reconnaissance met with serious resistance, misjudgment of and indeed contempt for the fighting powers of "new formations," and the rise of a spirit of ferocity in the man in the ranks, born of his resentment at the continuance of the war and the ceaseless sniping of the franc-tireur's rifle and the peasant's shot-gun. On the French side the continual efforts of the statesmen to stimulate the generals to decisive efforts, coupled with actual suggestions as to the plans of the campaign to be followed (in default, be it said, of the generals themselves producing such plans), and the professional soldiers' distrust of half-trained troops, acted and reacted upon one another in such a way as to neutralize the powerful, if disconnected and erratic, forces that the war and the Republic had unchained. As for the soldiers themselves, their most conspicuous qualities were their uncomplaining endurance of fatigues and wet bivouacs, and in action their capacity for a single great effort and no more. But they were unreliable in the hands of the veteran regular general, because they were heterogeneous in recruiting, and unequal in experience and military qualities, and the French staff in those days was wholly incapable of moving masses of troops with the rapidity demanded by the enemy's methods of war, so that on the whole it is difficult to know whether to wonder more at their missing success or at their so nearly achieving it.

The decision, as we have said, was fought out on the Loire and the Sarthe. Nevertheless the glorious story of the "Défense nationale" includes two other important campaigns—that of Faidherbe in the north and that of Bourbaki in the east.

In the north the organization of the new formations was begun by Dr Testelin and General Farre. Bourbaki held the command for a short time in November before proceeding to Tours, but the active command in field operations came into the hands of Faidherbe, a general whose natural powers, so far from being cramped by years of peace routine and court repression, had been developed by a career of pioneer warfare and colonial administration. General Farre was his capable chief of staff. Troops were raised from fugitives from Metz and Sedan, as well as from depot troops and the Garde Mobile, and several minor successes were won by the national troops in the Seine valley, for here, as on the side of the Loire, mere detachments of the investing army round Paris were almost powerless. But the capitulation of Metz came too soon for the full development of these sources of military strength, and the German I. army under Manteuffel, released from duty at Metz, marched north-eastward, capturing the minor fortresses on its way. Before Faidherbe assumed command, Farre had fought several severe actions near Amiens, but, greatly outnumbered, had been defeated and forced to retire behind the Somme. Another French general, Briand, had also engaged the enemy without success near Rouen. Faidherbe assumed the command on the 3rd of December, and promptly moved forward. A general engagement on the little river Hallue (December 23), east-north-east of Amiens, was fought with no decisive results, but Faidherbe, feeling that his troops were only capable of winning victories in the first rush, drew them off on the 24th. His next effort, at Bapaûme (January 2-3, 1871), was more successful, but its effects were counterbalanced by the surrender of the fortress of Péronne (January 9) and the consequent establishment of the Germans on the line of the Somme. Meanwhile the Rouen troops had been contained by a strong German detachment, and there was no further chance of succouring Paris from the north. But Faidherbe, like Chanzy, was far from despair, and in spite of the deficiencies of his troops in equipment (50,000 pairs of shoes, supplied by English contractors, proved to have paper soles), he risked a third great battle at St Quentin (January 19). This time he was severely defeated, though his loss in killed and wounded was about equal to that of the Germans, who were commanded by Goeben. Still the attempt of the Germans to surround him failed and he drew off his forces with his artillery and trains unharmed. The Germans, who had been greatly impressed by the solidity of his army, did not pursue him far, and Faidherbe was preparing for a fresh effort when he received orders to suspend hostilities.

Faidherbe's campaign.

The last episode is Bourbaki's campaign in the east, with its mournful close at Pontarlier. Before the crisis of the last week of November, the French forces under General Crémer, Cambriels' successor, had been so far successful in minor enterprises that, as mentioned above, the right wing of the Loire army, severed from the left by the battle of Orleans and subsequently held inactive at Bourges and Nevers, was ordered to Franche Comté to take the offensive against the XIV. corps and other German troops there, to relieve Belfort and to strike a blow across the invaders' line of communications. But there were many delays in execution. The staff work, which was at no time satisfactory in the French armies of 1870, was complicated by the snow, the bad state of the roads, and the mountainous nature of the country, and Bourbaki, a brave general of division in action,

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but irresolute and pretentious as a commander in chief, was not the man to cope with the situation. Only the furious courage and patient endurance of hardships of the rank and file, and the good qualities of some of the generals, such as Clinchant, Crémer and Billot, and junior staff officers such as Major Brugère (afterwards generalissimo of the French army), secured what success was attained.

The campaign in the East.

Werder, the German commander, warned of the imposing concentration of the French, evacuated Dijon and Dôle just in time to avoid the blow and rapidly drew together his forces behind the Ognon above Vesoul. A furious attack on one of his divisions at Villersexel (January 9) — cost him 2000 prisoners as well as his killed and wounded, and Bourbaki, heading for Belfort, was actually nearer to the fortress than the Germans. But at the crisis more time was wasted, Werder (who had almost lost hope of maintaining himself and had received both encouragement and stringent instructions to do so) slipped in front of the French, and took up a long weak line of defence on the river Lisaine, almost within cannon shot of Belfort. The cumbrous French army moved up and attacked him there with 150,000 against 60,000 (January 15-17, 1871). It was at last repulsed, thanks chiefly to Bourbaki's inability to handle his forces, and, to the bitter disappointment of officers and men alike, he ordered a retreat, leaving Belfort to its fate.

Ere this, so urgent was the necessity of assisting Werder, Manteuffel had been placed at the head of a new Army of the South. Bringing two corps from the I. army opposing Faidherbe and calling up a third from the armies around Paris, and a fourth from the II. army, Manteuffel hurried southward by Langres to the Saône. Then, hearing of Werder's victory on the Lisaine, he deflected the march so as to cut off Bourbaki's retreat, drawing off the left flank guard of the latter (commanded with much *éclat* and little real effect by Garibaldi) by a sharp feint attack on Dijon. The pressure of Werder in front and Manteuffel in flank gradually forced the now thoroughly disheartened French forces towards the Swiss frontier, and Bourbaki, realizing at once the ruin of his army and his own incapacity to re-establish its efficiency, shot himself, though not fatally, on the 26th of January. Clinchant, his successor, acted promptly enough to remove the immediate danger, but on the 29th he was informed of the armistice without at the same time being told that Belfort and the eastern theatre of war had been on Jules Favre's demand expressly excepted from its operation.[1] Thus the French, the leaders distracted by doubts and the worn-out soldiers fully aware that the war was practically over, stood still, while Manteuffel completed his preparations for hemming them in. On the 1st of February General Clinchant led his troops into Switzerland, where they were disarmed, interned and well cared for by the authorities of the neutral state. The rearguard fought a last action with the advancing Germans before passing the frontier. On the 16th, by order of the French government, Belfort capitulated, but it was not until the 11th of March that the Germans took possession of Bitche, the little fortress on the Vosges, where in the early days of the war de Failly had illustrated so signally the want of concerted action and the neglect of opportunities which had throughout proved the bane of the French armies.

The losses of the Germans during the whole war were 28,000 dead and 101,000 wounded and disabled, those of the French, 156,000 dead (17,000 of whom died, of sickness and wounds, as prisoners in German hands) and 143,000 wounded and disabled. 720,000 men surrendered to the Germans or to the authorities of neutral states, and at the close of the war there were still 250,000 troops on foot, with further resources not immediately available to the number of 280,000 more. In this connexion, and as evidence of the respective numerical yields of the German system working normally and of the French improvised for the emergency, we quote from Berndt (*Zahl im Kriege*) the following comparative figures:—

End of July	French 250,000,	Germans 384,000	under arms.
Middle of November	„ 300,000	„ 425,000	„
After the surrender of Paris and the disarmament of Bourbaki's army	„ 534,000	„ 835,000	„

The date of the armistice was the 28th of January, and that of the ratification of the treaty of Frankfurt the 23rd of May 1871.

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(C. F. A.)

[1] Jules Favre, it appears, neglected to inform Gambetta of the exception.

FRANÇOIS DE NEUFCHÂTEAU, NICOLAS LOUIS, COUNT (1750–1828), French statesman and poet, was born at Saffais near Rozières in Lorraine on the 17th of April 1750, the son of a school-teacher. He studied at the Jesuit college of Neufchâteau in the Vosges, and at the age of fourteen published a volume of poetry which obtained the approbation of Rousseau and of Voltaire. Neufchâteau conferred on him its name, and he was elected member of some of the principal academies of France. In 1783 he was named *procureur-général* to the council of Santo Domingo. He had previously been engaged on a translation of Ariosto, which he finished before his return to France five years afterwards, but it perished during the shipwreck which occurred during his voyage home. After the Revolution he was elected deputy *suppléant* to the National Assembly, was charged with the organization of the Department of the Vosges, and was elected later to the Legislative Assembly, of which he became successively secretary and vice-president. In 1793 he was imprisoned on account of the political sentiments, in reality very innocent, of his drama *Pamela ou la vertu récompensée* (Théâtre de la Nation, 1st August 1793), but was set free a few days afterwards at the revolution of the 9th Thermidor. In 1797 he became minister of the interior, in which office he distinguished himself by the thoroughness of his administration in all departments. It is to him that France owes its system of inland navigation. He inaugurated the museum of the Louvre,

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and was one of the promoters of the first universal exhibition of industrial products. From 1804 to 1806 he was president of the Senate, and in that capacity the duty devolved upon him of soliciting Napoleon to assume the title of emperor. In 1808 he received the dignity of count. Retiring from public life in 1814, he occupied himself chiefly in the study of agriculture, until his death on the 10th of January 1828.

François de Neufchâteau had very multifarious accomplishments, and interested himself in a great variety of subjects, but his fame rests chiefly on what he did as a statesman for the encouragement and development of the industries of France. His maturer poetical productions did not fulfil the promise of those of his early years, for though some of his verses have a superficial elegance, his poetry generally lacks force and originality. He had considerable qualifications as a grammarian and critic, as is witnessed by his editions of the *Provinciales* and *Pensées* of Pascal (Paris, 1822 and 1826) and *Gil Blas* (Paris, 1820). His principal poetical works are *Poésies diverses* (1765); *Ode sur les parlements* (1771); *Nouveaux Contes moraux* (1781); *Les Vosges* (1796); *Fables et contes* (1814); and *Les Tropes, ou les figures de mots* (1817). He was also the author of a large number of works on agriculture.

See *Recueil des lettres, circulaires, discours et autres actes publics émanés du Cte. François pendant ses deux exercices du ministère de l'intérieur* (Paris, An. vii.–viii., 2 vols.); *Notice biographique sur M. le comte François de Neufchâteau* (1828), by A. F. de Sillery; H. Bonnelier, *Mémoires sur François de Neufchâteau* (Paris, 1829); J. Lamoureux, *Notice historique et littéraire sur la vie et les écrits de François de Neufchâteau* (Paris, 1843); E. Meaume, *Étude historique et biographique sur les Lorrains révolutionnaires: Palissot, Grégoire, François de Neufchâteau* (Nancy, 1882); Ch. Simian, *François de Neufchâteau et les expositions* (Paris, 1889).

FRANCONIA (Ger. *Franken*), the name of one of the stem-duchies of medieval Germany. It stretched along the valley of the Main from the Rhine to Bohemia, and was bounded on the north by Saxony and Thuringia, and on the south by Swabia and Bavaria. It also included a district around Mainz, Spires and Worms, on the left bank of the Rhine. The word *Franconia*, first used in a Latin charter of 1053, was applied like the words *France*, *Francia* and *Franken*, to a portion of the land occupied by the Franks.

About the close of the 5th century this territory was conquered by Clovis, king of the Salian Franks, was afterwards incorporated with the kingdom of Austrasia, and at a later period came under the rule of Charlemagne. After the treaty of Verdun in 843 it became the centre of the East Frankish or German kingdom, and in theory remained so for a long period, and was for a time the most important of the duchies which arose on the ruins of the Carolingian empire. The land was divided into counties, or *gauen*, which were ruled by counts, prominent among whom were members of the families of Conradine and Babenberg, by whose feuds it was frequently devastated. Conrad, a member of the former family, who took the title of "duke in Franconia" about the year 900, was chosen German king in 911 as the representative of the foremost of the German races. Conrad handed over the chief authority in Franconia to his brother Eberhard, who remained on good terms with Conrad's successor Henry I. the Fowler, but rose against the succeeding king, Otto the Great, and was killed in battle in 939, when his territories were divided. The influence of Franconia began to decline under the kings of the Saxon house. It lacked political unity, had no opportunities for extension, and soon became divided into Rhenish Franconia (*Francia rhenensis*, Ger. *Rheinfranken*) and Eastern Franconia (*Francia orientalis*, Ger. *Ostfranken*). The most influential family in Rhenish Franconia was that of the Salians, the head of which early in the 10th century was Conrad the Red, duke of Lorraine, and son-in-law of Otto the Great. This Conrad, his son Otto and his grandson Conrad are sometimes called dukes of Franconia; and in 1024 his great-grandson Conrad, also duke of Franconia, was elected German king as Conrad II. and founded the line of Franconian or Salian emperors. Rhenish Franconia gradually became a land of free towns and lesser nobles, and under the earlier Franconian emperors sections passed to the count palatine of the Rhine, the archbishop of Mainz, the bishops of Worms and Spires and other clerical and lay nobles; and the name Franconia, or *Francia orientalis* as it was then called, was confined to the eastern portion of the duchy. Clerical authority was becoming predominant in this region. A series of charters dating from 822 to 1025 had granted considerable powers to the bishops of Würzburg, who, by the time of the emperor Henry II., possessed judicial authority over the whole of eastern Franconia. The duchy was nominally retained by the emperors in their own hands until 1115, when the emperor Henry V., wishing to curb the episcopal influence in this neighbourhood, appointed his nephew Conrad of Hohenstaufen as duke of Franconia. Conrad's son Frederick took the title of duke of Rothenburg instead of duke of Franconia, but in 1196, on the death of Conrad of Hohenstaufen, son of the emperor Frederick I., the title fell into disuse. Meanwhile the bishop of Würzburg had regained his former power in the duchy, and this was confirmed in 1168 by the emperor Frederick I.

The title remained in abeyance until the early years of the 15th century, when it was assumed by John II., bishop of Würzburg, and retained by his successors until the bishopric was secularized in 1802. The greater part of the lands were united with Bavaria, and the name Franconia again fell into abeyance. It was revived in 1837, when Louis I., king of Bavaria, gave to three northern portions of his kingdom the names of Upper, Middle and Lower Franconia. In 1633 Bernhard, duke of Saxe-Weimar, hoping to create a principality for himself out of the ecclesiastical lands, had taken the title of duke of Franconia, but his hopes were destroyed by his defeat at Nördlingen in 1634. When Germany was divided into circles by the emperor Maximilian I. in 1500, the name Franconia was given to that circle which included the eastern part of the old duchy. The lands formerly comprised in the duchy of Franconia are now divided between the kingdoms of Bavaria and Württemberg, the grand-duchies of Baden and Hesse, and the Prussian province of Hesse-Nassau.

See J. G. ab Eckhart, *Commentarii de rebus Franciae orientalis et episcopatus Wirceburgensis* (Würzburg, 1729); F. Stein, *Geschichte Frankens* (Schweinfurt, 1885–1886); T. Henner, *Die herzogliche Gewalt der Bischöfe von Würzburg* (Würzburg, 1874).

FRANCS-ARCHERS. The institution of the *francs-archers* was the first attempt at the formation of regular infantry in France. They were created by the ordinance of Montils-les-Tours on the 28th of August 1448, which prescribed that in each parish an archer should be chosen from among the most apt in the use of arms; this archer to be exempt from the *taille* and certain obligations, to practise shooting with the bow on Sundays and feast-days, and to hold himself ready to march fully equipped at the first signal. Under Charles VII. the *francs-archers* distinguished themselves in numerous battles with the English, and assisted the king to drive them from France. During the succeeding reigns the institution languished, and finally disappeared in the middle of the 16th century. The *francs-archers* were also called *francs-taupins*.

See Daniel, *Histoire de la milice française* (1721); and E. Boutaric, *Institutions militaires de la France avant les armées permanentes* (1863).

FRANCS-TIREURS ("Free-Shooters"), irregular troops, almost exclusively infantry, employed by the French in the war of 1870–1871. They were originally rifle clubs or unofficial military societies formed in the east of France at the time of the Luxemburg crisis of 1867. The members were chiefly concerned with the practice of rifle-shooting, and were expected in war to act as light troops. As under the then system of conscription the greater part of the nation's military energy was allowed to run to waste, the francs-tireurs were not only popular, but efficient workers in their sphere of action. As they were no uniforms, were armed with the best existing rifles and elected their own officers, the government made repeated attempts to bring the societies, which were at once a valuable asset to the armed strength of France and a possible menace to internal order, under military discipline. This was strenuously resisted by the societies, to their sorrow as it turned out, for the Germans treated

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captured francs-tireurs as irresponsible non-combatants found with arms in their hands and usually exacted the death penalty. In July 1870, at the outbreak of the war, the societies were brought under the control of the minister of war and organized for field service, but it was not until the 4th of November—by which time the *levée en masse* was in force—that they were placed under the orders of the generals in the field. After that they were sometimes organized in large bodies and incorporated in the mass of the armies, but more usually they continued to work in small bands, blowing up culverts on the invaders' lines of communication, cutting off small reconnoitring parties, surprising small posts, &c. It is now acknowledged, even by the Germans, that though the francs-tireurs did relatively little active mischief, they paralysed large detachments of the enemy, contested every step of his advance (as in the Loire campaign), and prevented him from gaining information, and that their soldierly qualities inproved with experience. Their most celebrated feats were the blowing up of the Moselle railway bridge at Fontenoy on the 22nd of January 1871 (see *Les Chasseurs des Vosges* by Lieut.-Colonel St Étienne, Toul, 1906), and the heroic defence of Châteaudun by Lipowski's Paris corps and the francs-tireurs of Cannes and Nantes (October 18, 1870). It cannot be denied that the original members of the rifle clubs were joined by many bad characters, but the patriotism of the majority was unquestionable, for little mercy was shown by the Germans to those francs-tireurs who fell into their hands. The severity of the German reprisals is itself the best testimony to the fear and anxiety inspired by the presence of active bands of francs-tireurs on the flanks and in rear of the invaders.

FRANEKER, a town in the province of Friesland, Holland, 5 m. E. of Harlingen on the railway and canal to Leeuwarden. Pop. (1900) 7187. It was at one time a favourite residence of the Frisian nobility, many of whom had their castles here, and it possessed a celebrated university, founded by the Frisian estates in 1585. This was suppressed by Napoleon I. in 1811, and the endowments were diverted four years later to the support of an athenaeum, and afterwards of a gymnasium, with which a physiological cabinet and a botanical garden are connected. Franeker also possesses a town hall (1591), which contains a *planetarium*, made by one Eise Eisinga in 1774–1781. The fine observatory was founded about 1780. The church of St Martin (1420) contains several fine tombs of the 15th–17th centuries. The industries of the town include silk-weaving, woollen-spinning, shipbuilding and pottery-making. It is also a considerable market for agricultural produce.

FRANK, JAKOB (1726–1791), a Jewish theologian, who founded in Poland, in the middle of the 18th century, a sect which emanated from Judaism but ended by merging with Christianity. The sect was the outcome of the Messianic mysticism of Sabbetai Zebi. It was an antinomian movement in which the authority of the Jewish law was held to be superseded by personal freedom. The Jewish authorities, alarmed at the moral laxity which resulted from the emotional rites of the Frankists, did their utmost to suppress the sect. But the latter, posing as an anti-Talmudic protest in behalf of a spiritual religion, won a certain amount of public sympathy. There was, however, no deep sincerity in the tenets of the Frankists, for though in 1759 they were baptized *en masse*, amid much pomp, the Church soon became convinced that Frank was not a genuine convert. He was imprisoned on a charge of heresy, but on his release in 1763 the empress Maria Theresa patronized him, regarding him as a propagandist of Christianity among the Jews. He thenceforth lived in state as baron of Offenbach, and on his death (1791) his daughter Eva succeeded him as head of the sect. The Frankists gradually merged in the general Christian body, the movement leaving no permanent trace in the synagogue. (I. A.)

FRANK-ALMOIGN (*libera elemosyna*, free alms), in the English law of real property, a species of spiritual tenure, whereby a religious corporation, aggregate or sole, holds lands of the donor to them and their successors for ever. It was a tenure dating from Saxon times, held not on the ordinary feudal conditions, but discharged of all services except the *trinoda necessitas*. But "they which hold in frank-almoign are bound of right before God to make orisons, prayers, masses and other divine services for the souls of their grantor or feoffor, and for the souls of their heirs which are dead, and for the prosperity and good life and good health of their heirs which are alive. And therefore they shall do no fealty to their lord, because that this divine service is better for them before God than any doing of fealty" (Litt. s. 135). It was the tenure by which the greater number of the monasteries and religious houses held their lands; it was expressly exempted from the statute 12 Car. II. c. 24 (1660), by which the other ancient tenures were abolished, and it is the tenure by which the parochial clergy and many ecclesiastical and eleemosynary foundations hold their lands at the present day. As a form of donation, however, it came to an end by the passing of the statute *Quia Emptores*, for by that statute no new tenure of frank-almoign could be created, except by the crown.

See Pollock and Maitland, *History of English Law*, where the history of frank-almoign is given at length.

FRANKEL, ZECHARIAS (1801–1875), Jewish theologian, one of the founders of the Breslau school of "historical Judaism." This school attempts to harmonize critical treatment of the documents of religion with fidelity to traditional beliefs and observances. For a time at least, the compromise succeeded in staying the disintegrating effects of the liberal movement in Judaism. Frankel was the author of several valuable works, among them *Septuagint Studies*, an *Introduction to the Mishnah* (1859), and a similar work on the Palestinian Talmud (1870). He also edited the *Monatsschrift*, devoted to Jewish learning on modern lines. But his chief claim to fame rests on his headship of the Breslau Seminary. This was founded in 1854 for the training of rabbis who should combine their rabbinic studies with secular courses at the university. The whole character of the rabbinate has been modified under the influence of this, the first seminary of the kind. (I. A.)

FRANKENBERG, a manufacturing town of Germany, in the kingdom of Saxony, on the Zschopau, 7 m. N.E. of Chemnitz, on the railway Niederwiesa-Rosswein. Pop. (1905) 13,303. The principal buildings are the large Evangelical parish church, restored in 1874–1875, and the town-hall. Its industries include extensive woollen, cotton and silk weaving, dyeing, the manufacture of brushes, furniture and cigars, iron-founding and machine building. It is well provided with schools, including one of weaving.

FRANKENHAUSEN, a town of Germany, in the principality of Schwarzburg-Rudolstadt, on an artificial arm of the Wipper, a tributary of the Saale, 36 m. N.N.E. of Gotha. Pop. (1905) 6534. It consists of an old and a new town, the latter mostly rebuilt since a destructive fire in 1833, and has an old château of the princes of Schwarzburg, three Protestant churches, a seminary for teachers, a hospital and a modern town-hall. Its industries include the manufacture of sugar, cigars and buttons, and there are brine springs, with baths, in the vicinity. At Frankenhausen a battle was fought on the 15th of May 1525, in which the insurgent peasants under Thomas Münzer were defeated by the allied princes of Saxony and Hesse.

FRANKENSTEIN, a town of Germany, in the Prussian province of Silesia, on the Pausebach, 35 m. S. by W. of Breslau. Pop. (1905) 7890. It is still surrounded by its medieval walls, has two Evangelical and three Roman Catholic churches, among the latter the parish church with a curious overhanging tower, and a monastery. The industries include the manufacture of artificial manures, bricks, beer and straw hats. There are also mills for grinding the magnesite found in the neighbourhood.

FRANKENTHAL, a town of Germany, in the Bavarian Palatinate, on the Isenach, connected with the Rhine by a canal 3 m. in length, 6 m. N.W. from Mannheim, and on the railways Neunkirchen-Worms and Frankenthal-Grosskarlbach. Pop. (1905) 18,191. It has two Evangelical and a Roman Catholic church, a fine medieval town-hall, two interesting old gates, remains of its former environing walls, several public monuments, including one to the veterans of the Napoleonic wars, and a museum. Its industries include the manufacture

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of machinery, casks, corks, soap, dolls and furniture, iron-founding and bell-founding—the famous "Kaiserglocke" of the Cologne cathedral was cast here. Frankenthal was formerly famous for its porcelain factory, established here in 1755 by Paul Anton Hannong of Strassburg, who sold it in 1762 to the elector palatine Charles Theodore. Its fame is mainly due to the modellers Konrad Link (1732–1802) and Johann Peter Melchior (d. 1796) (who worked at Frankenthal between 1779 and 1793). The best products of this factory are figures and groups representing contemporary life, or allegorical subjects in the rococo taste of the period, and they are surpassed only by those of the more famous factory at Meissen. In 1795 the factory was sold to Peter von Reccum, who removed it to Grünstadt.

Frankenthal (Franconodal) is mentioned as a village in the 8th century. A house of Augustinian canons established here in 1119 by Erkenbert, chamberlain of Worms, was suppressed in 1562 by the elector palatine Frederick III., who gave its possessions to Protestant refugees from the Netherlands. In 1577 this colony received town rights from the elector John Casimir, whose successor fortified the place. From 1623 until 1652, save for two years, it was occupied by the Spaniards, and in 1688–1689 it was stormed and burned by the French, the fortifications being razed. In 1697 it was reconstituted as a town, and under the elector Charles Theodore it became the capital of the Palatinate. From 1798 to 1814 it was incorporated in the French department of Mont Tonnerre.

See Wille, *Stadt u. Festung Frankenthal während des dreissigjährigen Krieges* (Heidelberg, 1877); Hildenbrand, *Gesch. der Stadt Frankenthal* (1893). For the porcelain see Heuser, *Frankenthaler Gruppen und Figuren* (Spires, 1899).

FRANKENWALD, a mountainous district of Germany, forming the geological connexion between the Fichtelgebirge and the Thuringian Forest. It is a broad well-wooded plateau, running for about 30 m. in a north-westerly direction, descending gently on the north and eastern sides towards the Saale, but more precipitously to the Bavarian plain in the west, and attaining its highest elevation in the Kieferle near Steinheid (2000 ft.). Along the centre lies the watershed between the basins of the Main and the Saale, belonging to the systems of the Rhine and Elbe respectively. The principal tributaries of the Main from the Frankenwald are the Rodach and Hassiach, and of the Saale, the Selbitz.

See H. Schmid, *Führer durch den Frankenwald* (Bamberg, 1894); Meyer, *Thüringen und der Frankenwald* (15th ed., Leipzig, 1900), and Gümbel, *Geognostische Beschreibung des Fichtelgebirges mit dem Frankenwald* (Gotha, 1879).

FRANKPORT, a city and the county-seat of Clinton county, Indiana, U.S.A., 40 m. N.W. of Indianapolis. Pop. (1890) 5019; (1900) 7100 (144 foreign-born); (1910) 8634. Frankfort is served by the Chicago, Indianapolis & Louisville, the Lake Erie & Western, the Vandalia, and the Toledo, St Louis & Western railways, and by the Indianapolis & North-Western Traction Interurban railway (electric). The city is a division point on the Toledo, St Louis & Western railway, which has large shops here. Frankfort is a trade centre for an agricultural and lumbering region; among its manufactures are handles, agricultural implements and foundry products. The first settlement in the neighbourhood was made in 1826; in 1830 the town was founded, and in 1875 it was chartered as a city. The city limits were considerably extended immediately after 1900.

FRANKFORT, the capital city of Kentucky, U.S.A., and the county-seat of Franklin county, on the Kentucky river, about 55 m. E. of Louisville. Pop. (1890) 7892; (1900) 9487, of whom 3316 were negroes; (1910 census) 10,465. The city is served by the Chesapeake & Ohio, the Louisville & Nashville, and the Frankfort & Cincinnati railways, by the Central Kentucky Traction Co. (electric), and by steamboat lines to Cincinnati, Louisville and other river ports. It is built among picturesque hills on both sides of the river, and is in the midst of the famous Kentucky "blue grass region" and of a rich lumber-producing region. The most prominent building is the Capitol, about 400 ft. long and 185 ft. wide, built of granite and white limestone in the Italian Renaissance style, with 70 large Ionic columns, and a dome 205 ft. above the terrace line, supported by 24 other columns. The Capitol was built in 1905–1907 at a cost of more than $2,000,000; in it are housed the state library and the library of the Kentucky State Historical Society. At Frankfort, also, are the state arsenal, the state penitentiary and the state home for feeble-minded children, and just outside the city limits is the state coloured normal school. The old capitol (first occupied in 1829) is still standing. In Franklin cemetery rest the remains of Daniel Boone and of Theodore O'Hara (1820–1867), a lawyer, soldier, journalist and poet, who served in the U.S. army in 1846–1848 during the Mexican War, took part in filibustering expeditions to Cuba, served in the Confederate army, and is best known as the author of "The Bivouac of the Dead," a poem written for the burial in Frankfort of some soldiers who had lost their lives at Buena Vista. Here also are the graves of Richard M. Johnson, vice-president of the United States in 1837–1841, and the sculptor Joel T. Hart (1810–1877). The city has a considerable trade with the surrounding country, in which large quantities of tobacco and hemp are produced; its manufactures include lumber, brooms, chairs, shoes, hemp twine, canned vegetables and glass bottles. The total value of the city's factory product in 1905 was $1,747,338, being 31·6% more than in 1900. Frankfort (said to have been named after Stephen Frank, one of an early pioneer party ambushed here by Indians) was founded in 1786 by General James Wilkinson, then deeply interested in trade with the Spanish at New Orleans, and in the midst of his Spanish intrigues. In 1792 the city was made the capital of the state. In 1862, during the famous campaign in Kentucky of General Braxton Bragg (Confederate) and General D. C. Buell (Federal), Frankfort was occupied for a short time by Bragg, who, just before being forced out by Buell, took part in the inauguration of Richard J. Hawes, chosen governor by the Confederates of the state. Hawes, however, never discharged the duties of his office. During the bitter contest for the governorship in 1900 between William Goebel (Democrat) and William S. Taylor (Republican), each of whom claimed the election, Goebel was assassinated at Frankfort. (See also KENTUCKY.) Frankfort received a city charter in 1839.

FRANKFORT-ON-MAIN (Ger. *Frankfurt am Main*), a city of Germany, in the Prussian province of Hesse-Nassau, principally on the right bank of the Main, 24 m. above its confluence with the Rhine at Mainz, and 16 m. N. from Darmstadt. Always a place of great trading importance, long the place of election for the German kings, and until 1866, together with Hamburg, Bremen and Lübeck, one of the four free cities of Germany, it still retains its position as one of the leading commercial centres of the German empire. Its situation in the broad and fertile valley of the Main, the northern horizon formed by the soft outlines of the Taunus range, is one of great natural beauty, the surrounding country being richly clad with orchard and forest.

Frankfort is one of the most interesting, as it is also one of the wealthiest, of German cities. Apart from its commercial importance, its position, close to the fashionable watering-places of Homburg, Nauheim and Wiesbaden, has rendered it "cosmopolitan" in the best sense of the term. The various stages in the development of the city are clearly indicated in its general plan and the surviving names of many of its streets. The line of the original 12th century walls and moat is marked by the streets of which the names end in *-graben*, from the Hirschgraben on the W. to the Wollgraben on the E. The space enclosed by these and by the river on the S. is known as the "old town" (*Altstadt*). The so-called "new town" (*Neustadt*), added in 1333, extends to the *Anlagen*, the beautiful gardens and promenades laid out (1806–1812) on the site of the 17th century fortifications, of which they faithfully preserve the general ground plan. Of the medieval fortifications the picturesque Eschenheimer Tor, a round tower 155 ft. high, dating from 1400 to 1428, the Rententurm (1456) on the Main and the Kuhhirtenturm (*c.* 1490) in Sachsenhausen, are the sole remains. Since the demolition of the fortifications the city has greatly expanded. Sachsenhausen, on the south bank of the river, formerly the seat of a commandery

of the Teutonic Order (by treaty with Austria in 1842 all property and rights of the order in Frankfort territory were sold to the city, except the church and house), is now a quarter of the city. In other directions also the expansion has been rapid; the village of Bornheim was incorporated in Frankfort in 1877, the former Hessian town of Bockenheim in 1895, and the suburbs of Niederrad, Oberrad and Seckbach in 1900.

The main development of the city has been to the north of the river, which is crossed by numerous bridges and flanked by fine quays and promenades. The Altstadt, though several broad streets have been opened through it, still preserves many of its narrow alleys and other medieval features. The Judengasse (Ghetto), down to 1806 the sole Jews' quarter, has been pulled down, with the exception of the ancestral house of the Rothschild family—No. 148—which has been restored and retains its ancient façade. As the Altstadt is mainly occupied by artisans and petty tradesmen, so the Neustadt is the principal business quarter of the city, containing the chief public buildings and the principal hotels. The main arteries of the city are the Zeil, a broad street running from the Friedberger Anlage to the Rossmarkt and thence continued, by the Kaiserstrasse, through the fine new quarter built after 1872, to the magnificent principal railway station; and the Steinweg and Goethestrasse, which lead by the Bockenheimer Tor to the Bockenheimer Landstrasse, a broad boulevard intersecting the fashionable residential suburb to the N.W.

Churches.—The principal ecclesiastical building in Frankfort is the cathedral (Dom). Built of red sandstone, with a massive tower terminating in a richly ornamented cupola and 300 ft. in height, it is the most conspicuous object in the city. This building, in which the Roman emperors were formerly elected and, since 1562, crowned, was founded in 852 by King Louis the German, and was later known as the Salvator Kirche. After its reconstruction (1235–1239), it was dedicated to St Bartholomew. From this period date the nave and the side aisles; the choir was completed in 1315–1338 and the long transepts in 1346–1354. The cloisters were rebuilt in 1348–1447, and the electoral chapel, on the south of the choir, was completed in 1355. The tower was begun in 1415, but remained unfinished. On the 15th of August 1867 the tower and roof were destroyed by fire and considerable damage was done to the rest of the edifice. The restoration was immediately taken in hand, and the whole work was finished in 1881, including the completion of the tower, according to the plans of the 15th century architect, Hans von Ingelheim. In the interior is the tomb of the German king Günther of Schwarzburg, who died in Frankfort in 1349, and that of Rudolph, the last knight of Sachsenhausen, who died in 1371. Among the other Roman Catholic churches are the Leonhardskirche, the Liebfrauenkirche (church of Our Lady) and the Deutschordenskirche (14th century) in Sachsenhausen. The Leonhardskirche (restored in 1882) was begun in 1219, it is said on the site of the palace of Charlemagne. It was originally a three-aisled basilica, but is now a five-aisled *Hallenkirche*; the choir was added in 1314. It has two Romanesque towers. The Liebfrauenkirche is first mentioned in 1314 as a collegiate church; the nave was consecrated in 1340. The choir was added in 1506–1509 and the whole church thoroughly restored in the second half of the 18th century, when the tower was built (1770). Of the Protestant churches the oldest is the Nikolaikirche, which dates from the 13th century; the fine cast-iron spire erected in 1843 had to be taken down in 1901. The Paulskirche, the principal Evangelical (Lutheran) church, built between 1786 and 1833, is a red sandstone edifice of no architectural pretensions, but interesting as the seat of the national parliament of 1848–1849. The Katharinenkirche, built 1678–1681 on the site of an older building, is famous in Frankfort history as the place where the first Protestant sermon was preached in 1522. Among the more noteworthy of the newer Protestant churches are the Peterskirche (1892–1895) in the North German Renaissance style, with a tower 256 ft. high, standing north from the Zeil, the Christuskirche (1883) and the Lutherkirche (1889–1893). An English church, in Early English Gothic style, situated adjacent to the Bockenheimer Landstrasse, was completed and consecrated in 1906.

Of the five synagogues, the chief (or Hauptsynagoge), lying in the Börnestrasse, is an attractive building of red sandstone in the Moorish-Byzantine style.

Public Buildings.—Of the secular buildings in Frankfort, the Römer, for almost five hundred years the Rathaus (town hall) of the city, is of prime historical interest. It lies on the Römerberg, a square flanked by curious medieval houses. It is first mentioned in 1322, was bought with the adjacent hostelry in 1405 by the city and rearranged as a town hall, and has since, from time to time, been enlarged by the purchase of adjoining patrician houses, forming a complex of buildings of various styles and dates surmounted by a clock tower. The façade was rebuilt (1896–1898) in late Gothic style. It was here, in the Wahlzimmer (or election-chamber) that the electors or their plenipotentiaries chose the German kings, and here in the Kaisersaal (emperors' hall) that the coronation festival was held, at which the new king or emperor dined with the electors after having shown himself from the balcony to the people. The Kaisersaal retained its antique appearance until 1843, when, as also again in 1904, it was restored and redecorated; it is now furnished with a series of modern paintings representing the German kings and Roman emperors from Charlemagne to Francis II., in all fifty-two, and a statue of the first German emperor, William I. New municipal buildings adjoining the "Römer" on the north side were erected in 1900–1903 in German Renaissance style, with a handsome tower 220 ft. high; beneath it is a public wine-cellar, and on the first storey a grand municipal hall. The palace of the princes of Thurn and Taxis in the Eschenheimer Gasse was built (1732–1741) from the designs of Robert de Cotte, chief architect to Louis XIV. of France. From 1806 to 1810 it was the residence of Karl von Dalberg, prince-primate of the Confederation of the Rhine, with whose dominions Frankfort had been incorporated by Napoleon. From 1816 to 1866 it was the seat of the German federal diet. It is now annexed to the principal post office (built 1892–1894), which lies close to it on the Zeil. The Saalhof, built on the site of the palace erected by Louis the Pious in 822, overlooking the Main, has a chapel of the 12th century, the substructure dating from Carolingian times. This is the oldest building in Frankfort. The façade of the Saalhof in the Saalgasse dates from 1604, the southern wing with the two gables from 1715 to 1717. Of numerous other medieval buildings may be mentioned the Leinwandhaus (linendrapers' hall), a 15th century building reconstructed in 1892 as a municipal museum. In the Grosser Hirschgraben is the Goethehaus, a 16th century building which came into the possession of the Goethe family in 1733. Here Goethe lived from his birth in 1749 until 1775. In 1863 the house was acquired by the *Freies deutsche Hochstift* and was opened to the public. It has been restored, from Goethe's account of it in *Dichtung und Wahrheit*, as nearly as possible to its condition in the poet's day, and is now connected with a Goethemuseum (1897), with archives and a library of 25,000 volumes representative of the Goethe period of German literature.

Literary and Scientific Institutions.—Few cities of the same size as Frankfort are so richly endowed with literary, scientific and artistic institutions, or possess so many handsome buildings appropriated to their service. The opera-house, erected near the Bockenheimer Tor in 1873–1880, is a magnificent edifice in the style of the Italian Renaissance and ranks among the finest theatres in Europe. There are also a theatre (*Schauspielhaus*) in modern Renaissance style (1899–1902), devoted especially to drama, a splendid concert hall (*Saalbau*), opened in 1861, and numerous minor places of theatrical entertainment. The public picture gallery in the Saalhof possesses works by Hans Holbein, Grünewald, Van Dyck, Teniers, Van der Neer, Hans von Kulmbach, Lucas Cranach and other masters. The Städel Art Institute (Städel'sches Kunstinstitut) in Sachsenhausen, founded by the banker J. F. Städel in 1816, contains a picture gallery and a cabinet of engravings extremely rich in works of German art. The municipal library, with 300,000 volumes,

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boasts among its rarer treasures a Gutenberg Bible printed at Mainz between 1450 and 1455, another on parchment dated 1462, the *Institutiones Justiniani* (Mainz, 1468), the *Theuerdank*, with woodcuts by Hans Schäufelein, and numerous valuable autographs. It also contains a fine collection of coins. The Bethmann Museum owes its celebrity principally to Dannecker's "Ariadne," but it also possesses the original plaster model of Thorwaldsen's "Entrance of Alexander the Great into Babylon." There may also be mentioned the Industrial Art Exhibition of the Polytechnic Association and two conservatories of music. Among the scientific institutions the first place belongs to the *Senckenberg'sches naturhistorische Museum*, containing valuable collections of birds and shells. Next must be mentioned the Kunstgewerbe (museum of arts and crafts) and the Musical Museum, with valuable MSS. and portraits. Besides the municipal library (*Stadtbibliothek*) mentioned above there are three others of importance, the Rothschild, the Senckenberg and the Jewish library (with a well-appointed reading-room). There are numerous high-grade schools, musical and other learned societies and excellent hospitals. The last include the large municipal infirmary and the Senckenberg'sches Stift, a hospital and almshouses founded by a doctor, Johann C. Senckenberg (d. 1772). The Royal Institute for experimental therapeutics (*Königl. Institut für experimentelle Therapie*), moved to Frankfort in 1899, attracts numerous foreign students, and is especially connected with the study of bacteriology and serums.

Bridges.—Seven bridges (of which two are railway) cross the Main. The most interesting of these is the Alte Mainbrücke, a red sandstone structure of fourteen arches, 815 ft. long, dating from the 14th century. On it are a mill, a statue of Charlemagne and an iron crucifix surmounted by a gilded cock. The latter commemorates, according to tradition, the fowl which was the first living being to cross the bridge and thus fell a prey to the devil, who in hope of a nobler victim had sold his assistance to the architect. Antiquaries, however, assert that it probably marks the spot where criminals were in olden times flung into the river. Other bridges are the Obermainbrücke of five iron arches, opened in 1878; an iron foot (suspension) bridge, the Untermainbrücke; the Wilhelmsbrücke, a fine structure, which from 1849 to 1890 served as a railway bridge and was then opened as a road bridge; and two new iron bridges at Gutleuthof and Niederrad (below the city), which carry the railway traffic from the south to the north bank of the Main, where all lines converge in a central station of the Prussian state railways. This station, which was built in 1883–1888 and has replaced the three stations belonging to private companies, which formerly stood in juxtaposition on the Anlagen (or promenades) near the Mainzer Tor, lies some half-mile to the west. The intervening ground upon which the railway lines and buildings stood was sold for building sites, the sum obtained being more than sufficient to cover the cost of the majestic central terminus (the third largest in the world), which, in addition to spacious and handsome halls for passenger accommodation, has three glass-covered spans of 180 ft. width each. Yet the exigencies of traffic demand further extensions, and another large station was in 1909 in process of construction at the east end of the city, devised to receive the local traffic of lines running eastward, while a through station for the north to south traffic was projected on a site farther west of the central terminus.

Frankfort lies at the junction of lines of railway connecting it directly with all the important cities of south and central Germany. Here cross and unite the lines from Berlin to Basel, from Cologne to Würzburg and Vienna, from Hamburg and Cassel, and from Dresden and Leipzig to France and Switzerland. The river Main has been dredged so as to afford heavy barge traffic with the towns of the upper Main and with the Rhine, and cargo boats load and unload alongside its busy quays. A well-devised system of electric tramways provides for local communication within the city and with the outlying suburbs.

Trade, Commerce and Industries.—Frankfort has always been more of a commercial than an industrial town, and though of late years it has somewhat lost its pre-eminent position as a banking centre it has counterbalanced the loss in increased industrial development. The suburbs of Sachsenhausen and Bockenheim have particularly developed considerable industrial activity, especially in publishing and printing, brewing and the manufacture of quinine. Other sources of employment are the cutting of hair for making hats, the production of fancy goods, type, machinery, soap and perfumery, ready-made clothing, chemicals, electro-technical apparatus, jewelry and metal wares. Market gardening is extensively carried on in the neighbourhood and cider largely manufactured. There are two great fairs held in the town,—the Ostermesse, or spring fair, and the Herbstmesse, or autumn fair. The former, which was the original nucleus of all the commercial prosperity of the city, begins on the second Wednesday before Easter; and the latter on the second Wednesday before the 8th of September. They last three weeks, and the last day save one, called the *Nickelchestag*, is distinguished by the influx of people from the neighbouring country. The trade in leather is of great and growing importance. A horse fair has been held twice a year since 1862 under the patronage of the agricultural society; and the wool market was reinstituted in 1872 by the German Trade Society (Deutscher Handelsverein). Frankfort has long been famous as one of the principal banking centres of Europe, and is now only second to Berlin, in this respect, among German cities, and it is remarkable for the large business that is done in government stock. In the 17th century the town was the seat of a great book-trade; but it has long been distanced in this department by Leipzig. The *Frankfurter Journal* was founded in 1615, the *Postzeitung* in 1616, the *Neue Frankfurter Zeitung* in 1859, and the *Frankfurter Presse* in 1866.

Of memorial monuments the largest and most elaborate in Frankfort is that erected in 1858 in honour of the early German printers. It was modelled by Ed. von der Launitz and executed by Herr von Kreis. The statues of Gutenberg, Fust and Schöffer form a group on the top; an ornamented frieze presents medallions of a number of famous printers; below these are figures representing the towns of Mainz, Strassburg, Venice and Frankfort; and on the corners of the pedestal are allegorical statues of theology, poetry, science and industry. The statue of Goethe (1844) in the Goetheplatz is by Ludwig von Schwanthaler. The Schiller statue, erected in 1863, is the work of a Frankfort artist, Johann Dielmann. A monument in the Bockenheim Anlage, dated 1837, preserves the memory of Guiollet, the burgomaster, to whom the town is mainly indebted for the beautiful promenades which occupy the site of the old fortifications; and similar monuments have been reared to Senckenberg (1863), Schopenhauer, Klemens Brentano the poet and Samuel Thomas Sömmerring (1755–1830), the anatomist and inventor of an electric telegraph. In the Opernplatz is an equestrian statue of the emperor Wilhelm I. by Buscher.

Cemeteries.—The new cemetery (opened in 1828) contains the graves of Arthur Schopenhauer and Feuerbach, of Passavant the biographer of Raphael, Ballenberger the artist, Hessemer the architect, Sömmerring, and Johann Friedrich Böhmer the historian. The Bethmann vault attracts attention by three bas-reliefs from the chisel of Thorwaldsen; and the Reichenbach mausoleum is a vast pile designed by Hessemer at the command of William II. of Hesse, and adorned with sculptures by Zwerger and von der Lausitz. In the Jewish section, which is walled off from the rest of the burying-ground, the most remarkable tombs are those of the Rothschild family.

Parks.—In addition to the park in the south-western district, Frankfort possesses two delightful pleasure grounds, which attract large numbers of visitors, the Palmengarten in the west and the zoological garden in the east of the city. The former is remarkable for the collection of palms purchased in 1868 from the deposed duke Adolph of Nassau.

Government.—The present municipal constitution of the city dates from 1867 and presents some points of difference from the ordinary Prussian system. Bismarck was desirous of giving the city, in view of its former freedom, a more liberal constitution than is usual in ordinary cases. Formerly fifty-four representatives were elected, but provision was made (in the

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constitution) for increasing the number, and they at present number sixty-four, elected for six years. Every two years a third of the number retire, but they are eligible for re-election. These sixty-four representatives elect twenty town-councillors, ten of whom receive a salary and ten do not. The chief burgomaster (Oberbürgermeister) is nominated by the emperor for twelve years, and the second burgomaster must receive the emperor's approval.

Since 1885 the city has been supplied with water of excellent quality from the Stadtwald, Goldstein and Hinkelstein, and the favourable sanitary condition of the town is seen in the low death rate.

Population.—The population of Frankfort has steadily increased since the beginning of the 19th century; it amounted in 1817 to 41,458; (1840) 55,269; (1864) 77,372; (1871) 59,265; (1875) 103,136; (1890) 179,985; and (1905), including the incorporated suburban districts, 334,951, of whom 175,909 were Protestants, 88,457 Roman Catholics and 21,974 Jews.

History.—Excavations around the cathedral have incontestably proved that Frankfort-on-Main (*Trajectum ad Moenum*) was a settlement in Roman times and was probably founded in the 1st century of the Christian era. It may thus be accounted one of the earliest German—the so-called "Roman"—towns. Numerous places in the valley of the Main are mentioned in chronicles anterior to the time that Frankfort is first noticed. Disregarding popular tradition, which connects the origin of the town with a legend that Charlemagne, when retreating before the Saxons, was safely conducted across the river by a doe, it may be asserted that the first genuine historical notice of the town occurs in 793, when Einhard, Charlemagne's biographer, tells us that he spent the winter in the villa Frankonovurd. Next year there is mention more than once of a royal palace here, and the early importance of the place is indicated by the fact that in this year it was chosen as the seat of the ecclesiastical council by which image-worship was condemned. The name Frankfort is also found in several official documents of Charlemagne's reign; and from the notices that occur in the early chronicles and charters it would appear that the place was the most populous at least of the numerous villages of the Main district. During the Carolingian period it was the seat of no fewer than 16 imperial councils or colloquies. The town was probably at first built on an island in the river. It was originally governed by the royal officer or *actor dominicus*, and down even to the close of the Empire it remained a purely imperial or royal town. It gradually acquired various privileges, and by the close of the 14th century the only mark of dependence was the payment of a yearly tax. Louis the Pious dwelt more frequently at Frankfort than his father Charlemagne had done, and about 823 he built himself a new palace, the basis of the later Saalhof. In 822 and 823 two great diets were held in the palace, and at the former there were present deputies from the eastern Slavs, the Avars and the Normans. The place continued to be a favourite residence with Louis the German, who died there in 876, and was the capital of the East Frankish kingdom. By the rest of the Carolingian kings it was less frequently visited, and this neglect was naturally greater during the period of the Saxon and Salic emperors from 919 to 1137. Diets, however, were held in the town in 951, 1015, 1069 and 1109, and councils in 1000 and 1006. From a privilege of Henry IV., in 1074, granting the city of Worms freedom from tax in their trade with several royal cities, it appears that Frankfort was even then a place of some commercial importance.

Under the Hohenstaufens many brilliant diets were held within its walls. That of 1147 saw, also, the first election of a German king at Frankfort, in the person of Henry, son of Conrad III. But as the father outlived the son, it was Frederick I., Barbarossa, who was actually the first reigning king to be elected here (in 1152). With the beginning of the 13th century the municipal constitution appears to have taken definite shape. The chief official was the royal bailiff (*Schultheiss*), who is first mentioned in 1193, and whose powers were subsequently enlarged by the abolition, in 1219, of the office of the royal *Vogt* or *advocatus*. About this time a body of *Schöffen* (*scabini*, jurats), fourteen in number, was formed to assist in the control of municipal affairs, and with their appointment the first step was taken towards civic representative government. Soon, however, the activity of the *Schöffen* became specifically confined to the determination of legal disputes, and in their place a new body (*Collegium*) of counsellors—*Rutmannen*—also fourteen in number, was appointed for the general administration of local matters. In 1311, the two burgomasters, now chiefs of the municipality, take the place of the royal *Schultheiss*. In the 13th century, the Frankfort Fair, which is first mentioned in 1150, and the origin of which must have been long anterior to that date, is referred to as being largely frequented. No fewer than 10 new churches were erected in the years from 1220 to 1270. It was about the same period, probably in 1240, that the Jews first settled in the town. In the contest which Louis the Bavarian maintained with the papacy Frankfort sided with the emperor, and it was consequently placed under an interdict for 20 years from 1329 to 1349. On Louis' death it refused to accept the papal conditions of pardon, and only yielded to Charles IV., the papal nominee, when Günther of Schwarzburg thought it more prudent to abdicate in his favour. Charles granted the city a full amnesty, and confirmed its liberties and privileges.

By the famous Golden Bull of 1356 Frankfort was declared the seat of the imperial elections, and it still preserves an official contemporaneous copy of the original document as the most precious of the eight imperial bulls in its possession. From the date of the bull to the close of the Empire Frankfort retained the position of "Wahlstadt," and only five of the two-and-twenty monarchs who ruled during that period were elected elsewhere. In 1388–1389 Frankfort assisted the South German towns in their wars with the princes and nobles (the Städtekrieg), and in a consequent battle with the troops of the Palatinate, the town banner was lost and carried to Kronberg, where it was long preserved as a trophy. On peace being concluded in 1391, the town had to pay 12,562 florins, and this brought it into great financial difficulties. In the course of the next 50 years debt was contracted to the amount of 126,772 florins. The diet at Worms in 1495 chose Frankfort as the seat of the newly instituted imperial chamber, or "*Reichskammergericht*," and it was not till 1527 that the chamber was removed to Spires. At the Reformation Frankfort heartily joined the Protestant party, and in consequence it was hardly treated both by the emperor Charles V. and by the archbishop of Mainz. It refused to subscribe the Augsburg Recess, but at the same time it was not till 1536 that it was persuaded to join the League of Schmalkalden. On the failure of this confederation it opened its gates to the imperial general Büren on the 20th of December 1546, although he had passed by the city, which he considered too strong for the forces under his command. The emperor was merciful enough to leave it in possession of its privileges, but he inflicted a fine of 80,000 gold gulden, and until October 1547 the citizens had to endure the presence of from 8000 to 10,000 soldiers. This resulted in a pestilence which not only lessened the population, but threatened to give the death-blow to the great annual fairs; and at the close of the war it was found that it had cost the city no less than 228,031 gulden. In 1552 Frankfort was invested for three weeks by Maurice of Saxony, who was still in arms against the emperor Charles V., but it continued to hold out till peace was concluded between the principal combatants. Between 1612 and 1616 occurred the great Fettmilch insurrection, perhaps the most remarkable episode in the internal history of Frankfort. The magistracy had been acquiring more and more the character of an oligarchy; all power was practically in the hands of a few closely-related families; and the gravest peculation and malversation took place without hindrance. The ordinary citizens were roused to assert their rights, and they found a leader in Vincenz Fettmilch, who carried the contest to dangerous excesses, but lacked ability to bring it to a successful issue. An imperial commission was ultimately appointed, and the three principal culprits and several of their associates were executed in 1616. It was not till

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1801 that the last mouldering head of the Fettmilch company dropped unnoticed from the Rententurm, the old tower near the bridge. In the words of Dr Kriegk, *Geschichte von Frankfurt*, (1871), the insurrection completely destroyed the political power of the gilds, gave new strength to the supremacy of the patriciate, and brought no further advantage to the rest of the citizens than a few improvements in the organization and administration of the magistracy. The Jews, who had been attacked by the popular party, were solemnly reinstated by imperial command in all their previous privileges, and received full compensation for their losses.

During the Thirty Years' War Frankfort did not escape. In 1631 Gustavus Adolphus garrisoned it with 600 men, who remained in possession till they were expelled four years later by the imperial general Lamboy. In 1792 the citizens had to pay 2,000,000 gulden to the French general Custine; and in 1796 Kléber exacted 8,000,000 francs. The independence of Frankfort was brought to an end in 1806, on the formation of the Confederation of the Rhine; and in 1810 it was made the capital of the grand-duchy of Frankfort, which had an area of 3215 sq.m. with 302,100 inhabitants, and was divided into the four districts of Frankfort, Aschaffenburg, Fulda and Hanau. On the reconstitution of Germany in 1815 it again became a free city, and in the following year it was declared the seat of the German Confederation. In April 1833 occurred what is known as the Frankfort Insurrection (Frankfurter Attentat), in which a number of insurgents led by Georg Bunsen attempted to break up the diet. The city joined the German Zollverein in 1836. During the revolutionary period of 1848 the people of Frankfort, where the united German parliament held its sessions, took a chief part in political movements, and the streets of the town were more than once the scene of conflict. In the war of 1866 they were on the Austrian side. On the 16th of July the Prussian troops, under General Vogel von Falkenstein, entered the town, and on the 18th of October it was formally incorporated with the Prussian state. A fine of 6,000,000 florins was exacted. In 1871 the treaty which concluded the Franco-German War was signed in the Swan Hotel by Prince Bismarck and Jules Favre, and it is consequently known as the peace of Frankfort.

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FRANKFORT-ON-ODER, a town of Germany, in the Prussian province of Brandenburg, 50 m. S.E. from Berlin on the main line of railway to Breslau and at the junction of lines to Cüstrin, Posen and Grossenhain. Pop. (1905) 64,043. The town proper lies on the left bank of the river Oder and is connected by a stone bridge (replacing the old historical wooden structure) 900 ft. long, with the suburb of Damm. The town is agreeably situated and has broad and handsome streets, among them the "Linden," a spacious avenue. Above, on the western side, and partly lying on the site of the old ramparts, is the residential quarter, consisting mainly of villas and commanding a fine prospect of the Oder valley. Between this suburb and the town lies the park, in which is a monument to the poet Ewald Christian von Kleist, who died here of wounds received in the battle of Kunersdorf. Among the more important public buildings must be noticed the Evangelical Marienkirche (Oberkirche), a handsome brick edifice of the 13th century with five aisles, the Roman Catholic church, the Rathhaus dating from 1607, and bearing on its southern gable the device of a member of the Hanseatic League, the government offices and the theatre. The university of Frankfort, founded in 1506 by Joachim I., elector of Brandenburg, was removed to Breslau in 1811, and the academical buildings are now occupied by a school. To compensate it for the loss of its university, Frankfort-on-Oder was long the seat of the court of appeal for the province, but of this it was deprived in 1879. There are several handsome public monuments, notably that to Duke Leopold of Brunswick, who was drowned in the Oder while attempting to save life, on the 27th of April 1785. The town has a large garrison, consisting of nearly all arms. Its industries are considerable, including the manufacture of machinery, metal ware, chemicals, paper, leather and sugar. Situated on the high road from Berlin to Silesia, and having an extensive system of water communication by means of the Oder and its canals to the Vistula and the Elbe, and being an important railway centre, it has a lively export trade, which is further fostered by its three annual fairs, held respectively at *Reminiscere* (the second Sunday in Lent), St Margaret's day and at Martinmas. In the neighbourhood are extensive coal fields.

Frankfort-on-the-Oder owes its origin and name to a settlement of Franconian merchants here, in the 13th century, on land conquered by the margrave of Brandenburg from the Wends. In 1253 it was raised to the rank of a town by the margrave John I. and borrowed from Berlin the Magdeburg civic constitution. In 1370 it received from King Sigismund, then margrave of Brandenburg, the right to free navigation of the Oder; and from 1368 to about 1450 it belonged to the Hanseatic League. The university, which is referred to above, was opened by the elector Joachim I. in 1506, was removed in 1516 to Kotthus and restored again to Frankfort in 1539, at which date the Reformation was introduced. It was dispersed during the Thirty Years' War and again restored by the Great Elector, but finally transferred to Breslau in 1811.

Frankfort has suffered much from the vicissitudes of war. In the 15th century it successfully withstood sieges by the Hussites (1429 and 1432), by the Poles (1450) and by the duke of Sagan (1477). In the Thirty Years' War it was successively taken by Gustavus Adolphus (1631), by Wallenstein (1633), by the elector of Brandenburg (1634), and again by the Swedes, who held it from 1640 to 1644. During the Seven Years' War it was taken by the Russians (1759). In 1812 it was occupied by the French, who remained till March 1813, when the Russians marched in.

See K. R. Hausen, *Geschichte der Universität und Stadt Frankfurt* (1866), and Bieder und Gurnik, *Bilder aus der Geschichte der Stadt Frankfurt-an-der-Oder* (1898).

FRANKINCENSE,[1] or **OLIBANUM**[2] (Gr. λιβανωτός, later *thios*; Lat., *ius* or *thus*; Heb., *lebonah*;[3] At., *lubân*;[4] Turk., *ghyunluk*; Hind., *ganda-birosâ*[5]), a gum-resin obtained from certain species of trees of the genus *Boswellia*, and natural order *Burseraceae*. The members of the genus are possessed of the following characters:—Bark often papyraceous; leaves deciduous, com-1 pound, alternate and imparipinnate, with leaflets serrate or entire; flowers in racemes or panicles, white, green, yellowish or pink, having a small persistent, 5-dentate calyx, 5 petals, 10 stamens, a sessile 3 to 5-chambered ovary, a long style, and a 3-lobed stigma; fruit trigonal or pentagonal; and seed compressed. Sir George Birdwood (*Trans. Lin. Soc.* xxvii.,

[1] Stephen Skinner, M.D. (*Etymologicon linguae Anglicanae*, Lond., 1671), gives the derivation: "Frankincense, Thus, qd. Incensum (*i.e.* Thus Libere seu Liberaliter, ut in sacris officiis par est, adolendum."

[2] "Sic *olibanum* dixere pro thure ex Graeco ὁ λίβανος "(Salmasius, *C. S. Plinianae exercitationes*, t. ii. p. 926, b. F., Traj. ad Rhen., 1689 fol.). See also Fuchs (*Op. citat.* pars. ii. p. 402, 1604 fol.), "Officinis non sine risu eruditorum, Graeco articulo adjecto, *Olibanus* vocatur." The term *olibano* was used in ecclesiastical Latin as early as the pontificate of Benedict IX., in the 11th century. (See Ferd. Ughellus, *Italia sacra*, tom. i. 108, D., Ven., 1717 fol.)

[3] So designated from its whiteness (J. G. Stuckius, *Sacror. et sacrific. gent. descrip.*, p. 79, Lugd. Bat., 1695, fol.; Kitto, *Cycl. Bibl. Lit.* ii. p. 806, 1870); cf. *Laben*, the Somali name for cream (R. F. Burton, *First Footsteps in E. Africa*, p. 178, 1856).

[4] Written *Louan* by Garcias da Horta (*Aromat. et simpl. medicament. hist.*, *C. Clusii Atrebatis Exoticorum lib. sept.*, p. 157, 1605, fol.), and stated to have been derived by the Arabs from the Greek name, the term less commonly used by them being *Conder:* cf. Sanskrit *Kunda*. According to Celebrooke (in *Asiatick Res.* ix. p. 379, 1807), the Hindu writers on Materia Medica use for the resin of *Boswellia thurifera* the designation *Cunduru*.

[5] A term applied also to the resinous exudation of *Pinus longifolia* (see Dr E. J. Waring, *Pharmacopoeia of India*, p. 52, Lond., 1868).

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1871) distinguishes five species of *Boswellia*: (A) *B. thurifera*, Colebr. (*B. glabra* and *B. serrata*, Roxb.), indigenous to the mountainous tracts of central India and the Coromandel coast, and *B. papyrifera* (*Plöszlea floribunda*, Endl.) of Abyssinia, which, though both thuriferous, are not known to yield any of the olibanum of commerce; and (B) *B. Frereana* (see Elfmi, vol. x. p. 259), *B. Bhua-Dajiana*, and *B. Carterii*, the "Yegaar," "Mohr Add," and "Mohr Madow" of the Somali country, in East Africa, the last species including a variety, the "Maghrayt d'Sheehaa" of Hadramaut, Arabia, all of which are sources of true frankincense or olibanum. The trees on the Somali coast are described by Captain G. B. Kempthorne as growing, without soil, out of polished marble rocks, to which they are attached by a thick oval mass of substance resembling a mixture of lime and mortar: the purer the marble the finer appears to be the growth of the tree. The young trees, he states, furnish the most valuable gum, the older yielding merely a clear glutinous fluid resembling copal varnish.[1] To obtain the frankincense a deep incision is made in the trunk of the tree, and below it a narrow strip of bark 5 in. in length is peeled off. When the milk-like juice ("spuma pinguis," Pliny) which exudes has hardened by exposure to the atmosphere, the incision is deepened. In about three months the resin has attained the required degree of consistency. The season for gathering lasts from May until the first rains in September. The large clear globules are scraped off into baskets, and the inferior quality that has run down the tree is collected separately. The coast of south Arabia is yearly visited by parties of Somalis, who pay the Arabs for the privilege of collecting frankincense.[2] In the interior of the country about the plain of Dhofār,[3] during the south-west monsoon, frankincense and other gums are gathered by the Beni Gurrah Bedouins, and might be obtained by them in much larger quantities; their lawlessness, however, and the lack of a safe place of exchange or sale are obstacles to the development of trade. (See C. Y. Ward, *The Gulf of 'Aden Pilot*, p. 117, 1863.) Much as formerly in the region of Sakhalites in Arabia (the tract between Ras Makalla and Ras Agab),[4] described by Arrian, so now on the sea-coast of the Somali country, the frankincense when collected is stored in heaps at various stations. Thence, packed in sheep- and goat-skins, in quantities of 20 to 40 lb, it is carried on camels to Berbera, for shipment either to Aden, Makalla and other Arabian ports, or directly to Bombay.[5] At Bombay, like gum-acacia, it is assorted, and is then packed for re-exportation to Europe, China and elsewhere.[6] Arrian relates that it was an import of Barbarike on the Sinthus (Indus). The idea held by several writers, including Niebuhr, that frankincense was a product of India, would seem to have originated in a confusion of that drug with benzoin and other odoriferous substances, and also in the sale of imported frankincense with the native products of India. The gum resin of *Boswellia thurifera* was described by Colebrooke (in *Asiatick Researches*, ix. 381), and after him by Dr J. Fleming (*Ib.* xi. 158), as true frankincense, or olibanum; from this, however, it differs in its softness, and tendency to melt into a mass[7] (Birdwood, *loc. cit.*, p. 146). It is sold in the village bazaars of Khandeish in India under the name of *Dup-Salai*, *i.e.* incense of the "Salai tree"; and according to Mr F. Porter Smith, M.B. (*Contrib. towards the Mat. Med. and Nat. Hist. of China*, p. 162, Shanghai, 1871), is used as incense in China. The last authority also mentions

[1] See "Appendix," vol. i. p. 419 of Sir W. C. Harris's *Highland of Aethiopia* (2nd ed., Lond., 1844); and *Trans. Bombay Geog. Soc.* xiii. (1857), p. 136.

[2] Cruttenden, *Trans. Bombay Geog. Soc.* vii. (1846), p. 121; S. B. Miles, *J. Geog. Soc.* (1872).

[3] Or Dhafār. The incense of "Dofar" is alluded to by Camoens, *Os Lusiadas*, x. 201.

[4] H. J. Carter, "Comparative Geog. of the South-East Coast of Arabia," in *J. Bombay Branch of R. Asiatic Soc.* iii. (Jan. 1851), p. 296; and Müller, *Geog. Graeci Minores*, i. p. 278 (Paris, 1855).

[5] J. Vaughan, *Pharm. Journ.* xii. (1853) pp. 227-229; and Ward, *op. cit.* p. 97.

[6] Pereira, *Elem. of Mat. Med.* ii. pt. 2, p. 380 (4th ed., 1847).

[7] "*Boswellia thurifera*," . . . says Waring (*Pharm. of India*, p. 52), "has been thought to yield East Indian olibanum, but there is no reliable evidence of its so doing."

olibanum as a reputed natural product of China. Bernhard von Breydenbach,[8] Ausonius, Florus and others, arguing, it would seem, from its Hebrew and Greek names, concluded that olibanum came from Mount Lebanon; and Chardin (*Voyage en Perse*, &c., 1711) makes the statement that the frankincense tree grows in the mountains of Persia, particularly Caramania.

Frankincense, or olibanum, occurs in commerce in semi-opaque, round, ovate or oblong tears or irregular lumps, which are covered externally with a white dust, the result of their friction against one another. It has an amorphous internal structure, a dull fracture; is of a yellow to yellowish-brown hue, the purer varieties being almost colourless, or possessing a greenish tinge, and has a somewhat bitter aromatic taste, and a balsamic odour, which is developed by heating. Immersed in alcohol it becomes opaque, and with water it yields an emulsion. It contains about 72% of resin soluble in alcohol (Kurbatow); a large proportion of gum soluble in water, and apparently identical with gum arabic; and a small quantity of a colourless inflammable essential oil, one of the constituents of which is the body olibene, $C_{10}H_{16}$. Frankincense burns with a bright white flame, leaving an ash consisting mainly of calcium carbonate, the remainder being calcium phosphate, and the sulphate, chloride and carbonate of potassium (Braconnot).[9] Good frankincense, Pliny tells us, is recognized by its whiteness, size, brittleness and ready inflammability. That which occurs in globular drops is, he says, termed "male frankincense"; the most esteemed, he further remarks, is in breast-shaped drops, formed each by the union of two tears.[10] The best frankincense, as we learn from Arrian,[11] was formerly exported from the neighbourhood of Cape Elephant in Africa (the modern Ras Fiel); and A. von Kremer, in his description of the commerce of the Red Sea (*Aegypten*, &c., p. 185, ii. Theil, Leipzig, 1863), observes that the African frankincense, called by the Arabs "asli," is of twice the value of the Arabian "luban." Captain S. B. Miles (*loc. cit.*, p. 64) states that the best kind of frankincense, known to the Somali as "bedwi" or "sheheri," comes from the trees "Mohr Add" and "Mohr Madow" (*vide supra*), and from a taller species of *Boswellia*, the "Boido," and is sent to Bombay for exportation to Europe; and that an inferior "mayeti," the produce of the "Yegaar," is exported chiefly to Jeddah and Yemen ports.[12] The latter may possibly be what Niebuhr alludes to as "Indian frankincense."[13] Garcias da Horta, in asserting the Arabian origin of the drug, remarks that the term "Indian" is often applied by the Arabs to a dark-coloured variety.[14]

According to Pliny (*Nat. Hist.* xiv. 1; cf. Ovid, *Fasti* i. 337

[8] "Libanus igitur est mons redolentic & summe aromaticitatis. nam ibi herbe odorifere crescunt. ibi etiam arbores thurifere coalescunt quarum gummi electum olibanum a medicis nuncupatur."—*Peregrinatio*, p. 53 (1502, fol.).

[9] See, on the chemistry of frankincense, Braconnot, *Ann. de chimie*, lxviii. (1808) pp. 60-69; Johnston, *Phil. Trans.* (1839), pp. 301-305; J. Stenhouse, *Ann. der Chem. und Pharm.* xxxv. (1840) p. 306; and A. Kurbatow, *Zeitsch. fur Chem.* (1871), p. 201.

[10] "Praecipua autem gratia est mammoso, cum haerente lacryma priore consecuta alia miscuit se" (*Nat. Hist.* xii. 32). One of the Chinese names for frankincense, *Ju-hiang*, "milk-perfume," is explained by the *Pen Ts'ao* (xxxiv. 45), a Chinese work, as being derived from the nipple-like form of its drops. (See E. Bretschneider, *On the Knowledge possessed by the Ancient Chinese of the Arabs*, &c., p. 19, Lond., 1871.)

[11] *The Voyage of Nearchus, loc. cit.*

[12] Vaughan (*Pharm. Journ.* xii. 1853) speaks of the Arabian Lubān, commonly called *Morbat* or *Shaharree Luban*, as realizing higher prices in the market than any of the qualities exported from Africa. The incense of "Esher," *i.e.* Shihr or Sheher, is mentioned by Marco Polo, as also by Barbosa. (See Yule, *op. cit.* ii. p. 377.) J. Raymond Wellsted (*Travels to the City of the Caliphs*, p. 173, Lond., 1840) distinguishes two kinds of frankincense—"*Mealy*," selling at $4 per cwt., and an inferior article fetching 20 %. less.

[13] "Es scheint, dass selber die Araber ihr eignes Räuchwerk nicht hoch schätzen; denn die Vornehmen in Jemen brauchen gemeiniglich indianisches Räuchwerk, ja eine grosse Menge Mastix von der Insel Scio" (*Beschreibung von Arabien*, p. 143, Kopenh., 1772).

[14] "De Arabibus minus mirum, qui nigricantem colorem, quo Thus Indicum praeditum esse vult Dioscorides [lib. i. c. 70], Indum plerumque vocent, ut ex Myrobalano nigro quem Indum appellant, patet" (*op. sup. cit.* p. 157).

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sq.), frankincense was not sacrificially employed in Trojan times. It was used by the ancient Egyptians in their religious rites, but, as Herodotus tells us (ii. 86), not in embalming. It constituted a fourth part of the Jewish incense of the sanctuary (Ex. xxx. 34), and is frequently mentioned in the Pentateuch. With other spices it was stored in a great chamber of the house of God at Jerusalem (1 Chron. ix. 29, Neh. xiii. 5-9). On the sacrificial use and import of frankincense and similar substances see INCENSE.

In the Red Sea regions frankincense is valued not only for its sweet odour when burnt, but as a masticatory; and blazing lumps of it are not infrequently used for illumination instead of oil lamps. Its fumes are an excellent insectifuge. As a medicine it was in former times in high repute. Pliny (*Nat. Hist.* xxv. 82) mentions it as an antidote to hemlock. Avicenna (ed. Plempii, lib. ii. p. 161, Lovanii, 1658, fol.) recommends it for tumours, ulcers of the head and ears, affections of the breast, vomiting, dysentery and fevers. In the East frankincense has been found efficacious as an external application in carbuncles, blind boils and gangrenous sores, and as an internal agent is given in gonorrhoea. In China it was an old internal remedy for leprosy and struma, and is accredited with stimulant, tonic, sedative, astringent and vulnerary properties. It is not used in modern medicine, being destitute of any special virtues. (See Waring, *Pharm. of India*, p. 443, &c.; and F. Porter Smith, *op. cit.*, p. 162.)

Common frankincense or thus, *Abietis resina*, is the term applied to a resin which exudes from fissures in the bark of the Norway spruce fir, *Abies excelsa*, D.C.; when melted in hot water and strained it constitutes "Burgundy pitch," *Pix abietina*. The concreted turpentine obtained in the United States by making incisions in the trunk of a species of pine, *Pinus australis*, is also so designated. It is commercially known as "scrape," and is similar to the French "galipot" or "barras." Common frankincense is an ingredient in some ointments and plasters, and on account of its pleasant odour when burned has been used in incense as a substitute for olibanum. (See Flückiger and Hanbury, *Pharmacographia*.) The "black frankincense oil" of the Turks is stated by Hanbury (*Science Papers*, p. 142, 1876) to be liquid storax. (F. H. B.)

FRANKING, a term used for the right of sending letters or postal packages free (Fr. *franc*) of charge. The privilege was claimed by the House of Commons in 1660 in "a Bill for erecting and establishing a Post Office," their demand being that all letters addressed to or sent by members during the session should be carried free. The clause embodying this claim was struck out by the Lords, but with the proviso in the Act as passed for the free carriage of all letters to and from the king and the great officers of state, and also the single inland letters of the members of that present parliament during that session only. It seems, however, that the practice was tolerated until 1764, when by an act dealing with postage it was legalized, every peer and each member of the House of Commons being allowed to send free ten letters a day, not exceeding an ounce in weight, to any part of the United Kingdom, and to receive fifteen. The act did not restrict the privilege to letters either actually written by or to the member, and thus the right was very easily abused, members sending and receiving letters for friends, all that was necessary being the signature of the peer or M.P. in the corner of the envelope. Wholesale franking grew usual, and M.P.'s supplied their friends with envelopes already signed to be used at any time. In 1837 the scandal had become so great that stricter regulations came into force. The franker had to write the full address, to which he had to add his name, the post-town and the day of the month; the letter had to be posted on the day written or the following day at the latest, and in a post-town not more than 20 m. from the place where the peer or M.P. was then living. On the 10th of January 1840 parliamentary franking was abolished on the introduction of the uniform penny rate.

In the United States the franking privilege was first granted in January 1776 to the soldiers engaged in the American War of Independence. The right was gradually extended till it included nearly all officials and members of the public service. By special acts the privilege was bestowed on presidents and their widows. By an act of the 3rd of March 1845, franking was limited to the president, vice-president, members and delegates in Congress and postmasters, other officers being required to keep quarterly accounts of postage and pay it from their contingent funds. In 1851 free exchange of newspapers was re-established. By an act of the 3rd of March 1863 the privilege was granted the president and his private secretary, the vice-president, chiefs of executive departments, such heads of bureaus and chief clerks as might be designated by the postmaster-general for official letters only; senators and representatives in Congress for all correspondence, senders of petitions to either branch of the legislature, and to publishers of newspapers for their exchanges. There was a limit as to weight. Members of Congress could also frank, in matters concerning the federal department of agriculture, "seeds, roots and cuttings," the weight to be fixed by the postmaster-general. This act remained in force till the 31st of January 1873, when franking was abolished. Since 1875, by sundry acts, franking for official correspondence, government publications, seeds, &c., has been allowed to congressmen, ex-congressmen (for 9 months after the close of their term), congressmen-elect and other government officials. By special acts of 1881, 1886, 1902, 1909, respectively, the franking privilege was granted to the widows of Presidents Garfield, Grant, McKinley and Cleveland.

FRANKL, LUDWIG AUGUST (1810–1894), Austrian poet. He took part in the revolution of 1848, and his poems on liberty had considerable vogue. His lyrics are among his best work. He was secretary of the Jewish community in Vienna, and did a lasting service to education by his visit to the Orient in 1856. He founded the first modern Jewish school (the Von Lämmel Schule) in Jerusalem. His brilliant volumes *Nach Jerusalem* describing his eastern tour have been translated into English, as is the case with many of his poems. His collected poems appeared in three volumes in 1880. (I. A.)

FRANKLAND, SIR EDWARD (1825–1899), English chemist, was born at Churchtown, near Lancaster, on the 18th of January 1825. After attending the grammar school at Lancaster he spent six years as an apprentice to a druggist in that town. In 1845 he went to London and entered Lyon Playfair's laboratory, subsequently working under R. W. Bunsen at Marburg. In 1847 he was appointed science-master at Queenwood school, Hampshire, where he first met J. Tyndall, and in 1851 first professor of chemistry at Owens College, Manchester. Returning to London six years later he became lecturer in chemistry at St Bartholomew's hospital, and in 1863 professor of chemistry at the Royal Institution. From an early age he engaged in original research with great success.

Analytical problems, such as the isolation of certain organic radicals, attracted his attention to begin with, but he soon turned to synthetical studies, and he was only about twenty-five years of age when an investigation, doubtless suggested by the work of his master, Bunsen, on cacodyl, yielded the interesting discovery of the organo-metallic compounds. The theoretical deductions which he drew from the consideration of these bodies were even more interesting and important than the bodies themselves. Perceiving a molecular isonomy between them and the inorganic compounds of the metals from which they may be formed, he saw their true molecular type in the oxygen, sulphur or chlorine compounds of those metals, from which he held them to be derived by the substitution of an organic group for the oxygen, sulphur, &c. In this way they enabled him to overthrow the theory of conjugate compounds, and they further led him in 1852 to publish the conception that the atoms of each elementary substance have a definite saturation capacity, so that they can only combine with a certain limited number of the atoms of other elements. The theory of valency thus founded has dominated the subsequent development of chemical doctrine, and forms the groundwork upon which the fabric of modern structural chemistry reposes.

In applied chemistry Frankland's great work was in connexion with water-supply. Appointed a member of the second royal commission on the pollution of rivers in 1868, he was provided

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by the government with a completely-equipped laboratory, in which, for a period of six years, he carried on the inquiries necessary for the purposes of that body, and was thus the means of bringing to light an enormous amount of valuable information respecting the contamination of rivers by sewage, trade-refuse, &c., and the purification of water for domestic use. In 1865, when he succeeded A. W. von Hofmann at the School of Mines, he undertook the duty of making monthly reports to the registrar-general on the character of the water supplied to London, and these he continued down to the end of his life. At one time he was an unsparing critic of its quality, but in later years he became strongly convinced of its general excellence and wholesomeness. His analyses were both chemical and bacteriological, and his dissatisfaction with the processes in vogue for the former at the time of his appointment caused him to spend two years in devising new and more accurate methods. In 1859 he passed a night on the very top of Mont Blanc in company with John Tyndall. One of the purposes of the expedition was to discover whether the rate of combustion of a candle varies with the density of the atmosphere in which it is burnt, a question which was answered in the negative. Other observations made by Frankland at the time formed the starting-point of a series of experiments which yielded far-reaching results. He noticed that at the summit the candle gave a very poor light, and was thereby led to investigate the effect produced on luminous flames by varying the pressure of the atmosphere in which they are burning. He found that pressure increases luminosity, so that hydrogen, for example, the flame of which in normal circumstances gives no light, burns with a luminous flame under a pressure of ten or twenty atmospheres, and the inference he drew was that the presence of solid particles is not the only factor that determines the light-giving power of a flame. Further, he showed that the spectrum of a dense ignited gas resembles that of an incandescent liquid or solid, and he traced a gradual change in the spectrum of an incandescent gas under increasing pressure, the sharp lines observable when it is extremely attenuated broadening out to nebulous bands as the pressure rises, till they merge in the continuous spectrum as the gas approaches a density comparable with that of the liquid state. An application of these results to solar physics in conjunction with Sir Norman Lockyer led to the view that at least the external layers of the sun cannot consist of matter in the liquid or solid forms, but must be composed of gases or vapours. Frankland and Lockyer were also the discoverers of helium. In 1868 they noticed in the solar spectrum a bright yellow line which did not correspond to any substance then known, and which they therefore attributed to the then hypothetical element, helium.

Sir Edward Frankland, who was made a K.C.B. in 1897, died on the 9th of August 1899 while on a holiday at Golaa, Gudbrandsdalen, Norway.

A memorial lecture delivered by Professor H. E. Armstrong before the London Chemical Society on the 31st of October 1901 contained many personal details of Frankland's life, together with a full discussion of his scientific work; and a volume of *Autobiographical Sketches* was printed for private circulation in 1902. His original papers, down to 1877, were collected and published in that year as *Experimental Researches in Pure, Applied and Physical Chemistry*.

FRANKLIN, BENJAMIN (1706–1790), American diplomat, statesman and scientist, was born on the 17th of January 1706 in a house in Milk Street, opposite the Old South church, Boston, Massachusetts. He was the tenth son of Josiah Franklin, and the eighth child and youngest son of ten children borne by Abiah Folger, his father's second wife. The elder Franklin was born at Ecton in Northamptonshire, England, where the strongly Protestant Franklin family may be traced back for nearly four centuries. He had married young and had migrated from Banbury to Boston, Massachusetts, in 1685. Benjamin could not remember when he did not know how to read, and when eight years old he was sent to the Boston grammar school, being destined by his father for the church as a tithe of his sons. He spent a year there and a year in a school for writing and arithmetic, and then at the age of ten he was taken from school to assist his father in the business of a tallow-chandler and soap-boiler. In his thirteenth year he was apprenticed to his half-brother James, who was establishing himself in the printing business, and who in 1721 started the *New England Courant*, one of the earliest newspapers in America.

Benjamin's tastes had at first been for the sea rather than the pulpit; now they inclined rather to intellectual than to other pleasures. At an early age he had made himself familiar with *The Pilgrim's Progress*, with Locke, *On the Human Understanding*, and with a volume of *The Spectator*. Thanks to his father's excellent advice, he gave up writing doggerel verse (much of which had been printed by his brother and sold on the streets) and turned to prose composition. His success in reproducing articles he had read in *The Spectator* led him to write an article for his brother's paper, which he slipped under the door of the printing shop with no name attached, and which was printed and attracted some attention. After repeated successes of the same sort Benjamin threw off his disguise and contributed regularly to the *Courant*. When, after various journalistic indiscretions, James Franklin in 1722 was forbidden to publish the *Courant*, it appeared with Benjamin's name as that of the publisher and was received with much favour, chiefly because of the cleverness of his articles signed "Dr Janus," which, like those previously signed "Mistress Silence Dogood," gave promise of "Poor Richard." But Benjamin's management of the paper, and particularly his free-thinking, displeased the authorities; the relations of the two brothers gradually grew unfriendly, possibly, as Benjamin thought, because of his brother's jealousy of his superior ability; and Benjamin determined to quit his brother's employ and to leave New England. He made his way first to New York City, and then (October 1723) to Philadelphia, where he got employment with a printer named Samuel Keimer.[1]

A rapid composer and a workman full of resource, Franklin was soon recognized as the master spirit of the shop. Sir William Keith (1680–1749), governor of the province, urged him to start in business for himself, and when Franklin had unsuccessfully appealed to his father for the means to do so, Keith promised to furnish him with what he needed for the equipment of a new printing office and sent him to England to buy the materials. Keith had repeatedly promised to send a letter of credit by the ship on which Franklin sailed, but when the Channel was reached and the ship's mails were examined no such letter was found. Franklin reached London in December 1724, and found employment first at Palmer's, a famous printing house in Bartholomew Close, and afterwards at Watts's Printing House. At Palmer's he had set up a second edition of Wollaston's *Religion of Nature Delineated*. To refute this book and to prove that there could be no such thing as religion, he wrote and printed a small pamphlet, *A Dissertation on Liberty and Necessity, Pleasure and Pain*, which brought him some curious acquaintances, and of which he soon became thoroughly ashamed. After a year and a half in London, Franklin was persuaded by a friend named Denham, a Quaker merchant, to return with him to America and engage in mercantile business; he accordingly gave up printing, but a few days before sailing he received a tempting offer to remain and give lessons in swimming—his feats as a swimmer having given him considerable reputation—and he says that he might have consented "had the overtures been sooner made." He reached Philadelphia in October 1726, but a few months later Denham died, and Franklin was induced by large wages to return to his old employer Keimer; with Keimer he quarrelled repeatedly, thinking himself ill used and kept only to train apprentices until they could in some degree take his place.

[1] Keimer and his sister had come the year before from London, where he had learned his trade; both were ardent members of the fanatic band of "French prophets." He proposed founding a new sect with the help of Franklin, who after leaving his shop ridiculed him for his long square beard and for keeping the seventh day. Keimer settled in the Barbadoes about 1730; and in 1731 began to publish at Bridgetown the semi-weekly *Barbadoes Gazette*. Selections from it called *Caribbeana* (1741) and *A Brand Plucked from the Burning, Exemplified in the Unparalleled Case of Samuel Keimer* (1718) are from his pen. He died about 1738.

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In 1728 Franklin and Hugh Meredith, a fellow-worker at Keimer's, set up in business for themselves; the capital being furnished by Meredith's father. In 1730 the partnership was dissolved, and Franklin, through the financial assistance of two friends, secured the sole management of the printing house. In September 1729 he bought at a merely nominal price *The Pennsylvania Gazette*, a weekly newspaper which Keimer had started nine months before to defeat a similar project of Franklin's, and which Franklin conducted until 1765. Franklin's superior management of the paper, his new type, "some spirited remarks" on the controversy between the Massachusetts assembly and Governor Burnet, brought his paper into immediate notice, and his success both as a printer and as a journalist was assured and complete. In 1731 he established in Philadelphia one of the earliest circulating libraries in America (often said to have been the earliest), and in 1732 he published the first of his Almanacks, under the pseudonym of Richard Saunders. These "Poor Richard's Almanacks" were issued for the next twenty-five years with remarkable success, the annual sale averaging 10,000 copies, and far exceeding the sale of any other publication in the colonies.

Beginning in 1733 Franklin taught himself enough French, Italian, Spanish and Latin to read these languages with some ease. In 1736 he was chosen clerk of the General Assembly, and served in this capacity until 1751. In 1737 he had been appointed postmaster at Philadelphia, and about the same time he organized the first police force and fire company in the colonies; in 1749, after he had written *Proposals Relating to the Education of Youth in Pensilvania*, he and twenty-three other citizens of Philadelphia formed themselves into an association for the purpose of establishing an academy, which was opened in 1751, was chartered in 1753, and eventually became the University of Pennsylvania; in 1727 he organized a debating club, the "Junto," in Philadelphia, and later he was one of the founders of the American Philosophical Society (1743; incorporated 1780); he took the lead in the organization of a militia force, and in the paving of the city streets, improved the method of street lighting, and assisted in the founding of a city hospital (1751); in brief, he gave the impulse to nearly every measure or project for the welfare and prosperity of Philadelphia undertaken in his day. In 1751 he became a member of the General Assembly of Pennsylvania, in which he served for thirteen years. In 1753 he and William Hunter were put in charge of the post service of the colonies, which he brought in the next ten years to a high state of efficiency and made a financial success; this position he held until 1774. He visited nearly every post office in the colonies and increased the mail service between New York and Philadelphia from once to three times a week in summer, and from twice a month to once a week in winter. When war with France appeared imminent in 1754, Franklin was sent to the Albany Convention, where he submitted his plan for colonial union (see ALBANY, N.Y.). When the home government sent over General Edward Braddock[1] with two regiments of British troops, Franklin undertook to secure the requisite number of horses and waggons for the march against Ft. Duquesne, and became personally responsible for payment to the Pennsylvanians who furnished them. Notwithstanding the alarm occasioned by Braddock's defeat, the old quarrel between the proprietors of Pennsylvania and the assembly prevented any adequate preparations for defence; "with incredible meanness" the proprietors had instructed their governors to approve no act for levying the necessary taxes, unless the vast estates of the proprietors were by the same act exempted. So great was the confidence in Franklin in this emergency that early in 1756 the governor of Pennsylvania placed him in charge of the north-western frontier of the province, with power to raise troops, issue commissions and erect blockhouses; and Franklin remained in the wilderness for over a month, superintending the building of forts and watching the Indians. In February 1757 the assembly, "finding the proprietary obstinately persisted in manacling their deputies with instructions inconsistent not only with the privileges of the people, but with the service of the crown, resolv'd to petition the king against them," and appointed Franklin as their agent to present the petition. He arrived in London on the 27th of July 1757, and shortly afterwards, when, at a conference with Earl Granville, president of the council, the latter declared that "the King is the legislator of the colonies," Franklin in reply declared that the laws of the colonies were to be made by their assemblies, to be passed upon by the king, and when once approved were no longer subject to repeal or amendment by the crown. As the assemblies, said he, could not make permanent laws without the king's consent, "neither could he make a law for them without theirs." This opposition of views distinctly raised the issue between the home government and the colonies. As to the proprietors Franklin succeeded in 1760 in securing an understanding that the assembly should pass an act exempting from taxation the *unsurveyed* waste lands of the Penn estate, the surveyed waste lands being assessed at the usual rate for other property of that description. Thus the proprietors finally acknowledged the right of the assembly to tax their estates.

The success of Franklin's first foreign mission was, therefore, substantial and satisfactory. During this sojourn of five years in England he had made many valuable friends outside of court and political circles, among whom Hume, Robertson and Adam Smith were conspicuous. In 1759, for his literary and more particularly his scientific attainments, he received the freedom of the city of Edinburgh and the degree of doctor of laws from the university of St Andrews. He had been made a Master of Arts at Harvard and at Yale in 1753, and at the college of William and Mary in 1756; and in 1762 he received the degree of D.C.L. at Oxford. While in England he had made active use of his remarkable talent for pamphleteering. In the clamour for peace following the death of George II. (25th of October 1760), he was for a vigorous prosecution of the war with France; he had written what purported to be a chapter from an old book written by a Spanish Jesuit, *On the Means of Disposing the Enemie to Peace*, which had a great effect; and in the spring of 1760 there had been published a more elaborate paper written by Franklin with the assistance of Richard Jackson, agent of Massachusetts and Connecticut in London, entitled *The Interest of Great Britain Considered with Regard to Her Colonies, and the Acquisitions of Canada and Guadeloupe* (1760). This pamphlet answered the argument that it would be unsafe to keep Canada because of the added strength that would thus be given to any possible movement for independence in the English colonies, by urging that so long as Canada remained French there could be no safety for the English colonies in North America, nor any permanent peace in Europe. Tradition reports that this pamphlet had considerable weight in determining the ministry to retain Canada.

Franklin sailed again for America in August 1762, hoping to be able to settle down in quiet and devote the remainder of his life to experiments in physics. This quiet was interrupted, however, by the "Paxton Massacre" (Dec. 14, 1763)—the slaughter of a score of Indians (children, women and old men) at Lancaster, Pennsylvania, by some young rowdies from the town of Paxton, who then marched upon Philadelphia to kill a few Christian Indians there. Franklin, appealed to by the governor, raised a troop sufficient to frighten away the "Paxton boys," and for the moment there seemed a possibility of an understanding between Franklin and the proprietors. But the question of taxing the estates of the proprietors came up in a new form, and a petition from the assembly was drawn by Franklin, requesting the king "to resume the government" of Pennsylvania. In the autumn election of 1764 the influence of the proprietors was exerted against Franklin, and by an adverse majority of 25 votes in 4000 he failed to be re-elected to the assembly. The new assembly sent Franklin again to England as its special agent to take charge of another petition for a change

[1] The meeting between Franklin, the type of the shrewd, cool provincial, and Braddock, a blustering, blundering, drinking British soldier, is dramatically portrayed by Thackeray in the 9th chapter of *The Virginians*.

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of government, which, however, came to nothing. Matters of much greater consequence soon demanded Franklin's attention.

Early in 1764 Lord Grenville had informed the London agents of the American colonies that he proposed to lay a portion of the burden left by the war with France upon the shoulders of the colonists by means of a stamp duty, unless some other tax equally productive and less inconvenient were proposed. The natural objection of the colonies, as voiced, for example, by the assembly of Pennsylvania, was that it was a cruel thing to tax colonies already taxed beyond their strength, and surrounded by enemies and exposed to constant expenditures for defence, and that it was an indignity that they should be taxed by a parliament in which they were not represented; at the same time the Pennsylvania assembly recognized it as "their duty to grant aid to the crown, according to their abilities, whenever required of them in the usual manner." To prevent the introduction of the Stamp Act, which he characterized as "the mother of mischief," Franklin used every effort, but the bill was easily passed, and it was thought that the colonists would soon be reconciled to it. Because he, too, thought so, and because he recommended John Hughes, a merchant of Philadelphia, for the office of distributor of stamps, Franklin himself was denounced —he was even accused of having planned the Stamp Act—and his family in Philadelphia was in danger of being mobbed. Of Franklin's examination, in February 1766, by the House in Committee of the Whole, as to the effects of the Stamp Act, Burke said that the scene reminded him of a master examined by a parcel of schoolboys, and George Whitefield said: "Dr Franklin has gained immortal honour by his behaviour at the bar of the House. His answer was always found equal to the questioner. He stood unappalled, gave pleasure to his friends and did honour to his country."[1] Franklin compared the position of the colonies to that of Scotland in the days before the union, and in the same year (1766) audaciously urged a similar union with the colonies before it was too late. The knowledge of colonial affairs gained from Franklin's testimony, probably more than all other causes combined, determined the immediate repeal of the Stamp Act. For Franklin this was a great triumph, and the news of it filled the colonists with delight and restored him to their confidence and affection. Another bill (the Declaratory Act), however, was almost immediately passed by the king's party, asserting absolute supremacy of parliament over the colonies, and in the succeeding parliament, by the Townshend Acts of 1767, duties were imposed on paper, paints and glass imported by the colonists; a tax was imposed on tea also. The imposition of these taxes was bitterly resented in the colonies, where it quickly crystallized public opinion round the principle of "No taxation without representation." In spite of the opposition in the colonies to the Declaratory Act, the Townshend Acts and the tea tax, Franklin continued to assure the British ministry and the British public of the loyalty of the colonists. He tried to find some middle ground of reconciliation, and kept up his quiet work of informing England as to the opinions and conditions of the colonies, and of moderating the attitude of the colonies toward the home government; so that, as he said, he was accused in America of being too much an Englishman, and in England of being too much an American. He was agent now, not only of Pennsylvania, but also of New Jersey, of Georgia and of Massachusetts. Hillsborough, who became secretary of state for the colonies in 1768, refused to recognize Franklin as agent of Massachusetts, because the governor of Massachusetts had not approved the appointment, which was by resolution of the assembly. Franklin contended that the governor, as a mere agent of the king, could have nothing to do with the assembly's appointment of its agent to the king; that "the King, and not the King, Lords, and Commons collectively, is their sovereign; and that the King, with *their* respective Parliaments, is their only legislator." Franklin's influence helped to oust Hillsborough, and Dartmouth, whose name Franklin suggested, was made secretary in 1772 and promptly recognized Franklin as the agent of Massachusetts.

In 1773 there appeared in the *Public Advertiser* one of Franklin's cleverest hoaxes, "An Edict of the King of Prussia," proclaiming that the island of Britain was a colony of Prussia, having been settled by Angles and Saxons, having been protected by Prussia, having been defended by Prussia against France in the war just past, and never having been definitely freed from Prussia's rule; and that, therefore, Great Britain should now submit to certain taxes laid by Prussia—the taxes being identical with those laid upon the American colonies by Great Britain. In the same year occurred the famous episode of the Hutchinson Letters. These were written by Thomas Hutchinson, Governor of Massachusetts, Andrew Oliver (1706–1774), his lieutenant-governor, and others to William Whately, a member of Parliament, and private secretary to George Grenville, suggesting an increase of the power of the governor at the expense of the assembly, "an abridgement of what are called English liberties," and other measures more extreme than those undertaken by the government. The correspondence was shown to Franklin by a mysterious "member of parliament" to back up the contention that the quartering of troops in Boston was suggested, not by the British ministry, but by Americans and Bostonians. Upon his promise not to publish the letters Franklin received permission to send them to Massachusetts, where they were much passed about and were printed, and they were soon republished in English newspapers. The Massachusetts assembly on receiving the letters resolved to petition the crown for the removal of both Hutchinson and Oliver. The petition was refused and was condemned as scandalous, and Franklin, who took upon himself the responsibility for the publication of the letters, in the hearing before the privy council at the Cockpit on the 29th of January 1774 was insulted and was called a thief by Alexander Wedderburn (the solicitor-general, who appeared for Hutchinson and Oliver), and was removed from his position as head of the post office in the American colonies.

Satisfied that his usefulness in England was at an end, Franklin entrusted his agencies to the care of Arthur Lee, and on the 21st of March 1775 again set sail for Philadelphia. During the last years of his stay in England there had been repeated attempts to win him (probably with an under-secretaryship) to the British service, and in these same years he had done a great work for the colonies by gaining friends for them among the opposition, and by impressing France with his ability and the excellence of his case. Upon reaching America, he heard of the fighting at Lexington and Concord, and with the news of an actual outbreak of hostilities his feeling toward England seems to have changed completely. He was no longer a peacemaker, but an ardent war-maker. On the 6th of May, the day after his arrival in Philadelphia, he was elected by the assembly of Pennsylvania a delegate to the Continental Congress in Philadelphia. In October he was elected a member of the Pennsylvania assembly, but, as members of this body were still required to take an oath of allegiance to the crown, he refused to serve. In the Congress he served on as many as ten committees, and upon the organization of a continental postal system, he was made postmaster-general, a position he held for one year, when (in 1776) he was succeeded by his son-in-law, Richard Bache, who had been his deputy. With Benjamin Harrison, John Dickinson, Thomas Johnson and John Jay he was appointed in November 1775 to a committee to carry on a secret correspondence with the friends of America "in Great Britain, Ireland and other parts of the world." He planned an appeal to the king of France for aid, and wrote the instructions of Silas Deane who was to convey it. In April 1776 he went to Montreal with Charles Carroll, Samuel Chase and John Carroll, as a member of the commission which conferred with General Arnold, and attempted without success to gain the co-operation of Canada. Immediately after his return from Montreal he was a member of the committee of five appointed to draw up the Declaration of Independence, but he took no actual part himself in drafting that instrument, aside from suggesting the change or insertion of a few

[1] Many questions (about 20 of the first 25) were put by his friends to draw out what he wished to be known.

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words in Jefferson's draft. From July 16 to September 28 he acted as president of the Constitutional Convention of Pennsylvania.

With John Adams and Edward Rutledge he was selected by Congress to discuss with Admiral Howe (September 1776, at Staten Island) the terms of peace proposed by Howe, who had arrived in New York harbour in July 1776, and who had been an intimate friend of Franklin; but the discussion was fruitless, as the American commissioners refused to treat "*back* of this step of independency." On the 26th of September in the same year Franklin was chosen as commissioner to France to join Arthur Lee, who was in London, and Silas Deane, who had arrived in France in June 1776. He collected all the money he could command, between £1000 and £4000, lent it to Congress before he set sail, and arrived at Paris on the 22nd of December. He found quarters at Passy,[1] then a suburb of Paris, in a house belonging to Le Ray de Chaumont, an active friend of the American cause, who had influential relations with the court, and through whom he was enabled to be in the fullest communication with the French government without compromising it in the eyes of Great Britain.

At the time of Franklin's arrival in Paris he was already one of the most talked about men in the world. He was a member of every important learned society in Europe; he was a member, and one of the managers, of the Royal Society, and was one of eight foreign members of the Royal Academy of Sciences in Paris. Three editions of his scientific works had already appeared in Paris, and a new edition had recently appeared in London. To all these advantages he added a political purpose—the dismemberment of the British empire—which was entirely congenial to every citizen of France. "Franklin's reputation," wrote John Adams with characteristic extravagance, "was more universal than that of Leibnitz or Newton, Frederick or Voltaire; and his character more esteemed and beloved than all of them. . . . If a collection could be made of all the gazettes of Europe, for the latter half of the 18th century, a greater number of panegyrical paragraphs upon *le grand Franklin* would appear, it is believed, than upon any other man that ever lived." "Franklin's appearance in the French salons, even before he began to negotiate," says Friedrich Christoph Schlosser, "was an event of great importance to the whole of Europe. . . . His dress, the simplicity of his external appearance, the friendly meekness of the old man, and the apparent humility of the Quaker, procured for Freedom a mass of votaries among the court circles who used to be alarmed at its coarseness and unsophisticated truths. Such was the number of portraits,[2] busts and medallions of him in circulation before he left Paris that he would have been recognized from them by any adult citizen in any part of the civilized world."

Franklin's position in France was a difficult one from the start, because of the delicacy of the task of getting French aid at a time when France was unready openly to take sides against Great Britain. But on the 6th of February 1778, after the news of the defeat and surrender of Burgoyne had reached Europe, a treaty of alliance and a treaty of amity and commerce between France and the United States were signed at Paris by Franklin, Deane and Lee. On the 28th of October this commission was discharged and Franklin was appointed sole plenipotentiary to the French court. Lee, from the beginning of the mission to Paris, seems to have been possessed of a mania of jealousy toward Franklin, or of misunderstanding of his acts, and he tried to undermine his influence with the Continental Congress. John Adams, when he succeeded Deane (recalled from Paris through Lee's machinations) joined in the chorus of fault-finding against Franklin, dilated upon his social habits, his personal slothfulness and his complete lack of business-like system; but Adams soon came to see that, although careless of details, Franklin was doing what no other man could have done, and he ceased his harsher criticism. Even greater than his diplomatic difficulties were Franklin's financial straits. Drafts were being drawn on him by all the American agents in Europe, and by the Continental Congress at home. Acting as American naval agent for the many successful privateers who harried the English Channel, and for whom he skilfully got every bit of assistance possible, open and covert, from the French government, he was continually called upon for funds in these ventures. Of the vessels to be sent to Paris with American cargoes which were to be sold for the liquidation of French loans to the colonies made through Beaumarchais, few arrived; those that did come did not cover Beaumarchais's advances, and hardly a vessel came from America without word of fresh drafts on Franklin. After bold and repeated overtures for an exchange of prisoners—an important matter, both because the American frigates had no place in which to stow away their prisoners, and because of the maltreatment of American captives in such prisons as Dartmoor—exchanges began at the end of March 1779, although there were annoying delays, and immediately after November 1781 there was a long break in the agreement; and the Americans discharged from English prisons were constantly in need of money. Franklin, besides, was constantly called upon to meet the indebtedness of Lee and of Ralph Izard (1742–1804), and of John Jay, who in Madrid was being drawn on by the American Congress. In spite of the poor condition in Europe of the credit of the struggling colonies, and of the fact that France was almost bankrupt (and in the later years was at war), and although Necker strenuously resisted the making of any loans to the colonies, France, largely because of Franklin's appeals, expended, by loan or gift to the colonies, or in sustenance of the French arms in America, a sum estimated at $60,000,000.

In 1781 Franklin, with John Adams, John Jay, Jefferson, who remained in America, and Henry Laurens, then a prisoner in England, was appointed on a commission to make peace with Great Britain. In the spring of 1782 Franklin had been informally negotiating with Shelburne, secretary of state for the home department, through the medium of Richard Oswald, a Scotch merchant, and had suggested that England should cede Canada to the United States in return for the recognition of loyalist claims by the states. When the formal negotiations began Franklin held closely to the instructions of Congress to its commissioners, that they should maintain confidential relations with the French ministers and that they were "to undertake nothing in the negotiations for peace or truce without their knowledge and concurrence," and were ultimately to be governed by "their advice and opinion." Jay and Adams disagreed with him on this point, believing that France intended to curtail the territorial aspirations of the Americans for her own benefit and for that of her ally, Spain. At last, after the British government had authorized its agents to treat with the commissioners as representatives of an independent power, thus recognizing American independence before the treaty was made, Franklin acquiesced in the policy of Jay. The preliminary treaty was signed by the commissioners on the 30th of November 1782, the final treaty on the 3rd of September 1783. Franklin had repeatedly petitioned Congress for his recall, but his letters were unanswered or his appeals refused until the 7th of March 1785, when Congress resolved that he be allowed to return to America; on the 10th of March Thomas Jefferson, who had joined him in August of the year before, was appointed to his place. Jefferson, when asked if he replaced Franklin, replied, "No one can replace him, sir; I am only his successor." Before Franklin left Paris on the 12th of July 1785 he had made commercial treaties with Sweden (1783) and Prussia (1785; signed after Franklin's departure by Jefferson and John Adams). Franklin arrived in Philadelphia on the 13th of September, disembarking at the same wharf as when he had first entered the city. He was immediately elected a member of the municipal council of Philadelphia, becoming its chairman; and was chosen president of the Supreme Executive Council (the chief executive officer) of Pennsylvania, and was re-elected in 1786 and 1787.

[1] The house is familiar from the drawing of it by Victor Hugo.

[2] Many of these portraits bore inscriptions, the most famous of which was Turgot's line, "Eripuit fulmen coelo sceptrumque tyrannis."

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serving from October 1785 to October 1788. In May 1787 he was elected a delegate to the Convention which drew up the Federal Constitution, this body thus having a member upon whom all could agree as chairman, should Washington be absent. He opposed over-centralization of government and favoured the Connecticut Compromise, and after the work of the Convention was done used his influence to secure the adoption of the Constitution.[1] As president of the Pennsylvania Society for Promoting the Abolition of Slavery, Franklin signed a petition to Congress (12th February 1790) for immediate abolition of slavery, and six weeks later in his most brilliant manner parodied the attack on the petition made by James Jackson (1757–1806) of Georgia, taking off Jackson's quotations of Scripture with pretended texts from the Koran cited by a member of the Divan of Algiers in opposition to a petition asking for the prohibition of holding Christians in slavery. These were his last public acts. His last days were marked by a fine serenity and calm; he died in his own house in Philadelphia on the 17th of April 1790, the immediate cause being an abscess in the lungs. He was buried with his wife in the graveyard (Fifth and Arch Streets) of Christ Church, Philadelphia.

Physically Franklin was large, about 5 ft. 10 in. tall, with a well-rounded, powerful figure; he inherited an excellent constitution from his parents—"I never knew," says he, "either my father or mother to have any sickness but that of which they d'y'd, he at 89, and she at 85 years of age"—but injured it somewhat by excesses; in early life he had severe attacks of pleurisy, from one of which, in 1727, it was not expected that he would recover, and in his later years he was the victim of stone and gout. When he was sixteen he became a vegetarian for a time, rather to save money for books than for any other reason, and he always preached moderation in eating, though he was less consistent in his practice in this particular than as regards moderate drinking. He was always enthusiastically fond of swimming, and was a great believer in fresh air, taking a cold air bath regularly in the morning, when he sat naked in his bedroom beguiling himself with a book or with writing for a half-hour or more. He insisted that fresh, cold air was not the cause of colds, and preached zealously the "gospel of ventilation." He was a charming talker, with a gay humour and a quiet sarcasm and a telling use of anecdote for argument. Henri Martin, the French historian, speaks of him as "of a mind altogether French in its grace and elasticity." In 1730 he married Deborah Read, in whose father's house he had lived when he had first come to Philadelphia, to whom he had been engaged before his first departure from Philadelphia for London, and who in his absence had married a ne'er-do-well, one Rogers, who had deserted her. The marriage to Franklin is presumed to have been a common law marriage, for there was no proof that Miss Read's former husband was dead, nor that, as was suspected, a former wife, alive when Rogers married Miss Read, was still alive, and that therefore his marriage to Deborah was void. His "Debby," or his "dear child," as Franklin usually addressed her in his letters, received into the family, soon after her marriage, Franklin's illegitimate son, William Franklin (1729–1813),[2] with whom she afterwards quarrelled, and whose mother, tradition says, was Barbara, a servant in the Franklin household. Another illegitimate child became the wife of John Foxcroft of Philadelphia. Deborah, who was "as much dispos'd to industry and frugality as" her husband, was illiterate and shared none of her husband's tastes for literature and science; her dread of an ocean voyage kept her in Philadelphia during Franklin's missions to England, and she died in 1774, while Franklin was in London. She bore him two children, one a son, Francis Folger, "whom I have seldom since seen equal'd in everything, and whom to this day [thirty-six years after the child's death] I cannot think of without a sigh," who died (1736) when four years old of small-pox, not having been inoculated; the other was Sarah (1744–1808), who married Richard Bache (1737–1811), Franklin's successor in 1776–1782 as postmaster-general. Franklin's gallant relations with women after his wife's death were probably innocent enough. Best known of his French *amies* were Mme Helvétius, widow of the philosopher, and the young Mme Brillon, who corrected her "Papa's" French and tried to bring him safely into the Roman Catholic Church. With him in France were his grandsons, William Temple Franklin, William Franklin's natural son, who acted as private secretary to his grandfather, and Benjamin Franklin Bache (1769–1798), Sarah's son, whom he sent to Geneva to be educated, for whom he later asked public office of Washington, and who became editor of the *Aurora*, one of the leading journals in the Republican attacks on Washington.

Franklin early rebelled against New England Puritanism and spent his Sundays in reading and in study instead of attending church. His free-thinking ran its extreme course at the time of his publication in London of *A Dissertation on Liberty and Necessity, Pleasure and Pain* (1725), which he recognized as one of the great *errata* of his life. He later called himself a deist, or theist, not discriminating between the terms. To his favourite sister he wrote: "There are some things in your New England doctrine and worship which I do not agree with; but I do not therefore condemn them, or desire to shake your belief or practice of them." Such was his general attitude. He did not believe in the divinity of Christ, but thought "his system of morals and his religion, as he left them to us, the best the world ever saw, or is like to see." His intense practical-mindedness drew him away from religion, but drove him to a morality of his own (the "art of virtue," he called it), based on thirteen virtues each accompanied by a short precept; the virtues were Temperance, Silence, Order, Resolution, Frugality, Industry, Sincerity, Justice, Moderation, Cleanliness, Tranquility, Chastity and Humility, the precept accompanying the last-named virtue being "Imitate Jesus and Socrates." He made a business-like little notebook, ruled off spaces for the thirteen virtues and the seven days of the week, "determined to give a week's strict attention to each of the virtues successively . . . [going] thro' a course compleate in thirteen weeks and four courses in a year," marking for each day a record of his adherence to each of the precepts. "And conceiving God to be the fountain of wisdom," he "thought it right and necessary to solicit His assistance for obtaining it," and drew up the following prayer for daily use: "O powerful Goodness! bountiful Father! merciful Guide! Increase in me that wisdom which discovers my truest interest. Strengthen my resolution to perform what that wisdom dictates. Accept my kind offices to Thy other children, as the only return in my power for Thy continual favours to me." He was by no means prone to overmuch introspection, his great interest in the conduct of others being shown in the wise maxims of Poor Richard, which were possibly too utilitarian but were wonderfully successful in instructing American morals. His *Art of Virtue* on which he worked for years was never completed or published in any form.

"Benjamin Franklin, Printer," was Franklin's own favourite description of himself. He was an excellent compositor and pressman; his workmanship, clear impressions, black ink and comparative freedom from errata did much to get him the public printing in Pennsylvania and New Jersey, and the printing of the paper money[3] and other public matters in Delaware. The first book with his imprint is *The Psalms of David Imitated in*

[1] Notably in a pamphlet comparing the Jews and the Anti-Federalists.

[2] William Franklin served on the Canadian frontier with Pennsylvania troops, becoming captain in 1750; was in the post-office in 1754–1756; went to England with his father in 1758; was admitted to legal practice in 1758; in 1763, recommended by Lord Fairfax, became governor of New Jersey; he left the Whig for the Tory party; and in the War of Independence was a faithful loyalist, much to the pain and regret of his father, who, however, was reconciled to him in part in 1784. He was held as a prisoner from 1776 until exchanged in 1778; and lived four years in New York, and during the remainder of his life in England with an annual pension of £800 from the crown.

[3] For the prevention of counterfeiting continental paper money Franklin long afterwards suggested the use on the different denominations of different leaves, having noted the infinite variety of leaf venation.

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the Language of the New Testament and apply'd to the Christian State and Worship. By I. Watts ..., Philadelphia: Printed by B. F. and H. M. for Thomas Godfrey, and Sold at his Shop, 1729. The first novel printed in America was Franklin's reprint in 1744 of *Pamela*; and the first American translation from the classics which was printed in America was a version by James Logan (1674–1751) of Cato's *Moral Distichs* (1735). In 1744 he published another translation of Logan's, Cicero *On Old Age*, which Franklin thought typographically the finest book he had ever printed. In 1733 he had established a press in Charleston, South Carolina, and soon after did the same in Lancaster, Pa., in New Haven, Conn., in New York, in Antigua, in Kingston, Jamaica, and in other places. Personally he had little connexion with the Philadelphia printing office after 1748, when David Hall became his partner and took charge of it. But in 1753 he was eagerly engaged in having several of his improvements incorporated in a new press, and more than twenty years after was actively interested in John Walter's scheme of "logography." In France he had a private press in his house in Passy, on which he printed "bagatelles." Franklin's work as a publisher is for the most part closely connected with his work in issuing the *Gazette* and *Poor Richard's Almanack* (a summary of the proverbs from which appeared in the number for 1758, and has often been reprinted—under such titles as *Father Abraham's Speech*, and *The Way to Wealth*).[1]

Of much of Franklin's work as an author something has already been said. Judged as literature, the first place belongs to his *Autobiography*, which unquestionably ranks among the few great autobiographies ever written. His style in its simplicity, facility and clearness owed something to De Foe, something to Cotton Mather, something to Plutarch, more to Bunyan and to his early attempts to reproduce the manner of the third volume of the *Spectator*; and not the least to his own careful study of word usage. From Xenophon's *Memorabilia* he learned when a boy the Socratic method of argument. Swift he resembled in the occasional touches of his humour, in his brilliantly successful use of sarcasm and irony,[2] and in his mastery of the hoax. Balzac said of him that he "invented the lightning-rod, the hoax ('le canard') and the republic." Among his more famous hoaxes were the "Edict of the King of Prussia" (1773), already described; the fictitious supplement to the Boston *Chronicle*, printed on his private press at Passy in 1782, and containing a letter with an invoice of eight packs of 954 cured, dried, hooped and painted scalps of rebels, men, women and children, taken by Indians in the British employ; and another fictitious *Letter from the Count de Schaumberg to the Baron Hohendorf commanding the Hessian Troops in America* (1777)—the count's only anxiety is that not enough men will be killed to bring him in moneys he needs, and he urges his officer in command in America "to prolong the war . . . for I have made arrangements for a grand Italian opera, and I do not wish to be obliged to give it up."[3]

Closely related to Franklin's political pamphlets are his writings on economics, which, though undertaken with a political or practical purpose and not in a purely scientific spirit, rank him as the first American economist. He wrote in 1729 *A Modest Enquiry into the Nature and Necessity of a Paper Currency*, which argued that a plentiful currency will make rates of interest low and will promote immigration and home manufactures, and which did much to secure the further issue of paper money in Pennsylvania. After the British Act of 1750 forbidding the erection or the operating of iron or steel mills in the colonies, Franklin wrote *Observations concerning the Increase of Mankind and the Peopling of Countries* (1751); its thesis was that manufactures come to be common only with a high degree of social development and with great density of population, and that Great Britain need not, therefore, fear the industrial competition of the colonies, but it is better known for the estimate (adopted by Adam Smith) that the population of the colonies would double every quarter-century; and for the likeness to Malthus's[4] "preventive check" of its statement: "The greater the common fashionable expense of any rank of people the more cautious they are of marriage." His *Positions to be examined concerning National Wealth* (1769) shows that he was greatly influenced by the French physiocrats after his visit to France in 1767. His *Wail of a Protected Manufacturer* voices a protest against protection as raising the cost of living; and he held that free trade was based on a natural right. He knew Kames, Hume and Adam Smith, and corresponded with Mirabeau, "the friend of Man." Some of the more important of his economic theses, as summarized by W. A. Wetzel, are: that money as coin may have more than its bullion value; that natural interest is determined by the rent of land valued at the sum of money loaned—an anticipation of Turgot; that high wages are not inconsistent with a large foreign trade; that the value of an article is determined by the amount of labour necessary to produce the food consumed in making the article; that manufactures are advantageous but agriculture only is truly productive; and that when practicable (as he did not think it practicable at the end of the War of Independence) state revenue should be raised by direct tax.

Franklin as a scientist[5] and as an inventor has been decried by experts as an amateur and a dabbler; but it should be remembered that it was always his hope to retire from public life and devote himself to science. In the American Philosophical Society (founded 1743) scientific subjects were much discussed. Franklin wrote a paper on the causes of earthquakes for his *Gazette* of the 15th of December 1737; and he eagerly collected material to uphold his theory that waterspouts and whirlwinds resulted from the same causes. In 1743, from the circumstance that an eclipse not visible in Philadelphia because of a storm had been observed in Boston, where the storm although north-easterly did not occur until an hour after the eclipse, he surmised that storms move *against* the wind along the Atlantic coast. In the year before (1742) he had planned the "Pennsylvania fire-place," better known as the "Franklin stove," which saved fuel, heated all the rooms, and had the same principle as the hot-air furnace; the stove was never patented by Franklin, but was described in his pamphlet dated 1744. He was much engaged at the same time in remedying smoking chimneys, and as late as 1785 wrote to Jan Ingenhousz, physician to the emperor of Austria, on chimneys and draughts; smoking street lamps he remedied by a simple contrivance. The study of electricity he took up in 1746 when he first saw a Leyden jar, in the manipulation of which he became expert and which he improved by the use of granulated lead in the place of water for the interior armatures; he recognized that condensation is due to the dielectric and not to the metal coatings. A note in his diary, dated the 7th of November 1749, shows that he had then

[1] "Seventy-five editions of it have been printed in English, fifty-six in French, eleven in German and nine in Italian. It has been translated into Spanish, Danish, Swedish, Welsh, Polish, Gaelic, Russian, Bohemian, Dutch, Catalan, Chinese, modern Greek and phonetic writing. It has been printed at least four hundred times, and is to-day as popular as ever."—P. L. Ford, in *The Many-Sided Franklin* (1899).

[2] Both Swift and Franklin made sport of the typical astrologer almanack-maker.

[3] Another hoax was Franklin's parable against religious persecution thrown into Scriptural form and quoted by him as the fifty-first chapter of Genesis. In a paper on a "Proposed New Version of the Bible" he paraphrased a few verses of the first chapter of Job, making them a satiric attack on royal government; but the version may well rank with these hoaxes, and even modern writers have been taken in by it, regarding it as a serious proposal for a "modernized" version and decrying it as poor taste. Matthew Arnold, for example, declared this an instance in which Franklin was lacking in his "imperturbable common sense"; and J. B. McMaster, though devoting several pages to its discussion, very ingenuously declares it "beneath criticism."

[4] Malthus quoted Franklin in his first edition, but it was not until the second that he introduced the theory of the "preventive check." Franklin noted the phenomenon with disapproval in his advocacy of increased population; Malthus with approval in his search for means to decrease population.

[5] The title of philosopher as used in Franklin's lifetime referred neither in England nor in France to him as author of moral maxims, but to him as a scientist—a "natural philosopher."

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conjectured that thunder and lightning were electrical manifestations; in the same year he planned the lightning-rod (long known as "Franklin's rod"), which he described and recommended to the public in 1753, when the Copley medal of the Royal Society was awarded him for his discoveries. The famous experiment with the kite, proving lightning an electrical phenomenon, was performed by Franklin in June 1752. He overthrew entirely the "friction" theory of electricity and conceived the idea of plus and minus charges (1753); he thought the sea the source of electricity. On light Franklin wrote to David Rittenhouse in June 1784; the sum of his own conjectures was that the corpuscular theory of Newton was wrong, and that light was due to the vibration of an elastic aether. He studied with some care the temperature of the Gulf Stream. In navigation he suggested many new contrivances, such as water-tight compartments, floating anchors to lay a ship to in a storm, and dishes that would not upset during a gale; and beginning in 1757 made repeated experiments with oil on stormy waters. As a mathematician he devised various elaborate magic squares and novel magic circles, of which he speaks apologetically, because they are of no practical use. Always much interested in agriculture, he made an especial effort (like Robert R. Livingston) to promote the use of plaster of Paris as a fertiliser. He took a prominent part in aeronautic experiments during his stay in France. He made an excellent clock, which because of a slight improvement introduced by James Ferguson in 1757 was long known as Ferguson's clock. In medicine Franklin was considered important enough to be elected to the Royal Medical Society of Paris in 1777, and an honorary member of the Medical Society of London in 1787. In 1784 he was on the committee which investigated Mesmer, and the report is a document of lasting scientific value. Franklin's advocacy of vegetarianism, of sparing and simple diet, and of temperance in the use of liquors, and of proper ventilation has already been referred to. His most direct contribution to medicine was the invention for his own use of bifocal eyeglasses.

A summary of so versatile a genius is impossible. His services to America in England and France rank him as one of the heroes of the American War of Independence and as the greatest of American diplomats. Almost the only American scientist of his day, he displayed remarkably deep as well as remarkably varied abilities in science and deserved the honours enthusiastically given him by the *savants* of Europe.

BIBLIOGRAPHY.—Franklin's works were not collected in his own lifetime, and he made no effort to publish his writings. *Experiments and Observations on Electricity* (London, 1769) was translated into French by Barbeu Dubourg (Paris, 1773); Vaughan attempted a more complete edition, *Political, Miscellaneous and Philosophical Pieces* (London, 1779); an edition in three volumes appeared after Franklin's death (London, 1806); what seemed the authentic *Works*, as it was under the care of Temple Franklin, was published at London (6 vols., 1817–1819; 3 vols., 1818) and with some additional matter at Philadelphia (6 vols., 1818). Sparks's edition (10 vols., Boston, 1836–1842; revised, Philadelphia, 1858) also contained fresh matter; and there are further additions in the edition of John Bigelow (Philadelphia, 1887–1888; 5th ed., 1905) and in that by Albert Henry Smyth (10 vols., New York, 1905–1907). There are important Franklinian, about 13,000 papers, in the possession of the American Philosophical Society, to which they were conveyed by the son of Temple Franklin's executor, George Fox. Other papers which had been left to Fox lay for years in barrels in a stable garret; they were finally cleared out, their owner, Mary Fox, intending to send them to a paper mill. One barrel went to the mill. The others, it was found, contained papers belonging to Franklin, and this important collection was bought and presented to the university of Pennsylvania. The valuable Franklinian collected by Henry Stevens were purchased by Congress in 1885. These MS. collections were first carefully gone over for the edition of the *Works* by A. H. Smyth. Franklin's *Autobiography* was begun in 1771 as a private chronicle for his son, Governor William Franklin; the papers, bringing the story of his father's life down to 1730, were lost by the governor during the War of Independence, and in 1783 came into the possession of Abel James, who restored them to Franklin and urged him to complete the sketch. He wrote a little in 1784, more in 1788, when he furnished a copy to his friend le Veillard, and a little more in 1790. The original manuscript was long in the possession of Temple Franklin, who spent years rearranging the matter in it and making over into politer English his grandfather's plain-spokenness. So long was the publication delayed that it was generally believed that Temple Franklin had sold all the papers to the British government; a French version, *Mémoires de la vie privée* (Paris, 1791), was retranslated into English twice in 1793 (London), and from one of these versions (by Robinson) still another French version was made (Paris, 1798). Temple Franklin, deciding to print, got from le Veillard the copy sent to him in 1788 (sending in return the original with autograph alterations and the final addition), and from the copy published (London, 1817) an edition supposed to be authentic and complete. The complete autograph of the biography, acquired by John Bigelow in 1867 from its French owners, upon collation with Temple Franklin's edition showed that the latter contained 1200 emasculations and that it omitted entirely what had been written in 1790. Bigelow published the complete *Autobiography* with additions from Franklin's correspondence and other writings in 1868; a second edition (3 vols., Philadelphia, 1888) was published under the title, *The Life of Benjamin Franklin, Written by Himself*.

In addition to the *Autobiography* see James Parton, *Life and Times of Benjamin Franklin* (2 vols., New York, 1864); John T. Morse, Jr., *Benjamin Franklin* (Boston, 1889, in the American Statesmen series); J. B. McMaster, *Benjamin Franklin as a Man of Letters* (Boston, 1887, in American Men of Letters series); Paul L. Ford, *The Many-Sided Franklin* (New York, 1899) and *Franklin Bibliography* (Brooklyn, 1889); E. E. Hale and E. E. Hale, Jr., *Franklin in France* (2 vols., Boston, 1888); J. H. A. Donioł, *Histoire de la participation de la France à l'établissement des Etats-Unis d'Amérique* (Paris, 6 vols., 1886–1900); S. G. Fisher, *The True Benjamin Franklin* (Philadelphia, 1899); E. Robins, *Benjamin Franklin* (New York, 1898, in the American Men of Energy series); W. A. Wetzel, "Benjamin Franklin as an Economist," No. 9, in series 13 of *Johns Hopkins Studies in Historical and Political Science*; and the prefaces and biographical matter in A. H. Smyth's edition of the *Works* (New York, 1905–1907). (W. Wo.)

FRANKLIN, SIR JOHN (1786–1847), English rear-admiral and explorer, was born at Spilsby, Lincolnshire, on the 16th of April 1786. His family was descended from a line of free-holders or "franklins" from whom some centuries earlier they had derived their surname; but the small family estate was sold by his father, who went into business. John, who was the fifth and youngest son and ninth child, was destined for the church. At the age of ten he was sent to school at St Ives, and soon afterwards was transferred to Louth grammar school, which he attended for two years. About this time his imagination was deeply impressed by a holiday walk of 12 m. which he made with a companion to look at the sea, and he determined to be a sailor. In the hope of dispelling this fancy his father sent him on a trial voyage to Lisbon in a merchantman; but it being found on his return that his wishes were unchanged he was entered as a midshipman on board the "Polyphemus," and shortly afterwards took part in her in the hard-fought battle of Copenhagen (2nd of April 1801). Two months later he joined the "Investigator," a discovery-ship commanded by his cousin Captain Matthew Flinders, and under the training of that able scientific officer was employed in the exploration and mapping of the coasts of Australia, where he acquired a correctness of astronomical observation and a skill in surveying which proved of eminent utility in his future career. He was on board the "Porpoise" when that ship and the "Cato" were wrecked (18th of August 1803) on a coral reef off the coast of Australia, and after this misfortune proceeded to China. Thence he obtained a passage to England in the "Earl Camden," East Indiaman, commanded by Captain (afterwards Sir) Nathaniel Dance, and performed the duty of signal midshipman in the famous action of the 15th of February 1804 when Captain Dance repulsed a strong French squadron led by the redoubtable Admiral Linois. On reaching England he joined the "Bellerophon," 74, and was in charge of the signals on board that ship during the battle of Trafalgar. Two years later he joined the "Bedford," attaining the rank of lieutenant the year after, and served in her on the Brazil station (whither the "Bedford" went as part of the convoy which escorted the royal family of Portugal to Rio de Janeiro in 1808), in the blockade of Flushing, and finally in the disastrous expedition against New Orleans (1814), in which campaign he displayed such zeal and intelligence as to merit special mention in despatches.

On peace being established, Franklin turned his attention once more to the scientific branch of his profession, and sedulously extended his knowledge of surveying. In 1818 the discovery of a North-West Passage to the Pacific became again, after a

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long interval, an object of national interest, and Lieutenant Franklin was given the command of the "Trent" in the Arctic expedition, under the orders of Captain Buchan in the "Dorothea". During a heavy storm the "Dorothea" was so much damaged by the pack-ice that her reaching England became doubtful, and, much to the chagrin of young Franklin, the "Trent" was compelled to convoy her home instead of being allowed to prosecute the voyage alone. This voyage, however, had brought Franklin into personal intercourse with the leading scientific men of London, and they were not slow in ascertaining his peculiar fitness for the command of such an enterprise. To calmness in danger, promptness and fertility of resource, and excellent seamanship, he added an ardent desire to promote science for its own sake, together with a love of truth that led him to do full justice to the merits of his subordinate officers, without wishing to claim their discoveries as a captain's right. Furthermore, he possessed a cheerful buoyancy of mind, sustained by deep religious principle, which was not depressed in the most gloomy times. It was therefore with full confidence in his ability and exertions that, in 1819, he was placed in command of an expedition appointed to proceed overland from the Hudson Bay to the shores of the Arctic Sea, and to determine the trendings of that coast eastward of the Coppermine river. At this period the northern coast of the American continent was known at two isolated points only,—this, the mouth of the Coppermine river (which, as Franklin discovered, was erroneously placed four degress of latitude too much to the north), and the mouth of the Mackenzie far to the west of it. Lieutenant Franklin and his party, consisting of Dr Richardson, Midshipmen George Back and Richard Hood, and a few ordinary boatmen, arrived at the depot of the Hudson's Bay Company at the end of August 1819, and making an autumnal journey of 700 m. spent the first winter on the Saskatchewan. Owing to the supplies which had been promised by the North-West and Hudson's Bay Companies not being forthcoming the following year, it was not until the summer of 1821 that the Coppermine was ascended to its mouth, and a considerable extent of sea-coast to the eastward surveyed. The return journey led over the region known as the Barren Ground, and was marked by the most terrible sufferings and privations and the tragic death of Lieutenant Hood. The survivors of the expedition reached York Factory in the month of June 1822, having accomplished altogether 5550 m. of travel. While engaged on this service Franklin was promoted to the rank of commander (1st of January 1821), and upon his return to England at the end of 1822 he obtained the post rank of captain and was elected a fellow of the Royal Society. The narrative of this expedition was published in the following year and became at once a classic of travel, and soon after he married Eleanor, the youngest daughter of William Porden, an eminent architect.

Early in 1825 he was entrusted with the command of a second overland expedition, and upon the earnest entreaty of his dying wife, who encouraged him to place his duty to his country before his love for her, he set sail without waiting to witness her end. Accompanied as before by Dr (afterwards Sir) John Richardson and Lieutenant (afterwards Sir) George Back, he descended the Mackenzie river in the season of 1826 and traced the North American coast as far as 149° 37′ W. long., whilst Richardson at the head of a separate party connected the mouths of the Coppermine and Mackenzie rivers. Thus between the years 1819 and 1827 he had added 1200 m. of coast-line to the American continent, or one-third of the whole distance from the Atlantic to the Pacific. These exertions were fully appreciated at home and abroad. He was knighted in 1829, received the honorary degree of D.C.L. from the university of Oxford, was awarded the gold medal of the Geographical Society of Paris, and was elected corresponding member of the Paris Academy of Sciences. The results of these expeditions are described by Franklin and Dr Richardson in two magnificent works published in 1824–1829. In 1828 he married his second wife, Jane, second daughter of John Griffin. His next official employment was on the Mediterranean station, in command of the "Rainbow," and his ship soon became proverbial in the squadron for the happiness and comfort of her officers and crew. As an acknowledgment of the essential service which he rendered off Patras in the Greek War of Independence, he received the cross of the Redeemer of Greece from King Otto, and after his return to England he was created knight commander of the Guelphic order of Hanover.

In 1836 he accepted the lieutenant-governorship of Van Diemen's Land (now Tasmania), and held that post till the end of 1843. His government was marked by several events of much interest, one of his most popular measures being the opening of the doors of the legislative council to the public. He also founded a college, endowing it largely from his private funds, and in 1838 established a scientific society at Hobart Town (now called the Royal Society of Tasmania), the meetings of which were held in Government House and its papers printed at his expense. In his time also the colony of Victoria was founded by settlers from Tasmania; and towards its close, transportation to New South Wales having been abolished, the convicts from every part of the British empire were sent to Tasmania. On an increase of the lieutenant-governor's salary being voted by the colonial legislature, Sir John declined to derive any advantage from it personally, while he secured the augmentation to his successors. He welcomed eagerly the various expeditions for exploration and surveying which visited Hobart Town, conspicuous among these, and of especial interest to himself, being the French and English Antarctic expeditions of Dumont d'Urville and Sir James C. Ross—the latter commanding the "Erebus" and "Terror," with which Franklin's own name was afterwards to be so pathetically connected. A magnetic observatory fixed at Hobart Town, as a dependency of the central establishment under Colonel Sabine, was also an object of deep interest up to the moment of his leaving the colony. That his unflinching efforts for the social and political advancement of the colony were appreciated was abundantly proved by the affection and respect shown him by every section of the community on his departure; and several years afterwards the colonists showed their remembrance of his virtues and services by sending Lady Franklin a subscription of £1700 in aid of her efforts for the search and relief of her husband, and later still by a unanimous vote of the legislature for the erection of a statue in honour of him at Hobart Town.

Sir John found on reaching England that there was about to be a renewal of polar research, and that the confidence of the admiralty in him was undiminished, as was shown by his being offered the command of an expedition for the discovery of a North-West Passage to the Pacific. This offer he accepted. The prestige of Arctic service and of his former experiences attracted a crowd of volunteers of all classes, from whom were selected a body of officers conspicuous for talent and energy. Captain Crozier, who was second in command, had been three voyages with Sir Edward Parry, and had commanded the "Terror" in Ross's Antarctic expedition. Captain Fitzjames, who was commander on board the "Erebus," had been five times gazetted for brilliant conduct in the operations of the first China war, and in a letter which he wrote from Greenland has bequeathed some good-natured but masterly sketches of his brother officers and messmates on this expedition. Thus supported, with crews carefully chosen (some of whom had been engaged in the whaling service), victualled for three years, and furnished with every appliance then known, Franklin's expedition, consisting of the "Erebus" and "Terror" (129 officers and men), with a transport ship to convey additional stores as far as Disco in Greenland, sailed from Greenhithe on the 19th of May 1845. The letters which Franklin despatched from Greenland were couched in language of cheerful anticipation of success, while those received from his officers expressed their glowing hope, their admiration of the seamanlike qualities of their commander, and the happiness they had in serving under him. The ships were last seen by a whaler near the entrance of Lancaster Sound, on the 26th of July, and the deep gloom which settled down upon their subsequent movements was not finally raised till fourteen years later.

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Franklin's instructions were framed in conjunction with Sir John Barrow and upon his own suggestions. The experience of Parry had established the navigability of Lancaster Sound (leading westwards out of Baffin Bay), whilst Franklin's own surveys had long before satisfied him that a navigable passage existed along the north coast of America from the Fish river to Bering Strait. He was therefore directed to push through Lancaster Sound and its continuation, Barrow Strait, without loss of time, until he reached the portion of land on which Cape Walker is situated, or about long. 98° W., and from that point to pursue a course southward towards the American coast. An explicit prohibition was given against a westerly course beyond the longitude of 98° W., but he was allowed the single alternative of previously examining Wellington Channel (which leads out of Barrow Strait) for a northward route, if the navigation here were open.

In 1847, though there was no real public anxiety as to the fate of the expedition, preparations began to be made for the possible necessity of sending relief. As time passed, however, and no tidings reached England, the search began in earnest, and from 1848 onwards expedition after expedition was despatched in quest of the missing explorers. The work of these expeditions forms a story of achievement which has no parallel in maritime annals, and resulted in the discovery and exploration of thousands of miles of new land within the grim Arctic regions, the development of the system of sledge travelling, and the discovery of a second North-West Passage in 1850 (see POLAR REGIONS). Here it is only necessary to mention the results so far as the search for Franklin was concerned. In this great national undertaking Lady Franklin's exertions were unwearied, and she exhausted her private funds in sending out auxiliary vessels to quarters not comprised in the public search, and by her pathetic appeals roused the sympathy of the whole civilized world.

The first traces of the missing ships, consisting of a few scattered articles, besides three graves, were discovered at Franklin's winter quarters (1845–1846) on Beechey Island, by Captain (afterwards Sir) Erasmus Ommanney of the "Assistance," in August 1851, and were brought home by the "Prince Albert," which had been fitted out by Lady Franklin. No further tidings were obtained until the spring of 1854, when Dr John Rae, then conducting a sledging expedition of the Hudson's Bay Company from Repulse Bay, was told by the Eskimo that (as was inferred) in 1850 white men, to the number of about forty, had been seen dragging a boat southward along the west shore of King William's Island, and that later in the same season the bodies of the whole party were found by the natives at a point a short distance to the north-west of Back's Great Fish river, where they had perished from the united effects of cold and famine. The latter statement was afterwards disproved by the discovery of skeletons upon the presumed line of route; but indisputable proof was given that the Eskimo had communicated with members of the missing expedition, by the various articles obtained from them and brought home by Dr Rae. In consequence of the information obtained by Dr Rae, a party in canoes, under Messrs Anderson and Stewart, was sent by government down the Great Fish river in 1855, and succeeded in obtaining from the Eskimo at the mouth of the river a considerable number of articles which had evidently belonged to the Franklin expedition; while others were picked up on Montreal Island a day's march to the northward. It was clear, therefore, that a party from the "Erebus" and "Terror" had endeavoured to reach the settlements of the Hudson's Bay Company by the Fish river route, and that in making a southerly course it had been arrested within the channel into which the Great Fish river empties itself. The admiralty now decided to take no further steps to determine the exact fate of the expedition, and granted to Dr Rae the reward of £10,000 which had been offered in 1849 to whosoever should first succeed in obtaining authentic news of the missing men. It was therefore reserved for the latest effort of Lady Franklin to develop, not only the fate of her husband's expedition but also the steps of its progress up to the very verge of success, mingled indeed with almost unprecedented disaster. With all her available means, and aided, as she had been before, by the subscriptions of sympathizing friends, she purchased and fitted out the little yacht "Fox," which sailed from Aberdeen in July 1857. The command was accepted by Captain (afterwards Sir) Leopold M'Clintock, whose high reputation had been won in three of the government expeditions sent out in search of Franklin. Having been compelled to pass the first winter in Baffin Bay, it was not till the autumn of 1858 that the "Fox" passed down Prince Regent's Inlet, and put into winter quarters at Port Kennedy at the eastern end of Bellot Strait, between North Somerset and Boothia Felix. In the spring of 1859 three sledging parties went out, Captain (afterwards Sir) Allen Young to examine Prince of Wales Island, Lieutenant (afterwards Captain) Hobson the north and west coasts of King William's Island, and M'Clintock the east and south coasts of the latter, the west coast of Boothia, and the region about the mouth of Great Fish river. This splendid and exhaustive search added 800 m. of new coast-line to the knowledge of the Arctic regions, and brought to light the course and fate of the expedition. From the Eskimo in Boothia many relics were obtained, and reports as to the fate of the ships and men; and on the west and south coast of King William's Island were discovered skeletons and remains of articles that told a terrible tale of disaster. Above all, in a cairn at Point Victory a precious record was discovered by Lieutenant Hobson that briefly told the history of the expedition up to April 25, 1848, three years after it set out full of hope. In 1845–1846 the "Erebus" and "Terror" wintered at Beechey Island on the S.W. coast of North Devon, in lat. 74° 43′ 28″ N., long. 91° 39′ 15″ W., after having ascended Wellington Channel to lat. 77° and returned by the west side of Cornwallis Island. This statement was signed by Graham Gore, lieutenant, and Charles F. des Voeux, mate, and bore date May 28, 1847. These two officers and six men, it was further told, left the ships on May 24, 1847 (no doubt for an exploring journey), at which time all was well.

Such an amount of successful work has seldom been accomplished by an Arctic expedition within any one season. The alternative course permitted Franklin by his intructions had been attempted but not pursued, and in the autumn of 1846 he had followed that route which was specially commended to him. But after successfully navigating Peel and Franklin Straits on his way southward, his progress had been suddenly and finally arrested by the obstruction of heavy ("palaeocrystic") ice, which presses down from the north-west through M'Clintock Channel (not then known to exist) upon King William's Island. It must be remembered that in the chart which Franklin carried King William's Island was laid down as a part of the mainland of Boothia, and he therefore could pursue his way *only* down its western coast. Upon the margin of the printed admiralty form on which this brief record was written was an addendum dated the 25th of April 1848, which extinguished all further hopes of a successful termination of this grand enterprise. The facts are best conveyed in the terse and expressive words in which they were written, and are therefore given *verbatim*: "April 25th, 1848. H.M. Ships 'Terror' and 'Erebus' were deserted on 22nd April, five leagues N.N.W. of this, having been beset since 12th September 1846. The officers and crews, consisting of 105 souls under the command of Captain F. R. M. Crozier, landed in lat. 69° 37′ 42″ N., long. 98° 41′ W. This paper was found by Lieut. Irving . . . where it had been deposited by the late Commander Gore in June 1847. Sir John Franklin died on the 11th June 1847; and the total loss by deaths in the expedition has been to this date 9 officers and 15 men." The handwriting is that of Captain Fitzjames, to whose signature is appended that of Captain Crozier, who also adds the words of chief importance, namely, that they would "start on to-morrow 26th April 1848 for Back's Fish river." A briefer record has never been told of so tragic a story.

All the party had without doubt been greatly reduced through want of sufficient food, and the injurious effects of three winters in these regions. They had attempted to drag with them two boats, besides heavily laden sledges, and doubtless had soon

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been compelled to abandon much of their burden, and leave one boat on the shore of King William's Island, where it was found by M'Clintock, near the middle of the west coast, containing two skeletons. The route adopted was the shortest possible, but their strength and supplies had failed, and at that season of the year the snow-covered land afforded no subsistence. An old Eskimo woman stated that these heroic men "fell down and died as they walked," and, as Sir John Richardson has well said, they "forged the last link of the North-West Passage with their lives." From all that can be gathered, one of the ships must have been crushed in the ice and sunk in deep water, and the other, stranded on the shore of King William's Island, lay there for years, forming a mine of wealth for the neighbouring Eskimo.

This is all we know of the fate of Franklin and his brave men. His memory is cherished as one of the most conspicuous of the naval heroes of Britain, and as one of the most successful and daring of her explorers. He is certainly entitled to the honour of being the first discoverer of the North-West Passage; the point reached by the ships having brought him to within a few miles of the known waters of America, and on the monument erected to him by his country, in Waterloo Place, London, this honour is justly awarded to him and his companions,—a fact which was also affirmed by the president of the Royal Geographical Society, when presenting their gold medal to Lady Franklin in 1860. On the 26th of October 1852 Franklin had been promoted to the rank of rear-admiral. He left an only daughter by his first marriage. Lady Franklin died in 1875 at the age of eighty-three, and a fortnight after her death a fine monument was unveiled in Westminster Abbey, commemorating the heroic deeds and fate of Sir John Franklin, and the inseparable connexion of Lady Franklin's name with the fame of her husband. Most of the relics brought home by M'Clintock were presented by Lady Franklin to the United Service Museum, while those given by Dr Rae to the admiralty are deposited in Greenwich hospital. In 1864–1869 the American explorer Captain Hall made two journeys in endeavouring to trace the remnant of Franklin's party, bringing back a number of additional relics and some information confirmatory of that given by M'Clintock, and in 1878 Lieutenant F. Schwatka of the United States army and a companion made a final land search, but although accomplishing a remarkable record of travel discovered nothing which threw any fresh light on the history of the expedition.

See H. D. Traill, *Life of Sir John Franklin* (1896).

FRANKLIN, WILLIAM BUEL (1823–1903), Federal general in the American Civil War, was born at York, Pennsylvania, on the 27th of February 1823. He graduated at West Point, at the head of his class, in 1843, was commissioned in the Engineer Corps, U.S.A., and served with distinction in the Mexican War, receiving the brevet of first lieutenant for his good conduct at Buena Vista, in which action he was on the staff of General Taylor. After the war he was engaged in miscellaneous engineering work, becoming a first lieutenant in 1853 and a captain in 1857. Soon after the outbreak of the Civil War in 1861 he was made colonel of a regular infantry regiment, and a few days later brigadier-general of volunteers. He led a brigade in the first battle of Bull Run, and on the organization by McClellan of the Army of the Potomac he received a divisional command. He commanded first a division and then the VI. Corps in the operations before Richmond in 1862, earning the brevet of brigadier-general in the U.S. Army; was promoted major-general, U.S.V., in July 1862; commanded the VI. corps at South Mountain and Antietam; and at Fredericksburg commanded the "Left Grand Division" of two corps (I. and VI.). His part in the last battle led to charges of disobedience and negligence being preferred against him by the commanding general, General A. E. Burnside, on which the congressional committee on the conduct of the war reported unfavourably to Franklin, largely, it seems, because Burnside's orders to Franklin were not put in evidence. Burnside had issued on the 23rd of January 1863 an order relieving Franklin from duty, and Franklin's only other service in the war was as commander of the XIX. corps in the abortive Red River Expedition of 1864. In this expedition he received a severe wound at the action of Sabine Cross Roads (April 8, 1864), in consequence of which he took no further active part in the war. He served for a time on the retiring board, and was captured by the Confederates on the 11th of July 1864, but escaped the same night. In 1865 he was brevetted major-general in the regular army, and in 1866 he was retired. After the war General Franklin was vice-president of the Colt's Patent Firearms Manufacturing Company, was president of the commission to lay out Long Island City, N.Y. (1871–1872), of the commission on the building of the Connecticut state house (1872–1873), and, from 1880 to 1899, of the board of managers of the national home for disabled volunteer soldiers; as a commissioner of the United States to the Paris Exposition of 1889 he was made a grand officer of the Legion of Honour; and he was for a time a director of the Panama railway. He died at Hartford, Connecticut, on the 8th of March 1903. He wrote a pamphlet, *The Galling Gun for Service Ashore and Afloat* (1874).

See *A Reply of Major-General William B. Franklin to the Report of the Joint Committee of Congress on the Conduct of the War* (New York, 1863; 2nd ed., 1867), and Jacob L. Greene, *Gen. W. B. Franklin and the Operations of the Left Wing at the Battle of Fredericksburg* (Hartford, 1900).

FRANKLIN, an organized district of Canada, extending from the Arctic Circle to the North Pole. It was formed by order-in-council on the 2nd of October 1895, and includes numerous islands and peninsulas, such as Banks, Prince Albert, Victoria, Wollaston, King Edward and Baffin Land, Melville, Bathurst, Prince of Wales and Cockburn Islands. Of these, Baffin Land alone extends south of the Arctic Circle. The area is estimated at 500,000 sq. m., but the inhabitants consist of a few Indians, Eskimo and fur-traders. Musk-oxen, polar bears, foxes and other valuable fur-bearing animals are found in large numbers. The district is named after Sir John Franklin.

FRANKLIN, a township of Norfolk county, Massachusetts, U.S.A., with an area of 29 sq. m. of rolling surface. Pop. (1900) 5017, of whom 1250 were foreign-born; (1905, state census) 5244; (1910 census) 5641. The principal village, also named Franklin, is about 27 m. S.W. of Boston, and is served by the New York, New Haven & Hartford railway. Franklin has a public library (housed in the Ray memorial building and containing 7700 volumes in 1910) and is the seat of Dean Academy (Universalist; founded in 1865), a secondary school for boys and girls. Straw goods, felt, cotton and woollen goods, pianos and printing presses are manufactured here. The township was incorporated in 1778, previous to which it was a part of Wrentham (1673). It was the first of the many places in the United States named in honour of Benjamin Franklin (who later contributed books for the public library). Horace Mann was born here.

FRANKLIN, a city of Merrimack county, New Hampshire, U.S.A., at the confluence of the Pemigewasset and Winnepesaukee rivers to form the Merrimac; about 95 m. N.N.W. of Boston. Pop. (1890) 4085; (1900) 5846 (1323 foreign-born); (1910) 6132; area, about 14.4 sq. m. Franklin is served by the Concord Division of the Boston & Maine railway, with a branch to Bristol (13 m. N.W.) and another connecting at Tilton (about 5 m. E.) with the White Mountains Division. It contains the villages of Franklin, Franklin Falls, Webster Place and Lake City, the last a summer resort. The rivers furnish good water power, which is used in the manufacture of a variety of commodities, including foundry products, paper and pulp, woollen goods, hosiery, saws, needles and knitting machines. The water-works are owned and operated by the municipality. Here, in what was then a part of the town of Salisbury, Daniel Webster was born, and on the Webster farm is the New Hampshire orphans' home, established in 1871. The town of Franklin was formed in 1828 by the union of portions of Salisbury, Sanbornton, Andover and Northfield. The earliest settlement within its limits was made in 1748 in the portion taken from Salisbury. Franklin was incorporated as a city in 1895.

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FRANKLIN, a city and the county-seat of Venango county, Pennsylvania, U.S.A., at the confluence of French Creek and Allegheny river, about 55 m. S. by E. of Erie, in the N.W. part of the state. Pop. (1890) 6221; (1900) 7317 (480 being foreign-born); (1910) 9767. Franklin is served by the Erie, the Pennsylvania, the Lake Shore & Michigan Southern, and the Franklin & Clearfield railways. Its streets are broad and well paved and shaded, and there are two public parks, a public library and many handsome residences. Franklin is the centre of the chief oil region of the state, and from it great quantities of refined oil are shipped. Natural gas also abounds. The city's manufacture include oil-well supplies, boilers, engines, steel castings, iron goods, lumber, bricks, asbestos goods, manifolding paper and flour. On the site of the present city the French built in 1754 a fortification, Fort Machault, which after the capture of Fort Duquesne by the English was a rallying place for Indians allied with the French. In 1759 the French abandoned and completely destroyed the fort; and in the following year the English built in the vicinity Fort Venango, which was captured by the Indians in 1763 during the Conspiracy of Pontiac, the whole garrison being massacred. In 1787 the United States built Fort Franklin (about 1 m. above the mouth of French Creek) as a protection against the Indians; in 1796 the troops were removed to a strongly built and well-fortified wooden building, known as "Old Garrison," at the mouth of French Creek, and in 1803 they were permanently withdrawn from the neighbourhood. Franklin was laid out as a town in 1795, was incorporated as a borough in 1828, and was chartered as a city in 1868. Most of its growth dates from the discovery of oil in 1860.

FRANKLIN, a town and the county-seat of Williamson county, Tennessee, U.S.A., in the central part of the state, on the Harpeth river, and about 20 m. S.W. of Nashville. Pop. (1900) 2180; (1910) 2924. Franklin is served by the Louisville & Nashville railway. It is the seat of the Tennessee Female College and the Battle Ground Academy, and its chief objects of interest are the battle-ground, the Confederate cemetery and the Confederate monument. During the Civil War Franklin was the scene of a minor engagement on the 10th of April 1863, and of a battle, celebrated as one of the most desperately fought of the war, which took place on the 30th of November 1864. The Union general Schofield, who was slowly withdrawing to Nashville before the advance of General J. B. Hood's army, which he was ordered to hold in check in order to give Thomas time to prepare for battle (see AMERICAN CIVIL WAR, § 32), was unable immediately to cross the Harpeth river and was compelled to entrench his forces south of the town until his wagon trains and artillery could be sent over the stream by means of two small bridges. In the afternoon Schofield's outposts and advanced lines were attacked by the Confederates in full strength, and instead of withdrawing as ordered they made a determined stand. Thus the assailants, carrying the advanced works by storm, rushed upon the main defences on the heels of the broken advanced guard, and a general engagement was brought on which lasted from 3·30 until nine o'clock in the evening. Against, it is said, thirteen separate assaults, all delivered with exceptional fury, Schofield managed to hold his position, and shortly before midnight he withdrew across the river in good order. The engagement was indecisive in its results, but the Union commander's purpose, to hold Hood momentarily in check, was gained, and Hood's effort to crush Schofield was unavailing. The losses were very heavy; Hood's effective forces in the engagement numbered about 27,000, Schofield's about 28,000; the Confederate losses (excluding cavalry) were about 6500, excluding the slightly wounded; six general officers were killed (including Major-General P. R. Cleburne, a brave Irishman who had been a corporal in the British army), six wounded, and one captured; the Union losses (excluding cavalry) were 2326. In two of the Confederate brigades all the general and field officers were killed or wounded.

See J. D. Cox, *The Battle of Franklin* (New York, 1897).

FRANKLIN, a word derived from the Late Lat. *francus*, free, and meaning primarily a freeman. Subsequently it was used in England to denote a land-holder who was of free but not of noble birth. Some of the older English writers occasionally use it to mean a liberal host. The Latin form of the word is *franchilanus*.

FRANKLINITE, a member of the spinel group of minerals, consisting of oxides of iron, manganese and zinc in varying proportions, $(Fe, Zn, Mn)''(Fe, Mn)_2'''O_4$. It occurs as large octahedral crystals often with rounded edges, and as granular masses. The colour is iron-black and the lustre metallic; hardness 6, specific gravity 5·2. It thus resembles magnetite in external characters, but is readily distinguished from this by the fact that it is only slightly magnetic. It is found in considerable amount, associated with zinc minerals (zincite and willemite) in crystalline limestone, at Franklin Furnace, New Jersey, where it is mined as an ore of zinc (containing 5 to 20% of the metal); after the extraction of the zinc, the residue is used in the manufacture of spiegeleisen (the mineral containing 15 to 20% of manganese oxides). Associated with franklinite at Franklin Furnace, and found also at some other localities, is another member of the spinel group, namely, gahnite or zinc-spinel, which is a zinc aluminate, $ZnAl_2O_4$, with a little of the zinc replaced by iron and manganese.

FRANK-MARRIAGE (*liberum maritagium*), in real property law, a species of estate tail, now obsolete. When a man was seized of land in fee simple, and gave it to a daughter on marriage, the daughter and her husband were termed the donees in frank-marriage, because they held the land granted to them and the heirs of their two bodies free from all manner of service, except fealty, to the donor or his heirs until the fourth degree of consanguinity from the donor was passed. This right of a freeholder so to give away his land at will was first recognized in the reign of Henry II., and became up to the reign of Elizabeth the most usual kind of settlement.

FRANKPLEDGE (Lat. *francum plegium*), an early English institution, consisting (as defined by Stubbs) of an association for mutual security whose members, according to Hallam, "were perpetual bail for each other." The custom whereby the inhabitants of a district were responsible for any crime or injury committed by one of their number is old and widespread; it prevailed in England before the Norman Conquest, and is an outcome of the earlier principle whereby this responsibility rested on kinship. Thus a law of Edgar (d. 975) says "and let every man so order that he have a *borh* (or surety), and let the borh then bring and hold him to every justice; and if any one then do wrong and run away, let the borh bear that which he ought to bear"; and a law of Canute about 1030 says "and that every one be brought into a hundred and in borh, and let the borh hold and lead him to every plea." About this time these societies, each having its headman, were called *frithborhs*, or peace-borhs, and the Normans translated the Anglo-Saxon word by frankpledge. But the history of the frankpledge proper begins not earlier than the time of the Norman Conquest. The laws, which although called the laws of Edward the Confessor were not drawn up until about 1130, contain a clause about frithborhs which decrees that in every place societies of ten men shall be formed for mutual security and reparation. And before this date William the Conqueror had ordered that "every one who wishes to be regarded as free must be in a pledge, and that the pledge must hold and bring him to justice if he commits any offence"; and the laws of Henry I. ordered every person of substance over twelve years of age to be enrolled in a frankpledge. This association of ten, or as it often was at a later date of twelve men, was also called a *tithing*, or *decima*, and in the north of England was known as *tenmanne tale*.

The view of frankpledge (*visus franciplegii*), or the duty of ascertaining that the law with regard to frankpledges was complied with, was in the hands of the sheriffs, who held an itinerant court called the "sheriff's tourn" for this and other purposes. This court was held twice a year, but in 1217 it was ordered that the view of frankpledge should only be taken once—at Michaelmas. Introduced at or before the time of Henry I., the view was regulated by the Assize of Clarendon of 1166 and

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by Magna Carta as reissued in 1217. Although the former of these lays stress upon the fact that the sheriff's supervisory powers are universal many men did not attend his tourn. Some lords of manors and of hundreds held a court of their own for view of frankpledge, and in the 13th century it may be fairly said "of all the franchises, the royal rights in private hands, view of frankpledge is perhaps the commonest." At the end of the same century the court for the view of frankpledge was generally known as the court leet, and was usually a manorial court in private hands. However, the principle of the frankpledge was still enforced. Thus Bracton says "every male of the age of twelve years, be he free be he serf, ought to be in frankpledge," but he allows for certain exceptions.

As the word frankpledge denotes, these societies were originally concerned only with freemen; but the unfree were afterwards admitted, and during the 13th century the frankpledges were composed chiefly of villains. From petitions presented to parliament in 1376 it seems that the view of frankpledge was in active operation at this time, but it soon began to fall into disuse, and its complete decay coincides with the new ideas of government introduced by the Tudors. In a formal fashion courts leet for the view of frankpledge were held in the time of the jurist Selden, and a few of these have survived until the present day. Sir F. Palgrave has asserted that the view of frankpledge was unknown in that part of the country which had been included in the kingdom of Northumbria. This statement is open to question, but it is highly probable that the system was not so deeply rooted in this part of England as elsewhere. The machinery of the frankpledge was probably used by Henry II. when he introduced the jury of presentment; and commenting on this connexion F. W. Maitland says "the duty of producing one's neighbour to answer accusations (the duty of the frankpledges) could well be converted into the duty of telling tales against him." The system of frankpledge prevailed in some English boroughs. Sometimes a court for view of frankpledge, called in some places a *sticklefon*, whereat the mayor or the bailiffs presided, was held for the whole borough; in other cases the borough was divided into wards, or into *leets*, each of which had its separate court.

See Pollock and Maitland, *History of English Law* (1895); G. Waitz, *Deutsche Verfassungsgeschichte*, Band i. (1880); and W. Stubbs, *Constitutional History*, vol. i. (1897).

FRANKS, SIR AUGUSTUS WOLLASTON (1826–1897), English antiquary, was born on the 20th of March 1826, and was educated at Eton and at Trinity College, Cambridge. He early showed inclination for antiquarian pursuits, and in 1851 was appointed assistant in the Antiquities Department of the British Museum. Here, and as director of the Society of Antiquaries, an appointment he received in 1878, he made himself the first authority in England upon medieval antiquities of all descriptions, upon porcelain, glass, the manufactures of savage nations, and in general upon all Oriental curiosities and works of art later than the Classical period. In 1866 the British and medieval antiquities, with the ethnographical collections, were formed into a distinct department under his superintendence; and the Christy collection of ethnography in Victoria Street, London, prior to its amalgamation with the British Museum collections, was also under his care. He became vice-president and ultimately president of the Society of Antiquaries, and in 1878 declined the principal librarianship of the museum. He retired on his seventieth birthday, 1896, and died on the 21st of May 1897. His ample fortune was largely devoted to the collection of ceramics and precious objects of medieval art, most of which became the property of the nation, either by donation in his lifetime or by bequest at his death. Although chiefly a medieval antiquary, Franks was also an authority on classical art, especially Roman remains in Britain: he was also greatly interested in book-marks and playing-cards, of both of which he formed important collections. He edited Kemble's *Horae Ferales*, and wrote numerous memoirs on archaeological subjects. Perhaps his most important work of this class is the catalogue of his own collection of porcelain.

FRANKS. The name Franks seems to have been given in the 4th century to a group of Germanic peoples dwelling north of the Main and reaching as far as the shores of the North Sea; south of the Main was the home of the Alamanni. The names of some of these tribes have come down to us. On the *Tabula Peutingeriana* appear the "Chamavi qui et *Franci*," which should doubtless read "qui et *Franci*"; these Chamavi apparently dwelt between the Yssel and the Ems. Later, we find them a little farther south, on the banks of the Rhine, in the district called Hamalant, and it is their customs which were brought together in the 9th century in the document known as the *Lex Francorum Chamavorum*. After the Chamavi we may mention the Attuarii or Chattuarii, who are referred to by Ammianus Marcellinus (xx. 10, 2): "Rheno exinde transmisso, regionem pervasit (Julianus) Francorum quos Atthuarios vocant." Later, the *pagus Attuariorum* corresponds to the district of Emmerich and Xanten. It should be noted that this name occurs again in the middle ages in Burgundy, not far from Dijon; in all probability a detachment of this people had settled in that spot in the 5th or 6th century. The Bructeri, Ampsivarii and Chatti may also be classed among the Frankish tribes. They are mentioned in a celebrated passage of Sulpicius Alexander, which is cited by Gregory of Tours (*Historia Francorum*, ii. 9). Sulpicius shows the general Arbogast, a barbarian in the service of Rome, seeking to take vengeance on the Franks (392): "Collecto exercitu, transgressus Rhenum, Bricteros ripae proximos, pagum etiam quem Chamavi incolunt depopulatus est, nullo unquam occursante, nisi quod pauci ex Ampsivariis et Catthis Marcomere duce in ulterioribus collium jugis apparuere." It is evidently this Marcomeres, the chief of these tribes, who is regarded by later historians as the father of the legendary Faramund (Pharamund) although in fact Marcomeres has nothing to do with the Salian Franks.

The earliest mention in history of the name Franks is the entry on the *Tabula Peutingeriana*, at least if we assume that the term "et Franci" is not a later emendation. The earliest occurrence of the name in any author is in the *Vita Aureliani* of Vopiscus (ch. vii.). When, in 241, Aurelian, who was then only a tribune, had just defeated some Franks in the neighbourhood of Mainz and was marching against the Persians, his troops sang the following refrain:

> Mille Sarmatas, mille *Francos*, semel et semel occidimus;
> Mille Persas, quaerimus.

All these Germanic tribes, which were known from the 3rd century onwards by the generic name of Franks, doubtless spoke a similar dialect and were governed by customs which must scarcely have differed from one another; but this was all they had in common. Each tribe was politically independent; they formed no confederations. Sometimes two or three tribes joined forces to wage a war; but, the struggle over, the bond was broken, and each tribe resumed its isolated life. Waitz holds with some show of probability that the Franks represent the ancient Istaevones of Tacitus, the Alamanni and the Saxons representing the Herminones and the Ingaevones.

Of all these Frankish tribes one especially was to become prominent, the tribe of the Salians. They are mentioned for the first time in 358, by Ammianus Marcellinus (xvii. 8, 3), who says that the Caesar Julian "petit primos omnium Francos, videlicet eos quos consuetudo Salios appellavit." As to the origin of the name, it was long held to be derived from the river Yssel or Saal. It is more probable, however, that it arose from the fact that the Salians for a long period occupied the shores of the salt sea.[1] The Salians inhabited the sea-coast, whereas the Ripuarians dwelt on the banks of the river Rhine.

The Salians, at the time when they are mentioned by Ammianus, occupied Toxandria, *i.e.* the region south of the Meuse, between that river and the Scheldt. Julian defeated them completely, but allowed them to remain in Toxandria, not, as of old, as conquerors, but as *foederati* of the Romans. They perhaps paid tribute, and they certainly furnished Rome with

[1] Their legends are connected with the sea, the name Meroveus signifying "sea-born."

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soldiers; *Salii seniores* and *Salii juniores* are mentioned in the *Notitia dignitatum*, and Salii appear among the *auxilia palatina*.

At the end of the 4th century and at the beginning of the 5th, when the Roman legions withdrew from the banks of the Rhine, the Salians installed themselves in the district as an independent people. The place-names became entirely Germanic; the Latin language disappeared; and the Christian religion suffered a check, for the Franks were to a man pagans. The Salians were subdivided into a certain number of tribes, each tribe placing at its head a king, distinguished by his long hair and chosen from the most noble family (*Historia Francorum*, ii. 9).

The most ancient of these kings, reigning over the principal tribe, who is known to us is Chlodio.[1] According to Gregory of Tours Chlodio dwelt at a place called Dispargum, which it is impossible to identify. Towards 431 he crossed the great Roman road from Bavay to Cologne, which was protected by numerous forts and had long arrested the invasions of the barbarians. He then invaded the territory of Arras, but was severely defeated at Hesdin-le-Vieux by Aetius, the commander of the Roman army in Gaul. Chlodio, however, soon took his revenge. He explored the region of Cambrai, seized that town, and occupied all the country as far as the Somme. At this time Tournai became the capital of the Salian Franks.

After Chlodio a certain Meroveus (Merowech) was king of the Salian Franks. We do not know if he was the son of Chlodio; Gregory of Tours simply says that he belonged to Chlodio's stock —"de hujus stirpe quidam Merovechum regem fuisse adserunt," —and then only gives the fact at second hand. Perhaps the remarks of the Byzantine historian Priscus may refer to Meroveus. A king of the Franks having died, his two sons disputed the power. The elder journeyed into Pannonia to obtain support from Attila; the younger betook himself to the imperial court at Rome. "I have seen him," writes Priscus; "he was still very young, and we all remarked his fair hair which fell upon his shoulders." Aetius welcomed him warmly and sent him back a friend and *foederatus*. In any case, eventually, Franks fought (451) in the Roman ranks at the great battle of Mauriac (the Catalaunian Fields), which arrested the progress of Attila into Gaul; and in the *Vita Lupi*, which, though undoubtedly of later date, is a recension of an earlier document, the name of Meroveus appears among the combatants. Towards 457 Meroveus was succeeded by his son Childeric. At first Childeric was a faithful *foederatus* of the Romans, fighting for them against the Visigoths and the Saxons south of the Loire; but he soon sought to make himself independent and to extend his conquests. He died in 481 and was succeeded by his son Clovis, who conquered the whole of Gaul with the exception of the kingdom of Burgundy and Provence. Clovis made his authority recognized over the other Salian tribes (whose kings dwelt at Cambrai and other cities), and put an end to the domination of the Ripuarian Franks.

These Ripuarians must have comprised a certain number of Frankish tribes, such as the Ampsivarii and the Bructeri. They settled in the 5th century in compact masses on the left bank of the Rhine, but their progress was slow. It was not until the Christian writer Salvian (who was born about 400) had already reached a fairly advanced age that they were able to seize Cologne. The town, however, was recaptured and was not definitely in their possession until 463. The Ripuarians subsequently occupied all the country from Cologne to Trier. Aix-la-Chapelle, Bonn and Zülpich were their principal centres, and they even advanced southward as far as Metz, which appears to have resisted their attacks. The Roman civilization and the Latin language disappeared from the countries which they occupied; indeed it seems that the actual boundaries of the German and French languages nearly coincide with those of their dominion. In their southward progress the Ripuarians encountered the Alamanni, who, already masters of Alsace, were endeavouring to extend their conquests in all directions. There were numerous battles between the Ripuarians and the Alamanni; and the memory of one fought at Zülpich has come down to us. In this battle Sigebert, the king of the Ripuarians, was wounded in the knee and limped during the remainder of his life—hence his surname Claudus (the Lame). The Ripuarians long remained allies of Clovis, Sigebert's son Chloderic fighting under the king of the Salian Franks at Vouillé in 507. Clovis, however, persuaded Chloderic to assassinate his father, and then posed as Sigebert's avenger, with the result that Chloderic was himself assassinated and the Ripuarians raised Clovis on the shield and chose him as king. Thus the Salian Franks united under their rule all the Franks on the left bank of the Rhine. During the reigns of Clovis's sons they again turned their eyes on Germany, and imposed their suzerainty upon the Franks on the right bank. This country, north of the Main and the first residence of the Franks, then received the name of *Francia Orientalis*, and became the origin of one of the duchies into which Germany was divided in the 10th century—the duchy of Franconia (Franken).

The Franks were redoubtable warriors, and were generally of great stature. Their fair or red hair was brought forward from the crown of the head towards the forehead, leaving the nape of the neck uncovered; they shaved the face except the upper lip. They wore fairly close breeches reaching to the knee and a tunic fastened by brooches. Round the waist over the tunic was worn a leathern girdle having a broad iron buckle damascened with silver. From the girdle hung the single-edged missile axe or *francisca*, the *scramasax* or short knife, a poniard and such articles of toilet as scissors, a comb (of wood or bone), &c. The Franks also used a weapon called the *framea* (an iron lance set firmly in a wooden shaft), and bows and arrows. They protected themselves in battle with a large wooden or wicker shield, the centre of which was ornamented with an iron boss (*umbo*). Frankish arms and armour have been found in the cemeteries which abound throughout northern France, the warriors being buried fully armed.

See J. Grimm, *Deutsche Rechtsalterthümer* (Göttingen, 1828); K. Müllenhoff, *Deutsche Altertumskunde* (Berlin, 1883–1900); E. von Wietersheim, *Geschichte der Völkerwanderung*, 2nd ed., ed. by F. Dahn (Leipzig, 1880–1881); G. Waitz, *Deutsche Verfassungsgeschichte*, vol. i. (4th ed. revised by Zeumer); R. Schröder, "Die Ausbreitung der salischen Franken," in *Forschungen zur deutschen Geschichte*, vol. xix.; K. Lamprecht, *Fränkische Wanderungen und Ansiedelungen* (Aix-la-Chapelle, 1882); W. Schultz, *Deutsche Geschichte von der Urzeit bis zu den Karolingern*, vol. ii. (Stuttgart, 1896); Fustel de Coulanges, *Histoire des institutions politiques de l'ancienne France—l'invasion germanique* (Paris, 1891). Also the articles SALIC LAW and GERMANIC LAWS, EARLY. (C. PF.)

FRANZ, ROBERT (1815–1892), German composer, was born at Halle on the 28th of June 1815. One of the most gifted of German song writers, he suffered in early life, as many musicians have suffered, from the hostility of his parents to a musical career. He was twenty years old when, his father's animosity conquered, he was allowed to live in Dessau to study organ-playing under Schneider. The two years of dry study under that famous teacher were advantageous chiefly in making him uncommonly intimate with the works of Bach and Handel, his knowledge of which he showed in his editions of the *Matthäus Passion*, *Magnificat*, ten cantatas, and of the *Messiah* and *L'Allegro*, though some of these editions have long been a subject of controversy among musicians. In 1843 he published his first book of songs, which ultimately was followed by some fifty more books, containing in all about 250 songs. At Halle, Franz filled various public offices, including those of organist to the city, conductor of the Sing-akademie and of the Symphony concerts, and he was also a royal music-director and master of the music at the university. The first book of songs was warmly praised by Schumann and Liszt, the latter of whom wrote a lengthy review of it in Schumann's paper, *Die neue Zeitschrift*, which later was published separately. Deafness had begun to make itself apparent as early as 1841, and Franz suffered also from a nervous disorder, which in 1868 compelled him to resign his

[1] The chronicler Fredegarius and the author of the *Liber historiae Francorum* make Sunno and Marcomeres his predecessors, but in reality they were chiefs of other Frankish tribes. The author of the *Liber* also claims that Chlodio was the son of Pharamund, but this personage is quite legendary. In the *Chronicon* of Fredegarius it is already affirmed that the Franks are descended from the Trojans.

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offices. His future was then provided for by Liszt, Dr Joachim, Frau Magnus and others, who gave him the receipts of a concert tour, amounting to some 100,000 marks. Franz died on the 24th of October 1892. On his seventieth birthday he published his first and only pianoforte piece. It is easy to find here and there among his songs gems that are hardly less brilliant than the best of Schumann's. Certainly no musician was ever more thoughtful and more painstaking. In addition to songs he wrote a setting for double choir of the 117th Psalm, and a four-part Kyrie; he also edited Astorga's *Stabat Mater* and Durante's *Magnificat*.

FRANZÉN, FRANS MIKAEL (1772–1847), Swedish poet, was born at Uleåborg in Finland on the 9th of February 1772. At thirteen he entered the university of Åbo, where he attended the lectures of H. G. Porthan (1739–1804), a pioneer in the study of Finnish history and legend. He graduated in 1789, and became "*eloquentiae docens*" in 1792. Three years later he started on a tour through Denmark, Germany, France and England, returning in 1796 to accept the office of university librarian at Åbo. In 1801 he became professor of history and ethics, and in 1808 was elected a member of the Swedish Academy. On the cession of Finland to Russia, Franzén removed to Sweden, where he was successively appointed parish priest of Kumla in the diocese of Strengnäs (1810), minister of the Clara Church in Stockholm (1824) and bishop of Hernösand (1831). He died at Säbrå parsonage on the 14th of August 1847. From the autumn of 1793, when his *Till en ung Flicka* and *Mennisknns anlete* were inserted by Kellgren in the *Stockholmspost*, Franzén grew in popular favour by means of many minor poems of singular simplicity and truth, as *Till Selma*, *Den gamle knekten*, *Riddar St Göran*, *De Små blommorna*, *Modren vid waggan*, *Nydrsmorgonen* and *Stjernhimmelen*. His songs *Goda gosse glaset töm*, *Sörj ej den gryende dagen först*, *Champagnevinet* and *Berdringsdng* were widely sung, and in 1797 he won the prize of the Swedish Academy by his *Sång öfver grefve Fälds Graf*. Henceforth his muse, touched with the academic spirit, grew more reflective and didactic. His longer works, as *Emili eller en afton i Lappland*, and the epics *Svante Sture eller mötet vid Alvastra*, *Kolumbus eller Amerikas upptäckt* and *Gustaf Adolf i Tyskland* (the last two incomplete), though rich in beauties of detail, are far inferior to his shorter pieces.

The poetical works of Franzén are collected under the title *Skaldestycken* (7 vols., 1824–1861); new ed., *Samlade dikter*, with a biography by A. A. Grafström (1867–1869); also a selection (*Valda dikter*) in 2 vols. (1871). His prose writings, *Om svenska drottningar* (Åbo, 1798; Örebro, 1823), *Skrifter i obunden stil*, vol. i. (1835), *Predikningar* (5 vols., 1841–1845) and *Minnesteckningar*, prepared for the Academy (3 vols., 1848–1860), are marked by faithful portraiture and purity of style. See B. E. Malmström, in the *Handlingar* of the Swedish Academy (1852, new series 1887), vol. ii.; S. A. Hollander, *Minne af F. M. Franzén* (Örebro, 1868); F. Cygnaeus, *Teckningar ur F. M. Franzens lefnad* (Helsingfors, 1872); and Gustaf Ljunggren, *Svenska vitterhetens häfder efter Gustaf III.'s död*, vol. ii. (1876).

FRANZENSBAD, or **KAISER-FRANZENSBAD**, a town and watering-place of Bohemia, Austria, 152 m. W.N.W. of Prague by rail. Pop. (1900) 2330. It is situated at an altitude of about 1500 ft. between the spurs of the Fichtelgebirge, the Böhmerwald and the Erzgebirge, and lies 4 m. N.W. of Eger. It possesses a large kursaal, several bathing establishments, a hospital for poor patients and several parks. There are altogether 12 mineral springs with saline, alkaline and ferruginous waters, of which the oldest and most important is the Franzensquelle. One of the springs gives off carbonic acid gas and another contains a considerable proportion of lithia salts. The waters, which have an average temperature between 50·2° F. and 54·5° F., are used both internally and externally, and are efficacious in cases of anaemia, nervous disorders, sexual diseases, specially for women, and heart diseases. Franzensbad is frequently resorted to as an after-cure by patients from Carlsbad and Marienbad. Another important part of the cure is the so-called *moor* or mud-baths, prepared from the peat of the Franzensbad marsh, which is very rich in mineral substances, like sulphates of iron, of soda and of potash, organic acids, salt, &c.

The first information about the springs dates from the 16th century, and an analysis of the waters was made in 1565. They were first used for bathing purposes in 1707. But the foundation of Franzensbad as a watering-place really dates from 1793, when Dr Adler built here the first *Kurhaus*, and the place received its name after the emperor Francis I.

See Dr Loimann, *Franzensbad* (3rd ed., Vienna, 1900).

FRANZ JOSEF LAND, an arctic archipelago lying E. of Spitsbergen and N. of Novaya Zemlya, extending northward from about 80° to 82° N., and between 42° and 64° E. It is described as a lofty glacier-covered land, reaching an extreme elevation of about 2400 ft. The glaciers front, with a perpendicular ice-wall, a shore of debris on which a few low plants are found to grow—poppies, mosses and the like. The islands are volcanic, the main geological formation being Tertiary or Jurassic basalt, which occasionally protrudes through the ice-cap in high isolated blocks near the shore. A connecting island-chain between Franz Josef Land and Spitzbergen is probable. The bear and fox are the only land mammals; insects are rare; but the avifauna is of interest, and the Jackson expedition distinguished several new species.

August Petermann expressed the opinion that Baffin may have sighted the west of Franz Josef Land in 1614, but the first actual discovery is due to Julius Payer, a lieutenant in the Austrian army, who was associated with Weyprecht in the second polar expedition fitted out by Count Wilczek on the ship "Tegetthof" in 1872. On the 13th of August 1873, the "Tegetthof" being then beset, high land was seen to the north-west. Later in the season Payer led expeditions to Hochstetter and Wilczek islands, and after a second winter in the ice-bound ship, a difficult journey was made northward through Austria Sound, which was reported to separate two large masses of land, Wilczek Land on the east from Zichy Land on the west, to Cape Fligely, in 82° 5′ N., where Rawlinson Sound branched away to the north-east. Cape Fligely was the highest latitude attained by Payer, and remained the highest attained in the Old World till 1895. Payer reported that from Cape Fligely land (Rudolf Land) stretched north-east to a cape (Cape Sherard Osborn), and mountain ranges were visible to the north, indicating lands beyond the 83rd parallel, to which the names King Oscar Land and Petermann Land were given. In 1879 De Bruyne sighted high land in the Franz Josef Land region, but otherwise it remained untouched until Leigh Smith, in the yacht "Eira," explored the whole southern coast from 42° to 54° E. in 1881 and 1882, discovering many islands and sounds, and ascertaining that the coast of Alexandra Land, in the extreme west, trended to north-west and north.

After Leigh Smith came another pause, and no further mention is made of Franz Josef Land till 1894. In that year Mr Alfred Harmsworth (afterwards Lord Northcliffe) fitted out an expedition in the ship "Windward" under the leadership of Mr F. G. Jackson, with the object of establishing a permanent base from which systematic exploration should be carried on for successive years and, if practicable, a journey should be made to the Pole. Mr Jackson and his party landed at "Elmwood" (which was named from Lord Northcliffe's seat in the Isle of Thanet), near Cape Flora, at the western extremity of Northbrook Island, on the 7th of September. After a preliminary reconnaissance to the north, which afterwards turned out to be vitally important, the summer of 1895 was spent in exploring the coast to the north-west by a boating expedition. This expedition visited many of the points seen by Leigh Smith, and discovered land, which it has been suggested may be the Gillies Land reported by the Dutch captain Gillies in 1707. In 1896 the Jackson-Harmsworth expedition worked northwards through an archipelago for about 70 m. and reached Cape Richthofen, a promontory 700 ft. high, whence an expanse of open water was seen to the northward, which received the name of Queen Victoria Sea. To the west, on the opposite side of a wide opening which was called the British Channel, appeared glacier-covered land, and an island lay to the northward. The island was probably the King Oscar Land of Payer. To north and north-east was the land which had been visited in the reconnaissance of the previous year, but beyond it a water-sky appeared in the

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supposed position of Petermann Land. Thus Zichy Land itself was resolved into a group of islands, and the outlying land sighted by Payer was found to be islands also. Meanwhile Nansen, on his southward journey, had approached Franz Josef Land from the north-east, finding only sea at the north end of Wilczek Land, and seeing nothing of Payer's Rawiinson Sound, or of the north end of Austria Sound. Nansen wintered near Cape Norway, only a few miles from the spot reached by Jackson in 1895. He had finally proved that a deep oceanic basin lies to the north. On the 17th of June 1896 the dramatic meeting of Jackson and Nansen took place, and in the same year the "Windward" revisited "Elmwood" and brought Nansen home, the work of the Jackson-Harmsworth expedition being continued for another year. As the non-existence of land to the north had been proved, the attempt to penetrate northwards was abandoned, and the last season was devoted to a survey and scientific examination of the archipelago, especially to the west; this was carried out by Messrs Jackson, Armitage, R. Koettlitz, H. Fisher and W. S. Bruce.

Further light was thrown on the relations of Franz Josef Land and Spitsbergen during 1897 by the discoveries of Captain Robertson of Dundee, and Wyche's Land was circumnavigated by Mr Arnold Pike and Sir Savile Crossley. The latter voyage was repeated in the following year by a German expedition under Dr Th. Lerner and Captain Rüdiger. In August 1898 an expedition under Mr Walter Wellman, an American, landed at Cape Tegetthof. Beginning a northward journey with sledges at the end of the winter, Wellman met with an accident which compelled him to return, but not before some exploration had been accomplished, and the eastern extension of the archipelago fairly well defined. In June 1899 H.R.H. the duke of Abruzzi started from Christiania in his yacht, the "Stella Polare," to make the first attempt to force a ship into the newly discovered ocean north of Franz Josef Land. The "Stella Polare" succeeded in making her way through the British Channel to Crown Prince Rudolf Land, and wintered in Teplitz Bay, in 81° 35′ N. lat. The ship was nearly wrecked in the autumn, and the party had to spend most of the winter on shore, the duke of Abruzzi suffering severely from frost-bite. In March 1900 a sledge party of thirteen, under Captain Cagni, started northwards. They found no trace of Petermann Land, but with great difficulty crossed the ice to 86° 33′ N. lat., 20 m. beyond Nansen's farthest, and 240 m. from the Pole. The party, with the exception of three, returned to the ship after an absence of 104 days, and the "Stella Polare" returned to Tromsö in September 1900. In 1901–1902 the Baldwin-Ziegler expedition also attempted a northward journey from Franz Josef Land.

See *Geographical Journal*, vol. xi., February 1898; F. G. Jackson, *A Thousand Days in the Arctic* (1899).

FRANZOS, KARL EMIL (1848–1904), German novelist, was born of Jewish parentage on the 25th of October 1848 in Russian Podolia, and spent his early years at Czortków in Galicia. His father, a district physician, died early, and the boy, after attending the gymnasium of Czernowitz, was obliged to teach in order to support himself and prepare for academic study. He studied law at the universities of Vienna and Graz, but after passing the examination for employment in the state judicial service abandoned this career and, becoming a journalist, travelled extensively in south-east Europe, and visited Asia Minor and Egypt. In 1877 he returned to Vienna, where from 1884 to 1886 he edited the *Neue illustrierte Zeitung*. In 1887 he removed to Berlin and founded the fortnightly review *Deutsche Dichtung*. Franzos died on the 28th of January 1904. His earliest collections of stories and sketches, *Aus Halb-Asien, Land und Leute des östlichen Europas* (1876) and *Die Juden von Barnow* (1877) depict graphically the life and manners of the races of south-eastern Europe. Among other of his works may be mentioned the short stories, *Junge Liebe* (1878), *Stille Geschichten* (1880), and the novels *Maschke von Parma* (1880), *Ein Kampf ums Recht* (1882), *Der Präsident* (1884), *Judith Trachtenberg* (1890), *Der Wahrheitsucher* (1894).

FRASCATI, a town and episcopal see of Italy, in the province of Rome, 15 m. S.E. of Rome by rail, and also reached by electric tramway via Grottaferrata. Pop. (1901) 8453. The town is situated 1056 ft. above the sea-level, on the N. slopes of the outer crater ring of the Alban Hills, and commands a very fine view of the Campagna of Rome. The cathedral contains a memorial tablet to Charles Edward, the Young Pretender, whose body for some while rested here; his brother, Henry, Cardinal York, owned a villa at Frascati. The villas of the Roman nobility, with their beautiful gardens and fountains, are the chief attraction of Frascati. The earliest in date is the Villa Falconieri, planned by Cardinal Ruffini before 1550; the most important of the rest are the Villa Torlonia (formerly Conti), Lancelotti (formerly Piccolomini), Ruffinella (now belonging to Prince Lancellotti), Aldobrandini, Borghese and Mondragone (now a Jesuit school). The surrounding country, covered with remains of ancient villas, is fertile and noted for its wine. Frascati seems to have arisen on the site of a very large ancient villa, which, under Domitian at any rate, belonged to the imperial family in the 1st century. In which period we find in the *Liber Pontificalis* the names of four churches *in Frascata*. The medieval stronghold of the counts of Tusculum (*q.v.*), which occupied the site of the ancient city, was dismantled by the Romans in 1191, and the inhabitants put to the sword or mutilated. Many of the fugitives naturally took refuge in Frascati. The see of Tusculum had, however, always had its cathedral church in Frascati. For the greater part of the middle ages Frascati belonged to the papacy.

See G. Tomassetti, *La Via Latina nel medio evo* (Rome, 1886), 170 seq.; T. Ashby in *Papers of the British School at Rome*, iv. (London, 1907). (T. As.)

FRASER, ALEXANDER CAMPBELL (1819–), Scottish philosopher, was born at Ardchattan, Argyllshire, on the 3rd of September 1819. He was educated at Glasgow and Edinburgh, where, from 1846 to 1856, he was professor of Logic at New College. He edited the *North British Review* from 1850 to 1857, and in 1856, having previously been a Free Church minister, he succeeded Sir William Hamilton as professor of Logic and Metaphysics at Edinburgh University. In 1859 he became dean of the faculty of arts. He devoted himself to the study of English philosophers, especially Berkeley, and published a *Collected Edition of the Works of Bishop Berkeley with Annotations, &c.* (1871; enlarged 1901), a *Biography of Berkeley* (1881), an *Annotated Edition of Locke's Essay* (1894), the *Philosophy of Theism* (1896) and the *Biography of Thomas Reid* (1898). He contributed the article on John Locke to the *Encyclopaedia Britannica*. In 1904 he published an autobiography entitled *Biographia philosophica*, in which he sketched the progress of his intellectual development. From this work and from his Gifford lectures we learn objectively what had previously been inferred from his critical works. After a childhood spent in an austerity which stigmatized as unholy even the novels of Sir Walter Scott, he began his college career at the age of fourteen at a time when Christopher North and Dr Ritchie were lecturing on Moral Philosophy and Logic. His first philosophical advance was stimulated by Thomas Brown's *Cause and Effect*, which introduced him to the problems which were to occupy his thought. From this point he fell into the scepticism of Hume. In 1836 Sir William Hamilton was appointed to the chair of Logic and Metaphysics, and Fraser became his pupil. He himself says, "I owe more to Hamilton than to any other influence." It was about this time also that he began his study of Berkeley and Coleridge, and deserted his early phenomenalism for the conception of a spiritual will as the universal cause. In the *Biographia* this "Theistic faith" appears in its full development (see the concluding chapter), and is especially important as perhaps the nearest approach to Kantian ethics made by original English philosophy. Apart from the philosophical interest of the *Biographia*, the work contains valuable pictures of the Land of Lorne and Argyllshire society in the early 19th century, of university life in Glasgow and Edinburgh, and a history of the *North British Review*.

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FRASER, JAMES (1818–1885), English bishop, was born at Prestbury, in Gloucestershire, on the 18th of August 1818, and was educated at Bridgnorth, Shrewsbury, and Lincoln College, Oxford. In 1839 he was Ireland scholar, and took a first class. In 1840 he gained an Oriel fellowship, and was for some time tutor of the college, but did not take orders until 1846. He was successively vicar of Cholderton, in Wiltshire, and rector of Ufton Nervet, in Berkshire; but his subsequent importance was largely due to W. K. Hamilton, bishop of Salisbury, who recommended him as an assistant commissioner of education. His report on the educational condition of thirteen poor-law unions, made in May 1859, was described by Thomas Hughes as "a superb, almost a unique piece of work." In 1865 he was commissioned to report on the state of education in the United States and Canada, and his able performance of this task brought him an offer of the bishopric of Calcutta, which he declined, but in January 1870 he accepted the see of Manchester. The task before him was an arduous one, for although his predecessor, James Prince Lee, had consecrated no fewer than 130 churches, the enormous population was still greatly in advance of the ecclesiastical machinery. Fraser worked with the utmost energy, and did even more for the church by the liberality and geniality which earned him the title of "the bishop of all denominations." He was prominent in secular as well as religious works, interesting himself in every movement that promoted health, morality, or education; and especially serviceable as the friendly, unofficious counsellor of all classes. His theology was that of a liberal high-churchman, and his sympathies were broad. In convocation he seconded a motion for the disuse of the Athanasian Creed, and in the House of Lords he voted for the abolition of university tests. He died suddenly on the 22nd of October 1885.

A biography by Thomas Hughes was published in 1887, and an account of his Lancashire life by J. W. Diggle (1889), who also edited 2 vols. of *University and Parochial Sermons* (1887).

FRASER, JAMES BAILLIE (1783–1856), Scottish traveller and author, was born at Reelick in the county of Inverness on the 11th of June 1783. He was the eldest of the four sons of Edward Satchell Fraser of Reelick, all of whom found their way to the East, and gave proof of their ability. In early life he went to the West Indies and thence to India. In 1815 he made a tour of exploration in the Himalayas, accompanied by his brother William (d. 1835). When Reza Kuli Mirza and Nejeff Kuli Mirza, the exiled Persian princes, visited England, he was appointed to look after them during their stay, and on their return he accompanied them as far as Constantinople. He was afterwards sent to Persia on a diplomatic mission by Lord Glenelg, and effected a most remarkable journey on horseback through Asia Minor to Teheran. His health, however, was impaired by the exposure. In 1823 he married a daughter of Alexander Fraser Tytler, Lord Woodhouselee, a sister of the historian Patrick Fraser Tytler. He died at Reelick in January 1856. Fraser is said to have displayed great skill in water-colours, and several of his drawings have been engraved; and the astronomical observations which he took during some of his journeys did considerable service to the cartography of Asia. The works by which he attained his literary reputation were accounts of his travels and fictitious tales illustrative of Eastern life. In both he employed a vigorous and impassioned style, which was on the whole wonderfully effective in spite of minor faults in taste and flaws in structure.

Fraser's earliest writings are: *Journal of a Tour through Part of the Himâlâ Mountains and to the Sources of the Jumna and the Ganges* (1820); *A Narrative of a Journey into Khorasan in the Years 1821 and 1822, including some Account of the Countries to the North-East of Persia* (1825); and *Travels and Adventures in the Persian Provinces on the Southern Banks of the Caspian Sea* (1826). His romances include *The Kuzzilbash, a Tale of Khorasan* (1828), and its sequel, *The Persian Adventurer* (1830); *Allan Neemroo* (1832); and *The Dark Falcon* (1844). He also wrote *An Historical and Descriptive Account of Persia* (1834); *A Winter's Journey (Tâtar) from Constantinople to Tehcran* (1838); *Travels in Koordistan, Mesopotamia, &c.* (1840); *Mesopotamia and Assyria* (1842); and *Military Memoirs of Col. James Skinner* (1851).

FRASER, SIR WILLIAM AUGUSTUS, Bart. (1826–1898), English politician, author and collector, was born on the 10th of February 1826, the son of Sir James John Fraser, 3rd baronet, a colonel of the 7th Hussars, who had served on Wellington's staff at Waterloo. He was educated at Eton and at Christ Church, Oxford, entered the 1st Life Guards in 1847, but retired with a captain's rank in 1852. He then set about entering parliament, and the ups and downs of his political career were rather remarkable. He was returned for Barnstaple in 1852, but the election was declared void on account of bribery, and the constituency was disfranchised for two years. At the election of 1857 Sir William, who had meantime been defeated at Harwich, was again returned at Barnstaple. He was, however, defeated in 1859, but was elected in 1863 at Ludlow. This seat he held for only two years, when he was again defeated and did not re-enter parliament until 1874, when he was returned for Kidderminster, a constituency he represented for six years, when he retired. He was a familiar figure at the Carlton Club, always ready with a copious collection of anecdotes of Wellington, Disraeli and Napoleon III. He died on the 17th of August 1898. He was an assiduous collector of relics; and his library was sold for some £20,000. His own books comprise *Words on Wellington* (1889), *Disraeli and his Day* (1891), *Hic et Ubique* (1893), *Napoleon III.* (1896) and the *Waterloo Ball* (1897).

FRASER, the chief river of British Columbia, Canada, rising in two branches among the Rocky Mountains near 52° 45′ N., 118° 30′ W. Length 740 m. It first flows N.W. for about 160 m., then rounds the head of the Cariboo Mountains, and flows directly S. for over 400 m. to Hope, where it again turns abruptly and flows W. for 80 m., falling into the Gulf of Georgia at New Westminster. After the junction of the two forks near its northern extremity, the first important tributary on its southern course is the Stuart, draining Lakes Stuart, Fraser and François. One hundred miles lower down the Quesnel, draining a large lake of the same name, flows in from the east at a town also so named. Farther on the Fraser receives from the west the Chilcotin, and at Lytton, about 180 m. from the sea, the Thompson, its largest tributary, flows in from the east, draining a series of mountain lakes, and receiving at Kamloops the North Thompson, which flows through deep and impassable canyons. Below Hope the Lillooet flows in from the north. The Fraser is a typical mountain stream, rapid and impetuous through all its length, and like most of its tributaries is in many parts not navigable even by canoes. On its southern course between Lytton and Yale, while bursting its way through the Coast Range, it flows through majestic canyons, which, like those of the Thompson, were the scene of many tragedies during the days of the gold-rush to the Cariboo district. At Yale, about 80 m. from its mouth, it becomes navigable, though its course is still very rapid. In the Cariboo district, comprised within the great bend of the river, near Tête Jaune Cache, are many valuable gold deposits. With its tributaries the Fraser drains the whole province from 54° to 49° N., except the extreme south-eastern corner, which is within the basin of the Columbia and its tributary the Kootenay.

FRASERBURGH, a police burgh and seaport, on the N. coast of Aberdeenshire, Scotland. Pop. (1891), 7466; (1901), 9105. It is situated 47½ m. by rail N. of Aberdeen, from which there is a branch line, of which it is the terminus, of the Great North of Scotland railway. It takes its name from Sir Alexander Fraser, the ancestor of Lord Saltoun, whose seat, Philorth House, lies 2 m. to the south. Sir Alexander obtained for it in 1613 a charter as a burgh of royalty, and also in 1592 a charter for the founding of a university. This latter project, however, was not carried out, and all that remains of the building intended for the college is a three-storeyed tower. The old castle of the Frasers on Kinnaird Head now contains a lighthouse, and close by is the Wine Tower, with a cave below. The town cross is a fine structure standing upon a huge hexagon, surmounted by a stone pillar 12 ft. high, ornamented by the royal and Fraser arms. The port is one of the leading stations of the herring fishery in the north of Scotland and the head

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of a fishery district. During the herring season (June to September) the population is increased by upwards of 10,000 persons. The fleet numbers more than 700 boats, and the annual value of the catch exceeds £200,000. The harbour, originally constructed as a refuge for British ships of war, is one of the best on the east coast, and has been improved by the widening of the piers and the extension of the breakwaters. It has an area of upwards of eight acres, is easy of access, and affords anchorage for vessels of every size.

FRASERVILLE (formerly Rivière du Loup en Bas), a town and watering-place in Temiscouata county, Quebec, Canada, 107 m. (by water) north-east of Quebec, on the south shore of the St Lawrence river, and at the mouth of the Rivière du Loup, at the junction of the Intercolonial and Temiscouata railways. It contains a convent, boys' college, hospital, several mills, and is a favourite summer resort on account of the angling and shooting, and the magnificent scenery. Pop. (1901) 4569.

FRATER, FRATER HOUSE or FRATERY, a term in architecture for the hall where the members of a monastery or friary met for meals or refreshment. The word is by origin the same as "refectory." The older forms, such as *freitur*, *fraytor* and the like, show the word to be an adaptation of the O.Fr. *fraitour*, a shortened form of *refraitour*, from the Med. Lat. *refectorium*. The word has been confused with *frater*, a brother or friar, and hence sometimes confined in meaning to the dining-hall of a friary, while "refectory" is used of a monastery.

FRATERNITIES, COLLEGE, a class of student societies peculiar to the colleges and universities of the United States and Canada, with certain common characteristics, and mostly named from two or three letters of the Greek alphabet; hence they are frequently called "Greek Letter Societies." They are organized on the lodge system, and each fraternity comprises a number of affiliated lodges of which only one of any one fraternity is connected with the same institution. The lodges, called "chapters," in memory of the convocations of monks of medieval times, are usually designated by Greek letters also. They are nominally secret, with one exception (*Delta Upsilon*). Each chapter admits members from the lowest or freshman class, and of course loses its members as the students depart from college, consequently each chapter has in it at the same time members of all the four college classes and frequently those pursuing postgraduate studies. Where the attendance at a college is large the material from which fraternity members may be drawn is correspondingly abundant, and in some of the large colleges (*e.g.* at Cornell University and the University of Michigan) there are chapters of over twenty fraternities. All the fraternities aim to be select and to pick their members from the mass of incoming students. Where, however, the material to select from is not abundant and the rival fraternities are numerous, care in selection is impossible, and the chapters at any one college are apt to secure much the same general type of men. Many of the fraternities have, however, on account of a persistent selection of men of about the same tastes at different colleges, acquired a distinct character and individuality; for instance, *Alpha Delta Phi* is literary.

The first of these fraternities was the *Phi Beta Kappa*, founded at the College of William and Mary at Williamsburg, Virginia, in 1776. It was a little social club of five students: John Heath, Richard Booker, Thomas Smith, Armistead Smith and John Jones. Its badge was a square silver medal displaying the Greek letters of its name and a few symbols. In 1779 it authorized Elisha Parmelee, one of its members, to establish "meetings" or chapters at Yale and Harvard, these chapters being authorized to establish subordinate branches in their respective states. In 1781 the College of William and Mary was closed, its buildings being occupied in turn by the British, French and American troops, and the society ceased to exist. The two branches, however, were established—that at Yale in 1780 and that at Harvard in 1781. Chapters were established at Dartmouth in 1787, at Union in 1817, at Bowdoin in 1824 and at Brown in 1830. This society changed its character in 1826 and became non-secret and purely honorary in character, admitting to membership a certain proportion of the scholars of highest standing in each class (only in classical courses, usually and with few exceptions only in graduating classes). More recent honorary societies of similar character among schools of science and engineering are *Sigma Xi* and *Tau Beta Pi*.

In 1825, at Union College, *Kappa Alpha* was organized, copying in style of badge, membership restrictions and the like, its predecessor. In 1827 two other similar societies, *Sigma Phi* and *Delta Phi*, were founded at the same place. In 1831 *Sigma Phi* placed a branch at Hamilton College and in 1833 *Alpha Delta Phi* originated there. In 1833 *Psi Upsilon*, a fourth society, was organized at Union. In 1835 *Alpha Delta Phi* placed a chapter at Miami University, and in 1839 *Beta Theta Pi* originated there, and so the system spread. These fraternities, it will be observed, were all undergraduate societies among the male students. In 1910 the total number of men's general fraternities was 32, with 1068 living chapters, and owning property worth many millions of dollars. In 1864 *Theta Xi*, the first professional fraternity restricting its membership to students intending to engage in the same profession, was organized. There were in 1910 about 50 of these organizations with some 400 chapters. In addition there are about 100 local societies or chapters acting as independent units. Some of the older of these, such as *Kappa Kappa Kappa* at Dartmouth, *IKA* at Trinity, *Phi Nu Theta* at Wesleyan and *Delta Psi* at Vermont, are permanent in character, but the majority of them are purely temporary, designed to maintain an organization until the society becomes a chapter of one of the general fraternities. In 1870 the first women's society or "sorority," the *Kappa Alpha Theta*, was organized at De Pauw University. There were in 1910, 17 general sororities with some 300 active chapters.

It is no exaggeration to say that these apparently insignificant organizations of irresponsible students have modified the college life of America and have had a wide influence. Members join in the impressionable years of their youth; they retain for their organizations a peculiar loyalty and affection, and freely contribute with money and influence to their advancement.

Almost universally the members of any particular chapter (or part of them) live together in a lodge or chapter house. The men's fraternities own hundreds of houses and rent as many more. The fraternities form a little aristocracy within the college community. Sometimes the line of separation is invisible, sometimes sharply marked. Sometimes this condition militates against the college discipline and sometimes it assists it. Conflicts not infrequently occur between the fraternity and non-fraternity element in a college.

It can readily be understood how young men living together in the intimate relationship of daily contact in the same house, having much the same tastes, culture and aspirations would form among themselves enduring friendships. In addition each fraternity has a reputation to maintain, and this engenders an esprit du corps which at times places loyalty to fraternity interests above loyalty to college interest or the real advantage of the individual. At commencements and upon other occasions the former members of the chapters return to their chapter houses and help to foster the pride and loyalty of the undergraduates. The chapter houses are commonly owned by corporations made up of the alumni. This brings the undergraduates into contact with men of mature age and often of national fame, who treat their membership as a serious privilege.

The development of this collegiate aristocracy has led to jealousy and bitter animosity among those not selected for membership. Some of the states, notably South Carolina and Arkansas, have by legislation, either abolished the fraternities at state-controlled institutions or seriously limited the privileges of their members. The constitutionality of such legislation has never been tested. Litigation has occasionally arisen out of attempts on the part of college authorities to prohibit the fraternities at their several institutions. This, it has been held, may lawfully be done at a college maintained by private endowment but not at an institution supported by public funds. In

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the latter case all classes of the public are equally entitled to the same educational privileges and members of the fraternities may not be discriminated against.

The fraternities are admirably organized. The usual system comprises a legislative body made up of delegates from the different chapters and an executive or administrative body elected by the delegates. Few of the fraternities have any judiciary. None is needed. The financial systems are sound, and the conventions of delegates meet in various parts of the United States, several hundred in number, spend thousands of dollars in travel and entertainment, and attract much public attention. Most of the fraternities have an inspection system by which chapters are periodically visited and kept up to a certain level of excellence.

The leading fraternities publish journals usually from four to eight times during the college year. The earliest of these was the *Beta Theta Pi*, first issued in 1872. All publish catalogues of their members and the most prosperous have issued histories. They also publish song books, music and many ephemeral and local publications.

The alumni of the fraternities are organized into clubs or associations having headquarters at centres of population. These organizations are somewhat loose, but nevertheless are capable of much exertion and influence should occasion arise.

The college fraternity system has no parallel among the students of colleges outside of America. One of the curious things about it, however, is that while it is practically uniform throughout the United States, at the three prominent universities of Harvard, Yale and Princeton it differs in many respects from its character elsewhere. At Harvard, although there are chapters of a few of the fraternities, their influence is insignificant, their place being taken by a group of local societies, some of them class organizations. At Yale, the regular system of fraternities obtains in the engineering or technical department (the Sheffield Scientific School), but in the classical department the fraternity chapters are called "junior" societies, because they limit their membership to the three upper classes and allow the juniors each year practically to control the chapter affairs. Certain senior societies, of which the oldest is the Skull and Bones, which are inter-fraternity societies admitting freely members of the fraternities, are more prominent at Yale than the fraternities themselves. Princeton has two (secret) literary and fraternal societies, the American Whig and the Cliosophic, and various local social clubs, with no relationship to organizations in other colleges and not having Greek letter names.

At a few universities (for instance, Michigan, Cornell and Virginia), senior societies or other inter-fraternity societies exert great influence and have modified the strength of the fraternity system.

Of late years, numerous societies bearing Greek names and imitating the externals of the college fraternities have sprung up in the high schools and academies of the country, but have excited the earnest and apparently united opposition of the authorities of such schools.

See William Raimond Baird, *American College Fraternities* (6th ed., New York, 1905); Albert C. Stevens, *Cyclopedia of Fraternities* (Paterson, N. J., 1899); Henry D. Sheldon, *Student Life and Customs* (New York, 1901); Homer L. Patterson, *Patterson's College and School Directory* (Chicago, 1904); H. K. Kellogg, *College Secret Societies* (Chicago, 1874); Albert P. Jacobs, *Greek Letter Societies* (Detroit, 1879). (W. R. B.*)

FRATICELLI (plural diminutive of Ital. *frate*, brother), the name given during the 13th, 14th and 15th centuries to a number of religious groups in Italy, differing widely from each other, but all derived more or less directly from the Franciscan movement. Fra Salimbenc says in his *Chronicle* (Parma ed., p. 108): "All who wished to found a new rule borrowed something from the Franciscan order, the sandals or the habit." As early as 1238 Gregory IX., in his bull *Quoniam abundavit iniquitas*, condemned and denounced as forgers (*tanquam falsarios*) all who begged or preached in a habit resembling that of the mendicant orders, and this condemnation was repeated by him or his successors. The term Fraticelli was used contemptuously to denote, not any particular sect, but the members of orders formed on the fringe of the church. Thus Giovanni Villani, speaking of the heretic Dolcino, says in his *Chronicle* (bk. viii. ch. 84): "He is not a brother of an ordered rule, but a *fraticello* without an order." Similarly, John XXII., in his bull *Sancta Romana et Universalis Ecclesia* (28th of December 1317), condemns vaguely those "*profanae multitudinis viri* commonly called Fraticelli, or Brethren of the Poor Life, or Bizocchi, or Beguines, or by all manner of other names."

Some historians, in their zeal for rigid classification, have regarded the Fraticelli as a distinct sect, and have attempted to discover its dogmas and its founder. Some of the contemporaries of these religious groups fell into the same error, and in this way the vague term Fraticelli has sometimes been applied to the disciples of Armanno Pongilupo of Ferrara (d. 1269), who was undoubtedly a Cathar, and to the followers of Gerard Segarelli and Dolcino, who were always known among themselves as Apostolic Brethren (Apostolici). Furthermore, it seems absurd to classify both the Dolcinists and the Spiritual Franciscans as Fraticelli, since, as has been pointed out by Ehrle (*Arch. f. Lit. u. Kirchengesch. des Mittelalters*, ii. 107, &c.), Angelo of Clarino, in his *De septem tribulationibus*, written to the glory of the Spirituals, does not scruple to stigmatize the Dolcinists as "disciples of the devil." It is equally absurd to include in the same category the ignorant Bizocchi and Segarellists and such learned disciples of Michael of Cesena and Louis of Bavaria as William of Occam and Bonagratia of Bergamo, who have often been placed under this comprehensive rubric.

The name Fraticelli may more justly be applied to the most exalted fraction of Franciscanism. In 1322 some prisoners declared to the inquisitor Bernard Gui at Toulouse that the Franciscan order was divided into three sections—the Conventuals, who were allowed to retain their real and personal property; the Spirituals or Beguines, who were at that time the objects of persecution; and the Fraticelli of Sicily, whose leader was Henry of Ceva (see Gui's *Practica Inquisitionis*, v.). It is this fraction of the order which John XXII. condemned in his bull *Gloriosam Ecclesiam* (23rd of January 1318), but without calling them Fraticelli. Henry of Ceva took refuge in Sicily at the time of Pope Boniface VIII.'s persecution of the Spirituals, and thanks to the good offices of Frederick of Sicily, a little colony of Franciscans who rejected all property had soon established itself in the island. Under Pope Clement V., and more especially under Pope John XXII., fresh Spirituals joined them; and this group of exalted and isolated ascetics soon began to regard itself as the sole legitimate order of the Minorites and then as the sole Catholic Church. After being excommunicated as "schismatics and rebels, founders of a superstitious sect, and propagators of false and pestiferous doctrines," they proceeded to elect a general (for Michael of Cesena had disavowed them) and then a pope called Celestine (L. Wadding, *Annales*, at date 1313). The rebels continued to carry on an active propaganda. In Tuscany particularly the Inquisition made persistent efforts to suppress them; Florence afflicted them with severe laws, but failed to rouse the populace against them. The papacy dreaded their social even more than their dogmatic influence. At first in Sicily and afterwards throughout Italy the Ghibellines gave them a warm welcome; the rigorists and the malcontents who had either left the church or were on the point of leaving it, were attracted by these communities of needy rebels; and the tribune Rienzi was at one time disposed to join them. To overcome these ascetics it was necessary to have recourse to other ascetics, and from the outset the reformed Franciscans, or Franciscans of the Strict Observance, under the direction of their first leaders, Paoluccio da Trinci (d. 1390), Giovanni Stronconi (d. 1405), and St Bernardine of Siena, had been at great pains to restore the Fraticelli to orthodoxy. These early efforts, however, had little success. Alarmed by the number of the sectaries and the extent of their influence, Pope Martin V., who had encouraged the Observants, and particularly Bernardine of Siena, fulminated two bulls (1418 and 1421) against the heretics, and entrusted different legates with the task of hunting them down. These measures failing, he decided, in

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1426, to appoint two Observants as inquisitors without territorial limitation to make a special crusade against the heresy of the Fraticelli. These two inquisitors, who pursued their duties under three popes (Martin V., Eugenius IV. and Nicholas V.) were Giovanni da Capistrano and Giacomo della Marca. The latter's valuable *Dialogus contra Fraticelles* (Baluze and Mansi, *Miscellanea*, Iv. 505-610) gives an account of the doctrines of these heretics and of the activity of the two inquisitors, and shows that the Fraticelli not only constituted a distinct church but a distinct society. They had a pope called Rinaldo, who was elected in 1420 and was succeeded by a brother named Gabriel. This supreme head of their church they styled "bishop of Philadelphia," Philadelphia being the mystic name of their community; under him were bishops, *e.g.* the bishops of Florence, Venice, &c.; and, furthermore, a member of the community named Guglielmo Majoretto bore the title of "Emperor of the Christians." This organization, at least in so far as concerns the heretical church, had already been observed among the Fraticelli in Sicily, and in 1423 the general council of Siena affirmed with horror that at Peniscola there was an heretical pope surrounded with a college of cardinals who made no attempt at concealment. From 1426 to 1449 the Fraticelli were unremittingly pursued, imprisoned and burned. The sect gradually died out after losing the protection of the common people, whose sympathy was now transferred to the austere Observants and their miracle-worker Capistrano. From 1466 to 1471 there were sporadic burnings of Fraticelli, and in 1471 Tommaso di Scarlino was sent to Piombino and the littoral of Tuscany to track out some Fraticelli who had been discovered in those parts. After that date the name disappears from history.

See F. Ehrle, "Die Spiritualen, ihr Verhältnis zum Franziskanerorden und zu den Fraticellen," and "Zur Vorgeschichte des Concils von Vienne," in *Archiv für Literatur- und Kirchengeschichte des Mittelalters*, vols. i., ii., iii.; Wetzer and Welte, *Kirchenlexikon, s.v.* "Fraticellen"; H. C. Lea, *History of the Inquisition of the Middle Ages*, iii. 129-180 (London, 1888). (P. A.)

FRAUD (Lat. *fraus*, deceit), in its widest sense, a term which has never been exhaustively defined by an English court of law, and for legal purposes probably cannot usefully be defined, except as denoting a cause of action for which damages can be recovered in civil proceedings it now has a clear and settled meaning. In actions in which damages are claimed for fraud, the difficulties and obscurities which commonly arise are due rather to the complexity of modern commerce and the ingenuity of modern swindlers than to any uncertainty or technicality in the modern law. To succeed in such an action, the person aggrieved must first prove a representation of fact, made either by words, by writing or by conduct, which is in fact untrue. Mere concealment is not actionable unless it amounts not only to *suppressio veri*, but to *suggestio falsi*. An expression of opinion or of intention is not enough, unless it can be shown that the opinion was not really held, or that the intention was not really entertained, in which case it must be borne in mind, to use the phrase of Lord Bowen, that the state of a man's mind is as much a matter of fact as the state of his digestion. Next, it must be proved that the representation was made without any honest belief in its truth, that is, either with actual knowledge of its falsity or with a reckless disregard whether it is true or false. It was finally established, after much controversy, in the case of *Derry* v. *Peek* in 1889, that a merely negligent misstatement is not actionable. Further, the person aggrieved must prove that the offender made the representation with the intention that he should act on it, though not necessarily directly to him, and that he did in fact act in reliance on it. Lastly, the complainant must prove that, as the direct consequence, he has suffered actual damage capable of pecuniary measurement.

As soon as the case of *Derry* v. *Peek* had established, as the general rule of law, that a merely negligent misstatement is not actionable, a statutory exception was made to the rule in the case of directors and promoters of companies who publish prospectuses and similar documents. By the Directors' Liability Act 1890, such persons are liable for damage caused by untrue statements in such documents, unless they can prove that they had reasonable grounds for believing the statements to be true. It is also to be observed that, though damages cannot be recovered in an action for a misrepresentation made with an honest belief in its truth, still any person induced to enter into a contract by a misrepresentation, whether fraudulent or innocent, is entitled to avoid the contract and to obtain a declaration that it is not binding upon him. This is in accordance with the rule of equity, which since the Judicature Act prevails in all the courts. Whether the representation is fraudulent or innocent, the contract is not void, but voidable. The party misled must exercise his option to avoid the contract without delay, and before it has become impossible to restore the other party to the position in which he stood before the contract was made. If he is too late, he can only rely on his claim for damages, and in order to assert this claim it is necessary to prove that the misrepresentation was fraudulent. Fraud, in its wider sense of dishonest dealing, though not a distinct cause of action, is often material as preventing the acquisition of a right, for which good faith is a necessary condition. Also a combination or conspiracy by two or more persons to defraud gives rise to liabilities not very clearly or completely defined.

FRAUENBURG, a town of Germany, in the kingdom of Prussia, on the Frische Haff, at the mouth of the Bande, 41 m. S.W. from Königsberg on the railway to Elbing. Pop. 2500. The cathedral (founded 1329), with six towers, stands on a commanding eminence adjoining the town and surrounded by castellated walls and bastions. This is known as Dom-Frauenburg, and is the seat of the Roman Catholic bishop of Ermeland. Within the cathedral is a monument to the astronomer Copernicus bearing the inscription *Astronomo celeberrimo, cujus nomen et gloria utrumque implevit orbem*. There is a small port with inconsiderable trade. Frauenberg was founded in 1287 and received the rights of a town in 1310.

FRAUENFELD, the capital of the Swiss canton of Thurgau, 27 m. by rail N.E. of Zürich or 14½ m. W. of Romanshorn. It is built on the Murg stream a little above its junction with the Thur. It is a prosperous commercial town, being situated at the meeting point of several routes, while it possesses several industrial establishments, chiefly concerned with different branches of the iron trade. In 1900 its population (including the neighbouring villages) was 7761, mainly German-speaking, while there were 5563 Protestants to 2188 Romanists. Frauenfeld is the artillery depôt for North-East Switzerland. The upper town is the older part, and centres round the castle, of which the tower dates from the 10th century, though the rest is of a later period. Both stood on land belonging to the abbot of Reichenau, who, with the count of Kyburg, founded the town, which is first mentioned in 1255. The abbot retained all manorial rights till 1803, while the political powers of the Kyburgers (who were the "protectors" of Reichenau) passed to the Habsburgs in 1273, and were seized by the Swiss in 1460 with the rest of the Thurgau. In 1712 the town succeeded Baden in Aargau as the meeting-place of the Federal Diet, and continued to be the capital of the Confederation till its transformation in 1798. In 1799 it was successively occupied by the Austrians and the French. The old Capuchin convent (1591–1838) is now occupied as a vicarage by the Romanist priest. (W. A. B. C.)

FRAUENLOB, the name by which HEINRICH VON MEISSEN, a German poet of the 13th century, is generally known. He seems to have acquired the sobriquet because in a famous *Liederstreit* with his rival Regenbogen he defended the use of the word *Frau* (*i.e. frowe*, = lady) instead of *Weib* (*wîp* = woman). Frauenlob was born about 1250 of a humble burgher family. His youth was spent in straitened circumstances, but he gradually acquired a reputation as a singer at the various courts of the German princes. In 1278 we find him with Rudolph I. in the Marchfeld, in 1286 he was at Prague at the knighting of Wenceslaus (Wenzel) II., and in 1311 he was present at a knightly festival celebrated by Waldemar of Brandenburg before Rostock. After this he settled in Mainz, and there according to the popular account, founded the first school of Meistersingers (*q.v.*). He died in 1318, and was buried in the cloisters of the cathedral at

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Mainz. His grave is still marked by a copy made in 1783 of the original tombstone of 1318; and in 1842 a monument by Schwanthaler was erected in the cloisters. Fraunlob's poems make a great display of learning; he delights in far-fetched metaphors, and his versification abounds in tricks of form and rhyme.

Fraunlob's poetry was edited by L. Ettmüller in 1843; a selection will be found in K. Bartsch, *Deutsche Liederdichter des 12. bis 14. Jahrhunderts* (3rd ed., 1893). An English translation of Fraunlob's *Cantica canticorum*, by A. E. Kroeger, with notes, appeared in 1877 at St Louis, U.S.A. See A. Boerkel, *Fraunlob* (2nd ed., 1881).

FRAUNCE, ABRAHAM (*c.* 1558–1633), English poet, a native of Shropshire, was born between 1558 and 1560. His name was registered as a pupil of Shrewsbury School in January 1571/2, and he joined St John's College, Cambridge, in 1576, becoming a fellow in 1580/81. His Latin comedy of *Victoria*, dedicated to Sidney, was probably written at Cambridge, where he remained until he had taken his M.A. degree in 1583. He was called to the bar at Gray's Inn in 1588, and then apparently practised as a barrister in the court of the Welsh marches. After the death of his patron Sir Philip Sidney, Fraunce was protected by Sidney's sister Mary, countess of Pembroke. His last work was published in 1592, and we have no further knowledge of him until 1633, when he is said to have written an *Epithalamium* in honour of the marriage of Lady Magdalen Egerton, 7th daughter of the earl of Bridgwater, whose service he may possibly have entered.

His works are: *The Lamentations of Amintas for the death of Phyllis* (1587), a version in English hexameters of his friend's, Thomas Watson's, Latin *Amyntas*; *The Lawiers Logike, exemplifying the praecepts of Logike by the practise of the common Lawe* (1588); *Arcadian Rhetorike* (1588); *Abrahami Fransi Insignium, Armorum . . . explicatio* (1588); *The Countess of Pembroke's Yvychurch* (1591/2), containing a translation of Tasso's *Aminta*, a reprint of his earlier version of Watson, "The Lamentation of Corydon for the love of Alexis" (Virgil, eclogue ii.), a short translation from Heliodorus, and, in the third part (1592) "Aminta's Dale," a collection of "conceited" tales supposed to be related by the nymphs of Ivychurch; *The Countess of Pembroke's Emanuell* (1591); *The Third Part of the Countess of Pembroke's Ivychurch, entituled Aminta's Dale* (1592). His *Arcadian Rhetorike* owes much to earlier critical treatises, but has a special interest from its references to Spenser, and Fraunce quotes from the *Faerie Queene* a year before the publication of the first books. In "Colin Clout's come home again," Spenser speaks of Fraunce as Corydon, on account of his translations of Virgil's second eclogue. His poems are written in classical metres, and he was regarded by his contemporaries as the best exponent of Gabriel Harvey's theory. Even Thomas Nashe had a good word for "sweete Master France."

The Countess of Pembroke's Emanuell, hexameters on the nativity and passion of Christ, with versions of some psalms, were reprinted by Dr A. B. Grosart in the third volume of his *Miscellanies of the Fuller Worthies Library* (1872). Joseph Hunter in his *Chorus Vatum* stated that five of Fraunce's songs were included in Sidney's *Astrophel and Stella*, but it is probable that these should be attributed not to Fraunce, but to Thomas Campion. See a life prefixed to the transcription of a MS. Latin comedy by Fraunce, *Victoria*, by Professor G. C. Moore Smith, published in Bang's *Materialien zur Kunde des alteren englischen Dramas*, vol. xiv., 1906.

FRAUNHOFER, JOSEPH VON (1787–1826), German optician and physicist, was born at Straubing in Bavaria on the 6th of March 1787, the son of a glazier who died in 1798. He was apprenticed in 1799 to Weichselberger, a glass-polisher and looking-glass maker. On the 21st of July 1801 he nearly lost his life by the fall of the house in which he lodged, and the elector of Bavaria, Maximilian Joseph, who was present at his extrication from the ruins, gave him 18 ducats. With a portion of this sum he obtained release from the last six months of his apprenticeship, and with the rest he purchased a glass-polishing machine. He now employed himself in making optical glasses, and in engraving on metal, devoting his spare time to the perusal of works on mathematics and optics. In 1806 he obtained the place of optician in the mathematical institute which in 1804 had been founded at Munich by Joseph von Utzschneider, G. Reichenbach and J. Liebherr; and in 1807 arrangements were made by Utzschneider for his instruction by Pierre Louis Guinand, a skilled optician, in the fabrication of flint and crown glass, in which he soon became an adept (see R. Wolf, *Gesch. der Wissensch. in Deutschl.* bd. xvi. p. 586). With Reichenbach and Utzschneider, Fraunhofer established in 1809 an optical institute at Benedictbeuern, near Munich, of which he in 1818 became sole manager. The institute was in 1819 removed to Munich, and on Fraunhofer's death came under the direction of G. Merz.

Amongst the earliest mechanical contrivances of Fraunhofer was a machine for polishing mathematically uniform spherical surfaces. He was the inventor of the stage-micrometer, and of a form of heliometer; and in 1816 he succeeded in constructing for the microscope achromatic glasses of long focus, consisting of a single lens, the constituent glasses of which were in juxtaposition, but not cemented together. The great reflecting telescope at Dorpat was manufactured by him, and so great was the skill he attained in the making of lenses for achromatic telescopes that, in a letter to Sir David Brewster, he expressed his willingness to furnish an achromatic glass of 18 in. diameter. Fraunhofer is especially known for the researches, published in the *Denkschriften der Münchener Akademie* for 1814–1815, by which he laid the foundation of solar and stellar chemistry. The dark lines of the spectrum of sunlight, earliest noted by Dr W. H. Wollaston (*Phil. Trans.*, 1802, p. 378), were independently discovered, and, by means of the telescope of a theodolite, between which and a distant slit admitting the light a prism was interposed, were for the first time carefully observed by Fraunhofer, and have on that account been designated "Fraunhofer's lines." He constructed a map of as many as 576 of these lines, the principal of which he denoted by the letters of the alphabet from A to G; and by ascertaining their refractive indices he determined that their relative positions are constant, whether in spectra produced by the direct rays of the sun, or by the reflected light of the moon and planets. The spectra of the stars he obtained by using, outside the object glass of his telescope, a large prism, through which the light passed to be brought to a focus in front of the eye-piece. He showed that in the spectra of the fixed stars many of the dark lines were different from those of the solar spectrum, whilst other well-known solar lines were wanting; and he concluded that it was not by any action of the terrestrial atmosphere upon the light passing through it that the lines were produced. He further expressed the belief that the dark lines D of the solar spectrum coincide with the bright lines of the sodium flame. He was also the inventor of the diffraction grating.

In 1823 he was appointed conservator of the physical cabinet at Munich, and in the following year he received from the king of Bavaria the civil order of merit. He died at Munich on the 7th of June 1826, and was buried near Reichenbach, whose decease had taken place eight years previously. On his tomb is the inscription "Approximavit sidera."

See J. von Utzschneider, *Kurzer Umriss der Lebensgeschichte des Herrn Dr J. von Fraunhofer* (Munich, 1826); and G. Merz, *Das Leben und Wirken Fraunhofers* (Landshut, 1865)

FRAUSTADT (Polish, *Wszowa*), a town of Germany, in the Prussian province of Posen, in a flat sandy country dotted with windmills, 50 m. S.S.W. of Posen, on the railway Lissa-Sagan. Pop. (including a garrison) 7500. It has three Evangelical and two Roman Catholic churches, a classical school and a teachers' seminary; the manufactures include woollen and cotton goods, hats, morocco leather and gloves, and there is a considerable trade in corn, cattle and wool. Fraustadt was founded by Silesians in 1348, and afterwards belonged to the principality of Glogau. Near the town the Swedes under Charles XII. defeated the Saxons on the 13th of February 1706.

FRAYSSINOUS, DENIS ANTOINE LUC, COMTE DE (1765–1841), French prelate and statesman, distinguished as an orator and as a controversial writer, was born of humble parentage at Curières, in the department of Aveyron, on the 9th of May 1765. He owes his reputation mainly to the lectures on dogmatic theology, known as the "conferences" of Saint Sulpice, delivered in the church of Saint Sulpice, Paris, from 1803 to

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1809, to which admiring crowds were attracted by his lucid exposition and by his graceful oratory. The freedom of his language in 1809, when Napoleon had arrested the pope and declared the annexation of Rome to France, led to a prohibition of his lectures; and the dispersion of the congregation of Saint Sulpice in 1811 was followed by his temporary retirement from the capital. He returned with the Bourbons, and resumed his lectures in 1814; but the events of the Hundred Days again compelled him to withdraw into private life, from which he did not emerge until February 1816. As court preacher and almoner to Louis XVIII., he now entered upon the period of his greatest public activity and influence. In connexion with the controversy raised by the signing of the reactionary concordat of 1817, he published in 1818 a treatise entitled *Vrais Principes de l'église Gallicane sur la puissance ecclésiastique*, which though unfavourably criticized by Lamennais, was received with favour by the civil and ecclesiastical authorities. The consecration of Frayssinous as bishop of Hermopolis "in partibus," his election to the French Academy, and his appointment to the grand-mastership of the university, followed in rapid succession. In 1824, on the accession of Charles X., he became minister of public instruction and of ecclesiastical affairs under the administration of Villèle; and about the same time he was created a peer of France with the title of count. His term of office was chiefly marked by the recall of the Jesuits. In 1825 he published his lectures under the title *Défense du christianisme*. The work passed through 15 editions within 18 years, and was translated into several European languages. In 1828 he, along with his colleagues in the Villèle ministry, was compelled to resign office, and the subsequent revolution of July 1830 led to his retirement to Rome. Shortly afterwards he became tutor to the duke of Bordeaux (Comte de Chambord) at Prague, where he continued to live until 1838. He died at St Géniez on the 12th of December 1841.

See Bertrand, *Bibl. Sulpicienne* (t. ii. 135 sq.; iii. 253) for bibliography, and G. A. Henrion (Paris, 2 vols., 1844) for biography.

FRÉCHETTE, LOUIS HONORÉ (1839–1908), French-Canadian poet, was born at Levis, Quebec, on the 16th of November 1839, the son of a contractor. He was educated in his native province, and called to the Canadian bar in 1864. He started the *Journal de Lévis*, and his revolutionary doctrines compelled him to leave Canada for the United States. After some years spent in journalism at Chicago, he was in 1874 elected as the Liberal candidate to represent Levis in the Canadian parliament. At the elections of 1878 and 1882 he was defeated, and thereafter confined himself to literature. He edited *La Patrie* and other French papers in the Dominion; and in 1889 was appointed clerk of the Quebec legislative council. He was long a warm advocate of the political union of Canada and the United States, but in later life became less ardent, and in 1897 accepted the honour of C.M.G. from Queen Victoria. He was president of the Royal Society of Canada, and of the Canadian Society of Arts, and received numerous honorary degrees. His works include: *Mes Loisirs* (1863); *La Voix d'un exilé* (1867), a satire against the Canadian government; *Pêle-mêle* (1877); *Les Fleurs boréales*, and *Les Oiseaux de neige* (1880), crowned by the French academy; *La Légende d'un peuple* (1887); two historical dramas, *Papineau* (1880) and *Felix Poutré* (1880); *La Noël au Canada* (1900), and several prose works and translations. An exponent of local French sentiment, he won the title of the "Canadian Laureate." He died on the 1st of June 1908.

FREDEGOND (*Fredigundis*) (d. 597), Frankish queen. Originally a serving-woman, she inspired the Frankish king, Chilperic I., with a violent passion. At her instigation he repudiated his first wife Audovera, and strangled his second, Galswintha, Queen Brunhilda's sister. A few days after this murder Chilperic married Fredegond (567). This woman exercised a most pernicious influence over him. She forced him into war against Austrasia, in the course of which she procured the assassination of the victorious king Sigebert (575); she carried on a malignant struggle against Chilperic's sons by his first wife, Theodebert, Merwich and Clovis, who all died tragic deaths; and she persistently endeavoured to secure the throne for her own children. Her first son Thierry, however, to whom Bishop Ragnemod of Paris stood godfather, died soon after birth, and Fredegond tortured a number of women whom she accused of having bewitched the child. Her second son also died in infancy. Finally, she gave birth to a child who afterwards became king as Clotaire II. Shortly after the birth of this third son, Chilperic himself perished in mysterious circumstances (584). Fredegond has been accused of complicity in his murder, but with little show of probability, since in her husband she lost her principal supporter.

Henceforth Fredegond did all in her power to gain the kingdom for her child. Taking refuge at the church of Notre Dame at Paris, she appealed to King Guntram of Burgundy, who took Clotaire under his protection and defended him against his other nephew, Childebert II., king of Austrasia. From that time until her death Fredegond governed the western kingdom. She endeavoured to prevent the alliance between King Guntram and Childebert, which was cemented by the pact of Andelot; and made several attempts to assassinate Childebert by sending against him hired bravoes armed with poisoned *scramasaxes* (heavy single-edged knives). After the death of Childebert in 595 she resolved to augment the kingdom of Neustria at the expense of Austrasia, and to this end seized some cities near Paris and defeated Theodebert at the battle of Laffaux, near Soissons. Her triumph, however, was short-lived, as she died quietly in her bed in 597 soon after her victory.

See V. N. Augustin Thierry, *Récits des temps mérovingiens* (Brussels, 1840), Ulysse Chevalier, *Bio-bibliographie* (2nd ed., *s.v.* "Frédégonde." (C. Pr.)

FREDERIC, HAROLD (1856–1898), Anglo-American novelist, was born on the 19th of August 1856 at Utica, N.Y., was educated there, and took to journalism. He went to live in England as London correspondent of the *New York Times* in 1884, and was soon recognized for his ability both as a writer and as a talker. He wrote several clever early stories, but it was not till he published *Illumination* (1896), followed by *Gloria Mundi* (1898), that his remarkable gifts as a novelist were fully realized. He died in England on the 19th of October 1898.

FREDERICIA (FRIEDERICIA), a seaport of Denmark, near the S.E. corner of Jutland, on the west shore of the Little Belt opposite the island of Fünen. Pop. (1901) 12,714. It has railway communication with both south and north, and a steam ferry connects with Middelfart, a seaside resort and railway station on Fünen. There is a considerable shipping trade, and the industries comprise the manufacture of tobacco, salt and chicory, and of cotton goods and hats. A small fort was erected on the site of Fredericia by Christian IV. of Denmark, and his successor, Frederick III., determined about 1650 to make it a powerful fortress. Free exercise of religion was offered to all who should settle in the new town, which at first bore the name of Frederiksodde, and only received its present designation in 1664. In 1657 it was taken by storm by the Swedish general Wrangel, and in 1659, after the fortress had been dismantled, it was occupied by Frederick William of Brandenburg. It was not till 1709–1710 that the works were again put in a state of defence. In 1848 no attempt was made by the Danes to oppose the Prussians, who entered on the 2nd of May, and maintained their position against the Danish gunboats. During the armistice of 1848–1849 the fortress was strengthened, and soon afterwards it stood a siege of two months, which was brought to a glorious close by a successful sortie on the 6th of July 1849. In memory of the victory several monuments have been erected in the town and its vicinity, of which the most noticeable are the bronze statue of the Danish Land Soldier by Bissen (one of Thorvaldsen's pupils), and the great barrow over 500 Danes in the cemetery of the Holy Trinity Church, with a bas-relief by the same sculptor. On the outbreak of the war of 1864, the fortress was again strengthened by new works and an entrenched camp; but the Danes suddenly evacuated it on the 28th of April after a siege of six weeks. The Austro-Prussian army partly destroyed the fortifications, and kept possession of the town till the conclusion of peace.

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FREDERICK (Mod. Ger. *Friedrich*; Ital. *Federigo*; Fr. *Frédéric* and *Fédéric*; M.H.G. *Friderich*; O.H.G. *Fridurih*, "king or lord of peace," from O.H.G. *fridu*, A.S. *frith*, "peace," and *rih* "rich," "a ruler," for derivation of which see HENRY), a Christian name borne by many European sovereigns and princes, the more important of whom are given below in the following order:—(1) Roman emperors and German kings; (2) other kings in the alphabetical order of their states; (3) other reigning princes in the same order.

FREDERICK I. (*c.* 1123–1190), Roman emperor, surnamed "Barbarossa" by the Italians, was the son of Frederick II. of Hohenstaufen, duke of Swabia, and Judith, daughter of Henry IX. the Black, duke of Bavaria. The precise date and place of his birth, together with details of his early life, are wanting; but in 1143 he assisted his maternal uncle, Count Welf VI., in his attempts to conquer Bavaria, and by his conduct in several local feuds earned the reputation of a brave and skilful warrior. When his father died in 1147 Frederick became duke of Swabia, and immediately afterwards accompanied his uncle, the German king Conrad III., on his disastrous crusade, during which he greatly distinguished himself and won the complete confidence of the king. Abandoning the cause of the Welfs, he fought for Conrad against them, and in 1152 the dying king advised the princes to choose Frederick as his successor to the exclusion of his own young son. Energetically pressing his candidature, he was chosen German king at Frankfort on the 4th or 5th of March 1152, and crowned at Aix-la-Chapelle on the 9th of the same month, owing his election partly to his personal qualities, and partly to the fact that he united in himself the blood of the rival families of Welf and Waiblingen.

The new king was anxious to restore the Empire to the position it had occupied under Charlemagne and Otto the Great, and saw clearly that the restoration of order in Germany was a necessary preliminary to the enforcement of the imperial rights in Italy. Issuing a general order for peace, he was prodigal in his concessions to the nobles. Count Welf was made duke of Spoleto and margrave of Tuscany; Berthold VI., duke of Zähringen, was entrusted with extensive rights in Burgundy; and the king's nephew, Frederick, received the duchy of Swabia. Abroad Frederick decided a quarrel for the Danish throne in favour of Svend, or Peter as he is sometimes called, who did homage for his kingdom, and negotiations were begun with the East Roman emperor, Manuel Comnenus. It was probably about this time that the king obtained a divorce from his wife Adela, daughter of Dietpold, margrave of Vohburg and Cham, on the ground of consanguinity, and made a vain effort to obtain a bride from the court of Constantinople. On his accession Frederick had communicated the news of his election to Pope Eugenius III., but neglected to ask for the papal confirmation. In spite of this omission, however, and of some trouble arising from a double election to the archbishopric of Magdeburg, a treaty was concluded between king and pope at Constance in March 1153, by which Frederick promised in return for his coronation to make no peace with Roger I. king of Sicily, or with the rebellious Romans, without the consent of Eugenius, and generally to help and defend the papacy.

The journey to Italy made by the king in 1154 was the precursor of five other expeditions which engaged his main energies for thirty years, during which the subjugation of the peninsula was the central and abiding aim of his policy. Meeting the new pope, Adrian IV., near Nepi, Frederick at first refused to hold his stirrup; but after some negotiations he consented and received the kiss of peace, which was followed by his coronation as emperor at Rome on the 18th of June 1155. As his slender forces were inadequate to encounter the fierce hostility which he aroused, he left Italy in the autumn of 1155 to prepare for a new and more formidable campaign. Disorder was again rampant in Germany, especially in Bavaria, but general peace was restored by Frederick's vigorous measures. Bavaria was transferred from Henry II. Jasomirgott, margrave of Austria, to Henry the Lion, duke of Saxony; and the former was pacified by the erection of his margraviate into a duchy, while Frederick's step-brother Conrad was invested with the Palatinate of the Rhine. On the 9th of June 1156 the king was married at Würzburg to Beatrix, daughter and heiress of the dead count of Upper Burgundy, Renaud III., when Upper Burgundy or Franche Comté, as it is sometimes called, was added to his possessions. An expedition into Poland reduced Duke Boleslaus IV. to an abject submission, after which Frederick received the homage of the Burgundian nobles at a diet held at Besançon in October 1157, which was marked by a quarrel between pope and emperor. A Swedish archbishop, returning from Rome, had been seized by robbers, and as Frederick had not punished the offenders Adrian sent two legates to remonstrate. The papal letter when translated referred to the imperial crown as a benefice conferred by the pope, and its reading aroused great indignation. The emperor had to protect the legates from the fury of the nobles; and afterwards issued a manifesto to his subjects declaring that he held the Empire from God alone, to which Adrian replied that he had used the ambiguous word *beneficia* as meaning benefits, and not in its feudal sense.

In June 1158 Frederick set out upon his second Italian expedition, which was signalized by the establishment of imperial officers called *podestas* in the cities of northern Italy, the revolt and capture of Milan, and the beginning of the long struggle with pope Alexander III., who excommunicated the emperor on the 2nd of March 1160. During this visit Frederick summoned the doctors of Bologna to the diet held near Roncaglia in November 1158, and as a result of their inquiries into the rights belonging to the kingdom of Italy he obtained a large amount of wealth. Returning to Germany towards the close of 1162, Frederick prevented a conflict between Henry the Lion, duke of Saxony, and a number of neighbouring princes, and severely punished the citizens of Mainz for their rebellion against Archbishop Arnold. A further visit to Italy in 1163 saw his plans for the conquest of Sicily checked by the formation of a powerful league against him, brought together mainly by the exactions of the *podestas* and the enforcement of the rights declared by the doctors of Bologna. Frederick had supported an anti-pope Victor IV. against Alexander, and on Victor's death in 1163 a new anti-pope called Paschal III. was chosen to succeed him. Having tried in vain to secure the general recognition of Victor and Paschal in Europe, the emperor held a diet at Würzburg in May 1165; and by taking an oath, followed by many of the clergy and nobles, to remain true to Paschal and his successors, brought about a schism in the German church. A temporary alliance with Henry II., king of England, the magnificent celebration of the canonization of Charlemagne at Aix-la-Chapelle, and the restoration of peace in the Rhineland, occupied Frederick's attention until October 1166, when he made his fourth journey to Italy. Having captured Ancona, he marched to Rome, stormed the Leonine city, and procured the enthronement of Paschal, and the coronation of his wife Beatrix; but his victorious career was stopped by the sudden outbreak of a pestilence which destroyed the German army and drove the emperor as a fugitive to Germany, where he remained for the ensuing six years. Henry the Lion was again saved from a threatening combination; conflicting claims to various bishoprics were decided; and the imperial authority was asserted over Bohemia, Poland and Hungary. Friendly relations were entered into with the emperor Manuel, and attempts made to come to a better understanding with Henry II., king of England, and Louis VII., king of France.

In 1174, when Frederick made his fifth expedition to Italy, the Lombard league had been formed, and the fortress of Alessandria raised to check his progress. The campaign was a complete failure. The refusal of Henry the Lion to bring help into Italy was followed by the defeat of the emperor at Legnano on the 29th of May 1176, when he was wounded and believed to be dead. Reaching Pavia, he began negotiations for peace with Alexander, which ripened into the treaty of Venice in August 1177, and at the same time a truce with the Lombard league was arranged for six years. Frederick, loosed from the papal ban, recognized Alexander as the rightful pope, and in July 1177 knelt before him and kissed his feet. The possession of the vast

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estates left by Matilda, marchioness of Tuscany, and claimed by both pope and emperor, was to be decided by arbitration, and in October 1178 the emperor was again in Germany. Various small feuds were suppressed; Henry the Lion was deprived of his duchy, which was dismembered, and sent into exile; a treaty was made with the Lombard league at Constance in June 1183; and most important of all, Frederick's son Henry was betrothed in 1184 to Constance, daughter of Roger I., king of Sicily, and aunt and heiress of the reigning king, William II. This betrothal, which threatened to unite Sicily with the Empire, made it difficult for Frederick, when during his last Italian expedition in 1184 he met Pope Lucius III. at Verona, to establish friendly relations with the papacy. Further causes of trouble arose, moreover, and when the potentates separated the question of Matilda's estates was undecided; and Lucius had refused to crown Henry or to recognize the German clergy who had been ordained during the schism. Frederick then formed an alliance with Milan, where the citizens witnessed a great festival on the 27th of January 1186. The emperor, who had been crowned king of Burgundy, or Arles, at Arles on the 30th of July 1178, had this ceremony repeated; while his son Henry was crowned king of Italy and married to Constance, who was crowned queen of Germany.

The quarrel with the papacy was continued with the new pope Urban III., and open warfare was begun. But Frederick was soon recalled to Germany by the news of a revolt raised by Philip of Heinsberg, archbishop of Cologne, in alliance with the pope. The German clergy remained loyal to the emperor, and hostilities were checked by the death of Urban and the election of a new pope as Gregory VIII., who adopted a more friendly policy towards the emperor. In 1188 Philip submitted, and immediately afterwards Frederick took the cross in order to stop the victorious career of Saladin, who had just taken Jerusalem. After extensive preparations he left Regensburg in May 1189 at the head of a splendid army, and having overcome the hostility of the East Roman emperor Isaac Angelus, marched into Asia Minor. On the 10th of June 1190 Frederick was either bathing or crossing the river Calycadnus (Geuksu), near Seleucia (Selefke) in Cilicia, when he was carried away by the stream and drowned. The place of his burial is unknown, and the legend which says he still sits in a cavern in the Kyffhäuser mountain in Thuringia waiting until the need of his country shall call him, is now thought to refer, at least in its earlier form, to his grandson, the emperor Frederick II. He left by his wife, Beatrix, five sons, of whom the eldest afterwards became emperor as Henry VI.

Frederick's reign, on the whole, was a happy and prosperous time for Germany. He encouraged the growth of towns, easily suppressed the few risings against his authority, and took strong and successful measures to establish order. Even after the severe reverses which he experienced in Italy, his position in Germany was never seriously weakened; and in 1181, when, almost without striking a blow, he deprived Henry the Lion of his duchy, he seemed stronger than ever. This power rested upon his earnest and commanding personality, and also upon the support which he received from the German church, the possession of a valuable private domain, and the care with which he exacted feudal dues from his dependents.

Frederick I. is said to have taken Charlemagne as his model; but the contest in which he engaged was entirely different both in character and results from that in which his great predecessor achieved such a wonderful temporary success. Though Frederick failed to subdue the republics, the failure can scarcely be said to reflect either on his prudence as a statesman or his skill as a general, for his ascendancy was finally overthrown rather by the ravages of pestilence than by the might of human arms. In Germany his resolute will and sagacious administration subdued or disarmed all discontent, and he not only succeeded in welding the various rival interests into a unity of devotion to himself against which papal intrigues were comparatively powerless, but won for the empire a prestige such as it had not possessed since the time of Otto the Great. The wide contrast between his German and Italian rule is strikingly exemplified in the fact that, while he endeavoured to overthrow the republics in Italy, he held in check the power of the nobles in Germany, by conferring municipal franchises and independent rights on the principal cities. Even in Italy, though his general course of action was warped by wrong prepossessions, be in many instances manifested exceptional practical sagacity in dealing with immediate difficulties and emergencies. Possessing frank and open manners, untiring and unresting energy, and a prowess which found its native element in difficulty and danger, he seemed the embodiment of the chivalrous and warlike spirit of his age, and was the model of all the qualities which then won highest admiration. Stern and ambitious he certainly was, but his aims can scarcely be said to have exceeded his prerogatives as emperor; and though he had sometimes recourse when in straits to expedients almost diabolically ingenious in their cruelty, yet his general conduct was marked by a clemency which in that age was exceptional. His quarrel with the papacy was an inherited conflict, not reflecting at all on his religious faith, but the inevitable consequence of inconsistent theories of government, which had been created and could be dissipated only by a long series of events. His interference in the quarrels of the republics was not only quite justifiable from the relation in which he stood to them, but seemed absolutely necessary. From the beginning, however, he treated the Italians, as indeed was only natural, less as rebellious subjects than as conquered aliens; and it must be admitted that in regard to them the only effective portion of his procedure was, not his energetic measures of repression nor his brilliant victories, but, after the battle of Legnano, his quiet and cheerful acceptance of the inevitable, and the consequent complete change in his policy, by which if he did not obtain the great object of his ambition, he at least did much to render innoxious for the Empire his previous mistakes.

In appearance Frederick was a man of well-proportioned, medium stature, with flowing yellow hair and a reddish beard. He delighted in hunting and the reading of history, was zealous in his attention to public business, and his private life was unimpeachable. Carlyle's tribute to him is interesting: "No king so furnished out with apparatus and arena, with personal faculty to rule and scene to do it in, has appeared elsewhere. A magnificent, magnanimous man; holding the reins of the world, not quite in the imaginary sense; scourging anarchy down, and urging noble effort up, really on a grand scale. A terror to evil-doers and a praise to well-doers in this world, probably beyond what was ever seen since."

The principal contemporary authority for the earlier part of the reign of Frederick is the *Gesta Friderici imperatoris*, mainly the work of Otto, bishop of Freising. This is continued from 1156 to 1160 by Rahewin, a canon of Freising, and from 1160 to 1170 by an anonymous author. The various annals and chronicles of the period, among which may be mentioned the *Chronica regia Coloniensis* and the *Annales Magdeburgenses*, are also important. Other authorities for the different periods in Frederick's reign are Tageno of Passau, *Descriptio expeditionis asiaticae Friderici I.*; Burchard, *Historia Friderici imperatoris magni*; Godfrey of Viterbo, *Carmen de gestis Friderici I.*, which are all found in the *Monumenta Germaniae historica, Scriptores* (Hanover and Berlin, 1826–1892); Otto Morena of Lodi, *Historia rerum Laudensium*, continued by his son, Acerbus, also in the *Monumenta*; Ansbert, *Historia de expeditione Friderici, 1187–1196*, published in the *Fontes rerum Austriacarum*, Scriptores (Vienna, 1855 fol.). Many valuable documents are found in the *Monumenta Germaniae selecta*, Band iv., edited by M. Doeberl (Munich, 1889–1890).

The best modern authorities are J. Jastrow, *Deutsche Geschichte im Zeitalter der Hohenstaufen* (Berlin, 1893); W. von Giesebrecht, *Geschichte der deutschen Kaiserzeit*, Band iv. (Brunswick, 1877); H. von Bünau, *Leben und Thaten Friedrichs I.* (Leipzig, 1872); H. Prutz, *Kaiser Friedrich I.* (Dantzig, 1871–1874); C. Peters, *Die Wahl Kaiser Friedrichs I.* in the *Forschungen zur deutschen Geschichte*, Band xx. (Göttingen, 1862–1886); W. Gundlach, *Barbarossalieder* (Innsbruck, 1899). For a complete bibliography see Dahlmann-Waitz, *Quellenkunde der deutschen Geschichte* (Göttingen, 1894), and U. Chevalier, *Répertoire des sources historiques du moyen âge*, tome iii. (Paris, 1904).

FREDERICK II. (1194–1250), Roman emperor, king of Sicily and Jerusalem, was the son of the emperor Henry VI. and Constance, daughter of Roger I. king of Sicily, and therefore grandson of the emperor Frederick I. and a member of the Hohenstaufen

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family. Born at Jesi near Ancona on the 26th of December 1194, he was baptized by the name of Frederick Roger, chosen German king at Frankfort in 1196, and after his father's death crowned king of Sicily at Palermo on the 17th of May 1198. His mother, who assumed the government, died in November 1198, leaving Pope Innocent III. as regent of Sicily and guardian of her son. The young king passed his early years amid the terrible anarchy in his island kingdom, which Innocent was powerless to check; but his education was not neglected, and his character and habits were formed by contact with men of varied nationalities and interests, while the darker traits of his nature were developed in the atmosphere of lawlessness in which he lived. In 1208 he was declared of age, and soon afterwards Innocent arranged a marriage, which was celebrated the following year, between him and Constance, daughter of Alphonso II. king of Aragon, and widow of Emerich or Imre, king of Hungary.

The dissatisfaction felt in Germany with the emperor Otto IV. came to a climax in September 1211, when a number of influential princes met at Nuremberg, declared Otto deposed, and invited Frederick to come and occupy the vacant throne. In spite of the reluctance of his wife, and the opposition of the Sicilian nobles, he accepted the invitation; and having recognized the papal supremacy over Sicily, and procured the coronation of his son Henry as its king, reached Germany after an adventurous journey in the autumn of 1212. This step was taken with the approval of the pope, who was anxious to strike a blow at Otto IV.

Frederick was welcomed in Swabia, and the renown of the Hohenstaufen name and a liberal distribution of promises made his progress easy. Having arranged a treaty against Otto with Louis, son of Philip Augustus, king of France, whom he met at Vaucouleurs, he was chosen German king a second time at Frankfort on the 5th of December 1212, and crowned four days later at Mainz. Anxious to retain the support of the pope, Frederick promulgated a bull at Eger on the 12th of July 1213, by which he renounced all lands claimed by the pope since the death of the emperor Henry VI. in 1197, gave up the right of spoils and all interference in episcopal elections, and acknowledged the right of appeal to Rome. He again affirmed the papal supremacy over Sicily, and promised to root out heresy in Germany. The victory of his French allies at Bouvines on the 27th of July 1214 greatly strengthened his position, and a large part of the Rhineland having fallen into his power, he was crowned German king at Aix-la-Chapelle on the 25th of July 1215. His cause continued to prosper, fresh supporters gathered round his standard, and in May 1218 the death of Otto freed him from his rival and left him undisputed ruler of Germany. A further attempt to allay the pope's apprehension lest Sicily should be united with the Empire had been made early in 1216, when Frederick, in a letter to Innocent, promised after his own coronation as emperor to recognize his son Henry as king of Sicily, and to place him under the suzerainty of Rome. Henry nevertheless was brought to Germany and chosen German king at Frankfort in April 1220, though Frederick assured the new pope, Honorius III., that this step had been taken without his consent. The truth, however, seems to be that he had taken great trouble to secure this election, and for the purpose had won the support of the spiritual princes by extensive concessions. In August 1220 Frederick set out for Italy, and was crowned emperor at Rome on the 22nd of November 1220; after which he repeated the undertaking he had entered into at Aix-la-Chapelle in 1215 to go on crusade, and made lavish promises to the Church. The clergy were freed from taxation and from lay jurisdiction, the ban of the Empire was to follow the ban of the Church, and heretics were to be severely punished.

Neglecting his promise to lead a crusade, Frederick was occupied until 1225 in restoring order in Sicily. The island was seething with disorder, but by stern and sometimes cruel measures the emperor suppressed the anarchy of the barons, curbed the power of the cities, and subdued the rebellious Saracens, many of whom, transferred to the mainland and settled at Nocera, afterwards rendered him valuable military service. Meanwhile the crusade was postponed again and again; until under a threat of excommunication, after the fall of Damietta in 1221, Frederick definitely undertook by a treaty made at San Germano in 1225 to set out in August 1227 or to submit to this penalty. His own interests turned more strongly to the East, when on the 9th of November 1225, after having been a widower since 1222, he married Iolande (Yolande or Isabella), daughter of John, count of Brienne, titular king of Jerusalem. John appears to have expected that this alliance would restore him to his kingdom, but his hopes were dashed to the ground when Frederick himself assumed the title of king of Jerusalem. The emperor's next step was an attempt to restore the imperial authority in northern Italy, and for the purpose a diet was called at Cremona. But the cities, watchful and suspicious, renewed the Lombard league and took up a hostile attitude. Frederick's reply was to annul the treaty of Constance and place the cities under the imperial ban; but he was forced by lack of military strength to accept the mediation of Pope Honorius and the maintenance of the *status quo*.

After these events, which occurred early in 1227, preparations for the crusade were pressed on, and the emperor sailed from Brindisi on the 8th of September. A pestilence, however, which attacked his forces compelled him to land in Italy three days later, and on the 29th of the same month he was excommunicated by the new pope, Gregory IX. The greater part of the succeeding year was spent by pope and emperor in a violent quarrel. Alarmed at the increase in his opponent's power, Gregory denounced him in a public letter, to which Frederick replied in a clever document addressed to the princes of Europe. The reading of this manifesto, drawing attention to the absolute power claimed by the popes, was received in Rome with such evidences of approval that Gregory was compelled to fly to Viterbo. Having lost his wife Isabella on the 8th of May 1228, Frederick again set sail for Palestine, where he met with considerable success, the result of diplomatic rather than of military skill. By a treaty made in February 1229 he secured possession of Jerusalem, Bethlehem, Nazareth and the surrounding neighbourhood. Entering Jerusalem, he crowned himself king of that city on the 18th of March 1229. These successes had been won in spite of the hostility of Gregory, which deprived Frederick of the assistance of many members of the military orders and of the clergy of Palestine. But although the emperor's possessions on the Italian mainland had been attacked in his absence by the papal troops and their allies, Gregory's efforts had failed to arouse serious opposition in Germany and Sicily; so that when Frederick returned unexpectedly to Italy in June 1229 he had no difficulty in driving back his enemies, and compelling the pope to sue for peace. The result was the treaty of San Germano, arranged in July 1230, by which the emperor, loosed from the ban, promised to respect the papal territory, and to allow freedom of election and other privileges to the Sicilian clergy. Frederick was next engaged in completing the pacification of Sicily. In 1231 a series of laws were published at Melfi which destroyed the ascendancy of the feudal nobles. Royal officials were appointed for administrative purposes, large estates were recovered for the crown, and fortresses were destroyed, while the church was placed under the royal jurisdiction and all gifts to it were prohibited. At the same time certain privileges of self-government were granted to the towns, representatives from which were summoned to sit in the diet. In short, by means of a centralized system of government, the king established an almost absolute monarchical power.

In Germany, on the other hand, an entirely different policy was pursued. The concessions granted by Frederick in 1220, together with the Privilege of Worms, dated the 1st of May 1231, made the German princes virtually independent. All jurisdiction over their lands was vested in them, no new mints or toll-centres were to be erected on their domains, and the imperial authority was restricted to a small and dwindling area. A fierce attack was also made on the rights of the cities. Compelled to restore all their lands, their jurisdiction was bounded by their city-walls; they were forbidden to receive the dependents of the princes; all trade gilds were declared abolished; and all official appointments made without the consent of the archbishop or bishop were

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annulled. A further attack on the Lombard cities at the diet of Ravenna in 1231 was answered by a renewal of their league, and was soon connected with unrest in Germany. About 1231 a breach took place between Frederick and his elder son Henry, who appears to have opposed the Privilege of Worms and to have favoured the towns against the princes. After refusing to travel to Italy, Henry changed his mind and submitted to his father at Aquileia in 1232; and a temporary peace was made with the Lombard cities in June 1233. But on his return to Germany Henry again raised the standard of revolt, and made a league with the Lombards in December 1234. Frederick, meanwhile, having helped Pope Gregory against the rebellious Romans and having secured the friendship of France and England, appeared in Germany early in 1235 and put down this rising without difficulty. Henry was imprisoned, but his associates were treated leniently. In August 1235 a splendid diet was held at Mainz, during which the marriage of the emperor with Isabella (1214–1241), daughter of John, king of England, was celebrated. A general peace (*Landfrieden*), which became the basis of all such peaces in the future, was sworn to; a new office, that of imperial justiciar, was created, and a permanent judicial record was first instituted. Otto of Brunswick, grandson of Henry the Lion, duke of Saxony, was made duke of Brunswick-Lüneburg; and war was declared against the Lombards.

Frederick was now at the height of his power. His second son, Conrad, was invested with the duchy of Swabia, and the claim of Wenceslaus, king of Bohemia, to some lands which had belonged to the German king Philip was bought off. The attitude of Frederick II. (the Quarrelsome), duke of Austria, had been considered by the emperor so suspicious that during a visit paid by Frederick to Italy a war against him was begun. Compelled to return by the ill-fortune which attended this campaign, the emperor took command of his troops, seized Austria, Styria and Carinthia, and declared these territories to be immediately dependent on the Empire. In January 1237 he secured the election of his son Conrad as German king at Vienna; and in September went to Italy to prosecute the war which had broken out with the Lombards in the preceding year. Pope Gregory attempted to mediate, but the cities refused to accept the insulting terms offered by Frederick. The emperor gained a great victory over their forces at Cortenuova in November 1237; but though he met with some further successes, his failure to take Brescia in October 1238, together with the changed attitude of Gregory, turned the fortune of war. The pope had become alarmed when the emperor brought about a marriage between the heiress of Sardinia, Adelasia, and his natural son Enzio, who afterwards assumed the title of king of Sardinia. But as his warnings had been disregarded, he issued a document after the emperor's retreat from Brescia, teeming with complaints against Frederick, and followed it up by an open alliance with the Lombards, and by the excommunication of the emperor on the 20th of March 1239. A violent war of words ensued. Frederick, accused of heresy, blasphemy and other crimes, called upon all kings and princes to unite against the pope, who on his side made vigorous efforts to arouse opposition in Germany, where his emissaries, a crowd of wandering friars, were actively preaching rebellion. It was, however, impossible to find an anti-king. In Italy, Spoleto and Ancona were declared part of the imperial dominions, and Rome itself, faithful on this occasion to the pope, was threatened. A number of ecclesiastics proceeding to a council called by Gregory were captured by Enzio at the sea-fight of Meloria, and the emperor was about to undertake the siege of Rome, when the pope died (August 1241). Germany was at this time menaced by the Mongols; but Frederick contented himself with issuing directions for a campaign against them, until in 1242 he was able to pay a short visit to Germany, where he gained some support from the towns by grants of extensive privileges.

The successor of Gregory was Pope Celestine IX. But this pontiff died soon after his election; and after a delay of eighteen months, during which Frederick marched against Rome on two occasions and devastated the lands of his opponents, one of his partisans, Sinibaldo Fiesco, was chosen pope, and took the name of Innocent IV. Negotiations for peace were begun, but the relations of the Lombard cities to the Empire could not be adjusted, and when the emperor began again to ravage the papal territories Innocent fled to Lyons. Hither he summoned a general council, which met in June 1245; but although Frederick sent his justiciar, Thaddeus of Suessa, to represent him, and expressed his willingness to treat, sentence of excommunication and deposition was pronounced against him. Once more an interchange of recriminations began, charged with all the violent hyperbole characteristic of the controversial style of the age. Accused of violating treaties, breaking oaths, persecuting the church and abetting heresy, Frederick replied by an open letter rebutting these charges, and in equally unmeasured terms denounced the arrogance and want of faith of the clergy from the pope downwards. The source of all the evil was, he declared, the excessive wealth of the church, which, in retaliation for the sentence of excommunication, he threatened to confiscate. In vain the mediation of the saintly king of France, Louis IX., was invoked. Innocent surpassed his predecessors in the ferocity and unscrupulousness of his attacks on the emperor (see INNOCENT IV.). War soon became general in Germany and Italy. Henry Raspe, landgrave of Thuringia, was chosen German king in opposition to Frederick in May 1246, but neither he nor his successor, William II., count of Holland, was successful in driving the Hohenstaufen from Germany. In Italy, during the emperor's absence, his cause had been upheld by Enzio and by the ferocious Eccelino da Romano. In 1246 a formidable conspiracy of the discontented Apulian barons against the emperor's power and life, fomented by papal emissaries, was discovered and crushed with ruthless cruelty. The emperor's power seemed more firmly established than ever, when suddenly the news reached him that Parma, a stronghold of the imperial authority in the north, had been surprised, while the garrison was off its guard, by the Guelphs. To recover the city was a matter of prime importance, and in 1247 Frederick concentrated his forces round it, building over against it a wooden town which, in anticipation of the success that astrologers had predicted, he named Vittoria. The siege, however, was protracted, and finally, in February 1248, during the absence of the emperor on a hunting expedition, was brought to an end by a sudden sortie of the men of Parma, who stormed the imperial camp. The disaster was complete. The emperor's forces were destroyed or scattered; the treasury, with the imperial insignia, together with Frederick's harem and some of the most trusted of his ministers, fell into the hands of the victors. Thaddeus of Suessa was hacked to pieces by the mob; the imperial crown was placed in mockery on the head of a hunch-backed beggar, who was carried back in triumph into the city.

Frederick struggled hard to retrieve his fortunes, and for a while with success. But his old confidence had left him; he had grown moody and suspicious, and his temper gave a ready handle to his enemies. Pier della Vigna, accused of treasonable designs, was disgraced; and the once all-powerful favourite and minister, blinded now and in rags, was dragged in the emperor's train, as a warning to traitors, till in despair he dashed out his brains. Then, in May 1248, came the tidings of Enzio's capture by the Bolognese, and of his hopeless imprisonment, the captors refusing all offers of ransom. This disaster to his favourite son broke the emperor's spirit. He retired to southern Italy, and after a short illness died at Fiorentino on the 13th of December 1250, after having been loosed from the ban by the archbishop of Palermo. He was buried in the cathedral of that city, where his splendid tomb may still be seen. By his will he appointed his son Conrad to succeed him in Germany and Sicily, and Henry, his son by Isabella of England, to be king of Jerusalem or Arles, neither of which kingdoms, however, he obtained. Frederick left several illegitimate children: Enzio has already been referred to; Frederick, who was made the imperial vicar in Tuscany; and Manfred, his son by the beloved Bianca Lancia or Lanzia, who was legitimatized just before his father's death, and was appointed by his will prince of Tarento and regent of Sicily.

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The character of Frederick is one of extraordinary interest and versatility, and contemporary opinion is expressed in the words *stupor mundi et immutator mirabilis*. Licentious and luxurious in his manners, cultured and catholic in his tastes, he united in his person the most diverse qualities. His Sicilian court was a centre of intellectual activity. Michael Scott, the translator of some treatises of Aristotle and of the commentaries of Averroes, Leonard of Pisa, who introduced Arabic numerals and algebra to the West, and other scholars, Jewish and Mahommedan as well as Christian, were welcome at his court. Frederick himself had a knowledge of six languages, was acquainted with mathematics, philosophy and natural history, and took an interest in medicine and architecture. In 1224 he founded the university of Naples, and he was a liberal patron of the medical school at Salerno. He formed a menagerie of strange animals, and wrote a treatise on falconry (*De arte venandi cum avibus*) which is remarkable for its accurate observation of the habits of birds.[1] It was at his court, too, that—as Dante points out—Italian poetry had its birth. Pier della Vigna there wrote the first sonnet, and Italian lyrics by Frederick himself are preserved to us. His wives were kept secluded in oriental fashion; a harem was maintained at Lucera, and eunuchs were a prominent feature of his household. His religious ideas have been the subject of much controversy. The theory of M. Huillard-Bréholles that he wished to unite to the functions of emperor those of a spiritual pontiff, and aspired to be the founder of a new religion, is insufficiently supported by evidence to be credible. Although at times he persecuted heretics with great cruelty, he tolerated Mahommedans and Jews, and both acts appear rather to have been the outcome of political considerations than of religious belief. His jests, which were used by his enemies as a charge against him, seem to have originated in religious indifference, or perhaps in a spirit of inquiry which anticipated the ideas of a later age. Frederick's rule in Germany and Italy was a failure, but this fact may be accounted for by the conditions of the time and the inevitable conflict with the papacy. In Germany the enactments of 1220 and 1231 contributed to the disintegration of the Empire and the fall of the Hohenstaufen, while conflicting interests made the government of Italy a problem of exceptional difficulty. In Sicily Frederick was more successful. He quelled disorder, and under his rule the island was prosperous and contented. His ideas of government were those of an absolute monarch, and he probably wished to surround himself with some of the pomp which bad encircled the older emperors of Rome. His chief claim to fame, perhaps, is as a lawgiver. The code of laws which he gave to Sicily in 1231 bears the impress of his personality, and has been described as "the fullest and most adequate body of legislation promulgated by any western ruler since Charlemagne." Without being a great soldier, Frederick was not unskilful in warfare, but was better acquainted with the arts of diplomacy. In person he is said to have been "red, bald and short-sighted," but with good features and a pleasing countenance. It was seriously believed in Germany for about a century after his death that Frederick was still alive, and many impostors attempted to personate him. A legend, afterwards transferred to Frederick Barbarossa, told how he sat in a cavern in the Kyffhäusser before a stone table through which his beard had grown, waiting for the time for him to awake and restore to the Empire the golden age of peace.

The contemporary documents relating to the reign of Frederick II. are very numerous. Among the most important are: Richard of San Germano, *Chronica regni Siciliae*; *Annales Placentini*, *Gibellini*; Albert of Stade, *Annales*; Matthew Paris, *Historia major Angliae*; Burchard, *Chronicon Urspergense*. All these are in the *Monumenta Germaniae historica. Scriptores*] (Hanover and Berlin, 1826–1892). The *Rerum Italicarum scriptores*, edited by L. A. Muratori (Milan, 1723–1751), contains *Annales Mediolanenses*; Nicholas of Jamsilla, *Historia de rebus gestis Friderici II.*, and *Vita Gregorii IX. pontificis*. There are also the *Epistolarum libri* of Peter della Vigna, edited by J. R. Iselin (Basel, 1740); and Salimbene of Parma's *Chronik*, published at Parma (1857). Many of the documents concerning the history of the time are found in the *Historia diplomatica Friderici II.*, edited by M. Huillard-Bréholles (Paris, 1852–1861); *Acta imperii selecta. Urkunden deutscher Könige und Kaiser*, edited by J. F. Böhmer and J. Ficker (Innsbruck, 1870); *Acta imperii inedita seculi XIII. Urkunden und Briefe zur Geschichte des Kaiserreichs und des Königreichs Sicilien*, edited by E. Winkelmann (Innsbruck, 1880); *Epistolae saeculi XIII. selecta e regestis pontificum Romanorum*, edited by C. Rodenberg, tome i. (Berlin, 1883); P. Pressutti, *Regesta Honorii papae III.* (Rome, 1888); L. Auvray, *Les Registres de Grégoire IX.* (Paris, 1890).

The best modern authorities are W. von Giesebrecht, *Geschichte der deutschen Kaiserzeit*, Band v. (Leipzig, 1888); J. Jastrow, *Deutsche Geschichte im Zeitalter der Hohenstaufen* (Berlin, 1893); K. Hillebrandt, *Kaiser Friedrich II.* (Göttingen, 1860–1865); "Beiträge zur Geschichte Kaiser Friedrichs II." in the *Forschungen zur deutschen Geschichte*, Band xi. (Göttingen, 1862–1886), and *Die letzten Hohenstaufen* (Göttingen, 1871); E. Winkelmann, *Geschichte Kaiser Friedrichs II und seiner Reiche* (Berlin, 1863) and *Kaiser Friedrich II.* (Leipzig, 1889); G. Blondel, *Étude sur la politique de l'empereur Frédéric II. en Allemagne* (Paris, 1892); M. Halbe, *Friedrich II. und der päpstliche Stuhl* (Berlin, 1888); R. Röhricht, *Die Kreuzfahrt des Kaisers Friedrich II.* (Berlin, 1874); C. Köhler, *Das Verhältnis Kaiser Friedrichs II. zu den Päpsten seiner Zeit* (Breslau, 1888); J. Felten, *Papst Gregor IX.* (Freiburg, 1886); C. Rodenberg, *Innocenz IV. und das Königreich Sicilien* (Halle, 1892); K. Lamprecht, *Deutsche Geschichte*, Band iii. (Berlin, 1891); M. Huillard-Bréholles, *Vie et correspondance de Pierre de la Vigne* (Paris, 1865); A. del Vecchio, *La legislazione de Federico II* (Turin, 1874); and K. Hampe, *Kaiser Friedrich II.* (Munich, 1899). (A. W. H.*)

FREDERICK III. (1415–1493), Roman emperor,—as Frederick IV., German king, and as Frederick V., archduke of Austria,—son of Ernest of Habsburg, duke of Styria and Carinthia, was born at Innsbruck on the 21st of September 1415. After his father's death in 1424 he passed his time at the court of his uncle and guardian, Frederick IV., count of Tirol. In 1435, together with his brother, Albert the Prodigal, he undertook the government of Styria and Carinthia, but the peace of these lands was disturbed by constant feuds between the brothers, which lasted until Albert's death in 1463. In 1439, upon the deaths of the German king Albert II. and of Frederick of Tirol left Frederick the senior member of the Habsburg family, and guardian of Sigismund, count of Tirol. In the following year he also became guardian of Ladislaus, the posthumous son of Albert II., and heir to Bohemia, Hungary and Austria, but these responsibilities brought only trouble and humiliation in their train. On the 2nd of February 1440 Frederick was chosen German king at Frankfort, but, owing to his absence from Germany, the coronation was delayed until the 17th of June 1442, when it took place at Aix-la-Chapelle.

Disregarding the neutral attitude of the German electors towards the papal schism, and acting under the influence of Aeneas Sylvius Piccolomini, afterwards Pope Pius II., Frederick in 1445 made a secret treaty with Pope Eugenius IV. This developed into the Concordat of Vienna, signed in 1448 with the succeeding pope, Nicholas V., by which the king, in return for a sum of money and a promise of the imperial crown, pledged the obedience of the German people to Rome, and so checked for a time the rising tide of liberty in the German church. Taking up the quarrel between the Habsburgs and the Swiss cantons, Frederick invited the Armagnacs to attack his enemies, but after meeting with a stubborn resistance at St Jacob on the 26th of August 1444, these allies proved faithless, and the king soon lost every vestige of authority in Switzerland. In 1451 Frederick, disregarding the revolts in Austria and Hungary, travelled to Rome, where, on the 16th of March 1452, his marriage with Leonora, daughter of Edward, king of Portugal, was celebrated, and three days later he was crowned emperor by pope Nicholas. On his return he found Germany seething with indignation. His capitulation to the pope was not forgotten; his refusal to attend the diets, and his apathy in the face of Turkish aggressions, constituted a serious danger; and plans for his deposition failed only because the electors could not unite upon a rival king. In 1457 Ladislaus, king of Hungary and Bohemia, and archduke of Austria, died; Frederick failed to secure either kingdom, but obtained lower Austria, from which, however, he was soon driven by his brother Albert, who occupied Vienna. On Albert's death in 1463 the emperor united upper and lower Austria under his rule, but these possessions were constantly ravaged by George

[1] First printed at Augsburg in 1596; a German edition was published at Berlin in 1896.

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Poděbrad, king of Bohemia, and by Matthias Corvinus, king of Hungary. A visit to Rome in 1468 to discuss measures against the Turks with Pope Paul II. had no result, and in 1470 Frederick began negotiations for a marriage between his son Maximilian and Mary, daughter and heiress of Charles the Bold, duke of Burgundy. The emperor met the duke at Treves in 1473, when Frederick, disliking to bestow the title of king upon Charles, left the city secretly, but brought about the marriage after the duke's death in 1477. Again attacked by Matthias, the emperor was driven from Vienna, and soon handed over the government of his lands to Maximilian, whose election as king of the Romans he vainly opposed in 1486. Frederick then retired to Linz, where he passed his time in the study of botany, alchemy and astronomy, until his death on the 19th of August 1493.

Frederick was a listless and incapable ruler, lacking alike the qualities of the soldier and of the diplomatist, but possessing a certain cleverness in evading difficulties. With a fine presence, he had many excellent personal qualities, is spoken of as mild and just, and had a real love of learning. He had a great belief in the future greatness of his family, to which he contributed largely by arranging the marriage of Maximilian with Mary of Burgundy, and delighted to inscribe his books and other articles of value with the letters A.E.I.O.U. (*Austriae est imperare orbi universo*; or in German, *Alles Erdreich ist Oesterreich unterthan*). His personality counts for very little in German history. One chronicler says: "He was a useless emperor, and the nation during his long reign forgot that she had a king." His tomb, a magnificent work in red and white marble, is in the cathedral of St Stephen at Vienna.

See Aeneas Sylvius Piccolomini, *De rebus et gestis Friderici III.* (trans. Th. Ilgen, Leipzig, 1889); J. Chmel, *Geschichte Kaiser Friedrichs IV. und seines Sohnes Maximilians I.* (Hamburg, 1840); A. Bachmann, *Deutsche Reichsgeschichte im Zeitalter Friedrichs III. und Maximilians I.* (Leipzig, 1884); A. Huber, *Geschichte Österreichs* (Gotha, 1885–1892); and E. M. Fürst von Lichnowsky, *Geschichte des Hauses Habsburg* (Vienna, 1836–1844).

FREDERICK III. (*c.* 1286–1330), surnamed "the Fair," German king and duke of Austria, was the second son of the German king, Albert I., and consequently a member of the Habsburg family. In 1298, when his father was chosen German king, Frederick was invested with some of the family lands, and in 1306, when his elder brother Rudolph became king of Bohemia, he succeeded to the duchy of Austria. In 1307 Rudolph died, and Frederick sought to obtain the Bohemian throne; but an expedition into that country was a failure, and his father's murder in May 1308 deprived him of considerable support. He was equally unsuccessful in his efforts to procure the German crown at this time, and the relations between the new king, Henry VII., and the Habsburgs were far from friendly. Frederick asked not only to be confirmed in the possession of Austria, but to be invested with Moravia, a demand to which Henry refused to accede; but an arrangement was subsequently made by which the duke agreed to renounce Moravia in return for a payment of 50,000 marks. Frederick then became involved in a quarrel with his cousin Louis IV., duke of Upper Bavaria (afterwards the emperor Louis IV.), over the guardianship of Henry II., duke of Lower Bavaria. Hostilities broke out, and on the 9th of November 1313 he was defeated by Louis at the battle of Gammelsdorf and compelled to renounce his claim.

Meanwhile the emperor Henry VII. had died in Italy, and a stubborn contest ensued for the vacant throne. After a long delay Frederick was chosen German king at Frankfort by a minority of the electors on the 19th of October 1314, while a majority elected Louis of Bavaria. Six days later Frederick was crowned at Bonn by the archbishop of Cologne, and war broke out at once between the rivals. During this contest, which was carried on in a desultory fashion, Frederick drew his chief strength from southern and eastern Germany, and was supported by the full power of the Habsburgs. The defeat of his brother Leopold by the Swiss at Morgarten in November 1315 was a heavy blow to him, but he prolonged the struggle for seven years. On the 28th of September 1322 a decisive battle was fought at Mühldorf; Frederick was defeated and sent as a prisoner to Trausnitz. Here he was retained until three years later a series of events induced Louis to come to terms. By the treaty of Trausnitz, signed on the 13th of March 1325, Frederick acknowledged the kingship of Louis in return for freedom, and promised to return to captivity unless he could induce his brother Leopold to make a similar acknowledgment. As Leopold refused to take this step, Frederick, although released from his oath by Pope John XXII., travelled back to Bavaria, where he was treated by Louis rather as a friend than as a prisoner. A suggestion was then made that the kings should rule jointly, but as this plan aroused some opposition it was agreed that Frederick should govern Germany while Louis went to Italy for the imperial crown. But this arrangement did not prove generally acceptable, and the death of Leopold in 1326 deprived Frederick of a powerful supporter. In these circumstances he returned to Austria broken down in mind and body, and on the 13th of January 1330 he died at Gutenstein, and was buried at Mauerbach, whence his remains were removed in 1783 to the cathedral of St Stephen at Vienna. He married Elizabeth, daughter of James I., king of Aragon, and left two daughters. His voluntary return into captivity is used by Schiller in his poem *Deutsche Treue*, and by J. L. Uhland in the drama *Ludwig der Bayer*.

The authorities for the life of Frederick are found in the *Fontes rerum Germanicarum*, Band i., edited by J. F. Böhmer (Stuttgart, 1843–1868), and in the *Fontes rerum Austriacorum*, part i. (Vienna, 1855). Modern works which may be consulted are: E. M. Fürst von Lichnowsky, *Geschichte des Hauses Habsburg* (Vienna, 1836–1844); Th. Lindner, *Deutsche Geschichte unter den Habsburgern und Luxemburgern* (Stuttgart, 1888–1893). R. Dübner, *Die Auseinandersetzung zwischen Ludwig IV. dem Bayer und Friedrich dem Schönen von Österreich* (Göttingen, 1875); F. Kurz, *Österreich unter König Friedrich dem Schönen* (Linz, 1818); F. Krones, *Handbuch der Geschichte Österreichs* (Berlin, 1876–1879); H. Schrohe, *Der Kampf der Gegenkönige Ludwig und Friedrich* (Berlin, 1902); W. Friedensburg, *Ludwig IV. der Bayer und Friedrich von Österreich* (Göttingen, 1877); B. Gebhardt, *Handbuch der deutschen Geschichte* (Berlin, 1901).

FREDERICK II. (1534–1588), king of Denmark and Norway, son of Christian III., was born at Hadersleben on the 1st of July 1534. His mother, Dorothea of Saxe-Lauenburg, was the elder sister of Catherine, the first wife of Gustavus Vasa and the mother of Eric XIV. The two little cousins, born the same year, were destined to be lifelong rivals. At the age of two Frederick was proclaimed successor to the throne at the *Rigsdag* of Copenhagen (October 30th, 1536), and homage was done to him at Oslo for Norway in 1548. The choice of his governor, the patriotic historiographer Hans Svaning, was so far fortunate that it ensured the devotion of the future king of Denmark to everything Danish; but Svaning was a poor pedagogue, and the wild and wayward lad suffered all his life from the defects of his early training. Frederick's youthful, innocent attachment to the daughter of his former tutor, Anna Hardenberg, indisposed him towards matrimony at the beginning of his reign (1558). After the hands of Elizabeth of England, Mary of Scotland and Renata of Lorraine had successively been sought for him, the council of state grew anxious about the succession, but he finally married his cousin, Sophia of Mecklenburg, on the 20th of July 1572.

The reign of Frederick II. falls into two well-defined divisions: (1) a period of war, 1559–1570; and (2) a period of peace, 1570–1588. The period of war began with the Ditmarsh expedition, when the independent peasant-republic of the Ditmarshers of West Holstein, which had stoutly maintained its independence for centuries against the counts of Holstein and the Danish kings, was subdued by a Dano-Holstein army of 20,000 men in 1559. Frederick and his uncles John and Adolphus, dukes of Holstein, dividing the land between them. Equally triumphant was Frederick in his war with Sweden, though here the contest was much more severe, lasting as it did for seven years; whence it is generally described in northern history as the Scandinavian Seven Years' War. The tension which had prevailed between the two kingdoms during the last years of Gustavus Vasa reached breaking point on the accession of Gustavus's eldest son Eric XIV. There were many causes of quarrel between the two ambitious young monarchs, but the detention at Copenhagen in 1563 of a splendid matrimonial embassy on its way to Germany,

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to negotiate a match between Eric and Christina of Hesse, which King Frederick for political reasons was determined to prevent, precipitated hostilities. During the war, which was marked by extraordinary ferocity throughout, the Danes were generally victorious on land owing to the genius of Daniel Rantzau, but at sea the Swedes were almost uniformly triumphant. By 1570 the strife had degenerated into a barbarous devastation of border provinces; and in July of the same year both countries accepted the mediation of the Emperor, and peace was finally concluded at Stettin on Dec. 13, 1570. During the course of this Seven Years' War Frederick II. had narrowly escaped the fate of his deposed cousin Eric XIV. The war was very unpopular in Denmark, and the closing of the Sound against foreign shipping, in order to starve out Sweden, had exasperated the maritime powers and all the Baltic states. On New Year's Day 1570 Frederick's difficulties seemed so overwhelming that he threatened to abdicate; but the peace of Stettin came in time to reconcile all parties, and though Frederick had now to relinquish his ambitious dream of re-establishing the Union of Kalmar, he had at least succeeded in maintaining the supremacy of Denmark in the north. After the peace Frederick's policy became still more imperial. He aspired to the dominion of all the seas which washed the Scandinavian coasts, and before he died he succeeded in suppressing the pirates who so long had haunted the Baltic and the German Ocean. He also erected the stately fortress of Kronborg, to guard the narrow channel of the Sound. Frederick possessed the truly royal gift of discovering and employing great men, irrespective of personal preferences and even of personal injuries. With infinite tact and admirable self-denial he gave free scope to ministers whose superiority in their various departments he frankly recognized, rarely interfering personally unless absolutely called upon to do so. His influence, always great, was increased by his genial and unaffected manners as a host. He is also remarkable as one of the few kings of the house of Oldenburg who had no illicit *liaison*. He died at Antvorskov on the 4th of April 1588. No other Danish king was ever so beloved by his people.

See *Lund* (*Troels*), *Danmarks og Norges Historie i Slutningen af det XVI. Aarh.* (Copenhagen, 1879); *Danmarks Riges Historie* (Copenhagen, 1897–1905), vol. 3; Robert Nisbet Bain, *Scandinavia*, cap. 4 (Cambridge, 1905). (R. N. B.)

FREDERICK III. (1609–1670), king of Denmark and Norway, son of Christian IV. and Anne Catherine of Brandenburg, was born on the 18th of March 1609 at Hadersleben. His position as a younger son profoundly influenced his future career. In his youth and early manhood there was no prospect of his ascending the Danish throne, and he consequently became the instrument of his father's schemes of aggrandizement in Germany. While still a lad he became successively bishop of Bremen, bishop of Verden and coadjutor of Halberstadt, while at the age of eighteen he was the chief commandant of the fortress of Stade. Thus from an early age he had considerable experience as an administrator, while his general education was very careful and thorough. He had always a pronounced liking for literary and scientific studies. On the 1st of October 1643 Frederick wedded Sophia Amelia of Brunswick Lüneburg, whose energetic, passionate and ambitious character was profoundly to affect not only Frederick's destiny but the destiny of Denmark. During the disastrous Swedish War of 1643–1645 Frederick was appointed generalissimo of the duchies by his father, but the laurels he won were scanty, chiefly owing to his quarrels with the Earl-Marshal Anders Bille, who commanded the Danish forces. This was Frederick's first collision with the Danish nobility, who ever afterwards regarded him with extreme distrust. The death of his elder brother Christian in June 1647 first opened to him the prospect of succeeding to the Danish throne, but the question was still unsettled when Christian IV. died on the 28th of February 1648. Not till the 6th of July in the same year did Frederick III. receive the homage of his subjects, and only after he had signed a *Haandfæstning* or charter, by which the already diminished royal prerogative was still further curtailed. It had been doubtful at first whether he would be allowed to inherit his ancestral throne at all; but Frederick removed the last scruples of the *Rigsraad* by unhesitatingly accepting the conditions imposed upon him.

The new monarch was a reserved, enigmatical prince, who seldom laughed, spoke little and wrote less—a striking contrast to Christian IV. But if he lacked the brilliant qualities of his impulsive, jovial father, he possessed in a high degree the compensating virtues of moderation, sobriety and self-control. But with all his good qualities Frederick was not the man to take a clear view of the political horizon, or even to recognize his own and his country's limitations. He rightly regarded the accession of Charles X. of Sweden (June 6th, 1654) as a source of danger to Denmark. He felt that temperament and policy would combine to make Charles an aggressive warrior-king: the only uncertainty was in which direction he would turn his arms first. Charles's invasion of Poland (July 1654) came as a distinct relief to the Danes, though even the Polish War was full of latent peril to Denmark. Frederick was resolved upon a rupture with Sweden at the first convenient opportunity. The *Rigsdag* which assembled on the 23rd of February 1657 willingly granted considerable subsidies for mobilization and other military expenses; on the 15th of April Frederick III. desired, and on the 23rd of April he received, the assent of the majority of the *Rigsraad* to attack Sweden's German provinces; in the beginning of May the still pending negotiations with that power were broken off, and on the 1st of June Frederick signed the manifesto justifying a war which was never formally declared. The Swedish king traversed all the plans of his enemies by his passage of the frozen Belts, in January and February 1658 (see CHARLES X. of Sweden). The effect of this unheard-of achievement on the Danish government was crushing. Frederick III. at once sued for peace; and, yielding to the persuasions of the English and French ministers, Charles finally agreed to be content with mutilating instead of annihilating the Danish monarchy (treaties of Taastrup, February 18th, and of Roskilde, February 26th, 1658). The conclusion of peace was followed by a remarkable episode. Frederick expressed the desire to make the personal acquaintance of his conqueror; and Charles X. consented to be his guest for three days (March 3–5) at the castle of Fredriksborg. Splendid banquets lasting far into the night, private and intimate conversations between the princes who had only just emerged from a mortal struggle, seemed to point to nothing but peace and friendship in the future. But Charles's insatiable lust for conquest, and his ineradicable suspicion of Denmark, induced him, on the 17th of July, without any reasonable cause, without a declaration of war, in defiance of all international equity, to endeavour to despatch an inconvenient neighbour.

Terror was the first feeling produced at Copenhagen by the landing of the main Swedish army at Korsör in Zealand. None had anticipated the possibility of such a sudden and brutal attack, and every one knew that the Danish capital was very inadequately fortified and garrisoned. Fortunately Frederick had never been deficient in courage. "I will die in my nest" were the memorable words with which he rebuked those counsellors who advised him to seek safety in flight. On the 8th of August representatives from every class in the capital urged the necessity of a vigorous resistance; and the citizens of Copenhagen, headed by the great burgomaster Hans Nansen (*q.v.*), protested their unshakable loyalty to the king, and their determination to defend Copenhagen to the uttermost. The Danes had only three days' warning of the approaching danger; and the vast and dilapidated line of defence had at first but 2000 regular defenders. But the government and the people displayed a memorable and exemplary energy, under the constant supervision of the king, the queen, and burgomaster Nansen. By the beginning of September all the breaches were repaired, the walls bristled with cannon, and 7000 men were under arms. So strong was the city by this time that Charles X., abandoning his original intention of carrying the place by assault, began a regular siege; but this also he was forced to abandon when, on the 29th of October, an auxiliary Dutch fleet, after reinforcing and reprovisioning the garrison, defeated, in conjunction with the Danish fleet, the

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Swedish navy of 44 liners in the Sound. Thus the Danish capital had saved the Danish monarchy. But it was Frederick III. who profited most by his spirited defence of the common interests of the country and the dynasty. The traditional loyalty of the Danish middle classes was transformed into a boundless enthusiasm for the king personally, and for a brief period Frederick found himself the most popular man in his kingdom. He made use of his popularity by realizing the dream of a lifetime and converting an elective into an absolute monarchy by the Revolution of 1660 (see DENMARK: *History*). Frederick III. died on the 6th of February 1670 at the castle of Copenhagen.

See R. Nisbet Bain, *Scandinavia*, caps. ix. and x. (Cambridge, 1905).

FREDERICK VIII. (1843–), king of Denmark, eldest son of King Christian IX., was born at Copenhagen on the 3rd of June 1843. As crown prince of Denmark he took part in the war of 1864 against Austria and Prussia, and subsequently assisted his father in the duties of government, becoming king on Christian's death in January 1906. In 1869 Frederick married Louise (b. 1851), daughter of Charles XV., king of Sweden, by whom he had a family of four sons and four daughters. His eldest son Christian, crown prince of Denmark (b. 1870), was married in 1898 to Alexandrina (b. 1879), daughter of Frederick Francis III., grand-duke of Mecklenburg-Schwerin; and his second son, Charles (b. 1872), who married his cousin Maud, daughter of Edward VII. of Great Britain, became king of Norway as Haakon VII. in 1905.

FREDERICK I. (1657–1713), king of Prussia, and (as Frederick III.) elector of Brandenburg, was the second son of the great elector, Frederick William, by his first marriage with Louise Henriette, daughter of Frederick Henry of Orange. Born at Königsberg on the 11th of July 1657, he was educated and greatly influenced by Eberhard Danckelmann, and became heir to the throne of Brandenburg through the death of his elder brother, Charles Emil, in 1674. He appears to have taken some part in public business before the death of his father; and the court at Berlin was soon disturbed by quarrels between the young prince and his stepmother, Dorothea of Holstein-Glücksburg. In 1686 Dorothea persuaded her husband to bequeath outlying portions of his lands to her four sons; and Frederick, fearing he would be poisoned, left Brandenburg determined to prevent any diminution of his inheritance. By promising to restore Schwiebus to Silesia after his accession he won the support of the emperor Leopold I.; but eventually he gained his end in a peaceable fashion. Having become elector of Brandenburg in May 1688, he came to terms with his half-brothers and their mother. In return for a sum of money these princes renounced their rights under their father's will, and the new elector thus secured the whole of Frederick William's territories. After much delay and grumbling he fulfilled his bargain with Leopold and gave up Schwiebus in 1695. At home and abroad Frederick continued the policy of the great elector. He helped William of Orange to make his descent on England; added various places, including the principality of Neuchâtel, to his lands; and exercised some influence on the course of European politics by placing his large and efficient army at the disposal of the emperor and his allies (see BRANDENBURG). He was present in person at the siege of Bonn in 1689, but was not often in command of his troops. The elector was very fond of pomp, and, striving to model his court upon that of Louis XIV., he directed his main energies towards obtaining for himself the title of king. In spite of the assistance he had given to the emperor his efforts met with no success for some years; but towards 1700 Leopold, faced with the prospect of a new struggle with France, was inclined to view the idea more favourably. Having insisted upon various conditions, prominent among them being military aid for the approaching war, he gave the imperial sanction to Frederick's request in November 1700; whereupon the elector, hurrying at once to Königsberg, crowned himself with great ceremony king of Prussia on the 18th of January 1701. According to his promise the king sent help to the emperor; and during the War of the Spanish Succession the troops of Brandenburg-Prussia rendered great assistance to the allies, fighting with distinction at Blenheim and elsewhere. Frederick, who was deformed through an injury to his spine, died on the 25th of February 1713. By his extravagance the king exhausted the treasure amassed by his father, burdened his country with heavy taxes, and reduced its finances to chaos. His constant obligations to the emperor drained Brandenburg of money which might have been employed more profitably at home, and prevented her sovereign from interfering in the politics of northern Europe. Frederick, however, was not an unpopular ruler, and by making Prussia into a kingdom he undoubtedly advanced it several stages towards its future greatness. He founded the university of Halle, and the Academy of Sciences at Berlin; welcomed and protected Protestant refugees from France and elsewhere; and lavished money on the erection of public buildings.

The king was married three times. His second wife, Sophie Charlotte (1668–1705), sister of the English king George I., was the friend of Leibnitz and one of the most cultured princesses of the age; she bore him his only son, his successor, King Frederick William I.

See W. Hahn, *Friedrich I., König in Preussen* (Berlin, 1876); J. G. Droysen, *Geschichte der preussischen Politik*, Band iv. (Leipzig, 1872); E. Heyck, *Friedrich I. und die Begründung des preussischen Königtums* (Bielefeld, 1901); C. Graf von Dohna, *Mémoires originaux sur le règne et la cour de Frédéric Ier* (Berlin, 1883); *Aus dem Briefwechsel König Friedrichs I. von Preussen und seiner Familie* (Berlin, 1901); and T. Carlyle, *History of Frederick the Great*, vol. i. (London, 1872).

FREDERICK II., known as "the Great" (1712–1786), king of Prussia, born on the 24th of January 1712, was the eldest son of Frederick William I. He was brought up with extreme rigour, his father devising a scheme of education which was intended to make him a hardy soldier, and prescribing for him every detail of his conduct. So great was Frederick William's horror of everything which did not seem to him practical, that he strictly excluded Latin from the list of his son's studies. Frederick, however, had free and generous impulses which could not be restrained by the sternest system. Encouraged by his mother, and under the influence of his governess Madame de Roucoulle, and of his first tutor Duhan, a French refugee, he acquired an excellent knowledge of French and a taste for literature and music. He even received secret lessons in Latin, which his father invested with all the charms of forbidden fruit. As he grew up he became extremely dissatisfied with the dull and monotonous life he was compelled to lead; and his discontent was heartily shared by his sister, Wilhelmina, a bright and intelligent young princess for whom Frederick had a warm affection.

Frederick William, seeing his son apparently absorbed in frivolous and effeminate amusements, gradually conceived for him an intense dislike, which had its share in causing him to break off the negotiations for a double marriage between the prince of Wales and Wilhelmina, and the princess Amelia, daughter of George II., and Frederick; for Frederick had been so indiscreet as to carry on a separate correspondence with the English court and to vow that he would marry Amelia or no one. Frederick William's hatred of his son, openly avowed, displayed itself in violent outbursts and public insults, and so harsh was his treatment that Frederick frequently thought of running away and taking refuge at the English court. He at last resolved to do so during a journey which he made with the king to south Germany in 1730, when he was eighteen years of age. He was helped by his two friends, Lieutenant Katte and Lieutenant Keith; but by the imprudence of the former the secret was found out. Frederick was placed under arrest, deprived of his rank as crown prince, tried by court-martial, and imprisoned in the fortress of Cüstrin. Warned by Frederick, Keith escaped; but Katte delayed his flight too long, and a court-martial decided that he should be punished with two years' fortress arrest. But the king was determined by a terrible example to wake Frederick once for all to a consciousness of the heavy responsibility of his position. He changed the sentence on Katte to one of death and ordered the execution to take place in Frederick's presence,

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himself arranging its every detail; Frederick's own fate would depend upon the effect of this terrible object-lesson and the response he should make to the exhortations of the chaplain sent to reason with him. On the morning of the 7th of November Katte was beheaded before Frederick's window, after the crown prince had asked his pardon and received the answer that there was nothing to forgive. On Frederick himself lay the terror of death, and the chaplain was able to send to the king a favourable report of his orthodoxy and his changed disposition. Frederick William, whose temper was by no means so ruthlessly Spartan as tradition has painted it, was overjoyed, and commissioned the clergyman to receive from the prince an oath of filial obedience, and in exchange for this proof of "his intention to improve in real earnest" his arrest was to be lightened, pending the earning of a full pardon. "The whole town shall be his prison," wrote the king; "I will give him employment, from morning to night, in the departments of war, and agriculture, and of the government. He shall work at financial matters, receive accounts, read minutes and make extracts. . . . But if he kicks or rears again, he shall forfeit the succession to the crown, and even, according to circumstances, life itself."

For about fifteen months Frederick lived in Cüstrin, busy according to the royal programme with the details of the Prussian administrative system. He was very careful not to "kick or rear," and his good conduct earned him a further stage in the restoration to favour. During this period of probation he had been deprived of his status as a soldier and refused the right to wear uniform, while officers and soldiers were forbidden to give him the military salute; in 1732 he was made colonel in command of the regiment at Neuruppin. In the following year he married, in obedience to the king's orders, the princess Elizabeth Christina, daughter of the duke of Brunswick-Bevern. He was given the estate of Rheinsberg in the neighbourhood of Neuruppin, and there he lived until he succeeded to the throne. These years were perhaps the happiest of his life. He discharged his duties with so much spirit and so conscientiously that he ultimately gained the esteem of Frederick William, who no longer feared that he would leave the crown to one unworthy of wearing it. At the same time the crown prince was able to indulge to the full his personal tastes. He carried on a lively correspondence with Voltaire and other French men of letters, and was a diligent student of philosophy, history and poetry. Two of his best-known works were written at this time—*Considérations sur l'état présent du corps politique de l'Europe* and his *Anti-Machiavel*. In the former he calls attention to the growing strength of Austria and France, and insists on the necessity of some third power, by which he clearly means Prussia, counterbalancing their excessive influence. The second treatise, which was issued by Voltaire in Hague in 1740, contains a generous exposition of some of the favourite ideas of the 18th-century philosophers respecting the duties of sovereigns, which may be summed up in the famous sentence: "the prince is not the absolute master, but only the first servant of his people."

On the 31st of May 1740 he became king. He maintained all the forms of government established by his father, but ruled in a far more enlightened spirit; he tolerated every form of religious opinion, abolished the use of torture, was most careful to secure an exact and impartial administration of justice, and, while keeping the reins of government strictly in his own hands, allowed every one with a genuine grievance free access to his presence. The Potsdam regiment of giants was disbanded, but the real interests of the army were carefully studied, for Frederick realized that the two pillars of the Prussian state were sound finances and a strong army. On the 20th of October 1740 the emperor Charles VI. died. Frederick at once began to make extensive military preparations, and it was soon clear to all the world that he intended to enter upon some serious enterprise. He had made up his mind to assert the ancient claim of the house of Brandenburg to the three Silesian duchies, which the Austrian rulers of Bohemia had ever denied, but the Hohenzollerns had never abandoned. Projects for the assertion of this claim by force of arms had been formed by more than one of Frederick's predecessors, and the extinction of the male line of the house of Habsburg may well have seemed to him a unique opportunity for realizing an ambition traditional in his family. For this resolution he is often abused still by historians, and at the time he had the approval of hardly any one out of Prussia. He himself, writing of the scheme in his *Mémoires*, laid no claim to lofty motives, but candidly confessed that "it was a means of acquiring reputation and of increasing the power of the state." He firmly believed, however, in the lawfulness of his claims; and although his father had recognized the Pragmatic Sanction, whereby the hereditary dominions of Charles VI. were to descend to his daughter, Maria Theresa, Frederick insisted that this sanction could refer only to lands which rightfully belonged to the house of Austria. He could also urge that, as Charles VI. had not fulfilled the engagements by which Frederick William's recognition of the Pragmatic Sanction had been secured, Prussia was freed from her obligation.

Frederick sent an ambassador to Vienna, offering, in the event of his rights in Silesia being conceded, to aid Maria Theresa against her enemies. The queen of Hungary, who regarded the proposal as that of a mere robber, haughtily declined; whereupon Frederick immediately invaded Silesia with an army of 30,000 men. His first victory was gained at Mollwitz on the 10th of April 1741. Under the impression, in consequence of a furious charge of Austrian cavalry, that the battle was lost, he rode rapidly away at an early stage of the struggle—a mistake which gave rise for a time to the groundless idea that he lacked personal courage. A second Prussian victory was gained at Chotusitz, near Caslau, on the 17th May 1742; by this time Frederick was master of all the fortified places of Silesia. Maria Theresa, in the heat of her struggle with France and the elector of Bavaria, now Charles VII., and pressed by England to rid herself of Frederick, concluded with him, on the 11th of June 1742, the peace of Breslau, conceding to Prussia, Upper and Lower Silesia as far as the Oppa, together with the county of Glatz. Frederick made good use of the next two years, fortifying his new territory, and repairing the evils inflicted upon it by the war. By the death of the prince of East Friesland without heirs, he also gained possession of that country (1744). He knew well that Maria Theresa would not, if she could help it, allow him to remain in Silesia; accordingly, in 1744, alarmed by her victories, he arrived at a secret understanding with France, and pledged himself, with Hesse-Cassel and the palatinate, to maintain the imperial rights of Charles VII., and to defend his hereditary Bavarian lands. Frederick began the second Silesian War by entering Bohemia in August 1744 and taking Prague. By this brilliant but rash venture he put himself in great danger, and soon had to retreat; but in 1745 he gained the battles of Hohenfriedberg, Soor and Hennersdorf; and Leopold of Dessau ("Der alte Dessauer") won for him the victory of Kesselsdorf in Saxony. The latter victory was decisive, and the peace of Dresden (December 25, 1745) assured to Frederick a second time the possession of Silesia. (See AUSTRIAN SUCCESSION, WAR OF THE.)

Frederick had thus, at the age of thirty-three, raised himself to a great position in Europe, and henceforth he was the most conspicuous sovereign of his time. He was a thoroughly absolute ruler, his so-called ministers being mere clerks whose business was to give effect to his will. To use his own famous phrase, however, he regarded himself as but "the first servant of the state"; and during the next eleven years he proved that the words expressed his inmost conviction and feeling. All kinds of questions were submitted to him, important and unimportant; and he is frequently censured for having troubled himself so much with mere details. But in so far as these details related to expenditure he was fully justified, for it was absolutely essential for him to have a large army, and with a small state this was impossible unless he carefully prevented unnecessary outlay. Being a keen judge of character, he filled the public offices with faithful, capable, energetic men, who were kept up to a high standard of duty by the consciousness that their work might at any time come under his strict supervision. The Academy of Sciences, which had fallen into contempt during

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his father's reign, he restored, infusing into it vigorous life; and he did more to promote elementary education than any of his predecessors. He did much too for the economic development of Prussia, especially for agriculture; he established colonies, peopling them with immigrants, extended the canal system, drained and diked the great marshes of the Oderbruch, turning them into rich pasturage, encouraged the planting of fruit trees and of root crops; and, though in accordance with his ideas of discipline he maintained serfdom, he did much to lighten the burdens of the peasants. All kinds of manufacture, too, particularly that of silk, owed much to his encouragement. To the army he gave unremitting attention, reviewing it at regular intervals, and sternly punishing negligence on the part of the officers. Its numbers were raised to 160,000 men, while fortresses and magazines were always kept in a state of readiness for war. The influence of the king's example was felt far beyond the limits of his immediate circle. The nation was proud of his genius, and displayed something of his energy in all departments of life. Lessing, who as a youth of twenty came to Berlin in 1749, composed enthusiastic odes in his honour, and Gleim, the Halberstadt poet, wrote of him as of a kind of demi-god. These may be taken as fair illustrations of the popular feeling long before the Seven Years' War.

He despised German as the language of boors, although it is remarkable that at a later period, in a French essay on German literature, he predicted for it a great future. He habitually wrote and spoke French, and had a strong ambition to rank as a distinguished French author. Nobody can now read his verses, but his prose writings have a certain calm simplicity and dignity, without, however, giving evidence of the splendid mental qualities which he revealed in practical life. To this period belong his *Mémoires pour servir à l'histoire de Brandebourg* and his poem *L'Art de la guerre*. The latter, judged as literature, is intolerably dull; but the former is valuable, throwing as it does considerable light on his personal sympathies as well as on the motives of important epochs in his career. He continued to correspond with French writers, and induced a number of them to settle in Berlin, Maupertuis being president of the Academy. In 1752 Voltaire, who had repeatedly visited him, came at Frederick's urgent entreaty, and received a truly royal welcome. The famous Hirsch trial, and Voltaire's vanity and caprice, greatly lowered him in the esteem of the king, who, on his side, irritated his guest by often requiring him to correct bad verses, and by making him the object of rude banter. The publication of *Doctor Akakia*, which brought down upon the president of the Academy a storm of ridicule, finally alienated Frederick; while Voltaire's wrongs culminated in the famous arrest at Frankfort, the most disagreeable elements of which were due to the misunderstanding of an order by a subordinate official.

The king lived as much as possible in a retired mansion, to which he gave the name of Sanssouci—not the palace so called, which was built after the Seven Years' War, and was never a favourite residence. He rose regularly in summer at five, in winter at six, devoting himself to public business till about eleven. During part of this time, after coffee, he would aid his reflections by playing on the flute, of which he was passionately fond, being a really skilful performer. At eleven came parade, and an hour afterwards, punctually, dinner, which continued till two, or later, if conversation happened to be particularly attractive. After dinner he glanced through and signed cabinet orders written in accordance with his morning instructions, often adding marginal notes and postscripts, many of which were in a caustic tone. These disposed of, he amused himself for a couple of hours with literary work; between six and seven he would converse with his friends or listen to his reader (a post held for some time by La Mettrie); at seven there was a concert; and at half-past eight he sat down to supper, which might go on till midnight. He liked good eating and drinking, although even here the cost was sharply looked after, the expenses of his kitchen mounting to no higher figure than £1800 a year. At supper he was always surrounded by a number of his most intimate friends, mainly Frenchmen; and he insisted on the conversation being perfectly free. His wit, however, was often cruel, and any one who responded with too much spirit was soon made to feel that the licence of talk was to be complete only on one side.

At Frederick's court ladies were seldom seen, a circumstance that gave occasion to much scandal for which there seems to have been no foundation. The queen he visited only on rare occasions. She had been forced upon him by his father, and he had never loved her; but he always treated her with marked respect, and provided her with a generous income, half of which she gave away in charity. Although without charm, she was a woman of many noble qualities; and, like her husband, she wrote French books, some of which attracted a certain attention in their day. She survived him by eleven years, dying in 1797.

Maria Theresa had never given up hope that she would recover Silesia; and as all the neighbouring sovereigns were bitterly jealous of Frederick, and somewhat afraid of him, she had no difficulty in inducing several of them to form a scheme for his ruin. Russia and Saxony entered into it heartily, and France, laying aside her ancient enmity towards Austria, joined the empress against the common object of dislike. Frederick, meanwhile, had turned towards England, which saw in him a possible ally of great importance against the French. A convention between Prussia and Great Britain was signed in January 1756, and it proved of incalculable value to both countries, leading as it did to a close alliance during the administration of Pitt. Through the treachery of a clerk in the Saxon foreign office Frederick was made aware of the future which was being prepared for him. Seeing the importance of taking the initiative, and if possible, of securing Saxony, he suddenly, on the 29th of August 1756, crossed the frontier of that country, and shut in the Saxon army between Pirna and Königstein, ultimately compelling it, after a victory gained over the Austrians at Lobositz, to surrender. Thus began the Seven Years' War, in which, supported by England, Brunswick and Hesse-Cassel, he had for a long time to oppose Austria, France, Russia, Saxony and Sweden. Virtually the whole Continent was in arms against a small state which, a few years before, had been regarded by most men as beneath serious notice. But it happened that this small state was led by a man of high military genius, capable of infusing into others his own undaunted spirit, while his subjects had learned both from him and his predecessors habits of patience, perseverance and discipline. In 1757, after defeating the Austrians at Prague, i.e was himself defeated by them at Kolin; and by the shameful convention of Closter-Seven, he was freely exposed to the attack of the French. In November 1757, however, when Europe looked upon him as ruined, he rid himself of the French by his splendid victory over them at Rossbach, and in about a month afterwards, by the still more splendid victory at Leuthen, he drove the Austrians from Silesia. From this time the French were kept well employed in the west by Prince Ferdinand of Brunswick, who defeated them at Crefeld in 1758, and at Minden in 1759. In the former year Frederick triumphed, at a heavy cost, over the Russians at Zorndorf; and although, through lack of his usual foresight, he lost the battle of Hochkirch, he prevented the Austrians from deriving any real advantage from their triumph, Silesia still remaining in his hands at the end of the year. The battle of Kunersdorf, fought on the 12th of August 1759, was the most disastrous to him in the course of the war. He had here to contend both with the Russians and the Austrians; and although at first he had some success, his army was in the end completely broken. "All is lost save the royal family," he wrote to his minister Friesenstein; "the consequences of this battle will be worse than the battle itself. I shall not survive the ruin of the Fatherland. Adieu for ever!" But he soon recovered from his despair, and in 1760 gained the important victories of Liegnitz and Torgau. He had now, however, to act on the defensive, and fortunately for him, the Russians, on the death of the empress Elizabeth, not only withdrew in 1762 from the compact against him, but for a time became his allies. On the 29th of October of that year he gained his last victory over the Austrians at Freiberg. Europe was by that time sick of war, every power being more or less exhausted.

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The result was that, on the 15th of February 1763, a few days after the conclusion of the peace of Paris, the treaty of Hubertusburg was signed, Austria confirming Prussia in the possession of Silesia. (See SEVEN YEARS' WAR.)

It would be difficult to overrate the importance of the contribution thus made by Frederick to the politics of Europe. Prussia was now universally recognized as one of the great powers of the Continent, and she definitely took her place in Germany as the rival of Austria. From this time it was inevitable that there should be a final struggle between the two nations for predominance, and that the smaller German states should group themselves around one or the other. Frederick himself acquired both in Germany and Europe the indefinable influence which springs from the recognition of great gifts that have been proved by great deeds.

His first care after the war was, as far as possible, to enable the country to recover from the terrific blows by which it had been almost destroyed; and he was never, either before or after, seen to better advantage than in the measures he adopted for this end. Although his resources had been so completely drained that he had been forced to melt the silver in his palaces and to debase the coinage, his energy soon brought back the national prosperity. Pomerania and Neumark were freed from taxation for two years, Silesia for six months. Many nobles whose lands had been wasted received corn for seed; his war horses were within a few months to be found on farms all over Prussia; and money was freely spent in the re-erection of houses which had been destroyed. The coinage was gradually restored to its proper value, and trade received a favourable impulse by the foundation of the Bank of Berlin. All these matters were carefully looked into by Frederick himself, who, while acting as generously as his circumstances would allow, insisted on everything being done in the most efficient manner at the least possible cost. Unfortunately, he adopted the French ideas of excise, and the French methods of imposing and collecting taxes—a system known as the Regie. This system secured for him a large revenue, but it led to a vast amount of petty tyranny, which was all the more intolerable because it was carried out by French officials. It was continued to the end of Frederick's reign, and nothing did so much to injure his otherwise immense popularity. He was quite aware of the discontent the system excited, and the good-nature with which he tolerated the criticisms directed against it and him is illustrated by a well-known incident. Riding along the Jäger Strasse one day, he saw a crowd of people. "See what it is," he said to the groom who was attending him. "They have something posted up about your Majesty," said the groom, returning. Frederick, riding forward, saw a caricature of himself: "King in very melancholy guise," says Preuss (as translated by Carlyle), "seated on a stool, a coffee-mill between his knees, diligently grinding with the one hand, and with the other picking up any bean that might have fallen. 'Hang it lower,' said the king, beckoning his groom with a wave of the finger; 'lower, that they may not have to hurt their necks about it.' No sooner were the words spoken, which spread instantly, than there rose from the whole crowd one universal huzzah of joy. They tore the caricature into a thousand pieces, and rolled after the king with loud '*Lebe Hoch*, our Frederick for ever,' as he rode slowly away." There are scores of anecdotes about Frederick, but not many so well authenticated as this.

There was nothing about which Frederick took so much trouble as the proper administration of justice. He disliked the formalities of the law, and in one instance, "the miller Arnold case," in connexion with which he thought injustice had been done to a poor man, he dismissed the judges, condemned them to a year's fortress arrest, and compelled them to make good out of their own pockets the loss sustained by their supposed victim—not a wise proceeding, but one springing from a generous motive. He once defined himself as "l'avocat du pauvre," and few things gave him more pleasure than the famous answer of the miller whose windmill stood on ground which was wanted for the king's garden. The miller sturdily refused to sell it. "Not at any price?" said the king's agent; "could not the king take it from you for nothing, if he chose?" "Have we not the Kammergericht at Berlin?" was the answer, which became a popular saying in Germany. Soon after he came to the throne Frederick began to make preparations for a new code. In 1747 appeared the *Codex Fridericianus*, by which the Prussian judicial body was established. But a greater monument of Frederick's interest in legal reform was the *Allgemeines preussisches Landrecht*, completed by the grand chancellor Count Johann H. C. von Carmer (1721–1801) on the basis of the *Project des Corporis Juris Fridericiani*, completed in the year 1749–1751 by the eminent jurist Samuel von Cocceji (1679–1755). The *Landrecht*, a work of vast labour and erudition, combines the two systems of German and Roman law supplemented by the law of nature; it was the first German code, but only came into force in 1794, after Frederick's death.

Looking ahead after the Seven Years' War, Frederick saw no means of securing himself so effectually as by cultivating the goodwill of Russia. In 1764 he accordingly concluded a treaty of alliance with the empress Catherine for eight years. Six years afterwards, unfortunately for his fame, he joined in the first partition of Poland, by which he received Polish Prussia, without Danzig and Thorn, and Great Poland as far as the river Netze. Prussia was then for the first time made continuous with Brandenburg and Pomerania.

The emperor Joseph II. greatly admired Frederick, and visited him at Neisse, in Silesia, in 1769, a visit which Frederick returned, in Moravia, in the following year. The young emperor was frank and cordial; Frederick was more cautious, for he detected under the respectful manner of Joseph a keen ambition that might one day become dangerous to Prussia. Ever after these interviews a portrait of the emperor hung conspicuously in the rooms in which Frederick lived, a circumstance on which some one remarked. "Ah yes," said Frederick, "I am obliged to keep that young gentleman in my eye." Nothing came of these suspicions till 1777, when, after the death of Maximilian Joseph, elector of Bavaria, without children, the emperor took possession of the greater part of his lands. The elector palatine, who lawfully inherited Bavaria, came to an arrangement, which was not admitted by his heir, Charles, duke of Zweibrücken. Under these circumstances the latter appealed to Frederick, who, resolved that Austria should gain no unnecessary advantage, took his part, and brought pressure to bear upon the emperor. Ultimately, greatly against his will, Frederick felt compelled to draw the sword, and in July 1778 crossed the Bohemian frontier at the head of a powerful army. No general engagement was fought, and after a great many delays the treaty of Teschen was signed on the 13th of May 1779. Austria received the circle of Burgau, and consented that the king of Prussia should take the Franconian principalities. Frederick never abandoned his jealousy of Austria, whose ambition he regarded as the chief danger against which Europe had to guard. He seems to have had no suspicion that evil days were coming in France. It was Austria which had given trouble in his time; and if her pride were curbed, he fancied that Prussia at least would be safe. Hence one of the last important acts of his life was to form, in 1785, a league of princes (the "Fürstenbund") for the defence of the imperial constitution, believed to be imperilled by Joseph's restless activity. The league came to an end after Frederick's death; but it is of considerable historical interest, as the first open attempt of Prussia to take the lead in Germany.

Frederick's chief trust was always in his treasury and his army. By continual economy he left in the former the immense sum of 70 million thalers; the latter, at the time of his death, numbered 200,000 men, disciplined with all the strictness to which he had throughout life accustomed his troops. He died at Sanssouci on the 17th of August 1786; his death being hastened by exposure to a storm of rain, stoically borne, during a military review. He passed away on the eve of tremendous events, which for a time obscured his fame; but now that he can be impartially estimated, he is seen to have been in many respects one of the greatest figures in modern history.

He was rather below the middle size, in youth inclined to

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stoutness, lean in old age, but of vigorous and active habits. An expression of keen intelligence lighted up his features, and his large, sparkling grey eyes darted penetrating glances at every one who approached him. In his later years an old blue uniform with red facings was his usual dress, and on his breast was generally some Spanish snuff, of which he consumed large quantities. He shared many of the chief intellectual tendencies of his age, having no feeling for the highest aspirations of human nature, but submitting all things to a searching critical analysis. Of Christianity he always spoke in the mocking tone of the "enlightened" philosophers, regarding it as the invention of priests; but it is noteworthy that after the Seven Years' War, the trials of which steadied his character, he sought to strengthen the church for the sake of its elevating moral influence. In his judgments of mankind he often talked as a misanthrope. He was once conversing with Sulzer, who was a school inspector, about education. Sulzer expressed the opinion that education had of late years greatly improved. "In former times, your Majesty," he said, "the notion being that mankind were naturally inclined to evil, a system of severity prevailed in schools; but now, when we recognize that the inborn inclination of men is rather to good than to evil, schoolmasters have adopted a more generous procedure." "Ah, my dear Sulzer," replied the king, "you don't know this damned race" ("Ach, mein lieber Sulzer, er kennt nicht diese verdammte Race"). This fearful saying unquestionably expressed a frequent mood of Frederick's; and he sometimes acted with great harshness, and seemed to take a malicious pleasure in tormenting his acquaintances. Yet he was capable of genuine attachments. He was beautifully loyal to his mother and his sister Wilhelmina; his letters to the duchess of Gotha are full of a certain tender reverence; the two Keiths found him a devoted friend. But the true evidence that beneath his misanthropical moods there was an enduring sentiment of humanity is afforded by the spirit in which he exercised his kingly functions. Taking his reign as a whole, it must be said that he looked upon his power rather as a trust than as a source of personal advantage; and the trust was faithfully discharged according to the best lights of his day. He has often been condemned for doing nothing to encourage German literature; and it is true that he was supremely indifferent to it. Before he died a tide of intellectual life was rising all about him; yet he failed to recognize it, declined to give Lessing even the small post of royal librarian, and thought *Götz von Berlichingen* a vulgar imitation of vulgar English models. But when his taste was formed, German literature did not exist; the choice was between Racine and Voltaire on the one hand and Gottsched and Gellert on the other. He survived into the era of Kant, Goethe and Schiller, but he was not of it, and it would have been unreasonable to expect that he should in old age pass beyond the limits of his own epoch. As Germans now generally admit, it was better that he let their literature alone, since, left to itself, it became a thoroughly independent product. Indirectly he powerfully promoted it by deepening the national life from which it sprang. At a time when there was no real bond of cohesion between the different states, he stirred among them a common enthusiasm; and in making Prussia great he laid the foundation of a genuinely united empire.

BIBLIOGRAPHICAL NOTE.—The main sources for the biography of Frederick the Great are his own works, which, in the words of Leopold von Ranke, "deal with the politics and wars of the period with the greatest possible objectivity, *i.e.* truthfulness, and form an imperishable monument of his life and opinions." A magnificent edition of Frederick's complete works was issued (1846–1857), at the instance of Frederick William IV., under the direction of the historian Johann D. E. Preuss (1785–1868). It is in thirty volumes, of which six contain verse, seven are historical, two philosophical, and three military, twelve being made up of correspondence. So long as the various state archives remained largely inaccessible historians relied upon this as their chief authority. Among works belonging to this period may be mentioned Thomas Carlyle, *History of Frederick II. of Prussia* (6 vols., London, 1858–1865); J. G. Droysen, *Friedrich der Grosse* (2 vols., Leipzig, 1874–1876, forming part V. of his *Geschichte der preussischen Politik*); Ranke, *Friedrich II., König von Preussen* (*Werke*, vols. ii. and iii.). A great stimulus to the study of Frederick's history has since been given by the publication of collections of documents preserved in various archives. Of these the most important is the great official edition of Frederick's political correspondence (Berlin, 1879), of which the thirty-first vol. appeared in 1906. Of later works, based on modern research, may be mentioned R. Koser, *König Friedrich der Grosse*, Bd. 2 (Stuttgart, 1893 and 1903; 3rd ed., 1905); Bourdeau, *Le Grand Frédéric* (2 vols., Paris, 1900–1902); L. Paul-Dubois, *Frédéric le Grand, d'après sa correspondance politique* (Paris, 1903); W. F. Reddaway, *Frederick the Great and the Rise of Prussia* (London, 1904). Of the numerous special studies may be noticed E. Zeller, *Friedrich der Grosse als Philosoph* (Berlin, 1886); H. Figge, *Die Staatslehren Friedrichs des Grossen* (Münster, 1904); T. von Bernhardi, *Friedrich der Grosse als Feldherr* (2 vols., Berlin, 1881); Ernest Lavisse, *La Jeunesse du Grand Frédéric* (Paris, 1891, 3rd ed., 1899; Eng. transl., London, 1891); R. Brode, *Friedrich der Grosse und der Krieg* (12 vols. in three parts, Berlin, 1890–1904). For a full list of other works see Dahlmann-Waitz, *Quellenkunde* (Leipzig, 1906). (J. St.; W. A. P.)

FREDERICK III. (1831–1888), king of Prussia and German emperor, was born at Potsdam on the 18th of October 1831, being the eldest son of Prince William of Prussia, afterwards first German emperor, and the princess Augusta. He was carefully educated, and in 1849–1850 studied at the university of Bonn. The next years were spent in military duties and in travels, in which he was accompanied by Moltke. In 1851 he visited England on the occasion of the Great Exhibition, and in 1855 became engaged to Victoria, princess royal of Great Britain, to whom he was married in London on the 25th of January 1858. On the death of his uncle in 1861 and the accession of his father, Prince Frederick William, as he was then always called, became crown prince of Prussia. His education, the influence of his mother, and perhaps still more that of his wife's father, the Prince Consort, had made him a strong Liberal, and he was much distressed at the course of events in Prussia after the appointment of Bismarck as minister. He was urged by the Liberals to put himself into open opposition to the government; this he refused to do, but he remonstrated privately with the king. In June 1863, however, he publicly dissociated himself from the press ordinances which had just been published. He ceased to attend meetings of the council of state, and was much away from Berlin. The opposition of the crown prince to the ministers was increased during the following year, for he was a warm friend of the prince of Augustenburg, whose claims to Schleswig-Holstein Bismarck refused to support. During the war with Denmark he had his first military experience, being attached to the staff of Marshal von Wrangel; he performed valuable service in arranging the difficulties caused by the disputes between the field marshal and the other officers, and was eventually given a control over him. After the war he continued to support the prince of Augustenburg and was strongly opposed to the war with Austria. During the campaign of 1866 he received the command of an army consisting of four army corps; he was assisted by General von Blumenthal, as chief of the staff, but took a very active part in directing the difficult operations by which his army fought its way through the mountains from Silesia to Bohemia, fighting four engagements in three days, and showed that he possessed genuine military capacity. In the decisive battle of Königgrätz the arrival of his army on the field of battle, after a march of nearly 20 m., secured the victory. During the negotiations which ended the war he gave valuable assistance by persuading the king to accept Bismarck's policy as regards peace with Austria. From this time he was very anxious to see the king of Prussia unite the whole of Germany, with the title of emperor, and was impatient of the caution with which Bismarck proceeded. In 1869 he paid a visit to Italy, and in the same year was present at the opening of the Suez Canal; on his way he visited the Holy Land.

He played a conspicuous part in the year 1870–1871, being appointed to command the armies of the Southern States,

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General Blumenthal again being his chief of the staff; his troops won the victory of Wörth, took an important part in the battle of Sedan, and later in the siege of Paris. The popularity he won was of political service in preparing the way for the union of North and South Germany, and he was the foremost advocate of the imperial idea at the Prussian court. During the years that followed, little opportunity for political activity was open to him. He and the crown princess took a great interest in art and industry, especially in the royal museums; and the excavations conducted at Olympia and Pergamon with such great results were chiefly due to him. The crown princess was a keen advocate of the higher education of women, and it was owing to her exertions that the Victoria Lyceum at Berlin (which was named after her) was founded. In 1878, when the emperor was incapacitated by the shot of an assassin, the prince acted for some months as regent. His palace was the centre of all that was best in the literary and learned society of the capital. He publicly expressed his disapproval of the attacks on the Jews in 1878; and the coalition of Liberal parties founded in 1884 was popularly known as the "crown prince's party," but he scrupulously refrained from any act that might embarrass his father's government. For many reasons the accession of the prince was looked forward to with great hope by a large part of the nation. Unfortunately he was attacked by cancer in the throat; he spent the winter of 1887–1888 at San Remo; in January 1888 the operation of tracheotomy had to be performed. On the death of his father, which took place on the 9th of March, he at once journeyed to Berlin; but his days were numbered, and he came to the throne only to die. In these circumstances his accession could not have the political importance which would otherwise have attached to it, though it was disfigured by a vicious outburst of party passion in which the names of the emperor and the empress were constantly misused. While the Liberals hoped the emperor would use his power for some signal declaration of policy, the adherents of Bismarck did not scruple to make bitter attacks on the empress. The emperor's most important act was a severe reprimand addressed to Herr von Puttkamer, the reactionary minister of the interior, which caused his resignation; in the distribution of honours he chose many who belonged to classes and parties hitherto excluded from court favour. A serious difference of opinion with the chancellor regarding the proposal for a marriage between Prince Alexander of Battenberg and the princess Victoria of Prussia was arranged by the intervention of Queen Victoria, who visited Berlin to see her dying son-in-law. He expired at Potsdam on the 15th of June 1888, after a reign of ninety-nine days.

After the emperor's death Professor Geffcken, a personal friend, published in the *Deutsche Rundschau* extracts from the diary of the crown prince containing passages which illustrated his differences with Bismarck during the war of 1870. The object was to injure Bismarck's reputation, and a very unseemly dispute ensued. Bismarck at first, in a letter addressed to the new emperor, denied the authenticity of the extracts on the ground that they were unworthy of the crown prince. Geffcken was then arrested and imprisoned. He had undoubtedly shown that he was an injudicious friend, for the diary proved that the prince, in his enthusiasm for German unity, had allowed himself to consider projects which would have seriously compromised the relations of Prussia and Bavaria. The treatment of the crown prince's illness also gave rise to an acrimonious controversy. It arose from the fact that as early as May 1887 the German physicians recognized the presence of cancer in the throat, but Sir Morell Mackenzie, the English specialist who was also consulted, disputed the correctness of this diagnosis, and advised that the operation for removal of the larynx, which they had recommended, should not be undertaken. His advice was followed, and the differences between the medical men were made the occasion for a considerable display of national and political animosity.

The empress VICTORIA, who, after the death of her husband, was known as the empress Frederick, died on the 5th of August 1901 at the castle of Friedrichskron, Cronberg, near Homburg v. d. H., where she spent her last years. Of the emperor's children two, Prince Sigismund (1864–1866) and Prince Waldemar (1868–1879), died in childhood. He left two sons, William, his successor as emperor, and Henry, who adopted a naval career. Of his daughters, the princess Charlotte was married to Bernard, hereditary prince of Meiningen; the princess Victoria to Prince Adolf of Schaumburg-Lippe; the princess Sophie to the duke of Sparta, crown prince of Greece; and the princess Margaretha to Prince Friedrich Karl of Hesse.

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FREDERICK III. (1272–1337), king of Sicily, third son of King Peter of Aragon and Sicily, and of Constance, daughter of Manfred. Peter died in 1285, leaving Aragon to his eldest son Alphonso, and Sicily to his second son James. When Alphonso died in 1291 James became king of Aragon, and left his brother Frederick as regent of Sicily. The war between the Angevins and the Aragonese for the possession of Sicily was still in progress, and although the Aragonese were successful in Italy James's position in Spain became very insecure to internal troubles and French attacks. Peace negotiations were begun with Charles II. of Anjou, but were interrupted by the successive deaths of two popes; at last under the auspices of Boniface VIII. James concluded a shameful treaty, by which, in exchange for being left undisturbed in Aragon and promised possession of Sardinia and Corsica, he gave up Sicily to the Church, for whom it was to be held by the Angevins (1295). The Sicilians refused to be made over once more to the hated French whom they had expelled in 1282, and found a national leader in the regent Frederick. In vain the pope tried to bribe him with promises and dignities; he was determined to stand by his subjects, and was crowned king by the nobles at Palermo in 1296. Young, brave and handsome, he won the love and devotion of his people, and guided them through the long years of storm and stress with wisdom and ability. Although the second Frederick of Sicily, he called himself third, being the third son of King Peter. He reformed the administration and extended the powers of the Sicilian parliament, which was composed of the barons, the prelates and the representatives of the towns.

His refusal to comply with the pope's injunctions led to a renewal of the war. Frederick landed in Calabria, where he seized several towns, encouraged revolt in Naples, negotiated with the Ghibellines of Tuscany and Lombardy, and assisted the house of Colonna against Pope Boniface. In the meanwhile James, who received many favours from the Church, married his sister Yolanda to Robert, the third son of Charles II. Unfortunately for Frederick, a part of the Aragonese nobles of Sicily favoured King James, and both John of Procida and Ruggiero di Lauria, the heroes of the war of the Vespers, went over to the Angevins, and the latter completely defeated the Sicilian fleet off Cape Orlando. Charles's sons Robert and Philip landed in Sicily, but after capturing Catania were defeated by Frederick, Philip being taken prisoner (1299), while several Calabrian towns were captured by the Sicilians. For two years more the fighting continued with varying success, until Charles of Valois, who had been sent by Boniface to invade Sicily, was forced to sue for peace, his army being decimated by the plague, and in August 1302 the treaty of Caltabellotta was signed, by which Frederick was recognized king of Trinacria (the name Sicily was not to be used) for his lifetime, and was to marry Eleonora, the daughter of Charles II.; at his death the kingdom was to revert to the Angevins (this clause was inserted chiefly to save Charles's face), and his children would receive

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compensation elsewhere. Boniface tried to induce King Charles to break the treaty, but the latter was only too anxious for peace, and finally in May 1303 the pope ratified it, Frederick agreeing to pay him a tribute.

For a few years Sicily enjoyed peace, and the kingdom was reorganized. But on the descent of the emperor Henry VII., Frederick entered into an alliance with him, and in violation of the pact of Caltabellotta made war on the Angevins again (1313) and captured Reggio. He set sail for Tuscany to co-operate with the emperor, but on the latter's death (1314) he returned to Sicily. Robert, who had succeeded Charles II. in 1309, made several raids into the island, which suffered much material injury. A truce was concluded in 1317, but as the Sicilians helped the north Italian Ghibellines in the attack on Genoa, and Frederick seized some Church revenues for military purposes, the pope (John XXII.) excommunicated him and placed the island under an interdict (1321) which lasted until 1335. An Angevin fleet and army, under Robert's son Charles, was defeated at Palermo by Giovanni da Chiaramonte in 1325, and in 1326 and 1327 there were further Angevin raids on the island, until the descent into Italy of the emperor Louis the Bavarian distracted their attention. The election of Pope Benedict XII. (1334), who was friendly to Frederick, promised a respite; but after fruitless negotiations the war broke out once more, and Chiaramonte went over to Robert, owing to a private feud. In 1337 Frederick died at Paternione, and in spite of the peace of Caltabellotta his son Peter succeeded. Frederick's great merit was that during his reign the Aragonese dynasty became thoroughly national and helped to weld the Sicilians into a united people.

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FREDERICK I. (*c.* 1371–1440), elector of Brandenburg, founder of the greatness of the House of Hohenzollern, was a son of Frederick V., burgrave of Nuremberg, and first came into prominence by saving the life of Sigismund, king of Hungary, at the battle of Nicopolis in 1396. In 1397 he became burgrave of Nuremberg, and after his father's death in 1398 he shared Ansbach, Bayreuth, and the smaller possessions of the family, with his only brother John, but became sole ruler after his brother's death in 1420. Loyal at first to King Wenceslaus, the king's neglect of Germany drove Frederick to take part in his deposition in 1400, and in the election of Rupert III., count palatine of the Rhine, whom he accompanied to Italy in the following year. In 1401 he married Elizabeth, or Elsa, daughter of Frederick, duke of Bavaria-Landshut (d. 1393), and after spending some time in family and other feuds, took service again with King Sigismund in 1409, whom he assisted in his struggle with the Hungarian rebels. The double election to the German throne in 1410 first brought Frederick into relation with Brandenburg. Sigismund, anxious to obtain another vote in the electoral college, appointed Frederick to exercise the Brandenburg vote on his behalf, and it was largely through his efforts that Sigismund was chosen German king. Frederick then passed some time as administrator of Brandenburg, where he restored a certain degree of order, and was formally invested with the electorate and margraviate by Sigismund at Constance on the 18th of April 1417 (see Brandenburg). He took part in the war against the Hussites, but became estranged from Sigismund when in 1423 the king invested Frederick of Wettin, margrave of Meissen, with the vacant electoral duchy of Saxe-Wittenberg. In 1427 he sold his rights as burgrave to the town of Nuremberg, and he was a prominent member of the band of electors who sought to impose reforms upon Sigismund. After having been an unsuccessful candidate for the German throne in 1438, Frederick was chosen king of Bohemia in 1440, but declined the proffered honour. He took part in the election of Frederick III. as German king in 1440, and died at Radolzburg on the 21st of September in the same year. In 1902 a bronze statue was erected to his memory at Friesack, and there is also a marble one of the elector in the "Siegesallee" at Berlin.

See A. F. Riedel, *Zehn Jahre aus der Geschichte der Ahnherren des preussischen Königshauses* (Berlin, 1851); E. Brandenburg, *König Sigmund und Kurfürst Friedrich I. von Brandenburg* (Berlin, 1891); and O. Franklin, *Die deutsche Politik Friedrichs I. Kurfürsten von Brandenburg* (Berlin, 1851).

FREDERICK I. (1425–1476), elector palatine of the Rhine, surnamed "the Victorious," and called by his enemies "wicked Fritz," second son of the elector palatine Louis III., was born on the 1st of August 1425. He inherited a part of the Palatinate on his father's death in 1439, but soon surrendered this inheritance to his elder brother, the elector Louis IV. On his brother's death in 1449, however, he became guardian of the young elector Philip, and ruler of the land. In 1451 he persuaded the nobles to recognize him as elector, on condition that Philip should be his successor, a scheme which was disliked by the emperor Frederick III. The elector was successful in various wars with neighbouring rulers, and was a leading member of the band of princes who formed plans to secure a more efficient government for Germany, and even discussed the deposition of Frederick III. Frederick himself was mentioned as a candidate for the German throne, but the jealousies of the princes prevented any decisive action, and soon became so acute that in 1459 they began to fight among themselves. In alliance with Louis IX., duke of Bavaria-Landshut, Frederick gained several victories during the struggle, and in 1462 won a decisive battle at Seckenheim over Ulrich V., count of Württemberg. In 1472 the elector married Clara Tott, or Dett, the daughter of an Augsburg citizen, and by her he had two sons, Frederick, who died during his father's lifetime, and Louis (d. 1524), who founded the line of the counts of Löwenstein. He died at Heidelberg on the 12th of December 1476, and was succeeded, according to the compact, by his nephew Philip. Frederick was a cultured prince, and, in spite of his warlike career, a wise and intelligent ruler. He added largely to the area of the Palatinate, and did not neglect to further its internal prosperity.

See N. Feeser, *Friedrich der Siegreiche, Kurfürst von der Pfalz* (Neuburg, 1880); C. J. Kremer, *Geschichte des Kurfürsten Friedrichs I. von der Pfalz* (Leipzig, 1765); and K. Menzel, *Kurfürst Friedrich der Siegreiche von der Pfalz* (Munich, 1861).

FREDERICK II. (1482–1556), surnamed "the Wise," elector palatine of the Rhine, fourth son of the elector Philip, was born on the 9th of December 1482. Of an active and adventurous temperament, he fought under the emperor Maximilian I. in 1508, and afterwards served the Habsburgs loyally in other ways. He worked to secure the election of Charles, afterwards the emperor Charles V., as the successor of Maximilian in 1519; fought in two campaigns against the Turks; and being disappointed in his hope of obtaining the hand of one of the emperor's sisters, married in 1535 Dorothea (d. 1580), daughter of Christian II., who had been driven from the Danish throne. The Habsburgs promised their aid in securing this crown for Frederick, but, like many previous promises made to him, this came to nothing. Having spent his time in various parts of Europe, and incurred heavy debts on account of his expensive tastes, Frederick became elector palatine by the death of his brother, Louis V., in March 1544. With regard to the religious troubles of Germany, he took up at first the rôle of a mediator, but in 1545 he joined the league of Schmalkalden, and in 1546 broke definitely with the older faith. He gave a little assistance to the league in its war with Charles, but soon submitted to the emperor, accepted the *Interim* issued from Augsburg in May 1548, and afterwards acted in harmony with Charles. The elector died on the 26th of February 1556, and as he left no children was succeeded by his nephew, Otto Henry (1502–1559). He was a great benefactor to the university of Heidelberg.

Frederick's life, *Annales de vita et rebus gestis Friderici II. electoris palatini* (Frankfort, 1624), was written by his secretary Hubert Thomas Leodius; this has been translated into German by E. von Bülow (Breslau, 1849). See also Rott, *Friedrich II. von der Pfalz und die Reformation* (Heidelberg, 1904).

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FREDERICK III. (1515–1576), called "the Pious," elector palatine of the Rhine, eldest son of John II., count palatine of Simmern, was born at Simmern on the 14th of February 1515. In 1537 he married Maria (d. 1567), daughter of Casimir, prince of Bayreuth, and in 1546, mainly as a result of this union, adopted the reformed doctrines, which had already made considerable progress in the Palatinate. He lived in comparative obscurity and poverty until 1557, when he became count palatine of Simmern by his father's death, succeeding his kinsman, Otto Henry (1502–1559), as elector palatine two years later. Although inclined to the views of Calvin rather than to those of Luther, the new elector showed great anxiety to unite the Protestants; but when these efforts failed, and the breach between the followers of the two reformers became wider, he definitely adopted Calvinism. This form of faith was quickly established in the Palatinate; in its interests the "Heidelberg Catechism" was drawn up in 1563; and Catholics and Lutherans were persecuted alike, while the churches were denuded of all their ornaments. The Lutheran princes wished to root out Calvinism in the Palatinate, but were not willing to exclude the elector from the benefits of the religious peace of Augsburg, which were confined to the adherents of the confession of Augsburg, and the matter came before the diet in 1566. Boldly defending his position, Frederick refused to give way an inch, and as the Lutherans were unwilling to proceed to extremities the emperor Maximilian II. could only warn him to mend his ways. The elector was an ardent supporter of the Protestants abroad, whom, rather than the German Lutherans, he regarded as his co-religionists. He aided the Huguenots in France and the insurgents in the Netherlands with men and money; one of his sons, John Casimir (1543–1592), took a prominent part in the French wars of religion, while another, Christopher, was killed in 1574 fighting for the Dutch at Mooker Heath. In his later years Frederick failed in his efforts to prevent the election of a member of the Habsburg family as Roman king, to secure the abrogation of the "ecclesiastical reservation" clause in the peace of Augsburg, or to obtain security for Protestants in the territories of the spiritual princes. He was assiduous in caring for the material, moral and educational welfare of his electorate, and was a benefactor to the university of Heidelberg. The elector died at Heidelberg on the 26th of October 1576, and was succeeded by his elder surviving son, Louis (1539–1583), who had offended his father by adopting Lutheranism.

See A. Kluckhohn, *Friedrich der Fromme* (Nördlingen, 1877–1879); and *Briefe Friedrichs des Frommen*, edited by Kluckhohn (Brunswick, 1868–1872).

FREDERICK IV. (1574–1610), elector palatine of the Rhine, only surviving son of the elector Louis VI., was born at Amberg on the 5th of March 1574. His father died in October 1583, when the young elector came under the guardianship of his uncle John Casimir, an ardent Calvinist, who, in spite of the wishes of the late elector, a Lutheran, had his nephew educated in his own form of faith. In January 1592, on the death of John Casimir, Frederick undertook the government of the Palatinate, and continued the policy of his uncle, hostility to the Catholic Church and the Habsburgs, and co-operation with foreign Protestants. He was often in communication with Henry of Navarre, afterwards Henry IV. of France, and like him was unremitting in his efforts to conclude a league among the German Protestants, while he sought to weaken the Habsburgs by refusing aid for the Turkish War. After many delays and disappointments the Union of Evangelical Estates was actually formed in May 1608, under the leadership of the elector, and he took a prominent part in directing the operations of the union until his death, which occurred on the 19th of September 1610. Frederick was very extravagant, and liked to surround himself with pomp and luxury. He married in 1593 Louise, daughter of William the Silent, prince of Orange, and was succeeded by Frederick, the elder of his two sons.

See M. Ritter, *Geschichte der deutschen Union* (Schaffhausen, 1867–1873); and L. Häusser, *Geschichte der rheinischen Pfalz* (Heidelberg, 1856).

FREDERICK V. (1596–1632), elector palatine of the Rhine and king of Bohemia, son of the elector Frederick IV. by his wife, Louisa Juliana, daughter of William the Silent, prince of Orange, was born at Amberg on the 26th of August 1596. He became elector on his father's death in September 1610, and was under the guardianship of his kinsman, John II., count palatine of Zweibrücken (d. 1635), until he was declared of age in July 1614. Having received a good education, Frederick had married Elizabeth, daughter of the English king James I., in February 1613, and was the recognized head of the Evangelical Union founded by his father to protect the interests of the Protestants. In 1619 he stepped into a larger arena. Before this date the estates of Bohemia, Protestant in sympathy and dissatisfied with the rule of the Habsburgs, had been in frequent communication with the elector palatine, and in August 1619, a few months after the death of the emperor Matthias, they declared his successor, Ferdinand, afterwards the emperor Ferdinand II., deposed, and chose Frederick as their king. After some hesitation the elector yielded to the entreaties of Christian I., prince of Anhalt (1568–1630), and other sanguine supporters, and was crowned king of Bohemia at Prague on the 4th of November 1619. By this time the emperor Ferdinand was able to take the aggressive, while Frederick, disappointed at receiving no assistance either from England or from the Union, had few soldiers and little money. Consequently on the 8th of November, four days after his coronation, his forces were easily routed by the imperial army under Tilly at the White Hill, near Prague, and his short reign in Bohemia ended abruptly. Soon afterwards the Palatinate was overrun by the Spaniards and Bavarians, and after a futile attempt to dislodge them, Frederick, called in derision the "Winter King," sought refuge in the Netherlands. Having been placed under the imperial ban his electorate was given in 1623 to Maximilian I. of Bavaria, who also received the electoral dignity.

The remainder of Frederick's life was spent in comparative obscurity, although his restoration was a constant subject of discussion among European diplomatists. He died at Mainz on the 29th of November 1632, having had a large family, among his children being Charles Louis (1617–1680), who regained the Palatinate at the peace of Westphalia in 1648, and Sophia, who married Ernest Augustus, afterwards elector of Hanover, and was the mother of George I., king of Great Britain. His third son was Prince Rupert, the hero of the English civil war, and another son was Prince Maurice (1620–1652), who also assisted his uncle Charles I. during the civil war. Having sailed with Rupert to the West Indies, Maurice was lost at sea in September 1652.

In addition to the numerous works which treat of the outbreak of the Thirty Years' War see A. Gindely, *Friedrich V. von der Pfalz* (Prague, 1884); J. Krebs, *Die Politik der evangelischen Union im Jahre 1618* (Breslau, 1890–1901); M. Ritter, "Friedrich V.," in the *Allgemeine deutsche Biographie*, Band vii. (Leipzig. 1878): and *Deutsche Lieder auf den Winterkönig*, edited by R. Wolkan (Prague, 1899).

FREDERICK I. (1369–1428), surnamed "the Warlike," elector and duke of Saxony, was the eldest son of Frederick "the Stern," count of Osterland, and Catherine, daughter and heiress of Henry VIII., count of Coburg. He was born at Altenburg on the 29th of March 1369, and was a member of the family of Wettin. When his father died in 1381 some trouble arose over the family possessions, and in the following year an arrangement was made by which Frederick and his brothers shared Meissen and Thuringia with their uncles Balthasar and William. Frederick's brother George died in 1402, and his uncle William in 1407. A further dispute then arose, but in 1410 a treaty was made at Naumburg, when Frederick and his brother William added the northern part of Meissen to their lands; and in 1425 the death of William left Frederick sole ruler. In the German town war of 1388 he assisted Frederick V. of Hohenzollern, burgrave of Nuremberg, and in 1391 did the same for the Teutonic Order against Ladislaus V., king of Poland and prince of Lithuania. He supported Rupert III., elector palatine of the Rhine, in his struggle with King Wenceslaus for the German

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throne, probably because Wenceslaus refused to fulfil a promise to give him his sister Anna in marriage. The danger to Germany from the Hussites induced Frederick to ally himself with the German and Bohemian king Sigismund; and he took a leading part in the war against them, during the earlier years of which he met with considerable success. In the prosecution of this enterprise Frederick spent large sums of money, for which he received various places in Bohemia and elsewhere in pledge from Sigismund, who further rewarded him in January 1423 with the vacant electoral duchy of Saxe-Wittenberg; and Frederick's formal investiture followed at Ofen on the 1st of August 1425. Thus spurred to renewed efforts against the Hussites, the elector was endeavouring to rouse the German princes to aid him in prosecuting this war when the Saxon army was almost annihilated at Aussig on the 16th of August 1426. Returning to Saxony, Frederick died at Altenburg on the 4th of January 1428, and was buried in the cathedral at Meissen. In 1402 he married Catherine of Brunswick, by whom he left four sons and two daughters. In 1409, in conjunction with his brother William, he founded the university of Leipzig, for the benefit of German students who had just left the university of Prague. Frederick's importance as an historical figure arises from his having obtained the electorate of Saxe-Wittenberg for the house of Wettin, and transformed the margraviate of Meissen into the territory which afterwards became the kingdom of Saxony. In addition to the king of Saxony, the sovereigns of England and of the Belgians are his direct descendants.

There is a life of Frederick by G. Spalatin in the *Scriptores rerum Germanicarum praecipue Saxonicarum*, Band ii., edited by J. B. Mencke (Leipzig, 1728–1730). See also C. W. Böttiger and Th. Flathe, *Geschichte des Kurstaates und Königreichs Sachsen* (Gotha, 1867–1873); and J. G. Horn, *Lebens- und Heldengeschichte Friedrichs des Streitbaren* (Leipzig, 1733).

FREDERICK II. (1411–1464), called "the Mild," elector and duke of Saxony, eldest son of the elector Frederick I., was born on the 22nd of August 1411. He succeeded his father as elector in 1428, but shared the family lands with his three brothers, and was at once engaged in defending Saxony against the attacks of the Hussites. Freed from these enemies about 1432, and turning his attention to increasing his possessions, he obtained the burgraviate of Meissen in 1439, and some part of Lower Lusatia after a struggle with Brandenburg about the same time. In 1438 it was decided that Frederick, and not his rival, Bernard IV., duke of Saxe-Lauenburg, was entitled to exercise the Saxon electoral vote at the elections for the German throne; and the elector then aided Albert II. to secure this dignity, performing a similar service for his own brother-in-law, Frederick, afterwards the emperor Frederick III., two years later. Family affairs, meanwhile, occupied Frederick's attention. One brother, Henry, having died in 1435, and another, Sigismund (d. 1463), having entered the church and become bishop of Würzburg, Frederick and his brother William (d. 1482) were the heirs of their childless cousin, Frederick "the Peaceful," who ruled Thuringia and other parts of the lands of the Wettins. On his death in 1440 the brothers divided Frederick's territory, but this arrangement was not satisfactory, and war broke out between them in 1446. Both combatants obtained extraneous aid, but after a desolating struggle peace was made in January 1451, when William received Thuringia, and Frederick Altenburg and other districts. The remainder of the elector's reign was uneventful, and he died at Leipzig on the 7th of September 1464. By his wife, Margaret (d. 1486), daughter of Ernest, duke of Styria, he left two sons and four daughters. In July 1455 occurred the celebrated *Prinzenraub*, the attempt of a knight named Kunz von Kaufungen (d. 1455) to abduct Frederick's two sons, Ernest and Albert. Having carried them off from Altenburg, Kunz was making his way to Bohemia when the plot was accidentally discovered and the princes restored.

See W. Schäfer, *Der Montag vor Kiliani* (1855); J. Gersdorf, *Einige Aktenstücke zur Geschichte des sächsischen Prinzenraubes* (1855); and T. Carlyle, *Critical and Miscellaneous Essays*, vol. iv. (London, 1899).

FREDERICK III. (1463–1525), called "the Wise," elector of Saxony, eldest son of Ernest, elector of Saxony, and Elizabeth, daughter of Albert, duke of Bavaria-Munich (d. 1508), was born at Torgau, and succeeded his father as elector in 1486. Retaining the government of Saxony in his own hands, he shared the other possessions of his family with his brother John, called "the Stedfast" (1468–1532). Frederick was among the princes who pressed the need of reform upon the German king Maximilian I. in 1495, and in 1500 he became president of the newly-formed council of regency (*Reichsregiment*). He took a genuine interest in learning; was a friend of Georg Spalatin; and in 1502 founded the university of Wittenberg, where he appointed Luther and Melanchthon to professorships. In 1493 he had gone as a pilgrim to Jerusalem, and had been made a knight of the Holy Sepulchre; but, although he remained throughout life an adherent of the older faith, he seems to have been drawn into sympathy with the reformers, probably through his connexion with the university of Wittenberg. In 1520 he refused to put into execution the papal bull which ordered Luther's writings to be burned and the reformer to be put under restraint or sent to Rome; and in 1521, after Luther had been placed under the imperial ban by the diet at Worms, the elector caused him to be conveyed to his castle at the Wartburg, and afterwards protected him while he attacked the enemies of the Reformation. In 1519, Frederick, who alone among the electors refused to be bribed by the rival candidates for the imperial throne, declined to be a candidate for this high dignity himself, and assisted to secure the election of Charles V. He died unmarried at Langau, near Annaberg, on the 5th of May 1525.

See G. Spalatin, *Das Leben und die Zeitgeschichte Friedrichs des Weisen*, edited by C. G. Neudecker and L. Preller (Jena, 1851); M. M. Tutzschmann, *Friedrich der Weise, Kurfürst von Sachsen* (Grimma, 1848); and T. Kolde, *Friedrich der Weise und die Anfänge der Reformation* (Erlangen, 1881).

FREDERICK, a city and the county-seat of Frederick county, Maryland, U.S.A., on Carroll's Creek, a tributary of the Monocacy, 61 m. by rail W. by N. from Baltimore and 45 m. N.W. from Washington. Pop. (1890) 8193; (1900) 9206, of whom 1535 were negroes; (1910 census) 10,411. It is served by the Baltimore & Ohio and the Northern Central railways, and by two interurban electric lines. Immediately surrounding it is the rich farming land of the Monocacy valley, but from a distance it appears to be completely shut in by picturesque hills and mountains; to the E., the Linga ore Hills; to the W., Catoctin Mountain; and to the S., Sugar Loaf Mountain. It is built for the most part of brick and stone. Frederick is the seat of the Maryland school for the deaf and dumb and of the Woman's College of Frederick (1893; formerly the Frederick Female Seminary, opened in 1843), which in 1907–1908 had 212 students, 121 of whom were in the Conservatory of Music. Francis Scott Key and Roger Brooke Taney were buried here, and a beautiful monument erected to the memory of Key stands at the entrance to Mount Olivet cemetery. Frederick has a considerable agricultural trade and is an important manufacturing centre, its industries including the canning of fruits and vegetables, and the manufacture of flour, bricks, brushes, leather goods and hosiery. The total value of the factory product in 1905 was $1,037,021, being 34·7% more than in 1900. The municipality owns and operates its water-works and electric-lighting plant. Frederick, so named in honour of Frederick Calvert, son and afterward successor of Charles, Lord Baltimore, was settled by Germans in 1733, and was laid out as a town in 1745, but was not incorporated until 1817. Here in 1755 General Braddock prepared for his disastrous expedition against the French at Fort Duquesne (Pittsburg). During the Civil War the city was occupied on different occasions by Unionists and Confederates, and was made famous by Whittier's poem "Barbara Frietchie."

FREDERICK AUGUSTUS I. (1750–1827), king of Saxony, son of the elector Frederick Christian, was born at Dresden on the 23rd of December 1750. He succeeded his father under the guardianship of Prince Xavier in 1763, and was declared of age in 1768. In the following year (January 17, 1769) he married Princess Maria Amelia, daughter of Duke Frederick of Zweibrücken, by whom he had only one child, Princess Augusta (born June 21, 1782). One of his chief aims was the reduction

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of taxes and imposts and of the army. He was always extremely methodical and conscientious, and a good example to all his officials, whence his surname "the Just." On account of the claims of his mother on the inheritance of her brother, the elector of Bavaria, he sided with Frederick the Great in the short Bavarian succession war of 1778 against Austria. At the peace of Teschen, which concluded the war, he received 6 million florins, which he employed partly in regaining those parts of his kingdom which had been lost, and partly in favour of his relatives. In 1785 he joined the league of German princes (*Deutscher Fürstenbund*) formed by Prussia, but without prejudice to his neutrality. Thus he remained neutral during the quarrel between Austria and Prussia in 1790. In the following year he declined the crown of Poland. He refused to join the league against France (February 7, 1793), but when war was declared his duty to the Empire necessitated his taking part in it. Even after the peace of Basel (April 5, 1795) he continued the war. But when the French army, during the following year, advanced into the heart of Germany, he was compelled by General Jourdan to retreat (August 13, 1796). He maintained his neutrality during the war between France and Austria in 1805, but in the following year he joined Prussia against France. After the disastrous battle of Jena he concluded a treaty of peace with Napoleon at Posen (December 11, 1806), and, assuming the title of king, he joined the Confederation of the Rhine. But he did not alter the constitution and administration of his new kingdom. After the peace of Tilsit (July 9, 1807) he was created by Napoleon grand-duke of Warsaw, but his sovereignty of Poland was little more than nominal. There was a kind of friendship between Frederick Augustus and Napoleon. In 1809 Frederick Augustus fought with him against Austria. On several occasions (1807, 1812, 1813) Napoleon was entertained at Dresden, and when, on his return from his disastrous Russian campaign, he passed through Saxony by Dresden (December 16, 1812), Frederick Augustus remained true to his friend and ally. It was only during April 1813 that he made overtures to Austria, but he soon afterwards returned to the side of the French. He returned to Dresden on the 10th of May and was present at the terrible battle of August 26 and 27, in which Napoleon's army and his own were defeated. He fell into the hands of the Allies after their entry into Leipzig on the 19th of October 1813; and, although he regained his freedom after the congress of Vienna, he was compelled to give up the northern part—three-fifths—of his kingdom to Prussia (May 21, 1814). He entered Dresden on the 7th of July, and was enthusiastically welcomed by his people. The remainder of his life was spent in repairing the damages caused by the Napoleonic wars, in developing the agricultural, commercial and industrial resources of his kingdom, reforming the administration of justice, establishing hospitals and other charitable institutions, encouraging art and science and promoting education. He had a special interest in botany, and originated the beautiful park at Pillnitz. His reign throughout was characterized by justice, probity, moderation and prudence. He died on the 5th of May 1827.

BIBLIOGRAPHY.—The earlier lives, by C. E. Weisse (1811), A. L. Herrmann (1827), Pölitz (1830), are mere panegyrics. On the other side see Flathe in *Allgemeine deutsche Biographie*, and Böttiger-Flathe, *History of Saxony* (2nd ed., 1867 ff.), vols. ii. and iii.; A. Bonnefons, *Un Ami de Napoléon, Frédéric Auguste, premier roi de Saxe* . . . (Paris, 1902); Fritz Friedrich, *Politik Sachsens 1807–1813* (1898); P. Rühlmann, *Öffentliche Meinung . . . 1806–1813* (1902). There are many pamphlets bearing on the Saxon question and on Frederick Augustus during the years 1814 and 1815. (J. Hn.)

FREDERICK AUGUSTUS II. (1797–1854), king of Saxony, eldest son of Prince Maximilian and of Caroline Maria Theresa of Parma, was born on the 18th of May 1797. The unsettled times in which his youth was passed necessitated his frequent change of residence, but care was nevertheless taken that his education should not be interrupted, and he also acquired, through his journeys in foreign states (Switzerland 1818, Montenegro 1838, England and Scotland 1844) and his intercourse with men of eminence, a special taste for art and for natural science. He was himself a good landscape-painter and had a fine collection of engravings on copper. He was twice married—in 1819 (October 7) to the duchess Caroline, fourth daughter of the emperor Francis I. of Austria (d. May 22, 1832), and in 1833 (April 4) to Maria, daughter of Maximilian I. of Bavaria. There were no children of either marriage. During the government of his uncles (Frederick Augustus I. and Anthony) he took no part in the administration of the country, though he was the sole heir to the crown. In 1830 a rising in Dresden led to his being named joint regent of the kingdom along with King Anthony on the 13th of September; and in this position his popularity and his wise and liberal reforms (for instance, in arranging public audiences) speedily quelled all discontent. On the 6th of June 1836 he succeeded his uncle. Though he administered the affairs of his kingdom with enlightened liberality Saxony did not escape the political storms which broke upon Germany in 1848. He elected Liberal ministers, and he was at first in favour of the programme of German unity put forward at Frankfort, but he refused to acknowledge the democratic constitution of the German parliament. This attitude led to the insurrection at Dresden in May 1849, which was suppressed by the help of Prussian troops. From that time onward his reign was tranquil and prosperous. Later Count Beust, leader of the Austrian and feudal party in Saxony, became his principal minister and guided his policy on most occasions. His death occurred accidentally through the upsetting of his carriage near Brennbühel, between Imst and Wenns in Tirol (August 9, 1854). Frederick Augustus devoted his leisure hours chiefly to the study of botany. He made botanical excursions into different countries, and *Flora Marienbadensis, oder Pflanzen und Gebirgsarten, gesammelt und beschrieben*, written by him, was published at Prague by Kedler, 1837.

See Böttiger-Flathe, *History of Saxony*, vol. iii.; R. Freiherr von Friesen, *Erinnerungen* (2 vols., Dresden, 1881); F. F. Graf von Beust, *Aus drei-viertel Jahrhunderten* (2 vols., 1887); Flathe, in *Allg. deutsche Biogr.* (J. Hn.)

FREDERICK CHARLES (FRIEDRICH KARL NIKOLAUS), PRINCE (1828–1885), Prussian general field marshal, son of Prince Charles of Prussia and grandson of King Frederick William III., was born in Berlin on the 20th of March 1828. He was educated for the army, which he entered on his tenth birthday as second lieutenant in the 14th Foot Guards. He became first lieutenant in 1844, and in 1846 entered the university of Bonn, where he stayed for two years, being accompanied throughout by Major von Roon, afterwards the famous war minister. In 1848 he became a company commander in his regiment, and soon afterwards served in the Schleswig-Holstein War on the staff of Marshal von Wrangel, being present at the battle of Schleswig (April 23, 1848). Later in 1848 he became *Rittmeister* in the *Garde du Corps* cavalry regiment, and in 1849 major in the Guard Hussars. In this year the prince took part in the campaign against the Baden insurgents, and was wounded at the action of Wiesenthal while leading a desperate charge against entrenched infantry. After this experience the wild courage of his youth gave place to the unshakable resolution which afterwards characterized the prince's generalship. In 1852 he became colonel, and in 1854 major-general and commander of a cavalry brigade. In this capacity he was brought closely in touch with General von Reyher, the chief of the general staff, and with Moltke. He married, in the same year, Princess Marie Anne of Anhalt. In 1857 he became commander of the 1st Guard Infantry division, but very shortly afterwards, on account of disputes concerned with the training methods then in force, he resigned the appointment.

In 1858 he visited France, where he minutely investigated the state of the French army, but it was not long before he was recalled, for in 1859, in consequence of the Franco-Austrian War, Prussia mobilized her forces, and Frederick Charles was made a divisional commander in the II. army corps. In this post he was given the liberty of action which had previously been denied to him. About this time (1860) the prince gave a lecture to the officers of his command on the French army and its methods, the substance of which (*Eine militärische Denkschrift*

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von P. F. K., Frankfort on Main, 1860) was circulated more widely than the author intended, and in the French translation gave rise to much indignation in France. In 1861 Frederick Charles became general of cavalry. He was then commander of the III. (Brandenburg) army corps. This post he held from 1860 to 1870, except during the campaigns of 1864 and 1866, and in it he displayed his real qualities as a troop leader. His self-imposed task was to raise the military spirit of his troops to the highest possible level, and ten years of his continuous and thorough training brought the III. corps to a pitch of real efficiency which the Guard corps alone, in virtue of its special recruiting powers, slightly surpassed. Prince Frederick Charles' work was tested to the full when von Alvensleben and the III. corps engaged the whole French army on the 16th of August 1870. In 1864 the prince once more fought against the Danes under his old leader "Papa" Wrangel. The Prussian contingent under Frederick Charles formed a corps of the allied army, and half of it was drawn from the III. corps. After the storming of the Düppel lines the prince succeeded Wrangel in the supreme command, with Lieutenant-General Freiherr von Moltke as his chief of staff. These two great soldiers then planned and brilliantly carried out the capture of the island of Alsen, after which the war came to an end.

In 1866 came the Seven Weeks' War with Austria. Prince Frederick Charles was appointed to command the I. Army, which he led through the mountains into Bohemia, driving before him the Austrians and Saxons to the upper Elbe, where on the 3rd of July took place the decisive battle of Königgrätz or Sadowa. This was brought on by the initiative of the leader of the I. Army, which had to bear the brunt of the fighting until the advance of the II. Army turned the Austrian flank. After the peace he returned to the III. army corps, which he finally left, in July 1870, when appointed to command the II. German Army in the war with France. In the early days of the advance the prince's ruthless energy led to much friction between the I. and II. Armies (see FRANCO-GERMAN WAR), while his strategical mistakes seriously embarrassed the great headquarters staff. The advance of the II. Army beyond the Saar to the Moselle and from that river to the Meuse displayed more energy than careful strategy, but herein at least the "Red Prince" (as he was called from the colour of his favourite hussar uniform) was in thorough sympathy with the king's headquarters on the one hand and the feelings of the troops on the other. Then came the discovery that the French were not in front, but to the right rear of the II. Army (August 16). Alvensleben with the III. corps held the French to their ground at Vionville while the prince hurried together his scattered forces. He himself directed with superb tactical skill the last efforts of the Germans at Vionville, and the victory of St Privat on the 18th was due to his leadership (see METZ), which shone all the more by contrast with the failures of the I. Army at Gravelotte. The prince was left in command of the forces which blockaded Bazaine in Metz, and received the surrender of that place and of the last remaining field army of the enemy. He was promoted at once to the rank of general field marshal, and shortly afterwards the II. Army was despatched to aid in crushing the newly organized army of the French republic on the Loire. Here again he retrieved strategical errors by energy and tactical skill, and his work was in the end crowned by the victory of Le Mans on the 12th of January 1871. Of all the subordinate leaders on the German side none enjoyed a greater and a better deserved reputation than the Red Prince.

He now became inspector-general of the 3rd "army inspection," and a little later inspector of cavalry, and in the latter post he was largely instrumental in bringing the German cavalry to the degree of perfection in manœuvre and general training which it gradually attained in the years after the war. He never ceased to improve his own soldierly qualities by further study and by the conduct of manœuvres on a large scale. His sternness of character kept him aloof from the court and from his own family, and he spent his leisure months chiefly on his various country estates. In 1872 and in 1882 he travelled in the Mediterranean and the Near East. He died on the 15th of June 1885 at Klein-Glienicke near Berlin, and was buried at the adjacent church of Nikolskoe. His third daughter, Princess Louise Margareta, was married, in March 1879, to the duke of Connaught.

FREDERICK HENRY (1584–1647), prince of Orange, the youngest child of William the Silent, was born at Delft about six months before his father's assassination on the 29th of January 1584. His mother, Louise de Coligny, was daughter of the famous Huguenot leader, Admiral de Coligny, and was the fourth wife of William the Silent. The boy was trained to arms by his elder brother, Maurice of Nassau, one of the first generals of his age. On the death of Maurice in 1625, Frederick Henry succeeded him in his paternal dignities and estates, and also in the stadtholderates of the five provinces of Holland, Zeeland, Utrecht, Overysel and Gelderland, and in the important posts of captain and admiral-general of the Union. Frederick Henry proved himself scarcely inferior to his brother as a general, and a far more capable statesman and politician. During twenty-two years he remained at the head of affairs in the United Provinces, and in his time the power of the stadtholderate reached its highest point. The "Period of Frederick Henry," as it is usually styled by Dutch writers, is generally accounted the golden age of the republic. It was marked by great military and naval triumphs, by world-wide maritime and commercial expansion, and by a wonderful outburst of activity in the domains of art and literature. The chief military exploits of Frederick Henry were the sieges and captures of Hertogenbosch in 1629, of Maastricht in 1632, of Breda in 1637, of Sas van Ghent in 1644, and of Hulst in 1645. During the greater part of his administration the alliance with France against Spain had been the pivot of Frederick Henry's foreign policy, but in his last years he sacrificed the French alliance for the sake of concluding a separate peace with Spain, by which the United Provinces obtained from that power all the advantages for which they had for eighty years been contending. Frederick Henry died on the 14th of March 1647, and was buried with great pomp beside his father and brother at Delft. The treaty of Münster, ending the long struggle between the Dutch and the Spaniards, was not actually signed until the 30th of January 1648, the illness and death of the stadtholder having caused a delay in the negotiations. Frederick Henry was married in 1625 to Amalia von Solms, and left one son, William II. of Orange, and four daughters.

Frederick Henry left an account of his campaigns in his *Mémoires de Frédéric Henri* (Amsterdam, 1743). See *Cambridge Mod. Hist.* vol. iv. chap. 24, and the bibliography on p. 931.

FREDERICK LOUIS (1707–1751), prince of Wales, eldest son of George II., was born at Hanover on the 20th of January 1707. After his grandfather, George I., became king of Great Britain and Ireland in 1714, Frederick was known as duke of Gloucester[1] and made a knight of the Garter, having previously been betrothed to Wilhelmina Sophia Dorothea (1709–1758), daughter of Frederick William I., king of Prussia, and sister of Frederick the Great. Although he was anxious to marry this lady, the match was rendered impossible by the dislike of George II. and Frederick William for each other. Soon after his father became king in 1727 Frederick took up his residence in England and in 1729 was created prince of Wales; but the relations between George II. and his son were very unfriendly, and there existed between them the jealousy which Stubbs calls the "incurable bane of royalty." The faults were not all on one side. The prince's character was not attractive, and the king refused to make him an adequate allowance. In 1735 Frederick wrote, or inspired the writing of, the *Histoire du prince Titi*, a book containing offensive caricatures of both king and queen; and losing no opportunity of irritating his father, "he made," says Lecky, "his court the special centre of opposition to the government, and he exerted all his influence for the ruin of Walpole." After a marriage between the prince and Lady Diana Spencer, afterwards the wife of John, 4th duke of Bedford, had been frustrated by Walpole, Frederick was married in April 1736 to

[1] Frederick was never actually created duke of Gloucester, and when he was raised to the peerage in 1726 it was as duke of Edinburgh only. See G. E. C(okayne), *Complete Peerage*, sub "Gloucester."

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Augusta (1719–1772), daughter of Frederick II., duke of Saxe-Gotha, a union which was welcomed by his parents, but which led to further trouble between father and son. George proposed to allow the prince £50,000 a year; but this sum was regarded as insufficient by the latter, whose appeal to parliament was unsuccessful. After the birth of his first child, Augusta, in 1737, Frederick was ordered by the king to quit St James' Palace, and the foreign ambassadors were requested to refrain from visiting him. The relations between the two were now worse than before. In 1745 George II. refused to allow his son to command the British army against the Jacobites. On the 20th of March 1751 the prince died in London, and was buried in Westminster Abbey. He left five sons and two daughters. The sons were George (afterwards King George III.), Edward Augustus, duke of York and Albany (1739–1767), William Henry, duke of Gloucester and Edinburgh (1743–1805), Henry Frederick, duke of Cumberland (1745–1790), and Frederick William (1750–1765); the daughters were Augusta (1737–1813), wife of Charles William Ferdinand, duke of Brunswick, and Caroline Matilda (1751–1775), wife of Christian VII., king of Denmark.

See Lord Hervey of Ickworth, *Memoirs of the Reign of George II.*, edited by J. W. Croker (London, 1884); Horace Walpole, *Memoirs of the Reign of George II.* (London, 1847); and Sir N. W. Wraxall, *Memoirs*, edited by H. B. Wheatley, vol. i. (London, 1884).

FREDERICK WILLIAM I. (1688–1740), king of Prussia, son of Frederick I. by his second marriage was born on the 15th of August 1688. He spent a considerable time in early youth at the court of his grandfather, the elector Ernest Augustus of Hanover. On his return to Berlin he was placed under General von Dohna and Count Finkenstein, who trained him to the energetic and regular habits which ever afterwards characterized him. He was soon imbued with a passion for military life, and this was deepened by acquaintance with the duke of Marlborough (1709), Prince Eugene, whom he visited during the siege of Tournai, and Prince Leopold of Anhalt (the "Old Dessauer"). In nearly every respect he was the opposite of his father, having frugal, simple tastes, a passionate temper and a determined will. Throughout his life he was always the protector of the church and of religion. But he detested religious quarrels and was very tolerant towards his Catholic subjects, except the Jesuits. His life was simple and puritanical, being founded on the teaching of the Bible. He was, however, fond of hunting and somewhat given to drinking. He intensely disliked the French, and highly disapproved of the imitation of their manners by his father and his court. When he came to the throne (February 25, 1713) his first act was to dismiss from the palace every unnecessary official and to regulate the royal household on principles of the strictest parsimony. The greater part of the beautiful furniture was sold. His importance for Prussia is twofold: in internal politics he laid down principles which continued to be followed long after his death. This was a province peculiarly suited to his genius; he was one of the greatest administrators who have ever worn the Prussian crown. His foreign policy was less successful, though under his rule the kingdom acquired some extension of territory.

Thus at the peace of Utrecht (April 11, 1713), after the War of the Spanish Succession, he acquired the greater part of the duchy of Gelderland. By the treaty of Schwedt, concluded with Russia on the 6th of October, he was assured of an important influence in the solution of the Baltic question, which during the long absence of Charles XII. had become burning; and Swedish Pomerania, as far as the Peene, was occupied by Prussia. But Charles XII. on his return turned against the king, though without success, for the Pomeranian campaign of 1715 ended in favour of Prussia (fall of Stralsund, December 22). This enabled Frederick William I. to maintain a more independent attitude towards the tsar; he refused, for example, to provide him with troops for a campaign (in Schonen) against the Swedes. When on the 28th of May 1718, in view of the disturbances in Mecklenburg, he signed at Havelberg the alliance with Russia, he confined himself to taking up a defensive attitude, and, on the other hand, on the 14th of August 1719 he also entered into relations with his former enemies, England and Hanover. And so, by the treaty of Stockholm (February 1, 1720), Frederick William succeeded in obtaining the consent of Sweden to the cession of that part of Pomerania which he had occupied (Usedom, Wollin, Stettin, Hither Pomerania, east of the Peene) in return for a payment of 2,000,000 thalers.

While Frederick William I. succeeded in carrying his wishes into effect in this direction, he was unable to realize another project which he had much at heart, namely, the Prussian succession to the Lower Rhine duchies of Jülich and Berg. The treaty concluded in 1725 at Vienna between the emperor and Spain brought the whole of this question up again, for both sides had pledged themselves to support the Palatinate-Sulzbach succession (in the event of the Palatinate-Neuberg line becoming extinct). Frederick William turned for help to the western powers, England and France, and secured it by the treaty of alliance signed at Herrenhausen on the 3rd of September 1725 (League of Hanover). But since the western powers soon sought to use the military strength of Prussia for their own ends, Frederick again turned towards the east, strengthened above all his relations with Russia, which had continued to be good, and finally, by the treaty of Wüsterhausen (October 12, 1726; ratified at Berlin, December 23, 1728), even allied himself with his former adversary, the court of Vienna; though this treaty only imperfectly safeguarded Prussian interests, inasmuch as Frederick William consented to renounce his claims to Jülich. But as in the following years the European situation became more and more favourable to the house of Habsburg, the latter began to try to withdraw part of the concessions which it had made to Frederick William. As early as 1728 Düsseldorf, the capital, was excluded from the guarantee of Berg. Nevertheless, in the War of the Polish Succession against France (1734–1735), Frederick William remained faithful to the emperor's cause, and sent an auxiliary force of 10,000 men. The peace of Vienna, which terminated the war, led to a reconciliation between France and Austria, and so to a further estrangement between Frederick William and the emperor. Moreover, in 1738 the western powers, together with the emperor, insisted in identical notes on the recognition of the emperor's right to decide the question of the succession in the Lower Rhine duchies. A breach with the emperor was now inevitable, and this explains why in a last treaty (April 5, 1739) Frederick William obtained from France a guarantee of a part, at least, of Berg (excluding Düsseldorf).

But Frederick William's failures in foreign policy were more than compensated for by his splendid services in the internal administration of Prussia. He saw the necessity of rigid economy not only in his private life but in the whole administration of the state. During his reign Prussia obtained for the first time a centralized and uniform financial administration. It was the king himself who composed and wrote in the year 1722 the famous instruction for the general directory (*Generaldirektorium*) of war, finance and domains. When he died the income of the state was about seven million thalers (£1,050,000). The consequence was that he paid off the debts incurred by his father, and left to his successor a well filled treasury. In the administration of the domains he made three innovations: (1) the private estates of the king were turned into domains of the crown (August 13, 1713); (2) the freeing of the serfs on the royal domains (March 22, 1719); (3) the conversion of the hereditary lease into a short-term lease on the basis of productiveness. His industrial policy was inspired by the mercantile spirit. On this account he forbade the importation of foreign manufactures and the export of raw materials from home, a policy which had a very good effect on the growth of Prussian industries.

The work of internal colonization he carried on with especial zeal. Most notable of all was his *rétablissement* of East Prussia, to which he devoted six million thalers (*c.* £900,000). His policy in respect of the towns was motived largely by fiscal considerations, but at the same time he tried also to improve their municipal administration; for example, in the matter of buildings, of the letting of domain lands and of the collection of the excise in towns. Frederick William had many opponents among the nobles because he pressed on the abolition of the old feudal rights, introduced in East Prussia and Lithuania a general land tax (the *General-*

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hufenschoss), and finally in 1730 attacked in a special edict the *Legen*, *i.e.* the expropriation of the peasant proprietors. He did nothing for the higher learning, and even banished the philosopher Christian Wolff at forty-eight hours' notice "on pain of the halter," for teaching, as he believed, fatalist doctrines. Afterwards he modified his judgment in favour of Wolff, and even, in 1739, recommended the study of his works. He established many village schools, which he often visited in person; and after the year 1717 (October 23) all Prussian parents were obliged to send their children to school (*Schulzwang*). He was the especial friend of the *Franckische Stiftungen* at Halle on the Saale. Under him the people flourished; and although it stood in awe of his vehement spirit it respected him for his firmness, his honesty of purpose and his love of justice. He was devoted also to his army, the number of which he raised from 38,000 to 83,500, so that under him Prussia became the third military power in the world, coming next after Russia and France. There was not a more thoroughly drilled or better appointed force. The Potsdam guard, made up of giants collected from all parts of Europe, sometimes kidnapped, was a sort of toy with which he amused himself. The reviewing of his troops was his chief pleasure. But he was also fond of meeting his friends in the evening in what he called his Tobacco-College, where amid clouds of tobacco smoke he not only discussed affairs of state but heard the newest "guard-room jokes." He died on the 31st of May 1740, leaving behind him his widow, Sophia Dorothea of Hanover, whom he had married on the 26th of November 1706. His son was Frederick the Great, who was the opposite of Frederick William. This opposition became so strong in 1730 that the crown prince fled from the court, and was later arrested and brought before a court-martial. A reconciliation was brought about, at first gradually. In later years the relations between father and son came to be of the best (see FREDERICK II., king of Prussia).

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FREDERICK WILLIAM II. (1744–1797), king of Prussia, son of Augustus William, second son of King Frederick William I. and of Louise Amalie of Brunswick, sister of the wife of Frederick the Great, was born at Berlin on the 25th of September 1744, and became heir to the throne on his father's death in 1757. The boy was of an easy-going and pleasure-loving disposition, averse from sustained effort of any kind, and sensual by nature. His marriage with Elisabeth Christine, daughter of Duke Charles of Brunswick, contracted in 1765, was dissolved in 1769, and he soon afterwards married Frederika Louisa, daughter of the landgrave Louis IX. of Hesse-Darmstadt. Although he had a numerous family by his wife, he was completely under the influence of his mistress, Wilhelmine Enke, afterwards created Countess Lichtenau, a woman of strong intellect and much ambition. He was a man of singularly handsome presence, not without mental qualities of a high order; he was devoted to the arts—Beethoven and Mozart enjoyed his patronage and his private orchestra had a European reputation. But an artistic temperament was hardly that required of a king of Prussia on the eve of the Revolution; and Frederick the Great, who had employed him in various services—notably in an abortive confidential mission to the court of Russia in 1780—openly expressed his misgivings as to the character of the prince and his surroundings.

The misgivings were justified by the event. Frederick William's accession to the throne (August 17, 1786) was, indeed, followed by a series of measures for lightening the burdens of the people, reforming the oppressive French system of tax-collecting introduced by Frederick, and encouraging trade by the diminution of customs dues and the making of roads and canals. This gave the new king much popularity with the mass of the people; while the educated classes were pleased by his removal of Frederick's ban on the German language by the admission of German writers to the Prussian Academy, and by the active encouragement given to schools and universities. But these reforms were vitiated in their source. In 1781 Frederick William, then prince of Prussia, inclined, like many sensual natures, to mysticism, had joined the Rosicrucians, and had fallen under the influence of Johann Christof Wöllner (1732–1800), and by him the royal policy was inspired. Wöllner, whom Frederick the Great had described as a "treacherous and intriguing priest," had started life as a poor tutor in the family of General von Itzenplitz, a noble of the mark of Brandenburg, had, after the general's death and to the scandal of king and nobility, married the general's daughter, and with his mother-in-law's assistance settled down on a small estate. By his practical experiments and by his writings he gained a considerable reputation as an economist; but his ambition was not content with this, and he sought to extend his influence by joining first the Freemasons and afterwards (1770) the Rosicrucians. Wöllner, with his impressive personality and easy if superficial eloquence, was just the man to lead a movement of this kind. Under his influence the order spread rapidly, and he soon found himself the supreme director (*Oberhauptdirektor*) of some 26 "circles," which included in their membership princes, officers and high officials. As a Rosicrucian Wöllner dabbled in alchemy and other mystic arts, but he also affected to be zealous for Christian orthodoxy, imperilled by Frederick II.'s patronage of "enlightenment," and a few months before Frederick's death wrote to his friend the Rosicrucian Johann Rudolph von Bischoffswerder (1741–1803) that his highest ambition was to be placed at the head of the religious department of the state "as an unworthy instrument in the hand of Ormesus" (the prince of Prussia's Rosicrucian name) "for the purpose of saving millions of souls from perdition and bringing back the whole country to the faith of Jesus Christ."

Such was the man whom Frederick William II., immediately after his accession, called to his counsels. On the 26th of August 1786 he was appointed privy councillor for finance (*Geheimer Oberfinanzrath*), and on the 2nd of October was ennobled. Though not in name, in fact he was prime minister; in all internal affairs it was he who decided; and the fiscal and economic reforms of the new reign were the application of his theories. Bischoffswerder, too, still a simple major, was called into the king's counsels; by 1789 he was already an adjutant-general. These were the two men who enmeshed the king in a web of Rosicrucian mystery and intrigue, which hampered whatever healthy development of his policy might have been possible, and led ultimately to disaster. The opposition to Wöllner was, indeed, at the outset strong enough to prevent his being entrusted with the department of religion; but this too in time was overcome, and on the 3rd of July 1788 he was appointed active privy councillor of state and of justice and head of the spiritual

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department for Lutheran and Catholic affairs. War was at once declared on what—to use a later term—we may call the "modernists." The king, so long as Wöllner was content to condone his immorality (which Bischoffswerder, to do him justice, condemned), was eager to help the orthodox crusade. On the 9th of July was issued the famous religious edict, which forbade Evangelical ministers to teach anything not contained in the letter of their official books, proclaimed the necessity of protecting the Christian religion against the "enlighteners" (*Aufklärer*), and placed educational establishments under the supervision of the orthodox clergy. On the 18th of December a new censorship law was issued, to secure the orthodoxy of all published books; and finally, in 1791, a sort of Protestant Inquisition was established at Berlin (*Immediat-Examinations-commission*) to watch over all ecclesiastical and scholastic appointments. In his zeal for orthodoxy, indeed, Frederick William outstripped his minister; he even blamed Wöllner's "idleness and vanity" for the inevitable failure of the attempt to regulate opinion from above, and in 1794 deprived him of one of his secular offices in order that he might have more time "to devote himself to the things of God"; in edict after edict the king continued to the end of his reign to make regulations "in order to maintain in his states a true and active Christianity, as the path to genuine fear of God."

The effects of this policy of blind obscurantism far out weighed any good that resulted from the king's well-meant efforts at economic and financial reform; and even this reform was but spasmodic and partial, and awoke ultimately more discontent than it allayed. But far more fateful for Prussia was the king's attitude towards the army and foreign policy. The army was the very foundation of the Prussian state, a truth which both Frederick William I. and the great Frederick had fully realized; the army had been their first care, and its efficiency had been maintained by their constant personal supervision. Frederick William, who had no taste for military matters, put his authority as "War-Lord" into commission under a supreme college of war (*Oberkriegs-Collegium*) under the duke of Brunswick and General von Möllendorf. It was the beginning of the process that ended in 1806 at Jena.

In the circumstances Frederick William's intervention in European affairs was not likely to prove of benefit to Prussia. The Dutch campaign of 1787, entered on for purely family reasons, was indeed successful; but Prussia received not even the cost of her intervention. An attempt to intervene in the war of Russia and Austria against Turkey failed of its object; Prussia did not succeed in obtaining any concessions of territory from the alarms of the Allies, and the dismissal of Hertzberg in 1791 marked the final abandonment of the anti-Austrian tradition of Frederick the Great. For, meanwhile, the French Revolution had entered upon alarming phases, and in August 1791 Frederick William, at the meeting at Pillnitz, arranged with the emperor Leopold to join in supporting the cause of Louis XVI. But neither the king's character, nor the confusion of the Prussian finances due to his extravagance, gave promise of any effective action. A formal alliance was indeed signed on the 7th of February 1792, and Frederick William took part personally in the campaigns of 1792 and 1793. He was hampered, however, by want of funds, and his counsels were distracted by the affairs of Poland, which promised a richer booty than was likely to be gained by the anti-revolutionary crusade into France. A subsidy treaty with the sea powers (April 10, 1794) filled his coffers; but the insurrection in Poland that followed the partition of 1793, and the threat of the isolated intervention of Russia, hurried him into the separate treaty of Basel with the French Republic (April 5, 1795), which was regarded by the great monarchies as a betrayal, and left Prussia morally isolated in Europe on the eve of the titanic struggle between the monarchical principle and the new political creed of the Revolution. Prussia had paid a heavy price for the territories acquired at the expense of Poland in 1793 and 1795, and when, on the 16th of November 1797, Frederick William died, he left the state in bankruptcy and confusion, the army decayed and the monarchy discredited.

Frederick William II. was twice married: (1) in 1765 to Elizabeth of Brunswick (d. 1841), by whom he had a daughter, Frederika, afterwards duchess of York, and from whom he was divorced in 1769; (2) in 1769 to Frederika Louisa of Hesse-Darmstadt, by whom he had four sons, Frederick William III., Louis (d. 1796), Henry and William, and two daughters, Wilhelmina, wife of William of Orange, afterwards William I., king of the Netherlands, and Augusta, wife of William II., elector of Hesse. Besides his relations with his *maîtresse en titre*, the countess Lichtenau, the king—who was a frank polygamist—contracted two "marriages of the left hand" with Fräulein von Voss and the countess Dönhoff.

See article by von Hartmann in *Allgem. deutsche Biog.* (Leipzig, 1878); Stadelmann, *Preussens Könige in ihrer Thätigkeit für die Landeskultur*, vol. iii. "Friedrich Wilhelm II." (Leipzig, 1885); Paulig, *Friedrich Wilhelm II., sein Privatleben u. seine Regierung* (Frankfurt-an-der-Oder, 1896).

FREDERICK WILLIAM III. (1770–1840), king of Prussia, eldest son of King Frederick William II., was born at Potsdam on the 3rd of August 1770. His father, then prince of Prussia, was out of favour with Frederick the Great and entirely under the influence of his mistress; and the boy, handed over to tutors appointed by the king, lived a solitary and repressed life which tended to increase the innate weakness of his character. But though his natural defects of intellect and will-power were not improved by the pedantic tutoring to which he was submitted, he grew up pious, honest and well-meaning; and had fate cast him in any but the most stormy times of his country's history he might well have left the reputation of a model king. As a soldier he received the usual training of a Prussian prince, obtained his lieutenancy in 1784, became a colonel commanding in 1790, and took part in the campaigns of 1792–94. In 1793 he married Louise, daughter of Prince Charles of Mecklenburg-Strelitz, whom he had met and fallen in love with at Frankfort (see LOUISE, queen of Prussia). He succeeded to the throne on the 16th of November 1797 and at once gave earnest of his good intentions by cutting down the expenses of the royal establishment, dismissing his father's ministers, and reforming the most oppressive abuses of the late reign. Unfortunately, however, he had all the Hohenzollern tenacity of personal power without the Hohenzollern genius for using it. Too distrustful to delegate his responsibility to his ministers, he was too infirm of will to strike out and follow a consistent course for himself.

The results of this infirmity of purpose are written large on the history of Prussia from the treaty of Lunéville in 1801 to the downfall that followed the campaign of Jena in 1806. By the treaty of Tilsit (July 9th, 1807) Frederick William had to surrender half his dominions, and what remained to him was exhausted by French exactions and liable at any moment to be crushed out of existence by some new whim of Napoleon. In the dark years that followed it was the indomitable courage of Queen Louise that helped the weak king not to despair of the state. She seconded the reforming efforts of Stein and the work of Scharnhorst and Gneisenau in reorganizing the army, by which the resurrection of Prussia became a possibility. When Stein was dismissed at the instance of Napoleon, Hardenberg succeeded him as chancellor (June 1810). In the following month Queen Louise died, and the king was left alone to deal with circumstances of ever-increasing difficulty. He was forced to join Napoleon in the war against Russia; and even when the disastrous campaign of 1812 had for the time broken the French power, it was not his own resolution, but the loyal disloyalty of General York in concluding with Russia the convention of Tauroggen that forced him into line with the patriotic fervour of his people.

Once committed to the Russian alliance, however, he became the faithful henchman of the emperor Alexander, whose fascinating personality exercised over him to the last a singular power, and began that influence of Russia at the court of Berlin which was to last till Frederick William IV.'s supposed Liberalism was to shatter the cordiality of the *entente*. That during and after the settlement of 1815 Frederick William played a very secondary part in European affairs is explicable as well by his character as

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by the absorbing character of the internal problems of Prussia. He was one of the original co-signatories of the Holy Alliance, though, in common with most, he signed it with reluctance; and in the counsels of the Grand Alliance he allowed himself to be practically subordinated to Alexander and later to Metternich. In a ruler of his character it is not surprising that the Revolution and its developments had produced an unconquerable suspicion of constitutional principles and methods, which the Liberal agitations in Germany tended to increase. At the various congresses, from Aix-la-Chapelle (1818) to Verona (1822), therefore, he showed himself heartily in sympathy with the repressive policy formulated in the Troppau Protocol. The promise of a constitution, which in the excitement of the War of Liberation he had made to his people, remained unfulfilled partly owing to this mental attitude, partly, however, to the all but insuperable difficulties in the way of its execution. But though reluctant to play the part of a constitutional king, Frederick William maintained to the full the traditional character of "first servant of the state." Though he chastised Liberal professors and turbulent students, it was in the spirit of a benevolent *Landesvater*; and he laboured assiduously at the enormous task of administrative reconstruction necessitated by the problem of welding the heterogeneous elements of the new Prussian kingdom into a united whole. He was sincerely religious; but his well-meant efforts to unite the Lutheran and Reformed Churches, in celebration of the tercentenary of the Reformation (1817), revealed the limits of his paternal power; eleven years passed in vain attempts to devise common formulae; a stubborn Lutheran minority had to be coerced by military force, the confiscation of their churches and the imprisonment or exile of their pastors; not till 1834 was outward union secured on the basis of common worship but separate symbols, the opponents of the measure being forbidden to form communities of their own. With the Roman Church, too, the king came into conflict on the vexed question of "mixed marriages," a conflict in which the Vatican gained an easy victory (see BUNSEN, C.C.J., BARON VON).

The revolutions of 1830 strengthened Frederick William in his reactionary tendencies; the question of the constitution was indefinitely shelved; and in 1831 Prussian troops concentrated on the frontier helped the task of the Russians in reducing the military rising in Poland. Yet, in spite of all, Frederick William was beloved by his subjects, who valued him for the simplicity of his manners, the goodness of his heart and the memories of the dark days after 1806. He died on the 7th of June 1840. In 1824 he had contracted a morganatic marriage with the countess Auguste von Harrach, whom he created Princess von Liegnitz. He wrote *Luther in Bezug auf die Kirchenagenda von 1822 und 1823* (Berlin, 1827), *Reminiszensen aus der Kampagne 1792 in Frankreich*, and *Journal meiner Brigade in der Kampagne am Rhein 1793*.

The correspondence (*Briefwechsel*) of King Friedrich William III. and Queen Louise with the emperor Alexander I. has been published (Leipzig, 1900) and also that between the king and queen (*ib.* 1903), both edited by P. Bailleu. See W. Hahn, *Friedrich Wilhelm III. und Luise* (3rd ed., Leipzig, 1877); M. W. Duncker, *Aus der Zeit Friedrichs des Grossen und Friedrich Wilhelms III.* (Leipzig, 1876); Bishop R. F. Eylert, *Charakterzüge aus dem Leben des Königs von Preussen Friedrich Wilhelm III.* (3 vols., Magdeburg, 1843–1846).

FREDERICK WILLIAM IV. (1795–1861), king of Prussia, eldest son of Frederick William III., was born on the 15th of October 1795. From his first tutor, Johann Delbrück, he imbibed a love of culture and art, and possibly also the dash of Liberalism which formed an element of his complex habit of mind. But after a time Delbrück, suspected of inspiring his charge with a dislike of the Prussian military caste and even of belonging to a political secret society, was dismissed, his place being taken by the pastor and historian Friedrich Ancillon, while a military governor was also appointed. By Ancillon he was grounded in religion, in history and political science, his natural taste for the antique and the picturesque making it easy for his tutor to impress upon him his own hatred of the Revolution and its principles. This hatred was confirmed by the sufferings of his country and family in the terrible years after 1806, and his first experience of active soldiering was in the campaigns that ended in the occupation of Paris by the Allies in 1814. In action his reckless bravery had earned him rebuke, and in Paris he was remarked for the exact performance of his military duties, though he found time to whet his appetite for art in the matchless collections gathered by Napoleon as the spoil of all Europe. On his return to Berlin he studied art under the sculptor Christian Daniel Rauch and the painter and architect Karl Friedrich Schinkel (1781–1841), proving himself in the end a good draughtsman, a born architect and an excellent landscape gardener. At the same time he was being tutored in law by Savigny and in finance by a series of distinguished masters. In 1823 he married the princess Elizabeth of Bavaria, who adopted the Lutheran creed. The union, though childless, was very happy. A long tour in Italy in 1828 was the beginning of his intimacy with Bunsen and did much to develop his knowledge of art and love of antiquity.

On his accession to the throne in 1840 much was expected of a prince so variously gifted and of so amiable a temper, and his first acts did not belie popular hopes. He reversed the unfortunate ecclesiastical policy of his father, allowing a wide liberty of dissent, and releasing the imprisoned archbishop of Cologne; he modified the strictness of the press censorship; above all he undertook, in the presence of the deputations of the provincial diets assembled to greet him on his accession, to carry out the long-deferred project of creating a central constitution, which he admitted to be required alike by the royal promises, the needs of the country and the temper of the times. The story of the evolution of the Prussian parliament belongs to the history of Prussia. Here it must suffice to notice Frederick William's personal share in the question, which was determined by his general attitude of mind. He was an idealist; but his idealism was of a type the exact reverse of that which the Revolution in arms had sought to impose upon Europe. The idea of the sovereignty of the people was to him utterly abhorrent, and even any delegation of sovereign power on his own part would have seemed a betrayal of a God-given trust. "I will never," he declared, "allow to come between Almighty God and this country a plotted parchment, to rule us with paragraphs, and to replace the ancient, sacred bond of loyalty." His vision of the ideal state was that of a patriarchial monarchy, surrounded and advised by the traditional estates of the realm—nobles, peasants, burghers—and cemented by the bonds of evangelical religion; but in which there should be no question of the sovereign power being vested in any other hands than those of the king by divine right. In Prussia, with its traditional loyalty and its old-world caste divisions, he believed that such a conception could be realized, and he took up an attitude half-way between those who would have rejected the proposal for a central diet altogether as a dangerous "thin end of the wedge," and those who would have approximated it more to the modern conception of a parliament. With a charter, or a representative system based on population, he would have nothing to do. The united diet which was opened on the 3rd of February 1847 was no more than a congregation of the diets instituted by Frederick William III. in the eight provinces of Prussia. Unrepresentative though it was—for the industrial working-classes had no share in it—it at once gave voice to the demand for a constitutional system.

This demand gained overwhelmingly in force with the revolutionary outbreaks of 1848. To Frederick William these came as a complete surprise, and, rudely awakened from his medieval dreamings, he even allowed himself to be carried away for a while by the popular tide. The loyalty of the Prussian army remained inviolate; but the king was too tender-hearted to use military force against his "beloved Berliners," and when the victory of the populace was thus assured his impressionable temper yielded to the general enthusiasm. He paraded the streets of Berlin wrapped in a scarf of the German black and gold, symbol of his intention to be the leader of the united Germany; and he even wrote to the indignant tsar in praise of "the glorious German revolution." The change of sentiment was, however, apparent rather than real. The shadow of venerable institutions, past or

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passing, still darkened his counsels. The united Germany which he was prepared to champion was not the democratic state which the theorists of the Frankfort national parliament were evolving on paper with interminable debate, but the old Holy Roman Empire, the heritage of the house of Habsburg, of which he was prepared to constitute himself the guardian so long as its lawful possessors should not have mastered the forces of disorder by which they were held captive. Finally, when Austria had been excluded from the new empire, he replied to the parliamentary deputation that came to offer him the imperial crown that he might have accepted it had it been freely offered to him by the German princes, but that he would never stoop "to pick up a crown out of the gutter."

Whatever may be thought of the manner of this refusal, or of its immediate motives, it was in itself wise, for the German empire would have lost immeasurably had it been the cause rather than the result of the inevitable struggle with Austria, and Bismarck was probably right when he said that, to weld the heterogeneous elements of Germany into a united whole, what was needed was, not speeches and resolutions, but a policy of "blood and iron." In any case Frederick William, uneasy enough as a constitutional king, would have been impossible as a constitutional emperor. As it was, his refusal to play this part gave the deathblow to the parliament and to all hope of the immediate creation of a united Germany. For Frederick William the position of leader of Germany now meant the employment of the military force of Prussia to crush the scattered elements of revolution that survived the collapse of the national movement. His establishment of the northern confederacy was a reversion to the traditional policy of Prussia in opposition to Austria, which, after the emperor Nicholas had crushed the insurrection in Hungary, was once more free to assert her claims to dominance in Germany. But Prussia was not ripe for a struggle with Austria, even had Frederick William found it in his conscience to turn his arms against his ancient ally, and the result was the humiliating convention of Olmütz (November 29th, 1850), by which Prussia agreed to surrender her separatist plans and to restore the old constitution of the confederation. Yet Frederick William had so far profited by the lessons of 1848 that he consented to establish (1850) a national parliament, though with a restricted franchise and limited powers. The House of Lords (*Herrenhaus*) justified the king's insistence in calling it into being by its support of Bismarck against the more popular House during the next reign.

In religious matters Frederick William was also largely swayed by his love for the ancient and picturesque. In concert with his friend Bunsen he laboured to bring about a rapprochement between the Lutheran and Anglican churches, the first-fruits of which was the establishment of the Jerusalem bishopric under the joint patronage of Great Britain and Prussia; but the only result of his efforts was to precipitate the secession of J. H. Newman and his followers to the Church of Rome. In general it may be said that Frederick William, in spite of his talents and his wide knowledge, lived in a dream-land of his own, out of touch with actuality. The style of his letters reveals a mind enthusiastic and ill-balanced. In the summer of 1857 he had a stroke of paralysis, and a second in October. From this time, with the exception of brief intervals, his mind was completely clouded, and the duties of government were undertaken by his brother William (afterwards emperor), who on the 7th of October 1858 was formally recognized as regent. Frederick William died on the 2nd of January 1861.

Selections from the correspondence (*Briefwechsel*) of Frederick William IV. and Bunsen were edited by Ranke (Leipzig, 1873); his proclamations, speeches, &c., from the 6th of March 1848 to the 31st of May 1851 have been published (Berlin, 1851); also his correspondence with Bettina von Arnim, *Bettina von Arnim und Friedrich Wilhelm IV., ungedruckte Briefe und Aktenstücke*, ed. L. Geiger (Frankfort-on-Main, 1902). See L. von Ranke, *Friedrich Wilhelm IV., König von Preussen* (works 51, 52 also in *Allgem. deutsche Biog.* vol. vii.), especially for the king's education and the inner history of the debates leading up to the united diet of 1847; H. von Petersdorff, *König Friedrich Wilhelm IV.* (Stuttgart, 1900); F. Rachfahl, *Deutschland, König Friedrich Wilhelm IV. und die Berliner Märzrevolution* (Halle, 1901); H. von Poschinger (ed.), *Unter Friedrich Wilhelm IV. Denkwürdigkeiten des Ministers Otto Frhr. von Manteuffel, 1848–1858* (3 vols., Berlin, 1900–1901); and *Preussens auswärtige Politik, 1850–1858* (3 vols., ib., 1902), documents selected from those left by Manteuffel; E. Friedberg, *Die Grundlagen der preussischen Kirchenpolitik unter Friedrich Wilhelm IV.* (Leipzig, 1882).

FREDERICK WILLIAM (1620–1688), elector of Brandenburg, usually called the "Great Elector," was born in Berlin on the 16th of February 1620. His father was the elector George William, and his mother was Elizabeth Charlotte, daughter of Frederick IV., elector palatine of the Rhine. Owing to the disorders which were prevalent in Brandenburg he passed part of his youth in the Netherlands, studying at the university of Leiden and learning something of war and statecraft under Frederick Henry, prince of Orange. During his boyhood a marriage had been suggested between him and Christina, afterwards queen of Sweden; but although the idea was revived during the peace negotiations between Sweden and Brandenburg, it came to nothing, and in 1646 he married Louise Henriette (d. 1667), daughter of Frederick Henry of Orange, a lady whose counsel was very helpful to him and who seconded his efforts for the welfare of his country.

Having become ruler of Brandenburg and Prussia by his father's death in December 1640, Frederick William set to work at once to repair the extensive damage wrought during the Thirty Years' War, still in progress. After some difficulty he secured his investiture as duke of Prussia from Wladislaus, king of Poland, in October 1641, but was not equally successful in crushing the independent tendencies of the estates of Cleves. It was in Brandenburg, however, that he showed his supreme skill as a diplomatist and administrator. His disorderly troops were replaced by an efficient and disciplined force; his patience and perseverance freed his dominions from the Swedish soldiers; and the restoration of law and order was followed by a revival of trade and an increase of material prosperity. After a tedious struggle he succeeded in centralizing the administration, and controlling and increasing the revenue, while no department of public life escaped his sedulous care (see BRANDENBURG). The area of his dominions was largely increased at the peace of Westphalia in 1648, and this treaty and the treaty of Oliva in 1660 alike added to his power and prestige. By a clever but unscrupulous use of his intermediate position between Sweden and Poland he procured his recognition as independent duke of Prussia from both powers, and eventually succeeded in crushing the stubborn and lengthened opposition which was offered to his authority by the estates of the duchy (see PRUSSIA). After two checks he made his position respected in Cleves, and in 1666 his title to Cleves, Jülich and Ravensberg was definitely recognized. His efforts, however, to annex the western part of the duchy of Pomerania, which he had conquered from the Swedes, failed owing to the insistence of Louis XIV. at the treaty of St Germain-en-Laye in 1679, and he was unable to obtain the Silesian duchies of Liegnitz, Brieg and Wohlau from the emperor Leopold I. after they had been left without a ruler in 1675.

Frederick William played an important part in European politics. Although found once or twice on the side of France, he was generally loyal to the interests of the empire and the Habsburgs, probably because his political acumen scented danger to Brandenburg from the aggressive policy of Louis XIV. He was a Protestant in religion, but he supported Protestant interests abroad on political rather than on religious grounds, and sought, but without much success, to strengthen Brandenburg by allaying the fierce hostility between Lutherans and Calvinists. His success in founding and organizing the army of Brandenburg-Prussia was amply demonstrated by the great victory which he gained over the Swedes at Fehrbellin in June 1675, and by the eagerness with which foreign powers sought his support. He was also the founder of the Prussian navy. The elector assisted trade in every possible way. He made the canal which still bears his name between the Oder and the Spree; established a trading company; and founded colonies on the west coast of Africa. He encouraged Flemings to settle in Brandenburg,

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and both before and after the revocation of the edict of Nantes in 1685 welcomed large numbers of Huguenots, who added greatly to the welfare of the country. Education was not neglected; and if in this direction some of his plans were abortive, it was from lack of means and opportunity rather than effort and inclination. It is difficult to overestimate the services of the great elector to Brandenburg and Prussia. They can only be properly appreciated by those who compare the condition of his country in 1640 with its condition in 1688. Both actually and relatively its importance had increased enormously; poverty had given place to comparative wealth, and anarchy to a system of government which afterwards made Prussia the most centralized state in Europe. He had scant sympathy with local privileges, and in fighting them his conduct was doubtless despotic. His aim was to make himself an absolute ruler, as he regarded this as the best guarantee for the internal and external welfare of the state.

The great elector died at Potsdam from dropsy on the 9th of May 1688, and was succeeded by his eldest surviving son, Frederick. His personal appearance was imposing, and although he was absolutely without scruples when working for the interests of Brandenburg, he did not lack a sense of justice and generosity. At all events he deserves the eulogy passed upon him by Frederick the Great, "*Messieurs; celui-ci a fait de grandes choses.*" His second wife, whom he married in 1668, was Dorothea (d. 1689), daughter of Philip, duke of Holstein-Glücksburg, and widow of Christian Louis, duke of Brunswick-Lüneburg; she bore him four sons and three daughters. His concluding years were troubled by differences between his wife and her step-son, Frederick; and influenced by Dorothea he bequeathed portions of Brandenburg to her four sons, a bequest which was annulled under his successor.

See S. de Pufendorf, *De rebus gestis Friderici Wilhelmi Magni* (Leipzig and Berlin, 1733); L. von Orlich, *Friedrich Wilhelm der grosse Kurfürst* (Berlin, 1836); K. H. S. Rödenbeck, *Zur Geschichte Friedrich Wilhelms des grossen Kurfürsten* (Berlin, 1851); B. Erdmannsdörffer, *Der grosse Kurfürst* (Leipzig, 1879); J. G. Droysen, *Geschichte der preussischen Politik* (Berlin, 1855–1886); M. Philippson, *Der grosse Kurfürst* (Berlin, 1897–1903); E. Heyck, *Der grosse Kurfürst* (Bielefeld, 1902); Spahn, *Der grosse Kurfürst* (Mainz, 1902); H. Landwehr, *Die Kirchenpolitik des grossen Kurfürsten* (Berlin, 1894); H. Prutz, *Aus des grossen Kurfürsten letzten Jahren* (Berlin, 1897). Also *Urkunden und Aktenstücke zur Geschichte des Kurfürsten Friedrich Wilhelm von Brandenburg* (Berlin, 1864–1902); T. Carlyle, *History of Frederick the Great*, vol. i. (London, 1858); and A. Waddington, *Le Grand Électeur et Louis XIV* (Paris, 1905).

FRÉDÉRICK-LEMAÎTRE, ANTOINE LOUIS PROSPER (1800–1876) French actor, the son of an architect, was born at Havre on the 28th of July 1800. He spent two years at the Conservatoire, and made his first appearance at a variety performance in one of the basement restaurants at the Palais Royal. At the Ambigu on the 12th of July 1823 he played the part of Robert Macaire in *L'Auberge des Adrets*. The melodrama was played seriously on the first night and was received with little favour, but it was changed on the second night to burlesque, and thanks to him had a great success. All Paris came to see it, and from that day he was famous. He created a number of parts that added to his popularity, especially Cardillac, Cagliostro and Cartouche. His success in the last led to an engagement at the Porte St Martin, where in 1827 he produced *Trente ans, ou la vie d'un joueur*, in which his vivid acting made a profound impression. Afterwards at the Odéon and other theatres he passed from one success to another, until he put the final touch to his reputation as an artist by creating the part of Ruy Blas in Victor Hugo's play. On his return to the Porte St Martin he created the title-rôle in Balzac's *Vautrin*, which was forbidden a second presentation, on account, it is said, of the resemblance of the actor's wig to the well-known *toupet* worn by Louis Philippe. His last appearance was at this theatre in 1873 as the old Jew in *Marie Tudor*, and he died at Paris on the 26th of January 1876.

FREDERICKSBURG, a city of Spottsylvania county, Virginia, U.S.A., on the Rappahannock river, at the head of tide-water navigation, about 60 m. N. of Richmond and about 55 m. S.S.W. of Washington. Pop. (1890) 4528; (1900) 5068 (1621 negroes); (1910) 5874. It is served by the Potomac, Fredericksburg & Piedmont, and the Richmond, Fredericksburg & Potomac railways, and by several coasting steamship lines. The city is built on a series of terraces between the river and hills of considerable height. The river is here spanned by iron bridges, and just above the city is a dam 900 ft. long and 18 ft. high. By means of this dam and a canal good water-power is furnished, and the city's manufactures include flour, leather, shoes, woollens, silks, wagons, agricultural implements and excelsior (fine wood-shavings for packing or stuffing). The water-works, gas and electric-lighting plants are owned and operated by the municipality. At Fredericksburg are Fredericksburg College (founded in 1893; co-educational), which includes the Kenmore school for girls and the Saunders memorial school for boys (both preparatory); a Confederate and a National cemetery (the latter on Marye's Heights), a monument (erected in 1906) to General Hugh Mercer (*c.* 1720–1777), whose home for several years was here and who fell in the battle of Princeton; and a monument to the memory of Washington's mother, who died here in 1789 and whose home is still standing. Other buildings of interest are the old Rising Sun Hotel, a popular resort during Washington's time, and "Kenmore," the home of Colonel Fielding Lewis, who married a sister of Washington. The city was named in honour of Frederick, father of George III., and was incorporated in 1727, long after its first settlement; in 1871 it was re-chartered by act of the General Assembly of Virginia.

The battle of Fredericksburg in the American Civil War was fought on the 13th of December 1862 between the Union forces (Army of the Potomac) under Major-General A. E. Burnside and the Confederates (Army of Northern Virginia) under General R. E. Lee. In the middle of November, Burnside, newly appointed to command the Army of the Potomac, had manœuvred from the neighbourhood of Warrenton with a view to beginning an offensive move from Fredericksburg and, as a preliminary, to seizing a foothold beyond the Rappahannock at or near that place. On arriving near Falmouth, however, he found that the means of crossing that he had asked for had not been forwarded from Washington, and he sat down to wait for them, while, on the other side, the Confederate army gradually assembled south of the Rappahannock in a strong position with the left on the river above Fredericksburg and the right near Hamilton's Crossing on the Richmond railway. On the 10th of December Burnside, having by now received his pontoons, prepared to cross the river and to attack the Confederate entrenched position on the heights beyond the town. The respective forces were Union 122,000, Confederate 79,000. Major-General E. V. Sumner, commanding the Federal right wing (II. and IX. corps), was to cross at Fredericksburg, Major-General W. B. Franklin with the left (I. and VI. corps) some miles below, while the centre (III. and V. corps) under Major-General Joseph Hooker was to connect the two attacks and to reinforce either at need. The Union artillery took position along the heights of the north bank to cover the crossing, and no opposition was encountered opposite Franklin's command, which formed up on the other side during the 11th and 12th. Opposite Sumner, however, the Confederate riflemen, hidden in the gardens and houses of Fredericksburg, caused much trouble and considerable losses to the Union pioneers, and a forlorn hope of volunteers from the infantry had to be rowed across under fire before the enemy's skirmishers could be dislodged. Sumner's two corps crossed on the 12th. The battle took place next morning.

Controversy has raged round Burnside's plan of action and in particular round his orders to Franklin, as to which it can only be said that whatever chance of success there was in so formidable an undertaking as attacking the well-posted enemy was thrown away through misunderstandings, and that nothing but misunderstandings could be expected from the vague and bewildering orders issued by the general in command. The actual battle can be described in a few words. Jackson held the right of Lee's line, Longstreet the left, both entrenched. Franklin, tied by

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his instructions, attacked with one division only, which a little later he supported by two more (I. corps, Major-General J. F. Reynolds) out of eight or nine available. His left flank was harassed by the Confederate horse artillery under the young and brilliant Captain John Pelham, and after breaking the first line of Stonewall Jackson's corps the assailants were in the end driven back with heavy losses. On the other flank, where part of Longstreet's corps held the low ridge opposite Fredericksburg called Marye's Heights, Burnside ordered in the II. corps under Major-General D. N. Couch about 11 A.M., and thenceforward division after division, on a front of little more than 800 yds., was sent forward to assault with the bayonet. The "Stone Wall" along the foot of Marye's was lined with every rifle of Longstreet's corps that could find room to fire, and above them the Confederate guns fired heavily on the assailants, whose artillery, on the height beyond the river, was too far off to assist them. Not a man of the Federals reached the wall, though the bravest were killed a few paces from it, and Sumner's and most of Hooker's brigades were broken one after the other as often as they tried to assault. At night the wrecks of the right wing were withdrawn. Burnside proposed next day to lead the IX. corps, which he had formerly commanded, in one mass to the assault of the Stone Wall, but his subordinates dissuaded him, and on the night of the 15th the Army of the Potomac withdrew to its camps about Falmouth. The losses of the Federals were 12,650 men, those of the Confederates 4200, little more than a third of which fell on Longstreet's corps.

See F. W. Palfrey, *Antietam and Fredericksburg* (New York, 1881); G. W. Redway, *Fredericksburg* (London, 1906); and G. F. R. Henderson, *Fredericksburg* (London, 1889).

FREDERICTON, a city and port of entry of New Brunswick, Canada, capital of the province, situated on the St John river, 84 m. from its mouth, and on the Canadian Pacific railway. It stands on a plain bounded on one side by the river, which is here ½ m. broad, and on the other by a range of hills which almost encircle the town. It is regularly built with long and straight streets, and contains the parliament buildings, government house, the Anglican cathedral, the provincial university and several other educational establishments. Fredericton is the chief commercial centre in the interior of the province, and has also a large trade in lumber. Its industries include canneries, tanneries and wooden ware factories. The river is navigable for large steamers up to the city, and above it by vessels of lighter draught. Two bridges, passenger and railway, unite the city with the towns of St Marye's and Gibson on the east side of the river, at its junction with the Nashwaak. The city was founded in 1785 by Sir Guy Carleton, and made the capital of the province, in spite of the jealousy of St John, on account of its superior strategical position. Pop. (1901) 7117.

FREDONIA, a village of Chautauqua county, New York, U.S.A., about 45 m. S.W. of Buffalo, and 3 m. from Lake Erie. Pop. (1900) 4127; (1905, state census) 5148; (1910 census) 5385. Fredonia is served by the Dunkirk, Allegheny Valley & Pittsburg railway, which connects at Dunkirk, 3 m. to the N., with the Erie, the Lake Shore & Michigan Southern, the New York, Chicago & St Louis, and the Pennsylvania railways; and by electric railway to Erie, Buffalo and Dunkirk. It is the seat of a State Normal School. The Darwin R. Barker public library contained 9700 volumes in 1908. Fredonia is situated in the grape-growing region of western New York, is an important shipping point for grapes, and has large grape-vine and general nurseries. The making of wine and of unfermented grape-juice are important industries of the village. Among other manufactures are canned goods, coal dealers' supplies, and patent medicines. The first settlement here was made in 1804, and the place was called Canandaway until 1817, when the present name was adopted. The village was incorporated in 1829. Fredonia was one of the first places in the United States, if not the first, to make use of natural gas for public purposes. Within the village limits, near a creek, whose waters showed the presence of gas, a well was sunk in 1821, and the supply of gas thus tapped was sufficient to light the streets of the village. Another well was sunk within the village limits in 1858. About 1905 natural gas was again obtained by deep drilling near Fredonia and came into general use for heat, light and power. In the Fredonia Baptist church on the 14th of December 1873 a Woman's Temperance Union was organized, and from this is sometimes dated the beginning of the Woman's Christian Temperance Union movement.

FREDRIKSHALD (FREDERIKSHALD, FRIEDRICHSHALL), a seaport and garrison town of Norway, in Smaalenene *amt* (county), 85 m. by rail S. by E. of Christiania. Pop. (1900) 11,048. It is picturesquely situated on both banks of the Tistedal river at its outflow to the Ide fjord, surrounded by several rocky eminences. The chief of these is occupied by the famous fortress Fredriksten, protected on three sides by precipices, founded by Frederick III. (1661), and mainly showing, in its present form, the works of Frederick V. (1766) and Christian VII. (1808). Between it and the smaller Gyldenlöve fort a monument marks the spot where Charles XII. was shot in the trenches while besieging the town (1718). The siege, which was then raised, is further commemorated by a monument to the heroic defence of the brothers Peter and Hans Kolbjörnsen. Fredrikshald is close to the Swedish frontier, and had previously (1660) withstood invasion, after which its name was changed from Halden to the present form in 1665 in honour of Frederick III. The town was almost totally destroyed by fire in 1759 and 1826. The castle surrendered to the Swedish crown prince Bernadotte in 1814, and its capture was speedily followed by the conquest of the kingdom and its union with Sweden. Fredrikshald is one of the principal ports of the kingdom for the export of timber. Marble of very fine quality and grain is extensively quarried and exported for architectural ornamentation and for furniture-making. Wood-pulp is also exported. The industries embrace granite quarries, wood-pulp factories, and factories for sugar, tobacco, curtains, travelling-bags, boots, &c. There are railway communications with Gothenburg and all parts of Sweden and regular coastal and steamer services.

FREDRIKSTAD (FREDERIKSTAD), a seaport and manufacturing town of Norway in Smaalenene *amt* (county), 58 m. S. by E. of Christiania by the Christiania-Gothenburg railway. Pop. (1900) 14,553. It lies at the mouth and on the eastern shore of Christiania fjord, occupying both banks of the great river Glommen, which, descending from the richly-wooded district of Österdal, floats down vast quantities of timber. The new town on the right bank is therefore a centre of the timber export trade, this place being the principal port in Norway for the export of pit-props, planed boards, and other varieties of timber. There is also a great industry in the making of red bricks, owing to the expansion of Christiania, Gothenburg and other towns. Granite is quarried and exported. Besides the large number of saw and planing mills, there are shipbuilding yards, engine and boiler works, cotton and woollen mills, and factories for acetic acid and naphtha. The harbour, which can be entered by vessels drawing 14 ft., is kept open in winter by an ice-breaker. In the vicinity is the island Hankö, the most fashionable Norwegian seaside resort. The old town on the left bank was founded by Frederick II. in 1567. It was for a long time strongly fortified, and in 1716 Charles XII. of Sweden made a vain attempt to capture it.

FREE BAPTISTS, formerly called (but no longer officially) FREEWILL BAPTISTS, an American denomination holding anti-paedobaptist and anti-Calvinistic doctrines, and practically identical in creed with the General Baptists of Great Britain. Many of the early Baptist churches in Rhode Island and throughout the South were believers in "general redemption" (hence called "general" Baptists); and there was a largely attended conference of this Arminian branch of the church at Newport in 1729. But the denomination known as "Free-willers" had its rise in 1779–1780, when anti-Calvinists in Loudon, Barrington and Canterbury, New Hampshire, seceded and were organized by Benjamin Randall (1749–1808), a native of New Hampshire. Randall was an itinerant missionary, who had been preaching for two years before his ordination in 1780; in the same year he was censured for "heterodox" teaching. The work of the church suffered a relapse after his death, and a movement to join

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the Freewill Baptists with the "Christians," who were led by Elias Smith (1769–1846) and had been bitterly opposed by Randall, was nearly successful. Between 1820 and 1830 the denomination made considerable progress, especially in New England and the Middle West. The Freewill Baptists were joined in 1841 by many "open-communion Baptists"—those in the Carolinas who did not join the larger body distinguishing themselves by the name of Original Freewill Baptists—and soon afterwards by some of the General Baptists of North Carolina and some of the Six Principle Baptists of Rhode Island (who had added the "laying on of hands" to the Five Principles hitherto held); and the abbreviation of the denominational name to "Free Baptists" suggests their liberal policy—indeed open communion is the main if not the only hindrance to union with the "regular" Baptist Church.

Colleges founded by the denomination, all co-educational, are: Hillsdale College, opened at Spring Harbor as Michigan Central College in 1844, and established at Hillsdale, Michigan, in 1855; Bates College, Lewiston, Maine, 1863, now non-sectarian; Rio Grande College, Rio Grande, Ohio, 1876; and Parker College, Winnebago City, Minnesota, opened in 1888. At the close of 1909 there were 1294 ministers, 1303 churches, and 73,536 members of the denomination in the United States. *The Morning Star* of Boston, established in 1826, is the most prominent journal published by the church. In British North America, according to a Canadian census bulletin of 1902, there were, in 1901, 24,229 Free Baptists, of whom 15,502 were inhabitants of New Brunswick, 8355 of Nova Scotia, 246 of Ontario, and 87 of Quebec. The United Societies of Free Baptist Young People, an international organization founded in 1888, had in 1907 about 15,000 members. At the close of 1907 the "Original Freewill Baptists" had 120 ministers, 167 churches, and 12,000 members, practically all in the Carolinas.

See I. D. Stewart, *History of the Free Will Baptists* (Dover, N. H., 1862) for 1780–1830, and his edition of the *Minutes of the General Conference of the Free Will Baptist Connection* (Boston, 1887); James B. Taylor, *The Centennial Record of the Free Will Baptists* (Dover, 1881); John Buzzell, *Memoir of Elder Benjamin Randall* (Parsonfield, Maine, 1827); and P. Richardson, "Randall and the Free Will Baptists," in *The Christian Review*, vol. xxiii. (Baltimore, 1858).

FREEBENCH, in English law, the interest which a widow has in the copyhold lands of her husband, corresponding to dower in the case of freeholds. It depends upon the custom of the manor, but as a general rule the widow takes a third for her life of the lands of which her husband dies seised, but it may be an estate greater or less than a third. If the husband surrenders his copyhold and the surrenderee is admitted, or if he contracts for a sale, it will defeat the widow's freebench. As freebench is regarded as a continuation of the husband's estate, the widow does not (except by special custom) require to be admitted.

FREE CHURCH FEDERATION, a voluntary association of British Nonconformist churches for co-operation in religious, social and civil work. It was the outcome of a unifying tendency displayed during the latter part of the 19th century. About 1890 the proposal that there should be a Nonconformist Church Congress analogous to the Anglican Church Congress was seriously considered, and the first was held in Manchester on the 7th of November 1892. In the following year it was resolved that the basis of representation should be neither personal (as in the Anglican Church Congress) nor denominational, but territorial. England and Wales have since been completely covered with a network of local councils, each of which elects its due proportion of representatives to the national gathering. This territorial arrangement eliminated all sectarian distinctions, and also the possibility of committing the different churches as such to any particular policy. The representatives of the local councils attend not as denominationalists but as Evangelical Free Churchmen. The name of the organization was changed from Congress to National Council as soon as the assembly ceased to be a fortuitous concourse of atoms, and consisted of duly appointed representatives from the local councils of every part of England. The local councils consist of representatives of the Congregational and Baptist Churches, the Methodist Churches, the Presbyterian Church of England, the Free Episcopal Churches, the Society of Friends, and such other Evangelical Churches as the National Council may at any time admit. The constitution states the following as the objects of the National Council: (*a*) To facilitate fraternal intercourse and co-operation among the Evangelical Free Churches; (*b*) to assist in the organization of local councils; (*c*) to encourage devotional fellowship and mutual counsel concerning the spiritual life and religious activities of the Churches; (*d*) to advocate the New Testament doctrine of the Church, and to defend the rights of the associated Churches; (*e*) to promote the application of the law of Christ in every relation of human life. Although the objects of the Free Church councils are thus in their nature and spirit religious rather than political, there are occasions on which action is taken on great national affairs. Thus a thorough-going opposition was offered to the Education Act of 1902, and whole-hearted support accorded to candidates at the general election of 1906 who pledged themselves to altering that measure.

A striking feature of the movement is the adoption of the parochial system for the purpose of local work. Each of the associated churches is requested to look after a parish, not of course with any attempt to exclude other churches, but as having a special responsibility for those in that area who are not already connected with some existing church. Throughout the United Kingdom local councils are formed into federations, some fifty in number, which are intermediate between them and the national council. The local councils do what is possible to prevent overlapping and excessive competition between the churches. They also combine the forces of the local churches for evangelistic and general devotional work, open-air services, efforts on behalf of Sunday observance, and the prevention of gambling. Services are arranged in connexion with workhouses, hospitals and other public institutions. Social work of a varied character forms a large part of the operations of the local councils, and the Free Church Girls' Guild has a function similar to that of the Anglican Girls' Friendly Society. The national council engages in mission work on a large scale, and a considerable number of periodicals, hymn-books for special occasions, and works of different kinds explaining the history and ideals of the Evangelical Free Churches have been published. The churches represented in the National Council have 9066 ministers, 55,828 local preachers, 407,991 Sunday-school teachers, 3,416,377 Sunday scholars, 2,178,221 communicants, and sitting accommodation for 8,555,460.

A remarkable manifestation of this unprecedented reunion was the fact that a committee of the associated churches prepared and published a catechism expressing the positive and fundamental agreement of all the Evangelical Free Churches on the essential doctrines of Christianity (see *The Contemporary Review*, January 1899). The catechism represents substantially the creed of not less than 80,000,000 Protestants. It has been widely circulated throughout Great Britain, the British Colonies and the United States of America, and has also been translated into Welsh, French and Italian.

The movement has spread to all parts of Australia, New Zealand, South Africa, Jamaica, the United States of America and India. It is perhaps necessary to add that it differs essentially from the Evangelical Alliance, inasmuch as its unit is not an individual, private Christian, but a definitely organized and visible Church. The essential doctrine of the movement is a particular doctrine of churchmanship which, as explained in the catechism, regards the Lord Jesus Christ as the sole and Divine Head of every branch of the Holy Catholic Church throughout the world. For this reason those who do not accept the deity of Christ are necessarily excluded from the national council and its local constituent councils.

FREE CHURCH OF ENGLAND, a Protestant episcopal church "essentially one with the established church of England, but free to go into any parish, to use a revised edition of the Book of Common Prayer, to associate the laity with the clergy in the government and work of the church, and to hold communion with Christians of other denominations." It was founded in 1844

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in opposition to the Tractarian movement, and embodies the distinctively evangelical elements of the Reformation. It preserves and maintains to the letter all that is Protestant and evangelical in the liturgy and services of the Anglican church, while its free constitution and revised formularies meet the needs of members of that communion who resent sacerdotal and ritualistic tendencies. There are two dioceses (northern and southern) each with a bishop, about 30 churches and ministers, and about 1300 members.

FREE CHURCH OF SCOTLAND. In one sense the Free Church of Scotland dated its existence from the Disruption of 1843, in another it claimed to be the rightful representative of the National Church of Scotland (see SCOTLAND, CHURCH OF) as it was reformed in 1560.[1] In the ecclesiastical history of Scotland the Free Churchman sees three great reforming periods. In his view these deserve to be called reforming on many accounts, but most especially because in them the independence of the church, her inherent scriptural right to exercise a spiritual jurisdiction in which she is responsible to her Divine Head alone, was both earnestly asserted and practically maintained. The first reformation extended from 1560, when the church freely held her first General Assembly, and of her own authority acted on the First Book of Discipline, to 1592, when her Presbyterian order was finally and fully ratified by the parliament. The second period began in 1638, when, after 20 years of suspended animation, the Assembly once more shook off Episcopacy, and terminated in 1649, when the parliament of Scotland confirmed the church in her liberties in a larger and ampler sense than before. The third period began in 1834, when the Assembly made use of what the church believed to be her rights in passing the Veto and Chapel Acts. It culminated in the Disruption of 1843.

The fact that the Church, as led first by John Knox and afterwards by Andrew Melville, claimed an inherent right to exercise a spiritual jurisdiction is notorious. More apt to be overlooked is the comparative freedom with which that right was actually used by the church irrespective of state recognition. That recognition was not given until after the queen's resignation in 1567;[2] but, for several years before it came, the church had been holding her Assemblies and settling all questions of discipline, worship, and administration as they arose, in accordance with the first book of polity or discipline which had been drawn up in 1560. Further, in 1581 she, of her own motion, adopted a second book of a similar character, in which she expressly claimed an independent and exclusive jurisdiction or power in all matters ecclesiastical, "which flows directly from God and the Mediator Jesus Christ, and is spiritual, not having a temporal head on earth, but only Christ, the only king and governor of his church"; and this claim, though directly negatived in 1584 by the "Black Acts," which included an Act of Supremacy over estates spiritual and temporal, continued to be asserted by the Assemblies, until at last it also was practically allowed in the act of 1592.[3] This legislation of 1592, however, did not long remain in force. An act of parliament in 1606, which "reponed, restored and reintegrated" the estate of bishops to their ancient dignities, prerogatives and privileges, was followed by several acts of various subservient assemblies, which, culminating in that of 1618, practically amounted to a complete surrender of jurisdiction by the church itself. For twenty years no Assemblies whatever were held. This interval must necessarily be regarded from the Presbyterian point of view as having been one of very deep depression. But a second reformation, characterized by great energy and vigour, began in 1638. The proceedings of the Assembly of that year, afterwards tardily and reluctantly acquiesced in by the state, finally issued in the acts of parliament of 1640, by which the Westminster standards were ratified, lay-patronage was abolished, and the coronation oath itself framed in accordance with the principles of Presbyterian church government. Another period of intense reaction soon set in. No Assemblies were permitted by Cromwell after 1653; and, soon after the Restoration, Presbytery was temporarily overthrown by a series of rescissory acts. Nor was the Revolution Settlement of 1690 so entirely favourable to the freedom of the church as the legislation of 1649 had been. Prelacy was abolished, and various obnoxious statutes were repealed, but the acts rescissory were not cancelled; presbyterianism was re-established, but the statutory recognition of the Confession of Faith took no notice of certain qualifications under which that document had originally been approved by the Assembly of 1647;[4] the old rights of patrons were again discontinued, but the large powers which had been conferred on congregations by the act of 1649 were not wholly restored. Nevertheless the great principle of a distinct ecclesiastical jurisdiction, embodied in the Confession of Faith, was accepted without reservation, and a Presbyterian polity effectively confirmed both then and at the ratification of the treaty of Union. This settlement, however, did not long subsist unimpaired. In 1712 the act of Queen Anne, restoring patronage to its ancient footing, was passed in spite of the earnest remonstrances of the Scottish people. For many years afterwards (until 1784) the Assembly continued to instruct each succeeding commission to make application to the king and the parliament for redress of the grievance. But meanwhile a new phase of Scottish ecclesiastical politics commonly known as Moderatism had been inaugurated, during the prevalence of which the church became even more indifferent than the lay patrons themselves to the rights of her congregations with regard to the "calling" of ministers. From the Free Church point of view, the period from which the secessions under Ebenezer Erskine and Thomas Gillespie are dated was also characterized by numerous other abuses on the Church's part which amounted to a practical surrender of the most important and distinctive principles of her ancient Presbyterian polity.[5] Towards the beginning of the present century there were many circumstances, both within and without the church, which conspired to bring about an evangelical and popular reaction against this reign of "Moderatism." The result was a protracted struggle, which is commonly referred to as the Ten Years' Conflict, and which has been aptly described as the last battle in the long war which for nearly 300 years had been waged within the church itself, between the friends and the foes of the doctrine of an exclusive ecclesiastical jurisdiction. That final struggle may be said to have begun with the passing in 1834 of the "Veto" Act, by which it was declared to be a fundamental law of the church that no pastor should be intruded on a congregation contrary to the will of the people,[6] and by which it was provided that the simple dissent of a majority of heads of families in a parish should be enough to warrant a presbytery in rejecting a presentee. The question of the legality of this measure soon came to be tried in the civil courts; and it was ultimately answered in a sense unfavourable to the church by the decision (1838) of the court of session in the Auchterarder case, to the effect that a presbytery had no right to reject a presentee simply because the parishioners protested against his settlement, but was bound to disregard the veto (see CHALMERS, THOMAS). This decision elicited from the Assembly

[1] "It is her being free, not her being established, that constitutes the real historical and hereditary identity of the Reformed National Church of Scotland." See *Act and Declaration*, &c., of Free Assembly, 1851.

[2] In the act *Anent the true and holy Kirk, and of those that are declared not to be of the same*. This act was supplemented by that of 1579, *Anent the Jurisdiction of the Kirk*.

[3] The Second Book of Discipline was not formally recognized in that act; but all former acts against "the jurisdiction and discipline of the true Kirk as the same is used and exercised within the realm" were abolished; and all "liberties, privileges, immunities and freedoms whatsoever" previously granted were ratified and approved.

[4] The most important of these had reference to the full right of a constituted church to the enjoyment of an absolutely unrestricted freedom in convening Assemblies. This very point on one occasion at least threatened to be the cause of serious misunderstandings between William and the people of Scotland. The difficulties were happily smoothed, however, by the wisdom and tact of William Carstares.

[5] See *Act and Declaration* of Free Assembly, 1851.

[6] This principle had been asserted even by an Assembly so late as that of 1736, and had been invariably presupposed in the "call," which had never ceased to be regarded as an indispensable prerequisite for the settlement of a minister.

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of that year a new declaration of the doctrine of the spiritual independence of the church. The "exclusive jurisdiction of the civil courts in regard to the civil rights and emoluments secured by law to the church and the ministers thereof" was acknowledged without qualification; and continued implicit obedience to their decisions with reference to these rights and emoluments was pledged. At the same time it was insisted on "that, as is declared in the Confession of Faith of this National Established Church, 'the Lord Jesus Christ, as King and Head of the church, hath therein appointed a government in the hand of church officers distinct from the civil magistrate'; and that in all matters touching the doctrine, discipline and government of the church her judicatories possess an exclusive jurisdiction, founded on the Word of God, which power ecclesiastical" (in the words of the Second Book of Discipline) "flows immediately from God and the Mediator the Lord Jesus Christ, and is spiritual, not having a temporal head on earth, but only Christ, the only spiritual King and Governor of His Kirk." And it was resolved to assert, and at all hazards defend, this spiritual jurisdiction, and firmly to enforce obedience to the same upon the office-bearers and members of the church. The decision of the court of session having been confirmed by the House of Lords early in 1839, it was decided in the Assembly of that year that the church, while acquiescing in the loss of the temporalities at Auchterarder, should reaffirm the principle of non-intrusion as an integral part of the constitution of the Reformed Church of Scotland, and that a committee should be appointed to confer with the government with a view to the prevention, if possible, of any further collision between the civil and ecclesiastical authorities. While the conference with the government had no better result than an unsuccessful attempt at compromise by means of Lord Aberdeen's Bill, which embodied the principle of a dissent with reasons, still graver complications were arising out of the Marnoch and other cases.[1] In the circumstances it was resolved by the Assembly of 1842 to transmit to the queen, by the hands of the lord high commissioner, a "claim, declaration, and protest," complaining of the encroachments of the court of session,[2] and also an address praying for the abolition of patronage. The home secretary's answer (received in January 1843) gave no hope of redress. Meanwhile the position of the evangelical party had been further hampered by the decision of the court of session declaring the ministers of chapels of ease to be unqualified to sit in any church court. A final appeal to parliament by petition was made in March 1843, when, by a majority of 135 (211 against 76), the House of Commons declined to attempt any redress of the grievances of the Scottish Church.[3] At the first session of the following General Assembly (18th May 1843) the reply of the non-intrusion party was made in a protest, signed by upwards of 200 commissioners, to the effect that since, in their opinion, the recent decisions of the civil courts, and the still more recent sanction of these decisions by the legislature, had made it impossible at that time to hold a free Assembly of the church as by law established, they therefore "protest that it shall be lawful for us, and such other commissioners as may concur with us, to withdraw to a separate place of meeting, for the purpose of taking steps for ourselves and all who adhere to us—maintaining with us the Confession of Faith and standards of the Church of Scotland as heretofore understood—*for* separating in an orderly way from the Establishment, and thereupon adopting such measures as may be competent to us, in humble dependence on God's grace and the aid of His Holy Spirit, for the advancement of His glory, the extension of the gospel of our Lord and Saviour, and the administration of the affairs of Christ's house according to His holy word." The reading of this document was followed by the withdrawal of the entire non-intrusion party to another place of meeting, where the first Assembly of the Free Church was constituted, with Dr Thomas Chalmers as moderator. This Assembly sat from the 18th to the 30th of May, and transacted a large amount of important business. On Tuesday the 23rd, 396[4] ministers and professors publicly adhibited their names to the Act of Separation and deed of demission by which they renounced all claim to the benefices they had held in connexion with the Establishment, declaring them to be vacant, and consenting to their being dealt with as such. By this impressive proceeding the signatories voluntarily surrendered an annual income amounting to fully £100,000.

The first care of the voluntarily disestablished church was to provide incomes for her clergy and places of worship for her people. As early as 1841 indeed the leading principle of a "sustentation fund" for the support of the ministry had been announced by Dr Robert Smith Candlish; and at "Convocation," a private unofficial meeting of the members of the evangelical or non-Intrusion party held in November 1842, Dr Chalmers was prepared with a carefully matured scheme according to which "each congregation should do its part in sustaining the whole, and the whole should sustain each congregation." Between November 1842 and May 1843, 647 associations had been formed; and at the first Assembly it was announced that upwards of £17,000 had already been contributed. At the close of the first financial year (1843–1844) it was reported that the fund had exceeded £61,000. It was participated in by 583 ministers; and 470 drew the full equal dividend of £105. Each successive year showed a steady increase in the gross amount of the fund; but owing to an almost equally rapid increase of the number of new ministerial charges participating in its benefits, the stipend payable to each minister did not for many years reach the sum of £150 which had been aimed at as a minimum. Thus in 1844–1845 the fund had risen to £76,180, but the ministers had also increased to 627, and the equal dividend therefore was only £122. During the first ten years the annual income averaged £84,057; during the next decade £108,643; and during the third £130,246. The minimum of £150 was reached at last in 1868; and subsequently the balance remaining after that minimum had been provided was treated as a surplus fund, and distributed among those ministers whose congregations have contributed at certain specified rates per member. In 1878 the total amount received for this fund was upwards of £177,000; in this 1075 ministers participated. The full equal dividend of £157 was paid to 766 ministers; and additional grants of £36 and £18

[1] According to the Free Church "Protest" of 1843 it was in these cases decided (1) that the courts of the church were liable to be compelled to intrude ministers on unwilling congregations; (2) that the civil courts had power to interfere with and interdict the preaching of the gospel and administration of ordinances as authorized and enjoined by the church; (3) that the civil courts had power to suspend spiritual censures pronounced by the courts of the church, and to interdict their execution as to spiritual effects, functions and privileges; (4) that deposed ministers, and probationers deprived of their licence, could be restored by the mandate of the civil courts to the spiritual office and status of which the church courts had deprived them; (5) that the right of membership in ecclesiastical courts could be determined by the civil courts; (6) that the civil courts had power to supersede the majority of a church court of the Establishment in regard to the exercise of its spiritual functions as a church court, and to authorize the minority to exercise the said functions in opposition to the court itself and to the superior judicatories of the church; (7) that processes of ecclesiastical discipline could be arrested by the civil courts; and (8) that without the sanction of the civil courts no increased provision could be made for the spiritual care of a parish, although such provision left all civil rights and patrimonial interests untouched.

[2] The narrative and argument of this elaborate and able document cannot be reproduced here. In substance it is a claim "as of right" on behalf of the church and of the nation and people of Scotland that the church shall freely possess and enjoy her liberties, government, discipline, rights and privileges according to law, and that she shall be protected therein from the forensal unconstitutional and illegal encroachments of the said court of session, and her people secured in their Christian and constitutional rights and liberties. This claim is followed by the "declaration" that the Assembly cannot intrude ministers on reclaiming congregations, or carry on the government of Christ's church subject to the coercion of the court of session; and by the "protest" that all acts of the parliament of Great Britain passed without the consent of the Scottish church and nation, in alteration or derogation of the government, discipline, rights and privileges of the church, as also all sentences of courts in contravention of said government, discipline, rights and privileges, "are and shall be in themselves void and null, and of no legal force or effect."

[3] The Scottish members voted with the minority in the proportion of 25 to 12.

[4] The number ultimately rose to 474.

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were paid out of the surplus fund to 632 and 129 ministers respectively.

To provide for the erection of the buildings which, it was foreseen, would be necessary, a general building fund, in which all should share alike, was also organized, and local building funds were as far as possible established in each parish, with the result that at the first Assembly a sum of £104,776 was reported as already available. By May 1844 a further sum of £123,060 had been collected, and 470 churches were reported as completed or nearly so. In the following year £131,737 was raised and 60 additional churches were built. At the end of four years considerably more than 700 churches had been provided.

During the winter session 1843–1844 the divinity students who had joined the Free Church continued their studies under Dr Chalmers and Dr David Welsh (1793–1845); and at the Assembly of 1844 arrangements were made for the erection of suitable collegiate buildings. The New College, Edinburgh, was built in 1847 at a cost of £46,506; and divinity halls were subsequently set up also in Glasgow and Aberdeen. In 1878 there were 13 professors of theology, with an aggregate of 230 students,—the numbers at Edinburgh, Glasgow and Aberdeen respectively being 129, 60 and 32.

A somewhat unforeseen result of the Disruption was the necessity for a duplicate system of elementary schools. At the 1843 Assembly it was for the first time announced by Dr Welsh that "schools to a certain extent must be opened to afford a suitable sphere of occupation for parochial and still more for private teachers of schools, who are threatened with deprivation of their present office on account of their opinions upon the church question." The suggestion was taken up with very great energy, with the result that in May 1845, 280 schools had been set up, while in May 1847 this number had risen to 513, with an attendance of upwards of 44,000 scholars. In 1869 it was stated in an authoritative document laid before members of parliament that at that time there were connected with and supported by the Free Church 598 schools (including two normal schools), with 633 teachers and 64,115 scholars. The school buildings had been erected at a cost of £220,000, of which the committee of privy council had contributed £35,000, while the remainder had been raised by voluntary effort. Annual payments made to teachers, &c., as at 1869, amounted to £16,000. In accordance with certain provisions of the Education Act of 1872 most of the schools of the Free Church were voluntarily transferred, without compensation, to the local school boards. The normal schools are now transferred to the state.

It has been seen already that during the period of the Ten Years' Conflict the non-intrusion party strenuously denied that in any one respect it was departing from acknowledged principles of the National Church. It continued to do so after the Disruption. In 1846, however, it was found to have become necessary, "in consequence of the late change in the outward condition of the church," to amend the "questions and formula" to be used at the licensing of probationers and the ordination of office-bearers. These were amended accordingly; and at the same time it was declared that, "while the church firmly maintains the same scriptural principles as to the duties of nations and their rulers in reference to true religion and the Church of Christ for which she has hitherto contended, she disclaims intolerant, or persecuting principles, and does not regard her Confession of Faith, or any portion thereof when fairly interpreted, as favouring intolerance or persecution, or consider that her office-bearers by subscribing it profess any principles inconsistent with liberty of conscience and the right of private judgment." The main difference between the "formula" of the Free Church and that of the Established Church (as at the year 1900) was that the former referred to the Confession of Faith simply as "approven by General Assemblies of this Church," while the latter described it as "approven by the General Assemblies of this National Church, and ratified by law in the year 1690, and frequently confirmed by divers Acts of Parliament since that time." The former inserted an additional clause,—"I also approve of the general principles respecting the jurisdiction of the church, and her subjection to Christ as her only Head, which are contained in the Claim of Right and in the Protest referred to in the questions already put to me"; and also added the words which are here distinguished by italics,—"And I promise that through the grace of God I shall firmly and constantly adhere to the same, and to the utmost of my power shall in my station assert, maintain, and defend the said doctrine, worship, discipline and government of this church by kirk-sessions, presbyteries, provincial synods, and general assemblies, *together with the liberty and exclusive jurisdiction thereof*; and that I shall, in my practice, conform myself to the said worship and submit to the said discipline [and] government, *and exclusive jurisdiction*, and not endeavour directly or indirectly the prejudice or subversion of the same." In the year 1851 an act and declaration anent the publication of the subordinate standards and other authoritative documents of the Free Church of Scotland was passed, in which the historical fact is recalled that the Church of Scotland had formally consented to adopt the Confession of Faith, catechisms, directory of public worship, and form of church government agreed upon by the Westminster Assembly; and it is declared that "these several formularies, as ratified, with certain explanations, by divers Acts of Assembly in the years 1645, 1646, and particularly in 1647, this church continues till this day to acknowledge as her subordinate standards of doctrine, worship and government."[1]

In 1858 circumstances arose which, in the opinion of many, seemed fitted to demonstrate to the Free Church that her freedom was an illusion, and that all her sacrifices had been made in vain. John Macmillan, minister of Cardross, accused of immorality, had been tried and found guilty by the Free Presbytery of Dumbarton. Appeal having been taken to the synod, an attempt was there made to revive one particular charge, of which he had been finally acquitted by the presbytery; and this attempt was successful in the General Assembly. That ultimate court of review did not confine itself to the points appealed, but went into the merits of the whole case as it had originally come before the presbytery. The result was a sentence of suspension. Macmillan, believing that the Assembly had acted with some irregularity, applied to the court of session for an interdict against the execution of that sentence; and for this act he was summoned to the bar of the Assembly to say whether or not it was the case that he had thus appealed. Having answered in the affirmative, he was deposed on the spot. Forthwith he raised a new action (his previous application for an interdict had been refused) concluding for reduction of the spiritual sentence of deposition and for substantial damages. The defences lodged by the Free Church were to the effect that the civil courts had no right to review and reduce spiritual sentences, or to decide whether the General Assembly of the Free Church had acted irregularly or not. Judgments adverse to the defenders were delivered on these points; and appeals were taken to the House of Lords. But before the case could be heard there, the lord president took an opportunity in the court of session to point out to the pursuer that, inasmuch as the particular General Assembly against which the action was brought had ceased to exist, it could not therefore be made in any circumstances to pay damages, and that the reduction of the sentence, being only auxiliary to the claim of damages, ought therefore to be dismissed. He further pointed out that Macmillan might obtain redress in another way, should he be able to prove malice against individuals. Very soon after this deliverance of the lord president, the case as it had stood against the Free Church was withdrawn, and Macmillan gave notice of an action of a wholly different kind. But this last was not persevered in. The appeals which had been taken to the House of Lords were, in these circumstances, also departed from by the Free Church. The case did not advance sufficiently to show

[1] By this formal recognition of the qualifications to the Confession of Faith made in 1647 the scruples of the majority of the Associate Synod of Original Seceders were removed, and 27 ministers, along with a considerable number of their people, joined the Free Church in the following year.

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how far the courts of law would be prepared to go in the direction of recognizing voluntary tribunals and a kind of secondary exclusive jurisdiction founded on contract.[1] But, whether recognized or not, the church for her part continued to believe that she had an inherent spiritual jurisdiction, and remained unmoved in her determination to act in accordance with that resolution "notwithstanding of whatsoever trouble or persecution may arise."[2]

In 1863 a motion was made and unanimously carried in the Free Church Assembly for the appointment of a committee to confer with a corresponding committee of the United Presbyterian Synod, and with the representatives of such other disestablished churches as might be willing to meet and deliberate with a view to an incorporating union. Formal negotiations between the representatives of these two churches were begun shortly afterwards, which resulted in a report laid before the following Assembly. From this document it appeared that the committees of the two churches were not at one on the question as to the relation of the civil magistrate to the church. While on the part of the Free Church it was maintained that he "may lawfully acknowledge, as being in accordance with the Word of God, the creed and jurisdiction of the church," and that "it is his duty, when necessary and expedient, to employ the national resources in aid of the church, provided always that in doing so, while reserving to himself full control over the temporalities which are his own gift, he abstain from all authoritative interference in the internal government of the church," it was declared by the committee of the United Presbyterian Church that, "inasmuch as the civil magistrate has no authority in spiritual things, and as the employment of force in such matters is opposed to the spirit and precepts of Christianity, it is not within his province to legislate as to what is true in religion, to prescribe a creed or form of worship to his subjects, or to endow the church from national resources." In other words, while the Free Church maintained that in certain circumstances it was lawful and even incumbent on the magistrate to endow the church and on the church to accept his endowment, the United Presbyterians maintained that in no case was this lawful either for the one party or for the other. Thus in a very short time it had been made perfectly evident that a union between the two bodies, if accomplished at all, could only be brought about on the understanding that the question as to the lawfulness of state endowments should be an open one. The Free Church Assembly, by increasing majorities, manifested a readiness for union, even although unanimity had not been attained on that theoretical point. But there was a minority which did not sympathize in this readiness, and after ten years of fruitless effort it was in 1873 found to be expedient that the idea of union with the United Presbyterians should for the time be abandoned. Other negotiations, however, which had been entered upon with the Reformed Presbyterian Church at a somewhat later date proved more successful; and a majority of the ministers of that church with their congregations were united with the Free Church in 1876.

(J. S. Bl.)

In the last quarter of the 19th century the Free Church continued to be the most active, theologically, of the Scottish Churches. The College chairs were almost uniformly filled by advanced critics or theologians, inspired more or less by Professor A. B. Davidson. Dr A. B. Bruce, author of *The Training of the Twelve*, &c., was appointed to the chair of apologetics and New Testament exegesis in the Glasgow College in 1875; Henry Drummond (author of *Natural Law in the Spiritual World*, &c.) was made lecturer in natural science in the same college in 1877 and became professor in 1884; and Dr George Adam Smith (author of *The Twelve Prophets*, &c.) was called to the Hebrew chair in 1892. Attempts were made between 1890 and 1895 to bring all these professors except Davidson (similar attacks were also made on Dr Marcus Dods, afterwards principal of the New College, Edinburgh) to the bar of the Assembly for unsound teaching or writing; but in every case these were abortive, the Assembly never taking any step beyond warning the accused that their primary duty was to teach and defend the church's faith as embodied in the confession. In 1892 the Free Church, following the example of the United Presbyterian Church and the Church of Scotland (1889), passed a Declaratory Act relaxing the stringency of subscription to the confession, with the result that a small number of ministers and congregations, mostly in the Highlands, severed their connexion with the church and formed the Free Presbyterian Church of Scotland, on strictly and straitly orthodox lines. In 1907 this body had twenty congregations and twelve ministers.

The Free Church always regarded herself as a National Church, and during this period she sought actively to be true to that character by providing church ordinances for the increasing population of Scotland and applying herself to the new problems of non-church-going, and of the changing habits of the people. Her Assembly's committee on religion and morals worked toward the same ends as the similar organization of the Established Church, and in her, as in the other churches, the standard of parochial and congregational activity was raised and new methods of operation devised. She passed legislation on the difficult problem of ridding the church of inefficient ministers. The use of instrumental music was sanctioned in Free Churches during this period. An association was formed in 1891 to promote the ends of edification, order and reverence in the public services of the church, and published in 1898 *A New Directory for Public Worship* which does not provide set forms of prayer, but directions as to the matter of prayer in the various services. The Free Church took a large share in the study of hymnology and church music, which led to the production of *The Church Hymnary*. From 1885 to 1895 much of the energy of all the Presbyterian churches was absorbed by the disestablishment agitation. In the former year the Free Church, having almost entirely shed the establishment principle on which it was founded, began to rival the United Presbyterian Church in its resolutions calling for the disestablishment of the Church of Scotland. In spite of the offers of the Establishment Assembly to confer with the dissenting churches about union, the assaults upon its status waxed in vigour, till in 1893 the Free Church hailed the result of the general election as a verdict of the constituencies in favour of disestablishment, and insisted upon the government of the day taking up Sir Charles Cameron's bill.

During the last four or five years of the century the Free and United Presbyterian churches, which after the failure of their union negotiations in 1873 had been connected together by a Mutual Eligibility Act enabling a congregation of one church to call a minister from the other, devoted their energy to the arrangement of an incorporating union. The Synod of the United Presbyterian Church resolved in 1896 to "take steps towards union," and in the following year the Free Assembly responded by appointing a committee to confer with a committee of the other church. The joint committee discovered a "remarkable and happy agreement" between the doctrinal standards, rules and methods of the two bodies, and with very little concessions on either side a common constitution and common "questions and formula" for the admission of ministers and office-bearers were arranged. A minority, always growing smaller, of the Free Church Assembly, protested against the proposed union, and threatened if it were carried through to test its legality in the courts. To meet this opposition, the suggestion is understood to have been made that an act of parliament should be applied for to legalize the union; but this was not done, and the union was carried through on the understanding that the question of the lawfulness of church establishments should be an open one.

The supreme courts of the churches met for the last time in their respective places of meeting on the 30th of October 1900, and on the following day the joint meeting took place at which the union was completed, and the United Free Church of Scotland (*q.v.*) entered on its career. The protesting and

[1] See Taylor Innes, *Law of Creeds in Scotland*, p. 258 seq.

[2] The language of Dr Buchanan, for example, in 1860 was (*mutatis mutandis*) the same as that which he had employed in 1838 in moving the Independence resolution already referred to.

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dissenting minority at once claimed to be the Free Church. They met outside the Free Assembly Hall on the 31st of October, and, failing to gain admission to it, withdrew to another hall, where they elected Mr Colin Bannatyne their moderator and held the remaining sittings of the Assembly. It was reported that between 16,000 and 17,000 names had been received of persons adhering to the anti-unionist principle. At the Assembly of 1901 it was stated that the Free Church had twenty-five ministers and at least sixty-three congregations. The character of the church is indicated by the fact that its office-bearers were the faithful survivors of the decreasing minority of the Old Free Church, which had protested against the disestablishment resolutions, against the relaxation of subscription, against toleration of the teaching of the Glasgow professors, and against the use in worship of organs or of human hymns. Her congregations were mostly in the Gaelic-speaking districts of Scotland. She was confronted with a very arduous undertaking; her congregations grew in number, but were far from each other and there were not nearly enough ministers. The Highlands were filled, by the Union, with exasperation and dispeace which could not soon subside. The church met with no sympathy or assistance at the hands of the United Free Church, and her work was conducted at first under considerable hardships, nor was her position one to appeal to the general popular sentiment of Scotland. But the little church continued her course with indomitable courage and without any compromise of principle. The Declaratory Act of 1892 was repealed after a consultation of presbyteries, and the old principles as to worship were declared. A professor was obliged to withdraw a book he had written, in which the results of criticism, with regard to the Synoptic Gospels, had been accepted and applied. The desire of the Church of Scotland to obtain relaxation of her formula was declared to make union with her impossible. Along with this unbending attitude, signs of material growth were not wanting. The revenue of the church increased; the grant from the sustentation fund was in 1901 only £75, but from 1903 onwards it was £167.

The decision of the House of Lords in 1904 did not bring the trials of the Free Church to an end. In the absence of any arrangement with the United Free Church, she could only gain possession of the property declared to belong to her by an application in each particular case to the Court of Session, and a series of law-suits began which were trying to all parties. In the year 1905 the Free Church Assembly met in the historic Free Church Assembly Hall, but it did not meet there again. Having been left by the awards of the commission without any station in the foreign mission field, the Free Church resolved to start a foreign mission of her own. The urgent task confronting the church was that of supplying ordinances to her congregations. The latter numbered 200 in 1907, and the church had as yet only 74 ordained ministers, so that many of the manses allocated to her by the commissioners were not yet occupied, and catechists and elders were called to conduct services where possible. The gallant stand this little church had made for principles which were no longer represented by any Presbyterian church outside the establishment attracted to her much interest and many hopes that she might be successful in her endeavours to do something for the religious life of Scotland.

See SCOTLAND, CHURCH OF, for bibliography and statistics. (A.M.*)

FREEDMEN'S BUREAU (officially the BUREAU OF FREEDMEN, REFUGEES AND ABANDONED LANDS), a bureau created in the United States war department by an act of Congress, 3rd of March 1865, to last one year, but continued until 1872 by later acts passed over the president's veto. Its establishment was due partly to the fear entertained by the North that the Southerners if left to deal with the blacks would attempt to re-establish some form of slavery, partly to the necessity for extending relief to needy negroes and whites in the lately conquered South, and partly to the need of creating some commission or bureau to take charge of lands confiscated in the South. During the Civil War a million negroes fell into the hands of the Federals and had to be cared for. Able-bodied blacks were enlisted in the army, and the women, children and old men were settled in large camps on confiscated Southern property, where they were cared for alternately by the war department and by the treasury department until the organization of the Freedmen's Bureau. At the head of the bureau was a commissioner, General O. O. Howard, and under him in each Southern state was an assistant commissioner with a corps of local superintendents, agents and inspectors. The officials had the broadest possible authority in all matters that concerned the blacks. The work of the bureau may be classified as follows: (1) distributing rations and medical supplies among the blacks; (2) establishing schools for them and aiding benevolent societies to establish schools and churches; (3) regulating labour and contracts; (4) taking charge of confiscated lands; and (5) administering justice in cases in which blacks were concerned. For several years the ex-slaves were under the almost absolute control of the bureau. Whether this control had a good or bad effect is still disputed, the Southern whites and many Northerners holding that the results of the bureau's work were distinctly bad, while others hold that much good resulted from its work. There is now no doubt, however, that while most of the higher officials of the bureau were good men, the subordinate agents were generally without character or judgment and that their interference between the races caused permanent discord. Much necessary relief work was done, but demoralization was also caused by it, and later the institution was used by its officials as a means of securing negro votes. In educating the blacks the bureau made some progress, but the instruction imparted by the missionary teachers resulted in giving the ex-slaves notions of liberty and racial equality that led to much trouble, finally resulting in the hostility of the whites to negro education. The secession of the blacks from the white churches was aided and encouraged by the bureau. The whole field of labour and contracts was covered by minute regulations, which, good in theory, were absurd in practice, and which failed altogether, but not until labour had been disorganized for several years. The administration of justice by the bureau agents amounted simply to a ceaseless persecution of the whites who had dealings with the blacks, and bloody conflicts sometimes resulted. The law creating the bureau provided for the division of the confiscated property among the negroes, and though carried out only in parts of South Carolina, Florida and Georgia, it caused the negroes to believe that they were to be cared for at the expense of their former masters. This belief made them subject to swindling schemes perpetrated by certain bureau agents and others who promised to secure lands for them. When negro suffrage was imposed by Congress upon the Southern States, the bureau aided the Union League (*q.v.*) in organizing the blacks into a political party opposed to the whites. A large majority of the bureau officials secured office through their control of the blacks. The failure of the bureau system and its discontinuance in the midst of reconstruction without harm to the blacks, and the intense hostility of the Southern whites to the institution caused by the irritating conduct of bureau officials, are indications that the institution was not well conceived nor wisely administered.

See P. S. Pierce, *The Freedmen's Bureau* (Iowa City, 1904); *Report of the Joint Committee on Reconstruction* (Washington, 1866); W. L. Fleming (ed.), *Documents relating to Reconstruction* (Cleveland, O., 1906); W. L. Fleming, *Civil War and Reconstruction in Alabama* (New York, 1905); and James W. Garner, *Reconstruction in Mississippi* (New York, 1901). (W. L. F.)

FREEHOLD, a town and the county-seat of Monmouth county, New Jersey, U.S.A., in the township of Freehold, about 25 m. E. by N. of Trenton. Pop. (1890) 2932; (1900) 2934, of whom 215 were foreign-born and 126 were negroes; (1905) 3064; (1910) 3233. Freehold is served by the Pennsylvania and the Central of New Jersey railways. It is the trade centre of one of the most productive agricultural districts of the state and has various manufactures, including carriages, carpets and rugs, files, shirts, underwear, and canned beans and peas. The town is the seat of two boarding schools for boys: the Freehold Military School and the New Jersey Military Academy (chartered, 1900; founded in 1844 as the Freehold Institute). One of the residences in the town dates from 1755. A settlement was made in the township about 1650, and the township was incorporated

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in 1693. In 1715 the town was founded and was made the county-seat; it was long commonly known (from the county) as Monmouth Court-House, but afterwards took (from the township) the name Freehold, and in 1869 it was incorporated as the Town of Freehold. An important battle of the War of Independence, known as the battle of Monmouth, was fought near the court-house on the 28th of June 1778. A short distance N.W. of the court-house is a park in which there is a monument, unveiled on the 13th of November 1884 in commemoration of the battle; the base is of Quincy granite and the shaft is of Concord granite. Surmounting the shaft is a statue representing "Liberty Triumphant" (the height to the top of which is about 100 ft.). The monument is adorned with five bronze reliefs, designed and modelled by James E. Kelly (b. 1855); one of these reliefs represents "Molly Pitcher"[1] (d. 1832), a national heroine, who, when her husband (John C. Hays), an artillerist, was rendered insensible during the battle, served the gun in his place and prevented its capture by the British.[1] Joel Parker (1816–1888), governor of New Jersey in 1863–1866 and 1872–1875, was long a resident of Freehold, and the erection of the monument was largely due to his efforts. A bronze tablet on a boulder in front of the present court-house, commemorating the old court-house, used as a hospital in the battle of Monmouth, was unveiled in 1907. Freehold was the birthplace and home of Dr Thomas Henderson (1743–1824), a Whig or Patriot leader in New Jersey, an officer in the War of Independence, and a member of the Continental Congress in 1779–1780 and of the national House of Representatives in 1795–1797.

The name Freehold was first used of a Presbyterian church established about 1692 by Scottish exiles who came to East Jersey in 1682–1685 and built what was called the "Old Scots' Church" near the present railway station of Wickatunk in Marlboro' township, Monmouth county. In this church, in December 1706, John Boyd (d. 1709) was ordained—the first recorded Presbyterian ordination in America. The church was the first regularly constituted Presbyterian church. No trace of the building now remains in the burying-ground where Boyd was interred, and where the Presbyterian Synod of New Jersey in 1900 raised a granite monument to his memory; his tombstone is preserved by the Presbyterian Historical Society in Philadelphia. John Tennent (1706–1732) became pastor of the Freehold church in 1730, when a new church was built by the Old Scots congregation on White Hill in the present township of Manalapan (then a part of Freehold township), near the railway station and village called Tennent; his brother William (1705–1777), whose trance, in which he thought he saw the glories of heaven, was a matter of much discussion in his time, was pastor in 1733–1777. In 1751–1753 the present "Old Tennent Church," then called the Freehold Church, was erected on (or near) the same site as the building of 1730; in it Whitefield preached and in the older building David Brainerd and his Indian converts met. In 1859 this church (whose corporate name is "The First Presbyterian Church of the County of Monmouth") adopted the name of Tennent, partly to distinguish it from the Presbyterian church organized at Monmouth Court-House (now Freehold) in 1838.

See Frank R. Symmes, *History of the Old Tennent Church* (2nd ed., Cranbury, New Jersey, 1904).

FREEHOLD, in the English law of real property, an estate in land, not being less than an estate for life. An estate for a term of years, no matter how long, was considered inferior in dignity to an estate for life, and unworthy of a freeman (see ESTATE). "Some time before the reign of Henry II., but apparently not so early as Domesday, the expression *liberum tenementum* was introduced to designate land held by a freeman by a free tenure. Thus freehold tenure is the sum of the rights and duties which constitute the relation of a free tenant to his lord."[2] In this sense freehold is distinguished from copyhold, which is a tenure having its origin in the relation of lord and villein (see COPYHOLD). Freehold is also distinguished from leasehold, which is an estate for a fixed number of years only. By analogy the interest of a person who holds an office for life is sometimes said to be a freehold interest. The term *customary freeholds* is applied to a kind of copyhold tenure in the north of England, viz. tenure by copy of court-roll, but not, as in other cases, expressed to be at the will of the lord.

[1] Her maiden name was Mary Ludwig. "Molly Pitcher" was a nickname given to her by the soldiers in reference to her carrying water to soldiers overcome by heat in the battle of Monmouth. She married Hays in 1769; Hays died soon after the war, and later she married one George McCauley. She lived for more than forty years at Carlisle, Penn., where a monument was erected to her memory in 1876.

[2] Digby's *History of the Law of Real Property*.

FREELAND, a borough of Luzerne county, Pennsylvania, U.S.A., about 20 m. S. of Wilkes-Barre, in the E. part of the state. Pop. (1890) 1730; (1900) 5254 (1330 foreign-born, many being Slavs); (1910) 6107. Freeland is served by the Lehigh Valley railway and by electric railway to Upper Lehigh (1 m. distant, served by the Central Railroad of New Jersey) and to other neighbouring places. The borough is built on Broad Mountain, nearly 2000 ft. above sea-level, and the chief industry is the mining of coal at the numerous surrounding collieries. Freeland is the seat of the Mining and Mechanical Institute of the Anthracite Region, chartered in 1894, modelled after the German *Steigerschulen*, with elementary and secondary departments and a night school for workmen. The borough has foundries and machine shops of considerable importance, and manufactures silk, overalls, beer and hames. Freeland was first settled about 1842, was laid out in 1870, and was incorporated in 1876.

FREEMAN, EDWARD AUGUSTUS (1823–1892), English historian, was born at Harborne, Staffordshire, on the 2nd of August 1823. He lost both his parents in infancy, was brought up by a grandmother, and was educated at private schools and by a private tutor. He was a studious and precocious boy, more interested in religious matters, history and foreign politics than in boyish things. He obtained a scholarship at Trinity College, Oxford, and a second class in the degree examination, and was elected fellow of his college (1845). While at Oxford he was much influenced by the High Church movement, and thought seriously of taking orders, but abandoned the idea. He married a daughter of his former tutor, the Rev. R. Gutch, in 1847, and entered on a life of study. Ecclesiastical architecture attracted him strongly. He visited many churches and began a practice, which he pursued throughout his life, of making drawings of buildings on the spot and afterwards tracing them over in ink. His first book, save for his share in a volume of English verse, was a *History of Architecture* (1849). Though he had not then seen any buildings outside England, it contains a good sketch of the development of the art. It is full of youthful enthusiasm and is written in florid language. After some changes of residence he bought a house called Somerleaze, near Wells, Somerset, and settled there in 1860.

Freeman's life was one of strenuous literary work. He wrote many books, and countless articles for reviews, newspapers and other publications, and was a constant contributor to the *Saturday Review* until 1878, when he ceased to write for it for political reasons. His *Saturday Review* articles corrected many errors and raised the level of historical knowledge among the educated classes, but as a reviewer he was apt to forget that a book may have blemishes and yet be praiseworthy. For some years he was an active county magistrate. He was deeply interested in politics, was a follower of Mr Gladstone, and approved the Home Rule Bill of 1886, but objected to the later proposal to retain the Irish members at Westminster. To be returned to Parliament was one of his few ambitions, and in 1868 he unsuccessfully contested Mid-Somerset. Foreign rather than domestic politics had the first place with him. Historical and religious sentiment combined with his destestation of all that was tyrannical to inspire him with hatred of the Turk and sympathy with the smaller and subject nationalities of eastern Europe. He took a prominent part in the agitation which followed "the Bulgarian atrocities"; his speeches were intemperate, and he was accused of uttering the words "Perish India!" at a public meeting in 1876. This, however, was a misrepresentation of his words. He was made a knight commander

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of the order of the Saviour by the king of Greece, and also received an order from the prince of Montenegro.

Freeman advanced the study of history in England in two special directions, by insistence on the unity of history, and by teaching the importance and right use of original authorities. History is not, he urges, to be divided "by a middle wall of partition" into ancient and modern, nor broken into fragments as though the history of each nation stood apart. It is more than a collection of narratives; it is a science, "the science of man in his political character." The historical student, then, cannot afford to be indifferent to any part of the record of man's political being; but as his abilities for study are limited, he will, while reckoning all history to be within his range, have his own special range within which he will master every detail (*Rede Lecture*). Freeman's range included Greek, Roman and the earlier part of English history, together with some portions of foreign medieval history, and he had a scholarly though general knowledge of the rest of the history of the European world. He regarded the abiding life of Rome as "the central truth of European history," the bond of its unity, and he undertook his *History of Sicily* (1891–1894) partly because it illustrated this unity. Further, he urges that all historical study is valueless which does not take in a knowledge of original authorities, and he teaches both by example and precept what authorities should be thus described, and how they are to be weighed and used. He did not use manuscript authorities, and for most of his work he had no need to do so. The authorities which he needed were already in print, and his books would not have been better if he had disinterred a few more facts from unprinted sources.

His reputation as a historian will chiefly rest on his *History of the Norman Conquest* (1867–1876), his longest completed book. In common with his works generally, it is distinguished by exhaustiveness of treatment and research, critical ability, a remarkable degree of accuracy, and a certain insight into the past which he gained from his practical experience of men and institutions. He is almost exclusively a political historian. His saying that "history is past politics and politics are present history" is significant of this limitation of his work, which left on one side subjects of the deepest interest in a nation's life. In dealing with constitutional matters he sometimes attaches too much weight to words and formal aspects. This gives certain of his arguments an air of pedantry, and seems to lead him to find evidences of continuity in institutions which in reality and spirit were different from what they once had been. As a rule his estimates of character are remarkably able. It is true that he is sometimes swayed by prejudice, but this is the common lot of great historians; they cannot altogether avoid sharing in the feelings of the past, for they live in it, and Freeman did so to an extraordinary degree. Yet if he judges too favourably the leaders of the national party in England on the eve of the Norman Conquest, that is a small matter to set against the insight which he exhibits in writing of Aratus, Sulla, Nicias, William the Conqueror, Thomas of Canterbury, Frederick the Second and many more. In width of view, thoroughness of investigation and honesty of purpose he is unsurpassed by any historian. He never conceals nor wilfully misrepresents anything, and he reckoned no labour too great which might help him to give a truthful picture of the past. When a place had any important connexion with his work he invariably visited it. He travelled much, always to gain knowledge, and generally to complete his historical equipment. His collected articles and essays on places of historical interest are perhaps the most pleasing of his writings, but they deal exclusively with historical associations and architectural features. The quantity of work which he turned out is enormous, for the fifteen large volumes which contain his *Norman Conquest*, his unfinished *History of Sicily*, his *William Rufus* (1882), and his *Essays* (1872–1879), and the crowd of his smaller books, are matched in amount by his uncollected contributions to periodicals. In respect of matter his historical work is uniformly excellent. In respect of form and style the case is different. Though his sentences themselves are not wordy, he is extremely diffuse in treatment, habitually repeating an idea in successive sentences of much the same import. While this habit was doubtless aggravated by the amount of his journalistic work, it seems originally to have sprung from what may be called a professorial spirit, which occasionally appears in the tone of his remarks. He was anxious to make sure that his readers would understand his exact meaning, and to guard them against all possible misconceptions. His lengthy explanations are the more grievous because he insists on the same points in several of his books. His prolixity was increased by his unwillingness, when writing without prescribed limits, to leave out any detail, however unimportant. His passion for details not only swelled his volumes to a portentous size, but was fatal to artistic construction. The length of his books has hindered their usefulness. They were written for the public at large, but few save professed students, who can admire and value his exhaustiveness, will read the many hundreds of pages which he devotes to a short period of history. In some of his smaller books, however, he shows great powers of condensation and arrangement, and writes tersely enough. His style is correct, lucid and virile, but generally nothing more, and his endeavour to use as far as possible only words of Teutonic origin limited his vocabulary and makes his sentences somewhat monotonous. While Froude often strayed away from his authorities, Freeman kept his authorities always before his eyes, and his narrative is here and there little more than a translation of their words. Accordingly, while it has nothing of Froude's carelessness and inaccuracy, it has nothing of his charm of style. Yet now and again he rises to the level of some heroic event, and parts of his chapter on the "Campaign of Hastings" and of his record of the wars of Syracuse and Athens, his reflections on the visit of Basil the Second to the church of the Virgin on the Acropolis, and some other passages in his books, are fine pieces of eloquent writing.

The high quality of Freeman's work was acknowledged by all competent judges. He was made D.C.L. of Oxford and LL.D. of Cambridge *honoris causa*, and when he visited the United States on a lecturing tour was warmly received at various places of learning. He served on the royal commission on ecclesiastical courts appointed in 1881. In 1884 he was appointed regius professor of modern history at Oxford. His lectures were thinly attended, for he did not care to adapt them to the requirements of the university examinations, and he was not perhaps well fitted to teach young men. But he exercised a wholesome influence over the more earnest students of history among the resident graduates. From 1886 he was forced by ill-health to spend much of his time abroad, and he died of smallpox at Alicante on the 16th of March 1892, while on a tour in Spain. Freeman had a strongly marked personality. Though impatient in temper and occasionally rude, he was tender-hearted and generous. His rudeness to strangers was partly caused by shyness and partly by a childlike inability to conceal his feelings. Eminently truthful, he could not understand that some verbal insincerities are necessary to social life. He had a peculiar faculty for friendship, and his friends always found him sympathetic and affectionate. In their society he would talk well and showed a keen sense of humour. He considered it his duty to expose careless and ignorant writers, and certainly enjoyed this occupation. He worked hard and methodically, often had several pieces of work in hand, and kept a daily record of the time which he devoted to each of them. His tastes were curiously limited. No art interested him except architecture, which he studied throughout his life; and he cared little for litcrature which was not either historical or political. In later life he ceased to hold the theological opinions of his youth, but remained a devout churchman.

See W. R. W. Stephens, *Life and Letters of E. A. Freeman* (London, 1895); Frederic Harrison, *Tennyson, Ruskin, Mill and other Literary Estimates* (London, 1899); James Bryce, "E. A. Freeman," *Eng. Hist. Rev.*, July 1892. (W. Hu.)

FREEMAN, primarily one who is free, as opposed to a slave or serf (see FEUDALISM; SLAVERY). The term is more specifically applied to one who possesses the freedom of a city, borough or company. Before the passing of the Municipal Corporations

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Act 1835, each English borough admitted freemen according to its own peculiar custom and by-laws. The rights and privileges of a freeman, though varying in different boroughs, generally included the right to vote at a parliamentary election of the borough, and exemption from all tolls and dues. The act of 1835 respected existing usages, and every person who was then an admitted freeman remained one, retaining at the same time all his former rights and privileges. The admission of freemen is now regulated by the Municipal Corporations Act 1882. By section 201 of that act the term "freeman" includes any person of the class whose rights and interests were reserved by the act of 1835 under the name either of freemen or of burgesses. By section 202 no person can be admitted a freeman by gift or by purchase; that is, only birth, servitude or marriage are qualifications. The Honorary Freedom of Boroughs Act 1885, however, makes an exception, as by that act the council of every borough may from time to time admit persons of distinction to be honorary freemen of the borough. The town clerk of every borough keeps a list, which is called "the freeman's roll," and when any person claims to be admitted a freeman in respect of birth, servitude or marriage, the mayor examines the claim, and if it is established the claimant's name is enrolled by the town clerk.

A person may become a freeman or freewoman of one of the London livery companies by (1) apprenticeship or servitude; (2) patrimony; (3) redemption; (4) gift. This last is purely honorary. The most usual form of acquiring freedom was by serving apprenticeship to a freeman, free both of a company and of the city of London. By an act of common council of 1836 apprenticeship was permitted to freemen of the city who had not taken up the freedom of a company. By an act of common council of 1889 the term of service was reduced from seven years to four years. Freedom by patrimony is always granted to children of a person who has been duly admitted to the freedom. Freedom by redemption or purchase requires the payment of certain entrance fees, which vary with the standing of the company. In the Grocers' Company freedom by redemption does not exist, and in such companies as still have a trade, *e.g.* the Apothecaries and Stationers, it is limited to members of the trade.

See W. C. Hazlitt, *The Livery Companies of the City of London* (1892).

FREEMASONRY. According to an old "Charge" delivered to initiates, Freemasonry is declared to be an "ancient and honourable institution: ancient no doubt it is, as having subsisted from time immemorial; and honourable it must be acknowledged to be, as by a natural tendency it conduces to make those so who are obedient to its precepts . . . to so high an eminence has its credit been advanced that in every age Monarchs themselves have been promoters of the art, have not thought it derogatory from their dignity to exchange the sceptre for the trowel, have patronised our mysteries and joined in our Assemblies." For many years the craft has been conducted without respect to clime, colour, caste or creed.

History.—The precise origin of the society has yet to be ascertained, but is not likely to be, as the early records are lost; there is, however, ample evidence remaining to justify the claim for its antiquity and its honourable character. Much has been written as to its eventful past, based upon actual records, but still more which has served only to amuse or repel inquirers, and led not a few to believe that the fraternity has no trustworthy history. An unfavourable opinion of the historians of the craft generally may fairly have been held during the 18th and early in the 19th centuries, but happily since the middle of the latter century quite a different principle has animated those brethren who have sought to make the facts of masonic history known to the brotherhood, as well as worth the study of students in general. The idea that it would require an investigator to be a member of the "mystic tie" in order to qualify as a reader of masonic history has been exploded. The evidences collected concerning the institution during the last five hundred years, or more, may now be examined and tested in the most severe manner by literary and critical experts (whether opposed or favourable to the body), who cannot fail to accept the claims made as to its great antiquity and continuity, as the lineal descendant of those craftsmen who raised the cathedrals and other great English buildings during the middle ages.

It is only needful to refer to the old works on freemasonry, and to compare them with the accepted histories of the present time, to be assured that such strictures as above are more than justified. The premier work on the subject was published in London in 1723, the Rev. James Anderson being the author of the "historical portion, introductory to the first "Book of Constitutions" of the original Grand Lodge of England. Dr Anderson gravely states that "Grand Master Moses often marshalled the Israelites into a regular and general lodge, whilst in the wilderness. . . King Solomon was Grand Master of the lodge at Jerusalem.[1] . . Nebuchadnezzar became the Grand Master Mason," &c., devoting many more pages to similar absurdities, but dismisses the important modern innovation (1716–1717) of a Grand Lodge with a few lines noteworthy for their brief and indefinite character.

In 1738 a second edition was issued, dedicated to the prince of Wales (" a Master Mason and master of a lodge "), and was the work of the same brother (as respects the historical part), the additions being mainly on the same lines as the former volume, only, if possible, still more ridiculous and extravagant; *e.g.* Cyrus constituted Jerubbabel "provincial grand master in Judah"; Charles Martel was "the Right Worshipful Grand Master of France, and Edward I. being deeply engaged in wars left the craft to the care of several successive grand masters" (duly enumerated). Such loose statements may now pass unheeded, but unfortunately they do not exhaust the objections to Dr Anderson's method of writing history. The excerpt concerning St Alban (apparently made from Cole's *Ancient Constitutions*, 1728–1729) has the unwarranted additional title of Grand Master conferred on that saint, and the extract concerning King Athelstan and Prince Edwin from the "Old MS. Charges" (given in the first edition) contains still more unauthorized modern terms, with the year added of 926; thus misleading most seriously those who accept the volume as trustworthy, because written by the accredited historian of the Grand Lodge, Junior Grand Warden in 1723. These examples hardly increase our confidence in the author's accuracy when Dr Anderson comes to treat of the origin of the premier Grand Lodge; but he "is our only informant as to that important event, and if his version of the occurrence is declined, we are absolutely without any information.

In considering the early history of Freemasonry, from a purely matter-of-fact standpoint, it will be well to settle as a necessary preliminary what the term did and does now include or mean, and how far back the inquiry should be conducted, as well as on what lines. If the view of the subject herein taken be correct, it will be useless to load the investigation by devoting considerable space to a consideration of the laws and customs of still older societies which may have been utilized and imitated by the fraternity, but which in no sense can be accepted as the actual forbears of the present society of Free and Accepted Masons. They were predecessors, or possibly prototypes, but not near relatives or progenitors of the Freemasons.[2]

The Mother Grand Lodge of the world is that of England, which was inaugurated in the metropolis on St John Baptist's day 1717 by four or more old lodges, three of which still flourish. There were other lodges also in London and the country at the time, but whether they were invited to the meeting is not now known. Probably not, as existing records of the period preserve a sphinx-like silence thereon. Likewise there were many scores of lodges at work in Scotland, and undoubtedly in Ireland the craft was widely patronized. Whatever the ceremonies may have been which were then known as Freemasonry in Great Britain and Ireland, they were practically alike, and the venerable *Old Charges* or MS. constitutions, dating back several centuries, were rightly held by them as the title-deeds of their masonic inheritance.

It was a bold thing to do, thus to start a governing body for the fraternity quite different in many respects to all preceding organizations, and to brand as irregular all lodges which declined

[1] If history be no ancient Fable
Free Masons came from Tower of Babel.
("The Freemasons; an Hudibrastic poem," London, 1723.)

[2] *The Early History and Antiquities of Freemasonry and Medieval Builders*, by Mr G. F. Fort (U.S.A.), and the *Cathedral Builders: The Magestri Comacini*, by "Leader Scott" (the late Mrs Baxter), take rather a different view on this point and ably present their arguments. The Rev. C. Kingsley in *Roman and Teuton* writes of the *Comacini*, "Perhaps the original germ of the great society of Freemasons."

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to accept such authority; but the very originality and audacity of its promoters appears to have led to its success, and it was not long before most of the lodges of the pre-Grand-Lodge era joined and accepted "constitution" by warrant of the Grand Master. Not only so, but Ireland quickly followed the lead, so early as 1725 there being a Grand Lodge for that country which must have been formed even still earlier, and probably by lodges started before any were authorized in the English counties. In Scotland the change was not made until 1736, many lodges even then holding aloof from such an organization. Indeed, out of some hundred lodges known to have been active then, only thirty-three responded and agreed to fall into line, though several joined later; some, however, kept separate down to the end of the 19th century, while others never united. Many of these lodges have records of the 17th century though not then newly formed; one in particular, the oldest (the Lodge of Edinburgh, No. 1), possesses minutes so far back as the year 1500.

It is important to bear in mind that all the regular lodges throughout the world, and likewise all the Grand Lodges, directly or indirectly, have sprung from one or other of the three governing bodies named; Ireland and Scotland following the example set by their masonic mother of England in having Grand Lodges of their own. It is not proved how the latter two became acquainted with Freemasonry as a secret society, guided more or less by the operative MS. *Constitutions* or *Charges* common to the three bodies, not met with elsewhere; but the credit of a Grand Lodge being established to control the lodges belongs to England.

It may be a startling declaration, but it is well authenticated, that there is no other Freemasonry, as the term is now understood, than what which has been so derived. In other words, the lodges and Grand Lodges in both hemispheres trace their origin and authority back to England for working what are known as the Three Degrees, controlled by regular Grand Lodges. That being so, a history of modern Freemasonry, the direct offspring of the British parents aforesaid, should first of all establish the descent of the three Grand Lodges from the Freemasonry of earlier days; such continuity, of five centuries or more, being a *sine qua non* of antiquity and regularity.

It will be found that from the early part of the 18th century back to the 16th century existing records testify to the assemblies of lodges, mainly operative, but partly speculative, in Great Britain, whose guiding stars and common heritage were the *Old Charges*, and that when their actual minutes and transactions cease to be traced by reason of their loss, these same MS. *Constitutions* furnish testimony of the still older working of such combinations of freemasons or masons, without the assistance, countenance or authority of any other masonic body; consequently such documents still preserved, of the 14th and later centuries (numbering about seventy, mostly in form of rolls), with the existing lodge minutes referred to of the 16th century, down to the establishment of the premier Grand Lodge in 1717, prove the continuity of the society. Indeed so universally has this claim been admitted, that in popular usage the term *Freemason* is only now applied to those who belong to this particular fraternity, that of *mason* being applicable to one who follows that trade, or honourable calling, as a builder.

There is no evidence that during this long period any other organization of any kind, religious, philosophical, mystical or otherwise, materially or even slightly influenced the customs of the fraternity, though they may have done so; but so far as is known the lodges were of much the same character throughout, and consisted really of operatives (who enjoyed practically a monopoly for some time of the trade as masons or freemasons), and, in part, of "speculatives," *i.e.* noblemen, gentlemen and men of other trades, who were admitted as honorary members.

Assuming then that the freemasons of the present day are the sole inheritors of the system arranged at the so-called "Revival of 1717," which was a development from an operative body to one partly speculative, and that, so far back as the MS. Records extend and furnish any light, they must have worked in Lodges in secret throughout the period noted, a history of Freemasonry should be mainly devoted to giving particulars, as far as possible, of the lodges, their traditions, customs and laws, based upon actual documents which can be tested and verified by members and non-members alike.

It has been the rule to treat, more or less fully, of the influence exerted on the fraternity by the Ancient Mysteries, the Essenes, Roman Colleges, Culdees, Hermeticism, Fehm-Gerichte *et hoc genus omne*, especially the *Steinmetzen*, the Craft Gilds and the Companionage of France, &c.; but in view of the separate and independent character of the freemasons, it appears to be quite unnecessary, and the time so employed would be better devoted to a more thorough search after additional evidences of the activity of the craft, especially during the crucial period overlapping the second decade of the 18th century, so as to discover information as to the transmitted secrets of the medieval masons, which, after all, may simply have been what Gaspard Monge felicitously entitles "Descriptive Geometry, or the Art and Science of Masonic Symbolism."

The rules and regulations of the masons were embodied in what are known as the *Old Charges*; the senior known copy being the *Regius MS.* (British Museum Bihl. Reg. 17 A, i.), which, however, is not so exclusively devoted to masonry as the later copies. David Casley, in his catalogue of the MSS. in the King's Library (1734), unfortunately styled the little gem *A Poem of Moral Duties*; and owing to this misdescription its true character was not recognized until the year 1839, and then by a non-mason (Mr Halliwell-Phillipps), who had it reproduced in 1840 and brought out an improved edition in 1844. Its date has been approximately fixed at 1390 by Casley and other authorities.

The curious legend of the craft, therein made known, deals first of all with the number of unemployed in early days and the necessity of finding work, "that they myght gete here lyvynge therby." Euclid was consulted, and recommended the "onest craft of good masonry," and the genesis of the society is found "yn Egypte lande." By a rapid transition, but "mony erys afterwarde," we are told that the "Craft com ynto England yn tyme of good kynge Adelstonus (Æthelstan) day," who called an assembly of the masons, when fifteen articles and as many more points were agreed to for the government of the craft, each being duly described. Each brother was instructed that—

> "He must love wel God, and holy Churche algate
> And hys mayster also, that he ys wythe."
>
> "The thrydde poynt must be severle.
> With the prentes knowe hyt wele,
> Hys mayster cownsel he kepe and close,
> And hys felows by hys goode purpose;
> The prevetyse of the chamber telle he no mon,
> Ny yn the logge whatsever they done,
> Whatsever thou heryst, or syste hem do,
> Telle hyt no mon, wherever thou go."

The rules generally, besides referring to trade regulations, are as a whole suggestive of the Ten Commandments in an extended form, winding up with the legend of the *Ars quatuor coronatorum*, as an incentive to a faithful discharge of the numerous obligations. A second part introduces a more lengthy account of the origin of masonry, in which Noah's flood and the Tower of Babylon are mentioned as well as the great skill of Euclid, who—

> "Through hys grace of Crist yn heven,
> He commensed yn the syens seven";

The "seven sciences" are duly named and explained. The compiler apparently was a priest, line 629 reading "And, when ye gospel *me rede schal*," thus also accounting for the many religious injunctions in the MS.; the last hundred lines are evidently based upon *Urbanitatis* (Cott. MS. Caligula A 11, fol. 88) and *Instructions for a Parish Priest* (Cott. MS. Claudius A 11, fol. 27), instructions such as lads and even men would need who were ignorant of the customs of polite society, correct deportment at church and in the presence of their social superiors.

The recital of the legend of the *Quatuor Coronati* has been held by Herr Findel in his *History of Freemasonry* (*Allgemeine Geschichte der Freimaurerei*, 1862; English editions, 1866–1869) to prove that British Freemasonry was derived from Germany,

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but without any justification, the legend being met with in England centuries prior to the date of the *Regius MS.*, and long prior to its incorporation in masonic legends on the Continent.

The next MS., in order, is known as the "Cooke" (Ad. MS. 23,198, British Museum), because Matthew Cooke published a fair reproduction of the document in 1861; and it is deemed by competent palæographers to date from the first part of the 15th century. There are two versions of the *Old Charges* in this little book, purchased for the British Museum in 1850. The compiler was probably a mason and familiar with several copies of these MS. *Constitutions*, two of which he utilizes and comments upon; he quotes from a MS. copy of the *Policronicon* the manner in which a written account of the sciences was preserved in the two historic stones at the time of the Flood, and generally makes known the traditions of the society as well as the laws which were to govern the members.

Its introduction into England through Egypt is noted (where the Children of Israel "lernyd ye craft of Masonry"), also the "lande of behest" (Jerusalem) and the Temple of Solomon (who "confirmed ye chargys yt David his Fadir" had made). Then masonry in France is interestingly described; and St Alban and "Æthelstane with his yongest sone" (the Edwin of the later MSS.) became the chosen mediums subsequently, as with the other *Charges*, portions of the Old Testament are often cited in order to convey a correct idea to the neophyte, who is to hear the document read, as to these sciences which are declared to be free in themselves (*fre in hem selfe*). Of all crafts followed by man in this world "Masonry hathe the moste notabilite," as confirmed by "Elders that were bi for us of masons [who] had these chargys wryten," and "as is write and taught in ye boke of our charges."

Until quite recently no representative or survival of this particular version had been traced, but in 1890 one was discovered of 1687 (since known as the *William Watson MS.*). Of some seventy copies of these old scrolls which have been unearthed, by far the greater proportion have been made public since 1860. They have all much in common, though often curious differences are to be detected; are of English origin, no matter where used; and when complete, as they mostly are, whether of the 16th or subsequent centuries, are noteworthy for an invocation or prayer which begins the recital:—

> "The mighte of the ffather of heaven
> And the wysedome of the glorious Sonne
> through the grace and the goodnes of the holly
> ghoste yt been three p'sons and one God
> be with us at or beginning and give us grace
> so to gou'ne us here in or lyving that wee maye
> come to his blisse that nevr shall have ending.—Amen."
> (*Grand Lodge MS. No. 1*, A.D. 1583.)

They are chiefly of the 17th century and nearly all located in England; particulars may be found in Hughan's *Old Charges of the British Freemasons* (1872, 1895 and supplement 1906).[1] The chief scrolls, with some others, have been reproduced in facsimile in six volumes of the *Quatuor Coronatorum Antigrapha*; and the collection in Yorkshire has been published separately, either in the *West Yorkshire Reprints* or the *Ancient York Masonic Rolls*. Several have been transcribed and issued in other works.

These scrolls give considerable information as to the traditions and customs of the craft, together with the regulations for its government, and were required to be read to apprentices long after the peculiar rules ceased to be acted upon, each lodge apparently having one or more copies kept for the purpose. The old Lodge of Aberdeen ordered in 1670 that the Charge was to be "read at ye entering of everie entered prenteise"; another at Alnwick in 1701 provided—

> "Noe Mason shall take any apprentice [but he must]
> Enter him and give him his Charge, within one whole
> year after":

and still another at Swallwell (now No. 48 Gateshead) demanded that "the Apprentices shall have their Charge given at the time of Registering, or within thirty days after"; the minutes inserting such entries accordingly even so late as 1754, nearly twenty years after the lodge had cast in its lot with the Grand Lodge of England.

Their Christian character is further emphasized by the "First Charge that you shall be true men to God and the holy Church"; the *York MS. No. 6* beseeches the brethren "at every meeting and assembly they pray heartily for all Christians"; the *Melrose MS. No. 2* (1674) mentions "Merchants and all other Christian men," and the *Aberdeen MS.* (1670) terms the invocation "A Prayer before the Meeting." Until the Grand Lodge era, Freemasonry was thus wholly Christian. The *York MS. No. 4* of 1693 contains a singular error in the admonitory lines:—

> "The [n] one of the elders takeing the Booke and that
> hee or *shee* that is to be made mason, shall lay their
> hands thereon and the charge shall be given."

This particular reading was cited by Hughan in 1871, but was considered doubtful; Findel,[2] however, confirmed it, on his visit to York under the guidance of the celebrated masonic student the late Rev. A. F. A. Woodford. The mistake was due possibly to the transcriber, who had an older roll before him, confusing "they," sometimes written "the," with "she," or reading that portion, which is often in Latin, as *ille vel illa*, instead of *ille vel illi*.

In some of the *Codices*, about the middle of the 17th century and later, New Articles are inserted, such as would be suitable for an organization similar to the Masons' Company of London, which had one, at least, of the *Old Charges* in its possession according to inventories of 1665 and 1676; and likewise in 1722, termed *The Book of the Constitutions of the Accepted Masons*. Save its mention ("Book wrote on parchment") by Sir Francis Palgrave in the *Edinburgh Review* (April 1839) as being in existence "not long since," this valuable document has been lost sight of for many years.

That there were signs and other secrets preserved and used by the brethren throughout this mainly operative period may be gathered from discreet references in these old MSS. The *Institutions in parchment* (22nd of November 1696) of the Dumfries Kilwinning Lodge (No. 53, Scotland) contain a copy of the oath taken "when any man should be made":—

> "These Charges which we now reherse to you and all others ye secrets and misterys belonging to free masons you shall faithfully and truly keep, together with ye Counsell of ye assembly or lodge, or any other lodge, or brother, or fellow."

"Then after ye oath taken and the book kissed" (*i.e.* the Bible) the "precepts" are read, the first being:—

> "You shall be true men to God and his holy Church, and that you do not countenance or maintaine any eror, faction, schism or herisey, in ye church to ye best of your understanding." (*History of No. 53*, by James Smith.)

The *Grand Lodge MS. No. 2* provides that "You shall keepe secret ye obscure and intricate pts. of ye science, not disclosinge them to any but such as study and use ye same."

The *Harleian MS. No. 2054* (Brit. Mus.) is still more explicit, termed *The free Masons Orders and Constitutions*, and is in the handwriting of Randle Holme (author of the *Academie of Armory*, 1688), who was a member of a lodge in Cheshire. Following the MS. *Constitutions*, in the same handwriting, about 1650, is a scrap of paper with the obligation:—

> "There is sevrall words and signes of a free Mason to be revailed to yu wch as yu will answr. before God at the Great and terrible day of judgmt. yu keep secret and not to revaile the same to any in the heares of any p'son, but to the Mrs and fellows of the Society of Free Masons, so helpe me God, &c."
> (W. H. Rylands, *Mas. Mag.*, 1882.)

[1] The service rendered by Dr W. Begemann (Germany) in his "Attempt to Classify the Old Charges of the British Masons" (vol. 1 Trans. of the *Quatuor Coronati* Lodge, London) has been very great, and the researches of the Rev. A. F. A. Woodford and G. W. Speth have also been of the utmost consequence.

[2] Findel claims that his *Treatise* on the society was the cause which "first impelled England to the study of masonic history and ushered in the intellectual movement which resulted in the writings of Bros. Hughan, Lyon, Gould and others." Great credit was due to the late German author for his important work, but before its advent the Rev. A. F. A. Woodford, D. Murray Lyon and others in Great Britain were diligent masonic students on similar lines.

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It is not yet settled who were the actual designers or architects of the grand old English cathedrals. Credit has been claimed for church dignitaries, to the exclusion more or less of the master masons, to whom presumably of right the distinction belonged. In early days the title "architect" is not met with, unless the term "Ingenator" had that meaning, which is doubtful. As to this interesting question, and as to the subject of building generally, an historical account of Master and Free Masons (*Discourses upon Architecture in England*, by the Rev. James Dallaway, 1833), and *Notes on the Superintendents of English Buildings in the Middle Ages* (by Wyatt Papworth, 1887), should be consulted. Both writers were non-masons. The former observes: "The honour due to the original founders of these edifices is almost invariably transferred to the ecclesiastics under whose patronage they rose, rather than to the skill and design of the master mason, or professional architect, because the only historians were monks. . . . They were probably not so well versed in geometrical science as the master masons, for mathematics formed a part of monastic learning in a very limited degree." In the *Journal of Proceedings R.I.B.A.* vol. iv. (1887), a skilful critic (W.H. White) declares that Papworth, in that valuable collection of facts, has contrived to annihilate all the professional ideals of the century, setting up in their place nothing except the master mason. The brotherhood of Bridge-builders,[1] that travelled far and wide to build bridges, and the travelling bodies of Freemasons,[2] he believes never existed; nor was William of Wykeham the designer of the colleges attributed to him. It seems well-nigh impossible to disprove the statements made by Papworth, because they are all so well grounded on attested facts; and the attempt to connect the Abbey of Cluny, or men trained at Cluny, with the original or preliminary designs of the great buildings erected during the middle ages, at least during the 12th and 13th centuries, is also a failure. The whole question is ably and fully treated in the *History of Freemasonry* by Robert Freke Gould (1886–1887), particularly in chapter vi. on "Medieval Operative Masonry," and in his *Concise History* (1903).

The lodge is often met with, either as the *tabulatum domicialem* (1200, at St Alban's Abbey) or actually so named in the *Fabric Rolls* of York Minster (1370), *ye loge* being situated close to the fane in course of erection; it was used as a place in which the stones were prepared in private for the structure, as well as occupied at meal-time, &c. Each mason was required to "swere upon ye boke yt he sall trewly ande bysyli at his power hold and kepe holy all ye poyntes of yis forsayde ordinance" (*Ordinacio Cementanorum*).

As to the term *free*-mason, from the 14th century, it is held by some authorities that it described simply those men who worked "freestone," but there is abundant evidence to prove that, whatever may have been intended at first, *free*-mason soon had a much wider signification, the prefix *free* being also employed by carpenters (1666), sewers (15th century, tailors at Exeter) and others, presumably to indicate they were free to follow their trades in certain localities. On this point Mr Gould well observes: "The class of persons from whom the Freemasons of Warrington (1646), Staffordshire (1686), Chester, York, London and their congeners in the 17th century derived the descriptive title, which became the inheritance of the Grand Lodge of England, were *free men*, and masons of Gilds or Companies" (*History*, vol. ii. p. 160). Dr Brentano may also be cited: "Wherever the Craft Guilds were legally acknowledged, we find foremost, that the right to exercise their craft, and sell their manufactures, depended upon the freedom of their city" (*Development of Guilds*, &c., p. 65). In like manner, the privilege of working as a mason was not conferred before candidates had been "made free." The regular free-masons would not work with men, even if they had a knowledge of their trade, "if *unfree*," but styled them "Cowans," a course justified by the king's "Maister of Work," William Schaw, whose *Statuis and Ordinances* (28th December 1598) required that "Na maister or fellow of craft ressaue any *cowanis* to wirk in his societie or companye, nor sent nane of his servants to wirk wt. cowanis, under the pane of twentie pounds." Gradually, however, the rule was relaxed, in time such monopoly practically ceased, and the word "cowan" is only known in connexion with speculative Freemasonry. Sir Walter Scott, as a member of Lodge St David (No. 36), was familiar with the word and used it in *Rob Roy*. In 1707 a cowan was described in the minutes of Mother Lodge Kilwinning, as a mason "without the word," thus one who was not a *free* mason (*History of the Lodge of Edinburgh No. 1*, by D. Murray Lyon, 1900).

In the *New English Dictionary* (Oxford, vol. iv., 1897) under "Freemason" it is noted that three views have been propounded:—(1) "The suggestion that *free-mason* stands for free-stone-mason would appear unworthy of attention, but for the curious fact that the earliest known instances of any similar appellation are *mestre mason de franche peer* (Act 25 Edw. III., 1350), and *sculptores lapidum liberorum*, alleged to occur in a document of 1217; the coincidence, however, seems to be merely accidental. (2) The view most generally held is that freemasons were those who were free of the masons' guild. Against this explanstion many forcible objections have been brought by Mr G. W. Speth, who suggests (3) that the itinerant masons were called free because they claimed exemption from the control of the local guilds of the towns in which they temporarily settled. (4) Perhaps the best hypothesis is that the term refers to the medieval practice of emancipating skilled artisans, in order that they might be able to travel and render their services wherever any great building was in process of construction." The late secretary of the Quatuor Coronati Lodge (No. 2076, London) has thus had his view sanctioned by "the highest tribunal in the Republic of Letters so far as Philology is concerned" (Dr W. J. Chetwode Crawley in *Ars Quatuor Coronatorum*, 1898). Still it cannot be denied that members of lodges in the 16th and following centuries exercised the privilege of making *free* masons and denied the freedom of working to cowans (also called *un*-freemen) who had not been so made free; "the masowrys of the luge" being the only ones recognised as *free*masons. As to the prefix being derived from the word *freer*, a sufficient answer is the fact that frequent reference is made to "Brother *free*masons," so that no ground for that supposition exists (cf. articles by Mr Gould in the *Freemason* for September 1898 on "Free and Freemasonry").

There are numerous indications of masonic activity in the British lodges of the 17th century, especially in Scotland; the existing records, however, of the southern part of the United Kingdom, though few, are of importance, some only having been made known in recent years. These concern the Masons' Company of London, whose valuable minutes and other documents are ably described and commented upon by Edward Conder, jr., in his *Hole Crafte and Fellowship of Masons* (1894), the author then being the Master of that ancient company. It was incorporated in 1677 by Charles II., who graciously met the wishes of the members, but as a company the information "that is to be found in the Corporation Records at Guildhall proves very clearly that in 1376 the Masons' Company existed and was represented in the court of common council." The title then favoured was "Masons," the entry of the term "Freemasons" being crossed out. Herbert erroneously overlooked the correction, and stated in his *History of the Twelve Great Livery Companies* (vol. i.) that the Freemasons returned two, and the Masons four members, but subsequently amalgamated; whereas the revised entry was for the "Masons" only. The Company obtained a grant of arms in 1472 (12th year Hen. VIII.), one of the first of the kind, being thus described:—"A feld of Sablys A Cheveron silver grailed thre Castellis of the same garnyshed wt. dores and wyndows of the feld in the Cheveron or Cumpas of Black of Blak"; it is the authority (if any) for all later armorial bearings having a chevron and castles, assumed by other masonic

[1] It is not considered necessary to refer at length to the *Fratres Pontis*, or other imaginary bodies of freemasons, as such questions may well be left to the curious and interested student.

[2] "No distinct trace of the general employment of large migratory bands of masons, going from place to place as a guild, or company, or brotherhood" (Prof. T. Hayter-Lewis, Brit. Arch. Assoc., 1889).

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organizations. This precious document was only discovered in 1871, having been missing for a long time, thus doubtless accounting for the erroneous representations met with, not having the correct blazon to follow. The oldest masonic motto known is "God is our Guide" on Kerwin's tomb in St Helen's church, Bishopgate, of 1594; that of "In the Lord is all our trust" not being traced until the next century. Supporters consisting of two doric columns are mentioned in 1688 by Randle Holme, but the Grand Lodge of England in the following century used Beavers as operative builders. Its first motto was "In the beginning was the Word" (in Greek), exchanged a few years onward for "Relief and Truth," the rival Grand Lodge (Atholl Masons) selecting "Holiness to the Lord" (in Hebrew), and the final selection at the "Union of December 1813" being *Audi Vide Tace*.

Mr Conder's discovery of a lodge of "Accepted Masons" being held under the wing of the Company was a great surprise, dating as the records do from 1620 to 1621 (the earliest of the kind yet traced in England), when seven were made masons, all of whom were free of the Company *before*, three being of the Livery; the entry commencing "Att the making masons." The meetings were entitled the "Acception," and the members of the lodge were called *Accepted* Masons, being those so *accepted* and initiated, the term never otherwise being met with in the Records. An additional fee had to be paid by a member of the Company to join the "Acception," and any not belonging thereto were mulct in twice the sum; though even then such "acceptance" did not qualify for membership of the superior body; the fees for the "Acception" being £1 and £2 respectively. In 1638–1639, when Nicholas Stone entered the lodge (he was Master of the Company 1632–1633) the banquet cost a considerable sum, showing that the number of brethren present must have been large.

Elias Ashmole (who according to his diary was "made a Free Mason of Warrington with Colonel Henry Mainwaring," seven brethen being named as in attendance at the lodge, 16th of October 1646) states that he "received a summons to appear at a Lodge to be held next day at Masons' Hall, London." Accordingly on the 11th of March 1682 he attended and saw six gentlemen "admitted into the Fellowship of Free Masons," of whom three only belonged to the Company; the Master, however, Mr Thomas Wise, the two wardens and six others being present on the occasion as members in their *dual* capacity. Ashmole adds: "We all dyned at the Halfe Moone Tavern in Cheapside at a noble dinner prepaired at the charge of the new-accepted Masons."

It is almost certain that there was not an operative mason present at the Lodge held in 1646, and at the one which met in 1682 there was a strong representation of the speculative branch. Before the year 1654 the Company was known as that of the Freemasons for some time, but after then the old title of Masons was reverted to, the terms "Acception" and "Accepted" belonging to the speculative Lodge, which, however, in all probability either became independent or ceased to work soon after 1682. It is very interesting to note that subsequently (but never before) the longer designation is met with of "Free and Accepted Masons," and is thus a combination of operative and speculative usage.

Mr Conder is of opinion that in the Records "there is no evidence of any particular ceremony attending the position of Master Mason, possibly it consisted of administering a different oath from the one taken by the apprentices on being entered." There is much to favour this supposition, and it may provide the key to the *vexata quaestio* as to the plurality of degrees prior to the Grand Lodge era. The fellow-crafts were recruited from those apprentices who had served their time and had their essay (or sufficient trial of their skill) duly passed; they and the Masters, by the *Schaw Statutes* of 1598, being only admitted in the presence of "sex Maisteris and *twa enterit prenteissis*." As a rule a master mason meant one who was master of his trade, *i.e.* duly qualified; but it sometimes described employers as distinct from journeymen Freemasons; being also a compliment conferred on honorary members during the 17th century in particular.

In Dr Plot's *History of Staffordshire* (1686) is a remarkable account of the "Society of Freemasons," which, being by an unfriendly critic, is all the more valuable. He states that the custom had spread "more or less all over the nation"; persons of the most eminent quality did not disdain to enter the Fellowship; they had "a large *parchment volum* containing the History and Rules of the Craft of Masonry"; St Amphibal, St Alban, King Athelstan and Edwin are mentioned, and these "charges and manners" were "after perusal approved by King Hen. 6 and his council, both as to Masters and Fellows of this right Worshipfull craft." It is but fair to add that notwithstanding the service he rendered the Society by his lengthy description, that credulous historian remarks of its history that there is nothing he ever "met with more falsc or incoherent."

The author of the *Academie of Armory*, previously noted, knew better what he was writing about in that work of 1688 in which he declares: "I cannot but Honor the Fellowship of the Masons because of its Antiquity; and the more, *as being a member of that Society, called Free Masons*." Mr Rylands states that in *Harl. MS. 5955* is a collection of the engraved plates for a second volume of this important work, one being devoted to the Arms of the Society, the columns, as supporters, having globes thereon, from which possibly are derived the two pillars, with such ornaments or additions seen in lodge rooms at a later period.

In the same year "A Tripos or Speech delivered at a commencement in the University of Dublin held there July 11, 1688, by John Jones, then A.B., afterwards D.D.," contained "notable evidence concerning Freemasonry in Dublin." The Tripos was included in Sir Walter Scott's edition of Dean Swift's works (1814), but as Dr Chetwode Crawley points out, though noticed by the Rev. Dr George Oliver (the voluminous Masonic author), he failed to realize its historical importance. The satirical and withal amusing speech was partly translated from the Latin by Dr Crawley for his scholarly introduction to the *Masonic Reprints*, &c., by Henry Sadler. "The point seems to be that Ridley (reputed to have been an informer against priests under the barbarous penal laws) was, or ought to have been, hanged; that his carcase, anatomized and stuffed, stood in the library; and that *froth scoundrellus* discovered on his remains the Freemasons' Mark." The importance of the references to the craft in Ireland is simply owing to the year in which they were made, as illustrative of the influence of the Society at that time, of which records are lacking.

It is primarily to Scotland, however, that we have to look for such numerous particulars of the activity of the fraternity from 1590 to the establishment of its Grand Lodge in 1736, for an excellent account of which we are indebted to Lyon, the Scottish masonic historian. As early as 1600 (8th of June) the attendance of John Boswell, Esq., the laird of Auchinleck, is entered in the minutes of the Lodge of Edinburgh; he attested the record and added his mark, as did the other members; so it was not his first appearance. Many noblemen and other gentlemen joined this ancient *atelier*, notably Lord Alexander, Sir Anthony Alexander and Sir Alexander Strachan in 1634, the king's Master of Work (Herrie Alexander) in 1638, General Alexander Hamilton in 1640, Dr Hamilton in 1647, and many other prominent and distinguished men later; "James Neilsone, Master Sklaitter to His Majestie," who was "entered and past in the Lodge of Linlithgow, being elected a joining member," 2nd March 1654. Quarter-Master General Robert Moray (or Murray) was initiated by members of the Lodge of Edinburgh, at Newcastle on the 20th of May 1641, while the Scottish army was in occupation. On due report to their Alma Mater such reception was allowed, the occurrence having been considered the first of its kind in England until the ancient Records of the Masons' Company were published.

The minute-books of a number of Scottish Lodges, which are still on the register, go back to the 17th century, and abundantly confirm the frequent admission of speculatives as members and officers, especially those of the venerable "Mother Lodge

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Kilwinning," of which the earl of Cassillis was the deacon in 1672, who was succeeded by Sir Alexander Cunningham, and the earl of Eglinton, who like the first of the trio was but an apprentice. There were three Head Lodges according to the Scottish Code of 1599, Edinburgh being "the first and principall," Kilwinning "the secund," and Stirling "the third ludge."

The Aberdeen Lodge (No. 1 *tris*) has records preserved from 1670, in which year what is known as the *Mark Book* begins, containing the oldest existing roll of members, numbering 49, all of whom have their marks registered, save two, though only ten were operatives. The names of the earls of Finlater, Erroll and Dunfermline, Lord Forbes, several ministers and professional men are on the list, which was written by a glazier, all of whom had been enlightened as to the "benefit of the measson word," and inserted in order as they "were made fellow craft." The Charter (*Old Charges*) had to be read at the "entering of everie prenteise," and the officers included a master and two wardens.

The lodge at Melrose (No. 1 *bis*) with records back to 1674 did not join the Grand Lodge until 1891, and was the last of those working (possibly centuries before that body was formed) to accept the modern system of government. Of the many noteworthy lodges mention should be made of that of "Canongate Kilwinning No. 2," Edinburgh, the first of the numerous pendicles of "Mother Lodge Kilwinning, No. 0," Ayrshire, started in 1677; and of the Journeymen No 8, formed in 1707, which was a secession from the Lodge of Edinburgh; the Fellow Crafts or Journeymen not being satisfied with their treatment by the Freemen Masters of the Incorporation of Masons, &c. This action led to a trial before the Lords of Council and Session, when finally a "Decreet Arbitral" was subscribed to by both parties, and the junior organization was permitted "to give the mason word as it is called" in a separate lodge. The presbytery of Kelso[1] in 1652 sustained the action of the Rev. James Ainslie in becoming a Freemason, declaring that "there is neither sinne nor scandale in that word" (*i.e.* the "Mason Word"), which is often alluded to but never revealed in the old records already referred to.[2] One Scottish family may be cited in illustration of the continuous working of Freemasonry, whose membership is enshrined in the records of the ancient Lodge of "Scoon and Perth No. 3" and others. A venerable document, lovingly cared for by No. 3, bears date 1658, and recites how John Mylne came to Perth from the "North Countrie," and was the king's Master Mason and W.M. of the Lodge, his successor being his son, who entered "King James the sixt as freemason and fellowcraft"; his third son John was a member of Lodge No. 1 and Master Mason to Charles I., 1631–1630, and his eldest son was a deacon of No. 1 eleven times during thirty years. To him was apprenticed his nephew, who was warden in 1663–1664 and deacon several times. William Mylne was a warden in 1695, Thomas (eldest son) was Master in 1735, and took part in the formation of the Grand Lodge of Scotland. Others of the family continued to join the Lodge No. 1, until Robert, the last of the Mylnes as Freemasons, was initiated in 1754, died in 1811, and "was buried in St Paul's cathedral, having been Surveyor to that Edifice for fifty years," and the last of the masonic Mylnes for five generations. The "St John's Lodge," Glasgow (No. 3 *bis*), has some valuable old records and a "Charter Chest" with the words carved thereon "God save the King and Masons Craft, 1684." *Loyalty and Charity* are the watchwords of the Society.

The Craft Gilds (*Corps d'État*) of France, and their progeny the *Companionage*, have been fully described by Mr Gould, and the *Steinmetzen* of Germany would require too detailed notice if we were to particularize its rules, customs and general character, from about the 12th century onward. Much as there was in common between the Stonemasons of Germany and the Freemasons of Great Britain and Ireland, it must be conceded that the two societies never united and were all through this long period wholly separate and independent; a knowledge of Freemasonry and authority to hold lodges in Germany being derived from the Grand Lodge of England during the first half of the 18th century. The theory of the derivation of the Freemasons from the *Steinmetzen* was first propounded in 1779 by the abbé Grandidier, and has been maintained by more modern writers, such as Fallou, Heideloff and Schneider, but a thorough examination of their statements has resulted in such an origin being generally discredited. Whether the *Steinmetzen* had secret signs of recognition or not, is not quite clear, but that the Freemasons had, for centuries, cannot be doubted, though precisely what they were may be open to question, and also what portions of the existing ceremonies are reminiscent of the craft anterior to the Revival of 1717. Messrs Speth and Gould favour the notion that there were two distinct and separate degrees prior to the third decade of the 18th century (*Ars* Q.C., 1898 and 1903), while other authorities have either supported the *One degree* theory, or consider there is not sufficient evidence to warrant a decision. Recent discoveries, however, tend in favour of the first view noted, such as the *Trinity College MS.*, Dublin ("Free Masonry, Feb. 1711"), and the invaluable[3] *Chetwode Crawley MS.* (Grand Lodge Library, Dublin); the second being read in connexion with the Haughfoot Lodge Records, beginning 1702 (*Hist. of Freemasonry*, by W. F. Vernon, 1893).

Two of the most remarkable lodges at work during the period of transition (1717–1723), out of the many then existing in England, assembled at Alnwick and at York. The origin of the first noted is not known, but there are minutes of the meetings from 1703, the Rules are of 1701, signed by quite a number of members, and a transcript of the *Old Charges* begins the volume. In 1708–1709 a minute provided for a masonic procession, at which the brethren were to walk "with their aprons on and Comon Square." The Lodge consisted mainly of operative "free Brothers," and continued for many years, a code of by-laws being published in 1763, but it never united with the Grand Lodge, giving up the struggle for existence a few years further on.

The other lodge, the most noteworthy of all the English predecessors of the Grand Lodge of England, was long held at York, the Mecca of English Freemasons.[4] Its origin is unknown, but there are traces of its existence at an early date, and possibly it was a survival of the Minster Lodge of the 14th century. Assuming that the *York MS. No. 4* of 1693 was the property of the lodge in that year (which Roll was presented by George Walker of Wetherby in 1777), the entry which concludes that Scroll is most suggestive, as it gives "The names of the Lodge" (members) and the "Lodge Ward(en)." Its influence most probably may be also noted at Scarborough, where "A private Lodge" was held on the 10th of July 1705, at which the president "William Thompson, Esq., and severall others brethren ffree Masons" were present, and six gentlemen (named) "were then admitted into the said ffraternity." These particulars are endorsed on the *Scarborough MS.* of the Old Charges, now owned by the Grand Lodge of Canada at Toronto. "A narrow folio manuscript Book beginning 7th March 1705–1706," which was quoted from in 1778, has long been missing, which is much to be regretted, as possibly it gave particulars of the lodge which assembled at Bradford, Yorkshire, "when 18 Gentlemen of the first families in that neighbourhood were made Masons." There is, however, another roll of records from 1712 to 1730 happily preserved of this "Ancient Honble. Society and Fraternity of Free Masons," sometimes styled "Company" or "Society of Free and Accepted Masons."

Not to be behind the London fratres, the York brethren formed a Grand Lodge on the 27th of December 1725 (the "Grand

[1] The Associate Synod which met at Edinburgh, March 1755, just a century later, took quite an opposite view, deciding to depose from office any of their brethren who would not give up their masonic membership (*Scots Mag.*, 1755, p. 158). Papal Bulls have also been issued against the craft, the first being in 1738; but neither interdicts nor anathemata have any influence with the fraternity, and fall quite harmless.

[2] "We have the *Mason Word* and second sight,
Things for to come we can fortell aright."
(*The Muses Threnodie*, by H. Adamson, Edin., 1638.)

[3] The *Chetwode Crawley MS.*, by W. J. Hughan (*Ars*, Q.C., 1904).

[4] The *York Grand Lodge*, by Messrs. Hughan and Whytehead (*Ars* Q.C., 1900), and *Masonic Sketches and Reprints* (1871), by the former.

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Lodge of *all* England" was its modest title), and was flourishing for years, receiving into their company many county men of great influence. Some twenty years later there was a brief period of somnolence, but in 1761 a revival took place, with Francis Drake, the historian, as Grand Master, ten lodges being chartered in Yorkshire, Cheshire and Lancashire, 1762–1790, and a Grand Lodge of England, south of the Trent, in 1779, at London, which warranted two lodges. Before the century ended all these collapsed or joined the Grand Lodge of England, so there was not a single representative of "York Masonry" left on the advent of the next century.

The premier Grand Lodge of England soon began to constitute new Lodges in the metropolis, and to reconstitute old ones that applied for recognition, one of the earliest of 1720–1721 being still on the Roll as No. 6, thus having kept company ever since with the three "time immemorial Lodges," Nos. 2, 4 and 12. Applications for constitution kept coming in, the provinces being represented from 1723 to 1724, before which time it is likely the Grand Lodge of Ireland[1] had been started, about which the most valuable *Cuementaria Hibernica* by Dr Chetwode Crawley may be consulted with absolute confidence. Provincial Grand Lodges were formed to ease the authorities at headquarters, and, as the society spread, also for the Continent, and gradually throughout the civilized globe. Owing to the custom prevailing before the 18th century, a few brethren were competent to form lodges on their own initiative anywhere, and hence the registers of the British Grand Lodges are not always indicative of the first appearance of the craft abroad. In North America[2] lodges were held before what is known as the first "regular" lodge was formed at Boston, Mass., in 1733, and probably in Canada[3] likewise. The same remark applies to Denmark, France, Germany, Holland, Italy, Portugal, Russia, Spain, Sweden and other countries. Of the many scores of military lodges, the first warrant was granted by Ireland in 1732. To no other body of Freemasons has the craft been so indebted for its prosperity in early days as to their military brethren. There were rivals to the Grand Lodge of England during the 18th century, one of considerable magnitude being known as the Ancients or Atholl Masons, formed in 1751, but in December 1813 a junction was effected, and from that time the prosperity of the United Grand Lodge of England, with few exceptions, has been extraordinary.

Nothing but a volume to itself could possibly describe the main features of the English Craft from 1717, when Anthony Sayer was elected the first Grand Master of a brilliant galaxy of rulers. The first nobleman to undertake that office was the duke of Montagu in 1721, the natural philosopher J. T. Desaguliers being his immediate predecessor, who has been credited (and also the Rev. James Anderson) with the honour of starting the premier Grand Lodge; but like the fable of Sir Christopher Wren having been Grand Master, evidence is entirely lacking. Irish and Scottish peers share with those of England the distinction of presiding over the Grand Lodge, and from 1782 to 1813 their Royal Highnesses the duke of Cumberland, the prince of Wales, or the duke of Sussex occupied the masonic throne. From 1753 to 1813 the rival Grand Lodge had been busy, but ultimately a desire for a *united* body prevailed, and until the "ancient" Grand Master, H.R.H. the duke of Kent, it was decided to amalgamate with the original ruling organization, H.R.H. the duke of Sussex becoming the Grand Master of the United Grand Lodge. On the decease of the prince in 1843 the earl of Zetland succeeded, followed by the marquess of Ripon in 1874, on whose resignation H.R.H. the prince of Wales became the Grand Master. Soon after succeeding to the throne, King Edward VII. ceased to govern the English craft, and was succeeded by H.R.H. the duke of Connaught. From 1737 to 1907 some sixteen English princes of the royal blood joined the brotherhood.

From 1723 to 1813 the number of lodges enrolled in England amounted to 1626, and from 1814 to the end of December 1909 as many as 3352 were warranted, making a grand total of 4978, of which the last then granted was numbered 3185. There were in 1909 still 2876 on the register, notwithstanding the many vacancies created by the foundation of new Grand Lodges in the colonies and elsewhere.[4]

Distribution and Organization.—The advantage of the cosmopolitan basis of the fraternity generally (though some Grand Lodges still preserve the original Christian foundation) has been conspicuously manifested and appreciated in India and other countries where the votaries of numerous religious systems congregate; but the unalterable basis of a belief in the Great Architect of the Universe remains, for without such a recognition there can be no Freemasonry, and it is now, as it always has been, entirely free from party politics. The charities of the Society in England, Ireland and Scotland are extensive and well organized, their united cost per day not being less than £500, and with those of other Grand Lodges throughout the world must amount to a very large sum, there being over two millions of Freemasons. The vast increase of late years, both of lodges and members, however, calls for renewed vigilance and extra care in selecting candidates, that numbers may not be a source of weakness instead of strength.

In its internal organization, the working of Freemasonry involves an elaborate system of symbolic ritual,[5] as carried out at meetings of the various lodges, uniformity as to essentials being the rule. The members are classified in numerous degrees, of which the first three are "Entered Apprentice," "Fellow Craft" and "Master Mason," each class of which, after initiation, can only be attained after passing a prescribed ordeal or examination, as a test of proficiency, corresponding to the "essays" of the operative period.

The lodges have their own by-laws for guidance, subject to the *Book of Constitutions* of their Grand Lodge, and the regulations of the provincial or district Grand Lodge if located in counties or held abroad.

It is to be regretted that on the continent of Europe Freemasonry has sometimes developed on different lines from that of the "Mother Grand Lodge" and Anglo-Saxon Grand Lodges generally, and through its political and anti-religious tendencies has come into contact or conflict with the state authorities[6] or the Roman Catholic church. The "Grand Orient of France" (but not the Supreme Council 33°, and its Grand Lodge) is an example of this retrograde movement, by its elimination of the paragraph referring to a belief in the "Great Architect of the Universe" from its *Statuts et règlements généraux*. This deplorable action has led to the withdrawal of all regular Grand Lodges from association with that body, and such separation must continue until a return is made to the ancient and inviolable landmark of the society, which makes it impossible for an atheist either to join or continue a member of the fraternity.

The Grand Lodge of England constituted its first lodge in Paris in the year 1732, but one was formed still earlier on the continent at Gibraltar 1728–1729. Others were also opened in Germany 1733, Portugal 1735, Holland 1735, Switzerland 1740, Denmark 1745, Italy 1763, Belgium 1765, Russia 1771, and

[1] The celebrated "Lady Freemason," the Hon. Mrs Aldworth (*née* Miss St Leger, daughter of Lord Doneraile), was initiated in Ireland, but at a much earlier date than popularly supposed; certainly not later than 1713, when the venturesome lady was twenty. All early accounts of the occurrence must be received with caution, as there are no contemporary records of the event.

[2] *History of Freemasonry*, by Dr A. G. Mackey (New York, 1898), and the *History* of the Fraternity Publishing Company, Boston, Mass., give very full particulars as to the United States.

[3] See *History of Freemasonry in Canada* (Toronto, 1899), by J. Ross Robertson.

[4] *The Masonic Records 1717–1894*, by John Lane, and the excellent *Masonic Yearbook*, published annually by the Grand Lodge of England, are the two standard works on Lodge enumeration, localization and nomenclature. For particulars of the Grand Lodges, and especially that of England, Gould's History is most useful and trustworthy; and for an original contribution to the history of the rival Grand Lodge or Atholl Masons, Sadler's *Masonic Facts and Fictions*.

[5] "A peculiar system of Morality, veiled in Allegory and illustrated by Symbols" (old definition of Freemasonry).

[6] The British House of Commons in 1799 and 1817, in acts of parliament, specifically recognized the laudable character of the society and provided for its continuance on definite lines.

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Sweden 1773. In most of these countries Grand Lodges were subsequently created and continue to this date, save that in Austria (not Hungary) and Russia no masonic lodges have for some time been permitted to assemble. There is a union of Grand Lodges of Germany, and an annual Diet is held for the transaction of business affecting the several masonic organizations in that country, which works well. H.R.H. Prince Frederick Leopold was in 1909 Protector, or the "Wisest Master" (Vicarius Salomonis). King Gustav V. was the Grand Master ✣ of the freemasons in Sweden, and the sovereign of the "Order of Charles XIII.," the only one of the kind confined to members of the fraternity.

Lodges were constituted in India from 1730 (Calcutta), 1752 (Madras), and 1758 (Bombay); in Jamaica 1742, Antigua 1738, and St Christopher 1730; soon after which period the Grand Lodges of England, Ireland and Scotland had representatives at work throughout the civilized world.

In no part, however, outside Great Britain has the craft flourished so much as in the United States of America, where the first "regular" lodge (*i.e.* according to the *new* regime) was opened in 1733 at Boston, Mass. Undoubtedly lodges had been meeting still earlier, one of which was held at Philadelphia, Penna., with records from 1731, which blossomed into a Grand Lodge, but no authority has yet been traced for its proceedings, save that which may be termed "time immemorial right," which was enjoyed by all lodges and brethren who were at work prior to the Grand Lodge era (1716–1717) or who declined to recognize the autocratic proceedings of the premier Grand Lodge of England, just as the brethren did in the city of York. A "deputation" was granted to Daniel Coxe, Esq. of New Jersey, by the duke of Norfolk, Grand Master, 5th of June 1730, as Prov. Grand Master of the "Provinces of New York, New Jersey and Pensilvania," but there is no evidence that he ever constituted any lodges or exercised any masonic authority in virtue thereof. Henry Price as Prov. Grand Master of New England, and his lodge, which was opened on the 31st of August 1733, in the city of Boston, so far as is known, began "regular" Freemasonry in the United States, and the older and independent organization was soon afterwards "regularized." Benjamin Franklin (an Initiate of the lodge of Philadelphia) printed and published the *Book of Constitutions*, 1723 (of London, England), in the "City of Brotherly Love" in 1734, being the oldest masonic work in America. English and Scottish Grand Lodges were soon after petitioned to grant warrants to hold lodges, and by the end of the 18th century several Grand Lodges were formed, the Craft becoming very popular, partly no doubt by reason of so many prominent men joining the fraternity, of whom the chief was George Washington, initiated in a Scottish lodge at Fredericksburg, Virginia, in 1752–1753. In 1907 there were fifty Grand Lodges assembling in the United States, with considerably over a million members.

In Canada in 1909 there were eight Grand Lodges, having about 64,000 members. Freemasonry in the Dominion is believed to date from 1740. The Grand Lodges are all of comparatively recent organization, the oldest and largest, with 40,000 members, being for Ontario; those of Manitoba, Nova Scotia and Quebec numbering about 5000 each. There are some seven Grand Lodges in Australia; South Australia coming first as a "sovereign body," followed closely by New South Wales and Victoria (of 1884–1889 constitution), the whole of the lodges in the Commonwealth probably having fully 50,000 members on the registers.

There are many additional degrees which may be taken or not (being quite optional), and dependent on a favourable ballot; the difficulty, however, of obtaining admission increases as progress is made, the numbers accepted decreasing rapidly with each advancement. The chief of these are arranged in separate classes and are governed either by the "Grand Chapter of the Royal Arch," the "Mark Grand Lodge," the "Great Priory of Knights Templars" or the "Ancient and Accepted Rite," these being mutually complementary and intimately connected as respects England, and more or less so in Ireland, Scotland, North America and wherever worked on a similar basis; the countries of the continent of Europe have also their own *Hautes Grades*. (W. J. H.*)

FREEPORT, a city and the county-seat of Stephenson county, Illinois, in the N.W. part of the state, on the Pecatonica river, 30 m. from its mouth and about 100 m. N.W. of Chicago. Pop. (1890) 10,189; (1900) 13,258, of whom 2764 were foreign-born; (1910 census) 17,567. The city is served by the Chicago & North-Western, the Chicago, Milwaukee & St Paul, and the Illinois Central railways, and by the Rockford & Interurban electric railway. The Illinois Central connects at South Freeport, about 3 m. S. of Freeport, with the Chicago Great Western railway. Among Freeport's manufactures are foundry and machine shop products, carriages, hardware specialties, patent medicines, windmills, engines, incubators, organs, beer and shoes. The Illinois Central has large railway repair shops here. The total value of the city's factory product in 1905 was $3,109,302, an increase of 14·8% since 1900. In the surrounding country cereals are grown, and swine and poultry are raised. Dairying is an important industry also. The city has a Carnegie library (1901). In the Court House Square is a monument, 80 ft. high, in memory of the soldiers who died in the Civil War. At the corner of Douglas Avenue and Mechanic Street a granite boulder commemorates the famous debate between Abraham Lincoln and Stephen A. Douglas, held in Freeport on the 27th of August 1858. In that debate Lincoln emphasized the differences between himself and the radical anti-slavery men, and in answer to one of Lincoln's questions Douglas declared that the people of a territory, through "unfriendly" laws or denial of legislative protection, could exclude slavery, and that "it matters not what way the Supreme Court may hereafter decide on the abstract question whether slavery may or may not go into a territory under the Constitution." This, the so-called "Freeport doctrine," greatly weakened Douglas in the presidential election of 1860. Freeport was settled in 1835, was laid out and named Winneshiek in 1836, and in 1837 under its present name was made the county-seat of Stephenson county. It was incorporated as a town in 1850 and chartered as a city in 1855.

FREE PORTS, a term, strictly speaking, given to localities where no customs duties are levied, and where no customs supervision exists. In these ports (subject to payment for specific services rendered, wharfage, storage, &c., and to the observance of local police and sanitary regulations) ships load and unload, cargoes are deposited and handled, industries are exercised, manufactures are carried on, goods are bought and sold, without any action on the part of fiscal authorities. Ports are likewise designated "free" where a space or zone exists within which commercial operations are conducted without payment of import or export duty, and without active interference on the part of customs authorities. The French and German designations for these two descriptions of ports are—for the former *La Ville franche*, *Freihafen*; for the latter *Le Port franc*, *Freibezirk* or *Freiläger*. The English phrase free port applies to both.[1] The leading conditions under which free ports in Europe derived their origin were as follows:—(1) When public order became re-established during the middle ages, trading centres were gradually formed. Marts for the exchange and purchase of goods arose in different localities. Many Italian settlements, constituting free zones, were established in the Levant. The Hanseatic towns arose in the 12th century. Great fairs became recognized—the Leipzig charter was granted in 1268. These localities were free as regards customs duties, although dues of the nature of octroi charges were often levied. (2) Until the 19th century European states were numerous, and often of small size. Accordingly uniform customs tariffs of wide application did not exist.

[1] In China at the present time (1902) certain ports are designated "free and open." This phrase means that the ports in question are (1) open to foreign trade, and (2) that vessels engaged in oversea voyages may freely resort there. Exemption from payment of customs duties is not implied, which is a matter distinct from the permission granted under treaty engagements to foreign vessels to carry cargoes to and from the "treaty ports."

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Uniform rates of duty were fixed in England by the Subsidy Act of 1660. In France, before the Revolution (besides the free ports), Alsace and the Lorraine Bishoprics were in trade matters treated as foreign countries. The unification of the German customs tariff began in 1834 with the Steuerverein and the Zollverein. The Spanish fiscal system did not include the Basque provinces until about 1850. The uniform Italian tariff dates from 1861. Thus until very recent times on the Continent free ports were compatible with the fiscal policy and practice of different countries. (3) Along the Mediterranean coast, up to the 19th century, convenient shelter was needed from corsairs. In other continental countries the prevalent colonial and mercantile policy sought to create trans-oceanic trade. Free ports were advantageous from all these points of view.

In following the history of these harbours in Europe, it is to be observed that in Great Britain free ports have never existed. In 1552 it was contemplated to place Hull and Southampton on this footing, but the design was abandoned. Subsequently the bonding and not the free port system was adopted in the United Kingdom.

Austria-Hungary.—Fiume and Trieste were respectively free ports during the periods 1722–1893 and 1719–1893.

Belgium.—The emperor Joseph II. during his visit to the Austrian Netherlands in June 1781 endeavoured to create a direct trade between that country and India. Ostend was made a free port, and large bonding facilities were afforded at Bruges, Brussels, Ghent and Louvain. In 1796, however, the revolutionary government abolished the Ostend privileges.

Denmark.—In November 1894 an area of about 150 acres at Copenhagen was opened as a free port, and great facilities are afforded for shipping and commercial operations in order that the Baltic trade may centre there.

France.—Marseilles was a free port in the middle ages, and so was Dunkirk when it formed part of Flanders. In 1669 these privileges were confirmed, and extended to Bayonne. In 1784 there was a fresh confirmation, and Lorient and St Jean de Luz were included in the *ordonnance*. The National Assembly in 1790 maintained this policy, and created free ports in the French West Indies. In 1795, however, all such privileges were abolished, but large bonding facilities were allowed at Marseilles to favour the Levant trade. The government of Louis XVIII. in 1814 restored, and in 1871 again revoked, the free port privileges of Marseilles. There are now no free ports in France or in French possessions; the bonding system is in force.

Germany.—Bremen, Hamburg and Lübeck were reconstituted free towns and ports under the treaties of 1814–1815. Certain minor ports, and several landing-stages on the Rhine and the Neckar, were also designated free. As the Zollverein policy became accepted throughout Germany, previous privileges were gradually lessened, and since 1888 only Hamburg remained a free port. There the area of about 2500 acres is exempt from customs duties and control, and is largely used for shipping and commercial purposes. Bremerhaven has a similar area of nearly 700 acres. Brake, Bremen, Cuxhaven, Emden, Geestemünde, Neuhawasser and Stettin possess Freihezirke areas, portions of the larger port. Heligoland is outside the Zollverein—practically a foreign country.

In *Italy* free ports were numerous and important, and possessed privileges which varied at different dates. They were—Ancona, during the period 1696–1868; Brindisi, 1845–1862; Leghorn (in the 17th and 18th centuries a very important Mediterranean harbour), 1675–1867; Messina, 1695–1879; Senigallia, 1821–1868, during the month of the local fair. Venice possessed warehouses, equivalent to bonded stores, for German and Turkish trade during the Republic, and was a free port 1851–1873. Genoa was a free port in the time of the Republic and under the French Empire, and was continued as such by the treaties of 1814–1815. The free port was, however, changed into a "*punto franco*" by a law passed in 1865, and only storing privileges now remain.

Rumania.—Braila, Galatz and Kustenji were free ports (for a period of about forty years) up to 1883, when bonded warehouses were established by the Rumanian government. Sulina remains free.

Russia.—Archangel was a free port, at least for English goods, from 1553 to 1648. During this period English products were admitted into Russia via Archangel without any customs payment for internal consumption, and also in transit to Persia. The tsar Alexis revoked this grant on the execution of Charles I. Free ports were opened in 1895 at Kola, in Russian Lapland. Dalny, adjoining Port Arthur, was a free port during the Russian occupation; and Japan after the war decided to renew this privilege as soon as practicable.

The number of free ports outside Europe has also lessened. The administrative policy of European countries has been gradually adopted in other parts of the world, and customs duties have become almost universal, conjoined with bonding and transhipment facilities. In British colonies and possessions, under an act of parliament passed in 1766, and repealed in 1867, two ports in Dominica and four in Jamaica were free, Malacca, Penang and Singapore have been free ports since 1824, Hong-Kong since 1842, and Weihaiwei since it was leased to Great Britain in 1898. Zanzibar was a free port during 1892–1899. Aden, Gibraltar, St Helena and St Thomas (West Indies) are sometimes designated free ports. A few duties are, however, levied, which are really octroi rather than customs charges. These places are mainly stations for coaling and awaiting orders.

Some harbours in the Netherlands East Indies were free ports between 1829 and 1899; but these privileges were withdrawn by laws passed in 1898–1899, in order to establish uniformity of customs administration. Harbours where custom houses are not maintained will be practically closed to foreign trade, though the governor-general may in special circumstances vary the application of the new regulations.

Macao has been a free port since 1845. Portugal has no other harbour of this character.

The American Republics have adopted the bonding system. In 1896 a free wharf was opened at New Orleans in imitation of the recent European plan. Livingstone (Guatemala) was a free port during the period 1882–1888.

The privileges enjoyed under the old free port system benefited the towns and districts where they existed; and their abolition has been, locally, injurious. These places were, however, "foreign" to their own country, and their inland intercourse was restricted by the duties levied on their products, and by the precautions adopted to prevent evasion of these charges. With fiscal usages involving preferential and deferential treatment of goods and places, the drawbacks thus arising did not attract serious attention. Under the limited means of communication within and beyond the country, in former times, these conveniences were not much felt. But when finance departments became more completely organized, the free port system fell out of favour with fiscal authorities: it afforded opportunities for smuggling, and impeded uniformity of action and practice. It became, in fact, out of harmony with the administrative and financial policy of later times. Bonding and entrepot facilities, on a scale commensurate with local needs, now satisfy trade requirements. In countries where high customs duties are levied, and where fiscal regulations are minute and rigid, if an extension of foreign trade is desired, and the competition which it involves is a national aim, special facilities must be granted for this purpose. In these circumstances a free zone sufficiently large to admit of commercial operations and transhipments on a scale which will fulfil these conditions (watched but not interfered with by the customs) becomes indispensable. The German government have, as we have seen, maintained a free zone of this nature at Hamburg. And when the free port at Copenhagen was opened, counter measures were adopted at Danzig and Stettin. An agitation has arisen in France to provide at certain ports free zones similar to those at Copenhagen and Hamburg, and to open free ports in French possessions. A bill to this effect was submitted to the chamber of deputies on the 12th of April 1905. Colonial free ports, such as Hong-Kong and Singapore, do not interfere with the uniformity of the home customs and excise policy. These two harbours in particular have become great shipping resorts and distributing centres. The policy which led to their establishment as free ports has certainly promoted British commercial interests.

See the Parliamentary Paper on "Continental Free Ports," 1904.

(C. M. K.)

FREE REED VIBRATOR (Fr. *anche libre*, Ger. *durchschlagende Zunge*, Ital. *ancia* or *lingua libera*), in musical instruments, a thin metal tongue fixed at one end and vibrating freely either in surrounding space, as in the accordion and concertina, or enclosed in a pipe or channel, as in certain reed stops of the organ or in the harmonium. The enclosed reed, in its typical and theoretical form, is fixed over an aperture of the same shape but just large enough to allow it to swing freely backwards and forwards, alternately opening and closing the aperture, when driven by a current of compressed air. We have to deal with air under three different conditions in considering the phenomenon of the sound produced by free reeds. (1) The stationary column or stratum in pipe or channel containing the reed, which is normally at rest. (2) The wind or current of air fed from the bellows with a variable velocity and pressure, which is broken up into periodic air puffs as its entrance into pipe or channel is

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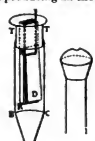
alternately checked or allowed by the vibrator. (1) The disturbed condition of No. 1 when acted upon by the metal vibrator and by No 2, whereby the air within the pipe is forced into alternate pulses of condensation and rarefaction. The free reed is therefore not the tone-producer but only the exciting agent, that is to say, the sound is not produced by the communication of the free reed's vibrations to the surrounding air,[1] as in the case of a vibrating string, but by the series of air puffs punctuated by infinitesimal pauses, which it produces by alternately opening and almost closing the aperture.[2] A musical sound is thus produced the pitch of which depends on the length and thickness of the metal tongue; the greater the length, the slower the vibrations and the lower the pitch, while on the contrary, the thicker the reed near the shoulder at the fixed end, the higher the pitch. It must be borne in mind that the periodic vibrations of the reed determine the pitch of the sound solely by the frequency per second they impose upon the pulses of rarefaction and condensation within the pipe.

The most valuable characteristic of the free reed is its power of producing all the delicate gradations of tone between forte and piano by virtue of a law of acoustics governing the vibration of free reeds, whereby increased pressure of wind produces a proportional increase in the volume of tone. The pitch of any sound depends upon the frequency of the sound-waves, that is, the number per second which reach the ear; the fullness of sound depends upon the amplitude of the waves, or, more strictly speaking, of the swing of the transmitting particles of the medium—greater pressure in the air current (No. 2 above) which sets the vibrator in motion producing amplitude of vibration in the air within the receptacle (No. 3 above) serving as resonating medium. The sound produced by the free reed itself is weak and requires to be reinforced by means of an additional stationary column or stratum of air. Free reed instruments are therefore classified according to the nature of the resonant medium provided:—(1) Free reeds vibrating in pipes, such as the reed stops of church organs on the continent of Europe (in England the reed pipes are generally provided with beating reeds, see REED INSTRUMENTS and CLARINET). (2) Free reeds vibrating in reed compartments and reinforced by air chambers of various shapes and sizes as in the harmonium (*q.v.*). (3) Instruments like the accordion and concertina having the free reed set in vibration through a valve, but having no reinforcing medium.



From J. B. Biot, *Traité de physique expérimentale.*

FIG. 1.—Grenie's organ pipe fitted with free-reed vibrator.
A. Tuning wire.
D, Free reed.
R, Reed-box.
B,C, Feed pipe with conical foot.
T, Part of resonating pipe, the upper end with cap and vent hole being shown separately at the side.

The arrangement of the free reed in an organ pipe is simple, and does not differ greatly from that of the beating reed shown in fig. 2 for the purpose of comparison. The reed-box, a rectangular wooden pipe, is closed at the bottom and covered on one face with a thin plate of copper having a rectangular slit over which is fixed the thin metal vibrating tongue or reed as described above. The reed-box, itself open at the top, is enclosed in a feed pipe having a conical foot pierced with a small hole through which the air current is forced by the action of the bellows. The impact of the incoming compressed air against the reed tongue sets it swinging through the slit, thus causing a disturbance or series of pulsations within the reed-box. The air then finds an escape through the resonating medium of a pipe fitting over the reed-box and terminating in an inverted cone covered with a cap in the top of which is pierced a small hole or vent. The quality of tone of free reeds is due to the tendency of air set in periodic pulsations to divide into aliquot vibrations or loops, producing the phenomenon known as harmonic overtones or upper partials, which may, in the highly composite clang of free reeds, be discerned as far as the 16th or 20th of the series. The more intermittent and interrupted the air current becomes, the greater the number of the upper partials produced.[3] The power of the overtones and their relation to the fundamental note depend greatly upon the form of the tongue, its position and the amount of the clearance left as it swings through the aperture.

Free reeds not associated with resonating media as in the concertina are peculiarly rich in harmonics, but as the higher harmonics lie very close together, disagreeable dissonances and a harsh tone result. The resonating pipe or chamber when suitably accommodated to the reed greatly modifies the tone by reinforcing the harmonics proper to itself, the others sinking into comparative insignificance. In order to produce a full rich tone, a resonator should be chosen whose deepest note coincides with the fundamental tone of the reed. The other upper partials will also be reinforced thereby, but to a less degree the higher the harmonics.[4]

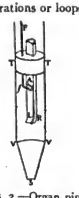


FIG. 2.—Organ pipe fitted with beating reed.
AL, Beating reed.
R, Reed box.
F, Tuning wire.
TV, Feed pipe.
VV, Conical foot.
S, Hole through which compressed air is fed.

For the history of the application of the free reed to keyboard instruments see HARMONIUM. (K. S.)

FREESIA, in botany, a genus of plants belonging to the Iris family (Iridaceae), and containing a single species, *F. refracta*, native at the Cape of Good Hope. The plants grow from a corm (a solid bulb, as in *Gladiolus*) which sends up a tuft of long narrow leaves and a slightly branched stem bearing a few leaves and loose one-sided spikes of fragrant narrowly funnel-shaped flowers. Several varieties are known in cultivation, differing in the colour of the flower, which is white, cream or yellow. They form pretty greenhouse plants which are readily increased from seed. They are extensively grown for the market in Guernsey, England and America. By potting successively throughout the autumn a supply of flowers is obtained through winter and spring. Some very fine large-flowered varieties, including rose-coloured ones, are now being raised by various growers in England, and are a great improvement on the older forms.

FREE SOIL PARTY, a political party in the United States, which was organized in 1847–1848 to oppose the extension of slavery into the Territories. It was a combination of the political abolitionists—many of whom had formerly been identified with the more radical Liberty party—the anti-slavery Whigs, and the faction of the Democratic party in the state of New York, called "Barnburners," who favoured the prohibition of slavery, in accordance with the "Wilmot Proviso" (see WILMOT, DAVID), in the territory acquired from Mexico. The party was prominent in the presidential campaigns of 1848 and 1852. At the national convention held in Buffalo, N.Y., on the 9th and 10th of August 1848, they secured the nomination to the presidency of ex-President Martin Van Buren, who had failed to secure nomination by the Democrats in 1844 because of his opposition to the annexation of Texas, and of Charles Francis Adams, of Massachusetts, for the vice-presidency, taking as their "platform" a Declaration that Congress, having "no more power to make a slave than to make a king," was bound to restrict slavery to the slave states, and concluding, "we inscribe on our banner 'Free Soil, Free Speech, Free Labor and Free Man,' and under it we will fight on and fight ever, until a triumphant victory shall reward our exertions." The Liberty party had previously, in November 1847, nominated

[1] See H. Helmholtz, *Die Lehre von den Tonempfindungen* (Brunswick, 1877), p. 166.

[2] See also Ernst Heinrich and Wilhelm Weber, *Wellenlehre* (Leipzig, 1825), where a particularly lucid explanation of the phenomenon is given, pp. 526–530.

[3] See Helmholtz, *op. cit.* p. 167.

[4] These phenomena are clearly explained at greater length by Sedley Taylor in *Sound and Music* (London, 1896), pp. 134–153 and pp. 74–86. See also Friedrich Zamminer, *Die Musik und die musikalischen Instrumente*, &c. (Giessen, 1855), p. 261.

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John P. Hale and Leicester King as president and vice-president respectively, but in the spring of 1848 it withdrew its candidates and joined the "free soil" movement. Representatives of eighteen states, including Delaware, Maryland and Virginia, attended the Buffalo convention. In the ensuing presidential election Van Buren and Adams received a popular vote of 291,263, of which 120,510 were cast in New York. They received no electoral votes, all these being divided between the Whig candidate, Zachary Taylor, who was elected, and the Democratic candidate, Lewis Cass. The "free soilers," however, succeeded in sending to the thirty-first Congress two senators and fourteen representatives, who by their ability exercised an influence out of proportion to their number.

Between 1848 and 1852 the "Barnburners" and the "Hunkers," their opponents, became partially reunited, and the former returning to the Democratic ranks, and thus greatly weakening the Free Soilers. The party held its national convention at Pittsburg, Pennsylvania, on the 11th of August 1852, delegates being present from all the free states, and from Delaware, Maryland, Virginia and Kentucky; and John P. Hale, of New Hampshire, and George W. Julian of Indiana, were nominated for the presidency and the vice-presidency respectively, on a platform which declared slavery "a sin against God and a crime against man," denounced the Compromise Measures of 1850, the fugitive slave law in particular, and again opposed the extension of slavery in the Territories. These candidates, however, received no electoral votes and a popular vote of only 156,149, of which but 25,329 were polled in New York. By 1856 they abandoned their separate organization and joined the movement which resulted in the formation of the powerful Republican party (*q.v.*), of which the Free Soil party was the legitimate precursor.

FREE-STONE (a translation of the O. Fr. *franche pere* or *pierre*, *i.e.* stone of good quality; the modern French equivalent is *pierre de taille*, and Ital. *pietra molle*), stone used in architecture for mouldings, tracery and other work required to be worked with the chisel. The oolitic stones are generally so called, although in some countries soft sandstones are used; in some churches an indurated chalk called "clunch" is employed for internal lining and for carving.

FREETOWN, capital of the British colony of Sierra Leone, West Africa, on the south side of the Sierra Leone estuary, about 5 m. from the cape of that name, in 8° 29′ N., 13° 10′ W. Pop. (1901) 34,463. About 500 of the inhabitants are Europeans. Freetown is picturesquely situated on a plain, closed in behind by a succession of wooded hills, the Sierra Leone, rising to a height of 1700 ft. As nearly every house is surrounded by a courtyard or garden, the town covers an unusually large area for the number of its inhabitants. It possesses few buildings of architectural merit. The principal are the governor's residence and government offices, the barracks, the cathedral, the missionary institutions, the fruit market, Wilberforce Hall, courts of justice, the railway station and the grammar school. Several of these institutions are built on the slopes of the hills, and on the highest point, Sugar Loaf Mountain, is a sanatorium. The botanic gardens form a pleasant and favourite place of resort. The roads are wide but badly kept. Horses do not live, and all wheeled traffic is done by manual labour—hammocks and sedan-chairs are the customary means of locomotion. Notwithstanding that Freetown possesses an abundant and pure water-supply, drawn from the adjacent hills, it is enervating and unhealthy, and it was particularly to the capital, often spoken of as Sierra Leone, that the designation "White Man's Grave" applied. Since the beginning of the 20th century strenuous efforts have been made to improve the sanitary condition by a new system of drainage, a better water service, the filling up of marshes wherein the malarial mosquito breeds, and in other directions. A light railway 6 m. long, opened in 1904, has been built to Hill Station (900 ft. high), where, on a healthy site, are the residences of the government officials and of other Europeans. As a consequence the public health has improved, the highest death-rate in the years 1901–1907 being 29·6 per 1000. The town is governed by a municipality (created in 1893) with a mayor and councillors, the large majority being elective. Freetown was the first place in British West Africa granted local self-government.

Both commercially and strategically Freetown is a place of importance. Its harbour affords ample accommodation for the largest fleets, it is a coaling station for the British navy, the headquarters of the British military forces in West Africa, the sea terminus of the railway to the rich oil-palm regions of Mendiland, and a port of call for all steamers serving West Africa. Its inhabitants are noted for their skill as traders; the town itself produces nothing in the way of exports.

In consequence of the character of the original settlement (see SIERRA LEONE), 75% of the inhabitants are descended from non-indigenous Negro races. As many as 150 different tribes are represented in the Sierra Leonis of to-day. Their semi-Europeanization is largely the result of missionary endeavour. The only language of the lower class is pidgin-English—quite incomprehensible to the newcomer from Great Britain,—but a large proportion of the inhabitants are highly educated men who excel as lawyers, clergymen, clerks and traders. Many members of the upper, that is, the best-educated, class have filled official positions of great responsibility. The most noted citizens are Bishop Crowther and Sir Samuel Lewis, chief justice of Sierra Leone 1882–1894. Both were full-blooded Africans. The Kru-men form a distinct section of the community, living in a separate quarter and preserving their tribal customs.

Since 1861–1862 there has been an independent Episcopal Native Church; but the Church Missionary Society, which in 1804 sent out the first missionaries to Sierra Leone, still maintains various agencies. Furah Bay College, built by the society on the site of General Charles Turner's estate (1½ m. E. of Freetown), and opened in 1828 with six pupils, one of whom was Bishop Crowther, was affiliated in 1876 to Durham University and has a high-class curriculum. The Wesleyans have a high school, a theological college, and other educative agencies. The Moslems, who are among the most law-abiding and intelligent citizens of Freetown, have several state-aided primary schools.

FREE TRADE, an expression which has now come to be appropriated to the economic policy of encouraging the greatest possible commercial intercourse, unrestricted by "protective" duties (see PROTECTION), between any one country and its neighbours. This policy was originally advocated in France, and it has had its adherents in many countries, but Great Britain stands alone among the great commercial nations of the world in having adopted it systematically from 1846 onwards as the fundamental principle of her economic policy.

In the economic literature of earlier periods, it may be noted that the term "free trade" is employed in senses which have no relation to modern usage. The term conveyed no suggestion of unrestricted trade or national liberty when it first appeared in controversial pamphlets;[1] it stood for a freedom conferred and maintained by authority—like that of a free town. The merchants desired to have good regulations for trade so that they might be free from the disabilities imposed upon them by foreign princes or unscrupulous fellow-subjects. After 1640 the term seems to have been commonly current in a different sense. When the practice which had been handed down from the middle ages—of organizing the trade with particular countries by means of privileged companies, which professed to regulate the trade according to the state of the market so as to secure its steady development in the interest of producers and traders—was seriously called in question under the Stuarts and at the Revolution, the interlopers and opponents of the companies insisted on the advantages of a "Free Trade"; they meant by this that the various branches of commerce should not be confined to particular persons or limited in amount, but should be thrown open to be pursued by any Englishman in the way he thought most profitable himself.[2] Again, in the latter half of the 18th

[1] E. Misselden, *Free Trade or the Meanes to make Trade Flourish* (1622), p. 68; G. Malynes, *The Maintenance of Free Trade* (1622), p. 105.

[2] H. Parker, *Of a Free Trade* (1648), p. 8.

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century, till Pitt's financial reforms[1] were brought into operation, the English customs duties on wine and brandy were excessive; and those who carried on a remunerative business by evading these duties were known as Fair Traders or Free Traders.[2] Since 1846 the term free trade has been popularly used, in England, to designate the policy of Cobden (*q.v.*) and others who advocated the abolition of the tax on imported corn (see CORN LAWS); this is the only one of the specialized senses of the term which is at all likely to be confused with the economic doctrine. The Anti-Corn Law movement was, as a matter of fact, a special application of the economic principle; but serious mistakes have arisen from the blunder of confusing the part with the whole, and treating the remission of one particular duty as if it were the essential element of a policy in which it was only an incident. W. E. Gladstone, in discussing the effect of improvements in locomotion on British trade, showed what a large proportion of the stimulus to commerce during the 19th century was to be credited to what he called the "liberalizing legislation" of the free-trade movement in the wide sense in which he used the term. "I rank the introduction of cheap postage for letters, documents, patterns and printed matter, and the abolition of all taxes on printed matter, in the category of Free Trade Legislation. Not only thought in general, but every communication, and every publication, relating to matters of business, was thus set free. These great measures, then, may well take their place beside the abolition of prohibitions and protective duties, the simplifying of revenue laws, and the repeal of the Navigation Act, as forming together the great code of industrial emancipation. Under this code, our race, restored to freedom in mind and hand, and braced by the powerful stimulus of open competition with the world, has upon the whole surpassed itself and every other, and has won for itself a commercial primacy more evident, more comprehensive, and more solid than it had at any previous time possessed."[3] In this large sense free trade may be almost interpreted as the combination of the doctrines of the division of labour and of *laissez-faire* in regard to the world as a whole. The division of labour between different countries of the world—so that each concentrates its energies in supplying that for the production of which it is best fitted—appears to offer the greatest possibility of production; but this result cannot be secured unless trade and industry are treated as the primary elements in the welfare of each community, and political considerations are not allowed to hamper them.

Stated in its simplest form, the principle which underlies the doctrine of free trade is almost a truism; it is directly deducible from the very notion of exchange (*q.v.*). Adam Smith and his successors have demonstrated that in every case of voluntary exchange each party gains something that is of greater value-in-use to him than that with which he parts, and that consequently in every exchange, either between individuals or between nations, both parties are the gainers. Hence it necessarily follows that, since both parties gain through exchanging, the more facilities there are for exchange the greater will be the advantage to every individual all round.[4] There is no difficulty in translating this principle into the terms of actual life, and stating the conditions in which it holds good absolutely. If, at any given moment, the mass of goods in the world were distributed among the consumers with the minimum of restriction on interchange, each competitor would obtain the largest possible share of the things he procures in the world's market. But the argument is less conclusive when the element of time is taken into account; what is true of each moment separately is not necessarily true of any period in which the conditions of production, or the requirements of communities, may possibly change. Each individual is likely to act with reference to his own future, but it may often be wise for the statesman to look far ahead, beyond the existing generation.[5] Owing to the neglect of this element of time, and the allowance which must be made for it, the reasoning as to the advantages of free trade, which is perfectly sound in regard to the distribution of goods already in existence, may become sophistical,[6] if it is put forward as affording a complete demonstration of the benefits of free trade as a regular policy. After all, human society is very complex, and any attempt to deal with its problems off-hand by appealing to a simple principle raises the suspicion that some important factor may have been left out of account. When there is such mistaken simplification, the reasoning may seem to have complete certainty, and yet it fails to produce conviction, because it does not profess to deal with the problem in all its aspects. When we concentrate attention on the phenomena of exchange, we are viewing society as a mechanism in which each acts under known laws and is impelled by one particular force—that of self-interest; now, society is, no doubt, in this sense a mechanism, but it is also an organism,[7] and it is only for very short periods, and in a very limited way, that we can venture to neglect its organic character without running the risk of falling into serious mistakes.

The doctrine of free trade maintains that in order to secure the greatest possible mass of goods in the world as a whole, and the greatest possibility of immediate comfort for the consumer, it is expedient that there should be no restriction on the exchange of goods and services either between individuals or communities. The controversies in regard to this doctrine have not turned on its certainty as a hypothetical principle, but on the legitimacy of the arguments based upon it. It certainly supplies a principle in the light of which all proposed trade regulations should be criticized. It gives us a basis for examining and estimating the expense at which any particular piece of trade restriction is carried out; but thus used, the principle does not necessarily condemn the expenditure; the game may be worth the candle or it may not, but at least it is well that we should know how fast the candle is being burnt. It was in this critical spirit that Adam Smith examined the various restrictions and encouragements to trade which were in vogue in his day; he proved of each in turn that it was expensive, but he showed that he was conscious that the final decision could not be taken from this standpoint, since he recognized in regard to the Navigation Acts that "defence is more than opulence."[8] In more recent times, the same sort of attitude was taken by Henry Sidgwick,[9] who criticizes various protective expedients in turn, in the light of free trade, but does not treat it as conveying an authoritative decision on their merits.

But other exponents of the doctrine have not been content to employ it in this fashion. They urge it in a more positive manner, and insist that free trade pure and simple is *the* foundation on which the economic life of the community ought to be based. By men who advocate it in this way, free trade is set forward as an ideal which it is a duty to realize, and those who hold aloof from it or oppose it have been held up to scorn as if they were almost guilty of a crime.[10] The development of the material resources of the world is undoubtedly an important element in the welfare of mankind; it is an aim which is common to the whole race, and may be looked upon as contributing to the greatest happiness of the greatest number. Competition in the open market seems to secure that each consumer shall obtain the best possible terms; and again, since all men are consumers whether they produce or not, or whatever they produce, the greatest measure of comforts for each seems likely to be attainable on these lines. For those who are frankly cosmopolitan, and who regard material prosperity as at all events the prime object at which public policy should aim, the free-trade doctrine is readily

[1] (1787), 27 Geo. III, c. 13.
[2] Sir Walter Scott, *Guy Mannering*, chapter v.
[3] Gladstone, "Free Trade, Railways and Commerce," in *Nineteenth Century* (Feb. 1880), vol. vii. p. 370.
[4] Parker states a similar argument in the form in which it suited the special problem of his day. "If merchandise be good for the commonweal, then the more common it is made, the more open it is laid, the more good it will convey to us." *Op. cit.* 20.
[5] Schmoller, *Grundriss der allgemeinen Volkswirtschaftslehre* (1904), ii. 607.
[6] Byles, *Sophisms of Free Trade*; L. S. Amery, *Fundamental Fallacies of Free Trade*, 13.
[7] W. Cunningham, *Rise and Decline of the Free Trade Movement*, pp. 5-11.
[8] *Wealth of Nations*, book iv. chap. ii.
[9] *Principles of Political Economy*, 485.
[10] J. Morley, *Life of Cobden*, i. 230.

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transformed, from a mere principle of criticism, till it comes to be regarded as the harbinger of a possible Utopia. It was in this fashion that it was put forward by French economists and proved attractive to some leading American statesmen in the 18th century. Turgot regarded the colonial systems of the European countries as at once unfair to their dependencies and dangerous to the peace of the world. "It will be a wise and happy thing for the nation which shall be the first to modify its policy according to the new conditions, and be content to regard its colonies as if they were allied provinces and not subjects of the mother country." It will be a wise and happy thing for the nation which is the first to be convinced that the secret of "success, so far as commercial policy is concerned, consists in employing all its land in the manner most profitable for the proprietary, all the hands in the manner most advantageous to the workman personally, that is to say, in the manner in which each would employ them, if we could let him be simply directed by his own interest, and that all the rest of the mercantile policy is vanity and vexation of spirit. When the entire separation of America shall have forced the whole world to recognize this truth and purged the European nations of commercial jealousy there will be one great cause of war less in the world."[1] Pitt, under the influence of Adam Smith, was prepared to admit the United States to the benefit of trade with the West Indian Colonies; and Jefferson, accepting the principles of his French teachers, would (in contradistinction to Alexander Hamilton) have been willing to see his country renounce the attempt to develop manufactures of her own.[2] It seemed as if a long step might be taken towards realizing the free-trade ideal for the Anglo-Saxon race; but British shipowners insisted on the retention of their privileges, and the propitious moment passed away with the failure of the negotiations of 1783.[3] Free trade ceased to be regarded as a gospel, even in France, till the ideal was revived in the writings of Bastiat, and helped to mould the enthusiasm of Richard Cobden.[4] Through his zealous advocacy, the doctrine secured converts in almost every part of the world; though it was only in Great Britain that a great majority of the citizens became so far satisfied with it that they adopted it as the foundation of the economic policy of the country.

It is not difficult to account for the conversion of Great Britain to this doctrine; in the special circumstances of the first half of the 19th century it was to the interest of the most vigorous factors in the economic life of the country to secure the greatest possible freedom for commercial intercourse. Great Britain had, through her shipping, access to all the markets of the world; she had obtained such a lead in the application of machinery to manufactures that she had a practical monopoly in textile manufactures and in the hardware trades; by removing every restriction, she could push her advantage to its farthest extent, and not only undersell native manufactures in other lands, but secure food, and the raw materials for her manufactures, on the cheapest possible terms. Free trade thus seemed to offer the means of placing an increasing distance between Britain and her rivals, and of rendering the industrial monopoly which she had attained impregnable. The capitalist employer had superseded the landowner as the mainstay of the resources and revenue of the realm, and insisted that the prosperity of manufactures was the primary interest of the community as a whole. The expectation, that a thoroughgoing policy of free trade would not only favour an increase of employment, but also the cheapening of food, could only have been roused in a country which was obliged to import a considerable amount of corn. The exceptional weakness, as well as the exceptional strength, of Great Britain, among European countries, made it seem desirable to adopt the principle of unrestricted commercial intercourse, not merely in the tentative fashion in which it had been put in operation by Huskisson, but in the thoroughgoing fashion in which it at last commended itself to the minds of Peel and Gladstone. The "Manchester men" saw clearly where their interest lay; and the fashionable political economy was ready to demonstrate that in pursuing their own interest they were conferring the benefit of cheap clothing on all the most poverty-stricken races of mankind. It seemed probable, in the 'forties and early 'fifties, that other countries would take a similar view of their own interests and would follow the example which Great Britain had set.[5] That they have not done so, is partly due to the fact that none of them had such a direct, or such a widely diffused, interest in increased commercial intercourse as existed in Great Britain; but their reluctance has been partly the result of the criticism to which the free-trade doctrine has been subjected. The principles expressed in the writings of Friedrich List have taken such firm hold, both in America and in Germany, that these countries have preferred to follow on the lines by which Great Britain successfully built up her industrial prosperity in the 17th and 18th century, rather than on those by which they have seen her striving to maintain it since 1846.

Free trade was attractive as an ideal, because it appeared to offer the greatest production of goods to the world as a whole, and the largest share of material goods to each consumer; it is cosmopolitan, and it treats consumption, and the interest of the consumer, as such, as the end to be considered. Hence it lies open to objections which are partly political and partly economic.

As cosmopolitan, free-trade doctrine is apt to be indifferent to national tradition and aspiration. In so far indeed as patriotism is a mere aesthetic sentiment, it may be tolerated, and in so far as it implies a genuine wish and intention to preserve and defend the national habits and character to the exclusion of alien elements, the cosmopolitan mind will condemn it as narrow and mischievous. In the first half of the 19th century there were many men who believed that national ambitions and jealousies of every kind were essentially dynastic, and that if monarchies were abolished there would be fewer occasions of war, so that the expenses of the business of government would be enormously curtailed. For Cobden and his contemporaries it was natural to regard the national administrative institutions as maintained for the benefit of the "classes" and without much advantage to the "masses." But in point of fact, modern times have shown the existence in democracies of a patriotic sentiment which is both exclusive and aggressive; and the burden of armaments has steadily increased. It was by means of a civil war that the United States attained to a consciousness of national life; while such later symptoms as the recent interpretations of the Monroe doctrine, or the war with Spain, have proved that the citizens of that democratic country cannot be regarded as destitute of self-aggrandizing national ambition.

In Germany the growth of militarism and nationalism have gone on side by side under constitutional government, and certainly in harmony with predominant public opinion. Neither of these communities is willing to sink its individual conception of progress in those of the world at large; each is jealous of the intrusion of alien elements which cannot be reconciled with its own political and social system. And a similar recrudescence of patriotic feeling has been observable in other countries, such as Norway and Hungary: the growth of national sentiment is shown, not only in the attempts to revive and popularize the use of a national language, but still more decidedly in the determination to have a real control over the economic life of the country. It is here that the new patriotism comes into direct conflict with the political principles of free trade as advocated by Bastiat and Cobden; for them the important point was that countries, by becoming dependent on one another, would be prevented from engaging in hostilities. The new nations are

[1] "Mémoire," 6 April 1776, in *Œuvres*, viii. 460.

[2] Jefferson, *Notes on Virginia*, 275. See also the articles on JEFFERSON and HAMILTON, ALEXANDER.

[3] One incidental effect of the failure to secure free trade was that the African slave trade, with West Indies as a depot for supplying the American market, ceased to be remunerative, and the opposition to the abolition of the trade was very much weaker than it would otherwise have been; see Hochstetter, "Die wirtschaftlichen und politischen Motive für die Abschaffung des britischen Sklavenhandels," in Schmoller, *Staats und Sozialwissenschaftliche Forschungen*, xxv. i. 37.

[4] J. Welsford, "Cobden's Foreign Teacher," in *National Review* (December 1905).

[5] *Compatriot Club Lectures* (1905), p. 306.

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determined that they will not allow other countries to have such control over their economic condition, as to be able to exercise a powerful influence on their political life. Each is determined to be the master in his own house, and each has rejected free trade because of the cosmopolitanism which it involves.

Economically, free trade lays stress on consumption as the chief criterion of prosperity. It is, of course, true that goods are produced with the object of being consumed, and it is plausible to insist on taking this test; but it is also true that consumption and production are mutually interdependent, and that in some ways production is the more important of the two. Consumption looks to the present, and the disposal of actual goods; production looks to the future, and the conditions under which goods can continue to be regularly provided and thus become available for consumption in the long run. As regards the prosperity of the community in the future it is important that goods should be consumed in such a fashion as to secure that they shall be replaced or increased before they are used up; it is the amount of production rather than the amount of consumption that demands consideration, and gives indication of growth or of decadence. In these circumstances there is much to be said for looking at the economic life of a country from the point of view which free-traders have abandoned or ignore. It is not on the possibilities of consumption in the present, but on the prospects of production *in the future*, that the continued wealth of the community depends; and this principle is the only one which conforms to the modern conception of the essential requirements of sociological science in its wider aspect (see SOCIOLOGY). This is most obviously true in regard to countries of which the resources are very imperfectly developed. If their policy is directed to securing the greatest possible comfort for each consumer in the present, it is certain that progress will be slow; the planting of industries for which the country has an advantage may be a tedious process; and in order to stimulate national efficiency temporary protection—involving what is otherwise unnecessary immediate cost to the consumer—may seem to be abundantly justified. Such a free trader as John Stuart Mill himself admits that a case may be made out for treating "infant industries" as exceptions;[1] and if this exception be admitted it is likely to establish a precedent. After all, the various countries of the world are all in different stages of development; some are old and some are new; and even the old countries differ greatly in the progress they have made in distinct arts. The introduction of machinery has everywhere changed the conditions of production, so that some countries have lost and others have gained a special advantage. Most of the countries of the world are convinced that the wisest economy is to attend to the husbanding of their resources of every kind, and to direct their policy not merely with a view to consumption in the present, but rather with regard to the possibilities of increased production in the future.

This deliberate rejection of the doctrine of free trade between nations, both in its political and economic aspects, has not interfered, however, with the steady progress of free commercial intercourse within the boundaries of a single though composite political community. "Internal free trade," though the name was not then current in this sense, was one of the burning questions in England in the 17th century; it was perhaps as important a factor as puritanism in the fall of Charles I. Internal free trade was secured in France in the 18th century; thanks to Hamilton,[2] it was embodied in the constitution of the United States; it was introduced into Germany by Bismarck; and was firmly established in the Dominion of Canada and the Commonwealth of Australia. It became in consequence, where practicable, a part of the modern federal idea as usually interpreted. There are thus great areas, externally self-protecting, where free trade, as between internal divisions, has been introduced with little, if any, political difficulty, and with considerable economic advantage. These cases are sometimes quoted as justifying the expectation that the same principle is likely to be adopted sooner or later in regard to external trading relations. There is some reason, however, for raising the question whether free trade has been equally successful, not only in its economic, but in its social results, in all the large political communities where it has been introduced. In a region like the United States of America, it is probably seen at its best; there is an immense variety of different products throughout that great zone of the continent, so that the mutual co-operation of the various parts is most beneficial, while the standard of habit and comfort is so far uniform[3] throughout the whole region, and the facilities for the change of employment are so many, that there is little injurious competition between different districts. In the British empire the conditions are reversed; but though the great self-governing colonies have withdrawn from the circle, in the hope of building up their own economic life in their own way, free trade is still maintained over a very large part of the British empire. Throughout this area, there are very varied physical conditions; there is also an extraordinary variety of races, each with its own habits, and own standard of comfort; and in these circumstances it may be doubted whether the free competition, involved in free trade, is really altogether wholesome. Within this sphere the ideal of Bastiat and his followers is being realized. England, as a great manufacturing country, has more than held her own; India and Ireland are supplied with manufactured goods by England, and in each case the population is forced to look to the soil for its means of support, and for purchasing power. In each case the preference for tillage, as an occupation, has rendered it comparatively easy to keep the people on the land; but there is some reason to believe that the law of diminishing returns is already making itself felt, at all events in India, and is forcing the people into deeper poverty.[4] It may be doubtful in the case of Ireland how far the superiority of England in industrial pursuits has prevented the development of manufactures; the progress in the last decades of the 18th century was too short-lived to be conclusive; but there is at least a strong impression in many quarters that the industries of Ireland might have flourished if they had had better opportunities allowed them.[5] In the case of India we know that the hereditary artistic skill, which had been built up in bygone generations, has been stamped out. It seems possible that the modern unrest in India, and the discontent in Ireland, may be connected with the economic conditions in these countries, on which free trade has been imposed without their consent. So far the population which subsists on the cheaper food, and has the lower standard of life, has been the sufferer; but the mischief might operate in another fashion. The self-governing colonies at all events feel that competition in the same market between races with different standards of comfort has infinite possibilities of mischief. It is easy to conjure up conditions under which the standard of comfort of wage-earners in England would be seriously threatened.

Since the 9th edition of the *Encyclopaedic Britannica* was published it has become clear that the free-trade doctrines of Bastiat and Cobden have not been gaining ground in the world at large, and at the opening of the 20th century it could hardly be said with confidence that the question was "finally settled" so far as England was concerned. As to whether the interests of Great Britain still demanded that she should continue on the line she adopted in the exceptional conditions of the middle of the 19th century, expert opinion was conspicuously divided ;[6] but there remained no longer the old enthusiasm for free trade as

[1] J. S. Mill, *Principles of Political Economy*, book v. chapter x. § 1.
[2] F. S. Oliver, *Alexander Hamilton*, 142.
[3] The standard is, of course, lower among the negroes and mean whites in the South than in the North and West.
[4] F. Beauclerk, "Free Trade in India," in *Economic Review* (July 1907), xvii. 284.
[5] A. E. Murray, *History of the Commercial and Financial Relations between England and Ireland*, 294.
[6] For the tariff reform movement in English politics see the article on CHAMBERLAIN, J. Among continental writers G. Schmoller (*Grundriss der allgemeinen Volkswirtschaftslehre*, ii. 643) and A. Wagner (Preface to M. Schwab's *Chamberlains Handelspolitik*) pronounce in favour of a change, as Fuchs did by anticipation. Schulze-Gaevernitz (*Britischer Imperialismus und englischer Freihandel*), Aubry (*Etude critique de la politique commerciale de l'Angleterre à l'égard de ses colonies*), and Blondel (*La politique Protectionniste en Angleterre un nouveau danger pour la France*) are against it.

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the harbinger of an Utopia. The old principles of the bourgeois manufacturers had been taken up by the proletariat and shaped to suit themselves. Socialism, like free trade, is cosmopolitan in its aims, and is indifferent to patriotism and hostile to militarism. Socialism, like free trade, insists on material welfare as the primary object to be aimed at in any policy, and, like free trade, socialism tests welfare by reference to possibilities of consumption. In one respect there is a difference; throughout Cobden's attack on the governing classes there are signs of his jealousy of the superior status of the landed gentry, but socialism has a somewhat wider range of view and demands "equality of opportunity" with the capitalist as well.

BIBLIOGRAPHY.—Reference has already been made to the principal works which deal critically with the free-trade policy. Professor Fawcett's *Free Trade* is a good exposition of free-trade principles; so also is Professor Bastable's *Commerce of Nations*. Among authors who have restated the principles with special reference to the revived controversy on the subject may be mentioned Professor W. Smart, *The Return to Protection, being a Restatement of the Case for Free Trade* (2nd ed., 1906), and A. C. Pigou, *Protective and Preferential Import Duties* (1906). (W. Cu.)

FREGELLAE, an ancient town of Latium adiectum, situated on the Via Latina, 11 m. W.N.W. of Aquinum, near the left branch of the Liris. It is said to have belonged in early times to the Opici or Oscans, and later to the Volscians. It was apparently destroyed by the Samnites a little before 330 B.C., in which year the people of Fabrateria Vetus (mod. Ceccano) besought the help of Rome against them, and in 328 B.C. a Latin colony was established there. The place was taken in 320 B.C. by the Samnites, but re-established by the Romans in 313 B.C. It continued henceforward to be faithful to Rome; by breaking the bridges over the Liris it interposed an obstacle to the advance of Hannibal on Rome in 212 B.C., and it was a native of Fregellae who headed the deputation of the non-revolting colonies in 209 B.C. It appears to have been a very important and flourishing place owing to its command of the crossing of the Liris, and to its position in a fertile territory, and it was here that, after the rejection of the proposals of M. Fulvius Flaccus for the extension of Roman burgess-rights in 125 B.C., a revolt against Rome broke out. It was captured by treachery in the same year and destroyed; but its place was taken in the following year by the colony of Fabrateria Nova, 3 m. to the S.E. on the opposite bank of the Liris, while a post station Fregellanum (mod. Ceprano) is mentioned in the itineraries; Fregellae itself, however, continued to exist as a village even under the empire. The site is clearly traceable about ½ m. E. of Ceprano, but the remains of the city are scanty.

See G. Colasanti, *Fregellae, storia e topografia* (1906). (T. As.)

FREIBERG, or FREYBERG, a town of Germany in the kingdom of Saxony, on the Münzbach, near its confluence with the Mulde, 19 m. S.W. of Dresden on the railway to Chemnitz, with a branch to Nossen. Pop. (1905) 30,896. Its situation, on the rugged northern slope of the Erzgebirge, is somewhat bleak and uninviting, but the town is generally well built and makes a prosperous impression. A part of its ancient walls still remains; the other portions have been converted into public walks and gardens. Freiberg is the seat of the general administration of the mines throughout the kingdom, and its celebrated mining academy (*Bergakademie*), founded in 1765, is frequented by students from all parts of the world. Connected with it are extensive collections of minerals and models, a library of 50,000 volumes, and laboratories for chemistry, metallurgy and assaying. Among its distinguished scholars it reckons Abraham Gottlob Werner (1750–1817), who was also a professor there, and Alexander von Humboldt. Freiberg has extensive manufactures of gold and silver lace, woollen cloths, linen and cotton goods, iron, copper and brass wares, gunpowder and white-lead. It has also several large breweries. In the immediate vicinity are its famous silver and lead mines, thirty in number, and of which the principal ones passed into the property of the state in 1886. The castle of Freudenstein or Freistein, as rebuilt by the elector Augustus in 1572, is situated in one of the suburbs and is now used as a military magazine. In its grounds a monument was erected to Werner in 1851. The cathedral, rebuilt in late Gothic style after its destruction by fire in 1484 and restored in 1893, was founded in the 12th century. Of the original church a magnificent German Romanesque doorway, known as the Golden Gate (*Goldene Pforte*), survives. The church contains numerous monuments, among others one to Prince Maurice of Saxony. Adjoining the cathedral is the mausoleum (*Begräbniskapelle*), built in 1594 in the Italian Renaissance style, in which are buried the remains of Henry the Pious and his successors down to John George IV., who died in 1694. Of the other four Protestant churches the most noteworthy is the Peterskirche which, with its three towers, is a conspicuous object on the highest point of the town. Among the other public buildings are the old town-hall, dating from the 15th century, the antiquarian museum, and the natural history museum. There are a classical and modern, a commercial and an agricultural school, and numerous charitable institutions.

Freiberg owes its origin to the discovery of its silver mines (*c.* 1163). The town, with the castle of Freudenstein, was built by Otto the Rich, margrave of Meissen, in 1175, and its name, which first appears in 1221, is derived from the extensive mining franchises granted to it about that time. In all the partitions of the territories of the Saxon house of Wettin, from the latter part of the 13th century onward, Freiberg always remained common property, and it was not till 1485 (the mines not till 1537) that it was definitively assigned to the Albertine line. The Reformation was introduced into Freiberg in 1536 by Henry the Pious, who resided here. The town suffered severely during the Thirty Years' War, and again during the French occupation from 1806 to 1814, during which time it had to support an army of 700,000 men and find forage for 200,000 horses.

See H. Gerlach, *Kleine Chronik von Freiberg* (2nd ed., Freiberg, 1898); H. Ermisch, *Das Freiberger Stadtrecht* (Leipzig, 1889); Ermisch and O. Posse, *Urkundenbuch der Stadt Freiberg*, in *Codex diplom. Saxoniae reg.* (3 vols., Leipzig, 1883–1891); *Freiberg Berg- und Hüttenwesen*, published by the Bergmännischer Verein (Freiberg, 1883); Ledebur, *Über die Bedeutung der Freiberger Bergakademie* (*ib.* 1903); Steche, *Bau- und Kunstdenkmäler der Amtshauptmannschaft Freiberg* (Dresden, 1884).

FREIBURG, a town of Germany in Prussian Silesia, on the Polnitz, 35 m. S.W. of Breslau, on the railway to Halbstadt. Pop. (1905) 9017. It has an Evangelical and Roman Catholic church, and its industries include watch-making, linen-weaving and distilling. In the neighbourhood are the old and modern castles of the Fürstenstein family, whence the town is sometimes distinguished as Freiburg unter dem Fürstenstein. At Freiburg, on the 22nd of July 1762, the Prussians defended themselves successfully against the superior forces of the Austrians.

FREIBURG IM BREISGAU, an archiepiscopal see and city of Germany in the grand duchy of Baden, 12 m. E. of the Rhine, beautifully situated on the Dreisam at the foot of the Schlossberg, one of the heights of the Black Forest range, on the railway between Basel and Mannheim, 40 m. N. of the former city. Pop. (1905) 76,285. The town is for the most part well built, having several wide and handsome streets and a number of spacious squares. It is kept clean and cool by the waters of the river, which flow through the streets in open channels; and its old fortifications have been replaced by public walks, and, what is more unusual, by vineyards. It possesses a famous university, the Ludovica Albertina, founded by Albert VI., archduke of Austria, in 1457, and attended by about 2000 students. The library contains upwards of 250,000 volumes and 600 MSS., and among the other auxiliary establishments are an anatomical hall and museum and botanical gardens. The Freiburg minster is considered one of the finest of all the Gothic churches of Germany, being remarkable alike for the symmetry of its proportions, for the taste of its decorations, and for the fact that it may more correctly be said to be finished than almost any other building of the kind. The period of its erection probably lies for the most part between 1122 and 1252; but the choir was not built till 1513. The tower, which rises above the western entrance, is 386 ft. in height, and it presents a skilful transition from a square base into an octagonal superstructure, which in its turn is surmounted by a pyramidal spire of the most

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exquisite open work in stone. In the interior of the church are some beautiful stained glass windows, both ancient and modern, the tombstones of several of the dukes of Zähringen, statues of archbishops of Freiburg, and paintings by Holbein and by Hans Baldung (*c.* 1470–1545), commonly called Grün. Among the other noteworthy buildings of Freiburg are the palaces of the grand duke and the archbishop, the old town-hall, the theatre, the *Kaufhaus* or merchants' hall, a 16th-century building with a handsome façade, the church of St Martin, with a graceful spire restored 1880–1881, the new town-hall, completed 1901, in Renaissance style, and the Protestant church, formerly the church of the abbey of Thennenbach, removed hither in 1839. In the centre of the fish-market square is a fountain surmounted by a statue of Duke Berthold III. of Zähringen; in the Franziskaner Platz there is a monument to Berthold Schwarz, the traditional discoverer here, in 1250, of gunpowder; the Rotteck Platz takes its name from the monument of Karl Wenzeslaus von Rotteck (1775–1840), the historian, which formerly stood on the site of the Schwarz statue; and in Kaiser Wilhelm Strasse a bronze statue was erected in 1876 to the memory of Herder, who in the early part of the 19th century founded in Freiburg an institute for draughtsmen, engravers and lithographers, and carried on a famous bookselling business. On the Schlossberg above the town there are massive ruins of two castles destroyed by the French in 1744; and about 2 m. to the N.E. stands the castle of Zähringen, the original seat of the famous family of the counts of that name. Situated on the ancient road which runs by the Höllenpass between the valleys of the Danube and the Rhine, Freiburg early acquired commercial importance, and it is still the principal centre of the trade of the Black Forest. It manufactures huttons, chemicals, starch, leather, tobacco, silk thread, paper, and hempen goods, as well as beer and wine.

Freiburg is of uncertain foundation. In 1120 it became a free town, with privileges similar to those of Cologne; but in 1219 it fell into the hands of a branch of the family of Urach. After it had vainly attempted to throw off the yoke by force of arms, it purchased its freedom in 1366; but, unable to reimburse the creditors who had advanced the money, it was, in 1368, obliged to recognize the supremacy of the house of Hapsburg. In the 17th and 18th centuries it played a considerable part as a fortified town. It was captured by the Swedes in 1632, 1634 and 1638; and in 1644 it was seized by the Bavarians, who shortly after, under General Mercy, defeated in the neighbourhood the French forces under Enghien and Turenne. The French were in possession from 1677 to 1697, and again in 1713–1714 and 1744; and when they left the place in 1748, at the peace of Aix-la-Chapelle, they dismantled the fortifications. The Baden insurgents gained a victory at Freiburg in 1848, and the revolutionary government took refuge in the town in June 1849, but in the following July the Prussian forces took possession and occupied it until 1851. Since 1821 Freiburg has been the seat of an archbishop with jurisdiction over the sees of Mainz, Rottenberg and Limburg.

See Schreiber, *Geschichte und Beschreibung des Münsters zu Freiburg* (1820 and 1825); *Geschichte der Stadt und Universität Freiburg* (1857–1859); *Der Schlossberg bei Freiburg* (1860); and Albert, *Die Geschichtsschreibung der Stadt Freiburg* (1902).

Battles of Freiburg, 3rd, 5th and 10th of August 1644.—During the Thirty Years' War the neighbourhood of Freiburg was the scene of a series of engagements between the French under Louis de Bourbon, duc d'Enghien (afterwards called the great Condé), and Henri de la Tour d'Auvergne, vicomte de Turenne, and the Bavarians and Austrians commanded by Franz, Freiherr von Mercy.

At the close of the campaign of 1643 the French "Army of Weimar," having been defeated and driven into Alsace by the Bavarians, had there been reorganized under the command of Turenne, then a young general of thirty-two and newly promoted to the marshalate. In May 1644 he opened the campaign by recrossing the Rhine and raiding the enemy's posts as far as Überlingen on the lake of Constance and Donaueschingen on the Danube. The French then fell back with their booty and prisoners to Breisach, a strong garrison being left in Freiburg. The Bavarian commander, however, revenged himself by besieging Freiburg (June 27th), and Turenne's first attempt to relieve the place failed. During July, as the siege progressed, the French government sent the duc d'Enghien, who was ten years younger still than Turenne, but had just gained his great victory of Rocroy, to take over the command. Enghien brought with him a veteran army, called the "Army of France," Turenne remaining in command of the Army of Weimar. The armies met at Breisach on the 2nd of August, by which date Freiburg had surrendered. At this point most commanders of the time would have decided not to fight, but to manœuvre Mercy away from Freiburg; Enghien, however, was a fighting general, and Mercy's entrenched lines at Freiburg seemed to him a target rather than an obstacle. A few hours after his arrival, therefore, without waiting for the rearmost troops of his columns, he set the combining armies in motion for Krozingen, a village on what was then the main road between Breisach and Freiburg. The total force immediately available numbered only 16,000 combatants. Enghien and Turenne had arranged that the Army of France was to move direct upon Freiburg by Wolfenweiter, while the Army of Weimar was to make its way by hillside tracks to Wittnau and thence to attack the rear of Mercy's lines while Enghien assaulted them in front. Turenne's march (August 3rd, 1644) was slow and painful, as had been anticipated, and late in the afternoon, on passing Wittnau, he encountered the enemy. The Weimarians carried the outer lines of defence without much difficulty, but as they pressed on towards Merzhausen the resistance became more and more serious. Turenne's force was little more than 6000, and these were wearied with a long day of marching and fighting on the steep and wooded hillsides of the Black Forest. Thus the turning movement came to a standstill far short of Uffingen, the village on Mercy's line of retreat that Turenne was to have seized, nor was a flank attack possible against Mercy's main line, from which he was separated by the crest of the Schönberg. Meanwhile, Enghien's army had at the prearranged hour (4 P.M.) attacked Mercy's position on the Ebringen spur. A steep slope, vineyards, low stone walls and abatis had all to be surmounted, under a galling fire from the Bavarian musketeers, before the Army of France found itself, breathless and in disorder, in front of the actual entrenchments of the crest. A first attack failed, as did an attempt to find an unguarded path round the shoulder of the Schönberg. The situation was grave in the extreme, but Enghien resolved on Turenne's account to renew the attack, although only a quarter of his original force was still capable of making an effort. He himself and all the young nobles of his staff dismounted and led the infantry forward again, the prince threw his baton into the enemy's lines for the soldiers to retrieve, and in the end, after a bitter struggle, the Bavarians, whose reserves had been taken away to oppose Turenne in the Merzhausen defile, abandoned the entrenchments and disappeared into the woods of the adjoining spur. Enghien hurriedly re-formed his troops, fearing at every moment to be hurled down the hill by a counterstroke; but none came. The French bivouacked in the rain, Turenne making his way across the mountain to confer with the prince, and meanwhile Mercy quietly drew off his army in the dark to a new set of entrenchments on the ridge of which stood the Loretto chapel. On the 4th of August the Army of France and the Army of Weimar met at Merzhausen, the rearmost troops of the Army of France came in, and the whole was arranged by the major-generals in the plain facing the Loretto ridge. This position was attacked on the 5th. Enghien had designed his battle even more carefully than before, but as the result of a series of accidents the two French armies attacked prematurely and straight to their front, one brigade after another, and though at one moment Enghien, sword in hand, broke the line of defence with his last intact reserve, a brilliant counterstroke, led by Mercy's brother Kaspar (who was killed), drove out the assailants. It is said that Enghien lost half his men on this day and Mercy one-third of his, so severe was the battle. But the result could

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not be gainsaid; it was for the French a complete and costly failure.

For three days after this the armies lay in position without fighting, the French well supplied with provisions and comforts from Breisach, the Bavarians suffering somewhat severely from want of food, and especially forage, as all their supplies had to be hauled from Villingen over the rough roads of the Black Forest. Enghien then decided to make use of the Glotter Tal to interrupt altogether this already unsatisfactory line of supply, and thus to force the Bavarians either to attack him at a serious disadvantage, or to retreat across the hills with the loss of their artillery and baggage and the disintegration of their army by famine and desertion. With this object, the Army of Weimar was drawn off on the morning of the 9th of August and marched round by Betzenhausen and Lehen to Langen Denzling. The infantry of the Army of France, then the trains, followed, while Enghien with his own cavalry faced Freiburg and the Loretto position.

Before dawn on the 10th the advance guard of Turenne's army was ascending the Glotter Tal. But Mercy had divined his

adversary's plan, and leaving a garrison to hold Freiburg, the Bavarian army had made a night march on the 9/10th to the Abbey of St Peter, whence on the morning of the 10th Mercy fell back to Graben, his nearest magazine in the mountains. Turenne's advanced guard appeared from the Glotter Tal only to find a stubborn rearguard of cavalry in front of the abbey. A sharp action began, but Mercy hearing the drums and fifes of the French infantry in the Glotter Tal broke it off and continued his retreat in good order. Enghien thus obtained little material result from his manœuvre. Only two guns and such of Mercy's wagons that were unable to keep up fell into the hands of the French. Enghien and Turenne did not continue the chase farther than Graben, and Mercy fell back unmolested to Rothenburg on the Tauber.

The moral results of this sanguinary fighting were, however, important and perhaps justified the sacrifice of so many valuable soldiers. Enghien's pertinacity had not achieved a decision with the sword, but Mercy had been so severely punished that he was unable to interfere with his opponent's new plan of campaign. This, which was carried out by the united armies and by reinforcements from France, while Turenne's cavalry screened them by bold demonstrations on the Tauber, led to nothing less than the conquest of the Rhine Valley from Basel to Coblenz, a task which was achieved so rapidly that the Army of France and its victorious young leader were free to return to France in two months from the time of their appearance in Turenne's quarters at Breisach.

FREIDANK (Vrîdanc), the name by which a Middle High German didactic poet of the early 13th century is known. It has been disputed whether the word, which is equivalent to "free-thought," is to be regarded as the poet's real name or only as a pseudonym; the latter is probably the case. Little is known of Freidank's life. He accompanied Frederick II. on his crusade to the Holy Land, where, in the years 1228–1229, a portion at least of his work was composed; and it is said that on his tomb (if indeed it was not the tomb of another Freidank) at Treviso there was inscribed, with allusion to the character of his style, "he always spoke and never sang." Wilhelm Grimm originated the hypothesis that Freidank was to be identified with Walther von der Vogelweide; but this is no longer tenable. Freidank's work bears the name of *Bescheidenheit*, i.e. "practical wisdom," "correct judgment," and consists of a collection of proverbs, pithy sayings, and moral and satirical reflections, arranged under general heads. Its popularity till the end of the 16th century is shown by the great number of MSS. extant.

Sebastian Brant published the *Bescheidenheit* in a modified form in 1508. Wilhelm Grimm's edition appeared in 1834 (2nd ed. 1860), H. F. Bezzenberger's in 1872. A later edition is by F. Sandvoss (1877). The old Latin translation, *Fridangi Discretio*, was printed by C. Lemcke in 1868; and there are two translations into modern German, A. Bacmeister's (1861) and K. Simrock's (1867). See also F. Pfeiffer, *Über Freidank* (*Zur deutschen Literaturgeschichte*, 1855), and H. Paul, *Über die ursprüngliche Anordnung von Freidanks Bescheidenheit* (1870).

FREIENWALDE, a town of Germany, in the kingdom of Prussia, on the Oder, 28 m. N.E. of Berlin, on the Frankfort-Angermünde railway. Pop. (1905) 7905. It has a small palace, built by the Great Elector, an Evangelical and a Roman Catholic church, and manufactures of furniture, machinery, &c. The neighbouring forests and its medicinal springs make it a favourite summer resort of the inhabitants of Berlin. A new tower commands a fine view of the Oderbruch (see Oder). Freienwalde, which must be distinguished from the smaller town of the same name in Pomerania, first appears as a town in 1364.

FREIESLEBENITE, a rare mineral consisting of sulphantimonite of silver and lead, $(Pb,Ag_2)_3Sb_2S_6$. The monoclinic crystals are prismatic in habit, with deeply striated prism and dome faces. The colour is steel-grey, and the lustre metallic; hardness $2\frac{1}{2}$, specific gravity 6·2. It occurs with argentite, chalybite and galena in the silver veins of the Himmelsfürst mine at Freiberg, Saxony, where it has been known since 1720. The species was named after J. K. Freiesleben, who had earlier called it *Schilf-Glaserz*. Other localities are Hiendelaencina near Guadalajara in Spain, Kapnik-Bánya in Hungary, and Guanajuato in Mexico. A species separated from freieslebenite by V. von Zepharovich in 1871, because of differences in crystalline form, is known as diaphorite (from διαφορά, "difference"); it is very similar to freieslebenite in appearance and has perhaps the same chemical composition (or possibly $Ag_2PbSb_2S_4$), but is orthorhombic in crystallization. A third mineral also very similar to freieslebenite in appearance is the orthorhombic andorite, $AgPbSb_3S_6$, which is mined as a silver ore at Oruro in Bolivia.

FREIGHT, (pronounced like "weight"; derived from the Dutch *vracht* or *vrecht*, in Fr. *fret*, the Eng. "fraught" being the same word, and formerly used for the same thing, but now only as an adjective = "laden"), the lading or cargo of a ship, and the hire paid for their transport (see Affreightment); from the original sense of water-transport of goods the word has also come to be used for land-transit (particularly in America, by railroad), and by analogy for any load or burden.

FREILIGRATH, FERDINAND (1810–1876), German poet, was born at Detmold on the 17th of June 1810. He was educated at the gymnasium of his native town, and in his sixteenth year was sent to Soest, with a view to preparing him for a commercial career. Here he had also time and opportunity to acquire a taste for French and English literature. The years from 1831 to 1836 he spent in a bank at Amsterdam, and 1837 to 1839 in a business house at Barmen. In 1838 his *Gedichte* appeared and met with such extraordinary success that he gave up the

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idea of a commercial life and resolved to devote himself entirely to literature. His repudiation of the political poetry of 1841 and its revolutionary ideals attracted the attention of the king of Prussia, Frederick William IV., who, in 1842, granted him a pension of 300 talers a year. He married, and, to be near his friend Emanuel Geibel, settled at St Goar. Before long, however, Freiligrath was himself carried away by the rising tide of liberalism. In the poem *Ein Glaubensbekenntnis* (1844) he openly avowed his sympathy with the political movement led by his old adversary, Georg Herwegh; the day, he declared, of his own poetic trifling with Romantic themes was over; Romanticism itself was dead. He laid down his pension, and, to avoid the inevitable political persecution, took refuge in Switzerland. As a sequel to the *Glaubensbekenntnis* he published *Ça ira!* (1846), which strained still further his relations with the German authorities. He fled to London, where he resumed the commercial life he had broken off seven years before. When the Revolution of 1848 broke out, it seemed to Freiligrath, as to all the liberal thinkers of the time, the dawn of an era of political freedom; and, as may be seen from the poems in his collection of *Politische und soziale Gedichte* (1849–1851), he welcomed it with unbounded enthusiasm. He returned to Germany and settled in Düsseldorf; but it was not long before he had again called down upon himself the ill-will of the ruling powers by a poem, *Die Toten ah die Lebenden* (1848). He was arrested on a charge of *lèse-majesté*, but the prosecution ended in his acquittal. New difficulties arose; his association with the democratic movement rendered him an object of constant suspicion, and in 1851 he judged it more prudent to go back to London, where he remained until 1868. In that year he returned to Germany, settling first in Stuttgart and in 1875 in the neighbouring town of Cannstatt, where he died on the 18th of March 1876.

As a poet, Freiligrath was the most gifted member of the German revolutionary group. Coming at the very close of the Romantic age, his own purely lyric poetry re-echoes for the most part the familiar thoughts and imagery of his Romantic predecessors; but at an early age he had been attracted by the work of French contemporary poets, and he reinvigorated the German lyric by grafting upon it the orientalism of Victor Hugo. In this reconciliation of French and German romanticism lay Freiligrath's significance for the development of the lyric in Germany. His remarkable power of assimilating foreign literatures is also to be seen in his translations of English and Scottish ballads, of the poetry of Burns, Mrs Hemans, Longfellow and Tennyson (*Englische Gedichte aus neuerer Zeit*, 1846; *The Rose, Thistle and Shamrock*, 1853, 6th ed. 1887); he also translated Shakespeare's *Cymbeline*, *Winter's Tale* and *Venus and Adonis*, as well as Longfellow's *Hiawatha* (1857). Freiligrath is most original in his revolutionary poetry. His poems of this class suffer, it is true, under the disadvantage of all political poetry—purely temporary interest and the unavoidable admixture of much that has no claim to be called poetry at all—but the agitator Freiligrath, when he is at his best, displays a vigour and strength, a power of direct and cogent poetic expression, not to be found in any other political singer of the age.

Freiligrath's *Gedichte* have passed through some fifty editions, and his *Gesammelte Dichtungen*, first published in 1870, have reached a sixth edition (1898). *Nachgelassenes* (including a translation of Byron's *Maseppa*) was published in 1883. A selection of Freiligrath's best-known poems in English translation was edited by his daughter, Mrs Freiligrath-Kroeker, in 1869; also *Songs of a Revolutionary Epoch* were translated by J. L. Joynes in 1888. Cp. E. Schmidt-Weissenfels, *F. Freiligrath, eine Biographie* (1876); W. Buchner, *F. Freiligrath, ein Dichterleben in Briefen* (2 vols., 1881); G. Freiligrath, *Erinnerungen an F. Freiligrath* (1889); P. Besson, *Freiligrath* (Paris, 1899); K. Richter, *Freiligrath als Übersetzer* (1899). (J. G. R.)

FREIND, JOHN (1675–1728), English physician, younger brother of Robert Freind (1667–1751), headmaster of Westminster school, was born in 1675 at Croton in Northamptonshire. He made great progress in classical knowledge under Richard Busby at Westminster, and at Christ Church, Oxford, under Dean Aldrich, and while still very young, produced, along with Peter Foulkes, an excellent edition of the speeches of Aeschines and Demosthenes on the affair of Ctesiphon. After this he began the study of medicine, and having proved his scientific attainments by various treatises was appointed a lecturer on chemistry at Oxford in 1704. In the following year he accompanied the English army, under the earl of Peterborough, into Spain, and on returning home in 1707, wrote an account of the expedition, which attained great popularity. Two years later he published his *Prelectiones chimicae*, which he dedicated to Sir Isaac Newton. Shortly after his return in 1713 from Flanders, whither he had accompanied the British troops, he took up his residence in London, where he soon obtained a great reputation as a physician. In 1716 he became fellow of the college of physicians, of which he was chosen one of the censors in 1718, and Harveian orator in 1720. In 1722 he entered parliament as member for Launceston in Cornwall, but, being suspected of favouring the cause of the exiled Stuarts, he spent half of that year in the Tower. During his imprisonment he conceived the plan of his most important work, *The History of Physic*, of which the first part appeared in 1725, and the second in the following year. In the latter year he was appointed physician to Queen Caroline, an office which he held till his death on the 26th of July 1728.

A complete edition of his Latin works, with a Latin translation of the *History of Physic*, edited by Dr John Wigan, was published in London in 1732.

FREINSHEIM [FREINSHEMIUS], **JOHANN** (1608–1660), German classical scholar and critic, was born at Ulm on the 16th of November 1608. After studying at the universities of Marburg, Giessen and Strassburg, he visited France, where he remained for three years. He returned to Strassburg in 1637, and in 1642 was appointed professor of eloquence at Upsala. In 1647 he was summoned by Queen Christina to Stockholm as court librarian and historiographer. In 1650 he resumed his professorship at Upsala, but early in the following year he was obliged to resign on account of ill-health. In 1656 he became honorary professor at Heidelberg, and died on the 31st of August 1660. Freinsheim's literary activity was chiefly devoted to the Roman historians. He first introduced the division into chapters and paragraphs, and by means of carefully compiled indexes illustrated the lexical peculiarities of each author. He is best known for his famous supplements to Quintus Curtius and Livy, containing the missing books written by himself. He also published critical editions of Curtius and Florus.

FREIRE, FRANCISCO JOSÉ (1719–1773), Portuguese historian and philologist, was born at Lisbon on the 3rd of January 1719. He belonged to the monastic society of St Philip Neri, and was a zealous member of the literary association known as the Academy of Arcadians, in connexion with which he adopted the pseudonym of Candido Lusitano. He contributed much to the improvement of the style of Portuguese prose literature, but his endeavour to effect a reformation in the national poetry by a translation of Horace's *Ars poëtica* was less successful. The work in which he set forth his opinions regarding the vicious taste pervading the current Portuguese prose literature is entitled *Maximas sobre a Arte Oratoria* (1745) and is preceded by a chronological table forming almost a social and physical history of Portugal. His best known work, however, is his *Vida do Infante D. Henrique* (1758), which has given him a place in the first rank of Portuguese historians, and has been translated into French (Paris, 1781). He also wrote a poetical dictionary (*Diccionario poetico*) and a translation of Racine's *Athalie* (1762), and his *Reflexions sur la langue portugaise* was published in 1842 by the Lisbon society for the promotion of useful knowledge. He died at Mafra on the 5th of July 1773.

FREISCHÜTZ, in German folklore, a marksman who by a compact with the devil has obtained a certain number of bullets destined to hit without fail whatever object he wishes. As the legend is usually told, six of the *Freikugeln* or "free bullets" are thus subservient to the marksman's will, but the seventh is at the absolute disposal of the devil himself. Various methods were adopted in order to procure possession of the marvellous missiles. According to one the marksman, instead of swallowing the sacramental host, kept it and fixed it on a tree, shot at it

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and caused it to bleed great drops of blood, gathered the drops on a piece of cloth and reduced the whole to ashes, and then with these ashes added the requisite virtue to the lead of which his bullets were made. Various vegetable or animal substances had the reputation of serving the same purpose. Stories about the Freischütz were especially common in Germany during the 14th, 15th and 16th centuries; but the first time that the legend was turned to literary profit is said to have been by Apel in the *Gespensterbuch* or "Book of Ghosts." It formed the subject of Weber's opera *Der Freischütz* (1821), the libretto of which was written by Friedrich Kind, who had suggested Apel's story as an excellent theme for the composer. The name by which the Freischütz is known in French is Robin des Bois.

See Kind, *Freyschützbuch* (Leipzig, 1843); *Revue des deux mondes* (February 1855); Grässe, *Die Quelle des Freischütz* (Dresden, 1875).

FREISING, a town of Germany, in the kingdom of Bavaria, on the Isar, 16 m. by rail N.N.E. of Munich. Pop. (1905) 13,538. Among its eight Roman Catholic churches the most remarkable is the cathedral, which dates from about 1160 and is famous for its curious crypt. Noteworthy also are the old palace of the bishops, now a clerical seminary, the theological lyceum and the town-hall. There are several schools in the town, and there is a statue to the chronicler, Otto of Freising, who was bishop here from 1138 to 1158. Freising has manufactures of agricultural machinery and of porcelain, while printing and brewing are carried on. Near the town is the site of the Benedictine abbey of Weihenstephan, which existed from 725 to 1803. This is now a model farm and brewery. Freising is a very ancient town and is said to have been founded by the Romans. After being destroyed by the Hungarians in 955 it was fortified by the emperor Otto II. in 976 and by Duke Welf of Bavaria in 1082. A bishopric was established here in 724 by St Corbinianus, whose brother Erimbert was consecrated second bishop by St Boniface in 739. Later on the bishops acquired considerable territorial power and in the 17th century became princes of the Empire. In 1802 the see was secularized, the bulk of its territories being assigned to Bavaria and the rest to Salzburg, of which Freising had been a suffragan bishopric. In 1817 an archbishopric was established at Freising, but in the following year it was transferred to Munich. The occupant of the see is now called archbishop of Munich and Freising.

See C. Meichelbeck, *Historiae Frisingensis* (Augsburg, 1724–1729, new and enlarged edition 1854).

FRÉJUS, a town in the department of the Var in S.E. France. Pop. (1906) 3430. It is 28½ m. S.E. of Draguignan (the chief town of the department), and 22½ m. S.W. of Cannes by rail. It is only important on account of the fine Roman remains that it contains, for it is now a mile from the sea, its harbour having been silted up by the deposits of the Argens river. Since the 4th century it has been a bishop's see, which is in the ecclesiastical province of Aix en Provence. In modern times the neighbouring fishing village at St Raphaël (2½ m. by rail S.E., and on the seashore) has become a town of 4865 inhabitants (in 1901); in 1799 Napoleon disembarked there on his return from Egypt, and re-embarked for Elba in 1814, while nowadays it is much frequented as a health resort, as is also Valescure (2 m. N.W. on the heights above). The cathedral church in part dates from the 12th century, but only small portions of the old medieval episcopal palace are now visible, as it was rebuilt about 1823. The ramparts of the old town can still be traced for a long distance, and there are fragments of two moles, of the theatre and of a gate. The amphitheatre, which seated 12,000 spectators, is in a better state of preservation. The ruins of the great aqueduct which brought the waters of the Siagnole, an affluent of the Siagne, to the town, can still be traced for a distance of nearly 10 m. The original hamlet was the capital of the tribe of the Oxybii, while the town of Forum Julii was founded on its site by Julius Caesar in order to secure to the Romans a harbour independent of that of Marseilles. The buildings of which ruins exist were mostly built by Caesar or by Augustus, and show that it was an important naval station and arsenal. But the town suffered much at the hands of the Arabs, of Barbary pirates, and of its inhabitants, who constructed many of their dwellings out of the ruined Roman buildings. The ancient harbour (really but a portion of the lagoons, which had been deepened) is now completely silted up. Even in early times a canal had to be kept open by perpetual digging, while about 1700 this was closed, and now a sandy and partly cultivated waste extends between the town and the seashore.

See J. A. Aubenas, *Histoire de Fréjus* (Fréjus, 1881); Ch. Lenthéric, *La Provence Maritime ancienne et moderne* (Paris, 1880), chap. vii. (W. A. B. C.)

FRELINGHUYSEN, FREDERICK THEODORE (1817–1885), American lawyer and statesman, of Dutch descent, was born at Millstone, New Jersey, on the 4th of August 1817. His grandfather, Frederick Frelinghuysen (1753–1804), was an eminent lawyer, one of the framers of the first New Jersey constitution, a soldier in the War of Independence, and a member (1778–1779 and 1782–1783) of the Continental Congress from New Jersey, and in 1793–1796 of the United States senate; and his uncle, Theodore (1787–1862), was attorney-general of New Jersey from 1817 to 1829, was a United States senator from New Jersey in 1829–1835, was the Whig candidate for vice-president on the Clay ticket in 1844, and was chancellor of the university of New York in 1839–1850 and president of Rutgers College in 1850–1862. Frederick Theodore, left an orphan at the age of three, was adopted by his uncle, graduated at Rutgers in 1836, and studied law in Newark with his uncle, to whose practice he succeeded in 1839, soon after his admission to the bar. He became attorney for the Central Railroad of New Jersey, the Morris Canal and Banking Company, and other corporations, and from 1861 to 1867 was attorney-general of New Jersey. In 1861 he was a delegate to the peace congress at Washington, and in 1866 was appointed by the governor of New Jersey, as a Republican, to fill a vacancy in the United States senate. In the winter of 1867 he was elected to fill the unexpired term, but a Democratic majority in the legislature prevented his re-election in 1869. In 1870 he was nominated by President Grant, and confirmed by the senate, as United States minister to England to succeed John Lothrop Motley, but declined the mission. From 1871 to 1877 he was again a member of the United States senate, in which he was prominent in debate and in committee work, and was chairman of the committee on foreign affairs during the Alabama Claims negotiations. He was a strong opponent of the reconstruction measures of President Johnson, for whose conviction he voted (on most of the specific charges) in the impeachment trial. He was a member of the joint committee which drew up and reported (1877) the Electoral Commission Bill, and subsequently served as a member of the commission. On the 12th of December 1881 he was appointed secretary of state by President Arthur to succeed James G. Blaine, and served until the inauguration of President Cleveland in 1885. Retiring, with his health impaired by overwork, to his home in Newark, he died there on the 20th of May, less than three months after relinquishing the cares of office.

FREMANTLE, a seaport of Swan county, Western Australia, at the mouth of the Swan river, 12 m. by rail S.W. of Perth. It is the terminus of the Eastern railway, and is a town of some industrial activity, shipbuilding, soap-boiling, saw-milling, smelting, iron-founding, furniture-making, flour-milling, brewing and tanning being its chief industries. The harbour, by the construction of two long moles and the blasting away of the rocks at the bar, has been rendered secure. The English, French and German mail steamers call at the port. Fremantle became a municipality in 1871; but there are now three separate municipalities—Fremantle, with a population in 1901 of 14,704; Fremantle East (2494); and Fremantle North (3246). At Rottnest Island, off the harbour, there are government salt-works and a residence of the governor, also penal and reformatory establishments.

FRÉMIET, EMMANUEL (1824–), French sculptor, born in Paris, was a nephew and pupil of Rude; he chiefly devoted himself to animal sculpture and to equestrian statues in armour. His earliest work was in scientific lithography (osteology), and

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for a while he served in times of adversity in the gruesome office of "painter to the Morgue." In 1843 he sent to the Salon a study of a "Gazelle," and after that date was very prolific in his works. His "Wounded Bear" and "Wounded Dog" were produced in 1850, and the Luxembourg Museum at once secured this striking example of his work. From 1855 to 1859 Frémiet was engaged on a series of military statuettes for Napoleon III. He produced his equestrian statue of "Napoleon I." in 1868, and of "Louis d'Orléans" in 1869 (at the Château de Pierrefonds) and in 1874 the first equestrian statue of "Joan of Arc," erected in the Place des Pyramides, Paris; this he afterwards (1889) replaced with another and still finer version. In the meanwhile he had exhibited his masterly "Gorilla and Woman" which won him a medal of honour at the Salon of 1887. Of the same character, and even more remarkable, is his "Ourang-Outange and Borneo Savage" of 1895, a commission from the Paris Museum of Natural History. Frémiet also executed the statue of "St Michael" for the summit of the spire of the Église St Michel, and the equestrian statue of Velasquez for the Jardin de l'Infante at the Louvre. He became a member of the Académie des Beaux-Arts in 1892, and succeeded Barye as professor of animal drawing at the Natural History Museum of Paris.

FRÉMONT, JOHN CHARLES (1813–1890), American explorer, soldier and political leader, was born in Savannah, Georgia, on the 21st of January 1813. His father, a native of France, died when the boy was in his sixth year, and his mother, a member of an aristocratic Virginia family, then removed to Charleston, South Carolina. In 1828, after a year's special preparation, young Frémont entered the junior class of the college of Charleston, and here displayed marked ability, especially in mathematics; but his irregular attendance and disregard of college discipline led to his expulsion from the institution, which, however, conferred upon him a degree in 1836. In 1833 he was appointed teacher of mathematics on board the sloop of war "Natchez," and was so engaged during a cruise along the South American coast which was continued for about two and a half years. Soon after returning to Charleston he was appointed professor of mathematics in the United States navy, but he chose instead to serve as assistant engineer of a survey undertaken chiefly for the purpose of finding a pass through the mountains for a proposed railway from Charleston to Cincinnati. In July 1838 he was appointed second lieutenant of Topographical Engineers in the United States army, and for the next three years he was assistant to the French explorer, Jean Nicholas Nicollet (1786–1843), employed by the war department to survey and map a large part of the country lying between the upper waters of the Mississippi and Missouri rivers. In 1841 Frémont surveyed, for the government, the lower course of the Des Moines river. In the same year he married Jessie, the daughter of Senator Thomas H. Benton of Missouri, and it was in no small measure through Benton's influence with the government that Frémont was enabled to accomplish within the next few years the exploration of much of the territory between the Mississippi Valley and the Pacific Ocean.

When the claim of the United States to the Oregon territory was being strengthened by occupation, Frémont was sent, at his urgent request, to explore the frontier beyond the Missouri river, and especially the Rocky Mountains in the vicinity of the South Pass, through which the American immigrants travelled. Within four months (1842) he surveyed the Pass and ascended to the summit of the highest of the Wind River Mountains, since known as Frémont's Peak, and the interest aroused by his descriptions was such that in the next year he was sent on a second expedition to complete the survey across the continent along the line of travel from Missouri to the mouth of the Columbia river. This time he not only carried out his instructions but, by further explorations together with interesting descriptions, dispelled general ignorance with respect to the main features of the country W. of the Rocky Mountains: the Great Salt Lake, the Great Basin, the Sierra Nevada Mountains, and the fertile river basins of the Mexican province of California.

His report of this expedition upon his return to Washington, D.C., in 1844, aroused much solicitude for California, which, it was feared, might, in the event of war then threatening between the United States and Mexico, be seized by Great Britain. In the spring of 1845 Frémont was despatched on a third expedition for the professed purposes of further exploring the Great Basin and the Pacific Coast, and of discovering the easiest lines of communication between them, as well as for the secret purpose of assisting the United States, in case of war with Mexico, to gain possession of California. He and his party of sixty-two arrived there in January 1846. Owing to the number of American immigrants who had settled in California, the Mexican authorities there became suspicious and hostile, and ordered Frémont out of the province. Instead of obeying he pitched his camp near the summit of a mountain overlooking Monterey, fortified his position, and raised the United States flag. A few days later he was proceeding toward the Oregon border when new instructions from Washington caused him to retrace his steps and, perhaps, to consider plans for provoking war. The extent of his responsibility for the events that ensued is not wholly clear, and has been the subject of much controversy; his defenders have asserted that he was not responsible for the seizure of Sonoma or for the so-called "Bear-Flag War"; and that he played a creditable part throughout. (For an opposite view see CALIFORNIA.) Commodore John D. Sloat, after seizing Monterey, transferred his command to Commodore Robert Field Stockton (1795–1866), who made Frémont major of a battalion; and by January 1847 Stockton and Frémont completed the conquest of California. In the meantime General Stephen Watts Kearny (1794–1848) had been sent by the Government to conquer it and to establish a government. This created a conflict of authority between Stockton and Kearny, both of whom were Frémont's superior officers. Stockton, ignoring Kearny, commissioned Frémont military commandant and governor. But Kearny's authority being confirmed about the 1st of April, Frémont, for repeated acts of disobedience, was sent under arrest to Washington, where he was tried by court-martial, found guilty (January 1847) of mutiny, disobedience and conduct prejudicial to military discipline, and sentenced to dismissal from the service. President Polk approved of the verdict except as to mutiny, but remitted the penalty, whereupon Frémont resigned.

With the mountain-traversed region he had been exploring acquired by the United States, Frémont was eager for a railway from the Atlantic to the Pacific, and in October 1848 he set out at his own and Senator Benton's expense to find passes for such a railway along a line westward from the headwaters of the Rio Grande. But he had not gone far when he was led astray by a guide, and after the loss of his entire outfit and several of his men, and intense suffering of the survivors from cold and hunger, he turned southward through the valley of the Rio Grande and then westward through the valley of the Gila into southern California. Late in the year 1853, however, he returned to the place where the guide had led him astray, found passes through the mountains to the westward between latitudes 37° and 38° N., and arrived in San Francisco early in May 1854. From the conclusion of his fourth expedition until March 1855, when he removed to New York city, he lived in California, and in December 1849 was elected one of the first two United States senators from the new state. But as he drew the short term, he served only from the 10th of September 1850 to the 3rd of March 1851. Although a candidate for re-election, he was defeated by the pro-slavery party. His opposition to slavery, however, together with his popularity—won by the successes, hardships and dangers of his exploring expeditions, and by his part in the conquest of California—led to his nomination, largely on the ground of "availability," for the presidency in 1856 by the Republicans (this being their first presidential campaign), and by the National Americans or "Know-Nothings." In the ensuing election he was defeated by James Buchanan by 174 to 114 electoral votes.

Soon after the Civil War began, Frémont was appointed major-general and placed in command of the western department

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with headquarters at St Louis, but his lack of judgment and of administrative ability soon became apparent, the affairs of his department fell into disorder, and Frémont seems to have been easily duped by dishonest contractors whom he trusted. On the 30th of August 1861 he issued a proclamation in which he declared the property of Missourians in rebellion confiscated and their slaves emancipated. For this he was applauded by the radical Republicans, but his action was contrary to an act of congress of the 6th of August and to the policy of the Administration. On the 11th of September President Lincoln, who regarded the action as premature and who saw that it might alienate Kentucky and other border states, whose adherence he was trying to secure, annulled these declarations. Impelled by serious charges against Frémont, the president sent Montgomery Blair, the postmaster-general, and Montgomery C. Meigs, the quartermaster-general, to investigate the department; they reported that Frémont's management was extravagant and inefficient; and in November he was removed. Out of consideration for the "Radicals," however, Frémont was placed in command of the Mountain Department of Virginia, Kentucky and Tennessee. In the spring and summer of 1862 he co-operated with General N. P. Banks against "Stonewall" Jackson in the Shenandoah Valley, but showed little ability as a commander, was defeated by General Ewell at Cross Keys, and when his troops were united with those of Generals Banks and McDowell to form the Army of Virginia, of which General John Pope was placed in command, Frémont declined to serve under Pope, whom he outranked, and retired from active service. On the 31st of May 1864 he was nominated for the presidency by a radical faction of the Republican party, opposed to President Lincoln, but his following was so small that on the 21st of September he withdrew from the contest. From 1878 to 1881 he was governor of the territory of Arizona, and in the last year of his life he was appointed by act of congress a major-general and placed on the retired list. He died in New York on the 13th of July 1890.

See J. C. Frémont, *Report of the Exploring Expedition to the Rocky Mountains, 1842, and to Oregon and North California, 1843–1844* (Washington, 1845); Frémont's *Memoirs of my Life* (New York, 1887); and J. Bigelow, *Memoirs of the Life and Public Services of John C. Frémont* (New York, 1856).

FREMONT, a city and the county-seat of Dodge county, Nebraska, U.S.A., about 37 m. N.W. of Omaha, on the N. bank of the Platte river, which here abounds in picturesque bluffs and wooded islands. Pop. (1890) 6747; (1900) 7241 (1303 foreign-born); (1910) 8718. It is on the main line of the Union Pacific railway, on a branch of the Chicago, Burlington & Quincy system, and on the main western line of the Chicago & North-Western railway, several branches of which (including the formerly independent Fremont, Elkhorn & Missouri Valley and the Sioux City & Pacific) converge here. The city has an attractive situation and is beautifully shaded. It has a public library and is the seat of the Fremont College, Commercial Institute and School of Pharmacy (1875), a private institution. There is considerable local trade with the rich farming country of the Platte and Elkhorn valleys; and the wholesale grain interests are especially important. Among the manufactures are flour, carriages, saddlery, canned vegetables, furniture, incubators and beer. The city owns and operates its electric-lighting plant and water-works. Fremont was founded in 1856, and became the county-seat in 1860. It was chartered as a city (second-class) in 1871, and became a city of the first class in 1901.

FREMONT, a city and the county-seat of Sandusky county, Ohio, U.S.A., on the Sandusky river, 30 m. S.E. of Toledo. Pop. (1890) 7141; (1900) 8439, of whom 1074 were foreign-born; (1910 census) 9039. Fremont is served by the Lake Shore & Michigan Southern, the Lake Shore Electric, the Lake Erie & Western, and the Wheeling & Lake Erie railways. The river is navigable to this point. Spiegel Grove, the former residence of Rutherford B. Hayes, is of interest, and the city has a public library (1873) and parks, in large measure the gifts of his uncle, Sardis Birchard. Fremont is situated in a good agricultural region; oil and natural gas abound in the vicinity; and the city has various manufactures, including boilers, electro-carbons, cutlery, bricks, agricultural implements, stoves and ranges, safety razors, carriage irons, sash, doors, blinds, furniture, beet sugar, canned vegetables, malt extract, garters and suspenders. The total factory product was valued at $2,833,385 in 1905, an increase of 23·4% over that of 1900. Fremont is on the site of a favourite abode of the Indians, and a trading post was at times maintained here; but the place is best known in history as the site of Fort Stephenson, erected during the War of 1812, and on the 2nd of August 1813 gallantly and successfully defended by Major George Croghan (1791–1849), with 160 men, against about 1000 British and Indians under Brigadier-General Henry A. Proctor. In 1906 Croghan's remains were re-interred on the site of the old fort. Until 1849, when the present name was adopted in honour of J. C. Frémont, the place was known as Lower Sandusky; it was incorporated as a village in 1829 and was first chartered as a city in 1867.

FRÉMY, EDMOND (1814–1894), French chemist, was born at Versailles on the 29th of February 1814. Entering Gay-Lussac's laboratory in 1831, he became *préparateur* at the École Polytechnique in 1834 and at the Collège de France in 1837. His next post was that of *répétiteur* at the École Polytechnique, where in 1846 he was appointed professor, and in 1850 he succeeded Gay-Lussac in the chair of chemistry at the Muséum d'Histoire Naturelle, of which he was director, in succession to M. E. Chevreul, from 1879 to 1891. He died at Paris on the 3rd of February 1894. His work included investigations of osmic acid, of the ferrates, stannates, plumbates, &c., and of ozone, attempts to obtain free fluorine by the electrolysis of fused fluorides, and the discovery of anhydrous hydrofluoric acid and of a series of *acides sulphazotés*, the precise nature of which long remained a matter of discussion. He also studied the colouring matters of leaves and flowers, the composition of bone, cerebral matter and other animal substances, and the processes of fermentation, in regard to the nature of which he was an opponent of Pasteur's views. Keenly alive to the importance of the technical applications of chemistry, he devoted special attention as a teacher to the training of industrial chemists. In this field he contributed to our knowledge of the manufacture of iron and steel, sulphuric acid, glass and paper, and in particular worked at the saponification of fats with sulphuric acid and the utilization of palmitic acid for candle-making. In the later years of his life he applied himself to the problem of obtaining alumina in the crystalline form, and succeeded in making rubies identical with the natural gem not merely in chemical composition but also in physical properties.

FRENCH, DANIEL CHESTER (1850–), American sculptor, was born at Exeter, New Hampshire, on the 20th of April 1850, the son of Henry Flagg French, a lawyer, who for a time was assistant-secretary of the United States treasury. After a year at the Massachusetts Institute of Technology, French spent a month in the studio of John Q. A. Ward, then began to work on commissions, and at the age of twenty-three received from the town of Concord, Massachusetts, an order for his well-known statue "The Minute Man," which was unveiled (April 19, 1875) on the centenary of the battle of Concord. Previously French had gone to Florence, Italy, where he spent a year with Thomas Ball. French's best-known work is "Death Staying the Hand of the Sculptor," a memorial for the tomb of the sculptor Martin Milmore, in the Forest Hills cemetery, Boston; this received a medal of honour at Paris, in 1900. Among his other works are: a monument to John Boyle O'Reilly, Boston; "Gen. Cass," National Hall of Statuary, Washington; "Dr Gallaudet and his First Deaf-Mute Pupil," Washington; the colossal "Statue of the Republic," for the Columbian Exposition at Chicago; statues of Rufus Choate (Boston), John Harvard (Cambridge, Mass.), and Thomas Starr King (San Francisco, California), a memorial to the architect Richard M. Hunt, in Fifth Avenue, opposite the Lenox library, New York, and a large "Alma Mater," near the approach to Columbia University, New York. In collaboration with Edward C. Potter he modelled the "Washington," presented to France by the Daughters of the American Revolution; the "General Grant" in Fairmount Park,

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Philadelphia, and the "General Joseph Hooker" in Boston. French became a member of the National Academy of Design (1901), the National Sculpture Society, the Architectural League, and the Accademia di San Luca, of Rome.

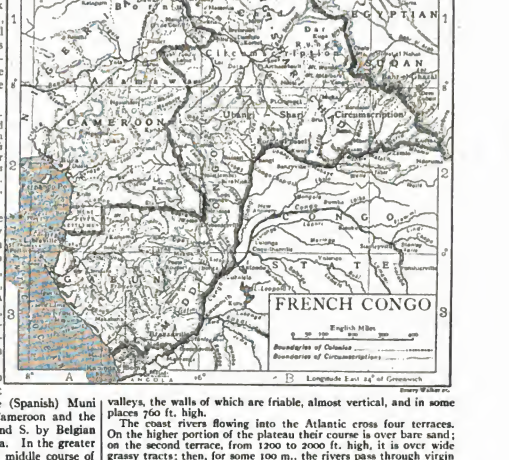
FRENCH, NICHOLAS (1604–1678), bishop of Ferns, was an Irish political pamphleteer, who was born at Wexford. He was educated at Louvain, and returning to Ireland became a priest at Wexford, and before 1646 was appointed bishop of Ferns. Having taken a prominent part in the political disturbances of this period, French deemed it prudent to leave Ireland in 1651, and the remainder of his life was passed on the continent of Europe. He acted as coadjutor to the archbishops of Santiago de Compostella and Paris, and to the bishop of Ghent, and died at Ghent on the 23rd of August 1678. In 1676 he published his attack on James Butler, marquess of Ormonde, entitled "The Unkinde Desertor of Loyall Men and True Frinds," and shortly afterwards "The Bleeding Iphigenia." The most important of his other pamphlets is the "Narrative of the Earl of Clarendon's Settlement and Sale of Ireland" (Louvain, 1668).

The *Historical Works* of Bishop French, comprising the three pamphlets already mentioned and some letters, were published by S. H. Bindon at Dublin in 1846. See T. D. McGee, *Irish Writers of the 17th Century* (Dublin, 1846); Sir J. T. Gilbert, *Contemporary History of Affairs in Ireland, 1641–1652* (Dublin, 1879–1880); and T. Carte, *Life of James, Duke of Ormond* (new ed., Oxford, 1851).

FRENCH CONGO, the general name of the French possessions in equatorial Africa. They have an area estimated at 700,000 sq. m., with a population, also estimated, of 6,000,000 to 10,000,000. The whites numbered (1906) 1278, of whom 502 were officials. French Congo, officially renamed FRENCH EQUATORIAL AFRICA in 1910, comprises—(1) the Gabun Colony, (2) the Middle Congo Colony, (3) the Ubangi-Shari Circumscription, (4) the Chad Circumscription. The two last-named divisions form the Ubangi-Shari-Chad Colony.

The present article treats of French Congo as a unit. It is bounded W. by the Atlantic, N. by the (Spanish) Muni River Settlements, the German colony of Cameroon and the Sahara, E. by the Anglo-Egyptian Sudan, and S. by Belgian Congo and the Portuguese territory of Kabinda. In the greater part of its length the southern frontier is the middle course of the Congo and the Ubangi and Mbomu, the chief northern affluents of that stream, but in the south-west the frontier keeps north of the Congo river, whose navigable lower course is partitioned between Belgium and Portugal. The coast line, some 600 m. long, extends from 5° S. to 1° N. The northern frontier, starting inland from the Muni estuary, after skirting the Spanish settlements follows a line drawn a little north of 2° N. and extending east to 16° E. North of this line the country is part of Cameroon, German territory extending so far inland from the Gulf of Guinea as to approach within 130 m. of the Ubangi. From the intersection of the lines named, at which point French Congo is at its narrowest, the frontier runs north and then east until the Shari is reached in 10° 40′ N. The Shari then forms the frontier up to Lake Chad, where French Congo joins the Saharan regions of French West Africa. The eastern frontier, separating the colony from the Anglo-Egyptian Sudan, is the water-parting between the Nile and the Congo. The Mahommedan sultanates of Wadai and Bagirmi occupy much of the northern part of French Congo (see WADAI and BAGIRMI).

Physical Features.—The coast line, beginning in the north at Corisco Bay, is shortly afterwards somewhat deeply indented by the estuary of the Gabun, south of which the shore runs in a nearly straight line until the delta of the Ogowé is reached, where Cape Lopez projects N.W. From this point the coast trends uniformly S.E. without presenting any striking features, though the Bay of Mayumba, the roadstead of Loango, and the Pointe Noire may be mentioned. A large proportion of the coast region is occupied by primeval forest, with trees rising to a height of 150 and 200 ft., but there is a considerable variety of scenery—open lagoons, mangrove swamps, scattered clusters of trees, park-like reaches, dense walls of tangled underwood along the rivers, prairies of tall grass and patches of cultivation. Behind the coast region is a ridge which rises from 3000 to 4500 ft., called the Crystal Mountains, then a plateau with an elevation varying from 1500 to 2800 ft., cleft with deep river-



valleys, the walls of which are friable, almost vertical, and in some places 760 ft. high.

The coast rivers flowing into the Atlantic cross four terraces. On the higher portion of the plateau their course is over bare sand; on the second terrace, from 1200 to 2000 ft. high, it is over wide grassy tracts; then, for some 100 m., the rivers pass through virgin forest, and, lastly, they cross the shore region, which is about 10 m. broad. The rivers which fall directly into the Atlantic are generally unnavigable. The most important, the Ogowé (*q.v.*), is, however, navigable from its mouth to N'Jole, a distance of 235 m. Rivers to the south of the Ogowé are the Nyanga, 120 m. long, and the Kwilu. The latter, 320 m. in length, is formed by the Kiasi and the Luété; it has a very winding course, flowing by turns from north to south, from east to west, from south to north-west and from north to south-west. It is encumbered with rocks and eddies, and is navigable only over 38 m., and for five months in the year. The mouth is 1100 ft. wide. The Muni river, the northernmost in the colony, is obstructed by cataracts in its passage through the escarpment to the coast.

Nearly all the upper basin of the Shari (*q.v.*) as well as the right bank of the lower river is within French Congo. The greater part of the country belongs, however, to the drainage area of the Congo river. In addition to the northern banks of the Mbomu and Ubangi, 330 m. of the north shore of the Congo itself are in the French protectorate as well as numerous subsidiary streams. For some 100 m., however, the right bank of the Sanga, the most important of these subsidiary streams, is in German territory (see CONGO).

Geology.—Three main divisions are recognized in the French Congo:—(1) the littoral zone, covered with alluvium and superficial deposits and underlain by Tertiary and Cretaceous rocks; (2) the mountain zone of the Crystal Mountains, composed of granite, metamorphic and ancient sediments; (3) the plateau of the northern portion of the Congo basin, occupied by Karroo sandstones. The core of the Crystal Mountains consists of granite and schists.

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Infolded with them, and on the flanks, are three rock systems ascribed to the Silurian, Devonian and Carboniferous. These are unfossiliferous, but fossils of Devonian age occur on the Congo (see CONGO FREE STATE). Granite covers wide areas north-west of the Crystal Mountains. The plateau sandstones lie horizontally and consist of a lower red sandstone group and an upper white sandstone group. They have not yielded fossils. Limestones of Lower Cretaceous age, with *Schloenbachia inflata*, occur north of the Gabun and in the Ogowé basin. Marls and limestones with fossils of an Eocene facies overlie the Cretaceous rocks on the Gabun. A superficial iron-cemented sand, erroneously termed laterite, covers large areas of the littoral zone, on the flanks of the mountains and on the high plateau.

Climate.—The whole of the country being in the equatorial region, the climate is everywhere very hot and dangerous for Europeans. On the coast four seasons are distinguished: the dry season (15th of May to 15th of September), the rainy season (15th of September to 15th of January), then a second dry season (15th of January to 1st of March), and a second rainy season (1st of March to 15th of May). The rainfall at Libreville is about 120 in. a year.

Flora and Fauna.—The elephant, the hippopotamus, the crocodile and several kinds of apes—including the chimpanzee and the rare gorilla—are the most noteworthy larger animals; the birds are various and beautiful—grey parrots, shrikes, fly-catchers, rhinoceros birds, weaver birds (often in large colonies on the palm-trees), ice-birds, from the *Cecyle Sharpii* to the dwarfish *Alcedo cristata*, butterfly finches, and helmet-birds (*Turacus giganteus*), as well as more familiar types. Snakes are extremely common. The curious climbing-fish, which frequents the *Pandanus* the *Prophreurs* or lung-fish, which lies in the mud in a state of lethargy during the dry season, the strange and poisonous *Tetrodon guttifer*, and the herring-like *Pellona africana*, often caught in great shoals—are the more remarkable of the fishes. Oysters are got in abundance from the lagoons, and the huge *Cardisoma armatum* or heart-crab is fattened for table. Fireflies, mosquitoes and sandflies are among the most familiar forms of insect life. A kind of ant builds very striking bent-house or umbrella-shaped nests rising on the tree trunks one above the other.

Among the more characteristic forms of vegetation are baobabs, silk-cotton trees, screw-pines and palms—especially *Hyphaene guineensis* (a fan-palm), *Raphia* (the wine-palm), and *Elaeis guineensis* (the oil-palm). Anonaceous plants (notably *Anona senegalensis*, and the *pallabanda*, an olive-myrtle-like tree, are common in the prairies; the papyrus shoots up to a height of 20 ft. along the rivers; the banks are fringed by *Nauclea*, *Tabernaemontana* and *Gardenia* and fragrant jasmines; and the thickets are bound together in one inextricable mass by lianas of many kinds. In the upper Shari region and that of the Kotto tributary of the Ubangi, are species of the coffee tree; one species attaining a height of over 60 ft. Its bean resembles that of Abyssinian coffee of medium quality. Among the fruit trees are the mango and the papaw, the orange and the lemon. Negro-pepper (a variety of capsicum) and ginger grow wild.

Inhabitants and Chief Towns.—A census, necessarily imperfect, taken in 1906 showed a total population, exclusive of Wadai, of 3,652,000, divided in districts as follows:—Gabun, 376,000; Middle Congo, 259,000; Ubangi-Shari, 2,130,000; Chad, 885,000. The country is peopled by diverse negro races, and, in the regions bordering Lake Chad and in Wadai, by Hausa, Arabs and semi-Arab tribes. Among the best-known tribes living in French Congo are the Fang (Fans), the Bakalai, the Batekes and the Zandeh or Niam-Niam. Several of the tribes are cannibals and among many of them the fetish worship characteristic of the West African negroes prevails. Their civilization is of a low order. In the northern regions the majority of the inhabitants are Mahommedans, and it is only in those districts that organized and powerful states exist. Elsewhere the authority of a chief or "king" extends, and scarcely, little beyond the village in which he lives. (An account of the chief tribes is given under their names.) The European inhabitants are chiefly of French nationality, and are for the most part traders, officials and missionaries.

The chief towns are Libreville (capital of the Gabun colony) with 3000 inhabitants; Brazzaville, on the Congo on the north side of Stanley Pool (opposite the Belgian capital of Leopoldville), the seat of the governor-general; Fort-Crampel, on the upper Ogowé; Loango, an important seaport in 4° 39′ S.; N'Jole, a busy trading centre on the lower Ogowé; Chekna, capital of Bagirmi, which forms part of the Chad territory; Abeshr, the capital of Wadai, Bangi on the Ubangi river, the administrative capital of the Ubangi-Shari-Chad colony. Kunde, Lame and Binder are native trading centres near the Cameroon frontier.

Communications.—The rivers are the chief means of internal communication. Access to the greater part of the colony is obtained by ocean steamers to Matadi on the lower Congo, and thence round the falls by the Congo railway to Stanley Pool. From Brazzaville on Stanley Pool there is 680 m. of uninterrupted steam navigation N.E. into the heart of Africa, 330 m. being on the Congo and 350 m. on the Ubangi. The farthest point reached is Zongo, where rapids block the river, but beyond that port there are several navigable stretches of the Ubangi, and for small vessels access to the Nile is possible by means of the Bahr-el-Ghazal tributaries. The Sanga, which joins the Congo, 270 m. above Brazzaville, can be navigated by steamers for 350 m., *i.e.* up to and beyond the S.E. frontier of the German colony of Cameroon. The Shari is also navigable for a considerable distance and by means of its affluent, the Logone, connects with the Benue and Niger, affording a waterway between the Gulf of Guinea and Lake Chad. Stores for government posts in the Chad territory are forwarded by this route. There is, however, no connecting link between the coast rivers—Gabun, Ogowé and Kwilu and the Congo system. A railway, about 500 m. long, from the Gabun to the Sanga is projected and the surveys for the purpose made. Another route surveyed for a railway is that from Loango to Brazzaville. A railway between Loango and Brazzaville to Mindule in the cataracts region was begun in November 1908, the first railway to be built in French Congo. The district served by the line is rich in copper and other minerals. From Wadai is carried on a trade across the Sahara by Tripoli and Benghazi on the shores of the Mediterranean. Telegraph lines connect Loango with Brazzaville and Libreville, there is telegraphic communication with Europe by submarine cable, and steamship communication between Loango and Libreville and Marseilles, Bordeaux, Liverpool and Hamburg.

Trade and Agriculture.—The chief wealth of the colony consists in the products of its forests and in ivory. The natives, in addition to manioc, their principal food, cultivate bananas, ground nuts and tobacco. On plantations owned by Europeans coffee, cocoa and vanilla are grown. European vegetables are raised easily. Gold, iron and copper are found. Copper ores have been exported from Mindule since 1905. The chief exports are rubber and ivory, next in importance coming palm nuts and palm oil, ebony and other woods, copper ores, cocoa and coffee. Imports are mainly cotton and metal goods, spirits and foodstuffs. In the Gabun and in the basin of the Ogowé the French customs tariff, with some modifications, prevails, but in the Congo basin, that is, in the greater part of the country, by virtue of international agreement no discrimination can be made between French and other merchandise, whilst customs duties must not exceed 10% *ad valorem*.[1] In the Shari basin and in Wadai the Anglo-French declaration of March 1899 accorded for thirty years equal treatment to British and French goods. The value of the trade rose in the ten years 1896–1905 from £360,000 to £850,000, imports and exports being nearly equal. The bulk of the export trade is with Great Britain, which takes most of the rubber, France coming second and Germany third. The imports are in about equal proportions from France and foreign countries.

Land Tenure. The Concessions Régime.—Land held by the natives is governed by tribal law, but the state only recognizes native ownership in land actually occupied by the aborigines. The greater part of the country is considered a state domain. Land held by Europeans is subject to the Civil Code of France except such estates as have been registered under the terms of a decree of the 28th of March 1899, when, registration having been effected, the title to the land is guaranteed by the state. Nearly the whole of the colony has been divided since 1899 into large estates held by limited liability companies to whom has been granted the sole right of exploiting the land leased to them. The companies holding concessions numbered in 1904 about forty, with a combined capital of over £2,000,000, whilst the concessions varied in size from 425 sq. m. to 54,000 sq. m. One effect of the granting of concessions was the rapid decline in the business of non-concessionaire traders, of whom the most important were Liverpool merchants established in the Gabun before the advent of the French. As by the Act of Berlin of 1885, to which all the European powers were signatories, equality of treatment in commercial affairs was guaranteed to all nations in the Congo basin, protests were raised against the concessions. The reply was that the critics confused the exercise of the right of proprietorship with the act of commerce, and that in no country was the landowner who farmed his land and sold the produce regarded as a merchant. Various decisions by the judges of the colony during 1902 and 1903 and by the French *cour de cassation* in 1905 confirmed that contention. The action of the companies was, however, in most cases, neither beneficial to the country nor financially successful, whilst the native cultivators resented the prohibition of their trading direct with their former customers. The case of the Liverpool traders was taken up by the British government and it was agreed that the dispute should be settled by arbitration. In September 1908 the French government issued a decree recognizing and rendering more stringent the control exercised by the local authorities over the concession companies, especially in matters concerning the rights of natives and the liberty of commerce.

History.—The Gabun was visited in the 15th century by the Portuguese explorers, and it became one of the chief seats of the slave trade. It was not, however, till well on in the 19th century that Europeans made any more permanent settlement than was absolutely necessary for the maintenance of their commerce. In 1839 Captain (afterwards Admiral) Bouët-Willaumez obtained for France the right of residence on the left bank, and in 1842 he secured better positions on the right bank. The primary object of the French settlement was to secure a

[1] Berlin Act of 1885; Brussels conference of 1890 (see AFRICA: *History*).

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port wherein men-of-war could revictual. The chief establishment, Libreville, was founded in 1849, with negroes taken from a slave ship. The settlement in time acquired importance as a trading port. In 1867 the troops numbered about 1000, and the civil population about 5000, while the official reports about the same date claimed for the whole colony an area of 8000 sq. m. and a population of 186,000. Cape Lopez had been ceded to France in 1862, and the colony's coast-line extended, nominally, to a length of 200 m. In consequence of the war with Germany the colony was practically abandoned in 1871, the establishment at Libreville being maintained as a coaling depot merely. In 1875, however, France again turned her attention to the Gabun estuary, the hinterland of which had already been partly explored. Paul du Chaillu penetrated (1855–1859 and 1863–1865) to the south of the Ogowé; Walker, an English merchant, explored the Ngunye, an affluent of the Ogowé, in 1866. In 1872–1873 Alfred Marche, a French naturalist, and the marquis de Compiègne[1] explored a portion of the Ogowé basin, but it was not until the expedition of 1875–1878 that the country east of the Ogowé was reached. This expedition was led by Savorgnan de Brazza (*q.v.*), who was accompanied by Dr Noel Eugène Ballay, and, for part of the time, by Marche. De Brazza's expedition, which was compelled to remain for many months at several places, ascended the Ogowé over 400 m., and beyond the basin of that stream discovered the Alima, which was, though the explorers were ignorant of the fact, a tributary of the Congo. From the Alima, de Brazza and Ballay turned north and finally reached the Gabun in November 1878, the journey being less fruitful in results than the time it occupied would indicate. Returning to Europe, de Brazza learned that H. M. Stanley had revealed the mystery of the Congo, and in his next journey, begun December 1879, the French traveller undertook to find a way to the Congo above the rapids via the Ogowé. In this he was successful, and in September 1880 reached Stanley Pool, on the north side of which Brazzaville was subsequently founded. Returning to the Gabun by the lower Congo, de Brazza met Stanley. Both explorers were nominally in the service of the International African Association (see CONGO FREE STATE), but de Brazza in reality acted solely in the interests of France and concluded treaties with Makoko, "king of the Batekes," and other chieftains, placing very large areas under the protection of that country. The conflicting claims of the Association (which became the Congo Free State) and France were adjusted by a convention signed in February 1885.[2] In the meantime de Brazza and Ballay had more fully explored the country behind the coast regions of Gabun and Loango, the last-named seaport being occupied by France in 1883. The conclusion of agreements with Germany (December 1885 and February–March 1894) and with Portugal (May 1886) secured France in the possession of the western portion of the colony as it now exists, whilst an arrangement with the Congo Free State in 1887 settled difficulties which had arisen in the Ubangi district.

De Brazza's treaties.

The extension of French influence northward towards Lake Chad and eastward to the verge of the basin of the Nile followed, though not without involving the country in serious disputes with the other European powers possessing rights in those regions. By creating the posts of Bangi (1890), Wesso and Abiras (1891), France strengthened her hold over the Ubangi and the Sanga. But at the same time the Congo Free State passed the parallel of 4° N.—which, after the compromise of 1887, France had regarded as the southern boundary of her possessions—and, occupying the sultanate of Bangasso (north of the Ubangi river), pushed on as far as 9° N. The dispute which ensued was only settled in 1894 and after the signature of the convention between Great Britain and the Congo State of the 12th of May of that year, against which both the German and the French governments protested, the last named because it erected a barrier against the extension of French territory to the Nile valley. By a compromise of the 14th of August the boundary was definitely drawn and, in accordance with this pact, which put the frontier back to about 4° N., France from 1895 to 1897 took possession of the upper Ubangi, with Bangasso, Rafai and Zemio. Then began the French encroachment on the Bahr-el-Ghazal; the Marchand expedition, despatched to the support of Victor Liotard, the lieutenant-governor of the upper Ubangi, reached Tambura in July 1897 and Fashoda in July 1898. A dispute with Great Britain arose, and it was decided that the expedition should evacuate Fashoda. The declaration of the 21st of March 1899 finally terminated the dispute, fixing the eastern frontier of the French colony as already stated. Thus, after the Franco-Spanish treaty of June 1900 settling the limits of the Spanish territory on the coast, the boundaries of the French Congo on all its frontiers were determined in broad outline. The Congo-Cameroon frontier was precisely defined by another Franco-German agreement in April 1908, following a detailed survey made by joint commissioners in 1905 and 1906. For a comprehensive description of these international rivalries see AFRICA, § 5, and for the conquest of the Chad regions see BAGIRMI and RABAH ZOBEIR. In the other portions of the colony French rule was accepted by the natives, for the most part, peaceably. For the relations of France with Wadai see that article.

The advance towards the Nile: Fashoda.

Following the acquisitions for France of de Brazza, the ancient Gabun colony was joined to the Congo territories. From 1886 to 1889 Gabun was, however, separately administered. By decree of the 11th of December 1888 the whole of the French possessions were created one "colony" under the style of Congo français, with various subdivisions; they were placed under a commissioner-general (de Brazza) having his residence at Brazzaville. This arrangement proved detrimental to the economic development of the Gabun settlements, which being outside the limits of the free trade conventional basin of the Congo (see AFRICA, § 5) enjoyed a separate tariff. By decree of the 29th of December 1903 (which became operative in July 1904) Congo français was divided into four parts as named in the opening paragraph. The first commissioner-general under the new scheme was Emile Gentil, the explorer of the Shari and Chad. In 1905 de Brazza was sent out from France to investigate charges of cruelty and maladministration brought against officials of the colony, several of which proved well founded. De Brazza died at Dakar when on his way home. The French government, after considering the report he had drawn up, decided to retain Gentil as commissioner-general, making however (decree of 15th of February 1906) various changes in administration with a view to protect the natives and control the concession companies. Gentil, who devoted the next two years to the reorganization of the finances of the country and the development of its commerce, resigned his post in February 1908. He was succeeded by M. Merlin, whose title was changed (June 1908) to that of governor-general.

Administration and Revenue.—The governor-general has control over the whole of French Congo, but does not directly administer any part of it, the separate colonies being under lieutenant-governors. The Gabun colony includes the Gabun estuary and the whole of the coast-line of French Congo, together with the basin of the Ogowé river. The inland frontier is so drawn as to include all the hinterland not within the Congo free-trade zone (the Chad district excepted). The Middle Congo has for its western frontier the Gabun colony and Cameroon, and extends inland to the easterly bend of the Ubangi river; the two circumscriptions extend east and north of the Middle Congo. There is a general budget for the whole of French Congo; each colony has also a separate budget and administrative autonomy. As in other French colonies the legislative power is in the French chambers only, but in the absence of specific legislation presidential decrees have the force of law. A judicial service independent of the executive exists, but the district administrators also exercise judicial functions. Education is in the hands of the missionaries, upwards of 50 schools being established by 1909. The military force maintained consists of natives officered by Europeans.

[1] Louis Eugène Henri Dupont, marquis de Compiègne (1846–1877), on his return from the West coast replaced Georg Schweinfurth at Cairo as president of the geographical commission. Arising out of this circumstance de Compiegne was killed in a duel by a German named Mayer.

[2] A Franco-Belgian agreement of the 23rd of Dec. 1908 defined precisely the frontier in the lower Congo. Bamu Island in Stanley Pool was recognized as French.

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Revenue is derived from taxes on land, rent paid by concession companies, a capitation or hut tax on natives, and customs receipts, supplemented by a subvention from France. In addition to defraying the military expenses, about £100,000 a year, a grant of £28,000 yearly was made up to 1906 by the French chambers towards the civil expenses. In 1907 the budget of the Congo balanced at about £250,000 without the aid of this subvention. In 1909 the chambers sanctioned a loan for the colony of £840,000, guaranteed by France and to be applied to the establishment of administrative stations and public works.

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FRENCH GUINEA, a French colony in West Africa, formerly known as Rivières du Sud. It is bounded W. by the Atlantic, N. by Portuguese Guinea and Senegal, E. by Upper Senegal and the Ivory Coast, and S. by Liberia and Sierra Leone. It has a sea-board running N.N.W. and S.S.E. from 10° 50′ N. to 9° 2′ N., a distance, without reckoning the indentations, of 170 m., the colony extends eastward 450 m. in a straight line and attains a maximum width N. to S. of nearly 300 m., covering fully 100,000 sq. m., and containing a population estimated at 2,000,000 to 2,500,000.

Physical Features.—Though in one or two places rocky headlands jut into the sea, the coast is in general sandy, low, and much broken by rivers and deep estuaries, dotted with swampy islands, giving it the appearance of a vast delta. The Los Islands (*q.v.*), off the promontory of Konakry, lie the Los Islands (*q.v.*), forming part of the colony. The coast plain, formed of alluvial deposits, is succeeded about 30 m. inland by a line of cliffs, the Susu Hills, which form the first step in the terrace-like formation of the interior, culminating in the massif of Futa Jallon, composed chiefly of Archean and granite rocks. While the coast lands are either densely forested or covered with savannas or park-like country, the Futa Jallon tableland is mainly covered with short grass. This tableland, the hydrographic centre of West Africa, is most elevated in its southern parts, where heights of 5000 ft. are found. Near the Sierra Leone frontier this high land is continued westward to within 20 m. of the sea, where Mount Kakulima rises over 3300 ft. East and south of Futa Jallon the country slopes to the basin of the upper Niger, the greater part of which is included in French Guinea. The southern frontier is formed by the escarpments which separate the Niger basin from those of the coast rivers of Liberia. Besides the Niger, Gambia and Senegal, all separately noticed, a large number of streams running direct to the Atlantic rise in Futa Jallon. Among them are the Great and Little Scarcies, whose lower courses are in Sierra Leone, and the Rio Grande which enters the sea in Portuguese Guinea. Those whose courses are entirely in French Guinea include the Cogon (or Componi), the Rio Nuñez, the Fatalla (which reaches the sea through an estuary named Rio Pongo), the Konkure, whose estuary is named Rio Bramaya, the Forekaria and the Melakori. The Cogon, Fatallah and Konkure are all large rivers which descend from the plateaus through deep, narrow valleys in rapids and cataracts, and are only navigable for a few miles from their mouth.

Climate.—The climate of the coast district is hot, moist and unhealthy, with a season of heavy rain lasting from May to November, during which time variable winds, calms and tornadoes succeed one another. The mean temperature in the dry season, when the "harmattan" is frequent, is 62° Fahr., in the wet season 86°. Throughout the year the humidity of the air is very great. There is much rain in the Futa Jallon highlands, but the Niger basin is somewhat drier. In that region and in the highlands the climate is fairly healthy for Europeans and the heat somewhat less than on the coast.

Flora and Fauna.—The seashore and the river banks are lined with mangroves, but the most important tree of the coast belt is the oil-palm. The dense forests also contain many varieties of lianas or rubber vines, huge bombax and bamboos. Gum-producing and kola trees are abundant, and there are many fruit trees, the orange and citron growing well in the Susu and Futa Jallon districts. The cotton and coffee plants are indigenous; banana plantations surround the villages. The baobab and the karite (shea butter tree) are found only in the Niger districts. The fauna is not so varied as was formerly the case, large game having been to a great extent driven out of the coast regions. The elephant is rare save in the Niger region. The lion is now confined to the more northern of Futa Jallon; panthers, leopards, hyenas and wild cats are more common and the civet is found. Hippopotamus, otter and the wild boar are numerous; a species of wild ox of small size with black horns and very agile is also found. The forests contain many kinds of monkeys, including huge chimpanzees; antelope are widespread but rather rare. Serpents are very common, both venomous and non-venomous; the pythons attain a great size. Fights between these huge serpents and the crocodiles which infest all the rivers are said to be not uncommon. Turtles are abundant along the coasts and in the Los Islands. Oysters are found in large numbers in the estuaries and fixed to the submerged parts of the mangroves. Fresh-water oysters, which attain a large size, are also found in the rivers, particularly those in the Niger. Fish are abundant, one large-headed species, in the Susu tongue called *khokon*, is so numerous as to have given its name to a province, Kokunia. Birds are very numerous; they include various eagles, several kinds of heron, the egret, the marabout, the crane and the pelican; turacos or plantain-eaters, are common, as are other brilliantly plumaged birds. Green and grey parrots, ravens, swallows and magpies are also common.

Inhabitants.—On the banks of the Cogon dwell the Tendas and Bulas, primitive negro tribes allied to those of Portuguese Guinea (*q.v.*). All other inhabitants of French Guinea are regarded as comparatively late arrivals from the interior who have displaced the aborigines.[1] Among the earliest of the new comers are the Baga, the Nalu, the Landuman and the Timni, regarded as typical Negroes (*q.v.*). Their migration southward appears to have taken place before the 17th century. To-day the Baga occupy the coast land between the Cogon and the Rio Pongo, and the Landuman the country immediately behind that of the Baga. The other tribes named are but sparsely represented in French Guinea, the coast region south of the Nuñez and all the interior up to Futa Jallon being occupied by the Susu, a tribe belonging to the great Mandingan race, which forced its way seaward about the beginning of the 18th century and pressed back the Timni into Sierra Leone. Futa Jallon is peopled principally by Fula (*q.v.*), and the rest of the country by Malinké and other tribes of Mandingo (*q.v.*). The Mandingo, the Fula and the Susu are Mahommedans, though the Susu retain many of their ancient rites and beliefs—more associated with spirit worship and fetish, still the religion of the Baga and other tribes. In the north-west part of Futa Jallon are found remnants of the aborigines, such as the Tiapi, Koniagui and the Bassari, all typical Negro tribes. The white inhabitants number a few hundreds only and are mainly French. Many of the coast peoples show, however, distinct traces of white blood, the result chiefly of the former presence of European slave traders. Thus at the Rio Pongo there are numerous mulattos. South of that river the coast tribes speak largely pidgin English.

Towns.—The principal towns are Konakry, the capital, and, on the Rio Nuñez, Dubreka, on the coast, a little north of Konakry, Benty, on the Melakori, Timbo and Labe, the chief towns of Futa Jallon, Heremakono and Kindia, on the main road to the Niger, Kurussa and Siguiri, on a navigable stretch of that river, and Bissandugu, formerly Samory's capital, an important military station east of the Niger. Konakry, in 9° 30′ N., 13° 46′ W., population about 20,000, is the one port of entry on the coast. It is built on the little island of Tombo which lies off the promontory of Konakry, the town being joined to the mainland by an iron bridge. During the administration of Noël Ballay (1848–1902), governor of the colony 1890–1900, Konakry was transformed from a place of small importance to one of the chief ports on the West African coast, a rival even to Sierra Leone. It has since grown considerably, and is provided with wharves and docks and a jetty 1066 ft. long. There is an ample supply of good water, and a large public garden in the centre of the town. In front of Government House is a statue of M. Ballay. Konakry is a port of call for French, British and German steamship companies, and is in telegraphic communication with Europe. It is the starting-point of a railway to the Niger (see below). The retail trade is in the hands of Syrians. The town is governed by a municipality.

Products and Industry.—French Guinea possesses a fertile soil, and is rich in tropical produce. The chief products are rubber, brought from the interior, and palm oil and palm kernels, obtained in the coast regions. Cotton is cultivated in the Niger basin. Gum copal, ground-nuts and sesame are largely cultivated, partly for

[1] Numerous remains of a stone age have been discovered, both on the coast and in the hinterland. See L. Desplagnes, "L'Archéologie préhistorique en Guinée française," in *Bull. Soc. Géog. Comm. de Bordeaux*. March 1907, and the authorities there cited.

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export. Among minor products are coffee, wax and ivory. Large herds of cattle and flocks of sheep are raised in Futa Jallon: these are sent in considerable numbers to Sierra Leone, Liberia and French Congo. The trade in hides is also of considerable value. The chief grain raised is millet, the staple food of the people. The rubber is mainly exported to England, the palm products to Germany, and the ground-nuts to France.

The principal imports are cotton goods, of which 80% come from Great Britain, rice, kola nuts, chiefly from Liberia, spirits, tobacco, building material, and arms and ammunition, chiefly "trade guns." The average annual value of the trade for the period 1900–1907 was about £1,250,000, the annual export of rubber alone being worth £400,000 or more. The great bulk of the trade of the colony is with France and Great Britain, the last-named country taking about 45% of the total; Germany comes third. Since April 1905 a surtax of 7% has been imposed on all goods of other than French origin.

Communications.—The railway from Konakry to the Niger at Kurussa, by the route chosen a distance of 342 m., was begun in 1900, and from 1902 has been built directly by the colony. The first section to Kindia, 93 m., was opened in 1904. The second section, to near Timbo in Futa Jallon, was completed in 1907, and the rails reached Kurussa in 1910. From Kurussa the Niger is navigable at high water all the way to Bamako in Upper Senegal, whence there is communication by rail and river with St Louis and Timbuktu. Besides the railway there is an excellent road, about 390 m. long, from Konakry to Kurussa, the road in its lower part being close to the Sierra Leone frontier, with the object of diverting trade from that British colony. Several other main roads have been built by the French, and there is a very complete telegraphic system, the lines having been connected with those of Senegal in 1899.

History.—This part of the Guinea coast was made known by the Portuguese voyagers of the 15th century. In consequence, largely, of the dangers attending its navigation, it was not visited by the European traders of the 16th–18th centuries so frequently as other regions north and east, but in the Rio Pongo, at Matakong (a diminutive island near the mouth of the Forekaria), and elsewhere, slave traders established themselves, and ruins of the strongholds they built, and defended with cannon, still exist. When driven from other parts of Guinea the slavers made this difficult and little known coast one of their last resorts, and many barracoons were built in the late years of the 18th century. It was not until after the restoration of Goree to her at the close of the Napoleonic wars that France evinced any marked interest in this region. At that time the British, from their bases at the Gambia and Sierra Leone, were devoting considerable attention to these Rivières du Sud (*i.e.* south of Senegal) and also to Futa Jallon. René Caillié, who started his journey to Timbuktu from Boké in 1827, did much to quicken French interest in the district, and from 1838 onward French naval officers, Bouët-Willaumez and his successors, made detailed studies of the coast. About the time that the British government became wearied of its efforts to open up the interior of West Africa, General Faidherbe was appointed governor of Senegal (1854), and under his direction vigorous efforts were made to consolidate French influence. Already in 1848 treaty relations had been entered into with the Nalu, and between that date and 1865 treaties of protectorate were signed with several of the coast tribes. During 1876–1880 new treaties were concluded with the chief tribes, and in 1881 the almany (or emir) of Futa Jallon placed his country under French protection, the French thus effectually preventing the junction, behind the coast lands, of the British colonies of the Gambia and Sierra Leone. The right of France to the littoral as far south as the basin of the Melakori was recognized by Great Britain in 1882; Germany (which had made some attempt to acquire a protectorate at Konakry) abandoned its claims in 1885, while in 1886 the northern frontier was settled in agreement with Portugal, which had ancient settlements in the same region (see PORTUGUESE GUINEA). In 1899 the limits of the colony were extended, on the dismemberment of the French Sudan, to include the upper Niger districts. In 1904 the Los Islands were ceded by Great Britain to France, in part return for the abandonment of French fishing rights in Newfoundland waters. (See also SENEGAL: *History*.)

French Guinea was made a colony independent of Senegal in 1891, but in 1895 came under the supreme authority of the newly constituted governor-generalship of French West Africa. Guinea has a considerable measure of autonomy and a separate budget. It is administered by a lieutenant-governor, assisted by a nominated council. Revenue is raised principally from customs and a capitation tax, which has replaced a hut tax. The local budget for 1907 balanced at £205,000. Over the greater part of the country the native princes retain their sovereignty under the superintendence of French officials. The development of agriculture and education are objects of special solicitude to the French authorities. In general the natives are friendly towards their white masters.

See M. Famechon, *Notice sur la Guinée française* (Paris, 1900); J. Chautard, *Étude géophysique et géologique sur le Fouta-Djallon* (Paris, 1905); André Arcin, *La Guinée française* (Paris, 1906), a valuable monograph; J. Machat, *Les Rivières du Sud et la Fouta-Diallon* (Paris, 1906), another valuable work, containing exhaustive bibliographies. Consult also F. Rouget, *La Guinée* (Paris, 1908), an official publication, the annual *Reports* on French West Africa, published by the British Foreign Office, and the Carte de la Guinée française by A. Méunier in 4 sheets on the scale 1 : 500,000 (Paris, 1902).

FRENCH LANGUAGE. I. *Geography.*—French is the general name of the north-north-western group of Romanic dialects, the modern Latin of northern Gaul (carried by emigration to some places—as lower Canada—out of France). In a restricted sense it is that variety of the Parisian dialect which is spoken by the educated, and is the general literary language of France. The region in which the native language is termed French consists of the northern half of France (including Lorraine) and parts of Belgium and Switzerland; its boundaries on the west are the Atlantic Ocean and the Celtic dialects of Brittany; on the north-west and north, the English Channel; on the north-east and east the Teutonic dialects of Belgium, Germany and Switzerland. In the south-east and south the boundary is to a great extent conventional and ill-defined, there being originally no linguistic break between the southern French dialects and the northern Provençal dialects of southern France, north-western Italy and south-western Switzerland. It is formed partly by spaces of intermediate dialects (some of whose features are French, others Provençal), partly by spaces of mixed dialects resulting from the invasion of the space by more northern and more southern settlers, partly by lines where the intermediate dialects have been suppressed by more northern (French) and more southern (Provençal) dialects without these having mixed. Starting in the west at the mouth of the Gironde, the boundary runs nearly north soon after passing Bordeaux; a little north of Angoulême it turns to the east, and runs in this direction into Switzerland to the north of Geneva.

II. *External History.*—(*a*) *Political.*—By the Roman conquests the language of Rome was spread over the greater part of southern and western Europe, and gradually supplanted the native tongues. The language introduced was at first nearly uniform over the whole empire, Latin provincialisms and many more or less general features of the older vulgar language being suppressed by the preponderating influence of the educated speech of the capital. As legions became stationary, as colonies were formed, and as the natives adopted the language of their conquerors, this language split up into local dialects, the distinguishing features of which are due, as far as can be ascertained (except, to some extent, as to the vocabulary), not to speakers of different nationalities misspeaking Latin, each with the peculiarities of his native language, but to the fact that linguistic changes, which are ever occurring, are not perfectly uniform over a large area, however homogeneous the speakers. As Gaul was not conquered by Caesar till the middle of the first century before our era, its Latin cannot have begun to differ from that of Rome till after that date; but the artificial retention of classical Latin as the literary and official language after the popular spoken language had diverged from it, often renders the chronology of the earlier periods of the Romanic languages obscure. It is, however, certain that the popular Latin of Gaul had become differentiated from that of central Italy before the Teutonic conquest of Gaul, which was not completed till the latter half of the 5th century; the invaders gradually adopted the language of their more civilized subjects, which remained unaffected, except in its vocabulary. Probably by this time it had diverged

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so widely from the artificially preserved literary language that it could no longer be regarded merely as mispronounced Latin; the Latin documents of the next following centuries contain many clearly popular words and forms, and the literary and popular languages are distinguished as *latina* and *romana*. The term *gallica*, at first denoting the native Celtic language of Gaul, is found applied to its supplanter before the end of the 9th century, and survives in the Breton *gallek*, the regular term for "French." After the Franks in Gaul had abandoned their native Teutonic language, the term *francisca*, by which this was denoted, came to be applied to the Romanic one they adopted, and, under the form *française*, remains its native name to this day; but this name was confined to the Romanic of northern Gaul, which makes it probable that this, at the time of the adoption of the name *francisca*, had become distinct from the Romanic of southern Gaul. *Francisca* is the Teutonic adjective *frankisk*, which occurs in Old English in the form *frencisc*; this word, with its umlauted *e* from *a* with following *i*, survives under the form *French*, which, though purely Teutonic in origin and form, has long been exclusively applied to the Romanic language and inhabitants of Gaul. The German name *franzose*, with its accent on, and *o* in, the second syllable, comes from *françois*, a native French form older than *français*, but later than the Early Old French *franceis*. The Scandinavian settlers on the north-west coast of France early in the 10th century quickly lost their native speech, which left no trace except in some contributions to the vocabulary of the language they adopted. The main feature since is the growth of the political supremacy of Paris, carrying with it that of its dialect; in 1539 Francis I. ordered that all public documents should be in French (of Paris), which then became the official language of the whole kingdom, though it is still foreign to nearly half its population.

The conquest of England in 1066 by William, duke of Normandy, introduced into England, as the language of the rulers and (for a time) most of the writers, the dialects spoken in Normandy (see also ANGLO-NORMAN LITERATURE). Confined in their native country to definite areas, these dialects, following their speakers, became mixed in England, so that their forms were used to some extent indifferently; and the constant communication with Normandy maintained during several reigns introduced also later forms of continental Norman. As the conquerors learned the language of the conquered, and as the more cultured of the latter learned that of the former, the Norman of England (including that of the English-speaking Lowlands of Scotland) became anglicized; instead of following the changes of the Norman of France, it followed those of English. The accession in 1154 of Henry II. of Anjou disturbed the Norman character of Anglo-French, and the loss of Normandy under John in 1204 gave full play to the literary importance of the French of Paris, many of whose forms afterwards penetrated to England. At the same time English, with a large French addition to its vocabulary, was steadily recovering its supremacy, and is officially employed (for the first time since the Conquest) in the Proclamation of Henry III., 1258. The semi-artificial result of this mixture of French of different dialects and of different periods, more or less anglicized according to the date or education of the speaker or writer, is generally termed "the Anglo-Norman dialect"; but the term is misleading for a great part of its existence, because while the French of Normandy was not a single dialect, the later French of England came from other French provinces besides Normandy, and being to a considerable extent in artificial conditions, was checked in the natural development implied by the term "dialect." The disuse of Anglo-French as a natural language is evidenced by English being substituted for it in legal proceedings in 1362, and in schools in 1387; but law reports were written in it up to about 1600, and, converted into modern literary French, it remains in official use for giving the royal assent to bills of parliament.

(*b*) *Literary.*—Doubtless because the popular Latin of northern Gaul changed more rapidly than that of any other part of the empire, French was, of all the Romanic dialects, the first to be recognized as a distinct language, and the first to be used in literature; and though the oldest specimen now extant is probably not the first, it is considerably earlier than any existing documents of the allied languages. In 813 the council of Tours ordered certain homilies to be translated into Rustic Roman or into German; and in 842 Louis the German, Charles the Bald, and their armies confirmed their engagements by taking oaths in both languages at Strassburg. These have been preserved to us by the historian Nithard (who died in 853); and though, in consequence of the only existing manuscript (at Paris) being more than a century later than the time of the author, certain alterations have occurred in the text of the French oaths, they present more archaic forms (probably of North-Eastern French) than any other document. The next memorials are a short poem, probably North-Eastern, on St Eulalia, preserved in a manuscript of the 10th century at Valenciennes, and some autograph fragments (also at Valenciennes) of a homily on the prophet Jonah, in mixed Latin and Eastern French, of the same period. To the same century belong a poem on Christ's Passion, apparently in a mixed (not intermediate) language of French and Provençal, and one, probably in South-Eastern French, on St Leger; both are preserved, in different handwritings, in a MS. at Clermont-Ferrand, whose scribes have introduced many Provençal forms. After the middle of the 11th century literary remains are comparatively numerous; the chief early representative of the main dialects are the following, some of them preserved in several MSS., the earliest of which, however (the only ones here mentioned), are in several cases a generation or two later than the works themselves. In Western French are a verse life of St Alexius (Alexis), probably Norman, in an Anglo-Norman MS. at Hildesheim; the epic poem of Roland, possibly also Norman, in an A.-N. MS. at Oxford; a Norman verbal translation of the Psalms, in an A.-N. MS. also at Oxford; another later one, from a different Latin version, in an A.-N. MS. at Cambridge; a Norman translation of the Four Books of Kings, in a probably A.-N. MS. at Paris. The earliest work in the Parisian dialect is probably the Travels of Charlemagne, preserved in a late Anglo-Norman MS., with much altered forms. In Eastern French, of rather later date, there are translations of the Dialogues of Pope Gregory, in a MS. at Paris, containing also fragments of Gregory's Moralities, and (still later) of some Sermons of St Bernard, in a MS. also in Paris. From the end of the 12th century literary and official documents, often including local charters, abound in almost every dialect, until the growing influence of Paris caused its language to supersede in writing the other local ones. This influence, occasionally apparent about the end of the 12th century, was overpowering in the 13th, when authors, though often displaying provincialisms, almost all wrote in the dialect of the capital; the last dialect to lose its literary independence was the North-Eastern, which, being the Romanic language of Flanders, had a political life of its own, and (modified by Parisian) was used in literature after 1400.

III. *Internal History.*—Though much has been done in recent years, in the scientific investigation of the sounds, inflexions, and syntax of the older stages and dialects of French, much still remains to be done, and it must suffice here to give a sketch, mainly of the dialects which were imported into England by the Normans—in which English readers will probably take most interest, and especially of the features which explain the forms of English words of French origin. Dates and places are only approximations, and many statements are liable to be modified by further researches. The primitive Latin forms given are often not classical Latin words, but derivatives from these; and reference is generally made to the Middle English (Chaucerian) pronunciation of English words, not the modern.

(*a*) *Vocabulary.*—The fundamental part of the vocabulary of French is the Latin imported into Gaul, the French words being simply the Latin words themselves, with the natural changes undergone by all living speech, or derivatives formed at various dates. Comparatively few words were introduced from the Celtic language of the native inhabitants (*bec*, *lieue* from the Celtic words given by Latin writers as *beccus*, *leuca*), but the number

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adopted from the language of the Teutonic conquerors of Gaul is large (*guerre* = *werra*; *laid* = *laidi*; *choisir* = *hausjan*). The words were imported at different periods of the Teutonic supremacy, and consequently show chronological differences in their sounds (*hair* = *hatan*; *français* = *frankisk*; *écrevisse* = *krebis*; *échine* = *skina*). Small separate importations of Teutonic words resulted from the Scandinavian settlement in France, and the commercial intercourse with the Low German nations on the North Sea (*frijer* = Norse *hrîpa*; *chaloupe* = Dutch *sloop*; *est* = Old English *east*). In the meantime, as Latin (with considerable alterations in pronunciation, vocabulary, &c.) continued in literary, official and ecclesiastical use, the popular language borrowed from time to time various more or less altered classical Latin words; and when the popular language came to be used in literature, especially in that of the church, these importations largely increased (*virginité* Eulalia = *virginitâtem*; *imagena* Alexis = *imâginem*—the popular forms would probably have been *vergedet*, *emain*). At the Renaissance they became very abundant, and have continued since, stifling to some extent the developmental power of the language. Imported words, whether Teutonic, classical Latin or other, often receive some modification at their importation, and always take part in all subsequent natural phonetic changes in the language (Early Old French *adversare*, Modern French *adversaire*). Those French words which appear to contradict the phonetic laws were mostly introduced into the language after the taking place (in words already existing in the language) of the changes formulated by the laws in question; compare the late imported *laïque* with the inherited *lai*, both from Latin *laicum*. In this and many other cases the language possesses two forms of the same Latin word, one descended from it, the other borrowed (*meuble* and *mobile* from *môbilem*). Some Oriental and other foreign words were brought in by the crusaders (*amiral* from *amir*); in the 16th century, wars, royal marriages and literature caused a large number of Italian words (*soldat* = *soldato*; *brave* = *bravo*; *caresser* = *carezzare*) to be introduced, and many Spanish ones (*alcôve* = *alcoba*; *hâbler* = *hablar*). A few words have been furnished by Provençal (*abeille*, *cadenas*), and several have been adopted from other dialects into the French of Paris (*esquiver* Norman or Picard for the Paris-French *eschiver*). German has contributed a few (*blocus* = *blochûs*; *choucroute* = *sûrkrût*); and recently a considerable number have been imported from England (*dress*, *confortable*, *flirter*). In Old French, new words are freely formed by derivation, and to a less extent by composition; in Modern French, borrowing from Latin or other foreign languages is the more usual course. Of the French words now obsolete some have disappeared because the things they express are obsolete; others have been replaced by words of native formation, and many have been superseded by foreign words generally of literary origin; of those which survive, many have undergone considerable alterations in meaning. A large number of Old French words and meanings, now extinct in the language of Paris, were introduced into English after the Norman Conquest; and though some have perished, many have survived—*strife* from Old French *estrif* (Teutonic *strît*); *quaint* from *cointe* (*cognitum*); *remember* from *remembrer* (*rememorâre*); *chaplet* (garland) from *chapelet* (Modern French "chaplet of beads"); *appointment* (rendezvous) from *appointement* (now "salary"). Many also survive in other French dialects.

(*b*) *Dialects.*—The history of the French language from the period of its earliest extant literary memorials is that of the dialects composing it. But as the popular notion of a dialect as the speech of a definite area, possessing certain peculiarities confined to and extending throughout that area, is far from correct, it will be advisable to drop the misleading divisions into "Norman dialect," "Picard dialect" and the like, and take instead each important feature in the chronological order (as far as can be ascertained) of its development, pointing out roughly the area in which it exists, and its present state. The local terms used are intentionally vague, and it does not, for instance, at all follow that because "Eastern" and "Western" are used to denote the localities of more than one dialectal feature, the boundary line between the two divisions is the same in each case. It is, indeed, because dialectal differences as they arise do not follow the same boundary lines (much less the political divisions of provinces), but cross one another to any extent, that to speak of the dialect of a large area as an individual whole, unless that area is cut off by physical or alien linguistic boundaries, creates only confusion. Thus the Central French of Paris, the ancestor of classical Modern French, agrees with a more southern form of Romanic (Limousin, Auvergne, Forez, Lyonnais, Dauphiné) in having *ts*, not *tsh*, for Latin *k* (*c*) before *i* and *e*; *tsh*, not *k*, for *k* (*c*) before *a*; and with the whole South in having *gu*, not *w*, for Teutonic *w*; while it belongs to the East in having *oi* for earlier *ei*; and to the West in having *é*, not *ei*, for Latin *a*; and *i*, not *ei*, from Latin *é*+*i*. It may be well to denote that Southern *French* does not correspond to southern *France*, whose native language is Provençal. "Modern French" means ordinary educated Parisian French.

(*c*) *Phonology.*—The history of the sounds of a language is, to a considerable extent, that of its inflections, which, no less than the body of a word, are composed of sounds. This fact, and the fact that unconscious changes are much more reducible to law than conscious ones, render the phonology of a language by far the surest and widest foundation for its dialectology, the importance of the sound-changes in this respect depending, not on their prominence, but on the earliness of their date. For several centuries after the divergence between spoken and written Latin, the history of these changes has to be determined mainly by reasoning, aided by a little direct evidence in the misspellings of inscriptions the semi-popular forms in glossaries, and the warnings of Latin grammarians against vulgarities. With the rise of Romanic literature the materials for tracing the changes become abundant, though as they do not give us the sounds themselves, but only their written representations, much difficulty, and some uncertainty, often attach to deciphering the evidence. Fortunately, early Romanic orthography, that of Old French included (for which see next section), was phonetic, as Italian orthography still is; the alphabet was imperfect, as many new sounds had to be represented which were not provided for in the Roman alphabet from which it arose, but writers aimed at representing the sounds they uttered, not at using a fixed combination of letters for each word, however they pronounced it.

The characteristics of French as distinguished from the allied languages and from Latin, and the relations of its sounds, inflections and syntax to those of the last-named language, belong to the general subject of the Romanic languages. It will be well, however, to mention here some of the features in which it agrees with the closely related Provençal, and some in which it differs. As to the latter, it has already been pointed out that the two languages glide insensibly into one another, there being a belt of dialects which possess some of the features of each. French and Provençal of the 10th century—the earliest date at which documents exist in both—agree to a great extent in the treatment of Latin final consonants and the vowels preceding them, a matter of great importance for inflections (numerous French examples occur in this section). (1) They reject all vowels, except *a*, of Latin final (unaccented) syllables, unless preceded by certain consonant combinations or followed by *nt* (here, as elsewhere, certain exceptions cannot be noticed); (2) they do not reject *a* similarly situated; (3) they reject final (unaccented) *m*; (4) they retain final *s*. French and Northern Provençal also agree in changing Latin *â* from a labio-guttural to a labio-palatal vowel; the modern sound (German *ä*) of the accented vowel of French *lune*, Provençal *luna*, contrasting with that in Italian and Spanish *luna*, appears to have existed before the earliest extant documents. The final vowel laws generally apply to the unaccented vowel preceding the accented syllable, if it is preceded by another syllable, and followed by a single consonant —*matin* (*mâtûtinum*), *dortoir* (*dormitôrium*), with vowel dropped; *canevas* (*cannabâceum*), *armeure*, later *armëure*, now *armure* (*armâturam*), with *e* = *ə*, as explained below.

On the other hand, French differs from Provençal: (1) in uniformly preserving (in Early Old French) Latin final *i*, which

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is generally rejected in Provençal—French *aimer* (Latin *amat*), Provençal *ama*; *aiment* (*amant*), Prov. *aman*; (2) in always rejecting, absorbing or consonantizing the vowel of the last syllable but one, if unaccented; in such words as *angele* (often spelt *angle*), the *c* after the *g* only serves to show its soft sound—French *veintre* (now *vaincre*, Latin *vincere*), Prov. *vencer*, with accent on first syllable; French *esclandre* (*scandalum*), Prov. *escandol*; French *oile* (dissyllabic, *i* = *y* consonant, now *huile*), Prov. *oli* (*oleum*); (3) in changing accented *a* not in position into *ai* before nasals and gutturals and not after a palatal, and elsewhere into *e* (West French) or *ei* (East French), which develops as *i* before it when preceded by a palatal—French *main* (Latin *manum*), Prov. *man*; *aigre* (*ācrem*), *agre*; *ele* (*ālam*), East French *eile*, Prov. *ala*; *meitié* (*medietātem*), East French *moitieii*, Prov. *meitat*; (4) in changing *a* in unaccented final syllables into the vowel *ə*, intermediate to *a* and *e*; this vowel is written *a* in one or two of the older documents, elsewhere *e*—French *aime* (Latin *amāt*), Prov. *ama*; *aimes* (*amās*), Prov. *amas*; *aiment* (*amant*), Prov. *ama*; (5) in changing original *au* into *ô*—French *or* (*aurum*), Prov. *aur*; *rober* (Teutonic *raubōn*), Prov. *raubar*; (6) in changing general Romanic *é*, from accented *ē* and *ī* not in position, into *ei*—French *veine* (*vēnam*), Prov. *vena*; *peil* (*pilum*), Prov. *pel*.

As some of the dialectal differences were in existence at the date of the earliest extant documents, and as the existing materials, till the latter half of the 11th century, are scanty and of uncertain locality, the chronological order (here adopted) of the earlier sound-changes is only tentative.

(1) Northern French has *tsh* (written *c* or *ch*) for Latin *k* (*c*) and *t* before palatal vowels, where Central and Southern French have *ts* (written *c* or *z*)—North Norman and Picard *chire* (*cēram*), *brach* (*brāchium*), *plache* (*platēam*); Parisian, South Norman, &c., *cire*, *bras*, *place*. Before the close of the Early Old French period (12th century) *ts* loses its initial consonant, and the same happened to *tsh* a century or two later; with this change the old distinction is maintained—Modern Guernsey and Picard *chire*, Modern Picard *plache* (in ordinary Modern French spelling) : usual French *cire*, *place*. English, having borrowed from North and South Norman (and later Parisian), has instances of both *tsh* and *s*, the former in comparatively small number—*chisel* (Modern French *ciseau* = (?) *cacellum*), *escuchen* (*escuchon*, *scuchon*); *city* (*cité*, *civitātem*), *place*. (2) Initial Teutonic *w* is retained in the north-east and along the north coast; elsewhere, as in the other Romance languages, *g* was prefixed—Picard, &c., *warde* (Teutonic *wardə*), *werre* (*werra*); Parisian, &c., *guarde*, *guerre*. In the 12th century the *u* or *ue* of *gu* dropped, giving the Modern French *garde*, *guerre* (with *gu* = *g*); *w* remains in Picard and Walloon, but in North Normandy it becomes *g*—Modern Guernsey *wâson*, Walloon *wazon*, Modern French *gazon* (Teutonic *wasən*). English has both forms, sometimes in words originally the same—*ward*, *ward gage* (Modern French *gage*, Teutonic *wadi*); *warden* and *guardian* (*gardien*, *wardinə*). (3) Latin *b* after accented *a* in the imperfect of the first conjugation, which becomes *v* in Eastern French, in Western French further changes to *w*, and forms the diphthong *au* with the preceding vower —Norman *amowe* (*amābam*), *portout* (*portābat*); Burgundian *ameve*, *portevet*. *-eve* is still retained in some places, but generally the imperfect of the first conjugation is assimilated to that of the others—*amoit*, like *aimoit* (*habēbat*). (4) The palatalization of every then existing *k* and *g* (hard) when followed by *a*, *i* or *e*, after having caused the development of *i* before the *e* (East French *ei*) derived from *a* not in position, is abandoned in the north, the consonants returning to ordinary *k* or *g*, which in the course of sound-change proceeded to *tsh* or *dzh*—North Norman and Picard *cachier* (*captāre*, *kier* (*cārum*), *cose* (*causam*), *eskiver* (Teutonic *skiuhan*), *wiket* (Teutonic *wik*+*itum*), *gal* (*gallum*), *gardin* (from Teutonic *gard*); South Norman and Parisian *chacer*, *cher*, *chose*, *eschiver*, *guichet*, *jal*, *jardin*. Probably in the 14th century the first consonant of the *tsh* disappeared, giving the modern French *chasser*, *jardin* with *ch* = *sh* and *j* = *zh*; but *tsh* is retained in Walloon, and *dzh* in Lorraine. The Northern forms survive—Modern Guernsey *cacher*, *gardin*; Picard *cacher*, *gardin*. English possesses numerous examples of both forms, sometimes in related words—*catch* and *chase*; *wicket*, *eschew*; *garden*, *jaundice* (*jaunisse*, from *galbanum*). (5) For Latin accented *a* not in position Western French usually has *é*, Eastern French *ei*, both of which take an *i* before when when a palatal precedes—Norman and Parisian *per* (*parem*), *oies* (*audiātis*); Lorraine *peir*, *oieis*. In the 17th and 18th centuries close *é* changed to open *è*, except when final or before a silent consonant—*amer* (*amārum*) now having *è*, *aimer* (*amāre*) retaining *é*. English shows the Western close *é*—*peer* (Modern French *pair*, Old French *per*), *chief* (*chef*, *caput*); Middle High German the Eastern *ei*—*lameir* (Modern French *l'amer*, *l'aimer*, la *mer* = Latin *mare*). (6) Latin accented *e* not in position, when it came to be followed in Old French by *i* unites with this to form *i* in the Western dialects, while the Eastern have the diphthongs *ei*—Picard, Norman and Parisian *pire* (*pejor*), *pis* (*pectus*); Burgundian *peire*, *peis*. The distinction is still preserved —Modern French *pire*, *pis*; Modern Burgundian *peire*, *pei*. English words show always *i*—*prior* (*prēlātum*), *spite* (*dēpit*, *dēspectum*). (7) The nasalization of vowels followed by a nasal consonant did not take place simultaneously with all the vowels. *A* and *e* before *n* (guttural *n*, as in *sing*), *ñ* (palatal *n*), *n* and *m* were nasal in the 11th century, such words as *tant* (*tantum*) and *gent* (*gentem*) forming in the Latin assonances to themselves, distinct from them assonances with *a* and *e* before non-nasal consonants. In the Roland *umbre* (*ombre*, *umbram*) and *cuilchet* (*couche*, *collocat*), *fier* (*ferum*) and *chiens* (*canēs*), *dit* (*dictum*) and *vint* (*vēnit*), *enitie* (*ciuitam*) and *veir* (*vox*, *vram*), *bran* (Teutonic *brān*) and *fait* (*fait*) associate freely, though *o* (*u*) before nasals shows a tendency to separation. The nasalization of *i* and *u* (= Modern French *u*) did not take place till the 16th century; and in all cases the loss of the following nasal consonant is quite modern, the earlier pronunciation of *tant*, *ombre* being *tânt*, *ômbre*, not as now *tã*, *ôbrh*. The nasalization took place whether the nasal consonant was or was not followed by a vowel, *femme* (*fēminam*), *honneur* (*honōrem*) being pronounced with nasal vowels in the first syllable till after the 16th century, as indicated by the doubling of the nasal consonant in the spelling and by the phonetic change (*femme* and other words) next to be mentioned. English generally has *au* (now often reduced to *o*) for Old French *ā*—*vaunt* (*vanter*, *vānitāre*), *tawny* (*tanné* (?) Celtic). (8) The assimilation of *ē* (nasal *e*) to *ā* (nasal *a*) did not begin till the middle of the 11th century, and is not yet universal, in France, though generally a century later. In the Alexis nasal *a* (as in *tant*) is never confounded with nasal *e* (as in *gent*) in the assonances, though the copyist (a century later) often writes *e* for nasal *e* in unaccented syllables, as in *gent* *enfant*, *infantem*); in the Roland there are several cases of mixture in the assonances, *gent*, for instance, occurring in *ant* stanzas, *tant* in *ent* ones. English has several words with *a* for *e* before nasals—*rank* (Old French *renc*, Teutonic *hrenk*), *sergeant* (*servant*, *servientem*); but the majority show *e*—*enter* (*entrer*, *intrāre*), *flegm* (*flamme*, Old French *fleme*, *phlebotomum*). The distinction is still preserved in the Norman of Guernsey, where *an* and *en*, though both nasal, have different sounds—*lânsier* (*lancer*, *lancēre*), but *mêntir* (Old French *menterie*, from *mentīri*). The loss of *s*, or rather *h*, before voiced consonants began early, *s* being often omitted or wrongly inserted in 12th century MSS.—Earliest Old French *masle* (*masculum*), *sisdre* (*sīcerum*); Modern French *mâle*, *cidre*. In English the *s* is generally retained—*master* (*maître*), *cider*; except in two words, where it appears, as occasionally in Old French, as *d*—*meddle* (*mêler*, *misculāre*), *medlar* (*nêflier*, Old French also *meslier*, *mespilārium*). The loss of *s* before voiceless consonants (except *f*) is about two centuries later in Modern French *contrée*, *tenir*. But in Eastern French final *th*, to which Latin *t* between vowels had probably been reduced through *d* and *dh*, appears in the 12th century and later as *t*, rhyming on ordinary French final *t*—Picard and Burgundian *pechiet* (*peccātum*) *apriet* (*apprētiātum*). In Modern French some final *th* were saved by being changed to *f*—Modern French *soif* (*sitim*), *mauf* (obsolete, *modum*). English has one or two instances of final *th*, none of medial *dh*—*faith* (*fos*, *fidem*); Middle English *carited* (*charité*, *caritātem*), *trud* (Old French *trut*, *gerfaud*); generally the consonant is lost—*country*, *charity*. Middle High German shows the Eastern French final consonant—*moraliteit* (*moralité*, *mōrālitātem*). (11) *T* from Latin final *t*, if in an Old French unaccented syllable, begins to disappear in the Roland, where sometimes *aimet* (*amat*), sometimes *aime*, in the 12th century by the latter form dropping in all dialects. The Modern French *t* of *aime-t-il* and similar forms is an analogical insertion from such forms as *dort-il* (*dormit*), where the *t* has always existed. (12) The change of the diphthong *ai* to *ei* and afterwards to *è* (the doubling indicates length) had taken place in the earliest French documents, words with *ai* assonating only on words with *a*; in the Roland such assonances occur, but those of *ai* on *è* are more frequent—*faire* (*facere*) assonating on *afaitier* (*adtractāre*) and on *aestre* (*esse*); and the 13th, half a century later than the poem) occasionally has *ei* and *e* for *ai*—*recleimet* (*reclāmat*), *desfere* (*disfacere*), the latter agreeing with the Modern French sound. Before nasals (as in *laine* = *lānam*) and *ié* (as in *payé* = *pācātum*), *ai* remained a diphthong up to the 16th century, being apparently *ei*, whose fate in this situation it has followed. English shows *ai* regularly before nasals and when final, and in a few other words—*vain* (*vain*, *vānum*), *pay* (*payer*, *pācāre*), *wait* (*guetter*, Teutonic *wahtēn*); but these most consonants it has usually *e*—*peace* (*pais*, *pācum*), *feat* (*fait*, *factum*). (13) The loss of transposition

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of *i* (= *y*-consonant) following the consonant ending an accented syllable begins in the 12th century—Early Old French *glorie* (*glôriam*), *estudie* (*studium*), *olie* (*oleum*); Modern French *gloire*, *étude*, *huile*. English sometimes shows the earlier form—*glory*, *study*; sometimes the later—*dower* (*douaire*, Early Old French *doaire*, *dôdtrium*), *oil* (*huile*). (14) The vocalization of *l* preceded by a vowel and followed by a consonant becomes frequent at the end of the 12th century; when preceded by open *è*, an *a* developed before the *l* while this was a consonant—11th century *salse* (*salsa*), *beltet* (*belitatem*, Leodegar *bellidâre*); 12th century *sausse*, *beauté*. In the Parisian, final *èl* followed the fate of *èl* before a consonant, becoming the triphthong *èau*, but in Norman the vocalization did not take place, and the *l* was afterwards rejected—Modern French *ruisseau*, Modern Norman *ruesse* (*rivellum*). English words of French origin sometimes show *l* before a consonant, but the general form is *u*—*scald* (*échauder*, *excaldâre*), *Walter* (*Gautier*, Teutonic *Waldhari*); *sauce*, *beauty*, *soder*. Final *èl* is kept—*veal* (*veau*, *vitellum*, *seal* (*sceau*, *sigillum*). (15) In the east and centre *è* changes to *ei*, while the older sound is retained in the north-west and west—Norman *estreit* (*étroit*, *strictum*), *preie* (*proie*, *praedam*), 12th century Picard, Parisian, &c., *estroit*, *proie*. But the earliest (10th century) specimens of the latter group of dialects have *ei*—*pleier* (*ployer*, *plicâre*) Enlalia, *mettreiet* (*mettrait*, *mittere habebâvit*). In Modern Norman—Guernsey *tièlle* (*étoile*, *stêlla*) with *è*, *ser* (*soir*, *sêrum*) with *è*. English shows generally *ei* (or *ai*) for original *ei*—*strait* (*estreit*), *prey* (*preie*); but in several words the later Parisian *oi*—*coy* (*coi*, *quiêtum*), *loyal* (*loyal*, *légâlem*). (16) The splitting of the vowel-sound (*ei*, *oi*) in Early French Latin *ê* or *u* not in position, represented in Old French by *o* and *u* indifferently, into *u*, *o* (before nasals), and *eu* (the latter at first a diphthong, now = German *ö*), is unknown to Western French till the 12th century, and is not general in the east. The sound in 11th century Norman was more frequently *u* (= Modern French *ou*) than to *ô* (Modern French *ô*), as the words borrowed by English show *uu* (at first written *u*, afterwards *ou* or *ow*), never *ôô*; but was probably not quite *u*, as Modern Norman shows the same splitting of the sound as Parisian. Examples in Early Old French *espuse* (*spônsam*), *nom* or *num* (*nômen*), *flor* or *flur* (*flôrem*); Modern French *épouse*, *nom*, *fleur*; Modern Guernsey *goule* (*gueule*, *gulam*), *nom*, *fleur*. Modern Picard also shows *u*, which is the regular sound before *r*—*fleur*; but Modern Picard often keeps the *ou* than to *ô* (Modern French *ô*)—as the words borrowed by English show *uu* (at first written *u*, afterwards *ou* or *ow*), never *ôô*; but was probably not quite *u*, as Modern Norman shows the same splitting of the sound as Parisian. Examples in Early Old French *espuse* (*spônsam*), *nom* or *num* (*nômen*), *flor* or *flur* (*flôrem*); Modern French *épouse*, *nom*, *fleur*; Modern Guernsey *goule* (*gueule*, *gulam*), *nom*, *fleur*. Modern Picard also shows *u*, which is the regular sound before *r*—*fleur*; but Modern Picard often keeps the *ou* than to *ô* (Modern French *ô*)—*ou* (*vous*, *vôs*). English shows almost always *uu*—*spouse*, *noun*, *flower* (Early Middle English *spuse*, *nun*, *flur*); but *nephew* with *eu* (*neveu*, *nepôtem*). (17) The loss of the *u* (or *w*) of *qu* dates from the end of the 12th century. Old French *quiter* (*quitter*), *quiter* (*quitter*) with *qu* = *kw*, Modern French *quart*, *quitter* with *qu* = *k*. In Walloon the *w* is preserved—*coudr* (*quart*), *cuitter*; as is the case in English—*quart*, *quit*. The *w* of *gw* seems to have been lost rather earlier. English having *wa*—*wage* (*gage*, older *gwage*, Teutonic *wadi*), *guise* (*guise*, Teutonic *wîsa*). (18) The change of the diphthong *ou* to *uu* did not take place till after the 12th century, such words as *Anjou* (*Andegâvum*) assonating in the Roland on *fort* (*fortem*); and did not occur in Picardy, where *o* became *au*—*caus* from older *cous*, *cols* (*cous*, *collôs*) coincidding with *caus* from *cals* (*chauds*, *calidôs*). English keeps *ou* distinct from *uu*—*vault* for *vaut* (Modern French *voûte*, *volvitum*), *soder* (*souder*, *solidâre*). (19) The change of the diphthong *oi* to simple *è* is specially Anglo-Normal, in Old French of the Continent it appears in rather rhyme, in Isle of England they constantly do, and English words show, with rare exceptions, the simple vowel—*fierce* (Old French *fiers*, *ferus*), *chief* (*chief*, *caput*), with *ie* = *e*; but *pannier* (*panser*, *pandârium*). At the beginning of the modern period, Parisian dropped the *i* of *ie* when preceded by *ch* or *j*—*chef*, *abrèger* (Old French *abregier*, *abbreviâre*); elsewhere (except in verbs) *ie* is retained—*fier* (*ferum*), *pitié* (*pietâtem*). Modern Guernsey retains *ie* after *ch*—*qu'ichier* (*approcher*, *ad propedâre*). (20) Some of the Modern French changes have found their places under older ones; those remaining to be noticed are so recent that English examples of the older forms are superfluous. In the 16th century the diphthong *au* changed to *ao* and then to *ô*, its present sound, rendering, for instance, *août* (Old French *mais*, *maûs*) identical with *mots* (*muttôs*). The *au* of *eau* underwent the same change, but its *e* was still sounded as *ə* (the *e* of *que*); in the next century this was dropped, making *veaux* (Old French *vêels*, *vitellôs*) identical with *eaux* (*uls*, *uallês*). (21) A more general and very important change took place in the 16th century, that is the loss of many final consonants. In Early Old French every consonant was pronounced as written; by degrees many of them disappeared when followed by another consonant, whether in the same word (in which case they were generally omitted in writing) or in a following one. This was the state of things in the 16th century; those final consonants which are usually silent in Modern French were still sounded, if before a vowel or at the end of a sentence or a line of poetry, but generally not elsewhere. Thus a large number of French words had two forms; the Old French *fort* appeared as *fòr* (though still written *fort*) before a consonant, *fórt* elsewhere. At a later period final consonants were lost (with certain exceptions) when the word stood at the end of a sentence or of a line of poetry; but they are generally kept when followed by a word beginning with a vowel. (22) A still later change is the general loss of the vowel (written *e*) of unaccented final syllables; this vowel preserved in the 16th century the sound *ə*, which it had in Early Old French. In later Anglo-Norman final *ə* (like every other sound) was treated exactly as the same sound in Middle English, and it came to be omitted or retained at pleasure, and in the 15th century disappeared. In Old French the loss of final *ə* is confined to a few words and forms; the 10th century *saveiet* (*sapêbat* for *sapêbat*) became in the 11th *saveit*, and *ore* (*ad hôram*), *ele* (*illam*) develop the unaccented *or*, *el*. In the 15th century *ə* before a vowel generally disappears—*mûr*, Old French *meür* (*mâtûrum*); and in the 16th, though still written, *ə* after an unaccented vowel, and in the syllable *ent* after a vowel, loses the same—*traiment*, Old French *traiement* (*trâctâ mentis*); *avoient* two syllables, as now (*avaient*), in Old French three syllables (as *habêbant*). These phenomena occur much earlier in the anglicized French of England—13th century *aneynt* (Old French *avenent*). But the universal loss of final *e*, which has clipped a syllable from half the French vocabulary, did not take place till the 18th century, after the general loss of final consonants; *fort* and *forte*, distinguished at the end of a sentence or line in the 16th century as *fórt* and *fórtə*, remain distinguished, but as *fór* and *fórt*. The metre of poetry is still constructed on the obsolete pronunciation, which is even revived in singing; "dîtes, la jeune belle," actually four syllables (*dit, la zhan bèl*), is considered as seven, fitted with music accordingly, and sung to fit the music (*dita, la zhanu bèla*). (23) In Old French, as in the other Romanic languages, the stress-accent was on the syllable which was accented in Latin; compare the treatment of the accented and unaccented vowels in *latrô*, *amâs*, giving *lère*, *dime*, and in *latrônem*, *amâtis*, giving *larón*, *amés*, the accented vowels being those which rhyme or assonate. At present, stress in French is much less marked than in English, German or Italian, and is to a certain extent variable; which is partly the reason why most native French scholars find no difficulty in maintaining that the stress in living Modern French is on the same syllable as in Old French. The fact that stress in the French of to-day is independent of length (quantity) and pitch (tone) largely aids the confusion; for though the final and originally accented syllable (not counting the silent *e* as a syllable) is now generally pronounced with less force, it very often has a long vowel with raised pitch. In actual pronunciation the chief stress is usually on the first syllable (counting according to the sounds, not the spelling), but in many polysyllables it is on the last but one; thus in *caution* the accented (strong) syllable can, in accurate it is *ca*. Poetry is still written according to the original place of the stress; the rhyme-syllables of *larron*, *aimez* are still *ron* and *mez*, which when set to music receive an accented (strong) note, and are sung accordingly, though in speech the *la* and *ai* generally have the principal stress. In reading poetry, as distinguished from singing, the modern pronunciation is used, both as to the loss of the final *ə* and the displacement of the stress, the result being that the theoretical metre in which the poetry is written disappears. (24) In certain cases accented vowels were lengthened in Old French, as before a lost *s*; this was indicated in the 16th century by a circumflex—*bête*, Old French *beste* (*bestiam*), *âme*, Old French *anme* (*anima*). The same occurred in the plural of many nouns, where a consonant was found before the *s* of the flection; thus singular *coc* with short vowel, plural *cos* with long. The plural *cos*, though spelt *cogs* instead of *cô* (= *kôô*), is still sometimes to be heard, but, like other similar ones, is generally refashioned after the singular, becoming *kôk*. In accepted French, except where a difference of quality has resulted, as in *côte* (Old French *coste*, *costam*) with *ô* and *cotte* (Old French *cote*), with *ò*, short and long vowels generally run together, quantity being now variable and uncertain; but at the beginning of this century the Early Modern distinctions appear to have been generally preserved.

(*d*) *Orthography*.—The history of French spelling is based on that of French sounds; as already stated, the former (apart from a few Latinisms in the earliest documents) for several centuries faithfully followed the latter. When the popular Latin of Gaul was first written, its sounds were represented by the letters of the Roman alphabet; but these were employed, not in the values they had in the time of Caesar, but in those they had acquired in consequence of the phonetic changes that had meantime taken place. Thus, as the Latin sound *u* had become *ô* (close *o*) and *ù* had become *y* (French *u*, German *ü*), the letter *u* was used sometimes to denote the sound *ô*, sometimes the sound *y*; as Latin *k* (written *c*) had become *tsh* or *ts*, according to dialect, before *e* and *i*, *c* was used to represent those sounds as well as that of *k*. The chief features of early French orthography (apart from the specialities of individual MSS., especially the earliest) are therefore these:—*c* stood for *k* and *tsh* or *ts*; *d* for *d*

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and *dh* (soft *th*); *c* for *é*, *è*, and *ə*; *g* for *g* and *dzh*; *h* was often written in words of Latin origin where not sounded; *i* (*j*) stood for *i*, *y* consonant, and *dzh*; *o* for *ô* (Anglo-Norman *u*) and *ò*; *s* for *s* and *z*; *t* for *t* and *th*; *u* (*v*) for *ô* (Anglo-Norman *u*), *y* and *v*; *y* (rare) for *i*; *z* for *ds* and *ts*. Some new sounds had also to be provided for: where *tsh* had to be distinguished from nonfinal *ts*, *ch*—at first, as in Italian, denoting *k* before *i* and *e* (*chi*=*ki* from *qui*)—was used for it; palatal *l* was represented by *ill*, which when final usually lost one *l*, and after *i* dropped its *i*; palatal *n* by *gn*, *ng* or *ngn*, to which *i* was often prefixed; and the new letter *w*, originally *uu* (*vv*), and sometimes representing merely *uv* or *vu*, was employed for the consonant-sound still denoted by it in English. All combinations of vowel-letters represented diphthongs; thus *ai* denoted *a* followed by *i*, *ou* either *ôu* or *òu*, *ui* either *ôi* (Anglo-Norman *ui*) or *yi*, and similarly with the others—*ei*, *eu*, *oi*, *iu*, *ie*, *ue* (and *oe*). and the triphthong *ieu*. Silent letters, except initial *h* in Latin words, are very rare; though MSS. copied from older ones often retain letters whose sounds, though existing in the language of the author, had disappeared from that of the more modern scribe. The subsequent changes in orthography are due mainly to changes of sound, and find their explanation in the preceding vowel; *e* before nasals, from the change of *ẽ* (nasal *e*) to *ã* (nasal *a*), represents *ã*; *c*, from the change of *ts* to *s*, represents *s*; *qu* and *gu*, from the loss of the *w* of *kw* and *gw*, represent *k* and *g* (hard); *ai*, from the change of *ai* to *è*, represents *è*; *ou*, from the change of *ôu* and *ôu* to *u*, represents *u*; *ch* and *g*, from the change of *tsh* and *dsh* to *sh* and *zh*, represent *sh* and *zh*; *eu* and *ue*, originally representing diphthongs, represent *œ* (German *ö*); *s*, from the change of *ts* and *ds* to *s* and *z*, represents *s* and *z*. The new values of some of these letters were applied to words not originally spelt with them: Old French *k* before *i* and *e* was replaced by *qu* (*evesque*, *eveske*, Latin *episcopum*); Old French *u* and *o* for *ô*, after this sound had split into *eu* and *u*, were replaced in the latter case by *ou* (*rous*, for *ros* or *rus*, Latin *russum*); *s* was accidentally inserted to mark a long vowel (*paste*, *pale*, Latin *pallidum*); *eu* replaced *ue* and *oe* (*neuf*, *nuef*, Latin *novum* and *novem*); *s* replaced *s* after *é* (*nes*, *nes*, *nesum*). The use of *x* for final *s* is due to an orthographical mistake; the MS. contraction of *us* having something like *x* was at last confused with it (*iex* for *iexus*, *oculûs*), and, its meaning being forgotten, *u* was inserted before the *x* (*yeux*) which thus meant no more than *s*, and was used for it after other vowels (*voix* for *vois*, *vôcem*). As literature came to be extensively cultivated, traditional as distinct from phonetic spelling began to be influential; and in the 14th century, the close of the Old French period, this influence, though not overpowering, was strong—stronger than in England at that time. About the same period there arose etymological as distinct from traditional spelling. This practice, the alteration of traditional spelling by the insertion or substitution of letters which occurred (or were supposed to occur) in the Latin (or supposed Latin) originals of the French words, became very prevalent in the three following centuries, when such forms as *debvoir* (*dêbêre*) for *devoir*, *faulx* (*falsum*) for *faus*, *aulheur* (*auctôrem*, supposed to be *authôrem*) for *auteur*, *poids* (supposed to be from *pondus*, really from *pênsum*) for *pois*, were the rule. But besides the etymological, there was a phonetic school of spelling (Ramus, in 1562, for instance, writes *ème*, *èmalez*—with *e*=*é*, *è*=*è*, and *ç*=*s*—for *aimai*, *aimasties*), which, though unsuccessful on the whole, had some effect in correcting the excesses of the other, so that in the 17th century most of these inserted letters began to drop; of those which remain, some (*flegme* for *flemme* or *fleume*, Latin *phlegma*) have corrupted the pronunciation. Some important reforms—as the dropping of silent *s*, and its replacement by a circumflex over the vowel when this was long; the frequent distinction of close and open *e* by acute and grave accents; the restriction of *i* and *u* to the vowel sound, of *j* and *v* to the consonant; and the introduction from Spain of the cedilla to distinguish *c*=*s* from *c*=*k* before *a*, *u* and *o*—are due to the 16th century. The replacement of *oi*, where it had assumed the value *è*, by *ai*, did not begin till the last century, and was not the rule till the present one. Indeed, since the 16th century the changes in French spelling have been small, compared with the changes of the sounds; final consonants and final *e* (unaccented) are still written, though the sounds they represent have disappeared.

Still, a marked effort towards the simplification of French orthography was made in the third edition of the *Dictionary* of the French Academy (1740), practically the work of the Abbé d'Olivet. While in the first (1694) and second (1718) editions of this dictionary words were overburdened with silent letters, supposed to represent better the etymology, in the third edition the spelling of about 5000 words (out of about 18,000) was altered and made more in conformity with the pronunciation. So, for instance, *c* was dropped in *beinfaicteur* and *object*, *ç* in *sçavoir*, *d* in *advocat*, *s* in *accroistre*, *albastre*, *aspre* and *bastard*, *e* in the past part. *creu*, *deu*, *veu*, and in such words as *alleure*, *sowilleure*; *y* was replaced by *i* in *cecy*, *celuy*, *gay*, *joye*, &c. But those changes were not made systematically, and many pedantic spellings were left untouched, while many inconsistencies still remain in the present orthography (*stiffer* and *persifler*, *souffler* and *bouwsfler*, &c.). The consequence of those efforts in contrary directions is that French orthography is now quite as traditional and unphonetic as English, and gives an even falser notion than this of the actual state of the language it is supposed to represent. Many of the features of Old French orthography, early and late, are preserved in English orthography; to it we owe the use of *c* for *s* (Old English *c*=*k* only), of *j* (*i*) for *dzh*, of *v* (*u*) for *v* (in Old English written *f*), and probably of *ch* for *tsh*. The English *w* is purely French, the Old English letter being the runic *þ*. When French was introduced into England, *kw* had not lost its *w*, and from the French *qu*, with that value, replaced the Old English *cþ* (*queen* for *cþen*). In Norman, Old French *ô* had become very like *u*, and in England went entirely into it; *o*, which was one of its French signs, thus came to be often used for *u* in English (*come* for *cume*). *U*, having often in Old French its Modern French value, was so used in England, and replaced the Old English *y* (*busy* for *bysi*, Middle English *brud* for *brŷd*), and *y* was often used for *i* (*day* for *dai*). In the 13th century, when *ou* had come to represent *u* in France, it was borrowed by English, and used for the long sound of that vowel (*sour* for *sûr*); and *gu*, which had come to mean simply *g* (hard), was occasionally used to represent the sound *g* before *i* and *e* (*guess* for *gesse*). Some of the Early Modern etymological spellings were imitated in England; *fleam* and *autour* were replaced by *phlegm* and *authour*, the latter spelling having corrupted the pronunciation.

(*e*) *Inflections.*—In the earliest Old French extant, the influence of analogy, especially in verbal forms, is very marked when these are compared with Latin (thus the present participles of all conjugations take *ant*, the ending of the first, Latin *antem*), and becomes stronger as the language progresses. Such isolated inflectional changes as *zaveil* into *zavoi*, which are cases of regular phonetic changes, are not noticed here.

(i.) *Verbs.*—(1) In the oldest French texts the Latin pluperfect (with the sense of the perfect) occasionally occurs—*arret* (*habuerat*), *roveret* (*rogâverat*); it disappears before the 12th century. (2) The *u* of the ending of the 1st pers. plur. *mus* drops in Old French, except in the perfect, where its presence (as *ô*) is not yet satisfactorily explained—*amoms* (*amâmus*, influenced by *sûmus*), but *amames* (*amâvimus*). In Picard the atonic ending *mes* is extended to all tenses, giving *amomes*, &c. (3) In the present indicative, 2nd person plur., the ending of the first conjugation (Latin *atis*) extends, even in the earliest documents, to all verbs—*avez*, *recevez*, *ois* (*habetis*, *recipîtis*, *audîtis*) like *amez* (*amatis*); such forms as *dites*, *faites* (*dictis*, *factis*) being exceptional archaisms. This levelling of the conjugation does not appear at such an early time in the future (formed from the infinitive and from *habêtis* reduced to *êtis*); in the Roland both forms occur, *porterois* (*portare habêtis*) assonating on *reis* (*roi*, *rêgem*), and the younger *porterez* on *citet* (*cité*, *civitâtem*), but about the end of the 13th century the older form *-eiz*, *-oiz*, is dropped, and *-ez* becomes gradually the uniform ending for this 2nd person of the plural in the future tense. (4) In Eastern French the 1st plur., when preceded by *i*, has *e*, not *o*, before the nasal, while Western French has *u* (or *o*), as in the present; *poscsomes* (*possêdimus*) in the Jonah homily makes it probable that the latter is the older form—Picard *aviemes*, Burgundian *aviens*, Norman

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avisms (habbêbmus). (5) The subjunctive of the first conjugation has at first in the singular no final *e*, in accordance with the final vowel laws—*plur, plurs, plurt (plôrem, plôrès, plôret)*. The forms are gradually assimilated to those of the other conjugations, which, deriving from Latin *am, as, at*, have *e, es, e(t)*; Modern French *pleure, pleures, pleure*, like *perde, perdes, perde* (*perdam, perdas, perdat*). (6) In Old French the present subjunctive and the 1st sing. pres. ind. generally show the influence of the *i* or *e* of the Latin *iam, eam, iô, eô*—Old French *muire* or *moerge* (*moriat* for *moriâtur*), *tienge* or *tienge* (*teneat*), *muir* or *moerge* (*moriam*), *tieng* or *tienc* (*teneô*). By degrees these forms are levelled under the other present forms—Modern French *meure* and *meurs* following *meurt* (*moriî* for *moritur*), *tienne* and *tiens* following *tient* (*tenet*). A few of the older forms remain—the vowel of *aie* (*habeam*) and *sai* (*habeô*) contrasting with that of *a* (*habet*). (7) A levelling of which instances occur in the 11th century, but which is not yet complete, is that of the accented and unaccented stem-syllables of verbs. In Old French many verb-stems with shifting accent vary in accordance with phonetic laws—*parler* (*parabolâre*), *amer* (*amâre*) have in the present indicative *parol* (*paraboî*), *paroles* (*paraboîs*), *parolet* (*paraboît*), *parlums* (*paraboâmus*), *parlez* (*paraboâtis*), *parolent* (*paraboant*); *aim* (*amô*), *aimes* (*amâs*), *aimet* (*amaî*), *amums* (*amâmus*), *amez* (*amâtis*), *aiment* (*amant*). In the first case the unaccented, in the second the accented form has prevailed—Modern French *parle, parler; aime, aimer*. In several verbs, as *tenir* (*tenêre*), the distinction is retained—*tiens, tiens, tient, tenons, tenez, tiennent*. (8) In Old French, as stated above, *s* final after a vowel is often elided, a partial (which, if a consonant, often split into *i* with a dental); the diphthong thus appears in several forms of many verbs of the 1st conjugation—*preser* (= *presi-er, prechre*), *venger* (*vindicâre*), *laisser* (*laxâre*), *aidier* (*adjûtâre*). At the close of the Old French period those verbs in which the stem ends in a dental replace *ie* by the *e* of other verbs—Old French *laissier, aidier, laissies* (*laxâtis*), *aidies* (*adjûtâtis*); Modern French *laisser, aider, laissez, aidez*, by analogy of *aimer, aimez*. The older forms generally remain in Norman—*laissier, aidier*. (9) The addition of *s* to the 1st sing. pres. ind. of all verbs of the first conjugation is rare before the 13th century, but is usual in the 15th; it is probably due to the analogy of the third person—Old French *chant* (*cantô*), *aim* (*amô*); Modern French *chante, aime*. (10) In the 13th century the 2nd pl. pres. ind. is generally similar to those of the indicative, gradually take an *i* before them, which is the rule after the 16th century—Old French *perdons* (*perdâmus*), *perdes* (*perdâtis*); Modern French *perdions, perdiez*, apparently by analogy of the imp. ind. (11) The loss in Late Old French of final *s, t, &c.*, when preceding another consonant, caused many words to have in reality (though often concealed by orthography) double forms of inflection—one without termination, the other with. Thus in the 16th century the verbal forms *dors* (*dormî*) and *dort* (*dormît*) the 3rd *dort* (*dormit*) were distinguished as *dòrs* and *dòrt* when before a vowel, as *dórs* and *dórt* at the end of a sentence or line of poetry, but ran together as *dòr* when followed by a consonant. Still later, the loss of the final consonant when not followed by a vowel caused the reduced the cases in which they were distinguished, so that the actual French conjugation is considerably simpler than is shown by the customary spellings, except when, in consequence of an immediately following vowel, the old terminations occasionally appear. Even here the antiquity is to a considerable extent unofficial and delusive, some of the insertions being due to analogy, and the popular language often omitting the traditional consonant or inserting a different one. (13) The subsequent general loss of *e=a* in unaccented final syllables has still further reduced the inflections, but not the distinctive forms—*perd* (*perdit*) and *perde* (*perdat*) being generally distinguished as *pèr* and *pèrd*, and before a vowel as *pèrt* and *pèrd*.

(ii.) *Substantives.*—(1) In Early Old French (as in Provençal) there are two main declensions, the masculine and the feminine; with a few exceptions the former ditinguishes nominative and accusative in both numbers, the latter in neither. The nom. and acc. sing. and acc. plur. mas. correspond to those of the Latin 2nd or 4th declension, the nom. plur. to that of the 2nd declension. The sing. fem. corresponds to the nom. and acc. of the Latin 1st declension, or to the acc. of the 3rd; the plur. fem. to the acc. of the 1st declension, or to the nom. and acc. of the 3rd. Thus mas. *lors* (*lauros*), *lore* (*laûrô*); *lor* (*taurum*), *laron* (*latrônem*); *lor* (*taurî*), *laron* (*latrôni* for *-nês*); *lors* (*taurôs*), *larons* (*latrônês*); but fem. only *ele* (*âla* and *âlam*), *flor* (*flôrem*); *eles* (*âlas*), *flors* (*flôrs* nom. and acc.). About the end of the 11th century feminines not ending in *e=a* take, by analogy of the masculines, *s* in the nom. sing., thus distinguishing nom. *flors* from acc. *flor*. A century later, masculines without *s* in the nom. sing. take this consonant by analogy of the other masculines, giving *leres* as nom. similar to *lors*. In Anglo-Norman the accusative forms very early begin to replace the nominative, and soon supersede them, the language following the tendency of contemporaneous English. In continental French the declension-system was preserved much longer, and did not break up till the 14th century, though acc. forms are occasionally substituted for nom. (rarely nom. for acc.) before that date. It must be noticed, however, that in this current language the reduction of the declension to one case (generally the accusative) per number appears much earlier than in the language of literature proper and poetry; Froissart, for instance, *c.* 1400, in his poetical works is much more careful of the declension than in his Chronicles. Indeed, in the latter language the system of one case is fully established; the form kept is almost always the accusative (sing. without *s*, plural with *s*), but in a few words, such as *fils* (*filius*), *sœur* (*soror*), *pastre* (*pastor*), and in proper names such as *Georges, Gilles, &c.*, the nom. sing. is used as vocative (therefore with the form of nom.); the nom. survives in the sing. Occasionally both forms exist, in different senses—*sire* (*senior*) and *seigneur* (*seniôrem*), *on* (*homô*) and *homme* (*hominem*). (2) Latin neuters are generally masculine in Old French, and inflected according to their analogy; as *ciels* (*cælus* for *cælum* nom.), *ciel* (*cælum* acc.), *ciel* (*cælî* for *cæla* nom.), *ciels* (*cælôs* for *cæla* acc.); but in some cases the form of the Latin neuter is preserved, as in *cors*, nom *corps*, Lat. *corpus*; *tens*, nom *temps*, Lat. *tempus*. Many neuters lose their singular form and treat the plural as a feminine singular, as in the related languages—*merveille* (*mirâbilia*), *feuille* (*folia*). But in a few words the neuter plural termination is used, as in Italian, in its primitive sense—*carre* (*carra*, which exists as well as *carri*), *paire* (*Lat. paria*). (3) Modern French declension. (3) Here only morphologically spelt with the consonant of the singular, as in *vifs*, pronounced *vis*; but in Late Modern French many of them disappear, *vifs*, with *f* sounded as in the singular, being the plural of *vif*, formerly *bauz* (*balteus*), *bal*. In many words, as *chant* (*cantîs*) and *champ* (*campôs*) with silent *t* and *p* (Old French *chans* in both cases), *maux* (Old French *mals*, sing. *mal*), *yeux* (*oculôs*, Old French *als*, sing. *œil*) the old change in the stem is kept. Sometimes, as in *cieux* (*cælôs*) and *ciels*, the old traditional and the modern analogical forms coexist, with a difference of meaning. (4) The general loss of final *s* (except when kept as *z* before a vowel) has seriously modified the French declension, the singulars *fort* (*fôr*) and *forte* (*fôrt*) being generally undistinguishable from their plurals *forts* and *fortes*. The subsequent loss of *t* finals has very affected the distinction between sing. and plur. forms; but with the frequent recoining of the plural forms on the singular present Modern French has very often no distinction between sing. and plur., except before a vowel. French plurals in *aux* have always been formed from the singular *al*; in those whose singular ends in *s* there never was any distinction, Old French *las* (now spelt *lacz*) corresponding to *laqueus, laqueum, laqueî* and *laqueôs*.

(iii.) *Adjectives.*—(1) The terminations of the cases and numbers of adjectives are the same as those of substantives, and are treated in the preceding paragraph. The feminine generally takes no *e* if the masc. has none, and if there is no distinction in Latin—fem. sing. *fort* (*fortem*), *grant* (*grandem*), fem. plur. *forts* (*fortês*), *grans* (*grandês*), like the acc. masc. Certain adjectives of this class, and among them all the adjectives formed with the Latin suffix *-ensis*, take regularly, even in the oldest French, the feminine ending *e*, in Provençal a (*courtois*, fem. *courtoise*; *commun*, fem. *commune*). (2) These adjectives not be added to the Late Old French *bon, bonz*, fem. *bone*, which probably comes from a Low Latin *dulcius, dulcia*. In the 11th century some other feminines, originally without *e*, begin in Norman to take this termination—*grande* (in a feminine assonance in the Alexis), plur. *grandes*; but other dialects generally preserve the original form till the 14th century. In the 16th century the *e* is general in the feminine, and is now universal, except in a few expressions—*grand'mère* (with erroneous apostrophe, *grandem, mâtrem*), *fines herbes* (*herbæ végétâles*), and most adverbial in adjectives in *-ant, -ent—couramment* (*currante* for *-ente mente*), *sciemment* (*sciente mente*). (2) Several adjectives have in Modern French replaced the masc. by the feminine—Old French masc. *roit* (*rigidum*), fem. *roide* (*rigidam*); Modern French masc. and fem. both *raide*. (3) In Old French several Latin simple comparatives are preserved—*maiur* (*majôrem*), nom. *maire* (*major*); *graignur* (*grandiôrem*), nom. *graindre* (*grandior*); only a few of these now survive—*pire* (*pejor*), *meilleur* (*melliôrem*), which have adverbial neuters (*pejus*), *mieux* (*melius*). The other simple superlatives found in Old French, as *merme* (*minimum*), *pesme* (*pessimus*), *proisme* (*proximum*), *haltisme* (*altissimum*), this last one being clearly a literary word, are now extinct, and, when they existed, had hardly the meaning of a superlative. (4) The modern loss of many feminine endings has not before vowels, and the subsequent loss of final *s*, have greatly affected the distinction between the masc. and fem. of adjectives—*fort* and *forte* are still distinguished as *fôr* and *fôrt*, but *amer* (*amârum*) and *amère* (*amâram*), with their plurals *amers* and *amères*, have run together.

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(*f*) *Derivation.*—Most of the Old French prefixes and suffixes are descendants of Latin ones, but a few are Teutonic (*ard* = *hard*), and some are later borrowings from Latin (*arie*, afterwards *aire*, from *drium*). In Modern French many old affixes are hardly used for forming new words; the inherited *ier* (*drium*) is yielding to the borrowed *aire*, the popular *contre* (*contrā*) to the learned *anti* (Greek), and the native *ée* (*ātam*) to the Italian *ade*. The suffixes of many words have been assimilated to more common ones; thus *sengler* (*singulārem*) is now *sanglier*.

(*g*) *Syntax.*—Old French syntax, gradually changing from the 10th to the 14th century, has a character of its own, distinct from that of Modern French; though when compared with Latin syntax it appears decidedly modern.

(1) The general formal distinction between nominative and accusative is the chief feature which causes French syntax to resemble that of Latin and differ from that of the modern language; and as the distinction had to be replaced by a comparatively fixed word-order, a serious loss of freedom ensued. If the forms are modernized while the word-order is kept, the Old French *l'archevesque ne puet flechir li reis Henris* (Latin *archiepiscopum non potest flectere rex Henricus*) assumes a totally different meaning—*l'archevêque ne peut fléchir le roi Henri*. (2) The replacement of the nominative form of nouns by the accusative is itself a syntactical feature, though treated above under inflection. The nominative instance is inflected by the personal pronouns, which, when not immediately the subject of a verb, occasionally take even in Old French, and regularly in the 16th century, the accusative form; the Old French *je qui sui* (*ego qui sum*) becomes *moi qui suis*, though the adverbial use survives in the legal phrase *je, soussigné*. . . . (3) The definite article is now required in many cases where Old French dispenses with it—*je cunquis Engleterre, suffrir mort* (as Modern French *avoir faim*); Modern French *l'Angleterre, la mort*. (4) Old French had either pronouns for "this" and "that "—*cest* (*ecce istum*) and *cel* (*ecce illum*) with their cases. Both exist in the 16th century, but the present language employs *cet* as adjective, *ce* as substantive, in both meanings, marking the old distinction by affixing the adverbs *-ci* and *-là*—*cet homme-ci, cet homme-là*; *celui-ci, celui-là*. (5) In Old French the verbal terminations being clear, the subject pronoun is usually not expressed—*si ferai* (*sic facere habeō*), *est durs* (*dūrus est*), *que ferai* (*quid facere habeō*)? In the 16th century the use of the pronoun is general, and is now universal, except in one or two impersonal phrases, as *n'importe, peu s'en faut*. (6) The present participle in Old French in its uninflected form coincided with the gerund (*amant* = *amantem* and *amandō*), and in the modern language has been replaced by the latter, and has become adjectival only; thus, Old French *complaignanz leur dolours* (Latin *plangentēs*) is now *plaignant leurs douleurs* (Latin *plangendō*). The now extinct use of *estre* with the participle present for the simple verb is not uncommon in Old French down to the 16th century—*nostre ancestres* (*iunt*) *alerrant*) = Modern French *ils disent* (as English *they are saying*). (7) In present Modern French the preterite participle when used with *avoir* to form verb-tenses is invariable, except when the object precedes (an exception now vanishing in the conversational language)—*j'ai écrit les lettres, les lettres que j'ai écrites*. In Old French down to the 16th century, formal concord was more common (though by no means necessary), partly because the object preceded the participle much oftener than now—*ed la reine made* (*habet*) *colurs maldite*, *ad faite sa vengance, les turs ad rendues*. (8) The sentences just quoted will serve as specimens of the freedom of Old French word-order—the object standing either before verb and participle, between them, or after both. The adjective-adjective can stand before or after the verb—*hah sunt li pui* (Latin *podia*), *e tenebrus e grant*. (9) In Old French *ne* (Early Old French *nen*, Latin *nōn*) suffices for the negation without *pas* (*passum*), *point* (*punctum*) or *mie* (*micam*, now obsolete), though these are frequently used—*je ne sui lis ters* (*je ne suis pas le tyran*), *autre feme ne sera* (*il n'aura pas autre femme*). In principal sentences Modern French uses *ne* by itself only in certain cases—*je ne puis marcher, je n'ai rien*. The slight weight as a negation usually attached to *ne* has caused several originally positive words to take a negative meaning—*rien* (Latin *rem*) now meaning "nothing" as well as "something." (10) In Old French interrogation was expressed with substantives as with pronouns by putting them after the verb—*est Saul entre les prophēs*? In Modern French the inversion (nominal inversion (the substantive being prefixed) or a verbal periphrasis must be used—*Saul est-il ? or est-ce que Saul est?*

(*h*) *Summary.*—Looking at the internal history of the French language as a whole, there is no such strongly marked division as exists between Old and Middle English, or even between Middle and Modern English. Some of the most important changes are quite modern, and are concealed by the traditional orthography; but, even making allowance for this, the difference between French of the 11th century and that of the 20th is less than that between English of the same dates. The most important change in itself and for its effects is probably that which is usually made the division between Old and Modern French, the loss of the formal distinction between nominative and accusative; next to this are perhaps the gradual loss of many final consonants, the still recent loss of the vowel of unaccented final syllables, and the extension of analogy in conjugation and declension. In its construction Old French is distinguished by a freedom strongly contrasting with the strictness of the modern language, and bears, as might be expected, a much stronger resemblance than the latter to the other Romanic dialects. In many features, indeed, both positive and negative, Modern French forms a class by itself, distinct in character from the other modern representatives of Latin.

IV. BIBLIOGRAPHY.—The few works which treat of French philology as a whole are now in many respects antiquated, and the important discoveries of recent years, which have revolutionized our ideas of Old French phonology and dialectology, are scattered in various editions, periodicals, and separate treatises. For many things Diez's *Grammatik der romanischen Sprachen* (4th edition—a reprint of the 3rd—Bonn, 1876–1877; French translation, Paris, 1872–1875) is still very valuable; Burguy's *Grammaire de la Langue d'Oïl* (2nd edition—a reprint of the 1st—Berlin, 1869–1870) is useful only as a collection of examples. Schwan's *Grammatik des Altfranzösischen*, as revised by Behrens in the 3rd edition (Leipzig, 1898; French translation, Leipzig and Paris, 1900), is by far the best old French grammar we possess. For the history of French language in general see F. Brunot, *Histoire de la langue française des origines à 1900* (Paris, 1905, 1906, &c.). For the history of spelling, A. F. Didot, *Observations sur l'orthographe ou orthographie française: sommes d'une histoire de la réforme orthographique depuis le Xe siècle jusqu'à nos jours* (2nd ed., Paris, 1868). For the history of French sounds: Ch. Thurot, *De la prononciation française depuis le commencement du XVIe siècle, d'après les témoignages des grammairiens* (2 vols., Paris, 1881–1883). For the history of syntax, apart from various grammatical works of a general character, much is to be gathered from Ad. Tobler's *Vermischte Beitrage zur französischen Grammatik* (3 parts, 1886, 1894, 1899; parts 1. and II. in second edition, 1902, 1906). G. Paris's edition of *La Vie de S. Alexis* (Paris, 1872) was the pioneer of, and retains an important place among, the recent original works on Old French. Darmesteter and Hatzfeld's *Le Seizième Siècle* (Paris, 1878) contains the first good account of Early Modern French. Littré's *Dictionnaire de la langue française* (4 vols., Paris, 1863–1869, and a Supplement, 1877); and Hatzfeld, Darmesteter and Thomas, *Dict. général de la langue française*, more convenient (1 vol., Paris, 1888–1900), contain much useful and often original information about the etymology and history of French words. For the etymology of many French (and also Provençal) words, reference must be made to Ant. Thomas's *Essais de philologie française* (Paris, 1897) and *Nouveaux essais de philologie française* (Paris, 1904). But there is no French dictionary properly historical. A *Dictionnaire historique de la langue française* was begun by the Académie française (4 vols., 1859–1894), but it was, from the first, antiquated. It contains only one letter (*A*) and has not been continued. The leading periodicals now in existence are the *Romania* (Paris), founded (in 1872) and edited by P. Meyer and G. Paris (with Ant. Thomas since the death of G. Paris in 1903), and the *Zeitschrift für romanische Philologie* (Halle), founded (in 1877) and edited by G. Gröber. To these reference should be made for information as to the very numerous articles, treatises and editions by the many and often distinguished scholars who, especially in France and Germany, now prosecute the scientific study of the language. It may be well to mention that Old French philology especially being complicated, and as yet incompletely investigated, these publications, the views in which are of various degrees of value, require not mere acquiescent reading, but critical study. The dialects of France in their present state (*patois*) are now being scientifically investigated. The special works on the subject (dictionaries, grammars, &c.) cannot be fully indicated here: we must limit ourselves to the mention of Behren's *Bibliographie des patois gallo-romans* (2nd ed., revised Berlin, 1893), and of Gilléron and Edmont's *Atlas linguistique de la France* (1902 et seq.), a huge publication planned to contain about 1800 maps. (H. N.; P.M.)

FRENCH LITERATURE. *Origins.*—The history of French literature in the proper sense of the term can hardly be said to extend further back than the 11th century. The actual manuscripts which we possess are seldom of older date than the century subsequent to this. But there is no doubt that by the end at least of the 11th century the French language, as a completely organized medium of literary expression, was in full, varied and constant use. For many centuries previous to this, literature had been composed in France, or by natives of that country, using the term France in its full modern acceptation; but until the 9th century, if not later, the written language of France, so far as we know, was Latin; and despite the practice of not a few literary historians, it does not seem reasonable to notice Latin writings in a history of French literature. Such a history properly busies itself only with the monuments of French itself from the time when the so-called Lingua Romana Rustica

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assumed a sufficiently independent form to deserve to be called a new language. This time it is indeed impossible exactly to determine, and the period at which literary compositions, as distinguished from mere conversation, began to employ the new tongue is entirely unknown. As early as the 7th century the Lingua Romana, as distinguished from Latin and from Teutonic dialects, is mentioned, and this Lingua Romana would be of necessity used for purposes of clerical admonition, especially in the country districts, though we need not suppose that such addresses had a very literary character. On the other hand, the mention, at early dates, of certain *cantilenae* or songs composed in the vulgar language has served for basis to a superstructure of much ingenious argument with regard to the highly interesting problem of the origin of the *Chansons de Geste*, the earliest and one of the greatest literary developments of northern French. It is sufficient in this article, where speculation would be out of place, to mention that only two such *cantilenae* actually exist, and that neither is French. One of the 9th century, the "Lay of Saucourt," is in a Teutonic dialect; the other, the "Song of St Faron," is of the 7th century, but exists only in Latin prose, the construction and style of which present traces of translation from a poetical and vernacular original. As far as facts go, the most ancient monuments of the written French language consist of a few documents of very various character, ranging in date from the 9th to the 11th century. The oldest gives us the oaths interchanged at Strassburg in 842 between Charles the Bald and Louis the German. The next probably in date and the first in literary merit is a short song celebrating the martyrdom of St Eulalia, which may be as old as the end of the 9th century, and is certainly not younger than the beginning of the 10th. Another, the *Life of St Leger*, in 240 octosyllabic lines, is dated by conjecture about 975. The discussion indeed of these short and fragmentary pieces is of more philological than literary interest, and belongs rather to the head of French language. They are, however, evidence of the progress which, continuing for at least four centuries, built up a literary instrument out of the decomposed and reconstructed Latin of the Roman conquerors, blended with a certain limited amount of contributions from the Celtic and Iberian dialects of the original inhabitants, the Teutonic speech of the Franks, and the Oriental tongue of the Moors who pressed upwards from Spain. But all these foreign elements bear a very small proportion to the element of Latin; and as Latin furnished the greater part of the vocabulary and the grammar, so did it also furnish the principal models and helps to literary composition. The earliest French versification is evidently inherited from that of the Latin hymns of the church, and for a certain time Latin originals were followed in the choice of literary forms. But by the 11th century it is tolerably certain that dramatic attempts were already being made in the vernacular, that lyric poetry was largely cultivated, that laws, charters, and such-like documents were written, and that commentators and translators busied themselves with religious subjects and texts. The most important of the extant documents, outside of the epics presently to be noticed, has of late been held to be the *Life of Saint Alexis*, a poem of 625 decasyllabic lines, arranged in five-line stanzas, each of one assonance or vowel-rhyme, which may be as early as 1050. But the most important development of the 11th century, and the one of which we are most certain, is that of which we have evidence remaining in the famous *Chanson de Roland*, discovered in a manuscript at Oxford and first published in 1837. This poem represents the first and greatest development of French literature, the chansons de geste (this form is now preferred to that with the plural *gestes*). The origin of these poems has been hotly debated, and it is only recently that the importance which they really possess has been accorded to them, —a fact the less remarkable in that, until about 1820, the epics of ancient France were unknown, or known only through late and disfigured prose versions. Whether they originated in the north or the south is a question on which there have been more than one or two revolutions of opinion, and will probably be others still, but which need not be dealt with here. We possess in round numbers a hundred of these chansons. Three only of them are in Provençal. Two of these, *Ferabras* and *Betonnet d'Hanstonne*, are obviously adaptations of French originals. The third, *Girarts de Rossilho* (Gerard de Roussillon), is undoubtedly Provençal, and is a work of great merit and originality, but its dialect is strongly tinged with the characteristics of the Langue d'Oïl, and its author seems to have been a native of the debatable land between the two districts. To suppose under these circumstances that the Provençal originals of the hundred others have perished seems gratuitous. It is sufficient to say that the chanson de geste, as it is now extant, is the almost exclusive property of northern France. Nor is there much authority for a supposition that the early French poets merely versified with amplifications the stories of chroniclers. On the contrary, chroniclers draw largely from the chansons, and the question of priority between *Roland* and the pseudo-Turpin, though a hard one to determine, seems to resolve itself in favour of the former. At most we may suppose, with much probability, that personal and family tradition gave a nucleus for at least the earliest.

Early monuments

Epic poetry.

Chansons de Geste.—Early French narrative poetry was divided by one of its own writers, Jean Bodel, under three heads —poems relating to French history, poems relating to ancient history, and poems of the Arthurian cycle (*Matières de France, de Bretagne, et de Rome*). To the first only is the term chansons de geste in strictness applicable. The definition of it goes partly by form and partly by matter. A chanson de geste must be written in verses either of ten or twelve syllables, the former being the earlier. These verses have a regular caesura, which, like the end of a line, carries with it the licence of a mute *e*. The lines are arranged, not in couplets or in stanzas of equal length, but in *laisses* or *tirades*, consisting of any number of lines from half a dozen to some hundreds. These are, in the earlier examples assonanced,—that is to say, the vowel sound of the last syllables is identical, but the consonants need not agree. Thus, for instance, the final words of a tirade of *Amis et Amiles* (ll. 199-206) are *erbe, nouvelle, selles, nouvelles, traversent, arrestent, guerre, corlège*. Sometimes the tirade is comprised by a shorter line, and the later chansons are regularly rhymed. As to the subject, a chanson de geste must be concerned with some event which is, or is supposed to be, historical and French. The tendency of the trouvères was constantly to affiliate their heroes on a particular *geste* or family. The three chief *gestes* are those of Charlemagne himself, of Doon de Mayence, and of Garin de Monglane; but there are not a few chansons, notably those concerning the Lorrainers, and the remarkable series sometimes called the *Chevalier au Cygne*, and dealing with the crusades, which lie outside these groups. By this joint definition of form and subject the chansons de geste are separated from the romances of antiquity, from the romances of the Round Table, which are written in octosyllabic couplets, and from the *romans d'aventures* or later fictitious tales, some of which, such as *Brun de la Montaigne*, are written in pure chanson form.

Chansons de Geste.

Volume and changes of early epics.

Not the least remarkable point about the chansons de geste is their vast extent. Their number, according to the strictest definition, exceeds 100, and the length of each chanson varies from 1000 lines, or thereabouts, to 20,000 or even 30,000. The entire mass, including, it may be supposed, the various versions and extensions of each chanson, is said to amount to between two and three million lines; and when, under the second empire, the publication of the whole Carolingian cycle was projected, it was estimated, taking the earliest versions alone, at over 300,000. The successive developments of the chansons de geste may be illustrated by the fortunes of *Huon de Bordeaux*, one of the most lively, varied and romantic of the older epics, and one which is interesting from the use made of it by Shakespeare, Wieland and Weber. In the oldest form now extant, though even this is probably not the original, *Huon* consists of over 10,000 lines. A subsequent version contains 4000 more; and lastly, in the 14th century, a later poet has amplified the legend to the extent of 30,000 lines.

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When this point had been reached, *Huon* began to be turned into prose, was with many of his fellows published and republished during the 15th and subsequent centuries, and retains, in the form of a roughly printed chap-book, the favour of the country districts of France to the present day. It is not, however, in the later versions that the special characteristics of the chansons de geste are to be looked for. Of those which we possess, one and one only, the *Chanson de Roland*, belongs in its present form to the 11th century. Their date of production extends, speaking roughly, from the 11th to the 14th century, their palmy days were the 11th and the 12th. After this latter period the Arthurian romances, with more complex attractions, became their rivals, and induced their authors to make great changes in their style and subject. But for a time they reigned supreme, and no better instance of their popularity can be given than the fact that manuscripts of them exist, not merely in every French dialect, but in many cases in a strange macaronic jargon of mingled French and Italian. Two classes of persons were concerned in them. There was the *trouvère* who composed them, and the *jongleur* who carried them about in manuscript or in his memory from castle to castle amd sang them, intermixing frequent appeals to his auditory for silence, declarations of the novelty and the strict copyright character of the chanson, revilings of rival minstrels, and frequently requests for money in plain words. Not a few of the manuscripts which we now possess appear to have been actually used by the jongleur. But the names of the authors, the trouvères who actually composed them, are in very few cases known, those of copyists, continuators, and mere possessors of manuscripts having been often mistaken for them.

The moral and poetical peculiarities of the older and more authentic of these chansons are strongly marked, though perhaps not quite so strongly as some of their encomiasts have contended, and as may appear to a reader of the most famous of them, the *Chanson de Roland*, alone. In that poem, indeed, war and religion are the sole motives employed, and its motto might be two lines from another of the finest chansons (*Aliscans*, 161-162):—

> "Dist à Bertran : 'N'avons mais nul loisir,
> Tant ke vivons alons paiens ferir.'"

In Roland there is no love-making whatever, and the hero's betrothed "la belle Aude" appears only in a casual gibe of her brother Oliver, and in the incident of her sudden death at the news of Roland's fall. M. Léon Gautier and others have drawn the conclusion that this stern and masculine character was a feature of all the older chansons, and that imitation of the Arthurian romance is the cause of its disappearance. This seems rather a hasty inference. In *Amis et Amiles*, admittedly a poem of old date, the parts of Bellicent and Lubias are prominent, and the former is demonstrative enough. In *Aliscans* the part of the Countess Guibourc is both prominent and heroic, and is seconded by that of Queen Blanchefior and her daughter Aelis. We might also mention Oriabel in *Jourdans de Blaivies* and others. But it may be admitted that the sex which fights and counsels plays the principal part, that love adventures are not introduced at any great length, and that the lady usually spares her knight the trouble and possible indignities of a long wooing. The characters of a chanson of the older style are somewhat uniform. There is the hero who is unjustly suspected of guilt or sore beset by Saracens, the heroine who falls in love with him, the traitor who accuses him or delays help, who is almost always of the lineage of Ganelon, and whose ways form a very curious study. There are friendly paladins and subordinate traitors; there is Charlemagne (who bears throughout the marks of the epic king common to Arthur and Agamemnon, but is not in the earlier chanson the incapable and venal dotard which he becomes in the later), and with Charlemagne generally the duke Naimes of Bavaria, the one figure who is invariably wise, brave, loyal and generous. In a few chansons there is to be added to these a very interesting class of personages who, though of low birth or condition, yet rescue the high-born knights from their enemies. Such are Rainoart in *Aliscans*, Gautier in *Gaydon*, Robastre in *Gaufrey*, Varocher in *Macaire*. These subjects, uniform rather than monotonous, are handled with great uniformity if not monotony of style. There are constant repetitions, and it sometimes seems, and may sometimes be the case, that the text is a mere cento of different and repeated versions. But the verse is generally harmonious and often stately. The recurrent assonances of the endless tirade soon impress the ear with a grateful music, and occasionally, and far more frequently than might be thought, passages of high poetry, such as the magnificent *Grans doel por la mort de Rollant*, appear to diversify the course of the story. The most remarkable of the chansons are *Roland*, *Aliscans*, *Gerard de Roussillon*, *Amis et Amiles*, *Raoul de Cambrai*, *Garin le Lohcrain* and its sequel *Les quatre Fils Aymon*, *Les Saisnes* (recounting the war of Charlemagne with Witekind), and lastly, *Le Chevalier au Cygne*, which is not a single poem but a series, dealing with the earlier crusades. The most remarkable *group* is that centring round William of Orange, the historical or half-historical defender of the south of France against Mahommedan invasion. Almost all the chansons of this group, from the long-known *Aliscans* to the recently printed *Chançon de Willame*, are distinguished by an unwonted *personality* of interest, as well as by an intensified dose of the rugged and martial poetry which pervades the whole class. It is noteworthy that one chanson and one only, *Floovant*, deals with Merovingian times. But the chronology, geography, and historic facts of nearly all are, it is hardly necessary to say, mainly arbitrary.

Arthurian Romances.—The second class of early French epics consists of the Arthurian cycle, the *Matière de Bretagne*, the earliest known compositions of which are at least a century junior to the earliest chanson de geste, but which soon succeeded the chansons in popular favour, and obtained a vogue both wider and far more enduring. It is not easy to conceive a greater contrast in form, style, subject and sentiment than is presented by the two classes. In both the religious sentiment is prominent, but the religion of the chansons is of the simplest, not to say of the most savage character. To pray to God and to kill his enemies constitutes the whole duty of man. In the romances the mystical element becomes on the contrary prominent, and furnishes, in the Holy Grail, one of the most important of the features of the Carlovingian knight the courtesy and clemency which we have learnt to associate with chivalry are almost entirely absent. The *gentix ber* contradicts, jeers at, and execrates his sovereign and his fellows with the utmost freedom. He thinks nothing of striking his *cortoise moullier* so that the blood runs down her *cler vis*. If a servant or even an equal offends him, he will throw the offender into the fire, knock his brains out, or set his whiskers ablaze. The Arthurian knight is far more of the modern model in these respects. But his chief difference from his predecessor is undoubtedly in his amorous devotion to his beloved, who, if not morally superior to Bellicent, Floripas, Esclairmonde, and the other Carlovingian heroines, is somewhat less forward. Even in minute details the difference is strongly marked. The romances are in octosyllabic couplets or in prose, and their language is different from that of the chansons, and contains much fewer of the usual epic repetitions and stock phrases. A voluminous controversy has been held respecting the origin of these differences, and of the story or stories which were destined to receive such remarkable attention. Reference must be made to the article ARTHURIAN LEGEND for the history of this controversy and for an account of its present state. This state, however, and all subsequent states, are likely to be rather dependent upon opinion than upon actual knowledge. From the point of view of the general historian of literature it may not be improper here to give a caution against the frequent use of the word "proven" in such matters. Very little in regard to early literature, except the literary value of the texts, is ever susceptible of *proof*; although things may be made more or less *probable*. What we are at present concerned with, however, is a body of verse and prose composed in the latter part of the 12th century and later. The earliest romances, the *Saint Graal*, the *Quête du Saint Graal*, *Joseph d'Arimathie* and *Merlin* bear the names of Walter Map and Robert de Borron. *Artus* and part at least of *Lancelot du Lac* (the whole of which has been by turns attributed and denied to

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Walter Map) appear to be due to unknown authors. *Tristan* came later, and has a stronger mixture of Celtic tradition. At the same time as Walter Map, or a little later, Chrétien (or Chrestien) de Troyes threw the legends of the Round Table into octosyllabic verse of a singularly spirited and picturesque character. The chief poems attributed to him are the *Chevalier au Lyon* (Sir Ewain of Wales), the *Chevalier à la Charette* (one of the episodes of *Lancelot*), *Eric et Enide*, *Tristan* and *Percivale*. These poems, independently of their merit, which is great, had an extensive literary influence. They were translated by the German minnesingers, Wolfram von Eschenbach, Gottfried of Strassburg, and others. With the romances already referred to, which are mostly in prose, and which by recent authorities have been put later than the verse tales which used to be postponed to them, Chrétien's poems complete the early forms of the Arthurian story, and supply the matter of it as it is best known to English readers in Malory's book. Nor does that book, though far later than the original forms, convey a very false impression of the characteristics of the older romances. Indeed, the Arthurian knight, his character and adventures, are so much better known than the heroes of the Carlovingian chanson that there is less need to dwell upon them. They had, however, as has been already pointed out, great influence upon their rivals, and their comparative fertility of invention, the much larger number of their *dramatis personae*, and the greater variety of interests to which they appealed, sufficiently explain their increased popularity. The ordinary attractions of poetry are also more largely present in them than in the chansons; there is more description, more life, and less of the mere chronicle. They have been accused of relaxing morality, and there is perhaps some truth in the charge. But the change is after all one rather of manners than of morals, and what is lost in simplicity is gained in refinement. *Doon de Mayence* is a late chanson, and *Lancelot du Lac* is an early romance. But the two beautiful scenes, in the former between Doon and Nicolette, in the latter between Lancelot, Galahault, Guinevere, and the Lady of Malehaut, may be compared as instances of the attitude of the two classes of poets towards the same subject.

Romances of Antiquity.—There is yet a third class of early narrative poems, differing from the two former in subject, but agreeing, sometimes with one sometimes with the other in form. These are the classical romances—the *Matière de Rome*—which are not much later than those of Charlemagne and Arthur. The chief subjects with which their authors busied themselves were the conquests of Alexander and the siege of Troy, though other classical stories come in. The most remarkable of all is the romance of *Alixandre* by Lambert the Short and Alexander of Bernay. It has been said that the excellence of the twelve-syllabled verse used in this romance was the origin of the term alexandrine. The Trojan romances, on the other hand, are chiefly in octosyllabic verse, and the principal poem which treats of them is the *Roman de Troie* of Benoît de Sainte More. Both this poem and *Alixandre* are attributed to the last quarter of the 12th century. The authorities consulted for these poems were, as may be supposed, none of the best. Dares Phrygius, Dictys Cretensis, the pseudo-Callisthenes supplied most of them. But the inexhaustible invention of the trouvères themselves was the chief authority consulted. The adventures of Medea, the wanderings of Alexander, the Trojan horse, the story of Thebes, were quite sufficient to spur on to exertion the minds which had been accustomed to spin a chanson of some 10,000 lines out of a casual allusion in some preceding poem. It is needless to say that anachronisms did not disturb them. From first to last the writers of the chansons had not in the least troubled themselves with attention to any such matters. Charlemagne himself had his life and exploits accommodated to the need of every poet who treats of him, and the same is the case with the heroes of antiquity. Indeed, Alexander is made in many respects a prototype of Charlemagne. He is regularly knighted, he has twelve peers, he holds tournaments, he has relations with Arthur, and comes in contact with fairies, he takes flights in the air, dives in the sea and so forth. There is perhaps more avowed imagination in these classical stories than in either of the other divisions of French epic poetry. Some of their authors even confess to the practice of fiction, while the trouvères of the chansons invariably assert the historical character of their facts and personages, and the authors of the Arthurian romances at least start from facts vouched for, partly by national tradition, partly by the authority of religion and the church. The classical romances, however, are important in two different ways. In the first place, they connect the early literature of France, however loosely, and with links of however dubious authenticity, with the great history and literature of the past. They show a certain amount of scholarship in their authors, and in their hearers they show a capacity of taking an interest in subjects which are not merely those directly connected with the village or the tribe. The chansons de geste had shown the creative power and independent character of French literature. There is, at least about the earlier ones, nothing borrowed, traditional or scholarly. They smack of the soil, and they rank France among the very few countries which, in this matter of indigenous growth, have yielded more than folk-songs and fireside tales. The Arthurian romances, less independent in origin, exhibit a wider range of view, a greater knowledge of human nature, and a more extensive command of the sources of poetical and romantic interest. The classical epics superadd the only ingredient necessary to an accomplished literature—that is to say, the knowledge of what has been done by other peoples and other literatures already, and the readiness to take advantage of the materials thus supplied.

Romans d'Aventures.—These are the three earliest developments of French literature on the great scale. They led, however, to a fourth, which, though later in date than all except their latest forms and far more loosely associated as a group, is so closely connected with them by literary and social considerations that it had best be mentioned here. This is the *roman d'aventures*, a title given to those almost avowedly fictitious poems which connect themselves, mainly and centrally, neither with French history, with the Round Table, nor with the heroes of antiquity. These began to be written in the 13th century, and continued until the prose form of fiction became generally preferred. The later forms of the chansons de geste and the Arthurian poems might indeed be well called romans d'aventures themselves. *Hugues Capet*, for instance, a chanson in form and class of subject, is certainly one of this latter kind in treatment; and there is a larger class of semi-Arthurian romance, which so to speak branches off from the main trunk. But for convenience sake the definition we have given is preferable. The style and subject of these romans d'aventures are naturally extremely various. *Guillaume de Palerme* deals with the adventures of a Sicilian prince who is befriended by a were-wolf; *Le Roman de l'escoufle*, with a heroine whose ring is carried off by a sparrow-hawk (*escoufle*), like Prince Camaralzaman's talisman; *Guy of Warwick*, with one of the most famous of imaginary heroes; *Meraugis de Portlegues* is a sort of branch or offshoot of the romances of the Round Table; *Cléomadès*, the work of the trouvère Adenès le Roi, who also rehandled the old chanson subjects of *Ogier* and *Berte aux grans piés*, connects itself once more with the *Arabian Nights* as well as with Chaucer forwards in the introduction of a flying mechanical horse. There is, in short, no possibility of classifying their subjects. The habit of writing in gestes, or of necessarily connecting the new work with an older one, had ceased to be binding, and the instinct of fiction writing was free; yet those romans d'aventures do not rank quite as high in literary importance as the classes which preceded them. This under-valuation arises rather from a lack of originality and distinctness of savour than from any shortcomings in treatment. Their versification, usually octosyllabic, is pleasant enough; but there is not much distinctness of character about them, and their incidents often strike the reader with something of the sameness, but seldom with much of the naïveté, of those of the older poems. Nevertheless some of them attained to a very high popularity, such, for instance, as the *Parlenopex de Blois* of Denis Pyramus, which has a motive drawn from the story of *Cupid and Psyche* and the charming *Floire et Blanchefleur*, giving the woes of a

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Christian prince and a Saracen slave-girl. With them may be connected a certain number of early romances and fictions of various dates in prose, none of which can vie in charm with *Aucassin et Nicolette* (13th century), an exquisite literary presentment of medieval sentiment in its most delightful form.

In these classes may be said to be summed up the literature of feudal chivalry in France. They were all, except perhaps the last, composed by one class of persons, the trouvères, and performed by another, the jongleurs. The latter, indeed, sometimes presumed to compose for himself, and was denounced as a *troveor batard* by the indignant members of the superior caste. They were all originally intended to be performed in the *palais marberin* of the baron to an audience of knights and ladies, and, when reading became more common, to be read by such persons. They dealt therefore chiefly, if not exclusively, with the class to whom they were addressed. The bourgeois and the villain, personages of political nonentity at the time of their early composition, come in for far slighter notice, although occasionally in the few curious instances we have mentioned, and others, persons of a class inferior to the seigneur play an important part. The habit of private wars and of insurrection against the sovereign supply the motives of the chanson de geste, the love of gallantry, adventure and foreign travel those of the romances Arthurian and miscellaneous. None of these motives much affected the lower classes, who were, with the early developed temper of the middle- and lower-class Frenchman, already apt to think and speak cynically enough of tournaments, courts, crusades and the other occupations of the nobility. The communal system was springing up, the towns were receiving royal encouragement as a counterpoise to the authority of the nobles. The corruptions and maladministration of the church attracted the satire rather of the citizens and peasantry who suffered by them, than of the nobles who had less to fear and even something to gain. On the other hand, the gradual spread of learning, inaccurate and ill-digested perhaps, but still learning, not only opened up new classes of subjects, but opened them to new classes of persons. The thousands of students who flocked to the schools of Paris were not all princes or nobles. Hence there arose two new classes of literature, the first consisting of the embodiment of learning of one kind or other in the vulgar tongue. The other, one of the most remarkable developments of sportive literature which the world has seen, produced the second indigenous literary growth of which France can boast, namely, the fabliaux, and the almost more remarkable work which is an immense conglomerate of fabliaux, the great beast-epic of the Roman de Renart.

General characteristics of early narrative.

Spread of literary taste.

Fabliaux.—There are few literary products which have more originality and at the same time more diversity than the fabliau. The epic and the drama, even when they are independently produced, are similar in their main characteristics all the world over. But there is nothing in previous literature which exactly corresponds to the fabliau. It comes nearest to the Aesopic fable and its eastern origins or parallels. But differs from these in being less allegorical, less obviously moral (though a moral of some sort is usually if not always enforced), and in having a much more direct personal interest. It is in many degrees further removed from the parable, and many degrees nearer to the novel. The story is the first thing, the moral the second, and the latter is never suffered to interfere with the former. These observations apply only to the fabliaux, properly so called, but the term has been used with considerable looseness. The collectors of those interesting pieces, Barbazan, Méon, Le Grand d'Aussy, have included in their collections large numbers of miscellaneous pieces such as *dits* (rhymed descriptions of various objects, the most famous known author of which was Baudouin de Condé, 13th century), and *débats* (discussions between two persons or contrasts of the attributes of two things), sometimes even short romances, farces and mystery plays. Not that the fable proper—the prose classical beast-story of "Aesop"—was neglected. Marie de France—the poetess to be mentioned again for her more strictly poetical work—is the most literary of not a few writers who composed what were often, after the mysterious original poet, named *Ysopets*. Aesop, Phaedrus, Babrius were translated and imitated in Latin and in the vernacular by this class of writer, and some of the best known of "fablers" date from this time. The fabliau, on the other hand, according to the best definition of it yet achieved, is "the recital, generally comic, of a real or possible incident occurring in ordinary human life." The comedy, it may be added, is usually of a satiric kind, and occupies itself with every class and rank of men, from the king to the villain. There is no limit to the variety of these lively verse-tales, which are invariably written in eight-syllabled couplets. Now the subject is the misadventure of two Englishmen, whose ignorance of the French language makes them confuse donkey and lamb; now it is the fortunes of an exceedingly foolish knight, who has an amiable and ingenious mother-in-law; now the deserved sufferings of an avaricious or ill-behaved priest; now the bringing of an ungrateful son to a better mind by the wisdom of babes and sucklings. Not a few of the *Canterbury Tales* are taken directly from fabliaux; indeed, Chaucer, with the possible exception of Prior, is our nearest approach to a fabliau-writer. At the other end of Europe the prose novels of Boccaccio and other Italian tale-tellers are largely based upon fabliaux. But their influence in their own country was the greatest. They were the first expression of the spirit which has since animated the most national and popular developments of French literature. Simple and unpretending as they are in form, the fabliaux announce not merely the *Cent Nouvelles Nouvelles* and the *Heptameron*, *L'Avocat Pâtelin*, and *Pantagruel*, but also *L'Avare* and the *Roman comique*, *Gil Blas* and *Candide*. They indeed do more than merely prophesy the spirit of these great performances—they directly lead to them. The prose-tale and the farce are the direct outcomes of the fabliau, and the prose-tale and the farce once given, the novel and the comedy inevitably follow.

The special period of fabliau composition appears to have been the 12th and 13th centuries. It signifies on the one side the growth of a lighter and more sportive spirit than had yet prevailed, on another the rise in importance of other and lower orders of men than the priest and the noble, on yet another the consciousness on the part of these lower orders of the defects of the two privileged classes, and of the shortcomings of the system of polity under which these privileged classes enjoyed their privileges. There is, however, in the fabliau proper not so very much of direct satire, this being indeed excluded by the definition given above, and by the thoroughly artistic spirit in which that definition is observed. The fabliaux are so numerous and so various that it is difficult to select any as specially representative. We may, however, mention, both as good examples and as interesting from their subsequent history, *Le Vair Palfroi*, treated in English by Leigh Hunt and by Peacock; *Le Vilain Mire*, the original consciously or unconsciously followed in *Le Médecin malgré lui*; *Le Roi d'Angleterre et le jongleur d'Éli*; *La houce partie*; *Le Sot Chevalier*, an indecorous but extremely amusing story; *Les deux bordeors ribaus*, a dialogue between two jongleurs of great literary interest, containing allusions to the chansons de geste and romances most in vogue; and *Le vilain qui conquist paradis par plait*, one of the numerous instances of what has unnecessarily puzzled moderns, the association in medieval times of sincere and unfeigned faith with extremely free handling of its objects. This lightheartedness in other subjects sometimes bubbled over into the *fatrasie*, an almost pure nonsense-piece, parent of the later *amphigouri*.

Social importance of fabliaux

Roman de Renart.—If the fabliaux are not remarkable for direct satire, that element is supplied in more than compensating quantity by an extraordinary composition which is closely related to them. *Le Roman de Renart*, or *History of Reynard the Fox*, is a poem, or rather series of poems, which, from the end of the 12th to the middle of the 14th century, served the citizen poets of northern France, not merely as an outlet for literary expression, but also as a vehicle of satirical comment,—now on the general vices and weaknesses of humanity, now on the usual corruptions in church and state, now on the various historical

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events which occupied public attention from time to time. The enormous popularity of the subject is shown by the long vogue which it had, and by the empire which it exercised over generations of writers who differed from each other widely in style and temper. Nothing can be farther from the allegorical erudition, the political diatribes and the sermonizing moralities of the authors of *Renart le Contre-fait* than the sly naïveté of the writers of the earlier branches. Yet these and a long and unknown series of intermediate bards the fox-king pressed into his service, and it is scarcely too much to say that, during the two centuries of his reign, there was hardly a thought in the popular mind which, as it rose to the surface, did not find expression in an addition to the huge cycle of *Renart*.

We shall not deal with the controversies which have been raised as to the origin of the poem and its central idea. The latter may have been a travestie of real persons and actual events, or it may (and much more probably) have been an expression of thoughts and experiences which recur in every generation. France, the Netherlands and Germany have contended for the honour of producing Renart; French, Flemish, German and Latin for the honour of first describing him. It is sufficient to say that the spirit of the work seems to be more that of the borderland between France and Flanders than of any other district, and that, wherever the idea may have originally arisen, it was incomparably more fruitful in France than in any other country. The French poems which we possess on the subject amount in all to nearly 100,000 lines, independently of mere variations, but including the different versions of *Renart le Contre-fait*. This vast total is divided into four different poems. The most ancient and remarkable is that edited by Méon under the title of *Roman du Renart*, and containing, with some additions made by M. Chabaille, 37 branches and about 32,000 lines. It must not, however, be supposed that this total forms a continuous poem like the *Aeneid* or *Paradise Lost*. Part was pretty certainly written by Pierre de Saint-Cloud, but he was not the author of the whole. On the contrary, the separate branches are the work of different authors, hardly any of whom are known, and, but for their community of subject and to some extent of treatment, might be regarded as separate poems. The history of Renart, his victories over Isengrim, the wolf, Bruin, the bear, and his other unfortunate rivals, his family affection, his outwittings of King Noble the Lion and all the rest, are too well known to need fresh description here. It is perhaps in the subsequent poems, though they are far less known and much less amusing, that the hold which the idea of Renart had obtained on the mind of northern France, and the ingenious uses to which it was put, are best shown. The first of these is *Le Couronnement Renart*, a poem of between 3000 and 4000 lines, attributed, on no grounds whatever, to the poetess Marie de France, and describing how the hero by his ingenuity got himself crowned king. This poem already shows signs of direct moral application and generalizing. These are still more apparent in *Renart le Nouvel*, a composition of some 8000 lines, finished in the year 1288 by the Fleming Jacquemart Gielée. Here the personification, of which, in noticing the *Roman de la rose*, we shall soon have to give extended mention, becomes evident. Instead of or at least beside the lively personal Renart who used to steal sausages, set Isengrim fishing with his tail, or make use of Chanticleer's comb for a purpose for which it was certainly never intended, we have *Renardie*, an abstraction of guile and hypocrisy, triumphantly prevailing over other and better qualities. Lastly, as the *Roman de la rose* of William of Lorris is paralleled by *Renart le Nouvel*, so its continuation by Jean de Meung is paralleled by the great miscellany of *Renart le Contrefait*, which, even in its existing versions, extends to fully 50,000 lines. Here we have, besides floods of miscellaneous erudition and discourse, political argument of the most direct and important kind. The wrongs of the lower orders are bitterly urged. They are almost openly incited to revolt; and it is scarcely too much to say, as M. Lenient has said, that the closely following Jacquerie is but a practical carrying out of the doctrines of the anonymous satirists of *Renart le Contre-fait*, one of whom (if indeed there was more than one) appears to have been a clerk of Troyes.

Early Lyric Poetry.—Side by side with these two forms of literature, the epics and romances of the higher classes, and the fabliau, which, at least in its original, represented rather the feelings of the lower, there grew up a third kind, consisting of purely lyrical poetry. The song literature of medieval France is extremely abundant and beautiful. From the 12th to the 15th century it received constant accessions, some signed, some anonymous, some purely popular in their character, some the work of more learned writers, others again produced by members of the aristocracy. Of the latter class it may fairly be said that the catalogue of royal and noble authors boasts few if any names superior to those of Thibaut de Champagne, king of Navarre at the beginning of the 13th century, and Charles d'Orléans, the father of Louis XII., at the beginning of the 15th. Although much of this lyric poetry is anonymous, the more popular part of it almost entirely so, yet M. Paulin Paris was able to enumerate some hundreds of French chansonniers between the 11th and the 13th century. The earliest song literature, chiefly known in the delightful collection of Bartsch (*Altfranzösische Romanzen und Pastourellen*), is mainly sentimental in character. The collector divides it under the two heads of romances and pastourelles, the former being usually the celebration of the loves of a noble knight and maiden, and recounting how Belle Doette or Eglantine or Oriour sat at her windows or in the tourney gallery, or embroidering silk and samite in her chamber, with her thoughts on Gerard or Guy or Henry,—the latter somewhat monotonous but naïve and often picturesque recitals, very often in the first person, of the meeting of an errant knight or minstrel with a shepherdess, and his cavalier but not always successful wooing. With these, some of which date from the 12th century, may be contrasted, at the other end of the medieval period, the more varied and popular collection dating in their present form from the 15th century, and published in 1875 by M. Gaston Paris. In both alike, making allowance for the difference of their age and the state of the language, may be noticed a charming lyrical faculty and great skill in the elaboration of light and suitable metres. Especially remarkable is the abundance of refrains of an admirably melodious kind. It is said that more than 500 of these exist. Among the lyric writers of these four centuries whose names are known may be mentioned Audefroi le Bastard (12th century), the author of the charming song of *Belle Idoine*, and others no way inferior, Quesnes de Bethune, the ancestor of Sully, whose song-writing inclines to a satirical cast in many instances, the Vidame de Chartres, Charles d'Anjou, King John of Brienne, the châtelain de Coucy, Gace Bruslé, Colin Muset, while not a few writers mentioned elsewhere—Guyot de Provins, Adam de la Halle, Jean Bodel and others—were also lyrists. But none of them, except perhaps Audefroi, can compare with Thibaut IV. (1201–1253), who united by his possessions and ancestry a connexion with the north and the south, and who employed the methods of both districts but used the language of the north only. Thibaut was supposed to be the lover of Blanche of Castile, the mother of St Louis, and a great deal of his verse is concerned with his love for her. But while knights and nobles were thus employing lyric poetry in courtly and sentimental verse, lyric forms were being freely employed by others, both of high and low birth, for more general purposes. Blanche and Thibaut themselves came in for contemporary lampoons, and both at this time and in the times immediately following, a cloud of writers composed light verse, sometimes of a lyric sometimes of a narrative kind, and sometimes in a mixture of both. By far the most remarkable of these is Rutebœuf (a name which is perhaps a nickname), the first of a long series of French poets to whom in recent days the title Bohemian has been applied, who passed their lives between gaiety and misery, and celebrated their lot in both conditions with copious verse. Rutebœuf is among the earliest French writers who tell us their personal history and make personal appeals. But he does not confine himself to these. He discusses the history of his times,

Audefroi le Bastard.

Thibaut de Champagne.

Rutebœuf.

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upbraids the nobles for their desertion of the Latin empire of Constantinople, considers the expediency of crusading, inveighs against the religious orders, and takes part in the disputes between the pope and the king. He composes pious poetry too, and in at least one poem takes care to distinguish between the church which he venerates and the corrupt churchmen whom he lampoons. Besides Rutebœuf the most characteristic figure of his class and time (about the middle of the 13th century) is

Adam de la Halle.

Adam de la Halle, commonly called the Hunchback of Arras. The earlier poems of Adam are of a sentimental character, the later ones satirical and somewhat ill-tempered. Such, for instance, is his invective against his native city. But his chief importance consists in his *jeux*, the *Jeu de la feuillie*, the *Jeu de Robin et Marion*, dramatic compositions which led the way to the regular dramatic form. Indeed the general tendency of the 13th century is to satire, fable and farce, even more than to serious or sentimental poetry. We should perhaps except the *lais*, the chief of which are known under the name of Marie de France. These lays are exclusively Breton in origin, though not in application, and the term seems originally to have had reference rather to the music to which they were sung than to the manner or matter of the pieces. Some resemblance to these lays may perhaps be traced in the genuine Breton songs published by M. Luzel. The subjects of the lais are indifferently taken from the Arthurian cycle, from ancient story, and from popular tradition, and, at any rate in Marie's hands, they give occasion for some passionate, and in the modern sense really romantic, poetry. The most famous of all is the *Lay of the Honeysuckle*, traditionally assigned to Sir Tristram.

Lais.

Satiric and Didactic Works.—Among the direct satirists of the middle ages, one of the earliest and foremost is Guyot de Provins, a monk of Clairvaux and Cluny, whose *Bible*, as he calls it, contains an elaborate satire on the time (the beginning of the 13th century), and who was imitated by others, especially Hugues de Brégy. The same spirit soon betrayed itself in curious travesties of the romances of chivalry, and sometimes invades the later specimens of these romances themselves. One of the earliest examples of this travesty is the remarkable composition entitled *Audigier*. This poem, half fabliau and half romance, is not so much an instance of the heroi-comic poems which afterwards found so much favour in Italy and elsewhere, as a direct and ferocious parody of the Carlovingian epic. The hero Audigier is a model of cowardice and disloyalty; his father and mother, Turgibus and Rainberge, are deformed and repulsive. The exploits of the hero himself are coarse and hideous failures, and the whole poem can only be taken as a counterblast to the spirit of chivalry. Elsewhere a trouvère, prophetic of Rabelais, describes a vast battle between all the nations of the world, the quarrel being suddenly atoned by the arrival of a holy man bearing a huge flagon of wine. Again, we have the history of a solemn crusade undertaken by the citizens of a country town against the neighbouring castle. As erudition and the fancy for allegory gained ground, satire naturally availed itself of the opportunity thus afforded it; the disputes of Philippe le Bel with the pope and the Templars had an immense literary influence, partly in the concluding portions of the *Renart*, partly in the *Roman de la rose*, still to be mentioned, and partly in other satiric allegories of which the chief is the romance of *Fauvel*, attributed to François de Rues. The hero of this is an allegorical personage, half man and half horse, signifying the union of bestial degradation with human ingenuity and cunning. Fauvel (the name, it may be worth while to recall, occurs in Langland) is a divinity in his way. All the personages of state, from kings and popes to mendicant friars, pay their court to him.

But this serious and discontented spirit betrays itself also in compositions which are not parodies or travesties in form.

Baudouin de Sebourc.

One of the latest, if not absolutely the latest (for Cuvelier's still later *Chronique de Du Guesclin* is only a most interesting *imitation* of the *chanson* form adapted to recent events), of the chansons de geste is *Baudouin de Sebourc*, one of the members of the great romance or cycle of romances dealing with the crusades, and entitled Le Chevalier au Cygne. *Baudouin de Sebourc* dates from the early years of the 14th century. It is strictly a chanson de geste in form, and also in the general run of its incidents. The hero is dispossessed of his inheritance by the agency of traitors, fights his battle with the world and its injustice, and at last prevails over his enemy Gaufrois, who has succeeded in obtaining the kingdom of Friesland and almost that of France. Gaufrois has as his assistants two personages who were very popular in the poetry of the time,—viz., the Devil, and Money. These two sinister figures pervade the fabliaux, tales and fantastic literature generally of the time. M. Lenient, the historian of French satire, has well remarked that a romance as long as the *Renart* might be spun out of the separate short poems of this period which have the Devil for hero, and many of which form a very interesting transition between the fabliau and the mystery. But the Devil is in one respect a far inferior hero to Renart. He has an adversary in the Virgin, who constantly upsets his best-laid schemes, and who does not always treat him quite fairly. The abuse of usury at the time, and the exactions of the Jews and Lombards, were severely felt, and Money itself, as personified, figures largely in the popular literature of the time.

Roman de la Rose.—A work of very different importance from all of these, though with a seeming touches of the same spirit, a work which deserves to take rank among the most important of the middle ages, is the *Roman de la rose*, —one of the few really remarkable books which is the work of two authors, and that not in collaboration but in continuation one of the other. The author of the earlier part was Guillaume de Lorris, who lived in the first half of the 13th century; the author of the later part was Jean de Meung, who was born about the middle of that century, and whose part in the *Roman* dates at least from its extreme end. This great poem exhibits in its two parts very different characteristics, which yet go to make up a not inharmonious whole. It is a love poem, and yet it is satire. But both gallantry and raillery are treated in an entirely allegorical spirit; and this allegory, while it makes the poem tedious to hasty appetites of to-day, was exactly what gave it its charm in the eyes of the middle ages. It might be described as an *Ars amoris* crossed with a *Quodlibeta*. This mixture exactly hit the taste of the time, and continued to hit it for two centuries and a half. When its obvious and gallant meaning was attacked by moralists and theologians, it was easy to quote the example of the Canticles, and to furnish esoteric explanations of the allegory. The writers of the 16th century were never tired of quoting and explaining it. Antoine de Baif, indeed, gave the simple and obvious meaning, and declared that "La rose c'est d'amours le guerdon gracieux"; but Marot, on the other hand, gives us the choice of four mystical interpretations,—the rose being either the state of wisdom, the state of grace, the state of eternal happiness or the Virgin herself. We cannot here analyse this celebrated poem. It is sufficient to say that the lover meets all sorts of obstacles in his pursuit of the rose, though he has for a guide the metaphorical personage Bel-Accueil. The early part, which belongs to William of Lorris, is remarkable for its gracious and fanciful descriptions. Forty years after Lorris's death, Jean de Meung completed it in an entirely different spirit. He keeps the allegorical form, and indeed introduces two new personages of importance, Nature and Faux-semblant. In the mouths of these personages and of another, Raison, he puts the most extraordinary mixture of erudition and satire. At one time we have the history of classical heroes, at another theories against the hoarding of money, about astronomy, about the duty of mankind to increase and multiply. Accounts of the origin of loyalty, which would have cost the poet his head at some periods of history, and even communistic ideas, are also to be found here. In Faux-semblant we have a real creation of the theatrical hypocrite. All this miscellaneous and apparently incongruous material in fact explains the success of the poem. It has the one characteristic which has at all times secured the popularity of great works of literature. It holds the mirror up firmly and fully to its age. As we find in Rabelais

William of Lorris.

Jean de Meung.

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the characteristics of the Renaissance, in Montaigne those of the sceptical reaction from Renaissance and reform alike, in Molière those of the society of France after Richelieu had tamed and levelled it, in Voltaire and Rousseau respectively the two aspects of the great revolt,—so there are to be found in the *Roman de la rose* the characteristics of the later middle age, its gallantry, its mysticism, its economical and social troubles and problems, its scholastic methods of thought, its naïve acceptance as science of everything that is written, and at the same time its shrewd and indiscriminate criticism of much that the age of criticism has accepted without doubt or question. The *Roman de la rose*, as might be supposed, set the example of an immense literature of allegorical poetry, which flourished more and more until the Renaissance. Some of these poems we have already mentioned, some will have to be considered under the head of the 15th century. But, as usually happens in such cases and was certain to happen in this case, the allegory which has seemed tedious to many, even in the original, became almost intolerable in the majority of the imitations.

We have observed that, at least in the later section of the *Roman de la rose*, there is observable a tendency to import into the poem indiscriminate erudition. This tendency is now remote from our poetical habits; but in its own day it was only the natural result of the use of poetry for all literary purposes. It was many centuries before prose became recognized as the proper vehicle for instruction, and at a very early date verse was used as well for educational and moral as for recreative and artistic purposes. French verse was the first born of all literary mediums in modern European speech, and the resources of ancient learning were certainly not less accessible in France than in any other country. Dante, in his *De vulgari eloquio*, acknowledges the excellence of the didactic writers of the Langue d'Oïl. We have already alluded to the *Bestiary* of Philippe de Thaun, a Norman trouvère who lived and wrote in England during the reign of Henry Beauclerc. Besides the *Bestiary*, which from its dedication to Queen Adela has been conjectured to belong to the third decade of the 12th century, Philippe wrote also in French a *Liber de creaturis*, both works being translated from the Latin. These works of mystical and apocryphal physics and zoology became extremely popular in the succeeding centuries, and were frequently imitated. A moralizing turn was also given to them, which was much helped by the importation of several miscellanies of Oriental origin, partly tales, partly didactic in character, the most celebrated of which is the *Roman des sept sages*, which, under that title and the variant of *Dolopathos*, received repeated treatment from French writers both in prose and verse. The odd notion of an *Ovide moralisé* used to be ascribed to Philippe de Vitry, bishop of Meaux (1291?–1391?), a person complimented by Petrarch, but is now assigned to a certain Chrétien Legonais. Art, too, soon demanded exposition in verse, as well as science. The favourite pastime of the chase was repeatedly dealt with, notably in the *Roi Modus* (1325), mixed prose and verse; the *Deduis de la chasse* (1387), of Gaston de Foix, prose; and the *Tresor de Venerie* of Hardouin (1394), verse. Very soon didactic verse extended itself to all the arts and sciences. Vegetius and his military precepts had found a home in French octosyllables as early as the 12th century; the end of the same age saw the ceremonies of knighthood solemnly versified, and *napes* (maps) *du monde* also soon appeared. At last, in 1245, Gautier of Metz translated from various Latin works into French verse a sort of encyclopaedia, while another, incongruous but known as *L'Image du monde*, exists from the same century. Profane knowledge was not the only subject which exercised didactic poets at this time. Religious handbooks and commentaries on the scriptures were common in the 13th and following centuries, and, under the title of *Castoiements*, *Enseignements* and *Doctrinaux*, moral treatises became common. The most famous of these, the *Castoiement d'un père à son fils*, falls under the class, already mentioned, of works due to oriental influence, being derived from the Indian *Panchatantra*. In the 14th century the influence of the *Roman de la rose* helped to render moral verse frequent and popular. The same century, moreover, which witnessed these developments of well-intentioned if not always judicious erudition witnessed also a considerable change in lyrical poetry. Hitherto such poetry had chiefly been composed in the melodious but unconstrained forms of the romance and the pastourelle. In the 14th century the writers of northern France subjected themselves to severer rules. In this age arose the forms which for so long a time were to occupy French singers,—the ballade, the rondeau, the rondel, the triolet, the chant royal and others. These received considerable alterations as time went on. We possess not a few *Artes poëticae*, such as that of Eustache Deschamps at the end of the 14th century, that formerly ascribed to Henri de Croy and now to Molinet at the end of the 15th, and that of Thomas Sibilet in the 16th, giving particulars of them, and these particulars show considerable changes. Thus the term rondeau, which since Villon has been chiefly limited to a poem of 15 lines, where the 9th and 15th repeat the first words of the first, was originally applied both to the rondel, a poem of 13 or 14 lines, where the first two are twice repeated integrally, and to the triolet, one of 8 only, where the first line occurs three times and the second twice. The last is an especially popular metre, and is found where we should least expect it, in the dialogue of the early farces, the speakers making up triolets between them. As these three forms are closely connected, so are the ballade and the chant royal, the latter being an extended and more stately and difficult version of the former, and the characteristic of both being the identity of rhyme and refrain in the several stanzas. It is quite uncertain at what time these fashions were first cultivated, but the earliest poets who appear to have practised them extensively were born at the close of the 13th and the beginning of the 14th centuries. Of these Guillaume de Machault (*c.* 1300–1380) is the oldest. He has left us 80,000 verses, never yet completely printed. Eustache Deschamps (*c.* 1340–*c.* 1410) was nearly as prolific, but more fortunate as more meritorious, the Société des anciens Textes having at last provided a complete edition of him. Froissart the historian (1333–1410) was also an agreeable and prolific poet. Deschamps, the most famous as a poet of the three, has left us nearly 1200 ballades and nearly 200 rondeaux, besides much other verse all manifesting very considerable poetical powers. Less known but not less noteworthy, and perhaps the earliest of all, is Jehannot de Lescurel, whose personality is obscure, and most of whose works are lost, but whose remains are full of grace. Froissart appears to have had many countrymen in Hainault and Brabant who devoted themselves to the art of versification; and the *Livre des cent ballades* of the Marshal Boucicault (1366–1421) and his friends—*c.* 1390—shows that the French gentleman of the 14th century was as apt at the ballade as his Elizabethan peer in England was at the sonnet.

Early didactic verse.

Artificial forms of verse.

Early Drama.—Before passing to the prose writers of the middle ages, we have to take some notice of the dramatic productions of those times—productions of an extremely interesting character, but, like the immense majority of medieval literature, poetic in form. The origin or the revival of dramatic composition in France has been hotly debated, and it has been sometimes contended that the tradition of Latin comedy was never entirely lost, but was handed on chiefly in the convents by adaptations of the Terentian plays, such as those of the nun Hroswitha. There is no doubt that the mysteries (subjects taken from the sacred writings) and miracle plays (subjects taken from the legends of the saints and the Virgin) are of very early date. The mystery of the *Foolish Virgins* (partly French, partly Latin), that of *Adam* and perhaps that of *Daniel*, are of the 12th century, though due to unknown authors. Jean Bodel and Ruteboeuf, already mentioned, gave, the one that of *Saint Nicolas* at the confines of the 12th and 13th, the other that of *Théophile* later in the 13th itself. But the later moralities, sotie, and farces seem to be also in part a very probable development of the simpler and earlier forms of the fabliau and of the tenson or jeu-parti, a poem in simple dialogue much used by both troubadours

Mysteries and miracles.

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and trouvères. The fabliau has been sufficiently dealt with already. It chiefly supplied the subject; and some miracle-plays and farces are little more than fabliaux thrown into dialogue. Of the jeux-partis there are many examples, varying from very simple questions and answers to something like regular dramatic dialogue; even short romances, such as *Aucassin et Nicolette*, were easily susceptible of dramatization. But the *Jeu de la feuillée* (or *feuillée*) of Adam de la Halle seems to be the earliest piece, profane in subject, containing something more than mere dialogue. The poet has not indeed gone far for his subject, for he brings in his own wife, father and friends, the interest being complicated by the introduction of stock characters (the doctor, the monk, the fool), and of certain fairies—personages already popular from the later romances of chivalry. Another piece of Adam's, *Le Jeu de Robin et Marion*, also already alluded to, is little more than a simple throwing into action of an ordinary pastourelle with a considerable number of songs to music. Nevertheless later criticism has seen, and not unreasonably, in these two pieces the origin in the one case of farce, and thus indirectly of comedy proper, in the other of comic opera.

For a long time, however, the mystery and miracle-plays remained the staple of theatrical performance, and until the 13th century actors as well as performers were more or less taken from the clergy. It has, indeed, been well pointed out that the offices of the church were themselves dramatic performances, and required little more than development at the hands of the mystery writers. The occasional festive outbursts, such as the Feast of Fools, that of the Boy Bishop and the rest, helped on the development. The variety of mysteries and miracles was very great. A single manuscript contains forty miracles of the Virgin, averaging from 1200 to 1500 lines each, written in octosyllahic couplets, and at least as old as the 14th century, most of them perhaps much earlier. The mysteries proper, or plays taken from the scriptures, are older still. Many of these are exceedingly long. There is a *Mystère de l'Ancien Testament*, which extends to many volumes, and must have taken weeks to act in its entirety. The *Mystère de la Passion*, though not quite so long, took several days, and recounts the whole history of the gospels. The best apparently of the authors of these pieces, which are mostly anonymous, were two brothers, Arnoul and Simon Grêban (authors of the *Actes des apôtres*, and in the first case of the *Passion*), *c.* 1450, while a certain Jean Michel (d. 1493) is credited with having continued the *Passion* from 30,000 lines to 50,000. But these performances, though they held their ground until the middle of the 16th century and extended their range of subject from sacred to profane history—legendary as in the *Destruction de Troie*, contemporary as in the *Siège d'Orléans*—were soon rivalled by the more profane performances of the moralities, the farces and the sotties. The palmy time of all these three kinds is the 15th century, while the Confrérie de la Passion itself, the special performers of the sacred drama, only obtained the licence constituting it by an ordinance of Charles VI. in 1402. In order, however, to take in the whole of the medieval theatre at a glance, we may anticipate a little. The Confraternity was not itself the author or performer of the profaner kind of dramatic performance. This latter was due to two other bodies, the clerks of the Bazoche and the Enfans sans Souci. As the Confraternity was chiefly composed of tradesmen and persons very similar to Peter Quince and his associates, so the clerks of the Bazoche were members of the legal profession of Paris, and the Enfans sans Souci were mostly young men of family. The morality was the special property of the first, the sotie of the second. But as the moralities were sometimes decidedly tedious plays, though by no means brief, they were varied by the introduction of farces, of which the *jeux* already mentioned were the early germ, and of which *L'Avocat Patelin*, dated by some about 1465 and certainly about 200 years subsequent to Adam de la Halle, is the most famous example.

Profane drama.

The morality was the natural result on the stage of the immense literary popularity of allegory in the *Roman de la rose* and its imitations. There is hardly an abstraction, a virtue, a vice, a disease, or anything else of the kind, which does not figure in these compositions. There is Bien Advisé and Mal Advisé, the good boy and the bad boy of nursery stories, who fall respectively with Faith, Reason and Humility, and with Rashness, Luxury and Folly. There is the hero Mange-Tout, who is invited to dinner by Banquet, and meets after dinner very unpleasant company in Colique, Goutte and Hydropisie. Honte-de-dire-ses-Péchés might seem an anticipation of Puritan nomenclature to an English reader who did not remember the contemporary or even earlier *personae* of Langland's poem. Some of these moralities possess distinct dramatic merit; among these is mentioned *Les Blasphémateurs*, an early and remarkable presentation of the Don Juan story. But their general character appears to be gravity, not to say dullness. The Enfans sans Souci, on the other hand, were definitely satirical, and nothing if not amusing. The chief of the society was entitled Prince des Sots, and his crown was a hood decorated with asses' ears. The sotie was directly satirical, and only assumed the guise of folly as a stalking-horse for shooting wit. It was more Aristophanic than any other modern form of comedy, and like its predecessor, it perished as a result of its political application. Encouraged for a moment as a political engine at the beginning of the 16th century, it was soon absolutely forbidden and put down, and had to give place in one direction to the lampoon and the prose pamphlet, in another to forms of comic satire more general and vague in their scope. The farce, on the other hand, having neither moral purpose nor political intention, was a purer work of art, enjoyed a wider range of subject, and was in no danger of any permanent extinction. Farcical interludes were interpolated in the mysteries themselves; short farces introduced and rendered palatable the moralities, while the sotie was itself but a variety of farce, and all the kinds were sometimes combined in a sort of tetralogy. It was a short composition, 500 verses being considered sufficient, while the morality might run to at least 1000 verses, the miracle-play to nearly double that number, and the mystery to some 40,000 or 50,000, or indeed to any length that the author could find in his heart to bestow upon the audience, or the audience in their patience to suffer from the author. The number of persons and societies who acted these performances grew to be very large, being estimated at more than 5000 towards the end of the 15th century. Many fantastic personages came to join the Prince des Sots, such as the Empereur de Galilée, the Princes de l'Étrille, and des Nouveaux Mariés, the Roi de l'Épinette, the Recteur des Fous. Of the pieces which these societies represented one only, that of *Maître Patelin*, is now much known; but many are almost equally amusing. *Patelin* itself has an immense number of versions and editions. Other farces are too numerous to attempt to classify; they bear, however, in their subjects, as in their manner, a remarkable resemblance to the fabliaux, their source. Conjugal disagreements, the unpleasantness of mothers-in-law, the shifty or, in the earlier stages, clumsy valet and chambermaid, the mishaps of too loosely given ecclesiastics, the abuses of relics and pardons, the extortion, violence, and sometimes cowardice of the seigneur and the soldiery, the corruption of justice, its delays and its pompous apparatus, supply the subjects. The treatment is rather narrative than dramatic in most cases, as might be expected, but makes up by the liveliness of the dialogue for the deficiency of elaborately planned action and interest. All these forms, it will be observed, are directly or indirectly comic. Tragedy in the middle ages is represented only by the religious drama, except for a brief period towards the decline of that form, when the "profane" mysteries referred to above came to be represented. These were, however, rather "histories," in the Elizabethan sense, than tragedies proper.

Moralities.

Sotie.

Prose History.—In France, as in all other countries of whose literary developments we have any record, literature in prose is considerably later than literature in verse. We have certain glosses or vocabularies possibly dating as far back as the 8th or even the 7th century; we have the Strassburg oaths, already described, of the 9th, and a commentary

Early chronicles.

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on the prophet Jonas which is probably as early. In the 10th century there are some charters and muniments in the vernacular; of the 11th the laws of William the Conqueror are the most important document; while the *Assises de Jérusalem* of Godfrey of Bouillon date, though not in the form in which we now possess them, from the same age. The 12th century gives us certain translations of the Scriptures, and the remarkable Arthurian romances already alluded to; and thenceforward French prose, though long less favoured than verse, begins to grow in importance. History, as is natural, was the first subject which gave it a really satisfactory opportunity of developing its powers. For a time the French chroniclers contented themselves with Latin prose or with French verse, after the fashion of Wace and the Belgian, Philippe Mouskés (1215–1283). These, after a fashion universal in medieval times, began from fabulous or merely literary origins, and just as Wyntoun later carries back the history of Scotland to the terrestrial paradise, so does Mouskés start that of France from the rape of Helen. But soon prose chronicles, first translated, then original, became common; the earliest of all is said to have been that of the pseudo-Turpin, which thus recovered in prose the language which had originally clothed it in verse, and which, to gain a false appearance of authenticity, it had exchanged still earlier for Latin. Then came French selections and versions from the great series of historical compositions undertaken by the monks of St Denys, the so-called *Grandes Chroniques de France* from the date of 1274, when they first took form in the hands of a monk styled Primat, to the reign of Charles V., when they assumed the title just given. But the first really remarkable author who used French prose as a vehicle of historical expression is Geoffroi de Villehardouin, marshal of Champagne, who was born rather after the middle of the 12th century, and died in Greece in 1212. Under the title of *Conquête de Constantinople* Villehardouin has left us a history of the fourth crusade, which has been accepted by all competent judges as the best picture extant of feudal chivalry in its prime. The *Conquête de Constantinople* has been well called a chanson de geste in prose, and indeed in the surprising nature of the feats it celebrates, in the abundance of detail, and in the vivid and picturesque poetry of the narration, it equals the very best of the chansons. Even the repetition of the same phrases which is characteristic of epic poetry repeats itself in this epic prose; and as in the chansons so in Villehardouin, few motives appear but religious fervour and the love of fighting, though neither of these excludes a lively appetite for booty and a constant tendency to disunion and disorder. Villehardouin was continued by Henri de Valenciennes, whose work is less remarkable, and has more the appearance of a rhymed chronicle thrown into prose, a process which is known to have been actually applied in some cases. Nor is the transition from Villehardouin to Jean de Joinville (considerable in point of time, for Joinville was not born till ten years after Villehardouin's death) in point of literary history immediate. The rhymed chroniclers of Philippe Mouskés and Guillaume Guiart belong to this interval; and in prose the most remarkable works are the *Chronique de Reims*, a well-written history, having the interesting characteristics of taking the lay and popular side, and the great compilation edited (in the modern sense) by Baudouin d'Avesnes (1213–1280). Joinville (? 1224–1317), whose special subject is the Life of St Louis, is far more modern than even the half-century which separates him from Villehardouin would lead us to suppose. There is nothing of the knight-errant about him personally, notwithstanding his devotion to his hero. Our Lady of the Broken Lances is far from being his favourite saint. He is an admirable writer, but far less simple than Villehardouin; the good King Louis tries in vain to make him share his own rather high-flown devotion. Joinville is shrewd, practical, there is even a touch of the Voltairean about him; but he, unlike his predecessor, has political ideas and antiquarian curiosity, and his descriptions are often very creditable pieces of deliberate literature.

Villehardouin.

Joinville.

It is very remarkable that each of the three last centuries of feudalism should have had one specially and extraordinarily gifted chronicler to describe it. What Villehardouin is to the 12th and Joinville to the 13th century, that Jean Froissart (1337–1410) is to the 14th. His picture is the most famous as it is the most varied of the three, but it has special drawbacks as well as special merits. French critics have indeed been scarcely fair to Froissart, because of his early partiality to our own nation in the great quarrel of the time, forgetting that there was really no reason why he as a Hainaulter should take the French side. But there is no doubt that if the duty of an historian is to take in all the political problems of his time, Froissart certainly comes short of it. Although the feudal state in which knights and churchmen were alone of estimation was at the point of death, and though new orders of society were becoming important, though the distress and confusion of a transition state were evident to all, Froissart takes no notice of them. Society is still to him all knights and ladies, tournaments, skirmishes and feasts. He depicts these, not like Joinville, still less like Villehardouin, as a sharer in them, but with the facile and picturesque pen of a sympathizing literary onlooker. As the comparison of the *Conquête de Constantinople* with a chanson de geste is inevitable, so is that of Froissart's *Chronique* with a roman d'aventures.

Froissart.

For Provençal Literature see the separate article under that heading.

15th Century.—The 15th century holds a peculiar and somewhat disputed position in the history of French literature, as, indeed, it does in the history of the literature of all Europe, except Italy. It has sometimes been regarded as the final stage of the medieval period, sometimes as the earliest of the modern, the influence of the Renaissance in Italy already filtering through. Others again have taken the easy step of marking it as an age of transition. There is as usual truth in all these views. Feudality died with Froissart and Eustache Deschamps. The modern spirit can hardly be said to arise before Rabelais and Ronsard. Yet the 15th century, from the point of view of French literature, is much more remarkable than its historians have been wont to confess. It has not the strongly marked and compact originality of some periods, and it furnishes only one name of the highest order of literary interest; but it abounds in names of the second rank, and the very difference which exists between their styles and characters testifies to the existence of a large number of separate forces working in their different manners on different persons. Its theatre we have already treated by anticipation, and to it we shall afterwards recur. It was the palmy time of the early French stage, and all the dramatic styles which we have enumerated then came to perfection. Of no other kind of literature can the same be said. The century which witnessed the invention of printing naturally devoted itself at first more to the spreading of old literature than to the production of new. Yet as it perfected the early drama, so it produced the prose tale. Nor, as regards individual and single names, can the century of Charles d'Orléans, of Alain Chartier, of Christine de Pisan, of Coquillart, of Comines, and, above all, of Villon, be said to lack illustrations.

First among the poets of the period falls to be mentioned the shadowy personality of Olivier Basselin. Modern criticism has attacked the identity of the jovial miller, who was once supposed to have written and perhaps invented the songs called *vaux de vire*, and to have also carried on a patriotic warfare against the English. But though Jean le Houx may have written the poems published under Basselin's name two centuries later, it is taken as certain that an actual Olivier wrote actual vaux de vire at the beginning of the 15th century. About Christine de Pisan (1363–1430) and Alain Chartier (1392–*c.* 1430) there is no such doubt. Christine was the daughter of an Italian astrologer who was patronized by Charles V. She was born in Italy but brought up in France, and she enriched the literature of her adopted country with much learning, good sense and patriotism. She wrote history, devotional works and poetry; and though her literary merit is not of the highest, it is very far from despicable. Alain Chartier, best known to modern readers by

Christine de Pisan.

Alain Chartier.

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the story of *Margaret of Scotland's Kiss*, was a writer of a somewhat similar character. In both Christine and Chartier there is a great deal of rather heavy moralizing, and a great deal of rather pedantic erudition. But it is only fair to remember that the intolerable political and social evils of the day called for a good deal of moralizing, and that it was the function of the writers of this time to fill up as well as they could the scantily filled vessels of medieval science and learning. A very different person is Charles d'Orléans (1391–1465), one of the greatest of *grands seigneurs*, for he was the father of a king of France, and heir to the duchies of Orléans and Milan. Charles, indeed, if not a Roland or a Bayard, was an admirable poet. He is the best-known and perhaps the best writer of the graceful poems in which an artificial versification is strictly observed, and helps by its recurrent lines and modulated rhymes to give to poetry something of a musical accompaniment even without the addition of music properly so called. His ballades are certainly inferior to those of Villon, but his rondels are unequalled. For fully a century and a half these forms engrossed the attention of French lyrical poets. Exercises in them were produced in enormous numbers, and of an excellence which has only recently obtained full recognition even in France. Charles d'Orléans is himself sufficient proof of what can be done in them in the way of elegance, sweetness, and grace which some have unjustly called effeminacy. But that this effeminacy was no natural or inevitable fault of the ballades and the rondeaux was fully proved by the most remarkable literary figure of the 15th century in France. To François Villon (1431–1463?), as to other great single writers, no attempt can be made to do justice in this place. His remarkable life and character especially lie outside our subject. But he is universally recognized as the most important single figure of French literature before the Renaissance. His work is very strange in form, the undoubtedly genuine part of it consisting merely of two compositions, known as the great and little Testament, written in stanzas of eight lines of eight syllables each, with lyrical compositions in ballade and rondeau form interspersed. Nothing in old French literature can compare with the best of these, such as the "Ballade des dames du temps jadis," the "Ballade pour sa mère," "La Grosse Margot," "Les Regrets de la belle Heaulmière," and others; while the whole composition is full of poetical traits of the most extraordinary vigour, picturesqueness and pathos. Towards the end of the century the poetical production of the time became very large. The artificial measures already alluded to, and others far more artificial and infinitely less beautiful, were largely practised. The typical poet of the end of the 15th century is Guillaume Crétin (d. 1525), who distinguished himself by writing verses with punning rhymes, verses ending with double or treble repetitions of the same sound, and many other tasteless absurdities, in which, as Pasquier remarks, "il perdit toute la grâce et la liberté de la composition." The other favourite direction of the poetry of the time was a vein of allegorical moralizing drawn from the *Roman de la rose* through the medium of Chartier and Christine, which produced "Castles of Love," "Temples of Honour," and such like. The combination of these drifts in verse-writing produced a school known in literary history, from a happy phrase of the satirist Coquillart (*v. inf.*), as the "Grands Rhétoriqueurs." The chief of these besides Crétin were Jean Molinet (d. 1507); Jean Meschinot (*c.* 1420–1491), author of the *Lunettes des princes*; Florimond Robertet (d. 1522); Georges Chastellain (1404–1475), to be mentioned again; and Octavien de Saint-Gelais (1466–1502), father of a better poet than himself. Yet some of the minor poets of the time are not to be despised. Such are Henri Baude (1430–1490), a less pedantic writer than most, Martial d'Auvergne (1440–1508), whose principal work is *L'Amant rendu cordelier au service de l'amour*, and others, many of whom formed part of the poetical court which Charles d'Orléans kept up at Blois after his release.

Charles d'Orléans.

Villon.

Crétin.

While the serious poetry of the age took this turn, there was no lack of lighter and satirical verse. Villon, indeed, were it not for the depth and pathos of his poetical sentiment, might be claimed as a poet of the lighter order, and the patriotic diatribes against the English to which we have alluded easily passed into satire. The political quarrels of the latter part of the century also provoked much satirical composition. The disputes of the Bien Public and those between Louis XI. and Charles of Burgundy employed many pens. The most remarkable piece of the light literature of the first is "Les Ânes Volants," a ballad on some of the early favourites of Louis. The battles of France and Burgundy were waged on paper between Gilles des Ormes and the above-named Georges Chastelain, typical representatives of the two styles of 15th-century poetry already alluded to—Des Ormes being the lighter and more graceful writer, Chastelain a pompous and learned allegorist. The most remarkable representative of purely light poetry outside the theatre is Guillaume Coquillart (1421–1510), a lawyer of Champagne, who resided for the greater part of his life in Reims. This city, like others, suffered from the pitiless tyranny of Louis XI. The beginnings of the standing army which Charles VII. had started were extremely unpopular, and the use to which his son put them by no means removed this unpopularity. Coquillart described the military man of the period in his *Monologue du gendarme cassé*. Again, when the king entertained the idea of unifying the taxes and laws of the different provinces, Coquillart, who was named commissioner for this purpose, wrote on the occasion a satire called *Les Droits nouveaux*. A certain kind of satire, much less good-tempered than the earlier forms, became indeed common in this epoch. M. Lenient has well pointed out that a new satirical personification dominates this literature. It is no longer Renart with his cynical gaiety, or the curiously travestied and almost amiable Devil of the Middle Ages. Now it is Death as an incident ever present to the imagination, celebrated in the thousand repetitions of the *Danse Macabre*, sculptured all over the buildings of the time, even frequently performed on holidays and in public. With the usual tendency to follow pattern, the idea of the "dance" seems to have been extended, and we have a *Danse aux aveugles* (1464) from Pierre Michaut, where the teachers are fortune, love and death, all blind. All through the century, too, anonymous verse of the lighter kind was written, some of it of great merit. The folk-songs already alluded to, published by Gaston Paris, show one side of this composition, and many of the pieces contained in M. de Montaiglon's extensive *Recueil des anciennes poésies françaises* exhibit others.

Coquillart.

The 15th century was perhaps more remarkable for its achievements in prose than in poetry. It produced, indeed, no prose writer of great distinction, except Comines; but it witnessed serious, if not extremely successful, efforts at prose composition. The invention of printing finally substituted the reader for the listener, and when this substitution has been effected, the main inducement to treat unsuitable subjects in verse is gone. The study of the classics at first hand contributed to the same end. As early as 1458 the university of Paris had a Greek professor. But long before this time translations in prose had been made. Pierre Bercheure (Bersuire) (1290–1352) had already translated Livy. Nicholas Oresme (*c.* 1334–1382), the tutor of Charles V., gave a version of certain Aristotelian works, which enriched the language with a large number of terms, then strange enough, now familiar. Raoul de Fresles (1316–1383) turned into French the *De civilate Dei* of St Augustine. These writers or others composed *Le Songe du vergier*, an elaborate discussion of the power of the pope. The famous chancellor, Jean Charlier or Gerson (1363–1429), to whom the *Imitation* has among so many others been attributed, spoke constantly and wrote often in the vulgar tongue, though he attacked the most famous and popular work in that tongue, the *Roman de la rose*. Christine de Pisan and Alain Chartier were at least as much prose writers as poets; and the latter, while he, like Gerson, dealt much with the reform of the church, used in his *Quadrilogue invectif* really forcible language for the purpose of spurring on the nobles of France to put an end to her sufferings and evils. These moral and didactic treatises were but continuations of others, which for convenience sake we have hitherto left unnoticed. Though

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verse was in the centuries prior to the 15th the favourite medium for literary composition, it was by no means the only one; and moral and educational treatises—some referred to above—already existed in pedestrian phrase. Certain household books (*Livres de raison*) have been preserved, some of which date as far back as the 13th century. These contain not merely accounts, but family chronicles, receipts and the like. Accounts of travel, especially to the Holy Land, culminated in the famous *Voyage* of Mandeville which, though it has never been of so much importance in French as in English, perhaps first took vernacular form in the French tongue. Of the 14th century, we have a *Menagier de Paris*, intended for the instruction of a young wife, and a large number of miscellaneous treatises of art, science and morality, while private letters, mostly as yet unpublished, exist in considerable numbers, and are generally of the moralizing character; books of devotion, too, are naturally frequent.

But the most important divisions of medieval energy in prose composition are the spoken exercises of the pulpit and the bar.

Early sermon-writers.

The beginnings of French sermons have been much discussed, especially the question whether St Bernard, whose discourses we possess in ancient, but doubtfully contemporary French, pronounced them in that language or in Latin. Towards the end of the 12th century, however, the sermons of Maurice de Sully (1160–1196) present the first undoubted examples of homiletics in the vernacular, and they are followed by many others—so many indeed that the 13th century alone counts 261 sermon-writers, besides a large body of anonymous work. These sermons were, as might indeed be expected, chiefly cast in a somewhat scholastic form—theme, exordium, development, example and peroration following in regular order. The 14th-century sermons, on the other hand, have as yet been little investigated. It must, however, be remembered that this age was the most famous of all for its scholastic illustrations, and for the early vigour of the Dominican and Franciscan orders. With the end of the century and the beginning of the 15th, the importance of the pulpit begins to revive. The early years of the new age have Gerson for their representative, while the end of the century sees the still more famous names of Michel Menot (1450–1518), Olivier Maillard (*c.* 1430–1502), and Jean Rauhn (1443–1514), all remarkable for the practice of a vigorous and homely style of oratory, recoiling before no aid of what we should nowadays style buffoonery, and manifesting a creditable indifference to the indignation of principalities and powers. Louis XI. is said to have threatened to throw Maillard into the Seine, and many instances of the boldness of these preachers and the rough vigour of their oratory have been preserved. Froissart had been followed as a chronicler by Enguerrand de Monstrelet (*c.* 1390–1453) and by the historiographers of the Burgundian court, Chastelain, already mentioned, whole interesting *Chronique de Jacques de Lalaing* is much the most attractive part of his work, and Olivier de la Marche. The memoir and chronicle writers, who were to be of so much importance in French literature, also begin to be numerous at this period. Juvenal des Ursins (1388–1473), an anonymous bourgeois de Paris (two such indeed), and the author of the *Chronique scandaleuse*, may be mentioned as presenting the character of minute observation and record which has distinguished the class ever since. Jean le maire de (not *des*) Belges (1473–*c.* 1525) was historiographer to Louis XII. and wrote *Illustrations des Gaules*.

Comines.

But Comines (1445–1509) is no imitator of Froissart or of any one else. The last of the quartette of great French medieval historians, he does not yield to any of his three predecessors in originality or merit, but he is very different from them. He fully represents the mania of the time for statecraft, and his book has long ranked with that of Machiavelli as a manual of the art, though he has not the absolutely non-moral character of the Italian. His memoirs, considered merely as literature, show a style well suited to their purport,—not, indeed, brilliant or picturesque, but clear, terse and thoroughly well suited to the expression of the acuteness, observation and common sense of their author.

But prose was not content with the domain of serious literature. It had already long possessed a respectable position as a vehicle of romance, and the end of the 14th and the beginning of the 15th centuries were pre-eminently the time when the epics of chivalry were re-edited and extended in prose. Few, however, of these extensions offer much literary interest. On the other hand, the best prose of the century, and almost the earliest which deserves the title of a satisfactory literary medium, was employed for the telling of romances in miniature. The *Cent Nouvelles Nouvelles* is undoubtedly the first work of prose belles-lettres in French, and the first, moreover, of a long and most remarkable class of literary work in which French writers may challenge all comers with the certainty of victory—the short prose tale of a comic character. This remarkable work has usually been attributed, like the somewhat similar but later *Heptaméron*, to a knot of literary courtiers gathered round a royal personage, in this case the dauphin Louis, afterwards Louis XI. Some evidence has recently been produced which seems to show that this tradition, which attributed some of the tales to Louis himself, is erroneous, but the question is still undecided. The subjects of the *Cent Nouvelles Nouvelles* are by no means new. They are simply the old themes of the fabliaux treated in the old way. The novelty is in the application of prose to such a purpose, and in the crispness, the fluency and the elegance of the prose used. The fortunate author or editor to whom these admirable tales have of late been attributed is Antoine de la Salle (1398–1461), who, if this attribution and certain others be correct, must be allowed to be one of the most original and fertile authors of early French literature. La Salle's one acknowledged work is the story of *Petit Jehan de Saintré*, a short romance exhibiting great command of character and abundance of delicate draughtsmanship. To this not only the authorship, part-authorship or editorship of the *Cent Nouvelles Nouvelles* has been added; but the still more famous and important work of *L'Avocat Patelin* has been assigned by respectable, though of course conjecturing, authority to the same paternity. The generosity of critics towards La Salle has not even stopped here. A fourth masterpiece of the period, *Les Quinze Joies de mariage*, has also been assigned to him. This last work, like the other three, is satirical in subject, and shows for the time a wonderful mastery of the language. Of the fifteen joys of marriage, or, in other words, the fifteen miseries of husbands, each has a chapter assigned to it, and each is treated with the peculiar mixture of gravity and ridicule which it requires. All who have read the book confess its infinite wit and the grace of its style. It is true that it has been reproached with cruelty and with a lack of the moral sentiment. But humanity and morality were not the strong point of the 15th century. There is, it must be admitted, about most of its productions a lack of poetry and a lack of imagination, produced, it may be, partly by political and other conditions outside literature, but very observable in it. The old forms of literature itself had lost their interest, and new ones possessing strength to last and power to develop themselves had not yet appeared. It was impossible, even if the taste for it had survived, to spin out the old themes any longer. But the new forces required some time to set to work, and to avail themselves of the tremendous weapon which the press had put into their hands. When these things had adjusted themselves, literature of a varied and vigorous kind became once more possible and indeed necessary, nor did it take long to make its appearance.

The Cent Nouvelles Nouvelles.

Antoine de la Salle.

Influence of the Renaissance.

16th Century.—In no country was the literary result of the Renaissance more striking and more manifold than in France. The double effect of the study of antiquity and the religious movement produced an outburst of literary developments of the most diverse kinds, which even the fierce and sanguinary civil dissensions of the Reformation did not succeed in checking. While the Renaissance in Italy had mainly exhausted its effects by the middle of the 16th century, while in Germany those effects only paved the way for a national literature, and did not themselves greatly contribute thereto, while in England it was not

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till the extreme end of the period that a great literature was forthcoming—in France almost the whole century was marked by the production of capital works in every branch of literary effort. Not even the 17th century, and certainly not the 18th, can show such a group of prose writers and poets as is formed by Calvin, St Francis de Sales, Montaigne, du Vair, Bodin, d'Aubigné, the authors of the *Satire Ménippée*, Monluc, Brantôme, Pasquier, Rabelais, des Periers, Herberay des Essarts, Amyot, Garnier, Marot, Ronsard and the rest of the "Pléiade," and finally Regnier. These great writers are not merely remarkable for the vigour and originality of their thoughts, the freshness, variety and grace of their fancy, the abundance of their learning and the solidity of their arguments in the cases where argument is required. Their great merit is the creation of a language and a style able to give expression to these good gifts. The foregoing account of the medieval literature of France will have shown sufficiently that it is not lawful to despise the literary capacities and achievements of the older French. But the old language, with all its merits, was ill-suited to be a vehicle for any but the simpler forms of literary composition. Pleasant or affecting tales could he told in it with interest and pathos. Songs of charming *naïveté* and grace could be sung; the requirements of the epic and the chronicle were suitably furnished. But it was barren of the terms of art and science; it did not readily lend itself to sustained eloquence, to impassioned poetry or to logical discussion. It had been too long accustomed to leave these things to Latin as their natural and legitimate exponent, and it bore marks of its original character as a *lingua rustica*, a tongue suited for homely conversation, for folk-lore and for ballads, rather than for the business of the forum and the court, the speculations of the study, and the declamation of the theatre. Efforts had indeed been made, culminating in the heavy and tasteless erudition of the schools of Chartier and Crétin, to supply the defect; but it was reserved for the 16th century completely to efface it. The series of prose writers from Calvin to Montaigne, of poets from Marot to Regnier, elaborated a language yielding to no modern tongue in beauty, richness, flexibility and strength, a language which the reactionary purism of succeeding generations defaced rather than improved, and the merits of which have in still later days been triumphantly vindicated by the confession and the practice of all the greatest writers of modern France.

16th-Century Poetry.—The first few years of the 16th century were naturally occupied rather with the last developments of the medieval forms than with the production of the new model. The clerks of the Bazoche and the Confraternity of the Passion still produced and acted mysteries, moralities and farces. The poets of the "Grands Rhétoriqueurs" school still wrote elaborate allegorical poetry. Chansons de geste, rhymed romances and fabliaux had long ceased to be written. But the press was multiplying the contents of the former in the prose form which they had finally assumed, and in the *Cent Nouvelles Nouvelles* there already existed admirable specimens of the short prose tale. There even were signs, as in some writers already mentioned and in Roger de Collérye, a lackpenny but light-hearted singer of the early part of the century, of definite enfranchisement in verse. But the first note of the new literature was sounded by Clément Marot (1496?–1544). The son of an elder poet, Jehan des Mares called Marot (1463–1523), Clément at first wrote, like his father's contemporaries, allegorical and mythological poetry, afterwards collected in a volume with a charming title, *L'Adolescence clémentine*. It was not till he was nearly thirty years old that his work became really remarkable. From that time forward till his death, about twenty years afterwards, he was much involved in the troubles and persecutions of the Huguenot party to which he belonged; nor was the protection of Marguerite d'Angoulême, the chief patroness of Huguenots and men of letters, always efficient. But his troubles, so far from harming, helped his literary faculties; and his epistles, epigrams, *blasons* (descendants of the medieval *dits*), and *coq-à-l'âne* became remarkable for their easy and polished style, their light and graceful wit, and a certain elegance which had not as yet been even attempted in any modern tongue, though the Italian humanists had not been far from it in so far as of their Latin compositions. Around Marot arose a whole school of disciples and imitators, such as Victor Brodeau (1470?–1540), the great authority on rondeaux, Maurice Scève, a fertile author of blasons, Salel, Marguerite herself (1492–1540), of whom more hereafter, and Mellin de Saint Gelais (1491–1558). The last, son of the bishop named above, is a courtly writer of occasional pieces, who sustained as well as he could the *style marotique* against Ronsard, and who has the credit of introducing the regular sonnet into French. But the inventive vigour of the age was so great that one school had hardly become popular before another pushed it from its stool, and even of the Marotists just mentioned Scève and Salel are often regarded as chief and member respectively of a Lyonnese coterie, intermediate between the schools of Marot and of Ronsard, containing other members of repute such as Antoine Heroët and Charles Fontaine and claiming Louise Labé (*q. inf.*) herself. Pierre de Ronsard (1524–1585) was the chief of this latter. At first a courtier and a diplomatist, physical disqualification made him change his career. He began to study the classics under Jean Daurat (1508–1588), and with his master and five other writers, Étienne Jodelle (1532–1573), Rémy Belleau (1528–1577), Joachim du Bellay (1525–1560), Jean Antoine de Baïf (1532–1589), and Pontus de Tyard (d. 1605, bishop of Châlons-sur-Saône), composed the famous "Pléiade." The object of this hand was to bring the French language, in vocabulary, constructions and application, on a level with the classical tongues by borrowings from the latter. They would have imported the Greek licence of compound words, though the genius of the French language is but little adapted thereto; and they wished to reproduce in French the regular tragedy, the Pindaric and Horatian ode, the Virgilian epic, &c. But it is an error (though one which until recently was very common, and which perhaps requires pretty thorough study of their work completely to extirpate it) to suppose that they advocated or practised *indiscriminate* borrowing. On the contrary both in du Bellay's famous manifesto, the *Deffense et illustration de la langue française*, and in Ronsard's own work, caution and attention to the genius and the tradition of French are insisted upon. Being all men of the highest talent, and not a few of them men of great genius, they achieved much that they designed, and even where they failed exactly to achieve it, they very often indirectly produced results as important and more beneficial than those which they intended. Their ideal of a separate poetical language distinct from that intended for prose use was indeed a doubtful if not a dangerous one. But it is certain that Marot, while setting an example of elegance and grace not easily to be imitated, set also an example of trivial and, so to speak, pedestrian language which was only too imitable. If France was ever to possess a literature containing something besides fabliaux and farces, the tongue must be enriched and strengthened. This accession of wealth and vigour it received from Ronsard and the Ronsardists. Doubtless they went too far and provoked to some extent the reaction which Malherbe led. Their importations were sometimes unnecessary. It is almost impossible to read the *Franciade* of Ronsard, and not too easy to read the tragedies of Jodelle and Garnier, fine as the latter are in parts. But the best of Ronsard's sonnets and odes, the finest of du Bellay's *Antiquités de Rome* (translated into English by Spenser), the exquisite *Vanneur* of the same author, and the *Avril* of Belleau, even the finer passages of d'Aubigné and du Bartas, are not only admirable in themselves, and of a kind not previously found in French literature, but are also such things as could not have been previously found, for the simple reason that the medium of expression was wanting. They constructed that medium for themselves, and no force of the reaction which they provoked was able to undo their work. Adverse criticism and the natural course of time rejected much that they had added. The charming diminutives they loved so much went out of fashion; their compounds (sometimes it must be confessed, justly) had their letters of naturalization promptly cancelled; many a gorgeous adjective, including some which could trace

Marot.

Ronsard.

The Pléiade.

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their pedigree to the earliest ages of French literature, but which bore an unfortunate likeness to the new-comers, was proscribed. But for all that no language has ever had its destiny influenced more powerfully and more beneficially by a small literary clique than the language of France was influenced by the example and disciples of that Ronsard whom for two centuries it was the fashion to deride and decry.

In a sketch such as the present it is impossible to give a separate account of individual writers, the more important of whom will be found treated under their own names. The effort of the "Pléiade" proper was continued and shared by a considerable number of minor poets, some of them, as has been already noted, belonging to different groups and schools. Olivier de Magny (d. 1560) and Louise Labé (b. 1526) were poets and lovers, the lady deserving far the higher rank in literature. There is more depth of passion in the writings of "La Belle Cordière," as this Lyonnese poetess was called, than in almost any of her contemporaries. Jacques Tahureau (1527–1555) scarcely deserves to be called a minor poet. There is less than the usual hyperbole in the contemporary comparison of him to Catullus, and he reminds an Englishman of the school represented nearly a century later by Carew, Randolph and Suckling. The title of a part of his poem—*Mignardises amoureuses de l'admirée*—is characteristic both of the style and of the time. Jean Doublet (*c.* 1528–*c.*1580), Amadis Jamyn (*c.* 1530–1585), and Jean de la Taille (1540–1608) deserve mention at least as poets, but two other writers require a longer allusion. Guillaume de Salluste, seigneur du Bartas (1544–1590), whom Sylvester's translation, Milton's imitation, and the copious citations of Southey's *Doctor*, have made known if not familiar in England, was partly a disciple and partly a rival of Ronsard. His poem of *Judith* was eclipsed by his better-known *La Divine Sepmaine* or epic of the Creation. Du Bartas was a great user and abuser of the double compounds alluded to above, but his style possesses much stateliness, and has a peculiar solemn eloquence which he shared with the other French Calvinists, and which was derived from the study partly of Calvin and partly of the Bible. Théodore Agrippa d'Aubigné (1552–1630), like du Bartas, was a Calvinist. His genius was of a more varied character. He wrote sonnets and odes as became a Ronsardist, but his chief poetical work is the satirical poem of *Les Tragiques*, in which the author brands the factions, corruptions and persecutions of the time, and in which there are to be found alexandrines of a strength, vigour and original cadence hardly to be discovered elsewhere, save in Corneille and Victor Hugo. Towards the end of the century, Philippe Desportes (1546–1606) and Jean Bertaut (1552–1611), with much enfeebled strength, but with a certain grace, continue the Ronsardizing tradition. Among their contemporaries must be noticed Jean Passerat (1534–1602), a writer of much wit and vigour and rather resembling Marot than Ronsard, and Vauquelin de la Fresnaye (1536–1607), the author of a valuable *Art poëtica* and of the first French satires which actually bear that title. Jean le Houx (fl. *c.* 1600) continued, rewrote or invented the vaux de vire, commonly known as the work of Olivier Basselin, and already alluded to, while a still lighter and more eccentric verse style was cultivated by Étienne Tabourot des Accords (1549–1590), whose epigrams and other pieces were collected under odd titles, *Les Bigarrures*, *Les Touches*, &c. A curious pair are Guy du Faur de Pibrac (1529–1584) and Pierre Mathieu (b. 1563), authors of moral quatrains, which were learnt by heart in the schools of the time, replacing the distichs of the grammarian Cato, which, translated into French, had served the same purpose in the middle ages.

The Ronsardists.

Du Bartas.

D'Aubigné.

The nephew of Desportes, Mathurin Regnier (1573-1613), marks the end, and at the same time perhaps the climax, of the poetry of the century. A descendant at once of the older Gallic spirit of Villon and Marot, in virtue of his consummate acuteness, terseness and wit, of the school of Ronsard by his erudition, his command of language, and his scholarship, Regnier is perhaps the best representative of French poetry at the critical time when it had got together all its materials, had lost none of its native vigour and force, and had not yet submitted to the cramping and numbing rules and restrictions which the next century introduced. The satirical poems of Regnier, and especially the admirable epistle to Rapin, in which he denounces and rebuts the critical dogmas of Malherbe, are models of nervous strength, while some of the elegies and odes contain expression not easily to be surpassed of the softer feelings of affection and regret. No poet has had more influence on the revival of French poetry in the last century than Regnier, and he had imitators in his own time, the chief of whom was Courval-Sonnet (Thomas Sonnet, sieur de Courval) (1577–1635), author of satires of some value for the history of manners.

Regnier.

16th-Century Drama.—The change which dramatic poetry underwent during the 16th century was at least as remarkable as that undergone by poetry proper. The first half of the period saw the end of the religious mysteries, the licence of which had irritated both the parliament and the clergy. Louis XII., at the beginning of the century, was far from discouraging the disorderly but popular and powerful theatre in which the Confraternity of the Passion, the clerks of the Bazoche, and the Enfans sans souci enacted mysteries, moralities, soties and farces. He made them, indeed, an instrument in his quarrel with the papacy, just as Philippe le Bel had made use of the allegorical poems of Jehan de Meung and his fellows. Under his patronage were produced the chief works of Gringore or Gringoire (*c.* 1480–1547), by far the most remarkable writer of this class of composition. His *Prince des sots* and his *Mystère de St Louis* are among the best of their kind. An enormous volume of composition of this class was produced between 1500 and 1550. One morality by itself, *L'Homme juste et l'homme mondain*, contains some 36,000 lines. But in 1548, when the Confraternity was formally established in the Hôtel de Bourgogne, leave to play sacred subjects was expressly refused it. Moralities and soties dragged on under difficulties till the end of the century, and the farce, which is immortal, continually affected comedy. But the effect of the Renaissance was to sweep away all other vestiges of the medieval drama, at least in the capital. An entirely new class of subjects, entirely new modes of treatment, and a different kind of performers were introduced. The change naturally came from Italy. In the close relationship with that country which France had during the early years of the century, Italian translations of the classical masterpieces were easily imported. Soon French translations were made afresh of the *Electra*, the *Hecuba*, the *Iphigenia in Aulis*, and the French humanists hastened to compose original tragedies on the classical model, especially as exhibited in the Latin tragedian Seneca. It was impossible that the "Pléiade" should not eagerly seize such an opportunity of carrying out its principles, and one of its members, Jodelle (1532–1573), devoting himself mainly to dramatic composition, fashioned at once the first tragedy, *Cléopâtre*, and the first comedy, *Eugène*, thus setting the example of the style of composition which for two centuries and a half Frenchmen were to regard as the highest effort of literary ambition. The amateur performance of these dramas by Jodelle and his friends was followed by a Bacchic procession after the manner of the ancients, which caused a great deal of scandal, and was represented by both Catholics and Protestants as a pagan orgy. The *Cléopâtre* is remarkable as being the first French tragedy, nor is it destitute of merit. It is curious that in this first instance the curt antithetic στιχομυθία, which was so long characteristic of French plays and plays imitated from them, and which Butler ridicules in his *Dialogue of Cat and Puss*, already appears. There appears also the grandiose and smooth but stilted declamation which came rather from the imitation of Seneca than of Sophocles, and the tradition of which was never to be lost. *Cléopâtre* was followed by *Didon*, which, unlike its predecessor, is entirely in alexandrines, and observes the regular alternation of masculine and feminine rhymes. Jodelle was followed by Jacques Grévin (1540?–1570) with a *Mort de César*, which shows an improvement in tragic art, and two still better comedies, *Les Ébahis* and *La Trésorière* by Jean de la Taille (1540–1608), who made still further progress

Regular tragedy and comedy.

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towards the accepted French dramatic pattern in his *Saul furieux* and his *Corrivaux*, Jacques, his brother (1541–1562), and Jean de la Péruse (1529–1554), who wrote a *Médée*. A very different poet from all these is Robert Garnier (1545–1601). Garnier is the first tragedian who deserves a place not too far below Rotrou, Corneille, Racine, Voltaire and Hugo, and who may be placed in the same class with them. He chose his subjects indifferently from classical, sacred and medieval literature. *Sédécie*, a play dealing with the capture of Jerusalem by Nebuchadnezzar, is held to be his masterpiece, and *Bradamante* deserves notice because it is the first tragi-comedy of merit in French, and because the famous confidant here makes his first appearance. Garnier's successor, Antoine de Monchrétien or Montchrestien (*c.* 1576–1621), set the example of dramatizing contemporary subjects. His masterpiece is *L'Écossaise*, the first of many dramas on the fate of Mary, queen of Scots. While tragedy thus clings closely to antique models, comedy, as might be expected in the country of the fabliaux, is more independent. Italy had already a comic school of some originality, and the French farce was too vigorous and lively a production to permit of its being entirely overlooked. The first comic writer of great merit was Pierre Larivey (*c.* 1550–*c.* 1612), an Italian by descent. Most if not all of his plays are founded on Italian originals, but the translations or adaptations are made with the greatest freedom, and almost deserve the title of original works. The style is admirable, and the skilful management of the action contrasts strongly with the languor, the awkward adjustment, and the lack of dramatic interest found in contemporary tragedians. Even Molière found something to use in Larivey.

Garnier.

Larivey.

16th-Century Prose Fiction.—Great as is the importance of the 16th century in the history of French poetry, its importance in the history of French prose is greater still. In poetry the middle ages could fairly hold their own with any of the ages that have succeeded them. The epics of chivalry, whether of the cycles of Charlemagne, Arthur, or the classic heroes, not to mention the miscellaneous romans d'aventures, have indeed more than held their own. Both relatively and absolutely the *Franciade* of the 16th century, the *Pucelle* of the 17th, the *Henriade* of the 18th, cut a very poor figure beside *Roland* and *Percivale*, *Gerard de Roussillon*, and *Parthenopex de Blois*. The romances, ballads and pastourelles, signed and unsigned, of medieval France were not merely the origin, but in some respects the superiors, of the lyric poetry which succeeded them. Thibaut de Champagne, Charles d'Orléans and Villon need not veil their crests in any society of bards. The charming forms of the rondel, the rondeau and the ballade have won admiration from every competent poet and critic who has known them. The fabliaux give something more than promise of La Fontaine, and the two great compositions of the *Roman du Renart* and the *Roman de la rose*, despite their faults and their alloy, will always command the admiration of all persons of taste and judgment who take the trouble to study them. But while poetry had in the middle ages no reason to blush for her French representatives, prose (always the younger and less forward sister) had far less to boast of. With the exception of chronicles and prose romances, no prose works of any real importance can be quoted before the end of the 15th century, and even then the chief if not the only place of importance must be assigned to the *Cent Nouvelles Nouvelles*, a work of admirable prose, but necessarily light in character, and not yet demonstrating the efficacy of the French language as a medium of expression for serious and weighty thought. Up to the time of the Renaissance and the consequent reformation, Latin had, as we have already remarked, been considered the sufficient and natural organ for this expression. In France as in other countries the disturbance in religious thought may undoubtedly claim the glory of having repaired this disgrace of the vulgar tongue, and of having fitted and taught it to express whatever thoughts the theologian, the historian, the philosopher, the politician and the savant had occasion to utter. But the use of prose as a vehicle for lighter themes was more continuous with the literature that preceded, and serves as a natural transition from poetry and the drama to history and science. Among the prose writers, therefore, of the 16th century we shall give the first place to the novelists and romantic writers.

Among these there can be no doubt of the precedence, in every sense of the word, of François Rabelais (*c.* 1490–1553), the one French writer (or with Molière one of the two) whom critics the least inclined to appreciate the characteristics of French literature have agreed to place among the few greatest of the world. With an immense erudition representing almost the whole of the knowledge of his time, with an untiring faculty of invention, with the judgment of a philosopher, and the common sense of a man of the world, with an observation that let no characteristic of the time pass unobserved, and with a tenfold portion of the special Gallic gift of good-humoured satire, Rabelais united a height of speculation and depth of insight and a vein of poetical imagination rarely found in any writer, but altogether portentous when taken in conjunction with his other characteristics. His great work has been taken for an exercise of transcendental philosophy, for a concealed theological polemic, for an allegorical history of this and that personage of his time, for a merely literary utterance, for an attempt to tickle the popular ear and taste. It is all of these, and it is none—all of them in parts, none of them in deliberate and exclusive intention. It may perhaps be called the exposition and commentary of all the thoughts, feelings, aspirations and knowledge of a particular time and nation put forth in attractive literary form by a man who for once combined the practical and the literary spirit, the power of knowledge and the power of expression. The work of Rabelais is the mirror of the 16th century in France, reflecting at once its comeliness and its uncomeliness, its high aspirations, its voluptuous tastes, its political and religious dissensions, its keen criticism, its eager appetite and hasty digestion of learning, its gleams of poetry, and its ferocity of manners. In Rabelais we can divine the "Pléiade" and Marot, the *Cymbalum mundi* and Montaigne, Amyot and the *Amadis*, even Calvin and Duperron.

Rabelais.

It was inevitable that such extraordinary works as *Gargantua* and *Pantagruel* should attract special imitators in the direction of their outward form. It was also inevitable that this imitation should frequently fix upon these Rabelaisian characteristics which are least deserving of imitation, and most likely to be depraved in the hands of imitators. It fell within the plan of the master to indulge in what has been called *fatrasie*, the huddling together, that is to say, of a medley of language and images which is best known to English readers in the not always successful following of Sterne. It pleased him also to disguise his naturally terse, strong and nervous style in a burlesque envelope of redundant language, partly ironical, partly the result of superfluous erudition, and partly that of a certain childish wantonness and exuberance, which is one of his raciest and pleasantest characteristics. In both these points he was somewhat corruptly followed. But fortunately the romancinical writers of the 16th century had not Rabelais for their sole model, but were also influenced by the simple and straightforward style of the *Cent Nouvelles Nouvelles*. The joint influence gives us some admirable work. Nicholas of Troyes, a saddler of Champagne, came too early (his *Grand Parangon des nouvelles nouvelles* appeared in 1536) to copy Rabelais. But Noël du Fail (d. *c.* 1585?), a judge at Rennes, shows the double influence in his *Propos rustiques* and *Contes d'Eutrapel*, both of which, especially the former, are lively and well-written pictures of contemporary life and thought, as the country magistrate actually saw and dealt with them. In 1558, however, appeared two works of far higher literary and social interest. These are the *Heptaméron* of the queen of Navarre, and the *Contes et joyeux devis* of Bonaventure des Periers (*c.* 1500–1544). Des Periers, who was a courtier of Marguerite's, has sometimes been thought to have had a good deal to do with the first-named work as well as with the second, and was also the author of a curious Lucianic satire, strongly sceptical in cast, the *Cymbalum mundi*. Indeed, not merely

Des Periers.

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the queen's prose works, but also the poems gracefully entitled *Les Marguerites de la Marguerite*, are often attributed to the literary men whom the sister of Francis I. gathered round her. However this may be, some single influence of power enough to give unity and distinctness of savour evidently presided over the composition of the *Heptaméron*.

The Heptaméron.

Composed as it is on the model of Boccaccio, its tone and character are entirely different, and few works have a more individual charm. The *Tales* of des Periers are shorter, simpler and more homely; there is more wit in them and less refinement. But both works breathe, more powerfully perhaps than any others, the peculiar mixture of cultivated and poetical voluptuousness with a certain religiosity and a vigorous spirit of action which characterizes the French Renaissance. Later in time, but too closely connected with Rabelais in form and spirit to be here omitted, came the *Moyen de parvenir* of Béroalde de Verville (1558?–1612?), a singular *fatrasie*, uniting wit, wisdom, learning and indecency, and crammed with anecdotes which are always amusing though rarely decorous.

At the same time a fresh vogue was given to the chivalric romance by Herberay's translation of *Amadis de Gaula*. French writers have supposed a French original for the *Amadis* in some lost roman d'aventures. It is of course impossible to say that this is not the case, but there is not one tittle of evidence to show that it is. At any rate the adventures of Amadis were prolonged in Spanish through generation after generation of his descendants. This vast work Herberay des Essarts in 1540 undertook to translate or re-translate, but it was not without the assistance of several followers that the task was completed. Southey has charged Herberay with corrupting the simplicity of the original, a charge which does not concern us here. It is sufficient to say that the French *Amadis* is an excellent piece of literary work, and that Herberay deserves no mean place among the fathers of French prose. His book had an immense popularity; it was translated into many foreign languages, and for some time it served as a favourite reading book for foreigners studying French. Nor is it to be doubted that the romancers of the Scudéry and Calprenède type in the next century were much more influenced both for good and harm by these Amadis romances than by any of the earlier tales of chivalry.

Amadis of Gaul.

16th-Century Historians.—As in the case of the tale-tellers, so in that of the historians, the writers of the 16th century had traditions to continue. It is doubtful indeed whether many of them can risk comparison as artists with the great names of Villehardouin and Joinville, Froissart and Comines. The 16th century, however, set the example of dividing the functions of the chronicler, setting those of the historian proper on one side, and of the anecdote-monger and biographer on the other. The efforts at regular history made in this century were not of the highest value. But on the other hand the practice of memoir-writing, in which the French were to excel every nation in the world, and of literary correspondence, in which they were to excel even their memoirs, was solidly founded.

One of the earliest historical writers of the century was Claude de Seyssel (1450–1520), whose history of Louis XII. aims not unsuccessfully at style. De Thou (1553–1617) wrote in Latin, but Bernard de Girard, sieur du Haillan (1537–1610), composed a *Histoire de France* on Thucydidean principles as transmitted through the successive mediums of Polybius, Guicciardini and Paulus Aemilius. The instance invariably quoted, after Thierry, of du Haillan's method is his introduction, with appropriate speeches, of two Merovingian statesmen who argue out the relative merits of monarchy and oligarchy on the occasion of the election of Pharamond. Besides du Haillan, la Popelinière (*c.* 1540–1608), who less ambitiously attempted a history of Europe during his own time, and expended immense labour on the collection of information and materials, deserves mention.

There is no such poverty of writers of memoirs. Robert de la Mark, du Bellay, Marguerite de Valois (the youngest or third Marguerite, first wife of Henri IV., 1553–1615), Villars, Tavannes, La Tour d'Auvergne, and many others composed commentaries and autobiographies. The well-known and very agreeable *Histoire du gentil seigneur de Bayart* (1524) is by an anonymous "Loyal Serviteur." Vincent Carloix (fl. 1550), the secretary of the marshal de Vieilleville, composed some memoirs abounding in detail and incident. The *Lettres* of Cardinal d'Ossat (1536–1604) and the *Négociations* of Pierre Jeannin (1540–1622) have always had a high place among documents of their kind. But there are four collections of memoirs concerning this time which far exceed all others in interest and importance. The turbulent dispositions of the time, the loose dependence of the nobles and even the smaller gentry on any single or central authority, the rapid changes of political situations, and the singularly active appetite, both for pleasure and for business, for learning and for war, which distinguished the French gentleman of the 16th century, place the memoirs of François de Lanoue (1531–1591), Blaise de Mon[t]luc (1503–1577), Agrippa d'Aubigné and Pierre de Bourdeille[s] Brantôme (1540–1614) almost at the head of the literature of their class. The name of Brantôme is known to all who have the least tincture of French literature, and the works of the others are not inferior in interest, and perhaps superior in spirit and conception, to the *Dames Galantes*, the *Grands Capitaines* and the *Hommes illustres*. The commentaries of Montluc, which Henri Quatre is said to have called the soldier's Bible, are exclusively military and deal with affairs only. Montluc was governor in Guienne, where he repressed the savage Huguenots of the south with a savagery worse than their own. He was, however, a partisan of order, not of Catholicism. He hung and shot both parties with perfect impartiality, and refused to have anything to do with the massacre of St Bartholomew. Though he was a man of no learning, his style is excellent, being vivid, flexible and straightforward. Lanoue, who was a moderate in politics, has left his principles reflected in his memoirs. D'Aubigné, so often to be mentioned, gives the extreme Huguenot side as opposed to the royalist partisanship of Montluc and the *via media* of Lanoue. Brantôme, on the other hand, is quite free from any political or religious prepossessions, and, indeed, troubles himself very little about any such matters. He is the shrewd and somewhat cynical observer, moving through the crowd and taking note of its ways, its outward appearance, its heroisms and its follies. It is really difficult to say whether the recital of a noble deed of arms or the telling of a scandalous story about a court lady gave him the most pleasure, and impossible to say which he did best. Certainly he had ample material for both exercises in the history of his time.

Brantôme.

The branches of literature of which we have just given an account may be fairly connected, from the historical point of view, with work of the same kind that went before as well as with work of the same kind that followed them. It was not so with the literature of theology, law, politics and erudition, which the 16th century also produced, and with which it for the first time enlarged the range of composition in the vulgar tongue. Not only had Latin been invariably adopted as the language of composition on such subjects, but the style of the treatises dealing with such matters had been traditional rather than original. In speculative philosophy or metaphysics proper even this century did not witness a great development; perhaps, indeed, such a development was not to be expected until the minds of men had in some degree settled down from their agitation on more practical matters. It is not without significance that Calvin (1509–1564) is the great figure in serious French prose in the first half of the century, Montaigne the corresponding figure in the second half. After Calvin and Montaigne we expect Descartes.

16th-Century Theologians.—In France, as in all other countries, the Reformation was an essentially popular movement, though from special causes, such as the absence of political homogeneity, the nobles took a more active part both with pen and sword in it than was the case in England. But the great textbook of the French Reformation was not the work of any noble. Jean Calvin's *Institution of the Christian Religion*

Calvin.

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is a book equally remarkable in matter and in form, in circumstances and in result. It is the first really great composition in argumentative French prose. Its severe logic and careful arrangement had as much influence on the manner of future thought, both in France and the other regions whither its widespread popularity carried it, as its style had on the expression of such thought. It was the work of a man of only seven-and-twenty, and it is impossible to exaggerate the originality of its manner when we remember that hardly any models of French prose then existed except tales and chronicles, which required and exhibited totally different qualities of style. It is indeed probable that had not the *Institution* been first written by its author in Latin, and afterwards translated by him, it might have had less dignity and vigour; but it must at the same time be remembered that this process of composition was at least equally likely, in the hands of any but a great genius, to produce a heavy and pedantic style neither French nor Latin in character. Something like this result was actually produced in some of Calvin's minor works, and still more in the works of many of his followers, whose lumbering language gained for itself, in allusion to their exile from France, the title of "style refugié." Nevertheless, the use of the vulgar tongue on the Protestant side, and the possession of a work of such importance written therein, gave the Reformers an immense advantage which their adversaries were some time in neutralizing. Even before the *Institution*, Lefèvre d'Étaples (1455–1537) and Guillaume Farel (1489–1565) saw and utilized the importance of the vernacular. Calvin (1509–1564) was much helped by Pierre Viret (1511–1571), who wrote a large number of small theological and moral dialogues, and of satirical pamphlets, destined to captivate as well as to instruct the lower people. The more famous Beza (Théodore de Bèze) (1519–1605) wrote chiefly in Latin, but he composed in French an ecclesiastical history of the Reformed churches and some translations of the Psalms. Marnix de Sainte Aldegonde (1530–1593), a gentleman of Brabant, followed Viret as a satirical pamphleteer on the Protestant side. On the other hand, the Catholic champions at first affected to disdain the use of the vulgar tongue, and their pamphleteers, when they did attempt it, were unequal to the task. Towards the end of the century a more decent war was waged with Philippe du Plessis Mornay (1549–1623) on the Protestant side, whose work is at least as much directed against freethinkers and enemies of Christianity in general as against the dogmas and discipline of Rome. His adversary, the redoubtable Cardinal du Perron (1556–1618), who, originally a Calvinist, went over to the other side, employed French most vigorously in controversial works, chiefly with reference to the eucharist. Du Perron was celebrated as the first controversialist of the time, and obtained dialectical victories over all comers. At the same time the bishop of Geneva, St Francis of Sales (1567–1622), supported the Catholic side, partly by controversial works, but still more by his devotional writings. The *Introduction to a Devout Life*, which, though actually published early in the next century, had been written some time previously, shares with Calvin's *Institution* the position of the most important theological work of the period, and is in remarkable contrast with it in style and sentiment as well as in principles and plan. It has indeed been accused of a certain effeminacy, the appearance of which is in all probability mainly due to this very contrast. The 16th century does not, like the 17th, distinguish itself by literary exercises in the pulpit. The furious preachers of the League, and their equally violent opponents, have no literary value.

16th-Century Moralists and Political Writers.—The religious dissensions and political disturbances of the time could not fail to exert an influence on ethical and philosophical thought. Yet, as we have said, the century was not prolific of pure philosophical speculation. The scholastic tradition, though long sterile, still survived, and with it the habit of composing in Latin all works in any way connected with philosophy. The *Logic* of Ramus in 1555 is cited as the first departure from this rule. Other philosophical works are few, and chiefly express the doubt and the freethinking which were characteristic of the time. This doubt assumes the form of positive religious scepticism only in the *Cymbalum mundi* of Bonaventure des Periers, a remarkable series of dialogues which excited a great storm, and ultimately drove the author to commit suicide. The *Cymbalum mundi* is a curious anticipation of the 18th century. The literature of doubt, however, was to receive its principal accession in the famous essays of Michel Eyguem, seigneur de Montaigne (1533–1592). It would be a mistake to imagine the existence of any sceptical propaganda in this charming and popular book. Its principle is not scepticism but egotism; and as the author was profoundly sceptical, this quality necessarily rather than intentionally appears. We have here to deal only very superficially with this as with other famous books, but it cannot be doubted that it expresses the mental attitude of the latter part of the century as completely as Rabelais expresses the mental attitude of the early part. There is considerably less vigour and life in this attitude. Inquiry and protest have given way to a placid conviction that there is not much to be found out, and that it does not much matter; the erudition though abundant is less indiscriminate, and is taken in and given out with less gusto; exuberant drollery has given way to quiet irony; and though neither business nor pleasure is decried, both are regarded rather as useful pastimes incident to the life of man than with the eager appetite of the Renaissance. From the purely literary point of view, the style is remarkable from its absence of pedantry in construction, and yet for its rich vocabulary and picturesque brilliancy. The follower and imitator of Montaigne, Pierre Charron (1541–1603), carried his master's scepticism to a somewhat more positive degree. His principal book, *De la sagesse*, scarcely deserves the comparative praise which Pope has given it. On the other hand Guillaume du Vair (1556–1621), a lawyer and orator, takes the positive rather than the negative side in morality, and regards the vicissitudes in human affairs from the religious and theological point of view in a series of works characterized by the special merit of the style of great orators.

Montaigne.

The revolutionary and innovating instinct which showed itself in the 16th century with reference to church government and doctrine spread naturally enough to political matters. The intolerable disorder of the religious wars naturally set the thinkers of the age speculating on the doctrines of government in general. The favourite and general study of antiquity helped this tendency, and the great accession of royal power in all the monarchies of Europe invited a speculative if not a practical reaction. The persecutions of the Protestants naturally provoked a republican spirit among them, and the violent antipathy of the League to the houses of Valois and Bourbon made its partisans adopt almost openly the principles of democracy and tyrannicide.

The greatest political writer of the age is Jean Bodin (1530–1596), whose *République* is founded partly on speculative considerations like the political theories of the ancients, and partly on an extended historical inquiry. Bodin, like most lawyers who have taken the royalist side, is for unlimited monarchy, but notwithstanding this, he condemns religious persecution and discourages slavery. In his speculations on the connexion between forms of government and natural causes, he serves as a link between Aristotle and Montesquieu. On the other hand, the causes which we have mentioned made a large number of writers adopt opposite conclusions. Étienne de la Boétie (1530–1563), the friend of Montaigne's youth, composed the *Contre un* or *Discours de la servitude volontaire*, a protest against the monarchical theory. The boldness of the protest and the affectionate admiration of Montaigne have given la Boétie a much higher reputation than any extant work of his actually deserves. The *Contre un* is a kind of prize essay, full of empty declamation borrowed from the ancients, and showing no grasp of the practical conditions of politics. Not much more historically based, but far more vigorous and original, is the *Franco-Gallia* of François Hotmann (1524–1590), a work which appeared both in Latin and French, which extols the authority of the states-general, represents them as direct successors of the political institutions of Gauls and Franks, and maintains the

Bodin.

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right of insurrection. In the last quarter of the century political animosity knew no bounds. The Protestants beheld a divine instrument in Poltrot de Méré, the Catholics in Jacques Clément. The Latin treatises of Hubert Languet (1518–1581) and Buchanan formally vindicated—the first, like Hotmann, the right of rebellion based on an original contract between prince and people, the second the right of tyrannicide. Indeed, as Montaigne confesses, divine authorization for political violence was claimed and denied by both parties according as the possession or the expectancy of power belonged to each, and the excesses of the preachers and pamphleteers knew no bounds.

Every one, however, was not carried away. The literary merits of the chancellor Michel de l'Hôpital (1507–1573) are not very great, but his efforts to promote peace and moderation were unceasing. On the other side Lanoue, with far greater literary gifts, pursued the same ends, and pointed out the ruinous consequences of continued dissension. Du Plessis Mornay took a part in political discussion even more important than that which he bore in religious polemics, and was of the utmost service to Henri Quatre in defending his cause against the League, as was also Hurault, another author of state papers. Du Vair, already mentioned, powerfully assisted the same cause by his successful defence of the Salic law, the disregard of which by the Leaguer states-general was intended to lead to the admission of the Spanish claim to the crown. But the foremost work against the League was the famous *Satire Ménippée* (1594), in a literary point of view one of the most remarkable of political books. The *Ménippée* was the work of no single author, but was due, it is said, to the collaboration of five, Pierre Leroi, who has the credit of the idea, Jacques Gillot, Florent Chrétien, Nicolas Rapin (1541–1596) and Pierre Pithou (1539–1596), with some assistance in verse from Passerat and Gilles Durand. The book is a kind of burlesque report of the meeting of the states-general, called for the purpose of supporting the views of the League in 1593. It gives an account of the procession of opening, and then we have the supposed speeches of the principal characters—the duc de Mayenne, the papal legate, the rector of the university (a ferocious Leaguer) and others. But by far the most remarkable is that attributed to Claude d'Aubray, the leader of the *Tiers État*, and said to be written by Pithou, in which all the evils of the time and the malpractices of the leaders of the League are exposed and branded. The satire is extraordinarily bitter and yet perfectly good-humoured. It resembles in character rather that of Butler, who unquestionably imitated it, than any other. The style is perfectly suited to the purpose, having got rid of almost all vestiges of the cumbrousness of the older tongue without losing its picturesque quaintness. It is no wonder that, as we are told by contemporaries, it did more for Henri Quatre than all other writings in his cause. In connexion with politics some mention of legal orators and writers may be necessary. In 1539 the ordinance of Villers-Cotterets enjoined the exclusive use of the French language in legal procedure. The bar and bench of France during the century produced, however, besides those names already mentioned in other connexions, only one deserving of special notice, that of Étienne Pasquier (1529–1615), author of a celebrated speech against the right of the Jesuits to take part in public teaching. This he inserted in his great work, *Recherches de la France*, a work dealing with almost every aspect of French history whether political, antiquarian or literary.

Satire Ménippée.

16th-Century Savants.—One more division, and only one, that of scientific and learned writers pure and simple, remains. Much of the work of this kind during the period was naturally done in Latin, the vulgar tongue of the learned. But in France, as in other countries, the study of the classics led to a vast number of translations, and it so happened that one of the translators deserves as a prose writer a rank among the highest. Many of the authors already mentioned contributed to the literature of translation. Des Periers translated the Platonic dialogue *Lysis*, la Boétie some works of Xenophon and Plutarch, du Vair the *De corona*, the *In Ctesiphontem* and the *Pro Milone*. Salel attempted the *Iliad*, Belleau the false *Anacreon*, Baif some plays of Plautus and Terence. Besides these Lefèvre d'Étaples gave a version of the Bible, Saliat one of Herodotus, and Louis Leroi (1510–1577), not to be confounded with the part author of the *Ménippée*, many works of Plato, Aristotle and other Greek writers. But while most if not all of these translators owed the merits of their work to their originals, and deserved, much more deserve, to be read only by those to whom those originals are sealed, Jacques Amyot (1513–1593), bishop of Auxerre, takes rank as a French classic by his translations of Plutarch, Longus and Heliodorus. The admiration which Amyot excited in his own time was immense. Montaigne declares that it was thanks to him that his contemporaries knew how to speak and to write, and the Academy in the next age, though not too much inclined to honour its predecessors, ranked him as a model. His Plutarch, which had an enormous influence at the time, and coloured perhaps more than any classic the thoughts and writings of the 16th century, both in French and English, was then considered his masterpiece. Nowadays perhaps, and from the purely literary standpoint, that position would be assigned to his exquisite version of the exquisite story of Daphnis and Chloe. It is needless to say that absolute fidelity and exact scholarship are not the pre-eminent merits of these versions. They are not philological exercises, but works of art.

Amyot.

On the other hand, Claude Fauchet (1530–1601) in two antiquarian works, *Antiquités gauloises et françoises* and *L'Origine de la langue et de la poésie françoise*, displays a remarkable critical faculty in sweeping away the fables which had encumbered history. Fauchet had the (for his time) wonderful habit of consulting manuscripts, and we owe to him literary notices of many of the trouvères. At the same time François Grudé, sieur de la Croix du Maine (1552–1592), and Antoine Duverdier (1544–1600) founded the study of bibliography in France. Pasquier's *Recherches*, already alluded to, carries out the principles of Fauchet independently, and besides treating the history of the past in a true critical spirit, supplies us with voluminous and invaluable information on contemporary politics and literature. He has, moreover, the merit which Fauchet had not, of being an excellent writer. Henri Estienne [Stephanus] (1528–1598) also deserves notice in this place, both for certain treatises on the French language, full of critical crotchets, and also for his curious *Apologie pour Hérodote*, a remarkable book not at all unlikely to class. It consists partly of a defence of its nominal subject, partly of satirical polemics on the Protestant side, and is filled almost equally with erudition and with the buffoonery and *fatrasie* of the time. The book, indeed, was much too Rabelaisian to suit the tastes of those in whose defence it was composed.

The 16th century is somewhat too early for us to speak of science, and such science as was then composed falls for the most part outside French literature. The famous potter, Bernard Palissy (1510–1590), however, was not much less skilful as a fashioner of words than as a fashioner of pots, and his description of the difficulties of his experiments in enamelling, which lasted sixteen years, is well known. The great surgeon Ambrose Paré (*c.* 1510–1590) was also a writer, and his descriptions of his military experiences at Turin, Metz and elsewhere have all the charm of the 16th-century memoir. The only other writers who require special mention are Olivier de Serres (1539–1619), who composed, under the title of *Théâtre d'agriculture*, a complete treatise on the various operations of rural economy, and Jacques du Fouilloux (1521–1580), who wrote on hunting (*Art Vénerie*). Both became extremely popular and were frequently reprinted.

17th-Century Poetry.—It is not always easy or possible to make the end or the beginning of a literary epoch synchronize exactly with historical dates. It happens, however, that for once the beginning of the 17th century coincides almost exactly with an entire revolution in French literature. The change of direction and of critical standard given by François de Malherbe (1556–1628) to poetry was to last for two whole

Malherbe.

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centuries, and to determine, not merely the language and complexion, but also the form of French verse during the whole of that time. Accidentally, or as a matter of logical consequence (it would not be proper here to attempt to decide the question), poetry became almost synonymous with drama. It is true, as we shall have to point out, that there were, in the early part of the 17th century at least, poets, properly so called, of no contemptible merit. But their merit, in itself respectable, sank in comparison with the far greater merit of their dramatic rivals. Théophile de Viau and Racan, Voiture and Saint-Amant cannot for a moment be mentioned in the same rank with Corneille. It is certainly curious, if it is not something more than curious, that this decline in poetry proper should have coincided with the so-called reforms of Malherbe. The tradition of respect for this elder and more gifted Ronsard was at one time all-powerful in France, and, notwithstanding the Romantic movement, is still strong. In rejecting a large number of the importations of the Ronsardists, he certainly did good service. But it is difficult to avoid ascribing in great measure to his influence the origin of the chief faults of modern French poetry, and modern French in general, as compared with the older language. He pronounced against "poetic diction" as such, forbade the overlapping (*enjambement*) of verse, insisted that the middle pause should be of sense as well as sound, and that rhyme must satisfy eye as well as ear. Like Pope, he sacrificed everything to "correctness," and, unluckily for French, the sacrifice was made at a time when no writer of an absolutely supreme order had yet appeared in the language. With Shakespeare and Milton, not to mention scores of writers only inferior to them, safely garnered, Pope and his followers could do us little harm. Corneille and Molière unfortunately came after Malherbe. Yet it would be unfair to this writer, however badly we may think of his influence, to deny him talent, and even a certain amount of poetical inspiration. He had not felt his own influence, and the very influences which he despised and proscribed produced in him much tolerable and some admirable verse, though he is not to be named as a poet with Regnier, who had the courage, the sense and the good taste to oppose and ridicule his innovations. Of Malherbe's school, Honorat de Bueil, marquis de Racan (1589–1670), and François de Maynard (1582–1646) were the most remarkable. The former was a true poet, though not a very strong one. Like his master, he is best when he follows the models whom that master contemned. Perhaps more than any other poet, he set the example of the classical alexandrine, the smooth and melodious but monotonous and rather effeminate measure which Racine was to bring to the highest perfection, and which his successors, while they could not improve its smoothness, were to make more and more monotonous until the genius of Victor Hugo once more broke up its facile polish, supplied its stiff uniformity, and introduced vigour, variety, colour and distinctness in the place of its feeble sameness and its pale indecision. But the vigour, not to say the licence, of the 16th century could not thus die all at once. In Théophile de Viau (1591–1626) the early years of the 17th century had their Villon. The later poet was almost as unfortunate as the earlier, and almost as disreputable, but he had a great share of poetical and not a small one of critical power. The *Ode ensragée* under which he complains that he was born was at least kind to him in this respect, and his readers, after he had been forgotten for two centuries, have once more done him justice. Racan and Théophile were followed in the second quarter of the century by two schools which sufficiently well represented the tendencies of each. The first was that of Vincent Voiture (1598–1648), Isaac de Benserade (1612–1691), and other poets such as Claude de Maleville (1597–1647), author of *La Belle Matineuse*, who were connected more or less with the famous literary coterie of the Hôtel de Rambouillet. Théophile was less worthily succeeded by a class, it can hardly be called a school of poets, some of whom, like Gérard Saint-Amant (1594–1660), wrote drinking songs of merit and other light pieces; others, like Paul Scarron (1610–1660) and Sarrasin (1603? 4? 5?–1654), devoted themselves rather to burlesque of serious verse. Most of the great dramatic authors of the time also wrote miscellaneous poetry, and there was even an epic school of the most singular kind, in ridiculing and discrediting which Boileau for once did undoubtedly good service. The *Pucelle* of Jean Chapelain (1595–1674), the unfortunate author who was deliberately trained and educated for a poet, who enjoyed for some time a sort of dictatorship in French literature on the strength of his forthcoming work, and at whom from the day of its publication every critic of French literature has agreed to laugh, was the most famous and perhaps the worst of these. But Georges de Scudéry (1601–1667) wrote an *Alaric*, the Père le Moyne (1602–1671) a *Saint Louis*, Jean Desmarets de Saint-Sorlin (1595–1676), a dramatist and critic of some note, a *Clovis*, and Saint-Amant a *Moïse*, which were not much better, though Théophile Gautier in his *Grotesques* has valiantly defended these and other contemporary versifiers. And indeed it cannot be denied that even the epics, especially *Saint Louis*, contain flashes of finer poetry than France was to produce for more than a century outside of the drama. Some of the lighter poets and classes of poetry just alluded to also produced some remarkable verse. The *Précieuses* of the Hôtel Rambouillet, with all their absurdities, encouraged if they did not produce good literary work. In their society there is no doubt that a great reformation of manners took place, if not of morals, and that the tendency to literature elegant and polished, yet not destitute of vigour, which marks the 17th century, was largely developed side by side with much scandal-mongering and anecdotage. Many of the authors whom these influences inspired, such as Voiture, Saint-Evremond and others, have been or will be noticed. But even such poets and wits as Antoine Baudouin de Sénecé (1643–1737), Jean de Segrais (1624–1701), Charles Faulure de Ris, sieur de Charleval (1612–1693), Antoine Godeau (1605–1672), Jean Ogier de Gombaud (1590–1666), are not without interest in the history of literature; while if Charles Cotin (1604–1682) sinks below this level and deserves Molière's caricature of him as Trissotin in *Les Femmes savantes*, Gilles de Ménage (1630–1692) certainly rises above it, notwithstanding the companion satire of Vadius. Ménage's name naturally suggests the *Ana* which arose at this time and were long fashionable, stores of endless gossip, sometimes providing instruction and often amusement. The *Guirlande de Julie*, in which most of the poets of the time celebrated Julie d'Angennes, daughter of the marquise de Rambouillet, is perhaps the best of all such albums, and Voiture, the typical poet of the coterie, was certainly the best writer of *vers de société* who is known to us. The poetical war which arose between the Uranistes, the followers of Voiture, and the Jobistes, those of Benserade, produced reams of sonnets, epigrams and similar verses. This habit of occasional versification continued long. It led as a less important consequence to the rhymed *Gazettes* of Jean Loret (d. 1665), which recount in octosyllabic verse of a light and lively kind the festivals and court events of the early years of Louis XIV. It led also to perhaps the most remarkable non-dramatic poetry of the century, the *Contes* and *Fables* of Jean de la Fontaine (1621–1695). No French writer is better known than la Fontaine, and there is no need to dilate on his merits. It has been well said that he completes Molière, and that the two together give something to French literature which no other literature possesses. Yet la Fontaine is after all only a writer of fabliaux, in the language and with the manners of his own century.

All the writers we have mentioned belong more or less to the first half of the century, and so do Valentin Conrart (1603–1675), Antoine Furetière (1626–1688), Chapelle (Claude Emmanuel) l'Huillier (1626–1686), and others not worth special mention. The latter half of the century is far less productive, and the poetical quality of its production is even lower than the quantity. In it Boileau (1636–1711) is the chief poetical figure. Next to him can only be mentioned Madame Deshoulières (1638–1694), Guillaume de Brébeuf (1618–1661), the translator of Lucan, Philippe Quinault (1635–1688), the composer of opera libretti. Boileau's satire, where it has much merit, is usually borrowed direct from Horace. He had a certain faculty as a critic of the slashing order, and might have profitably used it if he had written in prose. But of his poetry it must be said, not so much that it is

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bad, as that it is not, in strictness, poetry at all, and the same is generally true of all those who followed him.

17th-Century Drama.—We have already seen how the medieval theatre was formed, and how in the second half of the 16th century it met with a formidable rival in the classical drama of Jodelle and Garnier. In 1588 mysteries had been prohibited, and with the prohibition of the mysteries the Confraternity of the Passion lost the principal part of its reason for existence. The other bodies and societies of amateur actors had already perished, and at length the Hôtel de Bourgogne itself, the home of the confraternity, had been handed over to a regular troop of actors, while companies of strollers, whose life has been vividly depicted in the *Roman comique* of Scarron and the *Capitaine Fracasse* of Théophile Gautier, wandered all about the provinces. The old farce was for a time maintained or revived by Tabarin, a remarkable figure in dramatic history, of whom but little is known. The great dramatic author of the first quarter of the 17th century was Alexandre Hardy (1569–1631), who surpassed even Heywood in fecundity, and very nearly approached the portentous productiveness of Lope de Vega. Seven hundred is put down as the modest total of Hardy's pieces, but not much more than a twentieth of these exist in print. From these latter we can judge Hardy. They are hardly up to the level of the worst specimens of the contemporary Elizabethan theatre, to which, however, they bear a certain resemblance. Marston's *Insatiate Countess* and the worst parts of Chapman's *Bussy d'Amhois* may give English readers some notion of them. Yet Hardy was not totally devoid of merit. He imitated and adapted Spanish literature, which was at this time to France what Italian was in the century before and English in the century after, in the most indiscriminate manner. But he had a considerable command of grandiloquent and melodramatic expression, a sound theory if not a sound practice of tragic writing, and that peculiar knowledge of theatrical art and of the taste of the theatrical public which since his time has been the special possession of the French playwright. It is instructive to compare the influence of his irregular and faulty genius with that of the regular and precise Malherbe. From Hardy to Rotrou is, in point of literary interest, a great step, and from Rotrou to Corneille a greater. Yet the theory of Hardy only wanted the genius of Rotrou and Corneille to produce the latter. Jean de Rotrou (1610–1650) has been called the French Marlowe, and there is a curious likeness and yet a curious contrast between the two poets. The best parts of Rotrou's two best plays, *Venceslas* and *St Genest*, are quite beyond comparison in respect of anything that preceded them, and the central speech of the last-named play will rank with anything in French dramatic poetry. Contemporary with Rotrou were other dramatic writers of considerable dramatic importance, most of them distinguished by the faults of the Spanish school, its declamatory rodomontade, its conceits, and its occasionally preposterous action. Jean de Schélandre (d. 1635) has left us a remarkable work in *Tyr et Sidon*, which exemplifies in practice, as its almost more remarkable preface by François Ogier defends in principle, the English-Spanish model. Théophile de Viau in *Pyrame et Thisbé* and in *Pasiphaé* produced a singular mixture of the classicism of Garnier and the extravagancies of Hardy. Scudéry in *L'Amour tyrannique* and other plays achieved a considerable success. The *Marianne* of Tristan (1601–1655) and the *Sophonisbe* of Jean de Mairet (1604–1686) are the chief pieces of their authors. Mairet resembles Marston in something more than his choice of subject. Another dramatic writer of some eminence is Pierre du Ryer (1606–1648). But the fertility of France at this moment in dramatic authors was immense; nearly 100 are enumerated in the first quarter of the century. The early plays of Pierre Corneille (1606–1684) showed all the faults of his contemporaries combined with merits to which none of them except Rotrou, and Rotrou himself only in part, could lay claim. His first play was *Mélite*, a comedy, and in *Clitandre*, a tragedy, he soon produced what may perhaps be not inconveniently taken as the typical piece of the school of Hardy. A full account of Corneille may be found elsewhere. It is sufficient to say here that his importance in French literature is quite as great in the way of influence and example as in the way of intellectual excellence. The *Cid* and the *Menteur* are respectively the first examples of French tragedy and comedy which can be called modern. But this influence and example did not at first find many imitators. Corneille was a member of Richelieu's band of five poets. Of the other four Rotrou alone deserves the title; the remaining three, the prolific abbé de Boisrobert, Guillaume Colletet (whose most valuable work, a MS. *Lives of Poets*, was never printed, and burnt by the Communards in 1871), and Claude de Lestoile (1597–1651), are as dramatists worthy of no notice, nor were they soon followed by others more worthy. Yet before many years had passed the examples which Corneille had set in tragedy and in comedy were followed up by unquestionably the greatest comic writer, and by one who long held the position of the greatest tragic writer of France. Beginning with mere farces of the Italian type, and passing from these to comedies still of an Italian character, it was in *Les Précieuses ridicules*, acted in 1659, that Molière (1622–1673), in the words of a spectator, hit at last on "la bonne comédie." The next fifteen years comprise the whole of his best known work, the finest expression beyond doubt of a certain class of comedy that any literature has produced. The tragic masterpieces of Racine (1639–1699) were not far from coinciding with the comic masterpieces of Molière, for, with the exception of the remarkable aftergrowth of *Esther* and *Athalie*, they were produced chiefly between 1667 and 1677. Both Racine and Molière fall into the class of writers who require separate mention. Here we can only remark that both to a certain extent committed and wittingly engaged a fault which distinguishes much subsequent French dramatic literature. This was the too great individualizing of one point in a character, and the making the man or woman nothing but a blunderer, a lover, a coxcomb, a tyrant and the like. The very titles of French plays show this influence—they are *Le Grondeur*, *Le Joueur*, &c. The complexity of human character is ignored. This fault distinguishes both Molière and Racine from writers of the very highest order; and in especial it distinguishes the comedy of Molière and the tragedy of Racine from the comedy and tragedy of Shakespeare. In all probability this and other defects of the French drama (which are not wholly apparent in the work of Molière and Corneille, are shown in their most favourable light in those of Racine, and appear in all their deformity in the successors of the latter) arise from the rigid adoption of the Aristotelian theory of the drama with its unities and other restrictions, especially as transmitted by Horace through Boileau. This adoption was very much due to the influence of the French Academy, which was founded unofficially by Conrart in 1629, which received official standing six years later, and which continued the tradition of Malherbe in attempting constantly to school and correct, as the phrase went, the somewhat disorderly instincts of the early French stage. Even the *Cid* was formally censured for irregularity by it. But it is fair to say that François Hédélin, abbé d'Aubignac (1604–1676), whose *Pratique du théâtre* is the most wooden of the critical treatises of the time, was not an academician. It is difficult to say whether the subordination of all other classes of composition to the drama, which has ever since been characteristic of French literature, was or was not due to the predilection of Richelieu, the main protector if not exactly the founder of the Academy, for the theatre. Among the immediate successors and later contemporaries of the three great dramatists we do not find any who deserve high rank as tragedians, though there are some whose comedies are more than respectable. It is at least significant that the restrictions imposed by the academic theory on the comic drama were far less severe than those which tragedy had to undergo. The latter was practically confined, in respect of sources of attraction, to the dexterous manipulation of the unities; the interest of a plot attenuated as much as possible, and intended to produce, instead of pity a mild sympathy, and instead of terror a mild alarm (for the purists decided against Corneille that "admiration was not

Hardy.

Molière.

Racine.

Rotrou.

Corneille.

The Academy.

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a tragic passion "); and lastly the composition of long tirades of smooth but monotonous verses, arranged in couplets tipped with delicately careful rhymes. Only Thomas Corneille (1625–1709), the inheritor of an older tradition and of a great name, deserves to be excepted from the condemnation to be passed on the lesser tragedians of this period. He was unfortunate in possessing his brother's name, and in being, like him, too voluminous in his compositions; but *Camma, Ariane, Le Comte d'Essex*, are not tragedies to be despised. On the other hand, the names of Jean de Campistron (1656–1723) and Nicolas Pradon (1632–1698) mainly serve to point injurious comparisons; Joseph François Duché (1668–1704) and Antoine La Fosse (1653–1708) are of still less importance, and Quinault's tragedies are chiefly remarkable because he had the good sense to give up writing them and to take to opera. The general excellence of French comedy, on the other hand, was sufficiently vindicated. Besides the splendid sum of Molière's work, the two great tragedians had each, in *Le Menteur* and *Les Plaideurs*, set a capital example to their successors, which was fairly followed. David Augustin de Brueys (1640–1723) and Jean Palaprat (1650–1721) brought out once more the ever new *Advocat Patelin* besides the capital *Grondeur* already referred to. Quinault and Campistron wrote fair comedies. Florent Carton Dancourt (1661–1726), Charles Rivière Dufresny (*c.* 1654–1724), Edmond Boursault (1638–1701), were all comic writers of considerable merit. But the chief comic dramatist of the latter part of the 17th century was Jean François Regnard (1655–1709), whose *Joueur* and *Légataire* are comedies almost of the first rank.

17th-Century Fiction.—In the department of literature which comes between poetry and prose, that of romance-writing, the 17th century, excepting one remarkable development, was not very fertile. It devoted itself to so many new or changed forms of literature that it had no time to anticipate the modern novel. Yet at the beginning of the century one very curious form of romance-writing was diligently cultivated, and its popularity, for the time immense, prevented the introduction of any stronger style. It is remarkable that, as the first quarter of the 17th century was pre-eminently the epoch of Spanish influence in France, the distinctive satire of Cervantes should have been less imitated than the models which Cervantes satirized. However this may be, the romances of 1600 to 1650 form a class of literature vast, isolated, and, perhaps, of all such classes of literature most utterly obsolete and extinct. Taste, affectation or antiquarian diligence have, at one time or another, restored to a just, and sometimes a more than just, measure of reputation most of the literary relics of the past. Romances of chivalry, fabliaux, early drama, Provençal poetry, prose chronicles, have all had, and deservedly, their rehabilitators. But *Polexandre* and *Cléopâtre*, *Clélie* and the *Grand Cyrus*, have been too heavy for all the industry and energy of literary antiquarians. As we have already hinted, the nearest ancestry which can be found for them is the romances of the *Amadis* type. But the *Amadis*, and in a less degree its followers, although long, are long in virtue of incident. The romances of the *Clélie* type are long in virtue of interminable discourse, moralizing and description. Their manner is not unlike that of the *Arcadia* and the *Euphues* which preceded them in England; and they express in point of style the tendency which simultaneously manifested itself all over Europe at this period, and whose chief exponents were Gongora in Spain, Marini in Italy, and Lyly in England. Everybody knows the *Carte de Tendre* which originally appeared in *Clélie*, while most people have heard of the shepherds and shepherdesses who figure in the *Astrée* of Honoré D'Urfé (1568–1625), on the borders of the Lignon; but here general knowledge ends, and there is perhaps no reason why it should go much further. It is sufficient to say that Madeleine de Scudéry (1607–1701) principally devotes herself in the books above mentioned to laborious gallantry and heroism, La Calprénède (1610–1663) in *Cassandre et Cléopâtre* to something which might have been the historical novel if it had been constructed on a less preposterous scale, and Marin le Roy de Gomberville (1600–1647) in *Polexandre* to moralizings and theological discussions on Jansenist principles, while Pierre Camus, bishop of Belley (1582–1652), in *Palombe* and others, approached still nearer to the strictly religious story. In the latter part of the century, the example of La Fontaine, though he himself wrote in poetry, helped to recall the tale-tellers of France to an occupation more worthy of them, more suitable to the genius of the literature, and more likely to last. The reaction against the *Clélie* school produced first Madame de Villedieu (Cathérine Desjardins) (1632–1692), a fluent and facile novelist, who enjoyed great but not enduring popularity. The form which the prose tale took at this period was that of the fairy story. Perrault (1628–1703) and Madame d'Aulnoy (d. 1705) composed specimens of this kind which have never ceased to be popular since. Hamilton (1646–1720), the author of the well-known *Mémoires du comte de Gramont*, wrote similar stories of extraordinary merit in style and ingenuity. There is yet a third class of prose writing which deserves to be mentioned. It also may probably be traced to Spanish influence, that is to say, to the picaresque romances which the 16th and 17th centuries produced in Spain in large numbers. The most remarkable example of this is the *Roman comique* of the burlesque writer Scarron. The *Roman bourgeois* of Antoine Furetière (1619–1688) also deserves mention as a collection of pictures of the life of the time, arranged in the most desultory manner, but drawn with great vividness, observation and skill. A remarkable writer who had great influence on Molière has already been mentioned in this connexion rather than in any other. This is Cyrano de Bergerac (1619–1655), who, besides composing doubtful comedies and tragedies, writing political pamphlets, and exercising the task of literary criticism in objecting to Scarron's burlesques, produced in his *Histoires comiques des états et empires de la lune et du soleil*, half romantic and half satirical compositions, in which some have seen the original of *Gulliver's Travels*, in which others have discovered only a not very successful imitation of Rabelais, and which, without attempting to decide these questions, may fairly be ranked in the same class of fiction with the masterpieces of Swift and Rabelais, though of course at an immense distance below them. One other work, and in literary influence perhaps the most remarkable of its kind in the century, remains. Madame de Lafayette, Marie de la Vergne (1634–1692), the friend of La Rochefoucauld and of Madame de Sévigné, though she did not exactly anticipate the modern novel, showed the way to it in her stories, the principal of which are *Zaïde* and still more *La Princesse de Clèves*. The latter, though a long way from *Manon Lescaut*, *Clarissa*, or *Tom Jones*, is a longer way still from *Polexandre* or the *Arcadia*. The novel becomes in it no longer a more or less fictitious chronicle, but an attempt at least at the display of character. *La Princesse de Clèves* has never been one of the works widely popular out of their own country, nor perhaps does it deserve such popularity, for it has more grace than strength; but as an original effort in an important direction its historical value is considerable. But with this exception, the art of fictitious prose composition, except on a small scale, is certainly not one in which the century excelled, nor are any of the masterpieces which it produced to be ranked in this class.

Heroic Romance.

17th-Century Prose.—If, however, this was the case, it cannot be said that French prose as a whole was unproductive at this time. On the contrary, it was now, and only now, that it attained the strength and perfection for which it has been so long renowned, and which has perhaps, by a curious process of compensation, somewhat deteriorated since the restoration of poetry proper in France. The prose Malherbe of French literature was Jean Guez de Balzac (1594–1654). The writers of the 17th century had practically created the literary language of prose, but they had not created a prose style. The charm of Rabelais, of Amyot, of Montaigne, and of the numerous writers of tales and memoirs whom we have noticed, was a charm of exuberance, of naïveté, of picturesque effect—in short, of a mixture of poetry and prose, rather than of prose proper. Sixteenth-century French prose is a delightful instrument in the hands of men and women of genius, but in the hands of those who have not genius it is full

J. G. de Balzac and modern French prose.

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of defects, and indeed is nearly unreadable. Now, prose is essentially an instrument of all work. The poet who has not genius had better not write at all; the prose writer often may and sometimes must dispense with this qualification. He has need, therefore, of a suitable machine to help him to perform his task, and this machine it is the glory of Balzac to have done more than any other person to create. He produced himself no great work, his principal writings being letters, a few discourses and dissertations, and a work entitled *Le Socrate chrétien*, a sort of treatise on political theology. But if the matter of his work is not of the first importance, its manner is of a very different value. Instead of the endless diffuseness of the preceding century, its ill-formed or rather unformed sentences, and its haphazard periods, we find clauses, sentences and paragraphs distinctly planned, shaped and balanced, a cadence introduced which is rhythmical but not metrical, and, in short, prose which is written knowingly instead of the prose which is unwittingly talked. It has been well said of him that he "*écrit pour écrire*"; and such a man, it is evident, if he does nothing else, sets a valuable example to those who write because they have something to say. Voiture seconded Balzac without much intending to do so. His prose style, also chiefly contained in letters, is lighter than that of his contemporary, and helped to gain for French prose the tradition of vivacity and sparkle which it has always possessed, as well as that of correctness and grace.

17th-Century History.—In historical composition, especially in the department of memoirs, this period was exceedingly rich. At last there was written, in French, an entire history of France. The author was François Eudes de Mézeray (1610–1683), whose work, though not exhibiting the perfection of style at which some of his contemporaries had already arrived, and though still more or less uncritical, yet deserves the title of history. The example was followed by a large number of writers, some of extended works, some of histories in part. Mézeray himself is said to have had a considerable share in the *Histoire du roi Henri le grand* by the archbishop Péréfixe (1605–1670); Scipion Mainteuong (1636–1680) wrote histories of the Crusades and of the League; Paul Pellisson (1624–1693) gave a history of Louis XIV. and a more valuable *Mémoire* in defence of the superintendent Fouquet. Still later in the century, or at the beginning of the next, the Père d'Orléans (1644–1698) wrote a history of the revolutions of England, the Père Daniel (1649–1728), like d'Orléans a Jesuit, composed a lengthy history of France and a shorter one on the French military forces. Finally, at the end of the period, comes the great ecclesiastical history of Claude Fleury (1640–1723), a work which perhaps belongs more to the section of erudition than to that of history proper. Three small treatises, however, composed by different authors towards the middle part of the century, supply remarkable instances of prose style in its application to history. These are the *Conjurations du comte de Fiesque*, written by the famous Cardinal de Retz (1613–1679), the *Conspiration de Walstein* of Sarrasin, and the *Conjuration des Espagnols contre Venise*, composed in 1672 by the abbé de Saint-Réal (1639–1692), the author of various historical and critical works deserving less notice. These three works, whose similarity of subject and successive composition at short intervals leave little doubt that a certain amount of intentional rivalry animated the two later authors, are among the earliest and best examples of the monographs for which French, in point of grace of style and lucidity of exposition, has long been the most successful vehicle of expression among European languages. Among other writers of history, as distinguished from memoirs, need only be noticed Agrippa d'Aubigné, whose *Histoire universelle* closed his long and varied list of works, and Varillas (1624–1696), a historian chiefly remarkable for his extreme untrustworthiness. In point of memoirs and correspondence the period is hardly less fruitful than that which preceded it. The *Régistres-Journaux* of Pierre de l'Étoile (1540–1611) consist of a diary something of the Pepys character, kept for nearly forty years by a person in high official employment. The memoirs of Sully (1560–1641), published under a curious title too long to quote, date also from this time. Henri IV. himself has left a considerable correspondence, which is not destitute of literary merit, though not equal to the memoirs of his wife. What are commonly called Richelieu's *Memoirs* were probably written to his order; his *Testament politique* may be his own. Henri de Rohan (1579–1638) has not memoirs of the first value. Both this and earlier times found chronicle in the singular *Historiettes* of Gédéon Tallemant des Réaux (1619–1690), a collection of anecdotes, frequently scandalous, reaching from the times of Henri IV. to those of Louis XIV., to which may be joined the letters of Guy Patin (1602–1676). The early years of the latter monarch and the period of the Fronde had the cardinal de Retz himself, than whom no one was certainly better qualified for historian, not to mention a crowd of others, of whom we may mention Madame de Motteville (1621–1689), Jean Hérault de Gourville (1625–1703), Mademoiselle de Montpensier ("La Grande Mademoiselle") (1627–1693), Conrart, Turenne and Mathieu Molé (1584–1653), François du Val, marquis de Fontenay-Mareuil (1594–1665), Arnauld d'Andilly (1588–1670). From this time memoirs and memoir writers were ever multiplying. The queen of them all is Madame de Sevigné (1626–1696), on whom, as on most of the great and better-known writers whom we have had and shall have to mention, it is impossible here to dwell at length. The last half of the century produced crowds of similar but inferior writers. The memoirs of Roger de Bussy-Rabutin (1618–1693) (author of a kind of scandalous chronicle called *Histoire amoureuse des Gaules*) and of Madame de Maintenon (1635–1719) perhaps deserve notice above the others. But this was in truth the style of composition in which the age most excelled. Memoir-writing became the occupation not so much of persons who made history, as was the case from Comines to Retz, as of those who, having culture, leisure and opportunity of observation, devoted themselves to the task of recording the deeds of others, and still more of regarding the incidents of the busy, splendid and cultivated if somewhat frivolous world of the court, in which, from the reign of Louis XIV.'s majority, the political life of the nation and almost its whole history were centred. Many, if not most, of these writers were women, who thus founded the celebrity of the French lady for managing her mother-tongue, and justified by results the taste and tendencies of the blue-stockings and précieuses of the Hôtel Rambouillet and similar coteries. The life which these writers saw before them furnished them with a subject to be handled with the minuteness and care to which they had been accustomed in the ponderous romances of the *Clélie* type, but also with the wit and terseness hereditary in France, and only temporarily absent in those ponderous compositions. The efforts of Balzac and the Academy supplied a suitable language and style, and the increasing tendency towards epigrammatic moralizing, which reached its acme in La Rochefoucauld (1663–1680) and La Bruyère (1630–1696), added in most cases point and attractiveness to their writings.

17th-Century Philosophers and Theologians.—To these moralists we might, perhaps, not inappropriately pass at once. But it seems better to consider first the philosophical and theological developments of the age, which must share with its historical experiences and studies the credit of producing these writers. Philosophy proper, as we have already had occasion to remark, had hitherto made no use of the vulgar tongue. The 16th century had contributed a few vernacular treatises on logic, a considerable body of political and ethical writing, and a good deal of sceptical speculation of a more or less vague character, continued into our present epoch by such writers as François de la Mothe le Vayer (1588–1672), the last representative of the orthodox doubt of Montaigne and Charron. But in metaphysics proper it had not dabbled. The 17th century, on the contrary, was to produce in René Descartes (1596–1650), at once a master of prose style, the greatest of French philosophers, and one of the greatest metaphysicians, not merely of France and of the 17th century, but of all countries and times. Even before Descartes there had been considerable and important developments of metaphysical speculation in France. The first eminent philosopher of French birth was Pierre Gassendi (1592–

Descartes.

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1655). Gassendi devoted himself to the maintenance of a modernized form of the Epicurean doctrines, but he wrote mainly, if not entirely, in Latin. Another sceptical philosopher of a less scientific character was the physicist Gabriel Naudé (1600–1653), who, like many others of the philosophers of the time, was accused of atheism. But as none of these could approach Descartes in philosophical power and originality, so also none has even a fraction of his importance in the history of French literature. Descartes stands with Plato, and possibly Berkeley and Malebranche, at the head of all philosophers in respect of style; and in his case the excellence is far more remarkable than in others, inasmuch as he had absolutely no models, and was forced in a great degree to create the language which he used. The *Discours de la méthode* is not only one of the epoch-making books of philosophy, it is also one of the epoch-making books of French style. The tradition of his clear and perfect expression was taken up, not merely by his philosophical disciples, but also by Blaise Pascal (1623–1662) and the school of Port Royal, who will be noticed presently. The very genius of the Cartesian philosophy was intimately connected with this clearness, distinctness and severity of style; and there is something more than a fanciful contrast between these literary characteristics of Descartes, on the one hand, and the elaborate splendour of Bacon, the knotty and crabbed strength of Hobbes, and the commonplace and almost vulgar slovenliness of Locke. Of the followers of Descartes, putting aside the Port Royalists, by far the most distinguished, both in philosophy and in literature,

Malebranche.

is Nicolas Malebranche (1638–1715). His *Recherche de la vérité*, admirable as it is for its subtlety and its consecutiveness of thought, is equally admirable for its elegance of style. Malebranche cannot indeed, like his great master, claim absolute originality. But his excellence as a writer is as great as, if not greater than, that of Descartes, and the *Recherche* remains to this day the one philosophical treatise of great length and abstruseness which, merely as a book, is delightful to read—not like the works of Plato and Berkeley, because of the adventitious graces of dialogue or description, but from the purity and grace of the language, and its admirable adjustment to the purposes of the argument. Yet, for all this, philosophy hardly flourished in France. It was too intimately connected with theological and ecclesiastical questions, and especially with Jansenism, to escape suspicion and persecution. Descartes himself was for much of his life an exile in Holland and Sweden; and though the unquestionable orthodoxy of Malebranche, the strongly religious cast of his works, and the remoteness of the abstruse region in which he sojourned from that of the controversies of the day, protected him, other followers of Descartes were not so fortunate. Holland, indeed, became a kind of city of refuge for students of philosophy, though even in Holland itself they were by no means entirely safe from persecution. By far the most remarkable of French philosophical

Bayle.

sojourners in the Netherlands was Pierre Bayle (1647–1706), a name not perhaps of the first rank in respect of literary value, but certainly of the first as regards literary influence. Bayle, after oscillating between the two confessions, nominally remained a Protestant in religion. In philosophy he in the same manner oscillated between Descartes and Gassendi, finally resting in an equally nominal Cartesianism. Bayle was, in fact, both in philosophy and in religion, merely a sceptic, with a scepticism at once like and unlike that of Montaigne, and differenced both by temperament and by circumstance—the scepticism of the mere student, exercised more or less in all histories, sciences and philosophies, and intellectually unable or unwilling to take a side. His style is hardly to be called good, being diffuse and often inelegant. But his great dictionary, though one of the most heterogeneous and unmethodical of compositions, exercised an enormous influence. It may be called the Bible of the 18th century, and contains in the germ all the desultory philosophy, the ill-ordered scepticism, and the critical but negatively critical acuteness of the *Aufklärung*.

We have said that the philosophical, theological and moral tendencies of the century, which produced, with the exception of its dramatic triumphs, all its greatest literary works, are almost inextricably intermingled. Its earliest years, however, bear in theological matters rather the complexion of the previous century. Du Perron and St Francis of Sales survived until nearly the end of its first quarter, and the most remarkable works of the latter bear the dates of 1608 and later. It was not, however, till some years had passed, till the counter-Reformation had reconverted the largest and most powerful portion of the Huguenot party, and till the influence of Jansenius and Descartes had time to work, that the extraordinary outburst of Gallican theology, both in pulpit and in press, took place. The Jansenist controversy may perhaps be awarded the merit of provoking this, as far as writing was concerned. The astonishing eloquence of contemporary pulpit oratory may be set down partly to the zeal for conversion of which du Perron and de Sales had given the example, partly to the same taste of the time which encouraged dramatic performances, for the sermon and the tirade have much in common. Jansenius himself, though a Dutchman by birth, passed much time in France, and it was in France that he found most disciples. These disciples consisted in the first place of the members of the society of Port Royal des Champs, a coterie after the fashion of the time, but one which devoted itself not to sonnets or madrigals but to devotional exercises, study and the teaching of youth. This coterie early adopted the Cartesian philosophy, and the Port Royal *Logic* was the most remarkable popular hand-book of that school. In theology they adopted Jansenism, and were in consequence soon at daggers drawn with the Jesuits, according to the polemical habits of the time. The most distinguished champions on the Jansenist side were Jean Duvergier de Hauranne, abbé de St Cyran (1581–1643), and Antoine Arnauld (1560–1619), but by far the most important literary results of the quarrel were the famous *Provinciales* of Pascal, or, to give them their proper title, *Lettres écrites à un provincial*.

Jansenists.

Port Royal.

Pascal.

Their literary importance consists, not merely in their grace of style, but in the application to serious discussion of the peculiarly polished and quiet irony of which Pascal is the greatest master the world has ever seen. Up to this time controversy had usually been conducted either in the mere bludgeon fashion of the Scaligers and Saumaises—of which in the vernacular the Jesuit François Garasse (1585–1631) had already contributed remarkable examples to literary and moral controversy—or else in a dull and legal style, or lastly under an envelope of Rabelaisian buffoonery such as survives to a considerable extent in the *Satire Ménippée*. Pascal set the example of combining the use of the most terribly effective weapons with good humour, good breeding and a polished style. The example was largely followed, and the manner of Voltaire and his followers in the 18th century owes at least as much to Pascal as their method and matter do to Bayle. The Jansenists, attacked and persecuted by the civil power, which the Jesuits had contrived to interest, were finally suppressed. But the *Provinciales* had given them an unapproachable superiority in matter of argument and literature. Their other literary works were inferior, though still remarkable. Antoine Arnauld (the younger, often called "the great") (1612–1694) and Pierre Nicole (1625–1695) managed their native language with vigour if not exactly with grace. They maintained their orthodoxy by writings, not merely against the Jesuits, but also against the Protestants such as the *Perpétuité de la foi* due to both, and the *Apologie des Catholiques* written by Arnauld alone. The latter, besides being responsible for a good deal of the *Logic* (*L'Art de penser*) to which we have alluded, wrote also much of a *Grammaire générale* composed by the Port Royalists for the use of their pupils; but his principal devotion was to theology and theological polemics. To the latter Nicole also contributed *Les Visionnaires*, *Les Imaginaires* and other works. The studious recluses of Port Royal also produced a large quantity of miscellaneous literary work, to which full justice has been done in Sainte-Beuve's well-known volumes.

17th-Century Preachers.—When we think of Gallican theology during the 17th century, it is always with the famous pulpit orators of the period that thought is most busied. Nor is this

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unjust, for though the most prominent of them all, Jacques Bénigne Bossuet (1627–1704) was remarkable as a writer of matter intended to be read, not merely as a speaker of matter intended to be heard, this double character is not possessed by most of the orthodox theologians of the time; and even Bossuet, great as is his genius, is more of a rhetorician than of a philosopher or a theologian. In no quarter was the advance of culture more remarkable in France than in the pulpit. We have already had occasion to notice the characteristics of French pulpit eloquence in the 15th and 16th centuries. Though this was very far from destitute of vigour and imagination, the political frenzy of the preachers, and the habit of introducing anecdotic buffoonery, spoilt the eloquence of Maillard and of Raulin, of Boucher and of Rose. The powerful use which the Reformed ministers made of the pulpit stirred up their rivals; the advance in science and classical study added weight and dignity to the matter of their discourses. The improvement of prose style and language provided them with a suitable instrument, and the growth of taste and refinement purged their sermons of grossness and buffoonery, of personal allusions, and even, as the monarchy became more absolute, of direct political purpose. The earliest examples of this improved style were given by St Francis de Sales and by Fenouillet, bishop of Marseilles (d. 1652); but it was not till the latter half of the century, when the troubles of the Fronde had completely subsided, and the church was established in the favour of Louis XIV., that the full efflorescence of theological eloquence took place. There were at the time pulpit orators of considerable excellence in England, and perhaps Jeremy Taylor, assisted by the genius of the language, has wrought a vein more precious than any which the somewhat academic methods and limitations of the French teachers allowed them to reach. But no country has ever been able to show a more magnificent concourse of orators, sacred or profane, than that formed by Bossuet, Fénelon (1651–1715), Esprit Fléchier (1632–1710), Jules Mascaron (1634–1703), Louis Bourdaloue (1632–1704), and Jean Baptiste Massillon (1663–1742), to whom may be justly added the Protestant divines, Jean Claude (1619–1687) and Jacques Saurin (1677–1730).

Bossuet. The characteristics of all these were different. Bossuet, the earliest and certainly the greatest, was also the most universal. He was not merely a preacher; he was, as we have said, a controversialist, indeed somewhat too much of a controversialist, as his battle with Fénelon proved. He was a philosophical or at least a theological historian, and his *Discours sur l'histoire universelle* is equally remarkable from the point of view of theology, philosophy, history and literature. Turning to theological politics, he wrote his *Politique tirée de l'ecriture sainte*, to theology proper his *Méditations sur les évangiles* and his *Élevations sur les mystères*. But his principal work, after all, is his *Oraisons funèbres*. The funeral sermon was the special oratorical exercise of the time. Its subject and character invited the gorgeous if somewhat theatrical commonplaces, the display of historical knowledge and parallel, and the moralizing analogies, in which the age specially rejoiced. It must also be noticed, to the credit of the preachers, that such occasions gave them an opportunity, rarely neglected, of correcting the adulation which was but too frequently characteristic of the period. The spirit of these compositions is fairly reflected in the most famous and often quoted of their phrases, the opening "Mes frères, Dieu seul est grand" of Massillon's funeral discourse on Louis XIV.; and though panegyric is necessarily by no means absent, it is rarely carried beyond bounds. While Bossuet made himself chiefly remarkable in his sermons and in his writings by an almost Hebraic grandeur and rudeness, the more special characteristics of Christianity, largely alloyed with a Greek and Platonic spirit, displayed themselves in Fénelon. In pure literature he is not less remarkable than in theology, politics and morals. His practice in matters of style was admirable, as the universally known *Télémaque* sufficiently shows to those who know nothing else of his writing. But his taste, both in its correctness and its audacity, is perhaps more admirable still. Despite of Malherbe, Balzac, Boileau and the traditions of nearly a century, he dared to speak favourably of Ronsard, and plainly expressed his opinion that the practice of his own contemporaries and predecessors had cramped and impoverished the French language quite as much as they had polished or purified it. The other doctors whom we have mentioned were more purely theological than the accomplished archbishop of Cambray. Fléchier is somewhat more archaic in style than Bossuet or Fénelon, and he is also more definitely a rhetorician than either. Mascaron has the older fault of prodigal and somewhat indiscriminate erudition. But the two latest of the series, Bourdaloue and Massillon, had far the greatest repute in their own time purely as orators, and perhaps deserved this preference. The difference between the two repeated that between du Perron and de Sales. Bourdaloue's great forte was vigorous argument and unsparing denunciation, but he is said to have been lacking in the power of influencing and affecting his hearers. His attraction was purely intellectual, and it is reflected in his style, which is clear and forcible, but destitute of warmth and colour. Massillon, on the other hand, was remarkable for his pathos, and for his power of enlisting and influencing the sympathies of his hearers. Of minor preachers on the same side, Charles de la Rue, a Jesuit (1643–1725), and the Père Cheminais (1652–1680), according to a somewhat idle form of nomenclature, "the Racine of the pulpit," may be mentioned. The two Protestant ministers whom we have mentioned, though inferior to their rivals, yet deserve honourable mention among the ecclesiastical writers of the period. Claude engaged in a controversy with Bossuet, in which victory is claimed for the invincible eagle of Meaux. Saurin, by far the greater preacher of the two, long continued to occupy, and indeed still occupies, in the libraries of French Protestants, the position given to Bossuet and Massillon on the other side.

Fénelon.

17th-Century Moralists.—It is not surprising that the works of Montaigne and Charron, with the immense popularity of the former, should have inclined the more thoughtful minds in France to moral reflection, especially as many other influences, both direct and indirect, contributed to produce the same result. The constant tendency of the refinements in French prose was towards clearness, succinctness and precision, the qualities most necessary in the moralist. The characteristics of the prevailing philosophy, that of Descartes, pointed in the same direction. It so happened, too, that the times were more favourable to the thinker and writer on ethical subjects than to the speculator in philosophy proper, in theology or in politics. Both the former subjects exposed their cultivators, as we have seen, to the suspicion of unorthodoxy; and to political speculation of any kind the rule of Richelieu, and still more that of Louis XIV., were in the highest degree unfavourable. No successors to Bodin and du Vair appeared; and even in the domain of legal writings, which comes nearest to that of politics, but few names of eminence are to be found.

Only the name of Omer-Talon (1595–1652) really illustrates the legal annals of France at this period on the bench, and that of Olivier Patru (1604–1681) at the bar. Thus it happened that the interests of many different classes of persons were concentrated upon moralizings, which took indeed very different forms in the hands of Pascal and other grave and serious thinkers of the Jansenist complexion in theology, and in those of literary courtiers like Saint-Évremond (1613–1703) and La Rochefoucauld, whose chief object was to depict the motives and characters prominent in the brilliant and not altogether frivolous society in which they moved. Both classes, however, were more or less tempted by the cast of their thoughts and the genius of the language to adopt the terser and most epigrammatic form of expression possible, and thus to originate the "*pensée*" in which, as its greatest later writer, Joubert, has said, "the ambition of the author is to put a book into a page, a page into a phrase, and a phrase into a word." The great genius and admirable style of Pascal are certainly not less shown in his *Pensées* than in his *Provinciales*, though perhaps the literary form of the former is less strikingly supreme than that of the latter. The author is more dominated by his

Pascal and pensée-writing.

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subject and dominates it less. Nicole, a far inferior writer as well as thinker, has also left a considerable number of *Pensées*, which have about them something more of the essay and less of the aphorism. They are, however, though not comparable to Pascal, excellent in matter and style, and go far to justify Bayle in calling their author " l'une des plus belles plumes de l'Europe." In sharp contrast with these thinkers, who are invariably not merely respecters of religion but ardently and avowedly religious, who treat morality from the point of view of the Bible and the church, there arose side by side with them, or only a little later, a very different group of moralists, whose writings have been as widely read, and who have had as great a practical and literary influence as perhaps any other class of authors. The earliest to be born and the last to die of these was Charles de Saint-Denis, seigneur de saint-Évremond (1613–1703). Saint-Évremond was long known rather as a conversational wit, some of whose good things were handed about in manuscript, or surreptitiously printed in foreign lands, than as a writer, and this is still to a certain extent his reputation. He was at least as cynical as his still better known contemporary La Rochefoucauld, if not more so, and he had less intellectual force and less nobility of character. But his wit was very great, and he set the example of the brilliant societies of the next century. Many of Saint-Évremond's printed works are nominally works of literary criticism, but the moralizing spirit pervades all of them. No writer had a greater influence on Voltaire, and through Voltaire on the whole course of French literature after him. In direct literary value, however, no comparison can be made between Saint-Évremond and the author of the *Sentences et maximes morales*. François, duc de la Rochefoucauld (1613–1680), has other literary claims besides those of this famous book. His *Mémoires* were very favourably judged by his contemporaries, and they are still held to deserve no little praise even among the numerous and excellent works of the kind which that age of memoir-writers produced. But while the *Mémoires* thus invite comparison, the *Maximes et sentences* stand alone. Even allowing that the mere publication of detached reflections in terse language was not absolutely new, it had never been carried, perhaps has never since been carried, to such a perfection. Beside La Rochefoucauld all other writers are diffuse, vacillating, unfinished, rough. Not only is there in him never a word too much, but there is never a word too little. The thought is always fully expressed, not compressed. Frequently as the metaphor of minting or stamping coin has been applied to the art of managing words, it has never been applied so appropriately as to the maxims of La Rochefoucauld. The form of them is almost beyond praise, and its excellencies, combined with their immense and enduring popularity, have had a very considerable share in influencing the character of subsequent French literature. Of hardly less importance in this respect, though of considerably less intellectual and literary individuality, was the translator of Theophrastus and the author of the *Caractères*, La Bruyère. Jean de la Bruyère (1645–1696), though frequently epigrammatic, did not aim at the same incredible terseness as the author of the *Maximes*. His plan did not, indeed, render it necessary. Both in England and in France there had been during the whole of the century a mania for character writing, both of the general and Theophrastic kind, and of the historical and personal order. The latter, of which our own Clarendon is perhaps the greatest master, abound in the French memoirs of the period. The former, of which the naïve sketches of Earle and Overbury are English examples, culminated in those of La Bruyère, which are not only light and easy in manner and matter, but also in style essentially amusing, though instructive as well. Both he and La Rochefoucauld had an enduring effect on the literature which followed them—an effect perhaps superior to that exercised by any other single work in French, except the *Roman de la rose* and the *Essais* of Montaigne.

Saint-Évremond.

La Rochefoucauld.

La Bruyère.

17th-Century Savants.—Of the literature of the 17th century there only remains to be dealt with the section of those writers who devoted themselves to scientific pursuits or to antiquarian erudition of one form or another. It was in this century that literary criticism of French and in French first began to be largely composed, and after this time we shall give it a separate heading. It was very far, however, from attaining the excellence or observing the form which it afterwards assumed. The institution of the Academy led to various linguistic works. One of the earliest of these was the *Remarques* of the Savoyard Claude Favre de Vaugelas (1595–1650), afterwards re-edited by Thomas Corneille. Pellisson wrote a history of the Academy itself when it had as yet but a brief one. The famous *Examen du Cid* was an instance of the literary criticism of the time which was afterwards represented by René Rapin (1621–1687), Dominique Bouhours (1628–1702) and René de Bossu (1631–1680), while Adrien Baillet (1649–1706) has collected the largest thesaurus of the subject in his *Jugemens des savants*. Boileau set the example of treating such subjects in verse, and in the latter part of the century *Reflexions, Discourses, Observations*, and the like, on particular styles, literary forms and authors, became exceedingly numerous. In earlier years France possessed a numerous band of classical scholars of the first rank, such as Scaliger and Casaubon, who did not lack followers. But all or almost all this sort of work was done in Latin, so that it contributed little to French literature properly so-called, though the translations from the classics of Nicolas Perrot d'Ablancourt (1606–1664) have always taken rank among the models of French style. On the other hand, mathematical studies were pursued by persons of far other and far greater genius, and, taking from this time forward a considerable position in education and literature in France, had much influence on both. The mathematical discoveries of Pascal and Descartes are well known. Of science proper, apart from mathematics, France did not produce many distinguished cultivators in this century. The philosophy of Descartes was not on the whole favourable to such investigations, which were in the next century to be pursued with ardour. Its tendencies found more congenial vent and are more thoroughly exemplified in the famous quarrel between the Ancients and the Moderns. This, of Italian origin, was mainly started in France by Charles Perrault (1628–1703), who thereby rendered much less service to literature than by his charming fairy tales. The opposite side was taken by Boileau, and the fight was afterwards revived by Antoine Houdar[d, t] de la Motte (1672–1731), a writer of little learning but much talent in various ways, and by the celebrated Madame Dacier, Anne Lefèvre (1654–1720). The discussion was conducted, as is well known, without very much knowledge or judgment among the disputants on the one side or on the other. But at this very time there were in France students and scholars of the most profound erudition. We have already mentioned Fleury and his ecclesiastical history. But Fleury is only the last and the most popular of a race of omnivorous and untiring scholars, whose labours have ever since, until the modern fashion of first-hand investigations came in, furnished the bulk of historical and scholarly references and quotations. To this century belong le Nain de Tillemont (1637–1698), whose enormous *Histoire des empereurs* and *Mémoires pour servir à l'histoire ecclésiastique* served Gibbon and a hundred others as quarry; Charles Dufresne, seigneur de Ducange (1614–1688), whose well-known glossary was only one of numerous productions; Jean Mabillon (1632–1707), one of the most voluminous of the voluminous Benedictines; and Bernard de Montfaucon (1655–1741), chief of all authorities of the dry-as-dust kind on classical archaeology and art.

Controversy between Ancients and Moderns.

Opening of the 18th Century.—The beginning of the 18th century is among the dead seasons of French literature. All the greatest men whose names had illustrated the early reign of Louis XIV. in profane literature passed away long before him, and the last if the least of them, Boileau and Thomas Corneille, only survived into the very earliest years of the new age. The political and military disasters of the last years of the reign were accompanied by a state of things in society unfavourable to literary development. The devotion to pure literature and philosophy proper which Descartes and Corneille had inspired had

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died out, and the devotion to physical science, to sociology, and to a kind of free-thinking optimism which was to inspire Voltaire and the Encyclopedists had not yet become fashionable. Fénelon and Malebranche still survived, but they were emphatically men of the last age, as was Massillon, though he lived till nearly the middle of the century. The characteristic literary figures of the opening years of the period are d'Aguesseau, Fontenelle, Saint-Simon, personages in many ways interesting and remarkable, but purely transitional in their characteristics. Bernard le Bovier de Fontenelle (1657–1757) is, indeed, perhaps the most typical figure of the time. He was a dramatist, a moralist, a philosopher, physical and metaphysical, a critic, an historian, a poet and a satirist. The manner of his works is always easy and graceful, and their matter rarely contemptible.

18th-Century Poetry.—The dispiriting signs shown during the 17th century by French poetry proper received entire fulfilment in the following age. The two poets who were most prominent at the opening of the period were the abbé de Chaulieu (1639–1720) and the marquis de la Fare (1644–1712), poetical or rather versifying twins who are always quoted together. They were both men who lived to a great age, yet their characteristics are rather those of their later than of their earlier contemporaries. They derive on the one hand from the somewhat trifling school of Voiture, on the other from the Bacchic sect of Saint-Amant; and they succeed in uniting the inferior qualities of both with the cramped and impoverished though elegant style of which Fénelon had complained. Their compositions are as a rule lyrical, as lyrical poetry was understood after the days of Malherbe—that is to say, quatrains of the kind ridiculed by Molière, and Pindaric odes, which have been justly described as made up of alexandrines after the manner of Boileau cut up into shorter or longer lengths. They were followed, however, by the one poet who succeeded in producing something resembling poetry in this artificial style, J. B. Rousseau (1671–1741). Rousseau, who in some respects was nothing so little as a religious poet, was never the less strongly influenced, as Marot had been, by the Psalms of David. His *Odes* and his *Cantates* are perhaps less destitute of that spirit than the work of any other poet of the century excepting André Chénier. Rousseau was also an extremely successful epigrammatist, having in this respect, too, resemblances to Marot. Le Franc de Pompignan (1709–1784), to whom Voltaire's well-known sarcasms are not altogether just, and Louis Racine (1692–1763), who wrote pious and altogether forgotten poems, belonged to the same poetical school; though both the style and matter of Racine are strongly tinctured by his Port Royalist sympathies and education. Lighter verse was represented in the 18th century by the long-lived Saint-Aulaire (1643–1742), by Gentil Bernard (1710–1775), by the abbé (afterwards cardinal) de Bernis (1715–1794), by Claude Joseph Dorat (1734–1780), by Antoine Bertin (1752–1790) and by Evariste de Parny (1753–1814), the last the most vigorous, but all somewhat deserving the term applied to Dorat of *ver luisant du Parnasse*. The jovial traditions of Saint-Amant begat a similar school of anacreontic songsters, which, represented in turn by Charles François Panard (1674–1765), Charles Collé (1709–1783), Armand Gouffé (1775–1845), and Marc-Antoine-Madeleine Desaugiers (1772–1827), led directly to the best of all such writers, Béranger. To this class Rouget de Lisle (1760–1836) perhaps also belongs; though his most famous composition, the *Marseillaise*, is of a different stamp. Nor is the account of the light verse of the 18th century complete without reference to a long succession of fable writers, who, in an unbroken chain, connect La Fontaine in the 17th century with Viennet in the 19th. None of the links, however, of this chain, with the exception of Jean Pierre Florian (1750–1794) deserve much attention. The universal faculty of Voltaire (1694–1778) showed itself in his poetical productions no less than in his other works, and it is perhaps not least remarkable in verse. It is impossible nowadays to regard the *Henriade* as anything but a highly successful prize poem, but the burlesque epic of *La Pucelle*, discreditable as it may be from the moral point of view, is remarkable enough as literature.

J. B. Rousseau.

Voltaire (poetry).

The epistles and satires are among the best of their kind, the verse tales are in the same way admirable, and the epigrams, impromptus, and short miscellaneous poems generally are the *ne plus ultra* of verse which is not poetry. The Anglomania of the century extended into poetry, and the *Seasons* of Thomson set the example of a whole library of tedious descriptive verse, which in its turn revenged France upon England by producing or helping to produce English poems of the Darwin school. The first of these descriptive performances was the *Saisons* of Jean François de Saint-Lambert (1716–1803), identical in title with its model, but of infinitely inferior value. Saint-Lambert was followed by Jacques Delille (1738–1813) in *Les Jardins*, Antoine Marin le Mierre (1723–1793) in *Les Fastes*, and Jean Antoine Roucher (1745–1794) in *Les Mois*. Indeed, everything that could be described was seized upon by these describers. Delille also translated the *Georgics*, and for a time was the greatest living poet of France, the title being only disputed by Escouchard le Brun (1729–1807), a lyrist and ode writer of the school of J. B. Rousseau, but not destitute of energy. The only other poets until Chénier who deserve notice are Nicolas Gilbert (1751–1780)—the French Chatterton, or perhaps rather the French Oldham, who died in a workhouse at twenty-nine after producing some vigorous satires and, at the point of death, an elegy of great beauty; Jacques Charles Louis Clinchaut de Malfilâtre (1732–1767), another short-lived poet whose "Ode to the Sun" has a certain stateliness; and Jean Baptiste Gresset (1709–1777), the author of *Ver-Vert* and of other poems of the lighter order, which are not far, if at all, below the level of Voltaire. André Chénier (1762–1794) stands far apart from the art of his century, though the strong chain of custom, and his early death by the guillotine, prevented him from breaking finally through the restraints of its language and its versification. Chénier, half a Greek by blood, was wholly one in spirit and sentiment. The manner of his verses, the very air which surrounds them and which they diffuse, are different from those of the 18th century; and his poetry is probably the utmost that its language and versification could produce. To do more, the revolution which followed a generation after his death was required.

Chénier.

18th-Century Drama.—The results of the cultivation of dramatic poetry at this time were even less individually remarkable than those of the attention paid to poetry proper. Here again the astonishing power and literary aptitude of Voltaire gave value to his attempts in a style which, notwithstanding that it counts Racine among its practitioners, was none the less predestined to failure. Voltaire's own efforts in this kind are indisputably as successful as they could be. Foreigners usually prefer *Mahomet* and *Zaïre* to *Bajazet* and *Mithridate*, though there is no doubt that no work of Voltaire's comes up to *Polyeucte* and *Rodogune*, as certainly no single passage in any of his plays can approach the best passages of *Cinna* and *Les Horaces*. But the remaining tragic writers of the century, with the single exception of Crébillon *père*, are scarcely third-rate. C. Jolyot de Crébillon (1674–1762) himself had genius, and there are to be found in his work evidences of a spirit which had seemed to die away with *Saint-Genest*, and was hardly to revive until *Hernani*. Of the imitators of Racine and Voltaire, La Motte in *Inès de Castro* was not wholly unsuccessful. François Joseph de la Grange-Chancel (1677–1758) copied chiefly the worst side of the author of *Britannicus*, and Bernard Joseph Saurin (1706–1781) and Pierre-Laurent de Belloy (1727–1775) performed the same service for Voltaire. Le Mierre and La Harpe, mentioned and to be mentioned, were tragedians; but the *Iphigénie en Tauride* of Guimond de la Touche (1725–1760) deserves more special mention than anything of theirs. There was an infinity of tragic writers and tragic plays in this century, but hardly any others of them even deserve mention. The muse of comedy was decidedly more happy in her devotees. Molière was a far safer if a more difficult model than Racine, and the inexorable fashion which had bound down tragedy to a feeble imitation of Euripides did not similarly prescribe an undeviating adherence to Terence. Tragedy had never been, has scarcely been since, anything but an exotic in France; comedy was of the

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soil and native. Very early in the century Alain René le Sage (1668–1747), in the admirable comedy of *Turcaret*, produced a work not unworthy to stand by the side of all but his master's best. Philippe Destouches (1680–1754) was also a fertile comedy writer in the early years of the century, and in *Le Glorieux* and *Le Philosophe marié* achieved considerable success. As the age went on, comedy, always apt to lay hold of passing events, devoted itself to the great struggle between the Philosophes and their opponents. Curiously enough, the party which engrossed almost all the wit of France had the worst of it in this dramatic portion of the contest, if in no other. The *Méchant* of Gresset and the *Métromanie* of Alexis Piron (1689–1773) were far superior to anything produced on the other side, and the *Philosophes* of Charles Palissot de Montenoy (1730–1814), though scurrilous and broadly farcical, had a great success. On the other hand, it was to a Philosophe that the invention of a new dramatic style was due, and still more the promulgation of certain ideas on dramatic criticism and construction, which, after being filtered through the German mind, were to return to France and to exercise the most powerful influence on its dramatic productions.

Diderot (plays).

This was Denis Diderot (1713–1784), the most fertile genius of the century, but also the least productive in finished and perfect work. His chief dramas, the *Fils naturel* and the *Père de famille*, are certainly not great successes; the shorter plays, *Est-il bon? est-il méchant?* and *La Pièce et le prologue*, are better. But it was his follower Michel Jean Sédaine (1719–1797) who, in *Le Philosophe sans le savoir* and other pieces, produced the best examples of the bourgeois as opposed to the heroic drama. Diderot is sometimes credited or discredited with the invention of the *Comédie Larmoyante*, a title which indeed his own plays do not altogether refuse, but this special variety seems to be, in its invention, rather the property of Pierre Claude Nivelle de la Chaussée (1692–1754). Comedy sustained itself, and even gained ground towards the end of the century; the *Jeune Indienne* of Nicolas Chamfort (1741–1794), if not quite worthy of its author's brilliant talent in other paths, is noteworthy, and so is the *Billet perdu* of Joseph François Edouard de Corsembleu Desmahis (1722–1761), while at the extreme limit of our present period there appears the remarkable figure of Pierre Caron de Beaumarchais (1732–1799). The *Mariage de Figaro* and the *Barbier de Séville* are well known as having had attributed to them no mean place among the literary causes and forerunners of the Revolution. Their dramatic and literary value would itself have sufficed to obtain attention for them at any time, though there can be no doubt that their popularity was mainly due to their political appositeness. The most remarkable point about them, as about the school of comedy of which Congreve was the chief master in England at the beginning of the century, was the abuse and superfluity of wit in the dialogue, indiscriminately allotted to all characters alike. It is difficult to give particulars, but would be improper to omit all mention, of such dramatic or quasi-dramatic work as the libretti of operas, farces for performance at fairs and the like. French authors of the time from Le Sage downwards usually managed these with remarkable skill.

18th-Century Fiction.—With prose fiction the case was altogether different. We have seen how the short tale of a few pages had already in the 16th century attained high if not the highest excellence; how at three different periods the fancy for long-winded prose narration developed itself in the prose rehandlings of the chivalric poems, in the *Amadis* romances, and in the portentous recitals of Gomberville and La Calprenède; how burlesques of these romances were produced from Rabelais to Scarron; and how at last Madame de Lafayette showed the way to something like the novel of the day. If we add the fairy story, of which Perrault and Madame d'Aulnoy were the chief practitioners, and a small class of miniature romances, of which *Aucassin et Nicolette* in the 13th, and the delightful *Jehan de Paris* (of the 15th or 16th, in which a king of England is patriotically sacrificed) are good representatives, we shall have exhausted the list. The 18th century was quick to develop the system of the author of the *Princesse de Clèves*, but it did not abandon the cultivation of the romance, that is to say, fiction dealing with incident and with the simpler passions, in devoting itself to the novel, that is to say, fiction dealing with the analysis of sentiment and character. Le Sage, its first great novelist, in his *Diable boiteux* and *Gil Blas*, went to Spain not merely for his subject but also for his inspiration and manner, following the lead of the picaroon romance of Rojas and Scarron. Like Fielding, however, whom he much resembles, Le Sage mingled with the romance of incident the most careful attention to character and the most lively portrayal of it, while his style and language are such as to make his work one of the classics of French literature. The novel of character was really founded in France by the abbé Prévost d'Exilles (1697–1763), the author of *Cleveland* and of the incomparable *Manon Lescaut*. The popularity of this style was much helped by the immense vogue in France of the works of Richardson. Side by side with it, however, and for a time enjoying still greater popularity, there flourished a very different school of fiction, of which Voltaire, whose name occupies the first or all but the first place in every branch of literature of his time, was the most brilliant cultivator. This was a direct development of the earlier *conte*, and consisted usually of the treatment, in a humorous, satirical, and not always over-decent fashion, of contemporary foibles, beliefs, philosophies and occupations. These tales are of every rank of excellence and merit both literary and moral, and range from the astonishing wit, grace and humour of *Candide* and *Zadig* to the book which is Diderot's one hardly pardonable sin, and the similar but more lively efforts of Crébillon *fils* (1707–1777). These latter deeps led in their turn to the still lower depths of La Clos and Louvet. A third class of 18th-century fiction consists of attempts to return to the humorous *fatrasie* of the 16th century, attempts which were as much influenced by Sterne as the sentimental novel was by Richardson. The *Homme aux quarante écus* of Voltaire has something of this character, but the most characteristic works of the style are the *Jacques le fataliste* of Diderot, which shows it nearly at its best, and the *Compère Mathieu*, sometimes attributed to Pigault-Lebrun (1753–1835), but no doubt in reality due to Jacques du Laurens (1710–1797), which shows it at perhaps its worst. Another remarkable story-teller was Cazotte (1719–1792), whose *Diable amoureux* displays much fantastic power, and connects itself with a singular fancy of the time for occult studies and *diableries*, manifested later by the patronage shown to Cagliostro, Mesmer, St Germain and others. In this connexion, too, may perhaps also be mentioned most appropriately Bestif de la Bretonne, a remarkably original and voluminous writer, who was little noticed by his contemporaries and successors for the best part of a century. Restif, who was nicknamed the "Rousseau of the gutter," *Rousseau du ruisseau*, presents to an English imagination many of the characteristics of a non-moral Defoe. While these various schools busied themselves more or less with real life seriously depicted or purposely travestied, the great vogue and success of *Télémaque* produced a certain number of didactic works, in which moral or historical information was sought to be conveyed under a more or less thin guise of fiction. Such was the *Voyage du jeune Anacharsis* of Jean Jacques Barthélemy (1716–1795); such the *Numa Pompilius* and *Gonzalve de Cordoue* of Florian (1755–1794), who also deserves notice as a writer of pastorals, fables and short prose tales; such the *Bélisaire* and *Les Incas* of Jean François Marmontel (1723–1799). Between this class and that of the novel of sentiment may perhaps be placed *Paul et Virginie* and *La Chaumière indienne*; though Bernardin de Saint-Pierre (1737–1814) should more properly be noticed after Rousseau and as a moralist. Diderot's fiction-writing has already been referred to more than once, but his *Religieuse* deserves citation here as a powerful specimen of the novel both of analysis and polemic; while his undoubted masterpiece, the *Neveu de Rameau*, though very difficult to class, comes under this head as well as under any other. There are, however, two of the novelists of this age, and of the most remarkable, who have yet to be noticed, and these are the author of *Marianne* and the author of *Julie*. We do

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not mention Pierre de Marivaux (1688–1763) in this connexion as the equal of Jean Jacques Rousseau (1712–1778), but merely as being in his way almost equally original and equally remote from any suspicion of school influence. He began with burlesque writing, and was also the author of several comedies, of which *Les Fausses Confidences* is the principal. But it is in prose fiction that he really excels. He may claim to have, at least in the opinion of his contemporaries, invented a style, though perhaps the term *marivaudage*, which was applied to it, has a not altogether complimentary connotation. He may claim also to have invented the novel without a purpose, which aims simply at amusement, and at the same time does not seek to attain that end by buffoonery or by satire. Gray's definition of happiness, "to lie on a sofa and read endless novels by Marivaux" (it is true that he added Crébillon), is well known, and the production of mere pastime by means more or less harmless has since become so well-recognized a function of the novelist that Marivaux, as one of the earliest to discharge it, deserves notice. The name, however, of Jean Jacques Rousseau is of far different importance. His two great works, the *Nouvelle Héloïse* and *Émile*, are as far as possible from being perfect as novels. But no novels in the world have ever had such influence as these. To a great extent this influence was due mainly to their attractions as novels, imperfect though they may be in this character, but it was beyond dispute also owing to the doctrines which they contained, and which were exhibited in novel form.

J. J. Rousseau.

Such are the principal developments of fiction during the century; but it is remarkable that, varied as they were, and excellent as was some of the work to which they gave rise, none of these schools was directly very fertile in results or successors. The period with which we shall next have to deal, that from the outbreak of the Revolution to the death of Louis XVIII., is curiously barren of fiction of any merit. It was not till English influence began again to assert itself in the later days of the Restoration that the prose romance began once more to be written.

18th-Century History.—It is not, however, in any of the departments of *belles-lettres* that the real eminence of the 18th century as a time of literary production in France consists. In all serious branches of study its accomplishments were, from a literary point of view, remarkable, uniting as it did an extraordinary power of popular and literary expression with an ardent spirit of inquiry, a great speculative ability, and even a far more considerable amount of laborious erudition than is generally supposed. The historical studies and results of 18th-century speculation in France are of especial and peculiar importance. There is no doubt that what is called the science of history dates from this time, and though the beginning of it is usually assigned to the Italian Vico, its complete indication may perhaps with equal or greater justice be claimed by the Frenchman Turgot. Before Turgot, however, there were great names in French historical writing, and perhaps the greatest of all is that of Charles Secondat de Montesquieu (1689–1755). The three principal works of this great writer are all historical and at the same time political in character. In the *Lettres persanes* he handled, with wit inferior to the wit of no other writer even in that witty age, the corruptions and dangers of contemporary morals and politics. The literary charm of this book—the plan of which was suggested by a work, the *Amusements sérieux et comiques*, of Dufresny (1648–1724), a comic writer not destitute of merit—is very great, and its plan was so popular as to lead to a thousand imitations, of which all, except those of Voltaire and Goldsmith, only bring out the immense superiority of the original. Few things could be more different from this lively and popular book than Montesquieu's next work, the *Grandeur et décadence des Romains*, in which the same acuteness and knowledge of human nature are united with considerable erudition, and with a weighty though perhaps somewhat grandiloquent and rhetorical style. His third and greatest work, the *Esprit des lois*, is again different both in style and character, and such defects as it has are as nothing when compared with the merits of its fertility in ideas, its splendid breadth of view, and the felicity with which the author, in a manner unknown before, recognizes the laws underlying complicated assemblages of fact. The style of this great work is equal to its substance; less light than that of the *Lettres*, less rhetorical than that of the *Grandeur des Romains*, it is still a marvellous union of dignity and wit. Around Montesquieu, partly before and partly after him, is a group of philosophical or at least systematic historians, of whom the chief are Jean Baptiste Dubos (1670–1742), and G. Bonnot de Mably (1709–1785). Dubos, whose chief work is not historical but aesthetic (*Réflexions sur la poésie et la peinture*), wrote a so-called *Histoire critique de l'établissement de la monarchie française*, which is as far as possible from being in the modern sense critical, inasmuch as, in the teeth of history, and in order to exalt the *Tiers état*, it pretends an amicable coalition of Franks and Gauls, and not an irruption by the former. Mably (*Observations sur l'histoire de la France*) had a much greater influence than either of these writers, and a decidedly mischievous one, especially at the period of the Revolution. He, more than any one else, is responsible for the ignorant and childish extolling of Greek and Roman institutions, and the still more ignorant depreciation of the middle ages, which was for a time characteristic of French politicians. Montesquieu was, as we have said, followed by Anne Robert Jacques Turgot (1727–1781), whose writings are few in number, and not remarkable for style, but full of original thought. Turgot in his turn was followed by Condorcet (1743–1794), whose tendency is somewhat more sociological than directly historical. Towards the end of the period, too, a considerable number of philosophical histories were written, the usual object of which was, under cover of a kind of allegory, to satirize and attack the existing institutions and government of France. The most famous of these was the *Histoire des Indes*, nominally written by the Abbé Guillaume Thomas François Raynal (1713–1796), but really the joint work of many members of the Philosophe party, especially Diderot. Side by side with this really or nominally philosophical school of history there existed another and less ambitious school, which contented itself with the older and simpler view of the science. The Abbé René de Vertot (1655–1735) belongs almost as much to the 17th as to the 18th century; but his principal works, especially the famous *Histoire des Chevaliers de Malte*, date from the later period, as do also the *Révolutions romaines*. Vertot is above all things a literary historian, and the well-known "Mon siége est fait," whether true or not, certainly expresses his system. Of the same school, though far more comprehensive, was the laborious Charles Rollin (1661–1741), whose works in the original, or translated and continued in the case of the *Histoire romaine* by Jean Baptiste Louis Crévier (1693–1765), were long the chief historical manuals of Europe. The president Charles Jean François Hénault (1685–1770), and Louis Pierre Anquetil (1723–1806) were praiseworthy writers, the first of French history, the second of that and much else. In the same class, too, far superior as is his literary power, must be ranked the historical works of Voltaire, *Charles XII*, *Pierre le Grand*, &c. A very perfect example of the historian who is literary first of all is supplied by Claude Carloman de Rulhière (1735–1791), whose *Révolution en Russie en 1762* is one of the little masterpieces of history, while his larger and posthumous work on the last days of the Polish kingdom exhibits perhaps some of the defects of this class of historians. Lastly must be mentioned the memoirs and correspondence of the period, the materials of history if not history itself. The century opened with the most famous of all these, the memoirs of the duc de Saint-Simon (1675–1755), an extraordinary series of pictures of the court of Louis XIV. and the Regency, written in an unequal and incorrect style, but with something of the irregular excellence of the great 16th-century writers, and most striking in the sombre bitterness of its tone. The subsequent and less remarkable memoirs of the century are so numerous that it is almost impossible to select a few for reference, and altogether impossible to mention all. Of those bearing on public history the memoirs of Madame de Staël (Mlle Delaunay) (1684–1750), of Pierre

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Louis de Voyer, marquis d'Argenson (1694–1757), of Charles Pinot Duclos (1704–1772), of Stephanie Félicité de Saint-Aubin, Madame de Genlis (1746–1830), of Pierre Victor de Béseval (1722–1791), of Madame Campan (1752–1822) and of the cardinal de Bernis (1715–1794), may perhaps be selected for mention; of those bearing on literary and private history, the memoirs of Madame d'Épinay (1726–1783), those of Mathieu Marais (1664–1737) the so-called *Mémoires secrets* of Louis Petit de Bachaumont (1690–1770), and the innumerable writings having reference to Voltaire and to the Philosophe party generally. Here, too, may be mentioned a remarkable class of literature, consisting of purely private and almost confidential letters, which were written at this time with very remarkable literary excellence. As specimens may be selected those of Mademoiselle Aissé (1694–1757), which are models of easy and unaffected tenderness, and those of Mademoiselle de Lespinasse (1732–1776) the companion of Madame du Deffand and afterwards of d'Alembert. These latter, in their extraordinary fervour and passion, not merely contrast strongly with the generally languid and frivolous gallantry of the age, but also constitute one of its most remarkable literary monuments. It has been said of them that they "burn the paper," and the expression is not exaggerated. Madame du Deffand's (1697–1780) own letters, many of which were written to Horace Walpole, are noteworthy in a very different way. Of lighter letters the charming correspondence of Diderot with Mademoiselle Voland deserves special mention. But the correspondence, like the memoirs of this century, defies justice to be done to it in any cursory or limited mention. In this connexion, however, it may be well to mention some of the most remarkable works of the time, the *Confessions*, *Rêveries*, and *Promenades d'un solitaire of* Rousseau. In these works, especially in the *Confessions*, there is not merely exhibited passion as fervid though perhaps less unaffected than that of Mademoiselle de Lespinasse—there appear in them two literary characteristics which, if not entirely novel, were for the first time brought out deliberately by powers of the first order, were for the first time made the mainspring of literary interest, and thereby set an example which for more than a century has been persistently followed, and which has produced some of the finest results of modern literature. The first of these was the elaborate and unsparing analysis and display of the motives, the weaknesses and the failings of individual character. This process, which Rousseau unflinchingly performed on himself, has been followed usually in respect to fictitious characters by his successors. The other novelty was the feeling for natural beauty and the elaborate description of it, the credit of which latter must, it has been agreed by all impartial critics, be assigned rather to Rousseau than to any other writer. His influence in this direction was, however, soon taken up and continued by Bernardin de Saint-Pierre, the connecting link between Rousseau and Chateaubriand, some of whose works have been already alluded to. In particular the author of *Paul et Virginie* set himself to develop the example of description which Rousseau had set, and his word-paintings, though less powerful than those of his model, are more abundant, more elaborate, and animated by a more amiable spirit.

18th-Century Philosophy.—The Anglomania which distinguished the time was nowhere more stongly shown than in the cast and direction of its philosophical speculations. As Montesquieu and Voltaire had imported into France a vivid theoretical admiration for the British constitution and for British theories in politics, so Voltaire, Diderot and a crowd of others popularized and continued in France the philosophical ideas of Hobbes and Locke and even Berkeley, the theological ideas of Bolingbroke, Shaftesbury and the English deists, and the physical discoveries of Newton. Descartes, Frenchman and genius as he was, and though his principles in physics and philosophy were long clung to in the schools, was completely abandoned by the more adventurous and progressive spirits. At no time indeed, owing to the confusion of thought and purpose to which we have already alluded, was the word philosophy used with greater looseness than at this time. Using it, as we have hitherto used it, in the sense of metaphysics, the majority of the Philosophes have very little claim to their title. There were some who manifested, however, an aptitude for purely philosophical argument, and one who confined himself strictly thereto. Among these the most remarkable are Julien Offroy de la Mettrie (1709–1751) and Denis Diderot. La Mettrie in his works *L'Homme machine*, *L'Homme plante*, &c., applied a lively and vigorous imagination, a considerable familiarity with physics and medicine, and a brilliant but unequal style, to the task of advocating materialistic ideas on the constitution of man. Diderot, in a series of early works, *Lettre sur les aveugles*, *Promenade d'un sceptique*, *Pensées philosophiques*, &c., exhibited a good acquaintance with philosophical history and opinion, and gave sign in this direction, as in so many others, of a far-reaching intellect. As in almost all his works, however, the value of the thought is extremely unequal, while the different pieces, always written in the hottest haste, and never duly matured or corrected, present but few specimens of finished and polished writing. Charles Bonnet (1720–1793), a Swiss of Geneva, wrote a large number of works, many of which are purely scientific. Others, however, are more psychological, and these, though advocating the materialistic philosophy generally in vogue, were remarkable for uniting materialism with an honest adherence to Christianity. The half mystical writer, Louis Claude de Saint-Martin (1743–1803) also deserves notice. But the French metaphysician of the century is undoubtedly Étienne Bonnot, abbé de Condillac (1714–1780), almost the only writer of the time in France who succeeded in keeping strictly to philosophy without attempting to pursue his system to its results in ethics, politics and theology. In the *Traité des sensations*, the *Essai sur l'origine des connaissances humaines* and other works Condillac elaborated and continued the imperfect sensationalism of Locke. As his philosophical view, though perhaps more restricted, was far more direct, consecutive and uncompromising than that of the Englishman, so his style greatly exceeded Locke's in clearness and elegance and as a good medium of philosophical expression. *Condillac.*

18th-Century Theology.—To devote a section to the history of the theological literature of the 18th century in France may seem something of a contradiction; for, indeed, all or most of such literature was anti-theological. The magnificent list of names which the church had been able to claim on her side in the 17th century was exhausted before the end of the second quarter of the 18th with Massillon, and none came to fill their place. Very rarely has orthodoxy been so badly defended as at this time. The literary championship of the church was entirely in the hands of the Jesuits, and of a few disreputable literary freelances like Élie Fréron (1719–1776) and Pierre François Guyot, abbé Desfontaines (1685–1745). The Jesuits were learned enough, and their principal journal, that of Trévoux, was conducted with much vigour and a great deal of erudition. But they were in the first place discredited by the moral taint which has always hung over Jesuitism, and in the second place by the persecutions of the Jansenists and the Protestants, which were attributed to their influence. But one single work on the orthodox side has preserved the least reputation; while, on the other hand, the names of Père Nonotte (1711–1793) and several of his fellows have been enshrined unenviably in the imperishable ridicule of Voltaire, one only of whose adversaries, the abbé Antoine Guénée (1717–1803), was able to meet him in the *Lettres de quelques Juifs* with something like his own weapons. It has never been at all accurately decided how far what may be called the scoffing school of Voltaire represents a direct revolt against Christianity, and how far it was merely a kind of guerilla warfare against the clergy. It is positively certain that Voltaire was not an atheist, and that he did not approve of atheism. But his *Dictionnaire philosophique*, which is typical of a vast amount of contemporary and subsequent literature, consists of a heterogeneous assemblage of articles directed against various points of dogma and ritual and various characteristics of the sacred records. From the literary point of view, it is one of the most characteristic of all Voltaire's works, though it is perhaps not entirely his. The desultory arrangement, the light *Voltaire (theology).*

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and lively style, the extensive but not always too accurate erudition, and the somewhat captious and quibbling objections, are intensely Voltairian. But there is little seriousness about it, and certainly no kind of rancorous or deep-seated hostility. With many, however, of Voltaire's pupils and younger contemporaries the case was altered. They were distinctively atheists and anti-supernaturalists. The atheism of Diderot, unquestionably the greatest of them all, has been keenly debated; but in the case of Étienne Damilaville (1723–1768), Jacques André Naigeon (1738–1810), Paul Henri Dietrich, baron d'Holbach, and others there is no room for doubt. By these persons a great mass of atheistic and anti-Christian literature was composed and set afloat. The characteristic work of this school, its last word indeed, is the famous *Système de la nature*, attributed to Holbach (1723–1789), but known to be, in part at least, the work of Diderot. In this remarkable work, which caps the climax of the metaphysical materialism or rather nihilism of the century, the atheistic position is clearly put. It made an immense sensation; and it so fluttered not merely the orthodox but the more moderate free-thinkers, that Frederick of Prussia and Voltaire, perhaps the most singular pair of defenders that orthodoxy ever had, actually set themselves to refute it. Its style and argument are very unequal, as books written in collaboration are apt to be, and especially books in which Diderot, the paragon of inequality, had a hand. But there is an almost entire absence of the heterogeneous assemblage of anecdotes, jokes good and bad, scraps of accurate or inaccurate physical science, and other incongruous matter with which the Philosophes were wont to stuff their works; and lastly, there is in the best passages a kind of sombre grandeur which recalls the manner as well as the matter of Lucretius. It is perhaps well to repeat, in the case of so notorious a book, that this criticism is of a purely literary and formal character; but there is little doubt that the literary merits of the work considerably assisted its didactic influence. As the Revolution approached, and the victory of the Philosophe party was declared, there appeared for a brief space a group of cynical and accomplished phrase-makers presenting some similarity to that of which, a hundred years before, Saint-Evremond was the most prominent figure. The chief of this group were Nicolas Chamfort (1747–1794) on the republican side, and Antoine Rivarol (1753–1801) on that of the royalists. Like the older writer to whom we have compared them, neither can be said to have produced any one work of eminence, and in this they stand distinguished from moralists like La Rochefoucauld. The floating sayings, however, which are attributed to them, or which occur here and there in their miscellaneous work, yield in no respect to those of the most famous of their predecessors in wit and a certain kind of wisdom, though they are frequently more personal than aphoristic.

The "System of Nature."

Chamfort. Rivarol.

18th-Century Moralists and Politicians.—Not the least part, however, of the energy of the period in thought and writing was devoted to questions of a directly moral and political kind. With regard to morality proper the favourite doctrine of the century was what is commonly called the selfish theory, the only one indeed which was suitable to the sensationalism of Condillac and the materialism of Holbach. The pattern book of this doctrine was the *De l'esprit* of Claude Adrien Helvétius (1715–1771), the most amusing book perhaps which ever pretended to the title of a solemn philosophical treatise. There is some analogy between the principles of this work and those of the *Système de la nature*. With the inconsistency—some would say with the questionable honesty—which distinguished the more famous members of the Philosophe party when their disciples spoke with what they considered imprudent outspokenness, Voltaire and even Diderot attacked Helvétius as the former afterwards attacked Holbach. But whatever may be the general value of *De l'esprit*, it is full of acuteness, though that acuteness is as desultory and disjointed as its style. As Helvétius may be taken as the representative author of the cynical school, so perhaps Alexandre Gérard Thomas (1732–1785) may be taken as representative of the votaries of noble sentiment to whom we have also alluded. The works of Thomas chiefly took the form of academic *éloges* or formal panegyrics, and they have all the defects, both in manner and substance, which are associated with that style. Of yet a third school, corresponding in form to La Rochefoucauld and La Bruyère, and possessed of some of the antique vigour of preceding centuries, was Luc de Clapiers, marquis de Vauvenargues (1715–1747). This writer, who died very young, has produced maxims and reflections of considerable mental force and literary finish. From Voltaire downwards it has been usual to compare him with Pascal, from whom he is chiefly distinguished by a striking but somewhat empty stoicism. Between the moralists, of whom we have taken these three as examples, and the politicians may be placed Rousseau, who in his novels and miscellaneous works is of the first class, in his famous *Contrat social* of the second. All his theories, whatever their originality and whatever their value, were made novel and influential by the force of their statement and the literary beauties of its form. Of direct and avowed political writings there were few during the century, and none of anything like the importance of the *Contrat social*, theoretical acceptance of the established French constitution being a point of necessity with all Frenchmen. Nevertheless it may be said that almost the whole of the voluminous writings of the Philosophes, even of those who, like Voltaire, were sincerely aristocratic and monarchic in predilection, were of more or less veiled political significance. There was one branch of political writing, moreover, which could be indulged in without much fear. Political economy and administrative theories received much attention. The earliest writer of eminence on these subjects was the great engineer Sébastien le Prestre, marquis de Vauban (1633–1707), whose *Oisivetés* and *Dîme royale* exhibit both great ability and extensive observation. A more utopian economist of the same time was Charles Irénée Castel, abbé de Saint-Pierre (1658–1743), not to be confounded with the author of *Paul et Virginie*. Soon political economy in the hands of François Quesnay (1694–1774) took a regular form, and towards the middle of the century a great number of works on questions connected with it, especially that of free trade in corn, on which Ferdinand Galiani (1728–1787), André Morellet (1727–1819), both abbés, and above all Turgot, distinguished themselves. Of writers on legal subjects and of the legal profession, the century, though not less fertile than in other directions, produced few or none of any great importance from the literary point of view. The chief name which in this connexion is known is that of Chancellor Henri François d'Agueseau (1668–1751), at the beginning of the century, an estimable writer of the Port Royal school, who took the orthodox side in the great disputes of the time, but failed to display any great ability therein. He was, as became his profession, more remarkable as an orator than a writer, and his works contain valuable testimonies to the especially perturbed and unquiet condition of his century—a disquiet which is perhaps also its chief literary note. There were other French magistrates, such as Montesquieu, Hénault (1685–1770), de Brosses (1706–1773) and others, who made considerable mark in literature; but it was usually (except in the case of Montesquieu) in subjects not even indirectly connected with their profession. The *Esprit des lois* stands alone; but as an example of work barristerial in kind, famous partly for political reasons but of some real literary merit, we may mention the *Mémoire* for Calas written by J. B. J. Élie de Beaumont (1732–1786).

Vauvenargues.

Helvétius.

Thomas.

18th-Century Criticism and Periodical Literature.—We have said that literary criticism assumes in this century a sufficient importance to be treated under a separate heading. Contributions were made to it of many different kinds and from many different points of view. Periodical literature, the chief stimulus to its production, began more and more to come into favour. Even in the 17th century the *Journal des savants*, the Jesuit *Journal de Trévoux*, and other publications had set the example of different kinds of it. Just before the Revolution the *Gazette de France* was in the hands of J. B. A. Suard (1734–1817), a man who was nothing if not a literary critic. Perhaps, however, the most

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remarkable contribution of the century to criticism of the periodical kind was the *Feuilles de Grimm*, a circular sent for many years to the German courts by Frédéric Melchior Grimm (1723–1807), the comrade of Diderot and Rousseau, and containing a *compte rendu* of the ways and works of Paris, literary and artistic as well as social. These *Leaves* not only include much excellent literary criticism by Diderot, but also gave occasion to the incomparable *salons* or accounts of the exhibition of pictures from the same hand, essays which founded the art of picture criticism, and which have hardly been surpassed since. The prize competitions of the Academy were also a considerable stimulus to literary criticism, though the prevailing taste in such compositions rather inclined to elegant themes than to careful studies of analyses. The most characteristic critic of the mid-century was the abbé Charles Batteux (1713–1780) who illustrated a tendency of the time by beginning with a treatise on *Les Beaux Arts réduits à un même principe* (1746); reduced it and others into *Principes de la littérature* (1764) and added in 1771 *Les Quatres Poétiques* (Aristotle, Horace, Vida and Boileau). Batteux is a very ingenious critic and his attempt to conciliate "taste" and "the rules," though inadequate, is interesting. Works on the arts in general or on special divisions of them were not wanting, as, for instance, that of Dubos before alluded to, the *Essai sur la peinture* of Diderot and others. Critically annotated editions of the great French writers also came into fashion, and were no longer written by mere pedants. Of these Voltaire's edition of Corneille was the most remarkable, and his annotations, united separately under the title of *Commentaire sur Corneille*, form not the least important portion of his works. Even older writers, looked down upon though they were by the general taste of the day, received a share of this critical interest. In the earlier portion of the century Nicolas Lenglet-Dufresnoy (1674–1755) and Bernard de la Monnoye (1641–1728) devoted their attention to Rabelais, Regnier, Villon, Marot and others. Étienne Barbazan (1696–1770) and P. J. B. Le Grand d'Aussy (1737–1800) gathered and brought into notice the long scattered and unknown rather than neglected fabliaux of the middle ages. Even the chansons de geste attracted the notice of the Comte de Caylus (1692–1765) and the Comte de Tressan (1705–1783). The latter, in his *Bibliothèque des romans*, worked up a large number of the old epics into a form suited to the taste of the century. In his hands they became lively tales of the kind suited to readers of Voltaire and Crébillon. But in this travestied form they had considerable influence both in France and abroad. By these publications attention was at least called to early French literature, and when it had been once called, a more serious and appreciative study became merely a matter of time. The method of much of the literary criticism of the close of this period was indeed deplorable enough. Jean François de la Harpe (1739–1803), who though a little later in time as to most of his critical productions is perhaps its most representative figure, shows criticism in one of its worst forms. The critic specially abhorred by Sterne, who looked only at the stop-watch, was a kind of prophecy of La Harpe, who lays it down distinctly that a beauty, however beautiful, produced in spite of rules is a "monstrous beauty" and cannot be allowed. But such a writer is a natural enough expression of an expiring principle. The year after the death of La Harpe Sainte-Beuve was born.

18th-Century Savants.—In science and general erudition the 18th century in France was at first much occupied with the mathematical studies for which the French genius is so peculiarly adapted, which the great discoveries of Descartes had made possible and popular, and which those of his supplanter Newton only made more popular still. Voltaire took to himself the credit, which he fairly deserves, of first introducing the Newtonian system into France, and it was soon widely popular—even ladies devoting themselves to the exposition of mathematical subjects, as in the case of Gabrielle de Breteuil, marquise du Châtelet (1706–1749) Voltaire's "divine Émilie." Indeed ladies played a great part in the literary and scientific activity of the century, by actual contribution sometimes, but still more by continuing and extending the tradition of "salons." The duchesse du Maine, Mesdames de Lambert, de Tencin, Geoffrin, du Deffand, Necker, and above all, the baronne d'Holbach (whose husband, however, was here the principal personage) presided over coteries which became more and more "philosophical." Many of the greatest mathematicians of the age, such as de Moivre and Laplace, were French by birth, while others like Euler belonged to French-speaking races, and wrote in French. The physical sciences were also ardently cultivated, the impulse to them being given partly by the generally materialistic tendency of the age, partly by the Newtonian system, and partly also by the extended knowledge of the world provided by the circumnavigatory voyage of Louis Antoine de Bougainville (1729–1811), and other travels. P. L. de Moreau Maupertuis (1698–1759) and C. M. de la Condamine (1701–1774) made long journeys for scientific purposes and duly recorded their experiences. The former, a mathematician and physicist of some ability but more oddity, is chiefly known to literature by the ridicule of Voltaire in the *Diatribe du Docteur Akakia*. Jean le Rond, called d'Alembert (1717–1783), a great mathematician and a writer of considerable though rather academic excellence, is principally known from his connexion with and introduction to the *Encyclopédie*, of which more presently. Chemistry was also assiduously cultivated, the baron d'Holbach, among others, being a devotee thereof, and helping to advance the science to the point where, at the conclusion of the century, it was illustrated by Berthollet and Lavoisier. During all this devotion to science in its modern acceptation, the older and more literary forms of erudition were not neglected, especially by the illustrious Benedictines of the abbey of St Maur. Dom Augustin Calmet (1672–1757) the author of the well-known *Dictionary of the Bible*, belonged to this order, and to them also (in particular to Dom Rivet) was due the beginning of the immense *Histoire littéraire de la France*, a work interrupted by the Revolution and long suspended, but diligently continued since the middle of the 19th century. Of less orthodox names distinguished for erudition, Nicolas Fréret (1688–1749), secretary of the Academy, is perhaps the most remarkable. But in the consideration of the science and learning in the 18th century from a literary point of view, there is one name and one book which require particular and, in the case of the book, somewhat extended mention. The man is Georges Louis Leclerc, comte de Buffon (1717–1788), the book the *Encyclopédie*. The immense *Natural History* of Buffon, though not entirely his own, is a remarkable monument of the union of scientific tastes with literary ability. **Buffon.** As has happened in many similar instances, there is in parts more literature than science to be found in it; and from the point of view of the latter, Buffon was far too careless in observation and far too solicitous of perfection of style and grandiosity of view. The style of Buffon has sometimes been made the subject of the highest eulogy, and it is at its best admirable; but one still feels in it the fault of all serious French prose in this century before Rousseau—the presence, that is to say, of an artificial spirit rather than of natural variety and power. The *Encyclopédie*, unquestionably on the whole the most important French literary production of the century, if we except the works of Rousseau and Voltaire, was conducted for a time by Diderot and d'Alembert, afterwards by Diderot alone. It numbered among its contributors almost every Frenchman of eminence in letters. It is often spoken of as if, under the guise of an encyclopaedia, it had been merely a *plaidoyer* against religion, but this is entirely erroneous. Whatever anti-ecclesiastical bent some of the articles may have, the book as a whole is simply what it professes to be, a dictionary—that is to say, not merely an historical and critical lexicon, like those of Bayle and Moreri (indeed history and biography were nominally excluded), but a dictionary of arts, sciences, trades and technical terms. Diderot himself had perhaps the greatest faculty of any man that ever lived for the literary treatment in a workman-like manner of the most heterogeneous and in some cases rebellious subjects; and his untiring labour, not merely in writing original articles, but in editing the contributions of others, determined the character of the whole work. There is no doubt that it had, **The Encyclopédie.**

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quite independently of any theological or political influence, an immense share in diffusing and gratifying the taste for general information.

1789–1830—General Sketch.—The period which elapsed between the outbreak of the Revolution and the accession of Charles X. has often been considered a sterile one in point of literature. As far as mere productiveness goes, this judgment is hardly correct. No class of literature was altogether neglected during these stirring five-and-thirty years, the political events of which have so engrossed the attention of posterity that it has sometimes been necessary for historians to remind us that during the height of the Terror and the final disasters of the empire the theatres were open and the booksellers' shops patronized. Journalism, parliamentary eloquence and scientific writing were especially cultivated, and the former in its modern sense may almost be said to have been created. But of the higher products of literature the period may justly be considered to have been somewhat barren. During the earlier part of it there is, with the exception of André Chénier, not a single name of the first or even second order of excellence. Towards the midst those of Chateaubriand (1768–1848) and Madame de Staël (1766–1817) stand almost alone; and at the close those of Courier, Béranger and Lamartine are not seconded by any others to tell of the magnificent literary burst which was to follow the publication of *Cromwell*. Of all departments of literature, poetry proper was worst represented during this period. André Chénier was silenced at its opening by the guillotine. Le Brun and Delille, favoured by an extraordinary longevity, continued to be admired and followed. It was the palmy time of descriptive poetry. Louis, marquis de Fontanes (1757–1821, who deserves rather more special notice as a critic and an official patron of literature), Castel, Boisjolin, Esmenard, Berchoux, Ricard, Martin, Gudin, Cournaud, are names which chiefly survive as those of the authors of scattered attempts to turn the Encyclopaedia into verse. Charles Julien de Chênedollé (1769–1833) owes his reputation rather to amiability, and to his association with men eminent in different ways, such as Rivarol and Joubert, than to any real power. He has been regarded as a precursor of Lamartine; but the resemblance is chiefly on Lamartine's weakest side; and the stress laid on him recently, as on Lamartine himself and even on Chénier, is part of a passing reaction against the school of Hugo. Even more ambitiously, Luce de Lancival, Campenon, Dumesnil and Parseval de Grand-Maison endeavoured to write epics, and succeeded rather worse than the Chapelains and Desmarets of the 17th century. The characteristic of all this poetry was the description of everything in metaphor and paraphrase, and the careful avoidance of anything like directness of expression; and the historians of the Romantic movement have collected many instances of this absurdity. Lamartine will be more properly noticed in the next division. But about the same time as Lamartine, and towards the end of the present period, there appeared a poet who may be regarded as the last important echo of Malherbe. This was Casimir Delavigne (1793–1843), the author of *Les Messéniennes*, a writer of very great talent, and, according to the measure of J. B. Rousseau and Lebrun, no mean poet. It is usual to reckon Delavigne as transitionary between the two schools, but in strictness he must be counted with the classicists. Dramatic poetry exhibited somewhat similar characteristics. The system of tragedy writing had become purely mechanical, and every act, almost every scene and situation, had its regular and appropriate business and language, the former of which the poet was not supposed to alter at all, and the latter only very slightly. Poinsinet, La Harpe, M. J. Chénier, Raynouard, de Jouy, Briffaut, Baour-Lormian, all wrote in this style. Of these Chénier (1764–1811) had some of the vigour of his brother André, from whom he was distinguished by more popular political principles and better fortune. On the other hand, Jean François Ducis (1733–1816), who passes with Englishmen as a feeble reducer of Shakespeare to classical rules, passed with his contemporaries as an introducer into French poetry of strange and revolutionary novelties. Comedy, on the other hand, fared better, as indeed it had always fared. Fabre d'Églantine (1755–1794) (the companion in death of Danton), Collin d'Harleville(1755–1806), François G. J. S. Andrieux (1759–1833), Picard, Alexandre Duval, and Népomucène Lemercier (1771–1840) (the most vigorous of all as a poet and a critic of mark) were the comic authors of the period, and their works have not suffered the complete eclipse of the contemporary tragedies which in part they also wrote. If not exactly worthy successors of Molière, they are at any rate not unworthy children of Beaumarchais. In romance writing there is again, until we come to Madame de Staël, a great want of originality and even of excellence in workmanship. The works of Madame de Genlis (1746–1830) exhibit the tendencies of the 18th century to platitude and noble sentiment at their worst. Madame Cottin (1770–1807), Madame de Souza (1761–1836), and Madame de Krudener, exhibited some of the qualities of Madame de Lafayette and more of those of Madame de Genlis. Joseph Fiévée (1767–1830), in *Le Dot de Suzette* and other works, showed some power over the domestic story; but perhaps the most remarkable work in point of originality of the time was Xavier de Maistre's (1763–1852) *Voyage autour de ma chambre*, an attempt in quite a new style, which has been happily followed up by other writers. Turning to history we find comparatively little written at this period. Indeed, until quite its close, men were too much occupied in making history to have time to write it. There is, however, a considerable body of memoir writers, especially in the earlier years of the period, and some great names appear also in history proper. Many of Sismondi's (1773–1842) best works were produced during the empire. A. G. P. Brugière, baron de Barante (1782–1866), though his best-known works date much later, belongs partially to this time. On the other hand, the production of philosophical writing, especially in what we may call applied philosophy, was considerable. The sensationalist views of Condillac were first continued as by Destutt de Tracy (1754–1836) and Laromiguière (1756–1837) and subsequently opposed, in consequence partly of a religious and spiritualist revival, partly of the influence of foreign schools of thought, especially the German and the Scotch. The chief philosophical writers from this latter point of view were Pierre Paul Royer Collard (1763–1845), F. P. G. Maine de Biran (1776–1824), and Théodore Simon Jouffroy (1796–1842). Their influence on literature, however, was altogether inferior to that of the reactionist school, of whom Louis Gabriel, vicomte de Bonald (1754–1840), and Joseph de Maistre (1753–1821) were the great leaders. These latter were strongly political in their tendencies, and political philosophy received, as was natural, a large share of the attention of the time. In continuation of the work of the Philosophes, the most remarkable writer was Constantin François Chasseboeuf, comte de Volney (1757–1820), whose *Ruines* are generally known. On the other hand, others belonging to that school, such as Necker and Morellet, wrote from the moderate point of view against revolutionary excesses. Of the reactionists Bonald is extremely royalist, and carries out in his *Législations primitives* somewhat the same patriarchal and absolutist theories as our own Filmer, but with infinitely greater genius. As Bonald is royalist and aristocratic, so Maistre is the advocate of a theocracy pure and simple, with the pope for its earthly head, and a vigorous despotism for its system of government. Pierre Simon Ballanche (1776–1847), often mentioned in the literary memoirs of his time, wrote among other things *Essais de palingénésie sociale*, good in style but vague in substance. Of theology proper there is almost necessarily little or nothing, the clergy being in the earlier period proscribed, in the latter part kept in a strict and somewhat discreditable subjection by the Empire. In moralizing literature there is one work of the very highest excellence, which, though not published till long afterwards, belongs in point of composition to this period. This is the *Pensées* of Joseph Joubert (1754–1824), the most illustrious successor of Pascal and Vauvenargues, and to be ranked perhaps above both in the literary finish of his maxims, and certainly above Vauvenargues in the breadth and depth of thought which

Maistre.

Joubert.

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they exhibit. In pure literary criticism more particularly, Joubert, though exhibiting some inconsistencies due to his time, is astonishingly penetrating and suggestive. Of science and erudition the time was fruitful. At an early period of it appeared the remarkable work of Pierre Cabanis(1757–1808),the *Rapports du physique et du morale de l'homme*, a work in which physiology is treated from the extreme materialist point of view but with all the liveliness and literary excellence of the Philosophe movement at its best. Another physiological work of great merit at this period was the *Traité de la vie et de la mort* of Bichat, and the example set by these works was widely followed; while in other branches of science Laplace, Lagrange,Haüy,Berthollet, &c., produced contributions of the highest value. From the literary point of view, however, the chief interest of this time is centred in two individual names, those of Chateaubriand and Madame de Staël, and in three literary developments of a more or less novel character, which were all of the highest importance in shaping the course which French literature has taken since 1824. One of these developments was the reactionary movement of Maistre and Bonald, which in its turn largely influenced Chateaubriand, then Lamennais and Montalembert, and was later represented in French literature in different guises, chiefly by Louis Veuillot (1815–1883) and Mgr Dupanloup(1802–1878). The second and third, closely connected, were the immense advances made by parliamentary eloquence and by political writing, the latter of which, by the hand of Paul Louis Courier (1773–1825),contributed for the first time an undoubted masterpiece to French literature. The influence of the two combined has since raised journalism to even a greater pitch of power in France than in any other country. It is in the development of these new openings for literature, and in the cast and complexion which they gave to its matter, that the real literary importance of the Revolutionary period consists; just as it is in the new elements which they supplied for the treatment of such subjects that the literary value of the authors of *René* and *De l'Allemagne* mainly lies. We have already alluded to some of the beginnings of periodical and journalistic letters in France. For some time, in the hands of Bayle, Basnage, Des Maizeaux, Jurieu, Leclerc, periodical literature consisted mainly of a series, more or less disconnected, of pamphlets, with occasional extracts from forthcoming works, critical *adversaria* and the like. Of a more regular kind were the often mentioned *Journal de Trévoux* and *Mercure de France*, and later the *Année littéraire* of Fréron and the like. The *Correspondance* of Grimm also, as we have pointed out, bore considerable resemblance to a modern monthly review, though it was addressed to a very few persons. Of political news there was, under a despotism, naturally very little. 1789, however, saw a vast change in this respect. An enormous efflorescence of periodical literature at once took place, and a few of the numerous journals founded in that year or soon afterwards survived for a considerable time. A whole class of authors arose who pretended to be nothing more than journalists, while many writers distinguished for more solid contributions to literature took part in the movement, and not a few active politicians contributed. Thus to the original staff of the *Moniteur*, or, as it was at first called, *La Gazette Nationale*, La Harpe, Lacretelle, Andrieux, Dominique Joseph Garat (1749–1833) and Pierre Ginguené (1748–1826) were attached. Among the writers of the *Journal de Paris* André Chénier had been ranked. Fontanes contributed to many royalist and moderate journals. Guizot and Morellet, representatives respectively of the 19th and the 18th century, shared in the *Nouvelles politiques*, while Bertin, Fievée and J. L. Geoffroy (1743–1814), a critic of peculiar acerbity, contributed to the *Journal de l'empire*, afterwards turned into the still existing *Journal des débats*. With Geoffroy, François Bénoit Hoffman (1760–1828), Jean F. J. Dussault (1769–1824) and Charles F. Dorimond, abbé de Féletz (1765–1850), constituted a quartet of critics sometimes spoken of as "the *Débats* four," though they were by no means all friends. Of active politicians Marat(*L'Ami du peuple*), Mirabeau(*Courrier de Provence*), Barère (*Journal des débats et des décrets*), Brissot (*Patriote français*), Hébert (*Père Duchesne*), Robespierre (*Défenseur de la constitution*), and Tallien (*La Sentinelle*) were the most remarkable who had an intimate connexion with journalism. On the other hand, the type of the journalist pure and simple is Camille Desmoulins(1759–1794), one of the most brilliant, in a literary point of view, of the short-lived celebrities of the time. Of the same class were Pelletier, Durozoir, Loustalot, Royou. As the immediate daily interest in politics drooped, there were formed periodicals of a partly political and partly literary character. Such had been the *décade philosophique*, which counted Cabanis,Chénier, and De Tracy among its contributors, and this was followed by the *Revue française* at a later period, which was in its turn succeeded by the *Revue des deux mondes*. On the other hand, parliamentary eloquence was even more important than journalism during the early period of the Revolution. Mirabeau naturally stands at the head of orators of this class, and next to him may be ranked the well-known names of Malouet and Meunier among constitutionalists; of Robespierre, Marat and Danton, the triumvirs of the Mountain; of Maury, Cazalès and the vicomte de Mirabeau, among the royalists; and above all of the Girondist speakers Barnave, Vergniaud, and Lanjuinais. The last named survived to take part in the revival of parliamentary discussion after the Restoration. But the permanent contributions to French literature of this period of voluminous eloquence are, as frequently happens in such cases, by no means large. The union of the journalist and the parliamentary spirit produced, however, in Paul Louis Courier a master of style. Courier spent the greater part of his life, tragically cut short, in translating the classics and studying the older writers of France, in which study he learnt thoroughly to despise the pseudo-classicism of the 18th century. It was not till he was past forty that he took to political writing, and the style of his pamphlets, and their wonderful irony and vigour, at once placed them on the level of the very best things of the kind. Along with Courier should be mentioned Benjamin Constant (1767–1830), who, though partly a romance writer and partly a philosophical author, was mainly a politician and an orator, besides being fertile in articles and pamphlets. Lamennais, like Lamartine, will best be dealt with later, and the same may be said of Béranger; but Chateaubriand and Madame de Staël must be noticed here. The former represents, in the influence which changed the literature of the 18th century into the literature of the 19th, the vague spirit of unrest and "Weltschmerz," the affection for the picturesque qualities of nature, the religious spirit occasionally turning into mysticism, and the respect, sure to become more and more definite and appreciative, for antiquity. He gives in short the romantic and conservative element. Madame de Staël (1766–1817) on the other hand, as became a daughter of Necker, retained a great deal of the Philosophe character and the traditions of the 18th century, especially its liberalism, its *sensibilité*, and its thirst for general information; to which, however, she added a cosmopolitan spirit, and a readiness to introduce into France the literary and social, as well as the political and philosophical, peculiarities of other countries to which the 18th century, in France at least, had been a stranger, and which Chateaubriand himself, notwithstanding his excursions into English literature, had been very far from feeling. She therefore contributed to the positive and liberal side of the future movement. The absolute literary importance of the two was very different. Madame de Staël's early writings were of the critical kind, half aesthetic half ethical, of which the 18th century had been fond, and which their titles, *Lettres sur J. Rousseau*, *De l'influence des passions*, *De la littérature considérée dans ses rapports avec les institutions sociales*, sufficiently show. Her romances, *Delphine* and *Corinne*, had immense literary influence at the time. Still more was this the case with *De l' Allemagne*, which practically opened up to the rising generation in France the till then unknown treasures of literature and philosophy, which during the most glorious half century of her literary history Germany had, sometimes on hints taken from France herself, been accumulating. The literary importance of Chateaubriand (1768–1848) is far greater, while his literary influence

Courier.

Madame de Staël.

Chateaubriand.

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can hardly be exaggerated. Chateaubriand's literary father was Rousseau, and his voyage to America helped to develop the seeds which Rousseau had sown. In *René* and other works of the same kind, the naturalism of Rousseau received a still further development. But it was not in mere naturalism that Chateaubriand was to find his most fertile and most successful theme. It was, on the contrary, in the rehabilitation of Christianity as an inspiring force in literature. The 18th century had used against religion the method of ridicule; Chateaubriand, by genius rather than by reasoning, set up against this method that of poetry and romance. "Christianity," says he, almost in so many words, "is the most poetical of all religions, the most attractive, the most fertile in literary, artistic and social results." This theme he develops with the most splendid language, and with every conceivable advantage of style, in the *Génie du Christianisme* and the *Martyrs*. The splendour of imagination, the summonings of history and literature to supply effective and touching illustrations, analogies and incidents, the rich colouring so different from the peculiarly monotonous and grey tones of the masters of the 18th century, and the fervid admiration for nature which were Chateaubriand's main attractions and characteristics, could not fail to have an enormous literary influence. Indeed he has been acclaimed, with more reason than is usually found in such acclamations, as the founder of comparative *and* imaginative literary criticism in France if not in Europe. The Romantic school acknowledged, and with justice, its direct indebtedness to him.

Literature since 1830.—In dealing with the last period of the history of French literature and that which was introduced by the literary revolution of 1830 and has continued, in phases of only partial change, to the present day, a slight alteration of treatment is requisite. The subdivisions of literature have lately become so numerous, and the contributions to each have reached such an immense volume, that it is impossible to give more than cursory notice, or indeed allusion, to most of them. It so happens, however, that the purely literary characteristics of this period, though of the most striking and remarkable, are confined to a few branches of literature. The character of the 19th century in France has hitherto been at least as strongly marked as that of any previous period. In the middle ages men of letters followed each other in the cultivation of certain literary forms for long centuries. The *chanson de geste*, the Arthurian legend, the *roman d' aventure*, the *fabliau*, the allegorical poem, the rough dramatic *jeu*, mystery and farce, served successively as moulds into which the thought and writing impulse of generations of authors were successively cast, often with little attention to the suitability of form and subject. The end of the 15th century, and still more the 16th, owing to the vast extension of thought and knowledge then introduced, finally broke up the old forms, and introduced the practice of treating each subject in a manner more or less appropriate to it, and whether appropriate or not, freely selected by the author. At the same time a vast but somewhat indiscriminate addition was made to the actual vocabulary of the language. The 17th and 18th centuries witnessed a process of restriction once more to certain forms and strict imitation of predecessors, combined with attention to purely arbitrary rules, the cramping and impoverishing effect of this (in Fénelon's words) being counterbalanced partly by the efforts of individual genius, and still more by the constant and steady enlargement of the range of thought, the choice of subjects, and the familiarity with other literature, both of the ancient and modern world. The literary work of the 19th century and of the great Romantic movement which began in its second quarter was to repeat on a far larger scale the work of the 16th, to break up and discard such literary forms as had become useless or hopelessly stiff, to give strength, suppleness and variety to such as were retained, to invent new ones where necessary, to enrich the language by importations, inventions and revivals, and, above all, to bring into prominence the principle of individualism. Authors and even books, rather than groups and kinds, demand principal attention.

The result of this revolution is naturally most remarkable in the *belles-lettres* and the kindred department of history. Poetry, not dramatic, has been revived; prose romance and literary criticism have been brought to a perfection previously unknown; and history has produced works more various, if not more remarkable, than at any previous stage of the language. Of all these branches we shall therefore endeavour to give some detailed account. But the services done to the language were not limited to the strictly literary branches of literature. Modern French, if it lacks, as it probably does lack, the statuesque precision and elegance of prose style to which between 1650 and 1800 all else was sacrificed, has become a much more suitable instrument for the accurate and copious treatment of positive and concrete subjects. These subjects have accordingly been treated in an abundance corresponding to that manifested in other countries, though the literary importance of the treatment has perhaps proportionately declined. We cannot even attempt to indicate the innumerable directions of scientific study which this copious industry has taken, and must confine ourselves to those which come more immediately under the headings previously adopted. In philosophy proper France, like other nations, has been more remarkable for attention to the historical side of the matter than for the production of new systems; and the principal exception among her philosophical writers, Auguste Comte (1793–1857), besides inclining, as far as his matter went to the political and scientific rather than to the purely philosophical side (which indeed he regarded as antiquated), was not very remarkable merely as a man of letters. Victor Cousin (1792–1867), on the other hand, almost a brilliant man of letters and for a time regarded as something of a philosophical apostle preaching "eclecticism," betook himself latterly to biographical and other miscellaneous writing, especially on the famous French ladies of the 17th century, and is likely to be remembered chiefly in this department, though not to be forgotten in that of philosophical history and criticism. The same curious declension was observable in the much younger Hippolyte Adolphe Taine (1828–1893), who, beginning with philosophical studies, and always maintaining a strong tincture of philosophical determinism, applied himself later, first to literary history and criticism in his famous *Histoire de la littérature anglaise* (1864), and then to history proper in his still more famous and far more solidly based *Origines de la France contemporaine* (1876). To him, however, we must recur under the head of literary criticism. And not dissimilar phenomena, not so much of inconstancy to philosophy as of a tendency towards the applied rather than the pure branches of the subject, are noticeable in Edgar Quinet (1803–1875), in Charles de Rémusat (1797–1875), and in Ernest Renan (1823–1892), the first of whom began by translating Herder while the second and third devoted themselves early to scholastic philosophy, de Rémusat dealing with Abelard (1845) and Anselm (1856), Renan with Averroes (1852). More single-minded devotion to at least the historical side was shown by Jean Philibert Damiron (1794–1862), who published in 1842 a *Cours de philosophie* and many minor works at different times; but the inconstancy recurs in Jules Simon (1814–1896), who, in the earlier part of his life a professor of philosophy and a writer of authority on the Greek philosophers (especially in *Histoire de l' école d' Alexandrie*, 1844–1845), began before long to take an active and, towards the close of his life-work, all but a foremost part in politics. In theology the chief name of great literary eminence in the earlier part of the century is that of Lamennais, of whom more presently, in the later, that of Renan again. But Charles Forbes de Montalembert (1810–1870), an historian with a strong theological tendency, deserves notice; and among ecclesiastics who have been orators and writers the père Jean Baptiste Henri Lacordaire (1802–1861), a pupil of Lamennais who returned to orthodoxy but always kept on the Liberal side; the père Célestin Joseph Félix (1810–1891), a Jesuit teacher and preacher of eminence; and the père Didon (1840–1900), a very popular preacher and writer who, though thoroughly orthodox, did not escape collision with his superiors. On the Protestant side Athanase Coquerel (1820–1875) is the most remarkable name. Recently Paul Sabatier (b. 1858) has displayed, especially

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in dealing with Saint Francis of Assisi, much power of literary and religious sympathy and a style somewhat modelled on that of Renan, but less unctuous and effeminate. There are strong philosophical tendencies, and at least a revolt against the religious as well as philosophical ideas of the Encyclopédists, in the *Pensées* of Joubert, while the hybrid position characteristic of the 19th century is particularly noticeable in Étienne Pivert de Sénancour (1770–1846), whose principal work, *Obermann* (1804), had an extraordinary influence on its own and the next generation in the direction of melancholy moralizing. This tone was notably taken up towards the other end of the century by Amiel (*q.v.*), who, however, does not strictly belong to *French* literature: while in Ximénès Doudon (1800–1872), author of *Mélanges et lettres* posthumously published, we find more of a return to the attitude of Joubert—literary criticism occupying a very large part of his reflections. Political philosophy and its kindred sciences have naturally received a large share of attention. Towards the middle of the century there was a great development of socialist and fanciful theorizing on politics, with which the names of Claude Henri, comte de Saint-Simon (1760–1825), Charles Fourier (1772–1837), Étienne Cabet (1788–1856), and others are connected. As political economists Frédéric Bastiat (1801–1850), L. G. L. Guilhaud de Lavergne (1800–1880), Louis Auguste Blanqui (1805–1881), and Michel Chevalier (1806–1879) may be noticed. In Alexis de Tocqueville (1805–1859) France produced a political observer of a remarkably acute, moderate and reflective character, and Armand Carrel (1800–1836), whose life was cut short in a duel, was a real man of letters, as well as a brilliant journalist and an honest if rather violent party politician. The name of Jean Louis Eugène Lerminier (1803–1857) is of wide repute for legal and constitutional writings, and that of Henri, baron de Jomini (1779–1869) is still more celebrated as a military historian; while that of François Lenormant (1837–1883) holds a not dissimilar position in archaeology. With the publications devoted to physical science proper we do not attempt to meddle. Philology, however, demands a brief notice. In classical studies France has till recently hardly maintained the position which might be expected of the country of Scaliger and Casaubon. She has, however, produced some considerable Orientalists, such as Champollion the younger, Burnouf, Silvestre de Sacy and Stanislas Julien. The foundation of Romance philology was due, indeed, to the foreigners Wolf and Diez. But early in the century the curiosity as to the older literature of France created by Barbazan, Tressan and others continued to extend. Dominique Martin Méon (1748–1829) published many unprinted fabliaux, gave the whole of the French *Renart* cycle, with the exception of *Renart le contrefait*, and edited the *Roman de la rose*. Charles Claude Fauriel (1772–1844) and François Raynouard (1761–1836) dealt elaborately with Provençal poetry as well as partially with that of the trouvères; and the latter produced his comprehensive *Lexique romane*. These examples were followed by many other writers, who edited manuscript works and commented on them, always with zeal and sometimes with discretion. Foremost among these must be mentioned Paulin Paris (1800–1881) who for fifty years served the cause of old French literature with untiring energy, great literary taste, and a pleasant and facile pen. His selections from manuscripts, his *Romancero français*, his editions of *Garin le Loherain* and *Berte aus grans piés*, and his *Romans de la table ronde* may especially be mentioned. Soon, too, the Benedictine *Histoire littéraire*, so long interrupted, was resumed under M. Paris's general management, and has proceeded nearly to the end of the 14th century. Among its contents M. Paris's dissertations on the later *chansons de gestes* and the early song writers, M. Victor le Clerc's on the *fabliaux*, and M. Littré's on the *romans d'aventures* may be specially noticed. For some time indeed the work of French editors was chargeable with a certain lack of critical and philological accuracy. This reproach, however, was wiped off by the efforts of a band of younger scholars, chiefly pupils of the École des Chartes, with MM. Gaston Paris (1839–1903) and Paul Meyer at their head. Of M. Paris in particular it may be said that no scholar in the subject has ever combined literary and linguistic competence more admirably. The Société des Anciens Textes Français was formed for the purpose of publishing scholarly editions of inedited works, and a lexicon of the older tongue by M. Godefroy at last supplemented, though not quite with equal accomplishment, the admirable dictionary in which Émile Littré (1801–1881), at the cost of a life's labour, embodied the whole vocabulary of the classical French language. Meanwhile the period between the middle ages proper and the 17th century has not lacked its share of this revival of attention. To the literature between Villon and Regnier especial attention was paid by the early Romantics, and Sainte-Beuve's *Tableau historique et critique de la poésie et du théâtre au xvi^e^me siècle* was one of the manifestoes of the school. Since the appearance of that work in 1828 editions with critical comments of the literature of this period have constantly multiplied, aided by the great fancy for tastefully produced works which exists among the richer classes in France; and there are probably now few countries in which works of old authors, whether in cheap reprints or in *éditions de luxe* can be more readily procured.

The Romantic Movement.—It is time, however, to return to the literary revolution itself, and its more purely literary results. At the accession of Charles X. France possessed three writers, and perhaps only three, of already remarkable eminence, if we except Chateaubriand, who was already of a past generation. These three were Pierre Jean de Béranger (1780–1857), Alphonse de Lamartine (1790–1869), and Hugues Félicité Robert Lamennais (1782–1854). The first belongs definitely in manner, despite his striking originality of *nuance*, to the past. He has remnants of the old periphrases, the cumbrous mythological allusions, the poetical "properties" of French verse. He has also the older and narrower limitations of a French poet; foreigners are for him mere barbarians. At the same time his extraordinary lyrical faculty, his excellent wit, which makes him a descendant of Rabelais and La Fontaine, and his occasional touches of pathos made him deserve and obtain something more than successes of occasion. Béranger, moreover, was very far from being the mere improvisatore which those who cling to the inspirationist theory of poetry would fain see in him. His studies in style and composition were persistent, and it was long before he attained the firm and brilliant manner which distinguishes him. Béranger's talent, however, was still too much a matter of individual genius to have great literary influence, and he formed no school. It was different with Lamartine, who was, nevertheless, like Béranger, a typical Frenchman. The *Méditations* and the *Harmonies* exhibit a remarkable transition between the old school and the new. In going direct to nature, in borrowing from her striking outlines, vivid and contrasted tints, harmony and variety of sound, the new poet showed himself an innovator of the best class. In using romantic and religious associations, and expressing them in affecting language, he was the Chateaubriand of verse. But with all this he retained some of the vices of the classical school. His versification, harmonious as it is, is monotonous, and he does not venture into the bold lyrical forms which true poetry loves. He has still the horror of the *mot propre*; he is always spiritualizing and idealizing, and his style and thought have a double portion of the feminine and almost flaccid softness which had come to pass for grace in French. The last of the trio, Lamennais, represents an altogether bolder and rougher genius. Strongly influenced by the Catholic reaction, Lamennais also shows the strongest possible influence of the revolutionary spirit. His earliest work, the *Essai sur l'indifférence en matière de religion* (1817 and 1818) was a defence of the church on curiously unecclesiastical lines. It was written in an ardent style, full of illustrations, and extremely ambitious in character. The plan was partly critical and partly constructive. The first part disposed of the 18th century; the second, adopting the theory of papal absolutism which Joseph de Maistre had already advocated, proceeded to base it on a supposed universal consent. The after history of Lamennais was perhaps not an unnatural recoil from this; but it is sufficient here to point out that in his prose,

Béranger.

Lamartine.

Lamennais.

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especially as afterwards developed in the apocalyptic *Paroles d'un croyant* (1839) are to be discerned many of the tendencies of the Romantic school, particularly its hardy and picturesque choice of language, and the disdain of established and accepted methods which it professed. The signs of the revolution itself were, as was natural, first given in periodical literature. The feudalist affectations of Chateaubriand and the legitimists excited a sort of aesthetic affection for Gothicism, and Walter Scott became one of the most favourite authors in France. Soon was started the periodical *La Muse française*, in which the names of Hugo, Vigny, Deschamps and Madame de Girardin appear. Almost all the writers in this periodical were eager royalists, and for some time the battle was still fought on political grounds. There could, however, be no special connexion between classical drama and liberalism; and the liberal journal, the *Globe*, with no less a person than Sainte-Beuve among its contributors, declared definite war against classicism in the drama. The chief "classical" organs were the *Constitutionnel*, the *Journal des débats*, and after a time and not exclusively, the *Revue des deux mondes*. Soon the question became purely literary, and the Romantic school proper was born in the famous *cénacle* or clique in which Hugo was chief poet, Sainte-Beuve chief critic, and Gautier, Gérard de Nerval, the brothers Émile (1791–1871) and Antony (1800–1869), Deschamps, Petrus Borel (1809–1859) and others were officers. Alfred de Vigny and Alfred de Musset stand somewhat apart, and so does Charles Nodier (1780–1844), a versatile and voluminous writer, the very variety and number of whose works have somewhat prevented the individual excellence of any of them from having justice done to it. The objects of the school, which was at first violently opposed, so much so that certain academicians actually petitioned the king to forbid the admission of any Romantic piece at the Théâtre Français, were, briefly stated, the burning of everything which had been adored, and the adoring of everything which had been burnt. They would have no unities, no arbitrary selection of subjects, no restraints on variety of versification, no academically limited vocabulary, no considerations of artificial beauty, and, above all, no periphrastic expression. The *mot propre*, the calling of a spade a spade, was the great commandment of Romanticism; but it must be allowed that what was taken away in periphrase was made up in adjectives. Musset, who was very much of a free-lance in the contest, maintained indeed that the *differentia* of the Romantic was the copious use of this part of speech. All sorts of epithets were invented to distinguish the two parties, of which *flamboyant* and *grisâtre* are perhaps the most accurate and expressive pair—the former serving to denote the gorgeous tints and bold attempts of the new school, the latter the grey colour and monotonous outlines of the old. The representation of *Hernani* in 1830 was the culmination of the struggle, and during great part of the reign of Louis Philippe almost all the younger men of letters in France were Romantics. The representation of the *Lucrèce* of François Ponsard (1814–1867) in 1846 is often quoted as the herald or sign of a classical reaction. But this was only apparent, and signified, if it signified anything, merely that the more juvenile excesses of the Romantics were out of date. All the greatest men of letters of France since 1830 have been on the innovating side, and all without exception, whether intentionally or not, have had their work coloured by the results of the movement, and of those which have succeeded it as developments rather than reactions.

Drama and Poetry since 1830.—Although the immediate subject on which the battles of Classics and Romantics arose was dramatic poetry, the dramatic results of the movement have not been those of greatest value or most permanent character. The principal effect in the long run has been the introduction of a species of play called *drame*, as opposed to regular comedy and tragedy, admitting of much freer treatment than either of these two as previously understood in French, and lending itself in some measure to the lengthy and disjointed action, the multiplicity of personages, and the absence of stock characters which characterized the English stage in its palmy days. All Victor Hugo's dramatic works are of this class, and each, as it was produced or published (*Cromwell*, *Hernani*, *Marion de l'Orme*, *Le Roi s'amuse*, *Lucrèce Borgia*, *Marie Tudor*, *Ruy Blas* and *Les Burgraves*), was a literary event, and excited the most violent discussion—the author's usual plan being to prefix a prose preface of a very militant character to his work. A still more melodramatic variety of *drame* was that chiefly represented by Alexandre Dumas (1802–1870), whose *Henri III* and *Antony*, to which may be added later *La Tour de Nesle* and *Mademoiselle de Belleisle*, were almost as much rallying points for the early Romantics as the dramas of Hugo, despite their inferior literary value. At the same time Alexandre Soumet (1788–1845), in *Norma*, *Une Fête de Néron*, &c., and Casimir Delavigne in *Marino Faliero*, *Louis XI*, &c., maintained a somewhat closer adherence to the older models. The classical or semi-classical reaction of the last years of Louis Philippe was represented in tragedy by Ponsard (*Lucrèce*, *Agnes de Méranie*, *Charlotte Corday*, *Ulysse*, and several comedies), and on the comic side, to a certain extent, by Émile Augier (1820–1889) in *L'Aventurière*, *Le Gendre de M. Poirier*, *Le Fils de Giboyer*, &c. During almost the whole period Eugène Scribe (1791–1861) poured forth innumerable comedies of the vaudeville order, which, without possessing much literary value, attained immense popularity. For the last half-century the realist development of Romanticism has had the upper hand in dramatic composition, its principal representatives being on the one side Victorien Sardou (b. 1831–1909), who in *Nos Intimes*, *La Famille Benoiton*, *Rabagas*, *Dora*, &c., chiefly devoted himself to the satirical treatment of manners, and Alexandre Dumas *fils* (1824–1895), author in 1852 of the famous *Dame aux camélias*, who in such pieces as *Les Idées de Madame Aubray* and *L'Étrangère* rather busied himself with morals and "problems," while his *Dame aux camélias* (1852) is sometimes ranked as the first of such things in "modern" style. Certain isolated authors also deserve notice, such as Joseph Autran (1813–1877), a poet and academician having some resemblance to Lamartine, whose *Fille d'Æschyle* created for him a dramatic reputation which he did not attempt to follow up, and Gabriel Legouvé (b. 1807), whose *Adrienne Lecouvreur* was assisted to popularity by the admirable talent of Rachel. A special variety of drama of the first literary importance has also been cultivated in this century under the title of *scènes* or *proverbes*, slight dramatic sketches in which the dialogue and style are of even more importance than the action. The best of all of these are those of Alfred de Musset (1810–1857), whose *Il faut qu'une porte soit ouverte ou fermée*, *On ne badine pas avec l'amour*, &c., are models of grace and wit. Among his followers may be mentioned especially Octave Feuillet (1821–1890). Few social dramas of the kind in modern times have attained a greater success than *Le Monde où l'on s'ennuie* (1868) of Édouard Pailleron (1834–1899). (See also DRAMA.)

Victor Hugo.

In poetry proper, as in drama, Victor Hugo showed the way. In him all the Romantic characteristics were expressed and embodied—disregard of arbitrary critical rules, free choice of subject, variety and vigour of metre, splendour and sonorousness of diction, abundant "local colour," and that irrepressible individualism which is one of the chief, though not perhaps the chief, of the symptoms. If the careful attention to form which is also characteristic of the movement is less apparent in him than in some of his followers, it is not because it is absent, but because the enthusiastic conviction with which he attacked every subject somewhat diverts attention from it. As with the merits so with the defects. A deficient sense of the ludicrous which characterized many of the Romantics was strongly apparent in their leader, as was also an equally representative grandiosity, and a fondness for the introduction of foreign and unfamiliar words, especially proper names, which occasionally produces an effect of burlesque. Victor Hugo's earliest poetical works, his chiefly royalist and political *Odes*, were cast in the older and accepted forms, but already displayed astonishing poetical qualities. But it was in the *Ballades* (for instance, the splendid *Pas d'armes du roi Jean*, written in verses of three syllables) and the *Orientales* (of which may be taken for a sample the sixth section of *Navarin*, a perfect

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torrent of outlandish terms poured forth in the most admirable verse, or *Les Djinns*, where some of the stanzas have lines of two syllables each) that the grand provocation was thrown to the believers in alexandrines, careful caesuras and strictly separated couplets. *Les Feuilles d'automne*, *Les Chants du crépuscule*, *Les Voix intérieures*, *Les Rayons et les ombres*, the productions of the next twenty years, were quieter in style and tone, but no less full of poetical spirit. The Revolution of 1848, the establishment of the empire and the poet's exile brought about a fresh determination of his genius to lyrical subjects. *Les Châtiments* and *La Légende des siècles*, the one political, the other historical, reach perhaps the high-water mark of French verse; and they were followed by the philosophical *Contemplations*, the lighter *Chansons des rues et des bois*, the *Année terrible*, the second *Légende des siècles*, and the later work to be found noticed *sub nom.* We have been thus particular here because the literary productiveness of Victor Hugo himself has been the measure and sample of the whole literary productiveness of France on the poetical side. At five-and-twenty he was acknowledged as a master, at seventy-five he was a master still. His poetical influence has been represented in three different schools, from which very few of the poetical writers of the century can be excluded. These few we may notice first. Alfred de Musset, a writer of great genius, felt part of the Romantic inspiration very strongly, but was on the whole unfortunately influenced by Byron, and partly out of wilfulness, partly from a natural want of persevering industry and vigour, allowed himself to be careless and even slovenly in composition. Notwithstanding this, many of his lyrics are among the finest poems in the language, and his verse, careless as it is, has extraordinary natural grace. Auguste Barbier (1805–1882) whose *Iambes* shows an extraordinary command of nervous and masculine versification, also comes in here, and the Breton poet, Auguste Brizeux (1803–1858), much admired by some, together with Hégésippe Moreau, an unequal writer possessing some talent, Pierre Dupont (1821–1870), one of much greater gifts, and Gustave Nadaud (1820–1893), a follower of Béranger, also deserve mention. Of the school of Lamartine rather than of Hugo are Alfred de Vigny (1799–1865) and Victor de Laprade (1812–1887), the former a writer of little bulk and somewhat over-fastidious, but possessing one of the most correct and elegant styles to be found in French, with a curious restrained passion and a complicated originality, the latter a meditative and philosophical poet, like Vigny an admirable writer, but somewhat deficient in pith and substance, as well as in warmth and colour. Madame Ackermann (1813–1890) is the chief philosophical poetess of France, and this style has recently been very popular; but for actual poetical powers, Marceline Desbordes-Valmore (1786–1859) perhaps excelled her, though in a looser and more sentimental fashion. The poetical schools which more directly derive from the Romantic movement as represented by Hugo are three in number, corresponding in point of time with the first outburst of the movement, with the period of reaction already alluded to, and with the closing years of the second empire. Of the first by far the most distinguished member was Théophile Gautier (1811–1872), the most perfect poet in point of form that France has produced. When quite a boy he devoted himself to the study of 16th-century masters, and though he acknowledged the supremacy of Hugo, his own talent was of an individual order, and developed itself more or less independently. *Albertus* alone of his poems has much of the extravagant and grotesque character which distinguished early romantic literature. The *Comédie de la mort*, the *Poésies diverses*, and still more the *Émaux et camées*, display a distinctly classical tendency—classical, that is to say, not in the party and perverted sense, but in its true acceptation. The tendency to the fantastic and horrible may be taken as best shown by Petrus Borel (1809–1859), a writer of singular power almost entirely wasted. Gerard Labrunie or de Nerval (1808–1855) adopted a manner also fantastic but more idealistic than Borel's, and distinguished himself by his Oriental travels and studies, and by his attention to popular ballads and traditions, while his style has an exquisite but unaffected strangeness hardly inferior to Gautier's. This peculiar and somewhat quintessenced style is also remarkable in the *Gaspard de la nuit* of Louis Bertrand (1807–1841), a work of rhythmical prose almost unique in its character. One famous sonnet preserves the name of Félix Arvers (1806–1850). The two Deschamps were chiefly remarkable as translators. The next generation produced three remarkable poets, to whom may perhaps be added a fourth. Théodore de Banville (1823–1891), adopting the principles of Gautier, and combining with them a considerable satiric faculty, composed a large amount of verse, faultless in form, delicate and exquisite in shades and colours, but so entirely neutral in moral and political tone that it has found fewer admirers than it deserved. Charles Marie René Leconte de Lisle (1818–1894), carrying out the principle of ransacking foreign literature for subjects, went to Celtic, classical or even Oriental sources for his inspiration, and despite a science in verse not much inferior to Banville's, and a far wider range and choice of subject, diffused an air of erudition, not to say pedantry, over his work which disgusted some readers, and a pessimism which displeased others, but has left poetry only inferior to that of the greatest of his countrymen. Charles Baudelaire (1821–1867), by his choice of unpopular subjects and the terrible truth of his analysis, revolted not a few of those who, in the words of an English critic, cannot take pleasure in the representation if they do not take pleasure in the thing represented, and who thus miss his extraordinary command of the poetical appeal in sound, in imagery and in suggestion generally. Thus, by a strange coincidence, each of the three representatives of the second Romantic generation was for a time disappointed of his due fame. A fourth poet of this time, Joséphin Soulary (1815–1891), produced sonnets of rare beauty and excellence. A fifth, Louis Bouilhet (1822–1869), an intimate friend of Flaubert, pushed even farther the fancy for strange subjects, but showed powers in *Melænis* and other things. In 1866 a collection of poems, entitled after an old French fashion *Le Parnasse contemporain*, appeared. It included contributions by many of the poets just mentioned, but the mass of the contributors were hitherto unknown to fame. A similar collection appeared in 1869, and was interrupted by the German war, but continued after it, and a third in 1876.

Musset.

Gautier.

The first *Parnasse* had been projected by MM. Xavier de Ricard (b. 1843) and Catulle Mendès (1841–1909) as a sort of manifesto of a school of young poets: but its contents were largely coloured by the inclusion among them of work by representatives of older generations—Gautier, Laprade, Leconte de Lisle, Banville, Baudelaire and others. The continuation, however, of the title in the later issues, rather than anything else, led to the formation and promulgation of the idea of a "Parnassien" or an "Impassible" school which was supposed to adopt as its watchword the motto of "Art for Art's sake," to pay especial attention to form, and also to aim at a certain objectivity. As a matter of fact the greater poets and the greater poems of the *Parnasse* admit of no such restrictive labelling, which can only be regarded as mischievous, though (or very mainly because) it has been continued. Another school, arising mainly in the later 'eighties and calling itself that of "Symbolism," has been supposed to indicate a reaction against Parnassianism and even against the main or Hugonic Romantic tradition generally; with a throwing back to Lamartine and perhaps Chénier. This idea of successive schools ("Decadents," "Naturists," "Simplists," &c.) has even been reduced to such an *absurdum* as the statement that "France sees a new school of poetry every fifteen years." Those who have studied literature sufficiently widely, and from a sufficient elevation, know that these systematisings are always more or less delusive. Parnassianism, symbolism and the other things are merely phases of the Romantic movement itself—as may be proved to demonstration by the simple process of taking, say, Hugo and Verlaine on the one hand, Delille or Escouchard Lebrun on the other, and comparing the two first mentioned with each other and with the older poet. The differences in the first case will be found to be

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differences at most of individuality: in the other of kind. We shall not, therefore, further refer to these dubious classifications: but specify briefly the most remarkable poets whom they concern, and all the older of whom, it may be observed, were represented in the *Parnasse* itself. Of these the most remarkable were Sully Prudhomme (1839–1907), Francois Coppée (1842–1908) and Paul Verlaine (1844–1896). The first (*Stances et poèmes*, 1865, *Vaines Tendresses*, 1875, *Bonheur*, 1888, &c.) is a philosophical and rather pessimistic poet who has very strongly rallied the suffrages of the rather large present public who care for the embodiment of these tendencies in verse; the second (*La Grève des forgerons*, 1869, *Les Humbles*, 1872, *Contes et vers*, 1881–1887, &c.) a dealer with more generally popular subjects in a more sentimental manner; and the third (*Sagesse*, 1881, *Parallèlement*, 1889, *Poèmes saturniens*, including early work, 1867–1890), by far the most original and remarkable poet of the three, starting with Baudelaire and pushing farther the fancy for forbidden subjects, but treating both these and others with wonderful command of sound and image-suggestion. Verlaine in fact (he was actually well acquainted with English) endeavoured, and to a small extent succeeded in the endeavour, to communicate to French the vague suggestion of visual and audible appeal which has characterized English poetry from Blake through Coleridge. Others of the original Parnassiens who deserve mention are Albert Glatigny (1839–1873), a Bohemian poet of great talent who died young; Stéphane Mallarmé (1842–1898), afterwards chief of the Symbolists, also a true poet in his way, but somewhat barren, and the victim of pose and trick; José Maria de Heredia (1842–1905), a very exquisite practitioner of the sonnet but with perhaps more art than matter in him; Henri Cazalis (1840–1909), who long afterwards, under his name of Jean Lahor, appeared as a Symbolist pessimist; A. Villiers de l'Isle-Adam, another eccentric but with a spark of genius; Emmanuel des Essarts; Auguste de Châtillon (1810–1882); Léon Dierx (b. 1838) who, after producing even less than Mallarmé, succeeded him as Symbolist chief; Jean Aicard (b. 1848), a southern bard of merit; and lastly Catulle Mendès himself, who has been a brilliant writer in verse and prose ever since, and whose *Mouvement poétique français de 1867 à 1900* (1903), an official report largely amplified so that it is in fact a history and dictionary of French poetry during the century, forms an almost unique work of reference on the subject. Among the later recruits the most specially noticeable was Armand Silvestre (1837–1901), whose verse (*La Chanson des heures*, 1878, *Ailes d'or*, 1880, *La Chanson des étoiles*, 1885), of an ethereal beauty, was contrasted with prose admirably written and sometimes most amusing, but "Pantagruelist," and more, in manners and morals. This declension from poetry to prose fiction was also noticeable in Guy de Maupassant, André Theuriet, Anatole France and even Alphonse Daudet.

Yet another flight of poets may be grouped as those specially representing the last quarter of the century and (whether Parnassian, Symbolist or what not) the latest development of French poetry. Verlaine and Mallarmé already mentioned were in a manner the leaders of these. Perhaps something of the influence of Whitman may be detected in the irregular verses of Gustave Kahn (b. 1859), Francis Viélé Griffin, actually an American by birth (b. 1864), Stuart Merrill, of like origin, and Paul Fort (b. 1872). But the whole tendency of the period has been to relax the stringency of French prosody. Albert Samain (1859–1900), a musical versifier enough; Jean Moréas (1856–1910) who began with a volume called *Les Syrtes* in 1884); Laurent Tailhade (b. 1854) and others are more or less Symbolist, and contributed to the Symbolist periodical (one of many such since the beginning of the Romantic movement which would almost require an article to themselves), the *Mercure de France*. An older man than many of these, M. Jean Richepin (b. 1849), made for a time considerable noise with poetical work of a colour older even than his age, and harking back somewhat to the Jeune-France and "Bousingot" type of early Romanticism—*La Chanson des gueux*, *Les Blasphèmes*, &c. Other writers of note are M. Paul Déroulède (b. 1846), a violently nationalist poet; M. Maurice Bouchor (b. 1864), who started his serious and respectable work with *Les Symboles* in 1888; while M. Henri de Regnier, born in the same year, has received very high praise for work from *Lendemains* in 1886 and other volumes up to *Les Jeux rustiques et divins* (1897) and *Les Médailles d'argile* (1900). The truth, however, perhaps is that this extraordinary abundance of verse (for we have not mentioned a quarter of the names which present themselves, or a twentieth part of those who figure in M. Mendès's catalogue for the last half-century) reminds the literary historian somewhat too much of similar phenomena in other times. There is undoubtedly a great diffusion of poetical dexterity, and not perhaps a small one of poetical spirit, but it requires the settling, clarifying and distinguishing effects of time to separate the poet from the minor poet. Still more perhaps must we look to time to decide whether the *vers libre* as it is called—that is to say, the verse freed from the minute traditions of the elder prosody, admitting hiatus, neglecting to a greater or less extent *caesura*, and sometimes relying upon mere rhythm to the neglect of strict metre altogether—can hold its ground. It has as yet been practised by no poet at all approaching the first class, except Verlaine, and not by him in its extremer forms. And the whole history of prosody and poetry teaches us that though similar changes often come in as it were unperceived, they scarcely ever take root in the language unless a great poet adopts them. Or rather it should perhaps be said that when they are going to take root in the language a great poet always does adopt them before very long.

Prose Fiction since 1830.—Even more remarkable, because more absolutely novel, was the outburst of prose fiction which followed 1830. Madame de Lafayette, Le Sage, Marivaux, Voltaire, the Abbé Prévost, Diderot, J. J. Rousseau, Bernardin de St-Pierre and Fiévée had all of them produced work excellent in its way, and comprising in a more or less rudimentary condition most varieties of the novel. But none of them had, in the French phrase, made a school, and at no time had prose fiction been composed in any considerable quantities. The immense influence which Walter Scott exercised was perhaps the direct cause of the attention paid to prose fiction; the facility, too, with which all the fancies, tastes and beliefs of the time could be embodied in such work may have had considerable importance. But it is difficult on any theory of cause and effect to account for the appearance in less than ten years of such a group of novelists as Hugo, Gautier, Dumas, Mérimée, Balzac, George Sand, Jules Sandeau and Charles de Bernard, names to which might be added others scarcely inferior. There is hardly anything else resembling it in literature, except the great cluster of English dramatists in the beginning of the 17th century, and of English poets at the beginning of the 19th; and it is remarkable that the excellence of the first group was maintained by a fresh generation—Murger, About, Feuillet, Flaubert, Erckmann-Chatrian, Droz, Daudet, Cherbuliez and Gaboriau, forming a company of *diadochi* not far inferior to their predecessors, and being themselves not unworthily succeeded almost up to the present day. The romance-writing of France during the period has taken two different directions—the first that of the novel of incident, the second that of analysis and character. The first, now mainly deserted, was that which, as was natural when Scott was the model, was formerly most trodden; the second required the genius of George Sand and of Balzac and the more problematical talent of Beyle to attract students to it. The novels of Victor Hugo are novels of incident, with a strong infusion of purpose, and considerable but rather ideal character drawing. They are in fact lengthy prose *drames* rather than romances proper, and they have found no imitators. They display, however, the powers of the master at their fullest. On the other hand, Alexandre Dumas originally composed his novels in close imitation of Scott, and they are much less dramatic than narrative in character, so that they lend themselves to almost indefinite continuation, and there is often no particular reason why they should terminate even at the end of the score or so of volumes to which they sometimes actually extend. Of this purely narrative kind, which hardly

Dumas.

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even attempts anything but the boldest character drawing, the best of them, such as *Les Trois Mousquetaires*, *Vingt ans après*, *La Reine Margot*, are probably the best specimens extant. Dumas possesses, almost alone among novelists, the secret of writing interminable dialogue without being tedious, and of telling the story by it. Of something the same kind, but of a far lower stamp, are the novels of Eugène Sue (1804–1857). Dumas and Sue were accompanied and followed by a vast crowd of companions, independent or imitative. Alfred de Vigny had already attempted the historical novel in *Cinq-Mars*. Henri de La Touche (1785–1851) (*Fragoletta*), an excellent critic who formed George Sand, but a mediocre novelist, may be mentioned: and perhaps also Roger de Beauvoir, whose real name was Eugène Auguste Roger de Bully (1806–1866) (*Le Chronique de Saint Georges*), and Frédéric Soulié (*Les Mémoires du diable*) (1800–1847). Paul Féval (*La Fée des grèves*) (1817–1877) and Amélée Achard (*Belle-Rose*) (1814–1875) are of the same school, and some of the attempts of Jules Janin (1804–1874), more celebrated as a critic, may also be connected with it. By degrees, however, the taste for the novel of incident, at least of an historical kind, died out till it was revived in another form, and with an admixture of domestic interest, by MM. Erckmann-Chatrian. The last and one of the most splendid instances of the old style was *Le Capitaine Fracasse*, which Théophile Gautier began early and finished late as a kind of *tour de force*. The last-named writer in his earlier days had modified the incident motive in many short tales, a kind of writing for which French has always been famous, and in which Gautier's sketches are masterpieces. His only other long novel, *Mademoiselle de Maupin*, belongs rather to the class of analysis. With Gautier, as a writer whose literary characteristics even excel his purely tale-telling powers, may be classed Prosper Mérimée (1803–1870), one of the most exquisite 19th-century masters of the language. Already, however, in 1830 the tide was setting strongly in favour of novels of contemporary life and manners. These were of course susceptible of extremely various treatment. For many years Paul de Kock (1793–1871), a writer who did not trouble himself about Classics or Romantics or any such matter, continued the tradition of Marivaux, Crébillon *fils*, and Pigault Lebrun (1753–1835) in a series of not very moral or polished but lively and amusing sketches of life, principally of the bourgeois type. Later Charles de Bernard (1804–1850) (*Gerfaut*) with infinitely greater wit, elegance, propriety and literary skill, did the same thing for the higher classes of French society. But the two great masters of the novel of character and manners as opposed to that of history and incident are Honoré de Balzac (1799–1850) and Aurore Dudevant, commonly called George Sand (1804–1876). Their influence affected the entire body of novelists who succeeded them, with very few exceptions. At the head of these exceptions may be placed Jules Sandeau (1811–1883), who, after writing a certain number of novels in a less individual style, at last made for himself a special subject in a certain kind of domestic novel, where the passions set in motion are less boisterous than those usually preferred by the French novelist, and reliance is mainly placed on minute character drawing and shades of colour sober in hue but very carefully adjusted (*Catherine*, *Mademoiselle de Penarvan*, *Mademoiselle de la Seiglière*). In the same class of the more quiet and purely domestic novelists may be placed X. B. Saintine (1798–1865) (*Picciola*), Madame C. Reybaud (1802–1871) (*Clémentine*, *Le Cadet de Colobrières*), J. T. de Saint-Germain (*Pour en épingle*, *La Feuille de coudrier*), Madame Craven (1808–1891) (*Récit d'une sœur*, *Fleurange*). Henri Beyle (1708–1865), who wrote under the *nom de plume* of Stendhal and belongs to an older generation than most of these, also stands by himself. His chief book in the line of fiction is *La Chartreuse de Parme*, an exceedingly powerful novel of the analytical kind, and he also composed a considerable number of critical and miscellaneous works. Of little influence at first (though he had great power over Mérimée) and never master of a perfect style, he has exercised ever increasing authority as a master of pessimist analysis. Indeed much of his work was never published till towards the close of the century. Last among the independents must be mentioned Henry Murger (1822–1861), the painter of what is called Bohemian life, that is to say, the struggles, difficulties and amusements of students, youthful artists, and men of letters. In this peculiar style, which may perhaps be regarded as an irregular descendant of the picaroon romance, Murger has no rival; and he is also, though on no extensive scale, a poet of great pathos. But with these exceptions, the influences of the two writers we have mentioned, sometimes combined, more often separate, may be traced throughout the whole of later novel literature. George Sand began with books strongly tinged with the spirit of revolt against moral and social arrangements, and she sometimes diverged into very curious paths of pseudo-philosophy, such as was popular in the second quarter of the century. At times, too, as in *Lucrezia Floriani* and some other works, she did not hesitate to draw largely on her own personal adventures and experiences. But latterly she devoted herself rather to sketches of country life and manners, and to novels involving bold if not very careful sketches of character and more or less dramatic situations. She was one of the most fertile of novelists, continuing to the end of her long life to pour forth fiction at the rate of many volumes a year. Of her different styles may be mentioned as fairly characteristic, *Lélia*, *Lucrezia Floriani*, *Consuelo*, *La Mare au diable*, *La Petite Fadette*, *François le champi*, *Mademoiselle de la Quintinie*. Considering the shorter length of his life the productiveness of Balzac was astonishing, especially if we consider that some of his early work was never reprinted, and that he left great stores of fragments and unfinished sketches. He is, moreover, the most remarkable example in literature of untiring work and determination to achieve success despite the greatest discouragements. His early work was worse than unsuccessful, it was positively bad. After more than a score of unsuccessful attempts, *Les Chouans* at last made its mark, and for twenty years from that time the astonishing productions composing the so-called *Comédie humaine* were poured forth successively. The sub-titles which Balzac imposed upon the different batches, *Scènes de la vie parisienne*, *de la vie de province*, *de la vie intime*, &c., show, like the general title, a deliberate intention on the author's part to cover the whole ground of human, at least of French life. Such an attempt could not succeed wholly; yet the amount of success attained is astonishing. Balzac has, however, with some justice been accused of creating the world which he described, and his personages, wonderful as is the accuracy and force with which many of the characteristics of humanity are exemplified in them, are somehow not altogether human. Since these two great novelists, many others have arisen, partly to tread in their steps, partly to strike out independent paths. Octave Feuillet (1821–1890), beginning his career by apprenticeship to Alexandre Dumas and the historical novel, soon found his way in a very different style of composition, the *roman intime* of fashionable life, in which, notwithstanding some grave defects, he attained much popularity and showed remarkable skill in keeping abreast of his time. The so-called realist side of Balzac was developed (but, as he himself acknowledged, with a double dose of intermixed if somewhat transformed Romanticism) by Gustave Flaubert (1821–1880), who showed culture, scholarship and a literary power over the language inferior to that of no writer of the century. No novelist of his generation has attained a higher literary rank than Flaubert. *Madame Bovary* and *L'Éducation sentimentale* are studies of contemporary life; in *Salammbô* and *La Tentation de Saint Antoine* erudition and antiquarian knowledge furnish the subjects for the display of the highest literary skill. Of about the same date Edmond About (1828–1883), before he abandoned novel-writing, devoted himself chiefly to sketches of abundant but not always refined wit (*L'Homme à l'oreille cassée*, *Le Nez d'un notaire*), and sometimes to foreign scenes (*Tolla*, *Le Roi des montagnes*). Champfleury (Henri Husson, 1829–1889), a prolific critic, deserves notice for stories of the extravaganza kind. During the whole of the Second Empire one of the most popular writers was Ernest Feydeau (1821–1873), a writer of great ability, but morbid and affected in the choice and treatment of his subjects (*Fanny*,

Balzac the younger.

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Sylvie, Catherine d'Overmeire). Émile Gaboriau (1833–1873), taking up that side of Balzac's talent which devoted itself to inextricable mysteries, criminal trials, and the like, produced *M. Le Coq, Le Crime d'Orcival, La Dégringolade*, &c.; and Adolphe Belot (b. 1829) for a time endeavoured to out-Feydeau Feydeau in *La Femme de feu* and other works. Eugène Fromentin (1820–1876), best known as a painter, wrote a novel, *Dominique*, which was highly appreciated by good judges.

During the last decade of the Second Empire there arose, continuing for varying lengths of time till nearly the end of the century, another remarkable group of novelists, most of whom are dealt with under separate headings, but who must receive combined treatment here; with the warning that even more danger than in the case of the poets is incurred by classing them in "schools." Undoubtedly, however, the "Naturalist" tendency, starting from Balzac and continued through Flaubert, but taking quite a new direction under some of those to be mentioned, is in a manner dominant. Flaubert himself and Feuillet (an exact observer of manners but an anti-Naturalist) have already been mentioned. Victor Cherbuliez (1829–1899), a constant writer in the *Revue des deux mondes* on politics and other subjects, also accomplished a long series of novels from *Le Comte Kostia* (1863) onwards, of which the most remarkable are that just named, *Le Roman d'une honnête femme* (1866), and *Meta Holdenis* (1873). With something of Balzac and more of Feuillet, Cherbuliez mixed with his observation of society a dose of sentimental and popular romance which offended the younger critics of his day, but he had solid merits. Gustave Droz (b. 1832) devoted himself chiefly to short stories sufficiently "free" in subject (*Monsieur, madame et bébé, Entre nous*, &c.) but full of fancy, excellently written, and of a delicate wit in one sense if not in all. André Theuriet (1833–1907) began with poetry but diverged to novels, in which the scenery of France and especially of its great forests is used with much skill; *Le Fils Maugars* (1879) may be mentioned out of many as a specimen. Léon Cladel (1835–1892), whose most remarkable work was *Les Va-nu-pieds* (1874), bad, as this title of itself shows, Naturalist leanings; but with a quaint Romantic tendency in prose and verse.

The Naturalists proper chiefly developed or seemed to develop one side of Balzac, but almost entirely abandoned his Romantic element. They aimed first at exact and almost photographic delineation of the accidents of modern life, and secondly at still more uncompromising non-suppression of the essential features and functions of that life which are usually suppressed. This school may be represented in chief by four novelists (really *three*, as two of them were brothers who wrote together till the rather early death of one of them), Émile Zola (1840–1903), Alphonse Daudet (1840–1897), and Edmond (1822–1897) and Jules (1830–1870) de Goncourt. The first, of Italian extraction and Marseillais birth, began by work of undecided kinds and was always a critic as well as a novelist. Of this first stage *Contes à Ninon* (1864) and *Thérèse Raquin* (1867) deserve to be specified. But after 1870 Zola entered upon a huge scheme (suggested no doubt by the *Comédie humaine*) of tracing the fortunes in every branch, legitimate and illegitimate, and in every rank of society of a family, *Les Rougon-Macquart*, and carried it out in a full score of novels during more than as many years. He followed this with a shorter series on places, *Paris, Rome, Lourdes*, and lastly by another of strangely apocalyptic tone, *Fécondité, Travail, Vérité*, the last a story of the Dreyfus case, retrospective and, as it proved, prophetic. The extreme repulsiveness of much of his work, and the overdone detail of almost the whole of it, caused great prejudice against him, and will probably always prevent his being ranked among the greatest novelists; but his power is indubitable, and in passages, if not in whole books, does itself justice.

MM. de Goncourt, besides their work in Naturalist (they would have preferred to call it "Impressionist") fiction, devoted themselves especially to study and collection in the fine arts, and produced many volumes on the historical side of these, volumes distinguished by accurate and careful research. This quality they carried, and the elder of them after his brother's death continued to carry, into novel-writing (*Renée Mauperin, Germinie Lacerteux, Chérie*, &c.) with the addition of an extraordinary care for peculiar and, as they called it, "personal" diction. On the other hand, Alphonse Daudet (who with the other three, Flaubert to some extent, and the Russian novelist Turgenieff, formed a sort of *cénacle* or literary club) mixed with some Naturalism a far greater amount of fancy and wit than his companions allowed themselves or could perhaps attain; and in the *Tartarin* series (dealing with the extravagances of his fellow-Provençaux) added not a little to the gaiety of Europe. His other novels (*Fromont jeune et Risler aîné, Jack, Le Nabab*, &c.), also very popular, have been variously judged, there being something strangely like plagiarism in some of them, and in others, in fact in most, an excessive use of that privilege of the novelist which consists in introducing real persons under more or less disguise. It should be observed in speaking of this group that the Goncourts, or rather the survivor of them, left an elaborate *Journal* disfigured by spite and bad taste, but of much importance for the appreciation of the personal side of French literature during the last half of the century.

In 1880 Zola, who had by this time formed a regular school of disciples, issued with certain of them a collection of short stories, *Les Soirées de Médan*, which contains one of his own best things, *L'Attaque du moulin*, and also the capital story, *Boule de suif*, by Guy de Maupassant (1850–1803), who in the same year published poems, *Des vers*, of very remarkable if not strictly poetical quality. Maupassant developed during his short literary career perhaps the greatest powers shown by any French novelist since Flaubert (his sponsor in both senses) in a series of longer novels (*Une Vie, Bel Ami, Pierre et Jean, Fort comme la mort*) and shorter stories (*Monsieur Parent, Les Sœurs Rondoli, Le Horla*), but they were distorted by the Naturalist pessimism and grime, and perhaps also by the brain-disease of which their author died. M. J. K. Huysmans (b. 1848), also a contributor to *Les Soirées de Médan*, who had begun a little earlier with *Marthe* (1876) and other books, gave his most characteristic work in 1884 with *Au rebours* and in 1891 with *Là-bas*, stories of exaggerated and "satanic" pose, decorated with perhaps the extremest achievements of the school in mere ugliness and nastiness. Afterwards, by an obvious reaction, he returned to Catholicism. Of about the same date as these two are two other novelists of note, Julien Viaud ("Pierre Loti," b. 1850), a naval officer who embodied his experiences of foreign service with a faint dose of story and character interest, and a far larger one of elaborate description, in a series of books (*Aziyadé, Le Mariage de Loti, Madame Chrysanthème*, &c.), and M. Paul Bourget (b. 1852), an important critic as well as novelist who deflected the Naturalist current into a "psychological" channel, connecting itself higher with Stendhal, and composed in its books very popular in their way—*Cruelle Énigme* (1885), *Le Disciple, Terre promise, Cosmopolis*. As a contrast or complement to Bourget's "psychological" novel may be taken the "ethical" novel of Edouard Rod (1857–1909)—*La Vie privée de Michel Tessier* (1893), *Le Sens de la vie, Les Trois Cœurs*. Contemporary with these as a novelist though a much older man, and occupied at different times of his life with verse and with criticism, came Anatole France (b. 1844), who in *Le Crime de Silvestre Bonnard, La Rôtisserie de la reine Pédauque, Le Lys rouge*, and others, has made a kind of novel as different from the ordinary styles as Pierre Loti's, but of far higher appeal in its wit, its subtle fancy, and its perfect French. Ferdinand Fabre (1830–1898) and René Bazin (b. 1853) represent the union, not too common in the French novel, of orthodoxy in morals and religion with literary ability. Further must be mentioned Paul Hervieu (b. 1857), a dramatist rather than a novelist; the brothers Marguerite (Paul, b. 1860, Victor, b. 1866), especially strong in short stories and passages; another pair of brothers of Belgian origin writing under the name of "J. H. Rosny"—Zolaists partly converted not to religion but to science and a sort of non-Christian virtue; the ingenious and amusing, if not exactly moral, brilliancy of Marcel Prévost (b. 1862); the

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contorted but rather attractive style and the perverse sentiment of Maurice Barrès (b. 1862); and, above all, the audacious and inimitable dialogue pieces of "Gyp" (Madame de Martel, b. 1820), worthy of the best times of French literature for gaiety, satire, acuteness and style, and perhaps likely, with the work of Maupassant, Pierre Loti and Anatole France, to represent the capital achievement of their particular generation to posterity.

Periodical Literature since 1830. Criticism.—One of the causes which led to this extensive composition of novels was the great spread of periodical literature in France, and the custom of including in almost all periodicals, daily, weekly or monthly, a *feuilleton* or instalment of fiction. Of the contributors of these periodicals who were strictly journalists and almost political journalists only, the most remarkable after Carrel were his opponent in the fatal duel,—Émile de Girardin, Lucien A. Prévost-Paradol (1829–1870), Jean Hippolyte Cartier, called de Villemessant (1812–1879), and, above all, Louis Veuillot (1815–1883), the most violent and unscrupulous but by no means the least gifted of his class. The same spread of periodical literature, together with the increasing interest in the literature of the past, led also to a very great development of criticism. Almost all French authors of any eminence during nearly the last century have devoted themselves more or less to criticism of literature, of the theatre, or of art. And sometimes, as in the case of Janin and Gautier, the comparatively lucrative nature of journalism, and the smaller demands which it made for labour and intellectual concentration, have diverted to feuilleton-writing abilities which might perhaps have been better employed. At the same time it must be remembered that from this devotion of men of the best talents to critical work has arisen an immense elevation of the standard of such work. Before the romantic movement in France Diderot in that country, Lessing and some of his successors in Germany, Hazlitt, Coleridge and Lamb in England, had been admirable critics and reviewers. But the theory of criticism, though these men's principles and practice had set it aside, still remained more or less what it had been for centuries. The critic was merely the administrator of certain hard and fast rules. There were certain recognized kinds of literary composition; every new book was bound to class itself under one or other of these. There were certain recognized rules for each class; and the goodness or badness of a book consisted simply in its obedience or disobedience to these rules. Even the kinds of admissible subjects and the modes of admissible treatment were strictly noted and numbered. This was especially the case in France and with regard to French *belles-lettres*, so that, as we have seen, certain classes of composition had been reduced to unimportant variations of a registered pattern. The Romantic protest against this absurdity was specially loud and completely victorious. It is said that a publisher advised the youthful Lamartine to try "to be like somebody else" if he wished to succeed. The Romantic standard of success was, on the contrary, to be as individual as possible. Victor Hugo himself composed a good deal of criticism, and in the preface to his *Orientales* he states the critical principles of the new school clearly. The critic, he says, has nothing to do with the subject chosen, the colours employed, the materials used. Is the work, judged by itself and with regard only to the ideal which the worker had in his mind, good or bad? It will be seen that as a legitimate corollary of this theorem the critic becomes even more of an interpreter than of a judge. He can no longer satisfy himself or his readers by comparing the work before him with some abstract and accepted standard, and marking off its shortcomings. He has to reconstruct, more or less conjecturally, the special ideal at which each of his authors aimed, and to do this he has to study their idiosyncrasies with the utmost care, and set them before his readers in as full and attractive a fashion as he can manage. The first writer who thoroughly grasped this necessity and successfully dealt with it was Charles Augustin Sainte-Beuve (1804–1869), who has indeed identified his name with the method of criticism just described. Sainte-Beuve's first remarkable work (his poems and novels we may leave out of consideration) was the sketch of 16th-century literature already alluded to, which he contributed to the *Globe*. But it was not till later that his style of criticism became fully developed and accentuated. During the first decade of Louis Philippe's reign his critical papers, united under the title of *Critiques et portraits littéraires*, show a gradual advance. During the next ten years he was mainly occupied with his studies of the writers of the Port Royal school. But it was during the last twenty years of his life, when the famous *Causeries du lundi* appeared weekly in the columns of the *Constitutionnel* and the *Moniteur*, that his most remarkable productions came out. Sainte-Beuve's style of criticism (which is the key to so much of French literature of the last half-century that it is necessary to dwell on it at some length), excellent and valuable as it is, lent itself to two corruptions. There is, in the first place, in making the careful investigations into the character and circumstances of each writer which it demands, a danger of paying too much attention to the man and too little to his work, and of substituting for a critical study a mere collection of personal anecdotes and traits, especially if the author dealt with belongs to a foreign country or a past age. The other danger is that of connecting the genius and character of particular authors too much with their conditions and circumstances, so as to regard them as merely so many products of the age. These faults, and especially the latter, have been very noticeable in many of Sainte-Beuve's successors, particularly in, perhaps, Hippolyte Taine, who, however, besides his work on English literature, did much of importance on French, and has been regarded as the first critic who did thorough honour to Balzac in his own country. A large number of other critics during the period deserve notice because, though acting more or less on the newer system of criticism, they have manifested considerable originality in its application. As far as merely critical faculty goes, and still more in the power of giving literary expression to criticism, Théophile Gautier yields to no one. His *Les Grotesques*, an early work dealing with Villon, the earlier "Théophile" de Viau, and other *enfants terribles* of French literature, has served as a model to many subsequent writers, such as Charles Monselet (1825–1888), and Charles Asselineau (1820–1874), the affectionate historian, in his *Bibliographie romantique* (1872–1874), of the less famous promoters of the Romantic movement. On the other hand, Gautier's picture criticisms, and his short reviews of books, obituary notices, and other things of the kind contributed to daily papers, are in point of style among the finest of all such fugitive compositions. Jules Janin (1804–1874), chiefly a theatrical critic, excelled in light and easy journalism, but his work has neither weight of substance nor careful elaboration of manner sufficient to give it permanent value. This sort of light critical comment has become almost a speciality of the French press, and among its numerous practitioners the names of Armand de Pontmartin (1811–1890) (an imitator and assailant of Sainte-Beuve), Arsène Houssaye, Pierangelo Fiorentino (1806–1864), may be mentioned. Edmond Scherer (1815–1889) and Paul de Saint-Victor (1827–1881) represent different sides of Sainte-Beuve's style in literary criticism, Scherer combining with it a martinet and somewhat prudish precision, while Saint-Victor, with great powers of appreciation, is the most flowery and "prose-poetical" of French critics. In theatrical censure Francisque Sarcey (1827–1899), an acute but somewhat severe and limited judge, succeeded to the good-natured sovereignty of Janin. The criticism of the *Revue des deux mondes* has played a sufficiently important part in French literature to deserve separate notice in passing. Founded in 1829, the *Revue*, after some vicissitudes, soon attained, under the direction of the Swiss Buloz, the character of being one of the first of European critical periodicals. Its style of criticism has, on the whole, inclined rather to the classical side—that is, to classicism as modified by, and possible after, the Romantic movement. Besides some of the authors already named, its principal critical contributors were Gustave Planche (1808–1857), an acute but somewhat truculent critic, Saint-René Taillandier (1817–1879), and Émile Montégut (1825–1895), a man of letters whom greater leisure would have made greater, but who actually combined much and varied critical power with

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an agreeable style. Lastly we must notice the important section of professorial or university critics, whose critical work has taken the form either of regular treatises or of courses of republished lectures, books somewhat academic and rhetorical in character, but often representing an amount of influence which has served largely to stir up attention to literature. The most prominent name among these is that of Abel Villemain (1790–1867), who was one of the earliest critics of the literature of his own country to obtain a hearing out of it. Désiré Nisard (1806–1888) was perhaps more fortunate in his dealings with Latin than with French, and in his *History* of the latter literature represents too much the classical tradition, but he had dignity, erudition and an excellent style. Alexandre Vinet (1797–1847), a Swiss critic of considerable eminence, Saint-Marc-Girardin (1801–1873), whose *Cours de littérature dramatique* is his chief work, and Eugène Géruzez (1799–1865), the author not only of an extremely useful and well-written handbook to French literature before the Revolution, but also of other works dealing with separate portions of the subject, must also be mentioned. One remarkable critic, Ernest Hello (1818–1885), attracted during his life little attention even in France, and hardly any out of it, his work being strongly tinctured with the unpopular flavour and colour of uncompromising "clericalism," and his extremely bad health keeping him out of the ordinary fraternities of literary society. It was, however, as full of idiosyncrasy as of partisanship, and is exceedingly interesting to those who regard criticism as mainly valuable because it gives different aspects of the same thing.

Perhaps in no branch of *belles-lettres* did the last quarter of the century maintain the level at which predecessors had arrived better than in criticism; though whether this fact is connected with something of decadence in the creative branches, is a question which may be better posed than resolved here. A remarkable writer whose talent, approaching genius, was spoilt by eccentricity and pose, and who belonged to a more modern generation, Jules Barbey d'Aurevilly (1808–1889), poet, novelist and critic, produced much of his last critical work, and corrected more, in these later days. Not only did the critical work in various ways of Renan, Taine, Scherer, Sarcey and others continue during parts of it, but a new generation, hardly in this case inferior to the old, appeared. The three chiefs of this were the already mentioned Anatole France, Émile Faguet (b. 1847), and Ferdinand Brunetière (1849–1906), to whom some would add Jules Lemaître (b. 1853). The last, however, though a brilliant writer, was but an "interim" critic, beginning with poetry and other matters, and after a time turning to yet others, while, brilliant as he was, his criticism was often ill-informed. So too Anatole France, after compiling four volumes of *La Vie littéraire* in his own inimitable style and with singular felicity of appreciation, also turned away. The phenomenon in both cases may be associated, though it must not be too intimately connected in the relation of cause and effect, with the fact that both were champions and practitioners of "impressionist criticism"—of the doctrine (unquestionably sound if not exaggerated) that the first duty of the critic is to reproduce the effect produced on his own mind by the author. Brunetière and Faguet, on the other hand, are partisans of the older academic style of criticism by kind and on principle. Faguet, besides regular volumes on each of the four great centuries of French literature, has produced much other work—all of it somewhat "classical" in tendency and frequently exhibiting something of a want of comprehension of the Romantic side. Brunetière was still more prolific on the same side but with still greater effort after system and "science." In the books definitely called *L'Évolution des genres*, in his *Manuel* of French literature, and in a large number of other volumes of collected essays he enforced with great learning and power of argument, if with a somewhat narrow purview and with some prejudice against writers whom he disliked, a new form of the old doctrine that the "kind" not the individual author or book ought to be the main subject of the critic's attention. He did not escape the consequential danger of taking authors and books not as they are but as in relation to the kinds which they in fact constitute and to his general views. But he was undoubtedly at his death the first critic of France and a worthy successor of her best.

Of others older and younger must be mentioned Paul Stapfer (b. 1840), professor of literature, and the author of divers excellent works from *Shakespeare et l'antiquité* to volumes of the first value on Montaigne and Rabelais; Paul Bourget and Edouard Rod, already noticed; Augustin Filon (b. 1841), author of much good work on English literature and an excellent book on Mérimée; Alexandre Beljame (1843–1906), another eminent student of English literature, in which subject J. A. Jusserand (b. 1855), Legouis, K. A. J. Angellier (b. 1848), and others have recently distinguished themselves; Gustave Larroumet, especially an authority on Marivaux; Eugène Lintilhac (b. 1854); Georges Pellissier; Gustave Lanson, author of a compact history of French literature in French; Marcel Schwob, who had done excellent work on Villon and other subjects before his early death; René Doumic, a frequent writer in the *Revue des deux mondes*, who collected four volumes of *Études sur la littérature française* between 1895 and 1900; and the Vicomte Melchior de Vogüé (b. 1848), whose interests have been more political-philosophical than strictly literary, but who has done much to familiarise the French public with that Russian literature to which Mérimée had been the first to introduce them. But the body of recent critical literature in France is perhaps larger in actual proportion and of greater value when considered in relation to other kinds of literature than has been the case at any previous period.

History since 1830.—The remarkable development of historical studies which we have noticed as taking place under the Restoration was accelerated and intensified in the reigns of Charles X. and Louis Philippe. Both the scope and the method of the historian underwent a sensible alteration. For something like 150 years historians had been divided into two classes, those who produced elegant literary works pleasant to read, and those who produced works of laborious erudition, but not even intended for general perusal. The Vertots and Voltaires were on one side, the Mabillons and Tillemonts on another. Now, although the duty of a French historian to produce works of literary merit was not forgotten, it was recognized as part of that duty to consult original documents and impart original observation. At the same time, to the merely political events which had formerly been recognized as forming the historian's province were added the social and literary phenomena which had long been more or less neglected. Old chronicles and histories were re-read and re-edited; innumerable monographs on special subjects and periods were produced, and these latter were of immense service to romance writers at the time of the popularity of the historical novel. Not a few of the works, for instance, which were signed by Alexandre Dumas consist mainly of extracts or condensations from old chronicles, or modern monographs, ingeniously united by dialogue and varnished with a little description. History, however, had not to wait for this second-hand popularity, and its cultivators had fully sufficient literary talent to maintain its dignity. Sismondi, whom we have already noticed, continued during this period his great *Histoire des Français*, and produced his even better-known *Histoire des républiques italiennes au moyen âge*. The brothers Thierry devoted themselves to early French history, Amédée Thierry (1797–1873) producing a *Histoire des Gaulois* and other works concerning the Roman period, and Augustin Thierry (1795–1856) the well-known history of the Norman Conquest, the equally attractive *Récits des temps Mérovingiens* and other excellent works. Philippe de Ségur (1780–1873) gave a history of the Russian campaign of Napoleon, and some other works chiefly dealing with Russian history. The voluminous *Histoire de France* of Henri Martin (1810–1883) is perhaps the best and most impartial work dealing in detail with the whole subject. A. G. P. Brugière, baron de Barante (1782–1866), after beginning with literary criticism, turned to history, and in his *Histoire des ducs de Bourgogne* produced a work of capital importance. As was to be expected, many of the most brilliant results of this devotion to historical subjects consisted of works dealing with the French Revolution. No

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series of historical events has ever perhaps received treatment at the same time from so many different points of view, and by writers of such varied literary excellence, among whom it must, however, be said that the purely royalist side is hardly at all represented. One of the earliest of these histories is that of François Mignet (1796–1884), a sober and judicious historian of the older school, also well known for his *Histoire de Marie Stuart*. About the same time was begun the brilliant if not extremely trustworthy work of Adolphe Thiers (1797–1877) on the Revolution, which established the literary reputation of the future president of the French republic, and was at a later period completed by the *Histoire du consulat et de l'empire*. The downfall of the July monarchy and the early years of the empire witnessed the publication of several works of the first importance on this subject. Barante contributed histories of the Convention and the Directory, but the three books of greatest note were those of Lamartine, Jules Michelet (1798–1874), and Louis Blanc (1811–1882). Lamartine's *Histoire des Girondins* is written from the constitutional-republican point of view, and is sometimes considered to have had much influence in producing the events of 1848. It is, perhaps, rather the work of an orator and poet than of an historian. The work of Michelet is of a more original character. Besides his history of the Revolution, Michelet wrote an extended history of France, and a very large number of smaller works on historical, political and social subjects. His imaginative powers are of the highest order, and his style stands alone in French for its strangely broken and picturesque character, its turbid abundance of striking images, and its somewhat sombre magnificence, qualities which, as may easily be supposed, found full occupation in a history of the Revolution. The work of Louis Blanc was that of a sincere but ardent republican, and is useful from this point of view, but possesses no extraordinary literary merit. The principal contributions to the history of the Revolution of the third quarter of the century were those of Quinet, Lanfrey and Taine. Edgar Quinet (1803–1875), like Louis Blanc a devotee of the republic and an exile for its sake, brought to this one of his latest works a mind and pen long trained to literary and historical studies; but *La Révolution* is not considered his best work. P. Lanfrey devoted himself with extraordinary patience and acuteness to the destruction of the Napoleonic legend, and the setting of the character of Napoleon I. in a new, authentic and very far from favourable light. And Taine, after distinguishing himself, as we have mentioned, in literary criticism (*Histoire de la littérature anglaise*), and attaining less success in philosophy (*De l'intelligence*), turned in *Les Origines de la France moderne* to an elaborate discussion of the Revolution, its causes, character and consequences, which excited some commotion among the more ardent devotees of the principles of '89. To return from this group, we must notice J. F. Michaud (1767–1839), the historian of the crusades, and François Pierre Guillaume Guizot (1787–1874), who, like his rival Thiers, devoted himself much to historical study. His earliest works were literary and linguistic, but he soon turned to political history, and for the last half-century of his long life his contributions to historical literature were almost incessant and of the most various character. The most important are the histories *Des Origines du gouvernement représentatif*, *De la révolution d'Angleterre*, *De la civilisation en France*, and latterly a *Histoire de France*, which he was writing at the time of his death. Among minor historians of the earlier century may be mentioned Prosper Duvergier de Hauranne (1798–1881) (*Gouvernement parlementaire en France*), J. J. Ampère (1800–1864) (*Histoire romaine à Rome*), Auguste Arthur Beugnot (1797–1865) (*Destruction du paganisme d'occident*), J. O. B. de Cléron, comte d'Haussonville (*La Réunion de la Lorraine à la France*), Achille Tendelle de Vaulabelle (1799–1870) (*Les Deux Restaurations*). In the last quarter of the century, under the department of history, the most remarkable names were still those of Taine and Renan, the former being distinguished for thought and matter, the latter for style. Indeed it may be here proper to remark that Renan, in the kind of elaborated semi-poetic style which has most characterized the prose of the 19th century in all countries of Europe, takes pre-eminence among French writers even in the estimation of critics who are not enamoured of his substance and tone. But, under the influence of Taine to some extent and of a general European tendency still more, France during this period attained or recovered a considerable place for what is called "scientific" history—the history which while, in some cases, though not in all, not neglecting the development of style attaches itself particularly to "the document," on the one hand, and to philosophical arrangement on the other. The chief representative of the school was probably Albert Sorel (1842–1906), whose various handlings of the Revolutionary period (including an excursion into partly literary criticism in the shape of an admirable monograph on Madame de Staël) have established themselves once for all. In a wider sweep Ernest Lavisse (b. 1842), who has dealt mainly with the 18th century, may hold a similar position. Of others, older and younger, the duc de Broglie (1821–1901), who devoted himself also to the 18th century and especially to its secret diplomacy; Gaston Boissier (b. 1823), a classical scholar rather than an historian proper, and one of the latest masters of the older French academic style; Thureau-Dangin (b. 1837), a student of mid 19th-century history; Henri Houssaye (b. 1848), one of the Napoleonic period; Gabriel Hanotaux (b. 1853), an historian of Richelieu and other subjects, and a practical politician, may be mentioned. A large accession has also been made to the publication of older memoirs—that important branch of French literature from almost the whole of its existence since the invention of prose.

Summary and Conclusion.—We have in these last pages given such an outline of the 19th-century literature of France as seemed convenient for the completion of what has gone before. It has been already remarked that the nearer approach is made to our own time the less is it possible to give exhaustive accounts of the individual cultivators of the different branches of literature. It may be added, perhaps, that such exhaustiveness becomes, as we advance, less and less necessary, as well as less and less possible. The individual poet of to-day may and does produce work that is in itself of greater literary value than that of the individual poet of 1600 or 1700. As a matter of literary history the contribution is less remarkable because of the examples he has before him and the circumstances which he has around him. Yet we have endeavoured to draw such a sketch of French literature from the *Chanson de Roland* onwards that no important development and hardly any important partaker in such development should be left out. A few lines may, perhaps, be now profitably given to summing up the aspects of the whole, remembering always that, as in no case is generalization easier than in the case of the literary aspects and tendencies of periods and nations, so in no case is it apt to be more delusive unless corrected and supported by ample information of fact and detail.

At the close of the 11th century and at the beginning of the 12th we find the vulgar tongue in France not merely in fully organized use for literary purposes, but already employed in most of the forms of poetical writing. An immense outburst of epic and narrative verse has taken place, and lyrical poetry, not limited as in the case of the epics to the north of France, but extending from Roussillon to the Pas de Calais, completes this. The 12th century adds to these earliest forms the important development of the mystery, extends the subjects and varies the manner of epic verse, and begins the compositions of literary prose with the chronicles of St Denis and of Villehardouin, and the prose romances of the Arthurian cycle. All this literaure is so far connected purely with the knightly and priestly orders, though it is largely composed and still more largely dealt in by classes of men, trouvères and jongleurs, who are not necessarily either knights or priests, and in the case of the jongleurs are certainly neither. With a possible ancestry of Romance and Teutonic *cantilenae*, Breton *lais*, and vernacular legends, the new literature has a certain pattern and model in Latin and for the most part ecclesiastical compositions. It has the sacred books and the legends of the saints for examples of narrative, the rhythm of the hymns for a guide to metre, and the ceremonies of the church for a stimulant to dramatic performance. By degrees

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also, in this 12th century, forms of literature which busy themselves with the unprivileged classes begin to be born. The fabliau takes every phase of life for its subject; the folk-song acquires elegance and does not lose raciness and truth. In the next century, the 13th, medieval literature in France arrives at its prime—a prime which lasts until the first quarter of the 14th. The early epics lose something of their savage charms, the polished literature of Provence quickly perishes. But in the provinces which speak the more prevailing tongue nothing is wanting to literary development. The language itself has shaken off all its youthful incapacities, and, though not yet well adapted for the requirements of modern life and study, is in every way equal to the demands made upon it by its own time. The dramatic germ contained in the fabliau and quickened by the mystery produces the profane drama. Ambitious works of merit in the most various kinds are published; *Aucassin et Nicolette* stands side by side with the *Vie de Saint Louis*, the *Jeu de la feuillie* with *Le Miracle de Théophile*, the *Roman de la rose* with the *Roman du Renart*. The earliest notes of ballads and rondeau are heard; endeavours are made with zeal, and not always without understanding, to naturalize the wisdom of the ancients in France, and in the graceful tongue that France possesses. Romance in prose and verse, drama, history, songs, satire, oratory and even erudition, are all represented and represented worthily. Meanwhile all nations of western Europe have come to France for their literary models and subjects, and the greatest writers in English, German, Italian, content themselves with adaptations of Chrétien de Troyes, of Benoit de Sainte More, and of a hundred other known and unknown trouvères and fabulists. But this age does not last long. The language has been put to all the uses of which it is as yet capable; those uses in their sameness begin to pall upon reader and hearer; and the enormous evils of the civil and religious state reflect themselves inevitably in literature. The old forms die out or are prolonged only in half-lifeless travesties. The brilliant colouring of Froissart, and the graceful science of ballade and rondeau writers like Lescurel and Deschamps, alone maintain the literary reputation of the time. Towards the end of the 14th century the translators and political writers import many terms of art, and strain the language to uses for which it is as yet unhandy, though at the beginning of the next age Charles d'Orléans by his natural grace and the virtue of the forms he used emerges from the mass of writers. Throughout the 15th century the process of enriching or at least increasing the vocabulary goes on, but as yet no organizing hand appears to direct the process. Villon stands alone in merit as in peculiarity. But in this time dramatic literature and the literature of the floating popular broadsheet acquire an immense extension—all or almost all the vigour of spirit being concentrated in the rough farce and rougher lampoon, while all the literary skill is engrossed by insipid *rhétoriqueurs* and pedants. Then comes the grand upheaval of the Renaissance and the Reformation. An immense influx of science, of thought to make the science living, of new terms to express the thought, takes place, and a band of literary workers appear of power enough to master and get into shape the turbid mass. Rabelais, Amyot, Calvin and Herberay fashion French prose; Marot, Ronsard and Regnier refashion French verse. The Pléiade introduces the drama as it is to be and the language that is to help the drama to express itself. Montaigne for the first time throws invention and originality into some other form than verse or than prose fiction. But by the end of the century the tide has receded. The work of arrangement has been but half done, and there are no master spirits left to complete it. At this period Malherbe and Balzac make their appearance. Unable to deal with the whole problem, they determine to deal with part of it, and to reject a portion of the riches of which they feel themselves unfit to be stewards. Balzac and his successors make of French prose an instrument faultless and admirable in precision, unequalled for the work for which it is fit, but unfit for certain portions of the work which it was once able to perform. Malherbe, seconded by Boileau, makes of French verse an instrument suited only for the purposes of the drama of Euripides, or rather of Seneca, with or without its chorus, and for a certain weakened echo of those choruses, under the name of lyrics. No French verse of the first merit other than dramatic is written for two whole centuries. The drama soon comes to its acme, and during the succeeding time usually maintains itself at a fairly high level until the death of Voltaire. But prose lends itself to almost everything that is required of it, and becomes constantly a more and more perfect instrument. To the highest efforts of pathos and sublimity its vocabulary and its arrangement likewise are still unsuited, though the great preachers of the 17th century do their utmost with it. But for clear exposition, smooth and agreeable narrative, sententious and pointed brevity, witty repartee, it soon proves itself to have no superior and scarcely an equal in Europe. In these directions practitioners of the highest skill apply it during the 17th century, while during the 18th its powers are shown to the utmost of their variety by Voltaire, and receive a new development at the hands of Rousseau. Yet, on the whole, it loses during this century. It becomes more and more unfit for any but trivial uses, and at last it is employed for those uses only. Then occurs the Revolution, repeating the mighty stir in men's minds which the Renaissance had given, but at first experiencing more difficulty in breaking up the ground and once more rendering it fertile. The faulty and incomplete genius of Chateaubriand and Madame de Staël gives the first evidence of a new growth, and after many years the Romantic movement completes the work. Whether the force of that movement is now, after three-quarters of a century, spent or not, its results remain. The poetical power of French has been once more triumphantly proved, and its productiveness in all branches of literature has been renewed, while in that of prose fiction there has been almost created a new class of composition. In the process of reform, however, not a little of the finish of French prose style has been lost, and the language itself has been affected in something the same way as it was affected by the less judicious innovations of the Ronsardists. The pedantry of the Pléiade led to the preposterous compounds of Du Bartas; the passion of the Romantics for foreign tongues and for the *mot propre* has loaded French with foreign terms on the one hand and with *argot* on the other, while it is questionable whether the *vers libre* is really suited to the French genius. There is, therefore, room for new Malherbes and Balzacs, if the days for Balzacs and Malherbes had not to all appearance passed. Should they be once more forthcoming, they have the failure as well as the success of their predecessors to guide them.

Finally, we may sum up even this summary. For volume and merit taken together the product of these eight centuries of literature excels that of any European nation, though for individual works of the supremest excellence they may perhaps be asked in vain. No French writer is lifted by the suffrages of other nations—the only criterion when sufficient time has elapsed —to the level of Homer, of Shakespeare, or of Dante, who reign alone. Of those of the authors of France who are indeed of the thirty but attain not to the first three Rabelais and Molière alone unite the general suffrage, and this fact roughly but surely points to the real excellence of the literature which these men are chosen to represent. It is great in all ways, but it is greatest on the lighter side. The house of mirth is more suited to it than the house of mourning. To the latter, indeed, the language of the unknown marvel who told Roland's death, of him who gave utterance to Camilla's wrath and despair, and of Victor Hugo, who sings how the mountain wind makes mad the lover who cannot forget, has amply made good its title of entrance. But for one Frenchman who can write admirably in this strain there are a hundred who can tell the most admirable story, formulate the most pregnant reflection, point the acutest jest. There is thus no really great epic in French, few great tragedies, and those imperfect and in a faulty kind, little prose like Milton's or like Jeremy Taylor's, little verse (though more than is generally thought) like Shelley's or like Spenser's. But there are the most delightful short tales, both in prose and in verse, that the world has ever seen, the most polished jewelry of reflection that has

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ever been wrought, songs of incomparable grace, comedies that must make men laugh as long as they are laughing animals, and above all such a body of narrative fiction, old and new, prose and verse, as no other nation can show for art and for originality, for grace of workmanship in him who fashions, and for certainty of delight to him who reads.

BIBLIOGRAPHY.—The most elaborate book on French literature as a whole is that edited by Petit de Julleville, and composed of chapters by different authors, *Histoire de la langue et de la littérature françaises* (8 vols., Paris, 1896–1899). Unfortunately these chapters, some of which are of the highest excellence, are of very unequal value: they require connexions which are not supplied, and there is throughout a neglect of minor authors. The bibliographical indications are, however, most valuable. For a survey in a single volume Larson's *Histoire* has superseded the older but still useful manuals of Demogeot and Géruzez, which, however, are still worth consulting. Brunetière's *Manuel* (translated into English) is very valuable with the cautions above given; and the large *Histoire de la langue française depuis le seizième siècle* of Condeffre supplies copious and well-chosen extracts with much biographical information. In English there is an extensive *History* by H. van Laun (3 vols., 1874, &c.); a *Short History* by Saintsbury (1882; 6th ed. continued to the end of the century, 1901); and a *History* by Professor Dowden (1895).

To pass to special periods—the fountain-head of the literature of the middle ages is the ponderous *Histoire littéraire* already referred to, which, notwithstanding that it extended to 27 quarto volumes in 1906, and had been occupied, with interruptions, 138 years at publication, had only reached the 14th century. Many of the monographs which it contains are the best authorities on their subjects, such as that of P. Paris on the early chansonniers, of V. Leclerc on the fabliaux, and of Littré on the romans d'aventures. For the history of literature before the 11th century, the period mainly Latin, J. J. Ampère's *Histoire littéraire de la France avant Charlemagne, sous Charlemagne, et jusqu'au onzième siècle* is the chief authority. Léon Gautier's *Épopées françaises* (3 vols., 1878–1897) contains almost everything known concerning the chansons de geste. P. Paris's *Romans de la table ronde* was long the main authority for this subject, but very much has been written recently in France and elsewhere. The most important of these French contributions, especially those by Gaston Paris (whose *Histoire poétique de Charlemagne* has been reprinted since his death), will be found in the periodical *Romania*, which for more than thirty years has been the chief receptacle of studies on old French literature. On the cycle of Reynard the standard work is that of Voigt, *Les Romans de Renart*. All parts of the lighter literature of old France are excellently treated by Lenient, *La Satire au moyen âge*. The early theatre has been frequently treated by the brothers Parfaict (*Histoire du théâtre français*), by Fabre (*Les Clercs de la Basoche*), by Leroy (*Étude sur les mystères*), by Aubertin (*Histoire de la langue et de la littérature française au moyen âge*). This latter book will be found a useful summary of the whole medieval period. The historical, dramatic and oratorical sections are especially full. On a smaller scale but of unsurpassed authority is G. Paris's *Littérature du moyen âge* translated into English.

On the 16th century an excellent handbook is that by Darmesteter and Hatzfeld; and the recent *Literature of the French Renaissance* of A. Tilley (2 vols., 1904) is of high value. Sainte-Beuve's *Tableau* has been more than once referred to. Ebert (*Entwicklungsgeschichte der französischen Tragödie vornehmlich im 16ten Jahrhundert*) is the chief authority for dramatic matters. Essays and volumes on periods and sub-periods since 1600 are innumerable; but those who desire thorough acquaintance with the literature of these three hundred years should read as widely as possible in all the critical work of Sainte-Beuve, of Schérer, of Faguet and Brunetière—which may be supplemented *ad libitum* from that of other critics mentioned above. The series of volumes entitled *Les grands écrivains français*, now pretty extensive, is generally very good, and Catulle Mendès's invaluable book on 19th-century poetry has been cited above. As a companion to the study of poetry E. Crepet's *Poètes français* (4 vols., 1861), an anthology with introductions by Sainte-Beuve and all the best critics of the day, cannot be surpassed, but to it may be added the later *Anthologie des poètes français du XIXe siècle* (1877–1879). (G. SA.)

FRENCH POLISH, a liquid for polishing wood, made by dissolving shellac in methylated spirit. There are four different tints, brown, white, garnet and red, but the first named is that most extensively used. All the tints are made in the same manner, with the exception of the red, which is a mixture of the brown polish and methylated spirit with either Saunders wood or Bismarck brown, according to the strength of colour required. Some woods, and especially mahogany, need to be stained before they are polished. To stain mahogany mix some bichromate of potash in hot water according to the depth of colour required. After staining the wood the most approved method of filling the grain is to rub in fine plaster of Paris (wet), wiping off before it "sets." After this is dry it should be oiled with linseed oil and thoroughly wiped off. The wood is then ready for the polish, which is put on with a rubber made of wadding covered with linen rag and well wetted with polish. The polishing process has to be repeated gradually, and after the work has hardened, the surface is smoothed down with fine glass-paper, a few drops of linseed oil being added until the surface is sufficiently smooth. After a day or two the surface can be cleared by using a fresh rubber with a double layer of linen, removing the top layer when it is getting hard and finishing off with the bottom layer.

FRENCH REVOLUTION, THE. Among the many revolutions which from time to time have given a new direction to the political development of nations the French Revolution stands out as at once the most dramatic in its incidents and the most momentous in its results. This exceptional character is, indeed, implied in the name by which it is known; for France has experienced many revolutions both before and since that of 1789, but the name "French Revolution," or simply "the Revolution," without qualification, is applied to this one alone. The causes which led to it: the gradual decay of the institutions which France had inherited from the feudal system, the decline of the centralized monarchy, and the immediate financial necessities that compelled the assembling of the long neglected states-general in 1789, are dealt with in the article on FRANCE: *History*. The successive constitutions, and the other legal changes which resulted from it, are also discussed in their general relation to the growth of the modern French polity in the article FRANCE (*Law and Institutions*). The present article deals with the progress of the Revolution itself from the convocation of the states-general to the coup d'état of the 18th Brumaire which placed Napoleon Bonaparte in power.

Opening of the States-General.

The elections to the states-general of 1789 were held in unfavourable circumstances. The failure of the harvest of 1788 and a severe winter had caused widespread distress. The government was weak and despised, and its agents were afraid or unwilling to quell outbreaks of disorder. At the same time the longing for radical reform and the belief that it would be easy were almost universal. The *cahiers* or written instructions given to the deputies covered well-nigh every subject of political, social or economic interest, and demanded an amazing number of changes. Amid this commotion the king and his ministers remained passive. They did not even determine the question whether the estates should act as separate bodies or deliberate collectively. On the 5th of May the states-general were opened by Louis in the Salle des Menus Plaisirs at Versailles. Barentin, the keeper of the seals, informed them that they were free to determine whether they would vote by orders or vote by head. Necker, as director-general of the finances, set forth the condition of the treasury and proposed some small reforms. The Tiers État (Third Estate) was dissatisfied that the question of joint or separate deliberation should have been left open. It was aware that some of the nobles and many of the inferior clergy agreed with it as to the need for comprehensive reform. Joint deliberation would ensure a majority to the reformers and therefore the abolition of privileges and the extinction of feudal rights of property. Separate deliberation would enable the majority among the nobles and the superior clergy to limit reform. Hence it became the first object of the Tiers État to effect the amalgamation of the three estates.

Conflict between the Three Estates.

The conflict between those who desired and those who resisted amalgamation took the form of a conflict over the verification of the powers of the deputies. The Tiers État insisted that the deputies of all three estates should have their powers verified in common as the first step towards making them all members of one House. It resolved to hold its meetings in the Salle des Menus Plaisirs, whereas the nobles and the clergy met in smaller apartments set aside for their exclusive use. It refrained from taking any step which might have implied that it was an organized assembly, and persevered in regarding itself as a mere crowd of individual members incapable of transacting business. Meanwhile the clergy and

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the nobles began a separate verification of their powers. But a few of the nobles and a great many of the clergy voted against this procedure. On the 7th the Tiers État sent deputations to exhort the other estates to union, while the clergy sent a deputation to it with the proposal that each estate should name commissioners to discuss the best method of verifying powers. The Tiers État accepted the proposal and conferences were held, but without result. It then made another appeal to the clergy which was almost successful. The king interposed with a command for the renewal of the conferences. They were resumed under the presidency of Barentin, but again to no purpose.

On the 10th of June Sieyès moved that the Tiers État should for the last time invite the First and Second Estates to join in the verification of powers and announce that, whether they did or not, the work of verifying would begin forthwith. The motion was carried by an immense majority. As there was no response, the Tiers État on the 12th named Bailly provisional president and commenced verification. Next day three curés of Poitou came to have their powers verified. Other clergymen followed later. When the work of verification was over, a title had to be found for the body thus created, which would no longer accept the style of the Tiers État. On the 15th Sieyès proposed that they should entitle themselves the Assembly of the known and verified representatives of the French nation. Mirabeau, Mounier and others proposed various appellations. But success was reserved for Legrand, an obscure deputy who proposed the simple name of National Assembly. Withdrawing his own motion, Sieyès adopted Legrand's suggestion, which was carried by 491 votes to 90. The Assembly went on to declare that it placed the debts of the crown under the safeguard of the national honour and that all existing taxes, although illegal as having been imposed without the consent of the people, should continue to be paid until the day of dissolution.

The National Assembly.

By these proceedings the Tiers État and a few of the clergy declared themselves the national legislature. Then and thereafter the National Assembly assumed full sovereign and constituent powers. Nobles and clergy might come in if they pleased, but it could do without them. The king's assent to its measures would be convenient, but not necessary. This boldness was rewarded, for on the 19th the clergy decided by a majority of one in favour of joint verification. On the same day the nobles voted an address to the king condemning the action of the Tiers État. Left to himself, Louis might have been too inert for resistance. But the queen and his brother, the count of Artois, with some of the ministers and courtiers, urged him to make a stand. A Séance Royale was notified for the 22nd and workmen were sent to prepare the Salle des Menus Plaisirs for the ceremony. On the 20th Bailly and the deputies proceeded to the hall and found it barred against their entrance.

Oath of the Tennis Court.

Thereupon they adjourned to a neighbouring tennis court, where Mounier proposed that they should swear not to separate until they had established the constitution. With a solitary exception they swore and the Oath of the Tennis Court became an era in French history. As the ministers could not agree on the policy which the king should announce in the Séance Royale, it was postponed to the 23rd. The Assembly found shelter in the church of St Louis, where it was joined by the main body of the clergy and by the first of the nobles.

At the Séance Royale Louis made known his will that the Estates should deliberate apart, and declared that if they should refuse to help him he would do by his sole authority what was necessary for the happiness of his people. When he quitted the hall, some of the clergy and most of the nobles retired to their separate chambers. But the rest, together with the Tiers État, remained, and Mirabeau declared that, as they had come by the will of the nation, force only should make them withdraw. "Gentlemen," said Sieyès, "you are to-day what you were yesterday." With one voice the Assembly proclaimed its adhesion to its former decrees and the inviolability of its members. In Versailles and in Paris popular feeling was clamorous for the Assembly and against the court. During the next few days many of the clergy and nobles, including the archbishop of Paris and the duke of Orleans, joined the Assembly. Louis tamely accepted his defeat. He recalled Necker, who had resigned after the Séance Royale. On the 27th he wrote to those clerical and noble deputies who still held out, urging submission. By the 2nd of July the joint verification of powers was completed. The last trace of the historic States-General disappeared and the National Assembly was perfect. On the same day it claimed an absolute discretion by a decree that the mandates of the electors were not binding on its members.

Dismissal of Necker.

Having failed in their first attempt on the Assembly, the Court party resolved to try what force could do. A large number of troops, chiefly foreign regiments in the service of France, were concentrated near Paris under the command of the marshal de Broglie. On Mirabeau's motion the Assembly voted an address to the king asking for their withdrawal. The king replied that the troops were not meant to act against the Assembly, but intimated his purpose of transferring the session to some provincial town. On the same day he dismissed Necker and ordered him to quit Versailles. These acts led to the first insurrection of Paris. The capital had long been in a dangerous condition. Bread was dear and employment was scarce. The measures taken to relieve distress had allured a multitude of needy and desperate men from the surrounding country. Among the middle class there already existed a party, consisting of men like Danton or Camille Desmoulins, which was prepared to go much further than any of the leaders of the Assembly. The rich citizens were generally fund-holders, who regarded the Assembly as the one bulwark against a public bankruptcy. The duke of Orleans, a weak and dissolute but ambitious man, had conceived the hope of supplanting his cousin on the throne. He strained his wealth and influence to recruit followers and to make mischief. The gardens of his residence, the Palais Royal, became the centre of political agitation. Ever since the elections virtual freedom of the press and freedom of speech had prevailed in Paris. Clubs were multiplied and pamphlets came forth every hour. The municipal officers who were named by the Crown had little influence with the citizens. The police were a mere handful. Of the two line regiments quartered in the capital, one was Swiss and therefore trusty; but the other, the Gardes Françaises, shared all the feelings of the populace.

Rioting in Paris.

On the 12th of July Camille Desmoulins announced the dismissal of Necker to the crowd in the Palais Royal. Warmed by his eloquence, they sallied into the street. Part of Broglie's troops occupied the Champs Elysées and the Place Louis Quinze. After one or two petty encounters with the mob they were withdrawn, either because their temper was uncertain or because their commanders shunned responsibility. Paris was thus left to the rioters, who seized arms wherever they could find them, broke open the jails, burnt the octroi barriers and soon had every man's life and goods at their discretion. Citizens with anything to lose were driven to act for themselves. For the purpose of choosing its representatives in the states-general the Third Estate of Paris had named 300 electors. Their function once discharged, these men had no public character, but they resolved that they would hold together in order to watch over the interests of the city. After the Séance Royale the municipal authority, conscious of its own weakness, allowed them to meet at the Hôtel de Ville, where they proceeded to consider the formation of a civic guard. On the 13th, when all was anarchy in Paris, they were joined by Flesselles, Provost of the Merchants, and other municipal officers. The project of a civic guard was then adopted. The insurrection, however, ran its course unchecked. Crowds of deserters from the regular troops swelled the ranks of the insurgents. They attacked the Hôtel des Invalides and carried off all the arms which were stored there. With the same object they assailed the Bastille. The garrison was small and disheartened, provisions were short, and after some hours' fighting De Launay the governor surrendered on promise of quarter. He and several of his men were, notwithstanding, butchered by the mob before they could be brought to

Fall of the Bastille, July 14, 1789.

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the Hôtel de Ville. As all Paris was in the hands of the insurgents, the king saw the necessity of submission. On the morning of the 15th he entered the hall of the Assembly to announce that the troops would be withdrawn. Immediately afterwards he dismissed his new ministers and recalled Necker. Thereupon the princes and courtiers most hostile to the National Assembly, the count of Artois, the prince of Condé, the duke of Bourbon and many others, feeling themselves no longer safe, quitted France. Their departure is known as the first emigration.

The capture of the Bastille was hailed throughout Europe as symbolizing the fall of absolute monarchy, and the victory of the insurgents had momentous consequences. Recognizing the 300 electors as a temporary municipal government, the Assembly sent a deputation to confer with them at the Hôtel de Ville, and on a sudden impulse one of these deputies, Bailly, lately president of the Assembly, was chosen to be mayor of Paris. The marquis Lafayette, doubly popular as a veteran of the American War and as one of the nobles who heartily upheld the cause of the Assembly, was chosen commandant of the new civic force, thenceforwards known as the National Guard. On the 17th Louis himself visited Paris and gave his sanction to the new authorities. In the course of the following weeks the example of Paris was copied throughout France. All the cities and towns set up new elective authorities and organized a National Guard. At the same time the revolution spread to the country districts. In most of the provinces the peasants rose and stormed and burnt the houses of the *seigneurs*, taking peculiar care to destroy their title-deeds. Some of the *seigneurs* were murdered and the rest were driven into the towns or across the frontier. Amid the universal confusion the old administrative system vanished. The intendants and sub-delegates quitted or were driven from their posts. The old courts of justice, whether royal or feudal, ceased to act. In many districts there was no more police, public works were suspended and the collection of taxes became almost impossible. The insurrection of July really ended the *ancien régime*.

New municipality of Paris and National Guard.

Revolution in the provinces.

Disorder in the provinces led directly to the proceedings on the famous night of the 4th of August. While the Assembly was considering a declaration which might calm revolt, the vicomte de Noailles and the duc d'Aiguillon moved that it should proclaim equality of taxation and the suppression of feudal burdens. Other deputies rose to demand the repeal of the game laws, the enfranchisement of such serfs as were still to be found in France, and the abolition of tithes and of feudal courts and to renounce all privileges, whether of classes, of cities, or of provinces. Amid indescribable enthusiasm the Assembly passed resolution after resolution embodying these changes. The resolutions were followed by decrees sometimes hastily and unskilfully drawn. In vain Sieyès remarked that in extinguishing tithes the Assembly was making a present to every landed proprietor. In vain the king, while approving most of the decrees, tendered some cautious criticisms of the rest. The majority did not, indeed, design to confiscate property wholesale. They drew a distinction between feudal claims which did and did not carry a moral claim to compensation. But they were embarrassed by the wording of their own decrees and forestalled by the violence of the people. The proceedings of the 4th of August issued in a wholesale transfer of property from one class to another without any indemnity for the losers.

The 4th of August.

The work of drafting a constitution for France had already been begun. Parties in the Assembly were numerous and ill-defined. The Extreme Right, who desired to keep the government as it stood, were a mere handful. The Right who wanted to revive, as they said, the ancient constitution, in other words, to limit the king's power by periodic States-General of the old-fashioned sort, were more numerous and had able chiefs in Cazalès and Maury, but strove in vain against the spirit of the time. The Right Centre, sometimes called the Monarchiens, were a large body and included several men of talent, notably Mounier and Malouet, as well as many men of rank and wealth. They desired a constitution like that of England which should reserve a large executive power to the king, while entrusting the taxing and legislative powers to a modern parliament. The Left or Constitutionals, known afterwards as the Feuillants, among whom Barnave and Charles and Alexander Lameth were conspicuous, also wished to preserve monarchy but disdained English precedent. They were possessed with feelings then widespread, weariness of arbitrary government, hatred of ministers and courtiers, and distrust not so much of Louis as of those who surrounded him and influenced his judgment. Republicans without knowing it, they grudged every remnant of power to the Crown. The Extreme Left, still more republican in spirit, of whom Robespierre was the most noteworthy, were few and had little power. Mirabeau's independence of judgment forbids us to place him in any party.

Parties in the Assembly.

The first Constitutional Committee, elected on the 14th of July, had Mounier for its reporter. It was instructed to begin with drafting a Declaration of the Rights of Man. Six weeks were spent by the Assembly in discussing this document. The Committee then presented a report which embodied the principle of two Chambers. This principle contradicted the extreme democratic theories so much in fashion. It also offended the self-love of most of the nobles and the clergy who were loath that a few of their number should be erected into a House of Lords. The Assembly rejected the principle of two Chambers by nearly 10 to 1. The question whether the king should have a veto on legislation was next raised. Mounier contended that he should have an absolute veto, and was supported by Mirabeau, who had already described the unlimited power of a single Chamber as worse than the tyranny of Constantinople. The Left maintained that the king, as depositary of the executive, should be wholly excluded from the legislative power. Lafayette, who imagined himself to be copying the American constitution, proposed that the king should have a suspensive veto. Thinking that it would be politic to claim no more, Necker persuaded the king to intimate that he was satisfied with Lafayette's proposal. The suspensive veto was therefore adopted. As the king had no power of dissolution, it was an idle form. Mounier and his friends having resigned their places in the Constitutional Committee, it came to an end and the Assembly elected a new Committee which represented the opinions of the Left.

Declaration of the Rights of Man.

The royal veto.

Soon afterwards a fresh revolt in Paris caused the king and the Assembly to migrate thither. The old causes of disorder were still working in that city. The scarcity of bread was set down to conspirators against the Revolution. Riots were frequent and persons supposed hostile to the Assembly and the nation were murdered with impunity. The king still had counsellors who wished for his departure as a means to regaining freedom of action. At the end of September the Flanders regiment came to Versailles to reinforce the Gardes du Corps. The officers of the Gardes du Corps entertained the officers of the Flanders regiment and of the Versailles National Guard at dinner in the palace. The king, queen and dauphin visited the company. There followed a vehement outbreak of loyalty. Rumour enlarged the incident into a military plot against freedom. Those who wanted a more thorough revolution wrought up the crowd and even respectable citizens wished to have the king among them and amenable to their opinion. On the 5th of October a mob which had gathered to assault the Hôtel de Ville was diverted into a march on Versailles. Lafayette was slow to follow it and, when he arrived, took insufficient precautions. At daybreak on the 6th some of the rioters made their way into the palace and stormed the apartment of the queen who escaped with difficulty. At length the National Guards arrived and the mob was quieted by the announcement that the king had resolved to go to Paris. The Assembly declared itself inseparable from the king's person. Louis and his family reached Paris on the same evening and took up their abode in the Tuileries. A little later the Assembly established itself in the riding school of the palace. Thenceforward the king and queen were to all intents prisoners. The Assembly itself was subject to constant

Removal of the royal family and Assembly to Paris.

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intimidation. Many members of the Right gave up the struggle and emigrated, or at least withdrew from attendance, so that the Left became supreme.

Mirabeau and the court.

Mirabeau had already taken alarm at the growing violence of the Revolution. In September he had foretold that it would not stop short of the death of both king and queen. After the insurrection of October he sought to communicate with them through his friend the comte de la Marck. In a remarkable correspondence he sketched a policy for the king. The abolition of privilege and the establishment of a parliamentary system were, he wrote, unalterable facts which it would be madness to dispute. But a strong executive authority was essential, and a king who frankly adopted the Revolution might still be powerful. In order to rally the sound part of the nation Louis should leave Paris, and, if necessary, he should prepare for a civil war; but he should never appeal to foreign powers. Neither the king nor the queen could grasp the wisdom of this advice. They distrusted Mirabeau as an unscrupulous adventurer, and were confirmed in this feeling by his demands for money. His correspondence with the court, although secret, was suspected. The politicians who envied his talents and believed him a rascal raised the cry of treason. In the Assembly Mirabeau, though sometimes successful on particular questions, never had a chance of giving effect to his policy as a whole. Whether even he could have controlled the Revolution is highly doubtful; but his letters and minutes drawn up for the king form the most striking monument of his genius (see MIRABEAU and MONTMORIN DE SAINT-HÉREM).

The Assembly and the royal power.

Early in the year 1790 a dispute with England concerning the frontier in North America induced the Spanish government to claim the help of France under the Family Compact. This demand led the Assembly to consider in what hands the power of concluding alliances and of making peace and war should be placed. Mirabeau tried to keep the initiative for the king, subject to confirmation by the Chamber. On Barnave's motion the Assembly decreed that the legislature should have the power of war and peace and the king a merely advisory power. Mirabeau was defeated on another point of the highest consequence, the inclusion of ministers in the National Assembly. His colleagues generally adhered to the principle that the legislative and executive powers should be totally separate. The Left assumed that, if deputies could hold office, the king would have the means of corrupting the ablest and most influential. It was decreed that no deputy should be minister while sitting in the House or for two years after. Ministers excluded from the House being necessarily objects of suspicion, the Assembly was careful to allow them the least possible power. The old provinces were abolished, and France was divided anew into eighty departments. Each department was subdivided into districts, cantons and communes.

Reorganization of France.

The main business of administration, even the levying of taxes, was entrusted to the elective local authorities. The judicature was likewise made elective. The army and the navy were so organized as to leave the king but a small share in appointing officers and to leave the officers but scanty means of maintaining discipline. Even the cases in which the sovereign might be deposed were foreseen and expressly stated. Monarchy was retained, but the monarch was regarded as a possible traitor and every precaution was taken to render him harmless even at the cost of having no effective national government.

Executive committees of the Assembly.

The distrust which the Assembly felt for the actual ministers led it to undertake the business of government as well as the business of reform. There were committees for all the chief departments of state, a committee for the army, a committee for the navy, another for diplomacy, another for finance. These committees sometimes asked the ministers for information, but rarely took their advice. Even Necker found the Assembly heedless of his counsels. The condition of the treasury became worse day by day. The yield of the indirect taxes fell off through the interruption of business, and the direct taxes were in large measure withheld, for want of an authority to enforce payment. With some trouble Necker induced the Assembly to sanction first a loan of 30,000,000 livres and then a loan of 80,000,000 livres. The public having shown no eagerness to subscribe, Necker proposed that every man should be invited to make a patriotic contribution of one-fourth of his income. This expedient also failed. On the 10th of October 1789 Talleyrand, bishop of Autun, proposed that the Assembly should take possession of the lands of the church. In November the Assembly enacted that they should be at the disposal of the nation, which would provide for the maintenance of the clergy. Since the church lands were supposed to occupy one-fifth of France, the Assembly thought that it had found an inexhaustible source of public wealth. On the security of the church lands it based a paper currency (the famous assignats). In December it ordered an issue to the amount of 400,000,000 livres. As the revenue still declined and the reforms enacted by the Assembly involved a heavy outlay, it recurred again and again to this expedient. Before its dissolution the Assembly had authorized the creation of 1,800,000,000 livres of assignats and the depreciation of its paper had begun. Finding that he had lost all credit with the Assembly, Necker resigned office and left France in September 1790.

Confiscation of church property.

The assignats.

Even the committees of the Assembly had far less power than the new municipal authorities throughout France. They really governed so far as there was any government. Often full of public spirit, they lacked experience and in a time of peculiar difficulty had no guide save their own discretion. They opened letters, arrested suspects, controlled the trade in corn, and sent their National Guards on such errands as they thought proper. The political clubs which sprang up all over the country often presumed to act as though they were public authorities (see JACOBINS). The revolutionary journalists, Desmoulins in his *Révolutions de France et de Brabant*, Loustallot in his *Révolutions de Paris*, Marat in his *Ami du peuple*, continued to feed the fire of discord. Amid this anarchy it became a practice for the National Guards of different districts to form federations, that is, to meet and swear loyalty to each other and obedience to the laws made by the National Assembly. At the suggestion of the municipality of Paris the Assembly decreed a general federation of all France, to be held on the anniversary of the fall of the Bastille. The ceremony took place in the Champ de Mars (July 14, 1790) in presence of the king, the queen, the Assembly, and an enormous concourse of spectators. It was attended by deputations from the National Guards in every part of the kingdom, from the regular regiments, and from the crews of the fleet. Talleyrand celebrated Mass, and Lafayette was the first to swear fidelity to the Assembly and the nation. In this gathering the provincial deputations caught the revolutionary fever of Paris. Still graver was the effect upon the regular army. It had been disaffected since the outbreak of the Revolution. The rank and file complained of their food, their lodging and their pay. The non-commissioned officers, often intelligent and hard-working, were embittered by the refusal of promotion. The officers, almost all nobles, rarely showed much concern for their men, and were often mere courtiers and triflers. After the festival of the federation the soldiers were drawn into the political clubs, and named regimental committees to defend their interests. Not content with asking for redress of grievances, they sometimes seized the regimental chest or imprisoned their officers. In August a formidable outbreak at Nancy was only quelled with much loss of life. Desertion became more frequent than ever, and the officers, finding their position unbearable, began to emigrate. Similar causes produced an even worse effect upon the navy.

Power of the municipalities and popular clubs.

Disaffection in the army.

By its rough handling of the church the Assembly brought fresh trouble upon France. The suppression of tithe and the confiscation of church lands had reduced the clergy to live on whatever stipend the legislature might think fit to give them. A law of February 1790 suppressed the religious orders not engaged in education or in works of charity, and forbade the introduction of new ones. Monastic vows

Civil constitution of the clergy.

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were deprived of legal force and a pension was granted to the religious who were cast upon the world. These measures aroused no serious discontent; but the so-called civil constitution of the clergy went much further. Old ecclesiastical divisions were set aside. Henceforth the diocese was to be conterminous with the department, and the parish with the commune. The electors of the commune were to choose the curé, the electors of the department the bishop. Every curé was to receive at least 1200 livres (about £50) a year. Relatively modest stipends were assigned to bishops and archbishops. French citizens were forbidden to acknowledge any ecclesiastical jurisdiction outside the kingdom. The Assembly not only adopted this constitution but decreed that all beneficed ecclesiastics should swear to its observance. As the constitution implicitly abrogated the papal authority and entrusted the choice of bishops and curés to electors who often were not Catholics, most of the clergy declined to swear and lost their preferments. Their places were filled by election. Thenceforwards the clergy were divided into hostile factions, the Constitutionals and the Nonjurors. As the generality of Frenchmen at that time were orthodox although not zealous Catholics, the Nonjurors carried with them a large part of the laity. The Assembly was misled by its Jansenist, Protestant and Free-thinking members, natural enemies of an established church which had persecuted them to the best of its power.

The Assembly, the colonies, and foreign powers.

In colonial affairs the Assembly acted with the same imprudence. Eager to set an example of suppressing slavery, it took measures which prepared a terrible negro insurrection in St Domingo. With regard to foreign relations the Assembly showed itself well-meaning but indiscreet. It protested in good faith that it desired no conquests and aimed only at peace. Yet it laid down maxims which involved the utmost danger of war. It held that no treaty could be binding without the national consent. As this consent had not been given to any existing treaty, they were all liable to be revised by the French government without consulting the other parties. Thus the Assembly treated the Family Compact as null and void. Similarly, when it abolished feudal tenures in France, it ignored the fact that the rights of certain German princes over lands in Alsace were guaranteed by the treaties of Westphalia. It offered compensation in money, and when this was declined, took no heed of their protests. Again, in the papal territory of Avignon a large number of the inhabitants declared for union with France. The Assembly could hardly be restrained by Mirabeau from acting upon their vote and annexing Avignon. Some time after his death it was annexed. The other states of Europe did not admit the doctrines of the Assembly, but peace was not broken. Foreign statesmen who flattered themselves that France was sinking into anarchy and therefore into decay were content to follow their respective ambitions without the dread of French interference.

Attempt of Louis XVI. to escape from Paris.

Deprived of authority and in fact a prisoner, Louis had for many months acquiesced in the decrees of the Assembly however distasteful. But the civil constitution of the clergy wounded him in his conscience as well as in his pride. From the autumn of 1790 onwards he began to scheme for his liberation. Himself incapable of strenuous effort, he was spurred on by Marie Antoinette, who keenly felt her own degradation and the curtailment of that royal prerogative which her son would one day inherit. The king and queen failed to measure the forces which had caused the Revolution. They ascribed all their misfortunes to the work of a malignant faction, and believed that, if they could escape from Paris, a display of force by friendly powers would enable them to restore the supremacy of the crown. But no foreign ruler, not even the emperor Leopold II., gave the king or queen any encouragement. Whatever secrecy they might observe, the adherents of the Revolution divined their wish to escape. When Louis tried to leave the Tuileries for St Cloud at Easter 1791, in order to enjoy the ministrations of a nonjuring priest, the National Guards of Paris would not let him budge. Mirabeau, who had always dissuaded the king from seeking foreign help, died on the 2nd of April. Finally the king and queen resolved to fly to the army of the East, which the marquis de Bouillé had in some measure kept under discipline. Sheltered by him they could await foreign succour or a reaction at home. On the evening of the 20th of June they escaped from the Tuileries. Louis left behind him a declaration complaining of the treatment which he had received and revoking his assent to all measures which had been laid before him while under restraint. On the following day the royal party was captured at Varennes and sent back to Paris. The king's eldest brother, the count of Provence, who had laid his plans much better, made his escape to Brussels and joined the *émigrés*.

It was no longer possible to pretend that the Revolution had been made with the free consent of the king. Some Republicans called for his deposition. Afraid to take a course which involved danger both at home and abroad, the Assembly decreed that Louis should be suspended from his office. The club of the Cordeliers (*q.v.*), led by Danton, demanded not only his deposition but his trial. A petition to that effect having been exposed for signature on the altar in the Champ de Mars, a disturbance ensued and the National Guard fired on the crowd, killing a few and wounding many. This incident afterwards became known as the massacre of the Champ de Mars. On the other hand, the leaders of the Left, Barnave and the Lameths, felt that they had weakened the executive power too much. They would gladly have come to an understanding with the king and revised the constitution so as to strengthen his prerogative. They failed in both objects. Louis and still more Marie Antoinette regarded them with incurable distrust. The Constitutional Act without any material change was voted on the 3rd of September. On the 14th Louis swore to the Constitution, thus regaining his nominal sovereignty. The National Assembly was dissolved on the 30th. Upon Robespierre's motion it had decreed that none of its members should be capable of sitting in the next legislature.

Review of the work of the National Assembly.

If we view the work of the National Assembly as a whole, we are struck by the immense demolition which it effected. No other legislature has ever destroyed so much in the same time. The old form of government, the old territorial divisions, the old fiscal system, the old judicature, the old army and navy, the old relations of Church and State, the old law relating to property in land, all were shattered. Such a destruction could not have been effected without the support of popular opinion. Most of what the Assembly did had been suggested in the *cahiers*, and many of its decrees were anticipated by actual revolt. In its constructive work many sound maxims were embodied. It asserted the principles of civil equality and freedom of conscience, it reformed the criminal law, and laid down a just scheme of taxation. Not intelligence and public spirit but political wisdom was lacking to the National Assembly. Its members did not suspect how limited is the usefulness of general propositions in practical life. Nor did they perceive that new ideas can be applied only by degrees in an old world. The Constitution of 1791 was impracticable and did not last a year. The civil constitution of the clergy was wholly mischievous. In the attempt to govern, the Assembly failed altogether. It left behind an empty treasury, an undisciplined army and navy, a people debauched by safe and successful riot.

The Legislative Assembly.

At the elections of 1791 the party which desired to carry the Revolution further had a success out of all keeping with its numbers. This was due partly to a weariness of politics which had come over the majority of French citizens, partly to downright intimidation exercised by the Jacobin Club and by its affiliated societies throughout the kingdom. The Legislative Assembly met on the 1st of October. It consisted of 745 members. Few were nobles, very few were clergymen, and the great body was drawn from the middle class. The members were generally young, and, since none had sat in the previous Assembly, they were wholly without experience. The Right consisted of the Feuillants (*q.v.*). They numbered about 160, and among them were some able men, such as Matthieu Dumas and Bigot de Préamenau, but they were

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guided chiefly by persons outside the House, because incapable of re-election, Barnave, Duport and the Lameths. The Left consisted of the Jacobins, a term which still included the party afterwards known as the Girondins or Girondists (*q.v.*)—so termed because several of their leaders came from the region of the Gironde in southern France. They numbered about 330. Among the extreme Left sat Cambon, Couthon, Merlin de Thionville. The Girondins could claim the most brilliant orators, Vergniaud, Guadet, Isnard. Inferior to these men in talent, Brissot de Warville, a restless pamphleteer, exerted more influence over the party which has sometimes gone by his name. The Left as a whole was republican, although it did not care to say so. Strong in numbers, it was reinforced by the disorderly elements in Paris and throughout France. The remainder of the House, about 250 deputies, scarcely belonged to any definite party, but voted oftenest with the Left, as the Left was the most powerful.

The Left had three objects of enmity: first, the king, the queen and the royal family; secondly, the *émigrés*; and thirdly, the clergy. The king could not like the new constitution, although, if left to himself, indolence and good nature might have rendered him passive. The queen throughout had only one thought, to shake off the impotence and humiliation of the crown; and for this end she still clung to the hope of foreign succour and corresponded with Vienna. Those *émigrés* who had assembled in arms on the territories of the electors of Mainz and Treves (Trier) and in the Austrian Netherlands had put themselves in the position of public enemies. Their chiefs were the king's brothers, who affected to consider Louis as a captive and his acts as therefore invalid. The count of Provence gave himself the airs of a regent and surrounded himself with a ministry. The *émigrés* were not, however, dangerous. They were only a few thousand strong; they had no competent leader and no money; they were unwelcome to the rulers whose hospitality they abused. The nonjuring clergy, although harassed by the local authorities, kept the respect and confidence of most Catholics. No acts of disloyalty were proved against them, and commissioners of the National Assembly reported to its successor that their flocks only desired to be let alone. But the anti-clerical bias of the Legislative Assembly was too strong for such a policy.

The court and the émigrés.

The king's ministers, named by him and excluded from the Assembly, were mostly persons of little mark. Montmorin gave up the portfolio of foreign affairs on the 31st of October and was succeeded by De Lessart. Cahier de Gerville was minister of the interior; Tarbé, minister of finance; and Bertrand de Molleville, minister of marine. But the only minister who influenced the course of affairs was the comte de Narbonne, minister of war.

On the 9th of November the Assembly decreed that the *émigrés* assembled on the frontiers should be liable to the penalties of death and confiscation unless they returned to France by the 1st of January following. Louis did not love his brothers, and he detested their policy, which without rendering him any service made his liberty and even his life precarious; yet, loath to condemn them to death, he vetoed the decree. On the 29th of November the Assembly decreed that every nonjuring clergyman must take within eight days the civic oath, substantially the same as the oath previously administered, on pain of losing his pension and, if any troubles broke out, of being deported. This decree Louis vetoed as a matter of conscience. In either case his resistance only served to give a weapon to his enemies in the Assembly. But foreign affairs were at this time the most critical. The armed bodies of *émigrés* on the territory of the Empire afforded matter of complaint to France. The persistence of the French in refusing more than a money compensation to the German princes who had claims in Alsace afforded matter of complaint to the Empire. Foreign statesmen noticed with alarm the effect of the French Revolution upon opinion in their own countries, and they resented the endeavours of French revolutionists to make converts there. Of these statesmen, the emperor Leopold was the most intelligent. He had skilfully extricated himself from the embarrassments at home and abroad left by his predecessor Joseph. He was bound by family ties to Louis, and he was obliged, as chief of the Holy Roman Empire, to protect the border princes. On the other hand, he understood the weakness of the Habsburg monarchy. He knew that the Austrian Netherlands, where he had with difficulty restored his authority, were full of friends of the Revolution and that a French army would be welcomed by many Belgians. He despised the weakness and the folly of the *émigrés* and excluded them from his councils. He earnestly desired to avoid a war which might endanger his sister or her husband. In August 1791 he had met Frederick William II. of Prussia at Pillnitz near Dresden, and the two monarchs had joined in a declaration that they considered the restoration of order and of monarchy in France an object of interest to all sovereigns. They further declared that they would be ready to act for this purpose in concert with the other powers. This declaration appears to have been drawn from Leopold by pressure of circumstances. He well knew that concerted action of the powers was impossible, as the English government had firmly resolved not to meddle with French affairs. After Louis had accepted the constitution, Leopold virtually withdrew his declaration. Nevertheless it was a grave error of judgment and contributed to the approaching war.

The king and the nonjurors.

Declaration of Pillnitz.

In France many persons desired war for various reasons. Narbonne trusted to find in it the means of restoring a certain authority to the crown and limiting the Revolution. He contemplated a war with Austria only. The Girondins desired war in the hope that it would enable them to abolish monarchy altogether. They desired a general war because they believed that it would carry the Revolution into other countries and make it secure in France by making it universal. The extreme Left had the same objects, but it held that a war for those objects could not safely be entrusted to the king and his ministers. Victory would revive the power of the crown; defeat would be the undoing of the Revolution. Hence Robespierre and those who thought with him desired peace. The French nation generally had never approved of the Austrian alliance, and regarded the Habsburgs as traditional enemies. The king and queen, however, who looked for help from abroad and especially from Leopold, dreaded a war with Austria and had no faith in the schemes of Narbonne. Nor was France in a condition to wage a serious war. The constitution was unworkable and the governing authorities were mutually hostile. The finances remained in disorder, and assignats of the face value of 900,000,000 livres were issued by the Legislative Assembly in less than a year. The army had been thinned by desertion and was enervated by long indiscipline. The fortresses were in bad condition and short of supplies.

In October Leopold ordered the dispersion of the *émigrés* who had mustered in arms in the Austrian Netherlands. His example was followed by the electors of Treves and Mainz. At the same time they implored the emperor's protection, and the Austrian chancellor Kaunitz informed Noailles the French ambassador that this protection would be given if necessary. Narbonne demanded a credit of 20,000,000 livres, which the Assembly granted. He made a tour of inspection in the north of France and reported untruly to the Assembly that all was in readiness for war. On the 14th of January 1792 the diplomatic committee reported to the Assembly that the emperor should be required to give satisfactory assurances before the 10th of February. The Assembly put off the term to the 1st of March. In February Leopold concluded a defensive treaty with Frederick William. But there was no mutual confidence between the sovereigns, who were at that very time pursuing opposite policies with regard to Poland. Leopold still hesitated and still hoped to avoid war. He died on the 1st of March, and the imperial dignity became vacant. The hereditary dominions of Austria passed to his son Francis, afterwards the emperor Francis II., a youth of small abilities and no experience. The real conduct of affairs fell, therefore, to the aged Kaunitz. In France Narbonne failed to carry the king or his colleagues along with him. The king took courage to dismiss

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him on the 9th of March, whereupon the assembly testified its confidence in Narbonne. De Lessart having incurred its anger by the tameness of his replies to Austrian dictation, the Assembly voted his impeachment.

The king, seeing no other course open, formed a new ministry which was chiefly Girondin. Roland became minister of the interior, Clavière of finance, De Grave of war, and Lacoste of marine. Far abler and more resolute than any of these men was Dumouriez, the new minister for foreign affairs. A soldier by profession, he had been employed in the secret diplomacy of Louis XV. and had thus gained a wide knowledge of international politics. He stood aloof from parties and had no rigid principles, but held views closely resembling those of Narbonne. He wished for a war with Austria which should restore some influence to the crown and make himself the arbiter of France. The king bent to necessity, and on the 20th of April came to the Assembly with the proposal that war should be declared against Austria. It was carried by acclamation. Dumouriez intended to begin with an invasion of the Austrian Netherlands. As this would awaken English jealousy, he sent Talleyrand to London with assurances that, if victorious, the French would annex no territory.

War declared against Austria.

It was designed that the French should invade the Netherlands at three points simultaneously. Lafayette was to march against Namur, Biron against Mons, and Dillon against Tournay. But the first movement disclosed the miserable state of the army. Smitten with panic, Dillon's force fled at sight of the enemy, and Dillon, after receiving a wound from one of his own soldiers, was murdered by the mob of Lille. Biron was easily routed before Mons. On hearing of these disasters Lafayette found it necessary to retreat. This shameful discomfiture quickened all the suspicion and jealousy fermenting in France. De Grave had to resign and was succeeded by Servan. The Austrian forces in the Netherlands were, however, so weak that they could not take the offensive. Austria demanded help from Prussia under the recent alliance, and the claim was admitted. Prussia declared war against France, and the duke of Brunswick was chosen to command the allied forces, but various causes delayed action. Austrian and Prussian interests clashed in Poland. The Austrian government wished to preserve a harmless neighbour. The Prussian government desired another partition and a large tract of Polish territory. Only after long discussion was it agreed that Prussia should be free to act in Poland, while Austria might find compensation in provinces conquered from France.

A respite was thus given and something was done to improve the army. Meantime the Assembly passed three decrees: one for the deportation of nonjuring priests, another to suppress the king's Constitutional Guard, and a third for the establishment of a camp of *fédérés* near Paris. Louis consented to sacrifice his guard, but vetoed the other decrees. Roland having addressed to him an arrogant letter of remonstrance, the king with the support of Dumouriez dismissed Roland, Servan and Clavière. Dumouriez then took the ministry of war, and the other places were filled with such men as could be had. Dumouriez, who cared only for the successful prosecution of the war, urged the king to accept the decrees. As Louis was obstinate, he felt that he could do no more, resigned office on the 15th of June and went to join the army of the north. Lafayette, who remained faithful to the constitution of 1791, ventured on a letter of remonstrance to the Assembly. It paid no attention, for Lafayette could no longer sway the people. The Jacobins tried to frighten the king into accepting the decrees and recalling his ministers. On the 20th of June the armed populace invaded the hall of the Assembly and the royal apartments in the Tuileries. For some hours the king and queen were in the utmost peril. With passive courage Louis refrained from making any promise to the insurgents.

Émeute of the 20th of June 1792.

The failure of the insurrection encouraged a movement in favour of the king. Some twenty thousand Parisians signed a petition expressing sympathy with Louis. Addresses of like tenour poured in from the departments and the provincial cities. Lafayette himself came to Paris in the hope of rallying the constitutional party, but the king and queen eluded his offers of assistance. They had always disliked and distrusted Lafayette and the Feuillants, and preferred to rest their hopes of deliverance on the foreigner. Lafayette returned to his troops without having effected anything. The Girondins made a last advance to Louis, offering to save the monarchy if he would accept them as ministers. His refusal united all the Jacobins in the project of overturning the monarchy by force. The ruling spirit of this new revolution was Danton, a barrister only thirty-two years of age, who had not sat in either Assembly, although he had been the leader of the Cordeliers, an advanced republican club, and had a strong hold on the common people of Paris. Danton and his friends were assisted in their work by the fear of invasion, for the allied army was at length mustering on the frontier. The Assembly declared the country in danger. All the regular troops in or near Paris were sent to the front. Volunteers and *fédérés* were constantly arriving in Paris, and, although most went on to join the army, the Jacobins enlisted those who were suitable for their purpose, especially some 500 whom Barbaroux, a Girondin, had summoned from Marseilles. At the same time the National Guard was opened to the lowest class. Brunswick's famous declaration of the 25th of July, announcing that the allies would enter France to restore the royal authority and would visit the Assembly and the city of Paris with military execution if any further outrage were offered to the king, heated the republican spirit to fury. It was resolved to strike the decisive blow on the 10th of August.

On the night of the 9th a new revolutionary Commune took possession of the hôtel de ville, and early on the morning of the 10th the insurgents assailed the Tuileries. As the preparations of the Jacobins had been notorious, some measures of defence had been taken. Beside a few gentlemen in arms and a number of National Guards the palace was garrisoned by the Swiss Guard, about 950 strong. The disparity of force was not so great as to make resistance altogether hopeless. But Louis let himself be persuaded into betraying his own cause and retiring with his family under the shelter of the Assembly. The National Guards either dispersed or fraternized with the assailants. The Swiss Guard stood firm, and, possibly by accident, a fusillade began. The enemy were gaining ground when the Swiss received an order from the king to cease firing and withdraw. They were mostly shot down as they were retiring, and of those who surrendered many were murdered in cold blood next day. The king and queen spent long hours in a reporter's box while the Assembly discussed their fate and the fate of the French monarchy. Little more than a third of the deputies were present and they were almost all Jacobins. They decreed that Louis should be suspended from his office and that a convention should be summoned to give France a new constitution. An executive council was formed by recalling Roland, Clavière and Servan to office and joining with them Danton as minister of justice, Lebrun as minister of foreign affairs, and Monge as minister of marine.

Rising of the 10th of August.

When Lafayette heard of the insurrection in Paris he tried to rally his troops in defence of the constitution, but they refused to follow him. He was driven to cross the frontier and surrender himself to the Austrians. Dumouriez was named his successor. But the new government was still beset with danger. It had no root in law and little hold on public opinion. It could not lean on the Assembly, a mere shrunken remnant, whose days were numbered. It remained dependent on the power which had set it up, the revolutionary Commune of Paris. The Commune could therefore extort what concessions it pleased. It got the custody of the king and his family who were imprisoned in the Temple. Having obtained an indefinite power of arrest, it soon filled the prisons of Paris. As the elections to the Convention were close at hand, the Commune resolved to strike the public with terror by the slaughter of its prisoners. It found its opportunity in the progress of invasion. On the 19th Brunswick crossed the frontier. On the 22nd Longwy surrendered. Verdun was invested and seemed likely to fall. On the 1st of September the Commune decreed

The revolutionary Commune of Paris.

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that on the following day the tocsin should be rung, all able-bodied citizens convened in the Champs de Mars, and 60,000 volunteers enrolled for the defence of the country.

The September massacres. While this assembly was in progress gangs of assassins were sent to the prisons and began a butchery which lasted four days and consumed 1400 victims. The Commune addressed a circular letter to the other cities of France inviting them to follow the example. A number of state prisoners awaiting trial at Orleans were ordered to Paris and on the way were murdered at Versailles. The Assembly offered a feeble resistance to these crimes. Danton can hardly be acquitted of connivance at them. Roland hinted disapproval, but did not venture more. He with many other Girondins had been marked for slaughter in the original project.

The elections to the Convention were by almost universal suffrage, but indifference or intimidation reduced the voters to a small number. Many who had sat in the National, and many more who had sat in the Legislative Assembly were returned. The Convention met on the 20th of September. Like the previous assemblies, it did not fall into well-defined parties. The success of the Jacobins in overthrowing the monarchy had ended their union. Thenceforwards the name of Jacobin was confined to the smaller and more fanatical group, while the rest came to be known as the Girondins. The Jacobins, about 100 strong, formed the Left of the Convention, afterwards known from the raised benches on which they sat as the Mountain (*q.v.*). The Girondins, numbering perhaps 180, formed the Right. The rest of the House, nearly 500 members, voted now on one side now on the other, until in the course of the Terror they fell under the Jacobin domination. This neutral mass is often termed the Plain, in allusion to its seats on the floor of the House. The Convention as a whole was Republican, if not on principle, from the feeling that no other form of government could be established. It decreed the abolition of monarchy on the 21st of September. A committee was named to draft a new constitution, which was presented and decreed in the following June, but never took effect and was superseded by a third constitution in 1795. The actual government of France was by committees of the Convention, but some months passed before it could be fully organized.

The National Convention.

Abolition of the monarchy.

The inner history of the Convention was strange and terrible. It turned on the successive schisms in the ruling minority. Whichever side prevailed destroyed its adversaries only to divide afresh and renew the strife until the victors were at length so reduced that their yoke was shaken off and the mass of the Convention, hitherto benumbed by fear, resumed its freedom and the government of France. The first and most memorable of these contests was the quarrel between Jacobin and Girondin. Both parties were republican and democratic; both wished to complete the Revolution; both were determined to maintain the integrity of France. But they differed in circumstances and temperament. Although the leaders on both sides were of the middle class, the Girondins represented the *bourgeoisie*, the Jacobins represented the populace. The Girondins desired a speedy return to law and order; the Jacobins thought that they could keep power only by violence. The Jacobins leant on the revolutionary commune and the mob of Paris; the Girondins leant on the thriving burghers of the provincial cities. Despite their smaller number the Jacobins were victors. They were the more resolute and unscrupulous. The Girondins numbered many orators, but not one man of action. The Jacobins controlled the parent club with its affiliated societies and the whole machinery of terror. The Girondins had no organized force at their disposal. The Jacobins perpetuated in a new form the old centralization of power to which France was accustomed. The Girondins addressed themselves to provincials who had lost the power of initiative. They were termed federalists by their enemies and accused, unjustly enough, of wishing to dissolve the national unity.

Jacobins and Girondins.

Even in the first days of the Convention the feud broke out. The Girondins condemned the September massacres and dreaded the Parisian populace. Barbaroux accused Robespierre of aiming at a dictatorship, and Buzot demanded a guard recruited in the departments to protect the Convention. In October Louvet reiterated the charge against Robespierre, and Barbaroux called for the dissolution of the Commune of Paris. But the Girondins gained no tangible result from this wordy warfare. For a time the question how to dispose of the king diverted the thoughts of all parties. It was approached in a political, not in a judicial spirit. The Jacobins desired the death of Louis, partly because they hated kings and deemed him a traitor, partly because they wished to envenom the Revolution, defy Europe and compromise their more temperate colleagues. The Girondins wished to spare Louis, but were afraid of incurring the reproach of royalism. At this critical moment the discovery of the famous iron chest, containing papers which showed that many public men had intrigued with the court, was disastrous for Louis. Members of the Convention were anxious to be thought severe lest they should be thought corrupt. Robespierre frankly demanded that Louis as a public enemy should be put to death without form of trial. The majority shrank from such open injustice and decreed on the 3rd of December that Louis should be tried by the Convention.

A committee of twenty-one was chosen to frame the indictment against Louis, and on the 11th of December he was brought to the bar for the first time to hear the charges read. The most essential might be summed up in the statement that he had plotted against the Constitution and against the safety of the kingdom. On the 26th Louis appeared at the bar a second time, and the trial began. The advocates of Louis could plead that all his actions down to the dissolution of the National Assembly came within the amnesty then granted, and that the Constitution had proclaimed his person inviolable, while enacting for certain offences the penalty of deposition which he had already undergone. Such arguments were not likely to weigh with such a tribunal. The Mountain called for immediate sentence of death; the Girondins desired an appeal to the people of France. The galleries of the Convention were packed with adherents of the Jacobins, whose fury, not confined to words, struck terror into all who might incline towards mercy. In Paris unmistakable signs announced a new insurrection, to be followed perhaps by new massacres. On the question whether Louis was guilty none ventured to give a negative vote. The motion for an appeal to the people was rejected by 424 votes to 283. The penalty of death was adopted by 361 votes against 360 in favour of other penalties or of postponing at least the execution of the sentence. On the 21st of January 1793 Louis was beheaded in the Place de la Révolution, now the Place de la Concorde.

Trial and execution of Louis XVI.

Between the deposition and the death of Louis the war had run a surprising course. Accompanied by King Frederick William, Brunswick had entered France with 80,000 men, of whom more than half were Prussians, the best soldiers in Europe. The disorder of France was such that many expected a triumphal march to Paris. But the Allies had opened the campaign late; they moved slowly; the weather broke, and sickness began to waste their ranks. Dumouriez succeeded in rousing the spirit of the French; he occupied the defiles of the forest of Argonne, thus causing the enemy to lose many valuable days, and when at last they turned his position, he retreated without loss. At Valmy on the 20th of September the two armies came in contact. The affair was only a cannonade, but the French stood firm and the advance of the Allies was stayed. Brunswick had no heart for his work; the king was ill satisfied with the Austrians, and both were alarmed by the ravages of disease among the soldiers. Within ten days after the affair of Valmy they began their retreat. Dumouriez, who still hoped to detach Prussia from Austria, left them unmolested. When the enemy had quitted France, he invaded Hainaut and defeated the Austrians at Jemappes on the 6th of November. In Belgium a large party regarded the French as deliverers. Dumouriez entered Brussels without further resistance, and was soon master of the whole country. Elsewhere the French were equally successful. With a slight force Custine

Battle of Valmy.

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assailed the electorate of Mainz. The common people were friendly, and he had no trouble in occupying the country as far as the Rhine. The king of Sardinia having shown a hostile temper, Montesquiou made an easy conquest of Savoy. At the close of 1792 the relative position of France and her enemies had been reversed. It was seen that the French were still able to wage war, and that the revolutionary spirit had permeated the adjoining countries, while the old governments of Europe, jealous of one another and uncertain of the loyalty of their subjects, were ill qualified for resistance.

Intoxicated with these victories, the Convention abandoned itself to the fervour of propaganda and conquest. The river Scheldt had been closed to commerce by various treaties to which England and Holland, neutral powers, were parties. Without a pretence of negotiation the French government declared on the 16th of November that the Scheldt was thenceforwards open. On the 19th a decree of the Convention offered the aid of France to all nations which were striving after freedom—in other words, to the malcontents in every neighbouring state. Not long afterwards the Convention annexed Savoy, with the consent, it should be added, of many Savoyards. On the 15th of December the Convention decreed that all peoples freed by its assistance should carry out a revolution like that which had been made in France on pain of being treated as enemies. Towards Great Britain the executive council and the Convention behaved with singular folly. There, in spite of a growing antipathy to the Revolution, Pitt earnestly desired to maintain peace. The conquest of the Netherlands and the symptoms of a wish to annex that country made his task most difficult. But the French government underrated the strength of Great Britain, imagining that all Englishmen who desired parliamentary reform desired revolution, and that a few democratic societies represented the nation. When Monge announced the intention of attacking Great Britain on behalf of the English republicans, the British government and nation were thoroughly alarmed and roused; and when the news of the execution of Louis XVI. was received, Chauvelin, the French envoy, was ordered to quit England. France declared war against England and Holland on the 1st of February and soon afterwards against Spain. In the course of the year 1793 the Empire, the kings of Portugal and Naples and the grand-duke of Tuscany declared war against France. Thus was formed the first coalition.

The first coalition against France.

France was not prepared to encounter so many enemies. Administrative confusion had been heightened by the triumph of the Jacobins. Servan was succeeded as minister of war by Pache who was incapable and dishonest. The army of Dumouriez was left in such want that it dwindled rapidly. The commissioners of the Convention plundered the Netherlands with so little remorse that the people became bitterly hostile. The attempt to enforce a revolution of the French sort on the Catholic and conservative Belgians drove them to fury. By every unfair means the commissioners extorted the semblance of a popular vote in favour of incorporation, and France annexed the Netherlands. This was the last outrage. When a new Austrian army under the prince of Coburg entered the country, Dumouriez, who had invaded Holland, was unable to defend Belgium. On the 18th of March he was defeated at Neerwinden, and a few days later he was driven back to the frontier. Alike on public and personal grounds Dumouriez was the enemy of the government. Trusting in his influence over the army he resolved to lead it against the Convention, and, in order to secure his rear, he negotiated with the enemy. But he could make no impression on his soldiers, and deserted to the Austrians. Events followed a similar course in the Rhine valley. There also the French wore out the goodwill at first shown to them. They summoned a convention and obtained a vote for incorporation with France. But they were unable to hold their ground on the approach of a Prussian army. By April they had lost the country with the exception of Mainz, which was invested. France thus lay open to invasion from the east and the north. The Convention decreed a levy of 300,000 men.

About the same time began the first formidable uprising against the Revolution, the War of La Vendée, the region lying to the south of the lower Loire and facing the Atlantic. Its inhabitants differed in many ways from the mass of the nation. Living far from large towns and busy routes of commerce, they remained primitive in all their thoughts and ways. The peasants had always been on friendly terms with the gentry, and the agrarian changes made by the Revolution had not been appreciated so highly as elsewhere. The people were ardent Catholics, who venerated the nonjuring clergy and resented the measures taken against them. But they remained passive until the enforcement of the decree for the levy of 300,000 men. Caring little for the Convention and knowing nothing of events on the northern or eastern frontier, the peasants were determined not to serve and preferred to fight the Republic at home. When once they had taken up arms they found gentlemen to lead and priests to exhort, and their rebellion became Royalist and Catholic. The chiefs were drawn from widely different classes. If Bonchamps and La Rochejacquelin were nobles, Stofflet was a gamekeeper and Cathelineau a mason. As the country was favourable to guerilla warfare, and the government could not spare regular troops from the frontiers, the rebels were usually successful, and by the end of May had almost expelled the Republicans from La Vendée.

Rising in La Vendée.

Danger without and within prompted the Convention to strengthen the executive authority. That the executive and legislative powers ought to be absolutely separate had been an axiom throughout the Revolution. Ministers had always been excluded from a seat in the legislature. But the Assemblies were suspicious of the executive and bent on absorbing the government. They had nominated committees of their own members to control every branch of public affairs. These committees, while reducing the ministers to impotence, were themselves clumsy and ineffectual. It may be said that since the first meeting of the states-general the executive authority had been paralysed in France. The Convention in theory maintained the separation of powers. Even Danton had been forced to resign office when he was elected a member. But unity of government was restored by the formation of a central committee. In January the first Committee of General Defence was formed of members of the committees for the several departments of state. Too large and too much divided for strenuous labour, it was reduced in April to nine members and re-named the Committee of Public Safety. It deliberated in secret and had authority over the ministers; it was entrusted with the whole of the national defence and empowered to use all the resources of the state, and it quickly became the supreme power in the republic. Under it the ministers were no more than head clerks. About the same time were instituted the deputies on mission in the provinces, who could overrule any local authority, and who corresponded regularly with the Committee. France thus returned under new forms to its traditional government: a despotic authority in Paris with all-powerful agents in the provinces. Against disaffection the government was armed with formidable weapons: the Committee of General Security and the Revolutionary Tribunal. The Committee of General Security, first established in October 1792, was several times remodelled. In September 1793 the Convention decreed that its members should be nominated by the Committee of Public Safety. The Committee of General Security had unlimited powers for the prevention or discovery of crime against the state. The Revolutionary Tribunal was decreed on the 10th of March. It was an extraordinary court, destined to try all offences against the Revolution without appeal. The jury, which received wages, voted openly, so that condemnation was almost certain. The director of the jury or public prosecutor was Fouquier Tinville. The first condemnation took place on the 11th of April.

The Committee of Public Safety.

Enmity between Girondin and Jacobin grew fiercer as the perils of the Republic increased. Danton strove to unite all partisans of the Revolution in defence of the country; but the Girondins, detesting his character and fearing his ambition,

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rejected all advances. The Commune of Paris and the journalists who were its mouthpieces, Hébert and Marat, aimed frankly at destroying the Girondins. In April the Girondins carried a decree that Marat should be sent before the Revolutionary Tribunal for incendiary writings, but his acquittal showed that a Jacobin leader was above the law. In May they proposed that the Commune of Paris should be dissolved, and that the *suppléants*, the persons elected to fill vacancies occurring in the Convention, should assemble at Bourges, where they would be safe from that violence which might be applied to the Convention itself. Barère, who was rising into notice by the skill with which he trimmed between parties, opposed this motion, and carried a decree appointing a Committee of Twelve to watch over the safety of the Convention. Then the Commune named as commandant of the National Guard, Hanriot, a man concerned in the September massacres. It raised an insurrection on the 31st of May. On Barère's proposal the Convention stooped to dissolving the Committee of Twelve. The Commune, which had hoped for the arrest of the Girondin leaders, was not satisfied. It undertook a new and more formidable outbreak on the 2nd of June. Enclosed by Hanriot's troops and thoroughly cowed, the Convention decreed the arrest of the Committee of Twelve and of twenty-two principal Girondins. They were put under confinement in their own houses. Thus the Jacobins became all-powerful.

Fall of the Girondins.

A tremor of revolt ran through the cities of the south which chafed under the despotism of the Parisian mob. These cities had their own grievances. The Jacobin clubs menaced the lives and properties of all who were guilty of wealth or of moderate opinions, while the representatives on mission deposed the municipal authorities and placed their own creatures in power. At the end of April the citizens of Marseilles closed the Jacobin club, put its chiefs on their trial and drove out the representatives on mission. In May Lyons rose. The Jacobin municipality was overturned, and Challier, their fiercest demagogue, was arrested. In June the citizens of Bordeaux declared that they would not acknowledge the authority of the Convention until the imprisoned deputies were set free. In July Toulon rebelled. But in the north the appeals of such Girondins as escaped from Paris were of no avail. Even the southern uprising proved far less dangerous than might have been expected. The peasants, who had gained more by the Revolution than any other class, held aloof from the citizens. The citizens lacked the qualities necessary for the successful conduct of civil war. Bordeaux surrendered almost without waiting to be summoned. Marseilles was taken in August and treated with great cruelty. Lyons, where the Royalists were strong, defended itself with courage, for the trial and execution of Challier made the townsmen hopeless of pardon. Toulon, also largely Royalist, invited the English and Spanish admirals, Hood and Langara, who occupied the port and garrisoned the town. At the same time the Vendean War continued formidable. In June the insurgents took the important town of Saumur, although they failed in an attempt upon Nantes. At the end of July the Republicans were still unable to make any impression upon the revolted territory.

Revolt of the provinces.

Thus in the summer of 1793 France seemed to be falling to pieces. It was saved by the imbecility and disunion of the hostile powers. In the north the French army after the treason of Dumouriez could only attempt to cover the frontier. The Austrians were joined by British, Dutch and Prussian forces. Had the Allies pushed straight upon Paris, they might have ended the war. But the desire of each ally to make conquests on his own account led them to spend time and strength in sieges. When Condé and Valenciennes had been taken, the British went off to assail Dunkirk and the Prussians retired into Luxemburg. In the east the Prussians and Austrians took Mainz at the end of July, allowing the garrison to depart on condition of not serving against the Allies for a year. Then they invaded Alsace, but their mutual jealousy prevented them from going farther. Thus the summer passed away without any decisive achievement of the coalition. Meanwhile the Committee of Public Safety, inspired by Danton, strove to rebuild the French administrative system. In July the Committee was renewed and Danton fell out; but soon afterwards it was reinforced by two officers, Carnot, who undertook the organization of the army, and Prieur of the Côte d'Or, who undertook its equipment. Administrators of the first rank, these men renovated the warlike power of France, and enabled her to deal those crushing blows which broke up the coalition.

Disunion of the allied powers.

The Royalist and Girondin insurrections and the critical aspect of the war favoured the establishment of what is known as the reign of terror. Terrorism had prevailed more or less since the beginning of the Revolution, but it was the work of those who desired to rule, not of the nominal rulers. It had been lawless and rebellious. It ended by becoming legal and official. While Danton kept power Terrorism remained imperfect, for Danton, although unscrupulous, did not love cruelty and kept in view a return to normal government. But soon after Danton had ceased to be a member of the Committee of Public Safety Robespierre was elected, and now became the most powerful man in France. Robespierre was an acrid fanatic, and unlike Danton, who only cared to secure the practical results of the Revolution, he had a moral and religious ideal which he intended to force on the nation. All who rejected his ideal were corrupt; all who resented his ascendancy were traitors. The death of Marat, who was stabbed by Charlotte Corday (*q.v.*) to avenge the Girondins, gave yet another pretext for terrible measures of repression. In Paris the armed ruffians who had long preyed upon respectable citizens were organized as a revolutionary army, and other revolutionary armies were established in the provinces. Two new laws placed almost everybody at the mercy of the government. The Law of the Maximum, passed on the 17th of September, fixed the price of food and made it capital to ask for more. The Law of Suspects, passed at the same time, declared suspect every person who was of noble birth, or had held office before the Revolution, or had any connexion with an *émigré*, or could not produce a card of *civisme* granted by the local authority, which had full discretion to refuse. Any suspect might be arrested and imprisoned until the peace or sent before the Revolutionary Tribunal. An earlier law had established in every commune an elective committee of surveillance. These bodies, better known as revolutionary committees, were charged with the enforcement of the Law of Suspects. On the 10th of October the new constitution was suspended, and the government declared revolutionary until the peace.

The reign of terror.

The spirit of those in power was shown by the massacres which followed on the surrender of Lyons in that month. In Paris the slaughter of distinguished victims began with the trial of Marie Antoinette, who was guillotined on the 16th. Twenty-one Girondin deputies were next brought to the bar and, with the exception of Valazé who stabbed himself, were beheaded on the last day of October, Madame Roland and other Girondins of note suffered later. In November the duke of Orleans, who had styled himself Philippe Égalité, had sat in the Convention, and had voted for the king's death, went to the scaffold. Bailly, Barnave and many others of note followed before the end of the year. As the bloody work went on the pretence of trial became more and more hollow, the chance of acquittal fainter and fainter. The Revolutionary Tribunal was a mere instrument of state. Knowing the slight foundation of its power the government deliberately sought to destroy all whose birth, political connexions or past career might mark them out as leaders of opposition. At the same time it took care to show that none was so obscure or so impotent as to be safe when its policy was to destroy.

Execution of the queen.

The disastrous effects of the Terror were heightened by the financial mismanagement of the Jacobins. Assignats were issued with such reckless profusion that the total for the three years of the Convention has been estimated at 7250 millions of francs. Enormous depreciation ensued and, although penalties rising to death itself were denounced against all who should refuse to take them at par, they fell to little more than 1% of their

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nominal value. What were known as revolutionary taxes were imposed at discretion by the representatives on mission and the local authorities. A forced loan of 1000 millions was exacted from those citizens who were reputed to be prosperous. Immense supplies of all kinds were requisitioned for the armies, and were sometimes allowed to rot unused. Anarchy and state interference having combined to check the trade in necessaries, the government undertook to feed the people, and spent huge sums, especially on bread for the starving inhabitants of Paris. As no regular budget was attempted, as accounts were not kept, and as audit was unknown, the opportunities for fraud and embezzlement were endless. Even when due allowance has been made for the financial disorder which the Convention inherited from previous assemblies, and for the war which it had to wage against a formidable alliance, it cannot be acquitted of reckless and wasteful maladministration.

Revolutionary legislation. The new calendar.

Notwithstanding the disorder of the time, the mass of new laws produced by the Convention was extraordinary. A new system of weights and measures, a new currency, a new chronological era (that of the Republic), and a new calendar were introduced (see the section *Republican Calendar* below). A new and elaborate system of education was decreed. Two drafts of a complete civil code were made and, although neither was enacted, particular changes of great moment were decreed. Many of the new laws were stamped with the passions of the time. Such were the laws which suppressed all the remaining bodies corporate, even the academies, and which extinguished all manorial rights without any indemnity to the owners. Such too were the laws which took away the power of testation, placed natural children upon an absolute equality with legitimate, and gave a boundless freedom of divorce. It would be absurd, however, to dismiss all the legislative work of the Convention as merely partisan or eccentric. Much of it was enlightened and skilful, the product of the best minds in the assembly. To compete for power or even to express an opinion on public affairs was dangerous, and wholly to refrain from attendance might be construed as disaffection. Able men who wished to be useful without hazarding their lives took refuge in the committees where new laws were drafted and discussed. The result of their labours was often decreed as a matter of course. Whether the decree would be carried into effect was always uncertain.

Overthrow of the Paris Commune. Fall of the Dantonists.

The ruling faction was still divided against itself. The Commune of Paris, which had overthrown the Girondins, was jealous of the Committee of Public Safety, which meant to be supreme. Robespierre, the leading member of the committee, abhorred the chiefs of the Commune, not merely because they conflicted with his ambition but from difference of character. He was orderly and temperate, they were gross and debauched; he was a deist, they were atheists. In November the Commune fitted up Notre Dame as a temple of Reason, selected an opera girl to impersonate the goddess, and with profane ceremony installed her in the choir. All the churches in Paris were closed. Danton, when he felt power slipping from his hands, had retired from public business to his native town of Arcis-sur-Aube. When he became aware of the feud between Robespierre and the Commune, he conceived the hope of limiting the Terror and guiding the Revolution into a sane course. He returned to Paris and joined with Robespierre in carrying the law of 14 Frimaire (December 4), which gave the Committee of Public Safety absolute control over all municipal authorities. He became the advocate of mercy, and his friend Camille Desmoulins pleaded for the same cause in the *Vieux Cordelier*. Then the oppressed nation took courage and began to demand pardon for the innocent and even justice upon murderers. A sharp contest ensued between the Dantonists and the Commune, Robespierre inclining now to this side, now to that, for he was really a friend to neither. His friend St Just, a younger and fiercer man, resolved to destroy both. Hébert and his followers in despair planned a new insurrection, but they were deserted by Hanriot, their military chief. Their doom was thus fixed. Twenty leaders of the Commune were arrested on the 17th of March 1794 and guillotined a week later. It was then Danton's turn. He had several warnings, but either through over-confidence or weariness of life he scorned to fly. On the 30th he was arrested along with his friends Desmoulins, Delacroix, Philippeaux and Westermann. St Just read to the Convention a report on their case pre-eminent even in that day for its shameless disregard of truth, nay, of plausibility. Before the Revolutionary Tribunal Danton defended himself with such energy that St Just took means to have him silenced. Danton and his friends were executed on the 5th of April.

Supremacy of Robespierre.

For a moment the conflict of parties seemed at an end. None could presume to challenge the authority of the Committee of Public Safety, and in the committee none disputed the leadership of Robespierre. Robespierre was at last free to establish the republic of virtue. On the 7th of May he persuaded the Convention to decree that the French people acknowledged the existence of a Supreme Being and the immortality of the soul. On the 4th of June he was elected president of the Convention, and from that time forward he appeared to be dictator of France. On the 8th the festival of the Supreme Being was solemnized, Robespierre acting as pontiff amid the outward deference and secret jeers of his colleagues. But Robespierre knew what a gulf parted him from almost all his countrymen. He knew that he could be safe only by keeping power and powerful only by making the Terror more stringent. Two days after the festival his friend Couthon presented the crowning law of the Terror, known as the Law of 22 Prairial. As the Revolutionary Tribunal was said to be paralysed by forms and delays, this law abolished the defence of prisoners by counsel and the examination of witnesses. Thenceforward the impressions of judges and jurors were to decide the fate of the accused. For all offences the penalty was to be death. The leave of the Convention was no longer required for the arrest of a member. In spite of some murmurs even this law was adopted. Its effect was fearful. The Revolutionary Tribunal had hitherto pronounced 1200 death sentences. In the next six weeks it pronounced 1400. With Robespierre's approval St Just sketched at this time the plan of an ideal society in which every man should have just enough land to maintain him; in which domestic life should be regulated by law and all children over seven years should be educated by the state. Pending this regeneration of society St Just advised the rule of a dictator.

The Revolutionary War. Republican successes.

The growing ferocity of the Terror appeared more hideous as the dangers threatening the government receded. The surrender of Toulon in December 1793 closed the south of France to foreign enemies. The war in La Vendée turned against the insurgents from the time when the veteran garrison of Mainz came to reinforce the Republican army. After a severe defeat at Cholet on the 16th of October the Royalists determined to cross the Loire and raise Brittany and Anjou, where the Chouans, or Royalist partisans, were already stirring. They failed in an attempt on the little seaport of Granville and in another upon Angers. In December they were defeated with immense loss at Le Mans and at Savenay. The rebellion would probably have died out but for the measures of the new Republican general Turreau, who wasted La Vendée so horribly with his "infernal columns" that he drove the peasants to take up arms once more. Yet Turreau's crimes were almost surpassed by Carrier, the representative on mission at Nantes, who, finding the guillotine too slow in the destruction of his prisoners, adopted the plan of drowning them wholesale. In the autumn of 1793 the war against the coalition took a turn favourable to France. The energy of Danton, the organizing skill of Carnot, and the high spirit of the French nation, resolute at all costs to avoid dismemberment, had well employed the respite given by the sluggishness of the Allies. In Flanders the English were defeated at Hondschoote (September 8) and the Austrians at Wattignies (October 15). In the east Hoche routed the Austrians at Weissenburg and forced them to recross the Rhine before the end of 1793. The summer of 1794 saw France victorious on all her frontiers. Jourdan won the battle of Fleurus

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(June 25), which decided the fate of the Belgian provinces. The Prussians were driven out of the eastern departments. Against the Spaniards and the Sardinians the French were also successful.

Under these circumstances government by terror could not endure. Robespierre was not a man of action; he knew not how to form or lead a party; he lived not with his fellows but with his own thoughts and ambitions. He was hated and feared by most of the oligarchy. They laughed at his religion, resented his puritanism, and felt themselves in daily peril. His only loyal friends in the Committee of Public Safety, Couthon and St Just, were themselves unpopular. Robespierre professed consideration for the deputies of the Plain, who were glad to buy safety by conforming to his will; but he could not reckon on their help in time of danger. By degrees a coalition against Robespierre was formed in the Mountain. It included old followers of Danton like Tallien, independent Jacobins like Cambon, some of the worst Terrorists like Fouché, and such a consummate time-server as Barère. In the course of July its influence began to be felt. When St Just proposed Robespierre to the committees as dictator, he found no response. On the 8th Thermidor (26th of July) Robespierre addressed the Convention, deploring the invectives against himself and the Revolutionary Tribunal and demanding the purification of the committees and the punishment of traitors. His enemies took the speech as a declaration of war and thwarted a proposal that it should be circulated in the departments. Robespierre felt his ascendancy totter. He repeated his speech with more success to the Jacobin Club. His friends determined to strike, and Hanriot ordered the National Guards to hold themselves in readiness. Robespierre's enemies called on the Committee of Public Safety to arrest the traitors, but the committee was divided. On the morning of the 9th Thermidor St Just was beginning to speak in the Convention when Tallien cut him short. Robespierre and all who tried to speak in his behalf were shouted down. The Plain was deaf to Robespierre's appeal. Finally the Convention decreed the arrest of Robespierre, of his brother Augustin, of Couthon and of St Just. But the Commune and the Jacobin Club were on the alert. They sounded the tocsin, mustered their partisans, and released the prisoners. The Convention outlawed Robespierre and his friends and sent out commissioners to rally the citizens. It named Barras, a deputy who had served in the royal army, to lead its forces. Had Robespierre possessed Danton's energy, the result might have been doubtful. He did nothing himself and benumbed his followers. Without an effort Barras captured the Hôtel de Ville. Robespierre, whose jaw had been shattered by a pistol shot, was left in agony for the night. On the next morning he was beheaded along with his brother, Couthon, St Just, Hanriot and seventeen more of his adherents. On the day after seventy-one members of the Commune followed them to the scaffold. Such was the revolution of the 9th Thermidor (27th of July 1794) which ended the Reign of Terror.

Fall of Robespierre. The 9th Thermidor.

In a period of fifteen months, it has been calculated, about 17,000 persons had been executed in France under form of law. The number of those who were shot, drowned or otherwise massacred without the pretence of a trial can never be accurately known, but must be reckoned far greater. The number of persons arrested and imprisoned reached hundreds of thousands, of whom many died in their crowded and filthy jails. The names on the list of *émigrés* at the close of the Terror were about 150,000. Of these a small proportion had borne arms against their country. The rest were either harmless fugitives from destruction or had never quitted France and had been placed on the list simply in order that they might incur the penalties of emigration. Every one of this multitude was liable to instant death if found in French territory. Their relatives were subjected to various pains and penalties. All the property of those condemned to death and of *émigrés* was confiscated. The carnage of the Terror spread far beyond the clergy and the nobility, beyond even the middle class, for peasants and artisans were among the victims. It spread far beyond those who could conspire or rebel, for bedridden old men and women and young boys and girls were often sacrificed. It made most havoc in the flower of the nation, since every kind of eminence marked men for death. By imbuing Frenchmen with such a mutual hatred as nothing but the arm of despotic power could control the Reign of Terror rendered political liberty impossible for many years. The rule of the Terrorists made inevitable the reign of Napoleon.

The fall of Robespierre had consequences unforeseen by his destroyers. Long kept mute by fear, the mass of the nation found a voice and demanded a total change of government. When once the reaction against Jacobin tyranny had begun, it was impossible to halt. Great numbers of prisoners were set at liberty. The Commune of Paris was abolished and the office of commandant of the National Guard was suppressed. The Revolutionary Tribunal was reorganized, and thenceforwards condemnations were rare. The Committees of Public Safety and General Security were remodelled, in virtue of a law that one-fourth of their number should retire at the end of every month and not be re-eligible until another month had elapsed. Somewhat later the Convention declared itself to be the only centre of authority, and executive business was parcelled out among sixteen committees. Most of the representatives on mission were recalled, and many office-holders were displaced. The trial of 130 prisoners sent up from Nantes led to so many terrible disclosures that public feeling turned still more fiercely against the Jacobins; Carrier himself was condemned and executed; and in November the Jacobin Club was closed. In December 73 members of the Convention who had been imprisoned for protesting against the violence done to the Girondins on the 2nd of June 1793 were allowed to resume their seats, and gave a decisive majority to the anti-Jacobins. Soon afterwards the law of the Maximum was repealed. A decree was passed in February 1795 severing the connexion of church and state and allowing general freedom of worship. At the beginning of March those Girondin deputies who survived came back to their places in the Convention.

Reaction after the Terror.

But the return to normal life after the Jacobin domination was not destined to be smooth or continuous. Beside the remnant of Terrorists, such as Billaud Varennes and Collot d'Herbois, who had joined in the revolt against Robespierre, there were in the Convention at that time three principal factions. The so-called Independents, such as Barras and Merlin of Douai, who were all Jacobins, but had stood aloof from the internal conflicts of the party, hated Royalism as much as ever and desired the continuance of the war which was essential to their power. The Thermidorians, the immediate agents in Robespierre's overthrow, such as Tallien, had loudly professed Jacobinism, but wanted to make their peace with the nation. They sought for an understanding with the Girondins and Feuillants, and some went so far as to correspond with the exiled princes. Lastly, those members who had never been Jacobins wanted a speedy return to legal government at home and therefore wished for peace abroad. While bent on preserving the civil equality introduced by the Revolution, many of these men were indifferent as between constitutional monarchy and a republic. The government, mainly Thermidorian, trimmed between Moderates and Independents, and for this reason its actions were often inconsistent.

Parties in the Assembly after Thermidor.

The Jacobins were strong enough to carry a decree for keeping the anniversary of the execution of Louis XVI. as a national festival. They could count on the populace, because work was still scarce, food was still dear, and a multitude of Parisians knew not where to find bread. A committee having recommended the indictment of Collot d'Herbois and three other Terrorists, there ensued the rising of the 12th Germinal (April 1). The mob forced their way into the hall of the Convention and remained there until the National Guards of the wealthy quarters drove them out. By a decree of the Convention the four accused persons were deported to Cayenne, a new mode of dealing with political offenders almost as effective as the guillotine, while less apt to excite

Progress of the reaction.

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compassion. The National Guard was reorganized so as to exclude the lowest class. The property of persons executed since the 10th of March 1793 was restored to their families. The signs of reaction daily became more unmistakable. Worshippers crowded to the churches; the *émigrés* returned by thousands; and Anti-Jacobin outbreaks, followed by massacre, took place in the south. The despair of the Jacobins produced a second rising in Paris on the 1st Prairial (May 20). Again the mob invaded the Convention, murdered a deputy named Féraud who attempted to shield the president, and set his head on a pike. The ultra-Jacobin members took possession and embodied their wishes in decrees. Again the hall was cleared by the National Guards, but order was restored in Paris only by employing regular troops, a new precedent in the history of the Revolution. Paris was disarmed, and several leaders of the insurrection were sentenced to death. The Revolutionary Tribunal was suppressed. Toleration was proclaimed for all priests who would declare their obedience to the laws of the state. Royalists began to count upon the restoration of young Louis the Dauphin, otherwise Louis XVII.; but his health had been ruined by persevering cruelty, and he died on the 10th of June.

The Thermidorian government also endeavoured to pacify the rebels of the west. Its best adviser, Hoche, recommended an amnesty and the assurance of religious freedom. **Progress of the war.** On these terms peace was made with the Vendeans at La Jaunaie in February and with the Chouans at La Mabilais in April. Some of the Vendean leaders persevered in resistance until May, and even after their submission the peace was ill observed, for the Royalists hearkened to the solicitations of the princes and their advisers. In the hope of rekindling the civil war a body of *émigrés* sailed under cover of the British fleet and landed on the peninsula of Quiberon. They were presently hemmed in by Hoche, and all who could not make their escape to the ships were forced to surrender at discretion (July 20). Nearly 700 were executed by court-martial. Yet the spirit of revolt lingered in the west and broke out time after time. Against the coalition the Republic was gloriously successful. (See FRENCH REVOLUTIONARY WARS.) In the summer of 1794 the French invaded Spain at both ends of the Pyrenees, and at the close of the year they made good their footing in Catalonia and Navarre. By the beginning of 1795 the Rhine frontier had been won. Against the king of Sardinia alone they accomplished little. At sea the French had sustained a severe defeat from Lord Howe, and several of their colonies had been taken by the British. But Great Britain, when the Netherlands were lost, could do little for her allies. Even before the close of 1794 the king of Prussia retired from any active part in the war, and on the 5th of April 1795 he concluded with France the treaty of Basel, which recognized her occupation of the left bank of the Rhine. The new democratic government which the French had established in Holland purchased peace by surrendering Dutch territory to the south of that river. A treaty of peace between France and Spain followed in July. The grand duke of Tuscany had been admitted to terms in February. The coalition thus fell into ruin and France occupied a more commanding position than in the proudest days of Louis XIV.

But this greatness was unsure so long as France remained without a stable government. A constitutional committee was named in April. It resolved that the constitution **Constitution of the year III. The Directory.** of 1793 was impracticable and proceeded to frame a new one. The draft was submitted to the Convention in June. In its final shape the constitution established a parliamentary system of two houses: a Council of Five Hundred and a Council of Ancients, 250 in number. Members of the Five Hundred were to be at least thirty years of age, members of the Ancients at least forty. The system of indirect election was maintained but universal suffrage was abandoned. A moderate qualification was required for electors in the first degree, a higher one for electors in the second degree.

When the 750 persons necessary had been elected they were to choose the Ancients out of their own body. A legislature was to last for three years, and one-third of the members were to be renewed every year. The Ancients had a suspensory veto, but no initiative in legislation. The executive was to consist of five directors chosen by the Ancients out of a list elected by the Five Hundred. One director was to retire every year. The directors were aided by ministers for the various departments of State. These ministers did not form a council and had no general powers of government. Provision was made for the stringent control of all local authorities by the central government. Since the separation of powers was still deemed axiomatic, the directors had no voice in legislation or taxation, nor could directors or ministers sit in either house. Freedom of religion, freedom of the press, and freedom of labour were guaranteed. Armed assemblies and even public meetings of political societies were forbidden. Petitions were to be tendered only by individuals or through the public authorities. The constitution was not, however, allowed free play from the beginning. The Convention was so unpopular that, if its members had retired into private life, they would not have been safe and their work might have been undone. It was therefore decreed that two-thirds of the first legislature must be chosen out of the Convention.

When the constitution was submitted to the primary assemblies, most electors held aloof, 1,050,000 voting for and only 5,000 voting against it. On the 23rd of September it was declared to be law. Then all the parties which resented the limit upon freedom of election combined to rise in Paris. The government entrusted its defence to Barras; but its true man of action was young General Bonaparte, who could dispose of a few thousand regular troops and a powerful artillery. The Parisians were ill-equipped and ill-led, and on the 13th of Vendémiaire (October 5) their insurrection was quelled almost without loss to the victors. No further resistance was possible. The Convention dissolved itself on the 26th of October. **Insurrection of 13 Vendémiaire.**

The feeling of the nation was clearly shown in the elections. Among those who had sat in the Convention the anti-Jacobins were generally preferred. A leader of the old Right was sometimes chosen by many departments at once. Owing to this circumstance, 104 places reserved to members of the Convention were left unfilled. When the persons elected met they had no choice but to co-opt the 104 from the Left of the Convention. The new one-third were, as a rule, enemies of the Jacobins, but not of the Revolution. Many had been members of the Constituent or of the Legislative Assembly. When the new legislature was complete, the Jacobins had a majority, although a weak one. After the Council of the Ancients had been chosen by lot, it remained to name the directors. For its own security the Left resolved that all five must be old members of the Convention and regicides. The persons chosen were Rewbell, Barras, La Révellière Lépeaux, Carnot and Letourneur. Rewbell was an able, although unscrupulous, man of action, Barras a dissolute and shameless adventurer, La Révellière Lépeaux the chief of a new sect, the Theophilanthropists, and therefore a bitter foe to other religions, especially the Catholic. Severe integrity and memorable public services raised Carnot far above his colleagues, but he was not a statesman and was hampered by his past. Letourneur, a harmless insignificant person, was his admirer and follower. The division in the legislature was reproduced in the Directory. Rewbell, Barras and La Révellière Lépeaux had a full measure of the Jacobin spirit; Carnot and Letourneur favoured a more temperate policy. **Balance of parties in the new legislature.**

With the establishment of the Directory the Revolution might seem closed. The nation only desired rest and the healing of its many wounds. Those who wished to restore Louis XVIII. and the *ancien régime* and those who would have renewed the Reign of Terror were insignificant in number. The possibility of foreign interference had vanished with the failure of the coalition. Nevertheless the four years of the Directory were a time of arbitrary government and chronic disquiet. The late atrocities had made confidence or goodwill between parties impossible. The same instinct of self-preservation which had led the members of the Convention to claim so large a part in the new legislature and the whole of **Character of the Directory.**

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the Directory impelled them to keep their predominance. As the majority of Frenchmen wanted to be rid of them, they could achieve their purpose only by extraordinary means. They habitually disregarded the terms of the constitution, and, when the elections went against them, appealed to the sword. They resolved to prolong the war as the best expedient for prolonging their power. They were thus driven to rely upon the armies, which also desired war and were becoming less and less civic in temper. Other reasons influenced them in this direction. The finances had been so thoroughly ruined that the government could not have met its expenses without the plunder and the tribute of foreign countries. If peace were made, the armies would return home and the directors would have to face the exasperation of the rank and file who had lost their livelihood, as well as the ambition of generals who could in a moment brush them aside. Barras and Rewbell were notoriously corrupt themselves and screened corruption in others. The patronage of the directors was ill bestowed, and the general maladministration heightened their unpopularity.

Military triumphs under the Directory. Bonaparte.

The contitutional party in the legislature desired a toleration of the nonjuring clergy, the repeal of the laws against the relatives of the *émigrés*, and some merciful discrimination toward the *émigrés* themselves. The directors baffled all such endeavours. On the other hand, the socialist conspiracy of Babeuf was easily quelled (see Babeuf, François N.). Little was done to improve the finances, and the *assignats* continued to fall in value. But the Directory was sustained by the military successes of the year 1796. Hoche again pacified La Vendée. Bonaparte's victories in Italy more than compensated for the reverses of Jourdan and Moreau in Germany. The king of Sardinia made peace in May, ceding Nice and Savoy to the Republic and consenting to receive French garrisons in his Piedmontese fortresses. By the treaty of San Ildefonso, concluded in August, Spain became the ally of France. In October Naples made peace. In 1797 Bonaparte finished the conquest of northern Italy and forced Austria to make the treaty of Campo Formio (October), whereby the emperor ceded Lombardy and the Austrian Netherlands to the Republic in exchange for Venice and undertook to urge upon the Diet the surrender of the lands beyond the Rhine. Notwithstanding the victory of Cape Vincent, England was brought into such extreme peril by the mutinies in the fleet that she offered to acknowledge the French conquest of the Netherlands and to restore the French colonies. The selfishness of the three directors threw away this golden opportunity. In March and April the election of a new third of the Councils had been held. It gave a majority to the constitutional party. Among the directors the lot fell on Letourneur to retire, and he was succeeded by Barthélemy, an eminent diplomatist, who allied himself with Carnot. The political disabilities imposed upon the relatives of *émigrés* were repealed. Priests who would declare their submission to the Republic were restored to their rights as citizens. It seemed likely that peace would be made and that moderate men would gain power.

Coup d'état of the 18th Fructidor.

Barras, Rewbell and La Révellière-Lépeaux then sought help from the armies. Although Royalists formed but a petty fraction of the majority, they raised the alarm that it was seeking to restore monarchy and undo the work of the Revolution. Hoche, then in command of the army of the Sambre and Meuse, visited Paris and sent troops. Bonaparte sent General Augereau, who executed the *coup d'état* of the 18th Fructidor (September 4). The councils were purged, the elections in forty-nine departments were cancelled, and many deputies and other men of note were arrested. Some of them, including Barthélemy, were deported to Cayenne. Carnot made good his escape. The two vacant places in the Directory were filled by Merlin of Douai and François of Neufchâteau. Then the government frankly returned to Jacobin methods. The law against the relatives of *émigrés* was re-enacted, and military tribunals were established to condemn *émigrés* who should return to France. The nonjuring priests were again persecuted. Many hundreds were either sent to Cayenne or imprisoned in the hulks of Ré and Oleron. La Révellière Lépeaux seized the opportunity to propagate his religion. Many churches were turned into Theophilanthropic temples. The government strained its power to secure the recognition of the *décadi* as the day of public worship and the non-observance of Sunday. Liberty of the press ceased. Newspapers were confiscated and journalists were deported wholesale. It was proposed to banish from France all members of the old *noblesse*. Although the proposal was dropped, they were all declared to be foreigners and were forced to obtain naturalization if they would enjoy the rights of other citizens. A formal bankruptcy of the state, the cancelling of two-thirds of the interest on the public debt, crowned the misgovernment of this disastrous time.

The second coalition.

In the spring of 1798 not only a new third of the legislature had to be chosen, but the places of the members expelled by the revolution of Fructidor had to be filled. The constitutional party had been rendered helpless, and the mass of the electors were indifferent. But among the Jacobins themselves there had arisen an extreme party hostile to the directors. With the support of many who were not Jacobins but detested the government, it bade fair to gain a majority. Before the new deputies could take their seats the directors forced through the councils the law of the 22nd Floréal (May 11), annulling or perverting the elections in thirty departments and excluding forty-eight deputies by name. Even this *coup d'état* did not secure harmony between the executive and the legislature. In the councils the directors were loudly charged with corruption and misgovernment. The retirement of François of Neufchâteau and the choice of Treilhard as his successor made no difference in the position of the Directory.

While France was thus inwardly convulsed, its rulers were doubly bound to husband the national strength and practise moderation towards other states. Since December 1797 a congress had been sitting at Rastadt to regulate the future of Germany. That it should be brought to a successful conclusion was of the utmost import for France. But the directors were driven by self-interest to new adventures abroad. Bonaparte was resolved not to sink into obscurity, and the directors were anxious to keep him as far as possible from Paris; they therefore sanctioned the expedition to Egypt which deprived the Republic of its most army and most renowned captain. Coveting the treasures of Bern, they sent Brune to invade Switzerland and remodel its constitution; in revenge for the murder of General Duphot, they sent Berthier to invade the papal states and erect the Roman Republic; they occupied and virtually annexed Piedmont. In all these countries they organized such an effective pillage that the French became universally hateful. As the armies were far below the strength required by the policy of unbounded conquest and rapine, the first permanent law of conscription was passed in the summer of 1798. The attempt to enforce it caused a revolt of the peasants in the Belgian departments. The priests were made responsible and some eight thousand were condemned in a mass to deportation, although much the greater part escaped by the goodwill of the people. Few soldiers were obtained by the conscription, for the government was as weak as it was tyrannical.

Under these circumstances Nelson's victory of Aboukir (1st of August), which gave the British full command of the Mediterranean and secluded Bonaparte in Egypt, was the signal for a second coalition. Naples, Austria, Russia and Turkey joined Great Britain against France. Ferdinand of Naples, rashly taking the offensive before his allies were ready, was defeated and forced to seek a refuge in Sicily. In January 1799 the French occupied Naples and set up the Parthenopean republic. But the consequent dispersion of their weak forces only exposed them to greater peril. At home the Directory was in a most critical position. In the elections of April 1799 a large number of Jacobins gained seats. A little later Rewbell retired. It was imperative to fill his place with a man of ability and influence. The choice fell upon Sieyès, who had kept aloof from office and retained not only his immeasurable self-conceit but the respect of the public. Sieyès felt that

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the Directory was bankrupt of reputation, and he intended to be far more than a mere member of a board. He hoped to concentrate power in his own hands, to bridle the Jacobins, and to remodel the constitution. With the help of Barras he proceeded to rid himself of the other directors. An irregularity having been discovered in Treilhard's election, he retired, and his place was taken by Gohier. Merlin of Douai and La Réveillière Lépeaux were driven to resign in June. They were succeeded by Moulin and Ducos. The three new directors were so insignificant that they could give no trouble, but for the same reason they were of little service.

Such a government was ill fitted to cope with the dangers then gathering round France. The directors having resolved on the offensive in Germany, the French crossed the Rhine early in March, but were defeated by the archduke Charles at Stockach on the 25th. The congress at Rastadt, which had sat for fifteen months without doing anything, broke up in April and the French envoys were murdered by Austrian hussars. In Italy the allies took the offensive with an army partly Austrian, partly Russian under the command of Suvarov. After defeating Moreau at Cassano on the 27th of April, he occupied Milan and Turin. The republics established by the French in Italy were overthrown, and the French army retreating from Naples was defeated by Suvarov on the Trebbia. Thus threatened with invasion on her German and Italian frontiers, France was disabled by anarchy within. The finances were in the last distress; the anti-religious policy of the government kept many departments on the verge of revolt; and commerce was almost suspended by the decay of roads and the increase of bandits. There was no real political freedom, yet none of the ease or security which enlightened despotism can bestow. The Terrorists lifted their heads in the Council of Five Hundred. A Law of Hostages, which was really a new Law of Suspects, and a progressive income tax showed the temper of the majority. The Jacobin Club was reopened and became once more the focus of disorder. The Jacobin press renewed the licence of Hébert and Marat. Never since the outbreak of the Revolution had the public temper been so gloomy and desponding.

French reverses. The Directory discredited.

In this extremity Sieyès chose as minister of police the old Terrorist Fouché, who best understood how to deal with his brethren. Fouché closed the Jacobin Club and deported a number of journalists. But like his predecessors Sieyès felt that for the revolution which he meditated he must have the help of a soldier. As his man of action he chose General Joubert, one of the most distinguished among French officers. Joubert was sent to restore the fortune of the war in Italy. At Novi on the 15th of August he encountered Suvarov. He was killed at the outset of the battle and his men were defeated. After this disaster the French held scarcely anything south of the Alps save Genoa. The Russian and Austrian governments then agreed to drive the enemy out of Switzerland and to invade France from the east. At the same time Holland was assailed by the joint forces of Great Britain and Russia. But the second coalition, like the first, was doomed to failure by the narrow views and conflicting interests of its members. The invasion of Switzerland was baffled by want of concert between Austrians and Russians and by Masséna's victory at Zürich on the 25th and 26th of September. In October the British and the Russians were forced to evacuate Holland. All immediate danger to France was ended, but the issue of the war was still in suspense. The directors had been forced to recall Bonaparte from Egypt. He anticipated their order and on the 9th of October landed at Fréjus.

Dazzled by his victories in the East the public forgot that the Egyptian expedition was ending in calamity. It received him with an ardour which convinced Sieyès that he was the indispensable soldier. Bonaparte was ready to act, but at his own time and for his own ends. Since the close of the Convention affairs at home and abroad had been tending more and more surely to the establishment of a military dictatorship. Feeling his powers equal to such an office he only hesitated about the means of attainment. At first he thought of becoming a director; finally he decided upon a partnership with Sieyès. They resolved to end the actual government by a fresh *coup d'état*. Means were to be taken for removing the councils from Paris to St Cloud, where pressure could more easily be applied. Then the councils would be induced to decree a provisional government by three consuls and the appointment of a commission to revise the constitution. The pretext for this irregular proceeding was to be a vast Jacobin conspiracy. Perhaps the gravest obstacles were to be expected from the army. Of the generals, some, like Jourdan, were honest republicans; others, like Bernadotte, believed themselves capable of governing France. With perfect subtlety Bonaparte worked on the feelings of all and kept his own intentions secret.

Coup d'état of the 18th Brumaire.

On the morning of the 18th Brumaire (November 9) the Ancients, to whom that power belonged, decreed the transference of the councils to St Cloud. Of the directors, Sieyès and his friend Ducos had arranged to resign; Barras was cajoled and bribed into resigning; Gohier and Moulins, who were intractable, found themselves imprisoned in the Luxemburg palace and helpless. So far all had gone well. But when the councils met at St Cloud on the following day, the majority of the Five Hundred showed themselves bent on resistance, and even the Ancients gave signs of wavering. When Bonaparte addressed the Ancients, he lost his self-possession and made a deplorable figure. When he appeared among the Five Hundred, they fell upon him with such fury that he was hardly rescued by his officers. A motion to outlaw him was only baffled by the audacity of the president, his brother Lucien. At length driven to undisguised violence, he sent in his grenadiers, who turned out the deputies. Then the Ancients passed a decree which adjourned the Councils for three months, appointed Bonaparte, Sieyès and Ducos provisional consuls, and named the Legislative Commission. Some tractable members of the Five Hundred were afterwards swept up and served to give these measures the confirmation of their House. Thus the Directory and the Councils came to their unlamented end. A shabby compound of brute force and imposture, the 18th Brumaire was nevertheless condoned, nay applauded, by the French nation. Weary of revolution, men sought no more than to be wisely and firmly governed.

Although the French Revolution seemed to contemporaries a total break in the history of France, it was really far otherwise. Its results were momentous and durable in proportion as they were the outcome of causes which had been working long. In France there had been no historic preparation for political freedom. The desire for such freedom was in the main confined to the upper classes. During the Revolution it was constantly baffled. No Assembly after the states-general was freely elected and none deliberated in freedom. After the Revolution Bonaparte established a monarchy even more absolute than the monarchy of Louis XIV. But the desire for uniformity, for equality and for what may be termed civil liberty was the growth of ages, had been in many respects nurtured by the action of the crown and its ministers, and had become intense and general. Accordingly it determined the principal results of the Revolution. Uniformity of laws and institutions was enforced throughout France. The legal privileges formerly distinguishing different classes were suppressed. An obsolete and burthensome agrarian system was abolished. A number of large estates belonging to the crown, the clergy and the nobles were broken up and sold at nominal prices to men of the middle or lower class. The new jurisprudence encouraged the multiplication of small properties. The new fiscal system taxed men according to their means and raised no obstacle to commerce within the national boundaries. Every calling and profession was made free to all French citizens, and in the public service the principle of an open career, for talent was adopted. Religious disabilities vanished, and there was well-nigh complete liberty of thought. It was because Napoleon gave a practical form to these achievements of the Revolution and ensured the public order necessary to their continuance that

General estimate of the Revolution.

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the majority of Frenchmen endured so long the fearful sacrifices which his policy exacted.

That a revolution largely inspired by generous and humane feeling should have issued in such havoc and such crimes is a paradox which astounded spectators and still perplexes the historian. Something in the cruelty of the French Revolution may be ascribed to national character. From the time when Burgundians and Armagnacs strove for dominion down to the last insurrection of Paris, civil discord in France has always been cruel. More, however, was due to the total dissolution of society which followed the meeting of the states-general. In the course of the Revolution we can discover no well-organized party, no governing mind. Mirabeau had the stuff of a great statesman, and Danton was capable of statesmanship. But these men were not followed or obeyed save by accident or for a moment. Those who seemed to govern were usually the sport of chance, often the victims of their colleagues. Neither Royalists nor Feuillants nor Girondins had the instinct of government. In the chaotic state of France all ferocious and destructive passions found ample scope. The same conditions explain the triumph of the Jacobins. Devoid of wisdom and virtue in the highest sense, they at least understood how power might be seized and kept. The Reign of Terror was the expedicnt of a party which knew its weakness and unpopularity. It was not necessary either to secure the lasting benefits of the Revolution or to save France from dismemberment; for nine Frenchmen out of ten were agreed on both of these points and were ready to lay down their lives for the national cause.

In the history of the French Revolution the influence which it exerted upon the surrounding countries demands peculiar attention. The French professed to act upon principles of universal authority, and from an early date they began to seek converts outside their own limits. The effect was slight upon England, which had already secured most of the reforms desired by the French, and upon Spain, where the bulk of the people were entirely submissive to church and king. But in the Netherlands, in western Germany and in northern Italy, countries which had attained a degree of civilization resembling that of France, where the middle and lower classes had grievances and aspirations not very different from those of the French, the effect was profound. Fear of revolution at home was one of the motives which led continental sovercigns to attack revolution in France. Their incoherent efforts only confirmed the Jacobin supremacy. Wherever the victorious French extended their dominion, they remodelled institutiors in the French manner. Their sway proved so oppressive that the very classes which had welcomed them with most fervour soon came to long for their expulsion. But revolutionary ideas kept their charm. Under Napoleon the essential part of the changes made by the Republic was preserved in these countries also. Moreover the effacement of old boundaries, the overthrow of ancestral governments, and the invocation, however hollow, of the sovereignty of the people, awoke national feeling which had slumbered long and prepared the struggle for national union and independence in the 19th century.

See also FRANCE, sections *History* and *Law and Institutions*. For the leading figures in the Revolution see their biographies under separate headings. Particular phases, facts, and institutions of the period are also separately dealt with, *e.g.* ASSIGNATS, CONVENTION, THE NATIONAL, JACOBINS.

BIBLIOGRAPHY.—The MS. authorities for the history of the French Revolution are exceedingly copious. The largest collection is in the Archives Nationales in Paris, but an immense number of documents are to be found in other collections in Paris and the provinces. The printed materials are so abundant and varied that any brief notice of them must be imperfect.

The condition of France and the state of public opinion at the beginning of the Revolution may be studied in the printed collections of *Cahiers*. The *Cahiers* were the statements of grievances drawn up for the guidance of deputies to the States-General by those who had elected them. In every *baillage* and *sénéchaussée* each estate drew up its own cahier and the cahiers of the Third Estate were condensed from separate cahiers drawn up by each parish in the district. Thus the cahiers of the Third Estate number many thousands, the greater part of which have not yet been printed. Among the collections printed we may mention *Les Élections et les cahiers de Paris en 1789*, by C. L. Chassin (4 vols., Paris, 1888); *Cahiers de plaintes et doléances des paroisses de la province de Maine*, by A. Bellée and E. Duchemin (4 vols., Le Mans, 1881–1903); *Cahiers de doléances de 1789 dans le département du Pas-de-Calais*, by H. Loriquet (2 vols., Arras, 1891); *Cahiers des paroisses et communautés du bailliage d'Autun*, by A. Charmasse (Autun, 1895). New collections are printed from time to time. A more general collection of cahiers than any above named is given in vols. i.–vi. of the *Archives parlementaires*. The cahiers must not be read in a spirit of absolute faith, as they were influenced by certain models circulated at the time of the elections and by popular excitement, but they remain an authority of the utmost value and a mine of information for the old régime. Reference should also be made to the works of travellers who visited France at the outbreak of the Revolution. Among these Arthur Young's *Travels in France during the years 1787, 1788 and 1789* (2 vols., Bury St Edmunds, 1792–1793) are peculiarly instructive.

For the history of the Assemblies during the Revolution a main authority is their *Procès verbaux* or Journals; those of the Constituent Assembly in 75 vols., those of the Legislative Assembly in 16 vols.; those of the Convention in 74 vols., and those of the Councils under the Directory in 99 vols. See also the *Archives parlementaires* edited by J. Mavidal and E. Laurent (Paris, 1867, and the following years); the *Histoire parlementaire de la Révolution*, by P. J. B. Buchez and P. C. Roux (Paris, 1838), and the *Histoire de la Révolution par deux amis de la liberté* (Paris, 1792–1803).

The newspapers, of which a few have been mentioned in the text, were numerous. They are useful chiefly as illustrating the ideas and passions of the time, for they give comparatively little information as to facts and that little is peculiarly inaccurate. The ablest of the Royalist journals was Mallet du Pan's *Mercure de France*. Pamphlets of the Revolution period number many thousands. Such pamphlets as Mounier's *Nouvelles Observations sur les États-Généraux de France* and Sieyès's *Qu'est-ce que le Tiers État* had a notable influence on opinion. The richest collections of Revolution pamphlets are in the Bibliothèque Nationale of Paris and in the British Museum.

The contemporary memoirs, &c., already published are numerous and fresh ones are always coming forth. A few of the best known and most useful are, for the Constituent Assembly, the memoirs of Bailly, of Ferrières, of Malouet. The *Correspondence of Mirabeau with the Count de la Marck*, edited by Bacourt (3 vols., Paris, 1851), is especially valuable. Dumont's *Recollections of Mirabeau* and the *Diary and Letters of Gouverneur Morris* give the impressions of foreigners with peculiar advantages for observing. For the Legislative Assembly and the Convention the memoirs of Madame Roland, of Bertrand de Molleville, of Barbaroux, of Buzot, of Louvet, of Dumouriez are instructive. For the Directory the memoirs of Barras, of La Réveillière Lépeaux and of Thibaudeau deserve mention. The memoirs of Lafayette are useful. Those of Talleyrand are singularly barren, the result, no doubt, of deliberate suppression. The memoirs of the marquise de La Rochejaqueleinare important for the war of La Vendée. The most notable Jacobins have seldom left memoirs, but the works of Robespierre and St Just enable us to form a clearer conception of the authors. The correspondence of the count of Mercy-Argenteau, the imperial ambassador, with Joseph II. and Kaunitz, and the correspondence of Mallet du Pan with the court of Vienna, are also instructive. But the contemporary literature of the French Revolution requires to be read in an unusually critical spirit. At no other historical crisis have passions been more fiercely excited; at none have shameless disregard of truth and blind credulity been more common.

Among later works based on these original materials the first place belongs to general histories. In French Louis Blanc's *Histoire de la Révolution* (12 vols., Paris, 1847–1862), and Michelet's *Histoire de la Révolution Française* (9 vols., Paris, 1847–1853), are the most elaborate of the older works. Michelet's book is marked by great eloquence and power. In H. Taine's *Origines de la France contemporaine* (Paris, 1876–1894) three volumes are devoted to the Revolution. They show exceptional talent and industry, but their value is impaired by the spirit of system and by strong prepossessions. F. A. M. Mignet's *Histoire de la Révolution Française* (2 vols., Paris, 1824) is short and devoid of literary charm, has the merits of learning and judgment and is still useful. F. A. Aulard's *Histoire politique de la Révolution Française* (Paris, 1901) is a most valuable précis of political history, based on deep knowledge and lucidly set forth, although not free from bias. The volume on the Revolution in Lavisse and Rambaud's *Histoire générale de l'Europe* (Paris, 1896) is the work of distinguished scholars using the latest information. In English, general histories of the Revolution are few. Carlyle's famous work, published in 1837, is more of a prose epic than a history, omitting all detail which would not heighten the imaginative effect and tinged by all the favourite ideas of the author. Some fifty years later H. M. Stephens published the first (1886) and second (1892) volumes of a *History of the French Revolution*. They are marked by solid learning and contain much information. Volume viii. of the *Cambridge Modern History*, published in 1904, contains a general survey of the Revolution.

The most notable German work is H. von Sybel's *Geschichte der Revolutionszeit* (5 vols., Stuttgart, 1853–1879). It is strongest in

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those parts which relate to international affairs and foreign policy. There is an English translation.

None of the general histories of the Revolution above named is really satisfactory. The immense mass of material has not yet been thoroughly sifted; and the passions of that age still disturb the judgment of the historian. More successful have been the attempts to treat particular aspects of the Revolution.

The foreign relations of France during the Revolution have been most ably unravelled by A. Sorel in *L'Europe et la Révolution Française* (8 vols., Paris, 1885–1904) carrying the story down to the settlement of Vienna. Five volumes cover the years 1789–1799.

The financial history of the Revolution has been traced by C. Gomel, *Histoire financière de l'Assemblée Constituante* (2 vols., Paris, 1897), and R. Stourm, *Les Finances de l'Ancien Régime et de la Révolution* (2 vols., Paris, 1885).

The relations of Church and State are sketched in E. Pressensé's *L'Église et la Révolution Française* (Paris, 1889).

The general legislation of the period has been discussed by Ph. Sagnac, *La Législation civile de la Révolution Française* (Paris, 1898). The best work upon the social life of the period is the *Histoire de la société française sous la Révolution*, by E. and J. de Goncourt (Paris, 1889). For military history see A. Duruy, *L'Armée royale en 1789* (Paris, 1888); E. de Hautcrive, *L'Armée sous la Révolution, 1789–1794* (Paris, 1894); A. Chuquet, *Les Guerres de la Révolution* (Paris, 1886, &c.). See also the memoirs and biographies of the distinguished soldiers of the Republic and Empire, too numerous for citation here.

Modern lives of the principal actors in the Revolution are numerous. Among the most important are *Mémoires de Mirabeau*, by L. de Montigny (Paris, 1834); *Les Mirabeau*, by L. de Loménie (Paris, 1889–1891); H. L. de Lanzac de Laborie's *Jean Joseph Mounier* (Paris, 1889); B. Mallet's *Mallet du Pan and the French Revolution* (London, 1902); Robinet's *Danton* (Paris, 1889); Hamel's *Histoire de Robespierre* (Paris, 1865–1867) and *Histoire de St-Just* (2 vols., Brussels, 1860); A. Bigeon, *Sieyès* (Paris, 1893); *Mémoirs of Carnot*, by his son (2 vols., Paris, 1861–1864).

For fuller information see M. Tourneux, *Les Sources bibliographiques de l'histoire de la Révolution Française* (Paris, 1898, etc.), and *Bibliographie de l'histoire de Paris pendant la Révolution* (Paris, 1890, etc.).

(F. C. M.)

French Republican Calendar.—Among the changes made during the Revolution was the substitution of a new calendar, usually called the revolutionary or republican calendar, for the prevailing Gregorian system. Something of the sort had been suggested in 1785 by a certain Riboud, and a definite scheme had been promulgated by Pierre Sylvain Maréchal (1750–1803) in his *Almanach des honnêtes gens* (1788). The objects which the advocates of a new calendar had in view were to strike a blow at the clergy and to divorce all calculations of time from the Christian associations with which they were loaded, in short, to abolish the Christian year; and enthusiasts were already speaking of "the first year of liberty" and "the first year of the republic" when the national convention took up the matter in 1793. The business of drawing up the new calendar was entrusted to the president of the committee of public instruction, Charles Gilbert Romme (1750–1795), who was aided in the work by the mathematicians Gaspard Monge and Joseph Louis Lagrange, the poet Fabre d'Églantine and others. The result of their labours was submitted to the convention in September; it was accepted, and the new calendar became law on the 5th of October 1793. The new arrangement was regarded as beginning on the 22nd of September 1792, this day being chosen because on it the republic was proclaimed and because it was in this year the day of the autumnal equinox.

By the new calendar the year of 365 days was divided into twelve months of thirty days each, every month being divided into three periods of ten days, each of which were called *décades*, and the tenth, or last, day of each decade being a day of rest. It was also proposed to divide the day on the decimal system, but this arrangement was found to be highly inconvenient and it was never put into practice. Five days of the 365 still remained to be dealt with, and these were set aside for national festivals and holidays and were called *Sans-culottides*. They were to fall at the end of the year, *i.e.* on the five days between the 17th and the 21st of September inclusive, and were called the festivals of virtue, of genius, of labour, of opinion and of rewards. A similar course was adopted with regard to the extra day which occurred once in every four years, but the first of these was to fall in the year III., *i.e.* in 1795, and not in 1796, the leap year in the Gregorian calendar. This day was set apart for the festival of the Revolution and was to be the last of the *Sans-culottides*. Each period of four years was to be called a *Franciade*.

Some discussion took place about the nomenclature of the new divisions of time. Eventually this work was entrusted to Fabre d'Églantine, who gave to each month a name taken from some seasonal event therein. Beginning with the new year on the 22nd of September the autumn months were *Vendémiaire*, the month of vintage, *Brumaire*, the months of fog, and *Frimaire*,

	An II. 1793–1794.	An III. 1794–1795.	An IV. 1795–1796.	An V. 1796–1797.	An VI. 1797–1798.	An VII. 1798–1799.	An VIII. 1799–1800.	An IX. 1800–1801.
1	Vendémiaire	22 Sept. 1793	22 Sept. 1794	23 Sept. 1795	22 Sept. 1796	22 Sept. 1797	22 Sept. 1798	23 Sept. 1799	23 Sept. 1800
1	Brumaire .	22 Oct. ,,	22 Oct. ,,	23 Oct. ,,	22 Oct. ,,	22 Oct. ,,	22 Oct. ,,	23 Oct. ,,	23 Oct. ,,
1	Frimaire .	21 Nov. ,,	21 Nov. ,,	22 Nov. ,,	21 Nov. ,,	21 Nov. ,,	21 Nov. ,,	22 Nov. ,,	22 Nov. ,,
1	Nivôse .	21 Déc. ,,	21 Déc. ,,	22 Déc. ,,	21 Déc. ,,	21 Déc. ,,	21 Déc. ,,	22 Déc. ,,	22 Déc. ,,
1	Pluviôse .	20 Janv. 1794	20 Janv. 1795	21 Janv. 1796	20 Janv. 1797	20 Janv. 1798	20 Janv. 1799	21 Janv. 1800	21 Janv. 1801
1	Ventôse .	19 Févr. ,,	19 Févr. ,,	20 Févr. ,,	19 Févr. ,,	19 Fév. ,,	19 Fév. ,,	20 Fév. ,,	20 Fév. ,,
1	Germinal .	21 Mars ,,	21 Mars ,,	21 Mars ,,	21 Mars ,,	21 Mars ,,	21 Mars ,,	22 Mars ,,	22 Mars ,,
1	Floréal .	20 Avr. ,,	20 Avr. ,,	20 Avr. ,,	20 Avr. ,,	20 Avr. ,,	20 Avr. ,,	21 Avr. ,,	21 Avr. ,,
1	Prairial .	20 Mai ,,	20 Mai ,,	20 Mai ,,	20 Mai ,,	20 Mai ,,	20 Mai ,,	21 Mai ,,	21 Mai ,,
1	Messidor .	19 Juin ,,	19 Juin ,,	19 Juin ,,	19 Juin ,,	19 Juin ,,	19 Juin ,,	20 Juin ,,	20 Juin ,,
1	Thermidor	19 Juil. ,,	19 Juil. ,,	19 Juil. ,,	19 Juil. ,,	19 Juil. ,,	19 Juil. ,,	20 Juil. ,,	20 Juil. ,,
1	Fructidor .	18 Août ,,	18 Août ,,	18 Août ,,	18 Août ,,	18 Août ,,	18 Août ,,	19 Août ,,	19 Août ,,
1	Sans-culottides	17 Sept. 1794	17 Sept. 1795	17 Sept. 1796	17 Sept. 1797	17 Sept. 1798	17 Sept. 1799	18 Sept. 1800	18 Sept. 1801
6	,,		22 ,, ,,				22 ,, ,,		

	An X. 1801–1802.	An XI. 1802–1803.	An XII. 1803–1804.	An XIII. 1804–1805.	An XIV. 1805.
1	Vendémiaire . . .	23 Septembre 1801	23 Septembre 1802	24 Septembre 1803	23 Septembre 1804	23 Septembre 1805
1	Brumaire . . .	23 Octobre ,,	23 Octobre ,,	24 Octobre ,,	23 Octobre ,,	23 Octobre ,,
1	Frimaire . . .	22 Novembre ,,	22 Novembre ,,	23 Novembre ,,	22 Novembre ,,	22 Novembre ,,
1	Nivôse . . .	22 Décembre ,,	22 Décembre ,,	23 Décembre ,,	22 Décembre ,,	22 Décembre ,,
1	Pluviôse . . .	21 Janvier 1802	21 Janvier 1803	22 Janvier 1804	21 Janvier 1805	
1	Ventôse . . .	20 Février ,,	20 Février ,,	21 Février ,,	20 Février ,,	
1	Germinal . . .	22 Mars ,,	22 Mars ,,	22 Mars ,,	22 Mars ,,	
1	Floréal . . .	21 Avril ,,	21 Avril ,,	21 Avril ,,	21 Avril ,,	
1	Prairial . . .	21 Mai ,,	21 Mai ,,	21 Mai ,,	21 Mai ,,	
1	Messidor . . .	20 Juin ,,	20 Juin ,,	20 Juin ,,	20 Juin ,,	
1	Thermidor . . .	20 Juillet ,,	20 Juillet ,,	20 Juillet ,,	20 Juillet ,,	
1	Fructidor . . .	19 Août ,,	19 Août ,,	19 Août ,,	19 Août ,,	
1	Sans-culottides . .	18 Septembre 1802	18 Septembre 1803	18 Septembre 1804	18 Septembre 1805	
6	,,		23 ,, ,,			

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the month of frost. The winter months were *Nivôse*, the snowy, *Pluviôse*, the rainy, and *Ventôse*, the windy month; then followed the spring months, *Germinal*, the month of buds, *Floréal*, the month of flowers, and *Prairial*, the month of meadows; and lastly the summer months, *Messidor*, the month of reaping, *Thermidor*, the month of heat, and *Fructidor*, the month of fruit. To the days Fabre d'Églantine gave names which retained the idea of their numerical order, calling them Primedi, Duodi, &c., the last day of the ten, the day of rest, being named Décadi. The new order was soon in force in France and the new method was employed in all public documents, but it did not last many years. In September 1805 it was decided to restore the Gregorian calendar, and the republican one was officially discontinued on the 1st of January 1806.

It will easily be seen that the connecting link between the old and the new calendars is very slight indeed and that the expression of a date in one calendar in terms of the other is a matter of some difficulty. A simple method of doing this, however, is afforded by the table on the preceding page, which is taken from the article by J. Dubourdieu in *La Grande Encyclopédie*.

Thus Robespierre was executed on 10 Thermidor An II., *i.e.* the 28th of July 1794. The insurrection of 12 Germinal An III. took place on the 1st of April 1795. The famous 18 Brumaire An VIII. fell on the 9th of November 1799, and the *coup d'état* of 18 Fructidor An V. on the 4th of September 1797.

For a complete concordance of the Gregorian and the republican calendars see Stokvis, *Manuel d'histoire*, tome iii. (Leiden, 1889); also G. Villain, "Le Calendrier républicain," in *La Révolution Française* for 1884–1885. (A. W. H.*)

FRENCH REVOLUTIONARY WARS (1792–1800), the general name for the first part of the series of French wars which went on continuously, except for some local and temporary cessations of hostilities, from the declaration of war against Britain in 1792 to the final overthrow of Napoleon in 1815. The most important of these cessations—viz. the peace of 1801–1803—closes the "Revolutionary" and opens the "Napoleonic" era of land warfare, for which see NAPOLEONIC CAMPAIGNS, PENINSULAR WAR and WATERLOO CAMPAIGN. The naval history of the period is divided somewhat differently; the first period, treated below, is 1792–1799; for the second, 1799–1815, see NAPOLEONIC CAMPAIGNS.

France declared war on Austria on the 20th of April 1792. But Prussia and other powers had allied themselves with Austria in view of war, and it was against a coalition and not a single power that France found herself pitted, at the moment when the "emigration," the ferment of the Revolution, and want of material and of funds had thoroughly disorganized her army. The first engagements were singularly disgraceful. Near Lille the French soldiers fled at sight of the Austrian outposts, crying *Nous sommes trahis*, and murdered their general (April 29). The commanders-in-chief of the armies that were formed became one after another "suspects"; and before a serious action had been fought, the three armies of Rochambeau, Lafayette and Lückner had resolved themselves into two commanded by Dumouriez and Kellermann. Thus the disciplined soldiers of the Allies had apparently good reason to consider the campaign before them a military promenade. On the Rhine, a combined army of Prussians, Austrians, Hessians and *émigrés* under the duke of Brunswick was formed for the invasion of France, flanked by two smaller armies on its right and left, all three being under the supreme command of the king of Prussia. In the Netherlands the Austrians were to besiege Lille, and in the south the Piedmontese also took the field. The first step, taken against Brunswick's advice, was the issue (July 25) of a proclamation which, couched in terms in the last degree offensive to the French nation, generated the spirit that was afterwards to find expression in the "armed nation" of 1793–4, and sealed the fate of Louis XVI. The duke, who was a model sovereign in his own principality, sympathized with the constitutional side of the Revolution, while as a soldier he had no confidence in the success of the enterprise. After completing its preparations in the leisurely manner of the previous generation, his army crossed the French frontier on the 19th of August. Longwy was easily captured; and the Allies slowly marched on to Verdun, which was more indefensible even than Longwy. The commandant, Colonel Beaurepaire, shot himself in despair, and the place surrendered on the 3rd of September. Brunswick now began his march on Paris and approached the defiles of the Argonne. But Dumouriez, who had been training his raw troops at Valenciennes in constant small engagements, with the purpose of invading Belgium, now threw himself into the Argonne by a rapid and daring flank march, almost under the eyes of the Prussian advanced guard, and barred the Paris road, summoning Kellermann to his assistance from Metz. The latter moved but slowly, and before he arrived the northern part of the line of defence had been forced. Dumouriez, undaunted, changed front so as to face north, with his right wing on the Argonne and his left stretching towards Châlons, and in this position Kellermann joined him at St Menehould on the 19th of September.

Valmy.

Brunswick meanwhile had passed the northern defiles and had then swung round to cut off Dumouriez from Châlons. At the moment when the Prussian manœuvre was nearly completed, Kellermann, commanding in Dumouriez's absence, advanced his left wing and took up a position between St Menehould and Valmy. The result was the momentary absence, advanced his left wing and took up a position between St Menehould and Valmy. The result was the world-renowned Cannonade of Valmy (September 20, 1792). Kellermann's infantry, nearly all regulars, stood steady. The French artillery justified its reputation as the best in Europe, and eventually, with no more than a half-hearted infantry attack, the duke broke off the action and retired. This trivial engagement was the turning-point of the campaign and a landmark in the world's history. Ten days later, without firing another shot, the invading army began its retreat. Dumouriez's pursuit was not seriously pressed; he occupied himself chiefly with a series of subtle and curious negotiations which, with the general advance of the French troops, brought about the complete withdrawal of the enemy from the soil of France.

Meanwhile, the French forces in the south had driven back the Piedmontese and had conquered Savoy and Nice. Another French success was the daring expedition into Germany made by Custine from Alsace. Custine captured Mainz itself on the 21st of October and penetrated as far as Frankfurt. In the north the Austrian siege of Lille had completely failed, and Dumouriez now resumed his interrupted scheme for the invasion of the Netherlands. His forward movement, made as it was late in the season, surprised the Austrians, and he disposed of enormously superior forces. On the 6th of November he won the first great victory of the war at Jemappes near Mons and, this time advancing boldly, he overran the whole country from Namur to Antwerp within a month.

Jemappes.

Such was the prelude of what is called the "Great War" in England and the "Épopée" in France. Before going further it is necessary to summarize the special features of the French army—in leadership, discipline, tactics, organization and movement—which made these campaigns the archetype of modern warfare.

At the outbreak of the Revolution the French army, like other armies in Europe, was a "voluntary" long-service army, augmented to some extent in war by drafts of militia.

The French army, 1792–1796.

One of the first problems that the Constituent Assembly took upon itself to solve was the nationalization of this strictly royal and professional force, and as early as October 1789 the word "Conscription" was heard in its debates. But it was decreed nevertheless that free enlistment alone befitted a free people, and the regular army was left unaltered in times of peace. However, a National Guard came into existence side by side with it, and the history of French army organization in the next few years is the history of the fusion of these two elements. The first step, as regards the regular army, was the abolition of proprietary rights, the serial numbering of regiments throughout the Army, and the disbandment of the *Maison du roi*. The next was the promotion of deserving soldiers to fill the numerous vacancies caused by the emigration. Along with these, however, there came to the surface many incompetent leaders, favourites in the political clubs of Paris, &c., and the old strict discipline became impossible owing to the frequent intervention of the civil authorities in matters affecting it, the denunciation of generals, and especially the wild words and wild behaviour of "Volunteer" (embodied national guard) battalions.

When war came, it was soon found that the regulars had fallen too low in numbers and that the national guard demanded too high

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pay, to admit of developing the expected field strength. Arms, discipline, training alike were wanting to the new levies, and the repulse of Brunswick was effected by manœuvring and fighting on the old lines and chiefly with the old army. The cry of *La patrie en danger*, after giving, at the crisis, the highest moral support to the troops in the front, dwindled away after victory, and the French government contented itself with the half-measures that had, apparently, sufficed to avert the peril. More, when the armies went into winter quarters, the Volunteers claimed leave of absence and went home.

But in the spring of 1793, confronted by a far more serious peril, the government took strong measures. Universal liability was asserted, and passed into law. Yet even now whole classes obtained exemption and the right of substitution as usual forced the burden of service on the poorer classes, so that of the 100,000 men called on for the regular army and 200,000 for the Volunteers, only some 180,000 were actually raised. Desertion, generally regarded as the curse of professional armies, became a conspicuous vice of the defenders of the Republic, except at moments when a supreme crisis called forth supreme devotion—moments which naturally were more or less prolonged in proportion to the gravity of the situation. Thus, while it almost disappeared in the great effort of 1793–1794, when the armies sustained bloody repulses or distant wars of conquest, as in 1799, it promptly rose again to an alarming height.

While this unsatisfactory general levy was being made, defeats, and invasion in earnest came in rapid succession, and to deal with the almost desperate emergency, the ruthless Committee of Public Safety sprang into existence. "The levy is to be universal. Unmarried citizens and widowers without children of ages from 18 to 25 are to be called up first," and 450,000 recruits were thus obtained by the end of this single act. The complete amalgamation of the regular and volunteer units was decided upon. The white uniforms of the line gave place to the blue of the National Guard in all arms and services. The titles of officers were changed, and the system of ranks, like that of régime, was the inherited solidity of the old regular battalions, was swept away. This rough combination of line and volunteers therefore—for the "Amalgam" was not officially begun until 1794—must be understood when we refer to the French army of Hondschoote or of Wattignies. It contained, that of its universality of service only because men were better off in the army than out of it—if they stayed at home they went in daily fear of denunciation and the guillotine—the best elements of the French nation. To some extent at any rate the political *épurateur* had been worked out, and though the old leaven, here as elsewhere, struck unseen blows, the mass of the army gradually evolved its true leaders and obeyed them. It was, therefore, an army of individual citizen-soldiers of the best type, welded by the enemy's fire, and conscious of its own solidarity in the midst of the Revolutionary chaos.

Universal service and the "Amalgam."

After 1794 the system underwent but little radical change until the end of the Revolutionary period. Its regiments grew in military value month by month and attained their highest level in the great campaign of 1796. In 1795 the French forces (now all styled National Guard) consisted of 531,000 men, of whom 323,000 were infantry (100 3-battalion demi-brigades), 97,000 light infantry (30 demi-brigades), 29,000 artillery, 20,000 engineers and 59,000 cavalry. This novel army developed novel fighting methods, above all in the infantry. This arm had just received a new drill-book, as the result of a prolonged controversy (see INFANTRY) between the advocates of "lines" and "columns," and this drill-book, while retaining the principle of the line, as controversy at rest by admitting battalion columns of attack, and movements at the "quick" (100-120 paces to the minute) instead of at the "slow" march (76). On these two prescriptions, ignoring the rest, the practical troop leaders built up the new tactics little by little, and almost unconsciously. The process of evolution cannot be stated exactly, for the officers learned to use and even to invent now one form, now another, according to ground and circumstances. But the main stream of progress is easily distinguishable.

Tactics.

The earlier battles were fought more or less according to the drill-book, partly in line for fire action, partly in column for the bayonet attack. But line movements required the most accurate drill, and what was attainable after years of peace was wholly impossible with regulars moving at the slow march was wholly impossible for new levies moving at 120 paces to the minute. When, therefore, the line marched off, it broke up into a shapeless swarm of individual firers. This was the form, if form it can be called, of the tactics of 1793—"horde-tactics," as they have quite justly been called—and a few such experiences as that of Hondschoote sufficed to suggest the need of a remedy. This was found in keeping as many troops as possible out of the firing line. From 1794 onwards the latter becomes thinner and thinner, and instead of the drill-book form, with half the army firing in line (practically in hordes) and the other half in support in columns, we find the rear lines becoming more and more important and numerous, till at last the fire of the leading line (skirmishers) becomes insignificant, and the decision rests with the bayonets of the closed masses in rear. Indeed, the latter often used mixed line and column formations, which enabled them not only to charge, but to fire close-order volleys—absolutely regardless of the skirmishers in front. In other words, the bravest and coolest marksmen were let loose to do what damage they could, and the rest, massed in close order, were kept under the control of their officers and only exposed to the dissolving influence of the fight when the moment arrived to deliver, whether by fire or by shock, the decisive blow.

The cavalry underwent little change in its organization and tactics, which continued as in the drill-books founded on Frederick's practice. But except in the case of the hussars, who were chiefly Alsatians, it was thoroughly disorganized by the emigration or execution of the nobles who had officered it, and for long it was incapable of facing the brunt of squadrons in the open. Still, its elements were good, it was fairly well trained, and mounted, and not overwhelmed with national guard drafts, and like the other arms it duly evolved and obeyed new leaders.

Cavalry. Artillery. Engineers.

In artillery matters this period, 1792–1796, marked an important progress, above all by Gribeauval (*q.v.*) and the two du Teils, Jean Pierre (1722–1794) and Jean (1733–1820) who were Napoleon's instructors. The change was chiefly in organization and equipment —the great tactical development of the arm was not to come until the time of the *Grande Armée*—and may be summarized as the transition from battalion guns and reserve artillery to batteries of "horse and field."

The engineers, like the artillery, were a technical and non-noble corps. They escaped, therefore, most of the troubles of the Revolution—indeed the artillery and engineer officers, Napoleon and Carnot amongst them, were conspicuous in the political regeneration of France—and the engineers carried on with little change the traditions of Vauban and the Cormontaigne school (see FORTIFICATION AND SIEGECRAFT). Both these corps were, after the Revolution as before it, the best in Europe, other armies admitting their superiority and following their precepts.

In all this the army naturally outgrew its old "linear" organization. Temporary divisions, called for by momentary necessities, placed under selected generals and released from the detailed supervision of the commander-in-chief, soon became, though in an irregular and haphazard fashion, permanent by 1796–1797, when the true divisional system had become practically universal. The next step, as the armies became fewer and larger, was the temporary grouping of divisions; this too in turn became permanent, and bequeathed to the military world of to-day both the army corps and the capable, self-reliant and enterprising subordinate generals, for whom the old linear organization had no room.

This subdivision of forces was intimately connected with the general method of making war adopted by the "New French," as their enemies called them. What astonished the Allies most of all was the number and the velocity of the Republicans. These improvised armies had in fact nothing to delay them. Tents were unprocurable for want of money, untransportable for want of the enormous number of wagons that would have been required, and also unnecessary, for the discomfort that would have caused wholesale desertion in professional armies was cheerfully borne by the men of 1793–1794. Supplies for armies of then unheard-of size could not be carried in convoys, and the French soon became familiar with "living on the country." Thus 1793 saw the birth of the modern system of war—rapidity of movement, full development of national strength, bivouacs and requisitions, and force, as against cautious manœuvring, small professional armies, tents and full rations, and chicane. The first represented the decision-compelling spirit, the second the spirit of risking little to gain a little. Above all, the decision-compelling spirit was reinforced not only by the presence in the armies of the Committee of Public Safety, the "representatives on mission" who practically controlled the guillotine. There were civil officials with the armies of the Allies too, but their chief function was not to infuse desperate energy into military operations, but to see that the troops did not maltreat civilians. Such were the fundamental principles of the "New French" method of warfare, from which the warfare of to-day descends in the direct line. But it was only after a painful period of trial and error, of waste and misdirection, that it became possible for the French army to have evolved Napoleon, and for Napoleon to evolve the principles and methods of war that conformed to and profited to the utmost by the new conditions.

The startling-point of modern warfare.

Those campaigns and battles of this army which are described in detail in the present article have been selected, some on account of their historical importance—as producing great results; others from their military interest—as typifying and illustrating the nature of the revolution undergone by the art of war in these heroic years.

CAMPAIGNS IN THE NETHERLANDS

The year 1793 opened disastrously for the Republic. As a consequence of Jemappes and Valmy, France had taken the offensive both in Belgium, which had been overrun by Dumouriez's army, and in the Rhine countries, where Custine had preached the new gospel to the sentimental and half-discontented Hessians and Mainzers. But the execution of Louis XVI. raised up a host of new and determined enemies. England, Holland, Austria, Prussia, Spain and Sardinia promptly

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formed the First Coalition. England poured out money in profusion to pay and equip her Allies' land armies, and herself began the great struggle for the command of the sea (see *Naval Operations*, below).

In the Low Countries, while Dumouriez was beginning his proposed invasion of Holland, Prince Josias of Saxe-Coburg, the new Austrian commander on the Lower Rhine, advanced with 42,000 men from the region of Cologne, and drove in the various detachments that Dumouriez had posted to cover his right. The French general thereupon abandoned his advance into Holland, and, with what forces he could gather, turned towards the Meuse. The two armies met at Neerwinden (*q.v.*) on the 18th of March 1793. Dumouriez had only a few thousand men more than his opponent, instead of the enormous superiority he had had at Jemappes. Thus the enveloping attack could not be repeated, and in a battle on equal fronts the old generalship and the old armies had the advantage. Dumouriez was thoroughly defeated, the house of cards collapsed, and the whole of the French forces retreated in confusion to the strong line of border fortresses, created by Louis XIV. and Vauban.[1] Dumouriez, witnessing the failure of his political schemes, declared against the Republic, and after a vain attempt to induce his own army to follow his example, fled (April 5) into the Austrian lines. The leaderless Republicans streamed back to Valenciennes. There, however, they found a general. Picot (comte de) Dampierre was a regimental officer of the old army, who, in spite of his vanity and extravagance, possessed real loyalty to the new order of things, and brilliant personal courage. At the darkest hour he seized the reins without and without reference to seniority, and began to reconstruct the force and the spirit of the shattered army by wise administration and dithyrambic proclamations. Moreover, he withdrew it well behind Valenciennes out of reach of a second reverse. The region of Dunkirk and Cassel, the camp of La Madeleine near Lille, and Bouchain were made the rallying points of the various groups, the principal army being at the last-named. But the blow of Neerwinden had struck deep, and the army was for long incapable of service, what with the general distrust, the misconduct of the newer battalions, and the discontent of the old white-coated regiments that were left ragged and shoeless to the profit of the "patriot" corps. "Beware of giving horses to the 'Hussars of Liberty,'" wrote Carnot, "all these new corps are abominable."

Neerwinden.

France was in fact defenceless, and the opportunity existed for the military promenade to Paris that the allied statesmen had imagined in 1792. But Coburg now ceased to be a purely Austrian commander, for one by one allied contingents, with instructions that varied with the political aims of the various governments, began to arrive. Moreover, he had his own views as to the political situation, fearing especially to be the cause of the queen's death as Brunswick had been of the king's, and negotiated for a settlement. The story of these negotiations should be read in Chuquet's *Valenciennes*—it gives the key to many mysteries of the campaign and shows that though the revolutionary spirit had already passed all understanding, enlightened men such as Coburg and his chief-of-staff Mack sympathized with its first efforts and thought the constitution of 1791 a gain to humanity. "If you come to Paris you will find 80,000 patriots ready to die," said the French negotiators. "The patriots could not resist the Austrian regulars," replied Coburg, "but I do not propose to go to Paris. I desire to see a stable government, with a chief, king or other, with whom we can treat." Soon, however, these personal negotiations were stopped by the emperor, and the idea of restoring order in France became little more than a pretext for a general intrigue amongst the confederate powers, each seeking to aggrandize itself at France's expense. "If you wish to deal with the French," observed Dumouriez ironically to Coburg, "talk 'constitution.' You may beat them but you cannot subdue them." And their subjugation was becoming less and less possible as the days went on and men talked of the partition of France as a question of the moment like the partition of Poland—a pretension that even the émigrés resented.

Assembly of the Allies.

Coburg's plan of campaign was limited to the objects acceptable to all the Allies alike. He aimed at the conquest of a first-class fortress—Lille or Valenciennes—and chiefly for this reason. War meant to the burgher of Germany and the Netherlands a special form of *haute politique* with which it was neither his business nor his inclination to meddle. He had no more compunction, therefore, in selling his worst goods at the best price to the army commissaries than in doing so to his ordinary customers. It followed that, owing to the distance between Vienna and Valenciennes, and the exorbitant prices charged by carters and horse-owners, a mere concentration of Austrian troops at the latter place cost as much as a campaign, and the transport expenses rose to such a figure that Coburg's first duty was to find a strong place to serve as a market for the country-side and a depot for the supplies purchased, and to have it as near as possible to the front to save the hire of vehicles. As for the other governments which Coburg served as best he could, the object of the war was material concessions, and it would be easy to negotiate for the cession of Dunkirk and Valenciennes when the British and Austrian colours already waved there. The Allies, therefore, instead of following up their advantage over the French field army and driving forward on the open Paris road, set their faces westward, intending to capture Valenciennes, Le Quesnoy, Dunkirk and Lille one after the other.

Dampierre meanwhile grew less confident as responsibility settled upon his shoulders. Quite unable to believe that Coburg would bury himself in a maze of rivers and fortresses when he could scatter the French army to the winds by a direct advance, he was disquieted and puzzled by the Austrian investment of Condé. This was followed by skirmishes around Valenciennes, so unfavourable to the French that their officers felt it would be madness to venture far beyond the support of the fortress guns. But the representatives on mission ordered Dampierre, who was reorganizing his army at Bouchain, to advance and occupy Famars camp, east of Valenciennes, and soon afterwards, disregarding his protests, bade him relieve Condé at all costs. His skill, though not commensurate with his personal courage and devotion, sufficed to give him the idea of attacking Coburg on the right bank of the Scheldt while Clerfayt, with the corps covering the siege of Condé, was on the left, and then to turn against Clerfayt —in fact, to operate on interior lines—but it was far from being adequate to the task of beating either with the disheartened forces he commanded. On the 1st of May, while Clerfayt was held in check by a very vigorous demonstration, Coburg's positions west of Quiévrain were attacked by Dampierre himself. The French won some local successes by force of numbers and surprise, but the Allies recovered themselves, thanks chiefly to the address and skill of Colonel Mack, and drove the Republicans in disorder to their entrenchments. Dampierre's discouragement now became desperation, and, urged on by the representatives (who, be it said, had exposed their own lives freely enough in the action), he attacked Clerfayt on the 8th at Raismes. The troops fought far better in the woods and hamlets west of the Scheldt than they had done in the plains to the east. But in the heat of the action Dampierre, becoming again the brilliant soldier that he had been before responsibility stifled him, risked and lost his life in leading a storming party, and his men retired sullenly, though this time in good order, to Valenciennes. Two days later the French gave up the open field and retired into Valenciennes. Dampierre's remains were by a vote of the Convention ordered to be deposited in the Panthéon. But he was a "ci-devant" noble, the demagogues denounced him as a traitor, and the only honour finally paid to the man who had tided over the weeks of greatest danger was the placing of his bust, in the strange company of those of Brutus and Marat, in the chamber of deputies.

Dampierre at Valenciennes.

Another pause followed, Coburg awaiting the British contingent under the duke of York, and the Republicans endeavouring to

[1] For the following operations see map in SPANISH SUCCESSION WAR.

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assimilate the reinforcements of conscripts, for the most part "undesirables," who now arrived. Mutiny and denunciations augmented the confusion in the French camp. Plan of campaign there was none, save a resolution to stay at Valenciennes in the hope of finding an opportunity of relieving Condé and to create diversions elsewhere by expeditions from Dunkirk, Lille and Sedan. These of course came to nothing, and before they had even started, Coburg, resuming the offensive, had stormed the lines of Famars (May 24), whereupon the French army retired to Bouchain, leaving not only Condé[1] but also Valenciennes to resist as best they could. The central point of the new positions about Bouchain was called Caesar's Camp. Here, surrounded by streams and marshes, the French generals thought that their troops were secure from the rush of the dreaded Austrian cavalry, and Mack himself shared their opinion.

Custine now took command of the abjectly dispirited army, the fourth change of command within two months. His first task was to institute a severe discipline, and his prestige was so great that his mere threat of death sentences for offenders produced the desired effect. As to operations, he wished for a concentration of all possible forces from other parts of the frontier towards Valenciennes, even if necessary at the cost of sacrificing his own conquest of Mainz. But after he had induced the government to assent to this, the generals of the numerous other armies refused to give up their troops, and on the 17th of June the idea was abandoned in view of the growing seriousness of the Vendéan insurrection (see VENDÉE). Custine, therefore, could do no more than continue the work of reorganization. Military operations were few. Coburg, who had all this time succeeded in remaining concentrated, now found himself compelled to extend leftwards towards Flanders,[2] for Custine had infused some energy into the scattered groups of the Republicans in the region of Douai, Lille and Dunkirk—and during this respite the Paris Jacobins sent to the guillotine both Custine and his successor La Marlière before July was ended. Both were "ci-devant" nobles and, so far as is ascertainable, neither was guilty of anything worse than attempts to make his orders respected by, and himself popular with, the soldiers. By this time, owing to the innumerable denunciations and arrests, the confusion in the Army of the North was at its height, and no further attempt was made either to relieve Valenciennes and Condé, or to press forward from Lille and Dunkirk. Condé, starved out as Coburg desired, capitulated on the 10th of June, and the Austrians, who had dreaded their work as soldiers, but were filled with pity for their suffering and distracted enemies, marched in with food for the women and children. Valenciennes, under the energetic General Ferrand, held out bravely until the fire of the Allies became intolerable, and then the civil population began to plot treachery, and to wear the Bourbon cockade in the open street. Ferrand and the representatives with him found themselves obliged to surrender to the duke of York, who commanded the siege corps, on the 28th of July, after rejecting the first draft of a capitulation sent in by the duke and threatening to continue the defence to the bitter end. Impossible as this was known to be—for Valenciennes seemed to have become a royalist town—Ferrand's soldierly bearing carried the day, and honourable terms were arranged. The duke even offered to assist the garrison in repressing disorder. Shortly after this the wreck of the field army was forced to evacuate Caesar's Camp after an unimportant action (Aug. 7–8) and retired on Arras. By this they gave up the direct defence of the Paris road, but placed themselves in a "flank position" relatively to it, and secured to themselves the resources and reinforcements available in the region of Dunkirk - Lille.

Fall of Valenciennes.

Bouchain and Cambrai, Landrecies and Le Quesnoy, were left to their own garrisons.

With this ended the second episode of the amazing campaign of 1793. Military operations were few and spasmodic, on the one side because the Allied statesmen were less concerned with the nebulous common object of restoring order in France than with their several schemes of aggrandisement, on the other owing to the almost incredible confusion of France under the régime of Danton and Marat. The third episode shows little or no change in the force and direction of the allied efforts, but a very great change in France. Thoroughly roused by disaster and now dominated by the furious and bloodthirsty energy of the terrorists, the French people and armies at last set before themselves clear and definite objects to be pursued at all costs.

Jean Nicolas Houchard, the next officer appointed to command, had been a heavy cavalry trooper in the Seven Years' War. His face bore the scars of wounds received at Minden, and his bravery, his stature, his bold and fierce manner, his want of education, seemed to all to betoken the ideal sans-culotte general. But he was nevertheless incapable of leading an army, and knowing this, carefully conformed to the advice of his staff officers Berthelmy and Gay-Vernon, the latter of whom, an exceptionally capable officer, had been Custine's chief of staff and was consequently under suspicion. At one moment, indeed, operations had to be suspended altogether because his papers were seized by the civil authorities, and amongst them were all the confidential memoranda and maps required for the business of headquarters. It was the darkest hour. The Vendéans, the people of Lyons, Marseilles and Toulon, were in open and hitherto successful revolt. Valenciennes had fallen and Coburg's hussar parties pressed forward into the Somme valley. Again the Allies had the decision of the war in their own hands. Coburg, indeed, was still afraid, on Marie Antoinette's account, of forcing the Republicans to extremities, and on military grounds too he thought an advance on Paris hazardous. But, hazardous or not, it would have been attempted but for the English. The duke of York had definite orders from his government to capture Dunkirk—at present a nest of corsairs which interfered with the Channel trade, and in the future, it was hoped, a second Gibraltar—and after the fall of Valenciennes and the capture of Caesar's Camp the English and Hanoverians marched away, via Tournai and Ypres, to besiege the coast fortress. Thereupon the king of Prussia in turn called off his contingent for operations on the middle Rhine. Holland, too, though she maintained her contingent in face of Lille (where it covered Flanders), was not disposed to send it to join the imperialists in an adventure in the heart of France. Coburg, therefore, was brought to a complete standstill, and the scene of the decision was shifted to the district between Lille and the coast.

Houchard.

Thither came Carnot, the engineer officer who was in charge of military affairs in the Committee of Public Safety and is known to history as the "Organizer of Victory." His views of the strategy to be pursued indicate either a purely geographical idea of war, which does not square with his later principles and practice, or, as is far more likely, a profound disbelief in the capacity of the Army of the North, as it then stood, to fight a battle, and they went no further than to recommend an inroad into Flanders on the ground that no enemy would be encountered there. This, however, in the event developed into an operation of almost decisive importance, for at the moment of its inception the duke of York was already on the march. Fighting *en route* a very severe but successful action (Lincelles, Aug. 18) with the French troops encamped near Lille, the Anglo-Hanoverians entered the district—densely intersected with canals and morasses—around Dunkirk and Bergues on the 21st and 22nd. On the right, by way of Furnes, the British moved towards Dunkirk and invested the east front of the weak fortress, while on the left the Hanoverian field marshal v. Freytag moved via Poperinghe on Bergues. The French had a chain of outposts between Furnes and Bergues, but Freytag attacked them resolutely, and the defenders, except a brave handful who stood

[1] Coburg refrained from a regular siege of Condé. He wished to gain possession of the fortress in a defensible state, intending to use it as his own depot later in the year. He therefore reduced it by famine. During the siege of Valenciennes the Allies appear to have been supplied from Mons.

[2] Henceforth to the end of 1794 both armies were more or less "in cordon," the cordon possessing greater or less density at any particular moment or place, according to the immediate intentions of the respective commanders and the general military situation.

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to cross bayonets, fled in all directions. The east front of Bergues was invested on the 23rd, and Freytag spread out his forces to cover the duke of York's attack on Dunkirk, his right being opposite Bergues and his centre at Bambeke, while his left covered the space between Roosbrugge and Ypres with a cordon of posts. Houchard was in despair at the bad conduct of his troops. But one young general, Jourdan, anticipating Houchard's orders, had already brought a strong force from Lille to Cassel, whence he incessantly harried Freytag's posts. Carnot encouraged the garrisons of Dunkirk and Bergues, and caused the sluices to be opened. The *moral* of the defenders rose rapidly. Houchard prepared to hring up every available man of the Army of the North, and only waited to make up his mind as to the direction in which his attack should be made. The Allies themselves recognized the extreme danger of their position. It was cut in half hy the Great Morass, stretches of which extended even to Furnes. Neither Dunkirk nor Bergues could be completely invested owing to the inundations, and Freytag sent a message to King George III. to the effect that if Dunkirk did not surrender in a few days the expedition would be a complete failure.

Dunkirk.

As for the French, they could hardly believe their good fortune. Generals, staff officers and representatives on mission alike were eager for a swift and crushing offensive. "'Attack' and 'attack in mass' became the shibboleth and the catch-phrase of the camps" (Chuquet), and hattresses and armies on other parts of the frontier were imperiously called upon to supply large drafts for the Army of the North. Gay-Vernon's strategical instinct found expression in a wide-ranging movement designed to secure the absolute annihilation of the duke of York's forces. Beginning with an attack on the Dutch posts north and east of Lille, the army was then to press forward towards Furnes, the left wing holding Freytag's left wing in check, and the right swinging inwards and across the line of retreat of both allied corps. At that moment all men were daring, and the scheme was adopted with enthusiasm. On the 28th of August, consequently, the Dutch posts were attacked and driven away hy the mohile forces at Lille, aided hy parts of the main army from Arras. But even before they had fired their last shot the Republicans dispersed to plunder and compromised their success. Houchard and Gay-Vernon began to fear that their army would not emerge successfully from the supreme test they were about to impose on it, and from this moment the scheme of destroying the English began to give way to the simpler and safer idea of relieving Dunkirk. The plan was ill-equipped that after a few days' siege it was *in extremis*, and the political importance of its preservation led not merely the civilian representatives, hut even Carnot, to implore Houchard to put an end to the crisis at once. On the 30th, Cassel, instead of Ypres, was designated as the point of concentration for the "mass of attack." This surprised the representatives and Carnot as much as it surprised the subordinate generals, all of whom thought that there would still be time to make the détour through Ypres and to cut off the Allies' retreat before Dunkirk fell. But Houchard and Gay-Vernon were no longer under any illusions as to the manœuvring power of their forces, and the government agents wisely left them to execute their own plans. Thirty-seven thousand men were left to watch Cohurg and to secure Arras and Douai, and the rest, 50,000 strong, assembled at Cassel. Everything was in Houchard's favour could he hut overcome the indiscipline of his own army. The duke of York was more dangerous in appearance than in reality—as the result must infallibly have shown had Houchard and Gay-Vernon possessed the courage to execute the original plan—and Freytag's covering army extended in a line of disconnected posts from Bergues to Ypres.

Against the left and centre of this feeble cordon 40,000 men advanced in many columns on the 6th of September. A confused outpost fight, in which the various assailing columns dissolved into excited swarms, ended, long after nightfall, in the orderly withdrawal of the various allied posts to Hondschoote. The French generals were occupied the whole of next day in sorting out their troops, who had not only completely wasted their strength against mere outposts, hut had actually consumed their rations and used up their ammunition. On the 8th, the assailants, having more or less recovered themselves, advanced again. They found Wallmoden (who had succeeded Freytag, disabled on the 6th) entrenched on either side of the village of Hondschoote, the right resting on the great morass and the left on the village of Leysele. Here was the opportunity for the "attack in mass" that had been so freely discussed; hut Houchard was now concerned more with the relief of Dunkirk than with the defeat of the enemy. He sent away one division to Dunkirk, another to Bergues, and a third towards Ypres, and left himself only some 20,000 men for the battle. But Wallmoden had only 13,000—so great was the disproportion between end and means in this ill-designed enterprise against Dunkirk.

Hondschoote.

Houchard despatched a column, guided by his staff officer Berthelmy, to turn the Hanoverians' left, but this column lost

Redrawn from a map in Fortescue's *History of the British Army*, by permission of Macmillan & Co., Ltd.

its way in the dense country about Loo. The centre waited motionless under the fire of the allied guns near Hondschoote. In vain the representative Delbrel implored the general to order the advance. Houchard was obstinate, and ere long the natural result followed. Though Delbrel posted himself in front of the line, conspicuous hy his white horse and tricoloured sash and plume, to steady the men, the hravest left the ranks and skirmished forward from hush to bush, and the rest sought cover. Then the allied commander ordered forward one regiment of Hessians, and these, advancing at a ceremonial slow march, and firing steady rolling volleys, scattered the Republicans before them. At this crisis Houchard uttered the fatal word "retreat," but Delbrel overwhelmed him with reproaches and stung him into renewed activity. He hurried away to urge forward the right wing while Jourdan rallied the centre and led it into the fight again. Once more Jourdan awaited in vain the order to advance, and once more the troops hroke. But at last the exasperated Delbrel rose to the occasion. "You fear the responsibility," he cried to Jourdan; "well, I assume it. My authority overrides the general's and I give you the formal order to attack at once!" Then, gently, as if to soften a rebuke, he continued, "You have forced me to speak as a superior; now I will be your aide-de-

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camp," and at once hurried off to bring up the reserves and to despatch cavalry to collect the fugitives. This incident, amongst many, serves to show that the representatives on mission were no mere savage marplots, as is too generally assumed. They were often wise and able men, brave and fearless of responsibility in camp and in action. Jourdan led on the reserves, and the men fighting in the bushes on either side of the road heard their drums to right and left. Jourdan fell wounded, but Delbrel headed a wild irregular bayonet charge which checked the Hanoverians, and Houchard himself, in his true place as a cavalry leader, came up with 500 fresh sabres and flung himself on the Allies. The Hanoverians, magnificently disciplined troops that they were, soon re-formed after the shock, but by this time the fugitives collected by Delbrel's troopers, reanimated by new hopes of victory, were returning to the front in hundreds, and a last assault on Hondschoote met with complete success.

Hondschoote was a psychological victory. Materially, it was no more than the crushing of an obstinate rearguard at enormous expense to the assailants, for the duke of York was able to withdraw while there was still time. Houchard had indeed called back the division he had sent to Bergues, and despatched it by Loo against the enemy's rear, but the movement was undertaken too late in the day to be useful. The struggle was practically a front to front battle, numbers and enthusiasm on the one side, discipline, position and steadiness on the other. Hence, though its strategical result was merely to compel the duke of York to give up an enterprise that he should never have undertaken, Hondschoote established the fact that the "New French" were determined to win, at any cost and by sheer weight and energy. It was long before they were able to meet equal numbers with confidence, and still longer before they could freely oppose a small corps to a larger one. But the nightmare of defeats and surrenders was dispelled.

The influence of Houchard on the course of the operations had been sometimes null, sometimes detrimental, and only occasionally good. The plan and its execution were the work of Berthelmy and Gay-Vernon, the victory itself was Jourdan's and, above all, Delbrel's. To these errors, forgiven to a victor, Houchard added the crowning offence of failure, in the reaction after the battle, to pursue his advantage. His enemies in Paris became more and more powerful as the campaign continued.

Having missed the great opportunity of crushing the English, Houchard turned his attention to the Dutch posts about Menin.

Menin. As far as the Allies were concerned Hondschoote was a mere reverse, not a disaster, and was counterbalanced in Coburg's eyes by his own capture of Le Quesnoy (Sept. 11). The proximity of the main body of the French to Menin induced him to order Beaulieu's corps (hitherto at Cysoing and linking the Dutch posts with the central group) to join the prince of Orange there, and to ask the duke of York to do the same. But this last meant negotiation, and before anything was settled Houchard, with the army from Hondschoote and a contingent from Lille, had attacked the prince at Menin and destroyed his corps (Sept. 12–13).

After this engagement, which, though it was won by immensely superior forces, was if not an important at any rate a complete victory, Houchard went still farther inland—leaving detachments to observe York and replacing them by troops from the various camps as he passed along the cordon—in the hope of dealing with Beaulieu as he had dealt with the Dutch, and even of relieving Le Quesnoy. But in all this he failed. He had expected to meet Beaulieu near Cysoing, but the Austrian general had long before gone northward to assist the prince of Orange. Thus Houchard missed his target. Worse still, one of his protective detachments chanced to meet Beaulieu near Courtrai on the 15th, and was not only defeated but driven in rout from Menin. Lastly, Coburg had already captured Le Quesnoy, and had also repulsed a straggling attack of the Landrecies, Bouchain and other French garrisons on the positions of his covering army (12th).[1]

Houchard's offensive died away completely, and he halted his army (45,000 strong excluding detachments) at Gaverelle, half-way between Douai and Arras, hoping thereby to succour Bouchain, Cambrai or Arras, whichever should prove to be Coburg's next objective. After standing still for several days, a prey to all the conflicting rumours that reached his ears, he came to the conclusion that Coburg was about to join the duke of York in a second siege of Dunkirk, and began to close on his left. But his conclusion was entirely wrong. The Allies were closing on *their* left inland to attack Maubeuge. Coburg drew in Beaulieu, and even persuaded the Dutch to assist, the duke of York undertaking for the moment to watch the whole of the Flanders cordon from the sea to Tournai. But this concentration of force was merely nominal, for each contingent worked in the interests of its own masters, and, above all, the siege that was the object of the concentration was calculated to last four weeks, *i.e.* gave the French four weeks unimpeded liberty of action.

Houchard was now denounced and brought captive to Paris. Placed upon his trial, he offered a calm and reasoned defence of his conduct, but when the intolerable word "coward" was hurled at him by one of his judges he wept with rage, pointing to the scars of his many wounds, and then, his spirit broken, sank into a lethargic indifference, in which he remained to the end. He was guillotined on the 16th of November 1793.

After Houchard's arrest, Jourdan accepted the command, though with many misgivings, for the higher ranks were filled by officers with even less experience than he had himself, equipment and clothing was wanting, and, perhaps more important still, the new levies, instead of filling up the depleted ranks of the line, were assembled in undisciplined and half-armed hordes at various frontier camps, under elected officers who had for the most part never undergone the least training. The field states showed a total of 104,000 men, of whom less than a third formed the operative army. But an enthusiasm equal to that of Hondschoote, and similarly demanding a plain, urgent and recognizable objective, animated it, and although Jourdan and Carnot (who was with him at Gaverelle, where the army had now reassembled) began to study the general strategic situation, the Committee brought them back to realities by ordering them to relieve Maubeuge at all costs.

The Allies disposed in all of 66,000 men around the threatened fortress, but 26,000 of these were actually employed in the siege, and the remainder, forming the covering army, extended in an enormous semicircle of posts facing west, south and east. Thus the Republicans, as before, had two men to one at the point of contact (44,000 against 21,000), but so formidable was the discipline and steadiness of manœuvre of the old armies that the chances were considered as no more than "rather in favour" of the French. Not that these chances were seriously weighed before engaging. The generals might squander their energies in the council chamber on plans of sieges and expeditions, but in the field they were glad enough to seize the opportunity of a battle which they were not skilful enough to compel. It took place on the 15th and 16th of October, and though the allied right and centre held their ground, on their left the plateau of Wattignies (*q.v.*), from which the battle derives its name, was stormed on the second day, Carnot, Jourdan and the representatives leading the columns in person. Coburg indeed retired in unbroken order, added to which the Maubeuge garrison had failed to co-operate with their rescuers by a sortie,[2] and the duke of York had hurried up with all the men he could spare from the Flanders cordon. But the Dutch generals refused to advance beyond the Sambre, and Coburg broke up the siege of Maubeuge and retired whence he had come, while Jourdan, so far from pressing forward, was anxiously awaiting a counter-attack, and entrenching himself with all possible energy. So ended the episode of Wattignies, which, alike in its general outline and in its details, gives a perfect picture of the character, at once intense and spasmodic, of the "New French" warfare in the days of the Terror.

Wattignies.

[1] In the course of this the column from Bouchain, 4500 strong, was caught in the open at Avesnes-le-Sec by 5 squadrons of the allied cavalry and literally annihilated.

[2] One of the generals at Maubeuge, Chancel, was guillotined.

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To complete the story of '93 it remains to sketch, very briefly, the principal events on the eastern and southern frontiers of France. These present, in the main, no special features, and all that it is necessary to retain of them is the fact of their existence. What this multiplication of their tasks meant to the Committee of Public Safety and to Carnot in particular it is impossible to realize. It was not merely on the Sambre and the Scheldt, nor against one army of heterogeneous allies that the Republic had to fight for life, but against Prussians and Hessians on the Rhine, Sardinians in the Alps, Spaniards in the Pyrenees, and also (one might say, indeed, above all) against Frenchmen in Vendée, Lyons, Marseilles and Toulon.

On the Rhine, the advance of a Prussian-Hessian army, 63,000 strong, rapidly drove back Custine from the Main into the valleys of the Saar and the Lauter. An Austrian corps under Wurmser soon afterwards invaded Alsace. Here, as on the northern frontier, there was a long period of trial and error, demoralisation and indiscipline, and of wholly trivial fighting, before the Republicans recovered themselves. But in the end the ragged enthusiasts found their true leader in Lazare Hoche, and, though defeated by Brunswick at Pirmasens and Kaiserslautern, they managed to develop and employ their full strength against Wurmser in Alsace. On the 26th of December the latter, who had already undergone a series of partial reverses, was driven by main force from the lines of Weissenburg, after which Hoche advanced into the Palatinate and delivered Landau, and Pichegru moved on to recapture Mainz, which had surrendered in July. On the Spanish frontier both sides indulged in a fruitless war of posts in broken ground. The Italian campaign of 1793, equally unprofitable, will be referred to below. Far more serious than either was the insurrection of Vendée (q.v.) and the counter-revolution in the south of France, the principal incidents of which were the terrible sieges of Lyons and Toulon.

Campaign of 1794.

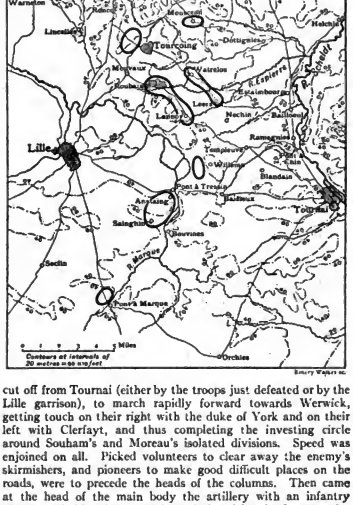
For 1794 Carnot planned a general advance of all the northern armies, that of the North (Pichegru) from Dunkirk-Cassel by Ypres and Oudenarde on Brussels, the minor Army of the Ardennes to Charleroi, and the Army of the Moselle (Jourdan) to Liége, while between Charleroi and Lille demonstrations were to be made against the hostile centre. He counted upon little as regards the two armies near the Meuse, but hoped to force on a decisive battle by the advance of the left wing towards Ypres. Coburg, on the other side, intended, if not forced to develop his strength on the Ypres side, to make his main effort against the French centre about Landrecies. This produced the siege of Landrecies, which need not concern us, a forward movement of the French to Menin and Courtrai which resulted in the battles of Tourcoing and Tournai, and the campaign of Fleurus, which, almost fortuitously, produced the long-sought decision.

The first crisis was brought about by the advance of the left wing of the Army of the North, under Souham, to Menin-Courtrai. This advance placed Souham in the midst of the enemy's right wing, and at last stimulated the Allies into adopting the plan that Mack had advocated, in season and out of season, since before Neerwinden—that of *annihilating the enemy's army*. This vigorous purpose, and the leading part in its execution played by the duke of York and the British contingent, give these operations, to Englishmen at any rate, a living interest which is entirely lacking in, say, the sieges of Le Quesnoy and Landrecies. On the other side, the "New French" armies and their leaders, without losing the energy of 1793, had emerged from confusion and inexperience, and the powers of the new army and the new system had begun to mature. Thus it was a fair trial of strength between the old way and the new.

In the second week of May the left wing of the Army of the North—the centre was towards Landrecies, and the right, fused in the Army of the Ardennes, towards Charleroi—found itself interposed at Menin-Courtrai-Lille between two hostile masses, the main body of the allied right wing about Tournai and a secondary corps at Thielt. Common-sense, therefore, dictated a converging attack for the Allies and a series of rapid radial blows for the French. In the allied camp common-sense had first to prevail over routine, and the emperor's first orders were for a raid of the Thielt corps towards Ypres, which his advisers hoped would of itself cause the French to decamp. But the duke of York formed a very different plan, and Feldzeugmeister Clerfayt, in command at Thielt, agreed to co-operate. Their proposal was to surround the French on the Lys with their two corps, and by the 15th the emperor had decided to use larger forces with the same object.

On that day Coburg himself, with 6000 men under Feldzeugmeister Kinsky from the central (Landrecies) group, entered Tournai and took up the general command, while another reinforcement under the archduke Charles marched towards Orchies. Orders were promptly issued for a general offensive. Clerfayt's corps was to be between Rousselaer and Menin on the 16th, and the next day to force its way across the Lys at Werwick and connect with the main army. The main army was to advance in four columns. The first three, under the duke of York, were to move off, at daylight on the 17th, by Dottignies, Leers and Lannoy respectively to the line Mouscron-Tourcoing-Mouveaux. The fourth and fifth under Kinsky and the archduke Charles were to defeat the French corps on the upper Marque, and then, leaving Lille on their left and guaranteeing themselves by a cordon system against being

Mack's "annihilation plan."



cut off from Tournai (either by the troops just defeated or by the Lille garrison), to march rapidly forward towards Werwick, getting touch on their right with the duke of York and on their left with Clerfayt, and thus completing the investing circle around Souham's and Moreau's isolated divisions. Speed was enjoined on all. Picked volunteers to clear away the enemy's skirmishers, and pioneers to make good difficult places on the roads, were to precede the heads of the columns. Then came at the head of the main body the artillery with an infantry escort. All this might have been designed by the Japanese for the attack of some well-defined Russian position in the war of 1904. Outpost and skirmisher resistance was to be overpowered the instant it was offered, and the attack on the closed bodies of the enemy was to be initiated by a heavy artillery fire at the earliest possible moment. But in 1904 the Russians stood still, which was the last thing that the Revolutionary armies of 1794 would or could do. Mack's well-considered and carefully balanced

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combinations failed, and doubtless helped to create the legend of his incapacity, which finds no support either in the opinion of Coburg, the representative of the old school, or in that of Scharnhorst, the founder of the new.

Souham, who commanded in the temporary absence of Pichegru, had formed his own plan. Finding himself with the major part of his forces between York and Clerfayt, he had decided to impose upon the former by means of a covering detachment, and to fall upon Clerfayt near Rousselaer with the bulk of his forces. This plan, based as it was on a sound calculation of time, space, strength and endurance, merits close consideration, for it contains more than a trace of the essential principles of modern strategy, yet with one vital difference, that whereas, in the present case, the factor of the enemy's independent will wrecked the scheme, Napoleon would have guaranteed to himself, before and during its development, the power of executing it in spite of the enemy. The appearance of fresh allied troops (Kinsky) on his right front at once modified these general arrangements. Divining Coburg's intentions from the arrival of the enemy near Pont-à-Marque and at Lannoy, he ordered Bonnaud (Lille group, 27,000) to leave enough troops on the upper Marque to amuse the enemy's leftmost columns, and with every man he had left beyond this absolute minimum to attack the left flank of the columns moving towards Tourcoing, which his weak centre (12,000 men at Tourcoing, Mouscron and Roubaix) was to stop by frontal defence. No rôle was as yet assigned to the principal mass (50,000 under Moreau) about Courtrai. Vandamme's brigade was to extend along the Lys from Menin to Werwick and beyond, to deny as long as possible the passage to Clerfayt.

This second plan failed like the first, because the enemy's counter-will was not controlled. All along the line Coburg's advance compelled the French to fight as they were without any redistribution. But the French were sufficiently elastic to adapt themselves readily to unforeseen conditions, and on Coburg's side too the unexpected happened. When Clerfayt appeared on the Lys above Menin, he found Werwick held. This was an accident, for the battalion there was on its way to Menin, and Vandamme, who had not yet received his new orders, was still far away. But the battalion fought boldly, Clerfayt sent for his pontoons, and ere they arrived Vandamme's leading troops managed to come up on the other side. Thus it was not till 1 A.M. on the 18th that the first Austrian battalions passed the Lys.

On the front of the main allied group the "annihilation plan" was crippled at the outset by the tardiness of the archduke's (fifth or left) column. On this the smooth working of the whole scheme depended, for Coburg considered that he must *defeat* Bonnaud before carrying out his intended envelopment of the Menin-Courtrai group (the idea of "binding" the enemy by a detachment while the main scheme proceeded had not yet arisen). The allied general, indeed, on discovering the backwardness of the archduke, went so far as to order all the other columns to begin by swerving southward against Bonnaud, but these were already too deeply committed to the original plan to execute any new variation.

The rightmost column (Hanoverians) under von dem Bussche moved on Mouscron, overpowering the fragmentary, if energetic, resistance of the French advanced posts. Next on the left, Lieutenant Field Marshal Otto moved by Leers and Watrelos, driving away a French post at Lis (near Lannoy) on his left flank, and entered Tourcoing. But meantime a French brigade had driven von dem Bussche away from Mouscron, so that Otto felt compelled to keep troops at Leers and Watrelos to protect his rear, which seriously weakened his hold on Tourcoing. The third column, led by the duke of York, advanced from Templeuve on Lannoy, at the same time securing its left by expelling the French from Willems. Lannoy was stormed by the British Guards under Sir R. Abercromby with such vigour that the cavalry which had been sent round the village to cut off the French retreat had no time to get into position. Beyond Lannoy, the French resistance, still disjointed, became more obstinate as the ground favoured it more, and the duke called up the Austrians from Willems to turn the right of the French position at Roubaix by way of a small valley. Once again, however, the Guards dislodged the enemy before the turning movement had taken effect. A third French position now appeared, at Mouvaux, and this seemed so formidable that the duke halted to rest his now weary men. The emperor himself, however, ordered the advance to be resumed, and Mouvaux too was carried by Abercromby. It was now nightfall, and the duke having attained his objective point prepared to hold it against a counter attack.

Kinsky meanwhile with the fourth column had made feints opposite Pont-à-Tressin, and had forced the passage of the Marque near Bouvines with his main body. But Bonnaud gave ground so slowly that up to 4 P.M. Kinsky had only progressed a few hundred paces from his crossing point. The fifth column, which was behind time on the 16th, did not arrive at Orchies till dawn on the 17th, and had to halt there for rest and food. Thence, moving across country in fighting formation, the archduke made his way to Pont-à-Marque. But he was unable to do more, before calling a halt, than deploy his troops on the other side of the stream.

So closed the first day's operations. The "annihilation plan" had already undergone a serious check. The archduke and Kinsky, instead of being ready for the second part of their task, had scarcely completed the first, and the same could be said of Clerfayt, while von dem Bussche had definitively failed. Only the duke of York and Otto had done their share in the centre, and they now stood at Tourcoing and Mouvaux isolated in the midst of the enemy's main body, with no hope of support from the other columns and no more than a chance of meeting Clerfayt. Coburg's entire force was, without deducting losses, no more than 13,000 for a front of 18 m., and only half of the enemy's available 80,000 men had as yet been engaged. Mack sent a staff officer, at 1 A.M., to implore the archduke to come up to Lannoy at once, but the young prince was asleep and his suite refused to wake him.

Matters did not, of course, present themselves in this light at Souham's headquarters, where the generals met in an informal council. The project of flinging Bonnaud's corps against the flank of the duke of York had not received even a beginning of execution, and the outposts, reinforced though they were from the main group, had everywhere been driven in. All the subordinate leaders, moreover (except Bonnaud), sent in the most despondent reports. "Councils of war never fight" is an old maxim, justified in ninety-nine cases in a hundred. But this council determined to do so, and with all possible vigour. The scheme was practically that which Coburg's first threat had produced and his first brusque advance had inhibited. Vandamme was to hold Clerfayt, the garrison of Lille and a few outlying corps to occupy the archduke and Kinsky, and in the centre Moreau and Bonnaud, with 40,000 effectives, were to attack the Tourcoing-Mouvaux position in front and flank at dawn with all possible energy.

The first shots were fired on the Lys, where, it will be remembered, Clerfayt's infantry had effected its crossing in the night. Vandamme, who was to defend the river, had in the evening assembled his troops (fatigued by a long march) near Menin instead of pushing on at once. Thus only one of his battalions had taken part in the defence of Werwick on the 17th, and the remainder were by this chance massed on the flank of Clerfayt's subsequent line of advance. Vandamme used his advantage well. He attacked, with perhaps 12,000 men against 21,000, the head and the middle of Clerfayt's columns as they moved on Lincelles. Clerfayt stopped at once, turned upon him and drove him towards Roncq and Menin. Still, fighting in succession, rallying and fighting again, Vandamme's regiments managed to spin out time and to commit Clerfayt deeper and deeper to a false direction till it was too late in the day to influence the battle elsewhere.

Battle of Tourcoing.

V. dem Bussche's column at Dottignies, shaken by the blow it had received the day before, did nothing, and actually retreated to the Scheldt. On the other flank, Kinsky and the archduke

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Charles practically remained inactive despite repeated orders to proceed to Lannoy, Kinsky waiting for the archduke, and the latter using up his time and forces in elaborating a protective cordon all around his left and rear. Both alleged that "the troops were tired," but there was a stronger motive. It was felt that Belgium was about to be handed over to France as the price of peace, and the generals did not see the force of wasting soldiers on a lost cause. There remained the two centre columns, Otto's and the duke of York's. The orders of the emperor to the duke were that he should advance to establish communication with Clerfayt at Lincelles. Having thus cut off the French Courtrai group, he was to initiate a general advance to crush it, in which all the allied columns would take part, Clerfayt, York and Otto in front, von dem Bussche on the right flank and the archduke and Kinsky in support. These airy schemes were destroyed at dawn on the 18th. Macdonald's brigade carried Tourcoing at the first rush, though Otto's guns and the volleys of the infantry checked its further progress. Malbrancq's brigade swarmed around the duke of York's entrenchments at Mouvaux, while Bonnaud's mass from the side of Lille passed the Marque and lapped round the flanks of the British posts at Roubaix and Lannoy. The duke had used up his reserves in assisting Otto, and by 8 A.M. the positions of Roubaix, Lannoy and Mouvaux were isolated from each other. But the Allies fought magnificently, and by now the Republicans were in confusion, excited to the highest pitch and therefore extremely sensitive to waves of enthusiasm or panic; and at this moment Clerfayt was nearing success, and Vandamme fighting almost back to back with Malbrancq. Otto was able to retire gradually, though with heavy losses, to Leers, before Macdonald's left column was able to storm Watrelos, or Daendels' brigade, still farther towards the Scheldt, could reach his rear. The resistance of the Austrians gave breathing space to the English, who held on to their positions till about 11.30, attacked again and again by Bonnaud, and then, not without confusion, retired to join Otto at Leers.

With the retreat of the two sorely tried columns and the suspension of Clerfayt's attack between Lincelles and Roncq, the battle of Tourcoing ended. It was a victory of which the young French generals had reason to be proud. The main attack was vigorously conducted, and the two-to-one numerical superiority which the French possessed at the decisive point is the best testimony at once to Souham's generalship and to Vandamme's bravery. As for the Allies, those of them who took part in the battle at all, generals and soldiers, covered themselves with glory, but the inaction of two-thirds of Coburg's army was the bankruptcy declaration of the old strategical system. The Allies lost, on this day, about 4000 killed and wounded and 1500 prisoners besides 60 guns. The French loss, which was probably heavier, is not known. The duke of York defeated, Souham at once turned his attention to Clerfayt, against whom he directed all the forces he could gather after a day's "horde-tactics." The Austrian commander, however, withdrew over the river unharmed. On the 19th he was at Rousselaer and Ingelminster, 9 or 10 m. north of Courtrai, while Coburg's forces assembled and encamped in a strong position some 3 m. west and north-west of Tournai, the Hanoverians remaining out in advance of the right on the Espierre.

Souham's victory, thanks to his geographical position, had merely given him air. The Allies, except for the loss of some 5500 men, were in no way worse off. The plan had failed, but the army as a whole had not been defeated, while the troops of the duke of York and Otto were far too well disciplined not to take their defeat as "all in the day's work." Souham was still on the Lys and midway between the two allied masses, able to strike each in turn or liable to be crushed between them in proportion as the opposing generals calculated time, space and endurance accurately. Souham, therefore, as early as the 19th, had decided that until Clerfayt had been pushed back to his old positions near Thielt he could not deal with the main body of the Allies on the side of Tournai, and he had left Bonnaud to hold the latter while he concentrated most of his forces towards Courtrai. This move had the desired effect, for Clerfayt retired without a contest, and on the 21st of May Souham issued his orders for an advance on Coburg's army, which, as he knew, had meantime been reinforced. Vandamme alone was left to face Clerfayt, and this time with outposts far out, at Ingelminster and Roosebeke, so as to ensure his chief, not a few hours', but two or three days' freedom from interference.

Pichegru now returned and took up the supreme command, Souham remaining in charge of his own and Moreau's divisions. On the extreme right, from Pont-à-Tressin, only demonstrations were to be made; the centre, between Baisieux and Estaimbourg, was to be the scene of the holding attack of Bonnaud's command, while Souham, in considerably greater density, delivered the decisive attack on the allied right by St Leger and Warcoing. At Helchin a brigade was to guard the outer flank of the assailants against a movement by the Hanoverians and to keep open communication with Courtrai in case of attack from the direction of Oudenarde. The details of the allied position were insufficiently known owing to the multiplicity of their advanced posts and the intricate and densely cultivated nature of the ground. The battle of Tournai opened in the early morning of the 22nd and was long and desperately contested. The demonstration on the French extreme right was soon recognized by the defenders to be negligible, and the allied left wing thereupon closed on the centre. There Bonnaud attacked with vigour, forcing back the various advanced posts, especially on the left, where he dislodged the Allies from Nechin. The defenders of Templeuve then fell back, and the attacking swarms—a dissolved line of battle—fringed the brook beyond Templeuve, on the other side of which was the Allies' main position, and even for a moment seized Blandain. Meanwhile the French at Nechin, in concert with the main attack, pressed on towards Ramegnies.

Battle of Tournai.

Macdonald's and other brigades had forced the Espierre rivulet and driven von dem Bussche's Hanoverians partly over the Scheldt (they had a pontoon bridge), partly southward. The main front of the Allies was defined by the brook that flows between Templeuve and Blandain, then between Ramegnies and Pont-à-Chin and empties into the Scheldt near the last-named hamlet. On this front till close on nightfall a fierce battle raged. Pichegru's main attack was still by his left, and Pont-à-Chin was taken and retaken by French, Austrians, British and Hanoverians in turn. Between Blandain and Pont-à-Chin Bonnaud's troops more than once entered the line of defence. But the attack was definitively broken off at nightfall and the Republicans withdrew slowly towards Lannoy and Leers. They had for the first time in a fiercely contested "soldier's battle" measured their strength, regiment for regiment, against the Allies, and failed, but by so narrow a margin that henceforward the Army of the North realized its own strength and solidity. The Army of the Revolution, already superior in numbers and imbued with the decision-compelling spirit, had at last achieved self-confidence.

But the actual decision was destined by a curious process of evolution to be given by Jourdan's far-distant Army of the Moselle, to which we now turn.

The Army of the Moselle had been ordered to assemble a striking force on its left wing, without prejudicing the rest of its cordon in Lorraine, and with this striking force to operate towards Liége and Namur. Its first movement on Arlon, in April, was repulsed by a small Austrian corps under Beaulieu that guarded this region. But in the beginning of May the advance was resumed though the troops were ill-equipped and ill-fed, and requisitions had reduced the civil population to semi-starvation and sullen hostility. We quote Jourdan's instructions to his advanced guard, not merely as evidence of the trivial purpose of the march as originally planned, but still more as an illustration of the driving power that made the troops march at all, and of the new method of marching and subsisting them.

Its commander was "to keep in mind the purpose of cutting the communications between Luxemburg and Namur, and was therefore to throw out strong bodies against the enemy daily and at different points, to parry the enemy's movements by rapid

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marches, to prevent any transfer of troops to Belgium, and lastly to seek an occasion for giving battle, for cutting off his convoys and for seizing his magazines." So much for the purpose. The method of achieving it is defined as follows. "General Hatry, in order to attain the object of these instructions, will have with him the minimum of wagons. He is to live at the expense of the enemy as much as possible, and to send back into the interior of the Republic whatever may be useful to it; he will maintain his communications with Longwy, report every movement to me, and when necessary to the Committee of Public Safety and to the minister of war, maintain order and discipline, and firmly oppose every sort of pillage." How the last of these instructions was to be reconciled with the rest, Hatry was not informed. In fact, it was ignored. "I am far from believing," wrote the representative on mission Gillet, "that we ought to adopt the principles of philanthropy with which we began the war."

Jourdan's movement on Liège.

At the moment when, on these terms, Jourdan's advance was resumed, the general situation east of the Scheldt was as follows: The Allies' centre under Coburg had captured Landrecies, and now (May 4) lay around that place, about 65,000 strong, while the left under Kaunitz (27,000) was somewhat north of Maubeuge, with detachments south of the Sambre as far as the Meuse. Beyond these again were the detachment of Beaulieu (8000) near Arlon, and another, 9000 strong, around Trier. On the side of the French, the Army of the Moselle (41,000 effectives) was in cordon between Saargemünd and Longwy; the Army of the Ardennes (22,000) between Beaumont and Givet; of the Army of the North, the right wing (38,000) in the area Beaumont—Maubeuge and the centre (24,000) about Guise. In the aggregate the allied field armies numbered 139,000 men, those of the French 203,000. Tactically the disproportion was sufficient to give the latter the victory, if, strategically, it could be made effective at a given time and place. But the French had mobility as a remedy for over-extension, and though their close massing on the extreme flanks left no more than equal forces opposite Coburg in the centre, the latter felt unable either to go forward or to close to one flank when on his right the storm was brewing at Menin and Tournai, and on his left Kaunitz reported the gathering of important masses of the French around Beaumont.

Thus the initiative passed over to the French, but they missed their opportunity, as Coburg had missed his in 1793. Pichegru's right was ordered to march on Mons, and his left to master the navigation of the Scheldt so as to reduce the Allies to wagon-drawn supplies—the latter an objective dear to the 18th-century general; while Jourdan's task, as we know, was to conquer the Liége or Namur country without unduly stripping the cordon on the Saar and the Moselle. Jourdan's orders and original purpose were to get Beaulieu out of his way by the usual strategical tricks, and to march through the Ardennes as rapidly as possible, living on what supplies he could pick up from the enemy or the inhabitants. But he had scarcely started when Beaulieu made his existence felt by attacking a French post at Bouillon. Thereupon Jourdan made the active enemy, instead of Namur, his first object.

The movement of the operative portion of the Army of the Moselle began on the 21st of May from Longwy through Arlon towards Neufchâteau. Irregular fighting, sometimes with the Austrians, sometimes with the bitterly hostile inhabitants, marked its progress. Beaulieu was nowhere forced into a battle. But fortune was on Jourdan's side. The Austrians were a detachment of Coburg's army, not an independent force, and when threatened they retired towards Ciney, drawing Jourdan after them in the very direction in which he desired to go. On the 28th the French, after a vain detour made in the hope of forcing Beaulieu to fight—"les esclaves n'osent pas se mesurer avec des hommes libres," wrote Jourdan in disgust,—reached Ciney, and there heard that the enemy had fallen back to a strongly entrenched position on the east bank of the Meuse near Namur. Jourdan was preparing to attack them there, when considerations of quite another kind intervened to change his direction, and thereby to produce the drama of Charleroi and Fleurus—which military historians have asserted to be the foreseen result of the initial plan.

The method of "living on the country" had failed lamentably in the Ardennes, and Jourdan, though he had spoken of changing his line of supply from Arlon to Carignan, then to Mézières and so on as his march progressed, was still actually living from hand to mouth on the convoys that arrived intermittently from his original base. When he sought to take what he needed from the towns on the Meuse, he infringed on the preserves of the Army of the Ardennes.[1] The advance, therefore, came for the moment to a standstill, while Beaulieu, solicitous for the safety of Charleroi—in which fortress he had a magazine—called up the outlying troops left behind on the Moselle to rejoin him by way of Bastogne. At the same moment (29th) Jourdan received new orders from Paris—(*a*) to take Dinant and Charleroi and to clear the country between the Meuse and the Sambre, and (*b*) to attack Namur, either by assault or by regular siege. In the latter case the bulk of the forces were to form a covering army beyond the place, to demonstrate towards Nivelles, Louvain and Liége, and to serve at need as a support to the right flank of the Ardennes Army. From these orders and from the action of the enemy the campaign at last took a definite shape.

When the Army of the Moselle passed over to the left bank of the Meuse, it was greeted by the distant roar of guns towards Charleroi and by news that the Army of the Ardennes, which had already twice been defeated by Kaunitz, was for the third time deeply and unsuccessfully engaged beyond the Sambre. The resumption of the march again complicated the supply question, and it was only slowly that the army advanced towards Charleroi, sweeping the country before it and extending its right towards Namur. But at last on the 3rd of June the concentration of parts of three armies on the Sambre was effected. Jourdan took command of the united force (Army of the Sambre and Meuse) with a strong hand, the 40,000 newcomers inspired fresh courage in the beaten Ardennes troops, and in the sudden dominating enthusiasm of the moment pillaging and straggling almost ceased. Troops that had secured bread shared it with less fortunate comrades, and even the Liégois peasantry made free gifts of supplies. "We must believe," says the French general staff of to-day, "that the idea symbolized by the Tricolour, around which marched ever these sansculottes, shoeless and hungry, unchained a mysterious force that preceded our columns and aided the achievement of military success."

Charleroi.

Friction, however, arose between Jourdan and the generals of the Ardennes Army, to whom the representatives thought it well to give a separate mission. This detachment of 18,000 men was followed by another, of 16,000, to keep touch with Maubeuge. Deducting another 6000 for the siege of Charleroi, when this should be made, the covering army destined to fight the Imperialists dwindled to 55,000 out of 96,000 effectives. Even now, we see, the objective was not primarily the enemy's army. The Republican leaders desired to strike out beyond the Sambre, and as a preliminary to capture Charleroi. They would not, however, risk the loss of their connexion with Maubeuge before attaining the new foothold.

Meanwhile, Tourcoing and Tournai had at last convinced Coburg that Pichegru was his most threatening opponent, and he had therefore, though with many misgivings, decided to move towards his right, leaving the prince of Orange with not more than 45,000 men on the side of Maubeuge-Charleroi-Namur.

Jourdan crossed the Sambre on the 12th of June, practically unopposed. Charleroi was rapidly invested and the covering army extended in a semicircular position. For the fourth time the Allies counter-attacked successfully, and after a severe struggle the French had to abandon their positions and their siege works and to recross the Sambre (June 16). But the army was not beaten. On the contrary, it was only desirous of having its revenge for a stroke of ill-fortune, due, the soldiers said, to

[1] Each of the fifteen armies on foot had been allotted certain departments as supply areas, Jourdan's being of course far away in Lorraine.

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the fog and to the want of ammunition. The fierce threats of St Just (who had joined the army) to *faire tomber les têtes* if more energy were not shown were unnecessary, and within two days the army was advancing again. On the 18th Jourdan's columns recrossed the river and extended around Charleroi in the same positions as before. This time, having in view the weariness of his troops and their heavy losses on the 16th, the prince of Orange allowed the siege to proceed. His reasons for so doing furnish an excellent illustration of the different ideas and capacities of a professional army and a "nation in arms." "The Imperial troops," wrote General Alvintzi, "are very fatigued. We have fought nine times since the 10th of May, we have bivouacked constantly, and made forced marches. Further, we are short of officers." All this, it need hardly be pointed out, applied equally to the French.

Charleroi, garrisoned by less than 3000 men, was intimidated into surrender (25th) when the third parallel was barely established. Thus the object of the first operations was achieved. As to the next neither Jourdan nor the representatives seem to have had anything further in view than the capture of more fortresses. But within twenty-four hours events had decided for them.

Coburg had quickly abandoned his intention of closing on his right wing, and (after the usual difficulties with his Allies on that side) had withdrawn 12,000 Austrians from the centre of his cordon opposite Pichegru, and made forced marches to join the prince of Orange. On the 24th of June he had collected 52,000 men at various points round Charleroi, and on the 25th he set out to relieve the little fortress. But he was in complete ignorance of the state of affairs at Charleroi. Signal guns were fired, but the woods drowned even the roar of the siege batteries, and at last a party under Lieutenant Radetzky made its way through the covering army and discovered that the place had fallen. The party was destroyed on its return, but Radetzky was reserved for greater things. He managed, though twice wounded, to rejoin Coburg with his bad news in the midst of the battle of Fleurus.

On the 26th Jourdan's army (now some 73,000 strong) was still posted in a semicircle of entrenched posts, 20 m. in extent, round the captured town, pending the removal of the now unnecessary pontoon bridge at Marchiennes and the selection of a shorter line of defence.

Coburg was still more widely extended. Inferior in numbers as he was, he proposed to attack on an equal front, and thus gave himself, for the attack of an entrenched position, an order of battle of three men to every two yards of front, all reserves included. The Allies were to attack in five columns, the prince of Orange from the west and north-west towards Trazegnies and Monceau wood, Quasdanovich from the north on Gosselies, Kaunitz from the north-east, the archduke Charles from the east through Fleurus, and finally Beaulieu towards Lambusart. The scheme was worked out in such minute detail and with so entire a disregard of the chance of unforeseen incidents, that once he had given the executive command to move, the Austrian general could do no more. If every detail worked out as planned, victory would be his; if accidents happened he could do nothing to redress them, and unless these righted themselves (which was improbable in the case of the stiffly organized old armies) he could only send round the order to break off the action and retreat.

Fleurus.

In these circumstances the battle of Fleurus is the sum rather than the product of the various fights that took place between each allied column and the French division that it met. The prince of Orange attacked at earliest dawn and gradually drove in the French left wing to Courcelles, Roux and Marchiennes, but somewhat after noon the French, under the direction for the most part of Kléber, began a series of counterstrokes which recovered the lost ground, and about 5, without waiting for Coburg's instructions, the prince retired north-westward off the battlefield. The French centre division, under Morlot, made a gradual fighting retreat on Gosselies, followed up by the Quasdanovich column and part of Kaunitz's force. No serious impression was made on the defenders, chiefly because the brook west of Mellet was a serious obstacle to the rigid order of the Allies and had to be bridged before their guns could be got over. Kaunitz's column and Championnet's division met on the battlefield of 1690. The French were gradually driven in from the outlying villages to their main position between Heppignies and Wangenies. Here the Allies, well led and taking every advantage of ground and momentary chances, had the best of it. They pressed the French hard, necessitated the intervention of such small reserves as Jourdan had available, and only gave way to the defenders' counterstroke at the moment they received Coburg's orders for a general retreat.

On the allied left wing the fighting was closer and more severe than at any point. Beaulieu on the extreme left advanced upon Velaine and the French positions in the woods to the south in several small groups of all arms. Here were the divisions of the Army of the Ardennes, markedly inferior in discipline and endurance to the rest, and only too mindful of their four previous reverses. For six hours, more or less, they resisted the oncoming Allies, but then, in spite of the example and the despairing appeals of their young general Marceau, they broke and fled, leaving Beaulieu free to combine with the archduke Charles, who carried Fleurus after obstinate fighting, and then pressed on towards Campinaire. Beaulieu took command of all the allied forces on this side about noon, and from then to 5 P.M. launched a series of terrible attacks on the French (Lefebvre's division, part of the general reserve, and the remnant of Marceau's troops) above Campinaire and Lambusart. The disciplined resolution of the imperial battalions, and the enthusiasm of the French Revolutionaries, were each at their height. The Austrians came on time after time over ground that was practically destitute of cover. Villages, farms and fields of corn caught fire. The French grew more and more excited—"No retreat to-day!" they called out to their leaders, and finally, clamouring to be led against the enemy, they had their wish. Lefebvre seized the psychological moment when the fourth attack of the Allies had failed, and (though he did not know it) the order to retreat had come from Coburg. The losses of the unit that delivered it were small, for the charge exactly responded to the moral conditions of the moment, but the proportion of killed to wounded (55 to 81) is good evidence of the intensity of the momentary conflict.

So ended the battle. Coburg had by now learned definitely that Charleroi had surrendered, and while the issue of the battle was still doubtful—for though the prince of Orange was beaten, Beaulieu was in the full tide of success—he gave (towards 3 P.M.) the order for a general retreat. This was delivered to the various commanders between 4 and 5, and these, having their men in hand even in the heat of the engagement, were able to break off the battle without undue confusion. The French were far too exhausted to pursue them (they had lost twice as many men as the Allies), and their leader had practically no formed body at hand to follow up the victory, thanks to the extraordinary dissemination of the army.

Tourcoing, Tournay and Fleurus represent the maximum result achievable under the earlier Revolutionary system of making war, and show the men and the leaders at the highest point of combined steadiness and enthusiasm they ever reached—that is, as a "sans-culotte" army. Fleurus was also the last great victory of the French, in point of time, prior to the advent of Napoleon, and may therefore be considered as illustrating the general conditions of warfare at one of the most important points in its development.

The second of these battles can be told in a few words. The Austrian government had, it is said, long ago decided to evacuate the Netherlands, and Coburg retired over the Meuse, practically unpursued, while the duke of York's forces fell back in good order, though pursued by Pichegru through Flanders. The English contingent embarked for home, the rest retired through Holland into Hanoverian territory, leaving the Dutch troops to surrender to the victors. The last phase of the pursuit reflected great glory on Pichegru, for it was conducted in midwinter through a country bare of supplies and densely intersected with dykes and meres. The crowning incident was the dramatic capture of the Dutch fleet, frozen in at the Texel, by a handful of hussars who rode over the ice and browbeat the crews of the well-armed battleships into surrender. It was many years before a prince of Orange ruled again in the United provinces, while the Austrian whitecoats never again mounted guard in Brussels.

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The Rhine campaign of 1794, waged as before chiefly by the Prussians, was not of great importance. General v. Möllendorf won a victory at Kaiserslautern on the 23rd of May, but operations thereafter became spasmodic, and were soon complicated by Coburg's retreat over the Meuse. With this event the offensive of the Allies against the French Revolution came to an inglorious end. Poland now occupied the thoughts of European statesmen, and Austria began to draw her forces on to the east. England stopped the payment of subsidies, and Prussia made the Peace of Basel on the 5th of April 1795. On the Spanish frontier the French under General Dugommier (who was killed in the last battle) were successful in almost every encounter, and Spain, too, made peace. Only the eternal enemies, France and Austria, were left face to face on the Rhine, and elsewhere, of all the Allies, Sardinia alone (see below under *Italian Campaigns*) continued the struggle in a half-hearted fashion.

The operations of 1795 on the Rhine present no feature of the Revolutionary Wars that other and more interesting campaigns fail to show. Austria had two armies on foot under the general command of Clerfayt, one on the upper Rhine, the other south of the Main, while Mainz was held by an army of imperial contingents. The French, Jourdan on the lower, Pichegru on the upper Rhine, had as usual superior numbers at their disposal. Jourdan combined a demonstrative frontal attack on Neuwied with an advance in force via Düsseldorf, reunited his wings beyond the river near Neuwied, and drove back the Austrians in a series of small engagements to the Main, while Pichegru passed at Mannheim and advanced towards the Neckar. But ere long both were beaten, Jourdan at Höchst and Pichegru at Mannheim, and the investment of Mainz had to be abandoned. This was followed by the invasion of the Palatinate by Clerfayt and the retreat of Jourdan to the Moselle. The position was further compromised by secret negotiations between Pichegru and the enemy for the restoration of the Bourbons. The mediated treason came to light early in the following year, and the guilty commander disappeared into the obscure ranks of the royalist secret agents till finally brought to justice in 1804.

The Campaign of 1796 in Germany

The wonder of Europe now transferred itself from the drama of the French Revolution to the equally absorbing drama of a great war on the Rhine. "Every day, for four terrible years," wrote a German pamphleteer early in 1796, "has surpassed the one before it in grandeur and terror, and to-day surpasses all in dizzy sublimity." That a manœuvre on the Lahn should possess an interest to the peoples of Europe surpassing that of the Reign of Terror is indeed hardly imaginable, but there was a good reason for the tense expectancy that prevailed everywhere. France's policy was no longer defensive. She aimed at invading and "revolutionizing" the monarchies and principalities of old Europe, and to this end the campaign of 1796 was to be the great and conclusive effort. The "liberation of the oppressed" had its part in the decision, and the glory of freeing the serf easily merged itself in the glory of defeating the serf's masters. But a still more pressing motive for carrying the war into the enemy's country was the fact that France and the lands she had overrun could no longer subsist her armies. The Directory frankly told its generals, when they complained that their men were starving and ragged, that they would find plenty of subsistence beyond the Rhine.

On her part, Austria, no longer fettered by allied contingents nor by the expenses of a far distant campaign, could put forth more strength than on former campaigns, and as war came nearer home and the citizen saw himself threatened by "revolutionizing" and devastating armies, he ceased to hamper or to swindle the troops. Thus the duel took place on the grandest scale then known in the history of European armies. Apart from the secondary theatre of Italy, the area embraced in the struggle was a vast triangle extending from Düsseldorf to Basel and thence to Ratisbon, and Carnot sketched the outlines in accordance with the scale of the picture. He imagined nothing less than the union of the armies of the Rhine and the Riviera before the walls of Vienna. Its practicability cannot here be discussed, but it is worth contrasting the attitude of contemporaries and of later strategical theorists towards it. The former, with their empirical knowledge of war, merely thought it impracticable with the available means, but the latter have condemned it root and branch as "an operation on exterior lines."

The scheme took shape only gradually. The first advance was made partly in search of food, partly to disengage the Palatinate, which Clerfayt had conquered in 1795. "If you have reason to believe that you would find some supplies on the Lahn, hasten thither with the greater part of your forces," wrote the Directory to Jourdan (Army of the Sambre-and-Meuse, 72,000) on the 29th of March. He was to move at once, before the Austrians could concentrate, and to pass the Rhine at Düsseldorf, thereby bringing back the centre of the enemy over the river. He was, further, to take every advantage of their want of concentration to deliver blow after blow, and to do his utmost to break them up completely. A fortnight later Moreau (Army of the Rhine-and-Moselle, 78,000) was ordered to take advantage of Jourdan's move, which would draw most of the Austrian forces to the Mainz region, to enter the Breisgau and Suabia. "You will attack Austria at home, and capture her magazines. You will enter a new country, the resources of which, properly handled, should suffice for the needs of the Army of the Rhine-and-Moselle."

Jourdan and Moreau.

Jourdan, therefore, was to take upon himself the destruction of the enemy, Moreau the invasion of South Germany. The first object of both was to subsist their armies beyond the Rhine, the second to defeat the armies and terrorize the populations of the empire. Under these instructions the campaign opened. Jourdan crossed at Düsseldorf and reached the Lahn, but the enemy concentrated against him very swiftly and he had to retire over the river. Still, if he had not been able to "break them up completely," he had at any rate drawn on himself the weight of the Austrian army, and enabled Moreau to cross at Strassburg without much difficulty.

The Austrians were now commanded by the archduke Charles, who, after all detachments had been made, disposed of some 56,000 men. At first he employed the bulk of this force against Jourdan, but on hearing of Moreau's progress he returned to the Neckar country with 20,000 men, leaving Feldzeugmeister v. Wartensleben with 36,000 to observe Jourdan. In later years he admitted himself that his own force was far too small to deal with Moreau, who, he probably thought, would retire after a few manœuvres.

But by now the two French generals were aiming at something more than alternate raids and feints. Carnot had set before them the ideal of a decisive battle as the great object. Jourdan was instructed, if the archduke turned on Moreau, to follow him up with all speed and to bring him to action. Moreau, too, was not retreating but advancing. The two armies, Moreau's and the archduke's, met in a struggling and indecisive battle at Malsch on the 9th of July, and soon afterwards Charles learned that Jourdan had recrossed the Rhine and was driving Wartensleben before him. He thereupon retired both armies from the Rhine valley into the interior, hoping that at least the French would detach large forces to besiege the river fortresses. Disappointed of this, and compelled to face a very grave situation, he resorted to an expedient which may be described in his own words: "to retire both armies step by step without committing himself to a battle, and to seize the first opportunity to unite them so as to throw himself with superior or at least equal strength on one of the two hostile enemies." This is the ever-recurring idea of "interior lines." It was not new, for Frederick the Great had used similar means in similar circumstances, as had Souham at Tourcoing and even Dampierre at Valenciennes. Nor was it differentiated, as were Napoleon's operations in this same year, by the deliberate use of a small containing force at one point to obtain relative superiority at another. A general of the 18th century did not believe in the efficacy of superior numbers—had not Frederick the Great disproved it?—and for him operations on "interior lines" were simply successive blows at successive targets, the efficacy of the blow in each case being dependent chiefly on his own personal qualities and skill as a general on the field of battle. In the present case the point to be observed is not the expedient, which was dictated by the circumstances, but the courage of the young general, who, unlike Wartensleben and the rest of his generals, unlike, too, Moreau and

The archduke's plan.

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Jourdan themselves, surmounted difficulties instead of lamenting them.

On the other side, Carnot, of course, foresaw this possibility. He warned the generals not to allow the enemy to "use his forces sometimes against one, sometimes against the other, as he did in the last campaign," and ordered them to go forward respectively into Franconia and into the country of the upper Neckar, with a view to seeking out and defeating the enemy's army. But the plan of operations soon grew bolder. Jourdan was informed on the 21st of July that if he reached the Regnitz without meeting the enemy, or if his arrival there forced the latter to retire rapidly to the Danube, he was not to hesitate to advance to Ratisbon and even to Passau if the disorganization of the enemy admitted it, but in these contingencies he was to detach a force into Bohemia to levy contributions. "We presume that the enemy is too weak to offer a successful resistance and will have united his forces on the Danube; we hope that our two armies will act in unison to rout him completely. Each is, in any case, strong enough to attack by itself, and nothing is so pernicious as slowness in war." Evidently the fear that the two Austrian armies would unite against one of their assailants had now given place to something like disdain.

This was due in all probability to the rapidity with which Moreau was driving the archduke before him. After a brief stand on the Neckar at Cannstadt, the Austrians, only 25,000 strong, fell back to the Kocher Alb, where they halted again, to cover their magazines at Ulm and Günzburg, towards the end of July. Wartensleben was similarly falling back before Jourdan, though the latter, starting considerably later than Moreau, had not advanced so far. The details of the successive positions occupied by Wartensleben need not be stated; all that concerns the general development of the campaign is the fact that the hitherto independent leader of the "Lower Rhine Army" resented the loss of his freedom of action, and besides lamentations opposed a dull passive resistance to all but the most formal orders of the prince. Many weeks passed before this was overcome sufficiently for his leader even to arrange for the contemplated combination, and in these weeks the archduke was being driven back day by day, and the German principalities were falling away one by one as the French advanced and preached the revolutionary formula. In such circumstances as these — the general facts, if not the causes, were patent enough — it was natural that the confident Paris strategists should think chiefly of the profits of their enterprise and ignore the fears of the generals at the front. But the latter were justified in one important respect; their operating armies had seriously diminished in numbers, Jourdan disposing of not more than 45,000 and Moreau of about 50,000. The archduke had now, owing to the arrival of a few detachments from the Black Forest and elsewhere, about 34,000 men, Wartensleben almost exactly the same, and the former, for some reason which has never been fully explained but has its justification in psychological factors, suddenly turned and fought a long, severe and straggling battle above Neresheim (August 11). This did not, however, give him much respite, and on the 12th and 13th he retired over the Danube. At this date Wartensleben was about Amberg, almost as far away from the other army as he had been on the Rhine, owing to the necessity of retreating round instead of through the principality of Bayreuth, which was a Prussian possession and could therefore make its neutrality respected.

Neresheim.

Hitherto Charles had intended to unite his armies on the Danube against Moreau. His later choice of Jourdan's army as the objective of his combination grew out of circumstances and in particular out of the brilliant reconnaissance work of a cavalry brigadier of the Lower Rhine Army, Nauendorff. This general's reports — he was working in the country south and south-east of Nürnberg, Wartensleben being at Amberg — indicated first an advance of Jourdan's army from Forchheim through Nürnberg to the *south*, and induced the archduke, on the 12th, to begin a concentration of his own army towards Ingolstadt. This was a purely defensive measure, but Nauendorff reported on the 13th and 14th that the main columns of the French were swinging away to the east against Wartensleben's front and inner flank, and on the 14th he boldly suggested the idea that decided the campaign. "If your Royal Highness will or can advance 12,000 men against Jourdan's rear, he is lost. We could not have a better opportunity." When this message arrived at headquarters the archduke had already issued orders to the same effect. Lieutenant Field Marshal Count Latour, with 30,000 men, was to keep Moreau occupied—another expedient of the moment, due to the very close pressure of Moreau's advance, and the failure of the attempt to put him out of action at Neresheim. The small remainder of the army, with a few detachments gathered *en route*, in all about 27,000 men, began to recross the Danube on the 14th, and slowly advanced north on a broad front, its leader being now sure that at some point on his line he would encounter the French, whether they were heading for Ratisbon or Amberg. Meanwhile, the Directory had, still acting on the theory of the archduke's weakness, ordered Moreau to combine the operations with those of Bonaparte in Italian Tirol, and Jourdan to turn both flanks of his immediate opponent, and thus to prevent his joining the archduke, as well as his retreat into Bohemia. And curiously enough it was this latter, and not Moreau's move, which suggested to the archduke that his chance had come. The chance was, in fact, one dear to the 18th century general, catching his opponent in the act of executing a manœuvre. So far from "exterior lines" being fatal to Jourdan, it was not until the French general began to operate against Wartensleben's *inner* flank that the archduke's opportunity came.

The decisive events of the campaign can be described very briefly, the ideas that directed them having been made clear. The long thin line of the archduke wrapped itself round Jourdan's right flank near Amberg, while Wartensleben fought him in front. The battle (August 24) was a series of engagements between the various columns that met; it was a repetition in fact of Fleurus, without the intensity of fighting spirit that redeems that battle from dulness. Success followed, not upon bravery or even tactics, but upon the pre-existing strategical conditions. At the end of the day the French retired, and next morning the archduke began another wide extension to his left, hoping to head them off. This consumed several days. In the course of it Jourdan attempted to take advantage of his opponent's dissemination to regain the direct road to Würzburg, but the attempt was defeated by an almost fortuitous combination of forces at the threatened point. More effective, indeed, than this indirect pursuit was the very active hostility of the peasantry, who had suffered in Jourdan's advance and retaliated so effectually during his retreat that the army became thoroughly demoralized, both by want of food and by the strain of incessant sniping. Defeated again at Würzburg on the 3rd of September, Jourdan continued his retreat to the Lahn, and finally withdrew the shattered army over the Rhine, partly by Düsseldorf, partly by Neuwied. In the last engagement on the Lahn the young and brilliant Marceau was mortally wounded. Far away in Bavaria, Moreau had meantime been driving Latour from one line of resistance to another. On receiving the news of Jourdan's reverses, however, he made a rapid and successful retreat to Strassburg, evading the prince's army, which had ascended the Rhine valley to head him off, in the nick of time.

Amberg and Würzburg.

This celebrated campaign is pre-eminently strategical in its character, in that the positions and movements anterior to the battle preordained its issue. It raised the reputation of the archduke Charles to the highest point, and deservedly, for he wrested victory from the most desperate circumstances by the skilful and resolute employment of his one advantage. But this was only possible because Moreau and Jourdan were content to accept strategical failure without seeking to redress the balance by hard fighting. The great question of this campaign is, why did Moreau and Jourdan fail against inferior numbers, when in Italy Bonaparte with a similar army against a similar opponent won victory after victory against equal and superior forces? The answer will not be supplied by any theory of "exterior and

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interior lines." It lies far deeper. So far as it is possible to summarize it in one phrase, it lies in the fact that though the Directory meant this campaign to be the final word on the Revolutionary War, for the nation at large this final word had been said at Fleurus. The troops were still the nation; they no longer fought for a cause and for bare existence, and Moreau and Jourdan were too closely allied in ideas and sympathies with the misplaced citizen soldiers they commanded to be able to dominate their collective will. In default of a cause, however, soldiers will fight for a man, and this brings us by a natural sequence of ideas to the war in Italy.

The War in Italy 1793–97

Hitherto we have ignored the operations on the Italian frontier, partly because they were of minor importance and partly because the conditions out of which Napoleon's first campaign arose can be best considered in connexion with that campaign itself, from which indeed the previous operations derive such light as they possess. It has been mentioned that in 1792 the French overran Savoy and Nice. In 1793 the Sardinian army and a small auxiliary corps of Austrians waged a desultory mountain warfare against the Army of the Alps about Briançon and the Army of Italy on the Var. That furious offensive on the part of the French, which signalized the year 1793 elsewhere, was made impossible here by the counter-revolution in the cities of the Midi.

In 1794, when this had been crushed, the intention of the French government was to take the offensive against the Austro-Sardinians. The first operation was to be the capture of Oneglia. The concentration of large forces in the lower Rhone valley had naturally infringed upon the areas told off for the provisioning of the Armies of the Alps (Kellermann) and of Italy (Dumerbion); indeed, the sullen population could hardly be induced to feed the troops suppressing the revolt, still less the distant frontier armies. Thus the only source of supply was the Riviera of Genoa: "Our connexion with this district is imperilled by the corsairs of Oneglia (a Sardinian town) owing to the cessation of our operations afloat. The army is living from hand to mouth," wrote the younger Robespierre in September 1793. Vessels bearing supplies from Genoa could not avoid the corsairs by taking the open sea, for there the British fleet was supreme. Carnot therefore ordered the Army of Italy to capture Oneglia, and 21,000 men (the rest of the 67,000 effectives were held back for coast defence) began operations in April. The French left moved against the enemy's positions on the main road over the Col di Tenda, the centre towards Ponte di Nava, and the right along the Riviera. All met with success, thanks to Masséna's bold handling of the centre column. Not only was Oneglia captured, but also the Col di Tenda. Napoleon Bonaparte served in these affairs on the headquarter staff. Meantime the Army of the Alps had possessed itself of the Little St Bernard and Mont Cenis, and the Republicans were now masters of several routes into Piedmont (May). But the Alpine roads merely led to fortresses, and both Carnot and Bonaparte—Napoleon had by now captivated the younger Robespierre and become the leading spirit in Dumerbion's army—considered that the Army of the Alps should be weakened to the profit of the Army of Italy, and that the time had come to disregard the feeble neutrality of Genoa, and to advance over the Col di Tenda.

Saorgio.

Napoleon's first suggestion for a rapid condensation of the French cordon, and an irresistible blow on the centre of the Allies by Tenda-Coni,[1] came to nothing owing to the waste of time in negotiations between the generals and the distant Committee, and meanwhile new factors came into play. The capture of the pass of Argentera by the right wing of the Army of the Alps suggested that the main effort should be made against the barrier fortress of Demonte, but here again Napoleon proposed a concentration of effort on the primary and economy of force in the secondary objective. About the same time, in a memoir on the war in general, he laid down his most celebrated maxim: "The principles of war are the same as those of a siege. Fire must be concentrated on one point, and as soon as the breach is made, the equilibrium is broken and the rest is nothing." In the domain of tactics he was and remains the principal exponent of the art of breaking the equilibrium, and already he imagined the solution of problems of policy and strategy on the same lines. "Austria is the great enemy; Austria crushed, Germany, Spain, Italy fall of themselves. We must not disperse, but concentrate our attack." Napoleon argued that Austria could be effectively wounded by an offensive against Piedmont, and even more effectively by an ulterior advance from Italian soil into Germany. In pursuance of the single aim he asked for the appointment of a single commander-in-chief to hold sway from Bayonne to the Lake of Geneva, and for the rejection of all schemes for "revolutionizing" Italy till after the defeat of the arch-enemy.

Napoleon in 1794.

Operations, however, did not after all take either of these forms. The younger Robespierre perished with his brother in the *coup d'état* of 9th Thermidor, the advance was suspended, and Bonaparte, amongst other leading spirits of the Army of Italy, was arrested and imprisoned. Profiting by this moment, Austria increased her auxiliary corps. An Austrian general took command of the whole of the allied forces, and pronounced a threat from the region of Cairo (where the Austrians took their place on the left wing of the combined army) towards the Riviera. The French, still dependent on Genoa for supplies, had to take the offensive at once to save themselves from starvation, and the result was the expedition of Dego, planned chiefly by Napoleon, who had been released from prison and was at headquarters, though unemployed. The movement began on the 17th of September; and although the Austrian general Colloredo repulsed an attack at Dego (Sept. 21) he retreated to Acqui, and the incipient offensive of the Allies ended abruptly.

The first months of the winter of 1794–1795 were spent in re-equipping the troops, who stood in sore need after their rapid movements in the mountains. For the future operations, the enforced condensation of the army on its right wing with the object of protecting its line of supply to Genoa and the dangers of its cramped situation on the Riviera suggested a plan roughly resembling one already recommended by Napoleon, who had since the affair of Dego become convinced that the way into Italy was through the Apennines and not the Alps. The essence of this was to anticipate the enemy by a very early and rapid advance from Vado towards Carcare by the Ceva road, the only good road of which the French disposed and which they significantly called the *chemin de canon*.

Schérer and Kellermann.

The plan, however, came to nothing; the Committee, which now changed its personnel at fixed intervals, was in consequence wavering and non-committal, troops were withdrawn for a projected invasion of Corsica, and in November 1794 Dumerbion was replaced by Schérer, who assembled only 17,000 of his 54,000 effectives for field operations, and selected as his line of advance the Col di Tenda-Coni road. Schérer, besides being hostile to any suggestion emanating from Napoleon, was impressed with the apparent danger to his right wing concentrated in the narrow Riviera, which it was at this stage impossible to avert by a sudden and early assumption of the offensive. After a brief tenure Schérer was transferred to the Spanish frontier, but Kellermann, who now received command of the Army of Italy in addition to his own, took the same view as his predecessor—the view of the ordinary general. But not even the Schérer plan was put into execution, for spring had scarcely arrived when the prospect of renewed revolts in the south of France practically paralysed the army.

This encouraged the enemy to deliver the blow that had so long been feared. The combined forces, under Devins,—the Sardinians, the Austrian auxiliary corps and the newly arrived Austrian main army,—advanced together and forced the French right wing to evacuate Vado and the Genoese littoral. But at this juncture the conclusion of peace with Spain released the Pyrenees armies, and Schérer returned to the Army of Italy at the head of reinforcements. He was faced with a difficult situation,

[1] Liguria was not at this period thought of, even by Napoleon, as anything more than a supply area.

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but he had the means wherewith to meet it, as Napoleon promptly pointed out. Up to this, Napoleon said, the French commanded the mountain crest, and therefore covered Savoy and Nice, and also Oneglia, Loano and Vado, the ports of the Riviera. But now that Vado was lost the breach was made. Genoa was cut off, and the south of France was the only remaining resource for the army commissariat. Vado must therefore be retaken and the line reopened to Genoa, and to do this it was essential first to close up the over-extended cordon—and with the greatest rapidity, lest the enemy, with the shorter line to move on, should gather at the point of contact before the French—and to advance on Vado. Further, knowing (as every one knew) that the king of Sardinia was not inclined to continue the struggle indefinitely, he predicted that this ruler would make peace once the French army had established itself in his dominions, and for this the way into the interior, he asserted, was the great road Savona-Ceva. But Napoleon's mind ranged beyond the immediate future. He calculated that once the French advanced the Austrians would seek to cover Lombardy, the Piedmontese Turin, and this separation, already morally accomplished, it was to be the French general's task to accentuate in fact. Next, Sardinia having been coerced into peace, the Army of Italy would expel the Austrians from Lombardy, and connect its operations with those of the French in South Germany by way of Tirol. The supply question, once the soldiers had gained the rich valley of the Po, would solve itself.

This was the essence of the first of four memoranda on this subject prepared by Napoleon in his Paris office. The second indicated the means of coercing Sardinia—first the Austrians were to be driven or scared away towards Alessandria, then the French army would turn sharp to the left, driving the Sardinians eastward and north-eastward through Ceva, and this was to be the signal for the general invasion of Piedmont from all sides. In the third paper he framed an elaborate plan for the retaking of Vado, and in the fourth he summarized the contents of the other three. Having thus cleared his own mind as to the conditions and the solution of the problem, he did his best to secure the command for himself.

Loano.

The measures recommended by Napoleon were translated into a formal and detailed order to recapture Vado. To Napoleon the miserable condition of the Army of Italy was the most urgent incentive to prompt action. In Schérer's judgment, however, the army was unfit to take the field, and therefore *ex hypothesi* to attack Vado, without thorough reorganization, and it was only in November that the advance was finally made. It culminated, thanks once more to the resolute Masséna, in the victory of Loano (November 23–24). But Schérer thought more of the destitution of his own army than of the fruits of success, and contented himself with resuming possession of the Riviera.

Meanwhile the Mentor whose suggestions and personality were equally repugnant to Schérer had undergone strange vicissitudes of fortune—dismissal from the headquarters' staff, expulsion from the list of general officers, and then the "whiff of grapeshot" of 13th Vendémiaire, followed shortly by his marriage with Josephine, and his nomination to command the Army of Italy. These events had neither shaken his cold resolution nor disturbed his balance.

Napoleon in command.

The Army of Italy spent the winter of 1795–1796 as before in the narrow Riviera, while on the one side, just over the mountains, lay the Austro-Sardinians, and on the other, out of range of the coast batteries but ready to pounce on the supply ships, were the British frigates. On Bonaparte's left Kellermann, with no more than 18,000, maintained a string of posts between Lake Geneva and the Argentera as before. Of the Army of Italy, 7000 watched the Tenda road and 20,000 men the coast-line. There remained for active operations some 27,000 men, ragged, famished and suffering in every way in spite of their victory of Loano. The Sardinian and Austrian auxiliaries (Colli), 25,000 men, lay between Mondovi and Ceva, a force strung out in the Alpine valleys opposed Kellermann, and the main Austrian army (commanded by Beaulieu), in widely extended cantonments between Acqui and Milan, numbered 27,000 field troops. Thus the short-lived concentration of all the allied forces for the battle against Schérer had ended in a fresh separation. Austria was far more concerned with Poland than with the moribund French question, and committed as few of her troops as possible to this distant and secondary theatre of war. As for Piedmont, "peace" was almost the universal cry, even within the army. All this scarcely affected the regimental spirit and discipline of the Austrian squadrons and battalions, which had now recovered from the defeat of Loano. But they were important factors for the new general-in-chief on the Riviera, and formed the basis of his strategy.

Napoleon's first task was far more difficult than the writing of memoranda. He had to grasp the reins and to prepare his troops, morally and physically, for active work. It was not merely that a young general with many enemies, a political favourite of the moment, had been thrust upon the army. The army itself was in a pitiable condition. Whole companies with their officers went plundering in search of mere food, the horses had never received as much as half-rations for a year past, and even the generals were half-starved. Thousands of men were barefooted and hundreds were without arms. But in a few days he had secured an almost incredible ascendancy over the sullen, starved, half-clothed army.

"Soldiers," he told them, "you are famished and nearly naked. The government owes you much, but can do nothing for you. Your patience, your courage, do you honour, but give you no glory, no advantage. I will lead you into the most fertile plains of the world. There you will find great towns, rich provinces. There you will find honour, glory and riches. Soldiers of Italy, will you be wanting in courage?"

Such words go far, and little as he was able to supply material deficiencies—all he could do was to expel rascally contractors, sell a captured privateer for £5000 and borrow £2500 from Genoa—he cheerfully told the Directory on the 28th of March that "the worst was over." He augmented his army of operations to about 40,000, at the expense of the coast divisions, and set on foot two small cavalry divisions, mounted on the half-starved horses that had survived the winter. Then he announced that the army was ready and opened the campaign.

The first plan, emanating from Paris, was that, after an expedition towards Genoa to assist in raising a loan there, the army should march against Beaulieu, previously neutralizing the Sardinians by the occupation of Ceva. When Beaulieu was beaten it was thought probable that the Piedmontese would enter into an alliance with the French against their former comrades. A second plan, however, authorized the general to begin by subduing the Piedmontese to the extent necessary to bring about peace and alliance, and on this Napoleon acted. If the present separation of the Allies continued, he proposed to overwhelm the Sardinians first, before the Austrians could assemble from winter quarters, and then to turn on Beaulieu. If, on the other hand, the Austrians, before he could strike his blow, united with Colli, he proposed to frighten them into separating again by moving on Acqui and Alessandria. Hence Carcare, where the road from Acqui joined the "cannon-road," was the first objective of his march, and from there he could manœuvre and widen the breach between the allied armies. His scattered left wing would assist in the attack on the Sardinians as well as it could—for the immediate attack on the Austrians its co-operation would of course have been out of the question. In any case he grudged every week spent in administrative preparation. The delay due to this, as a matter of fact, allowed a new situation to develop. Beaulieu was himself the first to move, and he moved towards Genoa instead of towards his Allies. The gap between the two allied wings was thereby widened, but it was no longer possible for the French to use it, for their plan of destroying Colli *while Beaulieu was ineffective* had collapsed.

In connexion with the Genoese loan, and to facilitate the movement of supply convoys, a small French force had been pushed forward to Voltri. Bonaparte ordered it back as soon as he arrived at the front, but the alarm was given. The Austrians

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broke up from winter quarters at once, and rather than lose the food supplies at Voltri, Bonaparte actually reinforced Masséna at that place, and gave him orders to hold on as long as possible, cautioning him only to watch his left rear (Montenotte). But he did not abandon his purpose. Starting from the new conditions, he devised other means, as we shall see, for reducing Beaulieu to ineffectiveness. Meanwhile Beaulieu's plan of offensive operations, such as they were, developed. The French advance to Voltri had not only spurred him into activity, but convinced him that the bulk of the French army lay east of Savona. He therefore made Voltri the objective of a converging attack, not with the intention of destroying the French army but with that of "cutting its communications with Genoa," and expelling it from "the only place in the Riviera where there were sufficient ovens to bake its bread." (Beaulieu to the Aulic Council, 15 April.) The Sardinians and auxiliary Austrians were ordered to extend leftwards on Dego to close the gap that Beaulieu's advance on Genoa-Voltri opened up, which they did, though only half-heartedly and in small force, for, unlike Beaulieu, they knew that masses of the enemy were still in the western stretch of the Riviera. The rightmost of Beaulieu's own columns was on the road between Acqui and Savona with orders to seize Monte Legino as an advanced post, the others were to converge towards Voltri from the Genoa side and the mountain passes about Campofreddo and Sassello. The wings were therefore so far connected that Colli wrote to Beaulieu on this day "the enemy will never dare to place himself between our two armies." The event belied the prediction, and the proposed minor operation against granaries and bakeries became the first act of a decisive campaign.

Opening movements.

On the night of the 9th of April the French were grouped as follows: brigades under Garnier and Macquard at the Finestre and Tenda passes, Sérurier's division and Rusca's brigade east of Garessio; Augereau's division about Loano, Meynier's at Finale, Laharpe's at Savona with an outpost on the Monte Legino, and Cervoni's brigade at Voltri. Masséna was in general charge of the last-named units. The cavalry was far in rear beyond Loano. Colli's army, excluding the troops in the valleys that led into Dauphiné, was around Coni and Mondovi-Ceva, the latter group connecting with Beaulieu by a detachment under Provera between Millesimo and Carcare. Of Beaulieu's army, Argenteau's division, still concentrating to the front in many small bodies, extended over the area Acqui-Dego-Sassello. Vukassovich's brigade was equally extended between Ovada and the mountain-crests above Voltri, and Pittoni's division was grouped around Gavi and the Bocchetta, the two last units being destined for the attack on Voltri. Farther to the rear was Sebottendorf's division around Alessandria-Tortona.

On the afternoon of the 10th Beaulieu delivered his blow at Voltri, not, as he anticipated, against three-quarters of the French army, but against Cervoni's detachment. This, after a long irregular fight, slipped away in the night to Savona. Discovering his mistake next morning, Beaulieu sent back some of his battalions to join Argenteau. But there was no road by which they could do so save the détour through Acqui and Dego, and long before they arrived Argenteau's advance on Monte Legino had forced on the crisis. On the 11th (a day behind time), this general drove in the French outposts, but he soon came on three battalions under Colonel Rampon, who threw himself into some old earthworks that lay near, and said to his men, "We must win or die here, my friends." His redoubt and his men stood the trial well, and when day broke on the 12th Bonaparte was ready to deliver his first "Napoleon-stroke."

The principle that guided him in the subsequent operations may be called "superior numbers at the decisive point." Touch had been gained with the enemy all along the long line between the Tenda and Voltri, and he decided to concentrate swiftly upon the nearest enemy—Argenteau. Augereau's division, or such part of it as could march at once, was ordered to Mallare, picking up here and there on the way a few horsemen and guns. Masséna, with 9000 men, was to send two brigades in the direction of Carcare and Altare, and with the third to swing round Argenteau's right and to head for Montenotte village in his rear. Laharpe with 7000 (it had become clear that the enemy at Voltri would not pursue their advantage) was to join Rampon, leaving only Cervoni and two battalions in Savona. Sérurier and Rusca were to keep the Sardinians in front of them occupied. The far-distant brigades of Garnier and Macquard stood fast, but the cavalry drew eastward as quickly as its condition permitted. In rain and mist on the early morning of the 12th the French marched up from all quarters, while Argenteau's men waited in their cold bivouacs for light enough to resume their attack on Monte Legino. About 9 the mists cleared, and heavy fighting began, but Laharpe held the mountain, and the vigorous Masséna with his nearest brigade stormed forward against Argenteau's right. A few hours later, seeing Augereau's columns heading for their line of retreat, the Austrians retired, sharply pressed, on Dego. The threatened intervention of Provera was checked by Augereau's presence at Carcare.

Montenotte.

Montenotte was a brilliant victory, and one can imagine its effects on the but lately despondent soldiers of the Army of

Sketch of the positions occupied on the night of April 14th.

Italy, for all imagined that Beaulieu's main body had been defeated. This was far from being the case, however, and although the French spent the night of the battle at Cairo-Carcare-Montenotte, midway between the allied wings, only two-thirds of Argenteau's force, and none of the other divisions, had been beaten, and the heaviest fighting was to come. This became evident on the afternoon of the 13th, but meanwhile Bonaparte, eager to begin at once the subjugation of the Piedmontese (for which purpose he wanted to bring Sérurier and Rusca into play) sent only Laharpe's division and a few details of Masséna's, under the latter, towards Dego. These were to protect the main attack from interference by the forces that had been engaged at Montenotte (presumed to be Beaulieu's main body), the said main attack being delivered by Augereau's division, reinforced by most of Masséna's, on the positions held by Provera. The latter, only 1000 strong to Augereau's 9000, shut himself in the castle of Cossaria, which he defended *à la* Rampon against a series of furious assaults. Not until the morning of the 14th was his surrender secured, after his ammunition and food had been exhausted.

Millesimo.

Argenteau also won a day's respite on the 13th, for Laharpe did not join Masséna till late, and nothing took place opposite Dego but a little skirmishing. During the day Bonaparte saw

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for himself that he had overrated the effects of Montenotte. Beaulieu, on the other hand, underrated them, treating it as a mishap which was more than counterbalanced by his own success in "cutting off the French from Genoa." He began to reconstruct his line on the front Dego-Sassello, trusting to Colli to harry the French until the Voltri troops had finished their détour through Acqui and rejoined Argenteau. This, of course, presumed that Argenteau's troops were intact and Colli's able to move, which was not the case with either. Not until the afternoon of the 14th did Beaulieu place a few extra battalions at Argenteau's disposal "to be used only in case of extreme necessity," and order Vukassovich from the region of Sassello to "make a diversion" against the French right with *two* battalions.

Thus Argenteau, already shaken, was exposed to destruction. On the 14th, after Provera's surrender, Masséna and Laharpe, reinforced until they had nearly a two-to-one superiority, stormed Dego and killed or captured 3000 of Argenteau's 5500 men, the remnant retreating in disorder to Acqui. But nothing was done towards the accomplishment of the purpose of destroying Colli on that day, save that Sérurier and Rusca began to close in to meet the main body between Ceva and Millesimo. Moreover, the victory at Dego had produced its usual results on the wild fighting swarms of the Republicans, who threw themselves like hungry wolves on the little town, without pursuing the beaten enemy or even placing a single outpost on the Acqui road. In this state, during the early hours of the 15th, Vukassovich's brigade,[1] marching up from Sassello, surprised them, and they broke and fled in an instant. The whole morning had to be spent in rallying them at Cairo, and Bonaparte had for the second time to postpone his union with Sérurier and Rusca, who meanwhile, isolated from one another and from the main army, were groping forward in the mountains. A fresh assault on Dego was ordered, and after very severe fighting, Masséna and Laharpe succeeded late in the evening in retaking it. Vukassovich lost heavily, but retired steadily and in order on Spigno. The killed and wounded numbered probably about 1000 French and 1500 Austrians, out of considerably less than 10,000 engaged on each side—a loss which contrasted very forcibly with those suffered in other battles of the Revolutionary Wars, and by teaching the Army of Italy to bear punishment, imbued it with self-confidence. But again success bred disorder, and there was a second orgy in the houses and streets of Dego which went on till late in the morning and paralysed the whole army.

Dego.

This was perhaps the crisis of the campaign. Even now it was not certain that the Austrians had been definitively pushed aside, while it was quite clear that Beaulieu's main body was intact and Colli was still more an unknown quantity. But Napoleon's intention remained the same, to attack the Piedmontese as quickly and as heavily as possible, Beaulieu being held in check by a containing force under Masséna and Laharpe. The remainder of the army, counting in now Rusca and Sérurier, was to move westward towards Ceva. This disposition, while it illustrates the Napoleonic principle of delivering a heavy blow on the selected target and warding off interference at other points, shows also the difficulty of rightly apportioning the available means between the offensive mass and the defensive system, for, as it turned out, Beaulieu was already sufficiently scared, and thought of nothing but self-defence on the line Acqui-Ovada-Bocchetta, while the French offensive mass was very weak compared with Colli's unbeaten and now fairly concentrated army about Ceva and Montezemolo.

On the afternoon of the 16th the real advance was begun by Augereau's division, reinforced by other troops. Rusca joined Augereau towards evening, and Sérurier approached Ceva from the south. Colli's object was now to spin out time, and having repulsed a weak attack by Augereau, and feeling able to repeat these tactics on each successive spur of the Apennines, he retired in the night to a new position behind the Cursaglia. On the 17th, reassured by the absence of fighting on the Dego side, and by the news that no enemy remained at Sassello, Bonaparte released Masséna from Dego, leaving only Laharpe there, and brought him over towards the right of the main body, which thus on the evening of the 17th formed a long straggling line on both sides of Ceva, Sérurier on the left, écheloned forward, Augereau, Joubert and Rusca in the centre, and Masséna, partly as support, partly as flank guard, on Augereau's right rear. Sérurier had been bidden to extend well out and to strive to get contact with Masséna, *i.e.* to encircle the enemy. There was no longer any idea of waiting to besiege Ceva, although the artillery train had been ordered up from the Riviera by the "cannon-road" for eventual use there. Further, the line of supply, as an extra guarantee against interference, was changed from that of Savona-Carcare to that of Loano-Bardinetto. When this was accomplished, four clear days could be reckoned on with certainty in which to deal with Colli.

The latter, still expecting the Austrians to advance to his assistance, had established his corps (not more than 12,000 muskets in all) in the immensely strong positions of the Cursaglia, with a thin line of posts on his left stretching towards Cherasco, whence he could communicate, by a roundabout way, with Acqui. Opposite this position the long straggling line of the French arrived, after many delays due to the weariness of the troops, on the 19th A day of irregular fighting followed, everywhere to the advantage of the defenders. Napoleon, fighting against time, ordered a fresh attack on the 20th, and only desisted when it became evident that the army was exhausted, and, in particular, when Sérurier reported frankly that, without bread, the soldiers would not march. The delay thus imposed, however, enabled him to clear the "cannon-road" of all vehicles, and to bring up the Dego detachment to replace Masséna in the valley of the western Bormida, the latter coming in to the main army. Further, part at any rate of the convoy service was transferred still farther westward to the line Albenga-Garessio-Ceva. Nelson's fleet, that had so powerfully contributed to force the French inland, was becoming less and less innocuous. If leadership and force of character could overcome internal friction, all the success he had hoped for was now within the young commander's grasp.

San Michele.

Twenty-four thousand men, for the first time with a due proportion of cavalry and artillery, were now disposed along Colli's front and beyond his right flank. Colli, outnumbered by two to one and threatened with envelopment, decided once more to retreat, and the Republicans occupied the Cursaglia lines on the morning of the 21st without firing a shot. But Colli halted again at Vico, half-way to Mondovì (in order, it is said, to protect the evacuation of a small magazine he had there), and while he was in this unfavourable situation the pursuers came on with true Republican swiftness, lapped round his flanks and crushed him. A few days later (27th April), the armistice of Cherasco put an end to the campaign before the Austrians moved a single battalion to his assistance.

Mondovì.

The interest of the campaign being above all Napoleonic, its moral must be found by discovering the "Napoleon touch" that differentiated it from other Revolutionary campaigns. A great deal is common to all, on both sides. The Austrians and Sardinians worked together at least as effectively as the Austrians, Prussians, British and Dutch in the Netherlands. Revolutionary energy was common to the Army of Italy and to the Army of the North. Why, therefore, when the war dragged on from one campaign to another in the great plains of the Meuse and Rhine countries, did Napoleon bring about so swift a decision in these cramped valleys? The answer is to be found partly in the exigencies of the supply service, but still more in Napoleon's own personality and the strategy born of it. The first, as we have seen, was at the end of its resources when Beaulieu placed himself across the Genoa road. Action of some sort was the plain alternative to starvation; and at this point Napoleon's personality intervened. He would have no quarter-rations on the Riviera, but plenty and to spare beyond the mountains. If there were many thousand soldiers who marched unarmed and shoeless in the ranks, it was towards "the Promised Land" that he led them. He looked always to the end, and

The "Napoleon touch."

[1] Vukassovich had received Beaulieu's order to demonstrate with two battalions, and also appeals for help from Argenteau. He therefore brought most of his troops with him.

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met each day as if with full expectation of attaining it before sunset. Strategical conditions and "new French" methods of war did not save Bonaparte in the two crises—the Dego rout and the sullen halt of the army at San Michele—but the personality which made the soldiers, on the way to Montenotte, march barefoot past a wagon-load of new boots.

We have said that Napoleon's strategy was the result of this personal magnetism. Later critics evolved from his success the theory of "interior lines," and then accounted for it by applying the criterion they had evolved. Actually, the form in which the will to conquer found expression was in many important respects old. What, therefore, in the theory or its application was the product of Napoleon's own genius and will-power? A comparison with Souham's campaign of Tourcoing will enable us to answer this question. To begin with, Souham found himself midway between Coburg and Clerfayt almost by accident, and his utilization of the advantages of his position was an expedient for the given case. Napoleon, however, placed himself *deliberately* and by fighting his way thither, in an analogous situation at Castiglione. Military opinion during his time considered it dangerous, as indeed it was, for no theory can alter the fact that had not Napoleon made his men fight harder and march farther than usual, he would have been destroyed. The effective play of forces on interior lines depends on the two conditions that the outer enemies are not so near together as to give no time for the inner mass to defeat one before the arrival of the other, and that they are not so far apart that before one can be brought to action the other has inflicted serious damage elsewhere.

Neither condition was fully met at any time in the Montenotte campaign. On the 11th Napoleon knew that the attack on Voltri had been made by a part only of the Austrian forces, yet he flung his own masses on Montenotte. On the 13th he thought that Beaulieu's main body was at Dego and Colli at Millesimo, and on this assumption had to exact the most extraordinary efforts from Augereau's troops at Cossaria. On the 19th and 20th he tried to exclude the risks of the Austrians' intervention, and with this the chances of a victory over them, by making his victory over Colli by transferring the centre of gravity of his army to Ceva and Garessio, and fighting it out with Colli alone.

It was not, in fact, to gain a position on interior lines—with respect to *two* opponents—that Napoleon pushed his army to Carcare. Before the campaign began he hoped by using the "cannon-road" to destroy the Piedmontese *before the Austrians were in existence at all* as an army. But on the news from Voltri and Monte Legino he swiftly "concentrated fire, made the breach, and forced the equilibrium" at the spot where the interests and forces of the two Allies converged and diverged. The hypothesis in the first case was that the Austrians were practically non-existent, and the whole object in the second was to keep apart two connected from the two Allies ("strategic penetration") and to cause them to break up into two separate systems. More, having made the breach, he had the choice (which he had not before) of attacking *either* the Austrians or the Sardinians, as every critic has pointed out. Indeed the Austrians offered by far the better target. But he neither wanted nor used the new alternative. His purpose was to crush Piedmont. "My enemies saw too much at once," said Napoleon. Singleness of aim and of purpose, the product of clear thinking and of "personality," was the foundation-stone of the new form of strategy.

In the course of subduing the Sardinians, Napoleon found himself placed on interior lines between two hostile masses, and another new idea, that of "relative superiority," reveals itself. Whereas Souham had been in superior force (90,000 against 70,000), Napoleon (36,000 against 50,000) was not, and yet the Army of Italy was always placed in a position of relative superiority (at first about 3 to 2 and ultimately 2 to 1) to the immediate antagonist. "The essence of strategy," said Napoleon in 1797, "is with a weaker army, contrived to have more force at the crucial point than the enemy. But this art is taught neither by books nor by practice; it is a matter of tact." In this he expressed the result of his victories on his own mind rather than a preconceived formula which produced those victories. But the idea, though undefined, and the method of practice, though imperfectly worked out, were in his mind from the first. As soon as he had made the breach, he widened it by pushing out Masséna and Laharpe to Dego to guard, not like Vandamme on the Lys against a real and pressing enemy, but against a *possibility*, and he only diminished the strength and altered the position of this containing detachment in proportion as the Austrian danger dwindled. Later in his career he defined this offensive-defensive system as "having all possible strength at the decisive point," and "being nowhere vulnerable," and the art of reconciling these two requirements, in each case as it arose, was always the principal secret of his generalship. At first his precautions (judged by events and not by the probabilities of the moment) were excessive, and the offensive mass small. But the latter was handled by a general untroubled by multiple aims and anxieties, and if such self-confidence was equivalent to 10,000 men on the battlefield, it was legitimate to detach 10,000 men to secure it. These 10,000 were posted 8 m. out on the dangerous flank, not almost back to back with the main body as Vandamme had been, and although this distance was but little compared to those of his later campaigns, when he employed small armies for the same purpose, it sufficed in this difficult mountain country, where the covering force enjoyed the advantage of strong positions. Of course, if Colli had been better concentrated, or if Beaulieu had been more active, the calculated proportions between covering force and main body might have proved fallacious, and the system on which Napoleon's relative superiority rested might have broken down. But the point is that such a system, however rough its first model, had been imagined and put into practice.

Relative superiority.

This was Napoleon's individual art of war, as raiding bakeries and cutting communications were Beaulieu's speciality. Napoleon made the art into a science, and in our own time, with modern conditions of effective armament and communications, it is more than possible that Moreaus and Jourdans will prove able to practise it with success. But in the old conditions it required a Napoleon. "Strategy," said Moltke, "is a system of expedients." But it was the intense personal force, as well as the genius, of Napoleon that forged these expedients into a *system*.

The first phase of the campaign satisfactorily settled, Napoleon was free to turn his attention to the "arch-enemy" to whom he was now considerably superior in numbers (35,000 to 25,000). The day after the signature of the armistice of Cherasco he began preparing for a new advance and also for the rôle of arbiter of the destinies of Italy. Many whispers there were, even in his own army, as to the dangers of passing on without "revolutionizing" aristocratic Genoa and monarchical Piedmont, and of bringing Venice, the pope and the Italian princes into the field against the French. But Bonaparte, flushed with victory, and better informed than the malcontents of the real condition of Italy, never hesitated. His first object was to drive out Beaulieu, his second to push through Tirol, and his only serious restriction the chance that the armistice with Piedmont would not result in a definitive treaty. Beaulieu had fallen back into Lombardy, and now bordered the Po right and left of Valenza. To achieve further progress, Napoleon had first to cross that river, and the point and method of crossing was the immediate problem, a problem the more difficult as Napoleon had no bridge train and could only make use of such existing bridges as he could seize intact.[1] If he crossed above Valenza, he would be confronted by one river-line after another, on one of which at least Beaulieu would probably stand to fight. But quite apart from the immediate problem, Napoleon's intention was less to beat the Austrians than to dislodge them. He needed a foothold in Lombardy which would make him independent of, and even a menace to, Piedmont. If this were assured, he could for a few weeks entirely ignore his communications with France and strike out against Beaulieu, dethrone the king of Sardinia, or revolutionize Parma, Modena and the papal states according to circumstances.

Milan, therefore, was his objective, and Tortona-Piacenza his route thither. To give himself every chance, he had stipulated with the Piedmontese authorities for the right of passing at Valenza, and he had the satisfaction of seeing Beaulieu fall into the trap and concentrate opposite that part of the river. The French meantime had moved to the region Alessandria-Tortona. Thence on the 6th of May Bonaparte, with a picked body of troops, set out for a forced march on Piacenza, and that night the advanced guard was 30 m. on the way, at Castel San Giovanni, and Laharpe's and the cavalry divisions at Stradella, 10 m. behind them. Augereau was at Broni, Masséna at Sale and Sérurier near Valenza, the whole forming a rapidly extending fan, 50 m. from point to point. If the Piacenza detachment succeeded in crossing, the army was to follow rapidly in its track. If, on the other hand, Beaulieu fell

Piacenza.

[1] We have seen that after Tourcoing, taught by experience, Souham posted Vandamme's covering force 14 or 15 m. out. But Napoleon's disposition was in advance of experience.

[2] The proposed alliance with the Sardinians came to nothing. The kings of Sardinia had always made their alliance with either Austria or France conditional on cessions of conquered territory. But, according to Thiers, the Directory only desired to conquer the Milanese to restore it to Austria in return for the definitive cession of the Austrian Netherlands. If this be so, Napoleon's proclamations of "freedom for Italy" were, if not a mere political expedient, at any rate no more than an expression of his own desires which he was not powerful enough to enforce.

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back to oppose the advanced guard, the Valenza divisions would take advantage of his absence to cross there. In either case, be it observed, the Austrians were to be *evaded*, not brought to action.

On the morning of the 7th, the swift advanced guard under General Dallemagne crossed at Piacenza,[1] and, hearing of this, Bonaparte ordered every division except Sérurier's thither with all possible speed. In the exultation of the moment he mocked at Beaulieu's incapacity, but the old Austrian was already on the alert. This game of manœuvres he understood; already one of his divisions had arrived in close proximity to Dallemagne and the others were marching eastward by all available roads. It was not until the 8th that the French, after a series of partial encounters, were securely established on the left bank of the Po, and Beaulieu had given up the idea of forcing their most advanced troops to accept battle at a disadvantage. The success of the French was due less to their plan than to their mobility, which enabled them first to pass the river before the Austrians (who had actually started a day in advance of them) put in an appearance, and afterwards to be in superior numbers at each point of contact. But the episode was destined after all to culminate in a great event, which Napoleon himself indicated as the turning-point of his life. "Vendémiaire and even Montenotte did not make me think myself a superior being. It was after Lodi that the idea came to me. . . . That first kindled the spark of boundless ambition."

The idea of a battle having been given up, Beaulieu retired to the Adda, and most of his troops were safely beyond it before the French arrived near Lodi, but he felt it necessary to leave a strong rearguard on the river opposite that place to cover the reassembly of his columns after their scattered march. On the afternoon of the 10th of May, Bonaparte, with Dallemagne, Masséna and Augereau, came up and seized the town. But 200 yds. of open ground had to be passed from the town gate to the bridge, and the bridge itself was another 250 in length. A few hundred yards beyond it stood the Austrians, 9000 strong with 14 guns. Napoleon brought up all his guns to prevent the enemy from destroying the bridge. Then sending all his cavalry to turn the enemy's right by a ford above the town, he waited two hours, employing the time in cannonading the Austrian lines, resting his advanced infantry and closing up Masséna's and Augereau's divisions. Finally he gave the order to Dallemagne's 4000 grenadiers, who were drawn up under cover of the town wall, to rush the bridge. As the column, not more than thirty men broad, made its appearance, it was met by the concentrated fire of the Austrian guns, and half way across the bridge it checked, but Bonaparte himself and Masséna rushed forward, the courage of the soldiers revived, and, while some jumped off the bridge and scrambled forward in the shallow water, the remainder stormed on, passed through the guns and drove back the infantry. This was, in bare outline, the astounding passage of the Bridge of Lodi. It was not till after the battle that Napoleon realized that only a rearguard was in front of him. When he launched his 4000 grenadiers he thought that on the other side there were four or five times that number of the enemy. No wonder, then, that after the event he recognized in himself the flash of genius, the courage to risk everything, and the "tact" which, independent of, and indeed contrary to all reasoned calculations, told him that the moment had come for "breaking the equilibrium." Lodi was a tactical success in the highest sense, in that the principles of his tactics rested on psychology—on the "sublime" part of the art of war as Saxe had called it long ago. The spirit produced the form, and Lodi was the prototype of the Napoleonic battle—contact, manœuvre, preparation, and finally the well-timed, massed and unhesitating assault. The absence of strategical results mattered little. Many months elapsed before this bold assertion of superiority ceased to decide the battles of France and Austria.

Lodi.

[1] On entering the territory of the duke of Parma Bonaparte imposed, besides other contributions, the surrender of twenty famous pictures, and thus began a practice which for many years enriched the Louvre and only ceased with the capture of Paris in 1814.

Next day, still under the vivid tactical impressions of the Bridge of Lodi, he postponed his occupation of the Milanese and set off in pursuit of Beaulieu, but the latter was now out of reach, and during the next few days the French divisions were installed at various points in the area Pavia-Milan-Pizzighetone, facing outwards in all dangerous directions, with a central reserve at Milan. Thus secured, Bonaparte turned his attention to political and military administration. This took the form of exacting from the neighbouring princes money, supplies and objects of art, and the once famished Army of Italy revelled in its opportunity. Now, however, the Directory, suspicious of the too successful and too sanguine young general, ordered him to turn over the command in Upper Italy to Kellermann, and to take an expeditionary corps himself into the heart of the Peninsula, there to preach the Republic and the overthrow of princes. Napoleon absolutely refused, and offered his resignation. In the end (partly by bribery) he prevailed, but the incident reawakened his desire to close with Beaulieu. This indeed he could now do with a free hand, since not only had the Milanese been effectively occupied, but also the treaty with Sardinia had been ratified.

Milan.

But no sooner had he resumed the advance than it was interrupted by a rising of the peasantry in his rear. The exactions of the French had in a few days generated sparks of discontent which it was easy for the priests and the nobles to fan into open flames. Milan and Pavia as well as the countryside broke into insurrection, and at the latter place the mob forced the French commandant to surrender. Bonaparte acted swiftly and ruthlessly. Bringing back a small portion of the army with him, he punished Milan on the 25th, sacked and burned Binasco on the 26th, and on the evening of the latter day, while his cavalry swept the open country, he broke his way into Pavia with 1500 men and beat down all resistance. Napoleon's cruelty was never purposeless. He deported several scores of hostages to France, executed most of the mob leaders, and shot the French officer who had surrendered. In addition, he gave his 1500 men three hours' leave to pillage. Then, as swiftly as they had come, they returned to the army on the Oglio. From this river Napoleon advanced to the banks of the Mincio, where the remainder of the Italian campaign was fought out, both sides contemptuously disregarding Venetian neutrality.

It centred on the fortress of Mantua, which Beaulieu, too weak to keep the field, and dislodged from the Mincio in the action of Borghetto (May 30), strongly garrisoned before retiring into Tirol. Beaulieu was soon afterwards replaced by Dagobert Siegmund, count von Wurmser (b. 1724), who brought considerable reinforcements from Germany.

At this point, mindful of the narrow escape he had had of losing his command, Bonaparte thought it well to begin the resettlement of Italy. The scheme for co-operating with Moreau on the Danube was indefinitely postponed, and the Army of Italy (now reinforced from the Army of the Alps and counting 42,000 effectives) was again disposed in a protective "zone of manœuvre," with a strong central reserve. Over 8000 men, however, garrisoned the fortresses of Piedmont and Lombardy, and the effective blockade of Mantua and political expeditions into the heart of the Peninsula soon used up the whole of this reserve.

Moreover, no siege artillery was available until the Austrians in the citadel of Milan capitulated, and thus it was not till the 18th of July that the first parallel was begun. Almost at the same moment Wurmser began his advance from Trent with 55,000 men to relieve Mantua.

Siege of Mantua.

The protective system on which his attack would fall in the first instance was now as follows:—Augereau (6000) about Legnago, Despinoy (8000) south-east of Verona, Masséna (13,000) at Verona and Peschiera, with outposts on the Monte Baldo and at La Corona, Sauret (4500) at Salo and Gavardo. Sérurier (12,000) was besieging Mantua, and the only central reserve was the cavalry (2000) under Kilmaine. The main road to Milan passed by Brescia. Sauret's brigade, therefore, was practically a detached

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post on the line of communication, and on the main defensive front less than 30,000 men were disposed at various points between La Corona and Legnago (30 m. apart), and at a distance of 15 to 20 m. from Mantua. The strength of such a disposition depended on the fighting power and handiness of the troops, who in each case would be called upon to act as a rearguard to gain time. Yet the lie of the country scarcely permitted a closer grouping, unless indeed Bonaparte fell back on the old-time device of a "circumvallation," and shut himself up, with the supplies necessary for the calculated duration of the siege, in an impregnable ring of earthworks round Mantua. This, however, he could not have done even if he had wished, for the wave of revolt radiating from Milan had made accumulations of food impossible, and the lakes above and below the fortress, besides being extremely unhealthy, would have extended the perimeter of the circumvallation so greatly that the available forces would not suffice to man it. It was not in this, but in the absence of an important central reserve that Bonaparte's disposition is open to criticism, which indeed could impugn the scheme in its entirety, as overtaxing the available resources, more easily than it could attack its details.

If Bonaparte has occasionally been criticized for his defensive measures, Wurmser's attack procedure has received almost universal condemnation, as to the justice of which it may be pointed out[1] that the object of the expedition was not to win a battle by falling on the disunited French with a well-concentrated army, but to overpower one, any one, of the corps covering the siege, and to press straight forward to the relief of Mantua, *i.e.* to the destruction of Bonaparte's batteries and the levelling of his trench work. The old principle that a battle was a grave event of doubtful issue was reinforced in the actual case by Beaulieu's late experiences of French *élan*, and as a temporary victory at one point would suffice for the purpose in hand, there was every incentive to multiply the points of contact. The soundness of Wurmser's plan was proved by the event. New ideas and new forces, undiscernible to a man of seventy-two years of age, obliterated his achievement by surpassing it, but such as it was—a limited use of force for a limited object—the venture undeniably succeeded.

The Austrians formed three corps, one (Quasdanovich, 18,000 men) marching round the west side of the Lake of Garda on Gavardo, Salo and the Brescia road, the second (under Wurmser, about 30,000) moving directly down the Adige, and the third (Davidovich, 6000) making a détour by the Brenta valley and heading for Verona by Vicenza.

[1] See C. von B.-K., *Geist und Stoff*, pp. 449-451.

On the 29th Quasdanovich attacked Sauret at Salo, drove him towards Desenzano, and pushed on to Gavardo and thence into Brescia. Wurmser expelled Masséna's advanced guard from La Corona, and captured in succession the Monte Baldo and Rivoli posts. The Brenta column approached Verona with little or no fighting. News of this column led Napoleon early in the day to close up Despinoy, Masséna and Kilmaine at Castelnuovo, and to order Augereau from Legnago to advance on Montebello (19 m. east of Verona) against Davidovich's left rear. But after these orders had been despatched came the news of Sauret's defeat, and this moment was one of the most anxious in Napoleon's career. He could not make up his mind to give up the siege of Mantua, but he hurried Augereau back to the Mincio, and sent order after order to the officers on the lines of communication to send all convoys by the Cremona instead of by the Brescia road. More, he had the baggage, the treasure and the sick set in motion at once for Marcaria, and wrote to Sérurier a despatch which included the words "perhaps we shall recover ourselves . . . but I must take serious measures for a retreat." On the 30th he wrote: "The enemy have broken through our line in three places . . . Sauret has evacuated Salo . . . and the enemy has captured Brescia. You see that our communications with Milan and Verona are cut." The reports that came to him during the morning of the 30th enabled him to place the main body of the enemy opposite Masséna, and this, without in the least alleviating the gravity of the situation, helped to make his course less doubtful. Augereau was ordered to hold the line of the Molinella, in case Davidovich's attack, the least-known factor, should after all prove to be serious; Masséna to reconnoitre a road from Peschiera through Castiglione towards Orzinovi, and to stand fast at Castelnuovo opposite Wurmser as long as he could. Sauret and Despinoy were concentrated at Desenzano with orders on the 31st to clear the main line of retreat and to recapture Brescia. The Austrian movements were merely the continuation of those of the 29th. Quasdanovich wheeled inwards, his right finally resting on Montechiaro and his left on Salo. Wurmser drove back Masséna to the west side of the Mincio. Davidovich made a slight advance.

In the late evening Bonaparte held a council of war at Roverbella. The proceedings of this council are unknown, but it at any rate enabled Napoleon to see clearly and to act. Hitherto he had been covering the siege of Mantua with various detachments, the defeat of any one of which might be fatal to the enterprise. Thus, when he had lost his main line of retreat, he could assemble no more than 8000 men at Desenzano to win it back. Now, however, he made up his mind that the siege could not be continued, and bitter as the decision must have been, it gave him freedom. At this moment of crisis the instincts of the great captain came into play, and showed the way to a victory that would more than counterbalance the now inevitable failure. Sérurier was ordered to spike the 140 siege guns that had been so welcome a few days before, and, after sending part of his force to Augereau, to establish himself with the rest at Marcaria on the Cremona road. The field forces were to be used on interior lines. On the 31st Sauret, Despinoy, Augereau and Kilmaine advanced westward against Quasdanovich. The first two found the Austrians at

Relief of Mantua.

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Salo and Lonato and drove them back, while with Augereau and the cavalry Bonaparte himself made a forced march on Brescia, never halting night or day till he reached the town and recovered his depots. Meantime Sérurier had retired (night of July 31), Masséna had gradually drawn in towards Lonato, and Wurmser's advanced guard triumphantly entered the fortress (August 1).

The Austrian general now formed the plan of crushing Bonaparte between Quasdanovich and his own main body. But meantime Quasdanovich had evacuated Brescia under the threat of Bonaparte's advance and was now fighting a long irregular action with Despinoy and Sauret about Gavardo and Salo, and Bonaparte, having missed his expected target, had brought Augereau by another severe march back to Montechiaro on the Chiese. Masséna was now assembled between Lonato and Ponte San Marco, and Sérurier was retiring quietly on Marcaria. Wurmser's main body, weakened by the detachment sent to Mantua, crossed the Mincio about Valeggio and Goito on the 2nd, and penetrated as far as Castiglione, whence Masséna's rearguard was expelled. But a renewed advance of Quasdanovich, ordered by Wurmser, which drove Sauret and Despinoy back on Brescia and Lonato, in the end only placed a strong detachment of the Austrians within striking distance of Masséna, who on the 3rd attacked it, front to front, and by sheer fighting destroyed it, while at the same time Augereau recaptured Castiglione from Wurmser. On the 4th Sauret and Despinoy pressed back Quasdanovich beyond Salo and Gavardo. One of the Austrian columns, finding itself isolated and unable to retreat with the others, turned back to break its way through to Wurmser, and was annihilated by Masséna in the neighbourhood of Lonato. On this day Augereau fought his way towards Solferino, and Wurmser, thinking rightly or wrongly that he could not now retire to the Mincio without a battle, drew up his whole force, close on 30,000 men, in the plain between Solferino and Medole. The finale may be described in very few words. Bonaparte, convinced that no more was to be feared from Quasdanovich, and seeing that Wurmser meant to fight, called in Despinoy's division to the main body and sent orders to Sérurier, then far distant on the Cremona road, to march against the left flank of the Austrians. On the 5th the battle of Castiglione was fought. Closely contested in the first hours of the frontal attack till Sérurier's arrival decided the day, it ended in the retreat of the Austrians over the Mincio and into Tirol whence they had come.

Lonato and Castiglione.

Thus the new way had failed to keep back Wurmser, and the old had failed to crush Napoleon. Each was the result of its own conditions. In former wars a commander threatened as Napoleon was, would have fallen back at once to the Adda, abandoning the siege in such good time that he would have been able to bring off his siege artillery. Instead of this Bonaparte hesitated long enough to lose it, which, according to accepted canons was a waste, and held his ground, which was, by the same rules, sheer madness. But Revolutionary discipline was not firm enough to stand a retreat. Once it turned back, the army would have streamed away to Milan and perhaps to the Alps (cf. 1799), and the only alternative to complete dissolution therefore was fighting.

As to the manner of this fighting, even the principle of "relative superiority" failed him so long as he was endeavouring to cover the siege and again when his chief care was to protect his new line of retreat and to clear his old. In this period, viz. up to his return from Brescia on the 2nd of August, the only "mass" he collected delivered a blow in the air, while the covering detachments had to fight hard for bare existence. Once released from its trammels, the Napoleonic principle had fair play. He stood between Wurmser and Quasdanovich, ready to fight either or both. The latter was crushed, thanks to local superiority and the resolute leading of Masséna, but at Castiglione Wurmser actually outnumbered his opponent till the last of Napoleon's precautionary dispositions had been given up, and Sérurier brought back from the "alternative line of retreat" to the battlefield. The moral is, again, that it was not the mere fact of being on interior lines that gave Napoleon the victory, but his "tact," his fine appreciation of the chances in his favour, measured in terms of time, space, attacking force and containing power. All these factors were greatly influenced by the ground, which favoured the swarms and columns of the French and deprived the brilliant Austrian cavalry of its power to act. But of far greater importance was the mobility that Napoleon's personal force imparted to the French. Napoleon himself rode five horses to death in three days, and Augereau's division marched from Roverbella to Brescia and back to Montechiaro, a total distance of nearly 50 m., in about thirty-six hours. This indeed was the foundation of his "relative superiority," for every hour saved in the time of marching meant more freedom to destroy one corps before the rest could overwhelm the covering detachments and come to its assistance.

Wurmser's plan for the relief of Mantua, suited to its purpose, succeeded. But when he made his objective the French field army, he had to take his own army as he found it, disposed for an altogether different purpose. A properly combined attack of convergent columns framed *ab initio* by a good staff officer, such as Mack, might indeed have given good results. But the success of such a plan depends principally on the assailant's original possession of the initiative, and not on the chances of his being able to win it over to his own side when operations, as here, are already in progress. When the time came to improvise such a plan, the initiative had passed over to Napoleon, and the plan was foredoomed.

By the end of the second week in August the blockade of Mantua had been resumed, without siege guns. But still under the impression of a great victory gained, Bonaparte was planning a long forward stride. He thought that by advancing past Mantua directly on Trieste and thence onwards to the Semmering he could impose a peace on the emperor. The Directory, however, which had by now focussed its attention on the German campaign, ordered him to pass through Tirol and to co-operate with Moreau, and this plan, Bonaparte, though protesting against an Alpine venture being made so late in the year, prepared to execute, drawing in reinforcements and collecting great quantities of supplies in boats on the Adige and Lake Garda. Wurmser was thought to have posted his main body near Trent, and to have detached one division to Bassano "to cover Trieste." The French advanced northward on the 2nd, in three disconnected columns (precisely as Wurmser had done in the reverse direction at the end of July)—Masséna (13,000) from Rivoli to Ala, Augereau (9000) from Verona by hill roads, keeping on his right rear, Vaubois (11,000) round the Lake of Garda by Riva and Torbole. Sahuguet's division (8000) remained before Mantua. The French divisions successfully combined and drove the enemy before them to Trent.

There, however, they missed their target. Wurmser had already drawn over the bulk of his army (22,000) into the Val Sugana, whence, with the Bassano division as his advanced guard, he intended once more to relieve Mantua, while Davidovich with 13,000 (excluding detachments) was to hold Tirol against any attempt of Bonaparte to join forces with Moreau.

Thus Austria was preparing to hazard a second (as in the event she hazarded a third and a fourth) highly trained and expensive professional army in the struggle for the preservation of a fortress, and we must conclude that there were weighty reasons which actuated so notoriously cautious a body as the Council of War in making this unconditional venture. While Mantua stood, Napoleon, for all his energy and sanguineness, could not press forward into Friuli and Carniola, and immunity from a Republican visitation was above all else important for the Vienna statesmen, governing as they did more or less discontented and heterogeneous populations that had not felt the pressure of war for a century and more. The Austrians, so far as is known, desired no more than to hold their own. They no longer possessed the superiority of *moral* that guarantees victory to one side when both are materially equal. There was therefore nothing to be gained, commensurate with the risk involved, by fighting a battle in the open field. *In Italien siegt nicht die Kavallerie* was an old saying in the Austrian army, and therefore the Austrians could not hope to win a victory of the first magnitude. The only practicable alternative was to strengthen Mantua as opportunities offered themselves, and to prolong the passive resistance as much as possible. Napoleon's own practice in providing for secondary theatres of war was to economize forces and to delay a decision, and the fault of the Austrians, viewed from a purely military standpoint, was that they squandered, instead of economizing, their forces to gain time. If we neglect pure theory, and regard strategy as the handmaiden of statesmanship—which fundamentally it is—we

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cannot condemn the Vienna authorities unless it be first proved that they grossly exaggerated the possible results of Bonaparte's threatened irruption. And if their capacity for judging the political situation be admitted, it naturally follows that their object was to preserve Mantua *at all costs*—which object Wurmser, though invariably defeated in action, did in fact accomplish.

When Masséna entered Trent on the morning of the 5th of September, Napoleon became aware that the force in his front was a mere detachment, and news soon came in that Wurmser was in the Val Sugana about Primolano and at Bassano. This move he supposed to be intended to cover Trieste, being influenced by his own hopes of advancing in that direction, and underestimating the importance, to the Austrians, of preserving Mantua. He therefore informed the Directory that he could not proceed with the Tirol scheme, and spent one more day in driving Davidovich well away from Trent. Then, leaving Vaubois to watch him, Napoleon marched Augereau and Masséna, with a rapidity he scarcely ever surpassed, into the Val Sugana. Wurmser's rearguard was attacked and defeated again and again, and Wurmser himself felt compelled to stand and fight, in the hope of checking the pursuit before going forward into the plains. Half his army had already reached Montebello on the Verona road, and with the rear half he posted himself at Bassano, where on the 8th he was attacked and defeated with heavy losses. Then began a strategic pursuit or general chase, and in this the mobility of the French should have finished the work so well begun by their tactics. **Bassano.**

But Napoleon directed the pursuers so as to cut off Wurmser from Trieste, not from Mantua. Masséna followed up the Austrians to Vicenza, while Augereau hurried towards Padua, and it was not until late on the 9th that Bonaparte realized that his opponent was heading for Mantua via Legnago. On the 10th Masséna crossed the Adige at Ronco, while Augereau from Padua reached Montagnara. Sahuguet from Mantua and Kilmaine from Verona joined forces at Castellaro on the 11th, with orders to interpose between Wurmser and the fortress. Wurmser meantime had halted for a day at Legnago, to restore order, and had then resumed his march. It was almost too late, for in the evening, after having to push aside the head of Masséna's column at Cerea, he had only reached Nogara, some miles short of Castellaro, and close upon his rear was Augereau, who reached Legnago that night. On the 12th, eluding Sahuguet by a detour to the southward, he reached Mantua, with all the columns of the French, weary as most of them were, in hot pursuit. After an attempt to keep the open field, defeated in a general action on the 15th, the relieving force was merged in the garrison, now some 28,000 in all. So ended the episode of Bassano, the most brilliant feature of which as usual was the marching power of the French infantry. This time it sufficed to redeem even strategical misconceptions and misdirections. Between the 5th and the 11th, besides fighting three actions, Masséna had marched 100 m. and Augereau 114.

Feldzeugmeister Alvintzi was now appointed to command a new army of relief. This time the mere distribution of the troops imposed a concentric advance of separate columns, for practically the whole of the fresh forces available were in Carniola, the Military Frontier, &c., while Davidovich was still in Tirol. Alvintzi's intention was to assemble his new army (29,000) in Friuli, and to move on Bassano, which was to be occupied on the 4th of November. Meantime Davidovich (18,000) was to capture Trent, and the two columns were to connect by the Val Sugana. All being well, Alvintzi and Davidovich, still separate, were then to converge on the Adige between Verona and Legnago. Wurmser was to co-operate by vigorous sorties. At this time Napoleon's protective system was as follows: Kilmaine (9000) investing Mantua, Vaubois (10,000) at Trent, and Masséna (9000) at Bassano and Treviso, Augereau (9000) and Macquard (3000) at Verona and Villafranca constituting, for the first time in these operations, important mobile reserves. Hearing of Alvintzi's approach in good time, he meant first to drive back Davidovich, then with Augereau, Masséna, Macquard and 3000 of Vaubois's force to fall upon Alvintzi, who, he calculated, would at this stage have reached Bassano, and finally to send back a large force through the Val Sugana to attack Davidovich. This plan practically failed.

Instead of advancing, Vaubois was driven steadily backward. By the 6th, Davidovich had fought his way almost to Roveredo, and Alvintzi had reached Bassano and was there successfully repelling the attacks of Masséna and Augereau. That night Napoleon drew back to Vicenza. On the 7th Davidovich drove in Vaubois to Corona and Rivoli, and Alvintzi came within 5 m. of Vicenza. Napoleon watched carefully for an opportunity to strike out, and on the 8th massed his troops closely around the central point of Verona. On the 9th, to give himself air, he ordered Masséna to join Vaubois, and to drive back Davidovich at all costs. But before this order was executed, reports came in to the effect that Davidovich had suspended his advance. The 10th and 11th were spent by both sides in relative inaction, the French waiting on events and opportunities, the Austrians resting after their prolonged exertions. Then, on the afternoon of the 11th, being informed that Alvintzi was approaching, Napoleon decided to attack him. On the 12th the advanced guard of Alvintzi's army was furiously assailed in the position of Caldiero. But the troops in rear came up rapidly, and by 4 P.M. the French were defeated all along the line and in retreat on Verona. Napoleon's situation was now indeed precarious. He was on "interior lines," it is true, but he had neither the force nor the space necessary for the delivery of rapid radial blows. Alvintzi was in superior numbers, as the battle of Caldiero had proved, and at any moment Davidovich, who had twice Vaubois's force, might advance on the attack of Rivoli. The reserves had proved insufficient, and Kilmaine had to be called up from Mantua, which was thus for the third time freed from the blockaders. Again the alternatives were retreat, in whatever order was possible to Republican armies, and beating the nearest enemy at any sacrifice. Napoleon chose the latter, though it was not until the evening of the 14th that he actually issued the fateful order. **Caldiero.**

The Austrians, too, had selected the 15th as the date of their final advance on Verona, Davidovich from the north, Alvintzi via Zevio from the south. But Napoleon was no longer there; leaving Vaubois to hold Davidovich as best he might, and posting only 3000 men in Verona, he had collected the rest of his small army between Albaro and Ronco. His plan seems to have been to cross the Adige well in rear of the Austrians, to march north on to the Verona-Vicenza highway, and there, supplying himself from their convoys, to fight to the last. On the 15th he had written to the Directory, "The weakness and the exhaustion of the army causes me to fear the worst. We are perhaps on the eve of losing Italy." In this extremity of danger the troops passed the Adige in three columns near Ronco and Albaredo, and marched forward along the dikes, with deep marshes and pools on either hand. If Napoleon's intention was to reach the dry open ground of S. Bonifacio in rear of the Austrians, it was not realized, for the Austrian army, instead of being at the gates of Verona, was still between Caldiero and S. Bonifacio, heading, as we know, for Zevio. Thus Alvintzi was able, easily and swiftly, to wheel to the south.

The battle of Arcola almost defies description. The first day passed in a series of resultless encounters between the heads of the columns as they met on the dikes. In the evening Bonaparte withdrew over the Adige, expecting at every moment to be summoned to Vaubois's aid. But Davidovich remained inactive, and on the 16th the French again crossed the river. Masséna from Ronco advanced on Porcile, driving the Austrians along the causeway thither, but on the side of Arcola, Alvintzi had deployed a considerable part of his forces on the edge of the marshes, within musket shot of the causeway by which Bonaparte and Augereau had to pass, along the Austrian front, to reach the bridge of Arcola. In these circumstances the second day's battle was more murderous and no more decisive than the first, and again the French retreated to Ronco. But Davidovich again stood still, and with incredible obstinacy Bonaparte ordered a third assault for the 17th, using **Arcola.**

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indeed more tactical expedients than before, but calculating chiefly on the fighting powers of his men and on the exhaustion of the enemy. Masséna again advanced on Porcile, Robert's brigade on Arcola, but the rest, under Augereau, were to pass the Alpone near its confluence with the Adige, and joining various small bodies which passed the main stream lower down, to storm forward on dry ground to Arcola. The Austrians, however, themselves advanced from Arcola, overwhelmed Robert's brigade on the causeway and almost reached Ronco. This was perhaps the crisis of the battle, for Augereau's force was now on the other side of the stream, and Masséna, with his back to the new danger, was approaching Porcile. But the fire of a deployed regiment stopped the head of the Austrian column; Masséna, turning about, cut into its flank on the dike; and Augereau, gathering force, was approaching Arcola from the south. The bridge and the village were evacuated soon afterwards, and Masséna and Augereau began to extend in the plain beyond. But the Austrians still sullenly resisted. It was at this moment that Bonaparte secured victory by a mere ruse, but a ruse which would have been unprofitable and ridiculous had it not been based on his fine sense of the moral conditions. Both sides were nearly fought out, and he sent a few trumpeters to the rear of the Austrian army to sound the charge. They did so, and in a few minutes the Austrians were streaming back to S. Bonifacio. This ended the drama of Arcola, which more than any other episode of these wars, perhaps of any wars in modern history, centres on the personality of the hero. It is said that the French fought without spirit on the first day, and yet on the second and third Bonaparte had so thoroughly imbued them with his own will to conquer that in the end they prevailed over an enemy nearly twice their own strength.

The climax was reached just in time, for on the 17th Vaubois was completely defeated at Rivoli and withdrew to Peschiera, leaving the Verona and Mantua roads completely open to Davidovich. But on the 19th Napoleon turned upon him, and combining the forces of Vaubois, Masséna and Augereau against him, drove him back to Trent. Meantime Alvintzi returned from Vicenza to San Bonifacio and Caldiero (November 21st), and Bonaparte at once stopped the pursuit of Davidovich. On the return of the French main body to Verona, Alvintzi finally withdrew, Wurmser, who had emerged from Mantua on the 23rd, was driven in again, and this epilogue of the great struggle came to a feeble end because neither side was now capable of prolonging the crisis.

Alvintzi renewed his advance in January 1797 with all the forces that could be assembled for a last attempt to save Mantua. At this time 8000 men under Sérurier blockaded Mantua. Masséna (9000) was at Verona, Joubert (Vaubois's successor) at Rivoli with 10,000, Augereau at Legnago with 9000. In reserve were Rey's division (4000) between Brescia and Montechiaro, and Victor's brigade at Goito and Castelnuovo. On the other side, Alvintzi had 9000 men under Provera at Padua, 6000 under Bayalič at Bassano, and he himself with 28,000 men stood in the Tirol about Trent. This time he intended to make his principal effort on the Rivoli side. Provera was to capture Legnago on the 9th of January, and Bayalič Verona on the 12th, while the main army was to deliver its blow against the Rivoli position on the 13th.

The first marches of this scheme were duly carried out, and several days elapsed before Napoleon was able to discern the direction of the real attack. Augereau fell back, skirmishing a little, as Provera's and Bayalič's advance developed. On the 11th, when the latter was nearing Verona, Alvintzi's leading troops appeared in front of the Rivoli position. On the 12th Bayalič with a weak force (he had sent reinforcements to Alvintzi by the Val Pantena) made an unsuccessful attack on Verona, Provera, farther south, remaining inactive. On the 13th Napoleon, still in doubt, launched Masséna's division against Bayalič, who was driven back to San Bonifacio; but at the same time definite news came from Joubert that Alvintzi's main army was in front of La Corona. From this point begins the decisive, though by no means the most intense or dramatic, struggle of the campaign. Once he felt sure of the situation Napoleon acted promptly. Joubert was ordered to hold on to Rivoli at all costs. Rey was brought up by a forced march to Castelnuovo, where Victor joined him, and ahead of them both Masséna was hurried on to Rivoli. Napoleon himself joined Joubert on the night of the 13th. There he saw the watch-fires of the enemy in a semicircle around him, for Alvintzi, thinking that he had only to deal with one division, had begun a wide-spread enveloping attack. The horns of this attack were as yet so far distant that Napoleon, instead of extending on an equal front, only spread out a few regiments to gain an hour or two and to keep the ground for Masséna and Rey, and on the morning of January 14th, with 10,000 men in hand against 26,000, he fell upon the central columns of the enemy as they advanced up the steep broken slopes of the foreground. The fighting was severe, but Bonaparte had the advantage. Masséna arrived at 9 A.M., and a little later the column of Quasdanovich, which had moved along the Adige and was now attempting to gain a foothold on the plateau in rear of Joubert, was crushed by the converging fire of Joubert's right brigade and by Masséna's guns, their rout being completed by the charge of a handful of cavalry under Lasalle. The right horn of Alvintzi's attack, when at last it swung in upon Napoleon's rear, was caught between Masséna and the advancing troops of Rey and annihilated, and even before this the dispirited Austrians were in full retreat. A last alarm, caused by the appearance of a French infantry regiment in the rear (this had crossed the lake in boats from Salo), completed their demoralization, and though less than 2000 had been killed and wounded, some 12,000 Austrian prisoners were left in the hands of the victors. Rivoli was indeed a moral triumph. After the ordeal of Arcola, the victory of the French was a foregone conclusion at each point of contact. Napoleon hesitated, or rather refrained from striking, so long as his information was incomplete, but he knew now from experience that his covering detachment, if well led, could not only hold its own without assistance until it had gained the necessary information, but could still give the rest of the army time to act upon it. Then, when the centre of gravity had been ascertained, the French divisions hurried thither, caught the enemy in the act of manœuvring and broke them up. And if that confidence in success which made all this possible needs a special illustration, it may be found in Napoleon's sending Murat's regiment over the lake to place a mere two thousand bayonets across the line of retreat of a whole army. Alvintzi's manœuvre was faulty neither strategically in the first instance nor tactically as regards the project of enveloping Joubert on the 14th. It failed because Joubert and his men were better soldiers than his own, and because a French division could move twice as fast as an Austrian, and from these two factors a new form of war was evolved, the essence of which was that, for a given time and in a given area, a small force of the French should engage and hold a much larger force of the enemy.

The remaining operations can be very briefly summarized. Provera, still advancing on Mantua, joined hands there with Wurmser, and for a time held Sérurier at a disadvantage. But hearing of this, Napoleon sent back Masséna from the field of Rivoli, and that general, with Augereau and Sérurier, not only forced Wurmser to retire again into the fortress, but compelled Provera to lay down his arms. On the 2nd of February 1797, after a long and honourable defence, Mantua, and with it what was left of Wurmser's army, surrendered.

The campaign of 1797, which ended the war of the First Coalition, was the brilliant sequel of these hard-won victories. Austria had decided to save Mantua at all costs, and had lost her armies in the attempt, a loss which was not compensated by the "strategic" victories of the archduke. Thus the Republican "visitation" of Carinthia and Carniola was one swift march—politically glorious, if dangerous from a purely military standpoint—of Napoleon's army to the Semmering. The archduke, who was called thither from Germany, could do no more than fight a few rearguard actions, and make threats against Napoleon's rear, which the latter, with his usual "tact," ignored. On the Rhine, as in 1795 and 1796, the armies of the Sambre-and-Meuse (Hoche) and the Rhine-and-Moselle (Moreau) were opposed by the armies of the Lower Rhine (Werneck) and of the Upper Rhine (Latour). Moreau crossed the river near Strassburg and fought a series of minor actions. Hoche, like his predecessors, crossed at Düsseldorf and Neuwied and fought his

Rivoli.

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way to the Lahn, where for the last time in the history of these wars, there was an irregular widespread battle. But Hoche, in this his last campaign, displayed the brilliant energy of his first, and delivered the "series of incessant blows" that Carnot had urged upon Jourdan the year before. Wernseck was driven with ever-increasing losses from the lower Lahn to Wetzlar and Giessen. Thence, pressed hard by the French left wing under Championnet, he retired on the Nidda, only to find that Hoche's right had swung completely round him. Nothing but the news of the armistice of Leoben saved him from envelopment and surrender. This general armistice was signed by Bonaparte, on his own authority and to the intense chagrin of the Directory and of Hoche, on the 18th of April, and was the basis of the peace of Campo Formio.

NAPOLEON IN EGYPT

Within the scope of this article, yet far more important from its political and personal than from its general military interest, comes the expedition of Napoleon to Egypt and its sequel (see also EGYPT: *History*; NAPOLEON, &c.). A very brief summary must here suffice. Napoleon left Toulon on the 19th of May 1798, at the same time as his army (40,000 strong in 400 transports) embarked secretly at various ports. Nelson's fleet was completely evaded, and, capturing Malta *en route*, the armada reached the coast of Egypt on the 1st of July. The republicans stormed Alexandria on the 2nd. Between Embabeh and Gizeh, on the left bank of the Nile, 60,000 Mamelukes were defeated and scattered on the 21st (battle of the Pyramids), the French for the most part marching and fighting in the chequer of infantry squares that afterwards became the classical formation for desert warfare. While his lieutenants pursued the more important groups of the enemy, Napoleon entered Cairo in triumph, and proceeded to organize Egypt as a French protectorate. Meantime Nelson, though too late to head off the expedition, had annihilated the squadron of Admiral Brueys. This blow severed the army from the home country, and destroyed all hope of reinforcement. But to eject the French already in Egypt, military invasion of that country was necessary. The first attempts at this were made in September by the Turks as overlords of Egypt. Napoleon—after suppressing a revolt in Cairo—marched into Syria to meet them, and captured El Arish and Jaffa (at the latter place the prisoners, whom he could afford neither to feed, to release, nor to guard, were shot by his order). But he was brought to a standstill (March 17-May 20) before the half-defensible fortifications of Acre, held by a Turkish garrison and animated by the leadership of Sir W. Sidney Smith (*q.v.*). In May, though meantime a Turkish relieving army had been severely beaten in the battle of Mount Tabor (April 16, 1799), Napoleon gave up his enterprise, and returned to Egypt, where he won a last victory in annihilating Abercrombie with 6000 men, a Turkish army 18,000 strong that had landed there (July 25, 1799). With this crowning tactical success to set against the Syrian reverses, he handed over the command to Kléber and returned to France (August 22) to ride the storm in a new *coup d'état*, the "18th Brumaire." Kléber, attacked by the English and Turks, concluded the convention of El Arish (January 27, 1800), whereby he secured free transport for the army back to France. But this convention was disavowed by the British government, and Kléber prepared to hold his ground. On the 20th of March 1800 he thoroughly defeated the Turkish army at Heliopolis and recovered Cairo, and French influence was once more in the ascendant in Egypt, when its director was murdered by a fanatic on the 14th of June, the day of Marengo. Kléber's successor, the incompetent Menou, fell an easy victim to the British expeditionary force under Sir Ralph Abercromby in 1801. The British forced their way ashore at Aboukir on the 8th of March. On the 21st, Abercromby won a decisive battle, and himself fell in the hour of victory (see ALEXANDRIA: *Battle of, 1801*). His successor, General Hely Hutchinson, slowly followed up this advantage, and received the surrender of Cairo in July and of Alexandria in August, the débris of the French army being given free passage back to France. Meantime a mixed force of British and native troops from India, under Sir David Baird, had landed at Kosseir and marched across the desert to Cairo.

THE WAR OF THE SECOND COALITION

In the autumn of 1798, while Napoleon's Egyptian expedition was in progress, and the Directory was endeavouring at home to reduce the importance and the predominance of the army and its leaders, the powers of Europe once more allied themselves, not now against the principles of the Republic, but against the treaty of Campo Formio. Russia, Austria, England, Turkey, Portugal, Naples and the Pope formed the Second Coalition. The war began with an advance into the Roman States by a worthless and ill-behaved Neapolitan army (commanded, much against his will, by Mack), which the French troops under Championnet destroyed with ease. Championnet then revolutionized Naples. After this unimportant prelude the curtain rose on a general European war. The Directory which now had at its command neither numbers nor enthusiasm, prepared as best it could to meet the storm. Four armies, numbering only 160,000, were set on foot, in Holland (Brune, 24,000); on the Upper Rhine (Jourdan, 46,000); in Switzerland, which had been militarily occupied in 1798 (Masséna, 30,000); and in upper Italy (Schérer, 60,000). In addition there was Championnet's army, now commanded by Macdonald, in southern Italy. All these forces the Directory ordered, in January and February 1799, to assume the offensive.

Jourdan, in the Constance and Schaffhausen region, had only 40,000 men against the archduke Charles's 80,000, and was soon brought to a standstill and driven back on Stokach. The archduke had won these preliminary successes with seven-eighths of his army acting as one concentrated mass. But as he had only encountered a portion of Jourdan's army, he became uneasy as to his flanks, checked his bold advance, and ordered a reconnaissance in force. This practically extended his army while Jourdan was closing his, and thus the French began the battle of Stokach (March 25) in superior numbers, and it was not until late in the day that the archduke brought up sufficient strength (60,000) to win a victory. This was a battle of the "strategic" type, a widespread straggling combat in which each side took fifteen hours to inflict a loss of 12% on the other, and which ended in Jourdan accepting defeat and drawing off, unpursued by the magnificent Austrian cavalry, though these counted five times as many sabres as the French. *Stokach.*

The French secondary army in Switzerland was in the hands of the bold and active Masséna. The forces of both sides in the Alpine region were, from a military point of view, mere flank guards to the main armies on the Rhine and the Adige. But unrest, amounting to civil war, among the Swiss and Grison peoples tempted both governments to give these flank guards considerable strength.[1]

The Austrians in the Vorarlberg and Grisons were under Hotze, who had 13,000 men at Bregenz, and 7000 commanded by Auffenberg around Chur, with, between them, 5000 men at Feldkirch and a post of 1000 in the strong position of the Luziensteig near Mayenfeld. Masséna's available force was about 20,000, and he used almost the whole of it against Auffenberg. The Rhine was crossed by his principal column near Mayenfeld, and the Luziensteig stormed (March 6), while a second column from the Zürich side descended upon Disentis and captured its defenders. In three days, thanks to Masséna's energy and the ardent attacking spirit of his men, Auffenberg's division was broken up, Oudinot meanwhile holding off Hotze by a hard-fought combat at Feldkirch (March 7). But a second attack on Feldkirch made on the 23rd by Masséna with 15,000 men was repulsed and the advance of his left wing came to a standstill. *Masséna in Switzerland.*

Behind Auffenberg and Hotze was Bellegarde in Tirol with some 47,000 men. Most of these were stationed north of Innsbruck and Landeck, probably as a sort of strategic reserve to the archduke. The rest, with the assistance of the Tirolese themselves, were to ward off irruptions from Italy. Here the French offensive was entrusted to two columns, one from Masséna's command under Lecourbe, the other from the Army of Italy under Dessolle. Simultaneously with Masséna, Lecourbe marched from Bellinzona with 10,000 men, by the San Bernadino pass into the Splügen valley, and thence over the Julier pass into the upper Engadine. A small Austrian force under Major-General Loudon attacked him near Zernetz, but was after three days of rapid manœuvres and bold tactics driven back to Martinsbrück, with considerable losses, especially in prisoners. But ere long the country people flew to arms, and Lecourbe found himself between two fires, the levies occupying Zernetz and Loudon's regulars Martinsbrück. But though he had only some 5000 of his original force left, he was not disconcerted, and, by driving back the levies into the high valleys whence they had come, and constantly threatening Loudon,

[1] The assumption by later critics (Clausewitz even included) that the "flank position" held by these forces relatively to the main armies in Italy and Germany was their *raison d'être* is unsupported by contemporary evidence.

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he was able to maintain himself and to wait for Dessolles. The latter, moving up the Valtelline, by now fought his way to the Stelvio pass, but beyond it the defile of Tauffers (S.W. of Glurns) was entrenched by Loudon, who thus occupied a position midway between the two French columns, while his irregulars beset all the passes and ways giving access to the Vintschgau and the lower Engadine. In this situation the French should have been destroyed in detail. But as usual their speed and dash gave them the advantage in every manœuvre and at every point of contact.

Lecourbe and Dessolles in Tirol.

On the 25th Lecourbe and Dessolles attacked Loudon at Nauders in the Engadine and Tauffers in the Vintschgau respectively. At Nauders the French passed round the flanks of the defence by scrambling along the high mountain crests adjacent, while at Tauffers the assailants, only 4500 strong, descended into a deep ravine, debouched unnoticed in the Austrians' rear, and captured 6000 men and 16 guns. The Austrian leader with a couple of companies made his way through Glurns to Nauders, and there, finding himself headed off by Lecourbe, he took to the mountains. His corps, like Auffenberg's, was annihilated.

This ended the French general offensive. Jourdan had been defeated by the archduke and forced or induced to retire over the Rhine. Masséna was at a standstill before the strong position of Feldkirch, and the Austrians of Hotze were still massed at Bregenz, but the Grisons were revolutionized, two strong bodies of Austrians numbering in all about 20,000 men had been destroyed, and Lecourbe and Dessolles had advanced far into Tirol. A pause followed. The Austrians in the mountains needed time to concentrate and to recover from their astonishment. The archduke fell ill, and the Vienna war council forbade his army to advance lest Tirol should be "uncovered," though Bellegarde and Hotze still disposed of numbers equal to those of Masséna and Lecourbe. Masséna succeeded Jourdan in general command on the French side and promptly collected all available forces of both armies in the hilly non-Alpine country between Basel, Zürich and Schaffhausen, thereby directly barring the roads into France (Berne-Neuchâtel-Pontarlier and Basel-Besançon) which the Austrians appeared to desire to conquer. The protection of Alsace and the Vosges was left to the fortresses. There was no suggestion, it would appear, that the Rhine between Basel and Schaffhausen was a flank position sufficient of itself to bar Alsace to the enemy.

It is now time to turn to events in Italy, where the Coalition intended to put forth its principal efforts. At the beginning of March the French had 80,000 men in Upper Italy and some 35,000 in the heart of the Peninsula, the latter engaged chiefly in supporting newly-founded republics. Of the former, 53,000 formed the field army on the Mincio under Schérer. The Austrians, commanded by Kray, numbered in all 84,000, but detachments reduced this figure to 67,000, of whom, moreover, 15,000 had not yet arrived when operations began. They were to be joined by a Russian contingent under the celebrated Suvárov, who was to command the whole on arrival, and whose extraordinary personality gives the campaign its special interest. Kray himself was a resolute soldier, and when the French, obeying the general order to advance, crossed the Adige, he defeated them in a severely fought battle at Magnano near Verona (March 5), the French losing 4000 killed and wounded and 4500 taken, out of 41,000. The Austrians lost some 3800 killed and wounded and 1500 prisoners, out of 46,000 engaged. The war, however, was undertaken not to annihilate, but to evict the French, and, probably under orders from Vienna, Kray allowed the beaten enemy to depart.

Suvárov appeared with 17,000 Russians on the 4th of April. His first step was to set Russian officers to teach the Austrian troops—whose feelings can be imagined—how to attack with the bayonet, his next to order the whole army forward. The Allies broke camp on the 17th, 18th and 19th of April, and on the 20th, after a forced march of close on 30 m., they passed the Chiese. Brescia had a French garrison, but Suvárov soon cowed it into surrender by threats of a massacre, which no one doubted that he would carry into execution.

Suvárov.

At the same time, dissatisfied with the marching of the Austrian infantry, he sent the following characteristic reproof to their commander: "The march was in the service of the Kaiser. Fair weather is for my lady's chamber, for dandies, for sluggards. He who dares to cavil against his high duty (*der Grosssprecher wider den hohen Dienst*) is, as an egoist, instantly to vacate his command. Whoever is in bad health can stay behind. The so-called reasoners (*raisonneurs*) do no army any good. . . ." One day later, under this unrelenting pressure, the advanced posts of the Allies reached Cremona and the main body the Oglio. The pace became slower in the following days, as many bridges had to be made, and meanwhile Moreau, Schérer's successor, prepared with a mere 20,000 men to defend Lodi, Cassano and Lecco on the Adda. On the 26th the Russian hero attacked him all along the line. The moral supremacy had passed over to the Allies. Melas, under Suvárov's stern orders, flung his battalions regardless of losses against the strong position of Cassano. The story of 1796 repeated itself with the rôles reversed. The passage was carried, and the French rearguard under Sérurier was surrounded and captured by an inferior corps of Austrians. The Austrians (the Russians at Lecco were hardly engaged) lost 6000 men, but they took 7000 prisoners, and in all Moreau's little army lost half its numbers and retreated in many disconnected bodies to the Ticino, and thence to Alessandria. Everywhere the Italians turned against the French, mindful of the exactions of their commissaries. The strange Cossack cavalry that western Europe had never yet seen entered Milan on the 29th of April, eleven days after passing the Mincio, and next day the city received with enthusiasm the old field marshal, whose exploits against the Turks had long invested him with a halo of romance and legend. Here, for the moment, his offensive culminated. He desired to pass into Switzerland and to unite his own, the archduke's, Hotze's and Bellegarde's armies in one powerful mass. But the emperor would not permit the execution of this scheme until all the fortresses held by the enemy in Upper Italy should have been captured. In any case, Macdonald's army in southern Italy, cut off from France by the rapidity of Suvárov's onslaught, and now returning with all speed to join Moreau by force or evasion, had still to be dealt with.

The Trebbia.

Suvárov's mobile army, originally 90,000 strong, had now dwindled, by reason of losses and detachments for sieges, to half that number, and serious differences arose between the Vienna government and himself. If he offended the pride of the Austrian army, he was at least respected as a leader who gave it victories, but in Vienna he was regarded as a madman who had to be kept within bounds. But at last, when he was becoming thoroughly exasperated by this treatment, Macdonald came within striking distance and the active campaign recommenced. In the second week of June, Moreau, who had retired into the Apennines about Gavi, advanced with the intention of drawing upon himself troops that would otherwise have been employed against Macdonald. He succeeded, for Suvárov with his usual rapidity collected 40,000 men at Alessandria, only to learn that Macdonald with 35,000 men was coming up on the Parma road. When this news arrived, Macdonald had already engaged an Austrian detachment at Modena and driven it back, and Suvárov found himself between Moreau and Macdonald with barely enough men under his hand to enable him to play the game of "interior lines." But at the crisis the rough energetic warrior who despised "raisonneurs," displayed generalship of the first order, and taking in hand all his scattered detachments, he manœuvred them in the Napoleonic fashion.

On the 14th Macdonald was calculated to be between Modena, Reggio and Carpi, but his destination was uncertain. Would he continue to hug the Apennines to join Moreau, or would he strike out northwards against Kray, who with 20,000 men was besieging Mantua? From Alessandria it is four marches to Piacenza and nine to Mantua, while from Reggio these places are four and two marches respectively. Piacenza, therefore, was the crucial point if

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Macdonald continued westward, while, in the other case, nothing could save Kray but the energetic conduct of Hohenzollern's detachment, which was posted near Reggio. This latter, however, was soon forced over the Po, and Ott, advancing from Cremona to join it, found himself sharply pressed in turn. The field marshal had hoped that Ott and Hohenzollern together would be able to win him time to assemble at Parma, where he could bring on a battle whichever way the French took. But on receipt of Ott's report he was convinced that Macdonald had chosen the western route, and ordering Ott to delay the French as long as possible by stubborn rearguard actions and to put a garrison into Piacenza under a general who was to hold out "on peril of his life and honour," he collected what forces were ready to move and hurried towards Piacenza, the rest being left to watch Moreau. He arrived just in time. When after three forced marches the main body (only 26,000 strong) reached Castel San Giovanni, Ott had been driven out of Piacenza, but the two joined forces safely. Both Suvárov and Macdonald spent the 17th in closing up and deploying for battle. The respective forces were Allies 30,000, French 35,000. Suvárov believed the enemy to be only 26,000 strong, and chiefly raw Italian regiments, but his temperament would not have allowed him to stand still even had he known his inferiority. He had already issued one of his peculiar battle-orders, which began with the words, "The hostile army will be taken prisoners" and continued with directions to the Cossacks to spare the surrendered enemy. But Macdonald too was full of energy, and believed still that he could annihilate Ott before the field marshal's arrival. Thus the battle of the Trebbia (June 17–19) was fought by both sides in the spirit of the offensive. It was one of the severest struggles in the Republican wars, and it ended in Macdonald's retreat with a loss of 15,000 men—probably 6000 in the fight and 9000 killed and prisoners when and after the equilibrium was broken—for Suvárov, unlike other generals, had the necessary surplus of energy after all the demands made upon him by a great battle, to order and to direct an effective pursuit. The Allies lost about 7000. Macdonald retreated to Parma and Modena, harassed by the peasantry, and finally recrossed the Apennines and made his way to Genoa. The battle of the Trebbia is one of the most clearly-defined examples in military history of the result of moral force—it was a matter not merely of energetic leading *on* the battlefield, but far more of educating the troops beforehand to meet the strain, of ingraining in the soldier the determination to win at all costs. "It was not," says Clausewitz, "a case of losing the key of the position, of turning a flank or breaking a centre, of a mistimed cavalry charge or a lost battery . . . it is a pure trial of strength and expense of force, and victory is the sinking of the balance, if ever so slightly, in favour of one side. And we mean not merely physical, but even more moral forces."

To return now to the Alpine region, where the French offensive had culminated at the end of March. Their defeated left was behind the Rhine in the northern part of Switzerland, the half-victorious centre athwart the Rhine between Mayenfeld and Chur, and their wholly victorious right far within Tirol between Glurns, Nauders and Landeck. But neither the centre nor the right could maintain itself. The forward impulse given by Suvárov spread along the whole Austrian front from left to right. Dessolles' column (now under Loison) was forced back to Chiavenna. Bellegarde drove Lecourbe from position to position towards the Rhine during April. There Lecourbe added to the remnant of his expeditionary column the outlying bodies of Masséna's right wing, but even so he had only 8000 men against Bellegarde's 17,000, and he was now exposed to the attack of Hotze's 25,000 as well. The Luziensteig fell to Hotze and Chur to Bellegarde, but the defenders managed to escape from the converging Austrian columns into the valley of the Reuss. Having thus reconquered all the lost ground and forced the French into the interior of Switzerland, Bellegarde and Hotze parted company, the former marching with the greater part of his forces to join Suvárov, the latter moving to his right to reinforce the archduke. Only a chain of posts was left in the Rhine Valley between Disentis and Feldkirch. The archduke's operations now recommenced.

Charles and Hotze stood, about the 15th of May, at opposite ends of the lake of Constance. The two together numbered about 88,000 men, but both had sent away numerous detachments to the flanks, and the main bodies dwindled to 35,000 for the archduke and 20,000 for Hotze. Masséna, with 45,000 men in all, retired slowly from the Rhine to the Thur. The archduke crossed the Rhine at Stein, Hotze at Balzers, and each then cautiously felt his way towards the other. Their active opponent attempted to take advantage of their separation, and an irregular fight took place in the Thur valley (May 25), but Masséna, finding Hotze close on his right flank, retired without attempting to force a decision. On the 27th, having joined forces, the Austrians dislodged Massena from his new position on the Töss without difficulty, and this process was repeated from time to time in the next few days, until at last Masséna halted in the position he had prepared for defence at Zürich. He had still but 25,000 of his 45,000 men in hand, for he maintained numerous small detachments on his right, behind the Zürcher See and the Wallen See, and on his left towards Basel. These 25,000 occupied an entrenched position 5 m. in length; against which the Austrians, detaching as usual many posts to protect their flanks and rear, deployed only 42,000 men, of whom 8000 were sent on a wide turning movement and 8000 held in reserve 4 m. in rear of the battlefield. Thus the frontal attack was made with forces not much greater than those of the defence and it failed accordingly (June 4). But Masséna, fearing perhaps to strain the loyalty of the Swiss to their French-made constitution by exposing their town to assault and sack, retired on the 5th.

Action of Zurich.

He did not fall back far, for his outposts still bordered the Limmat and the Linth, while his main body stood in the valley of the Aar between Baden and Lucerne. The archduke pressed Masséna as little as he had pressed Jourdan after Stokach (though in this case he had less to gain by pursuit), and awaited the arrival of a second Russian army, 30,000 strong, under Korsákov, before resuming the advance, meantime throwing out covering detachments towards Basel, where Masséna had a division. Thus for two months operations, elsewhere than in Italy, were at a standstill, while Masséna drew in reinforcements and organized the fractions of his forces in Alsace as a skeleton army, and the Austrians distributed arms to the peasantry of South Germany.

In the end, under pressure from Paris, it was Masséna who resumed active movements. Towards the middle of August, Lecourbe, who formed a loose right wing of the French army in the Reuss valley, was reinforced to a strength of 25,000 men, and pounced upon the extended left wing of the enemy, which had stretched itself, to keep pace with Suvárov, as far west ward as the St Gotthard. The movement began on the 14th, and in two days the Austrians were driven back from the St Gothard and the Furka to the line of the Linth, with the loss of 8000 men and many guns. At the same time an attempt to take advantage of Masséna's momentary weakness by forcing the Aar at Döttingen near its mouth failed completely (August 16–17). Only 200 men guarded the point of passage, but the Austrian engineers had neglected to make a proper examination of the river, and unlike the French, the Austrian generals had no authority to waste their expensive battalions in forcing the passage in boats. No one regarded this war as a struggle for existence, and no one but Suvárov possessed the iron strength of character to send thousands of men to death for the realization of a diplomatic success—for ordinary men, the object of the Coalition was to upset the treaty of Campo Formio. This was the end of the archduke's campaign in Switzerland. Though he would have preferred to continue it, the Vienna government desired him to return to Germany. An Anglo-Russian expedition was about to land in Holland,[1] and the French were assembling fresh forces on the Rhine, and, with the double object of preventing an invasion of

[1] For this expedition, which was repulsed by Brune in the battle of Castricum, see Fortescue's *Hist. of the British Army*, vol. iv., and Sachot's *Brune en Hollande*.

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South Germany and of inducing the French to augment their forces in Alsace at the expense of those in Holland, the archduke left affairs in Switzerland to Hotze and Korsákov, and marched away with 35,000 men to join the detachment of Sztarray (20,000) that he had placed in the Black Forest before entering Switzerland. His new campaign never rose above the level of a war of posts and of manœuvres about Mannheim and Philippsburg. In the latter stage of it Lecourbe commanded the French and obtained a slight advantage.

Suvárov's last exploit in Italy coincided in time, but in no other respect, with the skirmish at Döttingen. Returning swiftly from the battlefield of the Trebbia, he began to drive back Moreau to the Riviera. At this point Joubert succeeded to the command on the French side, and against the advice of his generals, gave battle. Equally against the advice of his own subordinates, the field marshal accepted it, and won his last great victory at Novi on the 13th of August, Joubert being killed. This was followed by another rapid march against a new French "Army of the Alps" (Championnet) which had entered Italy by way of the Mont Cenis. But immediately after this he left all further operations in Italy to Melas with 60,000 men and himself with the Russians and an Austrian corps marched away, via Varese, for the St Gothard to combine operations against Masséna with Hotze and Korsákov. It was with a heavy heart that he left the scene of his battles, in which the force of his personality had carried the old-fashioned "linear" armies for the last time to complete victory. In the early summer he had himself suggested, eagerly and almost angrily, the concentration of his own and the archduke's armies in Switzerland with a view, not to conquering that country, but to forcing Jourdan and Masséna into a grand decisive battle. But, as we have seen, the Vienna government would not release him until the last Italian fortress had been reoccupied, and when finally he received the order that a little while before he had so ardently desired, it was too late. The archduke had already left Switzerland, and he was committed to a resultless warfare in the high mountains, with an army which was a mere detachment and in the hope of co-operating with two other detachments far away on the other side of Switzerland. As for the reasons which led to the issue of such an order, it can only be said that the bad feeling known to exist between the Austrians and Russians induced England to recommend, as the first essential of further operations, the separate concentration of the troops of each nationality under their own generals. Still stranger was the reason which induced the tsar to give his consent. It was alleged that the Russians would be healthier in Switzerland than the men of the southern plains! From such premises as these the Allied diplomats evolved a new plan of campaign, by which the Anglo-Russians under the duke of York were to reconquer Holland and Belgium, the Archduke Charles to operate on the Middle Rhine, Suvárov in Switzerland and Melas in Piedmont—a plan destitute of every merit but that of simplicity.

Suvárov ordered to Switzerland.

It is often said that it is the duty of a commander to resign rather than undertake an operation which he believes to be faulty. So, however, Suvárov did not understand it. In the simplicity of his loyalty to the formal order of his sovereign he prepared to carry out his instructions to the letter. Masséna's command (77,000 men) was distributed, at the beginning of September, along an enormous S, from the Simplon, through the St Gothard and Glarus, and along the Linth, the Züricher See and the Limmat to Basel. Opposite the lower point of this S, Suvárov (28,000) was about to advance. Hotze's corps (25,000 Austrians), extending from Utznach by Chur to Disentis, formed a thin line roughly parallel to the lower curve of the S, Korsákov's Russians (30,000) were opposite the centre at Zürich, while Nauendorff with a small Austrian corps at Waldshut faced the extreme upper point. Thus the only completely safe way in which Suvárov could reach the Zürich region was by skirting the lower curve of the S, under protection of Hotze. But this detour would be long and painful, and the ardent old man preferred to cross the mountains once for all at the St Gothard, and to follow the valley of the Reuss to Altdorf and Schwyz—*i.e.* to strike vertically upward to the centre of the S—and to force his way through the French cordon to Zürich, and if events, so far as concerned his own corps, belied his optimism, they at any rate justified his choice of the shortest route. For, aware of the danger gathering in his rear, Masséna gathered up all his forces within reach towards his centre, leaving Lecourbe to defend the St Gothard and the Reuss valley and Soult on the Linth. On the 24th he forced the passage of the Limmat at Dietikon. On the 25th, in the second battle of Zürich, he completely routed Korsákov, who lost 8000 killed and wounded, large numbers of prisoners and 100 guns. All along the line the Allies fell back, one corps after another, at the moment when Suvárov was approaching the foot of the St Gothard.

Battle of Zurich.

On the 21st the field marshal's headquarters were at Bellinzona, where he made the final preparations. Expecting to be four days *en route* before he could reach the nearest friendly magazine, he took his trains with him, which inevitably augmented the difficulties of the expedition. On the 24th Airolo was taken, but when the far greater task of storming the pass itself presented itself before them, even the stolid Russians were terrified, and only the passionate protests of the old man, who reproached his "children" with deserting their father in his extremity, induced them to face the danger. At last after twelve hours' fighting, the summit was reached. The same evening Suvárov pushed on to Hospenthal, while a flanking column from Disentis made its way towards Amsteg over the Crispalt. Lecourbe was threatened in rear and pressed in front, and his engineers, to hold off the Disentis column, had broken the Devil's Bridge. Discovering this, he left the road, threw his guns into the river and made his way by fords and water-meadows to Göschenen, where by a furious attack he cleared the Disentis troops off his line of retreat. His rearguard meantime held the ruined Devil's Bridge. This point and the tunnel leading to it, called the Urner Loch, the Russians attempted to force, with the most terrible losses, battalion after battalion crowding into the tunnel and pushing the foremost ranks into the chasm left by the broken bridge. But at last a ford was discovered and the bridge, cleared by a turning movement, was repaired. More broken bridges lay beyond, but at last Suvárov joined the Disentis column near Göschenen. When Altdorf was reached, however, Suvárov found not only Lecourbe in a threatening position, but an entire absence of boats on the Lake of the Four Cantons. It was impossible (in those days the Axenstrasse did not exist) to take an army along the precipitous eastern shore, and thus passing through one trial after another, each more severe than the last, the Russians, men and horses and pack animals in an interminable single file, ventured on the path leading over the Kinzig pass into the Muotta Thal. The passage lasted three days, the leading troops losing men and horses over the precipices, the rearguard from the fire of the enemy, now in pursuit. And at last, on arrival in the Muotta Thal, the field marshal received definite information that Korsákov's army was no longer in existence. Yet even so it was long before he could make up his mind to retreat, and the pursuers gathered on all sides. Fighting, sometimes severe, and never altogether ceasing, went on day after day as the Allied column, now reduced to 15,000 men, struggled on over one pass after another, but at last it reached Ilanz on the Vorder Rhine (October 8). The Archduke Charles meanwhile had, on hearing of the disaster of Zürich, brought over a corps from the Neckar, and for some time negotiations were made for a fresh combined operation against Masséna. But these came to nothing, for the archduke and Suvárov could not agree, either as to their own relations or as to the plan to be pursued. Practically, Suvárov's retreat from Altdorf to Ilanz closed the campaign. It was his last active service, and formed a gloomy but grand climax to the career of the greatest soldier who ever wore the Russian uniform.

Suvárov in the Alps.

Marengo and Hohenlinden

The disasters of 1799 sealed the fate of the Directory, and placed Bonaparte, who returned from Egypt with the prestige of a recent victory, in his natural place as civil and military

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head of France. In the course of the campaign the field strength of the French had been gradually augmented, and in spite of losses now numbered 227,000 at the front. These were divided into the Army of Batavia, Brune (25,000), the Army of the Rhine, Moreau (146,000), the Army of Italy, Masséna (56,000), and, in addition, there were some 100,000 in garrisons and depots in France.

Most of these field armies were in a miserable condition owing to the losses and fatigues of the last campaign. The treasury was empty and credit exhausted, and worse still—for spirit and enthusiasm, as in 1794, would have remedied material deficiencies—the conscripts obtained under Jourdan's law of 1798 (see CONSCRIPTION) came to their regiments most unwillingly. Most of them, indeed, deserted on the way to join the colours. A large draft sent to the Army of Italy arrived with 310 men instead of 10,250, and after a few such experiences, the First Consul decided that the untrained men were to be assembled in the fortresses of the interior and afterwards sent to the active battalions in numerous small drafts, which they could more easily assimilate. Besides accomplishing the immense task of reorganizing existing forces, he created new ones, including the Consular Guard, and carried out at this moment of crisis two such far-reaching reforms as the replacement of the civilian drivers of the artillery by soldiers, and of the hired teams by horses belonging to the state, and the permanent grouping of divisions in army corps.

As early as the 25th of January 1800 the First Consul provided for the assembly of all available forces in the interior in an "Army of Reserve." He reserved to himself the command of this army,[1] which gradually came into being as the pacification of Vendée and the return of some of Brune's troops from Holland set free the necessary nucleus troops. The conscription law was stringently re-enforced, and impassioned calls were made for volunteers (the latter, be it said, did not produce five hundred useful men). The district of Dijon, partly as being central with respect to the Rhine and Italian Armies, partly as being convenient for supply purposes, was selected as the zone of assembly. Chabran's division was formed from some depleted corps of the Army of Italy and from the depots of those in Egypt. Chambarlhac's, chiefly of young soldiers, lost 5% of its numbers on the way to Dijon from desertion—a loss which appeared slight and even satisfactory after the wholesale *débandade* of the winter months. Lechi's Italian legion was newly formed from Italian refugees. Boudet's division was originally assembled from some of the southern garrison towns, but the units composing it were frequently changed up to the beginning of May. The cavalry was deficient in saddles, and many of its units were new formations. The Consular Guard of course was a *corps d'élite*, and this and two and a half infantry divisions and a cavalry brigade coming from the veteran "Army of the West" formed the real backbone of the army. Most of the newer units were not even armed till they had left Dijon for the front.

The Army of Reserve.

Such was the first constitution of the Army of Reserve. We can scarcely imagine one which required more accurate and detailed staff work to assemble it—correspondence with the district commanders, with the adjutant-generals of the various armies, and orders to the civil authorities on the lines of march, to the troops themselves and to the arsenals and magazines. No one but Napoleon, even aided by a Berthier, could have achieved so great a task in six weeks, and the great captain, himself doing the work that nowadays is apportioned amongst a crowd of administrative staff officers, still found time to administer France's affairs at home and abroad, and to think out a general plan of campaign that embraced Moreau's, Masséna's and his own armies.

The Army of the Rhine, by far the strongest and best equipped, lay on the upper Rhine. The small and worn-out Army of Italy was watching the Alps and the Apennines from Mont Blanc to Genoa. Between them Switzerland, secured by the victory of Zürich, offered a starting-point for a turning movement on either side—this year the advantage of the flank position was recognized and acted upon. The Army of Reserve was assembling around Dijon, within 200 m. of either theatre of war. The general plan was that the Army of Reserve should march through Switzerland to close on the right wing of the Army of the Rhine. Thus supported to whatever degree might prove to be necessary, Moreau was to force the passage of the Rhine about Schaffhausen, to push back the Austrians rapidly beyond the Lech, and then, if they took the offensive in turn, to hold them in check for ten or twelve days. During this period of guaranteed freedom the decisive movement was to be made. The Army of Reserve, augmented by one large corps of the Army of the Rhine, was to descend by the Splügen (alternatively by the St Gothard and even by Tirol) into the plains of Lombardy. Magazines were to be established at Zürich and Lucerne (not at Chur, lest the plan should become obvious from the beginning), and all likely routes reconnoitred in advance. The Army of Italy was at first

to maintain a strict defensive, then to occupy the Austrians until the entry of the Reserve Army into Italy was assured, and finally to manœuvre to join it.

Moreau, however, owing to want of horses for his pontoon train and also because of the character of the Rhine above Basel, preferred to cross below that place, especially as in Alsace there were considerably greater supply facilities than in a country which had already been fought over and stripped bare. With the greatest reluctance Bonaparte let him have his way, and giving up the idea of using the Splügen and the St Gothard, began to turn his attention to the more westerly passes, the St Bernard and the Simplon. It was not merely Moreau's scruples that led to this essential modification in the scheme. At the beginning of April the enemy took the offensive against Masséna. On the 8th Melas's right wing dislodged the French from the Mont Cenis, and most of the troops that had then reached Dijon were shifted southward to be ready for emergencies. By the 25th Berthier reported that Masséna was seriously attacked and that he might have to be supported by the shortest route. Bonaparte's resolution was already taken. He waited no longer for Moreau

[1] He afterwards appointed Berthier to command the Army of Reserve, but himself accompanied it and directed it, using Berthier as chief of staff.

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(who indeed so far from volunteering assistance, actually demanded it for himself). Convinced from the paucity of news that Masséna's army was closely pressed and probably severed from France, and feeling also that the Austrians were deeply committed to their struggle with the Army of Italy, he told Berthier to march with 40,000 men at once by way of the St Bernard unless otherwise advised. Berthier protested that he had only 25,000 effectives, and the equipment and armament was still far from complete—as indeed it remained to the end—but the troops marched, though their very means of existence were precarious from the time of leaving Geneva to the time of reaching Milan, for nothing could extort supplies and money from the sullen Swiss.

Napoleon's plan of campaign.

At the beginning of May the First Consul learned of the serious plight of the Army of Italy. Masséna with his right wing was shut up in Genoa, Suchet with the left wing driven back to the Var. Meanwhile Moreau had won a preliminary victory at Stokach, and the Army of Reserve had begun its movement to Geneva. With these data the plan of campaign took a clear shape at last—Masséna to resist as long as possible; Suchet to resume the offensive, if he could do so, towards Turin; the Army of Reserve to pass the Alps and to debouch into Piedmont by Aosta; the Army of the Rhine to send a strong force into Italy by the St Gothard. The First Consul left Paris on the 6th of May. Berthier went forward to Geneva, and still farther on the route magazines were established at Villeneuve and St-Pierre. Gradually, and with immense efforts, the leading troops of the long column[1] were passed over the St Bernard, drawing their artillery on sledges, on the 15th and succeeding days. Driving away small posts of the Austrian army, the advance guard entered Aosta on the 16th and Châtillon on the 18th, and the alarm was given. Melas, committed as he was to his Riviera campaign, began to look to his right rear, but he was far from suspecting the seriousness of his opponent's purpose.

Bard.

Infinitely more dangerous for the French than the small detachment that Melas opposed to them, or even the actual crossing of the pass, was the unexpected stopping power of the little fort of Bard. The advanced guard of the French appeared before it on the 19th, and after three wasted days the infantry managed to find a difficult mountain by-way and to pass round the obstacle. Ivrea was occupied on the 23rd, and Napoleon hoped to assemble the whole army there by the 27th. But except for a few guns that with infinite precautions were smuggled one by one through the streets of Bard, the whole of the artillery, as well as a detachment (under Chabran) to besiege the fort, had to be left behind. Bard surrendered on the 2nd of June, having delayed the infantry of the French army for four days and the artillery for a fortnight. The military situation in the last week of May, as it presented itself to the First Consul at Ivrea, was this. The Army of Italy under Masséna was closely besieged in Genoa, where provisions were running short, and the population so hostile that the French general placed his field artillery to sweep the streets. But Masséna was no ordinary general, and the First Consul knew that while Masséna lived the garrison would resist to the last extremity. Suchet was defending Nice and the Var by vigorous minor operations. The Army of Reserve, the centre of which had reached at Ivrea the edge of the Italian plains, consisted of four weak army corps under Victor, Duhesme, Lannes and Murat. There were still to be added to this small army of 34,000 effectives, Turreau's division, which had passed over the Mont Cenis and was now in the valley of the Dora Riparia, Moncey's corps of the Army of the Rhine, which had at last been extorted from Moreau and was due to pass the St Gothard before the end of May, Chabran's division left to besiege Bard, and a small force under Béthencourt, which was to cross the Simplon and to descend by Arona (this place proved in the event a second Bard and immobilized Béthencourt until after the decisive battle). Thus it was only the simplest part of Napoleon's task to concentrate half of his army at Ivrea, and he had yet to bring in the rest. The problem was to reconcile the necessity for time, which he wanted to ensure the maximum force being brought over the Alps, with the necessity for haste, in view of the impending fall of Genoa and the probability that once this conquest was achieved, Melas would bring back his 100,000 men into the Milanese to deal with the Army of Reserve. As early as the 14th of May he had informed Moncey that from Ivrea the Army of Reserve would move on Milan. On the 25th of May, in response to Berthier's request for guidance, the First Consul ordered Lannes (advanced guard) to push out on the Turin road, "in order to deceive the enemy and to obtain news of Turreau," and Duhesme's and Murat's corps to proceed along the Milan road. On the 27th, after Lannes had on the 26th defeated an Austrian column near Chivasso, the main body was already advancing on Vercelli.

The march to Milan.

Very few of Napoleon's acts of generalship have been more criticized than this resolution to march on Milan, which abandoned Genoa to its fate and gave Melas a week's leisure to assemble his scattered forces. The account of his motives he dictated at St Helena (*Nap. Correspondence*, v. 39, pp. 375-377), in itself an unconvincing appeal to the rules of strategy as laid down by the theorists—which rules his own practice throughout transcended—gives, when closely examined, some at least of the deliberately set aside. Having done so, for reasons that will appear in the sequel, he could only defend it by saying in effect that he might have been defeated—which was true, but not the Napoleonic principle of war. Of the alternatives, one was to hasten to Genoa; this in Napoleon's eyes would have been playing the enemy's game, for they would have concentrated at Alessandria, facing west "in their natural position." It is equally obvious that thus the enemy would have played *his* game, supposing that this was to relieve Genoa, and the implication is that it was not. The third course, which Napoleon took, and in this memorandum defended, gave his army the enemy's depots at Milan, of which it unquestionably stood in sore need, and the reinforcement of Moncey's 15,000 men from the Rhine, while at the same time Moncey's route offered an "assured line of retreat" by the Simplon[1] and the St Gothard. He would in fact make for himself there a "natural position" without forfeiting the advantage of being in Melas's rear. Once possessed of Milan, Napoleon says, he could have engaged Melas with a light heart and with confidence in the greatest possible results of a victory, whether the Austrians sought to force their way back to the east by the right or the left bank of the Po, and he adds that if the French passed on and concentrated south of the Po there would be no danger to the Milan-St Gothard line of retreat, as this was secured by the rivers Ticino and Sesia. In this last, as we shall see, he is shielding an undeniable mistake, but considering for the moment only the movement to Milan, we are justified in assuming that his object was not the relief of Genoa, but the most thorough defeat of Melas's field army, to which end, putting all sentiment aside, he treated the hard-pressed Masséna as a "containing force" to keep Melas occupied during the strategical deployment of the Army of Reserve. In the beginning he had told Masséna that he would "disengage" him, even if he had to go as far east as Trent to find a way into Italy. From the first, then, no direct relief was intended, and when, on hearing bad news from the Riviera, he altered his route to the more westerly passes, it was probably because he felt that Masséna's containing power was almost exhausted, and that the passage and reassembly of the Reserve Army must be brought about in the minimum time and by the shortest way. But the object was still the defeat of Melas, and for this, as the Austrians possessed an enormous numerical superiority, the assembly of all forces, including Moncey's, was indispensable. One essential condition of this was that the points of passage used should be out of reach of the enemy. The more westerly the passes chosen, the more dangerous was the whole operation—in fact the Mont Cenis column never reached him at all—and though his expressed objections to the St Bernard line seem, as we have said, to be written after the event, to disarm his critics, there is no doubt that at the time he disliked it. It was a *pis aller* forced upon him by Moreau's delay and Masséna's extremity, and from the moment at which he arrived at Milan he did, as a fact, abandon it altogether in favour of the St Gothard. Lastly, so strongly was he impressed with the necessity of completing the deployment of all his forces, that though he found the Austrians on the Turin side much scattered and could justifiably expect a series of rapid

[1] Only one division of the main body used the Little St Bernard.

[1] When he made his decision he was unaware that Béthencourt had been held up at Arona.

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partial victories, Napoleon let them go, and devoted his whole energy to creating for himself a "natural" position about Milan. If he sinned, at any rate he sinned handsomely, and except that he went to Milan by Vercelli instead of by Lausanne and Domodossola [1] (on the safe side of the mountains), his march is logistically beyond cavil.

Napoleon's immediate purpose, then, was to reassemble the Army of Reserve in a zone of manœuvre about Milan. This was carried out in the first days of June. Lannes at Chivasso stood ready to ward off a flank attack until the main army had filed past on the Vercelli road, then leaving a small force to combine with Turreau (whose column had not been able to advance into the plain) in demonstrations towards Turin, he moved off, still acting as right flank guard to the army, in the direction of Pavia. The main body meanwhile, headed by Murat, advanced on Milan by way of Vercelli and Magenta, forcing the passage of the Ticino on the 31st of May at Turbigo and Buffalora. On the same day the other divisions closed up to the Ticino,[2] and faithful to his principles Napoleon had an examination made of the little fortress of Novara, intending to occupy it as a *place du moment* to help in securing his zone of manœuvre. On the morning of the 2nd of June Murat occupied Milan, and in the evening of the same day the headquarters entered the great city, the Austrian detachment under Vukassovich (the flying right wing of Melas's general cordon system in Piedmont) retiring to the Adda. Duhesme's corps forced that river at Lodi, and pressed on with orders to organize Crema and if possible Orzinovi as temporary fortresses. Lecchi's Italians were sent towards Bergamo and Brescia. Lannes meantime had passed Vercelli, and on the evening of the 2nd his cavalry reached Pavia, where, as at Milan, immense stores of food, equipment and warlike stores were seized.

Napoleon was now safe in his "natural" position, and barred one of the two main lines of retreat open to the Austrians. But his ambitions went further, and he intended to cross the Po and to establish himself on the other likewise, thus establishing across the plain a complete barrage between Melas and Mantua. Here his end outranged his means, as we shall see. But he gave himself every chance that rapidity could afford him, and the moment that some sort of a "zone of manœuvre" had been secured between the Ticino and the Oglio, he pushed on his main body—or rather what was left after the protective system had been provided for—to the Po. He would not wait even for his guns, which had at last emerged from the Bard defile and were ordered to come to Milan by a safe and circuitous route along the foot of the Alps.

Melas's movements.

At this point the action of the enemy began to make itself felt. Melas had not gained the successes that he had expected in Piedmont and on the Riviera, thanks to Massena's obstinacy and to Suchet's brilliant defence of the Var. These operations had led him very far afield, and the protection of his over-long line of communications had caused him to weaken his large army by throwing off many detachments to watch the Alpine valleys on his right rear. One of these successfully opposed Turreau in the valley of the Dora Riparia, but another had been severely handled by Lannes at Chivasso, and a third (Vukassovich) found itself, as we know, directly in the path of the French as they moved from Ivrea to Milan, and was driven far to the eastward. He was further handicapped by the necessity of supporting Ott before Genoa and Elsnitz on the Var, and hearing of Lannes's bold advance on Chivasso and of the presence of a French column with artillery (Turreau) west of Turin, he assumed that the latter represented the main body of the Army of Reserve—in so far indeed as he believed in the existence of that army at all.[3] Next, when Lannes moved away towards Pavia, Melas thought for a moment that fate had delivered his enemy into his hands, and began to collect such troops as were at hand at Turin with a view to cutting off the retreat of the French on Ivrea while Vukassovich held them in front. It was only when news came of Moncey's arrival in Italy and of Vukassovich's fighting retreat on Brescia that the magnitude and purpose of the French column that had penetrated by Ivrea became evident. Melas promptly decided to give up his western enterprises, and to concentrate at Alessandria, preparatory to breaking his way through the network of small columns—as the disseminated Army of Reserve still appeared to be—which threatened to bar his retreat. But orders circulated so slowly that he had to wait in Turin till the 8th of June for Elsnitz, whose retreat was, moreover, sharply followed up and made exceedingly costly by the enterprising Suchet. Ott, too, in spite of orders to give up the siege of Genoa at once and to march with all speed to hold the Alessandria-Piacenza road, waited two days to secure the prize, and agreed (June 4) to allow Massena's army to go free and to join Suchet. And lastly, the cavalry of O'Reilly, sent on ahead from Alessandria to the Stradella defile, reached that point only to encounter the French. The barrage was complete, and it remained for Melas to break it with the mass that he was assembling, with all these misfortunes and delays, about Alessandria. His chances of doing so were anything but desperate.

On the 5th of June Murat, with his own corps and part of Duhesme's, had moved on Piacenza, and stormed the bridge-head there. Duhesme with one of his divisions pushed out on Crema and Orzinovi and also towards Pizzighetone. Moncey's leading regiments approached Milan, and Berthier thereupon sent on Victor's corps to support Murat and Lannes. Meantime the half abandoned line of operations, Ivrea-Vercelli, was briskly attacked by the Austrians, who had still detachments on the side of Turin, waiting for Elsnitz to rejoin, and the French artillery train was once more checked. On the 6th Lannes from Pavia, crossing the Po at San Cipriano, encountered and defeated a large force, (O'Reilly's column), and barred the Alessandria-Parma main road. Opposite Piacenza Murat had to spend the day in gathering material for his passage, as the pontoon bridge had been cut by the retreating garrison of the bridge-head. On the eastern border of the "zone of manœuvre" Duhesme's various columns moved out towards Brescia and Cremona, pushing back Vukassovich. Meantime the last divisions of the Army of Reserve (two of Moncey's excepted) were hurried towards Lannes's point of passage, as Murat had not yet secured Piacenza. On the 7th, while Duhesme continued to push back Vukassovich and seized Cremona, Murat at last captured Piacenza, finding there immense magazines. Meantime the army division by division, passed over, slowly owing to a sudden flood, near Belgiojoso, and Lannes's advanced guard was ordered to open communication with Murat along the main road Stradella-Piacenza. "Moments are precious" said the First Consul. He was aware that Elsnitz was retreating before Suchet, that Melas had left Turin for Alessandria, and that heavy forces of the enemy were at or east of Tortona. He knew, too, that Murat had been engaged with certain regiments recently before Genoa and (wrongly) assumed O'Reilly's column, beaten by Lannes at San Cipriano, to have come from the same quarter. Whether this meant the deliverance or the surrender of Genoa he did not yet know, but it was certain that Massena's holding action was over, and that Melas was gathering up his forces to recover his communications. Hence Napoleon's great object was concentration. "Twenty thousand men at Stradella," in his own words, was the goal of his efforts, and with the accomplishment of this purpose the campaign enters on a new phase.

On the 8th of June, Lannes's corps was across, Victor following as quickly as the flood would allow. Murat was at Piacenza, but the road between Lannes and Murat was not known to be clear, and the First Consul made the establishment of the

[1] This may be accounted for by the fact that Napoleon's mind was not yet definitively made up when his advanced guard had already begun to climb the St Bernard (12th). Napoleon's instructions for Moncey were written on the 14th. The magazines, too, had to be provided and placed before it was known whether Moreau's detachment would be forthcoming.

[2] Six guns had by now passed Fort Bard and four of these were with Murat and Duhesme, two with Lannes.

[3] It is supposed that the foreign spies at Dijon sent word to their various employers that the Army was a bogy. In fact a great part of it never entered Dijon at all, and the troops reviewed there by Bonaparte were only conscripts and details. By the time that the veteran divisions from the west and Paris arrived, either the spies had been ejected or their news was sent off too late to be of use.

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connexion, and the construction of a third point of passage midway between the other two, the principal objects of the day's work. The army now being disseminated between the Alps, the Apennines, the Ticino and the Chiese, it was of vital importance to connect up the various parts into a well-balanced system. But the Napoleon of 1800 solved the problem that lay at the root of his strategy, "concentrate, but be vulnerable nowhere," in a way that compares unfavourably indeed with the methods of the Napoleon of 1806. Duhesme was still absent at Cremona. Lechi was far away in the Brescia country, Béthencourt detained at Arona. Moncey with about 15,000 men had to cover an area of 40 m. square around Milan, which constituted the original zone of manœuvre, and if Melas chose to break through the flimsy cordon of outposts on this side (the risk of which was the motive for detaching Moncey at all) instead of at the Stradella, it would take Moncey two days to concentrate his force on any battlefield within the area named, and even then he would be outnumbered by two to one. As for the main body at the Stradella, its position was wisely chosen, for the ground was too cramped for the deployment of the superior force that Melas might bring up, but the strategy that set before itself as an object 20,000 men at the decisive point out of 50,000 available, is, to say the least, imperfect. The most serious feature in all this was the injudicious order to Lannes to send forward his advanced guard, and to attack whatever enemy he met with on the road to Voghera. The First Consul, in fact, calculated that Melas could not assemble 20,000 men at Alessandria before the 12th of June, and he told Lannes that if he met the Austrians towards Voghera, they could not be more than 12,000 strong. later order betrays some anxiety as to the exactitude of these assumptions, warns Lannes not to let himself be surprised, indicates his line of retreat, and, instead of ordering him to advance on Voghera, authorizes him to attack any corps that presented itself at Stradella. But all this came too late. Acting on the earlier order Lannes fought the battle of Montebello on the 9th. This was a very severe running fight, beginning east of Casteggio and ending at Montebello, in which the French drove the Austrians from several successive positions, and which culminated in a savage fight at close quarters about Montebello itself. The singular feature of the battle is the disproportion between the losses on either side —French, 500 out of 12,000 engaged; Austrians, 2100 killed and wounded and 2100 prisoners out of 14,000. These figures are most conclusive evidence of the intensity of the French military spirit in those days. One of the two divisions (Watrin's) was indeed a veteran organization, but the other, Chambarlhac's, was formed of young troops and was the same that, in the march to Dijon, had congratulated itself that only 5% of its men had deserted. On the other side the soldiers fought for "the honour of their arms"—not even with the courage of despair, for they were ignorant of the "strategic barrage" set in front of them by Napoleon, and the loss of their communications had not as yet lessened their daily rations by an ounce.

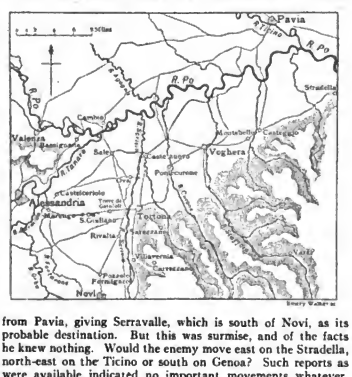
Napoleon's dispositions.

Montebello.

Meanwhile, Napoleon had issued orders for the main body to stand fast, and for the detachments to take up their definitive covering positions. Duhesme's corps was directed, from its eastern foray, to Piacenza, to join the main body. Moncey was to provide for the defence of the Ticino line, Lechi to form a "flying camp" in the region of Orzinovi-Brescia and Cremona, and another mixed brigade was to control the Austrians in Pizzighetone and in the citadel of Piacenza. On the other side of the Po, between Piacenza and Montebello, was the main body (Lannes, Murat and part of Victor's and Duhesme's corps), and a flank guard was stationed near Pavia, with orders to keep on the right of the army as it advanced (this is the first and only hint of any intention to go westward) and to fall back fighting should Melas come on by the left bank. One division was to be always a day's march behind the army on the right bank, and a flotilla was to ascend the Po, to facilitate the speedy reinforcement of the flank guard. Farther to the north was a small column on the road Milan-Vercelli. All the protective troops, except the division of the main body detailed as an eventual support for the flank guard, was to be found by Moncey's corps (which had besides to watch the Austrians in the citadel of Milan) and Chabran's and Lechi's weak commands. On this same day Bonaparte tells the Minister of War, Carnot, that Moncey has only brought half the expected reinforcements and that half of these are unreliable. As to the result of the impending contest Napoleon counts greatly upon the union of 18,000 men under Masséna and Suchet to crush Melas against the "strategic barrage" of the Army of Reserve, by one or other bank of the Po, and he seems equally confident of the result in either case. If Genoa had held out three days more, he says, it would have been easy to count the number of Melas's men who escaped. The exact significance of this last notion is difficult to establish, and all that could be written about it would be merely conjectural. But it is interesting to note that, without admitting it, Napoleon felt that his "barrage" might not stand before the flood. The details of the orders of the 9th to the main body (written before the news of Montebello arrived at headquarters) tend to the closest possible concentration of the main body towards Casteggio, in view of a decisive battle on the 12th or 13th.

But another idea had begun to form itself in his mind. Still believing that Melas would attack him on the Stradella side, and hastening his preparations to meet this, he began to allow for the contingency of Melas giving up or failing in his attempt to re-establish his communication with the Mantovese, and retiring on Genoa, which was now in his hands and could be provisioned and reinforced by sea. On the 10th Napoleon ordered reserve ammunition to be sent from Pavia, giving Serravalle, which is south of Novi, as its probable destination. But this was surmise, and of the facts he knew nothing. Would the enemy move east on the Stradella, north-east on the Ticino or south on Genoa? Such reports as were available indicated no important movements whatever, which happened to be true, but could hardly appear so to the French headquarters. On the 11th, though he thereby forfeited the reinforcements coming up from Duhesme's corps at Cremona, Napoleon ordered the main body to advance to the Scrivia. Lapoype's division (the right flank guard), which was observing the Austrian posts towards Casale, was called to the south bank of the Po, the zone around Milan was stripped so bare of troops that there was no escort for the prisoners taken at Montebello, while information sent by Chabran (now moving up from Ivrea) as to the construction of bridges at Casale (this was a feint made by Melas on the 10th) passed unheeded. The crisis was at hand, and, clutching at the reports collected by Lapoype as to the quietude of the Austrians toward Valenza and Casale, Bonaparte and Berthier strained every nerve to bring up more men to the

Napoleon's advance.



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Voghera side in the hope of preventing the prey from slipping away to Genoa.

On the 12th, consequently, the army (the *ordre de bataille* of which had been considerably modified on the 11th) moved to the Scrivia, Lannes halting at Castelnuovo, Desaix (who had just joined the army from Egypt) at Pontecurone, Victor at Tortona with Murat's cavalry in front towards Alessandria. Lapoype's division, from the left bank of the Po, was marching in all haste to join Desaix. Moncey, Duhesme, Lechi and Chabran were absent. The latter represented almost exactly half of Berthier's command (30,000 out of 58,000), and even the concentration of 28,000 men on the Scrivia had only been obtained by practically giving up the "barrage" on the left bank of the Po. Even now the enemy showed nothing but a rearguard, and the old questions reappeared in a new and acute form. Was Melas still in Alessandria? Was he marching on Valenza and Casale to cross the Po? or to Acqui against Suchet, or to Genoa to base himself on the British fleet? As to the first, why had he given up his chances of fighting on one of the few cavalry battlegrounds in north Italy—the plain of Marengo—since he could not stay in Alessandria for any indefinite time? The second question had been answered in the negative by Lapoype, but his latest information was thirty-six hours old. As for the other questions, no answer whatever was forthcoming, and the only course open was to postpone decisive measures and to send forward the cavalry, supported by infantry, to gain information.

On the 13th, therefore, Murat, Lannes and Victor advanced into the plain of Marengo, traversed it without difficulty and carrying the villages held by the Austrian rearguard, established themselves for the night within a mile of the fortress. But meanwhile Napoleon, informed we may suppose of their progress, had taken a step that was fraught with the gravest consequences. He had, as we know, no intention of forcing on a decision until his reconnaissance produced the information on which to base it, and he had therefore kept back three divisions under Desaix at Pontecurone. But as the day wore on without incident, he began to fear that the reconnaissance would be profitless, and unwilling to give Melas any further start, he sent out these divisions right and left to find and to hold the enemy, whichever way the latter had gone. At noon Desaix with one division was despatched southward to Rivalta to head off Melas from Genoa and at 9 A.M. on the 14th,[1] Lapoype was sent back over the Po to hold the Austrians should they be advancing from Valenza towards the Ticino. Thus there remained in hand only 21,000 men when at last, in the forenoon of the 14th the whole of Melas's army, more than 40,000 strong, moved out of Alessandria, not southward nor northward, but due west into the plain of Marengo (*q.v.*). The extraordinary battle that followed is described elsewhere. The outline of it is simple enough. The Austrians advanced slowly and in the face of the most resolute opposition, until their attack had gathered weight, and at last they were carrying all before them, when Desaix returned from beyond Rivalta and initiated a series of counterstrokes. These were brilliantly successful, and gave the French not only local victory but the supreme self-confidence that, next day, enabled them to extort from Melas an agreement to evacuate all Lombardy as far as the Mincio. And though in this way the chief prize, Melas's army, escaped after all, Marengo was the birthday of the First Empire.

Marengo.

One more blow, however, was required before the Second Coalition collapsed, and it was delivered by Moreau. We have seen that he had crossed the upper Rhine and defeated Kray at Stokach. This was followed by other partial victories, and Kray then retired to Ulm, where he reassembled his forces, hitherto scattered in a long weak line from the Neckar to Schaffhausen. Moreau continued his advance, extending his forces up to and over the Danube below Ulm, and winning several combats, of which the most important was that of Höchstädt, fought on the famous battlegrounds of 1703 and 1704, and memorable for the death of La Tour d'Auvergne, the "First Grenadier of France" (June 19). Finding himself in danger of envelopment, Kray now retired, swiftly and skilfully, across the front of the advancing French, and reached Ingolstadt in safety. Thence he retreated over the Inn, Moreau following him to the edge of that river, and an armistice put an end for the moment to further operations.

This not resulting in a treaty of peace, the war was resumed both in Italy and in Germany. The Army of Reserve and the Army of Italy, after being fused into one, under Masséna's command, were divided again into a fighting army under Brune, who opposed the Austrians (Bellegarde) on the Mincio, and a political army under Murat, which re-established French influence in the Peninsula. The former, extending on a wide front as usual, won a few strategical successes without tactical victory, the only incidents of which worth recording are the gallant fight of Dupont's division, which had become isolated during a manœuvre, at Pozzolo on the Mincio (December 25) and the descent of a corps under Macdonald from the Grisons by way of the Splügen, an achievement far surpassing Napoleon's and even Suvárov's exploits, in that it was made after the winter snows had set in.

In Germany the war for a moment reached the sublime. Kray had been displaced in command by the young archduke John, who ordered the denunciation of the armistice and a general advance. His plan, or that of his advisers, was to cross the lower Inn, out of reach of Moreau's principal mass, and then to swing round the French flank until a complete chain was drawn across their rear. But during the development of the manœuvre, Moreau also moved, and by rapid marching made good the time he had lost in concentrating his over-dispersed forces. The weather was appalling, snow and rain succeeding one another until the roads were almost impassable. On the 2nd of December the Austrians were brought to a standstill, but the inherent mobility of the Revolutionary armies enabled them to surmount all difficulties, and thanks to the respite afforded him by the archduke's halt, Moreau was able to see clearly into the enemy's plans and dispositions. On the 3rd of December, while the Austrians in many disconnected columns were struggling through the dark and muddy forest paths about Hohenlinden, Moreau struck the decisive blow. While Ney and Grouchy held fast the head of the Austrian main column at Hohenlinden, Richepanse's corps was directed on its left flank. In the forest Richepanse unexpectedly met a subsidiary Austrian column which actually cut his column in two. But profiting by the momentary confusion he drew off that part of his forces which had passed beyond the point of contact and continued his march, striking the flank of the archduke's main column, most of which had not succeeded in deploying opposite Ney, at the village of Mattempost. First the baggage train and then the artillery park fell into his hands, and lastly he reached the rear of the troops engaged opposite Hohenlinden, whereupon the Austrian main body practically dissolved. The rear of Richepanse's corps, after disengaging itself from the Austrian column it had met in the earlier part of the day, arrived at Mattempost in time to head off thousands of fugitives who had escaped from the carnage at Hohenlinden. The other columns of the unfortunate army were first checked and then driven back by the French divisions they met, which, moving more swiftly and fighting better in the broken ground and the woods, were able to combine two brigades against one wherever a fight developed. On this disastrous day the Austrians lost 20,000 men, 12,000 of them being prisoners, and 90 guns.

Hohenlinden.

Marengo and Hohenlinden decided the war of the Second Coalition as Rivoli had decided that of the First, and the Revolutionary Wars came to an end with the armistice of Steyer (December 25, 1800) and the treaty of Lunéville (February 9, 1801). But only the first act of the great drama was accomplished. After a short respite Europe entered upon the Napoleonic Wars.

[1] On the strength of a report, false as it turned out, that the Austrian rearguard had broken the bridges of the Bormida.

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NAVAL OPERATIONS

The naval side of the wars arising out of the French Revolution was marked by unity, and even by simplicity. France had but one serious enemy, Great Britain, and Great Britain had but one purpose, to beat down France. Other states were drawn into the strife, but it was as the allies, the enemies and at times the victims, of the two dominating powers. The field of battle was the whole expanse of the ocean and the landlocked seas. The weapons, the methods and the results were the same. When a general survey of the whole struggle is taken, its unity is manifest. The Revolution produced a profound alteration in the government of France, but none in the final purposes of its policy. To secure for France its so-called "natural limits"—the Rhine, the Alps, the Pyrenees and the ocean; to protect both flanks by reducing Holland on the north and Spain on the south to submission; to confirm the mighty power thus constituted, by the subjugation of Great Britain, were the objects of the Republic and of Napoleon, as they had been of Louis XIV. The naval war, like the war on land, is here considered in the first of its two phases—the Revolutionary (1792–99). (For the Napoleonic phase (1800–15), see NAPOLEONIC CAMPAIGNS.)

The Revolutionary war began in April 1792. In the September of that year Admiral Truguet sailed from Toulon to co-operate with the French troops operating against the Austrians and their allies in northern Italy. In December Latouche Tréville was sent with another squadron to cow the Bourbon rulers of Naples. The extreme feebleness of their opponents alone saved the French from disaster. Mutinies, which began within ten days of the storming of the Bastille (14th of July 1789), had disorganized their navy, and the effects of these disorders continued to be felt so long as the war lasted. In February 1793 war broke out with Great Britain and Holland. In March Spain was added to the list of the powers against which France declared war. Her resources at sea were wholly inadequate to meet the coalition she had provoked. The Convention did indeed order that fifty-two ships of the line should be commissioned in the Channel, but it was not able in fact to do more than send out a few diminutive and ill-appointed squadrons, manned by mutinous crews, which kept close to the coast. The British navy was in excellent order, but the many calls made on it for the protection of world-wide commerce and colonial possessions caused the operations in the Channel to be somewhat languid. Lord Howe cruised in search of the enemy without being able to bring them to action. The severe blockade which in the later stages of the war kept the British fleet permanently outside of Brest was not enforced in the earlier stages. Lord Howe preferred to save his fleet from the wear and tear of perpetual cruising by maintaining his headquarters at St Helens, and keeping watch on the French ports by frigates. The French thus secured a freedom of movement which in the course of 1794 enabled them to cover the arrival of a great convoy laden with food from America (see FIRST OF JUNE, BATTLE OF). This great effort was followed by a long period of languor. Its internal defects compelled the French fleet in the Channel to play a very poor part till the last days of 1796. Squadrons were indeed sent a short way to sea, but their inefficiency was conspicuously displayed when, on the 17th of June 1795, a much superior number of their line of battle ships failed to do any harm to the small force of Cornwallis, and when on the 22nd of the same month they fled in disorder before Lord Bridport at the Isle de Groix.

Operations of a more decisive character had in the meantime taken place both in the Mediterranean and in the West Indies. In April 1793 the first detachment of a British fleet, which was finally raised to a strength of 21 sail of the line, under the command of Lord Hood, sailed for the Mediterranean. By August the admiral was off Toulon, acting in combination with a Spanish naval force. France was torn by the contentions of Jacobins and Girondins, and its dissensions led to the surrender of the great arsenal to the British admiral and his Spanish colleague Don Juan de Lángara, on the 27th of August. The allies were joined later by a contingent from Naples. But the military forces were insufficient to hold the land defences against the army collected to expel them. High ground commanding the anchorage was occupied by the besieging force, and on the 18th of December 1793 the allies retired. They carried away or destroyed thirty-three French vessels, of which thirteen were of the line. But partly through the inefficiency and partly through the ill-will of the Spaniards, who were indisposed to cripple the French, whom they considered as their only possible allies against Great Britain, the destruction was not so complete as had been intended. Twenty-five ships, of which eighteen were of the line, were left to serve as the nucleus of an active fleet in later years. Fourteen thousand of the inhabitants fled with the allies to escape the vengeance of the victorious Jacobins. Their sufferings, and the ferocious massacre perpetrated on those who remained behind by the conquerors, form one of the blackest pages of the French Revolution. The Spanish fleet took no further part in the war. Lord Hood now turned to the occupation of Corsica, where the intervention of the British fleet was invited by the patriotic party headed by Pascual Paoli. The French ships left at Toulon were refitted and came to sea in the spring of 1794, but Admiral Martin who commanded them did not feel justified in giving battle, and his sorties were mere demonstrations. From the 25th of January 1794 till November 1796 the British fleet in the Mediterranean was mainly occupied in and about Corsica, securing the island, watching Toulon and co-operating with the allied Austrians and Piedmontese in northern Italy. It did much to hamper the coastwise communications of the French. But neither Lord Hood, who went home at the end of 1794, nor his indolent successor Hotham, was able to deliver an effective blow at the Toulon squadron. The second of these officers fought two confused actions with Admiral Martin in the Gulf of Lyons on the 16th of March and the 12th of July 1795, but though three French ships were cut off and captured, the baffling winds and the placid disposition of Hotham united to prevent decisive results. A new spirit was introduced into the command of the British fleet when Sir John Jervis, afterwards Earl Saint Vincent, succeeded Hotham in November 1795.

Jervis came to the Mediterranean with a high reputation, which had been much enhanced by his recent command in the West Indies. In every war with France it was the natural policy

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of the British government to seize on its enemy's colonial possessions, not only because of their intrinsic value, but because they were the headquarters of active privateers. The occupation of the little fishing stations of St Pierre and Miquelon (14th May 1793) and of Pondicherry in the East Indies (23rd Aug. 1793) were almost formal measures taken at the beginning of every war. But the French West Indian islands possessed intrinsic strength which rendered their occupation a service of difficulty and hazard. In 1793 they were torn by dissensions, the result of the revolution in the mother country. Tobago was occupied in April, and the French part of the great island of San Domingo was partially thrown into British hands by the Creoles, who were threatened by their insurgent slaves. During 1794 a lively series of operations, in which there were some marked alternations of fortune, took place in and about Martinique and Guadaloupe. The British squadron, and the contingent of troops it carried, after a first repulse, occupied them both in March and April, together with Santa Lucia. A vigorous counter-attack was carried out by the Terrorist Victor Hugues with ability and ferocity. Guadaloupe and Santa Lucia were recovered in August. Yet on the whole the British government was successful in its policy of destroying the French naval power in distant seas. The seaborne commerce of the Republic was destroyed.

The naval supremacy of Great Britain was limited, and was for a time menaced, in consequence of the advance of the French armies on land. The invasion of Holland in 1794 led to the downfall of the house of Orange, and the establishment of the Batavian Republic. War with Great Britain under French dictation followed in January 1795. In that year a British expedition under the command of Admiral Keith Elphinstone (afterwards Lord Keith) occupied the Dutch colony at the Cape (August–September) and their trading station in Malacca. The British colonial empire was again extended, and the command of the sea by its fleet confirmed. But the necessity to maintain a blockading force in the German Ocean imposed a fresh strain on its naval resources, and the hostility of Holland closed a most important route to British commerce in Europe. In 1795 Spain made peace with France at Basel, and in September 1796 re-entered the war as her ally. The Spanish navy was most inefficient, but it required to be watched and therefore increased the heavy strain on the British fleet. At the same time the rapid advance of the French arms in Italy began to close the ports of the peninsula to Great Britain. Its ships were for a time withdrawn from the Mediterranean. Poor as it was in quality, the Spanish fleet was numerous. It was able to facilitate the movements of French squadrons sent to harass British commerce in the Atlantic, and a concentration of forces became necessary.

It was henceforth more important because the cherished French scheme for an attack on the heart of the British empire began to take shape. While Spain occupied one part of the British fleet to the south, and Holland another in the north, a French expedition, which was to have been aided by a Dutch expedition from the Texel, was prepared at Brest. The Dutch were confined to harbour by the vigilant blockade of Admiral Duncan, afterwards Lord Camperdown. But in December 1796 a French fleet commanded by Admiral Morard de Galle, carying 13,000 troops under General Hoche, was allowed to sail from Brest for Ireland, by the slack management of the blockade under Admiral Colpoys. Being ill-fitted, ill-manned and exposed to constant bad weather the French ships were scattered. Some reached their destination, Bantry Bay, only to be driven out again by north-easterly gales. The expedition finally returned after much suffering, and in fragments, to Brest. Yet the year 1797 was one of extreme trial to Great Britain. The victory of Sir John Jervis over the Spaniards near Cape Saint Vincent on the 14th of February (see SAINT VINCENT, BATTLE OF) disposed of the Spanish fleet. In the autumn of the year the Dutch, having put to sea, were defeated at Camperdown by Admiral Duncan on the 11th of October. Admiral Duncan had the more numerous force, sixteen ships to fifteen, and they were on the average heavier. Attacking from windward he broke through the enemy's line and concentrated on his rear and centre. Eight line of battleships and two frigates were taken, but the good gunnery and steady resistance of the Dutch made the victory costly. Between these two battles the British fleet was for a time menaced in its very existence by a succession of mutinies, the result of much neglect of the undoubted grievances of the sailors. The victory of Camperdown, completing what the victory of Cape Saint Vincent had begun, seemed to put Great Britain beyond fear of invasion. But the government of the Republic was intent on renewing the attempt. The successes of Napoleon at the head of the army of Italy had reduced Austria to sign the peace of Campo Formio, on the 17th of October 1797, and he was appointed commander of the new army of invasion. It was still thought necessary to maintain the bulk of the British fleet in European waters, within call in the ocean. The Mediterranean was left free to the French, whose squadrons cruised in the Levant, where the Republic had become possessed of the Ionian Islands by the plunder of Venice. The absence of a British force in the Mediterranean offered to the government of the French Republic an alternative to an invasion of Great Britain or Ireland, which promised to be less hazardous and equally effective. It was induced largely by the persuasion of Napoleon himself, and the wish of the politicians who were very willing to see him employed at a distance. The expedition to Egypt under his command sailed on the 19th of May 1798, having for its immediate purpose the occupation of the Nile valley, and for its ultimate aim an attack on Great Britain "from behind" in India (see NILE, BATTLE OF THE). The British fleet re-entered the Mediterranean to pursue and baffle Napoleon. The destruction of the French squadron at the anchorage of Aboukir on the 1st of August gave it the complete command of the sea. A second invasion of Ireland on a smaller scale was attempted and to some extent carried out, while the great attack by Egypt was in progress. One French squadron of four frigates carrying 1150 soldiers under General Humbert succeeded in sailing from Rochefort on the 6th of August. On the 22nd Humbert was landed at Killala Bay, but after making a vigorous raid he was compelled to surrender at Ballinamuck on the 8th of September. Eight days after his surrender, another French squadron of one sail of the line and eight frigates carrying 3000 troops, sailed from Brest under Commodore Bompart to support Humbert. It was watched and pursued by frigates, and on the 12th of October was overtaken and destroyed by a superior British force commanded by Sir John Borlase Warren, near Tory Island.

From the close of 1798 till the *coup d'état* of the 18th Brumaire (9th November) 1799, which established Napoleon as First Consul and master of France, the French navy had only one object—to reinforce and relieve the army cut off in Egypt by the battle of the Nile. The relief of the French garrison in Malta was a subordinate part of the main purpose. But the supremacy of the British navy was by this time so firmly founded that neither Egypt nor Malta could be reached except by small ships which ran the blockade. On the 25th of April, Admiral Bruix did indeed leave Brest, after baffling the blockading fleet of Lord Bridport, which was sent on a wild-goose chase to the south of Ireland by means of a despatch sent out to be captured and to deceive. Admiral Bruix succeeded in reaching Toulon, and his presence in the Mediterranean caused some disturbance. But, though his twenty-five sail of the line formed the best-manned fleet which the French had sent to sea during the war, and though he escaped being brought to battle, he did not venture to steer for the eastern Mediterranean. On the 13th of August he was back at Brest, bringing with him a Spanish squadron carried off as a hostage for the fidelity of the government at Madrid to its disastrous alliance with France. On the day on which Bruix re-entered Brest, the 13th of August 1799, a combined Russian and British expedition sailed from the Downs to attack the French army of occupation in the Batavian Republic. The military operations were unsuccessful, and terminated in the withdrawal of the allies. But the naval part was well executed. Vice-admiral Mitchell forced the entrance to the Texel, and on the 30th of August received the surrender of the remainder of the

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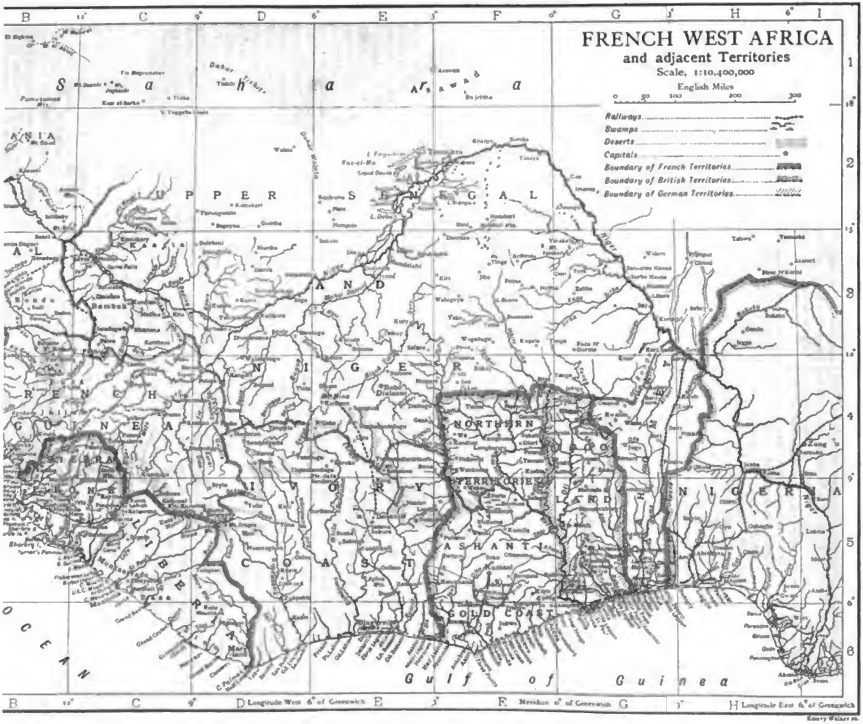
FRENCH WEST AFRICA
and adjacent Territories
Scale, 1:10,400,000
English Miles
0 50 100 200 300
Railways
Swamps
Deserts
Capitals
Boundary of French Territories
Boundary of British Territories
Boundary of German Territories
Sahara
Atlantic
Ocean
Gulf of Guinea
UPPER SENEGAL AND NIGER
FRENCH GUINEA
SIERRA LEONE
LIBERIA
IVORY COAST
GOLD COAST
ASHANTI
NORTHERN TERRITORIES
TOGO
NIGERIA
Longitude West 6° of Greenwich
Meridian 0° of Greenwich
Longitude East 6° of Greenwich

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Dutch fleet—thirteen vessels in the Nieuwe Diep—the sailors having refused to fight for the republic. In spite of the failure on land, the expedition did much to confirm the naval supremacy of Great Britain by the entire suppression of the most seaman-like of the forces opposed to it.

AUTHORITIES.—Chevalier, *Histoire de la marine française sous la première République* (Paris, 1886); James's *Naval History* (London, 1837); Captain Mahan, *Influence of Sea Power upon the French Revolution and the Empire* (London, 1892). The French schemes of invasion are exhaustively dealt with in Captain E. Desbrière's *Projets et tentatives de débarquements aux Iles Britanniques* (Paris, 1900, &c.). (D. H.)

FRENCH WEST AFRICA (*L'Afrique occidentale française*), the common designation of the following colonies of France:—(1) Senegal, (2) Upper Senegal and Niger, (3) Guinea, (4) the Ivory Coast, (5) Dahomey; of the territory of Mauretania, and of a large portion of the Sahara. The area is estimated at nearly 2,000,000 sq. m., of which more than half is Saharan territory. The countries thus grouped under the common designation French West Africa comprise the greater part of the continent west of the Niger delta (which is British territory) and south of the tropic of Cancer. It embraces the upper and middle course of the Niger, the whole of the basin of the Senegal and the south-western part of the Sahara. Its most northern point on the coast is Cape Blanco, and it includes Cape Verde, the most westerly point of Africa. Along the Guinea coast the French possessions are separated from one another by colonies of Great Britain and other powers, but in the interior they unite not only with one another but with the hinterlands of Algeria and the French Congo.

In physical characteristics French West Africa presents three types: (1) a dense forest region succeeding a narrow coast belt greatly broken by lagoons; (2) moderately elevated and fertile plateaus, generally below 2000 ft., such as the region enclosed in the great bend of the Niger; (3) north of the Senegal and Niger, the desert lands forming part of the Sahara (*q.v.*). The most elevated districts are Futa Jallon, whence rise the Senegal, Gambia and Niger, and Gon—both massifs along the south-western edge of the plateau lands, containing heights of 5000 to 6000 ft. or more. Among the chief towns are Timbuktu and Jenné on the Niger, Porto Novo in Dahomey, and St Louis and Dakar in Senegal, Dakar being an important naval and commercial port. The inhabitants are for the most part typical Negroes, with in Senegal and in the Sahara an admixture of Berber and Arab tribes. In the upper Senegal and Futa Jallon large numbers of the inhabitants are Fula. The total population of French West Africa is estimated at about 13,000,000. The European inhabitants number about 12,000.

The French possessions in West Africa have grown by the extension inland of coast colonies, each having an independent origin. They were first brought under one general government in 1895, when they were placed under the supervision of the governor of Senegal, whose title was altered to meet the new situation. Between that date and 1905 various changes in the areas and administrations of the different colonies were made, involving the disappearance of the protectorates and military territories known as French Sudan and dependent on Senegal. These were partly absorbed in the coast colonies, whilst the central portion became the colony of Upper Senegal and Niger. At the same time the central government was freed from the direct administration of the Senegal and Niger countries (Decrees of Oct. 1902 and Oct. 1904). Over the whole of French West Africa is a governor-general, whose headquarters are at Dakar.[1] He is assisted by a government council, composed of high functionaries, including the lieutenant-governors of all colonies under his control. The central government, like all other French colonial administrations, is responsible, not to the colonists, but to the home government, and its constitution is alterable at will by presidential decree save in matters on which the chambers have expressly legislated. To it is confided financial control over the colonies, responsibility for the public debt, the direction of the departments of education and agriculture, and the carrying out of works of general utility. It alone communicates with the home authorities. Its expenses are met by the duties levied on goods and vessels entering and leaving any port of French West Africa. It may make advances to the colonies under its care, and may, in case of need, demand from them contributions to the central exchequer. The administration of justice is centralized and uniform for all French West Africa. The court of appeal sits at Dakar. There is also a uniform system of land registration adopted in 1906 and based on that in force in Australia. Subject to the limitations indicated the five colonies enjoy autonomy. The territory of Mauretania is administered by a civil commissioner under the direct control of the governor-general. The colony of Senegal is represented in the French parliament by one deputy.

Since the changes in administration effected in 1895 the commerce of French West Africa has shown a steady growth, the volume of external trade increasing in the ten years 1895–1904 from £3,151,094 to £6,238,091. In 1907 the value of the trade was £7,097,000; of this 53% was with France. Apart from military expenditure, about £600,000 a year, which is borne by France, French West Africa is self-supporting. The general budget for 1906 balanced at £1,356,000. There is a public debt of some £1,000,000, mainly incurred for works of general utility.

See SENEGAL, FRENCH GUINEA, IVORY COAST and DAHOMEY. For Anglo-French boundaries east of the Niger see SAHARA and NIGERIA. For the constitutional connexion between the colonies and France see FRANCE: *Colonies*. An account of the economic situation of the colonies is given by G. François in *Le Gouvernement général de l'Afrique occidentale française* (Paris, 1908). Consult also the annual *Report on the Trade, Agriculture, &c. of French West Africa* issued by the British foreign office. A map of French West Africa by A. Meunier and E. Barralier (6 sheets on the scale 1:2,000,000) was published in Paris, 1903.

FRENTANI, one of the ancient Samnite tribes which formed an independent community on the east coast of Italy. They entered the Roman alliance after their capital, Frentrum, was taken by the Romans in 305 or 304 B.C. (Livy ix. 16. 45). This town either changed its name or perished some time after the middle of the 3rd century B.C., when it was issuing coins of its own with an Oscan legend. The town Larinum, which belonged to the same people (Pliny, *Nat. Hist.* iii. 103), became latinized before 200 B.C., as its coins of that epoch bear a legend—LARINOR(VM)—which cannot reasonably be treated as anything but Latin. Several Oscan inscriptions survive from the neighbourhood of Vasto (anc. *Histonium*), which was in the Frentane area.

On the forms of the name, and for further details see R.S.Conway, *Italic Dialects*, p. 206 ff and p. 212: for the coins *id.* No. 195-196.

FREPPEL, CHARLES ÉMILE (1827–1891), French bishop and politician, was born at Oberehnheim(Obernai), Alsace, on the 1st of June 1827. He was ordained priest in 1849 and for a short time taught history at the seminary of Strassburg, where he had previously received his clerical training. In 1854 he was appointed professor of theology at the Sorbonne, and became known as a successful preacher. He went to Rome in 1869, at the instance of Pius IX., to assist in the steps preparatory to the promulgation of the dogma of papal infallibility. He was consecrated bishop of Angers in 1870. During the Franco-German war Freppel organized a body of priests to minister to the French prisoners in Germany, and penned an eloquent protest to the emperor William I. against the annexation of Alsace-Lorraine. In 1880 he was elected deputy for Brest and continued to represent it until his death. Being the only priest in the Chamber of Deputies since the death of Dupanloup, he became the chief parliamentary champion of the Church, and, though no orator, was a frequent speaker. On all ecclesiastical affairs Freppel voted with the Royalist and Catholic party, yet on questions in which French colonial prestige was involved, such as the expedition to Tunis, Tong-King, Madagascar (1881, 1883–85), he supported the government of the day. He always remained a staunch Royalist and went so far as to oppose Leo XIII.'s policy

[1] The organization of the new government was largely the work of E. N. Roume (b. 1858), governor-general 1902–1907, an able and energetic official, formerly director of Asian affairs at the colonial ministry.

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of conciliating the Republic. He died at Angers on the 12th of December 1891. Freppel's historical and theological works form 30 vols., the best known of which are: *Les Pères apostoliques et leur époque* (1859); *Les Apologistes chrétiens au IIe siècle* (2 vols., 1860); *Saint Irénée et l'éloquence chrétienne dans la Gaule aux deux premiers siècles* (1861); *Tertullien* (2 vols., 1863); *Saint Cyprien et l'Église d'Afrique* (1864); *Clément d'Alexandrie* (1865); *Origène* (2 vols., 1867).

There are interesting lives by E. Cornut (Paris, 1893) and F. Charpentier (Angers, 1904).

FRERE, SIR HENRY BARTLE EDWARD (1815–1884), British administrator, born at Clydach in Brecknockshire, on the 29th of March 1815, was the son of Edward Frere, a member of an old east county family, and a nephew of John Hookham Frere, of *Anti-Jacobin* and *Aristophanes* fame. After leaving Haileybury, Bartle Frere was appointed a writer in the Bombay civil service in 1834, and went out to India by way of Egypt, crossing the Red Sea in an open boat from Kosseir to Mokha, and sailing thence to Bombay in an Arab dhow. Having passed his examination in the native languages, he was appointed assistant collector at Poona in 1835. There he did valuable work and was in 1842 chosen as private secretary to Sir George Arthur, governor of Bombay. Two years later he became political resident at the court of the rajah of Satara, where he did much to benefit the country by the development of its communications. On the rajah's death in 1848 he administered the province both before and after its formal annexation in 1849. In 1850 he was appointed chief commissioner of Sind, and took ample advantage of the opportunities afforded him of developing the province. He pensioned off the dispossessed amirs, improved the harbour at Karachi, where he also established municipal buildings, a museum and barracks, instituted fairs, multiplied roads, canals and schools.

Returning to India in 1857 after a well-earned rest, Frere was greeted at Karachi with news of the mutiny. His rule had been so successful that he felt he could answer for the internal peace of his province. He therefore sent his only European regiment to Multan, thus securing that strong fortress against the rebels, and sent further detachments to aid Sir John Lawrence in the Punjab. The 170 British soldiers who remained in Sind proved sufficient to extinguish such insignificant outbreaks as occurred. His services were fully recognized by the Indian authorities, and he received the thanks of both houses of parliament and was made K.C.B. He became a member of the viceroy's council in 1859, and was especially serviceable in financial matters. In 1862 he was appointed governor of Bombay, where he effected great improvements, such as the demolition of the old ramparts, and the erection of handsome public offices upon a portion of the space, the inauguration of the university buildings and the improvement of the harbour. He established the Deccan College at Poona, as well as a college for instructing natives in civil engineering. The prosperity—due to the American Civil War—which rendered these developments possible brought in its train a speculative mania, which led eventually to the disastrous failure of the Bombay Bank (1866), an affair in which, from neglecting to exercise such means of control as he possessed, Frere incurred severe and not wholly undeserved censure. In 1867 he returned to England, was made G.C.S.I., and received honorary degrees from Oxford and Cambridge; he was also appointed a member of the Indian council.

In 1872 he was sent by the foreign office to Zanzibar to negotiate a treaty with the sultan, Seyyid Burghash, for the suppression of the slave traffic. In 1875 he accompanied the prince of Wales to Egypt and India. The tour was beyond expectation successful, and to Frere, from Queen Victoria downwards, came acknowledgments of the service he had rendered in piloting the expedition. He was asked by Lord Beaconsfield to choose between being made a baronet or G.C.B. He chose the former, but the queen bestowed both honours upon him. But the greatest service that Frere undertook on behalf of his country was to be attempted not in Asia, but in Africa. Sir Bartle landed at Cape Town as high commissioner of South Africa on the 31st of March 1877. He had been chosen by Lord Carnarvon in the previous October as the statesman most capable of carrying his scheme of confederation into effect, and within two years it was hoped that he would be the first governor of the South African Dominion. He went out in harmony with the aims and enthusiasm of his chief, "hoping to crown by one great constructive effort the work of a bright and noble life." In this hope he was disappointed. As he stated at the close of his high commissionership, a great mistake seemed to have been made in trying to hasten what could only result from natural growth, and the state of South Africa during Frere's tenure of office was inimical to such growth.

Discord or a policy of blind drifting seemed to he the alternatives presented to Frere upon his arrival at the Cape. He chose the former as the less dangerous, and the first year of his sway was marked by a Kaffir war on the one hand and by a rupture with the Cape (Molteno–Merriman) ministry on the other. The Transkei Kaffirs were subjugated early in 1878 by General Thesiger (the 2nd Lord Chelmsford) and a small force of regular and colonial troops. The constitutional difficulty was solved by Frere dismissing his obstructive cabinet and entrusting the formation of a ministry to Mr (afterwards Sir) Gordon Sprigg. Frere emerged successfully from a year of crisis, but the advantage was more than counterbalanced by the resignation of Lord Carnarvon early in 1878, at a time when Frere required the steadiest and most unflinching support. He had reached the conclusion that there was a widespread insurgent spirit pervading the natives, which had its focus and strength in the celibate military organization of Cetywayo and in the prestige which impunity for the outrages he had committed had gained for the Zulu king in the native mind. That organization and that evil prestige must be put an end to, if possible by moral pressure, but otherwise by force. Frere reiterated these views to the colonial office, where they found a general acceptance. When, however, Frere undertook the responsibility of forwarding, in December 1878, an ultimatum to Cetywayo, the home government abruptly discovered that a native war in South Africa was inopportune and raised difficulties about reinforcements. Having entrusted to Lord Chelmsford the enforcement of the British demands, Frere's immediate responsibility ceased. On the 11th of January 1879 the British troops crossed the Tugela, and fourteen days later the disaster of Isandhlwana was reported; and Frere, attacked and censured in the House of Commons, was but feebly defended by the government. Lord Beaconsfield, it appears, supported Frere; the majority of the cabinet were inclined to recall him. The result was the unsatisfactory compromise by which he was censured and begged to stay on. Frere wrote an elaborate justification of his conduct, which was adversely commented on by the colonial secretary (Sir Michael Hicks Beach), who "did not see why Frere should take notice of attacks; and as to the war, all African wars had been unpopular." Frere's rejoinder was that no other sufficient answer had been made to his critics, and that he wished to place one on record. "Few may now agree with my view as to the necessity of the suppression of the Zulu rebellion. Few, I fear, in this generation. But unless my countrymen are much changed, they will some day do me justice. I shall not leave a name to be permanently dishonoured."

The Zulu trouble and the disaffection that was brewing in the Transvaal reacted upon each other in the most disastrous manner. Frere had borne no part in the actual annexation of the Transvaal, which was announced by Sir Theophilus Shepstone a few days after the high commissioner's arrival at Cape Town. The delay in giving the country a constitution afforded a pretext for agitation to the malcontent Boers, a rapidly increasing minority, while the reverse at Isandhlwana had lowered British prestige. Owing to the Kaffir and Zulu wars Sir Bartle had hitherto been unable to give his undivided attention to the state of things in the Transvaal. In April 1879 he was at last able to visit that province, and the conviction was forced upon him that the government had been unsatisfactory in many ways. The country was very unsettled. A large camp, numbering

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4000 disaffected Boers, had been formed near Pretoria, and they were terrorizing the country. Frere visited them unarmed and practically alone. Even yet all might have been well, for he won the Boers' respect and liking. On the condition that the Boers dispersed, Frere undertook to present their complaints to the British government, and to urge the fulfilment of the promises that had been made to them. They parted with mutual good feeling, and the Boers did eventually disperse—on the very day upon which Frere received the telegram announcing the government's censure. He returned to Cape Town, and his journey back was in the nature of a triumph. But bad news awaited him at Government House—on the 1st of June 1879 the prince imperial had met his death in Zululand—and a few hours later Frere heard that the government of the Transvaal and Natal, together with the high commissionership in the eastern part of South Africa, had been transferred from him to Sir Garnet Wolseley.

When Gladstone's ministry came into office in the spring of 1880, Lord Kimberley had no intention of recalling Frere. In June, however, a section of the Liberal party memorialized Gladstone to remove him, and the prime minister weakly complied (1st August 1880). Upon his return Frere replied to the charges relating to his conduct respecting Afghanistan as well as South Africa, previously preferred in Gladstone's Midlothian speeches, and was preparing a fuller vindication when he died at Wimbledon from the effect of a severe chill on the 29th of May 1884. He was buried in St Paul's, and in 1888 a statue of Frere upon the Thames embankment was unveiled by the prince of Wales. Frere edited the works of his uncle, Hookham Frere, and the popular story-book, *Old Deccan Days*, written by his daughter, Mary Frere. He was three times president of the Royal Asiatic Society.

His *Life and Correspondence*, by John Martineau, was published in 1895. For the South African anti-confederation view, see P. A. Molteno's *Life and Times of Sir John Charles Molteno* (2 vols., London 1900). See also SOUTH AFRICA: *History*.

FRERE, JOHN HOOKHAM (1769–1846), English diplomatist and author, was born in London on the 21st of May 1769. His father, John Frere, a gentleman of a good Suffolk family, had been educated at Caius College, Cambridge, and would have been senior wrangler in 1763 but for the redoubtable competition of Paley; his mother, daughter of John Hookham, a rich London merchant, was a lady of no small culture, accustomed to amuse her leisure with verse-writing. His father's sister Eleanor, who married Sir John Fenn (1739–1794), the learned editor of the *Paston Letters*, wrote various educational works for children under the pseudonyms "Mrs Lovechild" and "Mrs Teachwell." Young Frere was sent to Eton in 1785, and there began an intimacy with Canning which greatly affected his after life. From Eton he went to his father's college at Cambridge, and graduated B.A. in 1792 and M.A. in 1795. He entered public service in the foreign office under Lord Grenville, and sat from 1796 to 1802 as member of parliament for the close borough of West Looe in Cornwall.

From his boyhood he had been a warm admirer of Pitt, and along with Canning he entered heart and soul into the defence of his government, and contributed freely to the pages of the *Anti-Jacobin*, edited by Gifford. He contributed, in collaboration with Canning, "The Loves of the Triangles," a clever parody of Darwin's "Loves of the Plants," "The Needy Knife-Grinder" and "The Rovers." On Canning's removal to the board of trade in 1799 he succeeded him as under-secretary of state; in October 1800 he was appointed envoy extraordinary and plenipotentiary to Lisbon; and in September 1802 he was transferred to Madrid, where he remained for two years. He was recalled on account of a personal disagreement he had with the duke of Alcudia, but the ministry showed its approval of his action by a pension of £1700 a year. He was made a member of the privy council in 1805; in 1807 he was appointed plenipotentiary at Berlin, but the mission was abandoned, and Frere was again sent to Spain in 1808 as plenipotentiary to the Central Junta. The condition of Spain rendered his position a very responsible and difficult one. When Napoleon began to advance on Madrid it became a matter of supreme importance to decide whether Sir John Moore, who was then in the north of Spain, should endeavour to anticipate the occupation of the capital or merely make good his retreat, and if he did retreat whether he should do so by Portgual or by Galicia. Frere was strongly of opinion that the bolder was the better course, and he urged his views on Sir John Moore with an urgent and fearless persistency that on one occasion at least overstepped the limits of his commission. After the disastrous retreat to Corunna, the public accused Frere of having by his advice endangered the British army, and though no direct censure was passed upon his conduct by the government, he was recalled, and the marquess of Wellesley was appointed in his place.

Thus ended Frere's public life. He afterwards refused to undertake an embassy to St Petersburg, and twice declined the honour of a peerage. In 1816 he married Elizabeth Jemima, dowager countess of Erroll, and in 1820, on account of her failing health, he went with her to the Mediterranean. There he finally settled in Malta, and though he afterwards visited England more than once, the rest of his life was for the most part spent in the island of his choice. In quiet retirement he devoted himself to literature, studied his favourite Greek authors, and taught himself Hebrew and Maltese. His hospitality was well known to many an English guest, and his charities and courtesies endeared him to his Maltese neighbours. He died at the Pietà Valetta on the 7th of January 1846. Frere's literary reputation now rests entirely upon his spirited verse translations of Aristophanes, which remain in many ways unrivalled. The principles according to which he conducted his task were elucidated in an article on Mitchell's *Aristophanes*, which he contributed to *The Quarterly Review*, vol. xxiii. The translations of *The Acharnians*, *The Knights*, *The Birds*, and *The Frogs* were privately printed, and were first brought into general notice by Sir G. Cornewall Lewis in the *Classical Museum* for 1847. They were followed some time after by *Theognis Restitutus, or the personal history of the poet Theognis, reduced from an analysis of his existing fragments*. In 1817 he published a mock-heroic Arthurian poem entitled *Prospectus and Specimen of an intended National Work, by William and Robert Whistlecraft, of Stowmarket in Suffolk, Harness and Collar Makers, intended to comprise the most interesting particulars relating to King Arthur and his Round Table*. William Tennant in *Anster Fair* had used the *ottava rima* as a vehicle for semi-burlesque poetry five years earlier, but Frere's experiment is interesting because Byron borrowed from it the measure that he brought to perfection in *Don Juan*.

Frere's complete works were published in 1871, with a memoir by his nephews, W. E. and Sir Bartle Frere, and reached a second edition in 1874. Compare also Gabrielle Festing, *J. H. Frere and his Friends* (1899).

FRÈRE, PIERRE ÉDOUARD (1819–1886), French painter, studied under Delaroche, entered the École des Beaux-Arts in 1836 and exhibited first at the Salon in 1843. The marked sentimental tendency of his art makes us wonder at Ruskin's enthusiastic eulogy which finds in Frère's work "the depth of Wordsworth, the grace of Reynolds, and the holiness of Angelico." What we can admire in his work is his accomplished craftsmanship and the intimacy and tender homeliness of his conception. Among his chief works are the two paintings, "Going to School" and "Coming from School," "The Little Glutton" (his first exhibited picture) and "*L'Exercice*" (Mr Astor's collection). A journey to Egypt in 1860 resulted in a small series of Orientalist subjects, but the majority of Frère's paintings deal with the life of the kitchen, the workshop, the dwellings of the humble, and mainly with the pleasures and little troubles of the young, which the artist brings before us with humour and sympathy. He was one of the most popular painters of domestic genre in the middle of the 19th century.

FRÈRE-ORBAN, HUBERT JOSEPH WALTHER (1812–1896), Belgian statesman, was born at Liége on the 24th of April 1812. His family name was Frère, to which on his marriage he added his wife's name of Orban. After studying law in Paris, he

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practised as a barrister at Liége, took a prominent part in the Liberal movement, and in June 1847 was returned to the Chamber as member for Liége. In August of the same year he was appointed minister of public works in the Rogier cabinet, and from 1848 to 1852 was minister of finance. He founded the Banque Nationale and the Caisse d'Épargne, abolished the newspaper tax, reduced the postage, and modified the customs duties as a preliminary to a decided free-trade policy. The Liberalism of the cabinet, in which Frère-Orban exercised an influence hardly inferior to that of Rogier, was, however, distasteful to Napoleon III. Frère-Orban, to facilitate the negotiations for a new commercial treaty, conceded to France a law of copyright, which proved highly unpopular in Belgium, and he resigned office, soon followed by the rest of the cabinet. His work *La Mainmorte et la charité* (1854–1857), published under the pseudonym of "Jean van Damme," contributed greatly to restore his party to power in 1857, when he again became minister of finance. He now embodied his free-trade principles in commercial treaties with England and France, and abolished the *octroi* duties and the tolls on the national roads. He resigned in 1861 on the gold question, but soon resumed office, and in 1868 succeeded Rogier as prime minister. In 1869 he defeated the attempt of France to gain control of the Luxemburg railways, but, despite this service to his country, fell from power at the elections of 1870. He returned to office in 1878 as president of the council and foreign minister. He provoked the bitter opposition of the Clerical party by his law of 1879 establishing secular primary education, and in 1880 went so far as to break off diplomatic relations with the Vatican. He next found himself at variance with the Radicals, whose leader, Janson, moved the introduction of universal suffrage. Frère-Orban, while rejecting the proposal, conceded an extension of the franchise (1883); but the hostility of the Radicals, and the discontent caused by a financial crisis, overthrew the government at the elections of 1884. Frère-Orban continued to take an active part in politics as leader of the Liberal opposition till 1894, when he failed to secure re-election. He died at Brussels on the 2nd of January 1896. Besides the work above mentioned, he published *La Question monétaire* (1874); *La Question monétaire en Belgique* in 1880; *Échange de vues entre MM. Frère-Orban et E. de Laveleye* (1890); and *La Révision constitutionnelle en Belgique et ses conséquences* (1894). He was also the author of numerous pamphlets, among which may be mentioned his last work, *La Situation présente* (1895).

FRÉRET, NICOLAS (1688–1749), French scholar, was born at Paris on the 15th of February 1688. His father was *procureur* to the parlement of Paris, and destined him to the profession of the law. His first tutors were the historian Charles Rollin and Father Desmolets (1677–1760). Amongst his early studies history, chronology and mythology held a prominent place. To please his father he studied law and began to practise at the bar; but the force of his genius soon carried him into his own path. At nineteen he was admitted to a society of learned men before whom he read memoirs on the religion of the Greeks, on the worship of Bacchus, of Ceres, of Cybele and of Apollo. He was hardly twenty-six years of age when he was admitted as pupil to the Academy of Inscriptions. One of the first memoirs which he read was a learned and critical discourse, *Sur l'origine des Francs* (1714). He maintained that the Franks were a league of South German tribes and not, according to the legend then almost universally received, a nation of free men deriving from Greece or Troy, who had kept their civilization intact in the heart of a barbarous country. These sensible views excited great indignation in the Abbé Vertot, who denounced Fréret to the government as a libeller of the monarchy. A *lettre de cachet* was issued, and Fréret was sent to the Bastille. During his three months of confinement he devoted himself to the study of the works of Xenophon, the fruit of which appeared later in his memoir on the *Cyropaedia*. From the time of his liberation in March 1715 his life was uneventful. In January 1716 he was received associate of the Academy of Inscriptions, and in December 1742 he was made perpetual secretary. He worked without intermission for the interests of the Academy, not even claiming any property in his own writings, which were printed in the *Recueil de l'académie des inscriptions*. The list of his memoirs, many of them posthumous, occupies four columns of the *Nouvelle Biographie générale*. They treat of history, chronology, geography, mythology and religion. Throughout he appears as the keen, learned and original critic; examining into the comparative value of documents, distinguishing between the mythical and the historical, and separating traditions with an historical element from pure fables and legends. He rejected the extreme pretensions of the chronology of Egypt and China, and at the same time controverted the scheme of Sir Isaac Newton as too limited. He investigated the mythology not only of the Greeks, but of the Celts, the Germans, the Chinese and the Indians. He was a vigorous opponent of the theory that the stories of mythology may be referred to historic originals. He also suggested that Greek mythology owed much to the Phoenicians and Egyptians. He was one of the first scholars of Europe to undertake the study of the Chinese language; and in this he was engaged at the time of his committal to the Bastille. He died in Paris on the 8th of March 1749.

Long after his death several works of an atheistic character were falsely attributed to him, and were long believed to be his. The most famous of these spurious works are the *Examen critique des apologistes de la religion chrétienne* (1766), and the *Lettre de Thrasybule à Leucippe*, printed in London about 1768. A very defective and inaccurate edition of Fréret's works was published in 1796–1799. A new and complete edition was projected by Champollion-Figeac, but of this only the first volume appeared (1825). It contains a life of Fréret. His manuscripts, after passing through many hands, were deposited in the library of the Institute. The best account of his works is "Examen critique des ouvrages composés par Fréret" in C. A. Walckenaer's *Recueil des notices*, &c. (1841–1850). See also Quérard's *France littéraire*.

FRÉRON, ÉLIE CATHERINE (1719–1776), French critic and controversialist, was born at Quimper in 1719. He was educated by the Jesuits, and made such rapid progress in his studies that before the age of twenty he was appointed professor at the college of Louis-le-Grand. He became a contributor to the *Observations sur les écrits modernes* of the abbé Guyot Desfontaines. The very fact of his collaboration with Desfontaines, one of Voltaire's bitterest enemies, was sufficient to arouse the latter's hostility, and although Fréron had begun his career as one of his admirers, his attitude towards Voltaire soon changed. Fréron in 1746 founded a similar journal of his own, entitled *Lettres de la Comtesse de . . .* It was suppressed in 1749, but he immediately replaced it by *Lettres sur quelques écrits de ce temps*, which, with the exception of a short suspension in 1752, on account of an attack on the character of Voltaire, was continued till 1754, when it was succeeded by the more ambitious *Année littéraire*. His death at Paris on the 10th of March 1776 is said to have been hastened by the temporary suppression of this journal. Fréron is now remembered solely for his attacks on Voltaire and the Encyclopaedists, and by the retaliations they provoked on the part of Voltaire, who, besides attacking him in epigrams, and even incidentally in some of his tragedies, directed against him a virulent satire, *Le Pauvre diable*, and made him the principal personage in a comedy *L'Écossaise*, in which the journal of Fréron is designated *L'Âne littéraire*. A further attack on Fréron entitled *Anecdotes sur Fréron . . .* (1760), published anonymously, is generally attributed to Voltaire.

Fréron was the author of *Ode sur la bataille de Fontenoy* (1745); *Histoire de Marie Stuart* (1742, 2 vols.); and *Histoire de l'empire d'Allemagne*, (1771, 8 vols.). See Ch. Nisard, *Les Ennemis de Voltaire* (1853); Despois, *Journalistes et journaux du XVIIIe siècle*; Barthélemy, *Les confessions de Fréron*; Ch. Monselet, *Fréron, ou l'illustre critique* (1864); *Fréron, sa vie, souvenirs*, &c. (1876).

FRÉRON, LOUIS MARIE STANISLAS (1754–1802), French revolutionist, son of the preceding, was born at Paris on the 17th of August 1754. His name was, on the death of his father, attached to *L'Année littéraire*, which was continued till 1790 and edited successively by the abbés G. M. Royou and J. L. Geoffroy. On the outbreak of the revolution Fréron, who was a schoolfellow of Robespierre and Camille Desmoulins, established

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the violent journal *L'Orateur du peuple*. Commissioned, along with Barras in 1793, to establish the authority of the convention at Marseilles and Toulon, he distinguished himself in the atrocity of his reprisals, but both afterwards joined the Thermidoriens, and Fréron became the leader of the *jeunesse dorée* and of the Thermidorian reaction. He brought about the accusation of Fouquier-Tinville, and of J. B. Carrier, the deportation of B. Barère, and the arrest of the last *Montagnards*. He made his paper the official journal of the reactionists, and being sent by the Directory on a mission of peace to Marseilles he published in 1796 *Mémoire historique sur la réaction royale et sur les malheurs du midi*. He was elected to the council of the Five Hundred, but not allowed to take his seat. Failing as suitor for the hand of Pauline Bonaparte, one of Napoleon's sisters, he went in 1799 as commissioner to Santo Domingo and died there in 1802. General V. M. Leclerc, who had married Pauline Bonaparte, also received a command in Santo Domingo in 1801, and died in the same year as his former rival.

FRESCO (Ital. for *cool*, "fresh"), a term introduced into English, both generally (as in such phrases as *al fresco*, "in the fresh air"), and more especially as a technical term for a sort of mural painting on plaster. In the latter sense the Italians distinguished painting *a secco* (when the plaster had been allowed to dry) from *a fresco* (when it was newly laid and still wet). The nature and history of fresco-painting is dealt with in the article PAINTING.

FRESCOBALDI, GIROLAMO (1583–1644), Italian musical composer, was born in 1583 at Ferrara. Little is known of his life except that he studied music under Alessandro Milleville, and owed his first reputation to his beautiful voice. He was organist at St Peter's in Rome from 1608 to 1628. According to Baini no less than 30,000 people flocked to St Peter's on his first appearance there. On the 20th of November 1628 he went to live in Florence, becoming organist to the duke. From December 1633 to March 1643 he was again organist at St Peter's. But in the last year of his life he was organist in the parish church of San Lorenzo in Monte. He died on the 2nd of March 1644, being buried at Rome in the Church of the Twelve Apostles. Frescobaldi also excelled as a teacher, Frohberger being the most distinguished of his pupils. Frescobaldi's compositions show the consummate art of the early Italian school, and his works for the organ more especially are full of the finest devices of fugal treatment. He also wrote numerous vocal compositions, such as canzone, motets, hymns, &c., a collection of madrigals for five voices (Antwerp, 1608) being among the earliest of his published works.

FRESENIUS, KARL REMIGIUS (1818–1897), German chemist, was born at Frankfort-on-Main on the 28th of December 1818. After spending some time in a pharmacy in his native town, he entered Bonn University in 1840, and a year later migrated to Giessen, where he acted as assistant in Liebig's laboratory, and in 1843 became assistant professor. In 1845 he was appointed to the chair of chemistry, physics and technology at the Wiesbaden Agricultural Institution, and three years later he became the first director of the chemical laboratory which he induced the Nassau government to establish at that place. Under his care this laboratory continuously increased in size and popularity, a school of pharmacy being added in 1862 (though given up in 1877) and an agricultural research laboratory in 1868. Apart from his administrative duties Fresenius occupied himself almost exclusively with analytical chemistry, and the fullness and accuracy of his text-books on that subject (of which that on qualitative analysis first appeared in 1841 and that on quantitative in 1846) soon rendered them standard works. Many of his original papers were published in the *Zeitschrift für analytische Chemie*, which he founded in 1862 and continued to edit till his death. He died suddenly at Wiesbaden on the 11th of June 1897. In 1881 he handed over the directorship of the agricultural research station to his son, Remigius Heinrich Fresenius (b. 1847), who was trained under H. Kolbe at Leipzig. Another son, Theodor Wilhelm Fresenius (b. 1850), was educated at Strassburg and occupied various positions in the Wiesbaden laboratory.

FRESHWATER, a watering place in the Isle of Wight, England, 12 m. W. by S. of Newport by rail. Pop.(1901) 3306. It is a scattered township lying on the peninsula west of the river Var, which forms the western extremity of the island. The portion known as Freshwater Gate fronts the English Channel from the strip of low-lying coast interposed between the cliffs of the peninsula and those of the main part of the island. The peninsula rises to 307 ft. in Headon Hill, and the cliffs are magnificent. The western promontory is flanked on the north by the picturesque Alum Bay, and the lofty detached rocks known as the Needles lie off it. Farringford House in the parish was for some time the home of Alfred, Lord Tennyson, who is commemorated by a tablet in All Saints' church and by a great cross on the high downs above the town. There are golf links on the downs.

FRESNEL, AUGUSTIN JEAN (1788–1827), French physicist, the son of an architect, was born at Broglie (Eure) on the 10th of May 1788. His early progress in learning was slow, and when eight years old he was still unable to read. At the age of thirteen he entered the École Centrale in Caen, and at sixteen and a half the École Polytechnique, where he acquitted himself with distinction. Thence he went to the École des Ponts et Chaussées. He served as an engineer successively in the departments of Vendée, Drôme and Ille-et-Villaine; but his espousal of the cause of the Bourbons in 1814 occasioned, on Napoleon's reaccession to power, the loss of his appointment. On the second restoration he obtained a post as engineer in Paris, where much of his life from that time was spent. His researches in optics, continued until his death, appear to have been begun about the year 1814, when he prepared a paper on the aberration of light, which, however, was not published. In 1818 he read a memoir on diffraction for which in the ensuing year he received the prize of the Académie des Sciences at Paris. He was in 1823 unanimously elected a member of the academy, and in 1825 he became a member of the Royal Society of London, which in 1827, at the time of his last illness, awarded him the Rumford medal. In 1819 he was nominated a commissioner of lighthouses, for which he was the first to construct compound lenses as substitutes for mirrors. He died of consumption at Ville-d'Avray, near Paris, on the 14th of July 1827.

The undulatory theory of light, first founded upon experimental demonstration by Thomas Young, was extended to a large class of optical phenomena, and permanently established by his brilliant discoveries and mathematical deductions. By the use of two plane mirrors of metal, forming with each other an angle of nearly 180°, he avoided the diffraction caused in the experiment of F. M. Grimaldi (1618–1663) on interference by the employment of apertures for the transmission of the light, and was thus enabled in the most conclusive manner to account for the phenomena of interference in accordance with the undulatory theory. With D. F. J. Arago he studied the laws of the interference of polarized rays. Circularly polarized light he obtained by means of a rhomb of glass, known as "Fresnel's rhomb," having obtuse angles of 126°, and acute angles of 54°. His labours in the cause of optical science received during his lifetime only scant public recognition, and some of his papers were not printed by the Académie des Sciences till many years after his decease. But, as he wrote to Young in 1824, in him "that sensibility, or that vanity, which people call love of glory" had been blunted. "All the compliments," he says, "that I have received from Arago, Laplace and Biot never gave me so much pleasure as the discovery of a theoretic truth, or the confirmation of a calculation by experiment."

See Duleau, "Notice sur Fresnel," *Revue ency.*, t. xxxix.; Arago, *Œuvres complètes*, t. i.; and Dr G. Peacock, *Miscellaneous Works of Thomas Young*, vol. i.

FRESNILLO, a town of the state of Zacatecas, Mexico, 37 m. N.W. of the city of Zacatecas on a branch of the Santiago river. Pop. (1900) 6309. It stands on a fertile plain between the Santa Cruz and Zacatecas ranges, about 7700 ft. above sea-level, has a temperate climate, and is surrounded by an agricultural district producing Indian corn and wheat. It is a clean, well-

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built town, whose chief distinction is its school of mines founded in 1853. Fresnillo has large amalgam works for the reduction of silver ores. Its silver mines, located in the neighbouring Proaño hill, were discovered in 1569, and were for a time among the most productive in Mexico. Since 1833, when their richest deposits were reached, the output has greatly decreased. There is a station near on the Mexican Central railway.

FRESNO, a city and the county-seat of Fresno county, California, U.S.A., situated in the San Joaquin valley (altitude about 300 ft.) near the geographical centre of the state. Pop. (1880) 1112; (1890) 10,818; (1900) 12,470, of whom 3299 were foreign-born and 1279 were Asiatics; (1910 census) 24,892. The city is served by the Southern Pacific and the Atchison, Topeka & Santa Fé railways. The county is mainly a vast expanse of naturally arid plains and mountains. The valley is the scene of an extensive irrigation system, water being brought (first in 1872–1876) from King's river, 20 m. distant; in 1905 500 sq. m. were irrigated. Fresno is in a rich farming country, producing grains and fruit, and is the only place in America where Smyrna figs have been grown with success; it is the centre of the finest raisin country of the state, and has extensive vineyards and wine-making establishments. The city's principal manufacture is preserved (dried) fruits, particularly raisins; the value of the fruits thus preserved in 1905 was $6,042,440, being 70·5% of the total value of the factory product in that year ($8,840,001). In 1900–1905 the factory product increased 257·9%, a ratio of increase greater than that of any other city in the state. In the mountains, lumbering and mining are important industries; lumber is carried from Shaver in the mountains to Clovis on the plains by a V-shaped flume 42 m. long, the waste water from which is ditched for irrigation. The petroleum field of the county is one of the richest in California. Fresno is the business and shipping centre of its county and of the surrounding region. The county was organized in 1856. In 1872 the railway went through, and Fresno was laid out and incorporated. It became the county-seat in 1874 and was chartered as a city in 1885.

FRESNOY, CHARLES ALPHONSE DU (1611–1665), French painter and writer on his art, was born in Paris, son of an apothecary. He was destined for the medical profession, and well educated in Latin and Greek; but, having a natural propensity for the fine arts, he would not apply to his intended vocation, and was allowed to learn the rudiments of design under Perrier and Vouet. At the age of twenty-one he went off to Rome, with no resources; he drew ruins and architectural subjects. After two years thus spent he re-encountered his old fellow-student Pierre Mignard, and by his aid obtained some amelioration of his professional prospects. He studied Raphael and the antique, went in 1633 to Venice, and in 1656 returned to France. During two years he was now employed in painting altar-pieces in the château of Raincy, landscapes, &c. His death was caused by an attack of apoplexy followed hy palsy; he expired at Villiers le Bel, near Paris. He never married. His pictorial works are few; they are correct in drawing, with something of the Caracci in design, and of Titian in colouring, but wanting fire and expression, and insufficient to keep his name in any eminent repute. He is remembered now almost entirely as a writer rather than painter. His Latin poem, *De arte graphica*, was written during his Italian sojourn, and embodied his observations on the art of painting; it may be termed a critical treatise on the practice of the art, with general advice to students. The precepts are sound according to the standard of his time; the poetical merits slender enough. The Latin style is formed chiefly on Lucretius and Horace. This poem was first published by Mignard, and has been translated into several languages. In 1684 it was turned into French by Roger de Piles; Dryden translated the work into English prose; and a rendering into verse by Mason followed, to which Sir Joshua Reynolds added some annotations.

FRET. (1) (From O. Eng. *fretan*, a word common in various forms to Teutonic languages; cf. Ger. *fressen*, to eat greedily), properly to devour, hence to gnaw, so used of the slow corroding action of chemicals, water, &c., and hence, figuratively, to chafe or irritate. Possibly connected with this word, in sense of rubbing, is the use of "fret" for a bar on the fingerboard of a banjo, guitar, or similar musical instruments to mark the fingering. (2) (Of doubtful origin; possibly from the O. Eng. *frætive*, ornaments, but its use is paralleled by the Fr. *frette*, trellis or lattice), network, a term used in heraldry for an interlaced figure, but best known as applied to the decoration used by the Greeks in their temples and vases: the Greek fret consists of a series of narrow bands of different lengths, placed at right angles to one another, and of great variety of design. It is an ornament which owes its origin to woven fabrics, and is found on the ceilings of the Egyptian tombs at Benihasan, Siout and elsewhere. In Greek work it was painted on the abacus of the Doric capital and probably on the architraves of their temples; when employed hy the Romans it was generally carved; the Propylaea of the temple at Damascus and the temple at Atil being examples of the 2nd century. It was carved in large dimensions on some of the Mexican temples, as for instance on the palace at Mitla with other decorative bands, all of which would seem to have been reproductions of woven patterns, and had therefore an independent origin. It is found in China and Japan, and in the latter country when painted on lacquer is employed as a fret-diaper, the bands not being at right angles to one another but forming acute and obtuse angles. In old English writers a wider signification was given to it, as it was applied to raised patterns in plaster on roofs or ceilings, which were not confined to the geometrical fret but extended to the modelling of flowers, leaves and fruit; in such cases the decoration was known as fret-work. In France the fret is better known as the "meander."

FREUDENSTADT, a town of Germany, in the kingdom of Württemberg, on the right bank of the Murg, 40 m. S.W. from Stuttgart, on the railway to Hochdorf. Pop. 7000. It has a Protestant and a Roman Catholic church, some small manufactures of cloth, furniture, knives, nails and glass, and is frequented as a climatic health resort. It was founded in 1599 by Protestant refugees from Salzburg.

FREUND, WILHELM (1806–1894), German philologist and lexicographer, was born at Kempen in the grand duchy of Posen on the 27th of January 1806. He studied at Berlin, Breslau and Halle, and was for twenty years chiefly engaged in private tuition. From 1855–1870 he was director of the Jewish school at Gleiwitz in Silesia, and subsequently retired to Breslau, where he died on the 4th of June 1894. Although chiefly known for his philological labours, Freund took an important part in the movement for the emancipation of his Prussian coreligionists, and the *Judengesetz* of 1847 was in great measure the result of his efforts. The work by which he is best known is his *Wörterbuch der lateinischen Sprache* (1834–1845), practically the basis of all Latin-English dictionaries. His *Wie studiert man klassische Philologie?* (6th ed., 1903) and *Triennium philologicum* (2nd ed., 1878–1885) are valuable aids to the classical student.

FREWEN, ACCEPTED (1588–1664), archbishop of York, was born at Northiam, in Sussex, and educated at Magdalen College, Oxford, where in 1612 he became a fellow. In 1617 and 1621 the college allowed him to act as chaplain to Sir John Digby, ambassador in Spain. At Madrid he preached a sermon which pleased Prince Charles, afterwards Charles I., and the latter on his accession appointed Frewen one of his chaplains. In 1625 he became canon of Canterhury and vice-president of Magdalen College, and in the following year he was elected president. He was vice-chancellor of the university in 1628 and 1629, and again in 1638 and 1639. It was mainly by his instrumentality that the university plate was sent to the king at York in 1642. Two years later he was consecrated bishop of Lichfield and Coventry, and resigned his presidentship. Parliament declared his estates forfeited for treason in 1652, and Cromwell afterwards set a price on his head. The proclamations, however, designated him Stephen Frewen, and he was consequently able to escape into France. At the Restoration he reappeared in public, and in 1660 he was consecrated archbishop of York. In 1661 he acted as chairman of the Savoy conference.

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FREY (Old Norse, Freyr) son of Njord, one of the chief deities in the northern pantheon and the national god of the Swedes. He is the god of fruitfulness, the giver of sunshine and rain, and thus the source of all prosperity. (See TEUTONIC PEOPLES, *ad fin.*)

FREYBURG [FREYBURG AN DER UNSTRUT], a town of Germany, in Prussian Saxony, in an undulating vine-clad country on the Unstrut, 6 m. N. from Naumberg-on-the-Saale, on the railway to Artern. It has a parish church, a mixture of Gothic and Romanesque architecture, with a handsome tower. It is, however, as being the "Mecca" of the German gymnastic societies that Freyburg is best known. Here Friedrich Ludwig Jahn (1778–1852), the father of German gymnastic exercises, lies buried. Over his grave is built the Turnhalle, with a statue of the "master," while hard by it the Jahn Museum in Romanesque style, erected in 1903. Freyburg produces sparkling wine of good quality and has some other small manufactures. On a hill commanding the town is the castle of Neuenburg, built originally in 1062 by Louis the Leaper, count in Thuringia, but in its present form mainly the work of the dukes of Saxe-Weissenfels.

FREYCINET, CHARLES LOUIS DE SAULCES DE (1828–), French statesman, was born at Foix on the 14th of November 1828. He was educated at the École Polytechnique, and entered the government service as a mining engineer. In 1858 he was appointed traffic manager to the Compagnie de chemins de fer du Midi, a post in which he gave proof of his remarkable talent for organization, and in 1862 returned to the engineering service (in which he attained in 1886 the rank of inspector-general). He was sent on a number of special scientific missions, among which may be mentioned one to England, on which he wrote a notable *Mémoire sur le travail des femmes et des enfants dans les manufactures de l'Angleterre* (1867). On the establishment of the Third Republic in September 1870, he offered his services to Gambetta, was appointed prefect of the department of Tarn-et-Garronne, and in October became chief of the military cabinet. It was mainly his powers of organization that enabled Gambetta to raise army after army to oppose the invading Germans. He showed himself a strategist of no mean order; but the policy of dictating operations to the generals in the field was not attended with happy results. The friction between him and General d'Aurelle de Paladines resulted in the loss of the advantage temporarily gained at Orleans, and he was responsible for the campaign in the east, which ended in the destruction of Bourbaki's army. In 1871 he published a defence of his administration under the title of *La Guerre en province pendant le siège de Paris*. He entered the Senate in 1876 as a follower of Gambetta, and in December 1877 became minister of public works in the Dufaure cabinet. He carried a great scheme for the gradual acquisition of the railways by the state and the construction of new lines at a cost of three milliards, and for the development of the canal system at a further cost of one milliard. He retained his post in the ministry of Waddington, whom he succeeded in December 1879 as president of the council and minister for foreign affairs. He passed an amnesty for the Communists, but in attempting to steer a middle course on the question of the religious associations, lost the support of Gambetta, and resigned in September 1880. In January 1882 he again became president of the council and minister for foreign affairs. His refusal to join England in the bombardment of Alexandria was the death-knell of French influence in Egypt. He attempted to compromise by occupying the Isthmus of Suez, but the vote of credit was rejected in the Chamber by 417 votes to 75, and the ministry resigned. He returned to office in April 1885 as foreign minister in the Brisson cabinet, and retained that post when, in January 1886, he succeeded to the premiership. He came into power with an ambitious programme of internal reform; but except that he settled the question of the exiled pretenders, his successes were won chiefly in the sphere of colonial extension. In spite of his unrivalled skill as a parliamentary tactician, he failed to keep his party together, and was defeated on 3rd December 1886. In the following year, after two unsuccessful attempts to construct new ministries he stood for the presidency of the republic; but the radicals, to whom his opportunism was distasteful, turned the scale against him by transferring the votes to M. Sadi Carnot.

In April 1888 he became minister of war in the Floquet cabinet —the first civilian since 1848 to hold that office. His services to France in this capacity were the crowning achievement of his life, and he enjoyed the conspicuous honour of holding his office without a break for five years through as many successive administrations—those of Floquet and Tirard, his own fourth ministry (March 1890–February 1892), and the Loubet and Ribot ministries. To him were due the introduction of the three-years' service and the establishment of a general staff, a supreme council of war, and the army commands. His premiership was marked by heated debates on the clerical question, and it was a hostile vote on his Bill against the religious associations that caused the fall of his cabinet. He failed to clear himself entirely of complicity in the Panama scandals, and in January 1893 resigned the ministry of war. In November 1898 he once more became minister of war in the Dupuy cabinet, but resigned office on 6th May 1899. He has published, besides the works already mentioned, *Traité de mécanique rationnelle* (1858); *De l'analyse infinitésimale* (1860, revised ed., 1881); *Des pentes économiques en chemin de fer* (1861); *Emploi des eaux d'égout en agriculture* (1869); *Principes de l'assainissement des villes* and *Traité d'assainissement industriel* (1870); *Essai sur la philosophie des sciences* (1896); *La Question d'Égypte* (1905); besides some remarkable "Pensées" contributed to the *Contemporain* under the pseudonym of "Alceste." In 1882 he was elected a member of the Academy of Sciences, and in 1890 to the French Academy in succession to Émile Augier.

FREYCINET, LOUIS CLAUDE DESAULSES DE (1779–1842), French navigator, was born at Montélimart, Drôme, on the 7th of August 1779. In 1793 he entered the French navy. After taking part in several engagements against the British, he joined in 1800, along with his brother Louis Henri Freycinet (1777–1840), who afterwards rose to the rank of admiral, the expedition sent out under Captain Baudin in the "Naturaliste" and "Géographe" to explore the south and south-west coasts of Australia. Much of the ground already gone over by Flinders was revisited, and new names imposed by this expedition, which claimed credit for discoveries really made by the English navigator. An inlet on the coast of West Australia, in 26° S., is called Freycinet Estuary; and a cape near the extreme south-west of the same coast also bears the explorer's name. In 1805 he returned to Paris, and was entrusted by the government with the work of preparing the maps and plans of the expedition; he also completed the narrative, and the whole work appeared under the title of *Voyage de découvertes aux terres australes* (Paris, 1807–1816). In 1817 he commanded the "Uranie," in which Arago and others went to Rio de Janeiro, to take a series of pendulum measurements. This was only part of a larger scheme for obtaining observations, not only in geography and ethnology, but in astronomy, terrestrial magnetism, and meteorology, and for the collection of specimens in natural history. On this expedition the hydrographic operations were conducted by Louis Isidore Duperry (1786–1865) who in 1822 was appointed to the command of the "Coquille," and during the next three years carried out scientific explorations in the southern Pacific and along the coast of South America. For three years Freycinet cruised about, visiting Australia, the Marianne, Sandwich, and other Pacific islands, South America, and other places, and, notwithstanding the loss of the "Uranie" on the Falkland Islands during the return voyage, returned to France with fine collections in all departments of natural history, and with voluminous notes and drawings which form an important contribution to a knowledge of the countries visited. The results of this voyage were published under Freycinet's supervision, with the title of *Voyage autour du monde sur les corvettes "l'Uranie" et "la Physicienne"* in 1824–1844, in 13 quarto volumes and 4 folio volumes of fine plates and maps. Freycinet was admitted into the Academy of Sciences in 1825, and was one

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of the founders of the Paris Geographical Society. He died at Freycinet, Drôme, on the 18th of August 1842.

FREYIA, the sister of Frey, and the most prominent goddess in Northern mythology. Her character seems in general to have resembled that of her brother. (See TEUTONIC PEOPLES, *ad fin.*)

FREYTAG, GEORG WILHELM FRIEDRICH (1788–1861), German philologist, was born at Lüneburg on the 19th of September 1788. After attending school he entered the university of Göttingen as a student of philology and theology; here from 1811 to 1813 he acted as a theological tutor, but in the latter year accepted an appointment as sub-librarian at Königsberg. In 1815 he became a chaplain in the Prussian army, and in that capacity visited Paris. On the proclamation of peace he resigned his chaplaincy, and returned to his researches in Arabic, Persian and Turkish, studying at Paris under De Sacy. In 1819 he was appointed to the professorship of oriental languages in the new university of Bonn, and this post he continued to hold until his death on the 16th of November 1861.

Besides a compendium of Hebrew grammar (*Kurzgefasste Grammatik der hebräischen Sprache*, 1835), and a treatise on Arabic versification (*Darstellung der arabischen Verskunst*, 1830), he edited two volumes of Arabic songs (*Hamasae carmina*, 1828–1852) and three of Arabic proverbs (*Arabum proverbia*, 1838–1843). But his principal work was the laborious and praiseworthy *Lexicon Arabico-latinum* (Halle, 1830–1837), an abridgment of which was published in 1837.

FREYTAG, GUSTAV (1816–1895), German novelist, was born at Kreuzburg, in Silesia, on the 13th of July 1816. After attending the gymnasium at Ols, he studied philology at the universities of Breslau and Berlin, and in 1838 took the degree with a remarkable dissertation, *De initiis poëseos scenicae apud Germanos*. In 1839 he settled at Breslau, as *Privatdocent* in German language and literature, but devoted his principal attention to writing for the stage, and achieved considerable success with the comedy *Die Brautfahrt, oder Kunz von der Rosen* (1844). This was followed by a volume of unimportant poems, *In Breslau* (1845) and the dramas *Die Valentine* (1846) and *Graf Waldemar* (1847). He at last attained a prominent position by his comedy, *Die Journalisten* (1853), one of the best German comedies of the 19th century. In 1847 he migrated to Berlin, and in the following year took over, in conjunction with Julian Schmidt, the editorship of *Die Grenzboten*, a weekly journal which, founded in 1841, now became the leading organ of German and Austrian liberalism. Freytag helped to conduct it until 1861, and again from 1867 till 1870, when for a short time he edited a new periodical, *Im neuen Reich*. His literary fame was made universal by the publication in 1855 of his novel, *Soll und Haben*, which was translated into almost all the languages of Europe. It was certainly the best German novel of its day, impressive by its sturdy but unexaggerated realism, and in many parts highly humorous. Its main purpose is the recommendation of the German middle class as the soundest element in the nation, but it also has a more directly patriotic intention in the contrast which it draws between the homely virtues of the Teuton and the shiftlessness of the Pole and the rapacity of the Jew. As a Silesian, Freytag had no great love for his Slavonic neighbours, and being a native of a province which owed everything to Prussia, he was naturally an earnest champion of Prussian hegemony over Germany. His powerful advocacy of this idea in his *Grenzboten* gained him the friendship of the duke of Saxe-Coburg-Gotha, whose neighbour he had become, on acquiring the estate of Siebleben near Gotha. At the duke's request Freytag was attached to the staff of the crown prince of Prussia in the campaign of 1870, and was present at the battles of Wörth and Sedan. Before this he had published another novel, *Die verlorene Handschrift* (1864), in which he endeavoured to do for German university life what in *Soll und Haben* he had done for commercial life. The hero is a young German professor, who is so wrapt up in his search for a manuscript by Tacitus that he is oblivious to an impending tragedy in his domestic life. The book was, however, less successful than its predecessor. Between 1859 and 1867 Freytag published in five volumes *Bilder aus der deutschen Vergangenheit*, a most valuable work on popular lines, illustrating the history and manners of Germany. In 1872 he began a work with a similar patriotic purpose, *Die Ahnen*, a series of historical romances in which he unfolds the history of a German family from the earliest times to the middle of the 19th century. The series comprises the following novels, none of which, however, reaches the level of Freytag's earlier books. (1) *Ingo und Ingraban* (1872), (2) *Das Nest der Zaunkönige* (1874), (3) *Die Brüder vom deutschen Hause* (1875), (4) *Marcus König* (1876), (5) *Die Geschwister* (1878), and (6) in conclusion, *Aus einer kleinen Stadt* (1880). Among Freytag's other works may be noticed *Die Technik des Dramas* (1863); an excellent biography of the Baden statesman *Karl Mathy* (1869); an autobiography (*Erinnerungen aus meinen Leben*, 1887); his *Gesammelte Aufsätze*, chiefly reprinted from the *Grenzboten* (1888); *Der Kronprinz und die deutsche Kaiserkrone*; *Erinnerungsblätter* (1889). He died at Wiesbaden on the 30th of April 1895.

Freytag's *Gesammelte Werke* were published in 22 vols. at Leipzig (1886–1888); his *Vermischte Aufsätze* have been edited by E. Elster, 2 vols. (Leipzig, 1901–1903). On Freytag's life see, besides his autobiography mentioned above, the lives by C. Alberti (Leipzig, 1890) and F. Seiler (Leipzig, 1898).

FRIAR (from the Lat. *frater*, through the Fr. *frère*), the English generic name for members of the mendicant religious orders. Formerly it was the title given to individual members of these orders, as Friar Laurence (in *Romeo and Juliet*), but this is not now common. In England the chief orders of friars were distinguished by the colour of their habit: thus the Franciscans or Minors were the Grey Friars; the Dominicans or Preachers were the Black Friars (from their black mantle over a white habit), and the Carmelites were the White Friars (from their white mantle over a brown habit): these, together with the Austin Friars or Hermits, formed the four great mendicant orders—Chaucer's "alle the ordres foure." Besides the four great orders of friars, the Trinitarians (*q.v.*), though really canons, were in England called Trinity Friars or Red Friars; the Crutched or Crossed Friars were often identified with them, but were really a distinct order; there were also a number of lesser orders of friars, many of which were suppressed by the second council of Lyons in 1274. Detailed information on these orders and on their position in England is given in separate articles. The difference between friars and monks is explained in article MONASTICISM. Though the usage is not accurate, friars, and also canons regular, are often spoken of as monks and included among the monastic orders.

See Fr. Cuthbert, *The Friars and how they came to England*, pp. 11-32 (1903); also F. A. Gasquet, *English Monastic Life*, pp. 234-249 (1904), where special information on all the English friars is conveniently brought together. (E. C. B.)

FRIBOURG [Ger. *Freiburg*], one of the Swiss Cantons, in the western portion of the country, and taking its name from the town around which the various districts that compose it gradually gathered. Its area is 646·3 sq. m., of which 568 sq. m. are classed as "productive" (forests covering 119 sq. m. and vineyards ·8 sq. m.); it boasts of no glaciers or eternal snow. It is a hilly, not mountainous, region, the highest summits (of which the Vanil Noir, 7858 ft., is the loftiest) rising in the Gruyère district at its south-eastern extremity, the best known being probably the Moléson (6582 ft.) and the Berra (5653 ft.). But it is the heart of pastoral Switzerland, is famed for its cheese and cattle, and is the original home of the "*Ranz des Vaches*," the melody by which the herdsmen call their cattle home at milking time. It is watered by the Sarine or Saane river (with its tributaries the Singine or Sense and the Glâne) that flows through the canton from north to south, and traverses its capital town. The upper course of the Broye (like the Sarine, a tributary of the Aar) and that of the Veveyse (flowing to the Lake of Geneva) are in the southern portion of the canton. A small share of the lakes of Neuchâtel and of Morat belongs to the canton, wherein the largest sheet of water is the Lac Noir or Schwarzsee. A sulphur spring rises near the last-named lake, and there are other such springs in the canton at Montbarry and at Bonn, near the capital. There are about 150 m. of railways in the canton, the main line from Lausanne to Bern past Fribourg running through

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it; there are also lines from Fribourg to Morat and to Estavayer, while from Romont (on the main line) a line runs to Bulle, and in 1904 was extended to Gessenay or Saanen near the head of the Sarine or Saane valley. The population of the canton amounted in 1900 to 127,951 souls, of whom 108,440 were Romanists, 19,305 Protestants, and 167 Jews. The canton is on the linguistic frontier in Switzerland, the line of division running nearly due north and south through it, and even right through its capital. In 1900 there were 78,353 French-speaking inhabitants, and 38,738 German-speaking, the latter being found chiefly in the north-western (Morat region) and north-eastern (Singine valley) portions, as well as in the upper valley of the Jogne or Jaun in the south-east. Besides the capital, Fribourg (*q.v.*), the only towns of any importance are Bulle (3330 inhabitants), Châtel St Denis (2500 inhabitants), Morat (*q.v.*) or Murten (2263 inhabitants), Romont (2110 inhabitants), and Estavayer le Lac or Stäffis am See (1636 inhabitants).

The canton is pre-eminently a pastoral and agricultural region, tobacco, cheese and timber being its chief products. Its industries are comparatively few: straw-plaiting, watch-making (Semsales), paper-making (Marly), lime-kilns, and, above all, the huge Cailler chocolate factory at Broc. It forms part of the diocese of Lausanne and Geneva, the bishop living since 1663 at Fribourg. It is a stronghold of the Romanists, and still contains many monasteries and nunneries, such as the Carthusian monks at Valsainte, and the Cistercian nuns at La Fille Dieu and at Maigrauge. The canton is divided into 7 administrative districts, and contains 283 communes. It sends 2 members (named by the cantonal legislature) to the Federal *Ständerath*, and 6 members to the Federal *Nationalrath*. The cantonal constitution has scarcely been altered since 1857, and is remarkable as containing none of the modern devices (referendum, initiative, proportional representation) save the right of "initiative" enjoyed by 6000 citizens to claim the revision of the cantonal constitution. The executive council of 7 members is named for 5 years by the cantonal legislature, which consists of members (holding office for 5 years) elected in the proportion of one to every 1200 (or fraction over 800) of the population.

(W. A. B. C.)

FRIBOURG [Ger. *Freiburg*], the capital of the Swiss canton of that name. It is built almost entirely on the left bank of the Sarine, the oldest bit (the Bourg) of the town being just above the river bank, flanked by the Neuveville and Auge quarters, these last (with the Planche quarter on the right bank of the river) forming the *Ville Basse*. On the steeply rising ground to the west of the Bourg is the Quartier des Places, beyond which, to the west and south-west, is the still newer Pérolles quarter, where are the railway station and the new University; all these (with the Bourg) constituting the *Ville Haute*. In 1900 the population of the town was 15,794, of whom 13,270 were Romanists and 109 Jews, while 9701 were French-speaking, and 5595 German-speaking, these last being mainly in the Ville Basse. Its linguistic history is curious. Founded as a German town, the French tongue became the official language during the greater part of the 14th and 15th centuries, but when it joined the Swiss Confederation in 1481 the German influence came to the fore, and German was the official language from 1483 to 1798, becoming thus associated with the rule of the patricians. From 1798 to 1814, and again from 1830 onwards, French prevailed, as at present, though the new University is a centre of German influence.

Fribourg is on the main line of railway from Bern (20 m.) to Lausanne (41 m.). The principal building in the town is the collegiate church of St Nicholas, of which the nave dates from the 13th-14th centuries, while the choir was rebuilt in the 17th century. It is a fine building, remarkable in itself, as well as for its lofty, late 15th century, bell-tower (249 ft. high), with a fine peal of bells; its famous organ was built between 1824 and 1834 by Aloys Mooser (a native of the town), has 7800 pipes, and is played daily in summer for the edification of tourists. The numerous monasteries in and around the town, its old-fashioned aspect, its steep and narrow streets, give it a most striking appearance. One of the most conspicuous buildings in the town is the college of St Michael, while in front of the 16th century town hall is an ancient lime tree stated (but this is very doubtful) to have been planted on the day of the victory of Morat (June 22, 1476). In the Lycée is the Cantonal Museum of Fine Arts, wherein, besides many interesting objects, is the collection of paintings and statuary bequeathed to the town in 1879 by Duchess Adela Colonna (a member of the d'Affry family of Fribourg), by whom many were executed under the name of "Marcello." The deep ravine of the Sarine is crossed by a very fine suspension bridge, constructed 1832–1834 by M. Chaley, of Lyons, which is 167 ft. above the Sarine, has a span of 808 ft., and consists of 6 huge cables composed of 3204 strands. A loftier suspension bridge is thrown over the Gotteron stream just before it joins the Sarine: it is 500 ft. long and 246 ft. in height, and was built in 1840. About 3 m. north of the town is the great railway viaduct or girder bridge of Grandfey, constructed in 1862 (1092 ft. in length, 249 ft. high) at a cost of 2½ million francs. Immediately above the town a vast dam (591 ft. long) was constructed across the Sarine by the engineer Ritter in 1870–1872, the fall thus obtained yielding a water-power of 2600 to 4000 horse-power, and forming a sheet of water known as the Lac de Pérolles. A motive force of 600 horse-power, secured by turbines in the stream, is conveyed to the plateau of Pérolles by "telodynamic" cables of 2510 ft. in length, for whose passage a tunnel has been pierced in the rock. On the Pérolles plateau is the International Catholic University founded in 1889.

History.—In 1178 the foundation of the town (meant to hold in check the turbulent nobles of the neighbourhood) was completed by Berchthold IV., duke of Zähringen, whose father Conrad had founded Freiburg in Breisgau in 1120, and whose son, Berchthold V., was to found Bern in 1191. The spot was chosen for purposes of military defence, and was situated in the *Uechtland* or waste land between Alamannian and Burgundian territory. He granted it many privileges, modelled on the charters of Cologne and of Freiburg in Breisgau, though the oldest existing charter of the town dates from 1249. On the extinction of the male line of the Zähringen dynasty, in 1218, their lands passed to Anna, the sister of the last duke and wife of Count Ulrich of Kyburg. That house kept Fribourg till it too became extinct, in 1264, in the male line. Anna, the heiress, married about 1273 Eberhard, count of Habsburg-Laufenburg, who sold Fribourg in 1277 for 3000 marks to his cousin Rudolf, the head of the house of Habsburg as well as emperor. The town had to fight many a hard battle for its existence against Bern and the count of Savoy, especially between 1448 and 1452. Abandoned by the Habsburgs, and desirous of escaping from the increasing power of Bern, Fribourg in 1452 finally submitted to the count of Savoy, to whom it had become indebted for vast sums of money. Yet, despite all its difficulties, it was in the first half of the 15th century that Fribourg exported much leather and cloth to France, Italy and Venice, as many as 10,000 to 20,000 bales of cloth being stamped with the seal of the town. When Yolande, dowager duchess of Savoy, entered into an alliance with Charles the Bold, duke of Burgundy, Fribourg joined Bern, and helped to gain the victories of Grandson and of Morat (1476).

In 1477 the town was finally freed from the rule of Savoy, while in 1481 (with Soleure) it became a member of the Swiss Confederation, largely, it is said, through the influence of the holy man, Bruder Klaus (Niklaus von der Flüe). In 1475 the town had taken Illens and Arconciel from Savoy, and in 1536 won from Vaud much territory, including Romont, Rue, Châtel St Denis, Estavayer, St Aubin (by these two conquests its dominion reached the Lake of Neuchâtel), as well as Vuissens and Surpierre, which still form outlying portions (physically within the canton of Vaud) of its territory, while in 1537 it took Bulle from the bishop of Lausanne. In 1502–1504 the lordship of Bellegarde or Jaun was bought, while in 1555 it acquired (jointly with Bern) the lands of the last count of the Gruyère, and thus obtained the rich district of that name. From 1475 it ruled (with Bern) the bailiwicks of Morat, Grandson, Orbe and

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Echallens, just taken from Savoy, but in 1798 Morat was incorporated with (finally annexed in 1814) the canton of Fribourg, the other bailiwicks being then given to the canton of Léman (later of Vaud). In the 16th century the original democratic government gradually gave place to the oligarchy of the patrician families. Though this government caused much discontent it continued till it was overthrown on the French occupation of 1798.

From 1803 (Act of Mediation) to 1814, Fribourg was one of the six cantons of the Swiss Confederation. But, on the fall of the new régime, in 1814, the old patrician rule was partly restored, as 108 of the 144 seats in the cantonal legislature were assigned to members of the patrician families. In 1831 the Radicals gained the power and secured the adoption of a more liberal constitution. In 1846 Fribourg (where the Conservatives had regained power in 1837) joined the *Sonderbund* and, in 1847, saw the Federal troops before its walls, and had to surrender to them. The Radicals now came back to power, and again revised the cantonal constitution in a liberal sense. The Catholic and Conservative party made several attempts to recover their supremacy, but their chiefs were driven into exile. In 1856 the Conservatives regained the upper hand at the general cantonal election, secured the adoption in 1857 of a new cantonal constitution, and have ever since maintained their rule, which is some dub "clerical," while others describe it as "anti-radical."

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FRICTION (from Lat. *fricare*, to rub), in physical and mechanical science, the term given to the resistance which every material surface presents to the sliding of any other such surface upon it. This resistance is due to the roughness of the surfaces; the minute projections upon each enter more or less into the minute depressions on the other, and when motion occurs these roughnesses must either be worn off, or continually lifted out of the hollows into which they have fallen, or both, the resistance to motion being in either case quite perceptible and measurable.

Friction is preferably spoken of as "resistance" rather than "force," for a reason exactly the same as that which induces us to treat stress rather as molecular resistance (to change of form) than as force, and which may be stated thus: although friction can be utilized as a moving force at will, and is continually so used, yet it cannot be a primary moving force; it can transmit or modify motion already existing, but cannot in the first instance cause it. For this some external force, not friction, is required. The analogy with stress appears complete; the motion of the "driving link" of a machine is communicated to all the other parts, modified or unchanged as the case may be, by the stresses in those parts; but the actual setting in motion of the driving link itself cannot come about by stress, but must have for its production force obtained directly from the expenditure of some form of energy. It is important, however, that the use of the term "resistance" should not be allowed to mislead. Friction resists the motion of one surface upon another, but it may and frequently does confer the motion of the one upon the other, and in this way causes, instead of resists, the motion of the latter. This may be made more clear, perhaps, by an illustration. Suppose we have a leather strap A passing over a fixed cylindrical drum B, and let a pulling force or effort be applied to the strap. The force applied to A can act on B only at the surfaces of contact between them. There it becomes an effort tending either to move A upon B, or to move the body B itself, according to the frictional conditions. In the absence of friction it would simply cause A to slide on B, so that we may call it an effort tending to make A slide on B. The friction is the resistance offered by the surface of B to any such motion. But the value of this resistance is not in any way a function of the effort itself,—it depends chiefly upon the pressure normal to the surfaces and the nature of the surfaces. It may therefore be either less or greater than the effort. If less, A slides over B, the rate of motion being determined by the excess of the effort over the resistance (friction). But if the latter be greater no sliding can occur, *i.e.* A cannot, under the action of the supposed force, move upon B. The effort between the surfaces exists, however, exactly as before,—and it must now tend to cause the motion of B. But the body B is fixed,—or, in other words, we suppose its resistance to motion greater than any effort which can tend to move it,—hence no motion takes place. It must be specially noticed, however, that it is not the friction between A and B that has prevented motion, this only prevented A moving on B.—it is the force which keeps B stationary, whatever that may be, which has finally prevented any motion taking place. This can be easily seen. Suppose B not to be fixed, but to be capable of moving against some third body C (which might, *e.g.*, contain cylindrical bearings, if B were a drum with its shaft), itself fixed,—and further, suppose the frictional resistance between B and C to be the only resistance to B's motion. Then if this be less than the effort of A upon B, as it of course may be, this effort will cause the motion of B. Thus friction causes motion, for had there been no frictional resistance between the surfaces of A and of B, the latter body would have remained stationary, and A only would have moved. In the case supposed, therefore, the friction between A and B is a necessary condition of B receiving any motion from the external force applied to A.

Without entering here on the mathematical treatment of the subject of friction, some general conclusions may be pointed out which have been arrived at as the results of experiment. The "laws" first enunciated by C. A. Coulomb (1781), and afterwards confirmed by A. J. Morin (1830–1834), have been found to hold good within very wide limits. These are: (1) that the friction is proportional to the normal pressure between the surfaces of contact, and therefore independent of the area of those surfaces, and (2) that it is independent of the velocity with which the surfaces slide one on the other. For many practical purposes these statements are sufficiently accurate, and they do in fact sensibly represent the results of experiment for the pressures and at the velocities most commonly occurring. Assuming the correctness of these, friction is generally measured in terms simply of the total pressure between the surfaces, by multiplying it by a "coefficient of friction" depending on the material of the surfaces and their state as to smoothness and lubrication. But beyond certain limits the "laws" stated are certainly incorrect, and are to be regarded as mere practical rules, of extensive application certainly, but without any pretension to be looked at as really general laws. Both at very high and very low pressures the coefficient of friction is affected by the intensity of pressure, and, just as with velocity, it can only be regarded as independent of the intensity and proportional simply to the total load within more or less definite limits.

Coulomb pointed out long ago that the resistance of a body to be set in motion was in many cases much greater than the resistance which it offered to continued motion; and since his time writers have always distinguished the "friction of rest," or static friction, from the "friction of motion," or kinetic friction. He showed also that the value of the former depended often both upon the intensity of the pressure and upon the length of time during which contact had lasted, both of which facts quite agree with what we should expect from our knowledge of the physical nature, already mentioned, of the causes of friction. It seems not unreasonable to expect that the influence of time upon friction should show itself in a comparison of very slow with very rapid motion, as well as in a comparison of starting (*i.e.* motion after a long time of rest) with continued

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motion. That the friction at the higher velocities occurring in engineering practice is much less than at common velocities has been shown by several modern experiments, such as those of Sir Douglas Galton (see *Report Brit. Assoc.*, 1878, and *Proc. Inst. Mech. Eng.*, 1878, 1879) on the friction between brake-blocks and wheels, and between wheels and rails. But no increase in the coefficient of friction had been detected at slow speeds, until the experiments of Prof. Fleeming Jenkin (*Phil. Trans.*, 1877, pt. 2) showed conclusively that at extremely low velocities (the lowest measured was about ·0002 ft. per second) there is a sensible increase of frictional resistance in many cases, most notably in those in which there is the most marked difference between the friction of rest and that of motion. These experiments distinctly point to the conclusion, although without absolutely proving it, that in such cases the coefficient of kinetic friction gradually increases as the velocity becomes extremely small, and passes without discontinuity into that of static friction.

(A. B. W. K.; W. E. D.)

FRIDAY (A.S. *frige-dæg*, fr. *frige*, gen. of *frigu*, love, or the goddess of love—the Norse Frigg,—the *dæg*, day; cf. Icelandic *frjddagr*, O.H. Ger. *friatag*, *frigatag*, mod. Ger. *Freitag*), the sixth day of the week, corresponding to the Roman *Dies Veneris*, the French *Vendredi* and Italian *Venerdì*. The ill-luck associated with the day undoubtedly arose from its connexion with the Crucifixion; for the ancient Scandinavian peoples regarded it as the luckiest day of the week. By the Western and Eastern Churches the Fridays throughout the year, except when Christmas falls on that day, have ever been observed as days of fast in memory of the Passion. The special day on which the Passion of Christ is annually commemorated is known as Good Friday (*q.v.*). According to Mahommedan tradition, Friday, which is the Moslem Sabbath, was the day on which Adam was created, entered Paradise and was expelled, and it was the day of his repentance, the day of his death, and will be the Day of Resurrection.

FRIEDBERG, the name of two towns in Germany.

1. A small town in Upper Bavaria, with an old castle, known mainly as the scene of Moreau's victory of the 24th of August 1796 over the Austrians.

2. FRIEDBERG IN DER WETTERAU, in the grand duchy of Hesse-Darmstadt, on an eminence above the Usa, 14 m. N. of Frankfort-on-Main, on the railway to Cassel and at the junction of a line to Hanau. Pop. (1905) 7702. It is a picturesque town, still surrounded by old walls and towers, and contains many medieval buildings, of which the beautiful Gothic town church (Evangelical) and the old castle are especially noteworthy. The grand-ducal palace has a beautiful garden. The schools include technical and agricultural academies and a teachers' seminary. It has manufactures of sugar, gloves and leather, and breweries. Friedberg is of Roman origin, but is first mentioned as a town in the 11th century. In 1211 it became a free imperial city, but in 1349 was pledged to the counts of Schwarzburg, and subsequently often changed hands, eventually in 1802 passing to Hesse-Darmstadt.

See Dieffenbach, *Geschichte der Stadt und Burg Friedberg* (Darms., 1857).

FRIEDEL, CHARLES (1832–1899), French chemist and mineralogist, was born at Strassburg on the 12th of March 1832. After graduating at Strassburg University he spent a year in the counting-house of his father, a banker and merchant, and then in 1851 went to live in Paris with his maternal grandfather, Georges Louis Duvernoy (1777–1855), professor of natural history and, from 1830, of comparative anatomy, at the Collège de France. In 1854 he entered C. A. Wurtz's laboratory, and in 1856, at the instance of H. H. de Sénarmont (1808–1862), was appointed conservator of the mineralogical collections at the École des Mines. In 1871 he began to lecture in place of A. L. O. L. Des Cloizeaux (1817–1897) at the École Normale, and in 1876 he became professor of mineralogy at the Sorbonne, but on the death of Wurtz in 1884 he exchanged that position for the chair of organic chemistry. He died at Montauban on the 20th of April 1899. Friedel achieved distinction both in mineralogy and organic chemistry. In the former he was one of the leading workers, in collaboration from 1879 to 1887 with Émile Edmond Sarasin (1843–1890), at the formation of minerals by artificial means, particularly in the wet way with the aid of heat and pressure, and he succeeded in reproducing a large number of the natural compounds. In 1893, as the result of an attempt to make diamond by the action of sulphur on highly carburetted cast iron at 450°–500° C. he obtained a black powder too small in quantity to be analysed but hard enough to scratch corundum. He also devoted much attention to the pyroelectric phenomena of crystals, which served as the theme of one of the two memoirs he presented for the degree of D.Sc. in 1869, and to the determination of crystallographic constants. In organic chemistry, his study of the ketones and aldehydes, begun in 1857, provided him with the subject of his other doctoral thesis. In 1862 he prepared secondary propyl alcohol, and in 1863, with James Mason Crafts (b. 1839), for many years a professor at the Massachusetts Institute of Technology, Boston, he obtained various organometallic compounds of silicon. A few years later further work, with Albert Ladenburg, on the same element yielded silicochloroform and led to a demonstration of the close analogy existing between the behaviour in combination of silicon and carbon. In 1871, with R. D. da Silva (b. 1837) he synthesized glycerin, starting from propylene. In 1877, with Crafts, he made the first publication of the fruitful and widely used method for synthesizing benzene homologues now generally known as the "Friedel and Crafts reaction." It was based on an accidental observation of the action of metallic aluminium on amyl chloride, and consists in bringing together a hydrocarbon and an organic chloride in presence of aluminium chloride, when the residues of the two compounds unite to form a more complex body. Friedel was associated with Wurtz in editing the latter's *Dictionnaire de chimie*, and undertook the supervision of the supplements issued after 1884. He was the chief founder of the *Revue générale de chimie* in 1899. His publications include a *Notice sur la vie et les travaux de Wurtz* (1885), *Cours de chimie organique* (1887) and *Cours de minéralogie* (1893). He acted as president of the International Congress held at Geneva in 1892 for revising the nomenclature of the fatty acid series.

See a memorial lecture by J. M. Crafts, printed in the *Journal of the London Chemical Society* for 1900.

FRIEDLAND, a town of Bohemia, Austria, 103 m. N.E. of Prague by rail. Pop. (1900) 6229. Besides the old town, which is still surrounded by walls, it contains three suburbs. The principal industry is the manufacture of woollen and linen cloth. Friedland is chiefly remarkable for its old castle, which occupies an imposing situation on a small hill commanding the town. A round watch-tower is said to have been built on its site as early as 1014; and the present castle dates from the 13th century. It was several times besieged in the Thirty Years' and Seven Years' Wars. In 1622 it was purchased by Wallenstein, who took from it his title of duke of Friedland. After his death it was given to Count Mathias Gallas by Ferdinand II., and since 1757 it has belonged to the Count Clam Gallas. It was magnificently restored in 1868–1869.

FRIEDLAND, the name of seven towns in Germany. The most important now is that in the grand duchy of Mecklenburg-Strelitz, on the Mühlenteich, 35 m. N.E. of Strelitz by the railway to Neu-Brandenburg. Pop. 7000. It possesses a fine Gothic church and a gymnasium, and has manufactures of woollen and linen cloth, leather and tobacco. Friedland was founded in 1244 by the margraves John and Otto III. of Brandenburg.

FRIEDLAND, a town of Prussia, on the Alle, 27 m. S.E. of Königsberg (pop. 3000), famous as the scene of the battle fought between the French under Napoleon and the Russians commanded by General Bennigsen, on the 14th of June 1807 (see NAPOLEONIC CAMPAIGNS). The Russians had on the 13th driven the French cavalry outposts from Friedland to the westward, and Bennigsen's main body began to occupy the town in the night. The army of Napoleon was set in motion for Friedland, but it was still dispersed on its various march routes, and the

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first stage of the engagement was thus, as usual, a pure "encounter-battle." The corps of Marshal Lannes as "general advanced guard" was first engaged, in the Sortlack Wood and in front of Posthenen (2.30-3 A.M. on the 14th). Both sides now used their cavalry freely to cover the formation of lines of battle, and a race between the rival squadrons for the possession of Heinrichsdorf resulted in favour of the French under Grouchy. Lannes in the meantime was fighting hard to hold Bennigsen, for Napoleon feared that the Russians meant to evade him again. Actually, by 6 A.M. Bennigsen had nearly 50,000 men across the river and forming up west of Friedland. His infantry, in two lines, with artillery, extended between the Heinrichsdorf-Friedland road and the upper bends of the river. Beyond the right of the infantry, cavalry and Cossacks extended the line to the wood N.E. of Heinrichsdorf, and small bodies of Cossacks penetrated even to Schwonau. The left wing also had some cavalry and, beyond the Alle, batteries were brought into action to cover it. A heavy and indecisive fire-fight raged in the Sortlack Wood between the Russian skirmishers and some of Lannes's troops. The head of Mortier's (French and Polish) corps appeared at

Heinrichsdorf and the Cossacks were driven out of Schwonau. Lannes held his own, and by noon, when Napoleon arrived, 40,000 French troops were on the scene of action. His orders were brief: Ney's corps was to take the line between Posthenen and the Sortlack Wood, Lannes closing on his left, to form the centre, Mortier at Heinrichsdorf the left wing. Victor and the Guard were placed in reserve behind Posthenen. Cavalry masses were collected at Heinrichsdorf. The main attack was to be delivered against the Russian left, which Napoleon saw at once to be cramped in the narrow tongue of land between the river and the Posthenen mill-stream. Three cavalry divisions were added to the general reserve. The course of the previous operations had been such that both armies had still large detachments out towards Königsberg. The afternoon was spent by the emperor in forming up the newly arrived masses, the deployment being covered by an artillery bombardment. At 5 o'clock all was ready, and Ney, preceded by a heavy artillery fire, rapidly carried the Sortlack Wood. The attack was pushed on toward the Alle. One of Ney's divisions (Marchand) drove part of the Russian left into the river at Sortlack. A furious charge of cavalry against Marchand's left was repulsed by the dragoon division of Latour-Maubourg. Soon the Russians were huddled together in the bends of the Alle, an easy target for the guns of Ney and of the reserve. Ney's attack indeed came eventually to a standstill; Bennigsen's reserve cavalry charged with great effect and drove him back in disorder. As at Eylau, the approach of night seemed to preclude a decisive success, but in June and on firm ground the old mobility of the French reasserted its value. The infantry division of Dupont advanced rapidly from Posthenen, the cavalry divisions drove back the Russian squadrons into the now congested masses of foot on the river bank, and finally the artillery general Sénarmont advanced a mass of guns to case-shot range. It was the first example of the terrible artillery preparations of modern warfare, and the Russian defence collapsed in a few minutes. Ney's exhausted infantry were able to pursue the broken regiments of Bennigsen's left into the streets of Friedland. Lannes and Mortier had all this time held the Russian centre and right on its ground, and their artillery had inflicted severe losses. When Friedland itself was seen to be on fire, the two marshals launched their infantry attack. Fresh French troops approached the battlefield. Dupont distinguished himself for the second time by fording the mill-stream and assailing the left flank of the Russian centre. This offered a stubborn resistance, but the French steadily forced the line backwards, and the battle was soon over. The losses incurred by the Russians in retreating over the river at Friedland were very heavy, many soldiers being drowned. Farther north the still unbroken troops of the right wing drew off by the Allenburg road; the French cavalry of the left wing, though ordered to pursue, remaining, for some reason, inactive. The losses of the victors were reckoned at 12,100 out of 86,000, or 14%, those of the Russians at 10,000 out of 46,000, or 21% (Berndt, *Zahl im Kriege*).

FRIEDMANN, MEIR (1831–1908), Hungarian Jewish scholar. His editions of the Midrash are the standard texts. His chief editions were the *Sifre* (1864), the *Mekhilta* (1870), *Pesiqla Rabbathi* (1880). At the time of his death he was editing the *Sifra*. Friedmann, while inspired with regard for tradition, dealt with the Rabbinic texts on modern scientific methods, and rendered conspicuous service to the critical investigation of the Midrash and to the history of early homilies. (I. A.)

FRIEDRICH, JOHANN (1836–), German theologian, was born at Poxdorf in Upper Franconia on the 5th of May 1836, and was educated at Bamberg and at Munich, where in 1865 he was appointed professor extraordinary of theology. In 1869 he went to the Vatican Council as secretary to Cardinal Hohenlohe, and took an active part in opposing the dogma of papal infallibility, notably by supplying the opposition bishops with historical and theological material. He left Rome before the council closed. "No German ecclesiastic of his age appears to have won for himself so unusual a repute as a theologian and to have held so important a position, as the trusted counsellor of the leading German cardinal at the Vatican Council. The path was fairly open before him to the highest advancement in the Church of Rome, yet he deliberately sacrificed all such hopes and placed himself in the van of a hard and doubtful struggle" (*The Guardian*, 1872, p. 1004). Sentence of excommunication was passed on Friedrich in April 1871, but he refused to acknowledge it and was upheld by the Bavarian government. He continued to perform ecclesiastical functions and maintained his academic position, becoming ordinary professor in 1872. In 1882 he was transferred to the philosophical faculty as professor of history. By this time he had to some extent withdrawn from the advanced position which he at first occupied in organizing the Old Catholic Church, for he was not in agreement with its abolition of enforced celibacy.

Friedrich was a prolific writer; among his chief works are: *Johann Wessel* (1862); *Die Lehre des Johann Hus* (1862); *Kirchengeschichte Deutschlands* (1867–1869); *Tagebuch während des Vatikan. Concils geführt* (1871); *Zur Vertheidigung meines Tagebuchs* (1872); *Beiträge zur Kirchengeschichte des 18ten Jahrh.* (1876); *Geschichte des Vatikan. Konzils* (1877–1886); *Beiträge zur Gesch. des Jesuitenordens* (1881); *Das Papstthum* (1892); *I. v. Döllinger* (1899–1901).

FRIEDRICHRODA, a summer resort in the duchy of Saxe-Coburg-Gotha, Germany, at the north foot of the Thuringian Forest, 13 m. by rail S.W. from Gotha. Pop. 4500. It is surrounded by fir-clad hills and possesses numerous handsome

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villa residences, a *Kurhaus*, sanatorium, &c. In the immediate neighbourhood is the beautiful ducal hunting seat of Reinhardsbrunn, built out of the ruins of the famous Benedictine monastery founded in 1085.

FRIEDRICHSDORF, a town of Germany, in the Prussian province of Hesse-Nassau, on the southern slope of the Taunus range, 3 m. N.E. from Homburg. Pop. 1300. It has a French Reformed church, a modern school, dyeworks, weaving mills, tanneries and tobacco manufactures. Friedrichsdorf was founded in 1687 by Huguenot refugees and the inhabitants still speak French. There is a monument to Philipp Reis (1834–1874), who in 1860 first constructed the telephone while a science master at the school.

FRIEDRICHSHAFEN, a town of Germany, in the kingdom of Württemberg, on the east shore of the Lake of Constance, at the junction of railways to Bretten and Lindau. Pop. 4600. It consists of the former imperial town of Buchhorn and the monastery and village of Hofen. The principal building is the palace, formerly the residence of the provosts of Hofen, and now the summer residence of the royal family. To the palace is attached the Evangelical parish church. The town has a hydropathic establishment and is a favourite tourist resort. Here are also the natural history and antiquarian collections of the Lake Constance Association. Buchhorn is mentioned (as Buachihorn or Puchihorn) in documents of 837 and was the seat of a powerful countship. The line of counts died out in 1089, and the place fell first to the Welfs and in 1191 to the Hohenstaufen. In 1275 it was made a free imperial city by King Rudolph I. In 1802 it lost this status and was assigned to Bavaria, and in 1810 to Württemberg. The monastery of Hofen was founded in 1050 as a convent of Benedictine nuns, but was changed in 1420 into a provostship of monks. It was suppressed in 1802 and in 1805 came to Württemberg. King Frederick I., who caused the harbour to be made, amalgamated Buchhorn and Hofen under the new name of Friedrichshafen.

FRIEDRICHSRUH, a village in the Prussian province of Schleswig-Holstein, 15 m. S.E. of Hamburg, with a station on the main line of railway to Berlin. It gives its name to the famous country seat of the Bismarck family. The house is a plain unpretentious structure, but the park and estate, forming a portion of the famous Sachsenwald, are attractive. Close by, on a knoll, the Schneckenberg, stands the mausoleum in which the remains of Prince Otto von Bismarck were entombed on the 16th of March 1899.

FRIENDLY[1] SOCIETIES. These organizations, according to the comprehensive definition of the Friendly Societies Act 1896, which regulates such societies in Great Britain and Ireland, are "societies for the purpose of providing by voluntary subscriptions of the members thereof, with or without the aid of donations, for the relief or maintenance of the members, their husbands, wives, children, fathers, mothers, brothers or sisters, nephews or nieces, or wards being orphans, during sickness or other infirmity, whether bodily or mental, in old age, or in widowhood, or for the relief or maintenance of the orphan children of members during minority; for insuring money to be paid on the birth of a member's child, or on the death of a member, or for the funeral expenses of the husband, wife, or child of a member, or of the widow of a deceased member, or, as respects persons of the Jewish persuasion, for the payment of a sum of money during the period of confined mourning; for the relief or maintenance of the members when on travel in search of employment or when in distressed circumstances, or in case of shipwreck, or loss or damage of or to boats or nets; for the endowment of members or nominees of members at any age; for the insurance against fire to any amount not exceeding £15 of the tools or implements of the trade or calling of the members"—and are limited in their contracts for assurance of annuities to £52 (previous to the Friendly Societies Act 1908 the sum was £50), and for insurance of a gross sum to £300 (previous to the act of 1908 the sum was £200). They may be described in a more popular and condensed form of words as the mutual insurance societies of the poorer classes, by which they seek to aid each other in the emergencies arising from sickness and death and other causes of distress. A phrase in the first act for the encouragement and relief of friendly societies, passed in 1793, designating them "societies of good fellowship," indicates another useful phase of their operations.

The origin of the friendly society is, probably in all countries, the burial club. It has been the policy of every religion, if indeed it is not a common instinct of humanity, to surround the disposal of a dead body with circumstances of pomp and expenditure, often beyond the means of the surviving relatives. The appeal for help to friends and neighbours which necessarily follows is soon organized into a system of mutual aid, that falls in naturally with the religious ceremonies by which honour is done to the dead. Thus in China there are burial societies, termed "long-life loan companies," in almost all the towns and villages. Among the Greeks the *ἔρανοι* combined the religious with the provident element (see CHARITY AND CHARITIES). From the Greeks the Romans derived their fraternities of a similar kind. The Teutons in like manner had their gilds. Whether the English friendly society owes its origin in the higher degree to the Roman or the Teutonic influence can hardly be determined. The utility of providing by combination for the ritual expenditure upon burial having been ascertained, the next step—to render mutual assistance in circumstances of distress generally—was an easy one, and we find it taken by the Greek *ἔρανοι* and by the English gilds. Another modification—that the societies should consist not so much of neighbours as of persons having the same occupation—soon arises; and this is the germ of our trade unions and our city companies in their original constitution. The interest, however, that these inquiries possess is mainly antiquarian. The legal definition of a friendly society quoted above points to an organization more complex than those of the ancient fraternities and gilds, and proceeding upon different principles. It may be that the one has grown out of the other. The common element of a provision for a contingent event by a joint contribution is in both; but the friendly society alone has attempted to define with precision what is the risk against which it intends to provide, and what should be the contributions of the members to meet that risk.

United Kingdom.—It would be curious to endeavour to trace how, after the suppression of the religious gilds in the 16th century, and the substitution of an organized system of relief by the poor law of Elizabeth for the more voluntary and casual means of relief that previously existed, the modern system of friendly societies grew up. The modern friendly society, particularly in rural districts, clings with fondness to its annual feast and procession to church, its procession of all the brethren on the occasion of the funeral of one of them, and other incidents which are almost obviously survivals of the customs of medieval gilds. The last recorded gild was in existence in 1628, and there are records of friendly societies as early as 1634 and 1639. The connecting links, however, cannot be traced. With the exception of a society in the port of Borrowstounness on the Firth of Forth, no existing friendly society is known to be able to trace back its history beyond a date late in the 17th century, and no records remain of any that might have existed in the latter half of the 16th century or the greater part of the 17th. One founded in 1666 was extant in 1850, but it has since ceased to exist. This is not so surprising as it might appear. Documents which exist in manuscript only are much less likely to have been preserved since the invention of printing than they were before; and such would be the simple rules and records of any society that might have existed during this interval—if, indeed, many of them kept records at all. On the whole, it seems probable therefore that the friendly society is a lineal descendant of the ancient gild—the idea never having wholly died out, but having been kept up from generation to generation in a succession of small and scattered societies.

[1] The word "friend" (O.E. *freond*, Ger. *Freund*, Dutch *Vriend* is derived from an old Teutonic verb meaning to love. While used generally as the opposite to enemy, it is specially the term which connotes any degree, but particularly a high degree of personal goodwill, affection or regard, from which the element of sexual love is absent.

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At the same time, it seems probable that the friendly society of the present day owes its revival to a great extent to the Protestant refugees of Spitalfields, one of whose societies was founded in 1703, and has continued among descendants of the same families, whose names proclaim their Norman origin. This society has distinguished itself by the intelligence with which it has adapted its machinery to the successive modifications of the law, and it completely reconstructed its rules under the provisions of the Friendly Societies Acts 1875 and 1876.

Another is the society of Lintot, founded in London in 1708, in which the office of secretary was for more than half a century filled by persons of the name of Levesque, one of whom published a translation of its original rules. No one was to be received into the society who was not a member, or the descendant of a member, of the church of Lintot, of recognized probity, a good Protestant, and well-intentioned towards the queen [Anne] and faithful to the government of the country. No one was to be admitted below the age of eighteen, or who had not been received at holy communion and become member of a church. A member should not have a claim to relief during his first year's membership, but if he fell sick within the year a collection should be made for him among the members. The foreign names still borne by a large proportion of the members show that the connexion with descendants of the refugees is maintained.

The example of providence given by these societies was so largely followed that Rose's Act in 1793 recognized the existence of numerous societies, and provided encouragement for them in various ways, as well as relief from taxation to an extent which in those days must have been of great pecuniary value, and exemption from removal under the poor law. The benefits offered by this statute were readily accepted by the societies, and the vast number of societies which speedily became enrolled shows that Rose's Act met with a real public want. In the county of Middlesex alone nearly a thousand societies were enrolled within a very few years after the passing of the act, and the number in some other counties was almost as great. The societies then formed were nearly all of a like kind—small clubs, in which the feature of good fellowship was in the ascendant, and that of provident assurance for sickness and death merely accessory. This is indicated by one provision which occurs in many of the early enrolled rules, viz. that the number of members shall be limited to 61, 81 or 101, as the case may be. The odd 1 which occurs in these numbers probably stands for the president or secretary, or is a contrivance to ensure a clear majority. Several of these old societies are still in existence, and can point to a prosperous career based rather upon good luck than upon scientific calculation. Founded among small tradesmen or persons in the way to thrive, the claims for sickness were only made in cases where the sickness was accompanied by distress, and even the funeral allowance was not always demanded.

The societies generally not being established upon any scientific principle, those which met with this prosperity were the exception to the rule; and accordingly the cry that friendly societies were failing in all quarters was as great in 1819 as in 1869. A writer of that time speaks of the instability of friendly societies as "universal", and the general conviction that this was so resulted in the passing of the act of 1819. It recites that "the habitual reliance of poor persons upon parochial relief, rather than upon their own industry, tends to the moral deterioration of the people and to the accumulation of heavy burthens upon parishes; and it is desirable, with a view as well to the reduction of the assessment made for the relief of the poor as to the improvement of the habits of the people, that encouragement should be afforded to persons desirous of making provision for themselves or their families out of the fruits of their own industry. By the contributions of the savings of many persons to one common fund the most effectual provision may be made for the casualties affecting all the contributors; and it is therefore desirable to afford further facilities and additional security to persons who may be willing to unite in appropriating small sums from time to time to a common fund for the purposes aforesaid, and it is desirable to protect such persons from the effects of fraud or miscalculation." This preamble went on to recite that the provisions of preceding acts had been found insufficient for these purposes, and great abuses had prevailed in many societies established under their authority. By this statute a friendly society was defined as "an institution, whereby it is intended to provide, by contribution, on the principle of mutual insurance, for the maintenance or assistance of the contributors thereto, their wives or children, in sickness, infancy, advanced age, widowhood or any other natural state or contingency, whereof the occurrence is susceptible of calculation by way of average." It will be seen that this act dealt exclusively with the scientific aspect of the societies, and had nothing to say to the element of good fellowship. Rules and tables were to be submitted by the persons intending to form a society to the justices, who, before confirming them, were to satisfy themselves that the contingencies which the society was to provide against were within the meaning of the act, and that the formation of the society would be useful and beneficial, regard being had to the existence of other societies in the same district. No tables or rules connected with calculation were to be confirmed by the justices until they had been approved by two persons at least, known to be professional actuaries or persons skilled in calculation, as fit and proper, according to the most correct calculation of which the nature of the case would admit. The justices in quarter sessions were also by this act authorized to publish general rules for the formation and government of friendly societies within their county. The practical effect of this statute in requiring that the societies formed under it should be established on sound principles does not appear to have been as great as might have been expected. The justices frequently accepted as "persons skilled in calculation" local schoolmasters and others who had no real knowledge of the technical difficulties of the subject, while the restrictions upon registry served only to increase the number of societies established without becoming registered.

In 1829 the law relating to friendly societies was entirely reconstructed by an act of that year, and a barrister was appointed under that act to examine the rules of societies, and ascertain that they were in conformity to law and to the provisions of the act. The barrister so appointed was John Tidd Pratt (1797–1870); and no account of friendly societies would be complete that did not do justice to the remarkable public service rendered by this gentleman. For forty years, though he had by statute really very slight authority over the societies, his name exercised the widest influence, and the numerous reports and publications by which he endeavoured to impress upon the public mind sound principles of management of friendly societies, and to expose those which were managed upon unsound principles, made him a terror to evil-doers. On the other hand, he lent with readiness the aid of his legal knowledge and great mental activity to assisting well-intentioned societies in coming within the provisions of the acts, and thus gave many excellent schemes a legal organization.

By the act of 1829, in lieu of the discretion as to whether the formation of the proposed society would be useful and beneficial, and the requirement of the actuarial certificate to the tables, it was enacted that the justices were to satisfy themselves that the tables proposed to be used might be adopted with safety to all parties concerned. This provision, of course, became a dead letter and was repealed in 1834. Thenceforth, societies were free to establish themselves upon what conditions and with what rates they chose, provided only they satisfied the barrister that the rules were "calculated to carry into effect the intention of the parties framing them," and were "in conformity to law."

By an act of 1846 the barrister certifying the rules was constituted "Registrar of Friendly Societies," and the rules of all societies were brought together under his custody. An actuarial certificate was to be obtained before any society could be registered "for the purpose of securing any benefit dependent on the laws of sickness and mortality." In 1850 the acts were again repealed and consolidated with amendments. Societies were divided into two classes, "certified" and "registered." The certified societies were such as obtained a

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certificate to their tables by an actuary possessing a given qualification, who was required to set forth the data of sickness and mortality upon which he proceeded, and the rate of interest assumed in the calculations. All other societies were to be simply registered. Very few societies were constituted of the "certified" class. The distinction of classes was repealed and the acts were again consolidated in 1855. Under this act, which admitted of all possible latitude to the framers of rules of societies, 21,875 societies were registered, a large number of them being lodges or courts of affiliated orders, and the act continued in force till the end of 1875.

The Friendly Societies Act 1875 and the several acts amending it are still, in effect, the law by which these societies are regulated, though in form they have been replaced by two consolidating acts, viz. the Friendly Societies Act 1896 and the Collecting Societies and Industrial Assurance Companies Act 1896. This legislation still bears the permissive and elastic character which marked the more successful of the previous acts, but it provides ampler means to members of ascertaining and remedying defects of management and of restraining fraud. The business of registry is under the control of a chief registrar, who has an assistant registrar in each of the three countries, with an actuary. An appeal to the chief registrar in the case of the refusal of an assistant registrar to register a society or an amendment of rules, and in the case of suspension or cancelling of registry, is interposed before appeal is to be made to the High Court. Registry under a particular name may be refused if in the opinion of the registrar the name is likely to deceive the members or the public as to the nature of the society or as to its identity. It is the duty of the chief registrar, among other things, to require from every society a return in proper form each year of its receipts and expenditure, funds and effects; and also once every five years a valuation of its assets and liabilities. Upon the application of a certain proportion of the members, varying according to the magnitude of the society, the chief registrar may appoint an inspector to examine into its affairs, or may call a general meeting of the members to consider and determine any matter affecting its interests. These are powers which have been used with excellent effect. Cases have occurred in which fraud has been detected and punished by this means that could not probably have been otherwise brought to light. In others a system of mismanagement has been exposed and effectually checked. The power of calling special meetings has enabled societies to remedy defects in their rules, to remove officers guilty of misconduct, &c., where the procedure prescribed by the rules was for some reason or other inapplicable. Upon an application of a like proportion of members the chief registrar may, if he finds that the funds of a society are insufficient to meet the existing claims thereon, or that the rates of contribution are insufficient to cover the benefits assured (upon which he consults his actuary), order the society to be dissolved, and direct how its funds are to be applied. Authority is given to the chief registrar to direct the expense (preliminary, incidental, &c.) of an inspection or special meeting to be defrayed by the members or officers, or former members or officers, of a society, if he does not think they should be defrayed either by the applicants or out of the society's funds. He is also empowered, with the approval of the treasury, to exempt any friendly society from the provisions of the Collecting Societies Act if he considers it to be one to which those provisions ought not to apply. Every society registered after 1895, to which these provisions do apply, is to use the words "Collecting Society" as the last words of its name.

The law as to the membership of infants has been altered three times. The act of 1875 allowed existing societies to continue any rule or practice of admitting children as members that was in force at its passing, and prohibited membership under sixteen years of age in any other case, except the case of a juvenile society composed wholly of members under that age. The treasury made special regulations for the registry of such juvenile societies. In 1887 the maximum age of their members was extended to twenty-one. In 1895 it was enacted that no society should have any members under one year of age, whether authorized by an existing rule or not; and that every society should be entitled to make a rule admitting members at any age over one year, but by the Friendly Societies Act 1908 membership was permitted to minors under the age of one year. The Treasury, upon the enactment of 1895 coming into operation, rescinded its regulations for the registry of juvenile societies; and though it is still the practice to submit for registry societies wholly composed of persons under twenty-one, these societies in no way differ from other societies, except in the circumstances that they are obliged to seek officers and a committee of management from outside, as no member of the committee of any society can be under twenty-one years of age. In order to promote the discontinuance of this anomalous proceeding of creating societies under the Friendly Societies Act, which, by the conditions of their existence, are unable to be self-governing, the act provides an easy method of amalgamating juvenile societies and ordinary societies or branches, or of distributing the members and the funds of a juvenile society among a number of branches. The liability of schoolboys and young working lads to sickness is small, and these societies frequently accumulate funds, which, as their membership is temporary, remain unclaimed and are sometimes misapplied.

The legislation of 1875 and 1876 was the result of the labours of a royal commission of high authority, presided over by Sir Stafford Northcote (afterwards Lord Iddesleigh), which sat from 1870 to 1874, and prosecuted an exhaustive inquiry into the organization and conditions of the various classes of friendly societies. Their reports occupy more than a dozen large bluebooks. They divided registered friendly societies into 13 classes.

The first class included the affiliated societies or "orders," such as the Manchester Unity of Oddfellows, the Ancient Order of Foresters, the Rechabites, Druids, &c. These societies have a central body, either situated in some large town, as in the case of the Manchester Unity, or moving from place to place, as in that of the Foresters. Under this central body, the country is (in most cases) parcelled out into districts, and these districts again consist each of a number of independent branches, called "lodges," "courts," "tents," or "divisions," having a separate fund administered by themselves, but contributing also to a fund under the control of the central body. Besides these great orders, there are smaller affiliated bodies, each having more than 1000 members; and the affiliated form of society appears to have great attraction. Indeed, in the colony of Victoria, Australia, all the existing friendly societies are of this class. The orders have their "secrets," but these, it may safely be said, are of a very innocent character, and merely serve the purpose of identifying a member of a distant branch by his knowledge of the "grip," and of the current password, &c. Indeed they are now so far from being "secret societies" that their meetings are attended by reporters and the dates published in the newspapers, and the Order of Foresters has passed a wise resolution expunging from its publications all affectation of mystery.

Most of the lodges existing before 1875 have converted themselves into registered branches. The requirement that for that purpose a vote of three-fourths should be necessary was altered in 1895 to a bare majority vote. The provisions as to settlement of disputes were extended in 1885 to every description of dispute between branches and the central body, and in 1895 it was provided that the forty days after which a member may apply to the court to settle a dispute where the society fails to do so, shall not begin to run until application has been made in succession to all the tribunals created by the order for the purpose. In 1887 it was enacted that no body which had been a registered branch should be registered as a separate society except upon production of a certificate from the order that it had seceded or been expelled; and in 1895 it was further enacted that no such body should, after secession or expulsion, use any name or number implying that it is still a branch of the order. The orders generally, especially the greater ones, have carefully supervised the valuations of their branches, and have urged and, as far as circumstances have rendered it practicable, have enforced upon the branches measures for diminishing the deficiencies which the valuations have disclosed. They have organized plans by which branches disposed to make an effort to help themselves in this matter may be assisted out of a central fund. The second class was made up of "general societies," principally existing in London, of which the commissioners enumerated 38, with nearly 60,000 members, and funds amounting to a quarter of a million.

The third class included the "county societies." These societies have been but feebly supported by those for whose benefit they are instituted, having all exacted high rates of contribution, in order to secure financial soundness.

Class 4, "local town societies," is a very numerous one. Among some of the larger societies may be mentioned the "Chelmsford Provident," the "Brighton and Sussex Mutual," the "Cannon Street, Birmingham," the "Birmingham General Provident." In

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this group might also be included the interesting societies which are established among the Jewish community. They differ from ordinary friendly societies partly in the nature of the benefits granted upon death, which are intended to compensate for loss of employment during the time of ceremonial seclusion enjoined by the Jewish law, which is called "sitting shiva." They also provide a cab for the mourners and rabbi, and a tombstone for the departed, and the same benefits as an ordinary friendly society during sickness. Some also provide a place of worship. Of these the "Pursuers of Peace" (enrolled in December 1797), the "Bikhur Cholim, or Visitors of the Sick" (April 1798), the "Hozier Holim" (1804), may be mentioned.

Class 5 was "local village and country societies," including the small public-house clubs which abound in the villages and rural districts, a large proportion of which are unregistered.

Class 6 was formed of "particular trade societies."

Class 7 was "dividing societies." These were before 1875 unauthorized by law, though they were very attractive to the members. Their practice is usually to start afresh every January, paying a subscription somewhat in excess of that usually charged by an ordinary friendly society, out of which a sick allowance is granted to any member who may fall sick during the year, and at Christmas the balance not so applied is divided among the members equally, with the exception of a small sum left to begin the new year with. The mischief of the system is that, as there is no accumulation of funds, the society cannot provide for prolonged sickness or old age, and must either break up altogether or exclude its sick and aged members at the very time when they most need its help. This, however, has not impaired the popularity of the societies, and by the act of 1875, framed on the sound principle that the protection of the law should not be withheld from any form of association, enables a society to be registered with a rule for dividing its funds, provided only that all existing claims upon the society are to be met before a division takes place.

Class 8, "deposit friendly societies," combine the characteristics of a savings bank with those of a friendly society. They were devised by the Hon. and Rev. Sir J. Yorke, on the principle that a certain proportion of the sick allowance is to be raised out of a member's separate deposit account, which, if not so used, is retained for his benefit. Their advantages are in the encouragement they offer to saving, and in meeting the main objection sometimes raised to friendly societies, that the man who is not sick gets nothing for his money; their disadvantage is in their failing to meet cases of sickness so prolonged as to exhaust the whole of the member's own deposit.

Class 9, "collecting societies," are so called because their contributions are received through a machinery of house-to-house collection. These were the subject of much laborious investigation and close attention on the part of the commissioners. They deal with a lower class of the community, both with respect to means and to intelligence, than that from which the members of ordinary friendly societies are drawn. The large emoluments gained by the officers and collectors, the high percentage of expenditure (often exceeding half the contributions), and the excessive frequency of lapsing of insurances point to mischiefs in their management. "The radical evil of the whole system (the commissioners remark) appears to us to lie in the employment of collectors, otherwise than under the direct supervision and control of the members, a supervision and control which we fear to be absolutely unattainable in societies that are not purely local." On the other hand, it must be conceded that these societies extend the benefits of life insurance to a class which the other societies cannot reach, namely, the class that will not take the trouble to attend at an office, but must be induced to effect an insurance by a house-to-house canvasser, and be regularly visited by the collector to ensure their paying the contributions. To many such persons these societies, despite all their errors of constitution and management, have been of great benefit. The great source of these errors lies in a tendency on the part of the managers of the societies to forget that they are simply trustees, and to look upon the concern as their own personal property to be managed for their own benefit. These societies are of two kinds, local and general. For the general societies the act of 1875 made certain stringent provisions. Each member was to be furnished with a copy of the rules for one penny, and a signed policy for the same charge. Forfeiture of benefit for non-payment is not to be enforced without fourteen days' written notice. The transfer of a member from one society to another was not to be made without his written consent and notice to the society affected. No collector is to be a manager, or vote or take part at any meeting. At least one general meeting was to be held every year, of which notice must be given either by advertisement or by letter or post card to each member. The balance-sheet is to be open for inspection seven days before the meeting, and to be certified by a public accountant, not an officer of the society. Disputes could be settled by justices, or county courts, notwithstanding anything in the rules of the society to the contrary. Closely associated with the question of the management of these societies is that of the risk incurred by infant life, through the facilities offered by these societies for making insurances on the death of children. That this is a real risk is certain from the records of the assizes, and from many circumstances of suspicion; but the extent of it cannot be measured, and has probably been exaggerated. It has never been lawful to assure more than £6 on the death of a child under five years of age, or more than £10 on the death of one under ten. Previous to the act of 1875, however, there was no machinery for ascertaining that the law was complied with, or for enforcing it. This is supplied by that act, though still somewhat imperfectly. When the bill went up to the House of Lords, an amendment was made, reducing the limit of assurance on a child under three years of age to £3, but this amendment was unfortunately disagreed with by the House of Commons.

Class 10, annuity societies, prevail in the west of England. These societies are few, and their business is diminishing. Most of them originated in the time when government subsidized friendly societies by allowing them £4:11:3% per annum interest. Now annuities may be purchased direct from the National Debt commissioners. These societies are more numerous, however, in Ireland.

Class 11, female societies, are numerous. Many of them resemble affiliated orders as at least in name, calling themselves Female Foresters, Odd Sisters, Loyal Orangewomen, Comforting Sisters and so forth. In their rules may be found such a provision as that a member shall be fined who does not "behave as becometh an Orangewoman." Many are unregistered. In the northern counties of England they are sometimes termed "life boxes," doubtless from the old custom of placing the contributions in a box. The trustees, treasurer, and committee are usually females, but very frequently the secretary is a man, paid a small salary.

Under Class 12 the commissioners included the societies for various purposes which were authorized by the secretary of state to be registered under the Friendly Societies Act of 1855, comprising working men's clubs, and other societies specially created by statutes, as well as others that are now defined to be friendly societies. Among these purposes are assisting members in search of employment; assisting members during slack seasons of trade; granting temporary relief to members in distressed circumstances; purchase of coals and other necessaries to be supplied to members; relief or maintenance in case of lameness, blindness, insanity, paralysis, or bodily hurt through accidents; also, the assurance against loss by disease or death of cattle employed in trade; the granting relief in case of shipwreck or loss or damage to boats or nets; and societies for social intercourse, mutual helpfulness, mental and moral improvement, rational recreation, &c., called working-men's clubs.

Class 13 was composed of the loan insurance societies.

These are the thirteen classes into which the commissioners divided registered friendly societies. There were 26,034 societies enrolled or certified under the various acts for friendly societies in force between 1793 and 1855; and, as we have seen, 21,875 societies registered under the act of 1855 before the 1st January 1876, when the act of 1875 came into operation. The total therefore of societies to which a legal constitution had been given was 47,909. Of these 26,087 were presumed to be in existence when the register called for his annual return, and 21,282 had furnished the return required. These had 3,404,187 members, and £9,336,946 funds. Twenty-two societies returned over 10,000 members each; nine over 30,000. One society (the Royal Liver Friendly Society, Liverpool) is the largest of the registered societies) returned 232,371 members. The next in order was one of the same class, the United Assurance Society, Liverpool, with 159,957 members; but in all societies of this class the membership consists very largely of infants. The average of members in the 11,260 societies with less than 10,000 members each was only 171.

Such were the registered societies; but there remained behind a large body of unregistered societies. With increased knowledge of the principles of registration, and of the proper principles upon which friendly societies should be established, the number of unregistered societies, in comparison with those registered, ought to become much less.

On the financial side it is in the highest degree essential to the interests of their members that friendly societies should be financially sound,—in other words, that they should throughout their existence be able to meet the engagements into which they have entered with their members. For this purpose it is necessary that the members' contributions should be so fixed as to prove adequate, with proper management, to provide the benefits promised to the members. These benefits almost entirely depend upon the contingencies of health and life; that is, they take the form of payments to members when sick, of payments to members upon attaining given ages, or of payments upon members' deaths, and frequently a member is

[1] These may be briefly summed up thus:—(1) power to hold land and vesting of property in trustees by mere appointment; (2) remedy against misapplication of funds; (3) priority in bankruptcy or on death of officer; (4) transfer of stock by direction of chief registrar; (5) exemption from stamp duties; (6) membership of minors; (7) certificates of birth and death at reduced cost; (8) investment with National Debt Commissioners; (9) reduction of fines on admission to copyholds; (10) discharge of mortgages by mere receipt; (11) obligation on officers to render accounts; (12) settlement of disputes; (13) insurance of funeral expenses for wives and children without insurable interest; (14) nomination at death; (15) payment without administration; (16) services of public auditors and valuers; (17) registry of documents, of which copies may be put in evidence.

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assured for all these benefits, viz. a weekly payment if at any time sick before attaining a certain age, a weekly payment for the remainder of life after attaining that age, and a sum to be paid upon his death. Of course the object of the allowance in sickness is to provide a substitute for the weekly wage lost in consequence of being unable to work, and the object of the weekly payment after attaining a certain age, when the member will probably be too infirm to be able to earn a living by the exercise of his calling or occupation, is to provide him with the necessaries of life, and so enable him to be independent of poor relief. There is every reason to believe that, when a large group of members of friendly societies and similar bodies is observed, there will be found to prevail among them, taken one with another, an average number of days' sickness, as well as an average rate of mortality, in passing through each year of life, which can be very nearly predicted from the records furnished by statistics based upon observations previously made upon similarly circumstanced groups. Assuming, therefore, the necessary statistics to be attainable, the computation of suitable rates of contribution to be paid by the members of a society in return for certain allowances during sickness, or upon attaining a certain age, or upon death, can be readily made by an actuarial expert. Accordingly, to furnish these statistics, the act of 1875, in continuation of an enactment which first appeared in a statute passed in 1829, required every registered society to make quinquennial returns of the sickness and mortality experienced by its members. By the year 1880 ten periods of five years had been completed, and at the end of each of them a number of returns had been received. Some of these had been tabulated by actuaries, the latest tabulation being of those for the five years ending 1875. There remained untabulated five complete sets of returns for the five subsequent quinquennial periods. It was resolved that these should be tabulated once for all, and it was considered that they would afford sufficient material for the construction of tables of sickness and mortality that might be adopted for the future as standard tables for friendly societies; and that it would be inexpedient to impose any longer on the societies the burden of making such returns. This requirement of the act was accordingly repealed in 1882. The result of the tabulation appeared in 1866, in a bluebook of 1367 folio pages, containing tables based upon the experience of nearly four and a half million years of life. These tables showed generally, as compared with previous observations, an increased liability to sickness. This inference has been confirmed by the observations of Mr Alfred W. Watson, actuary to the Independent Order of Oddfellows, Manchester Unity Friendly Society, on his investigation of the sickness and mortality experience of that society during the five years 1893–1897, which extended over 800,000 individuals, more than 3,000,000 years of life and 7,000,000 weeks of sickness.

The establishment of the National Conference of Friendly Societies by the orders and a few other societies has been of great service in obtaining improvements in the law, and in enabling the societies strongly to represent to the government and the legislature any grievance entertained by them. A complaint that membership of a shop club was made by certain employers a condition of employment, and that the rules of the club required the members to withdraw from other societies, led to the appointment of a departmental committee, who recommended that such a condition of employment should be made illegal, except in certain cases, and that in every case it should be illegal to make the withdrawal from a society a condition of employment. In 1902 an act was passed based upon this recommendation.

It is an increasing practice among societies of combining together to obtain medical attendance and medicine for their members by the formation of medical associations. In 1895 trade unions were enabled to join in such associations, and it was provided that a contributing society or union should not withdraw from an association except upon three months' notice. The working of these associations has been viewed with dissatisfaction by members of the medical profession, and it has been suggested that a board of conciliation should be formed consisting of representatives of the Conference of Friendly Societies and of an equal number of medical men.

The following figures are derived from returns of registered societies and branches of registered societies to the beginning of 1905:

	Number of Returns.	Number of Members.	Amount of Funds.
Ordinary Friendly Societies (classes 2 to 8, 10 and 11).	6,938	3,132,065	£17,042,398
Societies having Branches (class 1)	20,819	2,606,029	23,446,330
Collecting Friendly Societies (class 9)	45	7,448,549	7,862,569
Benevolent Societies (class 12)	75	26,309	317,913
Working Men's Clubs (class 12)	913	236,398	318,945
Specially Authorized Societies (class 12)	122	75,089	628,759
Specially Authorized Loan Societies (class 12)	517	115,511	771,578
Medical Societies (see last paragraph)	95	324,145	62,049
Cattle Insurance Societies (class 13)	57	3,736	7,746
Shop Clubs (under act of 1902)	7	10,859	773
	29,588	13,978,790	£50,459,060

British Empire.—In many of the British colonies legislation on the subject similar to that of the mother-country has been adopted. In those forming the Commonwealth of Australia and in New Zealand the affiliated orders hold the field, there being few, if any, independent friendly societies. The state of Victoria has more than 1000 lodges with more than 100,000 members and nearly 1½ million pounds funds, averaging nearly £14 per member. Besides the registrar there is a government actuary for friendly societies, by whom the liabilities and accounts of all societies are valued every five years, a method which ensures uniformity in the processes of valuation. The friendly societies in the other Australasian states are not so numerous nor so wealthy, but are in each case under the supervision of vigilant public officials. In New Zealand a friendly society was established at New Plymouth in 1841, the first year of that settlement. The formation of a society at Nelson was resolved upon by the emigrants on shipboard on their passage out, and the first meeting was held among the tall fern near the beach a few days after they landed. The societies have now a registrar, an actuary, a revising barrister and two public valuers. Investigations have been made into their sickness experience, with results which compare favourably with those of the Manchester Unity and the registry office in the mother-country until the higher ages, when greater sickness appears to result from lower mortality. The average funds per member are £19,10s. Nearly four-fifths are invested in the purchase or on mortgage of real estate.

In Cape Colony no society is allowed to register unless it be shown to the satisfaction of the registrar that the contributions which it proposes to charge are adequate to provide for the benefits which it undertakes to grant. The consequence is that little more than one-third of the existing societies are registered.

In the Dominion of Canada, province of Ontario, extensive powers of control are given to the registrar, and societies are not admitted to registry without strict proof of their compliance with the conditions of registry imposed by the law. Very full returns of their transactions are required and published, and registry is cancelled when any of the conditions of registry cease to be observed. These conditions apply not only to societies existing in Ontario, but to foreign societies transacting business there.

In several of the West Indian Islands statutes have been passed on the model of British legislation and registrars have been appointed.

European Countries.—In foreign countries the development of friendly societies has proceeded upon different lines. Belgium has a *Commission royale permanente des sociétés de secours mutuel.* Under laws passed in 1851 and 1894 societies are divided into two classes, recognized and not recognized. The recognized societies were in 1886 only about half as many as the unrecognized. There were in 1904 nearly 7000 recognized societies with 700,000 members. They enjoy the privileges of incorporation, exemption from stamp duty, gratuitous announcement in the official Moniteur and may have free postage.

In France under the second empire a scheme was prepared for assisting friendly societies by granting them collective insurances under government security. The societies have the privilege of investing their funds in the Caisse des Dépôts et Consignations, corresponding to the English National Debt commission. The dual classification of societies in France is into those "authorized" and those "approved." By a law of the 1st of April 1898 a friendly society may be established by merely depositing a copy of its rules and list of officers with the sousprefet. Approved societies are entitled to certain state subventions for assisting in the purchase of old-age pensions and otherwise. A higher council has been established to advise on their working.

In Germany a law was passed on

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the 7th of April 1876 (amended on the 1st of June 1884) which prescribed for registered friendly societies many things which in England are left to the discretion of their founders; and it provided for an amount of official interference in their management that is wholly unknown here. The superintending authority had a right to inspect the books of every society, whether registered or not, and to give formal notice to a society to call in arrears, exclude defaulters, pay benefits or revoke illegal resolutions. A higher authority might, in certain cases, order societies to be dissolved. These provisions related to voluntary societies; but it was competent for communal authorities also to order the formation of a friendly society, and to make a regulation compelling all workmen not already members of a society to join it. Since then the great series of imperial statutes has been passed, commencing in 1883 with that for sickness insurance, followed in 1884 by that for workmen's accident insurance, extended to sickness insurance in 1885, developed in the laws relating to accident and sickness insurance of persons engaged in agricultural and forestry pursuits in 1886, of persons engaged in the building trade and of seamen and others engaged in seafaring pursuits in 1887, and crowned by the law relating to infirmity and old-age insurance in 1889. Mr H. Unger, a distinguished actuary, remarks that the whole German workman's insurance and its executive bodies (sickness funds, trade associations, insurance institutions) are constantly endeavouring to improve the position of the workmen in a social and sanitary aspect, to the benefit of internal peace and the welfare of the German empire.

In Holland it is stated that the number of burial clubs and sickness benefit societies appears to be greater in proportion to the population than in any other country; but that the burial clubs do not rest upon a scientific basis, and have an unfavourable influence upon infant mortality. Half the population are insured in some burial club or other. The sick benefit societies are, as in England, some in a good and some in a bad financial condition; and legislation follows the English system of compulsory publicity, combined with freedom of competition.

In Spain friendly societies have grown out of the religious gilds. They are regulated by an act of 1887. Their actuarial condition appears to be backward, but to show indications of improvement. (E. W. B.)

United States.—Under the title of fraternal societies are included in the United States what are known in England as friendly societies, having some basis of mutual help to members, mutual insurance associations and benefit associations of all kinds. There are various classes and a great variety of forms of fraternal associations. It is therefore difficult to give a concrete historical statement of their origin and growth; but, dealing with those having benefit features for the payment of certain amounts in case of sickness, accident or death, it is found that their history in the United States is practically within the last half of the 19th century. The more important of the older organizations are the Improved Order of Red Men, founded in 1771 and reorganized in 1834; Ancient Order of Foresters, 1836; Ancient Order of Hibernians of America, 1836; United Ancient Order of Druids, 1839; Independent Order of Rechabites, 1842; Independent Order of B'nai B'rith, founded in 1843; Order of the United American Mechanics, 1845; Independent Order of Free Sons of Israel, 1849; Junior Order of United American Mechanics, 1853. A very large proportion, probably more than one-half, of the societies which have secret organizations pay benefits in case of sickness, accident, disability, and funeral expenses in case of death. This class of societies grew out of the English friendly societies and have masonic characteristics. The Freemasons and other secret societies, while not all having benefit features in their distinctive organizations, have auxiliary societies with such features. There is also a class of secret societies, based largely on masonic usages, that have for their principal object the payment of benefits in some form. These are the Oddfellows, the Knights of Pythias, the Knights of Honour, the Royal Arcanum and some others. Many trade unions have now adopted benefit features, especially the Typographical Union, while many subordinate unions and great publishing houses have mutual relief associations purely of a local character, and some of the more important newspapers have such mutual relief or benefit societies. The New York trade unions, taken as a whole, have paid out large sums of money in benefits where members have been out of work, or are sick, or are on strike or have died. The total paid in one year for all these benefits was over $500,000.

It is impossible to give the membership of all the fraternal associations in the United States; but, including Oddfellows, Freemasons, purely benefit associations and all the class of the larger fraternal organizations, the membership is over 6,000,000. Among the more important, so far as membership is concerned, are the Knights of Pythias, the Oddfellows, the Modern Woodmen of America, the Ancient Order of United Workmen, Improved Order of Red Men, Royal Arcanum, Knights of the Maccabees, Junior Order of United American Mechanics, Foresters of America, Independent Order of Foresters, &c. These and other organizations pay out a vast amount of money every year in the various forms.

Assessment insurance.

Since about the year 1870 a new form of benefit organization has come into existence. This is a life insurance based on the assessment plan, assessments being levied whenever a member dies; or, as more recently, regular assessments being made in advance of death, as post-mortem assessments have proved a fallacious method of securing the means of paying death benefits. There are about 200 mutual benefit insurance companies or associations in the United States conducted on the "lodge system"; that is to say, they have regular meetings for social purposes and for general improvement, and in their work there is found the mysticism, forms and ceremonies which belong to secret societies generally. These elements have proved a very strong force in keeping this class of associations fairly intact. The "work" of the lodges in the initiation of members and their passing through various degrees is attractive to many people, and in small places, remote from the amusements of the city, these lodges constitute a resort where members can give play to their histrionic talents. In most of them the features of the Masonic ritual are prominent. The amount of insurance which a single member can carry in such associations is small. In the Knights of Honour, one of the first of this class, policies ranging from $500 to $2000 are issued. In the Royal Arcanum the maximum is $3000. This form of insurance may be called co-operative, and has many elements which make the organizations practising it stronger than the ordinary assessment insurance companies having no stated meetings of members. The co-operative insurance societies are organized on the federal plan—as the Knights of Honour, for instance—having local assemblies, where the lodge-room element is in force; state organizations, to which the local bodies send delegates, and the national organization, which conducts all the insurance business through its executive officers. The local societies pay a certain given amount towards the support of the state and national offices, and while originally they paid death assessments, as called for, they now pay regular monthly assessments, in order to avoid the weakness of the post-mortem assessment. The difficulty which these organizations have in conducting the insurance business is in keeping the average age of membership at a low point, for with an increase in the average the assessments increase, and many such organizations have had great trouble to convince younger members that their assessments should be increased to make up for the heavy losses among the older members. The experience of these purely insurance associations has not been such as to demonstrate their absolute worthlessness or desirability, but they have enabled a large number of persons of limited means to carry insurance at a very low rate. They have not materially interfered with regular level premium insurance enterprises, for they have stimulated the people to understand the benefits of insurance, and have really been an educational force in this direction.

Railway relief departments.

A modern method of benefit association is found in the railway relief departments of some of the large railway corporations. These departments are organized upon a different plan from the benefit features of labour organizations and secret societies, providing the members not only with payments on account of death, but also with assistance of definite amounts in case of sickness or accident, the railway companies contributing to the funds, partly from philanthropic and partly from financial motives. The principal railway companies in the United States which have established these relief departments are the Pennsylvania, the Philadelphia & Reading, the Baltimore & Ohio, the Chicago, Burlington & Quincy, and the Plant System. The relief department benefits the employés, the railways, and the public, because it is based upon the sound principle that the "interests and welfare of labour, capital and society are common and harmonious, and can be promoted more by co-operation of effort than by antagonism and strife."

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The railway employés support one-twentieth of the entire population, and most of their associations maintain organizations to provide their members with relief and insurance. The Brotherhood of Locomotive Engineers, the Order of Railway Conductors of America, the Brotherhood of Locomotive Firemen, the Brotherhood of Railway Trainmen, the Brotherhood of Railway Trackmen, the Switchmen's Union, the Brotherhood of Railway Carmen, and the Order of Railway Telegraphers, all have relief and benefit features. The oldest and largest of these is the International Brotherhood of Locomotive Engineers, founded at Detroit in August 1863. Like other labour organizations of the higher class of workmen, the objects of the brotherhoods of railway employés are partly social and partly educational, but in addition to these great purposes they seek to protect their members through relief and benefit features. Of course the relief departments of the railway companies are competitors of the relief and insurance features of the railway employés orders, but both methods of providing assistance have proved successful and beneficial.

For a history of the various American organizations, see Albert C. Stevens, *The Cyclopaedia of Fraternities* (New York, 1899); *Facts for Fraternalists*, published by the *Fraternal Monitor*, Rochester, N.Y.; for annual statements, "The *World* Almanac," "Railway Relief Departments," "Brotherhood Relief and Insurance of Railway Employés," "Mutual Relief and Benefit Associations in the Printing Trade," "Benefit Features of American Trade Unions," *Bulletins* Nos. 8, 17, 19 and 22 of the U.S. Department of Labour. (C. D. W.)

FRIENDS, SOCIETY OF, the name adopted by a body of Christians, who, in law and general usage, are commonly called QUAKERS. Though small in number, the Society occupies a position of singular interest. To the student of ecclesiastical history it is remarkable as exhibiting a form of Christianity widely divergent from the prevalent types, being a religious fellowship which has no formulated creed demanding definite subscription, and no liturgy, priesthood or outward sacrament, and which gives to women an equal place with men in church organization. The student of English constitutional history will observe the success with which Friends have, by the mere force of passive resistance, obtained, from the legislature and the courts, indulgence for all their scruples and a legal recognition of their customs. In American history they occupy an important place because of the very prominent part which they played in the colonization of New Jersey and Pennsylvania.

The history of Quakerism in England may be divided into three periods:—(1) from the first preaching of George Fox in 1647 to the Toleration Act 1689; (2) from 1689 to the evangelical movement in 1835; (3) from 1835 to the present time.

1. *Period 1647–1689.*—George Fox (1624–1691), the son of a weaver of Drayton-in-the-Clay (now called Fenny Drayton) in Leicestershire, was the founder of the Society. He began his public ministry in 1647, but there is no evidence to show that he set out to form a separate religious body. Impressed by the formalism and deadness of contemporary Christianity (of which there is much evidence in the confessions of the Puritan writers themselves) he emphasized the importance of repentance and personal striving after the truth. When, however, his preaching attracted followers, a community began to be formed, and traces of organization and discipline may be noted in very early times. In 1652 a number of people in Westmorland and north Lancashire who had separated from the common national worship,[1] came under the influence of Fox, and it was this community (if it can be so called) at Preston Patrick which formed the nucleus of the Quaker church. For two years the movement spread rapidly throughout the north of England, and in 1654 more than sixty ministers went to Norwich, London, Bristol, the Midlands, Wales and other parts. Fox and his fellow-preachers spoke whenever opportunity offered,—sometimes in churches(declining, for the most part, to occupy the pulpit), sometimes in barns, sometimes at market crosses. The insistence on an inward spiritual experience was the great contribution made by Friends to the religious life of the time, and to thousands it came as a new revelation. There is evidence to show that the arrangement for this "publishing of Truth" rested mainly with Fox, and that the expenses of it and of the foreign missions were borne out of a common fund. Margaret Fell (1614–1702), wife of Thomas Fell (1598–1658), vice-chancellor of the duchy of Lancaster, and afterwards of George Fox, opened her house, Swarthmore Hall near Ulverston, to these preachers and probably contributed largely to this fund.

George Fox.

Their insistence on the personal aspect of religious experience made it impossible for Friends to countenance the setting apart of any man or building for the purpose of divine worship to the exclusion of all others. The operation of the Spirit was in no way limited to time, or individual or place. The great stress which they laid upon this aspect of Christian truth caused them to be charged with unbelief in the current orthodox views as to the inspiration of the Scriptures, and the person and work of Christ, a charge which they always denied. Contrary to the Puritan teaching of the time, they insisted on the possibility, in this life, of complete victory over sin. Robert Barclay, writing some twenty years later, admits of degrees of perfection, and the possibility of a fall from it (*Apology*, Prop. viii.). Such teaching necessarily brought Fox and his friends into conflict with all the religious bodies of England, and there were continually recurring strife with the Presbyterians, Independents, Baptists, Episcopalians and the wilder sectaries, such as the Ranters and the Muggletonians. The strife was often conducted on both sides with a zeal and bitterness of language which were characteristic of the period. Although there was little or no stress laid on either the joys or the terrors of a future life, the movement was not infrequently accompanied by most of those physical symptoms which usually go with vehement appeals to the conscience and emotions of a rude multitude. It was owing to these physical manifestations that the name "Quaker" was either first given or was regarded as appropriate when given for another reason (see Fox's *Journal* concerning Justice Bennet at Derby in 1650 and Barclay's *Apology*, Prop. 11, § 8). The early Friends definitely asserted that those who did not know quaking and trembling were strangers to the experience of Moses, David and other saints.

Some of the earliest adherents indulged in extravagances of no measured kind. Some of them imitated the Hebrew prophets in the performance of symbolic acts of denunciation, foretelling or warning, going barefoot, or in sackcloth or sandals, and, in a few cases, for brief periods, altogether naked; even women in some cases distinguished themselves by extravagance of conduct. The case of James Nayler (1617?–1660), who, in spite of Fox's grave warning, allowed Messianic homage to be paid to him, is the best known of these instances; they are to be explained partly by mental disturbance, resulting from the undue prominence of a single idea, and partly by the general religious excitement of the time and the rudeness of manners prevailing in the classes of society from which many of these individuals came. It must be remembered that at this time, and for long after, there was no definite or formal membership or system of admission to the society, and it was open to any one by attending the meetings to gain the reputation of being a Quaker.

The activity of the early Friends was not confined to England or even to the British Isles. Fox and others travelled in America and the West India Islands; another reached Jerusalem and preached against the superstition of the monks; Mary Fisher (fl. 1652–1697), "a religious maiden," visited Smyrna, the Morea and the court of Mahommed IV. at Adrianople; Alexander Parker (1628–1689) went to Africa; others made their way to Rome; two women were imprisoned by the Inquisition at Malta; two men passed into Austria and Hungary; and William Penn, George Fox and several others preached in Holland and Germany.

It was only gradually that the Quaker community clothed itself with an organization. The beginning of this appears to be due to William Dewsbury (1621–1688) and George Fox; it was not until 1666 that a complete system of church organization

[1] At the time referred to, and during the Commonwealth, the pulpits of the cathedrals and churches were occupied by Episcopalians of the Richard Baxter type, Presbyterians, Independents and a few Baptists. It is these, and not the clergy of the Church of England, who are continually referred to by George Fox as "priests."

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was established. The introduction of an ordered system and discipline was, naturally, viewed with some suspicion by people taught to believe that the inward light of each individual man was the only true guide for his conduct. The project met with determined opposition for about twenty years (1675–1695) from persons of considerable repute in the body. John Wilkinson and John Story of Westmorland, together with William Rogers of Bristol, raised a party against Fox concerning the management of the affairs of the society, regarding with suspicion any fixed arrangement for meetings for conducting church business, and in fact hardly finding a place for such meetings at all. They stood for the principle of Independency against the Presbyterian form of church government which Fox had recently established in the "Monthly Meetings" (see below). They opposed all arrangement for the orderly distribution of travelling ministers to different localities, and even for the payment of their expenses (see above); they also strongly objected to any disciplinary power being entrusted to the women's separate meetings for business, which had become of considerable importance after the Plague (1665) and the Fire of London (1666) in consequence of the need for poor relief. They also claimed the right to meet secretly for worship in time of persecution (see below). They drew a considerable following away with them and set up a rival organization, but before long a number returned to their original leader. William Rogers set forth his views in *The Christian Quaker*, 1680; the story of the dissension is told, to some extent, in *The Inner Life of the Religious Societies of the Commonwealth*, by R. Barclay (not the "Apologist"); the best account is given in a pamphlet entitled *Micah's Mother* by John S. Rowntree.

Robert Barclay (*q.v.*), a descendant of an ancient Scottish family, who had received a liberal education, principally in Paris, at the Scots College, of which his uncle was rector, joined the Quakers about 1666, and William Penn (*q.v.*) came to them about two years later. The Quakers had always been active controversialists, and a great body of tracts and papers was issued by them; but hitherto these had been of small account from a literary point of view. Now, however, a more logical and scholarly aspect was given to their literature by the writings of Barclay, especially his *Apology for the True Christian Divinity* published in Latin (1676) and in English (1678), and by the works of Penn, amongst which *No Cross No Crown* and the *Maxims* or *Fruits of Solitude* are the best known.

During the whole time between their rise and the passing of the Toleration Act 1689, the Quakers were the subject of almost continuous persecution which they endured with extraordinary constancy and patience; they insisted on the duty of meeting openly in time of persecution, declining to hold secret assemblies for worship as other Nonconformists were doing. The number who died in prison approached 400, and at least 100 more perished from violence and ill-usage. A petition to the first parliament of Charles II. stated that 3179 had been imprisoned; the number rose to 4500 in 1662, the Fifth Monarchy outbreak, in which Friends were in no way concerned, being largely responsible for this increase. There is no evidence to show that they were in any way connected with any of the plots of the Commonwealth or Restoration periods. A petition to James II. in 1685 stated that 1460 were then in prison. Under the Quaker Act of 1662 and the Conventicle Act of 1664 a number were transported out of England, and under the last-named act and that of 1670 (the second Conventicle Act) hundreds of households were despoiled of all their goods. The penal laws under which Friends suffered may be divided chronologically into those of the Commonwealth and the Restoration periods. Under the former there were a few charges of plotting against the government. Several imprisonments, including that of George Fox at Derby in 1650–1651, were brought about under the Blasphemy Act of 1650, which inflicted penalties on any one who asserted himself to be very God or equal with God, a charge to which the Friends were peculiarly liable owing to their doctrine of perfection. After a royalist insurrection in 1655, a proclamation was issued announcing that persons suspected of Roman Catholicism would be required to take an oath abjuring the papal authority and transubstantiation. The Quakers, accused as they were of being Jesuits, and refusing to take the oath, suffered under this proclamation and under the more stringent act of 1656. A considerable number were flogged under the Vagrancy Acts (39 Eliz. c. 4; 7 Jac. I. c. 4), which were strained to cover the case of itinerant Quaker preachers. They also came under the provisions of the acts of 1644, 1650 and 1656 directed against travelling on the Lord's day. The interruption of preachers when celebrating divine service rendered the offender liable to three months' imprisonment under a statute of the first year of Mary, but Friends generally waited to speak till the service was over.[1] The Lord's Day Act 1656 also enacted penalties against any one disturbing the service, but apart from statute many Friends were imprisoned for open contempt of ministers and magistrates. At the Restoration 700 Friends, imprisoned for contempt and some minor offences, were set at liberty. After the Restoration there began a persecution of Friends and other Nonconformists *as such*, notwithstanding the king's Declaration of Breda which had proclaimed liberty for tender consciences as long as no disturbance of the peace was caused. Among the most common causes of imprisonment was the practice adopted by judges and magistrates of tendering to Friends (particularly when no other charge could be proved against them) the Oaths of Supremacy and Allegiance (5 Eliz. c. 1 & 7 Jac. I. c. 6). The refusal in any circumstance to take an oath led to much suffering. The Act 3 Jac. I. c. 4, passed in consequence of the Gunpowder Plot, against Roman Catholics for not attending church, was put in force against Friends, and under it enormous fines were levied. The Quaker Act 1662 and the Conventicle Acts of 1664 and 1670, designed to enforce attendance at church, and inflicting severe penalties on those attending other religious gatherings, were responsible for the most severe persecution of all. The act of 1670 gave to informers a pecuniary interest (they were to have one-third of the fine imposed) in hunting down Nonconformists who broke the law, and this and other statutes were unduly strained to secure convictions. A somewhat similar act of 35 Eliz. c. 1., enacting even more severe penalties, had never been repealed, and was sometimes put in force against Friends. The Militia Act 1663 (14 Car. II. c. 3), enacting fines against those who refused to find a man for the militia, was occasionally put in force. The refusal to pay tithes and other ecclesiastical demands led to continuous and heavy distraints, under the various laws made in that behalf. This state of things continued to some extent into the 19th century. For further information see "The Penal Laws affecting Early Friends in England" (from which the foregoing summary is taken) by Wm. Chas. Braithwaite in *The First Publishers of Truth*. On the 15th of March 1672 Charles II. issued his declaration suspending the penal laws in ecclesiastical matters, and shortly afterwards, by pardon under the great seal, he released nearly 500 Quakers from prison, remitted their fines and released such of their estates as were forfeited by *praemunire*. It is of interest to note that, although John Bunyan was bitterly opposed to Quakers, his friends, on hearing of the petition contemplated by them, requested them to insert his name on the list, and in this way he gained his freedom. The dissatisfaction which this exercise of the royal prerogative aroused induced the king, in the following year, to withdraw his proclamation, and, notwithstanding appeals to him, the persecution continued intermittently throughout his reign. On the accession of James II. the Quakers addressed him (see above) with some hope on account of his known friendship for William Penn, and the king not long afterwards directed a stay of proceedings in all matters pending in the exchequer against Quakers on the ground of non-attendance at the national worship. In 1687 came his declaration for liberty of conscience, and, after the Revolution of 1688, the Toleration Act 1689 put an end to the persecution of Quakers (along with other Dissenters) for non-attendance at church.

Persecution.

[1] On the whole subject of preaching "after the priest had done," see Barclay's *Inner Life of the Religious Societies of the Commonwealth*, ch. xii.

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For many years after this they were liable to imprisonment for non-payment of tithes, and, together with other Dissenters, they remained under various civil disabilities, the gradual removal of which is part of the general history of England. In the years succeeding the Toleration Act at least twelve of their number were prosecuted (often more than once in the spiritual and other courts) for keeping school without a bishop's licence. It is coming to be recognized that the growth of religious toleration owed much to the early Quakers who, with the exception of a few Baptists at the first, stood almost alone among Dissenters in holding their public meetings openly and regularly.

The Toleration Act was not the only law of William and Mary which benefited Quakers. The legislature has continually had regard to their refusal to take oaths, and not only the said act but also another of the same reign, and numerous others subsequently passed, have respected the peculiar scruples of Friends (see Davis's *Digest of Legislative Enactments relating to Friends*, Bristol, 1820).

2. *Period 1689–1835.*—From the beginning of the 18th century the zeal of the Quaker body abated. Although many "General" and other meetings were held in different parts of the country for the purpose of setting forth Quakerism, the notion that the whole Christian church would be absorbed in it, and that the Quakers were, in fact, the church, gave place to the conception that they were "a peculiar people" to whom, more than to others, had been given an understanding of the will of God. The Quakerism of this period was largely of a traditional kind; it dwelt with increasing emphasis on the peculiarities of its dress and language; it rested much upon discipline, which developed and hardened into rigorous forms; and the correction or exclusion of its members occupied more attention than did the winning of converts.

Period of Decline.

Excluded from political and municipal life by the laws which required either the taking of an oath or joining in the Lord's Supper according to the rites of the Established Church, excluding themselves not only from the frivolous pursuits of pleasure, but from music and art in general, attaining no high average level of literary culture (though producing some men of eminence in science and medicine), the Quakers occupied themselves mainly with trade, the business of their Society, and the calls of philanthropy. From early times George Fox and many others had taken a keen interest in education, and in 1779 there was founded at Ackworth, near Pontefract, a school for boys and girls; this was followed by the reconstitution, in 1808, of a school at Sidcot in the Mendips, and in 1811, of one in Islington Road, London; it was afterwards removed to Croydon, and, later, to Saffron Walden. Others have since been established at York and in other parts of England and Ireland. None of them are now reserved exclusively for the children of Friends.

During this period Quakerism was sketched from the outside by two very different men. Voltaire (*Dictionnaire Philosophique*, "Quaker," "Toleration") described the body, which attracted his curiosity, his sympathy and his sneers, with all his brilliance. Thomas Clarkson (*Portraiture of Quakerism*) has given an elaborate and sympathetic account of the Quakers as he knew them when he travelled amongst them from house to house on his crusade against the slave trade.

3. *From 1835.*—During the 18th century the doctrine of the Inward Light acquired such exclusive prominence as to bring about a tendency to disparage, or, at least, to neglect, the written word (the Scriptures) as being "outward" and non-essential. In the early part of the 19th century an American Friend, Elias Hicks, pressed this doctrine to its furthest limits, and, in doing so, he laid stress on "Christ within" in such a way as practically to take little account of the person and work of the "outward," *i.e.* the historic Christ. The result was a separation of the Society in America into two divisions which persist to the present day (see below, "Quakerism in America"). This led to a counter movement in England, known as the Beacon Controversy, from the name of a warning publication issued by Isaac Crewdson of Manchester in 1835, advocating views of a pronounced "evangelical" type. Much controversy ensued, and a certain number of Friends (Beaconites as they are sometimes called) departed from the parent stock. They left behind them, however, many influential members, who may be described as a middle party, and who strove to give a more "evangelical" tone to Quaker doctrine. Joseph John Gurney of Norwich, a brother of Elizabeth Fry, by means of his high social position and his various writings (some published before 1835), was the most prominent actor in this movement. Those who quitted the Society maintained, for some little time, a separate organization of their own, but sooner or later most of them joined the Evangelical Church or the Plymouth Brethren.

Other causes have been at work modifying the Quaker society. The repeal of the Test Act, the admission of Quakers to Parliament in consequence of their being allowed to affirm instead of taking the oath (1832, when Joseph Pease was elected for South Durham), the establishment of the University of London, and, more recently, the opening of the universities of Oxford and Cambridge to Nonconformists, have all had their effect upon the body. It has abandoned its peculiarities of dress and language, as well as its hostility to music and art, and it has cultivated a wider taste in literature. In fact, the number of men, either Quakers or of Quaker origin and proclivities, who occupy positions of influence in English life is large in proportion to the small body with which they are connected. During the 19th century the interests of Friends became widened and they are no longer a close community.

Doctrine.—It is not easy to state with certainty the doctrines of a body which (in England at least) has never demanded subscription to any creed, and whose views have undoubtedly undergone more or less definite changes. There is not now the sharp distinction which formerly existed between Friends and other non-sacerdotal evangelical bodies; these have, in theory at least, largely accepted the spiritual message of Quakerism. By their spiritual insistence on the fact of immediate communion between God and man, Friends have been led into those views and practices which still mark them off from their fellow-Christians.

Nearly all their distinctive views (*e.g.* their refusal to take oaths, their testimony against war, their disuse of a professional ministry, and their recognition of women's ministry) were being put forward in England, by various individuals or sects, in the strife which raged during the intense religious excitement of the middle of the 17th century. Nevertheless, before the rise of the Quakers, these views were nowhere found in conjunction as held by any one set of people; still less were they regarded as the outcome of any one central belief or principle. It is rather in their emphasis on this thought of Divine communion, in their insistence on its reasonable consequences (as it seems to them), that Friends constitute a separate community. The appointment of one man to preach, to the exclusion of others, whether he feels a divine call so to do or not, is regarded as a limitation of the work of the Spirit and an undue concentration of that responsibility which ought to be shared by a wider circle. For the same reason they refuse to occupy the time of worship with an arranged programme of vocal service; they meet in silence, desiring that the service of the meeting shall depend on spiritual guidance. Thus it is left to any man or woman to offer vocal prayer, to read the Scriptures, or to utter such exhortation or teaching as may seem to be called for. Of late years, in certain of their meetings on Sunday evening, it has become customary for part of the time to be occupied with set addresses for the purpose of instructing the members of the congregation, or of conveying the Quaker message to others who may be present, all their meetings for worship being freely open to the public. In a few meetings hymns are occasionally sung, very rarely as part of any arrangement, but almost always upon the request of some individual for a particular hymn appropriate to the need of the congregation. The periods of silence are regarded as times of worship equally with those occupied with vocal service, inasmuch as Friends hold that robustness of spiritual life is best promoted by earnest striving on the part of each one to know the will of God for

Public worship.

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himself, and to be drawn into Christian fellowship with the other worshippers. The points on which special stress is laid are:—(1) the share of responsibility resting on each individual, whether called to vocal service or not, for the right spiritual atmosphere of the Meeting, and for the welfare of the congregation; (2) the privilege which may be enjoyed by each worshipper of waiting upon the Lord without relying on spoken words, however helpful, or on other outward matters; (3) freedom for each individual (whether a Friend or not) to speak, for the help of others, such message as he or she may feel called to utter; (4) a fresh sense of a divine call to deliver the message on that particular occasion, whether previous thought has been given to it or not. The idea which ought to underlie a Friends' meeting is thus set forth by Robert Barclay: "When I came into the silent assemblies of God's people, I felt a secret power among them, which touched my heart, and as I gave way unto it, I found the evil weakening in me and the good raised up" (*Apology*, xi. 7). In many places Friends have felt the need of bringing spiritual help to those who are unable to profit by the somewhat severe discipline of their ordinary manner of worship. To meet this need they hold (chiefly on Sunday evenings) meetings which are not professedly "Friends' meetings for worship," but which are services conducted on lines similar to those of other religious bodies, with, in some cases, a portion of time set apart for silent worship, and freedom for any one of the congregation to utter words of exhortation or prayer.

From the beginning Friends have not practised the outward ordinances of Baptism and the Lord's Supper, even in a non-sacerdotal spirit. They attach, however, supreme value to the realities of which the observances are reminders or types—on the Baptism which is more than putting away the filth of the flesh, and on the vital union with Christ which is behind any outward ceremony. Their testimony is not *primarily* against these outward observances; their disuse of them is due to a sense of the danger of substituting the shadow for the reality. They believe that an experience of more than 250 years gives ample warrant for the belief that Christ did not command them as a perpetual outward ordinance; on the contrary, they hold that it was alien to His method to lay down minute, outward rules for all time, but that He enunciated principles which His Church should, under the guidance of the Holy Spirit, apply to the varying needs of the day. Their contention that every event of life may be turned into a sacrament, a means of grace, is summed up in the words of Stephen Grellet: "I very much doubt whether, since the Lord by His grace brought me into the faith of His dear Son, I have ever broken bread or drunk wine, even in the ordinary course of life, without the remembrance of, and some devout feeling regarding, the broken body and the blood-shedding of my dear Lord and Saviour."

When the ministry of any man or woman has been found to be helpful to the congregation, the Monthly Meeting (see below) may, after solemn consideration, record the fact that it believes the individual to have a divine call to the ministry, and that it encourages him or her to be faithful to the gift. Such ministers are said to be "acknowledged" or "recorded"; they are emphatically *not* appointed to preach, and the fact of their acknowledgment is not regarded as conferring any special status upon them. The various Monthly Meetings appoint Elders, or some body of Friends, to give advice of encouragement or restraint as may be needed, and, generally, to take the ministry under their care. *Ministers.*

With regard to the ministry of women, Friends hold that there is no evidence that the gifts of prophecy and teaching are confined to one sex. On the contrary, they see that a manifest blessing has rested on women's preaching, and they regard its almost universal prohibition as a relic of the seclusion of women which was customary in the countries where Christianity took its rise. The particular prohibition of Paul (1 Cor. xiv. 34, 35) they regard as due to the special circumstances of time and place. *Women.*

Friends have always held that war is contrary to the precepts and spirit of the Gospel, believing that it springs from the lower impulses of human nature, and not from the seed of divine life with its infinite capacity of response to the Spirit of God. Their testimony is not based *primarily* on any objection to the use of force in itself, or even on the fact that war involves suffering and loss of life; their root objection is based on the fact that war is both the outcome and the cause of ambition, pride, greed, hatred and everything that is opposed to the mind of Christ; and that no end to be attained can justify the use of such means. While not unaware that with this, as with all moral questions, there may be a certain borderland of practical difficulty, Friends endeavour to bring all things to the test of the Realities which, though not seen, are eternal, and to hold up the ideal, set forth by George Fox, of living in the virtue of that life and power which takes away the *occasion of war*. *War.*

Friends have always held that the attempt to enforce truth-speaking by means of an oath, in courts of law and elsewhere, tends to create a double standard of truth. They find Scripture warrant for this belief in Matt. v. 33-37 and James v. 12. Their testimony in this respect is the better understood when we bear in mind the large amount of perjury in the law courts, and profane swearing in general which prevailed at the time when the Society took its rise. "People swear to the end that they may speak truth; Christ would have men speak truth to the end they might not swear" (W. Penn, *A Treatise of Oaths*). *Oaths.*

With regard to the fundamental doctrines of Christianity, the belief of the Society of Friends does not essentially differ from that of other Christian bodies. At the same time their avoidance of exact definition embodied in a rigid creed, together with their disuse of the outward ordinances of Baptism and the Supper, has laid them open to considerable misunderstanding. As will have been seen, they hold an exalted view of the divinity and work of Christ as the Word become flesh and the Saviour of the world; but they have always shrunk from rigid Trinitarian *definitions*. They believe that the same Spirit who gave forth the Scriptures still guides men to a right understanding of them. "You profess the Holy Scriptures: but what do you witness and experience? What interest have you in them? Can you set to your seal that they are true by the work of the same spirit in you that gave them forth in the holy ancients?" (William Penn, *A Summons or Call to Christendom*). At certain periods this doctrine, pushed to an extreme, has led to a practical undervaluing of the Scriptures, but of late times it has enabled Friends to face fearlessly the conclusions of modern criticism, and has contributed to a largely increased interest in Bible study. During the past few years a new movement has been started in the shape of lecture schools, lasting for longer or shorter periods, for the purpose of studying Biblical, ecclesiastical and social subjects. In 1903 there was established at Woodbrooke, an estate at Selly Oak on the outskirts of Birmingham, a permanent settlement for men and women, for the study of these questions on modern lines. The outward beginning of this movement was the Manchester Conference of 1895, a turning-point in Quaker history. Speaking generally, it may be noted that the Society includes various shades of opinion, from that known as "evangelical," with a certain hesitation in receiving modern thought, to the more "advanced" position which finds greater freedom to consider and adopt new suggestions of scientific, religious or other thinkers. The differences, however, are seldom pressed, and rarely become acute. Apart from points of doctrine which can be more or less definitely stated (not always with unanimity) Quakerism is an *atmosphere*, a manner of life, a method of approaching questions, a habit and attitude of mind. *Theology.*

Quakerism in Scotland.—Quakerism was preached in Scotland very soon after its rise in England; but in the north and south of Scotland there existed, independently of and before this preaching, groups of persons who were dissatisfied with the national form of worship and who met together in silence for devotion. They naturally fell into this Society. In Aberdeen the Quakers took considerable hold, and were there joined by

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some persons of influence and position, especially Alexander Jaffray, sometime provost of Aberdeen, and Colonel David Barclay of Ury and his son Robert, the author of the *Apology*. Much light has been thrown on the history of the Quakers in Aberdeenshire by the discovery in 1826 at Ury of a MS. *Diary* of Jaffray, since published with elucidations (2nd ed., London, 1836).

Ireland—The father of Quakerism in Ireland was William Edmondson; his preaching began in 1653–1654. The *History of the Quakers in Ireland* (from 1653 to 1752), by Wight and Rutty, may be consulted. Duhlin Yearly Meeting, constituted in 1670, is independent of London Yearly Meeting (see below).

America.—In July 1656 two women Quakers, Mary Fisher and Ann Austin, arrived at Boston. Under the general law against heresy their books were hurnt by the hangman, they were searched for signs of witchcraft, they were imprisoned for five weeks and then sent away. During the same year eight others were sent back to England.

In 1656, 1657 and 1658 laws were passed to prevent the introduction of Quakers into Massachusetts, and it was enacted that on the first conviction one ear should be cut off, on the second the remaining ear, and that on the third conviction the tongue should be bored with a hot iron. Fines were laid upon all who entertained these people or were present at their meetings. Thereupon the Quakers, who were perhaps not without the obstinacy of which Marcus Aurelius complained in the early Christians, rushed to Massachusetts as if invited, and the result was that the general court of the colony banished them on pain of death, and four of them, three men and one woman, were hanged for refusing to depart from the jurisdiction or for obstinately returning within it. That the Quakers were, at times, irritating cannot be denied: some of them appear to have publicly mocked the institutions and the rulers of the colony and to have interrupted public worship; and a few of their men and women acted with the fanaticism and disorder which frequently characterized the religious controversies of the time. The particulars of the proceedings of Governor Endecott and the magistrates of New England as given in Besse's *Sufferings of the Quakers* (see below) are startling to read. On the Restoration of Charles II. a memorial was presented to him by the Quakers in England stating the persecutions which their fellow-members had undergone in New England. Even the careless Charles was moved to issue an order to the colony which effectually stopped the hanging of the Quakers for their religion, though it by no means put an end to the persecution of the body in New England.

It is not wonderful that the Quakers, persecuted and oppressed at home and in New England, should turn their eyes to the unoccupied parts of America, and cherish the hope of founding, amidst their woods, some refuge from oppression, and some likeness of a city of God upon earth. As early as 1660 George Fox was considering the question of huying land from the Indians. In 1671–1673 hehad visited the American plantations from Carolina to Rhode Island and had preached alike to Indians and to settlers; in 1674 a portion of New Jersey (*q.v.*) was sold hy Lord Berkeley to John Fenwicke in trust for Edward Byllynge. Both these men were Quakers, and in 1675 Fenwicke with a large company of his co-religionists crossed the Atlantic, sailed up Delaware Bay, and landed at a fertile spot which he called Salem. Byllynge, having become emharrassed in his circumstances, placed his interest in the land in the hands of Penn and others as trustees for his creditors; they invited buyers, and companies of Quakers in Yorkshire and London were amongst the largest purchasers. In 1677–1678 five vessels with eight hundred emigrants, chiefly Quakers, arrived in the colony (then separated from the rest of New Jersey, under the name of West New Jersey), and the town of Burlington was established. In 1677 the fundamental laws of West New Jersey were published, and recognized in a most absolute form the principles of democratic equality and perfect freedom of conscience. Notwithstanding certain troubles from claims of the governor of New York and of the duke of York, the colony prospered, and in 1681 the first legislative assembly of the colony, consisting mainly of Quakers, was held. They agreed to raise an annual sum of £200 for the expenses of their commonwealth; they assigned their governor a salary of £30; they prohibited the sale of ardent spirits to the Indians and imprisonment for debt. (See New Jersey.)

William Penn.

But beyond question the most interesting event in connexion with Quakerism in America is the foundation by William Penn (*q.v.*) of the colony of Pennsylvania, where he hoped to carry into effect the principles of his sect—to found and govern a colony without armies or military power, to reduce the Indians by justice and kindness to civilization and Christianity, to administer justice without oaths, and to extend an equal toleration to all persons who professed a belief in God. The history of this is part of the history of America and of Pennsylvania (*q.v.*) in particular. The chief point of interest in the history of Friends in America during the 18th century is their effort to clear themselves of complicity in slavery and the slave trade. As early as 1671 George Fox when in Barbados counselled kind treatment of slaves and ultimate liberation of them. William Penn provided for the freedom of slaves after fourteen years' service. In 1688 the German Friends of Germantown, Philadelphia, raised the first official protest uttered by any religious body against slavery. In 1711 a law was passed in Pennsylvania, prohibiting the importation of slaves, but it was rejected by the Council in England. The prominent anti-slavery workers were Ralph Sandiford, Benjamin Lay, Anthony Benezet and John Woolman.[1] By the end of the 18th century slavery was practically extinct among Friends, and the Society as a whole laboured for its abolition, which came about in 1865, the poet Whittier being one of the chief writers and workers in the cause. From early times up to the present day Friends have laboured for the welfare of the North American Indians. The history of the 19th century is largely one of division. Elias Hicks (*q.v.*), of Long Island, N.Y., propounded doctrines inconsistent with the orthodox views concerning Christ and the Scriptures, and a separation resulted in 1827–1828 (see above). His followers are known as "Hicksites," a name not officially used by themselves, and only assented to for purposes of description under some protest. They have their own organization, being divided into seven yearly meetings numbering about 20,000 members, but these meetings form no part of the official organization which links London Yearly Meeting with other bodies of Friends on the American continent. This separation led to strong insistence on "evangelical" views (in the usual sense of the term) concerning Christ, the Atonement, imputed righteousness, the Scriptures, &c. This showed itself in the Beaconite controversy in England (see above), and in a further division in America. John Wilbur, a minister of New England, headed a party of protest against the new evangelicalism, laying extreme stress on the "Inward Light"; the result was a further separation of "Wilburites" or "the smaller body," who, like the "Hicksites," have a separate independent organization of their own. In 1907 they were divided into seven yearly meetings (together with some smaller independent bodies, the result of extreme emphasis laid on individualism), with a membership of about 5000. Broadly speaking, the "smaller body" is characterized by a rigid adherence to old forms of dress and speech, to a disapproval of music and art, and to an insistence on the "Inward Light" which, at times, leaves but little room for the Scriptures or the historic Christ, although with no definite or intended repudiation of them. In 1908 the number of "orthodox" yearly meetings in America, including one in Canada, was fifteen, with a total membership of about 100,000. They have, for the most part, adopted, to a greater or less degree, the "pastoral system," *i.e.* the appointment of one man or woman in each congregation to "conduct" the meeting for worship and to carry on pastoral work. In most cases the pastor receives a salary. A few of them demand from their ministers definite subscription to a specific body of doctrine, mostly of the ordinary "evangelical" type. In the matters of

[1] Woolman's *Journal* and *Works* are remarkable. He had a vision of a political economy based not on selfishness but on love, not on desire but on self-denial.

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organization, disuse of the outward ordinances (this point is subject to some slight exception, principally in Ohio), and women's ministry, they do not differ from English Friends. The yearly meetings of Baltimore and Philadelphia have not adopted the pastoral system; the latter contains a very strong conservative element, and, contrary to the practice of London and the other "orthodox" yearly meetings, it officially regards the meetings of "the smaller body" (see above) as meetings of the Society of Friends. In 1902 the "orthodox" yearly meetings in the United States established a "Five Years' Meeting," a representative body meeting once every five years to consider matters affecting the welfare of all, and to further such philanthropic and religious work as may be undertaken in common, *e.g.* matters concerning foreign missions, temperance and peace, and the welfare of negroes and Indians. Two yearly meetings remain outside the organization, that of Ohio on ultra-evangelical grounds, while that of Philadelphia has not taken the matter into consideration. Canada joined at the first, and having withdrawn, again joined in 1907.

See James Bowden, *History of the Society of Friends in America* (1850–1854); Allan C. and Richard H. Thomas, *The History of Friends in America* (4th edition, 1905); Isaac Sharpless, *History of Quaker Government in Pennsylvania* (1898, 1899); R. P. Hallowell, *The Quaker Invasion of Massachusetts* (1887), and *The Pioneer Quakers* (1887).

Organization and Discipline.—The duty of watching over one another for good was insisted on by the early Friends, and has been embodied in a system of discipline. Its objects embrace (*a*) admonition to those who fail in the payment of their just debts, or otherwise walk contrary to the standard of Quaker ethics, and the exclusion of obstinate or gross offenders from the body, and, as incident to this, the hearing of appeals from individuals or meetings considering themselves aggrieved; (*b*) the care and maintenance of the poor and provision for the Christian education of their children, for which purpose the Society has established boarding schools in different parts of the country; (*c*) the amicable settlement of "all differences about outward things," either by the parties in controversy or by the submission of the dispute to arbitration, and the restraint of all proceedings at law between members except by leave; (*d*) the "recording" of ministers (see above); (*e*) the cognizance of all steps preceding marriage according to Quaker forms; (*f*) the registration of births, deaths and marriages and the admission of members; (*g*) the issuing of certificates or letters of approval granted to ministers travelling away from their homes, or to members removing from one meeting to another; and (*h*) the management of the property belonging to the Society. The meetings for business further concern themselves with arrangements for spreading the Quaker doctrine, and for carrying out various religious, philanthropic and social activities not necessarily confined to the Society of Friends.

Periodic "meetings."

The present organization of the Quaker church is essentially democratic; every person born of Quaker parents is a member, and, together with those who have been admitted on their own request, is entitled to take part in the business assemblies of any meeting of which he or she is a member. The Society is organized as a series of subordinated meetings which recall to the mind the Presbyterian model. The "Preparative Meeting" usually consists of a single congregation; next in order comes the "Monthly Meeting," the executive body, usually embracing several Preparative Meetings called together, as in the Irish canon, monthly (in some cases less often); then the "Quarterly Meeting," embracing several Monthly Meetings; and lastly the "Yearly Meeting," embracing the whole of Great Britain (but not Ireland). After several yearly or "general" meetings had been held in different places at irregular intervals as need arose, the first of an uninterrupted series met in 1668. From that date until 1904 it was held in London. In 1905 it met in Leeds, and in 1908 in Birmingham. Its official title is "London Yearly Meeting." It is the legislative body of Friends in Great Britain. It considers questions of policy, and some of its sittings are conferences for the consideration of reports on religious, philanthropic, educational and social work which is carried on. Its sessions occupy a week in May of each year. Representatives are sent from each inferior to each superior meeting, but they have no precedence over others, and all Friends may attend any meeting and take part in any of which they are members. Formerly the system was double, the men and women meeting separately for their own appointed business. Of late years the meetings have been, for the most part, held jointly, with equal liberty for all men and women to state their opinions, and to serve on all committees and other appointments. The mode of conducting these meetings is noteworthy. A secretary or "clerk," as he is called, acts as chairman or president; there are no formal resolutions; and there is no voting or applause. The clerk ascertains what he considers to be the judgment of the assembly, and records it in a minute. The permanent standing committee of the Society is known as the "Meeting for Sufferings" (established in 1675), which took its rise in the days when the persecution of many Friends demanded the Christian care and material help of those who were able to give it. It is composed of representatives (men and women) sent by the quarterly meetings, and of all recorded Ministers and Elders. Its work is not confined to the interests of Friends; it is sensitive to the call of oppression and distress (*e.g.* a famine) in all parts of the world, it frequently raises large sums of money to alleviate the same, and intervenes, often successfully, and mostly without publicity, with those in authority who have the power to bring about an amelioration.

The offices known to the Quaker body are: (1) that of *minister* (the term "office" is not strictly applicable, see above as to "recording"); (2) of *elder*, whose duty it is "to encourage and help young ministers, and advise others as they, in the wisdom of God, see occasion"; (3) of *overseer*, to whom is especially entrusted that duty of Christian care for and interest in one another which Quakers recognize as obligatory in all the members of a church. In most Monthly Meetings the care of the poor is committed to the overseers. These officers hold, from time to time, meetings separate from the general assemblies of the members, but the special organization for many years known as the Meeting of Ministers and Elders, reconstituted in 1876 as the Meeting on Ministry and Oversight, came to an end in 1906–1907.

This present form both of organization and of discipline has been reached only by a process of development. As early as 1652–1654 there is evidence of some slight organization dealing with marriages, poor relief, "disorderly walkers," matters of arbitration, &c. The Quarterly or "General" meetings of the different counties seem to have been the first unions of separate congregations. In 1666 Fox established Monthly Meetings; in 1727 elders were first appointed; in 1752 overseers were added; and in 1737 the right of children of Quakers to be considered as members was fully recognized. Concerning the 18th century in general, see above.

Of late years the stringency of the Quaker discipline has been relaxed: the peculiarities of dress and language have been abandoned; marriage with a non-member or between two non-members is now possible at a Quaker meeting-house; and marriage elsewhere has ceased to involve exclusion from the body. Above all, many of its members have ceased to disown, which is not new, but old, that the virtues which can be rewarded and the vices which can be punished by external discipline are not as a rule the virtues and the vices that make or mar the soul" (Hatch, *Hibbert Lectures*, 81).

Philanthropic interests.

A genuine vein of philanthropy has always existed in the Quaker body. In nothing has this been more conspicuous than in the matter of slavery. George Fox and William Penn laboured to secure the religious teaching of slaves. As early as 1676 the assembly of Barbados passed "An Act to prevent the people called Quakers from bringing negroes to their meetings." On the attitude of Friends in America to slavery, see the section "Quakerism in America" (above). In 1783 the first petition to the House of Commons for the abolition of the slave trade and slavery went up from the Quakers; and in the long agitation which ensued the Society took a prominent part.

Education.

In 1798 Joseph Lancaster, himself a Friend, opened his first school for the education of the poor; and the cause of unsectarian religious education found in the Quakers steady support. They also took an active part in Sir Samuel Romilly's efforts to ameliorate the penal code, in prison reform, with which the name of Elizabeth Fry (a Friend) is especially connected, and in the efforts to ameliorate the condition of lunatics in England (the Friends' Retreat at York, founded in 1792, was the earliest example in England of kindly treatment of the insane). It is noteworthy that Quaker efforts for the education of the poor are philanthropic in general, though they have always been Christian in character, have not been undertaken primarily for the purpose of bringing proselytes within the body, and have not done so to any great extent.

By means of the Adult Schools, Friends have been able to exercise a religious influence beyond the borders of their own Society. The movement began in Birmingham in 1845, in an attempt to help the loungers at street corners; reading and writing were the chief inducements offered. The schools are unsectarian in character and mainly democratic in government: the aim is to draw out what is best in men and to induce them to act for the help of their fellows. Whilst the work is essentially religious in character, a well-equipped school also caters for the social, intellectual and physical parts of a man's nature. Bible teaching is the central part of the school session: the lessons are mainly concerned with life's practical problems. The spirit of brotherliness which prevails is largely the secret of the success of the movement. At the end of 1909 there were in connexion with the "National Council of Adult-School Associations" 1818 "schools" for men with

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a membership of about 113,789; and 402 for women with a membership of about 27,000. The movement, which is no longer exclusively under the control of Friends, is rapidly becoming one of the chief means of bringing about a religious fellowship among a class which the organized churches have largely failed to reach. The effect of the work upon the Society itself may be summarized thus: some addition to membership; the creation of a sphere of usefulness for the younger and more active members; a general stirring of interest in social questions.[1]

A strong interest in Sunday schools for children preceded the Adult School movement. The earliest schools which are still existing were formed at Bristol, for boys in 1810 and for girls in the following year. Several isolated efforts were made earlier than this; it is evident that there was a school at Lothersdale near Skipton in 1800 "for the preservation of the youth of both sexes, and for their instruction in useful learning"; and another at Nottingham. Even earlier still were the Sunday schools in Rumney and Penketh, Lancashire, dating from 1793. At the end of 1909 there were in connexion with the Friends' First-Day School Association 240 schools with 2722 teachers and 25,215 scholars, very few of whom were the children of Friends. Not included in these figures are classes for children of members and "attenders," which are usually held before or during a portion of the time of the morning meeting for worship; in these distinctly denominational teaching is given. Monthly organ, *Teachers and Taught*.

A "provisional committee" of the members of the Society of Friends was formed in 1865 to deal with offers of service in foreign lands.

Foreign missions. In 1868 this developed into the Friends' Foreign Mission Association, which now undertakes Missionary work in India (begun 1866), Madagascar (1867), Syria (1868), China (1886), Ceylon (1896). In 1909 the number of missionaries (including wives) was 113; organized churches, 194; members and adherents, 21,085; schools, 135; pupils, 7042; hospitals and dispensaries, 17; patients treated, 68,662; subscriptions raised from Friends in Great Britain and Ireland, £26,689, besides £3245 received in the fields of work. Quarterly organ, *Our Missions*.

Statistics of Quakerism.—At the close of 1909 there were 18,686 Quakers (the number includes children) in Great Britain; and "associates" and habitual "attenders" not in membership, 8586; number of congregations regularly meeting, 390. Ireland—members, 2528; habitual attenders not in membership, 402.

The central offices and reference library of the Society of Friends are situate at Devonshire House, Bishopsgate Without, London.

Bibliography.—The writings of the early Friends are very numerous: the most noteworthy are the *Journals* of George Fox and of Thomas Ellwood, both autobiographies, the *Apology* and other works of Robert Barclay, and the works of Penn and Fox generally. Early in the 18th century William Sewel, a Dutch Quaker, wrote a history of the Society and published an English translation; modern (small) histories have been written by T. Edmund Harvey (*The Rise of the Quakers*) and by Mrs Emmott (*The Story of Quakerism*). *The Sufferings of the Quakers* by Joseph Besse (1753) gives a detailed account of the persecution of the early Friends in England and America. An excellent portraiture of early Quakerism is given in William Tanner's *Lectures on Friends in Bristol and Somersetshire*. *The Book of Discipline* of the successive printed editions from 1783 to 1906 contains the working rules of the organization, and also a compilation of testimonies borne by the Society at different periods, to important points of Christian truth, and often called forth by the special circumstances of the time. *The Inner Life of the Religious Societies of the Commonwealth* (London, 1876) by Robert Barclay, a descendant of the Apologist, contains much curious information about the Quakers. See also Quaker " in the index to Masson's *Life of Milton*. Joseph Smith's *Descriptive Catalogue of Friends' Books* (London, 1867) gives the information which its title promises; the same author has also published a catalogue of works hostile to Quakerism. For an exposition of Quakerism on its spiritual side many of the poems by Whittier may be referred to, also *Quaker Strongholds* and *Light Arising* by Caroline E. Stephen; *The Society of Friends, its Faith and Practice*, and other works by John Stephenson Rowntree, *A Dynamic Faith* and other works by Rufus M. Jones; *Authority and the Light Within* and other works by Edw. Grubb, and the series of "Leaders of Religion," as well as the literature above mentioned. Much valuable information will be found in *John Stephenson Rowntree: His Life and Work* (1908). The history of the modern forward movement may be studied in *Essays and Addresses* by John Wilhelm Rowntree, and in *First Day Papers* edited by Edward Grubb. The social life of the 18th century and the first half of the 19th is portrayed in *Records of a Quaker Family, the Richardsons of Cleveland*, by Mrs Boyce, and *The Diaries of Edward Pease, the Father of English Railways*, edited by Sir A. E. Pease. Other works which may usefully be consulted are the Journals of John Woolman, Stephen Grellet and Elizabeth Fry; also *The First Publishers of Truth*, a reprint of contemporary accounts of the rise of Quakerism in various districts. The periodicals issued (not officially) in connexion with the Quaker body are *The Friend* (weekly), *The British Friend* (monthly), *The Friends' Witness, The Friendly Messenger, The Friends' Fellowship Papers, The Friends' Quarterly Examiner, Journal of the Friends' Historical Society*. Officially issued: *The Book of Meetings* and *The Friends' Year Book*. See also works mentioned in the close of sections on Adult Schools and on Quakerism in America, Scotland and Ireland, and elsewhere in this article; also Fox, George.

(A. N. B.)

FRIES, ELIAS MAGNUS (1794–1878), Swedish botanist, was born at Femsjö, Småland, on the 15th of August 1794. From his father, the pastor of the church at Femsjö, he early acquired an extensive knowledge of flowering plants. In 1811 he entered the university of Lund, where in 1814 he was elected docent of botany and in 1824 professor. In 1832 he became professor of practical economy at Upsala, and in 1844 and 1848 he represented the university of that city in the Rigsdag. On the death of Göran Wahlenberg (1780–1851) he was appointed professor of botany at Upsala, where he died on the 8th of February 1878. Fries was admitted a member of the Swedish Royal Academy in 1847, and a foreign member of the Royal Society of London in 1875.

As an author on the Cryptogamia he was in the first rank. He wrote *Novitiae florae Suecicae* (1814 and 1823); *Observationes mycologicae* (1815); *Flora Hollandica* (1817–1818); *Systema mycologicum* (1821–1829); *Systema orbis vegetabilis*, not completed (1825); *Elenchus fungorum* (1828); *Lichenographia Europaea* (1831); *Epicrisis systematis mycologici* (1838; and ed., or *Hymenomycetes Europaei*, 1874); *Summa vegetabilium Scandinaviae* (1846); *Sveriges ätliga och giftiga Svampar*, with coloured plates (1860); *Monographia hymenomycetum Suecicae* (1863), with the *Icones hymenomycetum*, vol. i. (1867), and pt. i. vol. ii. (1877).

FRIES, JAKOB FRIEDRICH (1773–1843), German philosopher, was born at Barby, Saxony, on the 23rd of August 1773. Having studied theology in the academy of the Moravian brethren at Niesky, and philosophy at Leipzig and Jena, he travelled for some time, and in 1806 became professor of philosophy and elementary mathematics at Heidelberg. Though the progress of his psychological thought compelled him to abandon the positive theology of the Moravians, he always retained an appreciation of its spiritual or symbolic significance. His philosophical position with regard to his contemporaries he had already made clear in the critical work *Reinhold, Fichte und Schelling* (1803; reprinted in 1824 as *Polemische Schriften*), and in the more systematic treatises *System der Philosophie als evidente Wissenschaft* (1804), *Wissen, Glaube und Ahnung* (1805, new ed. 1905). His most important treatise, the *Neue oder anthropologische Kritik der Vernunft* (2nd ed., 1828–1831), was an attempt to give a new foundation of psychological analysis to the critical theory of Kant. In 1811 appeared his *System der Logik* (ed. 1819 and 1837), a very instructive work, and in 1814 *Julius und Evagoras*, a philosophical romance. In 1816 he was invited to Jena to fill the chair of theoretical philosophy (including mathematics and physics, and philosophy proper), and entered upon a crusade against the prevailing Romanticism. In politics he was a strong Liberal and Unionist, and did much to inspire the organization of the *Burschenschaft*. In 1816 he had published his views in a brochure, *Vom deutschen Bund und deutscher Staatsverfassung*, dedicated to "the youth of Germany," and his influence gave a powerful impetus to the agitation which led in 1819 to the issue of the Carlsbad Decrees by the representatives of the German governments. Karl Sand, the murderer of Kotzebue, was one of his pupils; and a letter of his, found on another student, warning the lad against participation in secret societies, was twisted by the suspicious authorities into evidence of his guilt. He was condemned by the Mainz Commission; the grand-duke of Weimar was compelled to deprive him of his professorship; and he was forbidden to lecture on philosophy. The grand-duke, however, continued to pay him his stipend, and in 1824 he was recalled to Jena as professor of mathematics and physics, receiving permission also to lecture on philosophy in his own rooms to a select number of students. Finally, in 1838, the unrestricted right of lecturing was restored to him. He died on the 10th of August 1843.

The most important of the many works written during his Jena professorate are the *Handbuch der praktischen Philosophie* (1817–1832), the *Handbuch der psychischen Anthropologie* (1820–1821, and ed. 1837–1839), *Die mathematische Naturphilosophie* (1822),

[1] See *A History of the Adult School Movement* by J. W. Rowntree and H. B. Binns. The organ of the movement is *One and All*, published monthly. See also *The Adult School Year Book*.

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System der Metaphysik (1824), *Die Geschichte der Philosophie* (1837–1840). Fries's point of view in philosophy may be described as a modified Kantianism, an attempt to reconcile the criticism of Kant and Jacobi's philosophy of belief. With Kant he regarded *Kritik*, or the critical investigation of the faculty of knowledge, as the essential preliminary to philosophy. But he differed from Kant both as regards the foundation for this criticism and as regards the metaphysical results yielded by it. Kant's analysis of knowledge had disclosed the a priori element as the necessary complement of the isolated a posteriori facts of experience. But it did not seem to Fries that Kant had with sufficient accuracy examined the mode in which we arrive at knowledge of this a priori element. According to him we only know these a priori principles through inner psychical experience; they are not then to be regarded as transcendental factors of all experience, but as the necessary, constant elements discovered by us in our inner experience. Accordingly Fries, like the Scotch school, places psychology or analysis of consciousness at the foundation of philosophy, and called his criticism of knowledge an anthropological critique. A second point in which Fries differed from Kant is the view taken as to the relation between immediate and mediate cognitions. According to Fries, the understanding is purely the faculty of thought, it is in itself void; immediate certitude is the only source of knowledge. Reason contains principles which we cannot demonstrate, but which can be deduced, and are the proper objects of belief. In this view of reason Fries approximates to Jacobi rather than to Kant. His most original idea is the graduation of knowledge into knowing, belief and presentiment. We know phenomena, how the existence of things appears to us in nature; we believe in the true nature, the eternal essence of things (the good, the true, the beautiful); by means of presentiment (*Ahnung*) the intermediary between knowledge and belief, we recognise the supra-sensible in the sensible, the being in the phenomenon.

See E. L. Henke, *J. F. Fries* (1867); C. Grapengiesser, *J. F. Fries, ein Gedenkblatt* and *Kant's "Kritik der Vernunft" und deren Fortbildung durch J. F. Fries* (1882); H. Strasosky, *J. F. Fries als Kritiker der Kantischen Erkenntnistheorie* (1891); articles in Ersch and Gruber's *Allgemeine Encyklopädie* and *Allgemeine deutsche Biographie*; J. E. Erdmann, *Hist. of Philos.* (Eng. trans., London, 1890), vol. ii. § 305.

FRIES, JOHN (*c.* 1764–1825), American insurgent leader, was born in Pennsylvania of "Dutch" (German) descent about 1764. As an itinerant auctioneer he became well acquainted with the Germans in the S.E. part of Pennsylvania. In July 1798, during the troubles between the United States and France, Congress levied a direct tax (on dwelling-houses, lands and slaves) of $2,000,000, of which Pennsylvania was called upon to contribute $237,000. There were very few slaves in the state, and the tax was accordingly assessed upon dwelling-houses and land, the value of the houses being determined by the number and size of the windows. The inquisitorial nature of the proceedings aroused strong opposition among the Germans, and many of them refused to pay. Fries, assuming leadership, organized an armed band of about sixty men, who marched about the country intimidating the assessors and encouraging the people to resist. At last the governor called out the militia (March 1799) and the leaders were arrested. Fries and two others were twice tried for treason (the second time before Samuel Chase) and were sentenced to be hanged, but they were pardoned by President Adams in April 1800, and a general amnesty was issued on 21st May. The affair is variously known as the "Fries Rebellion," the "Hot-Water Rebellion"—because hot water was used to drive assessors from houses—, and the "Home Tax Rebellion." Fries died in Philadelphia in 1825.

See T. Carpenter, *Two Trials of John Fries . . . Taken in Shorthand* (Philadelphia, 1800); the second volume of McMaster's *History of the United States* (New York, 1883); and W. W. H. Davis, *The Fries Rebellion* (Doylestown, Pa., 1899).

FRIESLAND, or VRIESLAND, a province of Holland, bounded S.W., W. and N. by the Zuider Zee and the North Sea, E. by Groningen and Drente, and S.E. by Overysel. It also includes the islands of Ameland and Schiermonnikoog (see FRISIAN ISLANDS). Area, 1281 sq. m.; pop. (1900) 340,262. The soil of Friesland falls naturally into three divisions consisting of sea-clay in the north and north-west, of low-fen between the south-west and north-east, and of a comparatively small area of high-fen in the south-east. The clay and low-fen furnish a luxuriant meadow-land for the principal industries of the province —cattle-rearing and cheese- and butter-making. Horse-breeding has also been practised for centuries, and the breed of black Frisian horse is well known. On the clay lands agriculture is also extensively practised. In the high-fen district peat-digging is the chief occupation. The effect of this industry, however is to lay bare a subsoil of diluvial sand which offers little inducement for subsequent cultivation. Despite the general productiveness of the soil, however, the social condition of Friesland has remained in a backward state and poverty is rife in many districts. The ownership of property being largely in the hands of absentee landlords, the peasantry have little interest in the land, the profits from which go to enrich other provinces. Moreover, the nature of the fertility of the meadow-lands is such as to require little manual labour, and other industrial means of subsistence have hardly yet come into existence. This state of affairs has given rise to a social-democratic outcry on account of which Friesland is sometimes regarded as the "Ireland of Holland." The water system of the province comprises a few small rivers (now largely canalized) in the high lands in the east, and the vast network of canals, waterways and lakes of the whole north and west. The principal lakes are Tjeuke Meer, Sloter Meer, De Fluessen and Sneeker Meer. The tides being lowest on the north coast of the province, the scheme of the Waterstaat, the government department (dating from 1879), provides for the largest removal of superfluous surface water into the Lauwerszee. But owing to the long distance which the water must travel from certain parts of the province, and the continual recession of the Lauwerszee, the drainage problem is a peculiarly difficult one, and floods are sometimes inevitable.

The population of the province is evenly distributed in small villages. The principal market centres are Leeuwarden, the chief towns, Sneek, Bolsward, Franeker (*qq.v.*), Dokkum (4053) and Heerenveen (5011). With the exception of Franeker and Heerenveen all these towns originally arose on the inlet of the Middle Sea. The seaport towns are more or less decayed; they include Stavoren (820), Hindeloopen (1030), Workum (3428), Harlingen (*q.v.*) and Makkum (2456).

For history see FRISIANS.

FRIEZE. 1. (Through the Fr. *frise*, and Ital. *fregio*, from the Lat. *Phrygium, sc. opus*, Phrygian or embroidered work), a term given in architecture to the central division of the entablature of an order (see ORDER), but also applied to any oblong horizontal feature, introduced for decorative purposes and enriched with carving. The Doric frieze had a structural origin as the triglyphs suggest vertical support. The Ionic frieze was purely decorative and probably did not exist in the earliest examples, if we may judge by the copies found in the Lycian tombs carved in the rock. There is no frieze in the Caryatide portico of the Erechtheum, but in the Ionic temples its introduction may have been necessitated in consequence of more height being required in the entablature to carry the beams supporting the lacunaria over the peristyle. In the frieze of the Erechtheum the figures (about 2 ft. high) were carved in white marble and affixed by clamps to a background of black Eleusinian marble. The frieze of the Choragic monument of Lysicrates (10 in. high) was carved with figures representing the story of Dionysus and the pirates. The most remarkable frieze ever sculptured was that on the outside of the wall of the cella of the Parthenon representing the procession of the celebrants of the Panathenaic Festival. It was 40 in. in height and 525 ft. long, being carried round the whole building under the peristyle. Nearly the whole of the western frieze exists *in situ*; of the remainder, about half is in the British Museum, and as much as remains is either in Athens or in other museums. In some of the Roman temples, as in the temple of Antoninus and Faustina and the temple of the Sun, the frieze is elaborately carved and in later work is made convex, to which the term "pulvinated" is given.

2. (Probably connected with "frizz," to curl; there is no historical reason to connect the word with Friesland), a thick, rough woollen cloth, of very lasting quality, and with a heavy nap, forming small tufts or curls. It is largely manufactured in Ireland.

FRIGATE (Fr. *frégate*, Span. and Port. *fragata*; the etymology of the word is obscure; it has been derived from the Late Lat.

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fabricata, and the use of the Fr. *bâtiment*, for a vessel as well as a building is compared; another suggestion derives the word from the Gr. ἄφρακτος, unfenced or unguarded), originally a small swift, undecked vessel, propelled by oars or sails, in use on the Mediterranean. The word is thus used of the large open boats, without guns, used for war purposes by the Portuguese in the East Indies during the 16th and 17th centuries. The French first applied the term to a particular type of ships of war during the second quarter of the 18th century. The Seven Years' War (1756–1763) marked the definite adoption of the "frigate" as a standard class of vessel, coming next to ships of the line, and used for cruising and scouting purposes. They were three-masted, fully rigged, fast vessels, with the main armament carried on a single deck, and additional guns on the poop and forecastle. The number of guns varied from 24 to 50, but between 30 and 40 guns was the usual amount carried. "Frigate" continued to be used as the name for this type of ship, even after the introduction of steam and of ironclad vessels, but the class is now represented by that known as "cruiser."

FRIGATE-BIRD, the name commonly given by English sailors, on account of the swiftness of its flight, its habit of cruising about near other species and of daringly pursuing them, to a large sea-bird—the *Fregata aquila* of most ornithologists—the *Fregatte* of French and the *Rabihorcado* of Spanish mariners. It was placed by Linnaeus in the genus *Pelecanus*, and its assignment to the family *Pelecanidae* had hardly ever been doubted till Professor St George Mivart declared (*Trans. Zool. Soc.* x. p. 364) that, as regards the postcranial part of its axial skeleton, he could not detect sufficiently good characters to unite it with that family in the group named by Professor J. F. Brandt *Steganopodes*. There seems to be no ground for disputing this decision so far as separating the genus *Fregata* from the *Pelecanidae* goes, but systematists will probably pause before they proceed to abolish the *Steganopodes*, and the result will most likely be that the frigate-birds will be considered to form a distinct family (*Fregatidae*) in that group. In one very remarkable way the osteology of *Fregata* differs from that of all other birds known. The furcula coalesces firmly at its symphysis with the carina of the sternum, and also with the coracoids at the upper extremity of each of its rami, the anterior end of each coracoid coalescing also with the proximal end of the scapula. Thus the only articulations in the whole sternal apparatus are where the coracoids meet the sternum, and the consequence is a bony framework which would be perfectly rigid did not the flexibility of the rami of the furcula permit a limited amount of motion. That this mechanism is closely related to the faculty which the bird possesses of soaring for a considerable time in the air with scarcely a perceptible movement of the wings can hardly be doubted.

Two species of *Fregata* are considered to exist, though they differ in little but size and geographical distribution. The larger, *F. aquila*, has a wide range all round the world within the tropics and at times passes their limits. The smaller, *F. minor*, appears to be confined to the eastern seas, from Madagascar to the Moluccas, and southward to Australia, being particularly abundant in Torres Strait,—the other species, however, being found there as well. Having a spread of wing equal to a swan's and a very small body, the buoyancy of these birds is very great. It is a beautiful sight to watch one or more of them floating overhead against the deep blue sky, the long forked tail alternately opening and shutting like a pair of scissors, and the head, which is of course kept to windward, inclined from side to side, while the wings are to all appearance fixedly extended, though the breeze may be constantly varying in strength and direction. Equally fine is the contrast afforded by these birds when engaged in fishing, or, as seems more often to happen, in robbing other birds, especially boobies, as they are fishing. Then the speed of their flight is indeed seen to advantage, as well as the marvellous suddenness with which they can change their rapid course as their victim tries to escape from their attack. Before gales frigate-birds are said often to fly low, and their appearance near or over land, except at their breeding-time; is supposed to portend a hurricane.[2] Generally seen singly or in pairs, except when the prospect of prey induces them to congregate, they breed in large companies, and O. Salvin has graphically described (*Ibis*, 1864, p. 375) one of their settlements off the coast of British Honduras, which he visited in May 1862. Here they chose the highest mangrove-trees[3] on which to build their frail nests, and seemed to prefer the leeward side. The single egg laid in each nest has a white and chalky shell very like that of a cormorant's. The nestlings are clothed in pure white down, and so thickly as to resemble puff-balls. When fledged, the beak, head, neck and belly are white, the legs and feet bluish-white, but the body is dark above. The adult females retain the white beneath, but the adult males lose it, and in both sexes at maturity the upper plumage is of a very dark chocolate brown, nearly black, with a bright metallic gloss, while the feet in the females are pink, and black in the males—the last also acquiring a bright scarlet pouch, capable of inflation, and being perceptible when on the wing. The habits of *F. minor* seem wholly to resemble those of *F. aquila*. According to J. M. Bechstein, an example of this last species was obtained at the mouth of the Weser in January 1792. (A. N.)

[1] "Man-of-war-bird" is also sometimes applied to it, and is perhaps the older name; but it is less distinctive, some of the larger Albatrosses being so called, and, in books at least, has generally passed out of use.

[2] Hence another of the names—"hurricane-bird"—by which this species is occasionally known.

[3] Captain Taylor, however, found their nests as well on low bushes of the same tree in the Bay of Fonseca (*Ibis*, 1859, pp. 150-152).

FRIGG, the wife of the god Odin (Woden) in northern mythology. She was known also to other Teutonic peoples both on the continent (O. H. Ger. *Friia*, Langobardic *Prea*) and in England, where her name still survives in Friday (O.E. *Frigedæg*). She is often wrongly identified with Freyia. (See TEUTONIC PEOPLES, *ad fin.*)

FRIGIDARIUM, the Latin term (from *frigidus*, cold) applied to the open area of the Roman thermae, in which there was generally a cold swimming bath, and sometimes to the bath (see BATHS). From the description given by Aelius Spartianus (A.D. 207) it would seem that portions of the frigidarium were covered over by a ceiling formed of interlaced bars of gilt bronze, and this statement has been to a certain extent substantiated by the discovery of many tons of T-shaped iron found in the excavations under the paving of the frigidarium of the thermae of Caracalla. Dr J. H. Middleton in *The Remains of Ancient Rome* (1892) points out that in the part of the enclosure walls are deep sinkings to receive the ends of the great girders. He suggests that the panels of the lattice-work ceiling were filled in with concrete made of light pumice stone.

FRIIS, JOHAN (1494–1570), Danish statesman, was born in 1494, and was educated at Odense and at Copenhagen, completing his studies abroad. Few among the ancient Danish nobility occupy so prominent a place in Danish history as Johan Friis, who exercised a decisive influence in the government of the realm during the reign of three kings. He was one of the first of the magnates to adhere to the Reformation and its promoter King Frederick I. (1523–1533), his apostasy being so richly rewarded out of the spoils of the plundered Church that his heirs had to restore property of the value of 1,000,000 kroner. Friis succeeded Claus Gjoodsen as imperial chancellor in 1532, and held that dignity till his death. During the ensuing interregnum he powerfully contributed, at the head of the nobles of Funen and Jutland, to the election of Christian III. (1533–1559), but in the course of the "Count's War" he was taken prisoner by Count Christopher, the Catholic candidate for the throne, and forced to do him homage. Subsequently by judicious bribery he contrived to escape to Germany, and from thence rejoined Christian III. He was one of the plenipotentiaries who concluded peace with Lübeck at the congress of Hamburg, and subsequently took an active part in the great work of national reconstruction necessitated by the Reformation, acting as mediator between the Danish and the German parties who were contesting for

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supremacy during the earlier years of Christian III. This he was able to do, as a moderate Lutheran, whose calmness and common sense contrasted advantageously with the unbridled violence of his contemporaries. As the first chancellor of the reconstructed university of Copenhagen, Friis took the keenest interest in spiritual and scientific matters, and was the first donor of a legacy to the institution. He also enjoyed the society of learned men, especially of "those who could talk with him concerning ancient monuments and their history." He encouraged Hans Svaning to complete Saxo's history of Denmark, and Anders Vedel to translate Saxo into Danish. His generosity to poor students was well known; but he could afford to be liberal, as his share of spoliated Church property had made him one of the wealthiest men in Denmark. Under King Frederick II. (1559–1588), who understood but little of state affairs, Friis was well-nigh omnipotent. He was largely responsible for the Scandinavian Seven Years' War (1562–70), which did so much to exacerbate the relations between Denmark and Sweden. Friis died on the 5th of December 1570, a few days before the peace of Stettin, which put an end to the exhausting and unnecessary struggle.

FRIMLEY, an urban district in the Chertsey parliamentary division of Surrey, England, 33 m. W.S.W. from London by the London & South-Western railway, and 1 m. N. of Farnborough in Hampshire. Pop. (1901) 8409. Its healthy climate, its position in the sandy heath-district of the west of Surrey, and its proximity to Aldershot Camp have contributed to its growth as a residential township. To the east the moorland rises in the picturesque elevation of Chobham Ridges; and 3 m. N.E. is Bagshot, another village growing into a residential town, on the heath of the same name extending into Berkshire. Bisley Camp, to which in 1890 the meetings of the National Rifle Association were removed from Wimbledon, is 4 m. E. Coniferous trees and rhododendrons are characteristic products of the soil, and large nurseries are devoted to their cultivation.

FRIMONT, JOHANN MARIA PHILIPP, COUNT OF PALOTA, PRINCE OF ANTRODOCCO (1759–1831), Austrian general, entered the Austrian cavalry as a trooper in 1776, won his commission in the War of the Bavarian Succession, and took part in the Turkish wars and in the early campaigns against the French Revolutionary armies, in which he frequently earned distinction. At Frankenthal in 1796 he won the cross of Maria Theresa. In the campaign of 1800 he distinguished himself greatly as a cavalry leader at Marengo (14th of June), and in the next year became major-general. In the war of 1805 he was again employed in Italy and won further renown by his gallantry at the battle of Caldiero. In 1809 he again saw active service in Italy in the rank of lieutenant field marshal, and in 1812 led the cavalry of Schwarzenberg's corps in the Russian campaign. He served in the campaigns of 1813–14 in high command, and rendered conspicuous service at Brienne-La Rothière and at Arcis-sur-Aube. In 1815 he was commander-in-chief of the Austrians in Italy, and his army penetrated France as far as Lyons, which was entered on the 11th of July. With the army of occupation he remained in France for some years, and in 1819 he commanded at Venice. In 1821 he led the Austrian army which was employed against the Neapolitan rebels, and by the 24th of March he had victoriously entered Naples. His reward from King Ferdinand of Naples was the title of prince of Antrodocco and a handsome sum of money, and from his own master the rank of general of cavalry. After this he commanded in North Italy, and was called upon to deal with many outbreaks of the Italian patriots. He became president of the Aulic council in 1831, but died a few months later.

FRISCHES HAFF, a lagoon on the Baltic coast of Germany, within the provinces East and West Prussia, between Danzig and Königsberg. It is 52 m. in length, from 4 to 12 m. broad, 332 sq. m. in area, and is separated from the Baltic by a narrow spit or bank of land. This barrier was torn open by a storm in 1510, and the channel thus formed, now dredged out to a depth of 22 ft., affords a navigable passage for vessels. Into the Haff flow the Nogat, the Elbing, the Passarge, the Pregel and the Frisching, from the last of which the name Frisches Haff probably arose.

FRISCHLIN, PHILIPP NIKODEMUS (1547–1590), German philologist and poet, was born on the 22nd of September 1547 at Balingen in Württemberg, where his father was parish minister. He was educated at the university of Tübingen, where in 1568 he was promoted to the chair of poetry and history. In 1575 for his comedy of *Rebecca*, which he read at Regensburg before the emperor Maximilian II., he was rewarded with the laureateship, and in 1577 he was made a count palatine (*comes palatinus*) or *Pfalzgraf*. In 1582 his unguarded language and reckless life made it necessary that he should leave Tübingen, and he accepted a mastership at Laibach in Carniola, which he held for about two years. Shortly after his return to the university in 1584, he was threatened with a criminal prosecution on a charge of immoral conduct, and the threat led to his withdrawal to Frankfort-on-Main in 1587. For eighteen months he taught in the Brunswick gymnasium, and he appears also to have resided occasionally at Strassburg, Marburg and Mainz. From the last-named city he wrote certain libellous letters, which led to his being arrested in March 1590. He was imprisoned in the fortress of Hohenurach, near Reutlingen, where, on the night of the 29th of November 1590, he was killed by a fall in attempting to let himself down from the window of his cell.

Frischlin's prolific and versatile genius produced a great variety of works, which entitle him to some rank both among poets and among scholars. In his Latin verse he often successfully imitated the classical models; his comedies are not without freshness and vivacity; and some of his versions and commentaries, particularly those on the *Georgics* and *Bucolics* of Virgil, though now well-nigh forgotten, were important contributions to the scholarship of his time. There is no collected edition of his works, but his *Opera poëtica* were published twelve times between 1535 and 1636. Among those most widely known may be mentioned the *Hebraeis* (1590), a Latin grammar based on the Scripture history of the Jews; the *Elegiaca* (1601), his collected lyric poetry, in twenty-two books; the *Opera scenica* (1604) consisting of six comedies and two tragedies (among the former, *Julius Caesar redivivus*, completed 1584); the *Grammatica Latina* (1585); the versions of Callimachus and Aristophanes; and the commentaries on Persius and Virgil. See the monograph of D. F. Strauss (*Leben und Schriften des Dichters und Philologen Frischlin*, 1856).

FRISI, PAOLO (1728–1784), Italian mathematician and astronomer, was born at Milan on the 13th of April 1728. He was educated at the Barnabite monastery and afterwards at Padua. When twenty-one years of age he composed a treatise on the figure of the earth, and the reputation which he soon acquired led to his appointment by the king of Sardinia to the professorship of philosophy in the college of Casale. His friendship with Radicati, a man of liberal opinions, occasioned Frisi's removal by his clerical superiors to Novara, where he was compelled to do duty as a preacher. In 1753 he was elected a corresponding member of the Paris Academy of Sciences, and shortly afterwards he became professor of philosophy in the Barnabite College of St Alexander at Milan. An acrimonious attack by a young Jesuit, about this time, upon his dissertation on the figure of the earth laid the foundation of his animosity against the Jesuits, with whose enemies, including J. d'Alembert, J. A. N. Condorcet and other Encyclopedists, he later closely associated himself. In 1756 he was appointed by Leopold, grand-duke of Tuscany, to the professorship of mathematics in the university of Pisa, a post which he held for eight years. In 1757 he became an associate of the Imperial Academy of St Petersburg, and a foreign member of the Royal Society of London, and in 1758 a member of the Academy of Berlin, in 1766 of that of Stockholm, and in 1770 of the Academies of Copenhagen and of Bern. From several European crowned heads he received, at various times, marks of special distinction, and the empress Maria Theresa granted him a yearly pension of 100 sequins (£50). In 1764 he was created professor of mathematics in the palatine schools at Milan, and obtained from Pope Pius VI. release from ecclesiastical jurisdiction, and authority to become a secular priest. In 1766 he visited France and England, and in 1768 Vienna. In 1777 he became director of a school of architecture at Milan. His knowledge of hydraulics

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caused him to be frequently consulted with respect to the management of canals and other watercourses in various parts of Europe. It was through his means that lightning-conductors were first introduced into Italy for the protection of buildings. He died on the 22nd of November 1784.

His publications include:—*Disquisitio mathematica in causam physicam figurae et magnitudinis terrae* (Milan, 1751); *Saggio della morale filosofia* (Lugano, 1753); *Nova electricitatis theoria* (Milan, 1755); *Dissertatio de motu diurno terrae* (Pisa, 1758); *Dissertationes variae* (2 vols. 4to, Lucca, 1759, 1761); *Del modo di regolare i fiumi e i torrenti* (Lucca, 1762); *Cosmographia physica et mathematica* (Milan, 1774, 1775, 2 vols. 4to, his chief work); *Dell' architettura, statica e idraulica* (Milan, 1777); and other treatises.

See Verri, *Memorie . . . del signor dom Paolo Frisi* (Milan, 1787), 4to; Fabbroni, "Elogj d' illustri Italiani," *Atti di Milano*, vol. ii.; J. C. Poggendorff, *Biograph. litterar. Handwörterbuch*, vol. i.

FRISIAN ISLANDS, a chain of islands, lying from 3 to 20 m. from the mainland, and stretching from the Zuider Zee E. and N. as far as Jutland, along the coasts of Holland and Germany. They are divided into three groups:—(1) The West Frisian, (2) the East Frisian, and (3) the North Frisian.

The chain of the Frisian Islands marks the outer fringe of the former continental coast-line, and is separated from the mainland by shallows, known as Wadden or Watten, answering to the *maria vadosa* of the Romans. Notwithstanding the protection afforded by sand-dunes and earthen embankments backed by stones and timber, the Frisian Islands are slowly but surely crumbling away under the persistent attacks of storm and flood, and the old Frisian proverb "*de nich will diken mut witken*" ("who will not build dikes must go away") still holds good. Many of the Frisian legends and folk-songs deal with the submerged villages and hamlets, which lie buried beneath the treacherous waters of the Wadden. Heinrich Heine made use of these legends in his *Nordseebilder*, composed during a visit to Norderney in 1825. The Prussian and Dutch governments annually expend large sums for the protection of the islands, and in some cases the erosion on the seaward side is counterbalanced by the accretion of land on the inner side, fine sandy beaches being formed well suited for sea-bathing, which attracts many visitors in summer. The inhabitants of these islands support themselves by seafaring, pilotage, grazing of cattle and sheep, fishing and a little agriculture, chiefly potato-growing.

The islands, though well lighted, are dangerous to navigation, and a glance at a wreck chart will show the entire chain to be densely dotted. One of the most remarkable disasters was the loss of H.M.S. "La Lutine," 32 guns, which was wrecked off Vlieland in October 1799, only one hand being saved, who died before reaching England. "La Lutine," which had been captured from the French by Admiral Duncan, was carrying a large quantity of bullion and specie, which was underwritten at Lloyd's. The Dutch government claimed the wreck and granted one-third of the salvage to bullion-fishers. Occasional recoveries were made of small quantities which led to repeated disputes and discussions, until eventually the king of the Netherlands ceded to Great Britain, for Lloyd's, half the remainder of the wreck. A Dutch salvage company, which began operations in August 1857, recovered £99,803 in the course of two years, but it was estimated that some £1,175,000 are still unaccounted for. The ship's rudder, which was recovered in 1859, has been fashioned into a chair and a table, now in the possession of Lloyd's.

West Frisian.

The West Frisian Islands belong to the kingdom of the Netherlands, and embrace Texel or Tessel (71 sq. m.), Vlieland (19 sq. m.), Terschelling (41 sq. m.), Ameland (23 sq. m.), Schiermonnikoog (19 sq. m.), as well as the much smaller islands of Boschplaat and Rottum, which are practically uninhabited. The northern end of Texel is called Eierland, or "island of eggs," in reference to the large number of sea-birds' eggs which are found there. It was joined to Texel by a sand-dike in 1629–1630, and is now undistinguishable from the main island. Texel was already separated from the mainland in the 8th century, but remained a Frisian province and countship, which once extended as far as Alkmaar in North Holland, until it came into the possession of the counts of Holland. The island was occupied by British troops from August to December 1799. The village of Oude Schild has a harbour. The island of Terschelling once formed a separate lordship, but was sold to the states of Holland. The principal village of West-Terschelling has a harbour. As early as the beginning of the 9th century Ameland was a lordship of the influential family of Cammingha who held immediately of the emperor, and in recognition of their independence the Amelanders were in 1360 declared to be neutral in the fighting between Holland and Friesland, while Cromwell made the same declaration in 1654 with respect to the war between England and the United Netherlands. The castle of the Camminghas in the village of Ballum remained standing till 1810, and finally disappeared in 1829 after four centuries. This island is joined to the mainland of Friesland by a stone dike constructed in 1873 for the purpose of promoting the deposit of mud. The island of Schiermonnikoog has a village and a lighthouse. Rottum was once the property of the ancient abbey at Rottum, 8 m. N. of Groningen, of which there are slight remains.

East Frisian.

With the exception of Wangeroog, which belongs to the grand duchy of Oldenburg, the East Frisian Islands belong to Prussia. They comprise Borkum (12½ sq. m.), with two lighthouses and connected by steamer with Emden and Leer; Memmert; Juist (2½ sq. m.), with two lifeboat stations, and connected by steamer with Norddeich and Greetsiel; Norderney (5½ sq. m.); Baltrum, with a lifeboat station; Langeoog (8 sq. m.), connected by steamer with the adjacent islands, and with Bensersiel on the mainland; Spiekeroog (4 sq. m.), with a tramway for conveyance to the bathing beach, and connected by steamer with Carolinensiel; and Wangeroog (2 sq. m.), with a lighthouse and lifeboat station. All these islands are visited for sea-bathing. In the beginning of the 18th century Wangeroog comprised eight times its present area. Borkum and Juist are two surviving fragments of the original island of Borkum (computed at 380 sq. m.), known to Drusus as *Fabaria*, and to Pliny as *Burchana*, which was rent asunder by the sea in 1170. Neuwerk and Scharhörn, situated off the mouth of the Elbe, are islands belonging to the state of Hamburg. Neuwerk, containing some marshland protected by dikes, has two lighthouses and a lifeboat station. At low water it can be reached from Duhnen by carriage.

North Frisian.

About the year 1250 the area of the North Frisian Islands was estimated at 1065 sq. m.; by 1850 this had diminished to only 105 sq. m. This group embraces the islands of Nordstrand (17½ sq. m.), which up to 1634 formed one larger island with the adjoining Pohnshallig and Nordstrandisch-Moor; Pellworm (16½ sq. m.), protected by a circle of dikes and connected by steamer with Husum on the mainland; Amrum (10½ sq. m.); Föhr (32 sq. m.); Sylt (38 sq. m.); Röm (16 sq. m.), with several villages, the principal of which is Kirkeby; Fanö (21 sq. m.); and Heligoland (½ sq. m.). With the exception of Fanö, which is Danish, all these islands belong to Prussia. In the North Frisian group there are also several smaller islands called Halligen. These rise generally only a few feet above the level of the sea, and are crowned by a single house standing on an artificial mound and protected by a surrounding dike or embankment.

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FRISIANS (Lat. *Frisii*; in Med. Lat. *Frisones*, *Frisiones*, *Fresones*; in their own tongue *Frêsa*, *Frêsen*), a people of Teutonic (Low-German) stock, who in the first century of our era were found by the Romans in occupation of the coast lands stretching from the mouth of the Scheldt to that of the Ems. They were nearly related both by speech and blood to the Saxons and Angles, and other Low German tribes, who lived to the east of the Ems and in Holstein and Schleswig. The first historical notices of the Frisians are found in the *Annals* of Tacitus. They were rendered (or a portion of them) tributary by Drusus, and became *socii* of the Roman people. In A.D. 28 the exactions of a Roman official drove them to revolt, and their subjection was henceforth nominal. They submitted again to Cn. Domitius Corbulo in the year 47, but shortly afterwards the emperor Claudius ordered the withdrawal of all Roman troops to the left bank of the Rhine. In 58 they attempted unsuccessfully to appropriate certain districts between the Rhine and the Yssel, and in 70 they took part in the campaign of Claudius Civilis. From this time onwards their name practically disappears. As regards their geographical position Ptolemy states that they inhabited the coast above the Bructeri as far as the Ems, while Tacitus speaks of them as adjacent to the Rhine. But there is some reason for believing that the part of Holland which lies to the west of the Zuider Zee was at first inhabited by a different people, the Canninefates, a sister tribe to the Batavi. A trace of this people is perhaps preserved in the name Kennemerland or Kinnehem, formerly applied to the same district. Possibly, therefore, Tacitus's statement holds good only for the period subsequent to the revolt of Civilis, when we hear of the Canninefates for the last time.

In connexion with the movements of the migration period the Frisians are hardly ever mentioned, though some of them are said to have surrendered to the Roman prince Constantius about the year 293. On the other hand we hear very frequently of Saxons in the coast regions of the Netherlands. Since the Saxons (Old Saxons) of later times were an inland people, one can hardly help suspecting either that the two nations have been confused or, what is more probable, that a considerable mixture of population, whether by conquest or otherwise, had taken place. Procopius (*Goth.* iv. 20) speaks of the Frisians as one of the nations which inhabited Britain in his day, but we have no evidence from other sources to bear out his statement. In Anglo-Saxon poetry mention is frequently made of a Frisian king named Finn, the son of Folcwalda, who came into conflict with a certain Hnaef, a vassal of the Danish king Healfdene, about the middle of the 5th century. Hnaef was killed, but his followers subsequently slew Finn in revenge. The incident is obscure in many respects, but it is perhaps worth noting that Hnaef's chief follower, Hengest, may quite possibly be identical with the founder of the Kentish dynasty. About the year 520 the Frisians are said to have joined the Frankish prince Theodberht in destroying a piratical expedition which had sailed up the Rhine under Chocilaicus (Hygelac), king of the Götar. Towards the close of the century they begin to figure much more prominently in Frankish writings. There is no doubt that by this time their territories had been greatly extended in both directions. Probably some Frisians took part with the Angles and Saxons in their sea-roving expeditions, and assisted their neighbours in their invasions and subsequent conquest of England and the Scottish lowlands.

The rise of the power of the Franks and the advance of their dominion northwards brought on a collision with the Frisians, who in the 7th century were still in possession of the whole of the sea-coast, and apparently ruled over the greater part of modern Flanders. Under the protection of the Frankish king Dagobert (622–638), the Christian missionaries Amandus (St Amand) and Eligius (St Eloi) attempted the conversion of these Flemish Frisians, and their efforts were attended with a certain measure of success; but farther north the building of a church by Dagobert at Trajectum (Utrecht) at once aroused the fierce hostility of the heathen tribesmen of the Zuider Zee. The "free" Frisians could not endure this Frankish outpost on their borders. Utrecht was attacked and captured, and the church destroyed. The first missionary to meet with any success among the Frisians was the Englishman Willfrid of York, who, being driven by a storm upon the coast, was hospitably received by the king, Adgild or Adgisl, and was allowed to preach Christianity in the land. Adgild appears to have admitted the overlordship of the Frankish king, Dagobert II. (675). Under his successor, however, Radbod (Frisian Redbad), an attempt was made to extirpate Christianity and to free the Frisians from the Frankish subjection. He was, however, beaten by Pippin of Heristal in the battle of Dorstadt (689), and was compelled to cede West Frisia (*Frisia citerior*) from the Scheldt to the Zuider Zee to the conqueror. On Pippin's death Radbod again attacked the Franks and advanced as far as Cologne, where he defeated Charles Martel, Pippin's natural son. Eventually, however, Charles prevailed and compelled the Frisians to submit. Radbod died in 719, but for some years his successors struggled against the Frankish power. A final defeat was, however, inflicted upon them by Charles Martel in 734, which secured the supremacy of the Franks in the north, though it was not until the days of Charles the Great (785) that the subjection of the Frisians was completed. Meanwhile Christianity had been making its conquests in the land, mainly through the lifelong labours and preaching of the Englishman Willibrord, who came to Frisia in 692 and made Utrecht his headquarters. He was consecrated (695) at Rome archbishop of the Frisians, and on his return founded a number of bishoprics in the northern Netherlands, and continued his labours unremittingly until his death in 739. It is an interesting fact that both Willfrid and Willibrord appear to have found no difficulty from the first in preaching to the Frisians in their native dialect, which was so nearly allied to their own Anglo-Saxon tongue. The see of Utrecht founded by Willibrord has remained the chief see of the Northern Netherlands from his day to our own. Friesland was likewise the scene of a portion of the missionary labours of a greater than Willibrord, the famous Boniface, the Apostle of the Germans, also an Englishman. It was at Dokkum in Friesland that he met a martyr's death (754).

Charles the Great granted the Frisians important privileges under a code known as the *Lex Frisionum*, based upon the ancient laws of the country. They received the title of freemen and were allowed to choose their own *podestat* or imperial governor. In the *Lex Frisionum* three districts are clearly distinguished: West Frisia from the Zwin to the Flie; Middle Frisia from the Flie to the Lauwers; East Frisia from the Lauwers to the Weser. At the partition treaty of Verdun (843) Frisia became part of Lotharingia or Lorraine; at the treaty of Mersen (870) it was divided between the kingdoms of the East Franks (Austrasia) and the West Franks (Westrasia); in 880 the whole country was united to Austrasia; in 911 it fell under the dominion of Charles the Simple, king of the West Franks, but the districts of East Frisia asserted their independence and for a long time governed themselves after a very simple democratic fashion. The history of West Frisia gradually loses itself in that of the countship of Holland and the see of Utrecht (see HOLLAND and UTRECHT).

The influence of the Frisians during the interval between the invasion of Britain and the loss of their independence must have been greater than is generally recognized. They were a seafaring people and engaged largely in trade, especially perhaps the slave trade, their chief emporium being Wyk te Duurstede. During the period in question there is considerable archaeological evidence for intercourse between the west coast of Norway and the regions south of the North Sea, and it is worth noting that this seems to have come to an end early in the 9th century. Probably it is no mere accident that the first appearance, or rather reappearance, of Scandinavian pirates in the west took place shortly after the overthrow of the Frisians. Since Radbod's dominions extended from Duerstede to Heligoland his power must have been by no means inconsiderable.

Besides the Frisians discussed above there is a people called North Frisians, who inhabit the west coast of Schleswig. At present a Frisian dialect is spoken only between Tondern and

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Husum, but formerly it extended farther both to the north and south. In historical times these North Frisians were subjects of the Danish kingdom and not connected in any way with the Frisians of the empire. They are first mentioned by Saxo Grammaticus in connexion with the exile of Knud V. Saxo recognized that they were of Frisian origin, but did not know when they had first settled in this region. Various opinions are still held with regard to the question; but it seems not unlikely that the original settlers were Frisians who had been expelled by the Franks in the 8th century. Whether the North Frisian language is entirely of Frisian origin is somewhat doubtful owing to the close relationship which Frisian bears to English. The inhabitants of the neighbouring islands, Sylt, Amrum and Föhr, who speak a kindred dialect, have apparently never regarded themselves as Frisians, and it is the view of many scholars that they are the direct descendants of the ancient Saxons.

In 1248 William of Holland, having become emperor, restored to the Frisians in his countship their ancient liberties in reward for the assistance they had rendered him in the siege of Aachen; but in 1254 they revolted, and William lost his life in the contest which ensued. After many struggles West Friesland became completely subdued, and was henceforth virtually absorbed in the county of Holland. But the Frieslanders east of the Zuider Zee obstinately resisted repeated attempts to bring them into subjection. In the course of the 14th century the country was in a state of anarchy; petty lordships sprang into existence, and interests of the common weal were forgotten or disregarded, and the people began to be split up into factions, and these were continually carrying on petty warfare with one another. Thus the Fetkoopers (Fatmongers) of Oostergoo had endless feuds with the Schieringers (Eelfishers) of Westergoo.

This state of affairs favoured the attempts of the counts of Holland to push their conquests eastward, but the main body of the Frisians was still independent when the countship of Holland passed into the hands of Philip the Good of Burgundy. Philip laid claim to the whole country, but the people appealed to the protection of the empire, and Frederick III., in August 1457, recognized their direct dependence on the empire and called on Philip to bring forward formal proof of his rights. Philip's successor, Charles the Bold, summoned an assembly of notables at Enkhuizen in 1469, in order to secure their homage; but the conference was without result, and the duke's attention was soon absorbed by other and more important affairs. The marriage of Maximilian of Austria with the heiress of Burgundy was to be productive of a change in the fortunes of that part of Frisia which lies between the Vlie and the Lauwers. In 1498 Maximilian reversed the policy of his father Frederick III., and detached this territory, known afterwards as the province of Friesland, from the empire. He gave it as a fief to Albert of Saxony, who thoroughly crushed out all resistance. In 1523 it fell with all the rest of the provinces of the Netherlands under the strong rule of the emperor Charles, the grandson of Maximilian and Mary of Burgundy.

That part of Frisia which lies to the east of the Lauwers had a divided history. The portion which lies between the Lauwers and the Ems after some struggles for independence had, like the rest of the country, to submit itself to Charles. It became ultimately the province of the town and district of Groningen (Stadt en Landen) (see Groningen). The easternmost part between the Ems and the Weser, which had since 1454 been a county, was ruled by the descendants of Edzard Cirksena, and was attached to the empire. The last of the Cirksenas, Count Charles Edward, died in 1744 and in default of heirs male the king of Prussia took possession of the county.

The province of Friesland was one of the seven provinces which by the treaty known as the Union of Utrecht bound themselves together to resist the tyranny of Spain. From 1579 to 1795 Friesland remained one of the constituent parts of the republic of the United Provinces, but it always jealously insisted on its sovereign rights, especially against the encroachments of the predominant province of Holland. It maintained throughout the whole of the republican period a certain distinctiveness of nationality, which was marked by the preservation of a different dialect and of a separate stadtholder. Count William Lewis of Nassau-Siegen, nephew and son-in-law of William the Silent, was chosen stadtholder, and through all the vicissitudes of the 17th and 18th centuries the stadtholdership was held by one of his descendants. Frederick Henry of Orange was stadtholder of six provinces, but not of Friesland, and even during the stadtholderless periods which followed the deaths of William II. and William III. of Orange the Frisians remained stanch to the family of Nassau-Siegen. Finally, by the revolution of 1748, William of Nassau-Siegen, stadtholder of Friesland (who, by default of heirs male of the elder line, had become William IV., prince of Orange), was made hereditary stadtholder of all the provinces. His grandson in 1815 took the title of William I., king of the Netherlands. The male line of the "Frisian" Nassaus came to an end with the death of King William III. in 1890.

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FRITH (or Fryth), **JOHN** (*c.* 1503–1533), English Reformer and Protestant martyr, was born at Westerham, Kent. He was educated at Eton and King's College, Cambridge, where Gardiner, afterwards bishop of Winchester, was his tutor. At the invitation of Cardinal Wolsey, after taking his degree he migrated (December 1525) to the newly founded college of St Frideswide or Cardinal College (now Christ Church), Oxford. The sympathetic interest which he showed in the Reformation movement in Germany caused him to be suspected as a heretic, and led to his imprisonment for some months. Subsequently he appears to have resided chiefly at the newly founded Protestant university of Marburg, where he became acquainted with several scholars and reformers of note, especially Patrick Hamilton (q.v.). Frith's first publication was a translation of Hamilton's *Places*, made shortly after the martyrdom of its author; and soon afterwards the *Revelation of Antichrist*, a translation from the German, appeared, along with *A Pistle to the Christen Reader*, by "Richard Brightwell" (supposed to be Frith), and *An Antithesis wherein are compared togeder Christes Actes and our Holye Father the Popes*, dated "at Malborow in the lande of Hesse," 12th July 1529. His *Disputacyon of Purgatorye*, a treatise in three books, against Rastell, Sir T. More and Fisher (bishop of Rochester) respectively, was published at the same place in 1531. While at Marburg, Frith also assisted Tyndale, whose acquaintance he had made at Oxford (or perhaps in London) in his literary labours. In 1532 he ventured back to England, apparently on some business in connexion with the prior of Reading. Warrants for his arrest were almost immediately issued at the instance of Sir T. More, then lord chancellor. Frith ultimately fell into the hands of the authorities at Milton Shore in Essex, as he was on the point of making his escape to Flanders. The rigour of his imprisonment in the Tower was somewhat abated when Sir T. Audley succeeded to the chancellorship, and it was understood that both Cromwell and Cranmer were disposed to show great leniency. But the treacherous circulation of a manuscript "lytle treatise" on the sacraments, which Frith had written for the information of a friend, and without any view to publication, served further to excite the

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hostility of his enemies. In consequence of a sermon preached before him against the "sacramentaries," the king ordered that Frith should be examined; he was afterwards tried and found guilty of having denied, with regard to the doctrines of purgatory and of transubstantiation, that they were necessary articles of faith. On the 23rd of June 1533 he was handed over to the secular arm, and at Smithfield on the 4th of July following he was burnt at the stake. During his captivity he wrote, besides several letters of interest, a reply to More's letter against Frith's "lytle treatise"; also two tracts entitled *A Mirror or Glass to know thyself*, and *A Mirror or Looking-glass wherein you may behold the Sacrament of Baptism*.

Frith is an interesting and so far important figure in English ecclesiastical history as having been the first to maintain and defend that doctrine regarding the sacrament of Christ's body and blood, which ultimately came to be incorporated in the English communion office. Twenty-three years after Frith's death as a martyr to the doctrine of that office, that "Christ's natural body and blood are in Heaven, not here," Cranmer, who had been one of his judges, went to the stake for the same belief. Within three years more, it had become the publicly professed faith of the entire English nation.

See A. à Wood, *Athenae Oxonienses* (ed. P. Bliss, 1813), i. p. 74; John Foxe, *Acts and Monuments* (ed. G. Townshend, 1843–1849), v. pp. 1-16 (also Index); G. Burnet, *Hist. of the Reformation of the Church of England* (ed. N. Pocock, 1865), i. p. 273; L. Richmond, *The Fathers of the English Church*, i. (1807); *Life and Martyrdom of John Frith* (London, 1824), published by the Church of England Tract Society; Deborah Alcock, *Six Heroic Men* (1906).

FRITH, WILLIAM POWELL (1819–1909), English painter, was born at Aldfield, in Yorkshire, on the 9th of January 1819. His parents moved in 1826 to Harrogate, where his father became landlord of the Dragon Inn, and it was then that the boy began his general education at a school at Knaresborough. Later he went for about two years to a school at St Margaret's, near Dover, where he was placed specially under the direction of the drawing-master, as a step towards his preparation for the profession which his father had decided on as the one that he wished him to adopt. In 1835 he was entered as a student in the well-known art school kept by Henry Sass in Bloomsbury, from which he passed after two years to the Royal Academy schools. His first independent experience was gained in 1839, when he went about for some months in Lincolnshire executing several commissions for portraits; but he soon began to attempt compositions, and in 1840 his first picture, "Malvolio, cross-gartered before the Countess Olivia," appeared at the Royal Academy. During the next few years he produced several notable paintings, among them "Squire Thornhill relating his own adventures to the Vicar's family," and "The Village Pastor," which established his reputation as one of the most promising of the younger men of that time. This last work was exhibited in 1845, and in the autumn of that year he was elected an Associate of the Royal Academy. His promotion to the rank of Academician followed in 1853, when he was chosen to fill the vacancy caused by Turner's death. The chief pictures painted by him during his tenure of Associateship were: "An English Merry-making in the Olden Time," "Old Woman accused of Witchcraft," "The Coming of Age," "Sancho and Don Quixote," "Hogarth before the Governor of Calais," and the "Scene from Goldsmith's 'Good-natured Man,'" which was commissioned in 1850 by Mr Sheepshanks, and bequeathed by him to the South Kensington Museum. Then came a succession of large compositions which gained for the artist an extraordinary popularity. "Life at the Seaside," better known as "Ramsgate Sands." was exhibited in 1854, and was bought by Queen Victoria; "The Derby Day," in 1858; "Claude Duval," in 1860; "The Railway Station," in 1862; "The Marriage of the Prince of Wales," painted for Queen Victoria, in 1865; "The Last Sunday of Charles II.," in 1867; "The Salon d'Or," in 1871; "The Road to Ruin," a series, in 1878; a similar series, "The Race for Wealth," shown at a gallery in King Street, St James's, in 1880; "The Private View," in 1883; and "John Knox at Holyrood," in 1886. Frith also painted a considerable number of portraits of well-known people. In 1889 he became an honorary retired academician. His "Derby Day" is in the National Gallery of British Art. In his youth, in common with the men by whom he was surrounded, he had leanings towards romance, and he scored many successes as a painter of imaginative subjects. In these he proved himself to be possessed of exceptional qualities as a colourist and manipulator, qualities that promised to earn for him a secure place among the best executants of the British School. But in his middle period he chose a fresh direction. Fascinated by the welcome which the public gave to his first attempts to illustrate the life of his own times, he undertook a considerable series of large canvases, in which he commented on the manners and morals of society as he found it. He became a pictorial preacher, a painter who moralised about the everyday incidents of modern existence; and he sacrificed some of his technical variety. There remained, however, a remarkable sense of characterization, and an acute appreciation of dramatic effect. Frith died on the 2nd of November 1909.

Frith published his *Autobiography and Reminiscences* in 1887, and *Further Reminiscences* in 1889.

FRITILLARY (*Fritillaria*: from Lat. *fritillus*, a chess-board, so called from the chequered markings on the petals), a genus of hardy bulbous plants of the natural order Liliaceae, containing about 50 species widely distributed in the northern hemisphere. The genus is represented in Britain by the fritillary or snake's head, which occurs in moist meadows in the southern half of England, especially in Oxfordshire. A much larger plant is the crown imperial (*F. imperialis*), a native of western Asia and well known in gardens. This grows to a height of about 3 ft., the lower part of the stoutish stem being furnished with leaves, while near the top is developed a crown of large pendant flowers surmounted by a tuft of bright green leaves like those of the lower part of the stem, only smaller. The flowers are bell-shaped, yellow or red, and in some of the forms double. The plant grows freely in good garden soil, preferring a deep well-drained loam, and is all the better for a top-dressing of manure as it approaches the flowering stage. Strong clumps of five or six roots of one kind have a very fine effect. It is a very suitable subject for the back row in mixed flower borders, or for recesses in the front part of shrubbery borders. It flowers in April or early in May. There are a few named varieties, but the most generally grown are the single and double yellow, and the single and double red, the single red having also two variegated varieties, with the leaves striped respectively with white and yellow.

"Fritillary" is also the name of a kind of butterfly.

FRITZLAR, a town of Germany, in the Prussian province of Hesse-Cassel, on the left bank of the Eder, 16 m. S.W. from Cassel, on the railway Wabern-Wildungen. Pop. (1905) 3448. It is a prettily situated old-fashioned place, with an Evangelical and two Roman Catholic churches, one of the latter, that of St Peter, a striking medieval edifice. As early as 732 Boniface, the apostle of Germany, established the church of St Peter and a small Benedictine monastery at Frideslar, "the quiet home" or "abode of peace." Before long the school connected with the monastery became famous, and among its earlier scholars it numbered Sturm, abbot of Fulda, and Megingod, second bishop of Würzburg. When Boniface found himself unable to continue the supervision of the society himself, he entrusted the office to Wigbert of Glastonbury, who thus became the first abbot of Fritzlar. In 774 the little settlement was taken and burnt by the Saxons; but it evidently soon recovered from the blow. For a short time after 786 it was the seat of the bishopric of Buraburg, which had been founded by Boniface in 741. At the diet of Fritzlar in 919 Henry I. was elected German king. In the beginning of the 13th century the village received municipal rights; in 1232 it was captured and burned by the landgrave Conrad of Thuringia and his allies; in 1631 it was taken by William of Hesse; in 1760 it was successfully defended by General Luckner against the French; and in 1761 it was occupied by the French and unsuccessfully bombarded by the Allies. As a principality Fritzlar continued subject to the archbishopric

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of Mainz till 1802, when it was incorporated with Hesse. From 1807 to 1814 it belonged to the kingdom of Westphalia; and in 1866 passed with Hesse Cassel to Prussia.

FRIULI (in the local dialect, *Furlanei*), a district at the head of the Adriatic Sea, at present divided between Italy and Austria, the Italian portion being included in the province of Udine and the district of Portogruaro, and the Austrian comprising the province of Görz and Gradiska, and the so-called Idrian district. In the north and east Friuli includes portions of the Julian and Carnic Alps, while the south is an alluvial plain richly watered by the Isonzo, the Tagliamento, and many lesser streams which, although of small volume during the dry season, come down in enormous floods after rain or thaw. The inhabitants, known as Furlanians, are mainly Italians, but they speak a dialect of their own which contains Celtic elements. The area of the country is about 3300 sq. m.; it contains about 700,000 inhabitants.

Friuli derives its name from the Roman town of *Forum Julii*, or *Forojulium*, the modern Cividale, which is said by Paulus Diaconus to have been founded by Julius Caesar. In the 2nd century B.C. the district was subjugated by the Romans, and became part of Gallia Transpadana. During the Roman period, besides Forum Julii, its principal towns were Concordia, Aquileia and Vedinium. On the conquest of the country by the Lombards during the 6th century it was made one of their thirty-six duchies, the capital being Forum Julii or, as they called it, Civitas Austriae. It is needless to repeat the list of dukes of the Lombard line, from Gisulf (d. 611) to Hrothgaud, who fell a victim to his opposition to Charlemagne about 776; their names and exploits may be read in the *Historia Langobardorum* of Paulus Diaconus, and they were mainly occupied in struggles with the Avars and other barbarian peoples, and in resisting the pretensions of the Lombard kings. The discovery, however, of Gisulf's grave at Cividale, in 1874, is an interesting proof of the historian's authenticity. Charlemagne filled Hrothgaud's place with one of his own followers, and the frontier position of Friuli gave the new line of counts, dukes or margraves (for they are variously designated) the opportunity of acquiring importance by exploits against the Bulgarians, Slovenians and other hostile peoples to the east. After the death of Charlemagne Friuli shared in general in the fortunes of northern Italy. In the 11th century the ducal rights over the greater part of Friuli were bestowed by the emperor Henry IV. on the patriarch of Aquileia; but towards the close of the 14th century the nobles called in the assistance of Venice, which, after defeating the archbishop, afforded a new illustration of Aesop's well-known fable, by securing possession of the country for itself. The eastern part of Friuli was held by the counts of Görz till 1500, when on the failure of their line it was appropriated by the German king, Maximilian I., and remained in the possession of the house of Austria until the Napoleonic wars. By the peace of Campo Formio in 1797 the Venetian district also came to Austria, and on the formation of the Napoleonic kingdom of Italy in 1805 the department of Passariano was made to include the whole of Venetian and part of Austrian Friuli, and in 1809 the rest was added to the Illyrian provinces. The title of duke of Friuli was borne by Marshal Duroc. In 1815 the whole country was recovered by the emperor of Austria, who himself assumed the ducal title and coat of arms; and it was not till 1866 that the Venetian portion was again ceded to Italy by the peace of Prague. The capital of the country is Udine, and its arms are a crowned eagle on a field azure.

See Manzano, *Annali del Friuli* (Udine, 1858–1879); and *Compendio di storia friulana* (Udine, 1876); Antonini, *Il Friuli orientale* (Milan, 1865); von Zahn, *Friaulische Studien* (Vienna, 1878); Pirona, *Vocabolario friulino* (Venice, 1869); and L. Fracasetti, *La Statistica etnografica del Friuli* (Udine, 1903). (T. As.)

FROBEN [FROBENIUS], **JOANNES** (*c.* 1460–1527), German printer and scholar, was born at Hammelburg in Bavaria about the year 1460. After completing his university career at Basel, where he made the acquaintance of the famous printer Johannes Auerbach (1443–1513), he established a printing house in that city about 1491, and this soon attained a European reputation for accuracy and for taste. In 1500 he married the daughter of the bookseller Wolfgang Lachner, who entered into partnership with him. He was on terms of friendship with Erasmus (*q.v.*), who not only had his own works printed by him, but superintended Frobenius's editions of St Jerome, St Cyprian, Tertullian, Hilary of Poitiers and St Ambrose. His *Neues Testament* in Greek (1516) was used by Luther for his translation. Frobenius employed Hans Holbein to illuminate his texts. It was part of his plan to print editions of the Greek Fathers. He did not, however, live to carry out this project, but it was very creditably executed by his son Jerome and his son-in-law Nikolaus Episcopius. Frobenius died in October 1527. His work in Basel made that city in the 16th century the leading centre of the German book trade. An extant letter of Erasmus, written in the year of Frobenius's death, gives an epitome of his life and an estimate of his character; and in it Erasmus mentions that his grief for the death of his friend was far more polgnant than that which he had felt for the loss of his own brother, adding that "all the apostles of science ought to wear mourning." The epistle concludes with an epitaph in Greek and Latin.

FROBISHER, SIR MARTIN (*c.* 1535–1594), English navigator and explorer, fourth child of Bernard Frobisher of Altofts in the parish of Normanton, Yorkshire, was born some time between 1530 and 1540. The family came originally from North Wales. At an early age he was sent to a school in London and placed under the care of a kinsman, Sir John York, who in 1544 placed him on board a ship belonging to a small fleet of merchantmen sailing to Guinea. By 1565 he is referred to as Captain Martin Frobisher, and in 1571–1572 as being in the public service at sea off the coast of Ireland. He married in 1559. As early as 1560 or 1561 Frobisher had formed a resolution to undertake a voyage in search of a North-West Passage to Cathay and India. The discovery of such a route was the motive of most of the Arctic voyages undertaken at that period and for long after, but Frobisher's special merit was in being the first to give to this enterprise a national character. For fifteen years he solicited in vain the necessary means to carry his project into execution, but in 1576, mainly by help of the earl of Warwick, he was put in command of an expedition consisting of two tiny barks, the "Gabriel" and "Michael," of about 20 to 25 tons each, and a pinnace of 10 tons, with an aggregate crew of 35.

He weighed anchor at Blackwall, and, after having received a good word from Queen Elizabeth at Greenwich, set sail on the 7th of June, by way of the Shetland Islands. Stormy weather was encountered in which the pinnace was lost, and some time afterwards the "Michael" deserted; but stoutly continuing the voyage alone, on the 28th of July the "Gabriel" sighted the coast of Labrador in lat. 62° 2′ N. Some days later the mouth of Frobisher Bay was reached, and a farther advance northwards being prevented by ice and contrary winds, Frobisher determined to sail westward up this passage (which he conceived to be a strait) to see "whether he mighte carrie himself through the same into some open sea on the backe syde." Butcher's Island was reached on the 18th of August, and some natives being met with here, intercourse was carried on with them for some days, the result being that five of Frobisher's men were decoyed and captured, and never more seen. After vainly trying to get back his men, Frobisher turned homewards, and reached London on the 9th of October.

Among the things which had been hastily brought away by the men was some "black earth," and just as it seemed as if nothing more was to come of this expedition, it was noised abroad that the apparently valueless "black earth" was really a lump of gold ore. It is difficult to say how this rumour arose, and whether there was any truth in it, or whether Frobisher was a party to a deception, in order to obtain means to carry out the great idea of his life. The story, at any rate, was so far successful; the greatest enthusiasm was manifested by the court and the commercial and speculating world of the time; and next year a much more important expedition than the former was fitted out, the queen

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lending the "Aid" from the royal navy and subscribing £1000 towards the expenses of the expedition. A Company of Cathay was established, with a charter from the crown, giving the company the sole right of sailing in every direction but the east; Frobisher was appointed high admiral of all lands and waters that might be discovered by him. On the 26th of May 1577 the expedition, consisting, besides the "Aid," of the ships "Gabriel" and "Michael," with boats, pinnaces and an aggregate complement of 120 men, including miners, refiners, &c., left Blackwall, and sailing by the north of Scotland reached Hall's Island at the mouth of Frobisher Bay on the 17th of July. A few days later the country and the south side of the bay was solemnly taken possession of in the queen's name. Several weeks were now spent in collecting ore, but very little was done in the way of discovery, Frobisher being specially directed by his commission to "defer the further discovery of the passage until another time." There was much parleying and some skirmishing with the natives, and earnest but futile attempts made to recover the men captured the previous year. The return was begun on the 23rd of August, and the "Aid" reached Milford Haven on the 23rd of September; the "Gabriel" and "Michael," having separated, arrived later at Bristol and Yarmouth.

Frobisher was received and thanked by the queen at Windsor. Great preparations were made and considerable expense incurred for the assaying of the great quantity of "ore" (about 200 tons) brought home. This took up much time, and led to considerable dispute among the various parties interested. Meantime the faith of the queen and others remained strong in the productiveness of the newly discovered territory, which she herself named *Meta Incognita*, and it was resolved to send out a larger expedition than ever, with all necessaries for the establishment of a colony of 100 men. Frobisher was again received by the queen at Greenwich, and her Majesty threw a fine chain of gold around his neck. On the 31st of May 1578 the expedition, consisting in all of fifteen vessels, left Harwich, and sailing by the English Channel on the 20th of June reached the south of Greenland, where Frobisher and some of his men managed to land. On the 2nd of July the foreland of Frobisher Bay was sighted, but stormy weather and dangerous ice prevented the rendezvous from being gained, and, besides causing the wreck of the barque "Dennis" of 100 tons, drove the fleet unwittingly up a new (Hudson) strait. After proceeding about 60 m. up this "mistaken strait," Frobisher with apparent reluctance turned back, and after many buffetings and separations the fleet at last came to anchor in Frobisher Bay. Some attempt was made at founding a settlement, and a large quantity of ore was shipped; but, as might be expected, there was much dissension and not a little discontent among so heterogeneous a company, and on the last day of August the fleet set out on its return to England, which was reached in the beginning of October. Thus ended what was little better than a fiasco, though Frobisher himself cannot be held to blame for the result; the scheme was altogether chimerical, and the "ore" seems to have been not worth smelting.

In 1580 Frobisher was employed as captain of one of the queen's ships in preventing the designs of Spain to assist the Irish insurgents, and in the same year obtained a grant of the reversionary title of clerk of the royal navy. In 1585 he commanded the "Primrose," as vice-admiral to Sir F. Drake in his expedition to the West Indies, and when soon afterwards the country was threatened with invasion by the Spanish Armada, Frobisher's name was one of four mentioned by the lord high admiral in a letter to the queen of "men of the greatest experience that this realm hath," and for his signal services in the "Triumph," in the dispersion of the Armada, he was knighted. He continued to cruise about in the Channel until 1590, when he was sent in command of a small fleet to the coast of Spain. In 1591 he visited his native Altofts, and there married his second wife, a daughter of Lord Wentworth, becoming at the same time a landed proprietor in Yorkshire and Notts. He found, however, little leisure for a country life, and the following year took charge of the fleet fitted out by Sir Walter Raleigh to the Spanish coast, returning with a rich prize. In November 1594 he was engaged with a squadron in the siege and relief of Brest, when he received a wound at Fort Crozon from which he died at Plymouth on the 22nd of November. His body was taken to London and buried at St Giles', Cripplegate. Though he appears to have been somewhat rough in his bearing, and too strict a disciplinarian to be much loved, Frobisher was undoubtedly one of the most able seamen of his time and justly takes rank among England's great naval heroes.

See Hakluyt's *Voyages*; the Hakluyt Society's *Three Voyages of Frobisher*; Rev. F. Jones's *Life of Frobisher* (1878); Julian Corbett, *Drake and the Tudor Navy* (1898).

FROCK, originally a long, loose gown with broad sleeves, more especially that worn by members of the religious orders. The word is derived from the O. Fr. *froc*, of somewhat obscure origin; in medieval Lat. *froccus* appears also as *floccus*, which, if it is the original, as Du Cange suggests (*litterula mutata*), would connect the word with "flock" (*q.v.*), properly a tuft of wool. Another suggestion refers the word to the German *Rock*, a coat (cf. "rochet"), which in some rare instances is found as *hrock*. The formal stripping off of the frock became part of the ceremony of degradation or deprivation in the case of a condemned monk; hence the expression "to unfrock" (med. Lat. *defrocare*, Fr. *défroquer*) used of the degradation of monks and of priests from holy orders. In the middle ages "frock" was also used of a long loose coat worn by men and of a coat of mail, the "frock of mail." In something of this sense the word survived into the 19th century for a coat with long skirts, now called the "frock coat." The word in now chiefly used in English for a child's or young girl's dress, of body and skirt, but is frequently used of a woman's dress. Du Cange (*Glossarium*, s.v. *floccus*) quotes an early use of the word for a woman's garment (*Miracula S. Udalrici*, ap. Mabillon, *Acta Sanctorum Benedict.* saec. v. p. 466). Here a woman, possessed of a devil, is cured, and sends her garments to the tomb of the saint, and a dalmatic is ordered to be made out of the floccus or *froccus*. "Frock" also appears in the "smock frock," once the typical outer garment of the English peasant. It consists of a loose shirt of linen or other material, worn over the other clothes and hanging to about the knee; its characteristic feature is the "smocking," a puckered honeycomb stitching round the neck and shoulders.

FROEBEL, FRIEDRICH WILHELM AUGUST (1782–1852), German philosopher, philanthropist and educational reformer, was born at Oberweissbach, a village of the Thuringian forest, on the 21st of April 1782. Like Comenius, with whom he had much in common, he was neglected in his youth, and the remembrance of his own early sufferings made him in after life the more eager in promoting the happiness of children. His mother he lost in his infancy, and his father, the pastor of Oberweissbach and the surrounding district, attended to his parish but not to his family. Friedrich soon had a stepmother, and neglect was succeeded by stepmotherly attention; but a maternal uncle took pity on him, and gave him a home for some years at Stadt-Ilm. Here he went to the village school, but like many thoughtful boys he passed for a dunce. Throughout life he was always seeking for hidden connexions and an underlying unity in all things. Nothing of the kind was to be perceived in the piecemeal studies of the school, and Froebel's mind, busy as it was for itself, would not work for the masters. His half-brother was therefore thought more worthy of a university education, and Friedrich was apprenticed for two years to a forester (1797–1799).

Left to himself in the Thuringian forest, Froebel began to study nature, and without scientific instruction he obtained a profound insight into the uniformity and essential unity of nature's laws. Years afterwards the celebrated Jahn (the "Father Jahn" of the German gymnasts) told a Berlin student of a queer fellow he had met, who made out all sorts of wonderful things from stones and cobwebs. This queer fellow was Froebel; and the habit of making out general truths from the observation of nature, especially from plants and trees, dated from the solitary rambles in the forest. No training could have been better suited to strengthen his inborn tendency to mysticism; and when he

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left the forest at the early age of seventeen, he seems to have been possessed by the main ideas which influenced him all his life. The conception which in him dominated all others was the unity of nature; and he longed to study natural sciences that he might find in them various applications of nature's universal laws. With great difficulty he got leave to join his elder brother at the university of Jena, and there for a year he went from lecture-room to lecture-room hoping to grasp that connexion of the sciences which had for him far more attraction than any particular science in itself. But Froebel's allowance of money was very small, and his skill in the management of money was never great, so his university career ended in an imprisonment of nine weeks for a debt of thirty shillings. He then returned home with very poor prospects, but much more intent on what he calls the course of "self-completion" (*Vervollkommung meines selbst*) than on "getting on" in a worldly point of view. He was sent to learn farming, but was recalled in consequence of the failing health of his father. In 1802 the father died, and Froebel, now twenty years old, had to shift for himself. It was some time before he found his true vocation, and for the next three and a half years we find him at work now in one part of Germany now in another—sometimes land-surveying, sometimes acting as accountant, sometimes as private secretary; but in all this his "outer life was far removed from his inner life," and in spite of his outward circumstances he became more and more conscious that a great task lay before him for the good of humanity. The nature of the task, however, was not clear to him, and it seemed determined by accident. While studying architecture in Frankfort-on-Main, he became acquainted with the director of a model school, who had caught some of the enthusiasm of Pestalozzi. This friend saw that Froebel's true field was education, and he persuaded him to give up architecture and take a post in the model school. In this school Froebel worked for two years with remarkable success, but he then retired and undertook the education of three lads of one family. In this he could not satisfy himself, and he obtained the parents' consent to his taking the boys to Yverdon, near Neuchâtel, and there forming with them a part of the celebrated institution of Pestalozzi. Thus from 1807 till 1809 Froebel was drinking in Pestalozzianism at the fountainhead, and qualifying himself to carry on the work which Pestalozzi had begun. For the science of education had to deduce from Pestalozzi's experience principles which Pestalozzi himself could not deduce. And "Froebel, the pupil of Pestalozzi, and a genius like his master, completed the reformer's system; taking the results at which Pestalozzi had arrived through the necessities of his position, Froebel developed the ideas involved in them, not by further experience but by deduction from the nature of man, and thus he attained to the conception of true human development and to the requirements of true education" (Schmidt's *Geschichte der Pädagogik*).

Holding that man and nature, inasmuch as they proceed from the same source, must be governed by the same laws, Froebel longed for more knowledge of natural science. Even Pestalozzi seemed to him not to "honour science in her divinity." He therefore determined to continue the university course which had been so rudely interrupted eleven years before, and in 1811 he began studying at Göttingen, whence he proceeded to Berlin. But again his studies were interrupted, this time by the king of Prussia's celebrated call "to my people." Though not a Prussian, Froebel was heart and soul a German. He therefore responded to the call, enlisted in Lützow's corps, and went through the campaign of 1813. But his military ardour did not take his mind off education. "Everywhere," he writes, "as far as the fatigues I underwent allowed, I carried in my thoughts my future calling as educator; yes, even in the few engagements in which I had to take part. Even in these I could gather experience for the task I proposed to myself." Froebel's soldiering showed him the value of discipline and united action, how the individual belongs not to himself but to the whole body, and how the whole body supports the individual.

Froebel was rewarded for his patriotism by the friendship of two men whose names will always be associated with his, Langethal and Middendorff. These young men, ten years younger than Froebel, became attached to him in the field, and were ever afterwards his devoted followers, sacrificing all their prospects in life for the sake of carrying out his ideas.

At the peace of Fontainebleau (signed in May 1814) Froebel returned to Berlin, and became curator of the museum of mineralogy under Professor Weiss. In accepting this appointment from the government he seemed to turn aside from his work as educator; but if not teaching he was learning. More and more the thought possessed him that the one thing needful for man was unity of development, perfect evolution in accordance with the laws of his being, such evolution as science discovers in the other organisms of nature. He at first intended to become a teacher of natural science, but before long wider views dawned upon him. Langethal and Middendorff were in Berlin, engaged in tuition. Froebel gave them regular instruction in his theory, and at length, counting on their support, he resolved to set about realizing his own idea of "the new education." This was in 1816. Three years before one of his brothers, a clergyman, had died of fever caught from the French prisoners. His widow was still living in the parsonage at Griesheim, a village on the Ilm. Froebel gave up his post, and set out for Griesheim on foot, spending his very last groschen on the way for bread. Here he undertook the education of his orphan niece and nephews, and also of two more nephews sent him by another brother. With these he opened a school and wrote to Middendorff and Langethal to come and help in the experiment. Middendorff came at once, Langethal a year or two later, when the school had been moved to Keilhau, another of the Thuringian villages, which became the Mecca of the new faith. In Keilhau Froebel, Langethal, Middendorff and Barop, a relation of Middendorff's, all married and formed an educational community. Such zeal could not be fruitless, and the school gradually increased, though for many years its teachers, with Froebel at their head, were in the greatest straits for money and at times even for food. After fourteen years' experience he determined to start other institutions to work in connexion with the parent institution at Keilhau, and being offered by a private friend the use of a castle on the Wartensee, in the canton of Lucerne, he left Keilhau under the direction of Barop, and with Langethal he opened the Swiss institution. The ground, however, was very ill chosen. The Catholic clergy resisted what they considered as a Protestant invasion, and the experiment on the Wartensee and at Willisau in the same canton, to which the institution was moved in 1833, never had a fair chance. It was in vain that Middendorff at Froebel's call left his wife and family at Keilhau, and laboured for four years in Switzerland without once seeing them. The Swiss institution never flourished. But the Swiss government wished to turn to account the presence of the great educator; so young teachers were sent to Froebel for instruction, and finally Froebel moved to Burgdorf (a Bernese town of some importance, and famous from Pestalozzi's labours there thirty years earlier) to undertake the establishment of a public orphanage and also to superintend a course of teaching for schoolmasters. The elementary teachers of the canton were to spend three months every alternate year at Burgdorf, and there compare experiences, and learn of distinguished men such as Froebel and Bitzius. In his conferences with these teachers Froebel found that the schools suffered from the state of the raw material brought into them. Till the school age was reached the children were entirely neglected. Froebel's conception of harmonious development naturally led him to attach much importance to the earliest years, and his great work on *The Education of Man*, published as early as 1826, deals chiefly with the child up to the age of seven. At Burgdorf his thoughts were much occupied with the proper treatment of young children, and in scheming for them a graduated course of exercises, modelled on the games in which he observed them to be most interested. In his eagerness to carry out his new plans he grew impatient of official restraints; so he returned to Keilhau, and soon afterwards opened the first *Kindergarten* or "Garden of Children," in the neighbouring village of Blankenburg (1837). Firmly convinced of the importance of

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the Kindergarten for the whole human race, Froebel described his system in a weekly paper (his *Sonntagsblatt*) which appeared from the middle of 1837 till 1840. He also lectured in great towns; and he gave a regular course of instruction to young teachers at Blankenburg. But although the principles of the Kindergarten were gradually making their way, the first Kindergarten was failing for want of funds. It had to be given up, and Froebel, now a widower (he had lost his wife in 1839), carried on his course for teachers first at Keilhau, and from 1848, for the last four years of his life, at or near Liebenstein, in the Thuringian forest, and in the duchy of Meiningen. It is in these last years that the man Froebel will be best known to posterity, for in 1840 he attracted within the circle of his influence a woman of great intellectual power, the baroness von Marenholtz-Bülow, who has given us in her *Recollections of Friedrich Froebel* the only lifelike portrait we possess.

These seemed likely to be Froebel's most peaceful days. He married again in 1851, and having now devoted himself to the training of women as educators, he spent his time in instructing his class of young female teachers. But trouble came upon him from a quarter whence he least expected it. In the great year of revolutions (1848) Froebel had hoped to turn to account the general eagerness for improvement, and Middendorff had presented an address on Kindergartens to the German parliament. Besides this, a nephew of Froebel's, Professor Karl Froebel of Zürich, published books which were supposed to teach socialism. True, the uncle and nephew differed so widely that the "new Froebelians" were the enemies of "the old," but the distinction was overlooked, and Friedrich and Karl Froebel were regarded as the united advocates of some new thing. In the reaction which soon set in, Froebel found himself suspected of socialism and irreligion, and in 1851 the "cultus-minister" Von Raumer issued an edict forbidding the establishment of schools "after Friedrich and Karl Froebel's principles" in Prussia. This was a heavy blow to the old man, who looked to the government of the "*Cultus-staat*" Prussia for support, and was met with denunciation. Whether from the worry of this new controversy, or from whatever cause, Froebel did not long survive the decree. His seventieth birthday was celebrated with great rejoicings in May 1852, but he died on the 21st of June, and was buried at Schweina, a village near his last abode, Marienthal, near Bad-Liebenstein.

"All education not founded on religion is unproductive." This conviction followed naturally from Froebel's conception of the unity of all things, a unity due to the original Unity from whom all proceed and in whom all "live, move and have their being." As man and nature have one origin they must be subject to the same laws. Hence Froebel, like Comenius two centuries before him, looked to the course of nature for the principles of human education. This he declares to be his fundamental belief: "In the creation, in nature and the order of the material world, and in the progress of mankind, God has given us the true type (*Urbild*) of education." As the cultivator creates nothing in the trees and plants, so the educator creates nothing in the children,—he merely superintends the development of inborn faculties. So far Froebel agrees with Pestalozzi; but in one respect he went beyond him. Pestalozzi said that the faculties were developed by exercise. Froebel added that the function of education was to develop the faculties by arousing *voluntary activity*. Action proceeding from inner impulse (*Selbsttätigkeit*) was the one thing needful.

The prominence which Froebel gave to action, his doctrine that man is primarily a doer and even a creator, and that he learns only through "self-activity," has its importance all through education. But it was to the first stage of life that Froebel paid the greatest attention. He held with Rousseau that each age has a completeness of its own, and that the perfection of the later stage can be attained only through the perfection of the earlier. If the infant is what he should be as an infant, and the child as a child, he will become what he should be as a boy, just as naturally as new shoots spring from the healthy plant. Every stage, then, must be cared for and tended in such a way that it may attain its own perfection. Impressed with the immense importance of the first stage, Froebel like Pestalozzi devoted himself to the instruction of mothers. But he would not, like Pestalozzi, leave the children entirely in the mother's hands. Pestalozzi held that the child belonged to the family; Fichte, on the other hand, claimed it for society and the state. Froebel, whose mind delighted in harmonizing apparent contradictions, and who taught that "all progress lay through opposites to their reconciliation," maintained that the child belonged both to the family and to society, and he would therefore have children spend some hours of the day in a common life and in well-organized common employments. These assemblies of children he would not call schools, for the children in them ought not to be old enough for schooling. So he invented the name *Kindergarten*, garden of children, and called the superintendents "children's gardeners." He laid great stress on every child cultivating its own plot of ground, but this was not his reason for the choice of the name. It was rather that he thought of these institutions as enclosures in which young human plants are nurtured. In the Kindergarten the children's employment should be *play*. But any occupation in which children delight is play to them; and Froebel invented a series of employments, which, while they are in this sense play to the children, have nevertheless, as seen from the adult point of view, a distinct educational object. This object, as Froebel himself describes it, is "to give the children employment in agreement with their whole nature, to strengthen their bodies, to exercise their senses, to engage their awakening mind, and through their senses to bring them acquainted with nature and their fellow creatures; it is especially to guide aright the heart and the affections, and to lead them to the original ground of all life, to unity with themselves."

Froebel's own works are: *Menschenerziehung* ("Education of Man"), (1826), which has been translated into French and English; *Pädagogik d. Kindergartens*; *Kleinere Schriften* and *Mutter- und Koselieder*; collected editions have been edited by Wichard Lange (1862) and Friedrich Seidel (1883).

A. B. Hauschmann's *Friedrich Fröbel* is a lengthy and unsatisfactory biography. An unpretentious but useful little book is *F. Froebel, a Biographical Sketch*, by Matilda H. Kriege, New York (Steiger). A very good account of Froebel's life and thoughts is given in Karl Schmidt's *Geschichte d. Pädagogik*, vol. iv.; also in Adalbert Weber's *Geschichte d. Volksschulpäd. u. d. Kleinkinderersiehung* (Weber carefully gives authorities). For a less favourable account see K. Strack's *Geschichte d. deutsch. Volksschulwesens*. Frau von Marenholtz-Bülow published her *Erinnerungen an F. Fröbel* (translated by Mrs. Horace Mann, 1877). This lady, the chief interpreter of Froebel, has expounded his principles in *Das Kind u. sein Wesen* and *Die Arbeit u. die neue Erziehung*. H. Courthope Bowen has written a memoir (1897) in the "Great Educators" series. In England Miss Emily A. E. Shirreff has published *Principles of Froebel's System*, and a short sketch of Froebel's life. See also Dr Henry Barnard's *Papers on Froebel's Kindergarten* (1881); R. H. Quick, *Educational Reformers* (1890). (R. H. Q.)

FROG,[1] a name in zoology, of somewhat wide application, strictly for an animal belonging to the family *Ranidae*, but also used of some other families of the order *Ecaudata* of the sub-class Batrachia (*q.v.*).

Frogs proper are typified by the common British species, *Rana temporaria*, and its allies, such as the edible frog, *R. esculenta*, and the American bull-frog *R. catesbiana*. The genus *Rana* may be defined as firmisternal Ecaudata with cylindrical transverse processes to the sacral vertebra, teeth in the upper jaw and on the vomer, a protrusible tongue which is free and forked behind, a horizontal pupil and more or less webbed toes. It includes about 200 species, distributed over the whole world

[1] The word "frog" is in O.E. *frocga* or *froz*, cf. Dutch *vorsch*, Ger. *Frosch*; Skeat suggests a possible original source in the root meaning "to jump," "to spring," Ger. *froh*, glad, joyful and "frolic." The term is also applied to the following objects: the horny part in the center of a horse's hoof; an attachment to a belt for suspending a sword, bayonet, &c.; a fastening for the front of a coat, still used in military uniforms, consisting of two buttons on opposite sides joined by ornamental looped braids; and, in railway construction, the point where two rails cross. These may be various transferred applications of the name of the animal, but the "frog" of a horse was also called "frush," probably a corruption of the French name *fourchette*, lit. little fork. The ornamental braiding is also more probably due to "frock," Lat. *floccus*.

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with the exception of the greater part of South America and Australia. Some of the species are thoroughly aquatic and have fully webbed toes, others are terrestrial, except during the breeding season, others are adapted for burrowing, by means of the much-enlarged and sharp-edged tubercle at the base of the inner toe, whilst not a few have the tips of the digits dilated into disks by which they are able to climb on trees. In most of the older classifications great importance was attached to these physiological characters, and a number of genera were established which, owing to the numerous annectent forms which have since been discovered, must be abandoned. The arboreal species were thus associated with the true tree-frogs, regardless of their internal structure. We now know that such adaptations are of comparatively small importance, and cannot be utilized for establishing groups higher than genera in a natural or phylogenetic classification. The tree-frogs, *Hylidae*, with which the arboreal *Ranidae* were formerly grouped, show in their anatomical structure a close resemblance to the toads, *Bufonidae*, and are therefore placed far away from the true frogs, however great the superficial resemblance between them.

Some frogs grow to a large size. The bull-frog of the eastern United States and Canada, reaching a length of nearly 8 in. from snout to vent, long regarded as the giant of the genus, has been surpassed by the discovery of *Rana guppyi* (8½ in.) in the Solomon Islands, and of *Rana goliath* (10 in.) in South Cameroon.

The family *Ranidae* embraces a large number of genera, some of which are very remarkable. Among these may be mentioned the hairy frog of West Africa, *Trichobatrachus robustus*, some specimens of which have the sides of the body and of the hind limbs covered with long villosities, the function of which is unknown, and its ally *Gampsosteonyx batesi*, in which the last phalanx of the fingers and toes is sharp, claw-like and perforates the skin. To this family also belong the *Rhacophorus* of eastern Asia, arboreal frogs, some of which are remarkable for the extremely developed webs between the fingers and toes, which are believed to act as a parachute when the frog leaps from the branches of trees (flying-frog of A. R. Wallace), whilst others have been observed to make aerial nests between leaves overhanging water, a habit which is shared by their near allies the mantis-frogs of tropical Africa. *Dimorphognathus*, from West Africa, is the unique example of a sexual dimorphism in the dentition, the males being provided with a series of large sharp teeth in the lower jaw, which in the female, as in most other members of the family, is edentulous. The curious horned frog of the Solomon Islands, *Ceratobatrachus guentheri*, which can hardly be separated from the *Ranidae*, has teeth in the lower jaw in both sexes, whilst a few forms, such as *Dendrobates* and *Cardioglossa*, which on this account have been placed in a distinct family, have no teeth at all, as in toads. These facts militate strongly against the importance which was once attached to the dentition in the classification of the tailless batrachians.

FROG-BIT, in botany, the English name for a small floating herb known botanically as *Hydrocharis Morsus-Ranae*, a member of the order Hydrocharideae, a family of Monocotyledons. The plant has rosettes of roundish floating leaves, and multiplies like the strawberry plant by means of runners, at the end of which new leaf-rosettes develop. Staminate and pistillate flowers are borne on different plants; they have three small green sepals and three broadly ovate white membranous petals. The fruit, which is fleshy, is not found in Britain. The plant occurs in ponds and ditches in England and is rare in Ireland.

FROGMORE, a mansion within the royal demesne of Windsor, England, in the Home Park, 1 m. S.E. of Windsor Castle. It was occupied by George III.'s queen, Charlotte, and later by the duchess of Kent, mother of Queen Victoria, who died here in 1861. The mansion, a plain building facing a small lake, has in its grounds the mausoleum of the duchess of Kent and the royal mausoleum. The first is a circular building surrounded with Ionic columns and rising in a dome, a lower chamber within containing the tomb, while in the upper chamber is a statue of the duchess. There is also a bust of Princess Hohenlohe-Langenberg, half-sister of Queen Victoria; and before the entrance is a memorial erected by the queen to Lady Augusta Stanley (d. 1876), wife of Dean Stanley. The royal mausoleum, a cruciform building with a central octagonal lantern, richly adorned within with marbles and mosaics, was erected (1862–1870) by Queen Victoria over the tomb of Albert, prince consort, by whose side the queen herself was buried in 1901. There are also memorials to Princess Alice and Prince Leopold in the mausoleum. To the south of the mansion are the royal gardens and dairy.

FRÖHLICH, ABRAHAM EMANUEL (1796–1865), Swiss poet, was born on the 1st of February 1796 at Brugg in the canton of Aargau, where his father was a teacher. After studying theology at Zürich he became a pastor in 1817 and returned as teacher to his native town, where he lived for ten years. He was then appointed professor of the German language and literature in the cantonal school at Aarau, which post he lost, however, in the political quarrels of 1830. He afterwards obtained the post of teacher and rector of the cantonal college, and was also appointed assistant minister at the parish church. He died at Baden in Aargau on the 1st of December 1865. His works are—*70 Fabeln* (1823); *Schweizerlieder* (1827); *Das Evangelium St Johannis, in Liedern* (1830); *Elegien an Wieg' und Sarg* (1833); *Die Epopöen*; *Ulrich Zwingli* (1840); *Ulrich von Hutten* (1845); *Auserlesene Psalmen und geistliche Lieder für die Evangelisch-reformirte Kirche des Cantons Aargau* (1844); *Über den Kirchengesang der Protestanten* (1846); *Trostlieder* (1852); *Der Junge Deutsch-Michel* (1846); *Reimsprüche aus Staat, Schule, und Kirche* (1820). An edition of his collected works, in 5 vols., was published at Frauenfeld in 1853. Fröhlich is best known for his two heroic poems, *Ulrich Zwingli* and *Ulrich von Hutten*, and especially for his fables, which have been ranked with those of Hagedorn, Lessing and Gellert.

See the Life by R. Fäsi (Zürich, 1907).

FROHSCHAMMER, JAKOB (1821–1893), German theologian and philosopher, was born at Illkofen, near Regensburg, on the 6th of January 1821. Destined by his parents for the Roman Catholic priesthood, he studied theology at Munich, but felt an ever-growing attraction to philosophy. Nevertheless, after much hesitation, he took what he himself calls the most mistaken step of his life, and in 1847 entered the priesthood. His keenly logical intellect, and his impatience of authority where it clashed with his own convictions, quite unfitted him for that unquestioning obedience which the Church demanded. It was only after open defiance of the bishop of Regensburg that he obtained permission to continue his studies at Munich. He at first devoted himself more especially to the study of the history of dogma, and in 1850 published his *Beiträge zur Kirchengeschichte*, which was placed on the Index Expurgatorius. But he felt that his real vocation was philosophy, and after holding for a short time an extraordinary professorship of theology, he became professor of philosophy in 1855. This appointment he owed chiefly to his work, *Über den Ursprung der menschlichen Seelen* (1854), in which he maintained that the human soul was not implanted by a special creative act in each case, but was the result of a secondary creative act on the part of the parents: that soul as well as body, therefore, was subject to the laws of heredity. This was supplemented in 1855 by the controversial *Menschenseele und Physiologie*. Undeterred by the offence which these works gave to his ecclesiastical superiors, he published in 1858 the *Einleitung in die Philosophie und Grundriss der Metaphysik*, in which he assailed the doctrine of Thomas Aquinas, that philosophy was the handmaid of theology. In 1861 appeared *Über die Aufgabe der Naturphilosophie und ihr Verhältnis zur Naturwissenschaft*, which was, he declared, directed against the purely mechanical conception of the universe, and affirmed the necessity of a creative Power. In the same year he published *Über die Freiheit der Wissenschaft*, in which he maintained the independence of science, whose goal was truth, against authority, and reproached the excessive respect for the latter in the Roman Church with the insignificant part played by the German Catholics in literature and philosophy. He was denounced by the pope himself in an apostolic brief of the 11th of December 1862, and students of theology were forbidden to attend his lectures.

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Public opinion was now keenly excited; he received an ovation from the Munich students, and the king, to whom he owed his appointment, supported him warmly. A conference of Catholic *savants*, held in 1863 under the presidency of Döllinger, decided that authority must be supreme in the Church. When, however, Döllinger and his school in their turn started the Old Catholic movement, Frohschammer refused to associate himself with their cause, holding that they did not go far enough, and that their declaration of 1863 had cut the ground from under their feet. Meanwhile he had, in 1862, founded the *Athenäum* as the organ of Liberal Catholicism. For this he wrote the first adequate account in German of the Darwinian theory of natural selection, which drew a warm letter of appreciation from Darwin himself. Excommunicated in 1871, he replied with three articles, which were reproduced in thousands as pamphlets in the chief European languages: *Der Fels Petri in Rom* (1873), *Der Primat Petri und des Papstes* (1875), and *Das Christenthum Christi und das Christenthum des Papstes* (1876). In *Das neue Wissen und der neue Glaube* (1873) he showed himself as vigorous an opponent of the materialism of Strauss as of the doctrine of papal infallibility. His later years were occupied with a series of philosophical works, of which the most important were: *Die Phantasie als Grundprincip des Weltprocesses* (1877), *Über die Genesis der Menschheit und deren geistige Entwicklung in Religion, Sittlichkeit und Sprache* (1883), and *Über die Organisation und Cultur der menschlichen Gesellschaft* (1885). His system is based on the unifying principle of imagination (*Phantasie*), which he extends to the objective creative force of Nature, as well as to the subjective mental phenomena to which the term is usually confined. He died at Bad Kreuth in the Bavarian Highlands on the 14th of June 1893.

In addition to other treatises on theological subjects, Frohschammer was also the author of *Monaden und Weltphantasie* and *Über die Bedeutung der Einbildungskraft in der Philosophie Kants und Spinozas* (1879); *Über die Principien der Aristotelischen Philosophie und die Bedeutung der Phantasie in derselben* (1881); *Die Philosophie als Idealwissenschaft und System* (1884); *Die Philosophie des Thomas von Aquino kritisch gewürdigt* (1889); *Über das* Mysterium Magnum *des Daseins* (1891); *System der Philosophie im Umriss*, pt. i. (1892). His autobiography was published in A. Hinrichsen's *Deutsche Denker* (1888). See also F. Kirchner, *Über das Grundprincip des Weltprocesses* (1882), with special reference to F.; E. Reich, *Weltanschauung und Menschenleben; Betrachtungen über die Philosophie J. Frohschammers* (1894); B. Münz, *J. Frohschammer, der Philosoph der Weltphantasie* (1894) and *Briefe von und über J. Frohschammer* (1897); J. Friedrich, *Jakob Frohschammer* (1896) and *Systematische und kritische Darstellung der Psychologie J. Frohschammers* (1899); A. Attensperger, *J. Frohschammers philosophisches System im Grundriss* (1899).

FROISSART, JEAN (1338–1410?), French chronicler and raconteur, historian of his own times. The personal history of Froissart, the circumstances of his birth and education, the incidents of his life, must all be sought in his own verses and chronicles. He possessed in his own lifetime no such fame as that which attended the steps of Petrarch; when he died it did not occur to his successors that a chapter might well be added to his *Chronicle* setting forth what manner of man he was who wrote it. The village of Lestines, where he was curé, has long forgotten that a great writer ever lived there. They cannot point to any house in Valenciennes as the lodging in which he put together his notes and made history out of personal reminiscences. It is not certain when or where he died, or where he was buried. One church, it is true, doubtfully claims the honour of holding his bones. It is that of St Monegunda of Chimay.

" Gallorum sublimis honos et fama tuorum,
Hic Froissarde, jaces, *si modo forte jaces.*"

It is fortunate, therefore, that the scattered statements in his writings may be so pieced together as to afford a tolerably connected history of his life year after year. The personality of the man, independently of his adventures, may be arrived at by the same process. It will be found that Froissart, without meaning it, has portrayed himself in clear and well-defined outline. His forefathers were *jurés* (aldermen) of the little town of Beaumont, lying near the river Sambre, to the west of the forest of Ardennes. Early in the 14th century the castle and seigneurie of Beaumont fell into the hands of Jean, younger son of the count of Hainaut. With this Jean, sire de Beaumont, lived a certain canon of Liége called Jean le Bel, who fortunately was not content simply to enjoy life. Instigated by his seigneur he set himself to write contemporary history, to tell " la pure veriteit de tout li fait entièrement al manire de chroniques." With this view, he compiled two books of chronicles. And the chronicles of Jean le Bel were not the only literary monuments belonging to the castle of Beaumont. A hundred years before him Baldwin d'Avernes, the then seigneur, had caused to be written a book of chronicles or rather genealogies. It must therefore be remembered that when Froissart undertook his own chronicles he was not conceiving a new idea, but only following along familiar lines.

Some 20 m. from Beaumont stood the prosperous city of Valenciennes, possessed in the 14th century of important privileges and a flourishing trade, second only to places like Bruges or Ghent in influence, population and wealth. Beaumont, once her rival, now regarded Valenciennes as a place where the ambitious might seek for wealth or advancement, and among those who migrated thither was the father of Foissart. He appears from a single passage in his son's verses to have been a painter of armorial bearings. There was, it may be noted, already what may be called a school of painters at Valenciennes. Among them were Jean and Colin de Valenciennes and André Beau-Neveu, of whom Froissart says that he had not his equal in any country.

The date generally adopted for his birth is 1338. In after years Froissart pleased himself by recalling in verse the scenes and pursuits of his childhood. These are presented in vague generalities. There is nothing to show that he was unlike any other boys, and, unfortunately, it did not occur to him that a photograph of a schoolboy's life amid bourgeois surroundings would be to posterity quite as interesting as that faithful portraiture of courts and knights which he has drawn up in his *Chronicle*. As it is, we learn that he loved games of dexterity and skill rather than the sedentary amusements of chess and draughts, that he was beaten when he did not know his lessons, and that with his companions he played at tournaments, and that he was always conscious—a statement which must be accepted with suspicion—that he was born

" Loer Dieu et servir le monde."

In any case he was born in a place, as well as at a time, singularly adapted to fill the brain of an imaginative boy. Valenciennes was then a city extremely rich in romantic associations. Not far from its walls was the western fringe of the great forest of Ardennes, sacred to the memory of Pepin, Charlemagne, Roland and Ogier. Along the banks of the Scheldt stood, one after the other, not then in ruins, but bright with banners, the gleam of armour, and the liveries of the men at arms, castles whose seigneurs, now forgotten, were famous in their day for many a gallant feat of arms. The castle of Valenciennes itself was illustrious in the romance of *Perceforest*. There was born that most glorious and most luckless hero, Baldwin, first emperor of Constantinople. All the splendour of medieval life was to be seen in Froissart's native city: on the walls of the Salle le Comte glittered—perhaps painted by his father—the arms and scutcheons beneath the banners and helmets of Luxembourg, Hainaut and Avesnes; the streets were crowded with knights and soldiers, priests, artisans and merchants; the churches were rich with stained glass, delicate tracery and precious carving; there were libraries full of richly illuminated manuscripts on which the boy could gaze with delight; every year there was the *fête* of the *puy d'Amour de Valenciennes*, at which he would hear the verses of the competing poets; there were festivals, masques, mummeries and moralities. And, whatever there might be elsewhere, in this happy city there was only the pomp, and not the misery, of war; the fields without were tilled, and the harvests reaped, in security; the workman within plied his craft unmolested for good wage. But the eyes of the boy were turned upon the castle and not upon the town; it was the splendour of the knights which dazzled him, insomuch that he

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regarded and continued ever afterwards to regard a prince gallant in the field, glittering of apparel, lavish of largesse, as almost a god.

The moon, he says, rules the first four years of life; Mercury the next ten; Venus follows. He was fourteen when the last goddess appeared to him in person, as he tells us, after the manner of his time, and informed him that he was to love a lady, "belle, jone, et gente." Awaiting this happy event, he began to consider how best to earn his livelihood. They first placed him in some commercial position—impossible now to say of what kind—which he simply calls "la marchandise." This undoubtedly means some kind of buying and selling, not a handicraft at all. He very soon abandoned merchandise—"car vaut mieux science qu'argens"—and resolved on becoming a learned clerk. He then naturally began to make verses, like every other learned clerk. Quite as naturally, and still in the character of a learned clerk, he fulfilled the prophecy of Venus and fell in love. He found one day a demoiselle reading a book of romances. He did not know who she was, but stealing gently towards her, he asked her what book she was reading. It was the romance of *Cleomades*. He remarks the singular beauty of her blue eyes and fair hair, while she reads a page or two, and then—one would almost suspect a reminiscence of Dante—

"Adont laissames nous le lire."

He was thus provided with that essential for soldier, knight or poet, a mistress—one for whom he could write verses. She was rich and he was poor; she was nobly born and he obscure; it was long before she would accept the devotion, even of the conventional kind which Froissart offered her, and which would in no way interfere with the practical business of her life. And in this hopeless way, the passion of the young poet remaining the same, and the coldness of the lady being unaltered, the course of this passion ran on for some time. Nor was it until the day of Froissart's departure from his native town that she gave him an interview and spoke kindly to him, even promising, with tears in her eyes, that "Douleur tuasse" would assure him that she would have no joyous day until she should see him again.

He was eighteen years of age; he had learned all that he wanted to learn; he possessed the mechanical art of verse; he had read the slender stock of classical literature accessible; he longed to see the world. He must already have acquired some distinction, because, on setting out for the court of England, he was able to take with him letters of recommendation from the king of Bohemia and the count of Hainaut to Queen Philippa, niece of the latter. He was well received by the queen, always ready to welcome her own countrymen; he wrote ballades and virelays for her and her ladies. But after a year he began to pine for another sight of "la très douce, simple, et quoie," whom he loved loyally. Good Queen Philippa, perceiving his altered looks and guessing the cause, made him confess that he was in love and longed to see his mistress. She gave him his *congé* on the condition that he was to return. It is clear that the young clerk had already learned to ingratiate himself with princes.

The conclusion of his single love adventure is simply and unaffectedly told in his *Tretiie de l'espinette amoureuse*. It was a passion conducted on the well-known lines of conventional love; the pair exchanged violets and roses, the lady accepted ballads; Froissart became either openly or in secret her recognized lover, a mere title of honour, which conferred distinction on her who bestowed it, as well as upon him who received it. But the progress of the amour was rudely interrupted by the arts of "Malebouche," or Calumny. The story, whatever it was, that Malebouche whispered in the ear of the lady led to a complete rupture. The *damoiselle* not only scornfully refused to speak to her lover or acknowledge him, but even seized him by the hair and pulled out a handful. Nor would she ever be reconciled to him again. Years afterwards, when Froissart writes the story of his one love passage, he shows that he still takes delight in the remembrance of her, loves to draw her portrait, and lingers with fondness over the thought of what she once was to him.

Perhaps to get healed of his sorrow. Froissart began those wanderings in which the best part of his life was to be consumed. He first visited Avignon, perhaps to ask for a benefice, perhaps as the bearer of a message from the bishop of Cambray to pope or cardinal. It was in the year 1360, and in the pontificate of Innocent VI. From the papal city he seems to have gone to Paris, perhaps charged with a diplomatic mission. In 1361 he returned to England after an absence of five years. He certainly interpreted his leave of absence in a liberal spirit, and it may have been with a view of averting the displeasure of his kind-hearted protector that he brought with him as a present a book of rhymed chronicles written by himself. He says that notwithstanding his youth, he took upon himself the task "à rimer et à dicter"—which can only mean to "turn into verse"—an account of the wars of his own time, which he carried over to England in a book "tout compilé,"—complete to date,—and presented to his noble mistress Philippa of Hainaut, who joyfully and gently received it of him. Such a rhymed chronicle was no new thing. One Colin had already turned the battle of Crécy into verse. The queen made young Froissart one of her secretaries, and he began to serve her with "beaux dittiés et traités amoureux."

Froissart would probably have been content to go on living at ease in this congenial atmosphere of flattery, praise and caresses, pouring out his virelays and chansons according to demand with facile monotony, but for the instigation of Queen Philippa, who seems to have suggested to him the propriety of travelling in order to get information for more rhymed chronicles. It was at her charges that Froissart made his first serious journey. He seems to have travelled a great part of the way alone, or accompanied only by his servants, for he was fain to beguile the journey by composing an imaginary conversation in verse between his horse and his hound. This may be found among his published poems, but it does not repay perusal. In Scotland he met with a favourable reception, not only from King David but from William of Douglas, and from the earls of Fife, Mar, March and others. The souvenirs of this journey are found scattered about in the chronicles. He was evidently much impressed with the Scots; he speaks of the valour of the Douglas, the Campbell, the Ramsay and the Graham; he describes the hospitality and rude life of the Highlanders; he admires the great castles of Stirling and Roxburgh and the famous abbey of Melrose. His travels in Scotland lasted for six months. Returning southwards he rode along the whole course of the Roman wall, a thing alone sufficient to show that he possessed the true spirit of an archaeologist; he thought that Carlisle was Carlyon, and congratulated himself on having found King Arthur's capital; he calls Westmorland, where the common people still spoke the ancient British tongue, North Wales; he rode down the banks of the Severn, and returned to London by way of Oxford—"l'escole d'Asque-Suffort."

In London Froissart entered into the service of King John of France as secretary, and grew daily more courtly, more in favour with princes and great ladies. He probably acquired at this period that art, in which he has probably never been surpassed, of making people tell him all they knew. No newspaper correspondent, no American interviewer, has ever equalled this medieval collector of intelligence. From Queen Philippa, who confided to him the tender story of her youthful and lasting love for her great husband, down to the simplest knight—Froissart conversed with none beneath the rank of gentlemen—all united in telling this man what he wanted to know. He wanted to know everything: he liked the story of a battle from both sides and from many points of view; he wanted the details of every little cavalry skirmish, every capture of a castle, every gallant action and brave deed. And what was more remarkable, he forgot nothing. "I had," he says, "thanks to God, sense, memory, good remembrance of everything, and an intellect clear and keen to seize upon the acts which I could learn." But as yet he had not begun to write in prose.

At the age of twenty-nine, in 1366, Froissart once more left England. This time he repaired first to Brussels, whither were gathered together a great concourse of minstrels from all parts,

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from the courts of the kings of Denmark, Navarre and Aragon, from those of the dukes of Lancaster, Bavaria and Brunswick. Hither came all who could "rimer et dicter." What distinction Froissart gained is not stated; but he received a gift of money, as appears from the accounts: "uni Fritsardo, dictori, qui est cum regina Angliae, dicto die, VI. mottones."

After this congress of versifiers, he made his way to Brittany, where he heard from eye-witnesses and knights who had actually fought there details of the battles of Cocherel and Auray, the Great Day of the Thirty and the heroism of Jeanne de Montfort. Windsor Herald told him something about Auray, and a French knight, one Antoine de Beaujeu, gave him the details of Cocherel. From Brittany he went southwards to Nantes, La Rochelle and Bordeaux, where he arrived a few days before the visit of Richard, afterwards second of that name. He accompanied the Black Prince to Dax, and hoped to go on with him into Spain, but was despatched to England on a mission. He next formed part of the expedition which escorted Lionel duke of Clarence to Milan, to marry the daughter of Galeazzo Visconti. Chaucer was also one of the prince's suite. At the wedding banquet Petrarch was a guest sitting among the princes.

From Milan Froissart, accepting gratefully a *colte hardie* with 20 florins of gold, set out upon his travels in Italy. At Bologna, then in decadence, he met Peter king of Cyprus, from whose follower and minister, Eustache de Conflans, he learned many interesting particulars of the king's exploits. He accompanied Peter as far as Venice, where he left him after receiving a gift of 40 ducats. With them and his *colte hardie*, still lined we may hope with the 20 florins, Froissart betook himself to Rome. The city was then at its lowest point: the churches were roofless; there was no pope; there were no pilgrims; there was no splendour; and yet, says Froissart sadly,

> "Ce furent jadis en Rome
> Li plus preu et li plus sage homme,
> Car par sens tons les arts passèrent."

It was at Rome that he learned of the death of his friend King Peter of Cyprus, and, worse still, an irreparable loss to him, that of the good Queen Philippa, of whom he writes, in grateful remembrance—

> "Propices li soit Diex à l'âme!
> J'en suis bien tenus de pryer
> Et ses largheseces escuyer,
> Car elle me fist et créa."

Philippa dead, Froissart looked around for a new patron. Then he hastened back to his own country and presented himself, with a new book in French, to the duchess of Brabant, from whom he received the sum of 16 francs, given in the accounts as paid *uni Frissardo dictatori*. The use of the word *uni* does not imply any meanness of position, but is simply an equivalent to the modern French *sieur*. Froissart may also have found a patron in Yolande de Bar, grandmother of King René of Anjou. In any case he received a substantial gift from some one in the shape of the benefice of Lestines, a village some three or four miles from the town of Binche. Also, in addition to his cure, he got placed upon the duke of Brabant's pension list, and was entitled to a yearly grant of grain and wine, with some small sum in money.

It is clear, from Froissart's own account of himself, that he was by no means a man who would at the age of four or five and thirty be contented to sit down at ease to discharge the duties of parish priest, to say mass, to bury the dead, to marry the villagers and to baptize the young. In those days, and in that country, it does not seem that other duties were expected. Preaching was not required, godliness of life, piety, good works, and the graces of a modern ecclesiastic were not looked for. Therefore, when Froissart complains to himself that the taverns of Lestines got 500 francs of his money, we need not at once set him down as either a bad priest or exceptionally given to drink. The people of the place were greatly addicted to wine; the *tavernïers de Lestines* proverbially sold good wine; the Flemings were proverbially of a joyous disposition—

> "Ceux de Hainaut chantent à pleines gorges."

Froissart, the parish priest of courtly manners, no doubt drank with the rest, and listened if they sang his own, not the coarse country songs. Mostly he preferred the society of Gerard d'Obies, provost of Binche, and the little circle of knights within that town. Or—for it was not incumbent on him to be always in residence—he repaired to the court of Coudenberg, and became "moult frère et accointé" with the duke of Brabant. And then came Gui de Blois, one of King John's hostages in London in the old days. He had been fighting in Prussia with the Teutonic knights, and now, a little tired of war, proposed to settle down for a time in his castle of Beaumont. This prince was a member of the great house of Chatillon. He was count of Blois, of Soissons and of Chimay. He had now, about the year 1374, an excellent reputation as a good captain. In him Froissart, who hastened to resume acquaintance, found a new patron. More than that, it was this sire de Beaumont, in emulation of his grandfather, the patron of Jean le Bel, who advised Froissart seriously to take in hand the history of his own time. Froissart was then in his thirty-sixth year. For twenty years he had been rhyming, for eighteen he had been making verses for queens and ladies. Yet during all this time he had been accumulating in his retentive brain the materials for his future work.

He began by editing, so to speak, that is, by rewriting with additions, the work of Jean le Bel; Gui de Blois, among others, supplied him with additional information. His own notes, taken from information obtained in his travels, gave him more details, and when in 1374 Gui married Marie de Namur, Froissart found in the bride's father, Robert de Namur, one who had himself largely shared in the events which he had to relate. He, for instance, is the authority for the story of the siege of Calais and the six burgesses. Provided with these materials, Froissart remained at Lestines, or at Beaumont, arranging and writing his chronicles. During this period, too, he composed his *Espinette amoureuse*, and the *Joli Buisson de jonesce*, and his romance of *Méliador*. He also became chaplain to the count of Blois, and obtained a canonry of Chimay. After this appointment we hear nothing more of Lestines, which he probably resigned.

In these quiet pursuits he passed twelve years, years of which we hear nothing, probably because there was nothing to tell. In 1386 his travels began again, when he accompanied Gui to his castle at Blois, in order to celebrate the marriage of his son Louis de Dunois with Marie de Berry. He wrote a *pastourelle* in honour of the event. Then he attached himself for a few days to the duke of Berry, from whom he learned certain particulars of current events, and then, becoming aware of what promised to be the most mighty feat of arms of his time, he hastened to Sluys in order to be on the spot. At this port the French were collecting an enormous fleet, and making preparations of the greatest magnitude in order to repeat the invasion of William the Conqueror. They were tired of being invaded by the English and wished to turn the tables. The talk was all of conquering the country and dividing it among the knights, as had been done by the Normans. It is not clear whether Froissart intended to go over with the invaders; but as his sympathies are ever with the side where he happens to be, he exhausts himself in admiration of this grand gathering of ships and men. "Any one," he says, "who had a fever would have been cured of his malady merely by going to look at the fleet." But the delays of the duke of Berry, and the arrival of bad weather, spoiled everything. There was no invasion of England. In Flanders Froissart met many knights who had fought at Rosebeque, and could tell him of the troubles which in a few years desolated that country, once so prosperous. He set himself to ascertain the history with as much accuracy as the comparison of various accounts by eye-witnesses and actors would allow. He stayed at Ghent, among those ruined merchants and mechanics, for whom, as one of the same class, he felt a sympathy never extended to English or French, perhaps quite as unfortunate, and he devotes no fewer than 300 chapters to the Flemish troubles, an amount out of all proportion to the comparative importance of the events. This portion of the chronicle was written at Valenciennes. During this residence in his birthplace his verses were crowned at the "puys d'amour" of Valenciennes and Tournay.

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This part of his work finished, he considered what to do next. There was small chance of anything important happening in Picardy or Hainault, and he determined on making a journey to the south of France in order to learn something new. He was then fifty-one years of age, and being still, as he tells us, in his prime, "of an age, strength, and limbs able to bear fatigue," he set out as eager to see new places as when, 33 years before, he rode through Scotland and marvelled at the bravery of the Douglas. What he had, in addition to strength, good memory and good spirits, was a manner singularly pleasing and great personal force of character. This he does not tell us, but it comes out abundantly in his writings; and, which he does tell us, he took a singular delight in his book. "The more I work at it," he says, "the better am I pleased with it."

On this occasion he rode first to Blois; on the way he fell in with two knights who told him of the disasters of the English army in Spain; one of them also informed him of the splendid hospitalities and generosity of Gaston Phoebus, count of Foix, on hearing of which Froissart resolved to seek him out. He avoided the English provinces of Poitou and Guienne, and rode southwards through Berry, Auvergne and Languedoc. Arrived at Foix he discovered that the count was at Orthez, whither he proceeded in company with a knight named Espaing de Lyon, who, Froissart found, had not only fought, but could describe.

The account of those few days' ride with Espaing de Lyon is the most charming, the most graphic, and the most vivid chapter in the whole of Froissart. Every turn of the road brings with it the sight of a ruined castle, about which this knight of many memories has a tale or a reminiscence. The whole country teems with fighting stories. Froissart never tires of listening nor the good knight of telling. "Sainte Marie!" cries Froissart in mere rapture. "How pleasant are your tales, and how much do they profit me while you relate them! And you shall not lose your trouble, for they shall all be set down in memory and remembrance in the history which I am writing." Arrived at length at Orthez, Froissart lost no time in presenting his credentials to the count of Foix. Gaston Phoebus was at this time fifty-nine years of age. His wife, from whom he was separated, was that princess, sister of Charles of Navarre, with whom Guillaume de Machault carried on his innocent and poetical amour. The story of the miserable death of his son is well known, and may be read in Froissart. But that was already a tale of the past, and the state which the count kept up was that of a monarch. To such a prince such a visitor as Froissart would be in every way welcome. Mindful no doubt of those paid clerks who were always writing verses, Froissart introduced himself as a chronicler. He could, of course, rhyme, and in proof he brought with him his romance of *Méliador*; but he did not present himself as a wandering poet. The count received him graciously, speedily discovered the good qualities of his guest, and often invited him to read his *Méliador* aloud in the evening, during which time, says Froissart, "nobody dared to say a word, because he wished me to be heard, such great delight did he take in listening." Very soon Froissart, from reader of a romance, became raconteur of the things he had seen and heard; the next step was that the count himself began to talk of affairs, so that the notebook was again in requisition. There was a good deal, too, to be learned of people about the court. One knight recently returned from the East told about the Genoese occupation of Famagosta; two more had been in the fray of Otterbourne; others had been in the Spanish wars.

Leaving Gaston at length, Froissart assisted at the wedding of the old duke of Berry with the youthful Jeanne de Bourbon, and was present at the grand reception given to Isabeau of Bavaria by the Parisians. He then returned to Valenciennes, and sat down to write his fourth book. A journey undertaken at this time is characteristic of the thorough and conscientious spirit in which he composed his work; it illustrates also his restless and curious spirit. While engaged in the events of the year 1385 he became aware that his notes taken at Orthez and elsewhere on the affairs of Castile and Portugal were wanting in completeness. He left Valenciennes and hastened to Bruges, where, he felt certain, he should find some one who would help him. There was, in fact, at this great commercial centre, a colony of Portuguese. From them he learned that a certain Portuguese knight, Dom Juan Fernand Pacheco, was at the moment in Middelburg on the point of starting for Prussia. He instantly embarked at Sluys, reached Middelburg in time to catch this knight, introduced himself, and conversed with him uninterruptedly for the space of six days, getting his information on the promise of due acknowledgment. During the next two years we learn little of his movements. He seems, however, to have had trouble with his seigneur Gui de Blois, and even to have resigned his chaplaincy. Froissart is tender with Gui's reputation, mindful of past favours and remembering how great a lord he is. Yet the truth is clear that in his declining years the once gallant Gui de Blois became a glutton and a drunkard, and allowed his affairs to fall into the greatest disorder. So much was he crippled with debt that he was obliged to sell his castle and county of Blois to the king of France. Froissart lays all the blame on evil counsellors. "He was my lord and master," he says simply, "an honourable lord and of great reputation; but he trusted too easily in those who looked for neither his welfare nor his honour." Although canon of Chimay and perhaps curé of Lestines as well, it would seem as if Froissart was not able to live without a patron. He next calls Robert de Namur his seigneur, and dedicates to him, in a general introduction, the whole of his chronicles. We then find him at Abbeville, trying to learn all about the negotiations pending between Charles VI. and the English. He was unsuccessful, either because he could not get at those who knew what was going on, or because the secret was too well kept. He next made his last visit to England, where, after forty years' absence, he naturally found no one who remembered him. Here he gave King Richard a copy of his "traité amoureux," and got favour at court. He stayed in England some months, seeking information on all points from his friends Henry Chrystead and Richard Stury, from the dukes of York and Gloucester, and from Robert the Hermit.

On his return to France, he found preparations going on for that unlucky crusade, the end of which he describes in his *Chronicle*. It was headed by the count of Nevers. After him floated many a banner of knights, descendants of the crusaders, who bore the proud titles of duke of Athens, duke of Thebes, sire de Sidon, sire de Jericho. They were going to invade the sultan's empire by way of Hungary; they were going to march south; they would reconquer the holy places. And presently we read how it all came to nothing, and how the slaughtered knights lay dead outside the city of Nikopoli. In almost the concluding words of the *Chronicle* the murder of Richard II. of England is described. His death ends the long and crowded *Chronicle*, though the pen of the writer struggles through a few more unfinished sentences.

The rest is vague tradition. He is said to have died at Chimay; it is further said that he died in poverty so great that his relations could not even afford to carve his name upon the headstone of his tomb; not one of his friends, not even Eustache Deschamps, writes a line of regret in remembrance; the greatest historian of his age had a reputation so limited that his death was no more regarded than that of any common monk or obscure priest. We would willingly place the date of his death, where his *Chronicle* stops, in the year 1400; but tradition assigns the date of 1410. What date more fitting than the close of the century for one who has made that century illustrious for ever?

Among his friends were Guillaume de Machault, Eustache Deschamps, the most vigorous poet of this age of decadence, and Cuvelier, a follower of Bertrand du Guesclin. These alliances are certain. It is probable that he knew Chaucer, with whom Deschamps maintained a poetical correspondence; there is nothing to show that he ever made the acquaintance of Christine de Pisan. Froissart was more proud of his poetry than his prose. Posterity has reversed this opinion, and though a selection of his verse has been published, it would be difficult to find an admirer, or even a reader, of his poems. The selection published by Buchon in 1829 consists of the *Dit dou florin*, half of which is a description of the power of money; the *Débat dou cheval*

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et dou levrier, written during his journey in Scotland; the *Dittie de la flour de la Margherite*; a *Dittie d'amour* called *L'Orlose amoureus*, in which he compares himself, the imaginary lover, with a clock; the *Espinette amoureuse*, which contains a sketch of his early life, freely and pleasantly drawn, accompanied by rondeaux and virelays; the *Buisson de jonesce*, in which he returns to the recollections of his own youth; and various smaller pieces. The verses are monotonous; the thoughts are not without poetical grace, but they are expressed at tedious length. It would be, however, absurd to expect in Froissart the vigour and verve possessed by none of his predecessors. The time was gone when Marie de France, Rutebœuf and Thibaut de Champagne made the 13th-century language a medium for verse of which any literature might be proud. Briefly, Froissart's poetry, unless the unpublished portion be better than that before us, is monotonous and mechanical. The chief merit it possesses is in simplicity of diction. This not infrequently produces a pleasing effect.

As for the character of his *Chronicle*, little need be said. There has never been any difference of opinion on the distinctive merits of this great work. It presents a vivid and faithful drawing of the things done in the 14th century. No more graphic account exists of any age. No historian has drawn so many and such faithful portraits. They are, it is true, portraits of men as they seemed to the writer, not of men as they were. Froissart was uncritical; he accepted princes by their appearance. Who, for instance, would recognize in his portrait of Gaston Phoebus de Foix the cruel voluptuary, stained with the blood of his own son, which we know him to have been? Froissart, again, had no sense of historical responsibility; he was no judge to inquire into motives and condemn actions; he was simply a chronicler. He has been accused by French authors of lacking patriotism. Yet it must be remembered that he was neither a Frenchman nor an Englishman, but a Fleming. He has been accused of insensibility to suffering. Indignation against oppression was not, however, common in the 14th century; why demand of Froissart a quality which is rare enough even in our own time? Yet there are moments when, as in describing the massacre of Limoges, he speaks with tears in his voice.

Let him be judged by his own aims. "Before I commence this book," he says, "I pray the Saviour of all the world, who created every thing out of nothing, that He will also create and put in me sense and understanding of so much worth, that this book, which I have begun, I may continue and persevere in, so that all those who shall read, see, and hear it may find in it delight and pleasance." To give delight and pleasure, then, was his sole design.

As regards his personal character, Froissart depicts it himself for us. Such as he was in youth, he tells us, so he remained in more advanced life; rejoicing mightily in dances and carols, in hearing minstrels and poems; inclined to love all those who love dogs and hawks; pricking up his ears at the uncorking of bottles,—"Car au voire prens grand plaisir"; pleased with good cheer, gorgeous apparel and joyous society, but no commonplace reveller or greedy voluptuary,—everything in Froissart was ruled by the good manners which he set before all else; and always eager to listen to tales of war and battle. As we have said above, he shows, not only by his success at courts, but also by the whole tone of his writings, that he possessed a singularly winning manner and strong personal character. He lived wholly in the present, and had no thought of the coming changes. Born when chivalrous ideas were most widely spread, but the spirit of chivalry itself, as inculcated by the best writers, in its decadence, he is penetrated with the sense of knightly honour, and ascribes to all his heroes alike those qualities which only the ideal knight possessed.

The first edition of Froissart's Chronicles was published in Paris. It bears no date; the next editions are those of the years 1505, 1514, 1518 and 1520. The edition of Buchon, 1824, was a continuation of one commenced by Dacier. The best modern editions are those of Kervyn de Lettenhove (Brussels, 1863–1877) and Siméon Luce (Paris, 1869–1888); for bibliography see Potthast, *Bibliotheca hist. medii aevi*, i. (Berlin, 1896). An abridgment was made in Latin by Belleforest, and published in 1672. An English translation was made by Bouchier, Lord Berners, and published in London, 1525 See the "Tudor Translations" edition of Berners (Nutt, 1901), with introduction by W. P. Ker; and the "Globe" edition, with introduction by G. C. Macaulay. The translation by Thomas Johnes was originally published in 1802–1805. For Froissart's poems see Scheler's text in K. de Lettenhove's complete edition; *Méliador* has been edited by Longnon for the Société des Anciens Textes (1895–1899). See also Madame Darmesteter (Duclaux), *Froissart* (1894). (W. BE.)

FROME, a market town in the Frome parliamentary division of Somersetshire, England, 107 m. W. by S. of London by the Great Western railway. Pop. of urban district (1901) 11,057. It is unevenly built on high ground above the river Frome, which is here crossed by a stone bridge of five arches. It was formerly called Frome or Froome Selwood, after the neighbouring forest of Selwood; and the country round is still richly wooded and picturesque. The parish church of St John the Baptist, with its fine tower and spire, was built about the close of the 14th century, and, though largely restored, has a beautiful chancel, Lady chapel and baptistery. Fragments of Norman work are left; the interior is elaborately adorned with sculptures and stained glass. The market-hall, museum, school of art, and a free grammar school, founded under Edward VI., may be noted among buildings and institutions. The chief industries are brewing and art metal-working, also printing, metal-founding, and the manufacture of cloth, silk, tools and cards for wool-dressing. Dairy farming is largely practised in the neighbourhood. Selwood forest was long a favourite haunt of brigands, and even in the 18th century gave shelter to a gang of coiners and highwaymen.

The Saxon occupation of Frome (From) is the earliest of which there is evidence, the settlement being due to the foundation of a monastery by Aldhelm in 705. A witenagemot was held there in 934, so that Frome must already have been a place of some size. At the time of the Domesday Survey the manor was owned by King William. Local tradition asserts that Frome was a medieval borough, and the reeve of Frome is occasionally mentioned in documents after the reign of Edward I., but there is no direct evidence that Frome was a borough and no trace of any charter granted to it. It was not represented in parliament until given one member by the Reform Act of 1832. Separate representation ceased in 1885. Frome was never incorporated. A charter of Henry VII. to Edmund Leveredge, then lord of the manor, granted the right to have fairs on the 22nd of July and the 21st of September. In the 18th century two other fairs on the 24th of February and the 25th of November were held. Cattle fairs are now held on the last Wednesday in February and November, and a cheese fair on the last Wednesday in September. The Wednesday market is held under the charter of Henry VII. There is also a Saturday cattle market. The manufacture of woollen cloth has been established since the 15th century, Frome being the only Somerset town in which this staple industry has flourished continuously.

FROMENTIN, EUGÈNE (1820–1876), French painter, was born at La Rochelle in December 1820. After leaving school he studied for some years under Louis Cabat, the landscape painter. Fromentin was one of the earliest pictorial interpreters of Algeria, having been able, while quite young, to visit the land and people that suggested the subjects of most of his works, and to store his memory as well as his portfolio with the picturesque and characteristic details of North African life. In 1849 he obtained a medal of the second class. In 1852 he paid a second visit to Algeria, accompanying an archaeological mission, and then completed that minute study of the scenery of the country and of the habits of its people which enabled him to give to his after-work the realistic accuracy that comes from intimate knowledge. In a certain sense his works are not more artistic results than contributions to ethnological science. His first great success was produced at the Salon of 1847, by the "Gorges de la Chiffa." Among his more important works are—"La Place de la brèche à Constantine" (1840); "Enterrement

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Maure" (1853); "Bateleurs nègres" and "Audience chez un chalife" (1859); "Berger kabyle" and "Courriers arabes" (1861); "Bivouac arabe," "Chasse au faucon," "Fauconnier arabe" (now at Luxembourg) (1863); "Chasse au héron" (1865); "Voleurs de nuit" (1867); "Centaures et arabes attaqués par une lionne" (1868); "Halte de muletiers" (1869); "Le Nil" and "Un Souvenir d'Esneh" (1875). Fromentin was much influenced in style by Eugène Delacroix. His works are distinguished by striking composition, great dexterity of handling and brilliancy of colour. In them is given with great truth and refinement the unconscious grandeur of barbarian and animal attitudes and gestures. His later works, however, show signs of an exhausted vein and of an exhausted spirit, accompanied or caused by physical enfeeblement. But it must be observed that Fromentin's paintings show only one side of a genius that was perhaps even more felicitously expressed in literature, though of course with less profusion. "Dominique," first published in the *Revue des deux mondes* in 1862, and dedicated to George Sand, is remarkable among the fiction of the century for delicate and imaginative observation and for emotional earnestness. Fromentin's other literary works are—*Visites artistiques* (1852); *Simples Pèlerinages* (1856); *Un Été dans le Sahara* (1857); *Une Année dans le Sahel* (1858); and *Les Maîtres d'autrefois* (1876). In 1876 he was an unsuccessful candidate for the Academy. He died suddenly at La Rochelle on the 27th of August 1876.

FROMMEL, GASTON (1862–1906), Swiss theologian, professor of theology in the university of Geneva from 1894 to 1906. An Alsatian by birth, he belonged mainly to French Switzerland, where he spent most of his life. He may best be described as continuing the spirit of Vinet (*q.v.*) amid the mental conditions marking the end of the 19th century. Like Vinet, he derived his philosophy of religion from a peculiarly deep experience of the Gospel of Christ as meeting the demands of the moral consciousness; but he developed even further than Vinet the psychological analysis of conscience and the method of verifying every doctrine by direct reference to spiritual experience. Both made much of moral individuality or personality as the crown and criterion of reality, believing that its correlation with Christianity, both historically and philosophically, was most intimate. But while Vinet laid most stress on the liberty from human authority essential to the moral consciousness, the changed needs of the age caused Frommel to develop rather the aspect of man's dependence as a moral being upon God's spiritual initiative, "the conditional nature of his liberty." "Liberty is not the primary, but the secondary characteristic" of conscience; "before being free, it is the subject of obligation." On this depends its objectivity as a real revelation of the Divine Will. Thus he claimed that a deeper analysis carried one beyond the human subjectivity of even Kant's categorical imperative, since consciousness of obligation was "une expérience imposée sous le mode de l'absolu." By his use of *imposée* Frommel emphasized the priority of man's sense of obligation to his consciousness either of self or of God. Here he appealed to the current psychology of the subconscious for confirmation of his analysis, by which he claimed to transcend mere intellectualism. In his language on this fundamental point he was perhaps too jealous of admitting an ideal element as implicit in the feeling of obligation. Still he did well in insisting on priority to self-conscious thought as a mark of metaphysical objectivity in the case of moral, no less than of physical experience. Further, he found in the Christian revelation the same characteristics as belonged to the universal revelation involved in conscience, viz. God's sovereign initiative and his living action in history. From this standpoint he argued against a purely psychological type of religion (*agnosticisme religieux*, as he termed it)—a tendency to which he saw even in A. Sabatier and the *symbolo-fidéisme* of the Paris School—as giving up a real and unifying faith. His influence on men, especially the student class, was greatly enhanced by the religious force and charm of his personality. Finally, like Vinet, he was a man of letters and a penetrating critic of men and systems.

LITERATURE.—G. Godet, *Gaston Frommel* (Neuchâtel, 1906), a compact sketch, with full citation of sources; cf. H. Bois, in *Sainte-Croix* for 1906, for "L'Étudiant et le professeur." A complete edition of his writings was begun in 1907. (J. V. B.)

FRONDE, THE, the name given to a civil war in France which lasted from 1648 to 1652, and to its sequel, the war with Spain in 1653–59. The word means a sling, and was applied to this contest from the circumstance that the windows of Cardinal Mazarin's adherents were pelted with stones by the Paris mob. Its original object was the redress of grievances, but the movement soon degenerated into a factional contest among the nobles, who sought to reverse the results of Richelieu's work and to overthrow his successor Mazarin. In May 1648 a tax levied on judicial officers of the parlement of Paris was met by that body, not merely with a refusal to pay, but with a condemnation of earlier financial edicts, and even with a demand for the acceptance of a scheme of constitutional reforms framed by a committee of the parlement. This charter was somewhat influenced by contemporary events in England. But there is no real likeness between the two revolutions, the French parlement being no more representative of the people than the Inns of Court were in England. The political history of the time is dealt with in the article FRANCE: *History*, the present article being concerned chiefly with the military operations of what was perhaps the most costly and least necessary civil war in history.

The military record of the first or "parliamentary" Fronde is almost blank. In August 1648, strengthened by the news of Condé's victory at Lens, Mazarin suddenly arrested the leaders of the parlement, whereupon Paris broke into insurrection and barricaded the streets. The court, having no army at its immediate disposal, had to release the prisoners and to promise reforms, and fled from Paris on the night of the 22nd of October. But the signing of the peace of Westphalia set free Condé's army, and by January 1649 it was besieging Paris. The peace of Rueil was signed in March, after little blood had been shed. The Parisians, though still and always anti-cardinalist, refused to ask for Spanish aid, as proposed by their princely and noble adherents, and having no prospect of military success without such aid, submitted and received concessions. Thenceforward the Fronde becomes a story of sordid intrigues and half-hearted warfare, losing all trace of its first constitutional phase. The leaders were discontented princes and nobles—Monsieur (Gaston of Orléans, the king's uncle), the great Condé and his brother Conti, the duc de Bouillon and his brother Turenne. To these must be added Gaston's daughter, Mademoiselle de Montpensier (La grande Mademoiselle), Condé's sister, Madame de Longueville, Madame de Chevreuse, and the astute intriguer Paul de Gondi, later Cardinal de Retz. The military operations fell into the hands of war-experienced mercenaries, led by two great, and many second-rate, generals, and of nobles to whom war was a polite pastime. The feelings of the people at large were enlisted on neither side.

This peace of Rueil lasted until the end of 1649. The princes, received at court once more, renewed their intrigues against Mazarin, who, having come to an understanding with Monsieur, Gondi and Madame de Chevreuse, suddenly arrested Condé, Conti and Longueville (January 14, 1650). The war which followed this *coup* is called the "Princes' Fronde." This time it was Turenne, before and afterwards the most loyal soldier of his day, who headed the armed rebellion. Listening to the promptings of his Egeria, Madame de Longueville, he resolved to rescue her brother, his old comrade of Freiburg and Nördlingen. It was with Spanish assistance that he hoped to do so; and a powerful army of that nation assembled in Artois under the archduke Leopold, governor-general of the Spanish Netherlands. But the peasants of the country-side rose against the invaders, the royal army in Champagne was in the capable hands of César de Choiseul, comte du Plessis-Praslin, who counted fifty-two years of age and thirty-six of war experience, and the little fortress of Guise successfully resisted the archduke's attack. Thereupon, however, Mazarin drew upon Plessis-Praslin's army

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for reinforcements to be sent to subdue the rebellion in the south, and the royal general had to retire. Then, happily for France, the archduke decided that he had spent sufficient of the king of Spain's money and men in the French quarrel. The magnificent regular army withdrew into winter quarters, and left Turenne to deliver the princes with a motley host of Frondeurs and Lorrainers. Plessis-Praslin by force and bribery secured the surrender of Rethel on the 13th of December 1650, and Turenne, who had advanced to relieve the place, fell back hurriedly. But he was a terrible opponent, and Plessis-Praslin and Mazarin himself, who accompanied the army, had many misgivings as to the result of a lost battle. The marshal chose nevertheless to force Turenne to a decision, and the battle of Blanc-Champ (near Somme-Py) or Rethel was the consequence. Both sides were at a standstill in strong positions, Plessis-Praslin doubtful of the trustworthiness of his cavalry, Turenne too weak to attack, when a dispute for precedence arose between the *Gardes françaises* and the *Picardie* regiment. The royal infantry had to be rearranged in order of regimental seniority, and Turenne, seeing and desiring to profit by the attendant disorder, came out of his stronghold and attacked with the greatest vigour. The battle (December 15, 1650) was severe and for a time doubtful, but Turenne's Frondeurs gave way in the end, and his army, as an army, ceased to exist. Turenne himself, undeceived as to the part he was playing in the drama, asked and received the young king's pardon, and meantime the court, with the *maison du roi* and other loyal troops, had subdued the minor risings without difficulty (March–April 1651). Condé, Conti and Longueville were released, and by April 1651 the rebellion had everywhere collapsed. Then followed a few months of hollow peace and the court returned to Paris. Mazarin, an object of hatred to all the princes, had already retired into exile. "Le temps est un galant homme," he remarked, "laissons le faire!" and so it proved. His absence left the field free for mutual jealousies, and for the remainder of the year anarchy reigned in France. In December 1651 Mazarin returned with a small army. The war began again, and this time Turenne and Condé were pitted against one another. After the first campaign, as we shall see, the civil war ceased, but for several other campaigns the two great soldiers were opposed to one another, Turenne as the defender of France, Condé as a Spanish invader. Their personalities alone give threads of continuity to these seven years of wearisome manœuvres, sieges and combats, though for a right understanding of the causes which were to produce the standing armies of the age of Louis XIV. and Frederick the Great the military student should search deeply into the material and moral factors that here decided the issue.

The début of the new Frondeurs took place in Guyenne (February–March 1652), while their Spanish ally, the archduke Leopold William, captured various northern fortresses. On the Loire, whither the centre of gravity was soon transferred, the Frondeurs were commanded by intriguers and quarrelsome lords, until Condé's arrival from Guyenne. His bold trenchant leadership made itself felt in the action of Bléneau (7th April 1652), in which a portion of the royal army was destroyed, but fresh troops came up to oppose him, and from the skilful dispositions made by his opponents Condé felt the presence of Turenne and broke off the action. The royal army did likewise. Condé invited the commander of Turenne's rearguard to supper, chaffed him unmercifully for allowing the prince's men to surprise him in the morning, and by way of farewell remarked to his guest, "Quel dommage que des braves gens comme nous se coupent la gorge pour un faquin"—an incident and a remark that thoroughly justify the iron-handed absolutism of Louis XIV. There was no hope for France while tournaments on a large scale and at the public's expense were fashionable amongst the *grands seigneurs*. After Bléneau both armies marched to Paris to negotiate with the parlement, de Retz and Mlle de Montpensier, while the archduke took more fortresses in Flanders, and Charles IV., duke of Lorraine, with an army of plundering mercenaries, marched through Champagne to join Condé. As to the latter, Turenne manœuvred past Condé and planted himself in front of the mercenaries, and their leader, not wishing to expend his men against the old French regiments, consented to depart with a money payment and the promise of two tiny Lorraine fortresses. A few more manœuvres, and the royal army was able to hem in the Frondeurs in the Faubourg St Antoine (2nd July 1652) with their backs to the closed gates of Paris. The royalists attacked all along the line and won a signal victory in spite of the knightly prowess of the prince and his great lords, but at the critical moment Gaston's daughter persuaded the Parisians to open the gates and to admit Condé's army. She herself turned the guns of the Bastille on the pursuers. An insurrectional government was organized in the capital and proclaimed Monsieur lieutenant-general of the realm. Mazarin, feeling that public opinion was solidly against him, left France again, and the bourgeois of Paris, quarrelling with the princes, permitted the king to enter the city on the 21st of October 1652. Mazarin returned unopposed in February 1653.

The Fronde as a civil war was now over. The whole country, wearied of anarchy and disgusted with the princes, came to look to the king's party as the party of order and settled government, and thus the Fronde prepared the way for the absolutism of Louis XIV. The general war continued in Flanders, Catalonia and Italy wherever a Spanish and a French garrison were face to face, and Condé with the wreck of his army openly and definitely entered the service of the king of Spain. The "Spanish Fronde" was almost purely a military affair and, except for a few outstanding incidents, a dull affair to boot. In 1653 France was so exhausted that neither invaders nor defenders were able to gather supplies to enable them to take the field till July. At one moment, near Péronne, Condé had Turenne at a serious disadvantage, but he could not galvanize the Spanish general Count Fuensaldana, who was more solicitous to preserve his master's soldiers than to establish Condé as mayor of the palace to the king of France, and the armies drew apart again without fighting. In 1654 the principal incident was the siege and relief of Arras. On the night of the 24th–25th August the lines of circumvallation drawn round that place by the prince were brilliantly stormed by Turenne's army, and Condé won equal credit for his safe withdrawal of the besieging corps under cover of a series of bold cavalry charges led by himself as usual, sword in hand. In 1655 Turenne captured the fortresses of Landrecies, Condé and St Ghislain. In 1656 the prince of Condé revenged himself for the defeat of Arras by storming Turenne's circumvallation around Valenciennes (16th July), but Turenne drew off his forces in good order. The campaign of 1657 was uneventful, and is only to be remembered because a body of 6000 British infantry, sent by Cromwell in pursuance of his treaty of alliance with Mazarin, took part in it. The presence of the English contingent and its very definite purpose of making Dunkirk a new Calais, to be held by England for ever, gave the next campaign a character of certainty and decision which is entirely wanting in the rest of the war. Dunkirk was besieged promptly and in great force, and when Don Juan of Austria and Condé appeared with the relieving army from Furnes, Turenne advanced boldly to meet him. The battle of the Dunes, fought on the 14th of June 1658, was the first real trial of strength since the battle of the Faubourg St Antoine. Successes on one wing were compromised by failure on the other, but in the end Condé drew off with heavy losses, the success of his own cavalry charges having entirely failed to make good the defeat of the Spanish right wing amongst the Dunes. Here the "red-coats" made their first appearance on a continental battlefield, under the leadership of Sir W. Lockhart, Cromwell's ambassador at Paris, and astonished both armies by the stubborn fierceness of their assaults, for they were the products of a war where passions ran higher and the determination to win rested on deeper foundations than in the *dégringolade* of the feudal spirit in which they now figured. Dunkirk fell, as a result of the victory, and flew the St George's cross till Charles II. sold it to the king of France. A last desultory campaign followed in 1659—the twenty-fifth year of the Franco-Spanish War—and the peace of the Pyrenees was signed on the 5th of November. On the 27th of January

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1660 the prince asked and obtained at Aix the forgiveness of Louis XIV. The later careers of Turenne and Condé as the great generals—and obedient subjects—of their sovereign are described in the article DUTCH WARS.

For the many memoirs and letters of the time see the list in G. Monod's *Bibliographie de l'histoire de France* (Paris, 1888). The *Lettres du cardinal Mazarin* have been collected in nine volumes (Paris, 1878–1906). See P. Adolphe Chéruel, *Histoire de France pendant la minorité de Louis XIV* (4 vols., 1879–1880), and his *Histoire de France sous le ministère de Mazarin* (3 vols., 1883); L. C. de Beaupoil de Sainte-Aulaire, *Histoire de la Fronde* (2nd ed., 2 vols., 1860); "Arvède Barine" (Mme Charles Vincens), *La Jeunesse de la grande mademoiselle* (Paris, 1902); Duc d'Aumale, *Histoire des princes de Condé* (Paris, 1889–1896, 7 vols.). The most interesting account of the military operations is in General Hardy de Périni's *Turenne et Condé* (*Batailles françaises*, vol. iv.).

FRONTENAC ET PALLUAU, LOUIS DE BUADE, COMTE DE (1620–1698), French-Canadian statesman, governor and lieutenant-general for the French king in *La Nouvelle France* (Canada), son of Henri de Buade, colonel in the regiment of Navarre, was born in the year 1620. The details of his early life are meagre, as no trace of the Frontenac papers has been discovered. The de Buades, however, were a family of distinction in the principality of Béarn. Antoine de Buade, seigneur de Frontenac, grandfather of the future governor of Canada, attained eminence as a councillor of state under Henri IV.; and his children were brought up with the dauphin, afterwards Louis XIII. Louis de Buade entered the army at an early age. In the year 1635 he served under the prince of Orange in Holland, and fought with credit and received many wounds during engagements in the Low Countries and in Italy. He was promoted to the rank of colonel in the regiment of Normandy in 1643, and three years later, after distinguishing himself at the siege of Orbitello, where he had an arm broken, he was made *maréchal de camp*. His service seems to have been continuous until the conclusion of the peace of Westphalia in 1648, when he returned to his father's house in Paris and married, without the consent of her parents, Anne de la Grange-Trianon, a girl of great beauty, who later became the friend and confidante of Madame de Montpensier. The marriage was not a happy one, and after the birth of a son incompatibility of temper led to a separation, the count retiring to his estate on the Indre, where by an extravagant course of living he became hopelessly involved in debt. Little is known of his career for the next fifteen years beyond the fact that he held a high position at court; but in the year 1669, when France sent a contingent to assist the Venetians in the defence of Crete against the Turks, Frontenac was placed in command of the troops on the recommendation of Turenne. In this expedition he won military glory; but his fortune was not improved thereby.

At this period the affairs of New France claimed the attention of the French court. From the year 1665 the colony had been successfully administered by three remarkable men—Daniel de Rémy de Courcelle, the governor, Jean Talon, the intendant, and the marquis de Tracy, who had been appointed lieutenant-general for the French king in America; but a difference of opinion had arisen between the governor and the intendant, and each had demanded the other's recall in the public interest. At this crisis in the administration of New France, Frontenac was appointed to succeed de Courcelle. The new governor arrived in Quebec on the 12th of September 1672. From the commencement it was evident that he was prepared to give effect to a policy of colonial expansion, and to exercise an independence of action that did not coincide with the views of the monarch or of his minister Colbert. One of the first acts of the governor, by which he sought to establish in Canada the three estates—nobles, clergy and people—met with the disapproval of the French court, and measures were adopted to curb his ambition by increasing the power of the sovereign council and by reviving the office of intendant. Frontenac, however, was a man of dominant spirit, jealous of authority, prepared to exact obedience from all and to yield to none. In the course of events he soon became involved in quarrels with the intendant touching questions of precedence, and with the ecclesiastics, one or two of whom ventured to criticize his proceedings. The church in Canada had been administered for many years by the religious orders; for the see of Quebec, so long contemplated, had not yet been erected. But three years after the arrival of Frontenac a former vicar apostolic, François Xavier de Laval de Montmorenci, returned to Quebec as bishop, with a jurisdiction over the whole of Canada. In this redoubtable churchman the governor found a vigorous opponent who was determined to render the state subordinate to the church. Frontenac, following in this respect in the footsteps of his predecessors, had issued trading licences which permitted the sale of intoxicants. The bishop, supported by the intendant, endeavoured to suppress this trade and sent an ambassador to France to obtain remedial action. The views of the bishop were upheld and henceforth authority was divided. Troubles ensued between the governor and the sovereign council, most of the members of which sided with the one permanent power in the colony—the bishop; while the suspicions and intrigues of the intendant, Duchesneau, were a constant source of vexation and strife. As the king and his minister had to listen to and adjudicate upon the appeals from the contending parties their patience was at last worn out, and both governor and intendant were recalled to France in the year 1682. During Frontenac's first administration many improvements had been made in the country. The defences had been strengthened, a fort was built at Cataraqui (now Kingston), Ontario, bearing the governor's name, and conditions of peace had been fairly maintained between the Iroquois on the one hand and the French and their allies, the Ottawas and the Hurons, on the other. The progress of events during the next few years proved that the recall of the governor had been ill-timed. The Iroquois were assuming a threatening attitude towards the inhabitants, and Frontenac's successor, La Barre, was quite incapable of leading an army against such cunning foes. At the end of a year La Barre was replaced by the marquis de Denonville, a man of ability and courage, who, though he showed some vigour in marching against the western Iroquois tribes, angered rather than intimidated them, and the massacre of Lachine (5th of August 1689) must be regarded as one of the unhappy results of his administration.

The affairs of the colony were in a critical condition; a man of experience and decision was needed to cope with the difficulties, and Louis XIV., who was not wanting in sagacity, wisely made choice of the choleric count to represent and uphold the power of France. When, therefore, on the 15th of October 1689, Frontenac arrived in Quebec as governor for the second time, he received an enthusiastic welcome, and confidence was at once restored in the public mind. Quebec was not long to enjoy the blessing of peace. On the 16th of October 1690 several New England ships under the command of Sir William Phipps appeared off the Island of Orleans, and an officer was sent ashore to demand the surrender of the fort. Frontenac, bold and fearless, sent a defiant answer to the hostile admiral, and handled so vigorously the forces he had collected as completely to repulse the enemy, who in their hasty retreat left behind a few pieces of artillery on the Beauport shore. The prestige of the governor was greatly increased by this event, and he was prepared to follow up his advantage by an attack on Boston from the sea, but his resources were inadequate for the undertaking. New France now rejoiced in a brief respite from her enemies, and during the interval Frontenac encouraged the revival of the drama at the Château St-Louis and paid some attention to the social life of the colony. The Indians, however, were not yet subdued, and for two years a petty warfare was maintained. In 1696 Frontenac decided to take the field against the Iroquois, although at this time he was seventy-six years of age. On the 6th of July he left Lachine at the head of a considerable force for the village of the Onondagas, where he arrived a month later. In the meantime the Iroquois had abandoned their villages, and as pursuit was impracticable the army commenced its return march on the 10th of August. The old warrior endured the fatigue of the march as well as the youngest soldier, and for his courage and prowess he received the cross of St

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Louis. Frontenac died on the 28th of November 1698 at the Château St-Louis after a brief illness, deeply mourned by the Canadian people. The faults of the governor were those of temperament, which had been fostered by early environment. His nature was turbulent, and from his youth he had been used to command; but underlying a rough exterior there was evidence of a kindly heart. He was fearless, resourceful and decisive, and triumphed as few men could have done over the difficulties and dangers of a most critical position.

See *Count Frontenac*, by W. D. Le Sueur (Toronto, 1906); *Count Frontenac and New France under Louis XIV*, by Francis Parkman (Boston, 1878); *Le Comte de Frontenac*, by Henri Lorin (Paris, 1895); *Frontenac et ses amis*, by Ernest Myrand (Quebec, 1902). (A. G. D.)

FRONTINUS, SEXTUS JULIUS (*c.* A.D. 40–103), Roman soldier and author. In 70 he was city praetor, and five years later was sent into Britain to succeed Petilius Cerealis as governor of that island. He subdued the Silures, and held the other native tribes in check till he was superseded by Agricola (78). In 97 he was appointed superintendant of the aqueducts (*curator aquarum*) at Rome, an office only conferred upon persons of very high standing. He was also a member of the college of augurs. His chief work is *De aquis urbis Romae*, in two books, containing a history and description of the water-supply of Rome, including the laws relating to its use and maintenance, and other matters of importance in the history of architecture. Frontinus also wrote a theoretical treatise on military science (*De re militari*) which is lost. His *Strategematicon libri iii.* is a collection of examples of military stratagems from Greek and Roman history, for the use of officers; a fourth book, the plan and style of which is different from the rest (more stress is laid on the moral aspects of war, *e.g.* discipline), is the work of another writer (best edition by G. Gundermann, 1888). Extracts from a treatise on land-surveying ascribed to Frontinus are preserved in Lachmann's *Gromatici veteres* (1848).

A valuable edition of the *De aquis* (text and translation) has been published by C. Herschel (Boston, Mass., 1899). It contains numerous illustrations; maps of the routes of the ancient aqueducts and the city of Rome in the time of Frontinus; a photographic reproduction of the only MS. (the Monte Cassino); several explanatory chapters, and a concise bibliography, in which special reference is made to P. d Tissot, *Étude sur la condition des agrimensores* (1879). There is a complete edition of the works by A. Dederich (1855), and an English translation of the *Strategematica* by R. Scott (1816).

FRONTISPIECE (through the French, from Med. Lat. *frontispicium*, a front view, *frons*, *frontis*, forehead or front, and *specere*, to look at; the English spelling is a mistaken adaptation to "piece"), an architectural term for the principal front of a building, but more generally applied to a richly decorated entrance doorway, if projecting slightly only in front of the main wall, otherwise portal or porch would be a more correct term. The word, however, is more used for a decorative design or the representation of some subject connected with the substance of a book and placed as the first illustrated page. A design at the end of the chapter of a book is called a tail-piece.

FRONTO, MARCUS CORNELIUS (*c.* A.D. 100–170), Roman grammarian, rhetorician and advocate, was born of an Italian family at Cirta in Numidia. He came to Rome in the reign of Hadrian, and soon gained such renown as an advocate and orator as to be reckoned inferior only to Cicero. He amassed a large fortune, erected magnificent buildings and purchased the famous gardens of Maecenas. Antoninus Pius, hearing of his fame, appointed him tutor to his adopted sons Marcus Aurelius and Lucius Verus. In 143 he was consul for two months, but declined the proconsulship of Asia on the ground of ill-health. His latter years were embittered by the loss of all his children except one daughter. His talents as an orator and rhetorician were greatly admired by his contemporaries, a number of whom formed themselves into a school called after him Frontoniani, whose avowed object it was to restore the ancient purity and simplicity of the Latin language in place of the exaggerations of the Greek sophistical school. However praiseworthy the intention may have been, the list of authors specially recommended does not speak well for Fronto's literary taste. The authors of the Augustan age are unduly depreciated, while Ennius, Plautus, Laberius, Sallust are held up as models of imitation. Till 1815 the only extant works ascribed (erroneously) to Fronto were two grammatical treatises, *De nominum verborumque differentiis* and *Exempla elocutionum* (the last being really by Arusianus Messius). In that year, however, Angelo Mai discovered in the Ambrosian library at Milan a palimpsest manuscript (and, later, some additional sheets of it in the Vatican), on which had been originally written some of Fronto's letters to his royal pupils and their replies. These palimpsests had originally belonged to the famous convent of St Columba at Bobbio, and had been written over by the monks with the acts of the first council of Chalcedon. The letters, together with the other fragments in the palimpsest, were published at Rome in 1823. Their contents falls far short of the writer's great reputation. The letters consist of correspondence with Antoninus Pius, Marcus Aurelius and Lucius Verus, in which the character of Fronto's pupils appears in a very favourable light, especially in the affection they both seem to have retained for their old master; and letters to friends, chiefly letters of recommendation. The collection also contains treatises on eloquence, some historical fragments, and literary trifles on such subjects as the praise of smoke and dust, of negligence, and a dissertation on Arion. "His style is a laborious mixture of archaisms, a motley cento, with the aid of which he conceals the poverty of his knowledge and ideas." His chief merit consists in having preserved extracts from ancient writers which would otherwise have been lost.

The best edition of his works is by S. A. Naber (1867), with an account of the palimpsest; see also G. Boissier, "Marc-Aurèle et les lettres de F.," in *Revue des deux mondes* (April 1868); R. Ellis, in *Journal of Philology* (1868) and *Correspondenz of Fronto and M. Aurelius* (1904); and the full bibliography in the article by Brzoska in the new edition of Pauly's *Realencyclopädie der classischen Alterthumswissenschaft*, iv. pt. i. (1900).

FROSINONE (anc. *Frusino*), a town of Italy in the province of Rome, from which it is 53 m. E.S.E. by rail. Pop. (1901) town, 9530; commune, 11,020. The place is picturesquely situated on a hill of 955 ft. above sea-level, but contains no buildings of interest. Of the ancient city walls a small fragment alone is preserved, and no other traces of antiquity are visible, not even of the amphitheatre which it once possessed, for which a ticket (*lessera*) has been found (Th. Mommsen in *Ber. d. Sächsischen Gesellschaft d. Wissenschaften*, 1849, 286). It was a Volscian, not a Hernican, town; a part of its territory was taken from it about 306–303 B.C. by the Romans and sold. The town then became a *praefectura*, probably with the *civitas sine suffragio*, and later a colony, but we hear nothing important of it. It was situated just above the Via Latina. (T. As.)

FROSSARD, CHARLES AUGUSTE (1807–1875), French general, was born on the 26th of April 1807, and entered the army from the École Polytechnique in 1827, being posted to the engineers. He took part in the siege of Rome in 1849 and in that of Sebastopol in 1855, after which he was promoted general of brigade. Four years later as general of division, and chief of engineers in the Italian campaign, he attracted the particular notice of the emperor Napoleon III., who made him in 1867 chief of his military household and governor to the prince imperial. He was one of the superior military authorities who in this period 1866–1870 foresaw and endeavoured to prepare for the inevitable war with Germany, and at the outbreak of war he was given by Napoleon the choice between a corps command and the post of chief engineer at headquarters. He chose the command of the II. corps. On the 6th of August 1870 he held the position of Spicheren against the Germans until the arrival of reinforcements for the latter, and the non-appearance of the other French corps compelled him to retire. After this he took part in the battles around Metz, and was involved with his corps in the surrender of Bazaine's army. General Frossard published in 1872 a *Rapport sur les opérations du 2e corps*. He died at Château-Villain (Haute-Marne) on the 25th of August 1875.

FROST, WILLIAM EDWARD (1810–1877), English painter, was born at Wandsworth, near London, in September 1810. About

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1825, through William Etty, R.A., he was sent to a drawing school in Bloomsbury, and after several years' study there, and in the sculpture rooms at the British Museum, Frost was in 1829 admitted as a student in the schools of the Royal Academy. He won medals in all the schools, except the antique, in which he was beaten by Maclise. During those years he maintained himself by portrait-painting. He is said to have painted about this time over 300 portraits. In 1830 he obtained the gold medal of the Royal Academy for his picture of "Prometheus bound by Force and Strength." At the cartoon exhibition at Westminster Hall in 1843 he was awarded a third-class prize of £100 for his cartoon of "Una alarmed by Fauns and Satyrs." He exhibited at the Academy "Christ crowned with Thorns" (1843), "Nymphs dancing" (1844), "Sabrina" (1845), "Diana and Actaeon" (1846). In 1846 he was elected Associate of the Royal Academy. His "Nymph disarming Cupid" was exhibited in 1847; "Una and the Wood-Nymphs" of the same year was bought by the queen. This was the time of Frost's highest popularity, which considerably declined after 1850. His later pictures are simply repetitions of earlier motives. Among them may be named "Euphrosyne" (1848), "Wood-Nymphs" (1851), "Chastity" (1854), "Il Penseroso" (1855), "The Graces" (1856), "Narcissus" (1857), "Zephyr with Aurora playing" (1858), "The Graces and Loves" (1863), "Hylas and the Nymphs" (1867). Frost was elected to full membership of the Royal Academy in December 1871. This dignity, however, he soon resigned. Frost had no high power of design, though some of his smaller and apparently less important works are not without grace and charm. Technically, his paintings are, in a sense, very highly finished, but they are entirely without mastery. He died on the 4th of June 1877.

FROST (a common Teutonic word, cf. Dutch, *vorst*, Ger. *Frost*, from the common Teutonic verb meaning "to freeze," Dutch, *vriezen*, Ger. *frieren*; the Indo-European root is seen in Lat. *pruina*, hoar-frost, cf. *prurire*, to itch, burn, *pruna*, burning coal, Sansk. *plush*, to burn), in meteorology, the act, or agent of the process, of freezing; hence the terms "hoar-frost" and "white-frost" applied to visible frozen vapour formed on exposed surfaces. A frost can only occur when the surface temperature falls below 32° F., the freezing-point of water; if the temperature be between 28° and 32° it is a "light frost," if below 28° it is a "heavy," "killing" or "black frost"; the term "black frost" is also used when no hoar-frost is present. The number of degrees below freezing-point is termed "degrees of frost." As soon as a mass of air is cooled to its dew-point, water begins to be precipitated in the form of rain, dew, snow or hail. Hoar-frost is only formed at the immediate surface of the land if the latter be at a temperature below 32°, and this may occur even when the temperature of the air a few feet above the ground is 12°-16° above the freezing-point. The heaviest hoar-frosts are formed under weather conditions similar to those under which the heaviest summer dews occur, namely, clear and calm nights, when there is no cloud to impede the radiation of heat from the surface of the land, which thereby becomes rapidly and completely cooled. The danger of frost is minimized when the soil is very moist, as for example after 10-12 mm. of rain; and it is a practice in America to flood fields on the receipt of a frost warning, radiation being checked by the light fog sheets which develop over moist soils, just as a cloud-layer in the upper atmosphere impedes radiation on a grand scale. A layer of smoke will also impede radiation locally, and to this end smoky fires are sometimes lit in such positions that the smoke may drift over planted ground which it is desirable to preserve from frost. Similarly, frost may occur in open country when a town, protected by its smoke-cloud above, is free of it. In a valley with fairly high and steep flanks frost sometimes occurs locally at the bottom, because the layer of air cooled by contact with the cold surface of the higher ground is heavier than that not so cooled, and therefore tends to flow or settle downwards along the slope of the land. When meteorological considerations point to a frost, an estimate of the night temperature may be obtained by multiplying the difference between the readings of the wet and dry bulb thermometer by 2·5 and subtracting the result from the dry bulb temperature. This rule applies when the evening air is at about 50° and 30·1-in. pressure, the sky being clear. An instrument has been devised in France for the prediction of frost. It consists of a wet bulb and a dry bulb thermometer, mounted on a board on which is also a scale of lines corresponding to degrees of the dry bulb, and a pointer traversing a scale graduated according to degrees of the wet bulb. Observations for the night are taken about half an hour before sunset. By means of the pointer and scale, the point may be found at which the line of the dry-bulb reading meets the pointer set to the reading of the wet bulb. The scale is further divided by colours so that the observed point may fall within one of three zones, indicating certain frost, probable frost or no probability of frost.

FROSTBITE, a form of mortification (*q.v.*), due to the action of extreme cold in cutting off the blood-supply from the fingers, toes, nose, ears, &c. In comparatively trifling forms it occurs as "chaps" and "chilblains," but the term frostbite is usually applied only to more severe cases, where the part affected becomes in danger of gangrene. An immediate application of snow, or ice-water, will restore the circulation; the application of heat would cause inflammation. But if the mortification has gone too far for the circulation to be restored, the part will be lost, and surgical treatment may be necessary.

FROSTBURG, a town of Allegany county, Maryland, U.S.A., 11 m. W. of Cumberland. Pop. (1890) 3804; (1900) 5274 (578 foreign-born and 236 negroes); (1910) 6028. It is served by the Cumberland & Pennsylvania railway and the Cumberland & Westernport electric railway. The town is about 2000 ft. above sea-level on a plateau between the Great Savage and Dans mountains, and its delightful scenery and air have made it attractive as a summer resort. It is the seat of the second state normal school, opened in 1904. Frostburg is in the midst of the coal region of the state, and is itself almost completely undermined; it has planing mills and manufactures large quantities of fire-brick. The municipality owns and operates its waterworks. Natural gas is piped to Frostburg from the West Virginia fields, 120 m. away. Frostburg was first settled in 1812; was called Mount Pleasant until about 1830, when the present name was substituted in honour of Meshech Frost, one of the town's founders; and was incorporated in 1870.

FROTHINGHAM, OCTAVIUS BROOKS (1822–1895), American clergyman and author, was born in Boston on the 26th of November 1822, son of Nathaniel Langdon Frothingham (1793–1870), a prominent Unitarian preacher of Boston, and through his mother's family related to Phillips Brooks. He graduated from Harvard College in 1843 and from the Divinity School in 1846. He was pastor of the North Unitarian church of Salem, Massachusetts, in 1847–1855. From 1855 to 1860 he was pastor of a new Unitarian society in Jersey City, where he gave up the Lord's Supper, thinking that it ministered to self-satisfaction; and it was as a radical Unitarian that he became pastor of another young church in New York City in 1860. Indeed in 1864 he was recognized as leader of the radicals after his reply to Dr Hedge's address to the graduating students of the Divinity School on *Anti-Supernaturalism in the Pulpit*. In 1865, when he had practically given up "transcendentalism," his church building was sold and his congregation began to worship in Lyric Hall under the name of the Independent Liberal Church; in 1875 they removed to the Masonic Temple, but four years later ill-health compelled Frothingham's resignation, and the church dissolved. Paralysis threatened him and he never fully recovered his health; in 1881 he returned to Boston, where he died on the 27th of November 1895. To this later period of his life belongs his best literary work. While he was in New York he was for a time art critic of the *Tribune*. Always himself on the unpopular side and an able but thoroughly fair critic of the majority, he habitually under-estimated his own worth; he was not only an anti-slavery leader when abolition was not popular even in New England, and a radical and rationalist when it was impossible for him to stay conveniently in the Unitarian Church, but he

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was the first president of the National Free Religious Association (1867) and an early and ardent disciple of Darwin and Spencer. To his radical views he was always faithful. It is a mistake to say that he grew more conservative in later years; but his judgment grew more generous and catholic. He was a greater orator than man of letters, and his sermons in New York were delivered to large audiences, averaging one thousand at the Masonic Temple, and were printed each week; in eloquence and in the charm of his spoken word he was probably surpassed in his day by none save George William Curtis. Personally he seemed cold and distant, partly because of his impressive appearance, and partly because of his own modesty, which made him backward in seeking friendships.

His principal published works are: *Stories from the Life of the Teacher* (1863), *A Child's Book of Religion* (1866), and other works of religious teaching for children; several volumes of sermons; *Beliefs of Unbelievers* (1876), *The Cradle of the Christ: a Study in Primitive Christianity* (1877), *The Spirit of New Faith* (1877), *The Rising and the Setting Faith* (1878), and other expositions of the "new faith" he preached; *Life of Theodore Parker* (1874), *Transcendentalism in New England* (1876), which is largely biographical, *Gerrit Smith, a Biography* (1878), *George Ripley* (1882), in the "American Men of Letters" series, *Memoir of William Henry Channing* (1886), *Boston Unitarianism, 1820–1850* (1890), really a biography of his father; and *Recollections and Impressions, 1822–1890* (1891).

FROUDE, JAMES ANTHONY (1818–1894), English historian, son of R. H. Froude, archdeacon of Totnes, was born at Dartington, Devon, on the 23rd of April 1818. He was educated at Westminster and Oriel College, Oxford, then the centre of the ecclesiastical revival. He obtained a second class and the chancellor's English essay prize, and was elected a fellow of Exeter College (1842). His elder brother, Richard Hurrell Froude (1803–1836), had been one of the leaders of the High Church movement at Oxford. Froude joined that party and helped J. H. Newman, afterwards cardinal, in his *Lives of the English Saints*. He was ordained deacon in 1845. By that time his religious opinions had begun to change, he grew dissatisfied with the views of the High Church party, and came under the influence of Carlyle's teaching. Signs of this change first appeared publicly in his *Shadows of the Clouds*, a volume containing two stories of a religious sort, which he published in 1847 under the pseudonym of "Zeta," and his complete desertion of his party was declared a year later in his *Nemesis of Faith*, an heretical and unpleasant book, of which the earlier part seems to be autobiographical.

On the demand of the college he resigned his fellowship at Oxford, and mainly at least supported himself by writing, contributing largely to *Fraser's Magazine* and the *Westminster Review*. The excellence of his style was soon generally recognized. The first two volumes of his *History of England from the Fall of Wolsey to the Defeat of the Spanish Armada* appeared in 1856, and the work was completed in 1870. As an historian he is chiefly remarkable for literary excellence, for the art with which he represents his conception of the past. He condemns a scientific treatment of history and disregards its philosophy. He held that its office was simply to record human actions and that it should be written as a drama. Accordingly he gives prominence to the personal element in history. His presentations of character and motives, whether truthful or not, are undeniably fine; but his doctrine that there should be "no theorizing" about history tended to narrow his survey, and consequently he sometimes, as in his remarks on the foreign policy of Elizabeth, seems to misapprehend the tendencies of a period on which he is writing.

Froude's work is often marred by prejudice and incorrect statements. He wrote with a purpose. The keynote of his *History* is contained in his assertion that the Reformation was "the root and source of the expansive force which has spread the Anglo-Saxon race over the globe." Hence he overpraises Henry VIII. and others who forwarded the movement, and speaks too harshly of some of its opponents. So too, in his *English in Ireland* (1872–1874), which was written to show the futility of attempts to conciliate the Irish, he aggravates all that can be said against the Irish, touches too lightly on English atrocities, and writes unjustly of the influence of Roman Catholicism. A strong anti-clerical prejudice is manifest in his historical work generally, and is doubtless the result of the change in his views on Church matters and his abandonment of the clerical profession. Carlyle's influence on him may be traced both in his admiration for strong rulers and strong government, which led him to write as though tyranny and brutality were excusable, and in his independent treatment of character. His rehabilitation of Henry VIII. was a useful protest against the idea that the king was a mere sanguinary profligate, but his representation of him as the self-denying minister of his people's will is erroneous, and is founded on the false theory that the preambles of the acts of Henry's parliaments represented the opinions of the educated laymen of England. As an advocate he occasionally forgets that sobriety of judgment and expression become an historian. He was not a judge of evidence, and seems to have been unwilling to admit the force of any argument or the authority of any statement which militated against his case. In his *Divorce of Catherine of Aragon* (1891) he made an unfortunate attempt to show that certain fresh evidence on the subject, brought forward by Dr Gairdner, Dr Friedmann and others, was not inconsistent with the views which he had expressed in his *History* nearly forty years before. He worked diligently at original manuscript authorities at Simancas, the Record Office and Hatfield House; but he used his materials carelessly, and evidently brought to his investigation of them a mind already made up as to their significance. His *Life of Caesar* (1879), a glorification of imperialism, betrays an imperfect acquaintance with Roman politics and the life of Cicero; and of his two pleasant books of travel, *The English in the West Indies* (1888) shows that he made little effort to master his subject, and *Oceana* (1886), the record of a tour in Australia and New Zealand, among a multitude of other blunders, notes the prosperity of the working-classes in Adelaide at the date of his visit, when, in fact, owing to a failure in the wheat-crop, hundreds were then living on charity.. He was constitutionally inaccurate, and seems to have been unable to represent the exact sense of a document which lay before him, or even to copy from it correctly. Historical scholars ridiculed his mistakes, and Freeman, the most violent of his critics, never let slip a chance of hitting at him in the *Saturday Review*. Froude's temperament was sensitive, and he suffered from these attacks, which were often unjust and always too savage in tone. The literary quarrel between him and Freeman excited general interest when it blazed out in a series of articles which Freeman wrote in the *Contemporary Review* (1878–1879) on Froude's *Short Study* of Thomas Becket.

Notwithstanding its defects, Froude's *History* is a great achievement; it presents an important and powerful account of the Reformation period in England, and lays before us a picture of the past magnificently conceived, and painted in colours which will never lose their freshness and beauty. As with Froude's work generally, its literary merit is remarkable; it is a well-balanced and orderly narrative, coherent in design and symmetrical in execution. Though it is perhaps needlessly long, the thread of the story is never lost amid a crowd of details; every incident is made subordinate to the general idea, appears in its appropriate place, and contributes its share to the perfection of the whole. The excellence of its form is matched by the beauty of its style, for Froude was a master of English prose. The most notable characteristic of his style is its graceful simplicity; it is never affected or laboured; his sentences are short and easy, and follow one another naturally. He is always lucid. He was never in doubt as to his own meaning, and never at a loss for the most appropriate words in which to express it. Simple as his language is, it is dignified and worthy of its subject. Nowhere perhaps does his style appear to more advantage than in his four series of essays entitled *Short Studies on Great Subjects* (1867–1882), for it is seen there unfettered by the obligations of narrative. Yet his narrative is admirably told. For the most part flowing easily along, it rises on fit occasions to splendour, picturesque beauty or pathos. Few more brilliant pieces of historical

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writing exist than his description of the coronation procession of Anne Boleyn through the streets of London, few more full of picturesque power than that in which he relates how the spire of St Paul's was struck by lightning; and to have once read is to remember for ever the touching and stately words in which he compares the monks of the London Charterhouse preparing for death with the Spartans at Thermopylae. Proofs of his power in the sustained narration of stirring events are abundant; his treatment of the Pilgrimage of Grace, of the sea fight at St Helens and the repulse of the French invasion, and of the murder of Rizzio, are among the most conspicuous examples of it. Nor is he less successful when recording pathetic events, for his stories of certain martyrdoms, and of the execution of Mary queen of Scots, are told with exquisite feeling and in language of well-restrained emotion. And his characters are alive. We may not always agree with his portraiture, but the men and women whom he saw exist for us instinct with the life with which he endows them and animated by the motives which he attributes to them. His successes must be set against his failures. At the least he wrote a great history, one which can never be disregarded by future writers on his period, be their opinions what they may; which attracts and delights a multitude of readers, and is a splendid example of literary form and grace in historical composition.

The merits of his work met with full recognition. Each instalment of his *History*, in common with almost everything which he wrote, was widely read, and in spite of some adverse criticisms was received with eager applause. In 1868 he was elected rector of St Andrews University, defeating Disraeli by a majority of fourteen. He was warmly welcomed in the United States, which he visited in 1872, but the lectures on Ireland which he delivered there caused much dissatisfaction. On the death of his adversary Freeman in 1892, he was appointed, on the recommendation of Lord Salisbury, to succeed him as regius professor of modern history at Oxford. Except to a few Oxford men, who considered that historical scholarship should have been held to be a necessary qualification for the office, his appointment gave general satisfaction. His lectures on Erasmus and other 16th-century subjects were largely attended. With some allowance for the purpose for which they were originally written, they present much the same characteristics as his earlier historical books. His health gave way in the summer of 1894, and he died on the 20th of October.

His long life was full of literary work. Besides his labours as an author, he was for fourteen years editor of *Fraser's Magazine*. He was one of Carlyle's literary executors, and brought some sharp criticism upon himself by publishing Carlyle's *Reminiscences* and the *Memorials of Jane Welsh Carlyle*, for they exhibited the domestic life and character of his old friend in an unpleasant light. Carlyle had given the manuscripts to him, telling him that he might publish them if he thought it well to do so, and at the close of his life agreed to their publication. Froude therefore declared that in giving them to the world he was carrying out his friend's wish by enabling him to make a posthumous confession of his faults. Besides publishing these manuscripts he wrote a *Life of Carlyle*. His earlier study of Irish history afforded him suggestions for a historical novel entitled *The Two Chiefs of Dunboy* (1889). In spite of one or two stirring scenes it is a tedious book, and its personages are little more than machines for the enunciation of the author's opinions and sentiments. Though Froude had some intimate friends he was generally reserved. When he cared to please, his manners and conversation were charming. Those who knew him well formed a high estimate of his ability in practical affairs. In 1874 Lord Carnarvon, then colonial secretary, sent Froude to South Africa to report on the best means of promoting a confederation of its colonies and states, and in 1875 he was again sent to the Cape as a member of a proposed conference to further confederation. Froude's speeches in South Africa were rather injudicious, and his mission was a failure (see SOUTH AFRICA: *History*). He was twice married. His first wife, a daughter of Pascoe Grenfell and sister of Mrs Charles Kingsley, died in 1860; his second, a daughter of John Warre, M.P. for Taunton, died in 1874.

Froude's *Life*, by Herbert Paul, was published in 1905.

(W. Hu.)

FRUCTOSE, LAEVULOSE, or FRUIT-SUGAR, a carbohydrate of the formula $C_6H_{12}O_6$. It is closely related to ordinary *d*-glucose, with which it occurs in many fruits, starches and also in honey. It is a hydrolytic product of inulin, from which it may be prepared; but it is more usual to obtain it from "invert sugar," the mixture obtained by hydrolysing cane sugar with sulphuric acid. Cane sugar then yields a syrupy mixture of glucose and fructose, which, having been freed from the acid and concentrated, is mixed with water, cooled in ice and calcium hydroxide added. The fructose is precipitated as a saccharate, which is filtered, suspended in water and decomposed by carbon dioxide. The liquid is filtered, the filtrate concentrated, and the syrup so obtained washed with cold alcohol. On cooling the fructose separates. It may be obtained as a syrup, as fine, silky needles, a white crystalline powder, or as a granular crystalline, somewhat hygroscopic mass. When anhydrous it melts at about 95° C. It is readily soluble in water and in dilute alcohol, but insoluble in absolute alcohol. It is sweeter than cane sugar and is more easily assimilated. It has been employed under the name diabetin as a sweetening agent for diabetics, since it does not increase the sugar-content of the urine; other medicinal applications are in phthisis (mixed with quassia or other bitter), and for children suffering from tuberculosis or scrofula in place of cane sugar or milk-sugar.

Chemically, fructose is an oxyketone or ketose, its structural formula being $CH_2OH{\cdot}(CH{\cdot}OH)_3{\cdot}CO{\cdot}CH_2OH$; this result followed from its conversion by H. Kiliani into methylbutylacetic acid. The form described above is *laevo*-rotatory, but it is termed *d*-fructose, since it is related to *d*-glucose. Solutions exhibit mutarotation, fresh solutions having a specific rotation of −104·0°, which gradually diminishes to −92°. It was synthesized by Emil Fischer, who found the synthetic sugar which he named α-acrose to be (*d*+*l*)-fructose, and by splitting this mixture he obtained both the *d* and *l* forms. Fructose resembles *d*-glucose in being fermentable by yeast (it is the one ketose which exhibits this property), and also in its power of reducing alkaline copper and silver solutions; this latter property is assigned to the readiness with which hydroxyl and ketone groups in close proximity suffer oxidation. For the structural (stereochemical) relations of fructose see SUGAR.

FRUGONI, CARLO INNOCENZIO MARIA (1692–1768), Italian poet, was born at Genoa on the 21st of November 1692. He was originally destined for the church and at the age of fifteen, in opposition to his strong wishes, was shut up in a convent; but although in the following year he was induced to pronounce monastic vows, he had no liking for this life. He acquired considerable reputation as an elegant writer both of Latin and Italian prose and verse; and from 1716 to 1724 he filled the chairs of rhetoric at Brescia, Rome, Genoa, Bologna and Modena successively, attracting by his brilliant fluency a large number of students at each university. Through Cardinal Bentivoglio he was recommended to Antonio Farnese, duke of Parma, who appointed him his poet laureate; and he remained at the court of Parma until the death of Antonio, after which he returned to Genoa. Shortly afterwards, through the intercession of Bentivoglio, he obtained from the pope the remission of his monastic vows, and ultimately succeeded in recovering a portion of his paternal inheritance. After the peace of Aix-la-Chapelle he returned to the court of Parma, and there devoted the later years of his life chiefly to poetical composition. He died on the 20th of December 1768. As a poet Frugoni was one of the best of the school of the Arcadian Academy, and his lyrics and pastorals had great facility and elegance.

His collected works were published at Parma in 10 vols. in 1779, and a more complete edition appeared at Lucca in the same year in 15 vols. A selection from his works was published at Brescia in 1782, in 4 vols.

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FRUIT (through the French from the Lat. *fructus*; *frui*, to enjoy), in its widest sense, any product of the soil that can be enjoyed by man or animals; the word is so used constantly in the Bible, and extended, as a Hebraism, to offspring or progeny of man and of animals, in such expressions as "the fruit of the body," "of the womb," "fruit of thy cattle" (Deut. xxviii. 4), &c., and generally to the product of any action or effort. Between this wide and frequently figurative use of the word and its application in the strict botanical sense treated below, there is a popular meaning, regarding the objects denoted by the word entirely from the standpoint of edibility, and differentiating them roughly from those other products of the soil, which, regarded similarly, are known as vegetables. In this sense "fruit" is applied to such seed-envelopes of plants as are edible, either raw or cooked, and are usually sweet, juicy or of a refreshing flavour. But applications of the word in this sense are apt to be loose and shifting according to the fashion of the time.

Fruit, in the botanical sense, is developed from the flower as the result of fertilization of the ovule. After fertilization various changes take place in the parts of the flower. Those more immediately concerned in the process, the anther and stigma, rapidly wither and decay, while the filaments and style often remain for some time; the floral envelopes become dry, the petals fall, and the sepals are either deciduous, or remain persistent in an altered form; the ovary becomes enlarged, forming the *pericarp*; and the ovules are developed as the seeds, containing the embryo-plant. The term fruit is strictly applied to the mature pistil or ovary, with the seeds in its interior; but it often includes other parts of the flower, such as the bracts and floral envelopes. Thus the fruit of the hazel and oak consists of the ovary enveloped by the bracts; that of the apple and pear, of the ovary and floral receptacle; and that of the pineapple, of the whole inflorescence. Such fruits are sometimes distinguished as *pseudocarps*. In popular language, the fruit includes all those parts which exhibit a striking change as the result of fertilization. In general, the fruit is not ripened unless fertilization has been effected; but cases occur as the result of cultivation in which the fruit swells and becomes to all appearance perfect, while no seeds are produced. Thus, there are seedless oranges, grapes and pineapples. When the ovules are unfertilized, it is common to find that the ovary withers and does not come to maturity; but in the case of bananas, plantains and breadfruit, the non-development of seeds seems to lead to a larger growth and a greater succulence of fruit.

The fruit, like the ovary, may be formed of a single carpel or of several. It may have one cell or cavity, being *unilocular*; or many, *multilocular*, &c. The number and nature of the divisions depend on the number of carpels and the extent to which their edges are folded inwards. The appearances presented by the ovary do not always remain permanent in the fruit. Great changes are observed to take place, not merely as regards the increased size of the ovary, its softening or hardening, but also in its internal structure, owing to the suppression, additional formation or enlargement of parts. Thus, in the ash (fig. 1) an ovary with two cells, each containing an ovule attached to a central placenta, is changed into a unilocular fruit with one seed; one ovule becomes abortive, while the other, *g*, gradually enlarging until the septum is pushed to one side, comes with the walls of the cell, and the placenta appears to be parietal. In the oak and hazel, an ovary with three and two cells respectively, and two ovules in each, produces a one-celled fruit with one seed. In the coco-nut, a trilocular and bivalvular ovary produces a one-celled, one-seeded fruit. This abortion may depend on the pressure caused by the development of certain ovules, or it may proceed from non-fertilization of all the ovules and consequent non-enlargement of the carpels. Again, by the growth of the placenta, or the folding inwards of parts of the carpels, divisions occur in the fruit which did not exist in the ovary. In *Cathartocarpus Fistula* a one-celled ovary is changed into a fruit having each of its seeds in a separate cell, in consequence of spurious dissepiments being produced horizontal from the inner wall of the ovary. In flax (*Linum*) by the folding inwards of the back of the carpels a five-celled ovary becomes a ten-celled fruit. In *Astragalus* the folding inwards of the dorsal suture converts a one-celled ovary into a two-celled fruit; and in *Oxytropis* the folding of the ventral suture gives rise to a similar change. The development of cellular or pulpy matter, and the enlargement of parts not forming whorls of the flower, frequently alter the appearance of the fruit, and render it difficult to discover its formation. In the gooseberry (fig. 29), grape, guava, tomato and pomegranate, the seeds nestle in pulp formed by the placentas. In the orange the pulpy matter surrounding the seeds is formed by succulent cells, which are produced from the inner partitioned lining of the pericarp. In the strawberry the receptacle becomes succulent, and bears the mature carpels on its convex surface (fig. 2); in the rose there is a fleshy hollow receptacle which bears the carpels on its concave surface (fig. 3). In the juniper the scaly bracts grow up round the seeds and become succulent, and in the fig (fig. 4) the receptacle becomes succulent and encloses an inflorescence.

The pericarp consists usually of three layers, the external, or *epicarp* (fig. 5, *ep*); the middle, or *mesocarp*, *m*; and the internal, or *endocarp*, *en*. These layers are well seen in such a fruit as the peach, plum or cherry, where they are separable one from the other; in them the epicarp forms what is commonly called the skin; the mesocarp, much developed, forms the flesh or pulp, and hence has sometimes been called *sarcocarp*; while the endocarp, hardened by the production of woody cells, forms the *stone* or *pulamen* immediately covering the kernel or seed. The pulpy matter found in the interior of fruits, such as the gooseberry, grape and orange, is formed from the placentas, and must not be confounded with the sarcocarp. In some fruits, as in the nut, the three layers become blended together and are indistinguishable. In bladder senna (*Colutea arborescens*) the pericarp retains its leaf-like appearance, but in most cases it becomes altered both in consistence and in colour. Thus in the date the epicarp is the outer brownish skin, the pulpy matter is the mesocarp or sarcocarp, and the thin papery-like lining is the endocarp covering the hard seed. In the medlar the endocarp becomes of a stony hardness. In the melon the epicarp and endocarp are very thin, while the mesocarp forms the bulk of the fruit, differing in texture and taste in its external and internal parts. The rind of the orange consists of epicarp and mesocarp, while the endocarp forms partitions in the interior, filled with pulpy cells. The part of the pericarp attached to the peduncle is the base, and the point where the style or stigma existed is the apex. This latter is not always the apparent apex, as in the case of the ovary; it may be lateral or even basilar. The style sometimes remains in a hardened form, rendering the fruit *apiculate*; at other times it falls off, leaving only traces of its existence. The presence of the style or stigma serves to distinguish certain single-seeded pericarps from seeds.

FIG. 1.

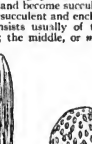

FIG. 2.

FIG. 3.

FIG. 4.

FIG. 5.

FIG. 1.—Samara or winged fruit of Ash (*Fraxinus*). 1, Entire, with its wing *a*; 2, lower portion cut transversely, to show that it consists of two cells; one of which, *l*, is abortive, and is reduced to a very small cavity, while the other is much enlarged and filled with a seed *g*.

FIG. 2.—Fruit of the Strawberry (*Fragaria vesca*), consisting of an enlarged succulent receptacle, bearing on its surface the small dry seed-like fruits (achenes). (After Duchartre.)

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FIG. 3.—Fruit of the Rose cut vertically. *s*, Fleshy hollowed receptacle; *s*, persistent sepals; *fr*, ripe carpels; *e*, stamens, withered.

FIG. 4.—Peduncle of Fig (*Ficus Carica*), ending in a hollow receptacle enclosing numerous male and female flowers.

FIG. 5.—Fruit of Cherry (*Prunus Cerasus*) in longitudinal section. *ep*, Epicarp; *m*, mesocarp; *en*, endocarp.

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When the fruit is mature and the seeds are ripe, the carpels usually give way either at the ventral or dorsal suture or at both, and so allow the seeds to escape. The fruit in this case is *dehiscent*. But some fruits are *indehiscent*, falling to the ground entire, and the seeds eventually reaching the soil by their decay. By dehiscence the pericarp becomes divided into different pieces, or *valves*, the fruit being univalvular, bivalvular or multivalvular, &c., according as there are one, two or many valves. The splitting extends the whole length of the fruit, or is partial, the valves forming teeth at the apex, as in the order Caryophyllaceae (fig. 6). Sometimes the valves are detached only at certain points, and thus dehiscence takes place by pores at the apex, as in poppy (fig. 7), or at the base, as in *Campanula*. Indehiscent fruits are either dry, as the nut, or fleshy, as the cherry and apple. They are formed of one or several carpels. In the former case they usually contain only a single seed, which may become so incorporated with the pericarp as to appear to be naked, as in the grain of wheat and generally in grasses. In such cases the presence of the remains of style or stigma determines their true nature.

Dehiscence of fruits.

FIG. 6. FIG. 7.

FIG. 6.—Seed-vessel or capsule of Campion, opening by ten teeth at the apex. The calyx *c* is seen surrounding the seed-vessel.

FIG. 7.—Capsule of Poppy, opening by pores *p*, under the radiating peltate stigma *s*.

Dehiscent fruits, when composed of single carpels, may open by the ventral suture only, as in the paeony, hellebore, *Aquilegia* (fig. 28) and *Caltha*; by the dorsal suture only, as in magnolias and some *Proteaceae*, or by both together, as in the pea (fig. 8) and bean; in these cases the dehiscence is *sutural*. When composed of several united carpels, two types of dehiscence occur—a longiudinal and a transverse. In the longitudinal the separation may take place by the dissepiments throughout their length, so that the fruit is resolved into its original carpels, and each valve represents a carpel, as in rhododendron, *Colchicum*, &c.; this dehiscence, in consequence of taking place through the septum, is called *septicidal* (figs. 9, 10). The valves separate from their commisure, or central line of union, carrying the placentas with them, or they leave the latter in the centre, so as to form with the axis a column of a cylindrical, conical or prismatic shape. Dehiscence is *loculicidal* when the union between the edges of the carpels is persistent, and they dehisce by the dorsal suture, or through the back of the loculaments, as in the lily and iris (figs. 11, 12). In these cases each valve consists of a half of each of two contiguous carpels. The placentas either remain united to the axis, or they separate from it, being attached to the septa on the valves. When the outer walls of the carpels break off from the septa, leaving them attached to the central column, the dehiscence is said to be *septifragal* (fig. 13), and where, as in *Linum catharticum* and *Calluna*, the splitting takes place first of all in a septicidal manner, the fruit is described as *septicidally septifragal*; while in other cases, as in thorn apple (*Datura Stramonium*), where the splitting is at first loculicidal, the dehiscence is *loculicidally septifragal*. In all those forms the separation of the valves takes place either from above downwards or from below upwards. In

FIG. 8.

FIG. 9. FIG. 10.

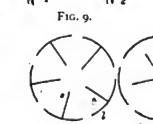

FIG. 12. FIG. 13.

FIG. 11.

FIG. 8.—Dry dehiscent fruit. The pod (legume) of the Pea; *r*, the dorsal suture; *b*, the ventral; *c*, calyx; *s*, seeds.

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FIG. 9.—(1) Fruit or capsule of Meadow Saffron (*Colchicum autumnale*), dehiscing along the septa (septicidally); (2) same cut across, showing the three chambers with the seeds attached along the middle line (axile placentation).

FIG. 10.—Diagram to illustrate the septicidal dehiscence in a pentalocular capsule. The loculaments *l* correspond to the number of the carpels, which separate by splitting through the septa, *s*.

FIG. 11.—The seed vessel (capsule) of the Flower-de-Luce (*Iris*), opening in a loculicidal manner. The three valves bear the septa in the centre, and the opening takes place through the back of the loculaments. Each valve is formed by the halves of contiguous carpels.

FIG. 12.—Diagram to illustrate loculicidal dehiscence. The loculaments *l*, split at the back, and the valves separate, bearing the septa *s* on their centres.

FIG. 13.—Diagram to illustrate septifragal dehiscence, in which the dehiscence takes place through the back of the loculaments *l*, and the valves separate from the septa *s*, which are left attached to the placentas in the centre.

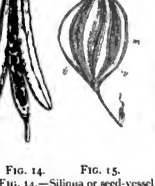

FIG. 14. FIG. 15. FIG. 17. FIG. 18.

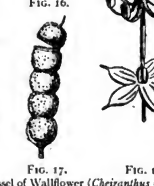

FIG. 16.

FIG. 14.—Siliqua or seed-vessel of Wallflower (*Cheiranthus Cheiri*), opening by two valves, which separate from the base upwards, leaving the seeds attached to the dissepiment which is supported by the replum.

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FIG. 15.—Capsule of an Orchid (*Xylobium*). *v*, valve.

FIG. 16.—Seed-vessel of *Anagallisarvensis*, opening by circumscissile dehiscence.

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FIG. 17.—Lomentum of *Hedysarum* which, when ripe, separates transversely into single-seeded portions or mericarps.

FIG. 18.—Fruit of *Geranium pratense*, after splitting.

Saxifraga a splitting for a short distance of the ventral sutures of the carpels takes place, so that a large apical pore is formed. In the fruit of Cruciferae, as wallflower (fig. 14), the valves separate from the base of the fruit, leaving a central *replum*, or frame, which supports the false septum formed by a prolongation from the parietal placentas on opposite sides of the fruit, extending between the ventral sutures of the carpels. In Orchidaceae (fig. 15) the pericarp, when ripe, separates into three valves in a loculicidal manner, but the midribs of the carpels, to which the placentas are attached, often remain adherent to the axis both at the apex and base after the valves bearing the seeds have fallen. The other type of dehiscence is transverse, or *circumscissile*, when the upper part of the united carpels falls off in the form of a lid or operculum, as in *Anagallis* and in henbane (*Hyoscyamus*) (fig. 16).

Sometimes the axis is prolonged beyond the base of the carpels, as in the mallow and castor-oil plant, the carpels being united to it throughout their length by their faces, and separating from it without opening. In the Umbelliferae the two carpels separate from the lower part of the axis, and remain attached by their apices to a prolongation of it, called a *carpophore* or *podocarp*, which splits into two (fig. 25) and suspends them; hence the fruit is termed a *cremocarp*, which divides into two *mericarps*. The general term *schizocarp* is applied to all dry fruits, which break up into two or more one-seeded indehiscent mericarps, as in *Hedysarum* (fig. 17). In the order Geraniaceae the styles remain attached to a central column, and the mericarps separate from below upwards, before dehiscing by their ventral suture (fig. 18). Carpels which separate one from another in this manner are called *cocci*. They are well

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seen in the order Euphorbiaceae, where there are usually three such carpels, and the fruit is termed tricoccus. In many of them, as *Hura crepitans*, the cocci separate with great force and elasticity. In many leguminous plants, such as *Ornithopus*, *Hedysarum* (fig. 17), *Entada*, *Coronilla* and the gum-arabic plant (*Acacia arabica*), the fruit becomes a schizocarp by the formation of transverse partitions from the folding in of the sides of the pericarp, and distinct separations taking place at these partitions.

Fruits are formed by one flower, or are the product of several flowers combined. In the former case they are either *apocarpous*, of one mature carpel or of several separate free carpels; or *syncarpous*, of several carpels, more or less completely united. When the fruit is composed of the ovaries of several flowers united, it is usual to find the bracts and floral envelopes also joined with them, so as to form one mass; hence such fruits are known as multiple, confluent or *anthocarpous*. The term simple is applied to fruits which are formed by the ovary of a single flower, whether they are composed of one or several carpels, and whether these carpels are separate or combined.

Dispersal of fruit or seed.

The object of the fruit in the economy of the plant is the protection and nursing of the developing seed and the dispersion of the ripe seeds. Hence, generally, one-seeded fruits are indehiscent, while fruits containing more than one seed open to allow of the dispersal of the seeds over as wide an area as possible. The form, colour, structure and method of dehiscence of fruits and the form of the contained seeds are intimately associated with the means of dispersal, which fall into several categories. (1) By a mechanism residing in the fruit. Thus many fruits open suddenly when they are dry, and the seeds are ejected by the twisting or curving of the valves, or in some other way; *e.g.* in gorse, by the spiral curving of the valves; in *Impatiens*, by the twisting of the cocci; in squirting cucumber, by the pressure exerted on the pulpy contents by the walls of the pericarp. (2) By aid of various external agencies such as water. Fruits or seeds are sometimes sufficiently buoyant to float for a long time on sea- or fresh-water; *e.g.* cocoa-nut, by means of its thick, fibrous coat (mesocarp), is carried hundreds of miles in the sea, the tough, leathery outer coat (epicarp) preventing it from becoming water-soaked. Fruits and seeds of West Indian plants are thrown up on the coasts of north-west Europe, having been carried by the Gulf Stream, and will often germinate; many are rendered buoyant by air-containing cavities, and the embryo is protected from the seawater by the tough coat of fruit or seed. Water-lily seeds are surrounded with a spongy tissue when set free from the fruit, and float for some distance before dropping to the bottom. (3) The most general agent in the dispersal of seeds is the wind or currents of air—the fruit or seed being rendered buoyant by wing-developments as in fruits of ash (fig. 1) or maple (fig. 21), seeds of pines and firs, or many members of the order Bignoniaceae; or hair-developments as in fruits of clematis, where the style forms a feathery

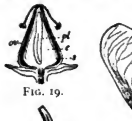

FIG. 19.

FIG. 21.

FIG. 20.

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FIG. 19.—Dry one-seeded fruit of dock (*Rumex*) cut vertically. *ov*, Pericarp formed from ovary wall; *s*, seed; *e*, endosperm; *pl*, embryo with radicle pointing upwards and cotyledons downwards—enlarged.

FIG. 20.—Achene of *Ranunculus arvensis* in longitudinal section; *e*, endosperm; *pl*, embryo. (After Baillon, enlarged.)
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FIG. 21.—Fruit of Common Sycamore (*Acer Pseudoplatanus*), dividing into two mericarps *m*; *s*, pedicel; *fl*, wings (nat. size).

appendage, fruits of many Compositae (dandelion, thistle, &c.), which are crowned by a plumose pappus, or seeds of willow and poplar, or *Asclepias* (fig. 36), which bear tufts of silky hairs; to this category belong bladder-like fruits, such as bladder-senna, which are easily rolled by the wind, or cases like the so-called rose of Jericho, a small cruciferous plant (*Anastatica hierocuntica*), where the plant dries up after developing its fruits and becomes detached from the ground; the branches curl inwards, and the whole plant is rolled over the dry ground by the wind. The wind also aids the dispersal of the seeds in the case of fruits which open by small teeth (many Caryophyllaceae [fig. 6]) or pores (poppy [fig. 7], *Campanula*, &c.); the seeds are in these cases small and numerous, and are jerked through the pores when the capsules, which are generally borne on long, dry stems or stalks, are shaken by the wind. (4) In other cases members of the animal world aid in seed-dispersal. Fruits often bear stiff hairs or small hooks, which cling to the coat of an animal or the feathers of a bird; such are fruits of cleavers (*Galium Aparine*), a common hedge-row plant, *Ranunculus arvensis* (fig. 20), carrot, *Geum*, &c.; or the fruit or seed has an often bright-coloured, fleshy

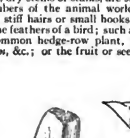

FIG. 22.

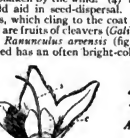

FIG. 23.

FIG. 24.

FIG. 25.

FIG. 22.—Vertical section of a grain of wheat, showing embryo below at the base of the endosperm *e*; *s*, scutellum separating embryo from endosperm; *fol*, foliage leaf; *p.s*, sheath of plumule; *p.r*, primary root; *s.p.r*, sheath of primary root.

FIG. 23.—Fruit of Comfrey (*Symphytum*) surrounded by persistent calyx, *c*. The style *s* appears to arise from the base of the carpels, enlarged.

FIG. 24.—Ovary of *Foeniculum officinale* with pendulous ovules, in longitudinal section. (After Berg and Schmidt, magnified.)
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FIG. 25.—Fruit of *Carum Carui*. *A*, Ovary of the flower; *B*, ripe fruit. The two carpels have separated so as to form two mericarps (*m*). Part of the septum constitutes the carpophore (*o*). *p*, Top of flower-stalk; *d*, disk on top of ovary; *n*, stigma.
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covering, which is sought by birds as food, as in stone-fruits such as plum, cherry (fig. 5), &c., where the seed is protected from injury in the mouth or stomach of the animal by the hard endocarp; or the hips of the rose (fig. 3), where the succulent scarlet "fruit" (the swollen receptacle) envelops a number of small dry true fruits (achenes), which cling by means of stiff hairs to the beak of the bird.

Forms of fruit.

Simple fruits have either a *dry* or *succulent* pericarp. The *achene* is a dry, one-seeded, indehiscent fruit, the pericarp of which is closely applied to the seed, but separable from it. It is solitary, forming a single fruit, as in the dock (fig. 19) and in the cashew, where it is supported on a fleshy peduncle; or *aggregate*, as in *Ranunculus* (fig. 20), where several achenes are placed on a common elevated receptacle. In the strawberry the achenes (fig. 2) are aggregated on a convex succulent receptacle. In the rose they are supported on a concave receptacle (fig. 3), and in the fig the succulent receptacle completely encloses the achenes (fig. 4). In *Dorstenia* the achenes are situated on a flat or slightly concave receptacle. Hence what in common language are called the seeds of the strawberry, rose and fig, are in reality ripe carpels. The styles occasionally remain attached to the achenes in the form of feathery appendages, as in *Clematis*. In Compositae, the fruit is an inferior achene (*cypsela*), to which the pappus (modified calyx) remains adherent. Such is also the nature of the fruit in Dipsacaceae (*e.g.* scabious). When the pericarp is thin, and appears like a bladder surrounding the seed, the achene is termed a *utricle*, as in Amaranthaceae. When the pericarp is extended in the form of a winged appendage, a *samara* or *samaroid achene* is produced, as in the ash (fig. 1) and common sycamore (fig. 21). In these cases there are usually two achenes united, one of which, however, as in *Fraxinus* (fig. 1), may be abortive. The wing surrounds the fruit longitudinally in the elm. When the pericarp becomes so incorporated with the seed as to be inseparable from it, as in grains of wheat (fig. 22), maize, oats and other grasses, then the name *caryopsis* is given. The one-seeded portions (mericarps) of schizocarps often take the form of achenes, *e.g.* the mericarps of the

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mallows or of umbelliferes (figs. 24, 25). In Labiatae and Boraginaceae (*e.g.* comfrey, fig. 23), where the bicarpellary ovary becomes our one-seeded portions in the fruit, the partial fruits are of the nature of achenes or nutlets according to the texture (leathery or hard) of the pericarp.

The *nut* or *glans* is a dry one-celled indehiscent fruit with a hardened pericarp, often surrounded by bracts at the base, and, when mature, containing only one seed. In the young state the ovary often contains two or more ovules, but one comes to maturity. It is illustrated by the fruits of the hazel and chestnut, which are covered by leafy bracts, in the form of a *husk*, and by the acorn, in which the bracts and receptacle form a *cupula* or *cup* (fig. 26). The parts of the pericarp of the nut are united so as to appear one. In common language the term nut is very vaguely applied both to fruit and seeds.

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FIG. 26.—Cupule of *Quercus Aegilops*. *cp*, cupule; *gl*, fruit. (After Duchartre.)

The *drupe* is a succulent usually one-seeded indehiscent fruit, with a pericarp easily distinguishable into epicarp, mesocarp and endocarp. This term is applied to such fruits as the cherry (fig. 5), peach, plum, apricot or mango. The endocarp is usually hard, forming the stone (putamen) of the fruit, which encloses the kernel or seed. The mesocarp is generally pulpy and succulent, so as to be truly a sarcocarp, as in the peach, but it is sometimes of a tough texture, as in the almond, and at other times is more or less fibrous, as in the coco-nut. In the almond there are often two ovules formed, only one of which comes to perfection. In the raspberry and bramble several small drupes or *drupels* are aggregated so as to constitute an *etaerio*.

The *follicle* is a dry unilocular many-seeded fruit, formed from one carpel and dehiscing by the ventral suture. It is rare to meet with a solitary follicle forming the fruit. There are usually several aggregated together, either in a whorl on a shortened receptacle, as in hellebore, aconite, larkspur, columbine (figs. 27, 28) or the order Crassulaceae, or in a spiral manner on an elongated receptacle, as in *Magnolia* and *Banksia*. Occasionally, follicles dehisce by the dorsal suture, as in *Magnolia grandiflora* and *Banksia*.

The *legume* or *pod* is a dry monocarpellary unilocular many-seeded fruit, formed from one carpel, dehiscing both by the ventral and the dorsal suture. It characterizes leguminous plants, as the bean and pea (fig. 8). In the bladder-senna it forms an inflated legume. In some Leguminosae, as *Arachis*, *Cathartocarpus* *Fistula* and the tamarind, the fruit must be considered a legume, although it does not dehisce. The first of these plants produces its fruit underground, and is called earth-nut; the second has a partitioned legume and is schizocarpic; and both the second and third have pulpy matter surrounding the seeds. Some legumes are schizocarpic by the formation of constrictions externally. Such a form is the *lomentum* or *lomentaceous legume* of *Hedysarum* (fig. 17), *Coronilla*, *Ornithopus*, *Entada* and of some Acacias. In *Medicago* the legume is twisted like a snail, and in *Cassalpinia coriaria*, or Divi-divi, it is vermiform or curved like a worm. Sometimes the number of seeds is reduced, as in *Erythrina monosperma* and *Geoffroya superba*, which are one-seeded, and in *Pterocarpus* and *Dalbergia*, which are two-seeded.

FIG. 27.

FIG. 28.

FIG. 30.

FIG. 27.—Fruit of Columbine (*Aquilegia*), formed of five follicles.

FIG. 28.—Single follicle, showing dehiscence by the ventral suture.

FIG. 29.

FIG. 29.—Transverse section of berry of Gooseberry, showing the seeds attached to the parietal placentas and immersed in pulp, which is formed partly from the endocarp, partly from the seed-coat.

FIG. 30.—Section of the fruit of the Apple (*Pyrus Malus*), or pome, consisting of a fleshy covering formed by the floral receptacle and the true fruit or core with five cavities with seeds.

The *berry* (*bacca*) is a term applied generally to all fruits with seeds immersed in pulp, and includes fruits of very various origin. In *Actaea* (baneberry) or *Berberis* (barberry) it is derived from a single free carpel; generally, however, it is the product of a syncarpous ovary, which is superior, as in grape or potato, or inferior, as in gooseberry (fig. 29) or currant. In the pomegranate there is a peculiar baccate many-celled inferior fruit, having a tough rind, enclosing two rows of carpels placed one above the other. The seeds are immersed in pulp, and are attached irregularly to the wall, base and centre of the loculi. In the baobab there is a multilocular syncarpous fruit, in which the seeds are immersed in pulp.

FIG. 31.—Transverse section of the fruit of the Melon (*Cucumis Melo*), showing the placentas with the seeds attached to them. The three carpels forming the pepo are separated by partitions. From the centre processes pass outwards, ending in the curved placenta.

The *pepo*, anothe. indehiscent syncarpous fruit, is illustrated by the fruit of the gourd, melon (fig. 31) and other Cucurbitaceae. It is formed of three carpels, surmounted by the calyx; the rind is thick and fleshy, and there are three or more seed-bearing parietal placentas, either surrounding a central cavity or prolonged inwards into it. The fruit of the papaw resembles the pepo, but the calyx is not superior.

The *hesperidium* is the name given to such indehiscent fleshy syncarpous fruits as the orange, lemon and shaddock, in which the epicarp and mesocarp form a separable rind, and the endocarp sends prolongations inwards, forming triangular divisions, to the inner angles of which the seeds are attached, pulpy cells being developed around them from the wall. Both pepo and hesperidium may be considered as modifications of the berry.

The *pome* (fig. 30), seen in the apple, pear, quince, medlar and hawthorn, is a fleshy indehiscent syncarpous fruit, in the formation of which the receptacle takes part. The outer succulent part is the swollen receptacle, the horny core being the true fruit developed from the usually five carpels and cuclosing the seeds. In the medlar the core (or true pericarp) is of a stony hardness, while the outer succulent covering is open at the summit. The pome somewhat resembles the fruit of the rose (fig. 3), where the succulent receptacle surrounds a number of separate achenes.

The name *capsule* is applied generally to all dry syncarpous fruits, which dehisce by valves. It may thus be unilocular or multilocular, one- or many-seeded. The true valvular capsule is observed in *Colchicum* (fig. 9), lily and iris (fig. 11). The *porote capsule* is seen in the poppy (fig. 7), *Antirrhinum* and *Campanula*. In *Campanula* the pores occur at the base of the capsule, which becomes inverted when ripe. When the capsule opens by a lid, or by circumscissile dehiscence, it is called a *pyxidium*, as in pimpernel (*Anagallis arvensis*) (fig. 16), henbane and monkey-pot (*Lecythis*). The capsule assumes a screw-like form in *Helicteres*, and a star-like form in star-anise (*Illicium anisatum*). In certain instances the cells of the capsule separate from each other, and open with elasticity to scatter the seeds. This kind of capsule is met with in the sandbox tree (*Hura crepitans*) and other Euphorbiaceae, where the cocci, containing each a single seed, burst asunder with force; and in Geraniaceae, where the cocci, each containing, when mature, usually one seed, separate from the carpophore, become curved upwards by their adherent styles, and open by the ventral suture (fig. 18).

The *silique* is a dry syncarpous bilocular many-seeded fruit, formed from two carpels, with a false septum, dehiscing by two valves from below upwards, the valves separating from the placentas and leaving them united by the septum (fig. 32). The seeds are attached on both sides of the septum, either in one row or in two. When the fruit is long and narrow it is a *siliqua* (fig. 14); when broad and short, *silicula* (fig. 33). It occurs in cruciferous plants, as wallflower, cabbage and cress. In *Glaucium* and *Eschscholtzia* (Papaveraceae) the dissepiment is of a spongy nature. It may become transversely constricted (*lomentaceous*), as in radish (*Raphanus*) and sea-kale, and it may be reduced, as in woad (*Isatis*), to a one-seeded condition.

It sometimes happens that the ovaries of two flowers unite so as to form a double fruit (*syncarp*). This may be seen in many species of honeysuckle. But the fruits which are now to be considered consist usually of the floral envelopes, as well as the ovaries of several flowers united into one, and are called *multiple* or *confluent*. The term *anthocarpous* has also been applied as indicating that the floral envelopes as well as the carpels are concerned in the formation of the fruit.

The *sorosis* is a succulent multiple fruit formed by the confluence

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of a spike of flowers, as in the fruit of the pine-apple (fig. 34), the bread-fruit and jack-fruit. Similarly the fruit of the mulberry represents a catkin-like inflorescence.

The *syconus* is an anthocarpous fruit, in which the receptacle completely encloses numerous flowers and becomes succulent. The fig (fig. 4) is of this nature, and what are called its seeds are the achenes of the numerous flowers scattered over the succulent hollowed receptacle. In *Dorstenia* the axis is less deeply hollowed, and of a harder texture, the fruit exhibiting often very anomalous forms.

The *strobilus*, or *cone*, is a seed-bearing spike, more or less elongated, covered with scales, each of which may be regarded as representing a separate flower, and has often two seeds at its base; the seeds are naked, no ovary being present. This fruit is seen in the cones of firs, spruces, larches and cedars, which have received the

FIG. 32.

FIG. 33.

FIG. 34.

FIG. 32.—Honesty (*Lunaria biennis*), showing the septum after the carpels have fallen away.

From Strasburger's *Lehrbuch der Botanik*, by permission of Gustav Fischer.

FIG. 33.—Silicula or pouch of shepherd's purse (*Capsella*), opening by two folded valves, which separate from above downwards. The partition is narrow, hence the silicula is angustiseptal.

From Strasburger's *Lehrbuch der Botanik*, by permission of Gustav Fischer.

FIG. 34.—Fruit of the pine-apple (*Ananassa sativa*), developed from a spike of numerous flowers with bracts, united so as to form a collective or anthocarpous fruit. The crown of the pine-apple, *c*, consists of a series of empty bracts prolonged beyond the fruit.

name of Coniferae, or cone-bearers, on this account. Cone-like fruit is also seen in most Cycadaceae. The scales of the strobilus are sometimes thick and closely united, so as to form a more or less angular and rounded mass, as in the cypress; while in the juniper they become fleshy, and are so incorporated as to form a globular fruit like a berry. The dry fruit of the cypress and the succulent fruit of the juniper have received the name of *galbulus*. In the hop the fruit is called also a strobilus, but in it the scales are thin and membranous, and the seeds are not naked but are contained in pericarps.

The same causes which produce alterations in the other parts of the flower give rise to anomalous appearances in the fruit. The carpels, in place of bearing seeds, are sometimes changed into leaves, with lobes at their margins. Leaves are sometimes produced from the upper part of the fruit. In the genus *Citrus*, to which the orange and lemon belong, it is very common to meet with a separation of the carpels, so as to produce what are called horned oranges and fingered citrons. In this case a syncarpous fruit has a tendency to become apocarpous. In the orange we occasionally find a super-numerary row of carpels produced, giving rise to the appearance of small and imperfect oranges enclosed within the original one; the navel orange is of this nature. It sometimes happens that, by the union of flowers, double fruits are produced. Occasionally a double fruit is produced, not by the coalescence of two flowers, but by the abnormal development of a second carpel in the flower.

Arrangement of Fruits.

A. True fruits—developed from the ovary alone.

1. Pericarp not fleshy or fibrous.
   i. Indehiscent—not opening to allow the escape of the seeds—generally one-seeded. Achene; caryopsis; cypsela; nut; schizocarp.
   ii. Dehiscent—the pericarp splits to allow the escape of the seeds—generally many-seeded. Follicle; legume; siliqua; capsule.
2. Pericarp generally differentiated into distinct layers, one of which is succulent or fibrous. Drupe; berry.

B. Pseudocarps—the development extends beyond the ovary. Pome; syconus; sorosis.

The Seed.—The *seed* is formed from the ovule as the result of fertilization. It is contained in a seed-vessel formed from the ovary in the plants called *angiospermous*; while in *gymnospermous* plants, such as Coniferae and Cycadaceae, it is naked, or, in other words, has no true pericarp. It sometimes happens in Angiosperms, that the seed-vessel is ruptured at an early period of growth, so that the seeds become more or less exposed during their development; this occurs in mignonette, where the capsule opens at the apex, and in *Cuphea*, where the placenta bursts through the ovary and floral envelopes, and appears as an erect process bearing the young seeds. After fertilization the ovule is greatly changed, in connexion with the formation of the embryo. In the embryo-sac of most Angiosperms (*q.v.*) there is a development of cellular tissue, the endosperm, more or less filling the embryo-sac. In Gymnosperms (*q.v.*) the endosperm is formed preparatory to fertilization. The fertilized egg enlarges and becomes multicellular, forming the embryo. The embryo-sac enlarges greatly, displacing gradually the surrounding nucellus, which eventually forms merely a thin layer around the sac, or completely disappears. The remainder of the nucellus and the integuments of the ovules form the seed-coats. In some cases (fig. 35) a delicate inner coat or *tegmen* can be distinguished from a tougher outer coat or *testa*; often, however, the layers are not thus separable. The consistency of the seed-coat, its thickness, the character of its surface, &c., vary widely, the variations being often closely associated with the environment or with the means of seed-dispersal. An account of the development of the seed from the ovule will be found in the article ANGIOSPERMS. When the pericarp is dehiscent the seed-covering is of a strong and often rough character; but when the pericarp is indehiscent and encloses the seed for a long period, the outer seed-coat is thin and soft. The cells of the testa are often coloured, and have projections and appendages of various kinds. Thus in *Abrus precatorius* and *Adenanthera pavonina* it is of a bright red colour; in French beans it is beautifully mottled; in the almond it is veined; in the tulip

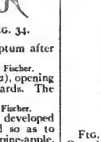

FIG. 35.

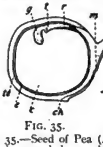

FIG. 36.

FIG. 35.—Seed of Pea (*Pisum*) with one cotyledon removed. *c*, Remaining cotyledon; *ch*, chalaza-point at which the nourishing vessels enter; *e*, tegmen or inner coat; *f*, funicle or stalk; *g*, plumule of embryo; *m*, micropyle; *pl*, placenta; *r*, radicle of embryo; *t*, tigellum or stalk between root and plumule; *te*, testa.

FIG. 36.—Seed of *Asclepias*, with a cluster of hairs arising from the edges of the micropyle.

and primrose it is rough; in the snapdragon it is marked with depressions; in cotton and *Asclepias* (fig. 36) it has hairs attached to it; and in mahogany, *Bignonia*, and the pines and firs it is expanded in the form of wing-like appendages (fig. 37). In *Collomia*, *Acacia dium*, *Cobaea scandens* and other seeds, it contains spiral cells, from which, when moistened with water, the fibres uncoil in a beautiful manner; and in flax (*Linum*) and others the cells are converted into mucilage. These structural peculiarities of the testa in different plants have relation to the scattering of the seed and its germination upon a suitable nidus. But in some plants the pericarps assume structures which subserve the same purpose; this especially occurs in small pericarps enclosing single seeds, as achenes, caryopsides, &c. Thus in Compositae and valerian, the pappose limb of the calyx forms a parachute to the pericarp; in Labiatae and some Compositae spiral cells are formed in the epicarp; and the epicarp is prolonged as a wing in *Fraxinus* (fig. 1) and *Acer* (fig. 21).

Sometimes there is an additional covering to the seed, formed after fertilization, to which the name *arillus* has been given (fig. 38). This is seen in the passion-flower, where the covering arises from the placenta or extremity of the funicle at the base of the ovule and passes upwards towards the apex, leaving the micropyle uncovered. In the nutmeg and spindle tree this additional coat is formed from above downwards, constituting in the former case a laciniated scarlet covering called *mace*. In such instances it has been called an *arillode* (fig. 39). This arillode, after growing downwards, may be reflected upwards so as to cover the micropyle. The fleshy scarlet covering formed around the naked seed in the yew is by some considered of the nature of an aril. On the testa, at various points, there are produced at times other cellular bodies, to which the name of *strophioles*, or *caruncles*, has been given, the seeds being strophiolate or carunculate. These tumours may occur near the base of the seed, as in *Polygala*, or at the apex, as in Castor-oil plant (*Ricinus*); or they may occur in the course of the raphe, as in blood-root (*Sanguinaria*) and *Asarabacca*. The funicles of the ovules frequently attain a great length in the seed, and in some magnolias, when the fruit dehisces, they appear as long scarlet cords suspending the seeds outside. The hilum or umbilicus of the seed is usually

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well marked, as a scar of varying size; in the calabar bean and in some species of *Mucuna* and *Dolichos* it extends along a large portion of the edge of the seed; it frequently exhibits marked colours, being black in the bean, white in many species of *Phaseolus*, &c. The *micropyle* (fig. 35, *m*) of the seed may be recognizable by the naked eye, as in the pea and bean tribe, *Iris*, &c., or it may be very minute or microscopic. It indicates the true apex of the seed, and is important as marking the point to which the root of the embryo is directed. At the micropyle in the bean is observed a small process of integument, which, when the young plant sprouts, is pushed up like a lid; it is called the *embryotega*. The chalaza (fig. 38, *ch*) is often of a different colour from the rest of the seed. In the orange (fig. 40) it is of a reddish-brown colour, and is easily recognized at one end of the seed when the integuments are carefully removed. In anatropal seeds the raphe forms a distinct ridge along one side of the seed (fig. 41).

The position of the seed as regards the pericarp resembles that of the ovule in the ovary, and the same terms are applied—erect, ascending, pendulous, suspended, curved, &c. These terms have no reference to the mode in which the fruit is attached to the axis. Thus the seed may be erect while the fruit itself is pendent, in the ordinary meaning of that term. The part of the seed next the axis or the ventral suture is its face, the opposite side being the back. Seeds exhibit great varieties of form. They may be flattened laterally (*compressed*), or from above downwards (*depressed*). They may be round, oval, triangular, polygonal, rolled up like a snail, as in *Physostemon*, or coiled up like a snake, as in *Ophiocaryon paradoxum*.

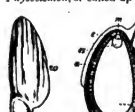

FIG. 37. FIG. 38. FIG. 39. FIG. 40. FIG. 41.

FIG. 37.—Seed of Pine (*Pinus*), with a membranous appendage to the testa, called a wing.

FIG. 38.—Young anatropal seed of the white Water-lily (*Nymphaea alba*), cut vertically. It is attached to the placenta by the funicle *f*, cellular prolongations from which form an aril *a a*. The vessels of the cord are prolonged to the base of the nucellus *n* by means of the raphe *r*. The base of the nucellus is indicated by the chalaza *ch*, while the apex is at the micropyle *m*. The covering of the seed is marked *i*. *n* is the nucellus or perisperm, enclosing the embryo-sac *es*, is which the endosperm is formed. The embryo *e*, with its suspensor, is contained in the sac, the radicle pointing to the micropyle *m*.

FIG. 39.—Arillode *a*, or false aril, of the Spindle-tree (*Euonymus*), arising from the micropyle *f*.

FIG. 40.—Anatropal seed of the Orange (*Citrus Aurantium*) opened to show the chalaza *c*, which forms a brown spot at one end.

FIG. 41.—Entire anatropal seed of the Orange (*Citrus Aurantium*), with its rugose or wrinkled testa, and the raphe *r* ramifying in the thickness of the testa on one side.

The endosperm formed in the embryo-sac of angiosperms after fertilization, and found previous to it in gymnosperms, consists of cells containing nitrogenous and starchy or fatty matter, destined for the nutriment of the embryo. It occupied the whole cavity of the embryo-sac, or is formed only at certain portions of it, at the apex, as in *Rhinanthus*, at the base, as in *Vaccinium*, or in the middle, as in *Veronica*. As the endosperm increases in size along with the embryo-sac and the embryo, the substance of the original nucellus of the ovule is gradually absorbed. Sometimes, however, as in Musaceae, Cannaceae, Zingiberaceae, no endosperm is formed; the cells of the original nucellus, becoming filled with food-materials for the embryo, are not absorbed, but remain surrounding the embryo-sac with the embryo, and constitute the *perisperm*. Again, in other plants, as Nymphaeaceae (fig. 38) and Piperaceae, both endosperm and perisperm are present. It was from observations on cases such as these that old authors, imagining a resemblance betwixt the plant-ovule and the animal ovum, applied the name *albumen* to the outer nutrient mass or perisperm, and designated the endosperm as *vitellus*. The term albumen is very generally used as including all the nutrient matter stored up in the seed, but it would be advisable to discard the name as implying a definite chemical substance. There is a large class of plants in which although at first after fertilization a mass of endosperm is formed, yet, as the embryo increases in size, the nutrient matter from the endospermic cells passes out from them, and is absorbed by the cells of the embryo plant. In the mature seed, in such cases, there is no separate mass of tissue containing nutrient food-material apart from the embryo itself. Such a seed is said to be *exalbuminous*, as in Compositae, Cruciferae and most Leguminosae (*e.g.* pea, fig. 35). When either endosperm or perisperm or both are present the seed is said to be *albuminous*.

The albumen varies much in its nature and consistence, and furnishes important characters. It may be farinaceous or mealy, consisting chiefly of cells filled with starch, as in cereal grains, where it is abundant; fleshy or cartilaginous, consisting of thicker cells which are still soft, as in the coco-nut, and which sometimes contain oil, as in the oily albumen of *Croton*, *Ricinus* and poppy; horny, when the cell-walls are slightly thickened and capable of distension, as in date and coffee; the cell-walls sometimes become greatly thickened, filling up the testa as a hard mass, as in vegetable ivory (*Phytelephas*). The albumen may be uniform throughout, or it may present a mottled appearance, as in the nutmeg, the seeds of Annonaceae and some Palms, where it is called *ruminated*. This mottled appearance is due to a protrusion of a dark lamella of the integument between folded protuberances of albumen. A cavity is sometimes left in the centre which is usually filled with fluid, as in the coco-nut. The relative size of the embryo and of the endosperm varies much. In Monocotyledons the embryo is usually small, and the endosperm large, and the same is true in the case of coffee and many other plants amongst Dicotyledons. The opposite is the case in other plants, as in the Labiatae, Plumbaginaceae, &c.

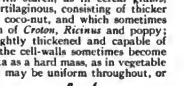

FIG. 42.—The dicotyledonous embryo of the Pea laid open. *c*, *c*, The two fleshy cotyledons, or seed-lobes, which remain under ground when the plant sprouts; *r*, the radicular extremity of the axis whence the root arises; *t*, the axis (hypocotyl) bearing the young stalk and leaves *g* (plumule), which lie in a depression of the cotyledons *f*.

The embryo consists of an axis bearing the *cotyledons* (fig. 42, *c*), or the first leaves of the plant. To that part of this axis immediately beneath the cotyledons the terms *hypocotyl*, *caulicle* or *tigellum* (*t*) have been applied, and continuous backwards with it is the young root or *radicle* (*r*), the descending axis, their point of union being the collar or neck. The terminal growing bud of the axis is called the *plumule* or *gemmule* (*g*), and represents the ascending axis. The radicular extremity points towards the micropyle, while the cotyledonary extremity is pointed towards the base of the ovule or the chalaza. Hence, by ascertaining the position of the micropyle and chalaza, the two extremities of the embryo can in general be discovered. It is in many cases difficult to recognize the parts in an embryo; thus in *Cuscuta*, the embryo appears as an elongated axis without divisions; and in *Caryocar* the mass of the embryo is made up by the radicular extremity and hypocotyl, in a groove of which the cotyledonary extremity lies embedded (fig. 52). In some monocotyledonous embryos, as in Orchidaceae, the embryo is a cellular mass showing no parts. In parasitic plants also which form no chlorophyll, as *Orobanche*, *Monotropa*, &c., the embryo remains without differentiation, consisting merely of a mass of cells until the ripening of the seed. When the embryo is surrounded by the endosperm on all sides except its radicular extremity it is internal (see figs. 19, 20); when lying outside the endosperm, and only coming into contact with it at certain points, it is external, as in grasses (*e.g.* wheat, fig. 22). When the embryo follows the direction of the axis of the seed, it is axile or axial (fig. 43); when it is not in the direction of the axis, it becomes abaxile or abaxial. In campylotropal seeds the embryo is curved, and in place of being embedded in endosperm, is frequently external to it, following the concavity of the seed (fig. 44), and becoming peripherical, with the chalaza situated in the curvature of the embryo, as in Caryophyllaceae.

It has been already stated that the radicle of the embryo is directed towards the micropyle, and the cotyledons to the chalaza. In some cases, by the growth of the integuments, the former is turned round so as not to correspond with the apex of the nucellus, and then the embryo has the radicle directed to one side, and is called excentric, as is seen in Primulaceae, Plantaginaceae and many palms, especially the date. The position of the embryo in different kinds of seeds varies. In an orthotropal seed the embryo is inverted or *antitropal*, the radicle pointing to the apex of the seed, or to the part opposite the hilum. Again, in an anatropal seed the embryo is erect or *homotropal* (fig. 43), the radicle being directed to the base of the seed. In curved or campylotropal seeds the embryo is folded so that its radicular and cotyledonary extremities are approximated, and it becomes *amphitropal* (fig. 44). In this instance the seed may be exalbuminous, and the embryo may be folded on itself; or albuminous, the embryo surrounding more or less completely the endosperm and being peripherical. According to the mode in which the seed is attached to the pericarp, the radicle may be directed upwards or downwards, or laterally, as regards the ovary. In an orthotropal seed attached to the base of the pericarp it is superior, as also in a suspended anatropal seed. In other anatropal seeds the radicle is inferior. When the seed is horizontal as regards the pericarp, the radicle is either centrifugal, when it points to the outer wall of the ovary; or centripetal, when it points to the axis or inner wall of the ovary. These characters are of value for purposes of classification, as they are often constant in large groups of genera.

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Plants in which there are two cotyledons produced in the embryo are *dicotyledonous*. The two cotyledons thus formed are opposite to each other (figs. 42 and 45), but are not always of the same size. Thus, in *Abronia* and other members of the order Nyctaginaceae, one of them is smaller than the other (often very small), and in *Carapa guianensis* there appears to be only one, in consequence of the intimate union which takes place between the two. The union between the cotyledonary leaves may continue after the young plant begins to germinate. Such embryos have been called *pseudomonocotyledonous*. The texture of the cotyledons varies. They may be thick, as in the pea (fig. 42), exhibiting no traces of venation, with their flat internal surfaces in contact, and their backs more or less convex; or they may be in the form of thin and delicate laminae, flattened on both sides, and having distinct venation, as in *Ricinus*, *Jatropha*, *Euonymus*, &c. The cotyledons usually form the greater part of the mature embryo, and this is remarkably well seen in such exalbuminous seeds as the bean and pea.

Cotyledons are usually entire and sessile. But they occasionally become lobed, as in the walnut and the lime; or petiolate, as in *Geranium molle*; or auriculate, as in the ash. Like leaves in the

FIG. 43.

FIG. 46.

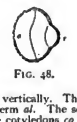

FIG. 47.

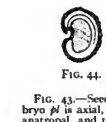

FIG. 44.

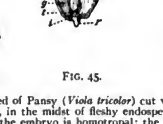

FIG. 45.

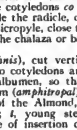

FIG. 48.

FIG. 43.—Seed of Pansy (*Viola tricolor*) cut vertically. The embryo *pl* is axial, in the midst of fleshy endosperm *al*. The seed is anatropal, and the embryo is homotropal; the cotyledons *co* point to the base of the nucellus or chalaza *ch*, while the radicle, or the other extremity of the embryo, points to the micropyle, close to the hilum *h*. The hilum or base of the seed, and the chalaza or base of the nucellus are united by means of the raphe *r*.

FIG. 44.—Seed of the Red Campion (*Lychnis*), cut vertically, showing the peripherical embryo, with its two cotyledons and its radicle. The embryo is curved round the albumen, so that its cotyledons and radicle both come near the hilum (*amphitropal*).

FIG. 45.—Mature dicotyledonous embryo of the Almond, with one of the cotyledons removed. *r*, Radicle; *s*, young stem or caulicle; *c*, one of the cotyledons left; *i*, line of insertion of the cotyledon which has been removed; *g*, plumule.

FIG. 46.—Exalbuminous seed of Wallflower (*Cheiranthus*) cut vertically. The radicle *r* is folded on the edges of the cotyledons *c* which are accumbent.

FIG. 47.—Transverse section of the seed of the Wallflower (*Cheiranthus*), showing the radicle *r* folded on the edges of the accumbent cotyledons *c*.

FIG. 48.—Transverse section of the seed of the Dame's Violet (*Hesperis*). The radicle *r* is folded on the back of the cotyledons *c*, which are said to be incumbent.

bud, cotyledons may be either applied directly to each other, or may be folded in various ways. In geranium the cotyledons are twisted and doubled; in convolvulus they are corrugated; and in the potato and in *Bunias*, they are spiral,—the same terms being applied as to the foliage leaves. The radicle and cotyledons are either straight or variously curved. Thus, in some cruciferous plants, as the wallflower, the cotyledons are applied by their faces, and the radicle (figs. 46, 47) is folded on their edges, so as to be lateral; the cotyledons are here *accumbent*. In others, as *Hesperis*, the cotyledons (fig. 48) are applied to each other by their faces, and the radicle, *r*, is folded on their back, so as to be dorsal, and the cotyledons are *incumbent*. Again, the cotyledons are *conduplicate* when the radicle is dorsal, and enclosed between their folds. In other divisions the radicle is folded in a spiral manner, and the cotyledons follow the same course.

In many gymnosperms more than two cotyledons are present, and they are arranged in a whorl. This occurs in Coniferae, especially in the pine, fir (fig. 49), spruce and larch, in which six, nine, twelve and even fifteen have been observed. They are linear, and resemble in their form and mode of development the clustered or fasciculated leaves of the larch. Plants having numerous cotyledons are termed *polycotyledonous*. In species of *Sireptocarpus* the cotyledons are permanent, and act the part of leaves. One of them is frequently largely developed, while the other is small or abortive.

In those plants in which there is only a single cotyledon in the embryo, hence called *monocotyledonous*, the embryo usually has a cylindrical form more or less rounded at the extremities, or elongated and fusiform, often oblique. The axis is usually very short compared with the cotyledon, which in general encloses the plumule by its lower portion, and exhibits on one side a small slit which indicates the union of the edges of the vaginal or sheathing portion of the leaf (fig. 50). In grasses, by the enlargement of the embryo in a particular direction, the endosperm is pushed on one side, and thus the embryo comes to lie outside at the base of the endosperm (figs. 22, 51). The lamina of the cotyledon is not developed. Upon the side of the embryo next the endosperm and enveloping it is a large shield-shaped body, termed the *scutellum*. This is an outgrowth from the base of the cotyledon, enveloping more or less the cotyledon

FIG. 49.

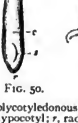

FIG. 50.

FIG. 51.

FIG. 52.

FIG. 49.—Polycotyledonous embryo of the Pine (*Pinus*) beginning to sprout. *t*, Hypocotyl; *r*, radicle. The cotyledons *c* are numerous. Within the cotyledons the primordial leaves are seen, constituting the plumule or first bud of the plant.

FIG. 50.—Embryo of a species of Arrow-grass (*Triglochin*), showing a uniform conical mass, with a slit *s* near the lower part. The cotyledon *c* envelops the young bud, which protrudes at the slit during germination. The radicle is developed from the lower part of the axis *r*.

FIG. 51.—Grain of Wheat (*Triticum*) germinating, showing (*b*) the cotyledon and (*c*) the rootlets surrounded by their sheaths (*coleorrhizae*).

FIG. 52.—Embryo of *Caryocar*. *t*, Thick hypocotyl, forming nearly the whole mass, becoming narrowed and curved at its extremity, and applied to the groove *s*. In the figure this narrowed portion is slightly separated from the groove; *c*, two rudimentary cotyledons.

and plumule, in some cases, as in maize, completely investing it; in other cases, as in rice, merely sending small prolongations over its anterior face at the apex. By others this scutellum is considered as the true cotyledon, and the sheathing structure covering the plumule is regarded as a ligule or axillary stipule (see GRASSES). In many aquatic monocotyledons (*e.g. Potamogeton*, *Ruppia* and others) there is a much-developed hypocotyl, which forms the greater part of the embryo and acts as a store of nutriment in germination; these are known as *macropodous* embryos. A similar case is that of *Caryocar* among Dicotyledons, where the swollen hypocotyl occupies most of the embryo (fig. 52). In some grasses, as oats and rice, a projection of cellular tissue is seen upon the side of the embryo opposite to the scutellum, that is, on the anterior side. This has been termed the *epiblast*. It is very large in rice. This by some was considered the rudimentary second cotyledon; but is now generally regarded as an outgrowth of the sheath of the true cotyledon. (A. B. R.)

FRUIT AND FLOWER FARMING. The different sorts of fruits and flowers are dealt with in articles under their own headings, to which reference may be made; and these give the substantial facts as to their cultivation. See also the article HORTICULTURE.

GREAT BRITAIN

The extent of the fruit industry may be gathered from the figures for the acreage of land under cultivation in orchards and small fruit plantations. The Board of Agriculture returns concerning the orchard areas of Great Britain showed a continuous expansion year by year from 199,178 acres in 1888 to 234,660 acres in 1901, as will be learnt from Table I. There was, it is true, an exception in 1892, but the decline in that year is explained by the circumstance that since 1891 the agricultural returns have been collected only from holdings of more than one acre, whereas they were previously obtained from all holdings of a quarter of an acre or more. As there are many holdings of less than an acre in extent upon which fruit is grown, and as fruit is largely raised also in suburban and other gardens which

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do not come into the returns, it may be taken for granted that the actual extent of land devoted to fruit culture exceeds that which is indicated by the official figures. In the Board of Agriculture returns up to June 1908, 308,000 acres are stated to be devoted to fruit cultivation of all kinds in Great Britain.

TABLE I.—*Extent of Orchards in Great Britain in each Year, 1887 to 1901.*

Year.	Acres.	Year.	Acres.	Year.	Acres.
1887	202,234	1892	208,950	1897	224,116
1888	199,178	1893	211,664	1898	226,059
1889	199,897	1894	214,187	1899	228,603
1890	202,305	1895	218,428	1900	232,129
1891	209,996	1896	221,254	1901	234,660

Table II. shows that the expansion of the orchard area of Great Britain is mainly confined to England, for it has slightly decreased in Wales and Scotland. The acreage officially returned as under orchards is that of arable or grass land which is also

TABLE II.—*Areas under Orchards in England, Wales and Scotland—Acres.*

Year.	England.	Wales.	Scotland.	Great Britain.
1896	215,642	3677	1935	221,254
1897	218,261	3707	2148	224,116
1898	220,220	3690	2149	226,059
1899	222,712	3666	2225	228,603
1900	226,164	3695	2270	232,129
1901	228,580	3767	2313	234,660
1908	244,430	3577	2290	250,297

used for fruit trees of any kind. Conditions of soil and climate determine the irregular distribution of orchards in Great Britain. The dozen counties which possess the largest extent of orchard land all lie in the south or west of the island. According to the returns for 1908 (excluding small fruit areas) they were the following:—

County.	Acres.	County.	Acres.	County.	Acres.
Kent .	32,751	Worcester .	23,653	Salop .	4685
Devon .	27,200	Gloucester .	20,424	Dorset .	4464
Hereford .	28,316	Cornwall .	5,415	Monmouth .	3934
Somerset .	25,279	Middlesex .	5,300	Wilts .	3630

Leaving out of consideration the county of Kent, which grows a greater variety of fruit than any of the others, the counties of Devon, Hereford, Somerset, Worcester and Gloucester have an aggregate orchard area of 124,872 acres. These five counties of the west and south-west of England—constituting in one continuous area what is essentially the cider country of Great Britain—embrace therefore rather less than half of the entire orchard area of the island, while Salop, Monmouth and Wilts have about 300 less than they had a few years ago. Five English counties have less than 1000 acres each of orchards, namely, the county of London, and the northern counties of Cumberland, Westmorland, Northumberland and Durham. Rutland has just over 100 acres. The largest orchard areas in Wales are in the two counties adjoining Hereford—Brecon with 1136 acres and Radnor with 727 acres; at the other extreme is Anglesey, with a decreasing orchard area of only 22 acres. Of the Scottish counties, Lanark takes the lead with 1285 acres, Perth, Stirling and Haddington following with 684 and 120 acres respectively. Ayr and Midlothian are the only other counties possessing 100 acres or more of orchards, whilst Kincardine, Orkney and Shetland return no orchard area, and Banff, Bute, Kinross, Nairn, Peebles, Sutherland and Wigtown return less than 10 acres each. It may be added that in 1908 Jersey returned 1090 acres of orchards, Guernsey, &c., 144 acres, and the Isle of Man, 121 acres; the two last-named places showing a decline as compared with eight years previously.

Outside the cider counties proper of England, the counties in which orchards for commercial fruit-growing have increased considerably in recent years include Berks, Buckingham, Cambridge, Essex, Lincoln, Middlesex, Monmouth, Norfolk, Oxford, Salop, Sussex, Warwick and Wilts. Apples are the principal fruit grown in the western and south-western counties, pears also being fairly common. In parts of Gloucestershire, however, and in the Evesham and Pershore districts of Worcestershire, plum orchards exist. Plums are almost as largely grown as apples in Cambridgeshire. Large quantities of apples, plums, damsons, cherries, and a fair quantity of pears are grown for the market in Kent, whilst apples, plums and pears predominate in Middlesex. In many counties damsons are cultivated around fruit plantations to shelter the latter from the wind.

Of small fruit (currants, gooseberries, strawberries, raspberries, &c.) no return was made of the acreage previous to 1888, in which year it was given as 36,724 acres for Great Britain. In 1889 it rose to 41,933 acres.

Later figures are shown in Table III. It will be observed that, owing to corrections made in the enumeration in 1897, a consider-

TABLE III.—*Areas of Small Fruit in Great Britain.*

Year.	Acres.	Year.	Acres.	Year.	Acres.
1890	46,234	1894	68,415	1898	69,753
1891	58,704	1895	74,547	1899	71,526
1892	62,148	1896	76,245	1900	73,780
1893	65,487	1897	69,792	1901	74,999

able reduction in the area is recorded for that year, and presumably the error then discovered existed in all the preceding returns. The returns for 1907 gave the acreage of small fruit as 82,175 acres, and in 1908 at 84,880 acres—an area more than double that of 1889.

There has undoubtedly been a considerable expansion, rather than a contraction, of small fruit plantations since 1896. The acreage of small fruit in Great Britain is about one-third that of the orchards. As may be seen in Table IV., it is mainly confined to England, though Scotland has over 4000 more acres of small

TABLE IV.—*Areas under Small Fruit in England, Wales and Scotland—Acres.*

Year.	England.	Wales.	Scotland.	Great Britain.
1898	63,438	1044	5271	69,753
1899	64,867	1106	5553	71,526
1900	66,749	1109	5922	73,780
1901	67,828	1092	6079	74,999
1908	75,750	1200	7930	84,880

fruit than of orchards. About one-third of the area of small fruit in England belongs to Kent alone, that county having returned 24,137 acres in 1908. Cambridge now ranks next with 6878 acres, followed by Norfolk with 5876 acres, Worcestershire with 4852 acres, Middlesex with 4163 acres, Hants with 3320 acres and Essex with 2150 acres. It should be remarked that between 1900 and 1908 Cambridgeshire had almost doubled its area of small fruits, from 3720 to 6878 acres; whilst both Norfolk and Worcestershire in 1908 had larger areas devoted to small fruits than Middlesex—in which county there had been a decrease of about 400 acres during the same period. The largest county area of small fruit in Wales is 806 acres in Denbighshire, and in Scotland 2791 acres in Perthshire, 2259 acres in Lanarkshire, followed by 412 acres in Forfarshire. The only counties in Great Britain which make no return under the head of small fruit are Orkney and Shetland; and Sutherland only gives 2½ acres. It is hardly necessary to say that considerable areas of small fruit, in kitchen gardens and elsewhere, find no place in the official returns, which, however, include small fruit grown between and under orchard trees.

Gooseberries are largely grown in most small fruit districts. Currants are less widely cultivated, but the red currant is more extensively grown than the black, the latter having suffered seriously from the ravages of the black currant mite. Kent is the great centre for raspberries and for strawberries, though, in addition, the latter fruit is largely grown in Cambridgeshire (2411 acres), Hampshire (2327 acres), Norfolk (2067 acres) and Worcestershire (1273 acres). Essex, Lincolnshire, Cheshire,

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Cornwall and Middlesex each has more than 500 acres devoted to strawberry cultivation.

The following statement from returns for 1908 shows the area under different kinds of fruit in 1907 and 1908 in Great Britain, and also whether there had been an increase or decrease:

	1907.	1908.	Increase or Decrease.
	Acres.	Acres.	Acres.
Small Fruit—			
Strawberries . .	27,827	28,815	+ 988
Raspberries . .	8,878	9,323	+ 445
Currants and Gooseberries . .	25,590	26,241	+ 651
Other kinds . .	19,880	20,501	+ 621
	82,175	84,880	+2705
Orchards—			
Apples	172,643	172,751	+ 108
Pears	8,911	9,603	+ 693
Cherries . . .	12,027	11,868	− 159
Plums	14,901	15,683	+ 782
Other kinds .	41,694	40,391	−1303
	250,176	250,297	+ 121

It appears from the Board of Agriculture returns that 27,433 acres of small fruit was grown in orchards, so that the total extent of land under fruit cultivation in Great Britain at the end of 1908 was about 308,000 acres.

There are no official returns as to the acreage devoted to orchard cultivation in Ireland. The figures relating to small fruit, moreover, extend back only to 1899, when the area under this head was returned as 4809 acres, which became 4359 acres in 1900 and 4877 acres in 1901. In most parts of the country there are districts favourable to the culture of small fruits, such as strawberries, raspberries, gooseberries and currants, and of top fruits, such as apples, pears, plums and damsons. The only localities largely identified with fruit culture as an industry are the Drogheda district and the Armagh district. In the former all the kinds named are grown except strawberries, the speciality being raspberries, which are marketed in Dublin, Belfast and Liverpool. In the Armagh district, again, all the kinds named are grown, but in this case strawberries are the speciality, the markets utilized being Richhill, Belfast, and those in Scotland. In the Drogheda district the grower bears the cost of picking, packing and shipping, but he cannot estimate his net returns until his fruit is on the market. Around Armagh the Scottish system prevails—that is, the fruit is sold while growing, the buyer being responsible for the picking and marketing.

The amount of fruit imported into the United Kingdom has such an important bearing on the possibilities of the industry that the following figures also may be useful:

The quantities of apples, pears, plums, cherries and grapes imported in the raw condition into the United Kingdom in each year, 1892 to 1901, are shown in Table V. Previous to 1892 apples only were separately enumerated. Up to 1899 inclusive the quantities were given in bushels, but in 1900 a change was made to hundredweights. This renders the quantities in that and subsequent years not directly comparable with those in earlier years, but the comparison of the values, which are also given in the table, continues to hold good. The figures for 1908 have been added to show the increase that had taken place. In some years the value of imported apples exceeds the aggregate value of the pears, plums, cherries and grapes imported. The extreme values for apples shown in the table are £844,000 in 1893 and £2,079,000 in 1908. Grapes next to apples in point of value, and over the seventeen years the amount ranged between £394,000 in 1892 and £728,000 in 1908. On the average, the annual outlay on imported pears is slightly in excess of that on plums. The extremes shown are £167,000 in 1895 and £515,000 in 1908. In the case of plums, the smallest outlay tabulated is £166,000 in 1895, whilst the largest is £498,000 in 1897. The amounts expended upon imported cherries varied between £96,000 in 1895 and £208,000 in 1900. In 1900 apricots and peaches, imported raw, previously included with raw plums, were for the first time separately enumerated, the import into the United Kingdom for that year amounting to 13,689 cwt., valued at £25,846; in 1901 the quantity was 13,463 cwt. and the value £32,350. The latter rose in 1908 to £60,000. In 1900, also, currants, gooseberries and strawberries, hitherto included in unenumerated raw fruit, were likewise for the first time separately returned. Of raw currants the import was 64,462 cwt., valued at £97,170 (1908, £121,850); of raw gooseberries 26,045 cwt., valued at £14,626 (1908, £25,520); and of raw strawberries, 52,225 cwt., valued at £85,949. In 1907 only 44,000 cwt. of strawberries were imported. In 1901 the quantities and values were respectively—currants, 70,402 cwt.,

TABLE V.—*Imports of Raw Apples, Pears, Plums, Cherries and Grapes into the United Kingdom, 1892 to 1901. Quantities in Thousands of Bushels (thousands of cwt. in 1900 and 1901). Values in Thousands of Pounds Sterling.*

Year.	Quantities.				
	Apples.	Pears.	Plums.	Cherries.	Grapes.
1892	4515	637	413	217	762
1893	3460	915	777	346	979
1894	4969	1310	777	311	833
1895	3292	407	401	196	865
1896	6177	483	560	219	883
1897	4200	1052	1044	312	994
1898	3459	492	922	402	1136
1899	3861	572	558	281	1158
1900	2129 [1]	477 [1]	423 [1]	243 [1]	593 [1]
1901	1830 [1]	349 [1]	264 [1]	213 [1]	680 [1]
	Values.				
1892	1354	297	200	135	394
1893	844	347	332	195	530
1894	1389	411	302	167	470
1895	960	167	166	96	487
1896	1582	207	242	106	443
1897	1187	378	498	178	495
1898	1108	222	435	231	550
1899	1186	266	294	154	588
1900	1225	367	393	208	595
1901	1183	296	244	214	695
1908	2079	515	428	235	728

[1] Thousands of cwts.

£75,308; gooseberries, 21,735 cwt., £11,420; strawberries, 38,604 cwt., £51,290. Up to 1899 the imports of tomatoes were included amongst unenumerated raw vegetables, so that the quantity was not separately ascertainable. For 1900 the import of tomatoes was 833,031 cwt., valued at £792,359, which is equivalent to a fraction under 2¼d. per lb. For 1901 the quantity was 793,991 cwt., and the value £734,051; for 1906, there were 1,124,700 cwt., valued at £953,475; for 1907, 1,135,499 cwt., valued at £1,020,805; and for 1908, 1,160,283 cwt., valued at £955,983.

In 1908 the outlay of the United Kingdom upon imported raw fruits, such as can easily be produced at home, was £4,195,654, made up as follows:

Apples	£2,079,703	Plums	£428,966
Grapes	728,026	Currants	121,852
Pears	515,914	Apricots and peaches	60,141
Cherries . . .	235,523	Gooseberries .	25,529

In addition about £280,000 was spent upon "unenumerated" raw fruit, and £560,000 on nuts other than almonds "used as fruit," which would include walnuts and filberts, both produced at home. It is certain, therefore, that the expenditure on imported fruits, such as are grown within the limits of the United Kingdom, exceeds four millions sterling per annum. The remainder of the outlay on imported fruit in 1908, amounting to over £5,000,000, was made up of £2,269,651 for oranges, £471,713 for lemons, £1,769,249 for bananas, and £560,301 for almond-nuts; these cannot be grown on an industrial scale in the British Isles.

It may be interesting to note the source of some of these imported fruits. The United States and Canada send most of the apples, the quantity for 1907 being 1,413,000 cwt. and 1,588,000 cwt. respectively, while Australia contributes 280,000 cwt. Plums come chiefly from France (200,000 cwt.), followed with 38,000 cwt. from Germany and 28,000 cwt. from the Netherlands. Pears are imported chiefly from France (204,000 cwt.) and Belgium (176,000); but the Netherlands send 52,000 cwt., and the United States 24,000 cwt. The great bulk of imported tomatoes comes from the Canary Islands, the quantity in 1907 being 624,692 cwt. The Channel Islands also sent 223,800 cwt., France 115,500 cwt., Spain 169,000 cwt., and Portugal a long way behind with 11,700 cwt. Most of the strawberries imported come from France (33,800 cwt.) and the Netherlands (10,300 cwt.).

Fruit-growing in Kent.—Kent is by far the largest fruit-growing county in England. For centuries that county has been famous for its fruit, and appears to have been the centre for the distribution of trees and grafts throughout the country. The cultivation

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of fruit land upon farms in many parts of Kent has been a prominent feature in its agriculture. An excellent description of this noteworthy characteristic of Kentish farming is contained in a comprehensive paper on the agriculture of Kent by Mr Charles Whitehead,[1] whose remarks, with various additions and modifications, are here reproduced.

Where the conditions are favourable, especially in East and Mid Kent, there is a considerable acreage of fruit land attached to each farm, planted with cherry, apple, pear, plum and damson trees, and with bush fruits, or soft fruits as they are sometimes called, including gooseberries, currants, raspberries, either with or without standard trees, and strawberries, and filberts and cob-nuts in Mid Kent. This acreage has largely increased, and will no doubt continue to increase, as, on the whole, fruit-growing has been profitable and has materially benefited those fortunate enough to have fruit land on their farms. There are many cultivators who grow nothing but fruit. These are principally in the district of East Kent, between Rochester and Canterbury, and in the district of Mid Kent near London, and they manage their fruit land, as a rule, better than farmers, as they give their undivided attention to it and have more technical knowledge. But there has been great improvement of late in the management of fruit land, especially of cherry and apple orchards, the grass of which is fed off by animals having corn or cake, or the land is well manured. Apple trees are grease-banded and sprayed systematically by advanced fruit growers to prevent or check the attacks of destructive insects. Far more attention is being paid to the selection of varieties of apples and pears having colour, size, flavour, keeping qualities, and other attributes to meet the tastes of the public and of consumers, with the beautiful fruit that comes from the United States and Canada.

Of the various kinds of apples at present grown in Kent mention should be made of Mr Gladstone, Beauty of Bath, Devonshire Quarrenden, Lady Sudeley, Yellow Ingestrie, Worcester Pearmain. These are dessert apples ready to pick in August and September, and are not stored. For storing, King of the Pippins, Cox's Orange Pippin (the best dessert apple in existence), Cox's Pomona, Duchess, Favourite, Lascoyne's Seedling, Court Pendu Plat, Wellington, Old Red Reinette, Allington Pippin, Duke of Devonshire and Blenheim Orange. Among kitchen apples for selling straight from the trees the most usually planted are Lord Grosvenor, Lord Suffield, Keswick Codlin, Early Julian, Ecclinville Seedling, Potts Seedling, Early Rivers, Gascoigne, Golden Spire, Sterling Castle and Dominie, for storing, the cooking sorts favoured now are Stone's or Loddington, Warner's King, Wellington, Lord Derby, Queen Caroline, Tower of Glamis, Winter Quecning, Lucombe's Seedling, Bismarck, Bramley's Seedling, Eden Nodo and Prince Arthur. Pyramid trees of apples will flourish equally as standards, pyramids and bushes. Among pears are Hessle, Clapp's Favourite, William's Bon Chrétien, Beurré de Capaumont, Fertility, Beurré Riche, Chissel, Beurré Clairgeau, Louise Bonne of Jersey, Doyenné du Comice and Vicar of Winkfield. Among plums, Rivers's Early Prolific, Tsar, Belgian Purple, Black Diamond, Kentish Bush Plum, Pond's Seedling, Magnum Bonum and Victoria are mainly cultivated. The damson known as Farleigh Prolific, or Crittenden's, is now planted throughout the county, and usually yields large crops, which make good prices. As a case in point, purchasers were offering to contract for quantities of this damson at £20 per ton in May of 1899, as the prospects of the yield were unsatisfactory. On the other hand, in one year some years when the crop was abnormally abundant, some of the fruit barely paid the expenses of sending to market. The varieties of cherries most frequently grown are Governor Wood, Knight's Early Black, Frogmore Bigarreau, Black Eagle, Elton, Amberheart, Bigarreau, Napoleon Bigarreau and Turk. A variety of cherry known as the Kentish cherry, of a light red colour and fine subacid flavour, is much grown in Kent for drying and cooking purposes. Another cherry, similar in colour and quality, which comes rather late, known as the Flemish, is also much cultivated in Kent, as is the very dark red large Morello, used for making cherry brandy. These three varieties are grown extensively as pyramids, and the last-named also on walls and sides of buildings. Sometimes the cherry crop is sold by auction to dealers, who pick, pack and consign the fruit to market. Large prices are often made, as much as £80 per acre being not uncommon. The crop on a large cherry orchard in Mid Kent has been sold for more than £100 per acre.

Where old standard trees have been long neglected and have become overgrown by mosses and lichens, the attempts made to improve them seldom succeed. The introduction of bush fruit trees dwarfed by grafting on the Paradise stock has been of much advantage to fruit cultivators, as they come into bearing in two or three years, and are more easily cultivated, pruned, sprayed and picked than standards. Many plantations of these bush trees have been formed in Kent of apples, pears and plums. Half standards and pyramids have also been planted of these fruits, as well as of cherries. Bushes of gooseberries and currants, and clumps or stools of raspberry canes, have been planted to a great extent in many parts of the East and Mid divisions of Kent, but not much in the Weald, where apples are principally grown. Sometimes fruit bushes are put in alternate rows with bush or standard trees of apple, pear, plum or damson, or they are planted by themselves. The distances apart for planting are generally for cherry and apple trees on grass 30 ft. by 30 ft.; for standard apples and pear trees from 20 ft. to 24 ft. upon arable land, with bush fruit, as gooseberries and currants, under them. These are set 6 ft. by 6 ft. apart, and 5 ft. by 2 ft. for raspberries, and strawberries 2 ft. 6 in. to 3 ft. by 1 ft. 6 in. to 1 ft. 3 in. apart. On some fruit farms bush or dwarf trees of apples, pears, plums, are planted alone, at distances varying from 8 ft. to 10 ft. apart, giving from 485 to 680 bush trees per acre, nothing being grown between them except perhaps strawberries or vegetables during the first two or three years. It is believed that this is the best way of ensuring fruit of high quality and colour. Another arrangement consists in putting standard apple or pear trees 30 ft. apart (48 trees per acre), and setting bush trees of apples or pears 15 ft. apart between them; these latter come quickly into bearing, and are removed when the standards are fully grown. Occasionally gooseberry or currant bushes, or raspberry canes or strawberry plants, are set between the bush trees, and taken away directly they interfere with the growth of these. Half standard apple or plum trees are set triangularly 15 ft. apart, and strawberry plants at a distance of 14 ft. from plant to plant and 2½ ft. from row to row. Or currant or gooseberry bushes are set between the half standards, and strawberry plants between these.

These systems involve high farming. The manures used are London stable manure, where hops are not grown, and bone meal, superphosphate, rags, shoddy, wool-waste, fish refuse, nitrate of soda, kainit and sulphate of ammonia. Where hops are grown the London manure is wanted for them. Fruit plantations are always dug by hand with the Kent spud. Fruit land is never ploughed, as in the United States and Canada. The soil is levelled down with the "Canterbury" hoe, and then the plantations are kept free from weeds with the ordinary draw or "plate" hoe. The best fruit farmers make their fruit trees regularly and early spring, and continue until the blossoms come out, with quassia and soft soap and paraffin emulsions, and a very few with Paris green only, where there is no under fruit, in order to prevent and check the constant attacks of the various caterpillars and other insect pests. This is a costly and laborious process, but it pays well on the whole, as a rule. The fallacy that fruit trees on grass land require no manure, and that the grass may be allowed to grow up to their trunks without any harm, is exploding, and many fruit farmers are well manuring their grass orchards and removing the grass for some distance round the stems, particularly where the trees are young.

Strawberries are produced in enormous quantities in the northern part of the Mid Kent district round the Crays, and from thence to Orpington and also near Sandwich, and in the extreme east at Maidstone. Raspberry canes have been extensively put in during the last few years, and in some seasons yield good profits. There is a very great and growing demand for all soft fruits for jam-making, and prices are fairly good, taking an average of years, notwithstanding the heavy importations from France, Belgium, Holland, Spain and Italy. The extraordinary increase in the national demand for jam and other fruit preserves has been of great benefit to Kent fruit producers. The cheapness of duty-free sugar, as compared with sugar paying duty in the United States and other large fruit-producing countries, afforded one of the very few advantages possessed by British cultivators, but the reimposition of the sugar duty in the United Kingdom in 1901 has modified the position in this respect. Jam factories were established in several parts of Kent about 1880 or 1890, but most of them collapsed either from want of capital or from bad management. There are still a few remaining, principally in connexion with large fruit farms. One of these is at Swanley, whose energetic owner farms nearly 2000 acres of fruit land in Kent. The fruit grown by them that will not make satisfactory prices in a fresh raw state is made into jam, or if time presses it is first made into pulp, and kept until the opportunity comes for making it into jam. In this factory there are fifteen steam-jacketed vats in one row, and six others for candied peel. A season's output on a recent occasion comprised about 3500 tons of jam, 850 tons of candied peel and 750 gross (108,000 bottles) of bottled fruit. A great deal of the fruit preserved is purchased, while much of that grown on the farms is sold. A strigging machine is employed, which does as much work as fifty women in taking currants off their strigs or stalks. Black currant pulp is stored in casks till winter, when there is time to convert it into jam. Strawberries are pulped to advantage, but it is otherwise with raspberries, the pulp of which is largely made. Apricots for jam are obtained chiefly from France and Spain. There is another flourishing factory near Sittingbourne worked on the same lines, and here is very advantageous to fruit farmers to join factories in connexion with their farms or to have them near, as they can thoroughly grade their fruit, and send only the best to market, thus ensuring a high reputation for its quality. Carriage is saved, which is a serious charge, though railway rates from Kent to the great manufacturing towns and to Scotland are very much less proportionally than those to London, and consequently Kent growers send increasing quantities to these distant markets, where prices are better, not being so directly interfered with by imported fruit, which generally finds its way to London.

Kentish fruit-growers are becoming more particular in picking,

[1] *Jour. Roy. Agric. Soc.*, 1899.

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grading, packing and storing fruit, as well as in marketing it. A larger quantity of fruit is now carefully stored, and sent to selected markets as it ripens, or when there is an ascertained demand, as it is found that if it is consigned to market direct from the trees there must frequently be forced sales and competition with foreign fruit that is fully matured and in good order. It was customary formerly for Kentish growers to consign all their fruit to the London markets; now a good deal of it is sent to Manchester, Birmingham, Liverpool, Sheffield, Newcastle and other large towns. Some is also sent to Edinburgh and Glasgow. Many large growers send no fruit to London now. It is by no means uncommon for growers to sell their fruit crops on the trees or bushes by auction or private treaty, or to contract to supply a stipulated quantity of specified fruit, say of currants, raspberries or strawberries, to jam manufacturers. There is a considerable quantity of fruit, such as grapes, peaches, nectarines, grown under glass, and this kind of culture tends to increase.

Filberts and cob-nuts are a special product of Kent, in the neighbourhood of Maidstone principally, and upon the Ragstone soils, certain conditions of soil and situation being essential for their profitable production. A part of the filbert and cob-nut crop is picked green in September, as they do well for dessert, though their kernels are not large or firm, and it pays to sell them green, as they weigh more heavily. One grower in Mid Kent has 100 acres of nuts, and has grown 100 tons in a good year. The average price of late years has been about 5d. per lb, which would make the gross return of the 100 acres amount to £166. Kentish filberts have long been of preverbial for their excellence. Cobs are larger and look better for dessert, though their flavour is not so fine. They are better croppers, and are now usually planted. This cultivation is not much extending, as it is not being believed the trees come into full bearing. The London market is supplied entirely with these nuts from Kent, and there is some demand in America for them. Filbert and cob trees are most closely pruned. All the year's growth is cut away except the very finest young wood, which the trained eye of the tree-cutter sees at a glance is blossom-bearing. The trees are kept from 5½ to 7 ft. high upon stems from 1½ to 2 ft. high, and are trained so as to form a cup of from 7 to 8 ft. in diameter.

There seems no reason to expect any decrease in the acreage of fruit land in Kent, and if the improvement in the selection of varieties and in the general management continues it will yet pay. A hundred years ago every one was grubbing fruit land in order that hops might be planted, and for this many acres of splendid cherry orchards were sacrificed. Now the disposition is to grub hop plants and substitute apples, plums, or small fruit or cherry trees.

Fruit-growing in other Districts.—The large fruit plantations in the vicinity of London are to be found mostly in the valley of the Thames, around such centres as Brentford, Isleworth, Twickenham, Heston, Hounslow, Cranford and Southall. All varieties of orchard trees, but mostly apples, pears, and plums and small fruit, are grown in these districts, the nearness of which to the metropolitan fruit market at Covent Garden is of course an advantage. Some of the orchards are old, and are managed on modern principles. They contain, moreover, varieties of fruit many of which are out of date and would not be employed in establishing new plantations. In the better-managed grounds the antiquated varieties have been removed, and their places taken by newer and more appreciated types. In addition to apples, pears, plums, damsons, cherries and quinces as top fruit, currants, gooseberries and raspberries are grown as bottom fruit. Strawberries are extensively grown in some of the localities, and in favourable seasons outdoor tomatoes are ripened and marketed.

Fruit is extensively grown in Cambridgeshire and adjacent counties in the east of England. A leading centre is Cottenham, where the Lower Greensand crops out and furnishes one of the best of soils for fruit-culture. In Cottenham about a thousand acres are devoted to fruit, and nearly the same acreage to asparagus, which is, however, giving place to fruit. Currants, gooseberries and strawberries are the most largely grown, apples, plums and raspberries following. Of varieties of plums the Victoria is first in favour, and then Rivers's Early Prolific, Tsar and Gisborne. London is the chief market, as it receives about half the fruit sent away, whilst a considerable quantity goes to Manchester, and some is sent to a neighbouring jam factory at Histon, where also a moderate acreage of fruit is grown. Another fruit-growing centre in Cambridgeshire is at Willingham, where—besides plums, gooseberries and raspberries—outdoor tomatoes are a feature. Greengages are largely grown near Cambridge. Wisbech is the centre of an extensive fruit district, situated partly in Cambridgeshire and partly in Norfolk. Gooseberries, strawberries and raspberries are largely grown, and as many as 80 tons of the first-named fruit have been sent away from Wisbech station in a single day. In the fruit-growing localities of Huntingdonshire apples, plums and gooseberries are the most extensively grown, but pears, greengages, cherries, currants, strawberries and raspberries are also cultivated. As illustrating variations in price, it may be mentioned that about the year 1880 the lowest price for gooseberries was £10 per ton, whereas it has since been down to £4. Huntingdonshire fruit is sent chiefly to Yorkshire, Scotland and South Wales, but railway freights are high.

Essex affords a good example of successful fruit-farming at Tiptree Heath, near Kelvedon, where under one management about 260 acres out of a total of 360 are under fruit. The soil, a stiff loam, grows strawberries to perfection, and 165 acres are allotted to this fruit. The other principal crops are 43 acres of raspberries and 30 acres of black currants, besides which there are small areas of red currants, gooseberries, plums, damsons, greengages, cherries, apples, quinces and blackberries. The variety of strawberry known as the Small Scarlet is a speciality here, and it occupies 55 acres, as it makes the best of jam. The Paxton, Royal Sovereign and Noble are the varieties also grown. Strawberries stand for six or seven years on this farm, and begin to yield well when two years old. A jam factory is worked in conjunction with the fruit farm. Pulp is not made except when there is a glut of fruit. Perishable fruit intended for the finest fruit preserves is never held over after it is gathered. The picking of strawberries begins at 4 A.M., and the first for is made into jam by 6 A.M.

Hampshire, like Cambridgeshire and Norfolk, are the only counties in which the area of small fruit exceeds that of orchards. The returns for 1908 show that Hampshire had 3320 acres of small fruit to 2236 acres of orchards; Cambridge had 6878 acres of small fruit to 5221 of orchards; and Norfolk had 5876 acres of small fruit against 5188 acres of orchards. Compared with twenty years previously, the acreage of small fruit had trebled. This is largely due in Hampshire to the extension of strawberry culture in the Southampton district, where the industry is in the hands of many small growers, few of whom cultivate more than 20 acres each. Sarisbury and Botley are two of the leading parishes in which the business is carried on. Most of the strawberry holdings are from half an acre to 5 acres in extent, a few are from 5 to 10 acres, fewer still from 10 to 20 acres and only half-a-dozen over that limit. Runners from one-year plants are used for planting, being found more fruitful than those from older plants. Peat-moss manure from London stables is much used, but artificial manures are also employed with good results. Shortly after flowering the plants are bedded down with straw at the rate of about 25 cwt. per acre. Picking begins some ten days earlier than in Kent at a date between 1st and 15th June. The first week's gathering is sent mostly to London, but subsequently the greater part of the fruit goes to the Midlands and to Scotland and Ireland.

In recent years fruit-growing has much increased in South Worcestershire, in the vicinity of Evesham and Pershore. Handlights are freely used in the market gardens of this district for the protection of cucumbers and vegetable marrows, besides which tomatoes are extensively grown for the early market. At one time egg plum and the Worcester damson were the chief fruit crops, apples and cherries ranking next, pears being grown to only a moderate extent. According to the 1908 returns, however, apples come first, plums second, cherries third and cherries fourth. A fairly prolific annual bearing tree of the Damascene or Worcester damson will yield from 400 to 500 lb of fruit. There is a tendency to grow plum trees in the bush shape, as they are less liable than standards to injury from wind. The manures used include soot, fish guano, blood manure and phosphates—basic slag amongst the last named. In the Pershore district, where there is a jam factory, plums are the chief tree fruit, whilst most of the orchard apples and pears are grown for cider and perry. Gooseberries are a feature, as are also strawberries, red and black currants, and a few acres of filberts, but raspberries are little grown. The soil, a strong or medium loam of fair depth, resting on clay, is so well adapted to plums that trees live for fifty years. In order to check the ravages of the winter moth, plum and apple trees are greased-banded at the beginning of October and again at the end of March. The trees are also sprayed when necessary with insecticidal solutions. Pruning is done in the autumn. An approved distance apart at which to grow plum trees is 12 ft. by 12 ft. In the Earl of Coventry's Croome Court, 40 acres in extent, plums and apples are planted alternately, the bottom fruit being black currants, which are less liable to injury from birds than are red currants or gooseberries. Details concerning the methods of cultivation of fruit-trees and bushes in various parts of England, Scotland and Ireland, grown, the expenditure involved, and allied matters, will be found in Mr W. E. Bear's papers in the *Journal of the Royal Agricultural Society* in 1898 and 1899.

Again altogether from market gardening and commercial fruit-growing, it must be borne in mind that an enormous business is done in the raising of young fruit-trees every year. Hundreds of thousands of apples, pears, plums, cherries, peaches, nectarines and apricots are budded or grafted each year on suitable stocks. They are trained in various ways, and are usually fit for sale the third year. These young trees replace old ones in private and commercial gardens, and are also used to establish new plantations in different parts of the kingdom.

The Woburn Experimental Fruit Farm.—The establishment in 1804 of the experimental fruit farm at Ridgmont, near Woburn, Beds, has exercised a healthy influence upon the progress and development of fruit-farming in England. The farm was founded and carried on by the public-spirited enterprise of the Duke of Bedford and Mr Spencer U. Pickering, the latter acting as director. The main object of the experimental station was "to ascertain facts relative to the culture of fruit, and to increase our knowledge of, and to improve our practice in, this industry." The farm is 20 acres in extent, and occupies a field which up to June 1894 had been used as

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arable land for the ordinary rotation of farm crops. The soil is a sandy loam 9 or 10 in. deep, resting on a bed of Oxford Clay. Although it contains a large proportion of sand, the land would generally be termed very heavy, and the water often used to stand on it in places for weeks together in a wet season. The tillage to which the ground was subjected for the purposes of the fruit farm much improved its character, and in dry weather it presents as good a tilth as could be desired. Chemical analyses of the soil from different parts of the field show such wide differences that it is admitted to be by no means an ideal one for experimental purposes. Without entering further into further details, it may be useful to give a summary of the chief results obtained.

Apples have been grown and treated in a variety of ways, but of the different methods of treatment careless planting, coupled with subsequent neglect, has given the most adverse results, the crop of fruit being not 5% of that from trees grown normally. Of the separate deleterious items constituting total neglect, by far the most effective was the growth of weeds on the surface; careless planting, absence of manure, and the omission of trenching all had comparatively little influence on the results. A set of trees that had been carelessly planted and neglected, but subsequently tended in the early part of 1896, were in the autumn of that year only 10% behind their normally-treated neighbours, thus demonstrating that the response to proper attention is prompt. The growth of grass around young apple trees produced a very striking effect, the injury being much greater than that due to weeds. It is possible, however, that in wet years the ill-effects of both grass and weeds would be less than in dry seasons. Nevertheless, the grass-grown trees, after five years, were scarcely bigger than when planted, and the actual increase in weight which they showed during that time was about eighteen times smaller than in the case of similar trees in tilled ground. It is believed that one of the main causes of the ill-effects is the large increase in the evaporation of water from the soil which is known to be produced by grass, the trees being thereby made to suffer from drought, with constant deprivation of other nutriment as well. That grass growing round young apple trees is deleterious was a circumstance known to many horticulturists, but the extent to which it interferes with the development of the trees had never before been realized. Thousands of pounds are annually thrown away in England through want of knowledge of this fact. Yet trees will flourish in grass under certain conditions. Whether the dominant factor is the age (or size) of the tree has been investigated by grassing over trees which have hitherto been in the open ground, and the results appear to indicate that the grass is as deleterious to the older trees as it was to the younger ones. Again, it appears to have been demonstrated that young apple trees, at all events in certain soils, require but little or no manure in the early stages of their existence, so that in this case also large sums must be annually wasted upon manurial dressings which produce no effects. The experiments have dealt with dwarf trees of Bramley, Cox and Potts, six trees of each variety constituting one investigation. Some of the experiments were repeated with Darling, Cox, and others with standard trees of Bramley, Cox and Lane's Prince Albert. All were planted in 1894–1895, the dwarfs being then three years old and the standards four. In each experiment the "normal" treatment is altered in some one particular, the remainder of the treatment consisting of planting the trees carefully in trenched ground, and subsequently keeping the surface clean; cutting back after planting, pruning moderately in autumn, and shortening the growths when it appeared necessary in summer; giving in autumn a dressing of mixed mineral manures, and in February one of nitrate of soda, this dressing being probably equivalent to one of 12 tons of dung per acre. In the experiments on branch treatment, the bad effects of omitting to cut the trees back on planting, or to prune them subsequently, is evident chiefly in the straggling and bad shape of the resulting trees, but such trees also are not so vigorous as they should be. The quantity of fruit borne, however, is in excess of the average. The check on the vigour and growth of a tree by cutting or injuring its roots is in marked contrast with the effects of a similar interference with the branches. Trees which had been root-pruned each year were in 1898 little more than half as big as the normal trees, whilst those root-pruned every second year were about two-thirds as big as the normal. The crops borne by these trees were nevertheless heavy in proportion to the size of the trees. Such frequent root-pruning is not, of course, a practice which should be adopted. It was found that trees which had been carefully lifted every other year and replanted at once experienced no ill-effects from the operation; but in a case where the trees after being lifted had been left in a shed for three days before replanting—which would reproduce to a certain extent the conditions experienced when trees are sent out from a nursery—material injury was suffered, these trees after four years being 28% smaller than similar ones which had not been replanted. Sets of trees planted respectively in November, January and March have, on the whole, shown nothing in favour of any of these different times for planting purposes. Some doubt is thrown on the accepted view that there is a tendency, at any rate with young apple and pear trees, to fruit in alternate seasons.

Strawberries of eighty-five different varieties have been experimented with, each variety being represented in 1900 by plants of five different ages, from one to five years. In 1896 and 1898 the crops of fruit were about twice as heavy as in 1897 and 1899, but it has not been found possible to correlate these variations with the meteorological records of the several seasons. Taking the average of all the varieties, the relative weights of crop per plant, when these are compared with the two-year-old plants in the same season, are, for the five ages of one to five years, 31, 100, 122, 121 and 134, apparently showing that the bearing power increases rapidly up to two years, less rapidly up to three years, after which age it remains practically constant. The relative average size of the berries shows a deterioration with the age of the plant. The comparative sizes of berries of one to five years old were 115, 100, 96, 91 and 82 respectively. If the money value of the crop is taken to be directly dependent on its total weight, and also on the size of the fruits, the relative values of the crop for the different ages would be 34, 100, 117, 111 and 110, so that, on the Ridgmont ground, strawberry plants could be profitably retained up to five years and probably longer. As regards what may be termed the order of merit of different varieties of strawberries, it appears that even small differences in position and treatment cause large variations, not only in the features of the crop generally, but also in the relative behaviour of the different varieties. The relative cropping power of the varieties under apparently similar conditions may often be expressed by a number five or tenfold as great in one case as in the other. A comparison of the relative behaviour of the same varieties in different seasons is attended by similar variations. The varying sensitiveness of different varieties of strawberry plants to small and undefinable differences in circumstances is indeed one of the most important facts brought to light in the experiments.

Fruit Culture in Ireland.—The following figures have been kindly supplied by the Irish Board of Agriculture, and deal with the acreage under fruit culture in Ireland up to the end of the year 1907.

	Statute Acres.
1. *Orchard Fruit*—	
Apples	5829
Pears	224
Plums	233
Damsons	138
Other kinds	129
Total	6543
2. *Small Fruit*—	
Currants, black	234
Currants, red and white	159
Gooseberries	675
Raspberries	374
Strawberries	994
Mixed fruit	2470
Total	4906

It therefore appears that while Ireland grows only about one-thirty-third the quantity of apples that England does, it is nevertheless nearly 5000 acres ahead of Scotland and about 2000 acres ahead of Wales. It grows 41 times fewer pears than England, but still is ahead of Scotland and a long way ahead of Wales in this fruit. There are 70 times fewer plums grown in Ireland than in England, and about the same in Scotland, while Wales does very little indeed. In small fruit Ireland is a long way behind Scotland in the culture of strawberries and raspberries, although with currants and gooseberries it is very close. Considering the climate, and the fact that there are, according to the latest available returns, over 62,000 holdings above 1 acre but not exceeding 5 acres (having a total of 224,000 acres), it is possible fruit culture may become more prevalent than it has been in the past.

The Flower-growing Industry.—During the last two or three decades of the 19th century a very marked increase in flower production occurred in England. Notably was this the case in the neighbourhood of London, where, within a radius of 15 or 20 m., the fruit crops, which had largely taken the place of garden vegetables, were themselves ousted in turn to satisfy the increasing demand for land for flower cultivation. No flower has entered more largely into the development of the industry than the narcissus or daffodil, of which there are now some 600 varieties. Comparatively few of these, however, are grown for market purposes, although all are charming from the amateur point of view. On some flower farms a dozen or more acres are devoted to narcissi alone, the production of bulbs for sale as well as of flowers for market being the object of the growers.

In the London district the country in the Thames valley west of the metropolis is as largely occupied by flower farms as it is by fruit farms—in fact, the cultivation of flowers is commonly associated with that of fruit. In the vicinity of Richmond narcissi are extensively grown, as they also are more to the west in the Long Ditton district, and likewise around Twickenham, Isleworth, Hounslow, Feltham and Hampton. Roses come more into evidence in the neighbourhood of Hounslow, Cranford,

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Hillingdon and Uxbridge, and in some gardens daffodils and roses occupy alternate rows. In this district also such flowers as herbaceous paeonies, Spanish irises, German irises, Christmas roses, lilies of the valley, chrysanthemums, foxgloves, hollyhocks, wallflowers, carnations, &c., are extensively grown in many market gardens. South of London is the Mitcham country, long noted for its production of lavender. The incessant growth of the lavender plant upon the same land, however, has led to the decline of this industry, which has been largely transferred to districts in the counties of Bedford, Essex and Hertford. At Mitcham, nevertheless, mixed flowers are very largely grown for the supply of the metropolis, and one farm alone has nearly 100 acres under flowers and glass-houses. Chrysanthemums, asters, Iceland poppies, gaillardias, pansies, bedding calceolarias, zonal pelargoniums and other plants are cultivated in immense quantities. At Swanley and Eynsford, in Kent, flowers are extensively cultivated in association with fruit and vegetables. Narcissi, chrysanthemums, violets, carnations, campanulas, roses, pansies, irises, sweet peas, and many other flowers are here raised, and disposed of in the form both of cut flowers and of plants.

The Scilly Isles are important as providing the main source of supply of narcissi to the English markets in the early months of the year. This trade arose almost by accident, for it was about the year 1865 that a box of narcissi sent to Covent Garden Market, London, realized £1; and the knowledge of this fact getting abroad, the farmers of the isles began collecting wild bulbs from the fields in order to cultivate them and increase their stocks. Some ten years, however, elapsed before the industry promised to become remunerative. In 1885 a Bulb and Flower Association was established to promote the industrial growth of flowers. The exports of flowers in that year reached 65 tons, and they steadily increased until 1893, when they amounted to 450 tons. A slight decline followed, but in 1896 the quantity exported was no less than 514 tons. This would represent upwards of 3½ million bunches of flowers, chiefly narcissi and anemones. Rather more than 500 acres are devoted to flower-growing in the isles, by far the greater part of this area being assigned to narcissi, whilst anemones, gladioli, margueirites, arum lilies, Spanish irises, pinks and wallflowers are cultivated on a much smaller scale. The great advantage enjoyed by the Scilly flower-growers is earliness of production, due to climatic causes; the soil, moreover, is well suited to flower culture and there is an abundance of sunshine. The long journey to London is somewhat of a drawback, in regard to both time and freight, but the earliness of the flowers more than compensates for this. Open-air narcissi are usually ready at the beginning of January, and the supply is maintained in different varieties up to the middle or end of May. The narcissus bulbs are usually planted in October, 4 in. by 3 in. apart for the smaller sorts and 6 in. by 4 to 6 in. for the larger. A compost of farmyard manure, seaweed, earth and road scrapings is the usual dressing, but nitrate of soda, guano and bones are also occasionally employed. A better plan, perhaps, is to manure heavily the previous crop, frequently potatoes, no direct manuring then being needed for the bulbs, these not being left in the ground more than two or three years. The expenses of cultivation are heavy, the cost of bulbs alone—of which it requires nearly a quarter of a million of the smaller varieties, or half as many of the largest, to plant an acre—being considerable. The polyanthus varieties of narcissus are likely to continue the most remunerative to the flower-growers of Scilly, as they flourish better in these isles than on the mainland.

In the district around the Wash, in the vicinity of such towns as Wisbech, Spalding and Boston, the industrial culture of bulbs and flowers underwent great expansion in the period between 1880 and 1900. At Wisbech one concern alone has a farm of some 900 acres, devoted chiefly to flowers and fruit, the soil being a deep fine alluvium. Roses are grown here, one field containing upwards of 100,000 trees. Nearly 20 acres are devoted to narcissi, which are grown for the bulbs and also, together with tulips, for cut flowers. Carnations are cultivated both in the field and in pots. Cut flowers are sent out in large quantities, neatly and effectively packed, the parcel post being mainly employed as a means of distribution. In the neighbourhood of Spalding crocuses and snowdrops are less extensively grown than used to be the case. On one farm, however, upwards of 20 acres are devoted to narcissi alone, whilst gladioli, lilies and irises are grown on a smaller scale. Around Boston narcissi are also extensively grown for the market, both bulbs and cut blooms being sold. The bulbs are planted 3 in. apart in rows, the latter being 9 in. apart, and are allowed to stand from two to four years.

The imports of fresh flowers into the United Kingdom were not separately shown prior to 1900. In that year, however, their value amounted to £200,585, in 1901 to £225,011, in 1906 to £233,884, in 1907 to £233,641, and in 1908 to £229,802, so that the trade showed a fairly steady condition. From the monthly totals quoted in Table VI. it would appear that the trade sinks to its minimum

TABLE VI.—*Values of Fresh Flowers imported into the United Kingdom.*

Month.	1906.	1907.	1908.
January	£31,035	£18,545	£29,180
February	34,647	25,541	30,541
March	50,232	42,611	35,185
April	30,809	50,418	42,681
May	22,980	21,767	23,129
June	17,641	18,358	16,904
July	3,386	4,509	3,467
August	1,646	1,539	1,081
September	852	736	953
October	4,481	3,180	4,504
November	17,506	15,763	15,097
December	18,669	30,674	27,080
Total	£233,884	£233,641	£229,802

dimensions in the four months July to October inclusive, and that after September the business continually expands up to April, subsequent to which contraction again sets in. About one-half of the trade belongs practically to the three months of February, March and April.

Hothouse Culture of Fruit and Flowers.—The cultivation of fruit and flowers under glass has increased enormously since about the year 1880, especially in the neighbourhood of London, where large sums of money have been sunk in the erection and equipment of hothouses. In the parish of Cheshunt, Herts, alone there are upwards of 130 acres covered with glass, and between that place on the north and London on the south extensive areas of land are similarly utilized. In Middlesex, in the north, in the districts of Edmonton, Enfield, Ponders End and Finchley, and in the west from Isleworth to Hampton, Feltham, Hillingdon, Sipson and Uxbridge, many crops are now cultivated under glass. At Erith, Swanley, and other places in Kent, as also at Worthing, in Sussex, glass-house culture has much extended. A careful estimate puts the area of industrial hothouses in England at about 1200 acres, but it is probably much more than this. Most of the greenhouses are fixtures, but in some parts of the kingdom structures that move on rails and wheels are used, to enable the ground to be prepared in the open for one crop while another is maturing under glass. The leading products are grapes, tomatoes and cucumbers, the last-named two being true fruits from the botanist's point of view, though commercially included with vegetables. To these may be added on the same ground dwarf or French beans, and runner or climbing beans. Peaches, nectarines and strawberries are largely grown under glass, and, in private hothouses—from which the produce is used mainly for household consumption, and which are not taken into consideration here—pineapples, figs and other fruit. Conservative estimates indicate the average annual yield of hothouse grapes to be about 12 tons per acre and of tomatoes 20 tons. The greater part of the space in the hothouses is assigned to fruit, but whilst some houses are devoted exclusively to flowers, in others, where fruit is the main object, flowers are forced in considerable quantities in winter and early spring. The flowers grown under glass include tulips, hyacinths, primulas, cyclamens, spiraeas, mignonettes, fuchsias,

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calceolarias, roses, chrysanthemums, daffodils, arum lilies or callas, liliums, azaleas, eucharises, camellias, stephanotis, tuberoses, bouvardias, gardenias, heaths or ericas, poinsettias, lilies of the valley, zonal pelargoniums, tuberous and fibrous rooted begonias, and many others. There is an increasing demand for foliage hothouse plants, such as ferns, palms, crotons, aspidistras, araucarias, dracaenas, India-rubber plants, aralias, grevilleas, &c. Berried plants like solaniums and aucubas also find a ready sale, while the ornamental kinds of asparagus such as *sprengeri* and *plumosus* nanus, are ever in demand for trailing decorations, as well as myrsiphyllum. Special mention must be made of the winter or perpetual flowering carnations which are now grown by hundreds of thousands in all parts of the kingdom for decorative work during the winter season. The converse of forcing plants into early blossom is adopted with such an important crop as lily of the valley. During the summer season the crowns are placed in refrigerators with about 2 degrees of frost, and quantities are taken out as required every week and transferred to the greenhouse to develop. Tomatoes are grown largely in houses exclusively occupied by them, in which case two and sometimes three crops can be gathered in the year. In the Channel Islands, where potatoes grown under glass are lifted in April and May, in order to secure the high prices of the early markets, tomato seedlings are planted out from boxes into the ground as quickly as the potatoes are removed, the tomato planter working only a few rows behind the potato digger. The trade in imported tomatoes is so considerable that home growers are well justified in their endeavours to meet the demand more fully with native produce, whether raised under glass or in the open. Tomatoes were not separately enumerated in the imports previous to 1900. It has already been stated that in 1900 the raw tomatoes imported amounted to 833,032 cwt., valued at £792,339, and in 1901 to 793,991 cwt., valued at £734,051. From the monthly quantities given in Table VII.,

TABLE VII.—*Quantities of Tomatoes imported into the United Kingdom.*

Month.	1906.	1907.	1908.
January	61,940	56,022	73,409
February	58,187	58,289	69,350
March	106,458	98,028	86,928
April	103,273	109,057	74,917
May	67,933	114,041	88,901
June	62,906	144,379	127,793
July	238,362	150,907	171,978
August	180,046	102,600	124,757
September	114,860	101,198	119,224
October	52,678	67,860	75,722
November	41,513	66,522	74,292
December	36,316	66,591	73,012
Total	1,124,472	1,135,494	1,160,283
Value	£953,475	£1,135,499	£1,160,283

it would appear that the imports are largest in June, July and August, about one-half of the year's total arriving during those three months. It is too early in June and July for home-grown outdoor tomatoes to enter into competition with the imported product, but home-grown hothouse tomatoes should be qualified to challenge this trade.

An important feature of modern flower growing is the production and cultivation of what are known as "hardy herbaceous perennials." Some 2000 or 3000 different species and varieties of these are now raised in special nurseries, and during the spring, summer and autumn seasons magnificent displays are to be seen not only in the markets but at the exhibitions in London and at the great provincial shows held throughout the kingdom. The production of many of these perennials is so easy that amateurs in several instances have taken it up as a business hobby; and in some cases, chiefly through advertising in the horticultural press, very lucrative concerns have been established.

Ornamental flowering trees and shrubs constitute another feature of modern gardening. These are grown and imported by thousands chiefly for their sprays of blossom or foliage, and for planting in large or small gardens, public parks, &c., for landscape effect. Indeed there is scarcely an easily grown plant from the northern or southern temperate zones that does not now find a place in the nursery or garden, provided it is sufficiently attractive to sell for its flowers, foliage or appearance.

Conditions of the Fruit and Flower growing Industries.—As regards open-air fruit-growing, the outlook for new ventures is perhaps brighter than in the hothouse industry, not—as Mr Bear has pointed out—because the area of fruit land in England is too small, but because the level of efficiency, from the selection of varieties to the packing and marketing of the produce, is very much lower in the former than in the latter branch of enterprise. In other words, whereas the practice of the majority of hothouse nurserymen is so skilled, so up-to-date, and so entirely under high pressure that a new competitor, however well trained, will find it difficult to rise above mediocrity, the converse is true of open-air fruit-growers. Many, and an increasing proportion, of the latter are thoroughly efficient in all branches of their business, and are in possession of plantations of the best market varieties of fruit, well cultivated, pruned and otherwise managed. But the extent of fruit plantations completely up to the mark in relation to varieties and treatment of trees and bushes, and in connexion with which the packing and marketing of the produce are equally satisfactory, is small in proportion to the total fruit area of the country. Information concerning the best treatment of fruit trees has spread widely in recent years, and old plantations, as a rule, suffer from the neglect or errors of the past, however skilful their present holders may be. Although the majority of professional market fruit-growers may be well up to the standard in skill, there are numerous contributors to the fruit supply who are either ignorant of the best methods of cultivation and marketing or careless in their application. The bad condition of the great majority of farm orchards is notorious, and many landowners, farmers and amateur gardeners who have planted fruit on a more or less extensive scale have mismanaged their undertakings. For these reasons new growers of open-air fruit for market have opportunities of succeeding by means of superiority to the majority of those with whom they will compete, provided that they possess the requisite knowledge, energy and capital. It has been asserted on sound authority that there is no chance of success for fruit-growers except in districts favourable as regards soil, climate and nearness to a railway or a good market; and, even under these conditions, only for men who have had experience in the industry and are prepared to devote their unremitting attention to it. Most important is it to a beginner that he should ascertain the varieties of fruit that flourish best in his particular district. Certain kinds seem to do well or fairly well in all parts of the country; others, whilst heavy croppers in some localities, are often unsatisfactory in others.

As has been intimated, there is probably in England less room for expansion of fruit culture under glass than in the open. The large increase of glass-houses in modern times appears to have brought the supply of hothouse produce, even at greatly reduced prices, at least up to the level of the demand; and as most nurserymen continue to extend their expanse of glass, the prospect for new competitors is not a bright one. Moreover, the vast scale upon which some of the growers conduct the hothouse industry puts small producers at a great disadvantage, not only because the extensive producers can grow grapes and other fruit more economically than small growers—with the possible exception of those who do all or nearly all their own work—but also, and still more, because the former have greater advantages in transporting and marketing their fruit. There has, in recent years, been a much greater fall in the prices of hothouse than of open-air fruit, especially under the existing system of distribution, which involves the payment by consumers of 50 to 100% more in prices than growers receive. The best openings for new nurseries are probably not where they are now to be found in large groups, and especially not in the neighbourhood

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of London, but in suitable spots near the great centres of population in the Midlands and the North, or big towns elsewhere not already well supplied with nurseries. By such a selection of a locality the beginner may build up a retail trade in hothouse fruit, or at least a trade with local fruiterers and grocers, thus avoiding railway charges and salesmen's commissions to a great extent, though it may often be advantageous to send certain kinds of produce to a distant market. Above all, a man who has no knowledge of the hothouse industry should avoid embarking his capital in it, trusting himself in the hands of a foreman, as experience shows that such a venture usually leads to disaster. Some years of training in different nurseries are desirable for any young man who is desirous of becoming a grower of hothouse fruits or flowers.

There can be no doubt that flower-growing is greatly extending in England, and that competition among home growers is becoming more severe. Foreign supplies of flowers have increased, but not nearly as greatly in proportion as home supplies, and it seems clear that home growers have gained ground in relation to their foreign rivals, except with respect to flowers for the growth of which foreigners have extraordinary natural advantages. There seems some danger of the home culture of the narcissus being over-done, and the florists' chrysanthemum appears to be produced in excess of the demand. Again, in the production of violets the warm and sunny South of France has an advantage not possessed by England, whilst Holland, likewise for climatic reasons, maintains her hold upon the hyacinth and tulip trade. Whether the production of flowers as a whole is gaining ground upon the demand or not is a difficult question to answer. It is true that the prices of flowers have fallen generally; but production, at any rate under glass, has been cheapened, and if a fair profit can be obtained, the fall in prices, without which the existing consumption of flowers would be impossible, does not necessarily imply over-production. There is some difference of opinion among growers upon this point; but nearly all agree that profits are now so small that production on a large scale is necessary to provide a fair income. Industrial flower-growing affords such a wide scope for the exercise of superior skill, industry and alertness, that it is not surprising to find some who are engaged in it doing remarkably well to all appearance, while others are struggling on and hardly paying their way. That a man with only a little capital, starting in a small way, has many disadvantages is certain; also, that his chance of saving money and extending his business quickly is much smaller than it was. To the casual looker-on, who knows nothing of the drudgery of the industry, flower-growing seems a delightful method of getting a living. That it is an entrancing pursuit there is no doubt; but it is equally true that it is a very arduous one, requiring careful forethought, ceaseless attention and abundant energy. Fortunately for those who might be tempted, without any knowledge of the industry, to embark capital in it, flower-growing, if at all comprehensive in scope, so obviously requires a varied and extensive technical knowledge, combined with good commercial ability, that any one can see that a thorough training is necessary to a man who intends to adopt it as a business, especially if hothouse flowers are to be produced.

The market for fruit, and more especially for flowers, is a fickle one, and there is nearly always some uncertainty as to the course of prices. The perishable nature of soft fruit and cut flowers renders the markets very sensitive to anything in the nature of a glut, the occurrence of which is usually attended with disastrous results to producers. Foreign competition, moreover, has constantly to be faced, and it is likely to increase rather than diminish. French growers have a great advantage over the open-air cultivators of England, for the climate enables them to get their produce into the markets early in the season, when the highest prices are obtainable. The geographical advantage which France enjoys in being so near to England is, however, considerably discounted by the increasing facilities for cold storage in transit, both by rail and sea. The development of such facilities permits of the retail sale in England of luscious fruit as fresh and attractive as when it was gathered beneath the sunny skies of California. In the case of flowers, fashion is an element not to be ignored. Flowers much in request in one season may meet with very little demand in another, and it is difficult for the producer to anticipate the changes which caprice may dictate. Even for the same kind of flower the requirements are very uncertain, and the white blossom which is all the rage in one season may be discarded in favour of one of another colour in the next. The sale of fresh flowers for church decoration at Christmas and Easter has reached enormous dimensions. The irregularity in the date of the festival, however, causes some inconvenience to growers. If it falls very early the great bulk of suitable flowers may not be sufficiently forward for sale, whilst a late Easter may find the season too far advanced. The trade in cut flowers, therefore, is generally attended by uncertainty, and often by anxiety. (W. Fk.; J. Ws.)

United States

In the United States horticulture and market gardening have now assumed immense proportions. In a country of over 3,000,000 sq. m., stretching from the Atlantic to the Pacific on the one hand, and from the Gulf of Mexico to the great northern lakes and the Dominion of Canada on the other, a great variation of climatic conditions is not unnatural. From a horticultural point of view there are practically two well-defined regions: (1) that to the east of the Rocky Mountains across to the Atlantic, where the climate is more like that of eastern Asia than of western Europe so far as rainfall, temperature and seasonable conditions are concerned; (2) that to the west of the Rockies, known as the Pacific coast region, where the climate is somewhat similar to that of western Europe. It may be added that in the northern states—in Washington, Montana, North Dakota, Minnesota, Wisconsin, &c.—the winters are often very severe, while the southern states practically enjoy a temperature somewhat similar to that of the Riviera. Indeed the range of temperature between the extreme northern states and the extreme southern may vary as much as 120° F. The great aim of American gardeners, therefore, has been to find out or to produce the kinds of fruits, flowers and vegetables that are likely to flourish in different parts of this immense country.

Fruit Culture.—There is probably no country in the world where so many different kinds of fruit can be grown with advantage to the nation as in the United States. In the temperate regions apples, pears and plums are largely grown, and orchards of these are chiefly to be found in the states of New York, Massachusetts, Pennsylvania, Michigan, Missouri, Colorado, and also in northern Texas, Arkansas and N. California. To these may be added cranberries and quinces, which are chiefly grown in the New England states. The quinces are not a crop of first-rate importance, but as much as 800,000 bushels of cranberries are grown each year. The peach orchards are assuming great proportions, and are chiefly to be found in Georgia and Texas, while grapes are grown throughout the Republic from east to west in all favourable localities. Oranges, lemons and citrons are more or less extensively grown in Florida and California, and in these regions what are known as Japanese or "Kelsey" plums (forms of *Prunus triflora*) are also grown as marketable crops. Pomegranates are not yet largely grown, but it is possible their culture will develop in southern Texas and Louisiana, where the climate is tempered by the waters of the Gulf of Mexico. Tomatoes are grown in most parts of the country so easily that there is frequently a glut; while the strawberry region extends from Florida to Virginia, Pennsylvania and other states—thus securing a natural succession from south to north for the various great market centres.

Of the fruits mentioned apples are undoubtedly the most important. Not only are the American people themselves supplied with fresh fruit, but immense quantities are exported to Europe—Great Britain alone absorbing as much as 1,430,000 cwt. in 1908. The varieties originally grown were of course those taken or introduced from Europe by the early settlers. Since the middle of the 19th century great changes have been brought about, and the varieties mostly cultivated now are distinctly American. They have been raised by crossing and intercrossing the most suitable European forms with others since imported from Russia. In the extreme northern states indeed, where it is essential to have apple trees that will stand the severest winters, the Russian varieties crossed with the berry crab of eastern Europe (*Pyrus baccata*) have produced

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a race eminently suited to that particular region. The individual fruits are not very large, but the trees are remarkably hardy. Farther south larger fruited varieties are grown, and among these may be noted Baldwins, Newton pippins, Spitzenbergs and Rhode Island greening. Apple orchards are numerous in the State of New York, where it is estimated that over 100,000 acres are devoted to them. In the hilly regions of Missouri, Arkansas and Colorado there are also great plantations of apples. The trees, however, are grown on different principles from those in New York State. In the latter state apple trees with ordinary care live to more than 100 years of age and produce great crops; in the other states, however, an apple tree is said to be middle-aged at 20, decrepit at 30 and practically useless at 40 years of age. They possess the advantage, however, of bearing early and heavily.

Until the introduction of the cold-storage system, about the year 1880, America could hardly be regarded as a commercial fruit-growing country. Since then, however, owing to the great improvements made in railway refrigerating vans and storage houses, immense quantities of fruit can be despatched in good condition to any part of the world; or they can be kept at home in safety until such time as the markets of Chicago, New York, Boston, Baltimore, Philadelphia, &c., are considered favourable for their reception.

Apple trees are planted at distances varying from 25 ft. to 30 ft. apart in the middle western states, to 40 ft. to 50 ft. apart in New York State. Here and there, however, in some of the very best orchards the trees are planted 60 ft. apart every way. Each tree thus has a chance to develop to its utmost limits, and as air and light reach it better, a far larger fruit-bearing surface is secured. Actual experience has shown that trees planted at 60 ft. apart—about 28 to the acre—produce more fruit by 43 bushels than trees at 30 ft. apart—*i.e.* about 48 to the acre.

Until recent years pruning as known to English and French gardeners was practically unknown. There was indeed no great necessity for it, as the trees, not being cramped for space, threw their branches outwards and upwards, and thus rarely become overcrowded. When practised, however, the operation could scarcely be called pruning; lopping or trimming would be more accurate descriptions.

Apple orchards are not immune from insect pests and fungoid diseases, and an enormous business is now done in spraying machines and various insecticides. It pays to spray the trees, and figures have been given to show that orchards that have been sprayed four times have produced an average income of £211 per acre against £103 per acre from unsprayed orchards.

The spring frosts are also troublesome, and in the Colorado and other orchards the process known as "smudging" is now adopted to save the crops. This consists in placing 20 or 30, or even more, iron or tin pots to an acre, each pot containing wooden chips soaked in tar (or pitch) mixed with kerosene. Whenever the thermometer shows 3 or 4 degrees of frost the smudge-pots are lighted. A dense white smoke then arises and is diffused throughout the orchards, enveloping the blossoming heads of the trees in a dense cloud. This prevents the frost from killing the tender pistils in the blossoms, and when several smudge-pots are alight at the same time the temperature of the orchard is raised two or three degrees. This work has generally to be done between 3 and 5 A.M., and the growers naturally have an anxious time until all danger is over. The failure to attend to smudging, even on one occasion, may result in the loss of the entire crop of plums, apples or pears.

Next to apples perhaps peaches are the most important fruit crop. The industry is chiefly carried on in Georgia, Texas and S. Carolina, and on a smaller scale in some of the adjoining states. Peaches thus flourish in regions that are quite unsuitable for apples or pears. In many orchards in Georgia, where over 3,000,000 acres have been planted, there are as many as 100,000 peach trees; while some of the large fruit companies grow as many as 365,000. In one place in West Virginia there is, however, a peach orchard containing 175,000 trees, and in Missouri another company has 3 sq. m. devoted to peach culture. As a rule the crops do well. Sometimes, however, a disease known as the "yellows" makes sad havoc amongst them, and scarcely a fruit is picked in an orchard which early in the season gave promise of a magnificent crop.

Plums are an important crop in many states. Besides the European varieties and those that have been raised by crossing with American forms, there is now a growing trade done in Japanese plums. The largest of these is popularly known as "Kelseys," named after John Kelsey, who raised the first fruit in 1876 from trees brought to California in 1870. Sometimes the fruits are 3 in. in diameter, and like most of the Japanese varieties are more heart-shaped and pointed than plums of European origin. One apparent drawback to the Kelsey plum is its irregularity in ripening. It has been known in some years to be quite ripe in June, while in others the fruits are still green in October.

Pears are much grown in such states as Massachusetts, New York, Pennsylvania, Missouri and California; while bush fruits like currants, gooseberries and raspberries find large spaces devoted in most of the middle and northern states. Naturally a good deal of crossing and intercrossing has taken place amongst the European and American forms of these fruits, but so far as gooseberries are concerned no great advance seems to have been made in securing varieties capable of resisting the devastating gooseberry mildew.

Other fruits of more or less commercial value are oranges, lemons and citrons, chiefly in Florida. Lemons are practically a necessity to the American people, owing to the heat of the summers, when cool and refreshing drinks with an agreeable acidulous taste are in great demand. The pomelo (grape-fruit) is a kind of lemon with a thicker rind and a more acid flavour. At one time its culture was confined to Florida, but of recent years it has found its way into Californian orchards. Notwithstanding the prevailing mildness of the climate in both California and Florida, the crops of oranges, lemons, citrons, &c., are sometimes severely injured by frosts when in blossom.

Other fruits likely to be heard of in the future are the kaki or persimmon, the loquat, which is already grown in Louisiana, as well as the pomegranate.

Great aid and encouragement are given by the government to the progress of American fruit-growing, and by the experiments that are being constantly carried out and tabulated at Cornell University and by the U.S.A. department of agriculture.

Flower Culture.—So far as flowers are concerned there appears to be little difference between the kinds of plants grown in the United States and in England, France, Belgium, Germany, Holland, &c. Indeed there is a great interchange of new varieties of plants between Europe and America, and modifications in systems of culture are being gradually introduced from one side of the Atlantic to the other. The building of greenhouses for commercial purposes is perhaps on a somewhat different scale from that in England, but there are probably no extensive areas of glass such as are to be seen north of London from Enfield Highway to Broxburne. Hot water apparatus differs merely in detail, although most of the boilers used resemble those on the continent of Europe rather than in England. Great business is done in bulbs—mostly imported from Holland—stove and greenhouse plants, hardy perennials, orchids, ferns of the "fancy" and "dagger" types of Nephrolepis, and in carnations and roses. Amongst the latter thousands of such varieties as Beauty, Liberty, Killarney, Richmond and Bride are grown, and realize good prices as a rule in the markets. Carnations of the winter-flowering or "perpetual" type have long been grown in America, and enormous prices have been given for individual plants on certain occasions, rivalling the fancy prices paid in England for certain orchids. The American system of carnation-growing has quite captivated English cultivators, and new varieties are being constantly raised in both countries. Chrysanthemums are another great feature of American florists, and sometimes during the winter season a speculative grower will send a living specimen to one of the London exhibitions in the hope of booking large orders for cuttings of it later on. Sweet

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peas, dahlias, lilies of the valley, arum lilies and indeed every flower that is popular in England is equally popular in America, and consequently is largely grown.

Vegetables.—So far as these are concerned, potatoes, cabbages, cauliflowers, beans of all kinds, cucumbers, tomatoes (already referred to under fruits), musk-melons, lettuces, radishes, endives, carrots, &c.; are naturally grown in great quantities, not only in the open air, but also under glass. The French system of intensive cultivation as practised on hot beds of manure round Paris is practically unknown at present. In the southern states there would be no necessity to practise it, but in the northern ones it is likely to attract attention. (J. Ws.)

FRUMENTIUS (*c.* 300–*c.* 360), the founder of the Abyssinian church, traditionally identified in Abyssinian literature with Abba Salama or Father of Peace (but see ETHIOPIA), was a native of Phoenicia. According to the 4th-century historian Rufinus (x. 9), who gives Aedesius himself as his authority, a certain Tyrian, Meropius, accompanied by his kinsmen Frumentius and Aedesius, set out on an expedition to "India," but fell into the hands of Ethiopians on the shore of the Red Sea and, with his ship's crew, was put to death. The two young men were taken to the king at Axum, where they were well treated and in time obtained great influence. With the help of Christian merchants who visited the country Frumentius gave Christianity a firm footing, which was strengthened when in 326 he was consecrated bishop by Athanasius of Alexandria, who in his *Epistola ad Constantinum* mentions the consecration, and gives some details of the history of Frumentius's mission. Later witnesses speak of his fidelity to the homoousian during the Arian controversies. Aedesius returned to Tyre, where he was ordained presbyter.

FRUNDSBERG, GEORG VON (1473–1528), German soldier, was born at Mindelheim on the 24th of September 1473. He fought for the German king Maximilian I. against the Swiss in 1490, and in the same year was among the imperial troops sent to assist Ludovico Sforza, duke of Milan, against the French. Still serving Maximilian, he took part in 1504 in the war over the succession to the duchy of Bavaria-Landshut, and afterwards fought in the Netherlands. Convinced of the necessity of a native body of trained infantry Frundsberg assisted Maximilian to organize the *Landsknechte* (*q.v.*), and subsequently at the head of bands of these formidable troops he was of great service to the Empire and the Habsburgs. In 1509 he shared in the war against Venice, winning fame for himself and his men; and after a short visit to Germany returned to Italy, where in 1513 and 1514 he gained fresh laurels by his enterprises against the Venetians and the French. Peace being made, he returned to Germany, and at the head of the infantry of the Swabian league assisted to drive Ulrich of Württemberg from his duchy in 1519. At the diet of Worms in 1521 he spoke words of encouragement to Luther, and when the struggle between France and the Empire was renewed he took part in the invasion of Picardy, and then proceeding to Italy brought the greater part of Lombardy under the influence of Charles V. through his victory at Bicocca in April 1522. He was partly responsible for the great victory over the French at Pavia in February 1525, and, returning to Germany, he assisted to suppress the Peasant revolt, using on this occasion, however, diplomacy as well as force. When the war in Italy was renewed Frundsberg raised an army at his own expense, and skilfully surmounting many difficulties, joined the constable de Bourbon near Piacenza and marched towards Rome. Before he reached the city, however, his unpaid troops showed signs of mutiny, and their leader, stricken with illness and unable to pacify them, gave up his command. Returning to Germany, he died at Mindelheim on the 20th of August 1528. He was a capable and chivalrous soldier, and a devoted servant of the Habsburgs. His son Caspar (1500–1536) and his grandson Georg (d. 1586) were both soldiers of some distinction. With the latter's death the family became extinct.

See Adam Reissner, *Historia Herrn Georgs und Herrn Kaspars von Frundsberg* (Frankfort, 1568). A German translation of this work was published at Frankfort in 1572. F. W. Barthold, *Georg von Frundsberg* (Hamburg, 1833); J. Heilmann, *Kriegsgeschichte von Bayern, Franken, Pfalz und Schwaben* (Munich, 1868).

FRUSTUM (Latin for a "piece broken off"), a term in geometry for the part of a solid figure, such as a cone or pyramid, cut off by a plane parallel to the base, or lying between two parallel planes; and hence in architecture a name given to the drum of a column.

FRUYTIERS, PHILIP (1627–1666), Flemish painter and engraver, was a pupil of the Jesuits' college at Antwerp in 1627, and entered the Antwerp gild of painters without a fee in 1631. He is described in the register of that institution as "illuminator, painter and engraver." The current account of his life is "that he worked exclusively in water colours, yet was so remarkable in this branch of his art for arrangement, drawing, and especially for force and clearness of colour, as to excite the admiration of Rubens, whom he portrayed with all his family." The truth is that he was an artist of the most versatile talents, as may be judged from the fact that in 1646 he executed an Assumption with figures of life size, and four smaller pictures in oil, for the church of St Jacques at Antwerp, for which he received the considerable sum of 1150 florins. Unhappily no undoubted production of his hand has been preserved. All that we can point to with certainty is a series of etched plates, chiefly portraits, which are acknowledged to have been powerfully and skilfully handled. If, however, we search the portfolios of art collections on the European continent, we sometimes stumble upon miniatures on vellum, drawn with great talent and coloured with extraordinary brilliancy. In form they quite recall the works of Rubens, and these, it may be, are the work of Philip Fruytiers.

FRY, the name of a well-known English Quaker family, originally living in Wiltshire. About the middle of the 18th century JOSEPH FRY (1728–1787), a doctor, settled in Bristol, where he acquired a large practice, but eventually abandoned medicine for commerce. He became interested in china-making, soap-boiling and type-founding businesses in Bristol, and in a chemical works at Battersea, all of which ventures proved very profitable. The type-founding business was subsequently removed to London and conducted by his son Edmund. Joseph Fry, however, is best remembered as the founder of the great Bristol firm of J. S. Fry & Sons, chocolate manufacturers. He purchased the chocolate-making patent of William Churchman and on it laid the foundations of the present large business. After his death the Bristol chocolate factory was carried on with increasing success by his widow and by his son, JOSEPH STORRS FRY (1767–1835).

In 1795 a new and larger factory was built in Union Street, Bristol, which still forms the centre of the firm's premises, and in 1798 a Watt's steam-engine was purchased and the cocoa-beans ground by steam. On the death of Joseph Storrs Fry his three sons, Joseph (1795–1879), Francis, and Richard (1807–1878) became partners in the firm, the control being mainly in the hands of FRANCIS FRY (1803–1886). Francis Fry was in every way a remarkable character. The development of the business to its modern enormous proportion was chiefly his work, but this did not exhaust his activities. He took a principal part in the introduction of railways to the west of England, and in 1852 drew up a scheme for a general English railway parcel service. He was an ardent bibliographer, taking a special interest in early English Bibles, of which he made in the course of a long life a large and striking collection, and of the most celebrated of which he published facsimiles with bibliographical notes. Francis Fry died in 1886, and his son Francis J. Fry and nephew Joseph Storrs Fry carried on the business, which in 1896 was for family reasons converted into a private limited company, Joseph Storrs Fry being chairman and all the directors members of the Fry family.

FRY, SIR EDWARD (1827–), English judge, second son of Joseph Fry (1795–1879), was born at Bristol on the 4th of November 1827, and educated at University College, London, and London University. He was called to the bar in 1854 and was made a Q.C. in 1869, practising in the rolls court and becoming recognized as a leading equity lawyer. In 1877 he was raised to the bench and knighted. As chancery judge he will be

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remembered for his careful interpretations and elucidations of the Judicature Acts, then first coming into operation. In 1883 he was made a lord justice of appeal, but resigned in 1892; and subsequently his knowledge of equity and talents for arbitration were utilized by the British government from time to time in various special directions, particularly as chairman of many commissions. He was also one of the British representatives at the Paris North Sea Inquiry Commission (1905), and was appointed a member of the Hague Permanent Arbitration Court. He wrote *A Treatise on the Specific Performance of Public Contracts* (London, 1858, and many subsequent editions).

FRY, ELIZABETH (1780–1845), English philanthropist, and, after Howard, the chief promoter of prison reform in Europe, was born in Norwich on the 21st of May 1780. Her father, John Gurney, afterwards of Earlham Hall, a wealthy merchant and banker, represented an old family which for some generations had belonged to the Society of Friends. While still a girl she gave many indications of the benevolence of disposition, clearness and independence of judgment, and strength of purpose, for which she was afterwards so distinguished; but it was not until after she had entered her eighteenth year that her religion assumed a decided character, and that she was induced, under the preaching of the American Quaker, William Savery, to become an earnest and enthusiastic though never fanatical "Friend." In August 1800 she became the wife of Joseph Fry, a London merchant.

Amid increasing family cares she was unwearied in her attention to the poor and the neglected of her neighbourhood; and in 1811 she was acknowledged by her co-religionists as a "minister," an honour and responsibility for which she was undoubtedly qualified, not only by vigour of intelligence and warmth of heart, but also by an altogether unusual faculty of clear, fluent and persuasive speech. Although she had made several visits to Newgate prison as early as February 1813, it was not until nearly four years afterwards that the great public work of her life may be said to have begun. The association for the Improvement of the Female Prisoners in Newgate was formed in April 1817. Its aim was the much-needed establishment of some of what are now regarded as the first principles of prison discipline, such as entire separation of the sexes, classification of criminals, female supervision for the women, and adequate provision for their religious and secular instruction, as also for their useful employment. The ameliorations effected by this association, and largely by the personal exertions of Mrs Fry, soon became obvious, and led to a rapid extension of similar methods to other places. In 1818 she, along with her brother, visited the prisons of Scotland and the north of England; and the publication (1819) of the notes of this tour, as also the cordial recognition of the value of her work by the House of Commons committee on the prisons of the metropolis, led to a great increase of her correspondence, which now extended to Italy, Denmark and Russia, as well as to all parts of the United Kingdom. Through a visit to Ireland, which she made in 1827, she was led to direct her attention to other houses of detention besides prisons; and her observations resulted in many important improvements in the British hospital system, and in the treatment of the insane. In 1838 she visited France, and besides conferring with many of the leading prison officials, she personally visited most of the houses of detention in Paris, as well as in Rouen, Caen and some other places. In the following year she obtained an official permission to visit all the prisons in that country; and her tour, which extended from Boulogne and Abbeville to Toulouse and Marseilles, resulted in a report which was presented to the minister of the interior and the prefect of police. Before returning to England she had included Geneva, Zürich, Stuttgart and Frankfort-on-Main in her inspection. The summer of 1840 found her travelling through Belgium, Holland and Prussia on the same mission; and in 1841 she also visited Copenhagen. In 1842, through failing health, Mrs Fry was compelled to forgo her plans for a still more widely extended activity, but had the satisfaction of hearing from almost every quarter of Europe that the authorities were giving increased practical effect to her suggestions. In 1844 she was seized with a lingering illness, of which she died on the 12th of October 1845. She was survived by a numerous family, the youngest of whom was born in 1822.

Two interesting volumes of *Memoirs, with Extracts from her Journals and Letters*, edited by two of her daughters, were published in 1847. See also *Elizabeth Fry*, by G. King Lewis (1910).

FRYXELL, ANDERS (1795–1881), Swedish historian, was born at Hesselskog, Dalsland, Sweden, on the 7th of February 1795. He was educated at Upsala, took holy orders in 1820, was made a doctor of philosophy in 1821, and in 1823 began to publish the great work of his life, the *Stories from Swedish History*. He did not bring this labour to a close until, fifty-six years later, he published the forty-sixth and crowning volume of his vast enterprise. Fryxell, as a historian, appealed to every class by the picturesqueness of his style and the breadth of his research; he had the gift of awakening to an extraordinary degree the national sense in his readers. In 1824 he published his *Swedish Grammar*, which was long without a rival. In 1833 he received the title of professor, and in 1835 he was appointed to the incumbency of Sunne, in the diocese of Karlstad, where he resided for the remainder of his life. In 1840 he was elected to the Swedish Academy in succession to the poet Wallin (1779–1839). In 1847 Fryxell received from his bishop permission to withdraw from all the services of the Church, that he might devote himself without interruption to historical investigation. Among his numerous minor writings are prominent his *Characteristics of Sweden between 1592 and 1600* (1830), his *Origins of the Inaccuracy with which the History of Sweden in Catholic Times has been Treated* (1847), and his *Contributions to the Literary History of Sweden*. It is now beginning to be seen that the abundant labours of Fryxell were rather of a popular than of a scientific order, and although their influence during his lifetime was unbounded, it is only fair to later and exacter historians to admit that they threaten to become obsolete in more than one direction. On the 21st of March 1881 Anders Fryxell died at Stockholm, and in 1884 his daughter Eva Fryxell (born 1829) published from his MS. an interesting *History of My History*, which was really a literary autobiography and displays the persistency and tirelessness of his industry. (E. G.)

FUAD PASHA (1815–1869), Turkish statesman, was the son of the distinguished poet Kechéji-zadé Izzet Molla. He was educated at the medical school and was at first an army surgeon. About 1836 he entered the civil service as an official of the foreign ministry. He became secretary of the embassy in London; was employed on special missions in the principalities and at St Petersburg (1848), and was sent to Egypt as special commissioner in 1851. In that year he became minister for foreign affairs, a post to which he was appointed also on four subsequent occasions and which he held at the time of his death. During the Crimean War he commanded the troops on the Greek frontier and distinguished himself by his bravery. He was Turkish delegate at the Paris conference of 1856; was charged with a mission to Syria in 1860; grand vizier in 1860 and 1861, and also minister of war. He accompanied the sultan Abd-ul-Aziz on his journey to Egypt and Europe, when the freedom of the city of London was conferred on him. He died at Nice (whither he had been ordered for his health) in 1869. Fuad was renowned for his boldness and promptness of decision, as well as for his ready wit and his many *bons mots*. Generally regarded as the partisan of a pro-English policy, he rendered most valuable service to his country by his able management of the foreign relations of Turkey, and not least by his efficacious settlement of affairs in Syria after the massacres of 1860.

FUCHOW, Fu-chau, Foochow, a city of China, capital of the province of Fu-kien, and one of the principal ports open to foreign commerce. In the local dialect it is called Hokchiu. It is situated on the river Min, about 35 m. from the sea, in 26° 5′ N. and 119° 20′ E., 140 m. N. of Amoy and 280 S. of Hang-chow. The city proper, lying nearly 3 m. from the north bank of the river, is surrounded by a wall about 30 ft. high and 12 ft. thick, which makes a circuit of upwards of 5 m. and is pierced by seven gateways surrounded by tall fantastic watch-towers.

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The whole district between the city and the river, the island of Nantaï, and the southern banks of the Min are occupied by extensive suburbs; and the river itself bears a large floating population. Communication from bank to bank is afforded by a long stone bridge supported by forty solid stone piers in its northern section and by nine in its southern. The most remarkable establishment of Fuchow is the arsenal situated about 3 m. down the stream at Pagoda Island, where the sea-going vessels usually anchor. It was founded in 1867, and is conducted under the direction of French engineers according to European methods. In 1870 it employed about 1000 workmen besides fifty European superintendents, and between that date and 1880 it turned out about 20 or 30 small gunboats. In 1884 it was partially destroyed by the French fleet, and for a number of years the workshops and machinery were allowed to stand idle and go to decay. On the 1st of August 1895 an attack was made on the English mission near the city of Ku-chang, 120 m. west of Fuchow, on which occasion nine missionaries, of whom eight were ladies, were massacred. The port was opened to European commerce in 1842; and in 1853 the firm of Russell and Co. shipped the first cargoes of tea from Fuchow to Europe and America. The total trade in foreign vessels in 1876 was imports to the value of £1,531,617, and exports to the value of £3,330,489. In 1904 the imports amounted to £1,449,351, and the exports to £1,014,436. The number of vessels that entered in 1876 was 275, and of these 211 were British, 27 German, 11 Danish and 9 American. While in 1904 480 vessels entered the port, 216 of which were British. A large trade is carried on by the native merchants in timber, paper, woollen and cotton goods, oranges and olives; but the foreign houses mainly confine themselves to opium and tea. Commercial intercourse with Australia and New Zealand is on the increase. The principal imports, besides opium, are shirtings, T-cloths, lead and tin, medicines, rice, tobacco, and beans and peas. Two steamboat lines afford regular communication with Hong-Kong twice a month. The town is the seat of several important missions, of which the first was founded in 1846. That supported by the American board had in 1876 issued 1,3000,000 copies of Chinese books and tracts.

FUCHS, JOHANN NEPOMUK VON (1774–1856), German chemist and mineralogist, was born at Mattenzell, near Brennberg in the Bavarian Forest, on the 15th of May 1774. In 1807 he became professor of chemistry and mineralogy at the university of Landshut, and in 1826 conservator of the mineralogical collections at Munich, where he was appointed professor of mineralogy three years later, on the removal thither of the university of Landshut. He retired in 1852, was ennobled by the king of Bavaria in 1854, and died at Munich on the 5th of March 1856. His name is chiefly known for his mineralogical observations and for his work on soluble glass.

His collected works, including *Über den Einfluss der Chemie und Mineralogie* (1824), *Die Naturgeschichte des Mineralreichs* (1842), *Über die Theorien der Erde* (1844), were published at Munich in 1856.

FUCHS, LEONHARD (1501–1566), German physician and botanist, was born at Wembdingen in Bavaria on the 17th of January 1501. He attended school at Heilbronn and Erfurt, and in 1521 graduated at the university of Ingolstadt. About the same time he espoused the doctrines of the Reformation. Having in 1524 received his diploma as doctor of medicine, he practised for two years in Munich. He became in 1526 professor of medicine at Ingolstadt, and in 1528 physician to the margrave of Anspach. In Anspach he was the means of saving the lives of many during the epidemic locally known as the "English sweating-sickness." By the duke of Württemberg he was, in 1535, appointed to the professorship of medicine at the university of Tübingen, a post held by him till his death on the 10th of May 1566. Fuchs was an advocate of the Galenic school of medicine, and published several Latin translations of treatises by its founder and by Hippocrates. But his most important publication was *De historia stirpium commentarii insignes* (Basel, 1542), a work illustrated with more than five hundred excellent outline illustrations, including figures of the common foxglove and of another species of the genus *Digitalis*, which was so named by him.

FUCHSIA, so named by Plumier in honour of the botanist Leonhard Fuchs, a genus of plants of the natural order Onagraceae, characterized by entire, usually opposite leaves, pendent flowers, a funnel-shaped, brightly coloured, quadripartite, deciduous calyx, 4 petals, alternating with the calycine segments, 8, rarely 10, exserted stamens, a long filiform style, an inferior ovary, and fruit, a fleshy ovoid many-seeded berry. All the members of the genus, with the exception of the New Zealand species, *F. excorticata*, *F. Colensoi* and *F. procumbens*, are natives of Central and South America—occurring in the interior of forests or in damp and shady mountainous situations. The various species differ not a little in size as well as in other characters; some, as *F. verrucosa*, being dwarf shrubs; others, as *F. arborescens* and *F. apetala*, attaining a height of 12 to 16 ft., and having stems several inches in diameter. Plumier, in his *Nova plantarum Americanarum genera* (p. 14, tab. 14, Paris, 1703), gave a description of a species of fuchsia, the first known, under the name of *Fuchsia triphylla, flore coccineo*, and a somewhat conventional outline figure of the same plant was published at Amsterdam in 1757 by Burmann. In the *Histoire des plantes médicinales* of the South American traveller Feuillée (p. 64, pl. XLVII.), written in 1709–1711, and published by him with his *Journal*, Paris, 1725, the name *Thilco* is applied to a species of fuchsia from Chile, which is described, though not evidently so figured, as having a pentamerous calyx. The *F. coccinea* of Aiton (fig.) (see J. D Hooker, in *Journal Linnean Soc.*, Botany, vol. x. p. 458, 1869), the first species of fuchsia cultivated in England, where it was long confined to the greenhouse, was brought from South America by Captain Firth in 1788 and placed in Kew Gardens. Of this species Mr Lee, a nurseryman at Hammersmith, soon afterwards obtained an example, and procured from it by means of cuttings several hundred plants, which he sold at a guinea each. In 1823 *F. macrostemma* and *F. gracilis*, and during the next two or three years several other species, were introduced into England; but it was not until about 1837, or soon after florists had acquired *F. fulgens*, that varieties of interest began to make their appearance. The numerous hybrid forms now existing are the result chiefly of the intercrossing of that or other long-flowered with globose-flowered plants. *F. Venus-victrix*, raised by Mr Gulliver, gardener to the Rev. S. Marriott of Horsemonden, Kent, and sold in 1832 to Messrs Cripps, was the earliest white-sepalled fuchsia. The first fuchsia with a white corolla was produced about 1853 by Mr Storey. In some varieties the blossoms are variegated, and in others they are double. There appears to be very little limit to the number of forms to be obtained by careful cultivation and selection. To hybridize, the flower as soon as it opens is emasculated, and it is then fertilized with pollen from some different flower.

Fuchsia coccinea.

1, Flower cut open after removal of sepals; 2, fruit; 3, floral diagram.

Ripe seed is sown either in autumn or about February or March in light, rich, well-drained mould, and is thinly covered with

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sandy soil and watered. A temperature of 70° to 75° Fahr. has been found suitable for raising. The seedlings are pricked off into shallow pots or pans, and when 3 in. in height are transferred to 3-in. pots, and are then treated the same as plants from cuttings. Fuchsias may be grafted as readily as camellias, preferably by the splice or whip method, the apex of a young shoot being employed as a scion; but the easiest and most usual method of propagation is by cuttings. The most expeditious way to procure these is to put plants in heat in January, and to take their shoots when 3 in. in length. For summer flowering in England they are best made about the end of August, and should be selected from the shortest-jointed young wood. They root readily in a compost of loam and silver-sand if kept close and sprinkled for a short time. In from two to three weeks they may be put into 3-in. pots containing a compost of equal parts of rich loam, silver-sand and leaf-mould. They are subsequently moved from the frame or bed, first to a warm and shady, and then to a more airy part of the greenhouse. In January a little artificial heat may be given, to be gradually increased as the days lengthen. The side-shoots are generally pruned when they have made three or four joints, and for bushy plants the leader is stopped soon after the first potting. Care is taken to keep the plants as near the glass as possible, and shaded from bright sunshine, also to provide them plentifully with water, except at the time of shifting, when the roots should be tolerably dry. For the second potting a suitable soil is a mixture of well-rotted cow-dung or old hotbed mould with leaf-mould and sandy peat, and to promote drainage a little peat-moss may be placed immediately over the crocks in the lower part of the pot. Weak liquid manure greatly promotes the advance of the plants, and should be regularly supplied twice or thrice a week during the flowering season. After this, water is gradually withheld from them, and they may be placed in the open air to ripen their wood.

Among the many hardy or half-hardy plants for inside borders are varieties of the Chilean species, *F. macrostemma* (or *F. magellanica*), a shrub 6 to 12 ft. high with a scarlet calyx, such as *F. m. globosa*, *F. m. gracilis*; one of the most graceful and hardy of these, a hybrid *F. riccartoni*, was raised at Riccarton, near Edinburgh, in 1830. For inside culture may be mentioned *F. boliviana*[1] (Bolivia), 2 to 4 ft. high, with rich crimson flowers with a trumpet-shaped tube; *F. corymbiflora* (Peru), 4 to 6 ft. high, with scarlet flowers nearly 2 in. long in long terminal clusters; *F. fulgens* (Mexico), 4 to 6 ft., with drooping apical clusters of scarlet flowers; *F. microphylla* (Central America), with small leaves and small scarlet funnel-shaped flowers, the petals deep red; *F. procumbens* (New Zealand), a pretty little creeper, the small flowers of which are succeeded by oval magenta-crimson berries which remain on for months; and *F. splendens* (Mexico), 6 ft. high, with very showy scarlet and green flowers. But these cannot compare in beauty or freedom of blossom with the numerous varieties raised by gardeners. The nectar of fuchsia flowers has been shown to contain nearly 78% of cane sugar, the remainder being fruit sugar. The berries of some fuchsias are subacid or sweet and edible. From certain species a dye is obtainable. The so-called "native fuchsias" of southern and eastern Australia are plants of the genus *Correa*, natural order Rutaceae.

FUCHSINE, or MAGENTA, a red dyestuff consisting of a mixture of the hydrochlorides or acetates of pararosaniline and rosaniline. It was obtained in 1856 by J. Natanson (*Ann.*, 1856, 98, p. 297) by the action of ethylene chloride on aniline, and by A. W. Hofmann in 1858 from aniline and carbon tetrachloride. It is prepared by oxidizing "aniline for red" (a mixture of aniline and ortho- and para-toluidine) with arsenic acid (H. Medlock, *Dingler's Poly. Jour.*, 1860, 158, p. 146); by heating aniline for red with nitrobenzene, concentrated hydrochloric acid and iron (Coupier, *Ber.*, 1873, 6, p. 423); or by condensing formaldehyde with aniline and ortho-toluidine and oxidizing the mixture. It forms small crystals, showing a brilliant green reflex, and is soluble in water and alcohol with formation of a deep red solution. It dyes silk, wool and leather direct, and cotton after mordanting with tannin and tartar emetic (see DYEING). An aqueous solution of fuchsine is decolorized on the addition of sulphurous acid, the easily soluble fuchsine sulphurous acid being formed. This solution is frequently used as a test reagent for the detection of aldehydes, giving, in most cases, a red coloration on the addition of a small quantity of the aldehyde.

The constitution of the fuchsine bases (pararosaniline and rosaniline) was determined by E. and O. Fischer in 1878 (*Ann.*, 1878, 194, p. 242); A. W. Hofmann having previously shown that oxidation of pure aniline alone or of pure toluidine yielded no fuchsine, whilst oxidation of a mixture of aniline and para-toluidine gave rise to the fine red dyestuff para-fuchsine (pararosaniline hydrochloride)

$$CH_3{\cdot}C_6H_4NH_2 + 2C_6H_5NH_2 + 3O = HO{\cdot}C(C_6H_4NH_2)_2 + 2H_2O.$$

Colour base (pararosaniline).

$$HO{\cdot}C(C_6H_4NH_2)_2{\cdot}HCl = H_2O + (H_2N{\cdot}C_6H_4)_2C : C_6H_4 : NH_2Cl.$$

Pararosaniline hydrochloride.

A. Rosenstiehl (*Jahres.*, 1869, p. 693) found also that different rosanilines were obtained according to whether ortho- or para-toluidine was oxidized with aniline, and he gave the name rosaniline to the one obtained from aniline and ortho-toluidine, reserving the term pararosaniline for the other. E. and O. Fischer showed that these compounds were derivatives of triphenylmethane and tolyldiphenylmethane respectively. Pararosaniline was reduced to the corresponding leuco compound (paraleucaniline), from which by diazotization and boiling with alcohol, the parent hydrocarbon was obtained

$$(H_2N{\cdot}C_6H_4)_2C{\cdot}C_6H_4{\cdot}NH_2{\cdot}HCl \rightarrow HC(C_6H_4NH_2{\cdot}HCl)_3 \rightarrow HC(C_6H_4N_2Cl_2)$$

Pararosaniline hydrochloride. Paraleucaniline.

$$\rightarrow HC(C_6H_5).$$

Triphenylmethane.

The reverse series of operations was also carried out by the Fischers, triphenylmethane being nitrated, and the nitro compound then reduced to triaminotriphenylmethane or paraleucaniline, which on careful oxidation is converted into the dyestuff. A similar series of reactions was carried out with rosaniline, which was shown to be the corresponding derivative of tolyldiphenylmethane.

The free pararosaniline, $C_{19}H_{19}N_3O$, and rosaniline, $C_{20}H_{21}N_3O$, may be obtained by precipitating solutions of their salts with a caustic alkali, colourless precipitates being obtained, which crystallize from hot water in the form of needles or plates. The position of the amino groups in pararosaniline was determined by the work of H. Caro and C. Graebe (*Ber.*, 1878, 11, p. 1348) and of E. and O. Fischer (*Ber.*, 1880, 13, p. 2204) as follows: Nitrous acid converts pararosaniline into aurin, which when superheated with water yields para-dioxybenzophenone. As the hydroxyl groups in aurin correspond to the amino groups in pararosaniline, two of these in the latter compound must be in the para position. The third is also in the para position; for if benzaldehyde be condensed with aniline, condensation occurs in the para position, for the compound formed may be converted into para-dioxybenzophenone,

$$C_6H_5CHO \rightarrow C_6H_5CH(C_6H_4NH_2)_2 \rightarrow C_6H_5CH(C_6H_4OH)_2$$

$$\rightarrow CO(C_6H_4OH)_2;$$

but if para-nitrobenzaldehyde be used in the above reaction and the resulting compound $NO_2{\cdot}C_6H_4{\cdot}CH(C_6H_4NH_2)_2$ be reduced, then pararosaniline is the final product, and consequently the third amino group occupies the para position. Many derivatives of pararosaniline and rosaniline are known, in which the hydrogen atoms of the amino groups are replaced by alkyl groups; this has the effect of producing a blue or violet shade, which becomes deeper as the number of groups increases (see DYEING).

FUCINO, LAGO DI [Lat. *Lacus Fucinus*], a lake bed of the Abruzzi, Italy, in the province of Aquila, 2 m. E. of the town of Avezzano. The lake was 37 m. in circumference and 65 ft. deep. From the lack of an outlet, the level of the lake was subject to great variations, often fraught with disastrous consequences. As early as A.D. 52 the emperor Claudius, realizing a project of Julius Caesar, constructed a tunnel $3\frac{1}{2}$ m. long, with 40 shafts at intervals, by which the surplus waters found an outlet to the Liris (or Garigliano). No less than 30,000 workmen were employed for eleven years in driving this tunnel. In the following reign the tunnel was allowed to fall into disrepair, but was repaired by Trajan. When, however, it finally went out of use is uncertain. The various attempts made to reopen it from 1240 onwards were unsuccessful. By 1852 the lake had gradually risen until it was 30 ft. above its original level, and had become a source of danger to the surrounding countryside. A company undertook to drain it on condition of becoming proprietors of the site when dry; in 1854, however, the rights and privileges were purchased by Prince Giulio Torlonia (d. 1886), the great Roman banker, who carried on the work at his own expense until, in 1876, the lake was finally drained at the cost of some £1,700,000. The

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reclaimed area is 12½ m. long, 7 m. broad, and is cultivated by families from the Torlonia estates. The outlet by which it was drained is 4 m. long and 24 sq. yds. in section.

See A. Brisse and L. de Rotron, *Le Dessèchement du lac Fucin, exécuté par S. E. le Prince A. Torlonia* (Rome, 1870). (T. As.)

FUEL (O. Fr. *feuaile*, popular Lat. *focalia*, from *focus*, hearth, fire), a term applicable to all substances that can be usefully employed for the production of heat by combustion. Any element or combination of elements susceptible of oxidation may under appropriate conditions be made to burn; but only those that ignite at a moderate initial temperature and burn with comparative rapidity, and, what is practically of more importance, are obtainable in quantity at moderate prices, can fairly be regarded as fuels. The elementary substances that can be so classed are primarily hydrogen, carbon and sulphur, while others finding more special applications are silicon, phosphorus, and the more readily oxidizable metals, such as iron, manganese, aluminium and magnesium. More important, however, than the elements are the carbohydrates or compounds of carbon, oxygen and hydrogen, which form the bulk of the natural fuels, wood, peat and coal, as well as of their liquid and gaseous derivatives—coal-gas, coal-tar, pitch, oil, &c., which have high values as fuel. Carbon in the elementary form has its nearest representative in the carbonized fuels, charcoal from wood and coke from coal.

Solid Fuels.

Wood may be considered as having the following average composition when in the air-dried state: Carbon, 39·6; hydrogen, 4·8; oxygen, 34·8; ash, 1·0; water, 20%.

Wood.

When it is freshly felled, the water may be from 18 to 50%. Air-dried or even green wood ignites readily when a considerable surface is exposed to the kindling flame, but in large masses with regular or smooth surfaces it is often difficult to get it to burn. When previously torrefied or scorched by heating to a temperature of about 200°, at which incipient charring is set up, it is exceedingly inflammable. The ends of imperfectly charred boughs from the charcoal heaps in this condition are used in Paris and other large towns in France for kindling purposes, under the name of *fumerons*. The inflammability, however, varies with the density,—the so-called hard woods, oak, beech and maple, taking fire less readily than the softer, and, more especially, the coniferous varieties rich in resin. The calorific power of absolutely dry woods may as an average be taken at about 4000 units, and when air-dried, *i.e.* containing 25% of water, at 2800 to 3000 units. Their evaporative values, *i.e.* the quantities of water evaporated by unit weight, are 3·68 and 4·44.

Wood being essentially a flaming fuel is admirably adapted for use with heat-receiving surfaces of large extent, such as locomotive and marine boilers, and is also very clean in use. The absence of all cohesion in the cinders or unburnt carbonized residue causes a large amount of ignited particles to be projected from the chimney, when a rapid draught is used, unless special spark-catchers of wire gauze or some analogous contrivance are used. When burnt in open fireplaces the volatile products given off in the apartment on the first heating have an acrid penetrating odour, which is, however, very generally considered to be agreeable. Owing to the large amount of water present, no very high temperatures can be obtained by the direct combustion of wood, and to produce these for metallurgical purposes it is necessary to convert it previously either into charcoal or into inflammable gas.

Peat includes a great number of substances of very unequal fuel value, the most recently formed spongy light brown kind approximating in composition to wood, while the dense pitchy brown compact substance, obtained from the bottom of bogs of ancient formation, may be compared with lignite or even in some instances with coal. Unlike wood, however, it contains incombustible matter in variable but large quantity, from 5 to 15% or even more. Much of this, when the amount is large, is often due to sand mechanically intermixed; when air-dried the proportion of water is from 8 to 20%. When these constituents are deducted the average composition may be stated to be—carbon, 52 to 66; hydrogen, 4·7 to 7·4; oxygen, 28 to 39; and nitrogen, 1·5 to 3%. Average air-dried peat may be taken as having a calorific value of 3000 to 3500 units, and when dried at 100° C., and with a minimum of ash (4 to 5%), at about 5200 units, or from a quarter to one-third more than that of an equal weight of wood. The lighter and more spongy varieties of peat when air-dried are exceedingly inflammable, firing at a temperature of 200° C.; the denser pulpy kinds ignite less readily when in the natural state, and often require a still higher temperature when prepared by pulping and compression or partial carbonization. Most kinds burn with a red smoky flame, developing a very strong odour, which, however, has its admirers in the same way that wood smoke has. This arises from the destructive distillation of imperfectly carbonized organic matter. The ash, like that of wood, is light and powdery, except when much sand is present, when it is of a denser character.

Peat.

Peat is principally found in high latitudes, on exposed high tablelands and treeless areas in more temperate climates, and in the valleys of slow-flowing rivers,—as in Ireland, the west of Scotland, the tableland of Bavaria, the North German plain, and parts of the valleys of the Somme, Oise and a few other rivers in northern France. A principal objection to its use is its extreme bulk, which for equal evaporative effect is from 8 to 18 times that of coal. Various methods have been proposed, and adopted more or less successfully, for the purpose of increasing the density of raw peat by compression, either with or without pulping; the latter process gives the best results, but the improvement is scarcely sufficient to compensate for the cost.

Lignite.

Lignite or brown coal is of intermediate character between peat and coal proper. The best kinds are undistinguishable in quality from free-burning coals, and the lowest earthy kinds are not equal to average peat. When freshly raised, the proportion of water may be from 45 to 50% and even more, which is reduced from 28 to 20% by exposure to dry air. Most varieties, however, when fully dried, break up into powder, which considerably diminishes their utility as fuel, as they cannot be consolidated by coking. Lignite dust may, however, be compacted into serviceable blocks for burning, by pressure in machines similar to those used for brick-making, either in the wet state as raised from the mines or when kiln-dried at 200° C. This method was adopted to a very large extent in Prussian Saxony. The calorific value varies between 3500 and 5000 units, and the evaporative factor from 2·16 when freshly raised to 5·84 for the best kinds of lignite when perfectly dried.

Other natural fuels.

Of the other natural fuels, apart from coal (*q.v.*), the most important is so-called vegetable refuse, such as cotton stalks, brushwood, straw, and the woody residue of sugar-cane after the extraction of the saccharine juice known as megasse or cane trash. These are extensively used in countries where wood and coal are scarce, usually for providing steam in the manufactures where they arise, *e.g.* straw for thrashing, cotton stalks for ploughing, irrigating, or working presses, and cane trash for boiling down sugar or driving the cane mill. According to J. Head (*Proc. Inst. of Civil Engineers*, vol. xlviii. p. 75), the evaporative values of 1 lb of these different articles when burnt in a tubular boiler are—coal, 8 lb; dry peat, 4 lb; dry wood, 3·58-3·52 lb; cotton stalks or megasse, 3·2-2·7 lb; straw, 2·46-2·30 lb. Owing to the siliceous nature of the ash of straw, it is desirable to have a means of clearing the grate bars from slags and clinkers at short intervals, and to use a steam jet to clear the tubes from similar deposits.

The common fuel of India and Egypt is derived from the dung of camels and oxen, moulded into thin cakes, and dried in the sun. It has a very low heating power, and in burning gives off acrid ammoniacal smoke and vapour.

Somewhat similar are the tan cakes made from spent tanners' bark, which are used to some extent in eastern France and in Germany. They are made by moulding the spent bark into cakes, which are then slowly dried by exposure to the air. Their effect is about equivalent to 80 and 30% of equal weights of wood and coal respectively.

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Sulphur, phosphorus and silicon, the other principal combustible elements, are only of limited application as fuels. The first is used in the liquidation of sulphur-bearing rocks. The ore is piled into large heaps, which are ignited at the bottom, a certain proportion, from one-fourth to one-third, of the sulphur content being sacrificed, in order to raise the mass to a sufficient temperature to allow the remainder to melt and run down to the collecting basin. Another application is in the so-called "pyritic smelting," where ores of copper (*q.v.*) containing iron pyrites, FeS_2, are smelted with appropriate fluxes in a hot blast, without preliminary roasting, the sulphur and iron of the pyrites giving sufficient heat by oxidation to liquefy both slag and metal. Phosphorus, which is of value from its low igniting point, receives its only application in the manufacture of lucifer matches.

The high temperature produced by burning phosphorus is in part due to the product of combustion (phosphoric acid) being solid, and therefore there is less heat absorbed than would be the case with a gaseous product. The same effect is observed in a still more striking manner with silicon, which in the only special case of its application to the production of heat, namely, in the Bessemer process of steel-making, gives rise to an enormous increase of temperature in the metal, sufficient indeed to keep the iron melted. The absolute calorific value of silicon is lower than that of carbon, but the product of combustion (silica) being non-volatile at all furnace temperatures, the whole of the heat developed is available for heating the molten iron, instead of a considerable part being consumed in the work of volatilization, as is the case with carbonic oxide, which burns to waste in the air.

Assay and Valuation of Carbonaceous Fuels.—The utility or value of a fuel depends upon two principal factors, namely, its calorific power and its calorific intensity or pyrometric effect, that is, the sensible temperature of the products of combustion.

Calorific power.

The first of these is constant for any particular product of combustion independently of the method by which the burning is effected, whether by oxygen, air or a reducible metallic oxide. It is most conveniently determined in the laboratory by measuring the heat evolved during the combustion of a given weight of the fuel. The method of Lewis Thompson is one of the most useful. The calorimeter consists of a copper cylinder in which a weighed quantity of coal intimately mixed with 10–12 parts of a mixture of 3 parts of potassium chlorate and 1 of potassium nitrate is deflagrated under a copper case like a diving-bell, placed at the bottom of a deep glass jar filled with a known weight of water. The mixture is fired by a fuse of lamp-cotton previously soaked in a nitre solution and dried. The gases produced by combustion rising through the water are cooled, with a corresponding increase of temperature in the latter, so that the difference between the temperature observed before and after the experiment measures the heat evolved. The instrument is so constructed that 30 grains (2 grammes) of coal are burnt in 29,010 grains of water, or in the proportion of 1 to 937, these numbers being selected that the observed rise of temperature in Fahrenheit degrees corresponds to the required evaporative value in pounds, subject only to a correction for the amount of heat absorbed by the mass of the instrument, for which a special coefficient is required and must be experimentally determined. The ordinary bomb calorimeter is also used. An approximate method is based upon the reduction of lead oxide by carbon and hydrogen of the coal, the amount of lead reduced affording a measure of the oxygen expended, whence the heating power may be calculated, 1 part of pure carbon being capable of producing 34½ times its weight of lead. The operation is performed by mixing the weighed sample with a large excess of litharge in a crucible, and exposing it to a bright red heat for a short time. After cooling, the crucible is broken and the reduced button of lead is cleaned and weighed. The results obtained by this method are less accurate with coals containing much disposable hydrogen and iron pyrites than with those approximating to anthracite, as the heat equivalent of the hydrogen in excess of that required to form water with the oxygen of the coal is calculated as carbon, while it is really about four times as great. Sulphur in iron pyrites also acts as a reducing agent upon litharge, and increases the apparent effect in a similar manner.

The evaporative power of a coal found by the above methods, and also by calculating the separate calorific factors of the components as determined by the chemical analysis, is always considerably above that obtained by actual combustion under a steam boiler, as in the latter case numerous sources of loss, such as imperfect combustion of gases, loss of unburnt coal in cinders, &c., come into play, which cannot be allowed for in laboratory experiments. It is usual, therefore, to determine the value of a coal by the combustion of a weighed quantity in the furnace of a boiler, and measuring the amount of water evaporated by the heat developed.

In a research upon the heating power and other properties of coal for naval use, carried out by the German admiralty, the results tabulated below were obtained with coals form different localities.

The heats of combustion of elements and compounds will be found in most of the larger works on physical and chemical constants;

	Slag left in Grate.	Ashes in Ashpit.	Soot in Flues.	Water evaporated by 1 lb of Coal
Westphalian gas coals .	0·33–6·42	2·83– 6·53	0·32–0·46	6·60–7·45 lb
Do. bituminous coals	0·98–9·10	1·97– 9·63	0·24–0·88	7·30–8·66
Do. dry coals .	1·93–5·70	4·37–10·63	0·24–0·48	7·03–8·51
Silesian coals .	0·92–1·30	3·15– 3·50	0·24–0·30	6·73–7·10
Welsh steam coals .	1·20–4·07	4·07	0·32	8·41
Newcastle coals .	1·92	2·57	0·35	7·28

a convenient series is given in the *Annuaire du Bureau des Longitudes*, appearing in alternate years. The following figures for the principal fuel elements are taken from the issue for 1908; they are expressed in gramme "calories" or heat units, signifying the weight of water in grammes that can be raised 1° C. in temperature by the combustion of 1 gramme of the substance, when it is oxidized to the condition shown in the second column:

Element.	Product of Combustion.	Calories.
Hydrogen . .	Water, H_2O, condensed to liquid	34,500
	" as vapour .	29,650
Carbon—		
Diamond . .	Carbon dioxide, CO_2 . . .	7,868
Graphite . .	" " . . .	7,900
Amorphous . .	" " . . .	8,133
Silicon—		
Amorphous . .	Silicon dioxide, SiO_2 . . .	6,414
Crystallized . .	" " . . .	6,570
Phosphorus . .	Phosphoric pentoxide, P_2O_5 .	5,938
Sulphur . .	Sulphur dioxide, SO_2, gaseous .	2,165

The results may also be expressed in terms of the atomic equivalent of the combustible by multiplying the above values by the atomic weight of the substance, 12 for carbon, 28 for silicon, &c.

In all fuels containing hydrogen the calorific value as found by the calorimeter is higher than that obtainable under working conditions by an amount equal to the latent heat of volatilization of water which reappears as heat when the vapour is condensed, though under ordinary conditions of use the vapour passes away uncondensed. This gives rise to the distinction of higher and lower calorific values for such substances, the latter being those generally used in practice. The differences for the more important compound gaseous fuels are as follows:—

	Calorific Value. Higher.	Lower.
Acetylene, C_2H_2 . . .	11,900	11,500
Ethylene, C_2H_4 . . .	11,880	11,120
Methane, CH_4 . . .	13,240	11,910
Carbon monoxide, CO . .	2,440	2,440

Calorific intensity.

The calorific intensity or pyrometric effect of any particular fuel depends upon so many variable elements that it cannot be determined except by actual experiment. The earlier method was to multiply the weight of the products of combustion by their specific heats, but this gave untrustworthy results as a rule, on account of two circumstances—the great increase in specific heat at high temperatures in compound gases such as water and carbon dioxide, and their instability when heated to 1800° or 2000°. At such temperatures dissociation to a notable extent takes place, especially with the latter substance, which is also readily reduced to carbon monoxide when brought in contact with carbon at a red heat—a change which is attended with a large heat absorption. This effect is higher with soft kinds of carbon, such as charcoal or soft coke, than with dense coke, gas retort carbon or graphite. These latter substances, therefore, are used when an intense local heat is required, as for example, in the Deville furnace, to which air is supplied under pressure. Such a method is, however, only of very special application, the ordinary method being to supply air to the fire in excess of that required to burn the fuel to perfect gas, the reduction of the carbon dioxide. The volume of flame, however, is increased by inert gas, and there is a proportionate diminution of the heating effect. Under the most favourable conditions, when the air employed has been previously raised to a high temperature and pressure, the highest attainable flame temperature from carbonaceous fuel seems to be about 2100°–2300° C.; this is realized in the bright spots or "eyes" of the tuyeres of blast furnaces.

Very much higher temperatures may be reached when the products of combustion are not volatile, and the operation can be effected by using the fuel and oxidizing agent in the proportions exactly

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required for perfect combustion and intimately mixed. These conditions are met in the "Thermit" process of Goldschmidt, where finely divided aluminium is oxidized by the oxide of some similar metal, such as iron, manganese or chromium, the reaction being started by a primer of magnesium and barium peroxide. The reaction is so rapidly effected that there is an enormous rise in temperature, estimated to be 5400° F. (3000° C.), which is sufficient to melt the most refractory metals, such as chromium. The slag consists of alumina which crystallizes in the forms of corundum and ruby, and is utilized as an abrasive under the name of corubin.

The chemical examination includes the determination of (1) moisture, (2) ash, (3) coke, (4) volatile matter, (5) fixed carbon in coke, (6) sulphur, (7) chlorine, (8) phosphorus. Moisture is determined by noting the loss in weight when a sample is heated at 100° for about one hour. The ash is determined by heating a sample in a muffle furnace until all the combustible matter has been burnt off. The ash, which generally contains silica, oxides of the alkaline earths, ferric oxide (which gives the ash a red colour), sulphur, &c., is analysed by the ordinary gravimetric methods. The determination of coke is very important on account of the conclusions concerning the nature of the coal which it permits to be drawn. A sample is finely powdered and placed in a covered porcelain crucible, which is surrounded by an outer one, the space between them being packed with small coke. The crucibles are heated in a wind furnace for 1 to 1½ hours, then allowed to cool, the inner crucible removed, and the coke weighed. The coke may be (1) pulverulent, (2) slightly fritted, (3) spongy and swelled, (4) compact. Pulverulent cokes indicate a non-caking bituminous coal, rich in oxygen if the amount be below 60%, but if the amount be very much less it generally indicates a lignite: if the amount be above 80%, it indicates an anthracite containing little oxygen or hydrogen. A fritted coke indicates a slightly coking coal, while the spongy appearance points to a highly coking coal which has been partly fused in the furnace. A compact coke is yielded by good coking coals, and is usually large in amount. The volatile matters are determined as the loss of weight on coking less the amount of moisture. The "fixed carbon" is the carbon retained in the coke, which contains in addition the ash already determined. The fixed carbon is therefore the difference between the coke and the ash, and may be determined from these figures; or it may be determined directly by burning off the coke in a muffle and noting the loss in weight. Sulphur may be present as (1) organic sulphur, (2) as iron pyrites or other sulphides, (3) as the sulphates of calcium, aluminium and other metals, but the amount is generally so small that only the total sulphur is determined. This is effected by heating a mixture of the fuel with lime and sodium carbonate in a porcelain dish to redness in a muffle until all the carbonaceous matter has been burnt off. The residue, which contains the sulphur as calcium sulphate, is transferred to a beaker containing water to which a little bromine has been added. Hydrochloric acid is carefully added, the liquid filtered and the residue washed. To the filtrate ammonia is added and then barium chloride, which precipitates the sulphur as barium sulphate. Sulphur existing in the form of sulphates may be removed by washing a sample with boiling water and determining the sulphuric acid in the solution. The washed sample is then fused in the usual way to determine the proportion of sulphur existing as iron pyrites. The distinction between sulphur present as sulphate and sulphide is of importance in the examination of coals intended for iron smelting, as the sulphates of the earthy metals are reduced by the gases of the furnace to sulphides, which pass into the slag without affecting the quality of the iron produced, while the sulphur of the metallic sulphides in the ash acts prejudicially upon the metal. Coals for gas-making should contain little sulphur, as the gases produced in the combustion are noxious and have very corrosive properties. Chlorine is rarely determined, but when present in quantity it corrodes copper and brass boiler tubes, with which consequently chlorine-bearing coals cannot be used. The element is determined by fusing with soda lime in a muffle, dissolving the residue in water and precipitating with silver nitrate. Phosphorus is determined in the ash by fusing it with a mixture of sodium and potassium carbonates, extracting the residue with hydrochloric acid, and twice evaporating to dryness with the same acid. The residue is dissolved in hydrochloric acid, a few drops of ferric chloride added, and then ammonia in excess. The precipitate of ferric phosphate is then treated as in the ordinary estimation of phosphates. If it be necessary to determine the absolute amount of carbon and hydrogen in a fuel, the dried sample is treated with copper oxide as in the ordinary estimation of these elements in organic compounds. (H. B.)

Liquid Fuel.

Vegetable oil is not used for fuel except for laboratory purposes, partly because its constituent parts are less adaptable for combustion under the conditions necessary for steam-raising, but chiefly because of the commercial difficulty of producing it with sufficient economy to compete with mineral fuel either solid or liquid.

The use of petroleum as fuel had long been recognized as a scientific possibility, and some attempts had been made to adopt it in practice upon a commercial scale, but the insufficiency, and still more the irregularity, of the supplies prevented it from coming into practical use to any important extent until about 1898, when discoveries of oil specially adapted by chemical composition for fuel purposes changed the aspect of the situation. These discoveries of special oil were made first in Borneo and later in Texas, and experience in treating the oils from both localities has shown that while not less adapted to produce kerosene or illuminating oil, they are better adapted to produce fuel oil than either the Russian or the Pennsylvanian products. Texas oil did not hold its place in the market for long, because the influx of water into the wells lowered their yield, but discoveries of fuel oil in Mexico have come later and will help to maintain the balance of the world's supply, although this is still a mere fraction of the assured supply of coal.

With regard to the chemical properties of petroleum, it is not necessary to say more in the present place than that the lighter and more volatile constituents, known commercially as naphtha and benzene, must be removed by distillation in order to leave a residue composed principally of hydrocarbons which, while containing the necessary carbon for combustion, shall be sufficiently free from volatile qualities to avoid premature ignition and consequent danger of explosion. Attempts have been made to use crude oil for fuel purposes, and these have had some success in the neighbourhood of the oil wells and under boilers of unusually good ventilation both as regards their chimneys and the surroundings of their stokeholds; but for reasons both of commerce and of safety it is not desirable to use crude oil where some distillation is possible. The more complete the process of distillation, and the consequent removal of the volatile constituents, the higher the flash-point, and the more turgid and viscous is the fuel resulting; and if the process is carried to an extreme, the residue or fuel becomes difficult to ignite by the ordinary process of spraying or atomizing mechanically at the moment immediately preceding combustion. The proportions which have been found to work efficiently in practice are as follows:—

Carbon	88·00 %
Hydrogen	10·75 %
Oxygen	1·25 %
Total	100

The standards of safety for liquid fuel as determined by flash-point are not yet finally settled, and are changing from time to time. The British admiralty require a flash-point of 270° F., and to this high standard, and the consequent viscosity of the fuel used by vessels in the British fleet, may partly be attributed the low rate of combustion that was at first found possible in them. The German admiralty have fixed a flash-point of 187° F., and have used oil of this standard with perfect safety, and at the same time with much higher measure of evaporative duty than has been attained in British war-vessels. In the British mercantile marine Lloyd's Register has permitted fuel with a flash-point as low as 150° F. as a minimum, and no harm has resulted. The British Board of Trade, the department of the government which controls the safety of passenger vessels, has fixed a higher standard upon the basis of a minimum of 185°. In the case of locomotives the flash-point as a standard of safety is of less importance than in the case of stationary or marine boilers, because the storage is more open, and the ventilation, both of the storage tanks and the boilers during combustion, much more perfect than in any other class of steam-boilers.

The process of refining by distillation is also necessary to reduce two impurities which greatly retard storage and combustion, *i.e.* water and sulphur. Water is found in all crude petroleum as it issues from the wells, and sulphur exists in important quantities in oil from the Texas wells. Its removal was at first found very expensive, but there no longer exists difficulty in this respect, and large quantities of petroleum fuel practically free from sulphur are now regularly exported from Texas to New York and to Europe.

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Water mixed with fuel is in intimate mechanical relation, and frequently so remains in considerable quantities even after the process of distillation. It is in fact so thoroughly mixed as to form an emulsion. The effect of feeding such a mixture into a furnace is extremely injurious, because the water must be decomposed chemically into its constituents, hydrogen and oxygen, thus absorbing a large quantity of heat which would otherwise be utilized for evaporation. Water also directly delays combustion by producing from the jet a long, dull, red flame instead of a short bright, white flame, and the process of combustion, which should take place by vaporization of the oil near the furnace mouth, is postponed and transferred to the upper part of the combustion-box, the tubes, and even the base of the chimney, producing loss of heat and injury to the boiler structure. The most effective means of ridding the fuel of this dangerous impurity is by heat and settlement. The coefficients of expansion of water and oil by heat are substantially different, and a moderate rise of temperature therefore separates the particles and precipitates the water, which is easily drawn off—leaving the oil available for use. The heating and precipitation are usually performed upon a patented system of settling tanks and heating apparatus known as the Flannery-Boyd system, which has proved itself indispensable for the successful use at sea of petroleum fuel containing any large proportion of water.

The laboratory and mechanical use of petroleum for fuel has already been referred to, but it was not until the year 1870 that petroleum was applied upon a wider and commercial scale. In the course of distillation of Russian crude petroleum for the production of kerosene or lamp oil, large quantities of refuse were produced—known by the Russian name of *astatki*—and these were found an incumbrance and useless for any commercial purpose. To a Russian oil-refiner gifted with mechanical instinct and the genius for invention occurred the idea of utilizing the waste product as fuel by spraying or atomizing it with steam, so that, the thick and sluggish fluid being broken up into particles, the air necessary for combustion could have free access to it. The earliest apparatus for this purpose was a simple piece of gas-tube, into which the thick oil was fed; by another connexion steam at high pressure was admitted to an inner and smaller tube, and, the end of the tube nearest to the furnace being open, the pressure of the steam blew the oil into the furnace, and by its velocity broke it up into spray. The apparatus worked with success from the first. Experience pointed out the proper proportionate sizes for the inlets of steam and oil, the proper pressure for the steam, and the proportionate sizes for the orifices of admission to the furnaces, as well as the sizes of air-openings and best arrangements of fire-bricks in the furnaces themselves; and what had been a waste product now became a by-product of great value. Practically all the steam power in South Russia, both for factories and navigation of the inland seas and rivers, is now raised from *astatki* fuel.

Progress of liquid fuel.

In the Far East, including Burma and parts of China and Japan, the use of liquid fuel spread rapidly during the years 1899, 1900 and 1901, owing entirely to the development of the Borneo oil-fields by the enterprise of Sir Marcus Samuel and the large British corporation known as the Shell Transport and Trading Company, of which he is the head. This corporation has since amalgamated with the Royal Dutch Petroleum Company controlling the extensive wells in Dutch Borneo, and together they supply large quantities of liquid fuel for use in the Far East. In the United States of America liquid fuel is not only used for practically the whole of the manufacturing and locomotive purposes of the state of Texas, but factories in New York, and a still larger number in California, are now discarding the use of coal and adopting petroleum, because it is more economical in its consumption and also more easily handled in transit, and saves nearly all the labour of stoking. So far the supplies for China and Japan have been exported from Borneo, but the discoveries of new oil-fields in California, of a character specially adapted for fuel, have encouraged the belief that it may be possible to supply Chile and Peru and other South American countries, where coal is extremely expensive, with Californian fuel; and it has also found its way across the Pacific to Japan. There are believed to be large deposits in West Africa, but in the meantime the only sources of supply to those parts of Africa where manufacture is progressing, *i.e.* South Africa and Egypt, are the oil-fields of Borneo and Texas, from which the import has well begun, from Texas to Alexandria via the Mediterranean, and from Borneo to Cape Town via Singapore.

In England, notwithstanding the fact that there exist the finest coal-fields in the world, there has been a surprising development of the use of petroleum as fuel. The Great Eastern railway adapted 120 locomotive engines to its use, and these ran with regularity and success both on express passenger and goods trains until the increase in price due to short supply compelled a return to coal fuel. The London, Brighton & South Coast railway also began the adaptation of some of their locomotive engines, but discontinued the use of liquid fuel from the same cause. Several large firms of contractors and cement manufacturers, chiefly on the banks of the Thames, made the same adaptations which proved mechanically successful, but were not continued when the price of liquid fuel increased with the increased demand.

The chief factors of economy are the greater calorific value of oil than coal (about 16 lb of water per lb of oil fuel evaporated from a temperature of 212° F.), not only in laboratory practice, but in actual use on a large scale, and the saving of labour both in transit from the source of supply to the place of use and in the act of stoking the furnaces. The use of cranes, hand labour with shovels, wagons and locomotives, horses and carts, is unavoidable for the transit of coal; and labour to trim the coal, to stoke it when under combustion, and to handle the residual ashes, are all indispensable to steam-raising by coal. On the other hand, a system of pipes and pumps, and a limited quantity of skilled

Economy of liquid fuel.

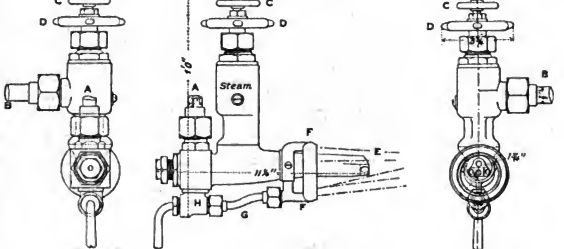

FIG. 1.—Holden Burner.

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labour to manage them, is all that is necessary for the transit and combustion of petroleum fuel; and it is certain that even in England will be found places which, from topographical and other circumstances, will use petroleum more economically than coal as fuel for manufacturing purposes under reasonable conditions of price for the fuel.

The theoretical calorific value of oil fuel is more nearly realized in practice than the theoretical calorific value of coal, because the facilities for complete combustion, due to the artificial admixture of the air by the atomizing process, are greater in the case of oil than coal, and for this reason, among others, the practical evaporative results are proportionately higher with liquid fuel. In some cases the work done in a steam-engine by 2 tons of coal has been performed by 1 ton of oil fuel, but in others the proportions have been as 3 to 2, and these latter can be safely relied on in practice as a minimum. This saving, combined with the savings of labour and transit already explained, will in the near future make the use of liquid fuel compulsory, except in places so near to coal-fields that the cost of coal becomes sufficiently low to counterbalance the savings in weight of fuel consumed and in labour in handling it. In some locomotives on the Great Eastern railway the consumption of oil and coal for the same development of horse-power was as 17 lb oil is to 35 lb coal; all, however, did not realize so high a result.

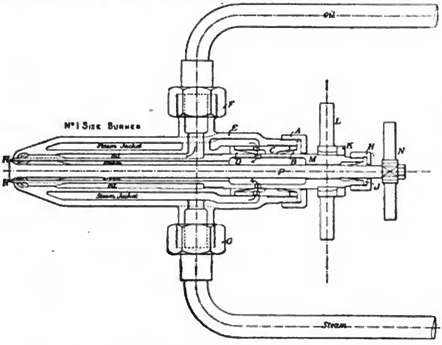

Fig. 2.—Rusden and Eeles Burner.

The mechanical apparatus for applying petroleum to steam-raising in locomotives is very simple. The space in the tender usually occupied by coal is closed up by steel-plating closely riveted and tested, so as to form a storage tank. From this tank a feed-pipe is led to a burner of the combined steam-and-oil type already indicated, and this burner is so arranged as to enter a short distance inside the furnace mouth. The ordinary fire-bars are covered with a thin layer of coal, which starts the ignition in the first place, and the whole apparatus is ready for work. The burner best adapted for locomotive practice is the Holden Burner (fig. 1), which was used on the Great Eastern railway. The steam-pipe is connected at A, the oil-pipe at B, and the hand-wheels C and D are for the adjustment of the internal orifices according to the rate of combustion required. The nozzle E is directed towards the furnace, and the external ring FF, supplied by the small pipe G and the by-pass valve H, projects a series of steam jets into the furnace, independent of the injections of atomized fuel, and so induces an artificial inrush of air for the promotion of combustion. This type of burner has also been tried on stationary boilers and on board ship. It works well, although the great consumption of steam by the supplementary ring is a difficulty at sea, where the water lost by the consumption of steam cannot easily be made up.

Liquid fuel in locomotives.

Although the application of the new fuel for land and locomotive boilers has already been large, the practice at sea has been far more extensive. The reason is chiefly to be found in the fact that although the sources of supply are at a distance from Great Britain, yet they are in countries to whose neighbourhood British steamships regularly trade, and in which British naval squadrons are regularly stationed, so that the advantages of adopting liquid fuel have been more immediate and the economy more direct. The certainty of continuous supply of the fuel and the wide distribution of storage stations have so altered the conditions that the general adoption of the new fuel for marine purposes becomes a matter of urgency for the statesman, the merchant and the engineer. None of these can afford to neglect the new conditions, lest they be noted and acted upon by their competitors. Storage for supply now exists at a number of sea ports: London, Barrow, Southampton, Amsterdam, Copenhagen, New Orleans, Savannah, New York, Philadelphia, Singapore, Hong Kong, Madras, Colombo, Suez, Hamburg, Port Arthur, Rangoon, Calcutta, Bombay, Alexandria, Bangkok, Saigon, Penang, Batavia, Surabaya, Amoy, Swatow, Fuchow, Shanghai, Hankow, Sydney, Melbourne, Adelaide, Zanzibar, Mombasa, Yokohama, Kobe and Nagasaki; also in South African and South American ports.

Liquid fuel at sea.

The British admiralty have undertaken experiments with liquid fuel at sea, and at the same time investigations of the

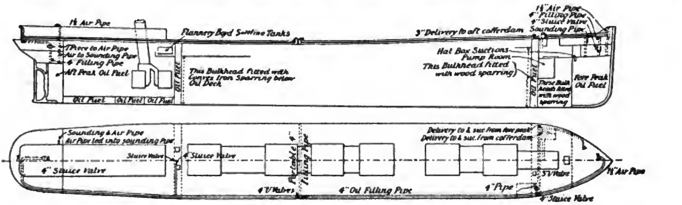

Fig. 3.—Storage of Liquid Fuel on Oil-carrying Steamers (Flannery-Boyd System).

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possibility of supply from sources within the regions of the British empire. There is an enormous supply of shale under the north-eastern counties of England, but no oil that can be pumped —still less oil with a pressure above it so as to "gush" like the wells in America—and the only sources of liquid supply under the British flag appear to be in Burma and Trinidad. The Borneo

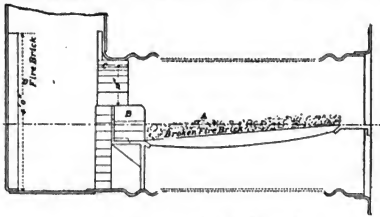

FIG. 4.—Installation on ss. "Trocas."

fields are not under British control, although developed entirely by British capital. The Italian admiralty have fitted several large warships with boiler apparatus to burn petroleum. The German admiralty are regularly using liquid fuel on the China station. The Dutch navy have fitted coal fuel and liquid fuel furnaces in combination, so that the smaller powers required

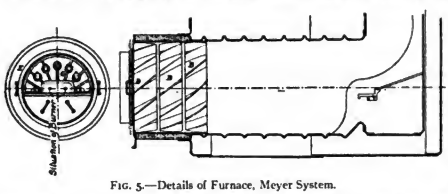

FIG. 5.—Details of Furnace, Meyer System.

may be developed by coal alone, and the larger powers by supplementing coal fuel with oil fuel. The speeds of some vessels of the destroyer type have by this means been accelerated nearly two knots.

The questions which govern the use of fuel in warships are more largely those of strategy and fighting efficiency than economy of evaporation. Indeed, the cost of construct-

Advantages in warships.

ing and maintaining in fighting efficiency a modern warship is so great that the utmost use strategically must be obtained from the vessel, and in this comparison the cost of fuel is relatively so small an item that its increase

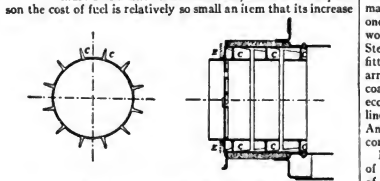

FIG. 6.—Details of Exterior Elongation of Furnace, Meyer System.

or decrease may be considered almost a negligible quantity. The desideratum in a warship is to obtain the greatest fighting efficiency based on the thickest armour, the heaviest and most numerous guns, the highest maximum speed, and, last and not least, the greatest range of effective action based upon the maximum supplies of fuel, provisions and other consumable stores that the ship can carry. Now, if by changing the type of fuel it be possible to reduce its weight by 30%, and to abolish the stokers, who are usually more than half the ship's company, the weight saved will be represented not merely by the fuel, but by the consumable stores otherwise necessary for the stokers. Conversely, the radius of effective action of the ship will be doubled as regards consumable stores if the crew be halved, and will be increased by 50% if the same weight of fuel be carried in the form of liquid instead of coal. In space the gain by using oil fuel is still greater, and 36 cubic feet of oil as stored are equal in practical calorific value to 67 cubic feet of coal according to the allowance usual for ship's bunkering. On the other hand, coal has been relied upon, when placed in the side bunkers of unarmoured ships, as a protection against shot and shell, and this advantage, if it really exists, could not be claimed in regard to liquid fuel.

Recent experiments in coaling warships at sea have not been very successful, as the least bad weather has prevented the safe transmission of coal bags from the collier to the ship. The same difficulty does not exist for oil fuel, which has been pumped through flexible tubing from one ship to the other even in comparatively rough weather. Smokelessness, so important a feature of sea strategy, has not always been attained by liquid fuel, but where the combustion is complete, by reason of suitable furnace arrangements and careful management, there is no smoke. The great drawback, however, to the use of liquid fuel in fast small vessels is the confined space allotted to the boilers, such confinement being unavoidable in view of the high power concentrated in a small hull. The British admiralty's experiments, however, have gone far to solve the problem, and the quantity of oil which can be consumed by forced draught in confined boilers now more nearly equals the quantity of coal consumed under similar conditions. All recent vessels built for the British navy are so constructed that the spaces between their double bottoms are oil-tight and capable of storing liquid fuel in the tanks so formed. Most recent battleships and cruisers have also liquid fuel furnace fittings, and in 1910 it already appeared probable that the use of oil fuel in warships would rapidly develop.

In view of recent accusations of insufficiency of coal storage in foreign naval depots, by reason of the allegation that coal so stored quickly perishes, it is interesting to note that liquid fuel may be stored in tanks for an indefinite time without any deterioration whatever.

In the case of merchant steamers large progress has also been made. The Shell Transport and Trading Company have twenty-one vessels successfully navigating in all parts of the world and using liquid fuel. The Hamburg-American Steamship Company have four large vessels similarly fitted for oil fuel, which, however, differ in furnace arrangements, as will be hereafter described, although using coal when the fluctuation of the market renders that the more economical fuel. One of the large American transatlantic lines is adopting liquid fuel, and French, German, Danish and American mercantile vessels are also beginning to use it in considerable amounts.

Advantages in merchant ships.

In the case of very large passenger steamers, such as those of 20 knots and upwards in the Atlantic trade, the saving in cost of fuel is trifling compared with the advantage arising from the greater weight and space available for freight. Adopting a basis of 3 to 2 as between coal consumption and oil consumption, there is an increase of 1000 tons of dead weight cargo in even a

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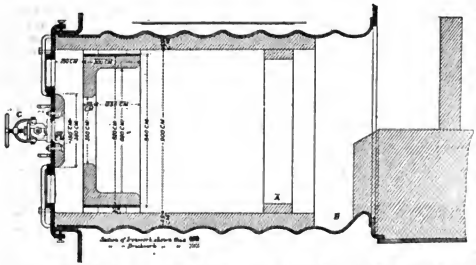

FIG. 7.—Furnace on ss. "Ferdinand Laeisz." A, it is proposed to do away with this ring of brickwork as being useless; B, it is proposed to fill this space up, thus continuing lining of furnace to combustion chamber, and also to fit protection bricks in way of saddle plate.

ships, whilst considerable additional speed is obtainable. The cost of the installation, however, is very considerable, as it includes not only burners and pipes for the furnaces, but also the construction of oil-tight tanks, with pumps and numerous valves and pipe connexions.

Fig. 2 shows a burner of Rusden and Eeles' patent as generally used on board ships for the purpose of injecting the oil. A is a movable cap holding the packing B, which renders the annular spindle M oil and steam tight. E is the outer casing containing the steam jacket from which the steam, after being led through the steam-supply pipe G, passes into the annular space surrounding the spindle P. It will be seen that if the spindle P be travelled inwards by turning the handle N, the orifice at the nozzle RR will be opened so as to allow the steam to flow out radially. If at the same time the annular spindle M be drawn inwards by revolving the handle L, the oil which passes through the supply pipe F will also have emission at RR, and, coming in contact with the outflowing steam, will be

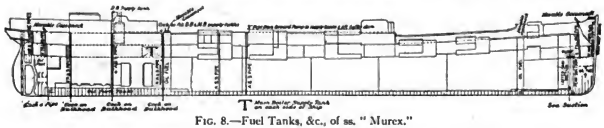

FIG. 8.—Fuel Tanks, &c., of ss. "Murex."

medium-sized Atlantic steamer, and a collateral gain of about 100,000 cub. ft. of measurement cargo, by reason of the ordinary bunkers being left quite free, and the oil being stored in the double bottom spaces hitherto unutilized except for the purpose of water ballast. The cleanliness and saving of time from bunkering by the use of oil fuel is also an important factor in passenger

pulverized and sprayed into the furnace. Fig. 3 is a profile and plan of a steamer adapted for carrying oil in bulk, and showing all the storage arrangements for handling liquid fuel. Fig. 4 shows the interior arrangement of the boiler furnace of the steamship "Trocas." A is broken fire-brick resting on the ordinary fire-bars, B is a brick bridge, C a casing of fire-brick intended to protect the riveted seam immediately above it from the direct

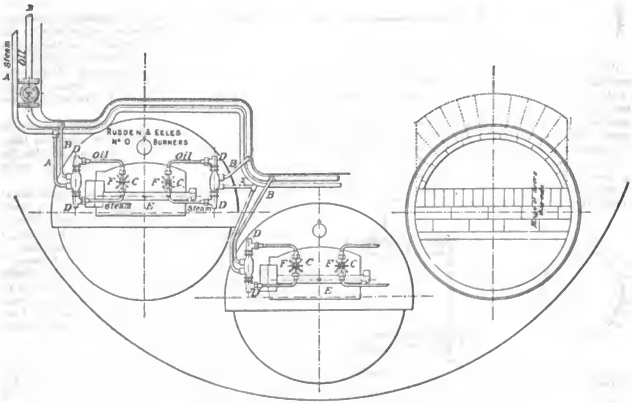

FIG. 9.—Furnace Gear of ss. "Murex."

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impact of the flame, and D is a lining of fire-brick at the back of the combustion-box, also intended to protect the plating from the direct impact of the petroleum flame. The arrangement of the furnace on the Meyer system is shown in fig. 5, where E is an annular projection built at the mouth of the furnace, and BB are spiral passages for heating the air before it passes into the furnace. Fig. 6 shows the rings CC and details of the casting which forms the projection or exterior elongation of the furnace. The brickwork arrangement adopted for the double-ended boilers on the Hamburg-American Steamship Company's "Ferdinand Laeisz" is represented in fig. 7. The whole furnace is lined with fire-brick, and the burner is mounted upon a circular disk plate which closes the end of the furnace. The oil is injected not by steam pulverization, but by pressure due to a steam-pump. The oil is heated to about 60° C. before entering the pump, and further heated to 90° C. after leaving the pump. It is then filtered, and passes to the furnace injector C at about 30-lb pressure; and its passage through this injector and the spiral passages of which it consists pulverizes the oil into spray, in which form it readily ignites on reaching the interior of the furnace. The injector is on the Körting principle, that is, it atomizes by fracture of the liquid oil arising from its own momentum under pressure. The advantage of this system as compared with the steam-jet system is the saving of fresh water, the abstraction of which is so injurious to the boiler by the formation of scale.

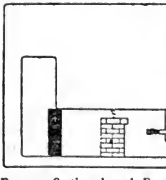

FIG. 10.—Section through Furnace of ss. "Murex."

The general arrangement of the fuel tanks and filling pipes on the ss. "Murex" is shown in fig. 8; and fig. 9 represents the furnace gear of the same vessel, A being the steam-pipe, B the oil-pipe, C the injector, D the swivel upon which the injector is hung so that it may be swung clear of the furnace, E the fire-door, and F the handle for adjusting the injector. In fig. 10, which represents a section of the furnace, H is a fire-brick pier and K a fire-brick baffling bridge.

It is found in practice that to leave out the fire-bars ordinarily used for coal produces a better result with liquid fuel than the alternative system of keeping them in place and protecting them by a layer of broken fire-brick.

Boilers fitted upon all the above systems have been run for thousands of miles without trouble. In new construction it is desirable to give larger combustion chambers and longer and narrower boiler tubes than in the case of boilers intended for the combustion of coal alone. (F. F.*)

Gaseous Fuel.

Strictly speaking, much, and sometimes even most, of the heating effected by solid or liquid fuel is actually performed by the gases given off during the combustion. We speak, however, of gaseous fuel only in those cases where we supply a combustible gas from the outset, or where we produce from ordinary solid (or liquid) fuel in one place a stream of combustible gas which is burned in another place, more or less distant from that where it has been generated.

The various descriptions of gaseous fuel employed in practice may be classified under the following heads:

I. Natural Gas.
II. Combustible Gases obtained as by-products in various technical operations.
III. Coal Gas (Illuminating Gas).
IV. Combustible Gases obtained by the partial combustion of coal, &c.

I. *Natural Gas.*—From time immemorial it has been known that in some parts of the Caucasus and of China large quantities of gases issue from the soil, sometimes under water, which can be lighted and burn with a luminous flame. The "eternal fires" of Baku belong to this class. In coal-mines frequently similar streams of gas issue from the coal; these are called "blowers," and when they are of somewhat regular occurrence are sometimes conducted away in pipes and used for underground lighting. As a regular source of heating power, however, natural gas is employed only in some parts of the United States, especially in Pennsylvania, Kansas, Ohio and West Virginia, where it always occurs in the neighbourhood of coal and petroleum fields. The first public mention of it was made in 1775, but it was not till 1821 that it was turned to use at Fredonia, N.Y. In Pennsylvania natural gas was discovered in 1859, but at first very little use was made of it. Its industrial employment dates only from 1874, and became of great importance about ten years later. Nobody ever doubted that the gas found in these localities was an accumulation of many ages and that, being tapped by thousands of bore-holes, it must rapidly come to an end. This assumption was strengthened by the fact that the "gas-wells," which at first gave out the gas at a pressure of 700 or 800, sometimes even of 1400 lb per sq. in., gradually showed a more and more diminishing pressure and many of them ceased to work altogether. About the year 1890 the belief was fairly general that the stock of natural gas would soon be entirely exhausted. Indeed, the value of the annual production of natural gas in the United States, computed as its equivalent of coal, was then estimated at twenty-one million dollars, in 1895 at twelve millions, in 1899 at eleven and a half millions. But the output rose again to a value of twenty-seven millions in 1901, and to fifty million dollars in 1907. Mostly the gas, derived from upwards of 10,000 gas-wells, is now artificially compressed to a pressure of 300 or 400 lb per sq. in. by means of steam-power or gas motors, fed by the gas itself, and is conveyed over great distances in iron pipes, from 9 or 10 to 36 in. in diameter. In 1904 nearly 30,000 m. of pipe lines were in operation. In 1907 the quantity of natural gas consumed in the United States (nearly half of which was in Pennsylvania) was 400,000 million cub. ft., or nearly 3 cub. m. Canada (Ontario) also produces some natural gas, reaching a maximum of about $746,000 in 1907.

The principal constituent of natural gas is always methane, CH_4, of which it contains from 68·4 to 94·0% by volume. Those gases which contain less methane contain all the more hydrogen, viz. 2·9 to 29·8%. There is also some ethylene, ethane and carbon monoxide, rarely exceeding 2 or 3%. The quantity of incombustible gases—oxygen, carbon dioxide, nitrogen—ranges from mere traces to about 5%. The density is from 0·45 to 0·55. The heating power of 1000 cub. ft. of natural gas is equal to from 80 to 120 lb, on the average 100 lb, of good coal, but it is really worth much more than this proportion would indicate, as it burns completely, without smoke or ashes, and without requiring any manual labour. It is employed for all domestic and for most industrial purposes.

The origin of natural gas is not properly understood, even now. The most natural assumption is, of course, that its formation is connected with that of the petroleum always found in the same neighbourhood, the latter principally consisting of the higher-boiling aliphatic hydrocarbons of the methane series. But whence do they both come? Some bring them into connexion with the formation of coal, others with the decomposition of animal remains, others with that of *diatomaceae*, &c., and even an inorganic origin of both petroleum and natural gas has been assumed by chemists of the rank of D. I. Mendeléeff and H. Moissan.

II. *Gases obtained as By-products.*—There are two important cases in which gaseous by-products are utilized as fuel; both are intimately connected with the manufacture of iron, but in a very different way, and the gases are of very different composition.

(*a*) *Blast-furnace Gases.*—The gases issuing from the mouths of blast-furnaces (see IRON AND STEEL) were first utilized in 1837 by Faber du Faur, at Wasseralfingen. Their use became more extensive after 1860, and practically universal after 1870. The volume of gas given off per ton of iron made is about 158,000 cub. ft. Its percentage composition by volume is:

Carbon monoxide	21·6 to 29·0,	mostly about	26	%
Hydrogen	1·8 „ 6·3,	„ „	3	%
Methane	0·1 „ 0·8,	„ „	0·5	%
Carbon dioxide	6 „ 12,	„ „	9·5	%
Nitrogen	51 „ 60,	„ „	56	%
Steam	5 „ 12,	„ „	5	%
			100	%

There is always a large amount of mechanically suspended

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flue-dust in this gas. It is practically equal to a poor producer-gas (see below), and is everywhere used, first for heating the blast in Cowper stoves or similar apparatus, and secondly for raising all the steam required for the operation of the blast-furnace, that is, for driving the blowing-engines, hoisting the materials, &c. Where the iron ore is roasted previously to being fed into the furnace, this can also be done by this gas, but in some cases the waste in using it is so great that there is not enough left for the last purpose. The calorific power of this gas per cubic foot is from 80 to 120 B.Th.U.

Since about 1900 a great advance has been made in this field. Instead of burning the blast-furnace gas under steam boilers and employing the steam for producing mechanical energy, the gas is directly burned in gas-motors on the explosion principle. Thus upwards of three times the mechanical energy is obtained in comparison with the indirect way through the steam boiler. After all the power required for the operations of the blast-furnace has been supplied, there is a surplus of from 10 to 20 h.p. for each ton of pig-iron made, which may be applied to any other purpose.

(*b*) *Coke-oven Gases.*—Where the coking of coal is performed in the old beehive ovens or similar apparatus the gas issuing at the mouth of the ovens is lost. The attempts at utilizing the gases in such cases have not been very successful. It is quite different where coke is manufactured in the same way as illuminating gas, viz. by the destructive distillation of coal in closed apparatus (retorts), heated from the outside. This industry, which is described in detail in G. Lunge's *Coal-Tar and Ammonia* (4th ed., 1909), originated in France, but has spread far more in Germany, where more than half of the coke produced is made by it; in the United Kingdom and the United States its progress has been much slower, but there also it has long been recognized as the only proper method. The output of coke is increased by about 15% in comparison with the beehive ovens, as the heat required for the process of distillation is not produced by burning part of the coal itself (as in the beehive ovens), but by burning part of the gas. The quality of the coke for iron-making is quite as good as that of beehive coke, although it differs from it in appearance. Moreover, the gases can be made to yield their ammonia, their tar, and even their benzene vapours, the value of which products sometimes exceeds that of the coke itself. And after all this there is still an excess of gas available for any other purpose.

Constituents.	Volume per cent.	Weight per cent.	Heat-value per Cubic Metre Calories.	Heat-value per Quantity contained in 1 Cub. Met.	Heat-value per cent. of Total.
Hydrogen, H_2	47	7·4	2,582	1213	22·8
Methane, CH_4	34	42·8	8,524	2898	54·5
Carbon monoxide, CO	9	19·9	3,043	273	5·1
Benzene vapour, C_6H_6	1·2	7·4	33,815	405	7·7
Ethylene, C_2H_4	3·8	8·4	13,960	530	9·9
Carbon dioxide, CO_2	2·5	8·6	..	..	..
Nitrogen, N_2	2·5	5·5	..	..	..
Total	100·0	100·0	..	5319	100·0

As the principle of distilling the coal is just the same, whether the object is the manufacture of coal gas proper or of coke as the main product, although there is much difference in the details of the manufacture, it follows that the quality of the gas is very similar in both cases, so far as its heating value is concerned. Of course this heating value is less where the benzene has been extracted from coke-oven gas, since this compound is the richest heat-producer in the gas. This is, however, of minor importance in the present case, as there is only about 1% benzene in these gases.

The composition of coke-oven gases, after the extraction of the ammonia and tar, is about 53% hydrogen, 36% methane, 6% carbon monoxide, 2% ethylene and benzene, 0·5% sulphuretted hydrogen, 1·5% carbon dioxide, 1% nitrogen.

III. *Coal Gas (Illuminating Gas).*—Although ordinary coal gas is primarily manufactured for illuminating purposes, it is also extensively used for cooking, frequently also for heating domestic rooms, baths, &c., and to some extent also for industrial operations on a small scale, where cleanliness and exact regulation of the work are of particular importance. In chemical laboratories it is preferred to every other kind of fuel wherever it is available. The manufacture of coal gas being described elsewhere in this work (see GAS, § *Manufacture*), we need here only point out that it is obtained by heating hituminous coal in fireclay retorts and purifying the products of this destructive distillation by cooling, washing and other operations. The residual gas, the ordinary composition of which is given in the table below, amounts to about 10,000 cub. ft. for a ton of coal, and represents about 21% of its original heating value, 56·5% being left in the coke, 5·5% in the tar and 17% being lost. As we must deduct from the coke that quantity which is required for the heating of the retorts, and which, even when good gas producers are employed, amounts to 12% of the weight of the coal, or 10% of its heat value, the total loss of heat rises to 27%. Taking, further, into account the cost of labour, the wear and tear, and the capital interest on the plant, coal gas must always be an expensive fuel in comparison with coal itself, and cannot be thought of as a general substitute for the latter. But in many cases the greater expense of the coal gas is more than compensated by its easy distribution, the facility and cleanliness of its application, the general freedom from the mechanical loss, unavoidable in the case of coal fires, the prevention of black smoke and so forth. The following table shows the average composition of coal gas by volume and weight, together with the heat developed by its single constituents, the latter being expressed in kilogram-calories per cub. metre (0·252 kilogram-calories = 1 British heat unit; 1 cub. metre = 35·3 cub. ft; therefore 0·1123 calories per cub. metre = 1 British heat unit per cub. foot).

One cubic metre of such gas weighs 568 grammes. *Rich gas*, or gas made hy the destructive distillation of certain hituminous schists, of oil, &c., contains much more of the heavy hydrocarbons, and its heat-value is therefore much higher than the above. The carburetted water gas, very generally made in America, and sometimes employed in England for mixing with coal gas, is of varying composition; its heat-value is generally rather less than that of coal gas (see below).

IV. *Combustible Gases produced by the Partial Combustion of Coal, &c.*—These form by far the most important kind of gaseous fuel. When coal is submitted to destructive distillation to produce the illuminating gas described in the preceding paragraph, only a comparatively small proportion of the heating value of the coal (say, a sixth or at most a fifth part) is obtained in the shape of gaseous fuel, by far the greater proportion remaining behind in the shape of coke.

An entirely different class of gaseous fuels comprises those produced by the incomplete combustion of the total carbon contained in the raw material, where the result is a mixture of gases which, being capable of combining with more oxygen, can be hurnt and employed for heating purposes. Apart from some descriptions of waste gases belonging to this class (of which the most notahle are those from blast-furnaces), we must distinguish two ways of producing such gaseous fuels entirely different in principle, though sometimes combined in one operation. The incomplete combustion of carbon may be brought about by means of atmospheric oxygen, by means of water, or hy a simultaneous combination of these two actions. In the first case the chemical reaction is

$$C+O=CO \quad . \quad . \quad . \quad . \quad . \quad (a);$$

the nitrogen accompanying the oxygen in the atmospheric air necessarily remains mixed with carbon monoxide, and the resulting gases, which always contain some carbon dioxide, some

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products of the destructive distillation of the coal, &c., are known as *producer gas* or *Siemens gas*. In the second case the chemical reaction is mainly

$$C+H_2O=CO+H_2 \quad . \quad . \quad . \quad (b);$$

that is to say, the carbon is converted into monoxide and the hydrogen is set free. As both of these substances can combine with oxygen, and as there is no atmospheric nitrogen to deal with, the resulting gas (*water gas*) is, apart from a few impurities, entirely combustible. Another kind of water gas is formed by the reaction

$$C+2H_2O=CO_2+2H_2 \quad . \quad . \quad . \quad (c),$$

but this reaction, which converts all the carbon into the incombustible form of CO_2, is considered as an unwelcome, although never entirely avoidable, concomitant of (*b*).

The reaction by which water gas is produced being endothermic (as we shall see), this gas cannot be obtained except by introducing the balance of energy in another manner. This might be done by heating the apparatus from without, but as this method would be uneconomical, the process is carried out by alternating the endothermic production of water gas with the exothermic combustion of carbon by atmospheric air. Pure water gas is not, therefore, made by a continuous process, but alternates with the production of other gases, combustible or not. But instead of constantly interrupting the process in this way, a continuous operation may be secured by simultaneously carrying on both the reactions (*a*) and (*b*) in such proportions that the heat generated by (*a*) at least equals the heat absorbed by (*b*). For this purpose the apparatus is fed at the same time with atmospheric air and with a certain quantity of steam, preferably in a superheated state. Gaseous mixtures of this kind have been made, more or less intentionally, for a long time past. One of the best known of them, intended less for the purpose of serving as ordinary fuel than for that of driving machinery, is the Dowson gas.

An advantage common to all kinds of gaseous fuel, which indeed forms the principal reason why it is intentionally produced from solid fuel, in spite of inevitable losses in the course of the operation, is the following. The combustion of solid fuel (coal, &c.) cannot be carried on with the theoretically necessary quantity of atmospheric air, but requires a considerable excess of the latter, at least 50%, sometimes 100% and more. This is best seen from the analyses of smoke gases. If all the oxygen of the air were converted into CO_2 and H_2O, the amount of CO_2 in the smoke gases should be in the case of pure carbon nearly 21 volumes %, as carbon dioxide occupies the same volume as oxygen; while ordinary coal, where the hydrogen takes up a certain quantity of oxygen as well, should show about 18·5% CO_2. But the best smoke gases of steam boilers show only 12 or 13%, much more frequently only 10% CO_2, and gases from reverberatory furnaces often show less than 5%. This means that the volume of the smoke gases escaping into the air is from 1½ to 2 times (in the case of high-temperature operations often 4 times) greater than the theoretical minimum; and as these gases always carry off a considerable quantity of heat, the loss of heat is all the greater the less complete is the utilization of the oxygen and the higher the temperature of the operation. This explains why, in the case of the best-constructed steam-boiler fires provided with heat economizers, where the smoke gases are deprived of most of their heat, the proportion of the heat value of the fuel actually utilized may rise to 70 or even 75%, while in some metallurgical operations, in glass-making and similar cases, it may be below 5%.

One way of overcoming this difficulty to a certain extent is to reduce the solid fuel to a very fine powder, which can be intimately mixed with the air so that the consumption of the latter is only very slightly in excess of the theoretical quantity; but this process, which has been only recently introduced on a somewhat extended scale, involves much additional expense and trouble, and cannot as yet be considered a real success. Generally, too, it is far less easily applied than gaseous fuel. The latter can be readily and intimately mixed with the exact quantity of air that is required and distributed in any suitable way, and much of the waste heat can be utilized for a preliminary heating of the air and the gas to be burned by means of "recuperators."

We shall now describe the principal classes of gaseous fuel, produced by the partial combustion of coal.

A. *Producer Gas, Siemens Gas.*—As we have seen above, this gas is made by the incomplete combustion of fuel. The materials generally employed for its production are anthracite, coke or other fuels which are not liable to cake during the operation, and thus stop the draught or otherwise disturb the process, but by special measures also bituminous coal, lignite, peat and other fuel may be utilized for gas producers. The fuel is arranged in a deep layer, generally from 4 ft. up to 10 ft., and the air is introduced from below, either by natural draught or by means of a blast, and either by a grate or only by a slit in the wall of the "gas producer." Even if the primary action taking place at the entrance of the air consisted in the complete combustion of the carbon to dioxide, CO_2, the latter, in rising through the high column of incandescent fuel, must be reduced to monoxide: $CO_2+C=2CO$. But as the temperature in the producer rises rather high, and as in ordinary circumstances the action of oxygen on carbon above 1000° C. consists almost entirely in the direct formation of CO, we may regard this compound as primarily formed in the hotter parts of the gas-producer. It is true that ordinary producer gas always contains more or less CO_2, but this may be formed higher up by air entering through leakages in the apparatus. If we ignore the hydrogen contained in the fuel, the theoretical composition of producer gas would be 33·3% CO and 66·7% N, both by volume and weight. Its weight per cubic metre is 1·251 grammes, and its heat value 1013 calories per cubic metre, or less than one-fifth of the heat-value of coal gas. Practically, however, producer gas contains a small percentage of gases, increasing its heat-value, like hydrogen, methane, &c., but on the other hand it is never free from carbon dioxide to the extent of from 2 to 8%. Its heat-value may therefore range between 800 and 1100 calories per cubic metre. Even when taking as the basis of our calculation a theoretical gas of 33·3% CO, we find that there is a great loss of heat-value in the manufacture of this gas. Thermochemistry teaches us that the reaction C+O develops 29·5% of the heat produced by the complete oxidation of C to CO_2, thus leaving only 70·5% for the stage $CO+O=CO_2$. If, therefore, the gas given off in the producer is allowed to cool down to ordinary temperature, nearly 30% of the heat-value of the coal is lost by radiation. If, however, the gas producer is built in close proximity to the place where the combustion takes place, so that the gas does not lose very much of its heat, the loss is correspondingly less. Even then there is no reason why this mode of burning the fuel, *i.e.* first with "primary air" in the producer ($C+O=CO$), then with "secondary air" in the furnace ($CO+O=CO_2$), should be preferred to the direct complete burning of the fuel on a grate, unless the above-mentioned advantage is secured, viz. reduction of the smoke gases to a minimum by confining the supply of air as nearly as possible to that required for the formation of CO_2, which is only possible by producing an intimate mixture of the producer gas with the secondary air. The advantage in question is not very great where the heat of the smoke gases can be very fully utilized, *e.g.* in well-constructed steam boilers, salt-pans and the like, and as a matter of fact gas producers have not found much use in such cases. But a very great advantage is attained in high-temperature operations, where the smoke gases escape very hot, and where it is on that account all-important to confine their quantity to a minimum.

It is precisely in these cases that another requirement frequently comes in, viz. the production at a given point of a higher temperature than is easily attained by ordinary fires. Gas-firing lends itself very well to this end, as it is easily combined with a preliminary heating up of the air, and even of the gas itself, by means of "recuperators." The original and best-known form of these, due to Siemens Brothers, consists of two brick chambers filled with loosely stacked fire-bricks in such manner that any gases passed through the chambers must seek their way through the interstices left between the bricks, by which means a thorough

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interchange of temperature takes place. The smoke gases, instead of escaping directly into the atmosphere, are made to pass through one of these chambers, giving up part of their heat to the brickwork. After a certain time the draught is changed by means of valves, the smoke gases are passed through another chamber, and the cold air intended to feed the combustion is made to pass through the first chamber, where it takes up heat from the white-hot bricks, and is thus heated up to a bright red heat until the chamber is cooled down too far, when the draughts are again reversed. Sometimes the producer gas itself is heated up in this manner (especially when it has been cooled down by travelling a long distance); in that case four recuperator chambers must be provided instead of two. Another class of recuperators is not founded on the alternating system, but acts continuously; the smoke gases travel always in the same direction in flues contiguous to other flues or pipes in which the air flows in the opposite direction, an interchange of heat taking place through the walls of the flues or pipes. Here the surface of contact must be made very large if a good effect is to be produced. In both cases not merely is a saving effected of all the calories which are abstracted by the cold air from the recuperator, but as less fuel has to be burned to get a given effect, the quantity of smoke gas is reduced. For details and other producer gases, see Gas, II. *For Fuel and Power*.

Gas-firing in the manner just described can be brought about by very simple means, viz. by lowering the fire-grate of an ordinary fire-place to at least 4 ft. below the fire-bridge, and by introducing the air partly below the grate and partly behind the fire-place, at or near the point where the greatest heat is required. Usually, however, more elaborate apparatus is employed, some of which we shall describe below. Gas-firing has now become universal in some of the most important industries and nearly so in others. The present extension of steel-making and other branches of metallurgy is intimately connected with this system, as is the modern method of glass-making, of heating coal gas retorts and so forth.

The composition of producer gas differs considerably, principally according to the material from which it is made. Analyses of ordinary producer gas (not such as falls under the heading of "semi-water gas," see *sub* C) by volume show *22* to 33% CO, 1 to 7% CO_2, 0·5 to 2% H_2, 0·5 to 3% hydrocarbons, and 64 to 68% N_2.

B. *Water Gas.*—The reaction of steam on highly heated carbonaceous matter was first observed by Felice Fontana in 1780. This was four years before Henry Cavendish isolated hydrogen from water, and thirteen years before William Murdoch made illuminating gas by the distillation of coal, so that it was no wonder that Fontana's laboratory work was soon forgotten. Nor had the use of carburetted water gas, as introduced by Donovan in 1830 for illuminating purposes, more than a very short life. More important is the fact that during nine years the illumination of the town of Narbonne was carried on by incandescent platinum wire, heated by water gas, where also internally heated generators were for the first time regularly employed. The Narbonne process was abandoned in 1865, and for some time no real progress was made in this field in Europe. But in America, T. S. C. Lowe, Strong, Tessié du Motay and others took up the matter, the first permanent success being obtained by the introduction (1873) of Lowe's system at Phoenixville, Pa. In the United States the abundance of anthracite, as well as of petroleum naphtha, adapted for carburetting the gas, secures a great commercial advantage to this kind of illuminant over coal gas, so that now three-fourths of all American gas-works employ carburetted water gas. In Europe the progress of this industry was naturally much less rapid, but here also since 1882, when the apparatus of Lowe and Dwight was introduced in the town of Essen, great improvements have been worked out, principally by E. Blass, and by these improvements water gas obtained a firm footing also for certain heating purposes. The American process for making carburetted water gas, as an auxiliary to ordinary coal gas, was first introduced by the London Gas Light and Coke Company on a large scale in 1890.

Water gas in its original state is called "blue gas," because it burns with a blue, non-luminous flame, which produces a very high temperature. According to the equation $C+H_2O=CO+H_2$, this gas consists theoretically of equal volumes of carbon monoxide and hydrogen. We shall presently see why it is impossible to avoid the presence of a little carbon dioxide and other gases, but we shall for the moment treat of water gas as if it were composed according to the above equation. The reaction $C+H_2O=CO+H_2$ is endothermic, that is, its thermal value is negative. One gram-molecule of carbon produces 97 great calories (1 great calorie or kilogram-calorie = 1000 gram-calories) when burning to CO_2, and this is of course the maximum effect obtainable from this source. If the same gram-molecule of carbon is used for making water gas, that is, $CO+H_2$, the heat produced by the combustion of the product is 68·4 + 57·6 = 126 great calories, an apparent surplus of 29 calories, which cannot be got out of nothing. This is made evident by another consideration. In the above reaction C is not burned to CO_2, but to CO, a reaction which produces 28·6 calories per gram-molecule. But as the oxygen is furnished from water, which must first be decomposed by the expenditure of energy, we must introduce this amount, 68·5 calories in the case of liquid water, or 57·6 calories in the case of steam, as a negative quantity, and the difference, viz. + 28·6 − 57·6 = 29 great calories, represents the amount of heat to be expended from another source in order to bring about the reaction of one gram-molecule of carbon on one gram-molecule of H_2O in the shape of steam. This explains why steam directed upon incandescent coal will produce water gas only for a very short time: even a large mass of coal will quickly be cooled down so much that at first a gas of different composition is formed and soon the process will cease altogether. We can avoid this result by carrying on the process in a retort heated from without by an ordinary coal fire, and all the early water gas apparatus was constructed in this way; but such a method is very uneconomical, and was long ago replaced by a process first patented by J. and T. N. Kirkham in 1854, and very much improved by successive inventors. This process consists in conducting the operation in an upright brick shaft, charged with anthracite, coke or other suitable fuel. This shaft resembles an ordinary gas producer, but it differs in being worked, not in a continuous manner, which, as shown above, would be impossible, but by alternately blowing air and steam through the coal for periods of a few minutes each. During the first phase, when carbon is burned by atmospheric oxygen, and thereby heat is produced, this heat, or rather that part of it which is not carried away by radiation and by the products of combustion on leaving the apparatus, is employed in raising the temperature of the remaining mass of fuel, and is thus available for the second phase, in which the reaction (*b*) $C+H_2O=CO+H_2$ goes on with the abstraction of a corresponding amount of heat from the incandescent fuel, so that the latter rapidly cools down, and the process must be reversed by blowing in air and so forth. The formation of exactly equal volumes of carbon monoxide and hydrogen goes on only at temperatures over 1200° C., that is, for a very few minutes. Even at 1100° C. a little CO_2 can be proved to exist in the gas, and at 900° its proportion becomes too high to allow the process to go on. About 650° C. the CO has fallen to a minimum, and the reaction is now essentially (*c*) $C+2H_2O=CO_2+2H_2$; soon after the temperature of the mass will have fallen to such a low point that the steam passes through it without any perceptible action. The gas produced by reaction (*c*) contains only two-thirds of combustible matter, and is on that account less valuable than proper water gas formed by reaction (*b*); moreover, it requires the generation of twice the amount of steam, and its presence is all the less desirable since it must soon lead to a total cessation of the process. In ordinary circumstances it is evident that the more steam is blown in during a unit of time, the sooner reaction (*c*) will set in; on the other hand, the more heat has been accumulated in the producer the longer can the blowing-in of steam be continued.

The process of making water gas consequently comprises

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two alternating operations, viz. first "blowing-up" by means of a current of air, by which the heat of the mass of fuel is raised to about 1200° C.; and, secondly "steaming," by injecting a current of (preferably superheated) steam until the temperature of the fuel had fallen to about 900° C., and too much carbon dioxide appears in the product. During the steaming the gas is carried off by a special conduit into a scrubber, where the dust mechanically carried away in the current is washed out, and the gas is at the same time cooled down nearly to the ordinary temperature. It is generally stored in a gas-holder, from which it is conducted away as required. It is never quite free from nitrogen, as the producer at the beginning of steaming contains much of this gas, together with CO or CO_2. The proportion of hydrogen may exceed 50%, in consequence of reaction (*c*) setting in at the close of the steaming. Ordinary "blue" water gas, if, as usual, made from coke or anthracite, contains 48-52% H_2, 40-41% CO, 1-5% CO_2, 4-5% N_2, and traces of hydrocarbons, especially methane. If made from bituminous coal, it contains more of the latter. If "carburetted" (a process which increases its volume 50% and more) by the vapours from superheated petroleum naphtha, the proportion of CO ranges about 25%, with about as much methane, and from 10 to 15% of "illuminants" (heavy hydrocarbons). The latter, of course, greatly enhance the fuel-value of the gas. Pure water gas would possess the following fuel-value per cubic metre:

0·5 cub. met. H_2 = 1291 calories
0·5 „ „ CO = 1522 „
2813 „

Ordinary "blue" water gas has a fuel-value of at least 2500 calories. Carburetted water gas, which varies very much in its percentage of hydrocarbons, sometimes reaches nearly the heat-value of coal gas, but such gas is only in exceptional cases used for heating purposes.

We must now turn to the "blowing-up" stage of the process. Until recently it was assumed that during this stage the combustion of carbon cannot be carried on beyond the formation of carbon monoxide, for as the gas-producer must necessarily contain a deep layer of fuel (generally about 6 to 10 ft.), any CO_2 formed at first would be reduced to CO; and it was further assumed that hardly any CO_2 would be formed from the outset, as the temperature of the apparatus is too high for this reaction to take place. But as the combustion of C to CO produces only about 30% of the heat produced when C is burned into CO_2, the quantity of fuel consumed for "blowing-up" is very large, and in fact considerably exceeds that consumed in "steaming." There is, of course, a further loss by radiation and minor sources, and the result is that 1 kilogram of carbon yields only about 1·2 cub. met. of water gas. Each period of blowing-up generally occupies from 8 to 12 minutes, that of steaming only 4 or 5 minutes. This low yield of water gas until quite recently appeared to be unavoidable, and the only question seemed to be whether and to what extent the gas formed during blowing-up, which is in fact identical with ordinary producer gas (Siemens gas), could be utilized. In America, where the water gas is mostly employed for illuminating purposes, at least part of the blowing-up gas is utilized for heating the apparatus in which the naphtha is volatilized and the vapours are "fixed" by superheating. This process, however, never utilizes anything like the whole of the blowing-up gas, nor can this be effected by raising and superheating the steam necessary for the second operation; indeed, the employment of this gas for raising steam is not very easy, owing to the irregularities of and constant interruptions in the supply. In some systems the gas made during the blowing-up stage is passed through chambers, loosely filled with bricks, like Siemens recuperators, where it is burned by "secondary" air: the heat thus imparted to the brickwork is utilized by passing through the recuperator, and thus superheating, the steam required for the next steaming operation. In many cases, principally where no carburetting is practised, the blowing-up gas is simply burned at the mouth of the producer, and is thus altogether lost; and in no case can it be utilized without great waste. A very important improvement in this respect was effected by C. Dellwik and E. Fleischer. They found that the view that it is unavoidable to burn the carbon to monoxide during the blowing-up holds good only for the pressure of blast formerly applied. This did not much exceed that which is required for overcoming the frictional resistance within the producer. If, however, the pressure is considerably increased, and the height of the column of fuel reduced, both of these conditions being strictly regulated in accordance with the result desired, it is easy to attain a combustion of the carbon to dioxide, with only traces of monoxide, in spite of the high temperature. Evidently the excess of oxygen coming into contact with each particle of carbon in a given unit of time produces other conditions of chemical equilibrium than those existing at lower pressures. At any rate, experience has shown that by this process, in which the full heat-value of carbon is utilized during the blowing-up stage, the time of heating-up can be reduced from 10 to 12 or 2 minutes, and the steaming can be prolonged from 4 or 5 to 8 or 10 minutes, with the result that twice the quantity of water gas is obtained, viz. upwards of 2 cub. metres from 1 kilogram of carbon.

The application of water gas as a fuel mainly depends upon the high temperatures which it is possible to attain by its aid, and these are principally due to the circumstance that it forms a much smaller flame than coal gas, not to speak of Siemens gas, which contains at most 33% of combustible matter against 90% or more in water gas. The latter circumstance also allows the gas to be conducted and distributed in pipes of moderate dimensions. Its application, apart from its use as an illuminant (with which we are not concerned here), was formerly retarded by its high cost in comparison with Siemens gas and other sources of heat, but as this state of affairs has been changed by the modern improvements, its use is rapidly extending, especially for metallurgical purposes.

C. *Mixed Gas (Semi-Water Gas).*—This class is sometimes called Dowson gas, irrespective of its method of production, although it was made and extensively used a long time before J. E. Dowson constructed his apparatus for generating such a gas principally for driving gas-engines. By a combination of the processes for generating Siemens gas and water gas, it is produced by injecting into a gas-producer at the same time a certain quantity of air and a corresponding quantity of steam, the latter never exceeding the amount which can be decomposed by the heat-absorbing reaction, $C+H_2O=CO+H_2$, at the expense of the heat generated by the action of the air in the reaction $C+O=CO$. Such gas used to be frequently obtained in an accidental way by introducing liquid water or steam into an ordinary gas-producer for the purpose of facilitating its working by avoiding an excessive temperature, such as might cause the rapid destruction of the brickwork and the fusion of the ashes of the fuel into troublesome cakes. It was soon found that by proceeding in this way a certain advantage could be gained in regard to the consumption of fuel, as the heat abstracted by the steam from the brickwork and the fuel itself was usefully employed for decomposing water, its energy thus reappearing in the shape of a combustible gas. It is hardly necessary to mention explicitly that the total heat obtained by any such process from a given quantity of carbon (or hydrogen) can in no case exceed that which is generated by (direct combustion; some inventors, however, whether inadvertently or intentionally, have actually represented this to be possible, in manifest violation of the law of the conservation of energy.

Roughly speaking, this gas may be said to be produced by the combination of the reactions, described *sub* A and B, to the joint reaction: $2C+O+H_2O=2CO+H_2$. The decomposition of H_2O (applied in the shape of steam) absorbs 57·6 gram calories, the formation of 2CO produces 59 gram calories; hence there is a small positive excess of 1·4 calories at disposal. This in reality would not be sufficient to cover the loss by radiation, &c.; hence rather more free oxygen (*i.e.* atmospheric air) must be employed than is represented by the above equation. All this free oxygen is, of course, accompanied by nearly four times its volume of nitrogen.

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The mixed gas thus obtained differs very much in composition, but is always much richer in hydrogen (of which it contains sometimes as much as 20%) and poorer in carbon monoxide (sometimes down to 20%) than Siemens gas; generally it contains more of CO_2 than the latter. The proportion of nitrogen is always less, about 50%. It is therefore a more concentrated fuel than Siemens gas, and better adapted to the driving of gas-engines. It scarcely costs more to make than ordinary Siemens gas, except where the steam is generated and superheated in special apparatus, as is done in the Dowson producer, which, on the other hand, yields a correspondingly better gas. As is natural, its properties are some way between those of Siemens gas and of water gas; but they approach more nearly the former, both as to costs and as to fuel-value, and also as to the temperatures reached in combustion. This is easily understood if we consider that gas of just the same description can be obtained by mixing one volume of real water gas with the four volumes of Siemens gas made during the blowing-up stage—an operation which is certainly too expensive for practical use.

A modification of this gas is the *Mond gas*, which is made, according to Mond's patent, by means of such an excess of steam that most of the nitrogen of the coke is converted into ammonia (Grouven's reaction). Of course much of this steam passes on undecomposed, and the quantity of the gas is greatly increased by the reaction $C+2H_2O=CO_2+2H_2$; hence the fuel-value of this gas is less than that of semi-water gas made in other ways. Against this loss must be set the gain of ammonia which is recovered by means of an arrangement of coolers and scrubbers, and, except at very low prices of ammonia, the profit thus made is probably more than sufficient to cover the extra cost. But as the process requires very large and expensive plant, and its profits would vanish in the case of the value of ammonia becoming much lower (a result which would very probably follow if it were somewhat generally introduced), it cannot be expected to supplant the other descriptions of gaseous fuel to more than a limited extent.

Semi-water gas is especially adapted for the purpose of driving gas-engines on the explosive principle (gas-motors). Ordinary producer-gas is too poor for this purpose in respect of heating power; moreover, owing to the prevalence of carbon monoxide, it does not light quickly enough. These defects are sufficiently overcome in semi-water gas by the larger proportion of hydrogen contained in it. For the purpose in question the gas should be purified from tar and ashes, and should also be cooled down before entering the gas-engine. The Dowson apparatus and others are constructed on this principle.

Air Gas.—By forcing air over or through volatile inflammable liquids a gaseous mixture can be obtained which burns with a bright flame and which can be used for illumination. Its employment for heating purposes is quite exceptional, *e.g.* in chemical laboratories, and we abstain, therefore, from describing any of the numerous appliances, some of them bearing very fanciful names, which have been devised for its manufacture. (G. L.)

FUENTE OVEJUNA [*Fuenteovejuna*], a town of Spain, in the province of Cordova; near the sources of the river Guadiato, and on the Fuente del Arco-Belmez-Cordova railway. Pop. (1900) 11,777. Fuente Ovejuna is built on a hill, in a well-irrigated district, which, besides producing an abundance of wheat, wine, fruit and honey, also contains argentiferous lead mines and stone quarries. Cattle-breeding is an important local industry, and leather, preserved meat, soap and flour are manufactured. The parish church formerly belonged to the knights of Calatrava (*c.* 1163–1486).

FUENTERRABIA (formerly sometimes written *Fontarabia*; Lat. *Fons Rapidus*), a town of northern Spain, in the province of Guipúzcoa; on the San Sebastian-Bayonne railway; near the Bay of Biscay and on the French frontier. Pop. (1870) about 750; (1900) 4345. Fuenterrabia stands on the slope of a hill on the left bank of the river Bidassoa, and near the point where its estuary begins. Towards the close of the 19th century the town became popular as a summer resort for visitors from the interior of Spain, and, in consequence, its appearance underwent many changes and much of its early prosperity returned. Hotels and villas were built in the new part of the town that sprang up outside the picturesque walled fortress, and there is quite a contrast between the part inside the heavy, half-ruined ramparts, with its narrow, steep streets and curious gable-roofed houses, its fine old church and castle and its massive town hall, and the new suburbs and fishermen's quarter facing the estuary of the Bidassoa. Many industries flourish on the outskirts of the town, including rope and net manufactures, flour mills, saw mills, mining railways, paper mills.

Fuenterrabia formerly possessed considerable strategic importance, and it has frequently been taken and retaken in wars between France and Spain. The tout of Charlemagne in 778, which has been associated with Fontarabia, by Milton (*Paradise Lost*, l. 587), is generally understood to have taken place not here but at Roncesvalles (*q.v.*), which is nearly 40 m. E.S.E. Unsuccessful attempts to seize Fuenterrabia were made by the French troops in 1476 and again in 1503. In a subsequent campaign (1521) these were more successful, but the fortress was retaken in 1524. The prince of Condé sustained a severe repulse under its walls in 1638, and it was on this occasion that the town received from Philip IV. the rank of city (*muy noble, muy leal, y muy valerosa ciudad*, "most noble, most loyal, and most valiant city"), a privilege which involved some measure of autonomy. After a severe siege, Fuenterrabia surrendered to the duke of Berwick and his French troops in 1719; and in 1794 it again fell into the hands of the French, who so dismantled it that it has never since been reckoned by the Spaniards among their fortified places. It was by the ford opposite Fuenterrabia that the duke of Wellington, on the 8th of October 1813, successfully forced a passage into France in the face of an opposing army commanded by Marshal Soult. Severe fighting also took place here during the Carlist War in 1837.

FUERO, a Spanish term, derived from the Latin *forum*. The Castilian use of the word in the sense of a right, privilege or charter is most probably to be traced to the Roman *conventus juridici*, otherwise known as *jurisdictiones* or *fora*, which in Pliny's time were already numerous in the Iberian peninsula. In each of these provincial *fora* the Roman magistrate, as is well known, was accustomed to pay all possible deference to the previously established common law of the district; and it was the privilege of every free subject to demand that he should be judged in accordance with the customs and usages of his proper forum. This was especially true in the case of the inhabitants of those towns which were in possession of the *jus italicum*. It is not, indeed, demonstrable, but there are many presumptions, besides some fragments of direct evidence, which make it more than probable that the old administrative arrangements both of the provinces and of the towns, but especially of the latter, remained practically undisturbed at the period of the Gothic occupation of Spain.[1] The Theodosian Code and the Breviary of Alaric alike seem to imply a continuance of the municipal system which had been established by the Romans; nor does the later Lex Visigothorum, though avowedly designed in some points to supersede the Roman law, appear to have contemplated any marked interference with the former *fora*, which were still to a large extent left to be regulated in the administration of justice by unwritten, immemorial, local custom. Little is known of the condition of the subject populations of the peninsula during the Arab occupation; but we are informed that the Christians were, sometimes at least, judged according to their own laws in separate tribunals presided over by Christian judges;[2] and the mere fact of the preservation of the name *alcalde*, an official whose functions corresponded so closely to those of the *judex* or *defensor civitatis*, is fitted to suggest that the old municipal *fora*, if much impaired, were not even then in all cases wholly destroyed. At all events when the word *forum*[3] begins to appear for the first time in documents of the 10th century in the sense of a liberty or

[1] The nature of the evidence may be gathered from Savigny, *Gesch. d. röm. Rechts*. See especially i. pp. 154, 259 seq.

[2] Compare Lembke u. Schäfer, *Geschichte von Spanien*, i. 314; ii. 117.

[3] Or rather *forus*. See Ducange, *s.v.*

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privilege, it is generally implied that the thing so named is nothing new. The earliest extant written fuero is probably that which was granted to the province and town of Leon by Alphonso V. in 1020. It emanated from the king in a general council of the kingdom of Leon and Castile, and consisted of two separate parts; in the first 19 chapters were contained a series of statutes which were to be valid for the kingdom at large, while the rest of the document was simply a municipal charter.[1] But in neither portion does it in any sense mark a new legislative departure, unless in so far as it marks the beginning of the era of written charters for towns. The "fuero general" does not profess to supersede the *consuetudines antiquorum jurium* or Chindaswint's codification of these in the Lex Visigothorum; the "fuero municipal" is really for the most part but a resuscitation of usages formerly established, a recognition and definition of liberties and privileges that had long before been conceded or taken for granted. The right of the burgesses to self-government and self-taxation is acknowledged and confirmed, they, on the other hand, being held bound to a constitutional obedience and subjection to the sovereign, particularly to the payment of definite imperial taxes, and the rendering of a certain amount of military service (as the ancient municipia had been). Almost contemporaneous with this fuero of Leon was that granted to Najera (Naxera) by Sancho el Mayor of Navarre (*ob.* 1035), and confirmed, in 1076, by Alphonso VI.[2] Traces of fathers of perhaps even an earlier date are occasionally to be met with. In the fuero of Cardeñas, for example, granted by Ferdinand I. in 1039, reference is made to a previous forum Burgense (Burgos), which, however, has not been preserved, if, indeed, it ever had been reduced to writing at all. The phraseology of that of Sepulveda (1076) in like manner points back to an indefinitely remote antiquity.[3] Among the later fueros of the 11th century, the most important are those of Jaca (1064) and of Logroño (1095). The former of these, which was distinguished by the unusual largeness of its concessions, and by the careful minuteness of its details, rapidly extended to many places in the neighbourhood, while the latter charter was given also to Miranda by Alphonso VI., and was further extended in 1181 by Sancho el Sabio of Navarre to Vitoria, thus constituting one of the earliest written *fora* of the "Provincias Vascongadas." In the course of the 12th and 13th centuries the number of such documents increased very rapidly; that of Toledo especially, granted to the Mozarabic population in 1101, but greatly enlarged and extended by Alphonso VII. (1118) and succeeding sovereigns, was used as a basis for many other Castilian fueros. Latterly the word fuero came to be used in Castile in a wider sense than before, as meaning a general code of laws; thus about the time of Saint Ferdinand the old Lex Visigothorum, then translated for the first time into the vernacular, was called the Fuero Juzgo, a name which was soon retranslated into the barbarous Latin of the period as Forum Judicum;[4] and among the compilations of Alphonso the Learned in like manner were an *Espejo de Fueros* and also the *Fuero de las leyes*, better known perhaps as the *Fuero Real*. The famous code known as the *Ordenamiento Real de Alcalá*, or *Fuero Viejo de Castilla*, dates from a still later period. As the power of the Spanish crown was gradually concentrated and consolidated, royal pragmaticas began to take the place of constitutional laws; the local fueros of the various districts slowly yielded before the superior force of imperialism; and only those of Navarre and the Basque provinces (see Basques) have had sufficient vitality to enable them to survive to comparatively modern times. While actually owning the lordship of the Castilian crown since about the middle of the 14th century, these provinces rigidly insisted upon compliance with their consuetudinary law, and especially with that which provided that the *señor*, before assuming the government, should personally appear before the assembly and swear to maintain the ancient constitutions. Each of the provinces mentioned had distinct sets of fueros, codified at different periods, and varying considerably as to details; the main features, however, were the same in all. Their rights, after having been recognized by successive Spanish sovereigns from Ferdinand the Catholic to Ferdinand VII., were, at the death of the latter in 1833, set aside by the government of Castaños. The result was a civil war, which terminated in a renewed acknowledgment of the fueros by Isabel II. (1839). The provisional government of 1868 also promised to respect them, and similar pledges were given by the governments which succeeded. In consequence, however, of the Carlist rising of 1873–1876, the Basque fueros were finally extinguished in 1876. The history of the *Foraes* of the Portuguese towns, and of the *Fors du Béarn*, is precisely analogous to that of the fueros of Castile.

Among the numerous works that more or less expressly deal with this subject, that of Marina (*Ensayo historico-critico sobre la antigua legislacion y principales cuerpos legales de los reynos de Leon y Castilla*) still continues to hold a high place. Reference may also be made to Colmeiro's *Curso de derecho politico segun la historia de Leon y de Castilla* (Madrid, 1873); to Schäfer's *Geschichte von Spanien*, ii. 418-428, iii. 293 seq.; and to Hallam's *Middle Ages*, c. iv.

FUERTEVENTURA, an island in the Atlantic Ocean, forming part of the Spanish archipelago of the Canary Islands (*q.v.*). Pop. (1900) 11,669; area 665 sq. m. Fuerteventura lies between Lanzarote and Grand Canary. It has a length of 52 m., and an average width of 12 m. Though less mountainous than the other islands, its aspect is barren. There are only two springs of fresh water, and these are confined to one valley. Lava streams and other signs of volcanic action abound, but there has been no igneous activity since the Spaniards took possession. At each extremity of the island are high mountains, which send off branches along the coast so as to enclose a large arid plain. The highest peak reaches 2500 ft. In external appearance, climate and productions, Fuerteventura greatly resembles Lanzarote. An interval of three years without rain has been known. Oliva (pop. 1900, 2464) is the largest town. A smaller place in the centre of the island named Betancuria (586) is the administrative capital. Cabras (1000) on the eastern coast is the chief port. Dromedaries are bred here.

FUGGER, the name of a famous German family of merchants and bankers. The founder of the family was Johann Fugger, a weaver at Graben, near Augsburg, whose son, Johann, settled in Augsburg probably in 1367. The younger Johann added the business of a merchant to that of a weaver, and through his marriage with Clara Widolph became a citizen of Augsburg. After a successful career he died in 1408, leaving two sons, Andreas and Jakob, who greatly extended the business which they inherited from their father. Andreas, called the "rich Fugger," had several sons, among them being Lukas, who was very prominent in the municipal politics of Augsburg and who was very wealthy until he was ruined by the repudiation by the town of Louvain of a great debt owing to him, and Jakob, who was granted the right to bear arms in 1452, and who founded the family of Fugger vom Reh—so called from the first arms of the Fuggers, a roe (*Reh*) or on a field azure—which became extinct on the death of his great-grandson, Ulrich, in 1583. Johann Fugger's son, Jakob, died in 1469, and three of his seven sons, Ulrich (1441–1510), Georg (1453–1506) and Jakob (1459–1525), men of great resource and industry, inherited the family business and added enormously to the family wealth. In 1473 Ulrich obtained from the emperor Frederick III. the right to bear arms for himself and his brothers, and about the same time he began

[1] Cap. xx. begins: "Constituimus etiam ut Legionensis civitas, quae depopulata fuit a Sarracenis in diebus patris mei Veremundi regis, repopulatur *per hos foros subscriptos*."

[2] "Mando et concedo et confirmo ut ista civitas cum sua plebe et cum omnibus suis pertinentiis sub tali lege et sub tali foro maneat per saecula cuncta. Amen. Isti sunt fueros quae habuerunt in Naxera in diebus Sanctii regis et Gartiani regis."

[3] "Ego Aldefonsus rex et uxor mea Agnes confirmamus ad Septempublica suo foro quod habuit in tempore antiquo de avolo meo et in tempore comitum Ferrando Gonzalez et comite Garcia Ferdinandez et comite Domno Santio."

[4] This Latin is later even than that of Ferdinand, whose words are: "Statuo et mando quod Liber Judicum, quo ego misi Cordubam, translatetur in vulgarem et vocetur forum de Corduba . . . et quod per saecula cuncta sit pro foro et nullus sit ausus istud forum aliter appellare nisi forum de Cordubа, et jubeo et mando quod omnis morator et populator . . . veniet ad judicium et ad forum de Cordubа."

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to act as the banker of the Habsburgs, a connexion destined to bring fame and fortune to his house. Under the lead of Jakob, who had been trained for business in Venice, the Fuggers were interested in silver mines in Tirol and copper mines in Hungary, while their trade in spices, wool and silk extended to almost all parts of Europe. Their wealth enabled them to make large loans to the German king, Maximilian I., who pledged to them the county of Kirchberg, the lordship of Weissenhorn and other lands, and bestowed various privileges upon them. Jakob built the castle of Fuggerau in Tirol, and erected the Fuggerei at Augsburg, a collection of 106 dwellings, which were let at low rents to poor people and which still exist. Jakob Fugger and his two nephews, Ulrich (d. 1525) and Hieronymus (d. 1536), the sons of Ulrich, died without direct heirs, and the family was continued by Georg's sons, Raimund (1489–1535) and Anton (1493–1560), under whom the Fuggers attained the summit of their wealth and influence.

Jakob Fugger's florins had contributed largely to the election of Charles V. to the imperial throne in 1519, and his nephews and heirs maintained close and friendly relations with the great emperor. In addition to lending him large sums of money, they farmed his valuable quicksilver mines at Almaden, his silver mines at Guadalcanal, the great estates of the military orders which had passed into his hands, and other parts of his revenue as king of Spain; receiving in return several tokens of the emperor's favour. In 1530 Raimund and Anton were granted the imperial dignity of counts of Kirchberg and Weissenhorn, and obtained full possession of these mortgaged properties; in 1534 they were given the right of coining money; and in 1541 received rights of jurisdiction over their lands. During the diet of Augsburg in 1530 Charles V. was the guest of Anton Fugger at his house in the Weinmarkt, and the story relates how the merchant astonished the emperor by lighting a fire of cinnamon with an imperial bond for money due to him. This incident forms the subject of a picture by Carl Becker which is in the National Gallery at Berlin. Continuing their mercantile career, the Fuggers brought the new world within the sphere of their operations, and also carried on an extensive and lucrative business in farming indulgences. Moreover, both brothers found time to acquire landed property, and were munificent patrons of literature and art. When Anton died he is said to have been worth 6,000,000 florins, besides a vast amount of property in Europe, Asia and America; and before this time the total wealth of the family had been estimated at 63,000,000 florins. The Fuggers were devotedly attached to the Roman Catholic Church, which benefited from their liberality. Jakob had been made a count palatine (*Pfalzgraf*) and had received other marks of favour from Pope Leo X., and several members of the family had entered the church; one, Raimund's son, Sigmund, becoming bishop of Regensburg.

In addition to the bishop, three of Raimund Fugger's sons attained some degree of celebrity. Johann Jakob (1516–1575), was the author of *Wahrhaftigen Beschreibung des österreichischen und habsburgischen Nahmens*, which was largely used by S. von Bircken in his *Spiegel der Ehren des Erzhauses Österreich* (Nuremberg, 1668), and of a *Geheim Ernbuch des Fuggerischen Geschlechtes*. He was also a patron of art, and a distinguished counsellor of Duke Albert IV. of Bavaria. After the death of his son Konstantin, in 1627, this branch of the family was divided into three lines, which became extinct in 1738, 1705 and 1846 respectively. Another of Raimund's sons was Ulrich (1526–1584), who, after serving Pope Paul III. at Rome, became a Protestant. Hated on this account by the other members of his family, he took refuge in the Rhenish Palatinate; greatly interested in the Greek classics, he occupied himself in collecting valuable manuscripts, which he bequeathed to the university of Heidelberg. Raimund's other son was Georg (d. 1579), who inherited the countships of Kirchberg and Weissenhorn, and founded a branch of the family which still exists, its present head being Georg, Count Fugger of Kirchberg and Weissenhorn (b. 1850).

Anton Fugger left three sons, Marcus (1529–1597), Johann (d. 1598) and Jakob (d. 1598), all of whom left male issue. Marcus was the author of a book on horse-breeding, *Wie und wo man ein Gestüt von guten edeln Kriegsrossen aufrichten soll* (1578), and of a German translation of the *Historia ecclesiastica* of Nicephorus Callistus. He founded the Nordendorf branch of the family, which became extinct on the death of his grandson, Nicolaus, in 1676. Another grandson of Marcus was Franz Fugger (1612–1664), who served under Wallenstein during the Thirty Years' War, and was afterwards governor of Ingolstadt. He was killed at the battle of St Gotthard on the 1st of August 1664.

Johann Fugger had three sons, Christoph (d. 1615) and Marcus (d. 1614), who founded the families of Fugger-Glött and Fugger-Kirchheim respectively, and Jakob, bishop of Constance from 1604 until his death in 1626. Christoph's son, Otto Heinrich (1592–1644), was a soldier of some distinction and a knight of the order of the Golden Fleece. He was one of the most active of the Bavarian generals during the Thirty Years' War, and acted as governor of Augsburg, where his rule aroused much discontent. The family of Kirchheim died out in 1672. That of Glött was divided into several branches by the sons of Otto Heinrich and of his brother Johann Ernst (d. 1628). These lines, however, have gradually become extinct except the eldest line, represented in 1909 by Karl Ernst, Count Fugger of Glött (b. 1859). Anton Fugger's third son Jakob, the founder of the family of Wellenburg, had two sons who left issue, but in 1777 the possessions of this branch of the family were again united by Anselm Joseph (d. 1793), Count Fugger of Babenhausen. In 1803 Anselm's son, Anselm Maria (d. 1821), was made a prince of the Holy Roman Empire, the title of Prince Fugger of Babenhausen being borne by his direct descendant Karl (b. 1861). On the fall of the empire in 1806 the lands of the Fuggers, which were held directly of the empire, were mediatized under Bavaria and Württemberg. The heads of the three existing branches of the Fuggers are all hereditary members of the Bavarian Upper House.

Augsburg has many interesting mementoes of the Fuggers, including the family burial-chapel in the church of St Anna; the Fugger chapel in the church of St Ulrich and St Afra; the Fuggerhaus, still in the possession of one branch of the family; and a statue of Johann Jakob Fugger.

In 1593 a collection of portraits of the Fuggers, engraved by Dominique Custos of Antwerp, was issued at Augsburg. Editions with 127 portraits appeared in 1618 and 1620, the former accompanied by a genealogy in Latin, the latter by one in German. Another edition of this *Pinacotheca Fuggerorum*, published at Vienna in 1754, includes 139 portraits. See *Chronik der Familie Fugger vom Jahre 1509*, edited by C. Meyer (Munich, 1902); A. Geiger, *Jakob Fugger, 1450–1525* (Regensburg, 1895); A. Schulte, *Die Fugger in Rom, 1495–1523* (Leipzig, 1904); R. Ehrenberg, *Das Zeitalter der Fugger* (Jena, 1896); K. Häbler, *Die Geschichte der Fuggerschen Handlung in Spanien* (Weimar, 1897); A. Stauber, *Das Haus Fugger* (Augsburg, 1900); and M. Jansen, *Die Anfange der Fugger* (Leipzig, 1907).

FUGITIVE SLAVE LAWS, a term applied in the United States to the Statutes passed by Congress in 1793 and 1850 to provide for the return of negro slaves who escaped from one state into another or into a public territory. A fugitive slave clause was inserted in the Articles of Confederation of the New England Confederation of 1643, providing for the return of the fugitive upon the certificate of one magistrate in the jurisdiction out of which the said servant fled—no trial by jury being provided for. This seems to have been the only instance of an intercolonial provision for the return of fugitive slaves; there were, indeed, not infrequent escapes by slaves from one colony to another, but it was not until after the growth of anti-slavery sentiment and the acquisition of western territory, that it became necessary to adopt a uniform method for the return of fugitive slaves. Such provision was made in the Ordinance of 1787 (for the Northwest Territory), which in Article VI. provided that in the case of "any person escaping into the same [the Northwest Territory] from whom labor or service is lawfully claimed in any one of the original states, such fugitive may be lawfully reclaimed and conveyed to the person claiming his or her labor or service as aforesaid." An agreement of the sort was

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necessary to persuade the slave-holding states to union, and in the Federal Constitution, Article IV., Section II., it is provided that "no person held to service or labor in one state, under the laws thereof, escaping into another, shall, in consequence of any law or regulation therein, be discharged from such service or labor, but shall be delivered up on claim of the party to whom such service or labour may be due."

The first specific legislation on the subject was enacted on the 12th of February 1793, and like the Ordinance for the Northwest Territory and the section of the Constitution quoted above, did not contain the word "slave"; by its provisions any Federal district or circuit judge or any state magistrate was authorized to decide finally and without a jury trial the status of an alleged fugitive. The measure soon met with strong opposition in the northern states, and Personal Liberty Laws were passed to hamper officials in the execution of the law; Indiana in 1824 and Connecticut in 1828 providing jury trial for fugitives who appealed from an original decision against them. In 1840 New York and Vermont extended the right of trial by jury to fugitives and provided them with attorneys. As early as the first decade of the 19th century individual dissatisfaction with the law of 1793 had taken the form of systematic assistance rendered to negroes escaping from the South to Canada or New England—the so-called "Underground Railroad."[1] The decision of the Supreme Court of the United States in the case of *Prigg* v. *Pennsylvania* in 1842 (16 Peters 539), that state authorities could not be forced to act in fugitive slave cases, but that national authorities must carry out the national law, was followed by legislation in Massachusetts (1843), Vermont (1843), Pennsylvania (1847) and Rhode Island (1848), forbidding state officials to help enforce the law and refusing the use of state gaols for fugitive slaves. The demand from the South for more effective Federal legislation was voiced in the second fugitive slave law, drafted by Senator J. M. Mason of Virginia, and enacted on the 18th of September 1850 as a part of the Compromise Measures of that year. Special commissioners were to have concurrent jurisdiction with the U.S. circuit and district courts and the inferior courts of Territories in enforcing the law; fugitives could not testify in their own behalf; no trial by jury was provided; penalties were imposed upon marshals who refused to enforce the law or from whom a fugitive should escape, and upon individuals who aided negroes to escape; the marshal might raise a *posse comitatus*; a fee of $10 was paid to the commissioner when his decision favoured the claimant and only $5 when it favoured the fugitive; and both the fact of the escape and the identity of the fugitive were to be determined on purely *ex parte* testimony. The severity of this measure led to gross abuses and defeated its purpose; the number of abolitionists increased, the operations of the Underground Railroad became more efficient, and new Personal Liberty Laws were enacted in Vermont (1850), Connecticut (1854), Rhode Island (1854), Massachusetts (1855), Michigan (1855), Maine (1855 and 1857), Kansas (1858) and Wisconsin (1858). These Personal Liberty Laws forbade justices and judges to take cognizance of claims, extended the *habeas corpus* act and the privilege of jury trial to fugitives, and punished false testimony severely. The supreme court of Wisconsin went so far (1859) as to declare the Fugitive Slave Law unconstitutional. These state laws were one of the grievances officially referred to by South Carolina (in Dec. 1860) as justifying her secession from the Union. Attempts to carry into effect the law of 1850 aroused much bitterness. The arrests of Sims and of Shadrach in Boston in 1851; of "Jerry" M'Henry, in Syracuse, New York, in the same year; of Anthony Burns in 1854, in Boston; and of the two Garner families in 1856, in Cincinnati, with other cases arising under the Fugitive Slave Law of 1850, probably had as much to do with bringing on the Civil War as did the controversy over slavery in the Territories.

With the beginning of the Civil War the legal status of the slave was changed by his master's being in arms. General B. F. Butler, in May 1861, declared negro slaves contraband of war. A confiscation bill was passed in August 1861 discharging from his service or labour any slave employed in aiding or promoting any insurrection against the government of the United States. By an act of the 17th of July 1862 any slave of a disloyal master who was in territory occupied by northern troops was declared *ipso facto* free. But for some time the Fugitive Slave Law was considered still to hold in the case of fugitives from masters in the border states who were loyal to the Union government, and it was not until the 28th of June 1864 that the Act of 1850 was repealed.

See J. F. Rhodes, *History of the United States from the Compromise of 1850*, vols. i. and ii. (New York, 1893); and M. G. M'Dougall, *Fugitive Slaves, 1619–1865* (Boston, 1891).

FUGLEMAN (from the Ger. *Flügelmann*, the man on the *Flügel* or wing), properly a military term for a soldier who is selected to act as "guide," and posted generally on the flanks with the duty of directing the march in the required line, or of giving the time, &c., to the remainder of the unit, which conforms to his movements, in any military exercise. The word is then applied to a ringleader or one who takes the lead in any movement or concerted movement.

FUGUE (Lat. *fuga*, flight), in music, the mutual "pursuit" of voices or parts. It was, up to the end of the 16th century, if not later, the name applied to two art-forms. (A) *Fuga ligata* was the exact reproduction by one or more voices of the statement of a leading part. The reproducing voice (*comes*) was seldom if ever written out, for all differences between it and the *dux* were rigidly systematic; *e.g.* it was an exact inversion, or exactly twice as slow, or to be sung backwards, &c. &c. Hence, a rule or *canon* was given, often in enigmatic form, by which the *comes* was deduced from the *dux*: and so the term *canon* became the appropriate name for the form itself, and is still retained. (B) A composition in which the canonic style was cultivated without canonic restriction was, in the 16th century, called *fuga ricercata* or simply a *ricercare*, a term which is still used by Bach as a title for the fugues in *Das musikalische Opfer*.

The whole conception of fugue, rightly understood, is one of the most important in music, and the reasons why some contrapuntal compositions are called fugues, while others are not, are so trivial, technically as well as aesthetically, that we have

[1] The precise amount of organization in the Underground Railroad cannot be definitely ascertained because of the exaggerated use of the figure of railroading in the documents of the "presidents" of the road, Robert Purvis and Levi Coffin, and of its many "conductors," and their discussion of the "packages" and "freight" shipped by them. The system extended from Kentucky and Virginia across Ohio, and from Maryland across Pennsylvania and New York, to New England and Canada, and as early as 1817 a group of anti-slavery men in southern Ohio had helped to Canada as many as 1000 slaves. The Quakers of Pennsylvania possibly began the work of the mysterious Underground Railroad; the best known of them was Thomas Garrett (1789–1871), a native of Pennsylvania, who, in 1822, removed to Wilmington, Delaware, where he was convicted in 1848 on four counts under the Fugitive Slave Law and was fined $8000; he is said to have helped 2700 slaves to freedom. The most picturesque figure of the Underground Railroad was Harriet Tubman (*c.* 1820), called by her friend, John Brown, "General" Tubman, and by her fellow negroes "Moses." She made about a score of trips into the South, bringing out with her 300 negroes altogether. At one time a reward of $40,000 was offered for her capture. She was a mystic, with remarkable clairvoyant powers, and did great service as a nurse, a spy and a scout in the Civil War. Levi Coffin (1798–1877), a native of North Carolina (whose cousin, Vestal Coffin, had established before 1819 a "station" of the Underground near what is now Guilford College, North Carolina), in 1826 settled in Wayne County, Ohio; his home at New Garden (now Fountain City) was the meeting point of three "lines" from Kentucky; and in 1847 he removed to Cincinnati, where his labours in bringing slaves out of the South were even more successful. It has been argued that the Underground Railroad delayed the final decision of the slavery question, inasmuch as it was a "safety valve"; for, without it, the more intelligent and capable of the negro slaves would, it is asserted, have become the leaders of insurrections in the South, and would not have been removed from the places where they could have done most damage. Consult William Still, *The Underground Railroad* (Philadelphia, 1872), a collection of anecdotes by a negro agent of the Pennsylvania Anti-Slavery Society, and of the Philadelphia branch of the Railroad; and the important and scholarly work of Wilbur H. Siebert, *The Underground Railroad from Slavery to Freedom* (New York, 1898).

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preferred to treat the subject separately under the general heading of CONTRAPUNTAL FORMS, reserving only technical terms for definition here.

(i.) If in the beginning or "exposition" the material with which the opening voice accompanies the answer is faithfully reproduced as the accompaniment to subsequent entries of the subject, it is called a *countersubject* (see COUNTERPOINT, under sub-heading *Double Counterpoint*). Obviously the process may be carried further, the first countersubject going on to a second when the subject enters in the third part and so on. The term is also applied to new subjects appearing later in the fugue in combination (immediate or destined) with the original subject. Cherubini, holding the doctrine that a fugue cannot have more than one subject, insists on applying the term to the less prominent of the subjects of what are commonly called double fugues, *i.e.* fugues which begin with two parts and two subjects simultaneously, and so also with *triple* and *quadruple fugues*.

(ii.) *Episodes* are passages separating the entries of the subject.[1] Episodes are usually developed from the material of the subject and countersubjects; they are very rarely independent, but then conspicuously so.

(iii.) *Stretto*, the overlapping of subject and answer, is a resource the possibilities of which may be exemplified by the setting of the words *omnes generationes* in Bach's *Magnificat* (see BACH).

(iv.) The distinction between *real* and *tonal* fugue, which is still sometimes treated as a thing of great historical and technical importance, is really a mere detail resulting from the fact that a violent oscillation between the keys of tonic and dominant is no part of the function of a fugal exposition, so that the answer is (especially in its first notes and in points that tend to shift the key) not so much a transposition of the subject to the key of the dominant as an adaptation of it from the tonic part to the dominant part of the scale, or vice versa; in short, the answer is as far as possible *on* the dominant, not *in* the dominant. The modifications this principle produces in the answer (which have been happily described as resembling "fore-shortening") are the only distinctive marks of tonal fugue; and the text-books are half filled with the attempt to reduce them from matters of ear to rules of thumb, which rules, however, have the merit (unusual in those of the academic fugue) of being founded on observation of the practice of great masters. But the same principle as often as not produces answers that are exact transpositions of the subject; and so the only kind of real fugue (*i.e.* fugue with an exact answer) that could rightly be contrasted with tonal fugue would be that in which the answer ought to be tonal but is not. It must be admitted that tonal answers are rare in the modal music of the 16th century, though their melodic principles are of yet earlier date; still, though tonal fugue does not become usual until well on in the 17th century, the idea that it is a separate species is manifestly absurd, unless the term simply means "fugue in modern tonality or key," whatever the answer may be.

The term "answer" is usually reserved for those entries of the subject that are placed in what may be called the "complementary" position of the scale, whether they are "tonally" modified or not. Thus the order of entries in the exposition of the first fugue of the *Wohltemp. Klav.* is subject, answer, answer, subject; a departure from the usual rule according to which subject and answer are strictly alternate in the exposition.

In conclusion we may remind the reader of the most accurate as well as the most vivid description ever given of the essentials of a fugue, in the famous lines in *Paradise Lost*, book xi.

> "His volant touch,
> Instinct through all proportions, low and high,
> Fled and pursued transverse the resonant fugue."

It is hard to realize that this description of organ-music was written in no classical period of instrumental polyphony, but just half-way between the death of Frescobaldi and the birth of Bach. Every word is a definition, both retrospective and prophetic; and in "transverse" we see all that Sir Frederick Gore Ouseley expresses in his popular distinction between the "perpendicular" or homophonic style in which harmony is built up in chords, and the "horizontal" or polyphonic style in which it is woven in threads of independent melody. (D. F. T.)

FÜHRICH, JOSEPH VON (1800–1876), Austrian painter, was born at Kratzau in Bohemia on the 9th of February 1800. Deeply impressed as a boy by rude pictures adorning the wayside chapels of his native country, his first attempt at composition was a sketch of the Nativity for the festival of Christmas in his father's house. He lived to see the day when, becoming celebrated as a composer of scriptural episodes, his sacred subjects were transferred in numberless repetitions to the roadside churches of the Austrian state, where humble peasants thus learnt to admire modern art reviving the models of earlier ages. Führich has been fairly described as a "Nazarene," a romantic religious artist whose pencil did more than any other to restore the old spirit of Dürer and give new shape to countless incidents of the gospel and scriptural legends. Without the power of Cornelius or the grace of Overbeck, he composed with great skill, especially in outline. His mastery of distribution, form, movement and expression was considerable. In its peculiar way his drapery was perfectly cast. Essentially creative as a landscape draughtsman, he had still no feeling for colour; and when he produced monumental pictures he was not nearly so successful as when designing subjects for woodcuts. Führich's fame extended far beyond the walls of the Austrian capital, and his illustrations to Tieck's *Genofeva*, the Lord's Prayer, the Triumph of Christ, the Road to Bethlehem, the Succession of Christ according to Thomas à Kempis, the Prodigal Son, and the verses of the Psalter, became well known. His Prodigal Son, especially, is remarkable for the fancy with which the spirit of evil is embodied in a figure constantly recurring, and like that of Mephistopheles exhibiting temptation in a human yet demoniacal shape. Führich became a pupil at the Academy of Prague in 1816. His first inspiration was derived from the prints of Dürer and the Faust of Cornelius, and the first fruit of this turn of study was the Genofeva series. In 1826 he went to Rome, where he added three frescoes to those executed by Cornelius and Overbeck in the Palazzo Massimi. His subjects were taken from the life of Tasso, and are almost solitary examples of his talent in this class of composition. In 1831 he finished the Triumph of Christ now in the Raczynski palace at Berlin. In 1834 he was made custos and in 1841 professor of composition in the Academy of Vienna. After this he completed the monumental pictures of the church of St Nepomuk, and in 1854–1861 the vast series of wall paintings which cover the inside of the Lerchenfeld church at Vienna. In 1872 he was pensioned and made a knight of the order of Franz Joseph; 1875 is the date of his illustrations to the Psalms. He died on the 13th of March 1876.

His autobiography was published in 1875, and a memoir by his son Lucas in 1886.

FUJI (Fuji-san, Fujiyama, Fusiyama), a celebrated mountain of Japan, standing W.S.W. of Tokyo, its base being about 70 m. by rail from that city. It rises to a height of 12,395 ft. and its southern slopes reach the shore of Suruga Bay. It is a cone of beautifully simple form, the more striking to view because it stands isolated; but its summit is not conical, being broken by a crater some 2000 ft. in diameter, for Fuji is a quiescent volcano. Small outbursts of steam are still to be observed at some points. An eruption is recorded so lately as the first decade of the 18th century. The mountain is the resort of great numbers of pilgrims (see also JAPAN).

FU-KIEN (formerly MIN), a south-eastern province of China, bounded N. by the province of Chek-kiang, S. by that of Kwang-tung, W. by that of Kiang-si and E. by the sea. It occupies an area of 53,480 sq. m. and its population is estimated at 20,000,000. The provincial capital is Fuchow Fu, and it is divided into eleven prefectures, besides that ruled over by the prefect of the capital city. Fu-kien is generally mountainous, being overspread by the Nan-shan ranges, which run a general course of N.E. and S.W.

[1] An episode occurring during the exposition is sometimes called *codetta*, a distinction the uselessness of which at once appears on an analysis of Bach's 2nd fugue in the *Wohltemp. Klav.* (the term codetta is more correctly applied to notes filling in a gap between subject and its first answer, but such a gap is rare in good examples).

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The principal river is the Min, which is formed by the junction, in the neighbourhood of the city of Yen-p'ing Fu, of three rivers, namely, the Nui-si, which takes its rise in the mountains on the western frontier in the prefecture of Kien-ning Fu, the Fuh-tun Ki, the source of which is found in the district of Kwang-tsih in the north-west of the province, and the Ta-shi-ki (Shao Ki), which rises in the mountains in the western district of Ning-hwa. From Yen-p'ing Fu the river takes a south-easterly course, and after passing along the south face of the city of Fuchow Fu, empties itself into the sea about 30 m. below that town. Its upper course is narrow and rocky and abounds in rapids, but as it approaches Fuchow Fu the channel widens and the current becomes slow and even. Its depth is very irregular, and it is navigable only by native boats of a small class. Two other rivers flow into the sea near Amoy, neither of which, however, is navigable for any distance from its mouth owing to the shallows and rapids with which they abound. Thirty-five miles inland from Amoy stands the city of Chang Chow, famous for the bridge which there spans the Kin-lung river. This bridge is 800 ft. long, and consists of granite monoliths stretching from one abutment to another. The soil of the province is, as its name, "Happy Establishment," indicates, very productive, and the scenery is of a rich and varied character. Most of the hills are covered with verdure, and the less rugged are laid out in terraces. The principal products of the province are tea, of which the best kind is that known as Bohea, which takes its name, by a mispronunciation, from the Wu-e Mountains, in the prefecture of Kien-ning Fu, where it is grown; grains of various kinds, oranges, plantins, lichis, bamboo, ginger, gold, silver, lead, tin, iron, salt (both marine and rock), deers' horns, beeswax, sugar, fish, birds' nests, medicine, paper, cloth, timber, &c. Fu-kien has three open ports, Fuchow Fu opened in 1842, Amoy opened to trade in the same year and Funing. The latter port was only opened to foreign trade in 1898, but in 1904 it imported and exported goods to the value of £7668 and £278,160 respectively.

FUKUI, a town of Japan in the province of Echizen, Nippon, near the west coast, 20 m. N. by E. of Wakasa Bay. It lies in a volcanic district much exposed to earthquakes, and suffered severely during the disturbances of 1891–1892, when a chasm over 40 m. long was opened across the Neo valley from Fukui to Katabira. But Fukui subsequently revived, and is now in a flourishing condition, with several local industries, especially the manufacture of paper, and an increasing population exceeding 50,000. Fukui has railway communication. There are ruins of a castle of the Daimios of Echizen.

FUKUOKA, a town on the north-west coast of the island of Kiushiu, Japan, in the province of Chikuzen, 90 m. N.N.E. of Nagasaki by rail. Pop. about 72,000. With Hakata, on the opposite side of a small coast stream, it forms a large centre of population, with an increasing export trade and several local industries. Of these the most important is silk-weaving, and Hakata especially is noted for its durable silk fabrics. Fukuoka was formerly the residence of the powerful daimio of Chikuzen, and played a conspicuous part in the medieval history of Japan; the renowned temple of Yeiyas in the district was destroyed by fire during the revolution of 1868. There are several other places of this name in Japan, the most important being Fukuoka in the province of Mutsu, North Nippon, a railway station on the main line from Tokyo to Aimori Ura Bay. Pop. about 5000.

FULA (Fulbe, Fellatah or Peuls), a numerous and powerful African people, spread over an immense region from Senegal nearly to Darfur. Strictly they have no country of their own, and nowhere form the whole of the population, though nearly always the dominant native race. They are most numerous in Upper Senegal and in the countries under French sway immediately south of Senegambia, notably Futa Jallon. Farther east they rule, subject to the control of the French, Segu and Massena, countries on both banks of the upper Niger, to the south-west of Timbuktu. The districts within the great bend of the Niger have a large Fula population. East of that river Sokoto and its tributary emirates are ruled by Fula princes, subject to the control of the British Nigerian administration. Fula are settled in Bornu, Bagirmi, Wadai and the upper Nile Valley,[1] but have no political power in those countries. Their most southerly emirate is Adamawa, the country on both sides of the upper Benue. In this vast region of distribution the Fula populations are most dense towards the west and north, most scattered towards the east and south. Originally herdsmen in the western and central Sudan, they extended their sway east of the Niger, under the leadership of Othman Dan Fodio, during the early years of the 19th century, and having subdued the Hausa states, founded the empire of Sokoto with the vassal emirates of Kano, Gando, Nupe, Adamawa, &c.

The question of the ethnic affinities of the Fula has given rise to an enormous amount of speculation, but the most reasonable theory is that they are a mixture of Berber and Negro. This is now the most generally accepted theory. Certainly there is no reason to connect them with the ancient Egyptians. In the district of Senegal known as Fuladugu or "Fula Land," where the purest types of the race are found, the people are of a reddish brown or light chestnut colour, with oval faces, ringlety or even smooth hair, never woolly, straight and even aquiline noses, delicately shaped lips and regular features quite differentiating them from the Negro type. Like most conquering races the Fula are, however, not of uniform physique, in many districts approximating to the local type. They nevertheless maintain throughout their widespread territory a certain national solidarity, thanks to common speech, traditions and usages. The ruling caste of the Fula differs widely in character from the herdsmen of the western Sudan. The latter are peaceable, inoffensive and abstemious. They are mainly monogamous, and by rigidly abstaining from foreign marriages have preserved racial purity. The ruling caste in Nigeria, on the other hand, despise their pastoral brethren, and through generations of polygamy with the conquered tribes have become more Negroid in type, black, burly and coarse featured. Love of luxury, pomp and finery is their chief characteristic. Taken as a whole, the Fula race is distinguished by great intelligence, frankness of disposition and strength of character. As soldiers they are renowned almost exclusively as cavalry; and the race has produced several leaders possessed of much strategical skill. Besides the ordinary Negro weapons, they use iron spears with leatherbound handles and swords. They are generally excellent rulers, stern but patient and just. The Nigerian emirs acquired, however, an evil reputation during the 19th century as slave raiders. They have long been devout Mahommedans, and mosques and schools exist in almost all their towns. Tradition says that of old every Fula boy and girl was a scholar; but during the decadence of their power towards the close of the 19th century education was not highly valued. Power seems to have somewhat spoilt this virile race, but such authorities as Sir Frederick Lugard believe them still capable of a great future.

The Fula language has as yet found no place in any African linguistic family. In its rudiments it is akin to the Hamito-Semitic group. It possesses two grammatical genders, not masculine and feminine, but the human and the non-human; the adjective agrees in assonance with its noun, and euphony plays a great part in verbal and nominal inflections. In some ways resembling the Negro dialects, it betrays non-Negroid influences in the use of suffixes. The name of the people has many variations. Fulbe or Fula (sing. Pullo, Peul) is the Mandingan name, Follani the Hausa, Fellatah the Kanuri, Fullan the Arab, and Fulde on the Benue. Like the name Abate, "white," given them in Kororofa, all these seem to refer to their light reddish hue.

See F. Ratzel, *History of Mankind* (English ed., London, 1896–1898); Sir F. Lugard, "Northern Nigeria," in *Geographical Journal* (July 1904); Grimal de Guirodon, *Les Puls* (1887); E. A. Brackenbury, *A Short Vocabulary of the Fulani Language* (Zungeru, 1907); the articles Nigeria and Sokoto and authorities there cited.

[1] Sir Wm. Wallace in a report on Northern Nigeria ("Colonial Office" series, No. 551, 1907) calls attention to the exodus "of thousands of Fulani of all sorts, but mostly Mellawa, from the French Middle Niger," and states that the majority of the emigrants are settling in the Nile valley.

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FULCHER (or FOUCHER) **OF CHARTRES** (1058–*c.* 1130), French chronicler, was a priest who was present at the council of Clermont in 1095, and accompanied Robert II., duke of Normandy, on the first crusade in 1096. Having spent some time in Italy and taken part in the fighting on the way to the Holy Land, he became chaplain to Baldwin, who was chosen king of Jerusalem in 1100, and lived with Baldwin at Edessa and then at Jerusalem. He accompanied this king on several warlike expeditions, but won more lasting fame by writing his *Historia Hierosolymitana* or *Gesta Francorum Jerusalem expugnantium*, one of the most trustworthy sources for the history of the first crusade. In its final form it is divided into three books, and covers the period between the council of Clermont and 1127, and the author only gives details of events which he himself had witnessed. It was used by William of Tyre. Fulcher died after 1127, probably at Jerusalem. He has been confused with Foucher of Mongervillier (d. 1171), abbot of St-Père-en-Vallée at Chartres, and also with another person of the same name who distinguished himself at the siege of Antioch in 1098.

The *Historia*, but in an incomplete form, was first published by J. Bongars in the *Gesta Dei per Francos* (Hanover, 1611). The best edition is in tome iii. of the *Recueil des historiens des croisades, Historiens occidentaux* (Paris, 1866); and there is a French translation in tome xxiv. of Guizot's *Collection des mémoires relatifs à l'histoire de France* (Paris, 1823–1835).

See H. von Sybel, *Geschichte des ersten Kreuzzuges* (Leipzig, 1881); and A. Molinier, *Les Sources de l'histoire de France*, tome ii. (Paris, 1902).

FULDA, a town and episcopal see of Germany, in the Prussian province of Hesse-Nassau, between the Rhön and the Vogel-Gebirge, 69 m. N.E. from Frankfort-on-Main on the railway to Bebra. Although irregularly built the town is pleasantly situated, and contains two fine squares, on one of which stands a fine statue of St Boniface. The present cathedral was built at the beginning of the 18th century on the model of St Peter's at Rome, but it has an ancient crypt, which contains the bones of St Boniface and was restored in 1802. Opposite the cathedral is the former monastery of St Michael, now the episcopal palace. The Michaelskirche, attached to it, is a small round church built, in imitation of the Holy Sepulchre, in 822 and restored in 1853. Of other buildings may be mentioned the Library, with upwards of 80,000 printed books and many valuable MSS., the stately palace with its gardens and orangery, the former Benedictine nunnery (founded 1625, and now used as a seminary), and the Minorite friary (1238) now used as a furniture warehouse. Among the secular buildings are the fine *Schloss*, the *Bibliothek*, the town hall and the post office. There are several schools, a hospital founded in the 13th century, and some new artillery barracks. Many industries are carried on in Fulda. These include weaving and dyeing, the manufacture of linen, plush and other textiles and brewing. There are also railway works in the town. A large trade is done in cattle and grain, many markets being held here. Fine views are obtained from several hills in the neighbourhood, among these being the Frauenberg, the Petersberg and the Kalvarienberg.

Fulda owes its existence to its famous abbey. It became a town in 1208, and during the middle ages there were many struggles between the abbots and the townsfolk. During the Peasants' War it was captured by the rebels and during the Seven Years' War by the Hanoverians. It came finally into the possession of Prussia in 1866. From 1734 to 1804 Fulda was the seat of a university, and latterly many assemblies of German bishops have been held in the town.

The great Benedictine abbey of Fulda occupies the place in the ecclesiastical history of Germany which Monte Cassino holds in Italy, St Gall in South Germany, Corvey in Saxony, Tours in France and Iona in Scotland. Founded in 744 at the instigation of St Boniface by his pupil Sturm, who was the first abbot, it became the centre of a great missionary work. It was liberally endowed with land by the princes of the Carolingian house and others, and soon became one of the most famous and wealthy establishments of its kind. About 968 the pope declared that its abbot was primate of all the abbots in Germany and Gaul, and later he became a prince of the Empire. Fulda was specially famous for its school, which was the centre of the theological learning of the early middle ages. Among the teachers here were Alcuin, Hrabanus Maurus, who was abbot from 822 to 842, and Walafrid Strabo. Early in the 10th century the monastery was reformed by introducing monks from Scotland, who were responsible for restoring in its old strictness the Benedictine rule. Later the abbey lost some of its lands and also its high position, and some time before the Reformation the days of its glory were over. Johann von Henneberg, who was abbot from 1529 to 1541, showed some sympathy with the teaching of the reformers, but the Counter-Reformation made great progress here under Abbot Balthasar von Dernbach. Gustavus Adolphus gave the abbey as a principality to William, landgrave of Hesse, but William's rule only lasted for ten years. In 1752 the abbot was raised to the rank of a bishop, and Fulda ranked as a prince-bishopric. This was secularized in 1802, and in quick succession it belonged to the prince of Orange, the king of France and the grand-duchy of Frankfort. In 1816 the greater part of the principality was ceded by Prussia to Hesse-Cassel, a smaller portion being united with Bavaria. Sharing the fate of Hesse-Cassel, this larger portion was annexed by Prussia in 1866. In 1829 a new bishopric was founded at Fulda.

For the town see A. Hartmann, *Zeitgeschichte von Fulda* (Fulda, 1895); F. Schneider, *Führer durch die Stadt Fulda* (Fulda, 1899); and *Chronik von Fulda und dessen Umgebungen* (1839). For the history of the abbey see Gegenbaur, *Das Kloster Fulda im Karolinger Zeitalter* (Fulda, 1871–1874); Arndt, *Geschichte des Hochstifts Fulda* (Fulda, 1860); and the *Fuldaer Geschichtsblätter* (1902 fol.).

FULGENTIUS, FABIUS PLANCIADES, Latin grammarian, a native of Africa, flourished in the first half of the 6th (or the last part of the 5th) century A.D. He is to be distinguished from Fulgentius, bishop of Ruspe (468–533), to whom he was probably related, and also from the bishop's pupil and biographer, Fulgentius Ferrandus. Four extant works are attributed to him. (1) *Mythologiarum libri iii.*, dedicated to a certain Catus, a presbyter of Carthage, containing 75 myths briefly told, and then explained in the mystical and allegorical manner of the Stoics and Neoplatonists. For this purpose the author generally invokes the aid of etymologies which, borrowed from the philosophers, are highly absurd. As a Christian, Fulgentius sometimes (but less frequently than might have been expected) quotes the Bible by the side of the philosophers, to give a Christian colouring to the moral lesson. (2) *Expositio Vergilianae continentiae* (*continentia* = contents), a sort of appendix to (1), dedicated to Catus. The poet himself appears to the author and explains the twelve books of the *Aeneid* as a picture of human life. The three words *arma* (= virtus), *vir* (= sapientia), *primus* (= principes) in the first line represent respectively *substantia corporalis, sensualis, ornans*. Book i. symbolizes the birth and early childhood of man (the shipwreck of Aeneas denotes the peril of birth), book vi. the plunge into the depths of wisdom. (3) *Expositio sermonum antiquorum*, explanations of 63 rare and obsolete words, supported by quotations (sometimes from authors and works that never existed). It is much inferior to the similar work of Nonius, with which it is often edited. (4) *Liber absque litteris de aetatibus mundi et hominis*. In the MS. heading of this work, the name of the author is given as Fabius Claudius Gordianus Fulgentius (Claudius is the name of the father, and Gordianus that of the grandfather of the bishop, to whom some attribute the work). The title *Absque litteris* indicates that one letter of the alphabet is wholly omitted in each successive book (A in bk. i., B in bk. ii.). Only 14 books are preserved. The matter is chiefly taken from sacred history. In addition to these, Fulgentius speaks of early poetical attempts after the manner of Anacreon, and of a work called *Physiologus*, dealing with medical questions, and including a discussion of the mystical signification of the numbers 7 and 9. Fulgentius is a representative of the so-called late African style, taking for his models Apuleius, Tertullian and Martianus Capella. His language is bombastic, affected and incorrect, while the lengthy and elaborate periods make it difficult to understand his meaning.

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See the edition of the four works by R. Helm (1898, Teubner series); also M. Zink, *Der Mytholog Fulgentius* (1867); E. Jungmann, "De Fulgentii aetate et scriptis," in *Acta Societatis Philologae Lipsiensis*, I. (1871); A. Ebert, *Allgemeine Geschichte der Lit. des Mittelalters*, i.; article "Fulgentius" by C. F. Böhr in Ersch and Gruber's *Allgemeine Encyklopädie*; Teuffel-Schwabe, *History of Roman Literature* (Eng. trans.).

FULGINIAE (mod. *Foligno*), an ancient town of Umbria, Italy, on the later line of the Via Flaminia, 15 m. S. of Nuceria. It appears to have been of comparatively late origin, inasmuch as it had no city walls, but, in imperial times especially, owing to its position on the new line of the Via Flaminia, it must have increased in importance as being the point of departure of roads to Perusia and to Picenum over the pass of Plestia. It appears to have had an amphitheatre, and three bridges over the Topino are attributed to the Roman period. Three miles to the N. lies the independent community of Forum Flaminii, the site of which is marked by the church of S. Giovanni Profiamma, at or near which the newer line of the Via Flaminia rejoined the older. It was no doubt founded by the builder of the road, C. Flaminius, consul in 220 B.C. (See FOLIGNO and FLAMINIA, VIA.) (T. As.)

FULGURITE (from Lat. *fulgur*, lightning), in petrology, the name given to rocks which have been fused on the surface by lightning, and to the characteristic holes in rocks formed by the same agency. When lightning strikes the naked surfaces of rocks, the sudden rise of temperature may produce a certain amount of fusion, especially when the rocks are dry and the electricity is not readily conducted away. Instances of this have been observed on Ararat and on several mountains in the Alps, Pyrenees, &c. A thin glassy crust, resembling a coat of varnish, is formed; its thickness is usually not more than one-eighth of an inch, and it may be colourless, white or yellow. When examined under the microscope, it usually shows no crystallization, and contains minute bubbles due to the expansion of air or other gases in the fused pellicle. Occasionally small microliths may appear, but this is uncommon because so thin a film would cool with extreme rapidity. The minerals of the rock beneath are in some cases partly fused, but the more refractory often appear quite unaffected. The glass has arisen from the melting of the most fusible ingredients alone.

Another type of fulgurite is commonest in dry sands and takes the shape of vertical tubes which may be nearly half an inch in diameter. Generally they are elliptical in cross section, or flattened by the pressure exerted by the surrounding sand on the fulgurite at a time when it was still very hot and plastic. These tubes are often vertical and may run downwards for several feet through the sand, branching and lessening as they descend. Tubular perforations in hard rocks have been noted also, but these are short and probably follow original cracks. The glassy material contains grains of sand and many small round or elliptical cavities, the long axes of which are radial. Minerals like felspar and mica are fused more readily than quartz, but analysis shows that some fulgurite glasses are very rich in silica, which perhaps was dissolved in the glass rather than simply fused. The central cavity of the tube and the bubbles in its walls point to the expansion of the gases (air, water, &c.) in the sand by sudden and extreme heating. Very fine threads of glass project from the surface of the tube as if fused droplets had been projected outwards with considerable force. Where the quartz grains have been greatly heated but not melted they become white and semi-opaque, but where they are in contact with the glass they usually show partial solution. Occasionally crystallization has begun before the glass solidified, and small microliths, the nature of which is undeterminable, occur in streams and wisps in the clear hyaline matrix. (J. S. F.)

FULHAM, a western metropolitan borough of London, England, bounded N.W. by Hammersmith, N.E. by Kensington, E. by Chelsea, and S.E., S. and S.W. by the river Thames. Pop. (1901) 137,289. The principal thoroughfares are Fulham Palace Road running S. from Hammersmith, Fulham Road and King's Road, W. from Chelsea, coverging and leading to Putney Bridge over the Thames; North End Road between Hammersmith and Fulham Roads; Lillie Road between South Kensington and Fulham Palace Road; and Wandsworth Bridge Road leading S. from New King's Road to Wandsworth Bridge. In the north Fulham includes the residential district known as West Kensington, and farther south that of Walham Green. The manor house or palace of the bishops of London stands in grounds, beautifully planted and surrounded by a moat, believed to be a Danish work, near the river west of Putney Bridge. Its oldest portion is the picturesque western quadrangle, built by Bishop Fitzjames (1506–1522). The parish church of All Saints, between the bridge and the grounds, was erected in 1881 from designs by Sir Arthur Blomfield. The fine old monuments from the former building, dating from the 16th to the 18th centuries, are mostly preserved, and in the churchyard are the memorials of several bishops of London and of Theodore Hook (1841). The public recreation grounds include the embankment and gardens between the river and the palace grounds, and there are also two well-known enclosures used for sports within the borough. Of these Hurlingham Park is the headquarters of the Hurlingham Polo Club and a fashionable resort; and Queen's Club, West Kensington, has tennis and other courts for the use of members, and is also the scene of important football matches, and of the athletic meetings between Oxford and Cambridge Universities, and those between the English and American Universities held in England. In Seagrave Road is the Western fever hospital. The parliamentary borough of Fulham returns one member. The borough council consists of a mayor, 6 aldermen and 36 councillors. Area, 1703·5 acres.

Fulham, or in its earliest form *Fullanham*, is uncertainly stated to signify "the place" either "of fowls" or "of dirt." The manor is said to have been given to Bishop Erkenwald about the year 691 for himself and his successors in the see of London, and Holinshed relates that the Bishop of London was lodging in his manor place in 1141 when Geoffrey de Mandeville, riding out from the Tower of London, took him prisoner. At the Commonwealth the manor was temporarily out of the bishops' hands, being sold to Colonel Edmund Harvey. There is no record of the first erection of a parish church, but the first known rector was appointed in 1242, and a church probably existed a century before this. The earliest part of the church demolished in 1881, however, did not date farther back than the 15th century. In 879 Danish invaders, sailing up the Thames, wintered at Fulham and Hammersmith. Near the former wooden Putney Bridge, built in 1729 and replaced in 1886, the earl of Essex threw a bridge of boats across the river in 1642 in order to march his army in pursuit of Charles I., who thereupon fell back on Oxford. Margravine Road recalls the existence of Bradenburg House, a riverside mansion built by Sir Nicholas Crispe in the time of Charles I., used as the headquarters of General Fairfax in 1647 during the civil wars, and occupied in 1792 by the margrave of Bradenburg-Anspach and Bayreuth and his wife, and in 1820 by Caroline, consort of George IV.

FULK, king of Jerusalem (b. 1092), was the son of Fulk IV., count of Anjou, and his wife Bertrada (who ultimately deserted her husband and became the mistress of Philip I. of France). He became count of Anjou in 1109, and considerably added to the prestige of his house. In particular he showed himself a doughty opponent to Henry I. of England, against whom he continually supported Louis VI. of France, until in 1127 Henry won him over by betrothing his daughter Matilda to Fulk's son Geoffrey Plantagenet. Already in 1120 Fulk had visited the Holy Land, and become a close friend of the Templars. On his return he assigned to the order of the Templars an annual subsidy, while he also maintained two knights in the Holy Land for a year. In 1128 he was preparing to return to the East, when he received an embassy from Baldwin II., king of Jerusalem, who had no male heir to succeed him, offering his daughter Melisinda in marriage, with the right of eventual succession to the kingdom. Fulk readily accepted the offer; and in 1129 he came and was married to Melisinda, receiving the towns of

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Acre and Tyre as her dower. In 1131, at the age of thirty-nine, he became king of Jerusalem. His reign is not marked by any considerable events: the kingdom which had reached its zenith under Baldwin II., and did not begin to decline till the capture of Edessa in the reign of Baldwin III., was quietly prosperous under his rule. In the beginning of his reign he had to act as regent of Antioch, and to provide a husband, Raymund of Poitou, for the infant heiress Constance. But the great problem with which he had to deal was the progress of the atabeg Zengi of Mosul. In 1137 he was beaten near Barin, and escaping into the fort was surrounded and forced to capitulate. A little later, however, he greatly improved his position by strengthening his alliance with the vizier of Damascus, who also had to fear the progress of Zengi (1140); and in this way he was able to capture the fort of Banias, to the N. of Lake Tiberias. Fulk also strengthened the kingdom on the south; while his butler, Paganus, planted the fortress of Krak to the south of the Dead Sea, and helped to give the kingdom an access towards the Red Sea, he himself constructed Blanche Garde and other forts on the S.W. to overawe the garrison of Ascalon, which was still held by the Mahommedans, and to clear the road towards Egypt. Twice in Fulk's reign the eastern emperor, John Comnenus, appeared in northern Syria (1137 and 1142); but his coming did not affect the king, who was able to decline politely a visit which the emperor proposed to make to Jerusalem. In 1143 he died, leaving two sons, who both became kings, as Baldwin III. and Amalric I.

Fulk continued the tradition of good statesmanship and sound churchmanship which Baldwin I. and Baldwin II. had begun. William of Tyre speaks of him as a fine soldier, an able politician, and a good son of the church, and only blames him for partiality to his friends, and a forgetfulness of names and faces, which placed him at a disadvantage and made him too dependent on his immediate intimates. Little, perhaps, need be made of these censures: the real fault of Fulk was his neglect to envisage the needs of the northern principalities, and to head a combined resistance to the rising power of Zengi of Mosul.

His reign in Jerusalem is narrated by R. Röhricht (*Geschichte des Königreichs Jerusalem*, Innsbruck, 1898), and has been made the subject of a monograph by G. Dodu (*De Fulconis Hierosolymitani regno*, Paris, 1894). (E. Br.)

FULK (d. 900), archbishop of Reims, and partisan of Charles the Simple in his struggle with Odo, count of Paris, was elected to the see as archbishop in 883 upon the death of Hincmar. In 887 he was engaged in a struggle with the Normans who invaded his territories. Upon the deposition of Charles the Fat he sided with Charles the Simple in his contest for the West Frankish dominions against Count Odo of Paris, and crowned him king in his own metropolitan church at Reims after most of the nobles had gone over to Odo (893). Upon the death of Odo he succeeded in having Charles recognized as king by a majority of the West Frankish nobility. In 897 he obtained special privileges for his province from Pope Formosus, who promised that thereafter, when the archbishopric became vacant, the revenues should not be enjoyed by anyone while the vacancy existed, but should be reserved for the new incumbent, provided the election took place within the canonical limit of three months. From 898 until his death he held the office of chancellor, which for some time afterwards was regularly filled by the archbishop of Reims. In his efforts to keep the wealthy abbeys and benefices of the church out of the hands of the nobles, he incurred the hatred of Baldwin, count of Flanders, who secured his assassination on the 17th of June 900, a crime which the weak Carolingian monarch left unpunished.

Fulk left some letters, which are collected in Migne, *Patrologia Latina*, vol. cxxxi. 11-14.

FULKE, WILLIAM (1538–1589), Puritan divine, was born in London and educated at Cambridge. After studying law for six years, he became a fellow at St John's College, Cambridge, in 1564. He took a leading part in the "vestiarian" controversy, and persuaded the college to discard the surplice. In consequence he was expelled from St. John's for a time, but in 1567 he became Hebrew lecturer and preacher there. After standing unsuccessfully for the headship of the college in 1569, he became chaplain to the earl of Leicester, and received from him the livings of Warley, in Essex, and Dennington in Suffolk. In 1578 he was elected master of Pembroke Hall, Cambridge. As a Puritan controversialist he was remarkably active; in 1580 the bishop of Ely appointed him to defend puritanism against the Roman Catholics, Thomas Watson, ex-bishop of Lincoln (1513–1584), and John Feckenham, formerly abbot of Westminster, and in 1581 he was one of the disputants with the Jesuit, Edmund Campion, while in 1582 he was among the clergy selected by the privy council to argue against any papist. His numerous polemical writings include *A Defense of the sincere true Translations of the holie Scriptures into the English tong* (London, 1583), and confutations of Thomas Stapleton (1535–1598), Cardinal Allen and other Roman Catholic controversialists.

FULK NERRA (*c.* 970–1040), count of Anjou, eldest son of Count Geoffrey I., "Grisegonelle" (Grey Tunic) and Adela of Vermandois, was born about 970 and succeeded his father in the countship of Anjou on the 21st of July 987. He was successful in repelling the attacks of the count of Rennes and laying the foundations of the conquest of Touraine (see ANJOU). In this connexion he built a great number of strong castles, which has led in modern times to his being called "the great builder." He also founded several religious houses, among them the abbeys of Beaulieu, near Loches (*c* 1007), of Saint-Nicholas at Angers (1020) and of Ronceray at Angers (1028), and, in order to expiate his crimes of violence, made three pilgrimages to the Holy Land (in 1002–1003, *c.* 1008 and in 1030). On his return from the third of these journeys he died at Metz in Lorraine on the 21st of June 1040. By his first marriage, with Elizabeth, daughter of Bouchard le Vénérable, count of Vendôme, he had a daughter, Adela, who married Boon of Nevers and transmitted to her children the countship of Vendôme. Elizabeth having died in 1000, Fulk married Hildegarde of Lorraine, by whom he had a son, Geoffrey Martel (q.v.), and a daughter Ermengarde, who married Geoffrey, count of Gâtinais, and was the mother of Geoffrey "le Barbu" (the Bearded) and of Fulk "le Réchin" (see ANJOU).

See Louis Halphen, *Le Comté d'Anjou au XIe siècle* (Paris, 1906). The biography of Fulk Nerra by Alexandre de Salies, *Histoire de Foulques Nerra* (Angers, 1874) is confused and uncritical. A very summary biography is given by Célestin Port, *Dictionnaire historique, géographique et biographique de Maine-et-Loire* (3 vols., Paris-Angers, 1874–1878), vol. ii. pp. 189-192, and there is also a sketch in Kate Norgate, *England under the Angevin Kings* (2 vols., London, 1887), vol. i. ch. iii. (L. H.*)

FÜLLEBORN, GEORG GUSTAV (1769–1803), German philosopher, philologist and miscellaneous writer, was born at Glogau, Silesia, on the 2nd of March 1769, and died at Breslau on the 6th of February 1803. He was educated at the University of Halle, and was made doctor of philosophy in recognition of his thesis *De Xenophane, Zenone et Gorgia*. He took diaconal orders in 1701, but almost immediately became professor of classics at Breslau. His philosophical works include annotations to Garve's translation of the *Politics* of Aristotle (1799–1800), and a large share in the *Beiträge zur Geschichte der Philosophie* (published in twelve parts between 1791 and 1799), in which he collaborated with Forberg, Reinhold and Niethammer. In philology he wrote *Encyclopaedia philologica sive primae lineae Isagoges in antiquorum studia* (1798; 2nd ed., 1805); *Kurze Theorie des lateinischen Stils* (1793); *Leitfaden der Rhetorik* (1802); and an annotated edition of the *Satires* of Persius. Under the pseudonym "Edelwald Justus" he published several collections of popular tales—*Bunte Blätter* (1795); *Kleine Schriften zur Unterhaltung* (1798); *Nebenstunden* (1799). After his death were published *Taschenbuch für Brunnengäste* (1806) and *Kanzelreden* (1807). He was a frequent contributor to the press, where his writings were very popular.

See Schummel, *Gedächtnisrede* (1803) and *Garve und Fülleborn*; Meusel, *Gelehrtes Teutschland*, vol. ii.

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FULLER, ANDREW (1754–1815), English Baptist divine, was born on the 6th of February 1754, at Wicken in Cambridgeshire. In his boyhood and youth he worked on his father's farm. In his seventeenth year he became a member of the Baptist church at Soham, and his gifts as an exhorter met with so much approval that, in the spring of 1775, he was called and ordained as pastor of that congregation. In 1782 he removed to Kettering in Northamptonshire, where he became friendly with some of the most eminent ministers of the denomination. Before leaving Soham he had written the substance of a treatise in which he had sought to counteract the prevailing Baptist hyper-Calvinism which, "admitting nothing spiritually good to be the duty of the unregenerate, and nothing to be addressed to them in a way of exhortation excepting what related to external obedience," had long perplexed his own mind. This work he published, under the title *The Gospel worthy of all Acceptation*, soon after his settlement in Kettering; and although it immediately involved him in a somewhat bitter controversy which lasted for nearly twenty years, it was ultimately successful in considerably modifying the views prevalent among English dissenters. In 1793 he published a treatise, *The Calvinistic and Socinian systems examined and compared as to their moral tendency*, in which he rebutted the accusation of antinomianism levelled by the Socinians against those who over-emphasized the doctrines of free grace. This work, along with another against Deism, entitled *The Gospel its own Witness*, is regarded as the production on which his reputation as a theologian mainly rests. Fuller also published an admirable *Memoir of the Rev. Samuel Pearce*, of Birmingham, and a volume of *Expository Lectures in Genesis*, besides a considerable number of smaller pieces, chiefly sermons and pamphlets, which were issued in a collected form after his death. He was a man of forceful character, more prominent on the practical side of religion than on the devotional, and accordingly not pre-eminently successful in his local ministry. His great work was done in connexion with the Baptist Missionary Society, formed at Kettering in 1792, of which he was secretary until his death on the 7th of May 1815. Both Princeton and Yale, U.S.A., conferred on him the degree of D. D., but he never used it.

Several editions of his collected works have appeared, and a *Memoir*, principally compiled from his own papers, was published about a year after his decease by Dr Ryland, his most intimate friend and coadjutor in the affairs of the Baptist mission. There is also a biography by the Rev. J. W. Morris (1816); and his son prefixed a memoir to an edition of his chief works in Bohn's Standard Library (1852).

FULLER, GEORGE (1822–1884), American figure and portrait painter, was born at Deerfield, Massachusetts, in 1822. At the age of twenty he entered the studio of the sculptor H. K. Brown, at Albany, New York, where he drew from the cast and modelled heads. Having attained some proficiency he went about the country painting portraits, settling at length in Boston, where he studied the works of the earlier Americans, Stuart, Copley and Allston. After three years in that city, and twelve in New York, where in 1857 he was elected a member of the National Academy of Design, he went to Europe for a brief visit and for study. During all this time his work had received little recognition and practically no financial encouragement, and on his return he settled on the family farm at Deerfield, where he continued to work in his own way with no thought of the outside world. In 1876, however, he was forced by pressing needs to dispose of his work, and he sent some pictures to a dealer in Boston, where he met with immediate success, financial and artistic, and for the remaining eight years of his life he never lacked patrons. He died in Boston on the 21st of March 1884. He was a poetic painter, and a dreamer of delicate fancies and quaint, intangible phases of nature, his canvases being usually enveloped in a brown mist that renders the outlines vague. Among his noteworthy canvases are: "The Turkey Pasture," "Romany Girl," "And she was a Witch," "Nydia," "Winifred Dysart" and "The Quadroon."

FULLER, MARGARET, Marchioness Ossoli (1810–1850), American authoress, eldest child of Timothy Fuller (1778–1835), a lawyer and politician of some eminence, was born at Cambridgeport, Massachusetts, on the 23rd of May 1810. Her education was conducted by her father, who, she states, made the mistake of thinking to "gain time by bringing forward the intellect as early as possible," the consequence being "a premature development of brain that made her a youthful prodigy by day, and by night a victim of spectral illusions, nightmare and somnambulism." At six years she began to read Latin, and at a very early age she had selected as her favourite authors Shakespeare, Cervantes and Molière. Soon the great amount of study exacted of her ceased to be a burden, and reading became a habit and a passion. Having made herself familiar with the masterpieces of French, Italian and Spanish literature, she in 1833 began the study of German, and within the year had read some of the masterpieces of Goethe, Körner, Novalis and Schiller.

After her father's death in 1835 she went to Boston to teach languages, and in 1837 she was chosen principal teacher in the Green Street school, Providence, Rhode Island, where she remained till 1839. From this year until 1844 she stayed at different places in the immediate neighbourhood of Boston, forming an intimate acquaintance with the colonists of Brook Farm, and numbering among her closest friends R. W. Emerson, Nathaniel Hawthorne and W. H. Channing. In 1839 she published a translation of Eckermann's *Conversations with Goethe*, which was followed in 1842 by a translation of the correspondence between Karoline von Günderode and Bettina von Arnim, entitled *Günderode*. Aided by R. W. Emerson and George Ripley, she in 1840 started *The Dial*, a poetical and philosophical magazine representing the opinions and aims of the New England Transcendentalists. This journal she continued to edit for two years, and while in Boston she also conducted conversation classes for ladies in which philosophical and social subjects were discussed with a somewhat over-accentuated earnestness. These meetings may be regarded as perhaps the beginning of the modern movement in behalf of women's rights. R. W. Emerson, who had met her as early as 1836, thus describes her appearance: "She was then twenty-six years old. She had a face and frame that would indicate fulness and tenacity of life. She was rather under the middle height; her complexion was fair, with strong fair hair. She was then, as always, carefully and becomingly dressed, and of ladylike self-possession. For the rest her appearance had nothing prepossessing. Her extreme plainness, a trick of incessantly opening and shutting her eyelids, the nasal tone of her voice, all repelled; and I said to myself we shall never get far." On better acquaintance this unprepossessing exterior seemed, however, to melt away, and her inordinate self-esteem to be lost in the depth and universality of her sympathy. She possessed an almost irresistible power of winning the intellectual and moral confidence of those with whom she came in contact, and "applied herself to her companion as the sponge applies itself to water." She obtained from each the best they had to give. It was indeed more as a conversationalist than as a writer that she earned the title of the Priestess of Transcendentalism. It was her intimate friends who admired her most. Smart and pungent though she is as a writer, the apparent originality of her views depends more on eccentricity than either intellectual depth or imaginative vigour. In 1844 she removed to New York at the desire of Horace Greeley to write literary criticism for *The Tribune*, and in 1846 she published a selection from her articles on contemporary authors in Europe and America, under the title *Papers on Literature and Art*. The same year she paid a visit to Europe, passing some time in England and France, and finally taking up her residence in Italy. There she was married in December 1847 to the marquis Giovanni Angelo Ossoli, a friend of Mazzini. During 1848–1849 she was present with her husband in Rome, and when the city was besieged she, at the request of Mazzini, took charge of one of the two hospitals while her husband fought on the walls. In May 1850, along with her husband and infant son, she embarked at Leghorn for America, but when they had all but reached their destination the vessel was wrecked on Fire

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Island beach on the 16th of June, and the Ossolis were among the passengers who perished.

Life Without and Life Within (Boston, 1860) is a collection of essays, poems, &c., supplementary to her *Collected Works*, printed in 1855. See the *Autobiography of Margaret Fuller Ossoli*, with additional memoirs by J. F. Clarke, R. W. Emerson and W. H. Channing (2 vols., Boston, 1852); also *Margaret Fuller (Marchesa Ossoli)*, by Julia Ward Howe (1883), in the "Eminent Women" series; *Margaret Fuller Ossoli* (Boston, 1884), by Thomas Wentworth Higginson in the "American Men of Letters" series, which is based largely on unedited material; and *The Love Letters of Margaret Fuller, 1845–1846* (London and New York, 1903), with an introduction by Julia Ward Howe.

FULLER, MELVILLE WESTON (1833–1910), American jurist, chief justice of the Supreme Court of the United States, was born at Augusta, Maine, on the 11th of February 1833. After graduating at Bowdoin College in 1853 he spent a year at the Harvard Law School, and in 1855 began the practice of law at Augusta, where he was an associate-editor of a Democratic paper, *The Age*, and served in the city council and as city attorney. In 1856 he removed to Chicago, Illinois, where he continued to practise until 1888, rising to a high position at the bar of the Northwest. For some years he was active in Democratic politics, being a member of the Illinois Constitutional Convention in 1862 and of the State House of Representatives from 1863 to 1865. He was a delegate to various National conventions of his party, and in that of 1876 placed Thomas A. Hendricks in nomination for the presidency. In 1888, by President Cleveland's appointment, he succeeded Morrison R. Waite as chief-justice of the Supreme Court of the United States. In 1890 he was appointed by President McKinley a member of the arbitration commission at Paris to settle the Venezuela-British Guiana boundary dispute.

FULLER, THOMAS (1608–1661), English divine and historian, eldest son of Thomas Fuller, rector of Aldwincle St Peter's, Northamptonshire, was born at his father's rectory and was baptized on the 19th of June 1608. Dr John Davenant, bishop of Salisbury, was his uncle and godfather. According to Aubrey, Fuller was "a boy of pregnant wit." At thirteen he was admitted to Queens' College, Cambridge, then presided over by Dr John Davenant. His cousin, Edward Davenant, was a tutor in the same college. He was apt and quick in study; and in Lent 1624–1625 he became B.A. and in July 1628 M.A. Being overlooked in an election of fellows of his college, he was removed by Bishop Davenant to Sidney Sussex College, November 1628. In 1630 he received from Corpus Christi College the curacy of St Benet's, Cambridge.

Fuller's quaint and humorous oratory soon attracted attention. He published in 1631 a poem on the subject of David and Bathsheba, entitled *David's Heinous Sinne, Heartie Repentance, Heavie Punishment*. In June of the same year his uncle gave him a prebend in Salisbury, where his father, who died in the following year, held a canonry. The rectory of Broadwindsor, Dorsetshire, then in the diocese of Bristol, was his next preferment (1634); and on the 11th of June 1635 he proceeded B.D. At Broadwindsor he compiled *The Historie of the Holy Warre* (1639), a history of the crusades, and *The Holy State and the Prophane State* (1642). This work describes the holy state as existing in the family and in public life, gives rules of conduct, model "characters" for the various professions and profane biographies. It was perhaps the most popular of all his writings. He was in 1640 elected proctor for Bristol in the memorable convocation of Canterbury, which assembled with the Short Parliament. On the sudden dissolution of the latter he joined those who urged that convocation should likewise dissolve as usual. That opinion was overruled; and the assembly continued to sit by virtue of a royal writ. Fuller has left in his *Church History* a valuable account of the proceedings of this synod, for sitting in which he was fined £200, which, however, was never exacted. His first published volume of sermons appeared in 1640 under the title of *Joseph's par-y-coloured Coat*, which contains many of his quaint utterances and odd conceits. His grosser mannerisms of style, derived from the divines of the former generation, disappeared for the most part in his subsequent discourses.

About 1640 he had married Eleanor, daughter of Hugh Grove of Chisenbury, Wiltshire. She died in 1641. Their eldest child, John, baptized at Broadwindsor by his father, 6th June 1641, was afterwards of Sidney Sussex College, edited the *Worthies of England*, 1662, and became rector of Great Wakering, Essex, where he died in 1687.

At Broadwindsor, early in the year 1641, Thomas Fuller, his curate Henry Sanders, the church wardens, and others, nine persons altogether, certified that their parish, represented by 242 grown-up male persons, had taken the Protestation ordered by the speaker of the Long Parliament. Fuller was not formally dispossessed of his living and prebend on the triumph of the Presbyterian party, but he relinquished both preferments about this time. For a short time he preached with success at the Inns of Court, and thence removed, at the invitation of the master of the Savoy (Dr Balcanqual) and the brotherhood of that foundation, to be lecturer at their chapel of St Mary Savoy. Some of the best discourses of the witty preacher were delivered at the Savoy to audiences which extended into the chapel-yard. In one he set forth with searching and truthful minuteness the hindrances to peace, and urged the signing of petitions to the king at Oxford, and to the parliament, to continue their care in advancing an accommodation. In his *Appeal of Injured Innocence* Fuller says that he was once deputed to carry a petition to the king at Oxford. This has been identified with a petition entrusted to Sir Edward Wardour, clerk of the pells, Dr Dukeson, "Dr Fuller," and four or five others from the city of Westminster and the parishes contiguous to the Savoy. A pass was granted by the House of Lords, on the 2nd of January 1643, for an equipage of two coaches, four or six horses and eight or ten attendants. On the arrival of the deputation at Uxbridge, on the 4th of January, officers of the Parliamentary army stopped the coaches and searched the gentlemen; and they found upon the latter "two scandalous books arraigning the proceedings of the House," and letters with ciphers to Lord Viscount Falkland and the Lord Spencer. Ultimately a joint order of both Houses remanded the party; and Fuller and his friends suffered a brief imprisonment. The Westminster Petition, notwithstanding, reached the king's hands; and it was published with the royal reply (see J. E. Bailey, *Life of Thomas Fuller*, pp. 245 *et seq.*). When it was expected, three months later, that a favourable result would attend the negotiations at Oxford, Fuller preached a sermon at Westminster Abbey, on the 27th of March 1643, on the anniversary of Charles I.'s accession, on the text, "Yea, let him take all, so my Lord the King return in peace." On Wednesday, the 26th of July, he preached on church reformation, satirizing the religious reformers, and maintaining that only the Supreme Power could initiate reforms.

He was now obliged to leave London, and in August 1643 he joined the king at Oxford. He lived in a hired chamber at Lincoln College for 17 weeks. Thence he put forth a witty and effective reply to John Saltmarsh, who had attacked his views on ecclesiastical reform. Fuller subsequently published by royal request a sermon preached on the 10th of May 1644, at St Mary's, Oxford, before the king and Prince Charles, called *Jacob's Vow*.

The spirit of Fuller's preaching, always characterized by calmness and moderation, gave offence to the high royalists, who charged him with lukewarmness in their cause. To silence unjust censures he became chaplain to the regiment of Sir Ralph Hopton. For the first five years of the war, as he said, when excusing the non-appearance of his *Church History*, "I had little list or leisure to write, fearing to be made a history, and shifting daily for my safety. All that time I could not live to study, who did only study to live." After the defeat of Hopton at Cheriton Down, Fuller retreated to Basing House. He took an active part in its defence, and his life with the troops caused him to be afterwards regarded as one of "the great cavalier parsons." In his marches with his regiment round about Oxford and in the west, he devoted much time to the collection of details,

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from churches, old buildings, and the conversation of ancient gossips, for his *Church-History* and *Worthies of England*. He compiled in 1645 a small volume of prayers and meditations,—the *Good Thoughts in Bad Times*,—which, set up and printed in the besieged city of Exeter, whither he had retired, was called by himself "the first fruits of Exeter press." It was inscribed to Lady Dalkeith, governess to the infant princess, Henrietta Anne (b. 1644), to whose household he was attached as chaplain. The corporation gave him the Bodleian lectureship on the 21st of March 1645/6, and he held it until the 17th of June following, soon after the surrender of the city to the parliament. *The Fear of losing the Old Light* (1646) was his farewell discourse to his Exeter friends. Under the Articles of Surrender Fuller made his composition with the government at London, his "delinquency" being that he had been present in the king's garrisons. In *Andronicus, or the Unfortunate Politician* (1646), partly authentic and partly fictitious, he satirized the leaders of the Revolution; and for the comfort of sufferers by the war he issued (1647) a second devotional manual, entitled *Good Thoughts in Worse Times*, abounding in fervent aspirations, and drawing moral lessons in beautiful language out of the events of his life or the circumstances of the time. In grief over his losses, which included his library and manuscripts (his "upper and nether millstone"), and over the calamities of the country, he wrote his work on the *Cause and Cure of a Wounded Conscience* (1647). It was prepared at Boughton House in his native county, where he and his son were entertained by Edward Lord Montagu, who had been one of his contemporaries at the university and had taken the side of the parliament.

For the next few years of his life Fuller was mainly dependent upon his dealings with booksellers, of whom he asserted that none had ever lost by him. He made considerable progress in an English translation from the MS. of the *Annales* of his friend Archbishop Ussher. Amongst his benefactors it is curious to find Sir John Danvers of Chelsea, the regicide. Fuller in 1647 began to preach at St Clement's, Eastcheap, and elsewhere in the capacity of lecturer. While at St Clement's he was suspended; but speedily recovering his freedom, he preached wherever he was invited. At Chelsea, where also he occasionally officiated, he covertly preached a sermon on the death of Charles I., but he did not break with his Roundhead patrons. James Hay, 2nd earl of Carlisle, made him his chaplain, and presented him in 1648 or 1649 to the curacy of Waltham Abbey. His possession of the living was in jeopardy on the appointment of Cromwell's "Tryers"; but he evaded their inquisitorial questions by his ready wit. He was not disturbed at Waltham in 1655, when the Protector's edict prohibited the adherents of the late king from preaching. Lionel, 3rd earl of Middlesex, who lived at Copt Hall, near Waltham, gave him what remained of the books of the lord treasurer his father; and through the good offices of the marchioness of Hertford, part of his own pillaged library was restored to him. Fuller was thus able to prosecute his literary labours, producing successively his descriptive geography of the Holy Land, called *A Pisgah-Sight of Palestine* (1650), and his *Church-History of Britain* (1655), from the birth of Jesus Christ until the year 1648. With the *Church-History* was printed *The History of the University of Cambridge since the Conquest* and *The History of Waltham Abbey*. These works were furthered in no slight degree by his connexion with Sion College, London, where he had a chamber, as well for the convenience of the press as of his city lectureships. The *Church-History* was angrily attacked by Dr P. Heylyn, who, in the spirit of High-Churchmanship, wished, as he said, to vindicate the truth, the church and the injured clergy. About 1652 Fuller married his second wife, Mary Roper, youngest sister of Thomas, Viscount Baltinglass, by whom he had several children. At the Oxford Act of 1657, Robert South, who was *Terræ filius*, lampooned Fuller, whom he described in this *Oratio* as living in London, ever scribbling and each year bringing forth new *folio* like a tree. At length, continues South, the *Church-History* came forth with its 166 dedications to wealthy and noble friends; and with this huge volume under one arm, and his wife (said to be little of stature) on the other, he ran up and down the streets of London, seeking at the houses of his patrons invitations to dinner, to be repaid by his dull jests at table.

His last and best patron was George Berkeley, 1st Earl Berkeley (1628–1698), of Cranford House, Middlesex, whose chaplain he was, and who gave him Cranford rectory (1658). To this nobleman Fuller's reply to Heylyn's *Examen Historicum*, called *The Appeal of Injured Innocence* (1659), was inscribed. At the end of the *Appeal* is an epistle "to my loving friend Dr Peter Heylyn," conceived in the admirable Christian spirit which characterized all Fuller's dealings with controversialists. "Why should *Peter*," he asked, "fall out with *Thomas*, both being disciples to the same Lord and Master? I assure you, sir, whatever you conceive to the contrary, I am cordial to the cause of the English Church, and my hoary hairs will go down to the grave in sorrow for her sufferings."

In *An Alarum to the Counties of England and Wales* (1660) Fuller argued for a free and full parliament—free from force, as he expressed it, as well as from abjurations or previous engagements. *Mixt Contemplations in Better Times* (1660), dedicated to Lady Monk, tendered advice in the spirit of its motto, "Let your moderation be known to all men: the Lord is at hand." There is good reason to suppose that Fuller was at the Hague immediately before the Restoration, in the retinue of Lord Berkeley, one of the commissioners of the House of Lords, whose last service to his friend was to interest himself in obtaining him a bishopric. *A Panegyrick to His Majesty on his Happy Return* was the last of Fuller's verse-efforts. On the 2nd of August, by royal letters, he was admitted D.D. at Cambridge. He resumed his lectures at the Savoy, where Samuel Pepys heard him preach; but he preferred his conversation or his books to his sermons. Fuller's last promotion was that of chaplain in extraordinary to Charles II. In the summer of 1661 he visited the west in connexion with the business of his prebend, which had been restored to him. On Sunday, the 12th of August, while preaching at the Savoy, he was seized with typhus fever, and died at his new lodgings in Covent Garden on the 16th of August. He was buried in Cranford church, where a mural tablet was afterwards set up on the north side of the chancel, with an epitaph which contains a conceit worthy of his own pen, to the effect that while he was endeavouring (viz. in *The Worthies*) to give immortality to others, he himself attained it.

Fuller's wit and vivacious good-humour made him a favourite with men of both sides, and his sense of humour kept him from extremes. Probably Heylyn and South had some excuse for their attitude towards his very moderate politics. "By his particular temper and management," said Echard (*Hist. of England*, iii. 71), "he weathered the late great storm with more success than many other great men." He was known as "a perfect walking library." The strength of his memory was proverbial, and some amusing anecdotes are connected with it.

His writings were the product of a highly original mind. He had a fertile imagination and a happy faculty of illustration. Antithetic and axiomatic sentences abound in his pages, embodying literally the wisdom of the many in the wit of one. He was "quaint," and something more. "Wit," said Coleridge, in a well-known eulogy, "was the stuff and substance of Fuller's intellect. It was the element, the earthen base, the material which he worked in; and this very circumstance has defrauded him of his due praise for the practical wisdom of the thoughts, for the beauty and variety of the truths, into which he shaped the stuff. Fuller was incomparably the most sensible, the least prejudiced, great man of an age that boasted a galaxy of great men" (*Literary Remains*, vol. ii. (1836), pp. 389-390). This opinion was formed after the perusal of the *Church-History*. That work and *The History of the Worthies of England* are unquestionably Fuller's greatest efforts. They embody the collections of an entire life; and since his day they have been the delight of many readers. The *Holy State* has taken rank amongst the best books of "characters." Charles Lamb made some selections from Fuller, and had a profound admiration for the "golden works" of the "dear, fine, silly old angel." Since

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Lamb's time, mainly through the appreciative criticisms of S. T. Coleridge, Robert Southey and others, Fuller's works have received much attention.

There is an elaborate account of the life and writings of Fuller by William Oldys in the *Biographia Britannica*, vol. iii. (1750), based on Fuller's own works and the anonymous *Life of . . . Dr Thomas Fuller* (1661; reprinted in a volume of selections by A. L. J. Gosset, 1893). The completest account of him is *The Life of Thomas Fuller, with Notices of his Books, his Kinsmen and his Friends* (1874), by J. E. Bailey, who gives a detailed bibliography (pp. 713-762) of his works. *The Worthies of England* was reprinted by John Nichols (1811) and by P. A. Nuttall (1840). His *Collected Sermons* were edited by J. E. Bailey and W. E. A. Axon in 1891. Fuller's quaint wit lends itself to selection, and there are several modern volumes of extracts from his works.

FULLER, WILLIAM (1670–*c.* 1717), English impostor, was born at Milton in Kent on the 20th of September 1670. His paternity is doubtful, but he was related to the family of Herbert. After 1688 he served James II.'s queen, Mary of Modena, and the Jacobites, seeking at the same time to gain favour with William III.; and after associating with Titus Oates, being imprisoned for debt and pretending to reveal Jacobite plots, the House of Commons in 1692 declared he was an "imposter, cheat and false accuser." Having stood in the pillory he was again imprisoned until 1695, when he was released; and at this time he took the opportunity to revive the old and familiar story that Mary of Modena was not the mother of the prince of Wales. In 1701 he published his autobiographical *Life of William Fuller* and some *Original Letters of the late King James*. Unable to prove the assertions made in his writings he was put in the pillory, whipped and fined. He died, probably in prison, about 1717. Fuller's other writings are *Mr William Fuller's trip to Bridewell, with a full account of his barbarous usage in the pillory; The sincere and hearty confession of Mr William Fuller* (1704); and *An humble appeal to the impartial judgment of all parties in Great Britain* (1716).

He must be distinguished from WILLIAM FULLER (1608–1675), dean of St Patrick's (1660), bishop of Limerick (1663), and bishop of Lincoln (1667), the friend of Samuel Pepys; and also from William Fuller, (*c.* 1580–1659), dean of Ely and later dean of Durham.

FULLER'S EARTH (Ger. *Walkererde*, Fr. *terre à foulon, argile smectique*)—so named from its use by fullers as an absorbent of the grease and oil of cloth,—a clay-like substance, which from its variability is somewhat difficult to define. In colour it is most often greenish, olive-green or greenish-grey; on weathering it changes to a brown tint or it may bleach. As a rule it falls to pieces when placed in water and is not markedly plastic; when dry it adheres strongly to the tongue; since, however, these properties are possessed by many clays that do not exhibit detergent qualities, the only test of value lies in the capacity to absorb grease or clarify oil. Fuller's earth has a specific gravity of 1·7–2·4, and a shining streak; it is usually unctuous to the touch. Microscopically, it consists of minute irregular-shaped particles of a mineral that appears to be the result of a chloritic or talcose alteration of a felspar. The small size of most of the grains, less than ·07 mm., makes their determination almost impossible. Chemical analysis shows that the peculiar properties of this earth are due to its physical rather than its chemical nature.

The following analyses of the weathered and unweathered condition of the earth from Nutfield, Surrey, represent the composition of one of the best known varieties:—

Blue Earth (dried at 100° C.).

Insoluble residue	69·96	Insoluble residue—	
Fe_2O_3	2·48	SiO_2	62·81
Al_2O_3	3·46	Al_2O_3	3·46
CaO	5·87	Fe_2O_3	1·30
MgO	1·41	CaO	1·53
P_2O_5	0·27	MgO	0·86
SO_3	0·05		
NaCl	0·05		69·96
K_2O	0·74		
H_2O (combined)	15·57		
	99·86		

Yellow Earth (dried at 100° C.).

Insoluble residue	70·13	Insoluble residue—	
Fe_2O_3	2·41	SiO_2	59·37
Al_2O_3	1·77	Al_2O_3	10·05
CaO	4·31	Fe_2O_3	3·86
MgO	1·05	CaO	1·86
P_2O_5	0·14	MgO	1·04
SO_3	0·07		
NaCl	0·14		76·18
K_2O	0·84		
H_2O (combined)	13·19		
	100·05		

(Analysis by P. G. Sanford, *Geol. Mag.*, 1889, 6, pp. 456, 526.)

Of other published analyses, not a few show a lower silica content (42 %, 50 %), along with a higher proportion of alumina (11 %, 23 %).

Fuller's earth may occur on any geological horizon; at Nutfield in Surrey, England, it is in the Cretaceous formations; at Midford near Bath it is of Jurassic age; at Bala, North Wales, it occurs in Ordovician strata; in Saxony it appears to be the decomposition product of a diabasic rock. In America it is found in California in rocks ranging from Cretaceous to Pleistocene age; in S. Dakota, Custer county and elsewhere a yellow, gritty earth of Jurassic age is worked; in Florida and Georgia occurs a brittle, whitish earth of Oligocene age. Other deposits are worked in Arkansas, Texas, Colorado, Massachusetts and South Carolina.

Fuller's earth is either mined or dug in the open according to local circumstances. It is then dried in the sun or by artificial heat and transported in small lumps in sacks. In other cases it is ground to a fine powder after being dried; or it is first roughly ground and made into a slurry with water, which is allowed to carry off the finer from the coarser particles and deposit them in a creamy state in suitable tanks. After consolidation this fine material is dried artificially on drying floors, broken into lumps, and packed for transport. The use of fuller's earth for cleansing wool and cloth has greatly decreased, but the demand for the material is as great or greater than it ever was. It is now used very largely in the filtration of mineral oils, and also for decolourizing certain vegetable oils. It is employed in the formation of certain soaps and cleansing preparations.

The term "Fuller's Earth" has a special significance in geology, for it was applied by W. Smith in 1799 to certain clays in the neighbourhood of Bath, and the use of the expression is still retained by English geologists, either in this form or in the generalized "Fullonian." The Fullonian lies at the base of the Great Oolite or Bathonian series, but its palaeontological characters place it between that series and the underlying Inferior Oolite. The zonal fossils are *Perisphinctes arbustigerus* and *Macrocephalus subcontractus* with *Ostrea acuminata*, *Rhynchonella concinna* and *Goniomya angulifera*. The formation is in part the equivalent of the "Vesulien" of J. Marcou (Vesoul in Haute-Saône). In Dorsetshire and Somersetshire, where it is best developed, it is represented by an Upper Fuller's Earth Clay, the Fuller's Earth Rock (an impersistent earthy limestone, usually fossiliferous), and the Lower Fuller's Earth Clay. Commercial fuller's earth has been obtained only from the Upper Clay. In eastern Gloucestershire and northern Oxfordshire the Fuller's Earth passes downwards without break into the Inferior Oolite; northward it dies out about Chipping Norton in Oxfordshire and passes laterally into the Stonesfield Slate series; in the midland counties it may perhaps be represented by the "Upper Estuarine Series." In parts of Dorsetshire the clays have been used for brickmaking and the limestone (rock) for local buildings.

See H. B. Woodward, "Jurassic Rocks of Great Britain," vol. iv. (1894), *Mem. Geol. Survey* (London). [J. A. H.]

FULLERTON, LADY GEORGIANA CHARLOTTE (1812–1885), English novelist and philanthropist, youngest daughter of the 1st Earl Granville, was born at Tixall Hall in Staffordshire on the 23rd of September 1812. In 1833 she married Alexander George Fullerton, then an Irish officer in the guards. After living in Paris for some eight years she and her husband accompanied Lord Granville to Cannes and thence to Rome. In 1843

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her husband entered the Roman Catholic church, and in the following year Lady Georgiana Fullerton published her first novel, *Ellen Middleton*, which attracted W. E. Gladstone's attention in the *English Review*. In 1846 she entered the Roman Catholic church. The death of her only son in 1854 plunged her in grief, and she continued to wear mourning until the end of her life. In 1856 she became one of the third order of St Francis, and thenceforward devoted herself to charitable work. In conjunction with Miss Taylor she founded the religious community known as "The Poor Servants of the Mother of God Incarnate," and she also took an active part in bringing to England the sisters of St Vincent of Paul. Her philanthropic work is described in Mrs Augustus Craven's work *Lady Georgiana Fullerton, sa vie et ses œuvres* (Paris, 1888), which was translated into English by Henry James Coleridge. She died at Bournemouth on the 19th of January 1885. Among her other novels were *Grantley Manor* (1847), *Lady Bird* (1852), and *Too Strange not to be True* (1864).

FULMAR, from the Gaelic *Fulmaire*, the *Fulmarus glacialis* of modern ornithologists, one of the largest of the petrels (*Procellariidae*) of the northern hemisphere, being about the size of the common gull (*Larus canus*) and not unlike it in general coloration, except that its primaries are grey instead of black. This bird, which ranges over the North Atlantic, is seldom seen on the European side below lat. 53° N., but on the American side comes habitually to lat. 45° or even lower. In the Pacific it is represented by a scarcely separable form, *F. glupischa*. It has been commonly believed to have two breeding-places in the British Islands, namely, St Kilda and South Barra; but, according to Robert Gray (*Birds of the West of Scotland*, p. 499), it has abandoned the latter since 1844, though still breeding in Skye. Northward it established itself about 1838 on Myggenaes Holm, one of the Faeroes, while it has several stations off the coast of Iceland and Spitsbergen, as well as at Bear Island. Its range towards the pole seems to be only bounded by open water, and it is the constant attendant upon all who are employed in the whale and seal fisheries, showing the greatest boldness in approaching boats and ships, and feeding on the offal obtained from them. By British seamen it is commonly called the "molly mawk"[1] (corrupted from *Mallemuck*), and is extremely well known to them, its flight, as it skims over the waves, first with a few beats of the wings and then gliding for a long way, being very peculiar. It only visits the land to deposit its single white egg, which is laid on a rocky ledge, where a shallow nest is made in the turf and lined with a little dried grass. Many of its breeding-places are a most valuable property to those who live near them and take the eggs and young, which, from the nature of the locality, are only to be had at a hazardous risk of life. In St Kilda a large number of the young are killed in one week of August, the only time when, by the custom of the community, they are allowed to be taken. These, after the oil is extracted from them, serve the islanders with food for the winter. The oil has been chemically analysed and found to be a fish-oil, and to possess nearly all the qualities of that obtained from the liver of the cod, with a lighter specific gravity. It, however, has an extremely strong scent, which is said by those who have visited St Kilda to pervade every thing and person on the island, and is certainly retained by an egg or skin of the bird for many years. Whenever a live example is seized in the hand it ejects a considerable quantity of this oil from its mouth.

FULMINIC ACID, HCNO or $H_2C_2N_2O_2$, an organic acid isomeric with cyanic and cyanuric acids, its salts, termed *fulminates*, are very explosive and are much employed as detonators. The free acid, which is obtained by treating the salts with acids, is an oily liquid smelling like prussic acid; it is very explosive, and the vapour is poisonous to about the same degree as that of prussic acid. The first fulminate prepared was the "fulminating silver" of L. G. Brugnatelli, who found in 1798 that if silver be dissolved in nitric acid and the solution added to spirits of wine, a white, highly explosive powder was obtained. This substance is to be distinguished from the black "fulminating silver" obtained by C. L. Berthollet in 1788 by acting with ammonia on precipitated silver oxide. The next salt to be obtained was the mercuric salt, which was prepared in 1799 by Edward Charles Howard, who substituted mercury for silver in Brugnatelli's process. A similar method is that of J. von Liebig (1823), who heated a mixture of alcohol, nitric acid and mercuric nitrate; the salt is largely manufactured by processes closely resembling the last. A laboratory method is to mix solutions of sodium nitromethane, CH_3: NO(ONa), and mercuric chloride, a yellow basic salt being formed at the same time. Mercuric fulminate is less explosive than the silver salt, and forms white needles (with $\frac{1}{2}H_2O$) which are tolerably soluble in water. The use of mercuric fulminate as a detonator dates from about 1814, when the explosive cap was invented. It is still the commonest detonator, but it is now usually mixed with other substances; the British service uses for percussion caps 6 parts of fulminate, 6 of potassium chlorate and 4 of antimony sulphide, and for time fuses 4 parts of fulminate, 6 of potassium chlorate and 4 of antimony sulphide, the mixture being damped with a shellac varnish; for use in blasting, a home office order of 1897 prescribes a mixture of 4 parts of fulminate and 1 of potassium chlorate. In 1900 Bielefeldt found that a fulminate placed on top of an aromatic nitro compound, such as trinitrotoluene, formed a useful detonator; this discovery has been especially taken advantage of in Germany, in which country detonators of this nature are being largely employed. Tetranitromethylaniline (tetryl) has also been employed (Brit. Pat. 13340 of 1905). It has been proposed to replace fulminate by silver azoimide (Wöhler & Matter, Brit. Pat. 4468 of 1908), and by lead azoimide (Hyronimus, Brit. Pat. 1819 of 1908).

The constitution of fulminic acid has been investigated by many experimenters, but apparently without definitive results. The researches of Liebig (1823), Liebig and Gay-Lussac (1824), and of Liebig again in 1838 showed the acid to be isomeric with cyanic acid, and probably $(HCNO)_2$, since it gave mixed and acid salts. Kekulé, in 1858, concluded that it was nitroacetonitrile, $NO_2{\cdot}CH_2{\cdot}CN$, a view opposed by Steiner (1883), E. Divers and M. Kawakita (1884), R. Scholl (1890), and by J. U. Nef (1894), who proposed the formulae:

C : N·OH	O< N : CH	CH : N·O	C : N·OH.
Ċ : N·OH,	N : C·OH.	CH : N·O,	
Steiner,	Divers,	Scholl,	Nef.

The formulae of Kekulé, Divers and Armstrong have been discarded, and it remains to be shown whether Nef's carbonyloxime formula (or the bimolecular formula of Steiner) or Scholl's glyoxime peroxide formula is correct. There is some doubt as to the molecular formula of fulminic acid. The existence of double salts, and the observations of L. Wöhler and R. Theodorovits (*Ber.*, 1905, 38, p. 345), that only compounds containing two carbon atoms yielded fulminates, points to $(HCNO)_2$; on the other hand, Wöhler (*loc. cit.* p. 1351) found that cryoscopic and electric conductivity measurements showed sodium fulminate to be NaCNO. Nef based his formula, which involves bivalent carbon, on many reactions; in particular, that silver fulminate with hydrochloric acid gave salts of formylchloridoxime, which with water gave hydroxylamine and formic acid, thus

$$C:NO\,OAg \rightarrow HC\lessdot^{NOAg}_{Cl} \rightarrow HC\lessdot^{N\cdot OH}_{OH} \rightarrow H\cdot CO_2H + H_2N\cdot OH,$$

and also on the production from sodium nitromethane and mercuric chloride, thus $CH_2 : NO\cdot Ohg \rightarrow H_2O + C : NOhg$ (hg = $\frac{1}{2}$Hg). H. Wieland and F. C. Palazzo (1907) support this formula, finding that methyl nitrolic acid, $NO_2{\cdot}CH : N{\cdot}OH$, yields fulminate under conditions fulminic acid, and vice versa (Palazzo, 1907). M. Z. Jowitschitsch (*Ann.*, 1906, 347, p. 233) inclines to Scholl's formula; he found that the synthetic silver salt of glyoxime peroxide resembled silver fulminate in yielding hydroxylamine with hydrochloric acid, but differed in being less explosive, and in being insoluble in nitric acid. H. Wieland and his collaborators regard "glyoxime peroxide" as an oxide of furazane (*q.v.*), and have shown that a close relationship exists between the nitrile oxides, furoxane, and fulminic acid (see *Ann. Rep.*, London Chem. Soc., 1909, p. 84). *Fulminuric acid*, $(HCNO)_3$, obtained by Liebig by boiling mercuric fulminate with water, was synthesized in 1905 by C. Ulpiani and L. Bernardini (*Gazetta*, iii. 35, p. 7), who regard it as $NO_2{\cdot}CH(CN){\cdot}CO{\cdot}NH_2$. It deflagrates at 145°, and forms a characteristic cuprammonium salt.

The early history of mercuric fulminate and a critical account of its application as a detonator is given in *The Rise and Progress of the British Explosives Industry* (International Congress of Applied Chemistry, 1909). The manufacture and modern aspects are treated in Oscar Guttmann, *The Manufacture of Explosives*, and *Manufacture of Explosives, Twenty Years' Progress* (1909).

[1] A name misapplied in the southern hemisphere to *Diomedea melanophrys*, one of the albatrosses.

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FULTON, ROBERT (1765–1815), American engineer, was born in 1765 in Little Britain (now Fulton, Lancaster county), Pa. His parents were Irish, and so poor that they could afford him only a very scanty education. At an early age he was bound apprentice to a jeweller in Philadelphia, but subsequently adopted portrait and landscape painting as his profession. In his twenty-second year, with the object of studying with his countryman, Benjamin West, he went to England, and there became acquainted with the duke of Bridgewater, Earl Stanhope and James Watt. Partly by their influence he was led to devote his attention to engineering, especially in connexion with canal construction; he obtained an English patent in 1794 for superseding canal locks by inclined planes, and in 1796 he published a *Treatise on the Improvement of Canal Navigation*. He then took up his residence in Paris, where he projected the first panorama ever exhibited in that city, and constructed a submarine boat, the "Nautilus," which was tried in Brest harbour in 1801 before a commission appointed by Napoleon I., and by the aid of which he was enabled to blow up a small vessel with a torpedo. It was at Paris also in 1803 that he first succeeded in propelling a boat by steam-power, thus realizing a design which he had conceived ten years previously. Returning to America he continued his experiments with submarine explosives, but failed to convince either the English, French or United States governments of the adequacy of his methods. With steam navigation he had more success. In association with Robert R. Livingston (*q.v.*), who in 1798 had been granted the exclusive right to navigate the waters of New York state with steam-vessels, he constructed the "Clermont," which, engined by Boulton & Watt of Birmingham, began to ply on the Hudson between New York and Albany in 1807. The privilege obtained by Livingston in 1798 was granted jointly to Fulton and Livingston in 1803, and by an act passed in 1808 the monopoly was secured to them and their associates for a period depending on the number of steamers constructed, but limited to a maximum of thirty years. In 1814–1815, on behalf of the United States government, he constructed the "Fulton," a vessel of 38 tons with central paddle-wheels, which was the first steam warship. He died at New York on the 24th of February 1815. Among Fulton's inventions were machines for spinning flax, for making ropes, and for sawing and polishing marble.

See C. D. Colden, *Life of Robert Fulton* (New York, 1817); Robert H. Thurston, *History of the Growth of the Steam-Engine* (New York, 1878); George H. Preble, *Chronological History of Steam Navigation* (Philadelphia, 1883); and Mrs A. C. Sutcliffe, *Robert Fulton and the Clermont* (New York, 1909).

FULTON, a city and the county-seat of Callaway county, Missouri, U.S.A., 25 m. N.E. of Jefferson City. Pop. (1890) 4314; (1900) 4883 (1167 negroes); (1910) 5228. It is served by the Chicago & Alton railway. The city has an important stock market and manufactures fire-brick and pottery. At Fulton are the Westminster College (Presbyterian, founded in 1853), the Synodical College for Young Women (Pres., founded in 1871), the William Woods College for Girls (Christian Church, 1890), and the Missouri school for the deaf (1851). Here, too, is a state hospital for the insane (1847), the first institution of the kind in Missouri. The place was laid out as a town in 1825 and named Volney, but in honour of Robert Fulton the present name was adopted a little later. Fulton was incorporated in 1859.

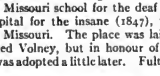
FULTON, a city of Oswego county, New York, U.S.A., on the right bank of the Oswego river, about 10 m. S. by E. of Oswego. Pop. (1900) 5281; (1905, state census) 8547; (1910) 10,480. Fulton is served by the Delaware, Lackawanna & Western, the New York Central & Hudson River, and the New York, Ontario & Western railways, by electric railway to Oswego and Syracuse and by the Oswego Canal. The city has a Carnegie library. Ample water-power is furnished by the Oswego river, which here flows in a series of rapids, and the manufactures are many in kind. On the 3rd of July 1756, on an island (afterward called Battle Island) 4 m. N. of the present city of Fulton, a British force of about 300 under Captain John Bradstreet (1711–1774) defeated an attacking force of French and Indians (numbering about 700) under De Villiers. Soon after this, Bradstreet built a fort within the present limits of Fulton. The first civilian settler came in 1793, and the first survey (which included only a part of the subsequent village) was made in 1815. Fulton was incorporated as a village in 1835, and in April 1902 was combined with the village of Oswego Falls (pop. in 1900, 2925) and was chartered as a city.

FUM, or FUNJ HWANG, one of the four symbolical creatures which in Chinese mythology are believed to keep watch and ward over the Celestial Empire. It was begotten by fire, was born in the Hill of the Sun's Halo, and its body bears inscribed on it the five cardinal virtues. It has the breast of a goose, the hind-quarters of a stag, a snake's neck, a fish's tail, a fowl's forehead, a duck's down, the marks of a dragon, the back of a tortoise, the face of a swallow, the beak of a cock, is about six cubits high, and perches only on the woo-tung tree. The appearance of Fum heralds an age of universal virtue. Its figure is that which is embroidered on the dresses of some mandarins.

FUMARIC AND MALEIC ACIDS, two isomeric unsaturated acids of composition $C_4H_4O_4$. *Fumaric acid* is found in fumitory (*Fumaria officinalis*), in various fungi (*Agaricus piperatus*, &c.), and in Iceland moss. It is obtained by heating malic acid alone to 150° C., or by heating it with hydrochloric acid (V. Dessaignes, *Jahresb.*, 1856, p. 463) or with a large quantity of hydrobromic acids (A. Kekulé, *Ann.*, 1864, 130, p. 21). It may also be obtained by boiling monobromosuccinic acid with water; by the action of dichloracetic acid and water on silver malonate (T. Komnenos, *Ann.*, 1883, 218, p. 160); by the cyanide synthesis from acetylene di-iodide; and by heating maleic acid to 210° C. (Z. Skraup, *Monats. f. Chemie*, 1891, 12, p. 112). It crystallizes in small prisms or needles, and is practically insoluble in cold water. It sublimes to some extent at about 200° C., being partially converted into maleic anhydride and water, the reaction becoming practically quantitative if dehydrating agents be used. Reducing agents (zinc and caustic alkali, hydriodic acid, sodium amalgam, &c.) convert it into succinic acid. Bromine converts it into dibromsuccinic acid. Potassium permanganate oxidizes it to racemic acid (A. Kekulé and R. Anschutz, *Ber.*, 1881, 14, p. 713). By long-continued heating with caustic soda at 100° C. it is converted into inactive malic acid.

Maleic acid is obtained by distilling malic or fumaric acids; by heating fumaric acid with acetyl chloride to 100° C.; or by the hydrolysis of trichlorphenomalic acid (β-trichlorlaceto-acrylic acid) [A. Kekulé, *Ann.*, 1884, 223, p. 185]. It crystallizes in monoclinic prisms, which are easily soluble in water, melt at 130° C., and boil at 160° C., decomposing into water and maleic anhydride. When heated with concentrated hydrobromic or hydriodic acids, it is converted into fumaric acid. It yields an anilide; oxidation converts it into mesotartaric acid. Maleic anhydride is obtained by distilling fumaric acid with phosphorus pentoxide. It forms triclinic crystals which melt at 60° C. and boil at 196° C.

Both acids are readily esterified by the action of alkyl halides on their silver salts, and the maleic ester is readily transformed into the fumaric ester by warming with iodine, the same result being obtained by esterification of maleic acid in alcoholic solution by means of hydrochloric acid. Both acids yield acetylene by the electrolysis of aqueous solutions of their alkali salts, and on reduction both yield succinic acid, whilst by the addition of hydrobromic acid they both yield monobromosuccinic acid (R. Fittig, *Ann.*, 1877, 188, p. 98). From these results it follows that the two acids are structurally identical, and the isomerism has consequently to be explained on other grounds. This was accomplished by W. Wislicenus ["Über die räumliche Anordnung der Atome," &c., *Trans. of the Saxon Acad. of Science* (Math. Phys. Section), 1887, p. 14] by an extension of the van't Hoff hypothesis (see STEREO-ISOMERISM). The formulae of the acids are written thus:



These account for maleic acid readily yielding an anhydride, whereas fumaric acid does not, and for the behaviour of the acids towards bromine; fumaric acid yielding ordinary dibromsuccinic acid, and maleic acid the isomeric isodibromsuccinic acid.

FUMAROLE, a vent from which volcanic vapours issue, named indirectly from the Lat. *fumariolum*, a smoke-hole.

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The vapours from fumaroles were studied first by R. W. Bunsen, on his visit to Iceland, and afterwards by H. Sainte-Claire Deville and other chemists and geologists in France, who examined the vapours from Santorin, Etna, &c. The hottest vapours issue from dry fumaroles, at temperatures of at least 500° C., and consist chiefly of anhydrous chlorides, notably sodium chloride. The acid fumaroles yield vapours of lower temperature (300° to 400°) containing much water vapour, with hydrogen chloride and sulphur dioxide. The alkaline fumaroles are still cooler, though above 100°, and evolve ammonium chloride with other vapours. Cold fumaroles, below 100°, discharge principally aqueous vapour, with carbon dioxide, and perhaps hydrogen sulphide. The fumaroles of Mont Pelé in Martinique during the eruption of 1902 were examined by A. Lacroix, and the vapours analysed by H. Moissan, who found that they consisted chiefly of water vapour, with hydrogen chloride, sulphur, carbon dioxide, carbon monoxide, methane, hydrogen, nitrogen, oxygen and argon. These vapours issued at a temperature of about 400°. Armand Gautier has pointed out that these gases are practically of the same composition as those which he obtained on heating granite and certain other rocks. (See VOLCANO).

FUMIGATION (from Lat. *fumigare*, to smoke), the process of producing smoke or fumes, as by burning sulphur, frankincense, tobacco, &c., whether as a ceremony of incantation, or for perfuming a room, or for purposes of disinfection or destruction of vermin. In medicine the term has been used of the exposure of the body, or a portion of it, to fumes such as those of nitre, sal-ammoniac, mercury, &c.; fumigation, by the injection of tobacco smoke into the great bowel, was a recognized procedure in the 18th century for the resuscitation of the apparently drowned. "Fumigated" or "fumed" oak is oak which has been darkened by exposure to ammonia vapour.

FUMITORY, in botany, the popular name for the British species of *Fumaria*, a genus of small, branched, often climbing annual herbs with much-divided leaves and racemes of small flowers. The flowers are tubular with a spurred base, and in the British species are pink to purplish in colour. They are weeds of cultivation growing in fields and waste places. *F. capreolata* climbs by means of twisting petioles. In past times fumitory was in esteem for its reputed cholagogue and other medicinal properties; and in England, boiled in water, milk or whey, it was used as a cosmetic. The root of the allied species (*Corydalis cava* or *luberosa*) is known as *radix aristolochia*, and has been used medicinally for various cutaneous and other disorders, in doses of 10 to 30 grains. Some eleven alkaloids have been isolated from it. The herbage of *Fumaria officinalis* and *F. racemosa* is used in China under the name of *Tsze-hwa-ti-ting* as an application for glandular swellings, carbuncles and abscesses, and was formerly valued in jaundice, and in cases of accidental swallowing of the beard of grain (see F. Porter Smith, *Contrib. towards the Mat. Medica . . . of China*, p. 90, 1871). The name fumitory, Latin *fumus terrae*, has been supposed to be derived from the fact that its juice irritates the eyes like smoke (see Fuchs, *De historia stirpium*, p. 338, 1542); but *The Grete Herball*, cap. clxix., 1529, fol., following the *De simplici medicina* of Platearius, fo. xciii. (see in *Nicolai Praepositi dispensatorium ad aromatarios*, 1536), says: "It is called Fumus terre fume or smoke of the erthe bycause it is engendred of a cours fumosyte rysynge frome the erthe in grete quantyte lyke smoke: this grosse or cours fumosyte of the erthe wyndeth and wryeth out: and by workynge of the ayre and sonne it turneth into this herbe."

FUNCHAL, the capital of the Portuguese archipelago of the Madeiras; on the south coast of Madeira, in 32° 37′ N. and 16° 54′ W. Pop. (1900) 20,850. Funchal is the see of a bishop, in the archiepiscopal province of Lisbon; it is also the administrative centre of the archipelago, and the residence of the governor and foreign consuls. The city has an attractive appearance from the sea. Its whitewashed houses, in their gardens full of tropical plants, are built along the curving shore of Funchal Bay, and on the lower slopes of an amphitheatre of mountains, which form a background 4000 ft. high. Numerous country houses (*quintas*), with terraced gardens, vineyards and sugar-cane plantations occupy the surrounding heights. Three mountain streams traverse the city through deep channels, which in summer are dry, owing to the diversion of the water for irrigation. A small fort, on an isolated rock off shore, guards the entrance to the bay, and a larger and more powerfully armed fort crowns an eminence inland. The chief buildings include the cathedral, Anglican and Presbyterian churches, hospitals, opera-house, museum and casino. There are small public gardens and a meteorological observatory. In the steep and narrow streets, which are lighted by electricity, wheeled traffic is impossible; sledges drawn by oxen, and other primitive conveyances are used instead (see MADEIRA). In winter the fine climate and scenery attract numerous invalids and other visitors, for whose accommodation there are good hotels; many foreigners engaged in the coal and wine trades also reside here permanently. The majority of these belong to the British community, which was first established here in the 18th century. Funchal is the headquarters of Madeiran industry and commerce (see MADEIRA). It has no docks and no facilities for landing passengers or goods; vessels are obliged to anchor in the roadstead, which, however, is sheltered from every wind except the south. Funchal is connected by cable with Carcavellos (for Lisbon), Porthcurnow (for Falmouth, England) and St Vincent in the Cape Verde Islands (for Pernambuco, Brazil).

FUNCTION,[1] in mathematics, a variable number the value of which depends upon the values of one or more other variable numbers. The theory of functions is conveniently divided into (I.) Functions of Real Variables, wherein real, and only real, numbers are involved, and (II.) Functions of Complex Variables, wherein complex or imaginary numbers are involved.

I. FUNCTIONS OF REAL VARIABLES

1. *Historical.*—The word function, defined in the above sense, was introduced by Leibnitz in a short note of date 1694 concerning the construction of what we now call an "envelope" (*Leibnizens mathematische Schriften*, edited by C. I. Gerhardt, Bd. v. p. 306), and was there used to denote a variable length related in a defined way to a variable point of a curve. In 1698 James Bernoulli used the word in a special sense in connexion with some isoperimetric problems (Joh. Bernoulli, *Opera*, t. i. p. 255). He said that when it is a question of selecting from an infinite set of like curves that one which best fulfils some function, then of two curves whose intersection determines the thing sought one is always the "line of the function" (*Linea functionis*). In 1718 John Bernoulli (*Opera*, t. ii. p. 241) defined a "function of a variable magnitude" as a quantity made up in any way of this variable magnitude and constants; and in 1730 (*Opera*, t. iii. p. 174) he noted a distinction between "algebraic" and "transcendental" functions. By the latter he meant integrals of algebraic functions. The notation $f(x)$ for a function of a variable x was introduced by Leonhard Euler in 1734 (*Comm. Acad. Petropol.* t. vii. p. 186), in connexion with the theorem of the interchange of the order of differentiations. The notion of functionality or functional relation of two magnitudes was thus of geometrical origin; but a function soon came to be regarded as an analytical expression, not necessarily an algebraic expression, containing the variable or variables. Thus we may have rational integral algebraic functions such as $ax^2 + bx + c$, or rational algebraic functions which are not integral, such as

$$\frac{a_1x^n + a_2x^{n-1} + \ldots + a_n}{b_1x^m + b_2x^{m-1} + \ldots + b_m}$$

or irrational algebraic functions, such as $\sqrt{x}$, or, more generally the algebraic functions that are determined implicitly by an algebraic equation, as, for instance,

$$f_n(x,y) + f_{n-1}(x,y) + \ldots + f_0 = 0$$

[1] The word "function" (from Lat. *fungi*, to perform) has many uses, with the fundamental sense of an activity special or proper to an office, business or profession, or to an organ of an animal or plant, the definite work for which the organ is an apparatus. From the use of the word, as in the Italian *funzione*, for a ceremony of the Roman Church, "function" is often employed for a public ceremony of any kind, and loosely of a social entertainment or gathering.

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where $f_n(x,y)$, . . . mean homogeneous expressions in x and y having constant coefficients, and having the degrees indicated by the suffixes, and f_0 is a constant. Or again we may have trigonometrical functions, such as $\sin x$ and $\tan x$, or inverse trigonometrical functions, such as $\sin^{-1}x$, or exponential functions, such as e^x and a^x, or logarithmic functions, such as $\log x$ and $\log(1+x)$. We may have these functional symbols combined in various ways, and thus there arises a great number of functions. Further we may have functions of more than one variable, as, for instance, the expression $xy/(x^2+y^2)$, in which both x and y are regarded as variable. Such functions were introduced into analysis somewhat unsystematically as the need for them arose, and the later developments of analysis led to the introduction of other classes of functions.

§ 2. *Graphic Representation.*—In the case of a function of one variable x, any value of x and the corresponding value y of the function can be the co-ordinates of a point in a plane. To any value of x there corresponds a point N on the axis of x, in accordance with the rule that x is the abscissa of N. The corresponding value of y determines a point P in accordance with the rule that x is the abscissa and y the ordinate of P. The ordinate y gives the value of the function which corresponds to that value of the variable x which is specified by N; and it may be described as "the value of the function at N." Since there is a one-to-one correspondence of the points N and the numbers x, we may also describe the ordinate as "the value of the function at x." In simple cases the aggregate of the points P which are determined by any particular function (of one variable) is a curve, called the "graph of the function" (see § 14). In like manner a function of two variables defines a surface.

3. *The Variable.*—Graphic methods of representation, such as those just described, enabled mathematicians to deal with irrational values of functions and variables at the time when there was no theory of irrational numbers other than Euclid's theory of incommensurables. In that theory an irrational number was the ratio of two incommensurable geometric magnitudes. In the modern theory of number irrational numbers are defined in a purely arithmetical manner, independent of the measurement of any quantities or magnitudes, whether geometric or of any other kind. The definition is effected by means of the system of *ordinal* numbers (see NUMBER). When this formal system is established, the theory of measurement may be founded upon it; and, in particular, the co-ordinates of a point are defined as numbers (not lengths), which are assigned in accordance with a rule. This rule involves the measurement of lengths. The theory of functions can be developed without any reference to graphs, or co-ordinates or lengths. The process by which analysis has been freed from any consideration of measurable quantities has been called the "arithmetization of analysis." In the theory so developed, the variable upon which a function depends is always to be regarded as a number, and the corresponding value of the function is also a number. Any reference to points or co-ordinates is to be regarded as a picturesque mode of expression, pointing to a possible application of the theory to geometry. The development of "arithmetized analysis" in the 19th century is associated with the name of Karl Weierstrass.

All possible values of a variable are numbers. In what follows we shall confine our attention to the case where the numbers are real. When complex numbers are introduced, instead of real ones, the theory of functions receives a wide extension, which is accompanied by appropriate limitations (see below, II. Functions of Complex Variables). The set of all real numbers forms a *continuum*. In fact the notion of a one-dimensional continuum first becomes precise in virtue of the establishment of the system of real numbers.

4. *Domain of a Variable.—Theory of Aggregates.*—The notion of a "variable" is that of a number to which we may assign at pleasure any one of the values that belong to some chosen set, or *aggregate*, of numbers; and this set, or aggregate, is called the "domain of the variable." This domain may be an "interval," that is to say it may consist of two terminal numbers, all the numbers between them and no others. When this is the case the number is said to be "continuously variable." When the domain consists of all real numbers, the variable is said to be "unrestricted." A domain which consists of all the real numbers which exceed some fixed number may be described as an "interval unlimited towards the right"; similarly we may have an interval "unlimited towards the left."

In more complicated cases we must have some rule or process for assigning the aggregate of numbers which constitute the domain of a variable. The methods of definition of particular types of aggregates, and the theorems relating to them, form a branch of analysis called the "theory of aggregates" (*Mengenlehre, Théorie des ensembles, Theory of sets of points*). The notion of an "aggregate" in general underlies the system of ordinal numbers. An aggregate is said to be "infinite" when it is possible to effect a one-to-one correspondence of all its elements to some of its elements. For example, we may make all the integers correspond to the even integers, by making 1 correspond to 2, 2 to 4, and generally n to $2n$. The aggregate of positive integers is an infinite aggregate. The aggregates of all rational numbers and of all real numbers and of points on a line are other examples of infinite aggregates. An aggregate whose elements are real numbers is said to "extend to infinite values" if, after any number N, however great, is specified, it is possible to find in the aggregate numbers which exceed N in absolute value. Such an aggregate is always infinite. The "neighbourhood of a number (or point) a for a positive number h" is the aggregate of all numbers (or points) x for which the absolute value of $x-a$ denoted by $|x-a|$, does not exceed h.

5. *General Notion of Functionality.*—A function of one variable was for a long time commonly regarded as the ordinate of a curve; and the two notions (1) that which is determined by a curve supposed drawn, and (2) that which is determined by an analytical expression supposed written down, were not for a long time clearly distinguished. It was for this reason that Fourier's discovery that a single analytical expression is capable of representing (in different parts of an interval) what would in his time have been called different functions so profoundly struck mathematicians (§ 23). The analysts who, in the middle of the 19th century, occupied themselves with the theory of the convergence of Fourier's series were led to impose a restriction on the character of a function in order that it should admit of such representation, and thus the door was opened for the introduction of the general notion of functional dependence. This notion may be expressed as follows: We have a variable number, y, and another variable number, x, a domain of the variable x, and a rule for assigning one or more definite values to y when x is any point in the domain; then y is said to be a "function" of the variable x, and x is called the "argument" of the function. According to this notion a function is, as it were, an indefinitely extended table, like a table of logarithms; to each point in the domain of the argument there correspond values for the function, but it remains arbitrary what values the function is to have at any such point.

For the specification of any particular function two things are requisite: (1) a statement of the values of the variable, or of the aggregate of points, to which values of the function are to be made to correspond, *i.e.* of the "domain of the argument"; (2) a rule for assigning the value or values of the function that correspond to any point in this domain. We may refer to the second of these two essentials as "the rule of calculation." The relation of functions to analytical expressions may then be stated in the form that the rule of calculation is: "Give the function the value of the expression at any point at which the expression has a determinate value," or again more generally, "Give the function the values the expression has at all points of a definite aggregate included in the domain of the argument." The former of these is the rule of those among the earlier analysts who regarded an analytical expression and a function as the same thing, and their usage may be retained without causing confusion and with the advantage of brevity, the analytical expression serving to specify the domain of the argument as well as the rule of calculation, *e.g.* we may speak of "the function $1/x$." This function is defined by the analytical expression $1/x$ at all points except the point $x=0$. But in more complicated cases separate statements of the domain of the argument and the rule of calculation cannot be dispensed with. In general, when the rule of calculation is determined as above by an analytical expression at any aggregate of points, the function is said to be "represented" by the expression at those points.

When the rule of calculation assigns a single definite value for a function at each point in the domain of the argument the function is "uniform" or "one-valued." In what follows it is to be understood that all the functions considered are one-valued, and the values

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assigned by the rule of calculation real. In the most important cases the domain of the function of one variable is an interval, with the possible exception of isolated points.

6. *Limits.*—Let $f(x)$ be a function of a variable number x; and let a be a point such that there are points of the domain of the argument x in the neighbourhood of a for any number h, however small. If there is a number L which has the property that, after any positive number ϵ, however small, has been specified, it is possible to find a positive number h, so that $|L-f(x)|<\epsilon$ for all points x of the domain (other than a) for which $|x-a|<h$, then L is the "limit of $f(x)$ at the point a." The condition for the existence of L is that, after the positive number ϵ has been specified, it must be possible to find a positive number h, so that $|f(x')-f(x)|<\epsilon$ for all points x and x' of the domain (other than a) for which $|x-a|<h$ and $|x'-a|<h$.

It is a fundamental theorem that, when this condition is satisfied, there exists a perfectly definite number L which is the limit of $f(x)$ at the point a as defined above. The limit of $f(x)$ at the point a is denoted by $Lt_{x=a} f(x)$, or by $\lim_{x=a} f(x)$.

If $f(x)$ is a function of one variable x in a domain which extends to infinite values, and if, after ϵ has been specified, it is possible to find a number N, so that $|f(x')-f(x)|<\epsilon$ for all values of x and x' which are in the domain and such that each is greater than N, which has the property that $|f(x)-L|<\epsilon$ for all such values of x. In this case $f(x)$ has a limit L at $x=\infty$. In like manner $f(x)$ may have a limit at $x=-\infty$. This statement includes the case where the domain of the argument consists exclusively of positive integers. The values of the function then form a "sequence," $u_1, u_2, \ldots u_n, \ldots$, and this sequence can have a limit at $n=\infty$.

The principle common to the above definitions and theorems is called, after P. du Bois Reymond, "the general principle of convergence to a limit."

It must be understood that the phrase "$x=\infty$" does not mean that x takes some particular value which is infinite. There is no such value. The phrase always refers to a limiting process in which, as the process is carried out, the variable number x increases without limit; it may, as in the above example of a sequence, increase by taking successively the values of all the integral numbers; in other cases it may increase by taking the values that belong to any domain which "extends to infinite values."

A very important type of limits is furnished by *infinite series*. When a sequence of numbers $u_1, u_2, \ldots u_n \ldots$ is given, we may form a new sequence $s_1, s_2, \ldots s_n, \ldots$ from it by the rules $s_1=u_1$, $s_2=u_1+u_2, \ldots s_n=u_1+u_2+\ldots+u_n$, or by the equivalent rules $s_1=u_1, s_n-s_{n-1}=u_n (n=2, 3, \ldots)$. If the new sequence has a limit at $n=\infty$, this limit is called the "sum of the infinite series" $u_1+u_2+\ldots$, and the series is said to be "convergent" (see SERIES).

A function which has not a limit at a point a may be such that, if a certain aggregate of points is chosen out of the domain of the argument, and the points x in the neighbourhood of a are restricted to belong to this aggregate, then the function has a limit at a. For example, $\sin(1/x)$ has limit zero at o if x is restricted to the aggregate $1/\pi$, $1/2\pi$, $\ldots$ $1/n\pi$, $\ldots$ or to the aggregate $1/2\pi$, $2/5\pi$, $\ldots$ $n/(n^2+1)\pi$, $\ldots$, but if x takes all values in the neighbourhood of o, $\sin(1/x)$ has not a limit at o. Again, there may be a limit at a if the points x in the neighbourhood of a are restricted by the condition that $x-a$ is positive; then we have a "limit on the right" at a; similarly we may have a "limit on the left" at a point. Any such limit is described as a "limit for a restricted domain." The limits on the left and on the right are denoted by $f(a-o)$ and $f(a+o)$.

The limit L of $f(x)$ at a stands in no necessary relation to the value of $f(x)$ at a. If the point a is in the domain of the argument, the value of $f(x)$ at a is assigned by the rule of calculation, and may be different from L. In case $f(a)=L$ the limit is said to be "attained." If the point a is not in the domain of the argument, there is no value for $f(x)$ at a. In the case where $f(x)$ is defined for all points in an interval containing a, except the point a, and has a limit L at a, we may arbitrarily annex the point a to the domain of the argument and assign to $f(a)$ the value L; the function may then be said to be "extrinsically defined." The so-called "indeterminate forms" (see INFINITESIMAL CALCULUS) are examples.

7. *Superior and Inferior Limits; Infinities.*—The value of a function at every point in the domain of its argument is finite, since, by definition, the value can be assigned, but this does not necessarily imply that there is a number N which exceeds all the values (or is less than all the values). It may happen that, however great a number N we take, there are among the values of the function numbers which exceed N (or are less than $-N$).

If a number can be found which is greater than every value of the function, then either (α) there is one value of the function which exceeds all the others, or (β) there is a number S which exceeds every value of the function but is such that, however small a positive number ϵ we take, there are values of the function which exceed $S-\epsilon$. In the case (α) the function has a greatest value; in case (β) the function has a "superior limit" S, and then there must be a point a which has the property that there are points of the domain of the argument, in the neighbourhood of a for any h, at which the values of the function differ from S by less than ϵ. Thus S is the limit of the function at a, either for the domain of the argument or for some more restricted domain. If a is in the domain of the argument, and if, after omission of a, there is a superior limit S which is in this way the limit of the function at a, if further $f(a)=S$, then S is the greatest value of the function; in this case the greatest value is a limit (at any rate for a restricted domain) which is attained; it may be called a "superior limit which is attained." In like manner we may have a "smallest value" or an "inferior limit," and a smallest value may be an "inferior limit which is attained."

All that has been said here may be adapted to the description of greatest values, superior limits, &c., of a function in a restricted domain contained in the domain of the argument. In particular, the domain of the argument may contain an interval; and therein the function may have a superior limit, or an inferior limit, which is attained. Such a limit is a *maximum* value or a *minimum* value of the function.

Again, if, after any number N, however great, has been specified, it is possible to find points of the domain of the argument at which the value of the function exceeds N, the values of the function are said to have an "infinite superior limit," and then there must be a point a which has the property that there are points of the domain, in the neighbourhood of a for any h, at which the value of the function exceeds N. If the point a is in the domain of the argument the function is said to "tend to become infinite" at a; it has of course a finite value at a. If the point a is not in the domain of the argument the function is said to "become infinite" at a; it has of course no value at a. In like manner we may have a (negatively) infinite inferior limit. Again, after any number N, however great, has been specified and a number h found, so that all the values of the function, at points in the neighbourhood of a for h, exceed N in absolute value, all these values may have the same sign; the function is then said to become, or to tend to become, "determinately (positively or negatively) infinite"; otherwise it is said to become or to tend to become, "indeterminately infinite."

All the infinities that occur in the theory of functions are of the nature of variable finite numbers, with the single exception of the infinity of an infinite aggregate. The latter is described as an "actual infinity," the former as "improper infinities." There is no "actual infinitely small" corresponding to the actual infinity. The only "infinitely small" is zero. All "infinite values" are of the nature of superior and inferior limits which are not attained.

8. *Increasing and Decreasing Functions.*—A function $f(x)$ of one variable x, defined in the interval between a and b, is "increasing throughout the interval" if, whenever x and x' are two numbers in the interval and $x'>x$, then $f(x')>f(x)$; the function "never decreases throughout the interval" if, x' and x being as before, $f(x')>f(x)$. Similarly for decreasing functions, and for functions which never increase throughout an interval. A function which either never increases or never diminishes throughout an interval is said to be "monotonous throughout" the interval. If we take in the above definition $b>a$, the definition may apply to a function under the restriction that x' is not b and x is not a; such a function is "monotonous within" the interval. In this case we have the theorem that the function (if it never decreases) has a limit on the left at b and a limit on the right at a, and these are the superior and inferior limits of its values at all points within the interval (the ends excluded); the like holds *mutatis mutandis* if the function never increases. If the function is monotonous throughout the interval, $f(b)$ is the greatest (or least) value of $f(x)$ in the interval; and if $f(b)$ is the limit of $f(x)$ on the left at b, such a greatest (or least) value is an example of a superior (or inferior) limit which is attained. In these cases the function tends continually to its limit.

These theorems and definitions can be extended, with obvious modifications, to the cases of a domain which is not an interval, or extends to infinite values. By means of them we arrive at sufficient, but not necessary, criteria for the existence of a limit; and these are frequently easier to apply than the general principle of convergence to a limit (§ 6), of which principle they are particular cases. For example, the function represented by $x \log(1/x)$ continually

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diminishes when $1/\epsilon > x > 0$ and x diminishes towards zero, and it never becomes negative. It therefore has a limit on the right at $x=0$. This limit is zero. The function represented by $x \sin(1/x)$ does not continually diminish towards zero as x diminishes towards zero, but is sometimes greater than zero and sometimes less than zero in any neighbourhood of $x=0$, however small. Nevertheless, the function has the limit zero at $x=0$.

9. *Continuity of Functions.*—A function $f(x)$ of one variable x is said to be continuous at a point a if (1) $f(x)$ is defined in an interval containing a; (2) $f(x)$ has a limit at a; (3) $f(a)$ is equal to this limit. The limit in question must be a limit for continuous variation, not for a restricted domain. If $f(x)$ has a limit on the left at a and $f(a)$ is equal to this limit, the function may be said to be "continuous to the left" at a; similarly the function may be "continuous to the right" at a.

A function is said to be "continuous throughout an interval" when it is continuous at every point of the interval. This implies continuity to the right at the smaller end-value and continuity to the left at the greater end-value. When these conditions at the ends are not satisfied the function is said to be continuous "within" the interval. By a "continuous function" of one variable we always mean a function which is continuous throughout an interval.

The principal properties of a continuous function are:

1. The function is practically constant throughout sufficiently small intervals. This means that, after any point a of the interval has been chosen, and any positive number ϵ, however small, has been specified, it is possible to find a number h, so that the difference between any two values of the function in the interval between $a-h$ and $a+h$ is less than ϵ. There is an obvious modification if a is an end-point of the interval.

2. The continuity of the function is "uniform." This means that the number h which corresponds to any ϵ as in (1) may be the same at all points of the interval, or, in other words, that the numbers h which correspond to ϵ for different values of a have a positive inferior limit.

3. The function has a greatest value and a least value in the interval, and these are superior and inferior limits which are attained.

4. There is at least one point of the interval at which the function takes any value between its greatest and least values in the interval.

5. If the interval is unlimited towards the right (or towards the left), the function has a limit at ∞ (or at $-\infty$).

10. *Discontinuity of Functions.*—The discontinuities of a function of one variable, defined in an interval with the possible exception of isolated points, may be classified as follows:

(1) The function may become infinite, or tend to become infinite, at a point.

(2) The function may be undefined at a point.

(3) The function may have a limit on the left and a limit on the right at the same point; these may be different from each other, and at least one of them must be different from the value of the function at the point.

(4) The function may have no limit at a point, or no limit on the left, or no limit on the right, at a point.

In case a funetion $f(x)$, defined as above, has no limit at a point a, there are four limiting values which come into consideration. Whatever positive number h we take, the values of the function at points between a and $a+h$ (a excluded) have a superior limit (or a greatest value), and an inferior limit (or a least value); further, as h decreases, the former never increases and the latter never decreases; accordingly each of them tends to a limit. We have in this way two limits on the right—the inferior limit of the superior limits in diminishing neighbourhoods, and the superior limit of the inferior limits in diminishing neighbourhoods. These are denoted by $f(a+0)$ and $f(a+0)$, and they are called the "limits of indefiniteness" on the right. Similar limits on the left are denoted by $f(a-0)$ and $f(a-0)$. Unless $f(x)$ becomes, or tends to become, infinite at a, all these must exist, any two of them may be equal, and at least one of them must be different from $f(a)$, if $f(a)$ exists. If the first two are equal there is a limit on the right denoted by $f(a+0)$; if the second two are equal, there is a limit on the left denoted by $f(a-0)$. In case the function becomes, or tends to become, infinite at a, one or more of these limits is infinite in the sense explained in § 7; and now it is to be noted that, *e.g.* the superior limit of the inferior limits in diminishing neighbourhoods on the right of a may be negatively infinite; this happens if, after any number N, however great, has been specified, it is possible to find a positive number h, so that all the values of the function in the interval between a and $a+h$ (a excluded) are less than $-N$; in such a case $f(x)$ tends to become negativelv infinite when x decreases towards a; other modes of tending to infinite limits may be described in similar terms.

11. *Oscillation of Functions.*—The difference between the greatest and least of the numbers $f(a)$, $f(a+0)$, $f(a+0)$, $f(a-0)$, $f(a-0)$, when they are all finite, is called the "oscillation" or "fluctuation" of the function $f(x)$ at the point a. This difference is the limit for $h=0$ of the difference between the superior and inferior limits of the values of the function at points in the interval between $a-h$ and $a+h$. The corresponding difference for points in a finite interval is called the "oscillation of the function in the interval." When any of the four limits of indefiniteness is infinite the oscillation is infinite in the sense explained in § 7.

For the further classification of functions we divide the domain of the argument into partial intervals by means of points between the end-points. Suppose that the domain is the interval between a and b. Let intermediate points $x_1, x_2 \ldots x_{n-1}$ be taken so that $b > x_{n-1} > x_{n-2} \ldots > x_1 > a$. We may devise a rule by which, as n increases indefinitely, all the differences $b-x_{n-1}, x_{n-1}-x_{n-2} \ldots x_2-x_1$ tend to zero as a limit. The interval is then said to be divided into "indefinitely small partial intervals."

A function defined in an interval with the possible exception of isolated points may be such that the interval can be divided into a set of finite partial intervals within each of which the function is monotonous (§ 8). When this is the case the sum of the oscillations of the function in those partial intervals is finite, provided the function does not tend to become infinite. Further, in such a case the sum of the oscillations will remain below a fixed number for any mode of dividing the interval into indefinitely small partial intervals. A class of functions may be defined by the condition that the sum of the oscillations has this property, and such functions are said to have "restricted oscillation." Sometimes the phrase "limited fluctuation" is used. It can be proved that any function with restricted oscillation is capable of being expressed as the sum of two monotonous functions, of which one never increases and the other never diminishes throughout the interval. Such a function has a limit on the right and a limit on the left at every point of the interval. This class of functions includes all those which have a finite number of maxima and minima in a finite-interval, and some which have an infinite number. It is to be noted that the class does not include all continuous functions.

12. *Differentiable Function.*—The idea of the differentiation of a continuous function is that of a process for measuring the rate of growth; the increment of the function is compared with the increment of the variable. If $f(x)$ is defined in an interval containing the point a, and $a-k$ and $a+k$ are points of the interval, the expression

$$\frac{f(a+h)-f(a)}{h} \qquad (1)$$

represents a function of h, which we may call $\phi(h)$, defined at all points of an interval for h between $-k$ and k except the point 0. Thus the four limits $\phi(+0)$, $\phi(+0)$, $\phi(-0)$, $\phi(-0)$ exist, and two or more of them may be equal. When the first two are equal either of them is the "progressive differential coefficient" of $f(x)$ at the point a; when the last two are equal either of them is the "regressive differential coefficient" of $f(x)$ at a; when all four are equal the function is said to be "differentiable" at a, and either of them is the "differential coefficient" of $f(x)$ at a, or the "first derived function" of $f(x)$ at a. It is denoted by $\frac{df(x)}{dx}$ or by $f'(x)$. In this case $\phi(h)$ has a definite limit at $h=0$, or is determinately infinite at $h=0$ (§ 7). The four limits here in question are called, after Dini, the "four derivates" of $f(x)$ at a. In accordance with the notation for derived functions they may be denoted by

$$\overline{f'_+(a)},\ \underline{f'_+(a)},\ \overline{f'_-(a)},\ \underline{f'_-(a)}.$$

A function which has a finite differential coefficient at all points of an interval is continuous throughout the interval, but if the differential coefficient becomes infinite at a point of the interval the function may or may not be continuous throughout the interval; on the other hand a function may be continuous without being differentiable. This result, comparable in importance, from the point of view of the general theory of functions, with the discovery of Fourier's theorem, is due to G. F. B. Riemann; but the failure of an attempt made by Ampère to prove that every continuous function must be differentiable may be regarded as the first step in the theory. Examples of analytical expressions which represent continuous functions that are not differentiable have been given by Riemann, Weierstrass, Darboux and Dini (see § 24). The most important theorem in regard to differentiable functions is the "theorem of intermediate value." (See INFINITESIMAL CALCULUS.)

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13. *Analytic Function.*—If $f(x)$ and its first n differential coefficients, denoted by $f'(x)$, $f''(x)$, . . . $f^{(n)}(x)$, are continuous in the interval between a and $a+h$, then

$$f(a+h)=f(a)+hf'(a)+\frac{h^2}{2!}f''(a)+\ldots+\frac{h^{n-1}}{(n-1)!}f^{(n-1)}(a)+R_n,$$

where R_n may have various forms, some of which are given in the article INFINITESIMAL CALCULUS. This result is known as "Taylor's theorem."

When Talyor's theorem leads to a representation of the function by means of an infinite series, the function is said to be "analytic" (cf. § 21).

14. *Ordinary Function.*—The idea of a curve representing a continuous function in an interval is that of a line which has the following properties: (1) the co-ordinates of a point of the curve are a value x of the argument and the corresponding value y of the function; (2) at every point the curve has a definite tangent; (3) the interval can be divided into a finite number of partial intervals within each of which the function is monotonous; (4) the property of monotony within partial intervals is retained after interchange of the axes of co-ordinates x and y. According to condition (2) y is a continuous and differentiable function of x, but this condition does not include conditions (3) and (4): there are continuous partially monotonous functions which are not differentiable, there are continuous differentiable functions which are not monotonous in any interval however small; and there are continuous, differentiable and monotonous functions which do not satisfy condition (4) (cf. § 24). A function which can be represented by a curve, in the sense explained above, is said to be "ordinary," and the curve is the graph of the function (§2). All analytic functions are ordinary, but not all ordinary functions are analytic.

15. *Integrable Function.*—The idea of integration is twofold. We may seek the function which has a given function as its differential coefficient, or we may generalize the question of finding the area of a curve. The first inquiry leads directly to the indefinite integral, the second directly to the definite integral. Following the second method we define "the definite integral of the function $f(x)$ through the interval between a and b" to be the limit of the sum

$$\sum_1^n f(x'_r)(x_r-x_{r-1})$$

when the interval is divided into ultimately indefinitely small partial intervals by points x_1, x_2, . . . x_{n-1}. Here x'_r denotes any point in the rth partial interval, x_0 is put for a, and x_n for b. It can be shown that the limit in question is finite and independent of the mode of division into partial intervals, and of the choice of the points such as x'_r, provided (1) the function is defined for all points of the interval, and does not tend to become infinite at any of them; (2) for any one mode of division of the interval into ultimately indefinitely small partial intervals, the sum of the products of the oscillation of the function in each partial interval and the difference of the end-values of that partial interval has limit zero when n is increased indefinitely. When these conditions are satisfied the function is said to be "integrable" in the interval. The numbers a and b which limit the interval are usually called the "lower and upper limits." We shall call them the "nearer and further end-values." The above definition of integration was introduced by Riemann in his memoir on trigonometric series (1854). A still more general definition has been given by Lebesgue. As the more general definition cannot be made intelligible without the introduction of some rather recondite notions belonging to the theory of aggregates, we shall, in what follows, adhere to Riemann's definition.

We have the following theorems:—

1. Any continuous function is integrable.
2. Any function with restricted oscillation is integrable.
3. A discontinuous function is integrable if it does not tend to become infinite, and if the points at which the oscillation of the function exceeds a given number σ, however small, can be enclosed in partial intervals the sum of whose breadths can be diminished indefinitely.

These partial intervals must be a set chosen out of some complete set obtained by the process used in the definition of integration.

4. The sum or product of two integrable functions is integrable.

As regards integrable functions we have the following theorems:

1. If S and I are the superior and inferior limits (or greatest and least values) of $f(x)$ in the interval between a and b, $\int_a^b f(x)dx$ is intermediate between $S(b-a)$ and $I(b-a)$.
2. The integral is a continuous function of each of the end-values.
3. If the further end-value b is variable, and if $\int_a^b f(x)dx=F(x)$, then if $f(x)$ is continuous at b, $F(x)$ is differentiable at b, and $F'(b)=f(b)$.
4. In case $f(x)$ is continuous throughout the interval $F(x)$ is continuous and differentiable throughout the interval, and $F'(x)=f(x)$ throughout the interval.
5. In case $f'(x)$ is continuous throughout the interval between a and b,

$$\int_a^b f'(x)dx=f(b)-f(a).$$

6. In case $f(x)$ is discontinuous at one or more points of the interval between a and b, in which it is integrable,

$$\int_a^x f(x)dx$$

is a function of x, of which the four derivates at any point of the interval are equal to the limits of indefiniteness of $f(x)$ at the point.

7. It may be that there exist functions which are differentiable throughout an interval in which their differential coefficients are not integrable; if, however, $F(x)$ is a function whose differential coefficient, $F'(x)$, is integrable in an interval, then

$$F(x)=\int_a^x F'(x)dx+\text{const.},$$

where a is a fixed point, and x a variable point, of the interval. Similarly, if any one of the four derivates of a function is integrable in an interval, all are integrable, and the integral of either differs from the original function by a constant only.

The theorems (4), (6), (7) show that there is some discrepancy between the indefinite integral considered as the function which has a given function as its differential coefficient, and as a definite integral with a variable end-value.

We have also two theorems concerning the integral of the product of two integrable functions $f(x)$ and $\phi(x)$: these are known as "the first and second theorems of the mean." The first theorem of the mean is that, if $\phi(x)$ is one-signed throughout the interval between a and b, there is a number M intermediate between the superior and inferior limits, or greatest and least values, of $f(x)$ in the interval, which has the property expressed by the equation

$$M\int_a^b \phi(x)dx=\int_a^b f(x)\phi(x)dx.$$

The second theorem of the mean is that, if $f(x)$ is monotonous throughout the interval, there is a number ξ between a and b which has the property expressed by the equation

$$\int_a^b f(x)\phi(x)dx=f(a)\int_a^\xi \phi(x)dx+f(b)\int_\xi^b \phi(x)dx.$$

(*See* FOURIER'S SERIES.)

16. *Improper Definite Integrals.*—We may extend the idea of integration to cases of functions which are not defined at some point, or which tend to become infinite in the neighbourhood of some point, and to cases where the domain of the argument extends to infinite values. If c is a point in the interval between a and b at which $f(x)$ is not defined, we impose a restriction on the points x'_r of the definition: none of them is to be the point c. This comes to the same thing as defining $\int_a^b f(x)dx$ to be

$$Lt_{\epsilon=0}\int_a^{c-\epsilon} f(x)dx+Lt_{\epsilon'=0}\int_{c+\epsilon'}^b f(x)dx, \qquad (1)$$

where, to fix ideas, b is taken $>a$, and ϵ and ϵ' are positive. The same definition applies to the case where $f(x)$ becomes infinite, or tends to become infinite, at c, provided both the limits exist. This definition may be otherwise expressed by saying that a partial interval containing the point c is omitted from the interval of integration, and a limit taken by diminishing the breadth of this partial interval indefinitely; in this form it applies to the cases where c is a or b.

Again, when the interval of integration is unlimited to the right, or extends to positively infinite values, we have as a definition

$$\int_a^\infty f(x)dx=Lt_{h=\infty}\int_a^h f(x)dx,$$

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provided this limit exists. Similar definitions apply to

$$\int_a^{-\infty} f(x)dx, \text{ and to } \int_{-a}^{\infty} f(x)dx.$$

All such definite integrals as the above are said to be "improper." For example, $\int_\epsilon^\infty \frac{\sin x}{x}dx$ is improper in two ways. It means

$$\underset{h=0}{Lt} \quad \underset{\epsilon=0}{Lt} \int_{\epsilon}^{\frac{1}{h}} \frac{\sin x}{x}dx,$$

in which the positive number ϵ is first diminished indefinitely, and the positive number h is afterwards increased indefinitely.

The "theorems of the mean" (§ 15) require modification when the integrals are improper (see FOURIER'S SERIES).

When the improper definite integral of a function which becomes, or tends to become, infinite, exists, the integral is said to be "convergent." If $f(x)$ tends to become infinite at a point c in the interval between a and b, and the expression (1) does not exist, then the expression $\int_a^b f(x)dx$, which has no value, is called a "divergent integral," and it may happen that there is a definite value for

$$Lt\left\{\int_a^{c-\epsilon} f(x)dx + \int_{c+\epsilon'}^{b} f(x)dx\right\}$$

provided that ϵ and ϵ' are connected by some definite relation, and both, remaining positive, tend to limit zero. The value of the above limit is then called a "principal value" of the divergent integral. Cauchy's principal value is obtained by making $\epsilon = \epsilon'$, *i.e.* by taking the omitted interval so that the infinity is at its middle point. A divergent integral which has one or more principal values is sometimes described as "semi-convergent."

17. *Domain of a Set of Variables.*—The numerical continuum of n dimensions (C_n) is the aggregate that is arrived at by attributing simultaneous values to each of n variables $x_1, x_2, \ldots x_n$, these values being any real numbers. The elements of such an aggregate are called "points," and the numbers $x_1, x_2, \ldots x_n$ the "co-ordinates" of a point. Denoting in general the points $(x_1, x_2, \ldots x_n)$ and $(x'_1, x'_2 \ldots x'_n)$ by x and x', the sum of the differences $|x_1 - x'_1| + |x_2 - x'_2| + \ldots + |x_n - x'_n|$ may be denoted by $|x - x'|$ and called the "difference of the two points." We can in various ways choose out of the continuum an aggregate of points, which may be an infinite aggregate, and any such aggregate can be the "domain" of a "variable point." The domain is said to "extend to an infinite distance" if, after any number N, however great, has been specified, it is possible to find in the domain points of which one or more co-ordinates exceed N in absolute value. The "neighbourhood" of a point a for a (positive) number h is the aggregate constituted of all the points x, which are such that the "difference" denoted by $|x - a| < h$. If an infinite aggregate of points does not extend to an infinite distance, there must be at least one point a, which has the property that the points of the aggregate which are in the neighbourhood of a for any number h, however small, themselves constitute an infinite aggregate, and then the point a is called a "limiting point" of the aggregate; it may or may not be a point of the aggregate. An aggregate of points is "perfect" when all its points are limiting points of it, and all its limiting points are points of it; it is "connected" when, after taking any two points a, b of it, and choosing any positive number ϵ, however small, a number m and points $x', x'', \ldots x^{(m)}$ of the aggregate can be found so that all the differences denoted by $|x' - a|, |x'' - x'|, \ldots |b - x^{(m)}|$ are less than ϵ. A perfect connected aggregate is a *continuum*. This is G. Cantor's definition.

The definition of a continuum in C_n leaves open the question of the number of dimensions of the continuum, and a further explanation is necessary in order to define arithmetically what is meant by a "homogeneous part" H_n of C_n. Such a part would correspond to an interval in C_1, or to an area bounded by a simple closed contour in C_2; and, besides being perfect and connected, it would have the following properties: (1) There are points of C_n, which are not points of H_n; these form a complementary aggregate H'_n. (2) There are points "within" H_n; this means that for any such point there is a neighbourhood consisting exclusively of points of H_n. (3) The points of H_n which do not lie "within" H_n are limiting points of H'_n; they are not points of H'_n, but the neighbourhood of any such point for any number h, however small, contains points within H_n and points of H'_n: the aggregate of these points is called the "boundary" of H_n. (4) When any two points a, b within H_n are taken, it is possible to find a number ϵ and a corresponding number m, and to choose points $x', x'', \ldots x^{(m)}$, so that the neighbourhood of a for ϵ contains x', and contains exclusively of points within H_n, and similarly for x' and x'', x'' and x''', $\ldots x^{(m)}$ and b. Condition (3) would exclude such an aggregate as that of the points within and upon two circles external to each other and a line joining a point on one to a point on the other, and condition (4) would exclude such an aggregate as that of the points within and upon two circles which touch externally.

18. *Functions of Several Variables.*—A function of several variables differs from a function of one variable in that the argument of the function consists of a set of variables, or is a variable point in a C_n when there are n variables. The function is definable by means of the domain of the argument and the rule of calculation. In the most important cases the domain of the argument is a homogeneous part H_n of C_n with the possible exception of isolated points, and the rule of calculation is that the value of the function in any assigned part of the domain of the argument is that value which is assumed at the point by an assigned analytical expression. The limit of a function at a point a is defined in the same way as in the case of a function of one variable.

We take a positive fraction ϵ and consider the neighbourhood of a for h, and from this neighbourhood we exclude the point a, and we also exclude any point which is not in the domain of the argument. Then we take x and x' to be any two of the retained points in the neighbourhood. The function f has a limit at a if for any positive ϵ, however small, there is a corresponding h which has the property that $|f(x') - f(x)| < \epsilon$, whatever points x, x' in the neighbourhood of a for h take (a excluded). For example, when there are two variables x_1, x_2, and both are unrestricted, the domain of the argument is represented by a plane, and the values of the function are correlated with the points of the plane. The function has a limit at a point a, if we can mark out on the plane a region containing the point a within it, and such that the difference of the values of the function which correspond to any two points of the region (neither of the points being a) can be made as small as we please in absolute value by contracting all the linear dimensions of the region sufficiently. When the domain of the argument of a function of n variables extends to an infinite distance, there is a "limit at an infinite distance" if, after any number ϵ, however small, has been specified, a number N can be found which is such that $|f(x') - f(x)| < \epsilon$, for all points x and x' (of the domain) of which one or more co-ordinates exceed N in absolute value. In the case of functions of several variables great importance attaches to limits for a restricted domain. The definition of such a limit is verbally the same as the corresponding definition in the case of functions of one variable (§ 6). For example, a function of x_1 and x_2 may have a limit at $(x_1 = 0, x_2 = 0)$ if we first diminish x_1 without limit, keeping x_2 constant, and afterwards diminish x_2 without limit. Expressed in geometrical language, this process amounts to approaching the origin along the axis of x_2. The definitions of superior and inferior limits, and of maxima and minima, and combinations of what is meant by saying that a function of several variables becomes infinite, or tends to become infinite, at a point, are almost identical verbally with the corresponding definitions and explanations in the case of a function of one variable (§ 7). The definition of a continuous function (§ 9) admits of immediate extension; but it is very important to observe that a function of two or more variables may be a continuous function of each of the variables, when the rest are kept constant, without being a continuous function of its argument. For example, a function of x and y may be defined by the conditions that when $x = 0$ it is zero whatever value y may have, and when $x \neq 0$ it has the value of $\sin\{4 \tan^{-1}(y/x)\}$. When y has any particular value this function is a continuous function of x, and, when x has any particular value this function is a continuous function of y; but the function of x and y is discontinuous at $(x = 0, y = 0)$.

19. *Differentiation and Integration.*—The definition of partial differentiation of a function of several variables presents no difficulty. The most important theorems concerning differentiable functions are the "theorem of the total differential," the theorem of the interchangeability of the order of partial differentiations, and the extension of Taylor's theorem (see INFINITESIMAL CALCULUS).

With a view to the establishment of the notion of integration through a domain, we must define the "extent" of the domain. Take first a domain consisting of the point a and all the points x for which $|x - a| < h$, where h is a chosen positive number; the extent of this domain is $h^n \cdot n$ being the number of variables; such a domain may be described as "square," and the number h may be called its "breadth"; it is a homogeneous part of the

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numerical continuum of n dimensions, and its boundary consists of all the points for which $|x-a| = \frac{1}{2}h$. Now the points of any domain, which does not extend to an infinite distance, may be assigned to a finite number m of square domains of finite breadths, so that every point of the domain is either within one of these square domains or on its boundary, and so that no point is within two of the square domains; also we may devise a rule by which, as the number m increases indefinitely, the breadths of all the square domains are diminished indefinitely. When this process is applied to a homogeneous part, H, of the numerical continuum C_n, then, at any stage of the process, there will be some square domains of which all the points belong to H, and there will generally be others of which some, but not all, of the points belong to H. As the number m is increased indefinitely the sums of the extents of both these categories of square domains will tend to definite limits, which cannot be negative; when the second of these limits is zero the domain H is said to be "measurable," and the first of these limits is its "extent"; it is independent of the rule adopted for constructing the square domains and contracting their breadths. The notion thus introduced may be adapted by suitable modifications to continua of lower dimensions in C_n.

The integral of a function $f(x)$ through a measurable domain H, which is a homogeneous part of the numerical continuum of n dimensions, is defined in just the same way as the integral through an interval, the extent of a square domain taking the place of the difference of the end-values of a partial interval; and the condition of integrability takes the same form as in the simple case. In particular, the condition is satisfied when the function is continuous throughout the domain. The definition of an integral through a domain may be adapted to any domain of measurable extent. The extensions to "improper" definite integrals may be made in the same way as for a function of one variable; in the particular case of a function which tends to become infinite at a point in the domain of integration, the point is enclosed in a partial domain which is omitted from the integration, and a limit is taken when the extent of the omitted partial domain is diminished indefinitely; a divergent integral may have different (principal) values for different modes of contracting the extent of the omitted partial domain. In applications to mathematical physics great importance attaches to convergent integrals and to principal values of divergent integrals. For example, any component of magnetic force at a point within a magnet, and the corresponding component of magnetic induction at the same point are expressed by different principal values of the same divergent integral. Delicate questions arise as to the possibility of representing the integral of a function of n variables through a domain H_n, as a repeated integral, of evaluating it by successive integrations with respect to the variables one at a time and of interchanging the order of such integrations. These questions have been discussed very completely by C. Jordan, and we may quote the result that all the transformations in question are valid when the function is continuous throughout the domain.

20. *Representation of Functions in General.*—We have seen that the notion of a function is wider than the notion of an analytical expression, and that the same function may be "represented" by one expression in one part of the domain of the argument and by some other expression in another part of the domain (§ 5). Thus there arises the general problem of the representation of functions. The function may be given by specifying the domain of the argument and the rule of calculation, or else the function may have to be determined in accordance with certain conditions; for example, it may have to satisfy in a prescribed domain an assigned differential equation. In either case the problem is to determine, when possible, a single analytical expression which shall have the same value as the function at all points in the domain of the argument. For the representation of most functions for which the problem can be solved recourse must be had to limiting processes. Thus we may utilize infinite series, or infinite products, or definite integrals; or again we may represent a function of one variable as the limit of an expression containing two variables in a domain in which one variable remains constant and another varies. An example of this process is afforded by the expression $Lt_{y=\infty} xy/(x^2y+1)$, which represents a function of x vanishing at $x=0$ and at all other values of x having the value of $1/x$. The method of series falls under this more general process (cf. § 6). When the terms $u_1, u_2, \ldots$ of a series are functions of a variable x, the sum s_n of the first n terms of the series is a function of x and n; and, when the series is convergent, its sum, which is $Lt_{n=\infty} s_n$, can represent a function of x. In most cases the series converges for some values of x and not for others, and the values for which it converges form the "domain of convergence." The sum of the series represents a function in this domain.

The apparently more general method of representation of a function of one variable as the limit of a function of two variables has been shown by R. Baire to be identical in scope with the method last named, and it has been developed by him so as to give a very complete account of the possibility of representing functions by analytical expressions. For example, he has shown that Riemann's totally discontinuous function, which is equal to 1 when x is rational and to 0 when x is irrational, can be represented by an analytical expression. An infinite process of a different kind has been adapted to the problem of the representation of a continuous function by T. Brodén. He begins with a function having a graph in the form of a regular polygon, and interpolates additional angular points in an ordered sequence without limit. The representation of a function by means of an infinite product falls clearly under Baire's method, while the representation by means of a definite integral is analogous to Brodén's method. As an example of these two latter processes we may cite the Gamma function $\Gamma(x)$ defined for positive values of x by the definite integral

$$\int_0^\infty e^{-t}t^{x-1}dt,$$

or by the infinite product

$$Lt_{n=\infty} n^x/x(1+x)(1+\tfrac{1}{2}x)\ldots\left(1+\frac{x}{n-1}\right).$$

The second of these expressions avails for the representation of the function at all points at which x is not a negative integer.

21. *Power Series.*—Taylor's theorem leads in certain cases to a representation of a function by an infinite series. We have under certain conditions (§ 13)

$$f(x) = f(a) + \sum_{r=1}^{n-1}\frac{(x-a)^r}{r!}f^{(r)}(a) + R_n;$$

and this becomes

$$f(x) = f(a) + \sum_{r=1}^{n}\frac{(x-a)^r}{r!}f^{(r)}(a),$$

provided that (α) a positive number k can be found so that at all points in the interval between a and $a+k$ (except these points) $f(x)$ has continuous differential coefficients of all finite orders, and at a has progressive differential coefficients of all finite orders; (β) Cauchy's form of the remainder R_n, viz. $\frac{(x-a)^n}{(n-1)!}(1-\theta)^{n-1}f^{(n)}[a+\theta(x-a)]$, has the limit zero when n increases indefinitely, for all values of θ between 0 and 1, and for all values of x in the interval between a and $a+k$, except possibly $a+k$. When these conditions are satisfied, the series (1) represents the function at all points of the interval between a and $a+k$, except possibly $a+k$, and the function is "analytic" (§ 13) in this domain. Obvious modifications admit of extension to an interval between a and $a-k$, or between $a-k$ and $a+k$. When a series of the form (1) represents a function it is called "the Taylor's series for the function."

Taylor's series is a power series, *i.e.* a series of the form

$$\sum_{n=0}^{\infty} a_n(x-a)^n.$$

As regards power series we have the following theorems:

1. If the power series converges at any point except a there is a number k which has the property that the series converges absolutely in the interval between $a-k$ and $a+k$, with the possible exception of one or both end-points.

2. The power series represents a continuous function in its domain of convergence (the end-points may have to be excluded).

3. This function is analytic in the domain, and the power series representing it is the Taylor's series for the function.

The theory of power series has been developed chiefly from the point of view of the theory of functions of complex variables.

22. *Uniform Convergence.*—We shall suppose that the domain of convergence of an infinite series of functions is an interval with the possible exception of isolated points. Let $f(x)$ be the sum of the series at any point x of the domain, and $f_n(x)$ the sum of the first $n+1$ terms. The condition of convergence at a point a is that, after any positive number ϵ, however small, has been specified, it must be possible to find a number n so that $|f_m(a) - f_p(a)| < \epsilon$ for all values of m and p which exceed n. The sum, $f(a)$, is the limit of the sequence of numbers $f_n(a)$ at

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$n=\infty$. The convergence is said to be "uniform" in an interval if, after specification of ϵ, the same number n suffices at all points of the interval to make $|f(x)-f_m(x)|<\epsilon$ for all values of m which exceed n. The numbers n corresponding to any ϵ, however small, are all finite, but, when ϵ is less than some fixed finite number, they may have an infinite superior limit (§ 7); when this is the case there must be at least one point, a, of the interval which has the property that, whatever number N we take, ϵ can be taken so small that, at some point in the neighbourhood of a, n must be taken $>N$ to make $|f(x)-f_m(x)|<\epsilon$ when $m>n$; then the series does not converge uniformly in the neighbourhood of a. The distinction may be otherwise expressed thus: Choose a first and ϵ afterwards, then the number n is finite; choose ϵ first and allow a to vary, then the number n becomes a function of a, which may tend to become infinite, or may remain below a fixed number; if such a fixed number exists, however small ϵ may be, the convergence is uniform.

For example, the series $\sin x-\frac{1}{2}\sin 2x+\frac{1}{3}\sin 3x-\ldots$ is convergent for all real values of x, and, when $\pi>x>-\pi$ its sum is $\frac{1}{2}x$; but, when x is but a little less than π, the number of terms which must be taken in order to bring the sum at all near to the value of $\frac{1}{2}x$ is very large, and this number tends to increase indefinitely as x approaches π. This series does not converge uniformly in the neighbourhood of $x=\pi$. Another example is afforded by the series $\sum_{n=0}^{\infty}\frac{nx}{n^2x^2+1}-\frac{(n+1)x}{(n+1)^2x^2+1}$, of which the remainder after n terms is $nx/(n^2x^2+1)$. If we put $x=1/n$, for any value of n, however great, the remainder is $\frac{1}{2}$; and the number of terms required to be taken to make the remainder tend to zero depends upon the value of x when x is near to zero—it must, in fact, be large compared with $1/x$. The series does not converge uniformly in the neighbourhood of $x=0$.

As regards series whose terms represent continuous functions we have the following theorems:

(1) If the series converges uniformly in an interval it represents a function which is continuous throughout the interval.

(2) If the series represents a function which is discontinuous in an interval it cannot converge uniformly in the interval.

(3) A series which does not converge uniformly in an interval may nevertheless represent a function which is continuous throughout the interval.

(4) A power series converges uniformly in any interval contained within its domain of convergence, the end-points being excluded.

(5) If $\sum_{r=0}^{\infty} f_r(x)=f(x)$ converges uniformly in the interval between a and b

$$\int_a^b f(x)dx=\sum_{r=0}^{\infty}\int_a^b f_r(x)dx,$$

or a series which converges uniformly may be integrated term by term.

(6) If $\sum_{r=0}^{\infty} f'r(x)$ converges uniformly in an interval, then $\sum_{r=0}^{\infty} f_r(x)$ converges in the interval, and represents a continuous differentiable function, $\phi(x)$; in fact we have

$$\phi'(x)=\sum_{r=0}^{\infty} f'_r(x),$$

or a series can be differentiated term by term if the series of derived functions converges uniformly.

A series whose terms represent functions which are not continuous throughout an interval may converge uniformly in the interval. If $\sum_{r=0}^{\infty} f_r(x)=f(x)$, is such a series, and if all the functions $f_r(x)$ have limits at a, then $f(x)$ has a limit at a, which is $\sum_{r=0}^{\infty} Lt_{x=a} f_r(x)$. A similar theorem holds for limits on the left or on the right.

23. *Fourier's Series.*—An extensive class of functions admit of being represented by series of the form

$$a_0+\sum_{n=1}^{\infty}\left(a_n\cos\frac{n\pi x}{c}+b_n\sin\frac{n\pi x}{c}\right), \qquad \text{(i.)}$$

and the rule for determining the coefficients a_n, b_n of such a series, in order that it may represent a given function $f(x)$ in the interval between $-c$ and c, was given by Fourier, viz. we have

$$a_0=\frac{1}{2c}\int_{-c}^{c} f(x)dx,\quad a_n=\frac{1}{c}\int_{-c}^{c} f(x)\cos\frac{n\pi x}{c}dx,\quad b_n=\frac{1}{c}\int_{-c}^{c} f(x)\sin\frac{n\pi x}{c}dx.$$

The interval between $-c$ and c may be called the "periodic interval," and we may replace it by any other interval, *e.g.* that between 0 and 1, without any restriction of generality. When this is done the sum of the series takes the form

$$Lt_{n=\infty}\int_0^1\sum_{r=-n}^{r=n} f(z)\cos[2r\pi(z-x)]dz,$$

and this is

$$Lt_{n=\infty}\int_0^1 f(z)\frac{\sin[(2n+1)(z-x)\pi]}{\sin[(z-x)\pi]}dz. \qquad \text{(ii.)}$$

Fourier's theorem is that, if the period of interval can be divided into a finite number of partial intervals within each of which the function is ordinary (§ 14), the series represents the function within each of those partial intervals. In Fourier's time a function of this character was regarded as completely arbitrary.

By a discussion of the integral (ii.) based on the Second Theorem of the Mean (§ 15) it can be shown that, if $f(x)$ has restricted oscillation in the interval (§ 11), the sum of the series is equal to $\frac{1}{2}[f(x+0)+f(x-0)]$ at any point x within the interval, and that it is equal to $\frac{1}{2}[f(+0)+f(1-0)]$ at each end of the interval. (See the article FOURIER'S SERIES.) It therefore represents the function at any point of the periodic interval at which the function is continuous (except possibly the end-points), and has a definite value at each point of discontinuity. The condition of restricted oscillation includes all the functions contemplated in the statement of the theorem and some others. Further, it can be shown that, in any partial interval throughout which $f(x)$ is continuous, the series converges uniformly, and that no series of the form (i), with coefficients other than those determined by Fourier's rule, can represent the function at all points, except points of discontinuity, in the same periodic interval. The result can be extended to a function $f(x)$ which tends to become infinite at a finite number of points a of the interval, provided (1) $f(x)$ tends to become determinately infinite at each of the points a, (2) the improper definite integral of $f(x)$ through the interval is convergent, (3) $f(x)$ has not an infinite number of discontinuities or of maxima or minima in the interval.

24. *Representation of Continuous Functions by Series.*—If the series for $f(x)$ formed by Fourier's rule converges at the point a of the periodic interval, and if $f(x)$ is continuous at a, the sum of the series is $f(a)$; but it has been proved by P. du Bois Reymond that the function may be continuous at a, and yet the series formed by Fourier's rule may be divergent at a. Thus some continuous functions do not admit of representation by Fourier's series. All continuous functions, however, admit of being represented with arbitrarily close approximation in either of two forms, which may be described as "terminated Fourier's series" and "terminated power series," according to the two following theorems:

(1) If $f(x)$ is continuous throughout the interval between 0 and 2π, and if any positive number ϵ however small is specified, it is possible to find an integer n, so that the difference between the value of $f(x)$ and the sum of the first n terms of the series for $f(x)$, formed by Fourier's rule with periodic interval from 0 to 2π, shall be less than ϵ at all points of the interval. This result can be extended to a function which is continuous in any given interval.

(2) If $f(x)$ is continuous throughout an interval, and any positive number ϵ however small is specified, it is possible to find an integer n and a polynomial in x of the nth degree, so that the difference between the value of $f(x)$ and the value of the polynomial shall be less than ϵ at all points of the interval.

Again it can be proved that, if $f(x)$ is continuous throughout a given interval, polynomials in x of finite degrees can be found, so as to form an infinite series of polynomials whose sum is equal to $f(x)$ at all points of the interval. Methods of representation of continuous functions by infinite series of rational fractional functions have also been devised.

Particular interest attaches to continuous functions which are not differentiable. Weierstrass gave as an example the function represented by the series $\sum_{n=0}^{\infty} a^n\cos(b^n\pi x)$, where a is positive and less than unity, and b is an odd integer exceeding $(1+\frac{3}{2}\pi)/a$. It can be shown that this series is uniformly convergent in every interval,

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and that the continuous function $f(x)$ represented by it has the property that there is, in the neighbourhood of any point x_0, an infinite aggregate of points x', having x_0 as a limiting point, for which $[f(x')-f(x_0)]/(x'-x_0)$ tends to become infinite with one sign when $x'-x_0$ approaches zero through positive values, and infinite with the opposite sign when $x'-x_0$ approaches zero through negative values. Accordingly the function is not differentiable at any point. The definite integral of such a function $f(x)$ through the interval between a fixed point and a variable point x, is a continuous differentiable function $F(x)$, for which $F'(x)=f(x)$; and, if $f(x)$ is one-signed throughout any interval $F(x)$ is monotonous throughout that interval, but yet $F(x)$ cannot be represented by a curve. In any interval, however small, the tangent would have to take the same direction for infinitely many points, and yet there is no interval in which the tangent has everywhere the same direction. Further, it can be shown that all functions which are everywhere continuous and nowhere differentiable are capable of representation by series of the form $\Sigma a_n\phi_n(x)$, where Σa_n is an absolutely convergent series of numbers, and $\phi_n(x)$ is an analytic function whose absolute value never exceeds unity.

25. *Calculations with Divergent Series.*—When the series described in (1) and (2) of § 24 diverge, they may, nevertheless, be used for the approximate numerical calculation of values of the function, provided the calculation is not carried beyond a certain number of terms. Expansions in series which have the property of representing a function approximately when the expansion is not carried too far are called "asymptotic expansions." Sometimes they are called "semi-convergent series"; but this term is avoided in the best modern usage, because it is often used to describe series whose convergence depends upon the order of the terms, such as the series $1-\frac{1}{2}+\frac{1}{3}-\cdots$.

In general, let $f_0(x)+f_1(x)+\ldots$ be a series of functions which does not converge in certain domain. It may happen that, if any number n, however small, is first specified, a number n can afterwards be found so that, at a point a of the domain, the value $f(a)$ of a certain function $f(x)$ is connected with the sum of the first $n+1$ terms of the series by the relation $|f(a)-\sum_{r=0}^{n} f_r(a)|<\epsilon$. It must also happen that, if any number N, however great, is specified, a number $n'(>n)$ can be found so that, for all values of m which exceed n', $|\sum_{r=0}^{m} f_r(a)|>N$. The divergent series $f_0(x)+f_1(x)+\ldots$ is then an asymptotic expansion for the function $f(x)$ in the domain.

The best known example of an asymptotic expansion is Stirling's formula for $n!$ when n is large, viz.

$$n! = \sqrt{(2\pi)}\, n^{n+\frac{1}{2}} e^{-n+\theta/12n},$$

where θ is some number lying between 0 and 1. This formula is included in the asymptotic expansion for the Gamma function. We have in fact

$$\log\{\Gamma(x)\} = (x-\tfrac{1}{2})\log x - x + \tfrac{1}{2}\log 2\pi + \varpi(x),$$

where $\varpi(x)$ is the function defined by the definite integral

$$\varpi(x) = \int_0^\infty \{(1-e^{-t})^{-1} - t^{-1} - \tfrac{1}{2}\}t^{x-1}e^{-t}dt.$$

The multiplier of e^{-x} under the sign of integration can be expanded in the power series

$$\frac{B_1}{2!}\frac{B_2}{4!}t^2 + \frac{B_3}{6!}t^4 - \ldots,$$

where $B_1, B_2, \ldots$ are "Bernoulli's numbers" given by the formula

$$B_m = 2.2m! \sum_{r=1}^{\infty} (2\pi)^{-2m} \frac{1}{r^{2m}}.$$

When the series is integrated term by term, the right-hand member of the equation for $\varpi(x)$ takes the form

$$\frac{B_1}{1.2}\frac{1}{x} - \frac{B_2}{3.4}\frac{1}{x^3} + \frac{B_3}{5.6}\frac{1}{x^5} - \ldots$$

This series is divergent; but, if it is stopped at any term, the difference between the sum of the series so terminated and the value of $\varpi(x)$ is less than the last of the retained terms. Stirling's formula is obtained by retaining the first term only. Other well-known examples of asymptotic expansions are afforded by the descending series for Bessel's functions. Methods of obtaining such expansions for the solutions of linear differential equations of the second order were investigated by G. G. Stokes (*Math. and Phys. Papers*, vol. ii. p. 329), and a general theory of asymptotic expansions has been developed by H. Poincaré. A still more general theory of divergent series, and of the conditions in which they can be used, as above, for the purposes of approximate calculation has been worked out by É. Borel. The great merit of asymptotic expansions is that they admit of addition, subtraction, multiplication and division, term by term, in the same way as absolutely convergent series, and they admit also of integration term by term; that is to say, the results of such operations are asymptotic expansions for the sum, difference, product, quotient, or integral, as the case may be.

26. *Interchange of the Order of Limiting Operations.*—When we require to perform any limiting operation upon a function which is itself represented by the result of a limiting process, the question of the possibility of interchanging the order of the two processes always arises. In the more elementary problems of analysis it generally happens that such an interchange is possible; but in general it is not possible. In other words, the performance of the two processes in different orders may lead to two different results; or the performance of them in one of the two orders may lead to no result. The fact that the interchange is possible under suitable restrictions for a particular class of operations is a theorem to be proved.

Among examples of such interchanges we have the differentiation and integration of an infinite series term by term (§ 22), and the differentiation and integration of a definite integral with respect to a parameter by performing the like processes upon the subject of integration (§ 19). As a last example we may take the limit of the sum of an infinite series of functions at a point in the domain of convergence. Suppose that the series $\sum_{r=0}^{\infty} f_r(x)$ represent a function $f(x)$ in an interval containing a point a, and that each of the functions $f_r(x)$ has a limit at a. If we first put $x=a$, and then sum the series, we have the value $f(a)$; if we first sum the series for any x, and afterwards take the limit of the sum at $x=a$, we have the limit of $f(x)$ at a; if we first replace each function $f_r(x)$ by its limit at a, and then sum the series, we may arrive at a value different from either of the foregoing. If the function $f(x)$ is continuous at a, the first and second results are equal; if the functions $f_r(x)$ are all continuous at a, the first and third results are equal; if the series is uniformly convergent, the second and third results are equal. This last case is an example of the interchange of the order of two limiting operations, and a sufficient, though not always a necessary, condition, for the validity of such an interchange will usually be found in some suitable extension of the notion of uniform convergence.

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II.—Functions of Complex Variables

In the preceding section the doctrine of functionality is discussed with respect to real quantities; in this section the theory when complex or imaginary quantities are involved receives treatment. The following abstract explains the arrangement of the subject matter: (§ 1), *Complex numbers*, states what a complex number is; (§ 2), *Plotting of simple expressions involving complex numbers*, illustrates the meaning in some simple cases, introducing the notion of conformal representation and proving that an algebraic equation has complex, if not real, roots; (§ 3), *Limiting operations*, defines certain simple functions of a complex variable which are obtained by passing to a limit, in particular the exponential function, and the generalized logarithm, here denoted by $\lambda(z)$; (§ 4), *Functions of a complex variable in general*, after explaining briefly what is to be understood by a region of the complex plane and by a path, and expounding a logical principle of some importance, gives the accepted definition of a function of a complex variable, establishes the existence of a complex integral, and proves Cauchy's theorem relating thereto; (§ 5), *Applications*, considers the differentiation and integration of series of functions of a complex variable, proves Laurent's theorem, and establishes the expansion of a function of a complex variable as a power series, leading, in (§ 6), *Singular points*, to a definition of the region of existence and singular points of a function of a complex variable, and thence, in (§ 7), *Monogenic Functions*, to what the writer believes to be the simplest definition of a function of a complex variable, that of Weierstrass; (§ 8), *Some elementary properties of single valued functions*, first discusses the meaning of a pole, proves that a single valued function with only poles is rational, gives Mittag-Leffler's theorem, and Weierstrass's theorem for the primary factors of an integral function, stating generalized forms for these, leading to the theorem of (§ 9), *The construction of a monogenic function with a given region of existence*, with which is connected (§ 10), *Expression of a monogenic function by rational functions in a given region*, of which the method is applied in (§ 11), *Expression of* $(z-z')^{-1}$ *by polynomials*, to a definite example, used here to obtain (§ 12), *An expansion of an arbitrary function by means of a series of polynomials, over a star region*, also obtained in the original manner of Mittag-Leffler; (§ 13), *Application of Cauchy's theorem to the determination of definite integrals*, gives two examples of this method; (§ 14), *Doubly Periodic Functions*, is introduced at this stage as furnishing an excellent example of the preceding principles. The reader who wishes to approach the matter from the point of view of Integral Calculus should first consult the section (§ 20) below, dealing with *Elliptic Integrals*; (§ 15), *Potential Functions*, *Conformal representation in general*, gives a sketch of the connexion of the theory of potential functions with the theory of conformal representation, enunciating the Schwarz-Christoffel theorem for the representation of a polygon, with the application to the case of an equilateral triangle; (§ 16), *Multiple-valued Functions*, *Algebraic Functions*, deals for the most part with algebraic functions, proving the residue theorem, and establishing that an algebraic function has a definite Order; (§ 17), *Integrals of Algebraic Functions*, enunciating Abel's theorem; (§ 18), *Indeterminateness of Algebraic Integrals*, deals with the periods associated with an algebraic integral, establishing that for an elliptic integral the number of these is two; (§ 19), *Reversion of an algebraic integral*, mentions a problem considered below in detail for an elliptic integral; (§ 20), *Elliptic Integrals*, considers the algebraic reduction of any elliptic integral to one of three standard forms, and proves that the function obtained by reversion is single-valued; (§ 21), *Modular Functions*, gives a statement of some of the more elementary properties of some functions of great importance, with a definition of Automorphic Functions, and a hint of the connexion with the theory of linear differential equations; (§ 22), *A property of integral functions, deduced from the theory of modular functions*, proves that there cannot be more than one value not assumed by an integral function, and gives the basis of the well-known expression of the modulus of the elliptic functions in terms of the ratio of the periods; (§ 23), *Geometrical applications of Elliptic Functions*, shows that any plane curve of deficiency unity can be expressed by elliptic functions, and gives a geometrical proof of the addition theorem for the function $\mathfrak{P}(u)$; (§ 24), *Integrals of Algebraic Functions in connexion with the theory of plane curves*, discusses the generalization to curves of any deficiency; (§ 25), *Monogenic Functions of several independent variables*, describes briefly the beginnings of this theory, with a mention of some fundamental theorems: (§ 26), *Multiply-Periodic Functions and the Theory of Surfaces*, attempts to show the nature of some problems now being actively pursued.

Beside the brevity necessarily attaching to the account here given of advanced parts of the subject, some of the more elementary results are stated only, without proof, as, for instance: the monogeneity of an algebraic function, no reference being made, moreover, to the cases of differential equations whose integrals are monogenic; that a function possessing an algebraic addition theorem is necessarily an elliptic function (or a particular case of such); that any area can be conformally represented on a half plane, a theorem requiring further much more detailed consideration of the meaning of *area* than we have given; while the character and properties, including the connectivity, of a Riemann surface have not been referred to. The theta functions are referred to only once, and the principles of the theory of Abelian Functions have been illustrated only by the developments given for elliptic functions.

§ 1. *Complex Numbers.*—Complex numbers are numbers of the form $x+iy$, where x, y are ordinary real numbers, and i is a symbol imagined capable of combination with itself and the ordinary real numbers, by way of addition, subtraction, multiplication and division, according to the ordinary commutative, associative and distributive laws; the symbol i is further such that $i^2=-1$.

Taking in a plane two rectangular axes Ox, Oy, we assume that every point of the plane is definitely associated with two real numbers x, y (its co-ordinates) and conversely: thus any point of the plane is associated with a single complex number; in particular, for every point of the axis Ox, for which $y=0$, the associated number is an ordinary real number; the complex numbers thus include the real numbers. The axis Ox is often called the real axis, and the axis Oy the imaginary axis. If P be the point associated with the complex variable $z=x+iy$, the distance OP be called r, and the positive angle less than 2π between Ox and OP be called θ, we may write $z=r(\cos\theta+i\sin\theta)$; then r is called the modulus or absolute value of z and often denoted by $|z|$ and θ is called the phase or amplitude of z, and often denoted by ph (z); strictly the phase is ambiguous by additive multiples of 2π. If $z'=x'+iy'$ be represented by P', the complex argument $z'+z$ is represented by a point P'' obtained by drawing from P' a line equal to and parallel to OP; the geometrical representation involves for its validity certain properties of the plane; as, for instance, the equation $z'+z=z+z'$ involves the possibility of constructing a parallelogram (with OP'' as diagonal). It is important constantly to bear in mind, what is capable of easy algebraic proof (and geometrically is Euclid's proposition III. 7), that the modulus of a sum or difference of two complex numbers is generally less than (and is never greater than) the sum of their moduli, and is greater than (or equal to) the difference of their moduli; the former statement thus holds for the sum of any number of complex numbers. We shall write $\mathrm{E}(i\theta)$ for $\cos\theta+i\sin\theta$; it is at once verified that $\mathrm{E}(i\alpha)\,\mathrm{E}(i\beta)=\mathrm{E}\{i(\alpha+\beta)\}$, so that the phase of a product of complex quantities is obtained by addition of their respective phases.

§ 2. *Plotting and Properties of Simple Expressions involving a Complex Number.*—If we put $\zeta=(z-i)/(z+i)$, and, putting $\zeta=\xi+i\eta$, take a new plane upon which ξ, η are rectangular co-ordinates, the equations $\xi=(x^2+y^2-1)/[x^2+(y+1)^2]$, $\eta=-2xy/[x^2+(y+1)^2]$ will determine, corresponding to any point of the first plane, a point of the second plane. There is the one exception of $z=-i$, that is, $x=0$, $y=-1$, of which the corresponding point is at infinity. It can now be easily proved that as z describes the real axis in its plane the point ζ describes once a circle of radius unity, with centre at $\zeta=0$, and that there is a definite correspondence of point to point between points in the z-plane which are above the real axis and points of the ζ-plane which are interior to this circle; in particular $z=i$ corresponds to $\zeta=0$.

Moreover, ζ being a rational function of z, both ξ and η are continuous differentiable functions of x and y, save when ζ is infinite;

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writing $f=f(x,y)=f(z-iy,y)$, the fact that this is really independent of y leads at once to $\partial f/\partial x+i\partial f/\partial y=0$, and hence to

$$\frac{\partial \xi}{\partial x}=\frac{\partial \eta}{\partial y}\ \frac{\partial \xi}{\partial y}=-\frac{\partial \eta}{\partial x}\ \frac{\partial^2 \xi}{\partial x^2}+\frac{\partial^2 \xi}{\partial y^2}=0;$$

so that ξ is not any arbitrary function of x, y, and when ξ is known η is determinate save for an additive constant. Also, in virtue of these equations, if ξ, η' be the values of ξ corresponding to two near values of x, say x and x', the ratio $(\xi'-\xi)/(x'-x)$ has a definite limit when $x'=x$, independent of the infinitesimal value of $x'-x$, this limit being therefore equal to $\partial\xi/\partial x$, that is, $\partial\xi/\partial x+i\partial\eta/\partial x$. Geometrically this fact is interpreted by saying that if two curves in the z-plane intersect at a point P, at which both the differential coefficients $\partial\xi/\partial x$, $\partial\eta/\partial x$ are not zero, and P', P'' be two points near to P on these curves respectively, and the corresponding points of the ζ-plane be Q, Q', Q'', then (1) the ratios PP''/PP', QQ''/QQ' are ultimately equal, (2) the angle P'PP'' is equal to Q'QQ'', (3) the rotation from PP' to P'P'' is in the same sense as from QQ' to Q'Q''. It being understood that the axes of ξ, η in the one plane are related as are the axes of x, y. Thus any diagram of the z-plane becomes a diagram of the ζ-plane with the same angles; the magnification, however, which is equal to $\left[\left(\frac{\partial\xi}{\partial x}\right)^2+\left(\frac{\partial\xi}{\partial y}\right)^2\right]^{\frac{1}{2}}$ varies from point to point. Conversely, it appears subsequently that the expression of any copy of a diagram (say, a map) which preserves angles requires the intervention of the complex variable.

As another illustration consider the case when ζ is a polynomial in z,

$$\zeta=p_0z^n+p_1z^{n-1}+\ldots+p_n;$$

(1) being an arbitrary real positive number, it can be shown that a radius R can be found such that every $|z|>R$ we have $|\zeta|>\Pi$; consider the lower limit of $|\zeta|$ for $|z|<R$; as $\xi^2+\eta^2$ is a real continuous function of x, y for $|z|<R$, there is a point (x,y), say (x_0,y_0), at which $|\zeta|$ is least, say equal to ρ, and therefore within a circle in the ζ-plane whose centre is the origin, of radius ρ, there are no points ζ representing values corresponding to $|z|<R$. But if ζ_0 be the value of ζ corresponding to (x_0,y_0), and the expression of $\zeta-\zeta_0$ near $z_0=x_0+iy_0$, in terms of $z-z_0$, be $A(z-z_0)^m+B(z-z_0)^{m+1}+\ldots$, where A is not zero, to two points near to (x_0,y_0), say (x_1,y_1) or z_1 and $z_1=z_0+(z_1-z_0)\left(\cos\frac{\pi}{m}+i\sin\frac{\pi}{m}\right)$, will correspond two points near to ζ_0, say ζ_1, and $2\zeta_0-\zeta_1$, situated so that ζ_0 is between them. One of these must be within the circle (ρ). We infer then that $\rho=0$, and have proved that every polynomial in z vanishes for some value of z, and can therefore be written as a product of factors of the form $z-\alpha$, where α denotes a complex number. This proposition alone suffices to suggest the importance of complex numbers.

§ 3. *Limiting Operations.*—In order that a complex number $\zeta=\xi+i\eta$ may have a limit it is necessary and sufficient that each of ξ and η has a limit. Thus an infinite series $w_0+w_1+w_2+\ldots$, whose terms are complex numbers, is convergent if the real series formed by taking the real parts of its terms and that formed by the imaginary terms are both convergent. The series is also convergent if the real series formed by the moduli of its terms is convergent; in that case the series is said to be absolutely convergent; and it can be shown that its sum is unaltered by taking the terms in any other order. Generally the necessary and sufficient condition of convergence is that, for a given real positive ϵ, a number m exists such that for every $n>m$, and every positive p, the batch of terms $w_n+w_{n+1}+\ldots+w_{n+p}$ is less than ϵ in absolute value. If the terms depend upon a complex variable z, the convergence is called *uniform* for a range of values of z, when the inequality holds, for the same ϵ and m, for all the points z of this range.

The infinite series of most importance are those of which the general term is a_nz^n, wherein a_n is a constant, and z is regarded as variable, $n=0,\ 1,\ 2,\ 3,\ldots$. Such a series is called a power series. If a real and positive number R exists such that for $z=z_0$ and for every n, $|a_nz_0^n|<M$, a condition which is satisfied, for instance, if the series converges for $z=z_0$, then it is at once proved that the series converges absolutely for every z for which $|z|<|z_0|$, and converges uniformly over every range $|z|<r'$ for which $r'<|z_0|$. To every power series there belongs the circle of convergence within which it converges absolutely and uniformly; the function of z represented by it is thus continuous within the circle (this being the result of a general property of uniformly convergent series of continuous functions); the sum for an interior point z is, however, continuous with the sum for a point z_0 on the circumference, as z approaches to z_0 provided the series converges for $z=z_0$, as can be shown without much difficulty. Within a common circle of convergence two power series Σa_nz^n, Σb_nz^n can be multiplied together according to the ordinary rule, this being a consequence of a theorem for absolutely convergent series. If r_1 be less than the radius of convergence of a series Σa_nz^n and for $|z|=r_1$, the sum of the series be in absolute value less than a real positive quantity M, it can be shown that for $|z|=r$ every term is also less than M in absolute value, namely, $|a_n|<Mr_1{}^{-n}$. If in every arbitrarily small neighbourhood of $z=0$ there be a point for which two converging power series Σa_nz^n, Σb_nz^n agree in value, then the series are identical, or $a_n=b_n$; thus also if $f(z)$ vanish at $z=0$ there is a circle of finite radius about $z=0$ as centre within which no other values of z make $f(z)$ vanish and the sum of the series is zero. Considering a power series $f(z)=\Sigma a_nz^n$ of radius of convergence R, if $|z_0|<R$ and we put $z=z_0+t$ within $|t|<R-|z_0|$, the resulting series $\Sigma a_n(z_0+t)^n$ may be regarded as a double series in z_0 and t, which, since $|z_0|+|<R$, is absolutely convergent; it may then be arranged according to powers of t. Thus we may write $f(z)=\Sigma A_nt^n$; hence $A_0=f(z_0)$, and we have $[f(z_0+t)-f(z_0)]/t=\Sigma\ nA_nt^{n-1}$, wherein the continuous series on the right reduces to A_1 for $t=0$; thus the ratio on the left has a definite limit when $t=0$, equal namely to A_1 or $\Sigma na_nz_0^{n-1}$. In other words, the original series may legitimately be differentiated at any interior point z_0 of its circle of convergence. Repeating this process we find $f(z_0+t)=\Sigma t^nf^n(z_0)/n!$, where $f^n(z_0)$ is the nth differential coefficient. Repeating for this power series, in t, the argument applied about $z=0$ for Σa_nz^n, we infer that for the series $f(z)$ every point which reduces it to zero is an isolated point, and of such points only a finite number lie within a circle which is within the circle of convergence of $f(z)$.

Perhaps the simplest possible power series is $e^z=\exp(z)=1+z^2/2!+z^2/3!+\ldots$ of which the radius of convergence is infinite. By multiplication we have $\exp(z)\exp(z')=\exp(z+z')$. In particular when x, y are real, and $z=x+iy$, $\exp(z)=\exp(x)\exp(iy)$. Now the functions

$$U_0=\sin y,\ V_0=1-\cos y,\ U_1=y-\sin y,$$
$$V_1=\tfrac{1}{2}y^2-1+\cos y,\ U_2=\tfrac{1}{2}y^2-\cos y+\sin y,\ V_2=\tfrac{1}{3!}y^3-1y+1-\cos y,\ldots$$

all vanish for $y=0$, and the differential coefficient of any one of the first is the preceding one; as a function (of a real variable) is increasing when its differential coefficient is positive, we infer, for y positive, that each of these functions is positive; proceeding to a limit we hence infer that

$$\cos y=1-\tfrac{1}{2}y^2+\tfrac{1}{4!}y^4-\ldots,\quad \sin y=y-\tfrac{1}{3!}y^3+\tfrac{1}{5!}y^5-\ldots,$$

for positive, and hence, for all values of y. We thus have $\exp(iy)=\cos y+i\sin y$, and $\exp(z)=\exp(x).(\cos y+i\sin y)$. In other words, the modulus of $\exp(z)$ is $\exp(x)$ and the phase is y. Hence also

$$\exp(z+2\pi i)=\exp(x)\{\cos(y+2\pi)+i\sin(y+2\pi)\},$$

which we express by saying that $\exp(z)$ has the period $2\pi i$, and hence also the period $2ki$, where k is an arbitrary integer. From the fact that the continually increasing function $\exp(x)$ can vanish only for $x=0$, we at once prove that $\exp(z)$ has no other periods.

Taking in the plane of s an infinite strip lying between the lines $y=a$, $y=\pi$ and plotting the function $\zeta=\exp(s)$ upon a new plane, it follows at once from what has been said that every complex value of ζ arises when z takes in turn all positions in this strip, and that no value arises twice over. The equation $\zeta=\exp(z)$ thus defines z, regarded as depending upon ζ, with only an additive ambiguity $2ki$, where k is an integer. We write $z=\lambda(\zeta)$; when ζ is real this becomes the logarithm of ζ; in general $\lambda(\zeta)=\log|\zeta|+i\ \text{ph}\ (\zeta)+2ki$, where k is an integer; and when ζ describes a closed circuit surrounding the origin the phase of ζ increases by 2π, or k increases by unity. Differentiating the series for ζ we have $d\zeta/dz=\zeta$, so that s, regarded as depending upon ζ, is also differentiable, with $dz/d\zeta=\zeta^{-1}$. On the other hand, consider the series $\zeta=1+\frac{1}{2}(\zeta-1)^2+\frac{1}{3}(\zeta-1)^3-\ldots$; it converges when $\zeta=2$ and hence converges for $|\zeta-1|<1$; its differential coefficient is, however, $1-(\zeta-1)+(\zeta-1)^2-\ldots$, that is, $(1+\zeta-1)^{-1}$. Wherefore if $\phi(\zeta)$ denote this series, for $|\zeta-1|<1$, the difference $\lambda(\zeta)-\phi(\zeta)$, regarded as a function of ξ and η, has vanishing differential coefficients; if we take the value of $\lambda(\zeta)$ which vanishes when $\zeta=1$ we infer thence that for $|\zeta-1|<1$, $\lambda(\zeta)=\sum_{n=1}^{n=\infty}\frac{(-1)^{n-1}}{n}(\zeta-1)^n$. It is to be remarked that it is impossible for ζ while subject to $|\zeta-1|<1$ to make a circuit about the origin. For values of ζ for which $|\zeta-1|\leqslant 1$, we can also calculate $\lambda(\zeta)$ with the help of infinite series, utilizing the fact that $\lambda(\zeta^p)=\lambda(\zeta)+\lambda(\zeta')$.

The function $\lambda(\zeta)$ is required to define ζ^α when ζ and α are complex numbers; this is defined as $\exp[\alpha\lambda(\zeta)]$, that is $\sum_{n=0}^{n=\infty}\alpha^n[\lambda(\zeta)]^n/n!$.

When α is a real integer the ambiguity of $\lambda(\zeta)$ is immaterial here, since $\exp[\alpha\lambda(\zeta)+2k\alpha\pi i]=\exp[\alpha\lambda(\zeta)]$; when α is of the form $1/q$, where q is a positive integer, there are q values possible for $\zeta^{1/q}$, of the form $\exp\left[\frac{1}{q}\lambda(\zeta)\right]\exp\left(\frac{2k\pi i}{q}\right)$, with $k=0,\ 1,\ldots q-1$, all other values of k leading to one of these; the qth power of any one of these values is ζ; when $\alpha=p/q$, where p, q are integers without common factor, q being positive, we have $\zeta^{p/q}=(\zeta^{1/q})^p$. The definition of the symbol ζ^α is thus a generalization of the ordinary definition of a power, when the numbers are real. As an example, let it be required to find the meaning of i^i; the number i is of modulus unity and phase $\frac{1}{2}\pi$: thus $\lambda(i)=i(\frac{1}{2}\pi+2k\pi)$; thus

$$i^i=\exp(-\tfrac{1}{2}\pi-2k\pi)=\exp(-\tfrac{1}{2}\pi)\exp(-2k\pi),$$

is always real, but has an infinite number of values.

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The function $\exp(z)$ is used also to define a generalized form of the cosine and sine functions when z is complex; we write, namely, $\cos z = \frac{1}{2}[\exp(iz) + \exp(-iz)]$ and $\sin z = -\frac{1}{2}i[\exp(iz) - \exp(-iz)]$. It will be found that these obey the ordinary relations holding when z is real, except that their moduli are not inferior to unity. For example, $\cos z = 1 + \frac{1}{2!}z^2 + \frac{1}{4!}z^4 + \ldots$ is obviously greater than unity.

§4. *Of Functions of a Complex Variable in General.*—We have in what precedes shown how to generalize the ordinary rational, algebraic and logarithmic functions, and considered more general cases, of functions expressible by power series in z. With the suggestions furnished by these cases we can frame a general definition. So far our use of the plane upon which z is represented has been only illustrative, the results being capable of analytical statement. In what follows this representation is vital to the mode of expression we adopt; as then the properties of numbers cannot be ultimately based upon spatial intuitions, it is necessary to indicate what are the geometrical ideas requiring elucidation.

Consider a square of side a, to whose perimeter is attached a definite direction of description, which we take to be counter-clockwise; another square, also of side a, may be added to this, so that there is a side common; this common side being erased we have a composite region with a definite direction of perimeter; to this a third square of the same size may be attached, so that there is a side common to it and one of the former squares, and this common side may be erased. If this process be continued any number of times we obtain a region of the plane bounded by one or more polygonal closed lines, no two of which intersect; and at each portion of the perimeter there is a definite direction of description, which is such that it is the same as that of the describing point. Similarly we may construct a region by piecing together triangles, so that every consecutive two have a side in common, it being understood that there is assigned an upper limit for the greatest side of a triangle, and a lower limit for the smallest angle. In the former method, each square may be divided into four others by lines through its centre parallel to its sides; in the latter method each triangle may be divided into four others by lines joining the middle points of its sides; this halves the sides and preserves the angles. When we speak of a region of the plane in general, unless the contrary is stated, we shall suppose it capable of being generated in this latter way by means of a finite number of triangles, there being an upper limit to the length of a side of the triangle and a lower limit to the size of an angle of the triangle. We shall also require to speak of a *path* in the plane; this is to be understood as capable of arising as a limit of a polygonal path of finite length, there being a definite direction or sense of description at every point of the path, which therefore never meets itself. From this the meaning of a closed path is clear. The boundary points of a region form one or more closed paths, but, in general, it is only in a limiting sense that the interior points of a closed path are a region.

There is a logical principle also which must be referred to. We frequently have cases where, about every interior or boundary point z_0 of a certain region a circle can be put, say of radius r_0, such that for all points z of the region which are interior to this circle, for which, that is, $|z - z_0| < r_0$, a certain property holds. Assuming that to r_0 is given the value which is the upper limit for z_0 of the possible values, we may call the points $|z - z_0| < r_0$, the neighbourhood belonging to or *proper* to z_0, and may speak of the property as the property (z, z_0). The value of r_0 will in general vary with z_0; what in in most cases of importance is the question whether the lower limit of r_0 for all positions is zero or greater than zero. (A) This lower limit is certainly greater than zero provided the property (z, z_0) is of a kind which we may call *extensive*; such, namely, that if it holds, for some position of z_0 and all positions of z, within a certain region, then the property (z, z_1) holds within a circle of radius R about any interior point z_1 of this region for all points z for which the circle $|z - z_1| = R$ is within the region. Also in this case r_0 varies continuously with z_0. (B) Whether the property is of this extensive character or not we can prove that the region can be subdivided into a finite number of sub-regions such that, for every one of these, the property holds, (1) for *some* point z_0 within or upon the boundary of the sub-region, (2) for *every* point z within or upon the boundary of the sub-region.

We prove these statements (A), (B) in reverse order. To prove (B) let a region for which the property (z, z_0) holds for all points z and some point z_0 of the region, be called *suitable*: if each of the triangles of which the region is built up be suitable, what is desired is proved; if not let an unsuitable triangle be subdivided into four, as before explained; if one of these subdivisions is unsuitable let it be again subdivided; and so on. Either the process terminates and then what is required is proved; or else we obtain an indefinitely continued sequence of unsuitable triangles, each contained in the preceding, which converge to a point, say ζ; after a certain stage all these will be interior to the proper region of ζ; this, however, is contrary to the supposition that they are all unsuitable.

We now make some applications of this result (B). Suppose a definite finite real value attached to every interior or boundary point of the region, say $f(x, y)$. It may have a finite upper limit H for the region, so that no point (x, y) exists for which $f(x, y) > H$, but points (x, y) exist for which $f(x, y) > H - \epsilon$, however small ϵ may be; if not we say that its upper limit is infinite. There is then at least one point of the region such that, for points of the region within a circle about this point, the upper limit of $f(x, y)$ is H, however small the radius of the circle be taken; for if not we can put about every point of the region a circle within which the upper limit of $f(x, y)$ is less than H; then by the result (B) the whole region consists of a finite number of sub-regions within each of which the upper limit is less than H; this is inconsistent with the hypothesis that the upper limit for the whole region is H. A similar statement holds for the lower limit. A function $f(x, y)$ is the radius r_0 of the neighbourhood proper to any point z_0, spoken of above. We can hence prove the statement (A) above.

Suppose the property (z, z_0) extensive, and, if possible, that the lower limit of r_0 is zero. Let then ξ be a point such that the lower limit of r_0 is zero for points z_0 within a circle about ξ however small; let r be the radius of the neighbourhood proper to ξ; take z_0 so that $|z_0 - \xi| < \frac{1}{2}r$; the property (z, z_0), being extensive, holds within a circle, centre z_0, of radius $r - |z_0 - \xi|$, which is greater than $\frac{1}{2}r$, and increases to r as $|z_0 - \xi|$ diminishes; this being true for all points z_0 near ξ, the lower limit of r_0 is not zero for the neighbourhood of ξ, contrary to what was supposed. This proves (A). Also, as is here shown that $r_0 > r - |z_0 - \xi|$, may similarly be shown that $r > r_0 - |z_0 - \xi|$. Thus r_0 differs arbitrarily little from r when $|z_0 - \xi|$ is sufficiently small; that is, r_0 varies continuously with z_0. Next suppose the function $f(x, y)$, which has a definite finite value at every point of the region considered, to be continuous but not necessarily real, so that about every point z_0, within or upon the boundary of the region, a being an arbitrary real positive quantity assigned beforehand, a circle is possible, so that for all points z of the region interior to this circle, we have $|f(x, y) - f(x_0, y_0)| < \frac{1}{2}\eta$, and therefore $|f(x', y') - f(x, y)| < \eta$, where (x', y') being any other point interior to this circle, $|f(x', y') - f(x, y)| < \eta$. We can then apply the result (A) obtained above, taking for the neighbourhood proper to any point z_0 the circular area within which, for any two points (x, y), (x', y'), we have $|f(x', y') - f(x, y)| < \eta$. This is clearly an extensive property. Thus, a number σ is assignable, greater than zero, such that, for any two points (x, y), (x', y') within a circle $|z - z_0| = r$ about any point z_0, we have $|f(x', y') - f(x, y)| < \eta$, and, in particular, $|f(x, y) - f(x_0, y_0)| < \eta$, where η is an arbitrary real positive quantity agreed upon beforehand.

Take now any path in the region, whose extreme points are z_0, z, and let $z_1, \ldots z_{n-1}$ be intermediate points of the path, in order; denote the continuous function $f(x, y)$ by $f(z)$, and let f_r denote any quantity such that $|f_r - f(z_r)| \equiv |f(z_{r+1}) - f(z_r)|$; consider the sum

$$(z_1 - z_0)f_0 + (z_2 - z_1)f_1 + \ldots + (z - z_{n-1})f_{n-1}.$$

By the definition of a path we can suppose, n being large enough, that the intermediate points $z_1, \ldots z_{n-1}$ are so taken that if z_r, z_{r+1} be any two points intermediate, in order, to z_s and z_{s+1}, we have $|z_{r+1} - z_r| < |z_{s+1} - z_s|$; we can thus suppose $|z_1 - z_0|, |z_2 - z_1|, \ldots |z - z_{n-1}|$ all to converge constantly to zero. This being so, we can show that the sum above has a definite limit. For this it is sufficient, as in the case of an integral of a function of one real variable, to prove this to be so when the convergence is obtained by taking new points of division intermediate to the former ones. If, however, $z_{r+1}, z_{r+2}, \ldots z_{r+m-1}$ be intermediate in order to z_r and z_{r+1}, and $|f_r - f(z_r)| < \frac{1}{2}|f(z_{r+1}) - f(z_r)|$, the difference between $\Sigma(z_{r+1} - z_r)f_r$ and

$$\Sigma[(z_{r+1} - z_r)f_{r+0} + (z_{r+2} - z_{r+1})f_{r+1} + \ldots + (z_{r+1} - z_{r+m-1})f_{r+m-1}],$$

which is equal to

$$\Sigma\Sigma(z_{r+s+1} - z_{r+s})(f_{r+s} - f_r),$$

is, when $|z_{r+1} - z_r|$ is small enough, to ensure $|f(z_{r+1}) - f(z_r)| < \eta$, less in absolute value than

$$\Sigma 2\eta\Sigma|z_{r+s+1} - z_{r+s}|,$$

which, if S be the upper limit of the perimeter of the polygon from which the path is generated, is $< 2\eta S$, and is therefore arbitrarily small.

The limit in question is called $\int_{z_0}^{z} f(z)dz$. In particular when $f(z) = 1$, it is obvious from the definition that its value is $z - z_0$; when $f(z) = z$, by taking $f_r = \frac{1}{2}(z_{r+1} + z_r)$, it is equally clear that its value is $\frac{1}{2}(z^2 - z_0^2)$: these results will be applied immediately.

Suppose now that to every interior and boundary point z_0 of a certain region there belong two definite finite numbers $f(z_0)$, $F(z_0)$, such that, whatever real positive quantity η may be, a real positive number ϵ exists for which the condition

$$\left| \frac{f(z) - f(z_0)}{z - z_0} - F(z_0) \right| < \eta,$$

which we describe as the condition (z, z_0), is satisfied for every point z, within or upon the boundary of the region, satisfying the limitation $|z - z_0| < \epsilon$. Then $f(z_0)$ is called a differentiable function of the complex variable z_0 over this region, its differential coefficient being $F(z_0)$. The function $f(z_0)$ is thus a continuous function of the real

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variables x_0, y_0, where $z_0 = x_0 + iy_0$, over the region; it will appear that $F(z_0)$ is also continuous and in fact also a differentiable function of z_0.

Supposing η to be retained the same for all points z_0 of the region, and σ_0 to be the upper limit of the possible values of ϵ for the point z_0, it is to be presumed that σ_0 will vary with z_0, and it is not obvious as yet that the lower limit of the values of σ_0 as z_0 varies over the region may not be zero. We can, however, show that the region can be divided into a finite number of sub-regions for each of which the condition (8, z_0), above, is satisfied for all points z, within or upon the boundary of this sub-region, for an appropriate position of z_0, within or upon the boundary of this sub-region. This is proved above as result (B).

Hence it can be proved that, for a differentiable function $f(z)$, the integral $\int_{z_1}^{z} f(z)dz$ has the same value by whatever path within the region we pass from z_1 to z. This we prove by showing that when taken round a closed path in the region the integral $\int f(z)dz$ vanishes. Consider first a triangle over which the condition (z, z_0) holds, for some position of z_0 and every position of z, within or upon the boundary of the triangle. Then as

$$f(z) = f(z_0) + (z - z_0)F(z_0) + \theta(z - z_0), \text{ where } |\theta| < 1,$$

we have

$$\int f(z)dz = [f(z_0) - z_0F(z_0)]/dz + F(z_0)/zdz + \eta\theta(z - z_0)dz,$$

which, as the path is closed, is $\eta\theta(z - z_0)dz$. Now, from the theorem that the absolute value of a sum is less than the sum of the absolute values of the terms, this last is less, in absolute value, than $\eta a p$, where a is the greatest side of the triangle and p is its perimeter; if Δ be the area of the triangle, we have $\Delta = \frac{1}{2}ab \sin C > (a/\pi)ba$, where a is the least angle of the triangle, whence $a(a+b+c) < 2\pi\Delta(a+b+c)/a$; the integral $\int f(z)dz$ round the perimeter of the triangle is thus $< 4\pi\eta\Delta/a$. Now consider any region made up of triangles, as before explained, in each of which the condition (z, z_0) holds, as in the triangle just taken. The integral $\int f(z)dz$ round the boundary of the region is equal to the sum of the values of the integral round the component triangles, and thus less in absolute value than $4\pi\eta K/a$, where K is the whole area of the region, and a is the smallest angle of the component triangles. However small η be taken, such a division of the region into a finite number of component triangles has been shown possible; the integral round the perimeter of the region is thus arbitrarily small. Thus it is actually zero, which it was desired to prove. Two remarks should be added: (1) The theorem is proved only on condition that the closed path of integration belongs to the region, at every point of which the conditions are satisfied. (2) The theorem, though proved only when the region consists of triangles, holds also when the boundary points of the region consist of one or more closed paths, no two of which meet.

Hence we can deduce the remarkable result that the value of $f(z)$ at any interior point of a region is expressible in terms of the value of $f(z)$ at the boundary points. For consider in the original region the function $f(z)/(z - z_0)$, where z_0 is an interior point: this satisfies the same conditions as $f(z)$ except in the immediate neighbourhood of z_0. Taking out then from the original region a small regular polygonal region with z_0 as centre, the theorem holds for the remaining portion. Proceeding to the limit when the polygon becomes a circle, it appears that the integral $\int \frac{f(z)}{z - z_0}dz$ round the boundary of the original region is equal to the same integral taken counter-clockwise round a small circle having z_0 as centre; on this circle, however, if $z - z_0 = re^{i\theta}$, $dz/(z - z_0) = id\theta$, and $f(z)$ differs arbitrarily little from $f(z_0)$ if r is sufficiently small; the value of the integral round this circle is therefore, ultimately, when r vanishes, equal to $2\pi i f(z_0)$. Hence $f(z_0) = \frac{1}{2\pi i}\int \frac{f(t)}{t - z_0}dt$, where this integral is round the boundary of the original region. From this it appears that

$$F(z_0) = \lim_{z \to z_0} \frac{f(z) - f(z_0)}{z - z_0} = \frac{1}{2\pi i}\int \frac{f(t)}{(t - z_0)^2}dt$$

also round the boundary of the original region. This form shows, however, that $F(z_0)$ is a continuous, finite, differentiable function of z_0 over the whole *interior* of the original region.

§ 5. *Applications.*—The previous results have manifold applications.

(1) If an infinite series of differentiable functions of z be uniformly convergent along a certain path lying with the region of definition of the functions, so that $S(z) = u_0(z) + u_1(z) + \ldots + u_{n-1}(z) + R_n(z)$, where $|R_n(z)| < \epsilon$ for all points of the path, we have

$$\int_a^b S(z)dz = \int_a^b u_0(z)dz + \int_a^b u_1(z)dz + \ldots + \int_a^b u_{n-1}(z)dz + \int_a^b R_n(z)dz,$$

wherein, in absolute value, $\int_a^b R_n(z)dz < \epsilon L$, if L be the length of the path. Thus the series may be integrated, and the resulting series is also uniformly convergent.

(2) If $f(x, y)$ be definite, finite and continuous at every point of a region, and over any closed path in the region $\int f(x, y)dz = 0$, then $\psi(z) = \int_{z_0}^{z} f(x, y)dx$, for interior points z_0, z, is a differentiable function of z, having for its differential coefficient the function $f(x, y)$, which is therefore also a differentiable function of z at interior points.

(3) Hence if the series $u_0(z) + u_1(z) + \ldots$ to ∞ be uniformly convergent over a region, its terms being differentiable functions of z, then its sum $S(z)$ is a differentiable function of z, whose differential coefficient, given by $\frac{1}{2\pi i}\int \frac{S(t)dt}{(t - z)^2}$, is obtainable by differentiating the series. This theorem, unlike (1), does not hold for functions of a real variable.

(4) If the region of definition of a differentiable function $f(z)$ include the region bounded by two concentric circles of radii r, R, with centre at the origin, and z_0 be an interior point of this region, $f(z_0) = \frac{1}{2\pi i}\int_{zi-z_0} \frac{f(t)dt}{t - z_0} - \frac{1}{2\pi i}\int_{ci-z_0} \frac{f(t)dt}{t - z_0}$, where the integrals are both counter-clockwise round the two circumferences respectively; putting in the first $(t - z_0)^{-1} = \sum_{n=0}^{n} z_0^n/t^{n+1}$, and in the second $(t - z_0)^{-1} = -\sum_{n=0}^{n} t^n/z_0^{n+1}$, we find $f(z_0) = \sum_{-\infty}^{\infty} A_n z_0^n$, wherein $A_n = \frac{1}{2\pi i}\int \frac{f(t)}{t^{n+1}}dt$, taken round any circle, centre the origin, of radius intermediate between r and R. Particular cases are: (α) when the region of definition of the function includes the whole interior of the outer circle; then we may take $r = 0$, the coefficients A_n for which $n < 0$ all vanish, and the function $f(z_0)$ is expressed for the whole interior $|z_0| < R$ by a power series $\sum A_n z_0^n$. In other words, *about every interior point c of the region of definition a differentiable function of z is expressible by a power series in* $z - c$; a very important result.

(β) If the region of definition, though not including the origin, extends to within arbitrary nearness of this on all sides, and at the same time the product $z^m f(z)$ has a finite limit when $|z|$ diminishes to zero, all the coefficients A_n for which $n < -m$ vanish, and we have $f(z_0) = A_{-m}z_0^{-m} + A_{-m+1}z_0^{-m+1} + \ldots + A_{-1}z_0^{-1} + A_0 + A_1z_0 \ldots$ to ∞. Such a case occurs, for instance, when $f(z) = \operatorname{cosec} z$, the number m being unity.

§ 6. *Singular Points.*—The *region of existence* of a differentiable function of z is an unclosed aggregate of points, each of which is an interior point of a neighbourhood consisting wholly of points of the aggregate, at every point of which the function is definite and finite and possesses a unique finite differential coefficient. Every point of the plane, not belonging to the aggregate, which is a limiting point of points of the aggregate, such, that is, that points of the aggregate lie in every neighbourhood of this, is called a *singular point* of the function.

About every interior point z_0 of the region of existence the function may be represented by a power series in $z - z_0$, and the series converges and represents the function over any circle centre at z_0 which contains no singular point in its interior. This has been proved above. And it can be similarly proved, putting $z = 1/\zeta$, that if the region of existence of the function contains all points of the plane for which $|z| > R$, then the function is representable for all such points by a power series in z^{-1} or ζ; in such case we say that the region of existence of the function contains the point $z = \infty$. A series in z^{-1} has a finite limit when $|z| = \infty$; a series in z cannot remain finite for all points z for which $|z| > R$; for if, for $|z| = R$, the sum of a power series $\Sigma a_n z^n$ in z is in absolute value less than M, we have $|a_n| < Mr^{-n}$, and therefore, if M remains finite for all values of r however great, $a_n = 0$. Thus the region of existence of a function if it contains all finite points of the plane cannot contain the point $z = \infty$; such is, for instance, the case of the function $\exp(z) = \Sigma z^n/n!$. This may be regarded as a particular case of a well-known result (§ 7), that the circumference of convergence of any power series representing the function contains at least one singular point. As an extreme case functions exist whose region of existence is circular, there being a singular point in every arc of the circumference, however small; for instance, this is the case for the functions represented for $|z| < 1$ by the series $\sum z^{m!}$, where $m = n!$, the series $\sum_{n=0}^{\infty} z^{n!}$ where $m = n!$, and the series $\sum_{n=1}^{\infty} z^{m!}/(m+1)(m+2)$ where $m = a^n$, a being a positive integer, although in the last case the series actually converges for every point of the circle of convergence $|z| = 1$. If z be a point interior to the circle of convergence of a series representing the function, the series may be rearranged in powers of $z - z_0$; as z_0 approaches to a singular point of the function, lying on the circle of convergence, the radii of convergence of these derived series in $z - z_0$ diminish to zero; when, however, a circle can be put about z_0, not containing any singular point of the function, but containing points outside the circle of convergence of the original series, then the series in $z - z_0$ gives the value of the function for these external points. If the function be supposed to be given only for the interior of the original circle, by the original power series, the series in $z - z_0$ converging beyond the original circle gives what is known as an *analytical continuation* of the function. It appears from what has

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been proved that the value of the function at all points of its region of existence can be obtained from its value, supposed given by a series in one original circle, by a succession of such processes of analytical continuation.

§ 7. *Monogenic Functions.*—This suggests an entirely different way of formulating the fundamental parts of the theory of functions of a complex variable, which appears to be preferable to that so far followed here.

Starting with a convergent power series, say in powers of z, this series can be arranged in powers of $z-z_0$, about any point z_0 interior to its circle of convergence, and the new series converges certainly within $|z-z_0|<r-|z_0|$, if r be the original radius of convergence. If for every position of z_0 this is the greatest radius of convergence of the derived series, then the original series represents a function existing only within its circle of convergence. If for some position of z_0 the derived series converges for $|z-z_0|<r-|z_0|+D$, then it can be shown that for points z_1 interior to the original circle, lying in the annulus $r-|z_0|<|z-z_0|<r-|z_0|+D$, the value represented by the derived series agrees with that represented by the original series. If for another point z_1 interior to the original circle the derived series converges for $|z-z_1|<r-|z_1|+E$, and the two circles $|z-z_0|=r-|z_0|+D$, $|z-z_1|=r-|z_1|+E$ have interior points common, lying beyond $|z|=r$, then it can be shown that the values represented by these series at these common points agree. Either series then can be used to furnish an analytical continuation of the function as originally defined. Continuing this process of continuation as far as possible, we arrive at the conception of the function as defined by an aggregate of power series of which every one has points of convergence common with some one or more others; the whole aggregate of points of the plane which can be so reached constitutes the region of existence of the function; the limiting points of this region are the points in whose neighbourhood the derived series have radii of convergence diminishing indefinitely to zero; these are the singular points. The circle of convergence of any of the series has at least one such singular point upon its circumference. So regarded the function is called a *monogenic* function, the epithet having reference to the single origin, by one power series of the expressions representing the function; it is also sometimes called a *monogenic analytical* function, or simply an *analytical* function; all that is necessary to define it is the value of the function and of all its differential coefficients, at some one point of the plane: in this respect a previously followed here it was necessary to suppose the function differentiable at every point of its region of existence. The theory of the integration of a monogenic function, and Cauchy's theorem, that $\int f(z)dz=0$ over a closed path, are at once deducible from the corresponding results applied to a single power series for the interior of its circle of convergence. There is another advantage belonging to the theory of monogenic functions: the theory as originally given here applies in the first instance only to single valued functions; a monogenic function is by no means necessarily single valued—may quite well happen that starting from a particular power series, converging over a certain circle, and applying the process of analytical continuation over a closed path back to an interior point of this circle, the value obtained does not agree with the initial value. The notion of basing the theory of functions on the theory of power series is, after Newton, largely due to Lagrange, who has some interesting remarks in this regard at the beginning of his *Théorie des fonctions analytiques*. He applies the idea, however, primarily to functions of a real variable for which the expression by power series is only of very limited validity; for functions of a complex variable probably the systematization of the theory owes most to Weierstrass, whose use of the word monogenic is that adopted above. In what follows we generally suppose this point of view to be regarded as fundamental.

§ 8. *Some Elementary Properties of Single Valued Functions.*—A *pole* is a singular point of the function $f(z)$ which is not a singularity of the function $1/f(z)$; this latter function is therefore, by the definition, capable of representation about this point, z_0, by a series $[f(z)]^{-1}=\Sigma a_n(z-z_0)^n$. If herein a_0 is not zero we can hence derive a representation for $f(z)$ as a power series about z_0, contrary to the hypothesis that z_0 is a singular point for this function. Hence $a_0=0$; suppose also $a_1=0, a_2=0, \ldots a_{m-1}=0$, but $a_m\neq 0$. Then $[f(z)]^{-1}=(z-z_0)^m[a_m+a_{m+1}(z-z_0)+\ldots]$, and hence $(z-z_0)^m f(z)=a_m^{-1}+\Sigma b_n(z-z_0)^n$, namely, the expression of $f(z)$ about $z=z_0$ contains a finite number of negative powers of $z-z_0$ and a (finite or) infinite number of positive powers. Thus a pole is always an isolated singularity.

The integral $\int f(z)dz$ taken by a closed circuit about the pole not containing any other singularity is at once seen to be $2\pi iA_1$, where A_1 is the coefficient of $(z-z_0)^{-1}$ in the expansion of $f(z)$ at the pole; this coefficient has therefore a certain uniqueness, and it is called the *residue of* $f(z)$ *at the pole*. Considering a region in which there are no other singularities than poles, all these being interior points, *the integral* $\frac{1}{2\pi i}\int f(z)dz$ *round the boundary of this region is equal to the sum of the residues at the included poles*, a very important result. Any singular point of a function which is not a pole is called an *essential singularity*; if it be isolated the function in question is, in the neighbourhood of this point, of approaching arbitrarily near to any assigned value. For, the point being isolated, the function can be represented, in its neighbourhood, as we have proved, by a series $\sum_{-\infty}^{n} a_n(z-z_0)^n$; it thus cannot remain finite in the immediate neighbourhood of the point. The point is necessarily an isolated essential singularity also of the function $[f(z)-A]^{-1}$, for if this were expressible by a power series about the point, so would also the function $f(z)$ be; as $[f(z)-A]^{-1}$ approaches infinity, so does $f(z)$ approach the arbitrary value A. Similar remarks apply to the point $z=\infty$, the function being regarded as a function of $\zeta=z^{-1}$. In the neighbourhood of an essential singularity, which is a limiting point also of poles, the function clearly becomes infinite. For an essential singularity which is not isolated the same result does not necessarily hold.

A single valued function is said to be an *integral* function when it has no singular points except $z=\infty$. Such is, for instance, an integral polynomial, which has $z=\infty$ for a pole, and the functions exp (z) which has $z=\infty$ as an essential singularity. A function which has no singular points for finite values of z other than poles is called a *meromorphic* function. If it also have a pole at $z=\infty$ it is a *rational* function; for then, if $a_1, \ldots a_s$ be its finite poles, of orders $m_1, m_2, \ldots m_s$, the product $(z-a_1)^{m_1}\ldots(z-a_s)^{m_s}f(z)$ is an integral function with a pole at infinity, capable therefore, for large values of z, of an expression $(z^{-1})^{-m}\sum_{n=0}^{n} A_n(z^{-1})^n$; thus $(z-a_1)^{m_1}\ldots(z-a_s)^{m_s}f(z)$ is capable of a form $\sum_{n=0}^{n} b_n z^n$, but $z^{-m}\sum_{n=0}^{n} b_n z^n$ remains finite for $z=\infty$. Therefore $b_{n+1}=b_{n+2}=\ldots=0$, and $f(z)$ is a rational function.

If for a single valued function $F(z)$ every singular point in the finite part of the plane is isolated there can only be a finite number of these in any finite part of the plane, and they can be taken to be $a_1, a_2, a_3, \ldots$ with $|a_1|\leq|a_2|\leq|a_3|\ldots$ and limit $|a_n|=\infty$. About a_s the function is expressible as $\sum_{-\infty}^{1} A_n(z-a_s)^n$; let $f_s(z)=\sum_{-\infty}^{-1} A^n(z-a_s)^n$ be the sum of the negative powers in this expansion. Assuming $z=0$ not to be a singular point, let $f_s(z)$ be expanded in powers of z, in the form $\sum_{0}^{\infty} C_n z^n$, and μ_s be chosen so that $F_s(z)=f_s(z)-\sum_{0}^{\mu_s} C_n z^n=\sum_{\mu_s}^{\infty} C_n z^n$ is, for $|z|<r_s<|a_s|$, less in absolute value than the general term ϵ_s of a fore-agreed convergent series of real positive terms. Then the series $\phi(z)=\sum_{1}^{\infty} F_s(z)$ converges uniformly in any finite region of the plane, other than at the points a_s, and is expressible about any point by a power series, and near a_s, $\phi(z)-f_s(z)$ is expressible by a power series in $z-a_s$. Thus $F(z)-\phi(z)$ is an integral function. In particular when all the finite singularities of $F(z)$ are poles, $F(z)$ is hereby expressed as the sum of an integral function and a series of rational functions. The condition $|F_s(z)|<\epsilon_s$ is imposed only to render the series $\Sigma F_s(z)$ uniformly convergent; this condition may in particular cases be satisfied by a series $\Sigma G_s(z)$ where $G_s(z)=f_s(z)-\sum_{0}^{\nu_s-1} C_n z^n$ and $\nu_s<\mu_s$.

An example of the theorem is the function $\pi\cot\pi z-z^{-1}$ for which, taking at first only half the poles, $f_s(z)=1/(z-s)$; in this case the series $\Sigma F_s(z)$ where $F_s(z)=(z-s)^{-1}+s^{-1}$ is uniformly convergent: thus $\pi\cot\pi z-z^{-1}=\sum'[(z-s)^{-1}+s^{-1}]$, where $s=0$ is excluded from the summation, is an integral function. It can be proved that this integral function vanishes.

Considering an integral function $f(z)$; if there be no finite positions of z for which this function vanishes, the function $\lambda[f(z)]$ is at once seen to be an integral function, $\phi(z)$, or $f(z)=\exp\{\phi(z)\}$; if however great R may be there be only a finite number of values of z for which $f(z)$ vanishes, say $z=a_1, \ldots a_m$, then it is at once seen that $f(z)=\exp\{\phi(z)\}.(z-a_1)^{n_1}\ldots(z-a_m)^{n_m}$, where $\phi(z)$ is an integral function, and $h_1, \ldots h_m$ are positive integers. If, however, $f(z)$ vanish for $z=a_1, a_2, \ldots$ where $|a_1|\leq|a_2|\leq\ldots$ and limit $|a_n|=\infty$, and if for simplicity we assume that $z=0$ is not a zero and all the zeros $a_1, a_2, \ldots$ are of the first order, we find, by applying the preceding theorem to the function $\frac{1}{f(z)}\frac{df(z)}{dz}$, that $f(s)=\exp\{\phi(z)\}\prod_{n=1}^{\infty}\{(1-z/a_n)\exp\phi_n(z)\}$, where $\phi(z)$ is an integral function, and $\phi_n(z)$ is an integral polynomial of the form $\phi_n(z)=\frac{z}{a_n}+\frac{z^2}{2a_n^2}+\ldots+\frac{z^s}{sa_n^s}$. The number s may be the same for all values of n, or it may increase indefinitely with n; it is sufficient in any case to take $s=n$. In particular for the function

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$\frac{\sin \pi z}{\pi z}$, we have

$$\frac{\sin \pi z}{\pi z} = \prod_{-\infty}^{\infty} \left\{ \left(1 - \frac{z}{n}\right) \exp\left(\frac{z}{n}\right) \right\},$$

where $n = 0$ is excluded from the product. Or again we have

$$\frac{1}{\Gamma(z)} = z e^{Cz} \prod_{n=1}^{\infty} \left\{ \left(1 + \frac{z}{n}\right) \exp\left(-\frac{z}{n}\right) \right\},$$

where C is a constant, and $\Gamma(x)$ is a function expressible when x is real and positive by the integral $\int_0^\infty e^{-t} t^{x-1} dt$.

There exist interesting investigations as to the connexion of the value of z above, the law of increase of the modulus of the integral function $f(z)$, and the law of increase of the coefficients in the series $f(z) = \Sigma a_n z^n$ as n increases (see the bibliography below under *Integral Functions*). It can be shown, moreover, that an integral function actually assumes every finite complex value, save, in exceptional cases, one value at most. For instance, the function exp (z) assumes every finite value except zero (see below under § 21, *Modular Functions*).

The two theorems given above, the one, known as Mittag-Leffler's theorem, relating to the expression as a sum of simpler functions of a function whose singular points have the point $z = \infty$ as their only limiting point, the other, Weierstrass's factor theorem, giving the expression of an integral function as a product of factors each with only one zero in the finite part of the plane, may be respectively generalized as follows:—

I. If $a_1, a_2, a_3 \ldots$ be an infinite series of isolated points having the points of the aggregate (c) as their limiting points, so that in any neighbourhood of a point of (c) there exists an infinite number of the points $a_1, a_2, \ldots$, and with every point a_r there be associated a polynomial in $(z-a_r)^{-1}$, say g_r; then there exists a single valued function whose region of existence excludes only the points (a) and the points (c), having in a point a_r a pole whereat the expansion consists of the terms g_r, together with a power series in $z-a_r$; the function is expressible as an infinite series of terms $g_r - \gamma_r$, where γ_r is also a rational function.

II. With a similar aggregate (a), with limiting points (c), suppose with every point a_r there is associated a positive integer r_r. Then there exists a single valued function whose region of existence excludes only the points (c), vanishing to order r_r at the point a_r, but not elsewhere, expressible in the form

$$\prod_{n=1}^{\infty} \left(1 - \frac{a_n - c_n}{z - c_n}\right)^{r_n} \exp\left(g_n\right),$$

where with every point a_n is associated a proper point c_n of (c), and

$$g_n = r_n \sum_{s=1}^{s=\mu_n} \frac{1}{s} \left(\frac{a_n - c_n}{z - c_n}\right)^s,$$

μ_n being a properly chosen positive integer.

If it should happen that the points (c) determine a path dividing the plane into separated regions, as, for instance, if $a_n = R(1 - n^{-2})\exp(i\pi\sqrt{2.n})$, when (c) consists of the points of the circle $|z| = R$, the product expression above denotes different monogenic functions in the different regions, not continuable into one another.

§ 9. *Construction of a Monogenic Function with a given Region of Existence.*—A series of isolated points interior to a given region can be constructed in infinitely many ways whose limiting points are the boundary points of the region, or are boundary points of the region of such denseness that one of them is found in the neighbourhood of every point of the boundary, however small. Then the application of the last enunciated theorem gives rise to a function having no singularities in the interior of the region, but having a singularity in a boundary point in every small neighbourhood of every boundary point; this function has the given region as region of existence.

§ 10. *Expression of a Monogenic Function by means of Rational Functions in a given Region.*—Suppose that we have a region R_0 of the plane, as previously explained, for all the interior or boundary points of which z is finite, and let its boundary points, consisting of one or more closed polygonal paths, no two of which have a point in common, be called C_0. Further suppose that all the points of this region, including the boundary points, are interior points of another region R, whose boundary is denoted by C. Let z be restricted to be within or upon the boundary of C_0; let $a, b, \ldots$ be finite points upon C or outside R. Then when b is near enough to a, the fraction $(a-b)/(z-b)$ is arbitrarily small for all positions of z; say

$$\left|\frac{a-b}{z-b}\right| < \epsilon, \text{ for } |a-b| < \eta;$$

the rational function of the complex variable t,

$$\frac{1}{t-a}\left[1 - \left(\frac{a-b}{t-b}\right)^n\right],$$

in which n is a positive integer, is not infinite at $t = a$, but has a pole at $t = b$. By taking n large enough, the value of this function, for all positions z of t belonging to R_0, differs as little as may be desired from $(t-a)^{-1}$. By taking a sum of terms such as

$$F = \Sigma A_p \left\{ \frac{1}{t-a}\left[1 - \left(\frac{a-b}{t-b}\right)^n\right] \right\}^p,$$

we can thus build a rational function differing, in value, in R_0, as little as may be desired from a given rational function

$$f = \Sigma A_p (t-a)^{-p},$$

and differing, outside R or upon the boundary of R, from f, in the fact that while f is infinite at $t = a$, F is infinite only at $t = b$. By a succession of steps of this kind we thus have the theorem that, given a rational function of t whose poles are outside R or upon the boundary of R, and an arbitrary point c outside R or upon the boundary of R, which can be reached by a finite continuous path outside R from all the poles of the rational function, we can build another rational function differing in R_0 arbitrarily little from the former, whose poles are all at the point c.

Now any monogenic function $f(t)$ whose region of definition includes C and the interior of R can be represented at all points z in R_0 by

$$f(z) = \frac{1}{2\pi i} \int \frac{f(t)\,dt}{t-z},$$

where the path of integration is C. This integral is the limit of a sum

$$S = \frac{1}{2\pi i} \Sigma \frac{f(t_i)(t_{i+1} - t_i)}{t_i - z},$$

where the points t_i are upon C: and the proof we have given of the existence of the limit shows that the sum S converges to $f(z)$ uniformly in regard to z, when z is in R_0, so that we can suppose, when the subdivision of C into intervals $t_{i+1} - t_i$ has been carried sufficiently far, that

$$|S - f(z)| < \epsilon,$$

for all points z of R_0, where ϵ is arbitrary and agreed upon beforehand. The function S is, however, a rational function of z with poles upon C, that is external to R_0. We can thus find a rational function differing arbitrarily little from S, and therefore arbitrarily little from $f(z)$, for all points z of R_0, with poles at arbitrary positions outside R_0 which can be reached by finite continuous curves lying outside R from the points of C.

In particular, to take the simplest case, if C_0, C be simple closed polygons, and Γ be a path to which C approximates by taking the number of sides of C continually greater, we can find a rational function differing arbitrarily little from $f(z)$ for all points of R_0 whose poles are at one finite point c external to Γ. By a transformation of the form $t - c = r \cdot t'$, with the appropriate change in the rational function, we can suppose this point c to be at infinity, in which case the rational function becomes a polynomial. Suppose $\epsilon_1, \epsilon_2, \ldots$ to be an indefinitely continued sequence of real positive numbers, converging to zero, and P_1 to be the polynomial such that, within C_0, $|P - f(z)| < \epsilon_1$; then the infinite series of polynomials

$$P_1(z) + [P_2(z) - P_1(z)] + [P_3(z) - P_2(z)] + \ldots,$$

whose sum to n terms is $P_n(z)$, converges for all finite values of z and represents $f(z)$ within C_0.

When C consists of a series of disconnected polygons, some of which may include others, and, by increasing indefinitely the number of sides of the polygons C, the points C become the boundary points Γ of a region, we can suppose the poles of the rational function, constructed to approximate to $f(z)$ within R_0, to be at points of Γ. A series of rational functions of the form

$$H_1(z) + [H_2(z) - H_1(z)] + [H_3(z) - H_2(z)] + \ldots$$

then, as before, represents $f(z)$ within R_0. And R_0 may be taken to coincide as nearly as desired with the interior of the region bounded by Γ.

§ 11. *Expression of $(z-c)^{-1}$ by means of Polynomials. Applications.*—We pursue the ideas just cursorily explained in some further detail.

Let c be an arbitrary real positive quantity; putting the complex variable $\xi = \xi + i\eta$, enclose the points $\xi = 1$, $\xi = 1 + c$ by means of (i.) the straight lines $\eta = \pm a$, from $\xi = 1$ to $\xi = 1 + c$, (ii.) a semicircle convex to $\xi = 0$ of equation $(\xi - 1)^2 + \eta^2 = a^2$, (iii.) a semicircle concave to $\xi = 0$ of equation $(\xi - 1 - c)^2 + \eta^2 = a^2$. The quantities c and a are to remain fixed. Take a positive integer r so that $\frac{1}{r}\left(\frac{c}{a}\right)$ is less than unity, and put $\sigma = \frac{1}{r}\left(\frac{\xi}{a}\right)$. Now take

$$\xi_1 = 1 + c/r,\ \xi_2 = 1 + 2c/r, \ldots \xi_r = 1 + c;$$

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if $n_1, n_2, \ldots n_r$ be positive integers, the rational function

$$\frac{1}{1-\xi}\left\{1-\left(\frac{\xi_1-1}{\xi_1-\xi}\right)^{n_1}\right\}$$

is finite at $\xi=1$, and has a pole of order n_1 at $\xi=\xi_1$; the rational function

$$\frac{1}{1-\xi}\left\{1-\left(\frac{\xi_1-1}{\xi_1-\xi}\right)^{n_1}\right\}\left\{1-\left(\frac{\xi_2-\xi_1}{\xi_2-\xi}\right)^{n_2}\right\}^{n_1}$$

is thus finite except for $\xi=\xi_2$, where it has a pole of order n_1n_2; finally, writing

$$x_s=\left(\frac{\xi_s-\xi_{s-1}}{\xi_s-\xi}\right)^{n_s},$$

the rational function

$$U=(1-\xi)^{-1}(1-x_1)(1-x_2)^{n_1}(1-x_3)^{n_1n_2}\ldots(1-x_r)^{n_1n_2\ldots n_{r-1}}$$

has a pole only at $\xi=1+\epsilon$, of order $n_1n_2\ldots n_r$.

The difference $(1-\xi)^{-1}-U$ is of the form $(1-\xi)^{-1}P$, where P, of the form

$$1-(1-\rho_1)(1-\rho_2)\ldots(1-\rho_k),$$

in which there are equalities among $\rho_1, \rho_2 \ldots \rho_k$ is of the form

$$\Sigma\rho_1-\Sigma\rho_1\rho_2+\Sigma\rho_1\rho_2\rho_3-\ldots;$$

therefore, if $|r_1|=|\rho_1|$, we have

$$|P|<\Sigma r_1+\Sigma r_1r_2+\Sigma r_1r_2r_3+\ldots<(1+r_1)(1+r_2)\ldots(1+r_k)-1;$$

now, so long as ξ is without the closed curve above described round $\xi=1$, $\xi=1+\epsilon$, we have

$$\left|\frac{1}{1-\xi}\right|<\frac{1}{a}, \quad \left|\frac{c_m{}^{-c}c_{m-n}}{c_m{}^{-\xi}}\right|<\frac{c'r}{a}<\sigma,$$

and hence

$$|(1-\xi)^{-1}-U|<\sigma^{-1}|(1+\sigma^{n_1})(1+\sigma^{n_1})(1+\sigma^{n_1n_2})\ldots(1+\sigma^{n_1})\ldots-1|.$$

Take an arbitrary real positive ϵ, and μ, a positive number, so that $e^{2\mu}-1<\epsilon a$, then a value of n_1 such that $\sigma^{n_1}<\mu/(1+\mu)$ and therefore

$$\sigma^{n_1}/(1-\sigma^{n_1})<\mu, \text{ and values for } n_2, n_3, \ldots \text{ such that } \sigma^{n_2}<\frac{1}{n_1}\sigma^{2n_1},$$

$$\sigma^{n_3}<\frac{1}{n_1n_2}\sigma^{3n_1\ldots n_2}<\frac{1}{n_1\ldots n_{r-1}}\sigma^{r_1\ldots}; \text{ then, as } 1+x<e^x, \text{ we have}$$

$$|(1-\xi)^{-1}-U|<a^{-1}|\exp(\sigma^{n_1}+n_1\sigma^{n_2}+n_1n_2\sigma^{n_3}+\ldots+n_1n_2\ldots n_{r-1}\sigma^{n_r})-1|,$$

and therefore less than

$$a^{-1}|\exp(\sigma^{n_1}+\sigma^{2n_1}+\ldots+\sigma^{n_r n_1})-1|,$$

which is less than

$$\frac{1}{a}\left[\exp\left(\frac{\sigma^{n_1}}{1-\sigma^{n_1}}\right)-1\right]$$

and therefore less than ϵ.

The rational function U, with a pole at $\xi=1+\epsilon$, differs therefore from $(1-\xi)^{-1}$, for all points outside the closed region put about $\xi=1$, $\xi=1+c$, by a quantity numerically less than ϵ. So long as a remains the same, r and σ will remain the same, and a less value of a will require at most an increase of the numbers $n_1, n_2, \ldots n_r$; but if a be taken smaller it may be necessary to increase r, and with this the complexity of the function U.

Now put $\quad s=\dfrac{c\xi}{c+1-\xi}, \ \xi=\dfrac{(c+1)s}{c+s}$;

thereby the points $\xi=0, 1, 1+c$ become the points $s=0, 1, \infty$, the function $(1-\xi)^{-1}$ being given by $(1-\xi)^{-1}=c(c+1)^{-1}(1-\xi)^{-1}+(c+1)^{-1}$; the function U becomes a rational function of s with a pole only at $s=\infty$, that is, it becomes a polynomial in s, say $\dfrac{c+1}{c}H-\dfrac{1}{c}$, where H is also a polynomial in s, and

$$\frac{1}{1-s}H=\frac{c}{c+1}\left[\frac{1}{1-\xi}U\right];$$

the lines $\eta=\pm a$ become the two circles expressed, if $s=x+iy$, by

$$(x+c)^2+y^2=\pm\frac{c(c+1)}{a}y,$$

the points $(\eta=0, \xi=1-a)$, $(\eta=0, \xi=1+c+a)$ become respectively the points $(y=0, x=c(1-a)/(c+a)$, $(y=0, x=-c(1+c+a)/a)$, whose limiting positions for $a=0$ are respectively $(y=0, x=1)$, $(y=0, x=-\infty)$. The circle $(x+c)^2+y^2=c(c+1)y/a$ can be written

$$y=\frac{(x+c)^2}{2\mu}+\frac{(x+c)^4}{2\mu}[\mu+\sqrt{[\mu^2-(x+c)^2]}]^{-2},$$

where $\mu=\frac{1}{2}c(c+1)/a$; its ordinate y, for a given value of x, can therefore be supposed arbitrarily small by taking a sufficiently small.

We have thus proved the following result; taking in the plane of s any finite region of which every interior and boundary point is at a finite distance, however short, from the points of the real axis for which $1\leqq x\leqq\infty$, we can take a quantity a, and hence, with an arbitrary c, determine a number r; then corresponding to an arbitrary ϵ, we can determine a polynomial P_n such that, for all points interior to the region, we have

$$|(1-s^{-1})-P_n|<\epsilon,$$

thus the series of polynomials

$$P_1+(P_2-P_1)+(P_3-P_2)+\ldots,$$

constructed with an arbitrary aggregate of real positive numbers $\epsilon_1, \epsilon_2, \epsilon_3 \ldots$ with zero as their limit, converges uniformly and represents $(1-s)^{-1}$ for the whole region considered.

§ 12. *Expansion of a Monogenic Function in Polynomials, over a Star Region.*—Now consider any monogenic function $f(z)$ of which the origin is not a singular point; joining the origin to any singular point by a straight line, let the part of this straight line, produced beyond the singular point, lying between the singular point and $z=\infty$, be regarded as a barrier in the plane, the portion of this straight line from the origin to the singular point being erased. Consider next any finite region of the plane, whose boundary points constitute a path of integration, in a sense previously explained, of which every point is at a finite distance greater than zero from each of the barriers before explained; we suppose this region to be such that any line joining the origin to a boundary point, when produced, does not meet the boundary again. For every point x in this region R we can then write

$$2\pi i f(x)=\int\frac{dt}{t}\frac{f(t)}{1-xt^{-1}},$$

where $f(t)$ represents a monogenic branch of the function, in case it be not everywhere single valued, and t is on the boundary of the region. Describe now another region R_0 lying entirely within R, and let x be restricted to be within R_0 or upon its boundary; then for any point t on the boundary of R, the points s of the plane for which xt^{-1} is real and positive and equal to or greater than 1, being points for which $|s|=|t|$ or $|s|>|t|$, are without the region R_0, and not infinitely near to its boundary points. Taking then an arbitrary real positive ϵ we can determine a polynomial in xt^{-1}, say $P(xt^{-1})$, such that for all points x in R_0 we have

$$|(1-xt^{-1})^{-1}-P(xt^{-1})|<\epsilon;$$

the form of this polynomial may be taken the same for all points t on the boundary of R, and hence, if E be a proper variable quantity of modulus not greater than ϵ,

$$\left|2\pi i f(x)-\int\frac{dt}{t}f(t)P(xt^{-1})\right|=\left|\int\frac{dt}{t}f(t)E\right|\leqq\epsilon LM,$$

where L is the length of the path of integration, the boundary of R, and M is a real positive quantity such that upon this boundary $|t^{-1}f(t)|<M$. If now

$$P(xt^{-1})=c_0+c_1xt^{-1}+\ldots+c_mx^mt^{-m},$$

and

$$\frac{1}{2\pi i}\int t^{-r-1}f(t)dt=\mu_r,$$

this gives

$$|f(x)-|c_0\mu_0+c_1\mu_1x+\ldots+c_m\mu_mx^m|\ |\leqq\epsilon LM/2\pi,$$

where the quantities $\mu_0, \mu_1, \mu_2 \ldots$ are the coefficients in the expansion of $f(x)$ about the origin.

If then an arbitrary finite region be constructed of the kind explained, excluding the barriers joining the singular points of $f(x)$ to $x=\infty$, it is possible, corresponding to an arbitrary real positive number ϵ, to determine a number m, and a polynomial $Q(x)$, of order m, such that for all interior points of this region

$$|f(x)-Q(x)|<\sigma.$$

Hence as before, within this region $f(x)$ can be represented by a series of polynomials, converging uniformly; when $f(x)$ is not a single valued function the series represents one branch of the function.

The same result can be obtained without the use of Cauchy's integral. We explain briefly the character of the proof. If a monogenic function of l, $\phi(l)$ be capable of expression as a power series in $l-x$ about a point x, for $|l-x|\leqq\rho$, and for all points of this circle $|\phi(l)|<\xi$, we know that $|\phi^{(n)}(x)|<\xi\rho^{-n}(n!)$. Hence, taking $|s|<\frac{1}{2}\rho$, and, for any assigned positive integer μ, taking m so that for $x>m$ we have $(\mu+n)\rho<(\frac{1}{2})^n$, we have

$$\left|\frac{\phi^{(\mu+n)}(x).s^n}{n!}\right|<\frac{\phi^{(\mu+n)}(x)}{(\mu+n)!}(\mu+n)\rho^n|s|^n<\frac{\xi}{\rho\mu+n}\left(\frac{1}{2}\right)^n<\left(\frac{1}{2}\right)^n<\frac{\xi}{\rho\mu 2^n},$$

and therefore

$$\phi^{(\mu)}(x+s)=\sum_{n=0}^{n=\infty}\frac{\phi^{(\mu+n)}(x)}{n!}s^n+k_\mu,$$

where

$$\left|k_\mu\right|<\frac{\xi}{\rho^{\mu}2^{-m+1}}\frac{\infty}{2^n}<\frac{\xi}{\rho^{-\mu}2^m}.$$

Now draw barriers as before, directed from the origin, joining the singular point of $\phi(z)$ to $z=\infty$, take a finite region excluding all these barriers, let ρ be a quantity less than the radii of convergence of all the power series developments of $\phi(z)$ about interior points of this region, so chosen moreover that no circle of radius ρ with centre at an interior point of the region includes any singular point of $\phi(z)$, let g be such that $|\phi(s)|<g$ for all circles of radius ρ whose centres are interior points of the region, and, x being any interior point of the region, choose the positive integer n so that $\left|\frac{1}{2}x\right|<\frac{1}{2}\rho$; then take the points $a_1=x/n$, $a_2=2x/n$, $a_3=3x/n, \ldots a_n=x$; it is supposed that the region is so taken that, whatever x may be, all these are interior points of the region. Then by what has been said, replacing x, s respectively by a and x/n, we have

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$$\phi^{(\nu)}(a_1)=\sum_{\lambda_1=0}^{m_1}\frac{\phi(\omega+\lambda_1)(0)}{\lambda_1!}\left(\frac{x}{n}\right)^{\lambda_1}+\sigma_\mu$$

with $\quad |\sigma_\mu|<\varepsilon/\rho\cdot 2^{m_1}$,

provided $(\mu+m_1+1)^\alpha<(\frac{1}{2})^{m_1}\varepsilon^1$; in fact for $\mu\overline{\in}2n^{2n-\frac{1}{2}}$ it is sufficient to take $m_1=n^{2n}$; by another application of the same inequality, replacing x, z respectively by a_1 and x/n, we have

$$\phi^{(\nu)}(a_2)=\sum_{\lambda_2=0}^{m_2}\frac{\phi(\omega+\lambda_2)(a_1)}{\lambda_2!}\left(\frac{x}{n}\right)^{\lambda_2}+\beta'_\mu,$$

where $\quad |\beta'_\mu|<\varepsilon/\rho\cdot 2^{m_2}$,

provided $(\mu+m_2+1)^\alpha<(\frac{1}{2})^{m_2}\varepsilon^1$; we take $m_2=n^{2n-\frac{1}{2}}$, supposing $\mu<2n^{2n-\frac{1}{2}}$. So long as $\mu\overline{\in}n^{2n-\frac{1}{2}}$ and $\mu<2n^{2n-\frac{1}{2}}$ we have $\mu+\lambda_1<2n^{2n-\frac{1}{2}}$, and we can use the previous inequality to substitute here for $\phi(\omega+\lambda_2)(a_1)$. When this is done we find

$$\phi^{(\nu)}(a_2)=\sum_{\lambda_2=0}^{m_2}\sum_{\lambda_1=0}^{m_1}\frac{\phi(\omega+\lambda_1+\lambda_2)(0)}{\lambda_1!\lambda_2!}\left(\frac{x}{n}\right)^{\lambda_1+\lambda_2}+\beta_\mu,$$

where $|\beta_\mu|<2\varepsilon/\rho\cdot 2^{m_2}$, the numbers m_1, m_2 being respectively n^{2n} and $n^{2n-\frac{1}{2}}$.

Applying then the original inequality to $\phi^{(\nu)}(a_2)=\phi^{(\nu)}(a_1+x\cdot n)$, and then using the series just obtained, we find a series for $\phi^{(\nu)}(a_2)$. This process being continued, we finally obtain

$$\phi(x)=\sum_{\lambda_1=0}^{m_1}\sum_{\lambda_2=0}^{m_2}\cdots\sum_{\lambda_K=0}^{m_K}\frac{\phi^{(k)}(0)}{K}\left(\frac{x}{n}\right)^k+\epsilon,$$

where $k=\lambda_1+\lambda_2+\ldots+\lambda_K$, $K=\lambda_1!\,\lambda_2!\ldots\lambda_K!$, $m_1=n^{2n}$, $m_2=n^{2n-\frac{1}{2}},\ldots$, $m_\kappa=n^k$, $|\epsilon|<2\varepsilon/\rho^{2n}$.

By this formula $\phi(x)$ is represented, with any required degree of accuracy, by a polynomial, within the region in question; and thence can be expressed as before by a series of polynomials converging uniformly (and absolutely) within this region.

§ 13. *Application of Cauchy's Theorem to the Determination of Definite Integrals.*—Some reference must be made to a method whereby real definite integrals may frequently be evaluated by use of the theorem of the vanishing of the integral of a function of a complex variable round a contour within which the function is single valued and non singular.

We are to evaluate an integral $\int_a^b f(x)dx$; we form a closed contour of which the portion of the real axis from $x=a$ to $x=b$ forms a part, and consider the integral $\int f(z)dz$ round this contour, supposing that the value of this integral can be determined along the curve forming the completion of the contour. The contour being supposed such that, within it, $f(z)$ is a single valued and finite function of the complex variable z save at a finite number of isolated interior points, the contour integral is equal to the sum of the values of $f(z)dz$ taken round these points. Two instances will suffice to explain the method. (1) The integral $\int_0^\infty\frac{\tan x}{x}dx$ is convergent if it be understood to mean the limit when $\epsilon, f, \sigma, \ldots$ all vanish of the sum of the integrals

$$\int_0^{\frac{1}{2}\pi-\epsilon}\frac{\tan z}{z}dz,\quad \int_{\frac{1}{2}\pi+\epsilon}^{\frac{3}{2}\pi-\zeta}\frac{\tan z}{z}dz,\quad \int_{\frac{3}{2}\pi+\zeta}^{\frac{5}{2}\pi-\sigma}\frac{\tan z}{z}dz,\ldots$$

Now draw a contour consisting in part of the whole of the positive and negative real axis from $x=-n\pi$ to $x=+n\pi$, where n is a positive integer, broken by semicircles of small radius whose centres are the points $x=\frac{1}{2}\pi$, $x=\frac{3}{2}\pi,\ldots$, the contour containing also the lines $x=n\pi$ and $x=-n\pi$ for values of y between o and $n\pi$ tan a, where a is a small fixed angle, the contour being completed by the portion of a semicircle of radius $n\pi\sec a$ which lies in the upper half of the plane and is terminated at the points $x=\pm n\pi$, $y=n\pi$ tan a. Round this contour the integral $\int\frac{\tan z}{z}dz$ has the value zero. The contributions to this contour integral arising from the semicircles of centres $-\frac{1}{2}(2\sigma-1)\pi$, $+\frac{1}{2}(2\sigma-1)\pi$, supposed of the same radius, are at once seen to have a sum which ultimately vanishes when the radius of the semicircles diminishes to zero. The part of the contour lying on the real axis gives what is meant by $2\int_0^{n\pi}\frac{\tan x}{x}dx$. The contribution to the contour integral from the two straight portions at $x=\pm n\pi$ is

$$\int_0^{n\pi\tan a}idy\left(\frac{\tan iy}{n\pi+iy}-\frac{\tan iy}{-n\pi+iy}\right)$$

where $i\tan iy$, $=-[\exp(y)-\exp(-y)]/[\exp(y)+\exp(-y)]$, is a real quantity which is numerically less than unity, so that the contribution in question is numerically less than

$$\int_0^{n\pi\tan a}dy\frac{2n\pi}{n^2\pi^2+y^2}, \text{ that is than } 2a.$$

Finally, for the remaining part of the contour, for which, with $R=n\pi\sec a$, we have $z=R(\cos\theta+i\sin\theta)=RE(i\theta)$, we have

$$\frac{dz}{z}=id\theta,\ i\tan z=\frac{\exp(-R\sin\theta)E(iR\cos\theta)-\exp(R\sin\theta)E(-iR\cos\theta)}{\exp(-R\sin\theta)E(iR\cos\theta)+\exp(R\sin\theta)E(-iR\cos\theta)};$$

when n and therefore R is very large, the limit of this contribution to the contour integral is thus

$$-\int_{\frac{1}{2}\pi-a}^{\frac{1}{2}\pi+a}id\theta=-(\pi-2a).$$

Making n very large the result obtained for the whole contour is

$$2\int_0^{n\pi}\frac{\tan x}{x}dx-(\pi-2a)-2a\epsilon=0,$$

where ϵ is numerically less than unity. Now supposing a to diminish to zero we finally obtain

$$\int_0^\infty\frac{\tan x}{x}dx=\frac{\pi}{2}.$$

(2) For another case, to illustrate a different point, we may take the integral

$$\int\frac{z^{\alpha-1}}{1+z}dz,$$

wherein α is real quantity such that $o<\alpha<1$, and the contour consists of a small circle, $z=rE(i\theta)$, terminated at the points $x=r\cos a$, $y=\pm r\sin a$, where a is small, of the two lines $y=\pm r\sin a$ for $r\cos a\overline{\in}x\overline{\in}R\cos\beta$, where R sin $\beta=r\sin a$, and finally of a large circle $z=RE(i\phi)$, terminated at the points $x=R\cos\beta$, $y=\pm R\sin\beta$. We suppose a and β both zero, and that the phase of z is zero for $r\cos a\overline{\in}x\overline{\in}R\cos\beta$, $y=r\sin a=R\sin\beta$. Then on $r\cos a\overline{\in}x\overline{\in}R\cos\beta$, $y=-r\sin a$, the phase of z will be 2π, and $z^{\alpha-1}$ will have a value $x^{\alpha-1}\exp[2\pi i(\alpha-1)]$, where x is real and positive. The two straight portions of the contour will thus together give a contribution

$$[1-\exp(2\pi i\alpha)]\int_{r\cos a}^{R\cos\beta}\frac{x^{\alpha-1}}{1+x}dx.$$

It can easily be shown that if the limit of $zf(z)$ for $z=o$ is zero, the integral $f(o)dz$ taken round an arc, of given angle, of a small circle enclosing the origin is ultimately zero when the radius of the circle diminishes to zero, and if the limit of $zf(z)$ for $z=\infty$ is zero, the same integral taken round an arc, of given angle, of a large circle whose centre is the origin is ultimately zero when the radius of the circle increases indefinitely; in our case with $f(z)=z^{\alpha-1}/(1+z)$, we have $zf(z)=z^\alpha/(1+z)$, which, for $o<\alpha<1$, diminishes to zero both for $z=o$ and for $z=\infty$. Thus, finally the limit of the contour integral when $r=o$, $R=\infty$ is

$$[1-\exp(2\pi i\alpha)]\int_0^\infty\frac{x^{\alpha-1}}{1+x}dx.$$

Within the contour $f(z)$ is single valued, and has a pole at $z=1$; at this point the phase of z is π and $z^{\alpha-1}$ is exp $[i\pi(\alpha-1)]$ or $-\exp(i\pi\alpha)$; this is then the residue of $f(z)$ at $z=-1$; we thus have

$$[1-\exp(2\pi i\alpha)]\int_0^\infty\frac{x^{\alpha-1}}{1+x}dx=-2\pi i\exp(i\pi\alpha),$$

that is

$$\int_0^\infty\frac{x^{\alpha-1}}{1+x}dx=\pi\operatorname{cosec}(\alpha\pi).$$

§ 14. *Doubly Periodic Functions.*—An excellent illustration of the preceding principles is furnished by the theory of single valued functions having in the finite part of the plane no singularities but poles, which have two periods.

Before passing to this it may be convenient to make here a few remarks as to the periodicity of (single valued) monogenic functions. To say that $f(z)$ is periodic is to say that there exists a constant ω such that for every point z of the interior of the region of existence of $f(z)$ we have $f(z+\omega)=f(z)$. This involves, considering all existing periods $\omega=\rho+i\sigma$, that there exists a lowest limited value of ρ other than zero; for otherwise all the differential coefficients of $f(z)$ would be zero, and $f(z)$ a constant; we can then suppose that not both ρ and σ are numerically less than ϵ, where $\epsilon>o$. Hence, if g be any real quantity, since among the range $(-g,\ldots,g)$ contains only a finite number of intervals of length ϵ, and there cannot be two periods $\omega=\rho+i\sigma$ such that $\mu\overline{\in}\rho<(\mu+1)\epsilon$, $\nu\overline{\in}\sigma<(\nu+1)\epsilon$, where μ, ν are integers, it follows that there is only a finite number of periods for which both ρ and σ are in the interval $(-g\ldots g)$. Considering then all the periods of the function which are real multiples of one period ω, and in particular those periods $\lambda\omega$ wherein $o<\lambda\overline{\in}1$, there is a lower limit for λ, greater than zero, and therefore, since there is only a finite number of such periods for which the real and imaginary parts both lie between $-g$ and g, a least value of λ, say λ_0. If $\Omega=\lambda_0\omega$ and $\lambda=M\lambda_0+\lambda'$, where M is an integer and $o\overline{\in}\lambda'<\lambda_0$, any period $\lambda\omega$ is of the form $M\Omega+\lambda'\omega$; since, however, Ω, $M\Omega$ and $\lambda\omega$ are periods, so also is $\lambda'\omega$, and hence, by the construction of λ_0, we have $\lambda'=o$; thus all periods which are real multiples of ω are expressible in the form $M\Omega$, where M is an integer, and Ω a period.

If beside ω the functions have a period ω' which is not a real multiple of ω, consider all existing periods of the form $\mu\omega+\nu\omega'$ wherein μ, ν are real, and of these those for which $o\overline{\in}\mu\overline{\in}1$, $o<\nu\overline{\in}1$:

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as before there is a least value for ν, actually occurring in one or more periods, say in the period $\Omega' = \mu\omega + \nu\omega'$; now take, if $\mu\omega + \nu\omega'$ be a period, $\nu = N'\lambda_0 + \nu'$, where N' is an integer, and $0 \leqq \nu' < \nu_0$; thence $\mu\omega + \nu\omega' = \mu\omega + N'(\Omega' - \mu\omega) + \nu'\omega'$; take then $\mu - N'\mu = N\lambda_0 + \lambda'$, where N is an integer and λ_0 is as above, and $0 \leqq \lambda' < \lambda_0$: we thus have a period $N\Omega' + N'\Omega' + \lambda'\omega + \nu'\omega'$, and hence a period $\lambda'\omega + \nu'\omega'$, wherein $\lambda' < \lambda_0$, $\nu' < \nu_0$; hence $\nu' = 0$ and $\lambda' = 0$. All periods of the form $\mu\omega + \nu\omega'$ are thus expressible in the form $N\Omega + N'\Omega'$, where Ω, Ω' are periods and N, N' are integers. But in fact any complex quantity, $P + Q$, and in particular any other possible period of the function, is expressible, with μ, ν real, in the form $\mu\omega + \nu\omega'$; for if $\omega = p + is$, $\omega' = p' + is'$, this requires only $P = \mu p + \nu p'$, $Q = \mu s + \nu s'$, which, since ω'/ω is not real, always give finite values for μ and ν.

It thus appears that if a single valued monogenic function of z be periodic, either all its periods are real multiples of one of them, and then all are of the form $M\Omega$, where Ω is a period and M is an integer, or else, if the function have two periods whose ratio is not real, then all its periods are expressible in the form $N\Omega + N'\Omega'$, where Ω, Ω' are periods, and N, N' are integers. In the former case, putting $\zeta = 2\pi i z/\Omega$, and the function $f(z) = \phi(\zeta)$, the function $\phi(\zeta)$ has, like exp (ζ), the period $2\pi i$, and if we take $t = \exp(\zeta)$ or $\zeta = \lambda(t)$ the function is a single valued function of t. If then in particular $f(z)$ is an integral function, regarded as a function of t, it has singularities only for $t = 0$ and $t = \infty$, and may be expanded in the form $\sum_{-\infty}^{\infty} a_n t^n$.

Taking the case when the single valued monogenic function has two periods ω, ω' whose ratio is not real, we can form a network of parallelograms covering the plane of the angular points of which are the points $c + m\omega + m'\omega'$, wherein c is some constant and m, m' are all possible positive and negative integers; choosing arbitrarily one of these parallelograms, and calling it the primary parallelogram, all the values of which the function takes at all points of the plane, those of this primary parallelogram, any point, z', of the plane being, as it is called, *congruent* to a definite point, z, of the primary parallelogram, z'–z being of the form $m\omega + m'\omega'$, where m, m' are integers. Such a function cannot be an integral function, since then, if, in the primary parallelogram $|f(z)| < M$, it would also be the case, in a circle of centre the origin and radius R, that $|f(z)| < M$, and therefore, if $\Sigma a_n z^n$ be the expansion of the function, which is valid for an integral function for all finite values of z, we should have $|a_n| < MR^{-n}$, which can be made arbitrarily small by taking R large enough. The function must then have singularities for finite values of z.

We consider only functions for which these are poles. Of these there cannot be an infinite number in the primary parallelogram, since then those of them which poles are sufficiently near to one of the necessarily existing limiting points of the poles would be arbitrarily near to one another, contrary to the character of a pole. Supposing the constant c used in naming the corners of the parallelograms so chosen that no pole falls on the perimeter of a parallelogram, it is clear that the integral $\frac{1}{2\pi i}\int f(z)dz$ round the perimeter of the primary parallelogram vanishes; for the elements of the integral corresponding to two such opposite perimeter points as z, $z + \omega$ (or as z, $z + \omega'$) are mutually destructive. This integral is, however, equal to the sum of the residues of $f(z)$ at the poles interior to the parallelogram. Which sum is therefore zero. There cannot therefore be such a function having only one pole of the first order in any parallelogram; we shall see that there can be such a function with two poles only in any parallelogram, each of the first order, with residues whose sum is zero, and that there can be such a function with one pole of the second order, having an expansion near this pole of the form $(z-a)^{-2} + (\text{power series in } z-a)$.

Considering next the function $\phi(z) = [f(z)]^{-1}\frac{df(z)}{dz}$, it is easily seen that an ordinary point of $f(z)$ is an ordinary point of $\phi(z)$, that a zero of order m for $f(z)$ in the neighbourhood of which $f(z)$ has a form, $(z-a)^m$ multiplied by a power series, is a pole of $\phi(z)$ of residue m, and that a pole of $f(z)$ of order n is a pole of $\phi(z)$ of residue $-n$; manifestly $\phi(z)$ has the two periods of $f(z)$. We thus infer, since the sum of the residues of $\phi(z)$ is zero, that for the function $f(z)$, the sum of the orders of its vanishing at points belonging to one parallelogram, Σm, is equal to the sum of the orders of its poles, Σn; which is briefly expressed by saying that the number of its zeros is equal to the number of its poles. Applying this theorem to the function $f(z) - A$, where A is an arbitrary constant, we have the result, that the function $f(z)$ assumes the value A in one of the parallelograms as many times as it becomes infinite. Thus, by what is proved above, every conceivable complex value does arise as a value for the doubly periodic function $f(z)$ in any one of its parallelograms, and in fact at least twice. The number of times it arises is called the *order* of the function; the result suggests a property of rational functions.

Consider further the integral $\int z\frac{f'(z)}{f(z)}dz$, where $f'(z) = \frac{df(z)}{dz}$, taken round the perimeter of the primary parallelogram; the contribution to this arising from two opposite perimeter points such as z and $z + \omega$ is of the form $-\omega\int\frac{f'(z)}{f(z)}dz$, which, as z increases from z_0 to $z_0 + \omega'$, gives, if λ denote the generalized logarithm, $-\omega[\lambda\{f(z_0 + \omega')\} - \lambda\{f(z_0)\}]$, that is, since $f(z_0 + \omega') = f(z_0)$, gives $2\pi i N\omega$, where N is an integer; similarly the result of the integration along the other two opposite sides is of the form $2\pi i N'\omega'$, where N' is an integer. The integral, however, is equal to $2\pi i$ times the sum of the residues of $zf'(z)/f(z)$ at the poles interior to the parallelogram. For a zero, of order m, of $f(z)$ at $z = a$, the contribution to this sum is $2\pi i m a$, for a pole of order n at $z = b$ the contribution is $-2\pi i n b$; we thus infer that $\Sigma m\omega - \Sigma n b = N\omega + N'\omega'$; this we express in words by saying that the sum of the values of z where $f(z) = 0$ within any parallelogram is equal to the sum of the values of z where $f(z) = \infty$ save for integral multiples of the periods. By considering similarly the function $f(z) - A$ where A is an arbitrary constant, we infer that the sum of the values of z for which $f(z) = A$ is the sum of the values of z where the function takes the value A in the parallelogram.

We pass now to the construction of a function having two arbitrary periods ω, ω' of unreal ratio, which has a single pole of the second order in any one of its parallelograms.

For this consider first the network of parallelograms whose corners are the points $z = m\omega + m'\omega'$, where m, m' take all positive and negative integer values; putting a small circle about each corner of this network, let P be a point outside all these circles; this will be interior to a parallelogram whose corners in order may be denoted by z_0, $z_0 + \omega$, $z_0 + \omega + \omega'$, $z_0 + \omega'$; we shall denote z_0, $z_0 + \omega$ by A_0, B_0; this parallelogram Π_0 is surrounded by eight parallelograms, forming with Π_0 a single parallelogram Π_1 of which one side, for instance, contains the points $z_0 - 2\omega - 2\omega'$, $z_0 - 2\omega'$, $z_0 + 2\omega - 2\omega'$, $z_0 + 2\omega - 2\omega'$, $z_0 + 3\omega - 2\omega'$, which we shall denote by A_1, B_1, C_1, D_1, E_1, F_1. And so on. Now consider the sum of the inverse cubes of the distances of the point P from the corners of all the original parallelograms. The sum will contain the terms

$$S_0 = \frac{1}{PA_1^3} + \left(\frac{1}{PA_1^3} + \frac{1}{PB_1^3} + \frac{1}{PC_1^3}\right) + \left(\frac{1}{PA_1^3} + \frac{1}{PB_1^3} + \ldots + \frac{1}{PE_1^3}\right) + \ldots$$

and three other sets of terms, each infinite in number, formed in a similar way. If the perpendiculars from P to the sides A_0B_0, $A_1B_1C_1$, $A_1B_1C_1D_1E_1$ and so on, be ρ, $\rho + \varphi$, $\rho + 2\varphi$ and so on, the sum S_0 is at most equal to

$$\frac{1}{\rho^3} + \frac{3}{(\rho+\varphi)^3} + \frac{5}{(\rho+2\varphi)^3} + \ldots + \frac{2n+1}{(\rho+n\varphi)^3} + \ldots$$

of which the general term is ultimately, when n is large, in a ratio of equality with $2\varphi^{-3}n^{-2}$, so that the series S_0 is convergent, as we know the sum Σn^{-2} to be; this assumes that $\rho \neq 0$; if P be on A_0B_0 the proof for the convergence of $S_0 - 1/PA_0^3$ is the same. Taking the three other sums analogous to S_0 we thus reach the result that the series

$$\phi(z) = -2\Sigma(z - \Omega)^{-3},$$

where Ω is $m\omega + m'\omega'$, and m, m' are to take all positive and negative integer values, and z is any point outside small circles described with the points Ω as centres, is *absolutely convergent*. Its sum is therefore independent of the order of its terms. By the nature of the proof, which holds for all positions of z outside the small circles spoken of, the series is also clearly *uniformly convergent* outside these circles. Each term of the series being a monogenic function of z, the series may therefore be differentiated and integrated outside these circles, and represents a monogenic function. It is clearly periodic with the periods ω, ω'; for $\phi(z + \omega)$ is the same sum as $\phi(z)$ with the terms in a slightly different order. Thus $\phi(z + \omega) = \phi(z)$ and $\phi(z + \omega') = \phi(z)$.

Consider now the function

$$f(z) = \frac{1}{z^2} + \int_0^z \left\{\phi(z) + \frac{2}{z^3}\right\} dz,$$

where, for the subject of integration, the area of uniform convergence clearly includes the point $z = 0$; this gives

$$\frac{df(z)}{dz} = \phi(z)$$

and

$$f(z) = \frac{1}{z^2} + \Sigma' \left\{\frac{1}{(z-\Omega)^2} - \frac{1}{\Omega^2}\right\},$$

wherein Σ' is a sum excluding the term for which $m = 0$ and $m' = 0$. Hence $f(z + \omega) - f(z)$ and $f(z + \omega') - f(z)$ are both independent of z. Noticing, however, that, by its form, $f(z)$ is an even function of z, and putting $z = -\frac{1}{2}\omega$, $z = -\frac{1}{2}\omega'$ respectively, we infer that also $f(z)$ has the two periods ω and ω'. In the primary parallelogram Π_0, however, $f(z)$ is only infinite at $z = 0$ in the neighbourhood of which its expansion is of the form $z^{-2} +$ (power series in z). Thus $f(z)$ is such a doubly periodic function as was to be constructed, having in any parallelogram of periods only one pole, of the second order.

It can be shown that any single valued meromorphic function of z with ω and ω' as periods can be expressed rationally in terms of $f(z)$ and $\phi(z)$, and that $[\phi(z)]^2$ is of the form $4[f(z)]^3 + A f(z) + B$, where A, B are constants.

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To prove the last of these results, we write, for $|s| < |\beta|$,

$$\frac{1}{(s-\beta)^2} = \frac{1}{\beta^2} + \frac{2s}{\beta^3} + \frac{3s^2}{\beta^4} + \dots,$$

and hence, if $\Sigma' \Omega^{-2n} = \sigma_{-2}$, since $\Sigma'(\gamma-\{2n-1\}) = 0$, we have, for sufficiently small z greater than zero,

$$f(z) = z^{-2} + 3\sigma_1 z^2 + 5\sigma_3 z^4 + \dots$$

and

$$\phi(z) = -2z^{-3} + 6\sigma_1 z + 20\sigma_3 z^3 + \dots;$$

using these series we find that the function

$$\mathrm{F}(z) = [\phi(z)]^2 - 4\{f(z)\}^3 + 60\sigma_1 f(z) + 140\sigma_3$$

contains no negative powers of z, being equal to a power series in z^2 beginning with a term in z^2. The function $\mathrm{F}(z)$ is, however, doubly periodic, with periods ω, ω', and can only be infinite when either $f(z)$ or $\phi(z)$ is infinite; this follows from its form in $f(z)$ and $\phi(z)$; thus in one parallelogram of periods it can be infinite only when $z = 0$; we have proved, however, that it is not infinite, but, on the contrary, vanishes, when $z = 0$. Being, therefore, never infinite for finite values of s it is a constant, and therefore necessarily always zero. Putting therefore $f(z) = \xi$ and $\phi(z) = d\xi/dz$ we see that

$$\frac{dz}{d\xi} = (4\xi^3 - 60\sigma_1\xi - 140\sigma_3)^{-\frac{1}{2}}.$$

Historically it was in the discussion of integrals such as

$$\int d\xi (4\xi^3 - 60\sigma_1 \cdot \xi - 140\sigma_3)^{-\frac{1}{2}},$$

regarded as a branch of Integral Calculus, that the doubly periodic functions arose. As in the familiar case

$$z = \int_{\xi_1}^{\xi} (\iota - \xi^3)^{-\frac{1}{2}} d\xi,$$

where $\xi = \sin z$, it has proved finally to be simpler to regard ξ as a function of z. We shall come to the other point of view below, under § 20, *Elliptic Integrals*.

To prove that any doubly periodic function $\mathrm{F}(s)$ with periods ω, ω', having poles at the points $s = a_1, \dots s = a_m$ of a parallelogram, these being, for simplicity of explanation, supposed to be all of the first order, is rationally expressible in terms of $\phi(s)$ and $f(s)$, and we proceed as follows:—

Consider the expression

$$\Phi(s) = \frac{\chi(\iota)_{m-2} + \eta\chi(\iota)_{m-3}}{(\zeta - A_1)(\zeta - A_2) \dots (\zeta - A_m)},$$

where $A_r = f(a_r)$, ζ is an abbreviation for $f(s)$ and η for $\phi(s)$, and $\chi(\iota)_m$, $\chi(\iota)_{m-1}$, denote integral polynomials in ζ, of respective orders m and $m-2$, so that there are $2m$ unspecified, homogeneously entering, constants in the numerator. It is supposed that no one of the points $a_1, \dots a_m$ is one of the points $m\omega + m'\omega'$ where $f(s) = \infty$. The function $\Phi(s)$ is a monogenic function of s with the periods ω, ω', becoming infinite (and having singularities) only when (1) $\zeta = \infty$ or (2) one of the factors $\zeta - A_r$ is zero. In a period parallelogram including $z = 0$ the first arises only for $s = 0$; since for $\zeta = \infty$, η is in a finite ratio to $\zeta^{3/2}$; the function $\Phi(s)$ for $\zeta = \infty$ is not infinite provided the coefficient of ζ^m in $\chi(\iota)_m$ is not zero; thus $\Phi(s)$ is regular about $s = 0$. Where $\zeta - A_r = 0$, that is $f(s) = f(a_r)$, we have $s = \pm a_r + m\omega + m'\omega'$, and no other values of s, m and m' being integers; suppose the unspecified coefficients in the numerator so taken that the numerator vanished to the first order in each of the m points $-a_1, -a_2, \dots -a_m$; that is, if $\phi(a_r) = \mathrm{B}_r$ and therefore $\phi(-a_r) = -\mathrm{B}_r$, so that we have the m relations

$$(\mathrm{A}_r, 1)_{m-1} - \mathrm{B}_r(\mathrm{A}_r, 1)_{m-2} = 0;$$

then the function $\Phi(s)$ will only have the m poles $a_1, \dots a_m$. Denoting further the m zeros of $\mathrm{F}(s)$ by $a_1', \dots a_m'$, putting $f(a_r') = \mathrm{A}_r'$, $\phi(a_r') = \mathrm{B}_r'$, suppose the coefficients in the numerator of $\Phi(s)$ to satisfy the further $m-1$ conditions

$$(\mathrm{A}_r', 1)_m + \mathrm{B}_r'(\mathrm{A}_r', 1)_{m-2} = 0$$

for $s = 1, 2, \dots (m-1)$. The ratios of the $2m$ coefficients in the numerator of $\Phi(z)$ can always be chosen so that the $m + (m-1)$ linear conditions are all satisfied. Consider then the ratio

$$\mathrm{F}(s)/\Phi(s):$$

it is a doubly periodic function with no singularity other than the one pole a_m'. It is therefore a constant, the numerator of $\Phi(s)$ vanishing spontaneously in a_m'. We have

$$\mathrm{F}(s) = \mathrm{A}\Phi(s),$$

where A is a constant; by which $\mathrm{F}(s)$ is expressed rationally in terms of $f(s)$ and $\phi(s)$, as was desired.

When $s = 0$ is a pole of $\mathrm{F}(s)$, say of order r, the other poles, each of the first order, being $a_1, \dots a_m$, similar reasoning can be applied to a function

$$\frac{(\chi, 1)_h + \eta(\chi, 1)_k}{(\zeta - A_1) \dots (\zeta - A_m)},$$

where h, k are such that the greater of $2h-2m$, $2k+3-2m$ is equal to r: the case where some of the poles $a_1, \dots a_m$ are multiple is to be met by introducing corresponding multiple factors in the denominator and taking a corresponding numerator. We give a solution of the general problem below, of a different form.

One important application of the result is the theorem that the functions $f(z+\delta)$, $\phi(z+\delta)$, which are such doubly periodic function of z as have been discussed, can each be expressed, so far as they depend on s, rationally in terms of $f(s)$ and $\phi(s)$, and therefore, so far as they depend on s and δ, rationally in terms of $f(s)$, $f(\delta)$, $\phi(s)$ and $\phi(\delta)$. It can in fact be shown, by reasoning analogous to that given above, that

$$f(z+\delta) + f(s) + f(\delta) = \frac{1}{4}\left[\frac{\phi(s) - \phi(\delta)}{f(s) - f(\delta)}\right]^2.$$

This shows that if $\mathrm{F}(s)$ be any single valued monogenic function which is doubly periodic and of meromorphic character, then $\mathrm{F}(s+\delta)$ is an algebraic function of $\mathrm{F}(s)$ and $\mathrm{F}(\delta)$. Conversely any single valued monogenic function of meromorphic character, $\mathrm{F}(s)$, which is such that $\mathrm{F}(s+\delta)$ is an algebraic function of $\mathrm{F}(s)$ and $\mathrm{F}(\delta)$, can be shown to be a doubly periodic function, or a function obtained from such by degeneration (in virtue of special relations connecting the fundamental constants).

The functions $f(z)$, $\phi(z)$ above are usually denoted by $\mathrm{P}(s)$, $\mathrm{P}'(s)$; further the fundamental differential equation is usually written

$$(\mathrm{P}'z)^2 = 4(\mathrm{P}z)^3 - g_2\mathrm{P}z - g_3,$$

and the roots of the cubic on the right are denoted by e_1, e_2, e_3; for the odd function $\mathrm{P}z$, we have, for the congruent arguments $-\frac{1}{2}\omega$ and $\frac{1}{2}\omega$, $\mathrm{P}'(\frac{1}{2}\omega) = -\mathrm{P}'(-\frac{1}{2}\omega) = -\mathrm{P}'(\frac{1}{2}\omega)$, and hence $\mathrm{P}'(\frac{1}{2}\omega) = 0$; hence we can take $e_1 = \mathrm{P}(\frac{1}{2}\omega)$, $e_2 = \mathrm{P}(\frac{1}{2}\omega + \frac{1}{2}\omega')$, $e_3 = \mathrm{P}(\frac{1}{2}\omega')$. It can then be proved that $[\mathrm{P}(s) - e_1][\mathrm{P}(s - \frac{1}{2}\omega) - e_1] = (e_2 - e_1)(e_3 - e_1)$, with similar equations for the other half periods. Consider more particularly the function $\mathrm{P}(s) - e_1$; like $\mathrm{P}(s)$ it has a pole of the second order at $s = 0$, its expansion in its neighbourhood being of the form $s^{-2}(1 - e_1 s^2 + \mathrm{A}s^4 + \dots)$; having no other pole, it has therefore either two zeros, or a double zero in a period parallelogram (ω, ω'). In fact near its zero $\frac{1}{2}\omega$ its expansion is $(s - \frac{1}{2}\omega)\mathrm{P}'(\frac{1}{2}\omega) + \frac{1}{2}(s - \frac{1}{2}\omega)^2\mathrm{P}''(\frac{1}{2}\omega) + \dots$; we have seen that $\mathrm{P}'(\frac{1}{2}\omega) = 0$, thus it has a zero of the second order unless therefore it vanishes. Thus it appears that the square root $[\mathrm{P}(s) - e_1]^{\frac{1}{2}}$, if we attach a definite sign to it for some particular value of s, is a single valued function of s; for it can at most have two values, and the only small circuits in the plane which could lead to an interchange of these values are those about either a pole or a zero, neither of which, as we have seen, has this effect; the function is therefore single valued for any circuit. Denoting the function, for a moment, by $f_1(s)$, we have $f_1(s + \omega) = \pm f_1(s)$, $f_1(s + \omega') = \pm f_1(s)$; it can be seen by considerations of continuity that the right sign in either of these equations does not vary with s; not both these signs can be positive, since the function has only one pole, of the first order, in a parallelogram (ω, ω'); from the expansion of $f_1(s)$ about $s = 0$, namely $s^{-1}(1 - \frac{1}{2}e_1 s^2 + \dots)$, it follows that $f_1(s)$ is an odd function, and hence $f_1(-\frac{1}{2}\omega) = -f_1(\frac{1}{2}\omega)$, which is only the case since $[f_1(\frac{1}{2}\omega)]^2 = e_2 - e_1$, so that we have $f_1(s + \omega') = -f_1(s)$; an equation $f_1(s + \omega) = -f_1(s)$ would then give $f_1(s + \omega + \omega') = f_1(s)$, and hence $f_1(\frac{1}{2}\omega + \frac{1}{2}\omega') = f_1(-\frac{1}{2}\omega - \frac{1}{2}\omega')$, of which the latter is $-f_1(\frac{1}{2}\omega + \frac{1}{2}\omega')$; this would give $f_1(\frac{1}{2}\omega + \frac{1}{2}\omega') = 0$, while $[f_1(\frac{1}{2}\omega + \frac{1}{2}\omega')]^2 = e_3 - e_1$. We thus infer that $f_1(z + \omega) = f_1(s)$, $[f_1(z + \omega') = -f_1(z)$, $f_1(z + \omega + \omega') = -f_1(z)$. The function $f_1(s)$ is thus doubly periodic with the periods ω and $2\omega'$; in a parallelogram of which two sides are ω and $2\omega'$ it has poles at $s = 0$, $s = \omega'$ each of the first order, and zeros of the first order at $s = \frac{1}{2}\omega$, $s = \frac{1}{2}\omega + \omega'$; it is thus a doubly periodic function of the second order with two different poles of the first order in its parallelogram $(\omega, 2\omega')$. We may similarly consider the functions $f_2(s) = [\mathrm{P}(s) - e_2]^{\frac{1}{2}}$, $f_3(s) = [\mathrm{P}(s) - e_3]^{\frac{1}{2}}$; they give

$$f_2(s + \omega + \omega') = f_2(s), \quad f_2(s + \omega) = -f_2(s), \quad f_2(s + \omega') = -f_2(s),$$
$$f_3(s + \omega') = f_3(s, \quad f_3(s + \omega) = -f_3(s), \quad f_3(s + \omega + \omega') = -f_3(s).$$

Taking $u = \pm(e_1 - e_3)^{\frac{1}{2}}$, with a definite determination of the constant $(e_1 - e_3)^{\frac{1}{2}}$, it is usual, taking the preliminary signs so that for $s = 0$ each of $sf_1(s)$, $sf_2(s)$, $sf_3(s)$ is equal to $+1$, to put

$$\mathrm{sn}(u) = \frac{(e_1 - e_3)^{\frac{1}{2}}}{f_1(s)}, \quad \mathrm{cn}(u) = \frac{f_2(s)}{f_1(s)}, \quad \mathrm{dn}(u) = \frac{f_3(s)}{f_1(s)},$$
$$k^2 = (e_2 - e_3)/(e_1 - e_3), \quad \mathrm{K} = \tfrac{1}{2}\omega(e_1 - e_3)^{\frac{1}{2}}, \quad i\mathrm{K}' = \tfrac{1}{2}\omega'(e_1 - e_3)^{\frac{1}{2}};$$

thus $\mathrm{sn}(u)$ is an odd doubly periodic function of the second order with the periods $4\mathrm{K}$, $2i\mathrm{K}$, having poles of the first order at $u = i\mathrm{K}'$, $u = 2\mathrm{K} + i\mathrm{K}'$, and zeros of the first order at $u = 0$, $u = 2\mathrm{K}$; similarly $\mathrm{cn}(u)$, $\mathrm{dn}(u)$ are even doubly periodic functions whose periods can be written down, and $\mathrm{sn}^2(u) + \mathrm{cn}^2(u) = 1$, $k^2\mathrm{sn}^2(u) + \mathrm{dn}^2(u) = 1$; if $x = \mathrm{sn}(u)$ we at once find, from the relations given here, that

$$\frac{du}{dx} = [(1 - x^2)(1 - k^2x^2)]^{-\frac{1}{2}};$$

if we put $x = \sin\phi$ we have

$$\frac{du}{d\phi} = [1 - k^2\sin^2\phi]^{-\frac{1}{2}},$$

and if we call ϕ the amplitude of u, we may write $\phi = \mathrm{am}(u)$, $x = \sin.\mathrm{am}(u)$, which explains the origin of the notation $\mathrm{sn}(u)$. Similarly $\mathrm{cn}(u)$ is an abbreviation of cos. $\mathrm{am}(u)$, and $\mathrm{dn}(u)$ of Δ am(u), where $\Delta(\phi)$ means $(1 - k^2\sin^2\phi)^{\frac{1}{2}}$. The addition equation for each of the functions $f_1(s)$, $f_2(s)$, $f_3(s)$ is very simple, being

$$f(s+t) = \tfrac{1}{2}\left(\frac{\partial}{\partial s} + \frac{\partial}{\partial t}\right)\log\frac{f(s)+f(t)}{f(s)-f(t)} = \frac{f(s)f'(t) - f(t)f'(s)}{f^2(s) - f^2(t)},$$

where $f'(s)$ means $df_1(s)/ds$, which is equal to $-f_2(s).f_3(s)$, and $f'(s)$

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means $[f(z)]^n$. This may be verified directly by showing, if R denote the right side of the equation, that $\partial R/\partial z = \partial R/\partial t$; this will require the use of the differential equation

$$[f_1(z)]^n = [f_1^n(z) + c_1 - c_2][f_1(z) + c_1 - c_2],$$

and in fact we find

$$\left(\frac{\partial^2}{\partial z^2} - \frac{\partial^2}{\partial t^2}\right) \log [f(z)+f(t)] = f^2(z) - f^2(t) = \left(\frac{\partial^2}{\partial z^2} - \frac{\partial^2}{\partial t^2}\right) \log [f(z)-f(t)];$$

hence it will follow that R is a function of $z+t$, and R is at once seen to reduce to $f(z)$ when $t=0$. From this the addition equation for each of the functions $\mathrm{sn}(u)$, $\mathrm{cn}(u)$, $\mathrm{dn}(u)$ can be deduced at once: if $s_1, c_1, d_1, s_2, c_2, d_2$ denote respectively $\mathrm{sn}(u_1)$, $\mathrm{cn}(u_1)$, $\mathrm{dn}(u_1)$, $\mathrm{sn}(u_2)$, $\mathrm{cn}(u_2)$, $\mathrm{dn}(u_2)$, they can be put into the forms

$$\begin{aligned} \mathrm{sn}(u_1+u_2) &= (s_1c_2d_2 + s_2c_1d_1) : \mathrm{D}, \\ \mathrm{cn}(u_1+u_2) &= (c_1c_2 - s_1s_2d_1d_2) : \mathrm{D}, \\ \mathrm{dn}(u_1+u_2) &= (d_1d_2 - k^2s_1s_2c_1c_2) : \mathrm{D}, \end{aligned}$$

where $\mathrm{D} = 1 - k^2 s_1^2 s_2^2$.

The introduction of the function $f_1(z)$ is equivalent to the introduction of the function $\mathfrak{P}(z;\ \omega,\ 2\omega')$ constructed from the periods $\omega, 2\omega'$ as was $\mathfrak{P}(z)$ from ω and ω'; denoting this function by $\mathfrak{P}_1(z)$ and its differential coefficient by $\mathfrak{P}_1'(z)$, we have in fact

$$f_1(z) = \tfrac{1}{2}\frac{\mathfrak{P}_1'(z)}{\mathfrak{P}_1(\omega') - \mathfrak{P}_1(z)}$$

as we see at once by considering the zeros and poles and the limit of $zf_1(z)$ when $z=0$. In terms of the function $\mathfrak{P}_1(z)$ the original function $\mathfrak{P}(z)$ is expressed by

$$\mathfrak{P}(z) = \mathfrak{P}_1(z) + \mathfrak{P}_1(z+\omega') - \mathfrak{P}_1(\omega'),$$

as a consideration of the poles and expansion near $z=0$ will show.

A function having ω, ω' for periods, with poles at two arbitrary points a, b and zeros at a', b', where $a'+b' = a+b$ save for an expression $m\omega + m'\omega'$, in which m, m' are integers, is a constant multiple of $\{\mathfrak{P}[z-\frac{1}{2}(a'+b')] - \mathfrak{P}[a'-\frac{1}{2}(a'+b')]\} / \{\mathfrak{P}[z-\frac{1}{2}(a+b)] - \mathfrak{P}[a-\frac{1}{2}(a+b)]\}$; if the expansion of this function near $z=a$ be

$$\lambda(z-a)^{-1} + \mu + \sum_{n=1}^{\infty} \mu_n (z-a)^n,$$

the expansion near $z=b$ is

$$-\lambda(z-b)^{-1} + \mu + \sum_{n=1}^{\infty} (-1)^n \mu_n (z-b)^n,$$

as we see by remarking that if $z'-b = -(z-a)$ the function has the same value at z and z'; hence the differential equation satisfied by the function is easily calculated in terms of the coefficients in the expansions.

From the function $\mathfrak{P}(u)$ we can obtain another function, termed the Zeta-function; it is usually denoted by $\zeta(z)$, and defined by

$$\zeta(z) - \frac{1}{z} = \int_0^z \left\{\frac{1}{z^2} - \mathfrak{P}(z)\right\} dz = \Sigma' \left(\frac{1}{z-\Omega} + \frac{1}{\Omega} + \frac{z}{\Omega^2}\right),$$

for which as before we have equations

$$\zeta(z+\omega) = \zeta(z) + 2\pi i\eta, \quad \zeta(z+\omega') = \zeta(z) + 2\pi i\eta',$$

where $2\eta, 2\eta'$ are certain constants, which in this case do not both vanish, since else $\zeta(u)$ would be a doubly periodic function with only one pole of the first order. By considering the integral

$$\int \zeta(z)\, dz$$

round the perimeter of a parallelogram of sides ω, ω' containing $z=0$ in its interior, we find $\eta\omega' - \eta'\omega = 1$, so that neither of η, η' is zero. We have $\zeta'(z) = -\mathfrak{P}(z)$. From $\zeta(z)$ by means of the equation

$$\frac{\sigma(z)}{\sigma(z)} = \exp\left\{\int_0^z \left[\zeta(z) - \frac{1}{z}\right] dz\right\} = \Pi' \left[\left(1 - \frac{z}{\Omega}\right) \exp\left(\frac{z}{\Omega} + \frac{z^2}{2\Omega^2}\right)\right],$$

we determine an integral function $\sigma(z)$, termed the Sigma-function, having a zero of the first order at each of the points $z = \Omega$; it can be seen to satisfy the equations

$$\frac{\sigma(z+\omega)}{\sigma(z)} = -\exp\{2\pi i\eta(z+\tfrac{1}{2}\omega)\}, \quad \frac{\sigma(z+\omega')}{\sigma(z)} = -\exp\{2\pi i\eta'(z+\tfrac{1}{2}\omega')\}.$$

By means of these equations, if $a_1+a_2+\ \dots\ +a_m = a'_1+a'_2+\ \dots\ +a'_m$, it is readily shown that

$$\frac{\sigma(z-a'_1)\sigma(z-a'_2)\ \dots\ \sigma(z-a'_m)}{\sigma(z-a_1)\sigma(z-a_2)\ \dots\ \sigma(z-a_m)}$$

is a doubly periodic function having $a_1, \dots a_m$ as its simple poles, and $a'_1, \dots a'_m$ as its simple zeros. Thus the function $\sigma(z)$ has the important property of enabling us to write any meromorphic doubly periodic function as a product of factors each having one zero in the parallelogram of periods; these form a generalization of the simple factors, $z-a$, which have the same utility for rational functions of z. We have $\zeta(z) = \sigma'(z)/\sigma(z)$.

The functions $\zeta(z)$, $\mathfrak{P}(z)$ may be used to write any meromorphic doubly periodic function $\mathrm{F}(z)$ as a sum of terms having each only one pole; for if in the expansion of $\mathrm{F}(z)$ near a pole $z=a$ the terms with negative powers of $z-a$ be

$$\mathrm{A}_1(z-a)^{-1} + \mathrm{A}_2(z-a)^{-2} + \dots + \mathrm{A}_{m+1}(z-a)^{-(m+1)},$$

then the difference

$$\mathrm{F}(z) - \mathrm{A}_1\zeta(z-a) - \mathrm{A}_2\mathfrak{P}(z-a) - \dots + \frac{\mathrm{A}_m(-1)^m}{m!}\mathfrak{P}^{(m-1)}(z-a)$$

will not be infinite at $z=a$. Adding to this a sum of further terms of the same form, one for each of the poles in a parallelogram of periods, we obtain, since the sum of the residues A is zero, a doubly periodic function without poles, that is, a constant; this gives the expression of $\mathrm{F}(z)$ referred to. The indefinite integral $\int \mathrm{F}(z)dz$ can then be expressed in terms of z, functions $\mathfrak{P}(z-a)$ and their differential coefficients, functions $\zeta(z-a)$ and functions $\log \sigma(z-a)$.

§ 15. *Potential Functions. Conformal Representation in General.*—Consider a circle of radius a lying within the region of existence of a single valued monogenic function, $u+iv$, of the complex variable $z = x+iy$, the origin $z=0$ being the centre of this circle. If $z = r\mathrm{E}(i\phi) = r(\cos\phi + i\sin\phi)$ be an internal point of this circle we have

$$u + iv = \frac{1}{2\pi i}\int \frac{(\mathrm{U}+i\mathrm{V})}{t-z}\, dt,$$

where $\mathrm{U}+i\mathrm{V}$ is the value of the function at a point of the circumference and $t = a\mathrm{E}(i\theta)$; this is the same as

$$u + iv = \frac{1}{2\pi}\int \frac{(\mathrm{U}+i\mathrm{V})\{1 - (r/a)\mathrm{E}(i\theta - i\phi)\}}{1 + (r/a)^2 - 2(r/a)\cos(\theta-\phi)} d\theta.$$

If in the above formula we replace z by the external point $(a^2/r)\mathrm{E}(i\phi)$ the corresponding contour integral will vanish, so that also

$$0 = \frac{1}{2\pi}\int \frac{(\mathrm{U}+i\mathrm{V})\{(r/a)\mathrm{E}(-i\phi) - (r/a)\mathrm{E}(i\theta - i\phi)\}}{1 + (r/a)^2 - 2(r/a)\cos(\theta-\phi)} d\theta;$$

hence by subtraction we have

$$u = \frac{1}{2\pi}\int \frac{\mathrm{U}(a^2 - r^2)}{a^2 + r^2 - 2ar\cos(\theta-\phi)} d\theta,$$

and a corresponding formula for v in terms of V. If O be the centre of the circle, Q be the interior point z, P the point $a\mathrm{E}(i\theta)$ of the circumference, and ω the angle which QP makes with OQ produced, this integral is at once found to be the same as

$$u = \frac{1}{\pi}\int \mathrm{U}\, d\omega - \frac{1}{2\pi}\int \mathrm{U}\, d\theta,$$

of which the second part does not depend upon the position of z, and the equivalence of the integrals holds for every arc of integration.

Conversely, let U be any continuous real function on the circumference, U_0 being the value of it at a point P_0 of the circumference, and describe a small circle with centre at P_0 cutting the given circle in A and B, so that for all points P of the arc $\mathrm{AP}_0\mathrm{B}$ we have $|\mathrm{U}-\mathrm{U}_0| < \epsilon$, where ϵ is a given small real quantity. Describe a further circle, centre P_0 within the former, cutting the given circle in A′ and B′, and let Q be restricted to lie in the small space bounded by the arc $\mathrm{A'P_0B'}$ and this second circle; then for all positions of P upon the greater arc AB of the original circle QP is greater than a definite finite quantity which is not zero, say $\mathrm{QP} > \mathrm{D}$. Consider now the integral

$$u' = \frac{1}{2\pi}\int \mathrm{U}\frac{(a^2-r^2)}{a^2+r^2-2ar\cos(\theta-\phi)} d\theta = \frac{1}{\pi}\int \mathrm{U}\, d\omega - \frac{1}{2\pi}\int \mathrm{U}\, d\theta,$$

which we evaluate as the sum of two, respectively along the small arc $\mathrm{AP_0B}$ and the greater arc AB. It is easy to verify that, for the whole circumference,

$$\mathrm{U}_0 = \frac{1}{2\pi}\int \mathrm{U}_0 \frac{a^2-r^2}{a^2+r^2-2ar\cos(\theta-\phi)} d\theta = \frac{1}{\pi}\int \mathrm{U}_0 d\omega - \frac{1}{2\pi}\int \mathrm{U}_0 d\theta.$$

Hence we can write

$$u' - \mathrm{U}_0 = \frac{1}{2\pi}\int_{\mathrm{AP_0B}} (\mathrm{U}-\mathrm{U}_0) d\omega - \frac{1}{2\pi}\int_{\mathrm{AP_0B}} (\mathrm{U}-\mathrm{U}_0) d\theta + \frac{1}{2\pi}\int_{\mathrm{AB}} (\mathrm{U}-\mathrm{U}_0)\frac{(a^2-r^2)}{\mathrm{QP}^2} d\theta.$$

If the finite angle between QA and QB be called Φ and the finite angle AOB be called Θ, the sum of the first two components is numerically less than

$$\frac{\epsilon}{2\pi}(\Phi + \Theta).$$

If the greatest value of $|\mathrm{U}-\mathrm{U}_0|$ on the greater arc AB be called H, the last component is numerically less than

$$\frac{\mathrm{H}}{2\pi}(a^2 - r^2),$$

of which, when the circle, of centre P_0, passing through A′B′ is sufficiently small, the factor a^2-r^2 is arbitrarily small. Thus it appears that u' is a function of the position of Q whose limit, when Q, interior to the original circle, approaches indefinitely near to P_0, is U_0. From the form

$$u' - \frac{1}{\pi}\int \mathrm{U}\, d\omega - \frac{1}{2\pi}\int \mathrm{U}\, d\theta,$$

since the inclination of QP to a fixed direction is, when Q varies, P remaining fixed, a solution of the differential equation

$$\frac{\partial^2 v}{\partial x^2} + \frac{\partial^2 v}{\partial y^2} = 0,$$

where $z, = x+iy$, is the point Q, we infer that u' is a differentiable

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function satisfying this equation; indeed, when $r<a$, we can write

$$\frac{1}{2\pi}\int U\frac{(a^2-r^2)}{a^2+r^2-2ar\cos(\theta-\phi)}d\theta$$
$$=\frac{1}{2\pi}\int U\left[1+2\frac{r}{a}\cos(\theta-\phi)+2\frac{r^2}{a^2}\cos 2(\theta-\phi)+\dots\right]d\theta$$
$$=a_0+a_1x+b_1y+a_2(x^2-y^2)+2b_2xy+\dots$$

where

$$a_0=\frac{1}{2\pi}\int Ud\theta,\quad a_1=\frac{1}{\pi}\int\frac{U\cos\theta}{a}d\theta,\quad b_1=\frac{1}{\pi}\int\frac{U\sin\theta}{a}d\theta,$$
$$a_2=\frac{1}{\pi}\int\frac{U\cos 2\theta}{a^2}d\theta,\quad b_2=\frac{1}{\pi}\int\frac{U\sin 2\theta}{a^2}d\theta.$$

In this series the terms of order n are sums, with real coefficients, of the various integral polynomials of dimension n which satisfy the equation $\partial^2\phi/\partial x^2+\partial^2\phi/\partial y^2$; the series is thus the real part of a power series in z, and is capable of differentiation and integration within its region of convergence.

Conversely we may suppose a function, P, defined for the interior of a finite region R of the plane of the real variables x, y, capable of expression about any interior point x_0, y_0 of this region by a power series in $x-x_0$, $y-y_0$, with real coefficients, these various series being obtainable from one of them by continuation. For any region R_0 interior to the region specified, the radii of convergence of these power series will then have a lower limit greater than zero, and hence a finite number of these power series suffice to specify the function for all points interior to R_0. Each of these series, and therefore the function, will be differentiable; suppose that at all points of R_0 the function satisfies the equation

$$\frac{\partial^2P}{\partial x^2}+\frac{\partial^2P}{\partial y^2}=0,$$

we then call it a monogenic potential function. From this, save for an additive constant, there is defined another potential function by means of the equation

$$Q=\int^{(x,y)}\left(\frac{\partial P}{\partial x}dy-\frac{\partial P}{\partial y}dx\right).$$

The functions P, Q, being given by a finite number of power series, will be single valued in R_0, and P+iQ will be a monogenic function of z within R_0. In drawing this inference it is supposed that the region R_0 is such that every closed path drawn in it is capable of being deformed continuously to a point lying within R_0 that is, is *simply connected*.

Suppose in particular, c being any point interior to R_0, that P approaches continuously, as z approaches to the boundary of R, to the value $\log r$, where r is the distance of c to the points of the perimeter of R. Then the function of z expressed by

$$\zeta=(z-c)\exp(-P-iQ)$$

will be developable by a power series in $(z-z_0)$ about every point z_0 interior to R_0, and will vanish at $z=c$; while on the boundary of R it will be of constant modulus unity. Thus if it be plotted upon a plane of ζ the boundary of R will become a circle of radius unity with centre at $\zeta=0$, this latter point corresponding to $z=c$. A closed path within R_0, passing once round $z=c$, will lead to a closed path passing once about $\zeta=0$. Thus every point of the interior of R will give rise to one point of the interior of the circle. The converse is also true, but is more difficult to prove; in fact, the differential coefficient $d\zeta/ds$ does not vanish for any point interior to R. This being assumed, we obtain a conformal representation of the interior of the region R upon the interior of a circle, in which the arbitrary interior point c of R corresponds to the centre of the circle, and, by utilizing the arbitrary constant arising in determining the function Q, an arbitrary point of the boundary of R corresponds to an arbitrary point of the circumference of the circle.

There thus arises the problem of the determination of a real monogenic potential function, single valued and finite within a given arbitrary region, with an assigned continuous value at all points of the boundary of the region. When the region is circular this problem is solved by the integral $\frac{1}{2\pi}\int Ud\omega-\frac{i}{2\pi}\int Ud\theta$ previously given. When the region is bounded by the outermost portions of the circumferences of two overlapping circles, it can hence be proved that the problem also has a solution; more generally, consider a finite simply connected region, whose boundary we suppose to consist of a single closed path in the sense previously explained, ABCD; joining A to C by two non-intersecting paths AEC, AHC lying within the region, so that the original region may be supposed to be generated by the overlapping regions AECD, CFAB, of which the common part is AECF; suppose now the problem of determining a single valued finite monogenic potential function for the region AECD with a given continuous boundary value can be solved, and also the same problem for the region CFAB; then it can be shown that the same problem can be solved for the original area. Taking indeed the values assigned for the original perimeter ABCD, assume arbitrarily values for the path AEC, continuous with one another and with the values at A and C; then determine the potential function for the interior of AECD; this will prescribe values for the path CFA which will be continuous at A and C with the values originally proposed for ABC; we can then determine a function for the interior of CFAB with the boundary values so prescribed. This in its turn will give values for the path AEC, so that we can determine a new function for the interior of AECD. With the values which this assumes along CFA we can then again determine a new function for the interior of CFAB. And so on. It can be shown that these functions, so alternately determined, have a limit representing such a potential function as is desired for the interior of the original region ABCD. There cannot be two functions with the given perimeter values, since their difference would be a monogenic potential function with boundary value zero, which can easily be shown to be everywhere zero. At least two other methods have been proposed for the solution of the same problem.

A particular case of the problem is that of the conformal representation of the interior of a closed polygon upon the upper half of the plane of a complex variable t. It can be shown without much difficulty that if $a, b, c, \dots$ be real values of t, and $\alpha, \beta, \gamma, \dots$ be n real numbers, whose sum is $n-2$, the integral

$$z=\int(t-a)^{\alpha-1}(t-b)^{\beta-1}\dots dt,$$

as t describes the real axis, describes in the plane of z a polygon of n sides with internal angles equal to $\alpha\pi$, $\beta\pi$, ..., and, a proper sign being given to the integral, points of the upper half of the plane of t give rise to interior points of the polygon. Herein the points $a, b, \dots$ of the real axis give rise to the corners of the polygon; the condition $\Sigma\alpha=n-2$ ensures merely that the point $t=\infty$ does not correspond to a corner; if this condition be not regarded, an additional corner and side is introduced in the polygon. Conversely it can be shown that the conformal representation of a polygon upon the half plane can be effected in this way; for a polygon of given position of more than three sides it is necessary for this to determine the positions of all but three of $a, b, c, \dots$; three of them may always be supposed to be at arbitrary positions, such as $t=0$, $t=1$, $t=\infty$.

As an illustration consider in the plane of z, $z=x+iy$, the portion of the imaginary axis from the origin to $z=ih$, where h is positive and less than unity; let C be this point $z=ih$; let BA be of length unity along the positive real axis, B being the origin and A the point $z=1$; let DE be of length unity along the negative real axis, D being also the origin and E the point $z=-1$; let EFA be a semicircle of radius unity, F being the point $z=i$. If we put $\zeta=[(z^2+h^2)/(1+h^2z^2)]^{\frac{1}{2}}$, with $\zeta=1$ when $z=1$, the function is single valued within the semicircle, in the plane of z, which is slit along the imaginary axis from the origin to $z=ih$; if we plot the value of ζ upon another plane, as z describes the continuous curve ABCDE, ζ will describe the real axis from $\zeta=1$ to $\zeta=-1$, the point C giving $\zeta=0$, and the points B, D giving the points $\zeta=\pm h$. Near $z=0$ the expansion of ζ is $\zeta-h=z\frac{1-h^4}{2h}+\dots$, or $\zeta+h=-z\frac{1-h^4}{2h}+\dots$; in either case an increase of $\frac{1}{2}\pi$ in the phase of z gives an increase of π in the phase of $\zeta-h$ or $\zeta+h$. Near $z=ih$ the expansion of ζ is $\zeta=(z-ih)^{\frac{1}{2}}|2ih/(1-h^4)|^{\frac{1}{2}}+\dots$, and an increase of 2π in the phase of $z-ih$ also leads to an increase of π in the phase of ζ. Then as z describes the semicircle EFA, ζ also describes a semicircle of radius unity, the point $z=i$ becoming $\zeta=i$. There is thus a conformal representation of the interior of the slit semicircle in the z-plane, upon the interior of the whole semicircle in the ζ-plane, the function

$$z=[(\zeta^2-h^2)/(1-h^2\zeta^2)]^{\frac{1}{2}}$$

being single valued in the latter semicircle. By means of a transformation $t=(\zeta+i)^2/(\zeta-i)^2$, the semicircle in the plane of ζ can further be conformably represented upon the upper half of the whole plane of t.

As another illustration we may take the conformal representation of an equilateral triangle upon a half plane. Taking the elliptic function $\mathfrak{P}(u)$ for which $\mathfrak{P}'^2(u)=4\mathfrak{P}^3(u)-e_1$, so that, with $\epsilon=\exp(\frac{2}{3}\pi i)$, we have $e_1=1$, $e_2=\epsilon^2$, $e_3=\epsilon$, the half periods may be taken to be

$$\tfrac{1}{2}\omega=\int_1^\infty\frac{dt}{2(t^3-1)^{\frac{1}{2}}},\quad \tfrac{1}{2}\omega'=\int_{\epsilon^2}^\infty\frac{dt}{2(t^3-1)^{\frac{1}{2}}}=\tfrac{1}{2}\epsilon\omega;$$

drawing the equilateral triangle whose vertices are O, of argument O, A of argument ω, and B of argument $\omega+\omega'=-\epsilon^2\omega$, and the equilateral triangle whose angular points are O, B and C, of arguments ω', let E, of argument $\frac{1}{2}(2\omega+\omega')$, and D, of argument $\frac{1}{2}(\omega+2\omega')$, be the centroids of these triangles respectively, and let BE, OE, AE cut OA, AB, BO in K, L, H respectively, and BD, OD, CD cut OC, BC, OA in F, G, I respectively; then if u and v be any point of the interior of the triangle OEI and $v=\epsilon u_0=\epsilon(\zeta-i)$ be any point of the interior of the triangle OHD, the points respectively of the ten triangles OEK, EKA, EAL, ELB, EBH, DHB, DBG, DGC, DCF, DFO are at once seen to be given by $-v$, $\omega+v$, $\omega-\epsilon^2v$, $\omega+\epsilon u'+\epsilon^2v$, $\omega+\omega'-v$, $\omega+\omega'-u$, $\omega+\omega'+\epsilon^2v$, $\omega'-\epsilon u$, $\omega'+\epsilon^2v$, $-\epsilon^2u$. Further, when u is real, since the term $-2(u+mo+m'\epsilon\omega)^{-1}$, which is the conjugate complex of $-2(u+mo+m'\epsilon\omega)^{-2}$, arises in the infinite sum which expresses $\mathfrak{P}'(u)$, namely as $-2(u+\mu\omega+\mu'\omega)^{-2}$, where $\mu=m-m'$, $\mu'=-m'$, it follows that $\mathfrak{P}'(u)$ is real; in a similar way we prove that $\mathfrak{P}'(u)$ is pure imaginary when u is pure imaginary, and that $\mathfrak{P}'(u)=\mathfrak{P}'(\epsilon u)=\mathfrak{P}'(\epsilon^2u)$, as also that for $v=\epsilon u_0$, $\mathfrak{P}'(v)$ is the conjugate complex of $\mathfrak{P}'(u)$. Hence it follows that the variable $t=\frac{1}{2}i\mathfrak{P}'(u)$

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takes each real value once as u passes along the perimeter of the triangle ODE, being as can be shown respectively ∞, 1, 0, -1 at O, D, H, E, and takes every complex value of imaginary part positive once in the interior of this triangle. This leads to

$$u = \tfrac{1}{2}i\int_1^\infty (t^2-1)^{-\frac{1}{2}}dt$$

in accordance with the general theory.

It can be deduced that $\tau = \bar{\tau}$ represents the triangle ODH on the upper half plane of τ, and $\zeta = (1-\tau^{-1})^{\frac{1}{2}}$ represents similarly the triangle OBD.

§ 16. *Multiple valued Functions. Algebraic Functions.*—The explanations and definitions of a monogenic function hitherto given have been framed for the most part with a view to single valued functions. But starting from a power series, say in $z-c$, which represents a single value all points of its circle of convergence, suppose that, by means of a derived series in $z-c'$, where c' is interior to the circle of convergence, we can continue the function beyond this, and then by means of a series derived from the first derived series we can make a further continuation, and so on; it may well be that when, after a closed circuit, we again consider points in the first circle of convergence, the value represented may not agree with the original value. One example is the case $z^{\frac{1}{2}}$, for which two values exist for any value of z; another is the generalized logarithm $\lambda(z)$, for which there is an infinite number of values. In such cases, as before, the region of existence of the function consists of all points which can be reached by such continuations with power series, and the singular points, which are the limiting points of the point-aggregate constituting the region of existence, are those points in whose neighbourhood the radii of convergence of derived series have zero for limit. In this description the point $z = \infty$ does not occupy an exceptional position, a power series in $z-c$ being transformed to a series in $1/z$ when z is near enough to c by means of $z-c = c(1-cz^{-1})[-(1-cz^{-1})]^{-1}$, and a series in $1/z$ to a series in $z-c$, when z is near enough to c, by means of $\frac{1}{z} = \frac{1}{c}\left(1+\frac{z-c}{c}\right)^{-1}$.

The commonest case of the occurrence of multiple valued functions is that in which the function z satisfies an algebraic equation $f(z,s) = \rho_0 s^n + \rho_1 s^{n-1} + \ldots + \rho_n = 0$, wherein $\rho_0, \rho_1 \ldots \rho_n$ are integral polynomials in z. Assuming $f(z,s)$ incapable of being written as a product of polynomials rational in z and s, and excepting values of z for which the polynomial coefficient of s^n vanishes, as also the values of z for which beside $f(z,s) = 0$ we have also $\partial f(z,s)/\partial s = 0$, and also in general the point $z = \infty$, the roots of this equation about any point $z = c$ are given by n power series in $z-c$. About a finite point c, or for which the equation $\partial f(z,s)/\partial s = 0$ is satisfied by one or more of the roots z of $f(z,s) = 0$, the n roots break up into a certain number of cycles, the r roots of a cycle being given by a set of power series in a radical $(z-c)^{1/r}$, these series of the cycle being collectively unaltered one another by replacing $(z-c)^{1/r}$ by $\omega(z-c)^{1/r}$, where ω, equal to $\exp(2\pi i/r)$, is one of the rth roots of unity. Putting then $z-c = t^r$ we may say that the r roots of a cycle are given by a single power series in t, an increase of 2π in the phase of t giving an increase of $2\pi r$ in the phase of $z-c$. This single series in t, giving the values of s belonging to one cycle in the neighbourhood of $z = c$ when the phase of $z-c$ varies through $2\pi r$, is to be looked upon as defining a single *place* among the aggregate of values of z and s which satisfy $f(z,s) = 0$; two such places may be at the same *point* ($z = c$, $z = d$) without coinciding, the corresponding power series for the neighbouring points being different. Thus for an ordinary value of z, $z = c$, there are n places for which the neighbouring values of z are given by n power series in $z-c$; for a value of z for which $\partial f(z,s)/\partial s = 0$ there are less than n places. Similar remarks hold for the neighbourhood of $z = \infty$; there may be n places whose neighbourhood is given by n power series in z^{-1} or fewer, one of these being associated with a series in t, where $t = (z^{-1})^{\frac{1}{r}}$, the number of values of r which thus arise is always n. In general, then, we may say, with t of one of the forms $(z-c)$, $(z-c)^{1/r}$, z^{-1}, $(z^{-1})^{1/r}$, that the neighbourhood of any place (c,d) for which $f(c,d) = 0$ is given by a pair of expressions $z = c+P(t)$, $s = d+Q(t)$, where $P(t)$ is a (particular case of a) power series vanishing for $t = 0$, and $Q(t)$ is a power series vanishing for $t = 0$, and t vanishes at (c,d), the expression $z-c$ being replaced by z^{-1} when c is infinite, and similarly the expression $s-d$ by s^{-1} when d is infinite. The last case arises when we consider the finite values of z for which the polynomial coefficient of s^n vanishes. Of such a pair of expressions we may obtain a continuation by writing $t = b_1 + \lambda_1\tau + \lambda_2\tau^2 + \ldots$, where τ is a new variable and λ_1 is not zero; in particular for an ordinary finite place this equation simply becomes $t = b_1 + \tau$. It can be shown that all the pairs of power series $z = c+P(t)$, $s = d+Q(t)$ which are necessary to represent all pairs of values of z, s satisfying the equation $f(z,s) = 0$ can be obtained from one of them by this process of continuation, a fact which we express by saying that the equation $f(z,s) = 0$ defines a *monogenic algebraic construct*. With less accuracy we may say that an irreducible algebraic equation $f(z,s) = 0$ determines a single monogenic function s of z.

Any rational function of z and s, where $f(z,s) = 0$, may be considered in the neighbourhood of any place (c,d) by substituting therein $z = c+P(t)$, $s = d+Q(t)$; the result is necessarily of the form $t^m R(t)$, where $R(0)$ is a power series in t not vanishing for $t = 0$ and m is an integer. If this integer is positive, the function is said to vanish to order m at the place; if this integer is negative, $= -\mu$, the function is infinite to order μ at the place. More generally, if A be an arbitrary constant, and, near (c,d), $R(z,s) - A$ is of the form $t^m H(t)$, where m is positive, we say that $R(z,s)$ becomes m times equal to A at the place; if $R(z,s)$ is infinite of order μ at the place, so also is $R(z,s) - A$. It can be shown that the sum of the values of m at all the places, including the places $z = \infty$, where $R(z,s)$ vanishes, which we call the number of zeros of $R(z,s)$ on the algebraic construct, is finite, and equal to the sum of the values of μ where $R(z,s)$ is infinite, and more generally equal to the sum of the values of m where $R(z,s) = A$; this we express by saying that a rational function $R(z,s)$ takes any value (including ∞) the same number of times on the algebraic construct; this number is called the *order* of the rational function.

That the total number of zeros of $R(z,s)$ is finite is at once obvious, these values being obtainable by rational elimination of z between $f(z,s) = 0$, $R(z,s) = 0$. That the number is equal to the total number of infinities is best deduced by means of a theorem which is also of more general utility. Let $R(z,s)$ be any rational function of z, s, which are connected by $f(z,s) = 0$; about any place (c,d) for which $z = c+P(t)$, $s = d+Q(t)$, expand the product

$$R(z,s)\frac{dz}{dt}$$

in powers of t and pick out the coefficient of t^{-1}. There is only a finite number of places of this kind. The theorem is that the sum of these coefficients of t^{-1} is zero. This we express by

$$\left[R(z,s)\frac{dz}{dt}\right]_{t^{-1}} = 0.$$

The theorem holds for the case $n = 1$, that is, for rational functions of one variable z; in that case, about any finite point we have $z-c = t$, and about $z = \infty$ we have $z^{-1} = t$, and therefore $dz/dt = -t^{-2}$; in the first case, then, the theorem is that in any rational function of z,

$$\Sigma\left(\frac{A_1}{z-a} + \frac{A_2}{(z-a)^2} + \ldots + \frac{A_m}{(z-a)^m}\right) + P_0z^k + P_1z^{k-1} + \ldots + R,$$

the sum ΣA_1 of the sum of the residues at the finite poles is equal to the coefficient of $1/z$ in the expansion, in ascending powers of $1/z$, about $z = \infty$; an obvious result. In general, if for a finite place of the algebraic construct associated with $f(z,s) = 0$, whose neighbourhood is given by $z = c+F, s = d+Q(t)$, there be a coefficient of t^{-1} in $R(z,s)\,dz/dt$, this will be r times the coefficient of t^{-r} in $R(z,s)$ or $R[d+Q(t), c+t^r]$, namely r^{-1} be the coefficient of t^{-r} in the sum of the r series obtainable from $R[d+Q(t), c+t^r]$ by replacing t by ωt, where ω is an rth root of unity; thus the sum of the coefficients of t^{-1} in $R(z,s)dz/dt$ for all the places which arise for $z = c$, and the corresponding values of s, is equal to the coefficient of $(z-c)^{-1}$ in $R(z,s)+R(z,s)+\ldots+R(z,s)$, where $z_1, \ldots s_n$ are the n values of z for a value of z near to $z = c$; this latter sum $\Sigma R(z_1, z)$ is, however, a rational function of z only. Similarly, near $z = \infty$, for a place given by $z^{-1} = F$, $s = d+Q(t)$, or $z^{-1} = c+Q(t)$, the coefficient of t^{-1} in $R(z,s)dz/dt$ is equal to $-r$ times the coefficient of F in $R[d+Q(t), F^r]$, that is equal to the negative coefficient of z^{-1} in the sum of the r series $R[d+Q(\omega t), F^r]$, so that, as before, the sum of the coefficients of t^{-1} in $R(z,s)dz/dt$ at the various places which arise for $z = \infty$ is equal to the negative coefficient of z^{-1} in the same rational function of z, $\Sigma R(z_1, z)$. Thus, from the corresponding theorem for rational functions of one variable, the general theorem now being proved is seen to follow.

Apply this theorem now to the rational function of z and s,

$$\frac{1}{R(z,s)}\frac{dR(z,s)}{dz};$$

at a zero of $R(z,s)$ near which $R(z,s) = t^m H(t)$, we have

$$\frac{1}{R(z,s)}\frac{dR(z,s)}{dz}\frac{dz}{dt} = \frac{d}{dt}[\lambda R(z,s)]],$$

where λ denotes the generalized logarithmic function, that is equal to $mt^{-1}+$ power series in t;

similarly at a place for which $R(z,s) = t^{-n}K(t)$; the theorem

$$\left[\frac{1}{R(z,s)}\frac{dR(z,s)}{dz}\frac{dz}{dt}\right]_{t^{-1}} = 0$$

thus gives $\Sigma m = \Sigma\mu$, or, in words, the total number of zeros of $R(z,s)$ on the algebraic construct is equal to the total number of its poles. The same is therefore true of the function $R(z,s) - A$, where A is an arbitrary constant; thus the number in question, being equal to the number of poles of $R(z,s) - A$, is equal also to the number of times that $R(z,s) = A$ on the algebraic construct.

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We have seen above that all single valued doubly periodic meromorphic functions, with the same periods, are rational functions of two variables s, z connected by an equation of the form $s^2 = 4z^3 + Az + B$. Taking account of the relation connecting these variables s, z with the argument of the doubly periodic functions (which was above denoted by z), it can then easily be seen that the theorem now proved is a generalization of the theorem proved previously establishing for a doubly periodic function a definite *order*. There exists a generalization of another theorem also proved above for doubly periodic functions, namely, that the sum of the values of the argument in one parallelogram of periods for which a doubly periodic function takes a given value is independent of that value; this generalization, known as Abel's Theorem, is given § 17 below.

§ 17. *Integrals of Algebraic Functions.*—In treatises on Integral Calculus it is proved that if $R(z)$ denote any rational function, an indefinite integral $\int R(z)dz$ can be evaluated in terms of rational and logarithmic functions, including the inverse trigonometrical functions. In generalization of this it was long ago discovered that if $s^2 = az^2 + bz + c$ and $R(z, z)$ be any rational function of z, z any integral $\int R(z, z)\, dz$ can be evaluated in terms of rational functions of z, z and logarithms of such functions; the simplest case is $\int z^{-1}dz$ or $\int (az^2 + bz + c)^{-\frac{1}{2}}dz$. More generally if $f(z, z) = 0$ be such a relation connecting z, z that when θ is an appropriate rational function of z and z both z and z are rationally expressible, in virtue of $f(z, z) = 0$ in terms of θ, the integral $\int R(z, z)dz$ is reducible to a form $\int H(\theta)d\theta$, where $H(\theta)$ is rational in θ, and can therefore also be evaluated by rational functions and logarithms of rational functions of z and z. It was natural to inquire whether a similar theorem holds for integrals $\int R(z, z)dz$ wherein z^2 is a cubic polynomial in z. The answer is in the negative. For instance, no one of the three integrals

$$\int \frac{dz}{z}, \quad \int \frac{dz}{z}, \quad \int \frac{ds}{(s-c)z}$$

can be expressed by rational and logarithms of rational functions of z and z; but it can be shown that every integral $\int R(z, z)dz$ can be expressed by means of integrals of these three types together with rational and logarithms of rational functions of z and z (see below under § 20, *Elliptic Integrals*). A similar theorem is true when z^2 = quartic polynomial in z; in fact when $z^2 = A(z-a)(z-b)(z-c)(z-d)$, putting $y = z(z-a)^{-2}$, $x = (z-a)^{-1}$, we obtain y^2 = cubic polynomial in x. Much less is the theorem true when the fundamental relation $f(z, z) = 0$ is of more general type. There exists then, however, a very general theorem, known as *Abel's Theorem*, which may be enunciated as follows: Beside the rational function $R(z, z)$ occurring in the integral $\int R(z, z)dz$, consider another rational function $H(z, z)$; let $(a_1), \ldots (a_n)$ denote the places of the construct associated with the fundamental equation $f(z, z) = 0$, for which $H(z, z)$ is equal to one value A, each taken with its proper multiplicity, and let $(b_1), \ldots (b_m)$ denote the places for which $H(z, z) = B$, where B is another value; then the sum of the m integrals $\int_{(a_1)}^{(b_1)} R(z, z)\, dz$ is equal to the sum of the coefficients of t^{-1} in the expansions of the function

$$R(z, z)\frac{dz}{dt} \lambda \left\{\frac{H(z, z) - B}{H(z, z) - A}\right\},$$

where λ denotes the generalized logarithmic function, at the various places where the expansion of $R(z, z)dz/dt$ contains negative powers of t. This fact may be obtained at once from the equation

$$\left[\frac{1}{H(z, z) - \mu} R(z, z)\frac{dz}{dt}\right]_{t=0} = 0,$$

wherein μ is a constant. (For illustrations see below, under § 20, *Elliptic Integrals*.)

§ 18. *Indeterminateness of Algebraic Integrals.*—The theorem that the integral $\int_a^z f(z)dz$ is independent of the path from a to z, holds only on the hypothesis that any two such paths are equivalent, that is, taken together from the complete boundary of a region of the plane within which $f(z)$ is finite and single valued, besides being differentiable. Suppose that these conditions fail only at a finite number of isolated points in the finite part of the plane. Then any path from a to z is equivalent, in the sense explained, to any other path together with closed paths beginning and ending at the arbitrary point a each enclosing one or more of the exceptional points, these closed paths being chosen, when $f(z)$ is not a single valued function, so that the final value of $f(z)$ at a is equal to its initial value. It is necessary for the statement that this condition may be capable of being satisfied.

For instance, the integral $\int^z z^{-1}dz$ is liable to an additive indeterminateness equal to the value obtained by a closed path about $z = 0$, which is equal to $2\pi i$; if we put $u = \int^z z^{-1}dz$ and consider z as a function of u, then we must regard this function as unaffected by the addition of $2\pi i$ to its argument u; we know in fact that $z = \exp(u)$ and is a single valued function of u, with the period $2\pi i$. Or again the integral $\int_0^z (1+z^2)^{-1}dz$ is liable to an additive indeterminateness equal to the value obtained by a closed path about either of the points $z = \pm i$; thus if we put $u = \int_0^z (1+z^2)^{-1}dz$, the function z of u is periodic with period π, this being the function $\tan(u)$. Next we take the integral $u = \int_{(a)}^{(z)} (1-z^2)^{-\frac{1}{2}}dz$, agreeing that the upper and lower limits refer not only to definite values of z, but to definite values of z each associated with a definite determination of the sign of the associated radical $(1-z^2)^{-\frac{1}{2}}$. We suppose $1-z$, $1+z$ each to have phase zero for $z = 0$; then a single closed circuit of $z = -1$ will lead back to $z = a$ with $(1-z^2)^{\frac{1}{2}} = -1$; the additive indeterminateness of the integral, obtained by a closed path which restores the initial value of the subject of integration, may be obtained by a closed circuit containing both the points $z = \pm 1$ in its interior: this gives, since the integral taken about a vanishing circle whose centre is either of the points $z = \pm 1$ has ultimately the value zero, the sum

$$\int_0^{-1} \frac{dz}{(1-z^2)^{\frac{1}{2}}} + \int_{-1}^{0} \frac{dz}{-(1-z^2)^{\frac{1}{2}}} + \int_0^{+1} \frac{dz}{-(1-z^2)^{\frac{1}{2}}} + \int_{+1}^{0} \frac{dz}{(1-z^2)^{\frac{1}{2}}},$$

where, in each case, $(1-z^2)^{\frac{1}{2}}$ is real and positive; that is, it gives

$$\int_{-1}^{+1} \frac{dz}{(1-z^2)^{\frac{1}{2}}}$$

or 2π. Thus the additive indeterminateness of the integral is of the form $2k\pi$, where k is an integer, and the function z of u, which is $\sin(u)$, has 2π for period. Take now the case

$$u = \int_{(a)}^{(z)} \frac{dz}{\sqrt{(z-a)(z-b)(z-c)(z-d)}},$$

adopting a definite determination for the phase of each of the factors $z-a$, $z-b$, $z-c$, $z-d$ at the arbitrary initial value a, and supposing the upper limit to refer, not only to a definite value of z, but also to a definite determination of the radical under the sign of integration. From z_0 describe a closed loop about the point $z = a$, consisting, suppose, of a straight path from z_0 to a, followed by a vanishing circle whose centre is at a, completed by the straight path from a to z_0. Let similar loops be imagined for each of the points b, c, d, no two of these having a point in common. Let A denote the value obtained by the positive circuit of the first loop; this will be in fact equal to twice the integral taken from z_0 along the straight path to a; for the contribution due to the vanishing circle is ultimately zero, and the effect of the circuit of this circle is to change the sign of the subject of integration. After the circuit about a, we arrive back at z_0 with the subject of integration changed in sign; let B, C, D denote the values of the integral taken by the loops enclosing respectively b, c and d when in each case the initial determination of the subject of integration is that adopted in calculating A. If then we take a circuit from z_0 enclosing both a and b but not either c or d, the value obtained will be A−B, and on returning to z_0 the subject of integration will have its initial value. It appears thus that the integral is subject to an additive indeterminateness equal to any one of the six differences such as A−B. Of these there are only two linearly independent: for clearly only A−B, A−C, A−D are linearly independent, and in fact, as we see by taking a closed circuit enclosing all of a, b, c, d, we have A−B+C−D = 0; for there is no other point in the plane beside a, b, c, d about which the subject of integration suffers a change of sign, and a circuit enclosing all of a, b, c, d may by putting $z = 1/\zeta$ be reduced to a circuit about $\zeta = 0$ about which the value of the integral is zero. The general value of the integral for any position of z and the associated sign of the radical, when we start with a definite determination of the subject of integration, is thus seen to be of the form $u_0 + m(A-B) + n(A-C)$, where m and n are integers. The value of A−B is independent of the position of z_0, being obtainable by a single closed positive circuit about a and b only; it is thus equal to twice the integral taken once from a to b, with a proper initial determination of the radical under the sign of integration. Similar remarks to the above apply to any integral $\int H(z)dz$, in which $H(z)$ is an algebraic function of z; in any such case $H(z)$ is a rational function of z and a quantity z connected therewith by an irreducible rational algebraic

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equation $f(s,z)=0$. Such an integral $\int K(s,z)\,dz$ is called an Abelian Integral.

§ 19. *Reversion of an Algebraic Integral.*—In a limited number of cases the equation $u=\int_a^s H(z)\,dz$, in which $H(z)$ is an algebraic function of z, defines z as a single valued function of u. Several cases of this have been mentioned in the previous section; from what was previously proved under § 14, *Doubly Periodic Functions*, it appears that it is necessary for this that the integral should have at most two linearly independent additive constants of indeterminateness; for instance, for an integral

$$u=\int_{z_0}^{z}(z-a)(z-b)(z-c)(z-d)(z-e)(z-f)^{-\frac{1}{2}}dz,$$

there are three such constants, of the form A−B, A−C, A−D, which are not connected by any linear equation with integral coefficients, and z is not a single valued function of u.

§ 20. *Elliptic Integrals.*—An integral of the form $\int R(z,s)\,dz$, where s denotes the square root of a quartic polynomial in z, which may reduce to a cubic polynomial, and R denotes a rational function of z and s, is called an *elliptic integral*.

To each value of z belong two values of s, of opposite sign; starting, for some particular value of z, with a definite one of these two values, the sign to be attached to s for any other value of z will be determined by the path of integration for z. When z is in the neighbourhood of any finite value z_0 for which the radical s is not zero, if we put $z-z_0=t$, we can find $z-s$ as a power series in t, say $z-z_0+Q(t)$; when z is in the neighbourhood of a value, a, for which s vanishes, if we put $z=a+t^2$, we shall obtain $s=tQ(t)$, where $Q(t)$ is a power series in t; when z is very large and s^2 is a quartic polynomial in z, if we put $z^{-1}=t$, we shall find $s^{-1}=tQ(t)$; when z is very large and s^2 is a cubic polynomial in z, if we put $z=t^2$, we shall find $s^{-1}=t^2Q(t)$. By means of substitutions of these forms the character of the integral $\int R(z,s)\,dz$ may be investigated for any position of z; in any case it takes a form $\int(1/t^{-m}+Kt^{-m+1}+\ldots+Pt^{-1}+K+Sz+\ldots)dt$ involving only a finite number of negative powers of t in the subject of integration. Consider first the particular case $\int z^{-1}dz$; it is easily seen that neither for any finite nor for infinite values of z can negative powers of t enter; the integral is *everywhere finite*, and is said to be of *the first kind*; it can, moreover, be shown without difficulty that no integral $\int R(z,s)\,dz$, save a constant multiple of $\int z^{-1}dz$, has this property. Consider next, s^2 being of the form $a_0z^4+4a_1z^3+\ldots$, wherein a_0 may be zero, the integral $\int(a_0z^2+2a_1z)z^{-3}dz$; for any finite value of z this integral is easily proved to be everywhere finite; but for infinite values of z its value is of the form $Az^{-1}+Q(t)$, where $Q(t)$ is a power series; denoting by $\sqrt{a_0}$ a particular square root of a_0 when a_0 is not zero, the integral becomes infinite for $z=\infty$ for both signs of s, the value of A being $+\sqrt{a_0}$ or $-\sqrt{a_0}$ according as s is $\sqrt{a_0}z^2\left(1+\frac{2a_1}{a_0}z^{-1}+\ldots\right)$ or is the negative of this; hence the integral $\mathrm{J}_1=\int\left(\frac{a_0z^2+2a_1z}{s}+\sqrt{a_0}\right)dz$ becomes infinite when z is infinite, for the former sign of s, its infinite term being $2\sqrt{a_0}.t^{-1}$ or $2\sqrt{a_0}.z$, but does not become infinite for z infinite for the other sign of s. When $a_0=0$ the signs of $z=\infty$ are not separated, being obtained one from the other by a circuit of z about an infinitely large circle, and the form obtained represents an integral becoming infinite as before for $z=\infty$, its infinite part being $2\sqrt{a_1}.t^{-1}$ or $2\sqrt{a_1}.\sqrt{z}$. Similarly if z_0 be any finite value of z which is not a root of the polynomial $f(z)$ to which s^2 is equal, and s_0 denotes a particular one of the determinations of s for $z=z_0$, the integral

$$\mathrm{J}_2=\int\left\{\frac{s^2+(z-z_0)f'(z_0)}{(z-z_0)^2s}+\frac{s_0}{(z-z_0)^2}\right\}dz,$$

wherein $f'(z)=df(z)/dz$, becomes infinite for $z=z_0$, $s=s_0$, but not for $z=z_0$, $s=-s_0$, it is infinite term in the former case being the negative of $2s_0/(z-z_0)$. For no other finite or infinite value of z is the integral infinite. If $s=0$ be a root of $f(z)$, in which case the corresponding value of z is zero, the integral

$$\mathrm{J}_3=\mathrm{J}'(\theta)\int\frac{dz}{(z-\theta)s}$$

becomes infinite for $z=\theta$, its infinite part being, if $z-\theta=t^2$, equal to $-\mathrm{J}'(\theta)/t^{-1}$; and this integral is not elsewhere infinite. In each of these cases, of the integrals J_1, J_2, J_3, the subject of integration has been chosen so that when the integral is written near its point of infinity in the form $f(t^{-1}+Kt^{-2}+\ldots)dt$, the coefficient K is zero, so that the infinity is of algebraic kind, and so that, when there are two signs distinguishable for the critical value of z, the integral becomes infinite for only one of these. An integral having only algebraic infinities, for finite or infinite values of z, is called an integral of the *second kind*, and it appears that such an integral can be formed with only one such infinity, that is, for an infinity arising only for one particular, and arbitrary, pair of values (z,s) satisfying the equation $s^2=f(z)$, this infinity being of the first order. A function having an algebraic infinity of the mth order $(m>1)$, only for one sign of s when these signs are separable, at (i) $z=\infty$, (2) $z=z_0$, (3) $z=a$, is given respectively by $\left(z\frac{d}{dz}\right)^{m-1}\mathrm{J}_1$, $\left(z\frac{d}{dz}\right)^{m-1}\mathrm{J}_2$, $\left(z\frac{d}{dz}\right)^{m-1}\mathrm{J}_3$, having algebraic infinities we can, by subtraction from it of an appropriate sum of constant multiples of J_1, J_2, J_3 and their differential coefficients just written down, obtain, as the result, an integral without algebraic infinities. But, in fact, if, J^1 denote any two of the three integrals J_1, J_2, J_3, there exists an equation $\mathrm{AJ}+\mathrm{BJ}'+Cfs^{-1}dz=$ rational function of z, s, where A,B,C are properly chosen constants. For the rational function

$$\frac{z+z_0}{z-z_0}+s\sqrt{a_0}$$

is at once found to become infinite for (z_0,s_0), not for $(z_0,-s_0)$, its infinite part for the first point being $2s/(z-z_0)$, and to become infinite for z infinitely large, and one sign of s only when these are separable, its infinite part there being $2s\sqrt{a_0}$ or $2\sqrt{a_1}z$ when $a_0=0$. It does not become infinite for any other pair (z,s) satisfying the relation $s^2=f(z)$; this is in accordance with the easily verified equation

$$\frac{z+z_0}{z-z_0}+s\sqrt{a_0}-\mathrm{J}_1+\mathrm{J}_2+(a_0z_0^2+2a_1z_0)\int\frac{dz}{s}=0;$$

and there exists the analogous equation

$$\frac{s}{z-\theta}+s\sqrt{a_0}-\mathrm{J}_1+\mathrm{J}_3+(a_0\theta^2+2a_1\theta)\int\frac{dz}{s}=0.$$

Consider now the integral

$$\mathrm{P}=\int\left(\frac{z+z_0}{z-z_0}+s\sqrt{a_0}\right)\frac{dz}{2s};$$

this is at once found to be infinite, for finite values of z, only for (z_0,s_0), its infinite part being $\log(z-z_0)$, and for $z=\infty$, for one sign of s only when these are separable, its infinite part being $-\log t$, that is $-\log z$ when $a_0=0$, and $-\log(z^{\frac{1}{2}})$ when $a_0=0$. And, if $f(\theta)=0$, the integral

$$\mathrm{P}_1=\int\left(\frac{s}{z-\theta}+s\sqrt{a_0}\right)\frac{dz}{2s}$$

is infinite at $z=\theta$, $s=0$ with an infinite part $\log t$, that is $\log(z-\theta)^{\frac{1}{2}}$, is not infinite for any other finite value of z, and is infinite like P for $z=\infty$. An integral possessing such logarithmic infinities is said to be of the *third kind*.

Hence it appears that any elliptic integral, by subtraction from it of an appropriate sum formed with constant multiples of the integral J_1 and the rational functions of the form $\left(\frac{d}{dz}\right)^{m-1}\mathrm{J}_1$ with constant multiples of integrals such as P or P_1, with constant multiples of the integral $u=\int s^{-1}dz$, and with rational functions, can be reduced to an integral H becoming infinite only for $z=\infty$, for one sign of s only when these are separable, its infinite part being of the form A $\log t$, that is, A $\log z$ or A $\log(z^{\frac{1}{2}})$. Such an integral $\mathrm{H}=f\mathrm{R}(z,s)\,dz$ does not exist, however, as we at once find by writing $\mathrm{R}(z,s)=\mathrm{P}(z)+s\mathrm{Q}(z)$, where $\mathrm{P}(z)$, $\mathrm{Q}(z)$ are rational functions of z, and examining the forms possible for these in order that the integral may have only the specified infinity. An analogous theorem holds for rational functions of z and s; there exists no rational function which is finite for finite values of z and is infinite only for $z=\infty$ for one sign of s and to the first order only; but there exists a rational function infinite in all to the first order for each of two or more pairs (z,s), however they may be situated, or infinite to the second order for an arbitrary pair (z,s); and any rational function may be formed by a sum of constant multiples of functions such as

$$\frac{s+s_0}{z-z_0}+s\sqrt{a_0}\text{ or }\frac{s}{z-\theta}+s\sqrt{a_0}$$

and their differential coefficients.

The consideration of elliptic integrals is therefore reducible to that of the three

$$u=\int\frac{dz}{s},\quad \mathrm{J}=\int\left(\frac{a_0z^2+2a_1z}{s}+s\sqrt{a_0}\right)dz,\quad \mathrm{P}=\int\left(\frac{z+z_0}{z-z_0}+s\sqrt{a_0}\right)\frac{dz}{2s}$$

respectively of the first, second and third kind. Now the equation $s^2=a_0(z-\theta)(z-\phi)(z-\psi)(z-\chi)$, by putting

$$y=2s(z-\theta)^{-2}[a_0(\theta-\phi)(\theta-\psi)(\theta-\chi)]^{-\frac{1}{2}}$$

$$x=\frac{1}{z-\theta}+\frac{1}{3}\left(\frac{1}{\theta-\phi}+\frac{1}{\theta-\psi}+\frac{1}{\theta-\chi}\right)$$

is at once reduced to the form $y^2=4x^3-g_2x-g_3=4(x-e_1)(x-e_2)(x-e_3)$, say; and these equations enable us to express z and s rationally in terms of x and y. It is therefore sufficient to consider three elliptic integrals

$$u=\int\frac{dx}{y},\quad \mathrm{J}=\int\frac{xdx}{y},\quad \mathrm{P}=\int\frac{y+y_0}{x-x_0}\frac{dx}{2y}.$$

Of these consider the first, putting

$$u=\int_{(\infty)}^{(x)}\frac{dx}{y},$$

where the limits involve not only a value for x, but a definite sign for the radical y. When x is very large, if we put $x^{-1}=t^2$, $y^{-1}=2t^3(1-\frac{1}{2}g_2t^4-\frac{1}{4}g_3t^6)^{-\frac{1}{2}}$, we have

$$u=\int_0^t(1+\tfrac{1}{2}g_2t^4+\ldots)dt=t+\tfrac{1}{10}g_2t^5+\ldots,$$

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whereby a definite power series in u, valid for sufficiently small value of u, is found for t, and hence a definite power series for x, of the form

$$x = u^{-2} + g_0 u^2 + \dots .$$

Let this expression be valid for $0 < |u| < R$, and the function defined thereby, which has a pole of the second order for $u = 0$, be denoted by $\phi(u)$. In the range in question it is single valued and satisfies the differential equation

$$[\phi'(u)]^2 = 4[\phi(u)]^3 - g_2\phi(u) - g_3;$$

in terms of it we can write $x = \phi(u)$, $y = -\phi'(u)$, and, $\phi'(u)$ being an odd function, the sign attached to y in the original integral for $x = \infty$ is immaterial. Now for any two values u, v in the range in question consider the function

$$F(u,v) = \tfrac{1}{4}\left[\frac{\phi'(u) - \phi'(v)}{\phi(u) - \phi(v)}\right]^2 - \phi(u) - \phi(v);$$

it is at once seen, from the differential equation, to be such that $\partial F/\partial u = \partial F/\partial v$; it is therefore a function of $u+v$; supposing $|u+v| < R$ we infer therefore, by putting $v = 0$, that

$$\phi(u+v) = \tfrac{1}{4}\left[\frac{\phi'(u) - \phi'(v)}{\phi(u) - \phi(v)}\right]^2 - \phi(u) - \phi(v).$$

By repetition of this equation we infer that if $u_1, \dots u_n$ be any arguments each of which is in absolute value less than R, whose sum is also in absolute value less than R, then $\phi(u_1 + \dots + u_n)$ is a rational function of the $2n$ functions $\phi(u_s)$, $\phi'(u_s)$; and hence, if $|u| < R$, that

$$\phi(nu) = \mathrm{H}\left[\phi\left(\frac{u}{n}\right),\ \phi'\left(\frac{u}{n}\right)\right],$$

where H is some rational function of the arguments $\phi(u/n)$, $\phi'(u/n)$. In fact, however, so long as $|u/n| < R$, each of the functions $\phi(u/n)$, $\phi'(u/n)$ is single valued and without singularity, save for the pole at $u = 0$; and a rational function of single valued functions, each of which has no singularities other than poles in a certain region, is also a single valued function without singularities other than poles in this region. We infer, therefore, that the function of u expressed by

$$\mathrm{H}\left[\phi\left(\frac{u}{n}\right),\ \phi'\left(\frac{u}{n}\right)\right]$$

is single valued and without singularities other than poles so long as $|u| < nR$; it agrees with $\phi(u)$ when $|u| < R$, and hence furnishes a continuation of this function over the extended range $|u| < nR$. Moreover, from the method of its derivation, it satisfies the differential equation $[\phi'(u)]^2 = 4[\phi(u)]^3 - g_2\phi(u) - g_3$. This equation has therefore one solution which is a single valued monogenic function with no singularities other than poles for any finite part of the plane, having in particular for $u = 0$, a pole of the second order; and the method adopted for obtaining this near $u = 0$ shows that the differential equation has no other such solution. This, however, is not the only solution which is a single valued mcromorphic function, all the functions $\phi(u+u)$, wherein a is arbitrary, being such. Taking now any range of values of u, from $u = 0$, and putting for any value of u, $x = \phi(u)$, $y = -\phi'(u)$, so that $y^2 = 4x^3 - g_2x - g_3$, we clearly have

$$u = \int_{(x_0,y)}^{(x,y)} \frac{dx}{y};$$

conversely if $x_0 = \phi(u_0)$, $y_0 = -\phi'(u_0)$ and ξ, η be any values satisfying $\eta^2 = 4\xi^3 - g_2\xi - g_3$, which are sufficiently near respectively to x_0, y_0, while v is defined by

$$v - u_0 = -\int_{(x_0,y_0)}^{(\xi,\eta)} \frac{d\xi}{\eta},$$

then ξ, η are respectively $\phi(v)$ and $-\phi'(v)$; for this equation leads to an expansion for $\xi - x_0$ in terms of $v - u_0$, and only one such expansion, and this is obtained by the same work as would be necessary to expand $\phi(v)$ when v is near to u_0: the function $\phi(u)$ can therefore be continued by the help of this equation, from $v = u_0$, provided the lower limit of $|\xi - x_0|$ necessary for the expansions is not zero in the neighbourhood of any value (x_0, y_0). In fact the function $\phi(u)$ can have only a finite number of poles in any finite part of the plane of u; each of these can be surrounded by a small circle, and in the portion of the finite part of the plane of u which is outside these circles, the lower limit of the radii of convergence of the expansions of $\phi(u)$ is greater than zero; the same will therefore be the case for the lower limit of the radii $|\xi - x_0|$ necessary for the continuations spoken of above provided that the values of (ξ, η) considered do not lead to infinitely increasing values of v; there does not exist, however, any definite point (ξ_0, η_0) in the neighbourhood of which the integral $\int_{(x_0,y_0)}^{(\xi,\eta)} \frac{d\xi}{\eta}$ increases indefinitely, it is only by a path of infinite length that the integral can so increase. We infer therefore that if (ξ, η) be any point, where $\eta^2 = 4\xi^3 - g_2\xi - g_3$, and v be defined by

$$v = \int_{(\xi,\eta)}^{(\infty)} \frac{dx}{y},$$

then $\xi = \phi(v)$ and $\eta = -\phi'(v)$. Thus this equation determines (ξ, η) without ambiguity. In particular the additive indeterminateneses of the integral obtained by closed circuits of the point of integration are periods of the function $\phi(u)$; by considerations advanced above it appears that these periods are sums of integral multiples of two which may be taken to be

$$\omega = 2\int_{e_1}^{\infty} \frac{dx}{y},\quad \omega' = 2\int_{e_3}^{\infty} \frac{dx}{y};$$

these quantities cannot therefore have a real ratio, for else, being periods of a monogenic function, they would, as we have previously seen, be each integral multiples of another period; there would then be a closed path for (x,y), starting from an arbitrary point (x_0,y_0), other than one enclosing two of the points $(e_1,0)$, $(e_2,0)$, $(e_3,0)$, (∞,∞), which leads back to the initial point (x_0,y_0), which is impassible. On the whole, therefore, it appears that the function $\phi(u)$ agrees with the function $\mathfrak{P}(u)$ previously discussed, and the discussion of the elliptic integrals can be continued in the manner given under § 14, *Doubly Periodic Functions*.

§ 21. *Modular Functions.*—One result of the previous theory is the remarkable fact that if

$$\omega = 2\int_{e_1}^{e_2} \frac{dx}{y},\quad \omega' = 2\int_{e_3}^{e_2} \frac{dx}{y},$$

where $y^2 = 4(x-e_1)(x-e_2)(x-e_3)$, then we have

$$e_1 = (\tfrac{1}{2}\omega)^{-2} + \Sigma'[\{(m+\tfrac{1}{2})\omega + m'\omega'\}^{-2} - \{m\omega + m'\omega'\}^{-2}],$$

and a similar equation for e_3, where the summation refers to all integer values of m and m' other than the one pair $m = 0$, $m' = 0$. This, with similar results, has led to the consideration of functions of the complex ratio ω'/ω.

It is easy to see that the series for $\mathfrak{P}(u)$, $u^{-2} + \Sigma'[(u+m\omega+m'\omega')^{-2} - (m\omega+m'\omega')^{-2}]$, is unaffected by replacing ω, ω' by two quantities Ω, Ω' equal respectively to $p\omega+q\omega'$, $p'\omega+q'\omega'$, where p, q, p', q' are any integers for which $pq' - p'q = \pm 1$; further it can be proved that all substitutions with integer coefficients $\Omega = p\omega + q\omega'$, $\Omega' = p'\omega + q'\omega'$, wherein $pq' - p'q = 1$, can be built up by repetitions of the two particular substitutions $(\Omega = -\omega', \Omega' = \omega)$, $(\Omega = \omega, \Omega' = \omega + \omega')$. Consider the function of the ratio ω'/ω expressed by

$$k = -\mathfrak{P}(\tfrac{1}{2}\omega')/\mathfrak{P}(\tfrac{1}{2}\omega);$$

it is at once seen from the properties of the function $\mathfrak{P}(u)$ that by the two particular substitutions referred to we obtain the corresponding substitutions for k expressed by

$$k' = 1/k,\quad k' = 1 - k;$$

thus, by all the integer substitutions $\Omega = p\omega + q\omega'$, $\Omega' = p'\omega + q'\omega'$, in which $pq' - p'q = 1$, the function k can only take one of the six values k, $1/k$, $1-k$, $1/(1-k)$, $k/(k-1)$, $(k-1)/k$, which are the roots of an equation in θ,

$$\frac{(1-\theta+\theta^2)^3}{\theta^2(1-\theta)^2} = \frac{(1-k+k^2)^3}{k^2(1-k)^2};$$

the function of τ, $=\omega'/\omega$, expressed by the right side, is thus unaltered by every one of the substitutions $\tau' = \dfrac{p'+q'\tau}{p+q\tau}$, wherein p, q, p', q' are integers having $pq' - p'q = 1$. If the imaginary part of σ, of τ, which we may write $\tau = \rho + i\sigma$, is positive, the imaginary part of τ', which is equal to $\sigma(pq' - p'q)/(p+q\rho)^2 + q^2\sigma^2|$, is also positive; suppose σ to be positive; it can be shown that if the upper half of the infinite plane of the complex variable τ can be divided into regions, all bounded by arcs of circles (or straight lines), no two of these regions overlapping, such that any substitution of the kind under consideration, $\tau' = (p' + q'\tau)/(p+q\tau)$ leads from an arbitrary point τ, of one of these regions, to a point τ' of another; taking $\tau = \rho + i\sigma$, one of these regions may be taken to be that for which $-\frac{1}{2} < \rho < \frac{1}{2}$, $\rho^2 + \sigma^2 > 1$, together with the points for which ρ is negative on the curves limiting this region; then every other region is obtained from this so-called fundamental region by one and only one of the substitutions $\tau = (p' + q'\tau)/(p+qr)$, and hence by a definite combination of the substitutions $\tau' = -1/\tau$, $\tau' = 1 + \tau$. Upon the infinite half plane of τ, the function considered above,

$$s(\tau) = \frac{[\mathfrak{P}'(\tfrac{1}{2}\omega) + \mathfrak{P}'(\tfrac{1}{2}\omega')\mathfrak{P}(\tfrac{1}{2}\omega')]^3}{\mathfrak{P}^2(\tfrac{1}{2}\omega)\mathfrak{P}(\tfrac{1}{2}\omega')[\mathfrak{P}(\tfrac{1}{2}\omega) + \mathfrak{P}(\tfrac{1}{2}\omega')]^2},$$

is a single valued monogenic function, whose only essential singularities are the points $\tau' = (p' + q'\tau)/(p+q\tau)$ for which $\tau = \infty$, namely those for which τ' is any real rational value; the real axis is thus a line over which the function $s(\tau)$ cannot be continued, having an essential singularity in every arc of it, however short; in the fundamental region, $s(\tau)$ has thus only the single essential singularity, $\tau = \rho + i\sigma$, where $\sigma = \infty$; in this fundamental region $s(\tau)$ takes any assigned complex value just once, the relation $s(\tau') = s(\tau)$ requiring, as can be shown, that τ' is of the form $(p' + q'\tau)/(p+qr)$, in which p, q, p', q' are integers with $pq' - p'q = 1$; the function $s(\tau)$ has thus a similar behaviour in every other of the regions. The division of the plane into regions is analogous to the division of the plane, in the case of doubly periodic functions, into parallelograms; in that case we considered only functions without essential singularities, and in each of the regions the function assumed every complex value twice, at least. Putting, as another function of τ, $J(\tau) = s(\tau)/[s(\tau) - 1]$, it can be shown that $J(\tau) = 0$ for $\tau = \exp(\frac{2}{3}\pi i)$, that $J(\tau) = 1$ for $\tau = i$, these being values of τ on the boundary of the fundamental region; like $s(\tau)$ it has an essential singularity for $\tau = \rho + i\sigma$, $\sigma = +\infty$. In the

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theory of linear differential equations it is important to consider the inverse function $\tau(\mathrm{J})$; this is infinitely many valued, having a cycle of three values for circulation of J about $\mathrm{J}=0$ (the circuit of this point leading to a linear substitution for τ of period 3, such as $\tau'=-(1+\tau)^{-1}$), having a cycle of two values about $\mathrm{J}=1$ (the circuit leading to a linear substitution for τ of period 2, such as $\tau'=-\tau^{-1}$), and having a cycle of infinitely many values about $\mathrm{J}=\infty$ (the circuit leading to a linear substitution for τ which is not periodic, such as $\tau'=1+\tau$). These are the only singularities for the function $\tau(\mathrm{J})$. Each of the functions

$$\mathrm{J}(\tau),\quad \mathrm{J}(\tau)-1,\quad \left[-\frac{\mathfrak{P}(\tfrac{1}{2}\omega)+2\mathfrak{P}(\tfrac{1}{2}\omega')}{\mathfrak{P}(\tfrac{1}{2}\omega)-\mathfrak{P}(\tfrac{1}{2}\omega')}\right]^2,$$

beside many others (see below), is a single valued function of τ, and is expressible without ambiguity in terms of the single valued function of τ,

$$\eta(\tau)=\exp\left(\frac{i\pi\tau}{12}\right)\prod_{n=1}^{\infty}(1-\exp(2i\pi n\tau)),$$
$$=\exp\left(\frac{i\pi\tau}{12}\right)\sum_{m=-\infty}^{\infty}(-1)^m\exp\left[(3m^2+m)i\pi\tau\right].$$

It should be remarked, however, that $\eta(\tau)$ is not unaltered by all the substitutions we have considered; in fact

$$\eta(-\tau^{-1})=(-i\tau)i\eta(\tau),\quad \eta(1+\tau)=\exp(i\tfrac{1}{12}\pi)\eta(\tau).$$

The aggregate of the substitutions $\tau'=(p'+q'\tau)/(p+q\tau)$, wherein $p,\ q,\ p',\ q'$ are integers with $pq'-p'q=1$, represents a *Group*; the function $\mathrm{J}(\tau)$, unaltered by all the group substitutions, is called a *Modular Function*. More generally any function unaltered by all the substitutions of a group of linear substitutions of its variable is called an *Automorphic Function*. A rational function, of its variable h, of this character, is the function $(1-k+k^2)^3k^{-2}(1-k)^{-2}$ presenting itself incidentally above; and there are other rational functions with a similar property, the group of substitutions belonging to any one of these being, what is a very curious fact, associable with that of the rotations of one of the regular solids, about an axis through its centre, which bring the solid into coincidence with itself. Other automorphic functions are the double periodic functions already discussed; these, as we have seen, enable us to solve the algebraic equation $y^2=4x^3-g_2x-g_3$ (and in fact many other algebraic equations, see below, under § 23, *Geometrical Applications of Elliptic Functions*) in terms of single valued functions $x=\mathfrak{P}(u)$, $y=\mathfrak{P}'(u)$. A similar utility, of a more extended kind, belongs to automorphic functions in general; but it can be shown that such functions necessarily have an infinite number of essential singularities except for the simplest cases.

The modular function $\mathrm{J}(\tau)$ considered above, unaltered by the group of linear substitutions $\tau'=(p'+q'\tau)/(p+q\tau)$, where $p,\ q,\ p',\ q'$ are integers with $pq'-p'q=1$, may be taken as the independent variable x of a differential equation of the third order, of the form

$$\frac{s'''}{s'}-\frac{3}{2}\left(\frac{s''}{s'}\right)^2=\frac{1-a^2}{2(x-1)^2}+\frac{1-\beta^2}{2x^2}+\frac{a^2+\beta^2-\gamma^2-1}{2x(x-1)},$$

where $s'=ds/dx$, &c., of which the dependent variable s is equal to τ. A differential equation of this form is satisfied by the quotient of two independent integrals of the linear differential equation of the second order satisfied by the hypergeometric functions. If the solution of the differential equation for s be written $s(\alpha,\beta,\gamma,x)$, we have in fact $\tau=s(\tfrac{1}{2},\tfrac{1}{2},0,\mathrm{J})$. If we introduce also the function of τ given by

$$\lambda=\frac{2\mathfrak{P}(\tfrac{1}{2}\omega')+\mathfrak{P}(\tfrac{1}{2}\omega)}{\mathfrak{P}(\tfrac{1}{2}\omega)-\mathfrak{P}(\tfrac{1}{2}\omega)},$$

we similarly have $\tau=s(0,0,0,\lambda)$; this function λ is a single valued function of τ, which is also a modular function, being unaltered by a group of integral substitutions also of the form $\tau'=(p'+q'\tau)/(p+q\tau)$, with $pq'-p'q=1$, but with the restriction that p' and q are even integers, and therefore p and q' are odd integers. This group is thus a subgroup of the general modular group, and is in fact of the kind called a self-conjugate subgroup. As in the general case this subgroup is associated with a subdivision of the plane into regions of which any one is obtained from a particular region, called the fundamental region, by a particular one of the substitutions of the subgroup. This fundamental region, putting $\tau=\sigma+i\rho$, may be taken to be that given by $-1<\sigma\leq 1$, $(\sigma+\frac{1}{2})^2+\rho^2>\frac{1}{4}$, $(\sigma-\frac{1}{2})^2+\rho^2>\frac{1}{4}$, and is built up of six of the regions which arose for the general modular group associated with $\mathrm{J}(\tau)$. Within this fundamental region, λ takes every complex value just once, except the values $\lambda=0,\ 1,\ \infty$, which arise only at the angular points $\tau=0$, $\tau=\infty$, $\tau=-1$ and the equivalent point $\tau=1$; these angular points are essential singularities for the function $\lambda(\tau)$. For $\lambda(\tau)$as for $\mathrm{J}(\tau)$, the region of existence is the upper half plane of τ, there being an essential singularity in every length of the real axis, however short.

If, beside the plane of τ, we take a plane to represent the values of λ, the function $\tau=s(0,0,0,\lambda)$ being considered thereon, the values of τ belonging to the interior of the fundamental region of the τ-plane considered above, will require the consideration of the whole of the λ-plane taken once with the exception of the portions of the real axis lying between $-\infty$ and 0 and between 1 and $+\infty$, the two sides of the first portion corresponding to the circumferences of the τ-plane expressed by $(\rho+\frac{1}{2})^2+\sigma^2=\frac{1}{4}$, $(\rho-\frac{1}{2})^2+\sigma^2=\frac{1}{4}$, while the two sides of the latter portion, for which λ is real and >1, correspond to the lines of the τ-plane expressed by $\rho=\infty$. The line for which λ is real, positive and less than unity corresponds to the imaginary axis of the τ-plane, lying in the interior of the fundamental region. All the values of $\tau=s(0,0,0,\lambda)$ may then be derived from those belonging to the fundamental region of the τ-plane by making λ describe a proper succession of circuits about the points $\lambda=0$, $\lambda=1$; any such circuit subjects τ to a linear substitution of the subgroup of τ considered, and corresponds to a change of τ from a point of the fundamental region to a corresponding point of one of the other regions.

§ 22. *A Property of Integral Functions deduced from the Theory of Modular Functions.*—Consider now the function $\exp(s)$, for finite values of z; for such values of z, $\exp(z)$ never vanishes, and it is impossible to assign a closed circuit for z in the finite part of the plane of z which will make the function $\lambda=\exp(z)$ pass through a closed succession of values in the plane of λ having $\lambda=0$ in its interior; the function $s[0,0,0,\exp(z)]$, however z vary in the finite part of the plane, will therefore never be subjected to those linear substitutions imposed upon $s(0,0,0,\lambda)$ by a circuit of λ about $\lambda=0$; more generally, if $\phi(z)$ be an integral function of z, never becoming either zero or unity for finite values of z, the function $\lambda=\phi(z)$, however z vary in the finite part of the plane, will never make, in the plane of λ, a circuit about either $\lambda=0$ or $\lambda=1$, and $s(0,0,0,\lambda)$, that is $s[0,0,0,\phi(z)]$, will be single valued for all finite values of z; it will moreover remain finite, and be monogenic. In other words, $s[0,0,0,\phi(z)]$ is also an integral function—whose imaginary part, moreover, by the property of $s(0,0,0,\lambda)$, remains positive for all finite values of z. In that case, however, $\exp\{is[0,0,0,\phi(z)]\}$ would also be an integral function of z with modulus less than unity for all finite values of z. If, however, we describe a circle of radius R in the z plane, and consider the greatest value of the modulus of an integral function upon this circle, this certainly increases indefinitely as R increases. We can infer therefore that *an integral function* $\phi(z)$ *which does not vanish for any finite value of* z, *takes the value unity and hence* (by considering the function $\mathrm{A}^{-1}\phi(z)$) *takes every other value for some definite value of* z; or, an integral function for which both the equations $\phi(z)=\mathrm{A}$, $\phi(z)=\mathrm{B}$ are unsatisfied by definite values of z, does not exist, A and B being arbitrary constants.

A similar theorem can be proved in regard to the values assumed by the function $\phi(z)$ for points z of modulus greater than R, however great R may be, also with the help of modular functions. In general terms it may be stated that it is a very exceptional thing for an integral function not to assume every complex value an infinite number of times.

Another application of modular functions is to prove that the function $s(\alpha,\beta,\gamma,\lambda)$ is a single valued function of $\tau=s(0,0,0,\lambda)$; for, putting $\tau'=(\sigma-i)/(\sigma+i)$, the values of λ which correspond to the singular points $\lambda=0,\ 1,\ \infty$ of $s(\alpha,\beta,\gamma,\lambda)$, though infinite in number, all lie on the circumference of the circle $|\tau'|=1$, within which therefore $s(\alpha,\beta,\gamma,x)$ is expressible in a form $\sum_{n=0}^{\infty}a_n\tau'^n$. More generally any monogenic function of λ which is single valued save for circuits of the points $\lambda=0,\ 1,\ \infty$, is a single valued function of $\tau=s(0,0,0,\lambda)$. Identifying λ with the square of the modulus in Legendre's form of the elliptical integral, we have $\tau=iK'/K$, where

$$\mathrm{K}=\int_0^1\frac{dt}{\sqrt{[1-t^2][1-\lambda t^2]}},\quad \mathrm{K}'=\int_0^1\frac{dt}{\sqrt{[1-t^2][1-(1-\lambda)t^2]}};$$

functions such as $\lambda^{\frac{1}{4}}$, $(1-\lambda)^{\frac{1}{4}}$, $[\lambda(1-\lambda)]^{\frac{1}{4}}$, which have only $\lambda=0,\ 1,\ \infty$ as singular points, were expressed by Jacobi as power series in $q=e^{i\pi\tau}$, and therefore, at least for a limited range of values of τ, as single valued functions of τ; it follows by the theorem given that any product of a root of λ and a root of $1-\lambda$ is a single valued function of τ. More generally the differential equation

$$x(1-x)\frac{d^2y}{dx^2}+[\gamma-(\alpha+\beta+1)x]\frac{dy}{dx}-\alpha\beta y=0$$

may be solved by expressing both the independent and dependent variables as single valued functions of a single variable τ, the expression for the independent variable being $x=\lambda(\tau)$.

§ 23. *Geometrical Applications of Elliptic Functions.*—Consider any irreducible algebraic equation rational in $x,y,f(x,y)=0$, of such a form that the equation represents a plane curve of order n with $\frac{1}{2}n(n-3)$ double points; taking upon this curve $n-3$ arbitrary fixed points, draw through these and the double points the most general curve of order $n-2$; this will intersect

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f in $n(n-2)-n(n-3)=3$ other points, and will contain homogeneously at least $\frac{1}{2}(n-1)n-\frac{1}{2}n(n-3)-(n-3)=3$ arbitrary constants, and so will be of the form $\lambda\phi+\lambda_1\phi_1+\lambda_2\phi_2+\ldots=0$, wherein $\lambda_1, \lambda_2, \ldots$ are a linearly connected zero. Put now $\xi=\phi_1/\phi$, $\eta=\phi_2/\phi$ and eliminate x,y between these equations and $f(x,y)=0$, so obtaining a rational irreducible equation $F(\xi,\eta)=0$, representing a further plane curve. To any point (x,y) of f will then correspond a definite point (ξ,η) of F.

For a general position of (x,y) upon f the equations $\phi_1(x',y')/\phi(x',y')=\phi_1(x,y)/\phi(x,y)$, $\phi_2(x',y')/\phi(x',y')=\phi_2(x,y)/\phi(x,y)$, subject to $f(x',y')=0$, will have the same number of solutions (x',y'); if their only solution is $x'=x$, $y'=y$, then to any position (ξ,η) of F will conversely correspond only one position (x,y) of f. If these equations have another solution beside (x,y), then any curve $\lambda\phi+\lambda_1\phi_1+\lambda_2\phi_2=0$ which passes (through the double points of f and) through the $n-2$ points of f constituted by the fixed $n-3$ points and a point (x_0,y_0), will necessarily pass through a further point, say (x_0',y_0'), and will have only one further intersection with f; such a curve, with the $n-2$ assigned points, beside the double points, of f, will be of the form $\mu\phi+\mu_1\phi_1+\ldots=0$, where $\mu, \mu_1, \mu_2 \ldots$ are generally zero; considering the curves $\psi+l\phi_1=0$, for variable l, one of these passes through a further arbitrary point of f, by choosing l properly, and conversely an arbitrary value of l determines a single further point of f; the co-ordinates of the points of f are thus rational functions of a parameter l, which is itself expressible rationally by the co-ordinates of the point; it can be shown algebraically that such a curve has only $\frac{1}{2}(n-1)(n-2)+1$ double points.

We may therefore assume that to every point of F corresponds only one point of f, and there is a birational transformation between these curves; the coefficients in this transformation will involve rationally the co-ordinates of the fixed points taken upon f, that is, at the least, by taking these to be consecutive points, will involve the co-ordinates of one point of f, and will not be rational in the coefficients of f unless we can specify a point of f whose co-ordinates are rational in these. The curve F is intersected by a straight line $a\xi+b\eta+c=0$ in as many points as the number of unspecified intersections of f with $a\phi+b\phi_1+c\phi_2=0$, that is, 3; or F will be a cubic curve, without double points.

Such a cubic curve has at least one point of inflection Y, and if a variable line YPQ be drawn through Y to cut the curve again in P and Q, the locus of a point R such that YR is the harmonic mean of YP and YQ, is easily proved to be a straight line. Take now a triangle of reference for homogeneous co-ordinates XYZ, of which this straight line is $Y=0$, and the inflexional tangent at Y is $Z=0$; the equation of the cubic curve will then be of the form

$$ZY^2=aX^3+bX^2Z+cXZ^2+dZ^3;$$

by putting X equal to $\lambda X+\mu Z$, that is, choosing a suitable line through Y to be $X=0$, and choosing λ properly, this is reduced to the form

$$ZY^2=4X^3-g_2XZ^2-g_3Z^3,$$

of which a representation is given, valid for every point, in terms of the elliptic functions $\mathfrak{P}(u)$, $\mathfrak{P}'(u)$, by taking $X=2\mathfrak{P}(u)$, $Y=2\mathfrak{P}'(u)$. The value of u belonging to any point is definite save for sums of integral multiples of the periods of the elliptic functions, being given by

$$u=\int_{(\infty)}^{(x)}\frac{2dX-Xdz}{2Y},$$

where (∞) denotes the point of inflection.

It thus appears that the co-ordinates of any point of a plane curve, f, of order n with $\frac{1}{2}(n-3)n$ double points are expressible as elliptic functions, there being, save for periods, a definite value of the argument u belonging to every point of the curve. It can then be shown that if a variable curve, ϕ, of order m be drawn, passing through the double points of the curve, the values of the argument u at the remaining intersections of ϕ with f, have a sum which is unaffected by variation of the coefficients of ϕ, save for additive aggregates of the periods. In virtue of the birational transformation this theorem can be deduced from the theorem that if any straight line cut the cubic $y^2=4x^3-g_2x-g_3$, in points (u_1), (u_2), (u_3), the sum $u_1+u_2+u_3$ is zero, or a period; or the general theorem is a corollary from Abel's theorem proved under § 17, *Integrals of Algebraic Functions*. To prove the result directly for the cubic we remark that the variation of one of the intersections (x,y) of the cubic with the straight line $y=mx+n$, due to a variation δm, δn in m and n, is obtained by differentiation of the equation for the three abscissae, namely the equation

$$F(x)=4x^3-g_2x-g_3-(mx+n)^2=0,$$

and is thus given by

$$\frac{dx}{y}=2\frac{x\delta m+\delta n}{F'(x)},$$

and the sum of three such fractions as that on the right for the three roots of $F(x)=0$ is zero; hence $u_1+u_2+u_3$ is independent of the straight line considered; if in particular this become the inflexional tangent each of u_1, u_2, u_3 vanishes. It may be remarked in passing that $x_1+x_2+x_3=\frac{1}{3}m^2$, and hence is $\frac{1}{2}\{(y_1-y_2)/(x_1-x_2)\}^2$; so that we have another proof of the addition equation for the function $\mathfrak{P}(u)$. From this theorem for the cubic curve many of its geometrical properties, as for example those of its inflections, the properties of inscribed polygons, of the three kinds of corresponding points, and the theory of residuation, are at once obvious. And similar results hold for the curve of order n with $\frac{1}{2}(n-3)n$ double points.

§ 24. *Integrals of Algebraic Functions in Connexion with the Theory of Plane Curves.*—The developments which have been explained in connexion with elliptic functions may enable the reader to appreciate the vastly more extensive theory similarly arising for any algebraical irrationality, $f(x,y)=0$.

The algebraical integrals $\int R(x,y)dx$ associated with this may as before be divided into those of the *first kind*, which have no infinities, those of the *second kind*, possessing only algebraical infinities, and those of the *third kind*, for which logarithmic infinities enter. Here there is a certain number, p, greater than unity, of linearly independent integrals of the first kind; and this number p is unaltered by any birational transformation of the fundamental equation $f(x,y)=0$; a rational function can be constructed with poles of the first order at $p+1$ arbitrary positions (x,y), satisfying $f(x,y)=0$, but not with a fewer number unless their positions are chosen properly, a property we found for the case $p=1$; and p is the number of linearly independent curves of order $n-3$ passing through the double points of the curve of order n expressed by $f(x,y)=0$. Again any integral of the second kind can be expressed as a sum of p integrals of this kind, with poles of the first order at arbitrary positions, together with rational functions and integrals of the first kind; and an integral of the second kind can be found with one pole of the first order of arbitrary position, and an integral of the third kind with two logarithmic infinities, also of arbitrary position; the corresponding properties for $p=1$ are proved below.

There is, however, a difference of essential kind in regard to the inversion of integrals of the first kind; if $u=\int R(x,y)dx$ be such an integral, it can be shown, in common with all algebraic integrals associated with $f(x,y)=0$, to have $2p$ linearly independent additive constants of indeterminateness; the upper limit of the integral cannot therefore, as we have shown, be a single valued function of the value of the integral. The corresponding theorem, if $\int R_1(x,y)dx$ denote one of the integrals of the first kind, is that the p equations

$$\int R_1(x,y)dx_1+\ldots+\int R_1(x_p,y_p)dx_p=u_1,$$

determine the rational symmetric functions of the p positions $(x_1,y_1), \ldots (x_p,y_p)$ as single valued functions of the p variables, $u_1 \ldots u_p$. It is thus necessary to enter into the theory of functions of several independent variables; and the equation $f(x,y)=0$ is thus not, in this way, capable of solution by single valued functions of one variable. That solution in fact is to be sought with the help of automorphic functions, which, however, as has been remarked, have, for $p>1$, an infinite number of essential singularities.

§ 25. *Monogenic Functions of Several Independent Variables.*—A monogenic function of several independent complex variables $u_1, \ldots u_p$ is to be regarded as given by an aggregate of power series all obtainable by continuation from any one of them in a manner analogous to that before explained in the case of one independent variable. The singular points, defined as the limiting points of the range over which such continuation is possible, may either be *poles*, or *polar points of indetermination*, or *essential singularities*.

A pole is a point $(u_1^{(0)}, \ldots u_p^{(0)})$ in the neighbourhood of which the function is expressible as a quotient of converging power series in $u_1-u_1^{(0)} \ldots u_p-u_p^{(0)}$; of these the denominator series D must vanish at $(u_1^{(0)}, \ldots u_p^{(0)})$, since else the fraction is expressible as a power series and the point is not a singular point, but the numerator series N must not also vanish at $(u_1^{(0)}, \ldots u_p^{(0)})$, or if it does, it must be possible to write $D=M'\ \ N=MN_0$, where M is a converging power series vanishing at $u_1^{(0)}, \ldots u_p^{(0)}$, and N_0 is a converging power series, in $(u_1-u_1^{(0)}, \ldots u_p-u_p^{(0)})$, not so vanishing. A polar point of indetermination is a point about which the function can be expressed as a quotient of two converging power series, *both* of which vanish at the point. As in such a simple case as $(Ax+By)/(ax+by)$, about $x=0$, $y=0$, it can be proved that then the function can be made to approach to any arbitrarily assigned value by making the variables $u_1, \ldots u_p$ approach to $u_1^{(0)}, \ldots u_p^{(0)}$ by a proper path. It is the necessary existence of such polar points of indetermination, which in case $p>2$ are not merely isolated points, which renders the theory essentially more difficult than that of functions of one variable. An essential singularity is any which does not come under one of the two former descriptions and includes very various possibilities. A point at infinity in this theory is one for which any one of the variables $u_1, \ldots u_p$ is infinitely great; such points are brought under the preceding definitions by means

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of the convention that for $u_1^{(0)} = \infty$, the difference $u_1 - u_1^{(0)}$ is to be understood to stand for u_1^{-1}. This being so, a single valued function of $u_1, \ldots u_\rho$ without essential singularities for infinite or finite values of the variables can be shown, by induction, to be, as in the case of $\rho = 1$, necessarily a rational function of the variables. A function having no singularities for finite values of all the variables is as before called an integral function; it is expressible by a power series converging for all finite values of the variables; a single valued function having for finite values of the variables no singularities other than poles or polar points of indetermination is called a meromorphic function; as for $\rho = 1$ such a function can be expressed as a quotient of two integral functions having no common zero point other than the points of indetermination of the function; but the proof of this theorem is difficult.

The single valued functions which occur, as explained above, in the inversion of algebraic integrals of the first kind, for $\rho > 1$, are meromorphic. They must also be periodic, unaffected that is when the variables $u_1, \ldots u_\rho$ are *simultaneously* increased each by a proper constant, these being the additive constants of indeterminateness for the ρ integrals $\int R_r(x,y)dx$ arising when (x,y) makes a closed circuit, the same for each integral. The theory of such single valued meromorphic periodic functions is simpler than that of meromorphic functions of several variables in general, as it is sufficient to consider only finite values of the variables; it is the natural extension of the theory of doubly periodic functions previously discussed. It can be shown to reduce, though the proof of this requires considerable developments of which we cannot speak, to the theory of a single integral function of $u_1, \ldots u_\rho$, called the *Theta Function*. This is expressible as a series of positive integral powers of ρ exponentials of positive integral powers of ρ sets in all, can be shown to be expressible rationally in terms of $\rho+1$ such periodic functions connected by a single algebraic equation. Let $x_1, \ldots x_\rho$, y denote $\rho+1$ such functions; then each of the partial derivatives dx_r/du_1 will equally be a meromorphic function of the same periods, and so expressible rationally in terms of $x_1, \ldots x_\rho, y$; thus there will exist ρ equations of the form

$$dx_r = R_1 du_1 + \ldots + R_\rho du_\rho,$$

and hence ρ equations of the form

$$du_i = H_{i,1} dx_1 + \ldots + H_{i,\rho} dx_\rho,$$

wherein $H_{i,j}$ are rational functions of $x_1, \ldots x_\rho, y$, these being connected by a fundamental algebraical relation, say $f(x_1, \ldots x_\rho, y) = 0$. This then is the generalized form of the corresponding equation for $p = 1$.

§ 26. *Multiply-Periodic Functions and the Theory of Surfaces.*—The theory of algebraic integrals $fR(x,y)dx$, wherein x,y are connected by a rational equation $f(x,y) = 0$, has developed concurrently with the theory of algebraic curves; in particular the existence of the number p invariant by all birational transformations is one result of an extensive theory in which curves capable of birational correspondence are regarded as equivalent; this point of view has made possible a general theory of what might otherwise have remained a collection of isolated theorems.

In recent years developments have been made which are, in a similar unity of conception as possible for surfaces, or indeed for algebraic constructs of any number of dimensions. These developments have been in two directions, at first followed independently, but now happily brought into the most intimate connexion. On the analytical side, E. Picard has considered the possibility of classifying integrals of the form $f(Rdx + Sdy)$, belonging to a surface $f(x,y,z) = 0$, wherein R and S are rational functions of x, y, z, according as they are (1) everywhere finite, (2) have poles, which then lie along curves upon the surface, or (3) have logarithmic infinities, also lying along curves, and has brought the theory to a high degree of perfection. On the geometrical side A. Clebsch and M. Noether, and more recently the Italian school, have considered the geometrical characteristics of a surface which are unaltered by birational transformation. It was first remarked that for surfaces of order n there are associated surfaces of order $n-4$, having properties in relation thereto analogous to those of curves of order $n-3$ for a plane curve of order n; if such a surface $f(x,y,z) = 0$ have a double curve with triple points triple also for the surface, and $\phi(x,y,z) = 0$ be a surface of order $n-4$ passing through the double curve, the double integral

$$\iint \frac{\phi\, dx\, dy}{\partial f/\partial z}$$

is everywhere finite; and, the most general everywhere finite integral of this form remains invariant in a birational transformation of the surface f, the theorem being capable of generalization to algebraic constructs of any number of dimensions. The number of linearly independent surfaces of order $n-4$, possessing the requisite particularity in regard to the singular lines and points of the surface, is thus a numeric invariant by birational transformation, and the equality of these numbers for two surfaces is a necessary condition of their being capable of such transformation. The number of surfaces of order m having the assigned particularity in regard to the singular points and lines of the fundamental surface can be given by a formula for a surface of given singularity; but the value of this formula for $m = n-4$ is in all cases equal to the actual number of surfaces of order $n-4$ with the assigned particularity, and for a cone (or indeed surface) is in fact negative, being the negative of the deficiency of the plane section of the cone. Nevertheless this number for $m = n-4$ is also found to be invariant for birational transformation. This number, now denoted by p_a, is then a second invariant of birational transformation, the former number, of actual surfaces of order $n-4$ with the assigned particularity in regard to the singularities of the surface, is now denoted by p_g. The difference $p_g - p_a$, which is never negative, is a most important characteristic of a surface. When it is zero, as in the case of the general surface of order n, and in a vast number of other ordinary cases, the surface is called regular.

On a plane algebraical curve we may consider linear series of sets of points, obtained by the intersection with it of curves $\lambda\phi + \lambda_1\phi_1 + \ldots = 0$, wherein $\lambda, \lambda_1, \ldots$ are variable coefficients; such a series consists of the sets of points where a rational function of given poles, belonging to the construct $f(x,y) = 0$, has constant values. And we may consider series of sets of points determined by variable curves whose coefficients are algebraical functions, not necessarily rational functions, of parameters. Similarly on a surface we may consider linear systems of curves, obtained by the intersection with the given surface of variable surfaces $\lambda\phi + \lambda_1\phi_1 + \ldots = 0$, and may consider algebraic systems, of which the individual curve is given by variable surfaces whose coefficients are algebraical, not necessarily rational, functions of parameters. Of a linear series upon a plane curve there are two numbers manifestly invariant in birational transformation, the *order*, which is the number of points forming a set of the series, and the *dimension*, which is the number of parameters $\lambda_1/\lambda, \lambda_2/\lambda, \ldots$ entering linearly in the equation of the series. The series is *complete* when it is not contained in a series of the same order but of higher dimension. So for a linear system of curves upon a surface, we have three invariants for birational transformation; the *order*, being in the number of variable intersections of two curves of the system, the *dimension*, being the number of linear parameters $\lambda_1/\lambda, \lambda_2/\lambda, \ldots$ in the equation for the system, and the *deficiency* of the individual curves of the system. Upon any curve of the linear system the other curves of the system define a linear series, called the *characteristic* series; but even when the linear system is complete, that is, not contained in another linear system of the same order and higher dimension, it does not follow that the characteristic series is complete; it may be contained in a series whose dimension is greater by $p_g - p_a$ than its own dimension. When this is so it can be shown that the linear system of curves is contained in an algebraic system whose dimension is greater by $p_g - p_a$ than the dimension of the linear system. The variable parameters so entering may be regarded as the independent co-ordinates of an algebraic construct $f(y, x_1, \ldots x_r) = 0$; this construct has the property that its co-ordinates are single valued meromorphic functions of ρ variables, which are periodic, possessing 2ρ systems of periods; the ρ variables are expressible in the forms

$$u_i = \int R_1(x,y)dx_1 + \ldots + R_\rho(x,y)dx_\rho,$$

wherein $R_i(x,y)$ denotes a rational function of $x_1, \ldots x_\rho$ and y. The original surface has correspondingly ρ integrals of the form $\int(Rdx + Sdy)$, wherein R, S are rational in x, y, z, which are everywhere finite; and it can be shown that it has no other such integrals. From this point of view, then, the number $p_g - p_a = p_i$, is, for a surface, analogous to the deficiency of a plane curve; another analogy arises in the comparison of the theorems: for a plane curve of zero deficiency there exists no algebraic series of sets of points which does not consist of sets belonging to a linear series; for a surface for which $p_g - p_a$ is zero there exists no algebraic system of curves not contained in a linear system.

But whereas for a plane curve of deficiency zero, the co-ordinates of the points of the curve are rational functions of a single parameter, it is not necessarily the case that for a surface $p_g - p_a = 0$ the co-ordinates of the points are rational functions of two parameters; it is necessary that $p_g - p_a = 0$, but this is not sufficient. For surfaces, beside the p_g linearly independent surfaces of order $n-4$ having a definite particularity at the singularities of the surface, it is useful to consider surfaces of order $k(n-4)$, also having each a definite particularity at the singularities, the number of these, not containing the original surface as component, which are linearly independent, is denoted by P_k. It can then be stated that a sufficient condition for a surface to be rational consists of the two conditions $p_a = 0$, $P_2 = 0$. More generally it becomes a problem to classify surfaces according to the values of the various numbers which are invariant under birational transformation, and to determine for each the simplest form of surface to which it is birationally equivalent. Thus, for example, the hyperelliptic surface discussed by Humbert,

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of which the co-ordinates are meromorphic functions of two variables of the simplest kind, with four sets of periods, is characterized by $\rho_6 = 1$, $\rho_5 = -1$; or again, any surface possessing a linear system of curves of which the order exceeds twice the deficiency of the individual curves diminished by two, is reducible by birational transformation to a ruled surface or is a rational surface. But beyond the general statement that much progress has already been made in this direction, of great interest to the student of the theory of functions, nothing further can be added here.

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Beside the books above enumerated there exists an unlimited number of individual memoirs, often of permanent importance and only imperfectly, or too elaborately, reproduced in the pages of the volumes in which the student will find references to them. The German *Encyclopaedia of Mathematics*, and the Royal Society's *Reference Catalogue of Current Scientific Literature, Pure Mathematics*, published yearly, should also be consulted. (H. F. Ba.)

FUNDY, BAY OF, an inlet of the North Atlantic, separating New Brunswick from Nova Scotia. It is 145 m. long and 48 m. wide at the mouth, but gradually narrows towards the head, where it divides into Chignecto Bay to the north, which subdivides into Shepody Bay and Cumberland Basin (the French Beaubassin), and Minas Channel, leading into Minas Basin, to the east and south. Off its western shore opens Passamaquoddy Bay, a magnificent sheet of deep water with good anchorage, receiving the waters of the St Croix river and forming part of the boundary between New Brunswick and the state of Maine. The Bay of Fundy is remarkable for the great rise and fall of the tide, which at the head of the bay has been known to reach 62 ft. In Passamaquoddy Bay the rise and fall is about 25 ft., which gradually increases toward the narrow upper reaches. At spring tides the water in the Bay of Fundy is 19 ft. higher than it is in Bay Verte, in Northumberland Strait, only 15 m. distant. Though the bay is deep, navigation is rendered dangerous by the violence and rapidity of the tide, and in summer by frequent fogs. At low tide, at such points as Moncton or Amherst, only an expanse of red mud can be seen, and the tide rushes in a bore or crest from 3 to 6 ft. in height. Large areas of fertile marshes are situated at the head of the bay, and the remains of a submerged forest show that the land has subsided in the latest geological period at least 40 ft. The bay receives the waters of the St Croix and St John rivers, and has numerous harbours, of which the chief are St Andrews (on Passamaquoddy Bay) and St John in New Brunswick, and Digby and Annapolis (on an inlet known as Annapolis Basin) in Nova Scotia. It was first explored by the Sieur de Monts (d. *c.* 1628) in 1604 and named by him La Baye Française.

FUNERAL RITES, the ceremonies associated with different methods of disposing of the dead. (See also BURIAL AND BURIAL ACTS; CEMETERY; and CREMATION.) In general we have little record, except in their tombs, of races which, in a past measured not merely by hundreds but by thousands of years, occupied the earth; and exploration of these often furnishes our only clue to the religions, opinions, customs, institutions and arts of long vanished societies. In the case of the great culture folks of antiquity, the Babylonians, Egyptians, Hindus, Persians, Greeks and Romans, we have, besides their monuments, the evidence of their literatures, and so can know nearly as much of their rites as we do of our own. The rites of modern savages not only help us to interpret prehistoric monuments, but explain peculiarities in our own rituals and in those of the culture folks of the past of which the significance was lost or buried under etiological myths. We must not then confine ourselves to the rites of a few leading races, neglecting their less fortunate brethren who have never achieved civilization. It is better to try to classify the rites of all races alike according as they embody certain leading conceptions of death, certain fears, hopes, beliefs entertained about the dead, about their future, and their relations with the living.

The main ideas, then, underlying funeral rites may roughly be enumerated as follows:

1. The pollution or taboo attaching to a corpse.
2. Mourning.
3. The continued life of the dead as evinced in the housing and equipment of the dead, in the furnishing of food for them, and in the orientation and posture assigned to the body.
4. Communion with the dead in a funeral feast and otherwise.
5. Sacrifice for the dead and expiation of their sins.
6. Death witchery.
7. Protection of the dead from ghouls.
8. Fear of ghosts.

1. A dead body is unclean, and the uncleanness extends to things and persons which touch it. Hence the Jewish law (Num. v. 2) enacted that "whoever is unclean by the dead shall be put outside the camp, that they defile not the camp in the midst whereof the Lord dwells." Such persons were unclean until the even, and might not eat of the holy things unless they bathed their flesh in water. A high priest might on no account "go in to any dead body" (Lev. xxi. 11). Why a corpse is so widely tabooed is not certain; but it is natural to see one reason in the corruption which in warm climates soon sets in. The common experience that where one has died another is likely to do so may also have contributed, though, of course, there was no scientific idea of infection. The old Persian scriptures are full of this taboo. He who has touched a corpse is "powerless in mind, tongue and hand" (*Zend Avesta* in *Sacred Books of the East*, pt. i. p. 120), and the paralysis is inflicted by the innumerable *drugs* or evil spirits which invest a corpse. Fire and earth, being alike creations of the good and pure god

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Ahuramazda, a body must not be burned or buried; and so the ancient Persians and their descendants the Parsees build Dakmas or "towers of silence" on hill-tops far from human habitations. Inside these the corpses are laid on a flagged terrace which drains into a central pit. Twice a year the bones, picked clean by dogs and birds of prey, are collected in the pit, and when it is full another tower is built. In ancient times perhaps the bodies of the magi or priests alone were exposed at such expense; the common folk were covered with wax and laid in the earth, the wax saving the earth from pollution. In Rome and Greece the corpse was buried by night, lest it should pollute the sunlight; and a trough of water was set at the door of the house of death that men might purify themselves when they came out, before mixing in general society. Priests and magistrates in Rome might not meet or look on a corpse, for they were thereby rendered unclean and incapable of fulfilling their official duties without undergoing troublesome rites of purification. At a Roman funeral, when the remains had been laid in the tomb, all present were sprinkled with lustral water from a branch of olive or laurel called *aspergillum*; and when they had gone home they were asperged afresh and stepped over a fire. The house was also swept out with a broom, probably lest the ghost of the dead should be lying about the floor. Many races, to avoid pollution, destroy the house and property of the deceased. Thus the Navahos pull down the hut in which he died, leaving its ruins on the ground; but if it be an expensive hut, a shanty is extemporized alongside, into which the dying man is transferred before death. No one will use the timbers of a hut so ruined. A burial custom of the Solomon Islands, noted by R. H. Codrington (*The Melanesians*, p. 255), may be dictated by the same scruple. There "the mourners having hung up a dead man's arms on his house make great lamentations; all remains afterwards untouched, the house goes to ruin, mantled, as time goes on, with the vines of the growing yams, a picturesque and indeed, perhaps, a touching sight; for these things are not set up that they may in a ghostly manner accompany their former owner." H. Oldenberg (*Religion des Veda*, p. 426) describes how Hindus shave themselves and cut off their nails after a death, at the same time that they wash, renew the hearth fire, and furnish themselves with new vessels. For the hair and nails may harbour pollution, just as the medieval Greeks believed that evil spirits could lurk in a man's beard (Leo Allatius, *De opinionibus quorundam Graecorum*). The dead man's body is shorn and the nails cut for a kindred reason; for it must be purified as much as can be before it is burned as an offering on the pyre and before he enters on a new sphere of existence.

2. We are accustomed to regard mourning costume as primarily an outward sign of our grief. Originally, however, the special garb seems to have been intended to warn the general public that persons so attired were unclean. In ancient Rome mourners stayed at home and avoided all feasts and amusements; laying aside gold, purple and jewels, they wore black dresses called *lugubria* or even skins. They cut neither hair nor beard, nor lighted fire. Under the emperors women began to wear white. On the west coast of Africa negroes wear white, on the Gold Coast red. The Chinese wear hemp, which is cheap, for mourning dress must as a rule be destroyed when the season of grief is past to get rid of the taboo. Among the Aruntas of Australia the wives of a dead man smear themselves with white pipe-clay until the last ceremonies are finished, sometimes adding ashes—this not to conceal themselves from the ghost (which may partly be the aim of some mourning costumes), but to show the ghost that they are duly sorrowing for their loss. These widows must not talk except on their hands for a whole year. "Among the Maoris," says Frazer (*Golden Bough*, i. 323), "anyone who had handled a corpse, helped to convey it to the grave, or touched a dead man's bones, was cut off from all intercourse and almost all communication with mankind. He could not enter any house, or come into contact with any person or thing, without utterly bedevilling them. He might not even touch food with his hands, which had become so frightfully tabooed or unclean as to be quite useless. Food would be set for him on the ground, and he would then sit or kneel down, and, with his hands carefully held behind his back, would gnaw at it as best he could." Often a degraded outcast was kept in a village to feed mourners. Such a taboo is strictly similar to those which surround a sacred chief or his property, a menstruous woman or a homicide, rendering them dangerous to themselves and to all who approach them.

3. Primitive folk cannot conceive of a man's soul surviving apart from his body, nor of another life as differing from this, and the dead must continue to enjoy what they had here. Accordingly the Patagonians kill horses at the grave that the dead may ride to *Alhuemapu*, or country of the dead. After a year they collect a chief's bones, arrange them, tie them together and dress them in his best garments with beads and feathers. Then they lay him with his weapons in a square pit, round which dead horses are placed set upright on their feet by stakes. As late as 1781 in Poland F. Casimir's horse was slain and buried with him. In the Caucasus a Christian lady's jewels are buried with her. The Hindus used to burn a man's widow on his pyre, because he could not do without her; and St Boniface commends the self-sacrifice of the Wend widows who in his day burned themselves alive on their husbands' pyres.

The tumuli met with all over the north of Europe (in the Orkneys alone 2000 remain) are regular houses of the dead, models of those they occupied in life. The greater the dignity of the deceased, the loftier was his barrow. Silbury hill is 170 ft. high; the tomb of Alyattes, father of Croesus, was a fourth of a league round; the Pyramids are still the largest buildings in existence; at Oberea in Tahiti is a barrow 267 ft. long, 87 wide and 44 high. Some Eskimo just leave a dead man's body in his house, and shut it up, often leaving by his side a dog's head to guide him on his last journey, along with his tools and kayak. The Sea Dyaks set a chief adrift in his war canoe with his weapons. So in Norse story Hake "was laid wounded on a ship with the dead men and arms; the ship was taken out to sea and set on fire." The Viking was regularly buried in his ship or boat under a great mound. He sailed after death to Valhalla. In the ship was laid a stone as anchor and the tools, clothes, weapons and treasures of the dead. The Egyptians, whose land was the gift of the river Nile, equally believed that the dead crossed over water, and fashioned the hearse in the form of a boat. Hence perhaps was derived the Greek myth of Charon and the Styx, and the custom, which still survives in parts of Europe, of placing a coin in the mouth of the dead with which to pay the ferryman. The Egyptians placed in the tomb books of a kind to guide the dead to the next world. The Copts in a later age did the same, and to this custom we owe the recovery in Egypt of much ancient literature. The Armenians till lately buried with a priest his missal or gospel.

In Egyptian entombments of the XIIth to the XIVth dynasties were added above the sepulchres what Professor Petrie terms soul-houses, viz. small models of houses furnished with couch and table, &c., for the use of the *ka* or double whenever it might wish to come above ground and partake of meats and drinks. They recall, in point of size, the hut-urns of the Etruscans, but the latter had another use, for they contain incinerated remains. Etruscan tombs, like those of Egypt and Asia Minor, were made to resemble the dwelling-houses of the living, and furnished with coffered ceilings, panelled walls, couches, stools, easy chairs with footstools attached, all hewn out of the living rock (Dennis, *Cities and Cemeteries of Etruria*, vol i. p. lxx.).

Of the old Peruvian mummies in the Kircherian Museum at Rome, several are of women with babies in their arms, whence it is evident that a mother had her suckling buried with her; it would console her in the next world and could hardly survive her in this. The practice of burying ornaments, tools and weapons with the dead characterizes the inhumations of the Quaternary epoch, as if in that dim and remote age death was already regarded as the portal of another life closely resembling this. The cups, tools, weapons, ornaments and other articles deposited with the dead are often carefully broken or turned upside down and inside out; for the soul or *manes* of objects is liberated by such fracture or inversion and so passes into the

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dead man's use and possession. For the same reason where the dead are hurned, their properties are committed to the flames. The ghost of the warrior has a ghostly sword and huckler to fight with and a ghostly cup to drink from, and he is also nourished by the impalpable odour and reek of the animal victims sacrificed over his grave. Instead of valuable objects cheap images and models are often substituted; and why not, if the mere ghosts of the things are all that the wraith can enjoy? Thus Marco Polo (ii. 76) describes how in the land of Kinsay (Hang-chau) "the friends and relations make a great mourning for the deceased, and clothe themselves in hempen garments, and follow the corpse, playing on a variety of instruments and singing nymns to their idols. And when they come to the burning place they take representations of things cut out of parchment, such as caparisoned horses, male and female slaves, camels, armour, suits of cloth of gold (and money), in great quantities, and these things they put on the fire along with the corpse so that they are all hurned with it. And they tell you that the dead man shall have all these slaves and animals of which the effigies are hurned, alive in flesh and blood, and the money in gold, at his disposal in the next world; and that the instruments which they have caused to be played at his funeral, and the idol hymns that have heen chaunted shall also he produced again to welcome him in the next world." The manufacture of such paper *simulacra* for consumption at funerals is still an important industry in Chinese cities. The ancient Egyptians, assured that a man's *ka* or double shall revivify his body, took pains to guard the flesh from corruption, steeping the corpse in natron and stuffing it with spices. A body so prepared is called a mummy (*q.v.*), and the custom was already of a hoary antiquity in 3200 B.C., when the oldest dated mummy we have was made. The bowels, removed in the process, were placed in jars over the corpse in the tomb, together with writing tablets, books, musical instruments, &c., of the dead. Cemeteries also remain full of mummies of crocodiles, cats, fish, cows and other sacred animals. The Greeks settled in Egypt learned to mummify their dead, but the custom was abhorrent to the Jews, although the Christian belief in the resurrection of the flesh must have been formed to a large extent under Egyptian influence. Half the superiority of the Jewish to other ancient religions lay in this, that it prescribed no funeral rites other than the simplest inhumation.

The dead all over the world and from remote antiquity have been laid not anyhow in the earth, but with the feet and face towards the region in which their future will be spent; the Samoans and Fijians towards the far west whither their souls have preceded them; the Guarayos with head turned eastwards because their god Tamoi has in that quarter "his happy hunting grounds where the dead will meet again" (Tylor, *Prim. Cult.* ii. 422). The legend is that Christ was buried with His head to the west, and the church follows the custom, more ancient than itself, of laying the dead looking to the East, because that is the attitude of prayer, and because at the last trump they will hurry eastwards. So in Eusebius (*Hist. Eccl.* 430. 19) a martyr explains to his pagan judge that the heavenly Jerusalem, the fatherland of the pious, lay exactly in the east at the rising place of the sun. Where the body is laid out straight it is difficult to discern the presence of any other idea than that it is at rest. In Scandinavian barrows, *e.g.* in the one opened at Goldhavn in 1830, the skeletons have been found seated on a low stone bench round the wall of the grave chamber facing its opening, which always looks south or east, never north. Here the dead were continuing the drinking bouts they enjoyed on earth.

The Peruvians mummified their dead and placed them jointed and huddled up with knees to chin, looking toward the sunset, with the hands held before the face. In the oldest prehistoric tombs along the Nile the bodies are doubled up in the same position. It would seem as if in these and numerous other similar cases the dead were deliberately given in their graves the attitude of a foetus in the womb, and, as Dr Budge remarks (*Egyptian Ideas of the Future Life*, London, 1899, p. 162), "we may perhaps be justified in seeing in this custom the symbol of a hope that, as the child is born from this position into the world, so might the deceased be born into the life heyond the grave." The late Quaternary skeletons of the Mentone cave were laid in a layer of ferrugineous earth specially laid down for them, and have contracted a red colour therefrom. Many other prehistoric skeletons found in Italy have a reddish colour, perhaps for the same reason, or because, as often to-day, the bones were stripped of flesh and painted. Ambrose relates that the skeletons of the martyrs Gervasius and Protasius, which he found and deposited A.D. 386 under the altar of his new hasilica in Milan, were *mirae magnitudinis ut prisca aetas ferebat*, and were also coloured red. He imagined the red to be the remains of the martyrs' blood! *Hic sanguis clamat coloris indicio.* Salomon Reinach has rightly divined that what Ambrose really hit upon was a prehistoric tomh. Red earth was probably chosen as a medium in which to lay a corpse hecause demons flee from red. Sacred trees and stones are painted red, and for the most solemn of their rites savages bedaub themselves with red clay. It is a favourite tahoo colour.

4. A feast is an essential feature of every primitive funeral, and in the Irish "wake" it still survives. A dead man's soul or double has to be fed at the tomh itself, perhaps to keep it from prowling about the homes of the survivors in search of victuals; and such food must also be supplied to the dead at stated intervals for months or years. Many races leave a narrow passage or tube open down to the cavity in which the corpse lies, and through it pour down drinks for the dead. Traces of such tubes are visihle in the prehistoric tomhs of the British Isles. However, such provision of food is not properly a funeral feast unless the survivors participate. In the Eastern churches and in Russia the departed are thus fed on the ninth, twelfth and fortieth days from death. "Ye appease the shades of the dead with wine and meals," was the charge levelled at the Catholics by the 4th-century Manichaeans, and it has hardly ceased to be true even now after the lapse of sixteen centuries. The funeral feast proper, however, is either a meal of communion with or in the dead, which accompanies interment, or a banquet off the flesh of victims slain in atonement of the dead man's sins. Some anthropologists see in the common meal held at the grave "the pledge and witness of the unity of the kin, the chief means, if not of making, at least of repairing and renewing it."[1] The flesh provided at these banquets is occasionally that of the dead man himself; Herodotus and Straho in antiquity relate this of several half-civilized races in the East and West, and a similar story is told by Marco Polo of certain Tatars. Nor among modern savages are funeral feasts off the flesh of the dead unknown, and they seem to be intended to effect and renew a sacramental union or kinship of the living with the dead. The Uaupes in the Amazons incinerate a corpse a month after death, pound up the ashes, and mix them with their fermented drink. They believe that the virtues of the dead will thus be passed on to his survivors. The life of the tribe is kept inside the trihe and not lost. Such cannihal sacraments, however, are rare, and, except in a very few cases, the evidence for them weak. The slaying and eating of animal victims, however, at the tomh is universal and hears several meanings, separately or all at once. The animals may he slain in order that their ghosts may accompany the deceased in his new life. This significance we have already dwelt upon. Or it is believed that the shade feeds upon them, as the shades came up from Hades and lapped up out of a trench the blood of the animals slain by Ulysses. The survivors by eating the flesh of a victim, whose blood and soul the dead thus consume, sacramentally confirm the mystic tie of blood kinship with the dead. Or lastly, the victim may be offered for the sins of the dead. His sins are even supposed to be transferred into it and eaten by the priest. Such expiatory sacrifices of animals for the dead survive in the Christian churches of Armenia, Syria and of the East generally. Their vicarious character is emphasized in the prayers which accompany them, hut the popular understanding of them probably comhines all the meanings above enumerated. It has been suggested by Robertson Smith (*Religion of the Semites*, 336) that the world-wide customs of

[1] E. S. Hartland, *Legend of Perseus* (1895), ii. 278.

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tearing the hair, rending the garments, and cutting and wounding the body were originally intended to establish a life-bond between the dead and the living. The survivors, he argues, in leaving portions of their hair and garments, and yet more by causing their own blood to stream over the corpse from self-inflicted wounds, by cutting off a finger and throwing it into the grave, leave what is eminently their own with the dead, so drawing closer their tie with him. Conversely, many savages daub themselves with the blood and other effluences of their dead kinsmen, and explain their custom by saying that in this way a portion of the dead is incorporated in themselves. Often the survivors, especially the widows, attach the bones or part of them to their persons and wear them, or at least keep them in their houses. The retention of the locks of the deceased and of parts of his dress is equally common. There is also another side to such customs. Having in their possession bits of the dead, and being so far in communion with him, the survivors are surer of his friendship. They have ensured themselves against ghosts who are apt to be by nature envious and mischievous. But whatever their original significance, the tearing of cheeks and hair and garments and cutting with knives are mostly expressions of real sorrow, and, as Robertson Smith remarks, of deprecation and supplication to an angry god or spirit. It must not be supposed that the savage or ancient man feels less than ourselves the poignancy of loss.

6. Death-witchery has close parallels in the witch and heretic hunts of the Christians, but, happily for us, only flourishes to-day among savages. Sixty % of the deaths which occur in West Africa are, according to Miss Mary Kingsley—a credible witness—believed to be due to witchcraft and sorcery. The blacks regard old age or effusion of blood as the sole legitimate causes of death. All ordinary diseases are in their opinion due to private magic on the part of neighbours, just as a widespread epidemic marks the active hatred "of some great outraged nature spirit, not of a mere human dabbler in devils."[1] Similarly in Christian countries an epidemic is set down to the wrath of a God offended by the presence of Jews, Arians and other heretics. The duty of an African witch-doctor is to find out who bewitched the deceased, just as it was of an inquisitor to discover the heretic. Every African post-mortem accordingly involves the murder of the person or persons who bewitched the dead man and caused him to die. The death-rate by these means is nearly doubled; but, since the use of poison against an obnoxious neighbour is common, the right person is occasionally executed. It is also well for neighbours not to quarrel, for, if they do and one of them dies of smallpox, the other is likely to be slain as a witch, and his lungs, liver and spleen impaled on a pole at the entrance of the village. It is the same case with the Australian blacks: "no such thing as natural death is realized by the native; a man who dies has of necessity been killed by some other man, or perhaps even by a woman, and sooner or later that man or woman will be attacked. In the normal condition of the tribe every death meant the killing of another individual."[2]

7. Lastly, a primitive interment guards against the double risk of the ghost haunting the living and of ghouls or vampires taking possession of the corpse. The latter end is likely to be achieved if the body is cremated, for then there is no nidus to harbour the demon; but whether, in the remote antiquity to which belong many barrows containing incinerated remains, this motive worked, cannot be ascertained. The Indo-European race seems to have cremated at an early epoch, perhaps before the several races of East and West separated. In Christian funeral rites many prayers are for the protection of the body from violation by vampires, and it would seem as if such a motive dictated the architectural solidity of some ancient tombs. Christian graves were for protection regularly sealed with the cross; and the following is a characteristic prayer from the old Armenian rite for the burial of a layman:

"Preserve, Almighty Lord, this man's spirit with all saints and with all lovers of Thy holy name. And do Thou seal and guard the sepulchre of Thy servant, Thou who shuttest up the depths and sealest them with Thy almighty right hand . . . so let the seal of Thy Lordship abide unmoved upon this man's dwelling-place and upon the shrine which guards Thy servant. And *let not any filthy and unclean devil dare to approach him, such as assail the body and souls of the heathen*, who possess not the birth of the holy font, and have not the dread seal laid upon their graves."

A terrible and revolting picture of the superstitious belief in ghouls which violate Christian tombs is given by Leo Allatius (who held it) in his tract *De opinionibus quorundam Graecorum* (Paris, 1646). It was probably the fear of such demonic assaults on the dead that inspired the insanitary custom of burying the dead under the floors of churches, and as near as possible to the altar. In the Greek Church this practice was happily forbidden by the code of Justinian as well as by the older law in the case of churches consecrated with *Encaenia* and deposition of relics. In the Armenian Church the same rule holds, and Ephrem Syrus in his testament particularly forbade his body to be laid within a church. Such prohibitions, however, are a witness to the tendency in question.

The custom of lighting candles round a dead body and watching at its side all night was originally due to the belief that a corpse, like a person asleep, is specially liable to the assaults of demons. The practice of tolling a bell at death must have had a similar origin, for it was a common medieval belief that the sound of a consecrated bell drives off the demons which when a man dies gather near in the air to waylay his fleeting soul. For a like reason the consecrated bread of the Eucharist was often buried with believers, and St Basil is said to have specially consecrated a Host to be placed in his coffin.

8. Some of the rites described under the previous heads may be really inspired by the fear of the dead haunting the living, but it must be kept in mind that the taboo attaching to a dead body is one thing and fear of a ghost another. A corpse is buried or burned, or scaffolded on a tree, a tower or a house-top, in order to get it out of the way and shield society from the dangerous infection of its taboo; but ghosts *qud* ghosts need not be feared and a kinsman's ghost usually is not. On the contrary, it is fed and consoled with everything it needs, is asked not to go away but to stay, is in a thousand ways assured of the sorrow and sympathy of the survivors. Even if the body be eaten, it is merely to keep the soul of the deceased inside the circle of kinsmen, and Strabo asserts that the ancient Irish and Massagetae regarded it as a high honour to be so consumed by relatives. In Santa Cruz in Melanesia they keep the bones for arrow heads and store a skull in a box and set food before it "saying that this is the man himself" (R. H. Codrington, *The Melanesians*, p. 264), or the skull and jaw bone are kept and "are called *mangite*, which are *saka*, hot with spiritual power, and by means of which the help of the *lio'a*, the powerful ghost of the man whose relics these are, can be obtained" (*ibid.* p. 266). Here we have the savage analogue to Christian relics. So the Australian natives make pointing sticks out of the small bones of the arm, with which to bewitch enemies.

We may conclude then that in the most primitive societies, where blood-kinship is the only social tie and root of social custom it is the shades, not of kinsmen, but of strangers, who as such are enemies, that are dangerous and uncanny. In more developed societies, however, all ghosts alike are held to be so; and if a ghost walks it is because its body has not been properly interred or because its owner was a malefactor. Still, even allowing for this, it remains true that for a friendly ghost the proper place is the grave and not the homes of the living, and accordingly the Aruntas with cries of *Wah! Wah!* with wearing of fantastic head-dresses, wild dancing and beating of the air with hands and weapons "drive the spirit away from the old camp which it is supposed to haunt," and which has been set fire to, and hunt it at a run into the grave prepared, and there stamp it down into the earth. "The loud shouting of the men and women shows him that they do not wish to be frightened by him in his present state, and that they will be angry with him if he does not rest."

[1] Mary Kingsley, *West African Studies* (1901), p. 178.
[2] B. Spencer and F. J. Gillen, *The Native Tribes of Central Australia* (1899), p. 48.

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(Spencer and Gillen, *Native Tribes of Central Australia*, p. 508). In Mesopotamia cemeteries have been discovered where the sepulchral jars were set upside down, clearly by way of hindering the ghosts from escaping into the upper world. In the Dublin museum we see specimens of ancient Celtic tombs showing the same peculiarity. For a like reason perhaps the name of the dead must among the Aruntas not be uttered, nor the grave approached, by certain classes of kinsmen. The same repugnance to naming the dead exists all over the world, and leads survivors who share the dead man's name to adopt another, at least for a time. If the dead man's name was that of a plant, tree, animal or stream, that too is changed. Here is a potent cause of linguistic change, that also renders any historical tradition impossible. The survivors seem to fear that the ghost will come when he hears his name called; but it also hangs together with the taboo which hedges round the dead as it does kings, chieftains and priests.

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FUNGI (pl. of Lat. *fungus*, a mushroom), the botanical name covering in the broad sense all the lower cellular Cryptogams devoid of chlorophyll, which arise from spores, and the thallus of which is either unicellular or composed of branched or unbranched tubes or cell-filaments (hyphae) with apical growth, or of more or less complex wefted sheets or tissue-like masses of such (mycelium). The latter may in certain cases attain large dimensions, and even undergo cell-divisions in their interior, resulting in the development of true tissues. The spores, which may be uni- or multi-cellular, are either abstricted free from the ends of hyphae (acrogenous), or formed from segments in their course (*chlamydospores*) or from protoplasm in their interior (endogenous). The want of chlorophyll restricts their mode of life—which is rarely aquatic—since they are therefore unable to decompose the carbon dioxide of the atmosphere, and renders them dependent on other plants or (rarely) animals for their carbonaceous food-materials. These they obtain usually in the form of carbohydrates from the dead remains of other organisms, or in this or other forms from the living cells of their hosts; in the former case they are termed saprophytes, in the latter parasites. While some moulds (*Penicillium*, *Aspergillus*) can utilize almost any organic food-materials, other fungi are more restricted in their choice—*e.g.* insect-parasites, horn- and feather-destroying fungi and parasites generally. It was formerly the custom to include with the Fungi the Schizomycetes or Bacteria, and the Myxomycetes or Mycetozoa; but the peculiar mode of growth and division, the cilia, spores and other peculiarities of the former, and the emission of naked amoeboid masses of protoplasm, which creep and fuse to streaming plasmodia, with special modes of nutrition and spore-formation of the latter, have led to their separation as groups of organisms independent of the true Fungi. On the other hand, lichens, previously regarded as autonomous plants, are now known to be dual organisms—fungi symbiotic with algae.

The number of species in 1889 was estimated by Saccardo at about 32,000, but of these 8500 were so-called *Fungi imperfecti*—*i.e.* forms of which we only know certain stages, such as conidia, pycnidia, &c., and which there are reasons for regarding as merely the corresponding stages of higher forms. Saccardo also included about 400 species of Myxomycetes and 650 of Schizomycetes. Allowing for these and for the cases, undoubtedly not few, where one and the same fungus has been described under different names, we obtain Schroeter's estimate (in 1892) of 20,000 species. In illustration of the very different estimates that have been made, however, may be mentioned that of De Bary in 1872 of 150,000 species, and that of Cooke in 1895 of 40,000, and Massee in 1899 of over 50,000 species, the fact being that no sufficient data are as yet to hand for any accurate census. As regards their geographical distribution, fungi, like flowering plants, have no doubt their centres of origin and of dispersal; but we must not forget that every exchange of wood, wheat, fruits, plants, animals, or other commodities involves transmission of fungi from one country to another; while the migrations of birds and other animals, currents of air and water, and so forth, are particularly efficacious in transmitting these minute organisms. Against this, of course, it may be argued that parasitic forms can only go where their hosts grow, as is proved to be the case by records concerning the introduction of *Puccinia malvacearum*, *Peronospora viticola*, *Hemileia vastatrix*, &c. Some fungi—*e.g.* moulds and yeasts—appear to be distributed all over the earth. That the north temperate regions appear richest in fungi may be due only to the fact that North America and Europe have been much more thoroughly investigated than other countries; it is certain that the tropics are the home of very numerous species. Again, the accuracy of the statement that the fleshy Agaricini, Polyporei, *Pezizae*, &c., are relatively rarer in the tropics may depend on the fact that they are more difficult to collect and remit for identification than the abundantly recorded woody and coriaceous forms of these regions. When we remember that many parts of the world are practically unexplored as regards fungi, and that new species are constantly being discovered in the United States, Australia and northern Europe—the best explored of all—it is clear that no very accurate census of fungi can as yet be made, and no generalizations of value as to their geographical distribution are possible..

The existence of fossil fungi is undoubted, though very few of the identifications can be relied on as regards species or genera. They extend back beyond the Carboniferous, where they occur as hyphae, &c., preserved in the fossil woods, but the best specimens are probably those in amber and in siliceous petrifactions of more recent origin.

Organs.—Individual hyphae or their branches often exhibit specializations of form. In many Basidiomycetes minute branches arise below the septa; their tips curve over the outside of the latter, and fuse with the cell above just beyond it, forming a *clamp-connexion*. Many parasitic hyphae put out minute lateral branches, which pierce the cell-wall of the host and form a peg-like (*Trichosphaeria*), sessile (*Cystopus*), or stalked (*Hemileia*), knot-like, or a

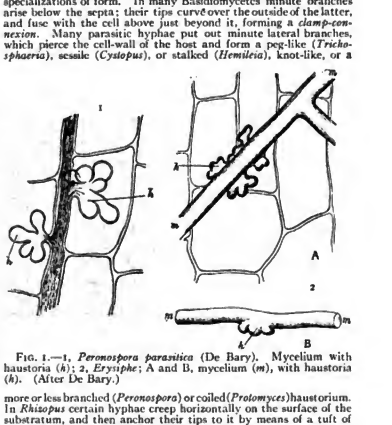

FIG. 1.—1, *Peronospora parasitica* (De Bary). Mycelium with haustoria (*h*); 2, *Erysiphe*; A and B, mycelium (*m*), with haustoria (*h*). (After De Bary.)

more or less branched (*Peronospora*) or coiled (*Protomyces*) haustorium. In *Rhizopus* certain hyphae creep horizontally on the surface of the substratum, and then anchor their tips to it by means of a tuft of short branches (*appressorium*), the walls of which soften and gum

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themselves to it, then another branch shoots out from the tuft and repeats the process, like a strawberry-runner. Appressoria are also formed by some parasitic fungi, as a minute flattening of the tip of a very short branch (*Erysiphe*), or the swollen end of any hypha which comes in contact with the surface of the host (*Phytocephalis*, *Synccphalis*), haustoria piercing in each case the cell-wall below. In *Botrytis* the appressoria assume the form of dense tassels of short branches. In *Arthrobotrys* side-branches of the mycelium sling themselves around the host (*Tylenchus*) much as tendrils round a support.

Many fungi (*Phallus*, *Agaricus*, *Polyporus*, &c.) when actively growing put out ribbon-like or cylindrical cords, or sheet-like mycelial plates of numerous parallel hyphae, all growing together equally, and fusing by anastomoses, and in this way extend long distances in the soil, or over the surfaces of leaves, branches, &c. These mycelial strands may be white and tender, or the outer hyphae may be hard and black, and very often the resemblance of the subterranean forms to a root is so marked that they are termed rhizomorphs. The outermost hyphae may even put forth thinner hyphae, radiating into the soil like root-hairs, and the convergent tips may be closely appressed and so divided by septa as to resemble the root-apex of a higher plant (*Armillaria mellea*).

Sclerotia.—Fungi, like other plants, are often found to store up large quantities of reserve materials (oil, glycogen, carbohydrates, &c.) in special parts of their vegetative tissues, where they lie accumulated between a period of active assimilation and one of renewed activity, forming reserves to be consumed particularly during the formation of large fructifications. These reserve stores may be packed away in single hyphae or in swollen cells, but the hyphae containing them are often gathered into thick cords or mycelial strands (*Phallus*, mushroom, &c.), or flattened and anastomosing ribbons and plates, often containing several kinds of hyphae (*Merulius lacrymans*), in other cases the strands undergo an differentiation into an outer layer with blackened, hardened cell-walls and a core of ordinary hyphae, and are then termed rhizomorphs (*Armillaria mellea*), capable not only of extending the fungus in the soil, like roots, but also of lying dormant, protected by the outer casing. Such aggregations of hyphae frequently become knotted up into dense masses of interwoven and closely packed hyphae, varying in size from that of a pin's head or a pea (*Peziza*, *Coprinus*) to that of a man's fist or head, and weighing to to 25 lb or more (*Polyporus Mylittae*, *P. tumulosus*, *Lentinus Tuberregium*, *P. Sapurema*, &c.). The interwoven hyphae fuse and branch copiously, filling up all interstices. They also undergo cutting up by numerous septa into short cells, and these often divide again in all planes, so that a pseudoparenchyma results, the cells of which may be thickened and swollen internally, or hardened and black on the exterior. In many cases the swollen cell-walls serve as reserves, and sometimes the substance is so thickly deposited in strata as to obliterate the lumen, and the hyphae become nodular (*Polyporus sacer*, *P. rhinoceros*, *Lentinus Woermanni*). The various sclerotia, if kept moist, give rise to the fructifications of the fungi concerned, much as a potato tuber does to a potato plant, and in the same way the reserve materials are consumed. They are principally Polyporei, Agaricini, Pezizae; none are known among the Phycomycetes, Uredineae or Ustilagineae. The functions of mycelial strands, rhizomorphs and sclerotia are not only to collect and store materials, but also to extend the fungus, and in many cases similar strands are organs of attack. The same functions of storage in advance of fructification are also exercised by the stromata so common in Ascomycetes.

Tissue Differentiations.—The simpler mycelia consist of hyphae all alike and thin-walled, or merely differing in the diameter of the branches of various orders, or in their relations to the environment, some plunging into the substratum like roots, others remaining on its surface, and others (aerial hyphae) rising into the air. Such hyphae may be multicellular, or they may consist of simple tubes with numerous nuclei and no septa (*Phycomycetes*), and are then non-cellular. In the more complex tissue-bodies of higher fungi, however, we find considerable differences in the various layers or strands of hyphae.

An epidermis-like or cortical protective outer layer is very common, and is usually characterized by the close septation of the densely interwoven hyphae and the thickening and dark colour of their outer walls (sclerotia, *Xylaria*, &c.). Fibre-like hyphae with the lumen almost obliterated by the thick walls occur in mycelial cords (*Merulius*). Latex-tubes bound in the tissues of *Lactarius*, *Stereum*, *Mycena*, *Fistulina*, filled with white or coloured milky fluids, and Istvanffi has shown that similar tubes with fluid or oily contents are widely spread in other Hymenomycetes. Sometimes fatty oil or watery sap is found in swollen hyphal ends, or such tubes contain coloured sap. Cystidia and paraphyses may be also classed here. In *Merulius lacrymans* Hartig has observed thin-walled hyphae with large lumina, the septa of which are perforated like those of sieve-tubes.

As regards ite composition, the cell-wall of fungi exhibits variations of the same kind as those met with in higher plants. While the fundamental constituent is a cellulose in many Mucorini and other Phycomycetes, in others bodies like pectose, callose, &c., commonly occur, and Wisselingh's researches show that chitin, a gluco-proteid common in animals, forms the main constituent in many cases, and is probably deposited directly as such, though, like the other substances, it may be mixed with cellulose. As in other cell-walls, so here the older membranes may be altered by deposits of various substances, such as resin, calcium oxalate, colouring matters; or more profoundly altered throughout, or in definite layers, by lignification, suberination (*Tremeles*, *Daedalea*), or swelling to a gelatinous mucilage (*Tremella*, *Gymnosporangium*), while cutinization of the outer layers is common. One of the most striking alterations of cell-walls is that termed *carbonisation*, in which the substance gradually turns black, hard and brittle, as in *Exosporium*, *Xylaria*, *Ustulina*, some sclerotia. At the other extreme the cell-walls of many lichen-fungi are soft and colourless, but turn blue in iodine, as does starch. The young cell-wall is always tenuous and flexible, and may remain so throughout, but in many cases thickening and structural differentiation as well as the changes referred to above, alter the primary wall considerably. Such thickening may be localized, and *pits* (*e.g. Uredospores*, septa of Basidiomycetes), *spirals*, *reticulations*, *rings*, &c. (capillitium fibres of *Podaxon*, *Galastoma*, *Battarrea*), occur as in the cells of higher plants, while sculptured networks, pittings and so forth are as common on fungus-spores as they are on pollen grains.

Cell-Contents.—The cells of fungi, in addition to protoplasm, nuclei and sap-vacuoles, like other vegetable cells, contain formed and amorphous bodies of various kinds. Among those directly visible to the microscope are oil drops, often coloured (*Uredineae*) crystals of calcium oxalate (*Phallus*, *Russula*), proteid crystals (*Mucor*, *Pilobolus*, &c.) and resin (Polyporei). The oidia of Erysiphese contain fibrosin hyphae of Saprolegniaceae cellulin bodies, but starch apparently never occurs. Invisible to the microscope, but rendered visible by reagents, are glycogen, *Mucor*, Ascomycetes, yeast, &c. In addition to these cell-contents we have good microchemical evidence of the presence of large soluble bodies, such as proteids, carbohydrates, organic acids, alkaloids, enzymes, &c. These must not be confounded with the numerous substances obtained by chemical analysis of masses of the fungus, as there is often no proof of the manner of occurrence of such bodies, though we may conclude with a good show of probability that some of them also exist preformed in the living cell. Such are sugars (glucose, mannite, &c.), acids (acetic, citric and a whole series of lichen-acids), ethereal oils and resinous bodies, often combined with the intense colours of fungi and lichens, and a number of powerful alkaloid poisons, such as muscarin (*Amanita*), ergotin (*Clavicpi*), &c.

Among the enzymes already extracted from fungi are *invertases* (yeasts, *Aspergillus*, &c.), which split cane-sugar and other complex sugars with hydrolysis into simpler sugars such as dextrose and levulose; *diastases*, which convert starches into sugars (*Aspergillus*, &c.); *cytases*, which dissolve cellulose similarly (*Botrytis*, &c.); *peptases*, using the term as generally applied to enzymes which convert proteids into peptones and other bodies (*Penicillium*, &c.); *lipases*, which break up fatty oils (*Empusa*, *Phycomyces*, &c.); *oxydases*, which bring about the oxidations and changes of colour observed in *Boletus*, and *zymase*, extracted by Buchner from yeast, which brings about the conversion of sugar into alcohol and carbon-dioxide. That such enzymes are formed in the protoplasm is evident from the behaviour of hyphae, which have been observed to pierce cell-membranes, the chitinous coats of insects, artificial collodion films and the cell-walls of wood. That a fungus can secrete more than one enzyme, according to the materials its hyphae have to attack, has been shown by the extraction of diastase, inulase, trehalase, invertase, maltase, raffinase, malizitase, emulsin, trypsin and lipase from *Aspergillus* by Bourquelot, and similar events occur in other fungi. The same fact is indicated by the wide range of organic substances which can be utilized by *Penicillium* and other moulds, and by the behaviour of parasitic fungi which destroy various cell-contents and tissues. Many of the coloured pigments of fungi are fixed in the cell-wall or excreted to the outside (*Peziza aeruginosa*). Matruchot has used them for staining the living protoplasm of other fungi by growing the two together. Striking instances of coloured mycelia are afforded by *Corticum sanguinolentum*, blood-red; *Chromosporium aureliei*, golden green; *Chlorosplenium aeruginosum*, verdigris green; and the *Dematei*, brown or black.

Nuclei.—Although many fungi have been regarded as devoid of nuclei, and all have not as yet been proved to contain them, the numerous investigations of recent years have revealed them in the cells of all forms thoroughly examined, and we are justified in concluding that the nucleus is as essential to the cell of a fungus as to that of other organisms. The hyphae of many contain numerous—even hundreds of nuclei (Phycomycetes); those of others have several (*Aspergillus*) in each segment, or only two (*Exoascus*) or one (*Erysiphe*) in each cell. Even the isolated cells of the yeast plant have each one nucleus. As a rule the nuclei of the mycelium are very minute (1-5-2 μ in *Phycomyces*), but those of many asci and spores are large and easily rendered visible. As with other plants, so in fungi the essential process of fertilization consists in the fusion of two nuclei, but owing to the absence of well-marked sexual organs from many fungi, a peculiar interest attaches to certain nuclear fusions in the vegetative cells or in young spores of many forms. Thus in Ustilagineae the chlamydospores, and in Uredineae

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the teleutospores, each contain two nuclei when young, which fuse as the spores mature. In young asci a similar fusion of two nuclei occurs, and also in basidia, in each case the nucleus of the ascus or of the basidium resulting from the fusion subsequently giving rise by division to the nuclei of the ascospores and basidiospores respectively. The significance of these fusions will be discussed under the various groups. Nuclear division is usually accompanied by all the essential features of karyokinesis.

Spores.—No agreement has ever been arrived at regarding the consistent use of the term spore. This is apparently owing to the facts that too much has been attempted in the definition, and that differences arise according as we aim at a morphological or a physiological definition. Physiologically, any cell or group of cells separated off from a hypha or unicellular fungus, and capable of itself growing out—germinating—to produce the fungus, is a spore; but it is evident that so wide a definition does not exclude the ordinary vegetative cells of sprouting fungi, such as yeasts, or small sclerotium like cell-aggregates of forms like *Coniothecium*. Morphologically considered, spores are marked by peculiarities of form, size, colour, place of origin, definiteness in number, mode of preparation, and so forth, such that they can be distinguished more or less sharply from the hyphae which produce them. The only physiological peculiarity exhibited in common by all spores is that they germinate and initiate the production of a new fungus-plant. Whether a spore results from the sexual union of two similar gametes (zygospore) or from the fertilization of an egg-cell by the protoplasm of a male organ (oospore); or is developed asexually as a motile (zoospore) or a quiescent body cut off from a hypha (conidium) or developed along its course (oidium or chlamydospore), or in its protoplasm (endospore), are matters of importance which have their uses in the classification and terminology of spores, though in many respects they are largely of academic interest.

Kleks has attempted to divide spores into three categories as follows: (1) kinospores, arising by relatively simple cell-divisions and subserving rapid dissemination and propagation, *e.g.* zoospores, conidia, endogonidia, stylospores, &c.; (2) paulospores, due to simple rearrangement of cell-contents, and subserving the persistence of the fungus through periods of exigency, *e.g.* gemmae, chlamydospores, resting-cells, cysts, &c.; (3) carpospores, produced by a more or less complex formative process, often in special fructifications, and subserving either or both multiplication and persistence, *e.g.* zygospores, oospores, hemi-spores, acidiospores, accospores, basidiospores, &c. Little or nothing is gained by these definitions, however, which are especially physiological. In practice these various kinds of spores of fungi receive further special names in the separate groups, and names, moreover, which will appear, to those unacquainted with the history, to have been given without any consistency or regard to general principles; nevertheless, for ordinary purposes these names are far more useful in most cases, owing to their descriptive character, than the proposed new names, which have been only partially accepted.

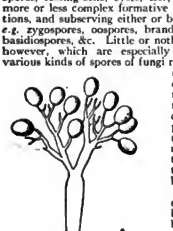

FIG. 2.—*Peronospora parasitica* (De Bary). Conidiophore with conidia.

Sporophores.—In some of the simpler fungi the spores are not borne on or in hyphae which can be distinguished from the vegetative parts or mycelium, but in the vast majority of cases the sporogenous hyphae either ascend free into the air or radiate into the surrounding water as distinct branches, or are grouped into special columns, cushions, layers or complex masses obviously different in colour, consistency, shape and other characters from the parts which gather up and assimilate the food-materials. The term "receptacle" sometimes applied to these spore-bearing hyphae is better replaced by sporophore. The sporophore is absolute when the spore-bearing hyphae are not sharply distinct from the mycelium, simple when the constituent hyphae are isolated, and compound when the latter are conjoined. The chief distinctive characters of the sporogenous hyphae are their orientation, usually vertical; their limited apical growth; their peculiar branching, form, colour, contents, consistency; and their spore-production. According to the characters of the last, we might theoretically divide them into conidiophores, sporangiophores, gametophores, oidiophores, &c.; but since the two latter rarely occur, and more than one kind of spore or spore-case may occur on a sporophore, it is impossible to carry such a scheme fully into practice.

A simple sporophore may be merely a single short hypha, the end of which stops growing and becomes cut off as a conidium by the formation of a septum, which then splits and allows the conidium to fall. More generally the hypha below the septum grows forwards again, and repeats this process several times before the terminal conidium falls, and so a chain of conidia results, the oldest of which terminates the series (*Erysiphe*); when the primary branch has thus formed a basipetal series, branches may arise from below and again repeat this process, thus forming a tuft (*Penicillium*). Or the primary hypha may first swell at its apex, and put forth a series of short peg-like branches (*sterigmata*) from the increased surface thus provided, each of which develops a similar basipetal chain of conidia (*Aspergillus*), and various combinations of these processes result in the development of numerous varieties of exquisitely branched sporophores of this type (*Botrytis*, *Botryosporium*, *Verticillium*, &c.).

A second type is developed as follows: the primary hypha forms a septum below its apex as before, and the terminal conidium, thus abstricted, puts out a branch at its apex, which starts as a mere point and rapidly swells to a second conidium; this repeats the process, and so on, so that we now have a chain of conidia developed in acropetal succession, the oldest being below, and, as in *Penicillium*, &c., branches put forth lower down may repeat the process (*Hormodendron*). In all these cases we may speak of simple conidiophores. The simple sporophore does not necessarily terminate in conidia, however. In *Mucor*, for example, the end of the primary hypha swells into a spheroidal head (sporangium), the protoplasm of which

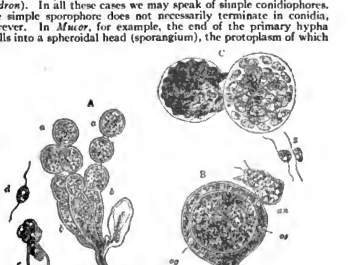

FIG. 3.—*Cystopus candidus*.

A. *a*, Conidia.
b, Conidiophores.
c, Conidium emitting zoospores.
d, Free zoospore.
B. *og*, Oogonium.
os, Oosphere.
an, Antheridium.
C. Formation of zoospores by oospores.
s, Free zoospores. (After De Bary.)

undergoes segmentation into more or less numerous globular masses, each of which secretes an enveloping cell-wall and becomes a spore (endospore), and branched systems of sporangia may arise as before (*Thamnidium*). Such may be termed sporangiophores. In *Sporodinia* the branches give rise also to short branches, which meet and fuse their contents to form zygospores. In *Peronospora*, *Saprolegnia*, &c., the ends of the branches swell up into sporangia, which develop zoospores in their interior (zoosporangia), or their contents become oospheres, which may be fertilized by the contents of other branches (antheridia) and so form egg-cases (oogonia). Since in such cases the sporophore bears sexual cells, they may be conveniently termed gametophores.

Compound sporophores arise when any of the branched or unbranched types of spore-bearing hyphae described above ascend into the air in consort, and are more or less crowded into definite layers, cushions, columns or other complex masses. The same laws apply to the individual hyphae and their branches as to simple sporophores, and as long as the conidia, sporangia, gametes, &c., are borne on their external surfaces, it is quite consistent to speak of these as compound sporophores, &c., in the sense described, however complex they may become. Among the simplest cases are the sheet-like aggregates of sporogenous hyphae in *Puccinia*, *Uromyces*, &c., or of basidia in *Exobasidium*, *Corticium*, &c., or of asci in *Exoascus*, *Ascocorticium*, &c. In the former, where the layer is small, it is often termed a sorus, but where, as in the latter, the sporogenous layer is extensive, and spread out more or less sheet-like on the supporting tissues, it is more frequently termed a hymenium. Another simple case is that of the columnar aggregates of sporogenous hyphae in forms like *Stilbum*, *Coremium*, &c. These lead

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us to cases where the main mass of the sporophore forms a supporting tissue of closely crowded or interwoven hyphae, the sporogenous terminal parts of the hyphae being found at the periphery or apical regions only. Here we have the cushion-like type (stroma) of *Nectria* and many Pyrenomycetes, the clavate "receptacle" of *Clavaria*, &c., passing into the complex forms met with in *Sparassis*, *Xylaria*, *Polyporei*, and *Agaricini*, &c. In these cases the compound sporophore is often termed the hymenophore, and its various parts demand special names (pileus, stipes, gills, pores, &c.) to denote peculiarities of distribution of the hymenium over the surface.

Other series of modifications arise in which the tissues corresponding to the stroma invest the sporogenous hyphal ends, and thus enclose the spores, asci, basidia, &c., in a cavity. In the simplest case the stroma, after bearing its crop of conidia or oidia, develops ascogenous branches in the loosened meshes of its interior (*e.g. Onygena*). Another simple case is where the plane or slightly convex surface of the stroma rises at its margins and overgrows the sporogenous hyphal ends, so that the spores, asci, &c., come to lie in the depression of a cavity—*e.g. Solenia, Cyphella*—and even simpler cases are met with in *Mortierella*, where the zygospore is invested by the overgrowth of a dense mat of closely branching hyphae, and in *Gymnoascus*, where a loose mat of similarly barren hyphae covers in the tufts of asci as they develop.

In such examples as the above we may regard the hymenium (*Solenia, Cyphella*), zygospores, or asci as truly invested by later growth, but in the vast majority of cases the process does not result in the enclosure of the spores, asci, &c., in a "fructification" are much more involved, inasmuch as the latter is developed in the interior of hyphal tissues, which are by no means obviously homologous with a stroma. In *Penicillium*, *Eurotium*, *Erysiphe*, &c., hyphal ends which are the initials of ascogenous branches, are invested by closely packed branches at an early stage of development, and the asci develop inside what has by that time become a complete investment. Whether a true sexual process precedes these processes or not does not affect the present question, the point being that the resulting spheroidal "fructification" (cleistocarp, perithecium) has a definite wall of its own not directly comparable with a stroma. In other cases (*Hypomyces, Nectria*) the perithecia arise on an already mature stroma, while yet more numerous examples can be given (*Poronia, Hypoxylon, Claviceps*, &c.) where the perithecia originate below the surface of a stroma formed long before. Similarly with the various types of conidial or oidial "fructifications," termed pycnidia, spermogonia, aecidia, &c. In the simplest of these cases—*e.g. Fumago*—a single mycelial cell divides by septa in all three planes until a more or less solid clump results. Then a hollow appears in the centre owing to the more rapid extension of the outer parts, and into this hollow the cells lining it put forth short sporogenous branches, from the tips of which the spores (stylospores, conidia, spermatia) are abstricted. In a similar way are developed the pycnidia of *Cicinnobolus*, *Pleospora*, *Cucurbitaria*, *Leptosphaeria* and others. In other cases (*Diplodia*, *Aecidium*, &c.) conidial or oidial "fructifications" arise by the aggregation of hyphae interweaving themselves into a knot, as if they were forming a sclerotium. The outer parts of the mass then differentiate as a wall or investment, and the interior becomes a hollow, into which hyphal ends grow and abstrict the spores. Still more complicated are the processes in a large series of "fructifications," where the mycelium first develops a densely packed mass of hyphae, all alike, in which labyrinths of cavities subsequently form by separation of hyphae in the previously homogeneous mass, and the hymenium covers the walls of these cavities and passages as the lining layer. Meanwhile differences in consistency appear in various strata, and a dense outer protective layer (peridium), soft gelatinous layers, and so on are formed, the whole eventually attaining great complexity—*e.g.* puff-balls, earth-stars and various *Phalloideae*.

Spore-Distribution.—Ordinary conidia and similarly abstricted dry spores are so minute, light and numerous that their dispersal is ensured by any current of air or water, and we also know that rats and other burrowing animals often carry them on their fur; similarly with birds, insects, slugs, worms, &c., on claws, feathers, proboscides, &c., or merely adherent to the slimy body. In addition to these accidental modes of dispersal, however, there is a series of interesting adaptations on the part of the fungus itself. Passing over the locomotor activity of zoospores (*Pythium, Peronospora, Saprolegnia*) we often find spores held under tension in sporangia (*Pilobolus*) or in asci (*Peziza*) until ripe, and then forcibly shot out by the sudden rupture of the sporangial wall under the pressure of liquid behind—mechanism comparable to that of a pop-gun, if we suppose air replaced by watery sap. Even a single conidium, held tense to the last moment by the elastic cell-wall, may be thus shot forward by a spurt of liquid under pressure in the hypha abstricting it (*e.g. Empusa*), and similarly with *basidiospores* (*Coprinus, Agaricus*, &c.). A more complicated case is illustrated by *Sphaerobolus*, where the entire mass of spores, enclosed in its own peridium, is suddenly shot up into the air like a bomb from a mortar by the elastic retroversion of a peculiar layer which, up to the last moment, surrounded the bomb, and then suddenly splits above, turns inside out, and drives the former as a projectile from a gun. Gelatinous or mucilaginous degenerations of cell-walls are frequently employed in the interests of spore dispersal. The mucilage surrounding endospores of *Mucor*, conidia of *Empusa*, &c., serves to gum the spore to animals. Such gums are formed abundantly in pycnidia, and, absorbing water, swell and carry out the spores in long tendrils, which emerge for days and even weeks as they reach the light, glued spores gradually being set free by rain, wind, &c. In oidial chains (*Sclerotinia*) a minute double wedge of wall-substance arises in the middle lamella between each pair of contiguous oidia, and by its enlargement splits the separating lamella. These disjunctors serve as points of application for the elastic push of the swelling spore-ends, and as the connecting outer lamella of cell-wall suddenly gives way, the spores are jerked asunder. In many cases the slimy masses of spermatia (*Uredineae*), conidia (*Claviceps*), basidiospores (*Phallus, Coprinus*), &c., emit more or less powerful odours, which attract flies or other insects, and it has been shown that bees carry the fragrant oidia of *Sclerotinia* to the stigma of *Vaccinium* and infect it, and that flies carry away the foetid spores of *Phallus*, just as pollen is dispersed by such insects. Whether the strong odour of trimethylamine evolved by the spores of *Tilletia* attracts insects is not known.

The recent observations and exceedingly ingenious experiments of Falck have shown that the sporophores of the Basidiomycetes—especially the large sporophores of such forms as *Boletus, Polyporus*—contain quantities of reserve combustible material which are burnt up by the active metabolism occurring when the fruit-body is ripe. By this means the temperature of the sporophore is raised and the difference between it and the surrounding air may be one of several degrees. As a result convection currents are produced in the air which are sufficient to catch the basidiospores in their fall and carry them, away from the regions of comparative atmospheric stillness near the ground, to the upper and more powerful air-currents can bring about their wide distribution.

Classification.—It has been accepted for some time now that the majority of the fungi proper fall into three main groups, the Phycomycetes, Ascomycetes and Basidiomycetes, the Schizomycetes and Myxomycetes (Mycetozoa) being considered as independent groups not coming under the true fungi.

The chief schemes of classification put forward in detail have been those of P. A. Saccardo (1882–1892), of Oskar Brefeld and Von Tavel (1892), of P. E. L. Van Tieghem (1893) and of J. Schroeter (1892). The scheme of Brefeld, which was based on the view that the Ascomycetes and Basidiomycetes were completely asexual and that these two groups had been derived from one division (Zygomycetes) of the Phycomycetes, has been very widely accepted. The recent work of the last twelve years has shown, however, that the two higher groups of fungi exhibit distinct sexuality, of either a normal or reduced type, and has also rendered very doubtful the view of the origin of these two groups from the Phycomycetes. The real difficulty of classification of the fungi lies in the polyphyletic nature of the group. There is very little doubt that the primitive fungi have been subject to degradation from the lower algae. It appears, however, that such a degradation has occurred not only once in evolution but on several occasions, so that we have in the Phycomycetes not a series of naturally related forms, but groups which have arisen perfectly independently of one another from various groups of the algae. It is also possible in the absence of satisfactory intermediate forms that the Ascomycetes and Basidiomycetes have also been derived from the algae independently of the Phycomycetes, and perhaps of one another.

A natural classification on these lines would obviously be very complicated, so that in the present state of our knowledge it will be best to retain the three main groups mentioned above, bearing in mind that the Phycomycetes especially are far from being a natural group. The following gives a tabular survey of the scheme adopted in the present article:

A. Phycomycetes. Alga-like fungi with unicellular thallus and well-marked sexual organs.

Class I.—Oomycetes. Mycelium usually well developed, but sometimes poor or absent. Sexual reproduction by oogonia and antheridia; asexual reproduction by zoospores or conidia.

1. Monoblepharidineae. Mycelium present, antheridia with antherozoids, oogonium with single oosphere: Monoblepharidaceae.
2. Peronosporineae. Mycelium present; antheridia but no antherozoids; oogonia with one or more oospheres: Peronosporaceae, Saprolegniaceae.
3. Chytridineae. Mycelium poorly developed or absent; oogonia and antheridia (without antherozoids) known in some cases; zoospores common: Chytridiaceae. Ancylistaceae.

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Class II.—Zygomycetes. Mycelium well developed; sexual reproduction by zygospores; asexual reproduction by sporangia and conidia.

1. Mucorineae. Sexual reproduction as above, asexual by sporangia or conidia or both: Mucoraceae. Mortierellaceae, Chaetocladiaceae, Piptocephalidaceae.
2. Entomophthorineae. Sexual reproduction typical but with sometimes inequality of the fusing gametes (gametangia ?): Entomophthoraceae.

B. Higher Fungi. Fungi with segmental thallus; sexual reproduction sometimes with typical antheridia and oogonia (ascogonia) but usually much reduced.

Class I.—Ustilaginales. Forms with septate thallus, and reproduction by chlamydospores which on germination produce sporidia; sexuality doubtful.

Class II.—Ascomycetes. Thallus septate; spores developed in special type of sporangium, the ascus, the number of spores being usually eight. Sexual reproduction sometimes typical, usually reduced.

Exoascineae, Saccharomycetineae, Perisporinea, Discomycetes, Pyrenomycetes, Tuberineae, Laboulbeniineae.

Class III.—Basidiales. Thallus septate. Conidia (basidiospores) borne in fours on a special conidiophore, the basidium. Sexual reproduction always much reduced.

1. Uredineae. Life-history in some cases very complex and with well-marked sexual process and alternation of generations, in others much reduced; basidium (promycelium) derived usually from a thick-walled spore (teleutospore).
2. Basidiomycetes. Life-history always very simple, no well-marked alternation of generations; basidium borne directly on the mycelium.
   (A) Protobasidiomycetes. Basidia septate. Auriculariaceae, Pilacreaceae, Tremellinaceae.
   (B) Autobasidiomycetes. Basidia non-septate. Hymenomycetes, Gasteromycetes.

A. Phycomycetes.—Most of the recent work of importance in this group deals with the cytology of sexual reproduction and of spore-formation, and the effect of external conditions on the production of reproductive organs.

Monoblepharidaceae consists of a very small group of aquatic forms living on fallen twigs in ponds and ditches. Only one genus, *Monoblepharis*, can certainly be placed here, though a somewhat similar genus, *Myrioblepharis*, with a peculiar multiciliate zoospore like that of *Vaucheria*, is provisionally placed in the same group. *Monoblepharis* was first described by Cornu in 1871, but from that time until 1895 when Roland Thaxter described several species from America the genus was completely lost sight of. *Monoblepharis* has oogonia with single oospheres and antheridia developing a few amoeboid uniciliate antherozoids; these creep to the opening of the oogonium and then swim in. The resemblance between this genus and *Dictyosiphon* among the algae is very striking, as is also that of *Myrioblepharis* and *Vaucheria*.

Peronosporaceae are a group of endophytic parasites—about 100 species—of great importance as comprising the agents of "damping off" disease (*Pythium*), vine-mildew (*Plasmopara*), potato disease (*Phytophthora*), onion-mildew (*Peronospora*). *Pythium* is a semi-aquatic form attacking seedlings which are too plentifully supplied with water; its hyphae penetrate the cell-walls and rapidly destroy the watery tissues of the living plants; then the fungus lives in the dead remains. When the free ends of the hyphae emerge again into the air they swell up into spherical bodies which may either fall off and behave as conidia, each putting out a germ-tube and infecting the host; or the germ-tube itself swells up into a zoosporangium which develops a number of zoospores. In the rotting tissues branches of the older mycelium similarly swell up and form antheridia and oogonia (fig. 4). The contents of the antheridium are not set free, but that organ penetrates the oogonium by means of a narrow outgrowth, the fertilizing tube, and a male nucleus then passes over into the single oosphere, which at first multinucleate becomes uninucleate before fertilization. *Pythium* is of interest as illustrating the dependence of zoospore-formation on conditions and the indeterminate nature of conidia. The other genera are more purely parasitic; the mycelium usually sends haustoria into the cells of the host and puts out branched, aerial conidiophores through the stomata, the branches of which abstrict numerous "conidia"; these either germinate directly or their contents break up into zoospores (fig. 5). The development of the "conidia" as true conidial spores or as zoosporangia may occur in one and the same species (*Cystopus candidus*, *Phytophthora infestans*) as in *Pythium* described above; in other cases the direct conidial germination is characteristic of genera—*e.g. Peronospora*; while others emit zoospores—*e.g. Plasmopara*, &c. In *Cystopus* (*Albugo*) the "conidia" are abstricted in basipetal chain-like series from the ends of hyphae which come to the surface in tufts and break through the epidermis as white pustules. Each "conidium" contains numerous nuclei and is really a zoosporangium, as after dispersal it breaks up into a number of zoospores. The Peronosporaceae reproduce themselves sexually by means of antheridia and oogonia as described in *Pythium*. In *Cystopus Bliti* the oosphere contains numerous nuclei, and all the male nuclei from the antheridium pass into it, the male and female nuclei then fusing in pairs. We thus have a process of "multiple fertilization"; the oosphere really represents a large

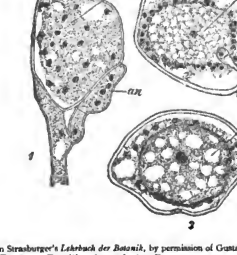

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Fig. 4.—Fertilization of the Peronosporeae. After Wager.

1. *Peronospora parasitica*. Young multinucleate oogonium (*og*) and antheridium (*an*).
2. *Albugo candida*. Oogonium with the central uninucleate oosphere and the fertilizing tube (*a*) of the antheridium which introduces the male nucleus.
3. The same. Fertilized egg-cell (*o*) surrounded by the periplasm (*p*).

number of undifferentiated gametes and has been termed a coenogamete. Between *Cystopus Bliti* on the one hand and *Pythium de Baryanum* on the other a number of cytologically intermediate forms are known. The oospore on germination usually gives origin

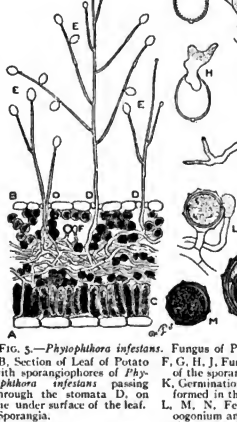

Fig. 5.—*Phytophthora infestans*. Fungus of Potato Disease.

A, B, Section of Leaf of Potato with sporangiophores of *Phytophthora infestans* passing through the stomata D, on the under surface of the leaf. E, Sporangia.
F, G, H, J, Further development of the sporangia.
K, Germination of the zoospores formed in the sporangia.
L, M, N, Fertilization of the oogonium and development of the oospore in *Peronospora*.

to a zoosporangium, but may form directly a germ tube which infects the host.

Saprolegnieaceae are aquatic forms found growing usually on dead insects lying in water but occasionally on living fish (*e.g.* the salmon disease associated with *Saprolegnia ferax*). The chief genera are

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Saprolegnia, Achlya, Pythiopsis, Dictyuchus, Aplanes. Motile zoospores which escape from the zoosporangium are present except in *Aplanes*. The sexual reproduction shows all transitions between forms which are normally sexual, like the Peronosporaceae, to forms in which no antheridium is developed and the oospheres develop parthenogenetically. The oogonia, unlike the Peronosporaceae, contain more than one oosphere. Klebs has shown that the development of zoosporangia or of oogonia and pollinodia respectively in *Saprolegnia* is dependent on the external conditions; so long as a continuous stream of suitable food-material is ensured the mycelium grows on without forming reproductive organs, but directly the supplies of nitrogenous and carbonaceous food fall below a certain degree of concentration sporangia are developed. Further reduction in the supplies of food effects the formation of oogonia. This explains the sequence of events in the case of a *Saprolegnia*-mycelium radiating from a dead fly in water. Those parts nearest the fly and best supplied develop barren hyphae only; in a zone at the periphery, where the products of putrefaction dissolved in the water form a dilute but easily accessible supply, the zoosporangia are developed in abundance; oogonia, however, are only formed in the depths of this radiating mycelium, where the supplies of available food materials are least abundant.

Chytridineae.—These parasitic and minute, chiefly aquatic, forms may be looked upon as degenerate Oomycetes, since a sexual process and feeble unicellular mycelium occur in some; or they may be regarded as series of primitive forms leading up to higher members. There is no means of deciding the question. They are usually included in Oomycetes, but their simple structure, minute size, usually uniciliate zoospores, and their negative characters would justify their retention as a separate group. It contains less than 200 species, chiefly parasitic on the algae and other water-plants or animals, of various kinds, or in other fungi, seedlings, pollen and higher plants. They are often devoid of hyphae, or put forth fine protoplasmic filaments into the cells of their hosts. After absorbing the cell-contents of the latter, which it does in a few hours or days, the fungus puts out a sporangium, the contents of which break up into numerous minute swarm-spores, usually one-ciliate, rarely two-ciliate. Any one of these soon comes to rest on a host-cell, and either pierces it and empties its contents into the latter—hence the further development occurs (*Olpidium*), or merely sends in delicate protoplasmic filaments (*Rhizophydium*) or a short hyphal tube of, at most, two or three cells, which acts as a haustorium, the further development taking place outside the cell-wall of the host (*Chytridium*). In some cases resting spores are formed within the host (*Chytridium*), and give rise to zoosporangia on germination. In a few species a sexual process is described, consisting in the conjugation of similar cells (*Zygochytrium*) or the union of two dissimilar ones (*Polyphagus*). In the development of distinct antheridial and oogonial cells the allied Ancylistineae show close alliances to *Pythium* and the Oomycetes. On the other hand, the uniciliate zoospores of *Polyphagus* have slightly amoeboid movements, and in this and the endopodium-like nature of the protoplasmic processes, such forms suggest resemblances to the Myxomycetes. Opinions differ as to whether the Chytridineae are degraded or primitive forms, and the group still needs critical revision. Many new forms will doubtless be discovered, as they are rarely collected on account of their minuteness. Some forms cause epidemics off of seedlings—*e.g. Olpidium Brassicae*; others discoloured spots and even tumour-like swellings—*e.g. Synchytium Scabiosae, S. Succisae, Urophlyctis*, &c., on higher plants. Analogies have been pointed out between Phytidiaceae and unicellular algae, such as Chlorosphaeraceae, Protococcaceae, "Palmellaceae," &c., some of which are parasitic, and suggestions may be entertained as to possible origin from such algae.

The *Zygomycetes*, of which about 200 species are described, are especially important from a theoretical standpoint, since they furnished the series whence Brefeld derived the vast majority of the fungi. They are characterized especially by the zygospores, but the asexual organs (sporangia) exhibit interesting series of changes, beginning with the typical sporangium of *Mucor* contained in external endospores, passing to cases where, as in *Thamnidium*, these are accompanied with more numerous small sporangia (sporangioles) containing few spores, and thence to *Chaetocladium* and *Piptocephalis*, where the sporangioles form but one spore and fall and germinate as a whole; that is to say, the monosporous sporangium has become a conidium, and Brefeld regarded these and similar series of changes as explaining the relation of ascus to conidium in higher fungi. According to his view, the ascus is in effect the sporangium with several spores, the conidium the sporangiole with but one spore, and that not loose but fused with the sporangiole wall. On this basis, with other interesting morphological comparisons, Brefeld erected his hypothesis, now untenable, that the Ascomycetes and Basidiomycetes diverge from the Zygomycetes, the former having particularly specialized the ascus (sporangial) mode of reproduction, the latter having specialized the conidial (indehiscent one-spored sporangiole) mode. In addition to sporangia and the conidial spores referred to, some Mucorini show a peculiar mode of vegetative reproduction by means of gemmae or chlamydospores—*i.e.* short segments of the hyphae become stored with fatty reserves and act as spores. The gemmae formed on submerged Mucors may bud like a yeast, and even bring about alcoholic fermentation in a saccharine solution.

The segments of the hyphae in this group usually contain several nuclei. At the time of sporangial formation the protoplasm with numerous nuclei streams into the swollen end of the sporangiophore and there becomes cut off by a cell-wall to form the sporangium. The protoplasm then becomes cut up by a series of clefts into a number of smaller and smaller pieces which are unicellular in *Rhizopus*, multicellular in *Sporodinia*. These then become surrounded by a cell-wall and form the spores. This mode of spore-formation is totally different from that in the ascus; hence one of the difficulties of the acceptance of Brefeld's view of the homology of ascus and sporangium. The cytology of zygospore-formation is not known in detail; the so-called gametes which fuse are multinucleate and are no doubt of the nature of gametangia. The fate of these nuclei is doubtful, probably they fuse in pairs (fig. 6).

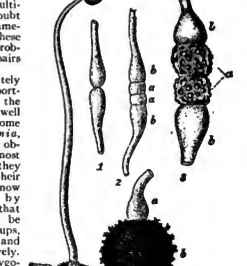

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FIG. 6.—*Mucor Mucedo*. Different stages in the formation and germination of the zygospore. (After Brefeld, 1–4. 5 from v. Tavel, *Pilze*.)

1. Two conjugating branches in contact.
2. Septation of the conjugating cells (*a*) from the suspensors (*b*).
3. More advanced stage, the conjugating cells (*a*) are still distinct from one another; the warty thickenings of their walls have commenced to form.
4. Ripe zygospore (*b*) between the suspensors (*a*).
5. Germinating zygospore with a germ-tube bearing a sporangium.

Blakeslee has lately made some very important observations of the Zygomycetes. It is well known that while in some forms, *e.g. Spordinia*, zygospores are easily obtained, in others, *e.g.* most species of *Mucor*, they are very erratic in their appearance. This has now been explained by Blakeslee, who finds that the Mucorinae can be divided into two groups, termed homothallic and heterothallic respectively. In the first group zygospores can arise by the union of branches from the *same* mycelium and so can be produced by the growth from a single spore; this group includes *Sporodinia grandis, Spinellus fusiger*, the three species of *Mucor*, &c. The majority of forms, however, fall into the heterothallic group, in which the association of branches from two mycelia *different in nature* is necessary for the formation of zygospores. These interbreeding races cannot then be produced from the product of a single spore nor even from the thalli derived from *any* two spores. The two kinds of thalli Blakeslee considers to have a differentiation of the nature of sex and he distinguishes them as (+) and (−) forms; the former being usually distinguished by a somewhat greater luxuriance of growth.

The classification of the Mucorini depends on the prevalence and characters of the conidia, and of the sporangia and zygospores—*e.g.* the presence or absence of a columella in the latter, the formation of an investment round the latter. Most genera are saprophytes, but some—*Chaetocladium, Piptocephalis*—are parasites on other Mucorini, and one or two are associated casually with the rotting of tomatoes, fruits, bulbs, &c., the fleshy parts of which are rapidly destroyed if once the hyphae gain entrance. Even more important is the question of mycosis in man and other animals, referred to species of *Mucor*, and investigated by Lucet and Costantin. Klebs has concluded that transpiration is the important factor in determining the formation of sporangia, while zygote-development depends on totally different conditions; these results have been called in question by Falck.

The *Entomophthoraceae* contain three genera, *Empusa, Entomophthora* and *Basidiobolus*. The two first genera consist of forms which are parasitic on insects. *Empusa Muscae* causes the well-known epidemic in house-flies during the autumn; the dead, affected flies are often found attached to the window surrounded by a white halo of conidia. *B. ranarum* is found in the alimentary canal of the frog and growing on its excrement. In these three genera the conidia are cast off with a jerk somewhat in the same way as the sporangium of *Pilobolus*.

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B. Higher Fungi.—Now that Brefeld's view of the origin of these forms from the Zygomycetes has been overthrown, the relationship of the higher and lower forms of fungi is left in obscurity. The term *Eumycetes* is sometimes applied to this group to distinguish them from the Phycomycetes, but as the same name is also applied to the fungi as a whole to differentiate them from the Mycetozoa and Bacteria, the term had best be dropped. The Higher Fungi fall into three groups: the *Ustilaginales*, of doubtful position, and the two very sharply marked groups *Basidiales* and *Ascomycetes*.

I. *Ustilaginales.*—This includes two families Ustilaginaceae (smuts) and Tilletiaceae (bunts). The bunts and smuts which damage our grain and fodder plants comprise about 400 species of internal parasites, found in all countries on herbaceous plants, and especially on Monocotyledons. They are remarkable for their dark spores developed in gall-like excrescences on the leaves, stems, &c., or in the fruits of the host. The discovery of the yeast-conidia of these fungi, and their thorough investigation by Brefeld, have thrown new lights on the group, as also have the results elucidating the nature of the ordinary dark spores—smuts, bunt, &c.—which by their mode of origin and development are chlamydospores. When the latter germinate a slender "promycelium" is put out; in *Ustilago* and its allies this is transversely septate, and bears lateral conidia (sporidia); in *Tilletia* and its allies non-septate, and bears a terminal tuft of conidia (sporidia) (fig. 7). Brefeld regarded the promycelium as a kind of *basidium*, bearing lateral or terminal conidia (comparable to *basidiospores*), but since the number of basidiospores is not fixed, and the basidium has not yet assumed very definite morphological characters, Brefeld termed the group *Hemibasidii*, and regarded them as a half-way stage in the evolution of the true Basidiomycetes from Phycomycetes, the *Tilletia* type leading to the true basidium (Autobasidium), the *Ustilago* type to the protobasidium, with lateral spores; but this view is based on very poor evidence, so that it is best to place these forms as a separate group, the *Ustilaginales*. The yeast-conidia, which bud off from the conidia or their resulting mycelium when sown in nutrient solutions, are developed in successive crops by budding exactly as in the yeast plant, but they cannot ferment sugar solutions. It is the rapid spread of these yeast-conidia in manure and soil waters which makes it so difficult to get rid of smuts, &c., in the fields, and they, like the ordinary conidia, readily infect the seedling wheat, oats, barley or other cereals. Infection in these cases occurs in the seedling at the place where root and shoot meet, and the infecting hypha having entered the plant goes on living in it and growing up with it as if it had no parasitic action at all. When the flowers form, however, the mycelium sends hyphae into the young ovaries and rapidly replaces the stores of sugar and starch, &c., which would have gone to make the grain, by the soot-like mass of spores so well known as smut, &c. These spores adhere to the grain, and unless destroyed, by "steeping" or other treatment, are sown with it, and again produce sporidia and yeast-conidia which infect the seedlings. In other species the infection occurs through the style of the flower, but the fungus after reaching the ovule develops no further during that year but remains dormant in the embryo of the seed. On germination, however, the fungus behaves in the same way as one which has sown itself in the seedling stage. The cytology of these forms is very little known; Dangeard states that there is a fusion of two nuclei in the chlamydospore, but this requires confirmation. Apart from this observation there is no other trace of sexuality in the group.

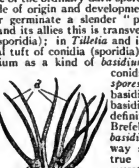

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Fig. 7.—Germinating resting-conidia. A, of *Ustilago receptaculorum*; B, of *Tilletia Caries*.

sp, The gonidium.
pm, The promycelium.
d, The sporidia: in B the sporidia have coalesced in pairs at *v*.

II. *Ascomycetes.*—This, except in the case of a few of the simpler forms, is a very sharply marked group characterized by a special type of sporangium, the *ascus*. In the development of the ascus we find two nuclei at the base which fuse together to form the single nucleus of the young ascus. The single nucleus divides by three successive divisions to form eight nuclei lying free in the protoplasm of the ascus. Then by a special method, described first by Harper, a mass of protoplasm is cut out round each nucleus; thus eight uninucleate ascospores are formed by free-cell formation. The protoplasm remaining over is termed *epiplasm* and often contains glycogen (fig. 8). In some cases nuclear division is carried further before spore-formation occurs, and the number of spores is then 16, 32 and 64, &c.; in a few cases the number of spores is less than eight by abortion of some of the eight nuclei. The ascus is thus one of the most sharply characterized structures among the fungi.

In some forms we find definite male and female sexual organs (*Sphaerotheca, Pyronema*, &c.), in others the antheridium is abortive or absent, but the ascogonium (oogonium) is still present and the female nuclei fuse in pairs (*Lachnea stercorea, Humaria granulata, Ascobolus furfuraceus*); while in other forms ascogonium and antheridium are both absent and fusion occurs between vegetative nuclei (*Humaria rutilans*, and probably the majority of other forms). In other cases the sexual fusion is apparently absent altogether, as in *Exoascus*. In the first case (fig. 9) we have a true sexual process, while in the second and third cases we have a *reduced* sexual process in which the fusion of other nuclei has replaced the fusion of the normal male and female nuclei. It is to be noted that all the forms exhibit the fusion of nuclei in the ascus, so that those with the normal or reduced sexual process described above have two nuclear fusions in their life-history. The advantage or significance of the second (ascus) fusion is not clearly understood.

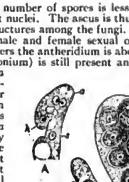

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Fig. 8.—Development of the Ascus.

A–C, Pyronema confluens. (After Harper.)
D, Young ascus of *Boudiera* with eight spores. (After Claussen.)

The group of the Hemiasci was founded by Brefeld to include forms which were supposed to be a connecting link between Phycomycetes and Ascomycetes. As mentioned before, the connexion between these two groups is very doubtful, and the derivation of the ascus from an ordinary sporangium of the Zygomycetes cannot be accepted. The majority of the forms which were formerly included in this group have been shown to be either true Phycomycetes (like *Ascoidea*) or true Ascomycetes (like *Thelebolus*). *Eremascus* and *Dipodascus*, which are often placed among the Hemiasci, possibly do not belong to the Ascomycetes series at all.

Exoascaceae are a small group of doubtful extent here used to include *Exoascus, Taphrina, Ascorticium* and *Endomyces*. The

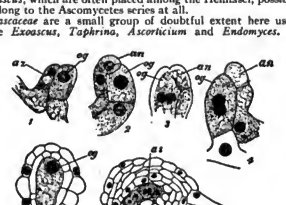

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Fig. 9.—*Sphaerotheca Castagnei*. Fertilization and Development of the Perithecium. (After Harper.)

1, Oogonium (*og*) with the antheridial branch (*at*) applied to its surface.
2, Separation of antheridium (*an*).
3, Passage of the antheridial nucleus towards that of the oogonium.
4, Union of the nuclei.
5, Fertilized oogonium surrounded by two layers of hyphae derived from the stalk-cell (*st*).
6, The multicellular ascogonium derived by division from the oogonium; the terminal cell with the two nuclei (*as*) gives rise to the ascus.

mycelium is very much reduced in extent. The asci are borne directly on the mycelium and are therefore fully exposed, being devoid from the beginning of any investment. The *Taphrinaceae*, which include *Exoascus* and *Taphrina*, are important parasites—*e.g.* pocket-plums and witches' brooms on birches, &c., are due to their action (fig. 10). *Exoascus* and *Ascorticium* present interesting parallels to *Exobasidium* and *Corticium* among the Basidiomycetes.

Saccharomycetaceae include the well-known yeasts which belong mainly to the genus *Saccharomyces*. They are characterized by their unicellular nature, their power of rapid budding, their capacity for fermenting various sugars, and their power of forming endogenous

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spores. The sporangium with its endogenous spores has been compared with an ascus, and on these grounds the group is placed among the Ascomycetes—a very doubtful association. The group has attained an importance of late even beyond that to which it was brought by Pasteur's researches on alcoholic fermentation, chiefly owing to the exact results of the investigations of Hansen, who first applied the methods of pure cultures to the study of these organisms, and showed that many of the inconsistencies hitherto

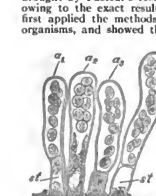

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FIG. 10.—*Taphrina Pruni*. Transverse section through the epidermis of an infected plum. Four ripe asci, a_1, a_2, with eight spores, a_3, a_4, with yeast-like conidia abstricted from the spores. After Sadebeck.
st, Stalk-cells of the asci.
m, Filaments of the mycelium cut transversely.
cut, Cuticle.
ep, Epidermis.

existing in the fact that were due to the coexistence in the cultures of several species or races of yeasts morphologically almost indistinguishable, but physiologically very different. About fifty species of *Saccharomyces* are described more or less completely, but since many of these cannot be distinguished by the microscope, and some have been found to develop physiological races or varieties under special conditions of growth, the limits are still far too ill-defined for complete botanical treatment of the genus. A typical yeast is able to develop new cells by budding when submerged in a saccharine solution, and to ferment the sugar—*i.e.* so to break up its molecules that, apart from small quantities used for its own substance, masses of it out of all proportion to the mass of yeast used become converted into other bodies, such as carbon dioxide and alcohol, the process requiring little or no oxygen. Brefeld regards the budding process as the formation of conidia. Under other conditions, of which the temperature is an important one, the nucleus in the yeast-cell divides, and each daughter-nucleus again,

and four spores are formed in the mother cell, a process obviously comparable to the typical development of ascospores in an ascus. Under yet other conditions the quiescent yeast-cells floating on the surface of the fermented liquor grow out into elongated sausage-shaped or cylindrical cells and branching cell-series, which mat together into mycelium-like veils. At the bottom of the fermented liquor the cells often obtain fatty contents and thick walls, and behave as resting cells (chlamydospores). The characters employed by experts for determining a species of yeast are the sum of its peculiarities as regards form and size: the shapes, colours, consistency, &c., of the colonies grown on certain definite media; the optimum temperature for spore-formation, and for the development of the "veils"; and the behaviour as regards the various sugars.

and other have shown that a ferment (zymase) can be extracted from yeast-cells which causes sugar to break up into carbon dioxide and alcohol. It has since been shown by Buchner and Albert that yeast-cells which have been killed by alcohol and ether, or with acetone, still retain the enzyme. Such material is far more active than the zymase obtained originally by Buchner from the expressed juice of yeast-cells. Thus alcoholic fermentation is brought into line with the other fermentations.

Schizosaccharomyces includes a few species in which the cells do not "bud" but become elongated and then divide transversely. In the formation of sporangia two cells fuse together by means of outgrowths, in a manner very similar to that of *Spirogyra*; sometimes, however, the wall between two cells merely breaks down. The fused cell becomes a sporangium, and in it eight spores are developed. In certain cases single cells develop parthenogenetically, without fusion, each cell producing, however, only four spores. In *Zygosaccharomyces* described by Barker (1901) we have a form of the usual sprouting type, but here again there is a fusion of two cells to form a sporangium.

Cytology.—The study of the nucleus of yeast-cells is rendered difficult by the presence of other deeply staining granules termed by Guilliermond *metachromatic granules*. These are often been mistaken for nuclei and have to be carefully distinguished by differential stains. In the process of budding the nucleus divides apparently by a process of direct division. In the formation of spores the nucleus of the cell divides, the protoplasm collects round the nuclei to form the spores, and the free-cell formation, the protoplast (epiplasm) not used in this process becomes disorganized. A fusion of nuclei was originally described by Jansens and Leblanc, but it was observed neither by Wager nor Guillermond and is probably absent. In *Schizosaccharomyces* and *Zygosaccharomyces*, however, we have a fusion of nuclei in connexion with the conjugation of cells which precedes sporangium-formation. The theory may be put forward that the ordinary forms have been derived from sexual forms like *Schizosaccharomyces* and *Zygosaccharomyces* by a loss of sexuality, the sporangium being formed parthenogenetically without any nuclear fusion. This suggests a possible relationship to *Eremascus*, which can only doubtfully be placed in the Ascomycetes (*vide supra*).

Carpoascomycetes.—The other divisions of the Ascomycetes may be distinguished as Carpoascomycetes because they do not bear the asci free on the mycelium but enclosed in definite fruit bodies or ascocarps. The ascocarps can be distinguished into two portions, a mass of sterile or vegetative hyphae forming the main mass of the fruit body, and surrounding the fertile ascogenous hyphae which bear at their ends the asci. When the ascogonium (female organ) is present the ascogenous hyphae arise from it, with or without its previous fusion with an antheridium. In other cases the ascogenous hyphae arise directly from the vegetative hyphae, in connexion with this condition of reduction a fusion of nuclei has been observed in *Humaria rutilans* and is probably of frequent occurrence. The asci may be derived from the terminal cell of the branches of the ascogenous hyphae, but usually they are derived from the penultimate cell, the tip curving over to form the so-called crozier. By this means the ascus cell is brought uppermost, and after the fusion of the two nuclei it develops enormously and produces the ascospores. The ascospores escape from the asci in various ways, sometimes by a special ejaculation-mechanism. The Ascomycetes, at least the Carpoascomycetes, exhibit a well-marked alternation of sexual and asexual generations. The ordinary mycelium is the gametophyte since it bears the ascogonia and antheridia when present; the

The following summary of some of the principal characteristics of half-a-dozen species will serve to show how such peculiarities can be utilized for systematic purposes:

Species.	Optimum Temperature for		Characters of			Sugars Fermented and Products, &c.
	Spores.	Veils.	Fermentation.	Cells.	Spores.	
S. cerevisiae I. . .	30°	20°–28°	High	Rounded	Globoid	Inverts maltose and saccharose and form alcohol 4–6 vol. %
S. Pastorianus I. . .	27°–5°	26°–28°	Low	Rounded	Globoid	
S. ellipsoideus . . .	25°	33°–34°	Low	Rounded	Globoid	
S. anomalus . . .	28°–31°	?	High	Elliptical	Hat-shaped	Ditto, and evolves a fragrant ether.
S. Ludwigii . . .	30°–31°	?	?	Elongated	Globoid	Will not invert maltose.
S. membranaefaciens .	30°	?	High	Elongated	Globoid	Inverts neither maltose nor saccharose.

Two questions of great theoretical importance have been raised over and over again in connexion with yeasts, namely, (1) the morphological one as to whether yeasts are merely degraded forms of higher fungi, as would seem implied by their tendency to form elongated, hypha-like cells in the veils, and their development of "ascosporics" as well as by the occurrence of yeast-like "sprouting forms" in other fungi (*e.g. Mucor*, Exoasci, Ustilagineae, higher Ascomycetes and Basidiomycetes); and (2) the question as to the physiological nature and meaning of fermentation. With regard to the first question no satisfactory proof has as yet been given that Saccharomycetes are derivable by culture from any higher form, the recent statements to that effect not having been confirmed. At the same time there are strong grounds for insisting on the resemblances between *Endomyces*, a hyphal fungus bearing yeast-like asci, and such a form as *Saccharomyces anomalus*. Concerning the second question, the recent investigations of Buchner

ascogenous hyphae with their asci represent the sporophyte since they are derived from the fertilized ascogonium. The matter is complicated by the apogamous transition from gametophyte to sporophyte in the absence of the ascogonium; also by the fact that there are normally two fusions in the life-history as mentioned earlier. If there are two fusions one would expect two reductions, and Harper has suggested that the division of the nuclei into eight in the ascus, instead of into four spores as in most reduction processes, is associated with a *double* reduction process in the ascus. Miss Fraser in *Humaria rutilans* finds two reductions, a normal synaptic reduction in the first nuclear division of the ascus, and a peculiar reduction division termed *brachymeiosis* in the third ascus division.

Various types of ascocarp are characteristic of the different divisions of the Carpoascomycetes: the cleistothecium, apothecium and perithecium.

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Perisporineae.—This includes two chief families, Erysiphaceae and Perisporiaceae. They are characterized by an ascocarp without any opening to the exterior, the ascospores being set free by the decay or rupture of the ascocarp wall; such a fruit-body is termed a *cleistothecium* (cleistocarp). The Erysiphaceae are a sharply marked group of forms which live as parasites. They form a superficial mycelium on the surface of the plant, the hyphae not usually penetrating the tissues but merely sending haustoria into the epidermal cells. Only in rare cases is the mycelium intercellular. Owing to their appearance they go by the popular name of mildews. *Sphaerotheca Humuli* is the well known hop-mildew, *Sphaerotheca Mors-Uvae* is the gooseberry mildew, the recent advent of which has led to special legislation in Great Britain to prevent its spreading, as when rampant it makes the culture of gooseberries impossible. *Erysiphe*, *Uncinula* and *Phyllactinia* are other well-known genera. The form of the fruit body, the difference and the nature of special outgrowths upon it—the appendages—are characteristic of the various genera. Besides peritheca the members of the Erysiphaceae possess conidia borne in simple chains. De Bary brought forward very strong evidence for the origin of the ascocarp in *Sphaerotheca* and *Erysiphe* by a sexual process, but Harper in 1895 was the first to prove conclusively, by the observation of the nuclear fusion, that there was a definite fertilization in *Sphaerotheca Humuli* by the fusion of a male (antheridial) nucleus with a female, ascogonial (oogonial) nucleus. Since then Harper has shown that the same process occurs in *Erysiphe* and *Phyllactinia*.

The Perisporiaceae are saprophytic forms, the two chief genera being *Aspergillus* and *Penicillium*. The blue-green mould *P. crustaceum* and the green mould *A. herbariorum* (=*Eurotium herbariorum*) are extraordinarily widely distributed, moulds being found on almost any food-material which is exposed to the air. They have characteristic conidiophores bearing numerous conidia, and also cleistothecia which are spherical in form and yellowish in colour. The latter arise from the crown of a spirally coiled archicarp (bearing an ascogonium at its end) and a straight antheridium. Vegetative hyphae then grow up and surround these and enclose them in a continuous sheath of plectenchyma (fig. 11). It has lately been shown by Fraser and Chambers that in *Eurotium* both

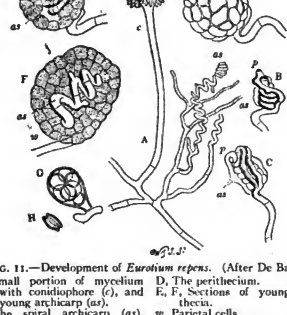

FIG. 11.—Development of *Eurotium repens*. (After De Bary.)

A, Small portion of mycelium with conidiophore (*c*), and young archicarp (*as*).
B, The spiral archicarp (*as*), with the antheridium (*p*).
D, The same, beginning to be surrounded by the hyphae forming the perithecium wall.
D, The perithecium.
E, F, Sections of young perithecia.
w, Parietal cells.
f, Pseudo-parenchyma.
as, Ascogonium.
G, An ascus.
H, An ascospore.

ascogonium and antheridium contain a number of nuclei (*i.e.* are coenogametes), but that the antheridium disorganizes without passing its contents into the ascogonium. There is apparently a reduced sexual process by the fusion of the ascogonal (female) nuclei in pairs. *Aspergillus Oryzae* plays an important part in saccharifying the starch of rice, maize, &c., by means of the abundant diastase it secretes, and, in symbiosis with a yeast which ferments the sugar formed, has long been used by the Japanese for the preparation of the alcoholic liquor saké. The process has now been successfully introduced into European commerce.

Discomycetes.—Used in its widest sense this includes the Hysteriaceae, Phacidiaceae, Helvellaceae, &c. The group is characterized in general by the possession of an ascocarp which, though usually a completely closed structure during the earlier stages of development, at maturity opens out to form a bowl or saucer-shaped organ, thus completely exposing the layer of asci which forms the hymenium. Such an ascocarp goes by the name of *apothecium*. Owing to the shape of the fruit-body many of these forms are known as cup-fungi, the cup or apothecium often attaining a large size, sometimes several inches across (fig. 12). Functional male and female organs have been shown to exist in *Pyronema* and *Boudiera*; in *Lachnea stercorea* both ascogonia and antheridia are present, but the antheridium is non-functional, the ascogonial (female) nuclei fusing in pairs; this is also the case in *Humaria granulata* and *Ascobolus furfuraceus*, where the antheridium is entirely absent. In *H. rutilans*, however, both sexual organs are absent and the ascogenous hyphae arise apogamously from the ordinary hyphae of the mycelium. In all these cases the

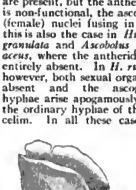

FIG. 13.—*Ascobolus furfuraceus*. Diagrammatic section of the fructification. (After Janczewski.)

m, Mycelium.
c, Archicarp.
l, Pollinodium.
s, Ascogenous filaments.
a, Asci.
r, *p*, The sterile tissue from which the paraphyses *h* spring.

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FIG. 12.—*Peziza auranliaca*. (After Krombholz, nat. size.)

ascogonium and antheridium contain numerous nuclei; they are to be looked upon as gametangia in which there is no differentiation of gametes, and since they act as single gametes they are termed coenogametes. In some forms as in *Ascobolus* the ascogonium is multicellular, the various cells communicating by pores in the transverse walls (fig. 13).

In the Helvellaceae there is no apothecium but a large irregular fruit body which at maturity bears the asci on its surface. The development is only slightly known, but there is some evidence for believing that the fruit-body is closed in its very early stages.

The genus *Peziza* (in its widest sense) may be taken as the type of the group. Most of them grow on living plants or on dead vegetable remains, very often on fallen wood; a number, however, are found growing on earth which is rich in humus. The genus *Sclerotinia* may be mentioned here; a number of forms have been investigated by Woronin. The conidia are fragrant and are carried by bees to the stigma of the bilberry; here they germinate with the pollen and the hyphae pass with the pollen tubes down the style; the former infect the ovules and produce sclerotia, therein reducing the fruits to a mummified condition. From the sclerotia later the apothecium develops. One species, *S. heterotica*, is *heteroecious*; the ascospores infecting the leaves of *Vaccinium uliginosum*, while the conidia which then arise infect only *Ledum palustre*. This is the only case of heteroecism known in the vegetable kingdom outside the Uredineae.

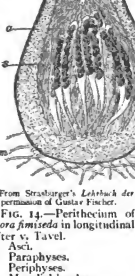

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FIG. 14.—Perithecium of *Podospora fimiseda* in longitudinal section After v. Tavel.
s, Asci.
a, Paraphyses.
e, Periphyses.
m, Mycelial hyphae.

Pyrenomycetes.—This is an extraordinarily large and varied group of forms which mostly live parasitically or saprophytically on vegetable tissue, but a few are parasitic on insect-larvae. The group

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is characterized by a special type of ascocarp, the *peritherium*. This is typically of a flask-shaped form opening with a small pore at the top. The asci live at the bottom often mixed with paraphyses, while the upper " neck " of the flask is lined with special hyphae, the periphyses, which aid in the ejection of the spores (fig. 14). The simpler forms bear the peritheciа directly on the mycelium, but the more highly developed forms often bear them on a special mycelial development—the stroma, which is often of large size and special shape and colour, and of dense consistence. The cytological details of development of the perithecia are not well known; most of them appear to develop their ascogenous hyphae in an apogamous way without any connexion with an ascogonium. Besides the special ascocarps, accessory reproductive organs are known in the majority of cases in the form of conidia.

Tuberineae.—These are a small group of fungi including the well-known truffles. They are found living saprophytically (in part parasitically) underground in forests. The asci are developed in the large dense fruit bodies (cleistothecia) and the spores escape by the decay of the wall. The fruit-body is of complicated structure, but its early stages of development are not known. Many of the fruit-bodies have a pleasant flavour and are eaten under the name of truffles (*Tuber brumale* and other species). The exact life-history of the truffle is not known.

Laboulbeniineae are a group of about 150 species of fungi found on insects, especially beetles, and principally known from the researches of Thaxter in America. The plant is a small, dark brown, erect structure (receptacle) of a few cells, and 1-10 mm. high, attached to the insect by the lowermost end (foot), and easily mistaken for a hair or similar appendage of the insect. The receptacle ends above in appendages, each consisting of one or a few cells, some of which are the male organs, others the female organs, and others again may be barren hairs. The male organ (antheridium) consists of a few cells, the terminal one of which either abstricts from its end, or emits from its interior the non-motile spermatia, reminding us of those of the Florideae. The female organ is essentially a flask-shaped structure; the neck of the flask growing out as the trichogyne, and the belly composed of an axial carpogenic cell surrounded by investing cells, and with one cell (trichophoric) between it and the trichogyne. These three elements—trichogyne, trichophoric cell, and carpogenic cell—are regarded as the procarp. The spermatia have been shown by Thaxter to fuse with the trichogyne, after which the axial cell below (carpogenic cell) undergoes divisions, and ultimately forms asci containing ascospores, while cells investing this form a perithecium, the whole structure reminding us essentially of the fructification of a Pyrenomycete. Many modifications in details occur, and the plants may be dioecious. No injury is done to the infested insects. It has lately been shown that there is a fusion of nuclei in connexion with ascus formation, so that there can be no doubt of the position of this extraordinary group of plants among the Ascomycetes. The various cells of these organisms are connected by large pits which are traversed by thick protoplasmic threads connecting one cell with the next. In this point and in their method of fertilization the Laboulbeniineae suggest a possible relationship of Ascomycetes and the Red Algae.

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FIG. 15.—*Armillaria mellea*. (After Ruhland.)

A, Young basidium with the two primary nuclei.

B, After fusion of the two nuclei.

Hypholoma appendiculatum.

C A basidium before the four nuclei derived from the secondary nucleus of the basidium have passed into the four basidiospores.

D, Passage of a nucleus through the sterigma into the basidiospore.

Basidiales.—This very large group of plants is characterized by the possession of a special type of conidiophore—the basidium, which gives its name to the group. The basidium is unicellular or multicellular structure from which four basidiospores arise as outgrowths; it starts as a binucleate structure, but soon, like the ascus, becomes uninucleate by the fusion of the two nuclei. Then two successive nuclear divisions occur resulting in the formation of four nuclei which later migrate respectively into the four basidiospores (fig. 15). The Basidiales are further characterized by the complete loss of normal sexuality, but at some time or other in the life-history there takes place an association of two nuclei in a cell; the two nuclei are derived from separate cells or possibly in some cases are sister nuclei of the same cell. The two nuclei when once associated are termed " conjugate " nuclei, and they always divide at the same time, a hall of each passing into each cell. This conjugate condition is finally brought to a close by the nuclear fusion in the basidium. Between the nuclear association and the nuclear fusion in the basidium many thousands of cell generations may be intercalated. This nuclear association of equivalent nuclei apparently represents a reduced sexual process (like the fusion of female nuclei in *Ustilago Tragmaria granulata* and of vegetative nuclei in *H. rutilans*, among the Ascomycetes) in which, however, the actual fusion (normally, in a sexual process, occurring immediately after association) is delayed until the formation of the basidium. During the tetrad division in the basidium nuclear reduction occurs. There is thus in all the Basidiales an alternation of generations, obscured, however, by the apogamous transition from the gametophyte to sporophyte. The sporophyte may be considered to begin at the stage of nuclear association and end with the nuclear reduction in the basidium.

Uredineae.—This is a large group of about 2000 forms. They are all intercellular parasites living mostly on the leaves of higher plants. Owing to the presence of oily globules of an orange-yellow or rusty-red colour in their hyphae and spores they are termed Rust-Fungi. They are distinguished from the other fungi and the rest of the Basidiales by the great variety of the spores and the great elaboration of the life-history to be found in many cases. Five different kinds of spores may be present—teleutospores, sporidia (=basidiospores), aecidiospores, spermatia and uredospores (fig. 16). The teleutospore, with the sporidia which arise from it, is always present, and the division into genera is based chiefly on

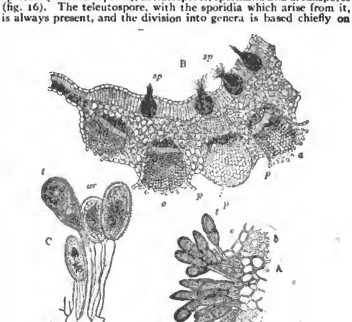

FIG. 16.—*Puccinia graminis*.

A, Mass of teleutospores (*t*) on a leaf of couch-grass.

c, Epidermis ruptured.

b, Sub-epidermal fibres. (After De Bary.)

B, Part of vertical section through leaf of *Berberis* vulgaris, with *a*, aecidium fruits, *p*, peridium, and *sp*, spermogonia. (After Sachs.)

C, Mass of uredospores (*ur*), with one teleutospore (*t*).

sh, Sub-hymenial hyphae. (After De Bary.)

its characters. The teleutospore puts forth on germination a four-celled structure, the promycelium or basidium, and this bears later four sporidia or basidiospores, one on each cell. When the sporidia infect a plant the mycelium so produced gives origin to aecidiospores and spermatia; the aecidiospores on infection produce a mycelium which bears uredospores and later teleutospores. This is the life-history of the most complicated forms, of the so-called *eu* forms. In the *opsis* forms the uredospores are absent, the mycelium from the aecidiospores producing directly the teleutospores. In *brachy* and *hemi* the aecidiospores are absent, the mycelium from the sporidia giving origin directly to the uredospores; the former possess spermatia, in the latter they are absent. In *lepto* and *micro* forms both aecidiospores and uredospores are absent, the sporidia producing a mycelium which gives rise directly to teleutospores; in the *lepto* forms the teleutospores can germinate directly, in the *micro* forms only after a period of rest. We have thus a series showing a progressive reduction in the complexity of the life-history, the *lepto* and *micro* forms having a life-history like that of the Basidiomycetes. The *eu* and *opsis* forms may exhibit the remarkable phenomenon of heteroecism, *i.e.* the dependence of the fungus on two distinct host-plants for the completion of the life-history. Heteroecism is very common in this group and is now known in over one hundred and fifty species. In all cases of heteroecism sporidia infect one host leading to the production of aecidiospores and spermatia (if present), while the aecidiospores are only able to infect another

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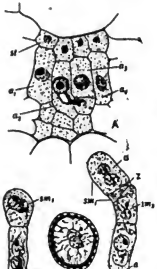
host on which the uredospores (if present) and the teleutospores are developed. A few examples are appended:

Species.	Teleutospores on	Aecidiospores on
Coleosporium Senecionis	*Pinus*	*Senecio*
Melampsora Rostrupi	*Populus*	*Mercurialis*
Pucciniastrum Goeppertianum	*Vaccinium*	*Abies*
Gymnosporangium Sabinae	*Juniperus*	*Pyrus*
Uromyces Pisi	*Pisum, &c.*	*Euphorbia*
Puccinia graminis	*Triticum, &c.*	*Berberis*
P. dispersa	*Secale, &c.*	*Anchusa*
P. coronata	*Agrostis*	*Rhamnus*
P. Ari-Phalaridis	*Phalaris*	*Arum*
P. Caricis	*Carex*	*Urtica*
Cronartium Ribicola	*Ribes*	*Pinus*
Chrysomyxa Rhododendri	*Rhododendron*	*Picea*

Some of the Uredineae also exhibit the peculiarity of the development of biologic forms within a single morphological species, sometimes termed specialization of parasitism; this will be dealt with later under the section Physiology.

Cytology of Uredineae.—The study of the nuclear behaviour of the cells of the Uredineae has thrown great light on the question of sexuality. This group like the rest of the Basidiales exhibits an association of nuclei at some point in its life-history, but unlike the case of the Basidiomycetes the point of association in the Uredineae is very well defined in all those forms which possess aecidiospores. We find thus that in the *eu* and *opsis* forms the association of nuclei takes place at the base of the aecidium which produces the aeciodiospores. There we find an association of nuclei either by the fusion of two similar cells as described by Christmann or by the migration of the nucleus of a vegetative cell into a special cell of the aecidium. After this association the nuclei continue in the conjugate condition so that the aeciodiospores, the uredospore-bearing mycelium, the uredospores and the young teleutospores all contain two paired nuclei in their cells (fig. 17). Before the teleutospore reaches maturity the nuclei fuse, and the uninucleate condition then continues again until aecidium formation. In the *hemi*, *brachy*, *macro* and *lepto* forms, which possess no aecidium, we find that the association takes place at various points in the ordinary mycelium but always before the formation of the uredospores in the *hemi* and *brachy* forms, and before the formation of teleutospores in *micro* and *lepto* form. Whether the association of nuclei in the ordinary mycelium takes place by the migration of a nucleus from one cell to another or whether two daughter nuclei become conjugate in one cell, is not yet clear. The most reasonable interpretation of the spermatia is that they are abortive male cells. They have never been found to cause infection, and they have not the characters of conidia; the large size of their nuclei, the reduction of their cytoplasm and the absence of reserve material and their thin cell wall all point to their being male gametes. Although in the forms without aecidia the two generations are not sharply marked off from one another, we may look up the generation with single nuclei in the cells as the gametophyte and that with conjugate nuclei as the sporophyte. The subjoined diagram will indicate the relationship of the forms.



From Strasburger's *Lehrbuch der Botanik*, by permission of Gustav Fischer.

FIG. 17.—*Phragmidium Violaceum.* (After Blackman.)

A, Portion of a young aecidium.
st, Sterile cell.
a, Fertile cells; at a_3 the passage of a nucleus from the adjoining cell is seen.
B, Formation of the first spore-mother-cell (*sm*), from the basal cell (*a*) of one of the rows of spores.
C, A further stage in which from *sm*, the first aeciodiospore (*a*) and the intercalary cell (*a*) have arisen.
sm_2, The second spore-mother-cell.
D, Ripe aeciodiospore.

Basidiomycetes.—This group is characterized by its greatly reduced life-history as compared with that of the *eu* forms among the Uredineae. All the forms have the same life-history as the *lepto* forms of that group, so that there is no longer any trace of sexual organs. There is also a further reduction in that the basidium is not derived from a teleutospore but is borne directly on the mycelium. Formerly, before the relationship of promycelium and basidium were understood, the Uredineae were considered as quite independent of the Basidiomycetes. Later, however, these Uredineae were placed as a mere subdivision of the Basidiomycetes. Although the Uredineae clearly lead on to the Basidiomycetes, yet owing to their retaining in many cases definite traces of sexual organs they are clearly a more primitive group. Their marked parasitic habit also separates them off, so that they are best included with the Basidiomycetes in a larger cohort which may be called Basidiales. Most of Basidiomycetes are characterized by the large sporophore on which the basidia with its basidiospores are borne.

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FIG. 18.

It must be clearly borne in mind that though the Basidiomycetes show no traces of differentiated sexual organs yet, like the *micro* and *lepto* forms of the Uredineae, they still show (in the association of nuclei and later fusion of nuclei in the basidium), a reduced fertilization which denotes their derivation, through the Uredineae, from more typically sexual forms. No one has yet made out in any form the exact way in which the association of nuclei takes place in the group. The mycelium is always found to contain conjugate nuclei before the formation of basidia, but the point at which the conjugate condition arises seems very variable. Miss Nichols finds that it occurs very soon after the germination of the spore in *Coprinus*, but no fusion of cells or migration of nuclei was to be observed.

Protobasidiomycetes.—This, by far the smaller division of Basidiomycetes, includes those forms which have a septate basidium. There are three families—Auriculariaceae, Pilacreaceae and Tremellinaceae.

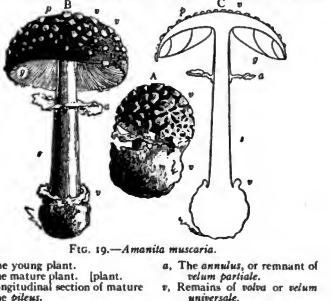

FIG. 19.—*Amanita muscaria.*

A, The young plant.
B, The mature plant. [plant.
C, Longitudinal section of mature
p, The *pileus*.
g, The gills.
a, The *annulus*, or remnant of *velum partiale*.
v, Remains of *volva* or *velum universale*.
s, The stalk.

The first named contains a small number of forms with the basidium divided like the promycelium of the Uredineae. They are characterized by their gelatinous consistence and large size of their sporophore. *Hirneola* (*Auricularia*) *Auricula-Judae* is the well-known Jew's Ear, so named from the resemblance of the sporophore to a human ear.

The Pilacreaceae are a family found by Brefeld to contain the genus *Pilacre*, *P. Petersii* has a transversely divided basidium as in *Auriculariaceae*, but the basidia are surrounded with a peridium-like sheath. The *Tremellinaceae* are characterized by the possession of basidia which are divided by two *vertical* walls at right angles to one another. From each of the four segments in the case of *Tremella* a long outgrowth arises which reaches to the surface of the hymenium

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and bears the basidiospores. In *Dacryomyces* only two outgrowths and two spores are produced.

Autobasidiomycetes.—In this by far the larger division of the Basidiomycetes the basidia are undivided and the four basidiospores are borne on short sterigmata nearly always at the apex of the basidium. The group may be divided into two main divisions, *Hymenomycetes* and *Gasteromycetes*.

Hymenomycetes are a very large group containing over 11,000 species, most of which live in soil rich in humus or on fallen wood or stems, a few only being parasites. In the simplest forms (*e.g. Exobasidium*) the basidia are borne directly on the ordinary mycelium, but in the majority of cases the basidia are found developed in layers (hymenium) on special sporophores of characteristic form in the various groups. In these sporophores (such as the well-known toadstools and mushrooms where the ordinary vegetative mycelium is underground) we have structures specially developed for bearing the basidiospores and protecting them from rain, &c., and for the distribution of the spores—see earlier part of article on distribution of spores (figs. 19 and 20). The underground

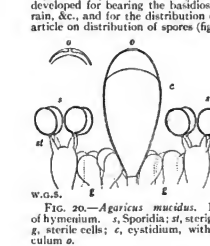

FIG. 20.—*Agaricus mucidus*. Portion of hymenium. *s*, Sporidia; *st*, sterigmata; *g*, sterile cells; *c*, cystidium, with operculum *o*.

mycelium in many cases spreads wider and wider each year, often in a circular manner, and the sporophores springing from it appear in the form of a ring—the so-called fairy rings. *Armillaria mellea*s and *Polyporus annosus* are examples of parasitic forms which attack and destroy living trees, while *Merulius lacrymans* is the well-known "dry rot" fungus. *Gasteromycetes* are characterized by having closed sporophores or fruit-bodies which only open after the spores are

ripe and then often merely by a small pore. The fruit-bodies are of very various shapes, showing a differentiation into an outer *peridium* and an inner spore-bearing mass, the *gleba*. The gleba is usually differentiated into a number of chambers which are lined directly by the hymenium (basidial layer), or else the chambers contain an interwoven mass of hyphae, the branches of which bear the basidia. By the breaking down of the inner tissues the spores often come to lie as a loose powdery mass in the interior of the hollow fruit-body, mixed sometimes with a capillitium. The best-known genera are *Bovista*, *Lycoperdon* (puff-ball) *Scleroderma*, *Geaster* (earth-star, *q.v.*). In the last-named genus the peridium is double and the outer layer becomes ruptured and spreads out in the form of star-shaped pieces; the inner layer, however, merely opens at the apex by a small pore.

The most complex members of the Gasteromycetes belong to the *Phalloideae*, which is sometimes placed as a distinct division of the Autobasidiomycetes. *Phallus impudicus*, the stink-horn, is occasionally found growing in woods in Britain. The fruit-body before it ruptures may reach the size of a hen's egg and is white in colour; from this there grows out a hollow cylindrical structure which can be distinguished at the distance of several yards by its disgusting odour. It is highly poisonous.

Physiology.—The physiology of the fungi comes under the head of that of plants generally, and the works of Pfeffer, Sachs, Vines, Darwin and Klebs may be consulted for details. But we may refer generally here to certain phenomena peculiar to these plants, the life-actions of which are restricted and specialized by their peculiar dependence on organic supplies of carbon and nitrogen, so that most fungi resemble the colourless cells of higher plants in their nutrition. Like these they require water, small but indispensable quantities of salts of potassium, magnesium, sulphur and phosphorus, and supplies of carbonaceous and nitrogenous materials in different stages of complexity in the different cases. Like these, also, they respire oxygen, and are independent of light; and their various powers of growth, secretion, and general metabolism, irritability, and response to external factors show similar specific variations in both cases. It is quite a mistake to suppose that, apart from the chlorophyll function, the physiology of the fungus-cell is fundamentally different from that of ordinary plant-cells. Nevertheless, certain biological phenomena in fungi are especially pronounced, and of these the following require particular notice.

Parasatism.—Some fungi, though able to live as saprophytes, occasionally enter the body of living plants, and are thus termed facultative parasites. The occasion may be a wound (*e.g. Nectria, Dasyscypha*, &c.), or the enfeeblement of the tissues of the host, or invigoration of the fungus, the mycelium of which then becomes strong enough to overcome the host's resistance (*Botrytis*). Many fungi, however, cannot complete their life-history apart from the host-plant. Such *obligate* parasites may be epiphytic (*Erysiphaeae*), the mycelium remaining on the outside and at most merely sending haustoria into the epidermal cells, or endophytic (*Uredineae, Ustilagineae*, &c.), when the mycelium is entirely inside the organs of the host-plant. An epiphyte is not necessarily a parasite, however, as many saprophytes (moulds, &c.) germinate and develop a loose mycelium on living leaves, but only enter and destroy the tissues after the leaf has fallen; in some cases, however, these saprophytic epiphytes can do harm by intercepting light and air from the leaf (*Fumago*, &c.), and such cases make it difficult to draw the line between saprophytism and parasitism. Endophytic parasites may be intracellular, when the fungus or its mycelium plunges into the cells and destroys their contents directly (*Olpidium, Lagenidium, Sclerotinia*, &c.), but they are far more frequently intercellular, at any rate while young, the mycelium growing in the laeunae between the cells (*Peronospora, Uredineae*) into which it may send short (*Cystopus*), or long and branched (*Peronospora Calotheca*) haustoria, or it extends in the middle lamella (*Ustilago*), or even in the solid substance of the cell-wall (*Botrytis*). No sharp lines can be drawn, however, since many mycelia are intercellular at first and subsequently become intracellular (*Ustilagineae*), and the various modes of life doubtless depend on the degrees of resistance which the host tissues are able to offer. Similar gradations are observed in the direct effect of the parasite on the host, which may be local (*Hemileia*) when the mycelium never extends far from the point of infection, or general (*Phytophthora*) when it runs throughout the plant. Destructive parasites rapidly ruin the whole plant-body (*Pythium*), whereas restrained parasites only tax the host slightly, and ill effects may not be visible for a long time, or only when the fungus is epidemic (*Rhytisma*). A parasite may be restricted during a long incubation-period, however, and rampant and destructive later (*Ustilago*). The latter fact, as well as the extraordinary fastidiousness, so to speak, of parasites in their choice of hosts or of organs for attack, point to reactions on the part of the host-plant, as well as capacities on that of the parasite, which may be fairly explained in the light of what we now know regarding enzymes and chemotropism. Some parasites attack many hosts and almost any tissue or organ (*Botrytis cinerea*), others are restricted to one family (*Cystopus candidus*) or genus (*Peronospora infestans*) or even species (*Puccinia strum Padi*), and it is customary to speak of root-parasites, leaf-parasites, &c., in expression of the fact that a given parasite occurs only on such organs—*e.g. Dematophora necatrix* on roots, *Cladosporium Goeppertianum* on stems, *Ustilago Scabiosae* in anthers, *Claviceps purpurea* in ovaries, &c. Associated with these relations are the specializations which parasites show in regard to the age of the host. Many parasites can enter a seedling, but are unable to do the same host when older—*e.g. Pythium, Phytophthora omnivora*.

Chemotropism.—Taken in conjunction with Pfeffer's beautiful discovery that certain chemicals exert a distinct attractive influence on fungous hyphae (*chemotropism*), and from results of Miyoshi's experimental application of it, the phenomena of enzyme-secretion throw considerable light on the processes of infection and parasitism of fungi. Pfeffer showed that certain substances in definite concentrations cause the tips of hyphae to turn towards them; other substances, though not innutritious, repel them, as also do nutritious bodies if too highly concentrated. Marshall Ward showed that the hyphae of *Botrytis* pierce the cell-walls of a lily by secreting a cytase and dissolving a hole through the membrane. Miyoshi then demonstrated that if *Botrytis* is sown in a lamella of gelatine, and this lamella is superposed on another similar one to which a chemotropic substance is added, the tips of the hyphae at once turn from the former and enter the latter. If a thin cellulose membrane is interposed between the lamellae, the hyphae nevertheless turn chemotropically from the one lamella to the other and pierce the cellulose membrane in the process. The hyphae will also dissolve their way through a lamella of collodion, parafin, parchment paper, elder-pith, or even cork or the wing of a fly, to which it must excrete very different enzymes. If the membrane is of some impermeable substance, like gold leaf, the hyphae cannot dissolve its way through, but the tip finds the most minute pore and traverses the barrier by means of it, as it does a stoma on a leaf. We may hence conclude that a parasitic hyphae pierces some plants or their stomata and refuses to enter others, because in the former case there are chemotropically attractive substances present which are absent from the latter, or are there replaced by repellent poisonous or protective substances such as enzymes or antitoxins.

Specialisation of Parasitism.—The careful investigations of recent years have shown that in several groups of fungi we cannot be content to distinguish as units morphologically different species, but we are compelled to go deeper and analyse further the species. It has been shown especially in the *Uredineae* and *Erysiphaceae* that many forms which can hardly be distinguished morphologically, or which cannot be differentiated at all by structural characters, are not really homogeneous but consist of a number of forms which are

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sharply distinguishable by their infecting power. Eriksson found, for example, that the well-known species *Puccinia graminis* could be split up into a number of forms which though morphologically similar were physiologically distinct. He found that the species really consisted of six distinct races, each having a more or less narrow range of grasses on which it can live. The six races he named *P. graminis Secalis, Tritici, Avenae, Airae, Agrostis, Poae.* The first named will grow on rye and barley but not on wheat or oat. The form *Tritici* is the least sharply marked and will grow on wheat, barley, rye and oat but not on the other grasses. The form *Avenae* will grow on oat and many grasses but not on the other three cereals mentioned. The last three forms grow only on the genera *Aira, Agrostis* and *Poa* respectively. All these forms have of course their alternate host, the accidium-stage on the barberry. The terms biologic forms, biological species, physiological species, physiological races, specialized forms have all been applied to these; perhaps the term biologic forms is the most satisfactory. A similar specialization has been observed by Marshall Ward in the *Puccinia* parasitic on species of *Bromus*, and by Neger, Marchal and especially Salmon in the Erysiphaceae. In the last-named family the single morphological species *Erysiphe graminis* is found growing on the cereals, barley, oat, wheat, rye and a number of wild grasses, as *Poa, Bromus* and *Lolium*. On each of these host-plants the fungus has become specialized so that the form on barley cannot infect the other three cereals or the wild grasses and so on. Just as the uredospores and aecidiospores both show these specialized characters in the case of *Puccinia graminis* so we find that both the conidia and ascospores of *E. graminis* show this phenomenon. Salmon has further shown in investigating the relation of *E. graminis* to various species of the genus, *Bromus*, that certain species may act as "bridging species," enabling the transfer of a biologic form to a host-plant which it cannot normally infect. Thus the biologic form on *B. racemosus* cannot infect *B. commutatus*. If, however, conidia from *B. racemosus* are sown on *B. hordaceus*, the conidia which develop on that plant are now able to infect *B. commutatus*: thus *B. hordaceus* is a bridging species. Salmon has also found that injury of a leaf by mechanical means, by heat, by anaesthetics, &c., would affect the immunity of the plant and allow infection by conidia which was not able to enter a normal leaf. The effect of the abnormal conditions is probably to stop the production of, or weaken or destroy the protective enzymes or antitoxins, the presence of which normally confers immunity on the leaf.

Symbiosis.—The remarkable case of life in common first observed in lichens, where a fungus and an alga unite to form a compound organism—the lichen—totally different in character from either, has been proved to be universal in these plants, and lichens are in all cases merely algae enmeshed in the interwoven hyphae of fungi (see LICHENS). This dualism, where the one constituent (alga) furnishes carbohydrates, and the other (fungus) supplies mineral and nitrogenous matters, shade and moisture, has been termed *symbiosis*. Since then numerous other cases of symbiosis have been demonstrated. Many trees are found to have their smaller roots invaded by fungi and deformed by their action, so far from these being injurious, experiments go to show that this mycorhiza (fungus-root) is necessary for the well-being of the tree. This is also the case with numerous other plants of moors and woodlands—*e.g.* Ericaceae, Pyrolaceae, Gentianaceae, Orchidaceae, ferns, &c. Recent experiments have shown that the difficulty in germinating tree seeds to germinate are due to the absence of the necessary fungus, which must be in readiness to infect the young seedling immediately it emerges from the seed. The well-known failures with rhododendrons, heaths, &c., in ordinary garden soils are also explained by the need of the fungus-infected peat for their roots. The rôle of the fungus appears to be to supply materials from the leaf-mould around, in forms which ordinary root-hairs are incapable of providing for the plant; in return the latter supports the fungus at slight expense from its abundant stores of reserve materials. Numerous other cases of symbiosis have been discovered among the fungi of fermentation, of which those between *Aspergillus* and yeast in saké manufacture, and between yeasts and bacteria in kephir and in the ginger-beer plant are best worked out. For cases of symbiosis see BACTERIOLOGY.

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FUNJ (Funniyeh, Fung, Fungha), a very mixed negroid race, occupying parts of Sennar and the hilly country to the south between the White and Blue Niles. They traditionally come from west of the White Nile and are affiliated by some to the Kordofan Nubas, by others, more justifiably, to the negro Shilluks. These Funj, who became the dominant race in Sennar in the 15th century, almost everywhere assimilated the speech, religion and habits of the Arabs settled in that region. Until the 19th century they were one of the most powerful of African peoples in the eastern Sudan. About the end of the 15th century they overthrew the kingdom of Aloa, between the two Niles, and conquered the neighbouring peoples of the Sudan, Nubia and even Kordofan. The Funj had mixed much with the Arabs before their conquests, and had been converted to Islam. But they were still in many ways savages, for James Bruce (who traversed the district in 1772) says that their most famous king, Malek-el-Gahman, preferred human liver to any other food, and the Belgian traveller E. Pruyssenaere (1826–1864) found them still performing pagan rites on their sacred Mount Gula. Ernst Marno declared that as late as 1870 the most southern branch of the race, the Boruns, a non-Arabic speaking tribe, were cannibals. The Funj kings were content with levying tribute on their neighbours, and in this loose way Shendi, Berber and Dongola were once tributary. The Arab viziers gradually absorbed all power, the Funj sovereignty becoming nominal; and in 1821 the Egyptians easily destroyed the Funj domination. To-day the Funj are few, and represent no real type. They are a bright, hospitable folk. Many of them are skilful surgeons and go far afield in their work. The fellahin, indeed, call surgeons "Senaari" (men of Sennar). See further Sennar and Sudan (Anglo-Egyptian).

FUNKIA, in botany, a genus of rather handsome, hardy, herbaceous plants belonging to the natural order Liliaceae, and natives of China and Japan. They are tuberous, with broadly ovate or heart-shaped leaves and racemes of white or pale lilac, drooping, funnel-shaped flowers. They are useful for the borders of a shrubbery, the lawn or rock-work, or may be grown in pots for the greenhouse. The plants are propagated by dividing the crowns in autumn or when growth begins in spring.

FUNNEL (through an O. Fr. *founil*, found in Breton, from Lat. *infundibulum*, that through which anything is poured, from *fundere*, to pour), a vessel shaped like a cone having a small tube at the apex through which powder, liquid, &c., may be easily passed into another vessel with a small opening. The term is used in metal-casting of the hole through which the metal is poured into a mould, and in anatomy and zoology of an *infundibulum* or funnel-shaped organ. The word is thus used generally of any shaft or passage to convey light, air or smoke, as of the chimney of an engine or a steam-boat, or the flue of an ordinary chimney. It is also used of a shaft or channel in rocks, and in the decoying of wild-fowl is applied to the cone-shaped passage leading from a pond and covered with a net, a "funnel-net," into which the birds are decoyed.

FUR (connected with O. Fr. *forre*, a sheath or case; so "an outer covering"), the name specially given to the covering of the skin in certain animals which are natives of the colder climates, lying alongside of another and longer covering, called the overhair. The fur differs from the overhair, in that it is soft, silky, curly, downy and barbed lengthwise, while the overhair is straight, smooth and comparatively rigid. These properties of fur constitute its essential value for felting purposes, and mark its difference from wool and silk; the first, after some slight preparation by the aid of hot water, readily unites its fibres into a strong and compact mass; the others can best be managed by spinning and weaving.

On the living animal the overhair keeps the fur filaments apart, prevents their tendency to felt, and protects them from injury—thus securing to the animal an immunity from cold and storm; while, as a matter of fact, this very overhair, though of an humbler name, is most generally the beauty and pride of the pelt, and marks its chief value with the furrier. We arrive thus at two distinct and opposite uses and values of fur. Regarded as useful for felt it is denominated staple fur, while with respect to its use with and on the pelt it is called fancy fur.

History.—The manufacture of fur into a felt is of comparatively modern origin, while the use of fur pelts as a covering for the body, for the couch, or for the tent is coeval with the earliest history of all northern tribes and nations. Their use was not simply a barbarous expedient to defend man from the rigours of an arctic winter; woven wool alone cannot, in its most perfect form, accomplish this. The pelt or skin is requisite to keep out the piercing wind and driving storm, while the fur and overhair ward off the cold; and "furs" are as much a necessity to-day among more northern peoples as they ever were in the days of barbarism. With them the providing of this necessary covering became the first purpose of their toil; subsequently it grew into an object of barter and traffic, at first among themselves, and afterwards with their neighbours of more temperate climes; and with the latter it naturally became an article of fashion, of ornament and of luxury. This, in brief, has been the history of its use in China, Tatary, Russia, Siberia and North America, and at present the employment of fancy furs among civilized nations has grown to be more extensive than at any former period.

The supply of this demand in earlier times led to such severe competition as to terminate in tribal pillages and even national wars; and in modern times it has led to commercial ventures on the part of individuals and companies, the account of which, told in its plainest form, reads like the pages of romance. Furs have constituted the price of redemption for royal captives, the gifts of emperors and kings, and the peculiar badge of state functionaries. At the present day they vie with precious gems and gold as ornaments and garniture for wealth and fashion; but by their abundance, and the cheapness of some varieties, they have recently come within the reach of men of moderate incomes. The history of furs can be read in Marco Polo, as he grows eloquent with the description of the rich skins of the khan of Tatary; in the early fathers of the church, who lament their introduction into Rome and Byzantium as an evidence of barbaric and debasing luxury; in the political history of Russia, stretching out a powerful arm over Siberia to secure her rich treasures; in the story of the French occupation of Canada, and the ascent of the St Lawrence to Lake Superior, and the subsequent contest to retain possession against England; in the history of early settlements of New England, New York and Virginia; in Irving's *Astoria*; in the records of the Hudson's Bay Company; and in the annals of the fairs held at Nizhniy Novgorod and Leipzig. Here it may suffice to give some account of the present condition of the trade in fancy furs. The collection of skins is now chiefly a matter of private enterprise. Few, if any, monopolies exist.

Natural Supplies.—We are dependent upon the Carnivora, Rodentia, Ungulata and Marsupialia for our supplies of furs, the first two classes being by far of the greatest importance. The Carnivora include bears, wolverines, wolves, raccoons, foxes, sables, martens, skunks, kolinskis, fitch, fishers, ermines, cats, sea otters, fur seals, hair seals, lions, tigers, leopards, lynxes, jackals, &c. The Rodentia include beavers, nutrias, musk-rats or musquash, marmots, hamsters, chinchillas, hares, rabbits, squirrels, &c. The Ungulata include Persian, Astrachan, Crimean,

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Chinese and Tibet lambs, mouflon, guanaco, goats, ponies, &c. The Marsupialia include opossums, wallabies and kangaroos. These, of course, could be subdivided, but for general purposes of the fur trade the above is deemed sufficient.

The question frequently arises, not only for those interested in the production of fur apparel, but for those who derive so much comfort and pleasure from its use, whether the supply of fur-bearing animals is likely to be exhausted. Although it is a fact that the demand is ever increasing, and that some of the rarer animals are decreasing in numbers, yet on the other hand some kinds of furs are occasionally neglected through vagaries of fashion, which give nature an opportunity to replenish their source. These respites are, however, becoming fewer every day, and what were formerly the most neglected kinds of furs are becoming more and more sought after. The supply of some of the most valuable, such as sable, silver and natural black fox, sea otter and ermine, which are all taken from animals of a more or less shy nature, does very gradually decrease with persistent hunting and the encroachment of man upon the districts where they live, but the climate of these vast regions is so cold and inhospitable that the probabilities of man ever permanently inhabiting them in numbers sufficient to scare away or exterminate the fur-bearing wild animals is unlikely. Besides these there are many useful, though commonplace, fur-bearing animals like mink, musquash, skunk, raccoon, opossum, hamster, rabbit, hares and moles, that thrive by depredations upon cultivated land. Some of these are reared upon extensive wild farms. In addition there are domestic fur-bearing animals, such as Persian, Astrachan and Chinese lambs, and goats, easily bred and available.

With regard to the rearing of the Persian lamb, there is a prevalent idea that the skins of the unborn lamb are frequently used; this, however, is a mistake. A few such skins have been taken, but they are too delicate to be of any service. The youngest, known as "broadtails," are killed when a few days old, but for the well-developed curly fur, the lambs must be six or seven weeks old. During these weeks their bodies are covered with leather so that the fur may develop in close, light and clean curls. The experiment has been tried of rearing rare, wild, fur-bearing animals in captivity, and although climatic conditions and food have been precisely as in their natural environment, the fur has been poor in quality and bad in colour, totally unlike that taken from animals in the wild state. The sensation of fear or the restriction of movement and the obtaining of food without exertion evidently prevent the normal development of the creature.

In mountainous districts in the more temperate zones some good supplies are found. Chinchillas and nutrias are obtained from South America, whence come also civet cats, jaguars, ocelots and pumas. Opossums and wallabies, good useful furs, come from Australia and New Zealand. The martens, foxes and otters imported from southern Europe and southern Asia, are very mixed in quality, and the majority are poor compared with those of Canada and the north.

Certain characteristics in the skin reveal to the expert from what section of territory they come, but in classifying them it is considered sufficient to mention territories only.

Some of the poorer sorts of furs, such as hamster, marmot, Chinese goats and lambs, Tatar ponies, weasels, kaluga, various monkeys, antelopes, foxes, otters, jackals and others from the warmer zones, which until recently were neglected on account of their inferior quality of colour, by the better class of the trade, are now being deftly dressed or dyed in Europe and America, and good effects are produced, although the lack of quality when compared with the better furs from colder climates which possess full top hair, close underwool and supple leathers, is readily manifest. It is only the pressure of increasing demand that makes marketable hard pelts with harsh brittle hair of nondescript hue, and these would, naturally, be the last to attract the notice of dealers.

As it is impossible that we shall ever discover any new fur-bearing animals other than those we know, it behoves responsible authorities to enforce close seasons and restrictions, as to the sex and age, in the killing for the purpose of equalizing the numbers of the catches. As evidence of indiscriminate slaughter the case of the American buffaloes may be cited. At one time thousands of buffalo skins were obtainable and provided material for most useful coats and rugs for rough wear in cold regions, but to-day only a herd or so of the animals remain, and in captivity.

The majority of animals taken for their fur are trapped or snared, the gun being avoided as much as possible in order that the coat may be quite undamaged. Many weary hours are spent in setting baits, traps and wires, and, frequently, when the hunter retraces his steps to collect the quarry it is only to find it gone, devoured by some large animal that has visited his traps before him. After the skins have been carefully removed—the sooner after death the better for the subsequent condition of the fur—they are lightly tacked out, pelt outwards, and, without being exposed to the sun or close contact with a fire, allowed to dry in a hut or shady place where there is some warmth or movement of air. With the exception of sealskins, which are pickled in brine, all raw skins come to the various trade markets simply dried like this.

Quality and Colour.—The best fur is obtained by killing animals when the winter is at its height and the colder the season the better its quality and colour. Fur skins taken out of season are indifferent, and the hair is liable to shed itself freely; a good furrier will, however, reject such faulty specimens in the manufacturing. The finest furs are obtained from the Arctic and northern regions, and the lower the latitude the less full and silky the fur, till, at the torrid zone, fur gives place to harsh hair without any underwool. The finest and closest wools are possessed by the amphibious Carnivora and Rodentia, viz. seals, otters, beavers, nutrias and musquash, the beauty of which is not seen until after the stiff water or top hairs are pulled out or otherwise removed. In this class of animal the underneath wool of the belly is thicker than that of the back, while the opposite is true of those found on the land. The sea otter, one of the richest and rarest of furs, especially for men's wear, is an exception to this unhairing process, which it does not require, the hair being of the same length as the wool, silky and bright, quite the reverse of the case of other aquatic animals.

Of sealskins there are two distinct classes, the fur seals and the hair seals. The latter have no growth of fur under the stiff top hair and are killed, with few exceptions (generally of the marbled seals), on account of the oil and leather they yield. The best fur seals are found off the Alaska coast and down as far south as San Francisco.

It is found that in densely wooded districts furs are darker in colour than in exposed regions, and that the quality of wool and hair is softer and more silky than those from bare tracts of country, where nature exacts from its creatures greater efforts to secure food, thereby developing stronger limbs and a consequently coarser body covering.

As regards density of colour the skunk or black marten has the blackest fur, and some cats of the domestic kind, specially reared for their fur, are nearly black. Black bears have occasionally very black coats, but the majority have a brownish underwool. The natural black fox is a member of the silver fox family and is very rare, the skins bringing a high price. Most silver foxes have dark necks and in some the dark shade runs a quarter, half-way, or three-quarters, or even the whole length of the skin, but it is rather of a brownish hue. Some Russian sables are of a very dense bluish brown almost a black, which is the origin undoubtedly of the term "sables," while some, from one district in particular, have a quantity of silver hairs, evenly interspersed in the fur, a peculiarity which has nothing to do with age. The best sea otters have very dark coats which are highly esteemed, a few with silver hairs in parts; where these are equally and evenly spread the skins are very valuable. Otters and beavers that run dark in the hair or wool are more valuable than the paler ones, the wools of which are frequently touched with a chemical to produce a golden shade. This is also done with nutrias after unhairing. The darker sorts of mink,

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musquash, raccoon and wolverine are more valuable than the paler skins.

Collective Supplies and Sales.—There are ten large American and Canadian companies with extensive systems for gathering the annual hauls of skins from the far-scattered trappers. These are the Hudson's Bay Co., Russian Fur Co., Alaska Commercial Co., North American Commercial Co., Russian Sealskin Co., Harmony Fur Co., Royal Greenland Fur Co., American Fur Co., Missouri Co. and Pacific Co. Most of the raw skins are forwarded to about half-a-dozen brokers in London, who roughly sort them in convenient lots, issuing catalogues to the traders of the world, and after due time for examination of the goods by intending purchasers, the lots are sold by public auction. The principal sales of general furs are held in London in January and March, smaller offerings being made in June and October; while the bulk of fur sealskins is sold separately in December. The Hudson's Bay Co.'s sales take place before the others, and, as no reserves are placed on any lot, the results are taken as exactly indicating current values. While many buyers from America and Russia are personally in attendance at the sales, many more are represented by London and Leipzig agents who buy for them upon commission. In addition to the fur skins coming from North America vast numbers from Russia, Siberia, China, Japan, Australia and South America are offered during the same periods at public auction. Fairs are also held in Siberia, Russia and Germany for the distribution of fur skins as follows:—

January:	Frankfort-on-the-Oder	Small collection of provincial produce, such as otter, fox, fitch and marten.
February:	Irbit, Siberia	General Russian furs.
Easter:	Leipzig, Germany	General furs.
August:	Nizhniy Novgorod, Russia	Persian lamb and general furs.
August:	Kiakhta, Siberia	Chinese furs and ermine.
December:	Ishim, Siberia	Chiefly squirrels.

Of course there are many transactions, generally in the cheaper and coarser kinds of furs, used only in central Europe, Russia and Asia which in no way interest the London market, and there are many direct consignments of skins from collectors in America and Russia to London, New York and Leipzig merchants. But the bulk of the fine furs of the world is sold at the large public trade auction sales in London. The chief exceptions are the Persian and Astrachan lambs, which are bought at the Russian fairs, and are dressed and dyed in Leipzig, and the ermine and Russian squirrels, which are dressed and manufactured into linings either in Russia or Germany before offered for sale to the wholesale merchants or manufacturers.

The annual collection of fur skins varies considerably in quantity according to the demand and to the good or bad climatic conditions of the season; and it is impossible to give a complete record, as many skins are used in the country of their origin or exported direct to merchants. But a fairly exact statement of the numbers sold in the great public trade auction sales in London during the year 1905–1906 is herewith set out.

Year ending 31st of March 1906.

	Total Number of Skins.
Badger	28,634
Badger, Japanese	6,026
Bear	18,576
Beaver	80,514
Cat, Civet	157,915
Cat, House	126,703
,, Wild	32,253
Chinchilla (La Plata), known also as Bastard	43,578
,, Peruvian finest	5,603
Deer, Chinese	124,355
Ermine	40,641
Fisher	5,949
Fitch	77,578
Fox, Blue	1,863
,, Cross	10,276
,, Grey	59,561
,, Japanese	81,429
,, Kit	4,023
,, Red	158,961
,, Silver	2,510
,, White	27,463
Goats, Chinese	261,190
Hares	41,256
Kangaroo	7,115
Kid, Chinese linings and skins equal to	5,080,047
Kolinsky	114,251
Lamb, Mongolian linings and skins equal to	214,072
,, Slink ,, ,, ,,	167,372
,, Tibet ,, ,, ,,	794,130
Leopard	3,574
Lynx	88,822
Marmot, linings and skins equal to	1,600,600
Marten, Baum	4,573
,, Japanese	16,461
,, Stone	12,939
Mink, Canadian and American	299,254
,, Japanese	360,373
Moufion	23,594
Musk-rat or Musquash, Brown	5,126,339
,, ,, Black	41,788
Nutria	82,474
Opossum, American	902,065
,, Australian	4,161,685
Otter, River	21,235
,, Sea	522
Raccoon	310,712
Sable, Canadian and American	97,282
,, Japanese	536
,, Russian	26,390
Seals, Fur	77,000
,, Hair	37,943
Skunk	1,068,408
Squirrel	194,596
,, Linings each averaging 126 skins	1,982,736
Tiger	392
Wallaby	60,956
Wolf	56,642
Wolverine	1,726
Wombat	193,625

A brief account of the different qualities of the pelts, with some general remarks as to their customary uses, follows. The prices quoted are subject to constant fluctuation and represent purely trade prices for bulk, and it should be explained that the very great variations are due to different sizes, qualities and colours, and morcover are only *first cost*, before skins are dressed and prepared. These preparations are in some cases expensive, and there is generally a considerable percentage of waste. The prices cannot be taken as a guide to the wholesale price of a single and finished skin, but simply as *relative* value.

The fullest and darkest skins of each kind are the most valuable, and, in cases of bluish grey or white, the fuller, clearer and brighter are the more expensive. A few albinos are found in every species, but whatever their value to a museum, they are of little commercial importance. Some odd lots of skins arrive designated simply as "sundries," so no classification is possible, and this will account for the absence of a few names of skins of which the imports are insignificant in quantity, or are received direct by the wholesale merchants.

Names, Qualities and Uses of Pelts.[1]

ASTRACHAN.—See *Lambs*, below.

BADGER.—Size 2×1 ft. American sorts have coarse thick underwool of a pale fawn or stone colour with a growth of longer black and white hairs, 3 or 4 in. long; a very durable but clumsy fur. The best skins are exported to France, Spain and Italy, and used for carriage rugs and military purposes. Asiatic, including Japanese, skins are more woolly. Russian and Prussian kinds are coarser and darker, and used mostly for brush trade. Value 6d. to 19s.

BEAR, AUSTRALIAN.—See *Wombat*, below.

BEAR, BLACK.—Size 6×3 ft. Fine dark brown underwool with bright black and flowing top hair 4 in. long. Cubs are nearly as long in the hair although only about half the size and not only softer and better, but have the advantage of being very much lighter in pelt. Widely distributed in North America, the best come from Canada, are costly and are used for military caps, boas, muffs, trimmings, carriage rugs and coachmen's capes, and the fur wears exceedingly well. Value 17s. 6d. to 86s. Those from East India and warm climates are harsh, poor and only fit for floor rugs.

BEAR, BROWN.—Size 6×3 ft. Similar in quality to the black, but far more limited in number; the colours range from light yellow to a rich dark brown. The best come from Hudson Bay territory and are valuable. Used for muffs, trimmings, boas, and carriage

[1] The measurements given are from nose to root of tail of average large sizes after the dressing process, which has a shrinking tendency. The depths of fur quoted are the greatest, but there are plenty of good useful skins possessing a lesser depth.

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rugs. Inferior sorts, almost grizzly in effect and some very pale, are found in Europe and Asia and are mostly used locally. In India there is a species called Isabelline bear, which was formerly imported to Great Britain, but does not now arrive in any quantity worth mentioning. Value 10s. 6d. to 60s., Isabelline sort 10s. 6d. to 78s.

BEAR, GRIZZLY.—Size 8X4 ft. Coarse hair, heavy pelt, mostly dark yellowish and brown colours, only found in western parts of United States, Russia and Siberia. Used as carriage rugs and floor rugs, most durable for latter purpose and of fine effect. They are about half the value of brown bear. Value 15s. to 54s.

BEAR, ISABELLINE.—See *Bear, Brown*, above.

BEAR, WHITE.—Size 8X4 ft. The largest of all bears. Short close hair except on flanks, colour white or yellow. An inhabitant of the Arctic circle, best from Greenland. Used for floor rugs, very durable; and very white specimens are valuable. Value 20s. to 52os.

BEAVER. Size 3X2 in. The largest of rodents, it possesses a close underwood of bluish-brown hue, nearly an inch in depth, with coarse, bright, black or reddish-brown top hair, 3 in. long. Found widely in North America. After being unhaired the darkest wools are the most valuable, although many people prefer the bright, lighter brown tones. Used for collars, cuffs, boas, muffs, trimmings, coat linings and carriage aprons, and is of a most durable nature, in addition to having a rich and good appearance. Value 10s. to 39s. 6d.

BROADTAIL.—See *Lambs*, below.

CARACAL.—A small lynx from India, the fur very poor, seldom imported.

CARACUL.—See *Goats* and *Lambs*, below.

CAT, CIVET.—Size 9X4½ in., short, thick and dark underwool with silky black top hair with irregular and unique white markings. It is similar to skunk, but is much lighter in weight, softer and less full, without any disagreeable odour. Used for coat linings it is very warm and durable. A fur come from China, but the fur is yellowish-grey, slightly spotted and worth little. Value 1s. 1d. to 1s. 11d.

CAT, HOUSE, &c.—18X9 in., mostly black and dark brown, imported from Holland, Bavaria, America and Russia, where they are reared for their coats. The furs from Holland are used for coat linings. Although in colour, weight and warmth they are excellent, the fur is apt to become loose and to fall off with friction of wear. The black are known as genet, although the true genet is a spotted wild cat. Wild sorts of the tabby order are coarser, and not so good and silky in effect as when domestically reared. Value of the black sorts 2d. to 3s. Wild 9d. to 14s. Some small wild cats, very poor flat fur of a pale fawn colour with yellow spots, are imported from Australia and used for linings. Value 5½d. to 1s. 6d.

CHEETAH.—Size of a small leopard and similar in colour, but has black spots in lieu of rings. Only a few are now imported, which are used for mats. Value 2s. 6d. to 18s.

CHINCHILLA, PERUVIAN and BOLIVIAN.—Size 12X7 in., fur 1 to 1½ in. deep. Delicate blue-grey with black shadings, one of nature's most beautiful productions, though not a durable one. Used for ladies' coats, stoles, muffs, hats and trimmings. Yearly becoming scarcer and most costly. Value 8s. 6d. to 56s. 8d.

CHINCHILLA, LA PLATA, incorrectly named and known in the trade as "bastard chinchilla," size 9X4 in., in a similar species, but owing to lower altitudes and warmer climatic conditions of habitation is smaller, with shorter and less beautiful fur, the underwool colour being darker and the top hair less pure. Used exactly as the better kind, and the picked skins are most effective. As with the best sort it is not serviceable for constant wear. Value 4s. 2d. to 27s. 6d.

CHINCHILLONE.—Size 13X8 in., obtained also from South America. Fur is longer and weaker and poorer and yellower than chinchilla. Probably a crossbred animal, very limited importation. Value 3s. 6d. to 16s. 8d.

DEER, CHINESE and EAST INDIAN.—Small, light, pelted skins, the majority of which are used for mats. Reindeer and other varieties are of little interest for use other than trophy mats. Thousands are taken for the leather trade. Value of Chinese 1s. 2d. to 1s. 6d. each.

DOG.—The only dogs that are used in the fur trade in civilized countries are those imported from China, which are heavy and coarse, and only used in the cheaper trade, chiefly for rugs. Value 6d. to 1s.

DOG WOLF.—See *Wolf*, below.

ERMINE.—Size 12X2½ in. Underwool short and even, with a shade longer top hair. Pelt light and close in texture, and durable. In the height of winter the colour is pure white with exception of the tip of tail, which is quite black. Supplies are obtained from Siberia and America. Best are from Siberia. Used for cloak linings, stoles, muffs and trimmings, also for embellishment of British state, parliamentary and legal robes. When this fur is symmetrically spotted with black lamb pieces it is styled miniver, in which form it is used at the grand coronation functions of British sovereigns. Value 1s. 3d. to 8s. 6d.

FISHER.—Size 30X12 in., tail 12 to 18 in. long, the largest of the martens; has a dark shaded deep underwool with fine, glossy, dark and strong top hair 2 in. or more long. Best obtained from British America. The tails are almost black and make up most handsomely into trimmings, muffs, &c. Tails worked separately in these forms are as rich and fine and more durable than any other fur suitable for a like purpose. The fur of the skin itself is something like a dark silky raccoon, but is not as attractive as the tails. Value 12s. to 40s.

FITCH.—Size 12X3 in., of the marten species, also known as the pole cat. Yellow underwool ¾ in. deep, black top hair, 1½ to 1¾ in. long, very fine and open in growth, and not close as in martens, largest skins come from Denmark, Holland and Germany. The Russian are smaller, but more silky and, as now dyed, make a cheap and fair substitute for sable. They are excellent for linings of ladies' coats, being of light weight and fairly strong in the pelt. English mayors' and civic officials' robes are frequently trimmed with this fur in lieu of sable. Value of the German variety 2s. to 5s. 6d. and of the Russian 7d. to 1s. 4d.

FOX, BLUE.—Size 24X8 in. Underwool thick and long. Top hair fine and not so plentiful as in other furs. Found in Alaska, Hudson Bay territory, Archangel and Greenland. Although called blue, the colour is a slaty or drab tone. Those from Archangel are more silky and of a smoky bluish colour and are the most valuable. These are scarce and consequently dear. The white foxes that are dyed smoke and celestial blue are brilliant and totally unlike the browner shades of this fox. Value 34s. to 195s.

FOX, COMMON.—The variation of size and quality is considerable, and the colour is anything from grey to red. In Great Britain the animal is more only regarded for the sport it provides. On the European continent, however, some hundreds of thousands of skins, principally Gernian, Russian and Norwegian, are sold annually, for home use, and for dyeing and exportation, chiefly to the United States. The qualities do not compare with those species found in North America and the Arctic circle. The Asiatic, African and South American varieties are, with the exception of those taken in the mountains, poorly furred and usually brittle and therefore of no great service. No commercial value can be quoted.

FOX, CROSS.—Size 20X7 in., as about as large as the silver and generally have a pale yellowish or orange tone with some silvery points and a darkish cross marking on the shoulders. Some are very similar to the pale red fox from the North-West of America and a few are unusually large. The darkest and best come from Labrador and Hudson Bay, and the ordinary sorts from the north-west of the United States and, as with silver and other kinds, the quality is inferior when taken from warmer latitudes. Value 10s. 6d. to 60s.

FOX, GREY.—Size 27X10 in. Has a close dark drab underwool with yellowish grizzly, grey, regular and coarse top hair. The majority used for the trade come from Virginia and the southern and western parts of the United States. Those from the north are larger than the average, with more fur of a brighter tone. The fur is fairly serviceable for carriage rugs, the leather being stout, but its harshness of quality and nondescript colour does not contribute to make it a favourite. Value 9d. to 4s. 9d.

FOX, JAPANESE.—See *Fox, Red*, and *Raccoon*, below.

FOX, KIT.—Size 20X6 in. The underwool is short and soft, as is also the top hair, which is of very pale grey mixed with some yellowish-white hair. It is the smallest of foxes, and is found in Canada and the northern sections of the United States. It is similar in colour and quality to the prairie fox and to many kinds from the warmer zones, such as from Turkey, eastern Asia and elsewhere. Value 1s. 3d. to 5s. 6d.

FOX, LABRADOR.—Size 24X8 in., though a few kinds are much larger. The underwool is long and soft and the hair plentiful and strong. It is found widely in the northern parts of America and in smaller numbers south of the United States, also in China, Japan and Australia. The colours vary from pale yellowish to a dark red, some being very brilliant. Those of Kamschatka are rich and fine in quality. Farther north, especially near the sea, the fur is coarse. Where the best coloured skins are not used for carriage rugs they are extensively dyed, and badger and other white hairs are inserted to resemble the silver fox. These are also dyed in various tints. The skins, being the strongest of foxes', both in the fur and pelt, are serviceable. The preparations in imitation of the natural black and silver sorts are very good and attractive. Value 1s. to 41s.

FOX, SILVER. Size 30X10 in. Underwool close and fine. Top hair black to silvery, 3 in. long. The fur upon the necks usually runs dark, almost black, and in some cases the fur is black halfway down the length of the skin, in rarer cases three-quarters of the length and, in the most exceptional instances, the whole length, and when this is the case they are known as "Natural Black Foxes" and fetch enormous prices. The even silvery sorts are highly esteemed, and the fur is one of the most effective and precious. The finest are taken in Labrador. The farther south they are found, the poorer and coarser the fur. The brush has invariably a white tip. Value £1 to £320.

FOX, WHITE.—Size 20X7 in. Animals of this species are generally small in size and inhabit the extreme northern sections of Hudson Bay, Newfoundland, Greenland, Labrador and Siberia. The Canadian are silky in nature and inclined to a creamy colour, while the Siberian are more woolly and rather whiter. Those taken in central Asia near or in Chinese territory are poorer and yellowish. The underwool in all sorts is generally of a bluish-grey tone, but the top hair in the depth of winter is usually full enough in quantity to

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hide any such variation. Those skins in which the underwool is quite white are rare and much more expensive. In summer specimens of this species, as with other white furred animals, have slightly discoloured coats. The skins that are not perfectly white are dyed jet black, dark or light smoke, violet-blue, blue-grey, and also in imitation of the drab shades of the natural blue. Value 18s. to 66s.

GENET.—Size 10×4 in. The genet proper is a small white spotted cat found in Europe, but the quantity is too small to be of commercial interest. The name has been adopted for the black cats used so much in the trade. (See *Cats*, above.) Value 1s. to 6s. 6d.

GOATS.—Size varies greatly. The European, Arabian and East Indian kinds are seldom used for furs, the skins being chiefly dressed as leather for books and furniture, and the kids for boots and gloves, and the finer wool and hair are woven into various materials. Many from Russia are dyed black for floor and carriage rugs; the hair is brittle, with poor underwool and not very durable; the cost, however, is small. The Chinese export thousands of similar skins in black, grey and white, usually ready dressed and made into rugs of two skins each. A great many are dyed black and brown, in imitation of bear, and are used largely in the western parts of the United States and Canada for sleigh and carriage rugs. Many are used for their leather. Thousands of the kids are also dyed black and worked into cross-shaped pieces, in which shape they are largely exported to Germany, France, Great Britain and America, and sold by the retail as caracal, kid or caracul. Very few ones are good demand for motor coats. The word caracul has been adopted from the Turkish and signifies black-eared. See also *Lambs, caracul*. Value of Chinese white 3s. 6d. to 6s. 6d.; grey, 4s. to 6s. 9d.

The Angora from the heights of central Asia Minor has curly, fleecy, silky, white wool, 4 to 7 in. long. The fur is not used in Great Britain, as formerly, and the greater quantity, known as mohair, is now imported for purposes of weaving. This species of goat was some years since introduced into Cape Colony, but its wool is not so good as the Asiatic breed. Good business, however, is done with the product, but chiefly for leather. Value 4s. to 12s. 6d.

The Mongolian goat has a very soft silk underwool, and after the long top hair is removed it is dressed and imported and erroneously named mouflon. The colour is a light brown, but it is so pale that it lends itself to be dyed any colour. It was popular some years since in the cheaper trade, but it is not now much seen in England. Value 2s. to 6s.

The Tibet goat is similar to the Angora in the fineness of its wool, and many are used in the making of cashmere shawls. The Tibet lamb so largely imported and used for children's wear is often miscalled Tibet goat. Value 3s. to 7s. 6d.

GUANACO.—Size 30×15 in. Is a species of goat found in Patagonia and other parts of South America. It has a very long neck and exceedingly soft woolly fur of a light reddish-fawn colour with very white flanks. It is usually imported in small quantities, native dressed, and ready made into rugs. The dressing is hard and brittle. If the skins are dressed in Europe they afford a very comfortable rug, though a very marked one in effect. They have a similar wool to the vicuna, but coarser and redder; both are largely used in South America. Value 1s. to 4s. 6d.

HAMSTER.—Size 8×3½ in. A destructive rodent, is found in great numbers in Russia and Germany. The fur is very flat and poor, of a yellowish pale brown with a little marking of black. Being of a light weight it is used for linings. Value 3d. to 1s.

HARE.—Size 24×9 in. The common hare of Europe does not much interest the furrier, the fur being chiefly used by makers of hatters' felt. The white hares, however, of Russia, Siberia and other regions in the Arctic circle are very largely used in the cheaper trade of Europe, America and the British colonies. The fur is of the whitest when killed in winter, and that upon the flanks of the animal is very much longer than that upon its back. The flanks are usually cut off and made into muffs and stoles. The hair is, however, brittle and is not at all durable. This fur is dyed jet black and various shades of brown and grey, and manufactured into articles for the small drapers and for exportation. The North American hares are also dyed black and brown and used in the same way. Value of white 2d. to 5d.

JACKAL.—Size 2 to 3 ft. long. Is found in India and north and south Africa. Indian are light brown and reddish, those from the Cape are dark grey and rather silvery. Few are imported. Fur generally poor and harsh, only suitable for carriage rugs. Value 1s. to 3s. 6d.

JAGUAR.—Size 7 to 10 ft. long. Is found in Mexico and British Honduras. The markings are an irregular ring formation with a spot in the centre. Leopards have rings only and cheetahs solid spots. Suitable only for hearthrugs. Supply very limited. Value 5s. to 45s.

KALUGA.—See *Souslik*, below.

KANGAROO.—The sizes vary considerably, some being huge, others quite small. The larger varieties, viz. the red and the great, do not usually interest furriers, the fur being harsh and poor without underwool. They are tanned for the leather trade. The sorts used for carriage aprons, coat linings and the outside of motor coats include: blue kangaroo, bush kangaroo, bridled kangaroo, wallaroo, yellow kangaroo, rock wallaby, swamp wallaby and short-tailed wallaby. Many of the swamp sort are dyed to imitate skunk and look well. Generally the colours are yellowish or brown. Some are dark brown as in the swamp, which being strong are suitable for motor coats. The rock wallabies are soft and woolly and often of a pretty bluish tone, and make moderately useful carriage rugs and perambulator aprons. The redder and browner sorts are also good for rugs as they are thick in the pelt. On the European continent many of these are dyed. The best of the lighter weights are frequently insufficiently strong in the hair to stand the friction of wear in a coat lining. Value, kangaroo 9d. to 3s., wallaby 1½d. to 5s. 3d., wallaroo 1s. to 5s. 6d.

KIDS.—See *Goats*, above.

KOLINSKY.—Size 12×2½ in. Is one of the marten tribe. The underwool is short and rather weak, but regular, as is also the top hair; the colour is usually yellow. They have been successfully dyed and used as a substitute for sable. They are found in Siberia, Amoor, China and Japan, but the best are from Siberia. They are light in weight and therefore suitable for linings of coats. The tails are used for artists' "sable" brushes. The fur has often been designated as red or Tatar sable. Value 1s. 6d. to 4s. 6d.

LAMBS.—The sorts that primarily interest the fur trade in Europe and America are those from south Russia, Persia and Afghanistan, which are included under the following wholesale or retail commercial terms: Persian lamb, broadtail, astrachan, Shiraz, Bokharan and caracul lamb. With the public the general term astrachan is an old one, embracing all the above varieties; the flatter kinds, as broadtail and caracul lamb, have always been named separately. The Persian lambs, size 18×9 in., are the finest and the best of them. When dressed and dyed they should have regular, close and bright curl, varying from a small curl to a very large one, and if of equal size, regularity, tightness and brightness, the value is comparatively a matter of fancy. Those that are dull and loose, or very coarse and flat in the curl, are of far less market value.

All the above enumerated lambs are naturally a rusty black or brown, and with very few exceptions are dyed a jet black. Lustre, however, cannot be imparted unless the wool was originally of a silky nature. Broadtails, size 10×5 in., are the very young of the Persian sheep, and are killed before the wool has time to develop beyond the flat wavy state which can be best compared to a piece of moiré silk. They are naturally exceedingly light in weight, and those that are of an even pattern, possessing a lustrous sheen, are costly. There is, notwithstanding, a great demand for these from the fashionable world, as not only are they very effective, but being so light in the wool the figure of the wearer can be shown as perfectly as in a garment made of silk. It cannot be regarded as an economical fur, as the pelt is too delicate to resist hard wear.

Persian Lamb price	12s. 6d.	to	25s.
Broadtail	,, 10s.	,,	35s.

Astrachan, Shiraz and Bokharan lambs, size 22 by 9 in., are of a coarser, looser curl, and chiefly used for coat linings, while the Persians are used for outside of garments, cuffs, stoles, muffs, hats and trimmings and gloves. The so-called caracul lambs, size 12×6 in., are the very young of the astrachan sheep, and the pick of them are almost as effective as broadtails, although less fine in the texture. See also remarks as to caracul kid under *Goats*, above.

Astrachan price	1s.	to	5s. 6d.
Caracul Lamb ,,	2s.	,,	10s. 6d.
Shiraz ,,	4s. 6d.	,,	10s.
Bokharan ,,	1s. 6d.	,,	3s. 6d.

Grey lambs, size 24×10 in., are obtained from the Crimea and known in the trade as "crimmers." They are of a similar nature to the caracul lambs, but looser in curl, ranging from a very light to a dark grey. The best are the pale bluish greys, and are chiefly used for ladies' coats, stoles, muffs and hats. Price 2s. to 6s. Mongolian lambs, size 24×15 in., are of a short wavy loose curl, creamy white colour, and are usually exported from China dressed, the majority being ready-made into cross-shaped coats or linings. They are used principally for linings of good evening wraps for ladies. Price 1s. to 2s. 6d. Slink lambs come from South America and China. The former are very small and generally those that are stillborn. They have a particularly thin pelt with very close wool of minute curl. The China sorts are much larger. The smaller are used for glove linings and the others for opera cloak linings. Price 1s. to 6s. 6d.

LEOPARD.—Size 3 to 6 ft. long. There are several kinds, the chief being the snow or ounce, Chinese, Bengal, Persian, East Indian and African. The first variety inhabits the Himalayas and is beautifully coated with a deep soft fur quite long compared to the flat harsh hair of the Bengal sort. The colours are pale orange and white with very dark markings, a strong contrast making a fine effect. Most artists prize these skins above all others. The Chinese are of a yellowish orange brown colour, but full in fur. The East Indian are less full and not so dark. The Bengal are dark and medium in colour, short and hard hair, but useful for floor rugs, as they do not hold the dust like the fuller and softer hair of the kinds previously named. They are also used for drummers' aprons and saddle cloths in the Indian army. The African are small with pale lemon colour grounds very closely marked with black spots on the skin, the strong contrast making a pleasing effect. Occasionally, where something very marked is wanted, skating jackets and carriage aprons are made

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from the softest and flattest of skins, but usually they are made into settee covers, floor rugs and foot muffs. Value 2s. to 40s.

LION.—Size 5 to 6 ft. long. These skins are found in Africa, Arabia and part of India, and are very year becoming scarcer. They are only used for floor rugs, and the males are more highly esteemed on account of the set-off of the mane. Value, lions' £10 to £100; lionesses' £5 to £25.

LYNX.—Size 45×20 in. The underwool is thinner than fox, but the top hair is fine, silky and flowing, 4 in. long, of a pale grey, slightly mottled with fine streaks and dark spots. The fur upon the flanks is longer and white with very pronounced markings of dark spots, and this part of the skin is generally worked separately from the rest and is very effective for gown trimmings. Where the underwool is of a sandy and reddish hue the value is far less than where it is of a bluish tone. They inhabit North America as far south as California, also Norway and Sweden. Those from the Hudson Bay district and Sweden are the best and are very similar. Those taken in Central Asia are mostly used locally. For attire the skins manufactured in Europe are generally dyed black or brown, in which state it has a similar appearance to dyed fox, but having less thick underwool and finer hair flows freely. The finest skins when dyed black are used very largely in America in place of the dyed black fox so fashionable for mourning wear in Great Britain and France. The British Hussar busbies are made of the dark brown lynx, and it is the free silky easy movement of the fur with the least disturbance in the atmosphere that gives it such a pleasing effect. It is used for rugs in its natural state and also in Turkey as trimmings for garments. Value 13s. 6d. to 56s.

LYNX CAT OR BAY LYNX.—Is about half the size and depth of fur of a lynx proper, and inhabits the central United States. It is a flat and reddish fur compared to the lynx and is suitable for cheap carriage aprons. A few come from Canada and are of better quality. Value 5s. to 15s.

MARMOT.—Size 18×19 in. Is a rodent and is found in considerable numbers in the south of Prussia. The fur is a yellowish brown and rather harsh and brittle and has no underwool. Since, however, the value of all good furs has advanced, dyers and manufacturers have made very successful efforts with this fur. The Viennese have been particularly successful, and their method has been to dye the skins a good brown and then not put in the dark stripes, which exist in sable and mink, until the garment or article is finished, thus obtaining as perfectly symmetrical effects as if the articles were made of small skins instead of large ones. Marmots are also found in Southern America, Canada and China; the best, however, come from Russia. It should always be a cheap fur, having so few good qualities to recommend it. Value 9d. to 2s. 6d.

MARTEN, AMERICAN.—See *Sable*, below.

MARTEN, BAUM.—Size 16×5 in. Is sometimes called the pine marten, and is found in quantity in the wooded and mountainous districts of Russia, Norway, Germany and Switzerland. It possesses a thick underwool with strong top hair, and ranges from a pale to a dark bluish brown. The best, from Norway, are very valuable and of good appearance and an excellent substitute for American sable. The tails when split into two or three, with small strips of narrow tape so as to separate the otherwise dense fur, formerly made very handsome sets of trimmings, ties and muffs, and the probabilities are, as with other fashions, such use will have its period of revival. Value 6s. to 85s.

MARTEN, BLACK.—See *Shunk*, below.

MARTEN, JAPANESE.—Size 16×5 in. Is of a woolly nature with rather coarse top hair and generally yellow in colour. It is dyed for the cheap trade for boas and muffs, but it is not an attractive fur at the best of times. It lacks a silky, bright and fresh appearance, and therefore is unlikely to be in great demand, except where economy is an object. Value 6d. to 15s. 6d.

MARTEN, STONE.—Size and quality similar to the baum; the colour, however, of the underwool is a stony white and the top hair is very dark, almost black. They live in rocky and stony districts. Skins of a pale bluish tone are generally used in their natural state for stoles, boas and muffs, but the less clear coloured skins are dyed in beautiful shades similar in density to the dark and valuable sables from Russia, and are the most effective skins that can be purchased at a reasonable price. The tails have also been worked, in the manner explained with regard to the baum marten, as wide mantle trimings and in other forms. Stone martens are found in Russia, Bosnia, Turkey, Greece, Germany, the Alps and France. The Bosnian and the French are the best in colour. The Asiatic sorts are less woolly, but being silky are useful when dyed. There are many from Afghanistan and India which are too poor to interest the European markets. Value 7s. 6d. to 26s.

MINK.—Size 16×5 in. Is of the amphibious class and is found throughout North America and in Russia, China and Japan. The underwool is short, close and even, as is also the top hair, which is very strong. The best skins are very dark and are obtained from Nova Scotia. In the central states of America the colour is a good brown, but in the north-west and south-west the fur is coarse and generally pale. It is very durable for linings, and is an economical substitute for sable for coats, capes, boas and trimmings. Values have greatly increased, and the fur possessing good qualities as to colour and durability will doubtless always be in good request. The Russian specie is dark but flat and poor in quality, and the Chinese and Japanese are so pale that they are invariably dyed. These, however, are of very inferior nature. Value of American 3s. 3d. to 40s., Japanese 3d. to 2s. 3d.

MOLE.—Size 3½×2½ in. Moles are plentiful in the British Isles and Europe, and owing to their lovely velvety coats of exquisite blue shade and to the dearness of other furs are much in demand. Though the fur is cheap in itself, the expense of dressing and working up these little skins is considerable, and they possess the unique charm of an exceptional colour with little weight of pelt; the quality of resistance to friction is, however, so slight as to make them expensive in wear. The best are the dark blue from the Fen district of Cambridgeshire in England. Value 4d. to 2d.

MONGOLIAN LAMBS.—See *Lambs*, above.

MONKEY, BLACK.—Size 18×10 in. Among the species of monkeys only one interests to any extent the fur trade, and that is the black monkey taken on the west coast of Africa (*Colobus satanas*). The hair is very long, very black and bright with no underwool, and the white pelt of the base of the hair, by reason of the great contrast of colour, is very noticeable. The skins were in 1850 very fashionable in England for stoles, muffs and trimmings, and in America also as recently as 1890. They are now mostly bought for Germany and the continent. Value 6d. to 1s. 6d.

MOUFLON.—Size 30×15 in. Is a sheep found in Russia and Corsica and now very little in demand, and but few are imported into Great Britain. Many Mongolian goats with the long hairs pulled out are sold as mouflon. Value 4s. to 10s. 6d.

MUSK-OX.—Size 6×3 ft. These animals have a dense coat of fine, long brown wool, with very long dark brown hair on the head, flanks and tail, and, in the centre, a peculiar pale oval marking. There is no other fur that is so thick, and it is eminently suitable for sleighing rugs, for which purpose it is highly prized in Canada. The musk-ox inhabits the north part of Greenland and part of Canada, but in very limited numbers. Value 10s. to 130s.

MUSQUASH OR MUSK-RAT, BROWN and BLACK RUSSIAN.—Size 12×8 in. A very prolific rodent of the amphibious class obtained from Canada and the United States, similar in habit to the English vole, with a fairly thick and even brown underwool and rather strong top hair of medium density. It is a very useful fur for men's coat linings and ladies' driving or motoring coats, being warm, durable and not too heavy. If the colour were less motley and the joins between the skins could be made less noticeable, it would be largely in demand for stoles, ties and muffs. As it is, this fur is much used for these small articles for the cheaper trade. It has, however, of later years been "unhaired," the underwool clipped very even and then dyed seal colour, in which way very useful and attractive garments are supplied at less than half the cost of the cheaper natural fur. They do not wear as well, however, as the pelt and the wool are not of a strength comparable to those of sealskin. With care, however, such a garment lasts sufficiently long to warrant the present outlay. Value 3½d. to 1s. 9d.

There is a so-called black variety found in Delaware and New Jersey, but the number is very small compared to the brown species. They are excellent for men's coat linings and the outside of ladies' coats, for stoles, muffs, collars and cuffs. Value 10d. to 3s. 7d.

The Russian musquash is very small, 7×4 in., and is limited in number compared to the brown. Musquash, black Russian are imported to London. It is of a very pretty silvery-blue shade of even wool with very little silky top hair, having silvery-white sides and altogether a very marked effect. The odour, however, even after dressing is rather pungent of musk, which is generally an objection. Value 4s. to 6s. 6d.

NUTRIA.—Size 20×12 in. Is a rodent known in natural history as the coypu, about half the size of a beaver, and when unhaired has been more than half, generally speaking, the depth of fur, which is also not so close. Formerly the fur was only used for hatters' felt, but with the rise in prices of furs these skins have been more carefully removed and—with improved dressing, unhairing and silvering processes—the best provides a very effective and suitable fur for ladies' coats, capes, stoles, muffs, linings and gloves, while the lower qualities make very useful, light-weighted and inexpensive linings for men's or women's driving coats. It is also dyed sealskin colour, but its woolly nature renders it less effective than the more silky musquash. They are obtained from the northern part of South America. Value 1s. 6d. to 6s. 6d.

OCELOT.—Size 36×13 in. Is of the nature of a leopard and prettily marked with stripes and oblong spots. Only a few are now imported from South America for carriage aprons or mats. The numbers are very limited. Value 1s. to 2s. 6d.

OPOSSUM, AMERICAN.—Size 18×10 in. Is a marsupial, a class with this exception not met with out of Australia. The underwool is of a very close frizzy nature, and nearly white, with long bluish grey mixed with some black top hair. It is only found in the central sections of the United States. About 1870 in England it was dyed dark brown or black and used for boas, muffs and trimmings, but until recently has been neglected on the continent. With, however, recent experiments in brown and skunk coloured dyes, it bids fair to become a popular fur. Value 2½d. to 5s. 6d.

OPOSSUM, AUSTRALIAN.—Size 16×8 in. Is a totally different nature of fur to the American. Although it has wool and top hair,

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the latter is so sparse and fine that the coat may be considered as one of close even wool. The colour varies according to the district of origin, from a blue grey to yellow with reddish tones. Those from the neighbourhood of Sydney are light clear blue, while those from Victoria are dark iron grey and stronger in the wool. These animals are most prolific and evidently increasing in numbers. Their fur is pretty, warm and as yet inexpensive, and is useful for rugs, coat linings, stoles, muffs, trimmings and perambulator aprons. The worst coloured ones are frequently dyed black and pass brown. The most pleasing natural grey come from Adelaide. The reddest are the cheapest. Value 3d. to 3s. 6d.

Opossum, Ringtailed.—Size 7×4 in. Has a very short close and dark grey wool, some being almost black. There are but a few thousands imported, and being so fine they are only of use for coat linings, but they are very warm and light in weight. Value 6d. to 10d.

Opossum, Tasmanian (grey and black).—Size 20×10 in. Is of a similar description, but darker and stronger in the wool and larger. Besides these there are some very rich brown skins which were formerly in such request in Europe, especially Russia, that undue killing occurred until 1899, when the government stopped for a time the taking of any of this species. They are excellent for carriage aprons, being not only very light in weight and warm, but handsome. Value 2s. 6d. to 8s. 6d.

Otter, River.—The size varies considerably, as does the underwool and the top hair, according to the country of origin. There are few rivers in the world where they do not live. But it is in the colder northern regions that they are found in the greatest numbers and with the best fur or underwool, the top hair, which, with the exception of the scarce and very rich dark brown specimens they have in common with most aquatic animals, is pulled out before the skins are manufactured. Most of the best river otter comes from Canada and the United States and averages 36×18 in. in size. Skins from Germany and China are smaller, and shorter in the wool. The colours of the under wools of river otters vary, some being very dark, others almost yellow. Both as a fur and as a pelt it is extremely strong, but owing to its short and close wool it is usually made up for the linings, collars and cuffs of men's coats. A large number of skins, after unhairing, is dyed seal colour and used in America. Those from hot climates are very poor in quality. Value 28s. to 118s.

Otter, Sea.—Size 50×25 in. Possesses one of the most beautiful of coats. Unlike other aquatic animals the skin undergoes no process of unhairing, the fur being of a rich dense silky wool with the softest and shortest of water hairs. The colour varies from pale grey brown to a rich black, and many have even or uneven sprinkling of white or silvery-white hairs. The blacker the wool and the more regular the silver points, the more valuable the skin. Sea otters are, unfortunately, decreasing in numbers, while the demand is close, increasing. The fur is most highly esteemed in Russia and China; in the latter country it is used to trim mandarins' state robes. In Europe and America it is much used for collar, long facings and cuffs of a gentleman's coat; such a set may cost from £200 to £600, and in all probability will soon cost more. Taking into consideration the size, it is not so costly as the natural black fox, or the darkest Russian sable, which is now the most expensive of all. The smaller and young sea otters of a grey or brown colour are of small value compared to the large dark and silvery ones. Value from 10s. to £220. A single skin has been known to fetch £300.

Ounce.—See *Leopard*, above.

Persian Lambs.—See *Lambs*, above.

Platypus.—Size 12×6 in. One of the most singular of furbearing animals, being the link between bird and beast. It has fur similar to otter, is of aquatic habits, being web-footed with spurs of a cock and the bill of a duck. The skins are not obtained in any numbers, but being brought over by travellers as curiosities and used for muffs, collars and cuffs, &c., they are included here for reference. Value 2s. to 3s. 6d.

Pony or Tatar Foal.—Size 36×20 in. These skins are of comparatively recent importation to the civilized world. They are obtained from the young of the numerous herds of wild horses that roam over the plains of Turkestan. The coat is usually a shade of brown, sometimes greyish, fairly bright and with a suggestion of waviness. Useful for motor coats. Value 3s. to 10s. 6d.

Puma.—Size 43×15. Is a native of South America, similar to a lion in habits and colour of coat. The hair and pelt is, however, of less strength, and only a few are now used for floor rugs. Value 5s. to 10s.

Raccoon.—Size 20×12 in. Is an animal varying considerably in size and in quality and colour of fur, according to the part of North America in which it is found. In common parlance, it may be described as a species of wild dog with close affinity to the bear. The underwool is 1 to 1½ in. deep, pale brown, with long top hairs of a dark and silvery-grey mixture of a grizzly type, the best having a bluish tone and the cheapest a yellowish or reddish-brown. A limited number of very dark and black sorts exist and are highly valued for trimmings. The very finest skins are chiefly used for stoles and muffs, and the general run for coachmen's capes and carriage rugs, which are very handsome when the tails, which are marked with rings of dark and light fur alternately, are left on. Raccoons are used in enormous quantities in Canada for men's coats, the fur outside. The poorer qualities are extensively bought and made up in a similar way for Austria-Hungary and Germany. These make excellent linings for coats or footsacks for open driving in very cold climates. The worst coloured skins are dyed black or brown and are used for British military busbies, or caps, stoles, boas, muffs and coachmen's capes. The best skins come from the northern parts of the United States. A smaller and poorer species inhabits South America, and a very few are found in the north of India, but these do not interest the European trade. From Japan a similar animal is obtained in smaller quantities with very good but longer fur, of yellowish motley light-brown shades. It is more often imported and sold as Japanese fox, but its resemblance to the fur of the American raccoon is so marked as to surely identify it. When dyed dark blue or skunk colour it is good-looking and is sold widely in Europe. Raccoon skins are also frequently unhaired, and if the underwool is of good quality the effect is similar to beaver. It is the most useful fur for use in America or Russia, having a full quantity of fur which will retain heat. Value 10d. to 8s.

Sable, American and Canadian.—Size 17×5 in. The skins are sold in the trade sale as martens, but as there are many that are of a very dark colour and the majority are almost as silky as the Russian sable, the small trade has for generations back applied the term of sable to this fur. The prevailing colour is a medium brown, and many are quite yellow. The dyeing of these very pale skins has been for so long well executed that it has been possible to make very good useful and effective articles of them at a moderate price compared to Russian sable. The finest skins are found in the East Main and the Esquimaux Bay, in the Hudson's Bay Company's districts, and the poorest in Alaska. They are not found very far south of the northern boundary of the United States. The best skins are excellent in quality, colour and effect, and wear well. Value 27s. 3d. to 290s.

Sable, Chinese and Japanese.—Size 14×4½ in. These are similar to the Amur skins previously referred to, but of much poorer quality and generally only suitable for linings. The very palest skins are dyed and made by the Chinese into mandarins' coats, in which form they are found in the London trade sales, but being overdressed they are inclined to be loose in the hair and the colour of the dye is not good. The Japanese kind are imported raw, but are few in numbers, very pale and require dyeing. Value 15s. to 150s.

Sable, Russian.—Size 15×5 in. These skins belong to a species of marten, very similar to the European and American, but much more silky in the nature of the fur. They are long have been known as "sables," doubtless owing to the density of colour to which many of them attain, and they have always been held in the highest esteem by connoisseurs as possessing a combination of rare qualities. The underwool is close, fine and soft, but the top hair is regular, fine, silky and flowing, varying from 1½ to 2½ in. in depth. In colour they range from a pale stony or yellowish shade to a rich dark brown, almost black with a bluish tone. The pelts are exceedingly fine and close in texture and, although of little weight, are very durable, and articles made of them produce a sensation of warmth immediately they are put upon the body.

The Yakutsk, Okhotsk and Kamschatka sorts are good, the last being the largest and fullest furred, but of less density of colour than the others. Many from old Russia have a very yellowish brown, and those from Saghalien are poor in quality. The most valuable are the darkest from Yakutsk in Siberia, particularly those that have silvery hairs evenly distributed over the skin. These however are exceedingly scarce, and when a number are required to match for a large garment, considerable time may be necessary to collect them. This class of skin is the most expensive fur in the world, reckoning values by a square foot unit.

The Amur skins are paler, but often of a pretty bluish stony tone with many frequently interspersed silvery hairs. The quality too is lower, that is, the fur is not so close or deep, but they are very effective, particularly for close-fitting garments, as they possess the least appearance of bulk. The paler skins from all districts in Siberia are much more evenly coloured as regards the fur, but the tips of the hair are stained dark, and it is only an expert who can detect them from perfectly natural shades. If this colouring process is properly executed it remains fairly fast. Notwithstanding the reported rights of the Russian government over some regions with respect to these and other valuable fur-bearing animals, there are in addition to the numbers regularly sent to the trade auction sales in London many good parcels of raw skins to be easily bought direct, provided price is not the first consideration. Value 25s. to 980s.

Seal, Fur.—Sizes range from 24×15 in. to 55×25 in., the width being taken at the widest part of the skin after preparation. The centre of the skin between the fins is very narrow and the skins taper at each end, particularly at the tail. The very small pups are of a beautiful quality, but too tiny to make into garments, and, as the skin of a good furrier is to avoid all lateral or cross seams, skins are selected that are the length of the garment that is to be made. The most useful skins for coats are the large pups 42 in. long, and the quality is very good and uniform. The largest skins, known in the trade as "wigs," which range up to 8 ft. in length, are uneven and weak in the fur, and hunters do not seek to obtain them. The supply of the best sort is chiefly from the North Pacific, viz. Pribilof

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Islands, Alaska, north-west coast of America, Copper Island of the Aleutian group near to Kamschatka, Robben Island and Japan. Other kinds are taken from the South Pacific and South Atlantic Oceans, around Cape Horn, the Falkland Islands up to Lobos Islands at the entrance of the La Plata river, off the Cape of Good Hope and Croaet Isles. With, however, the exception of the pick of the Lobos Island seals the fur of the southern sea seals is very poor and only suitable for the cheapest market. Formerly many skins were obtained from New Zealand and Australia, but the importation is now small and the fur not good. The natural colour of seal skin occupies a longer time than any other fur skin, but its fine rich effect when finished and its many properties of warmth and durability will repay it. Value 10s. to 23s.

SEAL, HAIR.—There are several varieties of these seals in the seas stretching north from Scotland, around Newfoundland, Greenland and the north-west coast of America, and they are far more numerous than fur seals. Generally they have coarse rigid hair and none possess any underwool. They are taken principally for the oil and leather they yield. Some of the better haired sorts are dyed black and brown and used for men's motor coats when quite a waterproof garment is wanted, and they are used also for this quality in China. The young of the Greenland seals are called whitecoats on account of the early growth long of a yellowish white colour; the hair is ¾ to 1 in. long, and at this early stage of their life is soft compared to that of the older seals. These fur skins are dyed black or dark brown and are used for military caps and hearth-rugs. Value 2s. to 15s. These are fewer hair seal than in the past, chiefly in the northern seas.

SHEEP.—Vary much in size and in quality of wool. Many of the domestic kind in central and northern Europe and Canada are used for drivers' and peasants' coat linings, &c. In Great Britain many coats of the home-reared sheep, having wools two and a half to five inches long, are dyed various colours and used as floor rugs. Skins with very short wool are dyed black and used for military saddle-cloths. The bulk, however, is used in the wool trade. The Hungarian peasants are very fond of their natural brown sheep coats, the leather side of which is not lined, but embellished by a very close fancy embroidery, worked upon the leather itself; these garments are reversible, the fur being worn inside when the weather is cold. Chinese sheep are largely used for cheap rugs. Value of English sheets from 3s. to 10s.

SKUNK or BLACK MARTEN.—Size 15×8 in. The underwool is full and fairly close with glossy, flowing top hair about 2½ in. long. The majority have two stripes of white hair, extending the whole length of the skin, but these are cut out by the manufacturing furrier and sold to the dealers in plain fur skins. The best skins all round are found widely spread throughout North and South America. The skins which are of the greatest interest to the European trade are those from North America, the South American species being small, coarser and generally brown. The best skins come from China and New York. If it were not for its disagreeable odour, skunk would be worth much more than the usual market value, as it is naturally the blackest fur, silky in appearance and most durable. The improved dressing processes have to a large extent removed the naturally pungent scent. The fur is excellent for sables, boas, collars, cuffs, muffs and trimmings. Value 1s. 6d. to 11s.

SOUSLIK.—Size 7 in.×2½. Is a small rodent found in the south of Russia and also in parts of America. It has very short hair and is a poor fur even for the cheapest trade, which is the only area in which the skin could be put. It is known as kaluga when imported in ready-made linings from Russia where the skins are dressed and worked in an inferior way. Value 1d. to 3d.

SQUIRREL.—Size 10×5 in. This measurement refers to the Russian and Siberian sorts, which are the only kind imported for the fur. The numerous other species are too poor in their coats to attract notice from fur dealers. The back of the Russian squirrel has an even close fur varying from a clear bluish-grey to a reddish-brown, the bellies in the former being of a flat quality and white, in the latter yellowish. The backs are worked into linings separately, as are the bellies or "locks." The pelts, although very light, are tough and durable, hence their good reputation for linings for ladies' walking or driving coats. The best skins also provide excellent material for coats, capes, stoles, ties, collars, cuffs, gloves, muffs, hoods and light-weight carriage aprons. The tails are dark and very small, and when required for ends of boas three or four are made as one. Value per skin from 2½d. to 1s. 1d.

TIBET LAMB.—Size 27 × 13 in. These pretty animals have a long, very fine, silky and curly fleece of a creamy white. The majority are consigned to the trade auction sales in London ready dressed and worked into crossbarred coats, and the remainder, a fourth of the total, come as dressed skins. They are excellent for trimmings of evening mantles and for children's ties, muffs and perambulator aprons. The fur is too long and bulky for linings. Value per skin from 4s. 6d. to 8s. 6d.

TIGER.—Size varies considerably, largest about 10 ft. from nose to root of tail. Tigers are found throughout India, Turkestan, China, Mongolia and the East Indies. The coats of the Bengal kind are short and of a dark orange brown with black stripes, those from east or further India are similar in colour, but longer in the hair, while those from north of the Himalayas and the mountains of China are not only huge in size, but have a very long soft hair of delicate orange brown with very white flanks, and marked generally with the blackest of stripes. The last are of a noble appearance and exceedingly scarce. They all make handsome floor rugs.

Value of the Indian . . . from £3 to £15.
" " Chinese " £10 to £65.

VICUNA is a species of long-necked sheep native to South America, bearing some resemblance to the guanaco, but the fur is shorter, closer and much finer. The colour is a pale golden-brown and the fur is held in great repute in South America for carriage rugs. The supply is evidently small as the prices are high. There is scarcely a commercial quotation in London, few coming in except from private sources. 2s. 6d. to 5s. 6d. may be considered as the average value.

WALLABY.—See *Kangaroo*, above.

WALLAROO.—See *Kangaroo*, above.

WOLF.—Size 50×25 in. Is closely allied to the dog tribe and, like the jackals, is found through a wide range of the world,—North and South America, Europe and Asia. Good supplies are available from North America and Siberia and a very few from China. The best are the full furred ones of a very pale bluish-grey with fine flowing black top hair, which are obtained from the Hudson Bay district. Those from the United States and Asia are harsher in quality and browner. A few black American specimens come into the market, but usually the quality is poor compared to the lighter furred animal. The Siberian is smaller than the North American and the Russian still smaller. Besides the wolf proper a large number of prairie or dog wolves from America and Asia are used for cheaper rugs. In size they are less than half that of a large wolf and are of a motley sandy colour. Numbers of the Russian are retained for home use. The finest wolves are very light weighted and most suitable for carriage aprons, in fact, ideal for the purpose, though lacking the strength of some other furs.

Wolves . . . value 2s. 6d. to 64s.
Dog wolves . . " 1s. to 2s. 6d.

WOLVERINE.—Size 16×18 in. Is native to America, Siberia, Russia and Scandinavia and generally partakes of the nature of a bear. The underwool is full and thick with strong and bright top hair about 2½ in. long. The colour is of two or three shades of brown in one skin, the centre being an oval dark saddle, edged as it were with quite a pale tone and merging to a darker one towards the flanks. This peculiar character alone stamps it as a distinguished fur, in addition to which it has the excellent advantage of being the most durable fur for carriage aprons, as well as the richest in colour. It is not prolific, added to which it is very difficult to match a number of skins in quality as well as colour. Hence it is an expensive fur, but its excellent qualities make it valuable. The darkest of the least coarse skins are worth the most. Prices from 6s. to 37s.

WOMBAT, KOALA or AUSTRALIAN BEAR.—Size 20×12 in. Has light grey or brown close thick wool half an inch deep without any top hair, with a rather thick spongy pelt. It is quite inexpensive and only suitable for cheap rough coats, carriage rugs, perambulator aprons and linings for footbags. The coats are largely used in western America and Canada. Value 3d. to 1s. 8½d.

Preparing and Dressing.—A furrier or skin merchant must possess a good eye for colour to be successful, the difference in value on this subtle matter solely (in the rarer precious sorts, especially sables, natural black, silver and blue fox, sea otters, chinchillas, fine mink, &c.) being so considerable that not only a practised but an intuitive sense of colour is necessary to accurately determine the exact merits of every skin. In addition to this a knowledge is required of what the condition of a pelt should be; a good judge knows by experience whether a skin will turn out soft and strong, after dressing, and whether the hair is in the best condition of strength and beauty. The dressing of the pelt or skin that is to be preserved for fur is totally different to the making of leather; in the latter tannic acid is used, but never should be with a fur skin, as is so often done by natives of districts where a regular fur trade is not carried on. The results of applying tannic acid are to harden the pelt and discolour and weaken the fur. The best methods for dressing fur skins are those of a tawer or currier, the aim being to retain all the natural oil in the pelt, in order to preserve the natural colour of the fur, and to render the pelt as supple as possible. Generally the skins are placed in an alkali bath, then by hand with a blunt wooden instrument the moisture of the pelt is worked out and it is drawn carefully to and fro over a straight, dull-edged knife to remove any superfluous flesh and unevenness. Special grease is then rubbed in and the skin placed in a machine which softly and continuously beats in the softening mixture, after which it is put into a slowly revolving drum, fitted with wooden paddles, partly filled with various kinds of fine hard sawdust according to the nature of the furs dealt with. This process with a moderate degree of heat thoroughly cleans it of external greasy matter,

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and all that is necessary before manufacturing is to gently tap the fur upon a leather cushion stuffed with horsehair with smooth canes of a flexibility suited to the strength of the fur. After dressing most skins alter in shape and decrease in size.

With regard to the merits of European dressing, it may be fairly taken that English, German and French dressers have specialities of excellence. In England, for instance, the dressing of sables, martens, foxes, otters, seals, bears, lions, tigers and leopards is first rate; while with skunk, mink, musquash, chinchillas, beavers, lambs and squirrels, the Germans show better results, particularly in the last. The pelt after the German dressing is dry, soft and white, which is due to a finishing process where meal is used, thus they compare favourably with the moister and consequently heavier English finish. In France they do well with cheaper skins, such as musquash, rabbit and hare, which they dye in addition to dressing. Russian dressing is seldom reliable; not only is there an unpleasant odour, but in damp weather the pelts often become clammy, which is due to the saline matter in the dressing mixture. Chinese dressing is white and supple, but contains much powder, which is disagreeable and difficult to get rid of, and in many instances the skin is rendered so thin that the roots of the fur are weakened, which means that it is liable to shed itself freely, when subject to ordinary friction in handling or wearing. American and Canadian dressing is gradually improving, but hitherto their results have been inferior to the older European methods.

In the case of seal and beaver skins the process is a much more difficult one, as the water or hard top hairs have to be removed by hand after the pelt has been carefully rendered moist and warm. With seal skins the process is longer than with any other fur preparation and the series of processes engage many specialists, each man being constantly kept upon one section of the work. The skins arrive simply salted. After being purchased at the auction sales they are washed, then stretched upon a hoop, when all blubber and unnecessary flesh is removed, and the pelt is reduced to an equal thickness, but not so thin as it is finally rendered. Subsequently the hard top hairs are taken out as in the case of otters and beavers and the whole thoroughly cleaned in the revolving drums. The close underwool, which is of a slightly wavy nature and mostly of a pale drab colour, is then dyed by repeated applications of a rich dark brown colour, one coat after another, each being allowed to thoroughly dry before the next is put on, till the effect is almost a lustrous black on the top. The whole is again put through the cleaning process and evenly reduced in thickness by revolving emery wheels, and eventually finished off in the palest buff colour.

The English dye for seals is to-day undoubtedly the best; its constituents are more or less of a trade secret, but the principal ingredients comprise gall nuts, copper dust, camphor and antimony, and it would appear after years of careful watching that the atmosphere and particularly the water of London are partly responsible for good and lasting results. The Paris dyers do excellent work in this direction, but the colour is not so durable, probably owing to a less pure water. In America of late, strides have been made in seal dyeing, but preference is still given to London work. In Paris, too, they obtain beautiful results in the "topping" or colouring Russian sables and the Germans are particularly successful in dyeing Persian lambs black and foxes in all blue, grey, black and smoke colours and in the insertion of white hairs in imitation of the real silver fox. Small quantities of good beaver are dyed in Russia occasionally, and white hairs put in so well that an effect similar to sea otter is obtained.

The process of inserting white hairs is called in the trade "pointing," and is either done by stitching them in with a needle or by adhesive caoutchouc.

The Viennese are successful in dyeing marmot well, and their cleverness in colouring it with a series of stripes to represent the natural markings of sable which has been done after the garments have been made, so as to obtain symmetry of lines, has secured for them a large trade among the dealers of cheap furs in England and the continent.

Manufacturing Methods and Specialities.—In the olden times the Skinners' Company of the city of London was an association of furriers and skin dressers established under royal charter granted by Edward III. At that period the chief concern of the body was to prevent buyers from being imposed upon by sellers who were much given to offering old furs as new; a century later the Skinners' Company received other charters empowering them to inspect not only warehouses and open markets, but workrooms. In 1667 they were given power to scrutinize the preparing of rabbit or cony wool for the wool trade and the registration of the then customary seven years' apprenticeship. To-day all these privileges and powers are in abeyance, and the interest that they took in the fur trade has been gradually transferred to the leather-dressing craft.

The work done by English furriers was generally good, but since about 1865 has considerably improved on account of the influx of German workmen, who have long been celebrated for excellent fur work, being in their own country obliged to satisfy officially appointed experts and to obtain a certificate of capacity before they can be there employed. The French influence upon the trade has been, and still is, primarily one of style and combination of colour, bad judgment in which will mar the beauty of the most valuable furs. It is a recognized law among high-class furriers that furs should be simply arranged, that is, that an article should consist of one fur or of two furs of a suitable contrast, to which lace may be in some cases added with advantage. As illustrative of this, it may be explained that any brown tone of fur such as sable, marten, mink, black marten, beaver, nutria, &c., will go well upon black or very dark-brown furs, while those of a white or grey nature, such as ermine, white lamb, chinchilla, blue fox, silver fox, opossum, grey squirrel, grey lamb, will sel well upon seal or black furs, as Persian lamb, broadtail, astrachan, caracul lamb, &c. White is also permissible upon some light browns and greys, but brown motley colours and greys should never be in contrast. One neutralizes the other and the effect is bad. The qualities, too have to be considered—the fulness of one, the flatness of the other, or the coarseness or fineness of the furs. The introduction of a third fur in the same garment or indiscriminate selection of colours of silk linings, braids, buttons, &c., often spoils an otherwise good article.

With regard to the natural colours of furs, the browns that command the highest prices are those that are of a bluish rather than a reddish tendency. With greys it is those that are bluish, not yellow, and with white those that are purest, and with black the most dense, that are most esteemed and that are the rarest.

Perhaps for ingenuity and the latest methods of manipulating skins in the manufacturing of furs the Americans lead the way, but as fur cutters are more or less of a roving and cosmopolitan character the larger fur businesses in London, Berlin, Vienna, St Petersburg, Paris and New York are guided by the same thorough and comparatively advanced principles.

During the period just mentioned the tailors' methods of scientific pattern cutting have been adopted by the leading furriers in place of the old chance methods of fur cutters, so that to-day a fur garment may be as accurately and gracefully fitted as plush or velvet, and with all good houses a material pattern is fitted and approved before the skins are cut.

Through the advent of German and American fur sewing-machines since about 1890 fur work has been done better and cheaper. There are, however, certain parts of a garment, such as the putting in of sleeves and placing on of collars, &c., that can only be sewn by hand. For straight seams the machines are excellent, making as neat a seam as is found in glove work, unless, of course, the pelts are especially heavy, such as bears and sheep rugs.

A very great feature of German and Russian work is the fur linings called rotondes, sacques or plates, which are made for their home use and exportation chiefly to Great Britain, America and France.

In Weissenfels, near Leipzig, the dressing of Russian grey squirrel and the making it into linings is a gigantic industry, and is the principal support of the place. After the dressing process the backs of the squirrels are made up separately from the under

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and thinner white and grey parts, the first being known as squirrel-back and the other as squirrel-lock linings. A few linings are made from entire skins and others are made from the quite white pieces, which in some instances are spotted with the black ear tips of the animals to resemble ermine. The smaller and uneven pieces of heads and legs are made up into linings, so there is absolutely no waste. Similar work is done in Russia on almost as extensive a scale, but neither the dressing nor the work is so good as the German.

The majority of heads, gills or throats, sides or flanks, paws and pieces of skins cut up in the fur workshops of Great Britain, America and France, weighing many tons, are chiefly exported to Leipzig, and made up in neighbouring countries and Greece, where labour can be obtained at an alarmingly low rate. Although the sewing, which is necessarily done by hand, the sections being of so unequal and tortuous a character, is rather roughly executed, the matching of colours and qualities is excellent. The enormous quantities of pieces admit of good selection and where odd colours prevail in a lining it is dyed. Many squirrel-lock linings are dyed blue and brown and used for the outside of cheap garments. They are of little weight, warm and effective, but not of great durability.

The principal linings are as follows: Sable sides, sable heads and paws, sable gills, mink sides, heads and gills, marten sides, heads and gills, Persian lamb pieces and paws, caracul lamb pieces or paws, musquash sides and heads, nutria sides, genet pieces, raccoon sides or flanks, fox sides, kolinski whole skins, and small rodents as kaluga and hamster. The white stripes cut out of skunks are made into rugs.

Another great source of inexpensive furs is China, and for many years past enormous quantities of dressed furs, many of which are made up in the form of linings and Chinese loose-shaped garments, have been imported by England, Germany and France for the lower class of business; the garments are only regarded as so much fur and are reworked. With, however, the exception of the best white Tibet lambs, the majority of Chinese furs can only be regarded as inferior material. While the work is often cleverly done as to matching and manipulation of the pelt which is very soft, there are great objections in the odour and the brittleness or weakness of the fur. One of the most remarkable results of the European intervention in the Boxer rising in China (1900) was the absurd price paid for so-called "loot" of furs, particularly in mandarins' coats of dyed and natural fox skins and pieces, and natural ermine, poor in quality and yellowish in colour; from three to ten times their value was paid for them when at the same time huge parcels of similar quality were warehoused in the London docks, because purchasers could not be found for them.

With regard to Japanese furs, there is little to commend them. The best are a species of raccoon usually sold as fox, and, being of close long quality of fur, they are serviceable for boas, collars, muffs and carriage aprons. The sables, martens, minks and otters are poor in quality, and all of a very yellow colour and they are generally dyed for the cheap trade. A small number of very pretty guanaco and vicuna carriage rugs are imported into Europe, and many come through travellers and private sources, but generally they are so badly dressed that they are quite brittle upon the leather side. Similar remarks are applicable to opossum rugs made in Australia. From South Africa a quantity of jackal, hyena, fox, leopard and sheep karosses, *i.e.* a peculiarly shaped rug or covering used by native chiefs, is privately brought over. The skins are invariably tanned and beautifully sewn, the furs are generally flat in quality and not very strong in the hair, and are retained more as curiosities than for use as a warm covering.

Hatters' Furs and Cloths and Shawls.—The hat trade is largely interested in the fur piece trade, the best felt hats being made from beaver and musquash wool and the cheaper sorts from nutria, hare and rabbit wools. For weaving, the most valuable pieces are mohair taken from the angora and vicuna. They are limited in quantity and costly, and the trade depends upon various sorts of other sheep and goat wools for the bulk of its productions.

Frauds and Imitations.—The opportunities for cheating in the fur trade are very considerable, and most serious frauds have been perpetrated in the selling of sables that have been coloured or "topped"; that is, just the tips of the hairs stained dark to represent more expensive skins. It is only by years of experience that some of these colourings can be detected. Where the skins are heavily dyed it is comparatively easy to see the difference between a natural and a dyed colour, as the underwool and top hair become almost alike and the leather is also dark, whereas in natural skins the base of the underwool is much paler than the top, or of a different colour, and the leather is white unless finished in a pale reddish tone as is sometimes the case when mahogany sawdust is used in the final cleaning. As has been explained, sable is a term applied for centuries past to the darker sorts of the Russian Siberian martens, and for years past the same term has been bestowed by the retail trade upon the American and Canadian martens. The baum and stone martens caught in France, the north of Turkey and Norway are of the same family, but coarser in underwool and the top hair is less in quantity and not so silky. The kolinski, or as it is sometimes styled Tatar sable, is the animal, the tail of which supplies hair for artists' brushes. This is also of the marten species and has been frequently offered, when dyed dark, as have baum and stone martens, as Russian sables. Hares, too, are dyed a sable colour and advertised as sable. The fur, apart from a clumsy appearance, is so brittle, however, as to be of scarcely any service whatever.

Among the principal imitations of other furs is musquash, out of which the top hair has been pulled and the undergrowth of wool clipped and dyed exactly the same colour as is used for seal, which is then offered as seal or red river seal. Its durability, however, is far less than that of seal. Rabbit is prepared and dyed and frequently offered as "electric sealskin." Nutria also is prepared to represent sealskin, and in its natural colour, after the long hairs are plucked out, it is sold as otter or beaver. The wool is, however, poor compared to the otter and beaver, and the pelt thin and in no way comparable to them in strength. White hares are frequently sold as white fox, but the fur is weak, brittle and exceedingly poor compared to fox and possesses no thick underwool. Foxes, too, and badger are dyed a brownish black, and white hairs inserted to imitate silver fox, but the white hairs are too coarse and the colour too dense to mislead any one who knows the real article. But if sold upon its own merits, pointed fox is a durable fur.

Garments made of sealskin pieces and Persian lamb pieces are frequently sold as if they were made of solid skins, the term "pieces" being simply suppressed. The London Chamber of Commerce have issued to the British trade a notice that any misleading term in advertising and all attempts at deception are illegal, and offenders are liable under the Merchandise Marks Act 1887.

The most usual misnaming of manufactured furs is as follow:—

Musquash, pulled and dyed	Sold as seal.
Nutria, pulled and dyed	Sold as seal.
Nutria, pulled and natural	Sold as beaver.
Rabbit, sheared and dyed	Sold as seal or electric seal.
Otter, pulled and dyed.	Sold as seal.
Marmot, dyed	Sold as mink or sable.
Fitch, dyed	Sold as sable.
Rabbit, dyed	Sold as sable or French sable.
Hare, dyed	Sold as sable, or fox, or lynx.
Musquash, dyed	Sold as mink or sable.
Wallaby, dyed	Sold as skunk.
White Rabbit	Sold as ermine.
White Rabbit, dyed	Sold as chinchilla.
White Hare, dyed or natural	Sold as fox, foxaline, and other similar names.
Goat, dyed	Sold as bear, leopard, &c.
Dyed manufactured articles of all kinds.	Sold as "natural."
White hairs inserted in foxes and sables	Sold as real or natural furs.
Kids	Sold as lamb or broadtails.
American sable	Sold as real Russian sable.
Mink	Sold as sable.

The Preservation of Furs.—For many years raw sealskins

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have been preserved in cold storage, but it is only within a recent period, owing to the difficulty there was in obtaining the necessary perfectly dry atmosphere, that dressed and made-up furs have been preserved by freezing. Furs kept in such a condition are not only immune from the ravages of the larvae of moth, but all the natural oils in the pelt and fur are conserved, so that its colour and life are prolonged, and the natural deterioration is arrested. Sunlight has a tendency to bleach furs and to encourage the development of moth eggs, therefore continued exposure is to be avoided. When furs are wetted by rain they should be well shaken and allowed to dry in a current of air without exposure to sun or open fire.

Where a freezing store for furs is not accessible, furs should be well shaken and afterwards packed in linen and kept in a perfectly cool dry place, and examined in the summer at periods of not less than five weeks. Naphthalene and the usual malodorous powders are not only very disagreeable, but quite useless. Any chemical that is strong enough to destroy the life in a moth egg would also be sufficiently potent to injure the fur itself. In England moth life is practically continuous all the year round, that is, as regards those moths that attack furs, though the destructive element exists to a far greater extent during spring and summer.

Comparative Durability of Various Furs and Weight of Unlined Skins per Square Foot.

The following estimates of durability refer to the use of fur when made up "hair outside" in garments or stoles, not as a lining. The durability of fur used as linings, which is affected by other conditions, is set forth separately. Otter, with its water hairs removed, the strongest of furs for external use, is, in this table, taken as the standard at 100 and other furs marked accordingly:—

The Precious Furs..

	Points of Durability.	[1] Weight in oz. per sq. ft.
Sable	60	2½
Seal	75	3
Fox, Silver or Black	40	3
,, White	20	3
Ermine	25	1½
Chinchilla	15	1½
Sea-otter (for stoles or collars)	100	4½

The Less Valuable Furs.

	Points of Durability.	Weight in oz. per sq. ft.
Sable "topped," *i.e.* top hairs coloured	55	2½
,, tinted, *i.e.* fur all coloured	50	2½
Baum Marten, natural	65	2½
,, tinted	45	2½
Stone Marten	40	2½
Nutria	27	3½
Musquash, natural	37	3¼
,, water hairs removed, sheared and seal finished	33	3¼
Skunk	70	2½
Mink	70	3½
Lynx, natural	25	2½
,, tinted black	20	2½
Marmot, tinted	10	3
Fox, tinted black	25	3
,, ,, blue	20	3
Opossum	37	3
Otter (with water hairs)	100	4
,, (water hairs removed)	95	3⅞
Beaver (water hairs cut level with fur)	90	4
,, (water hairs removed)	85	3⅞
Moleskin	7	1½
Persian Lamb	65	3½
Grey ,,	30	3½
Broadtail	15	2½
Caracul Kid	10	3½
,, Lamb	15	3½
Squirrel	25	1½
Hare	5	1½
Rabbit	5	2½

[1] Stout, old-fashioned boxcloth is almost the only cloth that (after a soft, heavy lining has been added to it) affords even two-thirds as much protection against cold as does fur. It weighs 4·27 oz. per sq. ft. more than the heaviest of coat-furs, and is so rigid as to be uncomfortable, while the subtileness of fur makes it "kind" to the body.

Quantities of Fur needed, in Square Feet.

The "Paris Model" figure is the basis of these estimates for ladies' garments, the standard measurements being height 5 ft. 6 in., waist 23 in., bust 38 in.

	Sq. Ft. (approximate).
Straight stole ¼ length (just below the waist line)	2½
Straight stole ½ length (just below the knee)	3½
Stole, broad enough at the neck to cover the top of arm ½ length	5
The same, full length (to hem of skirt)	6
Eton jacket, without collar	13
Plain cape, 15 in. long	6½
Deep cape, 30 in. long	15
Full cape with broad stole front, ½ length	15
Inverness cape (to knee)	25
Double-breasted, straight, semi-fitting coat, covering hips	16
Double-breasted sacque jacket, 36 in. long, full sleeves	20
Same, 30 in. long	18
Same, 22 in. long	15
Long, full, shawl cape with points at back and front, well below knee	15
Shorter shawl cape	16
Motoring or driving coat, ¾ length	22
Motoring or driving coat, full length	27

Weight and Durability of Furs for Men's Coat Linings.

Otter with the water hairs removed, the strongest fur suited for linings, is here taken as the standard.

	Points of Durability.	Weight in oz. per sq. ft.
Otter (the water hairs removed)	100	3⅛
Beaver ,, ,,	90	3⅛
Mink	90	3¼
Sealskin	75	3
Raccoon	75	4½
Persian lamb or astrachan	70	3½
Sable	65	2½
Musquash	55	3½
Nutria	40	3½
Grey Opossum	40	3
Wallaby	30	3½
Squirrel	30	1½
Hamster	15	1½
Rabbit	10	2½

Durability and Weight of Linings for Ladies' Coats or Wraps.

Sable gills, the strongest fur suited for ladies' linings, is taken as the standard.

	Points of Durability.	Weight in oz. per sq. ft.
Sable gills	100	2½
Sable	85	2½
Sable paws	64	1½
Ermine	57	1½
Squirrel back	50	1½
Squirrel heads	36	2½
Squirrel lock	21	1⅜
Hamster	10	1½
Rabbit	7	2½

Durability and Weight of Motoring Furs made up with Fur outside.

Otter with the water hairs, the strongest fur suited for motoring garments, is taken as the standard.

	Points of Durability.	Weight in oz. per sq. ft.
Otter (with water hairs)	100	4
Sealskin, marble	80	3
"Hair Sealskin" (tinted) with water hairs (a special variety of seal)	75	3½
Raccoon	65	4½
Russian Pony	35	2½

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Durability and Weight of Furs for Rugs and Foot-sacks.

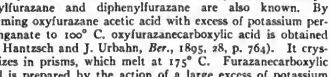
	Points of Durability.	Weight in oz. per sq. ft.
Wolverine	100	6
Bear (black or brown natural)	94	7
Bear (tinted black)	88	7½
Beaver	88	4
Raccoon	77	4½
Opossum	61	3
Wolf	50	6½
Jackal	27	4½
Australian Bear	16	6
Goat	11	4½

Wolverine, the strongest fur suited for rugs and foot-sacks, is taken as the standard.

For a rug about 20 to 25 sq. ft. of fur are needed, for a foot-sack 14½. (W. S. P.)

FURAZANES (*furo*—a.a′—*diazoles*), organic compounds obtained by heating the glyoximes (dioximes of ortho-diketones) with alkalis or ammonia. Dimethylfurazane is prepared by heating dimethylglyoxime with excess of ammonia for six hours at 165° C. (L. Wolff, *Ber.*, 1895, 28, p. 70). It is a liquid (at ordinary temperature) which boils at 156° C. (744 mm.). Potassium permanganate oxidizes it first to methylfurazanecarboxylic acid and then to furazanedicarboxylic acid. Methylethylfurazane and diphenylfurazane are also known. By warming oxyfurazane acetic acid with excess of potassium permanganate to 100° C. oxyfurazanecarboxylic acid is obtained (A. Hantzsch and J. Urbahn, *Ber.*, 1895, 28, p. 764). It crystallizes in prisms, which melt at 175° C. Furazanecarboxylic acid is prepared by the action of a large excess of potassium permanganate on a hot solution of furazanepropionic acid. It melts at 107° C., and dissolves in caustic soda, with a deep yellow colour and formation of nitrosocyanacetic acid (L. Wolff and P. F. Ganz, *Ber.*, 1891, 24, p. 1167). Furoxane is an oxide of furazane, considered by H. Wieland to be identical with glyoxime peroxide; Kekulé's dibromnitroacetonitrile is dibromfuroxane.

The formulae of the compounds above mentioned are:



Furazane. Dimethylfurazane. Furazanecarboxylic acid. Furoxane.

FURETIÈRE, ANTOINE (1619–1688), French scholar and miscellaneous writer, was born in Paris on the 28th of December 1619. He first studied law, and practised for a time as an advocate, but eventually took orders and after various preferments became abbé of Chalivoy in the diocese of Bourges in 1662. In his leisure moments he devoted himself to letters, and in virtue of his satires—*Nouvelle Allégorique, ou histoire des derniers troubles arrivés au royaume d'éloquence* (1658); *Voyage de Mercure* (1653)—he was admitted a member of the French Academy in 1662. That learned body had long promised a complete dictionary of the French tongue; and when they found that Furetière was on the point of issuing a work of a similar nature, they interfered, alleging that he had purloined from their stores, and that they possessed the exclusive privilege of publishing such a book. After much bitter recrimination on both sides the offender was expelled in 1685; but for this act of injustice he took a severe revenge in his satire, *Couches de l'académie* (Amsterdam, 1687). His *Dictionnaire universel* was posthumously published in 1690 (Rotterdam, 2 vols.). It was afterwards revised and improved by the Protestant jurist, Henri Basnage de Beauval (1656–1710), who published his edition (3 vols.) in 1701; and it was only superseded by the compilation known as the *Dictionnaire de Trévoux* (Paris, 3 vols., 1704; 7th ed., 8 vols., 1771), which was in fact little more than a reimpression of Basnage's edition. Furetière is perhaps even better known as the author of *Le Roman bourgeois* (1666). It cast ridicule on the fashionable romances of Mlle de Scudéry and of La Calprenède, and is of interest as descriptive of the everyday life of his times. There is no element of burlesque, as in Scarron's *Roman comique*, but the author contents himself with stringing together a number of episodes and portraits, obviously drawn from life, without much attempt at sequence. The book was edited in 1854 by Edward Fournier and Charles Asselineau and by P. Jannet.

The *Furetériana*, which appeared in Paris eight years after Furetière's death, which took place on the 14th of May 1688, is a collection of but little value.

FURFOOZ, a village some 10 m. from Dinant in the Ardennes, Belgium. Three caves containing prehistoric remains were here excavated in 1872. Of these the *Trou de Frontal* is the most famous. In it were found human skeletons with brachycephalic skulls, associated with animal bones, those of the reindeer being particularly plentiful. Among the skeletons was discovered an oval vase of pottery. The Furfooz type of mankind is believed to date from the close of the Quaternary age. G. de Mortillet dates the type in the Robenhausen epoch of the Neolithic period. His theory is that the bones are those of men of that period buried in what had been a cave-dwelling of the Madelenian epoch.

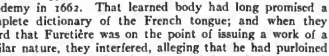
FURFURANE, or FURANE, C_4H_4O, a colourless liquid boiling at 32° C., found in the distillation products of pine wood. It was first synthetically prepared by H. Limpricht (*Ann.*, 1873, 165, p. 281) by distilling barium mucate with soda lime, pyromucic acid $C_4H_3O{\cdot}CO_2H$ being formed, which, on further loss of carbon dioxide, yielded furfurane. A. Henniger (*Ann. chim. phys.*, 1886 [2], 7, p. 220), by distilling erthyrite with formic acid, obtained a dihydrofurfurane

$$C_4H_6(OH)_4+2H_2CO_3=C_4H_4O+CO+CO_3+4H_2O,$$

which, on treatment with phosphorus pentachloride, yielded furfurane. Furfurane is insoluble in water and possesses a characteristic smell. It does not react with sodium or with phenylhydrazine, but yields dye-stuffs with isatin and phenanthrenequinone. It reacts violently with hydrochloric acid, producing a brown amorphous substance. Methyl and phenyl derivatives have been prepared by C. Paal (*Ber.*, 1884, 17, p. 915). Paal prepared acetonyl acetophenone by condensing sodium acetoacetate with phenacylbromide, and this substance on dehydration yields αα′-phenylmethylfurfurane, the acetonyl acetophenone probably reacting in the tautomeric "enolic" form,

$$CH_3{\cdot}CO{\cdot}CHNa{\cdot}COOR+C_6H_5{\cdot}CO{\cdot}CH_2Br=CH_3{\cdot}CO{\cdot}CH(CH_2COC_6H_5){\cdot}COOR.$$

This ester readily hydrolyses, and the acid formed yields acetonyl acetophenone (by loss of carbon dioxide), which then on dehydration yields the furfurane derivative, thus



L. Knorr (*Ber.*, 1889, 22, p. 158) obtained diacetosuccinic ester by condensing sodium acetoacetate with iodine, and by dehydrating the ester he prepared αα′-dimethylfurfurane ββ′-dicarboxylic acid (carbopyrotritaric acid), which on distillation yields αα′-dimethylfurfurane as a liquid boiling at 94° C. Paal also obtained this compound by using monochloracetone in the place of phenacylbromide. By the distillation of mucic acid or isosaccharic acid, furfurane-α-carboxylic acid (pyromucic acid), $C_4H_3O{\cdot}CO_2H$, is obtained; it crystallizes in needles or leaflets, and melts at 134° C.

Furfurol (furol), $C_4H_3O{\cdot}CHO$, is the aldehyde of pyromucic acid, and is formed on distilling bran, sugar, wood and most carbohydrates with dilute sulphuric acid, or by distilling the pentoses with hydrochloric acid. It is a colourless liquid which boils at 162° C., and is moderately soluble in water; it turns brown on exposure to air and has a characteristic aromatic smell. It shows all the usual properties of an aldehyde, forming a bisulphite compound, an oxime and a hydrazone; whilst it can be reduced to the corresponding furfuryl alcohol by means of sodium amalgam, and oxidized to pyromucic acid by means of silver oxide. It also shows all the condensation reactions of benzaldehyde (*q.v.*); condensing with aldehydes and ketones in the presence of caustic soda to form more complex aldehydes and ketones with unsaturated side chains,

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such as furfuracrolein, $C_4H_3O{\cdot}CH{:}CH{\cdot}CHO$, and furfuracetone, $C_4H_3O{\cdot}CH{:}CH{\cdot}CO{\cdot}CH_3$. With alcoholic potassium cyanide it changes to furoin, $C_4H_3O{\cdot}CHOH{\cdot}CO{\cdot}C_4H_3O$, which can be oxidized to furil, $C_4H_3O{\cdot}CO{\cdot}CO{\cdot}C_4H_3O$, whilst alcoholic potash converts it into furfuryl alcohol. With fatty acids and acid anhydrides it gives the "Perkin" reaction (see CINNAMIC ACID). Furfurol is shown to have its aldehydic group in the *a* position, by conversion into furfurpropionic acid, $C_4H_3O{\cdot}CH_2{\cdot}CH_2{\cdot}CO_2H$, which on oxidation by bromine water and subsequent reduction of the oxidized product is converted into *n*-pimelic acid, $HO_2C(CH_2)_5CO_2H$. Furfurol in minute quantities can be detected by the red colour it forms with a solution of aniline acetate.

Furfurane-aa'-dicarboxylic acid or dehydromucic acid, $C_4H_2O(CO_2H)_2$, is formed when mucic acid is heated with hydrochloric acid at 100° C. On being heated, it loses carbon dioxide and gives pyromucic acid. By digesting acetoacetic ester with sodium succinate and acetic anhydride, methronic acid, $C_8H_{12}O_4$, is obtained; for the constitution of this acid, see L. Knorr, *Ber.*, 1889, 22, p. 152, and R. Fittig, *Ann.*, 1889, 250, p. 166.

Di- and tetrahydrofurfurane compounds are also known (see A. Lipp, *Ber.*, 1889, 22, p. 1106; W. H. Perkin, junr. *Journ. Chem. Soc.*, 1890, 57, p. 944; and S. Ruhemann, *ibid.*, 1896, 69, p. 1383).

FURIES (Lat. *Furiae*, also called DIRAE), in Roman mythology an adaptation of the Greek Erinyes (*q.v.*), with whom they are generally identical. A special aspect of them in Virgil is that of agents employed by the higher gods to stir up mischief, strife and hatred upon earth. Mention may here be made of an old Italian deity Furina (or Furrina), whose worship fell early into disuse, and who was almost forgotten in the time of Varro. By the mythologists of Cicero's time the name was connected with the verb *furere* and the noun *furia*, which in the plural (not being used in the singular in this sense) was accepted as the equivalent of the Greek Erinyes. But it is more probably related to *furvus*, *fuscus*, and signifies one of the spirits of darkness, who watched over men's lives and haunted their abodes. This goddess had her own special priest, a grove across the Tiber where Gaius Gracchus was slain, and a festival on the 25th of July. Authorities differ as to the existence of more than one goddess called Furina, and their identity with the Forinae mentioned in two inscriptions found at Rome (*C.I.L.* vi. 422 and 10,209).

FURLONG (from the O. Eng. *furlang*, *i.e.* "furrow-long"), a measure of length, originally the length of a furrow in the "common field" system. As the field in this system was generally taken to be a square, 10 acres in extent, and as the acre varied in different districts and at different times, the "furlong" also varied. The side of a square containing 10 statute acres is 220 yds. or 40 poles, which was the usually accepted length of the furlong. This is also the length of $\frac{1}{8}$th of the statute mile. "Furlong" was as early as the 9th century used to translate the Latin *stadium*, $\frac{1}{8}$th of the Roman mile.

FURNACE, a contrivance for the production and utilization of heat by the combustion of fuel. The word is common to all the Romance tongues, appearing in more or less modified forms of the Latin *fornax*. But in all those languages the word has a more extended meaning than in English, as it covers every variety of heating apparatus; while here, in addition to furnaces proper, we distinguish other varieties as *ovens*, *stoves* and *kilns*. The first of these, in the form *Ofen*, is used in German as a general term like the French *four*; but in English it has been restricted to those apparatus in which only a moderate temperature, usually below a red heat, is produced in a close chamber. Our bakers' ovens, hot-air ovens or stoves, annealing ovens for glass or metal, &c., would all be called *fours* in French and *Öfen* in German, in common with furnaces of all kinds. Stove, an equivalent of oven, is from the German *Stube*, *i.e.* a heated room, and is commonly so understood; but is also applied to open fire-places, which appears to be somewhat of a departure from the original signification.

Furnaces are constructed according to many different patterns with varying degrees of complexity in arrangement; but all may be considered as combining three essential parts, namely, the fire-place in which the fuel is consumed, the heated chamber, laboratory, hearth or working bed, as it is variously called, where the heat is applied to the special work for which the furnace is designed, and the apparatus for producing rapid combustion by the supply of air under pressure to the fire. In the simplest cases the functions of two or more of these parts may be combined into one, as in the smith's forge, where the fire-place and heating chamber are united, the iron being placed among the coals, only the air for burning being supplied under pressure from a blowing engine by a second special contrivance, the tuyere, tuiron, twyer or blast-pipe; but in the more refined modern furnaces, where great economy of fuel is an object, the different functions are distributed over separate and distinct apparatus, the fuel being converted into gas in one, dried in another, and heated in a third, before arriving at the point of combustion in the working chamber of the furnace proper.

Furnaces may be classified according as the products of combustion are employed (1) only for heating purposes, or (2) both for heating and bringing about some chemical change. The furnaces employed for steam-raising or for heating buildings are invariably of the first type (see BOILER and HEATING), while those employed in metallurgy are generally of the second. The essential difference in construction is that in the first class the substances heated do not come into contact with either the fuel or the furnace gases, whereas in the second they do. Metallurgical furnaces of the first class are termed crucible, muffle or retort furnaces, and of the second shaft and reverberatory furnaces. The following is a detailed subdivision:—

(1) Fuel and substance in contact.
  (*a*) Height of furnace greater than diameter = shaft furnaces.
    (*a*) No blast = kilns.
    (*β*) With blast = blast furnaces.
  (*b*) Height not much greater than diameter = hearth furnaces.
(2) Substance heated by products of combustion = reverberatory furnaces.
  (*a*) Charge not melted = roasting or calcining furnaces.
  (*b*) Charge melted = melting furnaces and oil-heated furnaces is treated in the article FUEL, and of the electric furnace in the article ELECTROMETALLURGY. For special furnaces reference should be made to the articles on the industry concerned, *e.g.* GLASS, GAS, § *Manufacture*, &c.
(3) Substance is not directly heated by the fuel or by the products of combustion.
  (*a*) Heating chamber fixed and forming part of furnace = muffle furnaces.
  (*b*) Crucible furnaces.
  (*c*) Retort furnaces.

Another classification may be based upon the nature of the heating agent, according as it is coal (or some similar combustible) oil, gas or electricity. In this article the general principles of metallurgical furnaces will be treated; the subject of gas- and oil-heated furnaces

Shaft, Blast and Hearth Furnaces.—The blast furnace in its simplest form is among the oldest, if not the oldest, of metallurgical contrivances. In the old copper-smelting district of Arabia Petraea, clay blast-pipes dating back to the earlier dynasties of ancient Egypt have been found buried in slag heaps; and in India the native smiths and iron-workers continue to use furnaces of similar types. These, when reduced to their most simple expression, are mere basin-shaped hollows in the ground, containing ignited charcoal and the substances to be heated, the fire being urged by a blast of air blown in through one or more nozzles from a bellows at or near the top. They are essentially the same as the smith's forge. This class of furnace is usually known as an open fire or hearth, and is represented in a more advanced stage of development by the Catalan, German and Walloon forges formerly used in the production of malleable iron.

Fig. 1 represents a Catalan forge. The cavity in the ground is represented by a pit of square or rectangular section lined with brick or stone of a kind not readily acted on by heat, about 1½ or 2 ft. deep, usually somewhat larger above than below, with a tuyere or blast-pipe of copper penetrating one of the walls near the top, with a considerable downward inclination, so that the air meets the fuel some way down. In iron-smelting the ore is laid in a heap upon the fuel (charcoal) filling up the hearth, and is gradually brought to the metallic state by the reducing action of the carbon monoxide formed at the tuyere. The metal sinks through the ignited fuel, forming, in the hearth a spongy mass or ball, which is lifted out by the smelters at the end of each operation, and carried to the forge hammer. The earthy matters form a fusible glass or slag melt, and

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collect at the lowest point of the hearth, whence they are removed by opening a hole pierced through the front wall at the bottom. The active portion of such a furnace is essentially that above the blast-pipe, the function of the lower part being merely the collection of the reduced metal; the fire may therefore be regarded as burning in an unconfined space, with the waste of a large amount of its heating power. By continuing the walls of the hearth above the tuyere, into a shaft or stack either of the same or some other section, we obtain a furnace of increased capacity, but with no greater power of consuming fuel, in which the material to be treated can be heated up gradually by loading it into the stack, alternately with layers of fuel, the charge descending regularly to the point of combustion, and absorbing a proportion of the heat of the flame that went to waste in the open fire. This principle is capable of very wide extension, the blast furnace being mainly limited in height by the strength the column of materials or "burden" has to resist crushing, under the weight due to the head adopted, and the power of the blowing engine to supply blast of sufficient density to overcome the resistance of the closely packed materials to the free passage of the spent gases. The consuming power of the furnace or the rate at which it can burn the fuel supplied is measured by the number of tuyeres and their section.

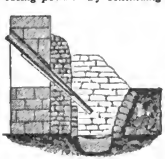

FIG. 1.—Elevation of Catalan Forge.

The development of blast furnaces is practically the development of iron-smelting. The profile has been very much varied at different times. The earliest examples were square or rectangular in horizontal section, but the general tendency of modern practice is to substitute round sections, their construction being facilitated by the use of specially moulded bricks which have entirely superseded the sandstone blocks formerly used. The vertical section, on the other hand, is subject to considerable variation according to the work to which the furnace is applied. Where the operation is simply one of fusion, as in the iron-founder's cupola, in which there is no very great change in volume in the materials on their descent to the tuyeres, the stack is nearly or quite straight-sided; but when, as is the case with the smelting of iron ores with limestone flux, a large proportion of volatile matter has to be removed in the process, a wall of varying inclination is used, so that the body of the furnace is formed of two dissimilar truncated cones, joined by their bases, the lower one passing downwards into a short, nearly cylindrical, position. For further consideration of this subject see IRON AND STEEL.

Hearth furnaces are employed in certain metallurgical operations, *e.g.* in the air-reduction process for smelting lead ores. The principle is essentially that of the Catalan forge. Such furnaces are very wasteful, and have little to recommend them (see Schnabel, *Metallurgy*, 1905, vol. i. p. 409).

Reverberatory Furnaces.—Blast furnaces are, from the intimate contact between the burden to be smelted and the fuel, the least wasteful of heat; but their use supposes the possibility of obtaining fuel of good quality and free from sulphur or other substances likely to deteriorate the metal produced. In all cases, therefore, where it is desired to do the work out of contact with the solid fuel, the operation of burning or heat-producing must be performed in a special fire-place or combustion chamber, the body of flame and heated gas being afterwards made to act upon the surface of the material exposed in a broad thin layer in the working bed or laboratory of the furnace by reverberation from the low vaulted roof covering the bed. Such furnaces are known by the general name of reverberatory or reverbatory furnaces, also as air or wind furnaces, to distinguish them from those worked with compressed air or blast.

Originally the term cupola was used for the reverberatory furnace, but in the course of time it has changed its meaning, and is now given to a small blast furnace such as that used by iron-founders—reverberatory smelting furnaces in the same trade being called air furnaces.

Figs. 2, 3 and 4 represent a reverberatory furnace such as is used for the fusion of copper ores for regulus, and may be taken as generally representing its class. The fire-place A is divided from the working bed B by a low wall C known as the fire bridge, and at the opposite end there is sometimes, though not invariably, a second bridge of less height called the flue bridge D. A short diagonal flue

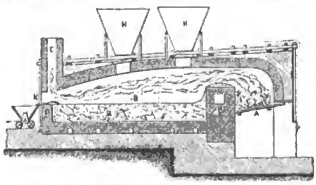

FIG. 2.—Longitudinal section of Reverberatory Furnace.

or up-take E conveys the current of spent flame to the chimney F, which is of square section, diminishing by steps at two or three different heights, and provided at the top with a covering plate or

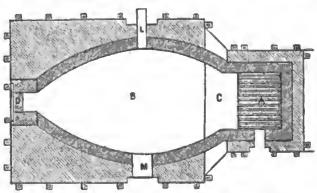

FIG. 3.—Reverberatory Furnace (horizontal section).

damper G, which may be raised or lowered by a chain reaching to the ground, and serves for regulating the speed of the exhaust gases, and thereby the draught of air through the fire. Where several

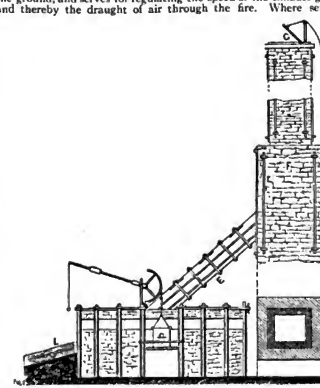

FIG. 4.—Reverberatory Furnace (elevation at flue end).

furnaces are connected with the same chimney stack, the damper takes the form of a sliding plate in the mouth of the connecting flue, so that the draught in one may be modified without affecting the others. The fire bridge is partially protected against the intense

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heat of the body of flame issuing through the fire arch by a passage to which the air has free access. The material to be melted is introduced into the furnace from the hoppers HH through the charging holes in the roof. When melted the products separate on the bed (which is made of closely packed sand or other infusible substances), according to their density; the lighter earthy matters forming an upper layer of slag are drawn out by the slag hole K at the flue end into an iron wagon or bogie, while the metal subsides to the bottom of the bed, and at the termination of the operation is run out by the tap hole L into moulds or granulated into water. The opposite opening M is the working door, through which the tool for stirring the charge is introduced. It is covered by a plate suspended to a lever, similar to that seen in the end elevation (fig. 4) in front of the slag hole.

According to the purposes to which they are applied, reverberatory furnaces may be classed into two groups, namely, fusion or melting furnaces, and calcining or wasting furnaces, also called calciners. The former have a very extended application in many branches of industry, being used by both founders and smelters in the fusion of metals; in the concentration of poor metallic compounds by fusion into regulus; in the reduction of lead and tin ores; for refining copper and silver; and for making malleable iron by the puddling processes and welding. Calcining furnaces have a less extended application, being chiefly employed in the conversion of metallic sulphides into oxides by continued exposure to the action of air at a temperature far below that of fusion, or into chlorides by roasting with common salt. As some of these substances (for example, lead sulphide and copper pyrites) are readily fusible when first heated, but become more refractory as part of the sulphur is dissipated and oxygen takes its place, it is important that the heat should be very carefully regulated at first, otherwise the mass may become clotted or fritted together, and the oxidizing effect of the air soon ceases unless the fritted masses be broken small again. This is generally done by making the bed of the furnace very long in proportion to its breadth and to the fire-grate area, which may be the more easily done as a not inconsiderable amount of heat is given out during the oxidation of the ore—such increased length being often obtained by placing two or even three working beds one above the other, and allowing the flame to pass over them in order from below upwards. Such calciners are used especially in roasting zinc blende into zinc oxide, and in the conversion of copper sulphides into chlorides in the wet extraction process. In some processes of lead-smelting, where the minerals treated contain sand, the long calciner is provided with a melting bottom close to the fire-place, so that the desulphurized ore leaves the furnace as a glassy slag or silicate, which is subsequently reduced to the metallic state by fusion with fluxes in blast furnaces. Reverberatory furnaces play an important part in the manufacture of sodium carbonate; descriptions and illustrations are given in the article ALKALI MANUFACTURE.

Muffle, Crucible and Retort Furnaces.—A third class of furnaces is so arranged that the work is done by indirect heating; that is, the material under treatment, whether subjected to calcination, fusion or any other process, is not brought in contact either with fuel or flame, but is raised to the proper temperature by exposure in a chamber heated externally by the products of combustion. These are known as muffle or chamber furnaces; and by supposing the crucibles or retorts to represent similar chambers of only temporary duration, the ordinary pot melting air furnaces, and those for the reduction of zinc ores or the manufacture of coal gas, may be included in the same category. These are almost invariably air furnaces, though sometimes air under pressure is used, as, for example, in the combustion of small anthracitic coal, where a current of air from a fan-blower is sometimes blown under the grate to promote combustion. Types of muffle furnaces are figured in the article ANNEALING, HARDENING AND TEMPERING.

Furnace Materials.—The materials used in the construction of furnaces are divisible into two classes, namely, ordinary and refractory or fire-resisting. The former are used principally as casing, walls, pillars or other supporting parts of the structure, and includes ordinary red or yellow bricks, clay-slate, granite and most building stones; the latter are reserved for the parts immediately in contact with the fuel and flame, such as the lining of the fire-place, the arches, roof and flues, the lower part if not the whole of the chimney lining in reverberatory furnaces, and the whole of the internal walls of blast furnaces. Among such substances are fireclay and firebricks, certain sandstones, silica in the form of ganister, and Dinas stone and bricks, ferric oxide and alumina, carbon (as coke and graphite), magnesia, lime and chromium oxide—their relative importance being indicated by their order, the last two or three indeed being only of limited use.

The most essential point in good fireclays, or in the bricks or other objects made from them, is the power of resisting fusion at the highest heat to which they may be exposed. This supposes them to be free from metallic oxides forming easily fusible compounds with silica, such as lime or iron, the presence of the former even in comparatively small proportion being very detrimental. As clays they must be sufficiently plastic to be readily moulded, but at the same time possess sufficient stiffness not to contract too strongly in drying, whereby the objects produced would be liable to be warped or cracked before firing. In most cases, however, the latter tendency is guarded against, in making up the paste for moulding, by adding to the fresh clay a certain proportion of burnt material of the same kind, such as old bricks or potsherds, ground to a coarse powder. Coke dust or graphite is used for the same purpose in crucible making (see FIREBRICK).

The most highly valued fireclays are derived from the Coal Measures. Among the chief localities are the neighbourhood of Stourbridge in Worcestershire and Stannington near Sheffield, which supply most of the materials for crucibles used in steel and brass melting, and the pots for glass houses; Newcastle-on-Tyne and Glenboig near Glasgow, where heavy blast furnace and other firebricks, gas retorts, &c., are made in large quantities. Coarse-grained but very strong firebricks are also made of the waste of china clay works.

In Belgium the clay raised at Andenne is very largely used for making retorts for zinc furnaces. The principal French fireclays are derived from the Tertiary strata in the south, and more nearly resemble porcelain clays than those of the Coal Measures. They give wares of remarkably fine texture and surface, combined with high refractory character.

In Germany, Ips and Passau on the Danube, and Gross Almerode in Hesse, are the best known localities producing fireclay goods, the crucibles from the last-mentioned place, known as Hessian crucibles, going all over the world. These, though not showing a great resistance to extreme heat, are very slightly affected by sudden alternations in heating, as they may be plunged cold into a strongly heated furnace without cracking, a treatment to which French and Stourbridge pots cannot be subjected with safety.

Plumbago or graphite is largely used in the production of crucibles, not in the pure state but in admixture with fireclay; the proportion of the former varies with the quality from 25 to nearly 50 %. These are the most enduring of all crucibles, the best lasting out 70 or 80 meltings in brass foundries, about 50 with bronze, and 8 to 10 in steel-melting.

Silica is used in furnace-building in the forms of sand, ganister, a finely ground sandstone from the Coal Measures of Yorkshire, and the analogous substance known as Dinas clay, which is really nearly pure silica, containing at most about 2½ % of bases. Dinas clay is found at various places in the Vale of Neath in South Wales, in the form of a loose disintegrated sandstone, which is crushed between rollers, mixed with about 1 % of lime, and moulded into bricks that are fired in kilns at a very high temperature. These bricks are specially used for the roof, fire arches, and other parts subjected to intense heat in reverberatory steel-melting furnaces, and, although infusible under ordinary conditions, are often fairly melted by the heat without fluxing or corrosion after a certain amount of exposure. Ganister, a slightly plastic siliceous sand, is similarly used for the lining of Bessemer steel converters; it is found in the neighbourhood of Sheffield.

Alumina as a refractory material is chiefly used in the form of bauxite, but its applications are somewhat special. It has been found to stand well for the linings of rotatory puddling furnaces, where, under long-continued heating, it changes into a substance as hard and infusible as natural emery. In the

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Paris Exhibition of 1878 bricks very hard and dense in character, said to be of pure alumina, were exhibited by Muller & Co. of Paris, as well as bricks of magnesia, the latter being specially remarkable for their great weight. They are intended for use at the extreme temperatures obtainable in steel furnaces, or for the melting of platinum before the oxy-hydrogen blowpipe. For the latter purpose, however, lime is generally used; but as this substance has only small stability, it is usually bedded in a casing of firebrick. Oxide of chromium and chrome iron ore have been proposed as refractory crucible materials. The former may be used as a bed for melting platinum in the same way as lime or magnesia, without affecting the quality of the metal.

Ferric oxide, though not strictly infusible, is largely used as a protecting lining for furnaces in which malleable iron is made, a portion of the ore being reduced and recovered in the process. In an oxidizing atmosphere it is indifferent to silica, and therefore siliceous bricks containing a considerable proportion of ferric oxide, when used in flues of boilers, brewers' coppers, &c. and similar situations, are perfectly fire-resisting so long as the heated gas contains a large proportion of unconsumed air. The red firebricks known as Windsor bricks, which are practically similar in composition to soft red sandstone, are of this character.

The electric furnace has led to the discovery of several important materials, which have been employed as furnace linings. Carborundum (*q.v.*) was applied by Engels in 1899, firebricks being washed with carborundum paste and then baked. Siloxicon, a compound of carbon, silicon and oxygen, formed from carbon and silica in the electric furnace, was patented by E. G. Acheson in 1903. It is very refractory, and is applied by mixing with water and some bond, such as sodium silicate or gas-tar. An amorphous, soft silicon carbide, also formed in the electric furnace, was patented by B. Talbot in 1899. For basic linings, magnesia crystallized in the electric furnace is being extensively used, replacing dolomite to some extent (see E. Kilburn Scott, "Refractory Materials for Furnace Linings," *Faraday Soc.*, 1906, p. 289).

Furnace Construction.—In the construction of furnaces provision has to be made for the unequal expansion of the different parts under the effect of heat. This is especially necessary in the case of reverberatory furnaces, which are essentially weak structures, and therefore require to be strengthened by complicated systems of tie rods and uprights or buck staves. The latter are very commonly made of old flat bottom rails, laid with the flat of the flange against the wall. Puddling furnaces are usually entirely cased with iron plates, and blast furnaces with hoops round each course of the stack, or in those of thinner constructions the firebrick work is entirely enclosed in a wrought iron casing or jacket. Such parts as may be subjected to extreme heat and the fretting action of molten material, as the tuyere and slag breasts of blast furnaces, and the fire bridges and bed plates of reverberatory furnaces, are often made in cast iron with double walls, a current of water or air being kept circulating through the intermediate space. In this way the metal, owing to its high conductivity and low specific heat as compared to that of water, is kept at a temperature far below its melting point if the water is renewed quickly enough. It is of course necessary in such cases that the circulation shall be perfectly free, in order to prevent the accumulation of steam under pressure in the interior of the casting. This method has received considerable extension, notably in furnace-smelting of iron ores containing manganese, where the entire hearth is often completely water-cased, and in some lead furnaces where no firebrick lining is used, the lower part of the furnace stack being a mere double iron box cooled by water sufficiently to keep a coating of slag adhering to the inner shell which prevents the metal from being acted upon.

Mechanical Furnaces.—The introduction and withdrawal of the charges in fusion furnaces is effected by gravitation, the solid masses of raw ore, fuel and flux being thrown in at the top, and flowing out of the furnace at the taphole or slag run at the bottom. Vertical kilns, such as those used for burning limestone, are worked in a similar manner—the raw stone going in at the top, and the burnt product falling through holes in the bottom when allowed to do so. With reverberatory calciners, however, where the work is done upon a horizontal bed, a considerable amount of hand labour is expended in raking out the charge when finished, and in drawing slags from fusion furnaces; and more particularly in the puddling process of refining iron the amount of manual exertion required is very much greater. To diminish the item of expenditure on this head, various kinds of mechanical furnaces have been adopted, all of which can be classified under three heads of gravitating furnaces, mechanical stirrers and revolving furnaces.

1. *In gravitating furnaces* the bed is laid at a slope just within the angle of repose of the charge, which is introduced at the upper end, and is pushed down the slope by fresh material, when necessary, in the contrary direction to the flame which enters at the lower end. Gerstenhofer's pyrites burner is a furnace of this class. It has a tall vertical chamber heated from below, and traversed by numerous narrow horizontal cross bars at different heights. The ore in fine powder is fed in at the top, through a hopper, in a regular thin stream, by a pair of rollers, and in falling lodges on the flats of the bars, forming a talus upon each of the height corresponding to the angle of rest of the material, which is, however, at short intervals removed to lower levels by the arrival of fresh ore from above. In this way a very large surface is exposed to the heat, and the ore, if containing sufficient sulphur to maintain the combustion, is perfectly burned when it arrives at the bottom; if, however, it is imperfectly sized or damp, or if it contains much earthy matter, the result is not very satisfactory. There are many other furnaces in which the same principle is utilized.

2. *Mechanical stirrers* constitute a second division of mechanical furnaces, in which the labour of rabbling or stirring the charges is performed by combinations of levers and wheel-work taking motion from a rotating shaft, and more or less perfectly imitating the action of hand labour. They are almost entirely confined to puddling furnaces.

3. *Revolving furnaces*, the third and most important division of mechanical furnaces, are of two kinds. The first of these resemble in outward appearance reverberatory furnaces by having a bed which, however, has the form of a circular disk mounted on a central shaft, and receives a slow movement of rotation from a water-wheel or other motor, so that every part of the surface is brought successively under the action of the fire, the charge being stirred and ultimately removed by passing under a series of fixed scraper arms placed above the surface at various points. Brunton's calciner, used in the "burning" of the pyritic minerals associated with tin ore, is a familiar example of this type. The hearth may either rotate on an inclined axis, so that the path of its surface is oblique to that of the flame, or the working part may be a hollow cylinder, between the fireplace and flue, with its axis horizontal or nearly so, whose inner surface represents the working bed, mounted upon friction rollers, and receiving motion from a special actuating engine by means of a central belt of spur gearing. Furnaces of the second kind were first used in alkali works for the conversion of sulphate into carbonate of sodium in the process known as black ash fusion, but have since been applied to other processes. As calciners they are used in tin mines and for the chlorination of silver ores. Mechanical furnaces are figured in the article ALKALI MANUFACTURE.

Use of Heated Air.—The calorific intensity of fuel is found to be very considerably enhanced, if the combustion be effected with air previously heated to any temperature short of that of boiling water and a dull red heat, the same effect being observed both with solid and gaseous fuel. The latter, especially when brought to the burning point at a high temperature, produces a heat that can be resisted by the most refractory substances only, such as silica, alumina and magnesia. This is attained in the regenerative furnace of Siemens, detailed consideration of which belongs more properly to the subject of iron.

Economy of Waste Heat.—In every system of artificial heating, the amount of heat usefully applied is but a small proportion of that developed by combustion. Even under the most advantageous application, that of evaporation of water in a steam boiler where the gases of the fire have to travel through a great length of flues bounded by thin iron surfaces of great heat-absorbing capacity, the temperature of the current at the chimney is generally much above that required to maintain an active draught in the fireplace; and other tubes containing water, often in considerable numbers, forming the so-called fuel economizers, may often be interposed between the boiler and the chimney with marked advantage as regards saving of fuel. In reverberatory and air furnaces used in the different operations of iron manufacture, where an extremely high temperature has to be maintained in spaces of comparatively small extent, such as the beds of puddling, welding and steel-melting furnaces, the temperature of the exhaust gases is exceedingly high, and if allowed to pass directly into the chimney they appear as a great body of flame at the top. It is now general to save a portion of this heat by passing the flame through flues of steam boilers, air-heating apparatus, or both—so that the steam required for the necessary operations of the forge and heated blast for the furnace itself may be obtained without further expenditure of fuel. The most perfect method of utilizing the waste heat hitherto applied is that of the Siemens regenerator, in which the spent gases are made to travel through chambers filled with open checkwork of refractory bricks, containing a quantity of thin firebricks piled into a cellular mass so as to offer a very large heat-absorbing surface, whereby their temperature is very considerably reduced, and they arrive at the chimney at a heat not exceeding 300 or 400 degrees. As soon as the bricks have become red hot, the current is diverted to an adjacent chamber or pair of chambers, and the acquired heat is removed by a current of cool gas or air passing towards the furnace, where it arrives at a temperature sufficiently high to ensure the greatest possible heating effect in combustion.

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In iron-smelting blast furnaces the waste gases are of considerable fuel value, and may reuder important services if properly applied. Owing to the conditions of the work, which require the maintenance of a sensibly reducing atmosphere, they contain a very notable proportion of carbonic oxide, and are drawn off by large wrought iron tubes near the top of the furnace and conveyed by branch pipes to the different boilers and air-heating apparatus, which are now entirely heated by the combustion of such gases, or mixed with air and exploded in gas engines. Formerly they were allowed to burn to waste at the mouth of a short chimney place above the furnace top, forming a huge body of flame, which was one of the most striking features of the Black Country landscape at night.

Laboratory and Portable Furnaces.—Small air-furnaces with hot plates or sand bath flues were formerly much employed in chemical laboratories, as well as small blast furnaces for crucibles heated with charcoal or coke. The use of such furnaces has very considerably diminished, owing to the general introduction of coal-gas for heating purposes in laboratories, which has been rendered possible by the invention of the Bunsen burner, in which the mixture of air and gas giving the least luminous but most powerfully heating flame is effected automatically by the effluent gas. These burners, or modifications of them, have also been applied to muffle furnaces, which are convenient when only a few assays have to be made—the furnace being a mere clay shell and soon brought to a working temperature; but the fuel is too expensive to allow of their being used habitually or on a large scale. Petroleum, or rather the heavy oils obtained in tar refineries, having an equal or superior heating power to coal-gas, may also be used in laboratories for producing high temperatures. The oil is introduced in a thin stream upon a series of inclined and channelled bars, where it is almost immediately volatilized and burnt by air flowing in through parallel orifices. Furnaces of this kind may be used for melting cast iron or bronze in small quantities, and were employed by H. Sainte Claire Deville in experiments in the metallurgy of the platinum group of metals.

Sefstrom's blast furnace, used in Sweden for the assay of iron ores, is a convenient form of portable furnace applied to melting in crucibles. It consists of a sheet-iron cylinder about 8 or 9 in. in diameter, within which is fixed one of smaller size lined with fire-clay. The space between the two cylinders serves as a heater and distributor for the blast, which is introduced through the nozzle at the bottom, and enters the furnace through a series of several small tuyeres arranged round the inner lining. Charcoal is the fuel used, and the crucibles stand upon the bottom of the clay lining. When a large body of fuel is required, the cylinder can be lengthened by an iron hoop which fits over the top ring. Deville's portable blast furnace is very similar in principle to the above, but the body of the furnace is formed of a single iron cylinder lined with fireclay, closed below by a cast iron plate perforated by a ring of small holes—a hemispherical basin below forming the air-heating chamber.

FURNEAUX, TOBIAS (1735–1781), English navigator, was born at Swilly near Plymouth on the 21st of August 1735. He entered the royal navy, and was employed on the French and African coasts and in the West Indies during the latter part of the Seven Years' War (1760–1763). He served as second lieutenant of the "Dolphin" under Captain Samuel Wallis on the latter's voyage round the globe (August 1766–May 1768); was made a commander in November 1771, and commanded the "Adventure" which accompanied Captain Cook (in the "Resolution") in Cook's second voyage. On this expedition Furneaux was twice separated from his leader (February 8–May 10, 1773; October 22, 1773–July 14, 1774, the date of his return to England). On the former occasion he explored a great part of the south and east coasts of Tasmania, and made the earliest British chart of the same. Most of his names here survive; Cook, visiting this shore-line on his third voyage, confirmed Furneaux's account and delineation of it (with certain minor criticisms and emendations), and named after him the islands in Banks Straits, opening into Bass's Straits, and the group now known as the Low Archipelago. After the "Adventure" was finally separated from the "Resolution" off New Zealand in October 1773, Furneaux returned home alone, bringing with him Omai of Ulaietea. This first South Sea Islander seen in the British Isles returned to his home with Cook in 1776–1777. Furneaux was made a captain in 1775, and commanded the "Syren" in the British attack of the 28th of June 1776 upon Charleston, South Carolina. His successful efforts to introduce domestic animals and potatoes into the South Sea Islands are worthy of note. He died at Swilly on the 19th of September 1781.

See Hawkesworth's *Narrative of Wallis' Voyage*; Captain Cook's *Narrative of his Second Voyage*; also T. Furneaux's life by Rev. Henry Furneaux in the *Dictionary of National Biography*.

FURNES (Flem. *Veurne*), an old-fashioned little town amid the dunes near the coast in West Flanders, Belgium, about 26 m. S.W. of Bruges. Pop. (1904) 6099. It is the centre of a considerable area extending to the French frontier, and its market is an important one for the disposal of corn, stock, hops and dairy produce. During the Norman raids Furnes was destroyed, and the present town was built by Baldwin Bras de Fer, first count of Flanders, about the year 870. At the height of the prosperity of the Flemish communes in the 14th century there were dependent on the barony of Furnes not fewer than fifty-two rich villages, but these have all disappeared, partly no doubt as the consequence of repeated French invasions down to the end of the 18th century, but chiefly through the encroachment of the sea followed by the accumulation of sand along the whole of this portion of the coast. Furnes contains many curious old houses and the church of St Walburga, which is a fine survival of the 13th century with some older portions. The old church and buildings, grouped round the Grand Place, which is the scene of the weekly market, present a quaint picture which is perhaps not to be equalled in the country. Near Furnes on the seashore is the fashionable bathing place called La Panne.

Furnes one day a year becomes a centre of attraction to all the people of Flanders. This is the last Sunday in July, when the fête of Calvary and the Crucifixion is celebrated. Of all popular festivities in Belgium this is the nearest approach to the old Passion Play. The whole story of Christ is told with great precision by means of succeeding groups which typify the different phases of the subject. The people of Furnes pose as Roman soldiers or Jewish priests, as the apostles or mere spectators, while the women put on long black veils so that they may figure in the procession as the just women.

FURNESS, HORACE HOWARD (1833–), American Shakespearian scholar, was born in Philadelphia on the 2nd of November 1833, being the son of William Henry Furness (1802–1896) minister of the First Unitarian church in that city, a powerful preacher and writer. He graduated at Harvard in 1854, and was admitted to the bar in 1859, but soon devoted himself to the study of Shakespeare. He accumulated a collection of illustrative material of great richness and extent, and brought out in 1871 the first volume of a new Variorum edition, designed to represent and summarize the conclusions of the best authorities in all languages—textual, critical and annotative. The volumes appeared as follows: *Romeo and Juliet* (1871); *Macbeth* (1873) (revised edition, 1903); *Hamlet* (2 vols., 1877); *King Lear* (1880); *Othello* (1886); *The Merchant of Venice* (1888); *As You Like It* (1890); *The Tempest* (1892); *A Midsummer Night's Dream* (1895); *The Winter's Tale* (1898); *Much Ado about Nothing* (1899); *Twelfth Night* (1901); *Love's Labour's Lost* (1904). The edition has been generally accepted as a thorough and scholarly piece of work; its chief fault is that, beginning with *Othello* (1886), the editor used the First Folio text as his basis, while in others he makes the text of the Cambridge (Globe) editors his foundation. His wife, Helen Kate Furness (1837–1883), compiled *A Concordance to the Poems of Shakespeare* (1872).

FURNESS, a district of Lancashire, England, separated from the major portion of the county by Morecambe Bay. It is bounded S.E. by this inlet of the Irish Sea, S.W. by the sea, W. by the Duddon estuary and Cumberland, and N. and E. by Westmorland. Its area is about 250 sq. m. It forms the greater part of the North Lonsdale parliamentary division of Lancashire, and contains the parliamentary borough of Barrow-in-Furness. The surface is almost entirely hilly. The northern half is included in the celebrated Lake District, and contains such eminences as the Old Man of Coniston and Wetherlam. Apart from the Duddon, which forms part of the western boundary, the principal rivers are the Leven and Crake, flowing southward into a common estuary in Morecambe Bay. The Leven drains Windermere and the Crake Coniston Lake. The usage of the term "Lake District," however, tends to limit the name of Furness in common thought to the district south of the Lakes, where several of the place-names are suffixed with that of the district, as Barrow-in-Furness, Dalton-in-Furness, Broughton-in-Furness. Between

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the Duddon and Morecambe Bay lies Walney Island, 8 m. in length, and in the shallow strait between it and the mainland are several smaller islands. That part of Furness which forms a peninsula between the Leven estuary and Morecambe Bay, and the Duddon estuary, is rich in hematite iron ore, which has been worked from very early times. It was known and smelted by British and Romans, and by the monks of Furness Abbey and Conishead Priory, both in the district. It was owing to the existence of this ore that the town of Barrow grew up in the 19th century; at first as a port from which the ore was exported to South Wales, while later furnaces were established on the spot, and acquired additional importance on the introduction of the Bessemer process, which requires a non-phosphoric ore such as is found here. The hematite is also worked at Ulverston, Askam, Dalton and elsewhere, but the furnaces now depend in part upon ore imported from Spain. The supposed extension of the ore under the sands of the Duddon estuary led to the construction of a sea wall to facilitate the working. The district is served by the main line of the Furness railway, from Carnforth (junction with the London & North-Western railway), passing the pleasant watering-place of Grange, and approximately following the coast by Ulverston, Dalton and Barrow, with branches to Lake Side, Windermere, and to Coniston.

Apart from its industrial importance and scenic attractions, Furness has an especial interest on account of its famous abbey.

Furness Abbey.

The ruins of this, beautifully situated in a wooded valley, are extensive, and mainly of fine transitional Norman and Early English date, acquiring additional picturesqueness from the warm colour of the red sandstone of which they are built. The abbey of Furness, otherwise Furdenesia or the further *ness* (promontory), which was dedicated to St Mary, was founded in 1127 by a small body of monks belonging to the Benedictine order of Savigny. In 1124 they had settled at Tulketh, near Preston, but migrated in 1127 to Furness under the auspices of Stephen, count of Boulogne, afterwards king, at that time lord of the liberty of Furness. In 1148 the brotherhood joined the Cistercian order. Stephen granted to the monks the lordship of Furness, and his charter was confirmed by Henry I., Henry II. and subsequent kings. The abbot's power throughout the lordship was almost absolute; he had a market and fair at Dalton, was free from service to the county and wapentake, and held a sheriff's tourn. By a succession of gifts the abbey became one of the richest in England and was the largest Cistercian foundation in the kingdom. At the Dissolution its revenues amounted to between £750 and £800 a year, exclusive of meadows, pastures, fisheries, mines, mills and salt works, and the wealth of the monks enabled them to practise a regal hospitality. The abbot was one of the twenty Cistercian abbots summoned to the parliament of 1264, but was not cited after 1330, as he did not hold of the king *in capite per baroniam*. The abbey founded several offshoot houses, one of the most important being Rushen Abbey in the Isle of Man. In 1535 the royal commissioners visited the abbey and reported four of its inmates, including the abbot, for incontinence. In 1536 the abbot was charged with complicity in the Pilgrimage of Grace, and on the 7th of April 1537, under compulsion, surrendered the abbey to the king. A few monks were granted pensions, and the abbot was endowed with the profits of the rectory of Dalton, valued at £33, 6s. 8d. per annum. In 1540 the estates and revenues were annexed by act of parliament to the Duchy of Lancaster. About James I.'s reign the site and territories were alienated to the Prestons of Preston-Patrick, from whom they descended to the dukes of Devonshire.

Conishead Priory, near Ulverston, an Augustinian foundation of the reign of Henry II., has left no remains, but of the priory of Cartmel (1188) the fine church is still in use. It is a cruciform structure of transitional Norman and later dates, its central tower having the upper storey set diagonally upon the lower. The chancel contains some superb Jacobean carved oak screens, with stalls of earlier date.

FURNISS, HARRY (1854–), British caricaturist and illustrator, was born at Wexford, Ireland, of English and Scottish parents. He was educated in Dublin, and in his schooldays edited a *Schoolboy's Punch* in close imitation of the original. He came to London when he was nineteen, and began to draw for the illustrated papers, being for some years a regular contributor to the *Illustrated London News*. His first drawing in *Punch* appeared in 1880, and he joined its staff in 1884. He illustrated Lucy's "Diary of Toby, M.P.," in *Punch*, where his political caricatures became a popular feature. Among his other successes were a series of "Puzzle Heads," and his annual "Royal Academy guy'd." In *Royal Academy Antics* (1890) he published a volume of caricatures of the work of leading artists. He resigned from the staff of *Punch* in 1894, produced for a short time a weekly comic paper *Lika Joko*, and in 1898 began a humorous monthly, *Fair Game*; but these were short-lived. Among the numerous books he illustrated were James Payn's *Talk of the Town*, Lewis Carroll's *Sylvie and Bruno*, Gilbert à Beckett's *Comic Blackstone*, G. E. Farrow's *Wallypug Book*, and his own novel, *Poverty Bay* (1905). *Our Joe, his great Fight* (1903), was a collection of original cartoons. His volume of reminiscences, *Confessions of a Caricaturist* (1901), was followed by *Harry Furniss at Home* (1904). In 1905 he published *How to draw in Pen and Ink*, and produced the first number of *Harry Furniss's Christmas Annual*.

FURNITURE (from "furnish," Fr. *fournir*), a general term of obscure origin, used to describe the chattels and fittings required to adapt houses and other buildings for use. Wood, ivory, precious stones, bronze, silver and gold have been used from the most ancient times in the construction or for the decoration of furniture. The kinds of objects required for furniture have varied according to the changes of manners and customs, as well as with reference to the materials at the command of the workman, in different climates and countries. Of really ancient furniture there are very few surviving examples, partly by reason of the perishable materials of which it was usually constructed, and partly because, however great may have been the splendour of Egypt, however consummate the taste of Greece, however luxurious the life of Rome, the number of household appliances was very limited. The chair, the couch, the table, the bed, were virtually the entire furniture of early peoples, whatever the degree of their civilization, and so they remained until the close of what are known in European history as the middle ages. During the long empire-strewn centuries which intervened between the lapse of Egypt and the obliteration of Babylon, the extinction of Greece and the dismemberment of Rome and the great awakening of the Renaissance, household comfort developed but little. The Ptolemies were as well lodged as the Plantagenets, and peoples who spent their lives in the open air, going to bed in the early hours of darkness, and rising as soon as it was light, needed but little household furniture.

Indoor life and the growth of sedentary habits exercised a powerful influence upon the development of furniture. From being splendid, or at least massive, and exceedingly sparse and costly, it gradually became light, plentiful and cheap. In the ancient civilizations, as in the periods when our own was slowly growing, household plenishings, save in the rudest and most elementary forms, were the privilege of the great—no person of mean degree could have obtained, or would have dared to use if he could, what is now the commonest object in every house, the chair (*q.v.*). Sparse examples of the furniture of Egypt, Nineveh, Greece and Rome are to be found in museums; but our chief sources of information are mural and sepulchral paintings and sculptures. The Egyptians used wooden furniture carved and gilded, covered with splendid textiles, and supported upon the legs of wild animals; they employed chests and coffers as receptacles for clothes, valuables and small objects generally. Wild animals and beasts of the chase were carved upon the furniture of Nineveh also; the lion, the bull and the ram were especially characteristic. The Assyrians were magnificent in their household appointments; their tables and couches were inlaid with ivory and precious metals. Cedar and ebony were much used by these great Eastern peoples, and it is probable that they were familiar with rosewood, walnut and teak. Solomon's

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bed was of cedar of Lebanon. Greek furniture was essentially Oriental in form; the more sumptuous varieties were of bronze, damascened with gold and silver. The Romans employed Greek artists and workmen and absorbed or adapted many of their mobiliary fashions, especially in chairs and couches. The Roman tables were of splendid marbles or rare woods. In the later ages of the empire, in Rome and afterwards in Constantinople, gold and silver were plentifully used in furniture; such indeed was the abundance of these precious metals that even cooking utensils and common domestic vessels were made of them.

The architectural features so prominent in much of the medieval furniture begin in these Byzantine and late Roman thrones and other seats. These features became paramount as Pointed architecture became general in Europe, and scarcely less so during the Renaissance. Most of the medieval furniture, chests, seats, trays, &c., of Italian make were richly gilt and painted. In northern Europe carved oak was more generally used. State seats in feudal halls were benches with ends carved in tracery, backs panelled or hung with cloths (called cloths of estate), and canopies projecting above. Bedsteads were square frames, the testers of panelled wood, resting on carved posts. Chests of oak carved with panels of tracery, or of Italian cypress (when they could be imported), were used to hold and to carry clothes, tapestries, &c., to distant castles and manor houses; for house furniture, owing to its scarcity and cost, had to be moved from place to place. Copes and other ecclesiastical vestments were kept in chests with ornamental lock plates and iron hinges. The splendour of most feudal houses depended on pictorial tapestries which could be packed and carried from place to place. Wardrobes were rooms fitted for the reception of dresses, as well as for spices and other valuable stores. Excellent carving in relief was executed on caskets, which were of wood or of ivory, with painting and gilding, and decorated with delicate hinge and lock metal-work. The general subjects of sculpture were taken from legends of the saints or from metrical romances. Renaissance art made a great change in architecture, and this change was exemplified in furniture. Cabinets (*q.v.*) and panelling took the outlines of palaces and temples. In Florence, Rome, Venice, Milan and other capitals of Italy, sumptuous cabinets, tables, chairs, chests, &c., were made to the orders of the native princes. Vasari (*Lives of Painters*) speaks of scientific diagrams and mathematical problems illustrated in costly materials, by the best artists of the day, on furniture made for the Medici family. The great extent of the rule of Charles V. helped to give a uniform training to artists from various countries resorting to Italy, so that cabinets, &c., which were made in vast numbers in Spain, Flanders and Germany, can hardly be distinguished from those executed in Italy. Francis I. and Henry VIII. encouraged the revived arts in their respective dominions. *Pietra dura*, or inlay of hard pebbles, agate, lapis lazuli, and other stones, ivory carved and inlaid, carved and gilt wood, marquetry or veneering with thin woods, tortoiseshell, brass, &c., were used in making sumptuous furniture during the first period of the Renaissance. Subjects of carving or relief were generally drawn from the theological and cardinal virtues, from classical mythology, from the seasons, months, &c. Carved altarpieces and woodwork in churches partook of the change in style.

The great period of furniture in almost every country was, however, unquestionably the 18th century. That century saw many extravagances in this, as in other forms of art, but on the whole it saw the richest *floraison* of taste, and the widest sense of invention. This is the more remarkable since the furniture of the 17th century has often been criticized as heavy and coarse. The criticism is only partly justified. Throughout the first three-quarters of the period between the accession of James I. and that of Queen Anne, massiveness and solidity were the distinguishing characteristics of all work. Towards the reign of James II., however, there came in one of the most pleasing and elegant styles ever known in England. Nearly a generation before then Boulle was developing in France the splendid and palatial method of inlay which, although he did not invent it, is inseparably associated with his name. We owe it perhaps to the fact that France, as the neighbour of Italy, was touched more immediately by the Renaissance than England that the reign of heaviness came earlier to an end in that country than on the other side of the Channel. But there is a heaviness which is pleasing as well as one which is forbidding, and much of the furniture made in England any time after the middle of the 17th century was highly attractive. If English furniture of the Stuart period be not sought after to the same extent as that of a hundred years later, it is yet highly prized and exceedingly decorative. Angularity it often still possessed, but generally speaking its elegance of form and richness of upholstering lent it an attraction which not long before had been entirely lacking. Alike in France and in England, the most attractive achievements of the cabinetmaker belong to the 18th century—English Queen Anne and early Georgian work is universally charming; the regency and the reigns of Louis XV. and XVI. formed a period of the greatest artistic splendour. The inspiration of much of the work of the great English school was derived from France, although the gropings after the Chinese taste and the earlier Gothic manner were mainly indigenous. The French styles of the century, which began with excessive flamboyance, closed before the Revolution with a chaste perfection of detail which is perhaps more delightful than anything that has ever been done in furniture. In the achievements of Riesener, David Röntgen, Gouthière, Oeben and Rousseau de la Rottière we have the high-water mark of craftsmanship. The marquetry of the period, although not always beautiful in itself, was executed with extraordinary smoothness and finish; the mounts of gilded bronze, which were the leading characteristic of most of the work of the century, were finished with a minute delicacy of touch which was until then unknown, and has never been rivalled since. If the periods of Francis I. and Henry II., of Louis XIV. and the regency produced much that was sumptuous and even elegant, that of Louis XVI., while men's minds were as yet undisturbed by violent political convulsions, stands out as, on the whole, the one consummate era in the annals of furniture. Times of great achievement are almost invariably followed directly by those in which no tall thistles grow and in which every little shrub is magnified to the dimensions of a forest tree; and the so-called "empire style" which had begun even while the last monarch of the *ancien régime* still reigned, lacked alike the graceful conception and the superb execution of the preceding style. Heavy and usually uninspired, it was nurtured in tragedy and perished amid disaster. Yet it is a profoundly interesting style, both by reason of the classical roots from which it sprang and the attempt, which it finally reflected, to establish new ideas in every department of life. Founded upon the wreck of a lingering feudalism it reached back to Rome and Greece, and even to Egypt. If it is rarely charming, it is often impressive by its severity. Mahogany, satinwood and other rich timbers were characteristic of the style of the end of the 18th century; rosewood was most commonly employed for the choicer work of the beginning of the 19th. Bronze mounts were in high favour, although their artistic character varied materially.

Previously to the middle of the 18th century the only cabinet-maker who gained sufficient personal distinction to have had his name preserved was André Charles Boulle; beginning with that period France and England produced many men whose renown is hardly less than that of artists in other media. With Chippendale there arose a marvellously brilliant school of English cabinetmakers, in which the most outstanding names are those of Sheraton, Heppelwhite, Shearer and the Adams. But if the school was splendid it was lamentably short-lived, and the 19th century produced no single name in the least worthy to be placed beside these giants. Whether, in an age of machinery, much room is left for fine individual execution may be doubted, and the manufacture of furniture now, to a great extent, takes place in large factories both in England and on the continent. Owing to the necessary subdivision of labour in these establishments, each piece of furniture passes through numerous distinct workshops. The master and a few artificers formerly

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FIG. 1.—Venetian Folding Chair of carved and gilt walnut, leather back and seat; about 1530.

FIG. 2.—Oak Arm-chair. English, 17th century.

FIG. 3.—Arm-chair, solid seat, cane back; about 1660.

FIG. 4.—Arm-chair, stuffed back and seat; about 1650.

FIG. 5.—Painted and carved High-Back Chair; about 1660.

FIG. 6.—Carved Walnut Chairs. English, early 18th century. The arm-chair is inlaid.

FIG. 7.—Walnut Chair; about 1720.

FIG. 8.—Carved Mahogany Chair in the style of Chippendale; 2nd half of 18th century.

FIG. 9.—Carved Mahogany Arm-chair, in the style of Chippendale, with ribbon pattern.

FIG. 10.—Carved and Inlaid Mahogany Chair, in the style of Hepplewhite; late 18th century.

FIG. 11.—Mahogany Chair in the style of Sheraton; about 1780.

FIG. 12.—Painted and gilt Arm-chair with cane seat, in the style of Adam; about 1790.

FIG. 13.—Arm-chair of carved and gilt wood with stuffed back, seat and arms. French, Louis XV. style.

FIG. 14.—Mahogany Arm-chair, Empire style, early 19th century, said to have belonged to the Bonaparte family.

FIG. 15.—Painted and gilt Beech Chair. English, about 1800.

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FURNITURE

FIG. 1.—Front of Oak Coffer with wrought iron bands. French, 2nd half of 13th century.

FIG. 2.—English Oak Chest, dated 1637.

FIG. 3.—Italian (Florentine) Coffer of Wood with gilt arabesque stucco ornament, about 1480.

FIG. 4.—Italian "Cassone" or Marriage Coffer, 13th century. Carved and gilt wood with painted front and ends.

FIG. 5.—Walnut Table with expanding leaves. Swiss, 17th century.

FIG. 6.—Oak Gate-Legged Table. English, 17th century.

FIG. 7.—Writing Table. French, end of Louis XV. period. Riesener marquetry, ormolu mounts and Sèvres plaques.

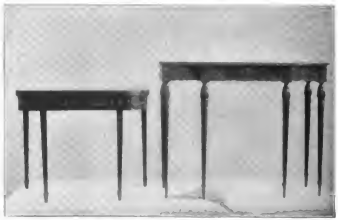

FIG. 8.—Painted Satin-Wood Tables, in the style of Sheraton, about 1790.

(The above are in the Victoria and Albert Museum, except Fig. 8, which were in the Bethnal Green Exhibition, 1892.)

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1. CARVED OAK SIDEBOARD. English, 17th century. Victoria and Albert Museum.

2. CARVED OAK COURT CUPBOARD. English, early 17th century. Victoria and Albert Museum.

3. EBONY CARVED CABINET. The interior decorated with inlaid ivory and coloured woods; French or Dutch, middle of 17th century. Victoria and Albert Museum.

4. VENEERED CHEST OF DRAWERS. About 1690. Lent to Bethnal Green Exhibition by Sir Spencer Ponsonby-Fane, G.C.B.

5. EBONY ARMOIRE. With tortoise-shell panels inlaid with brass and other metals, and ormolu mountings. Designed by Bérain, and executed by André Boulle. French, Louis XIV. period. Victoria and Albert Museum.

6. GLASS-FRONTED BOOKCASE AND CABINET. Of mahogany. In the style of Sheraton, about 1790. Lent to the Bethnal Green Exhibition by the late Vincent J. Robinson, C.I.E.

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FURNITURE

1. COMMODE OF PINE. With marquetry of brass, ebony, tortoise-shell, mother-of-pearl, ivory, and green-stained bone. "Boulle" work with designs in the style of Bérain. French, late period of Louis XIV.

2. COMMODE. With panels of Japanese lacquer and ormolu mountings, in the style of Cafferi. French, Louis XV. period.

3. TABLE OF KING AND TULIP WOODS. With ormolu mountings. Louis XV. period.

4. ESCRITOIRE À TOILETTE. Formerly belonging to Marie Antoinette. Of tulip and sycamore woods inlaid with other coloured woods, ormolu mounts. Louis XV. period.

5. FOUR-POST BEDSTEAD. Of oak inlaid with bog-oak and holly, from the "Inlaid Room" at Sizergh Castle, Westmorland. Latter half of sixteenth century.

6. CARVED AND GILT BEDSTEAD. With blue silk damask coverings and hangings. French, late 18th century. Louis XVI. period.

From the Victoria and Albert Museum, S. Kensington.

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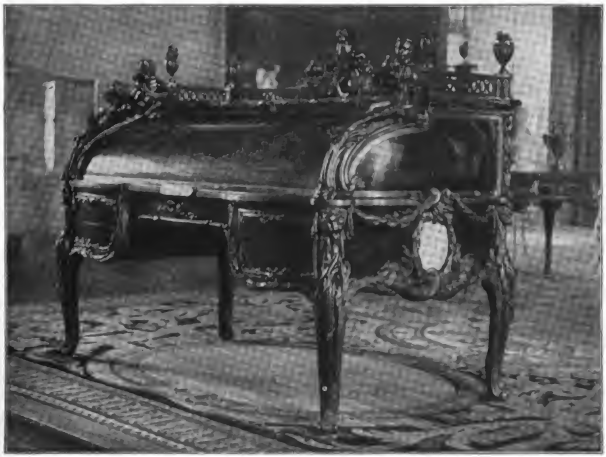

Photo, Mansell & Co.

THE "BUREAU DU ROI," MADE FOR LOUIS XV., NOW IN THE LOUVRE. For description, see DESK.

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superintended each piece of work, which, therefore, was never far removed from the designer's eye. Though accomplished artists are retained by the manufacturers of London, Paris and other capitals, there can no longer be the same relation between the designer and his work. Many operations in these modern factories are carried on by machinery. This, though an economy of labour, entails loss of artistic effect. The chisel and the knife are no longer in such cases guided and controlled by the sensitive touch of the human hand.

A decided, if not always intelligent, effort to devise a new style in furniture began during the last few years of the 19th century, which gained the name of "*l'art nouveau.*" Its pioneers professed to be free from all old traditions and to seek inspiration from nature alone. Happily nature is less forbidding than many of these interpretations of it, and much of the "new art" is a remarkable exemplification of the impossibility of altogether ignoring traditional forms. The style was not long in degenerating into extreme extravagance. Perhaps the most striking consequence of this effort has been, especially in England, the revival of the use of oak. Lightly polished, or waxed. the cheap foreign oaks often produce very agreeable results, especially when there is applied to them a simple inlay of boxwood and stained holly, or a modern form of pewter. The simplicity of these English forms is in remarkable contrast to the tortured and ungainly outlines of continental seekers after a conscious and unpleasing "originality."

Until a very recent period the most famous collections of historic furniture were to be found in such French museums as the Louvre, Cluny and the Garde Meuble. Now, however, they are rivalled, if not surpassed, by the magnificent collections of the Victoria and Albert Museum at South Kensington, and the Wallace collection at Hertford House, London. The latter, in conjunction with the Jones bequest at South Kensington, forms the finest of all gatherings of French furniture of the great periods, notwithstanding that in the Bureau du Roi the Louvre possesses the most magnificent individual example in existence. In America there are a number of admirable collections representative of the graceful and homely "colonial furniture" made in England and the United States during the Queen Anne and Georgian periods.

See also the separate articles in this work on particular forms of furniture. The literature of the subject has become very extensive, and it is needless to multiply here the references to books. Perrot and Chipiez, in their great *Histoire de l'art dans l'antiquité* (1882 et seq.), deal with ancient times, and A. de Champeaux, in *Le Meuble* (1885), with the middle ages and later period; English furniture is admirably treated by Percy Macquoid in his *History of English Furniture* (1905); and Lady Dilke's *French Furniture in the 18th Century* (1901), and Luke Vincent Lockwood's *Colonial Furniture in America* (1901), should also be consulted. (J. P.-B.)

FURNIVALL, FREDERICK JAMES (1825–1910), English philologist and editor, was born at Egham, Surrey, on the 4th of February 1825, the son of a surgeon. He was called to the bar in 1849, but his attention was soon diverted to philological studies and social problems. He gave Frederick Denison Maurice valuable assistance in the Christian Socialist movement, and was one of the founders of the Working Men's College. For half a century he indefatigably promoted the study of early English literature, partly by his own work as editor, and still more efficaciously by the agency of the numerous learned societies of which he was both founder and director, especially the Early English Text Society (1864), which has been of inestimable service in promoting the study of early and middle English. He also established and conducted the Chaucer, Ballad, New Shakespeare and Wyclif Societies, and at a later period societies for the special study of Browning and Shelley. He edited texts for the Early English Text Society, for the Roxburghe Club and the Rolls Series; but his most important labours were devoted to Chaucer, whose study he as an editor greatly assisted by his "Six-Text" edition of the *Canterbury Tales*, and other publications of the Chaucer Society. He was the honorary secretary of the Philological Society, and was one of the original promoters of the Oxford *New English Dictionary*. He co-operated with its first editor, Herbert Coleridge, and after his death was for some time principal editor during the preliminary period of the collection of material. The completion of his half-century of labour was acknowledged in 1900 by a handsome testimonial, including the preparation by his friends of a volume of philological essays specially dedicated to him, *An English Miscellany* (Oxford, 1901), and a considerable donation to the Early English Text Society. Dr Furnivall was always an enthusiastic oarsman, and till the end kept up his interest in rowing; with John Beesley in 1845 he introduced the new type of narrow sculling boat, and in 1886 started races on the Thames for sculling fours and sculling eights. He died on the 2nd of July 1910.

FURSE, CHARLES WELLINGTON (1868–1904), English painter, born at Staines, the son of the Rev. C. W. Furse, archdeacon of Westminster, was descended collaterally from Sir Joshua Reynolds, and in his short span of life achieved such rare excellence as a portrait and figure painter that he forms an important link in the chain of British portraiture which extends from the time when Van Dyck was called to the court of Charles I. to our own day. His talent was precocious; at the age of seven he gave indications of it in a number of drawings illustrating Scott's novels. He entered the Slade school in 1884, winning the Slade scholarship in the following year, and completed his education at Julian's *atelier* in Paris. Hard worker as he was, his activity was frequently interrupted by spells of illness, for he had developed signs of consumption when he was still attending the Slade school. An important canvas called "Cain" was his first contribution (1888) to the Royal Academy, to the associateship of which he was elected in the year of his death. For some years before he had been a staunch supporter of the New English Art Club, to the exhibitions of which he was a regular contributor. He was married in October 1900 to Katherine, daughter of John Addington Symonds. His fondness for sport and of an open-air life found expression in his art and introduced a new, fresh and vigorous note into portraiture. There is never a suggestion of the studio or of the fatiguing pose in his portraits. The sitters appear unconscious of being painted, and are generally seen in the pursuit of their favourite outdoor sport or pastime, in the full enjoyment of life. Such are the "Diana of the Uplands," the Lord Roberts" and "The Return from the Ride" at the Tate Gallery; the four children in the "Cubing with the York and Ainsty," "The Lilac Gown," "Mr and Mrs Oliver Fishing," and the portrait of Lord Charles Beresford. Most of these pictures, and indeed nearly all the work completed in the few years of Furse's activity, show a pronounced decorative tendency. His sense of space, composition and decorative design can best be judged by his admirable mural decorations for Liverpool town hall, executed between 1899 and 1902. A memorial exhibition of Furse's paintings and sketches was held at the Burlington Fine Arts Club in 1906.

FÜRST, JULIUS (1805–1873), German Orientalist, was born of Jewish parents at Zerkowo in Posen, on the 12th of May 1805. He studied philosophy and philology at Berlin, and oriental literature at Posen, Breslau and Halle. In 1857 he was appointed to a lectureship at the university of Leipzig, and he was promoted to a professorship in 1864, which he held until his death at Leipzig on the 9th of February 1873. Among his writings may be mentioned *Lehrgebäude der aramäischen Idiome* (Leipzig, 1835); *Librorum sacrorum Veteris Testamenti concordantiae Hebraicae atque Chaldaicae* (Leipzig, 1837–1840); *Hebräisches und chaldäisches Wörterbuch* (1851, English translation by S. Davidson 1867); *Kultur und Literaturgeschichte der Juden in Asien* (1849). Fürst also edited a valuable *Bibliotheca Judaica* (Leipzig, 1849–1863), and was the author of some other works of minor importance. From 1840 to 1851 he was editor of *Der Orient*, a journal devoted to the language, literature, history and antiquities of the Jews.

FÜRSTENBERG, the name of two noble houses of Germany.

1. The more important is in possession of a mediatized principality in the district of the Black Forest and the Upper Danube, which comprises the countship of Heiligenberg, about 7 m. to the N. of the Lake of Constance, the landgraviates of Stühlingen and Baar, and the lordships of Jungnau, Trochtelfingen, Hausen

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and Möskirch or Messkirch. The territory is discontinuous; and as it lies partly in Baden, partly in Württemberg, and partly in the Prussian province of Sigmaringen, the head of the family is an hereditary member of the first chamber of Baden and of the chamber of peers in Württemberg and in Prussia. The relations of the principality with Baden are defined by the treaty of May 1825, and its relations with Württemberg by the royal declaration of 1839. The *Stammort* or ancestral seat of the family is Fürstenberg in the Black Forest, about 13 m. N. of Schaffhausen, but the principal residence of the present representatives of the main line is at Donaueschingen.

The family of Fürstenberg claims descent from a certain Count Unruoch, a contemporary of Charlemagne, but their authentic pedigree is only traceable to Egino II., count of Urach, who died before 1136. In 1218 his successors inherited the possessions of the house of Zähringen in the Baar district of the Black Forest, where they built the town and castle of Fürstenberg. Of the two sons of Egino V. of Urach, Conrad, the elder, inherited the Breisgau and founded the line of the counts of Freiburg, while the younger, Heinrich (1215–1284), received the territories lying in the Kinzigthal and Baar, and from 1250 onward styled himself first lord, then count, of Fürstenberg. His territories were subsequently divided among several branches of his descendants, though temporarily reunited under Count Friedrich III., whose wife, Anna, heiress of the last count of Wardenberg, brought him the countship of Heiligenberg and lordships of Jungnau and Trochtelfingen in 1534. On Friedrich's death (1559) his territories were divided between his two sons, Joachim and Christof I. Of these the former founded the line of Heiligenberg, the latter that of Kinzigthal. The Kinzigthal branch was again subdivided in the 17th century between the two sons of Christof II. (d. 1614), the elder, Wratislaw II. (d. 1642), founding the line of Mösskirch, the younger, Friedrich Rudolf (d. 1655), that of Stühlingen. The Heiligenberg branch received an accession of dignity by the elevation of Count Hermann Egon (d. 1674) to the rank of prince of the Empire in 1664, but his line became extinct with the death of his son Prince Anton Egon, favourite of King Augustus the Strong and regent of Saxony, in 1716. The heads of both the Mösskirch and Stühlingen lines were now raised to the dignity of princes of the Empire (1716). The Mösskirch branch died out with Prince Karl Friedrich (d. 1744); the territories of the Stühlingen branch had been divided on the death of Count Prosper Ferdinand (1662–1704) between his two sons, Joseph Wilhelm Ernst (1699–1762) and Ludwig August Egon (1705–1750). The first of these was created prince of the Empire on the 10th of December 1716, and founded the princely line of the Swabian Fürstenbergs; in 1772 he obtained from the emperor Francis I. for all his legitimate sons and their descendants the right to bear, instead of the style of landgrave, that of prince, which had so far been confined to the reigning head of the family. Ludwig, on the other hand, founded the family of the landgraves of Fürstenberg, who, since their territories lay in Austria and Moravia, were known as the "cadet line in Austria." The princely line became extinct with the death of Karl Joachim in 1804, and the inheritance passed to the Bohemian branch of the Austrian cadet line in the person of Karl Egon II. (see below). Two years later the principality was mediatized.

In 1909 there were two branches of the princely house of Fürstenberg: (1) the main branch, that of Fürstenberg-Donaueschingen, the head of which was Prince Maximilian Egon (b. 1863), who succeeded his cousin Karl Egon III. in 1896; (2) that of Fürstenberg-Königshof, in Bohemia, the head of which was Prince Emil Egon (b. 1876), chamberlain and secretary of legation to the Austro-Hungarian embassy in London (1907). The cadet line of the landgraves of Fürstenberg is now extinct, its last representative having been the landgrave Joseph Friedrich Ernst of Fürstenberg-Weitra (1860–1896), son of the landgrave Ernst (1816–1889) by a morganatic marriage. He was not recognized as *ebenbürtig* by the family. The landgraves of Fürstenberg were in 1909 represented only by the landgravines Theresa (b. 1839) and Gabrielle (b. 1844), daughters of the landgrave Johann Egon (1802–1870).

From the days of Heinrich of Urach, a relative and notable supporter of Rudolph of Habsburg, the Fürstenbergs have played a stirring part in German history as statesmen, ecclesiastics and notably soldiers. There was a popular saying that "the emperor fights no great battle but a Fürstenberg falls." In the Heiligenberg line the following may be more particularly noticed.

Franz Egon (1625–1682), bishop of Strassburg, was the elder son of Egon VII., count of Fürstenberg (1588–1635), who served with distinction as a Bavarian general in the Thirty Years' War. He began life as a soldier in the imperial service, but on the elevation of his friend Maximilian Henry of Bavaria to the electorate of Cologne in 1650, he went to his court and embraced the ecclesiastical career. He soon gained a complete ascendancy over the weak-minded elector, and, with his brother William Egon (see below), was mainly instrumental in making him the tool of the aggressive policy of Louis XIV. of France. Ecclesiastical preferments were heaped upon him. As a child he had been appointed to a canonry of Cologne; to these he added others at Strassburg, Liége, Hildesheim and Spires; he became also suffragan bishop and dean of Cologne and provost of Hildesheim, and in 1663 bishop of Strassburg. Later he was also prince-abbot of Lüders and Murbach and abbot of Stablo and Malmedy. On the conclusion of a treaty between the emperor and the elector of Cologne, on the 11th of May 1674, Franz was deprived of all his preferments in Germany, and was compelled to take refuge in France. He was, however, amnestied with his brother William by a special article of the treaty of Nijmwegen (1679), whereupon he returned to Cologne. After the French occupation of Strassburg (1681) he took up his residence there and died on the 1st of April 1682.

His brother William Egon (1629–1704), bishop of Strassburg, began his career as a soldier in the French service. He went to the court of the elector of Cologne at the same time as Franz Egon, whose zeal for the cause of Louis XIV. of France he shared. In 1672 the intrigues of the two Fürstenbergs had resulted in a treaty of offensive alliance between the French monarchy and the electorate of Cologne, and, the brothers being regarded by the Imperialists as the main cause of this disaster, William was seized by imperial soldiers in the monastery of St Pantaleon at Cologne, hurried off to Vienna and there tried for his life. He was saved by the intervention of the papal nuncio, but was kept in prison till the signature of the treaty of Nijmwegen (1679). As a reward for his services Louis XIV. appointed him bishop of Strassburg in succession to his brother in 1682, in 1686 obtained for him from Pope Innocent XI. the cardinal's hat, and in 1688 succeeded in obtaining his election as coadjutor-archbishop of Cologne and successor to the elector Maximilian Henry. At the instance of the emperor, however, the pope interposed his veto; the canons followed the papal lead, and, the progress of the Allies against Louis XIV. depriving him of all prospect of success, William Egon retired to France. Here he took up his abode at his abbey of St Germain des Près near Paris, where he died on the 10th of April 1704.

In the Stühlingen line the most notable was Karl Egon (1796–1854), prince of Fürstenberg, the son of Prince Karl Alois of Fürstenberg, a general in the Austrian service, who was killed at the battle of Loptingen on the 25th of March 1799. In 1804 he inherited the Swabian principality of Fürstenberg and all the possessions of the family except the Moravian estates. He studied at Freiburg and Würzburg, and in 1815 accompanied Prince Schwarzenberg to Paris as staff-officer. In 1817 he came of age, and in the following year married the princess Amalie of Baden. By the mediatization of his principality in 1806 the greater part of his vast estates had fallen under the sovereignty of the grand-duke of Baden, and Prince Fürstenberg took a conspicuous part in the upper house of the grand-duchy. In politics he distinguished himself by a liberalism rare in a great German noble, carrying through by his personal influence with his peers the abolition of tithes and feudal dues and stanchly

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advocating the freedom of the press. He was not less distinguished by his large charities: among other foundations he established a hospital at Donaueschingen. For the industrial development of the country, too, he did much, and proved himself also a notable patron of the arts. His palace of Donaueschingen, with its collections of paintings, engravings and coins, was a centre of culture, where poets, painters and musicians met with princely entertainment. He died on the 14th of September 1869, and was succeeded by his son Karl Egon II. (1820–1892), with the death of whose son, Karl Egon III., in 1896, the title and estates passed to Prince Maximilian Egon, head of the cadet line of Fürstenberg-Pürglitz.

See Münch, *Gesch. des Hauses und des Landes Fürstenberg*, 4 vols. (Aix-la-Chapelle, 1829–1847); S. Riezler, *Gesch. des fürstlichen Hauses Fürstenberg bis 1507* (Tübingen, 1883); *Fürstenbergisches Urkundenbuch*, edited by S. Riezler and F. L. Baumann, vols. i.–vii. (Tübingen, 1877–1891), continued *s. lit. Mitteilungen aus dem fürstlich. Fürstenbergischen Archiv* by Baumann and G. Tumbült, 2 vols. (*ib.* 1899–1902); Stokvis, *Manuel d'histoire* (Leiden, 1890–1893); *Almanach de Gotha*; *Allgemeine deutsche Biographie*.

2. The second Fürstenberg family has its possessions in Westphalia and the country of the Rhine, and takes its name from the castle of Fürstenberg on the Ruhr. The two most remarkable men whom it has produced are Franz Friedrich Wilhelm, freiherr von Fürstenberg, and Franz Egon, count von Fürstenberg-Stammheim. The former (1728–1810) became ultimately vicar-general of the prince-bishop of Münster, and effected a great number of important reforms in the administration of the country, besides doing much for its educational and industrial development. The latter (1707–1859) was an enthusiastic patron of art, who zealously advocated the completion of the Cologne cathedral, and erected the beautiful church of St Apollinaris near Remagen on the Rhine. He was a member of the Prussian Upper House in 1849, collaborated in founding the *Preussisches Wochenblatt*, and was an ardent defender of Catholic interests. His son, Count Gisbert von Fürstenberg-Stammheim (b. 1836), was in 1900 head of the Rhenish line of the house of Fürstenberg.

FÜRSTENWALDE, a town of Germany, in the Prussian province of Brandenburg, on the right bank of the Spree, and on the railway from Berlin to Frankfort-on-Oder, 28 m. E. of the former city. Pop. (1905) 20,498. Its beautiful cathedral church contains several old monuments. The industries are important, including, besides brewing and malting, manufactures of starch, vinegar, electric lamps and gas-fittings, stoves, &c., iron-founding and wool-weaving. Fürstenwalde is one of the oldest towns of Brandenburg. From 1385 it was the seat of the bishop of Lebus, whose bishopric was incorporated with the electorate of Brunswick in 1505.

FÜRTH, a manufacturing town of Germany, in the kingdom of Bavaria, at the confluence of the Pegnitz with the Regnitz, 5 m. N.W. from Nuremberg by rail, at the junction of lines to Hof and Würzburg. Pop. (1885) 35,455; (1905) 60,638. It is a modern town in appearance, with broad streets and palatial business houses. Of its four Evangelical churches, the old St Michaeliskirche is a handsome structure; but its chief edifices are the new town hall, with a tower 175 ft. high and the magnificent synagogue. The Jews have also a high school, which enjoys a great reputation. There are besides a classical, a wood-carving and an agricultural school and a library. Fürth is the seat of several important industries; particularly, the production of chromolithographs and picture-books, the manufacture of mirrors and mirror-frames, bronze and gold-leaf wares, pencils, toys, haberdashery, optical instruments, silver work, turnery, chicory, machinery, fancy boxes and cases, and an extensive trade is carried on in these goods as also in hops, metals, wool, groceries and coal. A large annual fair is held at Michaelmas and lasts for eleven days. The earliest railway in Germany was that between Nuremberg and Fürth (opened on the 7th of December 1835).

Fürth was founded, according to tradition, by Charlemagne, who erected a chapel there. It was for a time a *Vogtei* (advocateship) under the burgraves of Nuremberg, but about 1314 it was bequeathed to the see of Bamberg, and in 1806 it came into the possession of Bavaria. In 1632 Gustavus Adolphus besieged it in vain, and in 1634 it was pillaged and burnt by the Croats. It owes its rise to prosperity to the tolerance it meted out to the Jews, who found here an asylum from the oppression under which they suffered in Nuremberg.

See Fronmüller, *Chronik der Stadt Fürth* (1887).

FURTWÄNGLER, ADOLF (1853–1907), German archaeologist, was born at Freiburg im Breisgau, and was educated there, at Leipzig and at Munich, where he was a pupil of H. Brunn, whose comparative method in art-criticism he much developed. He took part in the excavations at Olympia in 1878, became an assistant in the Berlin Museum in 1880, and professor at Berlin (1884) and later at Munich. His latest excavation work was at Aegina. He was a prolific writer, with a prodigious knowledge and memory, and a most ingenious and confident critic; and his work not only dominated the field of archaeological criticism but also raised its standing both at home and abroad. Among his numerous publications the most important were a volume on the bronzes found at Olympia, vast works on ancient gems and Greek vases, and the invaluable *Masterpieces of Greek Sculpture* (English translation by Eugénie Strong). He died at Athens on the 10th of October 1907.

FURZE, Gorse or Whin; botanical name *Ulex* (Ger. *Stechginster*, Fr. *ajonc*), a genus of thorny papilionaceous shrubs, of few species, confined to west and central Europe and north-west Africa. Common furze, *U. europaeus*, is found on heaths and commons in western Europe from Denmark to Italy and Greece, and in the Canaries and Azores, and is abundant in nearly all parts of the British Isles. It grows to a height of 2–6 ft.; it has hairy stems, and the smaller branches end each in a spine; the leaves, sometimes lanceolate on the lowermost branches, are mostly represented by spines from 2 to 6 lines long, and branching at their base; and the flowers, about three-quarters of an inch in length, have a shaggy, yellowish-olive calyx, with two small ovate bracts at its base, and appear in early spring and late autumn. They are yellow and sweet-scented and visited by bees. The pods are few-seeded; their crackling as they burst may often be heard in hot weather. This species comprises the varieties *vulgaris*, or *U. europaeus* proper, which has spreading branches, and strong, many-ridged spines, and *strictus* (Irish furze), with erect branches, and slender 4-edged spines. The other British species of furze is *U. nanus*, dwarf furze, a native of Belgium, Spain and the west of France; it is a procumbent plant, less hairy than *U. europaeus*, with smaller and more orange-coloured flowers, which spring from the primary spines, and have a nearly smooth calyx, with minute basal bracts. Furze, or gorse, is sometimes employed for fences.

Notwithstanding its formidable spines, the young shoots yield a palatable and nutritious winter forage for horses and cattle. To fit it for this purpose it must be chopped and bruised to destroy the spines. This is sometimes done in a primitive and laborious way by laying the gorse upon a block of wood and beating it with a mallet, flat at one end and armed with crossed knife-edges at the other, by the alternate use of which it is bruised and chopped. There are now a variety of machines by which this is done rapidly and efficiently, and which are in use where this kind of forage is used to any extent. The agricultural value of this plant has often been over-rated by theoretical writers. In the case of very poor, dry soils it does, however, yield much valuable food at a season when green forage is not otherwise to be had. It is on this account of importance to dairymen; and to them it has this further recommendation, that cows fed upon it give much rich milk, which is free from any unpleasant flavour. To turn it to good account, it must be sown in drills, kept clean by hoeing, and treated as a regular green crop. If sown in March, on land fully prepared and afterwards duly cared for, it is ready for use in the autumn of the following year. A succession of cuttings of proper age is obtained for several years from the same field. It is cut by a short stout scythe, and must be brought from the field daily; for when put in a heap after being

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chopped and bruised it heats rapidly. It is given to horses and cows in combination with chopped hay or straw. An acre will produce about 2000 faggots of green two-year-old gorse, weighing 20 lb each.

This plant is invaluable in mountain sheep-walks. The rounded form of the furze bushes that are met with in such situations shows how diligently the annual growth, as far as it is accessible, is nibbled by the sheep. The food and shelter afforded to them in snowstorms by clusters of such bushes is of such importance that the wonder is our sheep farmers do not bestow more pains to have it in adequate quantity. Young plants of whin are so kept down by the sheep that they can seldom attain to a profitable size unless protected by a fence for a few years. In various parts of England it is cut for fuel. The ashes contain a large proportion of alkali, and are a good manure, especially for peaty land.

FUSARO, LAGO, a lake of Campania, Italy, ½ m. W. of Baia, and 1 m. S. of the acropolis of Cumae. It is the ancient *Acherusia palus*, separated from the sea on the W. by a line of sandhills. It may have been the harbour of Cumae in early antiquity. In the 1st century A.D. an artificial outlet was dug for it at its S. end, with a tunnel, lined with *opus reticulatum* and brick, under the hill of Torregaveta. This hill is covered with the remains of a large villa, which is almost certainly that of Servilius Vatia, described by Seneca (*Epist.* 55). There are remains of other villas on the shores of the lake. Oyster cultivation is carried on there.

See J. Beloch, *Campanien* (2nd ed., Breslau, 1890), 188. (T. As.)

FUSELI, HENRY (1741–1825), English painter and writer on art, of German-Swiss family, was born at Zürich in Switzerland on the 7th of February 1741; he himself asserted in 1745, but this appears to have been a mere whim. He was the second child in a family of eighteen. His father was John Caspar Füssli, of some note as a painter of portraits and landscapes, and author of Lives of the *Helvetic Painters*. This parent destined his son for the church, and with this view sent him to the Caroline college of his native town, where he received an excellent classical education. One of his schoolmates there was Lavater, with whom he formed an intimate friendship.

After taking orders in 1761 Fuseli was obliged to leave his country for a while in consequence of having aided Lavater to expose an unjust magistrate, whose family was still powerful enough to make its vengeance felt. He first travelled through Germany, and then, in 1765, visited England, where he supported himself for some time by miscellaneous writing; there was a sort of project of promoting through his means a regular literary communication between England and Germany. He became in course of time acquainted with Sir Joshua Reynolds, to whom he showed his drawings. By Sir Joshua's advice he then devoted himself wholly to art. In 1770 he made an art-pilgrimage to Italy, where he remained till 1778, changing his name from Füssli to Fuseli, as more Italian-sounding. Early in 1779 he returned to England, taking Zürich on his way. He found a commission awaiting him from Alderman Boydell, who was then organizing his celebrated Shakespeare gallery. Fuseli painted a number of pieces for this patron, and about this time published an English edition of Lavater's work on physiognomy. He likewise gave Cowper some valuable assistance in preparing the translation of Homer. In 1788 Fuseli married Miss Sophia Rawlins (who it appears was originally one of his models, and who proved an affectionate wife), and he soon after became an associate of the Royal Academy. Two years later he was promoted to the grade of Academician. In 1790 he exhibited a series of paintings from subjects furnished by the works of Milton, with a view to forming a Milton gallery corresponding to Boydell's Shakespeare gallery. The number of the Milton paintings was forty-seven, many of them very large; they were executed at intervals within nine years. This exhibition, which closed in 1800, proved a failure as regards profit. In 1799 also he was appointed professor of painting to the Academy. Four years afterwards he was chosen keeper, and resigned his professorship; but he resumed it in 1810, and continued to hold both offices till his death. In 1805 he brought out an edition of Pilkington's *Lives of the Painters*, which, however, did not add much to his reputation. Canova, when on his visit to England, was much taken with Fuseli's works, and on returning to Rome in 1817 caused him to be elected a member of the first class in the Academy of St Luke. Fuseli, after a life of uninterrupted good health, died at Putney Hill on the 16th of April 1825, at the advanced age of eighty-four, and was buried in the crypt of St Paul's cathedral. He was comparatively rich at his death, though his professional gains had always appeared to be meagre.

As a painter, Fuseli had a daring invention, was original, fertile in resource, and ever aspiring after the highest forms of excellence. His mind was capable of grasping and realizing the loftiest conceptions, which, however, he often spoiled on the canvas by exaggerating the due proportions of the parts, and throwing his figures into attitudes of fantastic and over-strained contortion. He delighted to select from the region of the supernatural, and pitched everything upon an ideal scale, believing a certain amount of exaggeration necessary in the higher branches of historical painting. "Damn Nature! she always puts me out," was his characteristic exclamation. In this theory he was confirmed by the study of Michelangelo's works and the marble statues of the Monte Cavallo, which, when at Rome, he used often to contemplate in the evening, relieved against a murky sky or illuminated by lightning. But this idea was by him carried out to an excess, not only in the forms, but also in the attitudes of his figures; and the violent and intemperate action which he often displays destroys the grand effect which many of his pieces would otherwise produce. A striking illustration of this occurs in his famous picture of "Hamlet breaking from his Attendants to follow the Ghost": Hamlet, it has been said, looks as though he would burst his clothes with convulsive cramps in all his muscles. This intemperance is the grand defect of nearly all Fuseli's compositions. On the other hand, his paintings are never either languid or cold. His figures are full of life and earnestness, and seem to have an object in view which they follow with rigid intensity. Like Rubens he excelled in the art of setting his figures in motion. Though the lofty and terrible was his proper sphere, Fuseli had a fine perception of the ludicrous. The grotesque humour of his fairy scenes, especially those taken from *A Midsummer-Night's Dream*, is in its way not less remarkable than the poetic power of his more ambitious works. As a colourist Fuseli has but small claims to distinction. He scorned to set a palette as most artists do; he merely dashed his tints recklessly over it. Not unfrequently he used his paints in the form of a dry powder, which he rubbed up with his pencil with oil, or turpentine, or gold size, regardless of the quantity, and depending for accident on the general effect., This recklessness may perhaps be explained by the fact that he did not paint in oil till he was twenty-five years of age. Despite these drawbacks he possessed the elements of a great painter.

Fuseli painted more than 200 pictures, but he exhibited only a minority of them. His earliest painting represented "Joseph interpreting the Dreams of the Baker and Butler"; the first to excite particular attention was the "Nightmare," exhibited in 1782. He produced only two portraits. His sketches or designs numbered about 800; they have admirable qualities of invention and design, and are frequently superior to his paintings.

His general powers of mind were large. He was a thorough master of French, Italian, English and German, and could write in all these tongues with equal facility and vigour, though he preferred German as the vehicle of his thoughts. His writings contain passages of the best art-criticism that English literature can show. The principal work is his series of *Lectures* in the Royal Academy, twelve in number, commenced in 1801.

Many interesting anecdotes of Fuseli, and his relations to contemporary artists, are given in his *Life* by John Knowles, who also edited his works in 3 vols. 8vo, London, 1831. (W. M. R.)

FUSEL OIL (from the Ger. *Fusel*, bad spirits), the name applied to the volatile oily liquids, of a nauseous fiery taste and smell, which are obtained in the rectification of spirituous liquors made by the fermentation of grain, potatoes, the marc of grapes, and

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other material, and which, as they are of higher boiling point than ethyl alcohol, occur in largest quantity in the last portions of the distillate. Besides ethyl or ordinary alcohol, and amyl alcohol, which are present in them all, there have been found in fusel oil several other bodies of the $C_nH_{2n+1}OH$ series, also certain ethers, and members of the $C_nH_{2n+1}CO_2H$ series of fatty acids. Normal propyl alcohol is contained in the fusel oil of the marc brandy of the south of France, and isopriinary butyl alcohol in that of beet-root molasses. The chief constituent of the fusel oil procured in the manufacture of alcohol from potatoes and grain, usually known as fusel oil and potato-spirit, is isoprimary amyl alcohol, or isobutylcarbinol. Ordinary fusel oil yields also an isomeric amyl alcohol (active amyl alcohol) boiling at about 128°. Variable quantities of fusel oil, less or greater according to the stage of ripening, exist in commercial spirits (see SPIRITS).

Fusel oil and its chief constituent, amyl alcohol, are direct nerve poisons. In small doses it causes only thirst and headache, with furred tongue and some excitement. In large doses it is a convulsent poison. Impure beverages induce all the graver neurotic and visceral disorders in alcoholism; and, like fusel oil, furfurol and the essence of absinthe, are convulsent poisons. Pure ethyl alcohol intoxication, indeed, is rarely seen, being modified in the case of spirits by the higher alcohols contained in fusel oil. According to Rabuteau the toxic properties of the higher alcohols increase with their molecular weight and boiling point. Richet considers that the fusel oil contained in spirits constitutes the chief danger in the consumption of alcoholic beverages. The expert can immediately detect the peculiarly virulent characters of the mixed intoxication due to the consumption of spirits containing a large percentage of fusel oil.

FUSIBLE METAL, a term applied to certain alloys, generally composed of bismuth, lead and tin, which possess the property of melting at comparatively low temperatures. Newton's fusible metal (named after Sir Isaac Newton) contains 50 parts of bismuth, 31·25 of lead and 18·75 of tin; that of Jean Darcet (1725–1801), 50 parts of bismuth with 25 each of lead and tin; and that of Valentin Rose the elder, 50 of bismuth with 28·1 of lead and 24·1 of tin. These melt between 91° and 95° C. The addition of cadmium gives still greater fusibility; in Wood's metal, for instance, which is Darcet's metal with half the tin replaced by cadmium, the melting point is lowered to 66°–71° C.; while another described by Lipowitz and containing 15 parts of bismuth, 8 of lead, 4 of tin and 3 of cadmium, softens at about 55° and is completely liquid a little above 60°. By the addition of mercury to Darcet's metal the melting point may be reduced so low as 45°. These fusible metals have the peculiarity of expanding as they cool; Rose's metal, for instance, remains pasty for a considerable range of temperature below its fusing point, contracts somewhat rapidly from 80° to 55°, expands from 55° to 35°, and contracts again from 35° to 0°. For this reason they may be used for taking casts of anatomical specimens or making *clichés* from wood-blocks, the expansion on cooling securing sharp impressions. By suitable modification in the proportions of the components, a series of alloys can be made which melt at various temperatures above the boiling point of water; for example, with 8 parts of bismuth, 8 of lead and 3 of tin the melting point is 123°, and with 8 of bismuth, 30 of lead and 24 of tin it is 172°. With tin and lead only in equal proportions it is 241°. Such alloys are used for making the fusible plugs inserted in the furnace-crowns of steam boilers, as a safeguard in the event of the water-level being allowed to fall too low. When this happens the plug being no longer covered with water is heated to such a temperature that it melts and allows the contents of the boiler to escape into the furnace. In automatic fire-sprinklers the orifices of the pipes are closed with fusible metal, which melts and liberates the water when, owing to an outbreak of fire in the room, the temperature rises above a predetermined limit.

FUSILIER, originally (in French about 1670, in English about 1680) the name of a soldier armed with a light flintlock musket called the fusil; now a regimental designation. Various forms of flintlock small arms had been used in warfare since the middle of the 16th century. At the time of the English civil war (1642–1652) the term "firelock" was usually employed to distinguish these weapons from the more common matchlock musket. The special value of the firelock in armies of the 17th century lay in the fact that the artillery of the time used open powder barrels for the service of the guns, making it unsafe to allow lighted matches in the muskets of the escort. Further, a military escort was required, not only for the protection, but also for the surveillance of the artillerymen of those days. Companies of "firelocks" were therefore organized for these duties, and out of these companies grew the "fusiliers" who were employed in the same way in the wars of Louis XIV. In the latter part of the Thirty Years' War (1643) fusiliers were simply mounted troops armed with the fusil, as carabiniers were with the carbine. But the escort companies of artillery came to be known by the name shortly afterwards, and the regiment of French Royal Fusiliers, organized in 1671 by Vauban, was considered the model for Europe. The general adoption of the flintlock musket and the suppression of the pike in the armies of Europe put an end to the original special duties of fusiliers, and they were subsequently employed to a large extent in light infantry work, perhaps on account of the greater individual aptitude for detached duties naturally shown by soldiers who had never been restricted to a fixed and unchangeable place in the line of battle. The senior fusilier regiment in the British service, the (7th) Royal Fusiliers (City of London Regiment), was formed on the French model in 1685; the 5th foot (now Northumberland Fusiliers), senior to the 7th in the army, was not at that time a fusilier regiment. The distinctive head-dress of fusiliers in the British service is a fur cap, generally resembling, but smaller than and different in details from, that of the Foot Guards.

In Germany the name "fusilier" is borne by certain infantry regiments and by one battalion in each grenadier regiment.

FUSION, the term generally applied to the melting of a solid substance, or the change of state of aggregation from the solid to the liquid. The term "liquefaction" is frequently employed in the same sense, but is often restricted to the condensation of a gas or vapour. The converse process of freezing or solidification, the change from the liquid to the solid state, is subject to the same laws, and must be considered together with fusion. The solution of a solid in a foreign liquid, and the deposition or crystallization of a solid from a solution, are so closely related to the fusion of a pure substance, that it will also be necessary to consider some of the analogies which they present.

1. *General Phenomena.*—There are two chief varieties of the process of fusion, namely, crystalline and amorphous, which are in many ways distinct, although it is possible to find intermediate cases which partake of the characteristics of both. The melting of ice may be taken as a typical case of crystalline fusion. The passage from rigid solid to mobile liquid occurs at a definite surface without any intermediate stage or plastic condition. The change takes place at a definite temperature, the fusing or freezing point (abbreviated F.P.), and requires the addition of a definite quantity of heat to the solid, which is called the latent heat of fusion. There is also in general a considerable change of volume during fusion, which amounts in the case of ice to a contraction of 9%. Typical cases of amorphous solidification are those of silica, glass, plastic sulphur, pitch, alcohol and many organic liquids. In this type the liquid gradually becomes more and more viscous as the temperature falls, and ultimately attains the rigidity characteristic of a solid, without any definite freezing point or latent heat. The condition of the substance remains uniform throughout, if its temperature is uniform; there is no separation into the two distinct phases of solid and liquid, and there is no sudden change of volume at any temperature.

A change or transition from one crystalline form to another may occur in the solid state with evolution or absorption of heat at a definite temperature, and is analogous to the change from solid to liquid, but usually takes place more slowly owing to the small molecular mobility of the solid state. Thus rhombic sulphur when heated passes slowly at 95·6° C. into the

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monosymmetric form which melts at 120°, but if heated rapidly the rhombic form melts at 114·5. The two forms, rhombic and monosymmetric, can exist in equilibrium at 95·6°, the transition point at which they have the same vapour pressure. Similarly a solid solution of carbon in iron, when cooled slowly, passes at about 700° C., with considerable evolution of heat, into the form of "pearlite," which is soft when cold, but if rapidly chilled the carbon remains in solution and the steel is very hard (see also ALLOYS).

In the case of crystalline fusion it is necessary to distinguish two cases, the homogeneous and the heterogeneous. In the first case the composition of the solid and liquid phases are the same, and the temperature remains constant during the whole process of fusion. In the second case the solid and liquid phases differ in composition; that of the liquid phase changes continuously, and the temperature does not remain constant during the fusion. The first case comprises the fusion of pure substances, and that of eutectics, or cryohydrates; the second is the general case of an alloy or a solution. These have been very fully studied and their phenomena greatly elucidated in recent years.

There is also a sub-variety of amorphous fusion, which may be styled colloid or gelatinous, and may be illustrated by the behaviour of solutions of water in gelatin. Many of these jellies melt at a fairly definite temperature on heating, and coagulate or set at a definite temperature on cooling. But in some cases the process is not reversible, and there is generally marked hysteresis, the temperature of setting and other phenomena depending on the rate of cooling. This case has not yet been fully worked out; but it appears probable that in many cases the jelly possesses a spongy framework of solid, holding liquid in its meshes or interstices. It might be regarded as a case of "heterogeneous" amorphous fusion, in which the liquid separates into two phases of different composition, one of which solidifies before the other. The two phases cannot, as a rule, be distinguished optically, but it is generally possible to squeeze out some of the liquid phase when the jelly has set, which proves that the substance is not really homogeneous. In very complicated mixtures, such as acid lavas or slags containing a large proportion of silica, amorphous and crystalline solidification may occur together. In this case the crystals separate first during the process of cooling, the mother liquor increases gradually in viscosity, and finally sets as an amorphous ground-mass or matrix, in which crystals of different kinds and sizes, formed at different stages of the cooling, remain embedded. The formation of crystals in an amorphous solid after it has set is also of frequent occurrence. It is termed devitrification, but is a very slow process unless the solid is in a plastic state.

2. *Homogeneous Crystalline Fusion.*—The fusion of a solid of this type is characterized most clearly by the perfect constancy of temperature during the process. In fact, the law of constant temperature, which is generally stated as the first of the so-called "laws of fusion," does not strictly apply except to this case. The constancy of the F.P. of a pure substance is so characteristic that change of the F.P. is often one of the most convenient tests of the presence of foreign material. In the case of substances like ice, which melt at a low temperature and are easily obtained in large quantities in a state of purity, the point of fusion may be very accurately determined by observing the temperature of an intimate mixture of the solid and liquid while slowly melting as it absorbs heat from surrounding bodies. But in the majority of cases it is more convenient to observe the freezing point as the liquid is cooled. By this method it is possible to ensure perfect uniformity of temperature throughout the mass by stirring the liquid continuously during the process of freezing, whereas it is difficult to ensure uniformity of temperature in melting a solid, however gradually the heat is supplied, unless the solid can be mixed with the liquid. It is also possible to observe the F.P. in other ways, as by noting the temperature at the moment of the breaking of a wire, of the stoppage of a stirrer, or of the maximum rate of change of volume, but these methods are generally less certain in their indications than the point of greatest constancy of temperature in the case of homogeneous crystalline solids.

Fusing Points of Common Metals.

Mercury	−38·8°	Antimony	630°
Potassium	62·5°	Aluminium	655°
Sodium	95·6°	Silver	962°
Tin	231·9°	Gold	1064°
Bismuth	269·2°	Copper	1082°
Cadmium	320·7°	Nickel	1427°
Lead	327·7°	Palladium	1535°
Zinc	419·0°	Platinum	1710°

The above table contains some of the most recent values of fusing points of metals determined (except the first three and the last three) with platinum thermometers. The last three values are those obtained by extrapolation with platinum-rhodium and platinum-iridium couples. (See Harker, *Proc. Roy. Soc.* A 76, p. 235, 1905.) Some doubt has recently been raised with regard to the value for platinum, which is much lower than that previously accepted, namely 1775°.

3. *Superfusion, Supersaturation.*—It is generally possible to cool a liquid several degrees below its normal freezing point without a separation of crystals, especially if it is protected from agitation, which would assist the molecules to rearrange themselves. A liquid in this state is said to be "undercooled" or "superfused." The phenomenon is even more familiar in the case of solutions (*e.g.* sodium sulphate or acetate) which may remain in the "metastable" condition for an indefinite time if protected from dust, &c. The introduction into the liquid under this condition of the smallest fragment of the crystal, with respect to which the solution is supersaturated, will produce immediate crystallization, which will continue until the temperature is raised to the saturation point by the liberation of the latent heat of fusion. The constancy of temperature at the normal freezing point is due to the equilibrium of exchange existing between the liquid and solid. Unless both solid and liquid are present, there is no condition of equilibrium, and the temperature is indeterminate.

It has been shown by H. A. Miers (*Jour. Chem. Soc.*, 1906, 89, p. 413) that for a supersaturated solution in metastable equilibrium there is an inferior limit of temperature, at which it passes into the "labile" state, *i.e.* spontaneous crystallization occurs throughout the mass in a fine shower. This seems to be analogous to the fine misty condensation which occurs in a supersaturated vapour in the absence of nuclei (see VAPORIZATION) when the supersaturation exceeds a certain limit.

4. *Effect of Pressure on the F.P.*—The effect of pressure on the fusing-point depends on the change of volume during fusion. Substances which expand on *freezing*, like ice, have their freezing points lowered by increase of pressure; substances which expand on *fusing*, like wax, have their melting points raised by pressure. In each case the effect of pressure is to retard increase of volume. This effect was first predicted by James Thomson on the analogy of the effect of pressure on the boiling point, and was numerically verified by Lord Kelvin in the case of ice, and later by Bunsen in the case of paraffin and spermaceti. The equation by which the change of the F.P. is calculated may be proved by a simple application of the Carnot cycle, exactly as in the case of vapour and liquid. (See THERMODYNAMICS.) If L be the latent heat of fusion in mechanical units, v' the volume of unit mass of the solid, and v'' that of the liquid, the work done in an elementary Carnot cycle of range $d\theta$ will be $dp(v''-v')$, if dp is the increase of pressure required to produce a change $d\theta$ in the F.P. Since the ratio of the work-difference or cycle-area to the heat-transferred L must be equal to $d\theta/\theta$, we have the relation

$$d\theta/dp = \theta(v''-v')/L. \qquad (1)$$

The sign of $d\theta$, the change of the F.P., is the same as that of the change of volume $(v''-v')$. Since the change of volume seldom exceeds 0·1 c.c. per gramme, the change of the F.P. per atmosphere is so small that it is not as a rule necessary to take account of variations of atmospheric pressure in observing a freezing point. A variation of 1 cm. in the height of the barometer would correspond to a change of ·0001° C. only in the F.P. of ice. This is far beyond the limits of accuracy of most observations. Although the effect of pressure is so small, it produces, as is well known, remarkable results in the motion of glaciers, the moulding and regelation of ice, and many other phenomena. It has also been employed to explain the apparent inversion of the order of crystallization in rocks like granite, in which the arrangement of the crystals indicates that the quartz matrix solidified subsequently to the crystals of

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felspar, mica or hornblende embedded in it, although the quartz has a higher melting point. It is contended that under enormous pressure the freezing points of the more fusible constituents might be raised above that of the quartz, if the latter is less affected by pressure. Thus Bunsen found the F.P. of paraffin wax 1·4° C. below that of spermaceti at atmospheric pressure. At 100 atmospheres the two melted at the same temperature. At higher pressures the paraffin would solidify first. The effect of pressure on the silicates, however, is much smaller, and it is not so easy to explain a change of several hundred degrees in the F.P. It seems more likely in this particular case that the order of crystallization depends on the action of superheated water or steam at high temperatures and pressures, which is well known to exert a highly solvent and metamorphic action on silicates.

5. *Variation of Latent Heat.*—C. C. Person in 1847 endeavoured to show by the application of the first law of thermodynamics that the increase of the latent heat per degree should be equal to the difference ($s'-s$) between the specific heats of the liquid and solid. If, for instance, water at 0° C. were first frozen and then cooled to $-t°$ C., the heat abstracted per gramme would be $(L'+s't)$ calories. But if the water were first cooled to $-t°$ C., and then frozen at $-t°$ C., by abstracting heat L', the heat abstracted would be $L'+st$, Assuming that the heat abstracted should be the same in the two cases, we evidently obtain $L'-L''=(s''-s')t$. This theory has been approximately verified by Petterson, by observing the freezing of a liquid cooled below its normal F.P. (*Jour. Chem. Soc.* 24, p. 151). But his method does not represent the true variation of the latent heat with temperature, since the freezing, in the case of a superfused liquid, really takes place at the normal freezing point. A quantity of heat $s't$ is abstracted in cooling to $-t$, $(L'-s't)$ in raising to 0° and freezing at 0°, and L'' in cooling the ice to $-t$. The latent heat L' at $-t$ does not really enter into the experiment. In order to make the liquid freeze at a different temperature, it is necessary to subject it to pressure, and the effect of the pressure on the latent heat cannot be neglected. The entropy of a liquid ϕ' at its F.P. reckoned from any convenient zero ϕ_0 in the solid state may be represented by the expression

$$\phi'-\phi_0=\int s'd\theta/\theta+L/\theta. \qquad (2)$$

Since $\theta d\phi'/d\theta=s'$, we obtain by differentiation the relation

$$dL/d\theta=s''-s'+L/\theta, \qquad (3)$$

which is exactly similar to the equation for the specific heat of a vapour maintained in the saturated condition. If we suppose that the specific heats s' and s'' of the solid and liquid at equilibrium pressure are nearly the same as those ordinarily observed at constant pressure, the relation (3) differs from that of Person only by the addition of the term L/θ. Since s'' is greater than s' in all cases hitherto investigated, and L/θ is necessarily positive, it is clear that the latent heat of fusion must increase with rise of temperature, or diminish with fall of temperature. It is possible to imagine the F.P. so lowered by pressure (positive or negative) that the latent heat should vanish, in which case we should probably obtain a continuous passage from the liquid to the solid state similar to that which occurs in the case of amorphous substances. According to equation (3), the rate of change of the latent heat of water is approximately 0·80 calorie per degree at 0° C. (as compared with 0·50, Person), if we assume $s''=1$, and $s'=0$. Putting $L'-L''=0$ in equation (2), we find $L=0$ at $-160°$ C. approximately, but no stress can be laid on this estimate, as the variation of $(s''-s')$ is so uncertain.

6. *Freezing of Solutions and Alloys.*—The phenomena of freezing of heterogeneous crystalline mixtures may be illustrated by the case of aqueous solutions and of metallic solutions or alloys, which have been most widely studied. The usual effect of an impurity, such as salt or sugar in solution in water, is to lower the freezing point, so that no crystallization occurs until the temperature has fallen below the normal F.P. of the pure solvent, the depression of F.P. being nearly proportional to the concentration of the solution. When freezing begins, the solvent generally separates out from the solution in the pure state. This separation of the solvent involves an increase in the strength of the remaining solution, so that the temperature does not remain constant during the freezing, but continues to fall as more of the solvent is separated. There is a perfectly definite relation between temperature and concentration at each stage of the process, which may be represented in the form of a curve as AC in fig. 1, called the freezing point curve. The equilibrium temperature, at the surface of contact between the solid and liquid, depends only on the composition of the liquid phase and not at all on the quantity of solid present. The abscissa of the F.P. curve represents the composition of that portion of the original solution which remains liquid at any temperature. If instead of starting with a dilute solution we start with a strong solution represented by a point N, and cool it as shown by the vertical line ND, a point D is generally reached at which the solution becomes "saturated." The dissolved substance or "solute" then separates out as the solution is further cooled, and the concentration diminishes with fall of temperature in a definite relation, as indicated by the curve CB, which is called the solubility curve. Though often called by different names, the two curves AC and CB are essentially of a similar nature. To take the case of an aqueous solution of salt as an example, along CB the solution is saturated with respect to salt, along AC the solution is saturated with respect to ice. When the point C is reached along either curve, the solution is saturated with respect to both salt and ice. The concentration cannot vary further, and the temperature remains constant, while the salt and ice crystallize out together, maintaining the exact proportions in which they exist in the solution. The resulting solid was termed a cryohydrate by F. Guthrie, but it is really an intimate mixture of two kinds of crystals, and not a chemical compound or hydrate containing the constituents in chemically equivalent proportions. The lowest temperature attainable by means of a freezing mixture is the temperature of the F.P. of the corresponding cryohydrate. In a mixture of salt and ice with the least trace of water a saturated brine is quickly formed, which dissolves the ice and falls rapidly in temperature, owing to the absorption of the latent heat of fusion. So long as both ice and salt are present, if the mixture is well stirred, the solution must necessarily become saturated with respect to both ice and salt, and this can only occur at the cryohydric temperature, at which the two curves of solubility intersect.

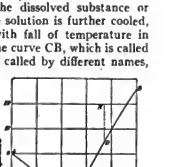

FIG. 1.—F.P. or Solubility Curve: simple case.

The curves in fig. 1 also illustrate the simplest type of freezing point curve in the case of alloys of two metals A and B which do not form mixed crystals or chemical compounds. The alloy corresponding to the cryohydrate, possessing the lowest melting point, is called the eutectic alloy, as it is most easily cast and worked. It generally possesses a very fine-grained structure, and is not a chemical compound. (See ALLOYS.)

To obtain a complete F.P. curve even for a binary alloy is a laborious and complicated process, but the information contained in such a curve is often very valuable. It is necessary to operate with a number of different alloys of suitably chosen composition, and to observe the freezing points of each separately. Each alloy should also be analysed after the process if there is any risk of its composition having been altered by oxidation or otherwise. The freezing points are generally best determined by observing the gradual cooling of a considerable mass, which is well stirred so long as it remains liquid. The curve of cooling may most conveniently be recorded, either photographically, using a thermocouple and galvanometer, as in the method of Sir W. Roberts-Austen, or with pen and ink, if a platinum thermometer is available, according to the method put in practice by C. T. Heycock and F. H. Neville. A typical set of curves obtained in this manner is shown in fig. 2. When the pure metal A in cooling reaches its F.P. the temperature suddenly becomes stationary, and remains accurately constant for a considerable period. Often it falls slightly below the F.P. owing to superfusion, but rises to the F.P. and remains constant as soon as freezing begins. The second curve shows the cooling of A with 10% of another metal B added. The freezing begins at a lower temperature with the separation of pure A. The temperature

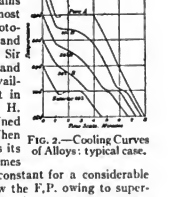

FIG. 2.—Cooling Curves of Alloys: typical case.

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no longer remains constant during freezing, but falls more and more rapidly as the proportion of B in the liquid increases. When the eutectic temperature is reached there is a second F.P. or arrest at which the whole of the remaining liquid solidifies. With 20% of B the first F.P. is further lowered, and the temperature falls faster. The eutectic F.P. is of longer duration, but still at the same temperature. For an alloy of the composition of the eutectic itself there is no arrest until the eutectic temperature is reached, at which the whole solidifies without change of temperature. There is a great advantage in recording these curves automatically, as the primary arrest is often very slight, and difficult to observe in any other way.

7. *Change of Solubility with Temperature.*—The lowering of the F.P. of a solution with increase of concentration, as shown by the F.P. or solubility curves, may be explained and calculated by equation (1) in terms of the osmotic pressure of the dissolved substance by analogy with the effect of mechanical pressure. It is possible in salt solutions to strain out the salt mechanically by a suitable filter or "semi-permeable membrane," which permits the water to pass, but retains the salt. To separate 1 gramme of salt requires the performance of work PV against the osmotic pressure P, where V is the corresponding diminution in the volume of the solution. In dilute solutions, to which alone the following calculation can be applied, the volume V is the reciprocal of the concentration C of the solution in grammes per unit volume, and the osmotic pressure P is equal to that of an equal number of molecules of gas in the same space, and may be deduced from the usual equation of a gas,

$$P = R\theta/VM = R\theta C/M, \tag{4}$$

where M is the molecular weight of the salt in solution, θ the absolute temperature, and R a constant which has the value 8·32 joules, or nearly 2 calories, per degree C. It is necessary to consider two cases, corresponding to the curves CB and AB in fig. 1, in which the solution is saturated with respect to salt and water respectively. To facilitate description we take the case of a salt dissolved in water, but similar results apply to solutions in other liquids and alloys of metals.

(*a*) If unit mass of salt is separated in the solid state from a saturated solution of salt (curve CB) by forcing out through a semi-permeable membrane against the osmotic pressure P the corresponding volume of water V in which it is dissolved, the heat evolved is the latent heat of saturated solution of the salt Q together with the work done PV. Writing $(Q+PV)$ for L, and V for $(v''-v')$ in equation (1), and substituting P for p, we obtain

$$Q + PV = V\theta dP/d\theta, \tag{5}$$

which is equivalent to equation (1), and may be established by similar reasoning. Substituting for P and V in terms of C from equation (4), if Q is measured in calories, $R=2$, and we obtain

$$QC = 2\theta^2 dC/d\theta, \tag{6}$$

which may be integrated, *assuming Q constant*, with the result

$$2\ log_e C'/C' = Q/\theta' - Q/\theta'', \tag{7}$$

where C', C'' are the concentrations of the saturated solution corresponding to the temperatures θ' and θ''. This equation may be employed to calculate the latent heat of solution Q from two observations of the solubility. It follows from these equations that Q is of the same sign as $dC/d\theta$, that is to say, the solubility increases with rise of temperature if heat is absorbed in the formation of the saturated solution, which is the usual case. If, on the other hand, heat is liberated on solution, as in the case of caustic potash or sulphate of calcium, the solubility diminishes with rise of temperature.

(*b*) In the case of a solution saturated with respect to ice (curve AC), if one gramme of water having a volume v is separated by freezing, we obtain a precisely similar equation to (5), but with L the latent heat of fusion of water instead of Q, and v instead of V. If the solution is dilute, we may neglect the external work Pv in comparison with L, and also the heat of dilution, and may write P/t for $dP/d\theta$, where t is the depression of the F.P. below that of the pure solvent. Substituting for P in terms of V from equation (4), we obtain

$$t = 2\theta^2 v/LVM = 2\theta^2 w/LWM, \tag{8}$$

where W is the weight of water and w that of salt in a given volume of solution. If M grammes of salt are dissolved in 100 of water, $w=M$ and $W=100$. The depression of the F.P. in this case is called by van t' Hoff the "Molecular Depression of the F.P." and is given by the simple formula

$$t = 0{\cdot}02\theta^2/L. \tag{9}$$

Equation (8) may be used to calculate L or M, if either is known, from observations of t, θ and w/W. The results obtained are sufficiently approximate to be of use in many cases in spite of the rather liberal assumptions and approximations effected in the course of the reasoning. In any case the equations give a simple theoretical basis with which to compare experimental data in order to estimate the order of error involved in the assumptions. We may thus estimate the variation of the osmotic pressure from the value given by the gaseous equation, as the concentration of the solution or the molecular dissociation changes. The most uncertain factor in the formula is the molecular weight M, since the molecule in solution may be quite different from that denoted by the chemical formula of the solid. In many cases the molecule of a metal in dilute solution in another metal is either monatomic, or forms a compound molecule with the solvent containing one atom of the dissolved metal, in which case the molecular depression is given by putting the atomic weight for M. In other cases, as Cu, Hg, Zn, in solution in cadmium, the depression of the F.P. per atom, according to Heycock and Neville, is only half as great, which would imply a diatomic molecule. Similarly As and Au in Cd appear to be triatomic, and Sn in Pb tetratomic. Intermediate cases may occur in which different molecules exist together in equilibrium in proportions which vary according to the temperature and concentration. The most familiar case is that of an electrolyte, in which the molecule of the dissolved substance is partly dissociated into ions. In such cases the degree of dissociation may be estimated by observing the depression of the F.P., but the results obtained cannot always be reconciled with those deduced by other methods, such as measurement of electrical conductivity, and there are many difficulties which await satisfactory interpretation.

Exactly similar relations to (8) and (9) apply to changes of boiling point or vapour pressure produced by substances in solution (see VAPORIZATION), the laws of which are very closely connected with the corresponding phenomena of fusion; but the consideration of the vapour phase may generally be omitted in dealing with the fusion of mixtures where the vapour pressure of either constituent is small.

8. *Hydrates.*—The simple case of a freezing point curve, illustrated in fig. 1, is generally modified by the occurrence of compounds of a character analogous to hydrates of soluble salts, in which the dissolved substance combines with one or more molecules of the solvent. These hydrates may exist as compound molecules in the solution, but their composition cannot be demonstrated unless they can be separated in the solid state. Corresponding to each crystalline hydrate there is generally a separate branch of the solubility curve along which the crystals of the hydrate are in equilibrium with the saturated solution. At any given temperature the hydrate possessing the least solubility is the most stable. If two are present in contact with the same solution, the more soluble will dissolve, and the less soluble will be formed at its expense until the conversion is complete. The two hydrates cannot be in equilibrium with the same solution except at the temperature at which their solubilities are equal, *i.e.* at the point where the corresponding curves of solubility intersect. This temperature is called the "Transition Point." In the case of $ZnSO_4$, as shown in fig. 3, the heptahydrate, with seven molecules of water, is the least soluble hydrate at ordinary temperatures, and is generally deposited from saturated solutions. Above 39° C., however, the hexahydrate, with six molecules, is less soluble, and a rapid conversion of the hepta- into the hexahydrate occurs if the former is heated above the transition point. The solubility of the hexahydrate is greater than that of the heptahydrate below 39°, but increases more slowly with rise of temperature. At about 80° C. the hexahydrate gives place to the monohydrate, which dissolves in water with evolution of heat, and diminishes in solubility with rise of temperature. Intermediate hydrates exist, but they are more soluble, and cannot be readily isolated. Both the mono- and hexahydrates are capable of existing in equilibrium with saturated solutions at temperatures far below their transition points, provided that the less soluble hydrate is not present in the crystalline form. The solubility curves can therefore be traced, as in fig. 3, over an extended range of temperature. The equilibrium of each hydrate with the solvent, considered separately, would present a diagram of two branches similar to fig. 1, but as a rule only a small portion of each curve can be realized, and the complete solubility curve, as experimentally determined, is composed of a number of separate pieces corresponding to the ranges of minimum solubility of different hydrates. Failure to recognize this coupled with the

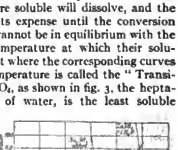

FIG. 3.—Solubility Curves of Hydrates.

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fact that in strong and viscous solutions the state of equilibrium is but slowly attained, is the probable explanation of the remarkable discrepancies existing in many recorded data of solubility.

Transition Points of Hydrates.

$Na_2CrO_4{\cdot}10H_2O$	19·9°	$NaBr{\cdot}2H_2O$	50·7°
$Na_2SO_4{\cdot}10H_2O$	32·4°	$MnCl_2{\cdot}4H_2O$	57·8°
$Na_2CO_3{\cdot}10H_2O$	35·1°	$Na_2PO_4{\cdot}12H_2O$	73·4°
$Na_2S_2O_3{\cdot}5H_2O$	48·0°	$Ba(OH)_2{\cdot}8H_2O$	77·9°

The transition points of the hydrates given in the above list Richards, *Proc. Amer. Acad.*, 1899, 34, p. 277) afford well-marked constant temperatures which can be utilized as fixed points for experimental purposes.

9. *Formation of Mixed Crystals.*—An important exception to the general type already described, in which the addition of a dissolved substance lowers the F.P. of the solvent, is presented by the formation of mixed crystals, or "solid solutions," in which the solvent and solute occur mixed in varying proportions. This isomorphous replacement of one substance by another, in the same crystal with little or no change of form, has long been known and studied in the case of minerals and salts, but the relations between composition and melting-point have seldom been investigated, and much still remains obscure. In this case the process of freezing does not necessitate the performance of work of separation of the constituents of the solution, the F.P. is not necessarily depressed, and the effect cannot be calculated by the usual formula for dilute solutions. One of the simplest types of F.P. curve which may result from the occurrence of mixed crystals is illustrated by the case of alloys of gold and silver, or gold and platinum, in which the F.P. curve is nearly a straight line joining the freezing-points of the constituents. The equilibrium between the solid and liquid, in both of which the two metals are capable of mixing in all proportions, bears in this case an obvious and close analogy to the equilibrium between a mixed liquid (*e.g.* alcohol and water) and its vapour. In the latter case, as is well known, the vapour will contain a larger proportion of the more volatile constituent. Similarly in the case of the formation of mixed crystals, the liquid should contain a larger proportion of the more fusible constituent than the solid with which it is in equilibrium. The composition of the crystals which are being deposited at any moment will, therefore, necessarily change as solidification proceeds, following the change in the composition of the liquid, and the temperature will fall until the last portions of the liquid to solidify will consist chiefly of the more fusible constituent, at the F.P. of which the solidification will be complete. If, however, as seems to be frequently the case, the composition of the solid and liquid phases do not greatly differ from each other, the greater part of the solidification will occur within a comparatively small range of temperature, and the initial F.P. of the alloy will be well marked. It is possible in this case to draw a second curve representing the composition of the *solid* phase which is in equilibrium with the liquid at any temperature. This curve will not represent the average composition of the crystals, but that of the outer coating only which is in equilibrium with the liquid at the moment. H. W. B. Roozeboom (*Zeit. Phys. Chem.* xxx. p. 385) has attempted to classify some of the possible cases which may occur in the formation of mixed crystals on the basis of J. W. Gibbs's thermodynamic potential, the general properties of which may be qualitatively deduced from a consideration of observed phenomena. But although this method may enable us to classify different types, and even to predict results in a qualitative manner, it does not admit of numerical calculation similar to equation (8), as the Gibbs's function itself is of a purely abstract nature and its form is unknown. There is no doubt that the formation of mixed crystals may explain many apparent anomalies in the study of F.P. curves. The whole subject has been most fruitful of results in recent years, and appears full of promise for the future.

For further details in this particular branch the reader may consult a report by Neville (*Brit. Assoc. Rep.*, 1900), which contains numerous references to original papers by Roberts-Austen, Le Chatelier, Roozeboom and others. For the properties of solutions see SOLUTION. (H. L. C.)

FÜSSEN, a town of Germany, in the kingdom of Bavaria, at the foot of the Alps (Tirol), on the Lech, 2500 ft. above the sea, with a branch line to Oberdorf on the railway to Augsburg. Pop. 4000. It has six Roman Catholic churches, a Franciscan monastery and a castle. Rope-making is an important industry. The castle, lying on a rocky eminence, is remarkable for the peace signed here on the 22nd of April 1745 between the elector Maximilian III., Joseph of Bavaria and Maria Theresa. Two miles to the S.E., immediately on the Austrian frontier, romantically situated on a rock overlooking the Schwanensee, is the magnificent castle of Hohenschwangau, and a little to the north, on the site of an old castle, that of Neuschwanstein, built by Louis II. of Bavaria.

See H. Feistle, *Füssen und Umgebung* (1898).

FUST, JOHANN (?–1466), early German printer, belonged to a rich and respectable burgher family of Mainz, which is known to have flourished from 1423, and to have held many civil and religious offices. The name was always written Fust, but in 1506 Johann Schöffer, in dedicating the German translation of Livy to the emperor Maximilian, called his grandfather Faust, and thenceforward the family assumed this name, and the Fausts of Aschaffenburg, an old and quite distinct family, placed Johann Fust in their pedigree. Johann's brother Jacob, a goldsmith, was one of the burgomasters in 1462, when Mainz was stormed and sacked by the troops of Count Adolf of Nassau, on which occasion he seems to have perished (see a document, dated May 8, 1463, published by Wyss in *Quartalbl. des hist. Vereins für Hessen*, 1870, p. 24). There is no evidence that, as is commonly asserted, Johann Fust was a goldsmith, but he appears to have been a money-lender or banker. On account of his connexion with Gutenberg (*q.v.*), he has been represented by some as the inventor of printing, and the instructor as well as the partner of Gutenberg, by others as his patron and benefactor, who saw the value of his discovery and supplied him with means to carry it out, whereas others paint him as a greedy and crafty speculator, who took advantage of Gutenberg's necessity and robbed him of the fruits of his invention. However this may be, the Helmaspergerer document of November 6, 1455, shows that Fust advanced money to Gutenberg (apparently 800 guilders in 1450, and another 800 in 1452) for carrying on his work, and that Fust, in 1455, brought a suit against Gutenberg to recover the money he had lent, claiming 2020 (more correctly 2026) guilders for principal and interest. It appears that he had not paid in the 300 guilders a year which he had undertaken to furnish for expenses, wages, &c., and, according to Gutenberg, had said that he had no intention of claiming interest. The suit was apparently decided in Fust's favour, November 6, 1455, in the refectory of the Barefooted Friars of Mainz, when Fust made oath that he himself had borrowed 1550 guilders and given them to Gutenberg. There is no evidence that Fust, as is usually supposed, removed the portion of the printing materials covered by his mortgage to his own house, and carried on printing there with the aid of Peter Schöffer, of Gernsheim (who is known to have been a scriptor at Paris in 1449), to whom, probably about 1455,[1] he gave his only daughter Dyna or Christina in marriage. Their first publication was the Psalter, August 14, 1457, a folio of 350 pages, the first printed book with a complete date, and remarkable for the beauty of the large initials printed each in two colours, red and blue, from types made in two pieces.[2] The Psalter was reprinted with the same types, 1459 (August 29), 1490, 1502 (Schöffer's last publication) and 1516. Fust and Schöffer's other works are given below.[3] In 1464 Adolf

[1] This date is uncertain; some place the marriage in 1453 or soon after, others about 1464. It is probable that Fust alluded to this relationship when he spoke of Schöffer as *puers mei* in the colophons of Cicero's *De officiis* of 1465 and 1466.

[2] This method was patented in England by Solomon Henry in 1783, and by Sir William Congreve in 1819.

[3] (3) Durandus, *Rationale divinorum officiorum* (1459), folio, 160 leaves; (4) the *Clementine Constitutions*, with the gloss of Johannes Andreae (1460), 51 leaves; (5) *Biblia Sacra Latina* (1462), folio, 2 vols., 242 and 239 leaves, 48 lines to a full page; (6) the Sixth Book of Decretals, with Andreae's gloss, 17th December 1465, folio, 141 leaves; (7) Cicero, *De officiis* (1465), 40, 88 leaves, the first

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of Nassau appointed for the parish of St Quintin three *Baumeisters* (master-builders) who were to choose twelve chief parishioners as assistants for life. One of the first of these "Vervaren," who were named on May-day 1464, was Johannes Fust, and in 1467 Adam von Hochheim was chosen instead of "the late" (*selig*) Johannes Fust. Fust is said to have gone to Paris in 1466 and to have died of the plague, which raged there in August and September. He certainly was in Paris on the 4th of July, when he gave Louis de Lavernade of the province of Forez, then chancellor of the duke of Bourbon and first president of the parliament of Toulouse, a copy of his second edition of Cicero, as appears from a note in Lavernade's own hand at the end of the book, which is now in the library of Geneva. But nothing further is known than that on the 30th of October, probably in 1471, an annual mass was instituted for him by Peter Schöffer, Conrad Henlif (for Henekes, or Henckis, Schöffer's partner? who married Fust's widow about 1468[1]) and Johann Fust (the son), in the abbey-church of St Victor of Paris, where he was buried; and that Peter Schöffer founded a similar memorial service for Fust in 1473 in the church of the Dominicans at Mainz (Bockenheimer, *Gesch. der Stadt Mainz*, iv. 15).

Fust was formerly often confused with the famous magician Dr Johann Faust, who, though an historical figure, had nothing to do with him (see FAUST).

See further the articles GUTENBERG and TYPOGRAPHY. (J. H.)

FUSTEL DE COULANGES, NUMA DENIS (1830–1889), French historian, was born in Paris on the 18th of March 1830, of Breton descent. After studying at the École Normale Supérieure he was sent to the French school at Athens in 1853, directed some excavations in Chios, and wrote an historical account of the island. After his return he filled various educational offices, and took his doctor's degree with two theses, *Quid Vestae cultus in institutis veterum privatis publicisque valuerit* and *Polybe, ou la Grèce conquise par les Romains* (1858). In these works his distinctive qualities were already revealed. His minute knowledge of the language of the Greek and Roman institutions, coupled with his low estimate of the conclusions of contemporary scholars, led him to go direct to the original texts, which he read without political or religious bias. When, however, he had succeeded in extracting from the sources a general idea that seemed to him clear and simple, he attached himself to it as if to the truth itself, employing dialectic of the most penetrating, subtle and even paradoxical character in his deduction of the logical consequences. From 1860 to 1870 he was professor of history at the faculty of letters at Strassburg, where he had a brilliant career as a teacher, but never yielded to the influence exercised by the German universities in the field of classical and Germanic antiquities.

It was at Strassburg that he published his remarkable volume *La Cité antique* (1864), in which he showed forcibly the part played by religion in the political and social evolution of Greece and Rome. Although his making religion the sole factor of this evolution was a perversion of the historical facts, the book was so consistent throughout, so full of ingenious ideas, and written in so striking a style, that it ranks as one of the masterpieces of the French language in the 19th century. By this literary merit Fustel set little store, but he clung tenaciously to his edition of a Latin classic and the first book containing Greek characters, while in the colophon Fust for the first time calls Schöffer "puerum suum"; (8) the *Rationale*, 4th February 1466; (9) *Grammatica rhytmica* (1466), folio, 11 leaves. They also printed in 1461–1462 several papal bulls, proclamations of Adolf of Nassau, &c. Nothing is known to have appeared for three years after the storming and capture of Mainz in 1462.

[1] Some confusion in the history of the Fust family has arisen since the publication of Bernard's *Orig. de l'imprimerie* (1853). On p. 262, vol. i. he gave an extract from the correspondence between Oberlin and Bodmann (now preserved in the Paris Nat. Library), from which it would appear that Peter Schöffer was the son-in-law, not of Johann Fust, but of a brother of his, Conrad Fust. Of the latter, however, no other trace has been found, and he is no doubt a fiction of F. J. Bodmann, who, partly basing himself on the "Conrad" (Henlif, or Henckis) mentioned above, added the rest to gratify Oberlin (see Wyss in *Quartalblätter des hist. Vereins fur Hessen*, 1879. p. 17).

theories. When he revised the book in 1875, his modifications were very slight, and it is conceivable that, had he recast it, as he often expressed the desire to do in the last years of his life, he would not have abandoned any part of his fundamental thesis. The work is now largely superseded.

Fustel de Coulanges was the most conscientious of men, the most systematic and uncompromising of historians. Appointed to a lectureship at the École Normale Supérieure in February 1870, to a professorship at the Paris faculty of letters in 1875, and to the chair of medieval history created for him at the Sorbonne in 1878, he applied himself to the study of the political institutions of ancient France. The invasion of France by the German armies during the war of 1870–71 attracted his attention to the Germanic invasions under the Roman Empire. Pursuing the theory of J. B. Dubos, but singularly transforming it, he maintained that those invasions were not marked by the violent and destructive character usually attributed to them; that the penetration of the German barbarians into Gaul was a slow process; that the Germans submitted to the imperial administration; that the political institutions of the Merovingians had their origins in the Roman laws at least as much as, if not more than, in German usages; and, consequently, that there was no conquest of Gaul by the Germans. This thesis he sustained brilliantly in his *Histoire des institutions politiques de l'ancienne France*, the first volume of which appeared in 1874. It was the author's original intention to complete this work in four volumes, but as the first volume was keenly attacked in Germany as well as in France, Fustel was forced in self-defence to recast the book entirely. With admirable conscientiousness he re-examined all the texts and wrote a number of dissertations, of which, though several (*e.g.* those on the Germanic mark and on the *allodium* and *beneficium*) were models of learning and sagacity, all were dominated by his general idea and characterized by a total disregard for the results of such historical disciplines as diplomatic. From this crucible issued an entirely new work, less well arranged than the original, but richer in facts and critical comments. The first volume was expanded into three volumes, *La Gaule romaine* (1891), *L'Invasion germanique et la fin de l'empire* (1891) and *La Monarchie franque* (1888), followed by three other volumes, *L'Alleu et le domaine rural pendant l'époque mérovingienne* (1889), *Les Origines du système féodal: le bénéfice et le patronat . . .* (1890) and *Les Transformations de la royauté pendant l'époque carolingienne* (1892). Thus, in six volumes, he had carried the work no farther than the Carolingian period. The result of this enormous labour, albeit worthy of a great historian, clearly showed that the author lacked all sense of historical proportion. He was a diligent seeker after the truth, and was perfectly sincere when he informed a critic of the exact number of "truths" he had discovered, and when he remarked to one of his pupils a few days before his death, "Rest assured that what I have written in my book is the truth." Such superb self-confidence can accomplish much, and it undoubtedly helped to form Fustel's talent and to give to his style that admirable concision which subjugates even when it fails to convince; but a student instinctively distrusts an historian who settles the most controverted problems with such impassioned assurance. The dissertations not embodied in his great work were collected by himself and (after his death) by his pupil, Camille Jullian, and published as volumes of miscellanies: *Recherches sur quelques problèmes d'histoire* (1885), dealing with the Roman colonate, the land system in Normandy, the Germanic mark, and the judiciary organization in the kingdom of the Franks; *Nouvelles recherches sur quelques problèmes d'histoire* (1891); and *Questions historiques* (1893), which contains his paper on Chios and his thesis on Polybius.

His life was devoted almost entirely to his teaching and his books. In 1875 he was elected member of the Académie des Sciences Morales, and in 1880 reluctantly accepted the post of director of the École Normale. Without intervening personally in French politics, he took a keen interest in the questions of administration and social reorganization arising from the fall of the imperialist régime and the disasters of the war. He wished

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the institutions of the present to approximate more closely to those of the past, and devised for the new French constitution a body of reforms which reflected the opinions he had formed upon the democracy at Rome and in ancient France. But these were dreams which did not hold him long, and he would have been scandalized had he known that his name was subsequently used as the emblem of a political and religious party. He died at Massy (Seine-et-Oise) on the 12th of September 1889. Throughout his historical career—at the École Normale and the Sorbonne and in his lectures delivered to the empress Eugénie—his sole aim was to ascertain the truth, and in the defence of truth his polemics against what he imagined to be the blindness and insincerity of his critics sometimes assumed a character of harshness and injustice. But, in France at least, these critics were the first to render justice to his learning, his talents and his disinterestedness.

See Paul Guiraud, *Fustel de Coulanges* (1896); H. d'Arbois de Jubainville, *Deux Manières d'écrire l'histoire: critique de Bossuet, d'Augustin Thierry et de Fustel de Coulanges* (1896); and Gabriel Monod, *Portraits et souvenirs* (1897). (C. B.*)

FUSTIAN, a term which includes a variety of heavy woven cotton fabrics, chiefly prepared for men's wear. It embraces plain twilled cloth called jean, and cut fabrics similar to velvet, known as velveteen, moleskin, corduroy, &c. The term was once applied to a coarse cloth made of cotton and flax; now, fustians are usually of cotton and dyed various colours. In the reign of Edward III. the name was given to a woollen fabric. The name is said to be derived from El-Fustat, a suburb of Cairo, where it was first made; and certainly a kind of cloth has long been known under that name. In a petition to parliament, *temp.* Philip and Mary, "fustian of Naples" is mentioned. In the 13th and 14th centuries priests' robes and women's dresses were made of fustian, but though dresses are still made from some kinds the chief use is for labourers' clothes.

FUSTIC (Fr. *fustoc*, from Arab. *fustuq*, Gr. πιστάκη, pistachio) YELLOW WOOD or OLD FUSTIC, a dye-stuff consisting of the wood of *Chlorophora tinctoria*, a large tree of the natural order Moraceae, growing in the West Indies and tropical America. Fustic occurs in commerce in blocks, which are brown without, and of a brownish-yellow within. It is sometimes employed for inlaid work. The dye-stuff termed young fustic or Zante fustic, and also Venetian sumach, is the wood of *Rhus cotinus* (fustet, or smoke tree), a southern European and Asiatic shrub of the natural order Anacardiaceae, called by Gerarde "red sumach," and apparently the "coccygia" and "cotinus" of Pliny (*Nat. Hist.* xiii. 41, xvi. 30). Its colouring matter is fisetin, $C_{15}H_{16}O_6$, which was synthesized by S. von Kostanecki (*Ber.*, 1904, 37, p. 384). (See DYEING.)

FUTURES, a term used in the produce markets for purchases or sales of commodities to be completed at a future date, as opposed to cash or "spot" transactions, which are settled immediately. See MARKET, and (for a detailed discussion of the question as affecting cotton) COTTON: *Marketing and Supply*.

FUX, JOHANN JOSEPH (1660–1741), Austrian musician, was born at Hirtenfeld (Styria) in 1660. Of his youth and early training nothing is known. In 1696 he was organist at one of the principal churches of Vienna, and in 1698 was appointed by the emperor Leopold I. as his "imperial court-composer," with a salary of about £6 a month. At the court of Leopold and of his successors Joseph I. and Charles VI., Fux remained for the rest of his life. To his various court dignities that of organist at St Stephen's cathedral was added in 1704. He married the daughter of the government secretary Schnitzbaum. As a proof of the high favour in which he was held by the art-loving Charles VI., it is told that at the coronation of that emperor as king of Bohemia in 1723 an opera, *La Constanza e la Fortezza*, especially composed by Fux for the occasion, was given at Prague in an open-air theatre. Fux at the time was suffering from gout, but the emperor had him carried in a litter all the way from Vienna, and gave him a seat in the imperial box. Fux died at Vienna on the 13th of February 1741. His life, although passed in the great world, was eventless, and his only troubles arose from the intrigues of his Italian rivals at court. Of the numerous operas which Fux wrote it is unnecessary to speak. They do not essentially differ from the style of the Italian *opera seria* of the time. Of greater importance are his sacred compositions, psalms, motets, oratorios and masses, the celebrated *Missa Canonica* amongst the latter. It is an all but unparalleled *tour de force* of learned musicianship, being written entirely in that most difficult of contrapuntal devices—the canon. As a contrapuntist and musical scholar generally, Fux was unsurpassed by any of his contemporaries, and his great theoretical work, the *Gradus ad Parnassum*, long remained by far the most thorough treatment of counterpoint and its various developments. The title of the original Latin edition is *Gradus ad Parnassum sive manuductio ad compositionem musicae regularem, methodo nova ac certa nondum ante tam exacta ordine in lucem edita, elaborata a Joanne Josepho Fux* (Vienna, 1715). It was translated into most European languages during the 18th century, and is still studied by musicians interested in the history of their art. The expenses of the publication were defrayed by the emperor Charles VI.

Fux's biography was published by Ludwig von Köchel (Vienna, 1871). It is based on minute original research and contains, amongst other valuable materials, a complete catalogue of the composer's numerous works.

FUZE or FUSE, an appliance for firing explosives in blasting operations, military shells, &c. (see BLASTING and AMMUNITION, § *Shell*). The spelling is not governed by authority, but modern convenience has dictated the adoption of the "*z*" by military engineers as a general rule, in order to distinguish this sense from that of melting by heat (see below). The word, according to the *New English Dictionary*, is one of the forms in which the Lat. *fusus*, spindle, has been adapted through Romanic into English, the ordinary fuze taking the shape of a spindle-like tube. Similarly the term "fusee" (Fr. *fusée*, spindle full of tow, Late Lat. *fusata*) is applied to a coned spindle sometimes used in the wheel train of watches and spring clocks to equalize the action of the mainspring (see WATCH); and the application of the same term to a special kind of match may also be due to its resemblance to a spindle. Again, in heraldry, another form, "fusil," derived through the French from a Late Lat. diminutive (*fusillus* or *fusellus*) of this same *fusus*, is used of a bearing, an elongated lozenge. According to other etymological authorities, however (see Skeat, *Etym. Dict.*, 1898), "fuze" or "fuse," and "fusee" in the sense of match, are all forms derived through the Fr. *fusil*, from Late Lat. *focile*, steel for striking fire from a flint, from Lat. *focus*, hearth. The Fr. *fusil* and English "fusil" were thus transferred to the "firelock," *i.e.* the light musket of the 17th century (see FUSILIER).

In electrical engineering a "fuse" (always so spelled) is a safety device, commonly consisting of a strip or wire of easily fusible metal, which melts and thus interrupts the circuit of which it forms part, whenever that circuit, through some accident or derangement, is caused to carry a current larger than that for which it is intended. In this sense the word must be connected with *fusus*, the past participle of Lat. *fundere*, to pour, whence comes the verb "fuse," to melt by heat, often used figuratively in the sense of blend, mix.

FYNE, LOCH, an inlet of the sea, Argyllshire, Scotland. From the head, 6 m. above Inveraray, to the mouth on the Sound of Bute, it has a south-westerly and then southerly trend and is 44 m. long, its width varying from ½ m. to 6 m. It receives the Fyne, Shira, Aray and many other streams, and, on the western side, gives off Lochs Shira, Gair, Gilp (with Ardrishaig, the Crinan Canal and Lochgilphead) and East Tarbert (with Tarbert village). The glens debouching on the lake are Fyne, Shira, Aray, Kinglas and Hell's Glen. The coast generally is picturesque and in many parts well wooded. All vessels using the Crinan Canal navigate the loch to and from Ardrishaig, and there are daily excursions during the season, as far up as Inveraray. There are ferries at St Catherine's and Otter, and piers at Tarbert, Ardrishaig, Kilmory, Crarae, Furnace, Inveraray, Strachur and elsewhere. The industries comprise granite quarrying at Furnace

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and Crarae, distilling at Ardrishaig, gunpowder-making at Furnace and Kilfinan, and, above all, fishing. Haddock, whiting and codling are taken, and the famous "Loch Fyne herrings" command the highest price in the market.

FYRD, the name given to the English army, or militia, during the Anglo-Saxon period (see ARMY, 60). It is first mentioned in the *Anglo-Saxon Chronicle* under the date 605. The ealdorman, or sheriff, of the shire was probably charged with the duty of calling out and leading the fyrd, which appears always to have retained a local character, as during the time of the Danish invasions we read of the fyrd of Kent, of Somerset and of Devon. As attendance at the fyrd was included in the *trinoda necessitas* it was compulsory on all holders of land; but that it was not confined to them is shown by the following extract from the laws of Ine, king of the West Saxons, dated about 690, which prescribes the penalty for the serious offence of neglecting the fyrd: "If a *gesithcund* man owning land neglect the fyrd, let him pay 120 shillings, and forfeit his land; one not owning land 60 shillings; a ceorlish man 30 shillings as *fyrdwite*." The fyrd was gradually superseded by the gathering of the thegns and their retainers, but it was occasionally called out for defensive purposes even after the Norman Conquest.

FYT, JOHANNES (1609–1661), Belgian animal painter, was born at Antwerp and christened on the 19th of August 1609. He was registered apprentice to Hans van den Berghe in 1621. Professionally van den Berghe was a restorer of old pictures rather than a painter of new ones. At twenty Johannes Fyt entered the gild of St Luke as a master, and from that time till his death in 1661 he produced a vast number of pictures in which the bold facility of Snyders is united to the powerful effects of Rembrandt, and harmonies of gorgeous tone are not less conspicuous than freedom of touch and a true semblance of nature. There never was such a master of technical processes as Fyt in the rendering of animal life in its most varied forms. He may have been less correct in outline, less bold in action than Snyders, but he was much more skilful and more true in the reproduction of the coat of deer, dogs, greyhounds, hares and monkeys, whilst in realizing the plumage of peacocks, woodcocks, ducks, hawks, and cocks and hens, he had not his equal, nor was any artist even of the Dutch school more effective in relieving his compositions with accessories of tinted cloth, porcelain ware, vases and fruit. He was not clever at figures, and he sometimes trusted for these to the co-operation of Cornelius Schut or Willeborts, whilst his architectural backgrounds were sometimes executed by Quellyn. "Silenus amongst Fruit and Flowers," in the Harrach collection at Vienna, "Diana and her Nymphs with the Produce of the Chase," in the Belvedere at Vienna, and "Dead Game and Fruit in front of a Triumphal Arch," belonging to Baron von Rothschild at Vienna, are specimens of the co-operation respectively of Schut, Willeborts and Quellyn. They are also Fyt's masterpieces. The earliest dated work of the master is a cat grabbing at a piece of dead poultry near a hare and birds, belonging to Baron Cetto at Munich, and executed in 1644. The latest is a "Dead Snipe with Ducks," of 1660, sold with the Jäger collection at Cologne in 1871. Great power is shown in the bear and boar hunts at Munich and Ravensworth castle. A "Hunted Roedeer with Dogs in the Water," in the Berlin Museum, has some of the life and more of the roughness of Snyders, but lacks variety of tint and finish. A splendid specimen is the Page and Parrot near a table covered with game, guarded by a dog staring at a monkey, in the Wallace collection. With the needle and the brush Fyt was equally clever. He etched 16 plates, and those representing dogs are of their kind unique.

FYZABAD, or FAIZABAD, a city, district and division of British India in the United Provinces. The city stands on the left bank of the river Gogra, 78 m. by rail E. of Lucknow. Pop. (1901) 75,085. To the E. of Fyzabad, and now forming a suburb, is the ancient site of Ajodhya (*q.v.*). Fyzabad was founded about 1730 by Sa'adat Ali Khan, the first nawab wazir of Oudh, who built a hunting-lodge here. It received its present name in the reign of his successor; and Shuja-ud-daula, the third nawab, laid out a large town and fortified it, and here he was buried. It was afterwards the residence of the Begums of Oudh, famous in connexion with the impeachment of Warren Hastings. When the court of Oudh was removed to Lucknow in 1775 all the leading merchants and bankers abandoned the place. At the census of 1869 Fyzabad contained only 37,804 inhabitants; but it is now again advancing in prosperity and population. On the outbreak of the Mutiny in 1857, the cantonment contained two regiments of infantry, a squadron of cavalry, and a light field battery of artillery—all natives. Owing to their threatening demeanour after the Meerut massacre, many of the European women and children were sheltered by one of the great landholders of Oudh, and others were sent to less disturbed parts of the country. The troops rose, as was anticipated, and although they at first permitted their officers to take boats and proceed towards Dinapur, a message was afterwards sent to a rebel force lower down the river to intercept the fugitives. Of four boats, one, having passed the rebels unnoticed, succeeded in reaching Dinapur safely. Of those in the other three boats, one alone escaped. Fyzabad is now a station for European as well as for native troops. It is the headquarters of a brigade in the 8th division of the northern army. There is a government college. Sugar-refining and trade in agricultural produce are important.

The DISTRICT OF FYZABAD, lying between the two great rivers Gogra and Gumti, has an area of 1740 sq. m. It is entirely alluvial and well wooded, and has a good climate. Pop. (1901) 1,225,374, an increase of ·7% in the decade. The district is traversed throughout its length by the Oudh and Rohilkhand railway from Lucknow to Benares, with a branch to Allahabad. Tanda, with a population in 1901 of 19,853, has the largest production of cotton goods in Oudh.

The DIVISION OF FYZABAD has an area of 12,113 sq. m., and comprises the six districts of Fyzabad, Gonda, Bahraich, Sultanpur, Partabgarh and Bara Banki. Pop. (1901) 6,855,991, an increase of 2% in the decade.

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The form of this letter which is familiar to us is an invention of the Romans, who had previously converted the third symbol of the alphabet into a representative of a *k*-sound (see C). Throughout the whole of Roman history C remained as the symbol for G in the abbreviations C and Cn. for the proper names Gaius and Gnaeus. According to Plutarch (*Roman Questions*, 54, 59) the symbol for G was invented by Spurius Carvilius Ruga about 293 B.C. This probably means that he was the first person to spell his cognomen RVGA instead of RVCA. G came to occupy the seventh place in the Roman alphabet which had earlier been taken by Z, because between 450 B.C. and 350 B.C. the *z*-sounds of Latin passed into *r*, names like *Papisius* and *Fusius* in that period becoming Papirius and Furius (see Z), so that the letter *z* had become superfluous. According to the late writer Martianus Capella *z* was removed from the alphabet by the censor Appius Claudius Caecus in 312 B.C. To Claudius the insertion of G into the alphabet is also sometimes ascribed.

In the earliest form the difference from C is very slight, the lower lip of the crescent merely rising up in a straight line C, but G and G are found also in republican times. In the earliest Roman-inscription which was found in the Forum in 1899 the form is ↄ written from right to left, but the hollow at the bottom lip of the crescent is an accidental pit in the stone and not a diacritical mark. The unvoiced sound in this inscription is represented by K. The use of the new form was not firmly established till after the middle of the 3rd century B.C.

In the Latin alphabet the sound was always the voiced stop (as in *gig*) in classical times. Later, before *e*, *g* passed into a sound like the English *y*, so that words begin indifferently with *g* or *j*; hence from the Lat. *generum* (accusative) and *Ianuarium* we have in Ital. *genero* and *Gennajo*, Fr. *gendre* and *janvier*. In the ancient Umbrian dialect *g* had made this change between vowels before the Christian era, the inhabitant of *Iguvium* (the modern Gubbio) being in the later form of his native speech *Iuvins*, Lat. *Iguvinus*. In most cases in Mid. Eng. also *g* passed into a *y* sound; hence the old prefix *ge* of the past participle appears only as *y* in *yclept* and the like. But *ng* and *gg* took a different course, the *g* becoming an affricate *dz* (*dzh*), as in *singe*, *ridge*, *sedge*, which in English before 1500 were *senge*, *rigge*, *segge*, and in Scotch are still pronounced *sing*, *rig*, *seg*. The affricate in words like *gaol* is of French origin (*geôle*), from a Late Lat. *gabiola*, out of *caveola*, a diminutive of the Lat. *cavea*.

The composite origin of English makes it impossible to lay down rules for the pronunciation of English *g*; thus there are in the language five words *Gill*, three of which have the *g* hard, while two have it soft: viz. (1) *gill* of a fish, (2) *gill*, a ravine, both of which are Norse, and (3) *Gill*, the surname, which is mostly Gaelic = White; and (4) *gill* a liquid measure, from O. Fr. *gelle*, Late Lat. *gella* in the same sense, and (5) *Gill*, a girl's name, shortened from *Gillian*, *Juliana* (see Skeat's *Etymological Dictionary*). No one of these words is of native origin; otherwise the initial *g* would have changed to *y*, as in Eng. *yell* from the O. Eng. *gellan*, *giellan*. (P. Gi.)

GABBRO, in petrology, a group of plutonic basic rocks, holocrystalline and usually rather coarse-grained, consisting essentially of a basic plagioclase felspar and one or more ferromagnesian minerals (such as augite, hornblende, hypersthene and olivine). The name was given originally in north Italy to certain coarsely crystalline dark green rocks, some of which are true gabbros, while others are serpentines. The gabbros are the plutonic or deep-seated representatives of the dolerites, basalts and diabases (also of some varieties of andesite) with which they agree closely in mineral composition, but not in minute structure. Of their minerals felspar is usually the most abundant, and is principally labradorite and bytownite, though anorthite occurs in some, while oligoclase and orthoclase have been found in others. The felspar is sometimes very clear and fresh, its crystals being for the most part short and broad, with rather irregular or rounded outlines. Albite twinning is very frequent, but in these rocks it is often accompanied by pericline twinning by which the broad or narrow albite plates are cut transversely by many thin, bright and dark bars as seen in polarized light. Equally characteristic of the gabbros is the alteration of the felspars to cloudy, semi-opaque masses of saussurite. These are compact, tough, devoid of cleavage, and have a waxy lustre and usually a greenish-white colour. When this substance can be resolved by the microscope it proves to consist usually of zoisite or epidote, with garnet and albite, but mixed with it are also chlorite, amphibole, serpentine, prehnite, sericite and other minerals. The augite is usually brown, but greenish, violet and colourless varieties may occur. Hypersthene, when present, is often strikingly pleochroic in colours varying from pink to bright green. It weathers readily to platy-pseudomorphs of bastite which are soft and yield low polarization colours. The olivine is colourless in itself, but in most cases is altered to green or yellow serpentine, often with bands of dark magnetite granules along its cleavages and cracks. Hornblende when primary is often brown, and may surround augite or be perthitically intergrown with it; original green hornblende probably occurs also, though it is more frequently secondary. Dark-brown biotite, although by no means an important constituent of these rocks, occurs in many of them. Quartz is rare, but is occasionally seen intergrown with felspar as micropegmatite. Among the accessory minerals may be mentioned apatite, magnetite, ilmenite, picotite and garnet.

A peculiar feature, repeated so constantly in many of the minerals of these rocks as to be almost typical of them, is the occurrence of small black or dark brown enclosures often regularly arranged parallel to certain crystallographic planes. Reflection of light from the surfaces of these minute enclosures produces a shimmering or *Schiller*. In augite or hypersthene the effect is that the surface of the mineral has a bronzy sub-metallic appearance, and polished plates seen at a definite angle yield a bright coppery-red reflection, but polished sections of the felspars may exhibit a brilliant play of colours, as is well seen in the Labrador spar, which is used as an ornamental or semi-precious stone. In olivine the black enclosures are not thin laminae, but branching growths resembling pieces of moss. The phenomenon is known as "schillerization"; its origin has been much discussed, some holding that it is secondary, while others regard these enclosures as original.

In many gabbros there is a tendency to a centric arrangement of the minerals, the first crystallized forming nuclei around which the others grow. Thus magnetite, apatite and picotite, with olivine, may be enclosed in augite, hornblende, and hypersthene, sometimes with a later growth of biotite, while the felspars occupy the interspaces between the clusters of ferromagnesian minerals. In some cases there are borders around olivine consisting of fibrous hornblende or tremolite and rhombic pyroxene (kelyphitic or ocellar structures); spinels and garnet may occur in this zone, and as it is developed most frequently where olivine is in contact with felspar it may be due to a chemical resorption at a late stage in the solidification of the rock. In some gabbros and norites reaction rims of fibrous hornblende are found around both hypersthene and diallage where these are in contact with felspar. Typical orbicular structure such as characterizes some granites and diorites is rare in the gabbros, though it has been observed in a few instances in Norway, California, &c.

In a very large number of the rocks of this group the plagioclase felspar has crystallized in large measure before the pyroxene, and is enveloped by it in ophitic manner exactly as occurs in the diabases. When these rocks become fine-grained they pass gradually into ophitic diabase and dolerite; only very rarely does olivine enclose

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felspar in this way. A fluxion structure or flow banding also can be observed in some of the rocks of this series, and is characterized by the occurrence of parallel sinuous bands of dark colour, rich in ferromagnesian minerals, and of lighter shades in which felspars predominate.

These basic holocrystalline rocks form a large and numerous class which can be subdivided into many groups according to their mineral composition; if we take it that typical gabbro consists of plagioclase and augite or diallage, norite of plagioclase and hypersthene, and troctolite of plagioclase and olivine, we must add to these olivine-gabbro and olivine-norite in which that mineral occurs in addition to those enumerated above. Hornblende-gabbros are distinctly rare, except when the hornblende has been developed from pyroxene by pressure and shearing, but many rocks may be described as hornblende- or biotite-bearing gabbro and norite, when they contain these ingredients in addition to the normal minerals

	SiO_2	TiO_2	Ab_2O_3	FeO	Fe_2O_3	MgO	CaO	Na_2O	K_2O	H_2O
I.	49·63	1·75	16·18	12·03	1·92	5·38	9·33	1·89	0·81	0·55
II.	49·90	..	16·04	..	7·81	10·08	14·48	1·69	0·55	1·46
III.	45·73	..	22·10	3·51	0·71	11·10	9·26	2·54	0·34	4·38
IV.	46·24	..	29·85	2·12	1·30	2·41	16·24	1·98	0·18	..

plagioclase, augite and hypersthene. We may recognize also quartz-gabbro and quartz-norite (containing primary quartz or micropegmatite) and orthoclase-gabbro (with a little orthoclase). The name eucrite has been given to gabbros in which the felspar is mainly anorthite; many of them also contain hypersthene or enstatite and olivine, while allivalites are anorthite-olivine rocks in which the two minerals occur in nearly equal proportions; harrisites have preponderating olivine, anorthite felspar and a little pyroxene. In areas of gabbro there are often masses consisting nearly entirely of a single mineral, for example, felspar rocks (anorthosites), augite or hornblende rocks (pyroxenites and hornblendites), olivine rocks (dunite or peridodites). Segregations of iron ores, such as ilmenite, usually with pyroxene or olivine, occur in association with some gabbro and anorthosite masses.

Some gabbros are exceedingly coarse-grained and consist of individual crystals several inches in length; such a type often form dikes or veins in serpentine or gabbro, and may be called gabbro-pegmatite. Very fine-grained gabbros, on the other hand, have been distinguished as beerbachites. Still more common is the occurrence of sheared, foliated or schistose forms of gabbro. In these the minerals have a parallel arrangement, the felspars are often broken down by pressure into a mosaic of irregular grains, while greenish fibrous or bladed amphibole takes the place of pyroxene and olivine. The diallage may be present as rounded or oval crystals around which the crushed felspar has flowed (augen-gabbro); or the whole rock may have a well-foliated structure (hornblende-schists and amphibolites). Very often a mass of normal gabbro with typical igneous character passes at its margin or along localized zones into foliated rocks of this kind, and every transition can be found between the different types. Some authors believe that the development of saussurite from felspar is also dependent on pressure rather than on weathering, and an analogous change may affect the olivine, replacing it by talc, chlorite, serpentine and garnet. Rocks showing structures of the latter type have been described from Switzerland under the name allalinites.

Rocks of the gabbro group, though perhaps not so common nor occurring in so great masses as granites, are exceedingly widespread. In Great Britain, for example, there are areas of gabbro in Shetland, Aberdeenshire, and other parts of the Highlands, Ayrshire, the Lizard (Cornwall), Carrock Fell (Cumberland) and St David's (Wales). Most of these occur in association with troctolites, norites, serpentine and peridotite. In Skye an interesting group of fresh olivine-gabbros is found in the Cuillin Hills; here also peridotites occur and there are sills and dikes of olivine-dolerite, while a great series of basaltic lavas and ash beds overlies the site of volcanic outbursts in early Tertiary time. In this case it is clearly seen that the gabbros are the deep-seated and slowly crystallized representatives of the basalts which were poured out at the surfaces, and the dolerites which consolidated in fissures. The older gabbros of Britain, such as those of the Lizard, Aberdeenshire and Ayrshire, are often more or less foliated and show a tendency to pass into hornblende-schists and amphibolites. In Germany gabbros are well known in the Harz Mountains, Saxony, the Odenwald and the Black Forest. Many outcrops of similar rocks have been found in the northern zones of the Alps, often with serpentine and hornblende-schist. They occupy considerable tracts of country in Norway and Sweden, as for instance in the vicinity of Bergen. The Pyrenees, Ligurian Alps, Dauphiné and Tuscany are other European localities for gabbro. In Canada great portions of the eastern portion of the Dominion are formed of gabbros, norite, anorthosite and allied rock types. In the United States gabbros and norites occur near Baltimore and near Peekskill on the Hudson river. The main bulk of these occurs, however, contains a diversity of petrographical types, which appear also in certain of the others; but there is often a well-marked individuality about the rocks of the various districts in which gabbros are found.

From an economic standpoint gabbros are not of great importance. They are used locally for building and for road-metal, but are too dark in colour, too tough and difficult to dress, to be popular as building stones, and, though occasionally polished, are not to be compared for beauty with the serpentines and the granites. Segregations of iron ores are found in connexion with many of them (Norway and Sweden) and are sometimes mined as sources of the metal.

Chemically the gabbros are typical rocks of the basic subdivision and show the characters of that group in the clearest way. They have low silica, much iron and magnesia, and the abundance of lime distinguishes them in a marked fashion from both the granites and the peridotites. A few analyses of well-known gabbros are cited here.

I. Gabbro, Radanthal, Harzburg; II. Gabbro, Penig, Saxony; III. Troctolite, Coverack, Cornwall; IV. Anorthosite, mouth of the Seine river, Bad Vermilion lake, Ontario, Canada. (J. S. F.)

GABEL, KRISTOFFER (1617–1673), Danish statesman, was born at Glückstadt, on the 6th of January 1617. His father, Wulbern, originally a landscape painter and subsequently recorder of Glückstadt, was killed at the siege of that fortress by the Imperialists in 1628. Kristoffer is first heard of in 1639, as overseer and accountant at the court of Duke Frederick. When the duke ascended the Danish throne as Frederick III., Gabel followed him to Copenhagen as his private secretary and man of business. Gabel, who veiled under a mysterious reticence considerable financial ability and uncommon shrewdness, had great influence over the irresolute king. During the brief interval between King Charles X.'s first and second attack upon Denmark, Gabel was employed in several secret missions to Sweden; and he took a part in the intrigues which resulted in the autocratic revolution of 1660 (see DENMARK: *History*). His services on this occasion have certainly been exaggerated; but if not the originator of the revolution, he was certainly the chief intermediary between Frederick III. and the conjoined Estates in the mysterious conspiracy which established absolutism in Denmark. His activity on this occasion won the king's lifelong gratitude. He was enriched, ennobled, and in 1664 made governor of Copenhagen. From this year must be dated his open and official influence and power, and from 1660 to 1670 he was the most considerable personage at court, and very largely employed in financial and diplomatic affairs. When Frederick III. died, in February 1670, Gabel's power was at an end. The new ruler, Christian V., hated him, and accusations against him poured in from every quarter. When, on the 18th of April 1670, he was dismissed, nobody sympathized with the man who had grown wealthy at a time when other people found it hard to live. He died on the 13th of October 1673.

See Carl Frederik Bricka, *Dansk. Biograf. Lex.* art "Gabel" (Copenhagen, 1887, &c.); *Danmarks Riges Historie* (Copenhagen, 1897–1905), vol. v.

GABELENTZ, HANS CONON VON DER (1807–1874), German linguist and ethnologist, born at Altenburg on the 13th of October 1807, was the only son of Hans Karl Leopold von der Gabelentz, chancellor and privy-councillor of the duchy of Altenburg. From 1821 to 1825 he attended the gymnasium of his native town, where he had Matthiae (the eminent Greek scholar) for teacher, and Hermann Brockhaus and Julius Löbe for schoolfellows. Here, in addition to ordinary school-work, he carried on the private study of Arabic and Chinese; and the latter language continued especially to engage his attention during his undergraduate course, from 1825 to 1828, at the universities of Leipzig and Göttingen. In 1830 he entered the public service of the duchy of Altenburg, where he attained to the rank of privy-councillor in 1843. Four years later he was chosen to fill the post of *Landmarschall* in the grand-duchy of Weimar, and in 1848 he attended the Frankfort parliament, and represented the Saxon duchies on the commission for drafting an imperial constitution for Germany. In November of the same year he became president of the Altenburg ministry, but he resigned office in the following August. From 1851 to 1868 he was president of the second chamber of the duchy of Altenburg; but in the latter year he withdrew entirely from public life, that he

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might give undivided attention to his learned researches. He died on his estate of Lemnitz, in Saxe-Weimar, on the 3rd of September 1874.

In the course of his life he is said to have learned no fewer than eighty languages, thirty of which he spoke with fluency and elegance. But he was less remarkable for his power of acquisition than for the higher talent which enabled him to turn his knowledge to the genuine advancement of linguistic science. Immediately after quitting the university, he followed up his Chinese researches by a study of the Finno-Ugrian languages, which resulted in the publication of his *Éléments de la grammaire mandchoue* in 1832. In 1837 he became one of the promoters, and a joint-editor, of the *Zeitschrift für die Kunde des Morgenlandes*, and through this medium he gave to the world his *Versuch einer mordwinischen Grammatik* and other valuable contributions. His *Grundzüge der syrjänischen Grammatik* appeared in 1841. In conjunction with his old school friend, Julius Löbe, he brought out a complete edition, with translation, glossary and grammar, of Ulfilas's Gothic version of the Bible (1843–1846); and from 1847 he began to contribute to the *Zeitschrift der deutschen morgenländischen Gesellschaft* the fruits of his researches into the languages of the Swahilis, the Samoyedes, the Hazaras, the Aimaks, the Formosans and other widely-separated tribes. The *Beiträge zur Sprachenkunde* (1852) contain Dyak, Dakota, and Kiriri grammars; to these were added in 1857 a *Grammatik u. Wörterbuch der Kassiasprache*, and in 1860 a treatise in universal grammar (*Über das Passivum*). In 1864 he edited the Manchu translations of the Chinese Sse-shu, Shu-king and Shi-king, along with a dictionary; and in 1873 he completed the work which constitutes his most important contribution to philology, *Die melanesischen Sprachen nach ihrem grammatischen Bau und ihrer Verwandschaft unter sich und mit den malaiisch-polynesischen Sprachen untersucht* (1860–1873). It treats of the language of the Fiji Islands, New Hebrides, Loyalty Islands, New Caledonia, &c., and shows their radical affinity with the Polynesian class. He also contributed most of the linguistic articles in Pierer's *Conversations-Lexicon*.

GABELLE (French, from the Med. Lat. *gabulum*, *gablum*, a tax, for the origin of which see GAVELKIND), a term which, in France, was originally applied to taxes on all commodities, but was gradually limited to the tax on salt. In process of time it became one of the most hated and most grossly unequal taxes in the country, but, though condemned by all supporters of reform, it was not abolished until 1790. First imposed in 1286, in the reign of Philip IV., as a temporary expedient, it was made a permanent tax by Charles V. Repressive as a state monopoly, it was made doubly so from the fact that the government obliged every individual above the age of eight years to purchase weekly a minimum amount of salt at a fixed price. When first instituted, it was levied uniformly on all the provinces in France, but for the greater part of its history the price varied in different provinces. There were five distinct groups of provinces, classified as follows: (*a*) the *Pays de grandes gabelles*, in which the tax was heaviest; (*b*) the *Pays de petites gabelles*, which paid a tax of about half the rate of the former; (*c*) the *Pays de salines*, in which the tax was levied on the salt extracted from the salt marshes; (*d*) the *Pays rédimés*, which had purchased redemption in 1549; and (*e*) the *Pays exempts*, which had stipulated for exemption on entering into union with the kingdom of France. *Greniers à sel* (dating from 1342) were established in each province, and to these all salt had to be taken by the producer on penalty of confiscation. The *grenier* fixed the price which it paid for the salt and then sold it to retail dealers at a higher rate.

See J. J. Clamageran, *Histoire de l'impôt en France* (1876); A. Gasquet, *Précis des institutions politiques de l'ancienne France* (1885); Necker, *Compte rendu* (1781).

GABERDINE, or GABARDINE, any long, loose over-garment, reaching to the feet and girt round the waist. It was, when made of coarse material, commonly worn in the middle ages by pilgrims, beggars and almsmen. The Jews, conservatively attached to the loose and flowing garments of the East, continued to wear the long upper garment to which the name "gaberdine" could be applied, long after it had ceased to be a common form as worn by non-Jews, and to this day in some parts of Europe, *e.g.* in Poland, it is still worn, while the tendency to wear the frock-coat very long and loose is a marked characteristic of the race. The fact that in the middle ages the Jews were forbidden to engage in handicrafts also, no doubt, tended to stereotype a form of dress unfitted for manual labour. The idea of the "gaberdine" being enforced by law upon the Jews as a distinctive garment is probably due to Shakespeare's use in the *Merchant of Venice*, I. iii. 113. The mark that the Jews were obliged to wear generally on the outer garment was the badge. This was first enforced by the fourth Lateran Council of 1215. The "badge" (Lat. *rota*; Fr. *rouelle*, wheel) took generally the shape of a circle of cloth worn on the breast. It varied in colour at different times. In France it was of yellow, later of red and white; in England it took the form of two bands or stripes, first of white, then of yellow. In Edward I.'s reign it was made in the shape of the Tables of the Law (see the *Jewish Encyclopedia*, s.v. "Costume" and "Badge"). The derivation of the word is obscure. It apparently occurs first in O. Fr. in the forms *gauverdine*, *galvardine*, and thence into Ital. as *gavardina*, and Span. *gabardina*, a form which has influenced the English word. The *New English Dictionary* suggests a connexion with the O.H. Ger. *wallevart*, pilgrimage. Sleat (*Etym. Dict.*, 1898) refers it to Span. *gaban*, coat, cloak; *cabaña*, hut, cabin.

GABES, a town of Tunisia, at the head of the gulf of the same name, and 70 m. by sea S.W. of Sfax. It occupies the site of the Tacape of the Romans and consists of an open port and European quarter and several small Arab towns built in an oasis of date palms. This oasis is copiously watered by a stream called the Wad Gabes. The European quarter is situated on the right bank of the Wad near its mouth, and adjacent are the Arab towns of Jara and Menzel. The houses of the native towns are built largely of dressed stones and broken columns from the ruins of Tacape. Gabes is the military headquarters for southern Tunisia. The population of the oasis is about 20,000, including some 1500 Europeans. There is a considerable export trade in dates.

Gabes lies at the head of the shat country of Tunisia and is intimately connected with the scheme of Commandant Roudaire to create a Saharan sea by making a channel from the Mediterranean to these shats (large salt lakes below the level of the sea). Roudaire proposed to cut a canal through the belt of high ground between Gabes and the shats, and fixed on Wad Melah, a spot 10 m. N. of Gabes, for the sea end of the channel (see SAHARA). The company formed to execute his project became simply an agricultural concern and by the sinking of artesian wells created an oasis of olive and palm trees.

The Gulf of Gabes, the *Syrtis Minor* of the ancients, is a semi-circular shallow indentation of the Mediterranean, about 50 m. across from the Kerkenna Islands, opposite Sfax on its northern shore, to Jerba Island, which lies at its southern end. The waters of the gulf abound in fish and sponge.

GABII, an ancient city of Latium, between 12 and 13 m. E. of Rome, on the Via Praenestina, which was in early times known as the Via Gabina. The part played by it in the story of the expulsion of the Tarquins is well known; but its importance in the earliest history of Rome rests upon other evidence—the continuance of certain ancient usages which imply a period of hostility between the two cities, such as the adoption of the *cinctus Gabinus* by the consul when war was to be declared. We hear of a treaty of alliance with Rome in the time of Tarquinius Superbus, the original text of which, written on a bullock's skin, was said by Dionysius of Halicarnassus to be still extant in his day. Its subsequent history is obscure, and we only hear of it again in the 1st century B.C. as a small and insignificant place, though its desolation is no doubt exaggerated by the poets. From inscriptions we learn that from the time of Augustus or Tiberius onwards it enjoyed a municipal organization. Its baths were well known, and Hadrian, who was responsible for much of the renewed prosperity of the small towns of Latium, appears to have been a very liberal patron, building a senate-house (*Curia*

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Aelia Augusta) and an aqueduct. After the 3rd century Gabii practically disappears from history, though its bishops continue to be mentioned in ecclesiastical documents till the close of the 9th. The primitive city occupied the eastern bank of the lake, the citadel being now marked by the ruins of the medieval fortress of Castiglione, while the Roman town extended farther to the south. The most conspicuous relic of the latter is a ruined temple, generally attributed to Juno, which had six columns in the front and six on each side. The plan is interesting, but the style of architecture was apparently mixed. To the east of the temple lay the Forum, where excavations were made by Gavin Hamilton in 1792. All the objects found were placed in the Villa Borghese, but many of them were carried off to Paris by Napoleon, and still remain in the Louvre. The statues and busts are especially numerous and interesting; besides the deities Venus, Diana, Nemesis, &c., they comprise Agrippa, Tiberius, Germanicus, Caligula, Claudius, Nero, Trajan and Plotina, Hadrian and Sabina, M. Aurelius, Septimius Severus, Geta, Gordianus Pius and others. The inscriptions relate mainly to local and municipal matters.

See E. Q. Visconti, *Monumenti Gabini della Villa Pinciana* (Rome, 1797, and Milan, 1835); T. Ashby in *Papers of the British School at Rome*, i. 180 seq.; G. Pinza in *Bull. Com.* (1903), 321 seq. (T. As.)

GABINIUS, AULUS, Roman statesman and general, and supporter of Pompey, a prominent figure in the later days of the Roman republic. In 67 B.C., when tribune of the people, he brought forward the famous law (*Lex Gabinia*) conferring upon Pompey the command in the war against the Mediterranean pirates, with extensive powers which gave him absolute control over that sea and the coasts for 50 m. inland. By two other measures of Gabinius loans of money to foreign ambassadors in Rome were made non-actionable (as a check on the corruption of the senate) and the senate was ordered to give audience to foreign envoys on certain fixed days (1st of Feb.–1st of March). In 61 Gabinius, then praetor, endeavoured to win the public favour by providing games on a scale of unusual splendour, and in 58 managed to secure the consulship, not without suspicion of bribery. During his term of office he aided Publius Clodius in bringing about the exile of Cicero. In 57 Gabinius went as proconsul to Syria. On his arrival he reinstated Hyrcanus in the high-priesthood at Jerusalem, suppressed revolts, introduced important changes in the government of Judaea, and rebuilt several towns. During his absence in Egypt, whither he had been sent by Pompey, without the consent of the senate, to restore Ptolemy Auletes to his kingdom, Syria had been devastated by robbers, and Alexander, son of Aristobulus, had again taken up arms with the object of depriving Hyrcanus of the high-priesthood. With some difficulty Gabinius restored order, and in 54 handed over the province to his successor, M. Licinius Crassus. The knights, who as farmers of the taxes had suffered heavy losses during the disturbances in Syria, were greatly embittered against Gabinius, and, when he appeared in the senate to give an account of his governorship, he was brought to trial on three counts, all involving a capital offence. On the charge of *majestas* (high treason) incurred by having left his province for Egypt without the consent of the senate and in defiance of the Sibylline books, he was acquitted; it is said that the judges were bribed, and even Cicero, who had recently attacked Gabinius with the utmost virulence, was persuaded by Pompey to say as little as he could in his evidence to damage his former enemy. On the second charge, that of *repetundae* (extortion during the administration of his province), with especial reference to the 10,000 talents paid by Ptolemy for his restoration, he was found guilty, in spite of evidence offered on his behalf by Pompey and witnesses from Alexandria and the eloquence of Cicero, who had been induced to plead his cause. Nothing but Cicero's wish to do a favour to Pompey could have induced him to take up what must have been a distasteful task; indeed, it is hinted that the half-heartedness of the defence materially contributed to Gabinius's condemnation. The third charge, that of *ambitus* (illegalities committed during his canvass for the consulship), was consequently dropped; Gabinius went into exile, and his property was confiscated. After the outbreak of the civil war, he was recalled by Caesar in 49, and entered his service, but took no active part against his old patron Pompey. After the battle of Pharsalus, he was commissioned to transport some recently levied troops to Illyricum. On his way thither by land, he was attacked by the Dalmatians and with difficulty made his way to Salonae (Dalmatia). Here he bravely defended himself against the attacks of the Pompeian commander, Marcus Octavius, but in a few months died of illness (48 or the beginning of 47).

See Dio Cassius xxxvi. 23-36, xxxviii. 13. 30, xxxix. 55-63; Plutarch, *Pompey*, 25. 48; Josephus, *Antiq.* xiv. 4-6; Appian, *Illyrica*, 12, *Bell. Civ.* ii. 24. 59; Cicero, *ad Att.* vi. 2, *ad Q. Fratrem*, ii. 13, *Post reditum in senatu*, 4-8, *Pro lege Manilia*, 17, 18, 19; exhaustive article by Bähr in Ersch and Gruber's *Allgemeine Encyclopädie*; and monograph by G. Stocchi, *Aulo Gabinio e i suoi processi* (1892).

GABION (a French word derived through Ital. *gabbione*, *gabbia*, from Lat. *cavea*, a cage), a cylindrical basket without top or bottom, used in revetting fortifications and for numerous other purposes of military engineering. The gabion is filled with earth when in position. The ordinary brushwood gabion in the British service has a diameter of 2 ft. and a height of 2 ft. 9 in. There are several forms of gabion in use, the best known being the Willesden paper band gabion and the Jones iron or steel band gabion.

GABLE, in architecture, the upper portion of a wall from the level of the eaves or gutter to the ridge of the roof. The word is a southern English form of the Scottish *gável*, or of an O. Fr. word *gable* or *jable*, both ultimately derived from O. Norwegian *gafl*. In other Teutonic languages, similar words, such as Ger. *Gabel* and Dutch *gaffel*, mean "fork," cf. Lat. *gabalus*, gallows, which is Teutonic in origin; "gable" is represented by such forms as Ger. *Giebel* and Dutch *gevel*. According to the *New English Dictionary* the primary meaning of all these words is probably "top" or "head," cf. Gr. κεφαλή, and refers to the forking timbers at the end of a roof. The gable corresponds to the pediment in classic buildings where the roof was of low pitch. If the roof is carried across on the top of the wall so that the purlins project beyond its face, they are masked or hidden by a "barge board," but as a rule the roof butts up against the back of the wall which is raised so as to form a parapet. In the middle ages the gable end was invariably parallel to the roof and was crowned by coping stones properly weathered on both sides to throw off the rain. In the 16th century in England variety was given to the outline of the gable by a series of alternating semi-circular and ogee curves. In Holland, Belgium and Scotland a succession of steps was employed, which in the latter country are known as crow gables or corbie steps. In Germany and the Netherlands in the 17th and 18th centuries the step gables assume very elaborate forms of an extremely rococo character, and they are sometimes of immense size, with windows in two or three storeys. Designs of a similar rococo character are found in England, but only in crestings such as those which surmount the towers of Wollaton and the gatehouse of Hardwick Hall.

Gabled Towers, in architecture, are those towers which are finished with gables instead of parapets, as at Sompting, Sussex. Many of the German Romanesque towers are gabled.

GABLER, GEORG ANDREAS (1786–1853), German Hegelian philosopher, son of J. P. Gabler (below), was born on the 30th of July 1786, at Altdorf in Bavaria. In 1804 he accompanied his father to Jena, where he completed his studies in philosophy and law, and became an enthusiastic disciple of Hegel. After holding various educational appointments, he was in 1821 appointed rector of the Bayreuth gymnasium, and in 1830 general superintendent of schools. In 1835 he succeeded Hegel in the Berlin chair. He died at Teplitz on the 13th of September 1853. His works include *Lehrbuch d. philos. Propädeutik* (1st vol., Erlangen, 1827), a popular exposition of the Hegelian system; *De verae philosophiae erga religionem Christianam pictate* (Berlin, 1836), and *Die Hegel'sche Philosophie* (*ib.*, 1843), a defence of the Hegelian philosophy against Trendelenburg.

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GABLER, JOHANN PHILIPP (1753–1826), German Protestant theologian of the school of J. J. Griesbach and J. G. Eichhorn, was born at Frankfort-on-Main on the 4th of June 1753. In 1772 he entered the university of Jena as a theological student. In 1776 he was on the point of abandoning theological pursuits, when the arrival of Griesbach inspired him with new ardour. After having been successively *Repetent* in Göttingen and teacher in the public schools of Dortmund (Westphalia) and Altdorf (Bavaria), he was, in 1785, appointed second professor of theology in the university of Altdorf, whence he was translated to a chair in Jena in 1804, where he succeeded Griesbach in 1812. Here he died on the 17th of February 1826. At Altdorf Gabler published (1791–1793) a new edition, with introduction and notes, of Eichhorn's *Urgeschichte*; this was followed, two years afterwards, by a supplement entitled *Neuer Versuch über die mosaische Schöpfungsgeschichte*. He was also the author of many essays which were characterized by much critical acumen, and which had considerable influence on the course of German thought on theological and Biblical questions. From 1798 to 1800 he was editor of the *Neuestes theologisches Journal*, first conjointly with H. K. A. Hänlein (1762–1829), C. F. von Ammon (1766–1850) and H. E. G. Paulus, and afterwards unassisted; from 1801 to 1804 of the *Journal für theologische Litteratur*; and from 1805 to 1811 of the *Journal für auserlesene theologische Litteratur*.

Some of his essays were published by his sons (2 vols., 1831); and a memoir appeared in 1827 by W. Schröter.

GABLETS (diminutive of "gable"), in architecture, triangular terminations to buttresses, much in use in the Early English and Decorated periods, after which the buttresses generally terminated in pinnacles. The Early English gablets are generally plain, and very sharp in pitch. In the Decorated period they are often enriched with panelling and crockets. They are sometimes finished with small crosses, but oftener with finials.

GABLONZ (Czech, *Jablonec*), a town of Bohemia, Austria, 94 m. N.E. of Prague by rail. Pop. (1900) 21,086, mostly German. It is the chief seat of the glass pearl and imitation jewelry manufacture, and has also an important textile industry, and produces large quantities of hardware, papier mâché and other paper goods.

GABORIAU, ÉMILE (1833–1873), French novelist, was born at Saujon (Charente Inférieure) on the 9th of November 1833. He became secretary to Paul Féval, and, after publishing some novels and miscellaneous writings, found his real gift in *L'Affaire Lerouge* (1866), a detective novel which was published in the *Pays* and at once made his reputation. The story was produced on the stage in 1872. A long series of novels dealing with the annals of the police court followed, and proved very popular. Among them are: *Le Crime d'Orcival* (1867), *Monsieur Lecoq* (1869), *La Vie infernale* (1870), *Les Esclaves de Paris* (1869), *L'Argent des autres* (1874). Gaboriau died in Paris on the 28th of September 1873.

GABRIEL (Heb. גַּבְרִיאֵל, man of God), in the Bible, the heavenly messenger (see ANGEL) sent to Daniel to explain the vision of the ram and the he-goat, and to communicate the prediction of the Seventy Weeks (Dan. viii. 16, ix. 21). He was also employed to announce the birth of John the Baptist to Zacharias, and that of the Messiah to the Virgin Mary (Luke i. 19, 26). Because he stood in the divine presence (see Luke i. 19; Rev. viii. 2; and cf. Tobit xii. 15), both Jewish and Christian writers generally speak of him as an archangel. In the *Book of Enoch* "the four great archangels" are Michael, Uriel, Suriel or Raphael, and Gabriel, who is set over "all the powers" and shares the work of intercession. His name frequently occurs in the Jewish literature of the later post-Biblical period. Thus, according to the Targum Pseudo-Jonathan, he was the man who showed the way to Joseph (Gen. xxxvii. 15); and in Deut. xxxiv. 6 it is affirmed that he, along with Michael, Uriel, Jophiel, Jephephiah and the Metatron, buried the body of Moses. In the Targum on 2 Chron. xxxii. 21 he is named as the angel who destroyed the host of Sennacherib; and in similar writings of a still later period he is spoken of as the spirit who presides over fire, thunder, the ripening of the fruits of the earth and similar processes. In the Koran great prominence is given to his function as the medium of divine revelation, and, according to the Mahommedan interpreters, he it is who is referred to by the appellations "Holy Spirit" and "Spirit of Truth." He is specially commemorated in the calendars of the Greek, Coptic and Armenian churches.

GABRIEL HOUNDS, a spectral pack supposed in the North of England to foretell death by their yelping at night. The legend is that they are the souls of unbaptized children wandering through the air till the day of judgment. They are also sometimes called Gabriel or Gabble Ratchet. A very prosaic explanation of this nocturnal noise is given by J. C. Atkinson in his *Cleveland Glossary* (1868). "This," he writes, "is the name for a yelping sound heard at night, more or less resembling the cry of hounds or yelping of dogs, probably due to large flocks of wild geese which chance to be flying by night."

See further Joseph Lucas, *Studies in Nidderdale* (1882), pp. 156–157.

GABRIELI, GIOVANNI (1557–1612?), Italian musical composer, was born at Venice in 1557, and was a pupil of his uncle Andrea, a distinguished musician of the contrapuntal school and organist of St Mark's. He succeeded Claudio Merulo as first organist of the same church in 1585, and died at Venice either in 1612 or 1613. He was remarkable for his compositions for several choirs, writing frequently for 12 or 16 voices, and is important as an early experimenter in chromatic harmony. It was probably for this reason that he made a special point of combining voices with instruments, being thus one of the founders of choral and orchestral composition. Among his pupils was Heinrich Schütz; and the church of St Mark, from the time of the Gabrielis onwards down to that of Lotti, became one of the most important musical schools in Europe.

See also Winterfeld, *Johann Gabrieli und seine Zeit* (1834).

GABUN, a district on the west coast of Africa, one of the colonies forming French Congo (*q.v.*). It derives its designation from the settlements on the Gabun river or Rio de Gabão. The Gabun, in reality an estuary of the sea, lies immediately north of the equator. At the entrance, between Cape Joinville or Santa Clara on the N. and Cape Pangara or Sandy Point on the S., it has a width of about 10 m. It maintains a breadth of some 7 m. for a distance of 40 m. inland, when it contracts into what is known as the Rio Olambo, which is not more than 2 or 3 m. from bank to bank. Several rivers, of which the Komo is the chief, discharge their waters into the estuary. The Gabun was discovered by Portuguese navigators towards the close of the 15th century, and was named from its fanciful resemblance to a *gabão* or cabin. On the small island of Koniké, which lies about the centre of the estuary, scanty remains of a Portuguese fort have been discovered. The three principal tribes in the Gabun are the Mpongwe, the Fang and the Bakalai.

GACE BRULÉ (d. *c.* 1220), French *trouvère*, was a native of Champagne. It has generally been asserted that he taught Thibaut of Champagne the art of verse, an assumption which is based on a statement in the *Chroniques de Saint-Denis*: "Si fist entre lui [Thibaut] et Gace Brulé les plus belles chançons et les plus délitables et melodieuses qui onque fussent ofes." This has been taken as evidence of collaboration between the two poets. The passage will bear the interpretation that with those of Gace the songs of Thibaut were the best hitherto known. Paulin Paris, in the *Histoire littéraire de la France* (vol. xxiii.), quotes a number of facts that fix an earlier date for Gace's songs. Gace is the author of the earliest known *jeu parti*. The interlocutors are Gace and a count of Brittany who is identified with Geoffrey of Brittany, son of Henry II. of England. Gace appears to have been banished from Champagne and to have found refuge in Brittany. A deed dated 1212 attests a contract between Gatho Brulé (Gace Brulé) and the Templars for a piece of land in Dreux. It seems most probable that Gace died before 1220, at the latest in 1225.

See Gédéon Busken Huet, *Chansons de Gace Brulé*, edited for the Société des anciens textes français (1902), with an exhaustive introduction. Dante quotes a song by Gace, *Ire d'amor qui en mon cuer repaire*, which he attributes erroneously to Thibaut of Navarre (*De vulgari eloquentia*, p. 151, ed. P. Rajna, Florence, 1895).

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GACHARD, LOUIS PROSPER (1800–1885), Belgian man of letters, was born in Paris on the 12th of March 1800. He entered the administration of the royal archives in 1826, and was appointed director-general, a post which he held for fifty-five years. During this long period he reorganized the service, added to the records by copies taken in other European collections, travelled for purposes of study, and carried on a wide correspondence with other keepers of records, and with historical scholars. He also edited and published many valuable collections of state papers; a full list of his various publications was printed in the *Annuaire de l'académie royale de Belgique* by Cb. Piot in 1888, pp. 220-236. It includes 246 entries. He was the author of several historical writings, of which the best known are *Don Carlos et Philippe II* (1867), *Études et notices historiques concernant l'histoire des Pays-Bas* (1863), *Histoire de la Belgique au commencement du XVIIIe siècle* (1880), *Histoire politique et diplomatique de P. P. Rubens* (1877), all published at Brussels. His chief editorial works are the *Actes des états généraux des Pays-Bas 1576–1585* (Brusscls, 1861–1866), *Collection de documents inédits concernant l'histoire de la Belgique* (Brussels, 1833–1835), and the *Relations des ambassadeurs Vénitiens sur Charles V et Philippe II* (Brussels, 1855). Gachard died in Brussels on the 24th of December 1885.

GAD, in the Bible. 1. A prophet or rather a "seer" (cp. 1 Sam. ix 9), who was a companion of David from his early days. He is first mentioned in 1 Sam. xxii. 5 as having warned David to take refuge in Judah, and appears again in 2 Sam. xxiv. 11 seq. to make known Yahweh's displeasure at the numbering of the people. Together with Nathan he is represented in post-exilic tradition as assisting to organize the musical service of the temple (2 Chron. xxix. 25), and like Natban and Samuel he is said to have written an account of David's deeds (1 Chron. xxix. 29); a history of David in accordance with later tradition and upon the lines of later prophetic ideas is far from improbable.

2. Son of Jacob, by Zilpah, Leah's maid; a tribe of Israel (Gen. xxx. 11). The name is that of the god of "luck" or fortune, mentioned in Isa. lxv. 11 (R.V. mg.), and in several names of places, *e.g.* Baal-Gad (Josh. xi. 17, xii. 7), and possibly also in Dibon-Gad, Migdol-Gad and Nahal-Gad.[1] There is another etymology in Gen. xlix. 19, where the name is played on: "Gad, a plundering troop (*gĕdûd*) shall plunder him (*yegudennu*), but he shall plunder at their heels." There are no traditions of the personal history of Gad. One of the earliest references to the name is the statement on the inscription of Mesha, king of Moab (about 850 B.C.), that the "men of Gad" had occupied Ataroth (E. of Dead Sea) from of old, and that the king of Israel had fortified the city. This is in the district ascribed to Reuben, with which tribe the fortunes of Gad were very closely connected. In Numbers xxxii. 34 sqq. the cities of Gad appear to lie chiefly to the south of Hesbbon; in Joshua xiii. 24-28 they lie almost wholly to the north; while other texts present discrepancies which are not easily reconciled with either passage. Possibly some cities were common to both Reuben and Gad, and perhaps others more than once changed hands. That Gad, at one time at least, held territory as far south as Pisgah and Nebo would follow from Deut. xxxiii. 21, if the rendering of the Targums be accepted, "and he looked out the first part for himself, because there was the portion of the buried law-giver." It is certain, however, that, at a late period, this tribe was localized chiefly in Gilead, in the district which now goes by the name of Jebel Jil'ad. The traditions encircling this district point, it would seem, to the tribe having been of Aramaean origin (see the story of Jacob); at all events its position was extremely exposed, and its population at the best must have been a mixed one. Its richness and fertility made it a prey to the marauding nomads of the desert; but the allusion in the Blessing of Jacob gives the tribe a character for bravery, and David's men of Gad (1 Chron. xii. 8) were famous in tradition. Although rarely mentioned by name (the geographical term Gilead is usual), the history of Gad enters into the lives of Jephthah and Saul, and in the wars of Ammon and Moab it must have played some part. It followed Jeroboam in the great revolt against the house of David, and its later fortunes until 734 B.C. (1 Chron. v. 26) would be those of the northern kingdom.

[1] See G. B. Gray, *Heb. Proper Names*, pp. 134 seq., 145.

See, for a critical discussion of the data, H. W. Hogg, *Ency. Bib.* cols. 1579 sqq.; also GILEAD; MANASSEH; REUBEN.

GADAG, or GARAG, a town of British India, in the Dbarwar district of Bombay, 43 m. E. of Dharwar town. Pop. (1901) 30,652. It is an important railway junction on the Southern Mahratta system, with a growing trade in raw cotton, and also in the weaving of cotton and silk. There are factories for ginning and pressing cotton, and a spinning mill. The town contains remains of a number of temples, some of which exhibit fine carving, while inscriptions in them indicate the existence of Gadag as early as the 10th century.

GADARA, an ancient town of the Syrian Decapolis, the capital of Peraea, and the political centre of the small district of Gadaris. It was a Greek city, probably entirely non-Syrian in origin. The earliest recorded event in its history is its capture by Antiochus III. of Syria in 218 B.C.; how long it may have existed before this date is unknown. About twenty years later it was besieged for ten months by Alexander Jannaeus. It was restored by Pompey, and in 30 B.C. was presented by Augustus to Herod the Great; on Herod's death it was reunited to Syria. The coins of the place bear Greek legends, and such inscriptions as have been found on its site are Greek. Its governing and wealthy classes were probably Greek, the common people being Hellenized and Judaized Aramaeans. The community was Hellenistically organized, and though dependent on Syria and acknowledging the supremacy of Rome it was governed by a democratic senate and managed its own internal affairs. In the Jewish war it surrendered to Vespasian, but in the Byzantine period it again flourished and was the seat of a bishop. It was renowned for its hot sulphur baths; the springs still exist and show the remains of bath-houses. The temperature of the springs is 110° F. This town was the birthplace of Meleager the anthologist. There is a confusion in the narrative of the healing of the demoniac between the very similar names *Gadara*, *Gerasa* and *Gergesa*; but the probabilities, both textual and geographical, are in favour of the reading of Mark (*Gerasenes*, ch. v. 1, revised version); and that the miracle has nothing to do with Gadara, but took place at *Kersa*, on the eastern shore of the Sea of Galilee.

Gadara is now represented by *Umm Kais*, a group of ruins about 6 m. S.E. of the Sea of Galilee, and 1194 ft. above the sea-level. There are very fine tombs with carved sarcophagi in the neighbourhood. There are the remains of two theatres and (probably) a temple, and many heaps of carved stones, representing ancient buildings of various kinds. The walls are, or were, traceable for a circuit of 2 m., and there are also the remains of a street of columns. The natives are rapidly destroying the ruins by quarrying building material out of them. (R. A. S. M.)

GADDI, Four painters of the early Florentine school—father, son and two grandsons—bore this name.

1. GADDO GADDI was, according to Vasari, an intimate friend of Cimabue, and afterwards of Giotto. The dates of birth and death have been given as 1239 and about 1312; these are probably too early; he may have been born towards 1260, and may have died in or about 1333. He was a painter and mosaicist, is said to have executed the great mosaic inside the portal of the cathedral of Florence, representing the coronation of the Virgin, and may with more certainty be credited with the mosaics inside the portico of the basilica of S. Maria Maggiore, Rome, relating to the legend of the foundation of that church; their date is probably 1308. In the original cathedral of St Peter in Rome he also executed the mosaics of the choir, and those of the front representing on a colossal scale God the Father, with many other figures; likewise an altarpiece in the church of S. Maria Novella, Florence; these works no longer exist. It is ordinarily held that no picture (as distinct from mosaics) by Gaddo Gaddi is now extant. Messrs Crowe & Cavalcaselle, however, consider that the mosaics of S. Maria Maggiore bear so strong a resemblance in style to four of the frescoes in the upper church of Assisi, representing incidents in the life of St Francis (frescoes 2, 3, 4

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and especially 5, which shows Francis stripping himself, and protected by the bishop), that those frescoes likewise may, with considerable confidence, be ascribed to Gaddi. Some other extant mosaics are attributed to him, but without full authentication. This artist laid the foundation of a very large fortune, which continued increasing, and placed his progeny in a highly distinguished worldly position.

2. Taddeo Gaddi (about 1300–1366, or later), son of Gaddo, was born in Florence, and is usually said to have been one of Giotto's most industrious assistants for a period of 24 years. This can hardly be other than an exaggeration; it is probable that he began painting on his own account towards 1330, when Giotto went to Naples. Taddeo also traded as a merchant, and had a branch establishment in Venice. He was a painter, mosaicist and architect. He executed in fresco, in the Baroncelli (now Giugni) chapel, in the Florentine church of S. Croce, the "Virgin and Child between Four Prophets," on the funeral monument at the entrance, and on the walls various incidents in the legend of the Virgin, from the expulsion of Joachim from the Temple up to the Nativity. In the subject of the "Presentation of the Virgin in the Temple" are the two heads traditionally accepted as portraits of Gaddo Gaddi and Andrea Tafi; they, at any rate, are not likely to be portraits of those artists from the life. On the ceiling of the same chapel are the "Eight Virtues." In the museum of Berlin is an altarpiece by Taddeo, the "Virgin and Child," and some other subjects, dated 1334; in the Naples gallery, a triptych, dated 1336, of the "Virgin enthroned along with Four Saints," the "Baptism of Jesus," and his "Deposition from the Cross"; in the sacristy of S. Pietro a Megognano, near Poggibonsi, an altarpiece dated 1355, the "Virgin and Child enthroned amid Angels." A series of paintings, partly from the life of St Francis, which Taddeo executed for the presses in S. Croce, are now divided between the Florentine Academy and the Berlin Museum; the compositions are taken from or founded on Giotto, to whom, indeed, the Berlin authorities have ascribed their examples. Taddeo also painted some frescoes still extant in Pisa, besides many in S. Croce and other Florentine buildings, which have perished. He deservedly ranks as one of the most eminent successors of Giotto; it may be said that he continued working up the material furnished by that great painter, with comparatively feeble inspiration of his own. His figures are vehement in action, long and slender in form; his execution rapid and somewhat conventional. To Taddeo are generally ascribed the celebrated frescoes—those of the ceiling and left or western wall—in the Cappella degli Spagnuoli, in the church of S. Maria Novella, Florence; this is, however, open to considerable doubt, although it may perhaps be conceded that the designs for the ceiling were furnished by Taddeo. Dubious also are the three pictures ascribed to him in the National Gallery, London. In mosaic he has left some work in the baptistery of Florence. As an architect he supplied in 1336 the plans for the present Ponte Vecchio, and those for the original (not the present) Ponte S. Trinita; in 1337 he was engaged on the church of Or San Michele; and he carried on after Giotto's death the work of the unrivalled Campanile.

3. Agnolo Gaddi, born in Florence, was the son of Taddeo; the date of his birth has been given as 1326, but possibly 1350 is nearer the mark. He was a painter and mosaicist, trained by his father, and a merchant as well; in middle age he settled down to commercial life in Venice, and he added greatly to the family wealth. He died in Florence in October 1396. His paintings show much early promise, hardly sustained as he advanced in life. One of the earliest, at S. Jacopo tra' Fossi, Florence, represents the "Resurrection of Lazarus." Another probably youthful performance is the series of frescoes of the Pieve di Prato—legends of the Virgin and of her Sacred Girdle, bestowed upon St Thomas, and brought to Prato in the 11th century by Michele dei Dagomari; the "Marriage of Mary" is one of the best of this series, the later compositions in which have suffered much by renewals. In S. Croce he painted, in eight frescoes, the legend of the Cross, beginning with the archangel Michael giving Seth a branch from the tree of knowledge, and ending with the emperor Heraclius carrying the Cross as he enters Jerusalem; in this picture is a portrait of the painter himself. Agnolo composed his subjects better than Taddeo; he had more dignity and individuality in the figures, and was a clear and bold colourist; the general effect is laudably decorative, but the drawing is poor, and the works show best from a distance. Various other productions of this master exist, and many have perished. Cennino Cennini, the author of the celebrated treatise on painting, was one of his pupils.

4. Giovanni Gaddi, brother of Agnolo, was also a painter of promise. He died young in 1383.

Vasari, and Crowe and Cavelcaselle can be consulted as to the Gaddi. Other notices appear here and there—such as *La Cappella de' Rinuccini in S. Croce di Firenze*, by G. Ajazzi (1845). (W. M. R.)

GADE, NIELS WILHELM (1817–1890), Danish composer, was born at Copenhagen, on the 22nd of February 1817, his father being a musical instrument maker. He was intended for his father's trade, but his passion for a musician's career, made evident by the ease and skill with which he learnt to play upon a number of instruments, was not to be denied. Though he became proficient on the violin under Wexschall, and in the elements of theory under Weyse and Berggreen, he was to a great extent self-taught. His opportunities of hearing and playing in the great masterpieces were many, since he was a member of the court band. In 1840 his *Aladdin* and his overture of *Ossian* attracted attention, and in 1841 his *Nachklänge aus Ossian* overture gained the local musical society's prize, the judges being Spohr and Schneider. This work also attracted the notice of the king, who gave the composer a stipend which enabled him to go to Leipzig and Italy. In 1844 Gade conducted the Gewandhaus concerts in Leipzig during Mendelssohn's absence, and on the latter's death became chief conductor. In 1848, on the outbreak of the Holstein War, he returned to Copenhagen, where he was appointed organist and conductor of the Musik-Verein. In 1852 he married a daughter of the composer J. P. E. Hartmann. He became court conductor in 1861, and was pensioned by the government in 1876—the year in which he visited Birmingham to conduct his *Crusaders*. This work, and the *Frühlingsfantasie*, the *Erlkönigs Tochter*, *Frühlingsbotschaft* and *Psyche* (written for Birmingham in 1882) have enjoyed a wide popularity. Indeed, they represent the strength and the weakness of Gade's musical ability quite as well as any of his eight symphonies (the best of which are the first and fourth, while the fifth has an obbligato pianoforte part). Gade was distinctly a romanticist, but his music is highly polished and beautifully finished, lyrical rather than dramatic and effective. Much of the pianoforte music, *Aquarellen*, *Spring Flowers*, for instance, enjoyed a considerable vogue, as did the *Novelletten* trio; but Gade's opera *Mariotta* has not been heard outside the Copenhagen opera house. He died at Copenhagen on the 21st of December 1890.

GADOLINIUM (symbol Gd., atomic weight 157·3), one of the rare earth metals (see Erbium). The element was discovered in 1880 in the mineral samarskite by C. Marignac (*Comptes rendus*, 1880, 90, p. 899; *Ann. chim. phys.*, 1880 [5] 20, p. 535). G. Urbain (*Comptes rendus*, 1905, 140, p. 583) separates the metal by crystallizing the double nitrate of nickel and gadolinium. The salts show absorption bands in the ultra-violet. The oxide Gd_2O_3 is colourless (Lecoq de Boisbaudran).

GADSDEN, CHRISTOPHER (1724–1805), American patriot, was born in Charleston, South Carolina, in 1724. His father, Thomas Gadsden, was for a time the king's collector for the port of Charleston. Christopher went to school near Bristol, in England, returned to America in 1741, was afterwards employed in a counting house in Philadelphia, and became a merchant and planter at Charleston. In 1759 he was captain of an artillery company in an expedition against the Cherokees. He was a member of the South Carolina legislature almost continuously from 1760 to 1780, and represented his province in the Stamp Act Congress of 1765 and in the Continental Congress in 1774–1776. In February 1776 he was placed in command of all the military forces of South Carolina, and in October of the same

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year was commissioned a brigadier-general and was taken into the Continental service: but on account of a dispute arising out of a conflict between state and Federal authority resigned his command in 1777. He was lieutenant-governor of his state in 1780, when Charleston was surrendered to the British. For about three months following this event he was held as a prisoner on parole within the limits of Charleston; then, because of his influence in deterring others from exchanging their paroles for the privileges of British subjects, he was seized, taken to St Augustine, Florida, and there, because he would not give another parole to those who had violated the former agreement affecting him, he was confined for forty-two weeks in a dungeon. In 1782 Gadsden was again elected a member of his state legislature; he was also elected governor, but declined to serve on the ground that he was too old and infirm; in 1788 he was a member of the convention which ratified for South Carolina the Federal constitution; and in 1790 he was a member of the convention which framed the new state constitution. He died in Charleston on the 28th of August 1805. From the time that Governor Thomas Boone, in 1762, pronounced his election to the legislature improper, and dissolved the House in consequence, Gadsden was hostile to the British administration. He was an ardent leader of the opposition to the Stamp Act, advocating even then a separation of the colonies from the mother country; and in the Continental Congress of 1774 he discussed the situation on the basis of inalienable rights and liberties, and urged an immediate attack on General Thomas Gage, that he might be defeated before receiving reinforcements.

GADSDEN, JAMES (1788–1858), American soldier and diplomat, was born at Charleston, S.C., on the 15th of May 1788, the grandson of Christopher Gadsden. He graduated at Yale in 1806, became a merchant in his native city, and in the war of 1812 served in the regular U.S. Army as a lieutenant of engineers. In 1818 he served against the Seminoles, with the rank of captain, as aide on the staff of Gen. Andrew Jackson. In October 1820 he became inspector-general of the Southern Division, with the rank of colonel, and as such assisted in the occupation and the establishment of posts in Florida after its acquisition. From August 1821 to March 1822 he was adjutant-general, but, his appointment not being confirmed by the Senate, he left the army and became a planter in Florida. He served in the Territorial legislature, and as Federal commissioner superintended in 1823 the removal of the Seminole Indians to South Florida. In 1832 he negotiated with the Seminoles a treaty which provided for their removal within three years to lands in what is now the state of Oklahoma; but the Seminoles refused to move, hostilities again broke out, and in the second Seminole War Gadsden was quartermaster-general of the Florida Volunteers from February to April 1836. Returning to South Carolina he became a rice planter, and was president of the South Carolina railway. In 1853 President Franklin Pierce appointed him minister to Mexico, with which country he negotiated the so-called "Gadsden treaty" (signed the 30th of December 1853), which gave to the United States freedom of transit for mails, merchandise and troops across the Isthmus of Tehuantepec, and provided for a readjustment of the boundary established by the treaty of Guadalupe Hidalgo, the United States acquiring 45,535 sq. m. of land, since known as the "Gadsden Purchase," in what is now New Mexico and Arizona. In addition, Article XI. of the treaty of Guadalupe Hidalgo, which bound the United States to prevent incursions of Indians from the United States into Mexico, and to restore Mexican prisoners captured by such Indians, was abrogated, and for these considerations the United States paid to Mexico the sum of $10,000,000. Ratifications of the treaty, slightly modified by the Senate, were exchanged on the 30th of June 1854; before this, however, Gadsden had retired from his post. The boundary line between Mexico and the "Gadsden Purchase" was marked by joint commissions appointed in 1855 and 1891, the second commission publishing its report in 1899. Gadsden died at Charleston, South Carolina, on the 25th of December 1858.

An elder brother, CHRISTOPHER EDWARDS GADSDEN (1785–1852), was Protestant Episcopal bishop of South Carolina in 1840–1852.

GADWALL, a word of obscure origin,[1] the common English name of the duck, called by Linnaeus *Anas strepera*, but considered by many modern ornithologists to require removal from the genus *Anas* to that of *Chaulelasmus* or *Ctenorhynchus*, of either of which it is almost the sole species. Its geographical distribution is almost identical with that of the common wild duck or mallard (see DUCK), since it is found over the greater part of the northern hemisphere; but, save in India, where it is one of the most abundant species of duck during the cold weather, it is hardly anywhere so numerous, and both in the eastern parts of the United States and in the British Islands it is rather rare than otherwise. Its habits also, so far as they have been observed, greatly resemble those of the wild duck; but its appearance on the water is very different, its small head, flat back, elongated form and elevated stern rendering it recognizable by the fowler even at such a distance as hinders him from seeing its very distinct plumage. In coloration the two sexes appear almost equally sombre; but on closer inspection the drake exhibits a pencilled grey coloration and upper wing-coverts of a deep chestnut, which are almost wanting in his soberly clad partner. She closely resembles the female of the mallard in colour, but has, like her own male, some of the secondary quills of a pure white, presenting a patch of that colour which forms one of the most readily perceived distinctive characters of the species. The gadwall is a bird of some interest in England, since it is one of the few that have been induced, by the protection afforded them in certain localities, to resume the indigenous position they once filled, but had, through the draining and reclaiming of marshy lands, long since abandoned. In regard to the present species, this fact was due to the efforts of Andrew Fountaine, on whose property, in West Norfolk and its immediate neighbourhood, the gadwall, from 1850, annually bred in increasing numbers. It has been always esteemed one of the best of wild fowl for the table.

(A. N.)

GAEKWAR, or GUICOWAR, the family name of the Mahratta rulers of Baroda (*q.v.*) in western India, which has been converted by the English into a dynastic title. It is derived from the vernacular word for the cow, but it is a mistake to suppose that the family are of the cowherd caste; they belong to the upper class of Mahrattas proper, sometimes claiming a Rajput origin. The dynasty was founded by a succession of three warriors, Damaji I., Pilaji and Damaji II., who established Mahratta supremacy throughout Gujarat during the first half of the 18th century. The present style of the ruler is Maharaja Gaekwar of Baroda.

GAETA (anc. *Caietae Portus*), a seaport and episcopal see of Campania, Italy, in the province of Caserta, from which it is 53 m. W.N.W. by rail via Sparanise. Pop. (1901) 5528. It occupies a lower projecting point of the promontory which forms the S.W. extremity of the Bay of Gaeta. The tomb of Munatius Plancus, on the summit of the promontory (see CAIETAE PORTUS), is now a naval signal station, and lies in the centre of the extensive earthworks of the modern fortifications. The harbour is well sheltered except on the E., but has little commercial importance, being mainly a naval station. To the N.W. is the suburb of Elena (formerly Borgo di Gaeta). Pop. (1901) 10,369. Above the town is a castle erected by the Angevin kings, and strengthened at various periods. The cathedral of St Erasmus (S. Elmo), consecrated in 1106, has a fine campanile begun in

[1] The *New English Dictionary* has nothing to say. Webster gives the etymology *gad well* = go about well. Dr R. G. Latham suggested that it was taken from the syllables *guedul*, of the Lat. *querquedula*, a teal. The spelling "gadwall" seems to be first found in Willughby in 1676, and has been generally adopted by later writers; but Merrett, in 1667, has "gaddel" (*Pinax rerum naturalium Britannicarum*, p. 180), saying that it was so called by bird-dealers. The synonym "gray," given by Willughby and Ray, is doubtless derived from the general colour of the species, and has its analogue in the Icelandic *Grárönd*, applied almost indifferently, or with some distinguishing epithet, to the female of any of the freshwater ducks, and especially to both sexes of the present, in which, as stated in the text, there is comparatively little conspicuous difference of plumage in drake and duck.

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860 and completed in 1279, and a nave and four aisles; the interior has, however, been modernized. Opposite the door of the cathedral is a candelabrum with interesting sculptures of the end of the 13th century, consisting of 48 panels in bas-relief, with 24 representations from the life of Christ, and 24 of the life of St Erasmus (A. Venturi, *Storia dell' arte Italiana*, iii. Milan, 1904, 642 seq.). The cathedral possesses three fine *Exultet* rolls, with miniatures dating from the 11th to the beginning of the 13th century. Behind the high altar is the banner sent by Pope Pius V. to Don John of Austria, the victor of Lepanto. The constable of Bourbon, who fell in the sack of Rome of 1527, is buried here. The other churches are of minor interest; close to that of La Trinità is the Montagna Spaccata, where a vertical fissure from 6 to 15 ft. wide runs right down to the sea-level. Over the chasm is a chapel *del Crocefisso*, the mountain having split, it is said, at the death of Christ.

During the break-up of the Roman empire, Gaeta, like Amalfi and Naples, would seem to have established itself as a practically independent port and to have carried on a thriving trade with the Levant. Its history, however, is obscure until, in 823, it appears as a lordship ruled by hereditary *hypati* or consuls. In 844 the town fell into the hands of the Arabs, but four years later they were driven out with help supplied by Pope Leo IV. In 875 the town was in the hands of Pope John VIII., who gave it to the count of Capua as a fief of the Holy See, which had long claimed jurisdiction over it. In 877, however, the *hypatus* John (Ioannes) II. succeeded in recovering the lordship, which he established as a duchy under the suzerainty of the East Roman emperors. In the 11th century the duchy fell into the hands of the Norman counts of Aversa, afterwards princes of Capua, and in 1135 it was definitively annexed to his kingdom by Roger of Sicily. The town, however, had its own coinage as late as 1229.

In military history the town has played a conspicuous part. Its fortifications were strengthened in the 15th century. On the 30th of September 1707 it was stormed, after a three months' siege, by the Austrians under Daun; and on the 6th of August 1734 it was taken, after a siege of four months, by French, Spanish and Sardinian troops under the future King Charles of Naples. The fortifications were again strengthened; and in 1799 it was temporarily occupied by the French. On the 18th of July 1806 it was captured, after an heroic defence, by the French under Masséna; and on the 18th of July 1815 it capitulated, after a three months' siege, to the Austrians. In November 1848 Pope Pius IX., after his flight in disguise from Rome, found a refuge at Gaeta, where he remained till the 4th of September 1849. Finally, in 1860, it was the scene of the last stand of Francis II. of Naples against the forces of United Italy. Shut up in the fortress with 12,000 men, after Garibaldi's occupation of Naples, the king, inspired by the heroic example of Queen Maria, offered a stubborn resistance, and it was not till the 13th of February 1861 that, the withdrawal of the French fleet having made bombardment from the sea possible, he was forced to capitulate.

See G. B. Federici, *Degli antichi duchi, consoli o ipati della città di Gaeta* (Naples, 1791); Onorato Gaetani d' Aragona, *Mem. stor. della città di Gaeta* (Milan, 1879); C. Ravizza, *Il Golfo di Gaeta* (Novara, 1876). (T. As.)

GAETANI, or CAETANI, the name of the oldest of the Roman princely families which played a great part in the history of the city and of the papacy. The Gaetani are of Longobard origin, and the founder of the house is said to be one Dominus Constantinus Cagetanus, who flourished in the 10th century, but the family had no great importance until the election of Benedetto Gaetani to the papacy as Boniface VIII. in 1204, when they at once became the most notable in the city. The pope conferred on them the fiefs of Sermoneta, Bassiano, Ninfa and San Donato (1297–1300), and the marquisate of Ancona in 1300, while Charles II. of Anjou created the pope's brother count of Caserta. Giordano Loffredo Gaetani by his marriage with Giovanna dell' Aquila, heiress of the counts of Fondi and Traetto, in 1297 added the name of Aquila to his own, and his grandson Giacomo acquired the lordships of Piedimonte and Gioia. The Gaetani proved brave warriors and formed a bodyguard to protect Boniface VIII. from his many foes. During the 14th and 15th centuries their feuds with the Colonna caused frequent disturbances in Rome and the Campagna, sometimes amounting to civil war. They also played an important rôle as Neapolitan nobles. In 1500 Alexander VI., in his attempt to crush the great Roman feudal nobility, confiscated the Gaetani fiefs and gave them to his daughter Lucrezia Borgia (*q.v.*); but they afterwards regained them.

At present there are two lines of Gaetani: (1) Gaetani, princes of Teano and dukes of Sermoneta, founded by Giacobello Gaetani, whose grandson, Guglielmo Gaetani, was granted the duchy of Sermoneta by Pius III. in 1503, the marquisate of Cisterna being conferred on the family by Sixtus V. in 1585. In 1642, Francesco, the 7th duke of Sermoneta, acquired by marriage the county of Caserta, which was exchanged for the principality of Teano in 1750. The present head of the house, Onorato Gaetani, 14th duke of Sermoneta, 4th prince of Teano, duke of San Marco, marquis of Cisterna, &c., is a senator of the kingdom of Italy, and was minister for foreign affairs for a short time. (2) Gaetani dell' Aquila d'Aragona, princes of Piedimonte, and dukes of Laurenzana, founded by Onorato Gaetani dell' Aquila, count of Fondi, Traetto, Alife and Morcone, lord of Piedimonte and Gioia, in 1454. The additional surname of Aragona was assumed after the marriage of Onorato Gaetani, duke of Traetto (d. 1529), with Lucrezia of Aragon, natural daughter of King Ferdinand I. of Naples. The duchy of Laurenzana, in the kingdom of Naples, was acquired by Alfonso Gaetani by his marriage in 1606 with Giulia di Ruggiero, duchess of Laurenzana. The lordship of Piedimonte was raised to a principality in 1715. The present (1908) head of the house is Nicola Gaetani dell' Aquila d'Aragona (b. 1857), 7th prince of Piedimonte and 12th duke of Laurenzana.

See A. von Reumont, *Geschichte der Stadt Rom* (Berlin, 1868); F. Gregorovius, *Geschichte der Stadt Rom* (Stuttgart, 1872); *Almanach de Gotha* (1907 and 1908).

GAETULIA, an ancient district in northern Africa, which in the usage of Roman writers comprised the wandering tribes of the southern slopes of Mount Aures and the Atlas, as far as the Atlantic, and the oases in the northern part of the Sahara. They were always distinguished from the Negro peoples to the south, and beyond doubt belonged to the same Berber race which formed the basis of the population of Numidia and Mauretania (*q.v.*). The tribes to be found there at the present day are probably of the same race, and retain the same wandering habits; and it is possible that they still bear in certain places the name of their Gaetulian ancestors (see Vivien St Martin, *Le Nord de l'Afrique*, 1863). A few only seem to have mingled with the Negroes of the Sahara, if we may thus interpret Ptolemy's allusion to Melano-Gaetuli (4. 6. 5.). They were noted for the rearing of horses, and according to Strabo had 100,000 foals in a single year. They were clad in skins, lived on flesh and milk, and the only manufacture connected with their name is that of the purple dye which became famous from the time of Augustus onwards, and was made from the purple fish found on the coast, apparently both in the Syrtes and on the Atlantic.

We first hear of this people in the Jugurthine War (111–106 B.C.), when, as Sallust tells us, they did not even know the name of Rome. They took part with Jugurtha against Rome; but when we next hear of them they are in alliance with Caesar against Juba I. (*Bell. Afr.* 32). In 25 B.C. Augustus seems to have given a part of Gaetulia to Juba II., together with his kingdom of Mauretania, doubtless with the object of controlling the turbulent tribes; but the Gaetulians rose and massacred the Roman residents, and it was not till a severe defeat had been inflicted on them by Lentulus Cossus (who thus acquired the surname Gaetulicus) in A.D. 6 that they submitted to the king. After Mauretania became a Roman province in A.D. 40, the Roman governors made frequent expeditions into the Gaetulian territory to the south, and the official view seems to be expressed by Pliny (v. 4. 30) when he says that all Gaetulia as far as the Niger and the Ethiopian frontier was reckoned as subject to the

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Empire. How far this represents the fact is not clear; but inscriptions prove that Gaetulians served in the auxiliary troops of the empire, and it may be assumed that the country passed within the sphere of Roman influence, though hardly within the pale of Roman civilization.

For bibliography see AFRICA, ROMAN.

GAGE, LYMAN JUDSON (1836–), American financier, was born at De Kuyter, Madison county, New York, on the 28th of June 1836. He was educated at an academy at Rome, New York, where at the age of seventeen he became a bank clerk. In 1855 he removed to Chicago, served for three years as bookkeeper in a planing-mill, and in 1858 entered the banking house of the Merchant's Loan and Trust Company, of which he was cashier in 1861–1868. Afterwards he became successively assistant cashier (1868), vice-president (1882), and president (1891) of the First National Bank of Chicago, one of the strongest financial institutions in the middle west. He was chosen in 1892 president of the board of directors of the World's Columbian Exposition, the successful financing of which was due more to him than to any other man. In politics he was originally a Republican, and was a delegate to the national convention of the party in 1880, and chairman of its finance committee. In 1884, however, he supported Grover Cleveland for the presidency, and came to be looked upon as a Democrat. In 1892 President Cleveland, after his second election, offered Gage the post of secretary of the treasury, but the offer was declined. In the "free-silver" campaign of 1896 Gage laboured effectively for the election of William McKinley, and from March 1897 until January 1902 he was secretary of the treasury in the cabinets successively of Presidents McKinley and Roosevelt. From April 1902 until 1906 he was president of the United States Trust Company in New York City. His administration of the treasury department, through a more than ordinarily trying period, was marked by a conservative policy, looking toward the strengthening of the gold standard, the securing of greater flexibility in the currency, and a more perfect adjustment of the relations between the government and the National banks.

GAGE, THOMAS (1721–1787), British general and governor of Massachusetts, second son of the first Viscount Gage, was born in 1721. He entered the army in 1741 and saw service in Flanders and in the campaign of Culloden, becoming lieutenant-colonel in the 44th foot in March 1751. In 1754 he served in America, and he took part in the following year in General Braddock's disastrous expedition. In 1758 he became colonel of a new regiment, and served in Amherst's operations against Montreal. He was made governor of Montreal, and promoted major-general in 1761, and in 1763 succeeded Amherst in the command of the British forces in America; in 1770 he was made a lieutenant-general. In 1774 he was appointed governor of Massachusetts, and in that capacity was entrusted with carrying into effect the Boston Port Act. The difficulties which surrounded him in the execution of his office at this time of the gravest unrest culminated in 1775, and the action of the 19th of April at Lexington initiated the American War of Independence. After the battle of Bunker Hill, Gage was superseded by General (Sir William) Howe, and returned to England. He became general in 1782, and died on the 2nd of April 1787.

GAGE, a pledge, something deposited as security for the performance of an agreement, and liable to be forfeited on failure to carry it out. The word also appears in "engage," and is taken from the O. Fr., as are "wage," payment for services, and "wager," bet, stake, from the collateral O. Fr. *waige*. These two words are from the Low Lat. *wadiare*, *vadiare*, to pledge, *vadium*, classical Lat. *vas*, *vadis*, but may be from the old Teutonic cognate base seen in Gothic *wadi*, a pledge (cf. Ger. *wetten*, to wager); this Teutonic base is seen in Eng. "wed," to marry, *i.e.* to engage by a pledge (cf. Goth. *gawadjon*, to betrothe). A particular form of giving a "gage" or pledge was that of throwing down a glove or gauntlet as a challenge to a judicial combat, the glove being the "pledge" that the parties would appear on the field; hence the common phrase "to throw down the gage of defiance" for any challenge (see GLOVE and WAGER).

GAGERN, HANS CHRISTOPH ERNST, BARON VON (1766–1852), German statesman and political writer, was born at Kleinniedesheim, near Worms, on the 25th of January 1766. After studying law at the universities of Leipzig and Göttingen, he entered the service of the prince of Nassau-Weilburg, whom in 1791 he represented at the imperial diet. He was afterwards appointed the prince's envoy at Paris, where he remained till the decree of Napoleon, forbidding all persons born on the left side of the Rhine to serve any other state than France, compelled him to resign his office (1811). He then retired to Vienna, and in 1812 he took part in the attempt to excite a second insurrection against Napoleon in Tirol. On the failure of this attempt he left Austria and joined the headquarters of the Prussian army (1813), and became a member of the board of administration for north Germany. In 1814 he was appointed administrator of the Orange principalities; and, when the prince of Orange became king of the Netherlands, Baron Gagern became his prime minister. In 1815 he represented him at the congress of Vienna, and succeeded in obtaining for the Netherlands a considerable augmentation of territory. From 1816 to 1818 he was Luxemburg envoy at the German diet, but was recalled, at the instance of Metternich, owing to his too independent advocacy of state constitutions. In 1820 he retired with a pension to his estate at Hornau, near Höchst, in Hesse-Darmstadt; but as a member of the first chamber of the states of the grand-duchy he continued to take an active share in the promotion of measures for the welfare of his country. He retired from public life in 1848, and died at Hornau on the 22nd of October 1852. Baron von Gagern wrote a history of the German nation (Vienna, 1813; 2nd ed., 2 vols., Frankfort, 1825–1826), and several other books on subjects connected with history and social and political science. Of most permanent value, however, is his autobiography, *Mein Antheil an der Politik*, 5 vols. (Stuttgart and Leipzig, 1823–1845).

Of Hans Christoph von Gagern's sons three attained considerable eminence:—

FRIEDRICH BALDUIN, Freiherr von Gagern (1794–1848), the eldest, was born at Weilburg on the 24th of October 1794. He entered the university of Göttingen, but soon left, and, taking service in the Austrian army, took part in the Russian campaign of 1812, and fought in the following year at Dresden, Kulm and Leipzig. He then entered the Dutch service, took part in the campaigns of 1815, and, after studying another year at Heidelberg, was member for Luxemburg of the military commission of the German federal diet (1824, 1825). In 1830 and 1831 he took part in the Dutch campaign in Belgium, and in 1844, after being promoted to the rank of general, was sent on an important mission to the Dutch East Indies to inquire into the state of their military defences. In 1847 he was appointed governor at the Hague, and commandant in South Holland. In the spring of 1848 he was in Germany, and on the outbreak of the revolutionary troubles he accepted the invitation of the government of Baden to take the command against the insurgent "free companies" (*Freischaaren*). At Kandern, on the 20th of April, he made a vain effort to persuade the leaders to submit, and was about to order his troops to attack when he was mortally wounded by the bullets of the insurgents. His *Life*, in 3 vols. (Heidelberg and Leipzig, 1856–1857), was written by his brother Heinrich von Gagern.

HEINRICH WILHELM AUGUST, Freiherr von Gagern (1799–1880), the third son, was born at Bayreuth on the 20th of August 1799, educated at the military academy at Munich, and, as an officer in the service of the duke of Nassau, fought at Waterloo. Leaving the service after the war, he studied jurisprudence at Heidelberg, Göttingen and Jena, and in 1819 went for a while to Geneva to complete his studies. In 1821 he began his official career as a lawyer in the grand-duchy of Hesse, and in 1832 was elected to the second chamber. Already at the universities he had proclaimed his Liberal sympathies as a member of the *Burschenschaft*, and he now threw himself into open opposition to the unconstitutional spirit of the Hessian government, an attitude which led to his dismissal from the state service in 1833. Henceforth he lived in comparative retirement, cultivating a

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farm rented by his father at Monsheim, and occasionally publishing criticisms of public affairs, until the February revolution of 1848 and its echoes in Germany recalled him to active political life. For a short while he was at the head of the new Hessian administration; but his ambition was to share in the creation of a united Germany. At the Heidelberg meeting and the preliminary convention (*Vorparlament*) of Frankfort he deeply impressed the assemblies with the breadth and moderation of his views; with the result that when the German national parliament met (May 18), he was elected its first president. His influence was at first paramount, both with the Unionist party and with the more moderate elements of the Left, and it was he who was mainly instrumental in imposing the principle of a united empire with a common parliament, and in carrying the election of the Archduke John as regent. With the growing split between the Great Germans (*Grossdeutschen*), who wished the new empire to include the Austrian provinces, and the Little Germans (*Kleindeutschen*), who realized that German unity could only be attained by excluding them, his position was shaken. On the 15th of December, when Schmerling and the Austrian members had left the cabinet, Gagern became head of the imperial ministry, and on the 18th he introduced a programme (known as the *Gagernsche Programm*) according to which Austria was to be excluded from the new federal state, but bound to it by a treaty of union. After a severe struggle this proposal was accepted; but the academic discussion on the constitution continued for weary months, and on the 20th of May, realizing the hopelessness of coming to terms with the ultra-democrats, Gagern and his friends resigned. Later on he attempted to influence the Prussian Northern Union in the direction of the national policy, and he took part in the sessions of the Erfurt parliament; but, soon realizing the hopelessness of any good results from the vacillating policy of Prussia, he retired from the contest, and, as a major in the service of the Schleswig-Holstein government, took part in the Danish War of 1850. After the war he retired into private life at Heidelberg. In 1860, misled by the constitutional tendency of Austrian politics, he publicly declared in favour of the Great German party. In 1864 he went as Hessian envoy to Vienna, retiring in 1872 when the post was abolished. He died at Darmstadt on the 22nd of May 1880.

MAXIMILIAN, Freiherr von Gagern (1810–1889), the youngest son, was born at Weilburg on the 26th of March 1810. Up to 1848 he was a government official in Nassau; in that year he became a member of the German national parliament and under-secretary of state for foreign affairs. Throughout the revolutionary years he supported his brother's policy, became a member of the Erfurt parliament, and, after the collapse of the national movement, returned to the service of the duchy of Nassau. In 1855 he turned Roman Catholic and entered the Austrian service as court and ministerial councillor in the department of foreign affairs. In 1871 he retired, and in 1881 was nominated a life member of the Upper Chamber (*Herrenhaus*). He died at Vienna on the 17th of October 1889.

See *Allgemeine deutsche Biographie*, Band viii. p. 301, &c. (1878) and Band xlix. p. 654 (1904).

GAHANBAR, festivals of the ancient Avesta calendar celebrated by the Parsees at six seasons of the year which correspond with the six periods of creation: (1) *Maidhyozaremaya* (mid spring), (2) *Maidhyoshema* (midsummer), (3) *Paitishahya* (season of corn), (4) *Ayathrema* (season of flocks), (5) *Maidhyarya* (winter solstice), (6) *Hamaspathmaedha* (festival of sacrifices).

GAIGNIÈRES, FRANÇOIS ROGER DE (1642–1715), French genealogist, antiquary and collector, was the son of Aimé de Gaignières, secretary to the governor of Burgundy, and was born on the 30th of December 1642. He became écuyer (esquire) to Louis Joseph, duke of Guise, and afterwards to Louis Joseph's aunt, Marie of Guise, by whom in 1670 he was appointed governor of her principality of Joinville. At an early age he began to make a collection of original materials for history generally, and, in particular, for that of the French church and court. He brought together a large collection of original letters and other documents, together with portraits and prints, and had copies made of a great number of the most curious antiquarian objects, such as seals, tombstones, stained glass, miniatures and tapestry. In 1711 he presented the whole of his collections to the king. The bulk of them is preserved in the Bibliothèque Nationale at Paris, and a certain number in the Bodleian library at Oxford.

See G. Duplessis, *Roger de Gaignières* (Paris, 1870); L. Delisle, *Cabinet des manuscrits*, t. i. pp. 335-356; H. Bouchot, *Les Portraits aux crayon des XVIe et XVIIe siècles* (Paris, 1884); Ch. de Grandmaison, *Gaignières, ses correspondants et ses collections de portraits* (Niort, 1892).

GAIL, JEAN BAPTISTE (1755–1829), French hellenist, was born in Paris on the 4th of July 1755. In 1791 he was appointed deputy, and in 1792 titular professor at the Collège de France. During the Revolution he quietly performed his professional duties, taking no part in politics, although he possessed the faculty of ingratiating himself with those in authority. In 1815 he was appointed by the king keeper of Greek MSS. in the royal library over the heads of the candidates proposed by the other conservators, an appointment which made him many enemies. Gail imagined that there was an organized conspiracy to belittle his learning and professional success, and there was a standing quarrel between him and his literary opponents, the most distinguished of whom was P. L. Courier. He died on the 5th of February 1829. Without being a great Greek scholar, Gail was a man of unwearied industry, whose whole life was devoted to his favourite studies, and he deserves every credit for having rescued Greek from the neglect into which it had fallen during the troublous times in which he lived. The list of Gail's published works filled 500 quarto pages of the introduction to his edition of Xenophon. The best of these is his edition of Theocritus (1828). He also wrote a number of elementary educational works, based on the principles of the school of Port Royal. His communications to the Académie des Inscriptions being coldly received and seldom accorded the honour of print, he inserted them in a vast compilation in 24 volumes, which he called *Le Philologue*, containing a mass of ill-digested notes on Greek grammar, geography, archaeology, and various authors.

See "Notice historique sur la vie et les ouvrages de J. B. G.," in *Mém. de l'Acad. des Inscriptions*, ix.; the articles in *Biographie universelle* (by A. Pillan) and Ersch and Gruber's *Allgemeine Encyclopädie* (by C. F. Bähr); a list of his works will be found in J. M. Quérard, *La France littéraire* (1829), including the contents of the volumes of *Le Philologue*.

GAILLAC, a town of south-western France, capital of an arrondissement in the department of Tarn, on the right bank of the Tarn, 15 m. W. of Albi on the railway from that city to Toulouse. Pop. (1906) town, 5388; commune, 7535. The churches of St Michel and St Pierre, both dating from the 13th and 14th centuries, have little architectural importance. There are some interesting houses, one of which, the Maison Yversen, of the Renaissance, is remarkable for the rich carving of its doors. The public institutions include the sub-prefecture, a tribunal of first instance, and a communal college. Its industries include the manufacture of lime and wooden shoes, while dyeing, woodsawing and flour-milling are also carried on; it has a considerable trade in grain, flour, vegetables, dried plums, anise, coriander, &c., and in wine, the white and red wines of the arrondissement having a high reputation. Gaillac grew up round the Benedictine abbey of St Michel, founded in the 10th century.

GAILLARD, GABRIEL HENRI (1726–1806), French historian, was born at Ostel, Picardy, in 1726. He was educated for the bar, but after finishing his studies adopted a literary career, ultimately devoting his chief attention to history. He was already a member of the Academy of Inscriptions and Belles-lettres (1760), when, after the publication of the three first volumes of his *Histoire de la rivalité de la France et d'Angleterre*, he was elected to the French Academy (1771); and when Napoleon created the Institute he was admitted into its third class (*Académie française*) in 1803. For forty years he was the intimate friend of Malesherbes, whose life (1805) he wrote. He died at St Firmin, near Chantilly, on the 13th of February 1806. Gaillard is painstaking and impartial in his statement of facts,

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and his style is correct and elegant, but the unity of his narrative is somewhat destroyed by digressions, and by his method of treating war, politics, civil administration, and ecclesiastical affairs under separate heads. His most important work is his *Histoire de la rivalité de la France et de l'Angleterre* (in 11 vols., 1771–1777); and among his other works may be mentioned *Essai de rhétorique française, à l'usage des jeunes demoiselles* (1745), often reprinted, and in 1822 with a life of the author; *Histoire de Marie de Bourgogne* (1757); *Histoire de François Ier* (7 vols., 1776–1779); *Histoire des grandes querelles entre Charles V. et François Ier* (2 vols., 1777); *Histoire de Charlemagne* (3 vols., 1782); *Histoire de la rivalité de la France et de l'Espagne* (8 vols., 1801); *Dictionnaire historique* (6 vols., 1789–1804), making part of the *Encyclopédie méthodique*; and *Mélanges littéraires*, containing *éloges* on Charles V., Henry IV., Descartes, Corneille, La Fontaine, Malesherbes and others.

GAINESVILLE, a city and the county-seat of Alachua county, Florida, U.S.A., about 70 m. S.W. of Jacksonville. Pop. (1890) 2790; (1900) 3633, of whom 1803 were negroes; (1905) 5413; (1910) 6183. Gainesville is served by the Atlantic Coast Line, the Seaboard Air Line, and the Tampa & Jacksonville railways, and is an important railway junction. It is the seat of the University of the State of Florida, established at Lake City in 1905 and removed to Gainesville in 1906. The university includes a school of language and literature, a general scientific school, a school of agriculture, a technological school, a school of pedagogy, a normal school, and an agricultural experiment station. In 1908 the university had 15 instructors and 103 students. The Florida Winter Bible Conference and Chautauqua is held here. Gainesville is well known as a winter resort, and its climate is especially beneficial to persons affected by pulmonary troubles. In the neighbourhood are the Alachua Sink, Payne's Prairie, Newman's Lake, the Devil's Mill Hopper and other objects of interest. The surrounding country produces Sea Island cotton, melons, citrus and other fruits, vegetables and naval stores. About 15 m. W. of the city there is a rich phosphate mining district. The city has bottling works, and manufactures fertilizers, lumber, coffins, ice, &c. The municipality owns and operates the water-works; the water-supply comes from a spring 2 m. from the city, and the water closely resembles that of the Poland Springs in Maine. Gainesville is in the midst of the famous Seminole country. The first settlement was made here about 1850; and Gainesville, named in honour of General E. P. Gaines, was incorporated as a town in 1869, and was chartered as a city in 1907.

GAINESVILLE, a city and the county-seat of Cooke county, Texas, U.S.A., about 6 m. S. of the Red river, and about 60 m. N. of Fort Worth. Pop. (1890) 6504; (1900) 7874 (1201 negroes and 269 foreign-born); (1910) 7624. The city is served by the Gulf, Colorado & Santa Fé, and the Missouri, Kansas & Texas railways, and by an interurban electric railway. Gainesville is a trading centre and market for the surrounding country, in which cotton, grains, garden truck, fruit and alfalfa are grown and live-stock is raised; and a wholesale distributing point for the neighbouring region in Texas and Oklahoma. The city has cotton-compresses and cotton-gins, and among its manufactures are cotton-seed oil, flour, cement blocks, pressed bricks, canned goods, foundry products, waggon-beds and creamery products. Gainesville was settled about 1851, was incorporated in 1873, and was chartered as a city in 1879; it was named in honour of General Edmund Pendleton Gaines (1777–1849), who served with distinction in the War of 1812, becoming a brigadier-general in March 1814 and receiving the brevet of major-general and the thanks of Congress for his defence of Fort Erie in August 1814. Gaines took a prominent part in the operations against the Seminoles in Florida in 1817 (when he was in command of the Southern Military District) and in 1836 and during the Mexican War commanded the department of the South-West, with headquarters at New Orleans.

GAINSBOROUGH, THOMAS (1727–1788), English painter, one of the greatest masters of the English school in portraiture, and only less so in landscape, was born at Sudbury, Suffolk, in the spring of 1727. His father, who carried on the business of a woollen crape-maker in that town, was of a respectable character and family, and was noted for his skill in fencing; his mother excelled in flower-painting, and encouraged her son in the use of the pencil. There were nine children of the marriage, two of the painter's brothers being of a very ingenious turn.

At ten years old, Gainsborough "had sketched every fine tree and picturesque cottage near Sudbury," and at fourteen, having filled his task-books with caricatures of his schoolmaster, and sketched the portrait of a man whom he had detected on the watch for robbing his father's orchard, he was allowed to follow the bent of his genius in London, with some instruction in etching from Gravelot, and under such advantages as Hayman, the historical painter, and the academy in St Martin's Lane could afford. Three years of study in the metropolis, where he did some modelling and a few landscapes, were succeeded by two years in the country. Here he fell in love with Margaret Burr, a young lady of many charms, including an annuity of £200, married her after painting her portrait, and a short courtship, and, at the age of twenty, became a householder in Ipswich, his rent being £6 a year. The annuity was reported to come from Margaret's real (not her putative) father, who was one of the exiled Stuart princes or else the duke of Bedford. She was sister of a young man employed by Gainsborough's father as a traveller. At Ipswich, Gainsborough tells us, he was "chiefly in the face-way"; his sitters were not so numerous as to prevent him from often rambling with his friend Joshua Kirby (president of the Society of Artists) on the banks of the Orwell, from painting many landscapes with an attention to details which his later works never exhibited, or from joining a musical club and entertaining himself and his fellow-townsmen by giving concerts. As he advanced in years he became ambitious of advancing in reputation. Bath was then the general resort of wealth and fashion, and to that city, towards the close of the year 1759, he removed with his wife and two daughters, the only issue of their marriage. His studio in the circus was soon thronged with visitors; he gradually raised his price for a half-length portrait from 5 to 40 guineas, and for a whole-length from 8 to 100 guineas; and he rapidly developed beyond the comparatively plain and humdrum quality of his Ipswich paintings. Among his sitters at this period were the authors Sterne and Richardson, and the actors Quin, Henderson and Garrick. Meanwhile he contributed both portraits and landscapes to the annual exhibitions in London. He indulged his taste for music by learning to play the viol-di-gamba, the harp, the hautboy, the violoncello. His house harboured Italian, German, French and English musicians. He haunted the green-room of Palmer's theatre, and painted gratuitously the portraits of many of the actors: he constantly gave away his sketches and landscapes. In the summer of 1774, having already attained a position of great prosperity, he took his departure for London, and fixed his residence at Schomberg House, Pall Mall, a noble mansion still standing, for a part of which the artist paid £300 a year.

Gainsborough had not been many months in London ere he received a summons to the palace, and to the end of his career he divided with West the favour of the court, and with Reynolds the favour of the town. Sheridan, Burke, Johnson, Franklin, Canning, Lady Mary Wortley Montagu, Mrs Siddons, Clive, Blackstone, Hurd, were among the number of those who sat to him. But in London as in Bath his landscapes were exhibited, were commended, and were year after year returned to him, "till they stood," says Sir William Beechey, "ranged in long lines from his hall to his painting-room." Gainsborough was a member of the Royal Academy, one of the original 36 elected in 1768; but in 1784, being dissatisfied with the position assigned on the exhibition walls to his portrait of the three princesses, he withdrew that and his other pictures, and he never afterwards exhibited there. Even before this he had taken no part in the business of the Institution. After seceding he got up an exhibition in his own house, not successfully. In February 1788, while witnessing the trial of Warren Hastings, he felt an extraordinary chill at the back of his neck; this was the beginning of a cancer

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(or, as some say, a malignant wen) which proved fatal on the 2nd of August of the same year. He lies buried at Kew.

Gainsborough was tall, fair and handsome, generous, impulsive to the point of capriciousness, easily irritated, not of bookish likings, a lively talker, good at repartee. He was a most thorough embodiment of the artistic temperament; delighting in nature and "the look of things," insatiable in working, fond of music and the theatre hardly less than of painting—a warm, rich personality, to whom severe principle was perhaps as foreign as deliberate wrong-doing. The property which he left at his death was not large. One of his daughters, Mary, had married the musician Fischer contrary to his wishes, and was subject to fits of mental aberration. The other daughter, Margaret, died unmarried. Mrs Gainsborough, an extremely sweet-tempered woman, survived her husband ten years. There is a pretty anecdote that Gainsborough, if he ever had a tiff with her, would write a pacifying note, confiding it to his dog Fox, who delivered it to the lady's pet spaniel Tristram. The note was worded as in the person of Fox to Tristram, and Mrs Gainsborough replied in the best of humours, as from Tristram to Fox.

Gainsborough and Reynolds rank side by side as the greatest portrait-painters of the English school. They were at variance; but Gainsborough on his death-bed sought and obtained a reconciliation. It is difficult to say which stands the higher of the two, although Reynolds may claim to have worked with a nearer approach to even and demonstrable excellence. In grace, spirit, and lightness of insight and of touch, Gainsborough is peculiarly eminent. His handling was slight for the most part, and somewhat arbitrary, but in a high degree masterly; and his landscapes and rustic compositions are not less gifted than his portraits. Among his finest works are portraits of "Lady Ligonier," "Georgiana, duchess of Devonshire," "Master Buttall (the Blue Boy)," now in Grosvenor House, "Mrs Sheridan and Mrs Tickell," "Orpin, the parish clerk" (National Gallery), "the Hon. Mrs Graham" (Scottish National Gallery), his own portrait (Royal Academy), "Mrs Siddons" (National Gallery); also "the Cottage Door," "the Market Cart," "the Return from Harvest," "the Woodman and his Dog in a Storm" (destroyed by fire), and "Waggon and Horses passing a Brook" (National Gallery—this was a favourite with its painter). He made a vast number of drawings and sketches.

A few observations may be added: (1) as to individual works by Gainsborough, and (2) as to his general characteristics as a painter.

Two of his first portraits, executed when he was settled at Ipswich, were separate likenesses of Mr and Mrs Hingeston. His first great hit was made at Bath with a portrait of Lord Nugent. With a likeness of Mr Poyntz, 1762, we find a decided advance in artistic type, and his style became fixed towards 1768. The date of the "Blue Boy" is somewhat uncertain: most accounts name 1779, but perhaps 1770 is nearer the mark. This point is not without interest for dilettanti; because it is said that Gainsborough painted the picture with a view to confuting a dictum of Reynolds, to the effect that blue was a colour unsuitable for the main light of a work. But, if the picture was produced before 1778, the date of Reynolds's dictum, this long-cherished and often-repeated tradition must be given up. A full-length of the duke of Norfolk was perhaps the latest work to which Gainsborough set his hand. His portrait of Elizabeth, duchess of Devonshire, famous for its long disappearance, has aroused much controversy; whether this painting, produced not long after Gainsborough had settled in London, and termed "the Duchess of Devonshire," does really represent that lady, is by no means certain. It was mysteriously stolen in 1876 in London immediately after it had been purchased by Messrs Agnew at the Wynn Ellis sale at a huge price, and a long time elapsed before it was retraced. The picture was taken to New York, and eventually to Chicago; and in April 1901, through the agency of a man named Pat Sheedy, it was given up to the American detectives working for Messrs Agnew; it was then sold to Mr Pierpont Morgan.

Gainsborough's total output of paintings exceeded 300, including 220 portraits: he also etched at least 18 plates, and 3 in aquatint. At the date of his death 56 paintings remained on hand: these, along with 148 drawings, were then exhibited. In his earlier days he made a practice of copying works by Vandyck (the object of his more special admiration), Titian, Rubens, Teniers, Hobbema, Claude and some others, but not in a spirit of servile reproduction.

Gainsborough was pre-eminent in that very essential element of portraiture—truthful likeness. In process of time he advanced in the rendering of immediate expression, while he somewhat receded in general character. He always made his sitters look pleasant, and, after a while, distinguished. Unity of impression is one of the most marked qualities in his work; he seems to have seen his subject as an integer, and he wrought at the various parts of it together, every touch (and very wilful some of his touches look) tending towards the foreseen result. He painted with arrowy speed, more especially in his later years. For portraits he used at times brushes upon sticks 6 ft. long; there was but little light in his painting-room, and he often worked in the evenings. He kept his landscape work distinct from his portraiture, not ever adding to the latter a fully realized landscape background; his views he never signed or dated—but his likenesses only once or twice. His skies are constantly cloudy, the country represented is rough and broken; the scenes are of a pastoral kind, with an effect generally of coming rain, or else of calm sun-setting. The prevalent feeling of his landscapes is somewhat sad, and to children, whether in subject-groups or in portraits, he mostly lent an expression rather plaintive than mirthful. It should be acknowledged that, whether in portraiture or in landscape, the painter's mannerisms of execution increased in process of time—patchings of the brush, tufty foliage, &c.; some of his portraits are hurried and flimsy, with a minimum of solid content, though not other than artistic in feeling. Here are a few of his axioms:—"What makes the difference between man and man is real performance, and not genius or conception." "I don't think it would be more ridiculous for a person to put his nose close to the canvas and say the colours smelt offensive than to say how rough the paint lies, for one is just as material as the other with regard to hurting the effect and drawing of a picture." "The eye is the only perspective-master needed by a landscape-painter."

AUTHORITIES.—In 1788 Philip Thicknesse, Lieutenant-Governor of Landguard Fort, Ipswich, who had been active in promoting the artist's fortunes at starting, published *A Sketch of the Life and Paintings of Thomas Gainsborough*. He had quarrelled with the painter at Bath, partly because the latter had undertaken to do a picture for him as a gift, and then neglected the work, and finally, in a huff, bundled it off only half done. The crucial question here is whether or not Gainsborough was reasonably pledged to perform any such gratuitous work, and this point has been contested. Thicknesse's book is in part adverse to Gainsborough, and more particularly so to his wife. Reynolds's "Lecture" on Gainsborough, replete with critical insight, should never be lost sight of as a leading document. In 1856 a heedfully compiled *Life of Thomas Gainsborough* was brought out by T. W. Fulcher. This was the first substantial work about him subsequent to Allan Cunningham's lively account (1829) in his *Lives of the Painters*. Of late years a great deal has been written, mainly but not by any means exclusively from the critical or technical point of view:—Sir Walter Armstrong (two works, 1896 and 1898); Mrs Arthur Bell (1902); Sir W. M. Conway, *Artistic Development of Reynolds and Gainsborough* (1886); Lord Ronald Sutherland Gower (1903); G. M. Brock-Arnold (1881). G. Pauli has brought out an illustrated work in Germany (1904) under the title *Gainsborough*. (W. M. R.)

GAINSBOROUGH, a market town in the W. Lindsey or Gainsborough parliamentary division of Lincolnshire, England; on the right (E.) bank of the Trent. Pop. of urban district (1901) 17,660. It is served by the Lincoln-Doncaster joint line of the Great Northern and Great Eastern railways, by which it is 16 m. N.W. of Lincoln, and by the Great Central railway. The parish church of All Saints is classic of the 18th century, excepting the Perpendicular tower. The two other parish churches are modern. The Old Hall, of the 15th century, enlarged in the 16th, is a picturesque building, forming three sides of a quadrangle, partially timber-framed, but having a beautiful oriel window and other parts of stone. There is also

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a Tudor tower of brick. A literary and scientific institute occupy part of the building. Gainsborough possesses a grammar school (founded in 1589 by a charter of Queen Elizabeth) and other schools, town-hall, county court-house, Albert Hall and Church of England Institute. There is a large carrying trade by water on the Trent and neighbouring canals. Shipbuilding and iron-founding are carried on, and there are manufactures of linseed cake, and agricultural and other machinery.

Gainsborough (*Gegnesburh*) was probably inhabited by the Saxons on account of the fishing in the Trent. The *Saxon Chronicle* states that in 1013 the Danish king Sweyn landed here and subjugated the inhabitants. Gainsborough, though not a chartered borough, was probably one by prescription, for mention is made of burghal tenure in 1280. The privilege of the return of writs was conferred on the lord of the manor, Aymer de Valence, earl of Pembroke, in 1323, and confirmed to Ralph de Percy in 1383. Mention is made in 1204 of a Wednesday market, but there is no extant grant before 1258, when Henry III. granted a Tuesday market to William de Valence, earl of Pembroke, who also obtained from Edward I. in 1291 licence for an annual fair on All Saints' Day, and the seven preceding and eight following days. In 1243 Henry III. granted to John Talbot licence for a yearly fair on the eve, day and morrow of St James the Apostle. Queen Elizabeth in 1592 granted to Thomas Lord Burgh two fairs, to begin on Easter Monday and on the 9th of October, each lasting three days. Charles I. in 1635–1636 extended the duration of each to nine days. The Tuesday market is still held, and the fair days are Tuesday and Wednesday in Easter-week, and the Tuesday and Wednesday after the 20th of October.

See Adam Stark, *History and Antiquities of Gainsburgh* (London, 1843).

GAIRDNER, JAMES (1828–), English historian, son of John Gairdner, M.D., was born in Edinburgh on the 22nd of March 1828. Educated in his native city, he entered the Public Record Office in London in 1846, becoming assistant keeper of the public records (1859–1893). Gairdner's valuable and pains-taking contributions to English history relate chiefly to the reigns of Richard III., Henry VII. and Henry VIII. For the "Rolls Series" he edited *Letters and Papers illustrative of the Reigns of Richard III. and Henry VII.* (London, 1861–1863), and *Memorials of Henry VII.* (London, 1858); and he succeeded J. S. Brewer in editing the *Letters and Papers*, foreign and domestic, of the reign of Henry VIII. (London, 1862–1905). He brought out the best edition of the *Paston Letters* (London, 1872–1875, and again 1896), for which he wrote a valuable introduction; and for the Camden Society he edited the *Historical collections of a Citizen of London* (London, 1876), and *Three 15th-century Chronicles* (London, 1880). His other works include excellent monographs on *Richard III.* (London, 1878, new and enlarged edition, Cambridge, 1898), and on *Henry VII.* (London, 1889, and subsequently); *The Houses of Lancaster and York* (London, 1874, and other editions); *The English Church in the 16th century* (London, 1902); *Lollardy and the Reformation in England* (1908); and contributions to the *Encyclopaedia Britannica*, the *Dictionary of National Biography*, the *Cambridge Modern History*, and the *English Historical Review*. Gairdner received the honorary degree of LL.D. from the university of Edinburgh in 1897, and was made a C.B. in 1900.

GAIRLOCH (Gaelic *gèarr*, short), a sea loch, village and parish in the west of the county of Ross and Cromarty, Scotland. Pop. of parish (1901) 3707. The parish covers a large district on the coast, and stretches inland beyond the farther banks of Loch Maree, the whole of which lies within its bounds. It also includes the islands of Dry and Horisdale in the loch, and Ewe in Loch Ewe, and occupies a total area of 200,646 acres. The place and loch must not be confounded with Gareloch in Dumbartonshire. Formerly an appanage of the earldom of Ross, Gairloch has belonged to the Mackenzies since the end of the 15th century. Flowerdale, an 18th-century house in the pretty little glen of the same name, lying close to the village, is the chief seat of the Gairloch branch of the clan Mackenzie. William Ross (1762–1790), the Gaelic poet, who was schoolmaster of Gairloch, of which his mother was a native, was buried in the old kirkyard, where a monument commemorates him.

GAISERIC, or GENSERIC (*c.* 390–477), king of the Vandals, was a son of King Godegisel (d. 406), and was born about 390. Though lame and only of moderate stature, he won renown as a warrior, and became king on the death of his brother Gonderic in 428. In 428 or 429 he led a great host of Vandals from Spain into Roman Africa, and took possession of Mauretania. This step is said to have been taken at the instigation of Boniface, the Roman general in Africa; if true, Boniface soon repented of his action, and was found resisting the Vandals and defending Hippo Regius against them. At the end of fourteen months Gaiseric raised the siege of Hippo; but Boniface was forced to fly to Italy, and the city afterwards fell into the hands of the Vandals. Having pillaged and conquered almost the whole of Roman Africa, the Vandal king concluded a treaty with the emperor Valentinian III. in 435, by which he was allowed to retain his conquests; this peace, however, did not last long, and in October 439 he captured Carthage, which he made the capital of his kingdom. According to some authorities Gaiseric at this time first actually assumed the title of king. In religious matters he was an Arian, and persecuted the members of the orthodox church in Africa, although his religious policy varied with his relations to the Roman empire. Turning his attention in another direction he built a fleet, and the ravages of the Vandals soon made them known and feared along the shores of the Mediterranean. "Let us make," said Gaiseric, "for the dwellings of the men with whom God is angry," and he left the conduct of his marauding ships to wind and wave. In 455, however, he led an expedition to Rome, stormed the city, which for fourteen days his troops were permitted to plunder, and then returned to Africa laden with spoil. He also carried with him many captives, including the empress Eudoxia, who is said to have invited the Vandals into Italy. The Romans made two attempts to avenge themselves, one by the Western emperor, Majorianus, in 460, and the other by the Eastern emperor, Leo I., eight years later; but both enterprises failed, owing principally to the genius of Gaiseric. Continuing his course on the sea the king brought Sicily, Sardinia, Corsica and the Balearic Islands under his rule, and even extended his conquests into Thrace, Egypt and Asia Minor. Having made peace with the eastern emperor Zeno in 476, he died on the 25th of January 477. Gaiseric was a cruel and cunning man, possessing great military talents and superior mental gifts. Though the effect of his victories was afterwards neutralized by the successes of Belisarius, his name long remained the glory of the Vandals. The name Gaiseric is said to be derived from *gais*, a javelin, and *reiks*, a king.

See VANDALS; also T. Hodgkin, *Italy and her Invaders*, vol. ii. (London, 1892); E. Gibbon, *Decline and Fall of the Roman Empire* (ed. J. B. Bury, 1896–1900); L. Schmidt, *Geschichte der Vandalen* (Leipzig, 1901); and F. Martroye, *Genseric; La Conquête vandale en Afrique* (Paris, 1907).

GAISFORD, THOMAS (1779–1855), English classical scholar, was born at Iford, Wiltshire, on the 22nd of December 1779. Proceeding to Oxford in 1797, he became successively student and tutor of Christ Church, and was in 1811 appointed regius professor of Greek in the university. Taking orders, he held (1815–1847) the college living of Westwell, in Oxfordshire, and other ecclesiastical preferments simultaneously with his professorship. From 1831 until his death on the 2nd of June 1855, he was dean of Christ Church. As curator of the Bodleian and principal delegate of the University Press he was instrumental in securing the co-operation of distinguished European scholars as collators, notably Bekker and Dindorf. Among his numerous contributions to Greek literature may be mentioned, Hephaestion's *Encheiridion* (1810); *Poëtae Graeci minores* (1814–1820); Stobaeus' *Florilegium* (1822); *Herodotus*, with variorum notes (1824); Suidas' *Lexicon* (1834); *Etymologicon magnum* (1848); Eusebius's *Praeparatio* (1843) and *Demonstratio evangelica* (1852). In 1856 the Gaisford prizes, for Greek composition, were founded at Oxford to perpetuate his memory.

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GAIUS, a celebrated Roman jurist. Of his personal history very little is known. It is impossible to discover even his full name, Gaius or Caius being merely the personal name (praenomen) so common in Rome. From internal evidence in his works it may be gathered that he flourished in the reigns of the emperors Hadrian, Antoninus Pius, Marcus Aurelius and Commodus. His works were thus composed between the years 130 and 180, at the time when the Roman empire was most prosperous, and its government the best. Most probably Gaius lived in some provincial town, and hence we find no contemporary notices of his life or works. After his death, however, his writings were recognized as of great authority, and the emperor Valentinian named him, along with Papinian, Ulpian, Modestinus and Paulus, as one of the five jurists whose opinions were to be followed by judicial officers in deciding cases. The works of these jurists accordingly became most important sources of Roman law.

Besides the *Institutes*, which are a complete exposition of the elements of Roman law, Gaius was the author of a treatise on the *Edicts of the Magistrates*, of *Commentaries on the Twelve Tables*, and on the important *Lex Papia Poppaea*, and several other works. His interest in the antiquities of Roman law is apparent, and for this reason his work is most valuable to the historian of early institutions. In the disputes between the two schools of Roman jurists he generally attached himself to that of the Sabinians, who were said to be followers of Ateius Capito, of whose life we have some account in the *Annals* of Tacitus, and to advocate a strict adherence as far as possible to ancient rules, and to resist innovation. Many quotations from the works of Gaius occur in the *Digest* of Justinian, and so acquired a permanent place in the system of Roman law; while a comparison of the *Institutes* of Justinian with those of Gaius shows that the whole method and arrangement of the later work were copied from that of the earlier, and very numerous passages are word for word the same. Probably, for the greater part of the period of three centuries which elapsed between Gaius and Justinian, the *Institutes* of the former had been the familiar text-book of all students of Roman law.

Unfortunately the work was lost to modern scholars, until, in 1816, a manuscript was discovered by B. G. Niebuhr in the chapter library of Verona, in which certain of the works of St Jerome were written over some earlier writings, which proved to be the lost work of Gaius. The greater part of the palimpsest has, however, been deciphered and the text is now fairly complete. This discovery has thrown a flood of light on portions of the history of Roman law which had previously been most obscure. Much of the historical information given by Gaius is wanting in the compilations of Justinian, and, in particular, the account of the ancient forms of procedure in actions. In these forms can be traced "survivals" from the most primitive times, which provide the science of comparative law with valuable illustrations, which may explain the strange forms of legal procedure found in other early systems. Another circumstance which renders the work of Gaius more interesting to the historical student than that of Justinian, is that Gaius lived at a time when actions were tried by the system of formulae, or formal directions given by the praetor before whom the case first came, to the judex to whom he referred it. Without a knowledge of the terms of these formulae it is impossible to solve the most interesting question in the history of Roman law, and show how the rigid rules peculiar to the ancient law of Rome were modified by what has been called the equitable jurisdiction of the praetors, and made applicable to new conditions, and brought into harmony with the notions and the needs of a more developed society. It is clear from evidence of Gaius that this result was obtained, not by an independent set of courts administering, as in England previous to the Judicature Acts, a system different from that of the ordinary courts, but by the manipulation of the formulae. In the time of Justinian the work was complete, and the formulary system had disappeared.

The *Institutes* of Gaius are divided into four books—the first treating of persons and the differences of the status they may occupy in the eye of the law; the second of things, and the modes in which rights over them may be acquired, including the law relating to wills; the third of intestate succession and of obligations; the fourth of actions and their forms.

There are several carefully prepared editions of the *Institutes*, starting from that of Göschen (1820), down to that of Studemund and Krüger (1900). The most complete English edition is that of E. Poste, which includes beside the text an English translation and copious commentary (1885). A comparison of the early forms of actions mentioned by Gaius with those used by other primitive societies will be found in Sir H. Maine's *Early Institutions*, cap. 9. For further information see M. Glasson, *Étude sur Gaius et sur le jus respondendi*; also ROMAN LAW.

GAIUS CAESAR (A.D. 12–41), surnamed CALIGULA, Roman emperor from 37–41, youngest son of Germanicus and Agrippina the elder, was born on the 31st of August A.D. 12. He was brought up in his father's camp on the Rhine among the soldiers, and received the name Caligula from the *caligae*, or foot-soldiers' boots, which he used to wear. He also accompanied his father to Syria, and after his death returned to Rome. In 32 he was summoned by Tiberius to Capreae, and by skilful flattery managed to escape the fate of his relatives. After the murder of Tiberius by Naevius Sertorius Macro, the prefect of the praetorian guards, which was probably due to his instigation, Caligula ascended the throne amidst the rejoicings of the people. The senate conferred the imperial power upon him alone, although Tiberius Gemellus, the grandson of the preceding emperor, had been designated as his co-heir. He entered on his first consulship in July 37. For the first eight months of his reign he did not disappoint the popular expectation; but after his recovery from a severe illness his true character showed itself. His extravagance, cruelty and profligacy can hardly be explained except on the assumption that he was out of his mind. According to Pelham, much of his conduct was due to the atmosphere in which he was brought up, and the ideas of sovereignty instilled into him, which led him to pose as a monarch of the Graeco-oriental type. To fill his exhausted treasury he put to death his wealthy subjects and confiscated their property; even the poor fell victims to his thirst for blood. He bestowed the priesthood and a consulship upon his horse Incitatus, and demanded that sacrifice should be offered to himself. He openly declared that he wished the whole Roman people had only one head, that he might cut it off at a single stroke. In 39 he set out with an army to Gaul, nominally to punish the Germans for having invaded Roman territory, but in reality to get money by plunder and confiscation. Before leaving, he led his troops to the coast opposite Britain, and ordered them to pick up shells on the seashore, to be dedicated to the gods at Rome as the spoils of ocean. On his return he entered Rome with an ovation (a minor form of triumph), temples were built, statues erected in his honour, and a special priesthood instituted to attend to his worship. The people were ground down by new forms of taxation and every kind of extortion, but on the whole Rome was free from internal disturbances during his reign; some insignificant conspiracies were discovered and rendered abortive. A personal insult to Cassius Chaerea, tribune of a praetorian cohort, led to Caligula's assassination on the 24th of January 41.

See Suetonius, *Caligula*; Tacitus, *Annals*, vi. 20 ff.; Dio Cassius lix.; see also S. Baring Gould, *The Tragedy of the Caesars* (3rd ed., 1892); H. F. Pelham in *Quarterly Review* (April, 1905); H. Willrich, *Beiträge zur alten Geschichte* (1903); H. Schiller, *Geschichte der römischen Kaiserzeit*, i. pt. 1; J. B. Bury, *Student's Hist. of the Roman Empire* (1893); Merivale, *History of the Romans under the Empire*, ch. 48; H. Furneaux's *Annals* of Tacitus, ii. (introduction). Mention may also be made of the famous pamphlet by L. Quidde, *Caligula. Eine Studie über römischen Cäsarenwahnsinn* and an anonymous supplement, *Ist Caligula mit unserer Zeit vergleichbar?* (both 1894); and a reply, *Fin-de-Siècle-Geschichtsschreibung*, by G. Sommerfeldt (1895).

GALAGO, the Senegal name of the long-tailed African representatives of the lemur-like Primates, which has been adopted as their technical designation. Till recently the galagos have been included in the family *Lemuridae*; but this is restricted to the lemurs of Madagascar, and they are now classed with the lorises and pottos in the family *Nycticebidae*, of which they form the section *Galaginae*, characterized by the great elongation of the upper portion of the feet (tarsus) and the power of folding the large ears. Throughout the greater part of Africa south of the

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Sahara galagos are widely distributed in the wooded districts, from Senegambia in the west to Abyssinia in the east, and as far south as Natal. They pass the day in sleep, but are very active at night, feeding on fruits, insects and small birds. When they descend to the ground they sit upright, and move about by jumping with their hind-legs like jerboas. They are pretty little animals, varying from the size of a small cat to less than that of a rat, with large eyes and ears, soft woolly fur and long tails. There are several species, of which *G. crassicaudatus* from Mozambique is the largest; together with *G. garnetti* of Natal, *G. agisymbanus* of Zanzibar, and *G. monteiroi* of Angola, this represents the subgenus *Otolemur*. The typical group includes *G. senegalensis* (or *galago*) of Senegal, *G. alleni* of West and Central Africa, and *G. moholi* of South Africa; while *G. demidoffi* of West and Central Africa and *G. anomurus* of French Congoland represent the subgenus *Hemigalago*.

(R. L.*)

GALANGAL, formerly written "galingale," and sometimes "garingal," *rhizoma galangae* (Arab. *Kholtnjan*;[1] Ger. *Galgantwurzel*; Fr. *Racine de Galanga*), a drug, now obsolete, with an aromatic taste like that of mingled ginger and pepper. Lesser galangal root, *radix galangae minoris*, the ordinary galangal of commerce, is the dried rhizome of *Alpinia officinarum*, a plant of the natural order Zingiberaceae, growing in the Chinese island of Hainan, where it is cultivated, and probably also in the woods of the southern provinces of China. The plant is closely allied to *Alpinia calcarata*, the rhizome of which is sold in the bazaars of some parts of India as a sort of galangal. Its stems attain a length of about 4 ft., and its leaves are slender, lanceolate and light-green, and have a hot taste; the flowers are white with red veins, and in simple racemes; the roots form dense masses, sometimes more than a foot in diameter; and the rhizomes grow horizontally, and are ¾ in. or less in thickness. Galangal seems to have been unknown to the ancient Greeks and Romans, and to have been first introduced into Europe by Arabian physicians. It is mentioned in the writings of Ibn Khurdâdbah, an Arabian geographer who flourished in the latter half of the 9th century, and "gallengar" (gallingale or galangal) is one of the ingredients in an Anglo-Saxon receipt for a "wen salve" (see O. Cockayne, *Saxon Leechdoms*, vol. iii. p. 13). In the middle ages, as at present in Livonia, Esthonia and central Russia, galangal was in request in Europe both as a medicine and a spice, and in China it is still employed as a therapeutic agent. Its chief consumption is in Russia, where it is used as a cattle-medicine, and as a flavouring for liqueurs.

GALAPAGOS ISLANDS, an archipelago of five larger and ten smaller islands in the Pacific Ocean, exactly under the equator. The nearest island to the South American coast lies 580 m. W. of Ecuador, to which country they belong. The name is derived from *galápago*, a tortoise, on account of the giant species, the characteristic feature of the fauna. The islands were discovered early in the 16th century by Spaniards, who gave them their present name. They were then uninhabited. The English names of the individual islands were probably given by buccaneers, for whom the group formed a convenient retreat.

The larger members of the group, several of which attain an elevation of 2000 to 2500 ft., are Albemarle or Isabela (100 m. long, 28 m. in extreme breadth, with an area of 1650 sq. m. and an extreme elevation of 5000 ft.), Narborough or Fernandina, Indefatigable or Santa Cruz, Chatham or San Cristobal, James or San Salvador, and Charles or Santa Maria. The total land area is estimated at about 2870 sq. m. (about that of the West Riding of Yorkshire). The extraordinary number of craters, a few of which are reported still to be active, gives evidence that the archipelago is the result of volcanic action. The number of main craters may be about twenty-five, but there are very many small eruptive cones on the flanks of the old volcanoes. There is a convict settlement on Chatham with some 300 inhabitants living in low thatched or iron-roofed huts, under the supervision of a police commissioner and other officials of Ecuador, by which country the group was annexed in 1832, when General Villamil founded Floreana on Charles Island, naming it in honour of Juan José Flores, president of Ecuador. A governor has been appointed since 1885, some importance being foreseen for the islands in connexion with the cutting of the Panama canal, as the group lies on the route to Australia opened up by that scheme. Charles Island, the most valuable of the group, is cultivated by a small colony. On many of the islets numerous tropical fruits are found growing wild, but they are no doubt escapes from cultivation, just as the large herds of wild cattle, horses, donkeys, pigs, goats and dogs—the last large and fierce—which occur abundantly on most of the islands have escaped from domestication.

The shores of the larger islands are fringed in some parts with a dense barrier of mangroves, backed by an often impenetrable thicket of tropical undergrowth, which, as the ridges are ascended, give place to taller trees and deep green bushes which are covered with orchids and trailing moss (*orchilla*), and from which creepers hang down interlacing the vegetation. But generally the low grounds are parched and rocky, presenting only a few thickets of Peruvian cactus and stunted shrubs, and a most uninviting shore. The contrast between this low zone and the upper zone of rich vegetation (above about 800 ft.) is curiously marked. From July to November the clouds hang low on the mountains, and give moisture to the upper zone, while the climate of the lower is dry. Rain in the lower zone is scanty, and from May to January does not occur. The porous soil absorbs the moisture, and fresh water is scarce. Though the islands are under the equator, the climate is not intensely hot, as it is tempered by cold currents from the Antarctic sea, which, having followed the coast of Peru as far as Cape Blanco, bear off to the N.W. towards and through the Galapagos. The mean temperature of the lower zone is about 71° F., that of the upper from 66° to 62°.

The Galapagos Islands are of some commercial importance to Ecuador, on account of the guano and the orchilla moss found on them and exported to Europe. Except on Charles Island, where settlement has existed longest, little or no influence of the presence of man is evident in the group; still, the running wild of dogs and cats, and, as regards the vegetation, especially goats, must in a comparatively short period greatly modify the biological conditions of the islands.

The origin and development of these conditions, in islands so distinctly oceanic as the Galapagos, have given its chief importance to this archipelago since it was visited by Darwin in the "Beagle." The Galapagos archipelago possesses a rare advantage from its isolated situation, and from the fact that its history has never been interfered with by any aborigines of the human race. Of the seven species of giant tortoises known to science (although at the discovery of the islands there were probably fifteen) all are indigenous, and each is confined to its own islet. There also occurs a peculiar genus of lizards with two species, the one marine, the other terrestrial. The majority of the birds are of endemic species peculiar to different islets, while more than half belong to peculiar genera. More than half of the flora is unknown elsewhere.

Since 1860 several visits have been paid to the group by scientific investigators—by Dr Habel in 1868; Messrs Baur and Adams, and the naturalists of the "Albatross," between 1888 and 1891; and in 1897–1898 by Mr Charles Harris, whose journey was specially undertaken at the instance of the Hon. Walter Rothschild. Very complete collections have therefore, as a result of these expeditions, been brought together; but their examination does not materially change the facts upon which the conclusions arrived at by Darwin, from the evidence of the birds and plants, were based; though he "no doubt would have paid more attention to [the evidence afforded by Land-tortoises], if he had been in possession of facts with which we are acquainted now" (Günther). His conclusions were that the group "has never been nearer the mainland than it is now, nor have its members been at any time closer together"; and that the character of the flora and fauna is the result of species straggling over from America, at long intervals of time, to the different islets, where in their isolation they have gradually varied in different degrees and ways from their ancestors. Equally indecisive is the further

[1] Apparently derived from the Chinese *Kau-liang-Kiang, i.e.* Kau-liang ginger, the term applied by the Chinese to galangal, after the prefecture Kau-chau fu in Canton province, formerly called Kau-liang (see F. Porter Smith, *Contrib. to the Materia Medica . . . of China*, p. 9, 1871).

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exploration as to evidence for the opinion held by other naturalists that the endemic species of the different islands have resulted from subsidences, through volcanic action, which have reduced one large island mass into a number of islets, wherein the separated species became differentiated during their isolation. The presence of these giant reptiles on the group is the chief fact on which a former land connexion with the continent of America may be sustained. "Nearly all authorities agree that it is not probable that they have crossed the wide sea between the Galapagos Islands and the American continent, although, while they are helpless and quite unable to swim, they can float on the water. If their ancestors had been carried out to sea once or twice by a flood and safely drifted as far as the Galapagos Islands" (Wallace), "they must have been numerous on the continent" (Rothschild and Hartert). "Of no remains, and of course no living species, of these tortoises are known to exist or have existed on the mainland. Rothschild and Hartert think "it is more natural to assume the disappearance of a great stock of animals, the remains of which have survived, . . . than to assume the disappearance in comparatively recent times (*i.e.* in the Eocene period or later) of enormous land masses." Past elevations of land, however (and doubtless equally great subsidences) have taken place in South America since the Eocene period—the conclusion that extensive areas of land have subsided in the Indian Ocean has long been based on a somewhat similar distribution of giant tortoises in the Mascarene region.

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GALASHIELS, a municipal and police burgh of Selkirkshire, Scotland. Pop. (1891) 17,367; (1901) 13,615. It is situated on Gala Water, within a short distance of its junction with the Tweed, 33½ m. S.S.E. of Edinburgh by the North British railway. The town stretches for more than 2 m. along both banks of the river, the mills and factories occupying the valley by the stream, the villas and better-class houses the high-lying ground on either side. The principal structures include the municipal buildings, corn exchange, library, public hall, and the market cross. The town is under the control of a provost, bailies and council, and, along with Hawick and Selkirk, forms the Hawick (or Border) group of parliamentary burghs. The woollen manufactures, dating from the close of the 16th century, are the most important in Scotland, though now mainly confined to the weaving of tweeds. Other leading industries are hosiery, tanning (with the largest yards in Scotland), dyeing, iron and brass founding, engineering and boot-making. Originally a village built for the accommodation of pilgrims to Melrose Abbey (4 m. E. by S.), it became, early in the 15th century, an occasional residence of the Douglases, who were then keepers of Ettrick Forest, and whose peel-tower was not demolished till 1814. Galashiels was created into a burgh of barony in 1599. The Catrail or Picts' Work begins near the town and passes immediately to the west. Clovenfords, 3½ m. W., is noted for the Tweed vineries, which are heated by 5 m. of water-pipes, and supply the London market throughout the winter. Two miles farther W. by S. is Ashestiel, where Sir Walter Scott resided from 1804 to 1812, where he wrote his most famous poems and began *Waverley*, and which he left for Abbotsford.

GALATIA. I. In the strict sense (Galatia Proper, Roman *Gallograecia*) this is the name applied by Greek-speaking peoples to a large inland district of Asia Minor since its occupation by Gaulish tribes in the 3rd century B.C. Bounded on the N. by Bithynia and Paphlagonia, W. by Phrygia, S. by Lycaonia and Cappadocia, E. by Pontus, it included the greater part of the modern vilayet of Angora, stretching from Pessinus eastwards to Tavium and from the Paphlagonian hills N. of Ancyra southwards to the N. end of the salt lake Tatta (but probably including the plains W. of the lake during the greater part of its history),—a rough oblong about 200 m. long and 100 (to 130) broad.

Galatia is part of the great central plateau of Asia Minor, here ranging from 2000 to 3000 ft. above sea-level, and falls geographically into two parts separated by the Halys (Kizil Irmak),—a small eastern district lying chiefly in the basin of the Delije Irmak, the principal affluent of the Halys, and a large western region drained almost entirely by the Sangarius (Sakaria) and its tributaries. On the N. side Galatia consists of a series of plains with fairly fertile soil, lying between bare hills. But the greater part is a dreary stretch of barren, undulating uplands, intersected by tiny streams and passing gradually into the vast level waste of treeless (anc. *Axylon*) plain that runs S. to Lycaonia; these uplands are little cultivated and only afford extensive pasturage for large flocks of sheep and goats. Cities are few and far apart, and the climate is one of extremes of heat and cold. The general condition and aspect of the country was much the same in ancient as in modern times.

The Gaulish invaders appeared in Asia Minor in 278–277 B.C. They numbered 20,000, of which only one-half were fighting men, the rest being doubtless women and children; and not long after their arrival we find them divided into three tribes, Trocmi, Tolistobogii and Tectosages, each of which claimed a separate sphere of operations. They had split off from the army which invaded Greece under Brennus in 279 B.C., and, marching into Thrace under Leonnorius and Lutarius, crossed over to Asia at the invitation of Nicomedes I. of Bithynia, who required help in his struggle against his brother. For about 46 years they were the scourge of the western half of Asia Minor, ravaging the country, as allies of one or other of the warring princes, without any serious check, until Attalus I., king of Pergamum (241–197), inflicted several severe defeats upon them, and about 232 B.C. forced them to settle permanently in the region to which they gave their name. Probably they already occupied parts of Galatia, but definite limits were now fixed and their right to the district was formally recognized. The tribes were settled where they afterwards remained, the Tectosages round Ancyra, the Tolistobogii round Pessinus, and the Trocmi round Tavium. The constitution of the Galatian state is described by Strabo: conformably to Gaulish custom, each tribe was divided into four cantons (Gr. τετραρχίαι), each governed by a chief ("tetrarch") of its own with a judge under him, whose powers were unlimited except in cases of murder, which were tried before a council of 300 drawn from the twelve cantons and meeting at a holy place called Drynemeton. But the power of the Gauls was not yet broken. They proved a formidable foe to the Romans in their wars with Antiochus, and after Attalus' death their raids into W. Asia Minor forced Rome in 189 B.C. to send an expedition against them under Cn. Manlius Vulso, who taught them a severe lesson. Henceforward their military power declined and they fell at times under Pontic ascendancy, from which they were finally freed by the Mithradatic wars, in which they heartily supported Rome. In the settlement of 64 B.C. Galatia became a client-state of the empire, the old constitution disappeared, and three chiefs (wrongly styled "tetrarchs") were appointed, one for each tribe. But this arrangement soon gave way before the ambition of one of these tetrarchs, Deiotarus, the contemporary of Cicero and Caesar, who made himself master of the other two tetrarchies and was finally recognized by the Romans as king of Galatia. On the death of the third king Amyntas in 25 B.C., Galatia was incorporated by Augustus in the Roman empire, and few of the provinces were more enthusiastically loyal.

The population of Galatia was not entirely Gallic. Before the arrival of the Gauls, western Galatia up to the Halys was inhabited by Phrygians, and eastern Galatia by Cappadocians and other native races. This native population remained, and constituted the majority of the inhabitants of the rural parts and almost the sole inhabitants of the towns. They were left in possession of two-thirds of the land (cf. Caesar, *B.G.* i. 31) on condition of paying part of the produce to their new lords, who

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took the other third, and agriculture and commerce with all the arts and crafts of peaceful life remained entirely in their hands. They were henceforth ranked as "Galatians" by the outside world equally with their overlords, and it was from their numbers that the "Galatian" slaves who figure in the markets of the ancient world were drawn. The conquerors, who were few in number, formed a small military aristocracy, living not in the towns, but in fortified villages, where the chiefs in their castles kept up a barbaric state, surrounded by their tribesmen. With the decline of their warlike vigour they began gradually to mix with the natives and to adopt at least their religion: the amalgamation was accelerated under Roman influence and ultimately became as complete as that of the Normans with the Saxons in England, but they gave to the mixed race a distinctive tone and spirit, and long retained their national characteristics and social customs, as well as their language (which continued in use, side by side with Greek, in the 4th century after Christ). In the 1st century, when St Paul made his missionary journeys, even the towns Ancyra, Pessinus and Tavium (where Gauls were few) were not Hellenized, though Greek, the language of government and trade, was spoken there; while the rural population was unaffected by Greek civilization. Hellenic ways and modes of thought begin to appear in the towns only in the later 2nd century. In the rustic parts a knowledge of Greek begins to spread in the 3rd century; but only in the 4th and 5th centuries, after the transference of the centre of government first to Nicomedia and then to Constantinople placed Galatia on the highway of imperial communication, was Hellenism in its Christian form gradually diffused over the country. (See also ANCYRA; PESSINUS; GORDIUM.)

II. The Roman province of Galatia, constituted 25 B.C., included the greater part of the country ruled by Amyntas, viz. Galatia Proper, part of Phrygia towards Pisidia (Apollonia, Antioch and Iconium), Pisidia, part of Lycaonia (including Lystra and Derbe) and Isauria. For nearly 100 years it was the frontier province, and the changes in its boundaries are an epitome of the stages of Roman advance to the Euphrates, one client-state after another being annexed: Paphlagonia in 6–5 B.C.; Sebastopolis, 3–2 B.C.; Amasia, A.D. 1–2; Comana, A.D. 34–35,—together forming Pontus Galaticus,—the Pontic kingdom of Polemon, A.D. 64, under the name Pontus Polemoniacus. In A.D. 70 Cappadocia (a procuratorial province since A.D. 17) with Armenia Minor became the centre of the forward movement and Galatia lost its importance, being merged with Cappadocia in a vast double governorship until A.D. 114 (probably), when Trajan separated the two parts, making Galatia an inferior province of diminished size, while Cappadocia with Armenia Minor and Pontus became a great consular military province, charged with the defence of the frontier. Under Diocletian's reorganization Galatia was divided, about 295, into two parts and the name retained for the northern (now nearly identical with the Galatia of Deiotarus); and about 300 this province, amplified by the addition of a few towns in the west, was divided into Galatia Prima and Secunda or Salutaris, the division indicating the renewed importance of Galatia in the Byzantine empire. After suffering from Persian and Arabic raids, Galatia was conquered by the Seljuk Turks in the 11th century and passed to the Ottoman Turks in the middle of the 14th.

The question whether the "Churches of Galatia," to which St Paul addressed his Epistle, were situated in the northern or southern part of the province has been much discussed, and in England Prof. Sir W. M. Ramsay has been the principal advocate of the adoption of the South-Galatian theory, which maintains that they were the churches planted in Derbe, Lystra, Iconium and Antioch (see GALATIANS). In the present writer's opinion this is supported by the study of the historical and geographical facts.[1]

AUTHORITIES.—Van Gelder, *De Gallis in Graecia et Asia* (1888); Staehelin, *Gesch. d. kleinasiat. Galater* (1897); Perrot, *De Galatia prov. Rom.* (1867); Sir W. M. Ramsay, *Histor. Geogr.* (1890), *St Paul* (1898), and Introd. to *Histor. Commentary on Galatians* (1899). For antiquities generally, Perrot, *Explor. archéol. de la Galatie* (1862); K. Humann and O. Puchstein, *Reisen in Kleinasien* (1890); Koerte, *Athen. Mitteilungen* (1897); Anderson and Crowfoot, *Journ. of Hellenic Studies* (1899); and Anderson, *Map of Asia Minor* (London, Murray, 1903). (J. G. C. A.)

GALATIANS, EPISTLE TO THE, one of the books of the New Testament. This early Christian scripture is one of the books militant in the world's literature. Its usefulness to Luther in his propaganda was no accident in its history; it originated in a controversy, and the varying views of the momentous struggle depicted in Gal. ii. and Acts xv. have naturally determined, from time to time, the conception of the epistle's aim and date. Details of the long critical discussion of this problem cannot be given here. (See PAUL.) It must suffice to say that to the present writer the identification of Gal. ii. 1-10 with Acts xi. 28 f. and not with Acts xv. appears quite untenable, while a fair exegesis of Acts xvi. 1-6 implies a distinction between such towns as Lystra, Derbe and Iconium on the one hand and the Galatian χώρα with Phrygia upon the other.[2] A further visit to the latter country is mentioned, upon this view, in Acts xviii. 23. The Christians to whom the epistle was addressed were thus inhabitants, for the most part (iv. 8) of pagan birth, belonging to the northern section of the province, perhaps mainly in its south-western district adjoining Bithynia and the province of Asia. The scanty allusions to this mission in Acts cannot be taken as any objection to the theory. Nor is there any valid geographical difficulty. The country was quite accessible from Antioch. Least of all does the historical evidence at our disposal justify the inference that the civilization of north Galatia, during the 1st century A.D., was Romano-Gallic rather than Hellenic; for, as the coins and inscriptions indicate, the Anatolian culture which predominated throughout the province did not exclude the infusion either of Greek religious conceptions or of the Greek language. The degree of elementary Greek culture needful for the understanding of Galatians cannot be shown to have been foreign to the inhabitants of north Galatia. So far as any trustworthy evidence is available, such Hellenic notions as are presupposed in this epistle might well have been intelligible to the Galatians of the northern provinces. Still less does the acquaintance with Roman jurisprudence in iii. 15-iv. 1 imply, as Halmel contends (*Der Brief an die Galater*, 1893), that merely that Paul must have acquired such knowledge in Italy but that he wrote the epistle there. A popular acquaintance with the outstanding features of Roman law was widely diffused by this time in Asia Minor.

The epistle can hardly have been written therefore until after the period described in Acts xviii. 22, but the *terminus ad quem* is more difficult to fix.[3] The composition may be placed (cf. the present writer's *Historical New Testament*, pp. 124 f. for details) either during the earlier part of Paul's residence at Ephesus (Acts xix. 1, 10, so most editors and scholars), or on his way from Ephesus to Corinth, or at Corinth itself (so Lightfoot, Bleek, Salmon).

The epistle was not written until Paul had visited Thessalonica,

[1] In the unsettled state of this controversy, weight naturally attaches to the opinion of experts on either side; and the above statement, while opposed to the view taken in the following article on the epistle, must be taken on its merits.—Ed. *E.B.*

[2] The historical and geographical facts concerning Galatia, which lead other writers to support the south Galatian theory, are stated in the preceding article on Galatia; and the question is still a matter of controversy, the division of opinion being to some extent dependent on whether it is approached from the point of view of the archaeologist or the Biblical critic. The ablest re-statements of the north Galatian theory, in the light of recent pleas for south Galatia as the destination of this epistle, may be found by the English reader in P. W. Schmiedel's exhaustive article in *Encycl. Biblica* (1592–1616) and Prof. G. H. Gilbert's *Student's Life of Paul* (1902), pp. 260-272. Schmiedel's arguments are mainly directed against Sir W. M. Ramsay, but a recent Roman Catholic scholar, Dr A. Steinmann, takes a wider survey in a pamphlet on the north Galatian side of the controversy (*Die Abfassungszeit des Galaterbriefs*, Münster, i. W., 1906), carrying forward the points already urged by Sieffert and Zöckler amongst others, and especially refuting his fellow-churchman, Prof. Valentine Weber.

[3] The tendency among adherents of the south Galatian theory is to put the epistle as early as possible, making it contemporaneous with, if not prior to, 1 Thessalonians. So Douglass Round in *The Date of St Paul's Epistle to the Galatians* (1906).

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but the Galatian churches owed their origin to a mission of Paul undertaken some time before he crossed from Asia to Europe. When he composed this letter, he had visited the churches twice. On the former of these visits (iv. 13 *τὸ πρότερον*), though broken down by illness (2 Cor. xii. 7-9?) he had been enthusiastically welcomed, and the immediate result of his mission was an outburst of religious fervour (iii. 1-5, iv. 14 f.). The local Christians made a most promising start (v. 7). But they failed to maintain their ardour. On his second visit (iv. 13, i. 7, v. 21) the apostle found in many of them a disheartening slackness, due to discord and incipient legalism. His plain-speaking gave offence in some quarters (iv. 16), though it was not wholly ineffective. Otherwise, this second visit is left in the shadow.[1] So far as it was accompanied by warnings, these were evidently general rather than elicited by any definite and imminent peril to the churches. Not long afterwards, however, some judaizing opponents of the apostle (note the contemptuous anonymity of the *τινες* in i. 7, as in Col. ii. 4 f.), headed by one prominent and influential individual (v. 10), made their appearance among the Galatians, promulgating a "gospel" which meant fidelity to, not freedom from, the Law (i. 6-10). Arguing from the Old Testament, they represented Paul's gospel as an imperfect creed which required to be supplemented by legal exactitude,[2] including ritual observance (iv. 10) and even circumcision,[3] while at the same time they sought to undermine his authority[4] by pointing out that it was derived from the apostles at Jerusalem and therefore that his teaching must be open to the checks and tests of that orthodox primitive standard which they themselves claimed to embody. The sole valid charter to Messianic privileges was observance of the Mosaic law, which remained obligatory upon pagan converts (iii. 6-9, 16).

When the news of this relapse reached Paul, matters had evidently not yet gone too far. Only a few had been circumcised. It was not too late to arrest the Galatians on their downward plane, and the apostle, unable or unwilling to re-visit them, despatched this epistle. How or when the information came to him, we do not know. But the gravity of the situation renders it unlikely that he would delay for any length of time in writing to counteract the intrigues of his opponents; to judge from allusions like those in i. 6 (*ταχέως* and *μετατίθεσθε*—the lapse still in progress), we may conclude that the interval between the reception of the news and the composition of the letter must have been comparatively brief.

After a short introduction[5] (i. 1-5), instead of giving his usual word of commendation, he plunges into a personal and historical vindication[6] of his apostolic independence, which, developed negatively and positively, forms the first of the three main sections in the epistle (i. 6–ii. 21). In the closing passage he drifts over from an account of this interview with Peter into a sort of monologue upon the incompatibility of the Mosaic law with the Christian gospel (ii. 15-21),[7] and this starts him afresh upon a trenchant expostulation and appeal (iii. 1–v. 12) regarding the alternatives of law and spirit. Faith dominates this section; faith in its historical career and as the vantage-ground of Christianity. The much-vaunted law is shown to be merely a provisional episode[8] culminating in the gospel (iii. 7-28) as a message of filial confidence and freedom (iii. 29–iv. 11). The genuine "sons of Abraham" are not legalistic Jewish Christians but those who simply possess faith in Jesus Christ. A passionate outburst then follows (iv. 12 f.), and, harping still on Abraham, the apostle essays, with fresh rabbinic dialectic, to establish Christianity over legalism as the free and final religion for men, applying this to the moral situation of the Galatians themselves (v. 1-12). This conception of freedom then leads him to define the moral responsibilities of the faith (v. 13–vi. 10), in order to prevent misconception and to enforce the claims of the gospel upon the individual and social life of the Galatians. The epilogue (vi. 11-21) reiterates, in a handful of abrupt, emphatic sentences, the main points of the epistle.

The allusion to iv. 11 (*ἴδετε πηλίκοις ὑμῖν γράμμασιν ἔγραψα τῇ ἐμῇ χειρί*) is to the large bold size[9] of the letters in Paul's handwriting, but the object and scope of the reference are matters of dispute. It is "a sensational heading" (Findlay), but it may either refer[10] to the whole epistle (so Augustine, Chrysostom, &c., followed by Zahn) or, as most hold (with Jerome) to the postscript (vi. 11-18). Paul commonly dictated his letters. His use of the autograph here may have been to prevent any suspicion of a forgery or to mark the personal emphasis of his message. In any case it is assumed that the Galatians knew his handwriting. It is unlikely that he inserted this postscript from a feeling of ironical playfulness, to make the Galatians realize that, after the sternness of the early chapters, he was now treating them like children, "playfully hinting that surely the large letters will touch their hearts" (so Deissmann, *Bible-Studies* (1901), 346 f.).

The earliest allusion to the epistle[11] is the notice of its inclusion in Marcion's canon, but almost verbal echoes of iii. 10-13 are to be heard in Justin Martyr's *Dial.* xciv.-xcv.; it was certainly known to Polycarp, and as the 2nd century advances the evidence of its popularity multiplies on all sides, from Ptolemaeus and the Ophites to Irenaeus and the Muratorian canon (cf. Gregory's *Canon and Text of N.T.*, 1907, pp. 201-203). It is no longer necessary for serious criticism to refute the objections to its authenticity raised during the 19th century in certain quarters;[12] as Macaulay said of the authenticity of Caesar's commentaries, "to doubt on that subject is the mere rage of scepticism."

[1] It is not quite clear whether traces of the Judaistic agitation were already found by Paul on this visit (so especially Holsten, Lipsius, Sieffert, Pfleiderer, Weiss and Weizsäcker) or whether they are to be dated subsequent to his departure (so Philippi, Renan and Hofmann, among others). The tone of surprise which marks the opening of the epistle tells in favour of the latter theory. Paul seems to have been taken aback by the news of the Galatians' defection.

[2] Apparently they were clever enough to keep the Galatians in ignorance that the entire law would require to be obeyed (v. 3).

[3] The critical dubiety about *ὁλόκληρον* in ii. 5 (Zahn's excursus and Prof. Lake in *Expositor*, March 1906, p. 236 f.) throws a slight doubt on the interpretation of ii. 3, but it is clear that the agitators had quoted Paul's practice as an authoritative sanction of the rite.

[4] This depreciation is voiced in their catch-word *οἱ δοκοῦντες* ("those of repute," ii. 6), while other echoes of their talk can be overheard in such phrases as "we are Abraham's seed" (iii. 16), "sinners of Gentiles" (ii. 15) and "Jerusalem which is our mother" (iv. 26), as well as in their charges against Paul of "seeking to please men" (i. 10) and "preaching circumcision" (v. 11).

[5] Not only is the address "to the churches of Galatia" unusually bare, but Paul associates no one with himself, either because he was on a journey or because, as the attacked party, he desired to concentrate attention upon his personal commission. Yet the *ἡμεῖς* of i. 8 indicates colleagues like Silas and Timothy.

[6] Cf. Hausrath's *History of the N.T. Times* (iii. pp. 181-199), with the fine remarks, on vi. 17, that "Paul stands before us like an ancient general who bares his breast before his mutinous legions, and shows them the scars of the wounds that proclaim him not unworthy to be called Imperator."

[7] Cf. T. H. Green's *Works*, iii. 186 f. Verses 15-17 are the indirect abstract of the speech's argument, but in verses 18-21 the apostle, carried away by the thought and barrier of the moment as he dictates to his amanuensis, forgets the original situation.

[8] Thus Paul reverses the ordinary rabbinic doctrine which taught (cf. Kiddushim, 30, b) that the law was given as the divine remedy for the evil *yezer* of man. So far from being a remedy, he argues, it is an aggravation.

[9] According to Plutarch, Cato the elder wrote histories for the use of his son "*διὰ χειρὸς καὶ μεγάλοις γράμμασιν* (cf. Field's *Notes on Translation of the New Testament*, p. 191). If the point of Gal. vi. 11 lies in the size of the letters, Paul cannot have contemplated copies of the epistle being made. He must have assumed that the autograph would reach all the local churches (cf. 2 Thess. iii. 17, with E. A. Abbott, *Johannine Grammar*, pp. 530-532).

[10] For *ἔγραψα*, the epistolary aorist, at the close of a letter, cf. Xen. *Anab.* i. 9. 25, Thuc. i. 129. 3, Ezra iv. 14 (LXX) and Lucian, *Dial. Meretr.* x.

[11] Hermann Schulze's attempt to bring out the filiation of the later N.T. literature to Galatians (*Die Ursprünglichkeit des Galaterbriefes*, Leipzig, 1903) involves repeated exaggerations of the literary evidence.

[12] Cf. especially J. Gloe's *Die jüngste Kritik des Galaterbriefes* (Leipzig, 1890) and Baljon's reply to Steck and Loman (*Exeg.-kritische verhandeling over den Brief van P. aan de Gal.*, 1889). The English reader may consult Schmiedel's article (already referred to) and Dr R. J. Knowling's *The Testimony of St Paul to Christ* (1905), 28 f.

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Even the problems of its integrity are quite secondary. Marcion (cf. Tert. *Adv. Marc.* 2-4) removed what he judged to be some interpolations, but van Manen's attempt to prove that Marcion's text is more original than the canonical (*Theolog. Tijdschrift*, 1887, 400 f. 451 f.) has won no support (cf. C. Clemen's refutation in *Die Einheitlichkeit der paulin. Briefe*, 1894, pp. 100 f. and Zahn's *Geschichte d. N.T. lichen Kanons*, ii. 409 f.), and little or no weight attaches to the attempts made (*e.g.* by J. A. Cramer) to disentangle a Pauline nucleus from later accretions. Even D. Völter, who applies this method to the other Pauline epistles, admits that Galatians, whether authentic or not, is substantially a literary unity (*Paulus und seine Briefe*, 1905, pp. 229-285). The frequent roughnesses of the traditional text suggest, however, that here and there marginal glosses may have crept in. Thus iv. 25*a* (τὸ γὰρ Σινᾶ ὄρος ἐστὶν ἐν τῇ Ἀραβίᾳ) probably represents the explanatory and prosaic gloss of a later editor, as many scholars have seen from Bentley (*Opuscula philologica*, 1781, pp. 533 f.) to H. A. Schott, J. A. Cramer, J. M. S. Baljon and C. Holsten. The general style of the epistle is vigorous and unpremeditated, "one continuous rush, a veritable torrent of genuine and inimitable Paulinism, like a mountain stream in full flood, such as may often have been seen by his Galatians" (J. Macgregor). But there is a certain rhythmical balance, especially in the first chapter (cf. J. Weiss, *Beiträge zur paulin. Rhetorik*, 1897, 8 f.); here as elsewhere the rush and flow of feeling carry with them some care for rhetorical form, in the shape of antitheses, such as a pupil of the schools might more or less unconsciously retain.[1] All through, the letter shows the breaks and pauses of a mind in direct contact with some personal crisis. Hurried, unconnected sentences, rather than sustained argument, are its most characteristic features.[2] The trenchant remonstrances and fiery outbursts make it indeed "read like a dithyramb from beginning to end."

BIBLIOGRAPHY.—Of more modern editions in English, the most competent are those of G. J. Ellicott (4th ed., 1867, strong in linguistic and grammatical material), Prof. Eadie (Edinburgh, 1869), J. B. Lightfoot (11th ed., 1892), Dean Alford (3rd ed., 1862) and F. Rendall (*Expositor's Greek Testament*, 1903) on the Greek text; Dr Sanday (in Ellicott's *Commentary*, 1879), Dr Jas. Macgregor (Edinburgh, 1879), B. Jowett (3rd ed., 1894), Huxtable (*Pulpit Comment.*, 1885), Dr Agar Beet (London, 1885, &c.), Dr W. F. Adeney (*Century Bible*), Dr E. H. Perowne (*Cambridge Bible*, 1890) and Dr James Drummond (*Internat. Handbooks to N.T.*, 1899) also comment on the English text. The editions of Lightfoot and Jowett are especially valuable for their subsidiary essays, and Sir W. M Ramsay's *Historical Commentary on Galatians* (1899) contains archaeological and historical material which is often illuminating. The French editions are few and mixed, those by A. Sardinoux (Valence, 1837) and E. Reuss (1878) being adequate, however. In Germany the two most up-to-date editions are by F. Sieffert (in Meyer's *Comment.*, 1899) and Th. Zahn (2nd ed., 1907); these supersede most of the earlier works, but H. A. Schott (1834), A. Wieseler (Göttingen, 1859), G. B. Winer (4th ed., 1859), J. C. K. von Hofmann (2nd ed., 1872), Philippi (1884), R. A. Lipsius (2nd ed., *Hand.-Commentar*, 1892), and Zöckler (2nd ed., 1894) may still be consulted with advantage, while Hilgenfeld's commentary (1852) discusses acutely the historical problems of the epistle from the standpoint of Baur's criticism. The works of A. Schlatter (2nd ed., 1894) and W. Bousset (in *Die Schriften des N.T.*, 2nd ed., 1907) are more popular in character. F. Windischmann (Mayence, 1823), F. X. Reithmayr (1865), A. Schäfer (Münster, 1890) and F. Cornely (1892, also in *Cursus scripturae sacrae*, 1907) are the most satisfactory modern editors, from the Roman Catholic church, but it should not be forgotten that the 16th century produced the *Literalis expositio* of Cajetan (Rome, 1529) and the similar work of Pierre Barahona (Salamanca, 1590), no less than the epoch-making edition of Luther (Latin, 1519, &c.; German, 1525 f.; English, 1575 f.). After Calvin and Grotius, H. E. G. Paulus (*Des Apostel P. Lehrbriefe an die Gal. u. Römer Christen*, 1831) was perhaps the most independent interpreter. For the patristic editions, see the introductory sections in Zahn and Lightfoot. The religious thought of the epistle is admirably expounded from different standpoints by C. Holsten (*Das Evangelium Paulus*, Teil I., i., 1880), A. B. Bruce (*St Paul's Conception of Christianity*, 1894, pp. 49-70) and Prof. G. B. Findlay (*Expositor's Bible*). On the historical aspects, Zimmer (*Galat. und Apostelgeschichte*, 1882) and M. Thomas (*Mélanges d'histoire et de litt. religieuse*, Paris, 1899, pp. 1-195) are excellent; E. H. Askwith's essay (*Epistle to the Galatians, its Destination and Date*, 1899) advocates ingeniously the south Galatian theory, and W. S. Wood (*Studies in St Paul's Epistle to the Galatians*, 1887) criticizes Lightfoot. General studies of the epistle will be found in all biographies of Paul and histories of the apostolic age, and in the works like Sabatier's *The Apostle Paul* (pp. 187 f.), B. W. Bacon's *Story of St Paul* (pp. 116 f.), Dr R. D. Shaw's *The Pauline Epistles* (2nd ed., pp. 60 f.), R. Mariano, *Il Cristianesimo nei primi secoli* (1902), i. pp. 111 f., and Volkmar's *Paulus vom Damascus bis zum Galaterbrief* (1887), to which may be added a series of papers by Haupt in *Deutsche Evang.-Blätter* (1904), 1-16, 89-108, 161-183, 238-259, and an earlier set by Hilgenfeld in the *Zeitschrift für wiss. Theologie* ("Zur Vorgeschichte des Gal." 1860, pp. 206 f., 1866, pp. 301 f., 1884, pp. 303 f.). Other monographs and essays have been noted in the course of this article. See further under PAUL.

(J. MT.)

GALATINA, a town of Apulia, Italy, in the province of Lecce, from which it is 14 m. S. by rail, 233 ft. above sea-level. Pop. (1901) 12,017 (town); 14,086 (commune). It is chiefly remarkable for the fine Gothic church of St Caterina, built in 1390 by Raimondello del Balzo Orsini, count of Soleto, with a fine portal and rose-window. The interior contains frescoes by Francesco d' Arezzo (1435). The apse contains the fine mausoleum of the son of the founder (d. 1454), a canopy supported by four columns, with his statue beneath it.

GALATZ (*Galații*), a city of Rumania, capital of the department of Covurlui; on the left bank of the river Danube, 90 m. W. by N. of its mouth at Sulina. Pop. (1900) 62,678, including 12,000 Jews. The Danube is joined by the Sereth 3 m. S.W. of Galatz, and by the Pruth 10 m. E. Galatz is built on a slight eminence among the marshes which line the intervening shore and form, beside the western bank of the Pruth, the shallow mere called Lake Bratych (*Brațeșul*), more than 50 sq. m. in extent. With the disappearance, towards the close of the 19th century, of most of its older quarters in which the crooked, ill-paved streets and insanitary houses were liable to be flooded every year, the city improved rapidly. Embankments and fine quays were constructed along the Danube; electric tramways were opened in the main streets, which were lighted by gas or electricity, and pure water was supplied. The higher, or north-western part of the city, which is the more open and comfortable, contains many of the chief buildings. These include the prefecture, consulate, prison, barracks, civil and military hospitals and the offices of the international commission for the control of the Danube (*q.v.*). The bishop of the lower Danube resides at Galatz. There are many Orthodox Greek, Roman Catholic and other churches; the most interesting being the cathedral, and St Mary's church, in which is the tomb of the famous Cossack chief, Mazeppa (1644–1709), said to have been rifled of its contents by the Russians. Galatz is a naval station, and the headquarters of the III. army corps, protected by a line of fortifications which extends for 45 m. E. to Focshani and is known as the Sereth line. But the main importance of the city is commercial. Galatz is the chief Moldavian port of entry, approached by three waterways, the Danube, Sereth and Pruth, down which there is a continual volume of traffic, except in mid-winter; and by the railways which intersect all the richest portions of the country. Textiles, machinery, and coal make up the hulk of imports. Besides a large trade in petroleum and salt, Galatz ranks first among Rumanian cities in its export of timber, and second to Braila in its export of grain. It possesses many saw-mills, paste-mills, flour-mills, roperies, chemical works and petroleum refineries, manufacturing also metal ware, wire, nails, soap and candles. Vessels of 2500 tons can discharge at the quays, but cargoes consigned to Galatz are often transhipped into lighters at Sulina. The shipping trade is largely in foreign hands, the principal owners being British.

GALAXY, properly the MILKY WAY, from the Greek name ὁ γαλαξίας, *sc.* κύκλος, from γάλα, milk, cf. the Lat. *via lactea* (see STAR). The word is more generally employed in its figurative or

[1] Compare the minute analysis of the whole epistle in F. Blass, *Die Rhythmen der asianischen und römischen Kunstprosa* (1905), pp. 43-53, 204-216, where, however, this feature is exaggerated into unreality. The comic trimeter in Philipp. iii. 1 (ἀσφαλὲς μὲν οὐκ ὀκνηρὸν ὑμῖν δ' ἀσφαλὲς) may well be, like that in 1 Cor. xv. 33, a reminiscence of Menander.

[2] This affects even the vocabulary which has also "einen gewissen vulgären Zug" (Nägeli, *Der Wortschatz des Apostels Paulus*, 1905, pp. 78-79).

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transferred sense, to describe a gathering of brilliant or distinguished persons or objects.

GALBA, SERVIUS SULPICIUS, Roman general and orator. He served under Lucius Aemilius Paulus in the third Macedonian War. As praetor in 151 B.C. in farther Spain he made himself infamous by the treacherous murder of a number of Lusitanians, with their wives and children, after inducing them to surrender by the promise of grants of land. For this in 149 he was brought to trial, but secured an acquittal by bribery and by holding up his little children before the people to gain their sympathy. He was consul in 144, and must have been alive in 138. He was an eloquent speaker, noted for his violent gesticulations, and, in Cicero's opinion, was the first of the Roman orators. His speeches, however, were almost forgotten in Cicero's time.

Livy xlv. 35; Appian, *Hisp.* 58-60; Cicero, *De orat.* i. 53, iii. 7; Brutus 21.

GALBA, SERVIUS SULPICIUS, Roman emperor (June A.D. 68 to January 69), born near Terracina, on the 24th of December 5 B.C. He came of a noble family and was a man of great wealth, but unconnected either by birth or by adoption with the first six Caesars. In his early years he was regarded as a youth of remarkable abilities, and it is said that both Augustus and Tiberius prophesied his future eminence (Tacitus, *Annals*, vi. 20; Suetonius, *Galba*, 4). Praetor in 20, and consul in 33, he acquired a well-merited reputation in the provinces of Gaul, Germany, Africa and Spain by his military capability, strictness and impartiality. On the death of Caligula, he refused the invitation of his friends to make a bid for empire, and loyally served Claudius. For the first half of Nero's reign he lived in retirement, till, in 61, the emperor bestowed on him the province of Hispania Tarraconensis. In the spring of 68 Galba was informed of Nero's intention to put him to death, and of the insurrection of Julius Vindex in Gaul. He was at first inclined to follow the example of Vindex, but the defeat and suicide of the latter renewed his hesitation. The news that Nymphidius Sabinus, the praefect of the praetorians, had declared in his favour revived Galba's spirits. Hitherto, he had only dared to call himself the legate of the senate and Roman people; after the murder of Nero, he assumed the title of Caesar, and marched straight for Rome. At first he was welcomed by the senate and the party of order, but he was never popular with the soldiers or the people. He incurred the hatred of the praetorians by scornfully refusing to pay them the reward promised in his name, and disgusted the mob by his meanness and dislike of pomp and display. His advanced age had destroyed his energy, and he was entirely in the hands of favourites. An outbreak amongst the legions of Germany, who demanded that the senate should choose another emperor, first made him aware of his own unpopularity and the general discontent. In order to check the rising storm, he adopted as his coadjutor and successor L. Calpurnius Piso Frugi Licinianus, a man in every way worthy of the honour. His choice was wise and patriotic; but the populace regarded it as a sign of fear, and the praetorians were indignant, because the usual donative was not forthcoming. M. Salvius Otho, formerly governor of Lusitania, and one of Galba's earliest supporters, disappointed at not being chosen instead of Piso, entered into communication with the discontented praetorians, and was adopted by them as their emperor. Galba, who at once set out to meet the rebels—he was so feeble that he had to be carried in a litter—was met by a troop of cavalry and butchered near the Lacus Curtius. During the later period of his provincial administration he was indolent and apathetic, but this was due either to a desire not to attract the notice of Nero or to the growing infirmities of age. Tacitus rightly says that all would have pronounced him worthy of empire if he had never been emperor ("omnium consensu capax imperii nisi imperasset").

See his life by Plutarch and Suetonius; Tacitus, *Histories*, i. 7-49; Dio Cassius lxiii. 23-lxiv. 6; B. W. Henderson, *Civil War and Rebellion in the Roman Empire, A.D. 69-70* (1908); W. A. Spooner, *On the Characters of Galba, Otho and Vitellius* in Introd. to his edition (1891) of the *Histories* of Tacitus.

GALBANUM (Heb. *Helbenâh*; Gr. χαλβάνη), a gum-resin, the product of *Ferula galbaniflua*, indigenous to Persia, and perhaps also of other umbelliferous plants. It occurs usually in hard or soft, irregular, more or less translucent and shining lumps, or occasionally in separate tears, of a light-brown, yellowish or greenish-yellow colour, and has a disagreeable, bitter taste, a peculiar, somewhat musky odour, and a specific gravity of 1·212. It contains about 8% of terpene; about 65% of a resin which contains sulphur; about 20% of gum; and a very small quantity of the colourless crystalline substance *umbelliferone*, $C_9H_6O_3$. Galbanum is one of the oldest of drugs. In Exodus xxx. 34 it is mentioned as a sweet spice, to be used in the making of a perfume for the tabernacle. Hippocrates employed it in medicine, and Pliny (*Nat. Hist.* xxiv. 13) ascribes to it extraordinary curative powers, concluding his account of it with the assertion that "the very touch of it mixed with oil of spondylium is sufficient to kill a serpent." The drug is occasionally given in modern medicine, in doses of from five to fifteen grains. It has the actions common to substances containing a resin and a volatile oil. Its use in medicine is, however, obsolescent.

GALCHAS, the name given to the highland tribes of Ferghana, Kohistan and Wakhan. These Aryans of the Pamir and Hindu Kush, kinsmen of the Tajiks, are identified with the *Calcienses populi* of the lay Jesuit Benedict Goes, who crossed the Pamir in 1603 and described them as "of light hair and beard like the Belgians." The word "Galcha," which has been explained as meaning "the hungry raven who has withdrawn to the mountains," in allusion to the retreat of this branch of the Tajik family to the mountains to escape the Tatar hordes, is probably simply the Persian *galcha*, "clown" or "rustic," in reference to their uncouth manners. The Galchas conform physically to what has been called the "Alpine or Celtic European race," so much so that French anthropologists have termed them "those belated Savoyards of Kohistan." D'Ujfalvy describes them as tall, brown or bronzed and even white, with ruddy cheeks, black, chestnut, sometimes red hair, brown, blue or grey eyes, never oblique, well-shaped, slightly curved nose, thin lips, oval face and round head. Thus it seems reasonable to hold that the Galchas represent the most eastern extension of the Alpine race through Armenia and the Bakhtiari uplands into central Asia. The Galchas for the most part profess Sunnite Mahommedanism.

See Robert Shaw, "On the Galtchah Languages," in *Journ. As. Soc. Bengal*, xlv. (1876), and xlvi. (1877); Major J. Biddulph, *Tribes of the Hindoo-Koosh* (Calcutta, 1880); Hon. Mountstuart Elphinstone, *An Account of the Kingdom of Caubul* (1815); *Bull. de la société d'anthropologie de Paris* (1887); Charles Eugene D'Ujfalvy de Mezoe-Koeveed, *Les Aryens* (1896), and in *Revue d'anthropologie* (1879), and *Bull. de la soc. de géogr.* (June 1878); W. Z. Ripley, *Races of Europe* (New York, 1899).

GALE, THEOPHILUS (1628-1678), English nonconformist divine, was born in 1628 at Kingsteignton, in Devonshire, where his father was vicar. In 1647 he was entered at Magdalen College, Oxford, where he took his B.A. degree in 1649, and M.A. in 1652. In 1650 he was made fellow and tutor of his college. He remained some years at Oxford, discharging actively the duties of tutor, and was in 1657 appointed as preacher in Winchester cathedral. In 1662 he refused to submit to the Act of Uniformity, and was ejected. He became tutor to the son of Lord Wharton, whom he accompanied to the Protestant college of Caen, in Normandy, returning to England in 1665. The latter portion of his life he passed in London as assistant to John Rowe, an Independent minister who had charge of an important church in Holborn; Gale succeeded Rowe in 1677, and died in the following year. His principal work, *The Court of the Gentiles*, which appeared in parts in 1669, 1671 and 1676, is a strange storehouse of miscellaneous philosophical learning. It resembles the *Intellectual System* of Ralph Cudworth, though much inferior to that work both in general construction and in fundamental idea. Gale's endeavour (based on a hint of Grotius in *De veritate*, i. 16) is to prove that the whole philosophy of the Gentiles is a distorted or mangled reproduction of Biblical truths. Just as Cudworth referred the Democritean doctrine of atoms to Moses as the original author, so Gale tries to show that the various systems of Greek thought may be traced back to Biblical sources. Like so many of the learned works of the 17th century, the *Court of the*

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Gentiles is chaotic and unsystematic, while its erudition is rendered almost valueless by the complete absence of any critical discrimination.

His other writings are: *A True Idea of Jansenism* (1669); *Theophil, or a Discourse of the Saint's Amitie with God in Christ* (1671); *Anatomie of Infidelitie* (1672); *Idea theologiae* (1673); *Philosophia generalis* (1676).

GALE, THOMAS (?1636–1702), English classical scholar and antiquarian, was born at Scruton, Yorkshire. He was educated at Westminster school and Trinity College, Cambridge, of which he became a fellow. In 1666 he was appointed regius professor of Greek at Cambridge, in 1672 high master of St Paul's school, in 1676 prebendary of St Paul's, in 1677 a fellow of the Royal Society, and in 1697 dean of York. He died at York on the 7th (or 8th) of April 1702. He published a collection, *Opuscula mythologica, ethica, et physica*, and editions of several Greek and Latin authors, but his fame rests chiefly on his collection of old works bearing on Early English history, entitled *Historiae Anglicanae scriptores* and *Historiae Britannicae, Saxonicae, Anglo-Danicae scriptores XV*. He was the author of the inscription on the London Monument in which the Roman Catholics were accused of having originated the great fire.

See J. E. B. Mayor, *Cambridge in the Time of Queen Anne*, 448-450.

GALE. 1. (A word of obscure origin; possibly derived from Dan. *gal*, mad or furious, sometimes applied to wind, in the sense of boisterous) a wind of considerable power, considerably stronger than a breeze, but not severe enough to be called a storm. In nautical language it is usually combined with some qualifying word, as "half a gale," a "stiff gale." In poetical and figurative language "gale" is often used in a pleasant sense, as in "favouring gale"; in America, it is used in a slang sense for boisterous or excited behaviour.

2. The payment of rent, customs or duty at regular intervals; a "hanging gale" is an arrear of rent left over after each successive "gale" or rent day. The term survives in the Forest of Dean, for leases granted to the "free miners" of the forest, granted by the "gaveller" or agent of the crown, and the term is also applied to the royalty paid to the crown, and to the area mined. The word is a contracted form of the O. Eng. *gafol*, which survives in "gavel," in gavelkind (*q.v.*), and in the name of the office mentioned above. The root from which these words derive is that of "give." Through Latinized forms it appears in *gabelle* (*q.v.*).

3. The popular name of a plant, also known as the sweet gale or gaul, sweet willow, bog or Dutch myrtle. The Old English form of the word is *gagel*. It is a small, twiggy, resinous fragrant shrub found on bogs and moors in the British Islands, and widely distributed in the north temperate zone. It has narrow, short-stalked leaves and inconspicuous, apetalous, unisexual flowers borne in short spikes. The small drupe-like fruit is attached to the persistent bracts. The leaves are used as tea and as a country medicine. John Gerard (*Herball*, p. 1228) describes it as sweet willow or gaule, and refers to its use in beer or ale. The genus *Myrica* is the type of a small, but widely distributed order, *Myricaceae*, which is placed among the apetalous families of Dicotyledons, and is perhaps most nearly allied to the willow family. *Myrica cerifera* is the candleberry, wax-myrtle or wax-tree (*q.v.*).

GALEN, CHRISTOPH BERNHARD, FREIHERR VON (1606–1678), prince bishop of Münster, belonged to a noble Westphalian family, and was born on the 12th of October 1606. Reduced to poverty through the loss of his paternal inheritance, he took holy orders; but this did not prevent him from fighting on the side of the emperor Ferdinand III. during the concluding stages of the Thirty Years' War. In 1650 he succeeded Ferdinand of Bavaria, archbishop of Cologne, as bishop of Münster. After restoring some degree of peace and prosperity in his principality, Galen had to contend with a formidable insurrection on the part of the citizens of Münster; but at length this was crushed, and the bellicose bishop, who maintained a strong army, became an important personage in Europe. In 1664 he was chosen one of the directors of the imperial army raised to fight the Turk; and after the peace which followed the Christian victory at St Gotthard in August 1664, he aided the English king Charles II. in his war with the Dutch, until the intervention of Louis XIV. and Frederick William I. of Brandenburg compelled him to make a disadvantageous peace in 1666. When Galen again attacked Holland six years later he was in alliance with Louis, but he soon deserted his new friend, and fought for the emperor Leopold I. against France. Afterwards in conjunction with Brandenburg and Denmark he attacked Charles XI. of Sweden, and conquered the duchy of Bremen. He died at Ahaus on the 19th of September 1678. Galen showed himself anxious to reform the church, but his chief energies were directed to increasing his power and prestige.

See K. Tücking, *Geschichte des Stifts Münster unter C. B. von Galen* (Münster, 1865); P. Corstiens, *Bernard van Galen, Vorst-Bisschop van Munster* (Rotterdam, 1872); A. Hüsing, *Fürstbischof C. B. von Galen* (Münster, 1887); and C. Brinkmann in the *English Historical Review*, vol. xxi. (1906). There is in the British Museum a poem printed in 1666, entitled *Letter to the bishop of Munster containing a Panegyrick of his heroick achievements in heroick verse*.

GALEN (or GALENUS), **CLAUDIUS,** called Gallien by Chaucer and other writers of the middle ages, the most celebrated of ancient medical writers, was born at Pergamus, in Mysia, about A.D. 130. His father Nicon, from whom he received his early education, is described as remarkable both for excellence of natural disposition and for mental culture; his mother, on the other hand, appears to have been a second Xanthippe. In 146 Galen began the study of medicine, and in about his twentieth year he left Pergamus for Smyrna, in order to place himself under the instruction of the anatomist and physician Pelops, and of the peripatetic philosopher Albinus. He subsequently visited other cities, and in 158 returned from Alexandria to Pergamus. A few years later he went for the first time to Rome. There he healed Eudemus, a celebrated peripatetic philosopher, and other persons of distinction; and ere long, by his learning and unparalleled success as a physician, earned for himself the titles of "Paradoxologus," the wonder-speaker, and "Paradoxopoeus," the wonder-worker, thereby incurring the jealousy and envy of his fellow-practitioners. Leaving Rome in 168, he repaired to his native city, whence he was soon sent for to Aquileia, in Venetia, by the emperors Lucius Verus and Marcus Aurelius. In 170 he returned to Rome with the latter, who, on departing thence to conduct the war on the Danube, having with difficulty been persuaded to dispense with his personal attendance, appointed him medical guardian of his son commodus. In Rome Galen remained for some years, greatly extending his reputation as a physician, and writing some of his most important treatises. It would appear that he eventually betook himself to Pergamus, after spending some time at the island of Lemnos, where he learned the method of preparing a certain popular medicine, the "terra lemnia" or "sigillata." Whether he ever revisited Rome is uncertain, as also are the time and place of his death. According to Suidas, he died at the age of seventy, or in the year 200, in the reign of Septimius Severus. If, however, we are to trust the testimony of Abul-faraj, his decease took place in Sicily, when he was in his eightieth year. Galen was one of the most versatile and accomplished writers of his age. He composed, it is said, nearly 500 treatises on various subjects, including logic, ethics and grammar. Of the published works attributed to him, 83 are recognized as genuine, 19 are of doubtful authenticity, 45 are confessedly spurious, 19 are fragments, and 15 are notes on the writings of Hippocrates.

Galen, who in his youth was carefully trained in the Stoic philosophy, was an unusually prolific writer on logic. Of the numerous commentaries and original treatises, a catalogue of which is given in his work *De propriis libris*, one only has come down to us, the treatise on *Fallacies in dictione* (Περὶ τῶν κατὰ τὴν λέξιν σοφισμάτων). Many points of logical theory, however, are discussed in his medical and scientific writings. His name is perhaps best known in the history of logic in connexion with the fourth syllogistic figure, the first distinct statement of which was ascribed to him by Averroes. There is no evidence from Galen's own works that he did make this addition to the doctrines of

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syllogism, and the remarkable passage quoted by Minoides Minas from a Greek commentator on the *Analytics*, referring the fourth figure to Galen, clearly shows that the addition did not, as generally supposed, rest on a new principle, but was merely an amplification or alteration of the indirect moods of the first figure already noted by Theophrastus and the earlier Peripatetics.

In 1844 Minas published a work, avowedly from a MS. with the superscription *Galenus*, entitled Γλαυκοῦ εἰσαγωγὴ διαλεκτική. Of this work, which contains no direct intimation of a fourth figure, and which in general exhibits an astonishing mixture of the Aristotelian and Stoic logic, Prantl speaks with the bitterest contempt. He shows demonstratively that it cannot be regarded as a writing of Galen's, and ascribes it to some one or other of the later Greek logicians. A full summary of its contents will be found in the 1st vol. of the *Geschichte der Logik* (pp. 591-610), and a notice of the logical theories of the true Galen in the same work, pp. 559-577.

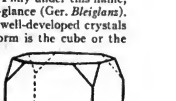
There have been numerous issues of the whole or parts of Galen's works, among the editors or illustrators of which may be mentioned Jo. Bapt. Opizo, N. Leonicenus, L. Fuchs, A. Lacuna, Ant. Musa Brassavolus, Aug. Gadaldinus, Conrad Gesner, Sylvius, Cornarius, Joannes Montanus, Joannes Caius, Thomas Linacre, Theodore Goulston, Caspar Hoffman, René Chartier, Haller and Kühn. Of Latin translations Choulant mentions one in the 15th and twenty-two in the following century. The Greek text was edited at Venice, in 1525, 5 vols. fol.; at Basel, in 1538, 5 vols. fol.; at Paris, with Latin version by René Chartier, in 1639, and in 1679, 13 vols. fol.; and at Leipzig, in 1821-1833, by C. G. Kühn, considered to be the best, 20 vols. 8vo. An epitome in English of the works of Hippocrates and Galen, by J. R. Coxe, was published at Philadelphia in 1846. A new edition of Galen's smaller works by J. Marquardt, Iwan Müller and G. Helmreich was published in three volumes at Leipzig in 1884-1909.

Further details as to the life and an account of the anatomical and medical knowledge of Galen will be found in the historical articles under the headings of ANATOMY and MEDICINE. See also René Chartier's Life, in his edition of Galen's works; N. F. J. Eloy, *Dictionnaire historique de la médecine*, s.v. "Galien," tom. 1. (1778); F. Adams's "Commentary" in his *Medical Works of Paulus Aegineta* (London and Aberdeen, 1834); J. Kidd, "A Cursory Analysis of the Works of Galen, so far as they relate to Anatomy and Physiology," *Trans. Provincial Med. and Surg. Assoc.* vi., 1837, pp. 299-336; C. V. Daremberg, *Exposition des connaissances de Galien sur l'anatomie, la physiologie et la pathologie du système nerveux* (Thèse pour le Doctorat en Médecine) (Paris, 1841); J. R. Gasquet, "The Practical Medicine of Galen and his Time," *The British and Foreign Medico-Chirurgical Rev.*, vol. xxxix., 1867, pp. 472-488; and Ilberg, "Die Schriften des Claudius Galenos," *Rheinisches Museum für Philologie*, 1889, 1892 and 1896.

GALENA, a city and the county-seat of Jo Daviess county, Illinois, U.S.A., in the N.W. part of the state, on the Galena (formerly the Fever) river, near its junction with the Mississippi, about 165 m. W.N.W. of Chicago. Pop. (1900) 5005, of whom 918 were foreign-born; (1910) 4835. It is served by the Chicago, Burlington & Quincy, the Chicago & North-Western and the Illinois Central railways; the Galena river has been made navigable by government locks at the mouth of the river, but the river traffic is unimportant. The city is built on rocky limestone bluffs, which rise rather abruptly on each side of the river, and a number of the parallel streets, of different levels, are connected by flights of steps. In Grant Park there is a statue of General U. S. Grant, who was a resident of Galena at the outbreak of the Civil War. In the vicinity there are the most important deposits of zinc and lead in the state, and the city derives its name from the deposits of sulphide of lead (galena), which were the first worked about here; below the galena is a zone of zinc carbonate (or smithsonite) ores, which was the main zone worked between 1860 and 1890; still lower is a zone of blende, or zinc sulphide, now the principal source of the mineral wealth of the region. The production of zinc is increasing, but that of lead is unimportant. The principal manufactures are mining pumps and machinery, flour, woollen goods, lumber and furniture. Water power is afforded by the river. Galena was originally a trading post, called by the French "La Pointe" and by the English "Fever River," the river having been named after le Fevre, a French trader who settled near its mouth. In 1826 Galena was laid out as a town and received its present name; it was incorporated in 1835 and was reincorporated in 1882. In 1838 a theatre was opened, one of whose proprietors was Joseph Jefferson, the father of the celebrated actor of that name.

GALENA, a city of Cherokee county, Kansas, U.S.A., in the extreme S.E. part of the state, on Short Creek and near Spring river. Pop. (1890) 2496; (1900) 10,155, of whom 580 were negroes and 251 were foreign-born; (1905) 6449; (1910) 6006. It is situated at the intersection of the Missouri, Kansas & Texas, and the Kansas City, Fort Scott & Memphis ("Frisco System") railways, in the midst of a lead and zinc region, extremely valuable deposits of these metals having been discovered in 1877. Smelters and foundries are its principal manufacturing establishments. Water power in abundance is furnished by the Spring river. After the discovery of the ore deposits two rival companies founded Galena and Empire City (pop. in 1905, 982), the former S. of Short Creek and the latter N. of it. Galena was incorporated in 1877, and in 1907 Empire City was annexed to it.

GALENA, an important ore of lead, consisting of lead sulphide (PbS). The mineral was mentioned by Pliny under this name, and it is sometimes now known as lead-glance (Ger. *Bleiglanz*). It crystallizes in the cubic system, and well-developed crystals are of common occurrence; the usual form is the cube or the cubo-octahedron (fig.). An important character, and one by which the mineral may always be recognized, is the perfect cubical cleavage, on which the lustre is brilliant and metallic. The colour of the mineral and of its streak is lead-grey; it is opaque; the hardness is 2½ and the specific gravity 7·5. Twinned crystals are not common, but the presence of polysynthetic twinning is sometimes shown by fine striations running diagonally or obliquely across the cleavage surfaces. Large masses with a coarse or fine granular structure are of common occurrence; the fractured surfaces of such masses present a spangled appearance owing to the numerous bright cleavages.



The formula PbS corresponds with lead 86·6 and sulphur 13·4%. The mineral nearly always contains a small amount of silver, and sometimes antimony, arsenic, copper, gold, selenium, &c. Argentiferous galena is an important source of silver; this metal is present in amounts rarely exceeding 1%, and often less than 0·03% (equivalent to 10 ounces per ton). Since argentite (Ag_2S) is isomorphous with galena, it is probable that the silver isomorphously replaces lead, but it is to be noted that native silver has been detected as an enclosure in galena.

Galena is of wide distribution, and occurs usually in metalliferous veins traversing crystalline rocks, clay-slates and limestones, and also as pockets in limestones. It is often associated with blende and pyrites, and with calcite, fluorspar, quartz, barytes, chalybite and pearlspar as gangue minerals; in the upper oxidized parts of the deposits, cerussite and anglesite occur as alteration products. The mineral has occasionally been observed as a recent formation replacing organic matter, such as wood; and it is sometimes found in beds of coal. As small concretionary nodules, it occurs disseminated through sandstone at Kommern in the Eifel. In the lead-mining districts of Derbyshire and the north of England the ore occurs as veins and flats in the Carboniferous Limestone series, whilst in Cornwall the veins traverse clay-slates. In the Upper Mississippi lead region of Missouri, Illinois, Iowa and Wisconsin the ore fills large cavities or chambers in limestone.

Galena is met with at all places where lead is mined; of localities which have yielded finely crystallized specimens the following may be selected for mention: Derbyshire, Alston in Cumberland, Laxey in the Isle of Man (where crystals measuring almost a foot across have been found), Neudorf in the Harz, Rossie in New York and Joplin in Missouri. Good crystals have also been obtained as a furnace product.

Coarsely grained galena is used for glazing pottery, and is then known as "potters' ore" or alquifoux.

The galena group includes several other cubic minerals, such as argentite (*q.v.*). Mention may also be made here of clausthalite

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(lead selenide, PbSe) and altaite (lead telluride, PbTe), which, with their lead-grey colour and perfect cubic cleavage, closely resemble galena in appearance; these species are named after the localities at which they were originally found, namely, Klausthal in the Harz and the Altai mountains in Asiatic Russia. Altaite is of interest as being one of the tellurides found associated with gold. (L. J. S.)

GALEOPITHECUS, the scientific designation of the Colugo (*q.v.*) or Cobego, commonly known as the flying-lemur, and alone representing the family *Galeopithecidae*. Much uncertainty has prevailed among naturalists as to the systematic position of this animal, or rather these animals (for there are two species); and while some have referred it to the lemurs, others have placed it with the bats, and others again among the *Insectivora*, as the representative of a special subordinal group, the *Dermoptera*. Dr H. C. Chapman, who has made a special study of the creature, writes, however, as follows: "It appears, at least in the judgment of the author, that *Galeopithecus* cannot be regarded as being either a lemur, or insectivore, or bat, but that it stands alone, the sole representative of an ancient group, *Galeopithecidae*, as *Hyrax* does of *Hyracoidea*. While *Galeopithecus* is but remotely related to the *Lemuroidea* and *Insectivora*, it is so closely related to *Chiroptera*, more particularly in regard to the structure of its patagium, brain, alimentary canal, genito-urinal apparatus,

Feet of Philippine Colugo, or Flying-Lemur (*Galeopithecus philippinensis*).

&c., that there can be but little doubt that the *Chiroptera* are the descendants of *Galeopithecus*, or, more probably, that both are the descendants of a *Galeopithecus*-like ancestor." Without going quite so far as this, it may be definitely admitted that the colugo is entitled to represent an order by itself, the characters of which will be as follows: Herbivorous, climbing, unguiculate mammals, provided with a very extensive flying-membrane, and having the dental formula *i.* $\frac{2}{3}$, *c.* $\frac{1}{1}$, *p.* $\frac{2}{2}$, *m.* $\frac{3}{3}$, total 34. The lower incisors are directed forwards and have a comb-like structure of their crowns, while the outermost of these teeth and the canines are double-rooted, being in these respects, taken together, quite unlike those of all other mammals; the cheek-teeth have numerous sharp cusps; and there is the normal replacement of milk-molars by premolars. In the skull the orbit is surrounded by bone, and the tympanic has a bulla and an ossified external meatus. The ulna and fibula are to some extent inclined backwards; the carpus has a scapho-lunar; and the feet are five-toed. The hemispheres of the brain are short and but slightly convoluted; the stomach is simple; there is a large caecum; the testes are received into inguinal pouches; the uterus is two-horned; the placenta is discoidal; and there are two pairs of pectoral teats. A single offspring is produced at a birth.

It will be obvious that if other representatives of the *Dermoptera* were discovered, some of these features might apply only to the family *Galeopithecidae*.

There are two species, *Galeopithecus volans*, ranging from Burma, Siam and the Malay Peninsula to Borneo, Sumatra and Java, and *G. philippinensis* of the Philippine group. The former, which is nearly 2 ft. in total length, is distinguished by its larger upper incisors, shorter ears and smaller skull. In both species not only are the long and slender limbs connected by a broad integumentary expansion extending outwards from the sides of the neck and body, but there is also a web between the fingers and toes as far as the base of the claws (fig.); and the hind-limbs are further connected by a similar expansion passing outwards along the back of the feet to the base of the claws, and, inwardly, involving the long tail to the tip, forming a true interfemoral membrane, as in bats. Besides differing from bats altogether in the form of the anterior limbs and of the double-rooted outer incisors and canines, *Galeopithecus* contrasts strongly with that order in the presence of a large sacculated caecum, and in the great length of the colon, which is so remarkably short in *Chiroptera*. From the lemurs, on the other hand, the form of the brain, the character of the teeth, the structure of the skull, and the deciduate discoidal placenta at once separate the group. (R. L.*)

GALERIUS [GALERIUS VALERIUS MAXIMIANUS], Roman emperor from A.D. 305 to 311, was born near Sardica in Thrace. He originally followed his father's occupation, that of a herdsman, whence his surname of *Armentarius* (Lat. *armentum*, herd). He served with distinction as a soldier under Aurelian and Probus, and in 293 was designated Caesar along with Constantius Chlorus, receiving in marriage Diocletian's daughter Valeria, and at the same time being entrusted with the care of the Illyrian provinces. In 296, at the beginning of the Persian War, he was removed from the Danube to the Euphrates; his first campaign ended in a crushing defeat, near Callinicum, but in 297, advancing through the mountains of Armenia, he gained a decisive victory over Narses (*q.v.*) and compelled him to make peace. In 305, on the abdication of Diocletian and Maximianus, he at once assumed the title of Augustus, with Constantius his former colleague, and having procured the promotion to the rank of Caesar of Flavius Valerius Severus, a faithful servant, and Daia (Maximinus), his nephew, he hoped on the death of Constantius to become sole master of the Roman world. This scheme, however, was defeated by the sudden elevation of Constantine at Eboracum (York) on the death of his father, and by the action of Maximianus and Maxentius in Italy. After an unsuccessful invasion of Italy in 307 he elevated his friend Licinius to the rank of Augustus, and, moderating his ambition, devoted the few remaining years of his life "to the enjoyment of pleasure and to the execution of some works of public utility." It was at the instance of Galerius that the first of the celebrated edicts of persecution against the Christians was published, on the 24th of February 303, and this policy of repression was maintained by him until the appearance of the general edict of toleration (311), issued in his own name and in those of Licinius and Constantine. He died in May 311 A.D.

See Zosimus ii. 8-11; Zonaras xii. 31-34; Eutropius ix. 24, x. 1.

GALESBURG, a city and the county-seat of Knox county, Illinois, U.S.A., in the N.W. part of the state, 163 m. S.W. of Chicago. Pop. (1890) 15,264; (1900) 18,607; of whom 3602 were foreign-born; (census, 1910) 22,089. It is served by the Atchison, Topeka & Santa Fé, and the Chicago, Burlington & Quincy railways. Knox College (non-sectarian and coeducational), which was chartered here in 1837 as the "Knox Manual Labor College" (the present name was adopted in 1857), was opened in 1841, and had in 1907–1908, 31 instructors and 628 students, of whom more than half were in the Conservatory of Music, a department of the college, and 79 were in the Academy. Lombard College (coeducational; Universalist), which was chartered as the "Illinois Liberal Institute" in 1851, was known as Lombard University (in honour of Benjamin Lombard, a benefactor) from 1855 to 1899; it includes a College of Liberal Arts, the Ryder Divinity School (1881), and departments of music and domestic science, and in 1907–1908 had 18 instructors and 117 students. Here also are Corpus Christi College (Roman Catholic), St Joseph's Academy (Roman Catholic) and Brown's Business College (1874). There is a public library, founded in 1874. The industries consist mainly of the construction and repairing of steam railway cars (in the shops of the Chicago, Burlington & Quincy railway) and the manufacture of foundry and machine-shop products, vitrified brick, agricultural implements

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and machinery. The total value of the factory product in 1905 was $2,217,772, being 52·0% more than in 1900. Galesburg was named in honour of the Rev. George Washington Gale (1789–1862), a prominent Presbyterian preacher, who in 1827–1834 had founded the Oneida Manual Labor Institute at Whitestown, Oneida county, New York. Desiring to establish a college in the Mississippi Valley to supply "an evangelical and able ministry" to "spread the Gospel throughout the world," and also wishing to counteract the influence of pro-slavery men in Illinois, he interested a number of people in the project, formed a society for colonization, and in 1836 led the first settlers to Galesburg, the "Mesopotamia in the West." Knox College was founded to fulfil his educational purpose. Galesburg was an important "station" of the Underground Railroad, one of the conditions of membership in the "Presbyterian Church of Galesburg" (the name of Mr Gale's society) being opposition to slavery; and in 1855 this caused the church to withdraw from the Presbytery. Galesburg was chartered as a city in 1857. On the 7th of October 1858 one of the famous Lincoln-Douglas debates was held in the grounds of Knox College.

GALGĀCUS, or perhaps rather CALGĀCUS, a Caledonian chief who led the tribes of North Britain against the invading Roman army under Cn. Julius Agricola about A.D. 85 and was defeated at the battle of Mons Graupius (Tac. *Agric.* 29). The name recurs much later, in Adamnan's *Life of Columba*, in the name of a wood near Londonderry, Daire-Calgaich or Roboretum Calgachi, "the wood of Calgacus": it may be Celtic and denote "the man with the sword."

GALIANI, FERDINANDO (1728–1787), Italian economist, was born at Chieti on the 2nd of December 1728. He was carefully educated by his uncle Monsignor C. Galiani at Naples and Rome with a view to entering the Church. Galiani gave early promise of distinction as an economist, and even more as a wit. At the age of twenty-two, after he had taken orders, he had produced two works by which his name became widely known far beyond the bounds of his own Naples. The one, his *Trattato della moneta*, in which he shows himself a strong supporter of the mercantile school, deals with many aspects of the question of exchange, but always with a special reference to the state of confusion then presented by the whole monetary system of the Neapolitan government. The other, *Raccolta in Morte del Boia*, established his fame as a humorist, and was highly popular in Italian literary circles at the end of the 18th century. In this volume Galiani parodied with exquisite felicity, in a series of discourses on the death of the public hangman, the styles of the most pompous and pedantic Neapolitan writers of the day. Galiani's political knowledge and social qualities now pointed him out to the discriminating eye of King Charles, afterwards Charles III. of Spain, and his liberal minister Tanucci, and he was appointed in 1759 secretary to the Neapolitan embassy at Paris. This post he held for ten years, when he returned to Naples and was made a councillor of the tribunal of commerce, and in 1777, minister of the royal domains. His economic reputation was made by a book written in French and published in Paris, namely, his *Dialogues sur le commerce des blés*. This work, by its light and pleasing style, and the vivacious wit with which it abounded, delighted Voltaire, who spoke of it as a book in the production of which Plato and Molière might have been combined! The author, says Pecchio, treated his arid subject as Fontenelle did the vortices of Descartes, or Algarotti the Newtonian system of the world. The question at issue was that of the freedom of the corn trade, then much agitated, and, in particular, the policy of the royal edict of 1764, which permitted the exportation of grain so long as the price had not arrived at a certain height. The general principle he maintains is that the best system in regard to this trade is to have no system—countries differently circumstanced requiring, according to him, different modes of treatment. He fell, however, into some of the most serious errors of the mercantilists—holding, as indeed did also Voltaire and even Verri, that one country cannot gain without another losing, and in his earlier treatise going so far as to defend the action of governments in debasing the currency. Until his death at Naples on the 30th of October 1787, Galiani kept up with his old Parisian friends a correspondence, which was published in 1818.

See *L'Abate Galiani*, by Alberto Marghieri (1878), and his correspondence with Tanucci in Viesseux's *L'Archivio storico* (Florence, 1876).

GALICIA (Ger. *Galizien*; Pol. *Halicz*), a crownland of Austria, bounded E. and N. by Russia, S. by Bukovina and Hungary, and W. by Austrian and Prussian Silesia. It has an area of 30,299 sq. m., and is the largest Austrian province. It comprises the old kingdoms of Galicia and Lodomeria, the duchies of Auschwitz and Zator, and the grand duchy of Cracow.

Galicia lies on the northern slopes of the Carpathians, which with their offshoots cover about a third of the whole area of the country. The surface gradually sinks down by undulating terraces to the valleys of the Vistula and Dniester. To the N. and E. of these rivers Galicia forms a continuation of the great plains of Russia, intersected only by a few hills, which descend from the plateaus of Poland and Podolia, and which attain in some places an altitude of 1300 to 1500 ft. The Carpathians, which, extending in the form of an arc, form the boundary between Galicia and Hungary, are divided into the West and the East Beskides, which are separated by the northern ramifications of the massif of the Tatra. The highest peaks are the Babia Góra (5650 ft.), the Wolowiec (6773 ft.) and the Czerna Góra (6505 ft.). The principal passes are those of Zdjar over the Tatra, and of Dukla, Vereczke Körösmezö or Delatyn in the East Beskides. The river Vistula, which becomes navigable at Cracow, and forms afterwards the north-western frontier of Galicia, receives the Sola, the Skawa, the Raba, the Dunajec with its affluents the Poprad and the Biala, the Wisloka, the San and the Bug. The Dniester, which rises in the Carpathians, within the territory of Galicia, becomes navigable at Sambor, and receives on the right the Stryj, the Swica, the Lomnica and the Bystrzyca, and on the left the Lipa, the Strypa, the Sereth and the Zbrucz, the boundary river towards Russia. The Pruth, which also rises in the Carpathians, within the territory of Galicia, traverses its south-eastern corner and receives the Czeremosz, the boundary river towards Bukovina. There are few lakes in the country except mountain tarns; but considerable morasses exist about the Upper Dneister, the Vistula and the San, while the ponds or dams in the Podolian valleys are estimated to cover an area of over 200 sq. m. The most frequented mineral springs are the alkaline springs at Szczawnica and Krynica, the sulphur springs at Krzesowice, Szklo and Lubian, and the iodine springs at Iwonicz.

Exposed to the cold northern and north-eastern winds, and shut out by the Carpathians from the warm southerly winds, Galicia has the severest climate in Austria. It has long winters, with an abundant snowfall, short and wet springs, hot summers and long and steady autumns. The mean annual temperature at Lemberg is 46·2° F., and at Tarnopol only 43° F.

Of the total area 48·45% is occupied by arable land, 11·16% by meadows, 9·19% by pastures, 1·30% by gardens and 25·76% by forests. The soil is generally fertile, but agriculture is still backward. The principal products are barley, oats, rye, wheat, maize and leguminous plants. Galicia has the largest area under potatoes and legumes in the whole of Austria, and hemp, flax, tobacco and hops are of considerable importance. The principal mineral products are salt, coal and petroleum. Salt is extracted at Wieliczka, Bochnia, Bolechow, Dolina, Kalusz and Kosow. Coals are found in the Cracow district at Jaworzno, at Siersza near Trzebinia and at Dabrowa. Some of the richest petroleum fields in Europe are spread in the region of the Carpathians, and are worked at Borysław and Schodnica near Drohobycz, Bobrka and Potok near Krosno, Sloboda-Rungurska near Kolomea, &c. Great quantities of ozocerite are also extracted in the petroliferous region of the Carpathians. Other mineral products are zinc, extracted at Trzebionka and Wodna in the Cracow region, amounting to 40% of the total zinc production in Austria, iron ore, marble and various stones for construction. The sulphur mines of Swoszowice near Cracow, which had been worked since 1598, were abandoned in 1884.

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The manufacturing industries of Galicia are not highly developed. The first place is occupied by the distilleries, whose output amounts to nearly 40% of the total production of spirits in Austria. Then follow the petroleum refineries and kindred industries, saw-mills and the fabrication of various wood articles, paper and milling. The sugar factory at Tlumacz and the tobacco factory at Winniki are amongst the largest establishments of their kind in Austria. Cloth manufacture is concentrated at Biala, while the weaving of linen and of woollens is pursued as a household industry, the former in the Carpathian region, the latter in eastern Galicia. The commerce, which is mainly in the hands of the Jews, is very active, and the transit trade to Russia and to the East is also of considerable importance.

Galicia had in 1900 a population of 7,295,538, which is equivalent to 241 inhabitants per sq. m. The two principal nationalities are the Poles (45%) and the Ruthenians (42%), the former predominating in the west and in the big towns, and the latter in the east. The Poles who inhabit the Carpathians are distinguished as Goralians (from *góry*, mountain), and those of the lower regions as Mazures and Cracoviaks. The Ruthenian highlanders bear the name of Huzulians. The Poles are mostly Roman Catholics, the Ruthenians are Greek Catholics, and there are over 770,000 Jews, and about 2500 Armenians, who are Catholics and stand under the jurisdiction of an Armenian archbishop at Lemberg.

The Roman Catholic Church has an archbishop, at Lemberg, and three bishops, at Cracow, at Przemysl and at Tarnow, and the Greek Catholic Church is represented by an archbishop, at Lemberg, and two bishops, at Przemysl and at Stanislau. At the head of the educational institutions stand the two universities of Lemberg and Cracow, and the Polish academy of science at Cracow.

The local Diet is composed of 151 members, including the 3 archbishops, the 5 bishops, and the 2 rectors of the universities, and Galicia sends 78 deputies to the Reichsrat at Vienna. For administrative purposes, the province is divided into 78 districts and 2 autonomous municipalities—Lemberg (pop. 159,618), the capital, and Cracow (91,310). Other principal towns are: Przemysl (46,439), Kolomea (34,188), Tarnów (31,548), Tarnopol (30,368), Stanislau (29,628), Stryj (23,673), Jaroslau (22,614), Drohobycz (19,146), Podgórze (18,142), Brody (17,360), Sambor (17,127), Neusandec (15,724), Rzeszów (14,714), Boczow (12,209), Grodek (11,845), Horodenka (11,615), Buczacz (11,504), Sniatyn (11,498), Brzezany (11,344), Kuty (11,127), Boryslaw (10,671), Chrzanów (10,170), Jaworów (10,090), Bochnia (10,049) and Biala (8265).

Galicia (or Halicz) took its rise, along with the neighbouring principality of Lodomeria (or Vladimir), in the course of the 12th century—the seat of the ruling dynasty being Halicz or Halitch. Disputes between the Galician and Lodomerian houses led to the interference of the king of Hungary, Bela III., who in 1190 assumed the title of king, and appointed his son Andreas lieutenant of the kingdom. Polish assistance, however, enabled Vladimir, the former possessor, to expel Andreas, and in 1198 Roman, prince of Lodomeria, made himself master of Galicia also. On his death in 1205 the struggle between Poland and Hungary for supremacy in the country was resumed; but in 1215 it was arranged that Daniel (1205–1264), son of Roman, should be invested with Lodomeria, and Coloman, son of the Hungarian king, with Galicia. Coloman, however, was expelled by Mstislav of Novgorod; and in his turn Andreas, Mstislav's nominee, was expelled by Daniel of Lodomeria, a powerful prince, who by a flexible policy succeeded in maintaining his position. Though in 1235 he had recognized the overlordship of Hungary, yet, when he found himself hard pressed by the Mongolian general Batu, he called in the assistance of Innocent IV., and accepted the crown of Galicia from the hands of a papal legate; and again, when Innocent disappointed his expectation, he returned to his former connexion with the Greek Church. On the extinction of his line in 1340 Casimir III. of Poland incorporated Galicia and Lemberg; on Casimir's death in 1370 Louis the Great of Hungary, in accordance with previous treaties, became king of Poland, Galicia and Lodomeria; and in 1382, by the marriage of Louis's daughter with Ladislaus II., Galicia, which he had regarded as part of his Hungarian rather than of his Polish possessions, became definitively assigned to Poland. On the first partition of Poland, in 1772, the kingdom of Galicia and Lodomeria came to Austria, and to this was added the district of New or West Galicia in 1795; but at the peace of Vienna in 1809 West Galicia and Cracow were surrendered to the grand-duchy of Warsaw, and in 1810 part of East Galicia, including Tarnopol, was made over to Russia. This latter portion was recovered by Austria at the peace of Paris (1814), and the former came back on the suppression of the independent republic of Cracow in 1846. After the introduction of the constitution of February 1861, Galicia gained a larger degree of autonomy than any other province in the Austrian empire.

See *Die österreichisch-ungarische Monarchie in Wort und Bild*, vol. 19 (Wien, 1885–1902, 24 vols.); *Die Länder Österreich-Ungarns in Wort und Bild*, vol. 10 (Wien, 1881–1886, 15 vols.). Remarkable sketches of Galician life are to be found in the works of the German novelist Sacher-Masoch (1835–1895).

GALICIA (the ancient *Gallaecia* or *Callaecia*, Καλλαικία or Καλλαϊκία), a captaincy-general, and formerly a kingdom, countship and province, in the north-western angle of Spain; bounded on the N. by the Bay of Biscay, E. by Leon and Asturias, S. by Portugal, and W. by the Atlantic Ocean. Pop. (1900) 1,980,515; area, 11,254 sq. m. In 1833 Galicia was divided for administrative purposes into the provinces of Corunna, Lugo, Orense and Pontevedra.

Galicia is traversed by mountain ranges, sometimes regarded as a continuation of the Cantabrian chain; and its surface is further broken in the east by the westernmost ridges of that system, which, running in a south-westerly direction, rise above the basin of the Miño. The high land north of the headwaters of the Miño forms the sole connecting link between the Cantabrians properly so-called and the mountains of central and western Galicia. The average elevation of the province is considerable, and the maximum height (6593 ft.) is reached in the Peña Trevinca on the eastern border of Orense.

The principal river is the Miño (Portuguese *Minho*; Lat. *Minius*; so named, it is said, from the *minium* or vermilion found in its bed). Rising near Mondoñedo, within 25 m. of the northern coast, the Miño enters the Atlantic near the port of Guardia, after a course of 170 m. S. and S.W. Its lower reaches are navigable by small vessels. Of its numerous affluents the most important is the Sil, which rises among the lofty mountains between Leon and Asturias. Among other rivers having a westerly direction may be mentioned the Tambre, the Ulla and the Lerez or Ler, which falls into the Atlantic by estuaries or *rias* called respectively Ria de Muros y Noya, Ria de Arosa and Ria de Pontevedra. The rivers of the northern versant, such as the Nera, are, like those of Asturias, for the most part short, rapid and subject to violent floods.

The coast-line of Galicia, extending to about 240 m., is everywhere bold and deeply indented, presenting a large number of secure harbours, and in this respect forming a marked contrast to the neighbouring province. The Eo, which bounds Galicia on the east, has a deep estuary, the Rivadeo or Ribadeo, which offers a safe and commodious anchorage. Vivero Bay and the Ria del Barquero y Vares are of a similar character; while the harbour of Ferrol ranks among the best in Europe, and is the chief naval station on the northern coast of Spain. On the opposite side of Betanzos Bay (*ἡ μέγιστη λιμήν* or *Portus Magnus* of the ancients) is the great port of Corunna or Coruña. The principal port on the western coast is that formed by the deep and sheltered bay of Vigo, but there are also good roadsteads at Corcubion under Cape Finisterre, at Marin and at Carril.

The climate of the Galician coast is mild and equable, but the interior, owing to the great elevation (the town of Lugo is 1500 ft. above sea-level), has a wide range of temperature. The rainfall is exceptionally large, and snow lies on some of the loftier elevations for a considerable portion of the year. The soil is on the whole fertile, and the produce very varied. A considerable quantity of

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timber is grown on the high lands, and the rich valley pastures support large herds of cattle, while the abundance of oaks and chestnuts favours the rearing of swine. In the lowland districts good crops of maize, wheat, barley, oats and rye, as well as of turnips and potatoes, are obtained. The fruit also is of excellent quality and in great variety, although the culture of the vine is limited to some of the warmer valleys in the southern districts. The *dehesas* or moorlands abound in game, and fish are plentiful in all the streams. The mineral resources of the province, which are considerable, were known to some extent to the ancients. Strabo (c. 63 B.C.–A.D. 21) speaks of its gold and tin, and Pliny (A.D. 23–79) mentions the *gemma Gallaica*, a precious stone. Galicia is also remarkable for the number of its sulphur and other warm springs, the most important of which are those at Lugo, and those from which Orense is said to take its name (*Aquae urentes*).

Ethnologically the Galicians (*Gallegos*) are allied to the Portuguese, whom they resemble in dialect, in appearance and in habits more than the other inhabitants of the peninsula. The men are well known all over Spain and Portugal as hardy, honest and industrious, but for the most part somewhat unskilled, labourers; indeed the word *Gallego* has come to be almost a synonym in Madrid for a "hewer of wood and drawer of water." It is also used as a term of abuse, meaning "boor." Agriculture engages the greater part of the resident population, both male and female; other industries, except the fisheries, are little developed. The largest town in Galicia is Corunna (pop. 1900, 43,971); Santiago de Compostela is the ancient capital and an archiepiscopal see; Lugo, Tuy, Mondoñedo and Orense are bishoprics.

Gallaecia, the country of the Galaeci, *Callaici* or *Gallaici*, seems to have been very imperfectly known to the earlier geographers. According to Eratosthenes (276–196 B.C.) the entire population of the peninsula were at one time called *Galatae*. The region properly called by their name, bounded on the south by the Douro and on the east by the Navia, was first entered by the Roman legions under Decius Junius Brutus in 137–136 B.C. (Livy lv., lvi., *Epit.*); but the final subjugation cannot be placed earlier than the time of Augustus (31 B.C.–A.D. 14). On the partition of Spain, which followed the successful invasions of the Suevi, Alans and Vandals, Gallaecia fell to the lot of the first named (A.D. 411). After an independent subsistence of nearly 200 years, the Suevian kingdom was annexed to the Visigothic dominions under Leovigild in 585. In 734 it was occupied by the Moors, who in turn were driven out by Alphonso I. of Asturias, in 739. During the 9th and 10th centuries it was the subject of dispute between more than one count of Galicia and the suzerain, and its coasts were repeatedly ravaged by the Normans. When Ferdinand I. divided his kingdom among his sons in 1063, Galicia was the portion allotted to Garcia, the youngest of the three. In 1072 it was forcibly reannexed by Garcia's brother Alphonso VI. of Castile and thenceforward it remained an integral part of the kingdom of Castile or of Leon. The honorary title of count of Galicia has frequently been borne by younger sons of the Spanish sovereign.

See Annette B. Meakin, *Galicia, the Switzerland of Spain* (London, 1909).

GALIGNANI, GIOVANNI ANTONIO (1752–1821), newspaper publisher, was born at Brescia, Italy, in 1752. After living some time in London, he went to Paris, where he started in 1800 an English library, and in 1808 a monthly publication, the *Repertory of English Literature*. In 1814 he began to publish, in Paris, *Galignani's Messenger*, a daily paper printed in English. At his death in 1821 the paper was carried on by his two sons, Jean-Antoine (1796–1873) and Guillaume (1798–1882). Under their management it enjoyed a high reputation. His policy was to promote good feeling between England and France. The brothers established and endowed hospitals at Corbeil and at Neuilly-sur-Seine. In recognition of their generosity the city of Corbeil erected a monument in their honour. In 1884 the Galignani family disposed of their interest in *Galignani's Messenger*, and from that date until 1904, when it was discontinued, the paper appeared under the title of the *Daily Messenger*.

GALILEE (Heb. גְּלִיל, "border" or "ring," Gr. Γαλιλαία), a Roman province of Palestine north of Samaria, bounded S. by Samaria and the Carmel range, E. by the Jordan, N. by the Leontes (Litāni), and W. by the Mediterranean and part of Phoenicia. Its maximum extent was about 60 m. north to south and 30 east to west. The name in the Hebrew Scriptures hardly had a definite territorial significance. It literally means a ring or circuit, and, like analogous words in English, could be applied to various districts. Thus Joshua (xiii. 2) and Joel (iii. 4) refer to the *Gelîloth* ("borders, coast") of the Philistines or of Palestine; Joshua again (xxii. 10, 11) and Ezekiel (xlvii. 8) mention the Jordan valley plain as the "Gelîloth of Jordan" in "the Eastern Gelilah." In its more restricted connotation, denoting the district to which it is usually applied or a part thereof, it is found in Joshua xx. 7, xxi. 32, 1 Chr. vi. 76, as the place where was situated the town of Kadesh; and in 1 Kings ix. 11, the district of "worthless" cities given by Solomon to Hiram. In Isa. ix. 1 we find the full name of the district, Galîl ha-Goyim, literally "the ring, circuit or border of the foreigners"—referring to the Phoenicians, Syrians and Aramaeans, by whose country the province was on three sides surrounded. In 1 Kings xv. 29 it is specified as one of the districts whose population was deported by Tiglath-Pileser. Throughout the Old Testament history, however, Galilee as a whole cannot be said to have a history; the unit of territorial subdivision was tribal rather than provincial, and though such important events as those associated with the names of Barak, Gideon, Gilboa, Armageddon, took place within its borders, yet these belong rather to the histories of Issachar, Zebulon, Asher or Naphtali, whose territories together almost correspond with Galilee, than to the province Joel.

After the Jewish return from exile the population confined itself to Judaea, and Galilee was left in the possession of the mixed multitude of successors established there by the Assyrians. When it once more came into Israelite hands is uncertain; it is generally supposed that its reconquest was due to John Hyrcanus. Before very long it developed a nationalism and patriotism as intense as that of Judaea itself, notwithstanding the contempt with which the metropolitans of Jerusalem looked down upon the Galilean provincials. Stock proverbial sayings such as "Out of Galilee cometh no prophet" (though Deborah, Jonah, Elisha, and probably Hosea, were Galileans) were apparently common. Provincialism of speech (Matt. xxvi. 73) distinguished the Galileans; it appears that they confused the gutturals in pronunciation.

Under the Roman domination Galilee was made a tetrarchate governed by members of the Herod family. Herod the Great was tetrarch of Galilee in 47 B.C.; in 4 B.C. he was succeeded by his son Antipas. Galilee was the land of Christ's boyhood and the chief centre of His active work, and in His various ministries here some of His chief discourses were uttered (as the Sermon on the Mount, Matt. v.) and some of His chief miracles performed.

After the destruction of Jerusalem the Judaean Rabbinic schools took refuge in the Galilee they had heretofore despised. No ancient remains of Jewish synagogues exist except those that have been identified in some of the ancient Galilean towns, such as Tell Ḥum (Talḥûm), Kerâzeh, Kefr Bir'îm, and elsewhere. One of the chief centres of Rabbinism was Ṣafed, still a sacred city of the Jews and largely inhabited by members of that faith. Near here is Meirûn, a place much revered by the Jews as containing the tombs of Hillel, Shammai and Simon ben Yohai; a yearly festival in honour of these rabbis is here celebrated. At Tiberias also are the tombs of distinguished Jewish teachers, including Maimonides.

Lower Galilee.

The province was subdivided into two parts, Upper and Lower Galilee, the two being divided by a ridge running west to east, which prolonged would cut the Jordan about midway between Hûleh and the Sea of Galilee. Lower Galilee includes the plains of Buttauf and Esdraelon.

The whole of Galilee presents country more or less disturbed by volcanic action. In the lower division the hills are all tilted up towards the east, and broad streams of lava have flowed over the plateau above the sea of Galilee. In this district the highest hills are only about 1800 ft. above the sea. The ridge of Nazareth rises north of the great plain of Esdraelon, and

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north of this again is the fertile basin of the Buttauf, separated from the sea-coast plains by low hills. East of the Buttauf extends the basaltic plateau called Sahel el-Ahmâ (" the inaccessible plain "), rising 1700 ft. above the Sea of Galilee. North of the Buttauf is a confused hill country, the spurs falling towards a broad valley which lies at the foot of the mountains of Upper Galilee. This broad valley, running westwards to the coast, is perhaps the old boundary of Zebulun—the valley of Jiphthah-el (Josh. xix. 14). The great plain of Esdraelon is of triangular form, bounded by Gilboa on the east and by the ridge which runs to Carmel on the west. It is 14 m. long from Jenin to the Nazareth hills, and its southern border is about 20 m. long. It rises 200 ft. above the sea, the hills on both sides being some 1500 ft. higher. The whole drainage is collected by the Kishon, which runs through a narrow gorge at the north-west corner of the plain, descending beside the ridge of Carmel to the sea. The broad valley of Jezreel on the east, descending towards the Jordan valley, forms the gate by which Palestine is entered from beyond Jordan. Mount Tabor stands isolated in the plain at the north-east corner, and rather farther south the conical hill called Nebi Dahi rises between Tabor and Gilboa. The whole of Lower Galilee is well watered. The Kishon is fed by springs from near Tabor and from a copious stream from the west side of the plain of Esdraelon. North-west of Nazareth is Wâdi el Melek, an open valley full of springs. The river Belus, south of Acre, rising in the sea-coast marshes, drains the whole valley above identified with Jiphthah-el. On the east the broad valley of Jezreel is full of magnificent springs, many of which are thermal. The plains of Esdraelon, and the Buttauf, and the plateau of el-Ahmâ are all remarkable for the rich humic soil which covers them, in which corn, cotton, maize, sesame, tobacco, millet and various kinds of vegetable are grown, while indigo and sugar-cane were cultivated in former times. The Nazareth hills and Gilboa are bare and white, but west of Nazareth is a fine oak wood, and fine thick wood spreads over the northern slopes of Tabor. The hills west of the great plain are partly of bare white chalk, partly covered with dense thickets. The mountains north of the Buttauf are rugged and covered with scrub, except near the villages, where olive groves exist. The principal places of importance in Lower Galilee are Nazareth (10,000 inhabitants), Sepphoris (now Sefluria), a large village standing above the Buttauf on the spurs of the southern hills, and Jenîn (En Gannim), a flourishing village, with a palm garden (3000 inhabitants). The ancient capital, Jezreel (Zerin), is now a miserable village on a precipitous spur of Gilboa; north of this are the small mud hamlets, Solam (Shunem), Endûr (Endor), Nein (Nain); on the west side of the plain is the ruin of Lejjûn (the Legio of the 4th century, which was then a place of importance). On the hills north of the Buttauf is Jefât, situated on a steep hill-top, and representing the Jotapata defended by Josephus. Kefr Kenna, now a flourishing Christian village at the foot of the Nazareth hills, south of the Buttauf, is one of the sites identified with Cana of Galilee, and the ruin Kâna, on the north side of the same plain, represents the site pointed out to the pilgrims of the 12th and 13th centuries.

The mountains are tilted up towards the Sea of Galilee, and the drainage of the district is towards the north-west. On the south is the rocky range of Jebel Jarmûk rises to nearly 4000 ft. above the sea; on the east a narrow ridge 2800 ft. high forms the watershed, with steep eastern slopes falling towards Jordan. Immediately west of the watershed are two small plateaux covered with basaltic débris, near el-Jish and Kades. On the west are rugged mountains with deep intricate valleys. The main drains of the country are—first, Wâdi el 'Ayûn, rising north of Jebel Jarmûk, and running north-west as an open valley; and secondly, Wâdi el Ahjîr, a rugged precipitous gorge running north to join the Leontes. The district is well provided with springs throughout, and the valleys are full of water in the spring-time. Though rocky and difficult, Upper Galilee is not barren, the soil of the plateaux is rich, and the vine flourishes in the higher hills, especially in the neighbourhood of Kefr Bir'im. The principal town is Safed, perched on a white mountain 2700 ft. above the sea. It has a population of about 9000, including Jews, Christians and Moslems.

Upper Galilee.

Josephus gives a good description of the Galilee of his time in *Wars*, iii. 3. 2 : " The Galileans are inured to war from their infancy, and have been always very numerous; nor hath the country been ever destitute of men of courage or wanted a numerous set of them; for their soil is universally rich and fruitful, and full of plantations of trees of all sorts, insomuch that it invites the most slothful to take pains in its cultivation. . . . Moreover, the cities lie here very thick, and the very many villages there are here are everywhere full of people." Though the population is diminished and the cities ruinous, the country is still remarkable for fertility, thanks to the copiousness of its water-supply draining from the Lebanon mountains.

The principal products of the country are corn, wine, oil and soap (from the olives), with every species of pulse and gourd.

The antiquities of Galilee include dolmens and rude stone monuments, rock-cut tombs, and wine-presses, with numerous remains of Byzantine monasteries and fine churches of the time of the crusades. There are also remains of Greek architecture in various places; but the most interesting buildings are the ancient synagogues, of which some eleven examples are now known. They are rectangular, with the door to the south, and two rows of columns forming aisles east and west. The architecture is a peculiar and debased imitation of classic style, attributed by architects to the 2nd century A.D. In Kefr Bir'im there were remains of two synagogues, but early in the 20th century one of them was completely destroyed by a local stone-mason. At Irbid, above Tiberias, is another synagogue of rather different character. Traces of synagogues have also been found on Carmel, and at Tireh, west of Nazareth. It is curious to find the representation of various animals in relief on the lintels of these buildings. Hebrew inscriptions also occur, and the carved work of the cornices and capitals is rich though debased.

In the 12th century Galilee was the outpost of the Christian kingdom of Jerusalem, and its borders were strongly protected by fortresses, the magnificent remains of which still crown the most important strategical points. Toron (mod. *Tibnin*) was built in 1104, the first fortress erected by the crusaders, and standing on the summit of the mountains of Upper Galilee. Beauvoir (Kaukab el-Hawa, built in 1182) stood on a precipice above Jordan south-west of the Sea of Galilee, and guarded the advance by the valley of Jezreel; and about the same time Château Neuf (Hunîn) was erected above the Hûleh lake. Belfort (esh Shukîf), on the north bank of the Leontes, the finest and most important, dates somewhat earlier; and Montfort (Kalat el Kurn) stood on a narrow spur north-east of Acre, completing the chain of frontier fortresses. The town of Banias, with its castle, formed also a strong outpost against Damascus, and was the scene, in common with the other strongholds, of many desperate encounters between Moslems and Christians. Lower Galilee was the last remaining portion of the Holy Land held by the Christians. In 1250 the knights of the Teutonic order owned lands extending round Acre as far east as the Sea of Galilee, and including Safed. These possessions were lost in 1291, on the fall of Acre.

The population of Galilee is mixed. In Lower Galilee the peasants are principally Moslem, with a sprinkling of Greek Christians round Nazareth, which is a Christian town. In Upper Galilee, however, there is a mixture of Jews and Maronites, Druses and Moslems (natives or Algerine settlers), while the slopes above the Jordan are inhabited by wandering Arabs. The Jews are engaged in trade, and the Christians, Druses and Moslems in agriculture; and the Arabs are an entirely pastoral people.

(C. R. C.; R. A. S. M.)

GALILEE, an architectural term sometimes given to a porch or chapel which formed the entrance to a church. This is the case at Durham and Ely cathedrals, and in Lincoln cathedral the name is sometimes given to the south-west porch. The name is said to be derived from the scriptural expression " Galilee of the Gentiles " (Matt. iv. 15). Galilees are supposed to have been used sometimes as courts of law, but they probably served chiefly for penitents not yet admitted to the body of the church. The Galilee would also appear to have been the vestibule of an abbey church where women were allowed to see the monks to whom they were related, or from which they could hear divine service. The foundation of what is considered to have been a Galilee exists at the west end of Fountains Abbey. Sometimes also corpses were placed there before interment.

GALILEE, SEA OF, a lake in Palestine consisting of an expansion of the Jordan, on the latitude of Mt. Carmel. It is 13 m. long, 8 m. broad, 64 sq. m. in area, 680 ft. below the level of the Mediterranean, and, according to Merrill and Barrois (who have corrected the excessive depth said to have been found by Lortet at the northern end), 150 ft. in maximum depth. It is pear-shaped, the narrow end pointing southward. In the Hebrew Scriptures it is called the Sea of Chinnereth or Chinneroth (probably derived from a town of the same name mentioned in Joshua xi. 2 and elsewhere; the etymology that connects it with נִנּוֹר, " a harp," is very doubtful.) In Josephus and the book of

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Maccabees it is named Gennesar; while in the Gospels it is usually called Sea of Galilee, though once it is called Lake of Gennesaret (Luke v. 1) and twice Sea of Tiberias (John vi. 1, xxi. 1). The modern Arabic name is *Bahr Tubaríya*, which is often rendered "Lake of Tiberias." Pliny refers to it as the Lake of Tarichеae.

Like the Dead Sea it is a "rift" lake, being part of the great fault that formed the Jordan-Araba depression. Deposits show that originally it formed part of the great inland sea that filled this depression in Pleistocene times. The district on each side of the lake has a number of hot springs, at least one of which is beneath the sea itself, and has always shown indications of volcanic and other subterranean disturbances. It is especially liable to earthquakes. The water of the sea, though slightly brackish and not very clear, is generally used for drinking. The shores are for the greater part formed of fine gravel; some yards from the shore the bed is uniformly covered with fine greyish mud. The temperature in summer is tropical, but after noon falls about 10° F. owing to strong north-west winds. This range of temperature affects the water to a depth of about 49 ft.; below that depth the water is uniformly about 59° F. The sea is set deep in hills which rise on the east side to a height of about 2000 ft. Sudden and violent storms (such as are described in Matt. viii. 23, xiv. 22, and the parallel passages) are often produced by the changes of temperature in the air resulting from these great differences of level.

The Sea of Galilee is best seen from the top of the western precipices. It presents a desolate appearance. On the north the hills rise gradually from the shore, which is fringed with oleander bushes and indented with small bays. The ground is here covered with black basalt. On the west the plateau known as Sahel el-Ahma terminates in precipices 1700 ft. above the lake, and over these the black rocky tops called "the Horns of Hattin" are conspicuous objects. On the south is a broad valley through which the Jordan flows. On the east are furrowed and rugged slopes, rising to the great plateau of the Jaulan (Gaulonitis). The Jordan enters the lake through a narrow gorge between lower hills. A marshy plain 2½ m. long and 1½ broad, called el-Batihah, exists immediately east of the Jordan inlet. There is also on the west side of the lake a small plain called el-Ghuweir, formed by the junction of three large valleys. It measures 3 m. along the shore, and is 1 m. wide. This plain is naturally fertile, but now almost uncultivated, is supposed to be the plain of Gennesareth, described by Josephus (*B. J.* iii. 10, 8). On the east the hills approach in one place within 40 ft. of the water, but there is generally a width of about ½ a mile from the hills to the beach. On the west the flat ground at the foot of the hills has an average width of about 200 yds. A few scattered palms dot the western shores, and a palm grove is to be found near Kefr Hārib on the south-east. The hot baths south of Tiberias include seven springs, the largest of which has a temperature of 137° F. In these springs a distinct rise in temperature was observed in 1837, when Tiberias and Safed were destroyed by an earthquake. The plain of Gennesareth, with its environs, is the best-watered part of the lake-basin. North of this plain are the five springs of et-Tabighah, the largest of which was enclosed about a century ago in an octagonal reservoir by 'Ali, son of Dhahr el-Amir, and the water led off by an aqueduct 52 ft. above the lake. The Tabighah springs, though abundant, are warm and brackish. At the north end of the plain is 'Ain et-Tineh (" spring of the fig-tree "), also a brackish spring with a good stream; south of the plain is 'Ain el-Bardeh (" the cold spring "), which is sweet, but scarcely lower in temperature than the others. One of the most important springs is 'Ain el-Madawera (" the round spring "), situated 1 m. from the south end of the plain and half a mile from the shore. The water rises in a circular well 32 ft. in diameter, and is clear and sweet, with a temperature of 73° F. The bottom is of loose sand, and the fish called *coracinus* by Josephus (*B. J.* iii. 10, 8) is here found in plenty. Dr Tristram was the first explorer to identify this fish, and on account of its presence suggested the identification of the "round spring" with the fountain of *Capharnaum*, which, according to Josephus, watered the plain of Gennesareth. There is, however, a difficulty in this identification; there are no ruins at 'Ain el-Madawera.

Fauna and Flora.—For half the year the hillsides are bare and steppe-like, but in spring are clothed with a subtropical vegetation. Oleanders flourish round the lake, and the large papyrus grows at 'Ain et-Tin as well as at the mouth of the Jordan. The lake swarms with fish, which are caught with nets by a gild of fishermen, whose boats are the only representatives of the many ships and boats which plied on the lake as late as the 10th century. Fishing was a lucrative industry at an early date, and the Jews ascribed the laws regulating it to Joshua. The fish, which were classed as clean and unclean, the good and bad of the parable (Matt. xiii. 47, 48), belong to the genera *Chromis*, *Barbus*, *Capoeta*, *Discognathus*, *Nemachilus*, *Biennius* and *Clarias*; and there is a great affinity between them and the fish of the East African lakes and streams. There are eight species of *Chromis*, most of which hatch their eggs and raise their young in the buccal cavities of the males. The *Chromis simonis* is popularly supposed to be the fish from which Peter took the piece of money (Matt. xvii. 27). *Clarias macracanthus* (Arab. *Burbur*) is the *coracinus* of Josephus. It was found by Lortet in the springs of 'Ain el-Madawwera, 'Ain et-Tineh and 'Ainet-Tabighah, on the lake shore where muddy, and in Lake Huleh. It is a scaleless, snake-like fish, often nearly 5 ft. long, which resembles the *C. anguillaris* of Egypt. From the absence of scales it was held by the Jews to be unclean, and some commentators suppose it to be the serpent of Matt. vii. 10 and Luke xi. 11. Large numbers of grebes—great crested, eared, and little,—gulls and pelicans frequent the lake. In its shores are tortoises, mud-turtles, crayfish and innumerable sand-hoppers; and at varying depths in the lake several species of *Melania*, *Melanopsis*, *Neritina*, *Corbicula* and *Unio* have been found.

Antiquities.—The principal sites of interest round the lake may be enumerated from north to west and from south to east. Kerazeh, the undoubted site of Chorazin, stands on a rocky spur 900 ft. above the lake, 2 m. north of the shore. Foundations and scattered stones cover the slopes and the flat valley below. On the west is a rugged gorge. In the middle of the ruins are the scattered remains of a synagogue of richly ornamental style built of black basalt. A small spring occurs on the north. Tell Ḥum (as the name is generally spelt, though *Talḥūm* would probably be preferable for several reasons) is an important ruin on the shore, south of the last-mentioned site. The remains consist of foundations and piles of stones (in spring concealed by gigantic thistles) extending about half a mile along the shore. The foundations of a fine synagogue, measuring 75 ft. by 57, and built in white limestone, have been excavated. A conspicuous building has been erected close to the water, from the fragments of the Tell Ḥum synagogue. Since the 4th century Tell Ḥum has been identified by all the Christian writers of importance as the site of Capernaum. Some modern geographers question this identification, but without sufficient reason (see CAPERNAUM). Minyeh is a ruined site at the north end of the plain of Gennesareth, 2½ m. from the last, and close to the shore. There are extensive ruins on flat ground, consisting of mounds and foundations. Masonry of well-dressed stones has also been here discovered in course of excavation. Near the ruins are remains of an old khān, which appears to have been built in the middle ages. This is another suggested identification for Capernaum; but all the remains belong to the Arab period. Between Tell Ḥum and Minyeh is *Tell 'Oreimeh*, the site of a forgotten Amorite city.

South of the supposed plain of Gennesaretb is Mejdel, commonly supposed to represent the New Testament town of Magdala. A few lotus trees and some rock-cut tombs are here found beside a miserable mud hamlet on the hill slope, with a modern tomb-house (*kubbeh*). Passing beneath rugged cliffs a recess in the hills is next reached, where stands Tubaríya, the ancient Tiberias or Rakkath, containing 3000 inhabitants, more than half of whom are Jews. The walls, flanked with round towers, but partly destroyed by the earthquake of 1837, were built by Dhahr el-Amir, as was the court-house. The two mosques, now partly ruinous, were erected by his sons. There are remains of a Crusaders' church, and the tomb of the celebrated Maimonides is shown in the town, while Rabbi Aqiba and Rabbi Meir lie buried outside. The ruins of the ancient city, including granite columns and traces of a sea-wall with towers, stretch southwards a mile beyond the modern town. An aqueduct in the cliff once brought water a distance of 9 m. from the south.

Kerak, at the south end of the lake, is an important site on a peninsula surrounded by the water of the lake, by the Jordan, and by a broad water ditch, while on the north-west a narrow neck of land remains. The plateau thus enclosed is partly artificial, and banked up 50 or 60 ft. above the water. A ruined citadel remains on the north-west, and on the east was a bridge over the Jordan; broken pottery and fragments of sculptured stone strew the site. The ruin of Kerak answers to the description given by Josephus of the city of Taricheae, which lay 30 stadia from Tiberias, the hot baths being between the two cities. Taricheae was situated, as is Kerak, on the shore below the cliffs, and partly surrounded by water, while before the city was a

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plain (the Ghor). Pliny further informs us that Taricheae was at the south end of the Sea of Galilee. *Sinn en-Nabreh*, a ruin on a spur of the hills close to the last-mentioned site, represents the ancient Sennabris, where Vespasian (Josephus, *B. J.* iii. 9, 7) fixed his camp, advancing from Scythopolis (Beisen) on Taricheae and Tiberias. Sennabris was 30 stadia from Tiberias, or about the distance of the ruin now existing.

The eastern shores of the Sea of Galilee have been less fully explored than the western, and the sites are not so perfectly recovered. The site of Hippos, one of the cities of Decapolis, is fixed by Clermont-Ganneau at Khurbet Susieh. Kalat el-Hosn (" castle of the stronghold ") is a ruin on a rocky spur opposite Tiberias. Two large ruined buildings remain, with traces of an old street and fallen columns and capitals. A strong wall once surrounded the town; a narrow neck of land exists on the east where the rock has been scarped. Rugged valleys enclose the site on the north and south; broken sarcophagi and rock-cut tombs are found beneath the ruin. This site is not identified; the suggestion that it is Gamala is douhtful, and not borne out by Josephus (*War*, iv. 1, 1), who says Gamala was over against Taricheae. Kersa, an insignificant ruin north of the last, is thought to represent the Gerasa or Gergesa of the 4th century, situated east of the lake; and the projecting spur of hill south of this ruin is conjectured to be the place where the swine " ran violently down a steep place " (Matt. viii. 32).

(C. R. C.; C. W. W.; R. A. S. M.)

GALILEO GALILEI (1564–1642), Italian astronomer and experimental philosopher, was born at Pisa on the 15th of February 1564. His father, Vincenzio, was an impoverished descendant of a noble Florentine house, which had exchanged the surname of Bonajuti for that of Galilei, on the election, in 1343, of one of its members, Tommaso de' Bonajuti, to the college of the twelve Buonuomini. The family, which was nineteen times represented in the signoria, and in 1445 gave a gonfalonier to Florence, flourished with the republic and declined with its fall. Vincenzio Galilei was a man of better parts than fortune. He was a competent mathematician, wrote with considerable ability on the theory and practice of music, and was especially distinguished amongst his contemporaries for the grace and skill of his performance upon the lute. By his wife, Giulia Ammannati of Pescia, he had three sons and four daughters.

From his earliest childhood Galileo, the eldest of the family, was remarkable for intellectual aptitude as well as for mechanical invention. His favourite pastime was the construction of original and ingenious toy-machines; but his application to literary studies was equally conspicuous. In the monastery of Vallombrosa, near Florence, where his education was principally conducted, he not only made himself acquainted with the best Latin authors, but acquired a fair command of the Greek tongue, thus laying the foundation of his brilliant and elegant style. From one of the monks he also received instruction in logic; but the subtleties of the scholastic science were thoroughly distasteful to him. A document published by F. Selmi in 1864 proves that he was at this time so far attracted towards a religious life as to have joined the novitiate; but his father, who had other designs for him, seized the opportunity of an attack of ophthalmia to withdraw him permanently from the care of the monks. Having had personal experience of the unremunerative character both of music and of mathematics, he desired that his son should apply himself to the cultivation of medicine, and, not without some straining of his slender resources, placed him, before he had completed his eighteenth year, at the university of Pisa. He accordingly matriculated there on the 5th of November 1581, and immediately entered upon attendance at the lectures of the celebrated physician and botanist Andrea Cesalpino.

The natural gifts of the young student seemed at this time equally ready to develop in any direction towards which choice or hazard might incline them. In musical skill and invention he already vied with the best professors of the art in Italy; his personal taste would have led him to choose painting as his profession, and one of the most eminent artists of his day, Lodovico Cigoli, owned that to his judgment and counsel he was mainly indebted for the success of his works. In 1581, while watching a lamp set swinging in the cathedral of Pisa, he observed that, whatever the range of its oscillations, they were invariably executed in equal times. The experimental verification of this fact led him to the important discovery of the isochronism of the pendulum. He at first applied the new principle to pulse-measurement, and more than fifty years later turned it to account in the construction of an astronomical clock. Up to this time he was entirely ignorant of mathematics, his father having carefully held him aloof from a study which he rightly apprehended would lead to his total alienation from that of medicine. Accident, however, frustrated this purpose. A lesson in geometry, given by Ostilio Ricci to the pages of the grand-ducal court, chanced, tradition avers, to have Galileo for an unseen listener; his attention was riveted, his dormant genius was roused, and he threw all his energies into the new pursuit thus unexpectedly presented to him. With Ricci's assistance, he rapidly mastered the elements of the science, and eventually extorted his father's reluctant permission to exchange Hippocrates and Galen for Euclid and Archimedes. In 1585 he was withdrawn from the university, through lack of means, before he had taken a degree, and returned to Florence, where his family habitually resided. We next hear of him as lecturing before the Florentine Academy on the size and dimensions of Dante's *Inferno*; and he shortly afterwards published an essay descriptive of his invention of the hydrostatic balance, which rapidly made his name known throughout Italy. His first patron was the Marchese Guidubaldo del Monte of Pesaro, a man equally eminent in science, and influential through family connexions. At the Marchese's request he wrote, in 1588, a treatise on the centre of gravity in solids, which obtained for him, together with the title of " the Archimedes of his time," the honourable though not lucrative post of mathematical lecturer at the Pisan university. During the ensuing two years (1589–1591) he carried on that remarkable series of experiments by which he established the first principles of dynamics and earned the undying hostility of bigoted Aristotelians. From the leaning tower of Pisa he afforded to all the professors and students of the university ocular demonstration of the falsehood of the Peripatetic dictum that heavy bodies fall with velocities proportional to their weights, and with unanswerable logic demolished all the time-honoured maxims of the schools regarding the motion of projectiles, and elemental weight or levity. But while he convinced, he failed to conciliate his adversaries. The keen sarcasm of his polished rhetoric was not calculated to soothe the susceptibilities of an already smarting under the deprivation of their most cherished illusions. He seems, in addition, to have compromised his position with the grand-ducal family by the imprudent candour with which he condemned a machine for clearing the port of Leghorn, invented by Giovanni de' Medici, an illegitimate son of Cosmo I. Princely favour being withdrawn, private rancour was free to show itself. He was publicly hissed at his lecture, and found it prudent to resign his professorship and withdraw to Florence in 1591. Through the death of his father in July of that year family cares and responsibilities devolved upon him, and thus his nomination to the chair of mathematics at the university of Padua, secured by the influence of the Marchese Guidubaldo with the Venetian senate, was welcome both as affording a relief from pecuniary embarrassment and as opening a field for scientific distinction.

His residence at Padua, which extended over a period of eighteen years, from 1592 to 1610, was a course of uninterrupted prosperity. His appointment was three times renewed, on each occasion with the expressions of the highest esteem on the part of the governing body, and his yearly salary was progressively raised from 180 to 1000 florins. His lectures were attended by persons of the highest distinction from all parts of Europe, and such was the charm of his demonstrations that a hall capable of containing 2000 people had eventually to be assigned for the accommodation of the overflowing audiences which they attracted. His invention of the proportional compass or sector—an implement still used in geometrical drawing—dates from 1597; and about the same time he constructed the first thermometer, consisting of a bulb

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and tube filled with air and water, and terminating in a vessel of water. In this instrument the results of varying atmospheric pressure were not distinguisbable from the expansive and contractive effects of heat and cold, and it became an efficient measure of temperature only when Rinieri, in 1646, introduced the improvement of hermetically sealing the liquid in glass. The substitution, in 1670, of mercury for water completed the modern thermometer.

Galileo seems, at an early period of his life, to have adopted the Copernican theory of the solar system, and was deterred from avowing his opinions—as is proved by his letter to Kepler of August 4, 1597—by the fear of ridicule rather than of persecution. The appearance, in September 1604, of a new star in the constellation Serpentarius afforded him indeed an opportunity, of which he eagerly availed himself, for making an onslaught upon the Aristotelian axiom of the incorruptibility of the heavens; but he continued to conform his public teachings in the main to Ptolemaic principles, until the discovery of a novel and potent implement of research in the shape of the telescope (*q.v.*) placed at his command startling and hitherto unsuspected evidence as to the constitution and mutual relations of the heavenly bodies. Galileo was not the original inventor of the telescope.[1] That bonour must be assigned to Johannes Lippershey, an obscure optician of Middleburg, who, on the 2nd of October 1608, petitioned the states-general of the Low Countries for exclusive rights in the manufacture of an instrument for increasing the apparent size of remote objects. A rumour of the new invention, which reached Venice in June 1609, sufficed to set Galileo on the track; and after one night's profound meditation on the principles of refraction, he succeeded in producing a telescope of threefold magnifying power. Upon this first attempt he rapidly improved, until he attained to a power of thirty-two, and his instruments, of which he manufactured hundreds with his own hands, were soon in request in every part of Europe. Two lenses only—a plano-convex and a plano-concave—were needed for the composition of each, and this simple principle is that still employed in the construction of opera-glasses. Galileo's direction of his new instrument to the heavens formed an era in the history of astronomy. Discoveries followed upon it with astounding rapidity and in bewildering variety. The *Sidereus Nuncius*, published at Venice early in 1610, contained the first-fruits of the new mode of investigation, which were sufficient to excite learned amazement on both sides of the Alps. The mountainous configuration of the moon's surface was there first described, and the so-called "phosphorescence" of the dark portion of our satellite attributed to its true cause—namely, illumination by sunlight reflected from the earth.[2] All the time-worn fables and conjectures regarding the composition of the Milky Way were at once dispated by the simple statement that to the eye, reinforced by the telescope, it appeared as a congeries of lesser stars, while the great nebulae were equally declared to be resolvable into similar elements. But the discovery which was at once perceived to be most important in itself, and most revolutionary in its effects, was that of Jupiter's satellites, first seen by Galileo on the 7th of January 1610, and by him named *Sidera Medicea*, in honour of the grand-duke of Tuscany, Cosmo II., who had been his pupil, and was about to become his employer. An illustration is, with the general run of mankind, more powerful to convince than an argument; and the cogency of the visible plea for the Copernican theory offered by the miniature system, then first disclosed to view, was recognizable in the triumph of its advocates as well as in the increased acrimony of its opponents.

In September 1610 Galileo finally abandoned Padua for Florence. His researches with the telescope had been rewarded by the Venetian senate with the appointment for life to his professorship, at an unprecedentedly high salary. His discovery of the "Medicean Stars" was acknowledged by his nomination (July 12, 1610) as philosopher and mathematician extraordinary to the grand-duke of Tuscany. The emoluments of this office, which involved no duties save that of continuing his scientific labours, were fixed at 1000 scudi; and it was the desire of increased leisure, rather than the promptings of local patriotism, which induced him to accept an offer the original suggestion of which had indeed come from himself. Before the close of 1610 the memorable cycle of discoveries begun in the previous year was completed by the observation of the ansated or, as it appeared to Galileo, triple form of Saturn (the ring-formation was first recognized by Christiaan Huygens in 1655), of the phases of Venus, and of the spots upon the sun. As regards sun-spots, however, Johann Fabricius of Osteel in Friesland can claim priority of publication, if not of actual detection. In the spring of 1611 Galileo visited Rome, and exhibited in the gardens of the Quirinal Palace the telescopic wonders of the heavens to the most eminent personages at the pontifical court. Encouraged by the flattering reception accorded to him, he ventured, in his *Letters on the Solar Spots*, printed at Rome in 1613, to take up a more decided position towards that doctrine on the establishment of which, as he avowed in a letter to Belisario Vinta, secretary to the grand-duke, "all his life and being henceforward depended." Even in the time of Copernicus some well-meaning persons, especially those of the reformed persuasion, had suspected a discrepancy between the new view of the solar system and certain passages of Scripture—a suspicion strengthened by the anti-Christian inferences drawn from it by Giordano Bruno; but the question was never formally debated until Galileo's brilliant disclosures, enhanced by his formidable dialectic and enthusiastic zeal, irresistibly challenged for it the attention of the authorities. Although he had no desire to raise the theological issue, it must be admitted that, the discussion once set on foot, he threw himself into it with characteristic impetuosity, and thus helped to precipitate a decision which it was his interest to avert. In December 1613 a Benedictine monk named Benedetto Castelli, at that time professor of mathematics at the university of Pisa, wrote to inform Galileo of a recent discussion at the grand-ducal table, in which he had been called upon to defend the Copernican doctrine against theological objections. This task Castelli, who was a steady friend and disciple of the Tuscan astronomer, seems to have discharged with moderation and success. Galileo's answer, written, as he said himself, *currente calamo*, was an exposition of a formal theory as to the relations of physical science to Holy Writ, still further developed in an elaborate apology addressed by him in the following year (1614) to Christina of Lorraine, dowager grand-duchess of Tuscany. Not satisfied with explaining adverse texts, he met his opponents with unwise audacity on their own ground, and endeavoured to produce scriptural confirmation of a system which seemed to the ignorant many an incredible paradox, and to the scientific few a beautiful but daring innovation. The rising agitation on the subject, fomented for their own purposes by the rabid Aristotelians of the schools, was heightened rather than allayed by these manifestocs, and on the fourth Sunday of the following Advent found a voice in the pulpit of Santa Maria Novella. Padre Caccini's denunciation of the new astronomy was indeed disavowed and strongly condemned by his superiors; nevertheless, on the 5th of February 1615, another Dominican monk named Lorini laid Galileo's letter to Castelli before the Inquisition.

Cardinal Robert Bellarmin was at that time by far the most influential member of the Sacred College. He was a man of vast learning and upright piety, but, although personally friendly to Galileo, there is no doubt that he saw in his scientific teachings a danger to religion. The year 1615 seems to have been a period of suspense. Galileo received, as the result of a conference between Cardinals Bellarmin and Del Monte, a semi-official warning to avoid theology, and limit himself to physical reasoning. "Write freely," he was told by Monsignor Dini, "but keep outside the

[1] The word *telescope*, from τῆλε, far, *σκοπέω*, to view, was invented by Demisicianus, an eminent Greek scholar, at the request of Prince Cesi, president of the Lyncean Academy. It was used by Galileo as early as 1612, but was not introduced into England until much later. In 1655 the word *telescope* was inserted and explained in Bagwell's *Mysteries of Astronomy, trunk* or *cylinder* being the terms until then ordinarily employed.

[2] Leonardo da Vinci, more than a hundred years earlier, had come to the same conclusion.

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sacristy." Unfortunately, he had already committed himself to dangerous ground. In December he repaired personally to Rome, full of confidence that the weight of his arguments and the vivacity of his eloquence could not fail to convert the entire pontifical court to his views. He was cordially received, and eagerly listened to, but his imprudent ardour served but to injure his cause. On the 24th of February 1616 the consulting theologians of the Holy Office characterized the two propositions—that the sun is immovable in the centre of the world, and that the earth has a diurnal motion of rotation—the first as "absurd in philosophy, and formally heretical, because expressly contrary to Holy Scripture," and the second as "open to the same censure in philosophy, and at least erroneous as to faith." Two days later Galileo was, by command of the pope (Paul V.), summoned to the palace of Cardinal Bellarmin, and there officially admonished not thenceforward to "hold, teach or defend" the condemned doctrine. This injunction he promised to obey. On the 5th of March the Congregation of the Index issued a decree reiterating, with the omission of the word "heretical," the censure of the theologians, suspending, *usque corrigatur*, the great work of Copernicus, *De revolutionibus orbium coelestium*, and absolutely prohibiting a treatise by a Carmelite monk named Foscarini, which treated the same subject from a theological point of view. At the same time it was given to be understood that the new theory of the solar system might be held *ex hypothesi*, and the trivial verbal alterations introduced into the Polish astonomer's book in 1620, when the work of revision was completed by Cardinal Gaetani, confirmed this interpretation. This edict, it is essential to observe, the responsibility for which rests with a disciplinary congregation in no sense representing the church, was never confirmed by the pope, and was virtually repealed in 1757 under Benedict XIV.

Galileo returned to Florence three months later, not ill-pleased, as his letters testify, with the result of his visit to Rome. He brought with him, for the refutation of calumnious reports circulated by his enemies, a written certificate from Cardinal Bellarmin, to the effect that no abjuration had been required of or penance imposed upon him. During a prolonged audience he had received from the pope assurances of private esteem and personal protection; and he trusted to his dialectical ingenuity to find the means of presenting his scientific convictions under the transparent veil of an hypothesis. Although a sincere Catholic, he seems to have laid but little stress on the secret admonition of the Holy Office, which his sanguine temperament encouraged him gradually to dismiss from his mind. He preserved no written memorandum of its terms, and it was represented to him, according to his own deposition in 1633, solely by Cardinal Bellarmin's certificate, in which, for obvious reasons, it was glossed over rather than expressly recorded. For seven years, nevertheless, during which he led a life of studious retirement in the Villa Segni at Bellosguardo, near Florence, he maintained an almost unbroken silence. At the end of that time he appeared in public with his *Saggiatore*, a polemical treatise written in reply to the *Libra astronomica* of Padre Grassi (under the pseudonym of Lotario Sarsi), the Jesuit astronomer of the Collegio Romano. The subject in debate was the nature of comets, the conspicuous appearance of three of which bodies in the year 1618 furnished the occasion of the controversy. Galileo's views, although erroneous, since he held comets to be mere atmospheric emanations reflecting sunlight after the evanescent fashion of a halo or a rainbow, were expressed with such triumphant vigour, and embellished with such telling sarcasms, that his opponent did not venture upon a reply. The *Saggiatore* was printed at Rome in October 1623 by the Academy of the Lincei, of which Galileo was a member, with a dedication to the new pope, Urban VIII., and notwithstanding some passages containing a covert defence of Copernican opinions, was received with acclamation by ecclesiastical, no less than by scientific authorities.

Everything seemed now to promise a close of unbroken prosperity to Galileo's career. Maffeo Barberini, his warmest friend and admirer in the Sacred College, was, by the election of the 8th of August 1623, seated on the pontifical throne; and the marked distinction with which he was received on his visit of congratulation to Rome in 1624 encouraged him to hope for the realization of his utmost wishes. He received every mark of private favour. The pope admitted him to six long audiences in the course of two months, wrote an enthusiastic letter to the grand-duke praising the great astronomer, not only for his distinguished learning, but also for his exemplary piety, and granted a pension to his son Vincenzio, which was afterwards transferred to himself, and paid, with some irregularities, to the end of his life. But on the subject of the decree of 1616, the revocation of which Galileo had hoped to obtain through his personal influence, he found him inexorable. Yet there seemed reason to expect that it would at least be interpreted in a liberal spirit, and Galileo's friends encouraged his imprudent confidence by eagerly retailing to him every papal utterance which it was possible to construe in a favourable sense. To Cardinal Hohenzollern, Urban was reported to have said that the theory of the earth's motion had not been and could not be condemned as heretical, but only as rash; and in 1630 the brilliant Dominican monk Tommaso Campanella wrote to Galileo that the pope had expressed to him in conversation his disapproval of the prohibitory decree. Thus, in the full anticipation of added renown, and without any misgiving as to ulterior consequences, Galileo set himself, on his return to Florence, to complete his famous but ill-starred work, the *Dialogo dei due massimi sistemi del mondo*. Finished in 1630, it was not until January 1632 that it emerged from the presses of Landini at Florence. The book was originally intended to appear in Rome, but unexpected obstacles interposed. The Lincean Academy collapsed with the death of Prince Federigo Cesi, its founder and president; an outbreak of plague impeded communication between the various Italian cities; and the *imprimatur* was finally extorted, rather than accorded, under the pressure of private friendship and powerful interest. A tumult of applause from every part of Europe followed its publication; and it would be difficult to find in any language a book in which animation and elegance of style are so happily combined with strength and clearness of scientific exposition. Three interlocutors, named respectively Salviati, Sagredo, and Simplicio, take part in the four dialogues of which the work is composed. The first-named expounds the views of the author; the second is an eager and intelligent listener; the third represents a well-meaning but obtuse Peripatetic, whom the others treat at times with undisguised contempt. Salviati and Sagredo took their names from two of Galileo's early friends, the former a learned Florentine, the latter a distinguished Venetian gentleman; Simplicio ostensibly derived his from the Cilician commentator of Aristotle, but the choice was doubtless instigated by a sarcastic regard to the double meaning of the word. There were not wanting those who insinuated that Galileo intended to depict the pope himself in the guise of the simpleton of the party; and the charge, though preposterous in itself, was supported by certain imprudences of expression, which Urban was not permitted to ignore.

It was at once evident that the whole tenor of this remarkable work was in flagrant contradiction with the edict passed sixteen years before its publication, as well as with the author's personal pledge of conformity to it. The ironical submission with which it opened, and the assumed indetermination with which it closed, were hardly intended to mask the vigorous assertion of Copernican principles which formed its substance. It is a singular circumstance, however, that the argument upon which Galileo mainly relied as furnishing a physical demonstration of the truth of the new theory rested on a misconception. The ebb and flow of the tides were, he asserted, a visible proof of the terrestrial double movement, since they resulted from inequalities in the absolute velocities through space of the various parts of the earth's surface, due to its rotation. To this notion, which took its rise in a confusion of thought, he attached capital importance, and he treated with scorn Kepler's suggestion that a certain occult attraction of the moon was in some way concerned in the phenomenon. The theological censures which the book did not fail to incur were not slow in making themselves felt. Towards

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the end of August the sale was prohibited; on the 1st of October the author was cited to Rome by the Inquisition. He pleaded his age, now close upon seventy years, his infirm health, and the obstacles to travel caused by quarantine regulations; but the pope was sternly indignant at what he held to be his ingratitude and insubordination, and no excuse was admitted. At length, on the 13th of February 1633, he arrived at the residence of Niccolini, the Tuscan ambassador to the pontifical court, and there abode in retirement for two months. From the 12th to the 30th of April he was detained in the palace of the Inquisition, where he occupied the best apartments and was treated with unexampled indulgence. On the 30th he was restored to the hospitality of Niccolini, his warm partisan. The accusation against him was that he had written in contravention of the decree of 1616, and in defiance of the command of the Holy Office communicated to him by Cardinal Bellarmin; and his defence consisted mainly in a disavowal of his opinions, and an appeal to his good intentions. On the 21st of June he was finally examined under menace of torture; but he continued to maintain his assertion that after its condemnation by the Congregation of the Index, he had never held the Copernican theory. Since the publication of the documents relating to this memorable trial, there can no longer be any doubt, not only that the threat of torture was not carried into execution, but that it was never intended that it should be. On the 22nd of June, in the church of Santa Maria sopra Minerva, Galileo read his recantation, and received his sentence. He was condemned, as "vehemently suspected of heresy," to incarceration at the pleasure of the tribunal, and by way of penance was enjoined to recite once a week for three years the seven penitential psalms. This sentence was signed by seven cardinals, but did not receive the customary papal ratification. The legend according to which Galileo, rising from his knees after repeating the formula of abjuration, stamped on the ground, and exclaimed, "*Eppur si muove!*" is, as may readily be supposed, entirely apocryphal. Its earliest ascertained appearance is in the Abbé Irailh's *Querelles littéraires* (vol. iii. p. 49, 1761).

Galileo remained in the custody of the Inquisition from the 21st to the 24th of June, on which day he was relegated to the Villa Medici on the Trinità de' Monti. Thence, on the 6th of July, he was permitted to depart for Siena, where he spent several months in the house of the archbishop, Ascanio Piccolomini, one of his numerous and trusty friends. It was not until December that his earnest desire of returning to Florence was realized, and the remaining eight years of his life were spent in his villa at Arcetri called "Il Giojello," in the strict seclusion which was the prescribed condition of his comparative freedom. Domestic afflictions combined with numerous and painful infirmities to embitter his old age. His sister-in-law and her whole family, who came to live with him on his return from Rome, perished shortly afterwards of the plague; and on the 2nd of April 1634 died, to the inexpressible grief of her father, his eldest and best-beloved daughter, a nun in the convent of San Matteo at Arcetri. Galileo was never married; but by a Venetian woman named Marina Gamba he had three children—a son who married and left descendants, and two daughters who took the veil at an early age. His prodigious mental activity continued undiminished to the last. In 1636 he completed his *Dialoghi delle nuove scienze*, in which he recapitulated the results of his early experiments and mature meditations on the principles of mechanics. This in many respects his most valuable work was printed by the Elzevirs at Leiden in 1638, and excited admiration equally universal and more lasting than that accorded to his astronomical treatises. His last telescopic discovery—that of the moon's diurnal and monthly librations—was made in 1637, only a few months before his eyes were for ever closed in hopeless blindness. It was in this condition that Milton found him when he visited him at Arcetri in 1638. But the fire of his genius was not even yet extinct. He continued his scientific correspondence with unbroken interest and undiminished logical acumen; he thought out the application of the pendulum to the regulation of clock-work, which Huygens successfully realized fifteen years later; and he was engaged in dictating to his disciples, Viviani and Torricelli, his latest ideas on the theory of impact when he was seized with the slow fever which in two months brought him to the grave. On the 8th of January 1642 he closed his long life of triumph and humiliation, which just spanned the interval between the death of Michelangelo and the birth of Isaac Newton.

The direct services which Galileo rendered to astronomy are virtually summed up in his telescopic discoveries. To the theoretical perfection of the science he contributed little or nothing. He pointed out indeed that the so-called "third motion," introduced by Copernicus to account for the constant parallelism of the earth's axis, was a superfluous complication. But he substituted the equally unnecessary hypothesis of a magnetic attraction, and failed to perceive that the phenomenon to be explained was, in relation to absolute space, not a movement but the absence of movement. The circumstance, however, which most seriously detracts from his scientific reputation is his neglect of the discoveries made during his lifetime by the greatest of his contemporaries. Kepler's first and second laws were published in 1609, and his third ten years later. By these momentous inductions the geometrical theory of the solar system was perfected, and a hitherto unimagined symmetry was perceived to regulate the mutual relations of its members. But by Galileo they were passed over in silence. In his *Dialogo dei massimi sistemi*, printed not less than thirteen years after the last of the three laws had been given to the world, the epicycles by which Copernicus, adhering to the ancient postulate of uniform circular motion, had endeavoured to reduce to theory the irregularities of the planetary movements, were neither expressly adopted nor expressly rejected; and the conclusion seems inevitable that this grave defection from the cause of progress was due to his perhaps unconscious reluctance to accept discoveries which he had not originated. His name is nevertheless justly associated with that vast extension of the bounds of the visible universe which has rendered modern astronomy the most sublime of sciences, and his telescopic observations are a standing monument to his sagacity and acumen.

With the sure instinct of genius, he seized the characteristic features of the phenomena presented to his attention, and his inferences, except when distorted by polemical exigencies, have been strikingly confirmed by modern investigations. Of his two capital errors, regarding respectively the theory of the tides and the nature of comets, the first was insidiously recommended to him by his passionate desire to find a physical confirmation of the earth's double motion; the second was adopted for the purpose of rebutting an anti-Copernican argument founded on the planetary analogies of those erratic subjects of the sun. Within two years of their first discovery, he had constructed approximately accurate tables of the revolutions of Jupiter's satellites, and he proposed their frequent eclipses as a means of determining longitudes, not only on land, but at sea. This method, on which he laid great stress, and for the facilitation of which he invented a binocular glass, and devised some skilful mechanical contrivances, was offered by him in 1616 to the Spanish government, and afterwards to that of Tuscany, but in each case unsuccessfully; and the close of his life was occupied with prolonged but fruitless negotiations on the same subject with the states-general of Holland. The idea, though ingenious, has been found of little practical utility at sea.

A series of careful observations made him acquainted with the principal appearances revealed by modern instruments in the solar spots. He pointed out that they were limited to a certain defined zone on the sun's surface; he noted the *faculae* with which they are associated, the penumbra by which they are bordered, their slight proper motions and their rapid changes of form. He inferred from the regularity of their general movements the rotation of the sun on its axis in a period of little less than a month; and he grounded on the varying nature of the paths seemingly traversed by them a plausible, though inconclusive, argument in favour of the earth's annual revolution. Twice in the year, he observed, they seem to travel across the solar disk in straight lines; at other times, in curves. These appearances he

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referred with great acuteness to the slight inclination of the sun's axis of rotation to the plane of the ecliptic. Thus, when the earth finds herself in the plane of the sun's equator, which occurs at two opposite points of her orbit, the spots, travelling in circles parallel with that plane, necessarily appear to describe right lines; but when the earth is above or below the equatorial level, the paths of the spots open out into curves turned downwards or upwards, according to the direction in which they are seen. But the explanation of this phenomenon is equally consistent with the geocentric as with the heliocentric theory of the solar system. The idea of a universal force of gravitation seems to have hovered on the borders of this great man's mind, without ever fully entering it. He perceived the analogy between the power which holds the moon in the neighbourhood of the earth, and compels Jupiter's satellites to circulate round their primary, and the attraction exercised by the earth on bodies at its surface;[1] but he failed to conceive the combination of central force with tangential velocity, and was disposed to connect the revolutions of the planets with the axial rotation of the sun. This notion, it is plain, tended rather towards Descartes's theory of vortices than towards Newton's theory of gravitation. More valid instances of the anticipation of modern discoveries may be found in his prevision that a small annual parallax would eventually be found for some of the fixed stars, and that extra-Saturnian planets would at some future time be ascertained to exist, and in his conviction that light travels with a measurable, although, in relation to terrestrial distances, infinite velocity.

The invention of the microscope, attributed to Galileo by his first biographer, Vincenzio Viviani, does not in truth belong to him. Such an instrument was made as early as 1590 by Zacharias Jansen of Middleburg; and although Galileo discovered, in 1610, a means of adapting his telescope to the examination of minute objects, he did not become acquainted with the compound microscope until 1624 when he saw one of Drebbel's instruments in Rome, and, with characteristic ingenuity, immediately introduced some material improvements into its construction.

The most substantial, if not the most brilliant part of his work consisted undoubtedly in his contributions towards the establishment of mechanics as a science. Some valuable but isolated facts and theorems had been previously discovered and proved, but it was he who first clearly grasped the idea of force as a mechanical agent, and extended to the external world the conception of the invariability of the relation between cause and effect. From the time of Archimedes there had existed a science of equilibrium, but the science of motion began with Galileo. It is not too much to say that the final triumph of the Copernican system was due in larger measure to his labours in this department than to his direct arguments in its favour. The problem of the heavens is essentially a mechanical one; and without the mechanical conceptions of the dependence of motion upon force which Galileo familiarized to men's minds, that problem might have remained a sealed book even to the intelligence of Newton. The interdependence of motion and force was not indeed formulated into definite laws by Galileo, but his writings on dynamics are everywhere suggestive of those laws, and his solutions of dynamical problems involve their recognition. The extraordinary advances made by him in this branch of knowledge were owing to his happy method of applying mathematical analysis to physical problems. As a pure mathematician he was, it is true, surpassed in profundity by more than one among his pupils and contemporaries; and in the wider imaginative grasp of abstract geometrical principles he cannot be compared with Fermat, Descartes or Pascal, to say nothing of Newton or Leibnitz. Still, even in the region of pure mathematics, his powerful and original mind left notable traces of its working. He studied the properties of the cycloid, and attempted the problem of its quadrature; and in the "infinitesimals," which he was one of the first to introduce into geometrical demonstrations, was contained the fruitful germ of the differential calculus. But the method which was peculiarly his, and which still forms the open road to discoveries in natural science, consisted in the combination of experiment with calculation—in the transformation of the concrete into the abstract, and the assiduous comparison of results. The first-fruits of the new system of investigation was his determination of the laws of falling bodies. Conceiving that the simplest principle is the most likely to be true, he assumed as a postulate that bodies falling freely towards the earth descend with a uniformly accelerated motion, and deduced thence that the velocities acquired are in the direct, and the spaces traversed in the duplicate ratio of the times, counted from the beginning of motion; finally, he proved, by observing the times of descent of bodies falling down inclined planes, that the postulated law was the true law. Even here, he was obliged to take for granted that the velocities acquired in descending from the same height along planes of every inclination are equal; and it was not until shortly before his death that he found the mathematical demonstration of this not very obvious principle.

The first law of motion—that which expresses the principle of inertia—is virtually contained in the idea of uniformly accelerated velocity. The recognition of the second—that of the independence of different motions—must be added to form the true theory of projectiles. This was due to Galileo. Up to his time it was universally held in the schools that the motion of a body should cease with the impulse communicated to it, but for the "reaction of the medium" helping it forward. Galileo showed, on the contrary, that the nature of motion once impressed is to continue indefinitely in a uniform direction, and that the effect of the medium is a retarding, not an impelling one. Another commonly received axiom was that no body could be affected by more than one movement at one time, and it was thus supposed that a cannon ball, or other projectile, moves forward in a right line until its first impulse is exhausted, when it falls vertically to the ground. In the fourth of Galileo's dialogues on mechanics, he demonstrated that the path described by a projectile, being the result of the combination of a uniform transverse motion with a uniformly accelerated vertical one, must, apart from the resistance of the air, be a parabola. The establishment of the principle of the composition of motions formed a conclusive answer to the most formidable of the arguments used against the rotation of the earth, and we find it accordingly triumphantly brought forward by Galileo in the second of his dialogues on the systems of the world. It was urged by anti-Copernicans that a body flung upward or cast downward would, if the earth were in motion, be left behind by the rapid translation of the point from which it started; Galileo proved on the contrary that the reception of a fresh impulse in no way interfered with the movement already impressed, and that the rotation of the earth was insensible, because shared equally by all bodies at its surface. His theory of the inclined plane, combined with his satisfactory definition of "momentum," led him towards the third law of motion. We find Newton's theorem, that "action and reaction are equal and opposite," stated with approximate precision in his treatise *Della scienza meccanica*, which contains the substance of lectures delivered during his professorship at Padua; and the same principle is involved in the axiom enunciated in the third of his mechanical dialogues, that "the propensity of a body to fall is equal to the least resistance which suffices to support it." The problems of percussion, however, received no definitive solution until after his death.

His services were as conspicuous in the statical as in the kinetical division of mechanics. He gave the first satisfactory demonstration of equilibrium on an inclined plane, reducing it to the level by a sound and ingenious train of reasoning; while, by establishing the theory of "virtual velocities," he laid down the fundamental principle which, in the opinion of Lagrange, contains the general expression of the laws of equilibrium. He

[1] The passage is sufficiently remarkable to deserve quotation in the original:—"Le parti della Terra hanno tal propensione al centro di essa, che quando ella cangiasse luogo, le dette parti, benchè lontane dal globo nel tempo delle mutazioni di esso, lo seguirebbero per tutto; esempio di ciò sia il seguito perpetuo delle Medicee, ancorchè separate continuamente da Giove. L'istesso si deve dire della Luna, obbligata a seguir la Terra."—*Dialogo dei massimi sistemi*, Giornata terza, p. 351 of Albèri's edition.

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studied with attention the still obscure subject of molecular cohesion, and little has been added to what he ascertained on the question of transverse strains and the strength of beams, first brought by him within the scope of mechanical theory. In his *Discorso intorno alle cose che stanno su l'acqua*, published in 1612, he used the principle of virtual velocities to demonstrate the more important theorems of hydrostatics, deducing from it the equilibrium of fluid in a siphon, and proved against the Aristotelians that the floating of solid bodies in a liquid depends not upon their form, but upon their specific gravities relative to such liquid.

In order to form an adequate estimate of the stride made by Galileo in natural philosophy, it would be necessary to enumerate the confused and erroneous opinions prevailing on all such subjects in his time. His best eulogium, it has been truly said, consists in the fallacies which he exposed. The scholastic distinctions between corruptible and incorruptible substances, between absolute gravity and absolute levity, between natural and violent motions, if they did not wholly disappear from scientific phraseology, ceased thenceforward to hold the place of honour in the controversies of the learned. Discarding these obscure and misleading notions, Galileo taught that gravity and levity are relative terms, and that all bodies are heavy, even those which, like the air, are invisible; that motion is the result of force, instantaneous or continuous; that weight is a continuous force, attracting towards the centre of the earth; that, in a vacuum, all bodies would fall with equal velocities; that the "inertia of matter" implies the continuance of motion, as well as the permanence of rest; and that the substance of the heavenly bodies is equally "corruptible" with that of the earth. These simple elementary ideas were eminently capable of development and investigation, and were not only true but the prelude to further truth; while those they superseded defied inquiry by their vagueness and obscurity. Galileo was a man born in due time. He was superior to his contemporaries, but not isolated amongst them. He represented and intensified a growing tendency of the age in which he lived. It was beginning to be suspected that from Aristotle an appeal lay to nature, and some were found who no longer treated the *ipse dixit* of the Stagirite as the final authority in matters of science. A vigorous but ineffectual warfare had already been waged against the blind traditions of the schools by Ramus and Telesius, by Patricius and Campanella, and the revolution which Galileo completed had been prepared by his predecessors. Newton, Boyle, the task which he so effectually accomplished demanded the highest and rarest quality of genius. He struck out for himself the happy middle path between the *a priori* and the empirical systems, and exemplified with brilliant success the method by which experimental science has wrested from nature so many of her secrets. His mind was eminently practical. He concerned himself above all with what fell within the range of exact inquiry, and left to others the larger but less fruitful speculations which can never be brought to the direct test of experiment. Thus, while far-reaching but hasty generalizations have had their day and been forgotten, his work has proved permanent, because he made sure of its foundations. His keen intuition of truth, his vigour and yet sobriety of argument, his fertility of illustration and acuteness of sarcasm, made him irresistible to his antagonists; and the evanescent triumphs of scornful controversy have given place to the sedate applause of a long-lived posterity.

The first complete edition of Galileo's writings was published at Florence (1842–1856), in 16 8vo vols., under the supervision of Signor Eugenio Albèri. Besides the works already enumerated, it contained the *Sermones de motu gravium* composed at Pisa between 1589 and 1591; his letters to his friends, with many of their replies, as well as several of the essays of his scientific opponents; his laudatory comments on the *Orlando Furioso*, and depreciatory notes on the *Gerusalemme Liberata*, some stanzas and sonnets of no great merit, together with the sketch of a comedy; finally, a reprint of Viviani's *Life*, with valuable notes and corrections. The original documents from the archives of the Inquisition, relating to the events of 1616 and 1633, recovered from Paris in 1846 by the efforts of Count Rossi, and now in the Vatican Library, were to a limited extent made public by Monsignor Marino-Marini in 1850, and more unreservedly by M. Henri de l'Épinois, in an essay entitled *Galilée, son procès, sa condemnation*, published in 1867 in the *Revue des questions historiques*. He was followed by M. Karl von Gebler, who, in an able and exhaustive but somewhat prejudiced work, *Galileo Galilei und die römische Curie* (Stuttgart, 1876), sought to impeach the authenticity of a document of prime importance in the trial of 1633. He was victoriously answered by Signor Domenico Berti, in *Il Processo originale di Galileo Galilei* (Rome, 1876), and by M. de l'Épinois, with *Les pièces du procès de Galilée* (Rome, Paris, 1877). The touching letters of Galileo's eldest daughter, Sister Maria Celeste, to her father were printed in 1862 by Professor Antonio Arduini, in a publication entitled *La Primogenita di Galileo Galilei*.

The issue of a "national edition" of the Works of Galileo, in 20 large volumes, was begun at Florence in 1890. It includes a mass of previously inedited correspondence and other documents, collected by the indefatigable director, Professor Antonio Favaro, among whose numerous publications on Galilean subjects may be mentioned: *Galileo e lo studio di Padova* (2 vols., 1883); *Scampoli Galileani* (12 series, 1886–1897); *Nuovi Studi Galileani* (1891); *Galileo Galilei e Suor Maria Celeste* (1891). See also Th. Henri Martin's *Galilée, les droits de la science et la méthode des sciences physiques* (1868); *Private Life of Galileo* (by Mrs Olney, 1870); J. J. Pahie's *Galileo; his Life and Work* (1903); *Galilée et Marius*, by A. C. Oudemans and J. Bosscha (1903). The relations of Galileo to the Church are temperately and ably discussed by F. R. Wegg-Prosser in *Galileo and his Judges* (1889), and in two articles published in the *American Catholic Quarterly* for April and July 1901. (A. M. C.)

GALION, a city of Crawford County, Ohio, U.S.A., about 75 m. S.W. of Cleveland. Pop. (1890) 6326; (1900) 7282 [503 foreign-born]; (1910) 7214. It is served by the Cleveland, Cincinnati, Chicago & St Louis, and the Erie railways, and by an interurban electric railway. The city is about 1165 ft. above sea level, and has extensive railway shops (of the Erie railway) and manufactories of brick and tile machinery, carriages and wagons, and grain and seed cleaners. The municipality owns and operates its electric-lighting plant. Galion was laid out as a town in 1831, was incorporated as a borough in 1840, and was chartered as a city in 1878.

GALL, FRANZ JOSEPH (1758–1828), anatomist, physiologist, and founder of phrenology (*q.v.*), was born at Tiefenbrunn near Pforzheim, Baden, on the 9th of March 1758. After completing the usual literary course at Baden and Bruchsal, he began the study of medicine under J. Hermann (1738–1800) at Strassburg, whence, attracted by the names of Gerhard van Swieten (1700–1772) and Maximilian Stoll (1742–1788), he removed to Vienna in 1781. Having received his diploma, he began to practise as a physician there in 1785; but his energies were mainly devoted to the scientific investigation of problems which had occupied his attention from boyhood. At a comparatively early period he formed the generalization that in the human subject at least a powerful memory is invariably associated with prominent eyes; and further observation enabled him, as he thought, also to define the external characteristics indicative of special talents for painting, music and the mechanical arts. Following out these researches, he gradually reached the strong conviction, not only that the talents and dispositions of men are dependent upon the functions of the brain, but also that they may be inferred with perfect exactitude and precision from the external appearances of the skull. Gall's first appearance as an author was made in 1791, when he published the first two chapters of a (never completed) work entitled *Philosophisch-medicinische Untersuchungen über Natur u. Kunst im kranken u. gesunden Zustande des Menschen*. The first public notice of his inquiries in cranioscopy, however, was in the form of a letter addressed to a friend, which appeared in C. M. Wieland's *Deutscher Mercur* in 1798; but two years previously he had begun to give private courses of phrenological lectures in Vienna, where his doctrines soon attracted general attention, and met with increasing success until, in 1802, they were interdicted by the government as being dangerous to religion. This step on the part of the authorities had the effect of greatly stimulating public curiosity and increasing Gall's celebrity.

In March 1805 he finally left Vienna in company with his friend and associate J. C. Spurzheim, and made a tour through Germany, in the course of which he lectured in Berlin, Dresden, Magdeburg and several of the university towns. His expositions, which he knew how to make popular and attractive, were much

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resorted to by the public, and excited considerable controversy in the scientific world. He had almost reached the zenith of his fame when, in 1807, he repaired to Paris and established himself there as a medical practitioner, at the same time continuing his activity as a lecturer and writer. In 1808 appeared his *Introduction au cours de physiologie du cerveau*, which was followed in 1809 by the *Recherches sur le système nerveux en général, et sur celui du cerveau en particulier* (originally laid before the Institute of France in March 1808), and in 1810 by the first instalment of the *Anatomie et physiologie du système nerveux en général, et du cerveau en particulier, avec des observations sur la possibilité de reconnaître plusieurs dispositions intellectuelles et morales de l'homme et des animaux par la configuration de leurs têtes*. The *Recherches* and the first two volumes of the *Anatomie* bear the conjoint names of Gall and Spurzheim. The latter work was completed in 1819, and appeared in a second edition of six volumes in 1822–1825. In 1811 he replied to a charge of Spinozism or atheism, which had been strongly urged against him, by a treatise entitled *Des dispositions innées de l'âme et de l'esprit*, which he afterwards incorporated with his greater work. In 1819 he became a naturalized French subject, but his efforts two years afterwards to obtain admission to the Academy of Sciences, although supported by E. Geoffroy Saint-Hilaire, were unsuccessful. In 1823 he visited London with the intention of giving a series of phrenological lectures, but his reception was not what he had anticipated, and he speedily abandoned his plans. He continued to lecture and practise in Paris until the beginning of 1828, when he was disabled by an apoplectic seizure. His death took place at Montrouge near Paris, on the 22nd of August 1828.

GALL (a word common to many Teutonic languages, cf. Dutch *gal*, and Ger. *Galle*; the Indo-European root appears in Gr. χολή, and Lat. *fel*; possibly connected with "yellow," with reference to the colour of bile), the secretion of the liver known as "bile," the term being also used of the pear-shaped *diverticulum* of the bile-duct, which forms a reservoir for the bile, more generally known as the "gall-bladder" (see LIVER). From the extreme bitterness of the secretion, "gall," like the Lat. *fel*, is used for anything extremely bitter, whether actually or metaphorically. From the idea that the gall-bladder was the dominating organ of a bitter, sharp temperament, "gall" was formerly used in English for such a spirit, and also for one very ready to resent injuries. It thus survives in American slang, with the meaning "impudence" or "assurance."

"Gall," meaning a sore or painful swelling, especially on a horse, may be the same word, derived from an early use of the word as meaning "poison." On the other hand, in Romanic languages, the Fr. *galle*, Sp. *agalla*, a wind-gall or puffy distension of the synovial bursa on the fetlock joint of a horse, is derived from the Lat. *galla*, oak-apple, from which comes the English "gall," meaning an excrescence on trees caused by certain insects. (See GALLS.)

GALLABAT, or GALABAT, called by the Abyssinians Matemma (Metemma), a town of the Anglo-Egyptian Sudan, in 13° N. 36° 12′ E. It is built, at the foot of a steep slope, on the left bank of a tributary of the Atbara called the Khor Abnaheir, which forms here the Sudan-Abyssinian frontier. Gallabat lies 90 m. W. by N. of Gondar, the capital of Amhara, and being on the main route from Sennar to Abyssinia, is a trade centre of some importance. Pop. about 3000. The majority of the buildings are grass *tukls*. Slaves, beeswax, coffee, cotton and hides were formerly the chief articles of commerce. The slave market was closed about 1874. Being on the frontier line, the possession of the town was for long a matter of dispute between the Sudanese, and later the Egyptians, on the one hand and the Abyssinians on the other. About 1870 the Egyptians garrisoned the town, which in 1886 was attacked by the dervishes and sacked. From Gallabat a dervish raiding party penetrated to Gondar, which they looted. In revenge an Abyssinian army under King John attacked the dervishes close to Gallabat in March 1889. The dervishes suffered very severely, but King John being killed by a stray bullet, the Abyssinians retired (see EGYPT: *Military Operations*, 1885–1896). In December 1898 an Anglo-Egyptian force entered Gallabat. The Abyssinians then held the fort, but as the result of frontier arrangement the town was definitely included in the Sudan, though Abyssinia takes half the customs revenue. Since 1899 the trade of the place has revived, coffee and live stock being the most important items.

The town and district form a small ethnographical island, having been peopled in the 18th century by a colony of Takruri from Darfur, who, finding the spot a convenient resting-place for their fellow-pilgrims on their way to Mecca and back, obtained permission from the negus of Abyssinia to make a permanent settlement. They are an industrious agricultural race, and cultivate cotton with considerable success. They also collect honey in large quantities. The Takruri possess jagged throwing knives, which are said to have been brought from their original home in the Upper Congo regions.

GALLAIT, LOUIS (1810–1887), Belgian painter, was born at Tournay, in Hainaut, Belgium, on the 9th of May 1810. He first studied in his native town under Hennequin. In 1832 his first picture, "Tribute to Caesar," won a prize at the exhibition at Ghent. He then went to Antwerp to prosecute his studies under Mathieu Ignace Van Brée, and in the following year exhibited at the Brussels Salon "Christ Healing the Blind." This picture was purchased by subscription and placed in the cathedral at Tournay. Gallait next went to Paris, whence he sent to the Belgian Salons "Job on the Dunghill," "Montaigne Visiting Tasso in Prison"; and, in 1841, "The Abdication of Charles V.," in the Brussels Gallery. This was hailed as a triumph, and gained for the painter a European reputation. Official invitations then caused him to settle at Brussels, where he died on the 20th of November 1887. Among his greater works may be named: "The Last Honours paid to Counts Egmont and Horn by the Corporations of the Town of Brussels," now at Tournay, "The Death of Egmont," in the Berlin gallery; the "Coronation of Baudouin, Emperor of Constantinople," painted for Versailles; "The Temptation of St Anthony," in the palace at Brussels; "The Siege of Antioch," "Art and Liberty," a "Portrait of M. B. Dumortier" and "The Plague at Tournay," all in the Brussels gallery. "A Gipsy Woman and her Children" was painted in 1852. "M. Gallait has all the gifts that may be acquired by work, taste, judgment and determination," wrote Théophile Gautier; his art is that of a man of tact, a skilled painter, happy in his dramatic treatment but superficial. No doubt, this Walloon artist, following the example of the Flemings of the Renaissance and the treatment of Belgian classical painters and the French Romantic school, sincerely aimed at truth; unfortunately, misled by contemporary taste, he could not conceive of it excepting as dressed in sentimentality. As an artist employed by the State he exercised considerable influence, and for a long period he was the leader of public taste in Brussels.

See Teichlin, *Louis Gallait und die Malerei in Deutschland* (1853); J. Dujardin, *L'Art flamand* (1899); C. Lemonnier, *Histoire des beaux-arts en Belgique* (1881).

GALLAND, ANTOINE (1646–1715), French Orientalist and archaeologist, the first European translator of the *Arabian Nights*, was born on the 4th of April 1646 at Rollot, in the department of Somme. The completion of his school education at Noyon was followed by a brief apprenticeship to a trade, from which, however, he soon escaped, to pursue his linguistic studies at Paris. After having been employed for some time in making a catalogue of the Oriental manuscripts at the Sorbonne, he was, in 1670, attached to the French embassy at Constantinople; and in 1673 he travelled in Syria and the Levant, where he copied a great number of inscriptions, and sketched, and in some cases removed historical monuments. After a brief visit to France, where his collection of ancient coins attracted some attention, Galland returned to the Levant in 1676; and in 1679 he undertook a third voyage, being commissioned by the French East India Company to collect for the cabinet of Colbert; on the expiration of this commission he was instructed by the government to continue his researches, and had the title of

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"antiquary to the king" conferred upon him. During his prolonged residences abroad he acquired a thorough knowledge of the Arabic, Turkish and Persian languages and literatures, which, on his final return to France, enabled him to render valuable assistance to Thevenot, the keeper of the royal library, and to Barthélemy d'Herbelot. After their deaths he lived for some time at Caen under the roof of Nicolas Foucault (1643–1721), the intendant of Caen, himself no mean archaeologist; and there he began the publication (12 vols., 1704–1717) of *Les mille et une nuits*, which excited immense interest during the time of its appearance, and is still the standard French translation. It had no pretensions to verbal accuracy, and the coarseness of the language was modified to suit European taste, but the narrative was adequately rendered. In 1701 Galland had been admitted into the Academy of Inscriptions, and in 1709 he was appointed to the chair of Arabic in the Collège de France. He continued to discharge the duties of this post until his death, which took place on the 17th of February 1715.

Besides a number of archaeological works, especially in the department of numismatics, he published a compilation from the Arabic, Persian and Turkish, entitled *Paroles remarquables, bons mots et maximes des orientaux* (1694), and a translation from an Arabic manuscript, *De l'origine et du progrès du café* (1699). The former of these works appeared in an English translation in 1795. His *Contes et fables indiennes de Bidpai et de Lokman* was published (1724) after his death. Among his numerous unpublished manuscripts are a translation of the Koran and a *Histoire générale des empereurs turcs*. His *Journal* was published by M. Charles Schefer in 1881.

GALLARATE, a town of Lombardy, Italy, in the province of Milan, from which it is 25 m. N.W. by rail. Pop. (1901) 12,002. The town is of medieval origin. It is remarkable mainly for its textile factories. It is the junction of railways to Varese, Laveno and Arona (for the Simplon). Six miles to the W. are the electric works of Vizzola, the largest in Europe, where 23,000 h.p. are derived from the river Ticino.

GALLARS [in Lat. GALLASTUS], **NICOLAS DES** (*c.* 1520–*c.* 1580), Calvinistic divine, first appears as author of a *Defensio* of William Farel, published at Geneva in 1545, followed (1545–1549) by translations into French of three tracts by Calvin. In 1551 he was admitted burgess of Geneva, and in 1553 made pastor of a country church in the neighbourhood. In 1557 he was sent to minister to the Protestants at Paris; his conductor, Nicolas du Rousseau, having prohibited books in his possession, was executed at Dijon; des Gallars, having nothing suspicious about him, continued his journey. On the revival of the Strangers' church in London (1560), he, being then minister at Geneva, came to London to organize the French branch; and in 1561 he published *La Forme de police ecclésiastique instituée à Londres en l'Église des Français*. In the same year he assisted Beza at the colloquy of Poissy. He became minister to the Protestants at Orleans in 1564; presided at the synod of Paris in 1565; was driven out of Orleans with other Protestants in 1568; and in 1571 was chaplain to Jeanne d'Albret, queen of Navarre. Calvin held him in high esteem, employing him as amanuensis, and as editor as well as translator of several of his exegetical and polemical works. He himself wrote a commentary on Exodus (1560); edited an annotated French Bible (1562) and New Testament (1562); and published tracts against Arians (1565–1566). His main work was his edition of Irenaeus (1570) with prefatory letter to Grindal, then bishop of London, and giving, for the first time, some fragments of the Greek text. His collaboration with Beza in the *Histoire des Églises Réformées du royaume de France* (1580) is doubted by Bayle.

See Bayle, *Dictionnaire hist. et crit.*; Jean Senebier, *Hist. littéraire de Genève* (1786); *Nouvelle Biog. gén.* (1857). (A. Go.*)

GALLAS, MATTHIAS, COUNT OF CAMPO, DUKE OF LUCERA (1584–1647), Austrian soldier, first saw service in Flanders, and in Savoy with the Spaniards, and subsequently joined the forces of the Catholic League as captain. On the general outbreak of hostilities in Germany, Gallas, as colonel of an infantry regiment, distinguished himself, especially at the battle of Stadtlohn (1623). In 1630 he was serving as *General-Feldwachtmeister* under Collalto in Italy, and was mainly instrumental in the capture of Mantua. Made count of the Empire for this service, he returned to Germany for the campaign against Gustavus Adolphus. In command of a corps of Wallenstein's army, he covered Bohemia against the Swedes in 1631–1632, and served at the Alte Veste near Nuremberg, and at Lützen. Further good service against Bernhard of Saxe-Weimar commended General Gallas to the notice of the emperor, who made him lieutenant-general in his own army. He was one of the chief conspirators against Wallenstein, and after the tragedy of Eger was appointed to the command of the army which Wallenstein had formed and led. At the great battle of Nördlingen (23rd of August 1634) in which the army of Sweden was almost annihilated, Gallas commanded the victorious Imperialists. His next command was in Lorraine, but even the Moselle valley had suffered so much from the ravages of war that his army perished of want. Still more was this the case in northern Germany, where Gallas commanded against the Swedish general Banér in 1637 and 1638. At first driving the Swedes before him, in the end he made a complete failure of the campaign, lost his command, and was subject to much ridicule. It was, however, rather the indiscipline of his men (the baneful legacy of Wallenstein's methods) than his own faults which brought about his disastrous retreat across North Germany, and at a moment of crisis he was recalled to endeavour to stop Torstenson's victorious advance, only to be shut up in Magdeburg, whence he escaped with the barest remnant of his forces. Once more relieved of his command, he was again called to make head against the Swedes in 1645 (after their victory at Jankow). Before long, old and warworn, he resigned his command, and died in 1647 at Vienna. His army had earned for itself the reputation of being the most cruel and rapacious force even in the Thirty Years' War, and his *Merode Brüder* have survived in the word *marauder*. Like many other generals of that period, he had acquired much wealth and great territorial possessions (the latter mostly his share of Wallenstein's estates). He was the founder of the Austrian family of Clam-Gallas, which furnished many distinguished soldiers to the Imperial army.

GALLAS, or more correctly GALLA, a powerful Hamitic people of eastern Africa, scattered over the wide region which extends for about 1000 m. from the central parts of Abyssinia to the neighbourhood of the river Sabaki in British East Africa. The name "Galla" or "Gala" appears to be an Abyssinian nickname, unknown to the people, who call themselves *Ilm' Orma*, "sons of men" or "sons of Orma," an eponymous hero. In Shoa (Abyssinia) the word is connected with the river Gála in Guragie, on the banks of which a great battle is said to have been fought between the Galla and the Abyssinians. Arnaud d'Abbadie says that the Abyssinian Moslems recount that, when summoned by the Prophet's messenger to adopt Islam, the chief of the Galla said "No,"—in Arabic *kâl* (or *gal*) *la*,—and the Prophet on hearing this said, "Then let their very name imply their denial of the Faith." Of all Hamitic peoples the Galla are the most numerous. Dr J. Ludwig Krapf estimated them (*c.* 1860) at from six to eight millions; later authorities put them at not much over three millions. Individual tribes are said to be able to bring 20,000 to 30,000 horsemen into the field.

Hardly anything is definitely known as to the origin and early home of the race, but it appears to have occupied the southern part of its present territory since the 16th century. According to Hiob Ludolf and James Bruce, the Galla invaders first crossed the Abyssinian frontiers in the year 1537. The Galla of Gojam (a district along the northern side of the river Abai) tell how their savage forefathers came from the south-east from a country on the other side of a bahr (lake or river), and the Yejju and Raia Galla also point towards the east and commemorate the passage of a bahr. Among the southern Galla tradition appears to be mainly concerned with the expulsion of the race from the country now occupied by the Somali. Their original home was possibly in the district east of Victoria Nyanza, for the tribes near Mount Kenya are stated to go on periodical pilgrimages to the mountain, making offerings to it as if to their mother. A theory has been advanced that the great exodus which it seems certain took place among the peoples throughout eastern Africa during the 15th century was caused by some great eruption of Kenya

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and other volcanoes of equatorial Africa. As a geographical term Galla-land is now used mainly to denote the south-central regions of the Abyssinian empire, the country in which the Galla are numerically strongest. There is no sharp dividing line between the territory occupied respectively by the Galla and by the Somali.

In any case the Galla must be regarded as members of that vast eastern Hamitic family which includes their neighbours, the Somali, the Afars (Danakil) and the Abyssinians. As in all the eastern Hamites, there is a perceptible strain of Negro blood in the Galla, who are, however, described by Sir Frederick Lugard as "a wonderfully handsome race, with high foreheads, brown skins, and soft wavy hair quite different from the wool of the Bantus." As a rule their features are quite European. Their colour is dark brown, but many of the northern Galla are of a coffee and milk tint. The finest men are to be found among the Limmu and Gudru on the river Abai.

The Galla are for the most part still in the nomadic and pastoral stage, though in Abyssinia they have some agricultural settlements. Their dwellings, circles of rough stones roofed with grasses, are generally built under trees. Their wealth consists chiefly in cattle and horses. Among the southern tribes it is said that about seven or eight head of cattle are kept for every man, woman and child; and among the northern tribes, as neither man nor woman ever thinks of going any distance on foot, the number of horses is very large. The ordinary food consists of flesh, blood, milk, butter and honey, the last being considered of so much importance by the southern Galla that a rude system of bee-keeping is in vogue, and the husband who fails to furnish his wife with a sufficient supply of honey may be excluded from all conjugal rights. In the south monogamy is the rule, but in the north the number of a man's wives is limited only by his wishes and his wealth. Marriage-forms are numerous, that of bride-capture being common. Each tribe has its own chief, who enjoys the strange privilege of being the only merchant for his people, but in all public concerns must take the advice of the fathers of families assembled in council. The greater proportion of the tribes are still pagan, worshipping a supreme god Waka, and the subordinate god and goddess Oglieh and Atetieh, whose favour is secured by sacrifice of oxen and sheep. With a strange liberality of sentiment, they say that at a certain time of the year Waka leaves them and goes to attend to the wants of their enemies the Somali, whom also he has created. Some tribes, and notably the Wollo Galla, have been converted to Mahommedanism and are very bigoted adherents of the Prophet. In the north, where the Galla are under Abyssinian rule, a kind of superficial Christianization has taken place, to the extent at least that the people are familiar with the names of Maremma or Mary, Balawold or Jesus, Girgis or St George, &c.; but to all practical intents paganism is still in force. The serpent is a special object of worship, the northern Galla believing that he is the author of the human race. There is a belief in were-wolves (*buda*), and the northern Galla have sorcerers who terrorize the people. Though armed to excess, all Galla respect their pledged word. They are armed with a lance, a two-edged knife, and a shield of buffalo or rhinoceros hide. A considerable number find employment in the Abyssinian armies.

Among the more important tribes in the south (the name in each instance being compounded with Galla) are the Ramatta, the Kukatta, the Baõle, the Aurova, the Wadjole, the Ilani, the Arrar and the Kanigo Galla; the Borani, a very powerful tribe, may be considered to mark the division between north and south; and in the north we find the Amoro, the Jarso, the Toolama, the Wollo, the Ambassil, the Aijjo, and the Azobo Galla.

See C. T. Beke, "On the Origin of the Gallas," in *Trans. of Brit. Assoc.* (1847); J. Ludwig Krapf, *Travels in Eastern Africa* (1860); and *Vocabulary of the Galla Language* (London, 1842); Arnaud d'Abbadie, *Douze Ans dans la Haute-Ethiopie* (1868); Ph. Paulitschke, *Ethnographie Nord-Ost-Afrikas*; *Die geistige Kultur der Dan'akil, Galla u. Somâl* (Berlin, 1896); P. M. de Salviac, *Les Galla* (Paris, 1901).

GALLATIN, ALBERT (1761–1849), American statesman, was born in Geneva (Switzerland) on the 29th of January 1761. The Gallatins were both an old and a noble family. They are first heard of in Savoy in the year 1258, and more than two centuries later they went to Geneva (1510), united with Calvin in his opposition to Rome, and associated their fortunes with those of the little Swiss city. Here they remained, and with one or two other great families governed Geneva, and sent forth many representatives to seek their fortune and win distinction in the service of foreign princes, both as soldiers and ministers. On the eve of the French Revolution the Gallatins were still in Geneva, occupying the same position which they had held for two hundred years. Albert Gallatin's father died in 1765, his mother five years later, and his only sister in 1777. Although left an orphan at nine, he was by no means lonely or unprotected. His grandparents, a large circle of near relatives and Mlle Catherine Pictet (d. 1795), an intimate friend of his mother, cared for him during his boyhood. He was thoroughly educated at the schools of Geneva, and graduated with honour from the college or academy there in 1779. His grandmother then wished him to enter the army of the landgrave of Hesse, but he declined to serve "a tyrant," and a year later slipped away from Geneva and embarked for the United States. A competent fortune, good prospects, social position, and a strong family connexion were all thrown aside in order to tempt fate in the New World. His relatives very properly opposed his course, but they nevertheless did all in their power to smooth his way, and continued to treat him kindly. In after life he himself admitted the justice of their opinions. The temper of the times, a vague discontent with the established order of things, and some political enthusiasm imbibed from the writings of Rousseau, are the best reasons which can now be assigned for Gallatin's desertion of home and friends.

In July 1780 Gallatin and his friend Henri Serre (d. 1784) landed in Massachusetts. They brought with them youth, hope and courage, as well as a little money, and at once entered into business The times, however, were unfavourable. The great convulsion of the Revolution was drawing to a close, and everything was in an unsettled condition The young Genevans failed in business, passed a severe winter in the wilds of Maine, and returned to Boston penniless. Gallatin tried to earn a living by teaching French in Harvard College, apparently not without success, but the cold and rigid civilization of New England repelled him, and he made his way to the South. In the backwoods of Pennsylvania and Virginia there seemed to be better chances for a young adventurer. Gallatin engaged in land speculations, and tried to lay the foundation of his fortune in a frontier farm. In 1789 he married Sophie Allègre, and every prospect seemed to be brightening. But clouds soon gathered again. After only a few months of wedlock his wife died, and Gallatin was once more alone. The solitary and desolate frontier life became now more dreary than ever; he flung himself into politics as the only outside resource open to him, and his long and eventful public career began.

The constitution of 1787 was then before the public, and Gallatin, with his dislike of strong government still upon him, threw himself into opposition and became one of the founders of the Anti-Federalist, or, as it was afterwards called, the Republican party. He was a member of the Pennsylvania Constitutional Convention of 1789–1790, and of the Pennsylvania Assembly in 1790, 1791, and 1792, and rose with surprising rapidity, despite his foreign birth and his inability to speak English with correctness or fluency. He was helped of course by his sound education; but the true cause of his success lay in his strong sense, untiring industry, courage, clear-sightedness and great intellectual force. In 1793 he was chosen United States senator from Pennsylvania by the votes of both political parties. No higher tribute was ever paid to character and ability than that conveyed by this election. But the staunch Federalists of the senate, who had begun to draw the party lines rather sharply, found the presence of the young Genevan highly distasteful. They disliked his French origin, and suspected him to be a man of levelling principles His seat was contested on account of a technical flaw in regard to the duration of his citizenship, and in February 1794, almost three months after the beginning of the session, the senate annulled the election and sent him back to Pennsylvania with all the glory of political martyrdom.

The leading part which Gallatin had taken in the "Whisky Insurrection" in Western Pennsylvania had, without doubt, been an efficient cause in his rejection by the senate. He intended fully to restrain within legal bounds the opposition which the excise on domestic spirits had provoked, but he made the serious mistake of not allowing sufficiently for the character of the backwoods population When legal resistance developed into insurrection, Gallatin did his best to retrieve his error and

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prevent open war. At Redstone Old Fort (Brownsville) on the 29th of August 1794, before the "Committee of Sixty" who were appointed to represent the disaffected people, he opposed with vigorous eloquence the use of force against the government, and refused to be intimidated by an excited band of riflemen who happened to be in the vicinity and represented the radical element. He effectively checked the excitement, and when a month later an overwhelming Federal force began moving upon the western counties, the insurrection collapsed without bloodshed. Of all the men who took part in the opposition to the excise, Gallatin alone came out with credit. He was at once elected to the national house of representatives, and took his seat in December 1795. There, by sheer force of ability and industry, he wrested from all competitors the leadership of the Republicans, and became the most dangerous opponent whom the Federalists had ever encountered in congress. Inflamed with a hatred of France just then rising to the dignity of a party principle, they found in Gallatin an enemy who was both by origin and opinion peculiarly obnoxious to them. They attacked him unsparingly, but in vain. His perfect command of temper, his moderation of speech and action, in a bitterly personal age, never failed, and were his most effective weapons; but he made his power felt in other ways. His clear mind and industrious habits drew him to questions of finance. He became the financier of his party, preached unceasingly his cardinal doctrines of simplicity and economy, and was an effective critic of the measures of government. Cool and temperate, Gallatin, when following his own theories, was usually in the right, although accused by his followers of trimming. Thus, in regard to the Jay treaty, he defended the constitutional right of the house to consider the treaty, but he did not urge rejection in this specific case. On the other hand, when following a purely party policy he generally erred. He resisted the navy, the mainspring of Washington's foreign policy; he opposed commercial treaties and diplomatic intercourse in a similar fashion. On these points he was grievously wrong, and on all he changed his views after a good deal of bitter experience.

The greatest period of Gallatin's career in congress was in 1798, after the publication of the famous X.Y.Z. despatches. The insults of Talleyrand, and his shameless attempts to extort bribes from the American commissioners, roused the deep anger of the people against France. The Federalists swept all before them, and the members of the opposition either retired from Philadelphia or went over to the government. Alone and single-handed, Gallatin carried on the fight in congress. The Federalists bore down on him unmercifully, and even attempted (1798) a constitutional amendment in regard to citizenship, partly, it appears, in order to drive him from office. Still he held on, making a national struggle in the national legislature, and relying very little upon the rights of States so eagerly grasped by Jefferson and Madison. But even then the tide was turning. The strong measures of the Federalists shocked the country; the leaders of the dominant party quarrelled fiercely among themselves; and the Republicans carried the elections of 1800. In the exciting contest for the presidency in the house of representatives between Jefferson and Burr, it was Gallatin who led the Republicans.

When, after this contest, Jefferson became president (1801), there were two men whose commanding abilities marked them for the first places in the cabinet. James Madison became secretary of state, and Albert Gallatin secretary of the treasury. Wise, prudent and conservative, Gallatin made few changes in Hamilton's arrangements, and for twelve years administered the national finances with the greatest skill. He and Jefferson were both imbued with the idea that government could be carried on upon a priori principles resting on the assumed perfectness of human nature, and the chief burden of carrying out this theory fell upon Gallatin. His guiding principles were still simplicity of administration and speedy extinction of all debt, and everything bent to these objects. Fighting or bribing the Barbary pirates was a mere question of expense. It was cheaper to seize Louisiana than to await the settlement of doubtful points. Commercial warfare was to be avoided because of the cost. All wars were bad, but if they could not be evaded it was less extravagant to be ready than to rush to arms unprepared. Amid many difficulties, and thwarted even by Jefferson himself in the matter of the navy, Gallatin pushed on; and after six years the public debt was decreased (in spite of the Louisiana purchase) by $14,260,000, a large surplus was on hand, a comprehensive and beneficent scheme of internal improvements was ready for execution, and the promised land seemed in sight. Then came the stress of war in Europe, a wretched neutrality at home, fierce outbreaks of human passions, and the fair structure of government by a priori theories based on the goodness of unoppressed humanity came to the ground. Gallatin was thrown helplessly back upon the rejected Federalist doctrine of government according to circumstances. He uttered no vain regrets, but the position was a trying one. The sworn foe of strong government, he was compelled, in pursuance of Jefferson's policy, to put into execution the Embargo and other radical and stringent measures. He did his best, but all was in vain. Commercial warfare failed, the Embargo was repealed, and Jefferson, having entangled foreign relations and brought the country to the verge of civil war, retired to private life, leaving to his successor Madison, and to Gallatin, the task of extricating the nation from its difficulties. From 1809 the new administration, drifting steadily towards war, struggled on from one abortive and exasperating negotiation to another. It was a period of sore trial to Gallatin. The peace policy had failed, and nothing else replaced it. He had lost his hold upon Pennsylvania and his support in the house, while a cabal in the senate, bitterly and personally hostile to the treasury, crippled the administration and reduced every government measure to mere inanity. At last, however, in June 1812, congress on Madison's recommendation declared war against England.

Gallatin never wasted time in futile complaints. His cherished schemes were shattered. War and extravagant expenditure had come, and he believed both to be fatal to the prosperity and progress of America. He therefore put the finances in the best order he could, and set himself to mitigate the evil effects of the war by obtaining an early peace. With this end in view he grasped eagerly at the proffered mediation of Russia, and without resigning the treasury sailed for Europe in May 1813.

Russian mediation proved barren, but Gallatin persevered, catching at every opportunity for negotiation. In the midst of his labours came the news that the senate had refused to confirm his appointment as peace commissioner. He still toiled on unofficially until, the objection of the senate having been met by the appointment of a new secretary of the treasury, his second nomination was approved, and he was able to proceed with direct negotiations. The English and American commissioners finally met at Ghent, and in the tedious and irritating discussions which ensued Gallatin took the leading part. His great difficulty lay in managing his colleagues, who were, especially Henry Clay and John Quincy Adams, able men of strong wills and jarring tempers. He succeeded in preserving harmony, and thus established his own reputation as an able diplomatist. Peace was his reward; on the 24th of December 1814 the treaty was signed; and after visiting Geneva for the first time since his boyhood, and assisting in negotiating a commercial convention (1815) with England by which all discriminating duties were abolished, Gallatin in July 1815 returned to America.

While still in Europe he had been asked by Madison to become minister to France; this appointment he accepted in January 1816, and adhered to his acceptance in spite of his being asked in April 1816 to serve once more as secretary of the treasury. He remained in France for the next seven years. He passed his time in thoroughly congenial society, seeing everybody of note or merit in Europe. He did not neglect the duties of his official position, but strove assiduously and with his wonted patience to settle the commercial relations of his adopted country with the nations of Europe, and in 1818 assisted Richard Rush, then United States minister in London, in negotiating a commercial convention with Great Britain to take the place of that negotiated in 1815.

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In June 1823 he returned to the United States, where he found himself plunged at once into the bitter struggle then in progress for the presidency. His favourite candidate was his personal friend William H. Crawford, whom he regarded as the true heir and representative of the old Jeffersonian principles. With these feelings he consented in May 1824 to stand for the vice-presidency on the Crawford ticket. But Gallatin had come home to new scenes and new actors, and he did not fully appreciate the situation. The contest was bitter, personal, factious and full of intrigue. Martin Van Buren, then in the Crawford interest, came to the conclusion that the candidate for the second place, by his foreign origin, weakened the ticket, and in October Gallatin retired from the contest. The election, undecided by the popular vote, was thrown into the house, and resulted in the choice of John Quincy Adams, who in 1826 drew Gallatin from his retirement and sent him as minister to England to conduct another complicated and arduous negotiation. Gallatin worked at his new task with his usual industry, tact and patience, but the results were meagre, although an open breach on the delicate question of the north-east boundary of the United States was avoided by referring it to the arbitration of the king of the Netherlands. In November 1827 he once more returned to the United States and bade farewell to public life.

Taking up his residence in New York, he was in 1832–1839 president of the National Bank (afterwards the Gallatin Bank) of New York, but his duties were light, and he devoted himself chiefly to the congenial pursuits of science and literature. In both fields he displayed much talent, and by writing his *Synopsis of the Indian Tribes within the United States East of the Rocky Mountains and in the British and Russian Possessions in North America* (1836), and by founding the American Ethnological Society of New York in 1842, he earned the title of "Father of American Ethnology." He continued, of course, to interest himself in public affairs, although no longer an active participant, and in all financial questions, especially in regard to the bank charter, the resumption of specie payments, and the panic of 1837, he exerted a powerful influence. The rise of the slavery question touched him nearly. Gallatin had always been a consistent opponent of slavery; he felt keenly, therefore, the attempts of the South to extend the slave power and confirm its existence, and the remnant of his strength was devoted in his last days to writing and distributing two able pamphlets against the war with Mexico. Almost his last public act was a speech, on the 24th of April 1844, in New York City, against the annexation of Texas; and in his eighty-fourth year he confronted a howling New York mob with the same cool, unflinching courage which he had displayed half a century before when he faced the armed frontiersmen of Redstone Old Fort. During the winter of 1848–1849 his health failed, and on the 12th of August 1849, at the home of his daughter in Astoria, Long Island, he passed peacefully away.

Gallatin was twice married. His second wife, whom he married in November 1793, was Miss Hannah Nicholson, of New York, the daughter of Com. James Nicholson (1737–1804), an American naval officer, commander-in-chief of the navy from 1777 until August 1781, when with his ship the "Virginia," he was taken by the British "Iris" and "General Monk." By her he had three children, two sons and a daughter, who all survived him. In personal appearance he was above middle height, with strongly-marked features, indicating great strength of intellect and character. He was reserved and very reticent, cold in manner and not sympathetic. There was, too, a certain Calvinistic austerity about him. But he was much beloved by his family. He was never a popular man, nor did he ever have a strong personal following or many attached friends. He stood, with Jefferson and Madison, at the head of his party, and won his place by force of character, courage, application and intellectual power. His eminent and manifold services to his adopted country, his great abilities and upright character, assure him a high position in the history of the United States.

The Writings of Albert Gallatin, edited by Henry Adams, were published at Philadelphia, in three volumes, in 1879. With these volumes was published an excellent biography, *The Life of Albert Gallatin*, also by Henry Adams; another good biography is John Austin Stevens's *Albert Gallatin* (Boston, 1884) in the "American Statesmen" series. (H. C. L.)

GALLAUDET, THOMAS HOPKINS (1787–1851), American educator of the deaf and dumb, was born in Philadelphia, Pennsylvania, of French Huguenot ancestry, on the 10th of December 1787. He graduated at Yale in 1805, where he was a tutor from 1808 to 1810. Subsequently he studied theology at Andover, and was licensed to preach in 1814, but having determined to abandon the ministry and devote his life to the education of deaf mutes, he visited Europe in 1815–1816, and studied the methods of the abbé Sicard in Paris, and of Thomas Braidwood (1715–1806) and his successor Joseph Watson (1765–1829) in Great Britain. Returning to the United States in 1816, he established at Hartford, Connecticut, with the aid of Laurent Clerc (1785–1869), a deaf mute assistant of the abbé Sicard, a school for deaf mutes, in support of which Congress, largely through the influence of Henry Clay, made a land grant, and which Gallaudet presided over with great success until ill-health compelled him to retire in 1830. It was the first institution of the sort in the United States, and served as a model for institutions which were subsequently established. He died at Hartford, Connecticut, on the 5th of September 1851.

There are three accounts of his life, one by Henry Barnard, *Life, Character and Services of the Rev. Thomas H. Gallaudet* (Hartford, 1852); another by Herman Humphrey (Hartford, 1858), and a third (and the best one) by his son Edward Miner Gallaudet (1888).

His son, **THOMAS GALLAUDET** (1822–1902), after graduating at Trinity College in 1842, entered the Protestant Episcopal ministry, settled in New York City, and there in 1852 organized St Anne's Episcopal church, where he conducted services for deaf mutes. In 1872 he organized and became general manager of the Church mission to deaf mutes, and in 1885 founded the Gallaudet home for deaf mutes, particularly the aged, at Wappingers Falls, near Poughkeepsie, New York.

Another son, **EDWARD MINER GALLAUDET** (b. 1837), was born at Hartford, Connecticut, on the 3rd of February 1837, and graduated at Trinity College in 1856. After teaching for a year in the institution for deaf mutes founded by his father at Hartford, he removed with his mother, Sophia Fowler Gallaudet (1798–1877), to Washington, D.C., where at the request of Amos Kendall (1789–1869), its founder, he organized and took charge of the Columbia Institution for the deaf and dumb, which received support from the government, and of which he became president. This institution was the first to furnish actual collegiate education for deaf mutes (in 1864 it acquired the right to grant degrees), and was successful from the start. The Gallaudet College (founded in 1864 as the National Deaf Mute College and renamed in 1893 in honour of Thomas H. Gallaudet) and the Kendall School are separate departments of this institution, under independent faculties (each headed by Gallaudet), but under the management of one board of directors.

GALLE, or **POINT DE GALLE**, a town and port of Ceylon on the south-west coast. It was made a municipality in 1865, and divided into the five districts of the Fort, Callowelle, Galopiadde, Hirimbure and Cumbalwalla. The fort, which is more than a mile in circumference, overlooks the whole harbour, but is commanded by a range of hills. Within its enclosure are not only several government buildings, but an old church erected by the Dutch East India Company, a mosque, a Wesleyan chapel, a hospital, and a considerable number of houses occupied by Europeans. The old Dutch building known as the queen's house, or governor's residence, which dated from 1687, was in such a dilapidated state that it was sold by the governor, Sir William Gregory, in 1873. Elsewhere there are few buildings of individual note, but the general style of domestic architecture is pleasant and comfortable, though not pretentious. One of the most delightful features of the place is the profusion of trees, even within the town, and along the edge of the shore—suriyas, palms, coco-nut trees and bread-fruit trees. The ramparts towards the sea furnish fine promenades. In the harbour deep water is found close to the shore, and the outer roads are spacious; but the south-west

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monsoon renders entrance difficult, and not unfrequently drives vessels from their moorings.

The opening of the Suez Canal in 1869, and the construction of a breakwater at Colombo, leading to the transfer of the mail and most of the commercial steamers to the capital of the island, seriously diminished the prosperity of Galle. Although a few steamers still call to coal and take in some cargo, yet the loss of the Peninsular and Oriental and other steamer agencies reduced the port to a subordinate position; nor has the extension of the railway from Colombo, and beyond Galle to Matara, very much improved matters. The tea-planting industry has, however, spread to the neighbourhood, and a great deal is done in digging plumbago and in growing grass for the distillation of citronella oil. The export trade is chiefly represented by coco-nut oil, plumbago, coir yarn, fibre, rope and tea. In the import trade cotton goods are the chief item. Both the export and import trade for the district, however, now chiefly passes through Colombo. Pop. (1901) 37,165.

Galle is mentioned by none of the Greek or Latin geographers, unless the identification with Ptolemy's Avium Promontorium or Cape of Birds be a correct one. It is hardly noticed in the native chronicles before 1267, and Ibn Batuta, in the middle of the 14th century, distinctly states that Kali—that is, Galle—was a *small* town. It was not till the period of Portuguese occupation that it rose to importance. When the Dutch succeeded the Portuguese they strengthened the fortifications, which had been vigorously defended against their admiral, Koster; and under their rule the place had the rank of a commandancy. In the marriage treaty of the infanta of Portugal with Charles II. of England it was agreed that if the Portuguese recovered Ceylon they were to hand over Galle to the English; but as the Portuguese did not recover Ceylon the town was left to fall into English hands at the conquest of the island from the Dutch in 1796. The name Galle is derived from the Sinhalese *galla*, equivalent to "rock"; but the Portuguese and Dutch settlers, being better fighters than philologists, connected it with the Latin *gallus*, a cock, and the image of a cock was carved as a symbol of the town in the front of the old government house.

GALLENGA, ANTONIO CARLO NAPOLEONE (1810–1895), Italian author and patriot, born at Parma on the 4th of November 1810, was the eldest son of a Piedmontese of good family, who served for ten years in the French army under Massena and Napoleon. He had finished his education at the university of Parma, when the French Revolution of 1830 caused a ferment in Italy. He sympathized with the movement, and within a few months was successively a conspirator, a state prisoner, a combatant and a fugitive. For the next five years he lived a wandering life in France, Spain and Africa. In August 1836 he embarked for New York, and three years later he proceeded to England, where he supported himself as a translator and teacher of languages. His first book, *Italy; General Views of its History and Literature*, which appeared in 1841, was well received, but was not successful financially. On the outbreak of the Italian revolution in 1848 he at once put himself in communication with the insurgents. He filled the post of Chargé d'Affaires for Piedmont at Frankfort in 1848–1849, and for the next few years he travelled incessantly between Italy and England, working for the liberation of his country. In 1854, through Cavour's influence, he was elected a deputy to the Italian parliament. He retained his seat until 1864, passing the summer in England and fulfilling his parliamentary duties at Turin in the winter. On the outbreak of the Austro-French War of 1859 he proceeded to Lombardy as war correspondent of *The Times*. The campaign was so brief that the fighting was over before he arrived, but his connexion with *The Times* endured for twenty years. He was a forcible and picturesque writer, with a command of English remarkable for an Italian. He materially helped to establish that friendly feeling towards Italy which became traditional in England. In 1859 Gallenga purchased the Falls, at Llandogo on the Wye, as a residence, and thither he retired in 1885. He died at this house on the 17th of December 1895. He was twice married. Among his chief works are an *Historical Memoir of Frà Dolcino and his Times* (1853); a *History of Piedmont* (3 vols., 1855; Italian translation, 1856); *Country Life in Piedmont* (1858); *The Invasion of Denmark* (2 vols., 1864); *The Pearl of the Antilles* [travels in Cuba] (1873); *Italy Revisited* (2 vols., 1875); *Two Years of the Eastern Question* (2 vols., 1877); *The Pope* [Pius IX.] *and the King* [Victor Emmanuel] (2 vols., 1879); *South America* (1880); *A Summer Tour in Russia* (1882); *Iberian Reminiscences* (2 vols., 1883); *Episodes of my Second Life* (1884); *Italy, Present and Future* (2 vols., 1887). Gallenga's earlier publications appeared under the pseudonym of Luigi Mariotti.

GALLERY (through Ital. *galleria*, from Med. Lat. *galeria*, of which the origin is unknown),[1] a covered passage or space outside a main wall, sometimes used as a verandah if on the ground floor, and as a balcony if on an upper floor and supported by columns, piers or corbels; similarly the upper seats in a theatre or a church, on either side as in many 17th-century churches, or across the west end under the organ. The word is also used of an internal passage primarily provided to place various rooms in communication with one another; but if of narrow width this is usually called a corridor or passage. When of sufficient width the gallery is utilized to exhibit pictures and other art treasures. In the 16th century the picture gallery formed the largest room or hall in English mansions, with wainscoted walls and a richly decorated plaster ceiling; the principal examples are those of Audley End, Essex (226 ft. by 34 ft.); Hardwick, Derbyshire (166 ft. by 22 ft.); Hatfield, Hertfordshire (163 ft. by 19 ft. 6 in.); Aston Hall, near Birmingham (136 ft. by 18 ft.); Haddon Hall, Derbyshire (116 ft. by 17 ft.); and Montacute in Somersetshire (189 ft. by 22 ft.). Hence the application of the term to art museums (the National Gallery, &c.) and also to smaller rooms with top-light in which temporary exhibitions are held.

GALLEY (derived through the O. Fr. *galee*, *galie*, from the Med. Lat. *galea*, Ital. *galea*, Port. *galé*, of uncertain origin; from the Med. Lat. variant form *galera* are derived the Mod. Fr. *galère*, Span. and Ital. *galera*), a long single or half decked vessel of war, with low free-board, propelled primarily by oars or sweeps, but also having masts for sails. The word is used generally of the ancient war vessels of Greece and Rome of various types, whose chief propelling power was the oar or sweep, but its more specific application is to the medieval war vessel which survived in the navies of the Mediterranean sea-powers after the general adoption of the larger many-decked ship of war, propelled solely by sail-power. Lepanto (1571) was the last great naval battle in which the galley played the principal part. The "galleass" or "galliass" (Med. Lat. *galeasea*, Ital. *galeazza*, an augmented form of *galea*) was a larger and heavier form of galley; it usually carried three masts and had at bow and stern a castellated structure. The "galliot" (O. Fr. *galiot*, Span. and Port. *galeota*, Ital. *galeotta*, a diminutive of *galea*) was a small light type of galley. The "galleon" (formerly in English "galloon," Fr. *galion*, derived from the Med. Lat. *galio*, *galionis*, a derivative of *galea*) was a sailing ship of war and trade, shorter than the galley and standing high out of the water with several decks, chiefly used by the Spaniards during the 16th century in the carrying of treasure from America. The number of oars or sweeps varied, the larger galley having twenty-five on each side; the galleass as many as thirty-two, each being worked by several men. This labour was from the earliest times often performed by slaves or prisoners of war. It became the custom among the Mediterranean powers to sentence condemned criminals to row in the war galleys of the state. Traces of this in France can be found as early as 1532, but the first legislative enactment is in the *Ordonnance d'Orléans* of 1561. In 1564 Charles IX. forbade the sentencing of prisoners to the galleys for less than ten years. The galley-slaves were branded with the letters GAL. At the end of the reign of Louis XIV. the use of the galley for war purposes had practically ceased, but the corps of the galleys was not incorporated with the navy till 1748. The headquarters of the galleys and of the convict rowers (*galériens*) was at Marseilles. The majority of these latter were brought to Toulon, the others were sent to Rochefort and Brest, where they were used for work

[1] Du Cange, *Glossarium*, *s.v.* "Galeria," suggests an origin from *galera*, a galley, on the analogy of "nave," from *navis*, the galley being a long and narrow ship; but, he adds, *alii alia opinantur*.

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in the arsenal. At Toulon the convicts remained (in chains) on the galleys, which were moored as hulks in the harbour. Shore prisons were, however, provided for them, known as *bagnes*, baths, a name given to such penal establishments first by the Italians (*bagno*), and said to have been derived from the prison at Constantinople situated close by or attached to the great baths there. The name *galérien* was still given to all convicts, though the galleys had been abandoned, and it was not till the French Revolution that the hated name with all it signified was changed to *forçat*. In Spain *galera* is still used for a criminal condemned to penal servitude.

A vivid account of the life of galley-slaves in France is given in Jean Marteilhes's *Memoirs of a Protestant*, translated by Oliver Goldsmith (new edition, 1895), which describes the experiences of one of the Huguenots who suffered after the revocation of the edict of Nantes.

GALLIA CISALPINA (Lat. *Cis*, on this side, *i.e.* of the Alps), in ancient geography, that portion of northern Italy north of Liguria and Umbria and south of the Alps, which was inhabited by various Celtic and other peoples, of whom the Celts were in continual hostility to Rome. In early times it was bounded on the S. by Liguria and the Aesis, in Caesar's time by Liguria and the Rubicon. After the Second Punic War (203 B.C.) these tribes were severely punished by the Roman generals for the assistance they had rendered to Hannibal. Sulla divided the district into two parts; the region between the Aesis and the Rubicon was made directly subject to the government at Rome, while the northern portion was put under a distinct authority, probably similar to the usual transmarine commands (see Mommsen, *Hist. of Rome*, Eng. trans., bk. iv. c. 10).

For the early Celtic and other peoples and the later history of the district see ITALY (ancient), and ROME: *History, Ancient*.

GALLIC ACID, trioxybenzoic acid $(HO)_3(3.4.5.)C_6H_2CO_2H\cdot H_2O$, the *acidum gallicum* of pharmacy, a substance discovered by K. W. Scheele; it occurs in the leaves of the bearberry, in pomegranate root-bark, in tea, in gall-nuts to the extent of about 3 %, and in other vegetable productions. It may be prepared by keeping moist and exposed to the air for from four to six weeks, at a temperature of 20° to 25° C., a paste of powdered gall-nuts and water, and removing from time to time the mould which forms on its surface; the paste is then boiled with water, the hot solution filtered, allowed to cool, the separated gallic acid drained, and purified by dissolving in boiling water, recrystallization at about 27° C., and washing of the crystals with ice-cold water. The production of the acid appears to be due to the presence in the galls of a ferment. Gallic acid is most readily obtained by boiling the tannin procured from oak-galls by means of alcohol and ether with weak solution of acids. It may also be produced by heating an aqueous solution of di-iodosalicylic acid with excess of alkaline carbonate, by acting on dibromosalicylic acid with moist silver oxide, and by other methods. It crystallizes in white or pale fawn-coloured acicular prisms or silky needles, and is soluble in alcohol and ether, and in 100 parts of cold and 3 of boiling water; it is without odour and has an astringent and an acid taste and reaction. It melts at about 200° C., and at 210° to 215° it is resolved into carbon dioxide and pyrogallol, $C_6H_3(OH)_3$. With ferric salts its solution gives a deep blue colour, and with ferrous salts, after exposure to the air, an insoluble, blue-black, ferroso-ferric gallate. Bases of the alkali metals give with it four series of salts; these are stable except in alkaline solutions, in which they absorb oxygen and turn brown. Solution of calcium bicarbonate becomes with gallic acid, on exposure to the air, of a dark blue colour. Unlike tannic acid, gallic acid does not precipitate albumen or salts of the alkaloids, or, except when mixed with gum, gelatin. Salts of gold and silver are reduced by it, slowly in cold, instantaneously in warm solutions, hence its employment in photography. With phosphorus oxychloride at 120° C. gallic acid yields tannic acid, and with concentrated sulphuric acid at 100°, *rufigallic acid*, $C_{14}H_8O_8$, an anthracene derivative. Oxidizing agents, such as arsenic acid, convert it into *ellagic acid*, $C_{14}H_6O_8+H_2O$, probably a fluorene derivative, a substance which occurs in gall-nuts, in the external membrane of the episperm of the walnut, and probably in many plants, and composes the "bezoar stones" found in the intestines of Persian wild goats. Medicinally, gallic acid has been, and is still, largely used as an astringent, styptic and haemostatic. Gallic acid, however, does not coagulate albumen and therefore possesses no local astringent action. So far is it from being an haemostatic that, if perfused through living blood-vessels, it actually dilates them. Its rapid neutralization in the intestine renders it equally devoid of any remote actions.

GALLICANISM, the collective name for various theories maintaining that the church and king of France had ecclesiastical rights of their own, independent and exclusive of the jurisdiction of the pope. Gallicanism had two distinct sides, a constitutional and a dogmatic, though both were generally held together, the second serving as the logical basis of the first. And neither is intelligible, except in relation to the rival theory of Ultramontanism (*q.v.*). Dogmatic Gallicanism was concerned with the question of ecclesiastical government. It maintained that the church's infallible authority was committed to pope and bishops jointly. The pope decided in the first instance, but his judgments must be tacitly or expressly confirmed by the bishops before they had the force of law. This ancient theory survived much longer in France than in other Catholic countries. Hence the name of Gallican is loosely given to all its modern upholders, whether of French nationality or not. Constitutional Gallicanism dealt with the relation of church and state in France. It began in the 13th century, as a protest against the theocratic pretensions of the medieval popes. They claimed that they, as vicars of Christ, had the right to interfere in the temporal concerns of princes, and even to depose sovereigns of whom they disapproved. Gallicanism answered that kings held their power directly of God; hence their temporal concerns lay altogether outside the jurisdiction of the pope. During the troubles of the Reformation era, when the papal deposing power threatened to become a reality, the Gallican theory became of great importance. It was elaborated, and connected with dogmatic Gallicanism, by the famous theologian, Edmond Richer (1559–1631), and finally incorporated by Bossuet in a solemn Declaration of the French Clergy, made in 1682. This document lays down: (1) that the temporal sovereignty of kings is independent of the pope; (2) that a general council is above the pope; (3) that the ancient liberties of the Gallican Church are sacred; (4) that the infallible teaching authority of the church belongs to pope and bishops jointly. This declaration led to a violent quarrel with Rome, and was officially withdrawn in 1693, though its doctrines continued to be largely held. They were asserted in an extreme form in the Civil Constitution of the Clergy (1790), which almost severed connexion between France and the papacy. In 1802 Napoleon contented himself by embodying Bossuet's declaration textually in a statute. Long before his time, however, the issue had been narrowed down to determining exactly how far the pope should be allowed to interfere in French ecclesiastical affairs. Down to the repeal of the Concordat in 1905 all French governments continued to uphold two of the ancient "Gallican Liberties." The secular courts took cognizance of ecclesiastical affairs whenever the law of the land was alleged to have been broken; and papal bulls were not allowed to be published without the leave of the state. (See also FERDINANDISM.) (SR. C.)

GALLIENI, JOSEPH SIMON (1849–), French soldier and colonial administrator, was born at Saint-Béat, in the department of Haute-Garonne, on the 24th of April 1849. He left the military academy of Saint-Cyr in July 1870 as a second lieutenant in the Marines, becoming lieutenant in 1873 and captain in 1878. He saw service in the Franco-German War, and between 1877 and 1881 took an important part in the explorations and military expeditions by which the French dominion was extended in the basin of the upper Niger. He rendered a particularly valuable service by obtaining, in March 1881, a treaty from Ahmadu, almany of Segu, giving the French exclusive rights of commerce on the upper Niger. For this he received the gold medal of the Société de Géographie. From 1883 to 1886 Gallieni was stationed in Martinique. On the 24th of June 1886 he attained the rank

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of lieutenant-colonel, and on the 20th of December was nominated governor of Upper Senegal. He obtained several successes against Ahmadu in 1887, and compelled Samory to agree to a treaty by which he abandoned the left bank of the Niger (see SENEGAL: *History*). In connexion with his service in West Africa, Gallieni published two works—*Mission d'exploration du Haut-Niger, 1879–1881* (Paris, 1885), and *Deux Campagnes au Sudan français* (Paris, 1891)—which, besides possessing great narrative interest, give information of considerable value in regard to the resources and topography of the country. In 1888 Gallieni was made an officer of the Legion of Honour. In 1892 he attained the rank of colonel, and from 1893 to 1895 he served in Tongking, commanding the second military division of the territory. In 1899 he published his experiences in *Trois Colonnes au Tonkin*. In 1896 Madagascar was made a French colony, and Gallieni was appointed resident-general (a title changed in 1897 to governor-general) and commander-in-chief. Under the weak administration of his predecessor a widespread revolt had broken out against the French. By a vigorous military system Gallieni succeeded in completing the subjugation of the island. He also turned his attention to the destruction of the political supremacy of the Hovas and the restoration of the autonomy of the other tribes. The execution of the queen's uncle, Ratsimamanga, and of Rainandrianampandry, the minister of the interior, in October 1896, and the exile of Queen Ranavalo III. herself in 1897, on the charge of fomenting rebellion, broke up the Hova hegemony, and made an end of Hova intrigues against French rule. The task of government was one of considerable difficulty. The application of the French customs and other like measures, disastrous to British and American trade, were matters for which Gallieni was not wholly responsible. His policy was directed to the development of the economic resources of the island and was conciliatory towards the non-French European population. He also secured for the Protestants religious liberty. In 1899 he published a *Rapport d'ensemble sur la situation générale de Madagascar*. In 1905, when he resigned the governorship, Madagascar enjoyed peace and a considerable measure of prosperity. In 1906 General Gallieni was appointed to command the XIV. army corps and military government of Lyons. He reviewed the results of his Madagascar administration in a book entitled *Neuf Ans à Madagascar* (Paris, 1908).

GALLIENUS, PUBLIUS LICINIUS EGNATIUS, Roman emperor from A.D. 260 to 268, son of the emperor Valerian, was born about 218. From 253 to 260 he reigned conjointly with his father, during which time he gave proof of military ability and bravery. But when his father was taken prisoner by Shapur I. of Persia, in 260, Gallienus made no effort to obtain his release, or to withstand the incursions of the invaders who threatened the empire from all sides. He occupied part of his time in dabbling in literature, science and various trifling arts, but gave himself up chiefly to excess and debauchery. He deprived the senators of their military and provincial commands, which were transferred to equites. During his reign the empire was ravaged by a fearful pestilence; and the chief cities of Greece were sacked by the Goths, who descended on the Greek coast with a fleet of five hundred. His generals rebelled against him in almost every province of the empire, and this period of Roman history came to be called the reign of the Thirty Tyrants. Nevertheless, these usurpers probably saved the empire at the time, by maintaining order and repelling the attacks of the barbarians. Gallienus was killed at Mediolanum by his own soldiers while besieging Aureolus, who was proclaimed emperor by the Illyrian legions. His sons Valerianus and Saloninus predeceased him.

Life by Trebellius Pollio in *Script. Hist. Aug.*; on coins see articles in *Numism. Zeit.* (1908) and *Rev. ital. d. num.* (1908).

GALLIFFET, GASTON ALEXANDRE AUGUSTE, MARQUIS DE, Prince de Martignes (1830–1909), French general, was born in Paris on the 23rd of January 1830. He entered the army in 1848, was commissioned as sub-lieutenant in 1853, and served with distinction at the siege of Sevastopol in 1855, in the Italian campaign of 1859, and in Algeria in 1860, after which for a time he served on the personal staff of the emperor Napoleon III. He displayed great gallantry as a captain at the siege and storm of Puebla, in Mexico, in 1863, when he was severely wounded. When he returned to France to recover from his wounds he was entrusted with the task of presenting the captured standards and colours to the emperor, and was promoted *chef d'escadrons*. He went again to Algeria in 1864, took part in expeditions against the Arabs, returned to Mexico as lieutenant-colonel, and, after winning further distinction, became in 1867 colonel of the 3rd Chasseurs d'Afrique. In the Franco-German War of 1870–71 he commanded this regiment in the army of the Rhine, until promoted to be general of brigade on the 30th of August. At the battle of Sedan he led the brigade of Chasseurs d'Afrique in the heroic charge of General Marguerite's cavalry division, which extorted the admiration of the old king of Prussia. Made prisoner of war at the capitulation, he returned to France during the siege of Paris by the French army of Versailles, and commanded a brigade against the Communists. In the suppression of the Commune he did his duty rigorously and inflexibly, and on that ground earned a reputation for severity, which, throughout his later career, and in all his efforts to improve the French army, made him the object of unceasing attacks in the press and the chamber of deputies. In 1872 he took command of the Batna subdivision of Algeria, and commanded an expedition against El Goles, surmounting great difficulties in a rapid march across the desert, and inflicting severe chastisement on the revolted tribes. On his general reorganization of the army he commanded the 31st infantry brigade. Promoted general of division in 1875, he successively commanded the 15th infantry division at Dijon, the IX. army corps at Tours, and in 1882 the XII. army corps at Limoges. In 1885 he became a member of the Conseil Supérieur de la Guerre. He conducted the cavalry manœuvres in successive years, and attained a European reputation on all cavalry questions, and, indeed, as an army commander. Decorated with the grand cross of the Legion of Honour in 1887, he received the military medal for his able conduct of the autumn manœuvres in 1891, and after again commanding at the manœuvres of 1894 he retired from the active list. Afterwards he took an important part in French politics, as war minister (22nd of June 1899 to 29th of May 1900) in M. Waldeck-Rousseau's cabinet, and distinguished himself by the firmness with which he dealt with cases of unrest in the army, but he then retired into private life, and died on the 8th of July 1909.

GALLIO, JUNIUS ANNAEUS (originally LUCIUS ANNAEUS NOVATUS), son of the rhetorician L. Annaeus Seneca and the elder brother of L. Annaeus Seneca the philosopher, was born at Corduba (Cordova) about the beginning of the Christian era. At Rome he was adopted by L. Junius Gallio, a rhetorician of some repute, from whom he took the name of Junius Gallio. His brother Seneca, who dedicated to him the treatises *De Ira* and *De Vita Beata*, speaks of the charm of his disposition, also alluded to by the poet Statius (*Silvae*, ii. 7, 32). It is probable that he was banished to Corsica with his brother, and that both returned together to Rome when Agrippina selected Seneca to be tutor to Nero. Towards the close of the reign of Claudius, Gallio was proconsul of the newly constituted senatorial province of Achaea, but seems to have been compelled by ill-health to resign the post within a few years. During his tenure of office (in 53) he dismissed the charge brought by the Jews against the apostle Paul (Acts xviii.). His behaviour on this occasion ("But Gallio cared for none of these things") shows the impartial attitude of the Roman officials towards Christianity in its early days. He survived his brother Seneca, but was subsequently put to death by order of Nero (in 65) or committed suicide.

Tacitus, *Annals*, xv. 73; Dio Cassius lx. 35, lxii. 25; Sir W. M. Ramsay, *St Paul the Traveller*, pp. 257-261; art. in Hastings' *Dict. of the Bible* (H. Cowan). An interesting reconstruction is given by Anatole France in *Sur la pierre blanche*.

GALLIPOLI (anc. *Callipolis*), a seaport town and episcopal see of Apulia, Italy, in the province of Lecce, 31 m. S. by W. of it by rail, 46 ft. above sea-level. Pop. (1901) town, 10,399; commune, 13,459. It is situated on a rocky island in the Gulf of Taranto, but is united to the mainland by a bridge, protected by

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a castle constructed by Charles I. of Anjou. The other fortifications have been removed. The handsome cathedral dates from 1629. The town was once famous for its exports of olive-oil, which was stored, until it clarified, in cisterns cut in the rock. This still continues, but to a less extent; the export of wine, however, is increasing, and fruit is also exported.

The ancient Callipolis was obviously of Greek origin, as its name ("beautiful city") shows. It is hardly mentioned in ancient times. Pliny tells us that in his time it was known as Anxa. It lay a little off the road from Tarentum to Hydruntum, but was reached by a branch from Aletium (the site is marked by the modern church of S. Maria della Lizza), among the ruins of which many Messapian inscriptions, but no Latin ones, have been found. (T. As.)

GALLIPOLI (Turk. *Gelibolu*, anc. Καλλίπολις), a seaport and city of European Turkey, in the vilayet of Adrianople; at the north-western extremity of the Dardanelles, on a narrow peninsula 132 m. W.S.W. of Constantinople, and 90 m. S. of Adrianople, in 40° 24′ N. and 26° 40′ 30″ E. Pop. (1905) about 25,000. Nearly opposite is Lapsaki on the Asiatic side of the channel, which is here about 9 m. wide. Gallipoli has an unattractive appearance; its streets are narrow and dirty, and many of its houses are built of wood, although there are a few better structures, occupied by the foreign residents and the richer class of Turkish citizens. The only noteworthy buildings are the large, crowded and well-furnished bazaars with leaden domes. There are several mosques, none of them remarkable, and many interesting Roman and Byzantine remains, especially a magazine of the emperor Justinian (483–565), a square castle and tower attributed to Bayezid I. (1389–1403), and some tumuli on the south, popularly called the tombs of the Thracian kings. The lighthouse, built on a cliff, has a fine appearance as seen from the Dardanelles. Gallipoli is the seat of a Greek bishop. It has two good harbours, and is the principal station for the Turkish fleet. From its position as the key of the Dardanelles, it was occupied by the allied French and British armies in 1854. Then the isthmus a few miles north of the town, between it and Bulair, was fortified with strong earthworks by English and French engineers, mainly on the lines of the old works constructed in 1357. These fortifications were renewed and enlarged in January 1878, on the Russians threatening to take possession of Constantinople. The peninsula thus isolated by the fortified positions has the Gulf of Saros on the N.W., and extends some 50 m. S.W. The guns of Gallipoli command the Dardanelles just before the strait joins the Sea of Marmora. The town itself is not very strongly fortified, the principal fortifications being farther down the Dardanelles, where the passage is narrower.

The district (*sanjak*) of Gallipoli is exceedingly fertile and well adapted for agriculture. It has about 100,000 inhabitants, and comprises four *kazas* (cantons), namely, (1) Maitos, noted for its excellent cotton; (2) Keshan, lying inland north of Gallipoli, noted for its cattle-market, and producing grain, linseed and canary seed; (3) Myriofyto; and (4) Sharkeui or Shar-Koi (Peristeri) on the coast of the Sea of Marmora. Copper ore and petroleum are worked at Sharkeui, and the neighbourhood formerly produced wine that was highly esteemed and largely exported to France for blending. Heavy taxation, however, amounting to 55% of the value of the wine, broke the spirit of the viticulturists, most of whom uprooted their vines and replanted their lands with mulberry trees, making sericulture their occupation.

There are no important industrial establishments in Gallipoli itself, except steam flour-mills and a sardine factory. The line of railway between Adrianople and the Aegean Sea has been prejudicial to the transit trade of Gallipoli, and several attempts have been made to obtain concessions for the construction of a railway that would connect this port with the Turkish railway system. Steamers to and from Constantinople call regularly. In 1904 the total value of the exports was £80,000. Wheat and maize are exported to the Aegean islands and to Turkish ports on the mainland; barley, oats and linseed to Great Britain; canary seed chiefly to Australia; beans to France and Spain. Semolina and bran are manufactured in the district. Live stock, principally sheep, pass through Gallipoli in transit to Constantinople and Smyrna. Cheese, sardines, goats' skins and sheepskins are also exported. The imports include woollen and cotton fabrics from Italy, Germany, France and Great Britain, and hardware from Germany and Austria. These goods are imported through Constantinople. Cordage is chiefly obtained from Servia. Other imports are fuel, iron and groceries.

The Macedonian city of Callipolis was founded in the 5th century B.C. At an early date it became a Christian bishopric, and in the middle ages developed into a great commercial city, with a population estimated at 100,000. It was fortified by the East Roman emperors owing to its commanding strategic position and its valuable trade with Greece and Italy. In 1190 the armies of the Third Crusade, under the emperor Frederick I. (Barbarossa), embarked here for Asia Minor. After the capture of Constantinople by the Latins in 1204, Gallipoli passed into the power of Venice. In 1294 the Genoese defeated a Venetian force in the neighbourhood. A body of Catalans, under Roger Florus, established themselves here in 1306, and after the death of their leader massacred almost all the citizens; they were vainly besieged by the allied troops of Venice and the Empire, and withdrew in 1307, after dismantling the fortifications. About the middle of the 14th century the Turks invaded Europe, and Gallipoli was the first city to fall into their power. The Venetians under Pietro Loredano defeated the Turks here in 1416.

GALLIPOLIS, a city and the county-seat of Gallia county, Ohio, U. S. A., on the Ohio river, about 125 m. E. by S. of Cincinnati. Pop. (1890) 4408; (1900) 5432 (852 negroes); (1910) 5560. It is served by the Kanawha & Michigan (Ohio Central Lines) and the Hocking Valley railways, and (at Gallipolis Ferry, West Virginia, across the Ohio) by the Baltimore & Ohio railway. The city is built on a level site several feet above the river's high-water mark. It has a United States marine hospital and a state hospital for epileptics. Among the city's manufactures are lumber, furniture, iron, stoves, flour and brooms. The municipality owns and operates its waterworks. Gallipolis was settled in 1790 by colonists from France, who had received worthless deeds to lands in Ohio from the Scioto Land Company, founded by Col. William Duer (1747–1799) and others in 1787 and officially organized in 1789 as the Compagnie du Scioto in Paris by Joel Barlow, the agent of Duer and his associates abroad, William Playfair, an Englishman, and six Frenchmen. This company had arranged with the Ohio Company in 1787 for the use of about 4,000,000 acres, N. of the Ohio and E. of the Scioto, on which the Ohio Company had secured an option only. The dishonesty of those who conducted the sales in France, the unbusinesslike methods of Barlow, and the failure of Duer and his associates to meet their contract with the Ohio Company, caused the collapse of the Scioto Company early in 1790, and two subsequent attempts to revive it failed. Meanwhile about 150,000 acres had been sold to prospective settlers in France, and in October 1790 the French immigrants, who had been detained for two months at Alexandria, Virginia, arrived on the site of Gallipolis, where rude huts had been built for them. This land, however, fell within the limits of the tract bought outright by the Ohio Company, which sold it to the Scioto Company, and to which it reverted on the failure of the Scioto Company to pay. In 1794 William Bradford, attorney-general of the United States, decided that all rights in the 4,000,000 acres, on which the Ohio Company had secured an option for the Scioto Company, were legally vested in the Ohio Company. In 1795 the Ohio Company sold to the French settlers for $1·25 an acre the land they occupied and adjacent improved lots, and the United States government granted to them 24,000 acres in the southern part of what is now Scioto County in 1795; little of this land (still known as the "French Grant"), however, was ever occupied by them. Gallipolis was incorporated as a village in 1842, and was first chartered as a city in 1865.

See Theodore T. Belote, *The Scioto Speculation and the French Settlement at Gallipolis* (Cincinnati, 1907), series 2, vol. iii. No. 3 of the *University Studies* of the University of Cincinnati.

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GALLITZIN, DEMETRIUS AUGUSTINE (1770–1840), American Roman Catholic priest, called "The Apostle of the Alleghanies," was born at the Hague on the 22nd of December 1770. His name is a form of Golitsuin (*q.v.*), the Russian family from which he came. His father, Dimitri Alexeievich Gallitzin (1735–1803), Russian ambassador to Holland, was an intimate friend of Voltaire and a follower of Diderot; so, too, for many years was his mother, Countess Adelheid Amalie von Schmettau (1748–1806), until a severe illness in 1786 led her back to the Roman Catholic church, in which she had been reared. At the age of seventeen he too became a member of that church. His father had planned for him a diplomatic or military career, and in 1792 he was aide-de-camp to the commander of the Austrian troops in Brabant; but, after the assassination of the king of Sweden, he, like all other foreigners, was dismissed from the service. He then set out to complete his education by travel, and on the 28th of October 1792 arrived in Baltimore, Maryland, where he finally decided to enter the priesthood. He was ordained priest in March 1795, being the first Roman Catholic priest ordained in America, and then worked in the mission at Port Tobacco, Maryland, whence he was soon transferred to the Conewago district. His impulsive objection to some of Bishop Carroll's instructions was sharply rebuked, and he was recalled to Baltimore. But in 1796 he removed to Taneytown, Maryland, and in both Maryland and Pennsylvania worked with such misdirected zeal and autocratic manners that he was again reproved by his bishop in 1798. In the Alleghanies, in 1799, he planned a settlement in what is now Cambria county, Pennsylvania, and bought up much land which he gave or sold at low prices to Catholic immigrants, spending $150,000 or more in the purchase of some 20,000 acres in a spot singularly ill suited for such an enterprise. In 1808, after his father's death, he was disinherited by the emperor Alexander I. of Russia "by reason of your Catholic faith and your ecclesiastical profession"; and although his sister Anne repeatedly promised him his half of the valuable estate and sent him money from time to time, after her death her brother received little or nothing from the estate. The priest, who after his father's death had in 1809 discarded the name of Augustine Smith, under which he had been naturalized, and had taken his real name, was soon deeply in debt. No small part was a loan from Charles Carroll, and when Gallitzin was suggested for the see of Philadelphia in 1814, Bishop Carroll gave as an objection Gallitzin's "great load of debt rashly, though for excellent and charitable purposes, contracted." In 1815 Gallitzin was suggested for the bishopric of Bardstown, Kentucky, and in 1827 for the proposed see of Pittsburg, and he refused the bishopric of Cincinnati. He died at Loretto, the settlement he had founded in Cambria county, on the 6th of May 1840. Among his parishioners Gallitzin was a great power for good. His part in building up the Roman Catholic Church in western Pennsylvania cannot be estimated; but it is said that at his death there were 10,000 members of his church in the district where forty years before he had found a scant dozen. One of the villages he founded bears his name. Among his controversial pamphlets are: *A Defence of Catholic Principles* (1816), *Letter to a Protestant Friend on the Holy Scriptures* (1820), *Appeal to the Protestant Public* (1834), and *Six Letters of Advice* (1834), in reply to attacks on the Catholic Church by a Presbyterian synod.

See Sarah M. Brownson, *Life of D. A. Gallitzin, Prince and Priest* (New York, 1873); a brief summary of his life by A. A. Lambing in *American Catholic Records* (Pittsburg, Pennsylvania, October 1886, pp. 58-68); and a good bibliography by Thomas C. Middleton in *The Gallitzin Memorandum Book*, in *American Catholic Historical Society of Philadelphia, Records*, vol. 4, pp. 32 sqq.

GALLIUM (symbol Ga; atomic weight 69·9), one of the metallic chemical elements. It was discovered in 1875 through its spectrum, in a specimen of zinc blende by Lecoq de Boisbaudran (*Comptes rendus*, 1875, 81, p. 493, and following years). The chief chemical and physical properties of gallium had been predicted many years before by D. Mendeléeff (*c.* 1869) from a consideration of the properties of aluminium, indium and zinc (see ELEMENT). The metal is obtained from zinc blende (which only contains it in very small quantity) by dissolving the mineral in an acid, and precipitating the gallium by metallic zinc. The precipitate is dissolved in hydrochloric acid and foreign metals are removed by sulphuretted hydrogen; the residual liquid being then fractionally precipitated by sodium carbonate, which throws out the gallium before the zinc. This precipitate is converted into gallium sulphate and finally into a pure specimen of the oxide, from which the metal is obtained by the electrolysis of an alkaline solution. Gallium crystallizes in greyish-white octahedra which melt at 30·15° C. to a silvery-white liquid. It is very hard and but slightly malleable and flexible, although in thin plates it may be bent several times without breaking. The specific gravity of the solid form is 5·956 (24·5° C.), of the liquid 6·069, whilst the specific heats of the two varieties are, for the solid form 0·079 (12-23° C.) and for the liquid 0·082 (106-119°) [M. Berthelot, *Comptes rendus*, 1878, 86, p. 786]. It is not appreciably volatilized at a red heat. Chlorine acts on it readily in the cold, bromine not so easily, and iodine only when the mixture is heated. The atomic weight of gallium has been determined by Lecoq de Boisbaudran by ignition of gallium ammonium alum, and also by L. Meyer and K. Seubert.

Gallium oxide Ga_2O_3 is obtained when the nitrate is heated, or by solution of the metal in nitric acid and ignition of the nitrate. It forms a white friable mass which after ignition is insoluble in acids. On heating to redness in a stream of hydrogen it forms a bluish mass which is probably a lower oxide of composition GaO. Gallium forms colourless salts, which in neutral dilute aqueous solutions are converted on heating into basic salts. The gallium salts are precipitated by alkaline carbonates and by barium carbonate, but not by sulphuretted hydrogen unless in acetic acid solution. Potassium ferrocyanide gives a precipitate even in very dilute solution. In neutral solutions, zinc gives a precipitate of gallium oxide. By heating gallium in a regulated stream of chlorine the *dichloride* $GaCl_2$ is obtained as a crystalline mass, which melts at 164° C. and readily decomposes on exposure to moist air. The *trichloride* $GaCl_3$ is similarly formed when the metal is heated in a rapid stream of chlorine, and may be purified by distillation in an atmosphere of nitrogen. It forms very deliquescent long white needles melting at 75·5° C. and boiling at 215-220° C. The bromide, iodide and sulphate are known, as is also gallium ammonium alum. Gallium is best detected by means of its spark spectrum, which gives two violet lines of wave length 4171 and 4031.

GALLON, an English measure of capacity, usually of liquids, but also used as a dry measure for corn. A gallon contains four quarts. The word was adapted from an O. Norm. Fr. *galon*, Central Fr. *jalon*, and was Latinized as *galo* and *galona*. It appears to be connected with the modern French *jale*, a bowl, but the ultimate origin is unknown; it has been referred without much plausibility to Gr. γαυλός, a milk pail. The British Imperial gallon of four quarts contains 277·274 cub. in. The old English wine gallon of 231 cub. in. capacity is the standard gallon of the United States.

GALLOWAY, JOSEPH (1731–1803), American lawyer and politician, one of the most prominent of the Loyalists, was born in West River, Anne Arundel county, Maryland, in 1731. He early removed to Philadelphia, where he acquired a high standing as a lawyer. From 1756 until 1774 (except in 1764) he was one of the most influential members of the Pennsylvania Assembly, over which he presided in 1766–1773. During this period, with his friend Benjamin Franklin, he led the opposition to the Proprietary government, and in 1764 and 1765 attempted to secure a royal charter for the province. With the approach of the crisis in the relations between Great Britain and the American colonies he adopted a conservative course, and, while recognizing the justice of many of the colonial complaints, discouraged radical action and advocated a compromise. As a member of the First Continental Congress, he introduced (28th September 1774) a "Plan of a Proposed Union between Great Britain and the Colonies," and it is for this chiefly that he is remembered. It provided for a president-general appointed by the crown, who should have supreme executive authority over all the colonies, and for a grand council, elected triennially by the several provincial assemblies, and to have such "rights, liberties and privileges as are held and exercised by and in the House of Commons of Great Britain"; the president-general and grand council were to be "an inferior distinct branch of the British legislature, united and incorporated with it." The assent of the

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grand council and of the British parliament was to be "requisite to the validity of all . . . general acts or statutes," except that "in time of War, all bills for granting aid to the crown, prepared by the grand council and approved by the president-general, shall be valid and passed into a law, without the assent of the British parliament." The individual colonies, however, were to retain control over their strictly internal affairs. The measure was debated at length, was advocated by such influential members as John Jay and James Duane of New York and Edward Rutledge of South Carolina, and was eventually defeated only by the vote of six colonies to five. Galloway declined a second election to Congress in 1775, joined the British army at New Brunswick, New Jersey (December 1776), advised the British to attack Philadelphia by the Delaware, and during the British occupation of Philadelphia (1777–1778) was superintendent of the port, of prohibited articles, and of police of the city. In October 1778 he went to England, where he remained until his death at Watford, Hertfordshire, on the 29th of August 1803. After he left America his life was attainted, and his property, valued at £40,000, was confiscated by the Pennsylvania Assembly, a loss for which he received a partial recompense in the form of a small parliamentary pension. He was one of the clearest thinkers and ablest political writers among the American Loyalists, and, according to Prof. Tyler, "shared with Thomas Hutchinson the supreme place among American statesmen opposed to the Revolution."

Among his pamphlets are *A Candid Examination of the Mutual Claims of Great Britain and the Colonies* (1775); *Historical and Political Reflections on the Rise and Progress of the American Rebellion* (1780); *Cool Thoughts on the Consequences to Great Britain of American Independence* (1780); and *The Claim of the American Loyalists Reviewed and Maintained upon Incontrovertible Principles of Law and Justice* (1788).

See Thomas Balch (Ed.), *The Examination of Joseph Galloway by a Committee of the House of Commons* (Philadelphia, 1855); Ernest H. Baldwin, *Joseph Galloway, the Loyalist Politician* (New Haven, 1903); and M. C. Tyler, *Literary History of the American Revolution* (2 vols., New York, 1897).

GALLOWAY, THOMAS (1796–1851), Scottish mathematician, was born at Symington, Lanarkshire, on the 26th of February 1796. In 1812 he entered the university of Edinburgh, where he distinguished himself specially in mathematics. In 1823 he was appointed one of the teachers of mathematics at the military college of Sandhurst, and in 1833 he was appointed actuary to the Amicable Life Assurance Office, the oldest institution of that kind in London; in which situation he remained till his death on the 1st of November 1851. Galloway was a voluminous, though, for the most part, an anonymous writer. His most interesting paper is "On the Proper Motion of the Solar System," and was published in the *Phil. Trans.*, 1847. He contributed largely to the seventh edition of the *Encyclopaedia Britannica*, and also wrote several scientific papers for the *Edinburgh Review* and various scientific journals. His *Encyclopaedia* article, "Probability," was published separately.

See *Transactions of the Royal Astronomical Society* (1852).

GALLOWAY, a district in the south-west of Scotland, comprising the counties of Kirkcudbright and Wigtown. It was the *Novantia* of the Romans, and till the end of the 12th century included Carrick, now the southern division of Ayrshire. Though the designation has not been adopted civilly, its use historically and locally has been long established. Thus the Bruces were lords of Galloway, and the title of earl of Galloway (created 1623) is now held by a branch of the Stewarts. Galloway also gives its name to a famous indigenous breed of black horned cattle. See KIRKCUDBRIGHTSHIRE and WIGTOWNSHIRE.

GALLOWS[1] (a common Teutonic word—cf. Goth. *galga*, O. H. Ger. *galgo*, Mod. Ger. *Galgen*, A.S. *galzan*, &c.—of uncertain origin), the apparatus for executing the sentence of death by hanging. It usually consists of two upright posts and a cross-beam, but sometimes of a single upright with a beam projecting from the top. The Roman gallows was the cross, and in the older translations of the Bible "gallows" was used for the cross on which Christ suffered (so *galga* in Ulfilas's Gothic Testament).[2] Another form of gallows in the middle ages was that of which the famous example at Montfaucon near Paris was the type. This was a square structure formed of columns of masonry connected in each tier with cross-pieces of wood, and with pits beneath, into which the bodies fell after disarticulation by exposure to the weather.

According to actual usage the condemned man stands on a platform or drop (introduced in England in 1760), the rope hangs from the cross-beam, and the noose at its end is placed round his neck. He is hanged by the falling of the drop, the knot in the noose being so adjusted that the spinal cord is broken by the fall and death instantaneous. In old times the process was far less merciful; sometimes the condemned man stood in a cart, which was drawn away from under him; sometimes he had to mount a ladder, from which he was thrust by the hangman. Until 1832 malefactors in England were sometimes hanged by being drawn up from the platform by a heavy weight at the other end of the rope. Death in these cases was by strangulation. At the present time executions in the United Kingdom are private, the gallows being erected in a chamber or enclosed space set apart for the purpose inside the gaol.

The word "gibbet," the Fr. *gibet*, gallows, which appears in the first instance to have meant a crooked stick,[3] was originally used in English synonymously with gallows, as it sometimes still is. Its later and more special application, however, was to the upright posts with a projecting arm on which the bodies of criminals were suspended after their execution. These gibbets were erected in conspicuous spots, on the tops of hills (Gallows Hill is still a common name) or near frequented roads. The bodies, smeared with pitch to prevent too rapid decomposition, hung in chains as a warning to evildoers. From the gruesome custom comes the common use of the word "to gibbet" for any holding up to public infamy or contempt.

GALLS. In animals galls occur mostly on or under the skin of living mammals and birds, and are produced by Acaridea, and by dipterous insects of the genus *Oestrus*. Signor Moriggia[4] has described and figured a horny excrescence, nearly 8 in. in length, from the back of the human hand, which was caused by *Acarus domesticus*. What are commonly known as galls are vegetable excrescences, and, according to the definition of Lacaze-Duthiers, comprise "all abnormal vegetable productions developed on plants by the action of animals, more particularly by insects, whatever may be their form, bulk or situation." For the larvae of their makers the galls provide shelter and sustenance. The exciting cause of the hypertrophy, in the case of the typical galls, appears to be a minute quantity of some irritating fluid, or virus, secreted by the female insect, and deposited with her egg in the puncture made by her ovipositor in the cortical or foliaceous parts of plants. This virus causes the rapid enlargement and subdivision of the cells affected by it, so as to form the tissues of the gall. Oval or larval irritation also, without doubt, plays an important part in the formation of many galls. Though, as Lacaze-Duthiers remarks, a certain relation is necessary between the "stimulus" and the "supporter of the stimulus," as evidenced by the limitation in the majority of cases of each species of gall-insect to some one vegetable structure, still it must be the quality of the irritant not strictly obsolete, is now seldom used; the formation is felt to be somewhat uncouth, so that the use of the word in the plural in commonly evaded" (*New Eng. Dict.* s.v. "Gallows").

[1] The word "gallows" is the plural of a word (*galwe*, *galowe*, *galowe*) which, according to the *New English Dictionary*, was occasionally used as late as the 17th century, though from the 13th century onwards the plural form was more usual. Caxton speaks both of "a gallows," and, in the older form, of "a pair of gallows," this referring probably to the two upright posts. From the 16th century onwards "gallows" has been consistently treated as a singular form, a new plural, "gallowses," having come into use. "The latter, though

[2] In Med. Lat. "gallows" was translated by *furia* and *patibulum*, both words applied in classical Latin to a fork-shaped instrument of punishment fastened on the neck of slaves and criminals. *Furia*, in feudal law, was the right granted to tenants having major jurisdiction to erect a gallows within the limits of their fief.

[3] Cf. Wace, *Roman de Rou*, iii. 8349:

"Et il a le gibet saisi
Qui a son destre braz pendi."

[4] Quoted in *Zoological Record*, iv. (1867), p. 192.

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of the tissues, rather than the specific peculiarities of the part of the plant affected, that principally determines the nature of the gall. Thus the characteristics of the currant-gall of *Spathegaster baccarum*, L., which occurs alike on the leaves and on the flower-stalks of the oak, are obviously due to the act of oviposition, and not to the functions of the parts producing it; the bright red galls of the saw-fly *Nematus gallicola* are found on four different species of willow, *Salix fragilis*, *S. alba*, *S. caprea* and *S. cinerea*;[1] and the galls of a Cynipid, *Biorhiza apiera*, usually developed on the rootlets of the oak, have been procured also from the deodar.[2] Often the gall bears no visible resemblance to the structures out of which it is developed; commonly, however, outside the larval chamber, or gall proper, and giving to the gall its distinctive form, are to be detected certain more or less modified special organs of the plant. The gall of *Cecidomyia strobilina*, formed from willow-buds, is mainly a rosette of leaves the stalks of which have had their growth arrested. The small, smooth, seed-shaped gall of the American *Cynips seminator*, Harris, according to W. F. Bassett,[3] is the petiole, and its terminal tuft of woolly hairs the enormously developed pubescence of the young oak-leaf. The moss-like covering of the "bedeguars" of the wild rose, the galls of a Cynipid, *Rhodites rosae*, represents leaves which have been developed with scarcely any parenchyma between their fibro-vascular bundles; and the "artichoke-galls" or "oak-strobile," produced by *Aphilothrix gemmae*, L., which insect arrests the development of the acorn, consists of a cupule to which more or less modified leaf-scales are attached, with a peduncular, oviform, inner gall.[4] E. Newman held the view that many oak-galls are pseudobalani or false acorns: "to produce an acorn has been the intention of the oak, but the gall-fly has frustrated the attempt." Their formation from buds which normally would have yielded leaves and shoots is explained by Parfitt as the outcome of an effort at fructification induced by oviposition, such as has been found to result in several plants from injury by insect-agency or otherwise.[5] Galls vary remarkably in size and shape according to the species of their makers. The polythalamous gall of *Aphilothrix radicis*, found on the roots of old oak-trees, may attain the size of a man's fist; the galls of another Cynipid, *Andricus occultus*, Tschek,[6] which occurs on the male flowers of *Quercus sessiliflora*, is 2 millimetres, or barely a line, in length. Many galls are brightly coloured, as, for instance, the oak-leaf hairy galls of *Spathegaster bricolor*, which are of a crimson hue, more or less diffused according to exposure to light. The variety of forms of galls is very great. Some are like urns or cups, others lenticular. The "knoppern" galls of *Cynips polycera*, Gir., are cones having the broad, slightly convex upper surface surrounded with a toothed ridge. Of the Ceylonese galls, "some are as symmetrical as a composite flower when in bud, others smooth and spherical like a berry; some protected by long spines, others clothed with yellow wool formed of long cellular hairs, others with regularly tufted hairs."[7] The characters of galls are constant, and as a rule exceedingly diagnostic, even when, as in the case of ten different gall-gnats of an American willow, *Salix humilis*, it is difficult or impossible to tell the full-grown insects that produce them from one another. In degree of complexity of internal structure galls differ considerably. Some are monothalamous, and contain but one larva of the gall-maker, whilst others are many-celled and numerously inhabited. The largest class are the unilocular, or simple, external galls, divided by Lacaze-Duthiers into those with and those without a superficial protective layer or rind, and composed of hard, or spongy, or cellular tissue. In a common gall-nut that authority distinguished seven constituent portions: an epidermis; a subdermic cellular tissue; a spongy and a hard layer, composing the parenchyma proper; vessels which, without forming a complete investment, underlie the parenchyma; a hard protective layer; and lastly, within that, an alimentary central mass inhabited by the growing larva.[8]

Galls are formed by insects of several orders. Among the Hymenoptera are the gall-wasps (*Cynips* and its allies), which infect the various species of oak. They are small insects, having straight antennae, and a compressed, usually very short abdomen with the second or second and third segments greatly developed, and the rest imbricated, and concealing the partially coiled ovipositor. The transformations from the larval state are completed within the gall, out of which the imago, or perfect insect, tunnels its way,—usually in autumn, though sometimes, as has been observed of some individuals of *Cynips Kollari*, after hibernation.

Among the commoner of the galls of the *Cynipidae* are the "oak-apple" or "oak-sponge" of *Andricus terminalis*, Fab.; the "currant" or "berry galls" of *Spathegaster baccarum*, L., above mentioned; and the "oak-spangles" of *Neuroterus lenticularis*,[9] Oliv., generally reputed to be fungoid growths, until the discovery of their true nature by Frederick Smith,[10] and the succulent "cherry-galls" of *Dryophanta scutellaris*, Oliv. The "marble" or "Devonshire woody galls" of oak-buds, which often destroy the leading shoots of young trees, are produced by *Cynips Kollari*,[11] already alluded to. They were first introduced into Devonshire about the year 1847, had become common near Birmingham by 1866, and two or three years later were observed in several parts of Scotland.[12] They contain about 17% of tannin.[13] On account of their regular form they have been used, threaded on wire, for making ornamental baskets. The large purplish Mecca or Bussorah galls,[14] produced on a species of oak by *Cynips insana*, Westw., have been regarded by many writers as the Dead Sea fruit, mad-apples (*mala insana*), or apples of Sodom (*poma sodomitica*), alluded to by Josephus and others, which, however, are stated by E. Robinson (*Bibl. Researches in Palestine*, vol. i. pp. 522-524, 3rd ed., 1867) to be the singular fruit called by the Arabs '*Ösher*, produced by the *Asclepias gigantea* or *procera* of botanists. What in California are known as "flea seeds" are oak-galls made by a species of *Cynips*; in August they become detached from the leaves that bear them, and are caused to jump by the spasmodic movements of the grub within the thin-walled gall-cavity.[15]

Common gall-nuts, nut-galls, or oak-galls, the Aleppo, Turkey, or Levant galls of commerce (Ger. *Galläpfel*, *levantische Gallen*; Fr. *noix de Galle*), are produced on *Quercus infectoria*, a variety of *Q. Lusitanica*, Webb, by *Cynips* (*Diplolepis*, Latr.) *tinctoria*, L., or *C. gallae tinctoriae* Oliv. Aleppo galls (*gallae halepenses*) are brittle, hard, spherical bodies, $\frac{3}{4}$-$\frac{4}{5}$ in. in diameter, ridged and warty on the upper half, and light brown to dark greyish-yellow within. What are termed "blue," "black," or "green" galls contain the insect; the inferior "white" galls, which are lighter coloured, and not so compact, heavy or astringent, are gathered after its escape (see fig. 1.). Less valued are the galls of Tripoli (Taraplus or Tarabulus, whence the name "Tarablous galls"). The most esteemed Syrian galls, according to Pereira, are those of Mosul on the Tigris. Other varieties of nut-galls, besides the above-mentioned, are employed in Europe for various purposes. Commercial gall-nuts have yielded on analysis from 26 (H. Davy) to 77 (Buchner) % of tannin (see

[1] P. Cameron, *Scottish Naturalist*, ii. pp. 11-15.
[2] *Entomologist*, vii. p. 47.
[3] See in *Proc. Entom. Soc. of London for the Year 1873*, p. xvi.
[4] See A. Müller, *Gardener's Chronicle* (1871), pp. 1162 and 1518; and E. A. Fitch, *Entomologist*, xi. p. 129.
[5] *Entomologist*, vi. pp. 275-278, 339-340.
[6] *Verhandl. d. zoolog.-bot. Ges. in Wien*, xxi. p. 799.
[7] Darwin, *Variations of Animals and Plants under Domestication*, ii. p. 282.
[8] "Recherches pour servir à l'histoire des galles," *Ann. des sci. nat.* xix. pp. 293 sqq.
According to Dr Adler, alternation of generations takes place between *N. lenticularis* and *Spathegaster baccarum* (see E. A. Ormerod, *Entomologist*, xi. p. 34).
[10] See Westwood, *Introd. to the Mod. Classif. of Insects*, ii. (1840) p. 130.
[11] For figures and descriptions of insect and gall, see *Entomologist*, iv. p. 17, vii. p. 241, ix. p. 53, xi. p. 131.
[12] *Scottish Naturalist*, i. (1871) p. 116, &c.
[13] Vinen, *Journ. de pharm. et de chim.* xxx. (1856) p. 290; "English Ink-Galls," *Pharm. Journ.* 2nd ser. iv. p. 520.
[14] See Pereira, *Materia Medica*, vol. ii. pt. i. p. 347; *Pharm. Journ.* 1st ser. vol. viii. pp. 422-424.
[15] See R. H. Stretch and C. D. Gibbes, *Proc. California Acad. of Sciences*, iv. pp. 265 and 266.

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Vinen, *loc. cit.*), with gallic and ellagic acids, ligneous fibre, water, and minute quantities of proteids, chlorophyll, resin, free sugar and, in the cells around the inner shelly chamber, calcium oxalate. Oak-galls are mentioned by Theophrastus, Dioscorides (i. 146), and other ancient writers, including Pliny (*Nat. Hist.* xvi. 9, 10, xxiv. 5), according to whom they may be produced "in a single night." Their insect origin appears to have been entirely unsuspected until within comparatively recent times, though Pliny, indeed, makes the observation that a kind of gnat is

FIG. 1.—*a*, Aleppo "blue" gall; *b*, ditto in section, showing central cavity for grub; *c*, Aleppo "white" gall, perforated by insect; *d*, the same in section (natural size).

produced in certain excrescences on oak leaves. Bacon describes oak-apples as "an exudation of plants joined with putrefaction." Pomet[1] thought that gall-nuts were the fruit of the oak, and a similar opinion obtains among the modern Chinese, who apply to them the term *Mu-shih-tsze*, or "fruits for the foodless."[2] Hippocrates administered gall-nuts for their astringent properties, and Pliny (*Nat. Hist.* xxiv. 5) recommends them as a remedy in affections of the gums and uvula, ulcerations of the mouth and some dozen more complaints. In British pharmacy gall-nuts are used in the preparation of the two astringent ointments *unguentum gallae* and *unguentum gallae cum opio*, and of the *tinctura gallae*, and also as a source of tannin and of gallic acid (*q.v.*). They have from very early times been resorted to as a means of staining the hair of a dark colour, and they are the base of the tattooing dye of the Somali women.[3]

The gall-making Hymenoptera include, besides the *Cynipidae* proper, certain species of the genus *Eurytoma* (*Isosoma*, Walsh) and family *Chalcididae*, e.g. *E. hordei*, the "joint-worm" of the United States, which produces galls on the stalks of wheat;[4] also various members of the family *Tenthredinidae*, or saw-flies. The larvae of the latter usually vacate their galls, to spin their cocoons in the earth, or, as in the case of *Athalia abdominalis*, Klg., of the clematis, may emerge from their shelter to feed for some days on the leaves of the gall-bearing plant.

The dipterous gall-formers include the gall-midges, or gall-gnats (*Cecidomyidae*), minute slender-bodied insects, with bodies usually covered with long hairs, and the wings folded over the back. Some of them build cocoons within their galls, others descend to the ground or become pupae. The true willow-galls are the work either of these or of saw-flies. Their galls are to be met with on a great variety of plants of widely distinct genera, *e.g.* the ash, maple, horn-beam, oak,[5] grape-vine,[6] alder, gooseberry, blackberry, pine, juniper, thistle, fennel, meadowsweet,[7]

[1] *A Complete History of Drugs* (translation), p. 169 (London, 1748).
[2] F. Porter Smith, *Contrib. towards the Mat. Medica . . . of China*, p. 100 (1871).
[3] R. F. Burton, *First Footsteps in E. Africa*, p. 178 (1856).
[4] A. S. Packard, jun., *Guide to the Study of Insects*, p. 205 (Salem, 1870).
[5] On the Cecidomyids of *Quercus Cerris*, see Fitch, *Entomologist*, xi. p. 14.
[6] See, on *Cecidomyia oenephila*, Von Haimhoffen, *Verhandl. d. zoolog.-bot. Ges. in Wien*, xxv. pp. 801-810.
[7] See *Entomologist's Month. Mag.* iv. (1868) p. 233; and for figure and description, *Entomologist*, xi. p. 13.

common cabbage and cereals. In the northern United States, in May, "legions of these delicate minute flies fill the air at twilight, hovering over wheat-fields and shrubbery. A strong north-west wind, at such times, is of incalculable value to the farmer."[8] Other gall-making dipterous flies are members of the family *Trypetidae*, which disfigure the seed-heads of plants, and of the family *Mycetophilidae*, such as the species *Sciara tilicola*,[9] Löw, the cause of the oblong or rounded green and red galls of the young shoots and leaves of the lime.

Galls are formed also by hemipterous and homopterous insects of the families *Tingidae*, *Psyllidae*, *Coccidae* and *Aphidae*. *Coccus pinicortis* is causes the growth of patches of white flocculent and downy matter on the smooth bark of young trees of the white pine in America.[10] The galls of examples of the last family are common objects on lime-leaves, and on the petioles of the poplar. An American Aphid of the genus *Pemphigus* produces black, ragged, leathery and cut-shaped excrescences on the young branches of the hickory.

The Chinese galls of commerce (*Woo-pei-tsze*) are stated to be produced by *Aphis Chinensis*, Bell, on *Rhus semialata*, Murr. (*R. Buchi-amela*, Roxb.), an Anacardiaceous tree indigenous to N. India, China and Japan. They are hollow, brittle, irregularly pyriform, tuberculated or branched vesicles, with thin walls, covered externally with a grey down, and internally with a white chalk-like matter, and insect-remains (see fig. 2). The escape of the insect takes place on the spontaneous bursting of the walls of the vesicle, probably when, after viviparous (thelytokous) reproduction for several generations, male winged insects are developed. The galls are gathered before the frosts set in, and are exposed to steam to kill the insects.[11]

Chinese galls examined by Virdt[12] yielded 72% of tannin, and less mucilage than Aleppo galls. Several other varieties of galls are produced by Aphides on species of *Pistacia*.

M. J. Lichtenstein has established the fact that from the egg of the Aphis of Pistachio galls, *Anopleura lentisci*, is hatched an apterous insect (the gall-founder), which gives birth to young Aphides (emigrants), and that these, having acquired wings, fly to the roots of certain grasses (*Bromus sterilis* and *Hordeum vulgare*), and by budding underground give rise to several generations of apterous insects, whence finally comes a winged brood (the pupifera). These last issuing from the ground fly to the Pistachio, and on it deposit their pupae. From the pupae, again, are developed sexual individuals, the females of which lay fecundated eggs productive of gall-founders, thus recommencing the biological cycle (see *Compt. rend.*, Nov. 18, 1878, p. 782, quoted in *Ann. and Mag. Nat. Hist.*, 1879, p. 174).

Of other insects which have been recognized as gall-makers

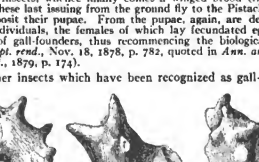

FIG. 2.—*a*, Chinese gall (abt. ½ natural size); *b*, ditto broken, showing thin-walled cavity; *c*, Japanese gall (natural size).

there are, among the Coleoptera, certain Curculionids (gall-weevils), and species of the exotic *Sagridae* and *Lamiadae* and an

[8] A. S. Packard, jun., *Our Common Insects*, p. 205 (Salem, U.S. 1873). On the Hessian fly, *Cecidomyia destructor*, Say, the May brood of which produces swellings immediately above the joints of barley attacked by it, see Asa Fitch, *The Hessian Fly* (Albany, 1847), reprinted from *Trans. New York State Agric. Soc.* vol. vi.
[9] J. Winnertz, *Beitrag zu einer Monographie der Sciarinen*, p. 164 (Vienna, 1867).
[10] Asa Fitch, *First and Second Rep. on the Noxious . . . Insects of the State of New York*, p. 167 (Albany, 1856).
[11] See E. Doubleday, *Pharm. Journ.* 1st ser. vol. vii. p. 310; and Pereira, *ib.* vol. iii. p. 377.
[12] *Dingler's Polyt. Journ.* ccxvi. p. 453.

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American beetle, *Saperda inornata* (*Cerambycidae*), which forms the pseudo-galls of *Salix longifolia* and *Populus angulata*, or cottonwood. Among the Lepidoptera are gall-forming species belonging to the *Tineidae*, *Aegeriidae*, *Tortricidae* and *Pterophoridae*. The larva of a New Zealand moth, *Morova subfasciata*, Walk. (*Cacoecia gallicolens*), of the family *Drepanulidae*, causes the stem of a creeping plant, on the pith of which it apparently subsists, to swell up into a fusiform gall.[1]

Mite-galls, or *acrocecidia*, are abnormal growths of the leaves of plants, produced by microscopic Acaridea of the genus *Phytoptus* (gall-mites), and consist of little tufts of hairs, or of thickened portions of the leaves, usually most hypertrophied on the upper surface, so that the lower is drawn up into the interior, producing a bursiform cavity. Mite-galls occur on the sycamore, pear, plum, ash, alder, vine, mulberry and many other plants; and formerly, *e.g.* the gall known as *Erineum quercinum*, on the leaves of *Quercus Cerris*, were taken for cryptogamic structures. The lime-leaf "nail-galls" of *Phytoptus tiliae* closely resemble the "trumpet-galls" formed on American vines by a species of *Cecidomyia*.[2] Certain minute Nematoid worms, as *Anguillula scandens*, which infests the ears of wheat, also give rise to galls.

Besides the larva of the gall-maker, or the householder, galls usually contain inquilines or lodgers, the larvae of what are termed guest-flies or cuckoo-flies. Thus the galls of *Cynips* and its allies are inhabited by members of other cynipideous genera, as *Synergus*, *Amblynotus* and *Synophrus*; and the pine-cone-like gall of *Salix strobiloides*, as Walsh has shown,[2] is made by a large species of *Cecidomyia*, which inhabits the heart of the mass, the numerous smaller cecidomyidous larvae in its outer part being mere inquilines. In many instances the lodgers are not of the same order of insects as the gall-makers. Some saw-flies, for example, are inquilinous in the galls of gall-gnats and some gall-gnats in the galls of saw-flies. Again, galls may afford harbour to insects which are not essentially gall-feeders, as in the case of the Curculio beetle *Conotrachelius nenuphar*, Hbst., of which one brood eats the fleshy part of the plum and peach, and another lives in the "black knot" of the plum-tree, regarded by Walsh as probably a true cecidomyidous gall. The same authority (*loc. cit.* p. 550) mentions a willow-gall which provides no less than sixteen insects with food and protection; these are preyed upon by about eight others, so that alltogether some twenty-four insects, representing eight orders, are dependent for their existence on what to the common observer appears to be nothing but "an unmeaning mass of leaves." Among the numerous insects parasitic on the inhabitants of galls are hymenopterous flies of the family *Proctotrypidae*, and of the family *Chalcididae*, e.g. *Callimome regius*, the larva of which preys on the larvae of both *Cynips glutinosa* and its lodger *Synergus facialis*. The oak-apple often contains the larvae of *Braconidae* and *Ichneumonidae*, which Von Schlechtendal (*loc. sup. cit.* p. 33) considers to be parasites not on the owner of the gall, *Andricus terminalis*, but on inquilinous *Tortricidae*. Birds are to be included among the enemies of gall-insects. Oak-galls, for example, are broken open by the titmouse in order to obtain the grub within, and the "button-galls" of *Neuroterus numismatis*, Oliv., are eaten by pheasants.

A great variety of deformations and growths produced by insects and mites as well as by fungi have been described. They are in some cases very slight, and in others form remarkably large and definite structures. The whole are now included under the term Cecidia; a prefix gives the name of the organism to which the attacks are due, *e.g.* Phytoptocecidia are the galls formed by Phytoptid mites. Simple galls are those that arise when only one member of a plant is involved; compound galls are the result of attacks on buds. Amongst the most remarkable galls recently discovered we may mention those found on Eucalyptus, Casuarina and other trees and plants in Australia. They are remarkable for their variety, and are due to small scale-insects of the peculiar sub-family Brachyscelinae. As regards the mode of production of galls, the most important distinction is between galls that result from the introduction of an egg, or other matter, into the interior of the plant, and those that are due to an agent acting externally, the gall in the latter case frequently growing in such a manner as ultimately to enclose its producers. The form and nature of the gall are the result of the powers of growth possessed by the plant. It has long been known, and is now generally recognized, that a gall can only be produced when the tissue of a plant is interfered with during, or prior to, the actual development of the tissue. Little more than this is known. The power that gall-producers possess of influencing by direct interference the growth of the cells of the plant that affords them the means of subsistence is an art that appears to be widely spread among animals, but is at the same time one of which we have little knowledge. The views of Adler as to the alternation of generations of numerous gall-flies have been fully confirmed, it having been ascertained by direct observation that the galls and the insects produced from them in one generation are entirely different from the next generation; and it has also been rendered certain that frequently one of the alternate generations is parthenogenetic, no males being produced. It is supposed that these remarkable phenomena have gradually been evoked by difference in the nutrition of the alternating generations. When two different generations are produced in one year on the same kind of tree it is clear the properties of the sap and tissues of the tree must be diverse so that the two generations are adapted to different conditions. In some cases the alternating generations are produced on different species of trees, and even on different parts of the two species.

Gall-flies and their makers and inhabitants are further—J. T. C. Ratzeburg, *Die Forst-Insecten*, Teil iii. pp. 53 seq. (Berlin, 1844); T. W. Harris, *Insects injurious to Vegetation* (Boston, U.S., 2nd ed., 1852); C. L. Koch, *Die Pflanzenläuse Aphiden* (Nuremberg, 1854); Id., *Die Familien der Blattwespen und Holzwespen* (Berlin, 1860); Walsh, "On the Insects, Coleopterous, Hymenopterous and Dipterous, inhabiting the Galls of certain species of Willow," *Proc. Ent. Soc. Philadelphia*, iii. (1863–1864), pp. 543-644, and vi. (1866–1867), pp. 223-288; T. A. Marshall, "On some British Cynipidae," *Ent. Month. Mag.* iv. pp. 6-8, &c.; H. W. Kidd and Albert Müller, "A List of Gall-bearing British Plants," *ib.* v. pp. 118 and 216; G. L. Mayr, *Die mitteleuropäischen Eichengallen in Wort und Bild* (Vienna, 1870–1871), and the translation of that work, with notes, in the *Österr-Naturgesch*, vols. vii. seq.; also, by the same author, "Die Einmiethler der mitteleuropäischen Eichengallen," *Verhandl. d. zoolog.-bot. Ges. in Wien*, xxii. pp. 669-726; and "Die europäischen Torymiden," *ib.* xxiv. pp. 53-142 (abstracted in *Cistula entomologica*, i., London, 1869–1876); F. Löw, "Beiträge zur Kenntnis der Gallmücken," *ib.* pp. 143-162, and 321-328; J. E. von Bergenstamm and P. Löw, "Synopsis Cecidomyidarum," *ib.* xxvi. pp. 1-104; Perris, *Ann. Soc. Entom. de France*, 4th ser. vol. x. pp. 176-185; R. Osten-Sacken, "On the North American Cecidomyidae," *Smithsonian Miscellaneous Collections*, vol. vi. (1867), p. 173; E. L. Taschenberg, *Entomologie für Gärtner und Gartenfreunde* (Leipzig, 1871); J. W. H. Traill, "Scottish Galls," *Scottish Naturalist*, i. (1871), pp. 1-8, &c.; Albert Müller, "British Gall Insects," *The Entomologist's Annual for* 1872, pp. 1-22; B. Altum, *Forstzoologie*, iii. "Insecten," pp. 250 seq. (Berlin, 1874); J. H. Kaltenbach, *Die Pflanzenfeinde aus der Classe der Insecten* (Stuttgart, 1874); A. d'Arbois de Jubainville and H. Vesque, *Les Maladies des plantes cultivées*, pp. 98-105 (Paris, 1878). (F. H. B.)

GALLUPPI, PASQUALE (1770–1846), Italian philosopher, was born on the 2nd of April 1770 at Tropea, in Calabria. He was of good family, and after studying at the university of Naples he entered the public service, and was for many years employed in the office of the administration of finances. At the age of sixty, having become widely known by his writings on philosophy, he was called to the chair of logic and metaphysics in the university of Naples, which he held till his death in November 1846. His most important works are: *Lettere filosofiche* (1827), in which he traces his philosophical development; *Elementi di filosofia* (1832); *Saggio filosofico sulla critica della conoscenza* (1819–1832); *Sull' analisi e sulla sintesi* (1807); *Lezioni di logica e di metafisica* (1832–1836); *Filosofia della volontà* (1832–1842,

[1] For figure and description see *Zoology of the "Erebus" and "Terror,"* ii. pp. 46, 47 (1844–1875).

[2] On the mite-galls and their makers, see F. Löw, "Beiträge zur Naturgesch. der Gallmilben (*Phytoptus*, Duj.)," *Verhandl. d. zoolog.-bot. Ges. in Wien*, xxiv. (1874), pp. 2-16, with plate; and "Über Milbengallen (Acarocecidien) der Wiener-Gegend," *ib.* pp. 495-508; Andrew Murray, *Economic Entomology. Aptera*, pp. 331-374 (1876); and F. A. W. Thomas, *Ältere und neue Beobachtungen über Phytopto-Cecidien* (Halle, 1877).

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incomplete); *Storia della filosofia* (i., 1842); *Considerazioni filosofiche sull' idealismo trascendentale* (1841), a memoir on the system of Fichte.

On his philosophical views see L. Ferri, *Essai sur l'histoire de la philosophie en Italie au XIXe siècle*, i. (1869); V. Botta in Ueberweg's *Hist. of Philosophy*, ii. app. 2; G. Barzellotti, "Philosophy in Italy," in *Mind*, iii. (1878); V. Lastrucci, *Pasquale Galluppi. Studio critico* (Florence, 1899).

GALLUS, CORNELIUS (c. 70–26 B.C.), Roman poet, orator and politician, was born of humble parents at Forum Julii (*Fréjus*) in Gaul. At an early age he removed to Rome, where he was taught by the same master as Virgil and Varius Rufus. Virgil, who dedicated one of his eclogues (x.) to him, was in great measure indebted to the influence of Gallus for the restoration of his estate. In political life Gallus espoused the cause of Octavianus, and as a reward for his services was made praefect of Egypt (Suetonius, *Augustus*, 66). His conduct in this position afterwards brought him into disgrace with the emperor, and having been deprived of his estates and sentenced to banishment, he put an end to his life (Dio Cassius liii. 23). Gallus enjoyed a high reputation among his contemporaries as a man of intellect, and Ovid (*Tristia*, iv. 10) considered him the first of the elegiac poets of Rome. He wrote four books of elegies chiefly on his mistress Lycoris (a poetical name for Cytheris, a notorious actress), in which he took for his model Euphorion of Chalcis (*q.v.*); he also translated some of this author's works into Latin. Nothing by him has survived; the fragments of the four poems attributed to him (first published by Aldus Manutius in 1590 and printed in A. Riese's *Anthologia Latina*, 1869) are generally regarded as a forgery.

See C. Völker, *De C. Galli vita et scriptis* (1840–1844); A. Nicolas, *De la vie et des ouvrages de C. Gallus* (1851), an exhaustive monograph. An inscription found at Philae (published 1896) records the Egyptian exploits; see M. Schanz, *Geschichte der römischen Litteratur*, and Plessis, *Poésie latine* (1909).

GALLUS, GAIUS AELIUS, praefect of Egypt 26–24 B.C. By order of Augustus he undertook an expedition to Arabia Felix, with disastrous results. The troops suffered greatly from disease, heat, want of water and the obstinate resistance of the inhabitants. The treachery of a foreign guide also added to his difficulties. After six months Gallus was obliged to return to Alexandria, having lost the greater part of his force. He was a friend of the geographer Strabo, who gives an account of the expedition (xvi. pp. 780-782; see also Dio Cassius liii. 29; Pliny, *Nat. Hist.* vi. 32; C. Merivale, *Hist. of the Romans under the Empire*, ch. 34; H. Krüger, *Der Feldzug des A. G. nach dem glücklichen Arabien*, 1862). He has been identified with the Aelius Gallus frequently quoted by Galen, whose remedies are stated to have been used with success in an Arabian expedition.

GALLUS, GAIUS CESTIUS, governor of Syria during the reign of Nero. When the Jews in Jerusalem, stirred to revolt by the outrages of the Roman procurators, had seized the fortress of Masada and treacherously murdered the garrison of the palace of Herod, Gallus set out from Antioch to restore order. On the 17th of November A.D. 66 he arrived before Jerusalem. Having gained possession of the northern suburb, he attacked the temple mount; but, after five days' fighting, just when (according to Josephus) success was within his grasp, he unaccountably withdrew his forces. During his retreat he was closely pursued by the Jews and surrounded in a ravine, and only succeeded in making good his escape to Antioch by sacrificing the greater part of his army and a large amount of war material. Soon after his return Gallus died (before the spring of 67), and was succeeded in the governorship by Licinius Mucianus, the prosecution of the war being entrusted to Vespasian.

See Tacitus, *Hist.* v. 10, 13; Suetonius, *Vespasian*, 4; Josephus, *Bell. Jud.* ii. 14-20; E. Schürer, *Hist. of the Jewish People*, div. i. vol. ii. p. 212 (Eng. tr., 1890).

GALLUS, GAIUS SULPICIUS, Roman general, statesman and orator. Under Lucius Aemilius Paulus, his intimate friend, he commanded the 2nd legion in the campaign against Perseus, king of Macedonia, and gained great reputation for having predicted an eclipse of the moon on the night before the battle of Pydna (168 B.C.). On his return from Macedonia he was elected consul (166), and in the same year reduced the Ligurians to submission. In 164 he was sent as ambassador to Greece and Asia, where he held a meeting at Sardis to investigate the charges brought against Eumenes of Pergamum by the representatives of various cities of Asia Minor. Gallus was a man of great learning, an excellent Greek scholar, and in his later years devoted himself to the study of astronomy, on which subject he is quoted as an authority by Pliny.

See Livy xliv. 37, *Epit.* 46; Polybius xxxi. 9, 10; Cicero, *Brutus*, 20, *De officiis*, i. 6, *De senectute*, 14; Pliny, *Nat. Hist.* ii. 9.

GALOIS, EVARISTE (1811–1832), French mathematician, was born on the 25th of October 1811, and killed in a duel on the 31st of May 1832. An obituary notice by his friend Auguste Chevalier appeared in the *Revue encyclopédique* (1832); and his collected works are published, *Journal de Liouville* (1846), pp. 381-444, about fifty of these pages being occupied by researches on the resolubility of algebraic equations by radicals. This branch of algebra he notably enriched, and to him is also due the notion of a group of substitutions (see EQUATION: *Theory of Equations*; also GROUPS, THEORY OF).

His collected works, with an introduction by C. F. Picard, were published in 1897 at Paris.

GALSTON, a police burgh and manufacturing town of Ayrshire, Scotland. Pop. (1901) 4876. It is situated on the Irvine, 5 m. E. by S. of Kilmarnock, with a station on the Glasgow & South-Western railway. The manufactures include blankets, lace, muslin, hosiery and paper-millboard, and coal is worked in the vicinity. About 1 m. to the north, amid the "bonnie woods and braes," is Loudoun Castle, a seat of the earl of Loudoun.

GALT, SIR ALEXANDER TILLOCH (1817–1893), Canadian statesman, was the youngest son of John Galt the author. Born in London on the 6th of September 1817, he emigrated to Canada in 1835, and settled in Sherbrooke, in the province of Quebec, where he entered the service of the British American Land Company, of which he rose to be chief commissioner. Later he was one of the contractors for extending the Grand Trunk railway westward from Toronto. He entered public life in 1840 as Liberal member for the county of Sherbrooke, but opposed the chief measure of his party, the Rebellion Losses Bill, and in the same year signed a manifesto in favour of union with the United States, believing that in no other way could Protestant and Anglo-Saxon ascendancy over the Roman Catholic French majority in his native province be maintained. In the same year he retired from parliament but re-entered it in 1853, and was till 1872 the chief representative of the English-speaking Protestants of Quebec province. On the fall of the Brown-Dorion administration in 1858 he was called on to form a ministry, but declined the task, and became finance minister under Sir John Macdonald and Sir George Cartier on condition that the federation of the British North American provinces should become a part of their programme. From 1858 to 1862 and 1864 to 1867 he was finance minister, and did much to reduce the somewhat chaotic finances of Canada into order. To him are due the introduction of the decimal system of currency and the adoption of a system of protection to Canadian manufactures. To his diplomacy was due the coalition in 1864 between Macdonald, Brown and Cartier, which carried the federation of the British North American provinces, and throughout the three years of negotiation which followed his was one of the chief influences. He became finance minister in the first Dominion ministry, but suddenly and mysteriously resigned on the 4th of November 1867. After his retirement he gave to the administration of Sir John Macdonald a support which grew more and more fitful, and advocated independence as the final destiny of Canada. In 1871 he was again offered the ministry of finance on condition of abandoning these views, but declined. In 1877 he was the Canadian nominee on the Anglo-American fisheries commission at Halifax, and rendered brilliant service. In 1880 he was appointed Canadian high commissioner to Great Britain, but retired in 1883 in favour of Sir Charles Tupper. During this period he advocated imperial federation. He was Canadian delegate at the Paris Monetary Conference of 1881, and to the International Exhibition of Fisheries in 1883. From this date till his death on the 19th of

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September 1803 he lived in retirement. No Canadian statesman has had sounder or more abundant ideas, but a certain intellectual fickleness made him always a somewhat untrustworthy colleague in political life. (W. L. G.)

GALT, JOHN (1779–1839), Scottish novelist, was born at Irvine, Ayrshire, on the 2nd of May 1779. He received his early education at Irvine and Greenock, and read largely from one of the public libraries while serving as a clerk in a mercantile office. In 1804 he went to settle in London, where he published anonymously a poem on the *Battle of Largs*. After unsuccessful attempts to succeed in business Galt entered at Lincoln's Inn, but was never called to the bar. He obtained a commission from a British firm to go abroad to find out whether the Berlin and Milan decrees could be evaded. He met Byron and Sir John Hobhouse at Gibraltar, travelled with Byron to Malta, and met him again at Athens. He was afterwards employed by the Glasgow merchant Kirkman Finlay on similar business at Gibraltar, and in 1814 visited France and Holland. His early works are the *Life and Administration of Wolsey*, *Voyages and Travels*, *Letters from the Levant*, the *Life of Benjamin West*, *Historical Pictures* and *The Wandering Jew*; and he induced Colburn to publish a periodical containing dramatic pieces rejected by London managers. These were afterwards edited by Galt as the *New British Theatre*, which included some plays of his own. He first showed his real power as a writer of fiction in *The Ayrshire Legatees*, which appeared in *Blackwood's Magazine* in 1820. This was followed in 1821 by his masterpiece—*The Annals of the Parish*; and, at short intervals, *Sir Andrew Wylie*, *The Entail*, *The Steam-Boat* and *The Provost* were published. These humorous studies of Scottish character are all in his happiest manner. His next works were *Ringan Gilhaize* (1823), a story of the Covenanters; *The Spaewife* (1823), which relates to the times of James I. of Scotland; *Rothelan* (1824), a novel founded on the reign of Edward III.; *The Omen* (1825), which was favourably criticized by Sir Walter Scott; and *The Last of the Lairds*, another picture of Scottish life.

In 1826 he went to America as secretary to the Canada Land Company. He carried out extensive schemes of colonization, and opened up a road through what was then forest country between Lakes Huron and Erie. In 1827 he founded Guelph in upper Canada, passing on his way the township of Galt on the Grand river, named after him by the Hon. William Dixon. But all this work proved financially unprofitable to Galt. In 1829 he returned to England commercially a ruined man, and devoted himself with great ardour to literary pursuits, of which the first fruit was *Lawrie Todd*—one of his best novels. Then came *Southennan*, a tale of Scottish life in the times of Queen Mary. In 1830 he was appointed editor of the *Courier* newspaper—a post he soon relinquished. His untiring industry was seen in the publication, in rapid succession, of a *Life of Byron*, *Lives of the Players*, *Bogle Corbet*, *Stanley Buxton*, *The Member*, *The Radical*, *Eben Erskine*, *The Stolen Child*, his *Autobiography*, and a collection of tales entitled *Stories of the Study*. In 1834 appeared his *Literary Life and Miscellanies*, dedicated by permission to William IV., who sent the author a present of £200. As soon as this work was published Galt retired to Greenock, where he continued his literary labours till his death on the 11th of April 1839.

Galt, like almost all voluminous writers, was exceedingly unequal. His masterpieces are *The Ayrshire Legatees*, *The Annals of the Parish*, *Sir Andrew Wylie*, *The Entail*, *The Provost* and *Lawrie Todd*. *The Ayrshire Legatees* gives, in the form of a number of exceedingly diverting letters, the adventures of the Rev. Dr Pringle and his family in London. The letters are made the excuse for endless tea-parties and meetings of kirk-session in the rural parish of Garnock. *The Annals of the Parish* are told by the Rev. Micah Balwhidder, Galt's finest character. This work (which, be it remembered, existed in MS. before *Waverley* was published) is a splendid picture of the old-fashioned Scottish pastor and the life of a country parish; and, in rich humour, genuine pathos and truth to nature it is unsurpassed even by Scott. It is a fine specimen of the homely graces of the Scottish dialect, and preserves much vigorous Doric phraseology fast passing out of use even in country districts. In this novel Mr Galt used, for the first time, the term "Utilitarian," which afterwards became so intimately associated with the doctrines of John Stuart Mill and Bentham (see *Annals of the Parish*, chap. xxxv., and a note by Mill in *Utilitarianism*, chap. ii.). In *Sir Andrew Wylie* the hero entered London as a poor lad, but achieved remarkable success by his shrewd business qualities. The character is somewhat exaggerated, but excessively amusing. *The Entail* was read thrice by Byron and Scott, and is the best of Galt's longer novels. Leddy Grippy is a wonderful creation, and was considered by Byron equal to any female character in literature since Shakespeare's time. *The Provost*, in which Provost Pawkie tells his own story, portrays inimitably the jobbery, bickerings and self-seeking of municipal dignitaries in a quaint Scottish burgh. In *Lawrie Todd* Galt, by giving us the Scot in America, accomplished a feat which Sir Walter never attempted. This novel exhibits more variety of style and a greater love of nature than his other books. The life of a settler is depicted with unerring pencil, and with an enthusiasm and imaginative power much more poetical than any of the author's professed poems.

The best of Galt's novels were reprinted in Blackwood's *Standard Novels*, to volume i. of which his friend Dr Moir prefixed a memoir.

GALT, a town in Waterloo county, Ontario, Canada, 23 m. N.N.W. of Hamilton, on the Grand river and on the Grand Trunk and Canadian Pacific railways. Pop. (1881) 5187; (1901) 7866. It is named after John Galt, the author. It has excellent water privileges which furnish power for flour-mills and for manufactures of edge tools, castings, machinery, paper and other industries.

GALTON, SIR FRANCIS (1822–), English anthropologist, son of S. T. Galton, of Duddeston, Warwickshire, was born on the 16th of February 1822. His grandfather was the poet-naturalist Erasmus Darwin, and Charles Darwin was his cousin. After attending King Edward VI.'s grammar school, Birmingham, he studied at Birmingham hospital, and afterwards at King's College, London, with the intention of making medicine his profession; but after taking his degree at Trinity College, Cambridge, in 1843 he changed his mind. The years 1845–1846 he spent in travelling in the Sudan, and in 1850 he made an exploration, with Dr John Anderson, of Damaraland and the Ovampo country in south-west Africa, starting from Walfisch Bay. These tracts had practically never been traversed before, and on the appearance of the published account of his journey and experiences under the title of *Narrative of an Explorer in Tropical South Africa* (1853) Galton was awarded the gold medal of the Royal Geographical Society. His *Art of Travel; or, Shifts and Contrivances in Wild Countries* was first published in 1855. In 1860 he visited the north of Spain, and published the fruits of his observations of the country and the people in the first of a series of volumes, which he edited, entitled *Vacation Tourists*. He then turned to meteorology, the result of his investigations appearing in *Meteorographica*, published in 1863. This work was the first serious attempt to chart the weather on an extensive scale, and in it also the author first established the existence and theory of anticyclones. Galton was a member of the meteorological committee (1868), and of the Meteorological Council which succeeded it, for over thirty years. But his name is most closely associated with studies in anthropology and especially in heredity. In 1869 appeared his *Hereditary Genius, its Laws and Consequences*, a work which excited much interest in scientific and medical circles. This was followed by *English Men of Science, their Nature and Nurture*, published in 1874; *Inquiries into Human Faculty and its Development*, issued in 1883; *Life-History Album* (1884); *Record of Family Faculties* (1884) (tabular forms and directions for entering data, with a preface); and *Natural Inheritance* (1889). The idea that systematic efforts should be made to improve the breed of mankind by checking the birth-rate of the unfit and furthering the productivity of the fit was first put forward by him in 1865; he mooted it again in 1884, using the term "eugenics" for the first time in *Human Faculty*, and in 1904 he endowed a research fellowship in the university of London for the promotion of

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knowledge of that subject, which was defined as "the study of agencies under social control that may improve or impair the racial qualities of future generations, either physically or mentally." Galton was the author of memoirs on various anthropometric subjects; he originated the process of composite portraiture, and paid much attention to finger-prints and their employment for the identification of criminals, his publications on this subject including *Finger Prints* (1892), *Decipherment of Blurred Finger Prints* (1893) and *Finger Print Directories* (1895). From the Royal Society, of which he was elected a fellow in 1860, he received a royal medal in 1886 and the Darwin medal in 1902, and honorary degrees were bestowed on him by Oxford (1894) and Cambridge (1895). In 1908 he published *Memories of My Life*, and in 1909 he received a knighthood.

GALUPPI, BALDASSARE (1706–1785), Italian musical composer, was born on the 18th of October 1706 on the island of Burano near Venice, from which he was often known by the nickname of Buranello. His father, a barber, and violinist at the local theatre, was his first teacher. His first opera, composed at the age of sixteen, being hissed off the stage, he determined to study seriously, and entered the Conservatorio degli Incurabili at Venice, as a pupil of Antonio Lotti. After successfully producing two operas in collaboration with a fellow-pupil, G. B. Pescetti, in 1728 and 1729, he entered upon a busy career as a composer of operas for Venetian theatres, writing sometimes as many as five in a year. He visited London in 1741, and arranged a *pasticcio*, *Alexander in Persia*, for the Haymarket. Burney considered his influence on English music to have been very powerful. In 1740 he became *vice-maestro di cappella* at St Mark's and *maestro* in 1762. In 1749 he began writing comic operas to libretti by Goldoni, which enjoyed an enormous popularity. He was invited to Russia by Catherine II. in 1766, where his operas made a favourable impression, and his influence was also felt in Russian church music. He returned to Venice in 1768, where he had held the post of director of the Conservatorio degli Incurabili since 1762. He died on the 3rd of January 1785.

Galuppi's best works are his comic operas, of which *Il Filosofo di Campagna* (1754), known in England as *The Guardian Trick'd* (Dublin, 1762) was the most popular. His melody is attractive rather than original, but his workmanship in harmony and orchestration is generally superior to that of his contemporaries. He seems to have been the first to extend the concerted finales of Leo and Logroscino into a chain of several separate movements, working up to a climax, but in this respect he is much inferior to Sarti and Mozart.

Browning's poem, "A Toccata of Galuppi," does not refer to any known composition, but more probably to an imaginary extemporization on the harpsichord, such as was of frequent occurrence in the musical gatherings of Galuppi's day.

See also Alfred Wotquerme, *Baldassare Galuppi, étude bibliographique sur ses œuvres dramatiques* (Brussels, 1902). Many of his autograph scores are in the library of the Brussels conservatoire. (E. J. D.)

GALVANI, LUIGI (1737–1798), Italian physiologist, after whom galvanism received its name, was born at Bologna on the 9th of September 1737. It was his wish in early life to enter the church, but by his parents he was educated for a medical career. At the university of Bologna, in which city he practised, he was in 1762 appointed public lecturer in anatomy, and soon gained repute as a skilled though not eloquent teacher, and, chiefly from his researches on the organs of hearing and genito-urinary tract of birds, as a comparative anatomist. His celebrated theory of animal electricity he enunciated in a treatise, "De viribus electricitatis in motu musculari commentarius," published in the 7th volume of the memoirs of the Institute of Sciences at Bologna in 1791, and separately at Modena in the following year, and elsewhere subsequently. The statement has frequently been repeated that, in 1786, Galvani had noticed that the leg of a skinned frog, on being accidentally touched by a scalpel which had lain near an electrical machine, was thrown into violent convulsions; and that it was thus that his attention was first directed to the relations of animal functions to electricity. From documents in the possession of the Institute of Bologna, however, it appears that twenty years previous to the publication of his *Commentary* Galvani was already engaged in investigations as to the action of electricity upon the muscles of frogs. The observation that the suspension of certain of these animals on an iron railing by copper hooks caused twitching in the muscles of their legs led him to the invention of his metallic arc, the first experiment with which is described in the third part of the *Commentary*, with the date September 20, 1786. The arc he constructed of two different metals, which, placed in contact the one with a frog's nerve and the other with a muscle, caused contraction of the latter. In Galvani's view the motions of the muscle were the result of the union, by means of the metallic arc, of its exterior or negative electrical charge with positive electricity which proceeded along the nerve from its inner substance. Volta, on the other hand, attributed them solely to the effect of electricity having its source in the junction of the two dissimilar metals of the arc, and regarded the nerve and muscle simply as conductors. On Galvani's refusal, from religious scruples, to take the oath of allegiance to the Cisalpine republic in 1797, he was removed from his professorship. Deprived thus of the means of livelihood, he retired to the house of his brother Giacomo, where he soon fell into a feverish decline. The republican government, in consideration of his great scientific fame, eventually, but too late, determined to reinstate him in his chair, and he died at Bologna on the 4th of December 1798.

A quarto edition of his works was published at Bologna in 1841–1842, by the Academy of Sciences of the Institute of that city, under the title *Opere edite ed inedite del professore Luigi Galvani*.

GALVANIZED IRON, sheet iron having its surface covered with a thin coating of zinc. In spite of the name, galvanic action has no part in the production of galvanized iron, which is prepared by dipping the iron, properly cleaned and pickled in acid, in a bath of molten zinc. The hotter the zinc the thinner the coating, but as a high temperature of the bath is attended with certain objections, it is a common practice to use a moderate temperature and clear off the excess of zinc by passing the plates between rollers. In Norwood and Rogers's process a thin coating of tin is applied to the iron before it is dipped in the zinc, by putting the plates between layers of granulated tin in a wooden tank containing a dilute solution of stannous chloride, when tin is deposited on them by galvanic action. In "cold galvanizing" the zinc is deposited electrolytically from a bath, preferably kept neutral or slightly acid, containing a 10% solution of crystallized zinc sulphate, $ZnSO_4{\cdot}7H_2O$. The resulting surface is usually duller and less lustrous than that obtained by the use of molten zinc. Another method of forming a coating of zinc, known as "sherardizing," was invented by Sherard Cowper-Coles, who found that metals embedded in zinc dust (a product obtained in zinc manufacture and consisting of metallic zinc mixed with a certain amount of zinc oxide) and heated to temperatures well below the melting point of zinc, become coated with a layer of that metal. In carrying out the process the articles are placed in an air-tight vessel with the zinc dust, which must be dry, and subjected to a heat of 250–330° C., the time for which the heating is continued depending on the thickness of the deposit required and varying from one-half to several hours. If an air-tight receptacle is not available, a small percentage of powdered carbon is added to the zinc-dust, to prevent increase in the amount of oxide, which, if present in excess, tends to make the deposit dull.

Galvanized iron by its zinc surface is protected from corrosion by the weather, though the protection is not very efficient in the presence of acid or sulphurous fumes, and accordingly it is extensively employed for roofing, especially in the form of corrugated sheets. The iron wire used for wire-netting, telegraphic purposes, &c., is commonly galvanized, as also are bolts, nuts, chains and other fittings on ships.

GALVANOMETER, an instrument for detecting or measuring electric currents. The term is generally applied to instruments which indicate electric current in scale divisions or arbitrary units, as opposed to instruments called amperemeters (*q.v.*), which show directly on a dial the value of the current in amperes.

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Galvanometers may be divided into direct current and alternating current instruments, according as they are intended to measure one or other of these two classes of currents (see ELECTROKINETICS).

Direct Current Galvanometers.—The principle on which one type of direct current galvanometer, called a movable needle galvanometer, depends for its action is that a small magnet when suspended in the centre of a coil of wire tends to set its magnetic axis in the direction of the magnetic field of the coil at that point due to the current passing through it. In the other type, or movable coil galvanometer, the coil is suspended and the magnet fixed; hence the coil tends to set itself with its axis parallel to the lines of force of the magnet. The movable system must be constrained in some way to take up and retain a definite position when no current is passing by means which are called its "control."

Movable needle galvanometer.

In its simple and original form the movable needle galvanometer consisted of a horizontal magnetic needle suspended within a coil of insulated wire by silk fibres or pivoted on a point like a compass needle. The direction of such a needle is controlled by the direction of the terrestrial magnetic force within the coil. If the needle is so placed that its axis is parallel to the plane of the coil, then when an electric current passes through the coil it is deflected and places itself at an angle to the axis of the coil determined by the strength of the current and of the controlling field. In the early forms of movable needle galvanometer the needle was either a comparatively large magnet several inches in length, or else a smaller magnet was employed carrying a long pointer which moved over a scale of degrees so as to indicate the deflexion. A method of measuring the deflexion by means of a mirror scale and telescope was introduced by K. F. Gauss and W. Weber. The magnet had a mirror attached to it, and a telescope having cross wires in the focus was used to observe the scale divisions of a fixed scale seen reflected in the mirror. Lord Kelvin (Professor W. Thomson) made the important improvement of reducing the size of the needle and attaching it to the back of a very small mirror, the two being suspended by a single fibre of cocoon silk. The mirror was made of silvered microscopic glass about $\frac{1}{4}$ in. in diameter, and the magnetic needle or needles consisted of short fragments of watchspring cemented to its back. A ray of light being thrown on the mirror from a lamp the deflexions of the needle were observed by watching the movements of a spot of light reflected from it upon a fixed scale. This form of mirror galvanometer was first devised in connexion with submarine cable signalling, but soon became an indispensable instrument in the physical laboratory.

Mirror galvanometers.

In course of time both the original form of single needle galvanometer and mirror galvanometer were improved by introducing the astatic principle and weakening the external controlling magnetic field. If two magnetic needles of equal size and moment are attached rigidly to one stem parallel to each other but with poles placed in opposite directions an astatic system results; that is, if the needles are so suspended as to be free to move in a horizontal plane, and if they are made exactly equal in magnetic strength, the system will have no directive power. If one needle is slightly weaker than the other, the suspended system will set itself with some axis parallel to the lines of force of a field in which it is placed. In a form of astatic needle galvanometer devised by Professor A. Broca of Paris, the pair of magnetized needles are suspended vertically and parallel to each other with poles in opposite directions. The upper poles are included in one coil and the lower poles within another coil, so connected that the current circulates in the same direction in each coil to displace the pairs of poles in the same direction. By this mode of arrangement a greater magnetic moment can be secured, together with more perfect astaticity and freedom from disturbance by external fields. The earth's magnetic field can be weakened by means of a controlling magnet arranged to create in the space in the interior of the galvanometer coils an extremely feeble controlling magnetic field. In instruments having a coil for each needle and designed so that the current in both coils passes so as to turn both needles in the same direction, the controlling magnet is so adjusted that the normal position of the needles is with the magnetic axis parallel to the plane of the coil. An astatic magnetic system used in conjunction with a mirror galvanometer gives a highly sensitive form of instrument (fig. 1); it is, however, easily disturbed by stray magnetic fields caused by neighbouring magnets or currents through conductors, and therefore is not suitable for use in many places.

Astatic galvanometers.

This fact led to the introduction of the movable coil galvanometer which was first devised by Lord Kelvin as a telegraphic signalling instrument but subsequently modified by A. d'Arsonval and others into a laboratory galvanometer (fig. 2). In this instrument a permanent magnet, generally of the horseshoe shape, is employed to create a strong magnetic field, in which a light movable coil is suspended. The suspension is bifilar, consisting of two fine wires which are connected to the ends of the coil and serve to lead the current in and out. If such a coil is placed with its plane parallel to the lines of force of the permanent magnet, then when a current is passing through it it displaces itself in the field, so as to set with its axis more nearly parallel to the lines of force of the field. The movable coil may carry a pointer or a mirror; in the latter form it is well represented by several much used laboratory instruments. The movable coil galvanometer has the great advantage that it is not easily disturbed by the magnetic fields caused by neighbouring magnets or electric currents, and thus is especially useful in the electrical workshop and factory.

Movable coil galvanometer.

In the practical construction of the suspended needle fixed coil galvanometer great care must be taken with the insulation of the wire of the coil. This wire is generally silk-covered, wound on a frame, the whole being thoroughly saturated with paraffin wax. In some cases two wires are wound on in parallel, constituting a "differential galvanometer." When properly adjusted this instrument can be used for the exact comparison of electric currents by a null method, because if an electric current is passed through one wire and creates certain deflexions of the needle, the current which annuls this deflexion when passed through the other wire must be equal to the first current. In the construction of a movable coil galvanometer, it is usual to intensify the magnetic field by inserting a fixed soft iron core in the interior of the movable coil. If the current to be measured is too large to be passed entirely through the galvanometer, a portion is allowed to flow through a circuit connecting the two terminals of the instrument. This circuit is called a *shunt* and is generally arranged so as to take 0·9, 0·99, or 0·999 of the total current, leaving 0·1, 0·01 or 0·001 to flow through the galvanometer. W. E. Ayrton and T. Mather have designed a universal shunt box or resistance which can be applied to any galvanometer and by which a known fraction of any current can be sent through the galvanometer when we know its resistance (see *Jour. Inst. Elec. Eng. Lond.*, 1894, 23, p. 314). A galvanometer can be calibrated, or the meaning of its deflexion determined, by passing through it an electric current of known value and observing the deflexion of the needle or coil. The known current can be provided in the following manner:—a single secondary cell of any kind can have its electromotive force measured by the potentiometer (q.v.), and compared with that of a standard voltaic cell. If the secondary cell is connected with the galvanometer through a known high resistance R, and if the galvanometer is shunted, that is, has its terminals connected by another resistance S, then if the resistance of the galvanometer itself is denoted by G,

Construction and use.

FIG. 1.—Kelvin Astatic Mirror Galvanometer. Elliott square pattern.

FIG. 2.—Movable Coil Galvanometer.

the whole resistance of the shunted galvanometer and high resistance has a value represented by $R+\frac{GS}{G+S}$, and therefore the current through the galvanometer produced by an electromotive force E of the cell is represented by

$$\frac{SE}{R(G+S)+GS}.$$

Suppose this current produces a deflexion of the needle or coil or spot of light equal to X scale divisions, we can then alter the value of the resistances R and S, and so determine the relation between the deflexion and the current. By the sensitiveness of the

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galvanometer is meant the deflexion produced by a known electromotive force put upon its terminals or a known current sent through it. It is usual to specify the sensitiveness of a mirror galvanometer by requiring a certain deflexion, measured in millimetres, of a spot of light thrown on the scale placed at one metre from the mirror, when an electromotive force of one-millionth of a volt (microvolt) is applied to the terminals of the galvanometer; it may be otherwise expressed by stating the deflexion produced under the same conditions when a current of one microampere is passed through the coil. In modern mirror galvanometers a deflexion of 1 mm. of the spot of light upon a scale at 1 metre distance can be produced by a current as small as one hundred millionth (10^{-8}) or even one ten thousand millionth (10^{-10}) of an ampere. It is easy to produce considerable sensitiveness in the galvanometer, but for practical purposes it must always be controlled by the condition that when a zero remains fixed, that is to say, the galvanometer needle or coil must come back to exactly the same position when no current is passing through the instrument. Other important qualifications of a galvanometer are its time-period and its dead-beatness. For certain purposes the needle or coil should return as quickly as possible to the zero position and with either no, or very few, oscillations. If the latter condition is fulfilled the galvanometer is said to be "dead-beat." On the other hand, for some purposes the galvanometer is required with the opposite quality, that is to say, there must be as little retardation as possible to the needle or coil when set in motion under an impulsive blow. Such a galvanometer is called "ballistic." The quality of a galvanometer in this respect is best estimated by taking the logarithmic decrement of the oscillations when the movable system is set swinging. This last term is defined as the logarithm of the ratio of one swing to the next succeeding swing, and a galvanometer of which the logarithmic decrement is large, is said to be highly damped. For many purposes, as also for resistance measurement, it is desirable to have a galvanometer which is highly damped; this result can be obtained by affixing to the needles either light pieces of mica, when it is a movable needle galvanometer, or by winding the coil on a silver frame when it is a movable coil galvanometer. On the other hand, for the comparison of capacities of condensers and for other purposes, a galvanometer is required which is as little damped as possible, and for this purpose the coil must have the smallest possible frictional resistance in its motion through the air. In this case the moment of inertia of the movable system must be decreased or the control strengthened.

The Einthoven string galvanometer is another form of sensitive instrument for the measurement of small direct currents. It consists of a fine wire or silvered quartz fibre stretched in a strong magnetic field. When a current passes through the wire it is displaced across the field and the displacement is observed with a microscope.

Tangent galvanometer.

For the measurement of large currents a "tangent galvanometer" is employed (fig. 3). Two fixed circular coils are placed apart at a distance equal to the radius of either coil, so that a current passing through them creates in the central region between them a nearly uniform magnetic field. At the centre of the coils is suspended a small magnetic needle the length of which should not be greater than $\frac{1}{10}$ the radius of either coil. The normal position of the needle is at right angles to the line joining the centre of the coils. If a current is passed through the coils, the needle will be deflected, and the tangent of the angle of its deflexion will be nearly proportional to the current passing through the coil, provided that the controlling field is uniform in strength and direction, and that the length of the magnetic needle is so short that the space in which it rotates is a practically uniform magnetic field.

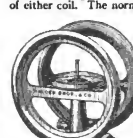

FIG. 3.—Helmholtz Tangent Galvanometer.

Alternating Current Galvanometers.—For the detection of small alternating currents a magnetic needle or suitable coil galvanometer is of no utility. We can, however, construct an instrument suitable for the purpose by suspending within a coil of insulated wire a small needle of soft iron placed with its axis at an angle of 45° to the axis of the coil. When an alternating current passes through the coil the soft iron needle tends to set itself in the direction of the axis of the coil, and if it is suspended by a quartz fibre or metallic wire so as to afford a control, it can be used as a measuring instrument. Another arrangement, devised by J. A. Fleming in 1887, consists of a silver or copper disk suspended within a coil, the plane of the disk being held at 45° to that of the coil. When an alternating current is passed through the coil, induced currents are set up in the disk and the mutual action causes the disk to endeavour to set itself so that these currents are a minimum. This metal disk galvanometer has been made sufficiently sensitive to detect the feeble oscillatory electric currents set up in the receiving wire of a wireless telegraph apparatus. The Duddell thermal ammeter is another very sensitive form of alternating current galvanometer. In it the current to be detected or measured is passed through a high resistance wire or strip of metal leaf mounted on glass, over which is suspended a closed loop of bismuth and antimony, forming a thermo-electric couple. This loop is suspended by a quartz fibre in a strong magnetic field, and one junction of the couple is held just over the resistance wire and as near it as possible without touching. When an alternating current passes through the resistance it creates heat which in turn acts on the thermo-junction and generates a continuous current in the loop, thus deflecting it in the magnetic field. The sensitiveness of such a thermal ammeter can be made sufficiently great to detect a current of a few microamperes.

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GALVESTON, a city and port of entry and the county-seat of Galveston county, Texas, U.S.A., on the Gulf of Mexico, near the N.E. extremity of Galveston Island and at the entrance to Galveston Bay. It is about 48 m. S.E. of Houston and 310 m. W. of New Orleans. Pop. (1890) 29,084; (1900) 37,789, (6339 were foreign-born and 8291 negroes); (1910) 36,981; land area (1906) 7·8 sq. m. It is served by the Galveston, Houston & Henderson, the Galveston, Harrisburg & San Antonio, the Gulf, Colorado & Santa Fé, the Trinity & Brazos Valley, the International & Great Northern, and the Missouri, Kansas & Texas railways, and by numerous steamship lines to Gulf ports in the United States and Mexico, and to Cuba, South America, Europe and the Atlantic ports of the United States. Galveston Island is a low, sandy strip of land about 28 m. long and 1½ to 3½ m. wide, lying from 2 to 3 m. off the mainland. The city, which extends across the island from Gulf to Bay, faces and has its harbour on the latter. The island was connected with the mainland before the 1900 storm by a road bridge and several railway bridges, which, a short distance W. of the city, crossed the narrow strip of water separating the West Bay from Galveston Bay proper; the bridge least harmed (a single-track railway bridge) was repaired immediately and was for a time the city's only connexion with the mainland, but in 1908 bonds were issued for building a concrete causeway, accommodating four railway tracks, one interurban car track, and a roadway for vehicles and pedestrians. An enormous sea-wall (completed in 1904 at a cost of $2,091,000) was constructed on the eastern and Gulf sides of the city, about 5 m. long, 17 ft. above mean low tide (1·5 ft. above the high-water mark of the storm of 1900 and 7·5 ft. above the previous high-water mark, that of September 1875), 16 ft. wide at the base and 5 ft. at the top, weighing 20 tons to the lineal foot, and with a granite rip-rap apron extending out 27 ft. on the Gulf side. The entire grade of the city was raised from 1 to 15 ft. above the old level. Between the sea-wall and the sea there is a splendid beach, the entire length of which is nearly 30 m. Among the principal buildings are the city hall, the court-house, the masonic temple, the Federal custom-house and post-office, the Y.M.C.A. building and the public library. The United States government maintains a marine hospital, a live-saving station, an immigrant landing station, and the state and the Federal government separate quarantine stations. In addition to the Ball public high school, Galveston is the seat of St Mary's University (1854), the Sacred Heart and Ursuline academies, and the Cathedral school, all under Roman Catholic control.

The government of the municipality was long vested in a council of ward aldermen, controlled by a "machine," which was proved corrupt in 1894 by an investigation undertaken at the personal expense of the mayor; it gave place in 1895 to a city council of aldermen at large, which by 1901 had proved its inefficiency especially in the crisis following the storm of the preceding year. Government then seemed a business question and was practically undertaken by the city's commercial experts, the Deepwater commission, whose previous aim had been harbour improvement, and who now drew up a charter providing for government by a board of five appointed by the governor of the state. A compromise measure making three members appointees

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of the governor and two elected by the voters of the city was in force for a time but was declared unconstitutional. A third charter was adopted providing for five commissioners, chosen by the people, dividing among themselves the posts of mayor-president and commissioners of finance and revenue, of water-works and sewerage, of streets and public property, and of police and fire protection, each commissioner being held individually responsible for the management of his department. These are business departments carefully systematized by their heads. The legislative power is vested in the commission as a whole, over whose meetings the mayor-president presides; he has a vote like every other commissioner, and has no veto power. The success of this commission government has been remarkable: in 1901–1908 the city, without issuing bonds except for grade raising, paid off a large debt, raised the salaries of city employees, paid its running expenses in cash, planned and began public improvements and sanitary reforms, and did much for the abolition of gambling and the regulation of other vice. The Galveston Plan and similar schemes of government have been adopted in many other American cities.

Galveston's manufactories, the products of which in 1900 were valued at $5,016,360, a decrease of 12·4% from 1890 (value of products under "factory system," $3,675,323 in 1900; $2,996,654 in 1905, a decrease of 18·5%), include cotton-seed oil refineries, flour and feed mills, lumber mills, wooden-ware factories, breweries, cement works, creosoting works, ship-yards and ice factories. There are extensive cotton warehouses, coal and grain elevators, and large wholesale supply depots. The Gulf Fisheries Company has its fleet's headquarters and large packing-houses at Galveston. It is as a commercial port that Galveston is chiefly important. In 1907 it was the second port in the United States in the value of its exports (domestic and foreign, $196,627,382, or 10·22% of the total), being surpassed only by New York City; and was the first of the Gulf ports (having 45·43% of the total value), New Orleans being second with $164,908,540. Galveston's imports in 1907 were valued at $7,669,458. Galveston is the greatest cotton-exporting port in the Union, its exports of cotton in 1907 being valued at $163,564,445. Other exports of great value are cotton seed products (oil and cake, $10,188,594 in 1907), Indian corn ($3,457,279 in 1907), wheat ($9,443,901 in 1906), lumber and flour. The electric lighting and water-supply systems are owned and operated by the municipality.

The harbour of Galveston seems to have been named about 1782 by Spanish explorers in honour either of José de Galvez, Marquis of Sonora, or his nephew Bernardo, governor of Louisiana; and in the early days of the 19th century was the principal rendezvous of a powerful band of buccaneers and pirates, of whom, for many years, the notorious Jean Lafitte was chief. After much difficulty these were finally dispersed about 1820 by the United States authorities, and in 1837 the first settlement from the United States was made on the site of the present city. The town was incorporated by the legislature of the Republic of Texas in 1839. On the 8th of October 1862 the city was taken by a Federal naval force under Commander William B. Renshaw (1816–1863). After a sharp engagement a Confederate force under General John B. Magruder (1810–1871) retook the city on the 1st of January 1863, one of the Federal ships, the "Harriet Lane," falling into Confederate hands, and another, the "Westfield," being blown up with Commander Renshaw on board. Thereafter Galveston remained in Confederate hands, although rigidly blockaded by the Federal navy, until the close of the war. On the 8th of September 1900 the city was seriously damaged by a West Indian hurricane, which, blowing steadily for eighteen hours, reached a velocity of 135 m. an hour. The waters of the Gulf were piled up in enormous waves that swept across a large part of the city, destroying or badly damaging more than 8000 buildings, entailing a loss of about 5000 lives, and a property loss estimated at about $17,000,000. Liberal contributions came from all over the country, and the state partially remitted the city's taxes for 17 years. The city was rapidly rebuilt on a more substantial plan.

GALWAY, a county in the west of Ireland, in the province of Connaught, bounded N. by Mayo and Roscommon; E. by Roscommon, King's County and Tipperary; S. by Clare and Galway Bay; and W. by the Atlantic Ocean. The area is 1,519,609 acres or about 2375 sq. m., the county being second in size to Cork among the Irish counties.

The county is naturally divided by Lough Corrib into two great divisions. The eastern, which comprehends all the county except the four western baronies, rests on a limestone base, and is, generally speaking, a level champaign country, but contains large quantities of wet bog. Its southern portion is partly a continuation of the Golden Vale of Limerick, celebrated for its fertility, and partly occupied by the Slievebaughty Mountains. The northern portion of the division contains rich pasture and tillage ground, beautifully diversified with hill and dale. Some of the intermediate country is comparatively uncultivated, but forms excellent pasturage for sheep. The western division of the county has a substratum of granite, and is harren, rugged and mountainous. It is divided into the three districts of Connemara, Jar-Connaught and Joyce's Country; the name of Connemara is, however, often applied to the whole district. Its highest mountains are the grand and picturesque group of Bunnabeola, or the Twelve Bens or Pins, which occupy a space of about 25 sq. m., the highest elevation being 2695 ft. Much of this district is a gently sloping plain, from 100 to 300 ft. above sea-level. Joyce's Country, farther north, is an elevated tract, with flat-topped hills 1300 to 2000 ft. high, and deep narrow valleys lying between them.

Galway possesses the advantage of a very extended line of sea-coast, indented by numerous harbours, which, however, are rarely used except by a few coasting and fishing vessels. At the boundary with the county Mayo in the north is Killary Harbour which separates the two counties. The first bay on the western coast capable of accommodating large ships is Ballynakill, sheltered by Freaghillaun or Heath Island. Next in succession is Cleggan Bay. Off these inlets lie the islands of Inishbofin and Inishark, with others. Streamstown is a narrow inlet, within which are the inhabited islands of Omey, Inishturk and Turbot. Ardbear harbour is divided into two inlets, the northern terminating at the town of Clifden, with excellent anchorage; the southern inlet has also good anchorage within the bar, and has a good salmon fishery. Mannin Bay, though large, is much exposed and little frequented by shipping. From Slyne Head the coast turns eastward to Roundstone Bay, which has its entrance protected by the islands of Inishnee and Inishlacken. Next in order is Bertraghboy Bay, studded with islets and rocks, but deep and sheltered. Kilkieran Bay, the largest on this coast, has a most productive kelp shore of nearly 100 m.; its mouth is but 3 m. broad. Between Gorumna Island and the mainland is Greatman's Bay and close to it Costello Bay, the most eastern of those in Connemara. The whole of the coast from Greatman's Bay eastward is comprehended in the Bay of Galway, the entrance of which is protected by the three limestone islands of Aran, Inishmore (or Aranmore), Inishmann and Inisheer.

The rivers are few, and, except the Shannon, of small size. The Suck, which forms the eastern boundary of the county, rises in Roscommon, and passing by Ballinasloe, unites with the Shannon at Shannonbridge. The Shannon forms the south-eastern boundary of the county, and passing Shannon Harbour, Banagher, Meelick and Portumna, swells into the great expanse of water called Lough Derg, which skirts the county as far as the village of Mount Shannon. The Claregalway flows southward through the centre of the county, and enters Lough Corrib some 4 m. above the town of Galway. The Ballynahinch, considered one of the best salmon-fishing rivers in Connaught, rises in the Twelve Pins, passes through Ballynahinch Lake, and after a short but rapid course falls into Bertraghboy Bay. Lakes are numerous. Lough Corrib extends from Galway town northwards over 30,000 acres, with a shore of 50 m. in extent. The lake is studded with many islands, some of them thickly inhabited. The district west of Lough Corrib contains a vast number of lakes, about twenty-five of them more than a mile in length. Lough Rea, by the town of the

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same name, is more remarkable for scenic beauty than for extent. Besides these perennial lakes, there are several low tracts, called turloughs, which are covered with water during a great part of the year. Loughs Mask and Corrib are connected by a salmon ladder, and contain large trout. Galway, with the Screab Waters, draining into Camus Bay, a branch of Kilkieran Bay, with Recess and the Ballynahinch waters, are the best fishing centres. On account of its scenic beauty, both coastal and inland, together with its facilities for sport, county Galway is frequented by summer visitors. Though for long the remoter parts were difficult of access, as in the case of Donegal, Mayo, Clare and the western counties generally, the Galway and Clifden railway assisted private enterprise to open up the country. The western mountains, broken by deep landlocked and island-sheltered bays, as well as by the innumerable small loughs of the Connemara districts, afford scenes varying from gentle slopes occasionally well wooded along the water's edge to wild, bare moorlands among the heights, while the summits are usually bold and rocky cones. Several small fishing villages have acquired the dignity of watering-places from the erection of hotels, which have also been planted in previously untenanted situations of high scenic attractions; among these may be mentioned Leenane at the head of Killary harbour, Renvyle House at its entrance, Letterfrack on Ballynakill Bay, Streamstown and Clifden, and Cashel on Bertraghboy Bay. Inland are Recess, near Lough Derryclare, and Ballynahinch, on the lough of that name, both on the railway, at the foot of the Twelve Pins.

Geology.—The east of this county lies in the Carboniferous Limestone plain, with domes of Old Red Sandstone rising near Dunmore and Mount Bellew. As Galway town is neared, the grey rock appears freely on the surface, and Lough Corrib spreads itself over almost level land. Its west branches, however, run up into "panoradian" hills, which rise abruptly on the threshold of Connemara. A broad mass of ice-worn gneiss and granite lies between Lough Corrib and Galway Bay, cut off so sharply at the sea as to suggest the presence of an east-and-west line of fracture. The Twelve Bens owe their supremacy to the quartzites, which are here well bedded and associated with limestone and mica-schist. Silurian conglomerates and sandstones, with andesitic lavas, overlie the Dalradians, with marked unconformity, south of Leenane and round Lough Nafooey. The surfaces of the hard rocks admirably record the action of ice throughout the county. There is black Carboniferous marble at Menlough near Galway; and the well-known "Connemara Marble" is a banded serpentinous crystalline limestone in the Dalradians at Recess, Ballynahinch and Streamstown. Compact red granite is worked at Shantallow, and the region west of Galway contains many handsome porphyritic red varieties.

Climate and Industries.—The climate is mild and healthy but variable, and violent winds from the west are not uncommon. Frost or snow seldom remains long on the western coast, and cattle of every description continue unhoused during the winter. The eastern part of the county produces the best wheat. Oats are frequently sown after potatoes in moorish soils less adapted for wheat. The flat shores of the bays afford large supplies of seaweed for manure. Limestone, gravel and marl are to be had in most other parts. When a sufficient quantity of manure for potatoes cannot be had, the usual practice is to pare and burn the surface. In such places on the seashore fine early potatoes are raised in deep sea-sand manured with seaweed, and the crop is succeeded by barley. Those parts of the eastern district less fitted for grain are employed in pasturage. Heathy sheep-walks occupy a very large tract between Monivea and Galway. An extensive range from Athenry, stretching to Galway Bay at Kinvarra, is also chiefly occupied by sheep. Over half the total acreage of the county is pasture-land, and cattle, sheep, pigs and poultry are extensively reared. The proportion of tillage to pasturage is roughly as one to four; and owing to the nature of the country fully one-third of the total area is quite barren.

Manufactures are not carried on beyond the demand caused by the domestic consumption of the people. Coarse friezes, flannels and blankets are made in all parts and sold largely in Galway and Loughrea. Connemara has been long celebrated for its hand-knit woollen stockings. Coarse linen, of a narrow breadth, called bandle linen, is also made for home consumption. There is a linen-weaving factory at Oughterard. The manufacture of kelp, formerly a great source of profit on the western shores, is still carried on to some extent. Feathers and sea-fowls' eggs are brought in great quantities from the islands of Aran, the produce of the puffins and other sea-fowl that frequent the cliffs. Fishing affords occupation to many of the inhabitants, the industry having as its centres the ports of Galway and Clifden.

The Midland Great Western main line enters the county at Ballinasloe, and runs by Athenry to Galway, with an extension to Oughterard (Lough Corrib) and Clifden. The Great Southern & Western line from Sligo to Limerick traverses the county from N. to S., by way of Tuam, Athenry and Gort.

Population and Administration.—The population of county Galway (211,277 in 1891; 192,549 in 1901) decreased by more than half in the last seventy years of the 19th century, and the decrease continues, as emigration is heavy. About 97% of the population are Roman Catholics, and a somewhat less percentage are rural. The Erse tongue is maintained by many in this remote county. The chief towns are Galway (pop. 13,426), Tuam (3012), Ballinasloe (4904) and Loughrea (2815), with the smaller towns of Portumna, Gort, Clifden, Athenry, Headford, Oughterard and Eyrecourt. The county is divided into four parliamentary divisions (returning one member each); north, south, east and Connemara, while the town of Galway returns one member. There are eighteen baronies. Assizes are held at Galway, quarter-sessions at Galway, Ballinasloe, Clifden, Gort, Loughrea, Oughterard, Portumna and Tuam. The county comprises parts of the Protestant dioceses of Tuam and of Killaloe; and of the Roman Catholic dioceses of Elphin, Galway, Clonfert and Killaloe.

History.—The history of county Galway is exceedingly obscure, and nearly every one of its striking physical features carries its legend with it. For centuries local septs struggled together for mastery undeterred by outside influence. The wreck of part of the Spanish Armada on this coast in 1588 left survivors whose influence is still to be traced. The formation of Galway into a county was effected about 1570 by Sir Henry Sydney, lord deputy of Ireland. In the county at Aughrim (*q.v.*) the decisive battle of the English Revolution was fought in 1691. Among the antiquities are several round towers. The only perfect one is at Kilmacduagh, a very fine example 112 ft. high, leaning considerably out of the perpendicular. Raths or encampments are numerous and several cromlechs are to be seen in good preservation. The ruins of monastic buildings are also numerous. That of Knockmoy, about 6 m. from Tuam, said to have been founded in 1180 by Cathal O'Connor, was adorned with rude fresco paintings, still discernible, which were considered valuable as being the best authentic representations existing of ancient Irish costumes. Ancient castles and square towers of the Anglo-Norman settlers are frequently met with; some have been kept in repair, but the greater number are in ruins. The castle of Tuam, built in 1161 by Roderick O'Connor, king of Ireland, at the period of the English invasion, is said to have been the first building of this description of stone and mortar in Ireland. The remains of a round castle, a form of building very uncommon in the military architecture of the country, are to be seen between Gort and Kilmacduagh. The extraordinary cyclopean and monastic ruins on the Aran Islands (*q.v.*) must be mentioned; and the town of Galway, Athenry, and the neighbourhood of Ballinasloe all show interesting remains. The small church of Clonfert, in the south of the county, with a fine Romanesque doorway, is a cathedral, the diocese of which was united with Kilfenora, Kilmacduagh and Killaloe in 1833.

GALWAY, a seaport, parliamentary borough and the county town of county Galway, Ireland, on the north shore of Galway Bay, and on the main line of the Midland Great Western railway. Pop. of urban district (1901) 13,426. Some of the streets are very narrow, and contain curious specimens of old buildings, chiefly in antique Spanish style, being square, with a central court, and a gateway opening into the street. The most noteworthy of these is the pile known as Lynch's Castle. This residence takes its name from the family of whom James Lynch Fitzstephen, mayor of Galway in 1493, was a member; whose severity as a magistrate is exemplified in the story that he executed his own son, and thus gave origin (according to one of several theories) to the familiar term of Lynch law. The principal streets are broad and contain good shops. St Nicholas church is a fine cruciform building founded in 1320, and containing monuments, and a bell, one of a peal, which appears to have been brought from Cavron in France, but how this happened is not known. The church was made collegiate in 1484, and Edward VI. created the Royal College of Galway in connexion with it;

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but the old college buildings no longer serve this purpose, and the church ceased to be collegiate in 1840. There are remains of a Franciscan friary founded in 1296. St Augustine's church (Roman Catholic) is modern (1859). The town is the seat of a Roman Catholic diocese. There are grammar, model and industrial schools, the first with exhibitions to Trinity College, Dublin; but the principal educational establishment is University College, a quadrangular building in Tudor Gothic style, of grey limestone. It was founded as Queen's College, with other colleges of the same name at Belfast and Cork, under an act of 1845, and its name was changed when it was granted a new charter pursuant to the Irish Universities Act 1908. The harbour comprises an extensive line of quays, and is connected for inland navigation with Lough Corrib. The shipping trade is considerable, but as a trans-Atlantic port Galway was exploited unsuccessfully. The fisheries, both sea and salmon, are important. The chief exports are wool, agricultural produce and black marble, which is polished in local mills. Other industrial establishments include corn-mills, iron-foundries, distilleries, and brush and bag factories. The borough, which returned two members to parliament until 1885, now returns one.

Galway is divided into the old and new towns, while a suburb known as the Claddagh is inhabited by fishermen. This is a curious collection of small cottages, where communal government by a locally elected mayor long prevailed, together with peculiar laws and customs, strictly exclusive inter-marriage, and a high moral and religious standard. Specimens of the distinctive Claddagh ring, for example, were worn and treasured as venerated heirlooms. These customs, with the distinctive dress of the women, died out but slowly, and even to-day their vestiges remain.

The environs of Galway are pleasant, with several handsome residences. The most interesting point in the vicinity is Roscam, with its round tower, ruined church and other remains. Salthill, with golf links, is a waterside residential suburb.

Little is known of the history of Galway until after the arrival of the English, at which time it was under the protection of O'Flaherty, who possessed the adjoining district to the west. On the extinction of the native dynasty of the O'Connors, the town fell into the hands of the De Burgos, the head of a branch of which, under the name of M'William Eighter, long governed it by magistrates of his own appointment. After it had been secured by walls, which began to be built about 1270 and are still in part traceable, it became the residence of a number of enterprising settlers, through whom it attained a position of much commercial celebrity. Of these settlers the principal families, fourteen in number, were known as the tribes of Galway. They were of Norman, Saxon or Welsh descent, and became so exclusive in their relationships that dispensations were frequently requisite for the canonical legality of marriages among them. The town rapidly increased from this period in wealth and commercial rank, far surpassing in this respect the rival city of Limerick. Richard II. granted it a charter of incorporation with liberal privileges, which was confirmed by his successor. It had the right of coinage by act of parliament, but there is no evidence to show that it exercised the privilege. Another charter, granted in 1545, extended the jurisdiction of the port to the islands of Aran, permitted the exportation of all kinds of goods except linens and woollens, and confirmed all the former privileges. Large numbers of Cromwell's soldiers are said to have settled in the town; and there are many traces of Spanish blood among the population. Its municipal privileges were extended by a charter from James I., whereby the town, and a district of two miles round in every direction, were formed into a distinct county, with exclusive jurisdiction and a right of choosing its own magistrates. During the civil wars of 1641 the town took part with the Irish, and was surrendered to the Parliamentary forces under Sir Charles Coote; after which the ancient inhabitants were mostly driven out, and their property was given to adventurers and soldiers, chiefly from England. On the accession of James II. the old inhabitants entertained sanguine hopes of recovering their former rights. But the successes of King William soon put an end to their expectations; and the town, after undergoing another siege, again capitulated to the force brought against it by General Ginkell.

GAMA, VASCO DA (*c.* 1460–1524), Portuguese navigator and discoverer of the sea-route to India, was born at Sines, a small seaport in the province of Alemtejo. Of da Gama's early history little is known. His descent, according to the *Nobiliario* of Antonio de Lima, was derived from a noble family which is mentioned in the year 1166; but the line cannot be traced without interruption farther back than the year 1280, to one Alvaro da Gama, from whom was descended Estevão da Gama, civil governor of Sines, whose third son Vasco was born probably about the year 1460. In that year died Prince Henry the Navigator, to whose intelligence and foresight must be traced back all the fame that Portugal gained on the seas in the 15th and 16th centuries. Explorers sent out at his instigation discovered the Azores and unknown regions on the African coast, whence continually came reports of a great monarch, "who lived east of Benin, 350 leagues in the interior, and who held both temporal and spiritual dominion over all the neighbouring kings," a story which tallied so remarkably with the accounts of "Prester John" which had been brought to the Peninsula by Abyssinian priests, that John II. of Portugal steadfastly resolved that both by sea and by land the attempt should be made to reach the country of this potentate. For this purpose Pedro de Covilham and Affonso de Payva were despatched eastward by land; while Bartholomeu Diaz (*q.v.*), in command of two vessels, was sent westward by sea (see ABYSSINIA, 14). That there was in truth an ocean highway to the East was proved by Diaz, who returned in December 1488 with the report that when sailing southward he was carried far to the east by a succession of fierce storms, past—as he discovered only on his return voyage—what he ascertained to be the southern extremity of the African continent. The condition of John's health and concerns of state, however, prevented the fitting out of the intended expedition; and it was not till nine years later, when Emanuel I. had succeeded to the throne, that the preparations for this great voyage were completed—hastened, doubtless, by Columbus's discovery of America in the meanwhile.

For the supreme command of this expedition the king selected Vasco da Gama, who had in his youth fought in the wars against Castile, and in his riper years gained distinction as an intrepid mariner. The fleet, consisting of four vessels specially built for this mission, sailed down the Tagus on the 9th of July 1497, after prayers and confession made by the officers and crews in a small chapel on the site where now stands the church of S. Maria de Belem (see LISBON), afterwards built to commemorate the event. Four months later the flotilla cast anchor in St Helena Bay, South Africa, rounded the Cape in safety, and in the beginning of the next year reached Malindi, on the east coast of Africa. Thence, steering eastward, under the direction of a pilot obtained from Indian merchants met with at this port, da Gama arrived at Calicut, on the Malabar coast, on the 20th May 1498, and set up, according to the custom of his country, a marble pillar as a mark of conquest and a proof of his discovery of India. His reception by the zamorin, or Hindu ruler of Calicut, would have in all probability been favourable enough, had it not been for the jealousy of the Mahommedan traders who, fearing for their gains, so incited the Hindus against the new-comers that da Gama was unable to establish a Portuguese factory. Having seen enough of India to assure him of its great resources, he returned to Portugal in September 1499. The king received him with every mark of distinction, granted him the use of the prefix *Dom*, thus elevating him to the rank of an untitled noble, and conferred on him pensions and other property. In prosecution of da Gama's discoveries another fleet of thirteen ships was immediately sent out to India under Pedro Alvares Cabral, who, in sailing too far westward, by accident discovered Brazil, and on reaching his destination established a factory at Calicut. The natives, again instigated by the Mahommedan merchants, rose up in arms and murdered all whom Cabral had left behind. To avenge this outrage a powerful armament of ten ships was fitted out at Lisbon, the command of which was at first given to

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Cabral, but was afterwards transferred to da Gama, who received the title admiral of India (January 1502). A few weeks later the fleet sailed, and on reaching Calicut da Gama immediately bombarded the town, treating its inhabitants with a savagery too horrible to describe. From Calicut he proceeded in November to Cochin, "doing all the harm he could on the way to all that he found at sea," and having made favourable trading terms with it and with other towns on the coast, he returned to Lisbon in September 1503, with richly laden ships. He and his captains were welcomed with great rejoicings and he received additional privileges and revenues.

Soon after his return da Gama retired to his residence in Evora, possibly from pique at not obtaining so high rewards as he expected, but more probably in order to enjoy the wealth and position which he had acquired; for he was now one of the richest men in the kingdom. He had married, probably in 1500, a lady of good family, named Catherina de Ataide, by whom he had six sons. According to Correa, he continued to advise King Emanuel I. on matters connected with India and maritime policy up to 1505, and there are extant twelve documents dated 1507–1522 which prove that he continued to enjoy the royal favour. The most important of these is a grant dated December 1519 by which Vasco da Gama was created count of Vidigueira, with the extraordinary privileges of civil and criminal jurisdiction and ecclesiastical patronage. During this time the Portuguese conquests increased in the East, and were presided over by successive viceroys. The fifth of these was so unfortunate that da Gama was recalled from his seclusion by Emanuel's successor, John III., and nominated viceroy of India, an honour which in April 1524 he left Lisbon to assume. Arriving at Goa during September of the same year, he immediately set himself to correct with vigour the many abuses which had crept in under the rule of his predecessors. He was not destined, however, to prosecute far the reforms he had inaugurated, for, on the Christmas-eve following his arrival, he died at Cochin after a short illness, and was buried in the Franciscan monastery there. In 1538 his body was conveyed to Portugal and entombed in the town of Vidigueira. In 1880 what were supposed on insufficient evidence to have been his remains were transferred to the church of Santa Maria de Belem. His voyage had the immediate result of enriching Portugal, and raising her to one of the foremost places among the nations of Europe, and eventually the far greater one of bringing to pass the colonization of the East by opening its commerce to the Western world.

BIBLIOGRAPHY.—*Vasco da Gama's First Voyage*, by Dr E. Ravenstein (London, Hakluyt Society, 1898), is a translation with notes, &c., of the anonymous *Roteiro* (Journal or Itinerary), written by one of Vasco da Gama's subordinates who sailed on board the "S. Raphael," which was commanded by the admiral's brother Paulo da Gama. This is the most important of the original authorities; five accounts of the voyage in letters contemporary with it are appended to the Hakluyt Society's translation. See also J. de Barros, *Decadas da India* (Lisbon, 1778–1788, written *c.* 1540); F. L. de Castanheda, *Historia do descobrimento da India* (Coimbra, 1551, largely based on the *Roteiro*); *The Three Voyages of Vasco da Gama and his Viceroyalty*, by Gaspar Correa (Hakluyt Society, 1869), chiefly valuable for the events of 1524; *The Lusiads* of Camoens, the central incident in which is Vasco da Gama's first voyage; *Calcoen* (*i.e. Calicut*), *a Dutch Narrative of the Second Voyage of Vasco da Gama*, written by some unknown seaman of the expedition, printed at Antwerp about 1504, reprinted in fac-simile, with introduction and translation, by J. Ph. Berjeau (London, 1874); Thomé Lopes, narrative (1502) in vol. i. of Ramusio.

GAMALIEL (גמליאל). This name, which in Old Testament times figures only as that of a prince of the tribe of Manasseh (*vide* Num. i. 10, &c.), was hereditary among the descendants of Hillel. Six persons bearing the name are known.

1. GAMALIEL I., a grandson of Hillel, and like him designated Ha-Zāqēn (the Elder), by which is apparently indicated that he was numbered among the Sanhedrin, the high council of Jerusalem. According to the tradition of the schools of Palestine Gamaliel succeeded his grandfather and his father (of the latter nothing is known but his name, Simeon) as *Nasi*, or president of the Sanhedrin. Even if this tradition does not correspond with historic fact, it is at any rate certain that Gamaliel took a leading position in the Sanhedrin, and enjoyed the highest repute as an authority on the subject of knowledge of the Law and in the interpretation of the Scriptures. He was the first to whose name was prefixed the title Rabban (Master, Teacher). It is related in the Acts of the Apostles (v. 34 et seq.) that his voice was uplifted in the Sanhedrin in favour of the disciples of Jesus who were threatened with death, and on this occasion he is designated as a Pharisee and as being "had in reputation among all the people" (νομοδιδάσκαλος τίμιος παντὶ τῷ λαῷ). In the Mishna (*Giṭṭin* iv. 1-3) he is spoken of as the author of certain legal ordinances affecting the welfare of the community (the expression in the original is "*iṣṣqqun ha-'Olām*," *i.e.* improvement of the world) and regulating certain questions as to conjugal rights. In the tradition was also preserved the text of the epistles regarding the insertion of the intercalary month, which he sent to the inhabitants of Galilee and the Darom (*i.e.* southern Palestine) and to the Jews of the Dispersion (Sanhedrin *11b* and elsewhere). He figures in two anecdotes as the religious adviser of the king and queen, *i.e.* Agrippa I. and his wife Cypris (Pesahim 88 *b*). His function as a teacher is proved by the fact that the Apostle Paul boasts of having sat at the feet of Gamaliel (Acts. xxii. 3). Of his teaching, beyond the saying preserved in Aboth i. 16, which enjoins the duty of study and of scrupulousness in the observance of religious ordinances, only a very remarkable characterization of the different natures of the scholars remains (Aboth di R. Nathan, ch. xl.). His renown in later days is summed up in the words (Mishna, end of Soṭah): "When Rabban Gamaliel the Elder died, regard for the Torah (the study of the Law) ceased, and purity and piety died." As Gamaliel I. is the only Jewish scribe whose name is mentioned in the New Testament he became a subject of Christian legend, and a monk of the 12th century (Hermann the Premonstratensian) relates how he met Jews in Worms studying Gamaliel's commentary on the Old Testament, thereby most probably meaning the Talmud.

2. GAMALIEL II., the son of Simon ben Gamaliel, one of Jerusalem's foremost men in the war against the Romans (*vide* Josephus, *Bellum Jud.* iv. 3, 9, *Vita* 38), and grandson of Gamaliel I. To distinguish him from the latter he is also called Gamaliel of Jabneh. In Jabneh (Jamnia), where during the siege of Jerusalem the scribes of the school of Hillel had taken refuge by permission of Vespasian, a new centre of Judaism arose under the leadership of the aged Johanan ben Zakkai, a school whose members inherited the authority of the Sanhedrin of Jerusalem. Gamaliel II. became Johanan ben Zakkai's successor, and rendered immense service in the strengthening and reintegration of Judaism, which had been deprived of its former basis by the destruction of the Temple and by the entire loss of its political autonomy. He put an end to the division which had arisen between the spiritual leaders of Palestinian Judaism by the separation of the scribes into the two schools called respectively after Hillel and Shammai, and took care to enforce his own authority as the president of the chief legal assembly of Judaism with energy and often with severity. He did this, as he himself said, not for his own honour nor for that of his family, but in order that disunion should not prevail in Israel. Gamaliel's position was recognized by the Roman government also. Towards the end of Domitian's reign (*c* A. D. 95) he went to Rome in company with the most prominent members of the school of Jabneh, in order to avert a danger threatening the Jews from the action of the terrible emperor. Many interesting particulars have been given regarding the journey of these learned men to Rome and their sojourn there. The impression made by the capital of the world upon Gamaliel and his companions was an overpowering one, and they wept when they thought of Jerusalem in ruins. In Rome, as at home, Gamaliel often had occasion to defend Judaism in polemical discussions with pagans, and also with professed Christians. In an anecdote regarding a suit which Gamaliel was prosecuting before a Christian judge, a converted Jew, he appeals to the Gospel and to the words of Jesus in Matt. v. 17 (Shabbath *116 a*, *b*). Gamaliel devoted special attention to the regulation of the rite of prayer, which after the

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cessation of sacrificial worship had become all-important. He gave the principal prayer, consisting of eighteen benedictions, its final revision, and declared it every Israelite's duty to recite it three times daily. He was on friendly terms with many who were not Jews, and was so warmly devoted to his slave Tabi that when the latter died he mourned for him as for a beloved member of his own family. He loved discussing the sense of single portions of the Bible with other scholars, and made many fine expositions of the text. With the words of Deut. xiii. 18 he associated the lesson: "So long as thou thyself art merciful, God will also be merciful to thee." Gamaliel died before the insurrections under Trajan had brought fresh unrest into Palestine. At his funeral obsequies the celebrated proselyte Aquila (Akylas Onkelos), reviving an ancient custom, burned costly materials to the value of seventy minae. Gamaliel himself had given directions that his body was to be wrapped in the simplest possible shroud. By this he wished to check the extravagance which had become associated with arrangements for the disposal of the dead, and his end was attained; for his example became the rule, and it also became the custom to commemorate him in the words of consolation addressed to the mourners (Kethub. 8 *b*). Gamaliel's son, Simon, long after his father's death, and after the persecutions under Hadrian, inherited his office, which thenceforward his descendants handed on from father to son.

3. GAMALIEL III., son of Jehuda I. the redactor of the Mishna, and his successor as *Nasi* (patriarch). The redaction of the Mishna was completed under him, and some of his sayings are incorporated therein (Aboth ii. 2-4). One of these runs as follows: "Beware of those in power, for they permit men to approach them only for their own uses; they behave as friends when it is for their advantage, but they do not stand by a man when he is in need." Evidently this was directed against the self-seeking of the Roman government. Gamaliel III. lived during the first half of the 3rd century.

4. GAMALIEL IV., grandson of the above, patriarch in the latter half of the 3rd century: about him very little is known.

5. GAMALIEL V., son and successor of the patriarch Hillel II.: beyond his name nothing is known of him. He lived in the latter half of the 4th century. He is the patriarch Gamaliel whom Jerome mentions in his letter to Pamachius, written in 393.

6. GAMALIEL VI., grandson of the above, the last of the patriarchs, died in 425. With him expired the office, which had already been robbed of its privileges by a decree of the emperors Honorius and Theodosius II. (dated the 17th of October 415). Gamaliel VI. was also a physician, and a celebrated remedy of his is mentioned by his contemporary Marcellus (*De Medicamentis*, liber 21).

(W. BA.)

GAMBETTA, LÉON (1838–1882), French statesman, was born at Cahors on the 2nd of April 1838. His father, a Genoese, who had established himself as a grocer and had married a French-woman named Massabie, is said to have been his son's prototype in vigour and fluency of speech. In his sixteenth year young Gambetta lost by an accident the sight of his left eye, which eventually had to be removed. Notwithstanding this privation, he highly distinguished himself at the public school of Cahors, and in 1857 proceeded to Paris to study law. His southern vehemence gave him great influence among the students of the Quartier Latin, and he was soon known as an inveterate enemy of the imperial government. He was called to the bar in 1859, but, although contributing to a Liberal review, edited by Challemel Lacour, did not make much way until, on the 17th of November 1868, he was selected to defend the journalist Delescluze, prosecuted for having promoted the erection of a monument to the representative Baudin, who was killed in resisting the *coup d'état* of 1851. Gambetta seized his opportunity and assailed both the *coup d'état* and the government with an eloquence of invective which made him immediately famous.

In May 1869 he was returned to the Assembly, both by the first circumscription of Paris and by Marseilles, defeating Hippolyte Carnot for the former constituency and Thiers and Lesseps for the latter. He elected to sit for Marseilles, and lost no opportunity of attacking the Empire in the Assembly. He was at first opposed to the war with Germany, but when satisfied that it had been forced upon France he did not, like some of his colleagues, refuse to vote supplies, but took the patriotic line of supporting the flag. When the news of the disaster at Sedan reached Paris, Gambetta called for strong measures. He himself proclaimed the fall of the emperor at the *corps législatif*, and the establishment of a republic at the hôtel de ville. He was one of the first members of the new government of national defence, becoming minister of the interior. He advised his colleagues to leave Paris and conduct the government from some provincial city. This advice was rejected from dread of another revolution in Paris, and a delegation to organize resistance in the provinces was despatched to Tours, but when this was seen to be inefficient Gambetta himself (7th October) quitted Paris in a balloon, and upon arriving at Tours took the supreme direction of affairs as minister of the interior and of war. Aided by M. de Freycinet, then a young officer of engineers, as his assistant secretary of war, he displayed prodigies of energy and intelligence. He speedily organized an army, which might possibly have effected the relief of Paris if Metz had held out, but the surrender of Bazaine brought the army of the crown prince into the field, and success was impossible. After the defeats of the French near Orleans early in December the seat of government had to be transferred to Bordeaux, and when Paris surrendered at the end of January, Gambetta, though resisting and protesting, was compelled to submit to the capitulation concluded with Prince Bismarck. He immediately resigned his office. Elected by nine departments to the National Assembly meeting at Bordeaux (on the 12th of March 1871) he chose to sit for Strassburg, which by the terms of the treaty about to be submitted to the Assembly for ratification was to be ceded to Prussia, and when the treaty was adopted he resigned in protest and retired to Spain.

He returned to France in June, was elected by three departments in July, and commenced an agitation for the definitive establishment of the Republic. On the 5th of November 1871 he established a journal, *La République française*, which soon became the most influential in France. His orations at public meetings were more effective than those delivered in the Assembly, especially that made at Bordeaux on his return, and that at Grenoble on the 26th of November 1872, in which he spoke of political power having passed to *les nouvelles couches sociales*. When Thiers, however, fell from power in May 1873, and a Royalist was placed at the head of the government in the person of Marshal MacMahon, Gambetta gave proof of his statesmanship by unceasingly urging his friends to a moderate course, and by his tact and parliamentary dexterity, no less than by his eloquence, he was mainly instrumental in the voting of the constitution in February 1875. This policy he continued during the early days of the now consolidated Republic, and gave it the appropriate name of "opportunism." It was not until the 4th of May 1877, when the peril from reactionary intrigues was notorious, and the clerical party had begun a campaign for the restoration of the temporal power of the pope, that he delivered his famous speech denouncing "clericalism" as "the enemy." On the 16th of May Marshal MacMahon, in order to support the clerical reactionaries, perpetrated his parliamentary *coup d'état*, and on the 15th of August Gambetta, in a speech at Lille, gave him the alternative *se soumettre ou se démettre*. He then undertook a political campaign to rouse the republican party throughout France, which culminated in a speech at Romans (September 18, 1878) formulating its programme. MacMahon, equally unwilling to resign or to provoke civil war, had no choice but to dismiss his advisers and form a moderate republican ministry under the premiership of Dufaure.

When the resignation of the Dufaure cabinet brought about the abdication of Marshal MacMahon, Gambetta declined to become a candidate for the presidency, but gave his support to Grévy; nor did he attempt to form a ministry, but accepted the office of president of the chamber of deputies (January 1879). This position, which he filled with much ability, did not prevent his occasionally descending from the presidential chair to make speeches, one of which, advocating an amnesty to the

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communards, was especially memorable. Although he really directed the policy of the various ministries, he evidently thought that the time was not ripe for asserting openly his own claims to direct the policy of the Republic, and seemed inclined to observe a neutral attitude as far as possible; but events hurried him on, and early in 1881 he placed himself at the head of a movement for restoring *scrutin de liste*, or the system by which deputies are returned by the entire department which they represent, so that each elector votes for several representatives at once, in place of *scrutin d'arrondissement*, the system of small constituencies, giving one member to each district and one vote to each elector. A bill to re-establish *scrutin de liste* was passed by the Assembly on 19th May 1881, but rejected by the Senate on the 19th of June.

But this personal rebuff could not alter the fact that in the country his was the name which was on the lips of the voters at the election. His supporters were in a large majority, and on the reassembling of the chamber, the Ferry cabinet quickly resigned. Gambetta was unwillingly entrusted by Grévy on the 14th of November 1881 with the formation of a ministry—known as *Le Grand Ministère*. He now experienced the Nemesis of his over-cautious system of abstinence from office for fear of compromising his popularity. Every one suspected him of aiming at a dictatorship; attacks, not the less formidable for their injustice, were directed against him from all sides, and his cabinet fell on the 26th of January 1882, after an existence of only sixty-six days. Had he remained in office his declarations leave no doubt that he would have cultivated the British alliance and co-operated with Great Britain in Egypt; and when the Freycinet administration, which succeeded, shrank from that enterprise only to see it undertaken with signal success by England alone, Gambetta's foresight was quickly justified. His fortunes were presenting a most interesting problem when, on the 31st of December 1882, at his house in Ville d'Avray, near Sèvres, he died by a shot from a revolver which accidentally went off. Then all France awoke to a sense of her obligation to him, and his public funeral on the 6th of January 1883 evoked one of the most overwhelming displays of national sentiment ever witnessed on a similar occasion.

Gambetta rendered France three inestimable services: by preserving her self-respect through the gallantry of the resistance he organized during the German War, by his tact in persuading extreme partisans to accept a moderate Republic, and by his energy in overcoming the usurpation attempted by the advisers of Marshal MacMahon. His death, at the early age of forty-four, cut short a career which had given promise of still greater things, for he had real statesmanship in his conceptions of the future of his country, and he had an eloquence which would have been potent in the education of his supporters. The romance of his life was his connexion with Léonie Léon (d. 1906), the full details of which were not known to the public till her death. This lady, with whom Gambetta fell in love in 1871, was the daughter of a French artillery officer. She became his mistress, and the *liaison* lasted till he died. Gambetta himself constantly urged her to marry him during this period, but she always refused, fearing to compromise his career; she remained, however, his confidante and intimate adviser in all his political plans. It is understood that at last she had just consented to become his wife, and the date of the marriage had been fixed, when the accident which caused his death occurred in her presence. Contradictory accounts have indeed been given as to this fatal episode, but that it was accidental, and not suicide, is certain. On Gambetta the influence of Léonie was absorbing, both as lover and as politician, and the correspondence which has been published shows how much he depended upon her. But in various matters of detail the serious student of political history must be cautious in accepting her later recollections, some of which have been embodied in the writings of M. Francis Laur, such as that an actual interview took place in 1878 between Gambetta and Bismarck. That Gambetta after 1875 felt strongly that the relations between France and Germany might be improved, and that he made it his object, by travelling incognito, to become better acquainted with Germany and the adjoining states, may be accepted, but M. Laur appears to have exaggerated the extent to which any actual negotiations took place. On the other hand, the increased knowledge of Gambetta's attitude towards European politics which later information has supplied confirms the view that in him France lost prematurely a master mind, whom she could ill spare. In April 1905 a monument by Dalou to his memory at Bordeaux was unveiled by President Loubet.

Gambetta's *Discours et plaidoyers politiques* were published by J. Reinach in 11 vols. (Paris, 1881–1886); his *Dépêches, circulaires, décrets . . .* in 2 vols. (Paris, 1886–1891). Many biographies have appeared. The principal are J. Reinach, *Léon Gambetta* (1884), *Gambetta orateur* (1884) and *Le Ministère Gambetta, histoire et doctrine* (1884); Neucastel, *Gambetta, sa vie, et ses idées politiques* (1885); J. Hanlon, *Gambetta* (London, 1881); Dr Laborde, *Léon Gambetta biographie psychologique* (1898); P. B. Gheusi, *Gambetta, Life and Letters* (Eng. trans. by V. M. Montagu, 1910). See also G. Hanotaux, *Histoire de la France contemporaine* (1903, &c.). F. Laur's *Le Cœur de Gambetta* (1907, Eng. trans., 1908) contains the correspondence with Léonie Léon; see also his articles on "Gambetta and Bismarck" in *The Times* of August 17 and 19, 1907, with the correspondence arising from them. (H. Ch.)

GAMBIA, an important river of West Africa, and the only river of Africa navigable by ocean-going boats at all seasons for over 200 m. from its mouth. It rises in about 11° 25′ N. and 12° 15′ W., within 150 m. of the sea on the north-eastern escarpment of the Futa Jallon highlands, the massif where also rise the head streams of the Senegal and some of the Niger tributaries, besides the Rio Grande and many other rivers flowing direct to the Gulf of Guinea. The Gambia, especially in its lower course, is very serpentine, and although the distance from the source to the mouth of the river is little more than 300 m. in a direct line, the total length of the stream is about 1000 m. It flows first N.N.E., receiving many left-hand tributaries, but about 12° 35′ N. takes a sharp bend N.W. and maintains this direction until it leaves the fertile and hilly region of Bondu. The descent to the lower district is marked by the Barraconda rapids, formed by a ledge of rock stretching across the river. Between 30 and 50 m. above the falls the Gambia is joined by two considerable affluents, the Nieriko from the north and the Kuluntu or Grey river from the south. From the Barraconda rapids to the Atlantic the Gambia has a course of about 350 m. Throughout this distance the waters are tidal, and the river is navigable all the year round by boats drawing 6 ft. of water. At Yarbatenda, a few miles below Barraconda, the river has a breadth, even at the dry season, of over 300 ft., with a depth of 13 to 20 ft. From the falls to McCarthy's Island, a distance of 200 m., the river valley, which here presents a park-like appearance, is enclosed by low rocky hills of volcanic character. For 50 m. below the island, where the stream is about 800 yds. wide, the banks of the river are steep and thickly wooded. They then become low and are fringed with mangrove swamps. From Devil's Point, a sharp promontory on the north bank—up to which place the water is salt—the river widens considerably and enters the Atlantic, in about 13½° N. and 16½° W., by a broad estuary. Near the mouth of the river on the south side is St Mary's Island (3½ m. long by 1½ broad), and opposite on the north bank is Barra Point, the river being here contracted to 2½ m. Eighteen miles lower down the distance from shore to shore is 27 m. There is a sand-bar at the entrance to the river, but at the lowest state of the tide there are 26 ft. of water over the bar. The Gambia is in flood from November to June, when the Barraconda rapids are navigable by small boats. Above the rapids the stream is navigable for 160 m. Politically the Gambia is divided between Great Britain and France—Britain possessing both banks of the river up to, but not including, Yarbatenda.

The Gambia was one of the rivers passed by Hanno the Carthaginian in his famous voyage along the west coast of Africa. It was known to Ptolemy and the Arabian geographers, and was at one time supposed to be a mouth of the Nile, and, later (18th century), a branch of the Niger. It was possibly visited by Genoese navigators in 1291, and was certainly discovered by the Portuguese *c.* 1446, but was first explored for any distance from its mouth (1455) by the Venetian Alvise Cadamosto

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(*q.v.*), who published an account of his travels at Vicenza in 1507 (*La Prima Navigatione per l'Oceano alle terre de' Negri della Bassa Ethiopia*). Afterwards the Gambia became a starting-place for explorers of the interior, among them Mungo Park, who began both his journeys (1795 and 1805) from this river. It was not until 1818 that the sources of the Gambia were reached, the discovery being made by a Frenchman, Gaspard Mollien, who had travelled by way of the Senegal and Bondu. The middle course of the river was explored in 1851 by R. G. MacDonnell, then governor of the Gambia colony, and in 1881 Dr V. S. Gouldsbury also navigated its middle course. No native craft of any kind was seen above Barraconda. The more correct name of the river is Gambra, and it is so called in old books of travel.

See Mungo Park's *Travels* (London, 1799); G. Mollien, *Travels . . . to the Sources of the Senegal and Gambia . . .*, edited by T. E. Bowdich (London, 1820); the account of Dr Gouldsbury's journey in the Blue Book C 3065 (1881); also under the country heading below.

GAMBIA, the most northerly of the British West African dependencies. It consists of a stretch of land on both sides of the lower Gambia. The colony, with the protectorate dependent upon it, has an area of about 4000 sq. m. and a population officially estimated (1907) at 163,000. The colony proper (including St Mary's Island, British Kommbo, the Ceded Mile, McCarthy's Island and other islets) has an area of about 69 sq. m. The protectorate consists of a strip of land extending ten kilometres (about 6 m.) on each side of the river to a distance of about 200 m. in a direct line from the sea. The land outside these limits is French. Within the protectorate are various petty kingdoms, such as Barra, to the north of the Gambia, and Kommbo, to the south. The breadth of the colony near the coast is somewhat greater than it is higher up. The greatest breadth is 39 m.

Physical Features, Fauna and Flora.—The colony, as its name implies, derives its character and value from the river Gambia (*q.v.*), which is navigable throughout and beyond the limits of the colony, while large ocean-going ships can always cross the bar at its mouth and enter the port of Bathurst. Away from the swamps by the river banks, the country is largely open above McCarthy's Island is hilly. Much of the land is cleared for cultivation. The fauna includes lions, leopards, several kinds of deer, monkeys, bush-cow and wild boar. Hippopotami are found in the upper part of the river, and crocodiles abound in the creeks. The birds most common are bush-fowl, bustards, guinea-fowl, quail, pigeon and sand-grouse. Bees are very numerous in parts of the country. The flora resembles that of West Africa generally, the mangrove being common. Mahogany and rosewood (*Pterocarpus erinaceus*) trees are found, though not in large numbers, and the rubber-vine and oil-palm are also comparatively scarce. There are many varieties of fern. The cassava (manioca) and indigo plants are indigenous.

Climate.—The climate during the dry season (November–June) is the best on the British West African coast, and the Gambia is then considered fairly healthy. Measures for the extermination of the malarial mosquito are carried on with good effect. The mean temperature at Bathurst is 77° F., the shade minimum being 56° and the solar maximum 165°. Upriver the variation in temperature is even greater than at Bathurst, from 50° in the morning to 100°-104° at 3 P.M. being common at McCarthy's Isle. The average rainfall is about 50 in. a year, but save for showers in May and June there is rarely any rain except between July and October. The first instance of rain in December in twenty-six years was recorded in 1906. The dry east wind known as the harmattan blows intermittently from December to March.

Inhabitants.—The inhabitants, who are both thrifty and industrious, are almost entirely of Negro or Negroid race, the chief tribes represented being the Mandingo (*q.v.*), the Jolof and the Jola. Numbers of Fula (*q.v.*) are also settled in the country. Fully four-fifths of the natives are Mahommedans. The few European residents are officials, traders or missionaries.

Towns and Trade.—Bathurst, pop. about 8000, the chief town of the colony, in 13° 24′ N., 16° 36′ W., is built on St Mary's Island, which lies at the mouth of the river near its south bank and is connected with the mainland by a bridge across Oyster Creek. It was founded in 1816 and is named after the 3rd earl Bathurst, secretary of state for the colonies from 1812 to 1827. Bathurst is a fairly well-built town, the chief material employed being red sandstone. It lies about 12 to 14 ft. above the level of the river. The principal buildings face the sea, and include Government House, barracks, a well-appointed hospital, founded by Sir R. G. MacDonnell (administrator, 1847–1852), and various churches. The market-place is shaded by a fine avenue of bombax and other wide-spreading trees. There are no other towns of any size in the Gambia. A trading station called Georgetown is situated on McCarthy's Island, so named after Sir Charles McCarthy, the governor of Sierra Leone, who in 1824 was captured and beheaded by the Ashanti at the battle of Essamako. Albreda, a small port on the north bank of the river, of some historic interest (see below), is in the Barra district.

Products.—Ground-nuts (*Arachis hypogaea*), rubber, beeswax, palm kernels, rice, cotton, and millet are the chief productions. Millet and rice are the staple food of the people. The curing of hides, the catching and drying of fish, boat-building, and especially the weaving of cotton into cloths called "pagns," afford employment to a considerable number of persons. Formerly the principal exports, besides slaves, were gold-dust, wax and hides, the gold being obtained from the Futa Jallon district farther inland. Between 1830 and 1840 from 1500 to 2000 oz. of gold were exported annually, but shipments ceased soon afterwards, though small quantities of gold-dust can still be obtained from native goldsmiths. The export of hides received a severe check in 1892–1893 through the death of nearly all the cattle, but after an interval of seven or eight years the industry gradually revived. The value of hides exported increased from £520 in 1902 to £9615 in 1907. The collection of rubber was started about 1880, but the trade has not assumed large proportions. In 1907 the value of the rubber exported was £4602. The export of wax, valued at £37,000 in 1843, had dwindled in 1907 to £2325. The cultivation of the ground-nut, first exported in 1830, assumed importance by 1837, and by 1850 had become the chief industry of the colony. In 1907 the value of the nuts was £256,685, over ⅓ of the total exports (exclusive of specie). Nearly the whole male population is engaged in the industry for eight months of the year. Planted in June, after the early rains, the crop is reaped in October or November and exported to Europe (for Marseilles) for the extraction of its oil, which is usually sold as olive oil. A feature of the industry is the appearance at the beginning of the planting season of thousands of men from a distance, "strange farmers," as they are called, who are housed and fed and given farms to cultivate. In return they have to give half the produce to the landlords. As soon as he has sold his nuts, the "strange farmer" goes off, often not returning for years.

Apart from the cultivation of the ground-nut, the agricultural resources of the country are undeveloped. Large herds of cattle are kept by the Fula, and in cattle rich natives usually invest their wealth. Land can be hired for 2d. an acre per annum for twenty-one years. All land lying vacant or unused, or to which the occupier is unable to produce any title, is vested in the crown. A botanical station was opened in 1894, and the cultivation of American and Egyptian cotton was taken in hand in 1902. The experiment proved discouraging. Great difficulty was experienced in getting farmers to gather cotton for export, as unless carried on on highly scientific lines its cultivation is not so profitable as that of the ground-nut. The principal imports, of which over ¾ come from Great Britain or British colonies, are cotton goods, kola-nuts (from Sierra Leone), tobacco, rice, sugar and spirits. In the year 1907 the total and average annual value of the exports was £301,000, of the imports £316,000. There are no mines in the colony, nor any apparent mineral wealth, except ridges of ironstone in the regions above McCarthy's Island. Bathurst is in telegraphic communication with Europe and the rest of Africa. There are no railways in the colony, but it is traversed by well-made roads of a uniform width of 18 ft. The Liverpool mail steamers call at the port every fortnight. A government steamer runs regularly from Bathurst to McCarthy's Island, and a smaller boat plies on the upper river. The shipping trade is chiefly British; French and German tonnage coming next.

Surrounded on all sides, save seawards, by French territory, the colony largely depends, economically, upon France, to which country most of the exports go. A considerable entrepôt trade is also done with the neighbouring French colonies. The extent of French influence is indicated by the fact that the five-franc piece, locally known as a dollar, is largely circulated throughout the protectorate, and is accepted as legal tender, although the currency in the colony proper is the English coinage.

Administration, Revenue, &c.—The Gambia is administered by a governor, assisted by an executive and a legislative council. On the last-named body nominated unofficial members have seats. The colony is self-supporting and has no public debt. The revenue, which in 1906 for the first time exceeded £60,000, is mainly derived from customs. A company of the West African Frontier Force is maintained. Travelling commissioners visit the five districts into which, for administrative purposes, the protectorate is divided, and in which the native form of government prevails. From the native law-courts appeal can be made to the supreme court at Bathurst. There is also at Bathurst a Mahommedan court, established in 1906, for the trial of cases involving the civil status of Moslems.

Primary schools are maintained by the various religious denominations, and receive grants from government. The Wesleyans have

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also a secondary and a technical school. There is a privately supported school for Mahommedans at Bathurst. The Anglicans, Wesleyans and Roman Catholics have numerous converts.

History.—Of the early history of the Gambia district there is scant mention. At what period the stone circles and pillars (apparently of a "Druidical" character), whose ruins are found at several places along the upper Gambia, were erected is not known. Those at Lamin Koto, on the right bank of the river opposite McCarthy's Island, are still in good preservation, and are an object of veneration to the Mahommedans (see *Geog. Journ.* vol. xii., 1898). The country appears to have formed part, successively, of the states of Ghana, Melle and Songhoi. The relations, political and commercial, of the natives were all with the north and east; consequently no large town was founded on the banks of the river, nor any trade carried on (before the coming of the white man) by vessels sailing the ocean About the 11th century the district came under Mahommedan influence.

The Portuguese visited the Gambia in the 15th century, and in the beginning of the 16th century were trading in the lower river. Embassies were sent from the Portuguese stations inland to Melle to open up trade with the interior, but about the middle of the century this trade—apparently mostly in gold and slaves—declined. At the end of the century the river was known as the resort of banished men and fugitives from Portugal and Spain. It was on the initiative of Portuguese living in England that Queen Elizabeth, in 1588, granted a patent to "certain merchants of Exeter and others of the west parts and of London for a trade to the river of Senega and Gambra in Guinea." This company was granted a monopoly of trade for ten years. Its operations led to no permanent settlement in the Gambia. In 1618 James I. granted a charter to another company named "The Company of Adventurers of London trading into Africa," and formed at the instigation of Sir Robert Rich, afterwards earl of Warwick, for trade with the Gambia and the Gold Coast. This company sought to open up trade with Timbuktu, then believed to be a great mart for gold, which reached the lower Gambia in considerable quantities. With this object George Thompson (a merchant who had traded with Barbary) was sent out in the "Catherine," and ascended the Gambia in his ship to Kassan, a Portuguese trading town, thence continuing his journey in small boats. In his absence the "Catherine" was seized and the crew murdered by Portuguese and half-castes, and Thompson himself was later on murdered by natives. Two years afterwards Richard Jobson, another agent of the Company of Adventurers, advanced beyond the falls of Barraconda; and he was followed, about forty years later, by Vermuyden, a Dutch merchant, who on his return to Europe asserted that he had reached a country full of gold.

The Company of Adventurers had built a fort near the mouth of the Gambia. This was superseded in 1664 by a fort built by Captain (afterwards Admiral Sir Robert) Holmes on a small island 20 m. from the mouth of the river and named Fort James, in honour of the duke of York (James II.). This fort was built expressly to defend the British trade against the Dutch, and from that time the British remained in permanent occupation of one or more ports on the river. In 1723 Captain Bartholomew Stibbs was sent out by the Royal African Company, which had succeeded the earlier companies, to verify Vermuyden's reports of gold. He proceeded 60 m. above the falls, but the land of gold was not found. The French now became rivals for the trade of the Gambia, but the treaty of Versailles in 1783 assigned the trade in the river to Britain, reserving, however, Albreda for French trade, while it assigned the Senegal to France, with the reservation of the right of the British to trade at Portendic for gum. This arrangement remained in force till 1857, when an exchange of possessions was effected and the lower Gambia became a purely British river. In the period between the signing of the treaty of Versailles and 1885 the small territories which form the colony proper were acquired by purchase or cession from native kings. St Mary's Isle was acquired in 1806; McCarthy's Isle was bought in 1823; the Ceded Mile was granted by the king of Barra in 1826; and British Kommbo between 1840 and 1855. During this period the colony had gone through an economic crisis by the abolition of the slave trade (1807), which had been since 1662 its chief financial support. The beginning of a return to prosperity came in 1816 when some British traders, obliged to leave Senegal on the restoration of that country to France after the Napoleonic wars, founded a settlement on St Mary's Isle. From that year the existing colony, as distinct from trading on the river, dates. The Gambia witnessed many administrative changes. When the slave trade was abolished, the settlement was placed under the jurisdiction of the governor of Sierra Leone, and was formally annexed to Sierra Leone on the dissolution of the Royal African Company (1822). It so remained until 1843, when the Gambia was made an independent colony, its first governor being Henry Frowd Seagram. Afterwards (1866) the Gambia became a portion of the officially styled "West African Settlements." In 1883 it was again made a separate government, administered as a crown colony. Between the years last mentioned—1866–1888—the colony had suffered from the retrograde policy adopted by parliament in respect to the West African Settlements (*vide* Report of the Select Committee of 1865).

In 1870 negotiations were opened between France and Great Britain on the basis of a mutual exchange of territories in West Africa. Suspended owing to the outbreak of the Franco-Prussian War the negotiations were resumed in 1876. "Definite proposals were at that time formulated by which the Gambia was to be exchanged for all posts by France between the Rio Pongas (Pongo river, French Guinea) and the Gabun. This would have been a comprehensive and intelligible arrangement, but so strong a feeling in opposition to any cession of British territory was manifested in parliament, and by various mercantile bodies, that the government of the day was unable to press the scheme."[1] Nothing was done, however, to secure for the Gambia a suitable *hinterland*, and in 1877 the 4th earl of Carnarvon (then colonial secretary) warned British traders that they proceeded beyond McCarthy's Isle at their own risk. Meantime the French from Senegal pushed their frontier close to the British settlements, so that when the boundaries were settled by the agreement of the 10th of August 1889 with France, Great Britain was able to secure only a ten-kilometre strip on either side of the river. This document fixed the frontier of the British protectorate inland at a radius of 10 m. from the centre of the town of Yarbatenda; which town is situated at the limit of navigability of the Gambia from the sea. By Art. 5 of the Anglo-French convention of the 8th of April 1904, Yarbatenda was ceded to France, with the object of giving that country a port on the river accessible to sea-going merchantmen.

Since 1871 the colony had been self-supporting, but on the acquirement of the protectorate it was decided, in order to balance increasing expenditure, to impose a "hut tax" on the natives. This was done in 1895. The tax, which averages 4s. per annum for a family, met with no opposition.

In 1892 a slave-raiding chief, named Fodi Kabba, had to be forcibly expelled from British territory. In 1894 another slave-raider, Fodi Silah, gave much trouble to the protectorate. An expedition under Captain E. H. (afterwards admiral) Gamble succeeded in routing him, and Fodi Silah took refuge in French territory, where he died. During the expedition Captain Gamble was led into an ambush, and in this engagement lost 15 killed and 47 wounded. In 1900 trouble again arose through the agency of Fodi Kabba, who had fixed his residence at Medina, in French territory. Two travelling commissioners (Mr F. C. Sitwell and Mr Silva) were murdered in June of that year, at a place called Suankandi, and a punitive expedition was sent out under Colonel H. E. Brake. Suankandi was captured and, the French co-operating, Medina was also captured, Fodi Kabba being killed on the 23rd of March 1901.

The people of the protectorate are in general peaceful and contented, and slave trading is a thing of the past. Provision was moreover made by an ordinance of 1906 for the extinction of slavery itself throughout the protectorate, it being enacted that

[1] Extract from a despatch of Lord Salisbury to the British ambassador to France, dated 30th of March 1892.

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henceforth all children born of slaves were free from birth, and that all slaves became free on the death of their master.

See the *Annual Reports* on the colony published by the colonial office, London, which give the latest official information; C. P. Lucas's *Historical Geography of the British Colonies*, vol. iii., *West Africa* (2nd ed., Oxford, 1900) (this book contains valuable bibliographical notes); and *The Gambia Colony and Protectorate*, an official handbook (with map and considerable historical information), by F. B. Archer, treasurer of the colony (London, 1906). Early accounts of the country will be found in vol. ii. of Thomas Astley's *New General Collection of Voyages and Travels* (London, 1745–1747). See also Major W. Gray and Surgeon Dochard, *Travels in Western Africa in 1818–1821 from the River Gambia to the River Niger* (London, 1829). The flora has been the subject of a special study, A. Rançon, *La Flore utile du bassin de la Gambie* (Bordeaux, 1895). Most of the books mentioned under GOLD COAST also deal with the Gambia.

GAMBIER, JAMES GAMBIER, BARON (1756–1833), English admiral, was born on the 13th of October 1756 at the Bahamas, of which his father, John Gambier, was at that time lieutenant-governor. He entered the navy in 1767 as a midshipman on board the "Yarmouth," under the command of his uncle; and, his family interest obtaining for him rapid promotion, he was raised in 1778 to the rank of post-captain, and appointed to the "Raleigh," a fine 32-gun frigate. At the peace of 1783 he was placed on half-pay; but, on the outbreak of the war of the French Revolution, he was appointed to the command of the 74-gun ship "Defence," under Lord Howe; and in her he had an honourable share in the battle on the 1st of June 1794. In recognition of his services on this occasion, Captain Gambier received the gold medal, and was made a colonel of marines; the following year he was advanced to the rank of rear-admiral, and appointed one of the lords of the admiralty. In this office he continued for six years, till, in February 1801, he, a vice-admiral of 1799, hoisted his flag on board the "Neptune," of 98 guns, as third in command of the Channel Fleet under Admiral Cornwallis, where, however, he remained for but a year, when he was appointed governor of Newfoundland and commander-in-chief of the ships on that station. In May 1804 he returned to the admiralty, and with a short intermission in 1806, continued there during the naval administration of Lord Melville, of his uncle, Lord Barham, and of Lord Mulgrave. In November 1805 he was raised to the rank of admiral; and in the summer of 1807, whilst still a lord of the admiralty, he was appointed to the command of the fleet ordered to the Baltic, which, in concert with the army under Lord Cathcart, reduced Copenhagen, and enforced the surrender of the Danish navy, consisting of nineteen ships of the line, besides frigates, sloops, gunboats, and naval stores. This service was considered by the government as worthy of special acknowledgment; the naval and military commanders, officers, seamen and soldiers received the thanks of both Houses of Parliament, and Admiral Gambier was rewarded with a peerage.

In the spring of the following year he gave up his seat at the admiralty on being appointed to the command of the Channel Fleet; and in that capacity he witnessed the partial, and prevented the total, destruction of the French fleet in Basque Roads, on the 12th of April 1809. It is in connexion with this event, which might have been as memorable in the history of the British navy as it is in the life of Lord Dundonald (see DUNDONALD), that Lord Gambier's name is now best known. A court-martial, assembled by order of a friendly admiralty, and presided over by a warm partisan, "most honourably acquitted" him on the charge "that, on the 12th of April, the enemy's ships being then on fire, and the signal having been made that they could be destroyed, he did, for a considerable time, neglect or delay taking effectual measures for destroying them"; but this decision was in reality nothing more than a party statement of the fact that a commander-in-chief, a supporter of the government, is not to be condemned or broken for not being a person of brilliant genius or dauntless resolution. No one now doubts that the French fleet should have been reduced to ashes, and might have been, had Lord Gambier had the talents, the energy, or the experience of many of his juniors. He continued to hold the command of the Channel Fleet for the full period of three years, at the end of which time—in 1811—he was superseded. In 1814 he acted in a civil capacity as chief commissioner for negotiating a treaty of peace with the United States; for his exertions in which business he was honoured with the Grand Cross of the Bath. In 1830 he was raised to the high rank of admiral of the fleet, and he died on the 19th of April 1833.

Lord Gambier was a man of earnest, almost morbid, religious principle, and of undoubted courage; but the administration of the admiralty has seldom given rise to such flagrant scandals as during the time when he was a member of it; and through the whole war the self-esteem of the navy suffered no such wound as during Lord Gambier's command in the Bay of Biscay.

The so-called *Memorials, Personal and Historical, of Admiral Lord Gambier*, by Lady Chatterton (1861), has no historical value. The life of Lord Gambier is to be read in Marshall's *Royal Naval Biography*, in Ralfe's *Naval Biography*, in Lord Dundonald's *Autobiography of a Seaman*, in the Minutes of the Courts-Martial and in the general history of the period.

GAMBIER, a village of College township, Knox county, Ohio, U.S.A., on the Kokosing river, 5 m. E. of Mount Vernon. Pop. (1900) 751; (1910) 537. It is served by the Cleveland, Akron & Columbus railway. The village is finely situated, and is the seat of Kenyon College and its theological seminary, Bexley Hall (Protestant Episcopal), and of Harcourt Place boarding school for girls (1889), also Protestant Episcopal. The college was incorporated in 1824 as the "Theological Seminary of the Protestant Episcopal Church in the Diocese of Ohio"; but in 1891 "Kenyon College," the name by which the institution has always been known, became the official title. Its first exercises were held at Worthington, Ohio, in the home of Philander Chase (1775–1852), first Protestant Episcopal bishop in the North-west Territory, by whose efforts the funds for its endowment had been raised in England in 1823–1824, the chief donors being Lords Kenyon and Gambier. The first permanent building, "Old Kenyon" (still standing, and used as a dormitory), was erected on Gambier Hill in 1827 in the midst of a forest. In 1907–1908 the theological seminary had 18 students and the collegiate department 119.

Some account of the founding of the college may be found in Bishop Chase's *Reminiscences; an Autobiography, comprising a History of the Principal Events in the Author's Life to 1847* (2 vols., New York, 1848).

GAMBOGE (from Camboja, a name of the district whence it is obtained), a gum-resin procured from *Garcinia Hanburii*, a dioecious tree with leathery, laurel-like leaves, small yellow flowers, and usually square-shaped and four-seeded fruit, a member of the natural order Guttiferae, and indigenous to Cambodia and parts of Siam and of the south of Cochin China, formerly comprised in Cambojan territory. The juice, which when hardened constitutes gamboge, is contained in the bark of the tree, chiefly in numerous ducts in its middle layer, and from this it is procured by making incisions, bamboo joints being placed to receive it as it exudes. Gamboge occurs in commerce in cylindrical pieces, known as pipe or roll gamboge, and also, usually of inferior quality, in cakes or amorphous masses. It is of a dirty orange externally; is hard and brittle, breaks with a conchoidal and reddish-yellow, glistening fracture, and affords a brilliant yellow powder; is odourless, and has a taste at first slight, but subsequently acrid; forms with water an emulsion; and consists of from 20 to 25% of gum soluble in water, and from 70 to 75% of a resin. Its commonest adulterants are rice-flour and pulverized bark.

Gamboge (*Cambogia*) is a drastic hydragogue cathartic, causing much griping and irritation of the intestine. A small quantity is absorbed, adding a yellow ingredient to the urine and acting as a mild diuretic. Its irritant action on the skin may cause the formation of pustules. It is less active only than croton oil and elaterium, and may be given in doses of half to two grains, combined with some sedative such as hyoscyamus, in apoplexy and in extreme cases of dropsy. Gamboge is used as a pigment, and as a colouring matter for varnishes. It appears to have been first brought into Europe by merchants from the East at the close of the 16th century.

GAMBRINUS, a mythical Flemish king who is credited with the first brewing of beer. His name is usually derived from that of Jan Primus, *i.e.* Jan (John) I., the victorious duke of Brabant, from 1261 to 1294, who was president of the Brussels gild of

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brewers; his portrait with a foaming glass of ale in his hand had the place of honour in the gild-hall, and this led in time, it is suggested, to the myth of the beer-king who is usually represented outside a barrel with a tankard in his hand.

GAME, a word which in its primary and widest significance means any amusement or sport, often combined in the early examples with "glee," "play," "joy" or "solace." It is a common Teutonic word, in O. Eng. *gamen*, in O.H.G. *gaman*, but only appears in modern usage outside English in Dan. *gammen* and Swed. *gamman*. The ulterior derivation is obscure, but philologists have identified it with the Goth. *gaman*, companion or companionship; if this be so, it is compounded of the prefix *ga-*, with, and the root seen in "man." Apart from its primary and general meaning the word has two specific applications, first to a contest played as a recreation or as an exhibition of skill, in accordance with rules and regulations; and, secondly, to those wild animals which are the objects of the chase, and their flesh as used for food, distinguished as such from meat, fish and poultry, and from the flesh of deer, to which the name "venison" is given. For "game," from the legal aspect, and the laws relating to its pursuit and capture see GAME LAWS. The athletic contests of the ancient Greeks (ἀγῶνες) and the public shows (*ludi*) of the arena and amphitheatre of the ancient Romans are treated below (GAMES, CLASSICAL); the various forms of modern games, indoor and outdoor, whether of skill, strength or chance, are dealt with under their specific titles. A special use ("gaming" or "gambling") restricts the term to the playing of games for money, or to betting and wagering on the results of events, as in horse-racing, &c. (see GAMING AND WAGERING). "Gamble," "gambler" and "gambling" appear very late in English. The earliest quotations in the *New English Dictionary* for the three words are dated 1775, 1747 and 1784 respectively. They were first regarded as cant or slang words, and implied a reproach, either as referring to cheats or sharpers, or to those who played recklessly for extravagant stakes. The form of the words is obscure, but is supposed to represent a local variation *gammle* of the M.E. *gamenian*. From this word must, of course, be distinguished "gambol," to sport, frisk, which, as the older forms (*gambald*, *gambaud*) show, is from the Fr. *gambade*, leap, jump, of a horse, It. *gambado*, *gamba*, leg (Mod. Fr. *jambe*).

GAME LAWS. This title in English law is applied to the statutes which regulate the right to pursue and take or kill certain kinds of wild animals (see above). The existence of these statutes is due to the rules of the common law as to the nature of property, and the interest of the Norman sovereigns and of feudal superiors in the pleasures of sport or the chase. The substantial basis of the law of property is physical possession of things and the power to deal with them as we see fit. By the common law wild animals are regarded as *res nullius*, and as not being the subject of private property until reduced into possession by being killed or captured. A bird in the hand is owned: a bird in the bush is not. Even bees do not become property until hived. "Though a swarm lights in my tree," says Bracton, "I have no more property therein than I have in the birds which make their nests thereon." If reclaimed or confined they become property. If they escape, the rights of the owner continue only while he is in pursuit of the fugitive, *i.e.* no other person can in the meantime establish a right of property against him by capturing the animal. A swarm of bees "which fly out of my hive are mine so long as I can keep them in sight and have power to pursue them." But the right of recapture does not entitle the owner to follow his animals on to the lands of another, and the only case in which any right to follow wild animals on to the lands of others is now expressly recognized is when deer or hares are hunted with hounds or greyhounds. This recognition merely excepts such pursuit from the law as to criminal game trespass, and fox-hunters and those who course hares or hunt stags are civilly liable for trespass if they pass over land without the consent of the occupier (*Paul* v. *Summerhayes*, 1878, 4 Q.B.D. 9).

It is a maxim of the common law that things in which no one can claim any property belong to the crown by its prerogative: this rule has been applied to wild animals, and in particular to deer and what is now called "game." The crown rights may pass to a subject by grant or equivalent prescription. In the course of time the exclusive right to take game, &c., on lands came to be regarded as incidental to the ownership or occupation of the lands. This is described as the right to game *ratione soli*. In certain districts of England which are crown forests or chases or legal parks, or subject to rights of free warren, the right to take deer and game is not in the owner or occupier of the soil, but is in the crown by prerogative, or *ratione privilegii* in the grantee of the rights of chase, park or free warren, which are anterior to and superior to those of the owner or occupier of the lands over which the privilege has been granted. In all cases where these special rights do not exist, the right to take or kill wild animals is treated as a profit incidental to the ownership or occupation of the land on which they are found, and there is no public right to take them on private land or even on a highway; nor is there any method known to the law by which the public at large or an undefined body of persons can lawfully acquire the right to take wild animals *in alieno solo*.

In the nature of things the right to take wild animals is valuable as to deer and the animals usually described as game, and not as to those which are merely noxious as vermin, or simply valueless, as small birds. Upon the rules of the common law there has been grafted much legislation which up till the end of the 18th century was framed for the preservation of deer and game for the recreation and amusement of persons of fortune, and to prevent persons of inferior rank from squandering in the pursuit of game time which their station in life required to be more profitably employed. These enactments included the rigorous code known as the Laws of the Forest (see FOREST LAWS), as well as what are usually called the Game Laws.

In England the older statutes relating to game were all repealed early in the 19th century. From the time of Richard II. (1389) to 1831, no person might kill game unless qualified by estate or social standing, a qualification raised from a 40s. freehold in 1389 to an interest of £100 a year in freehold or £150 in long leaseholds (1673). In 1831 this qualification by estate was abolished as to England. But in Scotland the right to hunt is theoretically reserved to persons who have in heritage that unknown quantity a "plough-gate of land" (Scots Act 1621, c. 31); and in Ireland qualifications by estate are made necessary for killing game and keeping sporting dogs (Irish Act 1698, 8 Will. III. c. 8). In England the game laws proper consist of the Night Poaching Acts of 1828 and 1844, the Game Act of 1831, the Poaching Prevention Act 1862, and the Ground Game Acts of 1880 and 1906. From the fact that the right of landowners over wild animals on their land does not amount to ownership it follows that they cannot prosecute any one for stealing live wild animals: and that apart from the game laws the only remedy against poachers is by civil action for trespass. As between trespasser and landowner the law is peculiar (*Blades* v. *Higgs*, 1865, 11 H.L.C. 621). If A starts and kills a hare on B's land the dead hare belongs to B (*ratione soli*) and not to A, though he has taken the hare by his own efforts (*per industriam*). But if A hunts the hare from B's land on to C's land and there kills it, the dead hare belongs to A and not to B or C. It is not B's because it was not taken on his land, and it is not C's because it was not started on his land. In other words the right of each owner is limited to animals both started and killed on his own land, and in the case of conflicting claims to the animal taken (made *ratione soli*) the captor can make title (*per industriam*) against both landowners. If he is a trespasser he is liable to civil or criminal proceedings by both landowners, but the game is his unless forfeited under a statute. Another peculiar result of the law is that where trespassers (*e.g.* poachers) kill and carry off game or rabbits as part of one continuous transaction they are not guilty of theft, but only of game trespass (*R.* v. *Townley*, 1871, L.R. 1 C.C.R. 315), but it is theft for a trespasser to pick up and carry off a pheasant killed by the owner of the land on his own land or even a pheasant killed by an independent gang of poachers. The young of wild animals belong (*propter impotentiam*) to the owner of the land until they are able to fly or run away. This right does not extend to the

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eggs of wild birds. But the owner can reduce the eggs into possession by taking them up and setting them under hens or in enclosures. And if this is done persons who take them are thieves and not merely poachers. A game farm, like a decoy for wild water-fowl, is treated as a trade or business; but a game preserve in which full-grown animals fly or run wild is subject to the ordinary incidents of the law as to animals *ferae naturae*.

The classification of wild animals for purposes of sport in England is as follows:—

1. Beasts of forest are hart and hind (red deer), boar, wolf and all beasts of venery.

2. Beasts of chase and park are buck and doe (fallow deer), fox, marten and roe, or all beasts of venery and hunting.

3. Beasts of (free) warren are roe, hare, rabbit, partridge, pheasant, woodcock, quail, rail and heron.

4. Game, as defined by the Night Poaching Act of 1828 and the Game Act of 1831, is pheasant, partridge, black game, red grouse, bustard and hare. In France game (*gibier*) includes everything eatable that runs or flies.

5. Wild fowl not in any of the previous lists which are nevertheless prized for sport, *e.g.* duck, snipe, plovers, &c.

6. Wild birds not falling within class 4 are more or less protected against destruction by the Wild Birds Protection Acts, which were, however, passed with quite other objects than the game laws.

As regards class 1 no subject without special authority of the crown may kill within a forest or its purlieus or on adjacent highways, rivers or enclosures. The right to the animals in a forest does not depend on ownership of the land but on the royal prerogative as to the animals, *i.e.* it exists not *ratione soli* but *ratione privilegii*; and this right is not in any way affected by the Game Act 1831. A chase is a forest in the hands of a subject and a legal park (which is an enclosed chase) is created by crown grant or by prescription founded on a lost grant. The rights of the grantee are in substance the same as those of the crown in its forest, and do not depend on ownership of the soil. In the case of a free warren the grantee usually but not necessarily owns some or all of the soil over which the right of warren runs. The right of free warren depends on crown grant or prescription founded on lost grant, and involves a right of property over beasts and fowl of warren on all lands within the franchise. As will appear from the list above, some game birds are not fowl of warren, *e.g.* black game and red grouse (*Duke of Devonshire* v. *Lodge*, 1827, 7 B. & C. 39). Free warren is quite different from ordinary warren, in which hares or rabbits are bred by the owner of the soil for sport or profit. Ground game in such warrens is protected under the Larceny Act 1861, s. 17, as well as by the game laws. In manors, of which none have been created since 1290, the lord by his franchise has the sporting rights over the manor, but at the present time this right is restricted to the commons and wastes of the manor, the freehold whereof is in him, and does not extend to enclosed freeholds nor as a general rule to enclosed copyholds, unless at the time of enclosure the sporting rights were reserved to him by the Enclosure Act or award (*Sowerby* v. *Smith*, 1873, L.R. 8 C.P. 514). In other words his rights exist *ratione soli* and not *ratione privilegii*. The Game Act 1831 gives lords of manors and privileged persons certain rights as to appointing gamekeepers with special powers to enforce the game laws within the district over which their rights extend (ss. 13, 14, 15, 16). The game laws in no way cut down the special privileges as to forest, park, chase or free warren (1831, s. 9), and confirm the sporting right of lords of manors on the wastes of the manor (1831, s. 10). As to all lands not affected by these rights, the right to kill or take game on the land is presumably in the occupier. On letting land the owner may, subject to the qualifications hereinafter stated, reserve to himself the right to kill or take "game" or rabbits or other wild animals concurrently with or in exclusion of the tenant. Where the exclusive right is in the landlord the tenant is not only liable to forfeiture or damages for breaches of covenants in the lease, but is also liable to penalties on summary conviction if without the lessor's authority he pursues, kills or takes any "game" upon the land or gives permission to others to do so (1831, s. 12). In effect he is made criminally liable for game trespass on lands in his own occupation, so far as relates to game, but is not so liable if he takes rabbits, snipe, woodcock, quails or rails.

The net effect of the common law and the game laws is to give the occupier of lands and the owner of sporting rights over them the following remedies against persons who infringe their right to kill or take wild animals on the land. A stranger who enters on the land of another to take any wild animals is liable to the occupier for trespass on the land and for the animals started and killed on the land by the trespasser. He is also criminally liable for game trespass if he has entered on the land to search for or in pursuit of "game" or woodcock, snipe, quail, landrails or rabbits. If the trespass is in the daytime (whether on lands of the subject or in royal forests, &c.), the penalty on conviction may not exceed 40s., unless five or more persons go together, in which case the maximum penalty is £5. If a single offender refuses his name or address or gives a false address to the occupier or to the owner of the sporting rights or his representatives, or refuses to leave the land, he may be arrested by them, and is liable to a penalty not exceeding £5, and if five or more concerned together in game trespass have a gun with them and use violence, intimidation or menace, to prevent the approach of persons entitled to take their names or order them off the land, they incur a further penalty up to £5.

If the trespass is in search or pursuit of game or *rabbits* in the night-time, the maximum penalty on a first conviction is imprisonment with hard labour for not over three months; on a second, imprisonment, &c., for not over six months, and the offender may be put under sureties not to offend again for a year after a first conviction or for two years after a second conviction. For a first or second offence the conviction is summary, subject to appeal to quarter sessions, but for a third offence the offender is tried on indictment and is liable to penal servitude (3-7 years) or imprisonment with hard labour (2 years). The offenders may be arrested by the owner or occupier of the land or their servants, and if the offenders assault or offer violence by firearms or offensive weapons they are liable to be indicted and on conviction punished to the same extent as in the last offence. In 1844 the above penalties were extended to persons found by night on highways in search or pursuit of game. If three or more trespass together on land by night to take or destroy game or rabbits, and any of them is armed with firearms, bludgeon or other offensive weapon, they are liable to be indicted and on conviction sentenced to penal servitude (3-14 years) or imprisonment with hard labour (2 years). By "day" time is meant from the beginning of the first hour before sunrise to the end of the first hour after sunset, and by "night" from the end of the first hour after sunset to the beginning of the first hour before sunrise (Night Poaching Act of 1828, s. 12; Act of 1831, s. 34). The time is reckoned by local and not by Greenwich time.

The penalties for night poaching are severe, but encounters between the owners of sporting rights and armed gangs of poachers nevertheless often ended in bloodshed. It is to be observed that it is illegal and severely punishable to set traps or loaded spring guns for poachers (Offences against the Person Act 1861, s. 31), whereby any grievous bodily harm is intended or may be caused even to a trespasser, so that the incursions of poachers can be prevented only by personal attendance on the scene of their activities; and it is to be observed also that the provisions of the Game Laws above stated are, so far as concerns private land, left to be enforced by private enterprise without the interference of the police, with the result that in many districts there are bands of private notorious war. Even in the Night Poaching Act 1844, which applies to highways, the arrest of offenders is made by owners, occupiers or their gamekeepers. The police were not given any direct authority as to poachers until the Poaching Prevention Act 1862, under which a constable is empowered "on any highway, street or public place, to search any person whom he may have good cause to suspect of coming from any land where he shall have been unlawfully in search or pursuit of 'game,' or any persons aiding or abetting such person, and having in his possession any game unlawfully obtained, or any gun, part of gun, or nets or engines used for the killing or taking game; and also to stop and search any cart or other conveyance in or upon which such constable or peace officer shall have good cause to suspect that any such game, or any such part of gun, or thing, is being carried by such person." If any such thing be found the constable is to detain it, and apply for a summons against the offender, summoning him to appear before a petty sessional court, on conviction before which he may be fined not more than £5, and forfeits the game, guns, &c., found in his possession. In this act "game" includes woodcock, snipe and rabbits, and the eggs of game birds other than bustards; and the act applies to poaching either by night or by day. In all cases of summary conviction for poaching an appeal lies to quarter sessions. In all cases of poaching the game, &c., taken may be forfeited by the court which tries the poacher.

Close Time.—On certain days, and within periods known as "close time," it is illegal to kill deer or game. The present close times are as follows:—

	England.	Ireland.	Scotland.
Hare	None	April 21 to Aug. 11[1]	None
Red deer (male)	None	Jan. 1 to June 9	None
Fallow deer	None	Sept. 29 to June 10	None
Roe deer	None	None	None
Pheasant	Feb. 1 to Sept. 30	Feb. 1 to Sept. 30 (1845)	Feb. 1 to Sept. 30
Partridge	Feb. 1 to Aug. 31	Feb. 1 to Aug. 31 (1869)	Feb. 1 to Aug. 31
Black game	Dec. 10 to Aug. 20[2]	Dec. 10 to Aug. 20	Dec. 10 to Aug. 20
Red grouse	Dec. 10 to Aug. 12	Dec. 10 to Aug. 12	Dec. 10 to Aug. 12
Ptarmigan	None	Dec. 10 to Aug. 20	Dec. 10 to Aug. 12
Bustard (wild turkey)	March 1 to Sept. 1	Jan. 10 to Sept. 1	None

[1] Unless varied by order of lord-lieutenant.

[2] Except in Devon, Somerset and New Forest, where to Sept. 1.

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In England and Ireland the winged game above named and hares may not be killed on Sundays or Christmas Day. It is illegal to sell or expose for sale hares or leverets in March, April, May, June and July. It is illegal throughout the United Kingdom to buy or sell winged game birds after ten days from the beginning of the close season as fixed by the English law (1831, s. 4; 1860, s. 13). This prohibition applies to the sale of live game, British or foreign, and to the sale of British dead game. It is illegal to lay poison for game or rabbits except in rabbit holes, and it is illegal to kill game by firearms at night. Wild birds not within the list above given but of interest for sport are protected by close times fixed under the Wild Birds Protection Acts, which may vary in each county of each kingdom.

Licences.—Besides the restrictions on the right to take or kill game which arise out of the law as to ownership or occupation of the lands on which it is found, there are further restrictions imposed by the laws of excise. From the time of Richard II. (1389) until 1831 the right of persons other than gamekeepers properly deputed by the lord of a manor to take game was made to depend on the social rank of the person, or on the amount of his interest in land, which ranged from a 40s. freehold (in 1389) to £100 a year (1671). These restrictions were abolished in 1831, and the right to kill game was made conditional on the possession of a game certificate, now called a game licence in Great Britain (act of 1831, ss. 6, 23). By s. 1 of the Game Licences Act 1860 "any person, before he shall in Great Britain take, kill or pursue, or aid or assist in any manner in the taking, killing or pursuing, by any means whatever, or use any dog, gun, net or other engine for the purpose of taking, killing or pursuing any game, or any woodcock, snipe, quail, landrail or coney, or any deer, shall take out a proper licence to kill game under this act"—subject to a penalty of £20. There are certain exceptions and exemptions as to royal personages, royal gamekeepers, and with reference to taking woodcock or snipe by nets or springes, by coursing or hunting hares or deer, or killing deer, rabbits or hares (Hares Acts 1848, Game Licences Act 1860) in certain enclosed lands by the owners or occupiers. A licence is not required for beaters and assistants who go out with holders of a game licence. The licence is granted by the Inland Revenue Department. The issue is regulated by the Game Licences Act 1860 as amended by the Customs and Inland Revenue Act 1883. The licences now in use are of four kinds:—

Those taken out after 31st July—			
To expire on the next 31st July	£3	0	0
To expire on the next 31st October . . .	2	0	0
Those taken out after 1st November—			
To expire on the next 31st July . . .	2	0	0
Those taken out for any continuous period of four-teen days specified in the licence	1	0	0

In the case of gamekeepers in Great Britain for whom the employer pays the duty on male servants, the annual licence fee is £2, but the licence extends only to lands on which the employer has a right to kill game. A licence granted to a person in his own right and not as gamekeeper or servant is effective throughout the United Kingdom. The game licence does not authorize trespass on the lands of others in search of game nor the shooting of game, &c., at night, and is forfeited on a conviction of game trespass (1831, s. 30; 1860, s. 11). Persons who have game licences need not have a gun licence, but the possession of a gun licence does not qualify the holder to kill game or even rabbits.

The sale of game when killed is also subject to statutory regulation. Gamekeepers may not sell game except under the authority of their employer (1831, ss. 17, 25). Persons who hold a full game licence may sell game, but only to persons who hold a licence to deal in game. These licences are annual (expiring on the 1st of July), and are granted in London by justices of the peace, and in the rest of England by the council of the borough or urban or rural district in which the dealer seeks to carry on business (1831, s. 18; 1893, c. 73, s. 27), and a notice of the existence of the licence must be posted on the licensed premises. A licence must be taken out for each shop. The following persons are disqualified for holding the licence: innkeepers, persons holding licences to sell intoxicants, owners, guards or drivers of mail-carts, stagecoaches or public conveyances, carriers and higglers (1831, s. 18). This enactment interferes with the grant of game licences to large stores which also have licences to sell beer. The licensed dealer may buy British game only from persons who are lawfully entitled to sell game. Conviction of an offence under the Game Act 1831 avoids the licence (s. 22). The local licence must also be supplemented by an excise licence for which a fee of £2 is charged. Licensed dealers in game are prohibited from selling game killed in the United Kingdom from the tenth day after the beginning of close time to the end of that period. The provisions above stated under the act of 1831 applied only to England, but were in 1860 extended to the rest of the United Kingdom, and were in 1893 applied to dealers in game imported from abroad. The main effect of the system of licences is to prevent the disposal of game by poachers rather than to benefit the revenue.

Deer.—Deer are not included within the definition of game in any of the English game laws. Deer-stealing was very seriously punished by the old law, and under an act of 9 George I. c. 22, known as the Waltham Black Act, passed because of the depredations of disguised deer-stealers in Epping Forest, it was under certain circumstances made a capital offence. At present offences with reference to deer are included in the Larceny Act 1861. It is a felony to hunt or kill deer in enclosures in forests, chases or purlieus, or in enclosed land where deer is usually kept, or after a previous conviction to hunt or kill deer in the open parts of a forest, &c., and certain minor provisions are made as to arrest by foresters, forfeiture of venison unlawfully possessed and for unlawfully setting traps for deer. These enactments do not prevent a man from killing on his own land deer which have strayed there (*Threlfold v. Smith*, 1901, 2 K.B. 531). In Scotland the unlawful killing of deer is punished as theft.

Eggs.—The owner or occupier of land has no property in the eggs of wild birds found on his lands unless he takes them up. But under s. 24 of the Game Act 1831 a penalty of 5s. per egg is incurred by persons who unlawfully (*i.e.* without being, or having licence from, the person entitled to kill the game) and wilfully take from the nest or destroy in the nest the eggs of any game bird, or of a swan, wild duck, teal or widgeon. Similar provisions exist in Ireland under an act of 1698, and by the Poaching Prevention Act 1862 (United Kingdom) power is given to constables to search persons suspected of poaching and to take from them the eggs of pheasants, partridges, grouse or black game. And the Wild Birds Protection Acts deal with the eggs of all wild birds except game and swans.

Damage to Crops by Game.—Where an occupier of lands has not the right to kill game or rabbits he runs the risk of suffering damage by the depredations of the protected animals, while he may not kill without incurring a liability to summary conviction or for breach of the conditions on which he holds the land. At common law the owner of land who has reserved to himself the sporting rights, and his sporting tenants, must use the reserved rights reasonably. They are not liable for any damage wilfully or unreasonably done to the crops, &c., of the occupier, such as trampling down standing crops or breaking hedges or fences. They are not directly liable to the occupier for damage done to the crops by game bred on the land or frequenting it in the ordinary course of nature; but are entitled to turn down game or rabbits on the land. And if game or rabbits are for the purposes of sport imported or artificially raised on land, the person who breeds or brings them there is liable for the damage done to the crops of adjoining owners or occupiers (*Farrer v. Nelson*, 1885, 15 Q.B.D. 258; *Birkbeck v. Paget*, 31 Beav. 403; *Hilton v. Green*, 1862, 2 F. & F. 821).

Recent legislation has greatly increased the rights of the occupiers of land as against the owners of sporting rights over it. As regards hares and rabbits the occupier's rights are regulated by the Ground Game Act 1880 (which is expressed to be made "in the interests of good husbandry and for the better security of capital and labour invested in the cultivation of the soil"). By that act the occupier has, as incident to and inseparable from his occupation, has the right to kill and take hares and rabbits on the land. The right is indefeasible and cannot be divested by contract with the owner or landlord or even by letting the occupier's sporting rights to another. But where apart from the act the right to kill game on the land is vested in a person other than the occupier, such person has a right concurrent with the statutory right of the occupier to take hares and rabbits on the land. The act does not extend to common lands nor to lands over which right to pasture or passage over more than nine months in the year exist. Consequently over such lands exclusive rights of killing ground game still continue, and the law appears not to apply in cases where a special right of killing or taking ground game vested before the 7th of September 1880 in any person (other than the landlord) by statute, charter or franchise (s. 5). The mode of exercise of the occupier's right is subject to certain limitations. The ground game is only to be taken by him or by persons whom he has duly authorized in writing, who must be members of his family or the servants or bona fide employed by him for reward to take ground game. The written authority must be produced on demand to persons having concurrent rights to take and kill the ground game (s. 1 (1) (c)). Firearms may not be used by the occupier, nor poison be laid, nor may snaring traps be set, except in rabbit holes (s. 6); nor may ground game be killed on days or seasons or by methods prohibited by statute in 1880 (s. 10).

In the case of moorland and unenclosed lands (which are not arable and do not consist of small detached portions of less than 25 acres) the occupier may between the 1st of September and the 31st of March kill and take ground game; but between the 1st of September and the 10th of December firearms may not be used (1880, s. 1 (2); 1906, s. 1). In the case of such lands the occupiers and owners of the sporting rights may between the 1st of September and the 10th of December make and enforce for their joint benefit agreements for taking the ground game. The Agricultural Holdings Act 1906 (operating from 1909) deals, *inter alia*, with damage to crops by deer and winged game, but does not apply to damages by hares or rabbits. The tenant of agricultural land is entitled to compensation for damage to his crops exceeding 1s. per acre over the area affected if caused by game, "the right to kill or take which is vested neither in him nor in any one claiming under him other than the landlord and which the tenant has not permission in writing to kill" (s. 2). The right of the tenant is indefeasible and cannot be

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contracted away. Disputes as to amount are to be settled by arbitration; but claims to be effectual must be made as to growing crops before reaping, raising or feeding off, and as to cut crops before carrying. In the case of contracts of tenancy created before the 1st of January 1909, allowances are to be made if by their terms compensation for damage by game is stipulated for, or an allowance of an agreed amount for damage by game was expressly made in fixing the rent. The compensation is payable by the landlord subject to his right to be indemnified in cases where the sporting rights are not vested in him.

Sporting Rights.—Sporting rights (*i.e.* rights of fowling or of shooting, or of taking or killing game or rabbits, or of fishing), when severed from the occupation of land, are subject to income or property tax, and to assessment for the purposes of local rates (Rating Act, 1874); and in valuing land whether for rates or taxes the value of the sporting rights is now an important and often the chief item of value in beneficial occupation of the land. Where the sporting rights are the landlord's, the rate thereon is paid in the first instance by the tenant and deducted from his rent. Where the sporting right is reserved and let, the rating authority may rate either the landlord or the sporting tenant as occupier of the right. The Ground Game Acts have not affected the liability to assessment or concurrent rating of killing hares and rabbits reserved by a landlord, or of a concurrent right granted by the occupier (Ryde (2nd ed.), 385-387). The ownership of sporting rights severed from the ownership or occupation of the land over which they are exercisable is not an interest in land giving the electoral franchise or a claim for compensation if the land is taken under the Lands Clauses Consolidation Acts.

Scotland.—By the law of Scotland all men have right and privilege of game on their own estates as a real right incident thereto, which does not pass by an agricultural lease except by express words, or in the case of ground game by the act of 1880. The landlord is liable to the tenant for damage done to the surface of the lands in exercise of his right to the game and also for extraordinary damage by over-preserving or over-stocking. Under an act of 1877 he is also liable for excessive damage done by rabbits or game reserved to or retained under a lease granted after the 1st of January 1878, or reserved by presumption of common law; this act from 1909 onwards is superseded by the provisions of the Agricultural Holdings Act 1906. Night poaching is punished by the same act as in England, and day poaching by an act of 1832 and the act of 1882. Until 1887 poaching by night under arms was a capital offence. The definition of game in Scotland for purposes of night poaching is the same as in England. The provisions of the act of 1832 as to game trespass by day apply also to deer, roe, rabbits, woodcock, snipe, rails and wild duck; but in other respects closely resemble those of the English act of 1831.

Offences against the game laws are not triable by justices of the peace, but only in the sheriff court. The close time for game birds in Scotland is the same as in England, so far as dealing in them is concerned, but differs slightly as to killing. Black game may not be killed between the 10th of December and the 25th of August, and ptarmigan between the 10th of December and the 20th of August. There is no close time for red, fallow or roe deer, or rabbits. By an old Scots act of 1621 (omitted from the recent wholesale repeal of such acts) no one may lawfully kill game in Scotland who does not own a plough-gate of land except on the land of a person so qualified.

Ireland.—The common law as to game is the same for Ireland as for England. The game laws of Ireland are contained partly in acts passed prior to the union (1698, 1707, 1787 and 1797), partly in acts limited to Ireland, and as to the rest in acts common to the whole United Kingdom.

Under the act of 1698 no one may kill game in Ireland who has not a freehold worth £40 a year or £1000 net personality, and elaborate provisions are made by that and later acts against the keeping of sporting dogs by persons not qualified by estate to kill game. British officers and soldiers in Ireland appear to have been much addicted to poaching, and their activities were restrained by enactments of 1698 and 1707.

Night poaching in Ireland is dealt with by an act of 1826. Trespass on lands in pursuit of game to which the landlord or lessor has by reservation exclusive right is summarily punishable under an act of 1864, which includes in the definition of game, woodcock, snipe, quails, landrails, wild duck, widgeon and teal. Under the Land Act 1881 the landlord of a statutory holding may at the commencement of the term subject to the Ground Game Acts retain and exercise the exclusive right of taking "game" as above defined.

A game licence is not required for taking or killing rabbits. But in other respects the law as to game licences, dog licences and licences to deal in game is the same as in Great Britain.

British Possessions Abroad.—The English game laws have not been carried to any colony as part of the personal law of the colonists, nor have they been extended to them by imperial or colonial legislation. But the legislatures of many colonies have passed acts to preserve or protect native or imported wild animals, and in some of these statutes the protected animals are described as game. These statutes are free from feudal prepossessions as to sporting rights, and are framed rather on the lines of the Wild Birds Protection Acts than on the English game laws, but in some possessions, *e.g.* Quebec, sporting leases by the crown are recognized. The acts since 1895 are indicated in the annual summary of colonial legislation furnished in the *Journal* of the Society of Comparative Legislation.

See also Oke's *Game Laws*, 4th ed., by Willis Bund (1897); Warry, *Game Laws of England* (1897); Marchant and Watkins, *Wild Birds Protection Act* (1897). (W. F. C.)

GAMES, CLASSICAL. 1. *Public Games.*—The public games of Greece (ἀγῶνες) and Rome (*Ludi*) consisted in athletic contests and spectacles of various kinds, generally connected with and forming part of a religious observance. Probably no institution exercised a greater influence in moulding the national character, and producing that unique type of physical and intellectual beauty which we see reflected in Greek art and literature, than the public contests of Greece (see ATHLETES; ATHLETIC SPORTS). For them each youth was trained in the gymnasium, they were the central mart whither poet, artist and merchant each brought his wares, and the common ground of union for every member of the Hellenic race. It is to Greece, then, that we must look for the earliest form and the fullest development of ancient games. The shows of the Roman circus and amphitheatre were at best a shadow, and in the later days of the empire a travesty, of the Olympia and Pythia, and require only a cursory notice.

The earliest games of which we have any record are those at the funeral of Patroclus, which form the subject of the twenty-third Iliad. They are noteworthy as showing that Greek games were in their origin clearly connected with religion; either, as here, a part of the funeral rites, or else instituted in honour of a god, or as a thank-offering for a victory gained or a calamity averted, or in expiation of some crime. Each of the great contests was held near some shrine or sacred place and is associated with some deity or mythical hero. It was not before the 4th century that this honour was paid to a living man (see Plutarch, *Lysander*, 18). The games of the *Iliad* and those of the *Odyssey* at the court of Alcinous are also of interest as showing at what an early date the distinctive forms of Greek athletics—boxing, wrestling, putting the weight, the foot and the chariot race—were determined. *Greek.*

The *Olympian* games were the earliest, and to the last they remained the most celebrated of the four national festivals. Olympia was a naturally enclosed spot in the rich plain of Elis, bounded on the N. by the rocky heights of Cronion, and on the S. and W. by the Alpheus and its tributary the Cladeus. There was the grove of Altis, in which were ranged the statues of the victorious athletes, and the temple of Olympian Zeus with the chryselephantine statue of the god, the masterpiece of Pheidias. There Heracles (so ran the legend which Pindar has introduced in one of his finest odes), when he had conquered Elis and slain its king Augeas, consecrated a temenos and instituted games in honour of his victory. A later legend, which probably embodies historical fact, tells how, when Greece was torn by dissensions and ravaged by pestilence, Iphitus inquired of the oracle for help, and was bidden restore the games which had fallen into desuetude; and there was in the time of Pausanias, suspended in the temple of Hera at Olympia, a bronze disk whereon were inscribed, with the regulations of the games, the names of Iphitus and Lycurgus. From this we may safely infer that the games were a primitive observance of the Eleians and Pisans, and first acquired their celebrity from the powerful concurrence of Sparta. The sacred armistice, or cessation of all hostilities, during the month in which the games were held, is also credited to Iphitus.

In 776 B.C. the Eleians engraved the name of their countryman Coroebus as victor in the foot race, and thenceforward we have an almost unbroken list of the victors in each succeeding Olympiad or fourth recurrent year. For the next fifty years no names occur but those of Eleians or their next neighbours. After 720 B.C. we find Corinthians and Megareans, and later still Athenians and extra-Peloponnesians. Thus what at first was nothing more than a village feast became a bond of union for all the branches of the Doric race, and grew in time to be the high festival to which every Greek gathered, from the mountain fastnesses of Thessaly to the remotest colonies of Cyrene and Marseilles. It survived even the extinction of Greek liberty, and had nearly completed twelve centuries when it was abolished by the decree of the

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Christian emperor Theodosius, in the tenth year of his reign. The last Olympian victor was a Romanized Armenian named Varastad.

Let us attempt to call up the scene which Olympia in its palmy days must have presented as the great festival approached. Heralds had proclaimed throughout Greece the "truce of God." So religiously was this observed that the Spartans chose to risk the liberties of Greece, when the Persians were at the gates of Pylae, rather than march during the holy days. Those white tents which stand out against the sombre grey of the olive groves belong to the Hellanodicae, or ten judges of the games, chosen one for each tribe of the Eleians. They have been here already ten months, receiving instruction in their duties. All, too, or most of the athletes must have arrived, for they have been undergoing the indispensable training in the gymnasium of the Altis. But along the "holy road" from the town of Elis there are crowding a motley throng. Conspicuous in the long train of pleasure-seekers are the *θεωροί* or sacred deputies, clad in their robes of office, and bearing with them in their carriages of state offerings to the shrine of the god. Nor is there any lack of distinguished visitors. It may be Alcibiades, who, they say, has entered no less than seven chariots; or Gorgias, who has written a famous *ἐπίδειξις* for the occasion; or the sophist Hippias, who boasts that all he bears about him, from the sandals on his feet to the dithyrambs he carries in his hand, are his own manufacture; or Aetion, who will exhibit his picture of the Marriage of Alexander and Roxana—the picture which gained him no less a prize than the daughter of the Hellanodices Praxonides; or, in an earlier age, the poet-laureate of the Olympians, Pindar himself. One feature of the medieval tournament and the modern racecourse is wanting. Women might indeed compete and win prizes as the owners of teams, but all except the priestesses of Demeter were forbidden, matrons on pain of death, to enter the enclosure.

At daybreak the athletes presented themselves in the Bouleuterium, where the presidents were sitting, and proved by witnesses that they were of pure Hellenic descent, and had no stain, religious or civil, on their character. Laying their hands on the bleeding victim, they swore that they had duly qualified themselves by ten months' continuous training in the gymnasium, and that they would use no fraud or guile in the sacred contests. Thence they proceeded to the stadium, where they stripped to the skin and anointed themselves. A herald proclaimed, "Let the runners put their feet to the line," and called on the spectators to challenge any disqualified by blood or character. If no objection was made, they were started by the note of the trumpet, running in heats of four, ranged in the places assigned them by lot. The presidents seated near the goal adjudged the victory. The foot-race was only one of twenty-four Olympian contests which Pausanias enumerates, though we must not suppose that these were all exhibited at any one festival. Till the 77th Olympiad all was concluded in one day, but afterwards the feast was extended to five.

The order of the games is for the most part a matter of conjecture, but, roughly speaking, the historical order of their institution was followed. We will now describe in this order the most important.

(1) The *Foot-race.*—For the first 13 Olympiads the *δρόμος*, or single lap of the stadium, which was 200 yds. long, was the only contest. The *δίαυλος*, in which the course was traversed twice, was added in the 14th Olympiad, and in the 15th the *ὅπλιτες*, or long race, of 7, 12 or, according to the highest computation, 24 laps, about 2½ m. in length. We are told that the Spartan Ladas, after winning this race, dropped down dead at the goal. There was also, for a short time, a race in heavy armour, which Plato highly commends as a preparation for active service. (2) *Wrestling* was introduced in the 18th Olympiad. The importance attached to this exercise is shown by the very word *palaestra*, and Plutarch calls it the most artistic and cunning of athletic games. The practice differed little from that of modern times, save that the wrestler's limbs were anointed with oil and sprinkled with sand. The third throw, which decided the victory, passed into a proverb, and struggling on the ground, such as we see in the famous statue at Florence, was not allowed, at least at the Olympia. (3) In the same year was introduced the *πένταθλον* (pentathlon), a combination of the five games enumerated in the well-known pentameter ascribed to Simonides:—

ἅλμα, τοδεκέλης, δίσκος, ἄκοντα, πάλην.

Only the first of these calls for any comment. The only leap practised seems to have been the long jump. The leapers increased their momentum by means of *ἁλτῆρες* or dumb-bells, which they swung in the act of leaping and dropped as they "took off." The stake-off may have been slightly raised, and some commentators with very little warrant have stated that spring-boards were used. The record jump with which Phayllus of Croton is credited, 55 ft., is incredible with or without a spring-board. It is disputed whether a victory in all five contests, or in three at least, was required to win the *πένταθλον*. (4) The rules for boxing were not unlike those of the modern ring (see PUGILISM), and the chief difference was in the use of the *caestus*. This in Greek times consisted of leather thongs bound round the boxer's fists and wrists; and the weighting with lead or iron or metal studs, which made the caestus more like a "knuckle-duster" than a boxing-glove, was a later Roman development. The death of an antagonist, unless proved to be accidental, not only disqualified for a prize but was severely punished. The use of ear-guards and the comic allusions to broken ears, not noses, suggest that the Greek boxer did not hit out straight from the shoulder, but fought windmill fashion, like the modern rustic. In the *pancratium*, a combination of wrestling and boxing, the use of the caestus, and every one of the clenched fist, was disallowed. (5) The *chariot-race* had its origin in the 23rd Olympiad. Of the hippodrome, or racecourse, no traces remain, but from the description of Pausanias we may infer that the dimensions were approximately 1600 ft. by 400. Down the centre there ran a bank of earth, and at each end of this bank was a turning-post round which the chariots had to pass. "To shun the goal with rapid wheels" required both nerve and skill, and the charioteer played a more important part in the race than even the modern jockey. Pindar tells us that horses would shy as they passed the fatal spots. The places of the chariots were determined by lot, and there were elaborate arrangements for giving all a fair start. The number of chariots that might appear on the course at once is uncertain. Four, the number introduced, but none of these invented any special interest. Races on horseback date from the 33rd Olympiad. As the course was the same, success must have depended on skill as much as on swiftness. Lastly, there were athletic contests of the same description for boys, and a competition of heralds and trumpeters, introduced in the 93rd Olympiad.

The prizes were at first, as in the Homeric times, of some intrinsic value, but after the 6th Olympiad the only prize for each contest was a garland of wild olive, which was cut with a golden sickle from the Elean Temenus, the sacred tree brought by Heracles "from the dark fountains of later in the land of the Hyperboreans, to be a shelter common to all men and a crown of noble deeds" (Pindar, *Ol.* iii. 18). Greek writers from Herodotus to Plutarch dwell with much enthusiasm on the magnanimity of victors who cared for nothing but honour and were content to struggle for a corruptible crown. But though the Greek games present in this respect a favourable contrast to the greed and gambling of the modern racecourse, yet the development from Milon and Damenus as actuated by pure love of glory is a pleasing fiction of the moralists. The successful athlete received in addition to the immediate honours very substantial rewards. A herald proclaimed his name, his parentage and his country; the Hellanodicae took from a table of ivory and gold the olive crown and placed it on his head, and in his hand a branch of palm; as he marched in the sacred revel to the temple of Zeus, his friends and admirers showered in his path flowers and costly gifts, singing the old song of Archilochus, *τήνελλα καλλίνικε*, and his name was chronicled in the Greek calendar. Fresh honours and rewards awaited him on his return home. If he was an Athenian he received, according to the law of Solon, 500 drachmae, and free rations for life in the Prytaneum; if a Spartan, he had as his prerogative the honour of honour in battle. Pindar, like Dindar, Simonides and Euripides sung his praises, and sculptors like Pheidias and Praxiteles were engaged by the state to carve his statue. We even read of a breach in the town walls being made to admit him, as if the common road were not good enough for such a hero; and there are well-attested instances of altars being built and sacrifices offered to a successful athlete. No wonder then that an Olympian prize was regarded as the crown of human happiness. Cicero, with a Roman's contempt for Greek frivolity, observes with a sneer that an Olympian victor receives more honours than a triumphant general at Rome, and tells the story of the Rhodian Diagoras, who, having himself won the prize at Olympia, and seen his two sons crowned on the same day, was addressed by a Laconian in these words:—"Die, Diagoras, for thou hast nothing short of divinity to desire." Alcibiades, when setting forth his services to the state, puts first his victory at Olympia, and the prestige he had won for Athens by his magnificent display. But perhaps the most remarkable evidence of the exaggerated value which the Greeks attached to athletic prowess is a casual expression which Thucydides employs when describing the

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enthusiastic reception of Brasidas at Scione. The state, he says, voted him a crown of gold, and the multitude flocked round him and decked him with garlands, *as though he were an athlete*.

The *Pythian* games originated in a local festival held at Delphi, anciently called Pytho, in honour of the Pythian Apollo, and were limited to musical competitions. The date at which they became a Panhellenic ἀγών (so Demosthenes calls them) cannot be determined, but the Pythiads as a chronological era date from 527 B.C., by which time music had been added to all the Panhellenic contests. Now, too, these were held at the end of every fourth year; previously there had been an interval of eight years. The Amphictyones presided and the prize was a chaplet of laurel.

The *Nemean* games were biennial and date from 516 B.C. They were by origin an Argive festival in honour of Nemean Zeus, but in historical times were open to all Greece and provided the established round of contests, except that no mention is made of a chariot-race. A wreath of wild celery was the prize.

The *Isthmian* games, held on the Isthmus of Corinth in the first and third year of each Olympiad, date, according to Eusebius, from 523 B.C. They are variously reported to have been founded by Poseidon or Sisyphus in honour of Melicertes, or by Theseus to celebrate his victory over the robbers Sinis and Sciron. Their early importance is attested by the law of Solon which bestowed a reward of 100 drachmae on every Athenian who gained a victory. The festival was managed by the Corinthians; and after the city was destroyed by Mummius (146 B.C.) the presidency passed to the Sicyonians until Julius Caesar rebuilt Corinth (46 B.C.). They probably continued to exist till Christianity became the religion of the Roman empire. The Athenians were closely connected with the festival, and had the privilege of *proedria*, the foremost seat at the games, while the Eleans were absolutely excluded from participation. The games included gymnastic, equestrian and musical contests, differing little from those of the other great festivals, and the prize was a crown made at one time of parsley (more probably wild celery), at a later period of pine. The importance of the Isthmian games in later times is shown by the fact that Flamininus chose the occasion for proclaiming the liberation of Greece, 196 B.C. That at a later anniversary (A.D. 67) Nero repeated the proclamation of Flamininus, and coupled with it the announcement of his own infamous victory at Olympia, shows alike the hollowness of the first gift and the degradation which had befallen the Greek games, the last faint relic of Greek nationality.

Roman.

The *Ludi Publici* of the Romans included feasts and theatrical exhibitions as well as the public games with which alone we are concerned. As in Greece, they were intimately connected with religion. At the beginning of each civil year it was the duty of the consuls to vow to the gods games for the safety of the commonwealth, and the expenses were defrayed by the treasury. Thus, at no cost to themselves, the Roman public were enabled to indulge at the same time their religious feelings and their love of amusement. Their taste for games naturally grew till it became a passion, and under the empire games were looked upon by the mob as one of the two necessaries of life. The aediles who succeeded to this duty of the consuls were expected to supplement the state allowance from their private purse. Political adventurers were not slow to discover so ready a road to popularity, and what at first had been exclusively a state charge devolved upon men of wealth and ambition. A victory over some barbarian horde or the death of a relation served as the pretext for a magnificent display. But the worst extravagance of private citizens was eclipsed by the reckless prodigality of the Caesars, who squandered the revenues of whole provinces in catering for the mob of idle sightseers on whose favour their throne depended. But though public games played as important a part in Roman as in Greek history, and must be studied by the Roman historian as an integral factor in social and political life, yet, regarded solely as exhibitions, they are comparatively devoid of interest, and we sympathize with Pliny, who asks his friend how any man of sense can go day after day to view the same dreary round of fights and races.

It is easy to explain the different feelings which the games of Greece and of Rome excite. The Greeks at their best were actors, the Romans from first to last were spectators. It is true that even in Greek games the professional element played a large and ever-increasing part. As early as the 6th century B.C. Xenophanes complains that the wrestler's strength is preferred to the wisdom of the philosopher, and Euripides, in a well-known fragment, holds up to scorn the brawny swaggering athlete. But what in Greece was a perversion and acknowledged to be such, the Romans not only practised but held up as their ideal. No Greek, however high in birth, was ashamed to compete in person for the Olympic crown. The Roman, though little inferior in gymnastic exercises, kept strictly to the privacy of the palaestra; and for a patrician to appear in public as a charioteer is stigmatized by the satirist as a mark of shameless effrontery.

Roman games are generally classified as *fixed*, *extraordinary* and *votive*; but they may be more conveniently grouped according to the place where they were held, viz. the circus or the amphitheatre.

For the Roman world the circus was at once a political club, a fashionable lounge, a rendezvous of gallantry, a betting ring, and a playground for the million. Juvenal, speaking loosely, says that in his day it held the whole of Rome; but there is no reason to doubt the precise statement of P. Victor, that in the Circus Maximus there were seats for 350,000 spectators.

Of the various *Ludi Circenses* it may be enough here to give a short account of the most important, the *Ludi Magni* or *Maximi*.

Initiated according to legend by Tarquinius Priscus, the *Ludi Magni* were originally a votive feast to Capitoline Jupiter, promised by the general when he took the field, and performed on his return from the annual campaign. They thus presented the appearance of a military spectacle, or rather a review of the whole burgess force, which marched in solemn procession from the capitol to the forum and thence to the circus, which lay between the Palatine and Aventine. First came the sons of patricians mounted on horseback, next the rest of the burghers ranged according to their military classes, after them the athletes, naked save for the girdle round their loins, then the company of dancers with the harp and flute players, next the priestly colleges bearing censers and other sacred instruments, and lastly the simulacra of the gods, carried aloft on their shoulders or drawn in cars. The games themselves were fourfold:—(1) the chariot race; (2) the *Ludus Troiae*; (3) the military review; (4) gymnastic contests. Of these only the first two call for any comment. (1) The chariot employed in the circus was the two-wheeled war car, at first drawn by two, afterwards by four, and more rarely by three horses. Originally only two chariots started for the course, but under Caligula as many as twenty-four heats run in the day, each of four chariots. The distance traversed was fourteen times the length of the circus or nearly 5 m. The charioteers were apparently from the first professionals, though the stigma under which the gladiator lay never attached to their calling. Indeed a successful driver may compare in popularity and fortune with a modern jockey. The drivers were divided into companies distinguished by the colours of their tunics, whence arose the factions of the circus which assumed such importance under the later emperors. In republican times there were two factions, the white and the red; two more, the green and the blue, were added under the empire, and for a short time in Domitian's reign there were also the gold and the purple. Even in Juvenal's day party spirit ran so high that a defeat of the green was looked upon as a second Cannae. After the seat of empire had been transferred to Constantinople these factions of the circus were made the basis of political revolts, and frequently resulted in sanguinary tumults, such as the famous Nika revolt (A.D. 532), in which 30,000 citizens lost their lives. (2) The Ludus Troiae was a sham-fight on horseback in which the actors were patrician youths. A spirited description of it will be found in the 5th Aeneid. (See also Circus.)

The two exhibitions we shall next notice, though occasionally given in the circus, belong more properly to the amphitheatre. *Venatio* was the baiting of wild animals who were pitted either with one another or with men—captives, criminals or trained hunters called *bestiarii*. The first certain instance on record of this amusement is in 186 B.C., when M. Fulvius exhibited lions and tigers in the arena. The taste for these brutalizing spectacles grew apace, and the most distant provinces were ransacked by generals and proconsuls to supply the arena with rare animals—giraffes, tigers and crocodiles. Sulla provided for a single show 100 lions, and Pompey 600 lions, besides elephants, which were matched with Gaetulian hunters. Julius Caesar enjoys the doubtful honour of inventing the bull-fight. At the inauguration of the Colosseum 5000 wild and 4000 tame beasts were killed, and to commemorate

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Trajan's Dacian victories there was a butchery of 11,000 beasts. The *naumachia* was a sea-fight, either in the arena, which was flooded for the occasion by a system of pipes and sluices, or on an artificial lake. The rival fleets were manned by prisoners of war or criminals, who often fought till one side was exterminated. In the sea-fight on Lake Fucinus, arranged by the emperor Claudius, 100 ships and 19,000 men were engaged.

But the special exhibition of the amphitheatre was the *munus gladiatorium*, which dates from the funeral games of Marcus and Decimus Brutus, given in honour of their father, 264 B.C. It was probably borrowed from Etruria, and a refinement on the common savage custom of slaughtering slaves or captives on the grave of a warrior or chieftain. Nothing so clearly brings before us the vein of coarseness and inhumanity which runs through the otherwise noble character of the Roman, as his passion for gladiatorial shows. We can fancy how Pericles, or even Alcibiades, would have loathed a spectacle that Augustus tolerated and Trajan patronized. Only after the conquest of Greece we hear of their introduction into Athens, and they were then admitted rather out of compliment to the conquerors than from any love of the sport. In spite of numerous prohibitions from Constantine downwards, they continued to flourish even as late as St Augustine. To a Christian mind, as he may credit the story told by Theodoret and Cassiodorus, belongs the honour of their final abolition. In the year 404 Telemachus, a monk who had travelled from the East on this sacred mission, rushed into the arena and endeavoured to separate the combatants. He was instantly despatched by the praetor's orders; but Honorius, on hearing the report, issued an edict abolishing the games, which were never afterwards revived. (See GLADIATORS.)

Of the other Roman games the briefest description must suffice. The *Ludi Apollinares* were established in 212 B.C., and were annual after 211 B.C.; mainly theatrical performances. The *Megalenses* were in honour of the great goddess, Cybele; instituted 204 B.C., and from 191 B.C. celebrated annually. A procession of Galli, or priests of Cybele, was a leading feature. Under the empire the festival assumed a more orgiastic character. Four of Terence's plays were produced at these games. The *Ludi Saeculares* were celebrated at the beginning or end of each *saeculum*, a period variously interpreted by the Romans themselves as 100 or 110 years. The celebration by Augustus in 17 B.C. is famous by reason of the Ode composed by Horace for the occasion. They were solemnized by the emperor Philip A.D. 248 to commemorate the millennium of the city.

2. *Private Games.*—These may be classified as outdoor and indoor games. There is naturally all the world over a much closer resemblance between the pursuits and amusements of children than of adults. Homer's children built castles in the sand, and Greek and Roman children alike had their dolls, their hoops, their skipping-ropes, their hobby-horses, their kites, their knuckle-bones and played at hopscotch, the top-of-war, pitch and toss, blind-man's buff, hide and seek, and kiss in the ring or at closely analogous games. Games of ball were popular in Greece from the days of Nausicaa, and at Rome there were five distinct kinds of ball and more ways of playing with them. For particulars the dictionary of antiquities must be consulted. It is strange that we can find in classical literature no analogy to cricket, tennis, golf or polo, and though the *follis* resembled our football, it was played with the hand and arm, not with the leg. Cock-fighting was popular both at Athens and Rome, and quails were kept and put to various tests to prove their pluck.

Under indoor games we may distinguish games of chance and games of skill, though in some of them the two elements are combined, *Tesserae*, shaped and marked with pips like modern dice, were evolved from the *tali*, knuckle-bones with only four flat sides. The old Roman threw a hazard and called a main, just as did Charles Fox, and the vice of gambling was lashed by Juvenal no less vigorously than by Pope. The Latin name for a dice-box has survived in the *fritillary* butterfly and flower.[1]

The primitive game of guessing the number of fingers simultaneously held up by the player and his opponent is still popular in Italy where it is known as "morra." The proverbial phrase for an honest man was *quicum in tenebris mices*, one you would trust to play at morra in the dark.

Athena found the suitors of Penelope seated on cowhides and playing at πεσσοί, some kind of draughts. The invention of the game was ascribed to Palamedes. In its earliest form it was played on a board with five lines and with five pieces. Later we find eleven lines, and a further development was the division of the board into squares, as in the game of πόλεις (cities). In the Roman *latrunculi* (soldiers), the men were distinguished as common soldiers and "rovers," the equivalent of crowned pieces.

Duodecim scripta, as the name implies, was played on a board with twelve double lines and approximated very closely to our backgammon. There were fifteen pieces on each side, and the moves were determined by a throw of the dice; "blots" might be taken, and the object of the player was to clear off all his own men. Lastly must be mentioned the *Cottabus* (*q.v.*), a game peculiar to the Greeks, and with them the usual accompaniment of a wine party. In its simplest form each guest threw what was left in his cup into a metal basin, and the success of the throw, determined partly by the sound of the wine in falling, was reckoned a divination of love. For the various elaborations of the game (in Sicily we read of Cottabus houses), Athenaeus and Pollux must be consulted.

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GAMING AND WAGERING. It is somewhat difficult exactly to define or adequately to distinguish these terms of allied meaning. The word "game" (*q.v.*) is applicable to most pastimes and many sports, irrespective of their lawful or unlawful character. "Gaming" is now always associated with the staking of money or money's worth on the result of a game of pure chance, or mixed skill and chance; and "gambling" has the same meaning, with a suggestion that the stakes are excessive or the practice otherwise reprehensible, while "wager" and "wagering" are applied to money hazarded on any contingency in which the person wagering has no interest at risk other than the amount at stake. "Betting" is usually restricted to wagers on events connected with sports or games, and "lottery" applies to speculation to obtain prizes by lot or chance.

At English common law no games were unlawful and no penalties were incurred by gambling, nor by keeping gaming-houses, unless by reason of disorder they became a public nuisance. From very early times, however, the English statute law has attempted to exercise control over the sports, pastimes and amusements of the lieges. Several points of view have been taken: (1) their competition with military exercises and training; (2) their attraction to workmen and servants, as drawing them from work to play; (3) their interference with the observance of Sunday; (4) their combination with betting or gambling as causing impoverishment and dishonesty in children, servants and other unwary persons; (5) the use of fraud or deceit in connexion with them. The legislation has assumed several forms: (1) declaring certain games unlawful either absolutely or if accompanied by staking or betting money or money's worth on the event of the game; (2) declaring the keeping of establishments for betting, gaming or lotteries illegal, or prohibiting the use of streets or public places for such purposes; (3) prohibiting the enforcement in courts of justice of gambling contracts.

The earliest English legislation against games was passed in the interests of archery and other manly sports which were believed to render the lieges more fit for service in war. A statute of Richard II. (1388) directed servants and labourers to have bows and arrows and to use them on Sundays and holidays, and to cease from playing football, quoits, dice, putting the stone, kails and other such importune games. A more drastic statute was passed in 1409 (11 Hen. IV. c. 4) and penalties were imposed in 1477 (17 Edw. IV. c. 3) on persons allowing unlawful games to be played on their premises. These acts were superseded in 1541 (33 Hen. VIII. c. 9) by a statute passed on the petition of the bowyers, fletchers (*fl*e*tchers*), stringers and arrowhead makers of the realm. This act (still partly in force) is entitled an "act for maintenance of archery and debarring of unlawful games"; and it recites that, since the last statutes (of 3 & 6 Hen. VIII.) "divers and many subtil inventive and crafty persons have found and daily find many and sundry new and crafty games and plays, as logating in the fields, slide-thrift, otherwise called shove-groat, as well within the city of London as elsewhere in many other and divers parts of this realm, keeping houses, plays and alleys for the maintenance thereof, by reason whereof archery is sore decayed, and daily is like to be more minished, and divers

Games, lawful and unlawful.

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bowyers and fletchers, for lack of work, gone and inhabit themselves in Scotland and other places out of this realm, there working and teaching their science, to the puissance of the same, to the great comfort of strangers and detriment of this realm." Accordingly penalties are imposed on all persons keeping houses for unlawful games, and all persons resorting thereto (s. 6). The games specified are tabling, table (backgammon) or carding, or any game prohibited by any statute theretofore made or any unlawful new game then or thereafter invented or to be invented. It is further provided that "no manner of artificer or craftsman of any handicraft or occupation, husbandman, apprentice, labourer, servant at husbandry, journeyman or servant of artificer, mariners, fishermen, watermen, or any serving man, shall play at the tables, tennis, dice, cards, bowls, clash, coyting, logating or any other unlawful game out of Christmas under the pain of xxs. to be forfeit for every time; and in Christmas to play at any of the said games in their masters' houses or in their masters' presence; and also that no manner of person shall at any time play at any bowl or bowls in open places out of his garden or orchard" (s. 1). The social evils of gambling (impoverishment, crime, neglect of divine service) are incidentally alluded to in the preamble, but only in connexion with the main purpose of the statute —the maintenance of archery. No distinction is made between games of skill and games of chance, and no reference is made to playing for money or money's worth. The *Book of Sports* of James I. (1617), republished by Charles I. (1633), was aimed at encouraging certain sports on Sundays and holidays; but with the growth of Puritanism the royal efforts failed. The Sunday Observance Act 1625 prohibits the meeting of persons out of their own parishes on the Lord's Day for any sports or pastimes whatsoever. It has been attempted to enforce this act against Sunday football. The act goes on to prohibit any bear-baiting, bull-baiting, interludes, common plays or other unlawful games or plays on Sunday to any parishioners within their own parishes. According to Blackstone (iv. *Comm.* c. 13) the principal ground of complaint leading to legislation in the 18th century was "gambling in high life." He collects the statutes made with this view, but only those still in force need have been mentioned.

The first act directed against gambling as distinct from playing games was that of 1665 (16 Car. II. c. 7) "against deceitful, disorderly and excessive gaming," which prohibits "all persons both of skill and chance at which people cheat, or play otherwise than with ready money, or lose more than £100 on credit. In 1698 (13 Will. III. c. 23) legislation was passed against lotteries, therein described as "mischievous and unlawful games." This act was amended in 1710 (9 Anne c. 6), and in the same year was passed a statute which is the beginning of the modern legislation against gambling (9 Anne c. 19). It includes within its scope money won by "gaming or playing" at cards, &c., and money won by "betting" on the sides or hands of those who game at any of the forbidden games. But it refers to tennis and bowls as well as to games with cards and dice.

The following list of lawful games, sports and exercises is given in *Oliphant on Horses*, &c. (6th ed.): horse-races, steeplechases, trotting matches, coursing matches, foot-races, regatta matches, rowing matches, golf, wrestling matches, cricket, tennis, fives, rackets, bowls, skittles, quoits, curling, putting the stone, football, and presumably every bona-fide variety, *e.g.* croquet, knurr and spell, hockey or any similar games. Cockfighting is said to be intended by unlawful at common law, and that and other modes of setting animals to fight are offences against the Prevention of Cruelty to Animals Acts. The following are also lawful games: whist and other lawful games at cards, backgammon, bagatelle, billiards, chess, draughts and dominoes. But to allow persons to play for money at these games or at skittles or "skittle pool" or "puff and dart" on licensed premises is gaming within the Licensing Act 1872. The earlier acts declared unlawful the following games of skill: football, quoits, putting the stone, kails, tennis, bowls, clash or kails, or cloysheycays, logating, half bowl, slide-thrift or shove-groat and backgammon. Backgammon and other games in 1739 played with backgammon tables were treated as lawful in that year. Horse-racing, long under restriction, being mentioned in the act of 1665 and many 18th-century acts, was fully legalized in 1840 (3 & 4 Vict. c. 35). The act of 1541, so far as it declared any game of mere skill unlawful, was repealed by the Gaming Act 1845. Billiards is legal in private houses or public places to suffer any gaming played. The following games have been declared by the statutes or the judges to be unlawful, whether played in public or in private, unless played in a royal palace where the sovereign is residing: ace of hearts, pharaoh (faro), basset and hazard (1738), passage, and every game then invented or to be invented with dice or with any other instrument, engine or device in the nature of dice having one or more figures or numbers thereon (1739), roulet or roly-poly (1744), and all lotteries (except Art Union lotteries), *rouge et noir*, *baccarat-banque* (1884), *chemin de fer* (1895), and all games at cards which are not games of mere skill. The definition of unlawful game does not include whist played for a prize not subscribed to by the players, but it does include playing cards for money in licensed premises; even in the private room of the licensee or with private friends during closing hours.

The first attack on lotteries was in 1698, against lotteries "by dice, lots, cards, balls or any other numbers or figures or in any other way whatsoever." An act of 1721 prohibited lotteries which under the name of sales distributed prizes in money, advowsons, land, jewels, &c., by lots, tickets, numbers or figures. Acts of 1722, 1733 and 1823 prohibited any sale of tickets, receipts, chances or numbers in foreign lotteries. The games of cards already referred to as unlawful were in 1738 declared to be "games or lotteries by cards or dice," and in 1802 the definition of lottery was extended to include "little-goes and any game or lottery not authorized by parliament, drawn by dice, lots, cards, balls, or by numbers or figures or by any other way, contrivance or device whatsoever." This wide definition reaches raffles and sweepstakes on races. The advertisement of foreign or illegal lotteries is forbidden by acts of 1836 and 1844. In 1846 art unions were exempted from the scope of the Lottery Acts. Attempts have been made to suppress the sale in England of foreign lottery tickets, but the task is difficult, as the post-office distributes the advertisements, although, under the Revenue Act 1898, the Customs treat as prohibited goods advertisements or notices as to foreign lotteries. More success has been obtained in putting down various devices by newspapers and shopkeepers to attract customers by instituting "missing word competitions" and "racing coupon competitions"; by automatic machines which give speculative chances in addition to the article obtained for the coin inserted by distribution of prizes by lot or chance to customers; by holding sweepstakes at public-houses, by putting coins in sweetmeats to tempt street urchins by cupidity to indigestion; or by gratuitous distribution of medals giving a chance of a prize from a newspaper. An absolutely gratuitous distribution of chances seems not to be within the acts, but a commercial distribution is, even if individuals who benefit do not pay for their chance.

As already stated, the keeping of a gaming-house was at common law punishable only if a public nuisance were created. The act of 1541 made severe penalties on persons maintaining house of unlawful games. Originally licences could be obtained for such houses, but these were abolished in 1555 (2 & 3 Phil. and Mar.). In 1698 lotteries were declared public nuisances, and in 1802 the same measure was meted out to lotteries known as little-goes. Special penalties are provided for those who set up lotteries or any unlawful game with cards or dice, &c. (1738, 1739, 1744). In 1751 inhabitants of a parish were enabled to insist on the prosecution of gaming-houses. The act of 1802 imposed severe penalties on persons publicly or privately keeping places for any lottery. This statute hits at the deliberate or habitual use of a place for the prohibited purpose, and does not touch isolated or incidental uses on a single occasion, *e.g.* on a bazaar or show; but under an act of 1823 the sale of lottery tickets is in itself an offence. The Gaming Act 1845 facilitates the search of suspected gaming-houses and the proof that they are such. It provides that, to prove any house to be a common gaming-house, it "shall be sufficient to show that it is kept or used for playing therein at any unlawful game, whether any bank is kept there by one or more of the players exclusively of the others, or that the chances of any game played therein are not alike favourable to all the players, including among the players the banker or other person by whom the game is managed, or against whom the other players stake, play or bet." Gambling, it will be noticed, is still in this definition connected with some kind of game. The act also provides that proof that the gaming was for money shall not be required, but that the presence of cards, dice or instruments of gaming shall be prima-facie evidence that the house was used as a common gaming-house. The most recent statute dealing with gaming-houses is of 1854, which provides summary remedies against the keepers of them. It makes further provisions to facilitate search. It may be added that the Gaming Act 1845 makes winning money by cheating at any game or wager punishable in the same way as obtaining money by false pretences. At the present time proceedings for keeping gaming-houses in the sense in which that word is commonly understood are comparatively rare, and are usually against foreigners. The statutes hit both public and private gaming-houses (see the Park Club case, *Jenks* v. *Turpin*, 1884, 13 Q.B.D. 505, the leading case on unlawful games). The proprietor and the person who keeps the bank at an unlawful game are dealt with by the statute: the players are not, but the act of Henry VIII. is so far alive that they can be put under recognizance not to frequent gaming-houses. Under the Licensing Act 1872 penalties are incurred by licensed persons who suffer any gaming or unlawful game to be played on their premises. A single instance of playing an unlawful game for money in a private house is not within the statutes (*R.* v. *Davies*, 1897, 2 Q.B. 199).

In England, so far as the general public is concerned, gaming at cards is to a large extent superseded by betting on sports and pastimes, or speculation by means of lotteries or like devices. The legislation against betting *eo nomine* began in 1853. In the Betting Act 1853 it is described as a kind of gaming of late sprung up to the injury and demoralization of improvident persons by the opening of places called betting houses and offices, and the receiving of money *in advance* by the owners or occupiers or their agents on promises to pay money on events or horse races and like contingencies. This act strikes at ready-money betting as distinguished from betting on credit ("on the nod"). It was avowedly framed to hit houses open to all and sundry as distinguished from private betting clubs such as Tattersall's. The act seeks to punish persons who keep a house,

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office, room or other place for the purpose (*inter alia*) of any person betting with persons "resorting thereto" or of receiving deposits in consideration of bets on contingencies relating to horse-races or other races, fights, games, sports or exercises. The act especially excepts persons who receive or hold prizes or stakes to be paid to the winner of a lawful sport, game or exercise, or to the owner of a dog or horse engaged in a race (s. 6). Besides the penalties incurred by keeping such places, the keeper is liable to repay to depositors the sums deposited (s. 5).

By the Licensing Act 1872 penalties are incurred by licensed persons who allow their houses to be used in contravention of the Betting Act 1853. There has been a great deal of litigation as to the meaning and scope of this enactment, and a keen contest between the police and the Anti-gambling League (which has been very active in the matter) and the betting confraternity, in which much ingenuity has been shown by the votaries of sport in devising means for evading the terms of the enactment. The consequent crop of legal decisions shows a considerable divergence of judicial opinion. The House of Lords has held that the Tattersall's enclosure or betting room at a racecourse is not a "place" within the statute; and members of a bona-fide club who bet with each other in the club are not subject to the penalties of the act. But the word "place" has been held to include a public-house bar, an archway, a small plot of waste ground, and a bookmaker's stand, and even a bookmaker's big umbrella, and it is difficult to extract from the judges any clear indication of the nature of the "places" to which the act applies. The act is construed as applying only to ready-money betting, i.e. when the stake is deposited with the bookmaker, and only to places used for betting with persons physically resorting thereto; so that bets by letter, telegram or telephone do not fall within its penalties. The arm of the law has been found long enough to punish as thieves "welshers," who receive and make off with deposits on bets which they never mean to pay if they lose. The act of 1853 makes it an offence to publish advertisements showing that a house is kept for betting. It was supplemented in 1874 by an act imposing penalties on persons advertising as to betting. But this has been read as applying to bets falling within the act of 1853, and it does not prohibit the publication of betting news or sporting tips in newspapers. A few newspapers do not publish these aids to ruin, and in some public libraries the betting news and tips are obliterated, as a protection to crowds of undesirable readers. The act of 1853 has been to a great extent effectual against betting houses, and has driven some of them to Holland and other places. But it has been deemed expedient to legislate against betting in the streets, which has been found too attractive to the British workman.

Street betting.

By the Metropolitan Streets Acts 1867 any three or more persons assembled together in any part of any street in the city of London or county of London, either for the purpose of betting, and deemed to be obstructing the street, may be arrested without warrant by a constable and fined a sum not exceeding £5. The Vagrancy Act 1873 (36 & 37 Vict. c. 38) provides that "Every person playing or betting by way of wagering or gaming on any street, road, highway or other open and public place, or in any open place to which the public have, or are permitted to have, access, at or with any table or instrument of gaming, or any coin, card, token or other article used as an instrument or means of gaming, at any game or pretended game of chance, shall be deemed a rogue and vagabond." This act amended a prior act of 1868, passed to repress the practice of playing pitch and toss in the streets, which had become a public nuisance in the colliery districts. The powers of making by-laws for the London and good government of streets and their districts, possessed by municipal boroughs—and since 1888 by county councils—and extended in 1899 to the new London boroughs, have in certain cases been exercised by making by-laws forbidding any person to "frequent or use any street or other public place, on behalf either of himself or any other person, for the purpose of bookmaking, or betting, or wagering, or agreeing to bet or wager with any person, or paying, or receiving or settling bets." This and similar by-laws have been held valid, but were found inadequate, and by the Street Betting Act 1906 (6 Edw. VII. c. 43), passed by the efforts of the late Lord Davey, it is made an offence for any person to frequent or loiter in a street or public place on behalf of himself or of any other person for the purpose of bookmaking or betting or wagering or agreeing to bet or wager or paying or receiving or settling bets. The punishment for a first offence is fine up to £10, for a second fine up to £20, and the punishment is still higher in the case of a third or subsequent offence, or where the accused while committing the offence has any betting transactions with a person under the age of sixteen. The act does not apply to ground used for a course for horse-racing or adjacent thereto on days on which races take place; but the expression public place includes a public park, garden or sea-beach, and any unenclosed ground to which the public for the time have unrestricted access, and enclosed places other than public parks or gardens to which the public have a restricted right of access with or without payment, if the owners or persons controlling the place exhibit conspicuously a notice prohibiting betting therein. A constable may arrest without warrant persons offending and seize all books, papers, cards and other articles relating to betting found in their possession, and these articles may be forfeited on conviction. Besides the above provision against betting with infants the Betting and Loans (Infants) Act 1892, passed at the instance of the late Lord Herschell, makes it a misdemeanour to send, with a view to profit, to any one known by the sender to be an infant, a document inviting him to enter into a betting or wagering transaction. The act is intended to protect lads at school and college from temptation by bookmakers.

We must now turn from the public law with respect to gaming to the treatment of bets and wagers from the point of view of their obligation on the individuals who lose them. A wager may be defined as "a promise to give money or money's worth upon the determination or ascertainment of an uncertain event" (Anson, *Law of Contract*, 11th ed., p. 260). The event may be uncertain because it has not happened or because its happening is not ascertained; but to make the bargain a wager the determination of the event must be the sole condition of the bargain. According to the view taken in England of the common law, bets or wagers were legally enforceable, subject to certain rules dictated by considerations of public policy, *e.g.* that they did not lead to immorality or breach of the peace, or expose a third person to ridicule.[1] The courts were constantly called upon to enforce wagers and constantly exercised their ingenuity to discover excuses for refusing. A writer on the law of contracts[2] discovers here the origin of that principle of "public policy" which plays so important a part in English law. Wagering contracts were rejected because the contingencies on which they depended tended to create interests hostile to the common weal. A bet on the life of the emperor Napoleon was declared void because it gave one of the parties an interest in keeping the king's enemy alive, and also because it gave the other an interest in compassing his death by unlawful means. A bet as to the amount of the hop-duty was held void as against public policy, because it tended to expose the condition of the king's revenue to all the world. A bet between two hackney coachmen, as to which of them should be selected by a gentleman for a particular journey, was void because it tended to expose the customer to their importunities. When no such subtlety could be invented, the law, however reluctantly, was compelled to enforce the fulfilment of a wager. Actions on wagers were not favoured by the judges; and though a judge could not refuse to try such an action, he could, and often did, postpone it until after the decision of more important cases.

Wagering.

Parliament gradually intervened to confine the common law within narrower limits, both in commercial and non-commercial wagers, and both by general and temporary enactments. An example of the latter was 7 Anne c. 16 (1710), avoiding all wagers and securities relating to the then war with France. The earliest general enactment was 16 Car. II. c. 7 (1665), prohibiting the recovery of a sum exceeding £100 lost in games or pastimes, or in betting on the sides or hands of the players, and avoiding securities for money so lost. 9 Anne c. 19 avoided securities for such wagers for any amount, even in the hands of bona-fide holders for value without notice, and enabled the loser of £10 or upwards to sue for and recover the money he had lost within three months of the loss. Contracts of insurance by way of gaming and wagering were declared void, in the case of marine risks in 1746, and in the case of other risks in 1774. It was not until 1845 that a general rule was made excluding wagers from the courts. Section 18 of the Gaming Act 1845 (passed after a parliamentary inquiry in 1844 as to gaming) enacted "that all contracts or agreements, whether by parole or in writing, by way of gaming or wagering shall be null and void, and that no suit shall be brought or maintained in any court of law or equity for recovering any sum of money or valuable thing alleged to be won upon any wager, or which shall have been deposited in the hands of any person to abide the event on which any wager shall have been made; provided always that this enactment shall not be deemed to apply to any subscription or contribution, or agreement to subscribe or contribute, for or towards any plate, prize or sum of money to be awarded to the winner or winners of any lawful game, sport, pastime or exercise."

The construction put on this enactment enabled turf commission

[1] Leake on *Contracts* (4th ed.), p. 529.
[2] Pollock, *Contracts* (7th ed.), p. 313.

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agents to recover from their principals bets made and paid for them. But the Gaming Act 1892 rendered null and void any promise, express or implied, to repay to any person any sum of money paid by him under, or in respect of, any contract or agreement rendered null and void by the Gaming Act 1845, or to pay any sum of money by way of commission, fee, reward, or otherwise in respect of any such contract or agreement, or of any services in relation thereto or in connexion therewith, and provided that no action should be brought or maintained to recover any such sum. By the combined effect of these two enactments the recovery by the winner from the loser or stakeholder of bets or of stakes on games falling within s. 18 of the Gaming Act 1845 is absolutely barred; but persons who have deposited money to abide the event of a wager are not debarred from crying off and recovering their stake before the event is decided, or even after the decision of the event and before the stake is paid over to the winner;[1] and a man who pays a bet for a friend, or a turf commission agent or other agent who pays a bet for a principal, has now no legal means of recovering the money, unless some actual deceit was used to induce him to pay in ignorance that it was a bet. But a person who has received a bet on account of another can still, it would seem, be compelled to pay it over, and the business of a betting man is treated as so far lawful that income-tax is charged on its profits, and actions between parties in such a business for the taking of partnership accounts have been entertained.

The effect of these enactments on speculative dealings in shares or other commodities calls for special consideration. It seems to be correct to define a wagering contract as one in which two persons, having opposite opinions touching the issue of an event (past or future), of which they are uncertain, mutually agree that on the determination of the event one shall win, and the other shall pay over a sum of money, or other stake, neither party having any other interest in the event than the sum or stake to be won or lost. This definition does not strike at contracts in "futures," under which the contractors are bound to give or take delivery at a date fixed of commodities not in existence at the date of the contract. Nor are such contracts rendered void because they are entered into for purposes of speculation; in fact, their legality is expressly recognized by the Sale of Goods Act 1893. Contracts of insurance are void if made by way of gaming or wagering on events in which the assured has no interest present or prospective whether the matter be life or fire risks (1774) or maritime risks (Marine Insurance Act 1906). An act known as Sir John Barnard's Act (7 Geo. II. c. 8, entitled "An act to prevent the infamous practice of stock jobbing") prohibited contracts for liberty to accept or refuse any public stocks or securities and wagers relating to public stocks, but this act was repealed in 1860, and contracts to buy or sell stocks and shares are not now void because entered into by way of speculation and not for purposes of investment. The only limitation on such contracts is that contained in Leeman's Act (30 & 31 Vict. c. 29) as to contracts for the sale of shares in joint-stock banking companies. But a transaction in any commodity, though in form commercial, falls within the Gaming Acts if in substance the transaction is a mere wager on the price of the commodity at a date fixed by the contract. It does not matter whether the dealing is in stocks or in cotton, nor whether it is entered into on the Stock Exchange, or on any produce exchange, or elsewhere; nor is it conclusive in favour of the validity of the bargain that it purports to bind the parties to take or deliver the article dealt in. The courts are entitled to examine into the true nature of the transaction; and where the substantial intention of the parties is merely to gamble in differences, to make what is called "a time bargain," the fact that it is carried out by a series of contracts, regular and valid in form, will not be sufficient to exclude the application of the Gaming Acts.

In very many cases transactions with "outside stockbrokers" or "bucket shops" have been held to be mere wagers, although the contracts purported to give "put" or "call" options to demand delivery or acceptance of the stocks dealt with; and the cover deposited by the "client" has been treated as a mere security for performance of the bargain, and recoverable if sued for in time, *i.e.* before it is used for the purpose for which it is deposited. There was not up to 1909 any authoritative decision as to the application of the Gaming Act 1892 to transactions on the London Stock Exchange through a stockbroker who is a member of "the House"; but the same principle appears to be applicable where the facts of the particular deal clearly indicate that the intention was to make a mere time bargain, or to pay or receive differences only. The form, however, of all bargains on the Stock Exchange is calculated and intended to preclude people from setting up a gaming act defence: as each contract entitles the holder to call for delivery or acceptance of the stock named therein. In the event of the bankruptcy of a person involved in speculations, the bankruptcy officials exclude from proof against the estate all claims founded on any dealing in the nature of a wager; and on the same principle the bankrupt's trustee cannot recover sums won by the bankrupt by gaming transactions, but unexhausted "cover" on uncompleted transactions may be recovered back.

Gambling debts.

Besides the enactments which prevent the recovery of bets or wagers by action there has also been a good deal of legislation dealing with securities given in respect of "gambling debts." The earliest (1665) dealt with persons playing at games otherwise than for ready money and losing £100 or more on credit, and not only prohibited the winner from recovering the overplus but subjected him to penalties for winning it. An act of 1710 (9 Anne c. 19) declared utterly void all notes, bills, bonds, judgments, mortgages or other securities where the consideration is for money or valuable security won by gaming at cards, stocks or other games, or by betting on the sides or hands of the gamesters, or for reimbursing money knowingly advanced for such gaming or betting. This act draws a distinction between gaming and other bets or wagers. Under this act the securities were void even in the hands of innocent transferees. In 1841 the law was altered, declaring such securities not void but made upon an "illegal" consideration. The effect of the change is to enable an innocent transferee for value, of a bill, note or cheque, to recover on a security worthless in the hands of the original taker (see s. 30 of the Bills of Exchange Act 1882), but to put on him the burden of proving that he is a bona fide holder for value. In the case of a negotiable security given for a wager not within the acts of 1710 or 1841 (*e.g.* a bet on a contested election), but within the act of 1845, a third person holding it would be presumed to be a holder for value and on the person prima facie liable under the security falls the burden of proving that no consideration was given for it. It has been decided after considerable divergence of judicial opinion that an action will not lie in England in favour of the drawee against the drawer of a cheque drawn at Algiers on an English bank, partly for losses at baccarat, and partly for money borrowed to continue playing the game. The ground of decision was in substance that the Gaming Acts of 1845 and 1892 as the *lex fori* prohibit the English courts from enforcing gaming debts wherever incurred (*Moulis* v. *Owen*, 1907, 1 K.B. 746).

Scotland.—A Scots act of 1621 c. 14 (said still to be in force) forbids playing at cards or dice in any common house of hostelry, and directs that sums over 100 marks won on any one day at carding or dicing or at wagers on horse races should be at once sent to the treasurer of the kirk session. The Lottery Acts, except that of 1698, apply to Scotland; and the Betting House Act 1853 was extended to Scotland in 1874. The Street Betting Act 1906 extends to Scotland, and gaming houses can be suppressed under the Burgh Police Act 1892, and street betting, lotteries or gaming under that of 1903.

The Scots courts refuse to try actions on wagers, as being *sponsiones ludicrae*, unbecoming the dignity of the courts. 9 Anne c. 19 and 5 & 6 Will. IV. c. 41 extend to Scotland, but the weight of judicial opinion is that the Gaming Act 1845 does not.

Ireland.—The British Acts against lotteries were extended to Ireland in 1780, and the general law as to gaming is the same in both countries.

British Possessions.—Certain of the earlier imperial acts are in force in British possessions, *e.g.* the act of 9 Anne c. 19, which is in force in Ontario subject to amendments made in 1902. In the Straits Settlements, Jamaica and British Guiana there are ordinances directed against gambling and lotteries, and particularly

[1] *Burge* v. *Ashby*, 1900, 1 Q.B. 744.

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against forms of gambling introduced by the Chinese. Under these ordinances the money paid for a lottery ticket is recoverable by law. In the Transvaal betting houses were suppressed by proclamation (No. 33) soon after the annexation. An invention known in France as the *pari mutuel*, and in Australia as the totalizator, is allowed to be used on race-courses in most of the states (but not in New South Wales). In Queensland, South Australia, Tasmania and Western Australia the state levies a duty on the takings of the machine. In Tasmania the balance of the money retained by the stewards of the course less the tax must be applied solely for improving the course or promoting horse-racing. In Victoria under an act of 1901 the promoters of sports may by advertisement duly posted make betting on the ground illegal.

Egypt.—By law No. 10 of 1905 all lotteries are prohibited with certain exceptions, and it is made illegal to hawk the tickets or offer them for sale or to bring illegal lotteries in any way to the notice of the public. The authorized lotteries are those for charitable purposes, *e.g.* those of the benevolent societies of the various foreign communities.

United States.—In the United States many of the states make gaming a penal offence when the bet is upon an election, or a horse race, or a game of hazard. Betting contracts and securities given upon a bet are often made void, and this may destroy a gaming note in the hands of an innocent purchaser for value. The subject lies outside of the province of the federal government. By the legislation of some states the loser may recover his money if he sue within a limited time, as he might have done in England under 9 Anne c. 19.

AUTHORITIES.—Brandt on *Games* (1872); Oliphant, *Law of Horses, &c.* (6th ed. by Lloyd, 1908); Schwabe on the *Stock Exchange* (1905); Melsheimer on the *Stock Exchange* (4th ed., 1905); Coldridge and Hawksford, *The Law of Gambling* (1895); Stutfield, *Betting* (3rd ed., 1901). (W. F. C.)

GAMUT (from the Greek letter *gamma*, used as a musical symbol, and *ut*, the first syllable of the medieval hymn *Sanctus Johannes*), a term in music used to mean generally the whole compass or range of notes possessed by an instrument or voice. Historically, however, the sense has developed from its stricter musical meaning of a scale (the recognized musical scale of any period), originating in the medieval "great scale," of which the invention has usually been ascribed to Guido of Arezzo (*q.v.*) in the 11th century. The whole question is somewhat obscure, but, in the evolution of musical notation out of the classical alphabetical system, the invention of the medieval gamut is more properly assigned to Huchald (d. 930). In his system of scales the semitone was always between the 2nd and 3rd of a tetrachord, as G, A, $\widehat{\flat}$ B, C, so the ♮ B and ♯ F of the second octave were in false relation to the ♭ B and ♮ F of the first two tetrachords. To this scale of four notes, G, A, $\widehat{\flat}$ B, C, were subsequently added a note below and a note above, which made the hexachord with the semitone between the 3rd and 4th both up and down, as $\widehat{\text{F}}$, G, A, $\widehat{\flat}$B, C, D. It was at a much later date that the 7th, our leading note, was admitted into a key, and for this the first two letters of the last line of the above-named hymn, "Sanctus Johannes," would have been used, save for the notion that as the note Mi was at a semitone below Fa, the same vowel should be heard at a semitone below the upper Ut, and the syllable Si was substituted for Sa. Long afterwards the syllable Ut was replaced by Do in Italy, but it is still retained in France; and in these two countries, with whatever others employ their nomenclature, the original Ut and the substituted Do stand for the sound defined by the letter C in English and German terminology. The literal musical alphabet thus accords with the

A	B	C	D	E	F	G

syllabic: La, Si, Ut or Do, Re, Mi, Fa, Sol. In Germany a remnant of Greek use survives. A was originally followed in the scale by the semitone above, as the classical Mesē was followed by Paramesē, and this note, namely ♭B, is still called B in German, English ♮ B (French and Italian Si) being represented by the letter H. The gamut which, whenever instituted, did not pass out of use until the 19th century, regarded the hexachord and not the octachord, employed both letters and syllables, made the former invariable while changing the latter according to key relationship, and acknowledged only the three keys of G, C and F; it took its name from having the Greek letter gamma with Ut for its lowest keynote, though the Latin letters with the corresponding syllables were applied to all the other notes.

GANDAK, a river of northern India. It rises in the Nepal Himalayas, flows south-west until it reaches British territory, where it forms the boundary between the United Provinces and Bengal for a considerable portion of its course, and falls into the Ganges opposite Patna. It is a snow-fed stream, and the surrounding country in the plains, lying at a lower level than its banks, is endangered by its floods. The river is accordingly enclosed by protective embankments.

The LITTLE GANDAK rises in the Nepal hills, enters Gorakhpur district about 8 m. west of the Gandak, and joins the Gogra just within the Saran district of Bengal.

The BURHI (or old) GANDAK also rises in the Nepal hills, and follows a course roughly parallel to and east of that of the Gandak, of which it represents an old channel, passing Muzaffarpur, and joining the Ganges nearly opposite to Moughjr. Its principal tributary is the Baghmati, which rises in the hills N. of Kathmandu, flows in a southerly direction through Tirhut, and joins the Burhi Gandak close to Rusera.

GANDAMAK, a village of Afghanistan, 35 m. from Jalalabad on the road to Kabul. On the retreat from Kabul of General Elphinstone's army in 1842, a hill near Gandamak was the scene of the massacre of the last survivors of the force, twenty officers and forty-five British soldiers. It is also notable for the treaty of Gandamak, which was signed here in 1879 with Yakub Khan. (See AFGHANISTAN.)

GANDERSHEIM, a town of Germany in the duchy of Brunswick, in the deep valley of the Gande, 48 m. S.W. of Brunswick, on the railway Bössum-Holzminden. Pop. (1905) 2847. It has two Protestant churches of which the convent church (*Stiftskirche*) contains the tombs of famous abbesses, a palace (now used as law courts) and the famous abbey (now occupied by provincial government offices). There are manufactures of linen, cigars, beet-root sugar and beer.

The abbey of Gandersheim was founded by Duke Ludolf of Saxony, who removed here in 856 the nuns who had been shortly before established at Brunshausen. His own daughter Hathumoda was the first abbess, who was succeeded on her death by her sister Gerberga. Under Gerberga's government Louis III. granted a privilege, by which the office of abbess was to continue in the ducal family of Saxony as long as any member was found competent and willing to accept the same. Otto III. gave the abbey a market, a right of toll and a mint; and after the bishop of Hildesheim and the archbishop of Mainz had long contested with each other about its supervision, Pope Innocent III. declared it altogether independent of both. The abbey was ultimately recognized as holding directly of the Empire, and the abbess had a vote in the imperial diet. The conventual estates were of great extent, and among the feudatories who could be summoned to the court of the abbess were the elector of Hanover and the king of Prussia. Protestantism was introduced in 1568, and Magdalena, the last Roman Catholic abbess, died in 1589; but Protestant abbesses were appointed to the foundation, and continued to enjoy their imperial privileges till 1803, when Gandersheim was incorporated with Brunswick. The last abbess, Augusta Dorothea of Brunswick, was a princess of the ducal house, and kept her rank till her death. The memory of Gandersheim will long be preserved by its literary memorials. Hroswitha, the famous Latin poet, was a member of the sisterhood in the 9th century; and the rhyming chronicle of Eberhard of Gandersheim ranks as in all probability the earliest historical work composed in low German.

The Chronicle, which contains an account of the first period of the monastery, is edited by L. Wieland in the *Monumenta Germ. historica* (1877), and has been the object of a special study by Paul Hasse (Göttingen, 1872). See also "Agii vita Hathumodae abbatissae Gandershemensis primae," in J. G. von Eckhart's *Veterum monumentorum quaternio* (Leipzig, 1720); and Hase, *Mittelalterliche Baudenkmäler Niedersachsens* (1870).

GANDHARVA, in Hindu mythology, the term used to denote (1) in the Rig-Veda usually a minor deity; (2) in later writings a class of divine beings. As a unity Gandharva has no special attributes but many duties, and is in close relation with the great gods. Thus he is director of the sun's horses; he is guardian of

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soma, the sacred liquor, and therefore is regarded as the heavenly physician, soma being a panacea. He is servant of Agni the god of light and of Varuna the divine judge. He is omnipresent: in the heavens, in the air and in the waters. He is the keeper of heaven's secrets and acts as messenger between gods and men. He is gorgeously clothed and carries shining weapons. For wife he has the spirit of the clouds and waters, Apsaras, and by her became father of the first mortals, Yama and Yami. He is the tutelary deity of women and presides over marriage ceremonies. In their collective capacity the Gandharva share the duties allotted to the single deity. They live in the house of Indra and with their wives, the Apsaras, beguile the time by singing, acting and dancing. Sometimes they are represented as numbering twelve, sometimes twenty-seven, or they are innumerable. In Hindu law a Gandharva marriage is one contracted by mutual consent and without formality.

GANDÍA, a seaport of eastern Spain, in the province of Valencia; on the Gandía-Alcóy and Alcira-Denia railways. Pop. (1900) 10,026. Gandía is on the left bank of the river Alcóy or Sérpis, which waters one of the richest and most populous plains of Valencia and enters the Mediterranean Sea at the small harbour of Gandía (*El Grao*), 3 m. N.E. The chief ancient buildings of Gandía are the Gothic church, the college, founded by San Francisco de Borgia, director-general of the order of Jesus (1510–1572), and the palace of the dukes of Gandía—a title held in the 15th and 16th centuries by members of the princely house of Borgia or Borja. A Jesuit convent, the theatre, schools and the palace of the dukes of Osuna, are modern. Besides its manufactures of leather, silk, velvet and ribbons, Gandía has a thriving export trade in fruit, and imports coal, guano, timber and flour. In 1904, 400 vessels, of 200,000 tons, entered the harbour.

GANDO, a sultanate of British West Africa, included in the protectorate of Nigeria, situated on the left bank of the Niger above Borgu. The sultanate was established, *c.* 1819, on the death of Othman Dan Fodio, the founder of the Fula empire, and its area and importance varied considerably during the 19th century, several of the Fula emirates being regarded as tributaries, while Gando itself was more or less dependent on Sokoto. Gando in the middle of the century included both banks of the Niger at least as far N.W. as Say. The districts outside the British protectorate now belong to France. Since 1884 Gando has been in treaty relations with the British, and in 1903 the part assigned to the British sphere by agreement with France came definitely under the control of the administration in Nigeria. Gando now forms the sub-province of the double province of Sokoto. The emir was appointed under British authority after the conquest of Sokoto in 1903. Since that date the province has been organized for administration on the same system as the rest of the protectorate of Northern Nigeria. Provincial and native courts of justice have been established, roads have been opened, the slave trade has been abolished, and the country assessed under the new scheme for taxation. British garrisons are stationed at Jegga and Ambrusa. The chief town is Gando, situated on the Sokoto, the first considerable affluent of the Niger from the east, about 60 m. S.W. of the town of Sokoto.

GANESA, or **GANESH**, in Hindu mythology, the god of wisdom and prudence, always represented with an elephant's head possibly to indicate his sagacity. He is the son of Siva and Parvati. He is among the most popular of Indian deities, and almost every act, religious or social, in a Hindu's life begins with an invocation to him, as do most books. He typifies not the wisdom of knowledge but that worldly wisdom which results in financial success, and thus he is particularly the god of the Hindu shopkeeper. In his divine aspect Ganesa is ruler over the hosts of heaven, the spirits which come and go to do Indra's will.

GANGES (GANGA), a great river of northern India, formed by the drainage of the southern ranges of the Himalayas. This mighty stream, which in its lower course supplies the river system of Bengal, rises in the Garhwal state, and falls into the Bay of Bengal after a course of 1500 m. It issues, under the name of the Bhagirathi, from an ice cave at the foot of a Himalayan snow-bed near Gangotri, 10,300 ft. above the level of the sea.

During its passage through the southern spurs of the Himalayas it receives the Jahnavi from the north-west, and subsequently the Alaknanda, after which the united stream takes the name of the Ganges. Deo Prayag, their point of junction, is a celebrated place of pilgrimage, as is also Gangotri, the source of the parent stream. At Sukhi it pierces through the Himalayas, and turns south-west to Hardwar, also a place of great sanctity. It proceeds by a tortuous course through the districts of Dehra Dun, Saharanpur, Muzaffarnagar, Bulandshahr and Farukhabad, in which last district it receives the Ramganga. Thus far the Ganges has been little more than a series of broad shoals, long deep pools and rapids, except, of course, during the melting of the snows and throughout the rainy season. At Allahabad, however, it receives the Jumna, a mighty water stream, which takes its rise also in the Himalayas to the west of the sources of the Ganges. The combined river winds eastwards by south-east through the United Provinces, receiving the Gumti and the Gogra. The point of junction with both the Gumti and the Gogra has more or less pretension to sanctity. But the tongue of land at Allahabad, where the Jumna and the Ganges join, is the true Prayag, *the* place of pilgrimage, to which hundreds of thousands of devout Hindus repair to wash away their sins in the sacred river. It is here that the great festival called the Magh mela is held.

Shortly after passing the holy city of Benares the Ganges enters Behar, and after receiving an important tributary, the Sone from the south, passes Patna, and obtains another increase to its volume from the Gandak, which rises in Nepal. Farther to the east it receives the Kosi, and then, skirting the Rajmahal hills, turns sharply to the southward, passing near the site of the ruined city of Gaur. By this time it has approached to within 240 m., as the crow flies, from the sea. About 20 m. farther on it begins to branch out over the level country, and this spot marks the commencement of the delta, 220 m. in a straight line, or 300 by the windings of the river, from the Bay of Bengal. The main channel takes the name of the Padma or Padda, and proceeds in a south-easterly direction, past Pabna to Goalanda, above which it is joined by the Jamuna or main stream of the Brahmaputra. The vast confluence of waters rushes towards the sea, receiving further additions from the hill country on the east, and forming a broad estuary known under the name of the Meghna, which enters the Bay of Bengal near Noakhali. This estuary, however, is only the largest and most useful of a great number of mouths or channels. The most westerly is the Hugli, which receives the waters of a number of distributary channels that start from the parent Ganges above Murshidabad. Between the Hugli on the west and the Meghna on the east lies the delta. The upper angle of it consists of rich and fertile districts, such as Murshidabad, Nadia, Jessore and the 24 Parganas. But towards its southern base, resting on the sea, the country sinks into a series of great swamps, intercepted by a network of innumerable channels. This wild waste is known as the Sundarbans, from the *sundari* tree, which grows in abundance in the seaboard tracts.

The most important channel of the Ganges for commerce is the Hugli, on which stands Calcutta, about 90 m. from the mouth. Beyond this point the navigation is conducted by many of the modern facilities for traffic by rail and the increasing shoals in the river having put an end to the previous steamer communication, which plied until about 1860 as high up as Allahabad. Below Calcutta important boat routes through the east also connect the Hugli with the eastern branches of the river, for both native craft and steamers.

The Ganges is essentially a river of great cities: Calcutta, Monghyr, Patna, Benares and Allahabad all lie on its course below its junction with the Jumna; and the ancient capitals, Agra and Delhi, are on the Jumna, higher up. The catchment basin of the Ganges is bounded on the N. by a length of about 700 m. of the Himalayan range, on the S. by the Vindhya mountains, and on the E. by the ranges which separate Bengal from Burma. The vast river basin thus enclosed embraces 432,480 sq. m. According to the latest calculations, the length of the main stream of the Ganges is 1540 m., or with its longest affluent, 1680; breadth at true entrance into the sea, 30 m.; breadth of channel in dry season, 13 to 23½ m.; depth in dry season, 30 ft.; flood discharge, 1,800,000 cub. ft. per second; ordinary discharge, 207,000 cub. ft.; longest duration of flood, about 40 days. The average fall from Allahabad to Benares is 6 in. per mile; from Benares to Calcutta, between 4 and 5 in.; from Calcutta to the sea, 1 to 2 in. Great changes take place from time to time in the river-bed, which alter the face of the country. Extensive islands are thrown up, and attach themselves to the mainland, while the river deserts its old bed and seeks a new channel, it may be many miles off. Such changes are so rapid and on so vast a scale, and the corroding power of the current on the bank so irresistible, that in Lower Bengal it is considered perilous to build any structure of a large or permanent character on its margin. Many decayed or ruined cities attest the changes in the river-bed in ancient times; and within our own times the main channel which formerly passed Rajmahal has turned away from it, and left the town high and dry, 7 m. from the bank.

The Ganges is crossed by six railway bridges on its course as far as Benares; and another, at Sara in Eastern Bengal, has been sanctioned.

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The UPPER GANGES CANAL and the LOWER GANGES CANAL are the two principal systems of perennial irrigation in the United Provinces. The Ganges canal was opened by Lord Dalhousie in 1854, and irrigates 978,000 acres. The Lower Ganges canal, an extension of the original canal, has been in operation since 1878 and irrigates 830,000 acres. The two canals, together with the eastern Jumna, command the greater portion of the Doab lying between the Ganges and the Jumna, above Allahabad. Navigation in either is insignificant. (T. H. H.*)

GANGOTRI, a celebrated place of Hindu pilgrimage, among the Himalaya Mountains. It is situated in the native state of Garhwal in the United Provinces, on the Bhagirathi, the chief head-stream of the Ganges, which is here not above 15 or 20 yds. broad, with a moderate current, and not in general above 3 ft. deep. The course of the river runs N. by E.; and on the bank near Gangotri there is a small temple about 20 ft. high, in which are images representing Ganga, Bhagirathi and other figures of mythology. It dates from the early part of the 18th century. The bed of the river adjoining the temple is divided off by the Brahmans into three basins, where the pilgrims bathe. One of these portions is dedicated to Brahma, another to Vishnu and the third to Siva. The pilgrimage to Gangotri is considered efficacious in washing away the sins of the devotee, and ensuring him eternal happiness in the world to come. The water taken from this sacred spot is exported by pilgrims to India and sold at a high price. The elevation of the temple above the sea is 10,319 ft.

GANGPUR, a tributary state of Orissa, Bengal, included until 1905 among the Chota Nagpur States. It is bounded N. by Ranchi district, E. by the Singhbhum district, S. by Sambalpur and Bamra, and W. by Raigarh in the Central Provinces. The country is for the most part an undulating plain, broken by detached ranges of hills, one of which, the Mahavira range, possesses a very remarkable appearance, springing abruptly from the plain in an irregular wall of tilted and disrupted rock, with two flanking peaks. The rivers are the Ib and the Brahmani, formed here by the union of the Sankh and the South Koel, both navigable by canoes. The Ib was formerly famous on account of diamonds found in its bed, and its sands are still washed for gold. One of the largest coalfields in India extends into the state, and iron ore is also found. Jungle products—lac, silk cocoons, catechu and resin, which are exported; wild animals—bisons, buffaloes, tigers, leopards, hyenas, wolves, jackals, wild dogs and many sorts of deer. Area, 2492 sq. m.; pop. (1901) 238,896; estimated revenue, £16,000.

GANGRENE (from Gr. γάγγραινα, an eating sore, from γραίειν, to gnaw), a synonym in medicine for mortification (*q.v.*), or a local death in the animal body due to interruption of the circulation by various causes.

GANILH, CHARLES (1758–1836), French economist and politician, was born at Allanche in Cantal on the 6th of January 1758. He was educated for the profession of law and practised as *avocat*. During the troubled period which culminated in the taking of the Bastille on the 14th of July 1789, he came prominently forward in public affairs, and was one of the seven members of the permanent Committee of Public Safety which sat at the hôtel de ville. He was imprisoned during the Reign of Terror, and was only released by the counter-revolution of the 9th Thermidor. During the first consulate he was called to the tribunate, but was excluded in 1802. In 1815 he was elected deputy for Cantal, and finally left the Chamber on its dissolution in 1823. He died in 1836. Ganilh is best known as the most vigorous defender of the mercantile school in opposition to the views of Adam Smith and the English economists.

His works, though interesting from the clearness and precision with which these peculiar opinions are presented, do not now possess much value for the student of political economy. He wrote *Essai politique sur le revenue des peuples de l'antiquité, du moyen âge, &c.* (1808); *Des systèmes d'économie politique* (1809); *Théorie d'économie politique* (1815); *Dictionnaire analytique de l'économie politique* (1826).

GANJAM, a district of British India, in the extreme north-east of the Madras Presidency. It has an area of 8372 sq. m. Much of the district is exceedingly mountainous and rocky, but is interspersed with open valleys and fertile plains. Pleasant groves of trees in the plains give to the scenery a greener appearance than is usually met with in the districts to the south. The mountainous tract known as the Maliyas, or chain of the Eastern Ghats, has an average height of about 2000 ft.—its principal peaks being Singharaj (4976 ft.), Mahendragiri (4923) and Devagiri (4535). The hilly region forms the agency of Ganjam, with an area of 3483 sq. m. and a population (in 1901) of 321,114, mostly wild backward tribes, incapable of being governed under ordinary conditions and therefore ruled by an agent of the governor with special powers. The chief rivers are the Rushikulya, the Vamsadhara and the Languliya. The sea and river fisheries afford a livelihood to a considerable section of the population. The hilly region abounds in forests consisting principally of *sal*, with satin-wood, ebony and sandal-wood in smaller quantities.

Ganjam formed part of the ancient kingdom of Kalinga. Its early history is involved in obscurity, and it was not till after the Gajapati dynasty ascended the throne of Orissa that this tract became even nominally a part of their dominions. Owing to the nature of the country the rising Mahommedan power was long kept at bay; and it was not till nearly a century after the first invasion of Orissa that a Mahommedan governor was sent to govern the Chicacole Circars, which included the present district of Ganjam. In 1753 Chicacole, with the Northern Circars, were made over to the French by Salabat Jang for the maintenance of his French auxiliaries. In 1750 Masulipatam was taken by an English force sent from Bengal, and the French were compelled to abandon Ganjam and their other factories in the north. In 1765 the Northern Circars (including Ganjam) were granted to the English by imperial firman, and in August 1768 an English factory was founded at Ganjam, protected by a fort. The present district of Ganjam was constituted in 1802. In the earlier years of British rule considerable difficulty was experienced in the administration of the district; and on more than one occasion the refractory large landholders had to be coerced by means of regular troops. In 1816 Ganjam was overrun by the Pindaris; and in 1836 occurred the Gumsur campaign, when the British first came into contact with the aboriginal Kondhs, the suppression of whose practice of human sacrifice was successfully accomplished. A petty rising of a section of the Kondhs occurred in 1865, which was, however, suppressed without the aid of regular troops.

In 1901 the pop. of the district was 2,010,256, showing an increase of 20% in the decade. There are two systems of government irrigation: (1) the Rushikulya project, and (2) the Ganjam minor rivers system. The principal crops are rice, other food grains, pulse, oil seeds and a little sugar-cane and cotton. Salt is evaporated, as a government monopoly, along the coast. Sugar is refined, according to German methods, at Aska, where rum also is produced. A considerable trade is conducted at the ports of Gopalpur and Calingapatam, which are only open roadsteads. The district is traversed throughout by the East Coast railway (Bengal-Nagpur system), which was opened from Calcutta to Madras in 1900. There are colleges at Berhampore and Parlakimedi. The headquarters station is Berhampore; the town of Ganjam occupied this position till 1815, when it was found unhealthy, and its importance has since declined.

GANNAL, JEAN NICOLAS (1791–1852), French chemist, was born at Sarre-Louis on the 28th of July 1791. In 1808 he entered the medical department of the French army, and witnessed the retreat from Moscow in 1812. After the downfall of the empire he worked at the École Polytechnique in Paris and subsequently at the Faculty of Sciences as assistant to L. J. Thénard. His contributions to technical chemistry included a method of refining borax, the introduction of elastic rollers formed of gelatin and sugar for use in printing, and processes for manufacturing glue and gelatin, lint, white lead, &c. The Institute awarded him a Montyon prize in 1827 for his advocacy of chlorine as a remedy in pulmonary phthisis, and again in 1835 for his discovery of the efficacy of solutions of aluminium acetate and chloride for preserving anatomical preparations. In the latter part of his life he turned his attention to embalmment, his method depending on the injection of solutions of aluminium salts into the arteries. He died at Paris in January 1852. His son

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Felix, born in 1829, also devoted himself to the question of the disposal of the dead, among his publications being *Mort réelle et mort apparente* (1868), *Inhumation et crémation* (1876), and *Les Cimetières* (1885), a work on the history and law of burial, of which only one volume appeared.

GANNET (O.E. *ganot*) or Solan Goose,[1] the *Pelecanus bassanus* of Linnaeus and the *Sula bassana* of modern ornithologists, a large sea-fowl long known as a numerous visitor, for the purpose of breeding, to the Bass Rock at the entrance of the Firth of

Gannet, or Solan Goose.

Forth, and to certain other islands off the coast of Britain, of which four are in Scottish waters—namely, Ailsa Craig, at the mouth of the Firth of Clyde; the group known collectively as St Kilda; Suleskerry, some 40 m. north-east of the Butt of Lewis; and the Stack and Skerry, about the same distance westward of Stromness. It appears also to have two stations off the coast of Ireland, the Skellig Islands and the Stags of Broadhaven, and it resorts besides to Lundy Island in the Bristol Channel—its only English breeding-place. Farther to the northward its settlements are Myggenaes, the most westerly of the Faeroes, and various small islands off the coast of Iceland, of which the Vestmannaeyjar, the Reykjanes Fuglaskér and Grimsey are the chief. On the western side of the Atlantic it appears to have but five stations, one in the Bay of Fundy, and four rocks in the Gulf of St Lawrence. On all these seventeen places the bird arrives about the end of March or in April and departs in autumn when its young are ready to fly; but even during the breeding-season many of the adults may be seen on their fishing excursions at a vast distance from their home, while at other times of the year their range is greater still, for they not only frequent the North Sea and the English Channel, but stray to the Baltic, and, in winter, extend their flight to the Madeiras, while the members of the species of American birth traverse the ocean from the shores of Greenland to the Gulf of Mexico.

Apparently as bulky as a goose, and with longer wings and tail, the gannet weighs considerably less. The plumage of the adult is white, tinged on the head and neck with buff, while the outer edge and principal quills of the wings are black, and some bare spaces round the eyes and on the throat reveal a dark blue skin. The first plumage of the young is of a deep brown above, but paler beneath, and each feather is tipped with a triangular white spot. The nest is a shallow depression, either on the ground itself or on a pile of turf, grass and seaweed—which last is often conveyed from a great distance. The single egg it contains has a white shell of the same chalky character as a cormorant's. The young are hatched blind and naked, but the slate-coloured skin with which their body is covered is soon clothed with white down, replaced in due time by true feathers of the dark colour already mentioned. The mature plumage is believed not to be attained for some three years. Towards the end of summer the majority of gannets, both old and young, leave the neighbourhood of their breeding-place, and, betaking themselves to the open sea, follow the shoals of herrings and other fishes (the presence of which they are most useful in indicating to fishermen) to a great distance from land. Their prey is almost invariably captured by plunging upon it from a height, and a company of gannets fishing presents a curious and interesting spectacle. Flying in a line, each bird, when it comes over the shoal, closes its wings and dashes perpendicularly into the waves, whence it emerges after a few seconds, and, shaking the water from its plumage, mounts in a wide curve, and orderly takes its place in the rear of the string, to repeat is headlong plunge so soon as it again finds itself above its prey.[2]

Structurally the gannet presents many points worthy of note, such as its closed nostrils, its aborted tongue, and its toes all connected by a web—characters which it possesses in common with most of the other members of the group of birds (*Steganopodes*) to which it belongs. But more remarkable still is the system of subcutaneous air-cells, some of large size, pervading almost the whole surface of the body, communicating with the lungs, and capable of being inflated or emptied at the will of the bird. This peculiarity has attracted the attention of several writers—Montagu, Sir R. Owen (*Proc. Zool. Soc.*, 1831, p. 90), and Macgillivray.

In the southern hemisphere the gannet is represented by two nearly allied but somewhat smaller forms—one, *Sula capensis*, inhabiting the coast of South Africa, and the other, *S. serrator*, the Australian seas. Both much resemble the northern bird, but

[1] The phrase *ganotes bath* (gannet's bath), a periphrasis for the sea, occurs in the *Anglo-Saxon Chronicle*, in reference to events which took place A.D. 975, as pointed out by Prof. Cunningham, whose learned treatise on this bird (*Ibis*, 1866, p. 1) nearly exhausts all that can be said of its history and habits. A few pages further on (p. 13) this writer remarks:—"The name gannet is intimately connected with our modern English gander, both words being modifications of the ancient British 'gan' or 'gans,' which is the same word as the modern German 'Gans,' which in its turn corresponds with the old High German 'Kans,' the Greek χήν, the Latin *anser*, and the Sanskrit 'hansa,' all of which possess the same signification, viz. a goose. The origin of the names solan or soland, sulan, sula and haf-sula, which are evidently all closely related, is not so obvious. Martin [*Voy. St Kilda*] informs us that 'some imagine that the word solan comes from the Irish souler, corrupted and adapted to the Scottish language, *qui oculis irretortis e longinquo respicial praedam.*' The earlier writers in general derive the word from the Latin *solea*, in consequence of the bird's supposed habit of hatching its egg with its foot; and in a note intercalated into Ray's description of the solan goose in the edition of his Itineraries published by the Ray Society, and edited by Dr Lankester, we are told, though no authority for the statement is given, that 'the gannet, *Sula alba*, should be written solent goose, *i.e.* a channel goose.' Hereon an editorial note remarks that this last statement appears to have been a suggestion of Yarrell's, and that it seems at least as possible that the "Solent" took its name from the bird.

[2] The large number of gannets, and the vast quantity of fish they take, has been frequently animadverted upon, but the computations on this last point are perhaps fallacious. It seems to be certain that in former days fishes, and herrings in particular, were at least as plentiful as now, if not more so, notwithstanding that gannets were more numerous. Those frequenting the Bass were reckoned by Macgillivray at 20,000 in 1831, while in 1869 they were computed at 12,000, showing a decrease of two-fifths in 38 years. On Ailsa in 1869 there were supposed to be as many as on the Bass, but their number was estimated at 10,000 in 1877 (*Report on the Herring Fisheries of Scotland*, 1878, pp. xxv. and 171),—being a diminution of one-sixth in eight years, or nearly twice as great as on the Bass.

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the former seems to have a permanently black tail, and the latter a tail the four middle feathers of which are blackish-brown with white shafts.

Apparently inseparable from the gannets generically are the smaller birds well known to sailors as boobies, from the extraordinary stupidity they commonly display. They differ, however, in having no median stripe of bare skin down the front of the throat; they almost invariably breed upon trees and are inhabitants of warmer climates. One of them, *S. cyanops*, when adult has much of the aspect of a gannet, but *S. piscator* is readily distinguishable by its red legs, and *S. leucogaster* by its upper plumage and neck of deep brown. These three are widely distributed within the tropics, and are in some places exceedingly abundant. The fourth, *S. variegata*, which seems to preserve throughout its life the spotted suit characteristic of the immature *S. bassana*, has a much more limited range, being as yet only known from the coast of Peru, where it is one of the birds which contribute to the formation of guano. (A. N.)

GANODONTA (so named from the presence of bands of enamel on the teeth), a group of specialized North American Lower and Middle Eocene mammals of uncertain affinity. The group includes *Hemiganus*, *Psittacotherium* and *Conoryctes* from the Puerco, *Calamodon* and *Hemiganus* from the Wasatch, and *Stylinodon* from the Bridger Eocene. With the exception of *Conoryctes*, in which it is longer, the skull is short and suggests affinity to the sloths, as does what little is known of the limb-bones. The dentition, too, is of a type which might well be considered ancestral to that of the Edentata. For instance, the molars when first developed have tritubercular summits, but these soon become worn away, leaving tall columnar crowns, with a subcircular surface of dentine exposed at the summit of each. Moreover, while the earlier types have a comparatively full series of teeth, all of which are rooted and invested with enamel, in the later forms the incisors are lost, the check-teeth never develop roots but grow continuously throughout life. These and other features induced Dr J. L. Wortman to regard the Ganodonta as an ancestral suborder of Edentata; but this view is not accepted by Prof. W. B. Scott. Teeth provisionally assigned to *Calamodon* have been obtained from the Lower Tertiary deposits of Switzerland.

See J. L. Wortman, "The Ganodonta and their Relationship to the Edentata," *Bull. Amer. Mus.* vol. ix. p. 59 (1897); W. B. Scott, "Mammalia of the Santa Cruz Beds, Edentata," *Rep. Princeton Exped. to Patagonia*, vol. v. (1903–1904). (R. L.*)

GANS, EDUARD (1797–1839), German jurist, was born at Berlin on the 22nd of March 1797, of prosperous Jewish parents. He studied law first at Berlin, then at Göttingen, and finally at Heidelberg, where he attended Hegel's lectures, and became thoroughly imbued with the principles of the Hegelian philosophy. In 1820, after taking his doctor's degree, he returned to Berlin as lecturer on law. In 1825 he turned Christian, and the following year was appointed extraordinary, and in 1828 ordinary, professor in the Berlin faculty of law. At this period the historical school of jurisprudence was coming to the front, and Gans, predisposed owing to his Hegelian tendencies to treat law historically, applied the method to one special branch—the right of succession. His great work, *Erbrecht in weltgeschichtlicher Entwickh ig* (1824, 1825, 1829 and 1835), is of permanent value, not only for its extensive survey of facts, but for the admirable manner in which the general theory of the slow evolution of legal principles is presented. In 1830, and again in 1835, Gans visited Paris, and formed an intimate acquaintance with the leaders of literary culture and criticism there. The liberality of his views, especially on political matters, drew upon Gans the displeasure of the Prussian government, and his course of lectures on the history of the last fifty years (published as *Vorlesungen über d. Geschichte d. letzten fünfzig Jahre*, Leipzig, 1833–1834) was prohibited. He died at Berlin on the 5th of May 1839. In addition to the works above mentioned, there may be noted the treatise on the fundamental laws of property (*Über die Grundlage des Besitzes*, Berlin, 1820), a portion of a systematic work on the Roman civil law (*System des römischen Civil-Rechts*, 1827), and a collection of his miscellaneous writings (*Vermischte Schriften*, 1832). Gans edited the *Philosophie der Geschichte* in Hegel's *Werke*, and contributed an admirable preface.

See *Revue des deux mondes* (Dec. 1839).

GÄNSBACHER, JOHANN BAPTIST (1778–1844), Austrian musical composer, was born in 1778 at Sterzing in Tirol. His father, a schoolmaster and teacher of music, undertook his son's early education, which the boy continued under various masters till 1802, when he became the pupil of the celebrated Abbé G. J. Vogler. To his connexion with this artist and with his fellow-pupils, more perhaps than to his own merits, Gänsbacher's permanent place in the history of music is due; for it was during his second stay with Vogler, then (1810) living at Darmstadt, that he became acquainted with Weber and Meyerbeer, and the close friendship which sprang up among the three young musicians, and was dissolved by death only, has become celebrated in the history of their art. But Gänsbacher was himself by no means without merit. He creditably filled the responsible and difficult post of director of the music at St Stephen's cathedral, Vienna, from 1823 till his death (July 13, 1844); and his compositions show high gifts and accomplishment. They consist chiefly of church music, 17 masses, besides litanies, motets, offertories, &c., being amongst the number. He also wrote several sonatas, a symphony, and one or two minor compositions of a dramatic kind.

GANTÉ, a cloth made from cotton or tow warp and jute weft. It is largely used for bags for sugar and similar material, and has the appearance of a fine hessian cloth.

GANYMEDE, in Greek mythology, son of Tros, king of Dardania, and Callirrhoë. He was the most beautiful of mortals, and was carried off by the gods (in the later story by Zeus himself, or by Zeus in the form of an eagle) to Olympus to serve as cup-bearer (Apollodorus iii. 12; Virgil, *Aeneid*, v. 254; Ovid, *Metam.* x. 255). By way of compensation, Zeus presented his father with a team of immortal horses (or a golden vine). Ganymede was afterwards regarded as the genius of the fountains of the Nile, the life-giving and fertilizing river, and identified by astronomers with the Aquarius of the zodiac. Thus the divinity that distributed drink to the gods in heaven became the genius who presided over the due supply of water on earth. When pederasty became common in Greece, an attempt was made to justify it and invest it with dignity by referring to the rape of the beautiful boy by Zeus; in Crete, where the love of boys was reduced to a system, Minos, the primitive ruler and law-giver, was said to have been the ravisher of Ganymede. Thus the name which once denoted the good genius who bestowed the precious gift of water upon man was adopted to this use in vulgar Latin under the form *Catamitus*. Ganymede being carried off by the eagle was the subject of a bronze group by the Athenian sculptor Leochares, imitated in a marble statuette in the Vatican. E. Veckenstedt (*Ganymedes*, Libau, 1881) endeavours to prove that Ganymede is the genius of intoxicating drink (*μέθυ*, mead, for which he postulates a form *μηδος*), whose original home was Phrygia.

See article by P. Weizsäcker in Roscher's *Lexikon der Mythologie*. In the article GREEK ART, fig. 53 (Pl. I.) gives an illustration of Ganymede borne aloft by an eagle.

GAO, GAO-GAO, or GARO, a town of French West Africa, in the Upper Senegal and Niger colony, on the left bank of the Niger, 400 m. by river below Timbuktu. Pop. about 5000. The present town dates from the French occupation in 1900; of the ancient city there are scanty ruins, the chief being a truncated pyramid, the remains of the tomb (16th century) of Mahommed Askia, the Songhoi conqueror, and those of the great mosque. According to tradition a city stood on this spot in very ancient times and its inhabitants are said to have had intercourse with the Egyptians. It is known, however, that the city of which the French settlement is the successor was founded by the Songhoi, probably in the 7th or 8th century, and became the capital of their empire. Garo (Ga-rho) appears to have been the correct name of the Songhoi city, though it was also known as Gogo and Kuku (Kaougha).[1] In the 12th century Idrisi describes Kuku as

[1] There was another city called Kaoka or Ganga east of Lake Chad in the country now known as Bagirmi. It was the seat of the

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a populous unwalled town devoted to commerce and industry; it is possible, however, that Idrisi is referring not to Gao but to another town somewhat to the south—at that period the middle course of the Niger had many prosperous towns along its banks. In the 14th century Gao was conquered by the king of Melle, and its great mosque was built (*c.* 1325) by the Melle sovereign Kunkur Musa on his return from a pilgrimage to Mecca. In the 15th century the Songhoi regained power and Gao attained its greatest prosperity in the reign of Askia. It did not enjoy the commercial importance of Jenné nor the intellectual supremacy of Timbuktu, but was the political centre of the western Sudan for a long period. On the break up of the Songhoi power the city declined in importance. It became subject in 1590 to the *Ruma* of Timbuktu, from whom it was wrested in 1770 by the Tuareg, the last named surrendering possession to the French. The first European to reach Gao was Mungo Park (1805); he was followed in 1851 by Heinrich Barth, and in 1896 by the French naval lieutenant Hourst. Gao is now the headquarters of a military district. A caravan route leads from it to Kano and Bornu. From Gao upwards the Niger is navigable for over 1000 m.

See TIMBUKTU. For the Gao region of the Niger see an article by F. Dubois in *L'Afrique française* (January 1909).

GAOL, or JAIL, a prison (*q.v.*). The two forms of the word are due to the parallel dual forms in Old Central and Norman French respectively, *jaiole* or *jaole*, and *gaiole* or *gayolle*. The common origin is the med. Lat. *gabiola*, a diminutive formed from *cavea*, a hollow, a den, from which the English "cave" is derived. The form "gaol" still commonly survives in English, and is in official usage, *e.g.* "gaol-delivery," but the common pronunciation of both words, "jail," shows the real surviving word.

GAON (Heb. for "Excellency," plural *Geonim*), the title given to the heads of the two Jewish academies in Babylonia, Sura and Pumbeditha. Though the name is far older, it is chiefly applied to Rabbis who lived between the close of the Talmud and the transference of the centre of Judaism from Asia to Europe—*i.e.* from the end of the 6th to the middle of the 11th century A.D. The Geonim were required to do homage to the Exilarchs (see EXILARCH) but were otherwise independent. They exercised wide authority and were appealed to in settlement of the social and religious affairs of the diaspora. To them must be assigned the arrangement of the main lines of the present Synagogue liturgy. Their chief literary activity took the form of Answers to Questions—a form which was extensively used in later centuries. The most noted of the Geonim, who will be found treated under their respective names, were Ahai, Amram, Ṣemach, Saadiah, Sherira and Hai. Hai Gaon died in 1038, closing the period of the Geonim after an activity of four and a half centuries.

A full list of the Geonim is given in tabular form in the *Jewish Encyclopaedia*, vol. v. p. 571. (I. A.)

GAP, the capital of the French department of the Hautes Alpes. Pop. (1906) town, 6888; commune, 10,823. It is built at a height of 2418 ft. on the right bank of the Luye (an affluent of the Durance), in an agreeable position, and is dominated afar by snowy peaks on the N.E. The little city has the look of a Provençal town, being white. The 17th-century cathedral church has been entirely reconstructed (1866–1905). In the prefecture is the tomb of the constable de Lesdiguières (1543–1626), dating from about 1613, and due to a Lorraine sculptor, Jacob Richier. The same building contains various scientific and archaeological collections, as well as the very rich archives, which include many MSS. from the monastery of Durbon, &c. There are a few small manufactories of purely local importance. Gap is connected by railway with Briançon (51½ m.) and with Grenoble (85¾ m.), while from the railway junction of Veynes (16¼ m. W. of Gap) it is 122 m. by rail to Marseilles. The episcopal see of Gap, now in the ecclesiastical province of Aix en Provence, is first certainly mentioned in the 6th century, and in 1791 was enlarged by the annexation of that of Embrun (then suppressed).

Gap is the *Vapincum* of the Romans, and was founded by Augustus about 14 B.C. It long formed part of Provence, but in 1232 most of the region passed by marriage to the dauphins of Viennois. The town itself, however, remained under the rule of the bishops until 1512, when it was annexed to the crown of France. The bishops continued to bear the title of count of Gap until the Revolution. The town was sacked by the Huguenots in 1567 and 1577, and by the duke of Savoy in 1692. It was the birthplace of the reformer Guillaume Farel (1489–1565), who first preached his doctrines there about 1561–1562, but then took refuge in Switzerland.

See J. Roman, *Histoire de la ville de Gap* (Gap, 1892).

(W. A. B. C.)

GAPAN, a town of the province of Nueva Ecija, Luzon, Philippine Islands, 3 m. E. of San Isidro, the capital. Pop. (1903) 11,278. It is situated in a rich rice-growing region, and extensive forests in its vicinity contain fine hardwoods. Its climate is comparatively cool and healthy. The principal native dialects spoken are Tagalog and Pampangan. Gapan is the oldest town of the province.

GARARISH (KARARISH), a semi-nomadic tribe of Semitic origin, dwelling along the right bank of the Nile from Wādi Halfa to Merawi. Many members of the tribe are agriculturists, others act as guides or transport drivers. They declare themselves kinsfolk of the Ababda, but they are more Arab than Beja.

GARASHANIN, ILIYA (1812–1874), Servian statesman, was the son of a Servian peasant, who made money by exporting cattle and pigs to Austria and by his intelligence and wealth attained to a certain influence in the country. He wanted to give his son as good an education as possible, and therefore sent him to Hungary to learn first in a Greek and then in a German school. Highly gifted, and having passed through a regular although somewhat short school training, the young Iliya very quickly came to the front. In 1836 Prince Milosh appointed him a colonel and commander of the then just organized regular army of Servia. In 1842 he was called to the position of assistant to the home minister, and from that time until his retirement from public life in 1867 he was repeatedly minister of home affairs, distinguishing himself by the energy and justice of his administration. But he rendered far greater services to his country as minister for foreign affairs. He was the first Servian statesman who had a political programme, and who worked to replace the Russian protectorate over Servia by the joint protectorate of all the great powers of Europe. As minister for foreign affairs in 1853 he was decidedly opposed to Servia joining Russia in war against Turkey and the western powers. His anti-Russian views resulted in Prince Menshikov, while on his mission in Constantinople, 1853, peremptorily demanding from the prince of Servia (Alexander Karageorgevich) his dismissal. But although dismissed, his personal influence in the country secured the neutrality of Servia during the Crimean War. He enjoyed esteem in France, and it was due to him that France proposed to the peace conference of Paris (1856) that the old constitution, granted to Servia by Turkey as suzerain and Russia as protector in 1830, should be replaced by a more modern and liberal constitution, framed by a European international commission. But the agreement of the powers was not secured. Garashanin induced Prince Alexander Karageorgevich to convoke a national assembly, which had not been called to meet for ten years. The assembly was convoked for St Andrew's Day 1858, but its first act was to dethrone Prince Alexander and to recall the old Prince Milosh Obrenovich. When after the death of his father Milosh (in 1860) Prince Michael ascended the throne, he entrusted the premiership and foreign affairs to Iliya Garashanin. The result of their policy was that Servia was given a new, although somewhat conservative, constitution, and that she obtained, without war, the evacuation of all the fortresses garrisoned by the Turkish troops on the Servian territory, including the fortress of Belgrade (1867). Garashanin was preparing a general rising of the Balkan nations

Bulala dynasty, an offshoot of the royal family of Kanem, whose rule in the 15th century extended from the Shari to Darfur. The existence of the state was first mentioned by Leo Africanus. To the Bornuese it was known as Bulala or Kuka Bulala, a name which persists as that of a district in French Congo (see BORNU). The similarity of the name Gaoga to that of the Songhoi capital has given rise to much confusion.

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against the Turkish rule, and had entered into confidential arrangements with the Rumanians, Bosnians, Albanians, Bulgarians and Greeks, and more especially with Montenegro. But the execution of his plans was frustrated by his sudden resignation (at the end of 1867), and more especially by the assassination of Prince Michael a few months later (the 10th of June 1868). Although he was a Conservative in politics, and as such often in conflict with the leader of the Liberal movement, Yovan Ristich, he certainly was one of the ablest statesmen whom Servia had in the 19th century. (C. Mi.)

GARAT, DOMINIQUE JOSEPH (1749–1833), French writer and politician, was born at Bayonne on the 8th of September 1749. After receiving a good education under the direction of a relation who was a curé, and having been an advocate at Bordeaux, he came to Paris, where he obtained introductions to the most distinguished writers of the time, and became a contributor to the *Encyclopédie méthodique* and the *Mercure de France*. He gained considerable reputation by an éloge on Michel de L'Hôpital in 1778, and was afterwards three times crowned by the Academy for éloges on Suger, Montausier and Fontenelle. In 1785 he was named professor of history at the *Lycée*, where his lectures enjoyed an equal popularity with those of G. F. Laharpe on literature. Being chosen a deputy to the states-general in 1789, he rendered important service to the popular cause by his narrative of the proceedings of the Assembly contributed to the *Journal de Paris*. Possessing strongly optimist views, a mild and irresolute character, and indefinite and changeable convictions, he played a somewhat undignified part in the great political events of the time, and became a pliant tool in carrying out the designs of others. Danton had him named minister of justice in 1792, and in this capacity had entrusted to him what he called the *commission affreuse* of communicating to Louis XVI. his sentence of death. In 1793 he became minister of the interior. In this capacity he proved himself quite inefficient. Though himself uncorrupt, he winked at the most scandalous corruption in his subordinates, and in spite of the admirably organized detective service, which kept him accurately informed of every movement in the capital, he entirely failed to maintain order, which might easily have been done by a moderate display of firmness. At last, disgusted with the excesses which he had been unable to control, he resigned (August 15, 1793). On the 2nd of October he was arrested for Girondist sympathies but soon released, and he escaped further molestation owing to the friendship of Barras and, more especially, of Robespierre, whose literary *amour-propre* he had been careful to flatter. On the 9th Thermidor, however, he took sides against Robespierre, and on the 12th of September 1794 he was named by the Convention as a member of the executive committee of public instruction. In 1798 he was appointed ambassador to Naples, and in the following year he became a member, then president, of the Council of the Ancients. After the revolution of the 18th Brumaire he was chosen a senator by Napoleon and created a count. During the Hundred Days he was a member of the chamber of representatives. In 1803 he was chosen a member of the Institute of France, but after the restoration of Louis XVIII. his name was, in 1816, deleted from the list of members. After the revolution of 1830 he was named a member of the new Academy of Moral and Political Science. He died at Ustaritz near Bayonne, April 25, 1833. His writings are characterized by elegance, grace and variety of style, and by the highest kind of rhetorical eloquence; but his grasp of his subject is superficial, and as his criticisms have no root in fixed and philosophical principles they are not unfrequently whimsical and inconsistent. He must not be confounded with his elder brother Dominique (1735–1799), who was also a deputy to the states-general.

The works of Garat include, besides those already mentioned, *Considérations sur la Révolution Française* (Paris, 1792); *Mémoires sur la Révolution, ou exposé de ma conduite* (1795); *Mémoires sur la vie de M. Suard, sur ses écrits, et sur le XVIIIe siècle* (1820); éloges on Joubert, Kléber and Desaix; several notices of distinguished persons; and a large number of articles in periodicals. Valuable materials for the history of Garat's tenure of the ministry, notably the police reports of Dutard, are given in W. A. Schmidt's *Tableaux de la Révolution Française* (3 vols., Leipzig, 1867–1870).

GARAT, PIERRE-JEAN (1764–1823), French singer, nephew of Dominique Joseph Garat, was born in Bordeaux on the 25th of April 1764. Gifted with a voice of exceptional timbre and compass he devoted himself, from an early age, to the cultivation of his musical talents. On account of his manifesting a distaste for the legal profession, for which his father wished him to study, he was deprived of his allowance, but through the patronage of a friend he obtained the office of secretary to Comte d'Artois, and was afterwards engaged to give musical lessons to the queen of France. At the beginning of the Revolution he accompanied Rode to England, where the two musicians appeared together in concerts. He returned to Paris in 1794. After the Revolution he became a professional singer, and on account of a song which he had composed in reference to the misfortunes of the royal family he was thrown into prison. On regaining his liberty he went to Hamburg, where he at once achieved extraordinary success; and by his subsequent appearances in Paris, and his visits to Italy, Spain, Germany and Russia, he made for himself a reputation as a singer unequalled by any other of his own time. He was a keen partisan of Gluck in opposition to Handel. On the institution of the Conservatoire de Musique he became its professor of singing. He also composed a number of songs, many of which have considerable merit. He died on the 1st of March 1823 in Paris.

GARAY, JÁNOS (1812–1853), Hungarian poet and author, was born on the 10th of October 1812, at Szegszárd, in the county of Tolna. From 1823 to 1828 he studied at Fünfkirchen, and subsequently, in 1829, at the university of Pest. In 1834 he brought out an heroic poem, in hexameters, under the title *Csatár*. After this he issued in quick succession various historical dramas, among which the most successful were *Arbócz*, *Országh Ilona* and *Báthori Erzsébet*,—the first two published at Pest in 1837 and the last in 1840. Garay was an energetic journalist, and in 1838 he removed to Pressburg, where he edited the political journal *Hirnök* (Herald). He returned to Pest in 1839, when he was elected a corresponding member of the Hungarian Academy of Sciences. In 1842 he was admitted into the Kisfaludy Society, of which he became second secretary. Garay enriched Hungarian literature with numerous lyrical poems, ballads and tales. The first collection of his poems was published at Pest in 1843; and his prose tales appeared in 1845, under the title of *Tollrajsok* (Sketches with the Pen). His historical ballads and legends, styled *Arpádok* (Pest, 1847, 2nd ed. 1848), showed him to be a master in the art of ballad-writing. Some of his lyrical poems also are excellent, as, for example, *Balatoni Kagylók* (Shells from the Balaton Lake) (Pest, 1848). His legend *Bosnyák Zsófia* (Pest, 1847), and his poetical romance *Frangepán Kristófné* (Christopher Frangepan's Wife) (Pest, 1846), gained the prize of the Kisfaludy Society. His last and most famous work was an historical poem in twelve cantos, with the title *Szent László* (Saint Ladislaus) (Eger, 1852, 2nd ed., Pest, 1853, 3rd ed. 1863). Garay was professor of Hungarian language and literature to the university of Pest in 1848–1849. After about four years' illness he died on the 5th of November 1853, in great want. A collective edition of his poems was published at Pest the year after his death by F. Ney (2nd ed. 1860), and several of his poems were translated by Kertbeny.

See *Garay János Összes költemányei* (2nd ed., Pest, 1860); and *Dichtungen von Johann Garay* (2nd ed., Vienna, 1856).

GARBLE (a word derived from the Arab. *gharbala*, to sift, and related to *ghirbal*, a sieve; the Arabic words are of foreign origin, probably from the Lat. *cribrum*, a sieve), originally a medieval commercial term in the Mediterranean ports, meaning to sort out, or to sift merchandize, such as corn, spices, &c., in order to separate what was good from the refuse or waste; hence to select the best of anything for retention. Similarly a "garbler" was an official who was appointed to sort out, or test the work of those who had already sorted, the spices or drugs offered for sale in the London markets. In this original sense the word is now obsolete, but by inversion, or rather perversion, "garble" now means to sort out or select, chiefly from books or other literary works, or from public speeches, some portion which twists, mutilates, or renders ineffective the meaning of the author or speaker.

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GARÇÃO, PEDRO ANTONIO JOAQUIM CORRÊA (1724–1772), Portuguese lyric poet, was the son of Philippe Corrêa da Serra, a *fidalgo* of the royal house who held an important post in the foreign office; his mother was of French descent. The poet's health was frail, and after going through a Jesuit school in Lisbon and learning English, French and Italian at home, he proceeded in 1742 to the university of Coimbra with a view to a legal career. He took his degree in 1748, and two years later was created a knight of the Order of Christ. In 1751 his marriage with D. Maria Salema brought him a rich dower which enabled him to live in ease and cultivate letters; but in later years a law-suit reduced him to poverty. From 1760 to 1762 he edited the *Lisbon Gazette*. In 1756, in conjunction with Cruz e Silva and others, Garção founded the *Arcadia Lusitana* to reform the prevailing bad taste in literature, identified with *Seicentismo*, which delighted in conceits, windy words and rhetorical phrases. The *Arcadia* fulfilled its mission to some extent, but it lacked creative power, became dogmatic, and ultimately died of inanition. Garção was the chief contributor to its proceedings, bearing the name of "Corydon Erimantheo," and his orations and dissertations, with many of his lyrics, were pronounced and read at its meetings. He lived much in the society of the English residents in Lisbon, and he is supposed to have conceived a passion for an English married lady which completely absorbed him and contributed to his ruin. In the midst of his literary activity and growing fame, he was arrested on the night of the 9th of April 1771, and committed to prison by Pombal, whose displeasure he had incurred by his independence of character. The immediate cause of his incarceration would appear to have been his connexion with a love intrigue between a young friend of his and the daughter of a Colonel Elsden, but he was never brought to trial, and the matter must remain in doubt. After much solicitation, his wife obtained from the king an order for her husband's release on the 10th of November 1772, but it came too late. Broken by infirmities and the hardships of prison life, Garção expired that very day in the Limoeiro, at the age of forty-seven.

Taking Horace as his model, and aided by sound judgment, scholarship and wide reading, Garção set out to raise and purify the standard of poetical taste, and his verses are characterized by a classical simplicity of form and expression. His sonnets *ad sodales* show a charming personality; his vigorous and elegant odes and epistles are sententious in tone and reveal an inspired poet and a man chastened by suffering. His two comedies in hendecasyllables, the *Theatro Novo* (played in January 1766) and the *Assembléa*, are excellent satires on the social life of the capital; and in the *Cantata de Dido*, included in the latter piece, the spirit of Greek art is allied to perfection of form, making this composition perhaps the gem of Portuguese 18th century poetry.

Garção wrote little and spent much time on the *labor limae*. His works were published posthumously in 1778, and the most complete and accessible edition is that of J. A. de Azevedo Castro (Rome, 1888). An English version of the *Cantata de Dido* appeared in the *Academy* (January 19th, 1895). See Innocencio da Silva, *Diccionario bibliographico Portuguez*, vol. vi. pp. 386-393, and vol. xvii. pp. 182-184; also Dr Theophilo Braga, *A Arcadia Lusitana* (Oporto, 1899). (E. Pr.)

GARCIA (DEL POPOLO VICENTO), MANOEL (1775–1832), Spanish singer and composer, was born in Seville on the 22nd of January 1775. He became a chorister at the cathedral of Seville, and studied music under the best masters of that city. At seventeen he made his début on the stage at Cadiz, in an operetta, in which were included songs of his own composition. Soon afterwards he appeared at Madrid in the twofold capacity of singer and composer. His reputation being established, he proceeded to Paris, where he appeared for the first time, in 1808, in Paer's opera *Griselda*. Here also he was received with great applause, his style of singing being especially appreciated. This he further improved by careful study of the Italian method in Italy itself, where he continued his successes. His opera *Il Califo di Bagdad* was favourably received at Naples in 1812, but his chief successes were again due to his perfection as a vocalist. His opera *La Morte di Tasso* was produced in 1821 in Paris, where it was followed in 1823 by his *Il Fazzoletto*. In 1824 he went to London, and thence proceeded to America (1825) with a company of artistes, amongst whom were his son Manoel and his daughter Maria, better known under her subsequent name of Malibran. In New York was produced his opera *La Figlia dell' aria* in 1827. He extended his artistic tour as far as Mexico, and was on the point of returning to Europe in order to retire from public life when he was robbed of his well-earned wealth by brigands on his way to Vera Cruz. Settled again in Paris in 1829, he soon retired from the stage, and devoted himself exclusively to teaching. He died in Paris on the 2nd of June 1832. His method of teaching was famous, and some of the most celebrated singers of the early part of the century were amongst his pupils. He also wrote an excellent book on the art of singing called *Metodo di canto*, of which the essence was subsequently incorporated by his son Manoel in his admirable *Traité complet de l'art du chant* (1847). His operas have not survived their day. He wrote nearly forty in all, but with the exception of those quoted, and *El Poeta calculista*, produced when he was thirty, none are remarkable. Besides the children already mentioned, his daughter Paulina, Madame Viardot (1821–1910), worthily continued the tradition for the best singing with which his name had become associated.

His son, MANOEL GARCIA (1895–1906), who celebrated his hundredth birthday in London on the 17th of March 1905, was born at Madrid, and after his father's death devoted himself to teaching. He was a professor at the Paris Conservatoire from 1830 to 1848, from that time to 1895 was a professor at the Royal Academy of Music in London. He became famous for his invention of the laryngoscope about 1850, apart from his position as the greatest representative of the old "*bel canto*" style of singing.

GARCÍA DE LA HUERTA, VICENTE ANTONIO (1734–1787), Spanish dramatist, was born at Zafra on the 9th of March 1734, and was educated at Salamanca. At Madrid he soon attracted attention by his literary arrogance and handsome person; and at an early age became chief of the National Library, a post from which he was dismissed owing to the intrigues of his numerous enemies. The publication of his unsatisfactory collection of Spanish plays entitled *Theatro Hespanol* (1785–1786) exposed him to severe censures, which appear to have affected his reason. He died at Madrid on the 12th of March 1787, without carrying into effect his avowed intention of reviving the national drama. His *Agamemnon vengado* derives from Sophocles, his *Jaire* is translated from Voltaire, and even his once famous *Raquel*, though Spanish in subject, is classic in form.

GARCÍA DE PAREDES, DIEGO (1466–1534), Spanish soldier and duellist, was a native of Trujillo in Estremadura, Spain. He never commanded an army or rose to the position of a general, but he was a notable figure in the wars of the end of the 15th and beginning of the 16th century, when personal prowess had still a considerable share in deciding the result of actions. His native town and its district, which lie between Talavera and Madrid, produced many of the most noted *conquistadores* of America, including the Pizarro family. Diego himself served in his youth in the war of Granada. His strength, daring and activity fitted him to shine in operations largely composed of night marches, escalades, surprises and hand-to-hand combats. The main scene of his achievements was in Italy, and he betook himself to it—on his own showing—not in search of glory, but because he had killed a relation of his own, Ruy Sanchez de Vargas, in a street fight arising out of a quarrel about a horse. He fled to Rome, then under the rule of the Borgias. Diego was a distant relation to the cardinal of Santa Cruz (Carvajal), a favourite with Pope Alexander VI., who was in conflict with the barons of the Romagna and took Diego into his service. He remained a soldier of the pope till he killed a man in a personal quarrel and found it necessary to pass over to the enemy. Now he became acquainted with the Colonnas, who appreciated his services. The wars between Ferdinand V. of Aragon (the Catholic king) and Louis XII. gave him a more creditable opening. The Spanish general Gonsalvo de Córdoba, who knew his value, employed him and trusted him; and he took part in all the wars of Italy on the

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frontier of Navarre, and once against the Turks on the Danube, till 1530. His countrymen made him the hero of many Münchausen-like stories of personal prowess. It was said that he held a bridge single-handed against 200 Frenchmen, that he stopped the wheel of a water-mill, and so forth. In the "Brief Summary" of his life and deeds attributed to him, and printed at the end of the *Chronicle of the Great Captain*, published in 1584 at Alcalá de Henares, he lays no claim to having done more than was open to a very athletic man. He was killed at Bologna in 1534 by a fall while engaged in a jumping-match with some of the younger officers of the army. His body was carried to his native town Trujillo, and buried in the church of Santa Maria Mayor in 1545.

GARCÍA GUTIÉRREZ, ANTONIO (1812–1884), Spanish dramatist, was born at Chiclana (Cadiz) on the 5th of July 1812, and studied medicine in his native town. In 1832 he removed to Madrid, and earned a scanty living by translating plays of Scribe and the elder Dumas; despairing of success, he was on the point of enlisting when he suddenly sprang into fame as the author of *El Trovador*, which was played for the first time on the 1st of March 1836. García Gutiérrez never surpassed this first effort, which placed him among the leaders of the romantic movement in Spain, and which became known all over Europe through Verdi's music. His next great success was *Simón Bocanegra* (1843), but, as his plays were not lucrative, he emigrated to Spanish America, working as a journalist in Cuba and Mexico till 1850, when he returned to Spain. The best works of his later period are a *zarzuela* entitled *El Grumete* (1853), *La Venganza catalana* (1864) and *Juan Lorenzo* (1865). He became head of the archaeological museum at Madrid, and died there on the 6th of August 1884. His *Poesías* (1840) and another volume of lyrics, entitled *Lus y tinieblas* (1842), are unimportant; but the brilliant versification of his plays, and his power of analysing feminine emotions, give him a foremost place among the Spanish dramatists of the 19th century.

GARD, a department in the south of France, consisting of part of the old province of Languedoc. Pop. (1906) 421,166. Area 2270 sq. m. It is bounded N. by the departments of Lozère and Ardèche, E. by the Rhone, which separates it from Vaucluse and Bouches-du-Rhône, S. by the Mediterranean, S.W. by Hérault and W. by Aveyron. Gard is divided into three sharply-defined regions. Its north-western districts are occupied by the range of the Cévennes, which on the frontier of Lozère attain a height of 5120 ft. The whole of this region is celebrated for its fruitful valleys, its gorges, its beautiful ravines, its pastures, and the chestnut, mulberry and other fruit trees with which the mountains are often clothed to their summits. The Garrigues, a dry, hilly region of limestone, which lends itself to the cultivation of cereals, the vine and olive, stretches from the foot of the Cévennes over the centre of the department, covering about half its area. The southern portion, which extends to the sea, and was probably at one time covered by it, is a low plain with numerous lakes and marshes. Though unhealthy, it is prosperous, and comprises the best arable land and vineyards in Gard.

Besides the Rhone, which bounds the department on the E., and the Ardèche, the lower course of which forms part of its boundary on the N., the principal rivers are the Cèze, Gard, Vidourle and Hérault. The most northern of these is the Cèze, which rises in the Cévennes, and after a course of about 30 m. in an E.S.E. direction falls into the Rhone above Roquemaure. The Gard, or Gardon, from which the department takes its name, is also an affluent of the Rhone, and, rising in the Cévennes from several sources, traverses the centre of the department, having a length of about 60 m. In the upper part of its course it flows through a succession of deep mountain gorges, and from the melting of the snows on the Cévennes is subject to inundations, which often cause great damage. Its waters not infrequently rise 18 or 20 ft. in a few hours, and its bed is sometimes increased in width to nearly a mile. Near Remoulins it is crossed by a celebrated Roman aqueduct—the Pont du Gard (see AQUEDUCT). The Vidourle flows in a S.S.E. direction from its source near Le Vigan, and after a course of about 50 m. falls into the sea. Below Sommières it forms the western boundary of the department. The Hérault has its source and part of its course in the west of Gard. The Canal de Beaucaire extends from the Rhone at Beaucaire to Aigues-Mortes, which communicates with the Mediterranean at Grau-du-Roi by means of the Grand-Roubine canal.

The climate is warm in the south-east, colder in the north-west; it is rather changeable, and rain-storms are common. The cold and violent north-west wind known as the mistral is its worst drawback. Les Fumades (near Allègre) and Euzet have mineral springs. The chief grain crops are wheat and oats. Rye, barley and potatoes are also grown. Gard is famed for its cattle, its breed of small horses, and its sheep, the wool of which is of a very fine quality. In the rearing of silk-worms it ranks first among French departments. The principal fruit trees are the olive, mulberry and chestnut. The vine is extensively cultivated and yields excellent red and white wines. The department is rich in minerals, and the mines of coal, iron, lignite, asphalt, zinc, lead and copper, which are for the most part situated in the neighbourhoods of Alais and La Grand'-Combe, constitute one of the chief sources of its wealth. Great quantities of salt are obtained from the salt marshes along the coast. The quarries of building and other stone employ a considerable number of workmen. The fisheries are productive. The manufactures are extensive, and include those of silk, of which Alais is the chief centre, cotton and woollen fabrics, hosiery, ironware, hats (Anduze), liquorice, gloves, paper, leather, earthenware and glass. There are also breweries and distilleries, and important metallurgical works, the chief of which are those of Bessèges. The exports of Gard include coal, lignite, coke, asphalt, building-stone, iron, steel, silk, hosiery, wine, olives, grapes and truffles.

The department is served by the Paris-Lyon railway. It is divided into the arrondissements of Nîmes, Alais, Uzès and Le Vigan, with 40 cantons and 351 communes. The chief town is Nîmes, which is the seat of a bishopric of the province of Avignon and of a court of appeal. Gard belongs to the 15th military region, which has its headquarters at Marseilles, and to the académie (educational division) of Montpellier. Nîmes, Alais, Uzès, Aigues-Mortes, Beaucaire, Saint-Gilles, Bessèges, La Grand'-Combe and Villeneuve-lès-Avignon are the principal places. Opposite the manufacturing town of Pont-St-Esprit the Rhone is crossed by a fine medieval bridge more than 1000 yds. long built by the Pontiff brethren. Le Vigan, an ancient town with several old houses, carries on silk-spinning.

GARDA, LAKE OF (the *Lacus Benacus* of the Romans), the most easterly and the most extensive of the great Lombard lakes, being only surpassed in the Alpine region by those of Geneva and Constance. Save the extreme northern extremity (Riva, which was secured from Venice by Tirol in 1517), the whole lake is Italian, being divided between the provinces of Verona and Brescia. Its broad basin orographically represents the southern portion of the valley of the Adige, though that river now flows through a narrow trench which is separated from the lake by the long narrow ridge of the Monte Baldo (7277 ft.). Nowadays the lake is fed by the Sarca, that flows in at its north end from the glaciers of the Adamello, while at the southern extremity of the lake the Mincio flows out, on its way to join the Po. The area of the lake is about 143 sq. m., its length is 32½ m., its greatest breadth is about 10 m., the height of its surface above sea-level is 216 ft. and the greatest depth yet measured is 1016 ft. Its upper or northern end is narrow, but between Garda (E.) and Salò (W.) the lake expands gradually into a nearly circular basin, which at the southern extremity is divided into two parts by the long low promontory of Sermione, that projects from the southern shore between Peschiera and Desenzano. Owing to this conformation the lake is much exposed to sudden and violent winds, which Virgil alludes to in his well-known line (*Georg.* ii. line 160): *fluctibus et fremitu assurgens, Benace, marino.* The most dangerous of these winds is the *Borea* or *Suer*, that sweeps down from the north as through a funnel. In the southern portion of the lake the *Vinessa*, an E.S.E. wind, is most dreaded. The *Ora* is a regular wind coming from the east which, on reaching the

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lake, blows from S. to N. The steep grey limestone crags of Monte Baldo, on the eastern side of the lake, contrast strongly with the rich vegetation on the western and southern shores. The portion of the western shore that extends from Gargnano to Salò is the most sheltered and warmest part of the region, so that not merely does it resemble one continuous garden (producing lemons, figs, mulberries, olives, &c.), but is frequented in winter, and has been given the name of the *Riviera Benacense*. The lovely promontory of Sermione, at the southern end of the lake, has also an extremely luxuriant vegetation, while it contains many remains of buildings of Roman and later date, having been the Sirmio of Catullus, who resided here and celebrated its beauties in many of his poems. In 1827 a boat with paddles set in motion by horses was put on the lake, but the first steamer dates only from 1844. At the south end of the lake, E. and W. respectively of the promontory of Sermione, are the towns of Peschiera (14¼ m. by rail from Verona on the east) and of Desenzano (17¼ m. by rail from Brescia on the west), which are 8¼ m. distant from each other. On the west shore of the lake are Salò, Toscolano, Gargnano and Limone, while the rugged east shore can boast only of Bardolino and Garda. At the northern tip of the lake, and in Tirol, is Riva, the most considerable town on the lake, and 15¾ m. by rail from the Mori station on the main Brenner line. (W. A. B. C.)

GARDANE, CLAUDE MATTHIEU, COUNT (1766–1818), French general and diplomatist, was born on the 30th of January 1766. He entered the army and rose rapidly during the revolutionary wars, becoming captain in 1793. In May 1799 he distinguished himself by saving a division of the French army which was about to be crushed by the Russians at the battle of Bassignana, and was named at once brigadier-general by Moreau. He incurred Napoleon's displeasure for an omission of duty shortly before the battle of Marengo (June 14th, 1800), but in 1805 was appointed to be aide-de-camp of the emperor. His chief distinction, however, was to be won in the diplomatic sphere. In the spring of 1807, when Russia and Prussia were at war with France, and the emperor Alexander I. of Russia was also engaged in hostilities with Persia, the court of Teheran sent a mission to the French emperor, then at the castle of Finkenstein in the east of Prussia, with a view to the conclusion of a Franco-Persian alliance. This was signed on the 4th of May 1807, at that castle; and Napoleon designed Gardane as special envoy for the cementing of that alliance. The secret instructions which he drew up for Gardane, and signed on the 30th of May, are of interest as showing the strong oriental trend of the emperor's policy. France was to guarantee the integrity of Persia, to recognize that Georgia (then being invaded by the Russians) belonged to the shah, and was to make all possible efforts for restoring that territory to him. She was also to furnish to the shah arms, officers and workmen, in the number and to the amount demanded by him. Napoleon on his side required Persia to declare war against Great Britain, to expel all Britons from her territory, and to come to an understanding with the Afghans with a view to a joint Franco-Perso-Afghan invasion of India. Gardane, whose family was well known in the Levant, had a long and dangerous journey overland, but was cordially received at Teheran in December 1807. The conclusion of the Franco-Russian treaty at Tilsit in July 1807 rendered the mission abortive. Persia longed only for help against Russia and had no desire, when all hope of that was past, to attack India. The shah, however, promised to expel Britons and to grant to France a commercial treaty. For a time French influence completely replaced that of England at Teheran, and the mission of Sir John Malcolm to that court was not allowed to proceed. Finally, however, Gardane saw that nothing much was to be hoped for in the changed situation of European affairs, and abruptly left the country (April 1809). This conduct was not wholly approved by Napoleon, but he named him count and in 1810 attached him to Masséna's army in Portugal. There, during the disastrous retreat from Santarem to Almeida, he suffered a check which brought him into disfavour. The rest of his career calls for no notice. He died in 1818. The report which he sent to Champagny (dated April 23rd, 1809) on the state of Persia and the prospects of a successful invasion of India is of great interest. He admitted the difficulties of this enterprise, but thought that a force of picked French troops, aided by Persians and Afghans, might under favourable conditions penetrate into India by way of Kandahar, or through Sind, especially if the British were distracted by maritime attacks from Mauritius.

See Count Alfred de Gardane, *Mission du général Gardane en Perse* (Paris, 1865); and P. A. L. de Driault, *La Politique orientale de Napoléon: Sébastiani et Gardane* (Paris, 1904). (J. Ht. R.)

GARDELEGEN, a town of Germany, in Prussian Saxony, on the right bank of the Milde, 20 m. W. from Stendal, on the main line of railway Berlin-Hanover. Pop. (1905) 8193. It has a Roman Catholic and three Evangelical churches, a hospital, founded in 1285, and a high-grade school. There are considerable manufactures, notably agricultural machinery and buttons, and its beer has a great repute. Gardelegen was founded in the 10th century, and was for a long time the seat of a line of counts. It suffered considerably in the Thirty Years' War, and in 1775 was burned by the French. On the neighbouring heath Margrave Louis I. of Brandenburg gained, in 1343, a victory over Otto the Mild of Brunswick.

GARDEN (from O. Fr. *gardin*, mod. Fr. *jardin*; this, like our words "garth," a paddock attached to a building, and "yard," comes from a Teutonic word for an enclosure which appears in Gothic as *gards* and O. H. Ger. *gart*, *cf.* Dutch *gaarde* and Ger. *garten*), the ground enclosed and cultivated for the growth of fruit, flowers or vegetables (see HORTICULTURE). The word is also used for grounds laid out ornamentally, used as places of public entertainment. Such were the famous Ranelagh and Vauxhall Gardens in London; it is similarly used in zoological gardens, and as a name in towns for squares, terraces or streets. From the fact that Epicurus (*q.v.*) taught in the gardens at Athens, the disciples of his school of philosophy were known as οἱ ἀπὸ τῶν κήπων (so Diog. Laërtius x. 10); and Cicero (*De finibus* i. 1, 3, and elsewhere) speaks of the *Horti Epicuri*. Thus as the "Academy" refers to the Platonic and the "Porch" (στοά) to the Stoic school, so the "Garden" is the name given to the Epicurean school of philosophy. Apollodorus was known as κηποτύραννος, the tyrant of the garden.

GARDENIA, in botany, a genus of the natural order Rubiaceae, containing about sixty species of evergreen trees and shrubs, natives of the warmer parts of the old world. Several are grown in stoves or greenhouses for their handsome, sweet-scented white flowers. The flowers are developed singly at the end of a branch or in the leaf-axils, and are funnel- or salver-shaped with a long tube. The double forms of *Gardenia florida* (a native of China) and *G. radicans* (a native of Japan) are amongst the most beautiful and highly perfumed of any in cultivation. Gardenias are grown chiefly for cut flowers, and are readily propagated by cuttings. They require plenty of heat and moisture in the growing season, and must be kept free from insects such as the mealy bug, green fly, red spider and scale-insect.

GARDINER, JAMES (1688–1745), Scottish soldier, was born at Carriden in Linlithgowshire, on the 11th of January 1688. At the age of fourteen he entered a Scottish regiment in the Dutch service, and was afterwards present at the battle of Ramillies, where he was wounded. He subsequently served in different cavalry regiments, and in 1730 was advanced to the rank of lieutenant-colonel, and in 1743 to that of colonel. He fell at the battle of Prestonpans, the 21st of September 1745. The circumstances of his death are described in Sir Walter Scott's *Waverley*. In his early years he was distinguished for his recklessness and profligacy, but in 1719 a supernatural vision, as he regarded it, led to his conversion, and from that time he lived a life of great devoutness and of thorough consistency with his Christian profession. Dr Alexander Carlyle of Inveresk, author of an autobiography, says that he was "very ostentatious" about his conversion—speaks of him as weak, and plainly thinks there was a great deal of delusion in Col. Gardiner's account of his sins.

His life was written by Dr Philip Doddridge and has been often reprinted.

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GARDINER, SAMUEL RAWSON (1829–1902), English historian, son of Rawson Boddam Gardiner, was born near Alresford, Hants, on the 4th of March 1829. He was educated at Winchester and Christ Church, Oxford, where he obtained a first class in *literae humaniores*. He was subsequently elected to fellowships at All Souls (1884) and Merton (1892). For some years he was professor of modern history at King's College, London, and devoted his life to historical work. He is the historian of the Puritan revolution, and has written its history in a series of volumes, originally published under different titles, beginning with the accession of James I.; the seventeenth (the third volume of the *History of the Commonwealth and Protectorate*) appeared in 1901. This was completed in two volumes by C. H. Firth as *The Last Years of the Protectorate* (1909). The series is *History of England from the Accession of James I. to the Outbreak of the Civil War, 1603–1642* (10 vols.); *History of the Great Civil War, 1642–1649* (4 vols.); and *History of the Commonwealth and Protectorate, 1649–1660*. His treatment is exhaustive and philosophical, taking in, along with political and constitutional history, the changes in religion, thought and sentiment during his period, their causes and their tendencies. Of the original authorities on which his work is founded many of great value exist only in manuscript, and his researches in public and private collections of manuscripts at home, and in the archives of Simancas, Venice, Rome, Brussels and Paris, were indefatigable and fruitful. His accuracy is universally acknowledged. He was perhaps drawn to the Puritan period by the fact of his descent from Cromwell and Ireton, but he has certainly written of it with no other purpose than to set forth the truth. In his judgments of men and their actions he is unbiassed, and his appreciations of character exhibit a remarkable fineness of perception and a broad sympathy. Among many proofs of these qualities it will be enough to refer to what he says of the characters of James I., Bacon, Laud, Strafford and Cromwell. On constitutional matters he writes with an insight to be attained only by the study of political philosophy, discussing in a masterly fashion the dreams of idealists and the schemes of government proposed by statesmen. Throughout his work he gives a prominent place to everything which illustrates human progress in moral and religious, as well as political conceptions, and specially to the rise and development of the idea of religious toleration, finding his authorities not only in the words and actions of men of mark, but in the writings of more or less obscure pamphleteers, whose essays indicate currents in the tide of public opinion. His record of the relations between England and other states proves his thorough knowledge of contemporary European history, and is rendered specially valuable by his researches among manuscript sources which have enabled him to expound for the first time some intricate pieces of diplomacy.

Gardiner's work is long and minute; the fifty-seven years which it covers are a period of exceptional importance in many directions, and the actions and characters of the principal persons in it demand careful analysis. He is perhaps apt to attach an exaggerated importance to some of the authorities which he was the first to bring to light, to see a general tendency in what may only be the expression of an individual eccentricity, to rely too much on ambassadors' reports which may have been written for some special end, to enter too fully into the details of diplomatic correspondence. In any case the length of his work is not the result of verbiage or repetitions. His style is clear, absolutely unadorned, and somewhat lacking in force; he appeals constantly to the intellect rather than to the emotions, and is seldom picturesque, though in describing a few famous scenes, such as the execution of Charles I., he writes with pathos and dignity. The minuteness of his narrative detracts from its interest; though his arrangement is generally good, here and there the reader finds the thread of a subject broken by the intrusion of incidents not immediately connected with it, and does not pick it up again without an effort. And Gardiner has the defects of his supreme qualities, of his fairness and critical ability as a judge of character; his work lacks enthusiasm, and leaves the reader cold and unmoved. Yet, apart from its sterling excellence, it is not without beauties, for it is marked by loftiness of thought, a love of purity and truth, and refinement in taste and feeling. He wrote other books, mostly on the same period, but his great history is that by which his name will live. It is a worthy result of a life of unremitting labour, a splendid monument of historical scholarship. His position as an historian was formally acknowledged: in 1862 he was given a civil list pension of £150 per annum, "in recognition of his valuable contributions to the history of England"; he was honorary D.C.L. of Oxford, LL.D. of Edinburgh, and Ph.D. of Göttingen, and honorary student of Christ Church, Oxford; and in 1894 he declined the appointment of regius professor of modern history at Oxford, lest its duties should interfere with the accomplishment of his history. He died on the 24th of February 1902.

Among the more noteworthy of Gardiner's separate works are: *Prince Charles and the Spanish Marriage* (2 vols., London, 1869); *Constitutional Documents of the Puritan Revolution, 1625–1660* (1st ed., Oxford, 1889; 2nd ed., Oxford, 1899); *Oliver Cromwell* (London, 1901); *What Gunpowder Plot was* (London, 1897); *Outline of English History* (1st ed., London, 1887; 2nd ed., London, 1896); and *Student's History of England* (2 vols., 1st ed., London, 1890–1891; 2nd ed., London, 1891–1892). He edited collections of papers for the Camden Society, and from 1891 was editor of the *English Historical Review*.

(W. Hu.)

GARDINER, STEPHEN (*c.* 1493–1555), English bishop and lord chancellor, was a native of Bury St Edmunds. The date of his birth as commonly given, 1483, seems to be about ten years too early, and surmises which have passed current that he was some one's illegitimate child are of no authority. His father is now known to have been John Gardiner, a substantial cloth merchant of the town where he was born (see his will, printed in *Proceedings of the Suffolk Archaeological Institute*, i. 329), who took care to give him a good education. In 1511 he, being then a lad, met Erasmus at Paris (Nichols's *Epistles of Erasmus*, ii. 12, 13). But he had probably already been to Cambridge, where he studied at Trinity Hall and greatly distinguished himself in the classics, especially in Greek. He afterwards devoted himself to the canon and civil law, in which subjects he attained so great a proficiency that no one could dispute his pre-eminence. He received the degree of doctor of civil law in 1520, and of canon law in the following year.

Ere long his abilities attracted the notice of Cardinal Wolsey, who made him his secretary, and in this capacity he is said to have been with him at More Park in Hertfordshire, when the conclusion of the celebrated treaty of the More brought Henry VIII. and the French ambassadors thither. It is stated, and with great probability, that this was the occasion on which he was first introduced to the king's notice, but he does not appear to have been actively engaged in Henry's service till three years later. In that of Wolsey he undoubtedly acquired a very intimate knowledge of foreign politics, and in 1527 he and Sir Thomas More were named commissioners on the part of England in arranging a treaty with the French ambassadors for the support of an army in Italy against the emperor. That year he accompanied Wolsey on his important diplomatic mission to France, the splendour and magnificence of which are so graphically described by Cavendish. Among the imposing train who went with the cardinal—including, as it did, several noblemen and privy councillors—Gardiner alone seems to have been acquainted with the real heart of the matter which made this embassy a thing of such peculiar moment. Henry was then particularly anxious to cement his alliance with Francis I., and gain his co-operation as far as possible in the object on which he had secretly set his heart—a divorce from Catherine of Aragon. In the course of his progress through France he received orders from Henry to send back his secretary Gardiner, or, as he was called at court, Master Stevens, for fresh instructions; to which he was obliged to reply that he positively could not spare him as he was the only instrument he had in advancing the king's "secret matter." Next year Gardiner, still in the service of Wolsey, was sent by him to Italy along with Edward Fox, provost of King's College, Cambridge, to promote the same business with the pope. His despatches on this occasion are still extant, and whatever we may think of the cause on which he was engaged, they certainly give a wonderful impression of the

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zeal and ability with which he discharged his functions. Here his perfect familiarity with the canon law gave him a great advantage. He was instructed to procure from the pope a decretal commission, laying down principles of law by which Wolsey and Campeggio might hear and determine the cause without appeal. The demand, though supported by plausible pretexts, was not only unusual but clearly inadmissible. Clement VII. was then at Orvieto, and had just recently escaped from captivity at St Angelo at the hands of the imperialists. But fear of offending the emperor could not have induced him to refuse a really legitimate request from a king like Henry. He naturally referred the question to the cardinals about him; with whom Gardiner held long arguments, enforced, it would seem, by not a little browbeating of the College. What was to be thought, he said, of a spiritual guide, who either could not or would not show the wanderer his way? The king and lords of England would be driven to think that God had taken away from the Holy See the key of knowledge, and that pontifical laws which were not clear to the pope himself might as well be committed to the flames.

This ingenious pleading, however, did not serve, and he was obliged to be content with a general commission for Campeggio and Wolsey to try the cause in England. This, as Wolsey saw, was quite inadequate for the purpose in view; and he again instructed Gardiner, while thanking the pope for the commission actually granted, to press him once more by very urgent pleas, to send the desired decretal on, even if the latter was only to be shown to the king and himself and then destroyed. Otherwise, he wrote, he would lose his credit with the king, who might even be tempted to throw off his allegiance to Rome altogether. At last the pope—to his own bitter regret afterwards—gave what was desired on the express conditions named, that Campeggio was to show it to the king and Wolsey and no one else, and then destroy it, the two legates holding their court under the general commission. After obtaining this Gardiner returned home; but early in the following year, 1529, when proceedings were delayed on information of the brief in Spain, he was sent once more to Rome. This time, however, his efforts were unavailing. The pope would make no further concessions, and would not even promise not to revoke the cause to Rome, as he did very shortly after.

Gardiner's services, however, were fully appreciated. He was appointed the king's secretary. He had been already some years archdeacon of Taunton, and the archdeaconry of Norfolk was added to it in March 1529, which two years later he resigned for that of Leicester. In 1530 he was sent to Cambridge to procure the decision of the university as to the unlawfulness of marriage with a deceased brother's wife, in accordance with the new plan devised for settling the question without the pope's intervention. In this he succeeded, though not without a good deal of artifice, more creditable to his ingenuity than to his virtue. In November 1531 the king rewarded him for his services with the bishopric of Winchester, vacant by Wolsey's death. The promotion was unexpected, and was accompanied by expressions from the king which made it still more honourable, as showing that if he had been in some things too subservient, it was from no abject, self-seeking policy of his own. Gardiner had, in fact, ere this remonstrated boldly with his sovereign on some points, and Henry now reminded him of the fact. "I have often *squared* with you, Gardiner," he said familiarly, "but I love you never the worse, as the bishopric I give will convince you." In 1532, nevertheless, he excited some displeasure in the king by the part he took in the preparation of the famous "Answer of the Ordinaries" to the complaints brought against them in the House of Commons. On this subject he wrote a very manly letter to the king in his own defence.

His next important action was not so creditable; for he was, not exactly, as is often said, one of Cranmer's assessors, but, according to Cranmer's own expression, "assistant" to him as counsel for the king, when the archbishop, in the absence of Queen Catherine, pronounced her marriage with Henry null and void on the 23rd of May 1533. Immediately afterwards he was sent over to Marseilles, where an interview between the pope and Francis I. took place in September, of which event Henry stood in great suspicion, as Francis was ostensibly his most cordial ally, and had hitherto maintained the justice of his cause in the matter of the divorce. It was at this interview that Bonner intimated the appeal of Henry VIII. to a general council in case the pope should venture to proceed to sentence against him. This appeal, and also one on behalf of Cranmer presented with it, were of Gardiner's drawing up. In 1535 he and other bishops were called upon to vindicate the king's new title of "Supreme Head of the Church of England." The result was his celebrated treatise *De vera obedientia*, the ablest, certainly, of all the vindications of royal supremacy. In the same year he had an unpleasant dispute with Cranmer about the visitation of his diocese. He was also employed to answer the pope's brief threatening to deprive Henry of his kingdom.

During the next few years he was engaged in various embassies in France and Germany. He was indeed so much abroad that he had little influence upon the king's councils. But in 1539 he took part in the enactment of the severe statute of the Six Articles, which led to the resignation of Bishops Latimer and Shaxton and the persecution of the Protestant party. In 1540, on the death of Cromwell, earl of Essex, he was elected chancellor of the university of Cambridge. A few years later he attempted, in concert with others, to fasten a charge of heresy upon Archbishop Cranmer in connexion with the Act of the Six Articles; and but for the personal intervention of the king he would probably have succeeded. He was, in fact, though he had supported the royal supremacy, a thorough opponent of the Reformation in a doctrinal point of view, and it was suspected that he even repented his advocacy of the royal supremacy. He certainly had not approved of Henry's general treatment of the church, especially during the ascendancy of Cromwell, and he was frequently visited with storms of royal indignation, which he schooled himself to bear with patience. In 1544 a relation of his own, named German Gardiner, whom he employed as his secretary, was put to death for treason in reference to the king's supremacy, and his enemies insinuated to the king that he himself was of his secretary's way of thinking. But in truth the king had need of him quite as much as he had of Cranmer; for it was Gardiner, who even under royal supremacy, was anxious to prove that England had not fallen away from the faith, while Cranmer's authority as primate was necessary to upholding that supremacy. Thus Gardiner and the archbishop maintained opposite sides of the king's church policy; and though Gardiner was encouraged by the king to put up articles against the archbishop himself for heresy, the archbishop could always rely on the king's protection in the end. Heresy was gaining ground in high places, especially after the king's marriage with Catherine Parr; and there seems to be some truth in the story that the queen herself was nearly committed for it at one time, when Gardiner, with the king's approbation, censured some of her expressions in conversation. In fact, just after her marriage, four men of the Court were condemned at Windsor and three of them were burned. The fourth, who was the musician Marbeck, was pardoned by Gardiner's procurement.

Great as Gardiner's influence had been with Henry VIII., his name was omitted at the last in the king's will, though Henry was believed to have intended making him one of his executors. Under Edward VI. he was completely opposed to the policy of the dominant party both in ecclesiastical and in civil matters. The religious changes he objected to both on principle and on the ground of their being moved during the king's minority, and he resisted Cranmer's project of a general visitation. His remonstrances, however, were met by his own committal to the Fleet, and the visitation of his diocese was held during his imprisonment. Though soon afterwards released, it was not long before he was called before the council, and, refusing to give them satisfaction on some points, was thrown into the Tower, where he continued during the whole remainder of the reign, a period slightly over five years. During this time he in vain demanded his liberty, and to be called before parliament as a peer of the realm. His bishopric was taken from him and given to Dr

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Poynet, a chaplain of Cranmer's who had not long before been made bishop of Rochester. At the accession of Queen Mary, the duke of Norfolk and other state prisoners of high rank were in the Tower along with him; but the queen, on her first entry into London, set them all at liberty. Gardiner was restored to his bishopric and appointed lord chancellor, and he set the crown on the queen's head at her coronation. He also opened her first parliament and for some time was her leading councillor.

He was now called upon, in advanced life, to undo not a little of the work in which he had been instrumental in his earlier years—to vindicate the legitimacy of the queen's birth and the lawfulness of her mother's marriage, to restore the old religion, and to recant what he himself had written touching the royal supremacy. It is said that he wrote a formal *Palinodia* or retractation of his book *De vera obedientia*, but it does not seem to be now extant; and the reference is probably to his sermon on Advent Sunday 1554, after Cardinal Pole had absolved the kingdom from schism. As chancellor he had the onerous task of negotiating the queen's marriage treaty with Philip, to which he shared the general repugnance, though he could not oppose her will. In executing it, however, he took care to make the terms as advantageous for England as possible, with express provision that the Spaniards should in nowise be allowed to interfere in the government of the country. After the coming of Cardinal Pole, and the reconciliation of the realm to the see of Rome, he still remained in high favour. How far he was responsible for the persecutions which afterwards arose is a debated question. He no doubt approved of the act, which passed the House of Lords while he presided there as chancellor, for the revival of the heresy laws. Neither is there any doubt that he sat in judgment on Bishop Hooper, and on several other preachers whom he condemned, not exactly to the flames, but to be degraded from the priesthood. The natural consequence of this, indeed, was that when they declined, even as laymen, to be reconciled to the Church, they were handed over to the secular power to be burned. Gardiner, however, undoubtedly did his best to persuade them to save themselves by a course which he conscientiously followed himself; nor does it appear that, when placed on a commission along with a number of other bishops to administer a severe law, he could very well have acted otherwise than he did. In his own diocese no victim of the persecution is known to have suffered till after his death; and, much as he was already maligned by opponents, there are strong evidences that his natural disposition was humane and generous. In May 1553 he went over to Calais as one of the English commissioners to promote peace with France; but their efforts were ineffectual. In October 1555 he again opened parliament as lord chancellor, but towards the end of the month he fell ill and grew rapidly worse till the 12th of November, when he died over sixty years of age.

Perhaps no celebrated character of that age has been the subject of so much ill-merited abuse at the hands of popular historians. That his virtue was not equal to every trial must be admitted, but that he was anything like the morose and narrow-minded bigot he is commonly represented there is nothing whatever to show. He has been called ambitious, turbulent, crafty, abject, vindictive, bloodthirsty and a good many other things besides, not quite in keeping with each other; in addition to which it is roundly asserted by Bishop Burnet that he was despised alike by Henry and by Mary, both of whom made use of him as a tool. How such a mean and abject character submitted to remain five years in prison rather than change his principles is not very clearly explained; and as to his being despised, we have seen already that neither Henry nor Mary considered him by any means despicable. The truth is, there is not a single divine or statesman of that day whose course throughout was so thoroughly consistent. He was no friend to the Reformation, it is true, but he was at least a conscientious opponent. In doctrine he adhered to the old faith from first to last, while as a question of church policy, the only matter for consideration with him was whether the new laws and ordinances were constitutionally justifiable.

His merits as a theologian it is unnecessary to discuss; it is as a statesman and a lawyer that he stands conspicuous. But his learning even in divinity was far from commonplace. The part that he was allowed to take in the drawing up of doctrinal formularies in Henry VIII.'s time is not clear; but at a later date he was the author of various tracts in defence of the Real Presence against Cranmer, some of which, being written in prison, were published abroad under a feigned name. Controversial writings also passed between him and Bucer, with whom he had several interviews in Germany, when he was there as Henry VIII.'s ambassador.

He was a friend of learning in every form, and took great interest especially in promoting the study of Greek at Cambridge. He was, however, opposed to the new method of pronouncing the language introduced by Sir John Cheke, and wrote letters to him and Sir Thomas Smith upon the subject, in which, according to Ascham, his opponents showed themselves the better critics, but he the superior genius. In his own household he loved to take in young university men of promise; and many whom he thus encouraged became distinguished in after life as bishops, ambassadors and secretaries of state. His house, indeed, was spoken of by Leland as the seat of eloquence and the special abode of the muses.

He lies buried in his own cathedral at Winchester, where his effigy is still to be seen. (J. GA.)

GARDINER, a city of Kennebec county, Maine, U.S.A., at the confluence of Cobbosseecontee river with the Kennebec, 6 m. below Augusta. Pop. (1890) 5491; (1900) 5501 (537 foreign-born); (1910) 5311. It is served by the Maine Central railway. The site of the city is only a few feet above sea-level, and the Kennebec is navigable for large vessels to this point; the water of the Cobbosseecontee, falling about 130 ft. in a mile, furnishes the city with good power for its manufactures (chiefly paper, machine-shop products, and shoes). The city exports considerable quantities of lumber and ice. Gardiner was founded in 1760 by Dr Sylvester Gardiner (1707–1786), and for a time the settlement was called Gardinerston; in 1779, when it was incorporated as a town, the founder being then a Tory, it was renamed Pittston. But in 1803, when that part of Pittston which lay on the W. bank of the Kennebec was incorporated as a separate town and new life was given to it by the grandson of the founder, the present name was adopted. Gardiner was chartered as a city in 1849. The town of Pittston, on the E. bank of the Kennebec, had a population of 1177 in 1900.

GARDNER, PERCY (1846–), English classical archaeologist, was born in London, and was educated at the City of London school and Christ's College, Cambridge (fellow, 1872). He was Disney professor of archaeology at Cambridge from 1880 to 1887, and was then appointed professor of classical archaeology at Oxford, where he had a stimulating influence on the study of ancient, and particularly Greek, art. He also became prominent as an historical critic on Biblical subjects. Among his works are: *Types of Greek Coins* (1883); *A Numismatic Commentary on Pausanias* (with F. Imhoof-Blumer, 1887); *New Chapters in Greek History* (1892), an account of excavations in Greece and Asia Minor; *Manual of Greek Antiquities* (with F. B. Jevons, 2nd ed. 1898); *Grammar of Greek Art* (1905); *Exploratio Evangelica* (1899), on the origin of Christian belief; *A Historic View of the New Testament* (1901); *Growth of Christianity* (1907).

His brother, ERNEST ARTHUR GARDNER (1862–), educated at the City of London school and Caius College, Cambridge (fellow, 1885), is also well known as an archaeologist. From 1887 to 1895 he was director of the British School of Archaeology at Athens, and later became professor of archaeology at University College, London. His publications include: *Introduction to Greek Epigraphy* (1887); *Ancient Athens* (1902); *Handbook of Greek Sculpture* (1905); *Six Greek Sculptors* (1910). He was elected first Public Orator of London University in 1910.

GARDNER, a township of Worcester county, Massachusetts, U.S.A. Pop. (1890) 8424; (1900) 10,813, of whom 3449 were foreign-born; (1910 census) 14,699. The township is traversed by the Boston & Maine railway. It has an area of 21·4 sq. m. of hill country, well watered with streams and ponds, and includes the villages of Gardner (15 m. by rail W. of Fitchburg), South

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Gardner and West Gardner. In the township are the state colony for the insane, the Henry Heywood memorial hospital, and the Levi Heywood memorial library (opened in 1886), a memorial to Levi Heywood (1800–1882), a prominent local manufacturer of chairs, who invented various kinds of chair-making machinery. By far the principal industry of the township (dating from 1809) is the manufacture of chairs, the township having in 1905 the largest chair factory in the world; among the other manufactures are toys, baby-carriages, silver-ware and oil stoves. In 1905 the total factory product of the township was valued at $5,019,019, the furniture product alone amounting to $4,267,064, or 85·2% of the total. Gardner, formed from parts of Ashburnham, Templeton, Westminster and Winchenden, was incorporated in 1785, and was named in honour of Col. Thomas Gardner (1724–1775), a patriot leader of Massachusetts, who was mortally wounded in the battle of Bunker Hill.

See W. D. Herrick, *History of the Town of Gardner* (Gardner, 1878), covering the years 1785–1878.

GARE-FOWL[1] (Icelandic, *Geirfugl*; Gaelic, *Gearbhul*), the anglicized form of the Hebridean name of a large sea-bird now considered extinct, formerly a visitor to certain remote Scottish islands, the Great Auk of most English book-writers, and the

Gare-Fowl, or Great Auk.

Alca impennis of Linnaeus. In size it was hardly less than a tame goose, and in appearance it much resembled its smaller and surviving relative the razor-bill (*Alca torda*); but the glossy black of its head was varied by a large patch of white occupying nearly all the space between the eye and the bill, in place of the razor-bill's thin whiteline, while the bill itself bore eight or more deep transverse grooves instead of the smaller number and the ivory-like mark possessed by the species last named. Otherwise the coloration was similar in both, and there is satisfactory evidence that the gare-fowl's winter-plumage differed from that of the breeding-season just as is ordinarily the case in other members of the family *Alcidae* to which it belongs. The most striking characteristic of the gare-fowl, however, was the comparatively abortive condition of its wings, the distal portions of which, though the bird was just about twice the linear dimensions of the razor-bill, were almost exactly of the same size as in that species—proving, if more direct evidence were wanting, its inability to fly.

The most prevalent misconception concerning the gare-fowl is one which has been repeated so often, and in books of such generally good repute and wide dispersal, that a successful refutation seems almost hopeless. This is the notion that it was a bird possessing a very high northern range, and consequently to be looked for by Arctic explorers. How this error arose would take too long to tell, but the fact remains indisputable that, setting aside general assertions resting on no evidence worthy of attention, there is but a single record deserving any credit at all of a single example of the species having been observed within the Arctic Circle, and this, according to Prof. Reinhardt, who had the best means of ascertaining the truth, is open to grave doubt.[2] It is clear that the older ornithologists let their imagination get the better of their knowledge or their judgment, and their statements have been blindly repeated by most of their successors. Another error which, if not so widely spread, is at least as serious, since Sir R. Owen unhappily gave it countenance, is that this bird "has not been specially hunted down like the dodo and dinornis, but by degrees has become more scarce." If any reliance can be placed upon the testimony of former observers, the first part of this statement is absolutely untrue. Of the dodo all we know is that it flourished in Mauritius, its only abode, at the time the island was discovered, and that some years later it had ceased to exist—the mode of its extinction being open to conjecture, and a strong suspicion existing that though indirectly due to man's acts it was accomplished by his thoughtless agents (*Phil. Trans.*, 1869, p. 354). The extinction of the *Dinornis* lies beyond the range of recorded history. Supposing it even to have taken place at the very latest period as yet suggested—and there is much to be urged in favour of such a supposition—little but oral tradition remains to tell us how its extirpation was effected. That it existed after New Zealand was inhabited by man is indeed certain, and there is nothing extraordinary in the proved fact that the early settlers (of whatever race they were) killed and ate moas. But evidence that the whole population of those birds was done to death by man, however likely it may seem, is wholly wanting. The contrary is the case with the gare-fowl. In Iceland there is the testimony of a score of witnesses, taken down from their lips by one of the most careful naturalists who ever lived, John Wolley, that the latest survivors of the species were caught and killed by expeditions expressly organized with the view of supplying the demands of caterers to the various museums of Europe. In like manner the fact is incontestable that its breeding-stations in the western part of the Atlantic were for three centuries regularly visited and devastated with the combined objects of furnishing food or bait to the fishermen from very early days, and its final extinction, according to Sir Richard Bonnycastle (*Newfoundland in 1842*, i. p. 232), was owing to "the ruthless trade in its eggs and skin." There is no doubt that one of the chief stations of this species in Icelandic waters disappeared through volcanic action, and that the destruction of the old Geirfuglaskér drove some at least of the birds which frequented it to a rock nearer the mainland, where they were exposed to danger from which they had in their former abode been comparatively free; yet on this rock (Eldey = fire-island) they were "specially hunted down" whenever opportunity offered, until the stock there was wholly extirpated in 1844.

A third misapprehension is that entertained by John Gould in his *Birds of Great Britain*, where he says that "formerly this bird was plentiful in all the northern parts of the British Islands, particularly the Orkneys and the Hebrides. At the commencement of the 19th century, however, its fate appears to have been sealed; for though it doubtless existed, and probably bred, up to the year 1830, its numbers annually diminished until they became so few that the species could not hold its own." Now of the

[1] The name first appears, and in this form, in the *Account of Hirta* (St Kilda) *and Rona*, &c., by the lord register, Sir George M'Kenzie, of Tarbat, printed by Pinkerton in his *Collection of Voyages and Travels* (iii. p. 730), and then in Sibbald's *Scotia illustrata* (1684). Martin soon after, in his *Voyage to St Kilda*, spelt it "Gairfowl." Sir R. Owen adopted the form "garfowl," without, as would seem, any precedent authority.

[2] The specimen is in the Museum of Copenhagen: the doubt lies as to the locality where it was obtained, whether at Disco, which is within, or at the Fiskernäs, which is without, the Arctic Circle.

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Orkneys, we know that George Low, who died in 1795, says in his posthumously-published *Fauna Orcadensis* that he could not find it was ever seen there; and on Bullock's visit in 1812 he was told, says Montagu (*Orn. Dict. App.*), that one male only had made its appearance for a long time. This bird he saw and unsuccessfully hunted, but it was killed soon after his departure, while its mate had been killed just before his arrival, and none have been seen there since. As to the Hebrides, St Kilda is the only locality recorded for it, and the last example known to have been obtained there, or in its neighbourhood, was that given to Fleming (*Edinb. Phil. Journ.* x. p. 96) in 1821 or 1822, having been some time before captured by Mr Macclellan of Glass. That the gare-fowl was not plentiful in either group of islands is sufficiently obvious, as also is the impossibility of its continuing to breed "up to the year 1830."

But mistakes like these are not confined to British authors. As on the death of an ancient hero myths gathered round his memory as quickly as clouds round the setting sun, so have stories, probable as well as impossible, accumulated over the true history of this species, and it behoves the conscientious naturalist to exercise more than common caution in sifting the truth from the large mass of error. Americans have asserted that the specimen which belonged to Audubon (now at Vassar College) was obtained by him on the banks of Newfoundland, though there is Macgillivray's distinct statement (*Brit. Birds*, v. p. 359) that Audubon procured it in London. The account given by Degland (*Orn. Europ.* ii. p. 520) in 1840, and repeated in the last edition of his work by M. Gerbe, of its extinction in Orkney, is so manifestly absurd that it deserves to be quoted in full: "Il se trouvait en assez grand nombre il y a une quinzaine d'années aux Orcades; mais le ministre presbytérien dans le Mainland, en effrant une forte prime aux personnes qui lui apportaient cet oiseau, a été cause de sa destruction sur ces îles." The same author claims the species as a visitor to the shores of France on the testimony of Hardy (*Annuaire normand*, 1841, p. 298), which he grievously misquotes both in his own work and in another place (*Naumannia*, 1855, p. 423), thereby misleading an anonymous English writer (*Nat. Hist. Rev.*, 1865, p. 475) and numerous German readers.

John Milne in 1875 visited Funk Island, one of the former resorts of the gare-fowl, or "penguin," as it was there called, in the Newfoundland seas, a place where bones had before been obtained by Stuvitz, and natural mummies so lately as 1863 and 1864. Landing on this rock at the risk of his life, he brought off a rich cargo of its remains, belonging to no fewer than fifty birds, some of them in size exceeding any that had before been known. His collection was subsequently dispersed, most of the specimens finding their way into various public museums.

A literature by no means inconsiderable has grown up respecting the gare-fowl. Neglecting works of general bearing, few of which are without many inaccuracies, the following treatises may be especially mentioned:—J. J. S. Steenstrup, "Et Bidrag til Geirfuglens Naturhistorie og saerligt til Kundskaben om dens tidligere Udbredningskreds," *Naturh. Foren. Vidensk. Meddelelser* (Copenhagen, 1855), p. 33; E. Charlton, "On the Great Auk," *Trans. Tyneside Nat. Field Club*, iv. p. 111; "Abstract of Mr J. Wolley's Researches in Iceland respecting the Gare-fowl," *Ibis* (1861), p. 374; W Preyer, "Über *Plautus impennis*," *Journ. für Orn.* (1862), pp. 110, 337); K. E. von Baer, "Über das Aussterben der Tieraten in physiologischer und nicht physiologischer Hinsicht," *Bull. de l'Acad. Imp. de St-Pétersb.* vi. p. 513; R. Owen, "Description of the Skeleton of the Great Auk," *Trans. Zool. Soc.* v. p. 317; "The Gare-fowl and its Historians," *Nat. Hist. Rev.* v. p. 467; J. H. Gurney, jun., "On the Great Auk," *Zoologist* (2nd ser.), pp. 1442, 1639; H. Reeks, "Great Auk in Newfoundland," &c., *op. cit.* p. 1854; V. Fatio, "Sur l'Alca impennis," *Bull. Soc. Orn. Suisse*, ii. pp. 1, 80, 147; "On existing Remains of the Gare-fowl," *Ibis* (1870), p. 256; J. Milne, "Relics of the Great Auk," *Field* (27th of March, 3rd and 10th of April 1875). Lastly, reference cannot be omitted to the happy exercise of poetic fancy with which Charles Kingsley was enabled to introduce the chief facts of the gare-fowl's extinction (derived from one of the above-named papers) into his charming *Water Babies*. (A. N.)

GARFIELD, JAMES ABRAM (1831–1881), twentieth president of the United States, was born on the 19th of November 1831 in a log cabin in the little frontier town of Orange, Cuyahoga county, Ohio. His early years were spent in the performance of such labour as fell to the lot of every farmer's son in the new states, and in the acquisition of such education as could be had in the district schools held for a few weeks each winter. But life on a farm was not to his liking, and at sixteen he left home and set off to make a living in some other way. A book of stories of adventure on the sea, which he read over and over again when a boy, had filled him with a longing for a seafaring life. He decided, therefore, to become a sailor, and, in 1848, tramping across the country to Cleveland, Ohio, he sought employment from the captain of a lake schooner. But the captain drove him from the deck, and, wandering on in search of work, he fell in with a canal boatman who engaged him. During some months young Garfield served as bowsman, deck-hand and driver of a canal boat. An attack of the ague sent him home, and on recovery, having resolved to attend a high school and fit himself to become a teacher, he passed the next four years in a hard struggle with poverty and in an earnest effort to secure an education, studying for a short time in the Geauga Seminary at Chester, Ohio. He worked as a teacher, a carpenter and a farmer; studied for a time at the Western Reserve Eclectic Institute at Hiram, Ohio, which afterward became Hiram College, and finally entered Williams College. On graduation, in 1856, Garfield became professor of ancient languages and literature in the Eclectic Institute at Hiram, and within a year had risen to the presidency of the institution.

Soon afterwards he entered political life. In the early days of the Republican party, when the shameful scenes of the Kansas struggle were exciting the whole country, and during the campaign of 1857 and 1858, he became known as an effective speaker and ardent anti-slavery man. His reward for his services in election in 1859 to the Ohio Senate as the member from Portage and Summit counties. When the "cotton states" seceded, Garfield appeared as a warm supporter of vigorous measures. He was one of the six Ohio senators who voted against the proposed amendment to the Federal Constitution (Feb. 28th, 1861) forbidding any constitutional amendment which should give Congress the power to abolish or interfere with slavery in any state; he upheld the right of the government to coerce seceded states; defended the "Million War Bill" appropriating a million dollars for the state's military expenses; and when the call came for 75,000 troops, he moved that Ohio furnish 20,000 soldiers and three millions of dollars as her share. He had just been admitted to the bar, but on the outbreak of war he at once offered his services to the governor, and became lieutenant-colonel and then colonel of the 42nd Ohio Volunteers, recruited largely from among his former students. He served in Kentucky, was promoted to the rank of brigadier-general of volunteers early in 1862; took part in the second day's fighting at the battle of Shiloh, served as chief of staff under Rosecrans in the Army of the Cumberland in 1863, fought at Chickamauga, and was made a major-general of volunteers for gallantry in that battle. In 1862 he was elected a member of Congress from the Ashtabula district of Ohio, and, resigning his military commission, took his seat in the House of Representatives in December 1863. In Congress he joined the radical wing of the Republican party, advocated the confiscation of Confederate property, approved and defended the Wade-Davis manifesto denouncing the tameness of Lincoln, and was soon recognized as a hard worker and ready speaker. Capacity for work brought him places on important committees—he was chairman successively of the committee on military affairs, the committee on banking and currency, and the committee on appropriations,—and his ability as a speaker enabled him to achieve distinction on the floor of the House and to rise to leadership. Between 1863 and 1873 Garfield delivered speeches of importance on "The Constitutional Amendment to abolish Slavery," "The Freedman's Bureau," "The Reconstruction of the Rebel States," "The Public Debt and Specie Payments," "Reconstruction," "The Currency," "Taxation of United States Bonds," "Enforcing the 14th Amendment," "National Aid to Education," and "the Right to Originate Revenue Bills." The year 1874 was one of disaster to the Republican party. The greenback

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issue, the troubles growing out of reconstruction in the South, the Crédit Mobilier and the "Salary Grab," disgusted thousands of independent voters and sent a wave of Democracy over the country. Garfield himself was accused of corruption in connexion with the Crédit Mobilier scandal, but the charge was never proved. A Republican convention in his district demanded his resignation, and re-election seemed impossible; but he defended himself in two pamphlets, "Increase of Salaries" and "Review of the Transactions of the Crédit Mobilier Company," made a village-to-village canvass, and was victorious. In 1876 Garfield for the eighth time was chosen to represent his district; and afterwards as one of the two representatives of the Republicans in the House, he was a member of the Electoral Commission which decided the dispute regarding the presidential election of 1876. When, in 1877, James G. Blaine was made a senator from Maine, the leadership of the House of Representatives passed to Garfield, and he became the Republican candidate for speaker. But the Democrats had a majority in the House, and he was defeated. Hayes, the new president, having chosen John Sherman to be his secretary of the treasury, an effort was made to send Garfield to the United States Senate in Sherman's place. But the president needed his services in the House, and he was not elected to the Senate until 1880.

The time had now come (1880) when the Republican party must nominate a candidate for the presidency. General Grant had served two terms (1869–1877), and the unwritten law of custom condemned his being given another. But the "bosses" of the Republican party in three great States—New York, Pennsylvania and Illinois—were determined that he should be renominated. These men and their followers were known as the "stalwarts." Opposed to them were two other factions, one supporting James G. Blaine, of Maine, and the other John Sherman, of Ohio. When the convention met and the balloting began, the contest along these factional lines started in earnest. For eight-and-twenty ballots no change of any consequence was noticeable. Though votes were often cast for ten names, there were but two real candidates before the convention, Grant and Blaine. That the partisans of neither would yield in favour of the other was certain. That the choice therefore rested with the supporters of the minor candidates was manifest, and with the cry "Anything to beat Grant!" an effort was made to find some man on whom the opposition could unite. Such a man was Garfield. His long term of service in the House, his leadership of his party on its floor, his candidacy for the speakership, and his recent election to the United States Senate, marked him out as the available man. Between the casting of the first and the thirty-third ballot, Garfield, who was the leader of Sherman's adherents in the convention, had sometimes received one or two votes and at other times none. On the thirty-fourth he received seventeen, on the next fifty, and on the next almost the entire vote hitherto cast for Blaine and Sherman, and was declared nominated. During the campaign Garfield was subject to violent personal abuse; the fact that he was alleged to have received $329 from the Crédit Mobilier as a dividend on stock led his opponents to raise the campaign cry of "329," and this number was placarded in the streets of the cities and printed in flaring type in partisan newspapers. The forged "Morey letter," in which he was made to appear as opposed to the exclusion of the Chinese, was widely circulated and injured his candidacy in the West. That the charges against Garfield were not generally credited, however, is shown by the fact that he received 214 electoral votes to his opponent's 155. He was inaugurated on the 4th of March 1881.

Unfortunately, the new president was unequal to the task of composing the differences in his party. For his secretary of state he chose James G. Blaine, the bitterest political enemy of Senator Roscoe Conkling (*q.v.*) the leader of the New York "stalwarts." Without consulting the New York senators, Garfield appointed William H. Robertson, another political enemy of Conkling's, to the desirable post of Collector of the Port of New York, and thereby destroyed all prospects of party harmony. On the 2nd of July, while on his way to attend the commencement exercises at Williams College, the new president was shot in a Washington railway station by a disappointed office-seeker named Charles J. Guiteau, whose mind had no doubt been somewhat influenced by the abuse lavished upon the president by his party opponents; and on the 19th of September 1881, he died at Elberon, New Jersey, whither he had been removed on the 6th. He was buried in Cleveland, Ohio, where in 1890 a monument was erected by popular subscription to his memory.

In 1858 Garfield had married Miss Lucretia Rudolph, by whom he had seven children. His son, HARRY AUGUSTUS GARFIELD (b. 1863) graduated at Williams College in 1885, practised law in Cleveland, Ohio, in 1888–1903, was professor of politics at Princeton University in 1903-1908, and in 1908 became president of Williams College. Another son, JAMES RUDOLPH GARFIELD (b. 1865), also graduated at Williams College in 1885 and practised law in Cleveland; he was a Republican member of the Ohio Senate in 1896-1899, was commissioner of corporations, Department of Commerce and Labour, in 1903–1907, attracting wide attention by his reports on certain large industrial organizations, and was secretary of the interior (1907–1909) in the cabinet of President Roosevelt.

President Garfield's writings, edited by Burke A. Hinsdale, were published at Boston, in two volumes, in 1882. (J. B. McM.)

GAR-FISH, the name given to a genus of fishes (*Belone*) found in nearly all the temperate and tropical seas, and readily recognized by their long, slender, compressed and silvery body, and by their jaws being produced into a long, pointed, bony and sharply-toothed beak. About fifty species are known from different parts of the globe, some attaining to a length of 4 or 5 ft. One species is common on the British coasts, and is well known by the names of "long-nose," "green-bone," &c. The last name is given to those fishes on account of the peculiar green colour of their bones, which deters many people from eating them, although their flesh is well flavoured and perfectly wholesome. The skipper (*Scomberesox*) and half-beak (*Hemirhamphus*), in which the lower jaw only is prolonged, are fishes nearly akin to the gar-pikes.

GARGANEY[1] (North-Italian, *Garganello*), or SUMMER-TEAL, the *Anas querquedula* and *A. circia* of Linnaeus (who made, as did Willughby and Ray, two species out of one), and the type of Stephens's genus *Querquedula*. This bird is one of the smallest of the *Anatidae*, and has gained its common English name from being almost exclusively a summer-visitant to England where nowadays it only regularly resorts to breed in some of the East-Norfolk Broads, though possibly at one time it was found at the same season throughout the great Fen-district. Slightly larger than the common teal (*A. crecca*), the male is readily distinguished therefrom by its peculiarly-coloured head, the sides of which are nutmeg-brown, closely freckled with short whitish streaks, while a conspicuous white curved line descends backwards from the eyes. The upper wing-coverts are bluish grey, the scapulars black with a white shaft-stripe, and the wing-spot (*speculum*) greyish green bordered above and below by white. The female closely resembles the hen teal, but possesses no wing-spot. In Ireland or Scotland the garganey is very rare, and though it is recorded from Iceland, more satisfactory evidence of its occurrence there is needed. It has not a high northern range, and its appearance in Norway and Sweden is casual. Though it breeds in many parts of Europe, in none can it be said to be common; but it ranges far to the eastward in Asia—even to Formosa, according to Swinhoe—and yearly visits India in winter in enormous numbers. Those that breed in Norfolk arrive somewhat late in spring and make their nests in the vast reed-beds which border the Broads—a situation rarely or never chosen by the teal. The labyrinth or bony enlargement of the trachea in the male garganey differs in form from that described in any other drake, being more oval and placed nearly in the

[1] The word was introduced by Willughby from Gesner (*Orn.*, lib. iii. p. 127), but, though generally adopted by authors, seems never to have become other than a book-name in English, the bird being invariably known in the parts of this island where it is indigenous as "summer-teal."

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median line of the windpipe, instead of on one side, as is usually the case.

GARGANO, MONTE (anc. *Garganus Mons*), a massive mountainous peninsula projecting E. from the N. coast of Apulia, Italy, and belonging geologically to the opposite Dalmatian coast; it was indeed separated from the rest of Italy by an arm of the sea as late as the Tertiary period. The highest point (Monte Calvo) is 3465 ft. above sea-level. The oak forests for which it was renowned in Roman times have entirely disappeared.

GARGOYLE, or GURGOYLE (from the Fr. *gargouille*, originally the throat or gullet, cf. Lat. *gurgulio, gula*, and similar words derived from root *gar*, to swallow, the word representing the gurgling sound of water; Ital. *doccia di grande*; Ger. *Ausguss*), in architecture, the carved termination to a spout which conveys away the water from the gutters. Gargoyles are mostly grotesque figures. The term is applied more especially to medieval work, but throughout all ages some means of throwing the water off the roofs, when not conveyed in gutters, has been adopted, and in Egypt there are gargoyles to eject the water used in the washing of the sacred vessels which would seem to have been done on the flat roofs of the temples. In Greek temples the water from the roof passed through the mouths of lions whose heads were carved or modelled in the marble or terra-cotta cymatium of the cornice. At Pompeii large numbers of terra-cotta gargoyles have been found which were modelled in the shape of various animals.

GARHWAL, or GURWAL. 1. A district of British India, in the Kumaon division of the United Provinces. It has an area of 5629 sq. m., and consists almost entirely of rugged mountain ranges running in all directions, and separated by narrow valleys which in some cases become deep gorges or ravines. The only level portion of the district is a narrow strip of waterless forest between the southern slopes of the hills and the fertile plains of Rohilkhand. The highest mountains are in the north, the principal peaks being Nanda Devi (25,661 ft.), Kamet (25,413), Trisul (23,382), Badrinath (23,210), Dunagiri (23,181) and Kedarnath (22,853). The Alaknanda, one of the main sources of the Ganges, receives with its affluents the whole drainage of the district. At Devaprayag the Alaknanda joins the Bhagirathi, and thenceforward the united streams bear the name of the Ganges. Cultivation is principally confined to the immediate vicinity of the rivers, which are employed for purposes of irrigation. Garhwal originally consisted of 52 petty chieftainships, each chief with his own independent fortress (*garh*). Nearly 500 years ago, one of these chiefs, Ajai Pál, reduced all the minor principalities under his own sway, and founded the Garhwal kingdom. He and his ancestors ruled over Garhwal and the adjacent state of Tehri, in an uninterrupted line till 1803, when the Gurkhas invaded Kumaon and Garhwal, driving the Garhwal chief into the plains. For twelve years the Gurkhas ruled the country with a rod of iron, until a series of encroachments by them on British territory led to the war with Nepal in 1814. At the termination of the campaign, Garhwal and Kumaon were converted into British districts, while the Tehri principality was restored to a son of the former chief. Since annexation, Garhwal has rapidly advanced in material prosperity. Pop. (1901) 420,000. Two battalions of the Indian army (the 30th Garhwal Rifles) are recruited in the district, which also contains the military cantonment of Lansdowne. Grain and coarse cloth are exported, and salt, borax, live stock and wool are imported, the trade with Tibet being considerable. The administrative headquarters are at the village of Pauri, but Srinagar is the largest place. This is an important mart, as is also Kotdwara, the terminus of a branch of the Oudh and Rohilkhand railway from Najibabad.

2. A native state, also known as Tehri, after its capital; area 4180 sq. m.; pop. (1901) 268,885. It adjoins the district mentioned above, and its topographical features are similar. It contains the sources of both the Ganges and the Jumna, which are visited by thousands of Hindu pilgrims. The gross revenue is about £28,000, of which nearly half is derived from forests. No tribute is paid to the British government.

GARIBALDI, GIUSEPPE (1807–1882), Italian patriot, was born at Nice on the 4th of July 1807. As a youth he fled from home to escape a clerical education, but afterwards joined his father in the coasting trade. After joining the "Giovine Italia" he entered the Sardinian navy, and, with a number of companions on board the frigate "Euridice," plotted to seize the vessel and occupy the arsenal of Genoa at the moment when Mazzini's Savoy expedition should enter Piedmont. The plot being discovered, Garibaldi fled, but was condemned to death by default on the 3rd of June 1834. Escaping to South America in 1836, he was given letters of marque by the state of Rio Grande do Sul, which had revolted against Brazil. After a series of victorious engagements he was taken prisoner and subjected to severe torture, which dislocated his limbs. Regaining liberty, he renewed the war against Brazil, and took Porto Allegro. During the campaign he met his wife, Anita, who became his inseparable companion and mother of three children, Anita, Ricciotti and Menotti. Passing into the service of Uruguay, he was sent to Corrientes with a small flotilla to oppose Rosas's forces, but was overtaken by Admiral Brown, against whose fleet he fought for three days. When his ammunition was exhausted he burned his ships and escaped. Returning to Montevideo, he formed the Italian Legion, with which he won the battles of Cerro and Sant' Antonio in the spring of 1846, and assured the freedom of Uruguay. Refusing all honours and recompense, he prepared to return to Italy upon receiving news of the incipient revolutionary movement. In October 1847 he wrote to Pius IX., offering his services to the Church, whose cause he for a moment believed to be that of national liberty.

Landing at Nice on the 24th of June 1848, he placed his sword at the disposal of Charles Albert, and, after various difficulties with the Piedmontese war office, formed a volunteer army 3000 strong, but shortly after taking the field was obliged, by the defeat of Custozza, to flee to Switzerland. Proceeding thence to Rome, he was entrusted by the Roman republic with the defence of San Pancrazio against the French, where he gained the victory of the 30th of April 1849, remaining all day in the saddle, although wounded in the side at the beginning of the fight. From the 3rd of May until the 30th of May he was continuously engaged against the Bourbon troops at Palestrina, Velletri and elsewhere, dispersing an army of 20,000 men with 3000 volunteers. After the fall of Rome he left the city at the head of 4000 volunteers, with the idea of joining the defenders of Venice, and started on that wonderful retreat through central Italy pursued by the armies of France, Austria, Spain and Naples. By his consummate generalship and the matchless endurance of his men the pursuers were evaded and San Marino reached, though with a sadly diminished force. Garibaldi and a few followers, including his devoted wife Anita, after vainly attempting to reach Venice, where the tricolor still floated, took refuge in the pine forests of Ravenna; the Austrians were seeking him in all directions, and most of his legionaries were captured and shot. Anita died near Comacchio, and he himself fled across the peninsula, being assisted by all classes of the people, to Tuscany, whence he escaped to Piedmont and ultimately to America. At New York, in order to earn a living, he became first a chandler, and afterwards a trading skipper, returning to Italy in 1854 with a small fortune, and purchasing the island of Caprera, on which he built the house thenceforth his home. On the outbreak of war in 1859 he was placed in command of the Alpine infantry, defeating the Austrians at Casale on the 8th of May, crossing the Ticino on the 23rd of May, and, after a series of victorious fights, liberating Alpine territory as far as the frontier of Tirol. When about to enter Austrian territory proper his advance was, however, checked by the armistice of Villafranca.

Returning to Como to wed the countess Raimondi, by whom he had been aided during the campaign, he was apprised, immediately after the wedding, of certain circumstances which caused him at once to abandon that lady and to start for central Italy. Forbidden to invade the Romagna, he returned indignantly to Caprera, where with Crispi and Bertani he planned the invasion of Sicily. Assured by Sir James Hudson of the

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sympathy of England, he began active preparations for the expedition to Marsala. At the last moment he hesitated, but Crispi succeeded in persuading him to sail from Genoa on the 5th of May 1860 with two vessels carrying a volunteer corps of 1070 strong. Calling at Talamone to embark arms and money, he reached Marsala on the 11th of May, and landed under the protection of the British vessels "Intrepid" and "Argus." On the 12th of May the dictatorship of Garibaldi was proclaimed at Salemi, on the 15th of May the Neapolitan troops were routed at Calatafimi, on the 25th of May Palermo was taken, and on the 6th of June 20,000 Neapolitan regulars, supported by nine frigates and protected by two forts, were compelled to capitulate. Once established at Palermo, Garibaldi organized an army to liberate Naples and march upon Rome, a plan opposed by the emissaries of Cavour, who desired the immediate annexation of Sicily to the Italian kingdom. Expelling Lafarina and driving out Depretis, who represented Cavour, Garibaldi routed the Neapolitans at Milazzo on the 20th of July. Messina fell on the 20th of July, but Garibaldi, instead of crossing to Calabria, secretly departed for Aranci Bay in Sardinia, where Bertani was fitting out an expedition against the papal states. Cavour, however, obliged the expedition to sail for Palermo. Returning to Messina, Garibaldi found a letter from Victor Emmanuel II. dissuading him from invading the kingdom of Naples. Garibaldi replied asking "permission to disobey." Next day he crossed the Strait, won the battle of Reggio on the 21st of August, accepted the capitulation of 9000 Neapolitan troops at San Giovanni and of 11,000 more at Soveria. The march upon Naples became a triumphal progress, which the wiles of Francesco II. were powerless to arrest. On the 7th of September Garibaldi entered Naples, while Francesco fled to Gaeta. On the 1st of October he routed the remnant of the Bourbon army 40,000 strong on the Volturno. Meanwhile the Italian troops had occupied the Marches, Umbria and the Abruzzi, a battalion of Bersaglieri reaching the Volturno in time to take part in the battle. Their presence put an end to the plan for the invasion of the papal states, and Garibaldi unwillingly issued a decree for the *plébiscite* which was to sanction the incorporation of the Two Sicilies in the Italian realm. On the 7th of November Garibaldi accompanied Victor Emmanuel during his solemn entry into Naples, and on the morrow returned to Caprera, after disbanding his volunteers and recommending their enrolment in the regular army.

Indignation at the cession of Nice to France and at the neglect of his followers by the Italian government induced him to return to political life. Elected deputy in 1861, his anger against Cavour found violent expression. Bixio attempted to reconcile them, but the publication by Cialdini of a letter against Garibaldi provoked a hostility which, but for the intervention of the king, would have led to a duel between Cialdini and Garibaldi. Returning to Caprera, Garibaldi awaited events. Cavour's successor, Ricasoli, enrolled the Garibaldians in the regular army; Rattazzi, who succeeded Ricasoli, urged Garibaldi to undertake an expedition in aid of the Hungarians, but Garibaldi, finding his followers ill-disposed towards the idea, decided to turn his arms against Rome. On the 29th of June 1862 he landed at Palermo and gathered an army under the banner "Roma o morte." Rattazzi, frightened at the prospect of an attack upon Rome, proclaimed a state of siege in Sicily, sent the fleet to Messina, and instructed Cialdini to oppose Garibaldi. Circumventing the Italian troops, Garibaldi entered Catania, crossed to Melito with 3000 men on the 25th of August, but was taken prisoner and wounded by Cialdini's forces at Aspromonte on the 27th of August. Liberated by an amnesty, Garibaldi returned once more to Caprera amidst general sympathy.

In the spring of 1864 he went to London, where he was accorded an enthusiastic reception and given the freedom of the city. From England he returned again to Caprera. On the outbreak of war in 1866 he assumed command of a volunteer army and, after the defeat of the Italian troops at Custozza, took the offensive in order to cover Brescia. On the 3rd of July he defeated the Austrians at Monte Saello, on the 7th at Lodrone, on the 10th at Darso, on the 16th at Condino, on the 19th at Ampola, on the 21st at Bezzecca, but, when on the point of attacking Trent, he was ordered by General Lamarmora to retire. His famous reply "Obbedisco" ("I obey") has often been cited as a classical example of military obedience to a command destructive of a successful leader's hopes, but documents now published (cf. *Corriere della sera*, 9th of August 1906) prove beyond doubt that Garibaldi had for some days known that the order to evacuate the Trentino would shortly reach him. The order arrived on the 9th of August, whereas Crispi had been sent as early as the 16th of July to warn Garibaldi that, owing to Prussian opposition, Austria would not cede the Trentino to Italy, and that the evacuation was inevitable. Hence Garibaldi's laconic reply. From the Trentino he returned to Caprera to mature his designs against Rome, which had been evacuated by the French in pursuance of the Franco-Italian convention of the 15th of September 1864. Gathering volunteers in the autumn of 1867, he prepared to enter papal territory, but was arrested at Sinalunga by the Italian government and conducted to Caprera. Eluding the surveillance of the Italian cruisers, he returned to Florence, and, with the complicity of the second Rattazzi cabinet, entered Roman territory at Passo Corese on the 23rd of October. Two days later he took Monterotondo, but on the 2nd of November his forces were dispersed at Mentana by French and papal troops. Recrossing the Italian frontier, he was arrested at Figline and taken back to Caprera, where he eked out his slender resources by writing several romances. In 1870 he formed a fresh volunteer corps and went to the aid of France, defeating the German troops at Dartillon, Autun and Dijon. Elected a member of the Versailles assembly, he resigned his mandate in anger at French insults, and withdrew to Caprera until, in 1874, he was elected deputy for Rome. Popular enthusiasm induced the Conservative Minghetti cabinet to propose that a sum of £40,000 with an annual pension of £2000 be conferred upon him as a recompense for his services, but the proposal, though adopted by parliament (27th May 1875), was indignantly refused by Garibaldi. Upon the advent of the Left to power, however, he accepted both gift and pension, and worked energetically upon the scheme for the Tiber embankment to prevent the flooding of Rome. At the same time he succeeded in obtaining the annulment of his marriage with the countess Raimondi (with whom he had never lived) and contracted another marriage with the mother of his children, Clelia and Manlio. In 1880 he went to Milan for the inauguration of the Mentana monument, and in 1882 visited Naples and Palermo, but was prevented by illness from being present at the 600th anniversary of the Sicilian Vespers. On the 2nd of June 1882 his death at Caprera plunged Italy into mourning.

See Garibaldi, *Epistolario*, ed. E. E. Ximenes (2 vols., Milan, 1885), and *Memorie autografiche* (11th ed., Florence, 1902; Eng. translation by A. Werner, with supplement by J. W. Mario in vol. iii. of 1888 ed.); Giuseppe Guerzoni, *Garibaldi* (2 vols., Florence, 1882); Jessie White Mario, *Garibaldi e i suoi tempi* (Milan, 1884); G. M. Trevelyan, *Garibaldi's Defence of the Roman Republic* (London, 1907), which contains an excellent sketch of Garibaldi's early career, of the events leading up to the proclamation of the Roman Republic, and a picturesque, detailed and authoritative account of the defence of Rome and of Garibaldi's flight, with a very full bibliography; also Trevelyan's *Garibaldi and the Thousand* (1909). (H. W. S.)

GARIN LE LOHERAIN, French epic hero. The 12th century *chanson de geste* of Garin le Loherain is one of the fiercest and most sanguinary narratives left by the *trouvères*. This local cycle of Lorraine, which is completed by Hervis de Metz, Girbers de Metz, Ansèis, fils de Girbert and Yon, is obviously based on history, and the failure absolutely to identify the events recorded does not deprive the poems of their value as a picture of the savage feudal wars of the 11th and 12th centuries. The episodes are evolved naturally and the usual devices adopted by the *trouvères* to reconcile their inconsistencies are absent. Nevertheless no satisfactory historical explanation of the story has yet been offered. It has been suggested by a recent critic (F. Settegast, *Quellenstudien zur gallo-romanischen Epik*, 1904) that these poems resume historical traditions going back to the Vandal irruption of 408 and the battle fought by the Romans and the West Goths against the Huns in 451. The cycle relates

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three wars against hosts of heathen invaders. In the first of these Charles Martel and his faithful vassal Hervis of Metz fight by an extraordinary anachronism against the Vandals, who have destroyed Reims and besieged other cities. They are defeated in a great battle near Troyes. In the second Hervis is besieged in Metz by the "Hongres." He sends first for help to Pippin, who defers his assistance by the advice of the traitor Hardré. Hervis then transfers his allegiance to Anséis of Cologne, by whose help the invaders are repulsed, though Hervis himself is slain. In the third Thierry, king of Moriane[1] sends to Pippin for help against four Saracen kings. He is delivered by a Frankish host, but falls in the battle. Hervis of Metz was the son of a citizen to whom the duke of Lorraine had married his daughter Aelis, and his sons Garin and Begue are the heroes of the *chanson* which gives its name to the cycle. The dying king Thierry bad desired that bis daughter Blanchefleur should marry Garin, but when Garin prefers his suit at the court of Pippin, Fromont of Bordeaux puts himself forward as bis rival and Hardré, Fromont's father, is slain by Garin. The rest of the poem is taken up with the war that ensues between the Lorrainers and the men of Bordeaux. They finally submit their differences to the king, only to begin their disputes once more. Blanchefleur becomes the wife of Pippin, while Garin remains her faithful servant. One of the most famous passages of the poem is the assassination of Begue by a nephew of Fromont, and Garin, after laying waste his enemy's territory, is himself slain. The remaining songs continue the feud between the two families. According to Paulin Paris, the family of Bordeaux represents the early dukes of Aquitaine, the last of whom, Waifar (745–768) was dispossessed and slain by Pippin the Short, king of the Franks; but the *Irouvères* had in mind no doubt the wars which marked the end of the Carolingian dynasty.

See *Li Romans de Garin le Loherain*, ed. P. Paris (Paris, 1833); *Hist. litt. de la France*, vol. xxii. (1852); J. M. Ludlow, *Popular Epics of the Middle Ages* (London and Cambridge, 1865); F. Lot, *Études d'histoire du moyen âge* (Paris, 1896); F. Settegast, *Quellenstudien zur gallo-romanischen Epik* (Leipzig, 1904). A complete edition of the cycle was undertaken by E. Stengel, the first volume of which, *Hervis de Mes* (Gesellschaft für roman. Lit., Dresden), appeared in 1903.

GARLAND, JOHN (fl. 1202–1252), Latin grammarian, known as Johannes Garlandius, or, more commonly, Johannes de Garlandia, was born in England, though most of bis life was spent in France. John Bale in his *Catalogus*, and John Pits, following Bale, placed him among the writers of the 11th century. The main facts of his life, however, are stated in a long poem *De triumphis ecclesiae* contained in Cotton MS. Claudius A x in the British Museum, and edited by Thomas Wright for the Roxburghe Club in 1856. Garland narrates the history of his time from the point of view of the victories gained by the church over heretics at home and infidels abroad. He studied at Oxford under a certain John of London, whom it is difficult to distinguish from others of the same name; but he must bave been in Paris in or before 1202, for he mentions as one of his teachers Alain de Lisle, who died in that year or the next. Garland was one of the professors chosen in 1229 for the new university of Toulouse, and remained in the south during the Albigensian crusade, of which he gives a detailed account in books iv.–vi. In 1232 or 1233 the hatred of the people made further residence in Toulouse unsafe for the professors of the university, who had been installed by the Catholic party. Garland was one of the first to fly, and the rest of his life was spent in Paris, where be finished his poem in 1252. Garland's grammatical works were much used in England, and were often printed by Richard Pynson and Wynkyn de Worde. He was also a voluminous Latin poet. Works on mathematics and music bave also been assigned to him, but the ascription may bave arisen from confusion of his works with those of Gerlandus, a canon of Besançon in the 12th century. The treatise on alchemy, *Compendium alchimiae*, often printed under his name, was by a 14th-century writer named Martin Ortolan, or Lortholain.

The best known of bis poems beside the "De Triumphis Ecclesiae" is "Epithalamium beatae Mariae Virginis," contained in the same MS. Among his other works are his "Dictionarius," a Latin vocabulary, printed by T. Wright in the *Library of National Antiquities* (vol. i., 1857); *Compendium totius grammatices* . . ., printed at Deventer, 1489; two metrical treatises, entitled *Synonyma* and *Equivoca*, frequently printed at the close of the 15th century.

For further bibliographical information see the British Museum catalogue; J. A. Fabricius, *Bibliotheca Latina mediae et infimae aetatis* . . ., vol. iii. (1754); G. Brunet, *Manuel du libraire*, &c. See also *Histoire litt. de la France*, vols. viii., xxi., xxiii. and xxx.; the prefaces to the editions by T. Wright mentioned above; P. Meyer, *La Chanson de la croisade contre les Albigeois*, vol. ii. pp. xxi-xxiii. (Paris, 1875); Dr A. Scheler, *Lexicographie latine du XIIe et du XIIIe siècles* (Leipzig, 1867); the article by C. L. Kingsford in the *Dict. Nat. Biog.*, giving a list also of the works on alchemy, mathematics and music, rightly or wrongly ascribed to him; J. E. Sandys, *Hist. of Class. Schol.* i. (1906) 549. (E. G.)

GARLIC (O. Eng. *garléac*, *i.e.* "spear-leek"; Gr. *σκόροδον*; Lat. *allium*; Ital. *aglio*; Fr. *ail*; Ger. *Knoblauch*), *Allium sativum*, a bulbous perennial plant of the natural order Liliaceae, indigenous apparently to south-west Siberia. It has long, narrow, flat, obscurely keeled leaves, a deciduous spathe, and a globose umbel of whitish flowers, among which are small bulbils. The bulb, which is the only part eaten, has membranous scales, in the axils of which are 10 or 12 cloves, or smaller bulbs. From these new bulbs can be procured by planting out in February or March. The bulbs are best preserved hung in a dry place. If of fair size, twenty of them weigh about 1 lb. To prevent the plant from running to leaf, Pliny (*Nat. Hist.* xix. 34) advises to bend the stalk downward and cover with earth; seeding, he observes, may be prevented by twisting the stalk.

Garlic is cultivated in the same manner as the shallot (*q.v.*). It is stated to have been grown in England before the year 1548. The percentage composition of the bulbs is given by E. Solly (*Trans. Hort. Soc. Lond.*, new ser., iii. p. 60) as water 84·09, organic matter 13·38, and inorganic matter 1·53—that of the leaves being water 87·14, organic matter 11·27 and inorganic matter 1·59. The bulb has a strong and characteristic odour and an acrid taste, and yields an offensively smelling oil, essence of garlic, identical with allyl sulphide (C_6H_{10})S (see Hofmann and Cahours, *Journ. Chem. Soc.* x. p. 320). This, when garlic has been eaten, is evolved by the excretory organs, the activity of which it promotes. From the earliest times garlic has been used as an article of diet. It formed part of the food of the Israelites in Egypt (Numb. xi. 5) and of the labourers employed by Cheops in the construction of his pyramid, and is still grown in Egypt, where, however, the Syrian is the kind most esteemed (see Rawlinson's *Herodotus*, ii. 125). It was largely consumed by the ancient Greek and Roman soldiers, sailors and rural classes (cf. Virg. *Ecl.* ii. 11), and, as Pliny tells us (*N.H.* xix. 32), by the African peasantry. Galen eulogizes it as the rustic's *theriac* (see F. Adams's *Paulus Aegineta*, p. 99), and Alexander Neckam, a writer of the 12th century (see Wright's edition of his works, p. 473, 1863), recommends it as a palliative of the heat of the sun in field labour. "The people in places where the simoon is frequent," says Mountstuart Elphinstone (*An Account of the Kingdom of Caubul*, p. 140, 1815), "eat garlic, and rub their lips and noses with it, when they go out in the heat of the summer, to prevent their suffering by the simoon." "O dura messorum ilia," exclaims Horace (*Epod.* iii.), as he records his detestation of the popular esculent, to smell of which was accounted a sign of vulgarity (cf. Shakespeare, *Coriol.* iv. 6, and *Meas. for Meas.* iii. 2). In England garlic is seldom used except as a seasoning, but in the southern countries of Europe it is a common ingredient in dishes, and is largely consumed by the agricultural population. Garlic was placed by the ancient Greeks on the piles of stones at cross-roads, as a supper for Hecate (Theophrastus, *Characters*, *Δεισιδαιμονίας*); and according to Pliny garlic and onions were invocated as deities by the Egyptians at the taking of oaths. The inhabitants of Pelusium in lower Egypt, who worshipped the onion, are said to have held both it and garlic in aversion as food. Garlic possesses stimulant and stomachic properties, and was of old, as still sometimes now, employed as a medicinal remedy.

[1] *i.e.* Maurienne, now a district and diocese (St Jean de Maurienne) of Savoy.

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Pliny (*N.H.* xx. 23) gives an exceedingly long list of complaints in which it was considered beneficial. Dr T. Sydenham valued it as an application in confluent smallpox, and, says Cullen (*Mat. Med.* ii. p. 174, 1789), found some dropsies cured by it alone. In the United States the bulb is given in doses of ½-2 drachms in cases of bronchiectasis and phthisis pulmonalis. Garlic may also be prescribed as an extract consisting of the inspissated juice, in doses of 5-10 grains, and as the *syrupus allii sectivi*, in doses of 1-4 drachms. This last preparation has recently been much extolled in the treatment of pulmonary tuberculosis or phthisis.

The wild "crow garlic" and "field garlic" of Britain are the species *Allium vineale* and *A. oleraceum* respectively.

GARNET, or GARNETT, **HENRY** (1555–1606), English Jesuit, son of Brian Garnett, a schoolmaster at Nottingham, was educated at Winchester and afterwards studied law in London. Having become a Roman Catholic, he went to Italy, joined the Society of Jesus in 1575, and acquired under Bellarmine and others a reputation for varied learning. In 1586 he joined the mission in England, becoming superior of the province on the imprisonment of William Weston in the following year. In the dispute between the Jesuits and the secular clergy known as the "Wisbech Stirs" (1595–1596) he zealously supported Weston in his resistance to any compromise with the civil government. His antagonism to the secular clergy was also shown later, when in 1603 he, with other Jesuits, was the means of betraying to the government the "Bye Plot," contrived by William Watson, a secular priest. In 1598 he was professed of the four vows.

Garnet supervised the Jesuit mission for eighteen years with conspicuous success. His life was one of concealment and disguises; a price was put on his head; but he was fearless and indefatigable in carrying on his propaganda and in ministering to the scattered Catholics, even in their prisons. The result was that he gained many converts, while the number of Jesuits in England increased during his tenure of office from three to forty. It is, however, in connexion with the Gunpowder Plot that he is best remembered. His part in this, for which he suffered death, needs discussion in greater detail.

In 1602 Garnet received briefs from Pope Clement VIII. directing that no person unfavourable to the Catholic religion should be allowed to succeed to the throne. About the same time he was consulted by Catesby, Tresham and Winter, all afterwards involved in the Gunpowder Plot, on the subject of the mission to be sent to Spain to induce Philip III. to invade England. According to his own statement he disapproved, but he gave Winter a recommendation to Father Creswell, an influential person at Madrid. Moreover, in May 1605 he gave introductions to Guy Fawkes when he went to Flanders, and to Sir Edmund Baynham when he went to Rome (see GUNPOWDER PLOT). The preparations for the plot had now been actively going forward since the beginning of 1604, and on the 9th of June 1605 Garnet was asked by Catesby whether it was lawful to enter upon any undertaking which should involve the destruction of the innocent together with the guilty; to which Garnet answered in the affirmative, giving as an illustration the fate of persons besieged in a town in time of war. Afterwards, feeling alarmed, according to his own accounts, he admonished Catesby against intending the death of "not only innocents but friends and necessary persons for a commonwealth," and showed him a letter from the pope forbidding rebellion. According to Sir Everard Digby, however, Garnet, when asked the meaning of the brief, replied "that they were not (meaning the priests) to undertake or procure stirs, but yet they would not hinder any, neither was it the pope's mind they should, that should be undertaken for Catholic good. . . . This answer, with Mr Catesby's proceedings with him and me, gave me absolute belief that the matter in general was approved, though every particular was not known." Both men were endeavouring to exculpate themselves, and therefore both statements are subject to suspicion. A few days later, according to Garnet, the Jesuit, Oswald Tesemond, known as Greenway, informed him of the whole plot "by way of confession," when, as he declares, he expressed horror at the design and urged Greenway to do his utmost to prevent its execution. Subsequently, after his trial, Garnet said he "could not certainly affirm" that Greenway intended to relate the matter to him in confession.

Garnet's conduct in now keeping the plot a secret has been a matter of considerable controversy not only between Roman Catholics and Protestants, but amongst Roman Catholic writers themselves. Father Martin del Rio, a Jesuit, writing in 1600, discusses the exact case of the revelation of a plot in confession. Almost all the learned doctors, he says, declare that the confessor may reveal it, but he adds, "the contrary opinion is the safer and better doctrine, and more consistent with religion and with the reverence due to the holy rite of confession." According to Bellarmine, Garnet's zealous friend and defender, "If the person confessing be concealed, it is lawful for a priest to break the seal of confession in order to avert a great calamity"; but he justifies Garnet's silence by insisting that it was not lawful to disclose a treasonable secret to a heretical king. According to Garnet's own opinion a priest cognizant of treason against the state "is bound to find all lawful means to discover it *salvo sigillo confessionis*." In this connexion it is worth pointing out that Garnet had not thought it his duty to disclose the treasonable intrigue with the king of Spain in 1602, though there was no pretence in this case that he was restricted by the seal of confession, and his inactivity now tells greatly in his disfavour; for, allowing even that he was bound by confessional secrecy from taking action on Greenway's information, he had still Catesby's earlier revelations to act upon. He appears to have taken no steps whatever to prevent the crime, beyond writing to Rome in vague terms that "he feared some particular desperate courses," which aroused no suspicions in that quarter. At the same time he wrote to Father Parsons on the 4th of September that "as far as he could now see the minds of the Catholics were quieted."

His movements immediately prior to the attempt were certainly suspicious. In September, shortly before the expected meeting of parliament on the 3rd of October, Garnet organized a pilgrimage to St Winifred's Well in Flintshire, which started from Gothurst (now Gayhurst), Sir Everard Digby's house in Buckinghamshire, included Rokewood, and stopped at the houses of John Grant and Robert Winter, three others of the conspirators. During the pilgrimage Garnet asked for the prayers of the company "for some good success for the Catholic cause at the beginning of parliament." After his return he went on the 29th of October to Coughton in Warwickshire, near which place it had been settled the conspirators were to assemble after the explosion. On the 6th of November, Bates, Catesby's servant and one of the conspirators, brought him a letter with the news of the failure of the plot and desiring advice. On the 30th Garnet addressed a letter to the government in which he protested his innocence with the most solemn oaths, "as one who hopeth for everlasting salvation."

It was not till the 4th of December, however, that Garnet and Greenway were, by the confession of Bates, implicated in the plot; and on the same day Garnet removed from Coughton to Hindlip Hall, near Worcester, a house furnished with cleverly-contrived hiding-places for the use of the proscribed priests. Here he remained some time in concealment in company with another priest, Oldcorne *alias* Hall, but at last on the 30th of January 1606, unable to bear the close confinement any longer, they surrendered and were taken up to London, being well treated during the journey by Salisbury's express orders. He was examined by the council on the 13th of February and frequently questioned during the following days, but refused to incriminate himself, and a threat to inflict torture had no effect upon his resolution. Subsequently Garnet and Oldcorne having been placed in adjoining rooms and enabled to communicate with one another, their conversations were overheard on several separate occasions and considerable information obtained. Garnet at first denied all speech with Oldcorne, but subsequently on the 8th of March confessed his connexion with the plot. He was tried at the Guildhall on the 28th.

Garnet was clearly guilty of misprision of treason, *i.e.* of having concealed his knowledge of the crime, an offence which exposed

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him to perpetual imprisonment and forfeiture of his property; for the law of England took no account of religious scruples or professional etiquette when they permit the execution of a preventable crime. Strangely enough, however, the government passed over the incriminating conversation with Greenway, and relied entirely on the strong circumstantial evidence to support the charge of high treason against the prisoner. The trial was not conducted in a manner which would be permitted in more modern days. The rules of evidence which now govern the procedure in criminal cases did not then exist, and Garnet's trial, like many others, was influenced by the political situation, the case against him being supported by general political accusations against the Jesuits as a body, and with evidence of their complicity in former plots against the government. The prisoner himself deeply prejudiced his cause by his numerous false statements, and still more by his adherence to the doctrine of equivocation. Garnet, it is true, claimed to limit the justification of equivocation to cases "of necessary defence from injustice and wrong or of the obtaining some good of great importance when there is no danger of harm to others," and he could justify his conduct in lying to the council by their own conduct towards him, which included treacherous eavesdropping and fraud, and also threats of torture. Moreover, the attempt of the counsel for the crown to force the prisoner to incriminate himself was opposed to the whole spirit and tradition of the law of England. He was declared guilty, and it is probable, in spite of the irregularity and unjudicial character of his trial, that substantial justice was done by his conviction. His execution took place on the 3rd of May 1606, Garnet acknowledging himself justly condemned for his concealment of the plot, but maintaining to the last that he had never approved it. The king, who had shown him favour throughout and who had forbidden his being tortured, directed that he should be hanged till he was quite dead and that the usual frightful cruelties should be omitted.

Soon after his death the story of the miracle of "Garnet's Straw" was circulated all over Europe, according to which a blood-stained straw from the scene of execution which came into the hands of one John Wilkinson, a young and fervent Roman Catholic, who was present, developed Garnet's likeness. In consequence of the credence which the story obtained, Archbishop Bancroft was commissioned by the privy council to discover and punish the impostors. Garnet's name was included in the list of the 353 Roman Catholic martyrs sent to Rome from England in 1880, and in the 2nd appendix of the Menology of England and Wales compiled by order of the cardinal archbishop and the bishops of the province of Westminster by R. Stanton in 1887, where he is styled "a martyr whose cause is deferred for future investigation." The passage in *Macbeth* (Act II. Scene iii.) on equivocators no doubt refers especially to Garnet. His *aliases* were Farmer, Marchant, Whalley, Darcey Meaze, Phillips, Humphreys, Roberts, Fulgeham, Allen. Garnet was the author of a letter on the Martyrdom of Godfrey Maurice, *alias* John Jones, in Diego Yepres's *Historia particular de la persecucion de Inglaterra* (1599); a *Treatise of Schism*, a MS. treatise in reply to *A Protestant Dialogue between a Gentleman and a Physician*; a translation of the *Stemma Christi* with supplements (1622); a treatise on the Rosary; a Treatise of Christian Renovation or Birth (1616).

AUTHORITIES.—Of the great number of works embodying the controversy on the question of Garnet's guilt the following may be mentioned, in order of date: *A True and Perfect Relation of the whole Proceedings against . . . Garnet a Jesuit and his Confederates* (1606, repr. 1679), the official account, but incomplete and inaccurate; *Apologia pro Henrico Garneto* (1610), by the Jesuit L'Heureux, under the pseudonym Endaemon-Joannes, and Dr Robert Abbot's reply, *Antilogia versus Apologiam Eudaemon-Joannes*, in which the whole subject is well treated; Henry More, *Hist. Provinciae Anglicanae Societatis* (1660); D. Jardine, *Gunpowder Plot* (1857); J. Morris, S. J., *Condition of the Catholics under James I.* (1872), containing Father Gerard's narrative; J. H. Pollen, *Father Henry Garnet and the Gunpowder Plot* (1888); S. R. Gardiner, *What Gunpowder Plot was* (1897), in reply to John Gerard, S.J., *What was the Gunpowder Plot?* (1897); J. Gerard, *Contributions towards a Life of Father Henry Garnet* (1898). See also *State Trials II.*, and *Cal. of State Papers Dom.*, (1603–1610). The original documents are preserved in the *Gunpowder Plot Book* at the Record Office.

GARNET, a name applied to a group of closely-related minerals, many of which are used as gem-stones. The name probably comes from the Lat. *granaticus*, a stone so named from its resemblance to the pulp of the pomegranate in colour, or to its seeds in shape; or possibly from *granum*, "cochineal," in allusion to the colour of the stone. The garnet was included, with other red stones, by Theophrastus, under the name of ἄνθραξ, while the common garnet seems to have been his ἀνθράκιον. Pliny groups several stones, including garnet, under the term *carbunculus*. The modern carbuncle is a deep red garnet (almandine) cut *en cabochon*, or with a smooth convex surface, frequently hollowed out at the back, in consequence of the depth of colour, and sometimes enlivened with a foil (see ALMANDINE). The Hebrew word *nophek*, translated ἄνθραξ in the Septuagint, seems to have been the garnet or carbuncle, whilst *bareketh* (αμάραγδος of the Septuagint), though also rendered "carbuncle," was probably either beryl or, in the opinion of Professor Flinders Petrie, rock-crystal. Garnets were used as beads in ancient Egypt. Though not extensively employed by the Greeks as a material for engraved gems, it was much used for this purpose by the Romans of the Empire. Flat polished slabs of garnet are found inlaid in mosaic work in Anglo-Saxon and Merovingian jewelry, the material used being almandine, or "precious garnet."

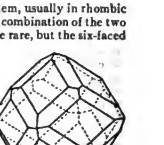
Garnets vary considerably in chemical composition, but the varition is limited within a certain range. All are orthosilicates, conformable to the general formula $R''_3(SiO_4)_3$, where $R'' = Ca, Mg, Fe, Mn$, and $R''' = Al, Fe, Cr$. Although there are many kinds of garnet they may be reduced to the following six types, which may occur intermixed isomorphously:—

1. Calcium-aluminium garnet (*Grossularite*), $Ca_3Al_2Si_3O_{12}$.
2. Calcium-ferric garnet (*Andradite*), $Ca_3Fe_2Si_3O_{12}$.
3. Calcium-chromium garnet (*Uvarovite*), $Ca_3Cr_2Si_3O_{12}$.
4. Magnesium-aluminium garnet (*Pyrope*), $Mg_3Al_2Si_3O_{12}$.
5. Ferrous-aluminium garnet (*Almandine*), $Fe_3Al_2Si_3O_{12}$.
6. Manganous-aluminium garnet (*Spessartine*), $Mn_3Al_2Si_3O_{12}$.

These are frequently called respectively:—(1) Lime-alumina garnet; (2) lime-iron garnet; (3) lime-chrome garnet; (4) magnesia-alumina garnet; (5) iron-alumina garnet; (6) manganese-alumina garnet.

The types are usually modified by isomorphous replacement of some of their elements.

All garnets crystallize in the cubic system, usually in rhombic dodecahedra or in icositetrahedra, or in a combination of the two forms (see fig.). Octahedra and cubes are rare, but the six-faced tetrahedron occurs in some of the combinations. Cleavage obtains parallel to the dodecahedron, but is imperfect. The hardness varies according to composition from 6·5 to 7·5, and the specific gravity in like manner has a wide range, varying from 3·4 in the calcium-aluminium garnets to 4·3 in the ferrous-aluminium species. Sir Arthur H. Church found that many garnets when fused yielded a product of lower density than the original mineral. The colour is typically red, but may be brown, yellow, green or even black, while some garnets are colourless. Being cubic the garnets are normally singly refracting, but anomalies frequently occur, leading some authorities to doubt whether the mineral is really cubic. The refractive power of garnet is high, so that in microscopic sections, viewed by transmitted light, the mineral stands out in relief.



Garnets are very widely distributed, occurring in crystalline schists, gneiss, granite, metamorphic limestone, serpentine, and occasionally in volcanic rocks. With omphacite and smaragdite, garnet forms the peculiar rock called eclogite. The garnets used for industrial purposes are usually found loose in detrital deposits, weathered from the parent rock, though in some important workings the rock is quarried. The garnets employed as gem-stones are described under their respective headings (see ALMANDINE, CINNAMON STONE, DEMANTOID and PYROPE). Most of the minerals noticed in this article are of scientific rather than commercial interest.

Grossularite or "gooseberry-stone," is typically a brownish-green garnet from Siberia, known also as wiluite (a name applied also to vesuvianite, *q.v.*), from the river Wilui where it occurs. It is related to hessonite, or cinnamon-stone. A Mexican variety occurs in rose-

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pink dodecahedra. Romanzovite is a brown garnet, of grossularia-type, from Finland, taking its name from Count Romanzov. Andradite was named by J. D. Dana after B. J. d'Andrada e Silva, who described, in 1800, one of its varieties allochroite, a Norwegian garnet, so named from its variable colour. This species includes most of the common garnet occurring in granular and compact masses, sometimes forming garnet rock. To andradite may be referred melanite, a black garnet well known from the volcanic tuffs near Rome, used occasionally in the 18th century for mourning jewelry. Another black garnet, in small crystals from the Pyrenees, is called pyrenеite. Under andradite may be placed topazolite, a honey-yellow garnet, rather like topaz, from Piedmont; colophonite, a brown resin-like garnet, with which certain kinds of idocrase have been confused; aplome, a green garnet from Saxony and Siberia; and jelleritе, a green Swiss garnet named after the Rev. J. H. Jellet. Here also may be placed the green Siberian mineral termed demantoid (*q.v.*), sometimes improperly called olivine by jewellers. Uvarovite, named after a Russian minister, Count S. S. Uvarov, is a rare green garnet from Siberia and Canada, but though of fine colour is never found in crystals large enough for gem-stones. Spessartite, or spessartine, named after Spessart, a German locality, is a fine aurora-red garnet, cut for jewelry when sufficiently clear, and rather resembling cinnamon-stone. It is found in Ceylon, and notably in the mica-mines in Amelia county, Virginia, United States. A beautiful rose-red garnet, forming a fine gem-stone, occurs in gravels in Macon county, N.C., and has been described by W. E. Hidden and Dr J. H. Pratt under the name of rhodolite. It seems related to both almandine and pyrope, and shows the absorption-spectrum of almandine. The Bohemian garnets largely used in jewelry belong to the species pyrope (*q.v.*).

Garnets are not only cut as gems, but are used for the bearings of pivots in watches, and are in request for abrasive purposes. Garnet paper is largely used, especially in America, in place of sand-paper for smoothing woodwork and for scouring leather in the boot-trade. As an abrasive agent it is worked at several localities in the United States, especially in New York State, along the borders of the Adirondacks, where it occurs in limestone and in gneiss. Much of the garnet used as an abrasive is coarse almandine. Common garnet, where abundant, has sometimes been used as a fluxing agent in metallurgical operations. Garnet has been formed artificially, and is known as a furnace-product.

It may be noted that the name of white garnet has been given to the mineral leucite, which occurs, like garnet, crystallized in icositetrahedra. (F. W. R.*)

GARNETT, RICHARD (1835–1906), English librarian and author, son of the learned philologist Rev. Richard Garnett (1789–1850), priest-vicar of Lichfield cathedral and afterwards keeper of printed books at the British Museum, who came of a Yorkshire family, was born at Lichfield on the 27th of February 1835. His father was really the pioneer of modern philological research in England; his articles in the *Quarterly Review* (1835, 1836) on English lexicography and dialects, and on the Celtic question, and his essays in the *Transactions* of the Philological Society (reprinted 1850), were invaluable to the later study of the English language. The son, who thus owed much to his parentage, was educated at home and at a private school, and in 1851, just after his father's death, entered the British Museum as an assistant in the library. In 1875 he rose to be superintendent of the reading-room, and from 1890 to 1899, when he retired, he was keeper of the printed books. In 1883 he was given the degree of LL.D. at Edinburgh, an honour repeated by other universities, and in 1895 he was made a C.B.

His long connexion with the British Museum library, and the value of his services there, made him a well-known figure in the literary world, and he published much original work in both prose and verse. His chief publications in book-form were: in verse, *Primula* (1858), *Io in Egypt* (1859), *Idylls and Epigrams* (1869, republished in 1892 as *A Chaplet from the Greek Anthology*), *The Queen and other Poems* (1902), *Collected Poems* (1893); in prose, biographies of Carlyle (1887), Emerson (1887), Milton (1890), Edward Gibbon Wakefield (1898); a volume of remarkably original and fanciful tales, *The Twilight of the Gods* (1888); a tragedy, *Iphigenia in Delphi* (1890); *A Short History of Italian Literature* (1898); *Essays in Librarianship and Bibliophily* (1899); *Essays of an Ex-librarian* (1901). He was an extensive contributor to the *Encyclopaedia Britannica* and the *Dictionary of National Biography*, editor of the *International Library of Famous Literature*, and co-editor, with E. Gosse, of the elaborate *English Literature: an illustrated Record*. So multifarious was his output, however, in contributions to reviews, &c., and as translator or editor, that this list represents only a small part of his published work. He was a member of numerous learned literary societies, British and foreign. His facility as an expositor, and his gift for lucid and acute generalization, together with his eminence as a bibliophile, gave his work an authority which was universally recognized, though it sometimes suffered from his relying too much on his memory and his power of generalizing—remarkable as both usually were—in cases requiring greater precision of statement in matters of detail. But as an interpreter, whether of biography or *belles lettres*, who brought an unusually wide range of book-learning, in its best sense, interestingly and comprehensibly before a large public, and at the same time acceptably to the canons of careful scholarship, Dr Garnett's writing was always characterized by clearness, common sense and sympathetic appreciation. His official career at the British Museum marked an epoch in the management of the library, in the history of which his place is second only to that of Panizzi. Besides introducing the "sliding press" in 1887 he was responsible for reviving the publication of the general catalogue, the printing of which, interrupted in 1841, was resumed under him in 1880, and gradually completed. The antipodes of a Dryasdust, his human interest in books made him an ideal librarian, and his courtesy and helpfulness were outstanding features in a personality of singular charm. The whole bookish world looked on him as a friend. Among his "hobbies" was a study of astrology, to which, without associating his name with it in public, he devoted prolonged inquiry. Under the pseudonym of "A. G. Trent" he published in 1880 an article (in the *University Magazine*) on "The Soul and the Stars"—quoted in Wilde and Dodson's *Natal Astrology*. He satisfied himself that there was more truth in the old astrology than modern criticism supposed, and he had intended to publish a further monograph on the subject, but the intention was frustrated by the ill-health which led up to his death on the 13th of April 1906. He married (1863) an Irish wife, Olivia Narney Singleton (d. 1903), and had a family of six children; his son Edward (b. 1868) being a well-known literary man, whose wife translated Turgenef's works into English. (H. Ch.)

GARNIER, CLÉMENT JOSEPH (1813–1881), French economist, was born at Beuil (Alpes maritimes) on the 3rd of October 1813. Coming to Paris he studied at the École de Commerce, of which he eventually became secretary and finally a professor. In 1842 he founded with Gilbert-Urbain Guillaumin (1801–1864) the Société d'Économie politique, becoming its secretary, a post which he held till his death; and in 1846 he organized the Association pour la Liberté des Échanges. He also helped to establish and edited for many years the *Journal des économistes* and the *Annuaire de l'économie politique*. Of the school of *laisser faire*, he was engaged during his whole life in the advancement of the science of political economy, and in the improvement of French commercial education. In 1873 he became a member of the Institute, and in 1876 a senator for the department in which he was born. He died at Paris on the 25th of September 1881. Of his writings, the following are the more important: *Traité d'économie politique* (1845), *Richard Cobden et la Ligue* (1846), *Traité des finances* (1862), and *Principes du population* (1857).

GARNIER, GERMAIN, MARQUIS (1754–1821), French politician and economist, was born at Auxerre on the 8th of November 1754. He was educated for the law, and obtained when young the office of *procureur* to the Châtelet in Paris. On the calling of the states-general he was elected as one of the *députés suppléants* of the city of Paris, and in 1791 administrator of the department of Paris. After the 10th of August 1792 he withdrew to the Pays de Vaud, and did not return to France till 1795. In public life, however, he seems to have been singularly fortunate. In 1797 he was on the list of candidates for the Directory; in 1800 he was prefect of Seine-et-Oise; and in 1804 he was made senator and in 1808 a count. After the Restoration he obtained a peerage, and on the return of Louis XVIII., after the Hundred Days, he became minister of state and member of privy council, and in 1817 was created a marquis. He died at Paris on the 4th of

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October 1821. At court he was, when young, noted for his facile power of writing society verse, but his literary reputation depends rather on his later works on political economy, especially his admirable translation, with notes and introduction, of Smith's *Wealth of Nations* (1805) and his *Histoire de la monnaie* (2 vols., 1819), which contains much sound and well-arranged material. His *Abrégé des principes de l'écon. polit.* (1796) is a very clear and instructive manual. The valuable *Description géographique, physique, et politique du département de Seine-et-Oise* (1802) was drawn up from his instructions. Other works are *De la propriété* (1792) and *Histoire des banques d'escompte* (1806).

GARNIER, JEAN LOUIS CHARLES (1825–1898), French architect, was born in Paris on the 6th of November 1825. He was educated in a primary school, and it was intended that he should pursue his father's craft, that of a wheelwright. His mother, however, having heard that with a little previous study he might enter an architect's office and eventually become a measuring surveyor (*vérificateur*), and earn as much as six francs a day, and foreseeing that in consequence of his delicate health he would be unfit to work at the forge, sent him to learn drawing and mathematics at the Petite École de Dessin, in the rue de Médecine, the cradle of so many of the great artists of France. His progress was such as to justify his being sent first into an architect's office and then to the well-known atelier of Lebas, where he began his studies in preparation for the examination of the École des Beaux Arts, which he passed in 1842, at the age of seventeen. Shortly after his admission it became necessary that he should support himself, and accordingly he worked during the day in various architects' offices, among them in that of M. Viollet-le-Duc, and confined his studies for the École to the evening. In 1848 he carried off, at the early age of twenty-three, the Grand Prix de Rome, and with his comrades in sculpture, engraving and music, set off for the Villa de Medicis. His principal works were the measured drawings of the Forum of Trajan and the temple of Vesta in Rome, and the temple of Serapis at Pozzuoli. In the fifth year of his travelling studentship he went to Athens and measured the temple at Aegina, subsequently working out a complete restoration of it, with its polychromatic decoration, which was published as a monograph in 1877. The elaborate set of drawings which he was commissioned by the duc de Luynes to make of the tombs of the house of Anjou were not published, owing to the death of his patron; and since Garnier's death they have been given to the library of the École des Beaux Arts, along with other drawings he made in Italy. On his return to Paris in 1853 he was appointed surveyor to one or two government buildings, with a very moderate salary, so that the commission given him by M. Victor Baltard to make two water-colour drawings of the Hôtel de Ville, to be placed in the album presented to Queen Victoria in 1855, on the occasion of her visit to Paris, proved very acceptable. These two drawings are now in the library at Windsor.

In 1860 came, at last, Garnier's chance: a competition was announced for a design for a new imperial academy of music, and out of 163 competitors Garnier was one of five selected for a second competition, in which, by unanimous vote, he carried off the first prize, and the execution of the design was placed in his hands. Begun in 1861, but delayed in its completion by the Franco-German War, it was not till 1875 that the structure of the present Grand Opera House of Paris was finished, at a cost of about 35,000,000 francs (£1,420,000). During the war the building was utilized as the municipal storehouse of provisions. The staircase and the magnificent hall are the finest portion of the interior, and alike in conception and realization have never been approached. Of Garnier's other works, the most remarkable are the Casino at Monte Carlo, the Bischoffsheim villa at Bordighera, the Hôtel du Cercle de la Librairie in Paris; and, among tombs, those of the musicians Bizet, Offenbach, Masséand Duprato. In 1874 he was elected a member of the Institute of France, and after passing through the grades of chevalier, officer and commander of the Legion of Honour, received in 1895 the rank of grand officer, a high distinction that had never before been granted to an architect. Charles Garnier's reputation was not confined to France; it was recognized by all the countries of Europe, and in England he received, in 1886, the royal gold medal of the Royal Institute of Architects, given by Queen Victoria. Besides his monograph on the temple of Aegina, he wrote several works, of which *Le Nouvel Opéra de Paris* is the most valuable. For the International Exhibition of 1889 he designed the buildings illustrating the "History of the House" in all periods, and a work on this subject was afterwards published by him in conjunction with M. Ammann. Not the least of his claims to the gratitude of his country were the services which he rendered on the various art juries appointed by the state, the Institute of France, and the École des Beaux-Arts, services which in France are rendered in an honorary capacity. Garnier died on the 3rd of August 1898. (R. P. S.)

GARNIER, MARIE JOSEPH FRANÇOIS [FRANCIS] (1839–1873), French officer and explorer, was born at St Étienne on the 25th of July 1839. He entered the navy, and after voyaging in Brazilian waters and the Pacific he obtained a post on the staff of Admiral Charner, who from 1860 to 1862 was campaigning in Cochin-China. After some time spent in France he returned to the East, and in 1862 he was appointed inspector of the natives in Cochin-China, and entrusted with the administration of Cho-lon, a suburb of Saigon. It was at his suggestion that the marquis de Chasseloup-Laubat determined to send a mission to explore the valley of the Mekong, but as Garnier was then considered old enough to be put in command, the chief authority was entrusted to Captain Doudart de Lagrée. In the course of the expedition—to quote the words of Sir Roderick Murchison addressed to the youthful traveller when, in 1870, he was presented with the Victoria Medal of the Royal Geographical Society of London—from Kratie in Cambodia to Shanghai 5392 m. were traversed, and of these 3625 m., chiefly of country unknown to European geography, were surveyed with care, and the positions fixed by astronomical observations, nearly the whole of the observations being taken by Garnier himself. Volunteering to lead a detachment to Talifu, the capital of Sultan Suleiman, the sovereign of the Mahommedan rebels in Yunnan, he successfully carried out the more than adventurous enterprise. When shortly afterwards Lagrée died, Garnier naturally assumed the command of the expedition, and he conducted it in safety to the Yang-tsze-Kiang, and thus to the Chinese coast. On his return to France he was received with enthusiasm. The preparation of his narrative was interrupted by the Franco-German War, and during the siege of Paris he was appointed staff officer to the admiral in command of the eighth "sector." His experiences during the siege were published anonymously in the feuilleton of *Le Temps*, and appeared separately as *Le Siège de Paris, journal d'un officier de marine* (1871). Returning to Cochin-China he found the political circumstances of the country unfavourable to further exploration, and accordingly he went to China, and in 1873 followed the upper course of the Yang-tsze-Kiang to the waterfalls. He was next commissioned by Admiral Dupré, governor of Cochin-China, to found a French protectorate or a new colony in Tongking. On the 20th of November 1873 he took Hanoi, the capital of Tongking, and on the 21st of December he was slain in fight with the Black Flags. His chief fame rests on the fact that he originated the idea of exploring the Mekong, and carried out the larger portion of the work.

The narrative of the principal expedition appeared in 1873, as *Voyage d'exploration en Indo-Chine effectué pendant les années 1866, 1867 et 1868, publié sous la direction de M. Francis Garnier, avec le concours de M. Delaporte et de MM. Joubert et Thorel* (2 vols.). An account of the Yang-tsze-Kiang from Garnier's pen is given in the *Bulletin de la Soc. de Géog.* (1874). His *Chronique royale du Cambodje*, was reprinted from the *Journal Asiatique* in 1872. See *Ocean Highways* (1874) for a memoir by Colonel Yule; and Hugh Clifford, *Further India*, in the Story of Exploration series (1904).

GARNIER, ROBERT (*c.* 1545–*c.*1600), French tragic poet, was born at Ferté Bernard (Le Maine) in 1545. He published his first work while still a law-student at Toulouse, where he won a prize (1565) in the *jeux floraux*. It was a collection of lyrical pieces, now lost, entitled *Plaintes amoureuses de Robert Garnier* (1565). After some practice at the Parisian bar, he became

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conseiller du roi au siège présidial et sénéchaussée of Le Maine, his native district, and later lieutenant-général criminel. His friend Lacroix du Maine says that he enjoyed a great reputation as an orator. He was a distinguished magistrate, of considerable weight in his native province, who gave his leisure to literature, and whose merits as a poet were fully recognized by his own generation. He died at Le Mans probably in 1590 or 1600.

In his early plays he was a close follower of the school of dramatists who were inspired by the study of Seneca. In these productions there is little that is strictly dramatic except the form. A tragedy was a series of rhetorical speeches relieved by a lyric chorus. His pieces in this manner are *Porcie* (published 1568, acted at the hôtel de Bourgogne in 1573), *Cornélie* and *Hippolyte* (both acted in 1573 and printed in 1574). In *Porcie* the deaths of Cassius, Brutus and Portia are each the subject of an eloquent recital, but the action is confined to the death of the nurse, who alone is allowed to die on the stage. His next group of tragedies—*Marc-Antoine* (1578), *La Troade* (1579), *Antigone* (acted and printed 1580)—shows an advance on the theatre of Étienne Jodelle and Jacques Grévin, and on his own early plays, in so much that the rhetorical element is accompanied by abundance of action, though this is accomplished by the plan of joining together two virtually independent pieces in the same way.

In 1582 and 1583 he produced his two masterpieces *Bradamante* and *Les Juives*. In *Bradamante*, which alone of his plays has no chorus, he has himself adrift from Seneca in models, and sought his subject in Ariosto, the result being what came to be known later as a tragi-comedy. The dramatic and romantic story becomes a real drama in Garnier's hands, though even there the lovers, Bradamante and Roger, never meet on the stage. The contest in the mind of Roger supplies a genuine dramatic interest in the manner of Corneille. *Les Juives* is the pathetic story of the barbarous vengeance of Nebuchadnezzar on the Jewish king Zedekiah and his children. The Jewish women lamenting the fate of their children take a principal part in this tragedy, which, although almost entirely elegiac in conception, is singularly well designed, and gains unity by the personality of the prophet. M. Faguet says that of all French tragedies of the 16th and 17th centuries it is, with *Athalie*, the best constructed with regard to the requirements of the stage. Actual representation is continually in the mind of the author; his drama is, in fact, visually conceived.

Garnier must be regarded as the greatest French tragic poet of his century and the precursor of the great achievements of the next.

The best edition of his works is by Wendelin Foefster (Heilbronn, 4 vols., 1882–1883). A detailed criticism of his works is to be found in Émile Faguet, *La Tragédie française au XVIe siècle* (1883, pp. 183–307).

GARNIER-PAGÈS, ÉTIENNE JOSEPH LOUIS (1801–1841), French politician, was born at Marseilles on the 27th of December 1801. Soon after his birth his father Jean François Garnier, a naval surgeon, died, and his mother married Simon Pagès, a college professor, by whom she had a son. The boys were brought up together, and took the double name Garnier-Pagès. Étienne found employment first in a commercial house in Marseilles, and then in an insurance office in Paris. In 1825 he began to study law, and made some mark as an advocate. A keen opponent of the Restoration, he joined various democratic societies, notably the *Aide-toi, le ciel l'aidera*, an organization for purifying the elections. He took part in the revolution of July 1830; became secretary of the *Aide-toi, le ciel l'aidera*, whose propaganda he brought into line with his anti-monarchical ideas; and in 1831 was sent from Isère to the chamber of deputies. He was concerned in the preparation of the *Compte rendu* of 1832, and advocated universal suffrage. He was an eloquent speaker, and his sound knowledge of business and finance gave him a marked influence among all parties in the chamber. He died in Paris on the 23rd of June 1841.

His half-brother, LOUIS ANTOINE GARNIER-PAGÈS (1803–1878), fought on the barricades during the revolution of July 1830, and after Étienne's death was elected to the chamber of deputies (1842). He was a keen promoter of reform, and was a leading spirit in the affair of the reform banquet fixed for the 22nd of February 1848. He was a member of the provisional government of 1848, and was named mayor of Paris. On the 5th of March 1848 he was made minister of finance, and incurred great unpopularity by the imposition of additional taxes. He was a member of the Constituent Assembly and of the Executive Commission. Under the Empire he was conspicuous in the republican opposition and opposed the war with Prussia, and after the fall of Napoleon III. became a member of the Government of National Defence. Unsuccessful at the elections for the National Assembly (the 8th of February 1871), he retired into private life, and died in Paris on the 31st of October 1878. He wrote *Histoire de la révolution de 1848* (1860–1862); *Histoire de la commission exécutive* (1869–1872); and *L'Opposition et l'empire* (1872).

GARNISH, a word meaning to fit out, equip, furnish, now particularly used of decoration or ornament. It is formed from the O. Fr. *garnisant* or *guarnissant*, participle of *garnir*, *guarnir*, to furnish, equip. This is of Teutonic origin, the base being represented in O. Eng. *warnian*, to take warning, beware, and Ger. *warnen*, to warn, Eng. *warn*; the original sense would be to guard against, fortify, hence equip or fit out. The meaning of "warn" is seen in the law term "garnishee," a person who owes money to or holds money belonging to another and is "warned" by order of the court not to pay it to his immediate creditor but to a third person who has obtained final judgment against that creditor. (See ATTACHMENT; EXECUTION; BANKRUPTCY.)

GARO HILLS, a district of British India, in the hills division of Eastern Bengal and Assam. It takes its name from the Garos, a tribe of doubtful ethnical affinities and peculiar customs, by whom it is almost entirely inhabited. The Garos are probably a section of the great Bodo tribe, which at one time occupied a large part of Assam. According to the census of 1901 they numbered 128,117. In the 18th century they are mentioned as being frequently in conflict with the inhabitants of the plains below their hills, and in 1790 the British government first tried to reduce them. No permanent success was achieved. In 1852 raids by the Garos were followed by a blockade of the hills, but in 1856 they were again in revolt. Again a repressive expedition was despatched in 1861, but in 1866 there was a further raid. A British officer was now posted among the hills; this step was effective; in 1869 the district was constituted, and though in 1871 an outrage was committed against a native on the survey staff, there was little opposition when an expedition was sent in 1872–1873 to bring the whole district into submission, and there were thereafter no further disturbances.

The district consists of the last spurs of the Assam hills, which here run down almost to the bank of the Brahmaputra, where that river debouches upon the plain of Bengal and takes its great sweep to the south. The administrative headquarters are at Tura. The area of the district is 3140 sq. m. In 1901 the population was 138,274, showing an increase of 14% in the decade. The American missionaries maintain a small training school for teachers. The public buildings at Tura were entirely destroyed by the earthquake of June 12, 1897, and the roads in the district were greatly damaged by subsidence and fissures. Coal in large quantities and petroleum are known to exist. The chief exports are cotton, timber and forest products. Trade is small, though the natives, according to their own standard, are prosperous. They are fair agriculturists. Communications within the district are by cart-roads, bridle-paths and native tracks.

GARONNE (Lat. *Garumna*), a river of south-western France, rising in the Maladetta group of the Pyrenees, and flowing in a wide curve to the Atlantic Ocean. It is formed by two torrents, one of which has a subterranean course of 2½ m., disappearing in the sink known as the Trou du Taureau ("bull's hole") and reappearing at the Gouëil de Jouéou. After a course of 30 m. in Spanish territory, during which it flows through the fine gorge called the Vallée d'Aran, the Garonne enters France in the department of Haute Garonne through the narrow defile of the

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Pont du Roi, and at once becomes navigable for rafts. At Montréjeau it receives on the left the Neste, and encountering at this point the vast plateau of Lannemezan is forced to turn abruptly east, flowing in a wide curve to Toulouse. At Saint Martory it gives off the irrigation canal of that name. At this point the Garonne enters a fertile plain, and supplies the motive power to several mills. It is joined on the right by various streams fed by the snows of the Pyrenees. Such are the Salat, at whose confluence river navigation proper begins, and the Arize and the Ariège (both names signifying "river"). From Toulouse the Garonne flows to the north-west, now skirting the northern border of the plateau of Lannemezan which here drains into it, the principal streams being the Save, the Gers and the Baïse. On its right hand the Garonne is swelled by its two chief tributaries, the Tarn, near Moissac, and the Lot, below Agen; farther down it is joined by the Drot (or Dropt), and on the left by the Ciron. Between Toulouse and Castets, 33½ m. above Bordeaux, and the highest point to which ordinary spring-tides ascend, the river is accompanied at a distance of from a ½ to 3 m. by the so-called "lateral canal" of the Garonne, constructed in 1838–1856. This canal is about 120 m. long, or 133 m. including its branches, one of which runs off at right angles to Montauban on the Tarn. From Toulouse to Agen the main canal follows the right bank of the Garonne, crossing the Tarn on an aqueduct at Moissac, while another magnificent aqueduct of twenty-three arches carries it at Agen from the right to the left bank of the river. It has a fall of 420 ft. and over fifty locks, and is navigable for vessels having the maximum dimensions of 98½ ft. length, 19 ft. breadth and 6½ ft. draught. The carrying trade upon it is chiefly in agricultural produce and provisions, building materials, wood and industrial products. At Toulouse the canal connects with the Canal du Midi, which runs to the Mediterranean. After passing Castets the Garonne begins to widen out considerably, and from being 160 yds. broad at Agen increases to about 650 yds. at Bordeaux, its great commercial port. From here it flows with ever increasing width between two flat shores to the Bec d'Ambès (15½ m.), where, after a course of 357 m., it unites with the Dordogne to form the vast estuary known as the Gironde. The triangular peninsula lying between these two great tidal rivers is called Entre-deux-mers ("between two seas") and is famous for its wines. The drainage area of the Garonne is nearly 33,000 sq. m. Floods are of common occurrence, and descend very suddenly. The most disastrous occurred in 1875, 1856 and in 1770, when the flood level at Castets attained the record height of 42⅔ ft. above low-water mark.

GARRET (from the O. Fr. *garite*, modern *guérite*, a watch-tower, connected ultimately with "guard" and "ward"), properly a small look-out tower built on a wall, and hence the name given to a room on the top storey of a building, the sloping ceiling of which is formed by the roof.

GARRETT, JOÃO BAPTISTA DA SILVA LEITÃO DE ALMEIDA, VISCONDE DE ALMEIDA-GARRETT (1799–1854), perhaps the greatest Portuguese poet since Camoens, was of Irish descent. Born in Oporto, his parents moved to the Quinta do Castello at Gaya when he was five years old. The French invasion of Portugal drove the family to the Azores, and Garrett made his first studies at Angra, beginning to versify at an early age under the influence of his uncle, a poet of the school of Bocage. Going to the university of Coimbra in 1816, he soon earned notoriety by the precocity of his talents and his fervent Liberalism, and there he gained his first oratorical and literary successes. His tragedy *Lucrecia* was played there in February 1819, and during this period he also wrote *Merope* as well as a great part of *Catão*, all these plays belonging to the so-called classical school. Leaving Coimbra with a law degree, he proceeded to Lisbon, and on the 11th of November 1822 married D. Luiza Midosi; but the alliance proved unhappy and a formal separation took place in 1839.

The reactionary movement against the Radical revolution of 1820 reached its height in 1823, and Garrett had to leave Portugal by order of the Absolutist ministry then in power, and went to England. He became acquainted with the masterpieces of the English and German romantic movements during his stay abroad.

Imbued with the spirit of nationality, he wrote in 1824 at Havre the poem "Camões," which destroyed the influence of the worn-out classical and Arcadian rhymers, and in the following year composed the patriotic poem "D. Branca," or "The Conquest of the Algarve." He was permitted to return to Portugal in 1826, and thereupon devoted himself to journalism. With the publication of *O Portuguez*, he raised the tone of the press, exhibiting an elevation of ideas and moderation of language then unknown in political controversy, and he introduced the "feuilleton." But his defence of Liberal principles brought him three months' imprisonment, and when D. Miguel was proclaimed absolute king on the 3rd of May 1828, Garrett had again to leave the country. In London, where he sought refuge, he continued his adhesion to romanticism by publishing *Adozinda* and *Bernal-Francez*, expansions of old folk-poems, which met with the warmest praise from Southey and were translated by Adamson. He spent the next three years in and about Birmingham, Warwick and London, engaged in writing poetry and political pamphlets, and by these and by his periodicals he did much to unite the Portuguese *émigrés* and to keep up their spirit amid their sufferings in a foreign land. Learning that an expedition was being organized in France for the liberation of Portugal, Garrett raised funds and joined the forces under D. Pedro as a volunteer. Sailing in February 1832, he disembarked at Terceira, whence he passed to S. Miguel, then the seat of the Liberal government. Here he became a co-operator with the statesman Mousinho da Silveira, and assisted him in drafting those laws which were to revolutionize the whole framework of Portuguese society, this important work being done far from books and without pecuniary reward. In his spare time he wrote some of the beautiful lyrics afterwards collected into *Flores sem Fructo*. He took part in the expedition that landed at the Mindello on the 8th of July 1832, and in the occupation of Oporto. Early in the siege he sketched out, under the influence of Walter Scott, the historical romance *Arco de Sant' Anna*, descriptive of the city in the reign of D. Pedro I.; and, in addition, he organized the Home and Foreign offices under the marquis of Palmella, drafted many important royal decrees, and prepared the criminal and commercial codes. In the following November he was despatched as secretary to the marquis on a diplomatic mission to foreign courts, which involved him in much personal hardship. In the next year the capture of Lisbon enabled him to return home, and he was charged to prepare a scheme for the reform of public instruction.

In 1834–1835 he served as consul-general and chargé d'affaires at Brussels, representing Portugal with distinction under most difficult circumstances, for which he received no thanks and little pay. When he got back, the government employed him to draw up a proposal for the construction of a national theatre and for a conservatoire of dramatic art, of which he became the head. He instituted prizes for the best plays, himself revising nearly all that were produced, and a school of dramatists and actors arose under his influence. To give them models, he proceeded to write a series of prose dramas, choosing his subjects from Portuguese history. He began in 1838 with the *Auto de Gil Vicente*, considering that the first step towards the re-creation of the Portuguese drama was to revive the memory of its founder, and he followed this up in 1842 by the *Alfageme de Santarem*, dealing with the Holy Constable, and in 1843 by *Frei Luiz de Sousa*, one of the few great tragedies of the 19th century, a work as intensely national as *The Lusiads*. The story, which in part is historically true, and has the merit of being simple, like the action, is briefly as follows. D. João de Portugal, who was supposed to have died at the battle of Alcacer, returns, years afterwards, to find his wife married to Manoel de Sousa and the mother of a daughter by him, named Maria. Thereupon the pair separate and enter religion, and Manoel becomes the famous chronicler, Frei Luiz de Sousa (*q.v.*). The characters live and move, especially Telmo, the old servant, who would never believe in the death of his former master D. João, and the consumptive

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child Maria, who helps Telmo to create the atmosphere of impending disaster; while the episodes, particularly those of the return of D. João and the death of Maria, are full of power, and the language is Portuguese of the best.

Entering parliament in 1837, Garrett soon made his mark as an orator. In that year he delivered many notable discourses in defence of liberal ideas. He also brought in a literary copyright bill, which, when it became law in 1851, served as a precedent for similar legislation in England and Prussia. In 1840 he made his famous speech known as *Porto Pyreu*, in which he skilfully turned the well-known anecdote of the "mad Athenian" against his opponents. While attending with assiduity to his duties as a deputy, he wrote, about this time, the drama *D. Filippa de Vilhena*, founded on an incident in the revolution of 1640, for representation by the pupils of the conservatoire, and the session of 1841 saw another of his oratorical triumphs in his speech against the law of tithes. In July 1843 an excursion to Santarem resulted in his prose masterpiece *Viagens na minha terra*, at once a novel and a miscellany of literary, political and philosophic criticism, written without plan or method, easy, jovial and epigrammatic. He took no part in the civil war that followed the revolution of Maria da Fonte, but continued his literary labours, producing in 1848 the comedy *A Sobrinha do Marquez*, dealing with the times of Pombal, and in 1849 an historical memoir on Mousinho da Silveira. He spent much of the year 1850 in finishing his *Romanceiro*, a collection of folk-poetry of which he was the first to perceive the value; and in June 1851 he was created a viscount. In the following December he drew up the additional act to the constitutional charter, and his draft was approved by the ministers at a cabinet meeting in his house. Further, he initiated the *Conselho Ultramarino*; and the *Law of the Misericordias*, with its preamble, published in 1852, was entirely from his pen. In the same year he became for a short time minister of foreign affairs. In 1853 he brought out *Folhas Cahidas*, a collection of short poems ablaze with passion and exquisite in form, of which his friend Herculano said: "if Camoens had written love verses at Garrett's age, he could not have equalled him." His final literary work was a novel, *Helena*, which he left unfinished, and on the 10th of February 1854 he made his last notable speech in the House. He died on the 9th of December 1854, and on the 3rd of May 1903 his remains were translated to the national pantheon, the Jeronymos at Belem, where they rest near to those of Camoens. As poet, novelist, journalist, orator and dramatist, he deserves the remark of Rebello da Silva: "Garrett was not a man of letters only but an entire literature in himself."

Besides his strong religious faith, Garrett was endowed with a deep sensibility, a creative imagination, rare taste and a singular capacity for sympathy. Thus, though a learned man and an able jurist, he was bound to be first and always an artist. His artistic temperament explains his many-sided activity, his expansive kindliness, his seductive charm, especially for women, his patriotism, his aristocratic pretensions, his huge vanity and dandyism, and the ingenuousness that absolves him from many faults in an irregular life. From his rich artistic nature sprang his profound, sincere, sensual and melancholy lyrics, the variety and perfection of his scenic creations, the splendour of his eloquence, the truth of his comic vein, the elegance of his lighter compositions. Of books stand out in bold relief from among his writings: *Folhas Cahidas*, and that tragedy of fatality and pity, *Frei Luis de Sousa*, with its gallery of noble figures incarnating the truest realism in an almost perfect prose form. The complete collection of his works comprises twenty-four volumes and there are several editions.

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GARRETTING, properly GALLETTING, a term in architecture for the process in which the "gallets" or small splinters of stone are inserted in the joints of coarse masonry to protect the mortar joints; they are stuck in while the mortar is wet.

GARRICK, DAVID (1717–1779), English actor and theatrical manager, was descended from a good French Protestant family named Garric or Garrique of Bordeaux, which had settled in England on the revocation of the Edict of Nantes. His father, Captain Peter Garrick, who had married Arabella Clough, the daughter of a vicar choral of Lichfield cathedral, was on a recruiting expedition when his famous third son was born at Hereford on the 19th of February 1717. Captain Garrick, who had made his home at Lichfield, where he had a large family, in 1731 rejoined his regiment at Gibraltar. This kept him absent from home for many years, during which letters were written to him by "little Davy," acquainting him with the doings at Lichfield. When the boy was about eleven years old he paid a short visit to Lisbon where his uncle David had settled as a wine merchant. On his father's return from Gibraltar, David, who had previously been educated at the grammar school of Lichfield, was, largely by the advice of Gilbert Walmesley, registrar of the ecclesiastical court, sent with his brother George to the "academy" at Edial just opened in June or July 1736 by Samuel Johnson, the senior by seven years of David, who was then nineteen. This seminary was, however, closed in about six months, and on the 2nd of March 1736/7 both Johnson and Garrick left Lichfield for London—Johnson, as he afterwards said, "with twopence halfpenny in his pocket," and Garrick "with three-halfpence in his." Johnson, whose chief asset was the MS. tragedy of *Irene*, was at first the host of his former pupil, who, however, before the end of the year took up his residence at Rochester with John Colson (afterwards Lucasian professor at Cambridge). Captain Garrick died about a month after David's arrival in London. Soon afterwards, his uncle, the wine merchant at Lisbon, having left David a sum of £1000, he and his brother entered into partnership as wine merchants in London and Lichfield, David taking up the London business. The concern was not prosperous —though Samuel Foote's assertion that he had known Garrick both three quarts of vinegar in the cellar calling himself a wine merchant need not be taken literally—and before the end of 1741 he had spent nearly half of his capital.

His passion for the stage completely engrossed him; he tried his hand both at dramatic criticism and at dramatic authorship. His first dramatic piece, *Lethe*, or *Aesop in the Shades*, which he was thirty-seven years later to read from a splendidly bound transcript to King George III. and Queen Charlotte, was played at Drury Lane on the 15th of April 1740; and he became a well-known frequenter of theatrical circles. His first appearance on the stage was made in March 1741, *incognito*, as harlequin at Goodman's Fields, Yates, who was ill, having allowed him to take his place during a few scenes of the pantomime entitled *Harlequin Student*, or *The Fall of Pantomime with the Restoration of the Drama*. Garrick subsequently accompanied a party of players from the same theatre to Ipswich, where he played his first part as an actor under the name of Lyddal, in the character of Aboan (in Southerne's *Oroonoko*). His success in this and other parts determined his future career. On the 19th of October 1741 he made his appearance at Goodman's Fields as Richard III. and gained the most enthusiastic applause. Among the audience was Macklin, whose performance of Shylock, early in the same year, had pointed the way along which Garrick was so rapidly to pass in triumph. On the morrow the latter wrote to his brother at Lichfield, proposing to make arrangements for his withdrawal from the partnership, which, after much distressful complaint on the part of his family, met by him with the utmost consideration, were ultimately carried into effect. Meanwhile, each night had added to his popularity on the stage. The town, as Gray (who, like Horace Walpole, at first held out against the *furore*) declared, was "horn-mad" about him. Before his Richard had exhausted its original effect, he won new applause as Aboan, and soon afterwards as Lear and as Pierre in Otway's *Venice Preserved*, as well as in several comic characters (including that of Bayes).

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Glover (" Leonidas ") attended every performance; the duke of Argyll, Lords Cobham and Lyttelton, Pitt, and several other members of parliament testified their admiration. Within the first six months of his theatrical career he acted in eighteen characters of all kinds, and from the 2nd of December he appeared in his own name. Pope went to see him three times during his first performances, and pronounced that " that young man never had his equal as an actor, and he will never have a rival." Before next spring he had supped with " the great Mr Murray, counsellor," and was engaged to do so with Mr Pope through Murray's introduction, while he was dining with Halifax, Sandwich and Chesterfield. " There was a dozen dukes of a night at Goodman's Fields," writes Horace Walpole. Garrick's farce of *The Lying Valet*, in which he performed the part of Sharp, was at this time brought out with so much success that he ventured to send a copy to his brother.

His fortune was now made, and while the managers of Covent Garden and Drury Lane resorted to the law to make Giffard, the manager of Goodman's Fields, close his little theatre, Garrick was engaged by Fleetwood for Drury Lane for the season of 1742. In June of that year he went over to Dublin, where he found the same homage paid to his talents as he had received from his own countrymen. He was accompanied by Margaret (Peg) Woffington, of whom he had been for some time a fervent admirer. (His claim to the authorship of the song to Lovely Peggy is still *sub judice*. There remains some obscurity as to the end of their liaison.) From September 1742 to April 1745 he played at Drury Lane, after which he again went over to Dublin. Here he remained during the whole season, as joint-manager with Sheridan, in the direction and profits of the Theatre Royal in Smock Alley. In 1746–1747 he fulfilled a short engagement with Rich at Covent Garden, his last series of performances under a management not his own. With the close of that season Fleetwood's patent for the management of Drury Lane expired, and Garrick, in conjunction with Lacy, purchased the property of the theatre, together with the renewal of the patent; contributing £8000 as two-thirds of the purchase-money. In September 1747 it was opened with a strong company of actors, Johnson's prologue being spoken by Garrick, while the epilogue, written by him, was spoken by Mrs Woffington. The negotiations involved Garrick in a bitter quarrel with Macklin, who appears to have had a real grievance in the matter. Garrick took no part himself till his performance of Archer in the *Beaux' Stratagem*, a month after the opening. For a time at least " the drama's patrons " were content with the higher entertainment furnished them; in the end Garrick had to " please " them, like most other managers, by gratifying their love of show. Garrick was surrounded by many players of eminence, and he had the art, as he was told by Mrs Clive, " of contradicting the proverb that one cannot make bricks without straw, by doing what is infinitely more difficult, making actors and actresses without genius." He had to encounter very serious opposition from the old actors whom he had distanced, and with the younger actors and actresses he was involved in frequent quarrels. But to none of them or their fellows did he, so far as it appears, show that jealousy of real merit from which so many great actors have been unable to remain free. For the present he was able to hold his own against all competition. The naturalness of his acting fascinated those who, like Partridge in *Tom Jones*, listened to nature's voice, and justified the preference of more conscious critics. To be " pleased with nature " was, as Churchill wrote, in the *Rosciad* (1761),[1] to be pleased with Garrick. For the stately declamation, the sonorous, and beyond a doubt impressive, chant of Quin and his fellows, Garrick substituted rapid changes of passion and humour in both voice and gesture, which held his audiences spellbound. " It seemed," wrote Richard Cumberland, " as if a whole century had been stepped over in the passage of a single scene; old things were done away, and a new order at once brought forward, bright and luminous, and clearly destined to dispel the barbarisms of a tasteless age, too long superstitiously devoted to the illusions of imposing declamation." Garrick's French descent and his education may have contributed to give him the vivacity and versatility which distinguished him as an actor; and nature had given him an eye, if not a stature, to command, and a mimic power of wonderful variety. The list of his characters in tragedy, comedy and farce is large, and would be extraordinary for a modern actor of high rank; it includes not less than seventeen Shakespearian parts. As a manager, though he committed some grievous blunders, he did good service to the theatre and signally advanced the popularity of Shakespeare's plays, of which not less than twenty-four were produced at Drury Lane under his management. Many of these were not pure Shakespeare; and he is credited with the addition of a dying speech to the text of *Macbeth*. On the other hand, Tate Wilkinson says that Garrick's production of *Hamlet* in 1773 was well received at Drury Lane even by the galleries, " though without their favourite acquaintances the gravediggers." Among his published adaptations are an opera, *The Fairies* (from *Midsummer Night's Dream*) (1755); an opera *The Tempest* (1756); *Catherine and Petruchio* (1758); *Florizel and Perdita* (1762). But not every generation has the same notions of the way in which Shakespeare is best honoured. Few sins of omission can be charged against Garrick as a manager, but he refused Home's *Douglas*, and made the wrong choice between *False Delicacy* and *The Good Natur'd Man*. For the rest, he purified the stage of much of its grossness, and introduced a relative correctness of costume and decoration unknown before. To the study of English dramatic literature he rendered an important service by bequeathing his then unrivalled collection of plays to the British Museum.

After escaping from the chains of his passion for the beautiful but reckless Mrs Woffington, Garrick had in 1749 married Mademoiselle Violette (Eva Maria Veigel), a German lady who had attracted admiration at Florence or at Vienna as a dancer, and had come to England early in 1746, where her modest grace and the rumours which surrounded her created a *furore*, and where she found enthusiastic patrons in the earl and countess of Burlington. Garrick, who called her " the best of women and wives," lived most happily with her in his villa at Hampton, acquired by him in 1754, whither he was glad to escape from his house in Southampton Street. To this period belongs Garrick's quarrel with Barry, the only actor who even temporarily rivalled him in the favour of the public. In 1763 Garrick and his wife visited Paris, where they were cordially received and made the acquaintance of Diderot and others at the house of the baron d'Holbach. It was about this time that Grimm extolled Garrick as the first and only actor who came up to the demands of his imagination; and it was in a reply to a pamphlet occasioned by Garrick's visit that Diderot first gave expression to the views expounded in his *Paradoxe sur le comédien*. After some months spent in Italy, where Garrick fell seriously ill, they returned to Paris in the autumn of 1764 and made more friends, reaching London in April 1765. Their union was childless, and Mrs Garrick survived her husband until 1822. Her portrait by Hogarth is at Windsor Castle.

Garrick practically ceased to act in 1766, but he continued the management of Drury Lane, and in 1769 organized the Shakespeare celebrations at Stratford-on-Avon, an undertaking which ended in dismal failure, though he composed an " Ode upon dedicating a building and erecting a Statue to Shakespeare " on the occasion. (See, *inter alia*, *Garrick's Vagary, or England Run Mad; with particulars of the Stratford Jubilee*, 1769.) Of his best supporters on the stage, Mrs Cibber, with whom he had been reconciled, died in 1766, and Mrs (Kitty) Clive retired in 1769; but Garrick contrived to maintain the success of his theatre. He sold his share in the property in 1776 for £35,000, and took leave of the stage by playing a round of his favourite characters—Hamlet, Lear, Richard and Benedick, among Shakespearian parts; Lusignan in *Zara*, Aaron Hill's adaptation of Voltaire's *Zaire*; and Kitely in his own adaptation of Ben Jonson's *Every Man in his Humour*; Archer in Farquhar's *Beaux' Stratagem*;

[1] In the subsequent *Apology addressed to the Critical Reviewers*, Churchill revenged himself for the slight which he supposed Garrick to have put upon him, by some spiteful lines, which, however, Garrick requited by good-humoured kindness.

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Abel Drugger in Ben Jonson's *Alchemist*; Sir John Brute in Vanbrugh's *Provoked Wife*; Leon in Fletcher's *Rule a Wife and have a Wife*. He ended the series, as Tate Wilkinson says, "in full glory" with "the youthful Don Felix" in Mrs Centlivre's *Wonder* on the 10th of June 1776. He died in London on the 20th of January 1779. He was buried in Westminster Abbey at the foot of Shakespeare's statue with imposing solemnities. An elegy on his death was published by William Tasker, poet and physiognomist, in the same year.

In person, Garrick was a little below middle height; in his later years he seems to have inclined to stoutness. The extraordinary mobility of his whole person, and his power of as it were transforming himself at will, are attested by many anecdotes and descriptions, but the piercing power of his eye must have been his most irresistible feature.

Johnson, of whose various and often merely churlish remarks on Garrick and his doings many are scattered through the pages of Boswell, spoke warmly of the elegance and sprightliness of his friend's conversation, as well as of his liberality and kindness of heart; while to the great actor's art he paid the exquisite tribute of describing Garrick's sudden death as having "eclipsed the gaiety of nations, and impoverished the public stock of harmless pleasure." But the most discriminating character of Garrick, slightly tinged with satire, is that drawn by Goldsmith in his poem of *Retaliation*. Beyond a doubt he was not without a certain moral timidity contrasting strangely with his eager temperament and alertness of intellect; but, though he was not cast in a heroic mould, he must have been one of the most amiable of men. Garrick was often happy in his epigrams and occasional verse, including his numerous prologues and epilogues. He had the good taste to recognize, and the spirit to make public his recognition of, the excellence of Gray's odes at a time when they were either ridiculed or neglected. His dramatic pieces, *The Lying Valet*, adapted from Motteux's *Novelty Lethe* (1740), *The Guardian*, *Linco's Travels* (1767), *Miss in her Teens* (1747), *Irish Widow*, &c., and his alterations and adaptations of old plays, which together fill four volumes, evinced his knowledge of stage effect and his appreciation of lively dialogue and action; but he cannot be said to have added one new or original character to the drama. He was joint author with Colman of *The Clandestine Marriage* (1766), in which he is said to have written his famous part of Lord Ogleby. The excellent farce, *High Life below Stairs*, appears to have been wrongly attributed to Garrick, and to be by James Townley. His *Dramatic Works* (1798) fill three, his *Poetic* (1735) two volumes.

Garrick's *Private Correspondence* (published in 1831–1832 with a short memoir by Boaden, in 2 vols. 4to), which includes his extensive *Foreign Correspondence* with distinguished French men and women, and the notices of him in the memoirs of Cumberland, Hannah More and Madame D'Arblay, and above all in Boswell's *Life of Johnson*, bear testimony to his many attractive qualities as a companion and to his fidelity as a friend.

BIBLIOGRAPHY.—A collection of unprinted Garrick letters is in the Forster library at South Kensington. A list of publications of all kinds for and against Garrick will be found in R. Lowe's *Bibliographical History of English Theatrical Literature* (1887). The earlier biographies of Garrick are by Arthur Murphy (2 vols., 1801) and by the bookseller Tom Davies (2 vols., 4th ed., 1805), the latter a work of some merit, but occasionally inaccurate and confused as to dates; and a searching if not altogether sympathetic survey of his verses is furnished by Joseph Knight's valuable *Life* (1894). A memoir of Garrick is included in a volume of French *Memoirs of Mlle Clairon and others*, published by Levain (H. L. Cain) at Paris in 1846; and an Italian *Biografia di Davide Garrick* was published by C. Blasis at Milan in 1840. Mr Percy Fitzgerald's *Life* (2 vols., 1868; new edition, 1899) is full and spirited, and has been reprinted, with additions, among Sir Theodore Martin's *Monographs* (1906). A delightful essay on Garrick appeared in the *Quarterly Review* (July 1868), directing attention to the admirable criticisms of Garrick's acting in 1775 in the letters of G. C. Lichtenberg (*Verm. Schriften*, iii., Göttingen, 1801). See also for a very valuable survey of Garrick's labours as an actor, with a bibliography, C. Gaehde, *David Garrick als Shakespeare-Darsteller*, &c. (Berlin, 1904). Mrs Parsons' *Garrick, and his Circle* and *Some unpublished Correspondence of David Garrick*, ed. G. P. Baker (Boston, Mass., 1907), are interesting additions to the literature of the subject. There is also a *Life* by James Smyth, *David Garrick* (1887). T. W. Robertson's play *David Garrick*, first acted by Sothern, and later associated with Sir Charles Wyndham, is of course mere fiction.

As to the portraits of Garrick, see W. T. Lawrence in *The Connoisseur* (April 1905). That by Gainsborough at Stratford-on-Avon was preferred by Mrs Garrick to all others. Several remain from the hand of Hogarth, including the famous picture of Garrick as Richard III. The portraits by Reynolds include the celebrated "Garrick between Tragedy and Comedy." Zoffany's are portraits in character. Roubiliac's statue of Shakespeare, for which Garrick sat, and for which he paid the sculptor three hundred guineas, was originally placed in a small temple at Hampton, and is now in the entrance hall at the British Museum. (R. CA.; A. W. W.)

GARRISON, WILLIAM LLOYD (1805–1879), the American anti-slavery leader, was born in Newburyport, Massachusetts, U.S.A., on the 10th of December 1805. His parents were from the British province of New Brunswick. The father, Abijah, a sea-captain, went away from home when William was a child, and it is not known whether he died at sea or on land. The mother, whose maiden name was Lloyd, is said to have been a woman of high character, charming in person and eminent for piety. She died in 1823. William had a taste for books, and made the most of his limited opportunities. His mother first set him to learn the trade of a shoemaker, first at Newburyport, and then, after 1815, at Baltimore, Maryland, and, when she found that this did not suit him, let him try his hand at cabinet-making (at Haverhill, Mass.). But this pleased him no better. In October 1818, when he was in his fourteenth year, he was made more than content by being indentured to Ephraim W. Allen, proprietor of the Newburyport *Herald*, to learn the trade of a printer. He soon became an expert compositor, and after a time began to write anonymously for the *Herald*. His communications won the commendation of the editor, who had not at first the slightest suspicion that he was the author. He also wrote for other papers with equal success. A series of political essays, written by him for the Salem *Gazette*, was copied by a prominent Philadelphia journal, the editor of which attributed them to the Hon. Timothy Pickering, a distinguished statesman of Massachusetts. His skill as a printer won for him the position of foreman, while his ability as a writer was so marked that the editor of the *Herald*, when temporarily called away from his post, left the paper in his charge.

The printing-office was for him, what it has been for many another poor boy, no mean substitute for the academy and for the college. He was full of enthusiasm for liberty; the struggle of the Greeks to throw off the Turkish yoke enlisted his warmest sympathy, and at one time he seriously thought of entering the West Point Academy and fitting himself for a soldier's career. His apprenticeship ended in 1826, when he began the publication of a new paper (actually the old one under a new name), the *Free Press*, in his native place. The paper, whose motto was "Our Country, our Whole Country, and nothing but our Country," was full of spirit and intellectual force, but Newburyport was a sleepy place and the enterprise failed. Garrison then went to Boston, where, after working for a time as a journeyman printer, he became the editor of the *National Philanthropist*, the first journal established in America to promote the cause of total abstinence from intoxicating liquors. His work in this paper was highly appreciated by the friends of temperance, but a change in the proprietorship led to his withdrawal before the end of the year. In 1828 he was induced to establish the *Journal of the Times* at Bennington, Vermont, to support the re-election of John Quincy Adams to the presidency of the United States. The new paper, though attractive in many ways, and full of force and fire, was too far ahead of public sentiment on moral questions to win a large support. In Boston he had met Benjamin Lundy (*q.v.*), who had for years been preaching the abolition of slavery. Garrison had been deeply moved by Lundy's appeals, and after going to Vermont he showed the deepest interest in the slavery question. Lundy was then publishing in Baltimore a small monthly paper, entitled *The Genius of Universal Emancipation*, and he resolved to go to Bennington and invite Garrison to join him in the editorship. With this object in view he walked from Boston to Bennington, through the frost and snow of a New England winter, a distance of 125 m. His mission was successful. Garrison was

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deeply impressed by the good Quaker's zeal and devotion, and he resolved to join him and devote himself thereafter to the work of abolishing slavery.

In pursuance of this plan he went to Baltimore in the autumn of 1829, and thenceforth the *Genius* was published weekly, under the joint editorship of the two men. It was understood, however, that Garrison would do most of the editorial work, while Lundy would spend most of his time in lecturing and procuring subscribers. On one point the two editors differed radically, Lundy being the advocate of gradual and Garrison of immediate emancipation. The former was possessed with the idea that the negroes, on being emancipated, must be colonized somewhere beyond the limits of the United States; the latter held that they should be emancipated on the soil of the country, with all the rights of freemen. In view of this difference it was agreed that each should speak on his own individual responsibility in the paper, appending his initial to each of his articles for the information of the reader. It deserves mention here that Garrison was then in utter ignorance of the change previously wrought in the opinions of English abolitionists by Elizabeth Heyrick's pamphlet in favour of immediate, in distinction from gradual emancipation. The sinfulness of slavery being admitted, the duty of immediate emancipation to his clear ethical instinct was perfectly manifest. He saw that it would be idle to expose and denounce the evils of slavery, while responsibility for the system was placed upon former generations, and the duty of abolishing it transferred to an indefinite future. His demand for immediate emancipation fell like a tocsin upon the ears of slaveholders. For general talk about the evils of slavery they cared little, but this assertion that every slave was entitled to instant freedom filled them with alarm and roused them to anger, for they saw that, if the conscience of the nation were to respond to the proposition, the system must inevitably fall. The *Genius*, now that it had become a vehicle for his dangerous doctrine, was a paper to be feared and intensely hated. Baltimore was then one of the centres of the domestic slave trade, and upon this traffic Garrison heaped the strongest denunciations. A vessel owned in Newburyport having taken a cargo of slaves from Baltimore to New Orleans, he characterized the transaction as an act of "domestic piracy," and avowed his purpose to "cover with thick infamy" those engaged therein. He was thereupon prosecuted for libel by the owner of the vessel, fined $50, mulcted in costs, and, in default of payment, committed to gaol. His imprisonment created much excitement, and in some quarters, in spite of the pro-slavery spirit of the time, was a subject of indignant comment in public as well as private. The excitement was fed by the publication of two or three striking sonnets, instinct with the spirit of liberty, which Garrison inscribed on the walls of his cell. One of these, *Freedom of Mind*, is remarkable for freshness of thought and terseness of expression.

John G. Whittier, the Quaker poet, interceded with Henry Clay to pay Garrison's fine and thus release him from prison. To the credit of the slaveholding statesman it must be said that he responded favourably, but before he had time for the requisite preliminaries Arthur Tappan, a philanthropic merchant of New York, contributed the necessary sum and set the prisoner free after an incarceration of seven weeks. The partnership between Garrison and Lundy was then dissolved by mutual consent, and the former resolved to establish a paper of his own, in which, upon his sole responsibility, he could advocate the doctrine of immediate emancipation and oppose the scheme of African colonization. He was sure, after his experiences at Baltimore, that a movement against slavery resting upon any less radical foundation than this would be ineffectual. He first proposed to establish his paper at Washington, in the midst of slavery, but on returning to New England and observing the state of public opinion there, he came to the conclusion that little could be done at the South while the non-slaveholding North was lending her influence, through political, commercial, religious and social channels, for the sustenance of slavery. He determined, therefore, to publish his paper in Boston, and, having issued his prospectus, set himself to the task of awakening an interest in the subject by means of lectures in some of the principal cities and towns of the North. It was an up-hill work. Contempt for the negro and indifference to his wrongs were almost universal. In Boston, then a great cotton mart, he tried in vain to procure a church or vestry for the delivery of his lectures, and thereupon announced in one of the daily journals that if some suitable place was not promptly offered he would speak on the common. A body of infidels under the leadership of Abner Kneeland (1774–1844), who had previously been in turn a Baptist minister and the editor of a Universalist magazine, proffered him the use of their small hall; and, no other place being accessible, he accepted it gratefully, and delivered therein (in October 1830) three lectures, in which he unfolded his principles and plans. He visited privately many of the leading citizens of the city, statesmen, divines and merchants, and besought them to take the lead in a national movement against slavery; but they all with one consent made excuse, some of them listening to his plea with manifest impatience. He was disappointed, but not disheartened. His conviction of the righteousness of his cause, of the evils and dangers of slavery, and of the absolute necessity of the contemplated movement, was intensified by opposition, and he resolved to go forward, trusting in God for success.

On the 1st of January 1831, without a dollar of capital, and without a single subscriber, he and his partner Isaac Knapp (1804–1843) issued the first number of the *Liberator*, avowing their "determination to print it as long as they could subsist on bread and water, or their hands obtain employment." Its motto was, "Our country is the world—our countrymen are mankind"; and the editor, in his address to the public, uttered the words which have become memorable as embodying the whole purpose and spirit of his life: "I am in earnest—I will not equivocate—I will not excuse—I will not retreat a single inch—and I will be heard." Help came but slowly. For many months Garrison and his brave partner, who died long before the end of the conflict, made their bed on the floor of the room, "dark, unfurnished and mean," in which they printed their paper, and where Mayor Harrison Gray Otis of Boston, in compliance with the request of Governor Robert Y. Hayne of South Carolina, "ferreted them out" in "an obscure hole," "their only visible auxiliary a negro boy." But the paper founded under such inauspicious circumstances exerted a mighty influence, and lived to record not only President Lincoln's proclamation of emancipation, but the adoption of an amendment to the constitution of the United States for ever prohibiting slavery. It was the beginning and the nucleus of an agitation that eventually pervaded and filled every part of the country. Other newspapers were afterwards established upon the same principles; anti-slavery societies, founded upon the doctrine of immediate emancipation, sprang up on every hand; the agitation was carried into political parties, into the press, and into legislative and ecclesiastical assemblies; until in 1861 the Southern states, taking alarm from the election of a president known to be at heart opposed to slavery though pledged to enforce all the constitutional safeguards of the system, seceded from the Union and set up a separate government.

Garrison sought the abolition of slavery by moral means alone. He knew that the national government had no power over the system in any state, though it could abolish it at the national capital, and prohibit it in the territories. He thought it should bring its moral influence to bear in favour of abolition; but neither he nor his associates ever asked Congress to exercise any unconstitutional power. His idea was to combine the moral influence of the North, and pour it through every open channel upon the South. To this end he made his appeal to the Northern churches and pulpits, beseeching them to bring the power of Christianity to bear against the slave system, and to advocate the rights of the slaves to immediate and unconditional freedom. He was a man of peace, hating war not less than he did slavery; but he warned his countrymen that if they refused to abolish slavery by moral power a retributive war must sooner or later ensue. The conflict was irrepressible. Slavery must be overthrown, if not by peaceful means, then in blood. The first society

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organized under Garrison's auspices, and in accordance with his principles, was the New England Anti-Slavery Society, which adopted its constitution in January 1832. In the spring of this year Garrison issued his *Thoughts on African Colonization*, in which he showed by ample citations from official documents that the American Colonization Society was organized in the interest of slavery, and that in offering itself to the people of the North as a practical remedy for that system it was guilty of deception. His book, aided by others taking substantially the same view, smote the society with a paralysis from which it never recovered. Agents of the American Colonization Society in England having succeeded in deceiving leading Abolitionists there as to its character and tendency, Garrison was deputed by the New England Anti-Slavery Society to visit England for the purpose of counteracting their influence. He went in the spring of 1833, when he was but twenty-seven years of age, and was received with great cordiality by British Abolitionists, some of whom had heard of his bold assaults upon American slavery, and had seen a few numbers of the *Liberator*. The struggle for emancipation in the West Indies was then at the point of culmination; the leaders of the cause, from all parts of the kingdom, were assembled in London, and Garrison was at once admitted to their councils and treated with distinguished consideration. He took home with him a "protest" against the American Colonization Society, signed by Wilberforce, Zachary Macaulay, Samuel Gurney, William Evans, S. Lushington, T. Fowell Buxton, James Cropper, Daniel O'Connell and others, in which they declared their deliberate judgment that "its precepts were delusive," and "its real effects of the most dangerous nature." He also received assurances of the cordial sympathy of British Abolitionists with him in his efforts to abolish American slavery. He gained a hearing before a large popular assembly in London, and won the confidence of those whom he addressed by his evident earnestness, sincerity and ability.

Garrison's visit to England enraged the pro-slavery people and press of the United States at the outset, and when he returned home in September with the "protest" against the Colonization Society, and announced that he had engaged the services of George Thompson as a lecturer against American slavery, there were fresh outbursts of rage on every hand. The American Anti-Slavery Society was organized in December of that year (1833), putting forth a masterly declaration of its principles and purposes from the pen of Garrison. This added fresh fuel to the public excitement, and when Thompson came over in the next spring, the hostility to the cause began to manifest itself in mobs organized to suppress the discussion of the slavery question. Now began what Harriet Martineau called "the martyr age in America." In the autumn of 1835 Thompson was compelled, in order to save his life, to embark secretly for England. Just before his departure the announcement that he would address the Woman's Anti-Slavery Society of Boston created "a mob of gentlemen of property and standing," from which, if he had been present, he could hardly have escaped with his life. The whole city was in an uproar. Garrison, almost denuded of his clothing, was dragged through the streets with a rope by infuriated men. He was rescued with great difficulty, and consigned to the gaol for safety, until he could be secretly removed from the city.

Anti-slavery societies were greatly multiplied throughout the North, and many men of influence, both in the church and in the state, were won to the cause. Garrison, true to his original purpose, never faltered or turned back. The Abolitionists of the United States were a united body until 1839–1840, when divisions sprang up among them. Garrison countenanced the activity of women in the cause, even to the extent of allowing them to vote and speak in the anti-slavery societies, and appointing them as lecturing agents; moreover, he believed in the political equality of the sexes, to which a strong party was opposed upon social and religious grounds. Then there were some who thought Garrison dealt too severely with the churches and pulpits for their complicity with slavery, and who accused him of a want of religious orthodoxy; indeed, according to the standards of his time he was decidedly heterodox, though he had an intensely religious nature and was far from being an infidel, as he was often charged with being. He was, moreover, not only a non-resistant but also an opponent of all political systems based on force. "As to the governments of this world," he said, "whatever their titles or forms we shall endeavour to prove that in their essential elements, as at present administered, they are all anti-Christ; that they can never by human wisdom be brought into conformity with the will of God; that they cannot be maintained except by naval and military power to carry them into effect; that all their penal enactments, being a dead letter without any army to carry them into effect, are virtually written in human blood; and that the followers of Jesus should instinctively shun their stations of honor, power, and emolument—at the same time 'submitting to every ordinance of man for the Lord's sake' and offering no physical resistance to any of their mandates, however unjust or tyrannical." These views were very distasteful to many, who, moreover, felt that Garrison greatly injured abolitionism by causing it to be associated in men's minds with these unpopular views on other subjects. The dissentients from his opinions determined to form an anti-slavery political party, while he believed in working by moral rather than political party instrumentalities. These differences led to the organization of a new National Anti-Slavery Society in 1840, and to the formation of the "Liberty Party" (*q.v.*) in politics. (See BIRNEY, JAMES G.) The two societies sent their delegates to the World's Anti-Slavery Convention in London in 1840, and Garrison refused to take his seat in that body, because the women delegates from the United States were excluded. The discussions of the next few years served to make clearer than before the practical workings of the constitution of the United States as a shield and support of slavery; and Garrison, after a long and painful reflection, came to the conclusion that its pro-slavery clauses were immoral, and that it was therefore wrong to take an oath for its support. The Southern states had greatly enlarged representation in Congress on account of their slaves, and the national government was constitutionally bound to assist in the capture of fugitive slaves, and to suppress every attempt on their part to gain their freedom by force. In view of these provisions, Garrison, adopting a bold scriptural figure of speech, denounced the constitution as "a covenant with death and an agreement with hell," and chose as his motto, "No union with slaveholders."

One class of Abolitionists sought to evade the difficulty by strained interpretations of the clauses referred to, while others, admitting that they were immoral, felt themselves obliged, notwithstanding, to support the constitution in order to avoid what they thought would be still greater evils. The American Anti-Slavery Society, of which Garrison was the president from 1843 to the day of emancipation, was during all this period the nucleus of an intense and powerful moral agitation, which was greatly valued by many of the most faithful workers in the field of politics, who respected Garrison for his fidelity to his convictions. On the other hand, he always had the highest respect for every earnest and faithful opponent of slavery, however far their special views might differ. When in 1861 the Southern states seceded from the Union and took up arms against it, he saw clearly that slavery would perish in the struggle, that the constitution would be purged of its pro-slavery clauses, and that the Union henceforth would rest upon the sure foundations of liberty, justice and equality to all men. He therefore ceased from that hour to advocate disunion, and devoted himself to the task of preparing the way for and hastening on the inevitable event. His services at this period were recognized and honoured by President Lincoln and others in authority, and the whole country knew that the agitation which made the abolition of slavery feasible and necessary was largely due to his uncompromising spirit and indomitable courage.

In 1865 at the close of the war, he declared that, slavery being abolished, his career as an abolitionist was ended. He counselled a dissolution of the American Anti-Slavery Society, insisting that it had become *functus officiis*, and that whatever needed

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to be done for the protection of the freedmen could best be accomplished by new associations formed for that purpose. The *Liberator* was discontinued at the end of the same year, after an existence of thirty-five years. He visited England for the second time in 1846, and again in 1867, when he was received with distinguished honours, public as well as private. In 1877, when he was there for the last time, he declined every form of public recognition. He died in New York on the 24th of May 1879, in the seventy-fourth year of his age, and was buried in Boston, after a most impressive funeral service, four days later. In 1843 a small volume of his *Sonnets and other Poems* was published, and in 1852 appeared a volume of *Selections from his Writings and Speeches*. His wife, Helen Eliza Benson, died in 1876. Four sons and one daughter survived them.

Garrison's son, WILLIAM LLOYD GARRISON (1838–1909), was a prominent advocate of the single tax, free trade, woman's suffrage, and of the repeal of the Chinese Exclusion Act, and an opponent of imperialism; another son, WENDELL PHILLIPS GARRISON (1840–1907), was literary editor of the New York *Nation* from 1865 to 1906.

The above article, with certain modifications, reproduces the account given in the 9th edition of this work by Oliver Johnson (reprinted from his *Garrison: an Outline of his Life*, New York, 1879). The writer (1809–1881) was a prominent Abolitionist, editor, and an intimate friend of Garrison; he edited the *Liberator* during Garrison's absence in England in 1833, and later was an editor or an associate editor of various journals, including, after the Civil War, the New York *Tribune* and the New York *Evening Post*. He also published an excellent brief biography in *William Lloyd Garrison and his Times* (Boston, 1880).

The great authority on the life of Garrison is the thorough and candid work of his sons, W. P. and F. J. Garrison, *William Lloyd Garrison 1805–1879: The Story of his Life told by his Children* (4 vols., New York, 1885–1889), which is indispensable for the student of the anti-slavery struggle in America. Goldwin Smith's *The Moral Crusader: a Biographical Essay on William Lloyd Garrison* (New York, 1892) is a brilliant sketch.

GARRISON, originally a term for stores or supplies, also a defence or protection, now confined in meaning to a body of troops stationed in a town or fortress for the purpose of defence. In form the word is derived from O. Fr. *garison*, modern *guérison*, from *guérir*, to furnish with stores, to preserve, but in its later meaning it has been confused with the Fr. *garnison*, the regular word for troops stationed for purposes of defence. In English "garnison" was used till the 16th century, when "garrison" took its place. In the British army "garrison troops," especially "garrison artillery," are troops trained and employed for garrison work as distinct from field operations.

GARROTE (Spanish for "cudgel"), an appliance used in Spain and Portugal for the execution of criminals condemned to death. The criminal is conducted to the place of execution (which is public) on horseback or in a cart, wearing a black tunic, and is attended by a procession of priests, &c. He is seated on a scaffold fastened to an upright post by an iron collar (the garrote), and a knob worked by a screw or lever dislocates his spinal column, or a small blade severs the spinal column at the base of the brain. (See CAPITAL PUNISHMENT.) Originally a stout cord or bandage was tied round the neck of the criminal, who was seated in a chair fixed to a post. Between the cord and the neck a stick was inserted (hence the name) and twisted till strangulation ensued.

"Garrotting" is the name given in England to a form of robbery with violence which became rather common in the winter of 1862–1863. The thief came up behind his victim, threw a cord over his head, and tightened it nearly to strangulation point, while robbing him. An act of 1863, imposing the penalty of flogging in addition to penal servitude for this offence, had the effect of stopping garrotting almost entirely. At any rate, the practice was checked; and, though the opponents of any sort of flogging refuse to admit that this was due to the penalty, that view has always been taken by the English judges who had experience of such cases.

GARRUCHA, a seaport of south-eastern Spain, in the province of Almeria; on the Mediterranean Sea and on the right bank of the river Antas. Pop. (1900) 4461. The harbour of Garrucha, which is defended by an ancient castle, affords shelter to large ships, and is the natural outlet for the commerce of a thriving agricultural and mining district. Despite its small size and the want of railway communication, Garrucha has thus a considerable trade in lead, silver, copper, iron, esparto grass, fruit, &c. Besides sea-going ships, many small coasters enter in ballast, and clear with valuable cargoes. In 1902, 135 vessels of 390,000 tons entered the harbour, the majority being British or Spanish; and in the same year the value of the exports reached £478,000, and that of the imports £128,000. Both imports and exports trebled their value in the ten years 1892–1902.

GARSTON, a seaport in the Widnes parliamentary division of Lancashire, England, on the Mersey, 6 m. S.E. of Liverpool. Pop. (1801) 13,444; (1901) 17,289. The docks, belonging to the London & North Western railway company, employ most of the working population. There is about a mile of quayage, with special machinery for the shipping of coal, which forms the chief article of export.

GARTH, SIR SAMUEL (1661–1719), English physician and poet, was born of a good Yorkshire family in 1661. He entered Peterhouse, Cambridge, in 1676, graduating B.A. in 1679 and M.A. in 1684. He took his M.D. and became a member of the College of Physicians in 1691. In 1697 he delivered the Harveian oration, in which he advocated a scheme dating from some ten years back for providing dispensaries for the relief of the sick poor, as a protection against the greed of the apothecaries. In 1699 he published a mock-heroic poem, *The Dispensary*, in six cantos, which had an instant success, passing through three editions within a year. In this he ridiculed the apothecaries and their allies among the physicians. The poem has little interest at the present day, except as a proof that the heroic couplet was written with smoothness and polish before the days of Pope. Garth was a member of the Kit-Kat Club, and became the leading physician of the Whigs, as Radcliffe was of the Tories. In 1714 he was knighted by George I. and he died on the 18th of January 1719. He wrote little besides his best-known work *The Dispensary* and *Claremont*, a moral epistle in verse. He made a Latin oration (1700) in praise of Dryden and translated the *Life of Otho* in the fifth volume of Dryden's Plutarch. In 1717 he edited a translation of Ovid's *Metamorphoses*, himself supplying the fourteenth and part of the fifteenth book.

GARTOK, a trade-market of Tibet, situated on the bank of the Indus on the road between Shigatse and Leh, to the east of Simla. In accordance with the Tibet treaty of 1904, Gartok, together with Yatung and Gyantse, was thrown open to British trade. On the return of the column from Lhasa in that year Gartok was visited by a party under Captain Ryder, who found only a few dozen people in winter quarters, their houses being in the midst of a bare plain. In summer, however, all the trade between Tibet and Ladakh passes through this place.

GARY, a city of Lake county, Indiana, U.S.A., at the southern end of Lake Michigan, about 25 m. S.E. of Chicago, Ill. Pop. (1910 census) 16,802. Gary is served by the Baltimore & Ohio, the Lake Shore & Michigan Southern, the Michigan Central, the Pennsylvania, the Wabash, and (for freight only) the Chicago, Lake Shore & Eastern, and the Indiana Harbor Belt railways, and by several steamship lines plying the Great Lakes. There are about 21 sq. m. within the municipal limits, but the city lies chiefly within a tract of about 8000 acres composed at the time of its settlement mainly of sand dunes and swamps intersected from east to west by the Grand Calumet and the Little Calumet rivers, small streams respectively about 1 and 3 m. S. of the lake shore. In 1906 the United States Steel Corporation bought this tract to establish on it a great industrial community, as direct water connexion with the Lake Superior ore region was possible, and it was comparatively accessible to West Virginia coal and Michigan limestone, with unusual railroad facilities. The Steel Corporation began the actual building of the town in June 1906, the first step being the installation of an elaborate system of sewers, and of mains and conduits, for the distribution of water, gas and electricity. The water-supply is taken from the lake at a point 2 m. offshore by means of a tunnel. These public

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utilities the Steel Corporation controls, and it has built about 500 dwellings, two hotels, a bank, and its own plant. A small patch of land, now within the limits of the city, has been from the beginning in the hands of private owners, but the remainder of the lots (except those already sold) are owned by the Steel Corporation, and are sold under certain restrictions intended to prevent real estate speculation, to guarantee bona fide improvement of the property, and to restrict the sale of intoxicating drinks. Between the Grand Calumet river (which has been dredged out into a canal) and the lake lies the plant of the Steel Corporation, covering about 1200 acres. All the machinery in this great plant is driven by electricity from generators whose motive power is supplied by the combustion of gases from the blast furnaces. From the same sources is also supplied the electricity for lighting the city. The rail mill is operated by three-phase induction motors of from 2000 to 6000 horse-power capacity. The city was chartered in 1906 and was named in honour of Elbert Henry Gary (b. 1846), chairman of the board of directors and chairman of the finance committee of the United States Steel Corporation.

GAS, a general term for one of the three states of aggregation of matter; also more specifically applied to coal-gas, the gaseous product formed in the destructive distillation of coal or other carbonaceous matter (see below, section *Gas Manufacture*; for gas engines see the separate heading Gas Engine).

The Gaseous State.—Matter is studied under three physical phases—solids, liquids and gases, the latter two being sometimes grouped as "fluids." The study of the physical properties of fluids in general constitutes the science of hydromechanics, and their applications in the arts is termed hydraulics; the special science dealing with the physical properties of gases is named pneumatics.

The gaseous fluid with which we have chiefly to do is our atmosphere. Though practically invisible, it appeals in its properties to other of our senses, so that the evidences of its presence are manifold. Thus we feel it in its motion as wind, and observe the dynamical effects of this motion in the quiver of the leaf or the motion of a sailing ship. It offers resistance to the passage of bodies through it, destroying their motion and transforming their energy—as is betrayed to our hearing in the whiz of the rifle bullet, to our sight in the flash of the meteor.

The practically obvious distinction between solids and fluids may be stated in dynamical language thus:—solids can sustain a longitudinal pressure without being supported by a lateral pressure; fluids cannot. Hence any region of space enclosed by a rigid boundary can be easily filled with a fluid, which then takes the form of the bounding surface at every point of it. But here we distinguish between fluids according as they are gases or liquids. The gas will always completely fill the region, however small the quantity put in. Remove any portion and the remainder will expand so as to fill the whole space again. On the other hand, it requires a definite quantity of liquid to fill the region. Remove any portion and a part of the space will be left unoccupied by liquid. Part of the liquid surface is then otherwise conditioned than by the form of the wall or bounding surface of the region; and if the portion of the wall not in contact with the liquid is removed the form and quantity of the liquid are in no way affected. Hence a liquid can be kept in an open vessel; a gas cannot so be. To quote the differentia of Sir Oliver Lodge: "A solid has volume and shape; a liquid has volume, but no shape; a gas has neither volume nor shape."

It is necessary to distinguish between a gas and a "vapour." The latter possesses the physical property stated above which distinguishes a gas from a fluid, but it differs from a gas by being readily condensible to a liquid, either by lowering the temperature or moderately increasing the pressure. The study of the effects of pressure and temperature on many gases led to the introduction of the term "permanent gases" to denote gases which were apparently not liquefiable. The list included hydrogen, nitrogen and oxygen; but with improved methods these gases have been liquefied and even solidified, thus rendering the term meaningless (see Liquid Gases). The term "perfect gas" is applied to an imaginary substance in which there is no frictional retardation of molecular motion; or, in other words, the time during which any molecule is influenced by other molecules is infinitesimally small compared with the time during which it traverses its mean free path. It serves as a means of research, more particularly in mathematical investigations, the simple laws thus deduced being subsequently modified by introducing assumptions in order to co-ordinate actual experiences.

The gaseous state was well known to the ancients; for instance, in Greek cosmology, "air" (πνεῦμα) was one of the fundamental elements. The alchemists used such terms as *spiritus, flatus, halitus, aura, emanatio nubila*, &c., words implying a "wind" or "breath." The word "gas" was invented by J. B. van Helmont in his *Ortus medicinae*, posthumously published in 1648, in the course of his description of the gas now known as carbon dioxide. He found that charcoal on burning yielded a "spirit," which he named *spiritus sylvestris* on account of its supposed untamable nature ("Gas sylvestre sive incoërcibile, quod in corpus cogi non potest visibile"); and he invented the word "gas" in the expression: ". . . this spirit, hitherto unknown, . . . I call by a new name *gas*" ("hunc spiritum, incognitum hactenus, novo nomine *gas* voco"). The word was suggested by the Gr. χάος, chaos, for he also writes: "I have called this spirit *gas*, it being scarcely distinguishable from the Chaos of the ancients" ("halitum illum *Gas* vocavi, non longe a Chao veterum secretum"). The view that the word was suggested by the Dutch *geest*, spirit, is consequently erroneous. Until the end of the 18th century the word "air," qualified by certain adjectives, was in common use for most of the gases known—a custom due in considerable measure to the important part which common air played in chemical and physical investigations.

The study of gases may be divided into two main branches: the physical and the chemical. The former investigates essentially general properties, such as the weight and density, the relation between pressure, volume and temperature (piezometric and thermometric properties), calorimetric properties, diffusion, viscosity, electrical and thermal conductivity, &c., and generally properties independent of composition. These subjects are discussed in the articles Density; Thermometry; Calorimetry; Diffusion; Conduction of Heat; and Condensation of Gases. The latter has for its province the preparation, collection and identification of gases, and the volume relations in which they combine; in general it deals with specific properties. The historical development of the chemistry of gases—pneumatic chemistry—is treated in the article Chemistry; the technical analysis of gaseous mixtures is treated below under *Gas Analysis*. Connecting the experimental study of the physical and chemical properties is the immense theoretical edifice termed the kinetic theory of gases. This subject, which is discussed in the article Molecule, has for its purpose (1) the derivation of a physical structure of a gas which will agree with the experimental observations of the diverse physical properties, and (2) a correlation of the physical properties and chemical composition.

Gas Analysis.—The term "gas analysis" is given to that branch of analytical chemistry which has for its object the quantitative determination of the components of a gaseous mixture. The chief applications are found in the analysis of flue gases (in which much information is gained as to the completeness and efficiency of combustion), and of coal gas (where it is necessary to have a product of a definite composition within certain limits). There are, in addition, many other branches of chemical technology in which the methods are employed. In general, volumetric methods are used, *i.e.* a component is absorbed by a suitable reagent and the diminution in volume noted, or it is absorbed in water and the amount determined by titration with a standard solution. Exact analysis is difficult and tedious, and consequently the laboratory methods are not employed in technology, where time is an important factor and moderate accuracy is all that is necessary. In this article an outline of the technical practice will be given.

The apparatus consists of (1) a measuring vessel, and (2) a

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series of absorption pipettes. A convenient form of measuring vessel is that devised by W Hempel. It consists of two vertical tubes provided with feet and connected at the bottom by flexible rubber tubing. One tube, called the "measuring tube," is provided with a capillary stopcock at the top and graduated downwards; the other tube, called the "level tube," is plain and open. To use the apparatus, the measuring tube is completely filled with water by pouring water into both tubes, raising the level tube until water overflows at the stopcock, which is then turned. The test gas is brought to the stopcock, by means of a fine tube which has been previously filled with water or in which the air has been displaced by running the gas through. By opening the stopcock and lowering the level tube any desired quantity of the gas can be aspirated over. In cases where a large quantity of gas, *i.e.* sufficient for several tests, is to be collected, the measuring tube is replaced by a large bottle.

The volume of the gas in the measuring tube is determined by bringing the water in both tubes to the same level, and reading the graduation on the tube, avoiding parallax and the other errors associated with recording the coincidence of a graduation with a meniscus. The temperature and atmospheric pressure are simultaneously noted. If the tests be carried out rapidly, the temperature and pressure may be assumed to be constant, and any diminution in volume due to the absorption of a constituent may be readily expressed as a percentage. If, however, the temperature and pressure vary, the volumes are reduced to 0° and 760 mm. by means of the formula $V_0 = V(P - \rho)/(1 + \cdot 00366t)760$, in which V is the observed volume, P the barometric pressure, ρ the vapour tension of water at the temperature t of the experiment. This reduction is facilitated by the use of tables.

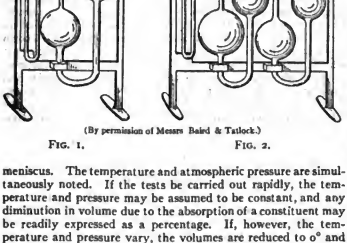

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FIG. 1. FIG. 2.

Some common forms of absorption pipettes are shown in figs. 1 and 2. The simpler form consists of two bulbs connected at the bottom by a wide tube. The lower bulb is provided with a smaller bulb bearing a capillary through which the gas is led to the apparatus, the higher bulb has a wider outlet tube. The arrangement is mounted vertically on a stand. Sometimes the small bulb on the left is omitted. The form of the pipette varies with the nature of the absorbing material. For solutions which remain permanent in air the two-bulbed form suffices; in other cases a composite pipette (fig. 2) is employed, in which the absorbent is protected by a second pipette containing water. In the case of solid reagents, *e.g.* phosphorus, the absorbing bulb has a tubulure at the bottom. To use a pipette, the absorbing liquid is brought to the outlet of the capillary by tilting or by squeezing a rubber ball fixed to the wide end, and the liquid is maintained there by closing with a clip. The capillary is connected with the measuring tube by a fine tube previously filled with water. The clip is removed, the stopcock opened, and the level tube of the measuring apparatus raised, so that the gas passes into the first bulb. There it is allowed to remain, the pipette being shaken from time to time. It is then run back into the measuring tube by lowering the level tube, the stopcock is closed, and the volume noted. The operation is repeated until there is no further absorption.

The choice of absorbents and the order in which the gases are to be estimated is strictly limited. Confining ourselves to cases where titration methods are not employed, the general order is as follows: carbon dioxide, olefines, oxygen, carbon monoxide, hydrogen, methane and nitrogen (by difference). This scheme is particularly applicable to coal-gas Carbon dioxide is absorbed by a potash solution containing one part of potash to between two and three of water; the stronger solution absorbs about 40 volumes of the gas. The olefines—ethylene, &c.—are generally absorbed by a very strong sulphuric acid prepared by adding sulphur trioxide to sulphuric acid to form a mixture which solidifies when slightly cooled. Bromine water is also employed. Oxygen is absorbed by stick phosphorus contained in a tubulated pipette filled with water. The temperature must be above 18°; and the absorption is prevented by ammonia, olefines, alcohol, and some other substances. An alkaline solution of pyrogallol is also used; this solution rapidly absorbs oxygen, becoming black in colour, and it is necessary to prepare the solution immediately before use. Carbon monoxide is absorbed by a solution of cuprous chloride in hydrochloric acid or, better, in ammonia. When small in amount, it is better to estimate as carbon dioxide by burning with oxygen and absorbing in potash; when large in amount, the bulk is absorbed in ammoniacal cuprous chloride and the residue burned. Hydrogen may be estimated by absorption by heated palladium contained in a capillary through which the gas is passed, or by exploding (under reduced pressure) with an excess of oxygen, and measuring the diminution in volume, two-thirds of which is the volume of hydrogen. The explosion method is unsatisfactory when the gas is contained over water, and is improved by using mercury. Methane cannot be burnt in this way even when there is much hydrogen present, and several other methods have been proposed, such as mixing with air and aspirating over copper oxide heated to redness, or mixing with oxygen and burning in a platinum tube heated to redness, the carbon dioxide formed being estimated by absorption in potash. Gases soluble in water, such as ammonia, hydrochloric acid, sulphuretted hydrogen, sulphur dioxide, &c., are estimated by passing a known volume of the gas through water and titrating the solution with a standard solution. Many types of absorption vessel are in use, and the standard solutions are generally such that 1 c.c. of the solution corresponds to 1 c.c. of the gas under normal conditions.

Many forms of composite gas-apparatus are in use. One of the commonest is the Orsat shown in fig. 3. The gas is measured in the graduated cylinder on the right, which is surrounded by a water jacket and provided with a levelling bottle. At the top it is connected by a capillary tube bent at right angles to a series of absorbing vessels, the connexion being effected by stopcocks. These vessels consist of two vertical cylinders joined at the bottom by a short tube. The cylinder in direct communication with the capillary is filled with glass tubes so as to expose a larger surface of the absorbing solution to the gas. The other cylinder is open to the air and serves to hold the liquid ejected from the absorbing cylinder. Any number of bulbs can be attached to the horizontal capillary; in the form illustrated there are four, the last being a hydrogen pipette in which the palladium is heated in a horizontal tube by a spirit lamp. At the end of the horizontal tube there is a three-way cock connecting with the air or an aspirator. To use the apparatus, the measuring tube is completely filled with water by raising the levelling bottle. The absorbing vessels are then about half filled with the absorbents, and, by opening the cocks and aspirating, the liquid is brought so as

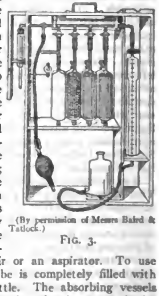

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FIG. 3.

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completely to fill the bulbs nearer the capillary. The cocks are then closed. By opening the three-way cock to the supply of the test gas and lowering the levelling bottle, any desired amount can be drawn into the measuring tube. The absorption is effected by opening the cock of an absorbing vessel and raising the levelling bottle. The same order of absorption and general directions pertaining to the use of Hempel pipettes have to be adopted.

Although the earliest attempts at gas analysis were made by Scheele, Priestley, Cavendish, Lavoisier, Dalton, Gay-Lussac and others, the methods were first systematized by R. Bunsen, who began his researches in 1838. He embodied his results in his classical *Gasometrische Methoden* (1857, second edition 1877), a work translated into English by H. Roscoe. Clemens Winkler contributed two works, *Anleitung zur chemischen Untersuchung der Industriegase* (1876–1877) and *Lehrbuch der technischen Gasanalyse* (2nd ed., 1892), both of which are very valuable for the commercial applications of the methods. W. Hempel's researches are given in his *Neue Methode zur Analyse der Gase* (1880) and *Gasanalytische Methoden* (1890, 3rd ed. 1900).

Gas Manufacture

1. *Illuminating Gas.*—The first practical application of gas distilled from coal as an illuminating agent is generally ascribed to William Murdoch, who between the years of 1792 and 1802 demonstrated the possibility of making gas from coal and using it as a lighting agent on a large scale. Prior to 1691, however, Dr John Clayton, dean of Kildare, filled bladders with inflammable gas obtained by the distillation of coal, and showed that on pricking the bladders and applying a light to the escaping gas it burnt with a luminous flame, and in 1726 Stephen Hales published the fact that by the distillation of 158 grains of Newcastle coal, 180 cub. in. of inflammable air would be obtained. Jean Pierre Minckelers, professor of natural philosophy in the university of Louvain, and later of chemistry and physics at Maestricht, made experiments on distilling gas from coal with the view of obtaining a permanent gas sufficiently light for filling balloons, and in 1785 experimentally lighted his lecture room with gas so obtained as a demonstration to his students, but no commercial application was made of the fact. Lord Dundonald, in 1787, whilst distilling coal for the production of tar and oil, noticed the formation of inflammable gas, and even used it for lighting the hall of Culross Abbey. It is clear from these facts that, prior to Murdoch's experiments, it was known that illuminating gas could be obtained by the destructive distillation of coal, but the experiments which he began at Redruth in 1792, and which culminated in the lighting of Messrs Boulton, Watt & Co.'s engine works at Soho, near Birmingham, in 1802, undoubtedly demonstrated the practical possibility of making gas on a large scale, and burning it in such a way as to make coal-gas the most important of the artificial illuminants. An impression exists in Cornwall, where Murdoch's early experiments were made, that it was a millwright named Hornblower who first suggested the process of making gas to Murdoch, but, as has been shown, the fact that illuminating gas could be obtained from coal by distillation was known a century before Murdoch made his experiments, and the most that can be claimed for him is that he made the first successful application of it on a practical scale.

Historical.

In 1799 a Frenchman named Philippe Lebon took out a patent in Paris for making an illuminating gas from wood, and gave an exhibition of it in 1802, which excited a considerable amount of attention on the European continent. It was seen by a German, F.A. Winsor, who made Lebon an offer for his secret process for Germany. This offer was, however, declined, and Winsor returned to Frankfort determined to find out how the gas could be made. Having quickly succeeded in discovering this, he in 1803 exhibited before the reigning duke of Brunswick a series of experiments with lighting gas made from wood and from coal. Looking upon London as a promising field for enterprise, he came over to England, and at the commencement of 1804 took the Lyceum theatre, where he gave demonstrations of his process. He then proceeded to float a company, and in 1807 the first public street gas lighting took place in Pall Mall, whilst in 1809 he applied to parliament to incorporate the National Heat and Light Company with a capital of half a million sterling. This application was opposed by Murdoch on the ground of his priority in invention, and the bill was thrown out, but coming to parliament for a second time in 1810, Winsor succeeded in getting it passed in a very much curtailed form, and, a charter being granted later in 1812, the company was called the Chartered Gas Light and Coke Company, and was the direct forerunner of the present London Gas Light and Coke Company. During this period Frederick C. Accum (1769–1838), Dr W. Henry and S. Clegg did so much by their writings and by the improvements they introduced in the manufacture, distribution and burning of coal gas, that their names have become inseparably connected with the subject.

In 1813 Westminster Bridge, and in the following year the streets of Westminster, were lighted with gas, and in 1816 it became common in London. After this so rapid was the progress of this new mode of illumination that in the course of a few years it was adopted by all the principal towns in the United Kingdom for lighting streets as well as shops and public edifices. In private houses it found its way more slowly, partly from an apprehension of danger attending its use, and partly from the discomfort which was experienced in many cases through the gas being distributed without purification, and to the careless and imperfect manner in which the service pipes were first fitted. It was during the last four decades of the 19th century that the greatest advance was made, this period having been marked not only by many improvements in the manufacture of illuminating gas, but by a complete revolution in the methods of utilizing it for the production of light. In 1875 the London Argand, giving a duty of 3·2 candles illuminating power per cubic foot of ordinary 16 candle gas, was looked upon as the most perfect burner of the day, and little hope was entertained that any burner capable of universal adoption would surpass it in its power of developing light from the combustion of coal gas; but the close of the century found the incandescent mantle and the atmospheric burner yielding six times the light that was given by the Argand for the consumption of an equal volume of gas, and to-day, by supplying gas at an increased pressure, a light of ten times the power may be obtained. Since the advent of the incandescent mantle, the efficiency of which is dependent upon the heating power of the gas more than on its illuminating power, the manufacture of coal gas has undergone considerable modifications.

The growth of gas lighting.

Coal, the raw material from which the gas is produced by a process of destructive distillation, varies very widely in composition (see COAL), and it is only the class of coals rich in hydrogen, known as bituminous coal, that can with advantage be utilized in gas manufacture. Coals of this character are obtained in England from the Newcastle and Durham field, South Yorkshire, Derbyshire and Barnsley districts, and an idea of their ultimate composition may be derived from the following table:–

Coals used for gas-making.

	Carbon.	Hydrogen.	Sulphur.	Nitrogen.	Oxygen.	Ash.	Moisture.
Newcastle gas coal	82·16	4·83	1·00	1·23	6·82	3·20	0·76
Durham gas coal	84·34	5·30	0·73	1·73	4·29	2·42	1·14
South Yorkshire silkstone	80·36	5·09	1·66	1·67	6·79	3·30	1·03
Derbyshire silkstone	76·96	5·04	2·39	1·77	6·92	3·28	3·64
Barnsley gas coal	75·64	4·94	2·84	1·65	7·25	4·28	3·40

Our knowledge of the composition of coal is limited to the total amount of carbon, hydrogen, nitrogen, oxygen and foreign materials which it contains; and at present we know practically but little of the way in which these bodies are combined. This being so, the ordinary analysis of a coal affords but little indication of its value for gas-making purposes, which can only be really satisfactorily arrived at by extended use on a practical scale. Bituminous coal, however, may be looked upon as containing carbon and also simple hydrocarbons, such as some of the higher members of the paraffin series, and likewise organic bodies containing carbon, hydrogen, nitrogen, oxygen and sulphur.

On submitting a complex substance of this character to destructive distillation, it will be found that the yield and quality of the products will vary very considerably with the temperature existing in the retorts, with the size of the charge of coal used, with its distribution

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in the retort, with the length of time the distillation has been going on, and with an infinity of other factors of a more or less complex nature. If bituminous coal is distilled at a low temperature, the tar is found to contain considerable quantities of light paraffin oils; and there is no doubt that paraffin hydrocarbons are present in the original coal. These paraffins, under the influence of heat, split up into simpler members of the same series and into olefines; and if we imagine the action in its simplest form, we should have the gases, as they were evolved, consisting of (say) ethane and ethylene. These have now to pass down the heated retort on their way to the ascension pipe, and the contact with the hot sides of the retort, and with the glow from the radiant heat in the retort, set up an infinity of changes. Ethane, when heated to this degree, splits up into ethylene and hydrogen, whilst ethylene decomposes to methane and acetylene, and the acetylene at once polymerizes to benzene, styrolene, retorte, &c. A portion also condenses, and at the same time loses some hydrogen, becoming naphthalene; and the compounds so formed by interactions amongst themselves build up the remainder of the hydrocarbons present in the coal tar, whilst the organic substances containing oxygen in the coal break down, and cause the formation of the phenols in the tar.

Destructive distillation of coal.

There is very little doubt that the general course of the decompositions follows these lines; but any such simple explanation of the actions taking place is rendered impossible by the fact that instead of the breaking-down of the hydrocarbons being completed in the coal, and only secondary reactions taking place in the retort, in practice the hydrocarbons to a great extent leave the coal as the vapours of condensible hydrocarbons, and the breaking down to give rise to such simple gaseous compounds as ethylene is proceeding in the retort at the same time as the breaking up of the ethylene already formed into acetylene and methane, and the polymerization of the former into higher compounds. Starting with a solid hydrocarbon of definite composition, it would be theoretically possible to decompose it entirely into carbon, hydrogen, ethylene and methane, and, by rapidly removing these from the heating zone before any secondary actions took place, to prevent formation of tar. But since such ideal is hopeless in practice, as the coal is not a definite compound, and it is impossible to subject it to a fixed temperature.

If the retorts are at a temperature of 1000° C. when the charge of coal is put in, the temperature of the distillation will vary from about 800° C. close to the walls, to about 400° C. in the centre of the coal; and in the same way, in the space above the coal, the products which come in contact with the sides of the retort are heated to 1000° C., whilst the gas near the centre is probably heated to only 600° C. Moreover, the gases and vapours in the retort are subjected to a period of heating which varies widely with the distance from the mouth of the retort of the coal that is undergoing carbonization. The gas developed by the coal near the mouth of the retort is quickly washed out into the ascension pipe by the push of the gas behind, and the period for which it has been exposed to the radiant heat from the walls of the retort is practically nil; whilst the gas evolved in the portion of the retort farthest from the mouthpiece has only its own rate of evolution to drive it forward, and has to traverse the longest run possible in the retort, exposed during the whole of that period to radiant heat and to contact with the highly heated surface of the retort itself. Hence we find that the tar is formed of two distinct sets of products, the first due to incomplete decomposition and the second to secondary reactions due to the products of the decomposition being kept too long in the zone of heat.

Effect of temperature in the retort.

Of the first class, the light paraffin oils and pitch may be taken as examples; whilst benzene, naphthalene and retort carbon represent the second. The formation of the second class of bodies is a great loss to the gas manufacturer, as, with the exception of the trace of benzene carried with the gas as vapour, these products are not only useless in the gas, but one of them, naphthalene, is a serious trouble, because any trace carried forward by the gas condenses with sudden changes of temperature, and causes obstructions in the service pipes, whilst their presence in the tar means the loss of a very large proportion of the illuminating constituents of the gas. Moreover, these secondary products cannot be successfully reduced, by further heating, to simpler hydrocarbons of any high illuminating value, and such bodies as naphthalene and anthracene have so great a stability that, when once formed, they resist any efforts again to decompose them by heat, short of the temperature which breaks them up into methane, carbon and hydrogen.

The ammonia is derived from the nitrogen present in the coal combining with hydrogen during destructive distillation, the nitrogen becoming distributed amongst all three classes of products. The following table will give an approximate idea of the proportions which go to each:—

	Per cent.
Nitrogen as ammonia	14·50
,, as cyanogen	1·56
,, free in gas and combined in tar	35·26
,, remaining in coke	48·68
	100·00

The effect produced by alteration in the temperature of the retort upon the composition of both gas and tar is very marked. As the temperature is raised, the yield of gas from a given weight of coal increases; but with the increase of volume there is a marked decrease in the illuminating value of the gas evolved. Lewis T. Wright found, in a series of experiments, that, when four portions of the same coal were distilled at temperatures ranging from a dull red heat to the highest temperature attainable in an iron retort, he obtained the following results as to yield and illuminating power:—

Temperature.	Cubic ft. of Gas per ton.	Illuminating Power, Candles.	Total Candles per ton.
1. Dull red	8,250	20·5	33·950
2. Hotter	9,603	17·8	34·510
3. ,,	10,821	16·7	36·140
4. Bright orange	12,006	15·6	37·460

Composition of the Gas.

	1. Per cent.	2. Per cent.	4. Per cent.
Hydrogen	38·09	43·77	48·02
Marsh gas	42·72	34·50	30·70
Olefines	7·55	5·83	4·51
Carbon monoxide	8·72	12·50	13·96
Nitrogen	2·92	3·40	2·81
	100·00	100·00	100·00

The gas analysis of No. 3 was lost, but the illuminating power shows that it was intermediate in composition between Nos. 2 and 4. From this it will be seen that, with the increase of temperature, the hydrocarbons—the olefines and marsh gas series—gradually break up, depositing carbon in the crown of the retort, and liberating hydrogen, the percentage of which steadily increases with the rise of temperature.

The tar formed is affected to an even greater extent than the gas by alterations in the temperature at which the destructive distillation takes place. The lower the temperature, the smaller will be the volume of gas produced, and the lighter the specific gravity of the tar, whilst with increase of temperature, the volume of gas rapidly rises, and so does the specific gravity of the tar. Working with a caking coal Wright obtained the following results:—

Yield of Gas per ton, Cub. ft.	Specific Gravity of Tar.
6,600	1·086
7,200	1·120
8,900	1·140
10,162	1·154
11,700	1·206

Analysis of the tar showed that the increase of the specific gravity was due to the increase in the quantity of pitch, which rose from 28·89 to 64·08% in the residuals; whilst the ammonia, naphtha and light oils steadily fell in quantity, the creosote and anthracene oils doing the same, but to a smaller extent. Naphthalene also begins to show in quantity in the tar as soon as the yield of gas reaches 10,000 cub. ft. per ton of coal carbonized.

In spite of these variations, however, the products in their main characteristics will remain the same. They may be divided into—(*a*) Solids, such as the coke and retort carbon; (*b*) liquids, consisting of the tar and ammoniacal liquor; and (*c*) gases, consisting of the unpurified coal gas. The proportions in which the products are approximately obtained from a ton of gas coal have been given as follows:—

10,000 cub. ft. of gas	= 380 lb.	= 17·0 per cent.	
10 gallons of tar	= 115 ,,	= 5·1	,,
Gas liquor[1]	= 177 ,,	= 7·9	,,
Coke	= 1568 ,,	= 70·0	,,
	2240	100·0	

Solid products.

The chief solid residue, coke, is not absolutely pure carbon, as it contains the mineral non-volatile constituents which remain behind as ash when the original coal is burnt, and which, to a great extent, existed in the sap that filled the cells of the plant from which the coal was formed. The retort carbon formed as a dense deposit on the crown of the retort by the action of the high temperature on the hydrocarbons is, however, carbon in a very pure form, and, on account of its density, is largely used for electrical purposes.

[1] Liquor condensed from gas alone, without wash water.

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The liquid products of the destructive distillation of coal are tar and ammoniacal liquor. Tar derived from ordinary bituminous coal is a black, somewhat viscid liquid, varying in specific gravity from 1·1 to 1·2. The ultimate composition of tar made in the London Gas Works is approximately as follows:—

Liquid products.

Carbon	77·53
Hydrogen	6·33
Nitrogen	1·03
Sulphur	0·61
Oxygen	14·50
	100·00

These elements in tar are built up into an enormous number of compounds (see COAL TAR), and its value as a by-product may be gathered from the fact that on fractional distillation it yields—(1) benzene and its homologues, from which aniline, the source of most of the coal-tar colours, can be derived; (2) carbolic acid, from which picric acid, used as a dye, a powerful explosive, and to give the bitter flavour to some kinds of beer, is made, also many most valuable disinfectants; (3) naphthalene, used for disinfecting, and also as the "Albo-carbon" employed in an enriching burner for gas; (4) pitch, extensively used in path-making, from which such bodies as anthracene and saccharin can be extracted.

The second liquid product of the destructive distillation of coal is the ammoniacal or gas liquor, which consists of water containing ammonia salts in solution, partly condensed from the hot gas, and partly added to wash the gas in the scrubbers. It contains, as its principal constituents, ammonia, partly combined with carbonic acid and sulphuretted hydrogen to form compounds which are decomposed on boiling, with evolution of ammonia gas, and partly combined with stronger acids to form compounds which require to be acted upon by a strong alkali before the ammonia contained in them can be liberated. The ammonia in the first class of compounds is technically spoken of as "free"; that present in the latter as "fixed." The following analysis by L. T. Wright will give an idea of the relative quantities in which these compounds exist in the liquor:—

		Grammes per litre.
Free	Ammonium sulphide	3·03
	Ammonium carbonate	39·16
	Ammonium chloride	14·23
Fixed	Ammonium thiocyanate	1·80
	Ammonium sulphate	0·19
	Ammonium thiosulphate	2·80
	Ammonium ferrocyanide	0·41

From a scientific point of view, the term "free" is absolutely incorrect, and in using it the fact must be clearly borne in mind that in this case it merely stands for ammonia, which can be liberated on simply boiling the liquor.

The gas which is obtained by the destructive distillation of coal, and which we employ as our chief illuminant, is not a definite compound, but a mechanical mixture of several gases, some of which are reduced to the lowest limit, in order to develop as fully as possible the light-giving properties of the most important constituents of the gas. The following analysis gives a fair idea of the composition of an average sample of gas made from coal, purified but without enrichment:—

Gaseous products.

Hydrogen	52·22
Unsaturated hydrocarbons	3·47
Saturated hydrocarbons	34·76
Carbon monoxide	4·23
Carbon dioxide	0·60
Nitrogen	4·23
Oxygen	0·49
	100·00

These constituents may be divided into—(*a*) light-yielding hydrocarbons, (*b*) combustible diluents and (*c*) impurities. The hydrocarbons, upon which the luminosity of the flame entirely depends, are divided in the analysis into two groups, saturated and unsaturated, according to their behaviour with a solution of bromine in potassium bromide, which has the power of absorbing those termed "unsaturated," but does not affect in diffused daylight the gaseous members of the "saturated" series of hydrocarbons. They may be separated in a similar way by concentrated sulphuric acid, which has the same absorbent effect on the one class, and not on the other. The chief unsaturated hydrocarbons present in coal gas are: ethylene, C_2H_4, butylene, C_4H_8, acetylene, C_2H_2, benzene, C_6H_6, and naphthalene, $C_{10}H_8$, and the saturated hydrocarbons consist chiefly of methane, CH_4, and ethane, C_2H_6.

The light-giving power of coal gas is undoubtedly entirely due to the hydrocarbons. The idea held up to about 1890 was that the illuminating value depended upon the amount of ethylene present. This, however, is manifestly incorrect, as, if it were true, 4% of ethylene mixed with 96% of a combustible diluent such as hydrogen should give 16- to 17-candle gas, whereas a mixture of 10% of ethylene and 90% of hydrogen is devoid of luminosity. In 1876 M.P.E. Berthelot came to the conclusion that the illuminating value of the Paris coal gas was almost entirely due to benzene vapour. But here again another mistaken idea arose, owing to a faulty method of estimating the benzene, and there is no doubt that methane is one of the most important of the hydrocarbons present, when the gas is burnt in such a way as to evolve from it the proper illuminating power, whilst the benzene vapour, small as the quantity is, comes next in importance and the ethylene last. It is the combined action of the hydrocarbons which gives the effect, not any one of them acting alone.

The series of operations connected with the manufacture and distribution of coal gas embraces the processes of distillation, condensation, exhaustion, wet purification by washing and scrubbing, dry purification, measuring, storing and distribution to the mains whence the consumer's supply is drawn.

Site of gas works.

The choice of a site for a gas works is necessarily governed by local circumstances; but it is a necessity that there should be a ready means of transport available, and for this reason the works should be built upon the banks of a navigable river or canal, and should have a convenient railway siding. By this means coal may be delivered direct to the store or retort-house, and in the same way residual products may be removed. The fact that considerable area is required and that the works do not improve the neighbourhood are important conditions, and although economy of space should be considered, arrangements should be such as to allow of extension. In the case of a works whose daily make of gas exceeds four to five million cub. ft., it is usual to divide the works into units, there being an efficiency limit to the size of apparatus employed. Under these conditions the gas is dealt with in separate streams, which mix when the holder is reached. From the accompanying ground plan of a works (fig. 4) it will be possible to gain an idea of the order in which the operations in gas manufacture are carried out and the arrangement of the plant.

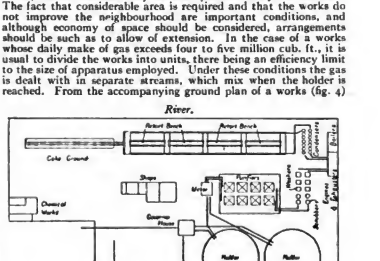

FIG. 4.—Plan of Works.

Retorts.

The retorts in which the coal is carbonized are almost universally made of fire-clay, and in all but small country works the old single-ended retort, which was about 9 ft. in length, has given way to a more economical construction known as doubles, double-ended, or "through" retorts. These are from 18 to 22 ft. long, and as it is found inconvenient to produce this length in one piece, they are manufactured in three sections, the jointing together of which demands great care. The two outer pieces are swelled at one end to take an iron mouthpiece. The cross sections generally employed for retorts are known as "D-shaped," "oval" and "round" (fig. 5). The "D" form is mostly adopted owing to its power of retaining its shape after long exposure to heat, and the large amount of heating surface it presents at its base. The life of this retort is about thirty working months. A cast iron mouthpiece and lid is bolted to the exterior end of each retort, the mouthpiece carrying a socket end to receive the ascension pipe, through which the gas passes on leaving the retort. The retorts are heated externally and are set in an arch, the construction depending upon the number of retorts, which varies from three to twelve. The arch and its retorts is termed a bed or setting, and a row of beds constitutes a bench. It is usual to have a separate furnace for each setting, the retorts resting upon walls built transversely in the furnace.

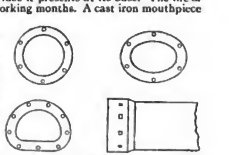

FIG. 5.—Cross Section of Retorts.

The heating of the retorts is carried out either by the "direct firing" or by the "regenerative" system, the latter affording

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marked advantages over the former method, which is now becoming extinct. In the regenerative system of firing, a mixture of carbon monoxide and nitrogen is produced by passing air through incandescent gas coke in a generator placed below the bench of retorts, and the heating value of the gases so produced is increased in most cases by the admixture of a small proportion of steam with the primary air supply, the steam being decomposed by contact with the red-hot coke in the generator into water gas, a mixture of carbon monoxide and hydrogen (see FUEL: *Gaseous*). The gases so formed vary in proportion with the temperature of the generator and the amount of steam, but generally contain 32 to 38% of combustible gas, the remainder being the residual nitrogen of the air and carbon dioxide. These gases enter the combustion chamber around the retorts at a high temperature, and are supplied with sufficient air to complete their combustion, this secondary air supply being heated by the hot products of combustion on their way to the exit flue. This method of firing results in the saving of about one-third the weight of coke used in the old form of furnace per ton of coal carbonized, and enables higher temperatures to be obtained, the heat being also more equally distributed.

There are a great number of methods of applying the regenerative principle which vary only in detail. Fig. 6 gives an idea of the general arrangement. The furnace A is built of fire-brick, coke is charged at the top through the iron door B, and near the bottom are placed fire bars C, upon which the fuel lies. The primary air necessary for the partial combustion of the coke in " producer " gas enters between these bars. The gases are conducted from the furnace to the combustion chamber E through the nostrils D D, and the secondary air is

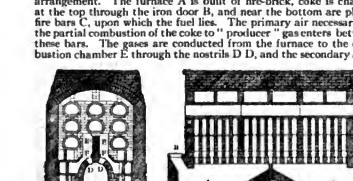

FIG. 6.—Regenerative Setting.

admitted at the inlet F a little above, this air having been already heated by traversing the setting. Complete combustion takes place at this point with the production of intense heat, the gases on rising are baffled in order to circulate them in every direction round the retorts, and upon arriving at the top of the setting they are conducted down a hollow chamber communicating with the main flue and shaft. The amount of draft which is necessary to carry out the circulation of the gases and to draw in the adequate amount of air is regulated by dampers placed in the main flue. By analysis of the " producer " and " spent " gases this amount can be readily gauged.

Charging and drawing.

Retorts are set in either the horizontal, inclined or vertical position, and the advantages of the one over the other is a question upon which almost every gas engineer has his own views.

The introduction of labour-saving appliances into gas works has rendered the difficult work of charging and discharging horizontal retorts comparatively simple. Formerly it was the practice to carry out such operations entirely by hand, men charging the retorts either by means of shovel or hand-scoop, and the coke produced being withdrawn with hand rakes. Now, however, only the smaller gas works adhere to this system, and this work is done by machinery driven by either compressed air, hydraulic or electric power. In the first two cases a scoop, filled with coal from an overhead hopper carried by the travelling machine, is made to enter the retort and is turned over; the operation is then repeated, but this time the scoop is turned over in the opposite direction, the coal thus assuming such a position that as much of its under surface as possible is exposed to the heated walls of the retort. With " through " retorts charging machines feed the retorts at both ends, the scoop, which has a capacity of about 1½ cwt., entering and discharging its contents twice at each end, so that the total charge is about 6 cwt., which is allowed from four to six hours to distil off according to the quality of the gas required. The machines charge simultaneously at each end, so that the lids of the retorts may be shut immediately the coal enters. The charging machines travel on lines in front of the retort bench, and the power is transmitted by connexions made with flexible hose. A device of more recent introduction is an electrically-driven charging machine, in which the centrifugal force created by a fly-wheel revolving at high speed is applied to drive coal into the retort. If the velocity is sufficiently high the coal may be carried the whole length of a 20-ft. retort, the coal following banking up until an even layer is formed throughout the length of the retort.

For the purpose of discharging the coke from the retort either compressed air or hydraulic machinery is employed, a rake being made to enter the retort and withdraw the coke on returning. With this method it is necessary that the rake should enter and discharge several times before the retort is clear, and thus the use of a telescopic ram worked by hydraulic power, which pushes the coke before it and discharges it at the other end, is an advantage. As much as one-third on each ton of coal carbonized is saved by the use of machinery in the retort-house. Taking into account the original cost of such machines, and the unavoidable wear and tear and time the retorts brought about by using labour-saving appliances, and the fact that the coke-dust is very detrimental to the machinery, it is clear that the suggestion of setting the retorts at an incline in order to facilitate the work presented great inducements to the gas manager. The object aimed at in thus setting retorts is to allow gravity to play the part of charging and discharging the coal and coke, the retorts being inclined at an angle to suit the slip of the class of coal used; this angle is between 28° and 34°. The coal, previously elevated to hoppers, is dropped into the feeding chambers, which are so arranged that they can travel from end to end of the retort-house and feed the coal into the retorts. When the retort is to be charged, an iron stop or barrier is placed in the lower mouthpiece, and the door closed. The shoot is placed in the upper mouthpiece, and the stop or door, which retains the coal in the chamber, is released; the coal is then discharged into the retort, and rushing down the incline, is arrested by the barrier, and banks up, forming a continuous backing to the coal following. By experience with the class of coal used and the adjustment of the stops in the shoot, the charge can be run into the retort to form an even layer of any desired depth. For the withdrawal of the residual coke at the end of the carbonization, the lower mouthpiece door is opened, the barrier removed and the coke in the lower part of the retort is " tickled " or gently stirred with an iron rod to overcome a slight adhesion to the retort; the entire mass then readily discharges itself. Guides are placed in front of the retort to direct its course to the coke hoppers or conveyer below, and to prevent scattering of the hot material. This system shows a greater economy in the cost of carbonizing the coal, but the large outlay and the wear and tear of the mechanical appliances involved have so far prevented its very general adoption.

The vertical retort was one of the first forms experimented with by Murdoch, but owing to the difficulty of withdrawing the coke, the low illuminating power of the gas made in it, and the damage to the retort itself, due to the swelling of the charge during distillation, it was quickly abandoned. About the beginning of the 20th century, however, the experiments of Messrs Settle and Padfield at Exeter, Messrs Woodall and Duckham at Bournemouth, and Dr Bueb in Germany showed such encouraging results that the idea of the vertical retort again came to the front, and several systems were proposed and tried. The cause of the failure of Murdoch's original vertical retort was undoubtedly that it was completely filled with coal during charging, with the result that the gas liberated from the lower portions of the retort had to pass through a deep bed of red-hot coke, which, by over-baking the gas, destroyed the illuminating hydrocarbons. There is no doubt that the question of rapidly removing the gas, as soon as it is properly formed, from the influence of the highly-heated walls of the retort and residual coke, is one of the most important in gas manufactures.

In the case of horizontal retorts the space between the top of the coal and the retort is of necessity considerable in order to permit the introduction of the scoop and rake; the gas has therefore a free channel to travel along, but has too much contact with the highly heated surface of the retort before it leaves the mouthpiece. In the case of inclined retorts this disadvantage is somewhat reduced, but with vertical retorts the ideal conditions can be more nearly approached. The heating as well as the illuminating value of the gas per unit of volume is lowered by over-baking, and Dr Bueb gives the following figures as to the heating value of gas obtained from the same coal but by different methods of carbonization:—

Vertical	Retorts,	604 British thermal units per cub. ft.
Inclined	"	584 " " "
Horizontal	"	570 " " "

Of the existing forms of vertical retort it remains a matter to be decided whether the coal should be charged in bulk to the retort or whether it should be introduced in small quantities at regular and short intervals; by this latter means (the characteristic feature of the Settle-Padfield process) a thin layer of coal is in process of carbonization on the top, whilst the gas escapes without contact with the mass of red-hot coke, a considerable increase in volume and value in the gas and a much denser coke being the result.

Hydraulic main.

From the retort the gas passes by the ascension pipe to the hydraulic main (fig. 7). This is a long reservoir placed in a horizontal position and supported by columns upon the top of the retort stack, and through it is maintained a slow but constant flow of water, the level of which is kept uniform. The ascension pipe dips about 2 in. into the liquid, and so makes a seal that allows of any retort being charged singly without the risk of the gas produced from the other retorts in the bench escaping

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through the open retort. Coal gas, being a mixture of gases and vapours of liquids having very varying boiling points, must necessarily undergo physical changes when the temperature is lowered. Vapours of liquids of high boiling point will be condensed more quickly than those having lower boiling points, but condensation of each vapour will take place in a definite ratio with the decrease of temperature, the rate being dependent upon the boiling point of the liquid from which it is formed. The result is that from the time the gaseous mixture leaves the retort it begins to deposit condensation products owing to the decrease in temperature. Condensation takes place in the ascension pipe, in the arch piece leading to the hydraulic main, and to a still greater extent in the hydraulic main itself where the gas has to pass through water.

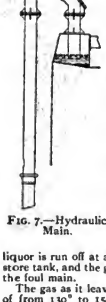

FIG. 7.—Hydraulic Main.

Ascension pipes give trouble unless they are frequently cleared by an instrument called an "auger," whilst the arch pipe is fitted with hand holes through which it may be easily cleared in case of stoppage. The most soluble of the constituents of crude coal gas is ammonia, two volumes of which are soluble in one volume of water at normal temperature and pressure, and the water in the hydraulic main absorbs a considerable quantity of this compound from the gas and helps to form the ammoniacal liquor, whilst, although the liquor is well agitated by the gas bubbling through it, a partial separation of tar from liquor is effected by gravitation. The liquor is run off at a constant level from the hydraulic main to the store tank, and the gas passes from the top of the hydraulic main to the foul main.

The gas as it leaves the hydraulic main is still at a temperature of from 130° to 150° F., and should now be reduced as nearly as possible to the temperature of the surrounding atmosphere. The operation of efficient condensing is not by any means as simple as might be supposed. The tar and liquor when condensed have a dissolving action on various valuable light-giving constituents of the gas, which in the ordinary way would not be deposited by the lowering of temperature, and for this reason the heavy tar, and especially that produced in the hydraulic main, should come in contact with the gas as little as possible, and condensation should take place slowly.

Condensation.

The main difficulty which the condenser ought to overcome and upon which its efficiency should depend is the removal of naphthalene; this compound, which is present in the gas, condenses on cooling to a solid which crystallizes out in the form of white flakes, and the trouble caused by pipe stoppages in the works as well as in the district supplied is very considerable. The higher the heat of carbonization the more naphthalene appears to be produced, and gas managers of to-day find the removal of naphthalene from coal gas a difficult problem to solve. It was for some time debated as to whether naphthalene added materially to the illuminating value of the gas, and whether an endeavour should be made to carry it to the point of combustion; but it is now acknowledged that it is a troublesome impurity, and that the sooner it is extracted the better. Gas leaves the retorts saturated with naphthalene, and its capacity for holding that impurity seems to be augmented by the presence of water vapour. The condenser, by effecting the condensation of water vapour, also brings about the deposition of solid naphthalene, apart from that which naturally condenses owing to reduction of temperature.

Condensers are either air-cooled or water-cooled, or both. In the former case the gas traverses pipes exposed to the atmosphere and so placed that the resulting products of condensation may be collected at the lowest point. Water is a more efficient cooling medium than air, owing to its high specific heat, and the degree of cooling may be more easily regulated by its use. In water-cooled condensers it is usual to arrange that the water passes through a large number of small pipes contained in a larger one through which the gas flows, and as it constantly happened that condenser pipes became choked by naphthalene, the so-called reversible condenser, in which the stream of gas may be altered from time to time and the walls of the pipes cleaned by pumping tar over them, is a decided advance.

The solubility of naphthalene by various oils has led some engineers to put in naphthalene washers, in which gas is brought into contact with a heavy tar oil or certain fractions distilled from it, the latter being previously mixed with some volatile hydrocarbon to replace in the gas those illuminating vapours which the oil dissolves out; and by fractional distillation of the washing oil the naphthalene and volatile hydrocarbons are afterwards recovered.

Exhauster.

The exhauster is practically a rotary gas pump which serves the purpose of drawing the gas from the hydraulic main through the condensers, and then forcing it through the purifying vessels to the holder. Moreover, by putting the retorts under a slight vacuum, the amount of gas produced is increased by about 12%, and is of better quality, owing to its leaving the heated retort more quickly. A horizontal compound steam-engine is usually employed to drive the exhauster.

At this point in the manufacturing process the gas has already undergone some important changes in its composition, but there yet remain impurities which must be removed, these being ammonia, sulphuretted hydrogen, carbon disulphide and carbon dioxide. Ammonia is of considerable marketable value, and even in places where the local Gas Act does not prescribe that it shall be removed, it is extracted. Sulphuretted hydrogen is a noxious impurity, and its complete removal from the gas is usually imposed by parliament. As nearly as possible all the carbon dioxide is extracted, but most gas companies are now exempt from having to purify the gas from sulphur compounds other than sulphuretted hydrogen. Cyanogen compounds also are present in the gas, and in large works, where the total quantity is sufficient, their extraction is effected for the production of either prussiate or cyanide of potash.

Atkinson Butterfield gives the composition of the gas at this point to be about

	per cent. by vol.
Hydrogen	from 42 to 53
Methane	„ 32 „ 39
Carbon monoxide	„ 3 „ 10
Hydrocarbons—	
Gases	„ 2·5 „ 4·5
Light condensable vapours	„ 0·5 „ 1·2
Carbon dioxide	„ 1·1 „ 1·8
Nitrogen	„ 1·0 „ 5·0
Sulphuretted hydrogen	„ 1·0 „ 2·0
Ammonia	„ 0·5 „ 0·95
Cyanogen	„ 0·05 „ 0·12
Carbon disulphide	„ 0·02 „ 0·035
Naphthalene	„ 0·005 „ 0·015

Washers.

It happens that ammonia, being a strong base, will effect the extraction of a certain proportion of such compounds as sulphuretted hydrogen, carbon dioxide and hydrocyanic acid, and the gas is now washed with water and ammoniacal liquor. The process is termed washing or scrubbing, and is carried out in various forms of apparatus, the efficiency of which is dependent upon the amount of contact the apparatus allows between the finely divided gas and water in a unit area and the facility with which it may be cleared out. The "Livesey" washer, a well-known type, is a rectangular cast iron vessel. The gas enters in the centre, and to make its escape again it has to pass into long wrought iron inverted troughs through perforations one-twentieth of an inch in diameter. A constant flow of liquor is regulated through the washer, and the gas, in order to pass through the perforations, drives the liquor up into the troughs. The liquor foams up owing to agitation by the finely divided streams of gas, and is brought into close contact with it. Two or three of these washers are connected in series according to the quantity of gas to be dealt with.

Scrubbers.

The final washing for ammonia is effected in an apparatus termed a "scrubber," which is a cylindrical tower packed with boards 1 in. thick by 11 in. broad, placed on end and close together; water is caused to flow down over the surface of these boards, the object being to break up the gas as much as possible and bring it into close contact with the water. In this wet purifying apparatus the gas is almost wholly freed from ammonia and from part of the sulphuretted hydrogen, whilst carbon dioxide and carbon disulphide are also partially extracted.

Purifiers.

The final purification is carried out in rectangular vessels, known as "dry purifiers" (fig. 8). Internally, each purifier is filled with ranges of wooden trays or sieves A, made in the form of grids (fig. 9), and covered with the purifying material B to a depth of about 6 in., the number of tiers and size of purifier boxes being proportional to the quantity of gas to be purified. The gas

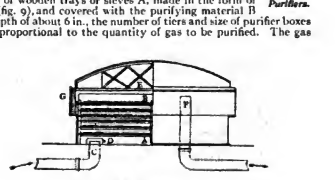

FIG. 8.—Purifier.

enters at the bottom by the pipe C, the inlet being protected from any falling material by the cover D; it forces its way upwards through all the trays until, reaching the lid or cover E, it descends by the exit tube F, which leads to the next purifier. The edges of the lid dip into an external water seal or lute G, whereby the gas is prevented from escaping.

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When the gas had to be purified from carbon disulphide as well as from sulphuretted hydrogen, slaked lime was employed for the removal of carbon dioxide and the greater quantity of the sulphur compounds, whilst a catch box or purifier of oxide of iron served to remove the last traces of sulphuretted hydrogen. Not fewer than four lime purifiers were employed, and as the one which was first in the series became exhausted, *i.e.* began to show signs of allowing carbon dioxide to pass through it unabsorbed, it was filled with fresh slaked lime and made the last of the series, the one which was second becoming first, and this procedure went on continuously. This operation was necessitated by the fact that carbon dioxide has the power of breaking up the sulphur compounds formed by the lime, so that until all carbon dioxide is absorbed with the formation of calcium carbonate, the withdrawal of sulphuretted hydrogen cannot proceed, whilst since it is calcium sulphide formed by the absorption of sulphuretted hydrogen by the slaked lime that absorbs the vapour of carbon disulphide, purification from the latter can only be accomplished after the necessary calcium sulphide has been formed. The foul gas leaving the scrubbers contains, as a general average, 30 grains of sulphuretted hydrogen, 40 grains of carbon disulphide and 200 grains of carbon dioxide per 100 cub. ft. In contact with the first purifier, which contains calcium thiocarbonate and other combinations of calcium and sulphur in small quantity, the sulphuretted hydrogen and disulphide vapour have practically no action upon the material, but the carbon dioxide immediately attacks the calcium thiocarbonate, forming calcium carbonate with the production of carbon disulphide vapour, which is carried over with the gas into the second box. In the connexion between the first and the second box the gas is found to contain 500 grains of sulphuretted hydrogen and 80 grains of carbon disulphide per 100 cub. ft., but no trace of carbon dioxide. In the second box the formation of calcium thiocarbonate takes place by the action of carbon disulphide upon the calcium sulphide with the liberation of sulphuretted hydrogen, which is carried over to the third purifier. The gas in the connecting pipe between the second and third purifier will be found to contain 400 grains of sulphuretted hydrogen and 20 grains of carbon disulphide. The contents of the third box, being mostly composed of slaked lime, take up sulphuretted hydrogen forming calcium sulphide, and practically remove the remaining impurities, the outlet gas showing 20 grains of sulphuretted hydrogen and 8 grains of carbon disulphide per 100 cub. ft., whilst the catch box of oxide of iron then removes all traces of sulphuretted hydrogen. It will be observed that in the earlier stages the quantity of sulphur impurities is actually increased between the purifiers—in fact, the greater amount of sulphiding procures the ready removal of the carbon disulphide,—but it is the carbon dioxide in the gas that is the chief impediment, inasmuch as it decomposes the combinations of sulphur and calcium; consequently it is a paramount object in this system to prevent this latter impurity finding its way through the first box of the series. The finding of any traces of carbon dioxide in the gas between the first two boxes is generally the signal for a new clean purifier being put into action, and the first one shut off, emptied and recharged with fresh lime, the impregnated material being sometimes sold for dressing certain soils.

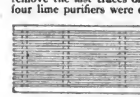

FIG. 9.—Purifier Grid.

The action of oxide of iron, which has now partly replaced the lime purification, depends on its power of combining with sulphuretted hydrogen to form sulphide of iron. Such is the affinity of the oxide for this impurity that it may contain from 30 to 60% by weight of free sulphur after revivification and still remain active. Upon removing the material from the vessel and exposing it to the atmosphere the sulphide of iron undergoes a revivifying process, the oxygen of the air displacing the sulphur from the sulphide as free sulphur and with moisture converting the iron into hydrated oxide of iron. This revivification can be carried on a number of times until the material when dry contains about 50% of free sulphur and even occasionally 60% and over; it is then sold to manufacturers of sulphuric acid to be used in the sulphur kilns instead of pyrites (see SULPHURIC ACID).

Apart from the by-products coke, coke-breeze, tar and retort carbon, which are sold direct, gas companies are now in many cases preparing from their several purifying material pure chemical products which are in great demand. The most important of these is sulphate of ammonia, which is used for agricultural purposes as a manure, and is obtained by passing ammonia into sulphuric acid and crystallizing out the ammonium sulphate produced. To do this, saturated ammoniacal liquor is decomposed by lime in the presence of steam, and the freed ammonia is passed into strong sulphuric acid, the saturated solution of ammonium sulphate being carefully crystallized. The market value of the salt varies, but an average figure is £12 per ton, whilst the average yield is about 24 lb of salt per ton of coal carbonized. In large works the sulphuric acid is usually manufactured on the spot from the spent oxide, so that the sulphuretted hydrogen, which in the gas is considered an undesirable impurity, plays a valuable part in the manufacture of an important by-product.

Cyanogen compounds are extracted either direct from the gas, from the spent oxide or from ammoniacal liquor, and some large gas works now produce sodium cyanide, this being one of the latest developments in the gas chemical industry.

The purified gas now passes to a gasholder (sometimes known as a gasometer), which may be either single lift, *i.e.* a simple bell inverted in a tank of water, or may be constructed on the telescopic principle, in which case much ground space is saved, as a holder of much greater capacity can be contained in the same-sized tank. The tank for the gasholder is usually made by excavating a circular reservoir somewhat larger in diameter than the proposed holder. A banking is allowed to remain in the centre, as shown in fig. 10, which is known as the "dumpling," this arrangement not only saving work and water, but acting as a support for the king post of a trussed holder when the holder is empty. The tank must be water-tight, and the precaution necessary to be taken in order to ensure this is dependent upon the nature of the soil; it is usual, however, for the tanks to be lined with concrete. Where the conditions of soil are very bad, steel tanks are built above ground, but the cost of these is much greater. The holder is made of sheet iron riveted together, the thickness depending upon the size of the holder. The telescopic form consists of two or more lifts which slide in one another, and may be described as a single lift holder encircled by other cylinders of slightly larger diameter, but of about the same length. Fig. 10 shows the general construction. Gas on entering at A causes the top lift to rise; the bottom of this lift being turned up all round to form a cup, whilst the top of the next lift is turned down to form a so-called grip, the two interlock (see fig. 11), forming what is known as the hydraulic cup. Under these conditions the cup will necessarily be filled with water, and a seal will be formed, preventing the escape of gas. A guide framing is built round the holder, and guide rollers are fixed at various intervals round the grips of each lift, whilst at the bottom of the cup guide rollers are also fixed (fig. 11). In the year 1892 the largest existing gasholder was built at the East Greenwich works of the South Metropolitan Gas Company; it has six lifts, its diameter is 293 ft., and when filled with gas stands 180 ft. high. The capacity for gas is 12 million cub. ft.

Gasholder.

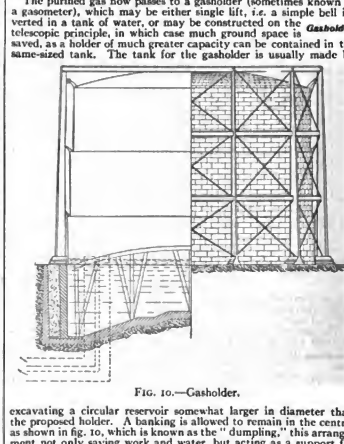

FIG. 10.—Gasholder.

The governor consists usually of a bell floating in a cast iron tank partially filled with water, and is in fact a small gas-holder, from the centre of which is suspended a conical valve controlling the gas inlet and closing it as the bell fills. Any deviation in pressure will cause the floating bell to be lifted or lowered, and the size of the inlet will be decreased or increased, thus regulating the flow.

Governor.

FIG. 11.—Cup and Grip.

The fact that coal gas of an illuminating power of from 14 to 16 candles can be made from ordinary gas coal at a fairly low rate, while every candle power added to the gas increases the cost in an enormous and rapidly growing ratio, has, from the earliest days of

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the gas industry, caused the attention of inventors to be turned to the enrichment of coal gas. Formerly cannel coal was used for producing a very rich gas which could be mixed with the ordinary gas, thereby enriching it, but as the supply became limited and the price prohibitive, other methods were from time to time advocated to replace its use in the enrichment of illuminating gas. These may be classified as follows:—

Enrichment.

1. Enriching the gas by vapours and permanent gases obtained by decomposing the tar formed at the same time as the gas.

2. Mixing with the coal gas oil gas, obtained by decomposing crude oils by heat.

3. The carburetting of low-power gas by impregnating it with the vapours of volatile hydrocarbons.

4. Mixing the coal gas with water gas, which has been highly carburetted by passing it with the vapours of various hydrocarbons through superheaters in order to give permanency to the hydrocarbon gases.

Enrichment by tar.

Very many attempts have been made to utilize tar for the production and enrichment of gas, and to do this two methods may be adopted:—

(*a*) Condensing the tar in the ordinary way, and afterwards using the whole or portions of it for cracking into a permanent gas.

(*b*) Cracking the tar vapours before condensation by passing the gas and vapours through superheaters.

If the first method be adopted, the trouble which presents itself is that the tar contains a high percentage of pitch, which tends rapidly to choke and clog up all the pipes. A partly successful attempt to make use of certain portions of the liquid products of distillation of coal before condensation by the second method was the Dinsmore process, in which the coal gas and vapours which, if allowed to cool, would form tar, were made to pass through a heated chamber, and a certain proportion of otherwise condensible hydrocarbons was thus converted into permanent gases. Even with a good class of coal it was claimed that 3800 cub. ft. of 20- to 21-candle gas could be made by this process, whereas by the ordinary process 3000 cub. ft. of 15-candle gas would have been produced. This process, although strongly advocated by the gas engineer who experimented with it, was not a commercial success. The true solution of the question of enrichment of gas by hydrocarbons derived from tar may be arrived at by a process which prevents the formation of part of the tar during the carbonization of the coal, or by the process devised by C. Tully and now in use at Putney, in which tar is injected into the incandescent fuel in a water-gas generator and enriches the water gas with methane and other hydrocarbons, the resulting pitch and carbon being filtered off by the column of coke through which the gases pass.

Enrichment by oil gas.

The earliest attempts at enrichment by oil gas consisted in spraying oil upon the red hot mass in the retort during carbonization; but experience soon showed that this was not an economical method of working, and that it was far better to decompose the liquid hydrocarbon in the presence of the diluents which are to mingle with it and act as its carrier, since, if this were done, a higher temperature could be employed and more of the heavier portions of the oil converted into gases, and so out at the same time breaking down the gaseous hydrocarbons too much. In carburetting poor coal gas with hydrocarbons from mineral oil it must be borne in mind that, as coal is undergoing distillation, a rich gas is given off in the earlier stages, but towards the end of the operation the gas is very poor in illuminants, the methane disappearing with the other hydrocarbons, and the increase in hydrogen being very marked. Lewis T. Wright employed a coal requiring six hours for its distillation, and took samples of the gas at different periods of the time. On analysis these yielded the following results:—

Time after beginning Distillation.

	10 minutes.	1 hour 30 minutes.	3 hours 25 minutes.	5 hours 35 minutes.
Sulphuretted hydrogen	1·30	1·42	0·49	0·11
Carbon dioxide	2·21	2·09	1·49	1·50
Hydrogen	20·10	38·33	52·68	67·12
Carbon monoxide	6·19	5·66	6·21	6·31
Saturated hydrocarbons	57·38	44·03	33·54	22·58
Unsaturated "	10·62	5·98	3·04	1·79
Nitrogen	2·20	2·47	2·55	0·78

This may be regarded as a fair example of the changes which take place in the quality of the gas during the distillation of the coal. In carburetting such a gas by injecting mineral oil into the retort, many of the products of the decomposition of the oil being vapours, it would be wasteful to do so for the first two hours, as a rich gas is being given off which has not the power of carrying in suspension a much larger quantity of hydrocarbon vapours without being supersaturated with them. Consequently, to make it carry any further quantity in a condition not easily deposited, the oil would have to be completely decomposed into permanent gases, and the temperature necessary to do this would seriously affect the quality of the gas given off by the coal. When, however, the distillation has gone on for three hours, the rich portions of coal have distilled off and the temperature of the retort has reached its highest point, and this is the best time to feed in the oil.

Undoubtedly the best process which has been proposed for the production of oil gas to be used in the enrichment of coal gas is the "Young" or "Peebles" process, which depends on the principle of washing the oil gas retorted at a moderate temperature by means of oil which is afterwards to undergo decomposition, because in this way it is freed from all condensible vapours, and only permanent gases are allowed to escape to the purifiers. In the course of this treatment considerable quantities of the ethylenes and other fixed gases are also absorbed, but no loss takes place, as these are again driven out by the heat in the subsequent retorting. The gas obtained by the Young process, when tested by itself in the burners most suited for its combustion, gives on the photometer an illuminating value averaging from 50 to 60 candle-power, but it is claimed, and quite correctly, that the enriching power of the gas is considerably greater. This is accounted for by the fact that it is impossible to construct a burner which will do justice to a gas of such illuminating power.

The fundamental objections to oil gas for the enrichment of coal gas are, first, that its manufacture is a slow process, requiring as much plant and space for retorting as coal gas; and, secondly, that although on a small scale it can be made to mix perfectly with coal gas and form a permanent gas, great difficulties are found in doing this on the large scale, because in spite of the fact that theoretically gases of such widely different specific gravities ought to form a perfect mixture by diffusion, layering of the gas is very apt to take place in the holder, and thus there is an increased liability to wide variations in the illuminating value of the gas sent out.

Enrichment by volatile hydrocarbons.

The wonderful carburetting power of benzol vapour is well known, a large proportion of the total illuminating power of coal gas being due to the presence of a minute trace of its vapour carried in suspension. For many years the price of benzol has been falling, owing to the large quantities produced in the coke ovens, and at its present price it is by far the cheapest enriching material that can be obtained. Hence many gas-works where it is not necessary to do so it is used in various forms of carburettor, in which it is volatilized and its vapour used for enriching coal gas up to the requisite illuminating power.

One of the most generally adopted methods of enrichment now is by means of carburetted water gas mixed with poor coal gas. When steam acts upon carbon at a high temperature the resultant action may be looked upon as giving a mixture of equal volumes of hydrogen and carbon monoxide, both of which are inflammable but non-luminous gases. This water gas is then carburetted, *i.e.* rendered luminous by passing it through chambers in which oils are decomposed by heat, the mixture being made so as to give an illuminating value of 22 to 25 candles. This, mixed with the poor coal gas, brings up its illuminating value to the required limit. Coke or anthracite is heated to incandescence by an air blast in a generator lined with fire-brick, and the heated products of combustion are led into the generator and enter the superheaters are supplied with more air, which causes the combustion of carbon monoxide present in the producer gas and heats up the fire-brick baffles with which the superheater is filled. When the necessary temperature of the fuel and superheater has been reached, the air blast is cut off, and steam is blown through the generator, forming water gas, which meets the enriching oil at the top of the first superheater, called the carburettor, and carries the vapours with it through the main superheaters, where the fixing of the hydrocarbons takes place. The chief advantage of this apparatus is that a low temperature can be used for fixing owing to the enormous surface for superheating, and thus to a great extent the deposition of carbon is avoided. This form of apparatus has been very generally adopted in Great Britain as well as in America, and practically all carburetted water-gas plants are founded upon the same set of actions. Important advantages in the use of carburetted water gas for enrichment are that it can be made with enormous rapidity and with a minimum of labour; and not only is the requisite increase in illuminating power secured, but the volume of the enriched gas is increased by the bulk of carburetted water gas added, which in ordinary English practice amounts to from 25 to 50%. The public at first strongly objected to its introduction on the ground of the poisonous properties of the carbon monoxide, which is present in it to the extent of about 28 to 30%. Still when this comes to be diluted with 60 to 75% of ordinary coal gas, containing as a rule only 4 to 6% of carbon monoxide, the percentage of poisonous monoxide in the mixture falls to below 16%, which experience has shown to be a fairly safe limit.

Enrichment by carburetted water gas.

A rise in the price of oil suitable for carburetting has caused the gas industry to consider other methods by which the volume of gas obtainable from coal can be increased by admixture with blue or non-luminous water gas. In Germany, at several important gas-works non-luminous water gas is passed into the foul main or through

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the retorts in the desired proportion, and the mixture of water gas and coal gas is then carburetted to the required extent by benzol vapour, a process which at the present price of oil and benzol is distinctly more economical than the use of carburetted water gas. In 1896 Karl Dellwik introduced a modification in the process of making water gas which entirely altered the whole aspect of the industry. In all the attempts to make water gas, up to that date, the incandescence of the fuel had been obtained by "blowing" so deep a bed of fuel that carbon monoxide and the residual nitrogen of the air formed the chief products, this mixture being known as "producer" gas. In the Dellwik process, however, the main point is the adjustment of the air supplied to the fuel in the generator in such a way that carbon dioxide is formed instead of carbon monoxide. Under these conditions producer gas ceases to exist as a by-product, and the gases of the blow consist merely of the incombustible products of complete combustion, carbon dioxide and nitrogen, the result being that more than three times the heat is developed for the combustion of the same amount of fuel, and nearly double the quantity of water gas can be made per pound of fuel than was before possible. The runs or times of steaming can also be continued for longer periods. The possibility of making from 60,000 to 70,000 cub. ft. of water gas per ton of coke used in the Dellwik generator as against 34,000 to 45,000 cub. ft. per ton made by previous processes reduces the price of water gas to about 3½d. per thousand, so that the economic value of using it in admixture with coal gas and then enriching the mixture by any cheap carburetting process is manifest. The universal adoption of the incandescent mantle for lighting purposes has made it evident that the illuminating value of the gas is a secondary consideration, and the whole tendency now is to do away with enrichment and produce a gas of low-candle power but good heating power at a cheap rate for fuel purposes and incandescent lighting. (See also LIGHTING: *Gas.*)

(V. B. L.)

2. *Gas for Fuel and Power.*—The first gas-producers, which were built by Faber du Faur at Wasseralfingen in 1836 and by C. G. C. Bischof at Mägdesprung (both in Germany), consisted of simple perpendicular shafts of masonry contracted at the top and the bottom, with or without a grate for the coal. Such producers, frequently strengthened by a wrought iron casing, are even now used to a great extent. Sometimes the purpose of a gas-producer is attained in a very simple manner by lowering the grate of an ordinary fireplace so much that a layer of coal 4 or 5 ft. deep is maintained in the fire. The effect of this arrangement is that the great body of coal reaches a higher temperature than in an ordinary fireplace, and this, together with the reduction of the carbon dioxide formed immediately above the grate by the red-hot coal in the upper part of the furnace, leads to the formation of carbon monoxide which later on, on the spot where the greatest heat is required, is burned into dioxide by admitting fresh air, preferably pre-heated. This simple and inexpensive arrangement has the further advantage that the producer-gas is utilized immediately after its formation, without being allowed to cool down. But it is not very well adapted to large furnaces, and especially not to those cases where all the space round the furnace is required for manipulating heavy, white-hot masses of iron, or for similar purposes. In these cases the producers are arranged outside the iron-works, glass-works, &c., in an open yard where all the manipulations of feeding them with coal, of stoking, and of removing the ashes are performed without interfering with the work inside. But care must always be taken to place the producers at such a low level that the gas has an upward tendency, in order to facilitate its passage to the furnace where it is to be burned. This purpose can be further promoted by various means. The gas-producers constructed by Messrs Siemens Brothers, from 1856 onwards, were provided with a kind of brick chimney; on the top of this there was a horizontal iron tube, continued into an iron down-draught, and only from this the underground flues were started which sent the gas into the single furnaces. This arrangement, by which the gas was cooled down by the action of the air, acted as a gas-siphon for drawing the gas out of the producer, but it has various drawbacks and has been abandoned in all modern constructions. Where the "natural draught" is not sufficient, it is aided either by blowing air under the grate or else by suction at the other end.

We shall now describe a few of the very large number of gas-

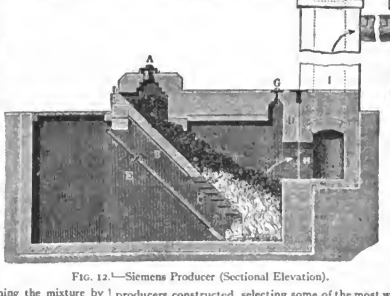
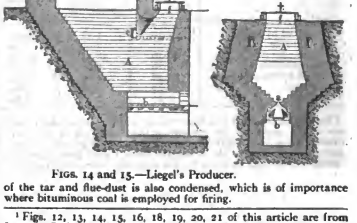


FIG. 12.[1]—Siemens Producer (Sectional Elevation).

producers constructed, selecting some of the most widely applied in practice.

The Siemens Producer in its original shape, of which hundreds have been erected and many may be still at work, is shown in fig. 12. A is the charging-hole; B, the inclined front wall, consisting of a cast iron plate with fire-brick lining; C, the equally inclined "step-grate"; D, a damper by which the producer may be isolated in case of repairs; E, a water-pipe, by which the cinders at the bottom may be quenched before taking away; the steam here formed rises into the producer where it forms some "semi-water gas" (see FUEL: *Gaseous*). Openings like that shown at G serve for introducing a poker in order to clean the brick-work from adhering slags. H is the gas flue; I, the perpendicularly ascending shaft, 10 or 12 ft. high; JJ, the horizontal iron tube; K, the descending branch mentioned above, for producing a certain amount of suction by means of the gas-siphon thus formed. In the horizontal branch JJ much

FIG. 13.—Lürmann's Producer.



FIGS. 14 and 15.—Liegel's Producer.

of the tar and flue-dust is also condensed, which is of importance where bituminous coal is employed for firing.

[1] Figs. 12, 13, 14, 15, 16, 18, 19, 20, 21 of this article are from Lunge's *Coal-tar and Ammonia*, by permission of Friedr. Vieweg u. Sohn.

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This as well as most other descriptions of gas-producers, is not adapted to being worked with such coal as softens in the heat and forms cakes, impenetrable to the air and impeding the regular sinking of the charge in the producer. The fuel employed should be non-bituminous coal, anthracite or coke, or at least so much of these materials should be mixed with ordinary coal that no semi-solid cakes of the kind just described are formed. Where it is unavoidable to work with coal softening in the fire, Lürmann's producer may be employed, which is shown in fig 13. V shows a gas-producer of the ordinary kind, which during regular work is filled with the coke formed in the horizontal retort E. The door *b* serves for removing the slags and ashes from the bottom of V, as far as they do not fall through the grate. The hot producer-gas formed in V is passed round the retort E in the flues n_1 n_2, and ultimately goes away through K to the furnace where it is to be used. The retort E is charged with ordinary bituminous coal which is submitted to destructive distillation by the heat communicated through the flues n_1 n_2, and is thus converted into coke. The gases formed during this process pass into the upper portion of V and get mixed with the producer-gas formed in the lower portion. From time to time, as the level of the coke in V goes down, some of the freshly formed coke in E is pushed into V, whereby the level of the coke in V should assume the shape shown by the dotted line *l . . . m*. If the level became

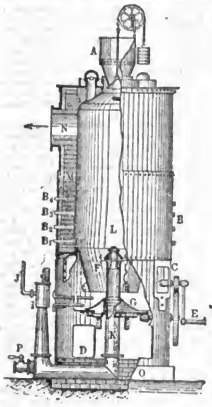

FIG. 16.—Taylor's Producer.

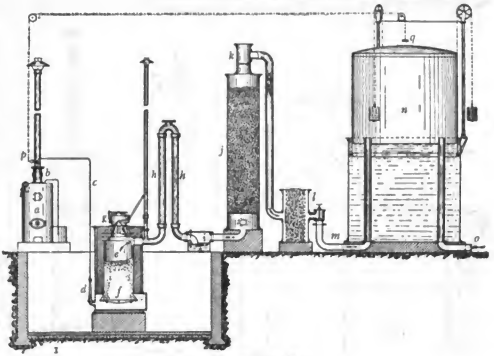

FIG. 17.—Dowson Gas Plant.

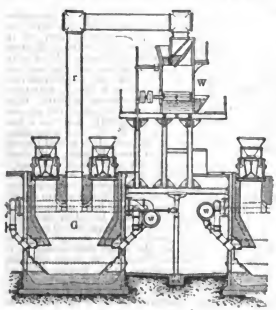

FIG. 18.—Mond Gas Plant.

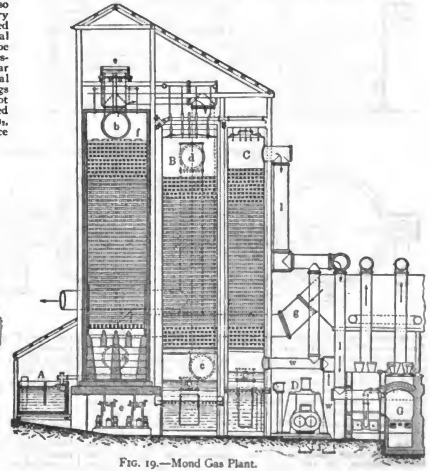

FIG. 19.—Mond Gas Plant.

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too low, such as is shown by the dotted line $x \ldots y$, the working of the producer would be wrong, as in this case the layer of coke at the front side would be too low, and carbon dioxide would be formed in lieu of monoxide.

Figs. 14 and 15 show Liegel's producer, the special object of which is to deal with any fuel (coal or coke) giving a tough, pasty slag on combustion. Such slags act very prejudicially by impeding the up-draught of the air and the sinking of the fuel; nor can they be removed by falling through a grate, like ordinary coal-ashes. To obviate these drawbacks the producer A is kept at a greater heat than is otherwise usual, the air required for feeding the producer being pre-heated in the channels e, e. The inside shape of the producer is such that the upper, less hot portion cannot get stopped, as it widens out towards the bottom; the lower, hotter portion, where the ashes are already fluxed, is contracted to a slit a, through which the air ascends. The grate b retains any small pieces of fuel, but allows the liquid cinder to pass through. The lateral flues c, c prevent the brickwork from being melted.

One of the best-known gas-producers for working with compressed air from below is Taylor's, shown in fig. 16. A is the feeding-hopper, on the same principle as is used in blast-furnaces. L is the producer-shaft, with an iron casing B and peep-holes B_1 to B_4, passing through the brick lining M. F is the contracted part, leading to the closed ash-pit, accessible through the doors D. An injector I, worked by means of the steam-pipe f, forces air through K into F. The circular grate G can be turned round K by means of the crank E from the outside. This is done, without interfering with the blast, in order to keep the fuel at the proper level in L, according to the indications of the burning zone, as shown through the peep-holes B_1 to B_4. The ashes collecting at the bottom are from time to time removed by the doors D. As the steam, introduced by J, is decomposed in the producer, we here obtain a "semi-water gas," with about 27% CO and 12% H_2.

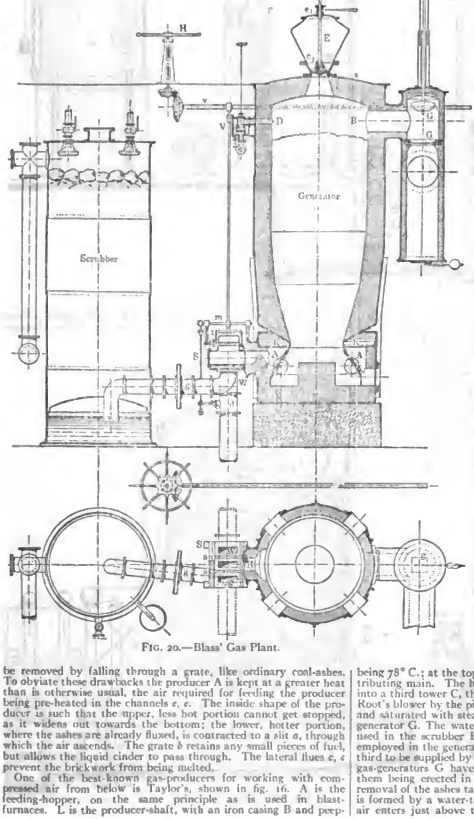

FIG. 20.—Blass' Gas Plant.

Fig. 17 shows the Dowson gas-producer, together with the arrangements for purifying the gas for the purpose of working a gas engine. a is a vertical steam boiler, heated by a central shaft filled with coke, with superheating tubes b passing through the central shaft. c is the steam-pipe, carrying the dry steam into the air-injector d. This mixture of steam and air enters into the gas-producer e below the fire-grate f. g is the feeding-hopper for the anthracite which is usually employed in this kind of producer. h, h are cooling-pipes for the gas where most of the undecomposed steam (say 10% of the whole employed in d) is condensed. i is a hydraulic box with water seal; j, a coke-scrubber; k, a filter; l, a sawdust-scrubber; m, inlet of gas-holder; n, gas-holder; o, outlet of same; p, a valve with weighted lever to regulate the admission of steam to the gas-producer; q, the weight which actuates the lever automatically by the rise or fall of the bell of the gas-holder. In practical work about ½ lb of steam is decomposed for each pound of anthracite consumed, and no more than 5% of carbon dioxide is found in the resulting gas. The latter has an average calorific power of 1732 calories per cubic metre, or 161 B.T.U. per cubic foot, at 0° and 760 mm.

The Mond plant is shown in figs. 18 and 19. The gases produced in the generators G are passed through pipes r into washers W, in which water is kept in violent motion by means of paddle-wheels. The spray of water removes the dust and part of the tar and ammonia from the gases, much steam being produced at the same time. This water is withdrawn from time to time and worked for the ammonia it contains. The gases, escaping from W at a temperature of about 100° C., and containing much steam, pass through g and a into a tower, fed with an acid-absorbing liquid, coming from the tank s, which is spread into many drops by the brick filling of the tower. This liquid is a strong solution of ammonium sulphate, containing about 2·5% free sulphuric acid which absorbs nearly all the ammonia from the gases, without dissolving much of the tarry substances. Most of the liquor arriving at the bottom, after mechanically separating the tar, is pumped back into s, but a portion is always withdrawn and worked for ammonium sulphate. When escaping from the acid tower, the gas contains about 0·013% NH_3, and has a temperature of about 80° C. and is saturated with aqueous vapour. It is passed through c into a second tower B, filled with blocks of wood, where it meets with a stream of comparatively cold water. At the bottom of this the water runs away, its temperature being 78° C.; at the top the gas passes away through d into the distributing main. The hot water from B, freed from tar, is pumped into a third tower C, through which cold air is forced by means of a Root's blower by the pipe w. This air, after being heated to 76° C., and saturated with steam at 76° C., passes through l into the generator G. The water in C leaves this tower cold enough to be used in the scrubber B. Thus two-thirds of the steam originally employed in the generator is reintroduced into it, leaving only one-third to be supplied by the exhaust steam of the steam-engine. The gas-generators G have a rectangular section, 6×12 ft., several of them being erected in series. The introduction of the air and the removal of the ashes takes place at the narrower ends. The bottom is formed by a water-tank and the ashes are quenched here. The air enters just above the water-level, at a pressure of 4 in. The

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Mond gas in the dry state contains 15% carbon dioxide, 10% monoxide, 23% hydrogen, 3% hydrocarbons, 49% nitrogen. The yield of ammonium sulphate in 75 lb from a ton of coal (slack with 11·5% ashes and 55% fixed carbon).

One of the best plants for the generation of *water-gas* is that constructed by E. Blass (fig. 20). Steam enters through the valve V at D into the generator, filled with coke, and passes away at the bottom through A. The pressure of the gas should not be such that it could get into the pipe conveying the air-blast, by which an explosive mixture would be formed. This is prevented by the water-cooled damper S, which always closes the air-blast when the gas-pipe is open and vice versa. Below the entry W of the air-blast there is a throttle valve *d* which is closed as soon as the damper S opens (by manual, thick or electric security against the production of a mixture of air and gas is afforded. The water-cooled ring channel K protects the bottom outlet of the generator and causes the cinders to solidify, so that they can be easily removed. But sometimes no such cooling is effected, in which case the cinders run away in the liquid form. Below K the fuel is lying in a conical heap, leaving the ring channel A free. During the period of hot-blowing (heating-up) S is turned so that the air-blast communicates with the generator; *d* and G are open; *g* (the damper connected with the scrubber) and V are closed. During the period of gas-making G and *d* are closed, S now closes the air-blast and connects the generator with the scrubber; V is opened, and the gas passes from the scrubber into the gas-holder, the inlet *w* being under a pressure of 4 in. All these various changes in the openings of the valves and dampers are automatically performed in the proper order by means of a hand-wheel H, the shaft *m* resting on the standards *l* and shaft *v*. This hand-wheel has merely to be turned one way for starting the hot-blowing, and the opposite way for gas-making, to be open and shut all the connexions, without any mistake being possible on the part of the attendant. The feeding-hopper E is so arranged that, when the cone e_2 opens, e_1 is shut, and vice versa, thus no more gas can escape, on feeding fresh coke into the generator, than that which is contained in E. G is the pipe through which the blowing-up gas (Siemens gas) is carried away, either into the open air (where it is at once burned) or into a pre-heater for the blast, or into some place where it can be utilized as fuel. This gas, which is evolved in 10 or 11 minutes, contains from 23 to 32% carbon monoxide, 7 to 1·5% carbon dioxide, 2 to 3% hydrogen, a little methane, 64 to 66% nitrogen, and has a heating value of 950 calories per cub. metre. The water-gas itself is made for 7 minutes, and has an average composition of 3·3% carbon dioxide, 44% carbon monoxide, 0·4% methane, 48·6% hydrogen, 3·7% nitrogen, and a heating value of 2970 calories per cub. metre. 1 kilogram coke yields 1·13 cub. metre water-gas and 3·13 Siemens gas. 100 parts of coke (of 7000 calories) furnish 42% of their heat value as water-gas and 42% as Siemens gas.

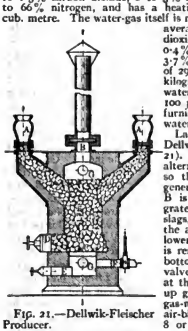

FIG. 21.—Dellwik-Fleischer Producer.

Lastly we give a section of the Dellwik-Fleischer gas-producer (fig. 21). The feeding-hoppers A are alternately charged every half-hour, so that the layer of fuel in the generator always remains 4 ft. deep. B is the chimney-damper, C the grate, D the door for removing the slags, E the ash-door, F the inlet of the air-blast, G the upper, G, the lower outlet for the water-gas which is removed alternately at top and bottom by means of an outside valve, steam being always admitted at the opposite end. The blowing-up generally lasts 1½ minutes, the gas-making 8 or 10 minutes. The air-blast works under a pressure of 8 or 9 in. below the grate, or 4 to 4½ in. above the coke. The blowing-up gas contains 17 or 18% carbon dioxide and 1·5% oxygen, with mere traces of carbon monoxide. The water-gas shows 4 to 5% carbon dioxide, 40% carbon monoxide, 0·8% methane, 48 to 51% hydrogen, 4 or 5% nitrogen. About 2·5 cub. metres is obtained per kilogram of best coke.

See Mills and Rowan, *Fuel and its Application* (London, 1889); Samuel S. Wyer, *Producer-Gas and Gas-Producers*, published by the *Engineering and Mining Journal* (New York); F. Fischer, *Chemische Technologie der Brennstoffe* (1897–1901); *Gasförmige Heizstoffe*, in Stohmann and Kerl's *Handbuch der technischen Chemie*, 4th edition, iii. 642 et seq. (G. L.)

GASCOIGNE, GEORGE (*c.* 1535–1577), English poet, eldest son of Sir John Gascoigne of Cardington, Bedfordshire, was born probably between 1530 and 1535. He was educated at Trinity College, Cambridge, and on leaving the university is supposed to have joined the Middle Temple. He became a member of Gray's Inn in 1555. He has been identified without much show of evidence with a lawyer named Gastone who was in prison in 1548 under very discreditable circumstances. There is no doubt that his escapades were notorious, and that he was imprisoned for debt. George Whetstone says that Sir John Gascoigne disinherited his son on account of his follies, but by his own account he was obliged to sell his patrimony to pay the debts contracted at court. He was M.P. for Bedford in 1557–1558 and 1558–1559, but when he presented himself in 1572 for election at Midhurst he was refused on the charges of being "a defamed person and noted for manslaughter," "a common Rymer and a deviser of slaunderous Pasquelles," "a notorious ruffianne," an atheist and constantly in debt. His poems, with the exception of some commendatory verses, were not published before 1572, but they were probably circulated in MS. before that date. He tells us that his friends at Gray's Inn importuned him to write on Latin themes set by them, and there two of his plays were acted. He repaired his fortunes by marrying the wealthy widow of William Breton, thus becoming step-father to the poet, Nicholas Breton. In 1568 an inquiry into the disposition of William Breton's property with a view to the protection of the children's rights was instituted before the lord mayor, but the matter was probably settled in a friendly manner, for Gascoigne continued to hold the Walthamstow estate, which he had from his wife, until his death. He sailed as a soldier of fortune to the Low Countries in 1572, and was driven by stress of weather to Brill, which luckily for him had just fallen into the hands of the Dutch. He obtained a captain's commission, and took an active part in the campaigns of the next two years, during which he acquired a profound dislike of the Dutch, and a great admiration for William of Orange, who had personally intervened on his behalf in a quarrel with his colonel, and secured him against the suspicion caused by his clandestine visits to a lady at the Hague. Taken prisoner after the evacuation of Valkenburg by the English troops, he was sent to England in the autumn of 1574. He dedicated to Lord Grey of Wilton the story of his adventures, "The Fruites of Warres" (printed in the edition of 1575) and "Gascoigne's Voyage into Hollande." In 1575 he had a share in devising the masques, published in the next year as *The Princely Pleasures at the Courte at Kenelworth*, which celebrated the queen's visit to the Earl of Leicester. At Woodstock in 1575 he delivered a prose speech before Elizabeth, and presented her with the *Pleasaunt Tale of Hemetes the Heremite*[1] in four languages. Most of his works were actually published during the last years of his life, after his return from the wars. He died at Bernack, near Stamford, where he was the guest of George Whetstone, on the 7th of October 1577. George Whetstone wrote a long dull poem in honour of his friend, entitled "A Remembrance of the wel-imployed life and godly end of George Gaskoigne, Esquire."

His theory of metrical composition is explained in a short critical treatise, "Certayne Notes of Instruction concerning the making of verse or ryme in English, written at the request of Master Edouardo Donati,"[2] prefixed to his *Posies* (1575). He acknowledged Chaucer as his master, and differed from the earlier poets of the school of Surrey and Wyatt chiefly in the added smoothness and sweetness of his verse. His poems were published in 1572 during his absence in Holland, surreptitiously, according to his own account, but it seems probable that the "editor" who supplied the running comment was no other than Gascoigne himself. *A hundreth Sundrie Flowres bound up in one small Posie. Gathered partely (by translation) in the fyne oullandish Gardens of Euripides, Ovid, Petrarke, Ariosto and others; and partely by Invention out of our owne fruitfull Orchardes in Englande, Yelding Sundrie Savours of tragical, comical and moral discourse, bothe pleasaunt and profitable, to the well-smelling*

[1] Printed in 1579 in a pamphlet called *The Paradoxe*, the author of which, Abraham Fleming, does not mention Gascoigne's name.

[2] Reprinted in vol. ii. of J. Haslewood's *Ancient Critical Essays* (1811–1815), and in Gregory Smith's *Elizabethan Critical Essays* (1904).

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noses of learned Readers, was followed in 1575 by an authorized edition, *The Posies of G. G. Esquire . . .* (not dated).

Gascoigne had an adventurous and original mind, and was a pioneer in more than one direction. In 1576 he published *The Steele Glas*, sometimes called the earliest regular English satire. Although this poem is Elizabethan in form and manner, it is written in the spirit of *Piers Plowman*. Gascoigne begins with a comparison between the sister arts of Satire and Poetry, and under a comparison between the old-fashioned "glas of trustie steele," and the new-fangled crystal mirrors which he takes as a symbol of the "Italianate" corruption of the time, he attacks the amusements of the governing classes, the evils of absentee landlordism, the corruption of the clergy, and pleads for the restoration of the feudal ideal.[1]

His dramatic work belongs to the period of his residence at Gray's Inn, both *Jocasta* (of which Acts i. and iv. were contributed by Francis Kinwelmersh) and *Supposes* being played there in 1566. *Jocasta* was said by J. P. Collier (*Hist. of Dram. Poetry* iii. 8) to be the "first known attempt to introduce a Greek play upon the English stage," but it turns out that Gascoigne was only very indirectly acquainted with Euripides. His play is a literal version of Lodovico Dolce's *Giocasta*, which was derived probably from the *Phoenissae* in the Latin translation of R. Winter. *Supposes*,[2] a version of Ariosto's *I Suppositi*, is notable as an early and excellent adaptation of Italian comedy, and moreover, as "the earliest play in English prose acted in public or private." Udal's *Ralph Roister Doister* had been inspired directly by Latin comedy; *Gammer Gurton's Needle* was a purely native product; but *Supposes* is the first example of the acclimatization of the Italian models that were to exercise so prolonged an influence on the English stage. A third play of Gascoigne's, *The Glasse of Government* (published in 1575), is a school drama of the "Prodigal Son" type, familiar on the continent at the time, but rare in England. It is defined by Mr C. H. Herford as an attempt "to connect *Terentian situation* with a *Christian moral* in a picture of *school life*," and it may be assumed that Gascoigne was familiar with the didactic drama of university life in vogue on the continent. The scene is laid at Antwerp, and the two prodigals meet with retribution in Geneva and Heidelberg respectively.

The Spoyle of Antwerpe, written by an eyewitness of the sack of the city in 1576, has sometimes been attributed to Gascoigne, but although a George Gascoigne was employed in that year to carry letters for Walsingham, internal evidence is against Gascoigne's authorship. A curious editorial preface by Gascoigne to Sir Humphrey Gilbert's *Discourse of a Discoverie for a new Passage to Calaia* (1576) has led to the assertion that Gascoigne printed the tract against its author's wish, but it is likely that he was really serving Gilbert, who desired the publication, but dared not avow it. The *Wyll of the Devill . . .* (reprinted for private circulation by Dr F. J. Furnivall, 1871), an anti-popish tract, once attributed, on slender evidence, to Gascoigne, is almost certainly by another hand.

Gascoigne's works not already mentioned include: "G. G. in commendation of the noble Arte of Venerie," prefixed to *The Noble Art of Venerie or Hunting* (1575); *The Complaynte of Phylomene*, bound up with *The Steele Glas* (1576); *The Droomme of Doomes-day* (1576), a prose compilation from various authors, especially from the *De contemptu mundi sive de miseria humanae conditionis* of Pope Innocent III., printed with varying titles, earliest ed. (1470?); *A Delicate Diet for daintie mouthde droonkardes . . .* (1576), a free version of St Augustine's *De obrietate*. *The Posies* (1572) included *Supposes*, *Jocasta*, *A Discourse of the Adventures of Master Ffordonando* [*Jeronimi*], in imitation of an Italian novella, a partly autobiographical *Don Bartholomew of Bath*, and miscellaneous poems. Real personages, some of whom were well known at court, were supposed to be concealed under fictitious names in *The Adventures of Master F. J.*, and the poem caused considerable scandal, so that the names are disguised in the second edition. A more comprehensive collection, *The Whole Workes of G. G. . .* appeared in 1587. In 1868–1870 *The Complete Poems of G. G. . . .* were edited for the Roxburghe Library by Mr W. C. Hazlitt. In his *English Reprints* Prof. E. Arber included *Certayne Notes of Instruction*, *The Steele Glas* and the *Complaynt of Philomene*. The *Steele Glas* was also edited for the *Library of English Literature*, by Henry Morley, vol. i. p. 184 (1889). A new edition, *The Works of George Gascoigne* (The Cambridge English Classics, 1907, &c.) is edited by Dr J. W. Cunliffe. See also, *The Life and Writings of George Gascoigne*, by Prof. Felix E. Schelling (Publications of the Univ. of Pennsylvania series in Philology, vol. ii. No. 4 [1894]); C. H. Herford, *Studies in the Literary Relations of England and Germany in the Sixteenth Century*, pp. 149–164 (1886); C. H. Herford, "Gascoigne's Glasse of Government," in *Englische Studien*, vol. ix. (Halle, 1877, &c.).

GASCOIGNE, SIR WILLIAM (*c.* 1350–1419), chief justice of England in the reign of Henry IV. Both history and tradition testify to the fact that he was one of the great lawyers who in times of doubt and danger have asserted the principle that the head of the state is subject to law, and that the traditional practice of public officers, or the expressed voice of the nation in parliament, and not the will of the monarch or any part of the legislature, must guide the tribunals of the country. He was a descendant of an ancient Yorkshire family. The date of his birth is uncertain, but it appears from the year-books that he practised as an advocate in the reigns of Edward III. and Richard II. On the banishment of Henry of Lancaster Gascoigne was appointed one of his attorneys, and soon after Henry's accession to the throne was made chief justice of the court of king's bench. After the suppression of the rising in the north in 1405, Henry eagerly pressed the chief justice to pronounce sentence upon Scrope, the archbishop of York, and the earl marshal Thomas Mowbray, who had been implicated in the revolt. This he absolutely refused to do, asserting the right of the prisoners to be tried by their peers. Although both were afterwards executed, the chief justice had no part in the transaction. It has been very much doubted, however, whether Gascoigne could have displayed such independence of action without prompt punishment or removal from office following. The old tale of his committing the prince of Wales to prison must also be regarded as unauthentic, though it is both picturesque and characteristic. The judge had directed the punishment of one of the prince's riotous companions, and the prince, who was present and enraged at the sentence, struck or grossly insulted the judge. Gascoigne immediately committed him to prison, using firm and forcible language, which brought him to a more reasonable mood, and secured his voluntary obedience to the sentence. The king is said to have approved of the act, but there appears to be good ground for the supposition that Gascoigne was removed from his post or resigned soon after the accession of Henry V. He died in 1419, and was buried in the parish church of Harewood in Yorkshire. Some biographies of the judge have stated that he died in 1412, but this is clearly disproved by Foss in his *Lives of the Judges*; and although it is clear that Gascoigne did not hold office long under Henry V., it is not absolutely impossible that the scene in the fifth act of the second part of Shakespeare's *Henry IV.* has some historical basis, and that the judge's resignation was voluntary.

GASCONY (*Wasconia*), an old province in the S.W. of France. It takes its name from the Vascones, a Spanish tribe which in 580 and 587 crossed the Pyrenees and invaded the district known to the Romans as Novempopulana or Aquitania tertia. Basque, the national language of the Vascones, took root only in a few of the high valleys of the Pyrenees, such as Soule and Labourd; in the plains Latin dialects prevailed, Gascon being a Romance language. In the 7th century the name of Vasconia was substituted for that of Novempopulana. The Vascones readily recognized the sovereignty of the Merovingian kings. In 602 they consented to be governed by a duke called Genialis, but in reality they remained independent. They even appointed national dukes, against whom Charlemagne had to fight at the beginning of his reign. Finally Duke Lupus II. made his

[1] "Againe I see, within my glasse of Steele
But foure estates, to serve each country soyle,
The King, the Knight, the Peasant, and the Priest.
The King should care for al the subjects still,
The Knight should fight, for to defend the same,
The Peasant, he shoulde labor for their ease,
And Priests should pray, for them and for themselves."—
(Arber's ed. p. 57.)

[2] The influence of this play on the Shakespearian *Taming of the Shrew* is dealt with by Prof. A. H. Tolman in *Shakespeare's Part in the Taming of the Shrew* (Pub. of the Mod. Lang. Assoc. vol. v. No. 4, pp. 215, 216, 1890).

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submission in 819, and the Carolingians were able to establish Frankish dukes in the country. Three of these are known: Séguin (Sighivinus), William (Guillaume), and Arnaud (Arnaldus). They were at the same time counts of Bordeaux, and succumbed to the Normans. After the death of Arnaud in 864 the history of Gascony falls into the profoundest obscurity. The lists of the 10th-century dukes prepared by ancient and modern historians can only be established by means of hypotheses based in many cases on spurious documents (*e.g.* the charter of Alaon), and little confidence can be placed in them. During this troubled period Gascony was from time to time attached to one or other of the other Vascon states which had been formed on the southern slope of the Pyrenees, but in the reign of Hugh Capet it was considered as forming part of France, from which it has never been separated. Disputed in the 11th century by the counts of Poitiers, who were also dukes of Aquitaine, and by the counts of Armagnac, the duchy finally passed to the house of Poitiers in 1073, when the title of duke of Gascony was merged in that of duke of Aquitaine and disappeared. In the feudal period Gascony comprised a great number of countships (including Armagnac, Bigorre, Fézensac, Gaure and Pardiac), viscountships (including Béarn, Lomagne, Dax, Juliac, Soule, Marsan, Tartas, Labourd and Maremne), and seigneuries (*e.g.* Albret, &c.). From the ecclesiastical point of view, it corresponded nearly to the archbishopric of Auch.

From about 1073 to 1137 Gascony was governed by the dukes of Aquitaine and counts of Poitiers, one of whom, William IX., gave the first charter of privileges to the town of Bayonne; but the duchy was weakened by the increasing independence of its great feudatories, especially the viscounts of Béarn and the counts of Armagnac. In 1137, the year of her father's death, Eleanor, the daughter and heiress of Duke William X., married the king of France, Louis VII., and with the rest of Aquitaine Gascony passed under his direct rule. In 1151, however, this marriage was annulled, and almost at once Eleanor married Henry of Anjou, who three years later became king of England as Henry II. Thus was the house of Plantagenet introduced into Gascony and a fresh bone of contention was thrown between the kings of England and of France. Having established himself in the duchy by force of arms, Henry handed it over to his son Richard, against whom many of the great Gascon lords revolted, and from Richard it passed to his brother John. The crusade against the Albigenses was carried into Gascony, and this warfare gave a new impetus to the process of disintegration which was already at work in the duchy. King John and his successor Henry III. were weak; the neighbouring counts of Toulouse were powerful and aggressive; and the house of Béarn was growing in strength. Gascony served Henry III. as headquarters during his two short and disastrous wars (1230 and 1242) with Louis IX., and in 1259 he did homage for it to this king; his son, Edward I., lost and then regained the duchy.

During the Hundred Years' War Gascony was obviously a battle-field for the forces of England and of France. The French seized the duchy, but, aided by the rivalry between the powerful houses of Foix and Armagnac, Edward III. was able to recover it, and by the treaty of Bretigny in 1360 John II. recognized the absolute sovereignty of England therein. Handed over as a principality by Edward to his son, the Black Prince, it was used by its new ruler as a base during his expedition into Spain, in which he received substantial help from the Gascon nobles. The renewal of the war between England and France, which took place in 1369, was due in part to a dispute over the sovereignty of Gascony, and during its course the position of the English was seriously weakened, the whole of the duchy save a few towns and fortresses being lost; but the victories of Henry V. in northern France postponed for a time the total expulsion of the foreigner. This was reserved for the final stage of the war and was one result of the efforts of Joan of Arc, the year 1451 witnessing the capture of Bayonne and the final retreat of the English troops from the duchy. During this time the inhabitants of Gascony suffered severely from the ravages of both parties, and the nobles ruled or misruled without restraint.

The French kings, especially Louis XI., managed to restore the royal authority in the duchy, although this was not really accomplished until the close of the 15th century when the house of Armagnac was overthrown. It was by means of administrative measures that these kings attained their object. Gascony was governed on the same lines as other parts of France and from the time of Henry IV., who was prince of Béarn, and who united his hereditary lands with the crown, its history differs very slightly from that of the rest of the country. The Renaissance inspired the foundation of educational institutions and the Reformation was largely accepted in Béarn, but not in other parts of Gascony. The wars of religion swept over the land, which was the scene of some of the military exploits of Henry IV., and Louis XIV. made some slight changes in its government. As may be surmised the boundaries of Gascony varied from time to time, but just before the outbreak of the Revolution they were the Atlantic Ocean, Guienne, Languedoc and the Pyrenees, and from east to west the duchy at its greatest extent measured 170 m.

At the end of the *ancien régime* Gascony was united with Guienne to form a great military government. After the division of France into departments, Gascony, together with Béarn, French Navarre and the Basque country, formed the departments of Basses-Pyrénées, Landes, Hautes-Pyrénées and Gers. Parts of Gascony also now form arrondissements and cantons of the departments of Lot-et-Garonne, Haute-Garonne, Ariège and Tarn-et-Garonne.

See Arnaud Oihénart, *Notitia utriusque Vasconiae, tam Ibericae quam Aquitanicae* (1637); L'Abbé Monlezun, *Histoire de la Gascogne* (1846–1850), comprising a number of useful but uncritically edited documents; and Jean de Jaurgain, *La Vasconie, étude historique et critique sur les origines . . . du duché de Gascogne . . . et des grands fiefs du duché de Gascogne* (1898–1902), a learned and ingenious work, but characterized by unbridled genealogical fancy. This last work was rectified by Ferdinand Lot in his *Études sur le règne de Hugues Capet* (1903; see especially appendix x.). See also Barrau-Dihigo, "La Gascogne," a bibliography of manuscript sources and of printed works published in the *Revue de synthèse historique* (1903). (C. B.*)

GAS ENGINE. A gas engine is a heat engine in which the working fluid is atmospheric air and the fuel an inflammable gas. It differs from a hot-air or a steam engine in that the heat is given to the working fluid by combustion within the motive power cylinder. In most gas engines—in fact, in all those at present on the market—the working fluid and the fuel that supplies it with heat are mixed with each other before the combustion of the fuel. The fuel—which in the steam and in most hot-air engines is burned in a separate furnace—is, in the gas engine, introduced directly to the motor cylinder and burned there; it is, indeed, part of the working fluid. A gas engine, therefore, is an internal combustion engine using gaseous fuel.

The commercial history of the gas engine dates from 1876, when Dr N. A. Otto patented the well-known engine now in extensive use, but long before that year inventors had been at work, attempting to utilize gas for producing motive power. The first proposal made in Great Britain is found in Street's Patent No. 1983 of 1794, where an explosion engine is suggested, the explosion to be caused by vaporizing spirits of turpentine on a heated metal surface, mixing the vapour with air in a cylinder, firing the mixture, and driving a piston by the explosion produced. Most of the early engines were suggested by the fact that a mixture of an inflammable gas and atmospheric air gives an explosion when ignited—that is, produces pressure which can be applied in a cylinder to propel a piston. Lebon, in France, proposed a gas engine in which the gas and air were raised to a pressure above that of the atmosphere before use in the cylinder, but he did not appear to be clear in his ideas.

Some interesting particulars of early experiments are given in a paper read at the Cambridge Philosophical Society in 1820 entitled, "On the Application of Hydrogen Gas to produce a Moving Power in Machinery, with a description of an Engine which is moved by the pressure of the Atmosphere upon a Vacuum caused by Explosions of Hydrogen Gas and Atmospheric Air." In that paper the Rev. W. Cecil describes an engine of his invention constructed to operate on the explosion vacuum method. This engine was stated to run with perfect regularity at 60 revolutions per minute, consuming 17.6 cub. ft. of hydrogen gas per hour. The hydrogen explosion, however, does not seem to have been noiseless, because Mr Cecil states that in building a larger engine "... to remedy the noise which is occasioned by the explosion, the lower end of the cylinder A, B, C, D may be buried in a well or it may be enclosed in a large air-tight vessel." Mr Cecil also mentions previous experiments at

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Cambridge by Prof. Farish, who exhibited at his lectures on mechanics an engine actuated by the explosion of a mixture of gas and air within a cylinder, the explosion taking place from atmospheric pressure. Prof. Farish is also stated to have operated an engine by gunpowder. These engines of Farish and Cecil appear to be the very earliest in actual operation in the world.

Samuel Brown, in patents dated 1823 and 1826, proposed to fill a closed chamber with a gas flame, and so expel the air; then he condensed the flame by injecting water, and operated on an air engine by exhausting into the partial vacuum so obtained. The idea was evidently suggested by Watt's condensing steam engine, flame being employed instead of steam to obtain a vacuum. Brown's engine is said to have been actually employed to pump water, and to drive a boat on the Thames, and propel a road carriage. L. W. Wright in 1833 described an explosion engine working at atmospheric pressure and exploding on both sides of the piston. The cylinder is shown as water-jacketed. In William Barnett's engine of 1838 no great advances were made. The engine was so constructed that the mixture of gas and air was compressed to a considerable extent in the motor cylinder before ignition. The method of igniting the compressed charge was also effective. The problem of transferring a flame to the interior of a cylinder when the pressure is much in excess of that of the external air was solved by means of a hollow plug cock having a gas jet burning within the hollow. In one position the hollow was opened to the atmosphere, and a gas jet issuing within it was lit by an external flame, so that it burned within the hollow. The plug was then quickly rotated, so that it closed to the external air and opened to the engine cylinder; the flame continued to burn with the air contained in the cock, until the compressed inflammable mixture rushed into the space from the cylinder and ignited at the flame. This mode of ignition is in essentials the one adopted by Otto about thirty years later. To Barnett belongs the credit of being the first to realise clearly the great idea of compression before explosion in gas engines, and to show one way of carrying out the idea in practice. Barnett appears to have constructed an engine, but he attained no commercial success. Several attempts to produce gas engines were made between 1838 and 1860, but they were all failures. Several valuable ideas were published in 1855. Drake, an American, described a mode of igniting a combustible gaseous mixture by raising a thimble-shaped piece of metal to incandescence. In 1857 Barsanti and Matteucci proposed a free-piston engine, in which the explosion propelled a free piston against the atmosphere, and the work was done on the return stroke by the atmospheric pressure, a partial vacuum being produced under the piston. The engine never came into commercial use, although the fundamental idea was good.

Previous to 1860 the gas engine was entirely in the experimental stage, and in spite of many attempts no practical success was attained. E. Lenoir, whose patent is dated 1860, was the inventor of the first gas engine that was brought into genuine use. The piston, moving forward for a portion of its stroke by the energy stored in the fly-wheel, drew into the cylinder a charge of gas and air at the ordinary atmospheric pressure. At about half stroke the valves closed, and the explosion, caused by an electric spark, propelled the piston to the end of its stroke. On the return stroke the burnt gases were discharged, just as a steam engine exhausts. These operations were repeated on both sides of the piston, and the engine was thus double-acting. Four hundred of these engines were said to be at work in Paris in 1865, and the Reading Iron Works Company Limited built and sold one hundred of them in Great Britain. They were quiet, and smooth in running; the gas consumption, however, was excessive, amounting to about 100 cub. ft. per indicated horse-power per hour. The electrical ignition also gave trouble. Hugon improved on the engine in 1865 by the introduction of a flame ignition, but no real commercial success was attained till 1867, when Otto and Langen exhibited their free-piston engine in the Paris Exhibition of that year. This engine was identical in principle with the Barsanti and Matteucci, but Otto succeeded where those inventors failed. He worked out the engine in a very perfect manner, used flame ignition, and designed a practical clutch, which allowed the piston free movement in one direction but engaged with the fly-wheel shaft when moved in the other; it consisted of rollers and wedge-shaped pockets—the same clutch, in fact, as has since been so much used in free-wheel bicycles. This engine consumed about 40 cub. ft. of gas per brake horse-power per hour—less than half as much as the Lenoir. Several thousands were made and sold, but its strange appearance and unmechanical operation raised many objections. Several inventors meanwhile again advocated compression of the gaseous mixture before ignition, among them being Schmidt, a German, and Million, a Frenchman, both in 1861.

To a Frenchman, Alph. Beau de Rochas, belongs the credit of proposing, with perfect clearness, the cycle of operations now widely used in compression gas engines. In a pamphlet published in Paris in 1862, he stated that to obtain economy with an explosion engine four conditions are requisite: (1) The greatest possible cylinder volume with the least possible cooling surface; (2) the greatest possible rapidity of explosion; (3) the greatest possible expansion; and (4) the greatest possible pressure at the beginning of the expansion. The sole arrangement capable of satisfying these conditions he stated would be found in an engine operating as follows: (1) Suction during an entire outstroke of the piston; (2) compression during the following instroke; (3) ignition at the dead point, and expansion during the third stroke; (4) forcing out of the burnt gases from the cylinder on the fourth and last return stroke. Beau de Rochas thus exactly contemplated, in theory at least, the engine produced by Dr Otto fourteen years later. He did not, however, put his engine into practice, and probably had no idea of the practical difficulties to be overcome before realizing his conception in iron and steel. To Dr Otto belongs the honour of independently inventing the same cycle, now correctly known as the Otto cycle, and at the same time overcoming all practical difficulties and making the gas engine of world-wide application. This he did in 1876, and his type of engine very rapidly surpassed all others, so that now the Otto-cycle engine is manufactured over the whole world by hundreds of makers. In 1876 Dr Otto used low compression, only about 30 lb per sq. in. above atmosphere. Year by year compression was increased and greater power and economy were obtained, and at present compressions of more than 100 lb per sq. in. are commonly used with most satisfactory results.

The history of the subject since 1876 is one of gradual improvement in detail of construction, enabling higher compressions to be used with safety, and of gradual but accelerating increase in dimensions and power. In the same period light and heavy oil engines have been developed, mostly using the Otto cycle (see Oil Engines).

Gas engines may be divided, so far as concerns their working process, into three well-defined types:—

(1) Engines igniting at constant volume, but without previous compression.

(2) Engines igniting at constant pressure, with previous compression.

(3) Engines igniting at constant volume, with previous compression.

For practical purposes engines of the first type may be disregarded. Gas engines without compression are now considered to be much too wasteful of gas to be of commercial importance. Those of the second type have never reached the stage of extended commercial application; they are scientifically interesting, however, and may take an important place in the future development of the gas engine. The expectations of Sir William Siemens with regard to them have not been realized, although he spent many years in experiments. Of other engineers who also devoted much thought and work to this second type may be mentioned Brayton (1852); Foulis (1858); Crowe (1883); Hargreaves (1888); Clerk (1880); and Diesel (1892). Diesel's engines are proving successful as oil engines but have not been introduced as gas engines.

The working cycles of the three types are as follows:—

First Type.—Four operations.
- (a) Charging the cylinder with explosive mixture at atmospheric pressure.
- (b) Exploding the charge.
- (c) Expanding after explosion.
- (d) Expelling the burnt gases.

Second Type.—Five operations.
- (a) Charging the pump cylinder with gas and air mixture at atmospheric pressure.
- (b) Compressing the charge into an intermediate receiver.
- (c) Admitting the charge to the motor cylinder, in a state of flame, at the pressure of compression.
- (d) Expanding after admission.
- (e) Expelling the burnt gases.

Third Type.—Five operations.
- (a) Charging the cylinder with gas and air mixture at atmospheric pressure.
- (b) Compressing the charge into a combustion space.
- (c) Exploding the charge.
- (d) Expanding after explosion.
- (e) Expelling the burnt gases.

In all these types the heating of the working fluid is accomplished by the rapid method of combustion within the cylinder, and for the cooling necessary in all heat engines is substituted the complete rejection of the working fluid with the heat it contains, and its replacement by a fresh portion taken from the atmosphere at atmospheric temperature. This is the reason why those cycles can be repeated with almost indefinite rapidity, while the old hot-air engines had to run slowly in order to give time for the working fluid to heat or cool through metal surfaces.

Four-cycle Engines.—Otto-cycle engines belong to the third type, being explosion engines in which the combustible mixture

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is compressed previous to explosion. Fig. 1 is a side elevation, fig. 2 is a sectional plan, and fig. 3 is an end elevation of an engine built about 1892 by Messrs Crossley of Manchester, who were the original makers of Otto engines in Great Britain. In external appearance it somewhat resembles a modern high-pressure

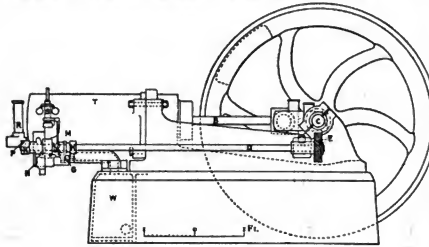

FIG. 1.—Side Elevation of Otto Cycle Engine.

steam engine, of which the working parts are exceedingly strong. In its motor and only cylinder, which is horizontal and open-ended, works a long trunk piston, the front end of which carries the crosshead pin. The crank shaft is heavy, and the fly-wheel large, considerable stored energy being required to carry the piston through the negative part of the cycle. The cylinder is considerably longer than the stroke, so that the piston when full in leaves a space into which it does not enter. This is the combustion space, in which the charge is first compressed and then burned. On the forward stroke, the piston A (fig. 2) takes into the cylinder a charge of mixed gas and air at atmospheric pressure, which is compressed by a backward stroke into the space Z at the end of the cylinder. The compressed charge is then ignited, and so the charge is exploded with the production of a high pressure. The piston now makes a forward stroke under the pressure of the explosion, and on its return, after the exhaust valve is opened, discharges the products of combustion. The engine is then ready to go through the same cycle of operations. It thus takes four strokes or two revolutions of the shaft to complete the Otto cycle, the cylinder being used alternately as a pump and a motor, and the engine, when working at full load, thus gives one impulse for every two revolutions. The valves, which are all of the conical-seated lift type, are four in number—charge inlet valve, gas inlet valve, igniting valve, and exhaust valve. The igniting valve is usually termed the timing valve, because it determines the time of the explosion. Since the valves have each to act once in every two revolutions, they cannot be operated by cams or eccentrics placed directly on the crank shaft. The valve shaft D is driven at half the rate of revolution of the crank shaft C by means of the skew or worm gear E, one wheel of which is mounted on the crank shaft and the other on the valve shaft. Ignition is accomplished by means of a metal tube heated to incandescence by a Bunsen burner. At the proper moment the ignition or timing valve is opened, and the mixed gas and air under pressure being admitted to the interior of the tube, the inflammable gases come into contact with the incandescent metal surface and ignite; the flame at once spreads back to the cylinder and fires its contents, thus producing the motive explosion.

The working parts are as follows:—A the piston, B the connecting rod, C the crank shaft, D the side or valve shaft, E the skew gearing, F the exhaust valve, G the exhaust valve lever, H the exhaust valve cam, I the charge inlet valve, J the charge inlet valve lever, K the charging valve cam, L the gas inlet valve, M the gas valve cam, N lever and link operating gas valve, O igniting or timing valve, P timing valve cam, Q timing valve lever or tumbler, R igniting tube, S governor, T water jacket and cylinder, U Bunsen burner for heating ignition tube. On the first forward or charging stroke the charge of gas and air is admitted by the inlet valve I, which is operated by the lever J from the cam K, on the valve shaft D. The gas supply is admitted to the inlet valve I by the lift valve L, which is also operated by the lever and link N from the cam M, controlled, however, by the centrifugal governor S. The governor operates either to admit gas wholly, or to cut it off completely, so that the variation in power is obtained by varying the number of the explosions.

Since the engine shown in figs. 1 to 3 was built further modifications have been made, principally in the direction of dispensing with or diminishing port space, that is, so arranging the ports that the compression space is not broken up into several separate chambers. In this way the cooling surface in contact with the intensely hot gases is reduced to a minimum. This is especially important when high compressions are used, as then the compression space being small, the port spaces form a large proportion of the total space. For maximum economy it is necessary to get rid of port space altogether; this is done by making the lift valves open directly into the compression space. This arrangement can be readily made in small and medium-sized engines, but in the larger engines it becomes necessary to provide ports, so as to allow the valves to be more easily removed for cleaning.

The construction of pressure gas plant in 1878 by J. E. Dowson for the production of inflammable gas from anthracite and coke by the action of air mixed with steam, soon led to the development of larger and larger Otto cycle engines. The gas obtained consisted of a mixture of carbon monoxide, hydrogen, nitrogen and some carbon dioxide and oxygen, having a lower heating value of about 150 British thermal units per cubic foot. With this gas these engines used about 1 lb of anthracite per b.h.p. per hour.

From the pressure producer sprang the suction producer first placed on the market in practical form by M. Benier of Paris in 1804, but then presenting many difficulties which were not removed till about nine years later when Dowson and others placed effective suction plants in use in considerable numbers. Such suction plants are now built by all the leading gas engine constructors for powers varying from 10 to 500 i.h.p.

Dr Ludwig Mond and Crossley Bros. also attacked the problem of the bituminous fuel producer, of which many examples are now at work for powers as large as 2000 i.h.p. In 1895 B. H. Thwaite demonstrated that the so-called waste gas from blast furnaces could be used in gas engines, and this undoubtedly led to the design and construction of the very large gas engines now becoming common both in Europe and in America. It appears from Thwaite's experiments that the surplus gas from the blast furnaces of Great Britain is capable of supplying at least three-quarters of a million horse-power continuously day

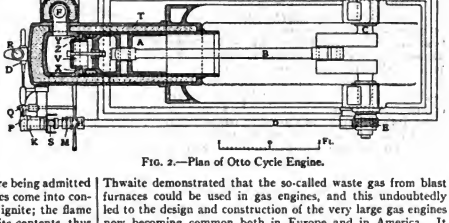

FIG. 2.—Plan of Otto Cycle Engine.

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and night, and it is calculated that in America nearly three million horse-power is available from this source. Thwaite's system was put into operation in 1805 at the Glasgow Iron Works, and it was also successfully applied near Barrow-in-Furness. For many reasons the system did not take immediate root in England, but in 1808 the Société Cockerill of Seraing near Liége applied an engine designed by Delamere-Debouteville to utilize blast furnace gas. This engine indicated 213 h.p. running at 105 revolutions per minute. This was followed in 1809 by an engine giving 600 b.h.p. at 90 revolutions per minute used for driving a blowing cylinder for a blast furnace. It had a single cylinder of 51·2 in. diameter and a piston stroke of 55·1 in. About 1900 the Gasmotoren Fabrik Deutz built an Otto cycle engine of 1000 b.h.p. having four cylinders each 33 in. diameter and 39·3 in. stroke, speed 135 revolutions per minute. It was coupled direct to a dynamo. Crossley Bros. Ltd. took up the

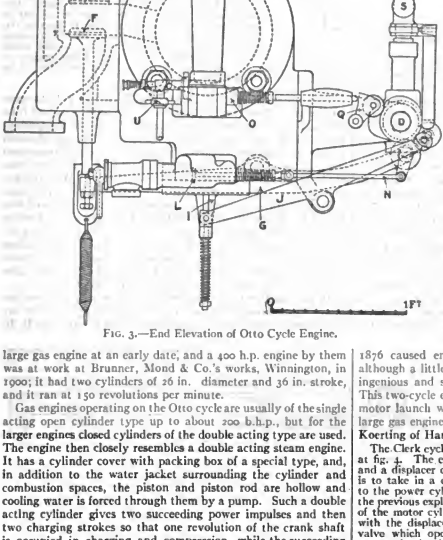

FIG. 3.—End Elevation of Otto Cycle Engine.

large gas engine at an early date, and a 400 h.p. engine by them was at work at Brunner, Mond & Co.'s works, Winnington, in 1900; it had two cylinders of 26 in. diameter and 36 in. stroke, and it ran at 150 revolutions per minute.

Gas engines operating on the Otto cycle are usually of the single acting open cylinder type up to about 200 b.h.p., but for the larger engines closed cylinders of the double acting type are used. The engine then closely resembles a double acting steam engine. It has a cylinder cover with packing box of a special type, and, in addition to the water jacket surrounding the cylinder and combustion spaces, the piston and piston rod are hollow and cooling water is forced through them by a pump. Such a double acting cylinder gives two succeeding power impulses and then two charging strokes so that one revolution of the crank shaft is occupied in charging and compression, while the succeeding revolution gets two power impulses. For still larger engines two such double acting cylinders are arranged in tandem, so that one piston rod runs through two pistons and connects to a slide in front and to one crank pin by a connecting rod. Such an engine gives two power impulses for every revolution of the crank shaft. The greatest power developed in one double acting cylinder is claimed by Ehrhardt and Schmer for a cylinder of 45½ in. diameter by 51½ in. stroke, which at 94 revolutions per minute gives 1100 i.h.p.

Two-Cycle Engine.—While the Otto or four-cycle engine was developing as above described, inventors were hard at work on the two-cycle engine. In Britain this work fell mostly upon Clerk, Robson and Atkinson, while on the continent of Europe the most persevering and determined worker was Koerting.

Dugald Clerk began work on the gas engine at the end of 1876. His first patent was dated 1877 and dealt with an engine of the air pressure vacuum type. His next patent was No. 3045 of 1878, and the engine there described was exhibited at the Royal Agricultural Show at Kilburn, London, 1879. In it a pump compressed a mixture of air and gas into a reservoir, from which it entered the motor cylinder during the first part of its stroke. After cut-off ignition was caused by a platinum igniter, the piston was driven forward, and exhausting was performed on the return stroke. This engine gave three b.h.p., and it was the first compression explosion engine ever run giving one impulse for each revolution of the crank shaft. It had difficulties, however, which prevented it from reaching the market.

The particular type of engine now widely known as operating on the Clerk cycle was patented in 1881 (Brit. Pat. No. 1089). One of the earliest of these engines was set up at Lord Kelvin's laboratory at the Glasgow university and used for the purpose of driving a Siemens dynamo and supplying his house with electric light. The engine was first exhibited in the Paris Electrical Exhibition of 1881 and the London Smoke Abatement Exhibition of the same year. In this engine the charge was not compressed by a separate pump. A pumping cylinder, it is true, was used, but its function was to act merely as a displacer to take in a mixture of gas and air and transfer it to the motor cylinder at as low a pressure as possible, in such a way that the entering charge displaced the exhaust gases through ports which were opened by the overrunning of the piston. The motor piston thus timed and controlled the exhaust discharge, and gave a power impulse for every revolution of the crank. Engines of the Clerk type were built largely by Messrs Sterne & Co. of Glasgow, the Clerk Gas Engine Co. of Philadelphia, U.S.A., the Campbell Gas Engine Co., and a modification was made and sold in considerable numbers by the Stockport Company. The lapsing of the Otto patent, however, in 1876 caused engineers to neglect the two cycle for a time, although a little later it was introduced for small engines in an ingenious and simple modification known as the Day engine. This two-cycle engine later became very popular, especially for motor launch work. The Clerk cycle is now much in use for large gas engines up to about 2000 horse as modified by Messrs Koerting of Hanover.

The Clerk cycle engine, as built in 1881, is shown in sectional plan at fig. 4. The engine contains two cylinders—a power cylinder A and a displacer cylinder B. The function of the displacer cylinder is to take in a combustible charge of gas and air and transfer it to the power cylinder, displacing as it enters the exhaust gases of the previous explosion. A compression space C is left at the end of the motor cylinder A. It is of conical shape and communicates with the displacer cylinder B by means of a large automatic lift valve which opens into the compression space from a chamber communicating by a pipe with the displacer cylinder. At the outer end of the motor cylinder are placed V-shaped ports E which open to the atmosphere by an exhaust pipe. The outward travel of the motor piston C causes it to overrun these ports, as seen in fig. 4, and allows the pressure in the cylinder to fall to atmosphere. The action of the engine is as follows:—The displacer piston D on its forward movement draws in its charge of gas and air, and it is so timed with reference to the motor piston C that it has returned a small portion of its stroke just when the motor piston overruns the exhaust ports. The overrunning of the exhaust ports at once causes the pressure in the cylinder to fall to atmosphere, and then the pressure in the displacer overcomes the pressure in the motor cylinder and opens

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the lift valve, when the charge flows in to the motor cylinder through the conical compression space and displaces the exhaust gases through the ports E, while it fills up the cylinder A with the inflammable charge. The exhaust gases are sufficiently displaced and the fresh charge introduced into the cylinder by the time the motor piston has opened the exhaust ports E on the out-stroke and closed them on the return stroke. The two cylinders are so proportioned that the exhaust gases are expelled as completely as possible and replaced by fresh explosive mixture without any material part of this mixture escaping with the exhaust. Unless the proportions are carefully made such an escape is possible. The relative operations of the motor piston C and the displacer piston D are secured by advancing the crank of the displacer about a right angle compared to the motor crank. The motor piston on its in-stroke compresses the mixed charge into the conical space G; and, when compression is complete, the mixture is ignited by the slide valve F. This produces the power explosion which forces the piston forward until the exhaust ports are opened again. By this cycle of operations one power impulse is given for every revolution of the crank. The motor cylinder is surrounded by a water jacket in the usual manner, but it is unnecessary to water-jacket the displacer, as the gases are never hot.

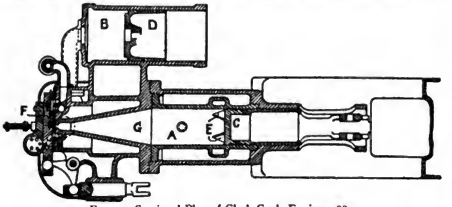

FIG. 4.—Sectional Plan of Clerk Cycle Engine, 1881.

Robson also invented two-cycle engines. His first patent was taken out in 1877 (No. 2334). The engines described in his patents of 1879–1880 were of the two-cycle type, and in them no second cylinder was used. The front end of the motor cylinder was enclosed by a cover and packing box, and was used as a pump to force gas and air into a reservoir at a few lb above atmosphere. The motor piston was arranged to overrun ports in the side of the cylinder, but the exhaust discharge was not timed in that way. A separate lift valve controlled the overrun ports and determined when the exhaust should be discharged. When the exhaust was discharged at the end of the stroke the pressure from the gas and air reservoir was admitted by a lift valve to the cylinder to displace the remaining exhaust gases and fill the cylinder with charge. This mixture was compressed into a space at the end of the cylinder and ignited by means of a flame ignition device. Robson's engine was built in considerable numbers by Messrs Tangye of Birmingham, the first exhibited by them at Bingley Hall at the end of 1880. The modern Day engine closely resembles the Robson engine so far as its broad operations are concerned.

Atkinson's work on the gas engine was begun in 1878, his first patent being No. 3212 of 1879. The engine described in that patent somewhat resembled the 1878 engine of Clerk as exhibited at Kilburn. Atkinson was ingenious and persevering in the invention of two-cycle engines. Two of his engines were made in considerable numbers. The first was known as the "Differential" engine, exhibited at the Inventions Exhibition, London, in 1885. A later engine produced by him was called the "Cycle" engine, and it proved to be the most economical of all the motors tested at the Society of Arts trials of motors for electric lighting in 1888–1889. Atkinson joined Crossley Bros., and many of his ingenious contrivances are now at work on the well-known engines of that firm.

Four-cycle engines now practically monopolize the field of the smaller internal combustion engines, and very large engines are also constructed on this plan. The two-cycle, or Clerk cycle engines, however, compete strongly with the four-cycle for large gas engines using blast furnace gas. Koerting engines on the Clerk cycle are now built giving 1000 i.h.p. per double acting motor cylinder, and one power cylinder on this method gives two impulses per revolution. Messrs Mather & Platt build a Koerting engine of a modified type in England; an engine of their construction with a power cylinder of about 29 in. and 40½ in. stroke gives 700 b.h.p.

Fig. 5 shows in longitudinal section the power and pump cylinders of a Mather & Platt Koerting engine on the Clerk cycle; the power cylinder section is shown above that of the pump cylinders, but it is to be understood that both cylinders are in the same horizontal plane as in the Clerk engine shown at fig. 4. The Koerting engine, however, is double acting, whereas the Clerk engine was single acting. The power cylinder A has a power piston A^1 and compression spaces A^1A^1. At the centre of the cylinders are exhaust ports E which open to the atmosphere and are overrun by the piston A^1 at both ends of the stroke. A^1 and A^2 are inlet valves for gas and air. The single acting pump cylinders BB^1 supply the air required for the charge, and the double acting gas cylinder CC^1 supplies the gas. Both gas and air are led from these cylinders by separate passages to the inlet valves A^1A^1. The air pump pistons are lettered B^1B^2 and the gas pump piston C^2. The main crank D connects as usual to the piston rod of the power piston A^1, and the pump crank F to the trunk air pump piston B^2 which drives the other air pump piston B^2 and the gas pump piston C^2 by a piston rod passing through all three. The gas mixture is not made until the inlet valves A^1A^1 are reached, so that no explosive mixture exists until it is formed within the cylinder A. The air is first introduced into the power cylinder to discharge some of the hot gases, and when the gas is also admitted the contents of the cylinder are cooled to some extent. The action of the engine is exactly as described with regard to the Clerk cycle, and the arrangement of the two cranks at about right angles to each other is also similar. The exhaust is discharged through the ports E, and the incoming charge fills the cylinder in the same way as in the Clerk engine.

Another large continental gas engine, known as the Oechelhäuser, operates on a modified Clerk cycle and is shown in sectional plan at fig. 6. The motor cylinder A has two pistons A^1A^1, A^1 being operated by a centre and A^1 by two outside cranks, side rods, and cross head; the pistons A^1A^1 thus move in opposite directions and give an effective stroke of double that due to one crank. B is the air and gas pump dealing with air on one side of its piston and gas on the other. A chamber C supplies to an air reservoir supplied from the pump and to the power cylinder by ports C^1; a similar chamber D opens to a gas reservoir supplied from the pump and to the power cylinder by ports D^1. The exhaust ports E are provided at the other end of the cylinder. When the front piston overruns the exhaust ports E the pressure within the power cylinder falls to atmosphere; the back piston then opens the air ports C^1 and air under slight pressure flows in, to be followed a little later by gas under slight pressure from the gas ports D^1. In this way the power cylinder A is charged with gas and air mixture at each stroke, and when the pistons A^1A^1 approach each other the charge is compressed into the space between and then ignited by the electric spark. The pistons are then forced apart and perform their power stroke. The Oechelhäuser engine, which is built in Great Britain by Messrs Beardmore

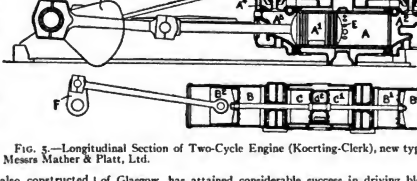

FIG. 5.—Longitudinal Section of Two-Cycle Engine (Koerting-Clerk), new type, by Messrs Mather & Platt, Ltd.

of Glasgow, has attained considerable success in driving blowing pumps for blast furnaces, in producing electric light, and in driving iron rolling mills.

Large gas engines are undoubtedly making great progress, as will be seen from the following interesting particulars prepared in 1908 by Mr R. E. Mathot of Brussels giving the numbers and horse power of large gas engines which had then been recently manufactured in Europe:—

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Messrs Crossley Brothers, Limited, 57 motors, with an aggregate of 23,660 h.p.; Messrs Ehrhardt & Sehmer, 59 motors, total 69,790 h.p.; the Otto Gasmotoren Fabrik, 82, total 47,400 h.p.; Gebrüder Koerting, 198, total 165,760 h.p.; Société Alsacienne, 55, total 23,410 h.p.; Société John Cockerill, 148, total 102,925 h.p.; Société Suisse, Winterthur, 67, total 8620 h.p.; Vereinigte Maschinen-

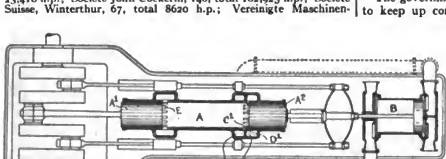

FIG. 6.—Arrangement of Oechelhäuser Gas Engine.

fabriken, Augsburg and Nürnberg, 215, total 256, 240 h.p. The mean power of each gas engine made by Messrs Ehrhardt & Sehmer and the Augsburg and Nürnberg companies is in each case 1200 h.p. It is stated that in one factory there are gas engines representing a total output of 35,000 h.p. These European large gas engines thus give nearly 575,000 h.p. between them.

The installation of large gas engines has made considerable progress in America. Mr E. L. Adams estimated that 350,000 h.p. was at work or in construction in the United States in 1908. The first large engines were installed at the works of the Lackawanna Steel Co., Buffalo, New York. They were of the Koerting-Clerk type, and were built by the De La Vergne Co. of New York. They included 16 blowing engines, each of 2000 h.p., and 8 engines of 1000 h.p. each, driving dynamos to produce electric light. This large power plant was started in 1902. The Westinghouse Co. of Pittsburg have also built large engines, several of which are in operation at the various works of the Carnegie Steel Co. These Westinghouse engines are of the horizontal twin tandem type, having two cranks and four double-acting cylinders in each unit, the cylinders being 38 in. in diameter and the stroke 54 in. The Snow Steam Pump Co. have built similar horizontal tandem engines with cylinders of 42 in. diameter and 54 in. stroke. The English Westinghouse Co. have also designed large gas engines, and they exhibited a very interesting vertical multiple cylinder gas engine having four cranks and eight single-acting cylinders, four pairs, in tandem, at the Franco-British Exhibition of 1908; it gave 750 h.p., and the pistons were not watered.

Over two million horse-power of the smaller gas engines are now at work in the world, and certainly above one million horse-power of petrol motors.

The application of large gas engines to marine work, the compounding of the gas engine, and many other matters are being strenuously pursued. Capitaine of Frankfort-on-Main has built several vessels used for towing purposes in which the vessel is driven by gas engines operated by means of suction gas-producers consuming anthracite. Messrs Thornycroft and Messrs Beardmore in Great Britain have adopted the Capitaine designs, and both firms have applied them to sea-going vessels, Thornycroft to a gas launch which has been tested in the Solent, and Beardmore to an old gunboat, the "Rattler." The "Rattler" was fitted with five-cylinder Otto cycle engines and suction gas-producers giving 500 i.h.p.; and has sailed some 1500 m. under gas power only. There are many difficulties to be overcome before large light and sufficiently slow-moving gas engines can be installed on board ship, but progress is being made, and without doubt all difficulties will be ultimately surmounted and gas power successfully applied to ships for both large and small power.

The flame and incandescent tube methods of ignition have been displaced by electrical ignition of both high and low tension types; all large gas engines are ignited electrically and generally by more than one igniter per cylinder.

The governing of large gas engines, too, is now effected so as to keep up continuity of impulses by the method either of throttling the charge inlet or by varying the point of admission of gas alone or air and gas mixed.

It may be said, indeed, without exaggeration, that the whole world is now alive to the possibilities of the internal-combustion motor, and that progress will be more and more rapid. This motor has almost fulfilled the expectations of those engineers who have devoted a large part of their lives to its study and advancement. They are looking forward now to the completion of the work begun so many years ago, and expect, at no distant date, to find the internal-combustion motor competing with the steam engine even in its latest form, the steam turbine, on sea as vigorously as it does at present on land.

Thermal Efficiency of Four-Cycle Engines.—The Otto and Clerk type engines are usually designated respectively four-cycle and two-cycle, because in the Otto type four strokes are necessary to complete the power-producing cycle of the engine and in the Clerk engine two strokes complete the cycle.

Indicated thermal efficiency may be defined as the proportion of the total heat of combustion which appears as work done by the explosion and expansion upon the piston. Brake thermal efficiency may be defined as the proportion of the total heat of combustion which appears as work given out by the engine available for overcoming external resistances; that is, brake thermal efficiency is the effective efficiency of the engine for doing work. In the early gas engines the indicated thermal efficiency was only 16% as shown by tests of Otto engines from 1877 to 1882, but now indicated thermal efficiencies of from 35% to 37% are often obtained. Some experimenters claim even higher efficiencies, but even 37% is higher than ordinary best practice of 1909. Table I. has been prepared to show this advance. It shows, in addition to indicated thermal

TABLE I.—*Indicated and Brake Thermal Efficiency of Four-Cycle Engines from 1882 to 1908.*

No.	Mechanical Efficiency.	Names of Experimenters.	Year.	Dimensions of Engine.	Indicated Thermal Efficiency.	Brake Thermal Efficiency.	Type of Engine.
	Per cent.			Diam. Stroke.	Per cent.	Per cent.	
1	87·6	Slaby	1882	6·75″×13·7″	16	14	Deutz
2	84·2	Thurston	1884	8·5″ ×14″	17	14·3	Crossley
3	86·1	Society of Arts	1888	9·5″ ×18″	22	18·9	Crossley
4	80·9	Society of Arts	1888	9·02″×14″	21	17	Griffin (6-cycle)
5	87·3	Kennedy	1888	7·5″ ×15″	21	18·3	Beck (6-cycle)
6	82·0	Capper	1892	8·5″ ×18″	22·8	17·4	Crossley
7	87·0	Robinson	1898	10″ ×18″	28·7	25	National
8	83	Humphrey	1900	26″ ×36″	31	25·7	Crossley
9	81·7	Witz	1900	31·2″ ×55·13″	28	22·9	Cockerill
10	85·5	Inst. Civil. Eng.	1905	14″ ×22″	35[1]	29·9	National
11	77·1	Burstall	1907	16″ ×24″	41·5[2]	32	Premier
12	87·5	Hopkinson	1908	11·5″ ×21″	36·8	32·2	Crossley

efficiency, the brake thermal efficiency and the mechanical efficiency, together with other particulars such as engine dimensions, types and names of experimenters. It will be seen that brake thermal efficiency has also increased from 14% to 32%; that is, practically one-third of the whole heat of combustion is obtained by these engines in effective work available for all motive power purposes.

Thermal Efficiency of Two-Cycle Engines.—It has been found that two-cycle engines present greater practical difficulties in regard to obtaining high indicated and brake thermal efficiencies, but the thermodynamic considerations are not affected by the practical difficulties. As shown by Table II., these engines improved in indicated thermal efficiency from the value of 16·4% attained in 1884 to 38% in 1903, while the brake thermal efficiency rose in the same period from 14% to 29%. The numbers in Table II. are not so well established as those in Table I. The four-cycle engines have been so far subjected to much more rigid and authoritative tests than those of the two-cycle. It is interesting to see from the table

[1] The value 35% is deduced by the author from the Inst.C.E. Committee's values.

[2] This value is, in the author's view, too high; probably due to indicator error.

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that the mechanical efficiency of the early Clerk engines was 84 %, while in the later large engines of the same type it has fallen to 75 %.

Standards of Thermal Efficiency.—To set up an absolute standard of thermal efficiency it is necessary to know in a complete manner the physical and chemical properties and occurrences in a gaseous explosion. A great deal of attention has been devoted to gaseous explosions by experimenters in England and on the continent of Europe, and much knowledge has been obtained from the work of Mallard and Le Chatelier, Clerk, Langen, Petavel, Hopkinson and Bairstow and Alexander. From these and other experiments it is possible to measure approximately the internal energy or the specific heats of the gases of combustion at very high temperatures, such as 2000° C.; and to advance the knowledge on the subject a committee of the British Association formed in Manchester in 1907. Recognizing, in 1882, that it was impossible to base any standard cycle of efficiency upon the then existing knowledge of gaseous explosions Dugald Clerk proposed what is called the air standard. This standard has been used for many years, and it was officially adopted by a committee of the Institution of Civil Engineers appointed in 1903, this committee's two reports, dated March 1905 and December 1905, definitely adopting the air-standard cycle as the standard of efficiency for internal combustion engines. This standard assumes that the working fluid is air, that its specific heat is constant throughout the range of temperature, and that the adiabatic compression raises the pressure and temperature of the working fluid through a certain range; the heat supply is added while the volume remains constant, that is, the volume to which the fluid is diminished by compression. Adiabatic expansion reduces the pressure and temperature of the working fluid until the volume is the same as the original volume before compression, and the necessary heat is discharged from the cycle at constant volume during falling temperature. Here also it can be shown that the thermal efficiency depends on the ratio between the temperature before compression and the temperature after compression. It is as before $E = 1 - t/t_e$. Where t is the temperature and v the volume before compression, and t_e the temperature and v_e the volume after adiabatic compression, it can be shown that $\left(\frac{v'}{v}\right)^{\gamma-1} = \frac{t}{t_e}$, so that E may be written

$$E = 1 - \left(\frac{v_e}{v}\right)^{\gamma-1},$$

and if $v_e/v = 1/r$, the compression ratio, then

$$E = 1 - \left(\frac{1}{r}\right)^{\gamma-1}.$$

Thus in all three symmetrical cycles of constant temperature, constant pressure and constant volume the thermal efficiency depends only on the ratio of the maximum volume of compression to the volume after compression; and, given this ratio, called $1/r$, which does not depend in any way upon temperature determinations but only upon the construction and valve-setting of the engine, we have a means of settling the ideal efficiency proper for the particular engine. Any desired ideal efficiency may be obtained from any of the cycles by selecting a suitable compression ratio. Table III., giving the theoretical thermal efficiency for these three symmetrical cycles of constant temperature, pressure and volume, extends from a compression ratio of $\frac{1}{3}$ to $\frac{1}{30}$th. Such compression ratios as

TABLE II.—*Indicated and Brake Thermal Efficiency of Two-cycle Engines from 1884 to 1908.*

Mechanical Efficiency.	Name of Experimenter.	Year.	Dimensions of Motor Cylinders.	Indicated Thermal Efficiency.	Brake Thermal Efficiency.	Type of Engine.
Per cent.			Diam. Stroke.	Per cent.	Per cent.	
84	Garrett . .	1884	9" × 20"	16·4	14	Clerk-Sterne
..	Stockport Co. .	1884	.. ..	11·2	11·2	Andrews & Co.
83	Clerk . . .	1887	9" × 15"	20·2	16·9	Clerk-Tangye
..	Atkinson . . .	1885	7½" ..	..	15	Atkinson
75	Meyer . . .	1903	26½"×(2"×37½")	38	29	Oechelhäuser
75	Mather & Platt .	1907	.. ..	30·6	23	Koerting

value of the ratio between the specific heat at constant volume and constant pressure is 1·4. The air-standard efficiency for different cycles will be found fully discussed in the report of that committee, but space here only allows of a short discussion of the various cycles using compression previous to ignition.

For such engines there are three symmetrical thermodynamic cycles, and each cycle has the maximum thermal efficiency possible for the conditions assumed. The three types may be defined as cycles of (1) constant temperature, (2) constant pressure, and (3) constant volume.

The term constant temperature indicates that the supply of heat is added at constant temperature. In this cycle adiabatic compression is assumed to raise the temperature of the working fluid from the lowest to the highest point. The fluid then expands at constant temperature, so that the whole of the heat is added at a constant temperature, which is the highest temperature of the cycle. The heat supply is stopped at a certain period, and then the fluid adiabatically expands until the temperature falls to the lowest temperature. A compression operation then takes place at the lowest temperature, so that the necessary heat is discharged by isothermal compression at the lower temperature. It will be recognized that this is the Carnot cycle, and the efficiency E is the maximum possible between the temperature limits in accordance with the well-known second law of thermo-dynamics. This efficiency is $E = (T - T')/T$ or $1 - T'/T$, where T is the absolute temperature at which heat is supplied and T' the absolute temperature at which heat is discharged.

It is obvious that the temperatures before and after compression are here the same as the lower and the higher temperatures, so that if t be the temperature before compression and t_e the temperature after compression, then $E = 1 - t/t_e$. This equation in effect says that thermal efficiency operating on the Carnot cycle depends upon the temperatures before and after compression.

The constant pressure cycle is named because heat is added to the working fluid at constant pressure. In this cycle adiabatic compression raises the pressure—not the temperature—from the lower to the higher limit. At the higher limit of pressure, heat is added while the working fluid expands at a constant pressure. The temperature thus increases in proportion to increase of volume. When the heat supply ceases, adiabatic expansion proceeds and reduces the pressure of the working fluid from the higher to the lower point. Again here we are dealing with pressure and not temperature. The heat in this case is discharged from the cycle at the lower pressure but at diminishing temperature. It can be shown in this case also that $E = 1 - t/t_e$, that is, that although the maximum temperature of the working fluid is higher than the temperature of compression and the temperature at the end of adiabatic expansion is higher than the lower temperature, yet the proportion of heat convertible into work is determined here also by the ratio of the temperatures before and after compression.

The constant volume cycle is so called because the heat required is added to the working fluid at constant volume. In this cycle

TABLE III.—*Theoretical Thermal Efficiency for the Three Symmetrical Cycles of Constant Temperature, Pressure and Volume.*

$1/r$	E	$1/r$	E
⅓	0·246	$\frac{1}{10}$	0·61
¼	0·36	$\frac{1}{16}$	0·70
⅕	0·43	$\frac{1}{20}$	0·85
⅙	0·48		

100 are, of course, not used in practice. The ordinary value in constant volume engines ranges from ⅓th to ⅙th. In the Diesel engine, which is a constant pressure engine, the ratio is usually $\frac{1}{13}$th. As the value of $1/r$ increases beyond certain limits, the effective power for given cylinder dimensions diminishes, because the temperature of compression is rapidly approaching the maximum temperature possible by explosion; thus a compression of $\frac{1}{16}$th raises the temperature of air from 17° C. to about 1600° C., and as 2000° C. is the highest available explosion temperature for ordinary purposes, it follows that a very small amount of work would be possible from an engine using such compressions, apart from other mechanical considerations. It has long been recognized that constant pressure and constant volume engines have the same thermal efficiency for similar range of compression temperature, but Prof. H. L. Callendar first pointed out the interesting fact that a Carnot cycle engine is equally dependent upon the ratio of the temperature before and after compression, and that its efficiency for a given compression ratio is the same as the efficiencies proper for constant pressure and constant volume engines. Prof. Callendar demonstrated this at a meeting of the Institution of Civil Engineers Committee on thermal standards in 1904. The work of this committee, together with Clerk's investigations, prove that in modern gas-engines up to to 50 h.p. it may be taken that the best result possible in practice is given by multiplying the air-standard value by ·7. For instance, an engine with a compression ratio of one-third has an air-standard efficiency of 0·36, and the actual indicated efficiency of a well-designed engine should be ·36 multiplied by ·7 = 0·25. If, however, the compression ratio be raised to one-fifth, then the air-standard value ·48 multiplied by ·7 gives ·336. The ideal efficiency of the real working fluid can be proved to be about 20 % short of the air-standard values given.

GASKELL, ELIZABETH CLEGHORN (1810–1865), English novelist and biographer, was born on the 29th of September 1810 in Lindsay Row, Chelsea, London, since destroyed to make way for Cheyne Walk. Her father, William Stevenson (1772–1829), came from Berwick-on-Tweed, and had been successively Unitarian minister, farmer, boarding-house keeper for students at Edinburgh, editor of the *Scots Magazine*, and contributor to the

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Edinburgh Review, before he received the post of Keeper of the Records to the Treasury, which he held until his death. His first wife, Elizabeth Holland, was Mrs Gaskell's mother. She was a Holland of Sandlebridge, Knutsford, Cheshire, in which county the family name had long been and is still of great account. Mrs Stevenson died a month after her daughter was born, and the babe was carried into Cheshire to Knutsford to be adopted by her aunt, Mrs Lumb. Thus her childhood was spent in the pleasant environment that she has idealized in *Cranford*. At fifteen years of age she went to a boarding-school at Stratford-on-Avon, kept by Miss Byerley, where she remained until her seventeenth year. Then came occasional visits to London to see her father and his second wife, and after her father's death in 1829 to her uncle, Swinton Holland. Two winters seem to have been spent in Newcastle-on-Tyne in the family of William Turner, a Unitarian minister, and a third in Edinburgh. On the 30th of August 1832 she was married in the parish church of Knutsford to William Gaskell, minister of the Unitarian chapel in Cross Street, Manchester, and the author of many treatises and sermons in support of his own religious denomination. Mr Gaskell held the chair of English history and literature in Manchester New College.

Henceforth Mrs Gaskell's life belonged to Manchester. She and her husband lived first in Dover Street, then in Rumford Street, and finally in 1850 at 84 Plymouth Grove. Her literary life began with poetry. She and her husband aspired to emulate George Crabbe and write the annals of the Manchester poor. One poetic "Sketch," which appeared in *Blackwood's Magazine* for January 1837, seems to have been the only outcome of this ambition. Henceforth, while in perfect union in all else, husband and wife were to go their separate literary ways, Mrs Gaskell to become a successful novelist, whose books were to live side by side with those of greater masters, Mr Gaskell to be a distinguished Unitarian divine, whose sermons, lectures and hymns are now all but forgotten. In her earlier married life Mrs Gaskell was mainly occupied with domestic duties—she had seven children—and philanthropic work among the poor. Her first published prose effort was probably a letter that she addressed to William Howitt on hearing that he contemplated a volume entitled *Visits to Remarkable Places*. She then told the legend of Clopton Hall, Warwickshire, as she had heard it in schooldays, and Howitt incorporated the letter in that book, which was published in 1840. Serious authorship, however, does not seem to have been commenced until four or five years later. In 1844 Mr and Mrs Gaskell visited North Wales, where their only son "Willie" died of scarlet fever at the age of ten months, and it was, it is said, to distract Mrs Gaskell from her sorrow that her husband suggested a long work of fiction, and *Mary Barton* was begun. There were earlier short stories in *Howitt's Journal*, where "Libbie Marsh's Three Eras" and "The Sexton's Hero" appeared in 1847. But it was *Mary Barton: A Tale of Manchester Life* that laid the foundation of Mrs Gaskell's literary career. It was completed in 1847 and offered to a publisher who returned it unread. It was then sent to Chapman & Hall, who retained the manuscript for a year without reading it or communicating with the author. A reminder, however, led to its being sought for, considered and accepted, the publishers agreeing to pay the author £100 for the copyright. It was published anonymously in two volumes in 1848. This story had a wide popularity, and its author secured first the praise and then the friendship of Carlyle, Landor and Dickens. Dickens indeed asked her in 1850 to become a contributor to his new magazine *Household Words*, and here the whole of *Cranford* appeared at intervals from December 1851 to May 1853, exclusive of one sketch, reprinted in the "World's Classics" edition (1907), that was published in *All the Year Round* for November 1863. Earlier than this, indeed, for the very first number of *Household Words* she had written "Lizzie Leigh." Mrs Gaskell's second book, however, was *The Moorland Cottage*, a dainty little volume that appeared at Christmas 1850 with illustrations by Birket Foster. In the Christmas number of *Household Words* for 1853 appeared "The Squire's Story," reprinted in *Lizzie Leigh and other Tales* in 1865. In 1853 appeared another long novel, *Ruth*, and the incomparable *Cranford*. This last—now the most popular of her books—is an idyll of village life, largely inspired by girlish memories of Knutsford and its people. In *Ruth*, which first appeared in three volumes, Mrs Gaskell turned to a delicate treatment of a girl's betrayal and her subsequent rescue. Once more we are introduced to Knutsford, thinly disguised, and to the little Unitarian chapel in that town where the author had worshipped in early years. In 1855 *North and South* was published. It had previously appeared serially in *Household Words*. Then came—in 1857—the *Life of Charlotte Brontë*, in two volumes. Miss Brontë, who had enjoyed the friendship of Mrs Gaskell and had exchanged visits, died in March 1855. Two years earlier she had begged her publishers to postpone the issue of her own novel *Villette* in order that her friend's *Ruth* should not suffer. This biography, by its vivid presentation of the sad, melancholy and indeed tragic story of the three Brontë sisters, greatly widened the interest in their writings and gave its author a considerable place among English biographers. But much matter was contained in the first and second editions that was withdrawn from the third. Certain statements made by the writer as to the school of Charlotte Brontë's infancy, an identification of the "Lowood" of *Jane Eyre* with the existing school, and the acceptance of the story of Bramwell Brontë's ruin having been caused by the woman in whose house he had lived as tutor, brought threats of libel actions. Apologies were published, and the third edition of the book was modified, as Mrs Gaskell declares, by "another hand." The book in any case remains one of the best biographies in the language. An introduction by Mrs Gaskell to the then popular novel, *Mabel Vaughan*, was also included in her work of this year 1857, but no further book was published by her until 1859, when, under the title of *Round the Sofa*, she collected many of her contributions to periodical literature. *Round the Sofa* appeared in two volumes, the first containing only "My Lady Ludlow," the second five short stories. These stories postponed the next year in one volume as *My Lady Ludlow and other Tales*. In the next year 1860 appeared yet another volume of short stories, entitled *Right at Last and other Tales*. The title story had appeared two years earlier in *Houschold Words* as "The Sin of a Father." In 1862 Mrs Gaskell wrote a preface to a little book by Colonel Vecchj, translated from the Italian—*Garibaldi and Caprera*, and in 1863 she published her last long novel, *Sylvia's Lovers*, dedicated "to My dear Husband by her who best knows his Value." After this we have—in 1863—a one-volume story, *A Dark Night's Work*, and in the same year *Cousin Phyllis and other Tales* appeared. Reprinted short stories from *All the Year Round*, *Cornhill Magazine*, and other publications, tend to lengthen the number of books published by Mrs Gaskell during her lifetime. *The Grey Woman and other Tales* appeared in 1865.

Mrs Gaskell died on the 12th of November 1865 at Holyburn, Alton, Hampshire, in a house she had just purchased with the profits of her writings as a present for her husband. She was buried in the little graveyard of the Knutsford Unitarian church. Her unfinished novel *Wives and Daughters* was published in two volumes in 1866. ☞

Mrs Gaskell has enjoyed an ever gaining popularity since her death. *Cranford* has been published in a hundred forms and with many illustrators. It is unanimously accepted as a classic. Scarcely less recognition is awarded to the *Life of Charlotte Brontë*, which is in every library. The many volumes of novels and stories seemed of less secure permanence until the falling in of their copyrights revealed the fact that a dozen publishers thought them worth reprinting. The most complete editions, however, are the "Knutsford Edition," edited with introductions by A.W. Ward, in eight volumes (Smith, Elder), and the "World's Classics" edition, edited by Clement Shorter, in 10 volumes (Henry Froude, 1908).

There is no biography of Mrs Gaskell, she having forbidden the publication of any of her letters. See, however, the biographical introduction to the "Knutsford" *Mary Barton* by A. W. Ward; the *Letters of Charles Dickens*; *Women Writers*, by C. J. Hamilton, second series; *H. B. Stowe's Life and Letters*, edited by Annie Fields; *Autobiography of Mrs Fletcher*; *Mrs Gaskell and Knutsford*, by G. A. Payne; *Cranford*, with a preface by Anne Thackeray Ritchie; *Écrivains modernes de l'Angleterre*, by Émile Montégut. (C. K. S.)

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GASSENDI[1] [GASSEND], **PIERRE** (1592–1655), French philosopher, scientist and mathematician, was born of poor parents at Champtercier, near Digne, in Provence, on the 22nd of January 1592. At a very early age he gave indications of remarkable mental powers and was sent to the college at Digne. He showed particular aptitude for languages and mathematics, and it is said that at the age of sixteen he was invited to lecture on rhetoric at the college. Soon afterwards he entered the university of Aix, to study philosophy under P. Fesaye. In 1612 he was called to the college of Digne to lecture on theology. Four years later he received the degree of doctor of theology at Avignon, and in 1617 he took holy orders. In the same year he was called to the chair of philosophy at Aix, and seems gradually to have withdrawn from theology. He lectured principally on the Aristotelian philosophy, conforming as far as possible to the orthodox methods. At the same time, however, he followed with interest the discoveries of Galileo and Kepler, and became more and more dissatisfied with the Peripatetic system. It was the period of revolt against the Aristotelianism of the schools, and Gassendi shared to the full the empirical tendencies of the age. He, too, began to draw up objections to the Aristotelian philosophy, but did not at first venture to publish them. In 1624, however, after he had left Aix for a canonry at Grenoble, he printed the first part of his *Exercitationes paradoxicae adversus Aristoteleos*. A fragment of the second book was published later at La Haye (1650), but the remaining five were never composed, Gassendi apparently thinking that after the *Discussiones Peripateticae* of Francesco Patrizzi little field was left for his labours.

After 1628 Gassendi travelled in Flanders and Holland. During this time he wrote, at the instance of Mersenne, his examination of the mystical philosophy of Robert Fludd (*Epistolica dissertatio in qua praecipua principia philosophiae Ro. Fludd deleguntur*, 1631), an essay on parhelia (*Epistola de parheliis*), and some valuable observations on the transit of Mercury which had been foretold by Kepler. He returned to France in 1631, and two years later became provost of the cathedral church at Digne. Some years were then spent in travelling through Provence with the duke of Angoulême, governor of the department. The only literary work of this period is the *Life of Peiresc*, which has been frequently reprinted, and was translated into English. In 1642 he was engaged by Mersenne in controversy with Descartes. His objections to the fundamental propositions of Descartes were published in 1642; they appear as the fifth in the series contained in the works of Descartes. In these objections Gassendi's tendency towards the empirical school of speculation appears more pronounced than in any of his other writings. In 1645 he accepted the chair of mathematics in the Collège Royal at Paris, and lectured for many years with great success. In addition to controversial writings on physical questions, there appeared during this period the first of the works by which he is known in the history of philosophy. In 1647 he published the treatise *De vita, moribus, et doctrina Epicuri libri octo*. The work was well received, and two years later appeared his commentary on the tenth book of Diogenes Laërtius, *De vita, moribus, et placitis Epicuri, seu Animadversiones in X. librum Diog. Laër.* (Lyons, 1649; last edition, 1675). In the same year the more important *Syntagma philosophiae Epicuri* (Lyons, 1649; Amsterdam, 1684) was published.

In 1648 ill-health compelled him to give up his lectures at the Collège Royal. He travelled in the south of France, spending nearly two years at Toulon, the climate of which suited him. In 1653 he returned to Paris and resumed his literary work, publishing in that year lives of Copernicus and Tycho Brahe. The disease from which he suffered, lung complaint, had, however, established a firm hold on him. His strength gradually failed, and he died at Paris on the 24th of October 1655. A bronze statue of him was erected by subscription at Digne in 1852.

His collected works, of which the most important is the *Syntagma philosophicum* (*Opera*, i. and ii.), were published in 1658 by Montmort (6 vols., Lyons). Another edition, also in 6 folio volumes, was published by N. Averanius in 1727. The first two are occupied entirely with his *Syntagma philosophicum*; the third contains his critical writings on Epicurus, Aristotle, Descartes, Fludd and Lord Herbert, with some occasional pieces on certain problems of physics; the fourth, his *Institutio astronomica*, and his *Commentarii de rebus celestibus*; the fifth, his commentary on the tenth book of Diogenes Laërtius, the biographies of Epicurus, N. C. F. de Peiresc, Tycho Brahe, Copernicus, Georg von Peuerbach, and Regiomontanus, with some tracts on the value of ancient money, on the Roman calendar, and on the theory of music, to all which is appended a large and prolix piece entitled *Notitia ecclesiae Diniensis*; the sixth volume contains his correspondence. The *Lives*, especially those of Copernicus, Tycho and Peiresc, have been justly admired. That of Peiresc has been repeatedly printed; it has also been translated into English. Gassendi was one of the first after the revival of letters who treated the *literature* of philosophy in a lively way. His writings of this kind; though too laudatory and somewhat diffuse, have great merit; they abound in those anecdotal details, natural yet not obvious reflections, and vivacious turns of thought, which made Gibbon style him, with some extravagance certainly, though it was true enough up to Gassendi's time—"le meilleur philosophe des littérateurs, et le meilleur littérateur des philosophes."

Gassendi holds an honourable place in the history of physical science. He certainly added little to the stock of human knowledge, but the clearness of his exposition and the manner in which he, like Bacon, used the importance of experimental research, were of inestimable service to the cause of science. To what extent any place can be assigned him in the history of philosophy is more doubtful. The *Exercitationes* on the whole seem to have excited more attention than they deserved. They contain little or nothing beyond what had been already advanced against Aristotle. The first book expounds clearly, and with much vigour, the evil effects of the blind acceptance of the Aristotelian dicta on physical and philosophical study; but, as is the case with so many of the anti-Aristotelian works of this period, the objections show the usual ignorance of Aristotle's own writings. The second book, which contains the review of Aristotle's dialectic or logic, is throughout Ramist in tone and method. The objections to Descartes—none of which is at least, through Descartes's statement of it in the appendix of objections in the *Meditationes* has become famous—have no speculative value, and in general are the outcome of the crudest empiricism. His adhesion to Epicurus have a certain historical value, but the want of consistency inherent in the philosophical system raised on Epicureanism is such as to deprive it of genuine worth. Along with strong expressions of empiricism we find him holding doctrines absolutely irreconcilable with empiricism in any form. For while he maintains constantly his favourite maxim "that there is nothing in the intellect which has not been in the senses" (*nihil in intellectu quod non prius fuerit in sensu*), while he contends that the imaginative faculty (*phantasia*) is the counterpart of sense—that, as it has to do with material images, it is itself, like sense, material, and essentially the same both in men and brutes; he at the same time admits that the intellect, which he affirms to be immaterial and immortal—the most characteristic distinction of humanity—attains notions and truths of which no effort of sensation or imagination can give us the slightest apprehension (*Op.* ii. 383). He instances the capacity of forming "general notions"; the very conception of universality itself (ib. 383), for, which he says brutes, which partake as truly as men in the faculty called *phantasia*, never attain; the notion of God, whom he says we may imagine to be corporeal, but understand to be incorporeal; and lastly, the reflex action by which the mind makes its own phenomena and operations the objects of attention.

The *Syntagma philosophicum*, in fact, is one of those eclectic systems which unite, or rather place in juxtaposition, irreconcilable dogmas from various schools of thought. It is divided, according to the usual fashion of the Epicureans, into logic (which, with Gassendi as with Epicurus, is truly *canonic*), physics and ethics. The logic, which contains at least one praiseworthy portion, a sketch of the history of the science, is divided into theory of right apprehension (*bene imaginari*), theory of right judgment (*bene proponere*), theory of right inference (*bene colligere*), theory of right method (*bene ordinare*). The first part contains the specially empirical positions which Gassendi afterwards neglects or leaves out of account. The senses, the sole source of knowledge, are supposed to yield us immediately cognition of individual things; phantasy (which Gassendi

[1] It was formerly thought that *Gassendi* was really the genitive of the Latin form *Gassendus*. C. Güttler, however, holds that it is a modernized form of the O. Fr. *Gassendy* (see paper quoted in bibliography).

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takes to be material in nature) reproduces these ideas; understanding compares these ideas, which are particular, and frames general ideas. Nevertheless, he at the same time admits that the senses yield knowledge—not of things—but of qualities only, and holds that we arrive at the idea of thing or substance by induction. He holds that the true method of research is the analytic, rising from lower to higher notions; yet he sees clearly, and admits, that inductive reasoning, as conceived by Bacon, rests on a general proposition not itself proved by induction. He ought to hold, and in disputing with Descartes he did apparently hold, that the evidence of the senses is the only convincing evidence; yet he maintains, and from his special mathematical training it was natural he should maintain, that the evidence of reason is absolutely satisfactory. The whole doctrine of judgment, syllogism and method is a mixture of Aristotelian and Ramist notions.

In the second part of the *Syntagma*, the physics, there is more that deserves attention; but here, too, appears in the most glaring manner the inner contradiction between Gassendi's fundamental principles. While approving of the Epicurean physics, he rejects altogether the Epicurean negation of God and particular providence. He states the various proofs for the existence of an immaterial, infinite, supreme Being, asserts that this Being is the author of the visible universe, and strongly defends the doctrine of the foreknowledge and particular providence of God. At the same time he holds, in opposition to Epicureanism, the doctrine of an immaterial rational soul, endowed with immortality and capable of free determination. It is altogether impossible to assent to the supposition of Lange (*Gesch. der Materialismus*, 2nd ed., i. 233), that all this portion of Gassendi's system contains nothing of his own opinions, but is introduced solely from motives of self-defence. The positive exposition of atomism has much that is attractive, but the hypothesis of the *calor vitalis* (vital heat), a species of *anima mundi* (world-soul) which is introduced as physical explanation of physical phenomena, does not seem to throw much light on the special problems which it is invoked to solve. Nor is his theory of the weight essential to atoms as being due to an inner force impelling them to motion in any way reconcilable with his general doctrine of mechanical causes.

In the third part, the ethics, over and above the discussion on freedom, which on the whole is indefinite, there is little that needs a milder statement of the Epicurean moral code. The final end of life is happiness, and happiness is harmony of soul and body (*tranquillitas animi et indolentia corporis*). Probably, Gassendi thinks, perfect happiness is not attainable in this life, but it may be in the life to come.

The *Syntagma* is thus an essentially unsystematic work, and clearly exhibits the main characteristics of Gassendi's genius. He was critical rather than constructive, widely read and trained thoroughly both in languages and in science, but deficient in speculative power and original force. Even in the department of natural science he shows the same inability steadfastly to retain principles and to work from them; he wavers between the systems of Brahe and Copernicus. That his revival of Epicureanism had an important influence on the general thinking of the 17th century may be admitted; that it has any real importance in the history of philosophy cannot be granted.

AUTHORITIES.—Gassendi's life is given by Sorbière in the first collected edition of the works, by Bugerel, *Vie de Gassendi* (1737; 2nd ed., 1770), and by Damiron, *Mémoire sur Gassendi* (1839). An abridgment of his philosophy was given by his friend, the celebrated traveller, Bernier (*Abrégé de la Philosophie de Gassendi*, 8 vols., 1678; 2nd ed., 7 vols., 1684). The most complete surveys of his work are those of G. S. Brett (*Philosophy of Gassendi*, London, 1908), Buhle (*Geschichte der neuern Philosophie*, iii. 1, 87-222), Damiron (*Mémoires pour servir à l'histoire de philosophie au XVIIe siècle*), and P. F. Thomas (*La Philosophie de Gassendi*, Paris, 1889). See also Ritter, *Geschichte der Philosophie*, x. 543-571; Feuerbach, *Gesch. d. neu. Phil. von Bacon bis Spinoza*, 127-150; F. X. Kiell, *P. Gassendis Erkenntnistheorie und seine Stellung zum Materialismus* (1893) and "Gassendi's Skepticismus" in *Philos. Jahrb.* vi. (1893); C. Güttler, "Gassend oder Gassendi?" in *Archiv f. Gesch. d. Philos.* x. (1897), pp. 238-242. (R. AD.; X.)

GASTEIN, in the duchy of Salzburg, Austria, a side valley of the Pongau or Upper Salzach, about 25 m. long and 1½ m. broad, renowned for its mineral springs. It has an elevation of between 3000 and 3500 ft. Behind it, to the S., tower the mountains Mallnitz or Nassfeld-Tauern (7907 ft.) and Ankogel (10,673 ft.), and from the right and left of these mountains two smaller ranges run northwards forming its two side walls. The river Ache traverses the valley, and near Wildbad-Gastein forms two magnificent waterfalls, the upper, the Kesselfall (196 ft.), and the lower, the Bärenfall (306 ft.). Near these falls is the Schleierfall (250 ft.), formed by the stream which drains the Bockhart-see. The valley is also traversed by the so-called Tauern railway (opened up to Wildbad-Gastein in September 1905), which goes to Mallnitz, piercing the Tauern range by a tunnel 9260 yds. in length. The principal villages of the valley are Hof-Gastein, Wildbad-Gastein and Böckstein.

HOF-GASTEIN, pop. (1900) 840, the capital of the valley, is also a watering-place, the thermal waters being conveyed here from Wildbad-Gastein by a conduit 5 m. long, constructed in 1828 by the emperor Francis I. of Austria. Hof-Gastein was, after Salzburg, the richest place in the duchy, owing to its gold and silver mines, which were already worked during the Roman period. During the 16th century these mines were yielding annually 1180 lb of gold and 9500 lb of silver, but since the 17th century they have been much neglected and many of them are now covered by glaciers.

WILDBAD-GASTEIN, commonly called *Bad-Gastein*, one of the most celebrated watering-places in Europe, is picturesquely situated in the narrow valley of the Gasteiner Ache, at an altitude of 3480 ft. The thermal springs, which issue from the granite mountains, have a temperature of 77°-120° F., and yield about 880,000 gallons of water daily. The water contains only 0·35 to 1000 of mineral ingredients and is used for bathing purposes. The springs are resorted to in cases of nervous affections, senile and general debility, skin diseases, gout and rheumatism. Wildbad-Gastein is annually visited by over 8500 guests. The springs were known as early as the 7th century, but first came into fame by a successful visit paid to them by Duke Frederick of Austria in 1436. Gastein was a favourite resort of William I. of Prussia and of the Austrian imperial family, and it was here that, on the 14th of August 1865, was signed the agreement known as the Gastein Convention, which by dividing the administration of the conquered provinces of Schleswig and Holstein between Austria and Prussia postponed for a while the outbreak of war between the two powers. It was also here (August–September 1879) that Prince Bismarck negotiated with Count Julius Andrássy the Austro-German treaty, which resulted in the formation of the Triple Alliance.

See Pröll, *Gastein, Its Springs and Climate* (Vienna, 5th ed., 1893).

GASTRIC ULCER (ulcer of the stomach), a disease of much gravity, commonest in females, and especially in anaemic domestic servants. It is connected in many instances with impairment of the circulation in the stomach and the formation of a clot in a small blood-vessel (thrombosis). It may be due to an impoverished state of the blood (anaemia), but it may also arise from disease of the blood-vessels, the result of long-continued indigestion and gastric catarrh.

When clotting takes place in a blood-vessel the nutrition of that limited area of the stomach is cut off, and the patch undergoes digestion by the unresisted action of the gastric juices, an ulcer being formed. The ulcer is usually of the size of a silver threepence or sixpence, round or oval, and, eating deeply, is apt to make a hole right through the coats of the stomach. Its usual site is upon the posterior wall of the upper curvature, near to the pyloric orifice. It may undergo a healing process at any stage, in which case it may leave but little trace of its existence; while, on the other hand, it may in the course of cicatrizing produce such an amount of contraction as to lead to stricture of the pylorus, or to a peculiar hour-glass deformity of the stomach. Perforation is in most cases quickly fatal, unless previously the stomach has become adherent to some neighbouring organ, by which the dangerous effects of this occurrence may be averted, or unless the condition has been promptly recognized and an operation has been quickly done. Usually there is but one ulcer, but sometimes there are several ulcers.

The symptoms of ulcer of the stomach are often indefinite and obscure, and in some cases the diagnosis has been first made on the occurrence of a fatal perforation. First among the symptoms is pain, which is present at all times, but is markedly increased after food. The pain is situated either at the lower end of the breast-bone or about the middle of the back. Sometimes it is felt in the sides. It is often extremely severe, and is usually accompanied with localized tenderness and also with a sense of oppression, and by an inability to wear tight clothing. The pain is due to the movements of the stomach set up by the presence

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of the food, as well as to the irritation of the inflamed nerve filaments in the floor of the ulcer. Vomiting is a usual symptom. It occurs either soon after the food is swallowed or at a later period, and generally relieves the pain and discomfort. Vomiting of blood (haematemesis) is a frequent and important symptom. The blood may show itself in the form of a brown or coffee-like mixture, or as pure blood of dark colour and containing clots. It comes from some vessel or vessels which the ulcerative process has ruptured. Blood is also found mixed with the discharges from the bowels, rendering them dark or tarry-looking. The general condition of the patient with gastric ulcer is, as a rule, that of extreme ill-health, with pallor, emaciation and debility. The tongue is red, and there is usually constipation. In most of the cases the disease is chronic, lasting for months or years; and in those cases where the ulcers are large or multiple, incomplete healing may take place, relapses occurring from time to time. But the ulcers may give rise to no marked symptoms, and there have been instances where fatal perforation suddenly took place, and where post-mortem examination revealed the existence of long-standing ulcers which had given rise to no suggestive symptoms. While gastric ulcer is to be regarded as dangerous, its termination, in the great majority of cases, is in recovery. It frequently, however, leaves the stomach in a delicate condition, necessitating the utmost care as regards diet. Occasionally the disease proves fatal by sudden haemorrhage, but a fatal result is more frequently due to perforation and the escape of the contents of the stomach into the peritoneal cavity, in which case death usually occurs in from twelve to forty-eight hours, either from shock or from peritonitis. Should the stomach become adherent to another organ, and fatal perforation be thus prevented, chronic "indigestion" may persist, owing to interference with the natural movements of the stomach. Stricture of the pylorus and consequent dilatation of the stomach may be caused by the cicatrization of an ulcer.

The patient should at once be sent to bed and kept there, and allowed for a while nothing stronger than milk and water or milk and lime water. But if bleeding has recently taken place no food whatever should be allowed by the stomach, and the feeding should be by nutrient enemata. As the symptoms quiet down, eggs may be given beaten up with milk, and later, bread and milk and home-made broths and soups. Thus the diet advances to chicken and vegetables rubbed through a sieve, to custard pudding and bread and butter. As regards medicines, iron is the most useful, but no pills of any sort should be given. Under the influence of rest and diet most gastric ulcers get well. The presence of healthy-looking scars upon the surface of the stomach, which are constantly found in operating upon the interior of the abdomen, or as revealed in post-mortem examinations, are evidence of the truth of this statement. It is unlikely that under the treatment just described perforation of the stomach will take place, and if the surgeon is called in to assist he will probably advise that operation is inadvisable. Moreover, he knows that if he should open the abdomen to search for an ulcer of the stomach he might fail to find it; more than that, his search might also be in vain if he opened the stomach itself and examined the interior. Serious haemorrhages, however, may make it necessary that a prompt and thorough search should be made in order that the surgeon may endeavour to locate the ulcer, and, having found it, secure the damaged vessel and save the patient from death by bleeding.

Perforation of a gastric ulcer having taken place, the septic germs, which were harmless whilst in the stomach, escape with the rest of the contents of the stomach into the general peritoneal cavity. The immediate effects of this leakage are sudden and severe pain in the upper part of the abdomen and a great shock to the system (collapse). The muscles of the abdominal wall become hard and resisting, and as peritonitis appears and the intestines are distended with gas, the abdomen is distended and becomes greatly increased in size and ceases to move, the respiratory movements being short and quick. At first, most likely, the temperature drops below normal, and the pulse quickens. Later, the temperature rises. If nothing is done, death from the septic poisoning of peritonitis is almost certain.

The treatment of ruptured gastric ulcer demands immediate operation. An incision should be made in the upper part of the middle line of the abdomen, and the perforation should be looked for. There is not, as a rule, much difficulty in finding it, as there are generally deposits of lymph near the spot, and other signs of local inflammation; moreover, the contents of the stomach may be seen escaping from the opening. The ulcer is to be closed by running a "purse-string" suture in the healthy tissue around it, and the place is then buried in the stomach by picking up small folds of the stomach-wall above and below it and fixing them together by suturing. This being done, the surface of the stomach, and the neighbouring viscera which have been soiled by the leakage, are wiped clean and the abdominal wound is closed, provision being made for efficient drainage. A large proportion of cases of perforated gastric ulcer thus treated recover.

(E. O.*)

GASTRITIS (Gr. γαστήρ, stomach), an inflammatory affection of the stomach, of which the condition of catarrh, or irritation of its mucous membrane, is the most frequent and most readily recognized. This may exist in an acute or a chronic form, and depends upon some condition, either local or general, which produces a congested state of the circulation in the walls of the stomach (see DIGESTIVE ORGANS: *Pathology*).

Acute Gastritis may arise from various causes. The most intense forms of inflammation of the stomach are the toxic conditions which follow the swallowing of corrosive poisons, such as strong mineral acids of alkalis which may extensively destroy the mucous membrane. Other non-corrosive poisons cause acute degeneration of the stomach wall (see POISONS). Acute inflammatory conditions may be secondary to zymotic diseases such as diphtheria, pyaemia, typhus fever and others. Gastritis is also caused by the ingestion of food which has begun to decompose, or may result from eating unsuitable articles which themselves remain undigested and so excite acute catarrhal conditions. These give rise to the symptoms well known as characterizing an acute "bilious attack," consisting in loss of appetite, sickness or nausea, and headache, frontal or occipital, often accompanied with giddiness. The tongue is furred, the breath foetid, and there is pain or discomfort in the region of the stomach, with sour eructations, and frequently vomiting, first of food and then of bilious matter. An attack of this kind tends to subside in a few days, especially if the exciting cause be removed. Sometimes, however, the symptoms recur with such frequency as to lead to the more serious chronic form of the disease.

The treatment bears reference, in the first place, to any known source of irritation, which, if it exist, may be expelled by an emetic or purgative (except in cases due to poisoning). This, however, is seldom necessary, since vomiting is usually present. For the relief of sickness and pain the sucking of ice and counter-irritation over the region of the stomach are of service. Further, remedies which exercise a soothing effect upon an irritable mucous membrane, such as bismuth or weak alkaline fluids, and along with these the use of a light milk diet, are usually sufficient to remove the symptoms.

Chronic Gastric Catarrh may result from the acute or may arise independently. It is not infrequently connected with antecedent disease in other organs, such as the lungs, heart, liver or kidneys, and it is especially common in persons addicted to alcoholic excess. In this form the texture of the stomach is more altered than in the acute form, except in the toxic and febrile forms above referred to. It is permanently in a state of congestion, and its mucous membrane and muscular coat undergo thickening and other changes, which markedly affect the function of digestion. The symptoms are those of dyspepsia in an aggravated form (see DYSPEPSIA), of which discomfort and pain after food, with distension and frequently vomiting, are the chief; and the treatment must be conducted in reference to the causes giving rise to it. The careful regulation of the diet, alike as to the amount, the quality, and the intervals between meals, demands special attention. Feeding on artificially soured milk may in

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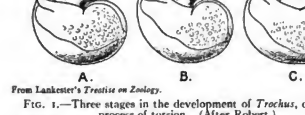
many cases be useful. Lavage or washing out of the stomach with weak alkaline solutions has been used with marked success in the treatment of chronic gastritis. Of medicinal agents, bismuth, arsenic, nux vomica, and the mineral acids are all of acknowledged efficacy, as are also preparations of pepsin.

GASTROPODA, the second of the five classes of animals constituting the phylum Mollusca. For a discussion of the relationship of the Gastropoda to the remaining classes of the phylum, see MOLLUSCA.

The Gastropoda are mainly characterized by a loss of symmetry, produced by torsion of the visceral sac. This torsion may be resolved into two successive movements. The first is a ventral flexure in the antero-posterior or sagittal plane; the result of this is to approximate the two ends of the alimentary canal. In development, the openings of the mantle-cavity and the anus are always originally posterior; later they are brought forward ventrally. During this first movement flexure is also produced by the coiling of the visceral sac and shell; primitively the latter was bowl-shaped; but the ventral flexure, which brings together the two extremities of the digestive tube, gives the visceral sac the outline of a more or less acute cone. The shell necessarily takes this form also, and then becomes coiled in a dorsal or anterior plane—that is to say, it becomes exogastric. This condition may be seen in embryonic *Patellidae*, *Fissurellidae* and *Trochidae* (fig. 1, A), and agrees with the method of coiling of a mollusc without lateral torsion, such as *Nautilus*. But ultimately the coil becomes ventral or endogastric, in consequence of the second torsion movement then apparent.



From Lankester's *Treatise on Zoology*.

FIG. 1.—Three stages in the development of *Trochus*, during the process of torsion. (After Robert.)

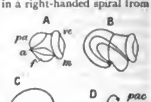
A, Nearly symmetrical larva (veliger).
B, A stage 1½ hours later than A.
C, A stage 3½ hours later than B.
f. Foot.
op, Operculum.
pac, Pallial cavity.
ve, Velum.

The shell is represented as fixed, while the head and foot rotate from left to right. In reality the head and foot are fixed and the shell rotates from right to left.

The second movement is a lateral torsion of the visceral mass, the foot remaining a fixed point; this torsion occurs in a plane approximately at right angles to that of the first movement, and carries the pallial aperture and the anus from behind forwards. If, at this moment, the animal were placed with mouth and ventral surface turned towards the observer, this torsion carries the circumanal complex in a clockwise direction (along the right side in dextral forms) through 180° as compared with its primitive condition. The (primitively) right-hand organs of the complex thus become left-hand, and vice versa. The visceral commissure, while still surrounding the digestive tract, becomes looped; its right half, with its proper ganglion, passes to the left side over the dorsal face of the alimentary canal (whence the name supra-intestinal), while the left half passes below towards the right side, thus originating the name infra-intestinal given to this half and to its ganglion. Next, the shell, the coil of which was at first exogastric, being also carried in this rotation through 180°, exhibits an endogastric coiling (fig. 1, B, C). This, however, is not generally retained in one plane, and the spire projects, little by little, on the side which was originally left, but finally becomes right (in dextral forms, with a clockwise direction, if viewed from the side of the spire; but counter-clockwise in sinistral forms). Finally, the original symmetry of the circumanal complex vanishes; the anus leaves the centre of the pallial cavity and passes towards the right side (left side in sinistral forms); the organs of this side become atrophied and disappear. The essential feature of the asymmetry of Gastropoda is the atrophy or disappearance of the primitively left half of the circumanal complex (the right half in sinistral forms), including the gill, the auricle, the osphradium, the hypobranchial gland and the kidney.

In dextral Gastropods the only structure found on the topographically right side of the rectum is the genital duct. But this is not part of the primitive complex. It is absent in the most primitive and symmetrical forms, such as *Haliotis* and *Pleurotomaria*. Originally the gonads opened into the kidneys. In the most primitive existing Gastropods the gonad opens into the right kidney (*Patellidae*, *Trochidae*, *Fissurellidae*). The gonaduct, therefore, is derived from the topographically right kidney. The transformation has been actually shown to take place in the development of *Paludina*. In a dextral Gastropod the shell is coiled in a right-handed spiral from apex to mouth, and the spiral also projects to the right of the median plane of the animal.

When the shell is sinistral the asymmetry of the organs is usually reversed, and there is a complete *situs inversus viscerum*, the direction of the spiral of the shell corresponding to the position of the organs of the body. *Troforis*, *Physa*, *Clausilia* are examples of sinistral Gastropods, but reversal also occurs as an individual variation among forms normally dextral. But there are forms in which the involution is "hyperstrophic," that is to say, the turns of the spire projecting but slightly, the spire, after flattening out gradually finally becomes re-entrant and transformed into a false umbilicus; at the same time that part which corresponds to the umbilicus of forms with a normal coil projects and constitutes a false spire; the coil thus appears to be sinistral, although the asymmetry remains dextral, and the coil of the operculum (always the opposite to that of the shell) sinistral (*e.g.* *Lanistes* among Streptoneura, *Limacinidae* among Opisthobranchia). The same, *mutatis mutandis*, may occur in sinistral shells.



From Lankester's *Treatise on Zoology*.

FIG. 2.—Four stages in the development of a Gastropod showing the process of body torsion. (After Robert.)

A, Embryo without flexure.
B, Embryo with ventral flexure of the intestine.
C, Embryo with ventral flexure and exogastric shell.
D, Embryo with lateral torsion and an endogastric shell.
a. Anus.
f. Foot.
m, Mouth.
pa, Mantle.
pac, Pallial cavity.
ve, Velum.

The problem of the causes of the torsion of the Gastropod body has been much discussed. E. R. Lankester in the ninth edition of this work attributed it to the pressure of the shell and visceral hump towards the right side. He referred also to the nautiloid shell of the larva falling to one side. But these are two distinct processes. In the larva a nautiloid shell is developed which is coiled exogastrically, that is, dorsally, and the pallial cavity is posterior or ventral (fig. 2, C); the larva therefore resembles *Nautilus* in the relations of body and shell. The shell then rotates towards the left side through 180°, so that it becomes ventral or endogastric (fig. 2, D). The pallial cavity, with its organs, is by this torsion moved up the *right* side of the larva to the dorsal surface, and thus the left organs become right and vice versa. In the subsequent growth of

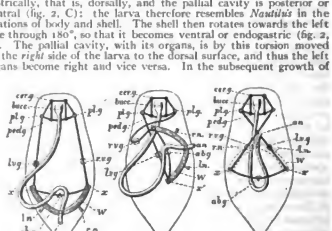


FIG. 3.—Sketch of a model designed so as to show the effect of torsion or rotation of the visceral hump in Streptoneurous Gastropoda.

A, Unrotated ancestral condition.
B, Quarter-rotation.
C, Complete semi-rotation (the limit).
an, Anus.
ln, *rn*, Primarily left nephridium and primarily right nephridium.
lvg. Primarily left (subsequently the sub-intestinal) visceral ganglion.
rvg, Primarily right (subsequently the sub-intestinal) visceral ganglion.
cerg, Cerebral ganglion.
plg, Pleural ganglion.
pedg, Pedal ganglion.
abg, Abdominal ganglion.
bucc, Buccal mass.
W, Wooden arc representing the base-line of the wall of the visceral hump.
x, *x'*, Pins fastening the elastic cord (representing the visceral nerve loop) to *W*.

the shell the spire comes to project on the right side, which was originally the left. Neither the rotation of the shell as a whole nor its helicoid spiral coiling in the immediate cause of the torsion of the body in the individual, for the direction of the torsion is indicated in the segmentation of the ovum, in which there is a complete

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reversal of the cleavage planes in sinistral as compared with dextral forms. The facts, however, strongly suggest that the original cause of the torsion was the weight of the exogastric shell and visceral hump, which in an animal creeping on its ventral surface necessarily fell over to one side. It is not certain that the projection of the spire to the originally left side of the shell has anything to do with the falling over of the shell to that side. The facts do not support such a suggestion. In the larva there is no projection at the time the torsion takes place. In some forms the coiling disappears in the adult, leaving the shell simply conical as in *Patellidae*, *Fissurellidae*, &c., and in some cases the shell is coiled in one plane, *e.g. Planorbis*. In all these cases the torsion and asymmetry of the body are unaffected.

The characteristic torsion attains its maximum effect among the majority of the Streptoneura. It is followed in some specialized Heteropoda and in the Euthyneura by a torsion in the opposite direction, or detorsion, which brings the anus farther back and untwists the visceral commissure (see Euthyneura, below). This conclusion has shown that the Euthyneura do not represent an archaic form of Gastropoda, but are themselves derived from streptoneurous forms. The difference between the two sub-classes has been shown to be slight; certain of the more archaic Tectibranchia (*Actaeon*) and Pulmonata (*Chilina*) still have the visceral commissure long and not untwisted. The fact that all the Euthyneura are hermaphrodite is not a fundamental difference; several Streptoneura are so, likewise *Valvata*, *Oncidiopsis*, *Marsenina*, *Odostomia*, *Balkysciadium*, *Entoconcha*.

Classification.—The class Gastropoda is subdivided as follows:

- Sub-class I. Streptoneura.
  - Order 1. Aspidobranchia.
    - Sub-order 1. Docoglossa.
    - ,, 2. Rhipidoglossa.
  - Order 2. Pectinibranchia.
    - Sub-order 1. Taenioglossa.
      - Tribe 1. Platyposda.
      - ,, 2. Heteropoda.
    - Sub-order 2. Stenoglossa.
      - Tribe 1. Rachiglossa.
      - ,, 2. Toxiglossa.
- Sub-class II. Euthyneura.
  - Order 1. Opisthobranchia.
    - Sub-order 1. Tectibranchia.
      - Tribe 1. Bullomorpha.
      - ,, 2. Aplysiomorpha.
      - ,, 3. Pleurobranchomorpha.
    - Sub-order 2. Nudibranchia.
      - Tribe 1. Tritoniomorpha.
      - ,, 2. Doridomorpha.
      - ,, 3. Eolidomorpha.
      - ,, 4. Elysiomorpha.
  - Order 2. Pulmonata.
    - Sub-order 1. Basommatophora.
    - ,, 2. Stylommatophora.
      - Tribe 1. Holognatha.
      - ,, 2. Agnatha.
      - ,, 3. Elasmognatha.
      - ,, 4. Ditremata.

Sub-Class I.—Streptoneura

In this division the torsion of the visceral mass and visceral commissure is at its maximum, the latter being twisted into a figure of eight. The right half of the commissure with its ganglion is supra-intestinal, the left half with its ganglion infra-intestinal. In some cases each pleural ganglion is connected with the opposite branch of the visceral commissure by anastomosis with the pallial nerve, a condition which is called dialyneury; or there may be a direct connective from the pleural ganglion to the visceral ganglion of the opposite side, which is called zygoneury. The head bears only one pair of tentacles. The radular teeth are of several different kinds in each transverse row. The heart is usually posterior to the branchia (proso-branchiate). The sexes are usually separate.

The old division into Zygobranchia and Azygobranchia must be abandoned, for the Azygobranchiate Rhipidoglossa have much greater affinity to the Zygobranchiate *Haliotidae* and *Fissurellidae* than to the Azygobranchia in general. This is shown by the labial commissure and pedal cords of the nervous system, by the opening of the gonad into the right kidney, and by other points. Further, the *Pleurotomariidae* have been discovered to possess two branchiae. The sub-class is now divided into two orders: the Aspidobranchia in which the branchia or ctenidium is bipectinate and attached only at its base, and the Pectinibranchia in which the ctenidium is monopectinate and attached to the mantle throughout its length.

Order 1. Aspidobranchia.—These are the most primitive Gastropods, retaining to a great degree the original symmetry of the

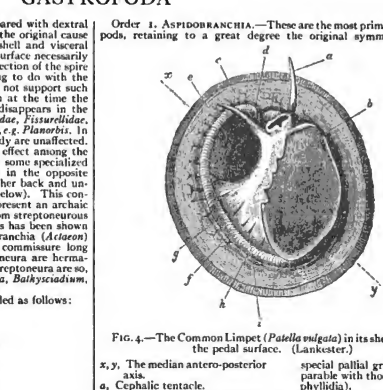

FIG. 4.—The Common Limpet (*Patella vulgata*) in its shell, seen from the pedal surface. (Lankester.)

x, y, The median antero-posterior axis.
a, Cephalic tentacle.
b, Plantar surface of the foot.
c, Free edge of the shell.
d, The branchial efferent vessel carrying aerated blood to the auricle, and here interrupting the circlet of gill lamellae.
e, Margin of the mantle-skirt.
f, Gill lamellae (*not* ctenidia, but special pallial growths, comparable with those of Pleurophyllidia).
g, The branchial efferent vessel.
h, Factor of the branchial advehent vessel.
i, Interspaces between the muscular bundles of the root of the foot, causing the separate areae seen in fig. 5, *c*.

organs of the pallial complex, having two kidneys, in some cases two branchiae, and two auricles. The gonad has no accessory organs and except in *Neritidae* no duct, but discharges into the right kidney.

Forms adapted to terrestrial life and to aerial respiration occur in various divisions of Gastropods, and do not constitute a single homogeneous group. Thus the *Helicinidae*, which are terrestrial, are now placed among the Aspidobranchia. In these there are neither branchia nor osphradium, and the pallial chamber which retains its large opening serves as a lung. Degeneration of the shell occurs in some members of the order. It is largely covered by the mantle in some *Fissurellidae*, is entirely internal in *Pupilla* and absent in *Titiscaniidae*.

The common limpet is a specially interesting and abundant example of the more primitive Aspidobranchia. The foot of the limpet is a nearly circular disk of muscular tissue; in front, projecting from and raised above it, are the head and neck (figs. 4, 13). The visceral hump forms a low conical dome above the subcircular foot, and standing out all round the base of this dome so as completely to overlap the head and foot, is the circular mantle-skirt. The depth of free mantle-skirt is greatest in front, where in by it. Upon the surface of the visceral dome, and extending

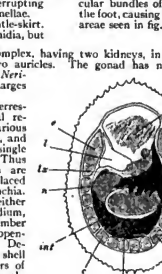

FIG. 5.—Dorsal surface of the Limpet removed from its shell and deprived of its black pigmented epithelium; the internal organs are seen through the transparent body-wall. (Lankester.)

c, Muscular bundles forming the root of the foot, and adherent to the shell.
e, Free mantle-skirt. [same.
em, Tentaculiferous margin of the
i, Smaller (left) nephridium.
k, Larger (right) nephridium.
l, Pericardium. [feardium.
lx, Fibrous septum, behind the peri-
n, Liver.
int, Intestine.
epr, Anterior area of the mantle-skirt over-hanging the head (cephalic hood).

the head and neck are covered

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to the edge of the free mantle-skirt, is the conical shell. When the shell is taken away (best effected by immersion in hot water) the surface of the visceral dome is found to be covered by a black-coloured epithelium, which may be removed, enabling the observer to note the position of some organs lying below the transparent integument (fig. 5). The muscular columns (*c*) attaching the foot to the shell form a ring incomplete in front, external to which is the free mantle-skirt. The limits of the large area formed by the flap over the head and neck (*ecr*) can be traced, and we note the anal papilla showing through and opening on the right shoulder, so to speak, of the animal into the large anterior region of the sub-pallial space. Close to this the small renal organ (*i*, mediad) and the larger renal organ (*k*, to the right and posteriorly) are seen, also the pericardium (*j*) and a coil of the intestine (*int*) embedded in the compact liver.

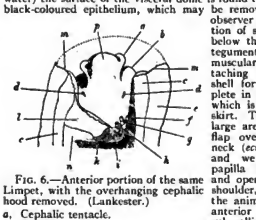

FIG. 6.—Anterior portion of the same Limpet, with the overhanging cephalic hood removed. (Lankester.)

a, Cephalic tentacle.
b, Foot.
c, Muscular substance forming the root of the foot.
d, The capito-pedal organs of Lankester (=rudimentary ctenidia).
e, Mantle-skirt.
f, Papilla of the larger nephridium.
g, Anus.
h, Papilla of the smaller nephridium.
i, Smaller nephridium.
k, Larger nephridium.
l, Pericardium.
m, Cut edge of the mantle-skirt.
n, Liver.
p, Snout.

On cutting away the anterior part of the mantle-skirt so as to expose the sub-pallial chamber in the region of the neck, we find the right and left renal papillae (discovered by Lankester in 1867) on either side of the anal papilla (fig. 6), but no gills. If a similar examination be made of the allied genus *Fissurella* (fig. 17, *d*), we find right and left of the two renal apertures a right and left gill-plume or ctenidium, which here as in *Haliotis* and *Pleurotomaria* retain their original paired condition. In *Patella* no such plume exist, but right and left of the neck are seen a pair of minute oblong yellow bodies (fig. 6, *d*), which were originally described by Lankester as orifices possibly connected with the evacuation of the generative products. On account of their position they were termed by him the "capito-pedal orifices," being placed near the junction of head and foot. J. W. Spengel has, however, in a most ingenious way shown that these bodies are the representatives of the typical pair of etenidia, here reduced to a mere rudiment. Near to each rudimentary etenidium Spengel has discovered an olfactory patch or osphradium (consisting of modified epithelium) and an olfactory nerve-ganglion (fig. 8). It will be remembered that, according to Spengel, the osphradium of mollusca is definitely and intimately related to the gill-plume or etenidium, being always placed near the base of that organ; further, Spengel has shown that the nerve-supply of this olfactory organ is always derived from the visceral loop. Accordingly, the nerve-supply affords a means of testing the conclusion that we have in Lankester's capito-pedal bodies the rudimentary etenidia. The accompanying diagrams (figs. 9, 10) of the nervous systems of *Patella* and of *Haliotis*, as determined by Spengel, show the identity in the origin of the nerves passing from the visceral loop to Spengel's olfactory ganglion of the Limpet, and that of the nerves which pass from the olfactory patch or osphradium, which lies in immediate relation on the right and on the left side to the right and left gill-plumes (ctenidia) respectively. The same diagrams serve to demonstrate the streptoneurous condition of the visceral loop in Aspidobranchia.

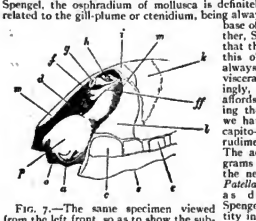

FIG. 7.—The same specimen viewed from the left front, so as to show the sub-anal tract (*ff*) of the larger nephridium, by which it communicates with the pericardium. *o*, Mouth; other letters as in fig. 6.

Thus, then, we find that the limpet possesses a symmetrically disposed pair of ctenidia in a rudimentary condition, and justifies its position among Aspidobranchia. At the same time it possesses a totally distinct series of *functional* gills, which are not derived from the modification of the typical molluscan ctenidium. These gills are in the form of delicate lamellae (fig. 4, *f*), which form a series extending completely round the inner face of the depending mantle-skirt. This circlet of gill-lamellae led Cuvier to class the limpets as Cyclobranchiata, and, by erroneous identification of them with the series of metamerically repeated ctenidia of *Chiton*, to associate the latter mollusc with the former. The gill-lamellae of *Patella* are processes of the mantle comparable with the plait-like folds often observed on the roof of the branchial chamber in other Gastropoda (*e.g. Buccinum* and *Haliotis*). They are termed pallial gills. The only other molluscs in which they are exactly represented are the curious Opisthobranchs *Phyllidia* and *Pleurophyllidia* (fig. 55). In these, as in *Patella*, the typical ctenidia are aborted, and the branchial function is assumed by close-set lamelliform processes arranged in a series beneath the mantle-skirt on either side of the foot. In fig. 4, *d*, the large branchial vein of *Patella* bringing blood from the gill-series to the heart is seen; where it crosses the series of lamellae there is a short interval devoid of lamellae.

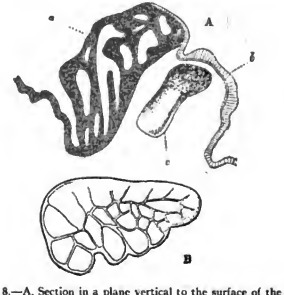

FIG. 8.—A, Section in a plane vertical to the surface of the neck of *Patella* through *a*, the rudimentary ctenidium (Lankester's organ), and *b*, the olfactory epithelium (osphradium); *c*, the olfactory (osphradial) ganglion. (After Spengel.)

B, Surface view of a rudimentary ctenidium of *Patella* excised and viewed as a transparent object. (Lankester.)

The heart in *Patella* consists of a single auricle (not two as in *Haliotis* and *Fissurella*) and a ventricle; the former receives the blood from the branchial vein, the latter distributes it through a large aorta which soon leads into irregular blood-lacunae.

The existence of two renal organs in *Patella*, and their relation to the pericardium (a portion of the coelom), is important. Each renal organ is a sac lined with glandular epithelium (ciliated cell, with concretions) communicating with the exterior by its papilla, and by a narrow passage with the pericardium. The connexion with the pericardium of the smaller of the two renal organs was demonstrated by Lankester in 1867, at a time when the fact that the renal organ of the Mollusca, as a rule, opens into the pericardium, and is therefore a typical nephridium, was not known. Subsequent investigations carried on under the direction of the same naturalist have shown that the larger as well as the smaller renal sac is in communication with the pericardium.

FIG. 9.—Nervous system of *Patella*; the visceral loop is lightly shaded; the buccal ganglia are omitted. (After Spengel.)

c, Cerebral ganglia.
c'c, Cerebral commissure.
pl, Pleural ganglion.
pe, Pedal ganglion.
p'e, Pedal nerve.
s, *s'*, Nerves (right and left) to the mantle.
o, Olfactory ganglion, connected by nerve to the streptoneurous visceral loop.

The walls of the renal sacs are deeply plaited and thrown into ridges. Below the surface these walls are excavated with blood-vessels, so that the sac is practically a series of blood-vessels covered with renal epithelium, and forming

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a meshwork within a space communicating with the exterior. The larger renal sac (remarkably enough, that which is aborted in other

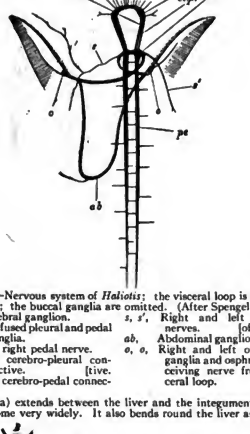

FIG. 10.—Nervous system of *Haliotis*; the visceral loop is lightly shaded; the buccal ganglia are omitted. (After Spengel.)

ce,	Cerebral ganglion.	*s*, *s'*,	Right and left mantle nerves.
pl.pe,	The fused pleural and pedal ganglia.		[of same.
pe,	The right pedal nerve.	*ab*,	Abdominal ganglion or site
ce.pl,	The cerebro-pleural connective.	*o*, *o*,	Right and left olfactory ganglia and osphradia receiving nerve from visceral loop.
	[tive.		
ce.pe,	The cerebro-pedal connec-		

Anisopleura) extends between the liver and the integument of the visceral dome very widely. It also bends round the liver as shown

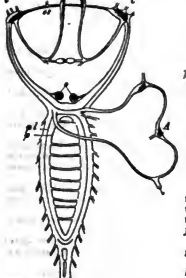

FIG. 11.—Nervous system of *Fissurella*. (From Gegenbaur, after Thering.)

pl,	Pallial nerve.
p,	Pedal nerve.
A,	Abdominal ganglia in the streptoneurous visceral commissure, with supra- and sub-intestine ganglion on each side.
B,	Buccal ganglia.
C, *C*,	Cerebral ganglia.
es,	Cerebral commissure.
o,	Otocysts attached to the cerebro-pedal connectives.

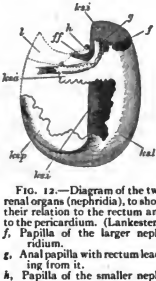

FIG. 12.—Diagram of the two renal organs (nephridia), to show their relation to the rectum and to the pericardium. (Lankester.)

f,	Papilla of the larger nephridium.
g,	Anal papilla with rectum leading from it.
h,	Papilla of the smaller nephridium, which is only represented by dotted outlines.
i,	Pericardium indicated by a dotted outline—at its right side can be seen the two reno-pericardial pores.
ff,	The sub-anal tract of the large nephridium given off near its papilla and seen through the unshaded smaller nephridium.
ks.a,	Anterior superior lobe of the large nephridium.
ks.i,	Left lobe of same.
ks.p,	Posterior lobe of same.
ks.s,	Inferior sub-visceral lobe of same.

in fig. 12, and forms a large sac on half of the upper surface of the muscular mass of the foot. Here it lies close upon the genital body (ovary or testis), and in such intimate relationship with it that, when ripe, the gonad bursts into the renal sac, and its products are carried to the exterior by the papilla on the right side of the anus

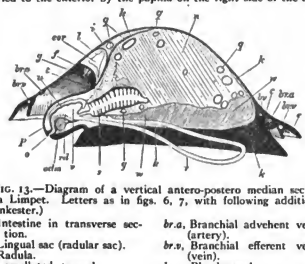

FIG. 13.—Diagram of a vertical antero-postero median section of a Limpet. Letters as in figs. 6, 7, with following additions. (Lankester.)

q,	Intestine in transverse section.
r,	Lingual sac (radular sac).
rd,	Radula.
s,	Lamellated stomach.
t,	Salivary gland.
u,	Duct of same.
v,	Buccal cavity
w,	Gonad.
br.a,	Branchial advehent vessel (artery).
br.v,	Branchial efferent vessel (vein).
bv,	Blood-vessel.
odm,	Muscles and cartilage of the odontophore.
cor,	Heart within the pericardium.

(Robin, Dall). This fact led Cuvier erroneously to the belief that a duct existed leading from the gonad to this papilla. The position of the gonad, best seen in the diagrammatic section (fig. 13), is, as in other Aspidobranchia, devoid of a special duct communicating with the exterior. This condition, probably an archaic one, distinguishes the Aspidobranchia from other Gastropoda.

The digestive tract of *Patella* offers some interesting features. The odontophore is powerfully developed; the radular sac is extraordinarily long, lying coiled in a space between the mass of the liver and the muscular foot. The radula has 160 rows of teeth with twelve teeth in each row. Two pairs of salivary ducts, each leading from a salivary gland, open into the buccal chamber. The oesophagus leads into a remarkable stomach, plaited like the manyplies of a sheep, and after this the intestine takes a very large number of turns embedded in the yellow liver, until at last it passes between the two renal sacs to the anal papilla. A curious ridge (spiral ? valve)

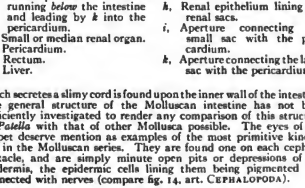

FIG. 14.—Vertical section in a plane running right and left through the anterior part of the visceral hump of *Patella* to show the two renal organs and their openings into the pericardium. (J. T. Cunningham.)

a,	Large or external or right renal organ.
ab,	Narrow process of the same running *below* the intestine and leading by *k* into the pericardium.
b,	Small or median renal organ.
c,	Pericardium.
d,	Rectum.
e,	Liver.
f,	Manyplies.
g,	Epithelium of the dorsal surface.
h,	Renal epithelium lining the renal sacs.
i,	Aperture connecting the small sac with the pericardium.
k,	Aperture connecting the large sac with the pericardium.

which secretes a slimy cord is found upon the inner wall of the intestine. The general structure of the Molluscan intestine has not been sufficiently investigated to render any comparison of this structure of *Patella* with that of other Mollusca possible. The eyes of the limpet deserve mention as examples of the most primitive kind of eye in the Molluscan series. They are found one on each cephalic tentacle, and are simply minute open pits or depressions of the epidermis, the epidermic cells lining them being pigmented and connected with nerves (compare fig. 14, art. CEPHALOPODA).

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The limpet breeds upon the southern English coast in the early part of April, but its development has not been followed. It has simply been traced as far as the formation of a diblastula which acquires a ciliated band, and becomes a nearly spherical trochosphere. It is probable that the limpet takes several years to attain full growth, and during that period it frequents the same spot, which becomes gradually sunk below the surrounding surface, especially if the rock be carbonate of lime. At low tide the limpet (being a strictly intertidal organism) is exposed to the air, and (according to trustworthy observers) quits its attachment and walks away in search of food (minute encrusting algae), and then once more returns to the identical spot, not an inch in diameter, which belongs, as it were, to it. Several millions limpets—twelve millions in Lincolnshire alone—are annually used on the east coast of Britain as bait.

Sub-order 1. *Docoglossa*.—Nervous system without dialyneury. Eyes are open invaginations without crystalline lens. Two osphradia present but no hypobranchial glands nor operculum. Teeth of radula beam-like, and at most three marginal teeth on each side. Heart has only a single auricle, neither heart nor pericardium traversed by rectum. Shell conical without spire.

Fam. 1.—*Acmaeidae*. A single bipectinate ctenidium on left side. *Acmaea*, without pallial branchiae, British. *Scurria*, with pallial branchiae in a circle beneath the mantle.

Fam. 2.—*Tryblidiidae*. Muscle scar divided into numerous impressions. *Trybldium*, Silurian.

Fam. 3.—*Patellidae*. No ctenidia but pallial branchiae in a circle between mantle and foot. *Patella*, pallial branchiae forming a complete circle, no epipodial tentacles, British. *Ancistromesus*, radula with median central tooth. *Nacella*, epipodial tentacles present. *Helcion*, circlet of branchiae interrupted anteriorly, British.

Fam. 4.—*Lepetidae*. Neither ctenidia nor pallial branchiae. *Lepeta*, without eyes. *Pilidium*. *Propilidium*.

Fam. 5.—*Bathysciadiidae*. Hermaphrodite; head with appendage on right side; radula without central tooth. *Bathysciadium*, abyssal.

Sub-order 2. RHIPIDOGLOSSA.—Aspidobranchia with a palliovisceral anastomosis (dialyneurous); eye-vesicle closed, with crystalline lens; ctenidia, osphradia and hypobranchial glands paired or single. Radula with very numerous marginal teeth arranged like the rays of a fan. Heart with two auricles; ventricle traversed by the rectum, except in the *Helicinidae*. An epipodial ridge on each side of the foot and cephalic expansions between the tentacles often present.

Fam. 1.—*Pleurotomariidae*. Shell spiral; mantle and shell with an anterior fissure; two ctenidia; a horny operculum. *Pleurotomaria*, epipodium without tentacles. Genus includes several hundred extinct species ranging from the Silurian to the Tertiary. Five living species from the Antilles, Japan and the Moluccas. Moluccan species is 19 cm. in height.

Fam. 2.—*Bellerophontidae*. 300 species, all fossil, from Cambrian to Trias.

Fam. 3.—*Euomphalidae*. Also extinct, from Cambrian to Cretaceous.

Fam. 4.—*Haliotidae*. Spire of shell much reduced; two bipectinate ctenidia, the right being the smaller; no operculum. *Haliotis*.

Fam. 5.—*Velainiellidae*, an extinct family from the Eocene.

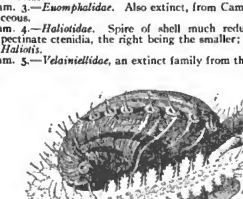

FIG. 15.—*Halio tuberculata*. *d*, Foot; *i*, tentacular processes of the mantle. (From Owen, after Cuvier.)

Fam. 6.—*Fissurellidae*. Shell conical; slit or hole in anterior part of mantle; two symmetrical ctenidia; no operculum. *Emarginula*, mantle and shell with a slit, British. *Scutum*, mantle split anteriorly and reflected over shell, which has no slit. *Punctturella*, mantle and shell with a foramen in front of the apex, British. *Fissurella*, mantle and shell perforated at apex, British.

Fam. 7.—*Cocculinidae*. Shell conical, symmetrical, without slit or perforation. *Cocculina*, abyssal.

Fam. 8.—*Trochidae*. Shell spirally coiled; a single ctenidium; eyes perforated; a horny operculum; lobes between the tentacles. *Trochus*, shell umbilicated, spire pointed and prominent, British. *Monodonta*, no jaws, spire not prominent, no umbilicus, columella toothed. *Gibbula*, with jaws, three pairs of epipodial cirri without pigment spots at their bases, British. *Margarita*, five to seven pairs of epipodial cirri with a pigment spot at base of each.

Fam. 9.—*Stomatellidae*. Spire of shell much reduced; a single ctenidium. *Stomatella*, foot truncated posteriorly, an operculum present, no epipodial tentacles. *Gena*, foot elongated posteriorly, no operculum.

FIG. 16.—*Scutum*, seen from the pedal surface. (Lankester.)
o, Mouth.
T, Cephalic tentacle.
br, One of the two symmetrical gills placed on the neck.

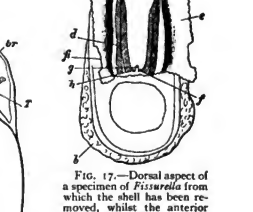

FIG. 17.—Dorsal aspect of a specimen of *Fissurella* from which the shell has been removed, whilst the anterior area of the mantle-skirt has been longitudinally slit and its sides reflected. (Lankester.)
a, Cephalic tentacle.
b, Foot. [plume.
d, Left (archaic right) gill-
e, Reflected mantle-flap.
f, The fissure or hole in the mantle-flap traversed by the longitudinal incision.
f, Right (archaic left) nephridium's aperture.
g, Anus.
h, Left (archaic right) aperture of nephridium.
p, Snout.

Fam. 10.—*Delphinulidae*. Shell spirally coiled; operculum horny; intertentacular lobes absent. *Delphinula*.

Fam. 11.—*Liotiidae*, shell globular, margin of aperture thickened. *Liotia*.

Fam. 12.—*Cyclostrematidae*. Shell flattened, umbilicated; foot anteriorly truncated with angles produced into lobes. *Cyclostrema*. *Teinostoma*.

Fam. 13.—*Trochonematidae*. All extinct, Cambrian to Cretaceous.

Fam. 14.—*Turbinidae*. Shell spirally coiled; epipodial tentacles present; operculum thick and calcareous. *Turbo*. *Astralium*. *Molleria*. *Cyclonema*.

Fam. 15.—*Phasianellidae*. Shell not nacreous, without umbilicus, with prominent spire and polished surface. *Phasianella*.

Fam. 16.—*Umbonidae*. Shell flattened, not umbilicated, generally smooth; operculum horny. *Umbonium*. *Isanda*.

Fam. 17.—*Neritopsidae*. Shell semi-globular, with short spire; operculum calcareous, not spiral. *Neritopsis*. *Naticopsis*, extinct.

Fam. 18.—*Macluritidae*. Extinct, Cambrian and Silurian.

Fam. 19.—*Neritidae*. Shell with very low spire, without umbilicus, internal partitions frequently absorbed; a single ctenidium; a cephalic penis present. *Nerita*, marine. *Neritina*, freshwater, British. *Septaria*, shell boat-shaped.

Fam. 20.—*Titiscaniidae*. Without shell and operculum, but with pallial cavity and ctenidium. *Titiscania*, Pacific.

Fam. 21.—*Helicinidae*. No ctenidium, but a pulmonary cavity; heart with a single auricle, not traversed by the rectum. *Helicina*. *Eutrochatella*. *Stoastoma*. *Boscrcria*.

Fam. 22.—*Hydrocenidae*. No ctenidium, but a pulmonary cavity; operculum with an apophysis. *Hydrocena*, Dalmatia.

Fam. 23.—*Proserpinidae*. No operculum. *Proserpina*, Central America.

Order 2. PECTINIBRANCHIA.—In this order there is no longer any trace of bilateral symmetry in the circulatory, respiratory and excretory organs, the topographically right half of the pallial complex having completely disappeared, except the right kidney, which is

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represented by the genital duct. There is usually a penis in the male. The ctenidium is monopectinate and attached to the mantle along its whole length, except in *Adeorbis* and *Valvata*; in the latter alone it is bipectinate. There is a single well-developed, often pectinated osphradium. The eye is always a closed vesicle, and the internal cornea is extensive. In the radula there is a single central tooth or none.

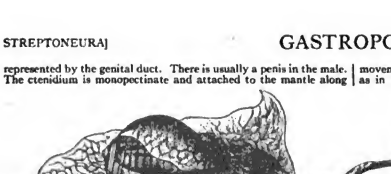

FIG. 18.—Animal and shell of *Pyrula laevigata*. (From Owen.)

a, Siphon.
b, Head-tentacles.
C, Head, the letter placed near the right eye.
d, The foot, expanded as in crawling.
h, The mantle-skirt reflected over the sides of the shell.

The former classification into Holochlamyda, Pneumochlamyda and Siphonochlamyda has been abandoned, as it was founded on adaptive characters not always indicative of true affinities. The order is now divided into two sub-orders: the Taenioglossa, in which there are three teeth on each side of the median tooth of the radula, and the Stenoglossa, in which there is only one tooth on each side of the median tooth. In the latter a pallial siphon, a well-developed proboscis and an unpaired oesophageal gland are always present, in the former they are usually absent. The siphon is an incompletely tubular outgrowth of the mantle margin on the left side, contained in a corresponding outgrowth of the edge of the shell-mouth, and serving to conduct water to the respiratory cavity.

The condition usually spoken of as a "proboscis" appears to be derived from the condition of a simple rostrum (having the mouth at its extremity) by the process of *incomplete introversion* of that simple rostrum. There is no reason in the actual significance of the word why the term "proboscis" should be applied to an alternately introversible and eversible tube connected with an animal's body, and yet such is a very customary use of the term. The introversible tube may be completely closed, as in the "proboscis" of Nemertine worms, or it may have a passage in it leading into a non-eversible oesophagus, as in the present case, and in the case of the eversible pharynx of the predatory Chaetopod worms. The diagrams here introduced (fig. 19) are intended to show certain important distinctions which obtain amongst the various "introverts," or intro-and e-versible tubes so frequently met with in animal bodies. Supposing the tube to be completely introverted and to commence its eversion, we then find that eversion may take place, either by a forward movement of the side of the tube near its attached base, as in the proboscis of the Nemertine worms, the pharynx of Chaetopods and the eye-tentacle of Gastropods, or by a forward movement of the inverted apex of the tube, as in the proboscis of the Rhabdocoel Planarians, and in that of Gastropods here under consideration. The former case we call "pleurecbolic" (fig. 19, A, B, C, H, I, K), the latter "acrecbolic" tubes or introverts (fig. 19, D, E, F, G). It is clear that, if we start from the condition of full eversion of the tube and watch the process of introversion, we shall find that the pleurecbolic variety is introverted by the apex of the tube sinking inwards; it may be called acrembolic, whilst conversely the acrecbolic tubes are pleurembolic. Further, it is obvious enough that the process either of introversion or of eversion of the tube may be arrested at any point, by the development of fibres connecting the wall of the introverted tube with the wall of the body, or with an axial structure such as the oesophagus; on the other hand, the range of movement of the tubular introvert may be unlimited or complete. The acrembolic proboscis or frontal introvert of the Nemertine worms has a complete range. So has the acrembolic pharynx of Chaetopods, if we consider the organ as terminating at that point where the jaws are placed and the oesophagus commences. So too the acrembolic eye-tentacle of the snail has a complete range of movement, and also the pleurembolic proboscis of the Rhabdocoel prostoma. The introverted rostrum of the Pectinibranch Gastropods presents in contrast to these a limited range of movement. The "introvert" in these Gastropods is not the pharynx as in the Chaetopod worms, but a prae-oral structure, its apical limit being formed by the true lips and jaws, whilst the apical limit of the Chaetopod's introvert is formed by the jaws placed at the junction of pharynx and oesophagus, so that the Chaetopod's introvert is part of the stomodaeum or fore-gut, whilst that of the Gastropod is external to the alimentary canal altogether, being in front of the mouth, not behind it, as is the Chaetopod's. Further, the Gastropod's introvert is pleurembolic (and therefore acrecbolic), and is limited both in eversion and in introversion; it cannot be completely everted owing to the muscular bands (fig. 19, G), nor can it be fully introverted owing to the bands (fig. 19, F) which tie the axial pharynx to the adjacent wall of the apical part of the introvert. As in all such intro- and e-versible organs, eversion of the Gastropod proboscis is effected by pressure communicated by the muscular body-wall to the fluid contents (blood) of the body-space, accompanied by the relaxation of the muscles which directly pull upon either the sides or the apex of the tubular organ. The inversion of the proboscis is effected directly by the contraction of these muscles. In various members of the Pectinibranchia the mouth-bearing cylinder is introversible (*i.e.* is a *proboscis*)—with rare exceptions these forms have a siphonate mantle-skirt. On the other hand, many which have a siphonate mantle-skirt are not provided with an introversible mouth-bearing

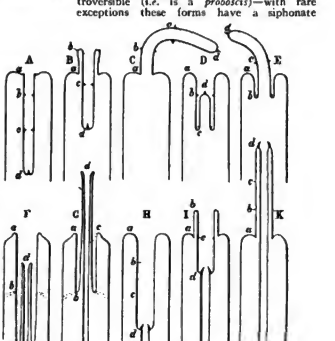

FIG. 19.—Diagrams explanatory of the nature of so-called proboscides or "introverts." (Lankester.)

A, Simple introvert completely introverted.
B, The same, partially everted by eversion of the sides, as in the Nemertine proboscis and Gastropod eye-tentacle = pleurecbolic.
C, The same, fully everted.
D, E, A similar simple introvert in course of eversion by the forward movement, not of its sides, but of its apex, as in the proboscidean Rhabdocoels = acrecbolic.
F, Acrecbolic (= pleurembolic) introvert, formed by the snout of the proboscidiferous Gastropod. *al*, alimentary canal; *d*, the true mouth. The introvert is not a simple one with complete range both in eversion and introversion, but is arrested in introversion by the fibrous bands at *c*, and similarly in eversion by the fibrous bands at *b*.
G, The acrecbolic snout of a proboscidiferous Gastropod, arrested short of complete eversion by the fibrous band *b*.
H, The acrembolic (= pleurecbolic) pharynx of a Chaetopod fully introverted. *al*, alimentary canal; at *d*, the jaws; at *a*, the mouth; therefore *a* to *d* is stomodaeum, whereas in the Gastropod (F) *a* to *d* is inverted body-surface.
I, Partial eversion of H.
K, Complete eversion of H.

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cylinder, but have a simple non-introversible rostrum, as it has been termed, which is also the condition presented by the mouth-bearing region in nearly all other Gastropoda. One of the best examples of the introversible mouth-cylinder or proboscis which can be found is that of the common whelk (*Buccinum undatum*) and its immediate allies. In fig. 23 the proboscis is seen in an everted state; it is only so carried when feeding, being withdrawn when the animal is at rest. Probably its use is to enable

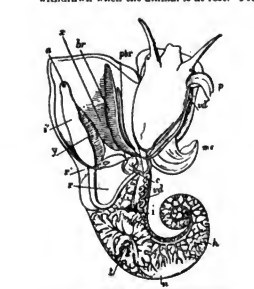

FIG. 20.—Male of *Littorina littoralis*, Lin., removed from its shell; the mantle-skirt cut along its right line of attachment and thrown over to the left side of the animal so as to expose the organs on its inner face.

a, Anus.
i, Intestine.
n, Nephridium (kidney).
r', Aperture of the nephridium.
c, Heart.
br, Ctenidium (gill-plume).
pbr, Parabranchia (= the osphradium or olfactory patch).
x, Glandular lamellae of the inner face of the mantle-skirt.
y, Adrectal (purpuriparous) gland.
t, Testis.
vd, Vas deferens.
p, Penis.
mc, Columella muscle (muscular process grasping the shell).
v, Stomach.
h, Liver.

N.B.—Note the simple snout or rostrum not introverted as a "proboscis."

FIG. 21.—Nervous system of *Paludina* as a type of the streptoneurous condition. (From Gegenbaur, after Jhering.)

B, Buccal (suboesophageal) ganglion.
C, Cerebral ganglion.
Co, Pleural ganglion.
P, Pedal ganglion with otocyst attached.
p, Pedal nerve.
A, Abdominal ganglion at the extremity of the twisted visceral loop.
sp, Supra-intestinal visceral ganglion on the course of the right visceral cord.
sb, Sub-intestinal ganglion on the course of the left visceral cord.

the animal to introduce its rasping and licking apparatus into very narrow apertures for the purposes of feeding, *e.g.* into a small hole bored in the shell of another mollusc.

The very large assemblage of forms coming under this order comprises the most highly developed predaceous sea-snails, numerous vegetarian species, a considerable number of freshwater and some terrestrial forms. The partial dissection of a male specimen of the common periwinkle, *Littorina littoralis*, drawn in fig. 20, will serve to exhibit the disposition of viscera which prevails in the group. The branchial chamber formed by the mantle-skirt overhanging the head has been exposed by cutting along a line extending backward from the letters *ad* to the base of the columella muscle *mc*, and the whole roof of the chamber thus detached from the right side of the animal's neck has been thrown over to the left, showing the organs which lie upon the roof. No opening into the body-cavity has been made; the organs which lie in the coiled visceral hump show through its transparent walls. The head is seen in front resting on the foot and carrying a median non-retractile snout or rostrum, and a pair of cephalic tentacles at the base of each of which is an eye. In many Gastropoda the eyes are not thus sessile but raised upon special eye-tentacles (figs. 25, 56). To the right of the head is seen the muscular penis *p*, close to the termination of the vas deferens (spermatic duct) *vd*. The testis *t* occupies a median position in the coiled visceral mass. Behind the penis on the same side is the hook-like columella muscle, a development of the retractor muscle of the foot, which clings to the spiral column or columella of the shell (see fig. 33). This columella muscle is the same thing as the muscles adhering to the shell in *Patella*, and the posterior adductor of Lamellibranchs.

The surface of the neck is covered by integument forming the floor of the branchial cavity. It has not been cut into. Of the organs lying on the reflected mantle-skirt, that which in its natural state lay nearest to the vas deferens on the right side of the median line of the roof of the branchial chamber is the rectum *s'*, ending in the anus *a*. It can be traced back to the intestine *i* near the surface of the visceral hump, and it is found that the apex of the coil formed by the hump is occupied by the liver *h* and the stomach *v*. Pharynx and oesophagus are concealed in the head. The enlarged glandular structure of the walls of the rectum is frequent in the Pectinibranchia, as is also though not universal the gland marked *y*, next to the rectum. It is the adrectal gland, and in the genera *Murex* and *Purpura* secretes a colourless liquid which turns purple upon exposure to the atmosphere, and was used by the ancients as a dye. Near this and less advanced into the branchial chamber is the single renal organ or nephridium *r* with its opening to the exterior *r'*. Internally this glandular sac presents a second slit or aperture which leads into the pericardium (as is now found to be the case in all Mollusca). The heart *c* lying in the pericardium is seen in close proximity to the renal organ, and consists of a single auricle receiving blood from the gill, and of a single ventricle which pumps it through the body by an anterior and posterior aorta. The surface *x* of the mantle between the rectum and the gill-plume *br* thrown into folds which in many sea-snails (whelks or *Buccinidae*, &c.) are very strongly developed. The whole of this surface appears to be active in the secretion of a mucous-like substance. The single gill-plume *br* lies to the left of the median line in natural position. It corresponds to the right of the two primitive ctenidia in the untwisted archaic condition of the molluscan body, and does not project freely into the branchial cavity, but its axis is attached (by concrescence) to the mantle-skirt (roof of the branchial chamber). It is rare for the gill-plume of a Pectinibranch Gastropod to stand out freely as a plume, but occasionally this more archaic condition is exhibited as in *Valvata* (fig. 30). Next beyond (to the left of) the gill-plume we find the so-called parabranchia, which is here simple, but sometimes bipectinated as in *Purpura* (fig. 22). This appendage has, without reason, been supposed to represent the second ctenidium of the typical mollusc, which it cannot do on account of its position. It should be to the right of the anus were this the case. Spengel showed that the parabranchia of Gastropoda is the typical olfactory organ or osphradium in a highly developed condition. The minute structure of the epithelium which clothes it, as well as the origin of the nerve which is distributed to the parabranchia, proves it to be the same organ which is found universally in molluscs at the base of each gill-plume, and tests the indrawn current of water by the sense of smell. The nerve to this organ is given off from the superior (original right, see fig. 3) visceral ganglion.

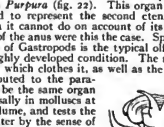

FIG. 22.—Female of *Purpura lapillus* removed from its shell; the mantle-skirt cut along its left line of attachment and thrown over to the right side of the animal so as to expose the organs on its inner face.

a, Anus.
vg, Vagina.
gp, Adrectal purpuriparous gland.
r', Aperture of the nephridium (kidney).
br, Ctenidium (branchial plume).
br', Parabranchia (= the comb-like osphradium or olfactory organ).

The figures which are given here of various Pectinibranchia are in most cases sufficiently explained by the references attached to them. As an excellent general type of the nervous system, attention may be directed to that of *Paludina* drawn in fig. 21. On the whole the ganglia are strongly individualized in the Pectinibranchia, nerve-cell tissue being concentrated in the ganglia and absent from the cords. At the same time, the junction of the visceral loop above the intestine prevents in all Streptoneura the shortening of the visceral loop, and it is rare to find a fusion of the visceral ganglia with either pleural, pedal or cerebral—a fusion which can and does take place where the visceral loop is not above but below the intestine, *e.g.* in the Euthyneura (fig. 48), Cephalopoda and Lamellibranchia. As contrasted with the Aspidobranchia, we find that in the Pectinibranchia the pedal nerves are distinctly nerves given off from the pedal ganglia, rather than cord-like nerve-tracts containing both nerve-cells or ganglionic elements and nerve-fibres. Yet in some Pectinibranchia (*Paludina*) a larder-like arrangement of the two pedal nerves and their lateral branches has been detected. The histology of the nervous system of Mollusca has yet to be seriously inquired into.

The alimentary canal of the Pectinibranchia presents little diversity of character, except in so far as the buccal region is concerned. Salivary glands are present, and in some carnivorous forms (*Dolium*) these secrete free sulphuric acid (as much as 2% is present in the secretion), which assists the animal in boring holes by means of its

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rasping tongue through the shells of other molluscs upon which it preys. A crop-like dilatation of the gut and a recurved intestine, embedded in the compact yellowish-brown liver, the ducts of which open into it, form the rest of the digestive tract and occupy a large bulk of the visceral hump. The buccal region presents a pair of shelly jaws placed laterally upon the lips, and a wide range of variation in the form of the denticles of the lingual ribbon or radula.

Well-developed glandular invaginations occur in different positions on the foot in Pectinibranchia. The most important of these opens by the ventral pedal pore, situated in the median line in the anterior half of the foot. This organ is probably homologous with the byssogenous gland of Lamellibranchs. The aperture, which was formerly supposed to be an aquiferous pore, leads into an extensive and often ramified cavity surrounded by glandular tubules. The gland has been found in both sub-orders of the Pectinibranchia, in *Cyclostoma* and *Cypraea* among the Taenioglossa, in *Hemifusus, Cassis, Nassa, Murex, Fasciolariidae, Turbinellidae, Olividae, Marginellidae* and *Comidae* among the Stenoglossa. It was discovered by J. T. Cunningham that in *Buccinum* the egg-capsules are formed by this pedal gland and not by any accessory organ of the generative system. Such horny egg-capsules doubtless have the same origin in all other species in which they occur, e.g. *Fusus, Pyrula, Purpura, Murex, Nassa, Trophon, Voluta*, &c. The float of the pelagic *Janthina*, to which the egg-capsules are attached, probably is also formed by the secretion of the pedal gland.

Other glands opening on or near the foot are: (1) The suprapedal gland opening in the middle line between the snout and the anterior border of the foot. It is most commonly found in sessile

FIG. 23.—A, *Triton variegatum*, to show the proboscis or buccal introvert (*e*) in a state of eversion.

a, Siphonal notch of the shell occupied by the siphonal fold of the mantle-skirt (Siphonochlamyda).
b, Edge of the mantle-skirt resting on the shell.
c, Cephalic eye.
d, Cephalic tentacle.
e, Everted buccal introvert (proboscis).
f, Foot.
g, Operculum.
h, Penis.
i, Under surface of the mantle-skirt forming the roof of the sub-pallial chamber.

B, Sole of the foot of *Pyrula tuba*, to show *a*, the pore usually said to be "aquiferous" but probably the orifice of a gland; *b*, median line of foot.

forms and in terrestrial genera such as *Cyclostoma*; (2) the anterior pedal gland opening into the anterior groove of the foot, generally present in aquatic species; (3) dorsal posterior mucous glands in certain *Cyclostomatidae*.

The foot of the Pectinibranchia, unlike the simple muscular disk of the Isopleura and Aspidobranchia, is very often divided into lobes, a fore, middle and hind lobe (pro-, meso- and meta-podium, see figs. 24 and 25). Very usually, but not universally, the metapodium carries an operculum. The division of the foot into lobes is a simple case of that much greater elaboration or breaking up into processes and regions which it undergoes in the class Cephalopoda. Even among some Gastropoda (viz. the Opisthobranchia) we find the lobation of the foot still further carried out by the development of lateral lobes, the parapodia, whilst there are many Pectinibranchia, on the other hand, in which the foot has a simple oblong form without any trace of lobes.

The development of the Pectinibranchia has been followed in several examples, *e.g. Paludina, Purpura, Nassa, Vermetus, Neritina*. As in other Molluscan groups, we find a wide variation in the early process of the formation of the first embryonic cells, and their arrangement as a diblastula, dependent on the greater or less amount of food-yolk which is present in the egg-cell when it commences its embryonic changes. In fig. 26 the early stages of *Paludina vivipara* are represented. There is but very little food-material in the egg of this Pectinibranch, and consequently the diblastula forms by invagination; the blastopore or orifice of invagination coincides with the anus, and never closes entirely. A well-marked trochosphere is formed by the development of an equatorial ciliated band; and subsequently, by the disproportionate growth of the lower hemisphere, the trochosphere becomes a veliger. The primitive shell-sac or shell-gland is well marked at this stage, and the pharynx is seen as a new ingrowth (the stomodaeum), about to fuse with and open into the primitively invaginated arch-enteron (fig. 26, F).

In other Pectinibranchia (and such variations are representative for all Mollusca, and not characteristic only of Pectinibranchia) we find that there is a very unequal division of the egg-cell at the commencement of embryonic development, as in *Nassa*. Consequently

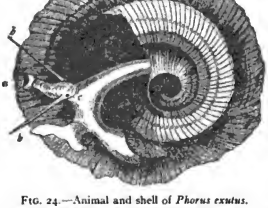

FIG. 24.—Animal and shell of *Phorus exutus*.

a, Snout (not introversible).
b, Cephalic tentacles.
c, Right eye.
d, Pro- and meso-podium; to the right of this is seen the metapodium bearing the sculptured operculum.

there is, strictly speaking, no invagination (emboly), but an overgrowth (epiboly) of the smaller cells to enclose the larger. The general features of this process and of the relation of the blastopore to mouth and anus have been explained in treating of the development of Mollusca generally. In such cases the blastopore may entirely close, and both mouth and anus develop as new ingrowths (stomodaeum and proctodaeum), whilst, according to the observations of N. Bobretzky, the closed blastopore may coincide in position with the mouth in some instances (*Nassa*, &c.), instead of with the anus. But in these epibolic forms, just as in the embolic *Paludina*, the embryo proceeds to develop its ciliated band and shell-gland, passing through the earlier condition of a trochosphere to that of the veliger. In the veliger stage many Pectinibranchia (*Purpura, Nassa*, &c.) exhibit, in the dorsal region behind the head, a contractile area of the body-wall. This acts as a larval heart, but ceases to pulsate after a time. Similar rhythmically contractile

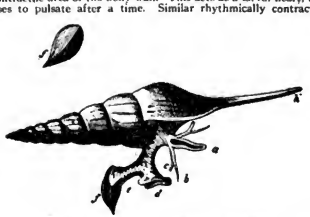

FIG. 25.—Animal and shell of *Rostellaria rectirostris*. (From Owen.)

a, Snout or rostrum.
b, Cephalic tentacle.
c, Eye.
d, Propodium and mesopodium.
e, Metapodium.
f, Operculum.
h', Prolonged siphonal notch of the shell occupied by the siphon, or trough-like process of the mantle-skirt.

areas are found on the foot of the embryo Pulmonate *Limax* and on the yolk-sac (distended foot-surface) of the Cephalopod *Loligo*. The preconchylian invagination or shell-gland is formed in the embryo behind the velum, on the surface opposite the blastopore. It is surrounded by a ridge of cells which gradually extends over the visceral sac and secretes the shell. In forms which are naked in the adult state, the shell falls off soon after the reduction of the velum, but in *Cenia, Runcina* and *Vaginula* the shell-gland and shell are not developed, and the young animal when hatched has already the naked form of the adult.

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One further feature of the development of the Pectinibranchia deserves special mention. Many Gastropoda deposit their eggs, after fertilization, enclosed in capsules; others, as *Paludina*, are viviparous; others, again, as the Zygobranchia, agree with the Lamellibranch Conchifera (the bivalves) in having simple exits for the ova without glandular walls, and therefore discharge their eggs unenclosed in capsules freely into the sea-water; such unencapsuled eggs are merely enclosed each in its own delicate chorion. When

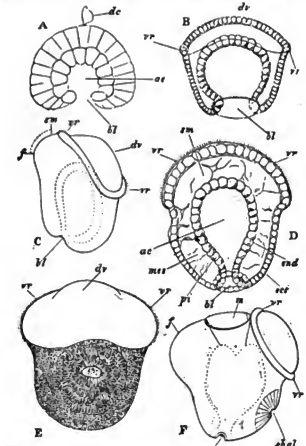

FIG. 26.—Developmentof the River-Snail, *Paludina*, *vivipara*.
(After Lankester, 17.)

dc, Directive corpuscle (outcast cell).
ae, Arch-enteron or cavity lined by the enteric cell-layer or endoderm.
bl, Blastopore.
vr, Velum or circlet of ciliated cells.
dv, Velar area or cephalic dome.
sm, Site of the as yet unformed mouth.
f, Foot.
mes, Rudiments of the skeleto-trophic tissues.
pi, The pedicle of invagination, the future rectum.
shgl, The primitive shell-sac or shell-gland.
m, Mouth.
an, Anus.

A, Diblastula phase (optical section).

B, The diblastula has become a trochosphere by the development of the ciliated ring *vr* (optical section).

C, Side view of the trochosphere with commencing formation of the foot.

D, Further advanced trochosphere (optical section).

E, The trochosphere passing to the veliger stage, dorsal view showing the formation of the primitive shell-sac.

F, Side view of the same, showing foot, shell-sac (*shgl*), velum (*vr*), mouth and anus.

N.B.—In this development the blastopore is not elongated; it persists as the anus. The mouth and stomodaeum form independently of the blastopore.

egg-capsules are formed they are often of large size, have tough walls, and in each capsule are several eggs floating in a viscid fluid. In some cases all the eggs in a capsule develop; in other cases one egg only in a capsule (*Neritina*), or a small proportion (*Purpura*, *Buccinum*), advance in development; the rest are arrested either after the first process of cell-division (cleavage) or before that process. The arrested embryos or eggs are then swallowed and digested by those in the same capsule which have advanced in development. This is clearly the same process in essence as that of the formation of a vitellogenous gland from part of the primitive ovary, or of the feeding of an ovarian egg by the absorption of neighbouring potential eggs; but here the period at which the sacrifice of one egg to another takes place is somewhat late. What it is that determines the arrest of some eggs and the progressive development of others in the same capsule is at present unknown.

In the tribe of Pectinibranchia called Heteropoda the foot takes the form of a swimming organ. The nervous system and sense organs are highly developed. The odontophore also is remarkably developed, its lateral teeth being mobile, and it serves as an efficient organ for attacking the other pelagic forms on which the Heteropoda prey. The sexes are distinct, as in all Streptoneura; and genital ducts and accessory glands and pouches are present, as in all Pectinibranchia. The Heteropoda exhibit a series of modifications in the form and proportions of the visceral mass and foot, leading from a condition readily comparable with that of a typical Pectinibranch such as *Rostellaria*, with the three regions of the foot strongly marked and a coiled visceral hump of the usual proportions, up to a condition in which the whole body is of a tapering cylindrical shape, the foot a plate-like vertical fin, and the visceral hump almost completely atrophied. Three steps of this modification may be

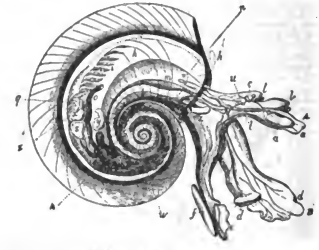

FIG. 27.—*Oxygyrus Keraudrenii*.
(From Owen.)

a, Mouth and odontophore.
b, Cephalic tentacles.
c, Eye.
d, Propodium (*B*) and mesopodium.
e, Metapodium.
f, Operculum.
h, Mantle-chamber.
i, Ctenidium (gill-plume).
k, Retractor muscle of foot.
l, Optic tentacle.
m, Stomach.
n, Dorsal surface overhung by the mantle-skirt; the letter is close to the salivary gland.
o, Rectum and anus.
p, Liver.
q, Renal organ (nephridium).
s, Ventricle.
u, The otocyst attached to the cerebral ganglion.
w, Testis.
x, Auricle of the heart.
y, Vesicle on genital duct.
z, Penis.

distinguished as three families:—*Atlantidae*, *Carinariidae* and *Pterotracheidae*. They are true Pectinibranchia which have taken to a pelagic life, and the peculiarities of structure which they exhibit are strictly adaptations consequent upon their changed mode of life. Such adaptations are the transparency and colourlessness of the tissues, and the modifications of the foot, which still shows in *Atlanta* the form common in Pectinibranchia (compare fig. 27 and fig. 24). The cylindrical body of *Pterotrachaea* is paralleled by the slug-like forms of Euthyneura. J. W. Spengel has shown that the visceral loop of the Heteropoda is streptoneurous. Special to the Heteropoda is the high elaboration of the lingual ribbon, and, as an agreement with some of the opisthobranchiate Euthyneura, but as a difference from the Pectinibranchia, we find the otocysts closely attached to the cerebral ganglia. This is, however, less of a difference than it was at one time supposed to be, for it has been shown by H. Lacaze-Duthiers, and also by F. Leydig, that the otocysts of Pectinibranchia even when lying close upon the pedal ganglion (as in fig. 21) yet receive their special nerve (which can sometimes be readily isolated) from the cerebral ganglion (see fig. 11). Accordingly the difference is one of position of the otocyst and not of its nerve-supply. The Heteropoda are further remarkable for the high development of their cephalic eyes, and for the typical character of their osphradium (Spengel's olfactory organ). This is a groove, the edges of which are raised and ciliated, lying near the branchial plume in the genera which possess that organ, whilst in *Firoloida*, which has no branchial plume, the osphradium occupies a corresponding position. Beneath the ciliated groove is placed an elongated ganglion (olfactory ganglion) connected by a nerve to the supra-intestinal (therefore the primitively dextral) ganglion of the long

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visceral nerve-loop, the strands of which cross one another—this being characteristic of Streptoneura (Spengel).

The Heteropoda belong to the "pelagic fauna" occurring near the surface in the Mediterranean and great oceans in company with the Pteropoda, the Siphonophorous Hydrozoa, Salpae, Leptocephali, and other specially-modified transparent swimming representatives of various groups of the animal kingdom. In development they pass through the typical trochosphere and veliger stages provided with boat-like shell.

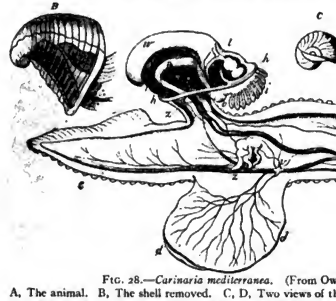

FIG. 28.—*Carinaria mediterranea.* (From Owen.)

A, The animal. B, The shell removed. C, D, Two views of the shell of *Cardiopoda.*

a,	Mouth and odontophore.	*h*,	Border of the mantle-flap.	*u*,	Cerebral ganglion.
b,	Cephalic tentacles.	*i*,	Ctenidium (gill-plume).	*v*,	Pleural and pedal ganglion
c,	Eye.	*m*,	Stomach.	*w*,	Testis.
d,	The fin-like mesopodium.	*n*,	Intestine.	*x*,	Visceral ganglion.
d',	Its sucker.	*o*,	Anus.	*y*,	Vesicula seminalis.
e,	Metapodium.	*p*,	Liver. [ventricle.	*z*,	Penis.
f,	Salivary glands.	*l*,	Aorta, springing from the		

Sub-order 1.—TAENIOGLOSSA. Radula with a median tooth and three teeth on each side of it. Formula 3 : 1 : 3.

Tribe 1.—PLATYPODA. Normal Taenioglossa of creeping habit. The foot is flattened ventrally, at all events in its anterior part (*Strombidae*). Otocysts situated close to the pedal nerve-centres. Accessory organs are rarely found on the genital ducts, but occur in *Paludina, Cyclostoma, Naticidae, Calyptraeidae,* &c. Mandibles usually present. This is the largest group of Mollusca, including nearly sixty families, some of which are insufficiently known from the anatomical point of view.

Fam. 1.—*Paludinidae.* Pedal centres in the form of ganglionated cords; kidney provided with a ureter; viviparous; fluviatile. *Paludina. Neothauma,* from Lake Tanganyika. *Tylopoma,* extinct, Tertiary.

Fam. 2.—*Cyclophoridae.* No ctenidium, pallial cavity transformed into a lung; aperture of shell circular; terrestrial.

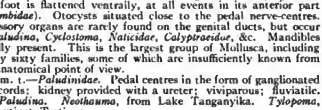

FIG. 29.—*Pterotrachea mutica* seen from the right side. (After Keferstein.)

a,	Pouch for reception of the snout when retracted.	*s*,	Stomach.
		i,	Intestine.
c,	Pericardium.	*n*,	So-called nucleus.
ph,	Pharynx.	*br*,	Branchial plume (ctenidium).
oc,	Cephalic eye.	*os*,	Osphradium.
g,	Cerebral ganglion.	*mt*,	Foot (metapodium).
g',	Pleuro-pedal ganglion.	*z*,	Caudal appendage.
pr,	Foot (mesopodium).		

Pomatias, shell turriculated. *Diplommatina. Hybocystis. Cyclophorus,* shell umbilicated, with a short spire and horny operculum. *Cyclosurus,* shell uncoiled. *Dermatocera,* foot with a horn-shaped protuberance at its posterior end. *Spiraculum.*

Fam. 3.—*Ampullaridae.* To the left of the ctenidium a pulmonary sac, separated from it by an incomplete septum, amphibious. *Ampullaria,* shell dextral, coiled. *Lanistes,* shell sinistral, spire short or obsolete. *Meladomus.*

Fam. 4.—*Litorinidae.* Oesophageal pouches present; pedal nerve-centres concentrated; a pedal penis near the right tentacle. *Littorina,* shell not umbilicated, littoral habit. *Lacuna,* foot with two posterior appendages, marine, entirely aquatic. *Cremnoconchus,* entirely aerial, Indian. *Risella. Teclarius.*

Fam. 5.—*Fossaridae.* Head with two lobes in some Rhipidoglossa. *Fossaria.*

Fam. 6.—*Purpurinidae,* extinct.

Fam. 7.—*Planaxidae.* Shell with pointed spire; a short pallial siphon. *Planaxis.*

Fam. 8.—*Cyclostomatidae.* Pallial cavity transformed into a lung; pedal centres concentrated; a deep pedal groove. *Cyclostoma,* shell turbinated, operculum calcareous, British. *Omphalotropis.*

Fam. 9.—*Aciculidae.* Pallial cavity transformed into a lung; operculum horny; shell narrow and elongated. *Acicula.*

Fam. 10.—*Valvatidae.* Ctenidium bipectinate, free; hermaphrodite; fluviatile. *Valvata,* British.

Fam. 11.—*Rissoidae.* Epipodial filaments present; one or two pallial tentacles. *Rissoa. Rissoina. Stira.*

Fam. 12.—*Litiopidae.* An epipodium bearing three pairs of tentacles and an operculigerous lobe with two appendages; inhabitants of the Sargasso weed. *Litiopa.*

Fam. 13.—*Adeorbidae.* Mantle with two posterior appendages; ctenidium large and capable of protrusion from pallial cavity. *Adeorbis,* British.

Fam. 14.—*Jeffreysiidae.* Head with two long labial palps; shell ovoid; operculum horny, semicircular, carinated. *Jeffreysia.*

Fam. 15.—*Homalogyridae.* Shell flattened; no cephalic tentacles. *Homalogyra,* British. *Ammoniceras.*

Fam. 16.—*Skeneidae.* Shell depressed, with rounded aperture; cephalic tentacles long. *Skenea,* British.

Fam. 17.—*Choristidae.* Shell spiral; four cephalic tentacles; eyes absent; two pedal appendages. *Choristes.*

Fam. 18.—*Assimineidae.* Eyes at free extremities of tentacles. *Assiminea,* estuarine, British.

Fam. 19.—*Truncatellidae.* Snout very long, bilobed; foot short. *Truncatella.*

Fam. 20.—*Hydrobiidae.* Shell with prominent spire; penis distant from right tentacle, generally appendiculated; brackish water or fluviatile. *Hydrobia,* British. *Baikalia,* from Lake Baikal. *Pomatiopsis. Bithynella. Lithoglyphus. Spekia,* viviparous, from Lake Tanganyika. *Tanganycia. Limnotrochus,* from Lake Tanganyika. *Chyra. Litorinida. Bithynia,* British, fluviatile. *Stenothyra.*

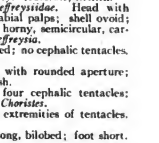

FIG. 30.—*Valvata cristata,* Müll.

Fam. 21.—*Melanisidae.* Spire of shell somewhat elongated; mantle-border fringed; viviparous; fluviatile. *Melania. Faunus. Paludomus. Melanopsis, Nassopsis. Bythoceras,* from Lake Tanganyika.

Fam. 22.—*Typhobiidae.* Foot wide; shell turriculated, with carinated whorls, the carinae tuberculated or spiny. *Typhobia. Bathanalia,* from Lake Tanganyika.

Fam. 23.—*Pleuroceridae.* Like *Melanitidae,* but mantle-border not fringed and reproduction oviparous. *Pleurocera. Anculotus.*

Fam. 24.—*Pseudomelaniidae.* All extinct.

Fam. 25.—*Subulitidae.* All extinct.

Fam. 26.—*Nerineidae.* All extinct.

Fam. 27.—*Cerithiidae.* Shell with numerous tuberculated whorls; aperture canaliculated anteriorly; short pallial siphon. *Cerithium. Bittium. Potamides. Triforis. Laeocochlis. Cerithiopsis.*

Fam. 28.—*Modulidae.* Shell with short spire; no siphon. *Modulus.*

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Fam. 29.—*Vermetidae.* Animal fixed by the shell, the last whorls of which are not in contact with each other; foot small; two anterior pedal tentacles. *Vermetus. Siliquaria.*

Fam. 30.—*Caecidae.* Shell almost completely uncoiled, in one plane, with internal septa. *Caecum*, British.

Fam. 31.—*Turritellidae.* Shell very long; head large; foot broad. *Turritella*, British. *Mesalia. Mathilda.*

Fam. 32.—*Struthiolariidae.* Shell conical; aperture slightly canaliculated; siphon slightly developed. *Struthiolaria.*

Fam. 33.—*Chenopodidae.* Shell elongated; aperture expanded; siphon very short. *Chenopus*, British. *Alaria, Spinigera, Diartema*, extinct.

Fig. 31.—Shell of *Cruciblum*, seen from below so as to show the inner whorl *b*, concealed by the cap-like outer whorl *a*.

Fam. 34.—*Strombidae.* Foot narrow, compressed, without sole. *Strombus. Pteroceras. Rostellaria. Terebellum.*

Fam. 35.—*Xenophoridae.* Foot transversely divided into two parts. *Xenophorus. Estrochus*, Silurian.

Fam. 36.—*Capulidae.* Shell conical, not coiled, but slightly incurved posteriorly; a tongue-shaped projection between snout and foot. *Capulus. Thyca*, parasitic on asterids. *Platyceras*, extinct.

Fam. 37.—*Hipponycidae.* Shell conical; foot secreting a ventral calcareous plate; animal fixed. *Hipponyx. Mitrularia.*

Fam. 38.—*Calyptraeidae.* Shell with short spire; lateral cervical lobes present; accessory genital glands. *Calyptraea*, British. *Crepidula. Crucibulum.*

Fam. 39.—*Naricidae.* Foot divided into two, posterior half bearing the operculum; a wide epipodial velum; shell turbinated. *Narica.*

Fam. 40.—*Naticidae.* Foot large, with aquiferous system; propodium reflected over head; eyes degenerate; burrowing habit. *Natica*, British. *Amaura. Sigaretus.*

Fam. 41.—*Lamellariidae.* Shell thin, more or less covered by the mantle; no operculum. *Lamellaria. Velutina. Marsenina, Oncidiopsis*, hermaphrodite.

Fam. 42.—*Trichotropidae.* Shell with short spire, carinate and pointed. *Trichotropis.*

Fam. 43.—*Seguenziidae.* Shell trochiform, with canaliculated aperture and twisted columella. *Seguenzia*, abyssal.

Fam. 44.—*Janthinidae.* Shell thin; operculum absent; tentacles bifid; foot secretes a float; pelagic. *Janthina. Recluzia.*

Fam. 45.—*Cypraeidae.* Shell inrolled, solid, polished, aperture very narrow in adult; short siphon; anus posterior; osphradium with three lobes; mantle reflected over shell. *Cypraea. Pustularia. Ovula. Pedicularia*, attached to corals. *Erato.*

Fam. 46.—*Tritonidae.* Shell turriculated and siphonated, thick, each whorl with varices; foot broad and truncated anteriorly; pallial siphon well developed; proboscis present. *Triton. Persona. Ranella.*

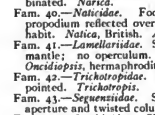

Fig. 32.—Animal and shell of *Ovula*. *b*, Cephalic tentacles. *d*, Foot. *h*, Mantle-skirt, which is naturally carried in a reflected condition so as to cover the sides of the shell.

Fam. 47.—*Columbellinidae.* All extinct.

Fam. 48.—*Cassididae.* Shell ventricose, with elongated aperture, and short spire; proboscis and siphon long; operculum with marginal nucleus. *Cassis. Cassidaria. Oniscia.*

Fam. 49.—*Oocorythidae.* Shell globular and ventricose; aperture oval and canaliculated; operculum spiral. *Oocorys*, abyssal.

Fam. 50.—*Dolisidae.* Shell ventricose, with short spire, and wide aperture; no varices and no operculum; foot very broad, with projecting anterior angles; siphon long. *Dolium. Pyrula.*

Fam. 51.—*Solariidae. Solarium. Torinia. Fluxina.*

Fam. 52.—*Scalariidae.* Shell turriculated, with elongated spire; proboscis short; siphon rudimentary. *Scalaria. Eglisia. Crossea. Acilis.*

The three following families have neither radula nor jaws, and are therefore called *Aglossa*. They have a well-developed proboscis which is used as a suctorial organ; some are abyssal, but the majority are either commensals or parasites of Echinoderms.

Fam. 53.—*Pyramidellidae.* Summit of spire heterostrophic; a projection, the mentum, between head and foot; operculum present. *Pyramidella. Turbonilla. Odostomia*, British. *Myxus.*

Fig. 33.—Section of the shell of *Triton*, Cuv. (From Owen.)
a, Apex.
ac, Siphonal notch of the mouth of the shell.
ac to *pc*, Mouth of the shell.
w, *w*, Whorls of the shell.
s, *s*, Sutures.
Occupying the axis, and exposed by the section, is seen the "columella" or spiral pillar. The upper whorls of the shell are seen to be divided into separate chambers by the formation of successively formed "septa."

Fam. 54.—*Eulimidae.* Visceral mass still coiled spirally; shell thin and shining. *Eulima*, foot well developed, with an operculum, animal usually free, but some live in the digestive cavity of Holothurians. *Mucronalia*, foot reduced, but still operculum present, animal fixed by its very long proboscis which is deeply buried in the tissues of an Echinoderm, no pseudopallium. *Stylifer*; the operculum is lost, animal fixed by a large proboscis which forms a pseudopallium covering the whole shell except the extremity of the spire, parasitic on all groups of Echinoderms. *Entosiphon*, visceral mass still coiled; shell much reduced, proboscis very long forming a pseudopallium which covers the whole body and projects beyond in the form of a siphon, foot and nervous system present, eyes, branchia and anus absent, parasite in the Holothurian *Deima blakei* in the Indian Ocean.

Fam. 55.—*Entoconchidae.* No shell; visceral mass not coiled; sensory organs, nervous system, branchia or anus; body reduced to a more or less tubular sac; hermaphrodite and viviparous; parasitic in Holothurians; larvae are veligers, with shell and operculum. *Entocolax*, mouth at free extremity, animal fixed by mouth orifice of pseudopallium, Pacific. *Entoconcha*, body elongated and tubular, animal fixed by the oral extremity, protandric hermaphrodite, parasitic in testes of Holothurians causing their abortion. *Enterozenos*, no pseudopallium and no intestine, hermaphrodite, larvae with operculum.

Tribe 1.—Heteropoda. Pelagic Taenioglossa with foot large and laterally compressed to form a fin.

Fam. 1. *Atlantidae.* Visceral sac and shell coiled in one plane; foot divided transversely into two parts, posterior part bearing an operculum, anterior part forming a fin provided with a sucker. *Atlanta. Oxygyrus.*

Fam. 2.—*Carinariidae.* Visceral sac and shell small in proportion to the rest of the body, which cannot be withdrawn into the shell; foot elongated, fin-shaped, with sucker, but without operculum. *Carinaria. Cardiopoda.*

Fam. 3.—*Pterotrachaeidae.* Visceral sac very much reduced; without shell or mantle; anus posterior; foot provided with sucker in male only. *Pterotrachaea. Firoloida. Pterosoma.*

Sub-order 2.—Stenoglossa. Radula narrow with one lateral tooth on each side, and one median tooth or none.

Tribe 1.—Rachiglossa. Radula with a median tooth and a single

Fig. 34.—Female *Janthina*, with egg-float (*a*) attached to the foot; *b*, egg-capsules; *c*, ctenidium (gill-plume); *d*, cephalic tentacles.

tooth on each side of it. Formula 1 : 1 : 1. Rudimentary jaws present.

Fam. 1.—*Turbinellidae.* Shell solid, piriform, with thick folded columella; lateral teeth of radula bicuspidate. *Turbinella. Cynodonta. Fulgur. Hemifusus. Tudicla. Strepsidura.*

Fam. 2.—*Fasciolariidae.* Shell elongated, with long siphon; lateral teeth of radula multicuspidate. *Fasciolaria. Fusus. Clavella. Latirus.*

Fam. 3.—*Mitridae.* Shell fusiform and solid, aperture elongated, columella folded; no operculum; eyes on sides of tentacles. *Mitra. Turricula. Cylindromitra. Imbricaria.*

Fam. 4.—*Buccinidae.* Foot large and broad; eyes at base of

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tentacles; operculum horny. *Buccinum. Chrysodomus. Liomesus. Cominella. Tritoniden. Pisania. Eulria. Phos. Dipsacus.*

Fam. 5.—*Nassidae.* Foot broad, with two slender posterior appendages; operculum unguiculate. *Nassa*, marine, British. *Canidia*, fluviatile. *Bullia.*

Fam. 6.—*Muricidae.* Shell with moderately long spire and canal, ornamented with ribs, often spiny; foot truncated anteriorly. *Murex*, British. *Trophon*, British. *Typhis. Ureosalpinx. Lachesis.*

Fam. 7.—*Purpuridae.* Shell thick, with short spire, last whorl large and canal short; aperture wide; operculum horny. *Purpura*, British. *Rapana. Monoceros. Sistrum. Concholepas.*

Fam. 8.—*Haliidae.* Shell ventricose, thin and smooth, with wide aperture; foot large and thick, without operculum. *Halia.*

Fam. 9.—*Cancellariadae.* Shell ovoid, with short spire and folded columella; foot small, no operculum; siphon short. *Cancellaria.*

Fam. 10.—*Columbellidae.* Spire of shell prominent, aperture narrow, canal very short, columella crenelated; foot large. *Columbella.*

Fam. 11.—*Coralliophilidae.* Shell irregular; radula absent; foot and siphon short; sedentary animals, living in corals. *Corallíophila. Rhizochilus. Leptoconchus. Magilus. Rupa.*

Fam. 12.—*Volutidae.* Head much flattened and wide, with eyes on sides; foot broad; siphon with internal appendages. *Voluta. Cuvierea. Cymba.*

Fam. 13.—*Olividae.* Foot with anterior transverse groove; a posterior pallial tentacle; generally burrowing. *Oliva. Olivella. Ancillaria. Agaronia.*

Fam. 14.—*Marginellidae.* Foot very large; mantle reflected over shell. *Marginella. Pseudomarginella.*

Fam. 15.—*Harpidae.* Foot very large; without operculum; shell with short spire and longitudinal ribs; siphon long. *Harpa.*

Tribe 2.—Toxiglossa. No jaws. No median tooth in radula. Formula: 1:0:1. Poison-gland present whose duct traverses the nerve-collar.

Fam. 1.—*Pleurotomatidae.* Shell fusiform, with elongated spire; margin of shell and mantle notched. *Pleurotoma. Clavatula. Mangilia. Bela. Pusionella. Pontiothauma.*

Fam. 2.—*Terebridae.* Shell turriculated, with numerous whorls; aperture and operculum oval; eyes at summits of tentacles; siphon long. *Terebra.*

Fam. 3.—*Conidae.* Shell conical, with very short spire, and narrow aperture with parallel borders; operculum unguiform. *Conus.*

Sub-Class II.—Euthyneura

The most important general character of the Euthyneura is the absence of torsion in the visceral commissure, and the more posterior position of the anus and pallial organs. Comparative anatomy and embryology prove that this condition is due, not as formerly supposed to a difference in the relations of the visceral commissure which prevented it from being included in the torsion of the visceral hump, but to an actual detorsion which has taken place in evolution and is repeated to a great extent in individual development. In several of the more primitive forms the same torsion occurs as in Streptoneura, viz. in *Actaeon* and *Limacina* among Opisthobranchia, and *Chilina* among Pulmonata. *Actaeon* is prosobranchiate, the visceral commissure is twisted in *Actaeon* and *Chilina*, and even slightly still in *Bulla* and *Scaphander*; in *Actaeon* and *Limacina* the osphradium is to the left, innervated by the supra-intestinal ganglion. But in the other members of the sub-class the detorsion of the visceral mass has carried back the anus and circumanal complex from the anterior dorsal region to the right side, as in *Bulla* and *Aplysia*, or even to the posterior end of the body, as in *Philine, Oncidium, Doris*, &c. Different degrees of the same process of detorsion are, as we have seen, exhibited by the Heteropoda among the Streptoneura, and both in them and in the Euthyneura the detorsion is associated with degeneration of the shell. Where the modification is carried to its extreme degree, not only the shell but the pallial cavity, ctenidium and visceral hump disappear, and the body acquires a simple elongated form and a secondary external symmetry, as in *Pterotrachaea* and in *Doris*, *Eolis*, and other Nudibranchia. These facts afford strong support to the hypothesis that the weight of the shell is the original cause of the torsion of the dorsal visceral mass in Gastropods. But this hypothesis leaves the elevation of the visceral mass and the exogastric coiling of the shell in the ancestral form unexplained.

In those Euthyneura in which the shell is entirely absent in the adult, it is, except in the three genera *Cenia*, *Runcina* and *Vaginula*, developed in the larva and then falls off. In other cases (Tectibranchs) the reduced shell is enclosed by upgrowths of the edge of the mantle and becomes internal, as in many Cephalopods. A few Euthyneura in which the shell is not much reduced retain an operculum in the adult state, *e.g. Actaeon*, *Limacina*, and the marine Pulmonate, *Amphibola*. The detorted visceral commissure shows a tendency to the concentration of all its elements round the oesophagus, so that except in the Bullomorpha and in *Aplysia* the whole nervous system is aggregated in the cephalic region, either dorsally or ventrally. The

Fig. 35.—*Acera bullata*. A single row of teeth of the Radula. (Formula, x.1.x.)

radula has a number of uniform teeth on each side of the median tooth in each transverse row. The head in most cases bears two pairs of tentacles. All the Euthyneura are hermaphrodite.

In the most primitive condition the genital duct is single throughout its length and has a single external aperture; it is therefore said to be monaulic. The hermaphrodite aperture is on the right side near the opening of the pallial cavity, and a ciliated groove conducts the spermatozoa to the penis, which is situated more anteriorly. This is the condition in the Bullomorpha, the Aplysiomorpha, and in one Pulmonate, *Pythia*. In some cases while the original aperture remains undivided, the seminal groove is closed and so converted into a canal. This is the modification found in *Cavolinia longirostris* among the Bullomorpha, and in all the *Auriculidae* except *Pythia*. A further degree of modification occurs when the male duct takes its origin from the hermaphrodite duct above the external opening, so that there are two distinct apertures, one male and one female, the latter being the original opening. The genital duct is now said to be diaulic, as in *Valvata*, *Oncidiopsis*, *Actaeon*, and *Lobiger* among the Bullomorpha, in the *Pleurobranchidae*, in the Nudibranchia, except the Doridomorpha and most of the Elysiomorpha, and in the Pulmonata. Originally in this condition the female aperture is at some distance from the male, as in the Basommatophora and in other cases; but in some forms the female aperture itself has shifted and come to be contiguous with the male opening and penis as in the Stylommatophora. In all these cases the female duct bears a bursa copulatrix or receptaculum seminis. In some forms this receptacle acquires a separate external opening remaining connected with the oviduct internally. There are thus two female openings, one for copulation, the other for oviposition, as well as a male opening. The genital duct is now trifurcated or triaulic, a condition which is confined to certain Nudibranchs, viz. the Doridomorpha and most of the Elysiomorpha.

The Pteropoda, formerly regarded as a distinct class of the Mollusca, were interpreted by E. R. Lankester as a branch of the Cephalopoda, chiefly on account of the protrusible sucker-bearing processes at the anterior end of *Pneumonoderma*. These he considered to be homologous with the arms of Cephalopods. He fully recognized, however, the similarity of Pteropods to Gastropods in their general asymmetry and in the torsion of the visceral mass in *Limacinidae*. It is now understood that they are Euthyneurous Gastropods adapted to natatory locomotion and pelagic life. The sucker-bearing processes of *Pneumonoderma* are outgrowths of the proboscis. The fins of Pteropods are now interpreted as the expanded lateral margins of the foot, termed parapodia, not homologous with the siphonof Cephalopods which is formed from epipodia. The Thecosomatous Pteropods are allied to *Bulla*, the Gymnosomatous forms to *Aplysia*. The Euthyneura comprises two orders, Opisthobranchia and Pulmonata.

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Order 1.—Opisthobranchia. Marine Euthyneura, the more archaic forms of which have a relatively large foot and a small visceral hump, from the base of which projects on the right side a short mantle-skirt. The anus is placed in such forms far back beyond the mantle-skirt. In front of the anus, and only partially covered

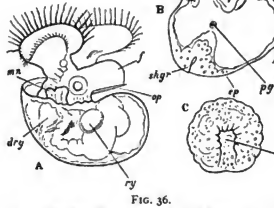

Fig. 36.

A, Veliger-larva of an Opisthobranch (*Polycera*). *f*, Foot; *op*, operculum; *mn*, anal papilla; *ry*, *dry*, two portions of unabsorbed nutritive yolk on either side of the intestine. The right otocyst is seen at the root of the foot.

B, Trochosphere of an Opisthobranch (*Pleurobranchidium*) showing—*shgr*, the shell-gland or primitive shell-sac; *v*, the cilia of the velum; *ph*, the commencing stomodaeum or oral invagination; *ot*, the left otocyst; *pg*, red-coloured pigment spot.

C, Diblastula of an Opisthobranch (*Polycera*) with elongated blastopore *oi*.

(All from Lankester.)

by the mantle-skirt, is the ctenidium with its free end turned backwards. The heart lies in front of, instead of to the side of, the attachment of the ctenidium—hence Opisthobranchia as opposed to "Prosobranchia," which correspond to the Streptoneura. A shell is possessed in the adult state by but few Opisthobranchia, but all pass through a veliger larval stage with a nautiloid shell (fig. 36). Many Opisthobranchia have by a process of atrophy lost the typical ctenidium and the mantle-skirt, and have developed other organs in their place. As in some Pectinibranchia, the free margin of the mantle-skirt is frequently reflected over the shell when a shell exists; and, as in some Pectinibranchia, broad lateral outgrowths of the foot (parapodia) are often developed which may be thrown over the shell or naked dorsal surface of the body.

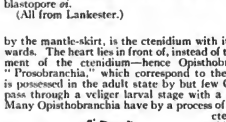

Fig. 37.—*Phyllirhoë bucephala*, twice the natural size, a transparent pisciform pelagic Opisthobranch. The internal organs are shown as seen by transmitted light. (After W. Keferstein.)

a, Mouth.
b, Radular sac.
c, Oesophagus.
d, Stomach.
c', Intestine.
f, Anus.
g, *g'*, *g''*, *g'''*, The four lobes of the liver.
h, The heart (auricle and ventricle).
i, The renal sac (nephridium).
i', The ciliated communication of the renal sac with the pericardium.
m, The external opening of the renal sac.
n, The cerebral ganglion.
o, The cephalic tentacles.
f, The genital pore.
y, The ovo-testes.
w, The parasitic hydromedusa *Mnestra*, usually found attached in this position by the aboral pole of its umbrella.

The variety of special developments of structure accompanying the atrophy of typical organs in the Opisthobranchia and general degeneration of organization is very great. The members of the order present the same wide range of superficial appearance as do the Pectinibranchiate Streptoneura, forms carrying well-developed spiral shells and large mantle-skirts being included in the group, together with flattened or cylindrical slug-like forms. But in respect of the substitution of other parts for the mantle-skirt and for the gill which the more degenerate Opisthobranchia exhibit, this order stands alone. Some Opisthobranchia are striking examples of degeneration (some Nudibranchia), having none of those regions or processes of the body developed which distinguish the archaic Mollusca from such flat-worms as the Dendrocoel Planarians. Indeed, were it not for their retention of the characteristic odontophore we should have little or no indication that such forms as *Phyllirhoë* and *Limapontia* really belong to the Mollusca at all. The interesting little *Rhodope norvegi*, which has no odontophore, has been associated by systematists both with these simplified Opisthobranchs and with Rhabdocoel Planarians.

In many respects the sea-hare (*Aplysia*), of which several species are known (some occurring on the English coast), serves as a convenient example of the fullest development of the organization characteristic of Opisthobranchia. The woodcut (fig. 38) gives a faithful representation of the great mobility of the various parts of the body. The head is well marked and joined to the body by a somewhat constricted neck. It carries two pairs of cephalic tentacles and a pair of sessile eyes. The visceral hump is low and not drawn out into a spire. The foot is long, carrying the oblong visceral mass upon it, and projecting (as metapodium) a little beyond it (*f*). Laterally the foot gives rise to a pair of mobile fleshy lobes, the parapodia (*ep*), which can be thrown up so as to cover in the dorsal surface of the animal. Such parapodia are common, though by no means universal, among Opisthobranchia. The torsion of the visceral hump is not carried out very fully, the consequence being that the anus has a posterior position a little to the right of the median line above the metapodium, whilst the branchial chamber formed by the overhanging mantle-skirt faces the right side of the body instead of lying well to the front as in Streptotnura and as in Pulmonate Euthyneura. The gill-plume, which in *Aplysia* is the typical Molluscan ctenidium, is seen in fig. 39 projecting from the branchial sub-pallial space.

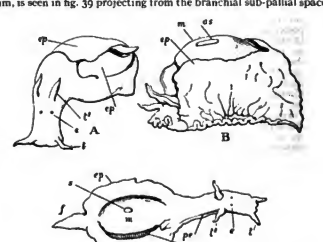

Fig. 38.—Three views of *Aplysia sp.*, in various conditions of expansion and retraction. (After Cuvier.)

t, Anterior cephalic tentacles.
t', Posterior cephalic tentacles.
e, Eyes.
f, Metapodium.
ep, Epipodium.
g, Gill-plume (ctenidium).
m, Mantle-flap reflected over the thin oval shell.
os, *s*, Orifice formed by the unclosed border of the reflected mantle-skirt, allowing the shell to show.
pe, The spermatic groove.

The relation of the delicate shell to the mantle is peculiar, since it occupies an oval area upon the visceral hump, the extent of which is indicated in fig. 38, C, but may be better understood by a glance at the figures of the allied genus *Umbrella* (fig. 40), in which the margin of the mantle-skirt coincides, just as it does in the limpet, with the margin of the shell. But in *Aplysia* the mantle is reflected over the edge of the shell, and grows over its upper surface so as to completely enclose it, excepting at the small central area *s* where the naked shell is exposed. This enclosure of the shell is a permanent development of the arrangement seen in many Streptoneura (*e.g. Pyrula*, *Ovula*, see figs. 18 and 32), where the border of the mantle can be, and usually is, drawn over the shell, though it is withdrawn (as it cannot be in *Aplysia*) when they are irritated. From the fact that *Aplysia* commences its life as a free-swimming veliger with a nautiloid shell not enclosed in any way by the border of the mantle, it is clear that the enclosure of the shell in the adult is a secondary process. Accordingly, the shell of *Aplysia* must not be confounded with a primitive shell in its shell-sac, such as we find realized in the shells of *Chiton* and in the plugs which form in the remarkable transitory "shell-sac" or "shell-gland" of Molluscan embryos (see figs. 26, 60). *Aplysia*, like other Mollusca, develops a primitive shell-sac in its trochosphere stage of development, which disappears and is succeeded by a nautiloid shell (fig. 36). This forms the nucleus of the adult shell, and, as the animal grows, becomes enclosed by a reflection of the mantle-skirt. When the shell of an *Aplysia* enclosed in its mantle is pushed well to the left, the sub-pallial space is fully exposed as in fig. 39, and the various apertures of the body are seen.

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Posteriorly we have the anus, in front of this the lobate gill-plume, between the two (hence corresponding in position to that of the Pectinibranchia) we have the aperture of the renal organ. In front, near the anterior attachment of the gill-plume, is the osphradium (olfactory organ) discovered by J. W. Spengel, yellowish in colour, in the typical position, and overlying an olfactory ganglion with typical nerve-connexion (see fig. 43). To the right of Spengel's osphradium is the opening of a peculiar gland which has, when dissected out, the form of a bunch of grapes; its secretion is said to be poisonous. On the under side of the free edge of the mantle are situated the numerous small cutaneous glands which, in the large *Aplysia camelus* (not in other species), form the purple secretion which was known to the ancients. In front of the osphradium is the single genital pore, the aperture of the common or hermaphrodite duct. From this point there passes forward to the right side of the head a groove—the spermatic groove—down which the spermatic fluid passes. In other Euthyneura this groove may close up and form a canal. At its termination by the side of the head is the muscular introvertent penis. In the hinder part of the foot (not shown in any of the diagrams) is the opening of a large mucus-forming gland very often found in the Mollusean foot.

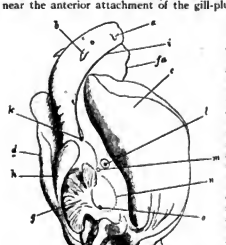

FIG. 39.—*Aplysia leporina* (*camelus*, Cuv.), with epipodia and mantle reflected away from the mid-line. (Lankester.)

a, Anterior cephalic tentacle.
b, Posterior cephalic tentacle; between *a* and *b*, the eyes.
c, Right epipodium.
d, Left epipodium.
e, Hinder part of visceral hump.
fp, Posterior extremity of the foot.
fa, Anterior part of the foot underlying the head.
g, The ctenidium (branchial plume).
h, The mantle-skirt tightly spread over the horny shell and pushed with it towards the left side.
i, The spermatic groove.
k, The common genital pore (male and female).
l, Orifice of the grape-shaped (supposed poisonous) gland.
m, The osphradium (olfactory organ of Spengel).
n, Outline of part of the renal sac (nephridium) below the surface.
o, External aperture of the nephridium.
p, Anus.

With regard to internal organization we may commence with the disposition of the renal organ (nephridium), the external opening of which has already been noted. The position of this opening and other features of the renal organ were determined by J. T. Cunningham.

There is considerable uncertainty with respect to the names of the species of *Aplysia*. There are two forms which are very common in the Gulf of Naples. One is quite black in colour, and measures when

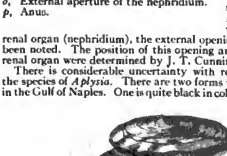

FIG. 40.—*Umbrella mediterranea*. *a*, mouth; *b*, cephalic tentacle; *h*, gill (ctenidium). The free edge of the mantle is seen just below the margin of the shell (compare with *Aplysia*, fig. 39). (From Owen.)

outstretched 8 or 9 in. in length. The other is light brown and somewhat smaller, its length usually not exceeding 7 in. The first is flaccid and sluggish in its movements, and has not much power of contraction; its epipodial lobes are enormously developed and extend far forward along the body; it gives out when handled an abundance of purple liquid, which is derived from cutaneous glands situated on the under side of the free edge of the mantle. According to F. Blochmann it is identical with *A. camelus* of Cuvier. The other species is *A. depilans*; it is firm to the touch, and contracts forcibly when irritated; the secretion of the mantle-glands is not abundant, and is milky white in appearance. The kidney has similar relations in both species, and is identical with the organ spoken of by many authors as the triangular gland. Its superficial extent is seen when the folds covering the shell are cut away and the shell removed; the external surface forms a triangle with its base bordering the pericardium, and its apex directed posteriorly and reaching to the left-hand posterior corner of the shell-chamber. The dorsal surface of the kidney extends to the left beyond the shell-chamber beneath the skin in the space between the shell-chamber and the left parapodium.

When the animal is turned on its left-hand side and the mantle-chamber widely opened, the gill being turned over to the left, a part of the kidney is seen beneath the skin between the attachment of the gill and the right parapodium (fig. 39). On examination this is found to be the under surface of the posterior limb of the gland, the upper surface of which has just been described as lying beneath the shell. In the posterior third of this portion, close to that edge which is adjacent to the base of the gill, is the external opening (fig. 39, *o*).

When the pericardium is cut open from above in an animal otherwise entire, the anterior face of the kidney is seen forming the posterior wall of the pericardial chamber; on the deep edge of this face, a little to the left of the attachment of the auricle to the floor of the pericardium, is seen a depression; this depression contains the opening from the pericardium into the kidney.

To complete the account of the relations of the organ: the right anterior corner can be seen superficially in the wall of the mantle-chamber above the gill. Thus the base of the gill passes in a slanting direction across the right-hand side of the kidney, the posterior end being dorsal to the apex of the gland, and the anterior end ventral to the right-hand corner.

As no part of the whole surface of the kidney lies adjacent to external surfaces of the body, the remaining part which faces the internal organs is small; it consists of the left part of the under surface; it is level with the floor of the pericardium, and lies over the glandular mass formed by the liver and convoluted intestine.

Thus the renal organ of *Aplysia* is shown to conform to the Mollusean type. The heart lying within the adjacent pericardium has the usual form, a single auricle and ventricle. The vascular system is not extensive, the arteries soon ending in the well-marked spongy tissue which builds up the muscular foot, parapodia, and dorsal body-wall.

The alimentary canal commences with the usual buccal mass; the lips are cartilaginous, but not armed with horny jaws, though these are common in other Opisthobranchs; the lingual ribbon is multidenticulate, and a pair of salivary glands pour in their secretion. The oesophagus expands into a curious gizzard, which is armed internally with large horny processes, some broad and thick, others spinous, fitted to act as crushing instruments. From this we pass to a stomach and a coil of intestine embedded in the lobes of a voluminous liver; a caecum of large size is given off near the commencement of the intestine. The liver opens by two ducts into the digestive tract.

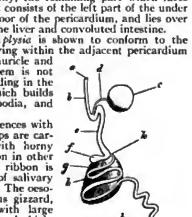

FIG. 41.—Gonad, and accessory glands and ducts of *Aplysia*. (Lankester.)

i, Ovo-testis.
h, Hermaphrodite duct.
g, Albuminiparous gland.
f, Vesicula seminalis.
k, Opening of the albuminiparous gland into the hermaphrodite duct.
e, Hermaphrodite duct (uterine portion).
b, Vaginal portion of the uterine duct.
c, Spermatheca.
d, Its duct.
a, Genital pore.

The generative organs lie close to the coil of intestine and liver, a little to the left side. When dissected out they appear as represented in fig. 41. The essential reproductive organ or gonad consists of both ovarian and testicular cells (see fig. 42). It is an ovo-testis. From it passes a common or hermaphrodite duct, which very soon becomes entwined in the spire of a gland—the albuminiparous gland. The latter opens into the common duct at the point *k*, and here also is a small diverticulum of the duct *f*. Passing on, we find not far from the genital pore a glandular spherical body (the spermatheca *c*) opening by means of a longish duct into the common duct, and then we reach the pore (fig. 39, *k*). Here the female apparatus terminates. But when the male secretion of the ovo-testis is active, the seminal fluid passes from the genital pore along the spermatic groove (fig. 39) to the penis, and is by the aid of that eversible muscular organ introduced into the genital pore of a second *Aplysia*, whence it passes into the spermatheca, there to await the activity of the female element of the ovo-testis of this second *Aplysia*. After an interval

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of some days—possibly weeks—the ova of the second *Aplysia* commence to descend the hermaphrodite duct; they become en-

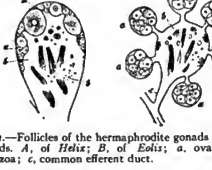

FIG. 42.—Follicles of the hermaphrodite gonads of Euthyneurous Gastropods. *A*, of *Helix*; *B*, of *Eolis*; *a*, ova; *b*, developing spermatozoa; *c*, common efferent duct.

closed in a viscid secretion at the point where the albuminiparous gland opens into the duct intertwined with it; and on reaching the point where the spermathecal duct debouches they are impregnated

by the spermatozoa which escape now from the spermatheca and meet the ova.

The development of *Aplysia* from the egg presents many points of interest from the point of view of comparative embryology, but in relation to the morphology of the Opisthobranchia it is sufficient to point to the occurrence of a trochosphere and a veliger stage (fig. 36), and of a shell-gland or primitive shell-sac (fig. 36, *shgr*), which is succeeded by a nautiloid shell.

In the nervous system of *Aplysia* the great ganglion-pairs are well developed and distinct. The euthyneurous visceral loop is long, and presents only one ganglion (in *Aplysia camelus*, but two distinct ganglia joined to one another in *Aplysia hybrida* of the English coast), placed at its extreme limit, representing both the right and left visceral ganglia and the third or abdominal ganglion, which are so often separately present. The diagram (fig. 43) shows the nerve connecting this abdomino-visceral ganglion with the olfactory ganglion of Spengel. It also seen to be connected with a more remote ganglion—the genital. Such special irregularities in the development of ganglia upon the visceral loop, and on account of the main nerves connected with it, are very frequent. Our figure of the nervous system of *Aplysia* does not give the small pair of buccal ganglia which are in all glossophorous Mollusca, present upon the nerves passing from the cerebral region to the odontophore.

FIG. 43.—Nervous system of *Aplysia*, as a type of the long-looped Euthyneurous condition. The untwisted visceral loop is lightly shaded. (After Spengel.)
ce, Cerebral ganglion.
pe, Pedal ganglion.
ab. sp, Abdominal ganglion which represents also the supra-intestinal ganglion of Streptoneura and gives off the nerve to the osphradium (olfactory organ) *o*, and another to an unlettered so-called "genital" ganglion. The buccal nerves and ganglia are omitted.

For a comparison of various Opisthobranchs, *Aplysia* will be found to present a convenient starting-point. It is one of the more typical Opisthobranchs, that is to say, it belongs to the section Tectibranchia, but other members of the sub-order, namely, *Bulla* and *Actaeon* (figs. 44 and 45), are less abnormal than *Aplysia* in regard to their shells and the form of the visceral hump. They have naked spirally twisted shells which may be concealed from view in the living animal by the expansion and reflection of the parapodia, but are not enclosed by the mantle, whilst *Actaeon* is ordinarily for possessing an operculum like that of so many Streptoneura.

The great development of the parapodia seen in *Aplysia* is usual in Tectibranchiate Opisthobranchs. The whole surface of the body becomes greatly modified in those Nudibranchiate forms which have lost, not only the shell, but also the ctenidium. Many of these have peculiar processes developed on the dorsal surface (fig. 46, A, B), or retain purely negative characters (fig. 46, D). The chief modification of internal organization presented by these forms, as compared with *Aplysia*, is found in the condition of the alimentary canal. The liver is no longer a compact organ opening by a pair of ducts into the median digestive tract, but we find very numerous hepatic diverticula on a shortened axial tract (fig. 47). These diverticula extend usually one into each of the dorsal papillae or "cerata" when these are present. They are not merely digestive glands, but are sufficiently wide to act as receptacles for food, and in them the digestion of food proceeds just as in the axial portion of the canal. A precisely similar modification

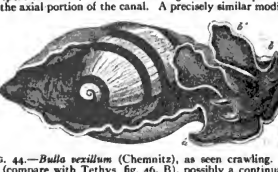

FIG. 44.—*Bulla vexillum* (Chemnitz), as seen crawling. *d*, oral hood (compare with Tethys, fig. 46, B), possibly a continuation of the epipodia; *b*, *b'*, cephalic tentacles. (From Owen.)

of the liver or great digestive gland is found in the scorpions, where the axial portion of the digestive canal is short and straight, and the lateral ducts sufficiently wide to admit food into the ramifications of the gland there to be digested; whilst in the spiders the gland is reduced to a series of simple caeca.

The typical character is retained by the heart, pericardium, and the communicating nephridium or renal organ in all Opisthobranchs. An interesting example of this is furnished by the fish-like transparent *Phyllirhoë* (fig. 37), in which it is possible most satisfactorily to study in the living animal, by means of the microscope, the course of the blood-stream, and also the reno-pericardial communication. In many of the Nudibranchiate Opisthobranchs the nervous system presents a concentration of the ganglia (fig. 48), contrasting greatly with what we have seen in *Aplysia*. Not only are the pleural ganglia fused to the cerebral, but also the visceral to these (see in further illustration the condition attained by the Pulmonate *Limnaeus*, fig. 59), and the visceral loop is astonishingly short and insignificant (fig. 48, *c'*). That the parts are rightly thus identified is probable from J. W. Spengel's observation of the osphradium and its nerve-supply in these forms; the nerve to that organ, which is placed somewhat anteriorly—on the dorsal surface—being given off from the hinder part (visceral) of the right compound ganglion—the fellow to that marked A in fig. 48. The Eolid-like Nudibranchs, amongst other specialities of structure, possess (in some cases at any rate) apertures at the apices of the "cerata" or dorsal papillae, which lead from the exterior into the hepatic caeca. Some amongst them (*Tergipes*, *Eolis*) are also remarkable for possessing peculiarly modified cells placed in sacs (cnidosacs) at the apices of these same papillae, which resemble the "thread-cells" of the Coelentera. According to T. S. Wright and J. H. Grosvenor these nematocysts are derived from the hydroids on which the animals feed.

The development of many Opisthobranchia has been examined—*e.g. Aplysia*, *Pleurobranchidium*, *Elysia*, *Pleurophyllidia*, *Doris*, *Tergipes*. All pass through trochosphere and veliger stages, and in all a nautiloid or boat-like shell is developed, preceded by a well-marked "shell-gland" (see fig. 36). The transition from the free-swimming veliger larva with its nautiloid shell (fig. 36) to the adult form has not been properly observed, and many interesting points as to the true nature of folds (whether parapodia or mantle folds) have yet to be cleared up by a knowledge of such development in forms like *Tethys*, *Doris*, *Phyllidia*, &c. As in other Molluscan groups, we find even in closely-allied genera (for instance, in *Aplysia* and *Pleurobranchidium*, and other genera), the greatest differences as to the *amount* of food-material by which the egg-shell is encumbered. Some form their diblastula by emboly, others by epiboly; and in the later history of the further development of the enclosed cells (archenteron) very marked variations occur in closely-allied forms, due to the influence of a greater or less abundance of food-material mixed with the protoplasm of the egg.

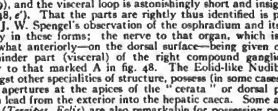

FIG. 45.—*Actaeon*. *k*, shell; *d*, oral hood; *d*, foot; *f*, operculum.

Sub-order I.—TECTIBRANCHIA. Opisthobranchs provided in the adult state with a shell and a mantle, except *Runcina*, *Pleurobranchaea*, *Cymbulidae*, and some Aplysiomorpha. There is a ctenidium, except in some Thecosomata and Gymnosomata, and an osphradium.

Tribe 1.—BULLOMORPHA. The shell is usually well developed, except in *Runcina* and *Cymbulidae*, and may be external or internal. No operculum, except in *Actaeonidae* and *Limacinidae*. The pallial cavity is always well developed, and contains the ctenidium, at least in part; ctenidium, except in *Lophocercidae*, of folded type. With

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the exception of the *Aplustridae*, *Lophocercidae* and *Thecosomata*, the head is devoid of tentacles, and its dorsal surface forms a digging

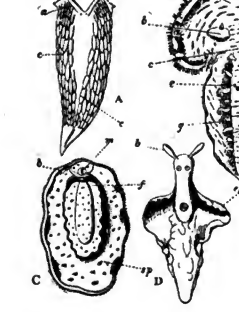

FIG. 46.

A, *Eolis papillosa* (Lin.), dorsal view.
a, *b*, Posterior and anterior cephalic tentacles. *c*, The dorsal "cerata."
B, *Tethys leporina*, dorsal view.
a, The cephalic hood. *e*, Anus.
b, Cephalic tentacles. *f*, Large cerata.
c, Neck. *g*, Smaller cerata.
d, Genital pore. *h*, Margin of the foot.
C, *Doris* (*Actinocyclus*) *tuberculatus* (Cuv.), seen from the pedal surface.
m, Mouth. *f*, Sole of the foot.
b, Margin of the head. *ep*, The mantle-like epipodium.
D, E, Dorsal and lateral view of *Elysia* (*Actaeon*) *viridis*. *ep*, epipodial outgrowths. (After Keferstein.)

disk or shield. The edges of the foot form parapodia, often transformed into fins. Posteriorly the mantle forms a large pallial lobe

FIG. 47.—Enteric Canal of *Eolis papillosa*. (From Gegenbaur, after Alder and Hancock.)
ph, Pharynx.
m, Midgut, with its hepatic appendages *h*, all of which are not figured.
e, Hind gut.
an, Anus.

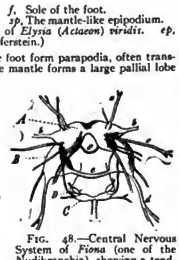

FIG. 48.—Central Nervous System of *Fiona* (one of the Nudibranchia), showing a tendency to fusion of the great ganglia. (From Gegenbaur, after Bergh.)
A, Cerebral, pleural and visceral ganglia united.
B, Pedal ganglion.
C, Buccal ganglion.
D, Oesophageal ganglion connected with the buccal.
a, Nerve to superior cephalic tentacle.
b, Nerves to inferior cephalic tentacles.
c, Nerve to generative organs.
d, Pedal nerve.
e, Pedal commissure.
e', Visceral loop or commissure (?).

under the pallial aperture. Stomach generally provided with chitinous or calcified masticatory plates. Visceral commissure fairly long, except in *Runcina*, *Lobiger* and *Thecosomata*. Hermaphrodite genital aperture, connected with the penis by a ciliated groove, except in *Actaeon*, *Lobiger* and *Cavolinia longirostris*, in which the spermiduct is a closed tube. Animals either swim or burrow.

Fam. 1.—*Actaeonidae*. Cephalic shield bifid posteriorly; margins of foot slightly developed; genital duct dialic; visceral commissure streptoneurous; shell thick, with prominent spire and elongated aperture; a horny operculum. *Actaeon*, British. *Solidula*. *Tornatellaea*, extinct. *Adelactaeon*. *Bullina*. *Bullinula*.

Fam. 2.—*Ringiculidae*. Cephalic disk enlarged anteriorly, forming an open tube posteriorly; shell external, thick, with prominent spire; no operculum. *Ringicula*. *Pugnus*.

Fam. 3.—*Tornatinidae*. Margins of foot not prominent; no radula; shell external, with inconspicuous spire. *Tornatina*, British. *Retusa*. *Volvula*.

Fam. 4.—*Scaphandridae*. Cephalic shield short, truncated posteriorly; eyes deeply embedded; three calcareous stomachal plates; shell external, with reduced spire. *Scaphander*, British. *Atys*. *Smaragdinella*. *Cylichna*, British. *Amphisphyra*, British.

Fam. 5.—*Bullidae*. Margins of foot well developed; eyes superficial; three chitinous stomachal plates; shell external, with reduced spire. *Bulla*, British. *Haminea*, British.

Fam. 6.—*Aceratidae*. Cephalic shield continuous with neck; twelve to fourteen stomachal plates; a posterior pallial filament passing through a notch in shell. *Acera*, British. *Cylindrobulla*. *Volutella*.

Fam. 7.—*Aplustridae*. Foot very broad; cephalic shield with four tentacles; shell external, thin, without prominent spire. *Aplustrum*. *Hydatina*. *Micromelo*.

Fam. 8.—*Philinidae*. Cephalic shield broad, thick and simple; shell wholly internal, thin, spire much reduced, aperture very large. *Philine*, British. *Cryptophthalmus*. *Chelinodura*. *Phanerophthalmus*. *Colpodaspis*, British. *Colobocephalus*.

Fam. 9.—*Doridiidae*. Cephalic shield ending posteriorly in a median point; shell internal, largely membranous; no radula or stomachal plates. *Doridium*. *Navarchus*.

Fam. 10.—*Gastropteridae*. Cephalic shield pointed behind; shell internal, chiefly membranous, with calcified nucleus, nautiloid; parapodia forming fins. *Gastropteron*.

Fam. 11.—*Runcinidae*. Cephalic shield continuous with dorsal integument; no shell; ctenidium projecting from mantle cavity. *Runcina*.

Fam. 12.—*Lophocercidae*. Shell external, globular or ovoid; foot elongated, parapodia separate from ventral surface; genital duct dialic. *Lobiger*. *Lophocercus*.

The next three families form the group formerly known as Thecosomatous Pteropods. They are all pelagic, the foot being entirely transformed into a pair of anterior fins; eyes are absent, and the nerve centres are concentrated on the ventral side of the oesophagus.

Fam. 13.—*Limacinidae*. Dextral animals, with shell coiled pseudo-sinistrally; operculum with sinistral spiral; pallial cavity dorsal. *Limacina*, British.

Fam. 14.—*Cymbulidae*. Adult without shell; a sub-epithelial pseudoconch formed by connective tissue; pallial cavity ventral. *Cymbulia*. *Cymbuliopsis*. *Gleba*. *Desmopterus*.

Fam. 15.—*Cavoliniidae*. Shell not coiled, symmetrical; pallial cavity ventral. *Cavolinia*. *Clio*. *Cuvierina*.

Tribe 2.—APLYSIOMORPHA. Shell more or less internal, much reduced or absent. Head bears two pairs of tentacles. Parapodia separate from ventral surface, and generally transformed into

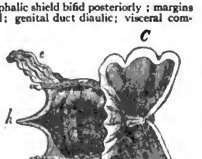

FIG. 49.—*Cavolinia tridentata*, Forsk. from the Mediterranean, magnified two diameters. (From Owen.)
a, Mouth.
b, Pair of cephalic tentacles.
C, *C*, Pteropodial lobes of the foot.
d, Median web connecting these.
e, *e*, Processes of the mantle-skirt reflected over the surface of the shell.
g, The shell enclosing the visceral hump.
h, The median spine of the shell.

FIG. 50.—Shell of *Cavolinia tridentata*, seen from the side.
f, Postero-dorsal surface.
g, Antero-ventral surface.
h, Median dorsal spine.
i, Mouth of the shell.

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swimming lobes. Visceral commissure much shortened, except in *Aplysia*. Genital duct monaulic; hermaphrodite duct connected with penis by a ciliated groove. Animals either swim or crawl.

Fam. 1.—*Aplysiidae*. Shell partly or wholly internal, or absent; foot long, with well-developed ventral surface. *Aplysia. Dolabella. Dolabrifer. Aplysiella. Phyllaplysia. Notarchus.*

The next six families include the animals formerly known as Gymnosomatous Pteropods, characterized by the absence of mantle and shell, the reduction of the ventral surface of the foot, and the parapodial fins at the anterior end of the body. They are all pelagic.

Fam. 2.—*Pneumonodermatidae*. Pharynx evaginable, with suckers. *Pneumonoderma. Dexiobranchaea. Spongiobranchaea. Schizobrachium.*

Fam. 3.—*Clionopsidae*. No buccal appendages or suckers; a very long evaginable proboscis; a quadriradiate terminal branchia. *Clionopsis.*

Fam. 4.—*Notobranchaeidae*. Posterior branchia triradiate. *Notobranchaea.*

Fam. 5.—*Thliptodontidae*. Head very large, not marked off from the body; neither branchia nor suckers; fins situated near the middle of the body. *Thliptodon.*

Fam. 6.—*Clionidae*. No branchia

FIG. 52.—*Styliola acicula*, Rang. sp. enlarged. (From Owen.)
C, C, The wing-like lobes of the foot.
d, Median fold of same.
e, Copulatory organ.
h, Pointed extremity of the shell.
i, Anterior margin of the mantle.
n, Stomach. [shell.
o, Liver.
u, Hermaphrodite gonad.

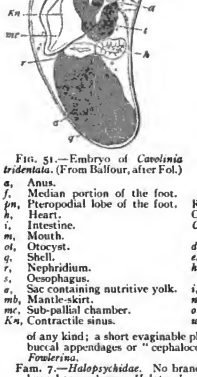

FIG. 51.—Embryo of *Cavolinia tridentata*. (From Balfour, after Fol.)
a, Anus.
f, Median portion of the foot.
fp, Pteropodial lobe of the foot.
h, Heart.
i, Intestine.
m, Mouth.
ot, Otocyst.
q, Shell.
r, Nephridium.
s, Oesophagus.
u, Sac containing nutritive yolk.
mb, Mantle-skirt.
mc, Sub-pallial chamber.
Kn, Contractile sinus.

of any kind; a short evaginable pharynx, bearing paired conical buccal appendages or "cephalocones." *Clione. Paraclione. Fowlerina.*

Fam. 7.—*Halopsychidae*. No branchia; two long and branched buccal appendages. *Halopsyche.*

Tribe 3.—PLEUROBRANCHOMORPHA. Two pairs of tentacles. Foot without parapodia; no pallial cavity, but always a single ctenidium situated on the right side between mantle and foot. Genital duct diaulic, without open seminal groove; male and female apertures contiguous. Visceral commissure short, tendency to concentration of all ganglia in dorsal side of oesophagus.

Fam. 1.—*Tylodinidae*. Shell external and conical; anterior tentacles form a frontal veil; ctenidium extending only over right side; a distinct osphradium. *Tylodina.*

Fam. 2.—*Umbrellidae*. Shell external, conical, much flattened; anterior tentacles very small, and situated with the mouth in a notch of the foot below the head; ctenidium very large. *Umbrella.*

Fam. 3.—*Pleurobranchidae*. Shell covered by mantle, or absent; anterior tentacles form a frontal veil; mantle contains spicules. *Pleurobranchus. Berthella. Haliotinella. Oscanius*, British. *Oscaniella. Oscaniopsis. Pleurobranchaea.*

Sub-order 2.—NUDIBRANCHIA. Shell absent in the adult; no ctenidium or osphradium. Body generally slug-like, and externally symmetrical. Visceral mass not marked off from the foot, except in *Hedylidae*. Dorsal respiratory appendages frequently present. Visceral commissure reduced; nervous system concentrated on dorsal side of oesophagus. Marine; generally carnivorous, and brightly coloured, affording many instances of protective resemblance.

Tribe 1.—TRITONIOMORPHA. Liver wholly or partially contained in the visceral mass. Anus lateral, on the right side. Usually two rows of ramified dorsal appendages. Genital duct diaulic; male and female apertures contiguous.

Fam. 1.—*Tritoniidae*. Anterior tentacles form a frontal veil; foot rather broad. *Tritonia*, British. *Marionia.*

Fam. 2.—*Scyllaeidae*. No anterior tentacles; dorsal appendages broad and foliaceous; foot very narrow; stomach with horny plates. *Scyllaea*, pelagic.

Fam. 3.—*Phyllirhoidae*. No anterior tentacles, and no dorsal appendages; body laterally compressed, transparent; pelagic. *Phyllirhoë.*

Fam. 4.—*Tethyidae*. Head broad, surrounded by a funnel-shaped velum or hood; no radula; dorsal appendages foliaceous. *Tethys. Melibe.*

Fam. 5.—*Dendronotidae*. Anterior tentacles forming a scalloped frontal veil; dorsal appendages and tentacles similarly ramified. *Dendronotus. Campaspe.*

Fam. 6.—*Bornellidae*. Dorsum furnished on either side with papillae, at the base of which are ramified appendages. *Bornella.*

Fam. 7.—*Lomanotidae*. Body flattened, the two dorsal borders prominent and foliaceous. *Lomanotus*, British.

Tribe 2.—DORIDOMORPHA. Body externally symmetrical; anus median, posterior, and generally dorsal, surrounded by ramified pallial appendages, constituting a secondary branchia. Liver not ramified in the integuments. Genital duct triaulic. Spicules present in the mantle.

Fam. 1.—*Polyceratidae*. A more or less prominent frontal

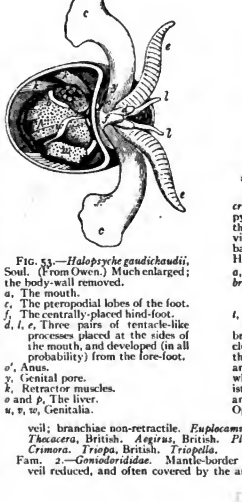

FIG. 53.—*Halopsyche gaudichaudii*, Soul. (From Owen.) Much enlarged; the body-wall removed.
a, The mouth.
c, The pteropodial lobes of the foot.
f, The centrally-placed hind-foot.
d, l, e, Three pairs of tentacle-like processes placed at the sides of the mouth, and developed (in all probability) from the fore-foot.
o', Anus.
y, Genital pore.
k, Retractor muscles.
o and *p*, The liver.
u, v, w, Genitalia.

FIG. 54.—*Ancula cristata*, one of the pygobranchiate Opisthobranchs (dorsal view). (From Gegenbaur, after Alder and Hancock.)
a, Anus.
br, Secondary branchia surrounding the anus.
t, Cephalic tentacles.

External to the branchia are seen ten club-like processes of the dorsal wall, these are the "cerata" which are characteristically developed in another sub-order of Opisthobranchs.

veil; branchiae non-retractile. *Euplocamus. Polycera*, British. *Thecacera*, British. *Aegirus*, British. *Plocamopherus. Palso. Crimora. Triopa*, British. *Triopella.*

Fam. 2.—*Goniodoridídae*. Mantle-border projecting; frontal veil reduced, and often covered by the anterior border of the

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mantle. *Goniodoris*, British. *Acanthodoris*, British. *Idalia*, British. *Ancula*, British. *Doridunculus*. *Lamellidoris*. *Ancylodoris*, the only fresh-water Nudibranch, from Lake Baikal.

Fam. 3.—*Heterodoridae*. No branchia. *Heterodoris*.

Fam. 4.—*Doridoidae*. Mantle oval, covering the head and the greater part of the body; anterior tentacles, ill-developed; branchiae generally retractile. *Doris*, British. *Hexabranchus*. *Chromodoris*.

Fam. 5.—*Doridopsidae*. Pharynx suctorial; no radula; branchial rosette on the dorsal surface, above the mantle-border. *Doridopsis*.

Fam. 6.—*Corambidae*. Anus and branchia posterior, below the mantle-border. *Corambe*.

Fam. 7.—*Phyllidiidae*. Pharynx suctorial; branchiae surrounding the body, between the mantle and foot. *Phyllidia*. *Fryeria*.

The last three families constitute the sub-tribe Porostomata, characterized by the reduction of the buccal mass, which is modified into a suctorial apparatus.

Tribe 3.—Eolidomorpha (*Cladohepatica*). The whole of the liver contained in the integuments and tegumentary papillae. Genital duct dialic; male and female apertures contiguous. The anus is antero-lateral, except in the *Proctonotidae*, in which it is median. Tegumentary papillae not ramified, and containing cnidosacs with nematocysts.

Fam. 1.—*Eolididae*. Dorsal papillae spindle-shaped or club-shaped. *Eolis*, British. *Facelina*, British. *Tergipes*, British. *Gonieolis*. *Cuthona*. *Embletonia*. *Galvina*. *Calma*. *Hero*.

Fam. 2.—*Glaucidae*. Body furnished with three pairs of lateral lobes, bearing the tegumentary papillae; foot very narrow; pelagic. *Glaucus*.

Fam. 3.—*Hedylidae*. Body elongated; visceral mass marked off from foot posteriorly; dorsal appendages absent, or reduced to a single pair; spicules in the integument. *Hedyle*.

Fam. 4.—*Pseudovermidae*. Head without tentacles; body elongated; anus on right side. *Pseudovermis*.

Fam. 5.—*Proctonotidae*. Anus posterior, median; anterior tentacles, atrophied; foot broad. *Janus*, British. *Proctonotus*, British.

Fam. 6.—*Dotonidae*. Bases of the rhinophores surrounded by a sheath; dorsal papillae tuberculated and club-shaped, in a single row on either side of the dorsum; no cnidosacs. *Doto*, British. *Gellina*. *Heromorpha*.

Fam. 7.—*Fionidae*. Dorsal papillae with a membranous expansion; male and female apertures at some distance from each other; pelagic. *Fiona*.

Fam. 8.—*Pleurophyllidae*. Anterior tentacles in the form of a digging shield; mantle without appendages, but respiratory papillae beneath the mantle-border. *Pleurophyllidia*.

Fam. 9.—*Dermatobranchidae*. Like the last, but wholly without branchiae. *Dermatobranchus*.

Tribe 4.—Elysiomorpha. Liver ramifies in integuments and extends into dorsal papillae, but there are no cnidosacs. Genital duct always triaulic, and male and female apertures distant from each other. No mandibles, and radula uniserial. Never more than one pair of tentacles, and these are absent in *Alderia* and some species of *Limapontia*.

Fam. 1.—*Hermaeidae*. Foot narrow; dorsal papillae linear or fusiform, in several series. *Hermaea*, British. *Stiliger*. *Alderia*, British.

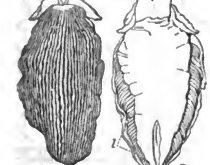

Fig. 55.—Dorsal and Ventral View of *Pleurophyllidia lineata* (Otto), one of the Eolidomorph Nudibranchs. (After Keferstein.)

b, The mouth.

i, The lamelliform sub-pallial gills, which (as in Patella) replace the typical Molluscan ctenidium.

Fam. 2.—*Phyllobranchidae*. Foot broad; dorsal papillae flattened and foliaceous. *Phyllobranchus*. *Cyerce*.

Fam. 3.—*Plakobranchidae*. Body depressed, without dorsal papillae, but with two very large lateral expansions, with dorsal plications. *Plakobranchus*.

Fam. 4.—*Elysiidae*. Body elongated, with lateral expansions; tentacles large; foot narrow. *Elysia*, British. *Tridachia*.

Fam. 5.—*Limapontiidae*. No lateral expansions, and no dorsal papillae; body planariform; anus dorsal, median and posterior. *Limapontia*, British. *Actaeonia*, British. *Cenia*.

Order 2 (of the Euthyneura).—Pulmonata. Euthyneurous Gastropoda, probably derived from ancestral forms similar to the Tectibranchiate Opisthobranchia by adaptation to a terrestrial life. The ctenidium is atrophied, and the edge of the mantle-skirt is fused to the dorsal integument by concrescence, except at one point which forms the aperture of the mantle-chamber, thus converted into a nearly closed sac. Air is admitted to this sac for respiratory and hydrostatic purposes, and it thus becomes a lung. An operculum is present only in *Amphibola*; a contrast being thus afforded with the operculate pulmonate Streptoneura (*Cyclostoma*, &c.), which differ in other essential features of structure from the Pulmonata. The Pulmonata are, like the other Euthyneura, hermaphrodite, with elaborately developed copulatory organs and accessory glands. Like other Euthyneura, they have very numerous small denticles on the lingual ribbon. In aquatic Pulmonata the osphradium is retained.

In some Pulmonata (snails) the foot is extended at right angles to the visceral hump, which rises from it in the form of a coil as in Streptoneura; in others the visceral hump is not elevated, but is extended with the foot, and the shell is small or absent (slugs).

Pulmonata are widely distinguished from a small number of Streptoneura at one time associated with them on account of their mantle-chamber being converted, as in Pulmonata, into a lung, and the ctenidium or branchial plume aborted. The terrestrial Streptoneura (represented in England by the common genus *Cyclostoma*)

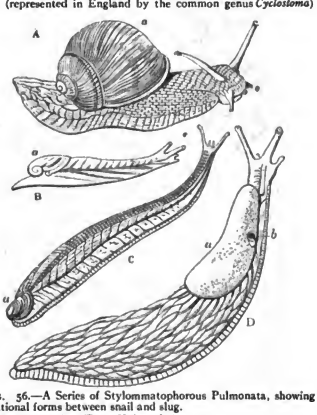

Fig. 56.—A Series of Stylommatophorous Pulmonata, showing transitional forms between snail and slug.

A, *Helix pomatia*. (From Keferstein.)

B, *Helicophania brevipes*. (From Keferstein, after Pfeiffer.)

C, *Testacella haliotidea*. (From Keferstein.)

D, *Arion ater*, the great black slug. (From Keferstein.)

a, Shell in A, B, C, shell-sac (closed) in D; *b*, orifice leading into the subpallial chamber (lung).

have a twisted visceral nerve-loop, an operculum on the foot, a complex rhipidoglossate or taenio-glossate radula, and are of distinct sexes. The Pulmonata have a straight visceral nerve-loop, usually no operculum even in the embryo, and a multidenticulate radula, the teeth being equi-formal; and they are hermaphrodite. Some Pulmonata (*Limnaea*, &c.) live in fresh waters although breathing air. The remarkable discovery has been made that in deep lakes such *Limnaei* do not breathe air, but admit water to the lung-sac and live at the bottom. The lung-sac serves undoubtedly as a hydrostatic apparatus in the aquatic Pulmonata, as well as assisting respiration.

Fig. 57.—*Ancylus fluviatilis*, a patelliform aquatic Pulmonate.

The same general range of body-form is shown in Pulmonata as in the Heteropoda and in the Opisthobranchia; at one extreme we have snails with coiled visceral hump, at the other cylindrical or flattened slugs (see fig. 56). Limpet-like forms are also found (fig. 57, *Ancylus*). The foot is always simple, with its flat crawling surface extending from end to end, but in the embryo *Limnaea* it shows a bilobed character, which leads on to the condition characteristic of Pteropoda.

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The adaptation of the Pulmonata to terrestrial life has entailed little modification of the internal organization. In one genus (*Planorbis*) the plasma of the blood is coloured red by haemoglobin, this being the only instance of the presence of this body in the blood of Glossophorous Mollusca, though it occurs in corpuscles in the blood of the bivalves *Arca* and *Solen* (Lankester).

The generative apparatus of the snail (*Helix*) may serve as an example of the hermaphrodite apparatus common to the Pulmonata and Opisthobranchia (fig. 58). From the ovo-testis, which lies near the apex of the visceral coil, a common hermaphrodite duct *pe* proceeds, which receives the duct of the compact white albuminiparous gland, *Ed*, and then becomes much enlarged, the additional width being due to the development of glandular folds, which are regarded as forming a uterus *u*. Where these folds cease the common duct splits into two portions, a male and a female. The male duct *vd* becomes fleshy and muscular near its termination at the genital pore, forming the penis *p*. Attached to it is a diverticulum *fl*, in which the spermatozoa which have descended from the ovo-testis are stored and modelled into sperm ropes or spermatophores. The female portion of the duct is more complex, soon after quitting the uterus it is joined by a long duct leading from a glandular sac, the spermatheca (*Rf*). In this duct and sac the spermatophores received in copulation from another snail are lodged. In *Helix hortensis* the spermatheca is simple. In other species of *Helix* a second duct (as large in *Helix aspersa* as the chief one) is given off from the spermatheca duct, and in the natural state is closely adherent to the wall of the uterus. This second duct has normally no spermathecal gland at its termination, which is simple and blunt. But in rare cases in *Helix aspersa* a second spermatheca is found at the end of this second duct. Tracing the widening female duct onwards we now come to the openings of the digitate accessory glands *d*, *d*, which probably assist in the formation of the egg-capsule. Close to them is the remarkable dart-sac *ps*, a thick-walled sac, in the lumen of which a crystalline four-fluted rod or dart consisting of carbonate of lime is found. It is supposed to act in some way as a stimulus in copulation, but possibly has to do with the calcareous covering of the egg-capsule. Other Pulmonata exhibit variations of secondary importance in the details of this hermaphrodite apparatus.

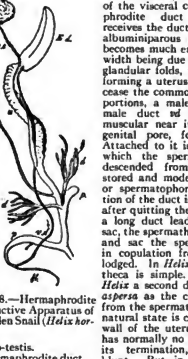

FIG. 58.—Hermaphrodite Reproductive Apparatus of the Garden Snail (*Helix hortensis*).

r, Ovo-testis.
ve, Hermaphrodite duct.
Ed, Albuminiparous gland.
u, Uterine dilatation of the hermaphrodite duct.
d, Digitate accessory glands on the female duct.
ps, Calciferous gland or dart-sac on the female duct.
Rf, Spermatheca or receptacle of the sperm in copulation, opening into the female duct.
vd, Male duct (vas deferens).
p, Penis.
fl, Flagellum.

The nervous system of *Helix* is not favourable as an example on account of the fusion of the ganglia to form an almost uniform ring of nervous matter around the oesophagus. The pond-snail (*Limnaeus*) furnishes, on the other hand, a very beautiful case of distinct ganglia and connecting cords (fig. 59). The demonstration which it affords of the extreme shortening of the Euthyneurous visceral nerve-loop is most instructive and valuable for comparison with and explanation of the condition of the nervous centres in Cephalopoda, as also of some Opisthobranchia. The brain (fig. 59) is sufficiently described in the letterpress attached to it; the pair of buccal ganglia joined by the connectives to the cerebrals are, as in most of our figures, omitted. Here we need only further draw attention to the osphradium, discovered by Lacaze-Duthiers, and shown by Spengel to agree in its innervation with that organ in all other Gastropoda. On account of the shortness of the visceral loop and the proximity of the right visceral ganglion to the oesophageal nerve-ring, the nerve to the osphradium and olfactory ganglion is very long. The position of the osphradium corresponds more or less closely with that of the vanished right ctenidium, with which it is normally associated. In *Helix* and *Limax* the osphradium has not been described, and possibly its discovery might clear up the doubts which have been raised as to the nature of the mantle-chamber of those genera. In *Planorbis*, which is sinistral (as are a few other genera or exceptional varieties of various Anisopleurous Gastropods), instead of being dextral, the osphradium is on the left side, and receives its nerve from the left visceral ganglion, the whole series of unilateral organs being reversed. This is, as might be expected, what is found to be the case in all "reversed" Gastropods.

The shell of the Pulmonata, though always light and delicate, is in many cases a well-developed spiral "house," into which the creature can withdraw itself; and, although the foot possesses no operculum, yet in *Helix* the aperture of the shell is closed in the winter by a complete lid, the "hybernaculum," more or less calcareous in nature, which is secreted by the foot. In *Clausilia* a peculiar modification of this lid exists permanently in the adult, attached by an elastic stalk to the mouth of the shell, and known as the "clausilium." In *Limnaeus* the permanent shell is preceded in the embryo by a well-marked shell-gland or primitive shell-sac (fig. 60), at one time supposed to be the developing anus, but shown by Lankester to be identical with the "shell-gland" discovered by him in other Mollusca (*Pisidium*, *Pleurobranchidium*, *Neritina*, &c.). As in other Gastropoda Anisopleura, this shell-sac may abnormally develop a plug of calthinous matter, but normally it flattens out and disappears, whilst the cap-like rudiment of the permanent shell is shed out from the dome-like surface of the visceral hump, in the centre of which the shell-sac existed for a brief period.

In *Clausilia*, according to the observations of C. Gegenbaur, the primitive shell-sac does not flatten out and disappear, but takes the form of a flattened closed sac. Within this closed sac a plate of calcareous matter is developed, and after a time the upper wall of the sac disappears, and the calcareous plate continues to grow as the nucleus of the permanent shell. In the slug *Testacella* (fig. 56, C) the shell-plate never attains a large size, though naked. In other slugs, namely, *Limax* and *Arion*, the shell-sac remains permanently closed over the shell-plate, which in the latter genus consists of a granular mass of carbonate of lime. The permanence of the primitive shell-sac in these slugs is a point of considerable interest. It is clear enough that the sac is of a different origin from that of *Aplysia* (described in the section treating of Opisthobranchia), being primitive instead of secondary. It seems probable that it is identical with one of the open sacs in which each shell-plate of a *Chiton* is formed, and the series of plate-like imbrications which are placed behind the single shell-sac on the dorsum of the curious slug, *Plectrochaetes*, suggest the possibility of the formation of a series of shell-sacs on the back of that animal similar to those which we find in *Chiton*. Whether the closed primitive shell-sac of the slugs (and with it the transient embryonic shell-gland of all other Mollusca) is precisely the same thing as the closed sac in which the calcareous pen or shell of the Cephalopod *Sepia* and its allies is formed, is a further question which we shall consider when dealing with the Cephalopoda. It is important here to note that *Clausilia* furnishes us with an exceptional instance of the *continuity* of the shell or secreted product of the primitive shell-sac with the adult shell. In most other Mollusca (Anisopleurous Gastropods, Pteropods and Cephichfera) there is a want of such continuity; the primitive shell-sac contributes no factor to the permanent shell, or only a very minute knob-like particle (*Neritina* and *Paludina*), which flattens out and disappears before the work of forming the permanent shell commences. And just as there is a break at this stage, so (as observed by A. Krohn in *Marsenia* = *Echinospira*) there *may* be a break at a later stage, the nautiloid shell formed on the larva being cast off, and a new one shell of a different form being formed afresh on the surface of the visceral hump. It is, then, in this sense that we may speak of primary, secondary and tertiary shells in Mollusca, recognizing the fact that they *may* be merely phases fused by continuity of growth so as to form but one shell, or that in other cases they *may* be presented to us as separate individual things, in virtue of the non-development of the later phases, or in virtue of sudden changes in the activity of the mantle-surface causing the shedding

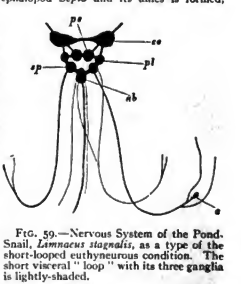

FIG. 59.—Nervous System of the Pond-Snail, *Limnaeus stagnalis*, as a type of the short-looped euthyneurous condition. The short visceral "loop" with its three ganglia is lightly-shaded.

ce, Cerebral ganglion.
pe, Pedal ganglion.
pl, Pleural ganglion.
ab, Abdominal ganglion.
sp, Visceral ganglion of the left side; opposite to it is the visceral ganglion of the right side, which gives off the long nerve to the olfactory ganglion and osphradium *o*.

In *Planorbis* and in *Auricula* (Pulmonata, allied to *Limnaeus*) the olfactory organ is on the *left* side and receives its nerve from the *left* visceral ganglion. (After Spengel.)

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or disappearance of one phase of shell-formation before a later one is entered upon.

The development of the aquatic Pulmonata from the egg offers considerable facilities for study, and that of *Limnaeus* has been elucidated by E. R. Lankester, whilst H. Rabl has with remarkable skill applied the method of sections to the study of the minute embryos of *Planorbis*. The chief features in the development of *Limnaeus* are exhibited in fig. 60. There is not a very large amount of food-material present in the egg of this snail, and accordingly the cells resulting from division are not so unequal as in many other cases. The four cells first formed are of equal size, and then four smaller cells are formed by division of these four so as to lie at one end of the first four (the pole corresponding to that at which the "directive corpuscles" are extruded and remain). The smaller cells now divide and spread over the four larger cells; at the same time a space—the cleavage cavity or blastocoel—forms in the centre of the mulberry-like mass. Then the large cells recommence the process of division and sink into the hollow of the sphere, leaving an elongated groove, the blastopore, on the surface. The invaginated cells (derived from the division of the four big cells) form the endoderm or arch-enteron; the outer cells are the ectoderm. The blastopore now closes along the middle part of its course, which coincides

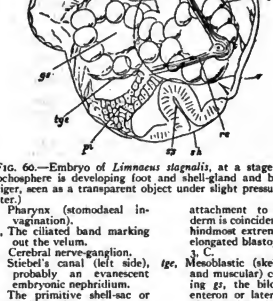

FIG. 60.—Embryo of *Limnaeus stagnalis*, at a stage when the Trochosphere is developing foot and shell-gland and becoming a Veliger, seen as a transparent object under slight pressure. (Lankester.)

ph, Pharynx (stomodaeal invagination).
v, v, The ciliated band marking out the velum.
ng, Cerebral nerve-ganglion.
re, Stiebel's canal (left side), probably an evanescent embryonic nephridium.
sh, The primitive shell-sac or shell-gland.
pi, The rectal peduncle or pedicle of invagination; its attachment to the ectoderm is coincident with the hindmost extremity of the elongated blastopore of fig. 3, C.
tge, Mesoblastic (skeletotrophic and muscular) cells investing *gs*, the bilobed arch-enteron or lateral vesicles of invaginated endoderm, which will develop into liver.
f, The foot.

in position with the future "foot." One end of the blastopore becomes nearly closed, and an ingrowth of ectoderm takes place around it to form the stomodaeum or fore-gut and mouth. The other extreme end closes, but the invaginated endoderm cells remain in continuity with this extremity of the blastopore, and form the "rectal peduncle" or "pedicle of invagination" of Lankester, although the endoderm cells retain no contact with the middle region of the now closed-up blastopore. The anal opening forms at a late period by a very short ingrowth or proctodaeum coinciding with the blind termination of the rectal peduncle (fig. 60, *pi*).

The body-cavity and the muscular, fibrous and vascular tissues are traced partly to two symmetrically disposed "mesoblasts," which bud off from the invaginated arch-enteron, partly to cells derived from the ectoderm, which at a very early stage is connected by long processes with the invaginated endoderm. The external form of the embryo goes through the same changes as in other Gastropods, and is not, as was held previously to Lankester's observations, exceptional. When the middle and hinder regions of the blastopore are closing in, an equatorial ridge of ciliated cells is formed, converting the embryo into a typical trochosphere.

The foot now protrudes below the mouth, and the post-oral hemisphere of the trochosphere grows more rapidly then the anterior or velar area. The young foot shows a bilobed form. Within the velar area the eyes and the cephalic tentacles commence to rise up, and on the surface of the post-oral region is formed a cap-like shell and an encircling ridge, which gradually increases in prominence and becomes the freely depending mantle-skirt. The outline of the velar area becomes strongly emarginated and can be traced through the more mature embryos to the cephalic lobes or labial processes of the adult *Limnaeus* (fig. 61).

The increase of the visceral dome, its spiral twisting, and the gradual closure of the space overhung by the mantle-skirt so as to

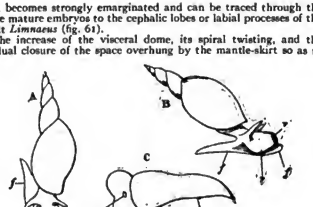

FIG. 61.—A, B, C. Three views of *Limnaeus stagnalis*, in order to show the persistence of the larval velar area *v*, as the circum-oral lobes of the adult. *m*, Mouth; *f*, foot; *v*, velar area, the margin corresponding with the ciliated band which demarcates the velar area or velum of the embryo Gastropod (see fig. 4, D, E, F, H, I, *v*). (Original.)

convert it into a lung-sac with a small contractile aperture, belong to stages in the development later than any represented in our figures.

We may now revert briefly to the internal organization at a period when the trochosphere is beginning to show a prominent foot growing out from the area where the mid-region of the elongated blastopore was situated, and having therefore at one end of it the mouth and at the other the anus. Fig. 60 represents such an embryo under slight compression as seen by transmitted light. The ciliated band of the left side of the velar area is indicated by a line extending from *v* to *v*; the foot *f* is seen between the pharynx *ph* and the pedicle of invagination *pi*. The mass of the arch-enteron or invaginated endodermal sac has taken on a bilobed form, and its cells are swollen (*gs* and *tge*). This bilobed sac becomes *entirely* the liver in the adult; the intestine and stomach are formed from the pedicle of invagination, whilst the pharynx, oesophagus and crop form from the stomodaeal invagination *ph*. To the right (in the figure) of the rectal peduncle is seen the deeply invaginated shell-gland *ss*, with a secretion *sh* protruding from it. The shell-gland is destined in *Limnaeus* to become very rapidly stretched out, and to disappear. Farther up, within the velar area, the rudiments of the cerebral nerve-ganglion *ng* are seen separating from the ectoderm. A remarkable cord of cells having a position just below the integument occurs on each side of the head. In the figure the cord on the left side is seen, marked *re*. This paired organ consists of a string of cells which are perforated by a duct opening to the exterior and ending internally in a flame-cell. Such cannulated cells are characteristic of the nephridia of many worms, and the organs thus formed in the embryo *Limnaeus* are embryonic nephridia. The most important fact about them is that they disappear, and are in no way connected with the typical nephridium of the adult. In reference to their first observer they were formerly called "Stiebel's canals." Other Pulmonata possess, when embryos, Stiebel's canals in a more fully developed state, for instance, the common slug *Limax*. Here too they disappear during embryonic life. Similar larval nephridia occur in other Gastropoda. In the marine Streptoneura they are ectodermic projections which ultimately fall off; in the Opisthobranchs they are closed pouches; in *Paludina* and *Bithynia* they are canals as in Pulmonata.

Marine Pulmonata.—Whilst the Pulmonata are essentially a terrestrial and fresh-water group, there is one genus of slug-like

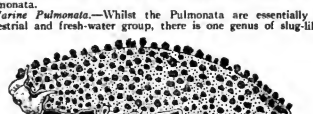

FIG. 62.—*Oncidium longanum*, a littoral Pulmonate, found on the shores of the Indian and Pacific Oceans (Mauritius, Japan).

Pulmonates which frequent the sea-coast (*Oncidium*, fig. 62). Karl Semper has shown that these slugs have, in addition to the usual pair of cephalic eyes, a number of eyes developed upon the dorsal integument. These dorsal eyes are very perfect in elaboration, possessing lens, retinal nerve-end cells, retinal pigment and optic nerve. Curiously enough, however, they differ from the cephalic Molluscan eye in the fact that, as in the vertebrate eye, the filaments of the optic nerve penetrate the retina, and are connected with the

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surfaces of the nerve-end cells nearer the lens instead of with the opposite end. The significance of this arrangement is not known, but it is important to note, as shown by V. Henson, S. J. Hickson and others, that in the bivalves *Pecten* and *Spondylus*, which also have eyes upon the mantle quite distinct from typical cephalic eyes, there is the same relationship as in Oncidiidae of the optic nerve to the retinal cells. In both Oncidiidae and *Pecten* the pallial eyes have probably been developed by the modification of tentacles, such as coexist in an unmodified form with the eyes. The Oncidiidae are, according to K. Semper, pursued as food by the leaping fish *Periophthalmus*, and the dorsal eyes are of especial value to them in aiding them to escape from this enemy.

Sub-order 1.—Basommatophora. Pulmonata with an external shell. The head bears a single pair of contractile but not invaginable tentacles, at the base of which are the eyes. Penis at some distance from the female aperture, except in *Amphibola* and *Siphonaria*. All have an osphradium, except the *Auriculidae*, which are terrestrial, and it is situated outside the pallial cavity in those forms in which water is not admitted into the lung. There is a veliger stage in development, but the velum is reduced.

Fam. 1.—*Auriculidae*. Terrestrial or feeding usually littoral; genital duct monaulic, the penis being connected with the aperture by an open or closed groove; shell with a prominent spire, the internal partitions often absorbed and the aperture denticulated. *Auricula. Cassidula. Alexia. Melampus. Carychium*, terrestrial, British. *Scarabus. Leuconia*, British. *Blauneria. Pedipes.*

Fam. 2.—*Otinidae*. Shell with short spire, and wide oval aperture; tentacles short. *Otina*, British. *Camptonyx*, terrestrial.

Fam. 3.—*Amphibolidae*. Shell spirally coiled; head broad, without prominent tentacles; foot short, operculated; marine. *Amphibola.*

Fam. 4.—*Siphonariidae*. Visceral mass and shell conical; tentacles atrophied; head expanded; genital apertures contiguous; marine animals, with an aquatic pallial cavity containing secondary branchial laminae. *Siphonaria.*

Fam. 5.—*Gadiniidae*. Visceral mass and shell conical; head flattened; pallial cavity aquatic, but without a branchia; genital apertures separated. *Gadinia.*

Fam. 6.—*Chilinidae*. Shell ovoid, with short spire, wide aperture and folded columella; inferior pallial lobe thick; visceral commissure still twisted. *Chilina.*

Fam. 7.—*Limnaeidae*. Shell thin, dextral, with prominent spire and oval aperture; no inferior pallial lobe. *Limnaea*, British. *Amphipeplea*, British.

Fam. 8.—*Pomphalygidae*. Shell dextral, hyperstrophic, animal sinistral. *Pompholyx. Choanomphalus.*

Fam. 9.—*Planorbidae*. Visceral mass and shell sinistral; inferior pallial lobe very prominent, and transformed into a branchia. *Planorbis*, British. *Bulinus. Miratesta.*

Fam. 10.—*Ancylidae*. Shell conical, not spiral; inferior pallial lobe transformed into a branchia. *Ancylus*, British. *Latia. Grundlachia.*

Fam. 11.—*Physidae*. Visceral mass and shell sinistrally coiled; shell thin, with narrow aperture; no inferior pallial lobe. *Physa*, British. *Aplexa*, British.

Sub-order 2.—Stylommatophora. Pulmonata with two pairs of tentacles, except *Janelleidae* and *Veriipa*; these tentacles are invaginable, and the eyes are borne on the summits of the posterior pair. Male and female genital apertures open into a common vestibule, except in *Vaginulidae* and *Oncidiidae*. Except in *Oncidium*, there is no longer a veliger stage in development.

Tribe 1.—Holognatha. Jaw simple, without a superior appendage.

Fam. 1.—*Selenitidae*. Radula with elongated and pointed teeth, like those of the Agnatha; a jaw present. *Plutonia. Trigonochlamys.*

Fam. 2.—*Zonitidae*. Shell external, smooth, heliciform or flattened; radula with pointed marginal teeth. *Zonites*, British. *Aegophania. Orpella. Vitrina. Helicarion.*

Fam. 3.—*Limacidae*. Shell internal. *Limax*, British. *Parmacella. Urocyclus. Parmarion. Amalia. Agriolimax. Mesolimax. Monochroma. Paralimax. Metalimax.*

Fam. 4.—*Philomycidae*. No shell; mantle covers the whole surface of the body; radula with squarish teeth. *Philomycus.*

Fam. 5.—*Ostracolethidae*. Shell largely chitinous, not spiral, its calcareous apex projecting through a small hole in the mantle. *Ostracolethe.*

Fam. 6.—*Arionidae*. Shell internal, or absent; mantle restricted to the anterior and middle part of the body; radula with squarish teeth. *Arion*, British. *Geomalacus. Ariolimax. Anadenus.*

Fam. 7.—*Helicidae*. Shell with medium spire, external or partly covered by the mantle; genital aperture below the right posterior tentacle; genital apparatus generally provided with a dart-sac and multifid vesicles. *Helix*, British. *Bulimus. Hemphillia. Berendtia. Cochlostyla. Rhodea.*

Fam. 8.—*Endodontidae*. Shell external, spiral, generally ornamented with ribs; borders of aperture thin and not reflected; radula with square teeth; genital ducts without accessory organs. *Endodonia. Punctum. Sphyradium. Laoma. Pyramidula.*

Fam. 9.—*Orthalicidae*. Shell external, ovoid, the last whorl swollen, aperture oval with a simple border; radular teeth in oblique rows. *Orthalicus.*

Fam. 10.—*Bulimulidae*. Jaw formed of folds imbricated externally and meeting at an acute angle near the base. *Bulimulus. Peltella. Amphibulimus.*

Fam. 11.—*Cylindrellidae*. Shell turriculated, with numerous whorls, the last more or less detached. *Cylindrella.*

Fam. 12.—*Pupidae*. Shell external, with elongated spire and numerous whorls, aperture generally narrow; male genital duct without multifid vesicles. *Pupa*, British. *Enscalodium. Vertigo*, British. *Buliminus*, British. *Clausilia*, British. *Balea. Zospeum. Megaspira. Strophia. Anostoma.*

Fam. 13.—*Stenogyridae*. Shell elongated, with a more or less obtuse summit; aperture with a simple border. *Achatina. Stenogyra. Ferussacia*, British. *Cionella. Caecilianella. Azeca. Opeas.*

Fam. 14.—*Helicteridae*. Shell bulimoid, dextral or sinistral; radular teeth, expanded at their extremities and multicuspidate. *Helicter. Tornatellina.*

Tribe 2.—Agnatha. No jaws; teeth narrow and pointed; carnivorous.

Fam. 1.—*Oleacinidae*. Shell oval, elongated, with narrow aperture; neck very long; labial palps prominent. *Oleacina* (*Glandina*). *Streptostyla.*

Fam. 2.—*Testacellidae*. Shell globular or auriform, external or partly covered by the mantle. *Streptaxis. Gibbulina. Aerope. Rhytida. Daudebardia. Testacella. Chlamydophorus. Schizoglossa.*

Fam. 3.—*Rathouisiidae*. No shell, a carinated mantle covering the whole body; male and female apertures distant, the female near the anus. *Rathouisia. Atopos.*

Tribe 3.—Elasmognatha. Jaw with a well-developed dorsal appendage.

Fam. 1.—*Succineidae*. Anterior tentacles much reduced; male and female apertures contiguous but distinct; shell thin, spiral, with short spire. *Succinea*, British. *Homalonyx. Hyalimax. Neohyalimax.*

Fam. 2.—*Janellidae*. Limaciform, with internal rounded shell; mantle very small and triangular; pulmonary chamber with tracheae; no anterior tentacles. *Janella. Aneitella. Anetea. Triboniophorus.*

Tribe 4.—Ditremata. Male and female apertures distant.

Fam. 1.—*Vaginulidae*. No shell; limaciform; terrestrial; female aperture on right side in middle of body; anus posterior. *Vaginula.*

Fam. 2.—*Oncidiidae*. No shell; limaciform; littoral; female aperture posterior, near anus; a reduced pulmonary cavity with a distinct aperture. *Oncidium. Oncidiella*, British. *Peronia.*

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GASTROTRICHA, a small group of fairly uniform animals which live among Rotifers and Protozoa at the bottom of ponds and marshes, hiding amongst the recesses of the algae and sphagnum and other fresh-water plants and eating organic débris and Infusoria. They are of minute size varying from one-sixtieth to one-three-hundredth of an inch, and they move by means of long cilia. Two ventral bands composed of regular transverse rows of cilia are usually found. The head bears some especially large cilia. The cuticle which covers the body is here and there raised into overlapping scales which may be prolonged into bristles. An enlarged, frontal scale may cover the head, and a row of scales separates the ventral ciliated areas from one

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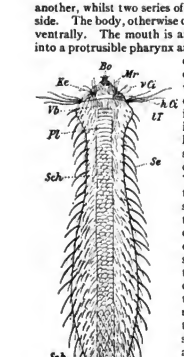
another, whilst two series of alternating rows cover the back and side. The body, otherwise circular in section, is slightly flattened ventrally. The mouth is anterior and slightly ventral; it leads into a protrusible pharynx armed with recurved teeth that can be everted. This leads to a muscular oesophagus with a triradiate lumen, which acts as a sucking pump and ends in a funnel-valve projecting into the stomach. The last named is oval and formed of four rows of large cells; it is separated by a sphincter from the rectum, which opens posteriorly and dorsally. The nitrogenous excretory apparatus consists of a coiled tube on each side of the stomach; internally the tubes end in large flame-cells, and externally by small pores which lie on the edges of the ventral row of scales. A cerebral ganglion rests on the oesophagus and supplies the cephalic cilia and hairs; it is continued some way back as two dorsal nerve trunks. The sense organs are the hairs and bristles and in some species eyes. The muscles are simple and unstriated and for the most part run longitudinally.



From *Zeitschrift für Wissenschaft Zoologie*, vol xlix. p. 209, by permission of Wilhelm Engelmann.

Chaetonotus maximus, Ehrb., ventral side. (After Zelinka.)
Bo, Bristles surrounding the mouth.
ds, Dorsal bristles.
hCi, Posterior lateral cilia.
Ke, Cuticular dome.
Mr, Oral cavity.
IT, Lateral sensory hairs.
Pl, Cuticular plates.
Sa, Dorsal bristle of the basal part.
Sch, Plates.
Se, Lateral bristles.
Vb, Point of union of ciliated tract.
vCi, Anterior group of cilia.
vS, Ventral bristles of the basal part.

The two ovaries lie at the level of the juncture of the stomach and rectum. The eggs become very large, sometimes half the length of the mother; they are laid amongst water weeds. The male reproductive system is but little known, a small gland lying between the ovaries has been thought to be a testis, and if it be, the Gastrotricha are hermaphrodite.

Zelinka classifies the group as follows:—

Sub-order 1.—EUICHTHYDINA with a forked tail.

(i.) Fam. Ichthydidae, without bristles. Genera: *Ichthydium*, *Lepidoderma*.

(ii.) Fam. Chaetonotidae, with bristles. Genera: *Chaetonotus*, *Chaetura*.

Sub-order 2.—APODINA, tail not forked. Genera: *Dasydytes*, *Gossea*, *Stylochaeta*.

The genus *Aspidiophorus* recently described by Voigt seems in some respects intermediate between *Lepidoderma* and *Chaetonotus*. *Zelinkia* and *Philosyrtis* are two slightly aberrant forms described by Giard from certain diatomaceous sands. Altogether there must be some forty to fifty described species.

The group is an isolated one and shows no clear affinities with any of the great phyla. Those that are usually dwelt on are treated with the Rotifers and Nematoda and Turbellaria.

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GATAKER, THOMAS (1574–1654), English divine, was born in London in September 1574, and educated at St John's College, Cambridge. From 1601 to 1611 he held the appointment of preacher to the society of Lincoln's Inn, which he resigned on accepting the rectory of Rotherhithe. In 1642 he was chosen a member of the assembly of divines at Westminster, and annotated for that assembly the books of Isaiah, Jeremiah and Lamentations. He disapproved of the introduction of the Covenant, and declared himself in favour of episcopacy. He was one of the forty-seven London clergymen who disapproved of the trial of Charles I. He was married four times, and died in July 1654.

His principal works, besides some volumes of sermons are—*On the Nature and Use of Lots* (1619), a curious treatise which led to his being accused of favouring games of chance; *Dissertatio de stylo Novi Testamenti* (1648); *Cinnus, sive Adversaria miscellanea, in quibus Sacrae Scripturae primo, deinde aliorum scriptorum, locis aliquam multis lux redditur* (1651), to which was afterwards subjoined *Adversaria Posthuma*; and his edition of *Marcus Antoninus* (1652), which, according to Hallam, is the "earliest edition of any classical writer published in England with original annotations," and, for the period at which it was written, possesses remarkable merit. His collected works were published at Utrecht in 1698.

GATCHINA, a town of Russia, in the government of St Petersburg, 29 m. by rail S. of the city of St Petersburg, in 59° 34′ N. and 30° 6′ E. Pop. (1860) 9184; (1897) 14,735. It is situatcd in a flat, well-wooded, and partly marshy district, and on the south side of the town are two lakes. Among its more important buildings are the imperial palace, which was founded in 1770 by Prince Orlov, and constructed according to the plans of the Italian architect Rinaldi; a military orphanage, founded in 1803; and a school for horticulture. Among the few industrial establishments is a porcelain factory. At Gatchina an alliance was concluded bet ween Russia and Sweden on the 29th of October 1790.

GATE, an opening into any enclosure for entrance or exit, capable of being closed by a barrier at will. The word is of wide application, embracing not only the defensive entrance ways into a fortified place, with which this article mainly deals, or the imposing architectural features which form the main entrances to palaces, colleges, monastic buildings, &c., but also the common five-barred barrier which closes an opening into a field. The most general distinction that can be made between "door" and "gate" is that of size, the greater entrance into a court containing other buildings being the "gate," the smaller entrances opening directly into the particular buildings the "doors," or that of construction, the whole entrance way being a "gate" or gateway, the barrier which closes it a "door." A further distinction is drawn by applying "door" to the solid barriers or "valves" of wood, metal, &c., made in panels and fitted to a framework, and "gate" to an openwork structure, whether of metal or wood (see further DOOR and METAL-WORK). The ultimate origin of the word is obscure; the early forms appear with a palatalized initial letter, still surviving in such dialectical forms as "yate," or in Scots "yett." It is probably connected with the root of "get," in the sense either of "means of access" or of "holding," "receptacle"; cf. Dutch *gat*, hole. There may be a connexion, however, with "gate," now usually spelled "gait," a manner of walking,[1] but originally a way, passage; cf. Ger. *Gasse*, narrow street, lane.

The entrance through the enclosing walls of a city or fortification has been from the earliest times a place of the utmost importance, considered architecturally, socially or from the point of view of the military engineer. In the East the "gate" was and still is in many Mahommedan countries the central place of civic life. Here was the seat of justice and of audience, the most important market-place, the spot where men gathered to receive and exchange news. The references in the Bible to the gates of the city in all these varied aspects are innumerable (cf. Gen. xix. 1; Deut. xxv. 7; Ruth iv. 1; 2 Sam. xix. 8; 2 Kings vii. 1). Later the seat of justice and of government is transferred to the gate of the palace of the king (cf. Dan. ii. 49. and Esther ii. 19), and this use is preserved to-day in the official title of the seat of government of the Turkish empire at Constantinople, the "Sublime Porte," a translation of the Turkish *Bab Aliy* (*bab*, gate, and *aliy*, high). A full account with many modern instances of Eastern customs will be found in Sir Charles Warren's article "Gate" in

[1] The spelling "gait" is confined to this meaning—the only literary one surviving. In the form "gate" it appears dialectally in this sense and in such particular meanings as a right to run cattle on common or private ground or as a passage way in mines. The principal survival is in names of streets in the north and midlands of England and in Scotland, *e.g.* Briggate at Leeds, Wheeler Gate and Castle Gate at Nottingham, Gallow Tree Gate at Leicester, and Canongate and Cowgate at Edinburgh.

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Hastings's *Dict. of Bible.* For the "pylon," the typical gate of Egyptian architecture, see ARCHITECTURE.

The gates into a walled town or other fortified place were necessarily in early times the chief points on which the attack concentrated, and the features, common throughout the ages, of flanking or surmounting towers and of galleries over the entrance way, are found in the Assyrian gate at Khorsabad (*cf.* 2 Chron. xxvi. 9; 2 Sam. xviii. 24). With the coming of peaceful times to a city or the removal of the fear of sudden attack, the gateways would take a form adapted more for ready exit and entrance than for defence, though the possibility of defending them was not forgotten. Such city gates often had separate openings for entrance and exit, and again for foot passengers and for vehicles. The Gallo-Roman gate at Autun has four entrances, two just wide enough to admit carriages, and two narrow alleys for foot passengers. A fine example of a Roman city gate, dating from the time of Constantine, is at Trèves. It is four storeys high, with ornamental windows, and decorated with columns on each storey. The two outer wings project beyond the central part, the two entrance ways are 14 ft. wide, and could be closed by doors and a portcullis. The chambers in the storeys above were used for the purposes of civil administration. In more modern times city gateways have often followed the type of the Roman triumphal arch, with a single wide opening and purely ornamental superstructure. On the other hand, the defensive gate formed by an archway entering as it were through a tower has been constantly followed as a type of entrance to buildings of an entirely peaceful character. A fine example of such a gateway, originally built for defence, is at Battle Abbey; this was built by Abbot Retlynge in 1338, when Edward III. granted a licence to fortify and crenellate the abbey. Such gateways are typical of Tudor palaces, as at St James's or at Hampton Court, and are the most common form in the colleges of Oxford and Cambridge. The Tom Gate at Christ Church, Oxford, with its surmounted domed bell tower, or the cupola resting on columns at Queen's College, Oxford, are further examples of the gate architecturally considered.

The changes the fortified gateway has undergone in construction and the varying relative importance it has held in the scheme of defence follow the lines of development taken by the history of FORTIFICATION AND SIEGECRAFT (*q.v.*). The following is a short sketch of the main stages in its history. A good example of the Roman fortified city gate still remains at Pompeii. Here there is one passage way for vehicles, 14 ft. wide; this is open to the sky. The two footways on either side are arched, with openings in the centre on to the central way. The doors of the gate are on the city side, but a portcullis (*cataracta*) closed it on the country side. The gateways of the Roman permanent camps (*castra stativa*) were four in number, the *porta praetoria* and *Decumana* at either end, with *principalis dextra* and *sinistra* on the side (see also CAMP). At Pevensey (*Anderida*) a small postern on the north side of the Roman walls was laid bare in 1906–1907, in which the passage curves in the thickness of the wall, and from a width admitting two men abreast narrows so that one alone could block it. Flanking towers or bastions guarded the main entrances, while in front were built outworks, of palisades, &c., to protect it; these were known as *procastra* or *antemuralia*, and the entrances to these were placed so that they could be flanked from the main walls.

In the defence of a fortified place the gate had not only to be protected from sudden surprise, but also had to undergo protracted attacks concentrated upon it during a siege. Thus until the coming of gunpowder, the ingenuity of military engineers was exhausted in accumulating the most complicated defences round the gateways, and the strength of a fortified place could be estimated by the fewness of its gates. Viollet-le-Duc (*Dict. de l'arch. du moyen âge*, s.v. *Porte*) takes the Narbonne and Aude gates (E. and W.) of Carcassonne as typical instances of this complication. The following brief account of the Narbonne Gate (fig. 1), one of the principal parts of the work on the fortifications begun by Philip the Bold in 1285, will give some idea of the varied means of defence, which may be found individually if not always in such collective abundance in the fortified gateways of the middle ages. Two massive towers flanked the actual entrance and were linked across by an iron chain; over the entrance (E) was a machicolation, further added to in time of war by a hoarding of timber; and an outer portcullis fell in front of the heavy iron-lined doors. On to the passage way between the first and second doors opened a square machicolation (G) from which the defenders in the upper chambers of the gate could attack an enemy that had succeeded in breaking through the first entrance or had been trapped by the falling of the first portcullis. Another machicolation (I) opened from the roof in front of the second portcullis and second door. So much for the gate itself; but before an attack could reach that point, the following defences had to be passed: an immense circular barbican (A) protected the entrance across the moat and through the outer *enceinte* of the city. This entrance was flanked by a masked return of the wall (C), while palisades (P) still further hampered the assailant in his passage across the "lists" to the foot of the gate towers. Here sappers would find themselves exposed to a fire from the loopholes and from the machicolated hoardings above them, while the projecting horns with which

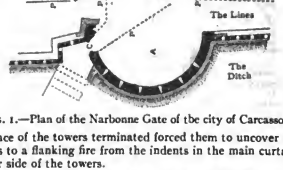

FIG. 1.—Plan of the Narbonne Gate of the City of Carcassonne.

the face of the towers terminated forced them to uncover themselves to a flanking fire from the indents in the main curtain on either side of the towers.

The later history of the gateway is merged in that of modern fortification. The more elaborate the gate defences the greater was the inducement for the besieger to attack the walls, and improvements in methods of siegecraft ultimately compelled the defender to develop the *enceinte* from its medieval form of a ring wall with flanking towers to the 17th century form of bastions, curtains, tenailles and ravelins, all intimately connected in one general scheme of defence. By Vauban's time there is little to distinguish the position and defences of the gateways from the rest of the fortifications surrounding a town. A road from the country usually entered one of the ravelins, sinking into the glacis, crossing the ditch of the ravelin and piercing the parapet almost at right angles to its proper direction (see fig. 2, which also shows a typical arrangement of minor communications such as ramps and staircases). From the interior of the ravelin it passed across the main ditch to a gate in the curtain of the enceinte. The road was in fact artificially made to wind in such a way that it was kept under fire from the defences throughout, while the part of it inside the works was bent so as to place a covering mass between the enemy's fire and troops using the road for a sortie. Thus the gate itself was merely a barrier against a *coup de main* and to keep out unauthorized persons. In conditions precluding the making of a breach in the walls, *i.e.* in surprises and assaults *de vive force*, the gateway and accompanying drawbridge continue to play their part in the 16th, 17th and 18th centuries, but they seldom or never appear as the objectives of a siege *en règle*. In Vauban's works, and those of most other engineers, there was generally a postern giving access to the floor of the main ditch, in the centre of the curtain escarp. The gates of Vauban's and later fortresses are strong heavy wooden

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doors, and the gateways more or less ornamental archways, exactly as in many private mansions of castellar form. In modern fortresses the gate of a detached fort or an *enceinte de sureté* is intended purely as a defence against an unexpected rush. The usual method is to have two gates, the outer one a lattice or portcullis of iron bars and the inner one a plate of half-inch steel armour, backed by wood and loopholed. The defenders of the gate can by this arrangement fire from the inner loopholes through the outer gate upon the approaches, and also keep the enemy under fire whilst he is trying to force the outer gate

Fig. 2.—Plan of Gate Arrangements of an 18th Century Fortress.

itself. The ditches are crossed either by drawbridges or by ramps leading the road down to the floor of the ditch.

The "gate" as a barrier to be removed and as an entrance to be passed is of constant occurrence in figurative language and in symbolical usage. The gates of the temple of Janus (*q.v.*) at Rome stood open in war and closed in peace. The *pylon* of ancient Egypt had a symbolical meaning in the Book of the Dead, and religious significance attaches to the *torii*, one of the outward signs of the Shinto religion in Japan, the Buddhist *toran*, and to the Chinese *pai-loo*, the honorific gateways erected to ancestors. The gates of heaven and hell, the gates of death and darkness, the wide and narrow gates that lead to destruction and life (Matt. vii. 13 and 14), are familiar metaphorical phrases in the Bible. In Greek and Roman legend dreams pass through gates of transparent horn if true, if deceptive and false through opaque gates of ivory (Hom. *Od.* xix. 560 sq.; Virg. *Aen.* vi. 893). (C. We.)

GATEHOUSE. In the second half of the 16th century in England the entrance gateway, which formed part of the principal front of the earlier feudal castles, became a detached feature attached to the mansions only by a wall enclosing the entrance court. The gatehouse then constituted a structure of some importance, and included sometimes many rooms as at Stanway Hall, Gloucestershire, where it measures 44 ft. by 22 ft. and has three storeys; at Westwood, Worcestershire, it had a frontage of 54 ft. with two storeys; and at Burton Agnes, Yorkshire, it was still larger and was flanked by great octagonal towers at the angles and had three storeys. At a later period smaller accommodation was provided so that it virtually became a lodge, but being designed to harmonize with the mansion it presented sometimes a monumental structure. On the continent of Europe the gatehouse forms a much more important building, as it formed part of the town fortifications, where it sometimes defended the passage of a bridge across the stream or moat. There are numerous examples in France and Germany.

GATES, HORATIO (1728–1806), American general, was born at Maldon in Essex, England, in 1728. He entered the English army at an early age, and was rapidly promoted. He accompanied General Braddock in his disastrous expedition against Fort Duquesne in 1755, and was severely wounded in the battle of July 9; and he saw other active service in the Seven Years' War. After the peace of 1763 he purchased an estate in Virginia, where he lived till the outbreak of the War of Independence in 1775, when he was named by Congress adjutant-general. In 1776 he was appointed to command the troops which had lately retreated from Canada, and in August 1777, as a result of a successful intrigue, was appointed to supersede General Philip Schuyler in command of the Northern Department. In the two battles of Saratoga (*q.v.*) his army defeated General Burgoyne, who, on the 17th of October, was forced to surrender his whole army. This success was, however, largely due to the previous manœuvres of Schuyler and to Gates's subordinate officers. The intrigues of the Conway Cabal to have Washington superseded by Gates completely failed, but Gates was president for a time of the Board of War, and in 1780 was placed in chief command in the South. He was totally defeated at Camden, S.C., by Cornwallis on the 17th of August 1780, and in December was superseded by Greene, though an investigation into his conduct terminated in acquittal (1782). He then retired to his Virginian estate, whence he removed to New York in 1790, after emancipating his slaves and providing for those who needed assistance. He died in New York on the 10th of April 1806.

GATESHEAD, a municipal, county and parliamentary borough of Durham, England; on the S. bank of the Tyne opposite Newcastle, and on the North Eastern railway. Pop. (1891) 85,692; (1901) 109,888. Though one of the largest towns in the county, neither its streets nor its public buildings, except perhaps its ecclesiastical buildings, have much claim to architectural beauty. The parish church of St Mary is an ancient cruciform edifice surmounted by a lofty tower; but extensive restoration was necessitated by a fire in 1854 which destroyed a considerable part of the town. The town-hall, public library and mechanic's institute are noteworthy buildings. Education is provided by a grammar school, a large day school for girls, and technical and art schools. There is a service of steam trams in the principal streets, and three fine bridges connect the town with Newcastle-upon-Tyne. There are large iron works (including foundries and factories for engines, boilers, chains and cables), shipbuilding yards, glass manufactories, chemical, soap and candle works, brick and tile works, breweries and tanneries. The town also contains a depot of the North Eastern railway, with large stores and locomotive works. Extensive coal mines exist in the vicinity; and at Gateshead Fell are large quarries for grindstones, which are much esteemed and are exported to all parts of the world. Large gas-works of the Newcastle and Gateshead Gas Company are also situated in the borough. The parliamentary borough returns one member. The corporation consists of a mayor, 9 aldermen, and 27 councillors. Area, 3132 acres.

Gateshead (Gatesheved) probably grew up during late Saxon times, the mention of the church there in which Bishop Walcher was murdered in 1080 being the first evidence of settlement. The borough probably obtained its charter during the following century, for Hugh de Puiset, bishop of Durham (1153–1195), confirmed to his burgesses similar rights to those of the burgesses of Newcastle, freedom of toll within the palatinate and other privileges. The bishop had a park here in 1348, and in 1438 Bishop Nevill appointed a keeper of the "tower." The position of the town led to a struggle with Newcastle over both fishing and trading rights. An inquisition of 1322 declared that the water of the Tyne was divided into three parts: the northern, belonging to Northumberland; the southern to Durham; and the central, common to all. At another inquisition held in 1336 the men of Gateshead claimed liberty of trading and fishing along the coast of Durham, and freedom to sell their fish where they would. In 1552, on the temporary extinction of the diocese of Durham, Gateshead was attached to Newcastle, but in 1554 was regranted to Bishop Tunstall. As compensation the bishop granted to Newcastle, at a nominal rent, the Gateshead salt-meadows, with rights of way to the High Street, thus abolishing the toll previously paid to the bishop. During the next century Bishop Tunstall's successors incorporated nearly all the various trades of Gateshead, and Cromwell continued this policy. The town government during this period was by

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the bishop's bailiff, and the holders of the burgages composed the juries of the bishop's courts leet and baron. No charter of incorporation is extant, but in 1563 contests were carried on under the name of the bailiffs, burgesses and commonalty, and a list of borough accounts exists for 1606. The bishop appointed the last borough bailiff in 1681, and though the inhabitants in 1772 petitioned for a bailiff the town remained under a steward and grassmen until the 19th century. As part of the palatinate of Durham, Gateshead was not represented in parliament until 1832. At the inquisition of 1336 the burgesses claimed an annual fair on St Peter's Day, and depositions in 1577 mention a borough market held on Tuesday and Friday, but these were apparently extinct in Camden's day, and no grant of them is extant. The medieval trade seems to have centred round the fisheries and the neighbouring coal mines which are mentioned in 1364 and also by Leland.

GATH, one of the five chief cities of the Philistines. It is frequently mentioned in the historical books of the Old Testament, and from Amos vi. 2 we conclude that, like Ashdod, it fell to Sargon in 711. Its site appears to have been known in the 4th century, but the name is now lost. Eusebius (in the *Onomasticon*) places it near the road from Eleutheropolis (Beit Jibrîn) to Diospolis (Ludd) about five Roman miles from the former. The Roman road between these two towns is still traceable, and its milestones remain in places. East of the road at the required distance rises a white cliff, almost isolated, 300 ft. high and full of caves. On the top is the little mud village of Tell eṣ-Ṣâfi ("the shining mound"), and beside the village is the mound which marks the site of the Crusaders' castle of Blanchegarde (Alba Custodia), built in 1144. Tell eṣ-Ṣâfi was known by its present name as far back as the 12th century; but it appears not improbable that the strong site here existing represents the ancient Gath. The cliff stands on the south side of the mouth of the Valley of Elah, and Gath appears to have been near this valley (1 Sam. xvii. 2, 52). This identification is not certain, but it is at least much more probable than the theory which makes Gath, Eleutheropolis, and Beit Jibrîn one and the same place. The site was partially excavated by the Palestine Exploration Fund in 1899, and remains extending in date back to the early Canaanite period were discovered.

GATLING, RICHARD JORDAN (1818–1903), American inventor, was born in Hertford county, North Carolina, on the 12th of September 1818. He was the son of a well-to-do planter and slave-owner, from whom he inherited a genius for mechanical invention and whom he assisted in the construction and perfecting of machines for sowing cotton seeds, and for thinning the plants. He was well educated and was successively a school teacher and a merchant, spending all his spare time in developing new inventions. In 1839 he perfected a practical screw propeller for steamboats, only to find that a patent had been granted to John Ericsson for a similar invention a few months earlier. He established himself in St Louis, Missouri, and taking the cotton-sowing machine as a basis he adapted it for sowing rice, wheat and other grains, and established factories for its manufacture. The introduction of these machines did much to revolutionize the agricultural system in the country. Becoming interested in the study of medicine through an attack of smallpox, he completed a course at the Ohio Medical College, taking his M.D. degree in 1850. In the same year he invented a hemp-breaking machine, and in 1857 a steam plough. At the outbreak of the Civil War he was living in Indianapolis, and devoted himself at once to the perfecting of fire-arms. In 1861 he conceived the idea of the rapid fire machine-gun which is associated with his name. By 1862 he had succeeded in perfecting a gun that would discharge 350 shots per minute; but the war was practically over before the Federal authorities consented to its official adoption. From that time, however, the success of the invention was assured, and within ten years it had been adopted by almost every civilized nation. Gatling died in New York City on the 26th of February 1903.

GATTY, MARGARET (1809–1873), English writer, daughter of the Rev. Alexander Scott (1768–1840), chaplain to Lord Nelson, was born at Burnham, Essex, in 1809. She early began to draw and to etch on copper, being a regular visitor to the print-room of the British Museum from the age of ten. She also illuminated on vellum, copying the old strawberry borders and designing initials. In 1839 Margaret Scott married the Rev. Alfred Gatty, D.D., vicar of Ecclesfield near Sheffield, subdean of York cathedral, and the author of various works both secular and religious. In 1842 she published in association with her husband a life of her father; but her first independent work was *The Fairy Godmother and other Tales*, which appeared in 1851. This was followed in 1855 by the first of five volumes of *Parables from Nature*, the last being published in 1871. It was under the *nom de plume* of Aunt Judy, as a pleasant and instructive writer for children, that Mrs Gatty was most widely known. Before starting *Aunt Judy's Magazine* in May 1866, she had brought out *Aunt Judy's Tales* (1858) and *Aunt Judy's Letters* (1862), and among the other children's books which she subsequently published were *Aunt Judy's Song Book for Children* and *The Mother's Book of Poetry*. "Aunt Judy" was the nickname given by her daughter Juliana Horatia Ewing (*q.v.*). The editor of the magazine was on the friendliest terms with her young correspondents and subscribers, and her success was largely due to the sympathy which enabled her to look at things from the child's point of view. Besides other excellences her children's books are specially characterized by wholesomeness of sentiment and cheerful humour. Her miscellaneous writings include, in addition to several volumes of tales, *The Old Folks from Home*, an account of a holiday ramble in Ireland; *The Travels and Adventures of Dr Wolff the Missionary* (1861), an autobiography edited by her; *British Sea Weeds* (1862); *Waifs and Strays of Natural History* (1871); *A Book of Emblems* and *The Book of Sun-Dials* (1872). She died at Ecclesfield vicarage on the 4th of October 1873.

GAU, JOHN (*c.* 1495–? 1553), Scottish translator, was born at Perth towards the close of the 15th century. He was educated in St Salvator's College at St Andrews. He appears to have been in residence at Malmö in 1533, perhaps as chaplain to the Scots community there. In that year John Hochstraten, the exiled Antwerp printer, issued a book by Gau entitled: *The Richt way to the Kingdome of Heuine*, of which the chief interest is that it is the first Scottish book written on the side of the Reformers. It is a translation of Christiern Pedersen's *Den rette vey till Himmerigis Rige* (Antwerp, 1531), for the most part direct, but showing intimate knowledge in places of the German edition of Urbanus Rhegius. Only one copy of Gau's text is extant, in the library of Britwell Court, Bucks. It has been assumed that all the copies were shipped from Malmö to Scotland, and that the cargo was intercepted by the Scottish officers on the look out for the heretical works which were printed abroad in large numbers. This may explain the silence of all the historians of the Reformed Church—Knox, Calderwood and Spottiswood. Gau married in 1536 a Malmö citizen's daughter, bearing the Christian name Birgitta. She died in 1551, and he in or about 1553.

The first reference to the *Richt Vay* appeared in Chalmers's *Caledonia*, ii. 616. Chalmers, who was the owner of the unique volume before it passed into the Britwell Court collection, considered it to be an original work. David Laing printed extracts for the Bannatyne Club (*Miscellany*, iii., 1855). The evidence that the book is a translation was first given by Sonnenstein Wendt in a paper "Om Reformatorerna i Malmö," in Rördam's *Ny Kirkehistoriske Samlinger*, ii. (Copenhagen, 1860). A complete edition was edited by A. F. Mitchell for the Scottish Text Society (1888). See also Lorimer's *Patrick Hamilton*.

GAUDEN, JOHN (1605–1662), English bishop and writer, reputed author of the *Eikon Basilike*, was born in 1605 at Mayland, Essex, where his father was vicar of the parish. Educated at Bury St Edmunds school and at St John's College, Cambridge, he took his M.A. degree in 1625/6. He married Elizabeth, daughter of Sir William Russell of Chippenham, Cambridgeshire, and was tutor at Oxford to two of his wife's brothers. He seems to have remained at Oxford until 1630, when he became vicar of Chippenham. His sympathies were at first with the parliamentary party. He was chaplain to Robert Rich, second earl of Warwick, and preached before the House of Commons in 1640.

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In 1641 he was appointed to the rural deanery of Bocking. Apparently his views changed as the revolutionary tendency of the Presbyterian party became more pronounced, for in 1648/9 he addressed to Lord Fairfax *A Religious and Loyal Protestation* . . . against the proceedings of the parliament. Under the Commonwealth he faced both ways, keeping his ecclesiastical preferment, but publishing from time to time pamphlets on behalf of the Church of England. At the Restoration he was made bishop of Exeter. He immediately began to complain to Hyde, earl of Clarendon, of the poverty of the see, and based claims for a better benefice on a certain secret service, which he explained on the 20th of January 1661 to be the sole invention of the *Eikon Basilike, The Pourtraicture of his sacred Majestie in his Solitudes and Sufferings* put forth within a few hours after the execution of Charles I. as written by the king himself. To which Clarendon replied that he had been before acquainted with the secret and had often wished he had remained ignorant of it. Gauden was advanced in 1662, not as he had wished to the see of Winchester, but to Worcester. He died on the 23rd of May of the same year.

The evidence in favour of Gauden's authorship rests chiefly on his own assertions and those of his wife (who after his death sent to her son John a narrative of the claim), and on the fact that it was admitted by Clarendon, who sould have had means of being acquainted with the truth. Gauden's letters on the subject are printed in the appendix to vol. iii. of the *Clarendon Papers*. The argument is that Gauden had prepared the book to inspire sympathy with the king by a representation of his pious and forgiving disposition, and so to rouse public opinion against his execution. In 1693 further correspondence between Gauden, Clarendon, the duke of York, and Sir Edward Nicholas was published by Mr Arthur North, who had found them among the papers of his sister-in-law, a daughter-in-law of Bishop Gauden; but doubt has been thrown on the authenticity of these papers. Gauden stated that he had begun the book in 1647 and was entirely responsible for it. But it is contended that the work was in existence at Naseby,[1] and testimony to Charles's authorship is brought forward from various witnesses who had seen Charles himself occupied with it at various times during his imprisonment. It is stated that the MS. was delivered by one of the king's agents to Edward Symmons, rector of Raine, near Bocking, and that it was in the handwriting of Oudart, Sir Edward Nicholas's secretary. The internal evidence has, as is usual in such cases, been brought forward as a conclusive argument in favour of both contentions. Doubt was thrown on Charles's authorship in Milton's *Eikonoklastes* (1649), which was followed almost immediately by a royalist answer, *The Princely Pelican. Royall Resolves—Extracted from his Majesty's Divine Meditations, with satisfactory reasons . . . that his Sacred Person was the only Author of them* (1649). The history of the whole controversy, which has been several times renewed, was dealt with in Christopher Wordsworth's tracts in a most exhaustive way. He eloquently advocated Charles's authorship. Since he wrote in 1820, some further evidence has been forthcoming in favour of the Nasceby copy. A correspondence relating to the French translation of the work has also come to light among the papers of Sir Edward Nicholas. None of the letters show any doubt that King Charles was the author. S. R. Gardiner (*Hist. of the Great Civil War*, iv. 325) regards Mr Doble's articles in the *Academy* (May and June 1883) as finally disposing of Charles's claim to the authorship, but this is by no means the attitude of other recent writers. If Gauden was the author, he may have incorporated papers, &c., by Charles, who may have corrected the work and thus been joint-author. The theory would reconcile the conflicting evidence, that of those who saw Charles writing parts and read the MS. before publication, and the deliberate statements of Gauden.

See also the article by Richard Hooper in the *Dict. Nat. Biog.*; Christopher Wordsworth, *Who wrote Eikon Basilike?* two letters addressed to the archbishop of Canterbury (1824), and *King Charles the First, the Author of Icon Basilikè* (1828); H. J. Todd, *A Letter to the Archbishop of Canterbury concerning Eikon Basilike* (1825); *Bishop Gauden, The Author of the Icôn Basilikè* (1829); W. G. Broughton, *A Letter to a Friend* (1826), *Additional Reasons* . . . (1829), supporting the contention in favour of Dr Gauden; Mr E. J. L. Scott's introduction to his reprint (1880) of the original edition; articles in the *Academy*, May and June 1883, by Mr C. E. Doble; another reprint edited by Mr Edward Almack for the King's Classics (1904); and Edward Almack, *Bibliography of the King's Book* (1896). This last book contains a summary of the arguments on either side, a full bibliography of works on the subject, and facsimiles of the title pages, with full descriptions of the various extant copies.

GAUDICHAUD-BEAUPRÉ, CHARLES (1789–1854), French botanist, was born at Angoulême on the 4th of September 1789. He studied pharmacy first in the shop of a brother-in-law at Cognac, and then under P. J. Robiquet at Paris, where from R. L. Desfontaines and L. C. Richard he acquired a knowledge of botany. In April 1810 he was appointed dispenser in the military marine, and from July 1811 to the end of 1814 he served at Antwerp. In 1817 he joined the corvette "Uranie" as pharmaceutical botanist to the circumpolar expedition commanded by D. de Freycinet. The wreck of the vessel on the Falkland Isles, at the close of 1819, deprived him of more than half the botanical collections he had made in various parts of the world. In 1830–1833 he visited Chile, Peru and Brazil, and in 1836–1837 he acted as botanist to "La Bonite" during its circumnavigation of the globe. His theory accounting for the growth of plants by the supposed coalescence of elementary "phytons" involved him, during the latter years of his life, in much controversy with his fellow-botanists, more especially C. F. B. de Mirbel. He died in Paris on the 16th of January 1854.

Besides accounts of his voyages round the world, Gaudichaud-Beaupré wrote "Lettres sur l'organographie et la physiologie," *Botanique*, ii., 1883; "Recherches générales sur l'organographie," &c. (prize essay, 1835), *Mém. de l'Académie des Sciences*, t. viii. and kindred treatises, with memoirs on the potato-blight, the multiplication of bulbous plants, the increase in diameter of dicotyledonous plants, and other subjects; and *Réfutation de toutes les objections contre les nouveaux principes physiologiques* (1852).

GAUDRY, JEAN ALBERT (1827–1908), French geologist and palaeontologist, was born at St Germain-en-Laye on the 16th of September 1827, and was educated at the college, Stanislas. At the age of twenty-five he made explorations in Cyprus and Greece, residing in the latter country from 1855 to 1860. He then investigated the rich deposit of fossil vertebrata at Pikermi and brought to light a remarkable mammalian fauna, Miocene in age, and intermediate in its forms between European, Asiatic and African types. He also published an account of the geology of the island of Cyprus (*Mém. Soc. Géol. de France*, 1862). In 1853, while still in Cyprus, he was appointed assistant to A. D'Orbigny, who was the first to hold the chair of palaeontology in the museum of natural history at Paris. In 1872 he succeeded to this important post; in 1882 he was elected member of the Academy of Sciences; and in 1900 he presided over the meetings of the eighth International Congress of Geology then held in Paris. He died on the 27th of November 1908. He is distinguished for his researches on fossil mammalia, and for the support which his studies have rendered to the theory of evolution.

PUBLICATIONS.—*Animaux fossiles et géologie de l'Attique* (2 vols., 1862–1867); *Cours de paléontologie* (1873); *Animaux fossiles du Mont Lébéron* (1873); *Les Enchaînements du monde animal dans les temps géologiques* (*Mammifères Tertiaires*, 1878; *Fossiles primaires*, 1883; *Fossiles secondaires*, 1890); *Essai de paléontologie philosophique* (1896). Brief memoir with portrait in *Geol. Mag.* (1903), p. 49. (H. B. W.)

GAUDY, an adjective meaning showy, very bright, gay, especially with a sense of tasteless or vulgar extravagance, of colour or ornament. The accurate origin of the various senses which this word and the substantive "gaud" have taken are somewhat difficult to trace. They are all ultimately to be referred to the Lat. *gaudere*, to rejoice, *gaudium*, joy, some of them directly, others to the French derivative *gaudir*, to rejoice, and O.Fr. *gaudie*. As a noun, in the sense of rejoicing or feast, "gaudy" is still used of a commemoration dinner at a college at the university of Oxford. "Gaud," meaning generally a toy, a gay adornment, a piece of showy jewelry, is more specifically applied to larger and more decorative beads in a rosary.

[1] See a note in Archbishop Tenison's handwriting in his copy of the *Eikon Basilike* preserved at Lambeth Palace, and quoted in Almack's *Bibliography*, p. 15.

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GAUERMANN, FRIEDRICH (1807–1862), Austrian painter, son of the landscape painter Jacob Gauermann (1773–1843), was born at Wiesenbach near Gutenstein in Lower Austria on the 20th of September 1807. It was the intention of his father that he should devote himself to agriculture, but the example of an elder brother, who, however, died early, fostered his inclination towards art. Under his father's direction he began studies in landscape, and he also diligently copied the works of the chief masters in animal painting which were contained in the academy and court library of Vienna. In the summer he made art tours in the districts of Styria, Tirol and Salzburg. Two animal pieces which he exhibited at the Vienna Exhibition of 1824 were regarded as remarkable productions for his years, and led to his receiving commissions in 1825 and 1826 from Prince Metternich and Caraman, the French ambassador. His reputation was greatly increased by his picture "The Storm," exhibited in 1829, and from that time his works were much sought after and obtained correspondingly high prices. His "Field Labourer" was regarded by many as the most noteworthy picture in the Vienna exhibition of 1834, and his numerous animal pieces have entitled him to a place in the first rank of painters of that class of subjects. The peculiarity of his pictures is the representation of human and animal figures in connexion with appropriate landscapes and in characteristic situations so as to manifest nature as a living whole, and he particularly excels in depicting the free life of animals in wild mountain scenery. Along with great mastery of the technicalities of his art, his works exhibit patient and keen observation, free and correct handling of details, and bold and clear colouring. He died at Vienna on the 7th of July 1862.

Many of his pictures have been engraved, and after his death a selection of fifty-three of his works was prepared for this purpose by the Austrian *Kunstverein* (Art Union).

GAUGE, or GAGE (Med. Lat. *gauja*, *jaugia*, Fr. *jauge*, perhaps connected with Fr. *jale*, a bowl, *galon*, gallon), a standard of measurement, and also the name given to various instruments and appliances by which measurement is effected. The word seems to have been primarily used in connexion with the process of ascertaining the contents of wine casks; the name gauger is still applied to certain custom-house officials in the United States, and in Scotland it means an exciseman. Thence it was extended to other measurements, and used of the instruments used in making them or of the standards to which they were referred. In the mechanical arts gauges are employed in great variety to enable the workmen to ascertain whether the object he is making is of the proper dimensions (see TOOL), and similar gauges of various forms are employed to ascertain and to specify the sizes of manufactured articles such as wire and screws. A rain gauge is an apparatus for measuring the amount of the rainfall at any locality, and a wind gauge indicates the pressure and force of the wind. The boilers of steam engines are provided with a water gauge and a steam or pressure gauge. The purpose of the former is to enable the attendant to see whether or not there is a sufficient quantity of water in the boiler. It consists of two cocks or taps communicating with the interior, one being placed at the lowest point to which it is permissible for the water to fall, and the other at the point above which it should not rise; a glass tube connects the two cocks, and when they are both open the water in this stands at the same level as in the boiler. The steam gauge shows the pressure of the steam in the boiler. One of the commonest forms, known as the Bourdon gauge, depends on the fact that a curved tube tends to straighten itself if the pressure within it is greater than that outside it. This gauge therefore consists of a curved or coiled tube of elastic material, and preferably of elliptic section, connected with the boiler and arranged with a multiplying gear so that its bending or unbending actuates a pointer moving over a graduated scale. If the pressure within the tube is less than that outside it, the tube tends to bend or coil itself up further; with a pointer arranged as before, the gauge then becomes a vacuum gauge, indicating how far the pressure in the vessel to which it is attached is below that of the atmosphere. In railway engineering the gauge of a line is the distance between the two rails (see RAILWAY). In nautical language, a ship is said to have the weather gage when she is to windward of another, and similarly the lee gage when to leeward of another; in this sense the word is usually spelt "gage," a spelling which prevails in America for all senses.

GAUHATI, a town of British India, in the Kamrup district of Eastern Bengal and Assam, mainly on the left or south, but partly on the right bank of the Brahmaputra. Pop. (1901) 14,244. It is beautifully situated, with an amphitheatre of wooded hills to the south, but is not very healthy. There are many evidences, such as ancient earthworks and tanks, of its historical importance. During the 17th century it was taken and retaken by Mahommedans and Ahoms eight times in fifty years, but in 1681 it became the residence of the Ahom governor of lower Assam, and in 1786 the capital of the Ahom raja. On the cession of Assam to the British in 1826 it was made the seat of the British administration of Assam, and so continued till 1874, when the headquarters were removed to Shillong in the Khasi hills, 67 m. distant, with which Gauhati is connected by an excellent cart-road. Two much-frequented places of Hindu pilgrimage are situated in the immediate vicinity, the temple of Kamakhya on a hill 2 m. west of the town, and the rocky island of Umananda in the mid-channel of the Brahmaputra. Gauhati is still the headquarters of the district and of the Brahmaputra Valley division, though no longer a military cantonment. It is the river terminus of a section of the Assam-Bengal railway. There are a second-grade college, a government high school, a law class and a training school for masters. Gauhati is an important centre of river trade, and the largest seat of commerce in Assam. Cotton-ginning, flour-milling, and an export trade in mustard seed, cotton, silk and forest produce are carried on. Gauhati suffered very severely from the earthquake of the 12th of June 1897.

GAUL, GILBERT WILLIAM (1855–), American artist, was born in Jersey City, New Jersey, on the 31st of March 1855. He was a pupil of J. G. Brown and L. E. Wilmarth, and he became a painter of military pictures, portraying incidents of the American Civil War. He was elected an associate of the National Academy of Design in 1880, and in 1882 a full academician, and in the latter year became a member of the Society of American Artists. His important works include: "Charging the Battery," "News from Home," "Cold Comfort on the Outpost," "Silenced," "On the Look-out," and "Guerillas returning from a Raid."

GAUL, the modern form of the Roman *Gallia*, the name of the two chief districts known to the Romans as inhabited by Celtic-speaking peoples, (*a*) *Gallia Cisalpina* (or *Citerior*, "Hither"), *i.e.* north Italy between Alps and Apennines and (*b*) the far more important *Gallia Transalpina* (or *Ulterior*, "Further"), usually called *Gallia* (Gaul) simply, the land bounded by the Alps, the Mediterranean, the Pyrenees, the Atlantic, the Rhine, *i.e.* modern France and Belgium with parts of Holland, Germany and Switzerland. The Greek form of *Gallia* was Γαλατία, but Galatia in Latin denoted another Celtic region in central Asia Minor, sometimes styled *Gallograecia*.

(*a*) Gallia Cisalpina was mainly conquered by Rome by 222 B.C.; later it adopted Roman civilization; about 42 B.C. it was united with Italy and its subsequent history is merged in that of the peninsula. Its chief distinctions are that during the later Republic and earlier Empire it yielded excellent soldiers, and thus much aided the success of Caesar against Pompey and of Octavian against Antony, and that it gave Rome the poet Virgil (by origin a Celt), the historian Livy, the lyrist Catullus, Cornelius Nepos, the elder and the younger Pliny and other distinguished writers.[1]

(*b*) Gaul proper first enters ancient history when the Greek colony of Massilia was founded (?600 B.C.). Roman armies began to enter it about 218 B.C. In 121 B.C. the coast from

[1] When Cisalpine Gaul became completely Romanized, it was often known as "Gallia Togata," while the Province was distinguished as "Gallia Bracata" (*braccae*, incorrectly *braccae*, "trousers"), from the long trousers worn by the inhabitants, and the rest of Gaul as "Gallia Comata," from the inhabitants wearing their hair long.

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Montpellier to the Pyrenees (*i.e.* all that was not Massiliot) with its port of Narbo (mod. *Narbonne*) and its trade route by Toulouse to the Atlantic, was formed into the province of Gallia Narbonensis and Narbo itself into a Roman municipality. Commercial motives prompted the step, and Roman traders and land speculators speedily flocked in. Gradually the province was extended north of Massilia, up the Rhone, while the Greek town itself became weak and dependent on Rome.

It is not, however, until the middle of the 1st century B.C. that we have any detailed knowledge of pre-Roman Gaul. The earliest account is that contained in the *Commentaries* of Julius Caesar. According to this authority, Gaul was at that time divided among three peoples, more or less distinct from one another, the Aquitani, the Gauls, who called themselves Celts, and the Belgae. The first of these extended from the Pyrenees to the Garumna (Garonne); the second, from that river to the Sequana (Seine) and its chief tributary the Matrona (Marne), reaching eastward presumably as far as the Rhenus (Rhine); and the third, from this bounding line to the mouth of the last-named river, thus bordering on the Germans. By implication Caesar recognizes as a fourth division the province of Gallia Narbonensis. By far the greater part of the country was a plain watered by numerous rivers, the chief of which have already been mentioned, with the exception of its great central stream, the Liger or Ligeris (Loire). Its principal mountain ranges were Cebenna or Gebenna (Cévennes) in the south, and Jura, with its continuation Vosegus or Vogesus (Vosges), in the east. The tribes inhabiting Gaul in Caesar's time, and belonging to one or other of the three races distinguished by him, were numerous. Prominent among them, and dwelling in the division occupied by the Celts, were the Helvetii, the Sequani and the Aedui, in the basins of the Rhodanus and its tributary the Arar (Saône), who, he says, were reckoned the three most powerful nations in all Gaul; the Arverni in the mountains of Cebenna; the Senones and Carnutes in the basin of the Liger; the Veneti and other Armorican tribes between the mouths of the Liger and Sequana. The Nervii, Bellovaci, Suessiones, Remi, Morini, Menapii and Aduatuci were Belgic tribes; the Tarbelli and others were Aquitani; while the Allobroges inhabited the north of the Provincia, having been conquered in 121 B.C. The ethnological divisions thus set forth by Caesar have been much discussed (see CELT, and articles on the chief tribes).

The Gallic Wars (58–51) of Caesar (q.v.) added all the rest of Gaul, north-west of the Cévennes, to the Rhine and the Ocean, and in 49 also annexed Massilia. All Gaul was now Roman territory. Now the second period of her history opens; it remained for Roman territory to become romanized.

Caesar had no time to organize his conquest; this work was left to Augustus. As settled by him, and in part perhaps also by his successor Tiberius, it fell into the following five administrative areas.

(i) *Narbonensis*, that is, the land between Alps, sea and Cévennes, extending up the Rhone to Vienne, was as Augustus found it, distinct in many ways from the rest of Gaul. By nature it is a sun-steeped southern region, the home of the vine and olive, of the minstrelsy of the Provençal and the exuberance of Tartarin, distinct from the colder and more sober north. By history it had already (in the time of Augustus) been Roman for from 80 to 100 years and was familiar with Roman ways. It was ready to be Italianized and it was civilized enough to need no garrison. Accordingly, it was henceforward governed by a proconsul (appointed by the senate) and freed from the burden of troops, while its local government was assimilated to that of Italy. The old Celtic tribes were broken up: instead, municipalities of Roman citizens were founded to rule their territories. Thus the Allobroges now disappear and the *colonia* of Vienna takes their place: the Volcae vanish and we find Nemausus (Nîmes). Thus thrown into Italian fashion, the province took rapidly to Italian ways. By A.D. 70 it was "Italia verius quam provincia" (Pliny). The Gauls obviously had a natural bias towards the Italian civilization, and there soon became no difference between Italy and southern Gaul. But though education spread, the results were somewhat disappointing. Trade flourished; the corporations of bargemen and the like on the Rhone made money; the many towns grew rich and could afford splendid public buildings. But no great writer and no great administrator came from Narbonensis; itinerant lecturers and journalists alone were produced in plenty, and at times minor poets.

(ii.-iv.) Across the Cévennes lay Caesar's conquests, Atlantic in climate, new to Roman ways. The whole area, often collectively styled "Gallia Comata," often "Tres Provinciae," was divided into three provinces, each under a *legatus pro praetore* appointed by the emperor, with a common capital at Lugudunum (Lyons). The three provinces were: *Aquitania*, reaching from the Pyrenees almost to the Loire; *Lugudunensis*, the land between Loire and Seine, reaching from Brittany in the west to Lyons in the south-east; and *Belgica* in the north. The boundaries, it will be observed, were wholly artificial. Here also it was found possible to dispense with garrisons, not because the provinces were as peaceful as Narbonensis, but because the Rhine army was close at hand. As befitted an unromanized region, the local government was unlike that of Italy or Narbonensis. Roman municipalities were not indeed unknown, but very few: the local authorities were the magistrates of the old tribal districts. Local autonomy was here carried to an extreme. But the policy succeeded. The Gauls of the Three Provinces, or some of them, revolted in A.D. 21 under Florus and Sacrovir, in 68 under Vindex, and in 70 under Classicus and Tutor (see CIVILIS, CLAUDIUS). But all five leaders were romanized nobles, with Roman names and Roman citizenship, and their risings were directed rather against the Roman government than the Roman empire. In general, the Gauls of these provinces accepted Roman civilization more or less rapidly, and in due course became hardly distinguishable from the Italian. In particular, they eagerly accepted the worship of "Augustus and Rome," devised by the first emperor as a bond of state religion connecting the provinces with Rome. Each August, despite the heat, representatives from the 60 (or 64) tribes of Gallia Comata met at Lyons, elected a priest, "sacerdos ad aram Augusti et Romae," and held games. The post of representative, and still more that of priest, was eagerly coveted and provided a scope for the ambitions which despotism usually crushes. It agrees with the vigorous development of this worship that the Three Provinces, though romanized, retained their own local feeling. Even in the 3rd century the cult of Celtic deities (Hercules Magusanus, Deusoniensis, &c.) were revived, the Celtic *leuga* reintroduced instead of the Roman mile on official milestones, and a brief effort made to establish an independent, though romanized, Gaul under Postumus and his short-lived successors (A.D. 259–273). Not only was the area too large and strong to lose its individuality: it was also too rural and too far from the Mediterranean to be romanized as fully and quickly as Narbonensis. It is even probable that Celtic was spoken in forest districts into the 4th century A.D. Town life, however, grew. The *chefs-lieux* of the tribes became practically, though not officially, municipalities, and many of these towns reached considerable size and magnificence of public buildings. But they attest their tribal relations by their appellations, which are commonly drawn from the name of the tribe and not of the town itself. Thus the capitals of the Remi and Parisii were actually Durocortorum and Lutetia: the appellations in use were Remis or Remus, Parisiis or Parisius—these forms being indeclinable nouns formed from a sort of locative of the tribe names. Literature also flourished. In the latest empire Ausonius, Symmachus, Apollinaris, Sidonius and other Gaulish writers, chiefly of Gallia Comata, kept alive the classical literary tradition, not only for Gaul but for the world.

(v.) The fifth division of Gaul was the Rhenish military frontier. Augustus had planned the conquest of Germany up to the Elbe. His plans were foiled by the courage of Arminius and the inability of the Roman exchequer to pay a larger army. Instead, his successor Tiberius organized the Rhine frontier in two military districts. The northern one was the valley of the Meuse and that of the Rhine to a point just south of Bonn: the southern was the rest of the Rhine valley to Switzerland. Each

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district was garrisoned at first by four, later by fewer legions, which were disposed at various times in some of the following fortresses: Vetera (Xanten), Novaesium (Neuss), Bonne (Bonn), Moguntiacum (Mainz), Argentorate (Strassburg) and Vindonissa (Windisch in Switzerland). At first the districts were purely military, were called, after the garrisons, "exercitus Germanicus superior" (south) and "inferior" (north). Later one or two municipalities were founded—Colonia Agrippinensis at Cologne (A.D. 51), Colonia Augusta Treverorum at Trier (date uncertain), Colonia Ulpia Traiana outside Vetera—and about 80–90 A.D. the two "Exercitus" were turned into the two provinces of Upper and Lower Germany. The armies in these districts formed the defence of Gaul against German invaders. They also helped to keep Gaul itself in order and their presence explains why the four provinces of Gaul proper contained no troops.

These provincial divisions were modified by Diocletian but without seriously affecting the life of Gaul. The whole country, indeed, continued Roman and fairly safe from barbarian invasions till after 400. In 407 a multitude of Franks, Vandals, &c., burst over Gaul: Roman rule practically ceased and the three kingdoms of the Visigoths, Burgundians and Franks began to form. There were still a Roman general and Roman troops when Attila was defeated in the *campi Catalaunici* in A.D. 451, but the general, Aetius, was "the last of the Romans," and in 486 Clovis the Frank ended the last vestige of Roman rule in Gaul.

For Roman antiquities in Gaul see, beside articles on the modern towns (ARLES, NIMES, ORANGE, &c.), BIBRACTE, ALESIA, ITIUS PORTUS, AQUEDUCT, ARCHITECTURE, &c.; for religion see DRUIDISM; for the famous schools of Autun, Lyons, Toulouse, Nimes, Vienne, Marseilles and Narbonne, see J. E. Sandys, *History of Classical Scholarship* (ed. 1906–1908), i. pp. 247–250; for the Roman provinces, Th. Mommsen, *Provinces of the Roman Empire* (trans. 1886), vol. i. chap. iii. See also Desjardins, *Géographie historique et administrative de la Gaule romaine* (Paris, 1877); Fustel de Coulanges, *Histoire des institutions politiques de l'ancienne France* (Paris, 1877); for Caesar's campaigns, article CAESAR, JULIUS, and works quoted for coins, art, NUMISMATICS and articles in the *Numismatische Zeitschrift* and *Revue numismatique* (e.g. Blanchet, 1907, pp. 461 foll.). (F. J. H.)

GAULT, in geology, one of the members of the Lower Cretaceous System. The name is still employed provincially in parts of England for a stiff blue clay of any kind; by the earlier writers it was sometimes spelt "Galt" or "Golt."

The formation now known as Gault in England has been variously designated "Blue Marle," "Brick Earth," "Golt Brick Earth" and "Oak-tree-soil." In certain parts of the south of England the Gault appears as a well-marked deposit of clay, lying between two sandy formations; the one above came to be known as the "Upper Greensand," the one below being the "Lower Greensand" (see GREENSAND). Since the typical clayey Gault is continually taking on a sandy facies as it is traced both horizontally and vertically; and since the fossils of the Upper Greensand and Gault are inseparably related, it has been proposed by A. J. Jukes-Browne that these two series of beds should be regarded as the arenaceous and argillaceous phases of a single formation, to which he has given the name "Selbornian" (from the village of Selborne where the beds are well developed). Lithologically, then, the Selbornian includes the blue and grey clays and marls of the Gault proper; the glauconitic sands of the Upper Greensand, and their local equivalent, the "malm," "malm rock" or "firestone," which in places passes into the micaceous sandstone containing sponge spicules and globules of silica, the counterpart of the rock called "gaize" on the same horizon in northern France. In Yorkshire, Lincolnshire and parts of Norfolk the Selbornian is represented by the Red Chalk. The malm is a ferruginous siliceous rock, the silica being mainly in the colloidal condition in the form of globules and sponge spicules; some quartz grains, mica and glauconite are usually present along with from 2 to 25% of calcareous matter. Chert-bands and nodules are common in the Upper Greensand of certain districts; and calcareous concretions, locally recognized as cowstones (Lyme Regis), doggers or buhrstones, are not infrequent.

The principal divisions of the Selbornian stage with their characteristic zonal fossils are as follows:—

Warminster Beds	*Pecten asper* and *Cardiaster fossarius*.
Upper Gault	Devizes Beds or Merstham Beds with *Schloenbachia rostratus*.
Lower Gault	*Hoplites lautus*. *H. interruptus*. *Acanthoceras mammillatum*.

The Gault (with Upper Greensand) crops out all round the Weald area; it extends beneath the London basin and reappears from beneath the northern scarp of the Chalk along the foot of the Chiltern Hills to near Tring. In the south of England the Gault clay is fairly constant in the lower part, with the Greensand above; the clay, however, passes into sand as it is followed westward and, as already pointed out, the clay and sand appear to pass into a red chalk towards the north-east. The Gault overlaps the Lower Greensand towards the east, where it rests upon the old Paleozoic axis; it also overlaps the same formation towards the west about Frome, and thence passes unconformably across the Portlandian beds, Kimeridge Clay, Corallian beds and Oxford Clay; in south Dorsetshire it rests upon the Wealden Series. The Gault (with Upper Greensand) passes on to the Jurassic and Rhaetic rocks near Axmouth, and oversteps farther westward, in the Haldon Hills, on to the Perman. A large outlier occurs on the Blackdown Hills of Devonshire. Good localities for fossils are Folkestone—where many of the shells are preserved with their original pearly nacre,—Burnham, Merstham, Isle of Wight, the Blackdown and Haldon Hills, Warminster, Hunstanton and Speeton, Black Veen near Lyme Regis, and Devizes (malmstone and gaize). The beds are well developed in the vale of Wardour, and in the Isle of Wight; the Gault forms the so-called "blue slipper" at Ventnor which has been the cause of the landslip or undercliff.

The Gault of north France is very similar to that in the south of England, but the French term *Albien* includes only a portion of the Selbornian formation. The Gault of north-west Germany is unbroken and it is there that would be placed by *Albien* by French authors; it comprises the "Flammenmergel"—a pale siliceous marl shot with flame-shaped darker patches—a clay with *Belemnites minimus*, and the "Gargasmergel" (Aptian). In the Diester and Teutoberger Wald, and in the region of Halberstadt, the clays and marls are replaced by sandstones, the so-called *Gault-Quader*. Continental writers usually place the Gault or Albian at the summit of the Lower Cretaceous; while with English geologists the practice is to commence the Upper Cretaceous with this formation. In addition to the fossils already noticed, the following may be mentioned: *Acanthoceras Desmoceras Beaudanti*, *Hoplites splendens*, *Hamites*, *Scaphites*, *Turrilites*, *Aporrhais retusa*, *Trigonia aliforme*, also *Ichthyosaurus* and *Ornithocheirus* (Pteroslactyl). From the clays, bricks and tiles are made at Burham, Barnwell, Dunton Green, Arlesey, Hitchin, &c. The cherts in the Greensand portion are used for road metal, and in the Blackdown Hills, for scythe stones; hearthstone is obtained about Merstham; phosphatic nodules occur at several horizons.

See CRETACEOUS SYSTEM; ALBIAN; APTIAN; also A. J. Jukes-Browne, "The Gault and Upper Greensand of England," vol. i., *Cretaceous Rocks of Britain*; *Mem. Geol. Survey*, 1900.

GAUNTLET (a diminutive of the Fr. *gant*, glove), a large form of glove, and especially the steel-plated glove of medieval armour. To "run the gauntlet," *i.e.* to run between two rows of men who, armed with sticks, rope-ends or other weapons, beat and strike at the person so running, was formerly a punishment for military and naval offences. It was abolished in the Prussian army by Scharnhorst. As a method of torturing prisoners, it was employed among the North American Indians. "Gauntlet" (earlier "gantlet") in this expression is a corruption of "gantlope," from a Swedish *gatlope*, from *gata*, lane, and *lopp*, a course (cf. Ger. *gassenlaufen*, to run the gauntlet). According to the *New English Dictionary* the word became familiar in England at the time of the Thirty Years' War.

GAUR, or LAKHNAUTI, a ruined city of British India, in Malda district of Eastern Bengal and Assam. The ruins are situated about 8m. to the south of English Bazar, the civil station of the district of Malda, and on the eastern bank of the Bhagirathi, an old channel of the Ganges. It is said to have been founded by Lakshman, and its most ancient name was Lakshmanavati, corrupted into Lakhnauti. Its known history begins with its conquest in A.D. 1198 by the Mahommedans, who retained it as the chief seat of their power in Bengal for more than three centuries. When the Afghan kings of Bengal established their independence, they transferred their seat of government (about 1350) to Pandua (*q.v.*), also in Malda district, and to build their new capital they plundered Gaur of every monument that could be removed. When Pandua was in its turn deserted (A.D. 1453), Gaur once more became the capital under the

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name of Jannatabad; it remained so as long as the Mahommedan kings retained their independence. In A.D. 1564 Sulaiman Kirani, a Pathan adventurer, abandoned it for Tanda, a place somewhat nearer the Ganges. Gaur was sacked by Sher Shah in 1539, and was occupied by Akbar's general in 1575, when Daud Shah, the last of the Afghan dynasty, refused to pay bomage to the Mogul emperor. This occupation was followed by an outbreak of the plague, which completed the downfall of the city, and since then it has been little better than a heap of ruins, almost overgrown with jungle.

The city in its prime measured 7½ m. from north to south, with a breadth of 1 to 2 m. With suburbs it covered an area of 20 to 30 sq. m., and in the 16th century the Portuguese historian Faria y Sousa described it as containing 1,200,000 inhabitants. The ramparts of this walled city, which was surrounded by extensive suburbs, still exist; they were works of vast labour, and were on the average about 40 ft. high, and 180 to 200 ft. thick at the base. The facing of masonry and the buildings with which they were covered have now disappeared, and the embankments themselves are overgrown with dense jungle. The western side of the city was washed by the Ganges, and within the space enclosed by these embankments and the river stood the city of Gaur proper, with the fort containing the palace in its south-west corner. Radiating north, south and east from the city, other embankments are to be traced running through the suburbs and extending in certain directions for 30 or 40 m. Surrounding the palace is an inner embankment of similar construction to that which surrounds the city, and even more overgrown with jungle. A deep moat protects it on the outside. To the north of the outer embankment lies the Sagar Dighi, a great reservoir, 1600 yds. by 800 yds., dating from A.D. 1126.

Fergusson in his *History of Eastern Architecture* thus describes the general architectural style of Gaur:—" It is neither like that of Delhi nor Jaunpore, nor any other style, but one purely local and not without considerable merit in itself; its principal characteristic being beavy short pillars of stone supporting pointed arches and vaults in brick—whereas at Jaunpore, for instance, light pillars carried horizontal architraves and flat ceilings." Owing to the lightness of the small, thin bricks, which were chiefly used in the making of Gaur, its buildings have not well withstood the ravages of time and the weather; while much of its enamelled work has been removed for the ornamentation of the surrounding cities of more modern origin. Moreover, the ruins long served as a quarry for the builders of neighbouring towns and villages, till in 1900 steps were taken for their preservation by the government. The finest ruin in Gaur is that of the Great Golden Mosque, also called Bara Darwaza, or twelve-doored (1526). An arched corridor running along the whole front of the original building is the principal portion now standing. There are eleven arches on either side of the corridor and one at each end of it, from which the mosque probably obtained its name. These arches are surmounted by eleven domes in fair preservation; the mosque had originally thirty-three.

The Small Golden or Eunuch's mosque, in the ancient suburb of Firozpur, has fine carving, and is faced with stone fairly well preserved. The Tantipara mosque (1475–1480) has beautiful moulding in brick, and the Lotan mosque of the same period is unique in retaining its glazed tiles. The citadel, of the Mahommedan period, was strongly fortified with a rampart and entered through a magnificent gateway called the Dakhil Darwaza (?1459–1474). At the south-east corner was a palace, surrounded by a wall of brick 66 ft. high, of which a part is standing. Near by were the royal tombs. Within the citadel is the Kadam Rasul mosque (1530), which is still used, and close outside is a tall tower called the Firoz Minar (perhaps signifying " tower of victory "). There are a number of Mahommedan buildings on the banks of the Sagar Dighi, including, notably, the tomb of the saint Makhdum Shaikh Akhi Siraj (d. 1357), and in the neighbourhood is a burning ghat, traditionally the only one allowed to the use of the Hindus by their Mahommedan conquerors, and still greatly venerated and frequented by them. Many inscriptions of historical importance have been found in the ruins.

See M. Martin (Buchanan Hamilton), *Eastern India*, vol. iii. (1831); G. H. Ravenshaw, *Gaur* (1878); James Fergusson, *History of Indian and Eastern Architecture* (1876); *Reports of the Archaeological Surveyor, Bengal Circle* (1900–1904).

GAUR, the native name of the wild ox, *Bos* (*Bibos*) *gaurus*, of India, miscalled bison by sportsmen. The gaur, which extends into Burma and the Malay Peninsula, where it is known as seladang, is the typical representative of an Indo-Malay group of wild cattle characterized by the presence of a ridge on the withers, the compressed horns, and the white legs. The gaur, which reaches a height of nearly 6 ft. at the shoulder, is specially characterized by the forward curve and great elevation of the ridge between the horns. The general colour is blackish-grey. Hill-forests are the resort of this species.

GAUSS, KARL FRIEDRICH (1777–1855), German mathematician, was born of bumble parents at Brunswick on the 30th of April 1777, and was indebted for a liberal education to the notice which his talents procured him from the reigning duke. His name became widely known by the publication, in his twenty-fifth year (1801), of the *Disquisitiones arithmeticae*. In 1807 he was appointed director of the Göttingen observatory, an office which he retained to his death: it is said that he never slept away from under the roof of his observatory, except on one occasion, when he accepted an invitation from Baron von Humboldt to attend a meeting of natural philosophers at Berlin. In 1809 he published at Hamburg his *Theoria motus corporum coelestium*, a work which gave a powerful impulse to the true methods of astronomical observation; and his astronomical workings, observations, calculations of orbits of planets and comets, &c., are very numerous and valuable. He continued his labours in the theory of numbers and other analytical subjects, and communicated a long series of memoirs to the Royal Society of Sciences (*Königliche Gesellschaft der Wissenschaften*) at Göttingen. His first memoir on the theory of magnetism, *Intensitas vis magneticae terrestris ad mensuram absolutam revocata*, was published in 1833, and he shortly afterwards proceeded, in conjunction with Wilhelm Weber, to invent new apparatus for observing the earth's magnetism and its changes; the instruments devised by them were the declination instrument and the bifilar magnetometer. With Weber's assistance he erected in 1833 at Göttingen a magnetic observatory free from iron (as Humboldt and F. J. D. Arago had previously done on a smaller scale), where he made magnetic observations, and from this same observatory he sent telegraphic signals to the neighbouring town, thus showing the practicability of an electromagnetic telegraph. He further instituted an association (*Magnetischer Verein*), composed at first almost entirely of Germans, whose continuous observations on fixed term-days extended from Holland to Sicily. The volumes of their publication, *Resultate aus den Beobachtungen des magnetischen Vereins*, extend from 1836 to 1839; and in those for 1838 and 1839 are contained the two important memoirs by Gauss, *Allgemeine Theorie des Erdmagnetismus*, and the *Allgemeine Lehrsätze*—on the theory of forces attracting according to the inverse square of the distance. The instruments and methods thus due to him are substantially those employed in the magnetic observatories throughout the world. He co-operated in the Danish and Hanoverian measurements of an arc and trigonometrical operations (1821–1848), and wrote (1843, 1846) the two memoirs *Über Gegenstände der höheren Geodäsie*. Connected with observations in general we have (1812–1826) the memoir *Theoria combinationis observationum erroribus minimis obnoxia*, with a second part and a supplement. Another memoir of applied mathematics is the *Dioptrische Untersuchungen* (1840). Gauss was well versed in general literature and the chief languages of modern Europe, and was a member of nearly all the leading scientific societies in Europe. He died at Göttingen on the 23rd of February 1855. The centenary of his birth was celebrated (1877) at his native place, Brunswick.

Gauss's collected works were published by the Royal Society of Göttingen, in 7 vols. 4to (Gött., 1863–1871), edited by E. J. Schering

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—(1) the *Disquisitiones arithmeticae*, (2) *Theory of Numbers*, (3) *Analysis*, (4) *Geometry and Method of Least Squares*, (5) *Mathematical Physics*, (6) *Astronomy*, and (7) the *Theoria motus corporum coelestium*. Additional volumes have since been published, *Fundamente der Geometrie* wnv. (1900), and *Geodatische Nachtrage zu Band iii.* (1903). They include, besides his various works and memoirs, notices by him of many of these, and of works of other authors in the *Göttingen gelehrte Anzeigen*, and a considerable amount of previously unpublished matter, *Nachlass*. Of the memoirs in pure mathematics, comprised for the most part in vols. ii., iii. and iv. (but to these must be added those on *Attractions* in vol. v.), it may be safely said there is not one which has not signally contributed to the progress of the branch of mathematics to which it belongs, or which would not repay careful study if carefully analysed in a history of the subject. Running through these volumes in order, we have in the second the memoir, *Summatio quarundam serierum singularium*, the memoirs on the theory of biquadratic residues, in which the notion of complex numbers of the form $a+bi$ was first introduced into the theory of numbers; and included in the *Nachlass* are some valuable tables. That for the conversion of a fraction into decimals (giving the complete period for all the prime numbers up to 997) is a specimen of the extraordinary love which Gauss had for long arithmetical calculations; and the amount of work gone through in the construction of the table of the number of the classes of binary quadratic forms must also have been tremendous. In vol. iii. we have memoirs relating to the proof of the theorem that every numerical equation has a real or imaginary root, the memoir on the *Hypergeometric Series*, that on *Interpolation*, and the memoir *Determinatio attractionis*—in which a planetary mass is considered as distributed over its orbit according to the time in which each portion of it the orbit is described, and the question having an implied reference to the theory of secular perturbations) is to find the attraction of such a ring. In the solution the value of an elliptic function is found by means of the *arithmetico-geometrical mean*. The *Nachlass* contains further researches on this subject, and also researches (unfortunately very fragmentary) on the lemniscate-function, &c., showing that Gauss was, even before 1800, in possession of many of the discoveries which have made the names of N. H. Abel and K. G. J. Jacobi illustrious. In vol. iv. we have the memoir *Allgemeine Auflösung*, on the graphical representation of one surface upon another, and the *Disquisitiones generales circa superficies curvas*. (An account of the treatment of surfaces which he originated in this paper will be found in the article SURFACE.) And in vol. v. we have a memoir *On the Attraction of Homogeneous Ellipsoids*, and the already mentioned memoir *Allgemeine Lehrsätze*, on the theory of forces attracting according to the inverse square of the distance.

(A. CA.)

GAUSSEN, FRANÇOIS SAMUEL ROBERT LOUIS (1790–1863), Swiss Protestant divine, was born at Geneva on the 25th of August 1790. His father, Georg Markus Gaussen, a member of the council of two hundred, was descended from an old Languedoc family which had been scattered at the time of the religious persecutions in France. At the close of his university career at Geneva, Louis was in 1816 appointed pastor of the Swiss Reformed Church at Satigny near Geneva, where he formed intimate relations with J. E. Cellérier, who had preceded him in the pastorate, and also with the members of the dissenting congregation at Bourg-de-Four, which, together with the Église du témoignage, had been formed under the influence of the preaching of James and Robert Haldane in 1817. The Swiss revival was distasteful to the pastors of Geneva (*Vénérable Compagnie des Pasteurs*), and on the 7th of May 1817 they passed an ordinance hostile to it. As a protest against this ordinance, in 1819 Gaussen published in conjunction with Cellérier a French translation of the Second Helvetic Confession, with a preface expounding the views he had reached upon the nature, use and necessity of confessions of faith; and in 1830, for having discarded the official catechism of his church as being insufficiently explicit on the divinity of Christ, original sin and the doctrines of grace, he was censured and suspended by his ecclesiastical superiors. In the following year he took part in the formation of a *Société Évangélique* (*Evangelische Gesellschaft*). When this society contemplated, among other objects, the establishment of a new theological college, he was finally deprived of his charge. After some time devoted to travel in Italy and England, he returned to Geneva and ministered to an independent congregation until 1834, when he joined Merle d'Aubigné as professor of systematic theology in the college which he had helped to found. This post he continued to occupy until 1857, when he retired from the active duties of the chair. He died at Les Grottes, Geneva, on the 18th of June 1863.

His best-known work, entitled *La Théopneustie ou pleine inspiration des saintes écritures*, an elaborate defence of the doctrine of "plenary inspiration," was originally published in Paris in 1840, and rapidly gained a wide popularity in France, as also, through translations, in England and America. It was followed in 1860 by a supplementary treatise on the canon (*Le Canon des saintes écritures au double point de vue de la science et de la foi*), which, though also popular, has hardly been so widely read.

See the article in Herzog-Hauck, *Realencyklopädie* (1899).

GAUTIER, ÉMILE THÉODORE LÉON (1832–1897), French literary historian, was born at Hâvre on the 8th of August 1832. He was educated at the École des Chartes, and became successively keeper of the archives of the department of Haute-Marne and of the imperial archives at Paris under the empire. In 1871 he became professor of palaeography at the École des Chartes. He was elected member of the Academy of Inscriptions in 1887, and became chief of the historical section of the national archives in 1893. Léon Gautier rendered great services to the study of early French literature, the most important of his numerous works on medieval subjects being a critical text (Tours, 1872) with translation and introduction of the *Chanson de Roland*, and *Les Épopées françaises* (3 vols., 1866–1867; 2nd ed., 5 vols., 1878–1897, including a *Bibliographie des chansons de geste*). He died in Paris on the 25th of August 1897.

GAUTIER, THÉOPHILE (1811–1872), French poet and miscellaneous writer, was born at Tarbes on the 31st of August 1811. He was educated at the grammar school of that town, and afterwards at the Collège Charlemagne in Paris, but was almost as much in the studios. He very early devoted himself to the study of the older French literature, especially that of the 16th and the early part of the 17th century. This study qualified him well to take part in the Romantic movement, and enabled him to astonish Sainte-Beuve by the phraseology and style of some literary essays which, when barely eighteen years old, he put into the critic's hands. In consequence of this introduction he at once came under the influence of the great Romantic *cénacle*, to which, as to Victor Hugo in particular, he was also introduced by his gifted but ill-starred schoolmate Gérard de Nerval. With Gérard, Petrus Borel, Corot, and many other less known painters and poets whose personalities he has delightfully sketched in the articles collected under the titles of *Histoire du Romantisme*, &c., he formed a minor romantic clique who were distinguished for a time by the most extravagant eccentricity. A flaming crimson waistcoat and a great mass of waving hair were the outward signs which qualified Gautier for a chief rank among the enthusiastic devotees who attended the rehearsals of *Hernani* with red tickets marked "Hierro," performed mocking dances round the bust of Racine, and were at all times ready to exchange word or blow with the *perruques* and *grisâtres* of the classical party. In Gautier's case these freaks were not inconsistent with real genius and real devotion to sound ideals of literature. He began (like Thackeray, to whom he presents in other ways some striking points of resemblance) as an artist, but soon found that his true powers lay in another direction.

His first considerable poem, *Albertus* (1830), displayed a good deal of the extravagant character which accompanied rather than marked the movement, but also gave evidence of uncommon command both of language and imagery, and in particular of a descriptive power hardly to be excelled. The promise thus given was more than fulfilled in his subsequent poetry, which, in consequence of its small bulk, may well be noticed at once and by anticipation. The *Comédie de la mort*, which appeared soon after (1832), is one of the most remarkable of French poems, and though never widely read has received the suffrage of every competent reader. Minor poems of various dates, published in 1840, display an almost unequalled command over poetical form, an advance even over *Albertus* in vigour, wealth and appropriateness of diction, and abundance of the special poetical essence. All these good gifts reached their climax in the *Émaux et camées*, first published in 1856, and again, with additions, just before the poet's death in 1872. These poems are in their own way such as

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cannot be surpassed. Gautier's poetical work contains in little an expression of his literary peculiarities. There are, in addition to the peculiarities of style and diction already noticed, an extraordinary feeling and affection for beauty in art and nature, and a strange indifference to anything beyond this range, which has doubtless injured the popularity of his work.

But it was not, after all, as a poet that Gautier was to achieve either profit or fame. For the theatre, he had but little gift, and his dramatic efforts (if we except certain masques or ballets in which his exuberant and graceful fancy came into play) are by far his weakest. It was otherwise with his prose fiction. His first novel of any size, and in many respects his most remarkable work, was *Mademoiselle de Maupin* (1835). Unfortunately this book, while it establishes his literary reputation on an imperishable basis, was unfitted by its subject, and in parts by its treatment, for general perusal, and created, even in France, a prejudice against its author which he was very far from really deserving. During the years from 1833 onwards, his fertility in novels and tales was very great. *Les Jeunes-France* (1833), which may rank as a sort of prose *Albertus* in some ways, displays the follies of the youthful Romantics in a vein of humorous and at the same time half-pathetic satire. *Fortunio* (1838) perhaps belongs to the same class. *Jettatura*, written somewhat later, is less extravagant and more pathetic. A crowd of minor tales display the highest literary qualities, and rank with Mérimée's at the head of all contemporary works of the class. First of all must be mentioned the ghost-story of *La Morte amoureuse*, a gem of the most perfect workmanship. For many years Gautier continued to write novels. *La Belle Jenny* (1864) is a not very successful attempt to draw on his English experience, but the earlier *Militona* (1847) is a most charming picture of Spanish life. In *Spirite* (1866) he endeavoured to enlist the fancy of the day for supernatural manifestations, and *Roman de la momie* (1856) is a learned study of ancient Egyptian ways. His most remarkable effort in this kind, towards the end of his life, was *Le Capitaine Fracasse* (1863), a novel, partly of the picaresque school, partly of that which Dumas was to make popular, projected nearly thirty years earlier, and before Dumas himself had taken to the style. This book contains some of the finest instances of his literary power.

Yet neither in poems nor in novels did the main occupation of Gautier as a literary man consist. He was early drawn to the more lucrative task of feuilleton-writing, and for more than thirty years he was among the most expert and successful practitioners of this art. Soon after the publication of *Mademoiselle de Maupin*, in which he had not been too polite to journalism, he became irrevocably a journalist. He was actually the editor of *L'Artiste* for a time: but his chief newspaper connexions were with *La Presse* from 1836 to 1854 and with the *Moniteur* later. His work was mainly theatrical and art criticism. The rest of his life was spent either at Paris or in travels of considerable extent to Spain, the Netherlands, Italy, Turkey, England, Algeria and Russia, all undertaken with a more or less definite purpose of book-making. Having absolutely no political opinions, he had no difficulty in accepting the Second Empire, and received from it considerable favours, in return for which, however, he in no way prostituted his pen, but remained a literary man pure and simple. He died on the 23rd of December 1872.

Accounts of his travels, criticisms of the theatrical and literary works of the day, obituary notices of his contemporaries and, above all, art criticism occupied him in turn. It has sometimes been deplored that this engagement in journalism should have diverted Gautier from the performance of more capital work in literature. Perhaps, however, this regret springs from a certain misconception. Gautier's power was literary power pure and simple, and it is as evident in his slightest sketches and criticisms as in *Émaux et camées* or *La Morte amoureuse*. On the other hand, his weakness, if he had a weakness, lay in his almost total indifference to the matters which usually supply subjects for art and therefore for literature. He has thus been accused of "lack of ideas" by those who have not cleared their own minds of cant; and in the recent set-back of the critical current against form and in favour of "philosophie" treatment, comment upon him has sometimes been unfavourable. But this injustice will, beyond all question, be redressed again. He was neither immoral, irreligious nor unduly subservient to despotism, but morals, religion and politics (to which we may add science and material progress) were matters of no interest to him. He was to all intents a humanist, as the word was understood in the 15th century. But he was a humorist as well, and this combination, joined to his singularly kindly and genial nature, saved him from some dangers and depravations as well as some absurdities to which the humanist temper is exposed. As time goes on it may be predicted that, though Gautier may not be widely read, yet his writings will never cease to be full of indescribable charm and of very definite instruction to men of letters. Besides those of his works which have been already cited, we may notice *Une Larme du diable* (1839), a charming mixture of humour and tenderness; *Les Grotesques* (1844), a volume of early criticisms on some oddities of 17th-century literature; *Caprices et zigzags* (1845), miscellanies dealing in part with English life; *Voyage en Espagne* (1843), *Constantinople* (1854), *Voyage en Russie* (1866), brilliant volumes of travel; *Ménagerie intime* (1869) and *Tableaux de siège* (1872), his two latest works, which display his incomparable style in its quietest but not least happy form.

There is no complete edition of Gautier's works, and the vicomte Spoelberch de Lovenjoul's *Histoire des œuvres de Théophile Gautier* (1887) shows how formidable such an undertaking would be. But since his death numerous further collections of articles have been made: *Fusains et eaux-fortes* and *Tableaux à la plume* (1880); *L'Orient* (2 vols., 1881); *Les Vacances du lundi* (new ed., 1888); *La Nature chez elle* (new ed., 1891). In 1879 his son-in-law, E. Bergerat, who had married his younger daughter Estelle (the elder, Mme Judith Gautier—herself a writer of distinction—was at one time Mme Catulle Mendès), issued a biography, *Théophile Gautier*, which has been often reprinted. With it should be compared Maxime Du Camp's volume in the *Grands Écrivains français* (1890) and the numerous references in the *Journal des Goncourt*. Critical eulogies, from Sainte-Beuve (repeatedly in the *Causeries*) and Baudelaire (two articles in *L'Art romantique*) downwards, are numerous. The chief of the detractors is Émile Faguet in his *Études littéraires sur le XIXe siècle*. In 1902 and 1903 there appeared two respectable academic *éloges* by H. Menal and H. Potez. (G. Sa.)

GAUTIER D'ARRAS, French *trouvère*, flourished in the second half of the 12th century. Nothing is known of his biography except what may be gleaned from his works. He dedicated his romance of *Éracle* to Theobald V., count of Blois (d. 1191); among his other patrons were Marie, countess of Champagne, daughter of Louis VII. and Eleanor of Guienne and Baldwin IV., count of Hainaut. *Éracle*, the hero of which becomes emperor of Constantinople as Heraclius, is purely a *roman d'aventures* and enjoyed great popularity. His second romance, *Ille et Galeron*, dedicated to Beatrix, the second wife of Frederick Barbarossa, treats of a similar situation to that outlined in the lay of "*Eliduc*" by Marie de France.

See the *Œuvres de Gautier d'Arras*, ed. E. Löseth (2 vols., Paris, 1890); *Hist. litt. de la France*, vol. xxii. (1852); A. Dinaux, *Les Trouvères* (1833–1843), vol. iii.

GAUZE, a light, transparent fabric, originally of silk, and now sometimes made of linen or cotton, woven in an open manner with very fine yarn. It is said to have been originally made at Gaza in Palestine, whence the name. Some of the gauzes from Southern Asia were brocaded with flowers of gold or silver. In the weaving of gauze the warp threads, in addition to being crossed as in plain weaving, are twisted in pairs from left to right and from right to left alternately, after each shot of weft, thereby keeping the weft threads at equal distances apart, and retaining them in their parallel position. The textures are woven either plain, striped or figured; and the material receives many designations, according to its appearance and the purposes to which it is devoted. A thin cotton fabric, woven in the same way, is known as leno, to distinguish it from muslin made by plain weaving. Silk gauze was a prominent and extensive industry in the west of Scotland during the second half of the 18th century, but on the introduction of cotton-weaving it greatly declined. In addition to its use for dress purposes silk gauze is much employed for bolting or sifting flour and other finely ground substances. The term gauze is applied generally

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to transparent fabrics of whatever fibre made, and to the fine-woven wire-cloth used in safety-lamps, sieves, window-blinds, &c.

GAVARNI, the name by which SULPICE GUILLAUME CHEVALIER (1801–1866), French caricaturist, is known. He is said to have taken the *nom de plume* from the place where he made his first published sketch. He was born in Paris of poor parents, and started in life as a workman in an engine-building factory. At the same time he attended the free school of drawing. In his first attempts to turn his abilities to some account he met with many disappointments, but was at last entrusted with the drawing of some illustrations for a journal of fashion. Gavarni was then thirty-four years of age. His sharp and witty pencil gave to these generally commonplace and unartistic figures a life-likeness and an expression which soon won for him a name in fashionable circles. Gradually he gave greater attention to this more congenial work, and finally ceased working as an engineer to become the director of the journal *Les Gens du monde*. His ambition rising in proportion to his success, Gavarni from this time followed the real bent of his inclination, and began a series of lithographed sketches, in which he portrayed the most striking characteristics, foibles and vices of the various classes of French society. The letterpress explanations attached to his drawings were always short, but were forcible and highly humorous, if sometimes trivial, and were admirably adapted to the particular subjects. The different stages through which Gavarni's talent passed, always elevating and refining itself, are well worth being noted. At first he confined himself to the study of Parisian manners, more especially those of the Parisian youth. To this vein belong *Les Lorettes*, *Les Actrices*, *Les Coulisses*, *Les Fashionables*, *Les Gentilshommes bourgeois*, *Les Artistes*, *Les Débardeurs*, *Clichy*, *Les Étudiants de Paris*, *Les Baliverneries parisiennes*, *Les Plaisirs champêtres*, *Les Bals masqués*, *Le Carnaval*, *Les Souvenirs du carnaval*, *Les Souvenirs du bal Chicard*, *La Vie des jeunes hommes*, *Les Palois de Paris*. He had now ceased to be director of *Les Gens du monde*; but he was engaged as ordinary caricaturist of *Le Charivari*, and, whilst making the fortune of the paper, he made his own. His name was exceedingly popular, and his illustrations for books were eagerly sought for by publishers. *Le Juif errant*, by Eugène Sue (1843, 4 vols. 8vo), the French translation of Hoffman's tales (1843, 8vo), the first collective edition of Balzac's works (Paris, Houssiaux, 1850, 20 vols. 8vo), *Le Diable à Paris* (1844–1846, 2 vols. 4to), *Les Français peints par eux-mêmes* (1840–1843, 9 vols. 8vo), the collection of *Physiologies* published by Aubert in 38 vols. 18mo (1840–1842),—all owed a great part of their success at the time, and are still sought for, on account of the clever and telling sketches contributed by Gavarni. A single frontispiece or vignette was sometimes enough to secure the sale of a new book. Always desiring to enlarge the field of his observations, Gavarni soon abandoned his once favourite topics. He no longer limited himself to such types as the *lorette* and the Parisian student, or to the description of the noisy and popular pleasures of the capital, but turned his mirror to the grotesque sides of family life and of humanity at large. *Les Enfants terribles*, *Les Parents terribles*, *Les Fourberies des femmes*, *La Politique des femmes*, *Les Maris vengés*, *Les Nuances du sentiment*, *Les Rêves*, *Les Petits Jeux de société*, *Les Petits Malheurs du bonheur*, *Les Impressions de menage*, *Les Interjections*, *Les Traductions en langue vulgaire*, *Les Propos de Thomas Vireloque*, &c., were composed at this time, and are his most elevated productions. But whilst showing the same power of irony as his former works, enhanced by a deeper insight into human nature, they generally bear the stamp of a bitter and even sometimes gloomy philosophy. This tendency was still more strengthened by a visit to England in 1849. He returned from London deeply impressed with the scenes of misery and degradation which he had observed among the lower classes of that city. In the midst of the cheerful atmosphere of Paris he had been struck chiefly by the ridiculous aspects of vulgarity and vice, and he had laughed at them. But the debasement of human nature which he saw in London appears to have affected him so forcibly that from that time the cheerful caricaturist never laughed or made others laugh again. What he had witnessed there became the almost exclusive subject of his drawings, as powerful, as impressive as ever, but better calculated to be appreciated by cultivated minds than by the public, which had in former years granted him so wide a popularity. Most of these last compositions appeared in the weekly paper *L'Illustration*. In 1857 he published in one volume the series entitled *Masques et visages* (1 vol. 12mo), and in 1869, about two years after his death, his last artistic work, *Les Douze Mois* (1 vol. fol.), was given to the world. Gavarni was much engaged, during the last period of his life, in scientific pursuits, and this fact must perhaps be connected with the great change which then took place in his manner as an artist. He sent several communications to the Académie des Sciences, and till his death on the 23rd of November 1866 he was eagerly interested in the question of aerial navigation. It is said that he made experiments on a large scale with a view to find the means of directing balloons; but it seems that he was not so successful in this line as his fellow-artist, the caricaturist and photographer, Nadar.

Gavarni's *Œuvres choisies* were edited in 1845 (4 vols. 4to) with letterpress by J. Janin, Th. Gautier and Balzac, followed in 1850 by two other volumes named *Perles et parures*; and some essays in prose and in verse written by him were collected by one of his biographers, Ch. Yriarte, and published in 1869. See also E. and J. de Goncourt, *Gavarni, l'homme et l'œuvre* (1873, 8vo). J. Claretie has also devoted to the great French caricaturist a curious and interesting essay. A catalogue *raisonné* of Gavarni's works was published by J. Arnelhault and E. Bocher (Paris, 1873, 8vo).

GAZZI, ALESSANDRO (1809–1889), Italian preacher and patriot, was born at Bologna on the 21st of March 1809. He at first became a monk (1825), and attached himself to the Barnabites at Naples, where he afterwards (1829) acted as professor of rhetoric. In 1840, having already expressed liberal views, he was removed to Rome to fill a subordinate position. Leaving his own country after the capture of Rome by the French, he carried on a vigorous campaign against priests and Jesuits in England, Scotland and North America, partly by means of a periodical, the *Gavazzi Free Word*. While in England he gradually went over (1855) to the Evangelical church, and became head and organizer of the Italian Protestants in London. Returning to Italy in 1860, he served as army-chaplain with Garibaldi. In 1870 he became head of the Free Church (*Chiesa libera*) of Italy, united the scattered Congregations into the "Unione delle Chiese libere in Italia," and in 1875 founded in Rome the theological college of the Free Church, in which he himself taught dogmatics, apologetics and polemics. He died in Rome on the 9th of January 1889.

Amongst his publications are *No Union with Rome* (1871); *The Priest in Absolution* (1877); *My Recollections of the Last Four Popes*, &c., in answer to Cardinal Wiseman (1858); *Orations*, 2 decades (1851).

GAVELKIND,[1] a peculiar system of tenure associated chiefly with the county of Kent, but found also in other parts of England. In Kent all land is presumed to be holden by this tenure until the contrary is proved, but some lands have been disgavelled by particular statutes. It is more correctly described as socage tenure, subject to the custom of gavelkind. The chief peculiarities of the custom are the following. (1) A tenant can alienate his lands by feoffment at fifteen years of age. (2) There is no escheat on attainder for felony, or as it is expressed in the old rhyme—

> "The father to the bough,
> The son to the plough."

(3) Generally the tenant could always dispose of his lands by will. (4) In case of intestacy the estate descends not to the eldest son but to all the sons (or, in the case of deceased sons, their representatives) in equal shares. "Every son is as great a gentleman as the eldest son is." It is to this remarkable peculiarity that gavelkind no doubt owes its local popularity. Though

[1] This word is generally taken to represent in O. Eng. *gafolgecynd*, from *gafol*, payment, tribute, and *gecynd*, species, kind, and originally to have meant tenure by payment of rent or non-military service, cf. *gafol-land*, and thence to have been applied to the particular custom attached to such tenure in Kent. *Gafol* apparently is derived from the Teutonic root seen in "to give"; the Med. Lat. *gabulum*, *gablum* gives the Fr. *gabelle*, tax.

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females claiming in their own right are postponed to males, yet by representation they may inherit together with them. (5) A wife is dowable of one-half, instead of one-third of the land. (6) A widower may be tenant by courtesy, without having had any issue, of one-half, but only so long as he remains unmarried. An act of 18 ,1, for commuting manorial rights in respect of lands of copyhold and customary tenure, contained a clause specially exempting from the operation of the act "the custom of gavelkind as the same now exists and prevails in the county of Kent." Gavelkind is one of the most interesting examples of the customary law of England; it was, previous to the Conquest, the general custom of the realm, but was then superseded by the feudal law of primogeniture. Its survival in this instance in one part of the country is regarded as a concession extorted from the Conqueror by the superior bravery of the men of Kent. *Irish gavelkind* was a species of tribal succession, by which the land, instead of being divided at the death of the holder amongst his sons, was thrown again into the common stock, and redivided among the surviving members of the sept. The equal division amongst children of an inheritance in land is of common occurrence outside the United Kingdom and is discussed under SUCCESSION.

See INHERITANCE; TENURE. Also Robinson, *On Gavelkind*; Digby, *History of the Law of Real Property*; Pollock and Maitland, *History of English Law*; Challis, *Real Property*.

GAVESTON, PIERS (d. 1312), earl of Cornwall, favourite of the English king Edward II., was the son of a Gascon knight, and was brought up at the court of Edward I. as companion to his son, the future king. Strong, talented and ambitious, Gaveston gained great influence over young Edward, and early in 1307 he was banished from England by the king; but he returned after the death of Edward I. a few months later, and at once became the chief adviser of Edward II. Made earl of Cornwall, he received both lands and money from the king, and added to his wealth and position by marrying Edward's niece, Margaret, daughter of Gilbert de Clare, earl of Gloucester (d. 1295). He was regent of the kingdom during the king's short absence in France in 1308, and took a very prominent part at Edward's coronation in February of this year. These proceedings aroused the anger and jealousy of the barons, and their wrath was diminished neither by Gaveston's superior skill at the tournament, nor by his haughty and arrogant behaviour to themselves. They demanded his banishment; and the king, forced to assent, sent his favourite to Ireland as lieutenant, where he remained for about a year. Returning to England in July 1309, Edward persuaded some of the barons to sanction this proceeding; but as Gaveston was more insolent than ever the old jealousies soon broke out afresh. In 1311 the king was forced to agree to the election of the "ordainers," and the ordinances they drew up provided *inter alia* for the perpetual banishment of his favourite. Gaveston then retired to Flanders, but returned secretly to England at the end of 1311. Soon he was publicly restored by Edward, and the barons had taken up arms. Deserted by the king he surrendered to Aymer de Valence, earl of Pembroke (d. 1324), at Scarborough in May 1312, and was taken to Deddington in Oxfordshire, where he was seized by Guy de Beauchamp, earl of Warwick (d. 1315). Conveyed to Warwick castle he was beheaded on Blacklow Hill near Warwick on the 19th of June 1312. Gaveston, whose body was buried in 1315 at King's Langley, left an only daughter.

See W. Stubbs, *Constitutional History*, vol. ii. (Oxford, 1896); and *Chronicles of the Reigns of Edward I. and Edward II.*, edited by W. Stubbs. Rolls series (London, 1882–1883).

GAVOTTE (a French word adopted from the Provençal *gavote*), properly the dance of the Gavots or natives of Gap, a district in the Upper Alps, in the old province of Dauphiné. It is a dance of a brisk and lively character, somewhat resembling the minuet, but quicker and less stately (see DANCE); hence also the use of this name for a corresponding form of musical composition.

GAWAIN (Fr. *Walwain* (*Brut*), *Gauvain*, *Gaugain*; Lat. *Walganus*, *Walwanus*; Dutch, *Walwein*, Welsh, *Gwalchmei*), son of King Loth of Orkney, and nephew to Arthur on his mother's side, the most famous hero of Arthurian romance. The first mention of his name is in a passage of William of Malmesbury, recording the discovery of his tomb in the province of Ros in Wales. He is there described as "*Walwen qui fuit haud degener Arturis ex sorore nepos.*" Here he is said to have reigned over Galloway; and there is certainly some connexion, the character of which is now not easy to determine, between the two. In the later *Historia* of Geoffrey of Monmouth, and its French translation by Wace, Gawain plays an important and "pseudo-historic" rôle. On the receipt by Arthur of the insulting message of the Roman emperor, demanding tribute, it is he who is despatched as ambassador to the enemy's camp, where his arrogant and insulting behaviour brings about the outbreak of hostilities. On receipt of the tidings of Mordred's treachery, Gawain accompanies Arthur to England, and is slain in the battle which ensues on their landing. Wace, however, evidently knew more of Gawain than he has included in his translation, for he speaks of him as

> Li quens Walwains
> Qui tant fu preudom de ses mains (11. 9057-58).

and later on says

> Prous fu et de mult grant mesure,
> D'orgoil et de forfait n'ot qure
> Plus vaut faire qu'il ne dist
> Et plus doner qu'il ne pramist (10. 106-109).

The English Arthurian poems regard him as the type and model of chivalrous courtesy, "the fine father of nurture," and as Professor Maynadier has well remarked, "previous to the appearance of Malory's compilation it was Gawain rather than Arthur, who was the typical English hero." It is thus rather surprising to find that in the earliest preserved MSS. of Arthurian romance, *i.e.* in the poems of Chrétien de Troyes, Gawain, though generally placed first in the list of knights, is by no means the hero *par excellence*. The latter part of the *Perceval* is indeed devoted to the recital of his adventures at the *Chastel Merveilleus*, but of none of Chrétien's poems is he the protagonist. The anonymous author of the *Chevalier à l'epée* indeed makes this apparent neglect of Gawain a ground of reproach against Chrétien. At the same time the majority of the short episodic poems connected with the cycle have Gawain for their hero. In the earlier form of the prose romances, *e.g.* in the *Merlin* proper, Gawain is a dominant personality, his feats rivalling in importance those ascribed to Arthur, but in the later forms such as the *Merlin* continuations, the *Tristan*, and the final *Lancelot* compilation, his character and position have undergone a complete change, he is represented as cruel, cowardly and treacherous, and of indifferent moral character. Most unfortunately our English version of the romances, Malory's *Morte Arthur*, being derived from these later forms (though his treatment of Gawain is by no means uniformly consistent), this unfavourable aspect is that under which the hero has become known to the modern reader. Tennyson, who only knew the Arthurian story through the medium of Malory, has, by exaggeration, largely contributed to this misunderstanding. Morris, in *The Defence of Guinevere*, speaks of "gloomy Gawain"; perhaps the most absurdly misleading epithet which could possibly have been applied to the "gay, gratious, and gude" knight of early English tradition.

The truth appears to be that Gawain, the Celtic and mythic origin of whose character was frankly admitted by the late M. Gaston Paris, belongs to the very earliest stage of Arthurian tradition, long antedating the crystallization of such tradition into literary form. He was certainly known in Italy at a very early date; Professor Rajna has found the names of Arthur and Gawain in charters of the early 12th century, the bearers of those names being then grown to manhood; and Gawain is figured in the architrave of the north doorway of Modena cathedral, a 12th-century building. Recent discoveries have made it practically certain that there existed, prior to the extant romances, a collection of short episodic poems, devoted to the glorification of Arthur's famous nephew and his immediate kin (his brother Ghaeris, or Gareth, and his son Guinglain), the authorship of which was attributed to a Welshman, Bleheris; fragments of this

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collection have been preserved to us alike in the first continuation of Chrétien de Troyes *Perceval*, due to Wauchier de Denain, and in our vernacular *Gawain* poems. Among these "Bleheris" poems was one dealing with Gawain's adventures at the Grail castle, where the Grail is represented as non-Christian, and presents features strongly reminiscent of the ancient Nature mysteries. There is good ground for believing that as Grail quester and winner, Gawain preceded alike Perceval and Galahad, and that the solution of the mysterious Grail problem is to be sought rather in the tales connected with the older hero than in those devoted to the glorification of the younger knights. The explanation of the very perplexing changes which the character of Gawain has undergone appears to lie in a misunderstanding of the original sources of that character. Whether or no Gawain was a sun-hero, and he certainly possessed some of the features—we are constantly told how his strength waxed with the waxing of the sun till noontide, and then gradually decreased; he owned a steed known by a definite name le Gringalet; and a light-giving sword, Escalibur (which, as a rule, is represented as belonging to Gawain, not to Arthur)—all traits of a sun-hero—he certainly has much in common with the primitive Irish hero Cuchullin. The famous head-cutting challenge, so admirably told in *Syr Gawayne and the Grene Knighte*, was originally connected with the Irish champion. Nor was the lady of Gawain's love a mortal maiden, but the queen of the other-world. In Irish tradition the other-world is often represented as an island, inhabited by women only; and it is this "Isle of Maidens" that Gawain visits in *Diu Crone*; returning therefrom dowered with the gift of eternal youth. The Chastel Merveilleus adventure, related at length by Chrétien and Wolfram is undoubtedly such an "other-world" story. It seems probable that it was this connexion which won for Gawain the title of the "Maidens' Knight," a title for which no satisfactory explanation is ever given. When the source of the name was forgotten its meaning was not unnaturally misinterpreted, and gained for Gawain the reputation of a facile morality, which was exaggerated by the pious compilers of the later Grail romances into persistent and aggravated wrong-doing; at the same time it is to be noted that Gawain is never like Tristan and Lancelot, the hero of an illicit connexion maintained under circumstances of falsehood and treachery. Gawain, however, belonged to the pre-Christian stage of Grail tradition, and it is not surprising that writers, bent on spiritual edification, found him somewhat of a stumbling-block. Chaucer, when he spoke of Gawain coming "again out of faërie," spoke better than he knew; the home of that very gallant and courteous knight is indeed Fairy-land, and the true Gawain-tradition is informed with fairy glamour and grace.

See *Syr Gawayne*, the English poems relative to that hero, edited by Sir Frederick Madden for the Bannatyne Club, 1839 (out of print and difficult to procure); *Histoire littéraire de la France*, vol. xxx., introduction and summary of episodic "Gawain" poems by Gaston Paris; *The Legend of Sir Gawain*, by Jessie L. Weston, Grimm Library, vol. vii.; *The Legend of Sir Perceval*, by Jessie L. Weston, Grimm Library, vol. xvii.; "Sir Gawain and the Green Knight," "Sir Gawain at the Grail Castle" and "Sir Gawain and the Lady of Lys," vols. i., vi and vii. of *Arthurian Romances* (Nutt).

GAWLER, a town of Gawler county, South Australia, on the Para river, 24½ m. by rail N.E. of Adelaide. It is one of the most thriving places in the colony, being the centre of a large wheat-growing district; it has also engineering works, foundries, flour-mills, breweries and saw-mills, while gold, silver, copper and lead are found in the neighbouring hills. The inhabitants of the town and its extensive suburbs number about 7000; though the population of the town itself in 1901 was 1996.

GAY, JOHN (1685–1732), English poet, was baptized on the 16th of September 1685 at Barnstaple, where his family had long been settled. He was educated at the grammar school of the town under Robert Luck, who had published some Latin and English poems. On leaving school he was apprenticed to a silk mercer in London, but being weary, according to Dr Johnson, "of either the restraint or the servility of his occupation," he soon returned to Barnstaple, where he spent some time with his uncle, the Rev. John Hanmer, the Nonconformist minister of the town. He then returned to London, and though no details are available for his biography until the publication of *Wine* in 1708, the account he gives in *Rurus Sports* (1713), of years wasted in attending on courtiers who were profuse in promises never kept, may account for his occupations. Among his early literary friends were Aaron Hill and Eustace Budgell. In *The Present State of Wit* (1711) Gay attempted to give an account of "all our periodical papers, whether monthly, weekly or diurnal." He especially praised the *Tatler* and the *Spectator*, and Swift, who knew nothing of the authorship of the pamphlet, suspected it to be inspired by Steele and Addison. To Lintot's *Miscellany* (1712) Gay contributed "An Epistle to Bernard Lintot," containing some lines in praise of Pope, and a version of the story of Arachne from the sixth book of the *Metamorphoses* of Ovid. In the same year he was received into the household of the duchess of Monmouth as secretary, a connexion which was, however, broken before June 1714.

The dedication of his *Rural Sports* (1713) to Pope was the beginning of a lasting friendship. Gay could have no pretensions to rivalry with Pope, who seems never to have tired of helping his friend. In 1713 he produced a comedy, *The Wife of Bath*, which was acted only three nights, and *The Fan*, one of his least successful poems; and in 1714 *The Shepherd's Week*, a series of six pastorals drawn from English rustic life. Pope had urged him to undertake this last task in order to ridicule the Arcadian pastorals of Ambrose Philips, who had been praised by the *Guardian*, to the neglect of Pope's claims as the first pastoral writer of the age and the true English Theocritus. Gay's pastorals completely achieved this object, but his ludicrous pictures of the English swains and their loves were found to be abundantly entertaining on their own account. Gay had just been appointed secretary to the British ambassador to the court of Hanover through the influence of Jonathan Swift, when the death of Queen Anne three months later put an end to all his hopes of official employment. In 1715, probably with some help from Pope, he produced *What d'ye call it?* a dramatic skit on contemporary tragedy, with special reference to Otway's *Venice Preserved*. It left the public so ignorant of its real meaning that Lewis Theobald and Benjamin Griffin (1680–1740) published a *Complete Key to what d'ye call it* by way of explanation. In 1716 appeared his *Trivia, or the Art of Walking the Streets of London*, a poem in three books, for which he acknowledged having received several hints from Swift. It contains graphic and humorous descriptions of the London of that period. In January 1717 he produced the comedy of *Three Hours after Marriage*, which was grossly indecent without being amusing, and was a complete failure. There is no doubt that in this piece he had assistance from Pope and Arbuthnot, but they were glad enough to have it assumed that Gay was the sole author.

Gay had numerous patrons, and in 1720 he published *Poems on Several Occasions* by subscription, realizing £1000 or more. In that year James Craggs, the secretary of state, presented him with some South Sea stock. Gay, disregarding the prudent advice of Pope and other of his friends, invested his all in South Sea stock, and, holding on to the end, he lost everything. The shock is said to have made him dangerously ill. As a matter of fact Gay had always been a spoilt child, who expected everything to be done for him. His friends did not fail him at this juncture. He had patrons in William Pulteney, afterwards earl of Bath, in the third earl of Burlington, who constantly entertained him at Chiswick or at Burlington House, and in the third earl of Queensberry. He was a frequent visitor with Pope, and received unvarying kindness from Congreve and Arbuthnot. In 1724 he produced a tragedy called *The Captives*. In 1727 he wrote for Prince William, afterwards duke of Cumberland, his famous *Fifty-one Fables in Verse*, for which he naturally hoped to gain some preferment, although he has much to say in them of the servility of courtiers and the vanity of court honours. He was offered the situation of gentleman-usher to the Princess Louisa, who was still a child. He refused this offer, which all his friends seem to have regarded, for no very obvious reason, as an indignity. As the *Fables* were written for the amusement of one royal child,

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there would appear to have been a measure of reason in giving him a sinecure in the service of another. His friends thought him unjustly neglected by the court, but he had already received (1722) a sinecure as lottery commissioner with a salary of £150 a year, and from 1722 to 1729 he had lodgings in the palace at Whitehall. He had never rendered any special services to the court.

He certainly did nothing to conciliate the favour of the government by his next production, the *Beggars' Opera*, a lyrical drama produced on the 29th of January 1728 by Rich, in which Sir Robert Walpole was caricatured. This famous piece, which was said to have made "Rich gay and Gay rich," was an innovation in many respects, and for a time it drove Italian opera off the English stage. Under cover of the thieves and highwaymen who figured in it was disguised a satire on society, for Gay made it plain that in describing the moral code of his characters he had in mind the corruptions of the governing class. Part of the success of the *Beggars' Opera* may have been due to the acting of Lavinia Fenton, afterwards duchess of Bolton, in the part of Polly Peachum. The play ran for sixty-two nights, though the representations, four of which were "benefits" of the author, were not, as has sometimes been stated, consecutive. Swift is said to have suggested the subject, and Pope and Arbuthnot were constantly consulted while the work was in progress, but Gay must be regarded as the sole author. He wrote a sequel, *Polly*, the representation of which was forbidden by the lord chamberlain, no doubt through the influence of Walpole. This act of "oppression" caused no loss to Gay. It proved an excellent advertisement for *Polly*, which was published by subscription in 1729, and brought its author more than £1000. The duchess of Queensberry was dismissed from court for enlisting subscribers in the palace. The duke of Queensberry gave him a home, and the duchess continued her affectionate patronage until Gay's death, which took place on the 4th of December 1732. He was buried in Westminster Abbey. The epitaph on his tomb is by Pope, and is followed by Gay's own mocking couplet:—

> "Life is a jest, and all things show it,
> I thought so once, and now I know it."

Acis and Galatea, an English pastoral opera, the music of which was written by Handel, was produced at the Haymarket in 1732. The profits of his posthumous opera of *Achilles* (1733), and a new volume of *Fables* (1738) went to his two sisters, who inherited from him a fortune of £6000. He left two other pieces, *The Distressed Wife* (1743), a comedy, and *The Rehearsal at Goatham* (1754), a farce. The *Fables*, slight as they may appear, cost him more labour than any of his other works. The narratives are in nearly every case original, and are told in clear and lively verse. The moral which rounds off each little story is never strained. They are masterpieces in their kind, and the very numerous editions of them prove their popularity. They have been translated into Latin, French and Italian, Urdu and Bengali.

See his *Poetical Works* (1893) in the Muses' Library, with an introduction by Mr John Underhill; also Samuel Johnson's *Lives of the Poets*; John Gay's *Singspiele* (1898), editedt by C. Sarrazin (*Englische Textbibliothek II.*); and an article by Austin Dobson in vol. 21 of the *Dictionary of National Biography*; *Gay's Chair* (1820), edited by Henry Lee, a fellow-townsman, contained a biographical sketch by his nephew, the Rev. Joseph Baller.

GAY, MARIE FRANÇOISE SOPHIE (1776–1852), French author, was born in Paris on the 1st of July 1776. Madame Gay was the daughter of M. Nichault de la Valette and of Francesca Peretti, an Italian lady. In 1793 she was married to M. Liottier, an exchange broker, but she was divorced from him in 1799, and shortly afterwards was married to M. Gay, receiver-general of the department of the Roër or Ruhr. This union brought her into intimate relations with many distinguished personages; and her salon came to be frequented by all the distinguished littérateurs, musicians, actors and painters of the time, whom she attracted by her beauty, her vivacity and her many amiable qualities. Her first literary production was a letter written in 1802 to the *Journal de Paris*, in defence of Madame de Staël's novel, *Delphine*; and in the same year she published anonymously her first novel *Laure d'Estell*. *Léonie de Montbreuse*, which appeared in 1813, is considered by Sainte-Beuve her best work; but *Anatole* (1815), the romance of a deaf-mute, has perhaps a higher reputation. Among her other works, *Salons célèbres* (2 vols., 1837) may be especially mentioned. Madame Gay wrote several comedies and opera libretti which met with considerable success. She was also an accomplished musician, and composed both the words and music of a number of songs. She died in Paris on the 5th of March 1852. For an account of her daughter, Delphine Gay, Madame de Girardin, see GIRARDIN.

See her own *Souvenirs d'une vieille femme* (1834); also Théophile Gautier, *Portraits contemporains*; and Sainte-Beuve, *Causeries du lundi*, vol. vi.

GAY, WALTER (1856–), American artist, was born at Hingham, Massachusetts, on the 22nd of January 1856. In 1876 he became a pupil of Léon Bonnat in Paris. He received an honourable mention in the Salon of 1885; a gold medal in 1888, and similar awards at Vienna (1894), Antwerp (1895), Berlin (1896) and Munich (1897). He became an officer of the Legion of Honour and a member of the Society of Secession, Munich. Works by him are in the Luxembourg, the Tate Gallery (London), and the Boston and Metropolitan (New York) Museums of Art. His compositions are mainly figure subjects portraying French peasant life.

GAYA, a city and district of British India, in the Patna division of Bengal. The city is situated 85 m. S. of Patna by rail. Pop. (1901) 71,288. It consists of two distinct parts, adjoining each other; the part containing the residences of the priests is Gaya proper; and the other, which is the business quarter, is called Sahibganj. The civil offices and residences of the European inhabitants are situated here. Gaya derives its sanctity from incidents in the life of Buddha. But a local legend also exists concerning a pagan monster of great sanctity, named Gaya, who by long penance had become holy, so that all who saw or touched him were saved from perdition. Yama, the lord of hell, appealed to the gods, who induced Gaya to lie down in order that his body might be a place of sacrifice; and once down, Yama placed a large stone on him to keep him there. The tricked demon struggled violently, and, in order to pacify him, Vishnu promised that the gods should take up their permanent residence in him, and that any one who made a pilgrimage to the spot where he lay should be delivered from the terrors of the Hindu place of torment. This may possibly be a Brahmanic rendering of Buddha's life and work. There are forty-five sacred spots (of which the temple of Vishnupada is the chief) in and around the city, and these are visited by thousands of pilgrims annually. During the Mutiny the large store of treasure here was conveyed safely to Calcutta by Mr A. Money. The city contains a government high school and an hospital, with a Lady Elgin branch for women.

The DISTRICT OF GAYA comprises an area of 4712 sq. m. Generally speaking, it consists of a level plain, with a ridge of prettily wooded hills along the southern boundary, whence the country falls with a gentle slope towards the Ganges. Rocky hills occasionally occur, either detached or in groups, the loftiest being Maher hill about 12 m. S.E. of Gaya city, with an elevation of 1620 ft. above sea-level. The eastern part of the district is highly cultivated; the portions to the north and west are less fertile; while in the south the country is thinly peopled and consists of hills, the jungles on which are full of wild animals. The principal river is the Son, which marks the boundary between Gaya and Shahabad, navigable by small boats throughout the year, and by craft of 20-tons burden in the rainy season. Other rivers are the Punpun, Phalgu and Jamuna. Two branches of the Son canal system, the eastern main canal and the Patna canal, intersect the district. In 1901 the population was 2,059,033, showing a decrease of 3% in the decade. Among the higher castes there is an unusually large proportion of Brahmans, a circumstance due to the number of sacred places which the district contains. The Gayawals, or priests in charge of the holy

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places, are held in high esteem by the pilgrims; but they are not pure Brahmans, and are looked down upon by those who are. They live an idle and dissolute life, but are very wealthy, from contributions extorted from the pilgrims. Buddh Gaya, about 6 m. S. of Gaya city, is one of the holiest sites of Buddhism, as containing the tree under which Sakyamuni attained enlightenment. In addition to many ruins and sculptures, there is a temple restored by the government in 1881. Another place of religious interest is a temple of great antiquity, which crowns the highest peak of the Barabar hills, and at which a religious fair is held each September, attended by 10,000 to 20,0000 pilgrims. At the foot of the hill are numerous rock caves excavated about 200 B.C. The opium poppy is largely cultivated. There are a number of lac factories. Manufactures consist of common brass utensils, black stone ornaments, pottery, tussur-silk and cotton cloth. Formerly paper-making was an important manufacture in the district, but it has entirely died out. The chief exports are food grains, oil seeds, indigo, crude opium (sent to Patna for manufacture), saltpetre, sugar, blankets, brass utensils, &c. The imports are salt, piece goods, cotton, timber, bamboos, tobacco, lac, iron, spices and fruits. The district is traversed by four branches of the East Indian railway. In 1901 it suffered severely from the plague.

See *District Gazetteer* (1906); Sir A. Cunningham, *Mahabodhi* (1892).

GAYAL, a domesticated ox allied to the Gaur, but distinguished, among other features, by the more conical and straighter horns, and the straight line between them. Gayal are kept by the natives of the hill-districts of Assam and parts of Tenasserim and Upper Burma. Although it has received a distinct name, *Bos* (*Bibos*) *frontalis*, there can be little doubt that the gayal is merely a domesticated breed of the gaur, many gayal-skulls showing characters approximating to those of the gaur.

GAYANGOS Y ARCE, PASCUAL DE (1809–1897), Spanish scholar and Orientalist, was born at Seville on the 21st of June 1809. At the age of thirteen he was sent to be educated at Pont-le-Voy near Blois, and in 1828 began the study of Arabic under Silvestre de Sacy. After a visit to England, where he married, he obtained a post in the Spanish treasury, and was transferred to the foreign office as translator in 1833. In 1836 he returned to England, wrote extensively in English periodicals, and translated Almakkari's *History of the Mahommedan Dynasties in Spain* (1840–1843) for the Royal Asiatic Society. In England he also made the acquaintance of Ticknor, to whom he was very serviceable. In 1843 he returned to Spain as professor of Arabic at the university of Madrid, which post he held until 1881, when he was made director of public instruction. This office he resigned upon being elected senator for the district of Huelva. His latter years were spent in cataloguing the Spanish manuscripts in the British Museum; he had previously continued Bergenroth's catalogue of the manuscripts relating to England in the Simancas archives. His best-known original work is his dissertation on Spanish romances of chivalry in Rivadeneyra's *Biblioteca de autores españoles*. He died in London on the 4th of October 1897.

GAYARRÉ, CHARLES ÉTIENNE ARTHUR (1805–1895), American historian, was born in New Orleans, Louisiana, on the 9th of January 1805. After studying at the Collège d'Orléans he began, in 1826, to study law in Philadelphia, and three years later was admitted to the bar. In 1830 he was elected a member of the House of Representatives of Louisiana, in 1831 was appointed deputy attorney-general of his state, in 1833 became presiding judge of the city court of New Orleans, and in 1834 was elected as a Jackson Democrat to the United States Senate. On account of ill-health, however, he immediately resigned without taking his seat, and for the next eight years travelled in Europe and collected historical material from the French and the Spanish archives. In 1844–1845 and in 1856–1857 he was again a member of the state House of Representatives, and from 1845 to 1853 was secretary of state of Louisiana. He supported the Southern Confederacy during the Civil War, in which he lost a large fortune, and after its close lived chiefly by his pen. He died in New Orleans on the 11th of February 1895. He is best known as the historian of Louisiana. He wrote *Histoire de la Louisiane* (1847); *Romance of the History of Louisiana* (1848); *Louisiana: its Colonial History and Romance* (1851), reprinted in *A History of Louisiana*; *History of Louisiana: the Spanish Domination* (1854); *Philip II. of Spain* (1866); and *A History of Louisiana* (4 vols., 1866), the last being a republication and continuation of his earlier works in this field, the whole comprehending the history of Louisiana from its earliest discovery to 1861. He wrote also several dramas and romances, the best of the latter being *Fernando de Lemos* (1872).

GAY-LUSSAC, JOSEPH LOUIS (1778–1850), French chemist and physicist, was born at St Léonard, in the department of Haute Vienne, on the 6th of December 1778. He was the elder son of Antoine Gay, *procureur du roi* and judge at Pont-de-Noblac, who assumed the name Lussac from a small property he had in the neighbourhood of St Léonard. Young Gay-Lussac received his early education at home under the direction of the abbé Bourdieux and other masters, and in 1794 was sent to Paris to prepare for the École Polytechnique, into which he was admitted at the end of 1797 after a brilliant examination. Three years later he was transferred to the École des Ponts et Chaussées, and shortly afterwards was assigned to C. L. Berthollet, who wanted an able student to help in his researches. The new assistant scarcely came up to expectations in respect of confirming certain theoretical views of his master's by the experiments set him to that end, and appears to have stated the discrepancy without reserve; but Berthollet nevertheless quickly recognized the ability displayed, and showed his appreciation not only by desiring to be Gay-Lussac's "father in science," but also by making him in 1807 an original member of the Société d'Arcueil. In 1802 he was appointed demonstrator to A. F. Fourcroy at the École Polytechnique, where subsequently (1809) he became professor of chemistry, and from 1808 to 1832 he was professor of physics at the Sorbonne, a post which he only resigned for the chair of chemistry at the Jardin des Plantes. In 1831 he was elected to represent Haute Vienne in the chamber of deputies, and in 1839 he entered the chamber of peers. He died in Paris on the 9th of May 1850.

Gay-Lussac's earlier researches were mostly physical in character and referred mainly to the properties of gases, vapour-tensions, hygrometry, capillarity, &c. In his first memoir (*Ann. de Chimie*, 1802) he showed that different gases are dilated in the same proportion when heated from 0° to 100° C. Apparently he did not know of Dalton's experiments on the same point, which indeed were far from accurate; but in a note he explained that "le cit. Charles avait remarqué depuis 15 ans la même propriété dans ces gaz; mais n'ayant jamais publié ses résultats, c'est par le plus grand hasard que je les ai connus." In consequence of his candour in thus rescuing from oblivion the observation which his fellow-citizen did not think worth publishing, his name is sometimes dissociated from this law, which instead is known as that of Charles. In 1804 he had an opportunity of prosecuting his researches on air in somewhat unusual conditions, for the French Academy, desirous of securing some observations on the force of terrestrial magnetism at great elevations above the earth, through Berthollet and J. E. Chaptal obtained the use of the balloon which had been employed in Egypt, and entrusted the task to him and J. B. Biot. In their first ascent from the garden of the Conservatoire des Arts on the 24th of August 1804 an altitude of 4000 metres (about 13,000 ft.) was attained. But this elevation was not considered sufficient by Gay-Lussac, who therefore made a second ascent by himself on the 16th of September, when the balloon rose 7016 metres (about 23,000 ft.) above sea-level. At this height, with the thermometer marking 9½ degrees below freezing, he remained for a considerable time, making observations not only on magnetism, but also on the temperature and humidity of the air, and collecting several samples of air at different heights. The magnetic observations, though imperfect, led him to the conclusion that the magnetic effect at all attainable elevations above

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the earth's surface remains constant; and on analysing the samples of air he could find no difference of composition at different heights. (For an account of both ascents see *Journ. de phys.* for 1804.) On the 1st of October in the same year, in conjunction with Alexander von Humboldt, he read a paper on eudiometric analysis (*Ann. de Chim.*, 1805), which contained the germ of his most important generalization, the authors noting that when oxygen and hydrogen combine together by volume, it is in the proportion of one volume of the former to two volumes of the latter. But his law of combination by volumes was not enunciated in its general form until after his return from a scientific journey through Switzerland, Italy and Germany, on which with Humboldt he started from Paris in March 1805. This journey was interrupted in the spring of 1806 by the news of the death of M. J. Brisson, and Gay-Lussac hurried back to Paris in the hope, which was gratified, that he would be elected to the seat thus vacated in the Academy. In 1807 an account of the magnetic observations made during the tour with Humboldt was published in the first volume of the *Mémoires d'Arcueil*, and the second volume, published in 1809, contained the important memoir on gaseous combination (read to the Société Philomathique on the last day of 1808), in which he pointed out that gases combining with each other in volume do so in the simplest proportions—1 to 1, 1 to 2, 1 to 3—and that the volume of the compound formed bears a simple ratio to that of the constituents.

About this time Gay-Lussac's work, although he hy no means entirely abandoned physical questions, became of a more chemical character; and in three instances it brought him into direct rivalry with Sir Humphry Davy. In the first case Davy's preparation of potassium and sodium by the electric current spurred on Gay-Lussac and his collaborator L. J. Thénard, who had no battery at their disposal, to search for a chemical method of obtaining those metals, and by the action of red-hot iron on fused potash—a method of which Davy admitted the advantages—they succeeded in 1808 in preparing potassium, going on to make a full study of its properties and to use it, as Davy also did, for the reduction of boron from boracic acid in 1809. The second concerned the nature of "oxymuriatic acid" (chlorine). While admitting the possibility that it was an elementary body, after many experiments they finally declared it to be a compound (*Mém. d'Arcueil*, 1809). Davy, on the other hand, could see no reason to suppose it contained oxygen, as they surmised, and ultimately they had to accept his view of its elementary character. The third case roused most feeling of all. Davy, passing through Paris on his way to Italy at the end of 1813, obtained a few fragments of iodine, which had been discovered by Bernard Courtois (1777–1838) in 1811, and after a brief examination by the aid of his limited portable laboratory perceived its analogy to chlorine and inferred it to be an element. Gay-Lussac, it is said, was nettled at the idea of a foreigner making such a discovery in Paris, and vigorously took up the study of the new substance, the result being the elaborate "Mémoire sur l'iode," which appeared in the *Ann. de chim.* in 1814. He too saw its resemblance to chlorine, and was obliged to agree with Davy's opinion as to its simple nature, though not without some hesitation, due doubtless to his previous declaration about chlorine. Davy on his side seems to have felt that the French chemist was competing with him, not altogether fairly, in trying to appropriate the honour of discovering the character of the substance and of its compound, hydriodic acid.

In 1810 he published a paper which contains some classic experiments on fermentation, a subject to which he returned in a second paper published in 1815. At the same time he was working with Thénard at the improvement of the methods of organic analysis, and by combustion with oxidizing agents, first potassium chlorate and subsequently copper oxide, he determined the composition of a number of organic substances. But his last great piece of pure research was on prussic acid. In a note published in 1811 he described the physical properties of this acid, but he said nothing about its chemical composition till 1815, when he described cyanogen as a compound radicle, prussic acid as a compound of that radicle with hydrogen alone, and the prussiates (cyanides) as compounds of the radicle with metals. The proof that prussic acid contains hydrogen but no oxygen was a most important support to the hydrogen-acid theory, and completed the downfall of Lavoisier's oxygen theory; while the isolation of cyanogen was of equal importance for the subsequent era of compound radicles in organic chemistry.

After this research Gay-Lussac's attention began to be distracted from purely scientific investigation. He had now secured a leading if not the foremost place among the chemists of the French capital, and the demand for his services as adviser in technical problems and matters of practical interest made great inroads on his available time. He had been a member of the consultative committee on arts and manufactures since 1805; he was attached to the "administration des poudres et salpêtres" in 1818, and in 1829 he received the lucrative post of assayer to the mint. In these new fields he displayed the powers so conspicuous in his scientific inquiries, and he was now to introduce and establish scientific accuracy where previously there had been merely practical approximations. His services to industry included his improvements in the processes for the manufacture of sulphuric acid (1818) and oxalic acid (1829); methods of estimating the amount of real alkali in potash and soda by the volume of standard acid required for neutralization, and for estimating the available chlorine in bleaching powder by a solution of arsenious acid; directions for the use of the centesimal alcoholometer published in 1824 and specially commended by the Institute; and the elaboration of a method of assaying silver by a standard solution of common salt, a volume on which was published in 1833. Among his research work of this period may be mentioned the improvements in organic analysis and the investigation of fulminic acid made with the help of Liebig, who gained the privilege of admission to his private laboratory in 1823–1824.

Gay-Lussac was patient, persevering, accurate to punctiliousness, perhaps a little cold and reserved, and not unaware of his great ability. But he was also bold and energetic, not only in his work but also in support and defence of his friends. His early childish adventures, as told by Arago, herald the fearless aeronaut and the undaunted investigator of volcanic eruptions (Vesuvius was in full eruption when he visited it during his tour in 1805); and the endurance he exhibited under the laboratory accidents that befell him shows the power of will with which he would face the prospect of becoming blind and useless for the prosecution of the science which was his very life, and of which he was one of the most distinguished ornaments. Only at the very end, when the disease from which he was suffering left him no hope, did he complain with some bitterness of the hardship of leaving this world where the many discoveries being made pointed to yet greater discoveries to come.

The most complete list of Gay-Lussac's papers is contained in the Royal Society's *Catalogue of Scientific Papers*, which enumerates 148, exclusive of others written jointly with Humboldt, Thénard, Welter and Liebig. Many of them were published in the *Annales de chimie*, which after it changed its title to *Annales de chimie et physique* he edited, with Arago, up to nearly the end of his life; but some are to be found in the *Mémoires d'Arcueil* and the *Comptes rendus*, and in the *Recherches physiques et chimiques*, published with Thénard in 1811.

GAZA, THEODORUS (*c.* 1400–1475), one of the Greek scholars who were the leaders of the revival of learning in the 15th century, was born at Thessalonica. On the capture of his native city by the Turks in 1430 he fled to Italy. During a three years' residence in Mantua he rapidly acquired a competent knowledge of Latin under the teaching of Vittorino da Feltre, supporting himself meanwhile by giving lessons in Greek, and by copying manuscripts of the ancient classics.[1] In 1447 he became professor of Greek in the newly founded university of Ferrara, to which students in great numbers from all parts of Italy were soon attracted by his fame as a teacher. He had taken some part in the councils which were held in Siena (1423), Ferrara (1438), and Florence (1439), with the object of bringing about a reconciliation between

[1] According to Voigt, Gaza came to Italy some ten years later from Constantinople, where he had been a teacher or held some clerical office.

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the Greek and Latin Churches; and in 1450, at the invitation of Pope Nicholas V., he went to Rome, where he was for some years employed by his patron in making Latin translations from Aristotle and other Greek authors. After the death of Nicholas (1455), being unable to make a living at Rome, Gaza removed to Naples, where he enjoyed the patronage of Alphonso the Magnanimous for two years (1456–1458). Shortly afterwards he was appointed by Cardinal Bessarion to a benefice in Calabria, where the later years of his life were spent, and where he died about 1475. Gaza stood high in the opinion of most of his learned contemporaries, but still higher in that of the scholars of the succeeding generation. His Greek grammar (in four books), written in Greek, first printed at Venice in 1495, and afterwards partially translated by Erasmus in 1521, although in many respects defective, especially in its syntax, was for a long time the leading text-book. His translations into Latin were very numerous, including the *Problemata*, *De partibus animalium* and *De generatione animalium* of Aristotle; the *Historia plantarum* of Theophrastus; the *Problemata* of Alexander Aphrodisias; the *De instruendis aciebus* of Aelian; the *De compositione verborum* of Dionysius of Halicarnassus; and some of the *Homilies* of John Chrysostom. He also turned into Greek Cicero's *De senectute* and *Somnium Scipionis*—with much success, in the opinion of Erasmus; with more elegance than exactitude, according to the colder judgment of modern scholars. He was the author also of two small treatises entitled *De mensibus* and *De origine Turcarum*.

See G. Voigt, *Die Wiederbelebung des klassischen Alterthums* (1893), and article by C. F. Bähr in Ersch and Gruber's *Allgemeine Encyklopädie*. For a complete list of his works, see Fabricius, *Bibliotheca Graeca* (ed. Harles), x.

GAZA (or 'Azzah, mod. *Ghuzeh*), the most southerly of the five princely Philistine cities, situated near the sea, at the point where the old trade routes from Egypt, Arabia and Petra to Syria met. It was always a strong border fortress and a place of commercial importance, in many respects the southern counterpart of Damascus. The earliest notice of it is in the Tell el-Amarna tablets, in a letter from the local governor, who then held it for Egypt, with which country it always stood in close connexion. It never passed for long into Israelite hands, though subject for a while to Hezekiah of Judah; from him it passed to Assyria. In Amos i. 6 the city is denounced for giving up Hebrew slaves to Edom. To Herodotus (iii. 5) the place seemed as important as Sardis. The city withstood Alexander the Great for five months (332 B.C.), and in 96 B.C. was razed to the ground by Alexander Jannaeus. It was rebuilt by Aulus Gabinius, 57 B.C., but on a new site; the old site was remembered and spoken of as "Old" or "Desert Gaza": compare Acts viii. 26. In the 2nd and 3rd centuries Gaza was a thriving Greek city, with good schools and famous temples, especially one to the local god Marna (*i.e.* "Lord" or "Our Lord"). A statue of this god has been found near Gaza; it much resembles the Greek representation of Zeus. The struggle with Christianity here was long and intense. Egyptian monks gradually won over the country folk, and in 402, under the influence of Theodosius and Porphyry the local bishop, the Marneion was destroyed and the cross made politically supreme. In the 5th and 6th centuries Gaza was held in high repute as a place of learning. But after it passed into Moslem hands (635) it gradually lost all save commercial importance, and even the Crusaders did little to revive its old military glory. It finally was captured by the Moslems in 1244. Napoleon captured it in 1799.

The modern town (pop. 16,000) is divided into four quarters, one of which is built on a low hill. A magnificent grove of very ancient olives forms an avenue 4 m. long to the north. There are many lofty minarets in various parts of the town, and a fine mosque built of ancient materials. A 12th century church towards the south side of the hill has also been converted into a mosque. On the east is shown the tomb of Samson (an erroneous tradition dating back to the middle ages). The ancient walls are now covered up beneath green mounds of rubbish. The water-supply is from wells sunk through the sandy soil to the rock; of these there are more than twenty—an unusual number for a Syrian town. The land for the 3 m. between Gaza and the sea consists principally of sand dunes. There is no natural harbour, but traces of ruins near the shore mark the site of the old Maiuma Gazae or Port of Gaza, now called el Mineh, which in the 5th century was a separate town and episcopal see, under the title Constantia or Limena Gaza. Hâshem, an ancestor of Mahomet, lies buried in the town. On the east are remains of a race-course, the corners marked by granite shafts with Greek inscriptions on them. To the south is a remarkable hill, quite isolated and bare, with a small mosque and a graveyard. It is called el Muntâr, "the watch tower," and is supposed to be the mountain "before (or facing) Hebron," to which Samson carried the gates of Gaza (Judg. xvi. 3). The bazaars of Gaza are considered good. An extensive pottery exists in the town, and black earthenware peculiar to the place is manufactured there. The climate is dry and comparatively healthy, but the summer temperature often exceeds 110° Fahr. The surrounding country is partly cornland, partly waste, and is inhabited by wandering Arabs. The prosperity of Ghuzzeh has partially revived through the growing trade in barley, of which the average annual export to Great Britain for 1897–1899 was over 30,000 tons. The dress of the people is Egyptian rather than Syrian. Gaza is an episcopal see both of the Greek and the Armenian church. The Church Missionary Society maintains a mission, with schools for both sexes, and a hospital.

GAZALAND, a district of Portuguese East Africa, extending north from the Komati or Manhissa river, Delagoa Bay, to the Pungwe river. It is a well-watered, fertile country. Gazaland is one of the chief recruiting grounds for negro labour in the Transvaal gold mines. The country derives its name from a Swazi chief named Gaza, a contemporary of Chaka, the Zulu king. Refugees from various clans oppressed by Dingaan (Chaka's successor) were welded into one tribe by Gaza's son Manikusa, who took the name of Sotshangana, his followers being known generally as Matshangana. A section of them was called Maviti or Landeens (*i.e.* couriers), a designation which persists as a tribal name. Between 1833 and 1836 Manikusa made himself master of the country as far north as the Zambezi and captured the Portuguese posts at Delagoa Bay, Inhambane, Sofala and Sena, killing nearly all the inhabitants. The Portuguese reoccupied their posts, but held them with great difficulty, while in the interior the Matshangana continued their ravages unchecked, depopulating large regions. Manikusa died about 1860, and his son Umzila, receiving some help from the Portuguese at Delagoa Bay in a struggle against a brother for the chieftainship, ceded to them the territory south of the Manhissa river. North of that stream as far as the Zambezi and inland to the continental plateau Umzila established himself in independence, a position he maintained till his death (*c.* 1884). His chief rival was a Goanese named Gouveia, who came to Africa about 1850. Having obtained possession of a *prazo* in the Gorongoza district, he ruled there as a feudal lord while acknowledging himself a Portuguese subject. Gouveia recovered from the Matshangana and other troublers of the peace much of the country in the Zambezi valley, and was appointed by the Portuguese captain-general of a large region. From 1868 onward the country began to be better known. Probably the first European to penetrate any distance inland from the Sofala coast since the Portuguese gold-seekers of the 16th century was St Vincent W. Erskine, who explored the region between the Limpopo and Pungwe (1868–1875). Portugal's hold on the coast had been more firmly established at the time of Umzila's death, and Gungunyana, his successor, was claimed as a vassal, while efforts were made to open up the interior. This led in 1890–1891 to collisions on the borderland of the plateau with the newly established British South Africa Company, and to the arrest by the company's agents of Gouveia, who was, however, set at liberty and returned to Mozambique via Cape Town. An offer made by Gungunyana (1891) to come under British protection was not accepted. In 1892 Gouveia was killed in a war with a native chief. Gungunyana maintained his independence until

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1895, when he was captured by a Portuguese force and exiled, first to Lisbon and afterwards to Angola, where he died in 1906. With the capture of Gungunyana opposition to Portuguese rule largely ceased.

In flora, fauna and commerce Gazaland resembles the neighbouring regions of Portuguese East Africa. (*g.p.*).

See G. McCall Theal, *History of South Africa since 1795*, vol. v. (London, 1908).

GAZEBO (usually explained as a comic Latinism, for "I will gaze"; the *New English Dictionary* suggests a possible oriental origin now lost), a term used in the 18th century for a structure on the outer wall of a garden, having an upper storey with windows on each side so as to overlook the road. Similar buildings are found in Holland on the borders of the canals, which in some cases form very picturesque features.

GAZETTE, a name given to news-sheets or newspapers having an abstract of current events (see NEWSPAPERS). The *London Gazette* is the title of the English official organ for announcements by the government, and is published every Tuesday and Friday. It contains all proclamations, orders of council, promotions and appointments to commissions in the army and navy, all appointments to offices of state, and such other orders, rules and regulations as are directed by act of parliament to be published therein. It also contains notices of proceedings in bankruptcy, dissolutions of partnership, &c. By the Documentary Evidence Act 1868 the production of a copy of the *Gazette* is prima facie evidence of royal proclamations and government orders and regulations. Similar gazettes are also published in Edinburgh and Dublin. Most countries (the United States excepted) have official journals containing information more or less similar to that of the *London Gazette*, as the French *Journal officiel*, the German *Deutscher Reichs-und Kgl. Preuss. Staats-Anzeiger*, &c. The word "gazetteer" was originally applied to one who wrote for "gazettes," but is now only used for a geographical dictionary arranged on an alphabetical plan.

GEAR (connected with "garb," properly elegance, fashion, especially of dress, and with "gar," to cause to do, only found in Scottish and northern dialects; the root of the word is seen in the Old Teut. *garwjan*, to make ready), an outfit, applied to the wearing apparel of a person, or to the harness and trappings of a horse or any draft animal, as riding-gear, hunting-gear, &c.; also to household goods or stuff. The phrase "out of gear," though now connected with the mechanical application of the word, was originally used to signify "out of harness" or condition, not ready to work, not fit. The word is also used of apparatus generally, and especially of the parts collectively in a machine by which motion is transmitted from one part to another by a series of cog-wheels, continuous bands, &c. It is used in a special sense in reference to a bicycle, meaning the diameter of an imaginary wheel, the circumference of which is equal to the distance accomplished by one revolution of the pedals (see BICYCLE).

GEBER. The name Geber has long been used to designate the author of a number of Latin treatises on alchemy, entitled *Summa perfectionis magisterii, De investigatione perfectionis, De inventione veritatis, Liber fornacum, Testamentum Gebri Regis Indiae* and *Alchemia Geberi*, and these writings were generally regarded as translations from the Arabic originals of Abu Abdallah Jaber ben Hayyam (Haiyan) ben Abdallah al-Kufi, who is supposed to have lived in the 8th or 9th century of the Christian era. About him, however, there is considerable uncertainty. According to the *Kitâb-al-Fihrist* (10th century), which gives his name as above, the authorities disagree, some asserting him to have been a writer on philosophy and rhetoric, and others claiming for him the first place among the adepts of his time in the art of making gold and silver. The writer of the *Kitâb-al-Fihrist* says he had been assured that Jaber only wrote one book and even that he never existed at all, but these statements he scouts as ridiculous, and expressing the conviction that Jaber really did exist, and that his works were numerous and important, goes on to quote the titles of some 500 treatises attributed to him. He is said to have resided most frequently at Kufa, where he prepared the "elixir," but, according to others, he never spent long in one place, having reason to keep his whereabouts unknown. His patron or master is variously given as Ja'far ben Yahya, and as Ja'far es-Sadiq; in the Arabic *Book of Royalty*, professedly written by him, he addresses the last-named as his master. In addition to these details the *Fihrist* mentions a tradition that he originally came from Khorasan. Another story given by d'Herbelot (*Bibliothèque orientale, s.v.* "Giaber") makes him a native of Harran in Mesopotamia and a Sabaean. Leo Africanus, who in 1526 gave an account of the Alchemists of Fez in Africa (see the English translation of his *Africae descriptio* by John Pory, *A Geographical History of Africa*, London, 1600, p. 155), states that their principal authority was Geber, a Greek who had apostatized to Mahommedanism and lived a century after Mahomet. In Albertus Magnus the name Geber occurs only once and then with the epithet "of Seville"; doubtless the reference is to the Arabian Jabir ben Aflah, who lived in that city in the 11th century, and wrote an astronomy in 9 books which is of importance in the history of trigonometry.

The great puzzle connected with the name Geber lies in the character of the writings attributed to him, their style and matter differentiating them strongly from those of even the best authors of the later alchemical period, and making it difficult to account for their existence at all. The researches of M. P. E. Berthelot threw a great deal of light on this question. Taking the six treatises enumerated above he concluded, after critical examination, that the two last may be disregarded as of later date than the others, and that the *De investigatione perfectionis*, the *De inventione* and the *Liber fornacum* are merely extracts from or summaries of the *Summa perfectionis* with later additions. The *Summa* he therefore regarded as representative of the work of the Latin Geber, and study of it convinced him that it contains no indication of an Arabic origin, either in its method, which is conspicuous for clearness of reasoning and logical co-ordination of material, or in its facts, or in the words and persons quoted. Without going so far as to deny that some words and phrases may be taken from the writings of the Arabian Jaber, he was disposed to hold that it is the original work of some unknown Latin author, who wrote it in the second half of the 13th century and put it under the patronage of the venerated name of Geber. The MS. of this work in the Bibliothèque Nationale at Paris dates from about the year 1300. Berthelot further investigated Arabic MSS. existing in the Paris library and in the university of Leiden, and containing works attributed to Jaber, and had translations made of six treatises—two, of which he gives the titles as *Livre de la royauté* and *Petit Livre de la miséricorde*,—from Paris, and four—*Livre des balances, Livre de la miséricorde, Livre de la concentration* and *Livre de la mercure orientale*—from Leiden. Berthelot was not prepared to assert that these treatises were actually written by Jaber, but he held it certain that they are works written in Arabic between the 9th and 12th centuries, at a period anterior to the relations of the Latins with the Arabs. In style these treatises are entirely different from the *Summa* of Geber. Their language is vague and allegorical, full of allusions and pious Mussulman invocations; the author continually announces that he is about to speak without mystery or reserve, but all the same never gives any precise details of the secrets he professes to reveal. He holds the doctrine that everything endowed with an apparent quality possesses an opposite occult quality in much the same terms as it is found in Latin writers of the middle ages, but he makes no allusion to the theory of the generation of the metals by sulphur and mercury, a theory generally attributed to Geber, who also added arsenic to the list. Again he fully accepts the influence of the stars on the production of the metals, whereas the Latin Geber disputes it, and in general the chemical knowledge of the two is on a different plane. Here again the inference is that the Latin treatises printed from the 15th century onwards as the work of Geber are not authentic, regarded as translations of the Arabic author Jaber, always supposing that the Arabic MSS. transcribed and translated for Berthelot are really, as they profess to be, the work of Jaber, and as representative of his opinions and attainments.

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But while Berthelot thus deprived the world of what were long regarded as genuine Latin versions of Jaber's works, he also gave it something in their place, for among the Paris MSS. he found a mutilated treatise, hitherto unpublished, entitled *Liber de Septuaginta* (*Johannis*), *translatus a Magistro Renaldo Cremonensi*, which he considered the only known Latin work that can be regarded as a translation from the Arabic Jaber. The latter states in the Arabic works referred to above that under that title he collected 70 of the 500 little treatises or tracts of which he was the author, and the titles of those tracts enumerated in the *Kitâb-al-Fihrist* as forming the chapters of the *Liber de Septuaginta* correspond in general with those of the Latin work, which further is written in a style similar to that of the Arabic Jaber and contains the same doctrines. Hence Berthelot felt justified in assigning it to Jaber, although no Arabic original is known.

The evidence collected by Berthelot has an important bearing on the history of chemistry. Most of the chemical knowledge attributed to the Arabs has been attributed to them on the strength of the reputed Latin writings of Geber. If, therefore, these are original works rather than translations, and contain facts and doctrines which are not to be found in the Arabian Jaber, it follows that, on the one hand, the chemical knowledge of the Arabs has been overestimated, and, on the other, that more progress was made in the middle ages than has generally been supposed.

See M. P. E. Berthelot's works on the history of alchemy and especially his *Chimie au moyen âge* (3 vols., Paris, 1893), the third volume of which contains a French translation of Jaber's works together with the Arabic text.

GEBHARD TRUCHSESS VON WALDBURG (1547–1601), elector and archbishop of Cologne, was the second son of William, count of Waldburg, and nephew of Otto, cardinal bishop of Augsburg (1514–1573). Belonging thus to an old and distinguished Swabian family, he was born on the 10th of November 1547, and after studying at the universities of Ingolstadt, Perugia, Louvain and elsewhere began his ecclesiastical career at Augsburg. Subsequently he held other positions at Strassburg, Cologne and Augsburg, and in December 1577 was chosen elector of Cologne after a spirited contest. Gebhard is chiefly noted for his conversion to the reformed doctrines, and for his marriage with Agnes, countess of Mansfeld, which was connected with this step. After living in concubinage with Agnes he decided, perhaps under compulsion, to marry her, doubtless intending at the same time to resign his see. Other counsels, however, prevailed. Instigated by some Protestant supporters he declared he would retain the electorate, and in December 1582 he formally announced his conversion to the reformed faith. The marriage with Agnes was celebrated in the following February, and Gebhard remained in possession of the see. This affair created a great stir in Germany, and the clause concerning ecclesiastical reservation in the religious peace of Augsburg was interpreted in one way by his friends, and in another way by his foes; the former holding that he could retain his office, the latter that he must resign. Anticipating events Gebhard had collected some troops, and had taken measures to convert his subjects to Protestantism. In April 1583 he was deposed and excommunicated by Pope Gregory XIII.; a Bavarian prince, Ernest, bishop of Liége, Freising and Hildesheim, was chosen elector, and war broke out between the rivals. The cautious Lutheran princes of Germany, especially Augustus I., elector of Saxony, were not enthusiastic in support of Gebhard, whose friendly relations with the Calvinists were not to their liking; and although Henry of Navarre, afterwards Henry IV. of France, tried to form a coalition to aid the deposed elector, the only assistance which he obtained came from John Casimir, administrator of the Palatinate of the Rhine. The inhabitants of the electorate were about equally divided on the question, and Ernest, supported by Spanish troops, was too strong for Gebhard. John Casimir, who acted as commander-in-chief, returned to the Palatinate in October 1583, and early in the following year Gebhard was driven from Bonn and took refuge in the Netherlands. The electorate was soon completely in the possession of Ernest, and the defeat of Gebhard was a serious blow to Protestantism, and marks a stage in the history of the Reformation. Living in the Netherlands he became very intimate with Elizabeth's envoy, Robert Dudley, earl of Leicester, but he failed to get assistance for renewing the war either from the English queen or in any other quarter. In 1589 Gebhard took up his residence at Strassburg, where he had held the office of dean of the cathedral since 1574. Before his arrival some trouble had arisen in the chapter owing to the fact that three excommunicated canons persisted in retaining their offices. He joined this party, which was strongly supported in the city, took part in a double election to the bishopric in 1592, and in spite of some opposition retained his office until his death at Strassburg on the 31st of May 1601. Gebhard was a drunken and licentious man, who owes his prominence rather to his surroundings than to his abilities.

See M. Lossen, *Der kölnische Krieg* (Gotha, 1882), and the article on Gebhard in band viii. of the *Allgemeine deutsche Biographie* (Leipzig, 1878); J. H. Hennes, *Der Kampf um das Erzstift Köln* (Cologne, 1878); L. Ennen, *Geschichte der Stadt Köln* (Cologne, 1863–1880); and *Nuntiaturberichte aus Deutschland. Der Kampf um Köln*, edited by J. Hansen (Berlin, 1892).

GEBWEILER (Fr. *Guebwiller*), a town of Germany in the imperial province of Alsace-Lorraine, at the foot of the Vosges, on the Lauch, 13 m. S. of Colmar, on the railway Bollweiler-Lautenbach. Pop. (1905) 13,259. Among the principal buildings are the Roman Catholic church of St Leodgar, dating from the 12th century, the Evangelical church, the synagogue, the town-house, and the old Dominican convent now used as a market and concert hall. The chief industries are spinning and dyeing, and the manufacture of cloth and of machinery; quarrying is carried on and the town is celebrated for its white wines.

Gebweiler is mentioned as early as 774. It belonged to the religious foundation of Murbach, and in 1759 the abbots chose it for their residence. In 1789, at the outbreak of the Revolution, the monastic buildings were laid in ruins, and, though the archives were rescued and removed to Colmar, the library perished.

GECKO,[1] the common name applied to all the species of the *Geckones*, one of the three sub-orders of the *Lacertilia*. The geckoes are small creatures, seldom exceeding 8 in. in length including the tail. With the head considerably flattened, the body short and thick, the legs not high enough to prevent the body dragging somewhat on the ground, the eyes large and almost destitute of eyelids, and the tail short and in some cases nearly as thick as the body, the geckoes altogether lack the litheness and grace characteristic of most lizards. Their colours also are dull,

Leaf-tailed Gecko (*Gymnodactylus platurus*) of Australia.

and to the weird and forbidding aspect thus produced the general prejudice against those creatures in the countries where they occur, which has led to their being classed with toads and snakes, is no doubt to be attributed. Their bite was supposed to be venomous, and their saliva to produce painful cutaneous eruptions; even their touch was thought sufficient to convey a dangerous taint. It is needless to say that in this instance the popular mind was misled by appearances. The geckoes are not only harmless, but are exceedingly useful creatures, feeding on insects, which, owing to the great width of their oesophagus, they are enabled to swallow whole, and in pursuit of which they do not hesitate to enter human dwellings, where they are often killed on

[1] The Malay name *gê-koq* imitates the animal's cry.

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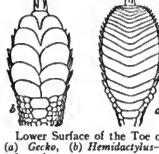
suspicion. The structure of the toes in these lizards forms one of their most characteristic anatomical features.

Most geckoes have adhesive digits and toes, by means of which they are enabled not only to climb absolutely smooth and vertical surfaces, for instance a window-pane, but to run along a white-washed ceiling, back downwards. The adhesion is not produced by sticky matter but by numerous transverse lamellae, each of which is further beset with tiny hair-like excrescences. The arrangement of the lamellae and pads differs much in the various genera and is used for classificatory purposes. Those which live on sandy ground have narrow digits without the adhesive apparatus. Most species have sharp, curved claws, often retractile between some of the lamellae or into a special sheath. The tail is very brittle and can be quickly regenerated; it varies much in size and shape; the most extraordinary is that of the leaf-tailed gecko. *Ptychozoon homalocephalon* of the Malay countries has membranous expansions on the sides of the head, body, limbs and tail, which look like parachutes, but more probably they aid in concealing the creature when it is closely pressed to the similarly coloured bark of a tree. Most geckoes are dull coloured, yellow to brown, and they soon change colour from lighter to dark tints. They are insectivorous and chiefly nocturnal, but are fond of basking in the sun, motionless on the bark of a tree, or on a rock the colour of which is then imitated to a nicety. Some species are more or less transparent.



Lower Surface of the Toe of (*a*) *Gecko*, (*b*) *Hemidactylus*—enlarged.

Geckoes, of which about 270 species are known, subdivided into about 50 genera, are cosmopolitan within the warmer zones, including New Zealand, and even the remotest volcanic islands. This wide distribution is due partly to the great age of the suborder (although fossils are unknown), partly to their being able to exist for several months without food so that, concealed in hollow trunks of trees, they may float about for a very long time. Ships, also, act as distributors. In south Europe occur only *Hemidactylus turcicus*, *Tarentola mauritanica* (*Platydactylus facetanus*) and *Phyllodactylus europaeus*.

GED, WILLIAM (1690–1749), the inventor of stereotyping, was born at Edinburgh in 1690. In 1725 he patented his invention, developed from the simple process of soldering together loose types of Van der Mey. Ged, although he succeeded in obtaining a cast in similar metal, of a type page, could not persuade Edinburgh printers to take up his invention, and finally entered into partnership with a London stationer named Jenner and Thomas James, a typefounder. The partnership, however, turned out very ill; and Ged, broken-hearted at his want of success due to trade jealousy and the compositors' dislike of the innovation, died in poverty on the 19th of October 1749. Two prayer-books for the university of Cambridge and an edition of Sallust were printed from his stereotype plates. In his time the best type was imported from Holland, and Ged's daughter reports that he had repeated offers from the Dutch which, from patriotic motives, he refused. His sons tried to carry out his patent, and it was eventually perfected by Andrew Wilson.

GEDDES, ALEXANDER (1737–1802), Scottish Roman Catholic theologian, was born in Rathven, Banffshire, on the 14th of September 1737. He was trained at the Roman Catholic seminary at Scalan and at the Scottish College in Paris, where he studied biblical philology, school divinity and modern languages. In 1764 he officiated as a priest in Dundee, but in May 1765 accepted an invitation to live with the earl of Traquair, where, with abundance of leisure and the free use of an adequate library, he made further progress in his favourite biblical studies. After a second visit to Paris, which was employed by him in reading and making extracts from rare books and manuscripts, he was appointed in 1769 priest of Auchinhalrig and Preshome in his native county. The freedom with which he fraternized with his Protestant neighbours called forth the rebuke of his bishop (George Hay), and ultimately, for hunting and for occasionally attending the parish church of Cullen, where one of his friends was minister, he was deprived of his charge and forbidden the exercise of ecclesiastical functions within the diocese. This happened in 1779; and in 1780 he went with his friend Lord Traquair to London, where he spent the rest of his life. Before leaving Scotland he had received the honorary degree of LL.D. from the university of Aberdeen, and had been made an honorary member of the Society of Antiquaries, in the institution of which he had taken a very active part. In London Geddes soon received an appointment in connexion with the chapel of the imperial ambassador, and was also helped by Lord Petre in his scheme for a new Catholic version of the Bible. In 1786, supported also by such scholars as Benjamin Kennicott and Robert Lowth, Geddes published a *Prospectus of a new Translation of the Holy Bible*, a considerable quarto volume, in which the defects of previous translations were fully pointed out, and the means indicated by which these might be removed. It was well received, and led to the publication in 1788 of *Proposals for Printing*, with a specimen, and in 1790 of a *General Answer to Queries, Counsels and Criticisms*. The first volume of the translation itself, which was entitled *The Holy Bible . . . faithfully translated from corrected Texts of the Originals, with various Readings, explanatory Notes and critical Remarks*, appeared in 1792, and was the signal for a storm of hostility on the part of both Catholics and Protestants. It was obvious enough—no small offence in the eyes of some—that as a critic Geddes had identified himself with C. F. Houbigant (1686–1783), Kennicott and J. D. Michaelis, but others did not hesitate to stigmatize him as the would-be "corrector of the Holy Ghost." Three of the vicars-apostolic almost immediately warned all the faithful against the "use and reception" of his translation, on the ostensible ground that it had not been examined and approved by due ecclesiastical authority; and by his own bishop (Douglas) he was in 1793 suspended from the exercise of his orders in the London district. The second volume of the translation, completing the historical books, published in 1797, found no more friendly reception; but this circumstance did not discourage him from giving forth in 1800 the volume of *Critical Remarks on the Hebrew Scriptures*, which presented in a somewhat brusque manner the then novel and startling views of Eichhorn and his school on the primitive history and early records of mankind.

Geddes was engaged on a critical translation of the Psalms (published in 1807) when he was seized with an illness of which he died on the 26th of February 1802. Although under ecclesiastical censures, he had never swerved from a consistent profession of faith as a Catholic; and on his death-bed he duly received the last rites of his communion.

Besides pamphlets on the Catholic and slavery questions, as well as several fugitive *jeux d'esprit*, and a number of unsigned articles in the *Analytical Review*, Geddes also published a free metrical version of *Select Satires of Horace* (1779), and a verbal rendering of the *First Book of the Iliad of Homer* (1792). The *Memoirs* of his life and writings by his friend John Mason Good appeared in 1803.

GEDDES, ANDREW (1783–1844), British painter, was born at Edinburgh. After receiving a good education in the high school and in the university of that city, he was for five years in the excise office, in which his father held the post of deputy auditor. After the death of his father, who had opposed his desire to become an artist, he came to London and entered the Royal Academy schools. His first contribution to the exhibitions of the Royal Academy, a "St John in the Wilderness," appeared at Somerset House in 1806, and from that year onwards Geddes was a fairly constant exhibitor of figure-subjects and portraits. His well-known portrait of Wilkie, with whom he was on terms of intimacy, was at the Royal Academy in 1816. He alternated for some years between London and Edinburgh, with some excursions on the Continent, but in 1831 settled in London, and was elected associate of the Royal Academy in 1832; and he

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died in London of consumption in 1844. A very able executant, a good colourist, and a close student of character, he made his chief success as a portrait-painter, but he produced occasional figure subjects and landscapes, and executed some admirable copies of the old masters as well. He was also a good etcher. His portrait of his mother, and a portrait study, called "Summer," are in the National Gallery of Scotland, and his portrait of Sir Walter Scott is in the Scottish National Portrait Gallery.

See *Art in Scotland: its Origin and Progress*, by Robert Brydall (1889); *The Scottish School of Painting*, by William D. McKay, R.S.A. (1906).

GEDDES, JAMES LORRAINE (1827–1887), American soldier and writer, was born in Edinburgh, Scotland, on the 19th of March 1827. In his boyhood he was taken to Canada, but in 1843 he returned to Scotland; then studied at Calcutta in the military academy, entered the army, and after distinguishing himself in the Punjab campaign, returned to Canada, whence in 1857 he removed to Vinton, Iowa. In the American Civil War he served in the Federal army first as lieutenant-colonel and after February 1862 as colonel of volunteers, taking part in the fighting at Shiloh, Vicksburg and Corinth. He was captured at Shiloh and was imprisoned for a time at Madison, Ga., and in Libby prison, Richmond, Va., and in 1865 was brevetted brigadier-general of volunteers. He was principal of the College for the Blind at Vinton after the war, and until his death was connected with the Iowa College of Agriculture at Ames, being military instructor and cashier in 1870–1882, acting president in 1876–1877, librarian in 1877–1878, vice-president and professor of military tactics in 1880–1882, and treasurer in 1884–1887. He died at Ames on the 21st of February 1887. He wrote a number of war songs, including "The Soldiers' Battle Prayer" and "The Stars and Stripes."

GEDDES, SIR WILLIAM DUGUID (1828–1900), Scottish scholar and educationist, was born in Aberdeenshire. He was educated at Elgin academy and university and King's College, Aberdeen, and after having held various scholastic posts he was appointed in 1860 professor of Greek and in 1885 principal of the (united) university of Aberdeen. He was knighted in 1892. He died in Aberdeen on the 9th of February 1900. It is chiefly as a teacher that Geddes will be remembered, and in his enthusiastic and successful efforts to raise the standard of Greek at the Scottish universities he has been compared with the humanists of the Renaissance. Amongst other works he was the author of *A Greek Grammar* (1855; 17th edition, 1883; new and revised edition, 1893); a meritorious edition of the *Phaedo* of Plato (2nd ed., 1885); and *The Problem of the Homeric Poems* (1878), in which, while supporting Grote's view that the *Iliad* consisted of an original Achilleis with insertions or additions by later hands, he maintains that these insertions are due to the author of the *Odyssey*.

GEDYMIN (d. 1342), grand-duke of Lithuania, was supposed by the earlier chroniclers to have been the servant of Witen, prince of Lithuania, but more probably he was Witen's younger brother and the son of Lutuwer, another Lithuanian prince. Gedymin inherited a vast domain, comprising Lithuania proper, Samogitia, Red Russia, Polotsk and Minsk; but these possessions were environed by powerful and greedy foes, the most dangerous of them being the Teutonic Knights and the Livonian knights of the Sword. The systematic raiding of Lithuania by the knights under the pretext of converting it had long since united all the Lithuanian tribes against the common enemy; but Gedymin aimed at establishing a dynasty which should make Lithuania not merely secure but mighty, and for this purpose he entered into direct diplomatic negotiations with the Holy See. At the end of 1322 he sent letters to Pope John XXII. soliciting his protection against the persecution of the knights, informing him of the privileges already granted to the Dominicans and the Franciscans in Lithuania for the preaching of God's Word, and desiring that legates should be sent to receive him also into the bosom of the church. On receiving a favourable reply from the Holy See, Gedymin issued circular letters, dated 25th of January 1325, to the principal Hanse towns, offering a free access into his domains to men of every order and profession from nobles and knights to tillers of the soil. The immigrants were to choose their own settlements and be governed by their own laws. Priests and monks were also invited to come and build churches at Vilna and Novogrodek. Similar letters were sent to the Wendish or Baltic cities, and to the bishops and landowners of Livonia and Esthonia. In short Gedymin, recognizing the superiority of western civilization, anticipated Ivan the Terrible and Peter the Great by throwing open the semi-savage Russian lands to influences of culture.

In October 1323 representatives of the archbishop of Riga, the bishop of Dorpat, the king of Denmark, the Dominican and Franciscan orders, and the Grand Master of the Teutonic Order assembled at Vilna, when Gedymin confirmed his promises and undertook to be baptized as soon as the papal legates arrived. A compact was then signed at Vilna, "in the name of the whole Christian World," between Gedymin and the delegates, confirming the promised privileges. But the christianizing of Lithuania was by no means to the liking of the Teutonic Knights, and they used every effort to nullify Gedymin's far-reaching design. This, unfortunately, it was easy to do. Gedymin's chief object was to save Lithuania from destruction at the hands of the Germans. But he was still a pagan reigning over semi-pagan lands; he was equally bound to his pagan kinsmen in Samogitia, to his orthodox subjects in Red Russia, and to his Catholic allies in Masovia. His policy, therefore, was necessarily tentative and ambiguous, and might very readily be misinterpreted. Thus his raid upon Dobrzyn, the latest acquisition of the knights on Polish soil, speedily gave them a ready weapon against him. The Prussian bishops, who were devoted to the knights, at a synod at Elbing questioned the authority of Gedymin's letters and denounced him as an enemy of the faith; his orthodox subjects reproached him with leaning towards the Latin heresy; while the pagan Lithuanians accused him of abandoning the ancient gods. Gedymin disentangled himself from his difficulties by repudiating his former promises; by refusing to receive the papal legates who arrived at Riga in September 1323; and by dismissing the Franciscans from his territories. These apparently retrogressive measures simply amounted to a statesmanlike recognition of the fact that the pagan element was still the strongest force in Lithuania, and could not yet be dispensed with in the coming struggle for nationality. At the same time Gedymin through his ambassadors privately informed the papal legates at Riga that his difficult position compelled him for a time to postpone his steadfast resolve of being baptized, and the legates showed their confidence in him by forbidding the neighbouring states to war against Lithuania for the next four years, besides ratifying the treaty made between Gedymin and the archbishop of Riga. Nevertheless in 1325 the Order, disregarding the censures of the church, resumed the war with Gedymin, who had in the meantime improved his position by an alliance with Wladislaus Lokietek, king of Poland, whose son Casimir now married Gedymin's daughter Aldona.

While on his guard against his northern foes, Gedymin from 1316 to 1340 was aggrandizing himself at the expense of the numerous Russian principalities in the south and east, whose incessant conflicts with each other wrought the ruin of them all. Here Gedymin's triumphal progress was irresistible; but the various stages of it are impossible to follow, the sources of its history being few and conflicting, and the date of every salient event exceedingly doubtful. One of his most important territorial accretions, the principality of Halicz-Vladimir, was obtained by the marriage of his son Lubart with the daughter of the Halician prince; the other, Kiev, apparently by conquest. Gedymin also secured an alliance with the grand-duchy of Muscovy by marrying his daughter, Anastasia, to the grand-duke Simeon. But he was strong enough to counterpoise the influence of Muscovy in northern Russia, and assisted the republic of Pskov, which acknowledged his overlordship, to break away from Great Novgorod. His internal administration bears all the marks of a wise ruler. He protected the Catholic as well as the orthodox clergy, encouraging them both to civilize his

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subjects; he raised the Lithuanian army to the highest state of efficiency then attainable; defended his borders with a chain of strong fortresses; and built numerous towns including Vilna, the capital (*c.* 1321). Gedymin died in the winter of 1342 of a wound received at the siege of Wielowa. He was married three times, and left seven sons and six daughters.

See Teodor Narbutt, *History of the Lithuanian nation* (Pol.) (Vilna, 1835); Antoni Prochaska, *On the Genuineness of the Letters of Gedymin* (Pol.) (Cracow, 1895); Vladimir Bonifatovich Antonovich, *Monograph concerning the History of Western and South-western Russia* (Rus.) (Kiev, 1885). (R. N. B.)

GEE, THOMAS (1815–1898), Welsh Nonconformist preacher and journalist, was born at Denbigh on the 24th of January 1815. At the age of fourteen he went into his father's printing office, but continued to attend the grammar school in the afternoons. In 1837 he went to London to improve his knowledge of printing, and on his return to Wales in the following year ardently threw himself into literary, educational and religious work. Among his publications were the well-known quarterly magazine *Y Traethodydd* ("The Essayist"), *Gwyddoniadur Cymreig* ("Encyclopaedia Cambrensis"), and Dr Silvan Evans's *English-Welsh Dictionary* (1868), but his greatest achievement in this field was the newspaper *Baner Cymru* ("The Banner of Wales"), founded in 1857 and amalgamated with *Yr Amserau* ("The Times") two years later. This paper soon became an oracle in Wales, and played a great part in stirring up the nationalist movement in the principality. In educational matters he waged a long and successful struggle on behalf of undenominational schools and for the establishment of the intermediate school system. He was an enthusiastic advocate of church disestablishment, and had a historic newspaper duel with Dr John Owen (afterwards bishop of St David's) on this question. The Eisteddfod found in him a thorough friend and a wise counsellor. His commanding presence, mastery of diction, and resonant voice made him an effective platform speaker. He was ordained to the Calvinistic Methodist ministry at Bala in 1847, and gave his time and talents ungrudgingly to Sunday school and temperance work. Throughout his life he believed in the itinerant unpaid ministry rather than in the settled pastorate. He died on the 28th of September 1898, and his funeral was the most imposing ever seen in North Wales.

GEEL, JACOB (1789–1862), Dutch scholar and critic, was born at Amsterdam on the 12th of November 1789. In 1823 he was appointed sub-librarian, and in 1833 chief librarian and honorary professor at Leiden, where he died on the 11th of November 1862. Geel materially contributed to the development of classical studies in Holland. He was the author of editions of Theocritus (1820), of the Vatican fragments of Polybius (1829), of the Ὀλυμπιακὸς of Dio Chrysostom (1840) and of numerous essays in the *Rheinisches Museum* and *Bibliotheca critica nova*, of which he was one of the founders. He also compiled a valuable catalogue of the MSS. in the Leiden library, wrote a history of the Greek sophists, and translated various German works into Dutch.

GEELONG, a seaport of Grant county, Victoria, Australia, situated on an extensive land-locked arm of Port Phillip known as Corio Bay, 45 m. by rail S.W. of Melbourne. Pop. of the city proper (1901) 12,390; with the adjacent boroughs of Geelong West, and Newton-and-Chilwell, 23,311. Geelong slopes to the bay on the north and to the Barwon river on the south, and its position in this respect, as well as the shelter it obtains from the Bellarine hills, renders it one of the healthiest towns in Victoria. As a manufacturing centre it is of considerable importance. The first woollen mill in the colony was established here, and the tweeds, cloths and other woollen fabrics of the town are noted throughout Australia. There are extensive tanneries, flour-mills and salt works, while at Fyansford, 3 m. distant, there are important cement works and paper-mills. The extensive vineyards in the neighbourhood of the town were destroyed under the Phylloxera Act, but replanting subsequently revived this industry. Corio Bay, a safe and commodious harbour, is entered by two channels across its bar, one of which has a depth of 23½ ft. There is extensive quayage, and the largest wool ships are able to load alongside the wharves, which are connected by rail with all parts of the colony. The facilities given for shipping wool direct to England from this port have caused a very extensive wool-broking trade to grow up in the town. The country surrounding Geelong is agricultural, but there are large limestone quarries east of the town, and in the Otway Forest, 23 m. distant, coal is worked. Geelong was incorporated in 1849.

GEESTEMÜNDE, a seaport town of Germany, in the Prussian province of Hanover, on the right bank of the Weser, at the mouth of the Geeste, which separates it from Bremerhaven, 32 m. N. from Bremen by rail. Pop. (1905) 23,625. The interest of the place is purely naval and commercial, its origin dating no farther back than 1857, when the construction of the harbour was begun. The great basin, which can accommodate large sea-going vessels, was completed in 1863, the petroleum basin was opened in 1874, and additional wharves have been constructed for the reception of vessels engaged in the fishing industry. The fish market of Geestemünde is the most important in Germany, and the auction hall practically determines the price of fish throughout the empire. The whole port is protected by powerful fortifications. Among the industrial establishments of the town are shipbuilding yards, foundries, engineering works and saw-mills.

GEFFCKEN, FRIEDRICH HEINRICH (1830–1896), German diplomatist and jurist, was born on the 9th of December 1830 at Hamburg, of which city his father was senator. After studying law at Bonn, Göttingen and Berlin, he was attached in 1854 to the Prussian legation at Paris. For ten years (1856–1866) he was the diplomatic representative of Hamburg in Berlin, first as chargé d'affaires, and afterwards as minister-resident, being afterwards transferred in a like capacity to London. Appointed in 1872 professor of constitutional history and public law in the reorganized university of Strassburg, Geffcken became in 1880 a member of the council of state of Alsace-Lorraine. Of too nervous a temperament to withstand the strain of the responsibilities of his position, he retired from public service in 1882, and lived henceforth mostly at Munich, where he died, suffocated by an accidental escape of gas into his bedchamber, on the 1st of May 1896. Geffcken was a man of great erudition and wide knowledge and of remarkable legal acumen, and from these qualities proceeded the personal influence he possessed. He was moreover a clear writer and made his mark as an essayist. He was one of the most trusted advisers of the Prussian crown prince, Frederick William (afterwards the emperor Frederick), and it was he (it is said, at Bismarck's suggestion) who drew up the draft of the New German federal constitution, which was submitted to the crown prince's headquarters at Versailles during the war of 1870–71. It was also Geffcken who assisted in framing the famous document which the emperor Frederick, on his accession to the throne in 1888, addressed to the chancellor. This memorandum gave umbrage, and on the publication by Geffcken in the *Deutsche Rundschau* (Oct. 1888) of extracts from the emperor Frederick's private diary during the war of 1870–71, he was, at Bismarck's instance, prosecuted for high treason. The Reichsgericht (supreme court), however, quashed the indictment, and Geffcken was liberated after being under arrest for three months. Publications of various kinds proceeded from his pen. Among these are *Zur Geschichte des orientalischen Krieges 1853–1856* (Berlin, 1881); *Frankreich, Russland und der Dreibund* (Berlin, 1894); and *Staat und Kirche* (1875), English translation by E. F. Fairfax (1877). His writings on English history have been translated by S. J. Macmullan and published as *The British Empire, with essays on Prince Albert, Palmerston, Beaconsfield, Gladstone, and reform of the House of Lords* (1889).

GEFFROY, MATHIEU AUGUSTE (1820–1895), French historian, was born in Paris. After studying at the École Normale Supérieure he held history professorships at various *lycées*. His French thesis for the doctorate of letters, *Étude sur les pamphlets politiques et religieux de Milton* (1848), showed that he was attracted towards foreign history, a study for which he soon qualified himself by mastering the Germanic and Scandinavian languages. In 1851 he published a *Histoire des états scandinaves*, which is especially valuable for clear arrangement and for the trustworthiness of its facts. Later, a long

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stay in Sweden furnished him with valuable documents for a political and social history of Sweden and France at the end of the 18th century. In 1864 and 1865 he published in the *Revue des deux mondes* a series of articles on Gustavus III. and the French court, which were republished in book form in 1867. To the second volume he appended a critical study on *Marie Antoinette et Louis XVI apocryphes*, in which he proved, by evidence drawn from documents in the private archives of the emperor of Austria, that the letters published by Feuillet de Conches (*Louis XVI, Marie Antoinette et Madame Elisabeth*, 1864–1873) and Hunolstein (*Corresp. inédite de Marie Antoinette*, 1864) are forgeries. With the collaboration of Alfred von Arneth, director of the imperial archives at Vienna, he edited the *Correspondance secrète entre Marie-Thérèse et le comte de Mercy-Argenteau* (3 vols., 1874), the first account based on trustworthy documents of Marie Antoinette's character, private conduct and policy. The Franco-German War drew Geffroy's attention to the origins of Germany, and his *Rome et les Barbares: étude sur la Germanie de Tacite* (1874) set forth some of the results of German scholarship. He was then appointed to superintend the opening of the French school of archaeology at Rome, and drew up two useful reports (1877 and 1884) on its origin and early work. But his personal tastes always led him back to the study of modern history. When the Paris archives of foreign affairs were thrown open to students, it was decided to publish a collection of the instructions given to French ambassadors since 1648 (*Recueil des instructions données aux ambassadeurs et ministres de France depuis le traité de Westphalie*), and Geffroy was commissioned to edit the volumes dealing with Sweden (vol.ii., 1885) and Denmark (vol. xiii., 1895). In the interval he wrote *Madame de Maintenon d'après sa correspondance authentique* (2 vols., 1887), in which he displayed his penetrating critical faculty in discriminating between authentic documents and the additions and corrections of arrangers like La Beaumelle and Lavallée. His last works were an *Essai sur la formation des collections d'antiques de la Suède* and *Des institutions et des mœurs du paganisme scandinave: l'Islande avant le Christianisme*, both published posthumously. He died at Bièvre on the 16th of August 1895.

GEFLE, a seaport of Sweden on an inlet of the Gulf of Bothnia, chief town of the district (*län*) of Gefleborg, 112 m. N.N.W. of Stockholm by rail. Pop. (1900) 29,522. It is the chief port of the district of Kopparberg, with its iron and other mines and forests. The exports consist principally of timber and woodpulp, iron and steel. The harbour, which has two entrances about 20 ft. deep, is usually ice-bound in mid-winter. Large vessels generally load in the roads at Gråberg, 6 m. distant. There are slips and shipbuilding yards, and a manufacture of sail-cloth. The town is an important industrial centre, having tobacco and leather factories, electrical and other mechanical works, and breweries. At Skutskär at the mouth of the Dal river are wood-pulp and saw mills, dealing with the large quantities of timber floated down the river; and there are large wood-yards in the suburb of Bomhus. Gefle was almost destroyed by fire in 1869, but was rebuilt in good style, and has the advantage of a beautiful situation. The principal buildings are a castle, founded by King John III. (1568–1592), but rebuilt later, a council-house erected by Gustavus III., who held a diet here in 1792, an exchange, and schools of commerce and navigation.

GEGENBAUR, CARL (1826–1903), German anatomist, was born on the 21st of August 1826 at Würzburg, the university of which he entered as a student in 1845. After taking his degree in 1851 he spent some time in travelling in Italy and Sicily, before returning to Würzburg as *Privatdocent* in 1854. In 1855 he was appointed extraordinary professor of anatomy at Jena, where after 1865 his fellow-worker, Ernst Haeckel, was professor of zoology, and in 1858 he became the ordinary professor. In 1873 he was appointed to Heidelberg, where he was professor of anatomy and director of the Anatomical Institute until his retirement in 1901. He died at Heidelberg on the 14th of June 1903. The work by which perhaps he is best known is his *Grundrisz der vergleichenden Anatomie* (Leipzig, 1874; 2nd edition, 1878). This was translated into English by W. F. Jeffrey Bell (*Elements of Comparative Anatomy*, 1878), with additions by E. Ray Lankester. While recognizing the importance of comparative embryology in the study of descent, Gegenbaur laid stress on the higher value of comparative anatomy as the basis of the study of homologies, *i.e.* of the relations between corresponding parts in different animals, as, for example, the arm of man, the foreleg of the horse and the wing of a fowl. A distinctive piece of work was effected by him in 1871 in supplementing the evidence adduced by Huxley in refutation of the theory of the origin of the skull from expanded vertebrae, which, formulated independently by Goethe and Oken, had been championed by Owen. Huxley demonstrated that the skull is built up of cartilaginous pieces; Gegenbaur showed that "in the lowest (gristly) fishes, where hints of the original vertebrae might be most expected, the skull is an unsegmented gristly brain-box, and that in higher forms the vertebral nature of the skull cannot be maintained, since many of the bones, notably those along the top of the skull, arise in the skin." Other publications by Gegenbaur include a *Text-book of Human Anatomy* (Leipzig, 1883, new ed. 1903), the *Epiglottis* (1892) and *Comparative Anatomy of the Vertebrates in relation to the Invertebrates* (Leipzig, 2 vols., 1898–1901). In 1875 he founded the *Morphologisches Jahrbuch*, which he edited for many years. In 1901 he published a short autobiography under the title *Erlebtes und Erstrebtes*.

See Fürbringer in *Heidelberger Professoren aus dem 19ten Jahrhundert* (Heidelberg, 1903).

GEGENSCHEIN (Ger. *gegen*, opposite, and *schein*, shine), an extremely faint luminescence of the sky, seen opposite the direction of the sun. Germany was the country in which it was first discovered and described. The English rendering "counterglow" is also given to it. Its faintness is such that it can be seen only by a practised eye under favourable conditions. It is invisible during the greater part of June, July, December and January, owing to its being then blotted out by the superior light of the Milky Way. It is also invisible during moonlight and near the horizon, and the neighbourhood of a bright star or planet may interfere with its recognition. When none of these unfavourable conditions supervene it may be seen at nearly any time when the air is clear and the depression of the sun below the horizon more than 20°. (See ZODIACAL LIGHT.)

GEIBEL, EMANUEL (1815–1884), German poet, was born at Lübeck on the 17th of October 1815, the son of a pastor in the city. He was originally intended for his father's profession, and studied at Bonn and Berlin, but his real interests lay not in theology but in classical and romance philology. In 1838 he accepted a tutorship at Athens, where he remained until 1840. In the same year he brought out, in conjunction with his friend Ernst Curtius, a volume of translations from the Greek. His first poems, *Zeitstimmen*, appeared in 1841; a tragedy, *König Roderich*, followed in 1843. In the same year he received a pension from the king of Prussia, which he retained until his invitation to Munich by the king of Bavaria in 1851 as honorary professor at the university. In the interim he had produced *König Sigurds Brautfahrt* (1846), an epic, and *Juniuslieder* (1848, 33rd ed. 1901), lyrics in a more spirited and manlier style than his early poems. A volume of *Neue Gedichte*, published at Munich in 1857, and principally consisting of poems on classical subjects, denoted a further considerable advance in objectivity, and the series was worthily closed by the *Spätherbstblätter*, published in 1877. He had quitted Munich in 1869 and returned to Lübeck, where he died on the 6th of April 1884. His works further include two tragedies, *Brunhild* (1858, 5th ed. 1890), and *Sophonisbe* (1869), and translations of French and Spanish popular poetry. Beginning as a member of the group of political poets who heralded the revolution of 1848, Geibel was also the chief poet to welcome the establishment of the Empire in 1871. His strength lay not, however, in his political songs but in his purely lyric poetry, such as the fine cycle *Ada* and his still popular love-songs. He may be regarded as the leading representative of German lyric poetry between 1848 and 1870.

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Geibel's *Gesammelte Werke* were published in 8 vols. (1883, 4th ed. 1906); his *Gedichte* have gone through about 130 editions. An excellent selection in one volume appeared in 1904. For biography and criticism, see K. Goedeke, *E. Geibel* (1869); W. Scherer's address on Geibel (1884); K. T. Gaedertz, *Geibel-Denkwürdigkeiten* (1886); C. C. T. Litzmann, *E. Geibel, aus Erinnerungen, Briefen und Tagebüchern* (1887), and biographies by C. Leimbach (2nd ed., 1894), and K. T. Gaedertz (1897).

GEIGE (O. Fr. *gigue, gige*; O. Ital. and Span. *giga*; Prov. *gigua*; O. Dutch *gighe*), in modern German the violin; in medieval German the name applied to the first stringed instruments played with a bow, in contradistinction to those whose strings were plucked by fingers or plectrum such as the cithara, rotta and fidula, the first of these terms having been very generally used to designate various instruments whose strings were plucked. The name *gige* in Germany, of which the origin is uncertain,[1] and its derivatives in other languages, were in the middle ages applied to rebecs having fingerboards. As the first bowed instruments in Europe were, as far as we know, those of the rebab type, both boat-shaped and pear-shaped, it seems probable that the name clung to them long after the bow had been applied to other stringed instruments derived from the cithara, such as the fiddle (videl) or vielle. In the romances of the 12th and 13th centuries the *gige* is frequently mentioned, and generally associated with the rotta. Early in the 16th century we find definite information concerning the Geige in the works of Sebastian Virdung (1511), Hans Judenkünig (1523), Martin Agricola (1532), Hans Gerle (1533); and from the instruments depicted, of two distinct types and many varieties, it would appear that the principal idea attached to the name was still that of the bow used to vibrate the strings. Virdung qualifies the word *Geige* with *Klein* (small) and *Gross* (large), which do not represent two sizes of the same instrument but widely different types, also recognized by Agricola, who names three or four sizes of each, discant, alto, tenor and bass. Virdung's *Klein Geige* is none other than the rebec with two C-shaped soundholes and a raised fingerboard cut in one piece with the vaulted back and having a separate flat soundboard glued over it, a change rendered necessary by the arched bridge. Agricola's *Klein Geige* with three strings was of a totally different construction, having ribs and wide incurvations but no bridge; there was a rose soundhole near the tailpiece and two C-shaped holes in the shoulders. Agricola (*Musica instrumentalis*) distinctly mentions three kinds of *Geigen* with three, four and five strings. From him we learn that only one position was as yet used on these instruments, one or two higher notes being occasionally obtained by sliding the little finger along. A century later Agricola's *Geige* was regarded as antiquated by Praetorius, who reproduces one of the bridgeless ones with five strings, a rose and two C-shaped soundholes, and calls it an old fiddle; under *Geige* he gives the violins. (K. S.)

GEIGER, ABRAHAM (1810–1874), Jewish theologian and orientalist, was born at Frankfort-on-Main on the 24th of May 1816, and educated at the universities of Heidelberg and Bonn. As a student he distinguished himself in philosophy and in philology, and at the close of his course wrote on the relations of Judaism and Mahommedanism a prize essay which was afterwards published in 1833 under the title *Was hat Mohammed aus dem Judentum aufgenommen?* (English trans. *Judaism and Islam*, Madras, 1898). In November 1832 he went to Wiesbaden as rabbi of the synagogue, and became in 1835 one of the most active promoters of the *Zeitschrift für jüdische Theologie* (1835–1839 and 1842–1847). From 1838 to 1863 he lived in Breslau, where he organized the reform movement in Judaism and wrote some of his most important works, including *Lehr- und Lesebuch zur Sprache der Mischna* (1845), *Studien* from Maimonides (1850), translation into German of the poems of Juda ha-Levi (1851), and *Urschrift und Übersetzungen der Bibel in ihrer Abhängigkeit von der innern Entwickelung des Judentums* (1857). The last-named work attracted little attention at the time, but now enjoys a great reputation as a new departure in the methods of studying the records of Judaism. The *Urschrift* has moreover been recognized as one of the most original contributions to biblical science. In 1863 Geiger became head of the synagogue of his native town, and in 1870 he removed to Berlin, where, in addition to his duties as chief rabbi, he took the principal charge of the newly established seminary for Jewish science. The *Urschrift* was followed by a more exhaustive handling of one of its topics in *Die Sadducäer und Pharisäer* (1863), and by a more thorough application of its leading principles in an elaborate history of Judaism (*Das Judentum und seine Geschichte*) in 1865–1871. Geiger also contributed frequently on Hebrew, Samaritan and Syriac subjects to the *Zeitschrift der deutschen morgenländischen Gesellschaft*, and from 1862 until his death (on the 23rd of October 1874) he was editor of a periodical entitled *Jüdische Zeitschrift für Wissenschaft und Leben*. He also published a Jewish prayer-book (*Israëlitisches Gebetbuch*) and a variety of minor monographs on historical and literary subjects connected with the fortunes of his people. (I. A.)

An *Allgemeine Einleitung* and five volumes of *Nachgelassene Schriften* were edited in 1875 by his son LUDWIG GEIGER (b. 1848), who in 1880 became extraordinary professor in the university of Berlin. Ludwig Geiger published a large number of biographical and literary works and made a special study of German humanism. He edited the *Goethe-Jahrbuch* from 1880, *Vierteljahrsschrift für Kultur und Litteratur der Renaissance* (1885–1886), *Zeitschr. für die Gesch. der Juden im Deutschland* (1886–1891), *Zeitschr. für vergleichende Litteraturgeschichte und Renaissance-Litteratur* (1887–1891). Among his works are *Johann Reuchlin, sein Leben und seine Werke* (Leipzig, 1871); and *Johann Reuchlin's Briefwechsel* (Tübingen, 1875); *Renaissance und Humanismus in Italien und Deutschland* (1882, and ed. 1901); *Gesch. des geistigen Lebens der preussischen Hauptstadt* (1892–1894); *Berlin's geistiges Leben* (1894–1896).

See also J. Derenbourg in *Jüd. Zeitschrift*, xi. 209-308; E. Schreiber, *Abraham Geiger als Reformator des Judentums* (1880), art. (with portrait) in *Jewish Encyclopedia*.

Abraham Geiger's nephew LAZARUS GEIGER (1829–1870), philosopher and philologist, born at Frankfort-on-Main, was destined to commerce, but soon gave himself up to scholarship and studied at Marburg, Bonn and Heidelberg. From 1861 till his sudden death in 1870 he was professor in the Jewish high school at Frankfort. His chief aim was to prove that the evolution of human reason is closely bound up with that of language. He further maintained that the origin of the Indo-Germanic language is to be sought not in Asia but in central Germany. He was a convinced opponent of rationalism in religion. His chief work was his *Ursprung und Entwickelung der menschlichen Sprache und Vernunft* (vol. i., Stuttgart, 1868), the principal results of which appeared in a more popular form as *Der Ursprung der Sprache* (Stuttgart, 1869 and 1878). The second volume of the former was published in an incomplete form (1872, 2nd ed. 1899) after his death by his brother Alfred Geiger, who also published a number of his scattered papers as *Zur Entwickelung der Menschheit* (1871, 2nd ed. 1878; Eng. trans. D. Asher, *Hist. of the Development of the Human Race*, Lond., 1880).

See L. A. Rosenthal, *Laz. Geiger: seine Lehre vom Ursprung d. Sprache und Vernunft und sein Leben* (Stuttgart, 1883); E. Peschier, *L. Geiger, sein Leben und Denken* (1871); J. Keller, *L. Geiger und d. Kritik d. Vernunft* (Wertheim, 1883) and *Der Ursprung d. Vernunft* (Heidelberg, 1884).

GEIJER, ERIK GUSTAF (1783–1847), Swedish historian, was born at Ransäter in Värmland, on the 12th of January 1783, of a family that had immigrated from Austria in the 17th century.

[1] The words *gige, gigen, geic* appear suddenly in the M. H. German of the 12th century, and thence passed apparently into the Romance languages, though some would reverse the process (e. g. the English "jig" is derived from *gige* through the O. Fr. *gigue* (in the sense of a stringed instrument); the modern French *gigue* (a dance) is the English "jig" re-imported (Hatzfeld and Darmesteter, *Dictionnaire*). This opens up another possibility, of the origin of the name of the instrument in the dance which it accompanied. (W. A. P.)

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He was educated at the university of Upsala, where in 1803 he carried off the Swedish Academy's great prize for his *Areminne öfver Sten Sture den äldre*. He graduated in 1806, and in 1810 returned from a year's residence in England to become *docent* in his university. Soon afterwards he accepted a post in the public record office at Stockholm, where, with some friends, he founded the "Gothic Society," to whose organ *Iduna* he contributed a number of prose essays and the songs *Manhem, Vikingen, Den siste kämpen, Den siste skalden, Odalbonden, Kolargossen*, which he set to music. About the same time he issued a volume of hymns, of which several are inserted in the Swedish Psalter.

Geijer's lyric muse was soon after silenced by his call to be assistant to Erik Michael Fant, professor of history at Upsala, whom he succeeded in 1817. In 1824 he was elected a member of the Swedish Academy. A single volume of a great projected work, *Svea Rikes Häfder*, itself a masterly critical examination of the sources of Sweden's legendary history, appeared in 1825. Geijer's researches in its preparation had severely strained his health, and he went the same year on a tour through Denmark and part of Germany, his impressions from which are recorded in his *Minnen*. In 1832–1836 he published three volumes of his *Svenska folkets historia* (Eng. trans. by J. H. Turner, 1845), a clear view of the political and social development of Sweden down to 1654. The acute critical insight, just thought, and finished historical art of these incomplete works of Geijer entitle him to the first place among Swedish historians. His chief other historical and political writings are his *Teckning af Sveriges tillstånd 1718–1772* (Stockholm, 1838), and *Feodalism och republikanism, ett bidrag till Samhällsförfattningens historia* (1844), which led to a controversy with the historian Anders Fryxell regarding the part played in history by the Swedish aristocracy. Geijer also edited, with the aid of J. H. Schröder, a continuation of Fant's *Scriptores rerum svecicarum medii aevi* (1818–1828), and, by himself, Thomas Thorild's *Samlade skrifter* (1819–1825), and *Konung Gustaf III.'s efterlemnade Papper* (4 vols., 1843–1846). Geijer's academic lectures, of which the last three, published in 1845 under the title *Om vår tids inre samhällsförhållanden, i synnerhet med afseende på Fädernesландet*, involved him in another controversy with Fryxell, but exercised a great influence over his students, who especially testified to their attachment after the failure of a prosecution against him for heresy. A number of his extempore lectures, recovered from notes, were published in 1856. He also wrote a life of Charles XIV. (Stockholm, 1844). Failing health forced Geijer to resign his chair in 1846, after which he removed to Stockholm for the purpose of completing his *Svenska folkets historia*, and died there on the 23rd of April 1847. His *Samlade skrifter* (13 vols., 1849–1855; new ed., 1873–1877) include a large number of philosophical and political essays contributed to reviews, particularly to *Litteraturbladet* (1838–1830), a periodical edited by himself, which attracted great attention in its day by its pronounced liberal views on public questions, a striking contrast to those he had defended in 1828–1830, when, as again in 1840–1841, he represented Upsala University in the Swedish diet. His poems were collected and published as *Skaldestycken* (Upsala, 1835 and 1878).

Geijer's style is strong and manly. His genius bursts out in sudden flashes that light up the dark corners of history. A few strokes, and a personality stands before us instinct with life. His language is at once the scholar's and the poet's; with his profoundest thought there beats in unison the warmest, the noblest, the most patriotic heart. Geijer came to the writing of history fresh from researches in the whole field of Scandinavian antiquity, researches whose first-fruits are garnered in numerous articles in *Iduna*, and his masterly treatise *Om den gamla nordiska folkvisan*, prefixed to the collection of *Svenska folkvisor* which he edited with A. A. Afzelius (3 vols., 1814–1816). The development of freedom is the idea that gives unity to all his historical writings.

For Geijer's biography, see his own *Minnen* (1834), which contains copious extracts from his letters and diaries; B. E. Malmström, *Minnestal öfver E. G. Geijer*, addressed to the Upsala students (June 6, 1848), and printed among his *Tal och esthetiska afhandlingar* (1868), and *Grunddragen af Svenska vitterhetens häfder* (1866–1868); and S. A. Hollander, *Minne af E. G. Geijer* (Örebro, 1869). See also lives of Geijer by J. Hellstenius (Stockholm, 1876) and J. Nielson (Odense, 1902).

GEIKIE, SIR ARCHIBALD (1835–), Scottish geologist, was born at Edinburgh on the 28th of December 1835. He was educated at the high school and university of Edinburgh, and in 1855 was appointed an assistant on the Geological Survey. Wielding the pen with no less facility than the hammer, he inaugurated his long list of works with *The Story of a Boulder; or, Gleanings from the Note-Book of a Geologist* (1858). His ability at once attracted the notice of his chief, Sir Roderick Murchison, with whom he formed a lifelong friendship, and whose biographer he subsequently became. With Murchison some of his earliest work was done on the complicated regions of the Highland schists; and the small geological map of Scotland published in 1862 was their joint work: a larger map was issued by Geikie in 1892. In 1863 he published an important essay "On the Phenomena of the Glacial Drift of Scotland," *Trans. Geol. Soc. Glasgow*, in which the effects of ice action in that country were for the first time clearly and connectedly delineated. In 1865 appeared Geikie's *Scenery of Scotland* (3rd edition, 1901), which was, he claimed, "the first attempt to elucidate in some detail the history of the topography of a country." In the same year he was elected F.R.S. At this time the Edinburgh school of geologists—prominent among them Sir Andrew Ramsay, with his *Physical Geology and Geography of Great Britain*—were maintaining the supreme importance of denudation in the configuration of land-surfaces, and particularly the erosion of valleys by the action of running water. Geikie's book, based on extensive personal knowledge of the country, was an able contribution to the doctrines of the Edinburgh school, of which he himself soon began to rank as one of the leaders.

In 1867, when a separate branch of the Geological Survey was established for Scotland, he was appointed director. On the foundation of the Murchison professorship of geology and mineralogy at the university of Edinburgh in 1871, he became the first occupant of the chair. These two appointments he continued to hold till 1881, when he succeeded Sir Andrew Ramsay in the joint offices of director-general of the Geological Survey of the United Kingdom and director of the museum of practical geology, London, from which he retired in February 1901. A feature of his tenure of office was the impetus given to microscopic petrography, a branch of geology to which he had devoted special study, by a splendid collection of sections of British rocks. Later he wrote two important and interesting Survey Memoirs, *The Geology of Central and Western Fife and Kinross* (1900), and *The Geology of Eastern Fife* (1902).

From the outset of his career, when he started to investigate the geology of Skye and other of the Western Isles, he took a keen interest in volcanic geology, and in 1871 he brought before the Geological Society of London an outline of the Tertiary volcanic history of Britain. Many difficult problems, however, remained to be solved. Here he was greatly aided by his extensive travels, not only throughout Europe, but in western America. While the canyons of the Colorado confirmed his long-standing views on erosion, the eruptive regions of Wyoming, Montana and Utah supplied him with valuable data in explanation of volcanic phenomena. The results of his further researches were given in an elaborate and charmingly written essay on "The History of Volcanic Action during the Tertiary Period in the British Isles," *Trans. Roy. Soc. Edin.*, (1888). His mature views on volcanic geology were given to the world in his presidential addresses to the Geological Society in 1891 and 1892, and afterwards embodied in his great work on *The Ancient Volcanoes of Great Britain* (1897). Other results of his travels are collected in his *Geological Sketches at Home and Abroad* (1882).

His experience as a field geologist resulted in an admirable text-book, *Outlines of Field Geology* (5th edition, 1900). After editing and practically re-writing Jukes's *Student's Manual of Geology* in 1872, he published in 1882 a *Text-Book* and in 1886 a *Class-Book* of geology, which have taken rank as standard works of their kind. A fourth edition of his *Text-Book*, in two vols., was

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issued in 1903. His writings are marked in a high degree by charm of style and power of vivid description. His literary ability has given him peculiar qualifications as a writer of scientific biography, and the *Memoir of Edward Forbes* (with G. Wilson), and those of his old chiefs, Sir R. I. Murchison (2 vols., 1875) and Sir Andrew Crombie Ramsay (1895), are models of what such works should be. His *Founders of Geology* consists of the inaugural course of Lectures (founded by Mrs G. H. Williams) at Johns Hopkins University, Baltimore, delivered in 1897. In 1897 he issued an admirable *Geological Map of England and Wales, with Descriptive Notes*. In 1898 he delivered the Romanes Lectures, and his address was published under the title of *Types of Scenery and their Influence on Literature*. The study of geography owes its improved position in Great Britain largely to his efforts. Among his works on this subject is *The Teaching of Geography* (1887). His *Scottish Reminiscences* (1904) and *Landscape in History and other Essays* (1905) are charmingly written and full of instruction. He was foreign secretary of the Royal Society from 1890 to 1894, joint secretary from 1903 to 1908, president in 1909, president of the Geological Society in 1891 and 1892, and president of the British Association, 1892. He received the honour of knighthood in 1891.

GEIKIE, JAMES (1839–), Scottish geologist, younger brother of Sir Archibald Geikie, was born at Edinburgh on the 23rd of August 1839. He was educated at the high school and university of Edinburgh. He served on the Geological Survey from 1861 until 1882, when he succeeded his brother as Murchison professor of geology and mineralogy at the university of Edinburgh. He took as his special subject of investigation the origin of surface-features, and the part played in their formation by glacial action. His views are embodied in his chief work, *The Great Ice Age and its Relation to the Antiquity of Man* (1874; 3rd ed., 1894). He was elected F.R.S. in 1875. James Geikie became the leader of the school that upholds the all-important action of land-ice, as against those geologists who assign chief importance to the work of pack-ice and icebergs. Continuing this line of investigation in his *Prehistoric Europe* (1881), he maintained the hypothesis of five inter-Glacial periods in Great Britain, and argued that the palaeolithic deposits of the Pleistocene period were not post- but inter- or pre-Glacial. His *Fragments of Earth Lore: Sketches and Addresses, Geological and Geographical* (1893) and *Earth Sculpture* (1898) are mainly concerned with the same subject. His *Outlines of Geology* (1886), a standard text-book of its subject, reached its third edition in 1896; and in 1905 he published an important manual on *Structural and Field Geology*. In 1887 he displayed another side of his activity in a volume of *Songs and Lyrics by H. Heine and other German Poets, done into English Verse*. From 1888 he was honorary editor of the *Scottish Geographical Magazine*.

GEIKIE, WALTER (1795–1837), Scottish painter, was born at Edinburgh on the 9th of November 1795. In his second year he was attacked by a nervous fever by which he permanently lost the faculty of hearing, but through the careful attention of his father he was enabled to obtain a good education. Before he had the advantage of the instruction of a master he had attained considerable proficiency in sketching both figures and landscapes from nature, and in 1812 he was admitted into the drawing academy of the board of Scottish manufactures. He first exhibited in 1815, and was elected an associate of the Royal Scottish Academy in 1831, and a fellow in 1834. He died on the 1st of August 1837, and was interred in the Greyfriars churchyard, Edinburgh. Owing to his want of feeling for colour, Geikie was not a successful painter in oils, but he sketched in India ink with great truth and humour the scenes and characters of Scottish lower-class life in his native city. A series of etchings which exhibit very high excellence were published by him in 1829–1831, and a collection of eighty-one of these was republished posthumously in 1841, with a biographical introduction by Sir Thomas Dick Lauder, Bart.

GEILER (or **GEYLER**) **VON KAISERSBERG, JOHANN** (1445–1510), "the German Savonarola," one of the greatest of the popular preachers of the 15th century, was born at Schaffhausen on the 16th of March 1445, but from 1448 passed his childhood and youth at Kaisersberg in Upper Alsace, from which place his current designation is derived. In 1460 he entered the university of Freiburg in Baden, where, after graduation, he lectured for some time on the *Sententiae* of Peter Lombard, the commentaries of Alexander of Hales, and several of the works of Aristotle. A living interest in theological subjects, awakened by the study of John Gerson, led him in 1471 to the university of Basel, a centre of attraction to some of the most earnest spirits of the time. Made a doctor of theology in 1475, he received a professorship at Freiburg in the following year; but his tastes, no less than the spirit of the age, began to incline him more strongly to the vocation of a preacher, while his fervour and eloquence soon led to his receiving numerous invitations to the larger towns. Ultimately he accepted in 1478 a call to the cathedral of Strassburg, where he continued to work with few interruptions until within a short time of his death on the 10th of March 1510. The beautiful pulpit erected for him in 1481 in the nave of the cathedral, when the chapel of St Lawrence had proved too small, still bears witness to the popularity he enjoyed as a preacher in the immediate sphere of his labours, and the testimonies of Sebastian Brant, Beatus Rhenanus, Johann Reuchlin, Melanchthon and others show how great had been the influence of his personal character. His sermons—bold, incisive, denunciatory, abounding in quaint illustrations and based not seldom by no means confined to the Bible,—taken down as he spoke them, and circulated (sometimes without his knowledge or consent) by his friends, told perceptibly on the German thought as well as on the German speech of his time.

Among the many volumes published under his name only two appear to have had the benefit of his revision, namely, *Der Seelen Paradies von waren und volkommen Tugenden*, and that entitled *Das Narrenschiff*. Of the rest, probably the best-known is a series of lectures on his friend Seb. Brant's work, *Das Narrenschiff* or the *Navicula* or *Speculum fatuorum*, of which an edition was published at Strassburg in 1511 under the following title:—*Navicula sive speculum fatuorum praestantissimi sacrarumliterarum doctoris Joannis Geiler Keysersbergii*.

See F. W. von Ammon, *Geyler's Leben, Lehren und Predigten* (1826); L. Dacheux, *Un Réformateur catholique à la fin du XVe siècle*, Jean Geiler de Kaysersberg (Paris, 1876); R. Cruel, *Geiler von Kaisersberg, der deutschen Prediger*, pp. 538-576 (1879); P. de Lorenzi, *Geiler's ausgewählte Schriften* (4 vols., 1881); T. M. Lindsay, *History of the Reformation*, i. 118 (1906); and G. Kawerau in Herzog-Hauck, *Realencyklopadie*, vi. 427.

GEINITZ, HANS BRUNO (1814–1900), German geologist, was born at Altenburg, the capital of the duchy of Saxe-Altenburg, on the 16th of October 1814. He was educated at the universities of Berlin and Jena, and gained the foundations of his geological knowledge under F. A. Quenstedt. In 1837 he took the degree of Ph.D. with a thesis on the Muschelkalk of Thuringia. In 1850 he became professor of geology and mineralogy in the Royal Polytechnic School at Dresden, and in 1857 he was made director of the Royal Mineralogical and Geological Museum; he held these posts until 1894. He was distinguished for his researches on the Carboniferous and Cretaceous rocks and fossils of Saxony, and in particular for those relating to the fauna and flora of the Permian or Dyas formation. He described also the graptolites of the local Silurian strata; and the flora of the Coal-formation of Altai and Nebraska. From 1863 to 1878 he was one of the editors of the *Neues Jahrbuch*. He was awarded the Murchison medal by the Geological Society of London in 1878. He died at Dresden on the 28th of January 1900. His son FRANZ EUGEN GEINITZ (b. 1854), professor of geology in the university of Rostock, became distinguished for researches on the geology of Saxony, Mecklenburg, &c.

H. B. Geinitz's publications were *Das Quadersandsteingebirge oder Kreidegebirge in Deutschland* (1849–1850); *Die Versteinerungen der Steinkohlenformation in Sachsen* (1855); *Dyas, oder die Zechsteinformation und das Rothliegende* (1861–1862); *Das Elbthalgebirge in Sachsen* (1871–1875).

GEISHA (a Chino-Japanese word meaning "person of pleasing accomplishments"), strictly the name of the professional dancing and singing girls of Japan. The word is, however, often loosely used for the girls and women inhabiting Shin Yoshiwara, the prostitutes' quarter of Tokyo. The training of the true Geisha

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or singing girl, which includes lessons in dancing, begins often as early as her seventh year. Her apprenticeship over, she contracts with her employer for a number of years, and is seldom able to reach independence except by marriage. There is a capitation fee of two *yen* per month on the actual singing girls, and of one *yen* on the apprentices.

See Jukichi Inouye, *Sketches of Tokyo Life*.

GEISLINGEN, a town of Germany in the kingdom of Württemberg, on the Thierbach, 38 m. by rail E.S.E. of Stuttgart. Pop. (1905) 7050. It has shops for the carving and turning of bone, ivory, wood and horn, besides iron-works, machinery factories, glass-works, brewing and bleaching works, &c. The church of St Mary contains wood-carving by Jörg Syrlin the Younger. Above the town lie the ruins of the castle of Helfenstein, which was destroyed in 1552. Having been for a few years in the possession of Bavaria, the town passed to Württemberg in 1810.

See Weitbrecht, *Wanderungen durch Geislingen und seine Umgebung* (Stuttgart, 1896).

GEISSLER, HEINRICH (1814–1879), German physicist, was born at the village of Igelshieb in Saxe-Meiningen on the 26th of May 1814 and was educated as a glass-blower. In 1854 he settled at Bonn, where he speedily gained a high reputation for his skill and ingenuity of conception in the fabrication of chemical and physical apparatus. With Julius Plücker, in 1852, he ascertained the maximum density of water to be at 3·8° C. He also determined the coefficient of expansion for ice between −24° and −7°, and for water freezing at 0°. In 1869, in conjunction with H. P. J. Vogelsang, he proved the existence of liquid carbon dioxide in cavities in quartz and topaz, and later he obtained amorphous from ordinary phosphorus by means of the electric current. He is best known as the inventor of the sealed glass tubes which bear his name, by means of which are exhibited the phenomena accompanying the discharge of electricity through highly rarefied vapours and gases. Among other apparatus contrived by him were a vaporimeter, mercury air-pump, balances, normal thermometer, and areometer. From the university of Bonn, on the occasion of its jubilee in 1868, he received the honorary degree of doctor of philosophy. He died at Bonn on the 24th of January 1879.

See A. W. Hofmann, *Ber. d. deut. chem. Ges.* p. 148 (1879).

GELA, a city of Sicily, generally and almost certainly identified with the modern Terranova (*q.v.*). It was founded by Cretan and Rhodian colonists in 688 B.C., and itself founded Acragas (see AGRIGENTUM) in 582 B.C. It also had a treasure-house at Olympia. The town took its name from the river to the east (Thucydides vi. 2), which in turn was so called from its winter frost (γέλα in the Sicel dialect; cf. Lat. *gelidus*). The Rhodian settlers called it Lindioi (see LINDUS). Gela enjoyed its greatest prosperity under Hippocrates (498–491 B.C.), whose dominion extended over a considerable part of the island. Gelon, who seized the tyranny on his death, became master of Syracuse in 485 B.C., and transferred his capital thither with half the inhabitants of Gela, leaving his brother Hiero to rule over the rest. Its prosperity returned, however, after the expulsion of Thrasybulus in 466 B.C.,[1] but in 405 it was besieged by the Carthaginians and abandoned by Dionysius' order, after his failure (perhaps due to treachery) to drive the besiegers away (E. A. Freeman, *Hist. of Sic.* iii. 562 seq.). The inhabitants later returned and rebuilt the town, but it never regained its position. In 311 B.C. Agathocles put to death 5000 of its inhabitants; and finally, after its destruction by the Mamertines about 281 B.C., Phintias of Agrigentum transferred the remainder to the new town of Phintias (now Licata, *q.v.*). It seems that in Roman times they still kept the name of Gelenses or Geloi in their new abode (Th. Mommsen in *C.I.L.* x., Berlin, 1883, p. 737). (T. As.)

[1] Aeschylus died there in 456 B.C.

GELADA, the Abyssinian name of a large species of baboon, differing from the members of the genus *Papio* (see BABOON) by the nostrils being situated some distance above the extremity of the muzzle, and hence made the type of a separate genus, under the name of *Theropithecus gelada*. In the heavy mantle of long brown hair covering the fore-quarters of the old males, with the exception of the bare chest, which is reddish flesh-colour, the gelada recalls the Arabian baboon (*Papio hamadryas*), and from this common feature it has been proposed to place the two species in the same genus. The gelada inhabits the mountains of Abyssinia, where, like other baboons, it descends in droves to pillage cultivated lands. A second species, or race, *Theropithecus obscurus*, distinguished by its darker hairs and the presence of a bare flesh-coloured ring round each eye, inhabits the eastern confines of Abyssinia. (R. L.*)

GELASIUS, the name of two popes.

GELASIUS I., pope from 492 to 496, was the successor of Felix III. He confirmed the estrangement between the Eastern and Western churches by insisting on the removal of the name of Acacius, bishop of Constantinople, from the diptychs. He is the author of *De duabus in Christo naturis adversus Eutychen et Nestorium*. A great number of his letters has also come down to us. His name has been attached to a *Liber Sacramentorum* anterior to that of St Gregory, but he can have composed only certain parts of it. As to the so-called *Decretum Gelasii de libris recipiendis et non recipiendis*, it also is a compilation of documents anterior to Gelasius, and it is difficult to determine Gelasius's contributions to it. At all events, as we know it, it is of Roman origin, and 6th-century or later. (L. D.*)

GELASIUS II. (Giovanni Coniulo), pope from the 24th of January 1118 to the 29th of January 1119, was born at Gaeta of an illustrious family. He became a monk of Monte Cassino, was taken to Rome by Urban II., and made chancellor and cardinal-deacon of Sta Maria in Cosmedin. Shortly after his unanimous election to succeed Paschal II. he was seized by Cencius Frangipane, a partisan of the emperor Henry V., but freed by a general uprising of the Romans in his behalf. The emperor drove Gelasius from Rome in March, pronounced his election null and void, and set up Burdinus, archbishop of Braga, as antipope under the name of Gregory VIII. Gelasius fled to Gaeta, where he was ordained priest on the 9th of March and on the following day received episcopal consecration. He at once excommunicated Henry and the antipope and, under Norman protection, was able to return to Rome in July; but the disturbances of the imperialist party, especially of the Frangipani, who attacked the pope while celebrating mass in the church of St Prassede, compelled Gelasius to go once more into exile. He set out for France, consecrating the cathedral of Pisa on the way, and arrived at Marseilles in October. He was received with great enthusiasm at Avignon, Montpellier and other cities, held a synod at Vienne in January 1119, and was planning to hold a general council to settle the investiture contest when he died at Cluny. His successor was Calixtus II.

His letters are in J. P. Migne, *Patrol. Lat.* vol. 163. The original life by Pandulf is in J. M. Watterich, *Pontif. Roman. vitae* (Leipzig, 1862), and there is an important digest of his bulls and official acts in Jaffé-Wattenbach, *Regesta pontif. Roman.* (1885–1888).

See J. Langen, *Geschichte der römischen Kirche von Gregor VII. bis Innocenz III.* (Bonn, 1893); F. Gregorovius, *Rome in the Middle Ages*, vol. 4, trans. by Mrs G. W. Hamilton (London, 1896); A. Wagner, *Die unterialischen Normannen und das Papsttum, 1086–1130* (Breslau, 1885); W. von Giesebrecht, *Geschichte der deutschen Kaiserzeit*, Bd. iii. (Brunswick, 1890); G. Richter, *Annalen der deutschen Geschichte im Mittelalter*, iii. (Halle, 1898); H. H. Milman, *Latin Christianity*, vol. 4 (London, 1899). (C. H. HA.)

GELATI, a Georgian monastery in Russian Transcaucasia, in the government of Kutais, 11 m. E. of the town of Kutais, standing on a rocky spur (705 ft. above sea-level) in the valley of the Rion. It was founded in 1109 by the Georgian king David the Renovator. The principal church, a sandstone cathedral, dates from the end of the preceding century, and contains the royal crown of the former Georgian kingdom of Imeretia, besides ancient MSS., ecclesiological furniture, and fresco portraits of the kings of Imeretia. Here also, in a separate chapel, is the tomb of David the Renovator (1089–1125) and part of the iron gate of the town of Ganja (now Elisavetpol), which that monarch brought away as a trophy of his capture of the place.

GELATIN, or GELATINE, the substance which passes into solution when "collagen," the ground substance of bone, cartilage and white fibrous tissue, is treated with boiling water

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or dilute acids. It is especially characterized by its property of forming a jelly at ordinary temperature, becoming liquid when heated, and resolidifying to a jelly on cooling. The word is derived from the Fr. *gélatine*, and Ital. *gelatina*, from the Lat. *gelata*, that which is frozen, congealed or stiff. It is, therefore, in origin cognate with "jelly," which came through the Fr. *gelée* from the same Latin original.

The "collagen," obtained from tendons and connective tissues, also occurs in the cornea and sclerotic coat of the eye, and in fish scales. Cartilage was considered to be composed of a substance chondrigen, which gave chondrin or cartilage-glue on boiling with water. Recent researches make it probable that cartilage contains (1) chondromucoid, (2) chondroitin-sulphuric acid, (3) collagen, (4) an albumoid present in old but not in young cartilage; whilst chondrin is a mixture of gelatin and mucin. "Bone collagen," or "ossein," constitutes, with calcium salts, the ground substance of bones. Gelatin consists of two substances, glutin and chondrin; the former is the main constituent of skin-gelatin, the latter of bone-gelatin.

True gelatigenous tissue occurs in all mature vertebrates, with the single exception, according to E. F. I. Hoppe-Seyler, of the *Amphioxus lanceolatus*. Gelatigenous tissue was discovered by Hoppe-Seyler in the cephalopods *Octopus* and *Sepiola*, but in an extension of his experiments to other invertebrates, as cockchafers and *Anodon* and *Unio*, no such tissue could be detected. Neither glutin nor chondrin occurs ready formed in the animal kingdom, but they separate when the tissues are boiled with water. A similar substance, vegetable gelatin, is obtained from certain mosses.

Pure gelatin is an amorphous, brittle, nearly transparent substance, faintly yellow, tasteless and inodorous, neutral in reaction and unaltered by exposure to dry air. Its composition is in round numbers C = 50, H = 7, N = 18, O = 25%; sulphur is also present in an amount varying from 0·25 to 0·7%.

Nothing is known with any certainty as to its chemical constitution, or of the mode in which it is formed from albuminoids. It exhibits in a general way a connexion with the large and important class of animal substances called *proteids*, being, like them, amorphous, soluble in acids and alkalis, and giving in solution a left-handed rotation of the plane of polarization. Nevertheless, the ordinary well-recognized reactions for proteids are but faintly observed in the case of gelatin, and the only substances which at once and freely precipitate it from solution are mercuric chloride, strong alcohol and tannic acid.

Although gelatin in a dry state is unalterable by exposure to air, its solution exhibits, like all the proteids, a remarkable tendency to putrefaction; but a characteristic feature of this process in the case of gelatin is that the solution assumes a transient acid reaction. The ultimate products of this decomposition are the same as are produced by prolonged boiling with acid. It has been found that oxalic acid, over and above the action common to all dilute acids of preventing the solidification of gelatin solutions, has the further property of preventing in a large measure this tendency to putrefy when the gelatin is treated with hot solutions of this acid, and then freed from adhering acid by means of calcium carbonate. Gelatin so treated has been called *metagelatin*.

In spite of the marked tendency of gelatin solutions to develop ferment-organisms and undergo putrefaction, the stability of the substance in the dry state is such that it has even been used, and with some success, as a means of preserving perishable foods. The process, invented by Dr Campbell Morfit, consists in impregnating the foods with gelatin, and then drying them till almost, or if less of water is present. Milk gelatinized in this way is superior in several respects to the products of the ordinary condensation process, more especially in the retention of a much larger proportion of albuminoids.

Gelatin has a marked affinity for water, abstracting it from admixture with alcohol, for example. Solid gelatin steeped for some hours in water absorbs a certain amount and swells up, in which condition a gentle heat serves to convert it into a liquid; or this may be readily produced by the addition of a trace of alkali, or mineral acid, or by strong acetic acid. In the last case, however, or if we use the mineral acids in a more concentrated form, the solution obtained has lost its power of solidifying, though not that of acting as a glue. This property is utilized in the preparation of liquid glue (see GLUE). By prolonged boiling of strong aqueous solutions at a high, or of weak solutions at a lower temperature, the characteristic properties of gelatin are impaired and ultimately destroyed. After this treatment it acts less powerfully as a glue, loses its tendency to solidify, and becomes increasingly soluble in cold water; nevertheless the solutions yield on precipitation with alcohol a substance identical in composition with gelatin.

By prolonged boiling in contact with hydrolytic agents, such as sulphuric acid or caustic alkali, it yields quantities of leucin and glycocoll (so-called "sugar of gelatin," this being the method by which glycocoll was first prepared), but no tyrosin. In this last respect it differs from the great body of proteids, the characteristic solid products of the decomposition of which are leucin and tyrosin.

Gelatin occurs in commerce in varying degrees of purity; the purer form obtained from skins and bones (to which this article is restricted) is named gelatin; a preparation of great purity is "patent isinglass," while isinglass (*q.v.*) itself is a fish-gelatin; less pure forms constitute glue (*q.v.*), while a dilute aqueous solution appears in commerce as size (*q.v.*). The manufacture follows much the same lines as that of glue; but it is essential that the raw materials must be carefully selected, and in view of the consumption of most of the gelatin in the kitchen—for soups, jellies, &c.—great care must be taken to ensure purity and cleanliness.

In the manufacture of bone-gelatin the sorted bones are degreased as in the case of glue manufacture, and then transferred to vats containing a dilute hydrochloric acid, by which means most of the mineral matter is dissolved out, and the bones become flexible. Instead of hydrochloric acid some French makers use phosphoric acid. After being well washed with water to remove all traces of hydrochloric acid, the bones are bleached by leading in sulphur dioxide. They are now transferred to the extractors, and heated by steam, care being taken that the temperature does not exceed 85° C. The digestion is repeated, and the runnings are clarified, concentrated, re-bleached and jellied as with glue. Skin-gelatin is manufactured in the same way as skin-glue. After steeping in lime pits the selected skins are digested three times; the first and second runnings are worked up for gelatin, while the third are reserved for "size."

Vegetable gelatin is manufactured from a seaweed, genus *Laminaria*; from the tenguса, an American seaweed, and from Irish moss. The *Laminaria* is first extracted with water, and the residue with sodium carbonate; the filtrate is acidified with hydrochloric acid and the precipitated alginic acid washed and bleached. It is then dissolved in an alkali, the solution concentrated, and cooled down by running over horizontal glass plates. Flexible colourless sheets resembling animal gelatin are thus obtained. In America the weed is simply boiled with water, the solution filtered, and cooled to a thick jelly. Irish moss is treated in the same way. Both tengusa and Irish moss yield a gelatin suitable for most purposes; tengusa gelatin clarifies liquids in the same way as isinglass, and forms a harder and firmer jelly than ordinary gelatin.

Applications of Gelatin.—First and foremost is the use of gelatin as a food-stuff—in jellies, soups, &c. Referring to the articles GLUE, ISINGLASS and SIZE for the special applications of these forms of gelatin, we here enumerate the more important uses of ordinary gelatin. In photography it is employed in carbon-processes, its use depending on the fact that when treated with potassium bichromate and exposed to light, it is oxidized to insoluble compounds; it plays a part in many other processes. A solution of gelatin containing readily crystallized salts—alum, nitre, &c.—solidifies with the formation of pretty designs; this is the basis of the so-called "crystalline glass" used for purposes of ornamentation. It is also used for coating pills to prevent them adhering together and to make them tasteless. Compounded with various mineral salts, the carbonates and phosphates of calcium, magnesium and aluminium, it yields a valuable ivory substitute. It also plays a part in the manufacture of artificial leather, of India inks, and of artificial silk (the Vanduara Company processes).

GELDERLAND, GELDERS, or GUELDERS, formerly a duchy of the Empire, on the lower Rhine and the Yssel, bounded by Friesland, Westphalia, Brabant, Holland and the Zuider Zee; part of which has become the province of Holland, dealt with separately below. The territory of the later duchy of Gelderland was inhabited at the beginning of the Christian era by the Teutonic tribes of the Sicambri and the Batavi, and later, during the period of the decline of the Roman empire, by the Chamavi and other Frank peoples. It formed part of the Caroling kingdom of Austrasia, and was divided into *pagi* or *gauen*, ruled by official counts (*comites-graven*). In 843, by the treaty of Verdun, it became part of Lotharingia (Lorraine), and in 870 was annexed to the kingdom of East Francia (Germany) by the treaty of Meerssen. The nucleus of the later county and duchy was the *gau* or district surrounding the town of Gelder or Gelre, lying between the Meuse and the Niers, and since 1715 included in Rhenish Prussia.

The early history is involved in much obscurity. There were in

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the 11th century a number of counts ruling in various parts of what was afterwards known as Gelderland. Towards the close of that century Gerard of Wassenburg, who besides the county of Gelre ruled over portions of Hamalant and Teisterbant, acquired a dominant position amongst his neighbours. He is generally reckoned as the first hereditary count of Gelderland (d. 1117/8). His son, Gerard II.—the Long—(d. 1131), married Irmingardis, daughter and heiress of Otto, count of Zutphen, and their son, Henry I. (d. 1182), inherited both countships. His successors Otto I. (1182–1207) and Gerard III. (1207–1229) were lovers of peace and strong supporters of the Hohenstaufen emperors, through whose favour they were able to increase their territories by acquisitions in the districts of Veluwe and Betuwe. He acted as guardian to his nephew Floris IV. of Holland during his minority. Otto II., the Lame (1229–1271), fortified several towns and bestowed privileges upon them for the purpose of encouraging trade. He became a person of so much importance that he was urged to be a candidate for the dignity of emperor. He preferred to support the claims of his cousin, William II. of Holland. In return for the loan of a considerable sum of money William gave to him the city of Nijmwegen in pledge. His son Reinald I. (d. 1326) married Irmingardis, heiress of Limburg, and in right of his wife laid claim to the duchy against Adolf of Berg, who had sold his rights to John I. of Brabant. War followed, and on the 5th of June 1288 Reinald, who meantime had also sold his rights to the count of Luxemburg, was defeated and taken prisoner at the battle of Woeringen. In this battle the count of Luxemburg was slain, and Reinald had to surrender his claims as the price of his defeat to John of Brabant. In 1310, in return for his support, Reinald received from the emperor Henry VII. for all his territories *privilegium de non evocando, i.e.* the exemption of his subjects from the liability to be sued before any court outside his jurisdiction. In 1317 he was made a prince of the Empire. A wound received at the battle of Woeringen had affected his brain, and an insurrection against him was in 1316 headed by his son Reinald, who assumed the government under the title of "Son of the Count." Reinald I. was finally in 1320 immured in prison, where he died in 1326.

Reinald II., the Black (1326–1343), was one of the foremost princes in the Netherlands of his day. He married (1) Sophia, heiress of Mechlin, and (2) in 1331 Eleanor, sister of Edward III. of England. By purchase or conquest he added considerably to his territories. He did much to improve the condition of the country, to foster trade, to promote the prosperity of the towns, and to maintain order and security in his lands by wise laws and firm administration. In 1338 the title of duke was bestowed upon him by the emperor Louis the Bavarian, who at the same time granted to him the fief of East Friesland. He died in 1343, leaving three daughters by his first marriage, and two sons, Reinald and Edward, both minors, by Eleanor of England. His elder son was ten years of age, and succeeded to the duchy under the guardianship of his mother Eleanor. Declared of age two years later, the youthful Reinald III. found himself involved in many difficulties through the struggles between the rival factions named after the two noble families of Bronkhorst and Hekeren. What was the quarrel between them, and what the causes they represented, cannot now be ascertained with certainty. There is good reason, however, to believe that they were the counterparts of the contemporary Cod and Hook parties in Holland, and of the Schieringers and Vetkoopers in Friesland. In Gelderland the quarrel between them was converted into a dynastic struggle, the Hekeren recognizing Duke Reinald, while the Bronkhorsten set up his younger brother Edward. At the battle of Tiel (1361) Reinald was defeated and taken prisoner, and Edward held the duchy till 1371. He was a good and successful ruler, and his death by an arrow wound, after a brilliant victory over the duke of Brabant near Baesweller (August 1371), was a loss to his country. He was in his thirty-fifth year and left no heirs. Reinald was now taken from the prison in which he had been confined to reign once more, but his health was broken and he died childless three years afterwards. The war of factions again broke out, the half-sisters of Reinald III. and Edward both claiming the inheritance; the elder, Matilda (Machteld), in her own right, the younger Maria on behalf of her seven-year-old boy William of Jülich, as the only male representative of the family. The Hekeren supported Matilda, the Bronkhorsten William of Jülich. The war of succession lasted till 1379, and ended in William's favour, the emperor Wenceslas (Wenzel) recognizing him as duke four years later.

Duke William was able, restless and adventurous, an ideal knight of the palmy days of chivalry. He took part in no less than five crusades with the Teutonic order against the heathen Lithuanians and Prussians. In 1393 he inherited the duchy of Jülich, and died in 1402. He was succeeded by his brother, Reinald IV. (d. 1423), in the united sovereignty of Gelderland, Zutphen and Jülich, who, in accordance with a promise made before his accession, ceded the town of Emmerich to Duke Adolf of Cleves. He took the part of his brother-in-law, John of Arkel, against William VI. of Holland, and in a war of several years' duration was not successful in preventing the Arkel territory being incorporated in Holland. On his death without legitimate issue, Gelderland passed to the young Arnold of Egmont, grandson of his sister Johanna, who had married John, lord of Arkel, their daughter Maria (d 1415) being the wife of John, count of Egmont (d. 1451). Arnold was recognized as duke in 1424 by the emperor Sigismund, but in the following year the emperor revoked his decision and bestowed the duchy upon Adolf of Berg. Arnold in retaliation laid claim to the duchy of Jülich, which had likewise been granted to Adolf by Sigismund, and a war followed in which the cities and nobles of Gelderland stood by Arnold; it ended in Arnold retaining Gelderland and Zutphen, and Gerard, the son of Adolf (d. 1437), being acknowledged as duke of Jülich. To gain the support of the estates of Gelderland in this war of succession, Arnold had been compelled to make many concessions limiting the ducal prerogatives, and granting large powers to a council consisting of representatives of the nobles and the four chief cities, and his extravagance and exactions led to continual conflicts, in which the prince was compelled to yield to the demands of his subjects. In his later years a conspiracy was formed against him, headed by his wife, the violent and ambitious Catherine of Cleves, and his son Adolf. Arnold was at first successful and Adolf had to go into exile; but he returned, and in 1465, having taken his father prisoner by treachery, interned him in the castle of Buren. Charles the Bold of Burgundy now seized the opportunity to intervene. In 1471 he forced Adolf to release his father, who sold the reversion of the duchy to the duke of Burgundy for 92,000 golden gulden. On the 23rd of February 1473 Arnold died, and Charles of Burgundy became duke of Gelderland. His succession was not unopposed. Nijmwegen offered an heroic resistance and only fell after a long siege. After Charles's death in 1477 Adolf was released from the captivity in which he had been held, and placed himself at the head of a party in the powerful city of Ghent, which sought to settle the disputed succession by forcing a match between him and Mary, the heiress of Burgundy. On the 29th of June 1477, however, he was killed at the siege of Tournai; and Mary gave her hand to Maximilian of Austria, afterwards emperor. Catherine, Adolf's sister, made an attempt to assert the rights of his son Charles to the duchy, but by 1483 Maximilian had crushed all opposition and established himself as duke of Gelderland.

Charles of Egmont, however, did not surrender his claims, but with the aid of the French collected an army, and in the course of 1492 and 1493 succeeded in reconquering his inheritance. The efforts of Maximilian to recover the country were vain, and the successive governors of the Netherlands, Philip the Fair and his sister Margaret, fared no better. In 1507 Charles of Egmont invaded Holland and Brabant, captured Harderwijk and Bommel in 1511, threatened Amsterdam in 1512, and took Groningen. It was, undoubtedly, a great and heroic achievement for the ruler of a petty state like Gelderland thus to assert and maintain his independence for a long period against the overwhelming power of the house of Austria. It was not till 1528 that the emperor Charles V. could force him to accept the compromise of the treaty of Gorichen, by which he received Gelderland and Zutphen for

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life as fiefs of the Empire. In 1534 the duke, who was childless, attempted to transfer the reversion of Gelderland to France, but this project was violently resisted by the estates of the duchy, and Charles was compelled by them in 1538 to appoint as his successor William V.—the Rich—of Cleves (d. 1592). Charles died the same year, and William, with the aid of the French, succeeded in maintaining his position in Gelderland for several years. The Habsburg power was, however, in the end too great for him, and he was forced to cede the duchy to Charles V. by the treaty of Venloo, signed on the 7th of September 1543.

Gelderland was now definitely amalgamated with the Habsburg dominions in the Netherlands, until the revolt of the Low Countries led to its partition. In 1579 the northern and greater part, comprising the three "quarters" of Nijmwegen, Arnhem and Zutphen, joined the Union of Utrecht and became the province of Gelderland in the Dutch republic. Only the quarter of Roermonde remained subject to the crown of Spain, and was called Spanish Gelderland. By the treaty of Utrecht (1713) this was ceded to Prussia with the exception of Venloo, which fell to the United Provinces, and Roermonde, which, with the remaining Spanish Netherlands, passed to Austria. Of this, part was ceded to France at the peace of Basel in 1795, and the whole by the treaty of Lunéville in 1801, when it received the name of the department of the Roer. By the peace of Paris of 1814 the bulk of Gelderland was incorporated in the United Netherlands, the remainder falling to Prussia, where it forms the circle of Düsseldorf.

The rise of the towns in Gelderland began in the 13th century, river commerce and markets being the chief cause of their prosperity, but they never attained to the importance of the larger cities in Holland and Utrecht, much less to that of the great Flemish municipalities. They differed also from the Flemish cities in the nature of their privileges and immunities, as they did not possess the rights of communes, but only those of "free cities" of the Rhenish type. The power of the feudal lord over them was much greater. The states of Gelderland first became a considerable power in the land during the reign of Arnold of Egmont (1423–1473). Their claim to large privileges and a considerable share in the government of the county were formulated in a document drawn up at Nijmwegen in April 1436. These the duke had to concede, and to agree further to the appointment of a council to assist him in his administration. From this time the absolute authority of the sovereign in Gelderland was broken. The states consisted of two members—the nobility and the towns. The towns were divided into four separate districts or "quarters" named after the chief town in each—Nijmwegen, Arnhem, Zutphen and Roermonde. In the time of the republic, as has been stated above, the province of Gelderland comprised the three first-named "quarters" only. The three quarters had each of them peculiar rights and customs, and their representatives met together in a separate assembly before taking part in the diet (*landdag*) of the states. The nobility possessed great influence in Gelderland and retained it in the time of the republic.

(G. E.)

GELDERLAND (*Guelders*), a province of Holland, bounded S. by Rhenish Prussia and North Brabant, W. by Utrecht and South Holland, N. by the Zuider Zee, N.E. by Overysel, and S.E. by the Prussian province of Westphalia. It has an area of 1906 sq. m. and a pop. (1900) of 566,540. Historically it was part of the duchy of Gelderland, which is treated separately above.

The main portion of Gelderland north of the Rhine and the Old Ysel forms as it were an extension of the province of Overysel, being composed of diluvial sand and gravel, covered with sombre heaths and patches of fen. South of this line, however, the soil consists of fertile river-clay. The northern portion is divided by the New (or Gelders) Ysel into two distinct regions, namely, the Veluwe ("had land") on the west, and the former countship of Zutphen on the east. In this last division the ground slopes downwards from south-east to north-west (131 to 26 ft.) and is intersected by several fertilizing streams which flow in the same direction to join the Ysel. The extreme eastern corner is occupied by older Tertiary loam, which is used for making bricks, and upon this and the river-banks are the most fertile spots, woods, cultivated land, pastures, towns and villages. The highlands of the Veluwe lying west of the Ysel really extend as far as the Crooked Rhine and the Vecht in the province of Utrecht, but are slightly detached from the Utrecht hills by the so-called Gelders valley, which forms the boundary between the two provinces. This valley extends from the Rhine along the Grift, the Luntersche Beek, and the Eem to the Zuider Zee, and would still offer an outlet in this direction to the Rhine at high water if it were not for the river dikes. The two main ridges of the Veluwe hills (164 and 360 ft.) extend from the neighbourhood of Arnhem north to Harderwyk and north-east to Hattem. In the south they stretch themselves along the banks of the Rhine, forming a strip of picturesque river scenery made up of the varied elements of sandhills and trees, clay-lands and pastures. A large number of country-houses and villas are to be found here, and the river-side villages of Dieren, Velp and Renkum. All over the Veluwe are heaths, scantily cultivated, with fields of rye and buckwheat, cattle of inferior quality, and sheep, and a sparse population. There is also a considerable cultivation of wood, especially of fir and copse, while tobacco plantations are found at Nykerk and Wageningen.

The southern division of the province presents a very different aspect, and contains many old towns and villages. It is watered by the three large rivers, the Rhine, the Waal and the Maas, and has a level clay soil, varied only by isolated hills and a sandy, wooded stretch between Nijmwegen and the southern border. The region enclosed between the Rhine and the Waal and watered by the Linge is called the Betuwe ("good land"), and gave its name to the Germanic tribe of Batavians, who are sometimes wrongly regarded as the parent stock of the Dutch people. There is here a denser population, occupied in the cultivation of wheat, beetroot and fruit, the breeding of excellent cattle, shipping and industrial pursuits. The principal centres of population, such as Zutphen, Arnhem (the chief town of the province), Nijmwegen and Tiel, lie along the large rivers. Smaller, but of equal antiquity, are the riverside towns of Doesburg, which is strongly fortified; Wageningen, with the State agricultural schools; Doetinchem, with a bridge over the Old Ysel which is mentioned as early as the 14th century; Zalt-Bommel, with an old church (1304), and a railway bridge over the Waal; and Kuilenburg, with a fine railway bridge (1863–1868) over the Rhine. Five m. S. of Zalt-Bommel, on the Maas, is the medieval castle of Ammerzode or Ammersooi, also called Amelroy during the French occupation in 1674. It is in an excellent state of preservation and has been restored in modern times. The first authentic record of the castle is its possession by John de Herlar of the noble family of Loo at the end of the 13th century. In 1480 it passed by marriage to the powerful lords van Arkel, and was partly destroyed by fire at the end of the 16th century. The chapel dates from the 15th century, and the keep from 1564. Among the family portraits are works by Albert Dürer. Zetten, on the railway between Nijmwegen and Tiel, is famous for the charitable institutions founded here by the preacher Otto Gerhard Heldring (d. 1876). They comprise a penitentiary (1849) for women; an educational home (1858) for girls; a theological training college (1864); and a Magdalen hospital. Nykerk, Harderwyk and Elburg are fishing towns on the Zuider Zee. Apeldoorn is situated on the edge of the sand-grounds. Heerenberg on the south-eastern border is remarkable for its ancient castle near the seat of the powerful lords van den Bergh. Other ancient and historical towns bordering on the Prussian frontier are Zevenaar, which was for long the cause of dispute between the houses of Cleves and Gelder and was finally attached to the kingdom of the Netherlands in 1816; Breedevoort, once the seat of a lordship of the same name belonging to the counts van Loon or Lohn, who built a castle here in the beginning of the 13th century which was destroyed in 1646—the lordship was presented to Prince William III. in 1697; Winterswyk, now an important railway junction, and of growing industrial importance; and Borkeloo, or Borkulo, the seat of an ancient lordship dating from the first half of the 12th century, which

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finally came into the possession of Prince William V. of Orange Nassau in 1777. The castle was formerly of importance.

Gelderland is intersected by the main railway lines, which are largely supplemented by steam-tram railways. Steam-tramways connect Arnhem and Zutphen, Wageningen, Nijmwegen, Velp, Doetinchem (by way of Dieren and Doesburg), whence there are various lines to Emmerich and Gendringen on the Prussian borders. Groenlo and Lichtenvorde, Borkulo and Deventer are also connected.

GELDERN, a town of Germany, in Rhenish Prussia, on the Niers, 28 m. N. W. of Düsseldorf, at the junction of railways to Wesel and Cologne. Pop. (1905) 6551. It has an Evangelical and two Roman Catholic churches and a town hall with a fine council chamber. Its industries include the manufacture of buttons, shoes, cigars and soap. The town dates from about 1100 and was early an important fortified place; until 1371 it was the residence of the counts and dukes of Gelderland. Having passed to Spain, its fortifications were strengthened by Philip II., but they were razed by Frederick the Great, the town having been in the possession of Prussia since 1703.

See Nettesheim, *Geschichte der Stadt und des Amtes Geldern* (Crefeld, 1863); Henrichs, *Beitrage zur innern Geschichte der Stadt Geldern* (Geldern, 1893); and Real, *Chronik der Stadt und Umgegend von Geldern* (Geldern, 1892).

GELL, SIR WILLIAM (1777–1836), English classical archaeologist, was born at Hopton in Derbyshire. He was educated at Jesus College, Cambridge, and subsequently elected a fellow of Emmanuel College (B.A. 1798, M.A. 1804). About 1800 he was sent on a diplomatic mission to the Ionian islands, and on his return in 1803 he was knighted. He went with Princess (afterwards Queen) Caroline to Italy in 1814 as one of her chamberlains, and gave evidence in her favour at the trial in 1820 (see G. P. Clerici, *A Queen of Indiscretions*, Eng. trans., London, 1907). He died at Naples on the 4th of February 1836. His numerous drawings of classical ruins and localities, executed with great detail and exactness, are preserved in the British Museum. Gell was a thorough dilettante, fond of society and possessed of little real scholarship. None the less his topographical works became recognized text-books at a time when Greece and even Italy were but superficially known to English travellers. He was a fellow of the Royal Society and the Society of Antiquaries, and a member of the Institute of France and the Berlin Academy.

His best-known work is *Pompeiana; the Topography, Edifices and Ornaments of Pompeii* (1817–1832), in the first part of which he was assisted by J. P. Gandy. It was followed in 1834 by the *Topography of Rome and its Vicinity* (new ed. by E. H. Bunbury, 1856). He wrote also *Topography of Troy and its Vicinity* (1804); *Geography and Antiquities of Ithaca* (1807); *Itinerary of Greece, with a Commentary on Pausanias and Strabo* (1810, enlarged ed. 1827); *Itinerary of the Morea* (1816; republished as *Narrative of a Journey in the Morea*, 1823). All these works have been superseded by later publications.

GELLERT, CHRISTIAN FÜRCHTEGOTT (1715–1769), German poet, was born at Hainichen in the Saxon Erzgebirge on the 4th of July 1715. After attending the famous school of St Afra in Meissen, he entered Leipzig University in 1734 as a student of theology, and on completing his studies in 1739 was for two years a private tutor. Returning to Leipzig in 1741 he contributed to the *Bremer Beiträge*, a periodical founded by former disciples of Johann Christoph Gottsched, who had revolted from the pedantry of his school. Owing to shyness and weak health Gellert gave up all idea of entering the ministry, and, establishing himself in 1745 as *privatdocent* in philosophy at the university of Leipzig, lectured on poetry, rhetoric and literary style with much success. In 1751 he was appointed extraordinary professor of philosophy, a post which he held until his death at Leipzig on the 13th of December 1769.

The esteem and veneration in which Gellert was held by the students, and indeed by persons in all classes of society, was unbounded, and yet due perhaps less to his unrivalled popularity as a lecturer and writer than to his personal character. He was the noblest and most amiable of men, generous, tender-hearted and of unaffected piety and humility. He wrote in order to raise the religious and moral character of the people, and to this end employed language which, though at times prolix, was always correct and clear. He thus became one of the most popular German authors, and some of his poems enjoyed a celebrity out of proportion to their literary value. This is more particularly true of his *Fabeln und Erzählungen* (1746–1748) and of his *Geistliche Oden und Lieder* (1757). The fables, for which he took La Fontaine as his model, are simple and didactic. The "spiritual songs," though in force and dignity they cannot compare with the older church hymns, were received by Catholics and Protestants with equal favour. Some of them were set to music by Beethoven. Gellert wrote a few comedies: *Die Betschwester* (1745), *Die kranke Frau* (1748), *Das Los in der Lotterie* (1748), and *Die zärtlichen Schwestern* (1748), the last of which was much admired. His novel *Die schwedische Gräfin von G.* (1746), a weak imitation of Richardson's *Pamela*, is remarkable as being the first German attempt at a psychological novel. Gellert's *Briefe* (letters) were regarded at the time as models of good style.

See Gellert's *Sämtliche Schriften* (first edition, 10 vols., Leipzig, 1769–1774; last edition, Berlin, 1867). *Sämtliche Fabeln und Erzählungen* have been often published separately, the latest edition in 1896. A selection of Gellert's poetry (with an excellent introduction) will be found in F. Muncker, *Die Bremer Beiträge* (Stuttgart, 1899). A translation by J. A. Murke, *Gellert's Fables and other Poems* (London, 1851). For a further account of Gellert's life and work see live by J. A. Cramer (Leipzig, 1774), H. Döring (Greiz, 1833), and H. O. Nietschmann (2nd ed., Halle, 1901); also *Gellerts Tagebuch aus dem Jahre 1761* (2nd ed., Leipzig, 1863) and *Gellerts Briefwechsel mit Demoiselle Lucius* (Leipzig, 1823).

GELLERT, or KILLHART, in Welsh traditional history, the dog of Llewellyn, prince of Wales. The dog, a greyhound, was left to guard the cradle in which the infant heir slept. A wolf enters, and is about to attack the child, when Gellert flies at him. In the struggle the cradle is upset and the infant falls underneath. Gellert kills the wolf, but when Prince Llewellyn arrives and sees the empty cradle and blood all around, he does not for the moment notice the wolf, but thinks Gellert has killed the baby. He at once stabs him, but almost instantly finds his son safe under the cradle and realizes the dog's bravery. Gellert is supposed to have been buried near the village of Beddgelert (" grave of Gellert "), Snowdon, where his tomb is still pointed out to visitors. The date of the incident is traditionally given as 1205. The incident has given rise to a Welsh proverb, " I repent as much as the man who slew his greyhound." The whole story is, however, only the Welsh version of a tale long before current in Europe, which is traced to the Indian Panchatantra and perhaps as far back as 200 B.C.

See W. A. Clouston, *Popular Tales and Fictions* (1887); D. E. Jenkins, *Beddgelert, its Facts, Fairies and Folklore* (Portmadoc, 1899).

GELLIUS, AULUS (*c.* A.D. 130–180), Latin author and grammarian, probably born at Rome. He studied grammar and rhetoric at Rome and philosophy at Athens, after which he returned to Rome, where he held a judicial office. His teachers and friends included many distinguished men—Sulpicius Apollinaris, Herodes Atticus and Fronto. His only work, the *Noctes Atticae*, takes its name from having been begun during the long nights of a winter which he spent in Attica. He afterwards continued it at Rome. It is compiled out of an Adversaria, or commonplace book, in which he had jotted down everything of unusual interest that he heard in conversation or read in books, and it comprises notes on grammar, geometry, philosophy, history and almost every other branch of knowledge. The work, which is utterly devoid of sequence or arrangement, is divided into twenty books. All these have come down to us except the eighth, of which nothing remains but the index. The *Noctes Atticae* is valuable for the insight it affords into the nature of the society and pursuits of those times, and for the numerous excerpts it contains from the works of lost ancient authors.

Editio princeps (Rome, 1469); the best editions are those of Gronovius (1706) and M. Hertz (1883–1885; editio minor, 1886, revised by C. Hosius, 1903, with bibliography). There is a translation in English by W. Beloe (1795), and in French by various hands (1896). See Sandys, *Hist. Class. Schol.* i. (1906), 210.

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GELLIVARA [GELLIVARE], a mining town of Sweden in the district (*län*) of Norrbotten, 815 m. N. by E. of Stockholm by rail. It lies in the well-nigh uninhabited region of Swedish Lapland, 43 m. N. of the Arctic Circle. It owes its importance to the iron mines in the mountain Malmberget 4½ m. to the north, rising to 2024 ft. above sea-level (830 ft. above Gellivara town). During the dark winter months work proceeds by the aid of electric light. In 1864 the mines were acquired by an English company, but abandoned in 1867. In 1884 another English company took them up and completed a provisional railway from Malmberget to Luleå at the head of the Gulf of Bothnia (127 m. S.S.E.), besides executing a considerable portion of the preliminary works for the continuation of the line on the Norwegian side from Ofoten Fjord upwards (see NARVIK). But this company, after extracting some 150,000 tons of ore in 1888–1889, went into liquidation in the latter year. Two years later the mines passed into the hands of a Swedish company, and the railway was acquired by the Swedish Government. The output of ore was insignificant until 1892, when it stood at 178,000 tons; but in 1902 it amounted to 1,074,000 tons. Three miles S.W. rises the hill Gellivara Dundret (2700 ft.), from which the sun is visible at midnight from June 5 to July 11. The population of the parish (about 6500 sq. m.) in 1900 was 11,745; the greater part of the population being congregated at the town of Gellivara and at Malmberget.

GELNHAUSEN, a town of Germany, in the Prussian province of Hesse-Nassau, on the Kinzig, 27 m. E.N.E. of Frankfort-on-Main, on the railway to Bebra. Pop. 4500. It is romantically situated on the slope of a vine-clad hill, and is still surrounded by ancient walls and towers. On an island in the river are the ivy-covered ruins of the imperial palace which Frederick I. (Barbarossa) built before 1170, and which was destroyed by the Swedes during the Thirty Years' War. It has an interesting and beautiful church (the Marien Kirche), with four spires (of which that on the transept is curiously crooked), built in the 13th century, and restored in 1876–1879; also several other ancient buildings, notably the town-hall, the Fürstenhof (now administrative offices), and the Hexenthurm. India-rubber goods are manufactured, and wine is made. Gelnhausen became an imperial town in 1169, and diets of the Empire were frequently held within its walls. In 1634 and 1635 it suffered severely from the Swedes. In 1803 the town became the property of Hesse-Cassel, and in 1866 passed to Prussia.

GELO, son of Deinomenes, tyrant of Gela and Syracuse. On the death of Hippocrates, tyrant of Gela (491 B.C.), Gelo, who had been his commander of cavalry, succeeded him; and in 485, his aid having been invoked by the Gamori (the oligarchical landed proprietors) of Syracuse who had been driven out by the populace, he seized the opportunity of making himself despot. From this time Gelo paid little attention to Gela, and devoted himself to the aggrandizement of Syracuse, which attained extraordinary wealth and influence. When the Greeks solicited his aid against Xerxes, he refused it, since they would not give him command of the allied forces (Herodotus vii. 171). In the same year the Carthaginians invaded Sicily, but were totally defeated at Himera, the result of the victory being that Gelo became lord of all Sicily. After he had thus established his power, he made a show of resigning it; but his proposal was rejected by the multitude, and he reigned without opposition till his death (478). He was honoured as a hero, and his memory was held in such respect that when all the brazen statues of tyrants were condemned to be sold in the time of Timoleon (150 years later) an exemption was made in favour of the statue of Gelo.

Herodotus vii.; Diod. Sic. xi. 20-38; see also SICILY: *History*, and SYRACUSE; for his coins see NUMISMATICS: *Sicily*.

GELSEMIUM, a drug consisting of the root of *Gelsemium nitidum*, a clinging shrub of the natural order Loganiaceae, having a milky juice, opposite, lanceolate shining leaves, and axillary clusters of from one to five large, funnel-shaped, very fragrant yellow flowers, whose perfume has been compared with that of the wallflower. The fruit is composed of two separable jointed pods, containing numerous flat-winged seeds. The stem often runs underground for a considerable distance, and indiscriminately with the root it is used in medicine. The plant is a native of the United States, growing on rich clay soil by the side of streams near the coast, from Virginia to the south of Florida. In the United States it is commonly known as the wild, yellow or Carolina jessamine, although in no way related to the true jessamines, which belong to the order Oleaceae. It was first described in 1640 by John Parkinson, who grew it in his garden from seed sent by Tradescant from Virginia; at the present time it is but rarely seen, even in botanical gardens, in Great Britian.

The drug contains a volatile oil and two potent alkaloids, gelseminine and gelsemine. Gelseminine is a yellowish, bitter substance, readily soluble in ether and alcohol. It is not employed therapeutically. Gelsemine has the formula $C_{11}H_{15}NO_2$, and is a colourless, odourless, intensely bitter solid, which is insoluble in water, but readily forms a soluble hydrochloride.

Gelsemium nitidum, half natural size; flower, nat. size.

The dose of this salt is from $\frac{1}{8}$th to $\frac{1}{3}$th of a grain. The British Pharmacopoeia contains a tincture of gelsemium, the dose of which is from five to fifteen minims.

The drug is essentially a nerve poison. It has no action on the skin and no marked action on the alimentary or circulatory systems. Its action on the cerebrum is slight, consciousness being retained even after toxic doses, but there may be headache and giddiness. The drug rapidly causes failure of vision, diplopia, ptosis or falling of the upper eyelid, dilatation of the pupil, and a lowering of the intra-ocular tension. This last action is doubtful. The symptoms appear to be due to a paralysis of the motor cells that control the internal and external ocular muscles. The most marked action of the drug is upon the anterior cornua of grey matter in the spinal cord. It can be shown by a process of experimental exclusion that to an arrest of function of these cells is due the paralysis of all the voluntary muscles of the body that follows the administration of gelsemium or gelsemine. Just before death the sensory part of the spinal cord is also paralysed, general anaesthesia resulting. The drug kills by its action on the respiratory centre in the medulla oblongata. Shortly after the administration of even a moderate dose the respiration is slowed and is ultimately arrested, this being the cause of death. In cases of poisoning the essential treatment is artificial respiration, which may be aided by the subcutaneous exhibition of strychnine.

Though the drug is still widely used, the rational indications for its employment are singularly rare and uncertain. The conditions in which it is most frequently employed are convulsions, bronchitis, severe and purposeless coughing, myalgia or muscular pain, neuralgia and various vague forms of pain.

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GELSENKIRCHEN, a town of Germany in the Prussian province of Westphalia, 27 m. W. of Dortmund on the railway Duisburg-Hamm. Pop. (1905) 147,037. It has coal mines, iron furnaces, steel and boiler works, and soap, glass and chemical factories. In 1903 various neighbouring industrial townships were incorporated with the town.

GEM (Lat. *gemma*, a bud,—from the root *gen*, meaning "to produce,"—or precious stone; in the latter sense the Greek term is *ψῆφος*), a word applied in a wide sense to certain minerals which, by reason of their brilliancy, hardness and rarity, are valued for personal decoration; it is extended to include pearl. In a restricted sense the term is applied only to precious stones after they have been cut and polished as jewels, whilst in their raw state the minerals are conveniently called "gem-stones." Sometimes, again, the term "gem" is used in a yet narrower sense, being restricted to engraved stones, like seals and cameos.

The subject is treated here in two sections: (1) Mineralogy and general properties; (2) Gemsin Art, *i.e.* engraved gems, such as seals and cameos. The artificial products which simulate natural gem-stones in properties and chemical composition are treated in the separate article GEM, ARTIFICIAL.

1. MINERALOGY AND GENERAL PROPERTIES

The gem-stones form a small conventional group of minerals, including principally the diamond, ruby, sapphire, emerald and opal. Other stones of less value—such as topaz, spinel, chrysoberyl, chrysolite, zircon and tourmaline—are sometimes called "fancy stones." Many minerals still less prized, yet often used as ornamental stones,—like moonstone, rock-crystal and agate,—occasionally pass under the name of "semi-precious stones," but this is rather a vague term and may include the stones of the preceding group. The classification of gem-stones is, indeed, to some extent a matter of fashion.

Descriptions of the several gem-stones will be found under their respective headings, and the present article gives only a brief review of the general characters of the group.

A high degree of hardness is an essential property of a gem-stone, for however beautiful and brilliant a mineral may be it is useless to the jeweller if it lack sufficient hardness to withstand the abrasion to which articles of personal decoration are necessarily subjected. Even if not definitely scratched, the polished stone becomes dull by wear. Imitations in paste may be extremely brilliant, but being comparatively soft they soon lose lustre when rubbed. In the article MINERALOGY it is explained that the varying degrees of hardness are registered on a definite scale. The exceptional hardness of the diamond gives it a supreme position in this scale, and to it the arbitrary value of 10 has been assigned. The corundum gem-stones (ruby and sapphire), though greatly inferior in hardness to the diamond, come next, with the value of 9; and it is notable that the sapphire is usually rather harder than ruby. Then follows the topaz, which, with spinel and chrysoberyl, has a hardness of 8; whilst quartz falls a degree lower. Most gem-stones are harder than quartz, though precious opal, turquoise, moonstone and sphene are inferior to it in hardness. Those stones which are softer than quartz have been called by jewellers *demi-dures*. To test the hardness of a cut stone, one of its sharp edges may be drawn, with firm pressure, across the smooth surface of a piece of quartz; if it leave a scratch its hardness must be above 7. The stone is then applied in like manner to a fragment of topaz, preferably a cleavage-piece, and if it fail to leave a distinct scratch its hardness is between 7 and 8, whereas if the topaz be scratched it is above 8. An expert may obtain a fair idea of hardness by gently passing the stone over a fine steel file, and observing the feel of the stone and the grating sound which it emits. If a stone be scratched by a steel knife its hardness is below 6. The degree of hardness of a precious stone is soon ascertained by the lapidary when cutting it.

Hardness.

Gem-stones differ markedly among themselves in density or specific weight; and although this is a character which does not directly affect their value for ornamental purposes, it furnishes by its constancy an important means of distinguishing one stone from another. Moreover, it is a character very easily determined and can be applied to cut stones without injury. The relative weightiness of a stone is called its specific gravity, and is often abbreviated as S.G. The number given in the description of a mineral as S.G. shows how many times the stone is heavier than an equal bulk of the standard with which it is compared, the standard being distilled water at 4° C. If, for example, the S.G. of diamond is said to be 3·5 it means that a diamond weighs 3½ times as much as a mass of water of the same bulk. The various methods of determining specific gravity are described under DENSITY. The readiest method of testing precious stones, especially when cut, is to use dense liquids. Suppose it be required to determine whether a yellow stone be true topaz or false topaz (quartz), it is merely necessary to drop the stone into a liquid made up to the specific gravity of about 3; and since topaz has S.G. of 3·5 it sinks in this medium, but as quartz has S.G. of only 2·65 it floats. The densest gem-stone is zircon, which may have S.G. as high as 4·7, whilst the lowest is opal with S.G. 2·2. Amber, it is true, is lighter still, being scarcely denser than water, but this substance can hardly be called a gem.

Specific gravity.

Although the great majority of precious stones occur crystallized, the characteristic form is destroyed in cutting. The crystal-forms of the several stones are noticed under their respective headings, and the subject is discussed fully under CRYSTALLOGRAPHY. A few substances used as ornamental stones—like opal, turquoise, obsidian and amber—are amorphous or without crystalline form; whilst others, like the various stones of the chalcedony-group, display no obvious crystal-characters, but are seen under the microscope to possess a crystalline structure. Gem-stones are frequently found in gravels or other detrital deposits, where they occur as rolled crystals or fragments of crystals, and in many cases have been reduced to the form of pebbles. By the disintegration of the rock which formed the original matrix, its constituent minerals were set free, and whilst many of them were worn away by long-continued attrition, the gem-stones survived by virtue of their superior hardness.

Crystalline form and cleavage.

Many crystallized gem-stones exhibit cleavage, or a tendency to split in definite directions. The lapidary recognizes a "grain" in the stone. When the cleavage is perfect, as in topaz, it may render the working of the stone difficult, and produce incipient cracks in the cut gem. Flaws due to the cleavage planes are called "feathers." The octahedral cleavage of the diamond is taken advantage of in dressing the stone before cutting it. The cutting of gem-stones is explained under LAPIDARY.

The beauty and consequent value of gems depend mainly on their colour. Some stones, it is true, are valued for entire absence of colour, as diamonds of pure "water." Certain kinds of sapphire and topaz, too, are "water clear," as also is pure rock-crystal; but in most stones colour is a prime element of attraction. The colour, however, is not generally an essential property of the mineral, but is due to the presence of foreign pigmentary matter, often in very small proportion and in some cases eluding determination. Thus, corundum when pure is colourless, but the presence of traces of certain mineral substances imparts to it not only the red of ruby and the blue of sapphire, but almost every other colour. The tinctorial matter may be distributed either uniformly throughout the stone or in regular zones, or in quite irregular patches. A tourmaline, for instance, may be red at one end of a prismatic crystal and green at the other extremity, or the colour may be so disposed that in transverse section the centre will be red and the outer zone green. A beryl may be yellow and green in the same crystal. Sapphire, again, is often parti-coloured, one portion of the stone being blue and other portions white or yellow; and the skilful lapidary, in cutting the stone, will take advantage of the blue portion. The character of the pigment is in many cases not definitely known. It by no means follows that the material capable of imparting a certain tint to glass is identical with that which naturally colours a stone of the same tint; thus a glass of sapphire-blue may be obtained by the use of cobalt, yet cobalt

Colour.

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has not been detected in the sapphire. Probably the most common mineral pigments are compounds of iron, manganese, copper and chromium. If the colour of the stone be discharged by heat, an organic pigment is presumably present. Some ornamental stones change their colour, or even lose it, on exposure to sunlight and air: such is the case with rose-quartz, chrysoprase and certain kinds of topaz and turquoise. Exposure to heat alters the colour of some stones so readily that the change is taken advantage of commercially; thus, sherry-yellow topaz may be rendered pink, smoky and amethystine quartz may become yellow, and coloured zircons may be decolorized, so as to resemble diamonds.

The colours of some gem-stones are greatly affected by radio-activity, and Prof. F. Bordas has found this to be particularly the case with sapphire. From his experiments he believes that yellow corundum, or oriental topaz, may have been formed from blue corundum under the influence of radioactive substances present in the soil in which the sapphire was embedded. Different shades of colour may be presented by different stones of the same species; and it was formerly the custom of lapidaries to regard the darker stones as masculine and the paler as feminine, a full blue sapphire, for instance, being called a "male sapphire" and a delicate blue stone a "female sapphire." It is notable that some stones appear to change colour by candle-light and by most other artificial means of illumination; some amethysts thus become inky, and certain sapphires acquire a murky tint, whilst others become amethystine. For an example of a remarkable change of this character, see ALEXANDRITE.

As the optical properties of minerals are fully explained under CRYSTALLOGRAPHY, little need be said here on this subject.

Refraction. The brilliancy of a cut stone depends on the amount of light reflected from its faces; and in the form known as the "brilliant" the gem is so cut that much of the incident light, after entering the stone and suffering refraction, is totally reflected from the facets at the back. The amount of light which is thus returned to the eye of the observer will be greater as the angle of total reflection, or critical angle, is smaller, but this angle will be small if the refractive power of the stone is great, so that the brilliancy directly depends on the refractivity. The diamond has the highest refractive index of any gem-stone (2·42). Jargoon, or zircon, has also a high index (mean 1·95), and sphene, which is occasionally cut as a gem, is likewise very notable in this respect. The index of refraction generally bears a relation to the specific gravity of the stone, the heaviest gems having the highest indices, though a few minerals offer exceptions. The refractive index, which is thus a very important character in the scientific discrimination of gem-stones, may be conveniently determined, within certain limits, by means of the refractometer devised by Dr G. F. Herbert Smith. This instrument is an improved form of the total reflectometer, in which the refractive power of a given substance is determined by the method of total reflection. It may be used for indices ranging from 1·300 to 1·775, and may be applied to faceted stones without removal from their settings.

The play of prismatic colours exhibited by a cut stone, often known as its "fire," is due to the decomposition of the white

Dispersion. light which enters the stone, and is returned, by internal reflection, after resolution into its coloured components. This decomposition depends on the dispersive power of the substance. The exceptional beauty of the fiery flashes in the diamond is due to its high dispersion, in other words, to the difference between the refractive indices for the red rays and the violet rays at the extremities of the spectrum. The peculiar lustre exhibited by the diamond is called adamantine, and is shared to some extent by certain other stones which have a high refractive index and high dispersion, such as zircon.

The use of the spectroscope may be valuable in discriminating between certain precious stones. It was shown by Sir A. H.

Spectroscopic characters. Church that almandine garnet and zircon when simply viewed through this instrument give, under proper conditions, characteristic absorption spectra, due to the light reflected from the stone having penetrated to some extent into the substance of the mineral and suffered absorption. It is sometimes useful to examine the behaviour of a stone under the action of the Röntgen rays.

A very useful means of discriminating between certain stones is found in their dichroism, or, to use a more general term, pleochroism. Neither amorphous minerals, like opal, nor minerals crystallizing in the cubic system, like spinel and garnet, possess this property; but coloured minerals which are doubly refracting may show different colours, when properly examined, in different directions. Occasionally this is so marked as to be detected by the naked eye, as in iolite or dichroite, but usually the stone needs to be examined with such an instrument as Haidinger's dichroscope (see CRYSTALLOGRAPHY). It must be remembered that in the direction of an optic axis the two images will be of the same colour in all positions of the instrument, and it is therefore necessary before reaching a definite conclusion to turn the stone about and examine it in various directions. The use of the dichroscope is so simple that it can be applied by any one to the examination of a cut stone, but there are other means of determining the nature of a stone by its optical properties available to the mineralogist and more suitably discussed under CRYSTALLOGRAPHY.

Dichroism.

In chemical composition the gem-stones present great variety. Diamond is composed of only a single element; ruby, sapphire and the quartz-group are oxides; spinel and chrysoberyl may be regarded as aluminates; turquoise and beryllonite are phosphates; and a great number of ornamental stones are silicates of greater or less complexity, such as emerald, topaz, chrysolite, garnet, zircon, tourmaline, kunzite, sphene and benitoite. In the examination of a cut stone chemical tests are not available, since they usually involve the partial destruction of the mineral. The artificial production of certain gems by chemical processes which yield products identical in composition and physical properties with the natural stones, is described in the article GEM, ARTIFICIAL.

Chemical composition.

Doublets and triplets are composite stone, sometimes prepared for fraudulent purposes. In a doublet a slab of real gem-stone covers the face of a paste, whilst in a triplet the paste is both faced and backed by a slice of genuine stone. By the action of a suitable solvent, such as chloroform or in some cases even hot water, the cement uniting the pieces gives way and the compound character of the structure is detected.

Before the chemical composition of gem-stones was understood, their classification remained vague and unscientific. As the ancients depended almost entirely on the eye, the colour of the stone naturally became the chief factor in classification. A variety of stones agreeing roughly in colour would be grouped together under a common name, widely as they might differ in other respects. Thus the emerald, the peridot, green fluorspar, malachite, and certain kinds of quartz and jade seem to have been united under the general name of σμάραγδος; whilst the ruby, red spinel and garnet were probably grouped together as *carbunculus*. In this way minerals radically different were associated on the ground of what is generally a superficial and accidental character, and rarely of any classificatory value. On the other hand, a grouping based only on colour led to several names being in some cases applied to the same mineral species. Thus the ruby and sapphire are essentially identical in chemical composition and in all physical characters, save colour.

Descriptions of precious stones by ancient writers generally are too vague for exact diagnosis. The principal classical authorities are Theophrastus and the elder Pliny. Stones were formerly held in esteem not only for their beauty and rarity but for the medicinal and magical powers with which they were reputed to be endowed. Up to comparatively recent years the toadstone, for example, was worn not for beauty but for sake of occult virtue; and even at the present day certain stones, like jade, are valued for a similar reason. Prof. W. Ridgeway has suggested that jewelry took its origin not, as often supposed, in an innate love of personal decoration, but rather in the belief that the objects used possessed magical virtue. Small stones peculiar in colour or shape, especially those with natural perforations, are usually valued by uncivilized peoples

Superstitions.

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as amulets. The Orphic poem *Λιθικά*, reputed to be of very early though unknown date, is rich in allusions to the virtues of many of the gem-stones. Many of the medical and other virtues of precious stones were evidently attributed to them on the well-known doctrine of signatures. Thus, the blood-red colour of a fine jasper suggested that the stone would be useful in haemorrhage; a green jasper would bring fertility to the soil; and the purple wine-colour of amethyst pointed to its value as a preventive of intoxication. Many of the superstitions came down to modern times, and even at the present day the belief in "lucky stones" is by no means extinct.

BIBLIOGRAPHY.—The most comprehensive work on gem-stones is Professor Max Bauer's *Edelsteinkunde* (1896), translated, with additions, by L. J. Spencer under the title *Precious Stones* (1904). Less detailed are Professor P. Groth's *Grundriss der Edelsteinkunde* (1887) and Professor C. Doelter's *Edelsteinkunde* (1893). Sir A. H. Church's *Precious Stones* (1908), intended as a guide to the collections in the Victoria and Albert Museum, is a convenient introduction; and Professor H. A. Miers's Cantor Lectures at the Society of Arts on *Precious Stones* (1896) may be studied with advantage. For American stones, the valuable work of Dr G. F. Kunz, *The Gems and Precious Stones of N. America*, is a standard authority; and the Annual Reports of this writer and others, published by the Geological Survey of the United States in the *Mineral Resources*, form a repertory of valuable information on precious stones in general. The articles in *The Mineral Industry* (founded by R. P. Rothwell) should also be consulted. See likewise O. C. Farrington, *Gems and Gem Minerals* (Chicago, 1903). For optical characters reference should be made to G. F. H. Smith, *The Herbert Smith Refractometer* (London, 1907); L. Claremont, *The Gem-Cutter's Craft* (London, 1906); W. Goodchild, *Precious Stones* (London, 1908). (F. W. R.*)

2. GEMS IN ART

In art, the word Gem is the general term for precious stones when engraved with designs, whether adapted for sealing (*σφραγίς, sigillum, inlaglio*), or mainly for artistic effect (*imagines exlypae, cameo*). They exist in a very large number of undoubtedly genuine old examples, extending from the mists of Babylonian antiquity to the decline of Roman civilization, and again starting with a new, but less original impulse on the revival of art. Apart from workmanship they possess the charms of colour deep, rich, and varied, of material unequalled for its endurance, and of scarcity, which in many instances has been enhanced by the remoteness of the lands whence they came or the fortuity of their occurrence. These qualities united within the small compass of a gem were precisely such as were required in a seal as a thing of constant use, so inalienable in its possession as to become naturally a personal ornament and an attractive medium of artistic skill, no less than the centre of traditions or of religious and legendary associations. As regards the nations of classical antiquity, all seals are classed as gems, though in many cases the material is not such as would strictly come under that heading, and precious stones in the modern sense are hardly known to occur. On the other hand it must not be supposed that gems engraved in intaglio were necessarily employed as seals. At all periods many intaglios are found which could not have been so employed without great difficulty. In Greece and Rome, within historic times, gems were worn engraved with designs to show that the bearer was an adherent of a particular worship, the follower of a certain philosopher, or the attached subject of an emperor. However, speaking generally, the intaglio engraving is a means to an end, namely, a seal-impression, while an engraving in relief is complete in itself.

Methods of Engraving (see also under LAPIDARY).—In gem-engraving the principal modern implement is a wheel or minute copper disk, driven in the manner of a lathe, and moistened with olive oil mixed with emery or diamond dust. There is no clear proof of the use among the ancients of a wheel mounted lathe-wise, but we have abundant indications of drilling with a revolving tool, which might be either a tubular drill making a ring-like depression, a pointed tool making a cup-like sinking, or a small wheel with a cutting edge, making a boat-shaped depression.

We have one sepulchral monument from Philadelphia showing the tool of an intaglio engraver (*δακτυλοκολογλύφος*; see *Athenische Mitteilungen des Arch. Inst.* xv. p. 333). Unfortunately the relief is incomplete, and the published illustration inadequate. It would seem, however, that a revolving tool was supported by a kind of mandrel, and actuated in primitive fashion by a bow. An alternative plan of working was to use a splinter of diamond set in a handle and applied like a graver. Both systems are clearly indicated by Pliny, who in one passage (*H.N.* xxxvii. 60) states that diamond splinters are sought out by gem engravers and set in iron, and so easily hollow out stones of any degree of hardness; while elsewhere (*H.N.* xxxvii. 200) he speaks of the special efficacy of the *ferror terebrarum*, the vehement action of drills. A third method is also indicated by Pliny (*ibid.*) when he speaks of the use of a blunted tool, which must have been moistened and supplied with emery of Naxos.

A four-sided pendant of the Hellenistic period published by Furtwängler (*Antike Gemmen, Gesch.* p. 400) shows clearly the successive stages of the operation. On side *a* the subject is slightly sketched in with the diamond point. On side *b* the deepest parts of the figure have also been roughly scooped out with the wheel. On sides *c* and *d* the wheel work is fairly complete, but the finer internal work has not been begun.

After the design had been completed the stone must have received a final polish on its surface, to obliterate any erroneous strokes of the first sketch; but this process was not carried as far as in modern work. It is a popular error to suppose that a high degree of internal polish is a proof of antiquity. If the interior of the design has a high degree of polish it may be either ancient or modern, or it may be an ancient stone repolished in modern times. If it has a matt surface uniformly produced by intention, it is probably modern. If the design is slightly dimmed and worn or scratched the stone may be antique, but is not necessarily so, since modern engravers have observed this peculiarity, and have imitated it with a success which, were there no other grounds of suspicion, might escape detection.

History.—It has been a subject of controversy whether the first infancy of the art was passed in Egypt or in Babylonia, but it seems highly probable that it was developed in Babylonia, whence at any rate the oldest examples of engraved gems at present known are obtained. It does not necessarily follow, however, that Egypt was therefore a pupil. It may well be that the art was developed independently in the two countries, although certain points of possible contact in respect of the forms employed will be described below in the section dealing with primitive Egypt.

Babylonia.—At a very remote period the cylindrical form of stone was introduced and became the approved shape, while the technical skill of the artist was still slight, and the traces of the tools employed (drill and pencil point) were still unconcealed.

The cylinder was suspended by a string and used as a seal. Impressions of cylinders are frequent on contract tablets. If one of the parties cannot use a seal he makes a nail-mark in lieu thereof, as is recorded in the document.

But from a time that was still comparatively early the engravers could work with considerable skill in the hard stone. In particular a cylinder may be quoted in the de Clercq Collection bearing the name of Sargon I. of Agade, who is placed about 3500 B.C. The cylinder is engraved with the king's name and titles and two symmetrically disposed renderings of Izdubar, with a vase of flowing water giving drink to a bull. The whole is treated in a conventionalized style that indicates long traditions. An important early cylinder in the British Museum is inscribed with the name of a viceroy of Ur-Gur, king of Ur (about 2500 B.C.). The engraving shows Ur-Gur being led into the presence of Sin, the moon-god.

The cylinder seal was adopted by the Assyrians, and so was carried on continuously till the time of the Persian conquest of Babylon (538 B.C.). Meanwhile, as an alternative form the conoidal seal, rounded at the top and having a flat base for the intaglio, came into use beside the cylinder.

In style the Assyrians carried on the Babylonian tradition, but with no freedom of design. Subjects and treatment became rigidly conventional.

After the Persian conquest the victors adopted the cylinder

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1–5.—ORIENTAL.

1. Babylonian (late Sumerian) Cylinder of a Viceroy of Ur-Gur (or Ur-Engur), 2100 B.C.
2. Assyrian Cylinder. Woman adoring Goddess.
3. Assyrian Cylinder. Amour worshipped by two Assyrian kings, and divine Attendants.
4. Persian Seal of Darius (500 B.C.). Lion Hunt.
5. Graeco-Persian Scarabaeoid. Boar Hunt.

6–15.—CRETAN AND MYCENAEAN INTAGLIOS.

6. Cretan Symbols.
7. Man and Bull. Crete.
8. Lions and Column. Ialysus.
9. Daemon. Crete.
10. Lioness and Deer.
11–13. Three-sided Stone. Peloponnesus.
14. Man and Bull. Crete.
15. Bull and Palm. Ialysus.

16–18.—GEMS OF THE ISLANDS.

16. Goddess on Waves. Birds.
17. Lion and Goat.
18. Heracles and Nereus.

19.—PHOENICIAN SEAL, inscribed.

20–26.—GRAECO-PHOENICIAN SCARABS FROM THARROS.

20. King, enthroned.
21. Bes with Antelope and Hound.
22. Bes with Lions.
23. Warrior.
24. Egyptian Device.
25. Bes and Goats.
26. Hawk of Horus.

XI. 362. All the above are in the British Museum.

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27–34.—EARLY GREEK SCARABS AND SCARABAEOIDS.
27. Pluto and Persephone. (New York.)
28. Boreas and Oreithyia. (New York.)
29. Youth and Dog.
30. Archer feeling Arrow Tip. (Lord Southesk.)
31. Satyr and Wine Cup.
32. Archer and Dog.
33. Satyr with Winnebin.
34. Athena with Gorgon Spoils.

35–44.—FINEST GREEK SCARABS AND SCARABAEOIDS.
35. Head of Young Warrior.
36. Lyre Player. (Cockerell Coll.)
37. Crane, with Deer's Antler.
38. Head of Eos.
39. Lyre Player. (Woodhouse Coll. and B.M.)
40. Lyre Player, signed by Syries.
41. Stork and Grasshopper, signed by Dexamenos. (St. Petersburg.)
42. Flying Crane, signed by Dexamenos. (St. Petersburg.)
43. Flying Goose.
44. Lion and Stag.

45–54.—ETRUSCAN SCARABS.
45. Achilles in Retirement.
46. Victory.
47. Caineneus struck by the Bolt.
48. Hercules.
49. Caeneneus struck by the Bolt.
50. Achilles.
51. Hercules and Cycnus.
52. Heracles.
53. Heracles and the Lion.
54. Machion bandaging Philoctetes.

55–57.—GREEK GEMS.
55. Girl with Scroll and Lyre.
56. Girl with Water-Jar.
57. Head of Arisuppus—Deities.

58–61.—SIGNED GEMS.
58. Asclepius of Aulos.
59. Citharist of Allos.
60. Medusa of Solon.
61. Heracles of Gnaios.

62–70.—ROMAN GEMS.
62. Portrait.
63. Head of Trajan Decius.
64. Ares and Aphrodite.
65. Junior of Heliocles.
66. Artemis of Ephesus.
67. So-called Psyche.
68. So-called Psyche.
69. Minerva with Mask. Stamp for the Eye Balsam of Herophilus.
70. Helios.

71–72.—CHRISTIAN GEMS.
71. Crucifixion.
72. Good Shepherd. Jonah.

73–76.—EIGHTEENTH CENTURY GEMS.
73. Achilles of Pamphilus, copied from the antique.
74. Eros and Psyche, by Pichler.
75. Head of Athena.
76. Athena, from Townley Bust by Marchant.

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form of the conquered, and continued to use it. A Persian cylinder seal of Darius (probably about 500 B.C.) in the British Museum shows the king in his chariot, transfixing a lion with his arrows, in a palm wood. Above is the winged emblem of the Persian deity Ahuramazda. The inscription gives the name and titles of Darius in the Persian, Scythic and Babylonian languages. The style is accurate and minute. The idea of the lion hunt is borrowed from the Assyrian monuments, but the engraver has been careful to make the necessary changes of costume and treatment. The cylinder was, as might be anticipated, imitated to a certain extent by peoples of the Eastern world in touch with Babylonia. It occurs in Armenia, Media and Elam. It has been found in Crete (*British School Annual*, viii. p. 77) and is frequent in the early Cypriote deposits. In some instances it has been found unfinished and therefore must be supposed to be of local manufacture. Sometimes a direct imitation of cuneiform characters occurs on the Cypriote cylinders. The same form was also employed by the Phoenicians (about the 8th century-7th century B.C.). By the Greeks and Etruscans it was used, but only rarely, and by way of exception.

Egypt.—We must go back to the remotest periods for the origin of intaglio engraving in Egypt. Recent discoveries of tombs of the earliest dynasties at Abydos and Nagada have thrown much light on the early stages of Egyptian art, and have revealed the remarkable fact that in Egypt (as in Babylonia) the cylinder was the earliest form used for the purpose of a seal. The cylinders that have been found are comparatively few in number; but a large number of jar-stoppings of clay are preserved on which cylinder designs have been rolled off while the clay was still soft. Such early incised cylinders as are extant are made either of hard wood or (as in an instance in the British Museum) of stone. The identity of form has been thought to indicate a connexion with Babylonia, but none can be traced in the designs of the respective cylinders.

The Egyptians of the earliest dynasties had an admirable command of hard stones, as shown by their beads and stone vases, but with the exception of the cylinders quoted they are not known to have applied their skill to the production of intaglios. At this early period the scarab (or beetle) was still unknown as a gem-form. It was only about the time of the 4th dynasty that the scarab (*q.v.*) was first introduced, and gradually took the place of the cylinder as the prevailing shape.

The *Scarabaeus sacer* (Egyptian, *Kheperer*), rolling its eggs in a ball of mud, became the accepted emblem of the sun-god, and so the form had an amuletic value. Scarabs of obsidian and crystal date back to the 4th dynasty. Others, coarse and uninscribed, belong to the beginning of the first Theban empire. After the 18th dynasty they are counted by thousands. While the beetle form was naturalistically treated, the flat surface underneath was well adapted to receive a hieroglyphic sign. The scarabs, however, are by no means the only product of the art. We have also figures of all kinds in the round and in intaglio—statuettes, figures of animals and of deities, and sacred emblems such as the ankh (*or crux ansata*) and the eye. Among interesting variations from the scarab form is the oblong intaglio of green jasper in the Louvre (*Gazette arch.*, 1878, p. 41) with a design on both sides. It represents on the obverse Tethmosis (Thothmes) II. (1800 B.C.) slaying a lion, and identified by his cartouche. On the reverse we have the same king drawing his bow against his enemies from a war chariot. The scarabs of Egypt though uninteresting in themselves, considered as examples of engraving, have this accidental importance in the history of art, that they furnished the Phoenicians with a model which they were able to improve as regards the intaglio by a more free spirit of design, gathered partly from Egypt and partly from Assyria. The scarab thus improved exercised a lasting influence on the later history, since, as will be seen below, it was adopted and modified both by Greeks and Etruscans.

Engraved Gems in the Bible.—While the Phoenicians have left actual specimens to show with what skill they could adopt the systems of gem-engraving prevailing at their time in Egypt and Assyria, the Israelites, on the other hand, have left records to prove, if not their skill, at least the estimation in which they held engraved gems. "The sin of Judah is written with a pen of iron and with the point of a diamond" (Jerem. xvii. 1). To pledge his word Judah gave Tamar his signet, with its cord for suspension, and staff (Gen. xxxviii. 18); whence if this passage be compared with the frequent use of "seal" in a metaphorical sense in the Bible, and with the usage of the Babylonians of carrying a seal with an emblem engraved on it recorded by Herodotus, it may be concluded that among the Israelites also every man of mark at least wore a signet. Their acquaintance with the use of seals in Egypt and Assyria is seen in the statement that Pharaoh gave Joseph his signet ring as a badge of investiture (Gen. xli. 42), and that the stone which closed the den of lions was sealed by Darius with his own signet and with the signet of his lords (Daniel vi. 17). Then as to the stones which were most prized, Ezekiel (xxviii. 13), speaking of the prince of Tyre, mentions "the sardius, the topaz and the diamond, the beryl, the onyx, and the jasper, the sapphire, the emerald and the carbuncle," stones which again occur in that most memorable of records, the description of the breastplate of the high priest

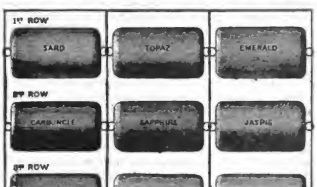

FIG. 1.—Jewish High Priest's Breastplate.

(Exodus xxviii. 16-21, and xxxix. 8-14). Twelve stones grouped in four rows, each with three specimens, may be arranged on a square, so as to have the rows placed either vertically or horizontally. If they are to cover the whole square, then, unless the gold mounts supplied the necessary compensation, they must be cut in an oblong form, and if the names engraved on them are to run lengthwise, as is the manner of Assyrian cylinders, then the stones, to be legible, must be grouped in four horizontal rows of three each. There is in fact no reason to suppose that the gems of the breastplate were in any other form than that of cylinders such as abounded to the knowledge of the Israelites, with this possibility, however, that they may have been cut lengthways into half-cylinders like a fragmentary one of sard in the British Museum, which has been mounted in bronze, and, as a remarkable exception, has been set with three small precious stones now missing. It could not have been a seal, because of this setting, and because the inscription is not reversed. The names of the twelve tribes, not their standards, as has been thought, may have been engraved in this fashion, just as on the two onyx stones in the preceding verses (Exodus xxviii. 9-11), where there can be no question but that actual names were incised. On these two stones the order of the names was according to primogeniture, and this, it is likely, would apply to the breastplate also. The accompanying diagram will show how the stones, supposing them to have been cylinders or half-cylinders, may have been arranged consistently with the

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descriptions of the Septuagint. In the arrangement of Josephus (iii. 7. 5) the jasper is made to change places with the sapphire, the amethyst with the agate, and the onyx with the beryl, while our version differs partly in the order and partly in the names of the stones; but probably in all these accounts the names had in some cases other meanings than those which they now carry. It must be remembered that we have two series of equivalents, namely, the Hebrew compared with the Septuagint, and the Greek words of the Septuagint compared with the modern names, which in many cases, though derived from the Greek, have changed their applications. From the fact that to each tribe was assigned a stone of different colour, it may be taken that in each case the colour was one which belonged prescriptively to the tribe and was symbolic, as in Assyria, where the seven planets appropriated each a special colour [see Brandis in *Hermes*, 1867, p. 259 seq., and de Saulcy, *Revue archéologique*, 1869, ii. p. 91; and compare Revelation xxi. 12, 13, where the twelve gates, which have the names of the twelve tribes written upon them, are grouped in four threes, and 19, 20, where the twelve precious stones of the walls are given]. The precious stones which occur among the cylinders of the British Museum are sard, emerald, lapis lazuli (sapphire of the ancients), agate, onyx, jasper and rock crystal.

Gem-Engraving in Greek Lands.—We must now turn to the history of gem-engraving in Greek lands. The excavations in Crete in the first years of the 20th century revealed a previously unknown culture, which lasted on the lowest computation for more than two thousand years, and was only interrupted by the national upheavals which preceded the opening of Greek history proper. (See CRETE; *Archaeology*; and AEGEAN CIVILIZATION.) Throughout the whole period the products of the gem-engraver occupy an important place among the surviving remains. It must suffice, however, in this place to indicate the chief groups of stones.

The earliest engraved stones of Minoan Crete are three-sided prism seals, made of a soft steatite, native in S.E. Crete (*Journ. of Hellenic Studies*, xvii. p. 328). These are incised with pictorial signs evidently belonging to a rudimentary hieroglyphic system, and are dated before 3000 B.C. At a period placed by A. J. Evans between 2800 and 2200 the method was fully systematized and employed on the signets, as well as on tablets and other materials. This development of the hieroglyphic system was accompanied by an increasing power of working in hard material, and cornelian and chalcedony superseded soft steatite (*Journ. of Hell. Studies*, xvii. p. 334).

Towards 2000 B.C. a highly developed linear form began to supersede the pictorial signs. It is abundant on the tablets, but the gems thus inscribed are comparatively rare. The linear form in turn died out some six hundred years later.

The signs of the pictorial script incised on the gems are representations of objects, expressed with precision, but giving little scope for the higher side of the gem-engraver's art. Simultaneously, however, with the use of the script, a high degree of skill was acquired by the engravers in rendering animal and human forms. Scenes occur of ritual observance, hunting, animal life, and strange compounded forms of demons. The excavations did not yield a large number of original gems of this class, but a great number of clay sealings from such signets were discovered. That they were synchronous with the use of the forms of script described above is proved by the fact that in the palace at Cnossus deposits were found, both in the linear and the hieroglyphic script, sealed with these signets, the seal impressions being again endorsed in the script (*Brit. School Annual*, xi. pp. 56, 62). For a remarkable group of sealings found at Zakro see *Journ. of Hell. Studies*, xxii. pll. 6-10. The finest naturalistic engravings are placed towards the close of the "Mid-Minoan" and beginning of the "Late-Minoan" periods (about 2200–1800 B.C.). During the progress of the "Late-Minoan" period the subjects tended to assume a more formal and heraldic character. The forms of stones in favour were the disk convex on each side (lenticular or lentoid stones), and during the "Mid-Minoan" period, elaborate signets in the form of modern fob-seals. Apart from the use of intaglios for sealing, the excavations have shown that the Cretan lapidaries were largely employed in the working of gems for purposes of decoration. Fragments of lapis lazuli and crystal for inlaying (the crystals having coloured designs on their lower surfaces) were found in the throne room at Cnossus; the royal gaming-board, also from the palace at Cnossus, had inlaid crystal disks and plaques. The workshop of a lapidary, with unfinished works in marble, steatite, jasper and beryl, was also found within the precincts of the palace (*Brit. School Annual*, vii. pp. 20, 77). Examples were also found of work in relief, substantially anticipating the art of cameo-cutting.

The area over which the Cretan influence extended was wide. Its manifestations in Greek lands proper, first revealed by Schliemann's excavation of the royal tombs of Mycenae, ran parallel with and outlasted the later periods of the Cretan culture to which it stood in close relation (see AEGEAN CIVILIZATION). Its gems and intaglio works in gold are known to us from the finds at Mycenae, and at analogous sites, such as Menidi, Vaphio and Ialysus. They have much in common with the finer class of Cretan stones already described. The engraved gems fall principally into two groups in respect of form, namely, the lenticular (or lentoid) stones already mentioned, and (more rarely) glandular stones, so called from their resemblance to a *glans* or sling bolt. A Cretan fresco shows a figure wearing an agate lenticular stone suspended from the left wrist. The finer specimens of the Aegean gems are engraved with the wheel and the point in hard stones, such as chalcedony, amethyst, sard, rock-crystal and haematite. A lapidary's workshop similar to that at Cnossus has been found at Mycenae, with a store of unused gems, and an unfinished lenticular stone (*Ephemeris Archaiologikê*, 1897, p. 121). The characteristic of the Aegean engraver is the free expression of living forms. His subjects are figures of animals, men and demons in combat, and heraldic compositions recalling the Gate of Lions at Mycenae. It was almost inevitable that the scarab should be found in the Cretan and Aegean deposits, but in such cases we have the Egyptian scarab directly imported, and not, as at a later period, non-Egyptian adaptations of the form. The cylinder also (except in Cyprus, the borderland between east and west) only occurs as an importation, and not as a currently manufactured shape.

FIG. 2.—Lenticular Rock-Crystal from Ialysus. (Brit. Mus.)

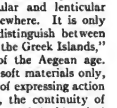

FIG. 3.—Lenticular Sard from Ialysus. (Brit. Mus.)

The "Island Gems."—The Aegean culture was swept away probably by that dimly seen upheaval which separated Mycenaean from historical Greece, and which is commonly known as the Dorian invasion. One of the few facts which indicate a certain continuity of tradition in later Greece is this, that we again find the same characteristic forms, the glandular and lenticular stones, in the cemeteries, of Melos and elsewhere. It is only recently that archaeologists have learnt to distinguish between the later lenticular and glandular stones "of the Greek Islands," as they are commonly called, and those of the Aegean age. Engravings of the later class are worked in soft materials only, such as steatite. They have not the power of expressing action peculiar to the Aegean artist. In general, the continuity of tradition between the gems of the Mycenaean and the historical periods is in respect of shape rather than of art. The subjects are for the most part decorative forms (the Gryphon, the winged Sphinx, the winged horse, &c.) in course of development into characters of Greek myth.

The Phoenicians and the Greeks.—About the end of the 8th and beginning of the 7th century B.C. the Phoenicians began to exercise a powerful influence as intermediaries between Egypt and Assyria and the Mediterranean. Porcelain and other

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imitations of Egyptian ornaments, and especially of Egyptian scarabs, are found in great numbers on such sites as Amathus in Cyprus, Camirus in Rhodes, in Etruria, and at Tharros in Sardinia. The Egyptian hieroglyphics are imitated with mistakes, the figures introduced are stiff and formal, the animals as a rule heraldic. The scarab form, which in Egypt had had its sacred significance, was now become nothing more than a convenient shape for an object of jewelry or for the reverse side of a stone. It was adopted from the Phoenicians both by Greeks and Etruscans. By the Greeks, with whom we are at present concerned, its use was occasional, and about 500 B.C. it was superseded by the scarabaeoid. Under this name two forms, somewhat similar but independent in origin, are usually grouped without sufficient discrimination. The scarabaeoid proper is a simplification of the scarab, effected by the omission of all details of the beetle. But many of the stones known as scarabaeoids, with a flat and oval base and a convex back, are in respect of their form probably of North Syrian origin (so Furtwängler). The earliest examples of archaic Greek gem-engraving (other than the later "Island gems" already described) are works of Ionian art. They show a desire, only limited by imperfect power of expression, to represent the human figure, though the particular theme may be a god or other mythical personages. By the beginning of the 5th century the engravers had reached the

FIG. 4.—Victory. Early Greek Scarab. (Brit. Mus.)

FIG. 5.—Citharist. Early Greek Scarabaeoid. (Brit. Mus.)

FIG. 6.—Head of Eos. (Brit. Mus.)

point of full development, and the scarabaeoids of the time embody its results. As an example of fine scarabaeoids the Woodhouse intaglio of a seated citharist (fig. 5; *Cat. of Gems in Brit. Mus.* No. 555) may be quoted as perhaps the very finest example of Greek gem-engraving that has come down to us. It would stand early in the 5th century B.C., a date which would also suit the head of Eos from Ithome in Messenia (fig. 6). The number, however, of fine scarabaeoids known to us has been considerably increased in recent years. They are marked by a broad and simple treatment, which attains a large effect without excessive minuteness or laboured detail. In these respects the style has something in common with the reliefs of the 5th century.

Literary History.—The literary references to the early gem-engravers are no longer of the same importance as before in view of the fuller knowledge we possess as to the quality of early gem-engraving, but it is necessary that they should be taken into account.

The records of gem-engravers in Greece begin in the island of Samos, where Mnesarchus, the father of the philosopher Pythagoras, earned by his art more of praise than of wealth. "Not to carry the image of a god on your seal," was a saying of Pythagoras; and, whatever his reason for it may have been, it is interesting to observe him founding a maxim on his father's profession of gem-engraving (Diogenes Laërt. viii. 1, 17). From Samos also came Theodorus, who made for Polycrates the seal of emerald (Herodotus iii. 41), which, according to the curious story, was cast in vain into the deep sea on purpose to be lost. That the design on it was a lyre, as is stated in one authority, is unlikely, at least if we accept Benndorf's ingenious interpretation of Pliny (*Nat. Hist.* xxxiv. 83). He has suggested that the portrait statue of Theodorus made by himself was in all probability a figure holding in one hand a graving tool, and in the other, not, as previously supposed, a quadriga so diminutive that a fly could cover it with its wings, but a scarab with the engraving of a quadriga on its face (*Zeitschrift für die österreich. Gymnasien*, 1873, pp. 401-421), whence it is not unreasonable to conclude that this scarab in fact represented the famous seal of Polycrates. Shortly after 600 B.C. there was a law of Solon's forbidding engravers to retain impressions of the seals they made, and this date would fall in roundly with that of Theodorus and Mnesarchus, as if there had in fact been at that time a special activity and unusual skill. That the use of seals had been general long before, in Cretan and Mycenaean times, we have seen above, and it is singular to find, as Pliny points out (xxxiii. 4), no direct mention of seals in Homer, not even in the passage (*Iliad*, vi. 168) where Bellerophon himself carries the tablets on which were written the orders against his life. From the time of Theodorus to that of Pyrgoteles in the 4th century B.C. is a long blank as to names, but not altogether as to gems, the production of which may be judged to have been carried on assiduously from the constant necessity of seals for every variety of purpose. The references to them in Aristophanes, for example, and the lists of them in the ancient inventories of treasures in the Parthenon and the Asclepieion at Athens confirm this frequent usage during the period in question. The mention of a public seal for authenticating state documents also becomes frequent in the inscriptions. In the reign of Alexander the Great we meet the name of Pyrgoteles, of whom Pliny records that he was no doubt the most famous engraver of his time, and that Alexander decreed that Pyrgoteles alone should engrave his portrait. Nothing else is known of Pyrgoteles. A portrait of Alexander in the British Museum (No. 2307), purporting to be signed by him, is palpably modern.

From literary sources we also learn the names of the engravers Apollonides, Chronius and Dioscorides, but the date of the last-mentioned only is certain. He is said to have made an excellent portrait of Augustus, which was used as a seal by that emperor in the latter part of his reign and also by his successors. Inscriptions on extant gems make it probable that Dioscorides was a native of Aegae in Cilicia, and that three sons, Hyllos, Herophilus and Eutyches, followed their father's occupation. We have also a few scattered notices of amateurs and collectors of gems, but it will be seen that for the whole period of classical antiquity the literary notices give little aid, and we must return to the gems.

Early Inscribed Gems.—Various early gems are inscribed with proper names, which may be supposed to indicate either the artist or the owner of the gem. In some cases there is no ambiguity, *e.g.* on a scarab is inscribed, "I am the seal of Thersis. Do not open me"; and a scarabaeoid (fig. 7) is inscribed, "Syries made me." But when we have the name alone, the general principle on which we must distinguish between owner and artist is that the name of the owner is naturally meant to be conspicuous (as in a gem in the British Museum inscribed in large letters with the name of Isagor[as]), while the name of an artist is naturally inconspicuous and subordinate to the design.

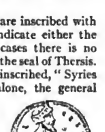

FIG. 7.—Scarabaeoid by Syries. (Brit. Mus.)

The early engravers known to us by their signatures are: Syries, who was author of the modified scarab in the British Museum, mentioned above, with a satyr's head in place of the beetle, and a citharist on the base—a work of the middle of the 6th century; Semon, who engraved a black jasper scarab now at Berlin, with a nude woman kneeling at a fountain filling her pitcher, of the close of the 6th century; Epimenes, who was the author of an admirable chalcedony scarabaeoid of a nude youth restraining a spirited horse—formerly in the Tyszkiewicz Collection, and of about the beginning of the 5th century. But better known to us than any of these artists is the 5th-century engraver, Dexamenus of Chios, of whose work four examples[1] survive, viz.:—

[1] For Nos. 1-4 see Furtwängler, pl. 14; for Nos. 2-4 see Evans, *Rev. archéologique*, xxxii. (1898) pl. 8.

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1. A chalcedony scarabaeoid from Greece, in the Fitzwilliam Museum at Cambridge, with a lady at her toilet, attended by her maid. Inscribed ΔΕΞΑΜΕΝΟΣ, and with the name of the lady, ΜΙΚΗΣ.

2. An agate with a stork standing on one leg, inscribed ΔΕΞΑΜΕΝΟΣ simply.

3. A chalcedony with the figure of a stork flying, and inscribed in two lines, the letters carefully disposed above each other, ΔΕΞΑΜΕΝΟΣ ΕΠΙΟΙΕ ΧΙΟΣ.

4. A gem, apparently by the same Dexamenus, is a cornelian formerly belonging to Admiral Soteriades in Athens, and subsequently in the collection of Dr Arthur Evans. It has a portrait head, bearded and inscribed ΔΕΞΑΜΕΝΟΣ ΕΠΙΟΙΕ.

FIG. 8.—Greek Sard, 5th Cent. B.C. (Brit. Mus.)

The design of a stork flying occurs on an agate scarab in the British Museum, from the old Cracherode Collection, and therefore beyond all suspicion of having been copied from the more recently discovered Kertch gem.

For the period immediately following that early prime to which the gems above described belong, our materials are less copious. Some of the finest examples are derived from the Greek tombs in the Crimea and South Russia. Reckoned among the best of the Crimean gems, and that is equivalent to saying among the best of all gems, are the following: (1) a burnt scarabaeoid with an eagle carrying off a hare; (2) a gem with scarab border and the figure of a youth seated playing on the trigonon, very much resembling the Woodhouse intaglio (both engraved, *Compte rendu*, 1871, pl. vi. figs. 16, 17). In these, and in almost all Greek gems belonging to this period of excellence, the material is of indifferent quality, consisting of agate, chalcedony or cornelian, just as in the older specimens. Brilliant colour and translucency are as yet not a necessary element, and accordingly the design is worked out solely with a view to its own artistic merit. The scarab tends to die out. The scarabaeoid in its turn is abandoned for the simple ring stone. The subjects chosen take by degrees a different character. Aphrodite (nude),

FIG. 9.—Amethyst Pendant. (Brit. Mus.)

Eros, children and women tend to replace the older and severer themes. The motives of 4th-century sculpture appear by degrees on the gems.

Etruscan Gems.—At this point it is convenient to discuss the gem-engraving of the Etruscans, which came into being towards the close of the archaic period of Greek art. In the early Etruscan deposits, such as that of the Polledrara tomb in the British Museum (towards 600 B.C.), we find nothing except Phoenician imports of porcelain or stone scarabs, both strongly Egyptian in character. During the 6th century a few of the semi-Egyptian stones of Sardinia make their appearance. But in the latter part of the century these oriental products tend to die out, and we have in their place the native works of Etruscan artists. These engravings stand in the closest relation to Greek works of the close of the 6th century and many imported Greek scarabs also occur.

The Etruscan scarab has its beetle form more minutely engraved than that of the Greeks. It is further distinguished in the better examples, alike from the Greek and the Egyptian form, by a small border of a sort of petal ornament round the lower edge of the beetle. Like the earlier Greek scarabs it has the cable border round the design, but the border continued in use in Etruria when it had been abandoned in Greece. The scarabaeoid form does not occur in Etruscan deposits. Etruscan engraving begins when Greek art was approaching maturity, with studies, sometimes stiff and cramped, of the heroic nude form. Some of the Greek deities such as Athena and Hermes occur, together with the winged personages of Greek mythology. To the heroic types the names of Greek legend are attached, with modifications of form, such as TTTE for Tydeus, and KAΠNE for Capaneus. Sometimes the names are appropriate and sometimes they are assigned at random. The subjects include certain favourite incidents in the Trojan and Theban cycles (*e.g.* the death of Capaneus); myths of Heracles; athletes, horsemen, a few scenes of daily life. Certain schemes of composition are frequent. In particular, a figure too large for the field, standing and bending over, is made to serve for many types. The engraving of the finer Etruscan gems is minute and precise, marked with elegance and command of the material. Its fault is its want of original inspiration. Special mention must be made of a very numerous group of cornelian scarabs, roughly engraved for the most part with cup-shaped sinkings (whence they are known as gems *a globolo tondo*) roughly joined together by furrows. Notwithstanding their apparent rudeness, these gems are shown, by the conditions in which they are found, to be comparatively late works of the 4th century. Furtwängler ingeniously suggests that the rough execution was intended to emphasize the shining surfaces of the cup-sinkings, rather than to produce any particular intaglio subject. (For an elaborate classification of the Etruscan scarabs see Furtwängler, *Geschichte*, p. 170.)

The Cameos.—After the beginning of the regal period, in the 4th century B.C., the introduction of more splendid materials from the East was turned to good account by the development of the cameo, *i.e.* of gem-carving in relief (for the origin of the word see CAMEO). But in its simpler forms the principle of the cameo necessarily dates from the beginning of the art. Thus a lion in rock-crystal was found in the very early royal tomb of Nagada (de Morgan, *Recherches*, *Tombeau de Negadah*, p. 193). The Egyptian scarab, on its rounded side, had been naturalistically carved in relief in beetle form. Steatite engravings in relief (notably the harvest festival vase from Hagia Triada) were found in the Cretan deposits. Subjects are found carved in the round in hard stone in Mycenaean graves. When we come to historical Greece and to Etruria the cameo of later times is anticipated by various attempts to modify the traditional form of the scarab. An example in cornelian was found at Orvieto in 1874 in a tomb along with vases dating from the beginning of the 5th century B.C., and it will be seen from the engraving of this gem (*Arch. Zeit.*, 1877, pl. xi. fig. 3) that, while the design on the face is in intaglio, the half-length figure of a Gorgon on the back is engraved in relief. Compare a cornelian fragment, apparently cut from the back of a scarabaeoid, now in the British Museum. As further examples of the same rare form of cameo, the following gems in the British Museum may be mentioned:—(1) a cornelian cut from back of a scarabaeoid, with head of Gorgon surrounded by wings; (2) cornelian scarabaeoid: Gorgon running to left; on face of the gem an intaglio of Thetis giving armour to Achilles; (3) steatite scarabaeoid, already mentioned, signed by Syries, head of a satyr, full face, with intaglio of citharist. There is, however, no evidence at present available to show that the cameo proper had been introduced in Greece before the time of Alexander. The earliest examples found in known conditions are derived from Crimean tombs of the middle of the 3rd century B.C.

Among the most splendid of ancient cameos are those at St Petersburg and Vienna, each representing a monarch of the Diadochi and his consort (Furtwängler, pl. 53). There is much controversy as to the persons represented, but the cameos are probably works of the 3rd century.

The materials which ancient artists used for cutting into cameos were chiefly those siliceous minerals which, under a variety of names, present various strata or bands of two or more distinct colours. The minerals, under different names, are

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essentially the chalcedonic variety of quartz, and the differences of colour they present are due to the presence of variable proportions of iron and other foreign ingredients. These banded stones, when cut parallel to the layers of different colours, and when only two coloured bands—white and black, or sometimes white and black and brown—are present, are known as onyxes; but when they have with the onyx bands layers of cornelian or sard, they are termed sardonyxes. The sardonyx, which was the favourite stone of ancient cameo-engravers, and the material in which their masterpieces were cut, was procured from India, and the increased intercourse with the East after the death of Alexander the Great had a marked influence on the development of the art.

Akin in their nature to the great regal cameos, which from the nature of the case are cut on a nearly plane surface, are the cups and vases cut out of a homogeneous stone and therefore capable of being worked in the round. A few examples of such works survive. The most famous are the Farnese Tazza and the cup of the Ptolemies. The Tazza, which is now in the National Museum at Naples, was bought by Lorenzo de' Medici from Pope Paul II. in 1471. It is a large shallow bowl of sardonyx, 8 in. in diameter On its exterior surface, is a Gorgoneion upon an aegis; in the interior is an allegorical design, relating to the Nile flood. The cup of the Ptolemies, formerly known as the cup of St Denis, is preserved in the Cabinet des Médailles of the French Bibliothèque Nationale. It is a cup 4⅞ in. high and 5¾ in. in diameter, carved out of oriental sardonyx, and richly decorated with Dionysiac emblems and attributes in relief.

The Cameo in the Roman Empire.—During the 1st century of the empire the engraver's art alike in cameo and in intaglio was at a high degree of excellence. The artist in cameo took full advantage of his rich opportunities in the way of sumptuous materials, and of the requirements of an imperial court. The two most famous examples of this art which have come down to the present day are the Great Agate of the Sainte Chapelle in the Bibliothèque Nationale, Paris, and the Augustus Cameo in the Vienna Collection. The former was pledged among other valuables in 1244 by Baldwin II. of Constantinople to Saint Louis. It is mentioned in 1344 as "Le Camahieu," having been sent in that year to Rome for the inspection of Pope Clement VI. It is a sardonyx of five layers of irregular shape, like all classical gems, measuring 12 in. by 10¼ in. It represents on its upper part the deified members of the Julian house. The centre is occupied with the reception of Germanicus on his return from his great German campaign by the emperor Tiberius and his mother Livia. The lower division is filled with a group of captives in attitudes expressive of woe and deep dejection. The Vienna gem (*Gemma augustea*), an onyx of two layers measuring 8⅝ in. by 7⅓, is a work of still greater artistic interest. The upper portion is occupied with an allegorical representation of the coronation of Augustus, the emperor being represented as Jupiter with Livia as the goddess Roma at his side. In the composition deities of Earth and Sea, and several members of the family of Augustus, are introduced; on the exergue or lower portion are Roman soldiers preparing a trophy, barbarian captives and female figures. This gem was in the 15th century at the abbey of St Sernin at Toulouse. According to tradition it had been placed there by Charlemagne. It came into the possession of the emperor Rudolph II. in the 16th century for the enormous sum of 12,000 gold ducats. The principal cameo in the collection of the British Museum was acquired at the final dispersion of the Marlborough Collection in 1899. It is a sardonyx measuring 8¼ in. by 6 in., and appears to represent a Roman emperor and empress in the forms of Serapis and Isis. Here also, in imperial times as in the Hellenistic period, side by side with the great cameos, we meet with works carved out in the round. Noted examples of such work are the Brunswick vase (at Brunswick), with the subject of Triptolemus; the Berlin vase with the lustration of a new-born imperial prince; and the Waddesdon vase in the British Museum, with a vine in relief set in a rich enamelled Renaissance mount. Hardly less precious than the cameos in sardonyx were the imitations carved out of coloured glass The material was not costly, but its extreme fragility made the work of extreme difficulty. Examples of such work are the Barberini or Portland vase, deposited in the British Museum, with scenes supposed to be connected with the story of Peleus and Thetis; and the "vase of blue glass" from Pompeii, in the museum at Naples (see Mau and Kelsey, p. 408). The world's great cameos, which are hardly more than a dozen in number, have not been found by excavation. They remained as precious objects in imperial and ecclesiastical treasuries and passed thence to the royal and national collections of modern Europe.

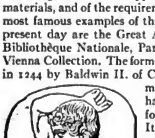

FIG. 10.—Actaeon. Fragment of Sardonyx Cameo. (Brit. Mus.)

The Intaglio in the Roman Empire.—The art of engraving in intaglio was also at a high level of excellence in the beginning of the Roman empire. This is to be inferred alike from the admirable portraits of the 1st century A.D., and from the number of signed gems bearing Roman artists' names, such as Aulus, Gnaius and the like, which could hardly belong to any other period. It is impossible, however, to found any argument upon the artists' signatures without taking into account the intricate questions of authenticity which are discussed in the following section.

Signed Gems.—The number of gems which have, or purport to have, the name of the artist inscribed upon them is very large. A great many of the supposed signatures are modern forgeries, dating from the period between 1724 (when the book of Stosch, *Gemmae antiquae caelatae, scalptorum nominibus insignitae*, first drew general attention to the subject) and 1833, when the multitude of forged signatures (about 1800 in number) in the collection of Prince Poniatowski made the whole pursuit ridiculous. It is known, however, that forged signatures were current before 1724 (see Stosch, p. xxi.), and in the period immediately following they were very numerous. Thus Laurence Natter (*Méthode de graver en pierres fines* (1754), p. xxx.) confesses that, whenever desired, he made copies. For example, he copied a Venus (Brit. Mus. No. 2296), converting the figure into a Danaë and affixing the name of Aulos which he found on the Venus. Cf. Mariette, *Traité* (1750), i. p. 101.

The question which of the multitude of supposed signatures can be accepted as genuine has been a subject of prolonged and intricate controversy. In the period immediately following the Poniatowski forgeries the extreme height of scepticism is represented by Koehler, who only acknowledged five gems (Koehler, iii. p. 206) as having genuine signatures. In recent years the subject has been principally dealt with by Furtwängler, whose conclusion is to admit a considerable number of gems rejected by his predecessors.

It must suffice here to point out a few general principles. In the first place a certain number of gems recently discovered have inscriptions which are undoubtedly genuine and which record the names of the engravers. The form of the signature may be a nominative with a verb, a nominative without a verb or a genitive. The artists in this class are Syries, Dexamenus, Epimenes and Semon, mentioned above, and a few others. Another group of gems which must be accepted consists of stones whose known history goes back to a period at which a forged inscription was impossible. Thus a bust of Athena in the Berlin Collection, signed by Eutyches, was seen by Cyriac of Ancona in 1445. A glass cameo signed by Herophilus, son of Dioscorides, now at Vienna, was, in the 17th century, in the monastery of Echternach, where it had probably been from old times. The portrait of Julia, daughter of Titus, by Euodos (now in the Bibliothèque Nationale) was formerly a part of a reliquary presented to the abbey of St Denis by Charles the Bold. Another group of undoubtedly genuine signatures occurs on cameos (in stone and paste) which have the inscriptions in relief, and therefore as part of the original design. Such are the works of Athenion, and of Quintus, son of Alexas.

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For the great majority of signed gems which do not fall into these categories the reader must refer to the discussions of Furtwängler and others (see *Bibliography* below). It must suffice to say that Furtwängler arrives at the result that we have in all genuine signatures of at least fifty ancient gem-engravers.

Gem-Engraving in the Later Empire.—In the following centuries the art of intaglio engraving, which was still at a high degree of perfection in the first century of the Roman empire, became more mechanical. The designs have a very characteristic appearance, due to the method of production with rough and hasty strokes of the wheel only. A collection of gems found in England, such as that in the possession of the corporation of Bath, shows the feeble character in particular of the gems current in the provinces. Except in portraiture, and in grylli or conceits, in which various things are combined into one, often with much skill, the subjects were as a rule only variations or adaptations of old types handed down from the Greeks. When new and distinctly Roman subjects occur, such as the finding of the head on the Capitol, or Faustulus, or the she-wolf with the twins, both the stones and the workmanship are poor. In such cases, where the design stirs a genuine national interest, it may happen that very little of artistic rendering will be acceptable rather than otherwise, and much more is this true when the design is a symbol of some article of faith, as in the early Christian gems. There both the art and the material are at what may be called the lowest level. The usual subjects on the early Christian gems are the fish, anchor, ship, dove, the good shepherd, and, according to

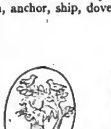

Fig. 11.—Christian Gem. The Good Shepherd. (Brit. Mus.)

Fig. 12.—Gnostic Gem. (Brit. Mus.)

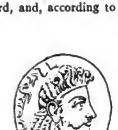

Fig. 13.—Sassanian Gem. (Brit. Mus.)

Clemens, the lyre. Under the Gnostics, however, with whom there was more of speculation than of faith, symbolism was developed to an extent which no art could realize without the aid of writing. A gem was to them a talisman more or less elaborate with long, but for the most part quite unintelligible, engraved formulae. The difficulty is to make out how the stones were carried; many specimens exist, but none show signs of mounting. The materials are usually haematite or jasper. As regards the designs, it is clear that Egyptian sources have been most drawn upon. But the symbolism is also largely associated with Mithraic worship. The name Abraxas, or more correctly Abrasax, which, from its frequency on these gems, has led to their being called also "Abraxas gems," is, when the Greek letters of which it is composed are treated as Greek numerals, equal to 365, the number of days in a year, and the same is the case with ΜΕΙΘΡΑΣ.

More interesting, from the occasionally forcible portraiture and the splendour of some of the jacinths employed, are the Sassanian gems, which as a class may be said to represent the last stage of true gem-engraving in ancient times.

The art of cameo-engraving, which, as we have seen, attained its greatest splendour at the beginning of the empire, followed on the whole a similar course. It waned in the early part of the 3rd century after the death of the emperor Severus, but under the first Christian emperor Constantine it enjoyed a brief period of revival. Fine cameo portraits of Constantine are extant; and it was during or shortly after his reign that Christian Scripture subjects began to appear on cameos. That class of subjects constituted the staple of such work—generally rude and artistically debased—as continued to be cultivated under the Byzantine empire down to nearly the epoch of the Renaissance. From the Byzantine period downward one peculiarity of gem-engraving becomes noticeable. Cameo-work as compared with intaglios in classical times was rare and infrequent, but now and onwards the opposite is the case, intaglio-sinking having almost died out, and cameos being chiefly produced. Commercial intercourse with the East still secured for the engravers a supply of magnificent sardonyxes, although blood-stone and other non-banded stones were very commonly used for works in relief. Cameos during the long dark ages were used chiefly for the decoration of reliquaries and other altar furniture, and as such their designs were purely ecclesiastical or scriptural. To this period also belongs the class of complimentary or motto cameos, which, containing only inscriptions and an ornamental border, executed in nicolo stones, were used as personal gifts and adornments.

In medieval times antique cameos were held in peculiar veneration on account of the belief, then universal, in their potency as medicinal charms. This power was supposed to be derived from their origin, of which two theories, equally satisfactory, were current. By the one they were held to be the work of the children of Israel during their sojourn in the wilderness (hence the name *Pierres d' Israël*), while the other theory held them to be direct products of nature, the engraved figures pointing to the peculiar virtue lodged in them. Interpreters less mystically inclined found Biblical interpretations for the subjects. Thus the cameo of the Sainte Chapelle was supposed to represent the triumph of Joseph in Egypt. A cameo with Poseidon, Athena and her serpent was Adam and Eve.

The revival of the glyptic arts in western Europe dates from the pontificate of the Venetian Paul II. (1464–1471), himself an ardent lover and collector of gems, to which passion, indeed, it is gravely affirmed he was a martyr, having died of a cold caught by the multiplicity of gems exposed on his fingers. The cameos of the early part of the 16th century rival in beauty of execution the finest classical works, and, indeed, many of them pass in the cabinets of collectors for genuine antiques, which they closely imitated. The Oriental sardonyx was not available for the purposes of the Renaissance artists, who were consequently obliged to content themselves with the colder German agate onyx. The scarcity of worthy materials led them to use the backs of ancient cameos, or to improve on classical works of inferior value executed on good material, and probably to this cause must also be assigned the development of shell cameos, which are rarely found, of an older period.

Among the means of distinguishing antique cameos from cinquecento work, the kind of stone is one of the best tests, the classical artists having used only rich and warm-tinted Oriental stones, which further are frequently drilled through their diameter with a minute hole, from having been used by their original Oriental possessors in the form of beads. The cinquecento artists also, as a rule, worked their subjects in high relief, and resorted to undercutting, no case of which is found in the flat low work of classical times. The projecting portions of antique work exhibit a dull chalky appearance, which, however, fabricators learned to imitate in various ways, one of which was by cramming the gizzards of turkey fowls with the gems. Another index of antiquity is found in the different methods of working adopted in classical and Renaissance times. The tools employed by the Renaissance engraver were the drill and the wheel, while the ancient artist also employed the diamond point.

Fig. 14.—Muse, by Pichler. (Brit. Mus.)

The gem-engraver's art again during the 18th century revived under an even greater amount of encouragement from men of wealth and rank. In this last period the names of engravers who succeeded best in imitating classical designs were Natter, Pichler (fig. 14), and the Englishmen Marchant (fig. 15) and Burch. Compared with Greek gems, it will be seen that what

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at first sight is attractive as refined and delicate is after all an exaggerated minuteness of execution, entirely devoid of the ancient spirit. The success with which modern engravers imposed on collectors is recorded in many instances, of which one may be taken as an instructive type. In the Bibliothèque Nationale is a gem (Chabouillet's catalogue, No. 2337), familiarly known as the signet of Michelangelo, the subject being a Bacchanalian scene. So much did he admire it, the story says, that he

FIG. 15.—Nereid and Sea-bull by Marchant. (Brit. Mus.)

copied from it one of the groups in his paintings in the Sistine chapel. The gem, however, is evidently in this part of it a mere copy from Michelangelo's group, and therefore a subsequent production, probably by da Pescia.

In our own day the engraving of cameos has practically ceased to be pursued as an art. Roman manufacturers cut stones in large quantities to be used as shirt-studs and for setting in finger-rings; and in Rome and Paris an extensive trade is carried on in the cutting of shell cameos, which are largely imported into England and mounted as brooches by Birmingham jewelry manufacturers. The principal shell used is the large bull's-mouth shell (*Cassis rufa*), found in East Indian seas, which has a sard-like underlayer. The black helmet (*Cassis tuberosa*) of the West Indian seas, the horned helmet (*C. cornuta*) of Madagascar, and the pinky queen's conch (*Strombus gigas*) of the West Indies are also employed. The famous potter Josiah Wedgwood introduced a method of making imitations of cameos in pottery by producing white figures on a coloured ground, this constituting the peculiarity of what is now known as Wedgwood ware.

Gem Collectors.—The habit of gem-collecting is recorded first in the instance of Ismenias, a musician of Cyprus, who appears to have lived in the 4th century B.C. But though individual collectors are not again mentioned till the time of Mithradates, whose cabinet was carried off to Rome by Pompey, still it is to be inferred that they existed, if not pretty generally, yet in such places as Cyrene, where the passion for gems was so great that the thriftiest person owned one worth 10 minas, and where, according to Aelian (*Var. hist.* xii. 30), the skill in engraving was astonishing. The first cabinet (*dactyliotheca*) in Rome was that of Scaurus, a stepson of Sulla. Caesar is said to have formed six cabinets for public exhibition, and from the time of Augustus all men of refinement were supposed to be judges both of the art and of the quality of the stones.

In the middle ages the chief collections were incorporated in works of art in the church treasuries. The first collector of modern times was, as already mentioned, Pope Paul II., who was followed by a long succession of princely and noble collectors such as Lorenzo de' Medici and the great earl of Arundel. The collection of the latter passed into the hands of the dukes of Marlborough and thence into the possession of Mr David Bromilow. The collection was finally dispersed by auction in June 1899.

In modern times the principal collections are contained in state museums. The cabinets of Vienna and of the Bibliothèque Nationale are incomparably rich in the historic cameos. Those of the British Museum and of Berlin are the strongest in their range over the whole field of the gem-engraver's art.

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For the history of the Poniatowski gems, see Reinach, *Pierres gravées*, p. 151.

Catalogues.—The chief catalogues dealing with modern public collections are: Berlin, A. Furtwängler, *Beschreibung der geschnittenen Steine im Antiquarium* (1896); British Museum, A. H. Smith, *A Catalogue of Engraved Gems in the British Museum (Popli Fulvium Ursinum* (Antwerp, 1606); Stosch, *Gemmae antiquae caelatae, scalptorum nominibus insignitae* (Amsterdam, 1724); Winckelmann, *Description des pierres gravées du feu Baron de Stosch* (1760); Kraus, *Pyrgoteles, oder die edlen Steine der Alten* (1856); a convenient reissue of Stosch, and seven others of the older works, by S. Reinach, *Pierres gravées, &c. . . . réunies et rédidées, avec un texte nouveau* (1895).

Pastes.—The principal collection of glass and sulphur pastes from gems was that issued by James Tassie of Glasgow, with *A Descriptive Catalogue of a General Collection of . . . Engraved Gems . . . arranged and described by R. E. Raspe* (the author of *Baron Munchausen*) (1791).

(A. S. M.; A. H. Sm.)

GEM, ARTIFICIAL. The term "Artificial Gems" does not mean *imitations* of real gems, but the actual formation by artificial means of the real precious stone, so that the product is identical, chemically, physically and optically, with the one found in nature. For instance, in chemical composition the lustrous diamond is nothing but crystallized carbon. Could we take black amorphous carbon in the form of charcoal or lampblack and dissolve it in a liquid, and by the slow evaporation of that liquid allow the dissolved carbon to separate out, it would probably crystallize in the transparent form of diamond. This would be a true synthesis of diamond, and the product would be just as much entitled to the name as the choicest products of Kimberley or Golconda. But this is a very different thing from the imitation diamond so common in shop windows. Here the chemist has only succeeded in making a paste or glass having limpidity and a somewhat high refractivity, but wanting the hardness and "fire" of the real stone.

The Diamond.—Within recent years chemists have actually succeeded in making the real diamond by artificial means, and although the largest yet made is not more than one-fiftieth of an inch across, the process itself and the train of reasoning leading up to such an achievement are sufficiently interesting to warrant a somewhat full description. Attempts to make diamonds artificially have been numerous, but, with the sole exception of those of Henri Moissan, all have resulted in failure. The nearest approach to success was attained by J. B. Hannay in 1880 and R. S. Marsden in 1881; but their results have not been verified by others who have tried to repeat them, and the probability is that what was then thought to be diamond was in reality carborundum or carbide of silicon.

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Attempts have been made by two methods to make carbon crystallize in the transparent form. One is to crystallize it slowly from a solution in which it has been dissolved. The difficulty is to find a solvent. Many organic and some inorganic bodies hold carbon so loosely combined that it can be separated out under the influence of chemical action, heat or electricity, but invariably the carbon assumes the black amorphous form. The other method is to try to fuse the carbon by fierce heat, when from analogy it is argued that on cooling it will solidify to a clear limpid crystal. The progress of science in other directions has now made it pretty certain that the true mode of making diamond artificially is by a combination of these two methods. Until recently it was assumed that carbon was non-volatile at any attainable temperature, but it is now known that at a temperature of about 3600° C. it volatilizes readily, passing without liquefying directly from the solid to the gaseous state. Very few bodies act in this manner, the great majority when heated at atmospheric pressure to a sufficient temperature passing through the intermediate condition of liquidity. Some few, however, which when heated at atmospheric pressure do not liquefy, when heated at higher pressures in closed vessels obey the common rule and first become liquid and then volatilize. Sir James Dewar found the critical pressure of carbon to be about 15 tons on the sq. in.; that is to say, if heated to its critical temperature (3600° C.), and at the same time subjected to a pressure of 15 tons to the sq. in., it will assume the liquid form. Enormous as such pressures and temperatures may appear to be, they have been exceeded in some of Sir Andrew Noble's and Sir F. Abel's researches; in their investigations on the gases from gunpowder and cordite fired in closed steel chambers, these chemists obtained pressures as great as 95 tons to the sq. in., and temperatures as high as 4000° C. Here then, if the observations are correct, we have sufficient temperature and enough pressure to liquefy carbon; and, were there only sufficient time for these to act on the carbon, there is little doubt that the artificial formation of diamonds would soon pass from the microscopic stage to a scale more likely to satisfy the requirements of science, if not those of personal adornment.

It has long been known that the metal iron in a molten state dissolves carbon and deposits it on cooling as black opaque graphite. Moissan carried out a laborious and systematic series of experiments on the solubility of carbon in iron and other metals, and came to the conclusion that whereas at ordinary pressures the carbon separates from the solidifying iron in the form of graphite, if the pressure be greatly increased the carbon on separation will form liquid drops, which on solidifying will assume the crystalline shape and become true diamond. Many other metals dissolve carbon, but molten iron has been found to be the best solvent. The quantity entering into solution increases with the temperature of the metal. But temperature alone is not enough; pressure must be superadded. Here Moissan ingeniously made use of a property which molten iron possesses in common with some few other liquids—water, for instance—of increasing in volume in the act of passing from the liquid to the solid state. Pure iron is mixed with carbon obtained from the calcination of sugar, and the whole is rapidly heated in a carbon crucible in an electric furnace, using a current of 700 amperes and 40 volts. The iron melts like wax and saturates itself with carbon. After a few minutes' heating to a temperature above 4000° C.—a temperature at which the lime furnace begins to melt and the iron volatilizes in clouds—the dazzling, fiery crucible is lifted out and plunged beneath the surface of cold water, where it is held till it sinks below a red heat. The sudden cooling solidifies the outer skin of molten metal and holds the inner liquid mass in an iron grip. The expansion of the inner liquid on solidifying produces enormous pressure, and under this stress the dissolved carbon separates out in a hard, transparent, dense form—in fact, as diamond. The succeeding operations are long and tedious. The metallic ingot is attacked with hot *aqua regia* till no iron is left undissolved. The bulky residue consists chiefly of graphite, together with translucent flakes of chestnut-coloured carbon, hard black opaque carbon of a density of from 3·0 to 3·5, black diamonds—carbonado, in fact—and a small quantity of transparent colourless diamonds showing crystalline structure. Besides these there may be corundum and carbide of silicon, arising from impurities in the materials employed. Heating with strong sulphuric acid, with hydrofluoric acid, with nitric acid and potassium chlorate, and fusing with potassium fluoride—operations repeated over and over again—at last eliminate the graphite and impurities and leave the true diamond untouched. The precious residue on microscopic examination shows many pieces of black diamond, and other colourless transparent pieces, some amorphous, others crystalline. Although many fragments of crystals are seen, the writer has scarcely ever met with a complete crystal. All appear broken up, as if, on being liberated from the intense pressure under which they were formed, they burst asunder. Direct evidence of this phenomenon has been seen. A very fine piece of diamond, prepared in the way just described and carefully mounted on a microscopic slide, exploded during the night and covered the slide with fragments. This bursting paroxysm is not unknown at the Kimberley mines.

Sir William Crookes in 1906 communicated to the Royal Society a paper on a new formation of diamond. Sir Andrew Noble has shown that in the explosion of cordite in closed steel cylinders pressures of over 50 tons to the sq. in. and a temperature probably reaching 5400° were obtained. Here then we have conditions favourable for the liquefaction of carbon, and if the time of explosion were sufficient to allow the reactions to take place we should expect to get liquid carbon solidified in the crystalline state. Experiment proved the truth of these anticipations. Working with specially prepared explosive containing a little excess of carbon Sir Andrew Noble collected the residue left in the steel cylinder. This residue was submitted by Sir William Crookes to the lengthy operations already described in the account of H. Moissan's fused iron experiment. Finally, minute crystals were obtained which showed octahedral planes with dark boundaries due to high refracting index. The position and angles of their faces, and cleavages, the absence of birefringence, and their high refractive index all showed that the crystals were true diamond.

The artificial diamonds, so far, have not been larger than microscopic specimens, and none has measured more than about half a millimetre across. That, however, is quite enough to show the correctness of the train of reasoning leading up to the achievement, and there is no reason to doubt that, working on a larger scale, larger diamonds will result. Diamonds so made burn in the air when heated to a high temperature, with formation of carbonic acid; and in lustre, crystalline form, optical properties, density and hardness, they are identical with the natural stone.

It having been shown that diamond is formed by the separation of carbon from molten iron under pressure, it became of interest to see if in some large metallurgical operations similar conditions might not prevail. A special form of steel is made at some large establishments by cooling the molten metal under intense hydraulic pressure. In some samples of the steel so made Professor Rosel, of the university of Bern, has found microscopic diamonds. The higher the temperature at which the steel has been melted the more diamonds it contains, and it has even been suggested that the hardness of steel in some measure may be due to the carbon distributed throughout its mass being in this adamantine form. The largest artificial diamond yet formed was found in a block of steel and slag from a furnace in Luxembourg; it is clear and crystalline, and measures about one-fiftieth of an inch across.

A striking confirmation of the theory that natural diamonds have been produced from their solution in masses of molten iron, the metal from which has gradually oxidized and been washed away under cycles of atmospheric influences, is afforded by the occurrence of diamonds in a meteorite. On a broad open plain in Arizona, over an area of about 5 m. in diameter, lie scattered thousands of masses of metallic iron, the fragments varying in weight from half a ton to a fraction of an ounce. There is little doubt that these fragments formed part of a meteoric shower, although no record exists as to when the fall took place.

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Near the centre, where most of the fragments have been found, is a crater with raised edges, three-quarters of a mile in diameter and 600 ft. deep, bearing just the appearance which would be produced had a mighty mass of iron—a falling star—struck the ground, scattered it in all directions, and buried itself deeply under the surface, fragments eroded from the surface forming the pieces now met with. Altogether ten tons of this iron have been collected, and specimens of the Canyon Diablo meteorite are in most collectors' cabinets. Dr A. E. Foote, a mineralogist, when cutting a section of this meteorite, found the tools injured by something vastly harder than metallic iron, and an emery wheel used for grinding it was ruined. He attacked the specimen chemically, and soon afterwards announced to the scientific world that the Canyon Diablo meteorite contained diamonds, both black and transparent. This startling discovery was subsequently verified by Professors C. Friedel and H. Moissan, and also by Sir W. Crookes.

The Ruby.—It is evident that of the other precious stones only the most prized are worth producing artificially. Apart from their inferior hardness and colour, the demand for what are known as "semi-precious stones" would not pay for the necessarily great expenses of the factory. Moreover, were it to be known that they were being produced artificially the demand—never very great—would almost cease. The only other gems, therefore, which need be mentioned in connexion with their artificial formation are those of the corundum or sapphire class, which include all the most highly prized gems, rivalling, and sometimes exceeding, the diamond in value. Here a remarkable and little-known fact deserves notice. Excepting the diamond and sapphire, each of the precious stones—the emerald, the topaz and amethyst—possesses a more noble, a harder, and more highly-prized counterpart of itself, alike in colour, but superior in brilliancy and hardness; still more strange, the precious stone to which its special name is usually attached is the variety the least prized. The ruby itself might almost be included in the same category. The true ruby consists of the earth alumina, in a clear, crystalline form, having a minute quantity of the element chromium as the colouring matter. It is often called the "Oriental Ruby," or red sapphire, and when of a paler colour, the "Pink Sapphire." But the ruby as met with in jewellers' shops of inferior standing is usually no true ruby, but a "spinel ruby" or "balas ruby," sometimes very beautiful in colour, but softer than the Oriental ruby, and different in chemical composition, consisting essentially of alumina and magnesia and a little silica, with the colouring matter chromium. The colourless basis of the true Oriental precious stones is being taken as crystallized alumina or white sapphire, when the colouring matter is red the stone is called ruby, when blue sapphire, when green Oriental emerald, when orange-yellow Oriental topaz, and when violet Oriental amethyst. Clear, colourless crystals are known as white sapphire, and are very valuable. It is evident, therefore, that whosoever succeeds in making artificially clear crystals of white sapphire has the power, by introducing appropriate colouring matter, to make the Oriental ruby, sapphire, emerald, topaz and amethyst. All of these stones, even when of small size, are costly and readily saleable, while when they are of fine quality and large size they are highly prized, a ruby of fine colour, and free from flaws, a few carats in weight, being of more value than a diamond of the same weight.

This being the case, it is not surprising that repeated attempts have been made to effect the crystallization of alumina. This is not a matter of difficulty, but unfortunately the crystals generally form thin plates, of good colour, but too thin to be useful as gems. In 1837 M. A. A. Gaudin made true rubies, of microscopic size, by fusing alum in a carbon crucible at a very high temperature, and adding a little chromium as colouring matter. In 1847 J. J. Ebelmen produced the white sapphire and rose-coloured spinel by fusing the constituents at a high temperature in boracic acid. Shortly afterwards he produced the ruby by employing borax as the solvent. The boracic acid was found to be too volatile to allow the alumina to crystallize, but the use of borax made the necessary difference. But it was not till about the year 1877 that E. Frémy and C. Feil first published a method whereby it was possible to produce a crystallized alumina from which small stones could be cut. They first formed lead aluminate by the fusion together of lead oxide and alumina. This was kept in a state of fusion in a fireclay crucible (in the composition of which silica enters largely). Under the influence of the high temperature the silica of the crucible gradually decomposes the lead aluminate, forming lead silicate, which remains in the liquid state, and alumina, which crystallizes as white sapphire. By the admixture of 2 or 3% of a chromium compound with original materials the resulting white sapphire became ruby. More recently Edmond Frémy and A. Verneuil obtained artificial rubies by reacting at a red heat with barium fluoride on amorphous alumina containing a small quantity of chromium. The rubies obtained in this manner are thus described by Frémy and Verneuil: "Their crystalline form is regular; their lustre is adamantine; they present the beautiful colour of the ruby; they are perfectly transparent, have the hardness of the ruby, and easily scratch topaz. They resemble the natural ruby in becoming dark when heated, resuming their rose-colour on cooling." Des Cloizeaux says of them that "under the microscope some of the crystals show bubbles. In converging polarized light the coloured rings and the negative black cross are of a remarkable regularity."

Other experimentalists have attacked the problem in other directions. Besides those already mentioned, L. Elsner, H. H. De Senarmont, Sainte-Claire Deville, and H. Caron and H. Debray have succeeded with more or less success in producing rubies. The general plan adopted has been to form a mixture of salts fusible at a red heat, forming a liquid in which alumina will dissolve. Alumina is now added till the fused mass will take up no more, and the crucible is left in the furnace for a long time, sometimes extending over weeks. The solvent slowly volatilizes, and the alumina is deposited in crystals, coloured by whatever colouring oxide has been added.

Mention has been made above of a stone frequently substituted for the true ruby, called the "spinel" or "balas" ruby. The spinel and ruby occur together in nature, stones from Burma being as often spinel as true Oriental ruby. In the artificial production of the ruby it sometimes happens that spinel crystallizes out when true Oriental ruby is expected. The fusion bath is so arranged that only red-coloured alumina shall crystallize out, but it is difficult to have all the materials of such purity as to ensure the complete absence of silica and magnesia. In this case, when these impurities have accumulated to a certain point they unite with the alumina, and spinel then results, as it crystallizes more easily than ruby. When all the magnesia and silica have been eliminated in this way the bath resumes its deposition of crystalline ruby. Rubies of fine colour and of considerable size have been shown in London, made on the Continent by a secret process. The writer has seen several cut stones so made weighing over a carat each, the uncut crystals measuring half an inch along a crystal edge, and weighing over 70 grains, and a clear plate of ruby cut from a single crystal weighing over 10 grains. Ruby has been made by Sir W. Roberts-Austen as a by-product in the production of metallic chromium. Oxide of chromium and aluminium powder are intimately mixed together in a refractory crucible, and the mixture is ignited at the upper part. The aluminium and chromium oxide react with evolution of so much heat that the reduced chromium is melted. Such is the intensity of the reaction that the resulting alumina is also completely fused, floating as a liquid on the molten chromium. Sometimes the alumina takes up the right amount of chromium to enable it to assume the ruby colour. On cooling the melted alumina crystallizes in large flakes, which on examination by transmitted light are seen to be true ruby. The development of the red colour is said by C. Greville-Williams only to take place at a white heat. It is not due to the presence of chromic acid, but to a reaction between alumina and chromic oxide, which requires an elevated temperature.

Artificially made but real rubies have been put on the market,

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prepared by a process of fusion by A. Verneuil. He finds that certain conditions have to be fulfilled in order to get the alumina in a transparent form. The temperature must not be higher than is absolutely necessary for fusion. The melted product must always be in the same part of the oxyhydrogen flame, and the point of contact between the melted product and the support should be reduced to as small an area as possible. M. Verneuil uses a vertical blowpipe flame directed on a support capable of movement up and down by means of a screw, so that the fused product may be removed from the zone of fusion as it gets higher by addition of fresh material. The material employed is either composed of small, valueless rubies, or alumina coloured with the right amount of chromium. It is very finely powdered and fed in through the blowpipe orifice, whence it is blown in a highly heated condition into the zone of fusion. The support is a small cylinder of alumina placed in the axis of the blowpipe. As the operation proceeds the fine grains of powder driven on to the support in the zone of fusion form a cone which gradually rises and broadens out until it becomes of sufficient size to be used for cutting. Rubies prepared in this way have the same specific gravity and hardness as the natural ruby, and they are also dichroic, and in the vacuum tube under the influence of the cathode stream they phosphoresce with a discontinuous spectrum showing the strong alumina line in the red. When properly cut and mounted it is almost impossible to distinguish them from natural stones.

The Sapphire.—Auguste Daubrée has shown that when a full quantity of chromium is added to the bath from which white sapphire crystallizes the colour is that of ruby, but when much less chromium is added the colour is blue, forming the true Oriental sapphire. The real colouring matter of the Oriental sapphire is not definitely known, some chemists considering it to be chromium and others cobalt. Artificial sapphires have been made of a fair size and perfectly transparent by the addition of cobalt to the igneous bath of alumina, but the writer does not consider them equal in colour to true Oriental sapphire.

The Oriental Emerald.—The stone known as emerald consists chemically of silica, alumina and glucina. Like the ruby, it owes its colour to chromium, but in a different state of oxidation. As already mentioned, there is another stone which consists of crystallized alumina coloured with chromium, but holding the chromium in a different state of oxidation. This is called the Oriental emerald, and, owing to its beauty of colour, its hardness and rarity, it is more highly prized than the emerald itself and commands higher prices. The Oriental emerald has been produced artificially in the same way as the ruby, by adding a larger amount of chromium to the alumina bath and regulating the temperature.

The Oriental Amethyst.—The amethyst is rock crystal (quartz) of a bluish-violet colour. It is one of the least valuable of the precious stones. The sapphire, however, is found occasionally of a beautiful violet colour; it is then called the Oriental amethyst, and, on account of its beauty and rarity, is of great value. It is evident that if to the igneous bath of alumina some colouring matter, such as manganese, is added capable of communicating a violet colour to the crystals of alumina, the Oriental amethyst will be the result. Oriental amethyst has been so formed artificially, but the stone being known only as a curiosity to mineralogists and experts in precious stones, and the public not being able to discriminate between the violet sapphire and amethystine quartz, there is no demand for the artificial stone.

The Oriental Topaz.—The topaz is what is called a semi-precious stone. It occurs of many colours, from clear white to pink, orange, yellow and pale green. The usual colour is from straw-yellow to sherry colour. The exact composition of the colouring matter is not known; it is not entirely of mineral origin, as it changes colour and sometimes fades altogether on exposure to light. Chemically the topaz consists of alumina, silica and fluorine. It is not so hard as the sapphire. There is also a yellow variety of quartz, which is sometimes called "false topaz." The Oriental topaz, on the other hand, is a precious stone of great value. It consists of clear crystalline sapphire coloured with a small quantity of ferric oxide. It has been produced artificially by adding iron instead of chromium to the matrix from which the white sapphire crystallizes.

The Zircon.—The zircon is a very beautiful stone, varying in colour, like the topaz, from red and yellow to green and blue. It is sometimes met with colourless, and such are its refractive powers and brilliancy that it has been mistaken for diamond. It is a compound of silica and zirconia. H. Sainte-Claire Deville formed the zircon artificially by passing silicon fluoride at a red heat over the oxide zirconia in a porcelain tube. Octahedral crystals of zircon are then produced, which have the same crystalline form, appearance and optical qualities as the natural zircon.

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GEMBLOUX, a town in the province of Namur and on the borders of Brabant, Belgium, 25 m. S.E. of Brussels on the main line to Namur and Luxemburg. Pop. (1904) 4643. It is a busy place with large railway and engine works, and the junction for several branch lines. On the 31st of January 1578 Don John of Austria gained here a signal victory over the army of the provinces led by Antony de Goignies.

GEMINI ("The Twins," *i.e.* Castor and Pollux), in astronomy, the third sign in the zodiac, denoted by the symbol II. It is also a constellation, mentioned by Eudoxus (4th century B.C.) and Aratus (3rd century B.C.), and catalogued by Ptolemy, 25 stars, Tycho Brahe 25, and Hevelius 38. By the Egyptians this constellation was symbolized as a couple of young kids; the Greeks altered this symbol to two children, variously said to be Castor and Pollux, Hercules and Apollo, or Triptolemus and Iasion; the Arabians used the symbol of a pair of peacocks. Interesting objects in this constellation are: α Geminorum or Castor, a very fine double star of magnitudes 2·0 and 2·8, the fainter component is a spectroscopic binary; η Geminorum, a long period (231 days) variable, the extreme range in magnitude being 3·2 to 4; ζ Geminorum, a short period variable, 10·15 days, the extreme range in magnitude being 3·7 to 4·5; *Nova* Geminorum, a "new" star discovered in 1903 by H. H. Turner of Oxford; and the star cluster M.35 Geminorum, a fine and bright, but loose, cluster, with very little central condensation.

GEMINIANI, FRANCESCO (*c.* 1680–1762), Italian violinist, was born at Lucca about 1680. He received lessons in music from Alessandro Scarlatti, and studied the violin under Lunati (Gobbo) and afterwards under Corelli. In 1714 he arrived in London, where he was taken under the special protection of the earl of Essex, and made a living by teaching and writing music. In 1715 he played his violin concertos with Handel at the English court. After visiting Paris and residing there for some time, he returned to England in 1755. In 1761 he went to Dublin, where a servant robbed him of a musical manuscript on which he had bestowed much time and labour. His vexation at this loss is said to have hastened his death on the 17th of September 1762. He appears to have been a first-rate violinist, but most of his compositions are dry and deficient in melody. His *Art of Playing the Violin* is a good work of its kind, but his *Guida*

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armonica is an inferior production. He published a number of solos for the violin, three sets of violin concertos, twelve violin trios, *The Art of Accompaniment on the Harpsichord, Organ*, &c., *Lessons for the Harpsichord* and some other works.

GEMISTUS PLETHO (or PLETHON), **GEORGIUS** (*c.* 1355–1450), Greek Platonic philosopher and scholar, one of the chief pioneers of the revival of learning in Western Europe, was a Byzantine by birth who settled at Mistra in the Peloponnese, the site of ancient Sparta. He changed his name from Gemistus to the equivalent Pletho ("the full"), perhaps owing to the similarity of sound between that name and that of his master Plato. He invented a religious system founded on the speculative mysticism of the Neoplatonists, and founded a sect, the members of which believed that the new creed would supersede all existing forms of belief. But he is chiefly memorable for having introduced Plato to the Western world. This took place upon his visit to Florence in 1439, as one of the deputies from Constantinople on occasion of the general council. Cardinal Bessarion became his disciple; he produced a great impression upon Cosimo de' Medici; and though not himself making any very important contribution to the study of Plato, he effectually shook the exclusive domination which Aristotle had exercised over European thought for eight centuries. He promoted the union of the Greek and Latin Churches as far as possible, but his efforts in this direction bore no permanent fruit. He probably died before the capture of Constantinople. The most important of his published works are treatises on the distinction between Plato and Aristotle as philosophers (published at Venice in 1540); on the religion of Zoroaster (Paris, 1538); on the condition of the Peloponnese (ed. A. Ellissen in *Analekten der mittel- und neugriechischen Literatur*, iv.); and the Νόμων (ed. C. Alexandre, Paris, 1858). In addition to these he compiled several volumes of excerpts from ancient authors, and wrote a number of works on geography, music and other subjects, many of which still exist in MS. in various European libraries.

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GEMMI PASS, a pass (7641 ft.) leading from Frutigen in the Swiss canton of Bern to Leukerbad in the Swiss canton of the Valais. It is much frequented by travellers in summer. From Kandersteg (7½ m. by road above Frutigen, which is 12 m. by rail from Spiez on the Berne-Interlaken line) a mule path leads to the summit of the pass, passing over the Spitalmatte plain, where in 1782 and again in 1895 a great avalanche fell from the Altels (11,930 ft.) to the S.E., causing on both occasions great loss of life and property. The mule path descends on the south side of the pass by an extraordinary series of zigzags, made accessible for mules (though no rider is now allowed to descend on mule-back) by a band of Tirolese workmen in 1740–1741. They are cut in a very steep wall of rock, about 1800 ft. in height, and lead down to the village of Leukerbad, which is 94 m. by carriage road past Leuk above the Susten station in the Rhône valley and on the Simplon line. (W. A. B. C.)

GENDARMERIE, originally a body of troops in France composed of *gendarmes* or men-at-arms. In the days of chivalry they were mounted and armed cap-à-pie, exactly as were the lords and knights with whom they constituted the most important part of an army. They were attended each by five soldiers of inferior rank and more lightly armed. In the later middle ages the men-at-arms were furnished by owners of fiefs. But after the Hundred Years' War this feudal gendarmerie was replaced by the *compagnies d'ordonnance* which Charles VII. formed when the English were driven out of France, and which were distributed throughout the whole extent of the kingdom for preserving order and maintaining the king's authority. These companies, fifteen in number, were composed of 100 lances or gendarmes fully equipped, each of whom was attended by at least three archers, one *coutillier* (soldier armed with a cutlass) and one *varlet* (soldier's servant). The states-general of Orleans (1439) had voted a yearly subsidy of 1,200,000 livres in perpetuity to keep up this national soldiery, which replaced, and in fact was recruited chiefly amongst, the bands of mercenaries who for about a century had made France their prey. The number and composition of the *compagnies d'ordonnance* were changed more than once before the reign of Louis XIV. This sovereign on his accession to the throne found only eight companies of gendarmes surviving out of an original total of more than one hundred, but after the victory of Fleurus (1690), which had been decided by their courage, he increased their number to sixteen. The four first companies (which were practically guard troops) were designated by the names of *Gendarmes écossais*, *Gendarmes anglais*, *Gendarmes bourguignons* and *Gendarmes flamands*, from the nationality of the soldiers who had originally composed them; but at that time they consisted entirely of French soldiers and officers. These four companies had a captain-general, who was the king. The fifth company was that of the queen; and the others bore the name of the princes who respectively commanded them. This organization was dissolved in 1788. The Revolution swept away all these institutions of the monarchy, and, with the exception of a short revival of the *Gendarmes de la garde* at the Restoration, henceforward the word "gendarmerie" possesses an altogether different significance—viz. military police.

GENEALOGY (from the Gr. γένος, family, and λόγος, theory), a pedigree or list of ancestors, or the study of family history.

1. *Biblical Genealogies.*—The aims and methods of ancient genealogists require to be carefully considered before the value of the numerous ancestral lists in the Bible can be properly estimated. Many of the old "genealogies," like those of Greece, have arisen from the desire to explain the origin of the various groups which they include. Information relating to the subdivision of tribes, their relation to each other, the intermingling of populations and the like are thus frequently represented in the form of genealogies. The "sons" of a "father" often stand merely for the branches of a family as they existed at some one period, and since in course of time tribal relations would vary, lists which have originated at different periods will present discrepancies. It is obvious that many of the Biblical names are nothing more than personifications of nations, tribes, towns, &c., which are grouped together to convey some idea of the bond by which they were believed to be connected.

For the personification of a people or tribe, cp. Gen. xxxiv. 30 ("Jacob said . . . I am a few men"), Josh. xvii. 14 ("the children of Joseph said . . . I am a numerous people"), Ex. xiv. 25 ("Egypt said, let me flee"), Jos. ix. 7, 1 Sam. v. 10, &c.; see G. B. Gray on Numbers, xx. 14 (*Internat. Crit. Comm.*). Thus we find among the "sons" of Japhet: (the nations) Gomer, Javan, Tubal; Canaan "begat" Sidon and Heth; the "sons" of Ishmael include the well-known tribes Kedar and Jetur; Jacob, or the synonym Israel, personifies the "children of Israel" (cf. use of "I," "thou" of the Israelites in Deut., and in poetical passages). The recognition of this characteristic usage often furnishes an ethnological interpretation to those genealogical stories which obviously do not relate to persons, but to tribes or peoples personified. The Edomites and Israelites are regarded as "brothers" (cf. Num. xx. 14, Deut. ii. 4, Am. i. 11), and since Esau (Edom) was born before Jacob (Israel) it would appear that the Edomites were held to be the older nation. The relationship of two clans is expressed as a marriage, or the wife is the territory which is dominated by the husband (tribe); see CALEB. If the woman is not of noble blood, but is a handmaiden or concubine, her children are naturally not upon the same footing as those of the wife; consequently the descendants of Ishmael, the son of Hagar (Sarah's maid), are inferior to Isaac and his descendants, whilst the children of Keturah ("incense"), Abraham's concubine, are still lower—from the Israelite point of view. This application of the terms of relationship is characteristic of the Semites. The "father" of the Rechabites is their head or founder (cf. 1 Sam. x. 12: "who is their father?"), and a common bond, which is not necessarily physical, unites all "sons," whether they are "sons of the prophets" (members of prophetic guilds) or "sons of Belial" (worthless men).

The interpretation of ethnological or statistical genealogies may easily be pushed too far. Every case has to be judged upon

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its own merits, and due allowance must be made both for the ambition of the weaker to claim or to strengthen an alliance with the stronger, and for the not unnatural desire of clans or individuals to magnify the greatness of their ancestry. The first step must always be the careful comparison of related lists in order to test the consistency of the tradition. Next, these must be critically studied in the light of all available historical material, though indeed such evidence is not necessarily conclusive. Finally, (*a*) literary criticism must be employed to determine if possible the dates of such lists, since obviously a contemporary register is more trustworthy than one which is centuries later; (*b*) a critical estimate of the character of the names and of their use in various periods of Old Testament history is of importance in estimating the antiquity of the list[1]—for example, many of the names in Chronicles attributed to the time of David are indubitably exilic or post-exilic; and (*c*) principles of ordinary historical probability are as necessary here as in dealing with the genealogies of other ancient peoples, and attention must be paid to such features as fluctuation in the number of links, representation of theories inconsistent with the growth of national life, schemes of relationship not in accordance with sociological conditions, &c.

The Biblical genealogies commence with "the generations of the heaven and earth," and by a process of elimination pass from Adam and Eve by successive steps to Jacob and to his sons (the tribes), and finally to the subdivisions of each tribe (cp. 1 Chron. i.–ix. 1). According to this theory every Israelite could trace back his descent to Jacob, the common father of the whole nation (Josh. vii. 17 seq., 1 Sam. x. 21). Such a scheme, however, is full of manifest improbabilities. It demands that every tribe and every clan should have been a homogeneous group which had preserved its unity from the earliest times, that family records extending back for several centuries were in existence, and that such a tribe as Simeon was able to maintain its independence in spite of the tradition that it lost its autonomy in very early times (Gen. xlix. 7). The whole conception of the unity of the tribes cannot be referred to a date previous to the time of David, and in the older writings a David or a Jeroboam was sufficiently described as the son of Jesse or of Nebat. The genealogical zeal as represented in the Old Testament is chiefly of later growth, and the exceptions are due to interpolation (Josh. vii. 1 18, contrast *v.* 24), or to the desire to modify or qualify an older notice. This, in the case of Saul (1 Sam. ix. 1), has led to textual corruption; a list of such a length as his should have reached back to one of the "sons" of Benjamin (cf. *e.g.* Gen. xlvi. 21), else it were purposeless. The genealogies, too, are often inconsistent amongst themselves and in contradiction to their object. They show, for example, that the population of southern Judah, so far from being "Israelite" was half-Edomite (see JUDAH), and several of the clans in this district bear names which indicate their original affinity with Midian or Edom. Moreover, there was a free intermixture of races, and many cities had a Canaanite (*i.e.* pre-Israelite) population which must have been gradually absorbed by the Israelites (cf. Judg. i.). That spirit of religious exclusiveness which marked later Judaism did not become prominent before the Deuteronomic reformation (see DEUTERONOMY), and it is under its influence that the writings begin to emphasize the importance of maintaining the purity of Israelite blood, although by this time the fusion was complete (see Judg. iii. 6) and for practical purposes a distinction between Canaanites and Israelites within the borders of Palestine could scarcely be discerned.

Many of the genealogical data are intricate. Thus, the interpretation of Gen. xxxiv. is particularly obscure (see LEVITES *ad fin.*; SIMEON). As regards the sons of Jacob, it is difficult to explain their division among the four wives of Jacob; viz. (*a*) the sons of Leah are Reuben, Simeon, Levi and Judah (S. Palestine), Issachar and Zebulun (in the north), and Dinah (associated with Shechem); (*b*) of Leah's maid Zilpah, Gad and Asher (E. and N. Palestine); (*c*) of Rachel, Joseph (Manasseh and Ephraim, *i.e.* central Palestine) and Benjamin; (*d*) of Rachel's maid Bilhah, Dan and Naphtali (N. Palestine). It has been urged that (*b*) and (*d*) stood upon a lower footing than the rest, or were of later origin; or that Bilhah points to an old clan associated with Reuben (Gen. xxxv. 22) or Edom (Bilhan, Gen. xxxvi. 27), whilst Zilpah represents an Aramaean strain. Tradition may have combined distinct schemes, and the belief that the wives were Aramaean at least coincides with the circumstance that Aramaean elements predominated in certain of the twelve tribes. The number "twelve" is artificial and can be obtained only by counting Manasseh and Ephraim as one or by omitting Levi, and a careful study of Old Testament history makes it extremely difficult to recover the tribes as historical units. See, on these points, the articles on the several tribes, B. Luther, *Zeit. d. alttest. Wissens.* (1901), pp. 1 seq.; G. B. Gray, *Expositor* (March 1902), pp. 225-240, and in *Ency. Bib.*, art. "Tribes"; and H. W. Hogg's thorough treatment of the tribes in the last-mentioned work.

The ideal of purity of descent shows itself conspicuously in portions of Deuteronomic law (Deut. vii. 1-3, xxiii. 2-8), and in the reforms of Nehemiah and Ezra (Ezr. ix. 1-4, 11 sqq.; Neh. xiii. 1-3). The desire to prove the continuity of the race, enforced by the experience of the exile, gave the impetus to genealogical zeal, and many of the extant lists proceed from this age when the true historical succession of names was a memory of the past. This applies with special force to the lists in Chronicles which present finished schemes of the Levitical divisions by the side of earlier attempts, with consequent confusion and contradiction. Thus the immediate ancestors of Ethan appear in the time of Hezekiah (2 Chron. xxix. 12), but he with Asaiah and Heman are contemporaries of David, and their genealogies from Levi downwards contain a very unequal number of links (1 Chron. vi.). By another application of genealogical method the account of the institution of priests and Levites by David (1 Chron. xxiv.) presents many names which belong solely to post-exilic days, thus suggesting that the scribes desired to show that the honourable families of their time were not unknown centuries previously. Everywhere we find the results of much skill and labour, often in accordance with definite theories, but a thorough investigation reveals their weakness and often quite incidentally furnishes valuable evidence of another nature.

The intricate Levitical genealogies betray the result of successive genealogists who sought to give effect to the development of the hierarchal system (see LEVITES). The climax is reached when all the Levites are traced back to Gershon, Kehath and Merari, to which are ascribed respectively Asaph, Heman and Ethan (or Jeduthun). The last two were not originally Levites in the later accepted sense of the term (see 1 Kings iv. 31). To Kehath is reckoned an important subdivision descended from Korah, but in 2 Chron. xx. 19 the two are distinct groups, and Korah's name is that of an Edomite clan (Gen. xxxvi. 5, 14, 18) related to Caleb, and thus included among the descendants of Judah (1 Chron. ii. 43). Cases of adjustment, redistribution and "Levitising" of individuals are frequent. There are traces of varying divisions both of the singers (Neh. xi. 17) and of the Levites (Num. xxvi. 58; Ezr. ii. 40, iii. 9; 1 Chron. xv. 5-10, xxiii.), and it is noteworthy that in the case of the latter we have mention of such families as Hebroni (Hebronite), Libni (from Libnah)—districts of South Judaean towns. In fact, a significant number of Levitical names find their analogy in the lists of names belonging to Judah, Simeon and even Edom, or are closely connected with the family of Moses; *e.g.* Mushi (*i.e.* Mosaite), Gershon and Eleazar (cp. Gershom and Eliezer, sons of Moses). The Levites bear a clan-name, and the genealogies show that many of them were connected with the minor clans and families of South Palestine which included among them Moses and his kin. Hence, it is not unnatural that Obed-edom, for example, obviously a southerner, should have been reckoned later as a Levite, and the work ascribed by the chronicler's history to the closing years of David's life may be influenced by the tradition that it was through him these mixed populations first attained importance. See further DAVID; JEWS; LEVITES.

In the time of Josephus every priest was supposed to be able to prove his descent, and perhaps from the time of Ezra downwards lists were carefully kept. But when Anna is called an Asherite (Luke ii. 36), or Paul a Benjamite (Rom. xi. 1), family tradition was probably the sole support to the claim, although the tribal feeling had not become entirely extinct. The genealogies of Jesus prefixed to two of the gospels are intended to prove that He was a son of David. But not that alone, for in Matt. i. he is traced back to Abraham the father of the Jews, whilst in Luke iii. He, as the second Adam, is traced back to the first man. The two lists are hopelessly inconsistent; not because one of them follows the line of Mary, but because they represent independent attempts. That in Matthew is characteristically arranged in

[1] G. B. Gray's *Hebrew Proper Names* (1896), with his article in the *Expositor* (Sept. 1897), pp. 173-190, should be consulted for the application and range of Hebrew names in O.T. genealogies and lists.

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three series of fourteen generations each through the kings of Judah, whilst Luke's passes through an almost unknown son of David; in spite of this, however, both converge in the person of Zerubbabel.

See further, A. C. Hervey, *Genealogies of Our Lord*; H. von Soden, *Ency. Bib.* ii. col. 1666 sqq.; B. W. Bacon, Hastings' *Dict. Bib.* ii. pp. 138 seq. On the subject generally see J. F. M'Lennan's *Studies* (2nd ser., ch. ix., "fabricated genealogies"); S. A. Cook, *Ency. Bib.* ii. col. 1657 sqq. (with references); W. R. Smith, *Kinship and Marriage* (2nd ed., especially ch. i.). (S. A. C.)

2. *Greek and Roman Genealogies.*—A passing reference only is needed to the intricate genealogies of gods and sons of gods which form so conspicuous a feature in classical literature.[1] In every one of the numerous states into which ancient Greece was divided there were aristocratic families, whose genealogies as a rule went back to prehistoric times, their first ancestor being some hero of divine descent, from whom, or from some distinguished younger ancestor, they derived their names. Many of these families were, as families, undoubtedly of great antiquity even at the beginning of the historical period; and in several instances they continued to maintain a conspicuous and separate existence for centuries. The element of family pride is prominent in the poetry of the Megarian Theognis; and in an inscription belonging to the 2nd century B.C. the recipient of certain honours from the community of Gythium is represented as the thirty-ninth in direct descent from the Dioscuri and the forty-first from Heracles. Even in Athens, long after the constitution had become thoroughly democratic, some of the clans continued to be known as Eupatridae (of noble family); and Alcibiades, for example, as a member of the phratria of the Eurysacidae, traced his origin through many generations to Eurysaces, who was represented as having been the first of the Aeacidae to settle in Attica. The Corinthian Bacchiadae traced their descent back to Heracles, but took their name from Bacchis, a younger ancestor. It is very doubtful, however, whether such pedigrees as this were very seriously put forward by those who claimed them; and it is certain that, almost along the whole line, they were unsupported by evidence.[2] We have the authority of Pollux (viii. 111) for stating that the Athenian γένη, of which there were thirty in each φρατρία, were organized without any exclusive regard being had to blood-relationship; they were constantly receiving accessions from without; and the public written registers of births, adoptions and the like do not appear to have been preserved with such care as would have made it possible to verify a pedigree for any considerable portion even of the strictly historical period.[3]

The great antiquity of the early Roman (patrician) *gentes*, who universally traced themselves back to illustrious ancestors, is indisputable; and the rigid exclusiveness with which each preserved its *hereditates gentiliciae* or *sacra gentilicia* is sufficiently illustrated by the fact that towards the close of the republic there were not more than fifty patrician families (Dion. Halic. i. 85). Yet even in these it is obvious that, owing to the frequency of resort to the well-recognized practice of adoption, while there was every guarantee for the historical identity of the family, there was none (documents apart) for the personal genealogy of the individual. There is no evidence that sufficient records of pedigree were kept during the earlier centuries of the Roman commonwealth, although the leading houses drew up genealogical tables, and their family pedigree was painted on the walls of the entrance hall. In later times, it is true, even plebeian families began to establish a prescriptive right (known as the *jus imaginum*) to preserve in small wooden shrines in their halls the busts (or rather, wax portrait masks fastened on to busts) of those of their members who had attained to curule office, and to exhibit these in public on appropriate occasions. Under these *imagines majorum*[4] it became usual to inscribe on the wall their respective *tituli*, the relationship of each to each being indicated by means of connecting lines; and thus arose the *stemmata gentilicia*, which at a later time began to be copied into family records. In the case of plebeian families (whose stemmata in no case went farther back than 366 B.C.) these written genealogies were probably trustworthy enough; but in the case of patricians who went back to Aeneas,[5] so much cannot, it is obvious, be said; and from a comparatively early period it was clearly recognized that such records lent themselves too readily to the devices of the falsifier and the forger to deserve confidence or reverence (Pliny, *H.N.* xxxv. 2; Juv. viii. 1).

Thus, parvenus were known to place the busts of fictitious ancestors in the shrines and to engage needy literary men to trace back their descent even to Aeneas himself.

The many and great social changes which marked the closing centuries of the Western empire almost invariably militated with great strength against the maintenance of an aristocracy of birth; and from the time of Constantine the dignity of patrician ceased to be hereditary.[6]

3. *Modern.*—Two forces have combined to give genealogy its importance during the period of modern history: the laws of inheritance, particularly those which govern the descent of real estate, and the desire to assert the privileges of a hereditary aristocracy. But it is long before genealogies are found in the possession of private families. The succession of kings and princes are in the chronicle book; the line of the founders and patrons of abbeys are recorded by the monks with curious embellishment of legend. But the famous suit of Scrope against Grosvenor will illustrate the late appearance of private genealogies in England. In 1385 Sir Richard Scrope, lord of Bolton, displaying his banner in the host that invaded Scotland, found that his arms of a golden bend in a blue field were borne by a knight of the Chester palatinate, one Sir Robert Grosvenor. He carried the dispute to a court of chivalry, whose decision in his favour was confirmed on appeal to the king. Grosvenor asserted that he derived his right from an ancestor, Sir Gilbert Grosvenor, who had come over with the Conqueror, while an intervening claimant, a Cornish squire named Thomas Carminowe, boasted that his own ancestors had borne the like arms since the days of King Arthur's Round Table. It is remarkable that in support of the false statements made by the claimants no written genealogy is produced. The evidence of tombs and monuments and the reports of ancient men are advanced, but no pedigree is exhibited in a case which hangs upon genealogy. It is possible that the art of pedigree-making had its first impulse in England from the many genealogies constructed to make men familiar with the claims of Edward III. to the crown of France, a second crop of such royal pedigrees being raised in later generations during the contests of York and Lancaster. But it is not until after the close of the middle ages that genealogies multiply in men's houses and are collected into volumes. The medieval baron, knight or squire, although proud of the nobility of his race, was content to let it rest upon legend handed down the

[1] On the subject generally see articles "Genos" and "Gens," by A. H. Greenidge, in Smith's *Dictionary of Greek and Roman Antiquities* (3rd ed., 1890), where the chief authorities are given.

[2] The fondness of Euripides for genealogies is ridiculed by Aristophanes (*Acharnians*, 47).

[3] All the earlier Greek historians appear to have constructed their narratives on assumed genealogical bases. The four books of Hecataeus of Miletus dealt respectively with the traditions about Deucalion, about Heracles and the Heraclidae, about the early settlements in Peloponnesus, and about those in Asia Minor; he further made a pedigree for himself, in which his sixteenth ancestor was a god. The works of Hellanicus of Lesbos bore titles (Δευκαλιώνεια and the like) which sufficiently explain their nature; his disciple, Damastes of Sigeum, was the author of genealogical histories of Trojan heroes; Apollodorus of Athens made use of three books of Γενεαλογικά by Acusilaus of Argos; Pherecydes of Leros also wrote γενεαλογίαι. See J. A. F. Töpffer, *Attische Genealogie* (1889); also J. H. Schubart, *Quaesti. geneal. historicae* (1832); G. Marckscheffel, *De genealogica Graecorum poësi* (1840).

[4] The chief authority on this subject is Polybius (vi. 53); see also T. Mommsen, *Römisches Staatsrecht*, i. (1887), p. 442.

[5] At the funeral of Drusus the images of Aeneas, of the Alban kings, of Romulus, of the Sabine nobles, of Attus Clausus, and of "the rest of the Claudians" were exhibited (Tac. *Ann.* iv. 9).

[6] The Roman stemmata had, as will be seen afterwards, great interest for the older modern genealogists. Reference may be made to J. Glandorp's *Descriptio gentis Antoniae* (1557); to the *Descriptio gentis Juliae* (1576) of the same author; and to J. Hübner's *Genealogische Tabellen*. See also G. A. Ruperti's *Tabulae genealogicae sive stemmata nobiliss. gent. Rom.* (1794). (X.)

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generations. The exact line of his descent was sought only when it was demanded for a plea in the king's courts to support his title to his lands.

From the first the work of the genealogist in England had that taint of inaccuracy tempered with forgery from which it has not yet been cleansed. The medieval kings, like the Welsh gentry of later ages, traced their lines to the housebold of Eden garden, while lesser men, even as early as the 14th century, eagerly asserted their descent from a companion of the Conqueror. Yet beside these false imaginations we find the law courts, whose business was often a clash of pedigrees, dealing with genealogies centuries long which, constructed as it would seem from worthy evidences, will often bear the test of modern criticism.

Genealogies in great plenty are found in manuscripts and printed volumes from the 16th century onward. Remarkable among these are the descents recorded in the Visitation Books of the heralds, who, armed with commissions from the crown, the first of which was issued in 20 Hen. VIII., perambulated the English counties, viewing arms and registering pedigrees. The notes in their register books range from the simple registration of a man's name and arms to entries of pedigrees many generations long. To the heralds these visitations were rare opportunities of obtaining fees from the visited, and the value of the pedigrees registered is notably unequal. Although it has always been the boast of the College of Arms that Visitation records may be produced as evidence in the law courts, few of these officially recorded genealogies are wholly trustworthy. Many of the officers of arms who recorded them were, even by the testimony of their comrades, of indifferent character, and even when the visiting herald was an honourable man and an industrious he had little time to spare for the investigation of any single genealogy. Deeds and evidences in private hands may have been hastily examined in some instances—indeed, a herald's summons invites their production—and monuments were often viewed in the churches, but for the most part men's memories and the hearsay of the country-side made the backbone of the pedigree. The further the pedigree is carried beyond the memory of living men the less trustworthy does it become. The principal visitations took place in the reigns of Elizabeth, James I. and Charles II. No commission has been issued since the accession of William and Mary, but from that time onwards large numbers of genealogies have been recorded in the registers of the College of Arms, the modern ones being compiled with a care which contrasts remarkably with the unsupported statements of the Tudor heralds.

Outside the doors of the College of Arms genealogy has now been for some centuries a favourite study of antiquaries, whose researches have been of the utmost value to the historian, the topographer and the biographer. County histories, following the example of Dugdale's Warwickshire folios, have given much space to the elucidation of genealogies and to the amassing of material from which they may be constructed. Dugdale's great work on the English baronage heads another host of works occupied with the genealogy of English noble families, and the second edition of "G.E.C.'s" *Complete Peerage* shows the mighty advance of the modern critical spirit. Nevertheless, the 20th century has not yet seen the abandoning of all the genealogical fables nourished by the Elizabethan pedigree-mongers, and the ancestry of many noble houses as recorded in popular works of reference is still derived from mythical forefathers. Thus the dukes of Norfolk, who, by their office of earl marshal are patrons of the heralds, are provided with a 10th-century Hereward for an ancestor; the dukes of Bedford, descendants of a 15th-century burgess of Weymouth, are traced to the knightly bouse of Russell of Kingston Russell, and the dukes of Westminster to the mytbical Gilbert le Grosvenor who "came over in the train of the Conqueror."

Genealogical research has, however, made great advance during the last generation. The critical spirit shown in such works as Round's *Studies in Peerage and Family History* (1901) has assailed with effective ridicule the methods of dishonest pedigree-makers. Much raw material of genealogy has been made available for all by the publication of parish registers, marriage-licence allegations, monumental inscriptions and the like, and above all by the mass of evidences contained in the volumes issued by the Public Record Office.

Within a small space it is impossible to set forth in detail the methods by which an English genealogy may be traced. But those who are setting out upon the task may be warned at the outset to avoid guesswork based upon the possession of a surname which may be shared by a dozen families between whom is no tie of kinship. A man whose family name is Howard may be presumed to descend from an ancestor for whom Howard was a personal name: it may not be presumed that this ancestor was he in whom the dukes of Norfolk have their origin. A genealogy should not be allowed to stray from facts which can be supported by evidence. A man may know that his grandfather was John Stiles who died in 1850 at the age of fifty-five. It does not follow that this John is identical with the John Stiles who is found as baptized in 1795 at Blackacre, the son of William Stiles. But if John the grandfather names in his letters a sister named Isabel Nokes, while the will of William Stiles gives legacies to his son and daughter John Stiles and Isabel Nokes, we may agree that reasonable proof has been given of the added generation. A new pedigree should begin with the carefully tested statements of living members of a family. The next step should be to collate such family records as bible entries, letters and diaries, and inscriptions on mourning rings, with monumental inscriptions of acknowledged members of the family. From such beginnings the genealogist will continue his search through the registers of parishes with which the family has been connected; wills and administrations registered in the various probate courts form, with parish registers, the backbone of most middle-class family histories. Court rolls of manors in which members of the family were tenants give, when existing and accessible, proofs which may carry back a line, however obscure, through many descents. When these have been exhausted the records of legal proceedings, and notably those of the court of chancery, may be searched. Few English households have been able in the past to avoid an appeal to the chancery court, and the bill and answer of a chancery plaintiff and defendant will often tell the story of a family quarrel in which a score of kinsfolk are involved, and the pleadings may contain the material for a family tree of many branching generations. Coram Rege and De Banco rolls may even, in the course of a dispute over a knight's fee or a manor carry a pedigree to the Conquest of England, although such good fortune can hardly be expected by the searcher out of an undistinguished line. In proving a genealogy it must be remembered that in the descent of an estate in land must be sought the best evidence for a pedigree.

At the present time the study of genealogy grows rapidly in English estimation. It is no less popular in America, where societies and private persons have of late years published a vast number of genealogies, many of which combine the results of laborious research in American records with extravagant and unfounded claims concerning the European origin of the families dealt with. A family with the surname of Cuthbert has been known to hail St Cuthbert of Lindisfarne as its progenitor, and one surnamed Eberhardt has incorporated in its pedigree such German princes of old times as were found to have Eberhardt for a Christian name.

Genealogy in modern France has, with a few honourable exceptions, fallen into the hands of the popular pedigree-makers, whose concern is to gratify the vanity of their employers. Italy likewise has not yet shaken off the influence of those venal genealogists who, three hundred years ago, sold pedigrees cheaply to all comers. But much laborious genealogical inquiry had been made in Germany since the days of Hübner, and even in Russia there has been some attempt to apply modern standards of criticism to the chronicles of the swarming descendants of the blood of Rurik.

In no way is the gap made by the Dark Ages between ancient and modern history more marked than by the fact that no

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European family makes a serious claim to bridge it with its genealogy. The unsupported claim of the Roman house of Massimo to a descent from Fabius Maximus is respectable beside such legends as that which made Lévis-Mirepoix head of the priestly tribe of Levi, but even the boast of such remote ancestry has now become rare. The ancient sovereign houses of Europe are, for the most part, content to attach themselves to some ancestor who, when the mist that followed the fall of the Western empire begins to lift, is seen rallying with his sword some group of spearmen.

AUTHORITIES.—Genealogical works have been published in such abundance that the bibliographies of the subject are already substantial volumes. Amongst the earlier books from the press may be noted Benvenuto de San Georgio's *Monitsferrati marchionis et principum regiae propagium successionumque series* (1515); Pingonius's *Arbor gentilitiae Sabaudiae Saxoneaque domus* (1521); Gebweiler's *Epitome regii ac vetustissimi ortus Caroli V. et Ferdinandi I., omniumque archiducum Austriae et comitum Habsburgiensium* (1527); Meyer's work on the counts of Flanders (1531), and Du Boulay's genealogies of the dukes of Lorraine (1547). Later in the same century Reineck of Helmstadt put forth many works having a wider genealogical scope, and we may cite Henninges's *Genealogiae Saxonicae* (1587) and *Theatrum genealogicum* (1598), and Reusner's *Opus genealogicum catholicum* (1580–1592). For the politically inconvenient falseness of François de Rosières' *Stemmata Lotharingiae ac Barri ducum* (1580), wherein the dukes of Lorraine were deduced from the line of Charlemagne, the author went to the Bastille by the parlement of Paris and his book suppressed.

The 17th century saw the production in England of Dugdale's great *Baronage* (1675–1676), a work which still holds a respectable place by reason of its citation of authorities, and of local and family history of the royal house. In the same century André Duchesne, the historian of the Montmorencys, Pierre d'Hozier, the chronicler of the house of La Rochefoucauld, Rittershusius, Imhoff, Spener, Lohmeier and many others contributed to the body of continental genealogies. Pierre de Guibours, known as Père Anselme de Ste Marie, published in 1674 the first edition of his magnificent *Histoire généalogique de la maison royale de France, des pairs, grands officiers de la couronne et de la maison du roy et des anciens barons du royaume*. Of this encyclopaedic work a third and complete edition appeared in 1726–1733. A modern edition under the editorship of M. Potier de Courcy began to be issued in 1873, but remains incomplete. Among 18th-century work Johann Hübner's *Bibliotheca genealogica* (1729) and *Genealogische Tabellen* (1737–1743), with Lenzen's commentary on the latter work (*c.* 1756), may be signalized, with Gatterer's *Handbuch der Genealogie* (1761) and his *Abriss der Genealogie* (1788), the latter an early manual on the science of genealogy, and Bergeret de Grancourt's *Diplomatica augustae gentis Habsburgicae* (1737) is the imperial genealogy compiled by the emperor's own historiographer.

Modern peerages in England may be said to date from that of Arthur Collins, whose one-volume first edition was published in 1709. The fifth edition appeared in 1778, in eight volumes, to be republished in 1812 by Sir Egerton Brydges, the "Baptist Hatton" of Disraeli's novel, who corrected many legendary pedigrees, besides inserting his own forged descent from a common ancestor with the dukes of Chandos. From this work and from the Irish peerage of Lodge (as re-edited by Archdall) most of the later peerages have quarried their material. With these may be named the baronetages of Wotton and Betham. Of modern popular peerages and baronetages that of Burke has been published since 1822 in many editions and now appears yearly. Most important for the historian are the *Complete Peerage* of G. E. C[ockayne] (2nd ed., 1910), and the *Complete Baronetage* of the same author. The *Peerage of Scotland* (1769) of Sir Robert Douglas of Glenbervie came to a second edition in 1813, edited by J. P. Wood, and the whole work has been revised and re-edited by Sir James Balfour Paul (1904, &c.). Of the popular manuals of English untitled families, Burke's *Genealogical and Heraldic Dictionary of the Landed Gentry* (1833–1858) is now brought up to date from time to time and reissued as the *Landed Gentry*.

Lists of pedigrees in English printed works are supplied by Marshall's *Genealogist's Guide* (1903), while pedigrees in the manuscript collections of the British Museum are indexed in the list of R. Sims (1849). Valuable genealogical material will be found in such periodicals as the *Genealogist*, the *Herald and Genealogist*, the *Topographer and Genealogist*, *Collectanea topographica et genealogica*, *Miscellanea genealogica et heraldica*, and the *Ancestor*. In Germany the *Deutscher Herold* is the organ of the Berlin Heraldic and Genealogical Society. The *Nederlandsche Leeuw* is a similar publication in the Low Countries.

Modern criticism of the older genealogical methods will be found in J. H. Round's *Peerage and Pedigree*, 2 vols. (London, 1910), and in other volumes by the same author. The Harleian Society has published many volumes of the Herald's Visitations; and the British Record Society's publications, supplying a key to a vast mass of wills, Chancery suits and marriage licences, are of still greater importance. The *Victoria History of the Counties of England* includes genealogies of the ancient English county families still among the land-owning classes. English pedigrees of the age before the Conquest are collected in W. G. Searle's *Anglo-Saxon Bishops, Kings and Nobles* (1899).

Genealogical dictionaries of noble French families include Victor de Saint Allais's *Nobiliaire universel* (21 vols., 1872–1877) and Aubert de la Chenaye-Desbois' *Dictionnaire de la noblesse* (15 vols., 1863–1876). A sumptuous work on the genealogy and heraldry of the ancient duchy of Savoy by Count Amédée de Foras began to appear in 1863. Spain has Lopez de Haro's *Nobiliario genealogico de los reyes y titulos de España*. Italy has the *Teatro araldico* of Tettoni and Saladini (1841–1848), Litti's *Famiglie celebri* and an *Annuario della nobiltà*. Such annuals are now published more or less intermittently in many European countries. Finland has a *Riddarscap och Adels Kalender*, Belgium the *Annuaire de la noblesse*, the Dutch Netherlands an *Adelsboek*, Denmark the *Adels-Garbog* and Russia the *Annuaire* of Ermerin. But chief of all such publications is the ancient *Almanach de Gotha*, containing the modern kinship of royal and princely houses, and now accompanied by volumes dealing with the houses of German and Austrian counts and barons, and with houses ennobled in modern times by patent. A useful modern reference book for students of history is Stokvis's *Manuel d'histoire et de généalogie de tous les états du globe* (1888–1893). The best manual for the English genealogist is Walter Rye's *Records and Record Searching* (1897), while an ill-arranged but valuable bibliography of English and foreign works on the subject is that of George Gatfield (1892). (O. BA.)

GENELLI, GIOVANNI BUONAVENTURA (1798–1868), German painter, was born at Berlin on the 28th of September 1798. He was the son of Janus Genelli, a painter whose landscapes are still preserved in the Schloss at Berlin, and grandson to Joseph Genelli, a Roman embroiderer employed to found a school of gobelins by Frederick the Great. Buonaventura Genelli first took lessons from his father and then became a student of the Berlin academy. After serving his time in the guards he went with a stipend to Rome, where he lived ten years, a friend and assistant to Koch the landscape painter, a colleague of the sculptor Ernst Hähnel (1811–1891), Reinhart, Overbeck and Führich, all of whom made a name in art. In 1830 he was commissioned by Dr Härtel to adorn a villa at Leipzig with frescoes, but quarrelling with this patron he withdrew to Munich, where he earned a scanty livelihood at first, though he succeeded at last in acquiring repute as an illustrative and figure draughtsman. In 1839 he was appointed a professor at Weimar, where he died on the 13th of November 1868. Genelli painted few pictures, and it is very rare to find his canvases in public galleries, but there are six of his compositions in oil in the Schack collection at Munich. These and numerous water-colours, as well as designs for engravings and lithographs, reveal an artist of considerable power whose ideal was the antique, but who was also fascinated by the works of Michelangelo. Though a German by birth, his spirit was unlike that of Overbeck or Führich, whose art was reminiscent of the old masters of their own country. He seemed to hark back to the land of his fathers and endeavour to revive the traditions of the Italian Renaissance. Subtle in thought and powerfully conceived, his compositions are usually mythological, but full of matter, energetic and fiery in execution, and marked almost invariably by daring effects of foreshortening. Impeded by straitened means, the artist seems frequently to have drawn from imagination rather than from life, and much of his anatomy of muscle is in consequence conventional and false. But none the less Genelli merits his reputation as a bold and imaginative artist, and his name deserves to be remembered beyond the narrow limits of the early schools of Munich and Weimar.

GENERAL (Lat. *generalis*, of or relating to a *genus*, kind or class), a term which, from its pointing to all or most of the members of a class, the whole of an area, &c., as opposed to "particular" or to "local," is hence used in various shades of meaning, for that which is prevalent, usual, widespread or miscellaneous, indefinite, vague. It has been added to the titles of various officials, military officers and others; thus the head of a religious order is the "superior-general," more usually the "general," and we find the same combination in such offices as that of "accountant-general," "postmaster-general," "attorney-" or "solicitor-general," and many others, the additional word implying that the official in question is of superior rank, as having a wider

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authority or sphere of activity. This is the use that accounts for the application of the term, as a substantive, to a military officer of superior rank, a "general officer," or "general," who commands or administers bodies of troops larger than a regiment, or consisting of more than one arm of the service (see also OFFICERS). It was towards the end of the 16th century that the word began to be used in its present sense as a noun, and in the armies of the time the "general" was commander-in-chief, the "lieutenant-general" commander of the horse and second in command of the army, and the "major-general" (strictly "sergeant-major-general") commander of the foot and chief of the staff. Field marshals, who have now the highest rank, were formerly subordinate to the general officers. These titles—general, lieutenant-general and major-general—are still applied in most armies to the first, second and third grades of general officer, and in the French service until 1870 the chief of the staff of the army bore the title of major-general. In the German and Russian services the three grades are qualified by the addition of the words "of cavalry," "of infantry" and "of artillery." The French service possesses only two grades, "general of brigade" and "general of division." The Austrian service has two ranks of general officers peculiar to itself, "lieutenant field marshal," equivalent to lieutenant-general, and *Feldzeugmeister* (master of the ordnance), equivalent to the German general of infantry or artillery. There is also the rank of "general of cavalry." The Spanish army still retains the old term "captain-general." In the German service *General Oberst* (colonel-general) and *General Feldzeugmeister* (master-general of ordnance) are ranks intermediate between that of full general and that of general field marshal. It may be noted that during the 17th century "general" was not confined to a commanding officer of an army, and was also equivalent to "admiral"; thus when under the Protectorate the office of lord high admiral was put into commission, the three first commissioners, Blake, Edward Popham and Richard Deane, were styled "generals at sea."

GENERATION (from Lat. *generare*, to beget, procreate; *genus*, stock, race), the act of procreation or begetting, hence any one of the various methods by which plants, animals or substances are produced. As applied to the result of procreation, "generation" is used of the offspring of the same parents, taken as one degree in descent from a common ancestor, or, widely, of the body of living persons born at or near the same time; thus the word is also used of the age or period of a generation, usually taken as about thirty years, or three generations to a century. As a term in biology or physiology, generation is synonymous with the Gr. *βιογένεσις* and the Ger. *Zeugung*, and may comprehend the whole history of the first origin and continued reproduction of living bodies, whether plants or animals; but it is frequently restricted to the sexual reproduction of animals. The subject may be divided into the following branches, viz.: (1) the first origin of life and living beings, (2) non-sexual or agamic reproduction, and (3) gamic or sexual reproduction. For the first two of these topics see ABIOGENESIS, BIOGENESIS and BIOLOGY; for the third and more extensive division, including (1) the formation and fecundation of the ovum, and (2) the development of the embryo in different animals, see REPRODUCTION and EMBRYOLOGY.

GENESIS (Gr. *γένεσις*, becoming; the term being used in English as a synonym for origin or process of coming into being), the name of the first book in the Bible, which derives its title from the Septuagint rendering of ch. ii. 4. It is the first of the five books (the Pentateuch), or, with the inclusion of Joshua, of the six (the Hexateuch), which cover the history of the Hebrews to their occupation of Canaan. The "genesis" of Hebrew history begins with records of antediluvian times: the creation of the world, of the first pair of human beings, and the origin of sin (i.–iii.), the civilization and moral degeneration of mankind, the history of man to the time of Noah (iv.–vi. 8), the flood (vi. 9–ix.), the confusion of languages and the divisions of the human race (x.–xi.). Turning next to the descendants of Shem, the book deals with Abraham (xii.–xxv. 18), Isaac and Jacob (xxv. 19–xxxv.), the "fathers" of the tribes of Israel, and concludes with the personal history of Joseph, and the descent of his father Jacob (or Israel) and his brethren into the land of Egypt (xxxvii.–l.). The book of Genesis, as a whole, is closely connected with the subsequent oppression of the sons of Israel, the revelation of Yahweh the God of their fathers (Ex. iii. 6, 15 seq., vi. 2-8), the "exodus" of the Israelites to the land promised to their fathers (Ex. xiii. 5, Deut. i. 8, xxvi. 3 sqq., xxxiv. 4) and its conquest (Josh. i. 6, xxiv.); cf. also the summaries Neh. ix. 7 sqq., Ps. cv. 6 sqq.

The words, "these are the generations of the heavens and of the earth when they were created" (ii. 4), introduce an account of the creation of the world, which, however, is preceded by a relatively later and less primitive record (i. 1–ii. 3). The differences between the two accounts lie partly in the style and partly in the form and contents of the narratives. i. 1–ii. 3 is marked by stereotyped formulae ("and God [*Elôhîm*] said . . . and it was so . . . and God saw that it was good, and there was evening and there was morning," &c.); it is precise and detailed, whereas ii. 4*b*–iii. is less systematic, fresher and more anthropomorphic. The former is cosmic, the latter is local. It is the latter which mentions the mysterious garden and the wonderful trees which Yahweh planted, and depicts Yahweh conversing with man and walking in the garden in the cool of the evening. The former, on the other hand, has an enlightened conception of *Elôhîm*; the Deity, although grand, is a lifeless figure; several antique ideas are nevertheless preserved. The account of the creation, too, is different; for example, in chap. i. man and woman are created together, whereas in ii. man is at first alone. The naiveness of the story of the creation of woman is in line with the interest which this more popular source takes in the origin or existence of phenomena, customs and contemporary beliefs (the garden, the naming of animals, &c.). The primitive record is continued in the story of Cain and Abel (iv.), where the old-time problem of Cain's wife and the reference to other human beings (iv. 14 seq.) gave rise in precritical days to the theory of pre-Adamites, as though Adam and Eve were not the only inhabitants of the earth. But all the indications go to show that there were at least two distinct popular narratives, one of which ignores the flood. Cain the murderer, doomed to be a wanderer, now becomes the builder of a city, and his descendants introduce various arts (iv. 16*b*–24).[1] (See the articles ABEL; ADAM; CAIN; COSMOGONY; ENOCH; EVE; LAMECH.) From the "generations" of the heavens and the earth (which one would have expected at the head of ch. i.) we pass to the "generations of Adam" (v. 1). The list of the "Sethites," with its characteristically stereotyped framework, has an older parallel in iv. 25 seq. (with the origin of the worship of Yahweh contrast Ex. vi. 2. seq.), and a fragment from the same source is found in v. 29.

After the birth of Noah the son of Lamech (v. 29, contrast iv. 19 sqq.) comes the brief story of the demigods (vi. 1-4). It is no part of the account of the fall or of the flood (see verse 4 and Num. xiii. 33), least of all does it furnish grounds for the old view of the division of the human race into evil Cainites and God-fearing Sethites. The excerpt with its description of the fall of the angels is used to form a prelude to the wickedness of man and the avenging flood (vi. 5). Noah, the father of Ham, Shem and Japheth, appears as the hero in the Hebrew version of the flood (see DELUGE; NOAH). Duplicates (vi. 5-8, 9-13) and discrepancies (vi. 19 sq. contrasted with vii. 2; or vii. 11, viii. 14 contrasted with viii. 8, 10, 12) point to the use of two sources (harmonizing passages in vii. 3, 7-9). The later narrative, which begins with "the generations of Noah (vi. 9-22; vii. 6, 11, 13-17*a*, 18-21, 24; viii. 1-2*a*, 3*b*-5, 13*a*, 14-19; ix. 1-17), is almost complete; note the superscription and the length of the flood (365 days; according to other notices the flood apparently lasted only 61 or 68 days). In the earlier source Noah collects seven pairs of clean animals, one of each kind; he sacrifices after leaving the ark, and Yahweh promises not to curse the ground or to smite living things again. But in the later, he takes only one pair, and subsequently Elôhîm blesses Noah and makes a covenant never again to destroy all flesh by a flood.[2] The covenant (characteristic of the latest narratives in Genesis) also prohibits the shedding of blood (cf. the story of Cain and Abel in the earlier source). Mankind is now made to descend from the three sons of Noah. The older story, however, continues with another step in the history of civilization, and to Noah is ascribed the cult of the vine, the abuse of which leads to the utterance of a curse upon Canaan and a blessing upon Shem and Japheth (ix. 20-27). The table of nations in x. ("the generations of the sons of Noah") preserves several signs of composite origin (contrast *e.g.* x. 7 with vv. 28 sq., Ludim v. 13 with v. 22, and the Canaanite families v. 15 with the dispersion "afterwards," v. 18, &c.); see CANAAN; GENEALOGY; NIMROD. The history of the primitive age concludes with the story of the tower

Analysis.

[1] The abrupt introduction of a small poem (iv. 23 seq.) was long ago regarded as due to the use of separate sources (so the Calvinist Isaac de la Peyrère, 1654).

[2] The divergences of detail, with corresponding stylistic variations, were recognized long ago (*e.g.* by Father Simon in 1682).

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of Babel (xi. 1-9), which, starting from a popular etymology of Babel (" gate of God "), as though from Balbel (" confusion "), tells how Yahweh feared lest mankind should become too powerful (cf. iii. 22-24), and seeks to explain the origin of the numerous languages in use. It is independent of x., which already assumes a confusion of tongues (*vv.* 5, 20, 31), the existence of Babel (*v.* 10), and gives a different account of the rise of the various races. This incident in the journey eastwards (xi. 2) is equally independent of the story of the Deluge and of Noah's family (see Wellhausen, *Prolegomena*, p. 316). The continuation of the chapter, " the generations of Shem " (xi. 10-27, see the Shemite genealogy in x. 21 sqq., and contrast the ages with vi. 3), is in the same stereotyped style as ch. v., and prepares the way for the history of the patriarchs.

The " generations of Terah " (xi. 27) lead to the introduction of the first great patriarch Abraham (*q.v.*).[1] There is a twofold account of his migration to Bethel with his nephew Lot; the more statistical form in xi. 31 sq., xii. 4*b*, 5 belongs to the latest source. The statement that the Canaanite was then in the land (xii. 6, cf. xiii. 7) points to a time long after the Israelite conquest, when readers needed such a reminder (so Hobbes in his *Leviathan*, 1651). A famine forces him to descend into Egypt, where a story of Sarai (here at least 65 years of age; see xii. 4, xvii. 17) is one of three variants of a similar peculiar incident (cf. xx. 1-17, xxvi. 6-14). The passage is an insertion (xii. 10-xiii. 2; xii. 9, xiii. 3 seq. being harmonistic). The thread is resumed in the account of the separation of the patriarch and his nephew Lot, who divide the land between them. Abraham occupies Canaan, but moves south to Hebron, which, according to Josh. xiv. 15, was formerly known as Kirjath-Arba. Lot dwells in the basin of the Jordan, and his history is continued in the story of the destruction of Sodom and Gomorrah (xviii.-xix.; Hos. xi. 8, Deut. xxix. 23 speak of Admah and Zeboim). Lot is saved and becomes the ancestor of the Moabites and Ammonites, who are thus closely related to the descendants of Abraham (note xix. 37, "unto this day "). The great war with Amraphel and Chedorlaomer —the defeat of a world-conquering army by 318 men—with the episode of Melchizedek, noteworthy for the reference to Jerusalem (xiv. 18, cf. Ps. lxxvi. 2), has nothing in common with the context (see ABRAHAM; MELCHIZEDEK). It treats as individuals the place-names Mamre and Eshcol (xiv. 13, cf. Num. xiii. 23 seq.), and by mentioning Dan (*v.* 14) anticipates the events in Josh. xix. 47, Judg. xviii. 29.[2] A cycle of narratives deals with the promise that the barren Sarai (Sarah) should bear a child whose descendants would inhabit the land of Canaan. The importance of the tradition for the history of Israel explains both the prominence given to it (cf. already xii. 7, xiii. 14-17) and their present complicated character (due to repeated revision). The older narratives comprise (*a*) the promise that Abraham shall have a son of his own flesh (xv.)—the account is composite;[3] (*b*) the birth of Ishmael, Abraham's son by Hagar, their exile, and Yahweh's promise (xvi., with a separate framework in *vv.* 1*a*. 3, 15 seq.)—before the birth of Isaac; and (*c*) the promise of a son to Sarai (xviii. 1-15), now combined with the story of Lot and the overthrow of Sodom. The latest source (xvii.) is marked by the solemn covenant between Yahweh and Abraham, the revelation of God Almighty (El-Shaddai, cf. Ex. vi. 3), and the institution of circumcision (otherwise treated in Ex. iv. 26, Josh. v. 2 seq.). The more elevated character of this source as contrasted with xv. and xviii. is as striking as the difference of religious tone in the two accounts of the creation (above). Abraham now travels thence (xx. 1, Hebron, see xviii. 1), and his adventure in the land of Abimelech, king of Gerar (xx.), is a duplicate of xii. (above). It is continued in xxi. 22-34, which has a close parallel in the life of Isaac (xxvi., below). Isaac is born in accordance with the divine promise (xviii. 10 at Hebron); the scene is the south of Palestine. The story of the dismissal of Hagar and Ishmael, and the revelation (xxi. 8-21) cannot be separated from xvi. 4-14, where *vv.* 9 seq. are intended to harmonize the passages. Although about sixteen years intervene (see xvi. 16; xxi. 5, 8), Ishmael is a young child who has to be carried (xxi. 15), but the Hebrew text of xxi. 14 (not, however, the Septuagint) endeavours to remove the discrepancy.[4] " After these things " comes the offering of Isaac which implicitly annuls the sacrifice of the first-born, a not unfamiliar rite in Palestine as the denunciations prove (cf. Ezek. xvi. 20 seq., xx. 26; Mic. vi. 7; Is. lvii. 5), and thus marks an advance, *e.g.* upon the story of Jephthah's daughter (Judg. xi.). The story may be contrasted with the Phoenician account of the sacrifice by Cronos (to be identified with El) of his only son, which practically justified the horrid custom. The detailed account of the purchase of the cave of Machpelah (contrast the brevity of xxxiii. 19) is of great importance for the traditions of the patriarchs, and, like the references to the death of Sarah and Abraham, belongs to the latest source (xxiii., xxv. 7-11*a*).[5] The idyllic picture of life in xxiv. presupposes that Isaac is sole heir (*v.* 36); since this is first stated in xxv. 5, it is probable that xxv. 5, 11*b* (and perhaps *vv.* 6, 18) are out of place. It is noteworthy that the district is Abraham's native place (xxiv. 4, 7, 10; contrast the Babylonian home specified in xi. 28, 31; xv. 7). In xxv. 1 sqq. Abraham takes as wife (but *concubine*, 1 Chron. i. 32 seq.) Keturah (" incense ") and becomes the father of various Arab tribes, *e.g.* Sheba and Dedan (grandsons of Cush in x. 7).

After " the generations of Ishmael " (xxv. 12 sqq.) the narrative turns to " the generations of Isaac " (xxv. 19 sqq.). The story of the events at the court of Abimelech (xxvi.) finds a parallel in the now disjointed xx., xxi. 22-34; note the new explanation of Beer-sheba, the reference in xxvi. 1 to the parallel story in xii., the absence of allusion to xx., and the apparent editorial references to xxi. in *vv.* 15, 18. On the whole, the story of Isaac's wife at Gerar is briefer and not so elevated as that of Sarah, but the parallel to xxi. 22-34 is more detailed. The birth of Esau and Jacob (xxv. 21-34) introduces the story of Jacob's craft when Isaac is on the point of death (xxvii.). Jacob flees to Laban at Haran to escape Esau's hatred (xxvii. 41-45); but, according to the latest source (P), he is charged by Isaac to go to Paddan-Aram, and take a wife there, and his father transfers to him the blessing of Abraham (xxvii. 46–xxviii. 9). On his way to Haran he stops at Bethel (formerly Luz, according to Judg. i. 22-26), where a vision prompts him to accept the God of the place should he return in peace to his father's home (xxviii. 10-22). He passes to the land of " the children of the east " (xxix. 1), and the scenes which follow are scarcely situated at Haran, the famous and ancient seat of the worship of the moon-god, but in the desert. Here he resides fifteen years or more, and by the daughters of Laban and their handmaidens becomes the " father " of the tribes of Israel. There are numerous traces of composition from different sources, but a satisfactory analysis is impossible.[6] The flight of Jacob and his household (from Paddan-Aram, xxxi. 18 P) leads over " the River " (*v.* 21, *i.e.* the Euphrates); though the seven days' journey of this concourse of men and cattle suggests that he came to Gilead, not from Haran (300 m. distant), but from some nearer locality. This is to be taken with the evidence against Haran already noticed, with the use of the term " children of the east " (xxix. 1; cf. Jer. xlix. 28; Ezek. xxv. 4, 10), and with the details of Laban's kindred (xxii. 20-24).[7] The arrival at Mahanaim (" [two ?] camps ") gives rise to specific allusions to the meaning of the name (xxxii. 1 seq., 7-12, 13-21); cf. also the plays upon Jabbok, Israel and Peniel in xxxii. 22-32. He meets Esau (xxxii. 3-21, xxxiii. 1-16, another reference to Peniel, " face of God," in *v.* 10), but they part. Jacob now comes to Shechem " in peace " (cf. the phrase in xxviii. 21), where he buys land and erects an altar (xxxiii. 18-20, cf. Abraham in xii. 6 seq.). There is a remarkable story of the violation of his daughter Dinah by Shechem, the son of Hamor the Hivite (xxxiv.). It has been heavily revised; note the alternating prominence of Hamor and Shechem, the condemnation of Simeon and Levi for their vengeance (cf. the curse in xlix. 5-7), the destruction of the city Shechem by all the sons of Jacob, and the survival of the Hamorites as a family centuries later (xxxiii. 19, Judg. ix. 28). The narrative continues with Jacob's journey to Bethel, the death of Deborah (who accompanied Rebekah to Palestine 140 years previously, see xxiv. 59, and the latest source in xxv. 20, xxxv. 28), the death of Rachel (xxxv. 16-20, contrast xxxvii. 10), and ceases abruptly in the middle of a sentence (xxxv. 22, but see xlix. 3-4). The latest source (xxxv. 9-13, 15, 22*b*-29) gives another account of the origin of the names Israel (cf. xxxii. 28) and Bethel (cf. xxviii. 19), and the genealogy wrongly includes Benjamin among the sons born outside Palestine (*vv.* 24-26). In narrating Jacob's leisurely return to Isaac at Hebron, the writers quite ignore the many years which have elapsed since he left his father at the point of death in Beersheba (xxvii. 1, 2, 7, 10, 41).

" The generations of Esau, the same is Edom," provide much valuable material for the study of Israel's rival (xxxvi.). The chapter gives yet another account of the separation of Jacob and Esau (with *vv.* 6-8, cf. Abraham and Lot, xiii. 5 seq.), and describes the latter's withdrawal to Seir (cf. already xxxii. 3; xxxiii. 14, 16). It includes lists of diverse origin (*e.g.* *vv.* 2-5, contrast xxvi. 34, xxviii. 9); various " dukes " (R.V. marg. " chiefs "), or rather

[1] As early as 1685 Jean le Clerc observed that Ur of the Chaldees (*Chasdim*) in xi. 28 anticipates *Chesed* in xxii. 22, and implied some knowledge of the land of the Chaldaeans (cf. Ezek. i. 3, xi. 24).

[2] The Catholic priest Andrew du Maes (1570) already pointed to the names Hebron and Dan as signs of post-Mosaic date.

[3] Note the repetitions in *vv.* 2 and 3; Abraham's faith, *vv.* 4-6, and his request, *v.* 8; contrast the time of day, *v.* 5 and *v.* 12, and the dates, *v.* 13 and *v.* 16. In *vv.* 12-15 there is a reference to the bondage in Egypt.

[4] These and other chronological embarrassments, now recognized as due to the framework of the post-exilic writer (P), have long been observed—by Spinoza, 1671.

[5] Points of resemblance in xxiii. with Babylonian usage have often been exaggerated; comparison " shows noteworthy differences " (T. G. Pinches, *The Old Testament*, p. 238); see Carpenter and Harford-Battersby, *Hexateuch*, i. 64, Driver, *Gen.* p. 230, and *Addenda*.

[6] Note, *e.g.*, the sudden introduction of xxix. 15, the curious position of *v.* 24 (due to P), the double play upon the names Zebulun and Joseph, xxx. 20, 23 seq., the internal intricacies in the agreement, *ib.* *vv.* 31-43; the difficulties in the reference to the latter in xxxi. 6 sqq. (especially *v.* 10).

[7] See Ed. Meyer (and B. Luther), *Die Israëliten und ihre Nachbarstämme* (1906), pp. 238 sqq.; also the shrewd remarks of C. T. Beke, *Origines biblicae* (1834), pp. 123 sqq.

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"thousands" or "clans"; and also the "sons" of Seir the Horite, *i.e.* Horite clans (vv. 20 seq. and vv. 29 seq.). A summary of Edomite kings is ascribed to the period before the Israelite monarchy (vv. 31-39), and the record concludes with the "dukes" of Esau, the father of the Edomites (vv. 40-43, cf. names in vv. 10-14, 15-19).[1]

Finally, Genesis turns from the patriarchs to the "generations of Jacob" (xxxvii. 2), and we have stories of the "sons," the ancestors of the tribes. (In xxxiv. the incidents which primarily concerned Simeon and Levi alone have, however, been adjusted to the general history of Jacob and his family.) The first place is given to Joseph (xxxvii.), although xxxviii. crowds the early history of the family of Judah into the twenty-two years between xxxvii. 2 and Jacob's descent into Egypt (see xli. 46, 47; xlv. 6).[2] In xxxvi., xxxix. seqq. we have an admirable specimen of writing quite distinct in style from the patriarchal stories. The romance which has been here utilized shows an acquaintance with Egypt; the narratives are discursive, not laconic, everything is more detailed, and more under the influence of literary art. The Reuben and Simeon story has appear in it are not the characters which we meet in xxxiv., xxxv. 22, or in the poem xlix. 3-7; and the tribes of Ephraim and Manasseh do not scruple to claim ancestry from Joseph and the daughter of an Egyptian priest at the same time as worship of the sun-god (xli. 45). The narratives are composite. Joseph incurs the ill-will of his brethren because of Israel's partiality or because of his significant dreams. He is at Shechem or at Dothan; and when the brothers seek to slay him, Judah proposes that he should be sold to Ishmaelites, or Reuben suggests that he should be cast into a pit, where Midianites find and kidnap him (xxxvii., cf. xl. 15). The latter sell him to the eunuch Potiphar, but he appears in the service of a married householder (xxxix., the second clause of v. 1 harmonizes). Another sign of dual origin are the alternation of "Jacob" and "Israel," and the prominence of Judah (xliii. 3, 8; xliv. 14, 18) or of Reuben (xlii. 22, 37). The money is found in a "bag" as the brothers encamp (xlii. 27, 28*a*; xliii.), or in a "sack" where they reach home (xlii. 8-26, 35, 28*b*, 36 seq.). When Israel and his family descend into Egypt, the latest source gives a detailed list which agrees in the main with the Israelite subdivisions (xlvi. 6-27, cf. Num. xxvi. and 1 Chron. ii.-viii.). The families dwell in the land of Goshen, east of the Delta, "for every shepherd is an abomination unto the Egyptians" (xlv. 10; xlvi. 28-34; xlvii. 1-6); or they are in the "land of Rameses" (xlvii. 11, and Septuagint in xlvi. 28).[3] Joseph's policy during the famine is next described (xlvii. 13-26), although it would have been more in place after xli. (see xli. 34). There are several difficulties in Jacob's blessing of the sons of Joseph (xlviii.).[4] The blessing in xlix. is a collection of poetical passages praising or blaming the various tribes, and must certainly date after the Israelite settlement in Palestine; see further the articles on the tribes. Jacob's dying instructions to Joseph (l. 24-31) are continued in l. 1 sqq., his charge to his sons (xlix. 28 seq., P) in l. 12 seq. It is significant that Jacob's body is taken to Palestine, but the brethren return to Egypt; in spite of a possible allusion to the famine in v. 21, the late chronological scheme would imply that it had long ceased (see xlv. 6, xlvii. 28). The book closes with the death of Joseph about fifty years later, after the birth of the children of Machir, who himself was a contemporary of Moses forty years after the Exodus (Num. xxxii. 39-41). Joseph's body is embalmed, but it is not until the concluding chapter of the book of Joshua (xxiv. 32) that his bones find their last resting-place.

Only on the assumption that the book of Genesis is a composite work is it possible to explain the duplication of events, the varying use of the divine names *Yahweh* and *Elōhim*, the linguistic and stylistic differences, the internal intricacies of the subject matter, and the differing standpoints as regards tradition, chronology, morals and religion.[5] The cumulative effect of the whole evidence is too strong to be withstood, and already in the 17th century it was recognized that the book was of composite origin. Immense labour has been spent in the critical analysis of the contents, but it is only since the work of Graf (1866) and Wellhausen (1878) that a satisfactory literary hypothesis has been found which explained the most obvious intricacies. The Graf-Wellhausen literary theory has gained the assent of almost all trained and unbiased biblical scholars, it has not been shaken by the more recent light from external evidence, and no alternative theory has as yet been produced. The internal features of Genesis demand some formulated theory, more precise than the indefinite concessions of the 17th century, beyond which the opponents of modern literary criticism scarcely advance, and the Graf-Wellhausen theory, in spite of the numerous difficulties which it leaves untouched, is the only adequate starting-point for the study of the book. According to this, Genesis is a post-exilic work composed of a post-exilic priestly source (P) and non-priestly earlier sources which differ markedly from P in language, style and religious standpoint, but much less markedly from one another.[6] These sources can be traced elsewhere in the Pentateuch and Joshua, and P itself is related to the post-exilic works Chronicles, Ezra and Nehemiah. In its *present* form Genesis is an indispensable portion of the biblical history, and consequently its literary growth cannot be viewed apart from that of the books which follow. On internal grounds it appears that the Pentateuch and Joshua, as they now read, virtually come in between an older history by "Deuteronomic" compilers (easily recognizable in Judges and Kings), and the later treatment of the monarchy in Chronicles, where the influence of the circle which produced P and the present Mosaic legislation is quite discernible. There have been stages where earlier extant sources have been cut down, adjusted or revised by compilers who have incorporated fresh material, and it is the later compilers of Genesis who have made the book a fairly knit whole. The technical investigation of the *literary* problems (especially the extent of the earlier sources) is a work of great complexity, and, for ordinary purposes, it is more important to obtain a preliminary appreciation of the general features of the contents of Genesis.

A composite work.

Value of traditions.

That the records of the pre-historic ages in Gen. i.–xi. are at complete variance with modern science and archaeological research is unquestionable.[7] But although it is impossible to regard them any longer either as genuine history or as subjects for an allegorical interpretation (which would prove the accuracy of *any* record) they are of distinct value as human documents. They reflect the ideas and thoughts of the Hebrews, they illustrate their conceptions of God and the universe, and they furnish material for a comparison of the moral development of the Hebrews with that of other early races. Some of the traditions are clearly akin to those current in ancient Babylonia, but a careful and impartial comparison at once illustrates in a striking manner the relative moral and spiritual superiority of our writers. On these subjects see further COSMOGONY; DELUGE.[8]

The records of the patriarchal age, xii.–l. are very variously estimated, although the great majority of scholars agree that they are not contemporary and that they cannot be used, as they stand, for pre-Mosaic times. Apart from the ordinary arguments of historical criticism, it is to be noticed that external evidence does not support the assumption that the records preserve

[1] It is interesting to find that the Spanish Rabbi Isaac (of Toledo, A.D. 982–1057), noticing that the royal list must be later than the time of Saul (also recognized by Martin Luther and others), proposed to assign the chapter to the age of Jehoshaphat.

[2] But the chronology is hopeless, and only ten years are allowed according to another and later scheme (xxv. 26, xxxv. 28, xlvii. 9).

[3] Cf. the account of the Israelites in Egypt, where they are in Goshen, unaffected by the plagues (Ex. viii. 22, ix. 26), or, according to another view, are living in the midst of the Egyptians (*e.g.* xii. 23).

[4] V. 7 breaks the context; there is repetition in vv. 10*b* and 13*b*; interchange of the names Jacob and Israel; v. 12 suggests a blessing upon Joseph himself; and with vv. 15 seq. (the blessing of the sons, not of Joseph), contrast vv. 20 seq. (the singular "in thee," v. 20).

[5] Only the more noticeable peculiarities have been mentioned in the preceding columns.

[6] On the course of modern criticism and on the various sources: P, J (Judaean or Yahwist), E (Ephraimite or Elohist), see BIBLE (*Old Test. Criticism*). The passages usually assigned to P in Genesis are i. 1–ii. 4*a*; v. 1-28, 30-32; vi. 9-22; vii. 6 (and parts of v. 7-9), 11, 13-16*a*, 18-21, 24; viii. 1-2*a*, 3*b*-5, 13*a*, 14-19; ix. 1-17, 28-29; x. 1-7, 20, 22-23, 31-32; xi. 10-27, 31-32; xii. 4*b*-5; xiii. 6, 11*b*-12*a*; xvi. 1*a*, 3, 15-16; xvii.; xix. 29; xxi. 1*b*, 2*b*-5; xxiii.; xxv. 7-11*a*, 12-17, 19-20, 26*b*; xxvi. 34-35; xxvii. 46-xxviii. 9; xxix. 24, 28*b*, 29; xxxi. 18*b*; xxxiii. 18*a*; xxxiv. 1-2*a*, 4, 6, 8-10, 13-18, 20-24, part of 25, 27-29; xxxv. 9-13, 15, 22*b*-29; xxxvi. (in the main); xxxvii. 1-2*a*; xli. 46; xlvi. 6-27; xlvii. 5-6*a*, 7-11, 27*b*-28; xlviii. 3-7; xlix. 1*a*, 28*b*-33, l. 12-13.

See on this, especially, S. R. Driver's *Genesis* in the "Westminster Commentaries" (seventh ed., 1909).

[7] The above is typical of modern biblical criticism which is compelled to recognize the human element (and can thus have no a priori preconceptions in approaching the Old Testament), but at the same time reveals ever more decisively the presence of purifying influences, without which the records of Israel would have had no permanent interest or value. They thus gain a new value which cannot be impaired when it is realized that their significance is quite independent of their origins.

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genuine pre-Mosaic history. There are no grounds for any arbitrary distinction between the "pre-historic" pre-Abrahamic age and the later age. External evidence, which recognizes no universal deluge and no dispersal of mankind in the third millennium B.C., throws its own light upon the opening centuries of the second. It has revealed conditions which are not reflected in Genesis, and important facts upon which the book is silent—unless, indeed, there is a passing allusion to the great Babylonian monarch Khammurabi in the Amraphel of Gen. xiv. Any careful perusal of modern attempts to recover historical facts or an historical outline from the book will show how very inadequate the material proves to be, and the reconstructions will be found to depend upon an interpretation of the narratives which is often liberal and not rarely precarious, and to imply such reshaping and rewriting of the presumed facts that the cautious reader can place little reliance on them. Whatever future research may bring, it cannot remove the *internal* peculiarities which combine to show that Genesis preserves, not literal history, but popular traditions of the past. External evidence has proved the antiquity of various elements, but not that of the form or context in which they now appear; and the difference is an important one. We have now a background upon which to view the book, and, on the one hand, it has become obvious that the records preserve—as is only to be expected—Oriental customs, beliefs and modes of thought. But it has not been demonstrated that these are exclusively pre-Mosaic. On the other hand, a better acquaintance with the ancient political, sociological and religious conditions has made it increasingly difficult to interpret the records as a whole literally, or even to find a place in pre-Mosaic Palestine for the lives of the patriarchs as they are depicted.[1] Nevertheless, though one cannot look to Genesis for the history of the early part of the second millennium B.C., the study of what was thought of the past, proves in this, as in many other cases, to be more instructive than the facts of the past, and it is distinctly more important for the biblical student and the theologian to understand the thought of the ages immediately preceding the foundation of Judaism in the 5th century B.C. than the actual history of many centuries earlier.

A noteworthy feature is the frequent *personification* of peoples, tribes or clans (see GENEALOGY: *Biblical*). Midian (*i.e.* the Midianites) is a son of Abraham; Canaan is a son of Ham (ix. 22), and Cush the son of Ham is the father of Ramah and grandfather of the famous S. Arabian state Sheba and the traders of Dedan (x. 6 sq., cf. Ezek. xxvii. 20–22). Bethuel the father of Rebekah is the brother of the tribal names Uz and Buz (xxii. 21 sqq., cf. Jer. xxv. 20, 23). Jacob is otherwise known as Israel and becomes the father of the tribes of Israel; Joseph is the father of Ephraim and Manasseh, and incidents in the life of Judah lead to the birth of Perez and Zerah, Judaean clans. This personification is entirely natural to the Oriental, and though "primitive" is not necessarily an ancient trait.[2] It gives rise to what may be termed the "prophetical interpretation of history" (S. R. Driver, *Genesis*, p. 111), where the character, fortunes or history of the apparent individual are practically descriptive of the people or tribe which, according to tradition, is named after or descended from him. The utterance of Noah over Canaan, Shem and Japheth (ix. 25 sqq.), of Isaac over Esau and Jacob (xxvii.), of Jacob over his sons (xlix.) or grandsons (xlviii.), would have no meaning to Israelites unless they had some connexion with and interest for contemporary life and thought. Herein lies the force of the description of the wild and independent Ishmael (xvi. 12), the "father" of certain well-known tribes (xxv. 13-15); or the contrast between the skilful hunter Esau and the quiet and respectable Jacob (xxv. 27), and between the tiller Cain who becomes the typical nomad and the pastoral Abel (iv. 1-15). The interest of the struggles between Jacob and Esau lay, not in the history of individuals of the distant past, but in the fact that the names actually represented Israel and its near rival Edom. These features are in entire accordance with Oriental usage and give expression to current belief, existing relationships, or to a poetical foreshadowing of historical vicissitudes. But in the effort to understand them as they were originally understood it is very obvious that this method of interpretation can be pressed too far It would be precarious to insist that the entrances into Palestine of Abraham and Jacob (or Israel) typified two distinct immigrations. The separation of Abraham from Lot (cf. Lotan, an Edomite name), of Isaac from Hagar-Ishmael, or of Jacob from Esau-Edom scarcely points to the relative antiquity of the origin of these non-Israelite peoples who, to judge from the evidence, were closely related. Or, if the "sons" of Jacob had Aramaean mothers, to prove that those which are derived from the wives were upon a higher level than the "sons" of the concubines is more difficult than to allow that certain of the tribes must have contained some element of Aramaean blood (cf. 1 Chron. vii. 14, and see ASHER; GAD; MANASSEH). Some of the names are clearly not those of known clans or tribes (*e.g.* Abraham, Isaac), and much of the details of the narratives obviously have no natural ethnological meaning. Stories of heroic ancestors and of tribal eponyms intermingle; personal, tribal and national traits are interwoven. The entrance of Jacob or Israel with his sons suggests that of the children of Israel. The story of Simeon and Levi at Shechem is clearly not that of two individuals, sons of the patriarch Israel; in fact the story actually uses the term "wrought folly in Israel" (cf. Jud. xx. 6, 10), and the individual Shechem, the son of Hamor, cannot be separated from the city, the scene of the incidents. Yet Jacob's life with Laban has many purely individual traits. And, further, there intervenes a remarkable passage with an account of his conflict with the divine being who fears the dawn and is unwilling to reveal his name. In a few verses the "wrestling" (*'-b -k*) of Jacob (*yd'āqōb*) is associated with the Jabbok (*yabbōq*); his "striving" explains his name Israel; at Peniel he sees "the face of God," and when touched on his vulnerable spot—the hollow of the thigh—he is lamed, hence "the children of Israel eat not the sinew of the hip which is upon the hollow of the thigh unto this day" (xxxii. 24-32). Other examples of the fusion of different features can be readily found. Three divine beings appear to Abraham at the sacred tree of Hebron, and when the birth of Isaac (from *ṣāḥaq*, "laugh") is foretold, the account of Sarah's behaviour is merely a popular and trivial story suggested by the child's name (xviii. 12-15; see also xvii. 17, xxi. 6, 9). An extremely fine passage then describes the patriarch's intercession for Sodom and Gomorrah, and the narrative passes on to the catastrophe which explains the Dead Sea and its desert region and has parallels elsewhere (*e.g.* the Greek legend of Zeus and Hermes in Phrygia). Lot escapes to Zoar, the name gives rise to the pun on the "little" city (xix. 20), and his wife, on looking back, becomes one of those pillars of salt which still invite speculation. Finally the names of his children Moab and Ammon are explained by an incident when he is a cave-dweller on a mountain.

Fusion of diverse features.

To primitive minds which speculated upon the "why and wherefore" of what they saw around them, the narratives of Genesis afforded an answer. They preserve, in fact, some of the popular philosophy and belief of the Hebrews. They furnish what must have been a satisfactory origin of the names Edom, Moab and Ammon, Mahanaim and Succoth, Bethel, Beersheba, &c. They explain why Shechem, Bethel and Beersheba were ancient sanctuaries (see further below); why the serpent writhes along the ground (iii. 14); and why the hip sinew might not be eaten (xxxii. 32). To these and a hundred other questions the national and tribal stories—of which no doubt only a few have survived, and of which other forms, earlier or later, more crude or more refined, were doubtless current—furnish an evidently adequate answer. Myth and legend, fact and fiction, the common stock of oral tradition, have been handed down, and thus constitute one of the most valuable sources for popular Hebrew thought.

The book is not to be judged from any one-sided estimate of its

[1] See the remarks of W. R. Smith, *Eng. Hist. Rev.* (1888), pp. 128 seq. (from the sociological side), and for general considerations, A. A. Bevan, *Crit. Rev.* (1893), pp. 138 sqq.; S. R. Driver, *Genesis*, pp. xliii. sqq.

[2] Cf. Amos i. 11; 1 Chron. ii. iv. (note iv. 10), the Book of Jubilees (see above), and also Arabian usage (W. R. Smith, *Kinship and Marriage*, ch. i.). For modern examples, see E. Littmann, *Orient. Stud. Theodor Nöldeke* (ed. Bezold, 1906), pp. 942-958.

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contents. By the side of much that seems trivial, and even non-moral—for the patriarchs themselves are not saints—it is noteworthy how frequently the narratives are didactic. The characteristic sense of collective responsibility, which appears more incidentally in xx. 7, is treated with striking intensity in a passage (xviii. 23-33) which uses the legend of Sodom and Gomorrah as a vehicle for the statement of a familiar problem (cf. Ezek. xviii., Ps. lxxiii., Job). It will be observed that interviews with divine beings presented as little difficulty to the primitive minds of old as to the modern native; even the idea of intercourse of supernatural beings with mortals (vi. 1-4) is to-day equally intelligible. The modern untutored native has a not dissimilar undeveloped and childlike attitude towards the divine, the naive query and a simple culture. The most circumstantial tales are told of imaginary figures, and the most incredible details clothe the lives of the historical heroes of the past. So abundant is the testimony of modern travellers to the extent to which Eastern custom and thought elucidate the interpretation of the Bible, that it is very important to notice those features which illustrate Genesis. "The Oriental," writes S. I. Curtiss (*Bibl. sacra*, Jan. 1901, pp. 103 sqq.), "is least of all a scientific historian. He is the prince of story-tellers, narratives real and imaginative, spring from his lips, which are the truest portraiture of composite rather than individual Oriental life, though narrated under forms of individual experience." There are, therefore, many preliminary points which combine to show that the critical student cannot isolate the book from Oriental life and thought; its uniqueness lies in the manner in which the material has been shaped and the use to which it has been put.

Questions of date.

The Book of Jubilees (not earlier than the 2nd century B.C.) presents the history in another form. It retains some of the canonical matter, often with considerable reshaping, omits many details (especially those to which exception could be taken), and adds much that is novel. The chronological system of the latest source in Genesis becomes an elaborate reckoning of heavenly origin. Written under the obvious influence of *later* religious aims, it is especially valuable because one can readily compare the two methods of presenting the old traditions.[1] There is the same kind of personification, fresh examples of the "prophetical interpretation of history," and by the side of the older "primitive" thought are ideas which can only belong to his later period. In each case we have merely a selection of current traditional lore. For example, Gen. vi. 1-4 mentions the marriage of divine beings with the daughters of men and the birth of Nephilim or giants (cf. Num. xiii. 33). Later allusions to this myth (*e.g.* Baruch iii. 26-28, Book of Enoch vi. sqq., 2 Peter ii. 4, &c.) are not based upon this passage; the fragment itself is all that remains of some more organic written myth which, as is well-known, has parallels among other peoples.[2] Old myths underlie the account of the creation and the garden of Eden, and traces of other versions or forms appear elsewhere in the Old Testament. Again, the Old Testament throws no light upon the redemption of Abraham (Is. xxix. 22), although the Targums and other sources profess to be well-informed. The isolated reference to Jacob's conquest of Shechem in Gen. xlviii. 22 must have belonged to another context, and later writings give in a later and thoroughly incredible form allied traditions. In Hosea xii. 4, Jacob's wrestling is mentioned before the scene at Bethel (Gen. xxxii. 24 sqq., xxviii. 11 sqq.). The overthrow of Sodom and Gomorrah is described in Genesis (xviii. seq.), but Hosea refers only to that of Admah and Zeboim (xi. 8, cf. Deut. xxix. 23, Gen. x. 19)—different versions of the great catastrophe were doubtless current. Consequently investigation must start with the particular details which happen to be preserved, and these not necessarily in their original or in their only form. Since the antiquity of elements of tradition is independent of the shape in which they appear before us, a careful distinction must be drawn between those details which do not admit of being dated or located and those which do. There is evidence for the existence of the *names* Abram, Jacob and Joseph previous to 900 B.C., but this does not prove the antiquity of the present narratives encircling them. Babylonian tablets of the creation date from the 7th century B.C., but their contents are many centuries earlier (viz. the age of Khammurabi), whereas the Phoenician myths of the origin of things are preserved in a late form by the late writers Damascius and Philo of Byblus. Gen. xiv., which may preserve some knowledge of the reign of Khammurabi, is on internal literary grounds of the post-exilic age, and it is at least a coincidence that the Babylonian texts, often quoted in support of the genuineness of the narrative, belong to about the same period and use early Babylonian history for purely didactic purposes.[3] In general, just as the Book of Jubilees, while presenting many elements of old tradition, betrays on decisive internal grounds an age later than Genesis itself, so, in turn, there is sufficient conclusive evidence that Genesis in its present form includes older features, but belongs to the age to which (on quite independent grounds) the rest of the Pentateuch must be ascribed.

Historical backgrounds.

Popular tradition often ignores events of historical importance, or, as repeated experience shows, will represent them in such a form that the true historical kernel could never have been recovered without some external clue. The absence of definite references to the events of the Israelite monarchy does not necessarily point to the priority of the traditions in Genesis or their later date. Nevertheless, some allusion to national fortunes is reflected in the exaltation of Jacob (Israel) over Esau (Edom), and in the promise that the latter should break the yoke from his neck.[4] Israelite kings are foreshadowed (xvii. 6, xxxv. 11, P), and Israel's kingdom has the ideal limits as ascribed to Solomon (xv. 18, see 1 Kings iv. 21; but cf. art. SOLOMON). Judah is promised a world-wide king (xlix. 8-10), though elsewhere the supremacy of Joseph rouses the jealousy of his "brothers" (xxxvii. 8). Different dates and circles of interest are thus manifest. The cursing and dispersion of Simeon and Levi (xlix. 5-7) recall the fact that Simeon's cities were in the territory of Judah (Josh. xix. 1, 9), and that the Levitical priests are later scattered and commended to the benevolence of the Israelites. But the curse obviously represents an attitude quite opposed to the blessing pronounced upon Levi by Moses (Deut. xxxiii. 8-11). The Edomite genealogies (xxxvi.) represent a more extensive people than the references in the popular stories suggest, and the latter by no means indicate that Edom had so important a career as we actually gather from a few allusions to its kings (xxxvi. 31-39).[5] The references to Philistines are anachronistic for the pre-Mosaic age, and it is clear that the tradition of a solemn covenant with a Philistine king and his general (xxi. 22 seq., xxvi. 26 sqq.) does not belong to the age or the circle which remembered the grievous oppressions of the Philistines or felt contempt for these "uncircumcised" enemies of Israel[6]. Finally, the thread of the tradition unmistakably represents a national unity of the twelve sons (tribes) of

[1] The Book of Jubilees also enables the student to test the arguments based upon any study restricted to Genesis alone. This it shows that the "primitive" features of Genesis afford a criterion which is sociological rather than chronological. This is often ignored. For example, the conveyance of the field of Machpelah (xxiii.) is conspicuous for the absence of any reference to a written contract in contrast to the "business" methods in Jer. xxxii. This does not prove that Gen. xxiii. is early, because writing was used in Palestine about 1400 B.C., and, on the other hand, the more simple forms of agreement are still familiar after the time of Jeremiah (*e.g.* Ruth, Proverbs). Similarly, no safe argument can be based upon the institution of blood-revenge in Gen. iv., when one observes the undeveloped conditions among the Trachonites of the time of Herod the Great (Josephus, *Ant.* xvi. 9, 1), or the varying usages among modern tribes.

[2] On the Jewish forms, see R. H. Charles, *Book of Jubilees* (1902), pp. 33 seq.

[3] A. H. Sayce, *Proc. of the Soc. of Bibl. Arch.* (1907), pp. 13-17.

[4] xxvii. 27-29, 39 seq. This is significantly altered in the later writings (Jub. xxvi. 34 and the Targums). It is worth noticing that in Jub. xxvi. 35 a new turn is given to Gen. xxvii. 41 by changing Isaac's approaching death (which raises serious difficulties in the history of Jacob) into Esau's wish that it may soon come.

[5] See E. Meyer (and B. Luther), *Die Israeliten und ihre Nachbarstämme* (1906), pp. 386-389, 442-446.

[6] See PHILISTINES. The covenant with Abimelech may be compared with the friendship between David and Achish (1 Sam. xxvii.), who is actually called Abimelech in the heading of Ps. xxxiv. (see 1 Sam. xxi. 10). If this is a mistake (and not a variant tradition) it is a very remarkable one. The treatment of the covenant by the author of Jubilees (xxiv. 28 sqq.), on the other hand, is only intelligible when one recalls the attitude of Judah to the Philistine cities in the 2nd century B.C.; see R. H. Charles, *ad loc.*

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Israel; but this unity was not felt at certain periods of disorganization, and the idea of including Judah among the sons of Israel could not have arisen at a time when Israel and Judah were rival kingdoms.[1] In so far as the traditions can be read in the light of biblical history it is evident that they belong to different ages and represent different national, tribal, or local standpoints.

Another noteworthy feature is the interest taken in *sacred sites*. Certain places are distinguished by theophanies or by the erection of an altar (*iii.* place of sacrificial slaughter), and incidents are narrated with a very intelligible purpose. *Mizpah* in Gilead is the scene of a covenant or treaty between Jacob and his Aramaean relative commemorated by a pillar (*Maṣṣēbāh*). It was otherwise known for an annual religious ceremony, the traditional origin of which is related in the story of Jephthah's vow and sacrifice (Judg. xi.), and its priests are denounced by Hosea (v. 1). *Shechem*, the famous city of the Samaritans (" the foolish nation," Ecclus. I. 26), where Joseph was buried (Josh. xxiv. 32), had a sanctuary and a sacred pillar and tree. It was the scene of the coronation (a religious ceremony) of Abimelech (Judg. ix.), and Rehoboam (1 Kings xii. 1). The pillar was ascribed to Joshua (Josh. xxiv. 26 seq.), and although Jacob set up at Shechem an " altar," the verb suggests that the original object was a pillar (Gen. xxxiii. 20). The first ancestor of Israel, on the other hand, is merely associated with a theophany at an oracular tree (xii. 6). The Benjamite *Bethel* was especially famous in Israelite religious history. The story tells how Jacob discovered its sanctity,—it was the gate of heaven,—made a covenant with its God, established the sacred pillar, and instituted its tithes (xxviii.). The prophetess Deborah dwelt under a palm-tree near Bethel (Judg. iv. 5), and her name is also that of the foster-mother of Rebekah who was buried near Bethel beneath the " oak of weeping " (xxxv. 8). *Bochim* (" weeping ") elsewhere receives its name when an angel appeared to the Israelites (Judg. ii. 1, Septuagint adds Bethel). To the prophets Hosea and Amos the cultus of Bethel was superstitious and immoral, even though it was Yahweh himself who was worshipped there (see BETHEL). South of Hebron lay *Beersheba*, an important centre and place of pilgrimage, with a special name by whom oaths were taken (Amos viii. 14, see Sept. and the commentaries). Isaac built its altar, and Isaac's God guarded Jacob in his journeying (xxxi. 29, xlvi. 1). This patriarch and his " brother " Ishmael are closely associated with the district south of Judah, both are connected with *Beer-lahai-roi* (xxiv. 62, Sept. xxv. 11), whose fountain was the scene of a theophany (xvi.), and their traditions are thus localized in the district of Kadesh famous in the events of the Exodus (cf. xvi. 14, xxi. 21, xxv. 18, Ex. xv. 22). (See EXODUS, THE.) Abraham planted a sacred tree at Beersheba and invoked " the everlasting God " (xxi. 33). But the patriarch is more closely identified with *Hebron*, which had a sanctuary (cf. 2 Sam. xv. 7 seq.), and an altar which he built " unto Yahweh " (xiii. 18). The sacred oak of Mamre was famous in the time of Josephus (*B. J.* iv. 9, 7), it was later a haunt of " angels " (Sozomen), and Constantine was obliged to put down the heathenish cultus. The place still has its holy tree. Beneath the oak there appeared the three divine beings, and in the cave of Machpelah the illustrious ancestor and his wife were buried. The story of his descent into Egypt and the plagueing of Pharaoh is a secondary insertion (xii. 10–xiii. 2), and where the patriarch appears at Beersheba it is in incidents which tend to connect him with his " son " Isaac. There is a very distinct tendency to emphasize the importance of Hebron. Taken from primitive gisnts by the non-Israelite clan Caleb (*q.v.*) it has now become predominant in the patriarchal traditions. Jacob leaves his dying father at Beersheba (xxviii. 10), but according to the *latest* source he returns to him at Hebron (xxxv. 27), and here, north of Beersheba, he continues to live (xxxvii. 14, xlvi. 1–5). The cave of Machpelah became the grave of Isaac, Rebekah and Leah (but not Rachel); and though Jacob appears to be buried beyond the Jordan, it is the latest source which places his grave at Hebron (l. 1–11 and 12 seq.). So in still later tradition, all the sons of Jacob with the exception of Joseph find their last resting-place at Hebron, and in Jewish prayers for the dead it is besought that their souls may be bound up with those of the patriarchs, or that they may go to the cave of Machpelah and thence to the Cherubim.[2] The increasing prominence of the old Calebite locality is not the least interesting phase in the comparative study of the patriarchal traditions.

Interest in holy places.

The association of the ancestors of Israel with certain sites is a feature which finds analogies even in modern Palestine. There are old centres of cult which have never lost the veneration of the people; the shrines are known as the tombs of saints or *walis* (patrons) with such orthodox names as St George, Elijah, &c. Traditions justify the reputation for sanctity, and not only are similar stories told of distinct figures, but there are varying traditions of a single figure.[3] The places have retained their sacred character despite political and religious vicissitudes; they are far older than their present names, and such is the conservatism of the east that it is not surprising when, for example, a sacred tomb at Gezer stands quite close to the site of an ancient holy place, about 3000 years old, the existence of which was first made known in the course of excavation. Genesis preserves a selection of traditions relating to a few of the old Palestinian centres of cult. We cannot suppose that these first gained their sacred character in the pre-Mosaic " patriarchal " age; there is in any case the obvious difficulty of bridging the gap between the descent into Egypt and the Exodus, and it is clear that when the Israelites entered Palestine they came among a people whose religion, tradition and thought were fully established. It is only in accordance with analogy if stories were current in Israel of the institution of the sacred places, and closer study shows that we do not preserve the original version of these traditions.[4]

A venerated tree in modern Palestine will owe its sanctity to some tradition, associating it, it may be, with some saint; the Israelites in their turn held the belief that the sacred tree at Hebron was one beneath which their first ancestor sat when three divine beings revealed themselves to him. But it is noteworthy that Yahweh alone is now prominent; the tradition has been revised, apparently in writing, and, later, the author of Jubilees (xvi.) ignores the triad. At Beer-lahai-roi an El (" god ") appeared to Hagar, whence the name of her child Ishmael; but the writer prefers the unambiguous proper name Yahweh, and, what is more, the divine being is now Yahweh's angel—the Almighty's subordinate (xvi.). The older traits show themselves partly in the manifestation of various *Elṣ*, and partly in the cruder anthropomorphism of the earlier sources. Later hands have by no means eliminated or modified them altogether, and in xxxi. 53 one can still perceive that the present text has endeavoured to obscure the older belief that the God of Abraham was not the God of his " brother " Nahor (see the commentaries). The sacred pillar erected by Jacob at Bethel was solemnly anointed with oil, and it (and not the place) was regarded as the abode of the Deity (xxviii. 18, 22). This agrees with all that is known of stone-cults, but it is quite obvious that this interesting example of popular belief is far below the religious ideas of the writer of the chapter in its present form.[5] There are many places where it could be said that Yahweh had recorded his name and would bless his worshippers (Ex. xx. 24). They were abhorrent to the advanced ethical teaching of prophets and of those imbued with the spirit of Deuteronomy (cf. 2 Kings xviii. 4 with *v.* 22), and it is patent from Jeremiah,

[1] In 2 Sam. xix. 43 (original text) the men of Israel claim to be the first-born rather than Judah; cf. 1 Chron. v. 1 seq., where the birthright (after Reuben was degraded) is explicitly conferred upon Joseph (Ephraim and Manasseh).

[2] Cf. Josephus, *Antiq.* ii. 8, 2; *Test. of xii. Patriarchs*; Acts vii. 16 (where Shechem is an error); Oesterley and Box, *Religion and Worship of the Synagogue*, pp. 340 seq.; M. G. Dampier, in *Church and Synagogue* (1909), p. 78.

[3] See J. P. Peters, *Early Heb. Story* (1904), pp. 81 sqq.; S. A. Cook, *Relig. of Anc. Palestine* (1908), pp. 19 sqq.

[4] In like manner the Babylonian story of the flood has been revised and adapted to the Hebrew Noah (cf. *Nippur, ad fin.*).

[5] The writer in Jub. xxvii. 27 treats the pillar as a " sign." Another useful example of revision is to be found in Josh. xxii., where what was regarded (by a reviser) as an object unworthy of the religion of Yahweh is now merely commemorative.

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Ezekiel and Is. lvi.-lxvi. that even at a late date opinion varied as to how Yahweh was to be served.[1] It is significant, therefore, that the narratives in Genesis (apart from P) reflect a certain tolerant attitude; there is much that is contrary to prophetical thought, but even the latest compilers have not obliterated all features that, from a strict standpoint, could appear distasteful. Although the priestly source shows how the lore could be reshaped, and Jubilees represents later efforts along similar lines, it is evident that for ordinary readers the patriarchal traditions could not be presented in an entirely new form, and that to achieve their aims the writers could not be at direct variance with current thought.

It will now be understood why several scholars have sought to recover earlier forms of the traditions, the stages through which the material has passed, and the place of the earlier forms and stages in the history and religion of Israel. These labours are indispensable for scientific biblical study, and are most fruitful when they depend upon comprehensive methods of research. When, for example, one observes the usual forms of hero-cult and the tendency to regard the occupant of the modern sacred shrine as the ancestor of his clients, deeper significance is attached to the references to the protective care of Abraham and Israel (Is. lxiii. 16), or to the motherly sympathy of Rachel (Jer. xxxi. 15). And, again, when one perceives the tendency to look upon the alleged ancestor or *weli* as an almost divine being, there is much to be said for the view that the patriarchal figures were endowed by popular opinion with divine attributes. But here the same external evidence warns us that these considerations throw no light upon the original significance of the patriarchs. It is impossible to recover the earliest traditions from the present narratives, and these alone offer sufficiently perplexing problems.[2]

Southern interests.

From a careful survey of all the accessible material it is beyond doubt that Genesis preserves only a selection of traditions of various ages and interests, and often not in their original form. We have relatively little tradition from North Israel; Beersheba, Beer-lahai-roi and Hebron are more prominent than even Bethel or Shechem, while there are no stories of Gilgal, Shiloh or Dan. Yet in the nature of the case there must have been a great store of local tradition accessible to some writers and at some periods.[3] Interest is taken not in Phoenicia, Damascus or the northern tribes, but in the east and south, in Gilead, Ammon, Moab and Ishmael. Particular attention is paid to Edom and Jacob, and there is good evidence for a close relationship between Edomite and allied names and those of South Palestine (including Simeon and Judah). Especially significant, too, is the interest in traditions which affected the South of Palestine, that district which is of importance for the history of Israel in the wilderness and of the Levites.[4] It is noteworthy, therefore, that while different peoples had their own theories of their earliest history, the first-born of the first human pair is Cain, the eponym of the Kenites, and the ancestor of the beginnings of civilization (iv. 17, 20–22). This "Kenite" version had its own view of the institution of the worship of Yahweh (iv. 26); it appears to have ignored the Deluge, and it implies the existence of a fuller corpus of written tradition. Elsewhere, in the records of the Exodus, there are traces of specific traditions associated with Kadesh, Kenites, Caleb and Jerahmeel, and with a movement into Judah, all originally independent of their present context. Like the prominence of the traditions of Hebron and its hero Abraham, these features cannot be merely casual.[5]

The fact that one is not dealing with literal history complicates the question of the nomadic or semi-nomadic life of the Israelite ancestors.[6] They are tent-dwellers, shepherds, sojourners (xvii. 8, xxiii. 4, xxvii. 28, xxxvi. 7, xxxvii. 1), and we breathe the air of the open country. But the impression gained from the narratives is of course due to the narrators. The movements of the patriarchs serve mainly to connect them with traditions which were originally independent. When Abraham separates from Lot he settles in "the land of Canaan," while Lot dwells in "the cities of the plain" (xiii. 12). Isaac at Beersheba enters into an alliance with the Philistines (xxvi. 12 sqq.), while Jacob seems to settle at Shechem (xxxiv.), and there or at Dothan, a few miles north, his sons pasture their flock (xxxvii. 12 sqq.). The statement (xxxiii. 19,) that, according to an isolated fragment Jacob conquered Shechem and gave it to Joseph (xlviii. 22), and this tradition underlies (and has not given birth to) the late and fantastic stories of his warfare (Jub. xxxiv. 1-9, Test. of Judah iii.). Judah, also, is represented as settling among the Canaanites (xxxviii.), and Simeon marries a Canaanite—according to late tradition, a woman of Zephath (xlvi. 10; Jub. xxxiv. 20, xliv. 13; see Judg. i. 17). These representations have been subordinated to others, in particular to the descent into Egypt of Jacob (Israel) and his sons, and the Exodus of the Israelites. But the critical study of these events raises very serious historical problems. Abraham's grandson, with his family—a mere handful of people—went down into Egypt during a famine (cf. Abraham xii. 10, and Isaac xxvi. 1 sqq.); 400 years pass, all memory of which is practically obliterated, and the Israelite nation composed of similar subdivisions returns. Although the later genealogies from Jacob to Moses allow only four generations (cf. Gen. xv. 13), the difficulties are not removed. Joseph lived to see the children of Machir (l. 23, note Ex. i. 8), though Machir received Gilead from the hands of Moses (Num. xxxii. 40); Levi descended with Kehath, who became the grandfather of Aaron and Moses, while Aaron married a descendant in the fifth generation from Judah (Ex. vi. 23). On the other hand the genealogies in 1 Chron. ii. sqq. are independent of the Exodus; Ephraim's children raid Gath, his daughter founds certain cities, and Manasseh has an Aramacan concubine who becomes the mother of Machir (1 Chron. vii. 14, 20–24).[7] Moreover the whole course of the invasion and settlement of Israel (under Joshua) has no real connexion with pre-Mosaic patriarchal history. If we reinterpret the history of the *family* and its descent into Egypt, and belittle its increase into a *nation*, and if we ignore the more gradual occupation of Palestine, we destroy the entire continuity of history as it was understood by those who compiled the biblical history, and we have no evidence for any confident reconstruction. With these thoroughness have the composites given effect to their views that only on closer examination is it found that even at a relatively late period fundamentally differing traditions still existed, and that those which belonged to circles which did not recognize the Exodus have been subordinated and adjusted by writers to whom this was the profoundest event in their past.[8]

The Southern nucleus.

That the journey of Jacob-Israel from his Aramaean relatives into Palestine hints at some pre-Mosaic immigration is possible, but has not been either proved or disproved. The details point rather to a reflection of the entrance of the children of Israel, elsewhere ascribed to the leadership of Joshua (*q.v.*). Though the latter proceeded to Gilgal, a variant tradition, now almost lost, seems to have recorded an immediate journey to Shechem (Deut. xxvii. 1-10, Josh. viii. 30-35) previous to Joshua's great campaigns (Josh. x. sqq., cf. Jacob's wars). His religious gathering at Shechem several respects less primitive (contrast vi. 1 sqq.), and the present story of Cain and his murder of Abel really places the former in an unfavourable light.

[1] For popular religious thought and practice (often described as pre-prophetical, though non-prophetical would be a safer term), see HEBREW RELIGION.

[2] Among recent efforts to find and explain mythical elements, see especially Stucken, *Astralmythen*: H. Winckler, *Geschichte Israels*, vol. ii.; and P. Jensen, *Das Gilgamesch-Epos in der Weltliteratur*.

[3] Again the analogy of the modern East is instructive. Especially interesting are the traditions associating the same figure or incident with widely separated localities.

[4] See EXODUS, THE; LEVITES. On this feature see Luther and Meyer, *op. cit.* pp. 158 sqq., 227 sqq., 259, 279, 305, 386, 443. Their researches on this subject are indispensable for a critical study of Genesis.

[5] The notion of an Eve (*hawwah*, "serpent") as the first woman may be conjecturally associated with (*a*) the frequent traditions of the serpent-origin of clans, and (*b*) with evidence which seems to connect the Levites and allied families with some kind of serpent-cult (see Meyer, *op. cit.* pp. 116, 426 sqq., 443, and art. SERPENT-WORSHIP). The account of mankind as it now reads (ii. sqq.) is in two versions, of which the first (ii. 4*b*-iii. 24) is Judaean, and the second (iv. 1, 2*a*, 25, 26) Kenite. The former is the more primitive, and the latter has been subordinated to it. The Kenite version is also found in Gen. v. 29, where Lamech is the eponym of the Kenites, and in Num. xxiv. 21, 22, where Kain is the Kenite settlement. The Kenite version has been subordinated to the Judaean in Gen. iv. 1, 2*b*, 3-24, and the Judaean to the Kenite in iv. 25, 26. The Kenite version is also found in Gen. v. 29, where Lamech is the eponym of the Kenites, and in Num. xxiv. 21, 22, where Kain is the Kenite settlement. The Kenite version has been subordinated to the Judaean in Gen. iv. 1, 2*b*, 3-24, and the Judaean to the Kenite in iv. 25, 26.

[6] See the discussion between B. D. Eerdmans and G. A. Smith in the *Expositor* (Aug.–Oct. 1908), and the former's *Alttest. Studien*, ii. (1908), *passim*.

[7] xxxiv. (note r. 9) indicates a possible alliance with Shechemites, and xxxv. 4 (taken literally) implies a residence long enough for a religious reform to be necessary. Yet the present aim of the narratives is to link together the traditions and emphasize Jacob's return from Laban to his dying father (xxviii. 21; xxxi. 3, 13, 18; xxxii. 9; xxxv. 27).

[8] Cf. Benjamin's descendants in 1 Chron. viii. 6 sq., and see on the naive and primitive character of these traditions, Kittel, comment. *ad loc.*

That there are traditions in Genesis which do not form the prelude to Exodus is very generally recognized by those who agree that the Israelites after entering Palestine took over some of the indigenous lore (whether from the Canaanites or from a presumed earlier layer of Israelites). This adoption of native tradition by new settlers, however, cannot be confined to any single period. See further, Luther and Meyer, *op. cit.* pp. 108, 110, 156, 227 sqq., 254 sq., 414 sq., 433; on traditions related to the descent into Egypt, *ib.* 122 sqq., 151 sq., 260; and on the story of Joseph (ch. xxxv., xxxvii. sqq.), as an independent cycle used to form a connecting link, Luther, *ib.* pp. 142-154.

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before the dismissal of the tribes finds its parallel in Jacob's reforms before leaving for Bethel (xxiv.; cf. v. 26, Gen. xxxv. 4). Owing, perhaps, to the locale of the writers, we hear relatively little of the northern tribes. Judah and Simeon are the first to conquer their lot, and the "house of Joseph" proceeds south to Bethel, where the story of the "weeping" at Bochim finds a parallel in the "oak of weeping" (Gen. xxxv. 8). In Gen. xxxviii. "at that time Judah went down from his brethren"—in xxxvii. they are at Shechem or Dothan—and settled among Canaanites, and there is a fragmentary allusion to a similar alliance of Simeon (xlvi. 10). The trend of the two series of traditions is too close to be accidental, yet the present sequence of the narratives in Joshua and Judges associates them with the Exodus. Further, Jacob's move to Shechem, Bethel and the south is parallel to that of Abraham, but his history actually represents a twofold course. On the one hand, he is the Aramaean (Deut. xxvi. 5), the favourite son of his Aramaean mother. On the other, Rebekah is brought to Beer-lahai-roi (xxiv.), Jacob belongs to the south and he leaves Beersheba for his lengthy sojourn beyond the Jordan. His separation from Esau, the revelation at Bethel, and the new name Israel are recorded twice, and if the entrance into Palestine reflects one ethnological tradition, the possibility that his departure from Beersheba reflects another, finds support (*a*) in the genealogies which associate the nomad "father" of the southern clans Caleb and Jerahmeel with Gilead (1 Chron. ii. 21), and (*b*) in the hints of an "exodus" from the district of Kadesh northwards.

The history of an immigration into Palestine from beyond the Jordan would take various shapes in local tradition. In Genesis it is preserved from the southern point of view. The northern standpoint appears when Rachel, mother of Joseph and Benjamin, is the favoured wife in contrast to the despised Leah, mother of Judah and Simeon; when Joseph is supreme among his brethren; and when Judah is included among the "sons" of Israel. It is possible that the application of the traditional immigration to the history of the tribes is secondary. This at all events suggests itself when xxxiv. extends to the history of all the sons, incidents which originally concerned Simeon and Levi alone, and which may have represented the Shechemite version of a "Levitical" tradition (see LEVITES). However this may be, it is necessary to account for the nomadic colouring of the narratives (cf. Meyer, pp. 305, 472) and the prominence of southern interests, and it would be in accordance with biblical evidence elsewhere if northern tradition had been taken over and adapted to the standpoint of the southern members of Israel, with the incorporation of local tradition which could only have originated in the south.[1] These and other indications point to a late date in biblical history. There is a manifest difference between the religious importance of Shechem in the traditions of Joshua (xxiv.) and Jacob's reforms when he leaves behind him the heathen symbols before journeying to the holy site of Bethel (Gen. xxxv. 4). There is even some polemic against marriage with Shechemites (xxxiv.; more emphatic in Jub. xxx.), while in the story of the Patriarchs Abraham, Bethel itself is avoided and Shechem is of little significance. Again, the present object of xxxviii. is to trace the origin of certain Judaean subdivisions after the death of the wicked Er and Onan. It is purely local and is interested in Shelah, and more especially in Perez and Zerah, names of families or clans of the post-exilic age.[2] Elsewhere, in 1 Chron. ii. and iv., the genealogies represent a Judah composed of clans from the south (Caleb and Jerahmeel) and of small families or guilds, Shelah included. It is not the Judah of the monarchy or of the post-exilic Babylonian-Israelite community. But the mixed elements were ultimately reckoned among the descendants of Judah, through Hezron the "father" of Caleb and Jerahmeel, and just as the southern groups finally became incorporated in Israel, so it is to be observed that although Hebron and Abraham have gained the first place in the patriarchal history, the traditions are no longer specifically Calebite, but are part of the common Israelite heritage.

We are taken to a period in biblical history when, though the historical sources are almost inexplicably scanty, the narratives of the past were approaching their present shape. Some time after the fall of Jerusalem (587 B.C.) there was a movement from the south of Judah northwards to the vicinity of Jerusalem (Bethlehem, Kirjath-jearim, &c.), where, as can be gathered from 1 Chron. ii., were congregated Kenite and Rechabite communities and families of scribes. Names related to those of Edomite and kindred groups are found in the late genealogies of both Judah and Benjamin, and recur even among families of the time of Nehemiah.[3] The same obscure period witnessed the advent of southern families,[4] the revival of the Davidic dynasty and its mysterious disappearance, the outbreak of fierce hatred of Edom, the return of exiles from Babylonia, the separation of Judah from Samaria and the rise of bitter anti-Samaritan feeling. It closes with the reorganization associated with Ezra and Nehemiah and the compilation of the historical books in practically their present form. It contains diverse interests and changing standpoints by which it is possible to explain the presence of purely southern tradition, the southern treatment of national history, and the antipathy to northern claims. As has already been mentioned, the specifically southern writings have everywhere been modified or adjusted to other standpoints, or have been almost entirely subordinated, and it is noteworthy, therefore, that in narratives elsewhere which reflect rivalries and conflicts among the priestly families, there is sometimes an animus against those whose names and traditions point to a southern origin (see LEVITES).

Thus the book of Genesis represents the result of efforts to systematize the earliest history, and to make it a worthy prelude to the Mosaic legislation which formed the charter of Judaism as it was established in or about the 5th century B.C. It goes back to traditions of the most varied character, whose tone was originally more in accord with earlier religion and thought. Though these have been made more edifying, they have not lost their charm and interest. The latest source, it is true, is without their freshness and life, but it is a matter for thankfulness that the simple compilers were conservative, and have neither presented a work entirely on the lines of P, nor rewritten their material as was done by the author of Jubilees and by Josephus. It is obvious that from Jubilees alone it would have been impossible to conceive the form which the traditions had taken a few centuries previously—viz. in Genesis. Also, from P alone it would have been equally impossible to recover the non-priestly forms. But while there is no unmeasurable gulf between the canonical book of Genesis and Jubilees, the internal study of the former reveals traces of earlier traditions most profoundly different as regards thought and contents. It

Summary.

The sympathies of these traditions are as suggestive as their presence in the canonical history, which, it must be remembered, ultimately passed through the hands of Judaean compilers.

[1] Cf. the late "Deuteronomic" form of Judges where a hero of Kenizzite origin (and therefore closely connected with Caleb) stands at the head of the Israelite "judges"; also, from another aspect, the specifically Judaean and anti-Israelite treatment of the history of the monarchy. But in each case the feature belongs to a relatively late stage in the literary history of the books; see JUDGES; SAMUEL, BOOKS OF; KINGS.

[2] Mahalalel (son of Kenan, another form of Cain, v. 12) is also a prominent ancestor in Perez (Neh. xi. 4), and Zerah claimed the renowned sages of Solomon's day (1 Chron. ii. 6, 1 Kings iv. 31). The story implies that Perez surpassed his "brother" clan Zerah (xxxviii. 27-30), and in fact Perez is ultimately reckoned the head of the Judaean subdivisions (1 Chron. ii. 4 sqq.), and thus is the reputed ancestor of the Davidic dynasty (Ruth iv. 12, 18 sqq.).

[3] Neh. iii. 9, 14; see Meyer, pp. 300, 430; S. A. Cook, *Critical Notes on O.T. History*, p. 58 n. 2. While the evidence points to an early close relationship among S. Palestinian groups (Edom, Ishmael, &c.; cf. Meyer, p. 446), there are many allusions to subsequent treacherous attacks which made Edom execrable. Here again biblical criticism cannot at present determine precisely when or precisely why the changed attitude began; see EDOM; JEWS, §§ 20, 22.

[4] Although the movement reflected in 1 Chron. ii. is scarcely pre-exilic, yet naturally there had always been a close relation between Judah and the south, as the Assyrian inscriptions of the latter part of the 8th century B.C. indicate.

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is not otherwise when one looks below the traditional history elsewhere (*e.g.* Samuel, Kings). An explanation may be found in the vicissitudes of the age. The movement from the south, which seems to account for a considerable cycle of the patriarchal traditions, belongs to the age after the downfall of the Israelite and(later)the Judaean monarchies when there were vital political and social changes. The removal of prominent inhabitants, by Assyria and later by Babylonia, the introduction of colonists from distant lands, and the movements of restless tribes around Palestine were more fatal to the continuity of trustworthy tradition than to the persistence of popular thought. New conditions arose as the population was reorganized, a new Israel claimed to be the heirs of the past (cf. *e.g.* the Samaritans, Ezr. iv. 2, Joseph. *Antiq.* ix. 14, 3; xi. 8, 6), and not until after these vicissitudes did the book of Genesis begin to assume its present shape.[1] (See JEWS; PALESTINE: *History*.)

The above pages handle only the more important details for the study of a book which, as regards contents and literary history, cannot be separated from the series to which it forms the introduction. As regards the literary-critical problems it is clear that with the elimination of P we have the sources (minor adjustment and revision excepted) which were accessible to the last compiler in the post-exilic age. Most critics have inclined to date these sources (J and E) as early as possible, whereas the admitted presence of secondary and of relatively late passages (*e.g.* xviii. 22 sqq., J; xxii., E) shows that one must work back from the sources as known in P's age, and that one can rely only upon those criteria which can be approximately dated. It is useless to regard the more primitive character of J and E as a mark of antiquity; but this ignores the regular survival of primitive modes of thought and of popular tradition outside more cultured circles. It is also recognized that J and E are non-prophetical and non-Deuteronomic, but it has not been proved that the present J and E are earlier than the prophets or the Deuteronomic reforms of Josiah (2 Kings xxii. seq.). J and E are linguistically almost identical (in contrast to P), and differ from P in features which are often not of chronological but of sociological significance (*e.g.* the mentality of the writers). Their language is without some of the phenomena found in narratives which emanate from the north (*e.g.* Judges v., stories of Elijah and Elisha), and their stylistic variations may be, as Gunkel suggests, the mark of a district or region; for this district one would look in the neighbourhood of Jerusalem. The conclusion that P's narratives and laws in the Pentateuch are post-exilic was found by biblical scholars to be a necessary correction to the original hypothesis of Graf (1866) that P's *narrative* were to be retained (with J and E) as an early date. This view was influenced by the close connexion between the subject-matter, J, E and P representing the same trend of tradition. But by still ascribing J and E as written sources to about the 9th or 8th century (individual opinion varies), many difficulties and inconsistencies are involved. The present J and E reflect a reshaping and readjustment of earlier tradition which is found elsewhere, and the suggestion that they are not far removed from the age of the priestly writers and redactors does not conflict with what is known of language, forms of religious thought, or tendencies of tradition. We reach thus approximately the age when post-Deuteronomic editors were able to utilize such records as Judg. i., xvii. sqq., 2 Sam. ix.-xx. (see JUDGES; SAMUEL, BOOKS OF), which are equally valuable as specimens of current thought and of written tradition. In conclusion, the tendency of criticism has been to recognize "schools" of J and E extending into the exile, thus making the three sources J, E and P more nearly contemporaneous. The most recent conservative authority also inclines to a similar contemporaneity ("collaboration" or "co-operation"), but at an impossibly early date (J. Orr, *Problem of the O. T.*, 1905, pp. 216, 345, 354, 375 seq., 527). By admitting possible revision in the post-exilic age (pp. 226, 369, 370 seq.), the conservative theory recalls the old legend that Ezra rewrote the Old Testament (2 Esd. xiv.) and thus restored the Law which had been lost; a view which, through the early Christian Fathers, gained currency and has enjoyed a certain popularity to the present day. But when once revision or rewriting is conceded, there is absolutely no guarantee that the present Pentateuch is in any way identical with the five books which tradition ascribed to Moses (*q.v.*), and the necessity for a comprehensive critical investigation of the *present* contents makes itself felt.[2]

LITERATURE.—Only a few of the numerous works can be mentioned. Of those written from a conservative or traditional standpoint the most notable are: W. H. Green's *Unity of Genesis* (1895); and J. Orr, *Problem of the O. T.* (which is nevertheless a great advance upon earlier non-critical literature). S. R. Driver's commentary (*Westminster Series*) deals thoroughly with all preliminary problems of criticism, and is the best for the ordinary reader; that of A. Dillmann (6th ed., Eng. trans.) is more technical, that of W. H. Bennett (*Century Bible*) is more concise and popular. G. J. Spurrell, *Notes on the Text of Genesis*, and C. J. Ball (in Haupt's *Sacred Books of the O. T.*) appeal to Hebrew students. W. E. Addis, *Documents of the Hexateuch*, Carpenter and Harford-Battersby, *The Hexateuch*, and C. F. Kent, *Beginnings of Hebrew History*, are more important for the literary analysis. J. Wellhausen's sketch in his *Prolog. to Hist. of Israel* (Eng. trans., pp. 259-342) is admirable, as also is the general Introduction (trans. by W. H. Carruth, 1907) to H. Gunkel's valuable commentary. Of recent works bearing upon the subject-matter reference may be made to J. P. Peters, *Early Hebrew Story* (1904), A. R. Gordon, *Early Traditions of Genesis* (1907), and T. K. Cheyne, *Traditions and Beliefs of Ancient Israel* (1907). Special mention must be made of Eduard Meyer and B. Luther, to whose *Die Israeliten und ihre Nachbarstämme* (1906) the present writer is indebted for many valuable suggestions and hints. Fuller bibliographical information will be found in the works already mentioned, in the articles in the *Ency. Bib.* (G. F. Moore), and Hastings's *Dict.* (G. A. Smith), and in the volume by J. Skinner in the elaborate and encyclopaedic *International Critical Series*. (S. A. C.)

GENET, typically a south European carnivorous mammal referable to the *Viverridae* or family of civets, but also taken to include several allied species from Africa. The true genet (*Genetta vulgaris* or *Genetta genetta*) occurs throughout the south of Europe and in Palestine, as well as North Africa. The fur is of a dark-grey colour, thickly spotted with black, and having a dark streak along the back, while the tail, which is nearly as long as the

The Genet (*Genetta vulgaris*).

body, is ringed with black and white. The genet is rare in the south of France, but commoner in Spain, where it frequents the banks of streams, and feeds on small mammals and birds. It differs from the true civets in that the anal pouch is a mere depression, and contains only a faint trace of the highly characteristic odour of the former. In south-western Europe and North Africa it is sought for its soft and beautifully spotted fur. In some parts of Europe, the genet, which is easily tamed, is kept like a cat for destroying mice and other vermin.

GENEVA, a city of Ontario county, New York, U.S.A., at the N. end of Seneca Lake, about 52 m. S.E. of Rochester. Pop. (1890) 7557; (1900) 10,433 (of whom 1916 were foreign-born); (1910 census) 12,446. It is served by the New York Central & Hudson River, and the Lehigh Valley railways, and by the Cayuga & Seneca Canal. It is an attractively built city, and has good mineral springs. Malt, tinware, flour and grist-mill products,

[1] The south of Palestine, if less disturbed by these changes, may well have had access to older authoritative material.

[2] For Orr's other concessions bearing upon Genesis, see *op. cit.*, pp. 9 seq., 87, 93, and (on J, E, P) 196, 335, 340. These, like the concessions of other apologetic writers, far outweigh the often hypercritical, irrelevant, and superficial objections brought against the literary and historical criticism of Genesis.

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boilers, stoves and ranges, optical supplies, wall-paper, cereals, canned goods, cutlery, tin cans and wagons are manufactured, and there are also extensive nurseries. The total value of the factory product in 1905 was $4,051,064, an increase of 82·3 % since 1900. Geneva has a public library, a city hospital and hygienic institute. It is the seat of the New York State Agricultural Experiment Station and of Hobart College (non-sectarian), which was first planned in 1812, was founded in 1822 (the majority of its incorporators being members of the Protestant Episcopal church) as successor to Geneva Academy, received a full charter as Geneva College in 1825, and was renamed Hobart Free College in 1852 and Hobart College in 1860, in honour of Bishop John Henry Hobart. The college had in 1908–1909 107 students, 21 instructors, and a library of 50,000 volumes and 15,000 pamphlets. A co-ordinate woman's college, the William Smith school for women, opened in 1908, was endowed in 1906 by William Smith of Geneva, who at the same time provided for a Hall of Science and for further instruction in science, especially in biology and psychology. In 1888 the Smith Observatory was built at Geneva, being maintained by William Smith, and placed in charge of Dr William Robert Brooks, professor of astronomy in Hobart College. The municipality owns its water-supply system. Geneva was first settled about 1787 almost on the site of the Indian village of Kanadasega, which was destroyed in 1779 during Gen. John Sullivan's expedition against the Indians in western New York. It was chartered as a city in 1898.

GENEVA (Fr. *Genève*, Ger. *Genf*, Ital. *Ginevra*, Late Lat. *Gebenna*, though *Genava* in good Latin), a city and canton of Switzerland, situated at the extreme south-west corner both of the country and of the Lake of Geneva or Lake Leman. The canton is, save Zug, the smallest in the Swiss Confederation, while the city, long the most populous in the land, is now surpassed by Zürich and by Basel.

The canton.

The canton has an area of 108·9 sq. m., of which 88·5 sq. m. are classed as "productive" (forests covering 9·9 sq. m. and vineyards 6·8 sq. m., the rest being cultivated land). Of the "unproductive" 20·3 sq. m., 11½ are accounted for by that portion of the Lake of Geneva which belongs to the canton. It is entirely surrounded by French territory (the department of Haute Savoie lying to the south, and that of the Ain to the west and the north), save for about 3½ m. on the extreme north, where it borders on the Swiss canton of Vaud. The Rhone flows through it from east to west, and then along its south-west edge, the total length of the river in or within the canton being about 13 m., as it is very sinuous. The turbid Arve is by far its largest tributary (left), and flows from the snows of the chain of Mont Blanc, the only other affluent of any size being the London (right). Market gardens, orchards, and vineyards occupy a large proportion of the soil (outside the city), the apparent fertility of which is largely due to the unremitting industry of the inhabitants. In 1901 there were 6586 cows, 3881 horses, 2468 swine and 2048 bee-hives in the canton. Besides building materials, such as sandstone, slate, &c., the only mineral to be found within the canton is bituminous shale, the products of which can be used for petroleum and asphalt. The broad-gauge railways in the canton have a length of 18¾ m., and include bits of the main lines towards Paris and Lausanne (for Bern or the Simplon), while there are also 7¾ m. of electric tramways. The canton was admitted into the Swiss Confederation in 1815 only, and ranks as the junior of the 22 cantons. In 1815–1816 it was created by adding to the old territory belonging to the city (just around it, with the outlying districts of Jussy, Genthod, Satigny and Cartigny) 16 communes (to the south and east, including Carouge and Chêne) ceded by Savoy, and 6 communes (to the north, including Versoix), cut off from the French district of Gex.

Statistics of canton and city.

In 1900 there were, not counting the city, 27,813 inhabitants in the canton, or, including the city, 132,609, the city alone having thus a population of 104,796. (In the following statistics those for the city are enclosed within brackets.) In 1900 this population was thus divided in point of religion: Romanists, 67,162 (49,965), Protestants, 62,400 (52,121), and Jews 1119 (1081). In point of language 109,741 (84,259) were French-speaking, 13,343 (12,001) German-speaking, and 7345 (6574) Italian-speaking, while there were also 80 (76) Romonsch-speaking persons. More remarkable are the results as to nationality: 43,550 (31,607) were Genevese citizens, and 36,415 (30,582) Swiss citizens of other cantons. Of the 52,644 (42,607) foreigners, there were 34,277 (26,018) French, 10,211 (9126) Italians, 4653 (4283) subjects of the German empire, 583 (468) British subjects, 832 (777) Russians, and 285 (251) citizens of the United States of America. In the canton there were 10,821 (5683) inhabited houses, while the number of separate households was 35,450 (28,621). Two points as to these statistics deserve to be noted. The number of foreign residents is steadily rising, for in 1900 there were only 70,965 (62,189) Swiss in all as against 52,644 (42,607) foreigners. One result of this foreign immigration, particularly from France and Italy, has been the rapid increase of Romanists, who now form the majority in the canton, while in the city they were still slightly less numerous than the Protestants in 1900; later (local) statistics give in the Canton 75,400 Romanists to 64,200 Protestants, and in the city 52,638 Romanists to 51,221 Protestants. Geneva has always been a favourite residence of foreigners, though few can ever have expected to hear that the "protestant Rome" has now a Romanist majority as regards its inhabitants. Galiffe (*Genève hist. et archéolog.*) estimates the population in 1356 at 5800, and in 1404 at 6400, in both cases within the fortifications. In 1536 the old city acquired the outlying districts mentioned above, as well as the suburb of St Gervais on the right bank of the Rhone, so that in 1545 the number is given as 12,500, reduced by 1572 to 11,000. After the revocation of the Edict of Nantes (1685) it rose, by 1698, to 16,934. Thenceforward the progress was fairly steady: 18,500 (1711); 24,712 (1782); 26,140 (1789). After the creation of the canton (1815) the numbers were (those for the city are enclosed within brackets) 48,489 (25,289), the city rising in 1837 to 33,714, and in 1843 to 36,452. The result of the Federal censuses (begun in 1850) are as follows: in 1850, 64,146 (42,127); in 1860, 82,876 (59,826); in 1870, 88,791 (65,606); in 1880, 99,712 (76,197), and in 1888, 105,509 (81,407).

Religion.

The canton comprises 3 administrative districts: the 13 communes on the right bank and the 34 on the left bank each form one, while the city proper, on both sides of the river, forms one district and one commune. From 1815 to 1842 the city and the cantonal government was the same. But at that date the city obtained its independence, and is now ruled by a town council of 25 members, and an executive of 5 members, the election in each case being made direct by the citizens, and the term of office being 4 years. The existing cantonal constitution dates, in most of its main features, from 1847. The legislature or *Grand Conseil* (now composed of 100 members) is elected (in the proportion of 1 member for every 1000 inhabitants or fraction over 500) for 3 years by a direct popular vote, subject (since 1892) to the principles of proportional representation, while the executive or *conseil d'état* (7 members) is elected (no proportional representation) by a popular vote for 3 years. By the latest enactments (one dating from 1905) 2500 citizens can claim a vote ("facultative referendum") as to any legislative project, or can exercise the "right of initiative" as to any such project or as to the revision of the cantonal constitution. The canton sends 2 members (elected by a popular vote) to the Federal *Ständerath*, and 7 to the Federal *Nationalrath*.

Government.

The Consistory rules the Established Protestant Church, and is now composed of 31 members, 25 being laymen and 6 (formerly 15) clerics, while the "venerable company of pastors" (pastors actually holding cures) has greatly lost its former importance and can now only submit proposals to the Consistory. The Christian Catholic Church is also "established" at Geneva (since 1873) and is governed by the *conseil supérieur*, composed of 25 lay members and 5 clerics. No other religious denominations are "established" at Geneva. But the Romanists (who form 13 % of the electors) are steadily growing in numbers

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and in influence, while the Christian Catholics are losing ground rapidly, the highest number of votes received by a candidate for the *conseil supérieur* having fallen from 2003 in 1874 to 806 in 1890 and 507 in 1906, while they are abandoning the country churches (some were lost as early as 1892) which they had taken from the Romanists in the course of the *Kulturkampf*.

Industry.

The fairs of Geneva (held 4 times a year) are mentioned as early as 1262, and attained the height of their prosperity about 1450, but declined after Louis XI.'s grants of 1462–1463 in favour of the fairs of Lyons. Among the chief articles brought to these fairs (which were largely frequented by Italian, French and Swiss merchants) were cloth, silk, armour, groceries, wine, timber and salt, this last coming mainly from Provence. The manufacturers of Geneva formed in 1487 no fewer than 38 gilds, including tailors, hatters, mercers, weavers, tanners, saddle-makers, furriers, shoe-makers, painters on glass, &c. Goldsmiths are mentioned as early as 1290. Printing was introduced in 1478 by Steinschaber of Schweinfurth, and flourished much in the 16th century, though the rigorous supervision exercised by the Consistory greatly hampered the Estiennes (Stephanus) in their enterprises. Nowadays the best known industry at Geneva is that of watchmaking, which was introduced in 1587 by Charles Cusin of Autun, and two years later regulations as to the trade were issued. In 1685 there were in Geneva 100 master watchmakers, employing 300 work-people, who turned out 5000 pieces a year, while in 1760 this trade employed 4000 work-people. Of recent years its prosperity has diminished greatly, so that the watchmaking and jewelry trades in 1902 numbered respectively but 38 and 32 of the 394 establishments in Geneva which were subject to the factory laws. Lately, huge establishments have been constructed for the utilization of the power contained in the Rhone. The local commerce of Geneva is much aided by the fact that the city is nearly entirely surrounded by "free zones," in which no customs duties are levied, though the districts are politically French: this privilege was given to Gex in 1814, and to the Savoyard districts in 1860, when they were also neutralized.

Celebrities.

Considering the small size of Geneva, till recently, it is surprising how many celebrated persons have been connected with it as natives or as residents. Here are a few of the principal, special articles being devoted to many of them in this work. In the 16th century, besides Calvin and Bonivard, we have Isaac Casaubon, the scholar; Robert and Henri Estienne, the printers, and, from 1572 to 1574, Joseph Scaliger himself, though but for a short time. J. J. Rousseau is, of course, the great Genevese of the 18th century. At that period, and in the 19th century, Geneva was a centre of light, especially in the case of various of the physical sciences. Among the scientific celebrities were de Saussure, the most many-sided of all; de Candolle and Boissier, the botanists; Alphonse Favre and Necker, the geologists; Marignac, the chemist; Deluc, the physicist, and Plantamour, the astronomer. Charles Bonnet was both a scientific man and a philosopher, while Amiel belonged to the latter class only. Pradier and Chaponnière, the sculptors; Arlaud, Diday and Calame, the artists; Mallet, who revealed Scandinavia to the literary world; Necker, the minister; Sismondi, the historian of the Italian republics; General Dufour, author of the great survey which bears the name of the "Dufour Map," have each a niche in the Temple of Fame. Of a less severe type were Cherbuliez, the novelist; Töpffer, who spread a taste for pedestrianism among Swiss youth; Duchosal, the poet; Marc Monnier, the littérateur; not to mention the names of any persons still living, or of politicians of any date.

The city and its buildings.

The city of Geneva is situated at the south-western extremity of the beautiful lake of the same name, w ence the "arrowy Rhone" flows westwards under the seven bridges by which the two halves of the town communicate with each other. To the south is the valley of the Arve (descending from the snows of the Mont Blanc chain), which unites with that of the Rhone a little below the town; while behind the Arve the grey and barren rocks of the Petit Salève rise like a wall, which in turn is overtopped by the distant and ethereal snows of Mont Blanc. Yet the actual site of the town is not as picturesque as that of several other spots in Switzerland. Though the cathedral crowns the hillock round which clusters the old part of the town, a large portion of the newer town is built on the alluvial flats on either bank of the Rhone. Since the demolition of the fortifications in 1849 the town has extended in every direction, and particularly on the right bank of the Rhone. It possesses many edifices, public and private, which are handsome or elegant, but it has almost nothing to which the memory reverts as a masterpiece of architectural art. It is possible that this is, in part, due to the artistic blight of the Calvinism which so long dominated the town. But, while lacking the mediæval appearance of Fribourg or Bern, or Sion or Coire, the great number of modern fine buildings in Geneva, hotels, villas, &c., gives it an air of prosperity and comfort that attracts many visitors, though on others modern French architecture produces a blinding glare. On the other hand, there are broad quays along the river, while public gardens afford grateful shade.

The cathedral (Protestant) of St Pierre is the finest of the older buildings in the city, but is a second-rate building, though as E. A. Freeman remarks, "it is an excellent example of a small cathedral of its own style and plan, with unusually little later alteration." The hillock on which it rises was no doubt the site of earlier churches, but the present Transitional building dates only from the 12th and 13th centuries, while its portico was built in the 18th century, after the model of the Pantheon at Rome. It contains a few sepulchral monuments, removed from the cloisters (pulled down in 1721), and a fine modern organ, but the historical old bell *La Clémence* has been replaced by a newer and larger one which bears the same name. More interesting than the church itself is the adjoining chapel of the Maccabees, built in the 15th century, and recently restored. Near the cathedral are the arsenal (now housing the historical museum, in which are preserved many relics of the "Escalade" of 1602, including the famous ladders), and the maison de ville or town hall. The latter building is first mentioned in 1448, but most of the present building dates from far later times, though the quaint paved spiral pathway (taking the place of a staircase in the interior) was made in the middle of the 16th century. In the *Salle du Conseil d'État* some curious 15th-century frescoes have lately been discovered, while the old Salle des Festins is now known as the Salle de l'Alabama, in memory of the arbitration tribunal of 1872. In the 15th-century Tour Baudet, adjoining the Town Hall, are preserved the rich archives of the city. Not far away is the palais de justice, built in 1709 as a hospital, but used as a court house since 1858. On the Île in the Rhone stands the tower (built *c.* 1219) of the old castle belonging to the bishop. Among the modern buildings we may mention the following: the University (founded in 1559, but raised to the rank of a University in 1873 only), the Athénée, the Conservatoire de Musique, the Victoria Hall (a concert hall, presented in 1904 to the city by Mr Barton, formerly H.B.M.'s Consul), the theatre, the Salle de la Réformation (for religious lectures and popular concerts), the Bâtiment Electoral, the Russian church and the new post office. At present the museums of various kinds at Geneva are widely dispersed, but a huge new building in course of construction (1906) will ultimately house most of them. The Musée Rath contains pictures and sculptures; the Musée Fol, antiquities of various dates; the Musée des Arts Décoratifs, *inter alia*, a fine collection of prints; the Musée Industriel, industrial objects and models; the Musée Archéologique, prehistoric and archaeological remains; the Musée d'Histoire Naturelle, scientific collections; and the Musée Epigraphique, a considerable number of inscriptions. Some way out of the town is the Musée Ariana (extensive art collections), left, with a fine park, in 1890 to the city by a rich citizen, Gustave Revilliod. The public library is in the university buildings and contains many valuable MSS. and printed books. Geneva boasts also of a fine observatory and of a number of technical schools (watchmaking, chemistry, medicine, commerce, fine arts, &c.), some of which are really annexes of the university, which in June 1906 was attended by 1158 matriculated students, of whom 903

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were non-Swiss, the Russians (475 in number) forming the majority of the foreign students. Geneva is well supplied with charitable institutions, hospitals, &c. Among other remarkable sights of the city may be mentioned the great hydraulic establishment (built 1882–1899) of the *Forces Motrices du Rhône* (turbines), the singular monument set up to the memory of the late duke of Brunswick who left his fortune to the city in 1873, and the Île Jean-Jacques Rousseau now connected with the Pont des Bergues. The house occupied by Rousseau is No. 40 in the Grand' Rue, while No. 13 in the same street is on the site of Calvin's house, though not the actual dwelling inhabited by him.

The real name of the city is *Genava*, that being the form under which it appears in almost all the known documents up to the 7th century, A.D., the variation *Genua* (which has led to great confusion with Genoa) being also found in the 6th century. But *Geneva* and *Gebenna* are of later date. The first mention of the city is made by Caesar (*Bell. Galli.* i. 6-7) who tells us that it was the last *oppidum* of the Allobroges, and the nearest to the territory of the Helvetii, with which it was connected by a bridge that, for military reasons, he was forced to destroy. Inscriptions of later date state that it was only a *vicus* of the Viennese province, while mentioning the fact that a gild of boatmen flourished there. But the many Roman remains found on the original site (in the region of the cathedral) of the city show that it must have been of some importance, and that it possessed a considerable commerce. About 400 the *Notitia Galliarum* calls it a *civitas* (so that it then had a municipal administration of its own), and reckons it as first among those of the Viennese. Probably this rise in dignity was connected with the establishment of a bishop's see there, the first bishop certainly known, Isaac, being heard of about 400 in a letter addressed by St Eucherius to Salvius, while, in 450, a letter of St Leo states that the see was then a suffragan of the archbishopric of Vienne. It is possible that there may be some ground for the local tradition that Christianity was introduced into this region by Dionysius and Paracodus, who successively occupied the see of Vienne, but another tradition that the first bishop was named St Nazarius rests on a confusion, as that saint belongs to Genoa and not to Geneva.

History.

About the middle of the 5th century A.D. it came into the possession of the Burgundians, who held it as late as 527 (thus leaving no room for any occupation by the Ostrogoths), and in 534 passed into the hands of the Franks. The Burgundian kings seem to have made Geneva one of their principal residences, and the *Notitia* (above named) tells us that the city was *restaurata* by King Gundibald (d. 516) which is generally supposed to mean that he first surrounded it with a wall, the city then comprising little more than the hill on which the present cathedral stands. That building is of course of much later date, but it seems certain that when (*c.* 513–516) Sigismund, son of King Gundibald, built a stone church on the site, it took the place of an earlier wooden church, constructed on Roman foundations, all three layers being clearly visible at the present day. We know that St Avitus, archbishop of Vienne (d. 518), preached a sermon (preserved to us) at the dedication of a church at Geneva which had been built on the site of one burnt by the enemy, and the bits of half-burnt wood found in the second of the two layers mentioned above, seem to make it probable that the reference is to Sigismund's church. But Geneva was in no sense one of the great cities of the region, though it is mentioned in the *Antonine Itinerary* and in the *Peutinger Table* (both 4th century A.D.), no doubt owing to its important position on the bank of the Rhone, which then rose to the foot of the hill on which the original city stood. This is no doubt the reason why, apart from some passing allusions (for instance, Charles the Great held a council of war there in 773, on his first journey to Italy), we hear very little about it.

In 1032, with the rest of the kingdom of Burgundy or Arles, it reverted to the emperor Conrad II., who was crowned king at Payerne in 1033, and in 1034 was recognized as such at Geneva by a great assembly of nobles from Germany, Burgundy and Italy, this rather unwilling surrender signifying the union of those 3 kingdoms. It is said that Conrad granted the temporal sovereignty of the city to the bishop, who, in 1162, was raised to the rank of a prince of the Holy Roman Empire, being elected, from 1215, by the chapter, but, after 1418, named directly by the pope himself.

Like many other prince-bishops, the ruler of Geneva had to defend his rights: without against powerful neighbours, and within against the rising power of the citizens. These struggles constitute the entire political history of Geneva up to about 1535, when a new epoch of unrest opens with the adoption of Protestantism. The first foe without was the family of the counts of the Genevois (the region south of the city and in the neighbourhood of Annecy), who were also "protectors" (*advocati*) of the church of Geneva, and are first heard of in the 11th and 12th centuries. Their influence was probably never stronger than during the rule as bishop (1118–1119) of Guy, the brother of the reigning count. But his successor, Humbert de Grammont, resumed the grants made to the count, and in 1125 by the Accord of Seyssel, the count fully acknowledged the suzerainty of the bishop. A fresh struggle under Bishop Ardutius (1135–1185) ended in the confirmation by Frederick Barbarossa, as emperor, of the position of the bishop as subject to no one but himself (1153), this declaration being strengthened by the elevation of the bishop and his successors to the rank of princes of the empire (1162).

In 1250 the counts of Savoy first appear in connexion with Geneva, being mortgagees of the Genevois family, and, in 1263, practically their heirs as "protectors" of the city. It was thus natural that the citizens should invoke the aid of Savoy against their bisbop, Robert of the Genevois (1276–1287). But Count Amadeus of Savoy not merely seized (1287) the castle built by the bishops (about 1219) on the Île, but also (1288) the office of *vicedominus* [*vidomne*], the official through whonf the bishop exercised his minor judicial rights. The new bishop, William of Conflans (1287–1295) could recover neither, and in 1290 had to formally recognize the position of Savoy (which was thus legalized) in his own cathedral city. It was during this struggle that about 1287 (these privileges were finally sanctioned by the bisbop in 1309) the citizens organized themselves into a commune or corporation, elected 4 syndics, and showed their independent position by causing a seal for the city to be prepared. The bishop was thus threatened on two sides by foes of whom the influence was rising, and against whom his struggles were of no avail. In 1365 the count obtained from the emperor the office of imperial vicar over Geneva, but the next bishop William of Marcossay (1366–1377 : he began the construction of a new wall round the greatly extended city, a process not completed till 1428) secured the withdrawal of this usurpation (1366–1367), which the count finally renounced (1371). One of that bishop's successors, Adhémar Fabri (1385–1388) codified and confirmed all the franchises, rights and privileges of the citizens (1387), this grant being the *Magna Carta* of the city of Geneva. In 1401 Amadeus VIII. of Savoy bought the county of the Genevois, as the dynasty of its rulers had become extinct. Geneva was now surrounded on all sides by the dominions of the house of Savoy.

Amadeus did homage, in 1405, to the bishop for those of the newly acquired lands which he held from the bishop. But, after his power had been strengthened by his elevation (1417) by the emperor to the rank of a duke, and by his succession to the principality of Piedmont (1418, long held by a cadet branch of his house), Amadeus tried to purchase Geneva from its bishop, John of Pierre-Scisé or Rochetaillée (1418–1422). This offer was refused both by the bishop and by the citizens, while in 1420 the emperor Sigismund declared that he alone was the suzerain of the city, and forbade any one to attack it or harm it in any fashion. Oddly enough Amadeus did in the end get hold of the city, for, having been elected pope under the name of Felix V., he named himself to the vacant see of Geneva (1444), and kept it, after his resignation of the Papacy in 1449, till his death in 1451. For the most part of this period he resided in Geneva. From 1451 to 1522 the see was almost continuously held by a cadet of the house of Savoy, which thus treated it as a kind of appange.

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Most probably Geneva would soon have become an integral part of the realms of the house of Savoy had it not been for the appearance of a new protector on the scene—the Swiss confederation. In the early 15th century the town of Fribourg made an alliance with Geneva for commercial purposes (the cloth warehouses of Fribourg at Geneva being enlarged in 1432 and 1465), as the cloth manufactured at Fribourg found a market in the fairs of Geneva (which are mentioned as early as 1262, and were at the height of their prosperity about 1450). The duke, however, was no better inclined towards the Swiss than towards Geneva. He struck a blow at both, when, in 1462–1463, he induced his son-in-law, Louis XI. of France, to forbid French merchants to attend the fairs of Geneva, altering also the days of the fairs at Lyons (established in 1420 and increased in number in 1463) so as to make them clash with those fixed for the fairs of Geneva. This nearly ruined Geneva, which, too, in 1477 had to pay a large indemnity to the Swiss army that, after the defeat of Charles the Bold, duke of Burgundy, advanced to take vengeance on the dominions of his ally, Yolande, dowager duchess of Savoy and sister of Louis XI., as well as on the bishop of Geneva, her brother-in-law. But, after this payment, the bishop made an alliance with the Swiss. A prolonged attempt was made (1517–1530) by the reigning duke of Savoy, Charles III. (1504–1553), to secure Geneva for his family, at first with the help of his bastard cousin John (1513–1522), the last of his house to hold the see. In this struggle the syndic, Philibert Berthelier, succeeded in concluding (1519) an alliance with Fribourg, which, however, had to be given up almost immediately. It split the citizens into two parties; the *Eidgenots* relying on the Swiss, while the *Mamelus* (mamelukes) supported the duke. Berthelier was executed in 1519, and Amé Lévrier in 1524, but Bezanson Hugues (d. 1532) took their place, and in 1526 succeeded in renewing the alliance with Fribourg and adding to it one with Bern. This much enraged the duke, who took active steps against the citizens, and tried (1527) to carry off the bishop, Pierre de la Baume (1522–1544), who soon found it best to make his submission.

The Genevese, thus abandoned by their natural protector, looked to the Swiss for help. They sent (October 1530) a considerable army to save the city. This armed intervention compelled the duke to sign the treaty of St Julien (19th October) by which he engaged not to trouble the Genevese any more, agreeing that if he did so the two towns of Fribourg and Bern should have the right to occupy his barony of Vaud. The two towns also, by the decision given as arbitrators at Payerne (30th December 1530), upheld their alliance with Geneva, condemned the duke to pay all the expenses of the war, and confirmed the clause as to their right to occupy Vaud; they also surrounding the exercise of the powers of *vidomne* by the duke with so many restrictions that in 1532 the duke, after much resistance, formally agreed to recognize the alliance of Geneva with the two towns and not to annoy the Genevese any more. Thus a legal tie between Geneva and two of the Swiss cantons was established, while the duke did not any longer venture to annoy the Genevese, as he clung to his fine barony of Vaud. In the course of this struggle (and especially after the last episcopal *vidomne* had left the town in 1526) the municipal authorities of the city greatly developed, a *grand conseil* of 200 members being set up in imitation of those at Bern and at Fribourg, while within the larger assembly there was a *petit conseil* of 60 members for more confidential business. Thus 1530 marks the date at which Geneva became its own mistress within, while allied externally with the Swiss confederation. But hardly had this settlement been reached when a fresh element of discord threatened to wholly upset matters—the adoption of Protestant principles by the city. Just before this event, however, the fortifications were once more (1534) rebuilt (bits still remain) and extended so as to take in several new suburbs, including that of St Gervais on the right bank of the Rhone which, till then, seems to have been unenclosed (1511–1527).

In 1532 William Farel, a Protestant preacher from Dauphiné, who had converted Vaud, &c., to the new belief, first came to Geneva and settled there in 1533. But although Bern supported the Reform, Fribourg did not, and in 1534 withdrew from its alliance with Geneva, while directly afterwards the duke of Savoy made a fresh attempt to seize the city. On the 10th of August 1535 the Protestant faith was formally adopted by Geneva, but an offer of help from France having been refused, as the city was unwilling to give up any of its sovereign rights, the duke's party continued its intrigues. Finally Bern, fearing that Geneva might fall to France instead of to itself, sent an army to protect the city (January 1536), but, not being able to persuade the citizens to give up their freedom, had to content itself with the conquest of the barony of Vaud and of the bishopric of Lausanne, thus acquiring rich territories, while becoming close neighbours of Geneva (January and March 1536). Meanwhile Farel had been advancing the cause of religious reform, which was definitively adopted on the 21st of May 1536. In July 1536 a French refugee, John Calvin (*q.v.*), came to Geneva for a night, but was detained by Farel who found in him a powerful helper. The opposition party of the *Libertins* succeeded in getting them both exiled in 1538, but, in September 1541, Calvin was recalled (Farel spending the rest of his life at Neuchâtel, where he died 1563) to Geneva. Born in 1509, he was then about 32 years of age. He set up this theocracy in Geneva, and ruled the reorganized republic with a strong hand till his death in 1564, when he was succeeded by the milder Théodore de Beza (1519–1605).

The great blot on Calvin's rule was his intolerance of other thinkers, as exemplified by his burning of Gruet (1547) and of Servetus (1553). But, on the other hand, he founded (1559) the Academy, which, originally meant as a seminary for his preachers, later greatly extended its scope, and in 1873 assumed the rank of a University. The strict rule of Calvin drove out many old Genevese families, while he caused to be received as citizens many French, Italian and English refugees, so that Geneva became not merely the "Protestant Rome" but also quite a cosmopolitan little city. The Bernese often interfered with the internal affairs of Geneva (while Calvin, a Frenchman, naturally looked towards France), and refused to allow the city to conclude any alliances save with itself. That alliance was finally renewed in 1558, while in 1560 the Romanist cantons made one with the duke of Savoy, a zealous supporter of the old faith. In 1564, after long negotiations, Bern restored to the duke part of its conquests of 1536, viz. Gex, the Genevois and the Chablais, Geneva being thus once more placed amidst the dominions of the duke; though by the same treaty (that of Lausanne, October 1564, Calvin having died the preceding May) the alliance of Bern with Geneva was maintained. In 1579 Geneva was included in the alliance concluded by France with Bern and Soleure, while in 1584 Zürich joined Bern in another alliance with Geneva. The struggle widened as Geneva became a pawn in the great attempt of the duke of Savoy to bring back his subjects to the old faith, his efforts being seconded by François de Sales, the "apostle of the Chablais." But the king of France, for political reasons, opposed Savoy, with whom, however, he made peace in 1601. In December 1602 François de Sales was consecrated bishop of Geneva (since 1535 the bishops had lived at Annecy), and a few days later the duke of Savoy made a final attempt to get hold of the city by a surprise attack in the night of 11-12th December 1602 (Old Style), known in history as the "Escalade," as ladders were used to scale the city walls. It was successfully repelled, over 200 of the foe being slain, while 17 Genevese only perished. Filled with joy at their rescue from this attack, the citizens crowded to their cathedral, where Beza (then 83 years of age) bid them to sing the 124th Psalm which has ever since been sung on the anniversary of this great delivery. The peace of St Julien (21st of July 1603) marked the final defeat of the duke of Savoy in the long struggle waged (since 1290) by his house against the city of Geneva.

In the charter of 1387 we hear only of the *conseil général* (composed of all male heads of families) which acted as the legislature, and elected annually the executive of 4 syndics; no doubt this form of rule existed earlier than 1387. Even before 1387 there was also the *petit conseil* or *conseil ordinaire* or *conseil étroit*, a body not recognized by the law, though it became very

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powerful; it was composed of the 4 syndics, with several other counsellors, and acted originally as the adviser of the syndics who were legally responsible for the rule of the city. In 1457 we first hear of the Council of the Fifty (re-established in 1502 and later known as the Sixty), and in 1526 of the Council of the Two Hundred (established in imitation of those of Bern and Fribourg), both being summoned in special cases of urgency. The members of both were named by the *petit conseil*, of which, in turn, the members were confirmed or not by the Two Hundred. By the Constitution of 1543 the *conseil général* had only the right of choosing the 4 syndics out of a list of 8 presented by the *petit conseil* and the Two Hundred, which therefore really elected them, subject to a formal approbation on the part of the larger body. This system was slightly modified in 1568, the constitution of that date lasting till 1794. The *conseil général* fell more and more into the background, the members of the other councils gradually obtained the privilege of being irremovable, and the system of co-optation resulted in the creation of a close monopoly of political offices in the hands of a few leading families.

During the 17th and 18th centuries, while the Romanist majority of the Swiss cantons steadily refused to accept Geneva as even a subordinate member of the Confederation, the city itself was distracted on several occasions by attempts of the citizens, as a whole, to gain some share in the aristocratic government of the town, though these attempts were only partially successful. But the last half of the 18th century marks the most brilliant period in the literary history of Geneva, whether as regards natives or resident foreigners, while in the succeeding half century the number of Genevese scientific celebrities is remarkable. In 1794 the effects of the French Revolution were shown in the more liberal constitution granted by the city government. But in 1798 the city was annexed to France and became the capital of the French department of Léman (to be carefully distinguished from the Swiss *canton* of Léman, that is Vaud, of the Helvetic Republic, also set up in 1798), while in 1802, by the Concordat, the ancient bishopric of Geneva was suppressed. On the fall of Napoleon (1813) the city recovered its independence, and finally, in 1815, was received as the junior member of the Swiss confederation, several bits of French and Savoyard territory (as pointed out above) being added to the narrow bounds of the old Genevese Republic in order to give the town some protection against its non-Swiss neighbours.

The constitution of 1814 set up a common form of government for the city and the canton, the city not obtaining its municipal independence till the constitution of 1842. From 1535 to 1798 public worship according to the Romanist form had been strictly forbidden. In 1799 already the first attempts were made to re-establish it, and in 1803 the church of St Germain was handed over to the Romanists. The constitution of 1814, looking forward to the annexation of Romanist districts to the city territory to form the new canton, guaranteed to that body the freedom of worship, at any rate in these newly gained districts. In 1819 the canton (the new portions of which were inhabited mainly by Romanists) was annexed to the bishopric of Lausanne, the bishop in 1821 being authorized to add "and of Geneva" to his episcopal style. After the adventure of the "Escalade" the fortifications were once more strengthened and extended, these works being completed about 1726. But, in 1822, some of the bastions were converted into promenades, while in 1849 the rest of the fortifications were pulled down so as to allow the city to expand and gradually assume its present aspect.

When Geneva recovered its political independence in 1814 a new constitution was drawn up, but it was very reactionary, for there is no mention in it of the sovereignty of the people. It set up a *conseil représentatif* or legislature of 250 members, which named the *conseil d'état* or executive, while it was itself elected by a limited class, for the electoral qualification was the annual payment of direct taxes to the amount of 20 Swiss livres or about 23 shillings. It was not till 1842 that this system, though much criticized, was modified. In the early part of 1841 the "Third of March Association" was formed to watch over the interests of the citizens, and in November of that year the government was forced by a popular demonstration to summon an *assemblée constituante*, which in 1842 elaborated a new constitution that was accepted by the citizens. Besides bestowing on the city a government distinct from that of the canton, it set up for the latter a *grand conseil* or legislature, and a *conseil d'état* or executive of 13 members, both elected for the term of 4 years. But this constitution did not seem liberal enough to many citizens, so that in 1846 the government gave way to the Radicals, led by James Fazy (1794–1878), who drew up a constitution that was accepted by a popular vote on the 21st of May 1847. It was much more advanced than that of 1842, and in its main features still prevails. From that date till 1864 the Radicals ruled the state, their head, Fazy, being an able man, though extravagant and inclined to absolutism. Under his sway the town was modernized and developed, but the finances were badly administered, and Fazy became more and more a radical dictator. "On voudrait faire de Genève," sighed the conservative, de la Rive, "la plus petite des grandes villes, et pour moi je préfère qu'elle reste la plus grande des petites villes." In 1861 and in 1864 Fazy failed to secure his re-election to the *conseil d'état*, riots followed his defeat, and the Federal troops were forced to intervene so as to restore order.

The Democratic party (liberal-conservative) ruled from 1865 to 1870, and did much to improve the finances of the state. In 1871 the Radicals regained the supremacy under their new chief, Antoine Carteret (1813–1889) and kept it till 1878. This was a period of religious strife, due to the irritation caused by the Vatican council, and the pope's attempt to revive the bishopric of Geneva. Gaspard Mermillod (1824–1891) was named in 1864 *curé* of Geneva, and made bishop of Hebron *in partibus*, acting as the helper of the bishop of Lausanne. Early in 1873 the pope named him "vicar apostolic of Geneva," but he was expelled a few weeks later from Switzerland, not returning till 1883, when he became bishop of Lausanne, being made cardinal in 1890. The Radical government enacted severe laws as to the Romanists in Geneva, and gave privileges to the Christian Catholic Church, which, organized in 1874 in Switzerland, had absorbed the community founded at Geneva by Père Hyacinthe, an ex-Carmelite friar. The Romanists therefore were no longer recognized by the state, and were persecuted in divers ways, though the tide afterwards turned in their favour. The Democrats ruled from 1878 to 1880, and introduced the "Referendum" (1879) into the cantonal constitution, but, their policy of the separation of church and state having been rejected by the people on a vote, they gave place to the Radicals. The Radicals went out in 1880, and the Democrats held the reins of power till 1897, their leader being Gustave Ador. In 1891 they introduced the "Initiative" into the cantonal constitution, and in 1892 the principle of proportional representation so far as regards the *grand conseil*, while Th. Turrettini did much to increase the economical prosperity of the city. In 1897 the Radicals came in again, their leaders being first Georges Favon (1843–1902) till his death, and then Henri Fazy, a distant relative of James and an excellent historian. They attempted to rule by aid of the Socialists, but their power fluctuated as the demands of the Socialists became greater. On the 30th of June 1907 the Genevese, by a popular vote, decided on the separation of Church and State.

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GENEVA CONVENTION, an international agreement for the purpose of improving the condition of wounded soldiers of armies in the field, originally adopted at an international conference held at Geneva, Switzerland, in 1864, and afterwards replaced by the convention of July 6, 1906, also adopted at Geneva. This later agreement is the one now known as the Geneva Convention. The conference of 1864 was the result of a movement which sprang from the publication in 1862 of a book entitled *Un Souvenir de Solférino* by Henri Dunant, a Genevese philanthroplist, in which he described the sufferings of the wounded at the battle of Solférino with such vivid effect that the subject became forthwith one of public interest. It was energetically taken up by M. Gustave Moynier, whose agitation led to an unofficial congress being held at Geneva in October 1863. This was followed by an official one at Geneva, called by the Swiss government in 1864. The convention which was there signed (22nd August 1864) on behalf of the states represented, afterwards received the adherence of every civilized power.

At a second conference on the same subject, held at Geneva in 1868, a supplementary convention was drawn up, consisting of fourteen additional articles, five of which related to war on land and nine to naval warfare. The additional articles were not, however, ratified by the chief states, and never became operative. The Brussels International Conference (1874) for the codification of the law and customs of war occupied itself with the Geneva Convention and again drew up a number of articles which were submitted to the interested governments. But, as in the case of the additional articles of 1868, no effect was ever given to them.

At the Peace Conference of 1899 Great Britain withdrew her objections to the application of the convention to maritime warfare, and agreed to the adoption of a special convention "adapting to Maritime warfare the principles of the Geneva Convention." A *voeu* was also adopted by the conference expressing the wish that a special conference should be held as soon as possible for the purpose of revising the convention of 1864.

In deference to the above *voeu* the Swiss government in 1901 sounded the other parties to the convention of 1864 as to whether the time had not come to call the proposed special conference, but the replies received did not give much encouragement and the matter was dropped for the time being. By a circular note of the 17th of February 1903, the Swiss government invited all the states which had signed or adhered to the Geneva Convention to send representatives to a conference to be held at Geneva in the following September. Some governments did not accept the invitation in time and the conference had to be postponed. At the beginning of 1904, there being no apparent obstacle, the Swiss government again invited the powers to send delegates to a conference in the following May. Meanwhile war broke out between Russia and Japan and there was again an adjournment. At length in March 1906 an invitation was accepted by thirty-five states, only Turkey, Salvador, Bolivia, Venezuela, Nicaragua and Colombia abstaining and the conference was held at Geneva in July 1906, when a full revised convention was adopted, which now takes the place of that of 1864.[1] The adoption of the new Geneva Convention entailed a revision of the above-mentioned Hague Convention and a new edition of the latter is one of the documents adopted at the Peace Conference of 1907.

The new Geneva Convention consists of thirty-three articles divided into the following chapters, (i.) the wounded and sick; (ii.) medical units and establishments; (iii.) personnel; (iv.) material; (v.) convoys of evacuation; (vi.) the distinctive emblem; (vii.) application and carrying out of the Convention; (viii.) prevention of abuses and infractions; (ix.) general provisions.

The essential parts of the new Hague Convention of 1907 (18th of October) adapting the above conventions to maritime warfare as follows: (N.B. The alterations are in italics. The parts of the older convention of 1899 which have been suppressed are in brackets).

i. Military hospital-ships, that is to say, ships constructed or assigned by states specially and solely for the purpose of assisting the wounded, sick or shipwrecked, and the names of which shall have been communicated to the belligerent powers at the commencement or during the course of hostilities, and in any case before they are employed, shall be respected and cannot be captured while hostilities last.

These ships, moreover, are not on the same footing as men-of-war as regards their stay in a neutral port.

ii. Hospital-ships, equipped wholly or in part at the cost of private individuals or officially-recognized Relief Societies, shall likewise be respected and exempt from capture, provided the belligerent power to whom they belong has given them an official commission and has notified their names to the hostile power at the commencement of or during hostilities, and in any case before they are employed.

These ships should be furnished with a certificate from the competent authorities, declaring that they had been under their control while fitting out and on final departure.

iii. Hospital-ships, equipped wholly or in part at the cost of private individuals or officially-recognized Societies of neutral countries shall be respected and exempt from capture [if the neutral power to whom they belong has given them an official commission and notified their names to the belligerent powers at the commencement of or during hostilities, and in any case before they are employed] *on condition that they are placed under the orders of one of the belligerents, with the previous consent of their own Government and with the authorization of the belligerent, and on condition that the latter shall have notified their names to the enemy at the commencement or during the course of hostilities, in any event, before they are employed.*

iv. The ships mentioned in Articles i., ii. and iii. shall afford relief and assistance to the wounded, sick and shipwrecked of the belligerents independently of their nationality.

The governments engage not to use these ships for any military purpose.

These ships must not in any way hamper the movements of the combatants.

During and after an engagement they will act at their own risk and peril.

The belligerents will have the right to control and visit them; they can refuse to help them, order them off, make them take a certain course, and put a commissioner on board; they can even detain them, if important circumstances require it.

As far as possible the belligerents shall inscribe in the sailing papers of the hospital-ships the orders they give them.

v. The military hospital-ships shall be distinguished by being painted white outside with a horizontal band of green about a metre and a half in breadth.

The ships mentioned in Articles ii. and iii. shall be distinguished by being painted white outside with a horizontal band of red about a metre and a half in breadth.

The boats of the ships above mentioned, as also small craft which may be used for hospital work, shall be distinguished by similar painting.

All hospital-ships shall make themselves known by hoisting, together with their national flag, the white flag with a red cross provided by the Geneva Convention, *and, in addition, if they belong to a neutral State, by hoisting on the mainmast the national flag of the belligerent under whose direction they are placed.*

Hospital-ships which, under the terms of Article iv., are detained by

[1] Another International Conference held in December 1904 at the Hague dealt with the status of hospital-ships in time of war. Great Britain did not take part in this Conference. Her abstention, however, was not owing to any objection of principle, but purely to considerations of domestic legislation.

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the enemy, must lower the national flag of the belligerent under whom they were acting.

The above-mentioned vessels and boats, desiring at night-time to ensure the respect due to them, shall, with the consent of the belligerent whom they are accompanying, take the necessary steps that the special painting denoting them shall be sufficiently conspicuous.

vi. [Neutral merchantmen, yachts or vessels, having, or taking on board, sick, wounded or shipwrecked of the belligerents, cannot be captured for so doing, but they are liable to capture for any violation of neutrality they may have committed.]

The distinctive signs provided by Article v. can only be used, whether in time of peace or in time of war, to protect ships therein mentioned.

vii. *In the case of a fight with a ship, the hospitals shall be respected and shall receive as much consideration as possible.*

These hospitals and their belongings are subject to the laws of war, but shall not be employed for any other purpose so long as they shall be necessary for the sick and wounded.

Nevertheless, the commander who has them under his orders, may make use of them in case of important military necessity, but he shall first ensure the safety of the sick and wounded on board.

viii. *The protection due to hospital-ships and to hospitals on board war-ships shall cease if they are used against the enemy.*

The fact that the crew of hospital-ships, and attached to hospitals on war-ships, are armed for the maintenance of order and for the defence of the sick or wounded, and the existence of a radio-telegraphic installation on board, is not considered as a justification for withdrawing the above-mentioned protection.

ix. *Belligerents may appeal to the charitable zeal of commanders of neutral merchant vessels, yachts or other craft, to take on board and look after the sick and wounded.*

Ships having responded to this appeal, as well as those who have spontaneously taken on board sick, wounded or shipwrecked men, shall have the advantage of a special protection and of certain immunities. In no case shall they be liable to capture on account of such transport; but subject to any promise made to them they are liable to capture for any violation of neutrality they may have committed.

[viii.] x. The religious, medical or hospital staff of any captured ship is inviolable, and its members cannot be made prisoners of war. On leaving the ship they take with them the objects and surgical instruments which are their own private property.

This staff shall continue to discharge its duties while necessary, and can afterwards leave when the commander-in-chief considers it possible.

The belligerents must guarantee to the staff that has fallen into their hands (the enjoyment of their salaries intact) *the same allowances and pay as those of persons of the same rank in their own navy.*

[viii.] xi. Sailors and soldiers, *being officially attached to navies or armies*, who are taken on board when sick or wounded, to whatever nation they belong, shall be [protected] respected and looked after by the captors.

xii. *Every vessel of war of a belligerent party may claim the return of the wounded, sick or shipwrecked who are on board military hospital-ships, hospital-ships of aid societies or of private individuals, merchant ships, yachts or other craft, whatever be the nationality of these vessels.*

xiii. *If the wounded, sick or shipwrecked are received on board a neutral ship of war, it shall be provided, as far as possible, that they may take no further part in war operations.*

xiv. The shipwrecked, wounded or sick of one of the belligerents who fall into the hands of the other, are prisoners of war. The captor must decide, according to circumstances, if it is best to keep them or send them to a port of his own country, to a neutral port, or even to a hostile port. In the last case, prisoners thus repatriated cannot serve as long as the war lasts.

xv. The shipwrecked, wounded or sick who are landed at a neutral port with the consent of the local authorities, must, failing a contrary arrangement between the neutral State and the belligerents, be guarded by the neutral State, so that they may not be again able to take part in the military operations.

The expenses of hospital treatment and internment shall be borne by the State to which the shipwrecked, wounded or sick belong. (T. Ba.)

GENEVA, LAKE OF, the largest lake of which any portion belongs to Switzerland, and indeed in central Europe. It is called *Lacus Lemannus* by the old Latin and Greek writers, in 4th century A.D. *Lacus Lausonius* or *Losaneles*, in the middle ages generally *Lac de Lausanne*, but from the 16th century onwards *Lac de Genève*, though from the end of the 18th century the name *Lac Léman* was revived—according to Prof. Forel *Le Léman* is the proper form. Its area is estimated at 223 sq.m. (Swiss Topographical Bureau) or 225½ sq. m. (Forel), of which about 140 sq. m. (134½ sq. m. Forel) are politically Swiss (123½ sq. m. belonging to the canton of Vaud, 11½ sq. m. to that of Geneva, and 5 sq. m. to that of the Valais), the remainder (83 sq.m.) being French since the annexation of Savoy in 1860—the entire lake is included in the territory (Swiss or Savoyard) neutralized by the congress of Vienna in 1815. The French part takes in nearly the whole of the south shore, save its western and eastern extremities which belong respectively to Geneva and to the Valais.

The lake is formed by the Rhone, which enters it at its east end, between Villeneuve (E.) and St Gingolph (W.), and quits it at its west end, flowing through the city of Geneva. The only important tributaries are the Drance (S.), the Venoge (N.) and the Veveyse (N.). The form of the lake is that of a crescent, of which the east end is broad and rounded, while the west end tapers towards the city of Geneva. The bird's eye length of the whole lake, from Chillon to Geneva, is 39½ m., but along its axis 45 m. The coast-line of the north shore is 59 m. in length and that of the south shore 44½ m. The maximum depth is 1,015½ ft., but the mean depth only 500 ft. The surface is 1231½ ft. (Swiss Topog. Bureau) or 1220 ft. (Forel) above sea-level. The greatest width (between Morges and Amphion) is 8½ m., but the normal width is 5 m. The lake forms two well-marked divisions, separated by the ridge of Promenthoux, which is 216½ ft. in depth, as a bar divides the Grand Lac from the Petit Lac. The *Grand Lac* includes the greater portion of the lake, the *Petit Lac* (to the west of the strait or bar) being the special Genevese portion of the lake, and having an area of but 30½ sq. m. The unusual blueness of the waters has long been remarked, and the transparency increases the farther we get from the point where the Rhone enters it, the deposits which the river brings down from the Alps gradually sinking to the bottom of the lake. At Geneva we recall Byron's phrase, "the blue rushing of the arrowy Rhone" (*Childe Harold*, canto iii. stanza 71). The limit of visibility of a white disk is 33 ft. in winter (in February 1891 Prof. Forel observed an extreme of 39½ ft.) and 21½ ft. in summer. Apart from the seasonal changes in the level of the lake (which is highest in summer, no doubt because of the melting of the Alpine snows that feed the Rhone), there are also the remarkable temporary disturbances of level known as the *seiches*, in which the whole mass of water in the lake rhythmically swings from shore to shore. According to Prof. Forel there are both longitudinal and transverse *seiches*. The effect of the longitudinal *seiches* at Geneva is four times as great as at Chillon, at the other end of the lake, while the extreme duration of a phenomenon is 73 minutes for the unionodal longitudinal *seiches* (35½ minutes for the binodal) and 10 minutes for the transverse *seiches* (5 minutes for the binodal). The maximum height of a recorded *seiche* at Geneva is rather over 6 ft. (October 1841). The currents in the water itself are irregular. The principal winds that blow over the lake are the *bise* (from the N.E.), the *vaudaire* or *Föhn* (from the S.E.), the *sudois* or *vent de pluie* (from the S.W.) and the *joran* (from the N.W.). The storm winds are the *nolan* (from the Arve valley towards Geneva) and the *bornan* (from the Drance valley towards the central portion of the lake). The lake is not as rich in fish as the other Swiss lakes, one reason being the obstacle opposed by the Perte du Rhône to fish seeking to ascend that river. Forel records but twenty indigenous species (of which the *Féra*, or *Coregonus fera*, is the principal) and six that have been introduced by man in the 19th century. A number of lake dwellings, of varying dates, have been found on the shores of the lake. The first steamer placed on the lake was the "Guillaume Tell," built in 1823 at Geneva by an Englishman named Church, while in 1873 the present Compagnie générale de navigation sur le lac Léman was formed, and in 1875 constructed the first saloon steamer, the "Mont Blanc." But despite this service and the railways along each shore, the lateen sails of minor craft still brighten the landscape. The railway along the northern shore runs from Geneva past Nyon, Rolle, Morges, Ouchy (the port of Lausanne), Vevey and Montreux to Villeneuve (56½ m.). That on the south shore gains the edge of the lake at Thonon only (22½ m. from Geneva), and then runs past Evian and St Gingolph to Le Bouveret (20 m. from Thonon). In the harbour of Geneva two erratic boulders of granite project above the surface of the water, and are named *Pierres du Vidon* (supposed to be altars to Neptune). The lower of the two, which is also the farthest from the shore, has been taken as the basis of the triangulation of Switzerland: the official height is 376·86 mètres, which in 1891 was reduced to 373·54 mètres, though 376·6 mètres gain now said to be the real figure. Of course the heights given on the Swiss Government map vary with these different estimates of the point taken as basis.

For all matters relating to the lake, see Prof. F. A. Forel's monumental work, *Le Léman* (3 vols., Lausanne, 1892–1904); also with fine illustrations) G. Fatio and F. Boissonnas, *Autour du lac Léman* (Geneva, 1902). (W. A. B. C.)

GENEVIÈVE, or GENOVEPA, ST (*c.* 422–512), patroness of Paris, lived during the latter half of the 5th century. According to tradition, she was born about 422 at Nanterre near Paris; her parents were called Severus and Gerontia, but accounts differ widely as to their social position. According to the legend, she was only in her seventh year when she was induced by St Germain, bishop of Auxerre, to dedicate herself to the religious life. On the death of her parents she removed to Paris, where she distinguished herself by her benevolence, as well as by her austere life. She is said to have predicted the invasion of the Huns; and

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when Attila with his army was threatening the city, she persuaded the inhabitants to remain on the island and encouraged them by an assurance, justified by subsequent events, that the attack would come to nothing (451). She is also said to have had great influence over Childeric, father of Clovis, and in 460 to have caused a church to be built over the tomb of St Denis. Her death occurred about 512 and she was buried in the church of the Holy Apostles, popularly known as the church of St Geneviève. In 1793 the body was taken from the new church, built in her honour by Louis XV., when it became the Panthéon, and burnt on the Place de Grève; but the relics were enshrined in a chapel of the neighbouring church of St Étienne du Mont, where they still attract pilgrims; her festival is celebrated with great pomp on the 3rd of January. The frescoes of the Panthéon by Puvis de Chavannes are based upon the legend of the saint.

BIBLIOGRAPHY.—The main source is the anonymous *Vita s. Genovefae virginis Parisiorum*, published in 1687 by D. P. Charpentier. The genuineness of this life was attacked by B. Krusch (*Neues Archiv*, 1893 and 1894) and defended by L. Duchesne, *Bibliothèque de l'École des Chartes* (1893), *Bulletin critique* (1897), p. 473. Krusch continued to hold that the life was an 8th-century forgery (*Scriptores rer. Merov.* iii. 204-238). See A. Potthast, *Bibliotheca medii aevi* (1331, 1332), and G. Kurth, *Clovis*, ii. 249-254. The legends and miracles are given in the Bollandists' *Acta Sanctorum*, January 1st; there is a short sketch by Henri Lesetre, *Ste Geneviève*, in "Les Saints" series (Paris, 1900).

GENEVIÈVE, GENOVEVA or **GENOVEFA, OF BRABANT,** heroine of medieval legend. Her story is a typical example of the widespread tale of the chaste wife falsely accused and repudiated, generally on the word of a rejected suitor. Genovefa of Brabant was said to be the wife of the palatine Siegfried of Treves, and was falsely accused by the majordomo Golo. Sentenced to death she was spared by the executioner, and lived for six years with her son in a cave in the Ardennes nourished by a roe. Siegfried, who had meanwhile found out Golo's treachery, was chasing the roe when he discovered her hiding-place, and reinstated her in her former honour. Her story is said to rest on the history of Marie of Brabant, wife of Louis II., duke of Bavaria, and count-palatine of the Rhine, who was tried by her husband and beheaded on the 18th of January 1256, for supposed infidelity, a crime for which Louis afterwards had to do penance. The change in name may have been due to the cult of St Geneviève, patroness of Paris. The tale first obtained wide popularity in *L'Innocence reconnue, ou vie de Sainte Geneviève de Brabant* (pr. 1638) by the Jesuit René de Cérisier (1603–1662), and was a frequent subject for dramatic representation in Germany. With Genovefa's history may be compared the Scandinavian ballads of *Ravengaard og Memering*, which exist in many recensions. These deal with the history of Gunild, who married Henry, duke of Brunswick and Schleswig. When Duke Henry went to the wars he left his wife in charge of Ravengaard, who accused her of infidelity. Gunild is cleared by the victory of her champion Memering, the "smallest of Christian men." The Scottish ballad of Sir Aldingar is a version of the same story. The heroine Gunhilda is said to have been the daughter of Canute the Great and Emma. She married in 1036 King Henry, afterwards the emperor Henry III., and there was nothing in her domestic history to warrant the legend, which is given as authentic history by William of Malmesbury (*De gestis regum Anglorum*, lib. ii. § 188). She was called Cuniqundafter her marriage, and perhaps was confused with St Cunigund, the wife of the emperor Henry II. In the *Karlamagnus-saga* the innocent wife is Oliva, sister of Charlemagne and wife of King Hugo, and in the French Carolingian cycle the emperor's wife Sibille (*La Reine Sibille*) or Blanchefleur (*Macaire*). Other forms of the legend are to be found in the story of Doolin's mother in *Doon de Mayence*, the English romance of *Sir Triamour*, in the story of the mother of Octavian in *Octavian the Emperor*, in the German folk book *Historie von der geduldigen Königin Crescentia*, based on a 13th-century poem to be found in the *Kaiserchronik*; and the English *Erl of Toulouse* (*c.* 1400). In the last-named romance it has been suggested that the story gives the relations between Bernard I. count of Toulouse, son of the Guillaume d'Orange of the Carolingian romances, and the empress Judith, second wife of Louis the Pious.

See F. J. Child, *English and Scottish Popular Ballads*, vol. ii. (1886), art. "Sir Aldingar"; S. Grundtvig, *Danske Kaempeviser* (Copenhagen, 1867); "Sir Triamore," in *Bishop Percy's Folio MS.*, ed. Hales and Furnivall, vol. ii. (London, 1868); *The Romance of Octavian*, ed. E. M. Goldsmid (Aungervyle Soc., Edinburgh, 1882); *The Erl of Toulous and the Emperes of Almayn*, ed. G. Lüdtke (Berlin, 1881); B. Seuffert, *Die Legende von der Pfalzgräfin Genovefa* (Würzburg, 1877); B. Golz, *Pfalzgräfin Genovefa in der deutschen Dichtung* (Leipzig, 1897); R. Köhler, "Die deutschen Volksbücher von der Pfalzgrafin Genovefa," in *Zeitschr. für deutsche Philologie* (1874).

GENGA, GIROLAMO (*c.* 1476–1551), Italian painter and architect, was born in Urbino about 1476. At the age of ten he was apprenticed to the woollen trade, but showed so much inclination for drawing that he was sent to study under an obscure painter, and at thirteen under Luca Signorelli, with whom he remained a considerable while, frequently painting the accessories of his pictures. He was afterwards for three years with Pietro Perugino, in company with Raphael. He next worked in Florence and Siena, along with Timoteo della Vite; and in the latter city he painted various compositions for Pandolfo Petrucci, the leading local statesman. Returning to Urbino, he was employed by Duke Guidobaldo in the decorations of his palace, and showed extraordinary aptitude for theatrical adornments. Thence he went to Rome; and in the church of S. Caterina da Siena, in that capital, is one of his most distinguished works, "The Resurrection," remarkable both for design and for colouring. He studied the Roman antiquities with zeal, and measured a number of edifices; this practice, combining with his previous mastery of perspective, qualified him to shine as an architect. Francesco Maria della Rovere, the reigning duke of Urbino, recalled Genga, and commissioned him to execute works in connexion with his marriage-festivities. This prince being soon afterwards expelled by Pope Leo X., Genga followed him to Mantua, whence he went for a time to Pesaro. The duke of Urbino was eventually restored to his dominions; he took Genga with him, and appointed him the ducal architect. As he neared the close of his career, Genga retired to a house in the vicinity of Pesaro, continuing still to produce designs in pencil; one, of the "Conversion of St Paul," was particularly admired. Here he died on the 11th of July 1551. Genga was a sculptor and musician as well as painter and architect. He was jovial, an excellent talker, and kindly to his friends. His principal pupil was Francesco Menzocchi. His own son Bartolommeo (1518–1558) became an architect of celebrity. In Genga's paintings there is a great deal of freedom, and a certain peculiarity of character consonant with his versatile, lively and social temperament. One of his leading works is in the church of S. Agostino in Cesena—a triptych in oil-colours, representing the "Annunciation," "God the Father in Glory," and the "Madonna and Child." Among his architectural labours are the church of San Giovanni Battista in Pesaro; the bishop's palace at Sinigaglia; the façade of the cathedral of Mantua, ranking high among the productions of the 16th century; and a new palace for the duke of Urbino, built on the Monte Imperiale. He was also concerned in the fortifications of Pesaro.

GENISTA, in botany, a genus of about eighty species of shrubs belonging to the natural order Leguminosae, and natives of Europe, western Asia and North Africa. Three are native in Britain. *G. anglica* is the needle-furze or petty whin, found on heaths and moist moors, a spinous plant with slender spreading branches 1 to 2 ft. long, very small leaves and short racemes of small yellow papilionaceous flowers. The pollen is emitted in a shower when an insect alights on it. *G. tinctoria*, dyer's green-weed, the flowers of which yield a yellow dye, has no spines. Other species are grown on rock-work or as greenhouse plants.

GENIUS (from Lat. *genere*, *gignere*), a term which originally meant, in Roman mythology, a generative and protecting spirit, who has no exact parallel in Greek religion, and at least in his earlier aspect is of purely Italian origin as one of the deities of family or household. Every man has his genius, who is not his creator, but only comes into being with him and is allotted to him at his birth. As a creative principle the genius is restricted

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to man, his place being taken by a Juno (cp. Juno Lucina, the goddess of childbirth) in the case of women. The male and female spirit may thus be distinguished respectively as the protector of generation and of parturition (*tutela generandi, pariendi*), although the female appears less prominent. It is the genius of the *paterfamilias* that keeps the marriage bed, named after him *lectus genialis* and dedicated to him, under his special protection. The genius of a man, as his higher intellectual self, accompanies him from the cradle to the grave. In many ways he exercises a decisive influence on the man's character and mode of life (Horace, *Epistles*, ii. 2. 187). The responsibility for happiness or unhappiness, good or bad fortune, lay with the genius; but this does not suppose the existence of two genii for man, the one good and the other bad (*ἀγαθοδαίμων, κακοδαίμων*), an idea borrowed from the Greek philosophers. The Roman genius, representing man's natural optimism, always endeavoured to guide him to happiness; that man was intended to enjoy life is shown by the fact that the Roman spoke of indulging or cheating his genius of his due according as he enjoyed himself or failed to do so, when he had the opportunity. A man's birthday was naturally a suitable occasion for honouring his genius, and on that occasion offerings of incense, wine, garlands, and cakes were made (Tibullus ii. 2; Ovid, *Tristia*, iii. 13. 18). As the representative of a man's higher *self* and participating in a divine nature, the genius could be sworn by, and a person could take an oath by his own or some one else's genius. When under Greek influence the Roman idea of the gods became more and more anthropomorphized, a genius was assigned to them, not however as a distinct personality. Thus we hear of the genius of Jupiter (Jovis Genio, *C.I.L.* i. 603), Mars, Juno, Pluto, Priapus. In a more extended sense the genius is also the generator and preserver of human society, as manifested in the family, corporate unions, the city, and the state generally. Thus, the genius publicus Populi Romani—probably distinct from the genius Urbis Romae, to whom an old shield on the Capitol was dedicated, with an inscription expressing doubt as to the sex (*Genio . . . sive mas sive femina*)—stood in the forum near the temple of Concord, in the form of a bearded man, crowned with a diadem, and carrying a cornu copiae and sceptre. It frequently appears on the coins of Trajan and Hadrian. Sacrifice, not confined to bloodless offerings like those of the genius of the house, was offered to him annually on the 8th of October. There were genii of cities, colonies, and even of provinces; of artists, business people and craftsmen; of cooks, gladiators, standard-bearers, a legion, a century, and of the army generally (*genius sanctus castrorum peregrinorum totiusque exercitus*). In imperial times the genius of Augustus and of the reigning emperor, as part of the *sacra* of the imperial family, were publicly worshipped. It was a common practice (often compulsory) to swear by the genius of the emperor, and any one who swore falsely was flogged. Localities also, such as theatres, baths, stables, streets, and markets, had their own genius. The word thus gradually lost its original meaning; the nameless local genii became an expression for the universality of the *divinum numen* and were sometimes identified with the higher gods. The local genius was usually represented by a snake, the symbol of the fruitfulness of the earth and of perpetual youth. Hence snakes were usually kept in houses (Virgil, *Aen.* v. 95; Persius i. 113), their death in which was considered a bad omen. The personal genius usually appeared as a handsome youth in a toga, with head sometimes veiled and sometimes bare, carrying a drinking cup and cornu copiae, frequently in the position of one offering sacrifice.

See W. H. Roscher, *Lexikon der Mythologie*, and article by J. A. Hild in Daremberg and Saglio, *Dictionnaire des antiquités*, where full references to ancient and modern authorities are given; L. Preller, *Römische Mythologie*, 3rd ed., by H. Jordan; G. Wissowa, *Religion und Kultur der Römer*.

Apart from the Latin use of the term, the plural "genii" (with a singular "genie") is used in English, as equivalent to the Arabic *jinn*, for a class of spirits, good or bad, such as are described, for instance, in *The Arabian Nights*. But "genius" itself has become the regular English word for the highest conceivable form of original ability, something altogether extraordinary and beyond even supreme educational prowess, and differing, in kind apparently, from "talent," which is usually distinguished as marked intellectual capacity short only of the inexplicable and unique endowment to which the term "genius" is confined. The attempt, however, to define either quality, or to discriminate accurately between them, has given rise to continual controversy, and there is no agreement as to the nature of either; and the commonly quoted definitions of genius—such as Carlyle's "transcendant capacity of taking trouble, first of all,"[1] in which the last three words are usually forgotten—are either admittedly incomplete or are of the nature of epigrams. Nor can it be said that any substantial light has been thrown on the matter by the modern physiological school, Lombroso and others, who regard the eccentricity of genius as its prime factor, and study it as a form of mental derangement. The error here is partly in ignoring the history of the word, and partly in misrepresenting the nature of the fact. There are many cases, no doubt, in which persons really insane, of one type or another, or with a history of physical degeneration or epilepsy, have shown remarkable originality, which may be described as genius, but there are at least just as many in whom no such physical abnormality can be observed. The word "genius" itself however has only gradually been used in English to express the degree of original greatness which is beyond ordinary powers of explanation, *i.e.* far beyond the capacity of the normal human being in creative work; and it is a convenient term (like Nietzsche's "superman") for application to those rare individuals who in the course of evolution reveal from time to time the heights to which humanity may develop, in literature, art, science, or administrative life. The English usage was originally derived, naturally enough, from the Roman ideas contained in the term (with the analogy of the Greek *δαίμων*), and in the 16th and 17th centuries we find it equivalent simply to "distinctive character or spirit," a meaning still commonly given to the word. The more modern sense is not even mentioned in Johnson's *Dictionary*, and represents an 18th-century development, primarily due to the influence of German writers; the meaning of "distinctive natural capacity or endowment" had gradually been applied specially to creative minds such as those of poets and artists, by contrast with those whose mental ability was due to the results of education and study, and the antithesis has extended since, through constant discussions over the attempt to differentiate between the real nature of genius and that of "talent," until we now speak of the exceptional person not merely as having genius but as a genius. This terminology appears to indicate some reversion to the original Roman usage, and the identification of the great man with a generative spirit.

Modern theories on the nature of "genius" should be studied with considerable detachment, but there is much that is interesting and thought-provoking in such works as J. F. Nisbet's *Insanity of Genius* (1891), Sir Francis Galton's *Hereditary Genius* (new ed., 1892), and C. Lombroso's *Man of Genius* (Eng. trans., 1891).

GENLIS, STÉPHANIE-FÉLICITÉ DU CREST DE SAINT-AUBIN, COMTESSE DE (1746–1830), French writer and educator, was born of a noble but impoverished Burgundian family, at Champcéry, near Autun, on the 25th of January 1746. When six years of age she was received as a canoness into the noble chapter of Alix, near Lyons, with the title of Madame la Comtesse de Lancy, taken from the town of Bourbon-Lancy. Her entire education, however, was conducted at home. In 1758, in Paris, her skill as a harpist and her vivacious wit speedily attracted admiration. In her sixteenth year she was married to Charles Brûlart de Genlis, a colonel of grenadiers, who afterwards became marquis de Sillery, but this was not allowed to interfere with her determination to remedy her incomplete education, and to satisfy a taste for acquiring and imparting knowledge. Some years later, through the influence of her aunt, Madame de Montesson, who had been clandestinely married to the duke of Orleans, she entered the Palais Royal as lady-in-waiting to the duchess of Chartres (1770). She acted with great energy and zeal as governess to the daughters of the family, and was in 1781

[1] *Frederick the Great*, iv. iii. 1407.

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appointed by the duke of Chartres to the responsible office of *gouverneur* of his sons, a bold step which led to the resignation of all the tutors as well as to much social scandal, though there is no reason to suppose that the intellectual interests of her pupils suffered on that account. The better to carry out her ingenious theories of education, she wrote several works for their use, the best known of which are the *Théâtre d'éducation* (4 vols., 1779–1780), a collection of short comedies for young people, *Les Annales de la vertu* (2 vols., 1781) and *Adèle et Théodore* (3 vols., 1782). Sainte-Beuve tells how she anticipated many modern methods of teaching. History was taught with the help of magic lantern slides and her pupils learnt botany from a practical botanist during their walks. In 1789 Madame de Genlis showed herself favourable to the Revolution, but the fall of the Girondins in 1793 compelled her to take refuge in Switzerland along with her pupil Mademoiselle d'Orléans. In this year her husband, the marquis de Sillery, from whom she had been separated since 1782, was guillotined. An "adopted" daughter, Pamela,[1] had been married to Lord Edward Fitzgerald (*q.v.*) in the preceding December.

In 1794 Madame de Genlis fixed her residence at Berlin, but, having been expelled by the orders of King Frederick William, she afterwards settled in Hamburg, where she supported herself for some years by writing and painting. After the revolution of 18th Brumaire (1799) she was permitted to return to France, and was received with favour by Napoleon, who gave her apartments at the arsenal, and afterwards assigned her a pension of 6000 francs. During this period she wrote largely, and produced, in addition to some historical novels, her best romance, *Mademoiselle de Clermont* (1802). Madame de Genlis had lost her influence over her old pupil Louis Philippe, who visited her but seldom, although he allowed her a small pension. Her government pension was discontinued by Louis XVIII., and she supported herself largely by her pen. Her later years were occupied largely with literary quarrels, notably with that which arose out of the publication of the *Dîners du Baron d'Holbach* (1822), a volume in which she set forth with a good deal of sarcastic cleverness the intolerance, the fanaticism, and the eccentricities of the "philosophes" of the 18th century. She survived until the 31st of December 1830, and saw her former pupil, Louis Philippe, seated on the throne of France.

The numerous works of Madame de Genlis (which considerably exceed eighty), comprising prose and poetical compositions on a vast variety of subjects and of various degrees of merit, owed much of their success to adventitious causes which have long ceased to operate. They are useful, however (especially the volumes entitled *Mémoires inédits sur le XVIIIe siècle*, 10 vols., 1825), as furnishing material for history. Most of her writings were translated into English almost as soon as they were published. A list of her writings with useful notes is given by Quérard in *La France littéraire*. Startling light was thrown on her relations with the duc de Chartres by the publication (1904) of her correspondence with him in *L'Idylle d'un "gouverneur"* by G. Maugras. See also Sainte-Beuve, *Causeries du lundi*, vol. iii.; H. Austin Dobson, *Four Frenchwomen* (1890); L. Chabaud, *Les Précurseurs du féminisme* (1901); W. de Chabreul, *Gouverneur de princes, 1737–1830* (1900); and *Lettres inédites à . . . Casimir Baecher, 1802–1830* (1902), edited by Henry Lapauze.

GENNA, a word of obscure origin borrowed from the Assamese, and used technically by anthropologists to describe a class of social and religious ordinances based on sanctions which derive their validity from a vague sense of mysterious danger which results from disobedience to them. These prohibitions—or system of things forbidden—affect the relations, permanent and temporary, of individuals (either as members of a tribe, village, clan or household, or as occupying an official position in the village or clan) towards other persons or groups of persons and towards material objects which possess intrinsic sanctity. The term is extended to the communal rites performed by the village, clan or household, either as magical ceremonies or as prophylactics on special occasions when the social, commensal, conjugal and alimentary relations of the group affected are subjected to temporary modifications. These practices and beliefs are observed among the hill tribes of Assam from the Abors and Mishmis on the north to the Lusheis on the south, all linguistically members of the Tibeto-Burman group, and among the Khasis, members of the Mon-Khmer group. Genna and taboo (*q.v.*) are products of an identical level of culture and similar psychological processes, and provide the mechanism of the social and religious systems.

Permanent Gennas.—The only universal *genna* is that which forbids the intermarriage of members of the same clan. In some cases in Manipur animals are *genna* to the tribe—*i.e.* they must not be killed or eaten—but tribal differentiation is, in practice, based on dialectical distinctions rather than on tribal *gennas*. The village as such possesses no permanent *gennas*, but the clans, as the units of marriage under the law of exogamy, have distinct elementary *gennas*, especially the clan to which the priest-chief belongs. The most important individual *gennas* are those which protect the priest-chief from impurity or contact with "sacred" substances such as the flesh of animals used in sacrifices. He may neither eat in a strange house, nor utter words of abuse, nor take an oath in a dispute, except in his representative capacity on behalf of his village. The first-fruits are *genna* to the village until he eats, thus establishing an opposition between him and his co-villagers. Married and unmarried women are subject to alimentary *gennas*; thus unmarried girls are forbidden the flesh of any male animal or of any female animal dying gravid.

Ritual Gennas.—Ritual *gennas* are held annually to foster the rice crops, all other industries and activities being *genna* (forbidden) during the cultivating season, to secure good hunting, to avert sickness, especially epidemics, to take omens, and to lay finally to rest the ghosts of all that have died within the year. The village gates are closed, men and women eat apart, and conjugal relations are suspended. Special village *gennas* are held when rain is needed, when a villager dies in any manner out of the ordinary, as women in childbirth, when an animal gives birth to still-born offspring, and when any permanent *genna* has been violated. Clan *gennas* are held for all ordinary cases of death. Household *gennas* are held on the occasions of birth (when the aliment and conduct of the father are specially regulated), naming, ear-piercing, the first hair-cutting, sickness, and, in certain areas, tattooing. Individuals are subjected to temporary *gennas* as warriors both before and after a head-hunting raid, pregnant women, married persons at the beginning of their married life, the wives of the priest-chief, and those who from ambition or pride of wealth seek to perpetuate their names by erecting a stone monument, an act which confers the right to wear the distinctive clothes of the priest-chief which otherwise are *genna* to the whole village. Ritual *gennas* are of varying duration. Some last for a month while others are complete in two days. As religious or magical rites, they prevent danger or establish and restore normal relations with powers which are potentially harmful or require placation.

AUTHORITIES.—Official records of the government of India, Nos. 23 (1855), 27 (1859), 68 (1870); Colonel T. H. Lewin, *Hill Tracts of Chittagong; Report on the Census of Assam* (1891), vol. i. Report, note by A. W. Davis, p. 237 seq.; Major P. R. T. Gurdon, *The Khasis* (1907); T. C. Hodson, *Journal of the Royal Anthropological Institute*, vol. xxxvi. (1906). (T. C. H.)

GENNADIUS II. [as layman GEORGIOS SCHOLARIOS] (d. *c.* 1468), patriarch of Constantinople from 1454 to 1456, philosopher and theologian, was one of the last representatives of Byzantine learning. Extremely little is known of his life, but he appears to have been born at Constantinople about 1400 and to have entered the service of the emperor John VII. Paleologus as imperial judge or counsellor. Georgios first appears conspicuously in history as present at the great council held in 1438 at Ferrara and Florence with the object of bringing about a union between the Greek and Latin Churches. At the same council was present the celebrated Platonist, Gemistus Pletho, the most powerful opponent of the then dominant Aristotelianism, and consequently the special object of reprobation to Georgios. In church matters, as in philosophy, the two were opposed,—Pletho maintaining strongly the principles of the Greek Church, and being unwilling to accept union through compromise, while Georgios, more politic and cautious, pressed the necessity for union and was instrumental in drawing up a form which from its vagueness and ambiguity might be accepted by both parties.

[1] See Gerald Campbell, *Edward and Pamela Fitzgerald* (1905).

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He was at a disadvantage because, being a layman, he could not directly take part in the discussions of the council. But on his return to Greece his views changed, and he violently and obstinately opposed the union he had previously urged. In 1448 he became a monk at Pantokrator and took the name Gennadius. In 1453, after the capture of Constantinople by the Turks, Mahommed II., finding that the patriarchal chair had been vacant for some time, resolved to elect some one to the office, and the choice fell on Gennadius. While holding the episcopal office Gennadius drew up, apparently for the use of Mahommed, a lucid confession or exposition of the Christian faith, which was translated into Turkish by Ahmed, judge of Beroea, and first printed by A. Brassicanus at Vienna in 1530. After a couple of years Gennadius found the position of patriarch under a Turkish sultan so irksome that he retired to the monastery of John the Baptist near Serrae in Macedonia, where he died about 1468. About one hundred of his alleged writings exist, the majority in manuscript and of doubtful authenticity.

The fullest account of his writings is given in Gass, *Gennadius and Pletho* (Berlin, 1844), the second part of which contains Pletho's *Contra Gennadium*. See also F. Schultze, *Grsch. der Phil. d. Renaissance*, I. (1874). A list of the known writings of Gennadius is given in Fabricius, *Bibliotheca Graeca*, ed. Harles, vol. xi., and what has been printed is to be found in Migne, *Patrol. Gr.* vol. clx.

GENOA (anc. *Genua*, Ital. *Genova*, Fr. *Gênes*), the chief port of Liguria, Italy, and capital of the province of Genoa, 110 m. N.W. of Leghorn by rail. . Pop. (1906) 255,204 (town); 267,248 (commune). The town is situated on the Gulf of Genoa, and is the chief port and commercial town of Italy, the seat of an archbishop and a university, the headquarters of the IV. Italian army corps, and a strong fortress. The city, as seen from the sea, is "built nobly," and deserves the title it has acquired or assumed of the Superb. Finding only a small space of level ground along the shore, it has been obliged to climb the lower hills of the Ligurian Alps, which afford many a coign of vantage for the effective display of its architectural magnificence. The original nucleus of the city is that portion which lies to the east of the port in the neighbourhood of the old pier (Molo Vecchio). In the 10th century it began to feel a lack of room within the limits of its fortifications; and accordingly, in the middle of the 12th century, it was found necessary to extend the line of circumvallation. Even this second circuit, however, was of small compass, and it was not till 1320–1330 that a third line took in the greater part of the modern site of the city proper. This presented about 3 m. of rampart towards the land side, and can still be easily traced from point to point through the city, though large portions, especially towards the east, have been dismantled. The present line of circumvallation dates from 1626–1632, the period when the independence of Genoa was threatened by the dukes of Savoy. From the mouth of the Bisagno in the east, and from the lighthouse point in the west, it stretches inland over hill and dale to the great fort of Sperone, *i.e.* the Spur, on the summits of Monte Peraldo at a height of 1650 ft.,—the circuit being little less than 12 m., and all the important points along the line being defended by forts or batteries.

A portion of the enclosed area is open country, dotted only here and there with houses and gardens. There are eight gates, the more important being Porta Pila and Porta Romana towards the east, and the Porta Lanterna or Lighthouse Gate to the west. The main architectural features of Genoa are its medieval churches, with striped façades of black and white marble, and its magnificent 16th-century palaces. The earlier churches of Genoa show a mixture of French Romanesque and the Pisan style—they are mostly basilicas with transepts, and as a rule a small dome; the pillars are sometimes ancient columns, and sometimes formed of alternate layers of black and white marble. The façades are simple, without galleries, having only pilasters projecting from the wall, and are also alternately black and white. This style continued in Gothic times also. The oldest is S. Maria di Castello (11th century), the columns and capitals of which are almost all antique. S. Cosma, S. Donato (with remains of the 10th-century building) and others belong to the 12th century, and S. Giovanni di Prè, S. Agostino (with a fine campanile), S. Stefano, S. Matteo and others to the 13th. The famous painting of the martyrdom of S. Stephen, by Giulio Romano, carried off by Napoleon in 1811, was restored to S. Stefano in 1815. S. Matteo, the church of the D'Oria or Doria family, was founded in 1126 by Martino Doria. The façade dates from 1278, and the interior of the edifice dates in the main from 1543. In the crypt is the tomb of Andrea Doria by Montorsoli, and above the main altar hangs the dagger presented to the doge by Pope Paul III. To the left of the church is an exquisite cloister of 1308 with double columns, in which a number of inscriptions relating to the Doria family and also the statue of Andrea Doria by Montorsoli are preserved. The little square in front of the church is surrounded by Gothic palaces of the Doria family. Of the churches the principal is the comparatively small cathedral of S. Lorenzo. Tradition makes its first foundation contemporary with St Lawrence himself; and a document of 987 implies that it was even then the metropolitan church. Reconstructed about the end of the 11th and beginning of the 12th century, it was formally consecrated by Pope Gelasius II. on the 18th of October 1118; and since then it has undergone a large number of extensive though partial renovations. The façade, with its three elaborate doorways, belongs to the 14th century and is a copy of French models of the 13th. The two side portals with Romanesque sculptures belong to the 12th–14th centuries. Some pagan reliefs are built into the tower. The interior was rebuilt in 1307, the old columns being used. The belfry, which rises above the right-hand doorway, was erected about 1520 by the doge, Ottaviano da Campofragoso, and the cupola was erected after the designs of the architect Galeazzo Alessi in 1567. The fine Early Renaissance (1448) sculptural decorations of the chapel of S. John the Baptist were due to Domenico Gagini of Bissone on the Lake of Lugano, who later transferred his activities to Naples and Palermo, and other Lombard masters. An edict of Innocent VIII. forbids women to enter the chapel except on one day in the year. In the treasury of the cathedral is a magnificent silver monstrance dating from 1553, and an octagonal bowl, the Sacro Catino, brought from Caesarea in 1101, which corresponds to the descriptions given of the Holy Grail, and was long regarded as an emerald of matchless value, but was found when broken at Paris, whither it had been carried by Napoleon I., to be only a remarkable piece of ancient glass. The choir-stalls are a very fine work of the 15th century and later, with intarsias. Near the cathedral is a small 12th-century (?) cloister.

Of older date than the cathedral is the church of S. Ambrose and S. Andrew, if its first foundation be correctly assigned to the Milanese bishop Honoratus of the 6th century; but the present edifice is due to the Society of Jesus, who obtained possession of the church in 1587. The interior is richly decorated and contains the "Circumcision" and "St Ignatius" by Rubens, and the "Assumption" of Guido Reni. The Annunziata del Guastato is one of the largest churches in the city, erected in 1587. It is a cruciform structure, with a dome, and the central nave is supported by fourteen Corinthian columns of white marble. To the otherwise unfinished brick façade a portal borne by marble columns was added in 1843. The interior is covered with gilding and frescoes of the 17th century, and is somewhat overloaded with rich decoration, while a range of white marble columns supports the nave. Santa Maria delle Vigne probably dates from the 9th century, but the present structure was erected in 1586. The campanile, however, is a remarkable work of the 13th century. Adjoining the church is a ruined cloister of the 11th century. San Siro, originally the "Church of the Apostles" and the cathedral of Genoa, was rebuilt by the Benedictines in the 11th century, and restored and enlarged by the Theatines in 1576, the façade being added in 1830; in this church in 1339 Simone Boccanera was elected first doge of Genoa. Santa Maria di Carignano, or more correctly Santa Maria Assunta e SS. Fabiano e Sebastiano, belongs mainly to the 16th century, and was designed by Galeazzo Alessi, in imitation of Bramante's plan for S. Peter's at Rome, as it was then being executed by

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Michelangelo. The interior is fine, harmonious and restrained, painted in white and grey, while the colouring of the exterior is less pleasing. From the highest gallery of the dome—368 ft. above the sea-level, and 194 ft. above the ground—a magnificent view is obtained of the city and the neighbouring coast.

Buildings of the 15th century do not occupy an important place in Genoa, but there are some small private houses and remains of sculptural decoration of the Early Renaissance to be seen in the older portions of the town. The palaces of the Genoese patricians, famous for their sumptuous architecture, their general effectiveness (though the architectural details are often faulty if closely examined), and their artistic collections, were many of them built in the latter part of the 16th century by Galeazzo Alessi, a pupil of Michelangelo, whose style is of an imposing and uniform character and displays marvellous ingenuity in using a limited or unfavourable site to the greatest advantage. Several of the villas in the vicinity of the city are also his work. The Via Garibaldi is flanked by a succession of magnificent palaces, chief among which is the Palazzo Rosso, so called from its red colour. Formerly the palace of the Brignole-Sale family, it was presented by the duchess of Galliera to the city in 1874, along with its valuable contents, its library and picture gallery, which includes fine examples of Van Dyck and Paris Bordone. The Palazzo Municipale, built by Rocco Lurago at the end of the 16th century, once the property of the dukes of Turin, has a beautiful entrance court and a hanging terraced garden fronting a noble staircase of marble which leads to the spacious council chamber. In an adjoining room are preserved a bronze tablet dating from 117 B.C. (see below), two autograph letters of Columbus, and the violin of Paganini, also a native of Genoa. Opposite the Palazzo Rosso is the Palazzo Bianco, a palace full of art treasures bequeathed to the city by the duchess of Galliera upon her death in 1889, and subsequently converted into a museum. The Roman antiquities here preserved belong to other places—Luna, Libarna, &c. The Adorno, Giorgio Doria (both containing small but choice picture-galleries), Parodi and Serra and other palaces in this street are worthy of mention. The Via Balbi again contains a number of palaces. The Durazzo Pallavicini palace has a noble façade and staircase and a rich picture-gallery. The street takes its name, however, from the Palazzo Balbi-Senarega, which has Doric colonnades and a fine orangery. The Palazzo dell' Università has an extremely fine court and staircase of the early 17th century. The Palazzo Reale is also handsome but somewhat later. The Palazzo Doria in the Piazza del Principe, presented to Andrea Doria by the Genoese in 1522, is on the other hand earlier; it was remodelled in 1529 by Montorsoli and decorated with fine frescoes by Perino del Vaga. The old palace of the doges, originally a building of the 13th century, to which the tower alone belongs, the rest of the building having been remodelled in the 16th century and modernized after a fire in 1777, stands in the Piazza Umberto Primo near the cathedral, and now contains the telegraph and other government offices. Another very fine building is the Gothic Palazzo di S. Giorgio, near the harbour, dating from about 1260, occupied from 1408 to 1797 by the Banca di S. Giorgio, and now converted into a produce exchange. The Campo Santo or Cimitero di Staglieno, about 1½ m. from the city on the banks of the Bisagno, is one of the chief features of Genoa; its situation is of great natural beauty and it is remarkable for its sepulchral monuments, many of which have been executed by the foremost sculptors of modern Italy. The university, founded in 1471, is a flourishing institution with faculties in law, medicine, natural science, engineering and philosophy. Attached to it are a library, an observatory, a botanical garden, and a physical and natural history museum. Genoa is also well supplied with technical schools and other institutions for higher education, while ample provision is made for primary education. The hospitals and the asylum for the poor are among the finest institutions of their kind in Italy. Mention must also be made of the Academy of Fine Arts, the municipal library, the great Teatro Carlo Felice and the Verdi Institute of Music.

The irregular relief of its site and its long confinement within the limits of fortifications, which it had outgrown, have both contributed to render Genoa a picturesque confusion of narrow streets, lanes and alleys, varied with stairways climbing the steeper slopes and bridges spanning the deeper valleys. Large portions of the town are inaccessible to ordinary carriages, and many of the important streets have very little room for traffic. In modern times, however, a number of fine streets and squares with beautiful gardens have been laid out. The Piazza Ferrari, a large irregular space, is the chief focus of traffic and the centre of the Genoese tramway system; it is embellished with a fine equestrian statue of Garibaldi, unveiled in 1893, which stands in front of the Teatro Carlo Felice. Leading from this piazza is the Via Venti Settembre, a broad, handsome street laid out since 1887, leading south-east to the Ponte Pila, the central bridge over the Bisagno. The street is itself spanned by an elegant bridge carrying the Corso Andrea Podesta, a modern avenue on the heights above. Adjoining the church of the Madonna della Consolazione is the new market, a building of no little beauty. The Via Roma, another important centre of traffic which gives on to the Via Carlo Felice near the Piazza Ferrari, leads to the Piazza Corvetto, in the centre of which stands the colossal equestrian statue of Victor Emmanuel II. To the left is the Villetta Dinegro, a beautiful park belonging to the city, decorated with cascades and a number of statues and busts of prominent statesmen and citizens. To the right is another park, the Acquasola, laid out in 1837 on the site of the old ramparts. In the west of the city, in front of the principal station, is the Piazza Acquaverde. On the north side, embowered in palm trees, is a great statue of Columbus, at whose feet kneels the figure of America. Opposite is the Palazzo Faraggiana, with scenes from the life of Columbus in relief on its marble pediment. Among other modern thoroughfares, the Via di Circonvallazione a Monte, laid out since 1876 on the hills at the back of the town, leads by many curves from the Piazza Manin along the hill-tops westward, and finally descends into the Piazza Acquaverde; its entire length is traversed by an electric tramway, and it commands magnificent views of the town. A similar road, the Via di Circonvallazione a Mare, was laid out in 1893–1895 on the site of the outer ramparts, and skirts the sea-front from the Piazza Cavour to the mouth of the Bisagno, thence ascending the right bank to the Ponte Pila. Genoa is remarkably well served with electric tramways, which are found in all the wider streets, and run, often through tunnels, into the suburbs and to the surrounding country on the east as far as Nervi and to Pegli on the west. Three funicular railways from different points of the city give access to the highest parts of the hills behind the town.

Though its existence as a maritime power was originally due to its port, it is only since 1870 that Genoa has provided the conveniences necessary for the modern development of its trade, the duke of Galliera's gift of £800,000 to the city in 1875 being devoted to this purpose. A further enlargement of the harbour was necessitated upon the opening of the St Gotthard tunnel in 1882, which extended the commercial range of the port through Switzerland into Germany. The old harbour is semi-circular in shape, 232 acres in area, with numerous quays, and protected by moles from southern and south-westerly winds. An outer harbour, 247 acres in area, has been constructed in front of this by extending the Molo Nuovo by the Molo Duca di Galliera, and another basin, the Vittorio Emanuele III., for coal vessels, with an area of 96 acres, is in course of construction to the west of this, between it and the lofty lighthouse which rises on the promontory at the south-west extremity of the harbour. This basin is to be extended to the east and the west, and allows for a future extension in front of San Pier d'Arena as far as the mouth of the river Polcevera. The port administration was placed under an autonomous harbour board (*consorzio*) in 1903. The largest ships can enter the harbour, which has a minimum depth of 30 ft.; it has two dry docks, a graving dock and a floating dry dock. Very large warehouses have been constructed. The exports are olive oil, hemp, flax, rice, fruit, wine, hats, cheese, steel, velvets, gloves, flour, paper, soap and marble, while the main imports are coal, cotton, grain, machinery, &c. Genoa has a large emigrant traffic with America, and a large general passenger steamer traffic both for America and for the East.

The development of industry has kept pace with that of the harbour. The Ansaldo shipbuilding yards construct armoured cruisers both for the Italian navy and for foreign governments.

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The Odero yards, for the construction of merchant and passenger steamers, have been similarly extended, and the Foce yard is also important. A number of foundries and metallurgical works supply material for repairs and shipbuilding. The sugar-refining industry has been introduced by two important companies, and most of the capital employed in sugar-refining in other parts of Italy has been subscribed at Genoa, where the administrative offices of the principal companies and individual refiners are situated. The old industries of macaroni and cognate products maintain their superiority. Tanneries and cotton-spinning and weaving mills have considerably extended throughout the province. Cement works have acquired an extension previously unknown, more than thirty firms being now engaged in that branch of industry. The manufactures of crystallized fruits and of filigree silver may also be mentioned. The trade of the port increased from well under 1,000,000 tons in 1876 to 6,164,873 metric tons in 1906 (the latter figure, however, includes home trade in a proportion of about 12%). Of this large total 5,365,544 tons are imported and only 799,329 tons are exported, and, comparing 1906 with 1905, we have a decrease of 34,355 tons on the exports, and an increase of 436,123 tons on the imports. The effect upon the railway problem is of course very great, inasmuch as, while the supply of trucks required per day in 1906 was from 1000 to 1200, about 80% of these had to be sent down empty to the harbour. Of the four main lines which centre on Genoa—(1) to Novi, which is the junction for Alessandria, where lines diverge to Turin and France via the Mont Cenis, and to Novara and Switzerland and France via the Simplon, and for Milan; (2) to Acqui and Piedmont; (3) to Savona, Ventimiglia and the French Riviera, along the coast; (4) to Spezia and Pisa—the first line has to take no less than 78% of the traffic. It has indeed two alternative double lines for the passage over the Apennines, but one of these has a maximum gradient of 1 : 18 and a tunnel over 2 m. long, and the other has a maximum gradient of 1 : 62, and a tunnel over 5 m. long. A marshalling station costing some £800,000, connected directly with the harbour by tunnels, with 31 m. of rails, capable of taking 2000 trucks, was constructed at Campasso in 1906 north of San Pier d'Arena (through which till then the traffic of the first three lines, representing 95% of the total, had to pass). It is computed that some 40% of the total commerce of Italy passes through Genoa; it is indeed the most important harbour in the western Mediterranean, with the exception of Marseilles, with which it carries on a keen rivalry. Genoa has in the past been somewhat handicapped in the race by the insufficiency of railway communication, which, owing to the mountains which surround it, is difficult to secure, many tunnels being necessary. The general condition of the Italian railways has also affected it, and the increased traffic has not always found the necessary facilities in the way of a proper amount of trucks to receive the goods discharged, besides to considerable encumbrance of the port and consequent diversion of a certain amount of trade elsewhere, and besides this to serious temporary deficiencies in the coal supply of northern Italy.

The imports of Genoa are divided into four main classes: about 50% of the total weight is coal, grain about 12%, cotton about 6%, and miscellaneous about 34%. Of the coal imports the great bulk is from British ports: about half comes from Cardiff and Barry, one-tenth from other Welsh ports, one-fifth from the Tyne ports. The amount shows an almost continued increase from 617,798 tons in 1881 to 2,737,919 in 1906. The total of shipping entered in 1906 was 6586 vessels with a tonnage of 6,867,442, while that cleared was 6611 vessels with a tonnage of 6,682,104.

History.—Genoa, being a natural harbour of the first rank, must have been in use as a seaport as early as navigation began in the Tyrrhenian Sea. We hear nothing from ancient authorities of its having been visited or occupied by the Greeks, but the discovery of a Greek cemetery of the 4th century B.C.[1] proves it. The construction of the Via Venti Settembre gave occasion for the discovery of a number of tombs, 85 in all, the bulk of which dated from the end of the 5th and the 4th centuries B.C. The bodies had in all cases been cremated, and were buried in small shaft graves, the interment itself being covered by a slab of limestone. The vases were of the last red figure style, and were mostly imported from Greece or Magna Graecia, while the bronze objects came from Etruria, and the brooches (*fibulae*) from Gaul. This illustrates the early importance of Genoa as a trading port, and the penetration of Greek customs, inhumation being the usual practice of the Ligurians. Genoa is believed to derive its name from the fact that the shape of this portion of the coast resembles that of a knee (*genu*).

We hear of the Romans touching here in 216 B.C., and of its destruction by the Carthaginians in 209 B.C. and immediate restoration by the Romans, who made it and Placentia their headquarters against the Ligurians. It was reached from Rome by the Via Aurelia, which ran along the north-west coast, and its prolongation, which later acquired the name of the Via Aemilia (Scauri); for the latter was only constructed in 109 B.C., and there must have been a coast-road long before, at least as early as 148 B.C., when the Via Postumia was built from Genua through Libarna (mod. Serravalle, where remains of an amphitheatre and inscriptions have been found), Dertona, Iria, Placentia, Cremona, and thence eastwards. We also have an inscription of 117 B.C. (now preserved in the Palazzo Municipale at Genoa) giving the text of the decision given by the *patroni*, Q. and M. Minucius, of Genua, in accordance with a decree of the Roman senate, in a controversy between the people of Genua and the Langenses or Langates (also known as the Viturii), the inhabitants of a neighbouring hill-town, which was included in the territory of Genua. But none of the other inscriptions found in Genoa or existing there at the present day, which are practically all sepulchral, can be demonstrated to have belonged to the ancient city; it is equally easy to suppose that they were brought from elsewhere by sea (Mommsen in *Corp. Inscr. Lat.* v. p. 884). It is only from inscriptions of other places that we know that it had municipal rights, and we do not know at what period it obtained them. Classical authors tell us but little of it. Strabo (iv. 6. 2, p. 202) states that it exported wood, skins and honey, and imported olive oil and wine, though Pliny speaks of the wine of the district as the best of Liguria (*H.N.*) xiv. 67.)

The history of Genoa during the dark ages, throughout the Lombard and Carolingian periods, is but the repetition of the general history of the Italian communes, which succeeded in snatching from contending princes and barons the first charters of their freedom. The patriotic spirit and naval prowess of the Genoese, developed in their defensive wars against the Saracens, led to the foundation of a popular constitution, and to the rapid growth of a powerful marine. From the necessity of leaguing together against the common Saracen foe, Genoa united with Pisa early in the 11th century in expelling the Moslems from the island of Sardinia, but the Sardinian territory thus acquired soon furnished occasions of jealousy to the conquering allies, and there commenced between the two republics the long naval wars destined to terminate so fatally for Pisa. With not less adroitness than Venice, Genoa saw and secured all the advantages of the great carrying trade which the crusades created between Western Europe and the East. The seaports wrested at the same period from the Saracens along the Spanish and Barbary coasts became important Genoese colonies, whilst in the Levant, on the shores of the Black Sea, and along the banks of the Euphrates were erected Genoese fortresses of great strength. No wonder if these conquests generated in the minds of the Venetians and the Pisans fresh jealousy against Genoa, and provoked fresh wars; but the struggle between Genoa and Pisa was brought to a disastrous conclusion for the latter state by the battle of Meloria in 1284.

The commercial and naval successes of the Genoese during the middle ages were the more remarkable because, unlike their rivals, the Venetians, they were the unceasing prey to intestine discord—the Genoese commons and nobles fighting against each other, rival factions amongst the nobles themselves striving to grasp the supreme power in the state, nobles and commons alike invoking the arbitration and rule of some foreign captain as the sole means of obtaining a temporary truce. From these contests of rival nobles, in which the names of Spinola and Doria stand forth with greatest prominence, Genoa was soon drawn into the great vortex of the Guelph and Ghibelline factions; but its recognition of foreign authority—successively German, Neapolitan and Milanese—gave way to a state of great independence in 1339, when the government assumed a more permanent form with the appointment of the first doge, an office held at Genoa for life, in the person of Simone Boccanera. Alternate victories and defeats of the Venetians and Genoese—the most terrible being the defeat sustained by the Venetians at Chioggia in 1380—ended by establishing the great relative inferiority of the Genoese rulers, who fell under the power now of France, now of the Visconti of Milan. The Banca di S. Giorgio, with its large possessions.

[1] See *Notizie degli scavi* (1898), 395 (A. d'Andrade), 464 (G. Ghirardini).

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mainly in Corsica, formed during this period the most stable element in the state, until in 1528 the national spirit appeared to regain its ancient vigour when Andrea Doria succeeded in throwing off the French domination and restoring the old form of government. It was at this very period—the close of the 15th and commencement of the 16th century—that the genius and daring of a Genoese mariner, Christopher Columbus, gave to Spain that new world, which might have become the possession of his native state, had Genoa been able to supply him with the ships and seamen which he so earnestly entreated her to furnish. The government as restored by Andrea Doria, with certain modifications tending to impart to it a more conservative character, remained unchanged until the outbreak of the French Revolution and the creation of the Ligurian republic. During this long period of nearly three centuries, in which the most dramatic incident is the conspiracy of Fieschi, the Genoese found no small compensation for their lost traffic in the East in the vast profits which they made as the bankers of the Spanish crown and outfitters of the Spanish armies and fleets both in the old world and the new, and Genoa, more fortunate than many of the other cities of Italy, was comparatively immune from foreign domination.

At the end of the 17th century the city was bombarded by the French, and in 1746, after the defeat of Piacenza, surrendered to the Austrians, who were, however, soon driven out. A revolt in Corsica, which began in 1729, was suppressed with the help of the French, who in 1768 took possession of the island for themselves (see CORSICA: *History*).

The short-lived Ligurian republic was soon swallowed up in the French empire, not, however, until Genoa had been made to experience, by the terrible privations of the siege when Masséna held the city against the Austrians (1800), all that was meant by a participation in the vicissitudes of the French Revolution. In 1814 Genoa rose against the French, on the assurance given by Lord William Bentinck that the allies would restore to the republic its independence. It had, however, been determined by a secret clause of the treaty of Paris that Genoa should be incorporated with the dominions of the king of Sardinia. The discontent created at the time by the provision of the treaty of Paris as confirmed by the congress of Vienna had doubtless no slight share in keeping alive in Genoa the republican spirit which, through the influence of a young Genoese citizen, Joseph Mazzini, assumed forms of permanent menace not only to the Sardinian monarchy but to all the established governments of the peninsula. Even the material benefits accruing from the union with Sardinia and the constitutional liberty accorded to all his subjects by King Charles Albert were unable to prevent the republican outbreak of 1848, when, after a short and sharp struggle, the city, momentarily seized by the republican party, was recovered by General Alfonzo La Marmora.

Among the earlier Genoese historians the most important are Bartolommeo Fazio and Jacopo Bracelli, both of the 15th century, and Paolo Partenopeo, Jacopo Bonfadio, Oberto Foglietta and Agostino Giustiniano of the 16th. Paganetti wrote the ecclesiastical history of the city; and Accinelli and Gaggero collected material for the ecclesiastical archaeology. The memoirs of local writers and artists were treated by Soprani and Ratti. Among more general works are Bréquigny, *Histoire des révolutions de Gênes jusqu'en 1748*; Serra, *La Storia dell' antica Liguria e di Genova* (Turin, 1834); Varesi, *Storia della repubblica di Genova sino al 1814* (Genoa, 1835–1839); Canale, *Storia dei Genovesi* (Genoa, 1844–1854), *Nuova istoria della repubblica di Genova* (Florence, 1858), and *Storia della rep. di Genova dall' anno 1528 al 1550* (Genoa, 1874); Blumenthal, *Zur Verfassungs- und Verwaltungsgeschichte Genua's im 12ten Jahrhundert* (Kalbe an der Saale, 1872); Malleson, *Studies from Genoese History* (London, 1875). The *Liber jurium reipublicae Genuensis* was edited by Ricotti in the 7th, 8th and 9th volumes of the *Monumenta historiae patriae* (Turin, 1854–1857). A great variety of interesting matter will be found in the *Atti della Società Ligure di storia patria* (1861 sqq.), and in the *Giornale Ligustico di archeologia, storia, e belle arti*. The history of the university has been written by Lorenzo Isnardi, and continued by Em. Celesia (2 vols., Genoa).

(T. As.)

GENOVESI, ANTONIO (1712–1769), Italian writer on philosophy and political economy, was born at Castiglione, near Salerno, on the 1st of November 1712. He was educated for the church, and, after some hesitation, took orders in 1736 at Salerno, where he was appointed professor of eloquence at the theological seminary. During this period of his life he began the study of philosophy, being especially attracted by Locke. Dissatisfied with ecclesiastical life, Genovesi resigned his post, and qualified as an advocate at Rome. Finding law as distasteful as theology, he devoted himself entirely to philosophy, of which he was appointed extraordinary professor in the university of Naples. His first works were *Elementa Metaphysicae* (1743 et seq.) and *Logica* (1745). The former is divided into four parts, Ontosophy, Cosmosophy, Theosophy, Psychosophy, supplemented by a treatise on ethics and a dissertation on first causes. The *Logic*, an eminently practical work, written from the point of view of Locke, is in five parts, dealing with (1) the nature of the human mind, its faculties and operations; (2) ideas and their kinds; (3) the true and the false, and the various degrees of knowledge; (4) reasoning and argumentation; (5) method and the ordering of our thoughts. If Genovesi does not take a high rank in philosophy, he deserves the credit of having introduced the new order of ideas into Italy, at the same time preserving a just mean between the two extremes of sensualism and idealism. Although bitterly opposed by the partisans of scholastic routine, Genovesi found influential patrons, amongst them Bartolomeo Intieri, a Florentine, who in 1754 founded the first Italian or European chair of political economy (commerce and mechanics), on condition that Genovesi should be the first professor, and that it should never be held by an ecclesiastic. The fruit of Genovesi's professorial labours was the *Lezioni di Commercio*, the first complete and systematic work in Italian on economics. On the whole he belongs to the "Mercantile" school, though he does not regard money as the only form of wealth. Specially noteworthy in the *Lezioni* are the sections on human wants as the foundation of economical theory, on labour as the source of wealth, on personal services as economic factors, and on the united working of the great industrial functions. He advocated freedom of the corn trade, reduction of the number of religious communities, and deprecated regulation of the interest on loans. In the spirit of his age he denounced the relics of medieval institutions, such as entails and tenures in mortmain. Gioja's more important treatise owes much to Genovesi's lectures. Genovesi died on the 22nd of September 1769.

See C. Ugoni, *Della letteratura italiana nella seconda metà del secolo VIII!* (1820–1822); A. Fabroni, *Vitae Italorum doctrina excellentium* (1778–1799); R. Bobba, *Commemorazione di A. Genovesi* (Benevento, 1867).

GENSONNÉ, ARMAND (1758–1793), French politician, the son of a military surgeon, was born at Bordeaux on the 10th of August 1758. He studied law, and at the outbreak of the Revolution was an advocate of the parlement of Bordeaux. In 1790 he became *procureur* of the Commune, and in July 1791 was elected by the newly created department of the Gironde a member of the court of appeal. In the same year he was elected deputy for the department to the Legislative Assembly. As reporter of the diplomatic committee, in which he supported the policy of Brissot, he proposed two of the most revolutionary measures passed by the Assembly: the decree of accusation against the king's brothers (January 1, 1792), and the declaration of war against the king of Bohemia and Hungary (April 20, 1792). He was vigorous in his denunciations of the intrigues of the court and of the "Austrian committee"; but the violence of the extreme democrats, culminating in the events of the 10th of August, alarmed him; and when he was returned to the National Convention, he attacked the Commune of Paris (October 24 and 25). At the trial of Louis XVI. he supported an appeal to the people, but voted for the death sentence. As a member of the Committee of General Defence, and as president of the Convention (March 7–21, 1793), he shared in the bitter attacks of the Girondists on the Mountain; and on the fatal day of the 2nd of June his name was among the first of those inscribed on the prosecution list. He was tried by the Revolutionary Tribunal on the 24th of October 1793, condemned to death and guillotined on the 31st of the month, displaying on the scaffold a stoic fortitude. Gensonné was accounted one of the most brilliant of the little band of brilliant

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orators from the Gironde, though his eloquence was somewhat cold and he always read his speeches.

GENTIAN, botanically *Gentiana*, a large genus of herbaceous plants belonging to the natural order Gentianaceae. The genus comprises about 300 species,—most of them perennial plants with tufted growth, growing in hilly or mountainous districts, chiefly in the northern hemisphere, some of the blue-flowered species ascending to a height of 16,000 ft. in the Himalaya Mountains. The leaves are opposite, entire and smooth, and often strongly ribbed. The flowers have a persistent 4- to 5-lobed calyx and a 4- to 5-lobed tubular corolla; the stamens are equal in number to the lobes of the corolla. The ovary is one-celled, with two stigmas, either separate and rolled back or contiguous and funnel-shaped. The fruit when ripe separates into two valves, and contains numerous small seeds. The majority of the genus are remarkable for the deep or brilliant blue colour of their blossoms, comparatively few having yellow, white, or more rarely red flowers; the last are almost exclusively found in the Andes.

Only a few species occur in Britain. *G. amarella* (felwort) and *G. campestris* are small annual species growing on chalky or calcareous hills, and bear in autumn somewhat tubular pale purple flowers; the latter is most easily distinguished by having two of the lobes of the calyx larger than the other two, while the former has the parts of the calyx in fives, and equal in size. Some intermediate forms between these two species occur, although rarely, in England; one of these, *G. germanica*, has larger flowers of a bluer tint, spreading branches, and a stouter stem. Some of these forms flower in spring. *G. pneumonanthe*, the Calathian violet, is a rather rare perennial species, growing in moist heathy places from Cumberland to Dorsetshire. Its average height is from 6 to 9 in. It has linear leaves, and a bright blue corolla 1½ in. long, marked externally with five greenish bands, is without hairs in its throat, and is found in perfection about the end of August. It is the handsomest of the British species; two varieties of it are known in cultivation, one with spotted and the other with white flowers. *G. verna* and *G. nivalis* are small species with brilliant blue flowers and small leaves. The former is a rare and local perennial, occurring, however, in Teesdale and the county of Clare in Ireland in tolerable abundance. It has a tufted habit of growth, and each stem bears only one flower. It is sometimes cultivated as an edging for flower borders. *G. nivalis* in Britain occurs only on a few of the loftiest Scottish mountains. It differs from the last in being an annual, and having a more isolated habit of growth, and in the stem bearing several flowers. On the Swiss mountains these beautiful little plants are very abundant; and the splendid blue colour of masses of gentian in flower is a sight which, when once seen, can never be forgotten. For ornamental purposes several species are cultivated. The great difficulty of growing them successfully renders them, however, less common than would otherwise be the case; although very hardy when once established, they are very impatient of removal, and rarely flower well until the third year after planting. Of the ornamental species found in British gardens some of the prettiest are *G. acaulis*, *G. verna*, *G. pyrenaica*, *G. bavarica*, *G. septemfida* and *G. gelida*. Perhaps the handsomest and most easily grown is the first named, often called *Gentianella*, which produces its large intensely blue flowers early in the spring.

All the species of the genus are remarkable for possessing an intense but pure bitter taste and tonic properties. About forty species are used in medicine in different parts of the world. The name of felwort given to *G. amarella*, but occasionally applied to the whole genus, is stated by Dr Prior to be given in allusion to these properties—*fel* meaning gall, and *wort* a plant. In the same way the Chinese call *G. asclepiadea*, and the Japanese *G. Buergeri*, "dragon's gall plants," in common with several other very bitter plants whose roots they use in medicine. *G. campestris* is sometimes used in Sweden and other northern countries as a substitute for hops.

By far the most important of the species used in medicine is *G. lutea*, a large handsome plant 3 or 4 ft. high, growing in open grassy places on the Alps, Apennines and Pyrenees, as well as on some of the mountainous ranges of France and Germany, extending as far east as Bosnia and the Danubian principalities. It has large oval strongly-ribbed leaves and dense whorls of conspicuous yellow flowers. Its use in medicine is of very ancient date. Pliny and Dioscorides mention that the plant was noticed by Gentius, a king of the Illyrians, living 180–167 B.C., from whom the name *Gentiana* is supposed to be derived. During the middle ages it was much employed in the cure of disease, and as an ingredient in counter-poisons. In 1552 Hieronymus Bock (Tragus) (1498–1554), a German priest, physician and botanist, mentions the use of the root as a means of dilating wounds.

The root, which is the part used in medicine, is tough and flexible, scarcely branched, and of a brownish colour and spongy texture. It has a pure bitter taste and faint distinctive odour. The bitter principle, known as *gentianin*, is a glucoside, soluble in water and alcohol. It can be decomposed into glucose and gentiopicrin by the action of dilute mineral acids. It is not precipitated by tannin or subacetate of lead. A solution of caustic potash or soda forms with gentianin a yellow solution, and the tincture of the root to which either of these alkalis has been added loses its bitterness in a few days. Gentian root also contains *gentianic acid* ($C_{14}H_{18}O_9$), which is inert and tasteless. It forms pale yellow silky crystals, very slightly soluble in water or ether, but soluble in hot strong alcohol and in aqueous alkaline solutions. This substance is also called *gentianin*, *gentisin* and *gentisic acid*.

The root also contains 12 to 15% of an uncrystallizable sugar called gentianose, of which fact advantage has long been taken in Switzerland and Bavaria for the production of a bitter cordial spirit called *Enzianbranntwein*. The use of this spirit, especially in Switzerland, has sometimes been followed by poisonous symptoms, which have been doubtfully attributed to inherent narcotic properties possessed by some species of gentian, the roots of which may have been indiscriminately collected with it; but it is quite possible that it may be due to the contamination of the root with that of *Veratrum album*, a poisonous plant growing at the same altitude, and having leaves extremely similar in appearance and size to those of *G. lutea*.

Gentian is one of the most efficient of the class of substances which act upon the stomach so as to invigorate digestion and thereby increase the general nutrition, without exerting any direct influence upon any other portion of the body than the alimentary canal. Having a pleasant taste and being non-astringent (owing to the absence of tannic acid), it is the most widely used of all bitter tonics. The British Pharmacopoeia contains an aqueous extract (dose, 2-8 grains), a compound infusion with orange and lemon peel (dose, ½-1 ounce), and a compound tincture with orange peel and cardamoms (dose ½-1 drachm). It is used in dyspepsia, chlorosis, anaemia and various other diseases, in which the tone of the stomach and alimentary canal is deficient, and is sometimes added to purgative medicines to increase and improve their action. In veterinary medicine it is also used as a tonic, and enters into a well-known compound called *diapente* as a chief ingredient.

GENTIANACEAE (the gentian family), in botany, an order of Dicotyledons belonging to the sub-class Sympetalae or Gamopetalae, and containing about 750 species in 64 genera. It has a world-wide distribution, and representatives adapted to very various conditions, including, for instance, alpine plants, like the true gentians (*Gentiana*), meadow plants such as the British *Chlora perfoliata* (yellow-wort) or *Erythraea Centaurium* (centaury), marsh plants such as *Menyanthes trifoliata* (bog-bean), floating water plants such as *Limnanthemum*, or steppe and sea-coast plants such as *Cicendia*. They are annual or perennial herbs, rarely becoming shrubby, and generally growing erect, with a characteristic forked manner of branching; the Asiatic genus *Crawfurdia* has a climbing stem; they are often low-growing and caespitose, as in the alpine gentians.

The leaves are in decussating pairs (that is, each pair is in a plane at right angles to the previous or succeeding pair), except in

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Menyanthes and a few allied aquatic or marsh genera, where they are alternate or radical. Several genera, chiefly American, are saprophytes, forming slender low-growing herbs, containing little or no chlorophyll and with leaves reduced to scales; such are *Voyria* and *Leiphaimos*, mainly tropical American. The inflorescence is generally cymose, often dichasial, recalling that of Caryophyllaceae, the lateral branches often becoming monochasial; it is sometimes reduced to a few flowers or one only, as in some gentians. The flowers are hermaphrodite, and regular with parts in 4's or 5's, with reduction to 2 in the pistil; in *Chlora* there are 6 to 8 members in each whorl. The calyx generally forms a tube with teeth or segments which usually overlap in the bud. The corolla shows great variety in form; thus among the British genera it is rotate in *Chlora*, funnel-shaped in *Erythraea*, and cylindrical, bell-shaped, funnel-shaped or salver-shaped in *Gentiana*; the segments are generally twisted to the right in the bud; the throat is often fimbriate or bears scales. The stamens, as many as, and alternating with, the corolla-segments, are inserted at very different heights on the corolla-tube; the filaments are slender, the anthers are usually attached dorsally, are versatile, and dehisce by two longitudinal slits; after escape of the pollen they sometimes become spirally twisted as in *Erythraea*. Dimorphic flowers are frequent, as in the bog-bean (*Menyanthes*). There is considerable variation in the size, shape and external markings of the pollen grains, and a division of the order into tribes and subtribes based primarily on pollen characters has been proposed. The form of the honey-secreting developments of the disk at the base of the ovary also shows considerable variety. The superior ovary is generally one-chambered, with two variously developed parietal placentas, which occasionally meet, forming two chambers; the ovules are generally very numerous and anatropous or half-anatropous in form. The style, which varies much in length, is simple, with an undivided or bilobed or bipartite stigma. The fruit is generally a membranous or leathery capsule, splitting septicidally into two valves; the seeds are small and numerous, and contain a small embryo in a copious endosperm.

Central figure and figs. 1-4 after Curtis, *Flora Londinensis*.

Gentiana Amarella.

1. A small form, natural size.
2. Calyx and protruding style.
3. Corolla, laid open.
4. Capsule, bursting into two valves, and showing the seeds attached to their margins.
5. Floral diagram.

The brilliant colour of the flowers, often occurring in large numbers (as in the alpine gentians), the presence of honey-glands and the frequency of dimorphy and dichogamy, are adaptations for pollination by insect visitors. In the true gentians (*Gentiana*) the flowers of different species are adapted for widely differing types of insect visitors. Thus *Gentiana lutea*, with a rotate yellow corolla and freely exposed honey, is adapted to short-tongued insect visitors; *G. Pneumonanthe*, with a long-tubed, bright blue corolla, is visited by humble bees; and *G. verna*, with a still longer narrower tube, is visited by Lepidoptera.

Gentiana, the largest genus, contains nearly three hundred species, distributed over Europe (including arctic), five being British, the mountains of Asia, south-east Australia and New Zealand, the whole of North America and along the Andes to Cape Horn; it does not occur in Africa. Bitter principles are general in the vegetative parts, especially in the rhizomes and roots, and have given a medicinal value to many species, *e.g.* *Gentiana lutea* and others.

GENTILE, in the English Bible, the term generally applied to those who were not of the Jewish race. It is an adaptation of the Lat. *gentilis*, of or belonging to the same *gens*, the clan or family; as defined in Paulus ex Festo "gentilis dicitur et ex eodem genere ortus et is qui simili nomine; ut ait Cincius, gentiles mihi sunt, qui meo nomine appellantur." In post-Augustan Latin *gentilis* became wider in meaning, following the usage of *gens*, in the sense of race, nation, and meant "national," belonging to the same race. Later still the word came to mean "foreign," *i.e.* other than Roman, and was so used in the Vulgate, with *gentes*, to translate the Hebrew *goyyim*, nations, LXX. ἔθνη, the non-Israelitish peoples (see further JEWS).

GENTILE DA FABRIANO (*c.* 1370–*c.* 1450), Italian painter, was born at Fabriano about 1370. He is said to have been a pupil of Allegretto di Nuzio, and has been supposed to have received most of his early instruction from Fra Angelico, to whose manner his bears in some respects a close similarity. About 1411 he went to Venice, where by order of the doge and senate he was engaged to adorn the great hall of the ducal palace with frescoes from the life of Barbarossa. He executed this work so entirely to the satisfaction of his employers that they granted him a pension for life, and accorded him the privilege of wearing the habit of a Venetian noble. About 1422 he went to Florence, where in 1423 he painted an "Adoration of the Magi" for the church of Santa Trinita, which is preserved in the Florence Accademia; this painting is considered his best work now extant. To the same period belongs a "Madonna and Child," which is now in the Berlin Museum. He had by this time attained a wide reputation, and was engaged to paint pictures for various churches, more particularly Siena, Perugia, Gubbio and Fabriano. About 1426 he was called to Rome by Martin V. to adorn the church of St John Lateran with frescoes from the life of John the Baptist. He also executed a portrait of the pope attended by ten cardinals, and in the church of St Francesco Romano a painting of the "Virgin and Child attended by St Benedict and St Joseph," which was much esteemed by Michelangelo, but is no longer in existence. Gentile da Fabriano died about 1450. Michelangelo said of him that his works resembled his name, meaning noble or refined. They are full of a quiet and serene joyousness, and he has a naïve and innocent delight in splendour and in gold ornaments, with which, however, his pictures are not overloaded.

GENTILESCHI, ARTEMISIA and **ORAZIO DE'**, Italian painters.

ORAZIO (*c.* 1565–1646) is generally named Orazio Lomi de' Gentileschi; it appears that De' Gentileschi was his correct surname, Lomi being the surname which his mother had borne during her first marriage. He was born at Pisa, and studied under his half-brother Aurelio Lomi, whom in course of time he surpassed. He afterwards went to Rome, and was associated with the landscape-painter Agostino Tasi, executing the figures for the landscape backgrounds of this artist in the Palazzo Rospigliosi, and it is said in the great hall of the Quirinal Palace, although by some authorities the figures in the last-named building are ascribed to Lanfranco. His best works are "Saints Cecilia and Valerian," in the Palazzo Borghese, Rome; "David after the death of Goliath," in the Palazzo Doria, Genoa; and some works in the royal palace, Turin, noticeable for vivid and uncommon colouring. At an advanced age Gentileschi went to England at the invitation of Charles I., and he was employed in the palace at Greenwich. Vandyck included him in his portraits of a hundred illustrious men. His works generally are strong in shadow and positive in colour. He died in England in 1646.

ARTEMISIA (1590–1642), Orazio's daughter, studied first under Guido, acquired much renown for portrait-painting, and considerably excelled her father's fame. She was a beautiful and elegant woman; her likeness, limned by her own hand, is to be seen in Hampton Court. Her most celebrated composition is "Judith and Holofernes," in the Uffizi Gallery; certainly a work of singular energy, and giving ample proof of executive faculty.

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but repulsive and unwomanly in its physical horror. She accompanied her father to England, but did not remain there long; the best picture which she produced for Charles I. was "David with the head of Goliath." Artemisia refused an offer of marriage from Agostino Tasi, and bestowed her hand on Pier Antonio Schiattesi, continuing, however, to use her own surname. She settled in Naples, whither she returned after her English sojourn; she lived there in no little splendour, and there she died in 1642. She had a daughter and perhaps other children.

GENTILI, ALBERICO (1552–1608), Italian jurist, who has great claims to be considered the founder of the science of international law, second son of Matteo Gentili, a physician of noble family and scientific eminence, was born on the 14th of January 1552 at Sanginesio, a small town of the march of Ancona which looks down from the slopes of the Apennines upon the distant Adriatic. After taking the degree of doctor of civil law at the university of Perugia, and holding a judicial office at Ascoli, he returned to his native city, and was entrusted with the task of recasting its statutes, but, sharing the Protestant opinions of his father, shared also, together with a brother, Scipio, afterwards a famous professor at Altdorf, his flight to Carniola, where in 1579 Matteo was appointed physician to the duchy. The Inquisition condemned the fugitives as contumacious, and they soon received orders to quit the dominions of Austria.

Alberico set out for England, travelling by way of Tübingen and Heidelberg, and everywhere meeting with the reception to which his already high reputation entitled him. He arrived at Oxford in the autumn of 1580, with a commendatory letter from the earl of Leicester, at that time chancellor of the university, and was shortly afterwards qualified to teach by being admitted to the same degree which he had taken at Perugia. His lectures on Roman law soon became famous, and the dialogues, disputations and commentaries, which he published henceforth in rapid succession, established his position as an accomplished civilian, of the older and severer type, and secured his appointment in 1587 to the regius professorship of civil law. It was, however, rather by an application of the old learning to the new questions suggested by the modern relations of states that his labours have produced their most lasting result. In 1584 he was consulted by government as to the proper course to be pursued with Mendoza, the Spanish ambassador, who had been detected in plotting against Elizabeth. He chose the topic to which his attention had thus been directed as a subject for a disputation when Leicester and Sir Philip Sidney visited the schools at Oxford in the same year; and this was six months later expanded into a book, the *De legationibus libri tres*. In 1588 Alberico selected the law of war as the subject of the law disputations at the annual "Act" which took place in July; and in the autumn published in London the *De Jure Belli commentatio prima*. A second and a third *Commentatio* followed, and the whole matter, with large additions and improvements, appeared at Hanau, in 1598, as the *De Jure Belli libri tres*. It was doubtless in consequence of the reputation gained by these works that Gentili became henceforth more and more engaged in forensic practice, and resided chiefly in London, leaving his Oxford work to be partly discharged by a deputy. In 1600 he was admitted to be a member of Gray's Inn, and in 1605 was appointed standing counsel to the king of Spain. He died on the 19th of June 1608, and was buried, by the side of Dr Matteo Gentili, who had followed his son to England, in the churchyard of St Helen's, Bishopsgate. By his wife, Hester de Peigni, he left two sons, Robert and Matthew, and a daughter, Anna, who married Sir John Colt. His notes of the cases in which he was engaged for the Spaniards were posthumously published in 1613 at Hanau, as *Hispanicae advocationis libri duo*. This was in accordance with his last wishes; but his direction that the remainder of his MSS. should be burnt was not complied with, since fifteen volumes of them found their way, at the beginning of the 19th century, from Amsterdam to the Bodleian library.

The true history of Gentili and of his principal writings has only been ascertained in recent years, in consequence of a revived appreciation of the services which he rendered to international law. The movement to do him honour originated in 1875 in England, as the result of the inaugural lecture of Prof. T. E. Holland, and was warmly taken up in Italy. In spreading through Europe it encountered two curious cross-currents of opinion,—one the ultra-Catholic, which three centuries before had ordered his name to be erased from all public documents and placed his works in the *Index*; another the narrowly-Dutch, which is, it seems, needlessly careful of the supremacy of Grotius. These two currents resulted respectively in a bust of Garcia Moreno being placed in the Vatican, and in the unveiling in 1886, with much international oratory, of a fine statue of Grotius at Delft. The English committee, under the honorary presidency of Prince Leopold, in 1877 erected a monument to the memory of Gentili in St Helen's church, and saw to the publication of a new edition of the *De Jure Belli*. The Italian committee, of which Prince (afterwards King) Humbert was honorary president, was less successful. It was only in 1908, the tercentenary of the death of Alberico, that the statue of the great heretic was at length unveiled in his native city by the minister of public instruction, in the presence of numerous deputations from Italian cities and universities. Preceding writers had dealt with various international questions, but they dealt with them singly, and with a servile submission to the decisions of the church. It was left to Gentili to grasp as a whole the relations of states one to another, to distinguish international questions from questions with which they are more or less intimately connected, and to attempt their solution by principles entirely independent of the authority of Rome. He uses the reasonings of the civil and even the canon law, but he proclaims as his real guide the *Jus Naturae*, the highest common sense of mankind, by which historical precedents are to be criticized and, if necessary, set aside.

His faults are not few. His style is prolix, obscure, and to the modern reader pedantic enough; but a comparison of his greatest work with what had been written upon the same subject by, for instance, Belli, or Soto, or even Ayala, will show that he greatly improved upon his predecessors, not only by the fulness with which he has worked out points of detail, but also by clearly separating the law of war from martial law, and by placing the subject once for all upon a non-theological basis. If, on the other hand, the same work be compared with the *De Jure Belli et Pacis* of Grotius, it is at once evident that the later writer is indebted to the earlier, not only for a large portion of his illustrative erudition, but also for all that is commendable in the method and arrangement of the treatise.

The following is probably a complete list of the writings of Gentili, with the places and dates of their first publication: *De juris interpretibus dialogi sex* (London, 1582); *Lectionum et epist. quae ad jus civile pertinent libri tres* (London, 1583–1584); *De legationibus libri tres* (London, 1585); *Legal. comitiorum Oxon. actio* (London, 1585–1586); *De duorum temp. appellationibus* (Hanau, 1586); *De nascendi tempore disputatio* (Wittenb., 1586); *Disputationum decas prima* (London, 1587); *Conditionum liber singularis* (London, 1587); *De jure belli comm. prima* (London, 1588); *secunda, ib.* (1588–1589); *tertia* (1589); *De injustitia bellica Romanorum* (Oxon, 1590); *Ad tit. de Malef. et Math. de Prof. et Med.* (Hanau, 1593); *De jure belli libri tres* (Hanau, 1598); *De armis Romanis, &c.* (Hanau, 1599); *De adoptivis et de absens mendacii* (Hanau, 1599); *De ludis scenicis epist. duae* (Middleburg, 1600); *Ad l. Maccabaeorum et de lingvarum mistura disp.* (Frankfurt, 1600); *Lectiones Virgilianae* (Hanau, 1600); *De nuptiis libri septem* (1601); *In tit. si quis princips, et ad leg. Jul. majest.* (Hanau, 1604); *De latin. vet. Bibl.* (Hanau, 1604); *De libro Pyano* (Oxon, 1604); *Laudes Acad. Perus. et Oxon.* (Hanau, 1605); *De unione Angliae et Scotiae* (London, 1605); *Disputationes tres, de libris jur. can., de libris jur. civ., de latinitate vet. vers.* (Hanau, 1605); *Regales disput. tres, de pot. regis absoluta, de unione regnorum, de vi civium* (London, 1605); *Hispanicae advocationis libri duo* (Hanau, 1613); *In tit. de verb. signif.* (Hanau, 1614); *De legatis in test.* (Amsterdam, 1661). The first edition of the *Opera omnia*, commenced at Naples in 1770, was cut short by the death of the publisher, Gravier, after the second volume. Of his numerous unpublished writings, Gentili complained that four volumes were lost "pessimo pontificiorum facinore," meaning probably that they were left behind in his flight to Carniola.

AUTHORITIES.—Several tracts by the Abate Benigni in Colucci, *Anticchità Picene* (1790); a dissertation by W. Reiger annexed to the *Program of the Groningen Gymnasium* for 1867; an inaugural lecture delivered in 1874 by T. E. Holland, translated into Italian,

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with additions by the author, by A. Saffi (1884); the preface to a new edition of the *De jure belli* (1877) and *Studies in International Law* (1898) (which see, for details as to the family and MSS. of Gentili), by the same; works by Valdarnini and Foglietti (1875), Speranza and De Giorgi (1876), Fiorini (a translation of the *De jure belli*, with essay, 1877), A. Saffi (1878), L. Marson (1885), M. Thamm (1896), B. Brugi (1898) T. A. Walker (an analysis of the principal works of Gentili) in his *History of the Law of Nations*, vol. i. (1899); H. Nézard, in Pillet's *Fondateurs de droit international* (1904); E. Agabiti (1908). See also E. Comba, in the *Rivista Christiana* (1876–1877); Sir T. Twiss, in the *Law Review* (1878); articles in the *Revue de droit international* (1875–1878, 1883, 1886, 1908); O. Scalvanti, in the *Annali dell' Univ. di Perugia*, N.S., xviii. viii. (1898). (T. E. H.)

GENTLE (through the Fr. *gentil*, from Lat. *gentilis*, belonging to the same *gens*, or family), properly an epithet of one born of a "good family"; the Latin *generosus*, "well born" (see GENTLEMAN), contrasted with "noble" on the one side and "simple" on the other. The word followed the wider application of the word "gentleman"; implying the manners, character and breeding proper to one to whom that name could be applied, courteous, polite; hence, with no reference to its original meaning, free from violence or roughness, mild, soft, kind or tender. With a physical meaning of soft to the touch, the word is used substantively of the maggot of the bluebottle fly, used as a bait by fishermen. At the end of the 16th century the French *gentil* was again adapted into English in the form "gentile," later changed to "genteel." The word was common in the 17th and 18th centuries as applied to behaviour, manner of living, dress, &c., suitable or proper to persons living in a position in society above the ordinary, hence polite, elegant. From the early part of the 19th century it has also been used in an ironical sense, and applied chiefly to those who pay an excessive and absurd importance to the outward marks of respectability as evidence of being in a higher rank in society than that to which they properly belong.

GENTLEMAN (from Lat. *gentilis*, "belonging to a race or *gens*," and "man"; Fr. *gentilhomme*, Span. *gentil hombre*, Ital. *gentil huomo*, in its original and strict signification, a term denoting a man of good family, the Lat. *generosus* (its invariable translation in English-Latin documents). In this sense it is the equivalent of the Fr. *gentilhomme*, "nobleman," which latter term has in Great Britain been long confined to the peerage (see NOBILITY); and the term "gentry" ("gentrice" from O. Fr. *genterise* for *gentelise*) has much of the significance of the Fr. *noblesse* or the Ger. *Adel*. This was what was meant by the rebels under John Ball in the 14th century when they repeated:

> "When Adam delved and Eve span,
> Who was then the gentleman?"

Selden (*Titles of Honor*, 1672), discussing the title "gentleman," speaks of "our English use of it" as "convertible with *nobilis*," and describes in connexion with it the forms of ennobling in various European countries. William Harrison, writing a century earlier, says "gentlemen be those whom their race and blood, or at the least their virtues, do make noble and known." But for the complete gentleman the possession of a coat of arms was in his time considered necessary; and Harrison gives the following account of how gentlemen were made in Shakespeare's day:

> ". . . gentlemen whose ancestors are not known to come in with William duke of Normandy (for of the Saxon races yet remaining we now make none accompt, much less of the British issue) do take their beginning in England after this manner in our times. Who soever studieth the laws of the realm, who so abideth in the university, giving his mind to his book, or professeth physic and the liberal sciences, or beside his service in the room of a captain in the wars, or good counsel given at home, whereby his commonwealth is benefited, can live without manual labour, and thereto is able and will bear the port, charge and countenance of a gentleman, he shall for money have a coat and arms bestowed upon him by heralds (who in the charter of the same do of custom pretend antiquity and service, and many gay things) and thereunto being made so good cheap be called master, which is the title that men give to esquires and gentlemen, and reputed for a gentleman ever after. Which is so much the less to be disallowed of, for that the prince doth lose nothing by it, the gentleman being so much subject to taxes and public payments as is the yeoman or husbandman, which he likewise doth bear the gladlier for the saving of his reputation. Being called also to the wars (for with the government of the commonwealth he medleth little) what soever it cost him, he will both array and arm himself accordingly, and show the more manly courage, and all the tokens of the person which he representeth. No man hath hurt by it but himself, who peradventure will go in wider buskins than his legs will bear, or as our proverb saith, now and then bear a bigger sail than his boat is able to sustain."[1]

In this way Shakespeare himself was turned, by the grant of his coat of arms, from a "vagabond" into a gentleman.

The fundamental idea of "gentry," symbolized in this grant of coat-armour, had come to be that of the essential superiority of the fighting man; and, as Selden points out (p. 707), the fiction was usually maintained in the granting of arms "to an ennobled person though of the long Robe wherein he hath little use of them as they mean a shield." At the last the wearing of a sword on all occasions was the outward and visible sign of a "gentleman"; and the custom survives in the sword worn with "court dress." This idea that a gentleman must have a coat of arms, and that no one is a "gentleman" without one is, however, of comparatively late growth, the outcome of the natural desire of the heralds to magnify their office and collect fees for registering coats; and the same is true of the conception of "gentlemen" as a separate class. That a distinct order of "gentry" existed in England very early has, indeed, been often assumed, and is supported by weighty authorities. Thus, the late Professor Freeman (*Encyc. Brit.* xvii. p. 540 b, 9th ed.) said: "Early in the 11th century the order of 'gentlemen' as a separate class seems to be forming as something new. By the time of the conquest of England the distinction seems to have been fully established." Stubbs (*Const. Hist.*, ed. 1878, iii. 544, 548) takes the same view. Sir George Sitwell, however, has conclusively proved that this opinion is based on a wrong conception of the conditions of medieval society, and that it is wholly opposed to the documentary evidence. The fundamental social cleavage in the middle ages was between the *nobiles*, *i.e.* the tenants in chivalry, whether earls, barons, knights, esquires or franklins, and the *ignobiles*, *i.e.* the villeins, citizens and burgesses;[2] and between the most powerful noble and the humblest franklin there was, until the 15th century, no "separate class of gentlemen." Even so late as 1400 the word "gentleman" still only had the sense of *generosus*, and could not be used as a personal description denoting rank or quality, or as the title of a class. Yet after 1413 we find it increasingly so used; and the list of landowners in 1431, printed in *Feudal Aids*, contains, besides knights, esquires, yeomen and husbandmen (*i.e.* householders), a fair number who are classed as "gentlemen."

Sir George Sitwell gives a lucid explanation of this development, the incidents of which are instructive and occasionally amusing. The immediate cause was the statute 1 Henry V. cap. v. of 1413, which laid down that in all original writs of action, personal appeals and indictments, in which process of outlawry lies, the "estate degree or mystery" of the defendant must be stated, as well as his present or former domicile. Now the Black Death (1349) had put the traditional social organization out of gear. Before that the younger sons of the *nobiles* had received their share of the farm stock, bought or hired land, and settled down as agriculturists in their native villages. Under the new conditions

[1] *Description of England*, bk. ii. ch. v. p. 128. Henry Peacham, in his *Compleat Gentleman* (1634), takes this matter more seriously. "Neither must we honour or esteem," he writes, "those ennobled, or made gentle in blood, who by mechanic and base means have raked up a mass of wealth . . . or have purchased an ill coat (of arms) at a good rate; no more than a player upon the stage, for wearing a lord's cast suit: since nobility hangeth not upon the airy esteem of vulgar opinion, but is indeed of itself essential and absolute" (Reprint, p. 3). Elsewhere (p. 161) he deplores the abuse of heraldry, which had even in his day produced "all the world over such a medley of coats" that, but for the commendable activity of the earls marshals, he feared that yeomen would soon be "as rare in *England* as they are in *France*." See also an amusing instance from the time of Henry VIII., given in "The Gentility of Richard Barker," by Oswald Barron, in the *Ancestor*, vol. ii. (July 1902).

[2] "Even this classification would seem to need modifying. For certain of the great patrician families of the cities were certainly *nobiles*.

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this became increasingly impossible, and they were forced to seek their fortunes abroad in the French wars, or at home as hangers-on of the great nobles. These men, under the old system, had no definite status; but they were *generosi*, men of birth, and, being now forced to describe themselves, they disdained to be classed with franklins (now sinking in the social scale), still more with yeomen or husbandmen; they chose, therefore, to be described as "gentlemen." On the character of these earliest "gentlemen" the records throw a lurid light. According to Sir George Sitwell (p. 76), "the premier gentleman of England, as the matter now stands, is 'Robert Erdeswyke of Stafford, gentilman,'" who had served among the men-at-arms of Lord Talbot at Agincourt (*ib.* note). He is typical of his class. "Fortunately—for the gentle reader will no doubt be anxious to follow in his footsteps—some particulars of his life may be gleaned from the public records. He was charged at the Staffordshire Assizes with housebreaking, wounding with intent to kill, and procuring the murder of one Thomas Page, who was cut to pieces while on his knees begging for his life." If any earlier claimant to the title of "gentleman" be discovered, Sir George Sitwell predicts that it will be within the same year (1414) and in connexion with some similar disreputable proceedings.[1]

From these unpromising beginnings the separate order of "gentlemen" was very slowly evolved. The first "gentleman" commemorated on an existing monument was John Daundelyon of Margate (*d. c.* 1443); the first gentleman to enter the House of Commons, hitherto composed mainly of "valets," was "William Weston, gentylman"; but even in the latter half of the 15th century the order was not clearly established. As to the connexion of "gentilesse" with the official grant or recognition of coat-armour, that is a profitable fiction invented and upheld by the heralds; for coat-armour was but the badge assumed by gentlemen to distinguish them in battle, and many gentlemen of long descent never had occasion to assume it, and never did. This fiction, however, had its effect; and by the 16th century, as has been already pointed out, the official view had become clearly established that "gentlemen" constituted a distinct order, and that the badge of this distinction was the heralds' recognition of the right to bear arms. It is unfortunate that this view, which is quite unhistorical and contradicted by the present practice of many undoubtedly "gentle" families of long descent, has of late years been given a wide currency in popular manuals of heraldry.

In this narrow sense, however, the word "gentleman" has long since become obsolete. The idea of "gentry" in the continental sense of *noblesse* is extinct in England, and is likely to remain so, in spite of the efforts of certain enthusiasts to revive it (see A. C. Fox-Davies, *Armorial Families*, Edinburgh, 1895). That it once existed has been sufficiently shown; but the whole spirit and tendency of English constitutional and social development tended to its early destruction. The comparative good order of England was not favourable to the continuance of a class, developed during the foreign and civil wars of the 14th and 15th centuries, for whom fighting was the sole honourable occupation. The younger sons of noble families became apprentices in the cities, and there grew up a new aristocracy of trade. Merchants are still "citizens" to William Harrison; but he adds "they often change estate with gentlemen, as gentlemen do with them, by a mutual conversion of the one into the other." A frontier line between classes so indefinite could not be maintained, especially as in England there was never a "nobiliary prefix" to stamp a person as a gentleman by his surname, as in France or Germany.[2] The process was hastened, moreover, by the corruption of the Heralds' College and by the ease with which coats of arms could be assumed without a shadow of claim; which tended to bring the "science of armory" into contempt. The word "gentleman" as an index of rank had already become of doubtful value before the great political and social changes of the 19th century gave to it a wider and essentially higher significance. The change is well illustrated in the definitions given in the successive editions of the *Encyclopaedia Britannica*. In the 5th edition (1815) "a gentleman is one, who without any title, bears a coat of arms, or whose ancestors have been freemen." In the 7th edition (1845) it still implies a definite social status: "All above the rank of yeomen." In the 8th edition (1856) this is still its "most extended sense"; "in a more limited sense" it is defined in the same words as those quoted above from the 5th edition; but the writer adds, "By courtesy this title is generally accorded to all persons above the rank of common tradesmen when their manners are indicative of a certain amount of refinement and intelligence." The Reform Bill of 1832 has done its work; the "middle classes" have come into their own; and the word "gentleman" has come in common use to signify not a distinction of blood, but a distinction of position, education and manners. The test is no longer good birth, or the right to bear arms, but the capacity to mingle on equal terms in good society. In its best use, moreover, "gentleman" involves a certain superior standard of conduct, due, to quote the 8th edition once more, to "that self-respect and intellectual refinement which manifest themselves in unrestrained yet delicate manners." The word "gentle," originally implying a certain social status, had very early come to be associated with the standard of manners expected from that status. Thus by a sort of punning process the "gentleman" becomes a "gentle-man." Chaucer in *The Meliboeus* (*c.* 1386) says: "Certes he sholde not be called a gentil man, that . . . ne dooth his diligence and bisynesse, to kepen his good name"; and in the *Wife of Bath's Tale*:

> "Loke who that is most vertuous alway
> Prive and apert, and most entendeth ay
> To do the gentil dedes that he can
> And take him for the greter gentilman,"

and in the *Romance of the Rose* (*c.* 1400) we find "he is gentil bycause he doth as longeth to a gentilman." This use develops through the centuries, until in 1714 we have Steele, in the *Tatler* (No. 207), laying down that "the appellation of Gentleman is never to be affixed to a man's circumstances, but to his Behaviour in them," a limitation over-narrow even for the present day. In this connexion, too, may be quoted the old story, told by some—very improbably—of James II., of the monarch who replied to a lady petitioning him to make her son a gentleman, "I could make him a nobleman, but God Almighty could not make him a gentleman." Selden, however, in referring to similar stories "that no Charter can make a Gentleman, which is cited as out of the mouth of some great Princes that have said it," adds that "they without question understood Gentleman for *Generosus* in the antient sense, or as if it came from *Gentilis* in that sense, as *Gentilis* denotes one of a noble Family, or indeed for a Gentleman by birth." For "no creation could make a man of another blood than he is." The word "gentleman," used in the wide sense with which birth and circumstances have nothing to do, is necessarily incapable of strict definition. For "to behave like a gentleman" may mean little or much, according to the person by whom the phrase is used; "to spend money like a gentleman" may even be no great praise; but "to conduct a business like a gentleman" implies a standard at least as high as that involved

[1] The designation "gentilman" is, indeed, found some two centuries earlier. In the *Inquisitio maneriorum Ecclesiae S. Pauli Londin.* of A.D. 1222 (W. A. Hale, *Domesday of St Paul's*, Camden Soc., 1858, p. 80) occurs the entry: *Adam gentilmã dim acrã, p' iii. d.* This is probably the earliest record of the "grand old name of gentleman"; but Adam, who held half an acre at a rent of three pence—less by half than that held by "Ralph the bondsman" (Rad' le bunde) in the same list—was certainly not a "gentleman." "Gentilman" here was a nickname, perhaps suggested by Adam's name, and thus in some sort anticipating the wit of the famous couplet repeated by John Ball's rebels.

[2] The prefix "de" attached to some English names is in no sense "nobiliary." In Latin documents *de was* the equivalent of the English "of," as *de la* of "at" (so de la Pole for Atte Poole, cf. such names as Attwood, Attwater). In English this "of" was in the 15th century dropped; *e.g.* the grandson of Johannes de Stoke (John of Stoke) in a 14th-century document becomes John Stoke. In modern times, under the influence of romanticism, the prefix "de" has been in some cases "revived" under a misconception, *e.g.* "de Trafford," "de Hoghton." Very rarely it is correctly retained as derived from a foreign place-name, *e.g.* de Grey.

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in the phrase "noblesse oblige." In this sense of a person of culture, character and good manners the word "gentleman" has supplied a gap in more than one foreign language.

The evolution of this meaning of "gentleman" reflects very accurately that of English society; and there are not wanting signs that the process of evolution, in the one as in the other, is not complete. The indefinableness of the word mirrors the indefinite character of "society" in England; and the use by "the masses" of "gentleman" as a mere synonym for "man" has spread *pari passu* with the growth of democracy. It is a protest against implied inferiority, and is cherished as the modern French *bourgeois* cherishes his right of duelling with swords, under the *ancien régime* a prerogative of the *noblesse*. Nor is there much justification for the denunciation by purists of the "vulgarization" and "abuse" of the "grand old name of gentleman." Its strict meaning has now fallen completely obsolete. Its current meaning varies with every class of society that uses it. But it always implies some sort of excellency of manners or morals. It may by courtesy be over-loosely applied by one common man to another; but the common man would understand the reproach conveyed in "You're no gentleman."

AUTHORITIES.—Selden, *Titles of Honor* (London, 1672); William Harrison, *Description of England*, ed. G. F. J. Furnivall for the New Shakspere Soc. (London, 1877–1878); Sir George Sitwell, "The English Gentleman," in the *Ancestor*, No. 1 (Westminster, April 1902); *Peacham's Compleat Gentleman* (1634), with an introduction by G. S. Gordon (Oxford, 1906); A. Smythe-Palmer, D.D., *The Ideal of a Gentleman, or a Mirror for Gentlefolk: A Portrayal in Literature from the Earliest Times* (London, 1908), a very exhaustive collection of extracts from authors so wide apart as Ptah-hotep (3300 B.C.) and William Watson, arranged under headings; "The Historical Idea of a Gentleman," "The Herald's Gentleman," "The Poet's Gentleman," &c. (W. A. P.)

GENTZ, FRIEDRICH VON (1764–1832), German publicist and statesman, was born at Breslau on the 2nd of May 1764. His father was an official, his mother an Ancillon, distantly related to the Prussian minister of that name. On his father's transference to Berlin, as director of the mint, the boy was sent to the Joachimsthal gymnasium there; his brilliant talents, however, did not develop until later, when at the university of Königsberg he fell under the influence of Kant. But though his intellect was sharpened and his zeal for learning quickened by the great thinker's influence, Kant's "categorical imperative" did not prevent him from yielding to the taste for wine, women and high play which pursued him through life. When in 1785 he returned to Berlin, he received the appointment of secret secretary to the royal *Generaldirectorium*, his talents soon gaining him promotion to the rank of councillor for war (*Kriegsrath*). During an illness, which kept him virtuous by confining him to his room, he studied French and English, gaining a mastery of these languages which, at that time exceedingly rare, opened up for him opportunities for a diplomatic career.

His interest in public affairs was, however, first aroused by the outbreak of the French Revolution. Like most quick-witted young men, he greeted this at first with enthusiasm; but its subsequent developments cooled his ardour and he was converted to more conservative counsels by Burke's *Essay on the French Revolution*, a translation of which into German (1794) was his first literary venture. This was followed, next year, by translations of works on the Revolution by Mallet du Pan and Mounier, and at this time he also founded and edited a monthly journal, the *Neue deutsche Monatsschrift*, in which for five years he wrote, mainly on historical and political questions, maintaining the principles of British constitutionalism against those of revolutionary France. The knowledge he displayed of the principles and practice of finance was especially remarkable. In 1797, at the instance of English statesmen, he published a translation of a history of French finance by François d'Ivernois (1757–1842), an eminent Genevese exile naturalized and knighted in England, extracts from which he had previously given in his journal. His literary output at this time, all inspired by a moderate Liberalism, was astounding, and included an essay on the results of the discovery of America, and another, written in French, on the English financial system (*Essai sur l'état de l'administration des finances de la Grande-Bretagne*, London, 1800). Especially noteworthy, however, was the *Denkschrift* or *Missive* addressed by him to King Frederick William III. on his accession (1797), in which, *inter alia*, he urged upon the king the necessity for granting freedom to the press and to commerce. For a Prussian official to venture to give uncalled-for advice to his sovereign was a breach of propriety not calculated to increase his chances of favour; but it gave Gentz a conspicuous position in the public eye, which his brilliant talents and literary style enabled him to maintain. Moreover, he was from the first aware of the probable developments of the Revolution and of the consequences to Prussia of the weakness and vacillations of her policy. Opposition to France was the inspiring principle of the *Historisches Journal* founded by him in 1799–1800, which once more held up English institutions as the model, and became in Germany the mouthpiece of British policy towards the revolutionary aggressions of the French republic. In 1801 he ceased the publication of the *Journal*, because he disliked the regularity of journalism, and issued instead, under the title *Beiträge zur Geschichte*, &c., a series of essays on contemporary politics. The first of these was *Uberden Ursprung und Charakter des Krieges gegen die französische Revolution* (1801), by many regarded as Gentz's masterpiece; another important brochure, *Von dem politischen Zustande von Europa vor und nach der Revolution*, a criticism of Hauterive's *De l'état de la France à la fin de l'an VIII*, appeared the same year.

This activity gained him recognition abroad and gifts of money from the British and Austrian governments; but it made his position as an official in Berlin impossible, for the Prussian government had no mind to abandon its attitude of cautious neutrality. Private affairs also combined to urge Gentz to leave the Prussian service; for, mainly through his own fault, a separation with his wife was arranged. In May 1802, accordingly, he took leave of his wife and left with his friend Adam Müller for Vienna. In Berlin he had been intimate with the Austrian ambassador, Count Stadion, whose good offices procured him an introduction to the emperor Francis. The immediate result was the title of imperial councillor, with a yearly salary of 4000 gulden (December 6th, 1802); but it was not till 1809 that he was actively employed. Before returning to Berlin to make arrangements for transferring himself finally to Vienna, Gentz paid a visit to London, where he made the acquaintance of Pitt and Granville, who were so impressed with his talents that, in addition to large money presents, he was guaranteed an annual pension by the British government in recognition of the value of the services of his pen against Bonaparte. From this time forward he was engaged in a ceaseless polemic against every fresh advance of the Napoleonic power and pretensions; with matchless sarcasm he lashed "the nerveless policy of the courts, which suffer indignity with resignation"; he denounced the recognition of Napoleon's imperial title, and drew up a manifesto of Louis XVIII. against it. The formation of the coalition and the outbreak of war for a while raised his hopes, in spite of his lively distrust of the competence of Austrian ministers; but the hopes were speedily dashed by Austerlitz and its results. Gentz used his enforced leisure to write a brilliant essay on "The relations between England and Spain before the outbreak of war between the two powers" (Leipzig, 1806); and shortly afterwards appeared *Fragmente aus der neuesten Geschichte des politischen Gleichgewichts in Europa* (translated *s.t. Fragments on the Balance of Power in Europe*, London, 1806). This latter, the last of Gentz's works as an independent publicist, was a masterly exposé of the actual political situation, and at the same time prophetic in its suggestions as to how this should be retrieved: "Through Germany Europe has perished, through Germany it must rise again." He realized that the dominance of France could only be broken by the union of Austria and Prussia, acting in concert with Great Britain. He watched with interest the Prussian military preparations, and, at the invitation of Count Haugwitz, he went at the outset of the campaign to the Prussian headquarters at Erfurt, where he drafted the king's proclamation and his letter to Napoleon. The writer was known, and it was in

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this connexion that Napoleon referred to him as "a wretched scribe named Gentz, one of those men without honour who sell themselves for money." In this mission Gentz had no official mandate from the Austrian government, and whatever hopes he may have cherished of privately influencing the situation in the direction of an alliance between the two German powers were speedily dashed by the campaign of Jena.

The downfall of Prussia left Austria the sole hope of Germany and of Europe. Gentz, who from the winter of 1806 onwards divided his time between Prague and the Bohemian watering-places, seemed to devote himself wholly to the pleasures of society, his fascinating personality gaining him a ready reception in those exalted circles which were to prove of use to him later on in Vienna. But, though he published nothing, his pen was not idle, and he was occupied with a series of essays on the future of Austria and the best means of liberating Germany and redressing the balance of Europe; though he himself confessed to his friend Adam Müller (August 4th, 1806) that, in the miserable circumstances of the time, his essay on "the principles of a general pacification" must be taken as a "political poem."

In 1809, on the outbreak of war between Austria and France, Gentz was for the first time actively employed by the Austrian government under Stadion; he drafted the proclamation announcing the declaration of war (15th of April), and during the continuance of hostilities his pen was ceaselessly employed. But the peace of 1810 and the fall of Stadion once more dashed his hopes, and, disillusioned and "hellishly blasé," he once more retired to comparative inactivity at Prague. Of Metternich, Stadion's successor, he had at the outset no high opinion, and it was not till 1812 that there sprang up between the two men the close relations that were to ripen into life-long friendship. But when Gentz returned to Vienna as Metternich's adviser and henchman, he was no longer the fiery patriot who had sympathized and corresponded with Stein in the darkest days of German depression and in fiery periods called upon all Europe to free itself from foreign rule. Disillusioned and cynical, though clear-sighted as ever, he was henceforth before all things an Austrian, more Austrian on occasion even than Metternich; as, *e.g.*, when, during the final stages of the campaign of 1814, he expressed the hope that Metternich would substitute "Austria" for "Europe" in his diplomacy and—strange advice from the old hater of Napoleon and of France—secure an Austro-French alliance by maintaining the husband of Marie Louise on the throne of France.

For ten years, from 1812 onward, Gentz was in closest touch with all the great affairs of European history, the assistant, confidant, and adviser of Metternich. He accompanied the chancellor on all his journeys; was present at all the conferences that preceded and followed the war; no political secrets were hidden from him; and his hand drafted all important diplomatic documents. He was secretary to the congress of Vienna (1814–1815) and to all the congresses and conferences that followed, up to that of Verona (1822), and in all his vast knowledge of men and affairs made him a power. He was under no illusion as to their achievements; his memoir on the work of the congress of Vienna is at once an incisive piece of criticism and a monument of his own disillusionment. But the Liberalism of his early years was gone for ever, and he had become reconciled to Metternich's view that, in an age of decay, the sole function of a statesman was to "prop up mouldering institutions." It was the hand of the author of that offensive *Missive* to Frederick William III., on the liberty of the press, that drafted the Carlsbad decrees; it was he who inspired the policy of repressing the freedom of the universities; and he noted in his diary as "a day more important than that of Leipzig" the session of the Vienna conference of 1819, in which it was decided to make the convocation of representative assemblies in the German states impossible, by enforcing the letter of Article XIII. of the Act of Confederation.

As to Gentz's private life there is not much to be said. He remained to the last a man of the world, though tormented with an exaggerated terror of death. His wife he had never seen again since their parting at Berlin, and his relations with other women, mostly of the highest rank, were too numerous to record. But passion tormented him to the end, and his infatuation for Fanny Elssler, the celebrated *danseuse*, forms the subject of some remarkable letters to his friend Rahel, the wife of Varnhagen von Ense (1830–1831). He died on the 9th of June 1832.

Gentz has been very aptly described as a mercenary of the pen, and assuredly no other such mercenary has ever carved out for himself a more remarkable career. To have done so would have been impossible, in spite of his brilliant gifts, had he been no more than the "wretched scribe" sneered at by Napoleon. Though by birth belonging to the middle class in a country of hide-bound aristocracy, he lived to move on equal terms in the society of princes and statesmen; which would never have been the case had he been notoriously "bought and sold." Yet that he was in the habit of receiving gifts from all and sundry who hoped for his backing is beyond dispute. He notes that at the congress of Vienna he received 22,000 florins through Talleyrand from Louis XVIII., while Castlereagh gave him £600, accompanied by *les plus folles promesses*; and his diary is full of such entries. Yet he never made any secret of these gifts; Metternich was aware of them, and he never suspected Gentz of writing or acting in consequence against his convictions. As a matter of fact, no man was more free or outspoken in his criticism of the policy of his employers than this apparently venal writer. These gifts and pensions were rather in the nature of subsidies than bribes; they were the recognition by various powers of the value of an ally whose pen had proved itself so potent a weapon in their cause.

It is, indeed, the very impartiality and objectivity of his attitude that make the writings of Gentz such illuminating documents for the period of history which they cover. Allowance must of course be made for his point of view, but less so perhaps than in the case of any other writer so intimately concerned with the policies which he criticizes. And, apart from their value as historical documents, Gentz's writings are literary monuments, classical examples of nervous and luminous German prose, or of French which is a model for diplomatic style.

A selection of Gentz's works (*Ausgewählte Schriften*) was published by Weick in 5 vols. (1836–1838); his lesser works (Mannheim, 1838–1840) in 5 vols. and *Mémoires et lettres inédites* (Stuttgart, 1841) were edited by G. Schlesier. Subsequently there have appeared *Briefe an Chr. Garve* (Breslau, 1857); correspondence (*Briefwechsel*) with Adam Müller (Stuttgart, 1857); *Briefe an Pilat* (2 vols., Leipzig, 1868); *Aus dem Nachlass Friedrichs von Gentz* (2 vols.), edited by Count Anton Prokesch-Osten (Vienna, 1867); *Aus der alten Registratur der Staats-Kanzlei: Briefe politischen Inhalts von und an Friedrich von Gentz*, edited by C. von Klinkowström (Vienna, 1870); *Dépêches inédites du chev. de Gentz aux Hospodars de Valachie 1813–1828* (a correspondence on current affairs commissioned by the Austrian government), edited by Count Anton von Prokesch-Osten the younger (3 vols., Paris, 1876), incomplete, but partly supplemented in *Oesterreichs Teilnahme an den Befreiungskriegen* (Vienna, 1887), a collection of documents of the greatest value; *Zur Geschichte der orientalischen Frage: Briefe aus dem Nachlass Friedrichs von Gentz* (Vienna, 1877), edited by Count Prokesch-Osten the younger. Finally Gentz's diaries, from 1800 to 1828, an invaluable mine of authentic material, were edited by Varnhagen von Ense and published after his death under the title *Tagebücher*, &c. (Leipzig, 1861; new ed., 4 vols., *ib.* 1873). Several lives of Gentz exist. The latest is by E. Guglia, *Friedrich von Gentz* (Vienna, 1901). (W. A. P.)

GEOCENTRIC, referred to the centre of the earth (Gr. γῆ) as an origin; a term designating especially the co-ordinates of a heavenly body referred to this origin.

GEODESY (from the Gr. γῆ, the earth, and δαίειν, to divide), the science of surveying (*q.v.*) extended to large tracts of country, having in view not only the production of a system of maps of very great accuracy, but the determination of the curvature of the surface of the earth, and eventually of the figure and dimensions of the earth. This last, indeed, may be the sole object in view, as was the case in the operations conducted in Peru and in Lapland by the celebrated French astronomers P. Bouguer, C. M. de la Condamine, P. L. M. de Maupertuis, A. C. Clairault and others; and the measurement of the meridian

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arc of France by P. F. A. Méchain and J. B. J. Delambre had for its end the determination of the true length of the "metre" which was to be the legal standard of length of France (see EARTH, FIGURE OF THE).

The basis of every extensive survey is an accurate triangulation, and the operations of geodesy consist in the measurement, by theodolites, of the angles of the triangles; the measurement of one or more sides of these triangles on the ground; the determination by astronomical observations of the azimuth of the whole network of triangles; the determination of the actual position of the same on the surface of the earth by observations, first for latitude at some of the stations, and secondly for longitude; the determination of altitude for all stations.

For the computation, the points of the actual surface of the earth are imagined as projected along their plumb lines on the mathematical figure, which is given by the stationary sea-level, and the extension of the sea through the continents by a system of imaginary canals. For many purposes the mathematical surface is assumed to be a plane; in other cases a sphere of radius 6371 kilometres (20,900,000 ft.). In the case of extensive operations the surface must be considered as a compressed ellipsoid of rotation, whose minor axis coincides with the earth's axis, and whose compression, flattening, or ellipticity is about 1/298.

Measurement of Base Lines.

To determine by actual measurement on the ground the length of a side of one of the triangles ("base line"), wherefrom to infer the lengths of all the other sides in the triangulation, is not the least difficult operation of a trigonometrical survey. When the problem is stated thus—To determine the number of times that a certain standard or unit of length is contained between two finely marked points on the surface of the earth at a distance of some miles asunder, so that the error of the result may be pronounced to lie between certain very narrow limits,—then the question demands very serious consideration. The representation of the unit of length by means of the distance between the fine lines on the surface of a bar of metal at a certain temperature is never itself free from uncertainty and probable error, owing to the difficulty of knowing at any moment the precise temperature of the bar; and the transference of this unit, or a multiple of it, to the measuring bar will be affected not only with errors of observation, but with errors arising from uncertainty of temperature of both bars. If the measuring bar be not self-compensating for temperature, its expansion must be determined by very careful experiments. The thermometers required for this purpose must be very carefully studied, and their errors of division and index error determined.

In order to avoid the difficulty in exactly determining the temperature of a bar by the mercury thermometer, F. W. Bessel introduced in 1834 near Königsberg a compound bar which constituted a metallic thermometer.[1] A zinc bar is laid on an iron bar two toises long, both bars being perfectly planed and in free contact, the zinc bar being slightly shorter and the two bars rigidly united at one end. As the temperature varies, the difference of the lengths of the bars, as perceived by the other end, also varies, and affords a quantitative correction for temperature variations, which is applied to reduce the length to standard temperature. During the measurement of the base line the bars were not allowed to come into contact, the interval being measured by the insertion of glass wedges. The results of the comparisons of four measuring rods with one another and with the standards were elaborately computed by the method of least-squares. The probable error of the measured length of 2 5 toises (about 6000 ft.) has been estimated as $1/863500$ or $1{\cdot}2\ \mu$ (μ denoting a millionth). With this apparatus fourteen base lines were measured in Prussia and some neighbouring states; in these cases a somewhat higher degree of accuracy was obtained.

The principal triangulation of Great Britain and Ireland has seven base lines: five have been measured by steel chains, and two, more exactly, by the compensation bars of General T. F. Colby, an apparatus introduced in 1827–1828 at Lough Foyle in Ireland. Ten base lines were measured in India in 1831–1869 by the same apparatus. This is a system of six compound-bars self-correcting for temperature. The bars may be thus described: Two bars, one of brass and the other of iron, are laid in parallelism side by side, firmly united at their centres, from which they may freely expand or contract; at the standard temperature they are of the same length. Let AB be one bar, A'B' the other; draw lines through the corresponding extremities AA' (to I') and BB' (to Q), and make A'P = BQ, AA' being equal to BB'. If the ratio A'P/AP equals the ratio of the coefficients of expansion of the bars A'B' and AB, then, obviously, the distance PQ is constant (or nearly so). In the actual instrument P and Q are finely engraved dots to ft. apart. In practice the bars, when aligned, are not in contact, but at an interval of 6 in. being allowed between each bar and its neighbour. This distance is accurately measured by an ingenious micrometrical arrangement constructed on exactly the same principle as the bars themselves.

The last base line measured in India had a length of 8913 ft. In consequence of some suspicion as to the accuracy of the compensation apparatus, the measurement was repeated four times, the operations being conducted so as to determine the actual values of the probable errors of the compensation. The direction of which is at Cape Comorin) is north and south. In two of the measurements the brass component was to the west, in the others to the east; the differences between the individual measurements and the mean of the four were +0·00·017, −0·00·049, −0·00·15, +0·00·04 ft. These differences are very small; an elaborate investigation of all sources of error shows that the probable error of a base line in India is on the average $=2{\cdot}8\ \mu$. These compensation bars were also used by Sir Thomas Maclear in the measurement of the base line in his extension of Lacaille's arc at the Cape. The account of this operation will be found in a volume entitled *Verification and Extension of Lacaille's Arc of Meridian at the Cape of Good Hope*, by Sir Thomas Maclear, published in 1866. A rediscussion has been given by Sir David Gill in his *Report on the Geodetic Survey of South Africa, &c., 1896*.

A very simple base apparatus was employed by W. Struve in his triangulations in Russia from 1817 to 1855. This consisted of four wrought-iron bars, each two toises (rather more than 13 ft.) long; one end of each bar is terminated in a small steel cylinder projecting a slightly convex surface for contact, the other end carries a contact lever rigidly connected with the bar. The shorter arm of the lever terminates below in a polished hemisphere, the upper and longer arm terminates in a vertical divided arc. In measuring, the plane end of one bar is brought into contact with the short arm of the contact lever (pushed forward by a weak spring) of the next bar. Each bar has two thermometers, and a level for determining the inclination of the bar in measuring. The manner of transferring the end of a bar to the ground is simply this: under the end of the bar a stake is driven very firmly into the ground, carrying on its upper surface a disk, capable of movement in the direction of the measured line by rigorous and slow-motion screws. A fine mark on this disk is brought vertically under the end of the bar by means of a theodolite which is planted at a distance of 25 ft. from the stake in a direction perpendicular to the base. Struve investigated for each base the probable error of the measurement arising from each of these causes: Alignment, inclination, comparisons with standards, readings of index, personal errors, uncertainties of temperature, and the probable errors of adopted rates of expansion. He found that $=0{\cdot}8\ \mu$ was the mean of the probable errors of the seven bases measured by him. The Austro-Hungarian apparatus is similar; the distance of the rods is measured by a slider, which rests on one of the ends of each rod. Twenty-two base lines were measured in 1840–1899.

General Carlos Ibañez employed in 1858–1879, for the measurement of nine base lines in Spain, two apparatus similar to the apparatus previously employed by Porro in Italy; one is complicated, the other simplified. The first, an apparatus of the brothers Brunner of Paris, was a thermometric combination of two bars, one of platinum and one of brass, in length 4 metres, furnished with three levels and four thermometers. Suppose A, B, C three micrometer microscopes very firmly supported at intervals of 4 metres with their axes vertical, and aligned in the plane of the base line by means of a fine strained instrument, their micrometer screws being in the line of measurement. The measuring bar is brought under say A and B, and those micrometers read; the bar is then shifted and brought under B and C. By repetition of this process, the reading of a micrometer indicating the end of each position of the bar, the measurement is made.

Quite similar apparatus (among others) has been employed by the French and Germans. Since, however, it only permitted a distance of about 300 m. to be measured daily, Ibañez introduced a simplification; the measuring rod being made simply of steel, and provided with inlaid mercury thermometers. This apparatus was used in Switzerland for the measurement of three base lines. The accuracy is shown by the estimated probable errors: $=0{\cdot}2\ \mu$ to $=0{\cdot}8\ \mu$. The distance measured daily amounts at first to 800 m.

A greater daily distance can be measured with the same accuracy by means of Bessel's apparatus; this permits the ready measurement of 2000 m. daily. For this, however, it is important to notice that a large staff and favourable ground are necessary. An important improvement was introduced by Edward Jäderin of Stockholm, who measures with stretched wires of about 24 metres long; these wires are about 1·65 mm. in diameter, and when in use are stretched by an accurate spring balance with a tension of 10 kg.[2] The nature of the ground has a very trifling effect on this method. The difficulty of temperature determinations is removed by employing wires made of invar, an alloy of steel (64 %) and nickel (36 %) which has practically no linear expansion for small thermal changes

[1] An arrangement acting similarly had been previously introduced by Borda.

[2] *Geodetic Survey of South Africa*, vol. iii. (1905), p. viii; *Les Nouveaux Appareils pour la mesure rapide des bases géod.*, par J. René Benoît et Ch. Éd. Guillaume (1906).

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at ordinary temperatures; this alloy was discovered in 1896 by Benôit and Guillaume of the International Bureau of Weights and Measures at Breteuil. Apparently the future of base-line measurements rests with the invar wires of the Jäderin apparatus; next comes Porro's apparatus with invar bars 4 to 5 metres long.

Results have been obtained in the United States, of great importance in view of their accuracy, rapidity of determination and economy. For the measurement of the arc of meridian in longitude 98° E., in 1900, nine base lines of a total length of 69·2 km. were measured in six months. The total cost of one base was $1231. At the beginning and at the end of the field-season a distance of exactly 100 m. was measured by C. S. Woodward's "5-m. steel bar" (invented in 1891); by means of the remeasurement of this length the standardization of the apparatus was done under the same conditions as existed in the case of the base measurements. For the measurements there were employed two steel tapes of 100 m. long, provided with supports at distances of 25 m., two of 50 m., and the duplex apparatus of Eimbeck, consisting of four 5-m. rods. Each base was divided into sections of about 1000 m.; one of these, the "test kilometre," was measured with all the five apparatus, the others only with two apparatus, mostly tapes. The probable error was about ±0·8 μ, and the day's work a distance of about 2000 m. Each of the four rods of the duplex apparatus consists of two bars of brass and steel. Mercury thermometers are inserted in both bars; these serve for the measurement of the length of the base lines by each of the bars, as they are brought into their consecutive positions, the contact being made by an elastic-sliding contact. The length of the base lines may be calculated for each bar only, and also by the supposition that both bars have the same temperature. The apparatus thus affords three sets of results, which mutually control themselves, and the contact adjustments permit rapid work. The same device has been applied to the older bimetallic-compensating apparatus of Bache-Wurdeman (base-bases, 1847–1857) and of Schott. There was also employed a single rod bimetallic apparatus on F. Porro's principle, constructed by the brothers Repsold for some base lines. Excellent results have been more recently obtained with invar tapes.

The following results show the lengths of the same German base lines as measured by different apparatus:

			metres.
Base at Berlin	1864	Apparatus of Bessel	2336·3920
" "	1880	" Brunner	·3924
Base at Strehlen	1854	" Bessel	2762·5824
" "	1879	" Brunner	·5852
Old base at Bonn	1847	" Bessel	2133·9095
" "	1892	" "	·9097
New base at Bonn	1892	" Bessel	2512·9612
" "	1892	" Brunner	·9696

It is necessary that the altitude above the level of the sea of every part of a base line be ascertained by spirit levelling, in order that the measured length may be reduced to what it would have been had the measurement been made on the surface of the sea, produced in imagination. Thus if l be the length of a measuring bar, h its height at any given position in the measurement, r the radius of the earth, then the length radially projected on to the level of the sea is $l(1-h/r)$. In the Salisbury Plain base line the reduction to the level of the sea is −0·6294 ft.

The total number of base lines measured in Europe up to the present time is about one hundred and ten, nineteen of which do not exceed in length 3500 metres, about 11 miles, and about half

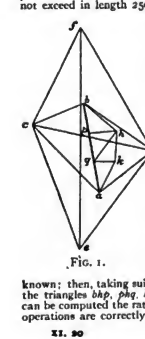

Fig. 1.

one in France, the others in Bavaria—exceed 19,000 metres. The question has been frequently discussed whether or not the advantage of a long base is sufficiently great to warrant the expenditure of time that it requires, or whether as much precision is not obtainable in the end by careful triangulation from a short base. But the answer cannot be given generally; it must depend on the circumstances of each particular case. With Jäderin's apparatus, provided with invar wires, bases of 20 to 30 km. long are obtained without difficulty.

In working away from a base line ab, stations c, d, e, f are carefully selected so as to obtain from well-shaped triangles gradually increasing sides. Before, however, finally leaving the base line, it is usual to verify it by triangulation thus: during the measurement two or more points, as p, q (fig. 1), are marked in the base in positions such that the lengths of the different segments of the line are known; then, taking suitable external stations, as h, k, the angles of the triangles bkp, pkq, hqk, kqa are measured. From these angles can be computed the ratios of the segments, which must agree, if all operations are correctly performed, with the ratios resulting from the measures. Leaving the base line, the sides increase up to 10, 30 or 50 miles occasionally, but seldom reaching 100 miles. The triangulation points may either be natural objects presenting themselves in suitable positions, such as church towers; or they may be objects specially constructed in stone or wood on mountain tops or other prominent ground. In every case it is necessary that the precise centre of the station be marked by some permanent mark. In India no expense is spared in making permanent the principal trigonometrical stations—costly towers in masonry being erected. It is essential that every trigonometrical station shall present a fine object for observation from surrounding stations.

Horizontal Angles.

In placing the theodolite over a station to be observed from, the first point to be attended to is that it shall rest upon a perfectly solid foundation. The method of obtaining this desideratum must depend entirely on the nature of the ground; the instrument must if possible be supported on rock, or if that be impossible a solid foundation must be obtained by digging. When the theodolite is required to be raised above the surface of the ground in order to command particular points, it is necessary to build two scaffolds—the outer one to carry the observatory, the inner one to carry the instrument,—and these two edifices must have no point of contact. Many cases of high scaffolding have occurred on the English Ordnance Survey, as for instance at Thaxted church, where the tower, 80 ft. high, is surmounted by a spire of 90 ft. The scaffold for the observatory was carried from the base to the top of the spire; that for the instrument was raised from a point of the spire 140 ft. above the ground, having its bearing upon timbers passing through the spire at that height. Thus the instrument, at a height of 178 ft. above the ground, was insulated, and not affected by the action of the wind on the observatory.

At every station it is necessary to examine and correct the adjustments of the theodolite, which are these: the line of collimation of the telescope must be perpendicular to its axis of rotation; this axis perpendicular to the vertical axis of the instrument; and the latter perpendicular to the plane of the horizon. The micrometer microscopes must also measure correct quantities on the divided circle or circles. The method of observing is this. Let A, B, C . . . be the stations to be observed taken in order of azimuth; the telescope is first directed to A and the cross-hairs of the telescope made to bisect the object presented by A, then the microscopes or verniers of the horizontal circle (also of the vertical circle if necessary) are read and recorded. The telescope is then turned to B, which is observed in the same manner; then C and the other stations. Coming round by continuous motion to A, it is again observed, and the agreement of this second reading with the first is one test of the stability of the instrument. In taking this round of angles—or "arc," as it is called on the Ordnance Survey—it is desirable that the interval of time between the first and second observations of A should be as small as may be consistent with due care. Before taking the next arc the horizontal circle is moved through 20° or 30°; thus a different set of divisions of the circle is used in each arc, which tends to eliminate the errors of division.

It is very desirable that all arcs of a station should contain one point in common, to which all angular measurements are thus referred,—the observations on each arc commencing and ending with this point, which is on the Ordnance Survey called the "referring object." It is usual for this purpose to select, from among the points which have to be observed, that one which affords the best object for precise observation. For mountain tops a "referring object" is constructed of two rectangular plates of metal in the same vertical plane, their edges parallel and placed at such a distance apart that the light of the sky seen through appears as a vertical line about 10″ in width. The best distance for this object is from 1 to 2 miles.

This method seems at first sight very advantageous; but if, however, it be desired to attain the highest accuracy, it is better, as shown by General Schreiber of Berlin in 1878, to measure only single angles, and as many of these as possible between the directions to be determined. Division-errors are thus more perfectly eliminated, and errors due to the variation in the stability, &c., of the instruments are diminished. This method is rapidly gaining precedence.

The theodolites used in geodesy vary in pattern and in size—the horizontal circles ranging from 10 in. to 36 in. in diameter. In Ramsden's 36-in. theodolite the telescope has a focal length of 36 in. and an aperture of 2·5 in., the ordinarily used magnifying power being 54; this last, however, can of course be changed at the requirements of the observer or of the weather. The probable error of a single observation of a fine object with this theodolite is about ±0·5″. Fig. 2 represents an altazimuth theodolite of an improved pattern used on the Ordnance Survey. The horizontal circle of 14-in. diameter is read by three micrometer microscopes; the vertical circle has a diameter of 12 in., and is read by two microscopes. In the great trigonometrical survey of India the theodolites used in the more important parts of the work have been of 2 and 3 ft. diameter—the circle read by five equidistant microscopes. Every angle is measured twice in each position of the zero of the horizontal circle, of which there are generally ten; the entire

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number of measures of an angle is never less than 20. An examination of 1407 angles showed that the probable error of an observed angle is on the average = 0″·28.

For the observations of very distant stations it is usual to employ a heliotrope (from the Gr. ἥλιος, sun; τρόπος, a turn), invented by Gauss at Göttingen in 1821. In its simplest form this is a plane mirror, 4, 6, or 8 in. in diameter, capable of rotation round a horizontal and a vertical axis. This mirror is placed at the station to be observed, and in fine weather it is kept so directed that the rays of the sun reflected by it strike the distant observing telescope. To the observer the heliotrope presents the appearance of a star of the first or second magnitude, and is generally a pleasant object for observing.

Observations at night, with the aid of light-signals, have been repeatedly made, and with good results, particularly in France by General François Perrier, and more recently in the United States by the Coast and Geodetic Survey; the signal employed being an acetylene bicycle-lamp, with a lens 5 in. in diameter. Particularly noteworthy are the trigonometrical connexions of Spain and Algeria, which were carried out in 1879 by Generals Ibañez and Perrier (over a distance of 270 km.), of Sicily and Malta in 1900, and of the islands of Elba and Sardinia in 1902 by Dr Guarducci (over distances up to 230 km.); in these cases artificial

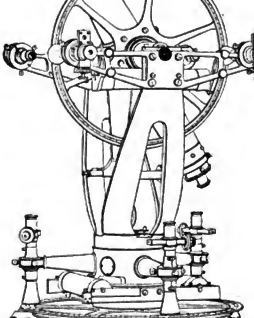

FIG. 2.—Altazimuth Theodolite.

light was employed: in the first case electric light and in the two others acetylene lamps.

Astronomical Observations.

The direction of the meridian is determined either by a theodolite or a portable transit instrument. In the former case the operation consists in observing the angle between a terrestrial object—generally a mark specially erected and capable of illumination at night—and a close circumpolar star at its greatest eastern or western azimuth, or, at any rate, when very near that position. If the observation be made *t* minutes of time before or after the time of greatest azimuth, the azimuth then will differ from its maximum value by $(450'')^2 \sin 1'' \sin 2\delta / \sin z$, in seconds of angle, omitting smaller terms, δ being the star's declination and z its zenith distance. The collimation and level errors are very carefully determined before and after these observations, and it is usual to arrange the observations by the reversal of the telescope so that collimation error shall disappear. If b, c be the level and collimation errors, the correction to the circle reading is $b \cot z \pm c \operatorname{cosec} z$, b being positive when the west end of the axis is high. It is clear that any uncertainty as to the real state of the level will produce a corresponding uncertainty in the resulting value of the azimuth,—an uncertainty which increases with the latitude and is very large in high latitudes. This may be partly remedied by observing in connexion with the star its reflection in mercury. In determining the value of "one division" of a level tube, it is necessary to bear in mind that in some the value varies considerably with the temperature. By experiments on the level of Ramsden's 3-foot theodolite, it was found that though at the ordinary temperature of 66° the value of a division was about one second, yet at 32° it was about five seconds.

In a very excellent portable transit used on the Ordnance Survey, the uprights carrying the telescope are constructed of mahogany, each upright being built of several pieces glued and screwed together; the base, which is a solid and heavy plate of iron, carries a reversing apparatus for lifting the telescope out of its bearings, reversing it and letting it down again. Thus is avoided the change of temperature which the telescope would incur by being lifted by the hands of the observer. Another form of transit is the German diagonal form, in which the rays of light after passing through the object-glass are turned by a total reflection prism through one of the transverse arms of the telescope, at the extremity of which arm is the eye-piece. The unused half of the ordinary telescope being cut away is replaced by a counterpoise. In this instrument there is the advantage that the observer without moving the position of his eye commands the whole meridian, and that the level may remain on the pivots whatever be the elevation of the telescope. But there is the disadvantage that the flexure of the transverse axis causes a variable collimation error depending on the zenith distance of the star to which it is directed; and moreover it has been found that in some cases the personal error of an observer is not the same in the two positions of the telescope.

To determine the direction of the meridian, it is well to erect two marks at nearly equal angular distances on either side of the north meridian line, so that the pole star crosses the vertical of each mark a short time before and after attaining its greatest eastern and western azimuths.

If now the instrument, perfectly levelled, is adjusted to have its centre wire on one of the marks, then when elevated to the star, the star will traverse the wire, and its exact position in the field at any moment can be measured by the micrometer wire. Alternate observations of the star and the terrestrial mark, combined with careful level readings and reversals of the instrument, will enable one, even with only one mark, to determine the direction of the meridian in the course of an hour with a probable error of less than a second. The second mark enables one to complete the station more rapidly and gives a check upon the work. As an instance, at Findlay Seat, in latitude 57° 35′, the resulting azimuths of the two marks were 177° 45′ 37″·29 ± 0″·5 and 182° 17′ 15″·61 ± 0″·13, while the angle between the two marks directly measured by a theodolite was found to be 4° 31′ 37″·43 ± 0″·23.

We now come to the consideration of the determination of time with the transit instrument. Let fig. 3 represent the sphere stereographically projected on the plane of the horizon,—*ns* being the meridian, *we* the prime vertical, Z,P the zenith and the pole. Let *p* be the point in which the production of the axis of the instrument meets the celestial sphere, S the position of a star when observed on a wire whose distance from the collimation centre is *c*. Let *a* be the azimuthal deviation, namely, the angle *wZp*, *b* the level error so that $Zp = 90° - b$. Let also the hour angle corresponding to *p* be $90° - n$, and the declination of the same $= m$, the star's declination being δ, and the latitude ϕ. Then to find the hour angle ZPS = *r* of the star when observed, in the triangles *p*PS, PPZ we have, since $pPS = 90 + r - n$,

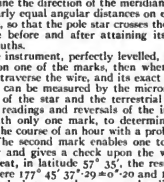

FIG. 3.

$$-\sin c = \sin m \sin \delta + \cos m \cos \delta \sin (n - r),$$
$$\sin m = \sin b \sin \phi - \cos b \cos \phi \sin a,$$
$$\cos m \sin n = \sin b \cos \phi + \cos b \sin \phi \sin a.$$

And these equations solve the problem, however large be the errors of the instrument. Supposing, as usual, a, b, n, π to be small, we have at once $r = \pi + c \sec \delta + m \tan \delta$, which is the correction to the observed time of transit. Or, eliminating m and n by means of the second and third equations, and putting z for the zenith distance of the star, *t* for the observed time of transit, the corrected time is $t + (a \sin z + b \cos z + c) / \cos \delta$. Another very convenient form for stars near the zenith is $r = b \sec \phi + c \sec \delta + m (\tan \delta - \tan \phi)$.

Suppose that in commencing to observe at a station the error of the chronometer is not known; then having secured for the instrument a very solid foundation, removed as far as possible level and collimation errors, and placed it by estimation nearly in the meridian, let two stars differing considerably in declination be observed—the instrument not being reversed between them. From these two stars, neither of which should be a close circumpolar star, a good approximation to the chronometer error can be obtained; thus

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let a_1, a_2 be the apparent clock errors given by these stars if δ_1, δ_2 be their declinations the real error is

$$\epsilon = a_1 + (\epsilon_1 - \epsilon_2)\ (\tan \phi - \tan \delta_1)/(\tan \delta_1 - \tan \delta_2).$$

Of course this is still only approximate, but it will enable the observer (who by the help of a table of natural tangents can compute ϵ in a few minutes) to find the meridian by placing at the proper time, which he now knows approximately, the centre wire of his instrument on the fixed star that passes—not near the zenith.

The transit instrument is always reversed at least once in the course of an evening's observing, the level being frequently read and recorded. It is necessary in most instruments to add a correction for the difference in size of the pivots.

The transit instrument is also used in the prime vertical for the determination of latitudes. In the preceding figure let q be the point in which the northern extremity of the axis of the instrument produced meets the celestial sphere. Let Zq be the azimuthal deviation $= a$, and b being the level error, $Zq = 90° - b$; let also $nPq = \tau$ and $Pq = \psi$. Let S′ be the position of a star when observed on a wire whose distance from the collimation centre is c, positive when to the south, and let h be the observed hour angle of the star, viz. ZPS′. Then the triangles qPS', qPZ give

$$-\sin c = \sin \delta \cos \psi - \cos \delta \sin \psi \cos (h + \tau),$$
$$\cos \psi = \sin b \sin \phi + \cos b \cos \phi \cos a,$$
$$\sin \psi \sin \tau = \cos b \sin a.$$

Now when a and b are very small, we see from the last two equations that $\psi = \phi - b$, $a = \tau \sin \psi$, and if we calculate ϕ' by the formula $\cot \phi' = \cot \delta \cos h$, the first equation leads us to this result—

$$\phi = \phi' + (a \sin z + b \cos z + c)/\cos z,$$

the correction for instrumental error being very similar to that applied to the observed time of transit in the case of meridian observations. When a is not very small and z is small, the formulae required are more complicated.

The method of determining latitude by transits in the prime vertical has the disadvantage of being a somewhat slow process, and of requiring a very precise knowledge of the time, a disadvantage from which the zenith telescope is free. In principle this instrument is based on the proposition that when the meridian zenith distances of two stars at their upper culminations—one being to the north and the other to the south of the zenith—are equal, the latitude is the mean of their declinations; or, if the zenith distance of a star culminating to the south of the zenith be Z, its declination being δ, and that of another culminating to the north with zenith distance Z′ and declination δ', then clearly the latitude is $\frac{1}{2}(\delta + \delta') + \frac{1}{2}(Z - Z')$. Now the zenith telescope does away with the divided circle, and substitutes the measurement micrometrically of the quantity Z′–Z.

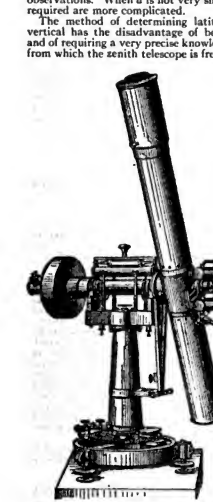

FIG. 4.—Zenith Telescope constructed for the International Stations at Mizusawa, Carloforte, Gaithersburg and Ukiah, by Hermann Wanschaff, Berlin.

In fig. 4 is shown a zenith telescope by H. Wanschaff of Berlin, which is the type used (according to the Central Bureau at Potsdam) since about 1890 for the determination of the variations of latitude due to different, but as yet imperfectly understood, influences. The instrument is supported on a strong tripod, fitted with levelling screws; to this tripod is fixed the azimuth circle and a long vertical steel axis. Fitting on this axis is a hollow axis which carries on its upper end a short transverse horizontal axis with a level. This latter carries the telescope, which, supported at the centre of its length, is free to rotate in a vertical plane. The telescope is thus mounted eccentrically with respect to the vertical axis around which it revolves. Two extremely sensitive levels are attached to the telescope, which latter carries a micrometer in its eye-piece, with a screw of long range for measuring differences of zenith distance. Two levels are employed for controlling and increasing the accuracy. For this instrument stars are selected in pairs, passing north and south of the zenith, culminating within a few minutes of time and within about twenty minutes tangible of zenith distance of each other. When a pair of stars is to be observed, the telescope is set to the mean of the zenith distances and in the plane of the meridian. The first star on passing the central meridional wire is bisected by the micrometer; then the telescope is rotated very carefully through 180° round the vertical axis, and the second star on passing through the field is bisected by the micrometer on the centre wire. The micrometer has thus measured the difference of the zenith distances, and the calculation to get the latitude is most simple. Of course it is necessary to rough-angle the level, and the observations are not necessarily confined to the centre wire. In fact if n, s be the north and south readings of the level for the south star, n', s' the same for the north star, l the value of one division of the level, m the value of one division of the micrometer, r, r' the refraction corrections, μ, μ' the micrometer readings of the south and north star, the micrometer being supposed to read *from* the zenith, then, supposing the observation made on the centre wire,—

$$\text{result} = \tfrac{1}{2}(\delta + \delta') + \tfrac{1}{2}(\mu - \mu')m + \tfrac{1}{2}(n + s' - s - n')l + \tfrac{1}{2}(r - r').$$

It is of course of the highest importance that the value m of the screw be well determined. This is done most effectually by observing the vertical movement of a close circumpolar star when at its greatest azimuth.

In a single night with this instrument a very accurate result, say with a probable error of about 0″·2, could be obtained for latitude from, say, twenty pair of stars; but when the latitude is required to be obtained with the highest possible precision, two nights or more are necessary. The weak point of the zenith telescope lies in the circumstance that its requirements prevent the selection of stars whose positions are well fixed; very frequently it is necessary to have the declinations of the stars selected for this instrument specially observed at fixed observatories. The zenith telescope is made in various sizes from 30 to 54 in. in focal length; a 30-in. telescope is sufficient for the highest purposes and is very portable. The net observation probable-error for one pair of stars is only ±0″·1.

The zenith telescope is a particularly pleasant instrument to work with, and an observer has been known (a sergeant of Royal Engineers, on one occasion) to take every star in his list during eleven hours on a stretch, namely, from 6 o'clock P.M. until 5 A.M., and this on a very cold November night on one of the highest points of the Grampians. Observers accustomed to geodetic operations attain considerable powers of endurance. Shortly after the commencement of the observations on one of the hills in the Isle of Skye a storm carried away the wooden houses of the men and left the observatory roofless. Three observatory roofs were subsequently demolished, and for some time the observatory was used without a roof, being filled with snow every night and emptied every morning. Quite different, however, was the experience at the same party when on the top of Ben Nevis, 4406 ft. high. For about a fortnight the state of the atmosphere was unusually calm, so much so, that a lighted candle could often be carried between the tents of the men and the observatory, whilst at the foot of the hill the weather was wild and stormy.

The determination of the difference of longitude between two stations A and B resolves itself into the determination of the local time at each of the stations, and the comparison by signals of the clocks at A and B. Whenever telegraphic lines are available these comparisons are made by telegraphy. A small and delicately-made apparatus introduced into the mechanism of an astronomical clock or chronometer breaks or closes by the action of the clock an electric circuit every second. In order to record the minutes as well as seconds, one second in each minute, namely that numbered 0 or 60, is omitted. The seconds are recorded on a chronograph, which consists of a cylinder revolving uniformly at the rate of one revolution per minute covered with white paper, on which a pen having a slow movement in the direction of the axis of the cylinder describes a continuous spiral. This pen is deflected through the agency of an electromagnet every second, and thus the seconds of the clock are recorded on the chronograph by offsets from the spiral curve. An observer having his hand on a contact key in the same circuit can record in the same manner his observed times of transits of stars. The method of determination of difference of longitude is, therefore, virtually as follows. After the necessary observations for instrumental corrections, which are recorded only at the station of observation, the clock at A is put in connexion with the circuit so as to write on both chronographs, namely, that at A and that at B. Then the clock at B is made to write on both chronographs. It is clear that by this double operation one can eliminate the effect of the small interval of time consumed in the transmission of signals, for the difference of longitude obtained from the one chronograph will be in excess by as much as that obtained from the other will be in defect. The determination of the personal errors of the observers in this delicate operation is a matter of the greatest importance as therein lies probably the chief source of residual error.

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These errors can nevertheless be almost entirely avoided by using the impersonal micrometer of Dr Repsold (Hamburg, 1889). In this device there is a movable micrometer wire which is brought by hand into coincidence with the star and moved along with it; at fixed points there are electrical contacts, which replace the fixed wires. Experiments at the Geodetic Institute and Central Bureau at Potsdam in 1891 gave the following personal equations in the case of four observers:—

	Older Procedure.	New Procedure.
A−B . . .	−0″·108	−0″·004
A−G . . .	−0″·314	−0″·035
A−S . . .	−0″·184	−0″·027
B−G . . .	+0″·225	+0″·013
B−S . . .	−0″·086	−0″·023
G−S . . .	+0″·109	−0″·006

These results show that in the later method the personal equation is small and not so variable; and consequently the repetition of longitude determinations with exchanged observers and apparatus entirely eliminates the constant errors, the probable error of such determinations on ten nights being scarcely ±0″·01.

Calculation of Triangulation.

The surface of Great Britain and Ireland is uniformly covered by triangulation, of which the sides are of various lengths from 10 to 111 miles. The largest triangle has one angle at Snowdon in Wales, another on Slieve Donard in Ireland, and a third at Scaw Fell in Cumberland; each side is over a hundred miles and the spherical excess is 64″. The more ordinary method of triangulation is, however, that of chains of triangles, in the direction of the meridian and perpendicular thereto. The principal triangulations of France, Spain, Austria and India are so arranged. Oblique chains of triangles are formed in Italy, Sweden and Norway, also in Germany and Russia, and in the United States. Chains are composed sometimes merely of consecutive plain triangles; sometimes, and more frequently in India, of combinations of triangles forming consecutive polygonal figures. In this method of triangulating, the sides of the triangles are generally from 20 to 30 miles in length—seldom exceeding 40.

The inevitable errors of observation, which are inseparable from all angular as well as other measurements, introduce a great difficulty into the calculation of the sides of a triangulation. Starting from a given base in order to get a required distance, it may generally be obtained in several different ways—that is, by using different sets of triangles. The results will certainly differ one from another, and probably no two will agree. The experience of the computer will then come to his aid, and enable him to say which is the most trustworthy result; but no experience or ability will carry him through a large network of triangles with anything like assurance. The only way to obtain trustworthy results is to employ the method of least squares. We cannot here give any illustration of this method as applied to general triangulation, for it is most laborious, even for the simplest cases.

Three stations, projected on the surface of the sea, give a spherical or spheroidal triangle according to the adoption of the sphere or the ellipsoid as the form of the surface. A spheroidal triangle differs from a spherical triangle, not only in that the curvatures of the sides are different one from another, and more especially in the fact that, while in the spherical triangle the normals to the surface at the angular points meet at the centre of the sphere, in the spheroidal triangle the normals at the angles A, B, C meet the axis of revolution of the spheroid in three different points, which we may designate α, β, γ respectively. Now the angle A of the triangle as measured by a theodolite is the inclination of the planes BAα and CAα, and the angle at B is that contained by the planes ABβ and CBβ. But the planes AAα and ABβ containing the line AB in common cut the surface in two distinct plane curves. In order, therefore, that a spheroidal triangle may be exactly defined, it is necessary that the nature of the lines joining the three vertices be stated. In a mathematical point of view the most natural definition is that the sides be geodetic or shortest lines. C. C. G. Andrae, of Copenhagen, has also shown that other lines give a less convenient computation.

K. F. Gauss, in his treatise, *Disquisitiones generales circa superficies curvas*, entered fully into the subject of geodetic (or geodesic) triangles, and investigated expressions for the angles of a geodetic triangle whose sides are given, not certainly finite expressions, but approximations inclusive of small quantities of the fourth order, the side of the triangle or its ratio to the radius of the nearly spherical surface being a small quantity of the first order. The terms of the fourth order, as given by Gauss for any surface in general, are very complicated even when the surface is a spheroid. If we retain small quantities of the second order only, and put $\mathfrak{A}$, $\mathfrak{B}$, $\mathfrak{C}$ for the angles of the geodetic triangle, while A, B, C are those of a plane triangle having sides equal respectively to those of the geodetic triangle, then, σ being the area of the plane triangle and a, b, t the measures of curvature at the angular points,

$$\mathfrak{A} = A + \sigma(2a+b+t)/12,$$
$$\mathfrak{B} = B + \sigma(a+2b+t)/12,$$
$$\mathfrak{C} = C + \sigma(a+b+2t)/12.$$

For the sphere $a = b = t$, and making this simplification, we obtain the theorem previously given by A. M. Legendre. With the terms of the fourth order, we have (after Andrae):

$$\mathfrak{A} - A = \frac{\epsilon}{3} + \frac{\sigma}{\rho^2}\left(\frac{m^2-a^2}{20}k + \frac{n-k}{4k}\right),$$
$$\mathfrak{B} - B = \frac{\epsilon}{3} + \frac{\sigma}{\rho^2}\left(\frac{m^2-b^2}{20}k + \frac{n-k}{4k}\right),$$
$$\mathfrak{C} - C = \frac{\epsilon}{3} + \frac{\sigma}{\rho^2}\left(\frac{m^2-c^2}{20}k + \frac{t-k}{4k}\right),$$

in which $\epsilon = \sigma k[1 + (m^2k/8)]$, $3m^2 = a^2+b^2+c^2$, $3k = a+b+t$. For the ellipsoid of rotation the measure of curvature is equal to $1/\rho m$, ρ and n being the radii of curvature of the meridian and perpendicular.

It is rarely that the terms of the fourth order are required. As a rule spheroidal triangles are calculated as spherical (after Legendre), *i.e.* like plane triangles with a decrease of each angle of about $\epsilon/3$; ϵ must, however, be calculated for each triangle separately with its mean measure of curvature k.

The geodetic line being the shortest that can be drawn on any surface between two given points, we may be conducted to its most important characteristics by the following considerations: let p, q be adjacent points on a curved surface; through q the middle point of the chord pq imagine a plane drawn perpendicular to pq, and let S be any point in the intersection of this plane with the surface; then $pS + Sq$ is evidently least when pS is a minimum, which is when pS is a normal to the surface; hence it follows that of all plane curves on the surface joining p, q, when those points are indefinitely near to one another, that is the shortest which is made by the normal plane. That is to say, the osculating plane at any point of a geodetic line contains the normal to the surface at that point. Imagine now three points in space, A, B, C, such that AB = BC = c; let the direction cosines of AB be l, m, n, those of BC l', m', n', then x, y, z being the co-ordinates of B, those of A and C will be respectively—

$$x - cl \;;\; y - cm \;;\; z - cn$$
$$x + cl' \;;\; y + cm' \;;\; z + cn'.$$

Hence the co-ordinates of the middle point M of AC are $x + \frac{1}{2}c(l'-l)$, $y + \frac{1}{2}c(m'-m)$, $z + \frac{1}{2}c(n'-n)$, and the direction cosines of BM are therefore proportional to $l'-l$: $m'-m$: $n'-n$. If the angle made by BC with AB be indefinitely small, the direction cosines of BM are as $\delta l : \delta m : \delta n$. Now if AB, BC be two contiguous elements of a geodetic, then BM must be a normal to the surface, and since δl, δm, δn are in this case represented by $\delta(dx/ds)$, $\delta(dy/ds)$, $\delta(dz/ds)$, and if the equation of the surface be $u = 0$, we have

$$\frac{d^2x}{ds^2}\Big/\frac{du}{dx} = \frac{d^2y}{ds^2}\Big/\frac{du}{dy} = \frac{d^2z}{ds^2}\Big/\frac{du}{dz},$$

which, however, are equivalent to only one equation. In the case of the spheroid this equation becomes

$$\frac{d^2x}{dz^2}dz - \frac{d^2y}{dz^2}dz = 0,$$

which integrated gives $ydx - xdy = Cdz$. This again may be put in the form $r\sin\alpha = C$, where α is the azimuth of the geodetic at any point—the angle between its direction and that of the meridian—and r the distance of the point from the axis of revolution.

From this it may be shown that the azimuth at A of the geodetic joining AB is not the same as the astronomical azimuth at A of B or that determined by the vertical plane AαB. Generally speaking, the geodetic lies between the two plane section curves joining A and B which are formed by the two vertical planes, supposing these points not to be apsaxi. If, however, A and B are nearly in the same latitude, the geodetic may cross (between A and B) that plane curve which lies nearest the adjacent pole of the spheroid. The condition of crossing is this. Suppose that for a moment we drop the consideration of the earth's non-sphericity, and draw a perpendicular from the pole C on AB, meeting it in S between A and B. Then A being that point which is nearest the pole, the geodetic will cross the plane curve if AS be between ½AB and ¾AB. If AS lie between this last value and ¾AB, the geodetic will lie wholly to the north of both plane curves, that is, supposing both points to be in the northern hemisphere.

The difference of the azimuths of the vertical section AB and of the geodetic AB, *i.e.* the astronomical and geodetic azimuths, is very small for all observable distances, being approximately:—

'Geod. azimuth − Astr. azimuth $= -\frac{1}{12}\frac{e^2}{1-e^2}\frac{s^2}{\rho n}\left(\cos^2\phi \sin 2\alpha + \frac{s}{4\rho}\sin 2\phi \sin\alpha\right)$, in which: e and a are the numerical eccentricity and semi-major axis respectively of the meridian ellipse, ϕ and α are the latitude and azimuth at A, s = AB, and ρ and n are the radii of curvature of the meridian and perpendicular at A. For s = 100 kilometres, only the first term is of moment; its value is $0''{\cdot}028\cos^2\phi \sin 2\alpha$, and it lies well within the errors of observation. If we imagine the geodetic AB, it will generally trisect the angles between the vertical sections at A and B, so that the geodetic at A is near

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the vertical section AB, and at B near the section BA.[1] The greatest distance of the vertical sections one from another is $e^2 s^2 \cos^2\phi_0 \sin 2\alpha_0 / 16 s^2$, in which ϕ_0 and α_0 are the mean latitude and azimuth respectively of the middle point of AB. For the value $s = 64$ kilometres, the maximum distance is 3 mm.

An idea of the course of a longer geodetic line may be gathered from the following example. Let the line be that joining Cadiz and St Petersburg, whose approximate positions are—

	Cadiz.	St Petersburg.
Lat.	36° 22′ N.	59° 56′ N.
Long.	6° 18′ W.	30° 17′ E.

If G be the point on the geodetic corresponding to F on that one of the plane curves which contains the normal at Cadiz (by "corresponding" we mean that F and G are on a meridian) then G is to the north of F; at a quarter of the whole distance from Cadiz GF is 458 ft., at half the distance it is 637 ft., and at three-quarters it is 473 ft. The azimuth of the geodetic at Cadiz differs 20″ from that of the vertical plane, which is the astronomical azimuth.

The azimuth of a geodetic line cannot be observed, so that the line does not enter of necessity into practical geodesy, although many formulæ connected with its use are of great simplicity and elegance. The geodetic line has always held a more important place in the science of geodesy among the mathematicians of France, Germany and Russia than has been assigned to it in the operations of the English and Indian triangulations. Although the observed angles of a triangulation are not geodetic angles, yet in the calculation of the distance and reciprocal bearings of two points which are far apart, and are connected by a long chain of triangles, we may fall upon the geodetic line in this manner:—

If A, Z be the points, then to start the calculation from A, we obtain by some preliminary calculation the approximate azimuth of Z, or the angle made by the direction of Z with the side AB or AC of the first triangle. Let P_1 be the point where this line intersects BC; then, to find P_1, where the line cuts the next triangle side CD, we make the angle BP_1P_2 such that $BP_1P_2 + BP_1A = 360°$. This fixes P_2, and P_2 is fixed by a repetition of the same process; so for P_4, P_5.... Now it is clear that the points P_1, P_2, P_3 so computed are those which would be actually fixed by an observer with a theodolite, proceeding in the following manner. Having set the instrument up at A, and turned the telescope in the direction of the computed bearing, an assistant places a mark P_1 on the line BC, adjusting it till bisected by the cross-hairs of the telescope at A. The theodolite is then placed over P_1, and the telescope turned to A; the horizontal circle is then moved through 180°. The assistant then places a mark P_2 on the line CD, so as to be bisected by the telescope, which is then moved to P_2, and in the same manner P_3 is fixed. Now it is clear that the series of points P_1, P_2, P_3 approaches to the geodetic line, for in the case of any two consecutive elements P_{n-1} P_n, P_n P_{n+1} contains the normal at P_n.

If the objection be raised that not the geodetic azimuths but the astronomical azimuths are observed, it is necessary to consider that the observed vertical sections do not correspond to points on the sea-level but to elevated points. Since the normals of the ellipsoid of rotation do not in general intersect, there consequently arises an influence of the height on the azimuth. In the case of the measurement of the azimuth from A to B, the instrument is set to a point A′ over the surface of the ellipsoid (the sea-level), and it is then adjusted to a point B′, also over the surface, say at a height h'. The vertical plane containing A′ and B′ also contains A but not B: it must therefore be rotated through a small azimuth in order to contain B. The correction amounts approximately to $-eh' \cos^2\phi \sin 2\alpha / 2s$; in the case of $h' = 1000$ m., its value is $0''{\cdot}108 \cos^2\phi \sin 2\alpha$.

This correction is therefore of greater importance in the case of observed azimuths and horizontal angles than in the previously considered case of the astronomical and the geodetic azimuth. The observed azimuths and horizontal angles must therefore also be corrected in the case, where it is required to dispense with geodetic lines.

When the angles of a triangulation have been adjusted by the method of least squares, and the sides are calculated, the next process is to calculate the latitudes and longitudes of all the stations starting from one given point. The calculated latitudes, longitudes and azimuths, which are designated geodetic latitudes, longitudes and azimuths, are not to be confounded with the observed latitudes, longitudes and azimuths, for these last are subject to somewhat large errors. Supposing the latitudes of a number of stations in the triangulation to be observed, practically the mean of these determines the position in latitude of the network, taken as a whole. So the orientation or general azimuth of the whole is inferred from all the azimuth observations. The triangulation is then supposed to be projected on a spheroid of given elements, representing as nearly as one knows the real figure of the earth. Then, taking the latitude of one point and the direction of the meridian there as given—obtained, namely, from the astronomical observations there—one can compute the latitudes of all the other points with any degree of precision that may be considered desirable. It is necessary to employ for this purpose formulæ which will give results true even for the longest distances to the second place of decimals of seconds, otherwise there will arise an accumulation of errors from imperfect calculation which should always be avoided. For very long distances, eight places of decimals should be employed in logarithmic calculations; if seven places only are available very great care will be required to keep the last place true. Now let ϕ, ϕ' be the latitudes of two stations A and B; α, α' their mutual azimuths counted from north by east continuously from 0° to 360°; ω their difference of longitude measured from west to east; and s the distance AB.

First compute a latitude ϕ_1 by means of the formula $\phi_1 = \phi + (s \cos\alpha)/\rho$, where ρ is the radius of curvature of the meridian at the latitude ϕ; this will require but four places of logarithms. Then, in the first two of the following, five places are sufficient—

$$\epsilon = \frac{s^2}{2\rho n} \sin\alpha \cos\alpha, \quad \eta = \frac{s^2}{2\rho n} \sin^2\alpha \tan\phi_1,$$

$$\phi' - \phi = \frac{s}{\rho_0} \cos\left(\alpha - \tfrac{1}{2}\epsilon\right) - \eta,$$

$$\omega = \frac{s \sin\left(\alpha - \frac{1}{2}\epsilon\right)}{n \cos\left(\phi' + \frac{1}{2}\eta\right)},$$

$$\alpha'' - \alpha = \omega \sin\left(\phi' + \tfrac{1}{2}\eta\right) - \epsilon + 180°.$$

Here n is the normal or radius of curvature perpendicular to the meridian; both n and ρ correspond to latitude ϕ_1, and ρ_0 to latitude $\frac{1}{2}(\phi + \phi')$. For calculations of latitude and longitude, tables of the logarithmic values of ρ sin 1″, n sin 1″, and $2n\rho$ sin 1″ are necessary. The following table contains these logarithms for every ten minutes of latitude from 52° to 53° computed with the elements $a = 20926606$ and $a : b = 295 : 294$:—

Lat.	Log. $\frac{1}{\rho \sin 1''}$.	Log. $\frac{1}{n \sin 1''}$.	Log. $\frac{1}{2\rho n \sin 1''}$.	
° ′				
52 0	7·9939434	7·9928231	0·37131	
10	9309	8190	29	
20	9185	8148	28	
30	9060	8107	26	
40	8936	8065	24	
50	8812	8024	23	
53 0	8688	7982	22	

The logarithm in the last column is that required also for the calculation of spherical excesses, the spherical excess of a triangle being expressed by $ab \sin C / 2\rho n \sin 1''$.

It is frequently necessary to obtain the co-ordinates of one point with reference to another point; that is, let a perpendicular arc be drawn from B to the meridian of A meeting it in P, then, α being the azimuth of B at A, the co-ordinates of B with reference to A are

$$AP = s \cos\left(\alpha - \tfrac{1}{2}\epsilon\right), \quad BP = s \sin\left(\alpha - \tfrac{1}{2}\epsilon\right),$$

where ϵ is the spherical excess of APB, viz. $s^2 \sin\alpha \cos\alpha$ multiplied by the quantity whose logarithm is in the fourth column of the above table.

If it be necessary to determine the geographical latitude and longitude as well as the azimuths to a greater degree of accuracy than is given by the above formulæ, we make use of the following formula: given the latitude ϕ of A, and the azimuth α and the distance s of B, to determine the latitude ϕ' and longitude ω of B, and the back azimuth α'. Here it is understood that α' is symmetrical to α, so that $\alpha'' + \alpha' = 360°$.

Let

$$\theta = s\Delta/a, \text{ where } \Delta = (1 - e^2 \sin^2\phi)^{\frac{1}{2}}$$

and

$$f = \frac{e^2\theta^2}{4(1-e^2)} \cos^2\phi \sin 2\alpha, \quad f' = \frac{e^2\theta^2}{6(1-e^2)} \cos^2\phi \cos^2\alpha;$$

f, f' are always very minute quantities even for the longest distances; then, putting $\epsilon = 90° - \phi$,

$$\tan\frac{\alpha' + f' - \omega}{2} = \frac{\sin\frac{1}{2}(\epsilon - \theta - f')}{\sin\frac{1}{2}(\epsilon + \theta + f')} \cot\frac{\alpha}{2},$$

$$\tan\frac{\alpha' + f' + \omega}{2} = \frac{\cos\frac{1}{2}(\epsilon - \theta - f')}{\cos\frac{1}{2}(\epsilon + \theta + f')} \cot\frac{\alpha}{2}$$

$$\phi' - \phi = \frac{s \sin\frac{1}{2}(\alpha' + f' - \alpha)}{\rho_0 \sin\frac{1}{2}(\epsilon + f' + \alpha)} \left(1 + \frac{\theta^2}{12} \cos^2\frac{\alpha'' - \epsilon}{2}\right);$$

here ρ_0 is the radius of curvature of the meridian for the mean latitude $\frac{1}{2}(\phi + \phi')$. These formulæ are approximate only, but they are sufficiently precise even for very long distances.

For lines of any length the formulæ of F. W. Bessel (*Astr. Nach.*, 1823, iv. 241) are suitable.

If the two points A and B be defined by their geographical

[1] See a paper "On the Course of Geodetic Lines on the Earth's Surface" in the *Phil. Mag.* 1870; Helmert, *Theorien der höheren Geodäsie*, 1. 321.

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co-ordinates, we can accurately calculate the corresponding astronomical azimuths, *i.e.* those of the vertical section, and then proceed, in the case of not too great distances, to determine the length and the azimuth of the shortest lines. For *any* distances recourse must again be made to Bessel's formula.[1]

Let a, a' be the mutual azimuths of two points A, B on a spheroid, k the chord line joining them, μ, μ' the angles made by the chord with the normals at A and B, ϕ, ϕ', ω their latitudes and difference of longitude, and $(x^2+y^2)/a^2+z^2/b^2=1$ the equation of the surface; then if the plane xz passes through A the co-ordinates of A and B will be

$$x=(a/\Delta)\cos\phi, \qquad x'=(a/\Delta')\cos\phi'\cos\omega,$$
$$y=0 \qquad\qquad y'=(a/\Delta')\cos\phi'\sin\omega,$$
$$z=(a/\Delta)\,(1-e^2)\sin\phi, \quad z'=(a/\Delta')\,(1-e^2)\sin\phi',$$

where $\Delta=(1-e^2\sin^2\phi)^{\frac{1}{2}}$, $\Delta'=(1-e^2\sin^2\phi')^{\frac{1}{2}}$, and e is the eccentricity. Let f, g, h be the direction cosines of the normal to that plane which contains the normal at A and the point B, and whose inclinations to the meridian plane of A is $=\epsilon$; let also l, m, n and l', m', n' be the direction cosines of the normal at A, and of the tangent to the surface at A which lies in the plane passing through B, then since the first line is perpendicular to each of the other two and to the chord k whose direction cosines are proportional to $x'-x$, $y'-y$, $z'-z$, we have these three equations

$$f(x'-x)+gy'+h(z'-z)=0$$
$$fl+gm+hn=0$$
$$fl'+gm'+hn'=0.$$

Eliminate f, g, h from these equations, and substitute

$$l=\cos\phi \qquad l'=-\sin\phi\cos\alpha$$
$$m=0 \qquad\qquad m'=\sin\alpha$$
$$n=\sin\phi \qquad\qquad n'=\cos\phi\cos\alpha,$$

and we get

$$(x'-x)\sin\phi+y'\cot\alpha-(z'-z)\cos\phi=0.$$

The substitution of the values of x, z, x', y', z' in this equation will give immediately the value of cot α; and if we put ζ, ζ' for the corresponding azimuths on a sphere, or on the supposition $\epsilon=0$, the following relations exist

$$\cot\alpha-\cot\zeta=\quad e^2\frac{\cos\phi\,Q}{\cos\phi'\Delta},$$
$$\cot\alpha'-\cot\zeta'=-e^2\frac{\cos\phi'Q}{\cos\phi\,\Delta'},$$
$$\Delta'\sin\phi-\Delta\sin\phi'=Q\sin\omega.$$

If from B we let fall a perpendicular on the meridian plane of A, and from A let fall a perpendicular on the meridian plane of B, then the following equations become geometrically evident:

$$k\sin\mu\sin a=(a/\Delta')\cos\phi'\sin\omega$$
$$k\sin\mu'\sin a'=(a/\Delta)\cos\phi\sin\omega.$$

Now in any surface $u=0$ we have

$$k^2=(x'-x)^2+(y'-y)^2+(z'-z)^2$$

$$-\cos\mu=\left[(x'-x)\frac{du}{dx}+(y'-y)\frac{du}{dy}+(z'-z)\frac{du}{dz}\right]\Big/\,k\left(\frac{du^2}{dx^2}+\frac{du^2}{dy^2}+\frac{du^2}{dz^2}\right)^{\frac{1}{2}}$$

$$\cos\mu'=\left[(x'-x)\frac{du}{dx}+(y'-y)\frac{du}{dy}+(z'-z)\frac{du}{dz}\right]\Big/\,k\left(\frac{du^2}{dx^2}+\frac{du^2}{dy^2}+\frac{du^2}{dz^2}\right)^{\frac{1}{2}}.$$

In the present case, if we put

$$1-\frac{xx'}{a^2}-\frac{zz'}{b^2}=\mathrm{U},$$

then

$$\frac{k^2}{a^2}=2\mathrm{U}-e^2\left(\frac{z'-z}{b}\right)^2$$

$$\cos\mu=(a/k)\Delta\mathrm{U};\ \cos\mu'=(a/k)\,\Delta'\mathrm{U}.$$

Let u be such an angle that

$$(1-e^2)^{\frac{1}{2}}\sin\phi=\Delta\sin u$$
$$\cos\phi=\Delta\cos u,$$

then on expressing x, x', z, z' in terms of u and u',

$$\mathrm{U}=1-\cos u\cos u'\cos\omega-\sin u\sin u';$$

also, if v be the third side of a spherical triangle, of which two sides are $\frac{1}{2}\pi-u$ and $\frac{1}{2}\pi-u'$ and the included angle ω, using a subsidiary angle ψ such that

$$\sin\psi\sin\tfrac{1}{2}v=e\sin\tfrac{1}{2}(u'-u)\cos\tfrac{1}{2}(u'+u),$$

we obtain finally the following equations:—

$$k=2a\cos\psi\sin\tfrac{1}{2}v$$
$$\cos\mu=\Delta\sec\psi\sin\tfrac{1}{2}v$$
$$\cos\mu'=\Delta'\sec\psi\sin\tfrac{1}{2}v$$
$$\sin a\sin\omega=(a/k)\cos u'\sin\omega$$
$$\sin a'\sin\omega=(a/k)\cos u\sin\omega.$$

These determine rigorously the distance, and the mutual zenith distances and azimuths, of any two points on a spheroid whose latitudes and difference of longitude are given.

By a series of reductions from the equations containing ζ, ζ' it may be shown that

$$a+a'=\xi+\xi'+\tfrac{1}{2}e^4\omega(\phi'-\phi)^3\cos^4\phi_0\sin\phi_0+\dots,$$

where ϕ_0 is the mean of ϕ and ϕ', and the higher powers of e are neglected. A short computation will show that the small quantity on the right-hand side of this equation cannot amount even to the thousandth part of a second for $k<0{\cdot}1a$, which is, practically speaking, zero; consequently the sum of the azimuths $a+a'$ on the spheroid is equal to the sum of the spherical azimuths, whence follows this very important theorem (known as Dalby's theorem). If ϕ, ϕ' be the latitudes of two points on the surface of a spheroid, ω their difference of longitude, a, a' their reciprocal azimuths,

$$\tan\tfrac{1}{2}\omega=\cot\tfrac{1}{2}(a+a')\,[\cos\tfrac{1}{2}(\phi'-\phi)/\sin\tfrac{1}{2}(\phi'+\phi)].$$

The computation of the geodetic from the astronomical azimuths has been given above From k we can now compute the length s of the vertical section, and from this the ellipsoidal chord. The difference of length of the geodetic line and either of the plane curves is

$$e^4s^4\cos^4\phi_0\sin^2 2a_0/360\,a^4.$$

At least this is an approximate expression. Supposing $s=0{\cdot}1a$, this quantity would be less than one-hundredth of a millimetre. The line is now to be calculated as a circular arc of mean radius r along AB. If $\phi_0=\frac{1}{2}(\phi+\phi')$, $a_0=\frac{1}{2}(180^\circ+a-a')$, $\Delta_0=(1-e^2\sin^2\phi_0)^{\frac{1}{2}}$, then $\frac{1}{r}=\frac{\Delta_0}{a}\left(1+\frac{e^2}{1-e^2}\cos^2\phi_0\cos^2 a_0\right)$, and approximately $\sin(s/2r)=k/2r$. These formulae give, in the case of $k=0{\cdot}1a$, values certain to eight logarithmic decimal places. An excellent series of formulae for the solution of the problem, to determine the azimuths, chord and distance along the surface from the geographical co-ordinates, was given in 1882 by Ch. M. Schols (*Archives Néerlandasses*, vol. xvii.).

Irregularities of the Earth's Surface.

In considering the effect of unequal distribution of matter in the earth's crust on the form of the surface, we may simplify the matter by disregarding the considerations of rotation and eccentricity. In the first place, supposing the earth a spheroid covered with a film of water, let the density ρ be a function of the distance from the centre so that surfaces of equal density are concentric spheres. Let now a disturbance of the arrangement of matter take place, so that the density is no longer to be expressed by ρ, a function of r only, but is expressed by $\rho+\rho'$, where ρ' is a function of three co-ordinates θ, ϕ, r. Then ρ' is the density of what may be designated disturbing matter; it is positive in some places and negative in others, and the whole quantity of matter whose density is ρ' is zero. The previously spherical surface of the sea of radius a now takes a new form. Let P be a point on the disturbed surface, P′ the corresponding point vertically below it on the undisturbed surface, PP′=N. The knowledge of N over the whole surface gives us the form of the disturbed or actual surface of the sea; it is an equipotential surface, and if V be the potential at P of the disturbing matter ρ', M the mass of the earth (the attraction-constant is assumed equal to unity)

$$\frac{\mathrm{M}}{a+\mathrm{N}}+\mathrm{V}=\mathrm{C}=\frac{\mathrm{M}}{a}-\frac{\mathrm{M}}{a^2}\mathrm{N}+\mathrm{V}.$$

As far as we know, N is always a very small quantity, and we have with sufficient approximation $\mathrm{N}=3\mathrm{V}/4\pi\delta a$, where δ is the mean density of the earth. Thus we have the disturbance in elevation of the sea-level expressed in terms of the potential of the disturbing matter. If at any point P the value of N remain constant when we pass to any adjacent point, then the actual surface is there parallel to the ideal spherical surface; as a rule, however, the normal at P is inclined to that at P′, and astronomical observations have shown that this inclination, the deflection or deviation, amounting ordinarily to one or two seconds, may in some cases exceed 10″, or, as at the foot of the Himalayas, even 60″. By the expression "mathematical figure of the earth" we mean the surface of the sea produced in imagination so as to percolate the continents. We see then that the effect of the uneven distribution of matter in the crust of the earth is to produce small elevations and depressions on the mathematical surface which would be otherwise spheroidal. No geodesist can proceed far in his work without encountering the irregularities of the mathematical surface, and it is necessary that he should know how they affect his astronomical observations. The whole of this subject is dealt with in his usual elegant manner by Bessel in the *Astronomische Nachrichten*, Nos. 329, 330, 331, in a paper entitled "Ueber den Einfluss der Unregelmässigkeiten der Figur der Erde auf geodätische Arbeiten, &c." But without entering into further details it is not difficult to see how local attraction at any station affects the determinations of latitude, longitude and azimuth there.

Let there be at the station an attraction to the north-east throwing the zenith to the south-west, so that it takes in the celestial sphere a position Z′, its undisturbed position being Z. Let the rectangular components of the displacement ZZ′ be ξ measured southwards

[1] Helmert, *Theorien der höheren Geodäsie*, 1. 232, 247.

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and η measured westwards. Now the great circle joining Z′ with the pole of the heavens P makes there an angle with the meridian $PZ = \eta \operatorname{cosec} PZ' = \eta \sec \phi$, where ϕ is the latitude of the station. Also this great circle meets the horizon in a point whose distance from the great circle PZ is $\eta \sec \phi \sin \phi = \eta \tan \phi$. That is, a meridian mark, fixed by observations of the pole star, will be placed that amount to the east of north. Hence the observed latitude requires the correction ξ; the observed longitude a correction $\eta \sec \phi$; and any observed azimuth a correction $\eta \tan \phi$. Here it is supposed that azimuths are measured from north by east, and longitudes eastwards. The horizontal attraction also influenced by the deflections of the plumb-line, in fact, just as if the direction of the vertical axis of the theodolite varied by the same amount. This influence, however, is slight, so long as the sights point almost horizontally at the objects, which is always the case in the observation of distant points.

The expression given for N enables one to form an approximate estimate of the effect of a compact mountain in raising the sea-level. Take, for instance, Ben Nevis, which contains about a couple of cubic miles; a simple calculation shows that the elevation produced would only amount to about 3 in. In the case of a mountain mass like the Himalayas, stretching over some 1500 miles of country with a breadth of 300 and an average height of 3 miles, although it is difficult or impossible to find an appropriate V, yet we may ascertain that an elevation amounting to several hundred feet may exist near their base. The geodetical operations, however, rather negative this idea, for it was shown by Colonel Clarke (*Phil. Mag.*, 1878) that the form of the sea-level along the Indian arc departs but slightly from that of the mean figure of the earth. If this be so, the action of the Himalayas must be counteracted by subterranean tenuity.

Suppose now that A, B, C, . . . are the stations of a network of triangulation projected on or lying on a spheroid of semiaxis major and eccentricity a, e, this spheroid having its axis parallel to the axis of rotation of the earth, and its surface coinciding with the mathematical surface of the earth at A. Then basing the calculations on the observed elements at A, the calculated latitudes, longitudes and directions of the meridian at the other points will be the true latitudes, &c., of the points as projected on the spheroid. On comparing these geodetic elements with the corresponding astronomical determinations, there will appear a system of differences which represent the inclinations, at various points, of the actual irregular surface to the surface of the spheroid of reference. These differences will suggest two things,—first, that we may improve the agreement of the two surfaces, by not restricting the spheroid of reference by the condition that at the other points will be the true mathematical surface of the earth at A; and secondly, by altering the form and dimensions of the spheroid. With respect to the first circumstance, we may allow the spheroid two degrees of freedom, that is, the normals of the surface at A may be allowed to separate a small quantity, compounded of a meridional difference and a difference perpendicular to the same. Let the spheroid be so placed that its normal at A lies to the north of the normal to the earth's surface by the small quantity ξ and to the east by the quantity η. Then in starting the calculation of geodetic latitudes, longitudes and azimuths from A, we must take, not the observed elements ϕ, a, but for ϕ, $\phi + \xi$, and for a, $a + \eta \tan \phi$, and zero longitude must be replaced by $\eta \sec \phi$. At the same time suppose the elements of the spheroid to be altered from a, e to $a + da$, $e + de$. Confining our attention at first to the two points A, B, let (ϕ'), (a'), (ω) be the numerical elements at B as obtained in the first calculation, viz. before the shifting and alteration of the spheroid; they will now take the form

$$\begin{aligned}(\phi') &+ f\xi + g\eta + hda + kde,\\ (a') &+ f'\xi + g'\eta + h'da + k'de,\\ (\omega) &+ f''\xi + g''\eta + h''da + k''de,\end{aligned}$$

where the coefficients f, g, . . . &c. can be numerically calculated. Now these elements, corresponding to the projection of B on the spheroid of reference, must be equal severally to the astronomically determined elements at B, corrected for the inclination of the surfaces there. If ξ', η' be the components of the inclination at that point, then we have

$$\begin{aligned}\xi' &= (\phi') - \phi' + f\xi + g\eta + hda + kde,\\ \eta' \tan \phi' &= (a') - a' + f'\xi + g'\eta + h'da + k'de,\\ \eta' \sec \phi' &= (\omega) - \omega + f''\xi + g''\eta + h''da + k''de,\end{aligned}$$

where ϕ', a', ω are the observed elements at B. Here it appears that the observation of longitude gives no additional information, but is available as a check upon the azimuthal observations.

If now there be a number of astronomical stations in the triangulation, and we form equations such as the above for each point, then we can from them determine those values of ξ, η, da, de, which make the quantity $\xi^2 + \eta^2 + \xi'^2 + \eta'^2 + \ldots$ a minimum. Thus we obtain that spheroid which best represents the surface covered by the triangulation.

In the *Account of the Principal Triangulation of Great Britain and Ireland* will be found the determination, from 75 equations, of the spheroid best representing the surface of the British Isles. Its elements are $a = 20927005 \pm 295$ ft., $b : a - b = 280 \pm 8$; and it is so placed that at Greenwich Observatory $\xi = 1''{\cdot}864$, $\eta = -0''{\cdot}546$.

Taking Durham Observatory as the origin, and the tangent plane to the surface (determined by $\xi = -0''{\cdot}664$, $\eta = -4''{\cdot}117$) as the plane of x and y, the former measured due north, and z measured vertically downwards, the equation to the surface is

$$\cdot 99524953x^2 + \cdot 99288005y^2 + \cdot 99763052z^2 - \cdot 00671003xz - 41655070z = 0.$$

Altitudes.

The precise determination of the altitude of his station is a matter of secondary importance to the geodesist; nevertheless it is usual to observe the zenith distances of all trigonometrical points. Of great importance is a knowledge of the height of the base for its reduction to the sea-level. Again the height of a station does influence a little the observation of terrestrial angles, for a vertical line at B does not lie generally in the vertical plane of A (see above). The height above the sea-level also influences the geographical latitude, inasmuch as the centrifugal force is increased and the magnitude and direction of the attraction of the earth are altered, and the effect upon the latitude is a very small term expressed by the formula $h(g' - g) \sin 2\phi / ag$, where g, g' are the values of gravity at the equator and at the pole. This is $h \sin 2\phi / 5820$ seconds, h being in metres, a quantity which may be neglected, since for ordinary mountain heights it amounts to only a few hundredths of a second. We can assume this amount as joined with the northern component of the plumb-line perturbations.

The uncertainties of terrestrial refraction render it impossible to determine accurately by vertical angles the heights of distant points. Generally speaking, refraction is greatest at about daybreak; from that time it diminishes, being at a minimum for a couple of hours before and after mid-day; later in the afternoon it again increases. This at least is the general march of the phenomenon, but it is by no means regular. The vertical angles measured at the station on Hart Fell showed on one occasion in the month of September a refraction of double the average amount, lasting from 1 P.M. to 5 P.M. The mean value of the coefficient of refraction k determined from a very large number of observations of terrestrial zenith distances in Great Britain is ·0792 ± ·0047; and if we separate those rays which for a considerable portion of their length cross the sea from those which do not, the former give $k = \cdot 0813$ and the latter $k = \cdot 0753$. These values are determined from high stations and long distances; when the distance is short, and the rays graze the ground, the amount of refraction is extremely uncertain and variable. A case is noted in the Indian survey where the zenith distance of a station 10·5 miles off varied from a depression of 4′ 52″·6 at 4.30 P.M. to an elevation of 2′ 23″·0 at 10.50 P.M.

If h, h' be the heights above the level of the sea of two stations, $90° + \delta$, $90° + \delta'$ their mutual zenith distances (δ being that observed at h), s their distance apart, the earth being regarded as a sphere of radius $= a$, then, with sufficient precision,

$$h' - h = s \tan\left(\frac{s}{2a} - \frac{1-2k}{2a}\delta\right), \quad h - h' = s \tan\left(\frac{s}{2a} - \frac{1-2k}{2a}\delta'\right).$$

If from a station whose height is h the horizon of the sea be observed to have a zenith distance $90° + \delta$, then the above formula gives for h the value

$$h = \frac{a}{2}\frac{\tan^2 \delta}{1 - 2k}.$$

Suppose the depression δ to be n minutes, then $h = 1{\cdot}054n^2$ if the ray be for the greater part of its length crossing the sea; if otherwise, $h = 1{\cdot}040n^2$. To take an example: the mean of eight observations of the zenith distance of the sea horizon at the top of Ben Nevis is 91° 4′ 48″, or $\delta = 64{\cdot}8$; the ray is pretty equally disposed over land and water, and hence $h = 1{\cdot}047n^2 = 4306$ ft. The actual height of the hill by spirit-levelling is 4406 ft., so that the error of the height thus obtained is only 10 ft.

The determination of altitudes by means of spirit-levelling is undoubtedly the most exact method, particularly in its present development as precise-levelling, by which there have been determined in all civilized countries close-meshed nets of elevated points covering the entire land. (A. R. C.; F. R. H.)

GEOFFREY, surnamed MARTEL (1006–1060), count of Anjou, son of the count Fulk Nerra (*q.v.*) and of the countess Hildegarde or Audegarde, was born on the 14th of October 1006. During his father's lifetime he was recognized as suzerain by Fulk l'Oison ("the Gosling"), count of Vendôme, the son of his half-sister Adela. Fulk having revolted, he confiscated the countship, which he did not restore till 1050. On the 1st of January 1032 he married Agnes, widow of William the Great, duke of Aquitaine, and taking arms against William the Fat, eldest son and successor of William the Great, defeated him and took him prisoner at Mont-Couër near Saint-Jouin-de-Marnes on the 20th of September 1033. He then tried to win recognition as dukes of Aquitaine for the sons of his wife Agnes by William the Great, who were still minors, but Fulk Nerra promptly took up arms to defend his suzerain William the Fat, from whom he held the Loudunois and

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Saintonge in fief against his son. In 1036 Geoffrey Martel had to liberate William the Fat, on payment of a heavy ransom, but the latter having died in 1038, and the second son of William the Great, Odo, duke of Gascony, having fallen in his turn at the siege of Mauzé (10th of March 1039) Geoffrey made peace with his father in the autumn of 1039, and had his wife's two sons recognized as dukes. About this time, also, he had interfered in the affairs of Maine, though without much result, for having aided against Gervais, bishop of Le Mans, who was trying to make himself guardian of the young count of Maine, Hugh, he had been beaten and forced to make terms with Gervais in 1038. In 1040 he succeeded his father in Anjou and was able to conquer Touraine (1044) and assert his authority over Maine (see Anjou). About 1050 he repudiated Agnes, his first wife, and married Grécie, the widow of Bellay, lord of Montreuil-Bellay (before August 1052), whom he subsequently left in order to marry Adela, daughter of a certain Count Odo. Later he returned to Grécie, but again left her to marry Adelaide the German. When, however, he died on the 14th of November 1060, at the monastery of St Nicholas at Angers, he left no children, and transmitted the countship to Geoffrey the Bearded, the eldest of his nephews (see Anjou).

See Louis Halphen, *Le Comté d'Anjou au XIe siècle* (Paris, 1906). A summary biography is given by Célestin Port, *Dictionnaire historique, géographique et biographique de Maine-et-Loire* (3 vols., Paris-Angers, 1874–1878), vol. ii. pp. 252-253, and a sketch of the wars by Kate Norgate, *England under the Angevin Kings* (2 vols., London, 1887), vol. i. chs. iii.–v. (L. H.*)

GEOFFREY, surnamed Plantagenet [or Plantegenet] (1113–1151), count of Anjou, was the son of Count Fulk the Young and of Eremburge (or Arembourg of La Flèche; he was born on the 24th of August 1113. He is also called "le bel" or "the handsome," and received the surname of Plantagenet from the habit which he is said to have had of wearing in his cap a sprig of broom (*genêt*). In 1127 he was made a knight, and on the 2nd of June 1129 married Matilda, daughter of Henry I. of England, and widow of the emperor Henry V. Some months afterwards he succeeded to his father, who gave up the countship when he definitively went to the kingdom of Jerusalem. The years of his government were spent in subduing the Angevin barons and in conquering Normandy (see Anjou). In 1151, while returning from the siege of Montreuil-Bellay, he took cold, in consequence of bathing in the Loir at Château-du-Loir, and died on the 7th of September. He was buried in the cathedral of Le Mans. By his wife Matilda he had three sons: Henry Plantagenet, born at Le Mans on Sunday, the 5th of March 1133; Geoffrey, born at Argentan on the 1st of June 1134; and William Long-Sword, born on the 22nd of July 1136.

See Kate Norgate, *England under the Angevin Kings* (2 vols., London, 1887), vol. i. chs. v.-viii.; Célestin Port, *Dictionnaire historique, géographique et biographique de Maine-et-Loire* (3 vols., Paris-Angers, 1874–1878), vol. ii. pp. 254-256. A history of Geoffrey le Bel has yet to be written; there is a biography of him written in the 12th century by Jean, a monk of Marmoutier, *Historia Gaufredi, ducis Normannorum et comitis Andegavorum*, published by Marchegay et Salmon; "Chroniques des comtes d'Anjou" (*Société de l'histoire de France*, Paris, 1856), pp. 229-310. (L. H.*)

GEOFFREY (1158–1186), duke of Brittany, fourth son of the English king Henry II. and his wife Eleanor of Aquitaine, was born on the 23rd of September 1158. In 1167 Henry suggested a marriage between Geoffrey and Constance (d. 1201), daughter and heiress of Conan IV., duke of Brittany (d. 1171); and Conan not only assented, perhaps under compulsion, to this proposal, but surrendered the greater part of his unruly duchy to the English king. Having received the homage of the Breton nobles, Geoffrey joined his brothers, Henry and Richard, who, in alliance with Louis VII. of France, were in revolt against their father; but he made his peace in 1174, afterwards helping to restore order in Brittany and Normandy, and aiding the new French king, Philip Augustus, to crush some rebellious vassals. In July 1181 his marriage with Constance was celebrated, and practically the whole of his subsequent life was spent in warfare with his brother Richard. In 1183 he made peace with his father, who had come to Richard's assistance; but a fresh struggle soon broke out for the possession of Anjou, and Geoffrey was in Paris treating for aid with Philip Augustus, when he died on the 19th of August 1186. He left a daughter, Eleanor, and his wife bore a posthumous son, the unfortunate Arthur.

GEOFFREY (*c.* 1152–1212), archbishop of York, was a bastard son of Henry II., king of England. He was distinguished from his legitimate half-brothers by his consistent attachment and fidelity to his father. He was made bishop of Lincoln at the age of 1 twenty-one (1173); but though he enjoyed the temporalities he was never consecrated and resigned the see in 1183. He then became his father's chancellor, holding a large number of lucrative benefices in plurality. Richard nominated him archbishop of York in 1189, but he was not consecrated till 1191, or enthroned till 1194. Geoffrey, though of high character, was a man of uneven temper; his history in chiefly one of quarrels, with the see of Canterbury, with the chancellor Willian Longchamp, with his half-brothers Richard and John, and especially with his canons at York. This last dispute kept him in litigation before Richard and the pope for many years. He led the clergy in their refusal to be taxed by John and was forced to fly the kingdom in 1207. He died in Normandy on the 12th of December 1212.

See Giraldus Cambrensis, *Vita Galfridi*; Stubbs's prefaces to *Roger de Hoveden*, vols. iii. and iv. (Rolls Series). (H. W. C. D.)

GEOFFREY DE MONTBRAY (d. 1093), bishop of Coutances (*Constantiensis*), a right-hand man of William the Conqueror, was a type of the great feudal prelate, warrior and administrator at need. He knew, says Orderic, more about marshalling mailed knights than edifying psalm-singing clerks. Obtaining, as a young man, in 1048, the see of Coutances, by his brother's influence (see Mowbray), he raised from his fellow nobles and from their Sicilian spoils funds for completing his cathedral, which was consecrated in 1056. With bishop Odo, a warrior like himself, he was on the battle-field of Hastings, exhorting the Normans to victory; and at William's coronation it was he who called on them to acclaim their duke as king. His reward in England was a mighty fief scattered over twelve counties. He accompanied William on his visit to Normandy (1067), but, returning, led a royal force to the relief of Montacute in September 1069. In 1075 he again took the field, leading with Bishop Odo a vast host against the rebel earl of Norfolk, whose stronghold at Norwich they besieged and captured.

Meanwhile the Conqueror had invested him with important judicial functions. In 1072 he had presided over the great Kentish suit between the primate and Bishop Odo, and about the same time over those between the abbot of Ely and his despoilers, and between the bishop of Worcester and the abbot of Ely, and there is some reason to think that he acted as a Domesday commissioner (1086), and was placed about the same time in charge of Northumberland. The bishop, who attended the Conqueror's funeral, joined in the great rising against William Rufus next year (1088), making Bristol, with which (as Domesday shows) he was closely connected and where he had built a strong castle, his base of operations. He burned Bath and ravaged Somerset, but had submitted to the king before the end of the year. He appears to have been at Dover with William in January 1090, but, withdrawing to Normandy, died at Coutances three years later. In his fidelity to Duke Robert he seems to have there held out for him against his brother Henry, when the latter obtained the Cotentin.

See E. A. Freeman, *Norman Conquest* and *William Rufus*; J. H. Round, *Feudal England*; and, for original authorities, the works of Orderic Vitalis and William of Poitiers, and of Florence of Worcester; the Anglo-Saxon Chronicle; William of Malmesbury's *Gesta pontificum*, and Lanfranc's works, ed. Giles; Domesday Book. (J. H. R.)

GEOFFREY OF MONMOUTH (d. 1154), bishop of St Asaph and writer on early British history, was born about the year 1100. Of his early life little is known, except that he received a liberal education under the eye of his paternal uncle, Uchtryd, who was at that time archdeacon, and subsequently bishop, of Llandaff. In 1129 Geoffrey appears at Oxford among the witnesses of an Oseney charter. He subscribes himself Geoffrey Arturus; from this we may perhaps infer that he had already begun his experiments in the manufacture of Celtic mythology. A first edition of his *Historia Britonum* was in circulation by the year

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1139, although the text which we possess appears to date from 1147. This famous work, which the author has the audacity to place on the same level with the histories of William of Malmesbury and Henry of Huntingdon, professes to be a translation from a Celtic source; "a very old book in the British tongue" which Walter, archdeacon of Oxford, had brought from Brittany. Whether the archdeacon is a historical personage, whether his book has any real existence may be fairly questioned. There is nothing in the matter or the style of the *Historia* to preclude us from supposing that Geoffrey drew partly upon confused traditions, partly on his own powers of invention, and to a very slight degree upon the accepted authorities for early British history. His chronology is fantastic and incredible; William of Newburgh justly remarks that, if we accepted the events which Geoffrey relates, we should have to suppose that they had happened in another world. William of Newburgh wrote, however, in the reign of Richard I. when the reputation of Geoffrey's work was too well established to be shaken by such criticisms. The fearless romancer had achieved an immediate success. He was patronized by Robert, earl of Gloucester, and by two bishops of Lincoln; he obtained, about 1140, the archdeaconry of Llandaff "on account of his learning"; and in 1151 was promoted to the see of St Asaph.

Before his death the *Historia Britonum* had already become a model and a quarry for poets and chroniclers. The list of imitators begins with Geoffrey Gaimar, the author of the *Estorie des Engles* (*c.* 1147), and Wace, whose *Roman de Brut* (1155) is partly a translation and partly a free paraphrase of the *Historia*. In the next century the influence of Geoffrey is unmistakably attested by the *Brut* of Layamon, and the rhyming English chronicle of Robert of Gloucester. Among later historians who were deceived by the *Historia Britonum* it is only needful to mention Higdon, Hardyng, Fabyan (1512), Holinshed (1580) and John Milton. Still greater was the influence of Geoffrey upon those writers who, like Warner in *Albion's England* (1586), and Drayton in *Polyolbion* (1613), deliberately made their accounts of English history as poetical as possible. The stories which Geoffrey preserved or invented were not infrequently a source of inspiration to literary artists. The earliest English tragedy, *Gorboduc* (1565), the *Mirror for Magistrates* (1587), and Shakespeare's *Lear*, are instances in point. It was, however, the Arthurian legend which of all his fabrications attained the greatest vogue. In the work of expanding and elaborating this theme the successors of Geoffrey went as far beyond him as he had gone beyond Nennius; but he retains the credit due to the founder of a great school. Marie de France, who wrote at the court of Henry II., and Chrétien de Troyes, her French contemporary, were the earliest of the avowed romancers to take up the theme. The succeeding age saw the Arthurian story popularized, through translations of the French romances, as far afield as Germany and Scandinavia. It produced in England the *Roman du Saint Graal* and the *Roman de Merlin*, both from the pen of Robert de Borron; the *Roman de Lancelot*; the *Roman de Tristan*, which is attributed to a fictitious Lucas de Gast. In the reign of Edward IV. Sir Thomas Malory paraphrased and arranged the best episodes of these romances in English prose. His *Morte d'Arthur*, printed by Caxton in 1485, epitomizes the rich mythology which Geoffrey's work had first called into life, and gave the Arthurian story a lasting place in the English imagination. The influence of the *Historia Britonum* may be illustrated in another way, by enumerating the more familiar of the legends to which it first gave popularity. Of the twelve books into which it is divided only three (Bks. IX., X., XI.) are concerned with Arthur. Earlier in the work, however, we have the adventures of Brutus; of his follower Corineus, the vanquisher of the Cornish giant Goemagol (Gogmagog); of Locrinus and his daughter Sabre (immortalized in Milton's *Comus*); of Bladud the builder of Bath; of Lear and his daughters; of the three pairs of brothers, Ferrex and Porrex, Brennius and Belinus, Elidure and Peridure. The story of Vortigern and Rowena takes its final form in the *Historia Britonum*; and Merlin makes his first appearance in the prelude to the Arthur legend. Besides the *Historia Britonum* Geoffrey is also credited with a *Life of Merlin* composed in Latin verse. The authorship of this work has, however, been disputed, on the ground that the style is distinctly superior to that of the *Historia*. A minor composition, the *Prophecies of Merlin*, was written before 1136, and afterwards incorporated with the *Historia*, of which it forms the seventh book.

For a discussion of the manuscripts of Geoffrey's work, see Sir T. D. Hardy's *Descriptive Catalogue* (Rolls Series), i. pp. 341 ff. The *Historia Britonum* has been critically edited by San Marte (Halle, 1854). There is an English translation by J. A. Giles (London, 1842). The *Vita Merlini* has been edited by F. Michel and T. Wright (Paris, 1837). See also the *Dublin Univ. Magazine* for April 1876, for an article by T. Gilray on the literary influence of Geoffrey; G. Heeger's *Trojanersage der Britten* (1889); and La Borderie's *Études historiques bretonnes* (1883).

(H. W. C. D.)

GEOFFREY OF PARIS (d. *c.* 1320), French chronicler, was probably the author of the *Chronique métrique de Philippe le Bel*, or *Chronique rimée de Geoffroi de Paris*. This work, which deals with the history of France from 1300 to 1316, contains 7018 verses, and is valuable as that of a writer who had a personal knowledge of many of the events which he relates. Various short historical poems have also been attributed to Geoffrey, but there is no certain information about either his life or his writings.

The *Chronique* was published by J. A. Buchon in his *Collection des chroniques*, tome ix. (Paris, 1827), and it has also been printed in tome xxii. of the *Recueil des historiens des Gaules et de la France* (Paris, 1865). See G. Paris, *Histoire de la littérature française au moyen âge* (Paris, 1890); and A. Molinier, *Les Sources de l'histoire de France*, tome iii. (Paris, 1903).

GEOFFREY THE BAKER (d. *c.* 1360), English chronicler, is also called Walter of Swinbroke, and was probably a secular clerk at Swinbrook in Oxfordshire. He wrote a *Chronicon Angliae temporibus Edwardi II. et Edwardi III.*, which deals with the history of England from 1303 to 1356. From the beginning until about 1324 this work is based upon Adam Murimuth's *Continuatio chronicarum*, but after this date it is valuable and interesting, containing information not found elsewhere, and closing with a good account of the battle of Poitiers. The author obtained his knowledge about the last days of Edward II. from William Bisschop, a companion of the king's murderers, Thomas Gurney and John Maltravers. Geoffrey also wrote a *Chroniculum* from the creation of the world until 1336, the value of which is very slight. His writings have been edited with notes by Sir E. M. Thompson as the *Chronicon Galfridi le Baker de Swynebroke* (Oxford, 1889). Some doubt exists concerning Geoffrey's share in the compilation of the *Vita et mors Edwardi II.*, usually attributed to Sir Thomas de la More, or Moor, and printed by Camden in his *Anglica scripta*. It has been maintained by Camden and others that More wrote an account of Edward's reign in French, and that this was translated into Latin by Geoffrey and used by him in compiling his *Chronicon*. Recent scholarship, however, asserts that More was no writer, and that the *Vita et mors* is an extract from Geoffrey's *Chronicon*, and was attributed to More, who was the author's patron. In the main this conclusion substantiates the verdict of Stubbs, who has published the *Vita et mors* in his *Chronicles of the reigns of Edward I. and Edward II.* (London, 1883). The manuscripts of Geoffrey's works are in the Bodleian library at Oxford.

GEOFFRIN, MARIE THÉRÈSE RODET (1699–1777), a Frenchwoman who played an interesting part in French literary and artistic life, was born in Paris in 1699. She married, on the 19th of July 1713, Pierre François Geoffrin, a rich manufacturer and lieutenant-colonel of the National Guard, who died in 1750. It was not till Mme Geoffrin was nearly fifty years of age that we begin to hear of her as a power in Parisian society. She had learned much from Mme de Tencin, and about 1748 began to gather round her a literary and artistic circle. She had every week two dinners, on Monday for artists, and on Wednesday for her friends the Encyclopaedists and other men of letters. She received many foreigners of distinction, Hume and Horace Walpole among others. Walpole spent much time in her society before he was finally attached to Mme du Deffand, and speaks of her in his letters as a model of common sense. She was indeed somewhat of a small tyrant in her circle. She had adopted the pose of an old woman earlier than necessary, and her coquetry, if

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such it can be called, took the form of being mother and mentor to her guests, many of whom were indebted to her generosity for substantial help. Although her alm appears to have been to have the *Encyclopédie* in conversation and action around her, she was extremely displeased with any of her friends who were so rash as to incur open disgrace. Marmontel but her favour after the official censure of *Bélisaire*, and her advanced views did not prevent her from observing the forms of religion. A devoted Parisian, Mme Geoffrin rarely left the city, so that her journey to Poland in 1766 to visit the king, Stanislas Poniatowski, whom she had known in his early days in Paris, was a great event in her life. Her experiences induced a sensible gratitude that she had been born "*Française*" and "*particulière*." In her last illness her daughter, Thérèse, marquise de la Ferté Imbault, excluded her mother's old friends so that she might die as a good Christian, a proceeding wittily described by the old lady: "My daughter is like Godfrey de Bouillon, she wished to defend my tomb from the infidels." Mme Geoffrin died in Paris on the 6th of October 1777.

See *Correspondance inédite du roi Stanislas Auguste Poniatowski et de Madame Geoffrin*, edited by the comte de Mouÿ (1875); P. de Ségur, *Le Royaume de la rue Saint-Honoré, Madame Geoffrin et sa fille* (1897); A. Tornezy, *Un Bureau d'esprit au XVIIIe siècle: le salon de Madame Geoffrin* (1895); and Janet Aldis, *Madame Geoffrin, her Salon and her Times, 1750–1777* (1905).

GEOFFROY, ÉTIENNE FRANÇOIS (1672–1731), French chemist, born in Paris on the 13th of February 1672, was first an apothecary and then practised medicine. After studying at Montpellier he accompanied Marshal Tallard on his embassy to London in 1698 and thence travelled to Holland and Italy. Returning to Paris he became professor of chemistry at the Jardin du Roi and of pharmacy and medicine at the Collège de France, and dean of the faculty of medicine. He died in Paris on the 6th of January 1731. His name is best known in connexion with his tables of affinities (*tables des rapports*), which he presented to the French Academy in 1718 and 1720. These were lists, prepared by collating observations on the actions of substances one upon another, showing the varying degrees of affinity exhibited by analogous bodies for different reagents, and they retained their vogue for the rest of the century, until displaced by the profounder conceptions introduced by C. L. Berthollet. Another of his papers dealt with the delusions of the philosopher's stone, but nevertheless he believed that iron could be artificially formed in the combustion of vegetable matter. His *Tractatus de materia medica*, published posthumously in 1741, was long celebrated.

His brother CLAUDE JOSEPH, known as Geoffroy the younger (1685–1752), was also an apothecary and chemist who, having a considerable knowledge of botany, devoted himself especially to the study of the essential oils in plants.

GEOFFROY, JULIEN LOUIS (1743–1814), French critic, was born at Rennes in 1743. He studied in the school of his native town and at the Collège Louis le Grand in Paris. He took orders and fulfilled for some time the humble functions of an usher, eventually becoming professor of rhetoric at the *Collège Mazarin*. A bad tragedy, *Calon*, was accepted at the *Théâtre Français*, but was never acted. On the death of Élie Fréron in 1776 the other collaborators in the *Année littéraire* asked Geoffroy to succeed him, and he conducted the journal until in 1792 it ceased to appear. Geoffroy was a bitter critic of Voltaire and his followers, and made for himself many enemies. An enthusiastic royalist, he published with Fréron's brother-in-law, the abbé Thomas Royou (1741–1792), a journal, *L'Ami du roi* (1790–1792), which possibly did more harm than good to the king's cause by its ill-advised partisanship. During the Terror Geoffroy hid in the neighbourhood of Paris, only returning in 1799. An attempt to revive the *Année littéraire* failed, and Geoffroy undertook the dramatic feuilleton of the *Journal des débats*. His scathing criticisms had a success of notoriety, but their popularity was ephemeral, and the publication of them (5 vols., 1819–1820) as *Cours de littérature dramatique* proved a failure. He was also the author of a perfunctory *Commentaire* on the works of Racine prefixed to Lenormant's edition (1808). He died in Paris on the 27th of February 1814.

GEOFFROY SAINT-HILAIRE, ÉTIENNE (1772–1844), French naturalist, was the son of Jean Gérard Geoffroy, procurator and magistrate of Étampes, Seine-et-Oise, where he was born on the 15th of April 1772. Destined for the church he entered the college of Navarre, in Paris, where he studied natural philosophy under M. J. Brisson; and in 1788 he obtained one of the canonicates of the chapter of Sainte Croix at Étampes, and also a benefice. Science, however, offered him a more congenial career, and he gained from his father permission to remain in Paris, and to attend the lectures at the Collège de France and the Jardin des Plantes, on the condition that he should also read law. He accordingly took up his residence at Cardinal Lemoine's college, and there became the pupil and soon the esteemed associate of Brisson's friend, the abbé Haüy, the mineralogist. Having, before the close of the year 1790, taken the degree of bachelor in law, he became a student of medicine, and attended the lectures of A. F. de Fourcroy at the Jardin des Plantes, and of L. J. M. Daubenton at the Collège de France. His studies at Paris were at length suddenly interrupted, for, in August 1792, Haüy and the other professors of Lemoine's college, as also those of the college of Navarre, were arrested by the revolutionists as priests, and confined in the prison of St Firmin. Through the influence of Daubenton and others Geoffroy on the 14th of August obtained an order for the release of Haüy in the name of the Academy; still the other professors of the two colleges, save C. F. Lhomond, who had been rescued by his pupil J. L. Tallien, remained in confinement. Geoffroy, foreseeing their certain destruction if they remained in the hands of the revolutionists, determined if possible to secure their liberty by stratagem. By bribing one of the officials at St Firmin, and disguising himself as a commissioner of prisons, he gained admission to his friends, and entreated them to effect their escape by following him. All, however, dreading lest their deliverance should render the doom of their fellow-captives the more certain, refused the offer, and one priest only, who was unknown to Geoffroy, left the prison. Already on the night of the 2nd of September the massacre of the proscribed had begun, when Geoffroy, yet intent on saving the life of his friends and teachers, repaired to St Firmin. At 4 o'clock on the morning of the 3rd of September, after eight hours' waiting, he by means of a ladder assisted the escape of twelve ecclesiastics, not of the number of his acquaintance, and then the approach of dawn and the discharge of a gun directed at him warned him, his chief purpose unaccomplished, to return to his lodgings. Leaving Paris he retired to Étampes, where, in consequence of the anxieties of which he had lately been the prey, and the horrors which he had witnessed, he was for some time seriously ill. At the beginning of the winter of 1792 he returned to his studies in Paris, and in March of the following year Daubenton, through the interest of Bernardin de Saint Pierre, procured him the office of sub-keeper and assistant demonstrator of the cabinet of natural history, vacant by the resignation of B. G. E. Lacépède. By a law passed in June 1793, Geoffroy was appointed one of the twelve professors of the newly constituted museum of natural history, being assigned the chair of zoology. In the same year he busied himself with the formation of a menagerie at that institution.

In 1794 through the introduction of A. H. Tessier he entered into correspondence with Georges Cuvier, to whom, after the perusal of some of his manuscripts, he wrote: "Venez jouer parmi nous le rôle de Linné, d'un autre législateur de l'histoire naturelle." Shortly after the appointment of Cuvier as assistant at the Muséum d'Histoire Naturelle, Geoffroy received him into his house. The two friends wrote together five memoirs on natural history, one of which, on the classification of mammals, puts forward the idea of the subordination of characters upon which Cuvier based his zoological system. It was in a paper entitled "Histoire des Makis, ou singes de Madagascar," written in 1795, that Geoffroy first gave expression to his views on "the unity of organic composition," the influence of which is perceptible in all his subsequent writings; nature, he observes, presents us with only one plan of construction, the same in principle, but varied in its accessory parts.

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In 1798 Geoffroy was chosen a member of the great scientific expedition to Egypt, and on the capitulation of Alexandria in August 1801, he took part in resisting the claim made by the British general to the collections of the expedition, declaring that, were that demand persisted in, history would have to record that he also had burnt a library in Alexandria. Early in January 1802 Geoffroy returned to his accustomed labours in Paris. He was elected a member of the academy of sciences of that city in September 1807. In March of the following year the emperor, who had already recognized his national services by the award of the cross of the legion of honour, selected him to visit the museums of Portugal, for the purpose of procuring collections from them, and in the face of considerable opposition from the British he eventually was successful in retaining them as a permanent possession for his country. In 1809, the year after his return to France, he was made professor of zoology at the faculty of sciences at Paris, and from that period he devoted himself more exclusively than before to anatomical study. In 1818 he gave to the world the first part of his celebrated *Philosophie anatomique*, the second volume of which, published in 1822, and subsequent memoirs account for the formation of monstrosities on the principle of arrest of development, and of the attraction of similar parts. When, in 1830, Geoffroy proceeded to apply to the invertebrata his views as to the unity of animal composition, he found a vigorous opponent in Georges Cuvier, and the discussion between them, continued up to the time of the death of the latter, soon attracted the attention of the scientific throughout Europe. Geoffroy, a synthesist, contended, in accordance with his theory of unity of plan in organic composition, that all animals are formed of the same elements, in the same number, and with the same connexions: homologous parts, however they differ in form and size, must remain associated in the same invariable order. With Goethe he held that there is in nature a law of compensation or balancing of growth, so that if one organ take on an excess of development, it is at the expense of some other part; and he maintained that, since nature takes no sudden leaps, even organs which are superfluous in any given species, if they have played an important part in other species of the same family, are retained as rudiments, which testify to the permanence of the general plan of creation. It was his conviction that, owing to the conditions of life, the same forms had not been perpetuated since the origin of all things, although it was not his belief that existing species are becoming modified. Cuvier, who was an analytical observer of facts, admitted only "the prevalence of "laws of co-existence" or "harmony" in animal organisms, and maintained the absolute invariability of species, which he declared had been created with a regard to the circumstances in which they were placed, each organ contrived with a view to the function it had to fulfil, thus putting, in Geoffroy's considerations, the effect for the cause.

In July 1840 Geoffroy became blind, and some months later he had a paralytic attack. From that time his strength gradually failed him. He resigned his chair at the museum in 1841, and died at Paris on the 19th of June 1844.

Geoffroy wrote: *Catalogue des mammifères du Muséum National d'Histoire Naturelle* (1813), not quite completed; *Philosophie anatomique*—t. i., *Des organes respiratoires* (1818), and t. ii., *Des monstruosités humaines* (1822); *Système dentaire des mammifères et des oiseaux* (1st pt., 1824); *Sur le principe de l'unité de composition organique* (1828); *Cours de l'histoire naturelle des mammifères* (1829); *Principes de philosophie zoologique* (1830); *Études progressives d'un naturaliste* (1835); *Fragments biographiques* (1832); *Notions synthétiques, historiques et physiologiques de philosophie naturelle* (1838), and other works; also part of the *Description de l'Égypte par la commission des sciences* (1821–1830); and, with Frédéric Cuvier (1773–1838), a younger brother of G. Cuvier, *Histoire naturelle des mammifères* (4 vols., 1820–1842); besides numerous papers on such subjects as the anatomy of marsupials, ruminants and electrical fishes, the vertebrate theory of the skull, the opercula of fishes, teratology, palaeontology and the influence of surrounding conditions in modifying animal forms.

See *Vie, travaux, et doctrine scientifique d'Étienne Geoffroy Saint-Hilaire, par son fils M. Isidore Geoffroy Saint-Hilaire* (Paris and Strasburg, 1847), to which is appended a list of Geoffroy's works; and Joly, in *Biog. universelle*, t. xvi. (1856).

GEOFFROY SAINT-HILAIRE, ISIDORE (1805–1861), French zoologist, son of the preceding, was born at Paris on the 16th of December 1805. In his earlier years he showed an aptitude for mathematics, but eventually he devoted himself to the study of natural history and of medicine, and in 1824 he was appointed assistant naturalist to his father. On the occasion of his taking the degree of doctor of medicine in September 1829, he read a thesis entitled *Propositions sur la monstruosité, considérée chez l'homme et les animaux*; and in 1832–1837 was published his great teratological work, *Histoire générale et particulière des anomalies de l'organisation chez l'homme et les animaux*, 3 vols. 8vo. with 20 plates. In 1829 he delivered for his father the second part of a course of lectures on ornithology, and during the three following years he taught zoology at the Athénée, and teratology at the École pratique. He was elected a member of the academy of sciences at Paris in 1833, was in 1837 appointed to act as deputy for his father at the faculty of sciences in Paris, and in the following year was sent to Bordeaux to organize a similar faculty there. He became successively inspector of the academy of Paris (1840), professor of the museum on the retirement of his father (1841), inspector-general of the university (1844), a member of the royal council for public instruction (1845), and on the death of H. M. D. de Blainville, professor of zoology at the faculty of sciences (1850). In 1854 he founded the Acclimatization Society of Paris, of which he was president. He died in Paris on the 10th of November 1861.

Besides the above-mentioned works, he wrote: *Essais de zoologie générale* (1841); *Vie . . . d'Étienne Geoffroy Saint-Hilaire* (1847); *Acclimatation et domestication des animaux utiles* (1849; 4th ed., 1861); *Lettres sur les substances alimentaires et particulièrement sur la viande de cheval* (1856); and *Histoire naturelle générale des règnes organiques* (3 vols., 1854–1862), which was not quite completed. He was the author also of various papers on zoology, comparative anatomy and palaeontology.

GEOGRAPHY (Gr. γῆ, earth, and γράφειν, to write), the exact and organized knowledge of the distribution of phenomena on the surface of the earth. The fundamental basis of geography is the vertical relief of the earth's crust, which controls all mobile distributions. The grander features of the relief of the lithosphere or stony crust of the earth control the distribution of the hydrosphere or collected waters which gather into the hollows, filling them up to a height corresponding to the volume, and thus producing the important practical division of the surface into land and water. The distribution of the mass of the atmosphere over the surface of the earth is also controlled by the relief of the crust, its greater or lesser density at the surface corresponding to the lesser or greater elevation of the surface. The simplicity of the zonal distribution of solar energy on the earth's surface, which would characterize a uniform globe, is entirely destroyed by the dissimilar action of land and water with regard to radiant heat, and by the influence of crust-forms on the direction of the resulting circulation. The influence of physical environment becomes clearer and stronger when the distribution of plant and animal life is considered, and if it is less distinct in the case of man, the reason is found in the modifications of environment consciously produced by human effort. Geography is a synthetic science, dependent for the data with which it deals on the results of specialized sciences such as astronomy, geology, oceanography, meteorology, biology and anthropology, as well as on topographical description. The physical and natural sciences are concerned in geography only so far as they deal with the forms of the earth's surface, or as regards the distribution of phenomena. The distinctive task of geography as a science is to investigate the control exercised by the crust-forms directly or indirectly upon the various mobile distributions. This gives to it unity and definiteness, and renders superfluous the attempts that have been made from time to time to define the limits which divide geography from geology on the one hand and from history on the other. It is essential to classify the subject-matter of geography in such a manner as to give prominence not only to facts, but to their mutual relations and their natural and inevitable order.

The fundamental conception of geography is form, including

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the figure of the earth and the varieties of crustal relief. Hence mathematical geography (see MAP), including cartography as a practical application, comes first. It merges into physical geography, which takes account of the forms of the lithosphere (geomorphology), and also of the distribution of the hydrosphere and the rearrangements resulting from the workings of solar energy throughout the hydrosphere and atmosphere (oceanography and climatology). Next follows the distribution of plants and animals (biogeography), and finally the distribution of mankind and the various artificial boundaries and redistributions (anthropogeography). The applications of anthropogeography to human uses give rise to political and commercial geography, in the elucidation of which all the earlier departments or stages have to be considered, together with historical and other purely human conditions. The evolutionary idea has revolutionized and unified geography as it did biology, breaking down the old hard-and-fast partitions between the various departments, and substituting the study of the nature and influence of actual terrestrial environments for the earlier motive, the discovery and exploration of new lands.

History of Geographical Theory

The earliest conceptions of the earth, like those held by the primitive peoples of the present day, are difficult to discover and almost impossible fully to grasp. Early generalizations, as far as they were made from known facts, were usually expressed in symbolic language, and for our present purpose it is not profitable to speculate on the underlying truths which may sometimes be suspected in the old mythological cosmogonies.

The first definite geographical theories to affect the western world were those evolved, or at least first expressed, by the Greeks.[1]

Early Greek ideas.

The earliest theoretical problem of geography was the form of the earth. The natural supposition that the earth is a flat disk, circular or elliptical in outline, had in the time of Homer acquired a special definiteness by the introduction of the idea of the ocean river bounding the whole, an application of imperfectly understood observations. Thales of Miletus is claimed as the first exponent of the idea of a spherical earth; but, although this does not seem to be warranted, his disciple Anaximander (*c.* 580 B.C.) put forward the theory that the earth had the figure of a solid body hanging freely in the centre of the hollow sphere of the starry heavens. The Pythagorean school of thinkers adopted the theory of a spherical earth, but from metaphysical rather than scientific reasons; their convincing argument was that a sphere being the most perfect solid figure was the only one worthy to circumscribe the dwelling-place of man. The division of the sphere into parallel zones and some of the consequences of this generalization seem to have presented themselves to Parmenides (*c.* 450 B.C.); but these ideas did not influence the Ionian school of philosophers, who in their treatment of geography preferred to deal with facts demonstrable by travel rather than with speculations. Thus Hecataeus, claimed by H. F. Tozer[2] as the father of geography on account of his *Periodos*, or general treatise on the earth, did not advance beyond the primitive conception of a circular disk. He systematized the form of the land within the ring of ocean—the *oikouméne*, or habitable world—by recognizing two continents: Europe to the north, and Asia to the south of the midland sea. Herodotus, equally oblivious of the sphere, criticized and ridiculed the circular outline of the *oikumene*, which he knew to be longer from east to west than it was broad from north to south. He also pointed out reasons for accepting a division of the land into three continents—Europe, Asia and Africa. Beyond the limits of his personal travels Herodotus applied the characteristically Greek theory of symmetry to complete, in the unknown, outline of lands and rivers analogous to those which had been explored. Symmetry was in fact the first geographical theory, and the effect of Herodotus's hypothesis that the Nile must flow from west to east before turning north in order to balance the Danube running from west to east before turning south lingered in the maps of Africa down to the time of Mungo Park.[3]

Flat earth of Homer.

Hecataeus.

Herodotus.

The idea of symmetry.

To Aristotle (384–322 B.C.) must be given the distinction of founding scientific geography. He demonstrated the sphericity of the earth by three arguments, two of which could be tested by observation. These were: (1) that the earth must be spherical, because of the tendency of matter to fall together towards a common centre; (2) that only a sphere could always throw a circular shadow on the moon during an eclipse; and (3) that the shifting of the horizon and the appearance of new constellations, or the disappearance of familiar stars, as one travelled from north to south, could only be explained on the hypothesis that the earth was a sphere. Aristotle, too, gave greater definiteness to the idea of zones conceived by Parmenides, who had pictured a torrid zone uninhabitable by reason of heat, two frigid zones uninhabitable by reason of cold, and two intermediate temperate zones fit for human occupation. Aristotle defined the temperate zone as extending from the tropic to the arctic circle, but there is some uncertainty as to the precise meaning he gave to the term "arctic circle." Soon after his time, however, this conception was clearly established, and with so large a generalization the mental horizon was widened to conceive of a geography which was a science. Aristotle had himself shown that in the southern temperate zone winds similar to those of the northern temperate zone should blow, but from the opposite direction.

Aristotle and the sphere.

While the theory of the sphere was being elaborated the efforts of practical geographers were steadily directed towards ascertaining the outline and configuration of the *oekumene*, or habitable world, the only portion of the terrestrial surface known to the ancients and to the medieval peoples, and still retaining a shadow of its old monopoly of geographical attention in its modern name of the "Old World." The fitting of the *oekumene* to the sphere was the second theoretical problem. The circular outline had given way in geographical opinion to the elliptical with the long axis lying east and west, and Aristotle was inclined to view it as a very long and relatively narrow band almost encircling the globe in the temperate zone. His argument as to the narrowness of the sea between West Africa and East Asia, from the occurrence of elephants at both extremities, is difficult to understand, although it shows that he looked on the distribution of animals as a problem of geography.

Fitting the oekumene to the sphere.

Pythagoras had speculated as to the existence of antipodes, but it was not until the first approximately accurate measurements of the globe and estimates of the length and breadth of the *oekumene* were made by Eratosthenes (*c.* 250 B.C.) that the fact that, as then known, it occupied less than a quarter of the surface of the sphere was clearly recognized. It was natural, if not strictly logical, that the ocean-girdle should be extended from a narrow stream to a world-embracing sea, and here again Greek theory, or rather fancy, gave its modern name to the greatest feature of the globe. The old instinctive idea of symmetry must also have suggested other *oekumene* balancing the known one in the other quarters of the globe. The Stoic philosophers, especially Crates of Mallus, arguing from the love of nature for life, placed an *oekumene* in each quarter of the sphere, the three unknown worlds standing for those of the Antoeci, Perioeci and Antipodes. This was a theory not only attractive to the philosophical mind, but eminently adapted to promote exploration. It had its opponents, however, for Herodotus showed that sea-basins existed cut off from the ocean, and it is still a matter of controversy how far the pre-Ptolemaic geographers believed in a water-connexion between the Atlantic and Indian oceans. It is quite clear that Pomponius Mela (*c.* A.D. 40), following Strabo, held that the southern temperate zone contained a habitable land, which he designated by the name *Antichthones*.

Problem of the Antipodes.

Aristotle left no work on geography, so that it is impossible to know what facts he associated with the science of the earth's surface. The word geography did not appear before Aristotle, the first author of it being in the *Iliad* appears, which in one of the writings doubtfully ascribed to him, and H. Berger considers that the expression was introduced by Eratosthenes.[4] Aristotle was certainly conversant with many facts, such as the formation of deltas, coast-erosion, and to a certain extent the dependence of plants and animals on their physical surroundings. He formed a comprehensive theory of the variations of climate with latitude and season, and was convinced of the necessity of a circulation of water between the sea and rivers, though, like Plato, he held that this took place by water rising from the sea through crevices in the rocks, losing its dissolved salts in the process. He speculated on the differences in the character of races of mankind living in different climates, and correlated the political forms of communities with their situation on a seashore, or in the neighbourhood of natural strongholds.

Aristotle's geographical views.

Strabo (*c.* 50 B.C.–A.D. 24) followed Eratosthenes rather than Aristotle, but with sympathies which went out more to the human interests than the mathematical basis of geography. He compiled a very remarkable work dealing, in large measure from personal travel, with the countries surrounding the Mediterranean. He may be said to have set the pattern which was followed in succeeding ages by the compilers of "political geographies"

Strabo.

[1] A concise sketch of the whole history of geographical method or theory as distinguished from the history of geographical discovery (see latter section of this article) is only to be found in the introduction to H. Wagner's *Lehrbuch der Geographie*, vol. i. (Leipzig, 1900), which is in every way the most complete treatise on the principles of geography.

[2] *History of Ancient Geography* (Cambridge, 1897), p. 70.

[3] See J. L. Myres, "An Attempt to reconstruct the Maps used by Herodotus," *Geographical Journal*, viii. (1896), p. 605.

[4] *Geschichte der wissenschaftlichen Erdkunde der Griechen* (Leipzig, 1891), Abt. 3, p. 60.

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dealing less with theories than with facts, and illustrating rather than formulating the principles of the science.

Claudius Ptolemaeus (*c.* A.D. 150) concentrated in his writings the final outcome of all Greek geographical learning, and passed it across the gulf of the middle ages by the hands of the Arabs, to form the starting-point of the science in modern times. His geography was based more immediately on the work of his predecessor, Marinus of Tyre, and on that of Hipparchus, the follower and critic of Eratosthenes. It was the ambition of Ptolemy to describe and represent the whole surface of the *oikoumene*, for which purpose he took immense trouble to collect all existing determinations of the latitude of places, all estimates of longitude, and to make every possible rectification in the estimates of distances by land or sea. His work was mainly cartographical in its aim, and theory was as far as possible excluded. The symmetrically placed hypothetical islands in the great continuous ocean disappeared, and the *oekumene* acquired a new form by the representation of the Indian Ocean as a larger Mediterranean completely cut off by land from the Atlantic. The *terra incognita* uniting Africa and Farther Asia was an unfortunate hypothesis which helped to retard exploration. Ptolemy used the word *geography* to signify the description of the whole *oekumene* on mathematical principles, while *chorography* signified the fuller description of a particular region, and *topography* the very detailed description of a smaller locality. He introduced the simile that geography represented an artist's sketch of a whole portrait, while chorography corresponded to the careful and detailed drawing of an eye or ear.[1] **Ptolemy.**

The Caliph al-Mamūn (*c.* A.D. 815), the son and successor of Hārūn al-Rashid, caused an Arabic version of Ptolemy's great astronomical work (*Συντάξις μεγάλη*) to be made, which is known as the *Almagest*, the word being nothing more than the Gr. μεγίστη with the Arabic article *al* prefixed. The geography of Ptolemy was also known and is constantly referred to by Arab writers. The Arab astronomers measured a degree on the plains of Mesopotamia, thereby deducing a fair approximation to the size of the earth. The caliph's librarian, Abu Jafar Muhammad Ben Musa, wrote a geographical work, now unfortunately lost, entitled *Rasm el Arsi* (" A Description of the World "), which is often referred to by subsequent writers as having been composed on the model of that of Ptolemy.

The middle ages saw geographical knowledge die out in Christendom, although it retained, through the Arabic translations of Ptolemy, a certain vitality in Islam. The verbal interpretation of Scripture led Lactantius (*c.* A.D. 320) and other ecclesiastics to denounce the spherical theory of the earth as heretical. The wretched subterfuge of Cosmas (*c.* A.D. 550) to explain the phenomena of the apparent movements of the sun by means of an earth modelled on the plan of the Jewish Tabernacle gave place ultimately to the wheel-map—the T in an O—which reverted to the primitive ignorance of the times of Homer and Hecataeus.[2] **Geography in the middle ages.**

The journey of Marco Polo, the increasing trade to the East and the voyages of the Arabs in the Indian Ocean prepared the way for the reacceptance of Ptolemy's ideas when the sealed books of the Greek original were translated into Latin by Angelus in 1410.

The old arguments of Aristotle and the old measurements of Ptolemy were used by Toscanelli and Columbus in urging a westward voyage to India; and mainly on this account did the crossing of the Atlantic rank higher in the history of scientific geography than the laborious feeling out of the coast-line of Africa. But not until the voyage of Magellan shook the scales from the eyes of Europe did modern geography begin to advance. Discovery had outrun theory; the rush of new facts made Ptolemy practically obsolete in a generation, after having been the fount and origin of all geography for a millennium. **Revival of geography.**

The earliest evidence of the reincarnation of a sound theoretical geography is to be found in the text-books by Peter Apian and Sebastian Münster. Apian in his *Cosmographicus liber*, published in 1524, and subsequently edited and added to by Gemma Frisius under the title of *Cosmographia*, based the whole science on mathematics and measurement. He followed Ptolemy closely, enlarging on his distinction between geography and chorography, and expressing the artistic analogy in a rough diagram. His slender distinction was made much of by most subsequent writers until Nathanael Carpenter in 1625 pointed out that the difference between geography and chorography was simply one of degree, not of kind. **Apianus.**

Sebastian Münster, on the other hand, in his *Cosmographia universalis* of 1544, paid no regard to the mathematical basis of geography, but, following the model of Strabo, described the world according to its different political divisions, and entered with great zest into the question of the productions of countries, and into the manners and costumes of the various peoples. Thus early commenced the separation between what were long called mathematical and political geography, the one subject appealing mainly to mathematicians, the other to historians. **Münster.**

Throughout the 16th and 17th centuries the rapidly accumulating stores of facts as to the extent, outline and mountain and river systems of the lands of the earth were put in order by the generation of cartographers of which Mercator was the chief; but the writings of Apian and Münster held the field for a hundred years without a serious rival, unless the many annotated editions of Ptolemy might be so considered. Meanwhile the new facts were the subject of original study by philosophers and by practical men without reference to classical traditions. Bacon argued keenly on geographical matters and was a lover of maps, in which he observed and reasoned upon such resemblances as that between the outlines of South America and Africa.

Philip Cluver's *Introductio in geographiam universam tam veterem quam novam* was published in 1624. Geography he defined as "the description of the whole earth, so far as it is known to us." It is distinguished from cosmography by dealing with the earth alone, not with the universe, and from chorography and topography by dealing with the whole earth, not with a country or a place. The first book, of fourteen short chapters, is concerned with the general properties of the globe; the remaining six books treat in considerable detail of the countries of Europe and of the other continents. Each country is described with particular regard to its position as well as to its extent, and the prominence given to the human element is of special interest. **Cluverius.**

A little-known book which appears to have escaped the attention of most writers on the history of modern geography was published at Oxford in 1625 by Nathanael Carpenter, fellow of Exeter College, with the title *Geographie delineated forth in Two Bookes, containing the Sphericall and Topicall parts thereof.* It is discursive in its style and verbose; but, considering the period at which it appeared, it is remarkable for the strong common sense displayed by the author, his comparative freedom from prejudice, and his firm application of the methods of scientific reasoning to the interpretation of phenomena. Basing his work on the principles of Ptolemy, he brings together illustrations from the most recent travellers, and does not hesitate to take as his illustrations examples the familiar city of Oxford and his native county of Devon. He divides geography into *The Spherical Part*, or that for the study of which mathematics alone is required, and *The Topical Part*, or the description of the physical relations of parts of the earth's surface, preferring this division to that favoured by the ancient geographers —into general and special. It is distinguished from other English geographical books of the period by confining attention to the principles of geography, and not describing the countries of the world. **Carpenter.**

A much more important work in the subject of mathematical method is the *Geographia generalis* of Bernhard Varenius, a German medical doctor of Leiden, who died at the age of twenty-eight in 1650, the year of the publication of his book. Although for a time it was lost sight of on the continent, Sir Isaac Newton thought so highly of this book that he prepared an annotated edition which was published in Cambridge in 1672, with the addition of the plates to which had been prepared by Varenius, but not produced by the original publishers. "The reason why this great man took so much care in correcting and publishing our author was, because he thought him necessary to be read by his audience, the young gentlemen of Cambridge, who was delivering lectures on the same subject from the Lucasian Chair." The treatise of Varenius is a model of logical arrangement and terse expression; it is a work of science and of genius; one of the few of that age which can still be studied with profit. The English translation describes its contents thus: "Geography is that part of *mixed mathematics* which explains the state of the earth and of its parts, depending on quantity, viz. its figure, place, magnitude and motion, with the celestial appearances, &c. By some it is taken in too limited a sense, for a bare description of the several countries; and by others too extensively, who along with such a description would have their political constitution.' **Varenius.**

Varenius was reluctant to include the human side of geography in his system, and only allowed it as a concession to custom, and in order to attract readers by imparting interest to the sterner details of the science. His division of geography was into two parts—(i.) General or universal, dealing with the earth in general, and explaining its properties without regard to particular countries; and (ii.) Special or particular, dealing with each country in turn from the chorographical or topographical point of view. General geography was divided into—(1) the *Absolute* part, dealing with the form, dimensions, position and substance of the earth, the distribution of land and water, mountains, woods and deserts, hydrography (including all the waters of the earth) and the atmosphere; (2) the *Relative* part, including the celestial properties, *i.e.* latitude, climate zones, longitude, &c.; and (3) the *Comparative* part, which "considers the

[1] Bunbury's *History of Ancient Geography* (2 vols., London, 1879). Müller's *Geographi Graeci minores* (2 vols., Paris, 1855, 1861) and Berger's *Geschichte der wissenschaftlichen Erdkunde der Griechen* (4 vols., Leipzig, 1887–1893) are standard authorities on the Greek geographers.

[2] The period of the early middle ages is dealt with in Beazley's *Dawn of Modern Geography* (London; part i., 1897; part ii., 1901; part iii., 1906); see also Winstedt, *Cosmos Indicopleustes* (1910).

[3] From translator's preface to the English version by Mr Dugdale (1733), entitled *A Complete System of General Geography*, revised by Dr Peter Shaw (London, 1736).

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particulars arising from comparing one part with another"; but under this head the questions discussed were longitude, the situation and distances of places, and navigation. Varenius does not treat of special geography, but gives a scheme for it under three heads—(1) *Terrestrial*, including position, outline, boundaries, mountains, mines, woods and deserts, waters, fertility and fruits, and living creatures; (2) *Celestial*, including appearance of the heavens and the climate; (3) *Human*, but this was added out of deference to popular usage.

This system of geography founded a new epoch, and the book—translated into English, Dutch and French—was the unchallenged standard for more than a century. The framework was capable of accommodating itself to new facts, and was indeed far in advance of the knowledge of the period. The method included a recognition of the causes and effects of phenomena as well as the mere fact of their occurrence, and for the first time the importance of the vertical relief of the land was fairly recognized.

The physical side of geography continued to be elaborated after Varenius's methods, while the historical side was developed separately. Both branches, although enriched by new facts, remained stationary so far as method is concerned until nearly the end of the 18th century. The compilation of "geography books" by uninstructed writers led to the pernicious habit, which is not yet wholly overcome, of reducing the general or "physical" part to a few pages of concentrated information, and expanding the particular or "political" part by including unrevised travellers' stories and uncritical descriptions of the whole world. Such books were in fact not geography, but merely compressed travel.

The next marked advance in the theory of geography may be taken as the nearly simultaneous studies of the physical earth carried out by the Swedish chemist, Torbern Bergman, acting under the impulse of Linnaeus, and by the German philosopher, Immanuel Kant. Bergman's *Physical Description of the Earth* was published in Swedish in 1766, and translated into English in 1772 and into German in 1774. It is a plain, straightforward description of the globe, and of the various phenomena of the surface, dealing only with definitely ascertained facts in the natural order of their relationships, but avoiding any systematic classification or even definitions of terms. *Bergman.*

The problems of geography had been lightened by the destructive criticism of the French cartographer D'Anville (who had purged the map of the world of the last remnants of traditional fact unverified by modern observations) and rendered richer by the dawn of the new era of scientific travel, which soon brought his logical powers to bear upon them. Kant's lectures on physical geography were delivered in the university of Königsberg from 1765 onwards.[1] Geography appealed to him as a valuable educational discipline, the subject-matter being arranged according to the region they inhabit; (3) *Political geography*, the divisions according to their organized governments; (4) *Mercantile geography*, dealing with the trade in the surplus products of countries; (5) *Theological geography*, or the distribution of religions. There then remains the formal statement of the interaction and causal relation of all the phenomena of distribution on the earth's surface, including the influence of physical geography upon the various activities of mankind from the lowest to the highest. Notwithstanding the clearness of this classification, Kant himself treats mathematical geography as preliminary to, and therefore not dependent on, physical geography. Physical geography itself is divided into two parts: a general, which has to do with the earth and all that belongs to it—water, air and land; and a particular, which deals with special products of the earth—mankind, animals, plants and minerals. Particular importance is given to the vertical relief of the land, on which the various branches of human geography are shown to depend. *Kant.*

Alexander von Humboldt (1769–1859) was the first modern geographer to become a great traveller, and thus to acquire an extensive stock of first-hand information on which an improved system of geography might be founded. The impulse given to the study of natural history by the example of Linnaeus, the results brought back by Sir Joseph Banks, Dr Solander and the two Forsters, who accompanied Cook in his voyages of discovery; the studies of De Saussure in the Alps, and the lists of desiderata in physical geography drawn up by that investigator, combined to prepare the way for Humboldt. The theory of geography was advanced by Humboldt mainly by his insistence on the great principle of the unity of nature. He brought all the "observable things," which the eager collectors of the previous century had been heaping together regardless of order or system, into relation with the physical relief and the horizontal forms of the earth's surface. Thus he demonstrated that the forms of the land exercise a directive and determining influence on climate, plant life, animal life and on man himself. This was no new idea; it had been familiar for centuries in a less definite form, dependent on considerations, and so far as regards the influence of surrounding circumstances upon man, Kant had already given it full expression. Humboldt's concrete illustrations and the remarkable power of his personality enabled him to enforce these principles in a way that produced an immediate and lasting effect. The tremendous physical geography by Mrs Mary Somerville and Sir John Herschel (the latter written for the eighth edition of the *Encyclopaedia Britannica*) showed the effect produced in Great Britain by the stimulus of Humboldt's work. *Humboldt.*

Humboldt's contemporary, Carl Ritter (1779–1859), extended and disseminated the same views, and in his interpretation of "Comparative Geography" he laid stress on the importance of forming conclusions, not from the study of one region by itself, but from the comparison of the phenomena of many places. Impressed by the influence of terrestrial relief and climate on human movements, Ritter was led deeper and deeper into the study of history and archaeology. His monumental *Vergleichende Geographie*, which was to have made the whole theme, died out in a wilderness of detail in twenty-one volumes before it had covered more of the earth's surface than Asia and a portion of Africa. Some of his followers showed a tendency to look on geography rather as an auxiliary to history than as a study of intrinsic worth. *Ritter.*

Humboldt, the rapid development of physical geography many branches of the study of nature, which had been included in the cosmography of the early writers, the physiography of Linnaeus and even the *Erdkunde* of Ritter, had been so much advanced by the labours of specialists that their connexion was apt to be forgotten. Thus geology, meteorology, oceanography and anthropology developed into distinct sciences. The absurd attempt was, and sometimes is still, made by geographers to take all natural science in geography; but it is more common for specialists in the various detailed sciences to think, and sometimes to assert, that the ground of physical geography is now fully occupied by these sciences. Political geography has been too often left to writers both able as a mere summary of guide-book knowledge, useful in the schoolroom, a poor relation of physical geography that it was rarely necessary to recognize. *Geography as a natural science.*

The science of geography, passed on from antiquity by Ptolemy, re-established by Varenius and Newton, and systematized by Kant, included within itself definite aspects of all those terrestrial phenomena which are now treated exhaustively under the heads of geology, meteorology, oceanography and anthropology; and the inclusion of these positive portions of the perfected results of these sciences in geography is simply the gathering in of fruit matured from the seed scattered by geography itself.

The study of geography was advanced by improvements in cartography (see MAP), not only in the methods of survey and projection, but in the representation of the third dimension by means of contour lines introduced by Philippe Buache in 1737, and the more remarkable because less obvious invention of isotherms introduced by Humboldt in 1817.

The "argument from design" had been a favourite form of reasoning amongst Christian theologians, and, as worked out by Paley in his *Natural Theology*, it served the useful purpose of impressing the fitness which exists between all the inhabitants of the earth and their physical environment. It was held that the earth had been created so as to fit the wants of man in every particular. This argument was not only accepted or explicitly worked by almost every writer on the theory of geography, and Carl Ritter distinctly recognized and adopted it as the unifying principle of his system. As a student of nature, however, he did not fail to see, and as professor of geography he always taught, that man was in very large measure conditioned by his physical environment. The apparent opposition of the observed fact to the assigned theory he overcame by looking upon the forms of the land and the arrangement of land and sea as instruments of Divine Providence for guiding the destiny as well as for supplying the requirements of man. This was the central theme of Ritter's philosophy; his religion and his geography were one, and the consequent fervour with which he pursued his mission goes far to account for the immense influence he acquired in Germany. *The teleological argument in geography.*

The evolutionary theory, now the fashion in Kant's "Physical Geography," has, since the writings of Charles Darwin, become the unifying principle in geography. The conception of the development of the plan of the earth from the first cooling of the surface of the planet throughout the long geological periods, the guiding power of environment on the circulation of water and of air, on the distribution of plants and animals, and finally on the movements of man, give to geography a philosophical dignity and a scientific completeness *The theory of evolution in geography.*

[1] Printed in *Schriften zur physischen Geographie*, vol. vi. of Schubert's edition of the collected works of Kant (Leipzig, 1839). First published with notes by Rink in 1802.

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which it never previously possessed. The influence of environment on the organism may not be quite so potent as it was once believed to be, in the writings of Buckle, for instance,[1] and certainly man, the ultimate term in the series, reacts upon and greatly modifies his environment; yet the fact that environment does influence all distributions is established beyond the possibility of doubt. In this way also the position of geography, at the point where physical science meets and mingles with mental science, is explained and justified. The change which took place during the 19th century in the substance and style of geography may be well seen by comparing the eight volumes of Malte-Brun's *Géographie universelle* (Paris, 1812–1829) with the twenty-one volumes of Reclus's *Géographie universelle* (Paris, 1876–1895).

In estimating the influence of recent writers on geography it is usual to assign to Oscar Peschel (1826–1875) the credit of having corrected the preponderance which Ritter gave to the historical element, and of restoring physical geography to its old pre-eminence.[2] As a matter of fact, early in the leading modern exponents of theoretical geography—such as Ferdinand von Richthofen, Hermann Wagner, Friedrich Ratzel, William M. Davis, A. Penck, A. de Lapparent and Elisée Reclus—has his individual point of view, one devoting more attention to the results of geological processes, another to anthropological conditions, and the rest viewing the subject in various blendings of the extreme lights.

The two conceptions which may now be said to animate the theory of geography are the genetic, which depends upon processes of origin, and the morphological, which depends on facts of form and distribution.

Progress of Geographical Discovery

Exploration and geographical discovery must have started from more than one centre, and to deal justly with the matter one ought to treat of these separately in the early ages before the whole civilized world was bound together by the bonds of modern intercommunication. At the least there should be some consideration of four separate systems of discovery—the Eastern, in which Chinese and Japanese explorers acquired knowledge of the geography of Asia, and felt their way towards Europe and America; the Western, in which the dominant races of the Mexican and South American plateaus extended their knowledge of the American continent before Columbus; the Polynesian, in which the conquering races of the Pacific Islands found their way from group to group; and the Mediterranean. For some of these we have on certain information, and regarding others the tales narrated in the early records are so hard to reconcile with present knowledge that they are better fitted to be the battle-ground of scholars championing rival theories than the basis of definite history. So it has come about that the only practicable history of geographical exploration starts from the Mediterranean centre, the first home of that civilization which has come to be known as European, though its field of activity has long since overspread the habitable land of both temperate zones, eastern Asia alone in part excepted.

From all centres the leading motives of exploration were probably the same—commercial intercourse, warlike operations, whether resulting in conquest or in flight, religious zeal expressed in pilgrimages or missionary journeys, the love of adventure, the avoidance of persecution, and, more particularly in later years, the advancement of knowledge for its own sake. At different times one or the other motive predominated.

Before the 14th century B.C. the warrior kings of Egypt had carried the power of their arms southward from the delta of the Nile well-nigh to its source, and eastward to the confines of Assyria. The hieroglyphic inscriptions of Egypt and the cuneiform inscriptions of Assyria are rich in records of the conquests and achievements of armies, the conquest of towns and the subjugation of peoples; but though many of the recorded sites have been identified, their discovery by wandering armies was isolated from their subsequent history and need not concern us here.

The Phoenicians.

The Phoenicians are the earliest Mediterranean people in the consecutive chain of geographical discovery which joins prehistoric time with the present. From Sidon, and later from its more famous rival Tyre, the merchant adventurers of Phoenicia explored and colonized the coasts of the Mediterranean and fared forth into the ocean beyond. They traded also on the Red sea, and opened up regular traffic with India as well as with the ports of the south and west, so that it was natural for Solomon to employ the merchant navies of Tyre in his overseas trade. The western emporium known in the scriptures as Tarshish was probably situated in the south of Spain, possibly at Cadiz, although some writers contend that it was Carthage in North Africa. Still more diversity of opinion prevails as to the southern gold-exporting port of Ophir, which some scholars place in Arabia, others at one or another point on the east coast of Africa. Whether associated with the exploitation of Ophir (*q.v.*) or not the first great voyage of African discovery appears to have been accomplished by the Phoenicians sailing the Red sea. Herodotus (himself a notable traveller in the 5th century B.C.) relates that the Egyptian king Necho of the XXVIth Dynasty (*c.* 600 B.C.) built a fleet on the Red Sea, and confided it to Phoenician sailors with the orders to sail southward and return to Egypt by the Pillars of Hercules and the Mediterranean sea. According to the tradition, which Herodotus quotes sceptically, this was accomplished; but the story is too vague to be accepted as more than a possibility.

The Greeks.

The great Phoenician colony of Carthage, founded before 800 B.C., perpetuated the commercial enterprise of the parent state, and extended the sphere of practical trade to the ocean shores of Africa and Europe. The most celebrated voyage of antiquity undertaken for the express purpose of discovery was that fitted out by the Carthaginian Hanno under the command of Hanno, with the intention of founding new colonies along the west coast of Africa. According to Pliny, the only authority on this point, the period of the voyage was that of the greatest prosperity of Carthage, which may be taken as somewhere between 570 and 480 B.C. The extent of this voyage is doubtful, but it seems probable that the farthest point reached was on the east-running coast which bounds the Gulf of Guinea on the north. Himilco, a contemporary of Hanno, was charged with an exploring expedition along the coast of Iberia northward, and as far as the uncertain references to this voyage can be understood, he seems to have passed the Bay of Biscay and possibly sighted the coast of England.

The maritime power of the Greek communities on the coast of Asia Minor and in the Archipelago began to be a formidable rival to the Phoenician soon after the time of Hanno and Himilco, and peculiar interest attaches to the first recorded Greek voyage beyond the Pillars of Hercules. Pytheas, a navigator of the Phocean colony of Massilia (Marseilles), determined the latitude of that port with considerable precision by the somewhat clumsy method of ascertaining the length of the longest day, and when, about 330 B.C., he set out on exploration to the northward he noted the length of the lands whence came gold, tin and amber, followed this system of ascertaining his position from time to time. If on each occasion he himself made the observations his voyage must have extended over six years; but it is not impossible that he ascertained the approximate length of the longest day in some cases by questioning the natives. Pytheas, whose own narrative is not preserved, coasted the Bay of Biscay, sailed up the English Channel and followed the coast of Britain to its most northerly point. Beyond he heard of the lands whence came gold, tin and amber, followed this system of ascertaining his position from time to time. If on each occasion he himself made the observations his voyage must have extended over six years; but it is not impossible that he ascertained the approximate length of the longest day in some cases by questioning the natives. Pytheas, whose own narrative is not preserved, coasted the Bay of Biscay, sailed up the English Channel and followed the coast of Britain to its most northerly point. Beyond he heard of a land called Thule, if his estimate of the length of the longest day is correct, may have been Shetland, but was possibly Iceland; and from some confused statements as to a sea which could not be sailed through, it has been assumed that Pytheas may have been the first of the Greeks to obtain direct knowledge of the Arctic regions. During this or a second voyage Pytheas entered the Baltic, discovered the coasts where amber is obtained and returned to the Mediterranean. It does not seem that any maritime trade followed these discoveries, and indeed it is doubtful whether his contemporaries accepted the truth of Pytheas's narrative; Strabo four hundred years later certainly did not, but the critical studies of modern scholars have rehabilitated the Massilian explorer.

Alexander the Great.

The Greco-Persian wars had made the remoter parts of Asia Minor familiar to Greece, and the campaigns of Xenophon before the time of Alexander the Great, but the campaigns of that conqueror from 329 to 325 B.C. opened up the greater Asia to the knowledge of Europe. His armies crossed the plains beyond the Caspian, penetrated the wild mountain passes northwest of India, and did not turn back until they had entered on the Indo-Gangetic plain. This was one of the few great epochs of geographical discovery.

The world was henceforth viewed as a very large place stretching far on every side beyond the Midland or Mediterranean Sea, and the land journey of Alexander resulted in a voyage of discovery in the outer ocean from the mouth of the Indus to that of the Tigris, thus opening direct intercourse between Grecian and Hindu civilization. The Greeks who accompanied Alexander described with care the towns and villages, the products and the aspect of the country. The conqueror also intended to open up trade by sea between Europe and India, and the narrative of his general Nearchus records this famous voyage of discovery. The detailed accounts of the chief pilot Onesicritus being lost. At the beginning of October 326 B.C. Nearchus left the Indus with his fleet, and the anchorages sought for each night are carefully recorded. He entered the Persian Gulf, and rejoined Alexander at Susa, when he was ordered to prepare another expedition for the circumnavigation of Arabia. Alexander died at Babylon in 323 B.C., and the fleet was dispersed without making the voyage.

The dynasties founded by Alexander's generals, Seleucus, Antiochus and Ptolemy, encouraged the same spirit of enterprise which their master had fostered, and extended geographical knowledge in several directions. Seleucus Nicator established the Greco-Bactrian empire and continued the intercourse with India. Authentic information respecting the great valley of the Ganges was supplied by Megasthenes, an ambassador sent by Seleucus, who reached the remote city of Patali-putra, the modern Patna.

The Ptolemies in Egypt showed equal anxiety to extend the bounds of geographical knowledge. Ptolemy Euergetes (247–222 B.C.)

[1] *History of Civilisation*, vol. i. (1857).

[2] See H. J. Mackinder in *British Association Report* (Ipswich), 1895, p. 738, for a summary of German opinion, which has been expressed by many writers in a somewhat voluminous literature.

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rendered the greatest service to geography by the protection and encouragement of Eratosthenes, whose labours gave the first approximate knowledge of the true size of the spherical earth. The second Euergetes and his successor Ptolemy Lathyrus (118–115 B.C.) furnished Eudoxus with a fleet to explore the Arabian sea. After two successful voyages, Eudoxus, impressed with the idea that Africa was surrounded by ocean on the south, left the Egyptian service, and proceeded to Cadiz and other Mediterranean centres of trade seeking a patron who would finance an expedition for the purpose of African discovery; and we learn from Strabo that the veteran explorer made at least two voyages southward along the coast of Africa. The Ptolemies continued to send fleets annually from their Red Sea ports of Berenice and Myos Hormus to Arabia, as well as to ports on the coasts of Africa and India.

The Ptolemies.

The Romans did not encourage navigation and commerce with the same ardour as their predecessors; still the luxury of Rome, which gave rise to demands for the varied products of all the countries of the known world, led to an active trade both by ships and caravans. But it was the military genius of Rome, and the ambition for universal empire, which led not only to the discovery, but also to the survey of nearly all Europe, and of large tracts in Asia and Africa. Every new war produced a new survey and itinerary of the countries which were conquered, and added one more to the innumerable roads that led from every quarter of the known world to Rome. In the height of their power the Romans had surveyed and explored all the coasts of the Mediterranean, Italy, Greece, the Balkan Peninsula, Spain, Gaul, western Germany and southern Britain. Africa their empire included Egypt, Carthage, Numidia and Mauritania. In Asia they held Asia Minor and Syria, had sent expeditions into Arabia, and were acquainted with the more distant countries formerly invaded by Alexander, including Persia, Scythia, Bactria and India. Some of this intercourse with India especially led to the extension of geographical knowledge.

The Romans.

Before the Roman legions were sent into a new region to extend the limits of the empire, it was usual to send out exploring expeditions to report as to the nature of the country. It is remarkable that Pliny and Seneca that the emperor Nero sent out two centurions on such a mission towards the source of the Nile (probably about A.D. 60), and that the travellers pushed southwards until they reached vast marshes through which they could not make their way either on foot or in boats. This seems to indicate that they had penetrated to about 9° N. Shortly before A.D. 79 Hippalus took advantage of the regular alternation of the monsoons to make the voyage from the Red Sea to India across the open ocean out of sight of land. Even though this sea-route was known, the author of the *Periplus of the Erythraean Sea*, published after the time of Pliny, recites the old itinerary around the coast of the Arabian Gulf. It was, however, in the reigns of Severus and his immediate successors that Roman intercourse with India was at its height, and from the writings of Pausanias (*c.* 174) it appears that direct communication between Rome and China had already taken place.

After the division of the Roman empire, Constantinople became the last refuge of learning, and long after date; while Alexandria continued to be the emporium whence were imported the commodities of the East. The emperor Justinian (483–565), in whose reign the greatness of the Eastern empire culminated, sent two Nestorian monks to China, who returned with eggs of the silkworm concealed in a hollow cane, and thus silk manufactures were established in the Peloponnesus and the Greek islands. It was also in the reign of Justinian that Cosmas Indicopleustes, an Egyptian merchant, made several voyages, and afterwards composed his *Χριστιανικὴ τοπογραφία* (Christian Topography), containing, in addition to his absurd cosmogony, a tolerable description of India.

The great outburst of Mahommedan conquest in the 7th century was followed by the Arab civilization, having its centres at Bagdad and Cordova, in connexion with which geography again received a share of attention. The works of the ancient Greek geographers were translated into Arabic, and starting with a sound basis of theoretical knowledge, exploration continued to progress. From the 9th to the 13th century intelligent Arab travellers wrote accounts of what they had seen and heard in distant lands. The earliest Arabian traveller whose observations have come down to us is the merchant Sulaiman, who embarked in the Persian Gulf and made several voyages to India and China, in the middle of the 9th century. Abu Zaid also wrote on India, and his work is the most important that we possess before the epoch-making discoveries of Marco Polo. Masudi, a great traveller who knew from personal experience all the countries between Spain and China, and who "saw plains, mountains and seas, the dynasties and peoples, in his *Meadows of Gold*, an abstract made by himself of his larger work *News of the Time*. He died in 956, and was known, from the comprehensiveness of his survey, as the Pliny of the East. Amongst his contemporaries were Istakhri, who travelled through all the Mahommedan countries and wrote his *Book of Climates* in 950, and Ibn Haukal, whose *Book of Roads and Kingdoms*, based on the work of Istakhri, was written in 976. Idrisi, the best known of the Arabian geographical authors, after travelling far and wide in the first half of the 12th century, settled in Sicily, where he wrote a treatise descriptive of an armillary sphere which he had constructed for Roger II., the Norman king, and in this work he incorporated all accessible results of contemporary travel.

The Arabs.

The Northmen of Denmark and Norway, whose piratical adventures were the terror of all the coasts of Europe, and who established themselves in Great Britain and Ireland, in France and Sicily, were also geographical explorers in their rough but practical way during the darkest period of the middle ages. All Northmen were not bent on rapine and plunder; many were peaceful merchants. Alfred the Great, king of the Saxons in England, not only educated his people in the learning of the past ages; he introduced in the geographical works he translated many narratives of the travel of his own time. Thus he placed on record the voyages of the merchant Ulfsten in the Baltic, including particulars of the geography of Germany. And in particular he told of the remarkable voyage of Other, a Norwegian or Helgeland, who was the first authentic Arctic explorer, the first to tell of the rounding of the North Cape and the sight of the midnight sun. This voyage of the middle of the 9th century deserves to be held in happy memory, for it unites the first Norwegian polar explorer with the first English collector of travels. Scandinavian merchants brought the products of India to England and Ireland. From the 8th to the 11th century a commercial route from India passed through Novgorod to the Baltic, and Arabian coins found in Sweden, and particularly in the Island of Gotland, prove how closely the enterprise of the Northmen and of the Arabs intertwined. Five-sixths of these coins preserved at Stockholm were from the mints of the Samanian dynasty, which reigned in Khorasan and Transoxiana from about A.D. 900 to 1000. It was the riches of the East that originally gave importance to the city of Visby in Gotland.

The Northmen.

In the end of the 9th century Iceland was colonized from Norway; and about 985 the intrepid viking, Eric the Red, discovered Greenland, and the indomitable son of his Icelandic countrywomen to settle on its inhospitable shores. His son, Leif Ericsson, and others of his followers were concerned in the discovery of the North American coast (see VINLAND), which, but for the isolation of Iceland from the centres of European awakening, would have had momentous consequences. As a thing of the past, the importance of these discoveries passed unnoticed. The story of two Venetians, Nicolo and Antonio Zeno, who gave a vague account of voyages in the northern seas in the end of the 13th century, is no longer to be accepted as history.

At length the long period of darkness which accompanied and followed the fall of the Roman empire drew to a close in Europe. The Crusades had a favourable influence on the intellectual state of the Western nations. Interesting regions, known only to the scant knowledge of pilgrims, were made the objects of attention and study; while religious zeal, and the hope of gain, combined with motives of mere curiosity, induced several persons to travel by land into remote regions of the East, far beyond the countries to which the operations of the crusaders extended. Among these was Benjamin of Tudela, who set out from Spain in 1160, travelled by land to Constantinople, and having visited India and some of the eastern islands, returned to Europe by way of Egypt after an absence of thirteen years.

Close of the dark ages.

Joannes de Plano Carpini, a Franciscan monk, was the head of one of the missions despatched by Pope Innocent to call the chief and people of the Tatars to a better mind. He reached the headquarters of Batu, on the Volga, in February 1246; after a short stay, went on to the camp of the great khan near Karakorum in central Asia, and returned safely in the autumn of 1247. A few years afterwards, a Fleming named Rubruquis was sent on a similar mission, and had the merit of being the first traveller of this era who gave a correct account of the Caspian Sea. He ascertained that it had no outlet. At nearly the same time Hayton, king of Armenia, made a journey to Karakorum in 1254, by a route far to the north of that followed by Carpini and Rubruquis. He was treated with honour and hospitality, and returned by way of Samarkand and Tabriz, to his own territory. The curious narrative of King Hayton was translated by Klaproth.

Asiatic journeys.

While the republics of Italy, and above all the state of Venice, were engaged in distributing the rich products of India and China, or East over the Western world, it was impossible that motives of curiosity, as well as a desire of commercial advantage, should not be awakened to such a degree as to impel some of the merchants to visit those remote lands. Among these were the brothers Polo, who traded with the East and themselves visited Tartary. The recital of their travels fired the youthful imagination of young Marco Polo, son of Nicolo, and he set out for the court of Kublai Khan, with his father and uncle, in 1265. Marco remained for seventeen years in the service of the Great Khan, and was employed on many important missions. Besides what he learnt from his own observation, he collected much information from others concerning countries which he did not visit. He returned to Europe possessed of a vast store of knowledge respecting the eastern parts of the world, and, being afterwards made a prisoner by the Genoese, he dictated the narrative of his travels during his captivity. The work of Marco Polo is the most valuable narrative of travels that appeared during the middle ages, and despite a cold reception and many denials of the accuracy of the record, its substantial truthfulness has been abundantly proved.

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Missionaries continued to do useful geographical work. Among them were John of Monte Corvino, a Franciscan monk, Andrew of Perugia, John Marignioli and Friar Jordanus, who visited the west coast of India, and above all Friar Odoric of Pordenone. Odoric set out on his travels about 1318, and his journeys embraced parts of India, the Malay Archipelago, China and even Tibet, where he was the first European to enter Lhasa, not yet a forbidden city.

Ibn Batuta, the great Arab traveller, is separated by a wide space of time from his countrymen already mentioned, and he finds his proper place in a chronological notice after the days of Marco Polo, for he did not begin his wanderings until 1325, his career thus coinciding in time with the fabled journeyings of Sir John Mandeville. While Arab learning flourished during the darkest ages of European ignorance, the last of the Arab geographers lived to see the dawn of the great period of the European awakening. Ibn Batuta went by land from Tangier to Cairo, then visited Syria, and performed the pilgrimages to Medina and Mecca. After exploring Persia, and again residing for some time at Mecca, he made a voyage down the Red sea to Yemen, and travelled inland to that country to Aden. Thence he visited the African coast, touching at Mombasa and Quiloa, and then sailed across to Ormuz and the Persian Gulf. He crossed Arabia from Bahrein to Jidda, traversed the Red sea and the desert to Syene, and descended the Nile to Cairo. After this he revisited Syria and Asia Minor, and crossed the Black sea, the desert from Astrakhan to Bokhara, and the Hindu Kush. He was in the service of Muhammad Tughluk, ruler of Delhi, about eight years, and was sent on an embassy to China, in the course of which the ambassadors sailed down the west coast of India to Calicut, and then visited the Maldive Islands and Ceylon. Ibn Batuta made the voyage through the Malay Archipelago to China, and on his return he proceeded from Malatiar to Bagdad and Damascus, ultimately reaching Fez, the capital of the native country of Mooverdeen, in 1349. His journey into Spain he set out once more for Central Africa in 1352, and reached Timbuktu and the Niger, returning to Fez in 1353. His narrative was committed to writing from his dictation.

The European country which became the most completely under the influence of Arab culture now began to send forth explorers to distant lands, though the impulse came not from the Moors but from Italian merchant navigators in Spanish service. The peaceful rule of Henry IV. of Castile is famous for the attempts of that prince to extend the diplomatic relations of Spain to the remotest parts of the earth. He sent embassies to all the princes of Christendom and to the Moors. In 1403 he despatched a knight of Madrid, Ruy Gonzalez de Clavijo, to the distant court of Timur, at Samarkand. He returned in 1406, and wrote a valuable narrative of his travels. *Spanish explorations.*

Italians continued to make important journeys in the East during the 15th century. Among them was Nicolo Conti, who passed through Persia, sailed along the coast of Malabar, visited Sumatra, Java and the south of China, returned by the Red sea, and got home to Venice in 1444 after an absence of twenty-five years. He related his adventures to Poggio Bracciolini, secretary to Pope Eugenius IV.; and the narrative contains much interesting information. One of the most remarkable of the Italian travellers was Ludovico di Varthema, who left his native land in 1502. He went to Egypt and Syria, and for the sake of visiting the holy cities became a Mahomedan. He was the first European who gained a knowledge of the interior of Yemen. He afterwards visited and described many places in Persia, India and the Malay Archipelago, returning to Europe in a Portuguese ship after an absence of five years.

In the 15th century the time was approaching when the discovery of the Cape of Good Hope was to widen the scope of geographical enterprise. This great event was preceded by the general utilization in Europe of the polarity of the magnetic needle in the construction of the mariner's compass. Portugal took the lead along this new path, and foremost among her pioneers stands Prince Henry the Navigator (1394–1460), who was a patron both of exploration and of the study of geographical theory. The great westward projection of the coast of Africa, and the islands to the north-west of that continent, were the principal scene of the work of the mariners sent out at his expense; but his object was to push onward and reach India from the Atlantic. The progress of discovery received a check on his death, but only for a time. In 1462 Pedro de Cintra extended Portuguese exploration along the African coast and discovered Sierra Leone. Fernan Gomez followed in 1469, and opened trade with the Gold Coast; and in 1484 Diogo Cão discovered the mouth of the Congo. The king of Portugal next despatched Bartolomeu Diaz in 1486 to continue discoveries southwards; while, in the following year, he sent Pedro de Covilhão and Affonso de Payva to discover the country of Prester John. Diaz succeeded in rounding the southern point of Africa, which he named Cabo Tormentoso—the Cape of Storms—but King João II., foreseeing the realization of the long-sought passage to India, gave it the stimulating and enduring name of the Cape of Good Hope. Payva died at Cairo; but Covilhão, having heard that a Christian ruler reigned in the mountains of Ethiopia, penetrated into Abyssinia in 1490. He delivered the letter which João II. had addressed to Prester John to the Negus Alexander of Abyssinia, but he was detained by that prince and never allowed to leave the country. *Portuguese exploration—Prince Henry the Navigator.*

The Portuguese, following the lead of Prince Henry, continued to look for the road to India by the Cape of Good Hope. The same end was sought by Christopher Columbus, following the suggestion of Toscanelli, and under-estimating the diameter of the globe, by sailing due west. The voyages of Columbus (1492–1502) resulted in the discovery of West Indies and North America which barred the way to the Far East. In 1493 the pope, Alexander VI., issued a bull instituting the famous "line of demarcation" running from N. to S. 100 leagues W. of the Azores, to the west of which the Spaniards were authorized to explore and to the east of which the Portuguese received the monopoly of discovery. The direct line of Portuguese exploration resulted in the discovery of the Cape route to India by Vasco da Gama (1498), and in 1500 to the independent discovery of South America by Pedro Alvarez Cabral. The voyages of Columbus and of Vasco da Gama were so important that it is unnecessary to detail their results in this place. See COLUMBUS, CHRISTOPHER; GAMA, VASCO DA. *Columbus.*

The three voyages of Vasco da Gama (who died on the scene of his labours, at Cochin, in 1524) revolutionized the commerce of the East. Until then the Venetians held the carrying trade of India, which was brought by the Persian Gulf and Red sea into Syria and Egypt, the Venetians receiving the products of the East at Alexandria and Beirut and distributing them over Europe. This commerce was a great source of wealth to Venice; but after the discovery of the new passage round the Cape, and the conquests of the Portuguese, the trade of the East passed into other hands. *Vasco da Gama.*

The discoveries of Columbus awakened a spirit of enterprise in Spain which continued in full force for a century; adventurers flocked eagerly across the Atlantic, and discovery followed discovery in rapid succession. Many of the companions of Columbus continued his work. Vicente Yañez Pinzon in 1500 reached the mouth of the Amazon. In the same year Alonso de Ojeda, accompanied by Juan de la Cosa, from whose maps we learn much of the discoveries of the 16th century navigators, and by a Florentine named Amerigo Vespucci, touched the coast of South America somewhere near Surinam, following the shore as far as the Gulf of Maracaibo. Vespucci afterwards made three voyages to the Brazilian coast; and in 1504 he wrote an account of his first two voyages, which was widely circulated, and gave the means of procuring for its author at the hands of the cartographer Waldseemüller in 1507 the disproportionate distinction of giving his name to the whole continent. In 1508 Alonso de Ojeda obtained the government of the coast of South America from Cabo de la Vela to the Gulf of Darien; Ojeda landed at Cartagena in 1510, and sustained a defeat from the natives, in which his lieutenant, Juan de la Cosa, was killed. After another reverse on the east side of the Gulf of Darien Ojeda returned to Hispaniola and died there. The Spaniards in the Gulf of Darien were left by Ojeda under the command of Francisco Pizarro, the future conqueror of Peru. After suffering much from famine and disease, Pizarro resolved to leave, and embarked the survivors in small vessels, but outside the harbour they met a ship which proved to be that of Martin Fernandez de Enciso, Ojeda's partner, coming with provisions and reinforcements. One of the crew of Enciso's ship, Vasco Nuñez de Balboa, the future discoverer of the Pacific Ocean, induced his commander to form a settlement on the other side of the Gulf of Darien. The soldiers became discontented and deposed Enciso, who was a man of learning and an accomplished cosmographer. His work *Suma de Geografia*, which was printed in 1519, is the first Spanish book which gives an account of America. Vasco Nuñez, the new commander, returned upon a career of conquest in the neighbourhood of Darien, which ended in the discovery of the Pacific Ocean on the 25th of September 1513. Vasco Nuñez was beheaded in 1517 by Pedrarias de Avila, who was sent out to supersede him. This was one of the greatest calamities that could have happened to South America; for the discoverer of the South sea was on the point of sailing with a little fleet into his unknown ocean, and a humane and judicious man would probably have been the conqueror of Peru, instead of the cruel and ignorant Pizarro. In the year 1519 Panama was founded by Pedrarias; and the conquest of Peru by Pizarro followed a few years afterwards. Hernan Cortes overran and conquered Mexico from 1518 to 1521, and the discovery and conquest of Guatemala by Alvarado, the invasion of Florida by De Soto, and of Nueva Granada by Quesada, followed in rapid succession. The first detailed account of the west coast of South America was written by a keenly observant old soldier, Pedro de Cieza de Leon, who was travelling in South America from 1533 to 1550, and published his story at Seville in 1553. *Spaniards in America.*

The great desire of the Spanish government at that time was to find a westward route to the Moluccas. For this purpose Juan Diaz de Solis was despatched in October 1515, and in January 1516 he discovered the mouth of the Rio de la Plata. He was, however, killed by the natives, and his ships returned. In the following year the Portuguese Ferdinando Magalhães, familiarly known as Magellan, laid before Charles V., at Valladolid, a scheme for reaching the Spice Islands by sailing westward. He started on the 21st of September 1519, entered the strait which now bears his name in October 1520, worked his way through between Patagonia and Tierra del Fuego, and entered on *Pacific Ocean.*

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the vast Pacific which he crossed without sighting any of its innumerable island groups. This was unquestionably the greatest of the voyages which followed from the impulse of Prince Henry, and it was rendered possible only by the magnificent courage of the commander in spite of rebellion, mutiny and starvation. It was the 6th of March 1521 when he reached the Ladrone Islands. Thence Magellan proceeded to the Philippines, and there his career ended in an unimportant encounter with hostile natives. Eventually a Biscayan named Sebastian del Cano, sailing home by way of the Cape of Good Hope, reached San Lucar in command of the "Victoria" on the 6th of September 1522, with eighteen survivors; this one ship of the squadron which sailed on the quest succeeded in accomplishing the first circumnavigation of the globe. Del Cano was received with great distinction by the emperor, who granted him a globe for his crest, and the motto *Primus circumdedisti me.*

Portuguese in Africa and the East.

While the Spaniards were circumnavigating the world and completing their knowledge of the coasts of Central and South America, the Portuguese were actively engaged on similar work as regards Africa and the East Indies.

With Abyssinia the mission of Covilhão led to further intercourse. In April 1520 Vasco da Gama, as viceroy of the Indies, took a fleet into the Red sea, and landed an embassy consisting of Dom Rodriguez de Lima and Father Francisco Alvarez, a priest whose detailed narrative is the earliest and not the least interesting account we possess of Abyssinia. It was not until 1526 that the embassy was dismissed; and not many years afterwards the negus entreated the help of the Portuguese against Mahommedan invaders, and the viceroy sent an expeditionary force, commanded by his brother Cristoforo da Gama, with 450 musketeers. Da Gama was taken prisoner and killed, but his followers enabled the Christians of Abyssinia to regain their power, and a Jesuit mission remained in the country. The Portuguese also established a close connexion with the kingdom of Congo on the west side of Africa, and obtained much information respecting the interior of the continent. Duarte Lopez, a Portuguese settled in the country, was sent on a mission to Rome by the king of Congo, and Pope Sixtus V. caused him to recount to his chamberlain, Felipe Pigafetta, all he had learned during the nine years he had been in Africa, from 1578 to 1587. This narrative, under the title of *Description of the Kingdom of Congo*, was published at Rome by Pigafetta in 1591. A map was attached on which several great equatorial lakes are shown, and the empire of Monomwezi or Unyamwezi is laid down. The most valuable work on Africa about this time is, however, that written by the Moor Leo Africanus in the early part of the 16th century. Leo travelled extensively in the north and west of Africa, and was eventually taken by pirates and sold to a master who presented him to Pope Leo X. At the pope's desire he translated his work on Africa into Italian.

In Further India and the Malay Archipelago the Portuguese acquired predominating influence at sea, establishing factories on the Malabar coast, in the Persian Gulf, at Malacca, and in the Spice Islands, and extending their commercial enterprises from the Red sea to China. Their missionaries were received at the court of Akbar, and Benedict Goes, a native of the Azores, was despatched on a journey overland from Agra to China. He started in 1603, and, after traversing the least known parts of Central Asia, he reached the confines of China. He appears to have ascended from Kabul to the plateau of the Pamir, and thence onwards by Yarkand, Khotan and Aksu. He died on the journey in March 1607; and thus, as one of the brethren pronounced his epitaph, "seeking Cathay he found heaven."

The activity and love of adventure, which became a passion for two or three generations in Spain and Portugal, spread to other countries. In the spirit of the age; and England, Holland and France were fired by it. English enterprise was first aroused by John and Sebastian Cabot, father and son, who came from Venice and settled at Bristol in the time of Henry VII. The Cabots received a patent in 1496, empowering them to seek unknown lands; and John Cabot discovered Newfoundland and part of the coast of America. Sebastian afterwards made a voyage to Rio de la Plata in the service of Spain, but he returned to England in 1548 and received a pension from Edward VI. At his suggestion a voyage was undertaken for the discovery of a north-east passage to Cathay, with Sir Hugh Willoughby as captain-general of the fleet and Richard Chancellor as pilot-major. They sailed in May 1553, but Willoughby and all his crew perished on the Lapland coast. Chancellor, however, was more fortunate. He reached the White Sea, performed the journey overland to Moscow, where he was well received, and may be said to have been the founder of the trade between Russia and England. He returned to Archangel and brought his ship back in safety to England. On a second voyage, in 1556, Chancellor was drowned; and three subsequent voyages, led by Stephen Burrough, Arthur Pet and Charles Jackman, in small craft of 50 tons and under, carried on an examination of the straits which lead into the Kara sea.

English, Dutch and French.

The French followed closely on the track of John Cabot, and Norman and Breton fishermen frequented the banks of Newfoundland at the beginning of the 16th century. In 1523 Francis I. sent Giovanni da Verazzano of Florence on an expedition of discovery to the coast of North America; and the details of his voyage were embodied in a letter addressed by him to the king of France from Dieppe, in July 1524. In 1534 Jacques Cartier set out to continue the discoveries of Verazzano, and visited Newfoundland and the Gulf of St Lawrence. In the following year he made another voyage, discovered the island of Anticosti, and ascended the St Lawrence to Hochelaga, now Montreal. He returned, after passing two winters in Canada; and on another occasion he also failed to establish a colony. Admiral de Coligny made several unsuccessful endeavours to form a colony in Florida under Jean Ribault of Dieppe, René de Laudonnière and others, but the settlers were furiously assailed by the Spaniards and the attempt was abandoned.

The Elizabethan era.

The reign of Elizabeth is famous for the gallant enterprises that were undertaken by sea and land to discover and bring to light the unknown parts of the earth. The great promoter of geographical discovery in the Elizabethan period was Richard Hakluyt (1553–1616), who was active in the formation of the two companies for colonizing Virginia in 1606; and devoted his life to encouraging and recording similar undertakings. He published much, and left many valuable papers at his death, most of which, together with many other narratives, were published in 1622 in the great work of the Rev. Samuel Purchas, entitled *Hakluytus Posthumus, or Purchas his Pilgrimes.*

It is from these works that our knowledge of the gallant deeds of the English and other explorers of the Elizabethan age is mainly derived. The great and splendidly illustrated collections of voyages and travels of Theodorus de Bry and Hulsius served a similar useful purpose on the continent of Europe. One important object of English maritime adventurers of those days was to discover a route to Cathay by the north-west, a second was to settle Virginia, and a third was to raid the Spanish settlements in the West Indies. Nor was the trade to Muscovy and Turkey neglected; while latterly a resolute and successful attempt was made to establish direct commercial relations with India.

The conception of the north-western route to Cathay now leads the story of exploration, for the first time as far as important and sustained efforts are concerned, towards the Arctic seas. This part of the subject is fully told under the heading of Arctic Regions, and only the names of Martin Frobisher (1576), John Davis (1585), Henry Hudson (1607) and William Baffin (1616) need be mentioned here in order to preserve the complete conspectus of the history of discovery. The Dutch engaged actively in the search during this period, directing their efforts mainly towards the discovery of a north-east passage round the northern end of Novaya Zemlya; and William Barents or Barendsz (1594–1597) is the most famous name in this connexion, his last voyage along the coast of Novaya Zemlya after losing his ship and wintering in a high latitude, being one of the most remarkable achievements in polar annals.

Many English voyages were also made to Guinea and the West Indies, and twice English vessels followed in the track of Magellan, and circumnavigated the globe. In 1577 Francis Drake, who had previously served with Hawkins in the West Indies, undertook his celebrated voyage round the world. Reaching the Pacific through the Strait of Magellan, Drake proceeded northward along the west coast of America, resolved to attempt the discovery of a northern passage from the Pacific to the Atlantic. The coast from the southern extremity of the Californian peninsula to Cape Mendocino had been discovered by Juan Rodriguez Cabrillo and Francisco de Ulloa in 1539. Drake's discoveries extended from Cape Mendocino to 48° N., in which latitude he gave up his quest, sailed across the Pacific and reached the Philippine Islands, returning home round the Cape of Good Hope in 1580.

Thomas Cavendish, emulous of Drake's example, fitted out three vessels for an expedition to the South sea in 1586. He took the same route as Drake along the west coast of America. From Cape San Lucas Cavendish steered across the Pacific, seeing no land until he reached the Ladrone Islands. He returned to England in 1588. The third English voyage into the Pacific was not so fortunate. Sir Richard Hawkins (1593) on reaching the bay of Atacames, in 1° N. in 1594, was attacked by a Spanish fleet, and, after a desperate naval engagement, was forced to surrender. Hawkins declared his object to be discovery and the survey of unknown lands, and his voyage, though terminating in disaster, bore good fruit. *The Observations of Sir Richard Hawkins in his Voyage into the South Sea*, published in 1622, are very valuable. It was long before another British ship entered the Pacific Ocean. Sir John Narborough took two ships through the Strait of Magellan in 1670 and touched on the coast of Chile, but it was not until 1685 that Dampier sailed over the part of the Pacific where Hawkins met his defeat.

The exploring enterprise of the Spanish nation did not wane after the conquest of Peru and Mexico, and the acquisition of the vast empire of the Indies. It was spurred into renewed activity by the audacity of Sir John Hawkins in the West Indies, and by the appearance of Drake, Cavendish and Richard Hawkins in the Pacific.

In the interior of South America the Spanish conquerors had explored the region of the Andes from the isthmus of Panama to Chile. Pedro de Valdivia in 1540 made an expedition into the country of the Araucanian Indians of Chile, and was the first to

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explore the eastern base of the Andes in what is now Argentine Patagonia. In 1541 Francisco de Orellana discovered the whole course of the Amazon from its source in the Andes to the Atlantic. A second voyage on the Amazon was made in 1561 by the mad pirate Lope de Aguirre; but it was not until 1639 that a full account was written of the great river by Father Cristoval de Acuña, who ascended it from its mouth and reached the city of Quito.

Spaniards in the Pacific.

The voyage of Drake across the Pacific was preceded by that of Alvaro de Mendaña, who was commander of Peru in 1567 to discover the great Antarctic continent which was believed to extend far northward into the South sea, the search for which now became one of the leading motives of exploration. After a voyage of eight months across the Pacific, Mendaña discovered the Solomon Islands; and the expedition returned in safety to Callao. The appearance of Drake on the Peruvian coast led to an expedition being fitted out at Callao, to go in chase of him, under Pedro Sarmiento, the navigator. He sailed from Callao in October 1579, and made a careful survey of the Strait of Magellan, with the object of fortifying that entrance to the South sea. The colony which he afterwards took out from Spain was a complete failure, and is only remembered now from the name of "Port Famine," which Cavendish gave to the site at which he found the starving remnant of Sarmiento's settlers. In June 1595 Mendaña sailed from the coast of Peru in command of a second expedition to colonize the Solomon Islands. After discovering the Marquesas, he reached the island of Santa Cruz of evil memory, where he and many of the settlers died. His young widow took command of the survivors and brought them safely to Manila. The viceroys of Peru still persevered in their attempts to plant a colony in the hypothetical southern continent. Pedro Fernandez de Quiros, who was pilot under Mendaña and Luis Vaez de Torres, were sent in command of two ships to continue the work of exploration. They sailed from Callao in December 1605, and discovered several islands of the New Hebrides group. They anchored in a bay of a large island which Quiros named "Australia del Espiritu Santo." From this place Quiros returned to America, but Torres continued the voyage, passed through the strait between Australia and New Guinea which bears his name, and explored and mapped the southern and eastern coasts of New Guinea.

The Portuguese, in the early part of the 17th century (1578–1640), were under the dominion of Spain, and their enterprise was to some extent damped; but their missionaries rendered considerable service to knowledge in Africa. Father Francisco Paez acquired great influence in Abyssinia, and explored its highlands from 1600 to 1622. Fathers Mendez and Lobo traversed the deserts between the coast of the Red sea and the mountains, became acquainted with Lake Tsana, and discovered the sources of the Blue Nile in 1624–1633.

Rivalry in the East.

But the attention of the Portuguese was mainly devoted to vain attempts to maintain their monopoly of the trade of India against the powerful rivalry of the English and Dutch. The English enterprise was extensive, continuous and successful. James Lancaster made a voyage to the Indian Ocean from 1591 to 1594; and in 1599 the merchants and adventurers of London resolved to form a company, with the object of establishing a trade with the East Indies. On the 31st of December the 1599 Queen Elizabeth granted the charter of incorporation to the East India Company, and Sir James Lancaster, one of the directors, was appointed general of their first fleet. He was accompanied by John Davis, the great Arctic navigator, as pilot-major. The voyage was eminently successful. The ships touched at Achin in Sumatra and at Java, returning with full ladings of pepper in 1603. The second voyage was commanded by Sir Henry Middleton; but it was in the third voyage, under Captain Hawkins, that the mainland of India was first reached in 1607. Captain Hawkins landed at Surat and travelled overland to Agra, passing some time at the court of the Great Mogul. In the voyage of Sir Edward Michelborne in 1605, John Davis lost his life in a fight with a Japanese junk. The eighth voyage, led by Captain Saris, extended the operations of the company to Japan; and in 1613 the Japanese government granted privileges to the company; but the British retired in 1623, giving up their factory. The chief result of this early intercourse between Great Britain and Japan was the publication of a series of letters written by William Adams from 1611 to 1617. From the tenth voyage of the East India Company, commanded by Captain Best, who left England in 1612, dates the establishment of permanent British factories on the coast of India. Captain Best who secured a regular *firman* for trade from the Great Mogul. From that time a fleet was despatched every year, and the company's operations greatly increased geographical knowledge of India and the Eastern Archipelago. British visits to Eastern countries at this time, were not confined to the voyages of the company. Journeys were also made by land, and, among others, the entertaining author of the *Crudities*, Thomas Coryate, of Odcombe in Somersetshire, wandered on foot from France to India, and died (1617) in the company's factory at Surat. In 1561 Anthony Jenkinson arrived in Persia with a letter from Queen Elizabeth to the shah. He travelled through Russia to Bokhara, and returned by the Caspian and Volga. In 1579 Christopher Burroughs built a ship at Nizhniy Novgorod and traded across the Caspian to Baku; and in 1598 Sir Anthony and Robert Shirley arrived in Persia, and Robert was afterwards sent by the shah to Europe as his ambassador. He was followed by a Spanish mission under Garcia de Silva, who wrote an interesting account of his travels; and to Sir Dormer Cotton's mission, in 1628, we are indebted for Sir Thomas Herbert's charming narrative. In like manner Sir Thomas Roe's mission to India resulted not only in a large collection of valuable reports and letters of his own, but also in the detailed account of his chaplain Terry. But the most learned and intelligent traveller in the East, during the 17th century, was the German, Engelbrecht Kaempfer, who accompanied an embassy to Persia, in 1684, and was afterwards a surgeon in the service of the Dutch East India Company. He was in the Persian Gulf, India and Java, and resided for more than two years in Japan, of which he wrote a history.

Dutch exploration, 16th–17th centuries.

The Dutch nation, as soon as it was emancipated from Spanish tyranny, displayed an amount of enterprise, which, for a long time, was fully equal to that of the British. The Arctic voyages of Barents were quickly followed by the establishment of a Dutch East India Company; and the Dutch, outing the Portuguese, not only established factories on the mainland of India and in Japan, but acquired a preponderating influence throughout the Malay Archipelago. In 1583 Jan Hugen van Linschoten made a voyage to India with a Portuguese fleet, and his full and graphic descriptions of India, Africa, China and the Malay Archipelago must have been of no small use to his countrymen in their distant voyages. The first of the Dutch Indian voyages was performed by ships which sailed in April 1595, and rounded the Cape of Good Hope. A second large Dutch fleet sailed in 1598; and, so eager was the republic to extend her commerce over the world that another fleet, consisting of five ships of Rotterdam, was sent out in the same year by way of Magellan's Strait. Under Jacob Mahu as admiral, with William Adams as pilot. Mahu died on the passage out, and was succeeded by Simon de Cordes, who was killed on the coast of Chile. In September 1599 the fleet had entered the Pacific. The ships were directed steer for Japan, and anchored off Bungo in April 1600. In the same year, 1598, a third expedition was despatched under Oliver van Noort, a native of Utrecht, but the voyage contributed nothing to geography. The Dutch East India company in 1614 again resolved to send a fleet to the Moluccas by the westward route, and Joris Spilbergen was appointed to the command as admiral, with a commission from the States-General. He was furnished with four ships of Amsterdam, two of Rotterdam and one of Zeeland. On the 6th of July 1615 Spilbergen entered the Pacific Ocean, and touched at several places on the coast of Chile and Peru, defeating the Spanish fleet in a naval engagement off Chilca. After plundering Payta and making requisitions at Acapulco, the Dutch fleet crossed the Pacific and reached the Moluccas in March 1616.

The Dutch now resolved to discover a passage into the Pacific to the south of Tierra del Fuego, the insular nature of which had been ascertained by Sir Francis Drake. The vessels fitted out for this purpose were the "Eendracht," of 360 tons, commanded by Jacob Lemaire, and the "Hoorn," of 110 tons, under Willem Schouten. They sailed from the Texel on the 14th of June 1615, and by the 20th of January 1616 they were south of the entrance of Magellan's Strait. Passing through the strait of Lemaire they came to the southern extremity of Tierra del Fuego, which was named Cape Horn, in honour of the town of Hoorn in West Friesland, of which Schouten was a native. They passed the cape on the 31st of January, encountering the usual westerly winds. The great merit of this discovery of a second passage into the South sea lies in the fact that it was not accidental or unforeseen, but was due to the sagacity of those who designed the voyage. On the 1st of March the Dutch fleet sighted the island of Juan Fernandez; and, having crossed the Pacific, the explorers sailed along the north coast of New Guinea and arrived at the Moluccas on the 17th of September 1616.

There were several early indications of the existence of the great Australian continent, and the Dutch endeavoured to obtain further knowledge concerning the country and its extent; but only its northern and western coasts had been visited before the time of Governor van Diemen. Dirk Hartog had been on the west coast in latitude 25° 30′ S. in 1616. He named the stretch on a reef "Houtman's Abrolhos" on the 4th of June 1629. In 1697 the Dutch captain Vlamingh landed on the west coast of Australia, then called New Holland, in 31° 43′ S., and named the Swan river from the black swans he discovered there. In 1642 the governor and council of Batavia fitted out two ships to prosecute the discovery of the south land, then believed to be part of a vast Antarctic continent, and entrusted the command to Captain Abel Jansen Tasman. This voyage proved to be the most important to geography that had been undertaken since the first circumnavigation of the globe. Tasman sailed from Batavia in 1642, and on the 24th of November sighted high land in 42° 30′ S., which was named van Diemen's Land, and after landing there proceeded to the discovery of the western coast of New Zealand; at first called Staten Land, and supposed to be connected with the Antarctic continent from which this voyage proved New Holland to be separated. He then reached Tongatabu, one of the Friendly Islands of Cook; and returned by the north coast of New Guinea to Batavia. In 1644 Tasman made a second voyage to effect a fuller discovery of New Guinea.

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The French directed their enterprise more in the direction of North America than of the Indies. One of their most distinguished explorers was Samuel Champlain, a captain in the navy, who, after a remarkable journey through Mexico and the West Indies from 1599 to 1602, established his historic connexion with Canada, to the geographical knowledge of which he made a very large addition.

French in North America.

The principles and methods of surveying and position finding had by this time become well advanced, and the most remarkable example of the early application of these improvements is to be found in the survey of China by Jesuit missionaries. They first prepared a map of the country round Pekin, which was submitted to the emperor Kang-hi, and, being satisfied with the accuracy of the European method of surveying, he resolved to have a survey made of the whole empire on the same principles. This great work was begun in July 1708, and the completed maps were presented to the emperor in 1718. The records preserved in each city were examined, topographical information was diligently collected, and the Jesuit fathers checked their triangulation by meridian altitudes of the sun and pole star, and by a system of remeasurements. The result was a more accurate map of China than existed, at that time, of any country in Europe. Kang-hi next ordered a similar map to be made of Tibet, the survey being executed by two lamas who were carefully trained as surveyors by the Jesuits at Peking. From these surveys were constructed the well-known maps which were forwarded to Duhalde, and which D'Anville utilized for his atlas.

Missionaries in the East.

Several European missionaries had previously found their way from India to Tibet. Antonio Andrada, in 1624, was the first European to enter Tibet since the visit of Friar Odoric in 1325. The next journey was that of Fathers Grueber and Dorville about 1660, who succeeded in passing from China, through Tibet, into India. In 1712 Fathers Desideri and Freyre made their way from Agra, across the Himalayas, to Lhasa, and the Capuchin Friar Orazio della Penna resided in that city from 1735 until 1747. But the most remarkable journey in this direction is performed by a lay traveller named Samuel Wood Da Putte. He left Holland in 1718, went by land through Persia to India, and eventually made his way to Lhasa, where he resided for a long time. He went thence to China, returned to Lhasa, and was in India in time to be an eye-witness of the sack of Delhi by Nadir Shah in 1737. In 1743 he left India and died at Batavia on the 27th of September 1745. The premature death of this illustrious traveller is the more to be lamented because his vast knowledge died with him. Two English men-servants of Warren Hastings to Tibet, one led by George Bogle in 1774, and the other by Captain Turner in 1783, complete Tibetan exploration in the 18th century.

The 18th century.

Asia.

From Persia much new information was supplied by Jean Chardin, Jean Tavernier, Charles Hamilton, Jean de Thévenot and Father Jude Krusinski, and by English traders on the Caspian. In 1738 John Elton traded between Astrakhan and the Persian port of Enzell on the Caspian, and undertook to build a fleet for Nadir Shah. Another English merchant, named Jonas Hanway, arrived at Astrabad from Russia, and travelled to the camp of Nadir at Kazvin. One lasting and valuable result of Hanway's wanderings was a charming book of travels. In 1700 Guillaume Delisle published his map of the continents of the Old World; and his nephew, D'Anville produced his map of India in 1752. D'Anville's map contained all that was then known, but ten years afterwards Major Rennell began his surveying labours, which extended over the period from 1763 to 1782. His survey covered an area of 300 m. by 300 wide, from the eastern confines of Bengal to Agra, and from the Himalayas to Calpi. Rennell was indefatigable in collecting geographical information; his Bengal atlas appeared in 1781, his famous map of India in 1788 and the memoir in 1792. Surveys were also made along the Indian coasts.

Arabia received very careful attention, in the 18th century, from the Danish scientific mission, which included Carsten Niebuhr among its members. Niebuhr landed at Loheia, on the coast of Yemen, in December 1762, and went by land to Sana. All the other members of the mission died, but he proceeded from Mokha to Bombay. He then made a journey through Persia and Syria to Constantinople, returning to Copenhagen in 1767. His valuable work, the *Description of Arabia*, was published in 1772, and was followed in 1774–1778 by two volumes of travels in Asia. The great traveller survived until 1815, when he died at the age of eighty-two.

Africa.

James Bruce of Kinnaird, the contemporary of Niebuhr, was equally devoted to Eastern travel, and his principal geographical work was the tracing of the Blue Nile from its source to its junction with the White Nile. Before the death of Bruce an African Association was formed, in 1788, for collecting information respecting the interior of that continent, with Major Rennell and Sir Joseph Banks as leading members. The association first employed John Ledyard (who had previously made an extraordinary journey into Siberia) to cross Africa from east to west on the parallel of the Niger, and William Lucas to cross the Sahara to Fezzan. Lucas went from Tripoli to Mesurata, obtained some information respecting Fezzan and returned in 1789. One of the chief problems the association wished to solve was that of the existence and course of the river Niger, which was believed by some authorities to be identical with the Congo. Mungo Park, then an assistant surgeon of an Indiaman, volunteered his services, which were accepted by the association, and in 1795 he succeeded in reaching the town of Segu on the Niger, but was prevented from continuing his journey to Timbuktu. Five years later he accepted an offer from the government to command an expedition into the interior of Africa, the plan being to cross from the Gambia to the Niger and descend the latter river to the sea. After losing most of his companions he himself and the rest perished in a rapid on the Niger at Busa, having been attacked from the shore by order of a chief who thought he had not received suitable presents. His work, however, had established the fact that the Niger was not identical with the Congo.

While the British were at work in the direction of the Niger, the Portuguese were not unmindful of their old exploring fame. In 1798 Dr F. J. M. de Lacerda, an accomplished astronomer, was appointed to command a scientific expedition of discovery to the north of the Zambesi. He started in July, crossed the Muchenja Mountains, and reached the capital of the Muembe, where he died of fever. Lacerda left a valuable record of his adventurous journey; but with Mungo Park and Lacerda the history of African exploration in the 18th century closes.

In South America scientific exploration was active during this period. The great geographical event of the century, as regards that continent, was the measurement of an arc of the meridian. The undertaking was proposed by the French Academy as part of an investigation with the object of ascertaining the length of the degree near the equator and near the pole respectively so as to determine the figure of the earth. A commission left Paris in 1735, consisting of Charles Marie de la Condamine, Pierre Bouguer, Louis Godin and Joseph de Jussieu (mathematicians), who were accompanied by two naval officers, the brothers Ulloa, as coadjutors. The operations were carried on during eight years on a plain to the south of Quito; and, in addition to his memoir on this memorable measurement, La Condamine collected much valuable geographical information during a voyage down the Amazon. The arc measured was 3° 7′ 3″ in length; and the work consisted of two measured bases connected by a series of triangles, one north and the other south of the equator, on the meridian of Quito. Condamine returned in 1738, Godin, Louis Moreau de Maupertuis, Alexis Claude Clairaut, Charles Etienne Louis Camus, Pierre Charles Lemonnier and the Swedish physicist Celsius measured an arc of the meridian in Lapland.

South America.

The British and French governments launched several expeditions of discovery into the Pacific and round the world during the 18th century. They were preceded by the wonderful and romantic voyages of the buccaneers. The narratives of such men as Woods Rogers, Edward Davis, George Shelvocke, Clipperton and William Dampier, can never fail to interest, while they are not without geographical value. The works of Dampier are especially valuable, and the narratives of William Funnell and Lionel Wafer furnished the best accounts then extant of the Isthmus of Darien. Dampier's literary ability eventually secured for him a commission in the king's service; and he was sent on a voyage of discovery, during which he explored part of the coasts of Australia and New Guinea, and discovered the strait which bears his name between New Guinea and New Britain, returning in 1701. In 1721 Jacob Roggewein was despatched on a voyage of some importance across the Pacific by the Dutch West India Company, during which he discovered Easter Island on the 6th of April 1722.

The Pacific Ocean.

The voyage of Lord Anson to the Pacific in 1740–1744 was of a predatory character, and he lost more than half his men from scurvy; while it is not pleasant to reflect that at the very time when the Spaniards were measuring an arc of the meridian at Quito, the British under Anson were pillaging along the coast of the Pacific and burning the town of Payta. But a romantic interest attaches to the wreck of the "Wager," one of Anson's fleet, on a desolate island near Chiloe, for it bore fruit in the charming narrative of Captain John Byron, which will endure for all time. In 1764 Byron himself was sent on a voyage of discovery round the world, which led immediately after his return to the despatch of another to complete his work, under the command of Captain Samuel Wallis. The expedition, consisting of the "Dolphin" commanded by Wallis, and the "Swallow" under Captain Philip Carteret, sailed in September 1766, but the ships were separated on entering the Pacific from the Strait of Magellan. Wallis discovered Tahiti on the 19th of June 1767, and he gave a detailed account of the island. He returned to England in May 1768. Carteret discovered the Charlotte and Gloucester Islands, and Pitcairn Island on the 2nd of July 1767; revisited the Santa Cruz group, which was discovered by Mendaña and Quiros; and discovered the strait separating New Britain from New Ireland. He reached Spithead again in February 1769. Wallis and Carteret were followed very closely by the French expedition of Bougainville, which sailed from Nantes in November 1766. Bougainville had first to perform the unpleasant task of delivering up the Falkland Islands, where he had encouraged the formation of a French settlement, to the Spaniards. He then entered the Pacific, and reached Tahiti in April 1768. Passing through the New

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Hebrides group he touched at Batavia, and arrived at St Malo after an absence of two years and four months.

The three voyages of Captain James Cook form an era in the history of geographical discovery. In 1767 he sailed for Tahiti, with the object of observing the transit of Venus, accompanied by two naturalists, Sir Joseph Banks and Dr Solander, a pupil of Linnaeus, as well as by two astronomers. The transit was observed on the 3rd of June 1769. After exploring Tahiti and the Society group, Cook spent six months surveying New Zealand, which he discovered to be an island, and the coast of New South Wales from latitude 38° S. to the northern extremity. The belief in a vast Antarctic continent stretching far into the temperate zone had never been abandoned, and was vehemently asserted by Charles Dalrymple, a disappointed candidate nominated by the Royal Society for the command of the Transit expedition of 1769. In 1772 the French explorer Yves Kerguelen de Tremarec had discovered the land that bears his name in the South Indian Ocean, without recognizing it to be an island, and naturally believed it to be part of the southern continent. *Captain Cook.*

Cook's second voyage was mainly intended to settle the question of the existence of such a continent once for all, and to define the limits of any land that might exist in navigable seas towards the Antarctic circle. James Cook at his first attempt reached a south latitude of 57° 15′. On a second cruise from the Society Islands, in 1773, he, first of all men, crossed the Antarctic circle, and was stopped by ice in 71° 10′ S. During the second voyage Cook visited Easter Island, discovered several islands of the New Hebrides and New Caledonia; and on his way home by Cape Horn, in March 1774, he discovered the Sandwich Island group and described South Georgia. He proved conclusively that any southern continent that might exist lay under the polar ice. The third voyage was intended to attempt the passage from the Pacific to the Atlantic by the north-east. The "Resolution" and "Discovery" sailed in 1776, and Cook again took the route by the Cape of Good Hope. On reaching the North American coast, he proceeded northward, fixed the position of the western extremity of America and surveyed Bering Strait. He was stopped by the ice in 70° 41′ N., and named the farthest visible point that he reached shore Icy Cape. Then he visited the Asiatic shore and discovered Cape North. Returning to Hawaii, Cook was murdered by the natives. On the 14th of February 1779, his second, Captain Edward Clerke, took command, and proceeding to Petropavlovsk in the following summer, he again examined the ledge of the ice, but only got as far as 70° 33′ N. The ships returned to England in October 1780.

In 1785 the French government carefully fitted out an expedition of discovery at Brest, which was placed under the command of François La Pérouse, an experienced officer of distinction. After touching at Concepcion in Chile and at Easter Island, La Pérouse proceeded to Hawaii and thence to the coast of California, of which he has given a very interesting account. He then crossed the Pacific to Macao, and in July 1787 proceeded to explore the first Gulf of Tartary and the shores of Sakhalin, remaining some time at Castries Bay, so named after the French minister of marine. Thence he went to the Kurile Islands and Kamchatka, and sailed from the far north down the meridian to the Navigators and Friendly Islands. He was in Botany Bay in January 1788; and sailing thence, the explorer, his ship and crew were never seen again. Their fate was long uncertain. In September 1791 Captain Antoine d'Entrecasteaux sailed from Brest with two vessels to seek for tidings. He visited the New Hebrides, Santa Cruz, New Caledonia and Solomon Islands, and made careful though rough surveys of the Louisiade Archipelago, islands north of New Britain and part of New Guinea. D'Entrecasteaux died on board his ship on the 20th of July 1793, without ascertaining the fate of La Pérouse. Captain Peter Dillon at length ascertained, in 1828, that the ships of La Pérouse had been wrecked on the island of Vanikoro during a hurricane.

The work of Captain Cook bore fruit in many ways. His master, Captain William Bligh, was sent out in "Bounty" to convey bread-fruit plants from Tahiti to the West Indies. He reached Tahiti in October 1788, and in April 1789 a mutiny broke out, and he, with several officers and men, was thrust into an open boat in mid-ocean. During the remarkable voyage that followed, Captain Bligh passed amongst the northern islands of the New Hebrides, which he named the Banks Group, and made several running surveys. He reached England in March 1790. The "Pandora," under Captain Edwards, was sent out in search of the "Bounty" and discovered the islands of Cherry and Mitre, east of the Santa Cruz group, but she was eventually lost on a reef in Torres Strait. In 1796–1797 Captain Wilson, in the missionary ship "Duff," discovered the Gambier and other islands, and rediscovered the islands known to and seen by Quiros, but since called the Duff Group. Another result of Captain Cook's work was the colonization of Australia. On the 18th of January 1788 Admiral Phillip and Captain Hunter arrived in Botany Bay in the "Supply" and "Sirius," followed by six transports, and established a colony at Port Jackson. Surveys were then undertaken in several directions. In 1795 and 1796 Matthew Flinders and George Bass were engaged on exploring work in a small boat called the "Tom Thumb." In 1797 Bass, who had been a surgeon, made an expedition southwards, continued the work of Cook from Ram Head, and explored the strait which bears his name, and in 1798 he and Flinders were surveying on the east coast of Van Diemen's land.

Yet another outcome of Captain Cook's work was the voyage of George Vancouver, who had served as a midshipman in Cook's second and third voyages. The Spaniards under Quadra had begun a survey of north-western America and occupied Nootka Sound, which their government eventually agreed to surrender. Captain Vancouver was sent out to receive the cession, and to survey the coast from Cape Mendocino northwards. He commanded the old "Discovery," and was at work during the seasons of 1792, 1793 and 1794, wintering at Hawaii. Returning home in 1795, he completed his narrative and a valuable series of charts.

The 18th century saw the Arctic coast of North America reached at two points, as well as the first scientific attempt to reach the North Pole. The Hudson Bay Company had been incorporated in 1670, and its servants soon extended their operations over a wide area to the north and west of Canada. In 1741 Captain Christopher Middleton was ordered to solve the question of a passage from Hudson Bay to the westward. Leaving Fort Churchill in July 1742, he discovered the Wager river and Repulse Bay. He was followed by Captain W. Moor in 1746, and Captain Coats in 1751, who examined the Wager inlet to the end. In November 1769 Samuel Hearne was sent by the Hudson Bay Company to discover the sea on the north side of America, but was obliged to return. In February 1770 he set out again from Fort Prince of Wales; but, after great hardships, he was again forced to return to the fort. He started once more in December 1771, and at length reached the Coppermine river, which he surveyed to its mouth, but his observations are unreliable. With the same object Alexander Mackenzie, with a party of Canadians, set out from Fort Chippewyan on the 3rd of June 1789, and descending the great river which now bears the explorer's name reached the Arctic sea. *Arctic regions.*

In February 1773 the Royal Society submitted a proposal to the king for an expedition towards the North Pole. The vessels were fitted out under Captains Constantine Phipps and Skeffington Lutwidge, and the highest latitude reached was 80° 48′ N., but no opening was discovered in the heavy Polar pack. The most important Arctic work in the 18th century was performed by the Russians, for they succeeded in delineating the whole of the northern coast of Siberia. Some of this work was possibly done at a still earlier date. The Cossack Simon Dezhneff is thought to have made a voyage, in the summer of 1648, from the river Kolyma, through Bering Strait (which was rediscovered by Vitus Bering in 1728) to Anadyr. Between 1738 and 1750 Manin and Sterlegoff made their way in small sloops from the mouth of the Yenesei as far north as 75° 15′ N. The land from Taimyr to Cape Chelyuskin, the most northern extremity of Siberia, was surveyed on the only part of ancient exploration by Chelyuskin, who reached the extreme point (77° 34′ N.) in May 1742. To the east of Cape Chelyuskin the Russians encountered greater difficulties. They built small vessels at Yakutsk on the river Lena, and at the mouth, when at length the first expedition was despatched under Lieut. Prontschichev in 1735. He sailed from the mouth of the Lena to the mouth of the Olonek, where he wintered, and on the 1st of September 1736 he got as far as 77° 29′ N., within 5 m. of Cape Chelyuskin. Both he and his young wife died of scurvy, and the vessel returned. A second expedition, under Lieut. Laptyev, started from the Lena in 1739, but encountered masses of drift ice in Chatanga bay, and with this ended the voyages to the westward of the Lena. Several attempts were also made to navigate the sea from the Lena to the Kolyma. In 1736 Lieut. Laptyev sailed, but was stopped by the drift ice in August, and in 1739, during another trial, he reached the mouth of the Indigirka, where he wintered. In the season of 1740 he continued his voyage to the mouth of the Kolyma, wintering at Nishni Kolymsk. In September 1740 Vitus Bering sailed from Okhotsk on a second Arctic voyage with George William Steller on board as naturalist. In June 1741 he named the magnificent peak on the coast of North America Mount St Elias, and discovered the Aleutian Islands. In November the ship was wrecked on Bering Island; and the gallant Dane, worn out with scurvy, died there on the 8th of December 1741. In March 1760 a merchant named Liakhov saw a large herd of reindeer passing from the north to the Siberian coast, which induced him to start in a sledge in the direction whence they came. Thus he reached the New Siberian or Liakhov Islands, and for years afterwards the seekers for fossil ivory resorted to them. The Russian Captain Vassili Chitschakov in 1765 and 1766 made two persevering attempts to penetrate the ice north of Spitsbergen, and reached 80° 30′ N., while Russian parties twice wintered at Bell Sound.

In reviewing the progress of geographical discovery thus far, it has been possible to keep fairly closely to a chronological order. But in the 19th century and after exploring work was so generally and steadily maintained in all directions, and was in so many cases narrowed down from long journeys to detailed surveys within relatively small areas, that it becomes desirable to cover the whole period at one view for certain great divisions of the world. (See AFRICA; ASIA; AUSTRALIA; POLAR REGIONS; &c.) Here, however, may be noticed the development of geographical societies devoted to the encouragement of exploration and research. The first of the existing geographical societies was *Geographical societies.*

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that of Paris, founded in 1825 under the title of La Société de Géographie. The Berlin Geographical Society (Gesellschaft für Erdkunde) is second in order of seniority, having been founded in 1827. The Royal Geographical Society, which was founded in London in 1830, comes third on the list; but it may be viewed as a direct result of the earlier African Association founded in 1788. Sir John Barrow, Sir John Cam Hobhouse (Lord Broughton), Sir Roderick Murchison, Mr Robert Brown and Mr Bartle Frere formed the foundation committee of the Royal Geographical Society, and the first president was Lord Goderich. The action of the society in supplying practical instruction to intending travellers, in astronomy, surveying and the various branches of science useful to collectors, has had much to do with advancement of discovery. Since the war of 1870 many geographical societies have been established on the continent of Europe. At the close of the 19th century there were upwards of 100 such societies in the world, with more than 50,000 members, and over 150 journals were devoted entirely to geographical subjects.[1] The great development of photography has been a notable aid to explorers, not only by placing at their disposal a faithful and ready means of recording the features of a country and the types of inhabitants, but by supplying a method of quick and accurate topographical surveying.

The Principles of Geography

As regards the scope of geography, the order of the various departments and their inter-relation, there is little difference of opinion, and the principles of geography[2] are now generally accepted by modern geographers. The order in which the various subjects are treated in the following sketch is the natural succession from fundamental to dependent facts, which corresponds also to the evolution of the diversities of the earth's crust and of its inhabitants.

Mathematical geography.

The fundamental geographical conceptions are mathematical, the relations of space and form. The figure and dimensions of the earth are the first matters. They are ascertained by a combination of actual measurement of the highest precision on the surface and angular observations of the positions of the heavenly bodies. The science of geodesy is part of mathematical geography, of which the arts of surveying and cartography are applications. The motions of the earth as a planet must be taken into account, as they render possible the determination of position and direction by observations of the heavenly bodies. The diurnal rotation of the earth furnishes two fixed points or poles, the axis joining which is fixed or nearly so in its direction in space. The rotation of the earth thus fixes the directions of north and south and defines those of east and west. The angle which the earth's axis makes with the plane in which the planet revolves round the sun determines the varying seasons of the earth of solar radiation over the surface and the mathematical zones of climate. Another important consequence of rotation is the deviation produced in moving bodies relatively to the surface. In the form known as Ferrell's Law this runs: "A body moves in any direction on the earth's surface, there is a deflecting force which arises from the earth's rotation which tends to deflect it to the right in the northern hemisphere but to the left in the southern hemisphere." The deviation is of importance in the movement of air, of ocean currents, and to some extent of rivers.[3]

Physical geography.

In popular usage the words "physical geography" have come to mean geography viewed from a particular standpoint rather than any special division of the subject. The popular meaning is better conveyed by the word physiography, a term which appears to have been introduced by Lionaeus, and was reinvented as a substitute for the cosmography of the middle ages by Professor Huxley. Although the term has since been limited by some writers to one particular part of the subject, it seems best to maintain the original and literal meaning. In the stricter sense, physical geography is that part of geography which involves the processes of contemporary change in the crust and the circulation of the fluid envelopes. It thus draws upon physics for the explanation of the phenomena with the space-relations of which it is specially concerned. Physical geography naturally falls into three divisions, dealing respectively with the surface of the lithosphere—geomorphology; the hydrosphere—oceanography; and the atmosphere—climatology. All these rest upon the facts of mathematical geography, and the three are so closely inter-related that they cannot be rigidly separated in any discussion.

Geomorphology.

Geomorphology is the part of geography which deals with terrestrial relief, including the submarine as well as the subaerial portions of the crust. The history of the origin of the various forms belongs to geology, and can be completely studied only by geological methods. But the relief of the crust is not a finished piece of sculpture; the forms are for the most part transitional, owing their characteristic outlines to the process by which they are produced; therefore the geographer must, for strictly geographical purposes, take some account of the processes which are now in action modifying the forms of the crust. Opinion still differs as to the extent to which the geographer's work should overlap that of the geologist.

The primary distinction of the forms of the crust is that between elevations and depressions. Granting that the geoid or mean surface of the ocean is a uniform spheroid, the distribution of land and water approximately indicates a division of the surface of the globe into two areas, one of elevation and one of depression. The increasing number of measurements of the height of land in all continents and islands, and the very detailed levellings in those countries which have been thoroughly surveyed, enable the average elevation of the land above sea-level to be fairly estimated, although many vast gaps in accurate knowledge remain, and the estimate is not an exact one. The only part of the sea-bed the configuration of which is at all well known is the zone bordering the coasts where the depth is less than about six fathoms or 200 metres, i.e. those parts which sailors speak of as "in soundings." Actual or projected routes for telegraph cables across the deep sea have also been sounded with extreme accuracy in many cases; but beyond these lines of sounding the vast spaces of the ocean remain unplumbed save for the rare researches of scientific expeditions, such as those of the "Challenger," the "Valdivia," the "Albatross" and the "Scotia." Thus the best approximatio to the average depth of the ocean is little more than a guess, but an expert guess of a large approximation is probable for the features of sub-oceanic relief are so much more uniform than those of the land that a smaller number of fixed points is required to determine them.

Crustal relief.

The greatest element of uncertainty as to the largest features of the relief of the earth's crust is due to the unexplored area in the Arctic region and the larger regions of the Antarctic, of which we know nothing. We know that the earth's surface if unworked by water would exhibit a great region of elevation surrounding the north pole, and extending southwards in three unequal arms which taper to points in the south. A depression surrounds the little-known south polar region in a continuous ring and extends northwards in three main hollows lying between the arms of the elevated area. So far only is it possible to speak with certaiety, but it is permissible to take a few steps into the twilight of dawning knowledge and indicate the chief subdivisions which are likely to be established in the great crust-hollow and the great crust-heap. The boundary between these should obviously be the mean surface of the sphere.

Sir John Murray deduced the mean height of the land of the globe as above 2,250 ft. above sea-level, and the mean depth of the oceans as 2080 fathoms or 12,480 ft. below sea-level.[4] Calculating the area of the land at 55,000,000 sq. m. (or 28·6% of the surface), and that of the oceans as 137,200,000 sq. m. (or 71·4% of the surface), he found that the volume of the land above sea-level was 23,450,000 cub. m., the volume of water below sea-level 323,800,000, and the total volume of the water equal to about $\frac{1}{21}$th of the volume of the whole globe. From these data, as revised by A. Supan,[5] H. R. Mill has calculated the position of mean sphere-level at about 10,000 ft. or 1700 fathoms below sea-level. He showed that an imaginary spheroidal shell, concentric with the earth and cutting the slope between the elevated and depressed areas at the contour-line of 1700 fathoms, would not only leave above it a volume of the crust equal to the volume of the hollow left below it, but would also divide the surface of the earth so that the area of the elevated region was equal to that of the depressed region.[6]

Areas of the crust according to Murray.

A similar observation was made almost simultaneously by Romieux,[7] who further speculated on the equilibrium between the weight of the elevated land mass and that of the total waters of the ocean, and deduced some interesting relations between them. Murray, as the result of his study, divided the earth's surface into three zones—the *continental area* containing all dry land, the *transitional area* including the submarine slopes down to 1000 fathoms, and the *abysmal area* consisting of the floor of the ocean beyond that depth; and Mill proposed to take the line of mean-sphere level, instead of the empirical depth of 1000 fathoms, as the boundary between the transitional and abysmal areas.

An elaborate criticism of all the existing data regarding the volume relations of the vertical relief of the globe was made in 1894 by Professor Hermann Wagner, whose recalculations of volumes

[1] H. Wagner's year-book, *Geographische Jahrbuch*, published at Gotha, is the best systematic record of the progress of geography in all departments; and Haack's *Geographen Kalender*, also published annually at Gotha, gives complete lists of the geographical societies and geographers of the world.

[2] This phrase is old, appearing in one of the earliest English works on geography, William Cuningham's *Cosmographical Glasse containeyng the pleasant Principles of Cosmographie, Geographie, Hydrographie or Navigation* (London, 1559).

[3] See also S. Gunther, *Handbuch der mathematischen Geographie* (Stuttgart, 1890).

[4] "On the Height of the Land and the Depth of the Ocean," *Scot. Geog. Mag.* iv. (1888), p. 1. Estimates had been made previously by Humboldt, De Lapparent, H. Wagner, and subsequently by Peock and Heiderich, and for the oceans by Karstens.

[5] *Petermanns Mitteilungen*, xxv. (1889), p. 17.

[6] *Proc. Roy. Soc. Edin.* xvii. (1890) p. 185.

[7] *Comptes rendus Acad. Sci.* (Paris, 1890), vol. iii. p. 994.

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and mean heights—the best results which have yet been obtained—led to the following conclusions.[1]

Areas of the crust according to Wagner.

The area of the dry land was taken as 28·3% of the surface of the globe, and that of the oceans as 71·7%. The mean height deduced for the land was 2300 ft. above sea-level, the mean depth of the sea 11,500 ft. below, while the position of mean-sphere level comes out as 7500 ft. (1250 fathoms) below sea-level. From this it would appear that 43% of the earth's surface was above and 57% below the mean level. It must be noted, however, that since 1895 the soundings of Nansen in the north polar area, of the "Valdivia," "Belgica," "Gauss" and "Scotia" in the Southern Ocean, and of various surveying ships in the North and South Pacific, have proved that the mean depth of the ocean is considerably greater than had been supposed, and mean-sphere level must therefore lie deeper than the calculations of 1895 show; possibly not far from the position deduced from the freer estimate of 1888. The whole of the available data were utilized by the prince of Monaco in 1903 in the preparation of a complete bathymetrical map of the oceans on a uniform scale, which must long remain the standard work for reference on ocean depths.

By the device of a hypsographic curve co-ordinating the vertical relief and the areas of the earth's surface occupied by each zone of elevation, according to the system introduced by Supan,[2] Wagner showed his results graphically.

This curve with the values reduced from metres to feet is reproduced below.

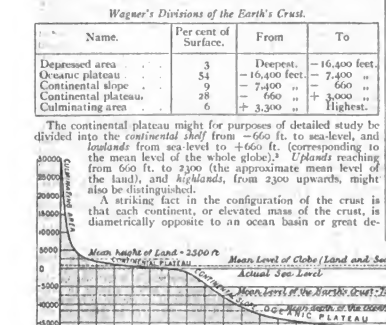
Wagner subdivides the earth's surface, according to elevation, into the following five regions:

Wagner's Divisions of the Earth's Crust.

Name.	Per cent of Surface.	From	To
Depressed area	3	Deepest.	−16,400 feet.
Oceanic plateau	54	−16,400 feet.	− 7,400 „
Continental slope	9	− 7,400 „	− 660 „
Continental plateau.	28	− 660 „	+ 3,000 „
Culminating area	6	+ 3,300 „	Highest.

The continental plateau might for purposes of detailed study be divided into the *continental shelf* from −660 ft. to sea-level, and *lowlands* from sea-level to +660 ft. (corresponding to the mean level of the whole globe).[3] *Uplands* reaching from 660 ft. to 2300 (the approximate mean level of the land), and *highlands*, from 2300 upwards, might also be distinguished.

A striking fact in the configuration of the crust is that each continent, or elevated mass of the crust, is diametrically opposite to an ocean basin or great de-



pression; the only partial exception being in the case of southern South America, which is antipodal to eastern Asia. Professor C. Lapworth has generalized the grand features of crustal relief in a scheme of attractive simplicity. He sees throughout all the chaos of irregular crust-forms the recurrence of a certain harmony, a succession of folds or waves which build up all the minor features.[4] One great series of crust waves from east to west is crossed by a second great series of crust waves from north to south, giving rise by their interference to six great elevated masses (the continents), arranged in three groups, each consisting of a northern and a southern member separated by a minor depression. These elevated masses are divided from one another by similar great depressions.

Arrangement of world-ridges and hollows.

Lapworth's fold-theory.

He says: "The surface of each of our great continental masses of land resembles that of a long and broad arch-like form, of which we see the simplest type in the New World. The surface of the North American arch is sagged downwards in the middle into a central regional hollow, in the cores of which still deeper grooves sink to the profoundest depths. This complementary relationship descends even to the minor features of the two. Where the great continental sag sinks below the ocean floors we have our gulfs and our Mediterraneans, seen in our type continent, as the Mexican Gulf and Hudson Bay. Where the central oceanic buckle attains the water-line we have our oceanic islands, seen in our type ocean, as St Helena and the Azores. Although the apparent crust-waves are neither equal in size nor symmetrical in form, this complementary relationship between them is always discernible. The broad Pacific depression seems to answer to the broad elevation of the Old World—the narrow trough of the Atlantic to the narrow continent of America."

Suess's theory.

The most thorough discussion of the great features of terrestrial relief in the light of their origin is that by Professor E. Suess,[5] who points out that the plan of the earth is the result of two movements of the crust—one, subsidence over wide areas, giving rise to oceanic depressions and leaving the continents protuberant; the other, folding along comparatively narrow belts, giving rise to mountain ranges. This theory of crust blocks dropped by subsidence is opposed to Lapworth's theory of vast crust-folds, but geology is the science which has to decide between them.

Geomorphology is concerned, however, in the suggestions which have been made as to the cause of the distribution of heap and hollow in the larger features of the crust. Élie de Beaumont, in his speculations on the relation between the direction of mountain ranges and their geological age and character, was feeling towards a comprehensive theory of the forms of crustal relief; but his ideas were too geometrical, and his theory that the earth is a spheroid built up on a rhombic dodecahedron, the pentagonal faces of which determined the direction of mountain ranges, could not be proved.[6] The "tetrahedral theory" brought forward by Lowthian Green,[7] that the form of the earth is a spheroid based on a regular tetrahedron, is more servicible, because it accounts for three very interesting facts of the terrestrial plan—(1) the antipodal position of continents and ocean basins; (2) the triangular outline of the continents; and (3) the excess of sea in the southern hemisphere. Recent investigations have recalled attention to the work of Lowthian Green, but the question is still in the controversial stage.[8] The study of tidal strain in the earth's crust by Sir George Darwin has led that physicist to indicate the possibility of the triangular form and southerly direction of the continents being a result of the differential or tidal attraction of the sun and moon. More recently Professor A. E. H. Love has shown that the great features of the relief of the lithosphere may be expressed by spherical harmonics of the first, second and third degrees, and their formation related to gravitational action in a sphere of unequal density.[9]

In any case it is fully recognized that the plan of the earth is so clear as to leave no doubt as to its being due to some general cause which should be capable of detection.

If the level of the sea were to become coincident with the mean level of the lithosphere, there would result one tri-radiate land-mass of nearly uniform outline and one continuous sheet of water

[1] "Areal und mittlere Erhebung der Landflächen sowie der Erdkruste." in Gerland's *Beiträge zur Geophysik*, ii. (1895) p. 667. See also *Nature*, 54 (1896), p. 112.

[2] *Petermanns Mitteilungen*, xxxv. (1889) p. 19.

[3] The areas of the continental shelf and lowlands are approximately equal, and it is an interesting circumstance that, taken as a whole, the actual coast-line comes just midway on the most nearly level belt of the earth's surface, excepting the ocean floor. The configuration of the continental slope has been treated in detail by Nansen in *Scientific Results of Norwegian North Polar Expedition*, vol. iv. (1904), where full references to the literature of the subject will be found.

[4] *British Association Report* (Edinburgh, 1892), p. 699.

[5] *Das Antlitz der Erde* (3 vols., Leipzig, 1885, 1888, 1901). Translated under the editorship of E. de Margerie, with much additional matter, as *La Face de la terre*, vols. i. and ii. (Paris, 1897, 1900), and into English by Dr Hertha Sollas as *The Face of the Earth*, vols. i. and ii. (Oxford, 1904, 1906).

[6] Élie de Beaumont, *Notice sur les systèmes de montagnes* (3 vols., Paris, 1852).

[7] *Vestiges of the Molten Globe* (London, 1875).

[8] See J. W. Gregory, "The Plan of the Earth and its Causes," *Geog. Journal*, xiii. (1899) p. 225; Lord Avebury, *ibid.* xv. (1900) p. 46; Marcel Bertrand, "Déformation tétraédrique de la terre et déplacement du pôle," *Comptes rendus Acad. Sci.* (Paris, 1900), vol. cxxx. p. 430; and A. de Lapparent, *ibid.* p. 614.

[9] See A. E. H. Love, "Gravitational Stability of the Earth," *Phil. Trans.* ser. A. vol. ccvii. (1907) p. 171.

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broken by few islands. The actual position of sea-level lies so near the summit of the crust-heap that the varied relief of the upper portion leads to the formation of a complicated coast-line and a great number of detached portions of land. The hydrosphere is, in fact, continuous and the land is all in insular masses: the largest is the Old World of Europe, Asia and Africa; the next in size, America; the third, possibly, Antarctica; the fourth, Australia; the fifth, Greenland. After this there is a considerable gap before New Guinea, Borneo, Madagascar, Sumatra and the vast multitude of smaller islands descending in size by regular gradations to mere rocks. The contrast between island and mainland was natural enough in the days before the discovery of Australia, and the mainland of the Old World was traditionally divided into three "continents." These "continents," "parts of the earth," or "quarters of the globe," proved to be convenient divisions; America was added as a fourth, and subsequently divided into two, while Australia on its discovery was classed sometimes as a new continent, sometimes merely as an island, sometimes compromisingly as an island-continent, according to individual opinion. The discovery of the insularity of Greenland might again give rise to the argument as to the distinction between island and continent. Although the name of continent was not applied to the large portions of land for any physical reasons, it so happens that there is a certain physical similarity or homology between them which is not shared by the smaller islands or peninsulas.

The continents.

Homology of continents.

The typical continental form is triangular as regards its sea-level outline. The relief of the surface typically includes a central plain, sometimes dipping below sea-level, bounded by lateral highlands or mountain ranges, loftier on one side than on the other, the higher enclosing a plateau shut in by mountains. South America and North America exhibit this type most closely; Eurasia (the land mass of Europe and Asia) comes next, while Africa and Australia are farther removed from the type, and the structure of Antarctica and Greenland is unknown.

If the continuous, unbroken, horizontal extent of land in a continent is termed its *trunk*,[1] and the portions cut up by inlets or channels of the sea into islands and peninsulas the *limbs*, it is possible to compare the continents in an instructive manner.

The following table is from the estimation of Professor H. Wagner,[2] his metric measurements being transposed into British units:

Comparison of the Continents.

	Area total mil. sq. m.	Mean height, feet.	Area trunk, mil. sq. m.	Area peninsulas, mil. sq. m.	Area islands, mil. sq. m.	Area limbs, mil. sq. m.	Area limbs, per cent.
Old World	35·8	2360					
New World	16·2	2230					
Eurasia	20·85	2620	15·42	4·09	1·34	5·43	26
Africa	11·46	2130	11·22	..	0·24	0·24	2·1
North America	9·26	2300	6·92	0·78	1·56	2·34	25
South America	6·84	1970	6·76	0·02	0·06	0·08	1·1
Australia	3·43	1310	2·77	0·16	0·50	0·66	19
Asia	17·02	3120	12·93	3·05	1·04	4·09	24
Europe	3·83	980	2·49	1·04	0·30	1·34	35

The usual classification of islands is into continental and oceanic. The former class includes all those which rise from the continental shelf, or show evidence in the character of their rocks of having at one time been continuous with a neighbouring continent. The latter rise abruptly from the oceanic abysses. Oceanic islands are divided according to their geological character into volcanic islands and those of organic origin, including coral islands. More elaborate subdivision according to structure, origin and position have been proposed.[3] In some cases a piece of land is only an island at high water, and by imperceptible gradation the form passes into a peninsula. The typical peninsula is connected with the mainland by a relatively narrow isthmus; the name is, however, extended to any limb projecting from the trunk of the mainland, even when, as in the Indian peninsula, it is connected by its widest part.

Islands.

Small peninsulas are known as promontories or headlands, and the extremity as a cape. The opposite form, an inlet of the sea, is known when wide as a gulf, bay or bight, according to size and degree of infliction, or as a fjord or ria when long and narrow. It is convenient to employ a specific name for a projection of a coast-line less pronounced than a peninsula, and for an inlet less pronounced than a bay or bight; outcurve and incurve may serve the turn. The varieties of coast-lines were reduced to an exact classification by Richthofen, who grouped them according to the height and slope of the land into cliff-coasts (*Steilküsten*)—narrow beach coasts with cliffs, wide beach coasts with cliffs, and low coasts, subdividing each group according as the coast-line runs parallel to or crosses the line of strike of the mountains, or is not related to mountain structure. A further subdivision depends on the character of the inter-relation of land and sea along the shore producing such types as a fjord-coast, ria-coast or lagoon-coast. This extremely elaborate subdivision may be reduced, as Wagner points out, to three types—the continental coast where the sea comes up to the solid rock-material of the land; the marine coast, which is formed entirely of soft material sorted out by the sea; and the composite coast, in which both forms are combined.

Coasts.

Coast-lines.

On large-scale maps it is necessary to show two coast-lines, one for the highest, the other for the lowest tide; but in small-scale maps a single line is usually wider than is required to represent the whole breadth of the littoral zone. The measurement of a coast-line is difficult, because the length will necessarily be greater when measured on a large-scale map where minute irregularities can be taken into account. It is usual to distinguish between the general coast-line measured from point to point of the headlands disregarding the smaller bays, and the detailed coast-line which takes account of every inflection shown by the map employed, and follows up river entrances to the point where the tidal action ceases. The ratio between these two coast-lines represents the "coastal development" of any region.

Submarine forms.

While the forms of the sea-bed are not yet sufficiently well known to admit of exact classification, they are recognized to be as a rule distinct from the forms of the land, and the importance of using a distinctive terminology is felt. Efforts have been made to arrive at a definite international agreement on this subject, and certain terms suggested by a committee were adopted by the Eighth International Geographical Congress at New York in 1904.[4] The forms of the ocean floor include the "shelf," or shallow sea margin, the "depression," a general term applied to all submarine hollows, and the "elevation." A depression when of great extent is termed a "basin," when it is of a more or less round form with approximately equal diameters, a "trough" when it is wide and elongated with gently sloping borders, and a "trench" when narrow and elongated with steeply sloping borders, one of which rises higher than the other. The extension of a trough or basin penetrating the land or an elevation is termed an "embayment" when wide, and a "gully" when long and narrow; and the deepest part of a depression is termed a "deep." A depression of small extent when steep-sided is termed a "caldron," and a long narrow depression crossing a part of the continental border is termed a "furrow." An elevation of great extent which rises at a very gentle angle from a surrounding depression is termed a "rise," one which is relatively narrow and steep-sided a "ridge," and one which is approximately equal in length and breadth but steep-sided a "plateau," whether it springs direct from a depression or from a rise. An elevation of small extent is distinguished as a "dome" when it is more than 100 fathoms from the surface, a "bank" when it is nearer the surface than 100 fathoms but deeper than 6 fathoms, and a "shoal" when it comes within 6 fathoms of the surface and so becomes a serious danger to shipping. The highest point of an elevation is termed a "height," if it does not form an island or one of the minor forms.

Land forms.

The forms of the dry land are of infinite variety, and have been studied in great detail.[5] From the descriptive or topographical point of view, geometrical form alone should be considered; but the origin and geological structure of land forms must in many cases be taken into account when dealing with the function they exercise in the control of mobile distributions. The geographers who have hitherto given most attention to the forms of the land have been trained as geologists, and consequently there is a general tendency to make origin or structure the basis of classification rather than form alone.

The six elementary land forms.

The fundamental form-elements may be reduced to the six proposed by Professor Penck as the basis of his objective system of classification by form and origin.[6] These may be looked upon as being all derived by various modifications or arrangements of the single form-unit, the *slope* or inclined plane surface. No one form occurs alone, but always in groups grouped together with others in various ways to make up districts, regions and lands of distinctive characters. The form-elements are:

[1] *Rumpf*, in German, the language in which this distinction was first made.

[2] *Lehrbuch der Geographie* (Hanover and Leipzig, 1900), Bd. i. S. 245, 249.

[3] See, for example, F. G. Hahn's *Insel-Studien* (Leipzig, 1883).

[4] See *Geographical Journal*, xxii. (1903) pp. 191–194.

[5] The most important works on the classification of land forms are F. von Richthofen, *Führer für Forschungsreisende* (Berlin, 1886); G. de la Noë and E. de Margerie, *Les Formes du terrain* (Paris, 1888); and above all A. Penck, *Morphologie der Erdoberfläche* (2 vols., Stuttgart, 1894). Compare also A. de Lapparent, *Leçons de géographie physique* (2nd ed., Paris, 1898), and W. M. Davis, *Physical Geography* (Boston, 1899).

[6] "Geomorphologie als genetische Wissenschaft," in *Report of Sixth International Geog. Congress* (London, 1895), p. 735 (English Abstract, p. 748).

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1. The *plain* or gently inclined uniform surface.
2. The *scarp* or steeply inclined slope; this is necessarily of small extent except in the direction of its length.
3. The *valley*, composed of two lateral parallel slopes inclined towards a narrow strip of plain at a lower level which itself slopes downwards in the direction of its length. Many varieties of this fundamental form may be distinguished.
4. The *mount*, composed of a surface falling away on every side from a particular place. This place may either be a point, as in a volcanic cone, or a line, as in a mountain range or ridge of hills.
5. The *hollow* or form produced by a land surface sloping inwards from all sides to a particular lowest place, the converse of a mount.
6. The *cavern* or space entirely surrounded by a land surface.

These forms never occur singly or haphazard over a region, but always in an orderly subordination depending on their mode of origin. The dominant forms result from crustal movements, the subsidiary from secondary reactions during the action of the primitive forms on mobile distributions. The geological structure and the mineral composition of the rocks are often the chief causes determining the character of the land forms of a region. Thus the scenery of a limestone country depends on the solubility and permeability of the rocks, leading to the typical Karst-formations of caverns, swallow-holes and underground stream courses, with the contingent phenomena of dry valleys and natural bridges. A sandy beach or desert owes its character to the mobility of its constituent sand-grains, which are readily drifted and piled up in the form of dunes. A region where volcanic activity has led to the embedding of dykes or bosses of hard rock amongst softer strata produces a plain broken by abrupt and isolated eminences.[1]

Geology and land forms.

It would be impracticable to go fully into the varieties of each specific form; but, partly as an example of modern geographical classification, partly because of the exceptional importance of mountains amongst the features of the land, one exception may be made. The classification of mountains into types has usually had regard rather to geological structure than to external form, so that some geologists would even apply the name of a mountain range to a region not distinguished by relief from the rest of the country if it bear geological evidence of having once been a chain range. Mountain may be described (it cannot be defined) as an elevated region of irregular surface rising comparatively abruptly from lower ground. The actual elevation of a summit above sea-level does not necessarily affect its mountainous character; in gentle relief, for instance, rising a few hundred feet above a tableland, even if at an elevation of say 15,000 ft., could only be called a hill.[2] But it may be said that any abrupt slope of 2000 ft. or more in vertical height may justly be called a mountain, while abrupt slopes of lesser height may be called hills. Existing classifications, however, do not take account of any difference in kind between mountain and hills, although it is common in the German language to speak of *Hügelland*, *Mittelgebirge* and *Hochgebirge* with a definite significance.

Classification of mountains.

The simple classification employed by Professor James Geikie[1] into mountains of accumulation, mountains of elevation and mountains of circumdenudation, is not considered sufficiently thorough by German geographers, who, following Richthofen, generally adopt a classification dependent on six primary divisions, each of which is subdivided. The terms employed, especially for the subdivisions, cannot be easily translated into other languages, and the English equivalents in the following table are only put forward tentatively:—

RICHTHOFEN'S CLASSIFICATION OF MOUNTAINS[4]

I. *Tektonische Gebirge*—Tectonic mountains.
  (*a*) *Bruchgebirge oder Schollengebirge*—Block mountains.
    1. *Einzelne Schollengebirge oder Schollenrandgebirge*—Scarp or tilted block mountains.
      (i.) *Tafelscholle*—Table blocks.
      (ii.) *Abrasionsscholle*—Abraded blocks.
      (iii.) *Transgressionsscholle*—Blocks of unconformable strata.
    2. *Flexurgebirge*—Flexure mountains.
    3. *Horstgebirge*—Symmetrical block mountains.
  (*b*) *Faltungsgebirge*—Fold mountains.
    1. *Homömorphe Faltungsgebirge*—Homomorphic fold mountains.
    2. *Heteromorphe Faltungsgebirge*—Heteromorphic fold mountains.
II. *Rumpfgebirge oder Abrasionsgebirge*—Trunk or abraded mountains.
III. *Ausbruchsgebirge*—Eruptive mountains.
IV. *Aufschüttungsgebirge*—Mountains of accumulation.
V. *Flachboden*—Plateaux.
  (*a*) *Abrasionsplateaux*—Abraded plateaux.
  (*b*) *Marines Flachland*—Plain of marine erosion.
  (*c*) *Schichtungstafelland*—Horizontally stratified tableland.
  (*d*) *Übergusstafelland*—Lava plain.
  (*e*) *Stromflachland*—River plain.
  (*f*) *Flachboden der atmosphärischen Aufschüttung*—Plains of aeolian formation.
VI. *Erosionsgebirge*—Mountains of erosion.

From the morphological point of view it is more important to distinguish the associations of forms, such as the *mountain mass* or group of mountains radiating from a centre, with the valleys furrowing their flanks spreading towards every direction; the *mountain chain* or line of heights, forming a long narrow ridge or series of ridges separated by parallel valleys; the *dissected plateau* or highland, divided into mountains of circumdenudation by a system of deeply-cut valleys; and the *isolated peak*, usually a volcanic cone or a hard rock mass left projecting after the softer strata which embedded it have been worn away (Monadnock of Professor Davis).

Mountain forms.

The geographical distribution of mountains is intimately associated with the great structural lines of the continents of which they form the culminating region. Lofty lines of fold mountains form the "backbones" of America in the Rocky Mountains and the west coast systems, of South America in the Cordillera of the Andes, of Europe in the Pyrenees, Alps, Carpathians and Caucasus, and of Asia in the mountains of Asia Minor, converging on the Pamirs and diverging thence in the Himalaya and the vast mountain systems of central and eastern Asia. The remarkable line of volcanoes around the whole coast of the Pacific and along the margin of the Caribbean and Mediterranean Seas is one of the most conspicuous features of the globe.

Distribution of mountains.

If land forms may be compared to organs, the part they serve in the economy of the earth may, without straining the term, be characterized as functions. The first and simplest function of the land surface is that of guiding loose material to a lower level. The downward pull of gravity suffices to bring about the fall of such material, but the path it will follow and the distance it will travel before coming to rest depend upon the land form. The loose material may, and in an arid region does, consist wholly of portions of the higher parts of the surface detached by the expansion and contraction produced by heating and cooling due to radiation. Such broken material rolling down a uniform scarp would tend to reduce its angle by the loss of material in the upper part and by the accumulation of a mound or scree against the lower part of the slope. But where the side is not a uniform scarp, but made up of a series of ridges and valleys, the tendency will be to distribute the debris in an irregular manner, starting it away from one place and collecting it in great masses in another, so that in time the land form assumes a new appearance. Snow accumulating on the higher portions of the land, when compacted into ice and caused to flow downwards by gravity, gives rise, on account of its more coherent character, to continuous glaciers, which would themselves to the slopes down which they are guided, different ice-streams converging to send forward a greater volume. Gradually coming to occupy definite beds, which are deepened and polished by the friction, they impress a characteristic appearance on the land, which guides them as they traverse it, and, although the ice melts at lower levels, vast quantities of clay and broken stones are brought down and deposited in terminal moraines where the glacier ends.

Functions of land forms.

Land waste.

Glaciers.

Rain is by far the most important of the inorganic mobile distributions upon which land forms exercise their function of guidance and control. The precipitation of rain from the aqueous vapour of the atmosphere is caused in part by vertical movements of the atmosphere involving heat changes and apparently independent of the surface upon which precipitation occurs; but in greater part it is dictated by the form and altitude of the land surface and the direction of the prevailing winds, which itself is largely influenced by the land. It is on the windward faces of the highest ground, or just beyond the summit of less dominant heights upon the leeward side, that most rain falls, and all that does not evaporate or percolate into the ground is conducted back to the sea by a route which depends only on the form of the land. More mobile and more searching than ice or rock rubbish, the trickling drops are guided by the deepest lines of the hillside in their incipient flow, and as these lines converge, the stream, gaining strength, proceeds in its torrential course to carve its channel deeper and entrench itself in permanent occupation. Thus the streambed, from which at first the water might be blown away into a new channel by a gale of wind, ultimately grows to be the strongest line of the landscape. As the main valley deepens, the tributary streambeds are deepened also, and gradually cut their way headwards, enlarging the area whence they draw their supplies. Thus new land forms are created—valleys of curious complexity, for example—

Rain.

River systems.

[1] On this subject see J. Geikie, *Earth Sculpture* (London, 1898); J. E. Marr, *The Scientific Study of Scenery* (London, 1900); Sir A. Geikie, *The Scenery and Geology of Scotland* (London, 2nd ed., 1887); Lord Avebury (Sir J. Lubbock) *The Scenery of Switzerland* (London, 1896) and *The Scenery of England* (London, 1902).

[2] Some geographers distinguish a mountain from a hill by origin; thus Professor Seeley says "a mountain implies elevation and a hill implies denudation, but the external forms of both are often identical." *Report VI. Int. Geog. Congress* (London, 1895), p. 751.

[3] "Mountains," in *Scot. Geog. Mag.* ii. (1896) p. 145.

[4] *Führer für Forschungsreisende*, pp. 652-685.

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by the "capture" and diversion of the water of one river by another, leading to a change of watershed.[1] The minor tributaries become more numerous and more constant, until the system of torrents has impressed its own individuality on the mountain side. As the river leaves the mountain, ever growing by the accession of tributaries, it ceases, save in flood time, to be a formidable instrument of destruction; the gentler slope of the land surface gives to it only power sufficient to transport small stones, gravel, sand and ultimately mud. Its valley banks are cut back by the erosion of minor tributaries, or by rain-wash if the climate be moist, or left steep and sharp while the river sinks its bed if the climate be arid. The outline of the curve of a valley's sides ultimately depends on the angle of repose of the detritus which covers them, if there has been no subsequent change, such as the passage of a glacier along the valley, which tends to destroy the regularity of the cross-section. The slope of the river bed diminishes until the plain compels the river to move slowly, swinging in *meanders* proportioned to its size, and gradually, controlled by the flattening land, ceasing to transport material, but raising its banks and silting up its bed by the dropped sediment, until, relatively shrunk, its diminished tributaries struggle across its delta to the sea. This is the typical river of which there are infinite varieties, yet every variety would, if time were given, and the land remained unchanged in level relatively to the sea, ultimately approach to the type. Movements of the land either of subsidence or elevation, changes in the land by the action of erosion in cutting back an escarpment or cutting through a col, changes in climate by affecting the rainfall and the volume of water, all tend to throw the river valley out of harmony with the actual condition of its stream. There is nothing more striking in geography than the perfection of the adjustment of a great river system to its valleys when the land has remained stable for a very lengthened period. Before full adjustment has been attained the river bed may be broken in places by waterfalls or interrupted by lakes; after adjustment the bed assumes a permanent outline, the slope diminishing more and more gradually, without a break in its symmetrical descent. Excellent examples of the imperfect drainage of a new land surface, on which the river system has not had time to impress itself, are to be seen in northern Canada and in Finland, where rivers are separated by scarcely perceptible divides, and the numerous lakes frequently belong to more than one river system.

Adjustment of rivers to land.

The action of rivers on the land is so important that it has been made the basis of a system of physical geography by Professor W. M. Davis, who classifies land surfaces in terms of the three factors—structure, process and time. Of these time, during which the process is acting on the structure, is the most important. A land may thus be characterized by its position in the "geographical cycle," or cycle of erosion, as young, mature or old. The last term being reached when the base-level of erosion is attained, and the land, however varied its relief may have been in youth or maturity, is reduced to a nearly uniform surface or peneplain. By a re-elevation of a peneplain the rivers of an old land surface may be restored to youthful activity, and resume their shaping action, deepening the old valleys and initiating new ones, starting afresh the whole course of the geographical cycle. It is, however, not the action of the running water on the land, but the function exercised by the land on the running water, that is considered here to be the special province of geography. At every stage of the geographical cycle the land forms, as they exist at that stage, are concerned in guiding the condensation and flow of water in certain definite ways. Thus, for example, in a mountain range at right angles to a prevailing sea-wind, it is the land forms which determine that one side of the range shall be richly watered and deeply dissected by a complete system of valleys, while the other side is dry, indefinite in its valley systems, and sends none of its scanty drainage to the sea. The action of rain, ice and rivers conspires with the movement of land waste to strip the layer of soil from steep slopes as rapidly as it forms, and to cause it to accumulate on the flat valley bottoms, on the gravel-littered coasts and alluvial fans, at the outlet of the gorges of tributaries, or in the smoothly-spread surface of alluvial plains.

The geographical cycle.

The whole question of the régime of rivers and lakes is sometimes treated under the name hydrography, a name used by some writers in the sense of marine surveying, and by others as synonymous with oceanography. For the study of rivers alone the name potamology[2] has been suggested by Penck, and the subject being of much practical importance has received a good deal of attention.[3]

The study of lakes has also been specialized under the name of limnology (see LAKE).[4] The existence of lakes in hollows of the land depends upon the balance between precipitation and evaporation. A stream flowing into a hollow will tend to fill it up, and the water will begin to escape as soon as its level rises high enough to reach the lowest part of the rim. In the case of a large hollow in a very dry climate the rate of evaporation may be sufficient to prevent the water from ever rising to the lip, so that there is no outflow to the sea, and a basin of internal drainage is the result. This is the case, for instance, in the Caspian sea, the Aral and Balkhash lakes, the Tarim basin, the Sahara, inner Australia, the great basin of the United States and the Titicaca basin. These basins of internal drainage are calculated to amount to 22% of the land surface. The percentages of the land surface draining to the different oceans are approximately—Atlantic, 34·3 %; Arctic, 9·5 %; Pacific, 14·4 %; Indian Ocean, 19·8 %.[5]

Lakes and internal drainage.

The parts of a river system have also clearly defined as is desirable, hence the exaggerated importance popularly attached to "the source" of a river. A well-developed river system is in fact many equally important and widely-separated sources, in the most distant parts from the mouth, the longest or even that of largest initial volume not being necessarily of greater geographical interest than the rest. The whole of the land which directs drainage towards one river is known as its basin, catchment area or drainage area—sometimes, by an incorrect expression, as its valley or even its watershed. The boundary line between one drainage area and others is rightly termed the watershed, but on account of the ambiguity which has been validated it is better to call it water-parting or, in America, divide. The only other important term which requires to be noted here is *talweg*, a word introduced from the German into French and English, and meaning the deepest line along the valley, which is necessarily occupied by a stream unless the valley is dry.

Terminology of river Systems.

The functions of land forms extend beyond the control of the circulation of the atmosphere, the hydrosphere and the water which is continually being interchanged between them; they are exercised with increased effect in the higher departments of biogeography and anthropogeography.

Biogeography.

The sum of the organic life on the globe is termed by some geographers the biosphere, and it has been estimated that the whole mass of living substance in existence at one time would cover the surface of the earth to a depth of one-fifth of an inch.[7] The distribution of living organisms is a complex problem, a function of many factors, several of which are yet but little known. They include the biological nature of the organisms and its physical environment, or, involving conditions in which geographical elements, direct or indirect, preponderate. The direct geographical elements are the arrangement of land and sea (continents and islands standing in sharp contrast) and the broad features of relief of the globe, which interpose barriers of a less absolute kind between portions of the same land area or oceanic depression. The indirect geographical elements, which, as a rule, act with and intensify the direct, are mainly climatic; the prevailing winds, rainfall, mean and extreme temperatures, and every locality depending on the arrangement of land and sea and of land forms. Climate thus guided affects the weathering of rocks, and so determines the kind and arrangement of soil. Different species of organisms come to perfection in different climates; and it may be stated as a general rule that a species, whether of plant or animal, once established at one point, would spread over the whole zone of the climate congenial to it unless some barrier were interposed to its progress. In the case of land and fresh-water organisms the sea is the chief barrier; in the case of marine organisms, the land. Differences in land forms do not exert great influence on the distribution of living creatures directly, but indirectly such land forms as mountain ranges and internal drainage basins are very potent through their action on soil and climate. A snow-capped mountain ridge or an arid desert forms a barrier between different forms of life which is often more effective than an equal breadth of sea. In this way the surface of the land is divided into numerous natural provinces, the flora and fauna of which are in each case distinctive species not shared by the others. The distribution of life is discussed in the various articles in this *Encyclopaedia* dealing with biological, botanical and zoological subjects.*

[1] See, for a summary of river-action, A. Phillipson, *Studien über Wasserscheiden* (Leipzig, 1896); also I.C. Russell, *River Development* (London, 1898) (published as *The Rivers of North America*, New York, 1898).

[2] W. M. Davis, "The Geographical Cycle," *Geog. Journ.* xiv. (1899) p. 484.

[3] A. Penck, "Potamology as a Branch of Physical Geography," *Geog. Journ.* x. (1897) p. 619.

[4] See, for instance, E. Wisotzki, *Hauptfluss und Nebenfluss* (Stettin, 1889). For practical studies see official reports on the Mississippi, Rhine, Seine, Elbe and other great rivers.

[5] F. A. Forel, *Handbuch der Seenkunde: allgemeine Limnologie* (Stuttgart, 1901); F. A. Forel, "La Limnologie, branche de la géographie," *Rapport VI. Int. Geog. Congress* (London, 1895), p. 593; also *Le Léman* (2 vols., Lausanne, 1892, 1894); H. Lullies, "Studien über Seen," *Jubiläumsschrift der Albertus-Universität* (Königsberg, 1894); and G. R. Credner, "Die Reliktenseen," *Petermanns Mitteilungen*, Ergänzungshefte 86 and 89 (Gotha, 1887, 1888).

[6] J. Murray, "Drainage Areas of the Continents," *Scot. Geog. Mag.* ii. (1886) p. 548.

[7] Wagner, *Lehrbuch der Geographie* (1900), i. 586.

* For details, see A. R. Wallace, *Geographical Distribution of Animals and Island Life*; A. Heilprin, *Geographical and Geological Distribution of Animals* (1887); O. Drude, *Handbuch der Pflanzengeographie*; A. Engler, *Entwickelungsgeschichte der Pflanzenwelt*; also Beddard, *Zoogeography* (Cambridge, 1895); and Sclater, *The Geography of Mammals* (London, 1899).

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Floral zones.

The classification of the land surface into areas inhabited by distinctive groups of plants has been attempted by many phytogeographers, but without resulting in any scheme of general acceptance. The simplest classification is perhaps that of Drude according to climatic zones, subdivided according to continents. This takes account of—(1) the *Arctic-Alpine* zone, including all the vegetation of the region bordering on perpetual snow; (2) the *Boreal* zone, including the temperate lands of North America, Europe and Asia, all of which are substantially alike in botanical character; (3) the *Tropical* zone, divided sharply into (a) the tropical forests of the New World, and (b) the tropical zone of the Old World, the forms of which differ in a significant degree; (4) the *Austral* zone, comprising all continental land south of the equator, and sharply divided into three regions the floras of which are strikingly distinct—(a) South American, (b) South African and (c) Australian; (5) the *Oceanic*, comprising all oceanic islands, the flora of which consists exclusively of forms whose seeds could be drifted unobstroyed by ocean currents or carried by birds. To these might be added the antarctic, which is still very imperfectly known. Many subdivisions and transitional zones have been suggested by different authors.

Vegetation areas.

From the point of view of the economy of the globe this classification by species is perhaps less important than that by mode of life and physiological character in relation to the environment. The following are the chief areas of vegetational activity usually recognized: (1) The ice-deserts of the arctic and antarctic and the highest mountain regions, where life is no vegetation except the lowest forms, like that which causes "red snow." (2) The tundra or region of intensely cold winters, forbidding tree-growth, where mosses and lichens cover most of the ground when unfrozen, and shrubs occur of species which in other conditions are trees, here stunted to the height of a few inches. A similar zone surrounds the permanent snow on lofty mountains in all latitudes. The tundra passes by imperceptible gradations into the moor, bog and heath of warmer climates. (3) The temperate forests of evergreen or deciduous trees, according to circumstances, chiefly the variety of the rain. In temperate zones where rainfall and sunlight are both abundant. (4) The grassy steppes or prairies where the rainfall is diminished and temperatures are extreme, and grass is the prevailing form of vegetation. These pass imperceptibly into—(5) the arid regions, where rainfall is at a minimum, and the only plants are those modified to subsist with the smallest supply of water. (6) The tropical forest, which represents the maximum of plant luxuriance, stimulated by the heaviest rainfall, greatest heat and strongest light. These divisions merge one into the other, and admit of almost indefinite subdivision, while they are subject to great modifications by human interference in clearing and cultivating. Plants exhibit the controlling power of environment to a high degree, and thus vegetation is usually in close adjustment to the bodier geographical features of a region.

Faunal realms.

The divisions of the earth into faunal regions by Dr P. L. Sclater have been found to hold good for a large number of groups of animals as different in their mode of life as birds and mammals, and they may thus be accepted as based on nature. They are six in number: (1) *Palaearctic*, including Europe, Asia north of the Himalaya, and Africa north of the Sahara; (2) *Ethiopian*, consisting of Africa south of the Atlas range, and Madagascar; (3) *Oriental*, including India, Indo-China and the Malay Archipelago north of Wallace's line, which runs between Bali and Lombok; (4) *Australian*, including Australia, New Zealand, New Guinea and Polynesia; (5) *Nearctic* or North America, north of Mexico; and (6) *Neotropical* or South America. Each of these divisions is the home of a special fauna, many species of which are confined to it alone; in the Australian region, indeed, practically the whole fauna is peculiar and distinctive, suggesting a prolonged period of complete biological isolation. In some cases, such as the Ethiopian and Neotropical and the Palaearctic and Nearctic regions, the faunas, although distinct, are related, several forms on opposite sides of the Atlantic being analogous, *e.g.* the lion and puma, ostrich and rhea. Where two of the faunal realms meet there is usually, though not always, a mixing of faunas. These facts have led some naturalists to include the Palaearctic and Nearctic regions in one, termed *Holarctic*, and to suggest transitional regions, such as the *Sonoran*, between North and South America, and the *Mediterranean*, between Europe and Africa, or to create sub-regions, such as Madagascar and New Zealand. Oceanic islands have, as a rule, distinctive faunas and floras which resemble, but are not identical with, those of other islands in similar positions.

Biological distribution as a means of geographical research.

The study of the evolution of faunas and the comparison of the faunas of distant regions have furnished a trustworthy instrument of pre-historic geographical research, which enables earlier geographical relations of land and sea to be traced out, and the approximate period, or at least the chronological order of the largest changes, to be estimated. In this way, for example, it has been suggested that a land, "Lemuria," once connected Madagascar with the Malay Archipelago, and that a northern extension of the antarctic land once united the three southern continents.

The distribution of fossils frequently makes it possible to map out approximately the general features of land and sea in long-past geological periods, and so to enable the history of crustal relief to be traced.[1]

Reaction of organisms on environment.

While the tendency is for the living forms to come into harmony with their environment and to approach the state of equilibrium by successive adjustments if the environment should happen to change, it is to be observed that the action of organisms themselves often tends to change their environment. Corals and other quick-growing calcareous marine organisms are the most powerful in this respect by creating new land in the ocean. Vegetation of all sorts acts in a similar way, either in forming soil and assisting in breaking up rocks, in filling up shallow lakes, and even, like the mangrove, in reclaiming wide stretches of land from the sea. Plant life, utilizing solar light to combine the inorganic elements of water, soil and air into living substance, is the basis of all animal life. This is not by the supply of food alone, but also by the withdrawal of carbonic acid from the atmosphere, by which vegetation maintains the composition of the air in a state fit for the support of animal life. Man in the primitive stages of culture is scarcely to be distinguished from other animals as regards his subjection to environment, but in the higher grades of culture the conditions of control and reaction become much more complicated, and the department of anthropogeography is devoted to their consideration.

Anthropogeography.

The first requisites of all human beings are food and protection, in their search for which men are brought into intimate relations with the forms and productions of the earth's surface. The degree of dependence of any people upon environment varies inversely as the degree of culture or civilization, which for this purpose may perhaps be defined as the power of an individual to exercise control over the individual and over the environment for the benefit of the community. The development of culture is to a certain extent a question of race, and although forming one species, the varieties of mandiffer in almost imperceptible gradations with a complexity defying classification (see ANTHROPOLOGY). Professor Keane groups man round four leading types, which he has named the black, yellow, red and white, or the Ethiopic, Mongolic, American and Caucasic. Each may be subdivided, though not with great exactness, into smaller groups, either according to physical characteristics, of which the form of the head is most important, or according to language.

Types of man.

The black type is found only in tropical or sub-tropical countries, and is usually in a primitive condition of culture, unless educated by contact with people of the white type. They follow chiefly pastoral occupations, or, in the case of the Bushmen, live on products of the woods or of the chase, with the minimum of work, and have only a loose political organization. The red type is peculiar to America, inhabiting every climate from polar to equatorial, and containing representatives of many stages of culture which had apparently developed without the aid or interference of people of any other race until the close of the 15th century. The yellow type is capable of a higher culture, cherishes higher religious beliefs, and inhabits as a rule the temperate zone, although extending to the tropics on one side and to the arctic regions on the other. The white type, originating in the north temperate zone, has spread over the whole world. They have attained the highest culture, profess the purest forms of monotheistic religion, and have brought all the people of the black type and many of those of the yellow under their domination.

The contrast between the yellow and white types has been softened by the remarkable development of the Japanese following the assumption of western methods.

The actual number of human inhabitants in the world has been calculated as follows:

	By Continents.[2]	By Race.[3]	
Asia . . .	875,000,000	White (Caucasic)	770,000,000
Europe . . .	392,000,000	Yellow (Mong) .	540,000,000
Africa . . .	170,000,000	Black (Ethiopic) .	175,000,000
America . . .	143,000,000	Red (American) .	22,000,000
Australia and Polynesia .	7,000,000	Total .	1,507,000,000
Total .	1,587,000,000		

In round numbers the population of the world is about 1,600,000,000, and, according to an estimate by Ravenstein,[4] the maximum population which it will be possible for the earth to maintain is 6000 millions, a number which, if the average rate of increase in 1891 continued, would be reached within 200 years.

While highly civilized communities are able to evade many of the restrictions of environment, to overcome the barriers to intercommunication interposed by land or sea, to counteract the adverse

[1] See particularly A. de Lapparent, *Traité de géologie* (4th ed., Paris, 1900).

[2] Estimate for 1900. H. Wagner, *Lehrbuch der Geographie*, i. p. 668.

[3] Estimate for year not stated. A. H. Keane in *International Geography*, p. 108.

[4] In *Proc. R.G.S.* xiii. (1891) p. 27.

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influence of climate, and by the development of trade even to inhabit countries which cannot yield a food-supply, the mass of mankind is still completely under the control of those conditions which in the past determined the distribution and the mode of life of the whole human race.

Influence of environment on man.

In tropical forests primitive tribes depend on the collection of wild fruits, and in a minor degree on the chase of wild animals, for their food. Clothing is unnecessary; hence there is little occasion for exercising the mental faculties beyond the sense of observation, and little energy or the inventive arts beyond what is required for the simplest weapons and the most primitive fortifications. When the pursuit of game becomes the chief occupation of a people there is of necessity a higher development of courage, skill, powers of observation and invention; and these qualities are still further enhanced in predatory tribes who take by force the food, clothing and other property prepared or collected by a feebler people. The fruit-eating savage cannot stray beyond his woods which bound his life as the water bounds that of a fish; the hunter is free to live on the margin of forests or in open country, while the robber or warrior from some natural stronghold of the mountains sweeps over the adjacent plains and carries his raids into distant lands. Wide grassy steppes lead to the organization of the people as nomads whose wealth consists in flocks and herds, and their dwellings are tents. The nomad not only domesticates and turns to his own use the gentler and more powerful animals, such as sheep, cattle, horses, camels, but even tames some predatory creatures, like the dog, into a means of defending their natural prey. They hunt the beasts of prey destructive to their flocks, and form armed bands for protection against marauders or for purposes of aggression on weaker sedentary neighbours. On the fertile low grounds along the margins of rivers or in clearings of forests, agricultural communities naturally take their rise, dwelling in villages and cultivating the wild grains, which by careful nurture and selection have been turned into rich cereals. The agriculturist as a rule is rooted to the soil. The land he tills he holds, and acquires a closer connexion with a particular patch of ground than either the hunter or the herdsman. In the temperate zone, where the seasons are sharply contrasted, but follow each other with regularity, foresight and self-denial were fostered, because if men did not exercise these qualities seed-time or harvest might pass into lost opportunities and the tribes would suffer. The more extreme climates of arid regions on the margins of the tropics, by the unpredictable succession of droughts and floods, confound the prevision of uninstructed people, and make the patience and industry qualities too uncertain in their results to be worth cultivating. Thus the civilization of agricultural peoples of the temperate zone grew rapidly, yet in each community a special type arose adapted to the soil, the crop and the climate. On the sea shore fishing naturally became a means of livelihood, and dwellers by the sea, in virtue of the dangers to which they are exposed from storm and unseaworthy craft, are stimulated to a higher degree of foresight, quicker observation, prompter decision and more energetic action in emergencies than those who live inland. The building and handling of vessels also, and the utilization of such uncontrollable powers of nature as wind and tide, helped forward mechanical invention. To every type of coast there may be related a special type of occupation and even of character; the deep indented sea fjord, backed by almost impassable mountains, bred bold mariners whose only outlet for enterprise was seawards towards other lands—the *viks* created the vikings. On the gently sloping margin of the estuary of a great river a view of tranquil inland life was equally presented to the shore-dweller, and the ocean did not present the only prospect of a career. Finally the mountain valley, with its patches of cultivable soil on the alluvial fans of tributary torrents, its narrow pastures on the uplands only left clear of snow in summer, its intensified extremes of climates and its isolation, almost equal to that of an island, has in all countries produced a special type of brave and hardy people, whose utmost effort may bring them comfort, but not wealth, by honest toil, who know little of the outer world, and to whom the natural outlet for ambition is marauding on the fertile plains. The highlander and viking, products of the valleys raised high amid the mountains or half-drowned in the sea, are everywhere of kindred spirit.

It is in some such manner as these that the natural conditions of regions, which must be conformed to by prudence and utilized by labour to yield shelter and food, have led to the growth of peoples differing in their ways of life, thought and speech. The initial differences so produced are confirmed and perpetuated by the same barriers which divide the faunal or floral regions, the sea, mountains, deserts and the like, and much of the course of past history and present politics becomes clear when the combined results of differing race and differing environment are taken into account.[1]

The specialization which accompanies the division of labour has important geographical consequences, for it necessitates communication between communities and the interchange of their products. Trade makes it possible to work mineral resources in localities where food can only be grown with great difficulty and expense, or which are even totally barren and waterless, entirely dependent on supplies from distant sources.

Density of population.

The population which can be permanently supported by a given area of land differs greatly according to the nature of the resources and the requirements of the people. Pastoral communities are always scattered very thinly over large areas; agricultural populations may be almost equally sparse where advanced methods of agriculture and labour-saving machinery are employed; but where a frugal people are situated on a fertile and inexhaustible soil, such as the deltas and river plains of Egypt, India and China, an enormous population may be supported on a small area. In most cases, however, a dense population can only be maintained in regions where mineral resources have fixed the site of great manufacturing industries. The maximum density of population which a given region can support is very difficult to determine; it depends partly on the habits and standard of culture of the people, partly on the nature and origin of the resources on which they depend, partly on the artificial burdens imposed and very largely on the climate. Density of population is measured by the average number of people residing on a unit of area; but in order to compare one part of the world with another the average should, strictly speaking, be taken for regions of equal size or of equal population; and the portions of the country which are permanently uninhabitable ought to be excluded from the calculation.[2] Considering the average density of population within the political limits of countries, the following list is of some value; the figures for a few smaller divisions of large countries are added (in brackets) for comparison:

Average Population on 1 sq. m. (*For 1900 or 1901.*)

Country.	Density of pop.	Country.	Density of pop.
(Saxony)	743[3]	Ceylon	141[4]
Belgium	580[3]	Greece	97
Java	568[4]	European Turkey	90
(England and Wales)	558	Spain	97
(Bengal)	495[4]	European Russia	55[4]
Holland	436	Sweden	30
United Kingdom	344	United States	25
Japan	317	Mexico	18
Italy	293	Norway	18
China proper	270[4]	Persia	15
German Empire	270	New Zealand	7
Austria	226	Argentina	5
Switzerland	207	Brazil	4·5
France	188	Eastern States of Australia	3
Indian Empire	167[4]	Dominion of Canada	1·5
Denmark	166[3]	Siberia	1
Hungary	154[4]	West Australia	0·2
Portugal	146		

Migration.

The movement of people from one place to another without the immediate intention of returning is known as migration, and according to its origin it may be classed as centrifugal (directed *from* a particular area) and centripetal (directed *towards* a particular area). Centrifugal migration is usually a matter of compulsion; it may be necessitated by natural causes, such as a change of climate leading to the withering of pastures or destruction of agricultural land, to inundation, earthquake, pestilence or to an increase of population over means of support; or to artificial causes, such as the wholesale deportation of a conquered people; or to political or religious persecution. In any case the people are driven out by some adverse change; and when the urgency is great they may require to drive out in turn weaker people who occupy a desirable territory, thus propagating the wave of migration, the direction of which is guided by the forms of the land into inevitable channels. Many of the great historic movements of peoples were doubtless due to the gradual change of geographical or climatic conditions; and the slow descication of Central Asia has been plausibly suggested as the real cause of the peopling of modern Europe and of the medieval wars of the Old World, the theatres of which were critical points on the great natural lines of communication between east and west.

In the case of centripetal migrations people flock to some particular place where exceptionally favourable conditions have been found to exist. The rushes to gold-fields and diamond-fields are typical instances; the growth of towns on coal-fields and near other sources of power, and the rapid settlement of such rich agricultural districts as the wheat-lands of the American prairies and great plains are other examples.

There is, however, a tendency for people to remain rooted to the

[1] On the influence of land on people see Shaler, *Nature and Man in America* (New York and London, 1892); and Ellen C. Semple's *American History and its Geographic Conditions* (Boston, 1903).

[2] See maps of density of population in Bartholomew's great large-scale atlases, *Atlas of Scotland* and *Atlas of England*.

[3] Almost exclusively industrial.

[4] Almost exclusively agricultural.

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land of their birth, when not compelled or induced by powerful external causes to seek a new home.

Thus arises the spirit of patriotism, a product of purely geographical conditions, thereby differing from the sentiment of loyalty, which is of racial origin. Where race and soil conspire to evoke both loyalty and patriotism in a people, the moral qualities of a great and permanent nation are secured. It is noticeable that the patriotic spirit is strongest in those places where people are brought most intimately into relation with the land, dwellers in the mountain or by the sea, and, above all, the people of rugged coasts and mountainous archipelagoes, have always been renowned for love of country, while the inhabitants of fertile plains and trading communities are frequently less strongly attached to their own land. ***Political geography.***

Amongst nomads the tribe is the unit of government, the political bond is personal, and there is no definite territorial association of the people, who may be loyal but cannot be patriotic. The idea of a country arises only when a nation, either homogeneous or composed of several races, establishes itself in a region the boundaries of which may be defined and defended against aggression from without. Political geography takes account of the partition of the earth amongst organized communities, dealing with the relation of races to regions, and of nations to countries, and considering the conditions of territorial equilibrium and instability.

Boundaries.

The definition of boundaries and their delimitation is one of the most important parts of political geography. Natural boundaries are always the most definite and the strongest, lending themselves most readily to defence against aggression. The sea is the most effective of all, and an island state is recognized as the most stable. Next in importance comes a mountain range, but here there is often difficulty as to the definition of the actual crest-line, and mountain ranges being broad regions, it may happen that a small independent state, like Switzerland or Andorra, occupies the mountain valleys between two or more great countries. Rivers do not form effective international boundaries, although between dependent self-governing communities they are convenient lines of demarcation. A desert, or a belt of country left purposely without inhabitants, like the mark, marches or debatable lands of the middle ages, was once a common means of separating nations which nourished hereditary grievances. The "buffer-state" of modern diplomacy is of the same ineffectual type. A less definite though very practical boundary is that formed by the meeting-line of two languages, or the districts inhabited by two races. The line of fortresses protecting Austria from Italy lies in some places well back from the political boundary, but just inside the linguistic frontier, so as to separate the German and Italian races occupying Austrian territory. Boundaries, either traced from point to point and marked by posts on the ground, or defined as portions of meridians and parallels, are now the most common type of boundaries fixed by treaty. In Europe and Asia frontiers are usually strongly fortified and strictly watched in times of peace as well as during war. In South America strictly defined boundaries are still the exception, and the claims of neighbouring nations have very frequently given rise to war, though now more commonly to arbitration.[1]

Forms of government.

The modes of government amongst civilized peoples have little influence on political geography; some republics are as arbitrary and exacting in their frontier regulations as some absolute monarchies. It is, however, to be noticed that absolute monarchies are confined to the east of Europe and to Asia, Japan being the only established constitutional monarchy east of the Carpathians. Limited monarchies are (with the exception of Japan) peculiar to Europe, and in these the degree of democratic control may be said to diminish as one passes eastwards from the United Kingdom. Republics, although represented in Europe, are the peculiar form of government of America and are unknown in Asia.

The forms of government of colonies present a series of transitional types from the autocratic administration of a governor appointed by the home government to complete democratic self-government. The latter occurs only in the temperate possessions of the British empire, in which there is no great preponderance of a coloured native population. New colonial forms have been developed during the partition of Africa amongst European powers, the sphere of influence being especially worthy of notice. This is a vaguer form of control than a protectorate, and frequently amounts merely to an agreement amongst civilized powers to respect the right of one of their number to exercise government within a certain area, if it should decide to do so at any future time.

The central governments of all civilized countries concerned with external relations are closely similar in their modes of action, but the internal administration may be very varied. In this respect a country is either centralized, like the United Kingdom or France, or federated of distinct self-governing units like Germany (where the units include kingdoms, at least three minor types of monarchies, municipalities and a crown land under a nominated governor), or the United States, where the units are democratic republics. The ultimate cause of the predominant form of federal government may be the geographical diversity of the country, as in the cantons occupying the once isolated mountain valleys of Switzerland, the racial diversity of the people, as in Austria-Hungary, or merely political expediency, as in the republics of the American type.

The minor subdivisions into provinces, counties and parishes, or analogous areas, may also be related in many cases to natural features or racial differences perpetuated by historical causes. The terms and divisions and subdivisions often survive the conditions which led to their origin; hence the study of political geography is allied to history as closely as the study of physical geography is allied to geology, and for the same reason.

Towns.

The aggregation of population in towns was at one time mainly brought about by the necessity for defence, a fact indicated by the defensive sites of many old towns. In later times, towns have been more often founded in proximity to valuable mineral resources, and at critical points or nodes on lines of communication. These are places where the mode of travelling or of transport is changed, such as seaports, river ports and railway termini, or natural resting-places, such as a ford, the foot of a steep ascent on a road, the entrance of a valley leading up from a plain towards the mountains, or a meeting-place of roads or railways.[2] The existence of a good natural harbour is often sufficient to give origin to a town and to fix one end of a line of land communication.

Lines of communication.

Countries of uniform surface or faint relief, roads and railways may be constructed in any direction without regard to the configuration. In places where the low ground is marshy, roads and railways often follow the ridge-lines of hills, or, as in Finland, the old glacial ridges, which run parallel to the shore. Wherever the relief of the land is pronounced, roads and railways are obliged to occupy the lowest ground winding along the valleys of rivers and through passes in the mountains. In exceptional cases obstructions which it would be impossible or too costly to turn are overcome by a bridge or tunnel, the magnitude of such works increasing with the growth of engineering skill and financial enterprise. Similarly the obstructions offered to water communication by interruption through land or shallows are overcome by artificial navigable canals or ship-canal channels. The economy and success of most lines of communication depend on following as far as possible existing natural lines and utilizing existing natural sources of power.[3]

Commercial geography.

Commercial geography may be defined as the description of the earth's surface with special reference to the discovery, production, transport and exchange of commodities. The transport concerns land routes and sea routes, the latter being of greatest importance. While steam has been said to make a ship independent of wind and tide, it is still true that a long voyage even by steam must be planned so as to encounter the least resistance possible from prevailing winds and permanent currents, and this involves the application of oceanographical and meteorological knowledge. The older art of sailing by utilizing the power of the wind demands a very intimate knowledge of these conditions, and it is probable that a revival of sailing ships may in the present century vastly increase the importance of the study of maritime meteorology.

The discovery and production of commodities require a knowledge of the distribution of geological formations for mineral products, of the natural distribution, life-conditions and cultivation of breeding of plants and animals and of the labour market. Attention must also be paid to the artificial restrictions of political geography, to the legislative restrictions bearing on labour and trade as imposed in different countries, and, above all, to the incessant fluctuations of the economic conditions of supply and demand and the combinations of capitalists or workers which affect the market.[4] The term "applied geography" has been employed to designate commercial geography, the fact being that every aspect of scientific geography may be applied to practical purposes, including the purposes of trade. But apart from the applied science, there is an aspect of pure geography which concerns the theory of the relation of economics to the surface of the earth.

It will be seen that as each successive aspect of geographical science is considered in its natural sequence the conditions become

[1] For the history of territorial changes in Europe, see Freeman, *Historical Geography of Europe*, edited by Bury (Oxford), 1903; and for the official definition of existing boundaries, see Hertslet, *The Map of Europe by Treaty* (4 vols., London, 1875, 1891); *The Map of Africa by Treaty* (3 vols., London, 1896). Also Lord Curzon's Oxford address on *Frontiers* (1907).

[2] For numerous special instances of the determining causes of town sites, see C. G. Chisholm, "On the Distribution of Towns and Villages in England," *Geographical Journal* (1897), ix. 76, x. 511.

[3] The whole subject of anthropogeography is treated in a masterly way by F. Ratzel in his *Anthropogeographie* (Stuttgart, vol. i. 2nd ed., 1899, vol. ii. 1891), and in his *Politische Geographie* (Leipzig, 1897). The special question of the reaction of man on his environment is handled by G. P. Marsh in *Man and Nature, or Physical Geography as modified by Human Action* (London, 1864).

[4] For commercial geography see C. G. Chisholm, *Manual of Commercial Geography* (1890).

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more numerous, complex, variable and practically important. From the underlying abstract mathematical considerations all through the superimposed physical, biological, anthropological, political and commercial development of the subject runs the determining control exercised by crust-forms acting directly or indirectly on mobile distributions; and this is the essential principle of geography. (H. R. M.)

Conclusion.

GEOID (from Gr. γῆ, the earth), an imaginary surface employed by geodesists which has the property that every element of it is perpendicular to the plumb-line where that line cuts it. Compared with the "spheroid of reference" the surface of the geoid is in general depressed over the oceans and raised over the great land masses. (See EARTH, FIGURE OF THE.)

GEOK-TEPE, a former fortress of the Turkomans, in Russian Transcaspia, in the oasis of Akhal-tekke, on the Transcaspian railway, 28 m. N.W. of Askabad. It consisted of a walled enclosure 1¼m. in circuit, the wall being 18 ft. high and 20 to 30 ft. thick. In December 1880 the place was attacked by 6000 Russians under General Skobelev, and after a siege of twenty-three days was carried by storm, although the defenders numbered 25,000. A monument and a small museum commemorate the event.

GEOLOGY (from Gr. γῆ, the earth, and λόγος, science), the science which investigates the physical history of the earth. Its object is to trace the structural progress of our planet from the earliest beginnings of its separate existence, through its various stages of growth, down to the present condition of things. It seeks to determine the manner in which the evolution of the earth's great surface features has been effected. It unravels the complicated processes by which each continent has been built up. It follows, even into detail, the varied sculpture of mountain and valley, crag and ravine. Nor does it confine itself merely to changes in the inorganic world. Geology shows that the present races of plants and animals are the descendants of other and very different races which once peopled the earth. It teaches that there has been a progressive development of the inhabitants, as well as one of the globe on which they have dwelt; that each successive period in the earth's history, since the introduction of living things, has been marked by characteristic types of the animal and vegetable kingdoms; and that, however imperfectly the remains of these organisms have been preserved or may be deciphered, materials exist for a history of life upon the planet. The geographical distribution of existing faunas and floras is often made clear and intelligible by geological evidence; and in the same way light is thrown upon some of the remoter phases in the history of man himself. A subject so comprehensive as this must require a wide and varied basis of evidence. It is one of the characteristics of geology to gather evidence from sources which at first sight seem far removed from its scope, and to seek aid from almost every other leading branch of science. Thus, in dealing with the earliest conditions of the planet, the geologist must fully avail himself of the labours of the astronomer. Whatever is ascertainable by telescope, spectroscope or chemical analysis, regarding the constitution of other heavenly bodies, has a geological bearing. The experiments of the physicist, undertaken to determine conditions of matter and of energy, may sometimes be taken as the starting-points of geological investigation. The work of the chemical laboratory forms the foundation of a vast and increasing mass of geological inquiry. To the botanist, the zoologist, even to the unscientific, if observant, traveller by land or sea, the geologist turns for information and assistance.

But while thus culling freely from the dominions of other sciences, geology claims as its peculiar territory the rocky framework of the globe. In the materials composing that framework, their composition and arrangement, the processes of their formation, the changes which they have undergone, and the terrestrial revolutions to which they bear witness, lie the main data of geological history. It is the task of the geologist to group these elements in such a way that they may be made to yield up their evidence as to the march of events in the evolution of the planet. He finds that they have in large measure arranged themselves in chronological sequence,—the oldest lying at the bottom and the newest at the top. Relics of an ancient sea-floor are overlain by traces of a vanished land-surface; these are in turn covered by the deposits of a former lake, above which once more appear proofs of the return of the sea. Among these rocky records lie the lavas and ashes of long-extinct volcanoes. The ripple left upon the shore, the cracks formed by the sun's heat upon the muddy bottom of a dried-up pool, the very imprint of the drops of a passing rain-shower, have all been accurately preserved, and yield their evidence as to geographical conditions often widely different from those which exist where such markings are now found.

But it is mainly by the remains of plants and animals imbedded in the rocks that the geologist is guided in unravelling the chronological succession of geological changes. He has found that a certain order of appearance characterizes these organic remains, that each great group of rocks is marked by its own special types of life, and that these types can be recognized, and the rocks in which they occur can be correlated even in distant countries, and where no other means of comparison would be possible. At one moment he has to deal with the bones of some large mammal scattered through a deposit of superficial gravel, at another time with the minute foraminifers and ostracods of an upraised sea-bottom. Corals and crinoids crowded and crushed into a massive limestone where they lived and died, ferns and terrestrial plants matted together into a bed of coal where they originally grew, the scattered shells of a submarine sand-bank, the snails and lizards which lived and died within a hollow-tree, the insects which have been imprisoned within the exuding resin of old forests, the footprints of birds and quadrupeds, the trails of worms left upon former shores—these, and innumerable other pieces of evidence, enable the geologist to realize in some measure what the faunas and floras of successive periods have been, and what geographical changes the site of every land has undergone.

It is evident that to deal successfully with these varied materials, a considerable acquaintance with different branches of science is needful. Especially necessary is a tolerably wide knowledge of the processes now at work in changing the surface of the earth, and of at least those forms of plant and animal life whose remains are apt to be preserved in geological deposits, or which in their structure and habitat enable us to realize what their forerunners were. It has often been insisted that the present is the key to the past; and in a wide sense this assertion is eminently true. Only in proportion as we understand the present, where everything is open on all sides to the fullest investigation, can we expect to decipher the past, where so much is obscure, imperfectly preserved or not preserved at all. A study of the existing economy of nature ought thus to be the foundation of the geologist's training.

While, however, the present condition of things is thus employed, we must obviously be on our guard against the danger of unconsciously assuming that the phase of nature's operations which we now witness has been the same in all past time, that geological changes have always or generally taken place in former ages in the manner and on the scale which we behold to-day, and that at the present time all the great geological processes, which have produced changes in the past eras of the earth's history, are still existent and active. As a working hypothesis we may suppose that the nature of geological processes has remained constant from the beginning; but we cannot postulate that the action of these processes has never varied in energy. The few centuries wherein man has been observing nature obviously form much too brief an interval by which to measure the intensity of geological action in all past time. For aught we can tell the present is an era of quietude and slow change, compared with some of the eras which have preceded it. Nor perhaps can we be quite sure that, when we have explored every geological process now in progress, we have exhausted all the causes of change which, even in comparatively recent times, have been at work.

In dealing with the geological record, as the accessible solid part of the globe is called, we cannot too vividly realize that at

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the best it forms but an imperfect chronicle. Geological history cannot be compiled from a full and continuous series of documents. From the very nature of its origin the record is necessarily fragmentary, and it has been further mutilated and obscured by the revolutions of successive ages. And even where the chronicle of events is continuous, it is of very unequal value in different places. In one case, for example, it may present us with an unbroken succession of deposits many thousands of feet in thickness, from which, however, only a few meagre facts as to geological history can be gleaned. In another instance it brings before us, within the compass of a few yards, the evidence of a most varied and complicated series of changes in physical geography, as well as an abundant and interesting suite of organic remains. These and other characteristics of the geological record become more apparent and intelligible as we proceed in the study of the science.

Classification.—For systematic treatment the subject may be conveniently arranged in the following parts:—

1. *The Historical Development of Geological Science.*—Here a brief outline will be given of the gradual growth of geological conceptions from the days of the Greeks and Romans down to modern times, tracing the separate progress of the more important branches of inquiry and noting some of the stages which in each case have led up to the present condition of the science.

2. *The Cosmical Aspects of Geology.*—This section embraces the evidence supplied by astronomy and physics regarding the form and motions of the earth, the composition of the planets and sun, and the probable history of the solar system. The subjects dealt with under this head are chiefly treated in separate articles.

3. *Geognosy.*—An inquiry into the materials of the earth's substance. This division, which deals with the parts of the earth, its envelopes of air and water, its solid crust and the probable condition of its interior, especially treats of the more important minerals of the crust, and the chief rocks of which that crust is built up. Geognosy thus lays a foundation of knowledge regarding the nature of the materials constituting the mass of the globe, and prepares the way for an investigation of the processes by which these materials are produced and altered.

4. *Dynamical Geology* studies the nature and working of the various geological processes whereby the rocks of the earth's crust are formed and metamorphosed, and by which changes are effected upon the distribution of sea and land, and upon the forms of terrestrial surfaces. Such an inquiry necessitates a careful examination of the existing geological economy of nature, and forms a fitting introduction to an inquiry into the geological changes of former periods.

5. *Geotectonic or Structural Geology* has for its object the architecture of the earth's crust. It embraces an inquiry into the manner in which the various materials composing this crust have been arranged. It shows that some have been formed in beds or strata of sediment on the floor of the sea, that others have been built up by the slow aggregation of organic forms, that others have been poured out in a molten condition or in showers of loose dust from subterranean sources. It further reveals that, though originally laid down in almost horizontal beds, the rocks have subsequently been crumpled, contorted and dislocated, that they have been incessantly worn down, and have often been depressed and buried beneath later accumulations.

6. *Palaeontological Geology.*—This branch of the subject, starting from the evidence supplied by the organic forms which are found preserved in the crust of the earth, includes such questions as the relations between extinct and living types, the laws which appear to have governed the distribution of life in time and in space, the relative importance of different genera of animals in geological inquiry, the nature and use of the evidence from organic remains regarding former conditions of physical geography. Some of these problems belong also to zoology and botany, and are more fully discussed in the articles PALAEONTOLOGY and PALAEOBOTANY.

7. *Stratigraphical Geology.*—This section might be called geological history. It works out the chronological succession of the great formations of the earth's crust, and endeavours to trace the sequence of events of which they contain the record. More particularly, it determines the order of succession of the various plants and animals which in past time have peopled the earth, and thus ascertains what has been the grand march of life upon this planet.

8. *Physiographical Geology*, proceeding from the basis of fact laid down by stratigraphical geology regarding former geographical changes, embraces an inquiry into the origin and history of the features of the earth's surface—continental ridges and ocean basins, plains, valleys and mountains. It explains the causes on which local differences of scenery depend, and shows under what very different circumstances, and at what widely separated intervals, the hills and mountains, even of a single country, have been produced.

Most of the detail embraced in these several sections is relegated to separate articles, to which references are here inserted. The following pages thus deal mainly with the general principles and historical development of the science:—

PART I.—HISTORICAL DEVELOPMENT

Geological Ideas among the Greeks and Romans.—Many geological phenomena present themselves in so striking a form that they could hardly fail to impress the imagination of the earliest and rudest races of mankind. Such incidents as earthquakes and volcanic eruptions, destructive storms on land and sea, disastrous floods and landslips suddenly strewing valleys with ruin, must have awakened the terror of those who witnessed them. Prominent features of landscape, such as mountain-chains with their snows, clouds and thunderstorms, dark river-chasms that seem purposely cleft open in order to give passage to the torrents that rush through them, crags with their impressive array of pinnacles and recesses must have appealed of old, as they still do, to the awe and wonder of those who for the first time behold them. Again, banks of sea-shells in far inland districts would, in course of time, arrest the attention of the more intelligent and reflective observers, and raise in their minds some kind of surmise as to how such shells could ever have come there. These and other conspicuous geological problems found their earliest solution in legends and myths, wherein the more striking terrestrial features and the elemental forces of nature were represented to be the manifestation of the power of unseen supernatural beings.

The basin of the Mediterranean Sea was especially well adapted, from its physical conditions, to be the birth-place of such fables. It is a region frequently shaken by earthquakes, and contains two distinct centres of volcanic activity, one in the Aegean Sea and one in Italy. It is bounded on the north by a long succession of lofty snow-capped mountain-ranges, whence copious rivers, often swollen by heavy rains or melted snows, carry the drainage into the sea. On the south it boasts the Nile, once so full of mystery; likewise wide tracts of arid desert with their oases and caravans. The Mediterranean itself, though an inland sea, is subject to gales, which, on exposed coasts, raise breakers quite large enough to give a vivid impression of the power of ocean waves. The countries that surround this great sheet of water display in many places widely-spread deposits full of sea shells, like those that still live in the neighbouring bays and gulfs. Such a region was not only well fitted to supply subjects for mythology, but also to furnish, on every side, materials which, in their interest and suggestiveness, would appeal to the reason of observant men.

It was natural, therefore, that the early philosophers of Greece should have noted some of these geological features, and should have sought for other explanations of them than those to be found in the current myths. The opinions entertained in antiquity on these subjects may be conveniently grouped under two heads: (1) Geological processes now in operation, and (2) geological changes in the past.

1. *Contemporary Processes.*—The geological processes of the present time are partly at work underground and partly on the surface of the earth. The former, from their frequently disastrous character, received much attention from Greek and Roman authors. Aristotle, in his *Meteorica*, cites the speculations of several of his predecessors which he rejects in favour of his own opinion to the effect that earthquakes are due to the generation of wind within the earth, under the influence of the warmth of the sun and the internal heat. Wind, being the lightest and most rapidly moving body, is the cause of motion in other bodies, and fire, united with wind, becomes flame, which is endowed with great rapidity of motion. Aristotle looked upon earthquakes and volcanic eruptions as closely connected with each other, the discharge of hot materials to the surface being the result of a severe earthquake, when finally the wind rushes out with violence, and sometimes buries the surrounding country under sparks and cinders,

Earthquakes and volcanoes.

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as had happened at Lipari. These crude conceptions of the nature of volcanic action, and the cause of earthquakes, continued to prevail for many centuries. They are repeated by Lucretius, who, however, following Anaximenes, includes as one of the causes of earthquakes the fall of mountainous masses of rock undermined by time, and the consequent propagation of gigantic tremors far and wide through the earth. Strabo, having travelled through the volcanic districts of Italy, was able to recognize that Vesuvius had once been an active volcano, although no eruption had taken place from it within human memory. He continued to hold the belief that volcanic energy arose from the movement of subterranean wind. He believed that the district around the Strait of Messina, which had formerly suffered from destructive earthquakes, was seldom visited by them after the volcanic vents of that region had been opened, so as to provide an escape for the subterranean fire, wind, water and burning masses. He cites in his *Geography* a number of examples of widespread and local sinking of land, and alludes also to the upraising of the sea-bottom. He likewise regards some islands as having been thrown up by volcanic agency, and others as torn from the mainland by such convulsions as earthquakes.

The most detailed account of earthquake phenomena which has come down to us from antiquity is that of Seneca in his *Quaestiones Naturales*. This philosopher had been much interested in the accounts given him by survivors and witnesses of the earthquake which convulsed the district of Naples in February A.D. 63. He distinguished several distinct movements of the ground: 1st, the up and down motion (*successio*); 2nd, the oscillatory motion (*inclinatio*); and probably a third, that of trembling or vibration. While admitting that some earthquakes may arise from the collapse of the weak substructures of caverns, he adhered to the old idea, held by the most numerous and important previous writers, that these commotions are caused mainly by the movements of wind imprisoned within the earth. As to the origin of volcanic outbursts he supposed that the subterranean fire in struggling for an outlet, and whirling through the chasms and passages, meets with great store of sulphur and other combustible substances, which by mere friction are set on fire. The elder Pliny reiterates the commonly accepted opinion as to the effects of wind confinement. In discussing the phenomena of earthquakes he remarks that towns with many culverts and houses with cellars suffer less than others, and that at Naples those houses are most shaken which stand on hard ground. It thus appears that with regard to the subterranean geological operations, no advance was made during the time of the Greeks and Romans as to the theoretical explanation of these phenomena; but a considerable body of facts was collected, especially as to the effects of earthquakes and the occurrence of volcanic eruptions.

The superficial processes of geology, being much less striking than those of subterranean energy, naturally attracted less attention in antiquity. The operations of rivers, however, which so intimately affect a dense population, were watched with more or less care. Herodotus, struck by the amount of alluvial silt brought down annually by the Nile and spread over the flat inundated land, inferred that "Egypt is the gift of the river." Aristotle, in discussing some of the features of rivers, displays considerable acquaintance with the various drainage-systems on the north side of the Mediterranean basin. He refers to the mountains as condensers of the atmospheric moisture, and shows that the largest rivers rise among the loftiest highlands. He shows that not assembly the alluvial deposits carried down to the sea increase the breadth of the land, and cites some parts of the shores of the Black Sea, where, in sixty years, the rivers had brought down such a quantity of material that the vessels then in use required to be of much smaller draught than previously, the water shallowing so much that the marshy ground would, in course of time, become dry land. Strabo supplies further interesting information as to the work of rivers in making their alluvial plains and in pushing their deltas seaward. He remarks that these deltas are prevented from advancing farther outward by the ebb and flow of the tides.

Action of rivers.

2. *Past Processes.*—The abundant well-preserved marine shells exposed among the upraised Tertiary and post-Tertiary deposits in the countries bordering the Mediterranean could not infrequently alluded to in Greek and Latin literature. Xenophanes of Colophon (614 B.C.) noticed the occurrence of shells and other marine productions inland among the mountains, and inferred from them that the land had risen out of the sea. A similar conclusion was drawn by Xanthus the Lydian (463 B.C.) from shells like scallops and cockles, which were found far from the sea in Armenia and Lower Phrygia. Herodotus, Eratosthenes, Strato and Strabo noted the vast quantities of fossil shells in different parts of Egypt, together with beds of salt, as evidence that the sea had once spread over the country. But by far the most philosophical opinions on the past mutations of the earth's surface are those expressed by Aristotle in the treatise already cited. Reviewing the evidence of these changes, he recognized that the sea now covers tracts that were once dry land, and that land will one day reappear where there is now sea. These alternations are to be regarded as following each other in a certain order and periodicity. But they are apt to escape our notice because they require successive periods of time, which, compared with our brief existence, are of enormous duration, and because they are brought about so imperceptibly that we fail to detect them in progress. In a celebrated passage in his *Metamorphoses*, Ovid puts into the mouth of the philosopher Pythagoras an account of what was probably regarded as the Pythagorean view of the subject in the Augustan age. It affirms the interchange of land and sea, the erosion of valleys by descending rivers, the washing down of mountains into the sea, the disappearance of the rivers and the submergence of land by earthquake movements, the separation of new islands from, and the union of others with, the mainland, the uprise of hills by volcanic action, the rise and extinction of burning mountains. There was a time before Etna began to glow, and the time is coming when the mountain will cease to burn.

Occurrence of fossils.

From this brief sketch it will be seen that while the ancients had accumulated a good deal of information regarding the occurrence of geological changes, their interpretations of the phenomena were to a considerable extent mere fanciful speculation. They had acquired only a most imperfect conception of the nature and operation of the geological processes; and though many writers realized that the surface of the earth has not always been, and will not always remain, as it is now, they had no glimpse of the vast succession of changes of that surface which have been revealed by geology. They built hypotheses on the slenderest basis of fact, and did not realize the necessity of testing or verifying them.

Progress of Geological Conceptions in the Middle Ages.—During the centuries that succeeded the fall of the Western empire little progress was made in natural science. The schoolmen in the monasteries and other seminaries were content to take their science from the literature of Greece and Rome. The Arabs, however, not only collected and translated much literature, but in many departments made original observations themselves. To one of the most illustrious of their number, Avicenna, the translator of Aristotle, a treatise has been ascribed, in which singularly modern ideas are expressed regarding mountains, some of which, it is said, have not been produced by an uplifting of the ground, while others have been left prominent, owing to the wearing away of the softer rocks around them. In either case, it is confessed that the process would demand long ranges of time for its completion.

After the revival of learning the ancient problem presented by fossil shells imbedded in the rocks of the interior of many countries received renewed attention. But the conditions for its solution were no longer what they had been in the days of the philosophers of antiquity. Men were not now free to adopt and teach any doctrine they pleased on the subject. The Christian church had meanwhile arisen to power all over Europe, and adjudged as heretics all who ventured to impugn any of her dogmas. She taught that the land and the sea had been separated on the third day of creation, before the appearance of any animal life, which was not created until the fifth day. To assert that the dry land is made up in great part of rocks that were formed in the sea, and are crowded with the remains of animals, was plainly to impugn the veracity of the Bible. Again, it had come to be the orthodox belief that only somewhere about 6000 years had elapsed since the time of Adam and Eve. If any thoughtful observer, impressed with the overwhelming force of the evidence that the fossiliferous strata of the earth's crust must have taken long periods of time for their accumulation, ventured to give public expression to his conviction, he ran considerable risk of being proceeded against as a heretic. It was needful, therefore, for those who would explain the facts of nature, that they not run counter to the ecclesiastical system of the day. Various such interpretations were proposed, doubtless in an honest endeavour at reconciliation. Three of these deserve special notice: (1) Many able observers and diligent collectors of fossils pronounced that these objects never belonged to organisms of any kind, but should be regarded as mere "freaks of nature," having no more connexion with any once living creature than the frost patterns on a window. They were styled "formed" or "figured" stones, "lapides ad genera," and were asserted to be due to some inorganic imitative process within the earth or to the influence of the stars. (2) Observers who could not resist the evidence of their senses that the fossil shells once belonged to living animals, and who, at the same time, felt the necessity of accounting for the presence of marine organisms in the rocks of which the dry land is largely built up, sought a way out of the difficulty by invoking the Deluge of Noah. Here was a catastrophe which, they said, extended over the whole globe, and by which the entire dry land was submerged even up to the tops of the high hills. True, it only lasted one hundred and fifty days, but so little were the facts then appreciated that no difficulty seems to have been generally felt in crowding the accumulation of the thousands of feet of fossiliferous formations into that brief space of time. (3) Some more intelligent men in Italy, recognizing that these interpretations could not be upheld, fell back upon the idea that the rocks in which fossil shells are imbedded might have been heaped up by repeated and vigorous eruptions from volcanic centres. Certain modern eruptions in the Aegean Sea and in the Bay of Naples had drawn attention to the rapidity with which hills of considerable size could be piled around an active crater. It was argued that if Monte Nuovo near Naples could have been accumulated to a height of nearly 500 ft. in two days, there seemed to be no reason against believing that, during the time of the Flood, and in the course of the

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centuries that have elapsed since that event, the whole of the fossiliferous rocks might have been deposited. Unfortunately for this hypothesis it ignored the fact that these rocks do not consist of volcanic materials.

So long as the fundamental question remained in dispute as to the true character and history of the stratified portions of the earth's crust containing organic remains, geology as a science could not begin its existence. The diluvialists (those who relied on the hypothesis of the Flood) held the field during the 16th, 17th and a great part of the 18th century. They were looked on as the champions of orthodoxy; and, on that account, they doubtless wielded much more influence than would have been gained by them from the force of their arguments. Yet during those ages there were not wanting occasional observers who did good service in combating the prevalent misconceptions, and in preparing the way for the ultimate triumph of truth. It was more especially in Italy, where many of the more striking phenomena of geology are conspicuously displayed, that the early pioneers of the science arose, and that for several generations the most marked progress was made towards putting the investigations of the past history of the earth upon a basis of careful observation and scientific deduction. One of the first of these leaders was Leonardo da Vinci (1452–1519), who, besides his achievements in painting, sculpture, architecture and engineering, contributed some notable observations regarding the great problem of the origin of fossil shells. He ridiculed the notion that these objects could have been formed by the influence of the stars, and maintained that they had once belonged to living organisms, and therefore that what is now land was formerly covered by the sea. Girolamo Fracastorio (1483–1553) claimed that the shells could never have been left by the Flood, which was a mere temporary inundation, but that they proved the mountains, in which they occur, to have been successively uplifted out of the sea. On the other hand, even an accomplished anatomist like Gabriello Falloppio (1523–1562) found it easier to believe that the bones of elephants, teeth of sharks, shells and other fossils were mere earthy inorganic concretions, than that the waters of Noah's Flood could ever have reached as far as Italy.

Leonardo da Vinci; Fracastorio; Falloppio.

By much the most important member of this early band of Italian writers was undoubtedly Nicolas Steno (1631–1687), who, though born in Copenhagen, ultimately settled in Florence. Having made a European reputation as an anatomist, his attention was drawn to geological problems by finding that the rocks of the north of Italy contained what appeared to be sharks' teeth closely resembling those of a dog-fish, of which he had published the anatomy. Cautiously at first, for fear of offending orthodox opinions, but afterwards more boldly, he proclaimed his conviction that those objects had once been part of living animals, and that they threw light on other of the past history of the earth. He published in 1669 a small tract, *De solido intra solidum naturaliter contento*, in which he developed the ideas he had formed of this history from an attentive study of the rocks. He showed that the stratified formations of the hills and valleys consist of layers which as would be laid down in the form of sediment in turbid water; that where they contain marine productions this water is proved to have been the sea; that diversities in their composition point to commingling of currents, carrying different kinds of sediment in which the heaviest would first sink to the bottom. He made original and important observations on stratification, and laid down some of the fundamental axioms in stratigraphy. He reasoned that as the original position of strata was approximately horizontal, when they are found to be steeply inclined or vertical, or bent into arches, they have been disrupted by subterranean exhalations, or by the falling in of the roofs of underground cavernous spaces. It is to this alteration of the original position of the strata that the inequalities of the earth's surface, such as mountains, are to be ascribed, though some have been formed by the outburst of fire, ashes and stones from inside the earth. Another effect of the dislocation has been to provide fissures, which serve as outlets for springs. Steno's anatomical training peculiarly fitted him for dealing authoritatively with the question of the nature and origin of the fossils contained in the rocks. He had no hesitation in affirming that, even if no shells had ever been found living in the sea, the internal structure of these fossils would demonstrate that they once formed parts of living animals. And not only shells, but teeth, bones and skeletons of many kinds of fishes had been quarried out of the rocks, while some of the strata had skulls, horns and teeth of land-animals. Illustrating his general principles by a sketch of what he supposed to have been the past history of Tuscany, he added a series of diagrams which show how clearly he had conceived the essential elements of stratigraphy. He thought he could perceive the records of six successive phases in the evolution of the framework of that country, and was inclined to believe that a similar chronological sequence would be found all over the world. He anticipated the objections that would be brought against his views on account of the insuperable difficulty in granting the length of time that would be required for all the geographical vicissitudes which his interpretation required. He thought that many of the fossils must be as old as the time of the general deluge, but he was careful not to indulge in any speculation as to the antiquity of the earth.

Nicolas Steno.

To the Italian school, as especially typified in Steno, must be assigned the honour of having thus begun to lay firmly and truly the first foundation stones of the modern science of geology. The same school included Antonio Vallisneri (1661–1730), who surpassed his predecessors in his wider and more exact knowledge of the fossiliferous rocks that form the backbone of the Italian peninsula, which he contended were formed during a wide and prolonged submergence of the region, altogether different from the brief deluge of Noah. There was likewise Lazzaro Moro (1687–1740), who did good service against the diluvialists, but the fundamental feature of his system of nature was in the preponderant part which, unaware of the great difference between volcanic materials and ordinary sediment, he assigned to volcanic action in the production of the sedimentary rocks of the earth's crust. He supposed that in the beginning the globe was completely surrounded with water, beneath which the solid earth lay as a smooth ball. On the third day of creation, however, vast fires were kindled inside the globe, whereby the smooth surface of stone was broken up, and portions of it, appearing above the water, formed the earliest land. From that time onward, volcanic eruptions succeeded each other, not only on the emerged land, but on the sea-floor, over which the ejected material spread in an ever augmenting thickness of sedimentary strata. In this way Moro carried the history of the stratified rocks beyond the time of the Flood back to the Creation, which was supposed to have been some 1600 years earlier; and he brought it down to the present day, when fresh sedimentary deposits are continually accumulating. He thus incurred no censure from the ecclesiastical guardians of the faith, and he succeeded in attracting increased public attention to the problems of geology. The influence of his teaching, however, was subsequently in great part due to the Carmelite friar Generelli, who published an eloquent exposition of Moro's views.

Lazzaro Moro.

The Cosmogonists and Theories of the Earth.—While in Italy substantial progress was made in collecting information regarding the fossiliferous formations of that country, and in forming conclusions concerning them based upon more or less accurate observations, the tendency to mere fanciful speculation, which could not be wholly repressed in any country, reached a remarkable extravagance in England. In proportion as materials were yet lacking from which to construct a history of the evolution of our planet in accordance with the teaching of the church, imagination supplied the place of ascertained fact, and there appeared during the last twenty years of the 18th century a group of English cosmogonists, who, by the sensational character of their speculations, successfully arrested attention both in Britain and on the continent. It may be doubted, however, whether the effect of their writings was not to hinder the advance of true science by diverting men from the observation of nature into barren controversy over unrealities. It is not needful here to do more than mention the names of Thomas Burnet, whose *Sacred Theory of the Earth* appeared in 1681, and William Whiston, whose *New Theory of the Earth* was published in 1696. Hardly less fanciful than these writers, though his practical acquaintance with rocks was more extensive, was John Woodward, whose *Essay towards a Natural History of the Earth* dates from 1695. More important as a contribution to science was the catalogue of the large collection of fossils, which he had made from the rocks of England and which he bequeathed to the University of Cambridge. This catalogue appeared in 1728–1729 with the title of *An attempt towards a Natural History of the Fossils of England.*

Descartes.

A striking contrast to these cosmogonists is furnished by another group, which arose in France fortunately at the same time in the world the first rational ideas concerning the probable primeval evolution of our globe. The earliest of these pioneers was the illustrious philosopher René Descartes (1596–1650). He propounded a scheme of cosmical development in which he supposed the earth, like the other planets, to have been originally a mass of glowing material like the sun, and to have gradually cooled on the outside, while still retaining an incandescent, self-luminous nucleus. Yet with this noble conception, which modern science has accepted, Descartes could not shake himself free from the time-honoured error in regard to the origin of volcanic action. He thought that certain exhalations within the earth condense into oil, which, when in violent motion, enters into the subterranean cavities, where it passes into a kind of smoke. This smoke is from time to time ignited by a spark of fire and, pressing violently against its containing walls, gives rise to earthquakes. If the flame breaks through to the surface at the top of a mountain, it may escape with enormous energy, hurling forth much earth mingled with sulphur or bitumen, and thus producing a volcano. The mountain might burn for a long time until at last its store of fuel in the shape of sulphur or bitumen would be exhausted. Not only did the philosopher refrain from assigning a limit himself of the high internal temperature of the globe as the source of volcanic energy, he even did not make use of it as the cause of the ignition of his supposed internal fuel, but speculated on the kindling of the subterranean fires by the spirits or gases setting fire to the exhalations, or by the fall of masses of rock and the sparks produced by their friction or percussion.

The ideas of Descartes regarding planetary evolution were enlarged and made more definite by Wilhelm Gottfried Leibnitz (1646–1716), whose teaching has largely influenced all subsequent speculation

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on the subject. In his great tract, the *Protogaea* (published in 1749, thirty-three years after his death), he traced the probable passage of our earth from an original condition of incandescent vapour into that of a smooth molten globe, which, by continuous cooling, acquired an external solid crust and rugose surface. He thought that the more ancient rocks, such as granite and gneiss, might be portions of the earliest outer crust; and that as the external solidification advanced, immense subterranean cavities were left which were filled with air and water. By the collapse of the roofs of these caverns, valleys were originated in the stratified rocks of the crust. Ridiculing the foolish attempts to account for the presence of these objects by calling them "sports of nature," he showed that they are to be regarded as historical monuments; and he adduced a number of instances wherein massive platforms of strata, containing organic remains, bear witness to a series of advances and retreats of the sea. He recognized that some of the fossils appeared to have nothing like them in the living world of to-day, but some analogous forms might yet be found, he thought, in still unexplored parts of the earth; and even if no living representatives should ever be discovered, many types of animals might have undergone transformation during the great changes which had affected the surface of the earth. In spite of his clear realization of the value of observed geological ideas within the fully known interior of the earth, Leibnitz continued to regard volcanic action as due to the combustion of inflammable substances enclosed within the terrestrial crust, such as stone-coal, naphtha and sulphur.

Buffon.

Appealing to a much wider public than Descartes or Leibnitz, and basing his speculations on a wider acquaintance with the organic and inorganic realms of nature, G. L. L. de Buffon (1707–1788) was undoubtedly one of the most influential forces that in Europe guided the growth of geological ideas during the 18th century. He published in 1749 a *Theory of the Earth*, in which he adopted views similar to those of Descartes and Leibnitz as to planetary evolution; but though he realized the importance of fossils as records of former conditions of the earth's surface, he accounted for them by supposing that they had been deposited from a universal ocean, a large part of which had subsequently been engulfed into caverns in the interior of the globe. Thirty years later, after having laboured with skill and enthusiasm in all branches of natural history, he published the work, his famous *Epoques de la nature* (1778), which is specially remarkable as the first attempt to deal with the history of the earth in a chronological manner, and to compute, on a basis of experiment, the antiquity of the several stages of this history. His experiments were made with balls of cast iron, and could not have yielded results of any value for his purpose; but in so far as his calculations were not mere random guesses but had some kind of foundation on experiment, they deserve respectful recognition. He divided the history of the earth into six periods of unequal duration, the whole comprising a period of some 70,000 or 75,000 years. He supposed that the stage of incandescence, before the globe had consolidated to the centre, lasted 2936 years, and that 35,000 years elapsed before the surface had cooled sufficiently to be touched, and therefore to be capable of supporting living things. Terrestrial animal life, however, was not introduced until 55,000 or 60,000 years after the beginning of the world or about 15,000 years before our time. Looking into the future, he foresaw that, by continued refrigeration, our globe will eventually become colder than ice, and this fair face of nature, with its manifold varieties of plant and animal life, will perish after having existed for 132,000 years.

Buffon's conception of the operation of the geological agents did not become broader or more accurate in the interval between the appearance of his two treatises. He still continued to believe in the lowering of the ocean by subsidence into vast subterranean cavities, with a consequent emergence of land. He still looked on volcanoes as due to the burning of "pyritous and combustible stones," though he now called in the co-operation of electricity. He calculated that the first volcanoes could not arise until some 50,000 years after the beginning of the world, by which time a sufficient extent of dense vegetation had been buried in the earth to supply them with fuel. He appears to have had but an imperfect acquaintance with the literature of his own time. At least there can be little doubt that had he availed himself of the labours of his own countryman, Jean Etienne Guettard (1715–1786), of Giovanni Arduino (1714–1795) in Italy, and of Johann Gottlob Lehmann (d. 1767) and George Christian Füchsel (1722–1773) in Germany, he would have been able to give to his "epochs" a more definite succession of events and a greater correspondence with the facts of nature.

Among the writers of the 18th century, who formed philosophical conceptions of the system of processes by which the life of our earth as a habitable globe is carried on, a foremost place must be assigned to James Hutton (1726–1797). Educated for the medical profession, he studied at Edinburgh and at Paris, and took his doctor's degree at Leiden. But having inherited a small landed property in Berwickshire, he took to agriculture, and after putting his land into excellent order, let his farm and betook himself to Edinburgh, there to gratify the scientific tastes which he had developed early in life. He had been more especially led to study minerals and rocks, and to meditate on the problems which they suggest as to the constitution and history of the earth. His journeys in Britain and on the continent of Europe had made him with many men of science, and he had gradually evolved a system or theory in which all the scattered facts could be arranged so as to show their mutual dependence and their place in the orderly mechanism of the world. He used to discuss his views with one or two of his friends, but refrained from publishing them to the world until, on the foundation of the Royal Society of Edinburgh, he communicated an outline of his doctrine to that learned body in 1785. Some years later he expanded this first essay into a larger work in two volumes, which were published in 1795 with the title of *Theory of the Earth, with Proofs and Illustrations*.

James Hutton.

Hutton's teaching has exercised a profound influence on modern geology. This influence, however, has arisen less from his own writings than from the account of his doctrines given by his friend John Playfair in the classic work entitled *Illustrations of the Huttonian Theory*, published in 1802. Hutton wrote in so prolix and obscure a style as rather to repel than attract readers. Playfair, on the other hand, expressed himself in such clear and graceful language as to command general attention, and to gain wide acceptance for his master's views. Unlike the older cosmogonists, Hutton refrained from trying to explain the origin of things, and from speculations as to what might possibly have been the early history of our globe. He determined from the outset to interpret the past by what can be seen to be the present order of nature; and he refused to admit the operation of causes which cannot be shown to be part of the actual terrestrial system. Like other observers who had preceded him, he recognized that the various rocks composing the dry land evidence of former geographical conditions very different from those which now prevail. He saw that the vast majority of rocks consist of hardened sediments and must have been deposited in the sea. He could distinguish among them an older or Primary series, and a younger or Secondary series; and did not dispute the existence of a Tertiary series claimed by Peter Simon Pallas (1741–1811). He believed that these various rocks had undergone certain changes produced by subterranean heat, that the oldest and lowest rocks had suffered most from this action, that into these more deep-seated masses subsequent veins and larger bodies of molten matter were injected from below, and thus that what was originally loose detritus eventually became changed into hard crystalline schists as are now found in mountain chains. In the course of these terrestrial revolutions sedimentary strata, originally more or less nearly horizontal, have been pushed upward, dislocated, crumpled, placed on end, and even elevated to form ranges of lofty mountains. Hutton looked upon these disturbances as due to the expansive power of subterranean heat; but he did not attempt to sketch the mechanism of the process, and he expressly declined to offer any conjecture as to how the land so elevated originated in the first position. He thought that the interior of our planet may "be a fluid mass, melted, but unchanged by the action of heat"; and, far from connecting volcanoes with the combustion of inflammable substances, as had been the prevalent belief for so many centuries, he looked upon them as a beneficent provision of "spiracles to the subterranean furnace, in order to prevent the unnecessary elevation of land and fatal effects of earthquakes."

A distinguishing feature of the Huttonian philosophy is to be seen in the breadth of its conceptions regarding the geological operations continually in progress on the surface of the globe. Hutton saw that the land is undergoing a ceaseless process of degradation, through the influence of the air, frost, rain, rivers and the sea, and that in course of time, if no counteracting agency should intervene, the whole of the dry land will be washed away into the sea. But he also perceived that this universal erosion is not everywhere carried on at the same rate; that it is specially active along the channels of torrents and rivers, and that, owing to this difference these channels are gradually deepened and widened, until the complicated valley-system of a country is carved out. He recognized that the detritus worn away from the land must be spread out over the floor of the sea, so as to form there strata similar to those that compose most of the dry land. As he could detect in the structure of land convincing evidence that former sea floors had been elevated to form the continents and islands of to-day, he could look forward to future ages, when the same subterranean agency which had raised up the present land would again be employed to uplift the bed of the existing ocean, thus to renew the surface of our earth as a habitable globe, and to start a fresh cycle of erosion and deposition.

Though Hutton was not unaware that organic remains abound in many of the stratified rocks, he left them out of consideration in the elaboration of his theory. It was otherwise with **Lamarck.** one of his French contemporaries, the illustrious J. B. Lamarck (1744–1829), who, after having attained great eminence as a botanist, turned to zoology when he was nearly fifty years of age, and before long rose to even greater distinction in that department,

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of science. His share in the classification and description of the mollusca and in founding invertebrate palaeontology, his theory of organic evolution and his philosophical treatment of many biological questions have been tardily recognized, but his contributions to geology have been less generally acknowledged. When he accepted the "professorship of zoology; of insects, of worms and of microscopic animals" at the Museum of Natural History, Paris, in 1793, he at once entered with characteristic ardour and capacity into the new field of research then opened to him. In dealing with the mollusca he considered not merely the living but also the extinct forms, especially the abundant, varied and well-preserved genera and species furnished by the Tertiary deposits of the Paris basin, of which he published elaborate plates that proved of essential service in the stratigraphical work of Cuvier and Alexandre Brongniart (1770–1847). His labours among these relics of ancient seas and lakes led him to ponder over the past history of the globe, and as he was seldom dilatory in making known the opinions he had formed, he communicated some of his conclusions to the National Institute in 1799. These, including a further elaboration of his views, he published in 1802 in a small volume entitled *Hydrogéologie*.

This treatise, though it did not reach a second edition and has never been reprinted, deserves an honourable place in geological literature. Its object, the author states, was to present some important and novel considerations, which he thought should form the basis of a true theory of the earth. He entirely agreed with the doctrine of the subaerial degradation of the land and the erosion of valleys by running water. Not even Playfair could have stated this doctrine more emphatically, and it is worthy of notice that Playfair's *Illustrations of the Huttonian Theory* appeared in the same year with Lamarck's book. The former naturalist, however, carried his conclusions so far as to take no account of any great movements of the terrestrial crust, which might have produced or modified the main physical features of the surface of the globe. He thought that all mountains, except such as were thrown up by volcanic energy or local accidents, have been cut out of plains, the original surfaces of which are indicated by the crests and summits of these elevations.

Lamarck, in reflecting upon the wide diffusion of fossil shells and the great height above the sea at which they are found, perceived the extraordinary idea that the ocean basin has been scoured out by the sea, and that, by an impulse communicated to the waters through the influence chiefly of the moon, the sea is slowly eating away the eastern margins of the continents, and throwing up detritus on their western coasts, and is thus gradually shifting its basin round the globe. He would not admit the operation of cataclysms; but insisted as strongly as Hutton on the continuity of natural processes, and on the necessity of explaining former changes of the earth's surface by causes which can still be seen to be in operation. As might be anticipated from his previous studies, he brought living things and their remains into the forefront of his theory of the earth. He looked upon fossils as one of the chief means of comprehending the revolutions which the surface of the earth has undergone, and in his little volume he again and again dwells on the vast antiquity to which these revolutions bear witness. He acutely argues, from the condition of fossil shells, that they must have lived and died where their remains are now found.

In the last part of his treatise Lamarck advances some peculiar opinions in physics and chemistry, which he had broached eighteen years before, but which had met with no acceptance among the scientific men of his time. He pronounced that the forces of all compound substances is to decay, and thereby to be resolved into their component constituents. Yet he saw that the visible crust of the earth consists almost wholly of compound bodies. He therefore set himself to solve the problem thus presented, conceiving that the biological action of living organisms is constantly forming combinations of matter, which would never have otherwise come into existence, he proceeded to draw the extraordinary conclusion that the action of plants and animal life (the *Pouvoir de la vie*) upon the inorganic world is so universal and so potent, that the rocks and minerals which form the outer part of the earth's crust are all, without exception, the result of the operations of once living bodies. Though this sweeping deduction must be allowed to detract from the value of Lamarck's work, there can be no doubt that he realized more fully than any one had done before him, the efficacy of plants and animals as agents of geological change.

The last notable contributor to the cosmological literature of geology was another illustrious Frenchman, the comparative anatomist Cuvier (1769–1832). He was contemporary with Lamarck, but of a very different type of mind. The brilliance of his speculations, and the charm with which he expounded them, early gained for him a prominent place in the society of Paris. He too was drawn by his zoological studies to investigate fossil organic remains, and to consider the former conditions of the earth's surface, of which they are memorials. It was among the vertebrate organisms of the Paris basin that he found his chief material, and from them that he prepared the memoirs which led to him being regarded as the founder of vertebrate palaeontology. But beyond their biological interest, they awakened in him a keen desire to ascertain the character and sequence of the geographical revolutions to which they bear witness. He approached the subject from an opposite and less philosophical point of view than that of Lamarck, coming to it with certain preconceived notions, which affected all his subsequent writings. While Lamarck was by instinct an evolutionist, who sought to trace in the history of the past the operation of the same natural processes as are still at work, Cuvier, on the other hand, was a catastrophist, who invoked a succession of vast cataclysms to account for the interruptions in the continuity of the geological record.

Cuvier.

In a preliminary *Discourse* prefixed to his *Recherches sur les ossemens fossiles* (1821) Cuvier gave an outline of what he conceived to have been the past history of our globe, so far as he had been able to comprehend it from his investigations of the Tertiary formations of France. He believed that in that history evidence can be recognized of the occurrence of many sudden and disastrous revolutions, which, to judge from their effects on the animal life of the time, must have exceeded in violence anything we can conceive at the present day, and must have been brought about by other agencies than those which are now in operation. Yet, in spite of these catastrophes, he saw that there has been an upward progress in the animal forms inhabiting the globe, until the series ended in the advent of man. He could not, however, find any evidence that one species has been developed from another, for in that case there should have been traces of intermediate forms among the stratified formations, where he affirmed that they had never been found. A prominent position in the *Discourse* is given to a strenuous argument to disprove the alleged antiquity of some nations, and to show that the last great catastrophe occurred not more than some 5000 or 6000 years ago. Cuvier thus linked himself with those who in previous generations had contended for the efficacy of the Deluge. But his researches among fossil animals had given him a far wider outlook than any of the geologists who had gone before him, and a succession of deeply interesting problems in the history of life upon the earth, which, though he had not himself material for their solution, he could foresee would be cleared up in the future.

Growth of Geology a Distinct Branch of Science.—It will be seen from the foregoing historical sketch that it was only after the lapse of long centuries, and from the labours of many successive generations of observers and writers, that what we now know as the science of geology began to be recognized as a distinct department of natural knowledge, founded upon careful and extended study of the structure of the earth, and upon observation of the natural processes, which are now at work in changing the earth's surface. The term "geology,"[1] descriptive of this branch of the investigation of nature, was not proposed until the last quarter of the 18th century by Jean André De Luc (1727–1817) and Horace Benedict De Saussure (1740–1749). But the science was then in a markedly half-formed condition, theoretical speculation still in large part usurping the place of observations based on a patient examination of actual fact. In 1807 a few enterprising spirits founded the Geological Society of London for the special purpose of counteracting the prevalent tendency and confining their intention "to investigations of the mineral structure of the earth." The Neptunists and framers of Theories of the Earth were succeeded by other schools of thought. The Catastrophists saw in the composition of the crust of the earth distinct evidence that the forces of nature were once much more stupendous in their operation than they now are, and that they had from time to time devastated the earth's surface; extirpating the races of plants and animals, and preparing the ground for new creations of organized life. Then came the Uniformitarians, who, pushing the doctrines of Hutton to an extreme which he did not propose, saw no evidence that the activity of the various geological causes has ever seriously differed from what it is at present. They were inclined to disbelieve that the stratified formations of the earth's crust furnish conclusive evidence of progression, from simple types of life in the oldest strata to the most highly developed forms in the youngest; and saw no reason why remains of the higher vertebrates should not be met with among the Palaeozoic formations. Sir Charles Lyell (1797–1875) was the great leader of this school. His admirably clear and philosophical presentations of geological facts which, with unwearied industry, he collected from the writings of observers in all parts of the world, impressed his views upon the whole English-speaking world, and gave to geological science a coherence and interest which largely accelerated its progress. In his later years, however, he frankly accepted the views of Darwin in regard to the progressive character of the geological record.

The youngest of the schools of geological thought is that of the Evolutionists. Pointing to the whole body of evidence from inorganic and organic nature, they maintain that the history of our planet has been one of continual and unbroken development from the earliest cosmical beginnings down to the present time, and that the crust of the earth contains an abundant, though incomplete, record of the successive stages through which the plant and animal

[1] In De Luc's *Lettres physiques et morales sur les montagnes* (1778), the word "cosmology" is used for our science, the author stating that "geology" is more appropriate, but it "was not a word in use." In a completed edition, published in 1779, the same statement is made, but "geology" occurs in the text; in the same year De Saussure used the word without any explanation, as if it were well known.

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kingdoms have reached their existing organization. The publication of Darwin's *Origin of Species* in 1859, in which evolution was made the key to the history of the animal and vegetable kingdoms, produced an extraordinary revolution in geological opinions. The older schools of thought rapidly died out, and evolution became the recognized creed of geologists all over the world.

Development of Opinion regarding Igneous Rocks.—So long as the idea prevailed that volcanoes are caused by the combustion of inflammable substances underground, there could be no rational conception of volcanic action and its products. Even so late as the middle of the 18th century, as above remarked, such a good observer as Lazzaro Moro drew so little distinction between volcanic and other rocks that he believed the fossiliferous formations to have been mainly formed of materials ejected from eruptive vents. After his time the notion continued to prevail that all the rocks which form the dry land were laid down under water. Even streams of lava, which were seen to flow from an active crater, were regarded only as portions of sedimentary or other rocks, which had been melted by the fervent heat of the burning inflammable materials that had been kindled underground. In spite of the speculations of Descartes and Leibniz, it was not yet generally comprehended that there exists beneath the terrestrial crust a molten magma, which, from time to time, has been injected into that crust, and has pierced through it, so as to escape at the surface with all the energy of an active volcano. What we now recognize to be memorials of these former injections and propulsions were all confounded with the rocks of unquestionably aqueous origin. The last great teacher by whom these antiquated doctrines were formulated into a system

Werner. and promulgated to the world was Abraham Gottlob Werner (1749–1815), the most illustrious German mineralogist and geognost of the second half of the 18th century. While still under twenty-six years of age, he was appointed teacher of mining and mineralogy at the Mining Academy of Freiberg in Saxony —a post which he continued to fill up to the end of his life. He possessed of great enthusiasm for his subject, clear, methodical and eloquent in his exposition of it, he soon drew around him men from all parts of the world, who repaired to study under the great oracle of what he called Geognosy (Gr. γῆ, the earth, and γνῶσις, knowledge of the earth) knowledge. Reviving doctrines that had been current long before his time, he taught that the globe was once completely surrounded with an ocean, from which the rocks of the earth's crust were deposited as chemical precipitates, in a certain definite order over the whole planet. Among these "universal formations" of aqueous origin were included many rocks, which have long been recognized to have been once molten, and to have risen from below into the upper parts of the terrestrial crust. Werner, following the old traditions, looked upon volcanoes as modern features in the history of the planet, which could not have come into existence until a sufficient amount of vegetation had been buried to furnish fuel for their maintenance. Hence he attached but little importance to them, and did not include in his system of rocks any distinct class of volcanic or igneous materials. From the predominant part assigned by him to the sea in the accumulation of the materials of the visible part of the earth, Werner and his school were knowns "Neptunists."

Origin of basalt.

But many years before the Saxon professor began his lectures, clear evidence had been produced from central France that basalt, one of the rocks claimed by him as a chemical precipitate and a universal formation, is a lava which has been poured out in a molten state at various widely separated periods of time and at many different places. So far back as 1753 J. E. Guettard (1715–1786) had shown that the basaltic rocks of Auvergne are true lavas, which have flowed out in streams from groups of once active cones. Eleven years later the observation was confirmed and greatly extended by Nicholas Desmarest (1725–1815), who, during a long course of years, worked out and mapped the complicated volcanic records of that interesting region, and demonstrated to all who were willing impartially to examine the evidence the purely volcanic nature of basalt. These views found acceptance from some observers, but they were vehemently opposed by the followers of Werner, who, by the force of his genius, made his theoretical conceptions predominate all over Europe. The controversy as to the origin of basalt was waged with great vigour during the latter decades of the 18th century. Desmarest took no part in it. He had accumulated such conclusive proof of the correctness of his deductions, and had so fully expounded the clearness of the evidence in their favour furnished by the region of Auvergne, that, when any one came to consult him on the subject, he contented himself with giving the advice to "go and see." While the debate was in progress on the continent, the subject was approached from a new and independent point of view by Hutton in Scotland. That luminous philosopher, as already stated, realized the importance of the internal heat of the globe in consolidating the sedimentary rocks, and believed that molten material from the earth's interior has been protruded from below into the overlying crust. Some of the material thus injected could be recognized, he thought, in granite and in the various dark massive rocks which, known in Scotland under the name of "whinstone," were afterwards called "Trap," and are now grouped under various names, such as basalt, dolerite and diorite. So important a share did Hutton thus assign to the internal heat in the geological evolution of the planet, that he and those who adopted the same opinions were styled "Plutonists," or, especially where they concerned themselves with the volcanic origin of basalt, "Vulcanists." The geological world was thus divided into two hostile camps, that of the Neptunists or Wernerians, and that of the Plutonists, Vulcanists or Huttonians.

After many years of futile controversy the first serious weakening of the position of the dominant Neptunist school arose from the defection of some of the most prominent of Werner's pupils. In particular Jean François D'Aubuisson de Voisins (1769–1819), who had written a treatise on the aqueous origin of the basalts of Saxony, went afterwards to Auvergne, where he was speedily a convert to the views expounded by Desmarest as to the volcanic nature of basalt. Having thus to relinquish one of the fundamental articles of the Freiberg faith, he was subsequently led to modify his adherence to others until, as he himself confessed, his views came almost wholly to agree with those of Hutton. Not less complete, and even more important, was the conversion of the illustrious Leopold von Buch (1774–1853). He, too, was trained by Werner himself, and proved to be the most illustrious pupil of the Saxon professor. Full of admiration for the Neptunism in which he had been reared, he, in his earliest separate work, maintained the aqueous origin of basalt, and contrasted the wide field opened up to the spirit of observation by his master's teaching with the narrower outlook offered by "the volcanic theory." But a little further acquaintance with the facts of nature led Von Buch also to abandon his earlier prepossessions. It was a personal visit to the volcanic region of Auvergne that first opened his eyes, and led him to recant what he had believed and written about basalt. But the abandonment of so essential a portion of the Wernerian creed prepared the way for further relinquishments. When a few years later he went to Norway and found a similar establishment that granite, which he had been taught to regard as the oldest chemical precipitate from the universal ocean, could there be seen to have broken through and metamorphosed fossiliferous limestones, and to have been sent veins into the overlying strata, and that the succession of the rocks in the earth's crust received a further momentous shock. While one after another of the Freiberg doctrines crumbled away before him, he was now able to interrogate nature on a wider basis than the comparatively limited area of Saxony, and thus gradually led to embrace the tenets of the opposite school. His commanding position, as the most accomplished geologist on the continent, gave great importance to his recantation of the Neptunist creed. The defection indeed was not universal, but from this event had yet sustained. It may be said to have rung the knell of Wernerianism, which thereafter rapidly declined in influence, while Plutonism came steadily to the front, where it has ever since remained.

Although Desmarest had traced in Auvergne a long succession of volcanic eruptions, of which the oldest date back to a remote period of time, and although he had shown that this succession, coupled with the records of contemporaneous denudation, might be used in defining epochs of geological history, it was not until the researches of Leopold von Buch and Jean Alexis Scrope came to be illustrated as a normal part of the mechanism of our globe, which had been in operation from the remotest past, and which had left numerous records among the rocks of the terrestrial crust. During the progress of the controversy between the two great opposing factions in the later portion of the 18th and the first three decades of the 19th century, those who espoused the Vulcanist cause were intent on proving that certain rocks, which are intercalated among the unquestionably aqueous formations and which were claimed by them as obviously formed by water, are nevertheless of truly igneous origin. These observers fixed their eyes on the evidence that the material of such rocks, instead of having been deposited from aqueous solution, had once been actually molten, and had in that condition been thrust between the strata, had enveloped portions of them, and had indurated or otherwise altered them. They spoke of these masses as "unerupted lavas"; and undoubtedly in innumerable instances they were right. But their zeal to establish an intrusive origin led them to overlook the proofs that sometimes sheets of igneous material had not been injected into the strata, but had been poured out at the surface as truly volcanic discharges, and therefore belonged to the ancient periods represented by the strata between which they are intercalated. It may readily be supposed that any proofs of the contemporaneous intercalation of such sheets would be eagerly seized upon by the Neptunists in favour of their aqueous theory. The influence of the ancient belief that "burning mountains" could only rise from the combustion of subterranean inflammable materials extended even into the ranks of the Vulcanists, so far at least as to lead to a general acquiescence in the assumption that volcanoes appeared to belong to a late phase in the history of the globe. It was not until after considerable progress had been made in determining the palaeontological distinctions and order of succession of the stratified formations of the earth's crust that it became possible to trace among these formations a succession of volcanic episodes which were contemporaneous with them. In no part of the world has an ampler record of such episodes been preserved than in the British Isles. It was natural, therefore, that the subject should there receive most attention. As far back as 1820 Ami Boué (1794–1881) showed that the Old Red Sandstone of Scotland includes a great series of volcanic rocks, and that other rocks of volcanic origin are associated with the Carboniferous formations. H. T.

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de la Beche (1796–1855) afterwards traced proofs of contemporaneous eruptions among the Devonian rocks of the south-west of England. Adam Sedgwick (1785–1873) showed, first in the Lake District, and afterwards in North Wales, the presence of abundant volcanic sheets among the oldest divisions of the Palaeozoic series; while Roderick Impey Murchison (1792–1871) made similar discoveries among the Lower Silurian rocks. From the time of these pioneers the volcanic history of the country has been worked out by many observers until it is now known with a fulness as yet unattained in any other region.

Growth of Opinion regarding Earthquakes.—We have seen how crude were the conceptions of the ancients regarding the causes of volcanic action, and that they connected volcanic and earthquake as results of the commotion of wind imprisoned within subterranean caverns and passages. One of the earliest treatises, in which the phenomena of terrestrial movements were discussed in the spirit of modern science, was the posthumous collection of papers by Robert Hooke (1635–1703), entitled *Lectures and Discourses of Earthquakes and Subterranean Eruptions*, where the probable agency of earthquakes in upheaving and depressing land is fully considered, but without any definite pronouncement as to the author's conception of its origin. Hooke still associated earthquakes with volcanic action, and connected both with what he called "the general congregation of sulphurous subterraneous vapours." He conceived that some kind of "fermentation" took place within the earth, and that the materials which catch fire and give rise to eruptions or earthquakes are analogous to those that constitute gunpowder. The first essay wherein earthquakes are treated from the modern point of view as the results of a shock through the solid crust of the earth was written by the Rev. John Michell, and communicated to the Royal Society in the year 1760. Still under the old misconception that volcanoes are due to the combustion of inflammable materials, he thought these might be set on fire by the spontaneous combustion of pyritous strata, but supposed that, by the sudden access of large bodies of water to these subterranean fires, vapour is produced in such quantity and with such force as to give rise to the shock. From the centre of origin of this shock waves, he thought, are propagated through the earth, which are largest at the start and gradually diminish as they travel outwards. By drawing lines at different places in the direction of the track of these waves, he believed that the place of common intersection of these lines would be nearly the centre of disturbance. In this way he showed that the great Lisbon earthquake of 1755 had its focus under the Atlantic, somewhere between the latitudes of Lisbon and Oporto, and he estimated that the depth at which it originated could not be much less than 1 m., and probably did not exceed 3 m. His views, however, misconceived the character of the waves which he described, seeing that he believed them to be due to the actual propagation of the vapour itself underneath the surface of the earth. A century had almost passed after the date of Michell's memoir before anything methods of observation and the use of recording instruments began to be applied to the study of earthquake phenomena. In 1846 Robert Mallet (1810–1881) published an important paper "On the Dynamics of Earthquakes" in the *Transactions of the Royal Irish Academy*. From that time onward he continued to devote his energies to this investigation, studying the effects of the Calabrian earthquake of 1857, experimenting on the transmission of waves of shock through various materials, caused by exploding charges of gunpowder, and collecting all the information to be obtained on the subject. His writings, and especially his work in two volumes on *The First Principles of Observational Seismology*, must be regarded as having laid the foundations of this branch of modern geology (see EARTHQUAKE; SEISMOMETER).

History of the Evolution of Stratigraphical Geology.—Men had long been familiar with the evidence that the present dry land once lay under the sea, before they began to realize that the rocks, of which the land consists, contain a record of many alternations of land and sea, and relics of a long succession of plants and animals from early and simple types up to the manifold and complex forms of to-day. In countries where coal-mining had been prosecuted for generations, it had been recognized that the rocks consist of strata disposed on each other in a definite order, which was found to extend over the whole of a district. As far back as 1719 John Strachey drew attention to this fact in a communication published in the *Philosophical Transactions*. John Michell (1760), in the paper quoted, on earthquakes already cited, showed that he had acquired a clear understanding of the order of succession among stratified formations, and perceived that to disturbances of the terrestrial crust must be ascribed the fact that the lower or older and more inclined strata form the mountains, while the younger and more horizontal strata are spread over the plains.

In Italy G. Arduino (1713–1795) classified the rocks in the north of the peninsula as Primitive, Secondary, Tertiary and Volcanic. A similar threefold order was announced for the Harz and Erzgebirge by J. G. Lehmann in 1756. He recognized in that region an ancient series of rocks in inclined or vertical strata, which rise to the tops of the hills and descend to an unknown depth into the interior. These masses, he thought, were contemporaneous with the making of the world. Next came the Flötzgebirge, consisting of younger sediments, disposed in flat or gently inclined sheets which overlie the first and more disturbed series, and are full of petrified remains of plants and animals. Lastly he included the mountains which have from time to time been formed by local accidents. Still more advanced were the conceptions of G. C. Füchsel, who in the year 1762 published in Latin *A History of the Earth and the Sea, based on a History of the Mountains of Thuringia*; and in 1773, in German, a *Sketch of the most Ancient History of the Earth and Man*. In these works he described the stratigraphical relations and general characters of the various geological formations in his little principality; and taking them as indicative of a general order of succession, he traced what he believed to have been a series of revolutions through which the earth has passed. In interpreting this geological history, he laid great stress on the character of the fossils contained in the rocks. He recognized that the various formations differ from each other in their enclosed organic remains, and that from these differences the existence of former sea-bottoms and land surfaces can be determined.

The labours of these pioneers paved the way for the advent of Werner. Though the system evolved by this teacher claimed to discard theory and to be established on a basis of observed facts, it rested on a succession of hypotheses, for which no better foundation could be shown than the belief of their author in their validity. Starting from the extremely limited stratigraphical range displayed in the geological structure of Saxony, he took it as a type for the rest of the globe, persuading himself and impressing upon his followers that the rocks of that small kingdom were to be taken as examples of his "universal formations." The oldest portion of the series, classed by him as "Primitive," consisted of rocks which he maintained had been deposited from chemical solution. Yet they included granite, gneiss, basalt, porphyry and serpentine, which, even in his own day, were by many observers correctly regarded as of igneous origin. A later group of rocks, to which he gave the name of "Transition," comprised, in his belief, partly chemical, partly mechanical sediments, and the earliest fossil and organic remains. A third group, for which he reserved Lehmann's name "Flötz," was made up chiefly of mechanical detritus, while youngest of all came the "Alluvial" series of loams, clays, sands, gravels and soils. It was by the gradual subsidence of the ocean that, as he believed, the general mass of the dry land emerged, the first-formed rocks being left standing up, sometimes on end, to form the mountains, while those of later date, less steeply inclined, occupied successively lower levels down to the flat accumulations of the plains. Neither Werner, nor any of his followers, ventured to account for what became of the water as the sea-level subsided, though, in despite of their antipathy to anything like speculation, they could not help suggesting, as an answer to the cogent arguments of their opponents, that "one of the celestial bodies which sometimes approach near to the earth may have been able to withdraw a portion of our atmosphere and of our ocean." Nor was any attempt made to explain the extraordinary nature of the supposed chemical precipitates of the universal ocean. The progress of inquiry even in Werner's lifetime disproved some of the fundamental portions of his system. Many of the chemical precipitates were shown to be masses that had been erupted in a molten state from below. His order of succession was found not to hold good; and though he tried to readjust his sequence and to introduce into it modifications to suit new facts, its inherent artificiality led to its speedy decline after his death. It must be conceded, however, that the stress which he laid upon the fact that the rocks of the earth's crust were deposited in a definite order had an important influence in directing attention to this subject, and in preparing the way for a more natural system, based not on mere mineralogical characters, but having regard to the organic remains, which were now being gathered in ever-increasing numbers and variety from stratified formations of many different ages and from all parts of the globe.

It was in France and in England that the foundations of stratigraphy, based upon a knowledge of organic remains, were first successfully laid. Abbé J. L. Giraud-Soulavie (1752–1813), in his *Histoire naturelle de la France meridionale*, which appeared in seven volumes, subdivided the limestones of Vivarais into three ages, each marked by a distinct assemblage of shells. In the lowest strata, representing the first age, none of the fossils were believed by him to have any living representatives, and he called these rocks "Primordial." In the next group a few species of living forms with corals was observable. The third age was marked by the presence of shells of still existing species. The strata of the fourth series were characterized by carbonaceous shales or slates, containing remains of primordial vegetation, and perhaps equivalents of the first three calcareous series. The fifth age was marked by recent deposits containing remains of terrestrial vegetation and of land animals. It is remarkable that these sagacious conclusions should have been formed and published at a time when the geologists of the Continent were engaged in the controversy about the origin of basalt, or in disputes about the character and stratigraphical position of the supposed universal formations, and when the interest and importance of fossil organic remains still remained unrecognized by the vast majority of the combatants.

The rocks of the Paris basin display so clearly an orderly arrangement, and are so distinguished for the variety and perfect

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preservation of their enclosed organic remains, that they could not fail to attract the early notice of observers. J. É. Guettard, G. F. Rouelle (1703–1770), N. Desmarest, A. L. Lavoisier (1743–1794) and others made observations in this interesting district. But it was reserved for Cuvier (1769–1832) and A. Brongniart (1770–1847) to work out the detailed succession of the Tertiary formations, and to show how each of these is characterized by its own peculiar assemblage of organic remains. The later progress of investigation has slightly corrected and greatly amplified the tabular arrangement established by these authors in 1808, but the broad outlines of the Tertiary stratigraphy of the Paris basin remain still as Cuvier and Brongniart left them. Among the most important subsequent changes in the classification of the Tertiary formations was made by Sir Charles Lyell, who, conceiving in 1828 the idea of a classification of these rocks by reference to their relative proportions of living and extinct species of shells, established, in collaboration with G. P. Deshayes, the now universally accepted divisions Eocene, Miocene and Pliocene.

Long before Cuvier and Brongniart published an account of their researches, another observer had been at work among the Secondary formations of the west of England, and had independently discovered that the component members of these formations were each distinguished by a peculiar group of organic remains; and that this distinction could be used to discriminate them over all the region through which he had traced them. The remarkable man who arrived at this far-reaching generalization was William Smith (1769–1839), a land surveyor who, in the prosecution of his professional business, found opportunity for acquiring a great part of England, and of putting his deductions to the test. As the result of these journeys he accumulated materials enough to enable him to produce a geological map of the country, on which the distribution and succession of the rocks were for the first time delineated. Smith's labours laid the foundation of stratigraphical geology in England and he was styled even in his lifetime the "Father of English geology." From his day onward the significance of fossil organic remains gained rapidly increasing recognition. Thus in England the outlines traced by him among the Secondary and Tertiary formations were admirably filled in by Thomas Webster (1773–1844), while the Cretaceous series was worked out in still greater detail in the classic memoirs of William Henry Fitton (1780–1861).

These various stratigraphical researches, however, left untouched William Smith did not enter. He traced his sequence of rocks down into the Coal Measures, but contented himself with only a vague reference to what lay underneath that formation. Though some of these underlying rocks had in various countries yielded abundant fossils, they had generally suffered so much from terrestrial disturbances, and their order of succession was consequently often so much obscured throughout western Europe, that they remained but little known for many years after the stratigraphy of the Secondary and Tertiary series had been established. At last in 1831 Murchison began to attack this *terra incognita* on the borders of South Wales, working into it from the Old Red Sandstone, the stratigraphical position of which was well known. In a few years he succeeded in demonstrating the existence of a succession of formations, each distinguished by its own peculiar assemblage of organic remains which were distinct from those in any of the overlying strata. To these formations he gave the name of Silurian (*q.v.*). From the key which his researches supplied, it was possible to recognize in other countries the same order of formations and the same sequence of fossils, so that, in the course of a few years, representatives of the Silurian system were found far and wide over the globe. While Murchison was thus engaged, Sedgwick devoted himself to the more difficult task of unravelling the complicated structure of North Wales. He eventually made out the order of the several formations there, with their vast intercalations of volcanic material. He named them the Cambrian system (*q.v.*), and found them to contain fossils which, however, lay for some time unexamined by him. He at first believed, as Murchison also did, that his rocks were all older than any part of the Silurian series. It was eventually discovered that a portion of them was equivalent to the lower part of that series. The oldest of Sedgwick's groups, containing distinctive fossils, retain the name Cambrian, and are of high interest, as they enclose the remains of the earliest faunas which are yet well known. Sedgwick and Murchison rendered yet another signal service to stratigraphical geology by establishing, in 1839, on a basis of palaeontological evidence supplied by W. Lonsdale, the independence of the Devonian system (*q.v.*).

For many years the rocks below the oldest fossiliferous deposits received comparatively little attention. They were vaguely described as the "crystalline schists" and were often referred to as parts of the primeval crust in which no chronology was to be looked for. W. E. Logan (1798–1875) led the way, in Canada, by establishing there several vast series of rocks, partly of crystalline schists and gneisses (Laurentian) and partly of slates and conglomerates (Huronian). Later observers, both in Canada and the United States, have greatly increased our knowledge of these rocks, and have shown their structure to be much more complex than was at first supposed (see ARCHEAN SYSTEM).

During the latter half of the 19th century the most important development of stratigraphical geology was the detailed working out and application of the principle of zonal classification to the fossiliferous formations—that is, the determination of the sequence and distribution of organic remains in these formations, and the arrangement of the strata into zones, each of which is distinguished by a peculiar assemblage of fossil species (see under Part VI.). The zones are usually named after one especially characteristic species. This system of classification was first used in Germany with reference to the members of the Jurassic system (*q.v.*) by A. Oppel (1856–1858) and F. A. von Quenstedt (1858), and it has since been extended through the other Mesozoic formations. It has even been found to be applicable to the Palaeozoic rocks, which are now subdivided into palaeontological zones. In the Silurian system, for example, the graptolites have been shown by C. Lapworth to furnish a useful basis for zonal subdivisions. The lowest fossiliferous horizon in the Cambrian rocks of Europe and North America is known as the *Olenellus* zone, from the prominence in it of that genus of trilobite.

Another conspicuous feature in the progress of stratigraphy during the second half of the 19th century was displayed by the rise and rapid development of what is known as Glacial geology. The various deposits of "drift" spread over northern Europe, and the boulders scattered across the surface of the plains had long attracted notice, and had even found a place in popular legend and superstition. When men began to examine them with a view to ascertain their origin, they were naturally referred to the evidence of the Noachian deluge. The first observer who drew attention to the smoothed and striated surfaces of rock that underlie the Drifts was Hutton's friend, Sir James Hall, who studied them in the lowlands of Scotland and referred them to the action of great obsdacles of water, which, in the course of some ancient terrestrial convulsion, had been launched across the face of the country. Playfair, however, pointed out that the most potent geological agents for the transportation of large blocks of stone are floating ice. But no one was then bold enough to connect the travelled boulders with glaciers on the plains of Germany and of Britain. Yet the transporting agency of ice was invoked in explanation of their diffusion. It came to be the prevalent belief among the geologists of the first half of the 19th century, that the fall of temperature, indicated by the gradual increase in the number of northern species of shells in the English Crag deposits, reached its climax during the time of the Drift, and that much of the north and centre of Europe was then submerged beneath a sea across which floated icebergs and floes transported the materials of the Drift and dropped the scattered boulders. As the phenomena are well developed around the Alps, it was necessary to suppose that the submergence involved the lowlands of the Continent up to the foot of that mountain chain—a geographical change so stupendous as to demand much more evidence than was adduced in its support. At last Louis Agassiz (1807–1873), who had varied his palaeontological studies at Neuchâtel by extensive journeys in the Alps, was struck by the marks of the former far greater extension of the Swiss glaciers, that he pursued the investigation and satisfied himself that the ice had formerly extended from the Alpine valleys right across the great plain of Switzerland, and had transported huge boulders from the central mountains to the flanks of the Jura. In the year 1840 he visited Britain and soon found evidence of similar conditions there. He showed that it was not by submergence in a sea cumbered with floating ice, but by the former presence of vast glaciers or sheets of ice that the Drift and erratic blocks had been distributed. The idea thus propounded by him did not at once command complete approval, though traces of ancient glaciers in Scotland and Wales were soon detected by native geologists, particularly by W. Buckland, Lyell, J. D. Forbes and Charles Maclaren. Robert Chambers (1802–1871) did good service in gathering additional evidence from Scotland and Norway in favour of Agassiz's views, which steadily gained adherents until, after some quarter of a century, they were adopted by the great majority of geologists in Britain and subsequently in other countries. Since that time the literature of geology has been swollen by a vast number of contributions in which the history of the Glacial period, and its records both in the Old and New World, have been fully discussed.

Rise and Progress of Palaeontological Geology.—As this branch of the science deals with the evidence furnished by fossil organic remains as to former geographical conditions, it early attracted observers who, in the superficial beds of marine shells found at some distance from the coast, saw proofs of the former submergence of the land under the sea. But the occurrence of fossils embedded in the heart of the solid rocks of the mountains offered much greater difficulties of explanation, and further progress was consequently slow. Especially baneful was the belief that these objects were mere sports of nature, and had no connexion with any once living organisms. So long as the true organic origin of the fossil plants and animals contained in the rocks was in dispute, it was hardly possible that much advance could be made in their systematic study, or in the geological deductions to be drawn from them. One good result of the controversy, however, was to be seen in the large collections of these "formed stones" that were gathered together in the cabinets and museums of the 17th and 18th centuries. The accumulation and comparison of these objects naturally led to the production of treatises in which they were described and not unfrequently illustrated by good engravings. Switzerland was more particularly

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noted for the number and merit of its works of this kind, such as that of K. N. Lang (*Historia lapidum figuratorum Helvetiae*, 1708) and those of Johann Jacob Scheuchzer (1672–1733). In England, also, illustrated treatises were published both by men who looked on fossils as mere freaks of nature, and by those who regarded them as proofs of Noah's flood. Of the former type were the works of Martin Lister (1638–1712) and Robert Plot (*Natural History of Oxfordshire*, 1677). The Celtic scholar Edward Llwyd (1660–1709) wrote a Latin treatise containing good plates of a thousand fossils in the Ashmolean Museum, Oxford, and J. Woodward, Jr. (1728), published his *Natural History of the Fossils of England*, already mentioned, wherein he described his own extensive collection, which he bequeathed to the University of Cambridge, where it is still carefully preserved. The most voluminous and important of all these works, however, appeared at a later date at Nuremberg. It was begun by G. W. Knorr (1705–1761), who himself engraved for it a series of plates which for beauty and accuracy have seldom been surpassed. After his death the work was continued by J. E. I. Walch (1725–1778), and ultimately consisted of four massive folio volumes and nearly 300 plates under the title of *Lapides diluvii universalis testes*. Although the authors supposed their fossils to be relics of Noah's flood, their work must be acknowledged to mark a distinct onward stage in the palaeontological department of zoology.

It was in France that palaeontological geology began to be cultivated in a scientific spirit. The potter Bernard Palissy, as far back as 1580, had dwelt on the importance of fossil shells as monuments of revolutions of the earth's surface; but the observer who first undertook the detailed study of the subject was Jean Etienne Guettard, who began in 1751 to publish his descriptions of fossils in the form of memoirs presented to the Academy of Sciences of Paris. To him they were not only of deep interest as monuments of former types of existence, but they had an especial value as the records of the changes which the country had undergone from sea to land and from land to sea. More especially noteworthy was a monograph by him which appeared in 1765 bearing the title "On the accidents that have befallen Fossil Shells compared with those which are found to happen to shells now living in the Sea." In this treatise he showed that the fossils have been encrusted with barnacles and serpulae, have been bored into by other organisms, and have often been rounded or broken by the final entombment. Hence he inferred that these fossils must have lived and died on the sea-floor under similar conditions to those which obtain on the sea-floor to-day. His argument was the most triumphant that had ever been brought against the doctrine of *lusus naturae*, and that of the efficacy of Noah's flood-doctrines which still held their ground in Guettard's day. When Soulavie, Cuvier and Brongniart in France, and William Smith in England, showed that the rock formations of the earth's crust could be arranged in chronological order, and could be recognized far and wide by means of their enclosed fossil remains, the vast significance of these remains in geological research was speedily realized, and palaeontological geology at once entered on a new and enlarged phase of development. But apart from their value as chronological monuments, and as witnesses of former conditions of geography, fossils presented in themselves a wide field of investigation as types of life that had formerly existed, but had now passed away. It was in France that this subject first took definite shape as an important branch of science. The fossils of the Tertiary deposits of the Paris basin became, in the hands of Lamarck, the basis on which invertebrate palaeontology was founded. The same series of strata furnished to Cuvier the remains of extinct land animals, of which, by critical study of their fragmentary bones and skeletons, he worked out restorations that may be looked on as the starting-point of vertebrate palaeontology. These brilliant researches, rousing widespread interest in such studies, showed how great a flood of light could be thrown on the past history of the earth and its inhabitants. But the full significance of these extinct types of life could not be understood so long as the doctrine of the immutability of species, so strenuously upheld by Cuvier, maintained its sway among naturalists. Lamarck, as far back as the year 1800, had begun to propound his theory of evolution and had given a succession of species; but his views, strongly opposed by Cuvier and the great body of naturalists of the day, fell into neglect. Not until after the publication in 1859 of the *Origin of Species* by Charles Darwin were the barriers of dull conservatism in this matter finally broken down. The possibility of tracing the ancestry of living forms back into the remotest ages was then perceived; the time-honoured fiction that the stratified formations record a series of catastrophes and re-creations was finally dissipated; and the earth's crust was seen to contain a noble, though imperfect, record of the grand evolution of organic types of which our planet has been the theatre.

Development of Petrographical Geology.—Theophrastus, the favourite pupil of Aristotle, wrote a treatise *On Stones*, which has come down to our own day, and may be regarded as the earliest work on petrography. At a subsequent period Pliny, in his *Natural History*, collected all that was known in his day regarding the occurrence and uses of minerals and rocks. But neither of these works is of great scientific importance, though containing much interesting information. Minerals from their beauty and value attracted notice before much attention was paid to rocks, and their study gave rise to the science of mineralogy long before geology came into existence. When rocks began to be more particularly scrutinized, it was chiefly from the side of their usefulness for building and other economic purposes. The occurrence of marine shells in many of them had early attracted attention to them. But their varieties of composition and origin did not become the subject of serious study until after Linnaeus and T. G. Wallerius in the 18th century had made a beginning. The first important contribution to this department of the science was that of Werner, who in 1786 published a classification and description of rocks in which he arranged them in two divisions, simple and compound, and further distinguished them by various external characters and by their relative age. The publication of this scheme may be said to mark the beginning of scientific petrography. Werner's system, however, had the serious defect that the chronological order in which he grouped the rocks, and the theory by which he accounted for them as chemical precipitates from the original ocean, were both alike contrary to nature. It was hardly possible indeed that much progress could be made in this branch of geology until chemistry and mineralogy had made greater advances; and especially until it was possible to ascertain the intimate chemical and mineralogical composition, and the minute structure of rocks. The study, however, continued to be pursued in Germany, where the influence of Werner's conclusions still led men to enter the petrographical rather than the palaeontological domain. The resources of modern chemistry were pressed into the service, and analyses were made and multiplied to such a degree that it seemed as if the ultimate chemical constitution of every type of rock had now been thoroughly revealed. The condition of the science in the middle of the 19th century was well shown by J. L. A. Roth, who in 1861 collected about 1000 trustworthy analyses which up to that time had been made. But though the chemical elements of the rocks had been fairly well determined, the manner in which they were combined in the compound rocks could for the most part be only more or less plausibly conjectured. As far back as 1833 an account was published of a process devised by William Nicol of Edinburgh, whereby sections of fossil wood could be cut, mounted on glass, and reduced to such a degree of transparency as to be easily examined under a microscope. Henry Sorby, of Sheffield, having seen Nicol's preparations, perceived how admirably adapted the process was for the study of the minute structure and mineral constitution of rocks. In 1851 he published in the *Quarterly Journal of the Geological Society* a paper "On the Microscopical Structure of Crystals." This essay led to a complete revolution of petrographical methods and gave a vast impetus to the study of rocks. Petrology entered upon a new and wider field of investigation. Not only were the mineralogical constituents of the rocks detected, but minute structures were revealed which shed new light on the origin and history of these mineral masses, and opened up new paths in theoretical geology. In the hands of H. Vogelsang, F. Zirkel, H. Rosenbusch, and a host of others in all the civilized countries, the literature of this department of the science has grown to a remarkable extent. Armed with the powerful aid of modern optical instruments, geologists are now able with far more prospect of success to examine the experiments of the last century before by de Saussure and Hall. G. A. Daubrée, C. Friedel, E. Sarasin, F. Fouqué and A. Michel Lévy in France, C. Doelter y Cisterich and E. Hussak of Gratz, J. Morozewicz of Warsaw and others, have greatly advanced our knowledge by their synthetical researches, and there is every reason to hope that further advances will be made in this field of research.

Rise of Physiographical Geology.—Until stratigraphical geology had advanced so far as to show what a vast succession of rocks the crust of the earth is built up, by what a long and complicated series of revolutions these rocks have come to assume their present positions, and how enormous has been the lapse of time which all these changes represent, it was not possible to make a scientific study of the surface features of our globe. From ancient times it had been known that many parts of the land had once been under the sea; but down even to the beginning of the 19th century the vaguest conceptions continued to prevail as to the operations concerned in the submergence and elevation of land, and as to the manner whereby the present outlines of terrestrial topography were determined. We have seen, for instance, that according to the teaching of Werner the oldest rocks were first precipitated from solution in the universal ocean to form the primitive crust of the earth; mountains, that the first of these was original, that as the waters subsided successive formations were deposited and laid bare, and that finally the superfluous portion of the ocean was whisked away into space by some unexplained co-operation of another planetary body. Desmarest, in his investigation of the volcanic history of Auvergne, was the first observer to perceive by what a long process of sculpture the present configuration of the land has been brought about. He showed conclusively that the valleys have been carved out by the streams that flow in them, and that while they have sunk deeper and deeper into the framework of the land, the spaces of ground between them have been left as intervening ridges and hills. De Saussure learnt a similar lesson from his studies of the Alps, and Hutton and Playfair made it a cardinal feature in their theory of the earth. Nevertheless the idea encountered so much opposition that it made but little way until after the middle of the 19th century. Geologists preferred to believe in convulsions of nature, whereby valleys were opened and mountains were

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upheaved. That the main features of the land, such as the great mountain-chains, had been produced by gigantic plication of the terrestrial crust was now generally admitted, and also that minor fractures and folds had probably initiated many of the valleys. But those who realized most vividly the momentous results achieved by ages of subaerial denudation perceived that, as Hutton showed, even without the aid of underground agency, the mere flow of water in streams across a mass of land must in course of time carve out just such a system of valleys as may anywhere be seen. It was J. B. Jukes who, in 1862, first revived the Huttonian doctrine, and showed how completely it explained the drainage-lines in the south of Ireland. Other writers followed in quick succession until, in a few years, the doctrine came to be widely recognized as one of the established principles of modern geology. Much help was derived from the admirable illustrations of land-sculpture and river-erosion supplied from the Western Territories and States of the American Union.

Another branch of physiographical geology which could only come into existence after most of the other departments of the science had made large progress, deals with the evolution of the framework of each country and of the several continents and oceans of the globe. It is now possible, with more or less confidence, to trace backward the history of every terrestrial area, to see how sea and land have there succeeded each other, how rivers and lakes have come and gone, how the crust of the earth has been ridged up at widely separated intervals, each movement determining some line of mountains or plains, how the boundaries of the oceans have shifted again and again in the past, and thus how, after so prolonged a series of revolutions, the present topography of each country, and of the globe as a whole, has been produced. In the prosecution of this subject maps have been constructed to show what is conjectured to have been the distribution of sea and land during the various geological periods in different parts of the world, and thus to indicate the successive stages through which the architecture of the land has been gradually evolved. The most noteworthy contribution to this department of the science is the *Antlitz der Erde* of Professor Suess of Vienna. This important and suggestive work has been translated into French and English.

Part II.—Cosmical Aspects

Before geology had attained to the position of an inductive science, it was customary to begin investigations into the history of the earth by propounding or adopting some more or less fanciful hypothesis in explanation of the origin of our planet, or even of the universe. Such preliminary notions were looked upon as essential to a right understanding of the manner in which the materials of the globe had been put together. One of the distinguishing features of Hutton's Theory of the Earth consisted in his protest that it is no part of the province of geology to discuss the origin of things. He taught that in the materials from which geological evidence is to be compiled there can be found "no traces of a beginning, no prospect of an end." In England, mainly to the influence of the school which he founded, and to the subsequent rise of the Geological Society of London, which resolved to collect facts instead of fighting over hypotheses, is due the disappearance of the crude and unscientific cosmologies by which the writings of the earlier geologists were distinguished.

But there can now be little doubt that in the reaction against those visionary and often grotesque speculations, geologists were carried too far in an opposite direction. In allowing themselves to believe that geology had nothing to do with questions of cosmogony, they gradually grew up in the conviction that such questions could never be other than mere speculation, interesting or amusing as a theme for the employment of the fancy, but hardly coming within the domain of sober and inductive science. Nor would they soon have been awakened out of this belief by anything in their own science. It is still true that in the data with which they are accustomed to deal, as comprising the sum of geological evidence, there can be found no trace of a beginning, though the evidence furnished by the terrestrial crust shows a general evolution of organic forms from some starting-point which cannot be seen. The oldest rocks which have been discovered on any part of the globe have probably been derived from other rocks older than themselves. Geology by itself has not yet revealed, and is little likely ever to reveal, a trace of the first solid crust of our globe. If, then, geological history is to be compiled from direct evidence furnished by the rocks of the earth, it cannot begin at the beginning of things, but must be content to date its first chapter from the earliest period of which any record has been preserved among the rocks.

Nevertheless, though geology in its usual restricted sense has been, and must ever be, unable to reveal the earliest history of our planet, it no longer ignores, as mere speculation, what is attempted in this subject by its sister sciences. Astronomy, physics and chemistry have in late years all contributed to cast light on the earlier stages of the earth's existence, previous to the beginning of what is commonly regarded as geological history. But whatever extends our knowledge of the former conditions of our globe may be legitimately claimed as part of the domain of geology. If this branch of inquiry, therefore, is to continue worthy of its name as the science of the earth, it must take cognizance of these recent contributions from other sciences. It must no longer be content to begin its annals with the records of the oldest rocks, but must endeavour to grope its way through the ages which preceded the formation of any rocks. Thanks to the results achieved with the telescope, the spectroscope and the chemical laboratory, the story of these earliest ages of our earth is every year becoming more definite and intelligible.

Up to the present time no definite light has been thrown by physics on the origin and earliest condition of our globe. The famous nebular theory (*q.v.*) of Kant and Laplace sketched the supposed evolution of the solar system from a gaseous nebula, slowly rotating round a more condensed central portion of its mass, which eventually became the sun. As a consequence of increased rapidity of rotation resulting from cooling and contraction, the nebula acquired a more and more lenticular form, until at last it threw off from its equatorial protuberance a ring of matter. Subsequently the same process was repeated, and other similar rings successively separated from the parent mass. Each ring went through a corresponding series of changes until it ultimately became a planet, with or without one or more attendant satellites. The intimate relationship of our earth to the sun and the other planets was, in this way, shown. But there are some serious physical difficulties in the way of the acceptance of the nebular hypothesis. Another explanation is given by the meteoritic hypothesis, according to which, out of the swarms of meteorites with which the regions of space are crowded, the sun and planets have been formed by gradual accretion.

According to these theoretical views we should expect to find a general uniformity of composition in the constituent matter of the solar system. For many years the only available evidence on this point was derived from the meteorites (*q.v.*) which so constantly fall from outer space upon the surface of the earth. These bodies were found to consist of elements all of which had been recognized as entering into the constitution of the earth. But the discoveries of spectroscopic research have made known a far more widely serviceable method of investigation, which can be applied even to the luminous stars and nebulae that lie far beyond the bounds of the solar system. By this method information has been obtained regarding the constitution of the sun, and many of our terrestrial metals, such as iron, nickel and magnesium, have been ascertained to exist in the form of incandescent vapour in the solar atmosphere. The present condition of the sun probably represents one of the phases through which stars and planets pass in their progress towards becoming cool and dark bodies in space. If our globe was at first, like its parent sun, an incandescent mass of probably gaseous matter, occupying much more space than it now fills, we can conceive that it has ever since been cooling and contracting until it has reached its present form and dimensions, and that it still retains a high internal temperature. Its oblately spheroidal form is such as would be assumed by a rotating mass of matter in the transition from a vaporous and self-luminous or liquid condition to one of cool and dark solidity. But it has been claimed that even a solid spherical globe might develop, under the influence of protracted rotation, such a shape as the earth at present possesses.

The observed increase of temperature downwards in our

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planet has hitherto been generally accepted as a relic and proof of an original high temperature and mobility of substance. Recently, however, the validity of this proof has been challenged on the ground that the ascertained amount of radium in the rocks of the outer crust is more than sufficient to account for the observed downward increase of temperature. Too little, however, is known of the history and properties of what is called radium to afford a satisfactory ground on which to discard what has been, and still remains, the prevalent belief on this subject.

An important epoch in the geological history of the earth was marked by the separation of the moon from its mass (see TIDE). Whether the severance arose from the rupture of a surrounding ring or the gradual condensation of matter in such a ring, or from the ejection of a single mass of matter from the rapidly rotating planet, it has been shown that our satellite was only a few thousand miles from the earth's surface, since when it has retreated to its present distance of 240,000 m. Hence the influence of the moon's attraction, and all the geological effects to which it gives rise, attained their maximum far back in the development of the globe, and have been slowly diminishing throughout geological history.

The sun by virtue of its vast size has not yet passed out of the condition of glowing gas, and still continues to radiate heat beyond the farthest planet of the solar system. The earth, however, being so small a body in comparison, would cool down much more quickly. Underneath its hot atmosphere a crust would conceivably begin to form over its molten surface, though the interior might still possess a high temperature and, owing to the feeble conducting power of rocks, would remain intensely hot for a protracted series of ages.

Full information regarding the form and size of the earth, and its relations to the other planetary members of the solar system, will be found in the articles PLANET and SOLAR SYSTEM. For the purposes of geological inquiry the reader will bear in mind that the equatorial diameter of our globe is estimated to be about 7925 m., and the polar diameter about 7899 m.; the difference between these two sums representing the amount of flattening at the poles (about 26¼m.). The planet has been compared in shape to an orange, but it resembles an orange which has been somewhat squeezed, for its equatorial circumference is not a regular circle but an ellipse, of which the major axis lies in long. 8° 15′ W.—on a meridian which cuts the north-west corner of America, passing through Portugal and Ireland, and the north-east corner of Asia in the opposite hemisphere.

The rotation of the earth on its axis exerts an important influence on the movements of the atmosphere, and thereby affects the geological operations connected with these movements. The influence of rotation is most marked in the great aerial circulation between the poles and the equator. Currents of air, which set out in a meridional direction from high latitudes towards the equator, come from regions where the velocity due to rotation is small to where it is greater, and they consequently fall behind. Thus, in the northern hemisphere a north wind, as it moves away from its northern source of origin, is gradually deflected more and more towards the west and becomes a north-east current; while in the opposite hemisphere a wind making from high southern latitudes towards the equator becomes, from the same cause, a south-east current. Where, on the other hand, the air moves from the equatorial to the polar regions its higher velocity of rotation carries it eastward, so that on the south side of the equator it becomes a north-west current and on the north side a south-west current. It is to this cause that the easting and westing of the great atmospheric currents are to be attributed, as is familiarly exemplified in the trade winds.

The atmospheric circulation thus deflected influences the circulation of the ocean. The winds which persistently blow from the north-east on the north side of the equator, and from the south-east on the south side, drive the superficial waters onwards, and give rise to converging oceanic currents which unite to form the great westerly equatorial current.

A more direct effect of terrestrial rotation has been claimed in the case of rivers which flow in a meridional direction. It has been asserted that those, which in the northern hemisphere flow from north to south, like the Volga, by continually passing into regions where the velocity of rotation is increasingly greater, are thrown more against their western than their eastern banks, while those whose general course is in an opposite direction, like the Irtisch and Yenesei, press more upon their eastern sides. There cannot be any doubt that the tendency of the streams must be in the directions indicated. But when the comparatively slow current and constantly meandering course of most rivers are taken into consideration, it may be doubted whether the influence of rotation is of much practical account so far as river-erosion is concerned.

One of the cosmical relations of our planet which has been more especially prominent in geological speculations relates to the position of the earth's axis of rotation. Abundant evidence has now been obtained to prove that at a comparatively late geological period a rich flora, resembling that of warm climates at the present day, existed in high latitudes even within less than 9° of the north pole, where, with an extremely low temperature and darkness lasting for half of the year, no such vegetation could possibly now exist. It has accordingly been maintained by many geologists that the axis of rotation must have shifted, and that when the remarkable Arctic assemblage of fossil plants lived the region of their growth must have lain in latitudes much nearer to the equator of the time.

The possibility of any serious displacement of the rotational axis since a very early period in the earth's history has been strenuously denied by astronomers, and their arguments have been generally, but somewhat reluctantly, accepted by geologists, who find themselves confronted with a problem which has hitherto seemed insoluble. That the axis is not rigidly stable, however, has been postulated by some physicists, and has now been demonstrated by actual observation and measurement. It is admitted that by the movement of large bodies of water the air over the surface of the globe, and more particularly by the accumulation of vast masses of snow and ice in different regions, the position of the axis might be to some extent shifted; more serious effects might follow from widespread upheavals or depressions of the surface of the lithosphere. On the assumption of the extreme rigidity of the earth's interior, however, the general result of mathematical calculation is to negative the supposition that in any of these ways within the period represented by what is known as the "geological record," that is, since the time of the oldest known sedimentary formations, the rotational axis has ever been so seriously displaced as to account for such stupendous geological events as the spread of a luxuriant vegetation far up into polar latitudes. If, however, the inside of the globe possesses a great plasticity than has been allowed, the shifting of the axis might not be impossible, even to such an extent as would satisfy the geological requirements. This question is one on which the last word has not been said, and regarding which judgment must remain in suspense.

In recent years fresh information bearing on the minor devagations of the pole has been obtained from a series of several thousand careful observations made in Europe and North America. It has thus been ascertained that the pole wanders with a curiously irregular but somewhat spiral movement, within an amplitude of between 40 and 50 ft., and completes its erratic circuit in about 428 days. It was not supposed that its movement had any geological interest, but Dr John Milne has recently pointed out that the times of sharpest curvature in the path of the pole coincide with the occurrence of large earthquakes, and has suggested that, although it can hardly be assumed that this coincidence shows any direct connexion between earthquake frequency and changes in the position of the earth's axis, both effects may not improbably arise from the same redistribution of surface material by ocean currents and meteorological causes.

If for any reason the earth's centre of gravity were sensibly displaced, momentous geological changes would necessarily ensue. That the centre of gravity does not coincide with the

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centre of figure of the globe, but lies to the south of it, has long been known. This greater aggregation of dense material in the southern hemisphere probably dates from the early ages of the earth's consolidation, and it is difficult to believe that any readjustment of the distribution of this material in the earth's interior is now possible. But certain rearrangements of the hydrosphere on the surface of the globe may, from time to time, cause a shifting of the centre of gravity, which will affect the level of the ocean. The accumulation of enormous masses of ice around the pole will give rise to such a displacement, and will thus increase the body of oceanic water in the glaciated hemisphere. Various calculations have been made of the effect of the transference of the ice-cap from one pole to the other, a revolution which may possibly have occurred more than once in the past history of the globe. James Croll estimated that if the mass of ice in the southern hemisphere be assumed to be 1000 ft. thick down to lat. 60°, its removal to the opposite hemisphere would raise the level of the sea 80 ft. at the north pole, while the Rev. Osmond Fisher made the rise as much as 400 ft. The melting of the ice would still further raise the sea-level by the addition of so large a volume of water to the ocean. To what extent superficial changes of this kind have operated in geological history remains an unsolved problem, but their probable occurrence in the past has to be recognized as one of the factors that must be considered in tracing the revolutions of the earth's surface.

The Age of the Earth.—Intimately connected with the relations of our globe to the sun and the other members of the solar system is the question of the planet's antiquity—a subject of great geological importance, regarding which much discussion has taken place since the middle of the 19th century. Though an account of this discussion necessarily involves allusion to departments of geology which are more appropriately referred to in later parts of this article, it may perhaps be most conveniently included here.

Geologists were for many years in the habit of believing that no limit could be assigned to the antiquity of the planet, and that they were at liberty to make unlimited drafts on the ages of the past. In 1862 and subsequent years, however, Lord Kelvin (then Sir William Thomson) pointed out that these demands were opposed to known physical facts, and that the amount of time required for geological history was not only limited, but must have been comprised within a comparatively narrow compass. His argument rested on three kinds of evidence: (1) the internal heat and rate of cooling of the earth; (2) the tidal retardation of the earth's rotation; and (3) the origin and age of the sun's heat.

1. Applying Fourier's theory of thermal conductivity, Lord Kelvin contended that in the known rate of increase of temperature downward and beneath the surface, and the rate of loss of heat from the earth, we have a limit to the antiquity of the planet. He showed, from the data available at the time, that the superficial consolidation of the globe could not have occurred less than 20 million years ago, or the underground heat would have been greater than it is; nor more than 400 million years ago, otherwise the underground temperature would have shown no sensible increase downwards. He admitted that very wide limits were necessary. In subsequently discussing the subject, he inclined rather towards the lower than the higher antiquity, but concluded that the limit, from a consideration of all the evidence, must be placed within some such period of past time as 100 millions of years.

2. The argument from tidal retardation proceeds on the admitted fact that, owing to the friction of the tide-wave, the rotation of the earth is retarded, and is, therefore, much slower now than it must have been at one time. Lord Kelvin affirmed that had the globe become solid some 10,000 million years ago, or indeed any high antiquity beyond 100 million years, the centrifugal force due to the more rapid rotation must have given the planet a very much greater polar flattening than it actually possesses. He admitted, however, that, though 100 million years ago that force must have been about 3% greater than now, yet "nothing we know regarding the figure of the earth, and the disposition of land and water, would justify us in saying that a body consolidated when there was more centrifugal force by 3% than now, might not now be in all respects like the earth, so far as we know it at present."

3. The third argument, based upon the age of the sun's heat, is confessedly less to be relied on than the two previous ones. It proceeds upon calculations as to the amount of heat which would be available by the falling together of masses from space, which gave rise by their impact to our sun. The vagueness of the data on which this argument rests may be inferred from the fact that in one passage P. G. Tait placed the limit of time during which the sun has been illuminating the earth as, "on the very highest computation, not more than about 15 or 20 millions of years"; while, in another sentence of the same volume, he admitted that, "by calculations in which there is no possibility of large error, this hypothesis [of the origin of the sun's heat by the falling together of masses of matter] is thoroughly competent to explain 100 millions of years' solar radiation at the present rate, perhaps more." In more recently reviewing his argument, Lord Kelvin expressed himself in favour of more strictly limiting geological time than he had at first been disposed to do. He insists that the time "was more than 20 and less than 40 millions of years and probably much nearer 20 than 40." Geologists appear to have reluctantly brought themselves to believe that perhaps, after all, 100 millions of years might suffice for the evolution of geological history. But when the time was cut down to 15 or 20 millions they protested that such a restricted period was insufficient for that evolution, and though they did not offer any effective criticism of the arguments of the physicists they felt convinced that there must be some flaw in the premises on which these arguments were based.

By degrees, however, there have arisen among the physicists themselves grave doubts as to the validity of the physical evidence on which the limitation of the earth's age has been founded, and at the same time greater appreciation has been shown of the signification and stength of the geological proofs of the high antiquity of our planet. In an address from the chair of the Mathematical Section of the British Association in 1886, Professor (afterwards Sir) George Darwin reviewed the controversy, and pronounced the following deliberate judgment in regard to it: "In considering these three arguments I have adduced some reasons against the validity of the first [tidal friction], and have endeavoured to show that there are elements of uncertainty surrounding the second [secular cooling of the earth]; nevertheless, they undoubtedly constitute a contribution of the first importance to physical geology. Whilst, then, we may protest against the precision with which Professor Tait seeks to deduce results from them, we are fully justified in following Sir William Thomson, who says that 'the existing state of things on the earth, life on the earth—all geological history showing continuity of life—must be limited within some such period of past time as 100 million years'." Lord Kelvin has never dealt with the geological and palaeontological objections against the limitation of geological time to a few millions of years. But Professor Darwin, in the address just cited, uttered the memorable warning: "At present our knowledge of a definite limit to geological time has so little precision that we should do wrong summarily to reject theories which appear to demand longer periods of time than those which now appear allowable." In his presidential address to the British Association at Cape Town in 1905 he returned to the subject, remarking that the argument derived from the increase of underground temperature "seems to be entirely destroyed" by the discovery of the properties of radium. He thinks that "it does not seem extravagant to suppose that 500 to 1000 million years may have elapsed since the birth of the moon." He has "always believed that the geologists were more nearly correct than the physicists, notwithstanding the fact that appearances were so strongly against them," and he concludes thus: "It appears, then, that the physical argument is not susceptible of a greater degree of

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certainty than that of the geologists, and the scale of geological time remains in great measure unknown" (see also TIDE, chap. viii.).

In an address to the mathematical section of the American Association for the Advancement of Science in 1889, the vice-president of the section, R. S. Woodward, thus expressed himself with regard to the physical arguments brought forward by Lord Kelvin and Professor Tait in limitation of geological time: "Having been at some pains to look into this matter, I feel bound to state that, although the hypothesis appears to be the best which can be formulated at present, the odds are against its correctness. Its weak links are the unverified assumptions of an initial uniform temperature and a constant diffusivity. Very likely these are approximations, but of what order we cannot decide. Furthermore, if we accept the hypothesis, the odds appear to be against the present attainment of trustworthy numerical results, since the data for calculation, obtained mostly from observations on continental areas, are far too meagre to give satisfactory average values for the entire mass of the earth."

Still more emphatic is the protest made from the physical side by Professor John Perry. He has attacked each of the three lines of argument of Lord Kelvin, and has impugned the validity of the conclusions drawn from them. The argument from tidal retardation he dismisses as fallacious, following in this contention the previous criticism of the Rev. Maxwell Close and Sir George Darwin. In dealing with the argument based on the secular cooling of the earth, he holds it to be perfectly allowable to assume a much higher conductivity for the interior of the globe, and that such a reasonable assumption would enable us greatly to increase our estimate of the earth's antiquity. As for the third argument, from the age of the sun's heat, he points out that the sun may have been repeatedly fed by a supply of meteorites from outside, while the earth may have been protected from radiation, and been able to retain much of its heat by being enveloped in a dense atmosphere. Remarking that "almost anything is possible as to the present internal state of the earth," he concludes thus: "To sum up, we can find no published record of any lower maximum age of life on the earth, as calculated by physicists, than 400 millions of years. From the three physical arguments Lord Kelvin's higher limits are 1000, 400 and 500 million years. I have shown that we have reasons for believing that the age, from all these, may be very considerably underestimated. It is to be observed that if we exclude everything but the arguments from mere physics, the *probable* age of life on the earth is much less than any of the above estimates; but if the palaeontologists have good reasons for demanding much greater times, I see nothing from the physicists' point of view which denies them four times the greatest of these estimates."

A fresh line of argument against Lord Kelvin's limitation of the antiquity of our globe has recently been started by the remarkable discoveries in radio-activity. From the ascertained properties of radium it appears to be possible that our estimates of solar heat, as derived from the theory of gravitation, may have to be augmented ten or twenty times; that stores of radium and similar bodies within the earth may have indefinitely deferred the establishment of the present temperature gradient from the surface inward; that consequently the earth may have remained for long ages at a temperature not greatly different from that which it now possesses, and hence that the times during which our globe has supported animal and vegetable life may be very much longer than that allowed in the estimates previously made by physicists from other data (see RADIO-ACTIVITY).

The arguments from the geological side against the physical contention that would limit the age of our globe to some 10 or 20 millions of years are mainly based on the observed rates of geological and biological changes at the present time upon land and sea, and on the nature, physical history and organic contents of the stratified crust of the earth. Unfortunately, actual numerical data are not obtainable in many departments of geological activity, and even where they can be procured they do not yet rest on a sufficiently wide collection of accurate and co-ordinated observations. But in some branches of dynamical geology, material exists for, at least, a preliminary computation of the rate of change. This is more especially the case in respect of the wide domain of denudation. The observational records of the action of the sea, of springs, rivers and glaciers are becoming gradually fuller and more trustworthy. A method of making use of these records for estimating the rate of denudation of the land has been devised. Taking the Mississippi as a general type of river action, it has been shown that the amount of material conveyed by this stream into the sea in one year is equivalent to the lowering of the general surface of the drainage basin of the river by $\frac{1}{6000}$ of a foot. This would amount to one foot in 6000 years and 1000 ft. in 6 million years. So that at the present rate of waste in the Mississippi basin a whole continent might be worn away in a few millions of years.

It is evident that as deposition and denudation are simultaneous processes, the ascertainment of the rate at which solid material is removed from the surface of the land supplies some necessary information for estimating the rate at which new sedimentary formations are being accumulated on the floor of the sea, and for a computation of the length of time that would be required at the present rate of change for the deposition of all the stratified rocks that enter into the composition of the crust of our globe. If the thickness of these rocks be assumed to be 100,000 ft., and if we could suppose them to have been laid down over as wide an area as that of the drainage basins from the waste of which they were derived, then at the present rate of denudation their accumulation would require some 600 millions of years. But, as Dr A. R. Wallace has justly pointed out, the tract of sea-floor over which the material derived from the waste of the terrestrial surface is laid down is at present much less than that from which this material is worn away. We have no means, however, of determining what may have been the ratio between the two areas in past time. Certainly ancient marine sedimentary rocks cover at the present day a much more extensive area than that in which they are now being elaborated. If we take the ratio postulated by Dr Wallace—1 to 19—the 100,000 ft. of sedimentary strata would require 31 millions of years for their accumulation. It is quite possible, however, that this ratio may be much too high. There are reasons for believing that the proportion of coast-line to land area has been diminishing during geological time; in other words, that in early times the land was more insular and is now more continental. So that the 31 millions of years may be much less than the period that would be required, even on the supposition of continuous uninterrupted denudation and sedimentation, during the whole of the time represented by the stratified formations.

But no one who has made himself familiar with the actual composition of these formations and the detailed structure of the terrestrial crust can fail to recognize how vague, imperfect and misleading are the data on which such computations are founded. It requires no prolonged acquaintance with the earth's crust to impress upon the mind that one all-important element is omitted, and indeed can hardly be allowed for from want of sufficiently precise data, but the neglect of which must needs seriously impair the value of all numerical calculations made without it. The assumption that the stratified formations can be treated as if they consisted of a continuous unbroken sequence of sediments, indicating a vast and uninterrupted process of waste and deposition, is one that is belied on every hand by the actual structure of these formations. It can only give us a minimum of the time required; for, instead of an unbroken series, the sedimentary formations are full of "unconformabilities"—gaps in the sequence of the chronological records—as if whole chapters and groups of chapters had been torn out of a historical work. It can often be shown that these breaks of continuity must have been of vast duration, and actually exceeded in chronological importance thick groups of strata lying below and above them (see Part VI.). Moreover, even among the uninterrupted strata, where no such unconformabilities exist, but where the sediments

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follow each other in apparently uninterrupted sequence, and might be thought to have been deposited continuously at the same general rate, and without the intervention of any pause, it can be demonstrated that sometimes an inch or two of sediment much, on certain horizons, represent the deposit of an enormously longer period than a hundred or a thousand times the same amount of sediment on other horizons. A prolonged study of these questions leads to a profound conviction that in many parts of the geological record the time represented by sedimentary deposits may be vastly less than the time which is not so represented.

It has often been objected that the present rate of geological change ought not to be taken as a measure of the rate in past time, because the total sum of terrestrial energy has been steadily diminishing, and geological processes must consequently have been more vigorous in former ages than they are now. Geologists do not pretend to assert that there has been no variation or diminution in the activities of the various processes which they have to study. What they do insist on is that the present rate of change is the only one which we can watch and measure, and which will thus supply a statistical basis for any computations on the subject. But it has been dogmatically affirmed that because terrestrial energy has been diminishing therefore all kinds of geological work must have been more vigorously and more rapidly carried on in former times than now; that there were far more abundant and more stupendous volcanoes, more frequent and more destructive earthquakes, more gigantic upheavals and subsidences, more powerful oceanic waves and tides, more violent atmospheric disturbances with heavier rainfall and more active denudation.

It is easy to make these assertions, and they look plausible; but, after all, they rest on nothing stronger than assumption. They can be tested by an appeal to the crust of the earth, in which the geological history of our planet has been so fully recorded. Had such portentous manifestations of geological activity ever been the normal condition of things since the beginning of that history, there ought to be a record of them in the rocks. But no evidence for them has been found there, though it has been diligently sought for in all quarters of the globe. We may confidently assert that while geological changes may quite possibly have taken place on a gigantic scale in the earliest ages of the earth's existence, of which no geological record remains, there is no proof that they have ever done so since the time when the very oldest of the stratified formations were deposited. There is no need to maintain that they have always been conducted precisely on the same scale as now, or to deny that they may have gradually become less vigorous as the general sum of terrestrial energy has diminished. But we may unhesitatingly affirm that no actual evidence of any such progressive diminution of activity has been adduced from the geological record in the crust of the earth: that, on the contrary, no appearances have been detected there which necessarily demand the assumption of those more powerful operations postulated by physicists, or which are not satisfactorily explicable by reference to the existing scale of nature's processes.

That this conclusion is warranted even with regard to the innate energy of the globe itself will be seen if we institute a comparison between the more ancient and the more recent manifestations of that energy. Take, for example, the proofs of gigantic plication, fracture and displacement within the terrestrial crust. These, as they have affected the most ancient rocks of Europe, have been worked out in great detail in the north-west of Scotland. But they are not essentially different from or on a greater scale than those which have been proved to have affected the Alps, and to have involved strata of so recent a date as the older Tertiary formations. On the contrary, it may be doubted whether any denuded core of an ancient mountain-chain reveals traces of such stupendous disturbances of the crust as those which have given rise to the younger mountain-chains of the globe. It may, indeed, quite well have been the rule that instead of diminishing in intensity of effect, the consequences of terrestrial contraction have increased in magnitude, the augmenting thickness of the crust offering greater resistance to the stresses, and giving rise to vaster plications, faults, thrust-planes and metamorphism, as this growing resistance had to be overcome.

The assertion that volcanic action must have been more violent and more persistent in ancient times than it is now has assuredly no geological evidence in its support. It is quite true that there are vastly more remains of former volcanoes scattered over the surface of the globe than there are active craters now, and that traces of copious eruptions of volcanic material can be followed back into some of the oldest parts of the geological record. But we have no proof that ever at any one time in geological history there have been more or larger or more vigorous volcanoes than those of recent periods. It may be said that the absence of such proof ought not to invalidate the assertion until a far wider area of the earth's surface has been geologically studied. But most assuredly, as far as geological investigation has yet gone, there is an overwhelming body of evidence to show that from the earliest epochs in geological history, as registered in the stratified rocks, volcanic action has manifested itself very much as it does now, but on a less rather than on a greater scale. Nowhere can this subject be more exhaustively studied than in the British Isles, where a remarkably complete series of volcanic eruptions has been chronicled ranging from the earliest Palaeozoic down to older Tertiary time. The result of a prolonged study of British volcanic geology has demonstrated that, even to minute points of detail, there has been a singular uniformity in the phenomena from beginning to end. The oldest lavas and ashes differ in no essential respect from the youngest. Nor have they been erupted more copiously or more frequently. Many successive volcanic periods have followed each other after prolonged intervals of repose, each displaying the same general sequence of phenomena and similar evidence of gradual diminution and extinction. The youngest, instead of being the feeblest, were the most extensive outbursts in the whole of this prolonged series.

If now we turn for evidence of the alleged greater activity of all the epigene or superficial forces, and especially for proofs of more rapid denudation and deposition on the earth's surface, we search for it in vain among the stratified formations of the terrestrial crust. Had the oldest of these rocks been accumulated in a time of great atmospheric perturbation, of torrential rains, colossal tides and violent storms, we might surely expect to find among the sediments some proof of such disturbed meteorological and geographical conditions. We should look, on the one hand, for tumultuous accumulations of coarse unworn detritus, rapidly swept by rains, floods and waves from land to sea, and on the other hand, for an absence of any evidence of the tranquil and continuous deposit of such fine laminated silt as could only settle in quiet water. But an appeal to the geological record is made in vain for any such proofs. The oldest sediments, like the youngest, reveal the operation only of such agents and such rates of activity as are still to be witnessed in the accumulation of the same kind of deposits. If, for instance, we search the most ancient thick sedimentary formation in Britain—the Torridon Sandstone of north-west Scotland, which is older than the oldest fossiliferous deposits—we meet with nothing which might not be found in any Palaeozoic, Mesozoic or Cainozoic group of similar sediments. We see an accumulation, at least 8000 or 10,000 ft. thick, of consolidated sand, gravel and mud, such as may be gathering now on the floor of any large mountain-girdled lake. The conglomerates of this ancient series are not pell-mell heaps of angular detritus, violently swept away from the land and huddled promiscuously on the sea-floor. They are, in general, built up of pebbles that have been worn smooth, rounded and polished by prolonged attrition in running water, and they follow each other on successive platforms with intervening layers of finer sediment. The sandstones are composed of well water-worn sand, some of which has been laid down so tranquilly that its component grains have been separated out in layers according to their specific gravity, in such manner that they now present dark laminae in which particles of magnetic iron, zircon and other heavy minerals have been sifted out

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together, just as iron-sand may be seen gathered into thin sheets on sandy beaches at the present day. Again, the same series of primeval sediments includes intercalations of fine silt, which has been deposited as regularly and intermittently there as it has been among the most recent formations. These bands of shale have been diligently searched for fossils, as yet without success; but they may eventually disclose organic remains older than any hitherto found in Europe.

We now come to the consideration of the palaeontological evidence as to the value of geological time. Here the conclusions derived from a study of the structure of the sedimentary formations are vastly strengthened and extended. In the first place, the organization of the most ancient plants and animals furnishes no indication that they had to contend with any greater violence of storm, flood, wave or ocean-current than is familiar to their modern descendants. The oldest trees, shrubs, ferns and club-mosses display no special structures that suggest a difference in the general conditions of their environment. The most ancient crinoids, sponges, crustaceans, arachnids and molluscs were as delicately constructed as those of to-day, and their remains are often found in such perfect preservation as to show that neither during their lifetime nor after their death were they subject to any greater violence of the elements than their living representatives now experience. Of much more cogency, however, is the evidence supplied by the grand upward succession of organic forms, from the most ancient stratified rocks up to the present day. No biologist now doubts for a moment that this marvellous succession is the result of a gradual process of evolution from lower to higher types of organization. There may be differences of opinion as to the causes which have governed this process and the order of the steps through which it has advanced, but no one who is conversant with the facts will now venture to deny that it has taken place, and that, on any possible explanation of its progress, it must have demanded an enormous lapse of time. In the Cambrian or oldest fossiliferous formations there is already a large and varied fauna, in which the leading groups of invertebrate life are represented. On no tenable hypothesis can these be regarded as the first organisms that came into being on our planet. They must have had a long ancestry, and as Darwin first maintained, the time required for their evolution may have been "as long as, or probably far longer than, the whole interval from the Silurian [Cambrian] age to the present day." The records of these earliest eras of organic development have unfortunately not survived the geological revolutions of the past; at least, they have not yet been recovered. But it cannot be doubted that they once existed and registered their testimony to the prodigious lapse of time prior to the deposition of the most ancient fossiliferous formations which have escaped destruction.

The impressive character of the evidence furnished by the sequence of organic forms throughout the great series of fossiliferous strata can hardly be fully realized without a detailed and careful study of the subject. Professor E. B. Poulton, in an address to the zoological section of the British Association at the Liverpool Meeting in 1896, showed how overwhelming are the demands which this evidence makes for long periods of time, and how impossible it is of comprehension unless these demands be conceded. The history of life upon the earth, though it will probably always be surrounded with great and even insuperable difficulties, becomes broadly comprehensible in its general progress when sufficient time is granted for the evolution which it records; but it remains unintelligible on any other conditions.

Taken then as a whole, the body of evidence, geological and palaeontological, in favour of the high antiquity of our globe is so great, so manifold, and based on such an ever-increasing breadth of observation and reflection, that it may be confidently appealed to in answer to the physical arguments which would seek to limit that antiquity to ten or twenty millions of years. In the present state of science it is out of our power to state positively what must be the lowest limit of the age of the earth. But we cannot assume it to be much less, and it may possibly have been much more, than the 100 millions of years which Lord Kelvin was at one time willing to concede.[1]

Part III.—Geognosy. The Investigation of the Nature and Composition of the Materials of which the Earth Consists

This division of the science is devoted to a description of the parts of the earth—of the atmosphere and ocean that surround the planet, and more especially of the solid materials that underlie these envelopes and extend downwards to an unknown distance into the interior. These various constituents of the globe are here considered as forms of matter capable of being analysed, and arranged according to their composition and the place they take in the general composition of the globe.

Viewed in the simplest way the earth may be regarded as made up of three distinct parts, each of which ever since an early period of planetary history has been the theatre of important geological operations. (1) An envelope of air, termed the *atmosphere*, which surrounds the whole globe; (2) A lower and less extensive envelope of water, known as the *hydrosphere* (Gr. ὕδωρ, water) which, constituting the oceans and seas, covers nearly three-fourths of the underlying solid surface of the planet; (3) A globe, called the *lithosphere* (Gr. λίθος, stone), the external part of which, consisting of solid stone, forms the *crust*, while underneath, and forming the vast mass of the interior, lies the *nucleus*, regarding the true constitution of which we are still ignorant.

1. *The Atmosphere.*—The general characters of the atmosphere are described in separate articles (see especially Atmosphere; Meteorology). Only its relations to geology have here to be considered. As this gaseous envelope encircles the whole globe it is the most universally present and active of all the agents of geological change. Its efficacy in this respect arises partly from its composition, and the chemical reactions which it effects upon the surface of the land, partly from its great variations in temperature and moisture, and partly from its movements.

Many speculations have been made regarding the chemical composition of the atmosphere during former geological periods. There can indeed be little doubt that it must originally have differed greatly from its present condition. If the whole mass of the planet originally existed in a gaseous state, there would be practically no atmosphere. The present outer envelope of air may be considered to be the surviving relic of this condition, after all the other constituents have been incorporated into the hydrosphere and lithosphere. The oxygen, which now forms fully a half of the outer crust of the earth, was doubtless originally, whether free or in combination, part of the atmosphere. So, too, the vast beds of coal found all over the world, in geological formations of many different ages, represent so much carbonic acid once present in the air. The chlorides and other salts in the sea may likewise partly represent materials carried down out of the atmosphere in the primitive condensation of the aqueous vapour, though they have been continually increased ever since by contributions from the drainage of the land. It has often been suggested that, during the Carboniferous period, the atmosphere must have been warmer and more charged with aqueous vapour and carbon dioxide than at the present day, to admit of so luxuriant a flora as that from which the coal-seams were formed. There seems, however, to be at present no method of arriving at any certainty on this subject. Lastly, the amount of carbonic acid absorbed in the weathering of rocks at the surface, and the consequent production of carbonates, represents an enormous abstraction of this gas.

As at present constituted, the atmosphere is regarded as a

[1] The subject of the age of the earth has also been discussed by Professor J. Joly and Professor W. J. Sollas. The former geologist, approaching the question from a novel point of view, has estimated the total quantity of sodium in the water of the ocean and the quantity of that element received annually by the ocean from the denudation of the land. Dividing the one sum by the other, he arrives at the result that the probable age of the earth is between 90 and 100 millions of years (*Trans. Roy. Dublin Soc.*, ser. ii. vol. vii., 1899, p. 23: *Geol. Mag.*, 1900, p. 220). Professor Sollas believes that this limit exceeds what is required for the evolution of geological history, that the lower limit assigned by Lord Kelvin falls short of what the facts demand, and that geological time will probably be found to have been comprised within some indeterminate period between these limits. (Address to Section C, *Brit. Assoc. Report*, 1900; *Age of the Earth*, London, 1905.)

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mechanical mixture of nearly four volumes of nitrogen and one of oxygen, together with an average of 3·5 parts of carbon dioxide in every 10,000 parts of air, and minute quantities of various other gases and solid particles. Of the vapours contained in it by far the most important is that of water which, although always present, varies greatly in amount according to variations in temperature. By condensation the water vapour appears in visible form as dew, mist, cloud, rain, hail, snow and ice, and in these forms includes and carries down some of the other vapours, gases and solid particles present in the air. The circulation of water from the atmosphere to the land, from the land to the sea, and again from the sea to the land, forms the great geological process whereby the habitable condition of the planet is maintained and the surface of the land is sculptured (Part IV.).

2. *The Hydrosphere.*—The water envelope covers nearly three-fourths of the surface of the earth, and forms the various oceans and seas which, though for convenience of reference distinguished by separate names, are all linked together in one great body. The physical characters of this vast envelope are discussed in separate articles (see OCEAN AND OCEANOGRAPHY). Viewed from the geological standpoint, the features of the sea that especially deserve attention are first the composition of its waters, and secondly its movements.

Sea-water is distinguished from that of ordinary lakes and rivers by its greater specific gravity and its saline taste. Its average density is about 1·026, but it varies even within the same ocean, being least where large quantities of fresh water are added from rain or melting snow and ice, and greatest where evaporation is most active. That sea-water is heavier than fresh arises from the greater proportion of salts which it contains in solution. These salts constitute about three and a half parts in every hundred of water. They consist mainly of chlorides of sodium and magnesium, the sulphates of magnesium, calcium and potassium, with minuter quantities of magnesium bromide and calcium carbonate. Still smaller proportions of other substances have been detected, gold for example having been found in the proportion of 1 part in 15,180,000.

That many of the salts have existed in the sea from the time of its first condensation out of the primeval atmosphere appears to be probable. It is manifest, however, that, whatever may have been the original composition of the ocean, they have for a vast section of geological time been constantly receiving mineral matter in solution from the land. Every spring, brook and river removes various salts from the rocks over which it moves, and these substances, thus dissolved, eventually find their way into the sea. Consequently sea-water ought to contain more or less traceable proportions of every substance which the terrestrial waters can remove from the land, in short, of probably every element present in the outer shell of the globe, for there seems to be no constituent of this earth which may not, under certain circumstances, be held in solution in water. Moreover, unless there be some counteracting process to remove these mineral ingredients, the ocean water ought to be growing, insensibly perhaps, but still assuredly, salter, for the supply of saline matter from the land is incessant.

To the geologist the presence of mineral solutions in sea-water is a fact of much importance, for it explains the origin of a considerable part of the stratified rocks of the earth's crust. By evaporation the water has given rise to deposits of rock-salt, gypsum and other materials. The lime contained in solution, whether as sulphate or carbonate, has been extracted by many tribes of marine animals, which have thus built up out of their remains vast masses of solid limestone, of which many mountain-chains largely consist.

Another important geological feature of the sea is to be seen in the fact that its basins form the great receptacles for the detritus worn away from the land. Besides the limestones, the visible parts of the terrestrial crust are, in large measure, composed of sedimentary rocks which were originally laid down on the sea-bottom. Moreover, by its various movements, the sea occupies a prominent place among the epigene or superficial agents which produce geological changes on the surface of the globe.

3. *The Lithosphere.*—Beneath the gaseous and liquid envelopes lies the solid part of the planet, which is conveniently regarded as consisting of two parts,—(*a*) the crust, and (*b*) the interior or nucleus.

It was for a long time a prevalent belief that the interior of the globe is a molten mass round which an outer shell has gradually formed through cooling. Hence the term "crust" was applied to this external solid envelope, which was variously computed to be 10, 20, or more miles in thickness. The portion of this crust accessible to human observation was seen to afford abundant evidence of vast plications and corrugations of its substance, which were regarded as only explicable on the supposition of a thin solid collapsible shell floating on a denser liquid interior. When, however, physical arguments were adduced to show the great rigidity of the earth as a whole, the idea of a thin crust enclosing a molten nucleus was reluctantly abandoned by geologists, who found the problem of the earth's interior to be incapable of solution by any evidence which their science could produce. They continued, however, to use the term "crust" as a convenient word to denote the cool outer layer of the earth's mass, the structure and history of which form the main subjects of geological investigation. More recently, however, various lines of research have concurred in suggesting that, whatever may be the condition of the interior, its substance must differ greatly from that of the outer shell, and that there may be more reason than appeared for the retention of the name of crust. Observations on earthquake motion by Dr John Milne and others, show that the rate and character of the waves transmitted through the interior of the earth differ in a marked degree from those propagated along the crust. This difference indicates that rocky material, such as we know at the surface, may extend inwards for some 30 m., below which the earth's interior rapidly becomes fairly homogeneous and possesses a high rigidity. From measurements of the force of gravity in India by Colonel S. G. Burrard, it has been inferred that the variations in density of the outer parts of the earth do not descend farther than 30 or 40 m., which might be assumed to be the limit of the thickness of the crust. Recent researches in regard to the radio-active substances present in rocks suggest that the crust is not more than 50 m. thick, and that the interior differs from it in possessing little or no radio-active material.

The crust.

The interior.

Though we cannot hope ever to have direct acquaintance with more than the mere outside skin of our planet, we may be led to infer the irregular distribution of materials within the crust from the present distribution of land and water, and the observed differences in the amount of deflection of the plumb-line near the sea and near mountain-chains. The fact that the southern hemisphere is almost wholly covered with water appears explicable only on the assumption of an excess of density in the mass of that portion of the planet. The existence of such a vast sheet of water as that of the Pacific Ocean is to be accounted for, as Archdeacon J. H. Pratt pointed out, by the presence of "some excess of matter in the solid parts of the earth between the Pacific Ocean and the earth's centre, which retains the water in its place, otherwise the ocean would flow away to the other parts of the earth." A deflection of the plumb-line towards the sea, which has in a number of cases been observed, indicates that "the density of the crust beneath the mountains must be less than that below the plains, and still less than that below the ocean-bed." Apart therefore from the depression of the earth's surface in which the oceans lie, we must regard the internal density, whether of crust or nucleus, to be somewhat irregularly arranged, there being an excess of heavy materials in the water hemisphere, and beneath the ocean-beds, as compared with the continental masses.

In our ignorance regarding the chemical constitution of the nucleus of our planet, an argument has sometimes been based upon the known fact that the specific gravity of the globe as a whole is about double that of the crust. This has been held by some writers to prove that the interior must consist of much heavier material and is therefore probably metallic. But the effect of pressure ought to make the density of the nucleus much higher, even if the interior consisted of matter no heavier than the crust. That the total density of the planet does not greatly exceed its observed amount seems only explicable on the supposition that some antagonistic force counteracts the effects of pressure. The only force we can suppose capable of so acting is heat. But comparatively little is yet known regarding the compression of gases, liquids and solids under such vast pressures as must exist within the nucleus.

That the interior of the earth possesses a high temperature is inferred from the evidence of various sources. (1) Volcanoes, which are openings that constantly, or intermittently, give out hot vapours and molten lava from reservoirs beneath the crust. Besides active volcanoes, it is known that former eruptive vents

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have been abundantly and widely distributed over the globe from the earliest geological periods down to our own day. (2) Hot springs are found in many parts of the globe, with temperatures varying up to the boiling point of water. (3) From mines, tunnels and deep borings into the earth it has been ascertained that in all quarters of the globe below the superficial zone of invariable temperature, there is a progressive increase of heat towards the interior. The rate of this increase varies, being influenced, among other causes, by the varying conductivity of the rocks. But the average appears to be about 1° Fahr. for every 50 or 60 ft. of descent, as far down as observations have extended. Though the increase may not advance in the same proportion at great depths, the inference has been confidently drawn that the temperature of the nucleus must be exceedingly high.

The probable condition of the earth's interior has been a fruitful source of speculation ever since geology came into existence; but no general agreement has been arrived at on the subject. Three chief hypotheses have been propounded: (1) that the nucleus is a molten mass enclosed within a solid shell; (2) that, save in local vesicular spaces which may be filled with molten or gaseous material, the globe is solid and rigid to the centre; (3) that the great body of the nucleus consists of incandescent vapours and gases, especially vaporous iron, which under the gigantic pressure within the earth are so compressed as to confer practical rigidity on the globe as a whole, and that outside this main part of the nucleus the gases pass into a shell of molten magma, which, in turn, shades off outwards into the comparatively thin, cool solidified crust. Recent seismological observations have led to the inference that the outer crust, some 30 to 45 m. thick, must rapidly merge into a fairly homogeneous nucleus which, whatever be its constitution, transmits undulatory movements through its substance with uniform velocity and is believed to possess a high rigidity.

The origin of the earth's high internal temperature has been variously accounted for. Most usually it has been assumed to be the residue of the original "tracts of fluent heat" out of which the planet shaped itself into a globe. According to another supposition the effects of the gradual gravitational compression of the earth's mass have been the main source of the high temperature. Recent researches in radio-activity, to which reference has already been made, have indicated another possible source of the internal heat in the presence of radium in the rocks of the crust. This substance has been detected in all igneous rocks, especially among the granites, in quantity sufficient, according to the Hon. R. J. Strutt, to account for the observed temperature-gradient in the crust, and to indicate that this crust cannot be more than 45 m. thick, otherwise the outflow of heat would be greater than the amount actually ascertained. Inside this external crust containing radio-active substances, it is supposed, as already stated, that the nucleus consists of some totally different matter containing little or no radium.

Constitution of the Earth's Crust.—As the crust of the earth contains the "geological record," or stony chronicle from which geology interprets the history of our globe, it forms the main subject of study to the geologist. The materials of which this crust consists are known as minerals and rocks. From many chemical analyses, which have been made of these materials, the general chemical constitution of, at least, the accessible portion of the crust has been satisfactorily ascertained. This information becomes of much importance in speculations regarding the early history of the globe. Of the elements known to the chemist the great majority form but a small proportion of the composition of the crust, which is mainly built up of about twenty of them. Of these by far the most important are the non-metallic elements oxygen and silicon. The former forms about 47% and the latter rather more than 28% of the original crust, so that these two elements make up about three-fourths of the whole. Next after them come the metals aluminium (8·16%), iron (4·64), calcium (3·50), magnesium (2·62), sodium (2·63), and potassium (2·35). The other twelve elements included in the twenty vary in amount from a proportion of 0·41% in the case of titanium, to not more than 0·01% of chlorine, fluorine, chromium, nickel and lithium. The other fifty or more elements exist in such minute proportions in the crust that, probably, not one of them amounts to as much as 0·01%, though they include the useful metals, except iron. Taking the crust, and the external envelopes of the ocean and the air, we thus perceive that these outer parts of our planet consist of more than three-fourths of non-metals and less than one-fourth of metals.

The combinations of the elements which are of most importance in the constitution of the terrestrial crust consist of oxides. From the mean of a large number of analyses of the rocks of the lower or primitive portion of the crust, it has been ascertained that silica (SiO_2) forms almost 60% and alumina (Al_2O_3) upwards of 15% of the whole. The other combinations in order of importance are lime (CaO) 4·90%, magnesia (MgO) 4·36, soda (Na_2O) 3·55, ferrous oxide (FeO) 3·52, potash (K_2O) 2·80, ferric oxide (Fe_2O_3) 2·63, water (H_2O) 1·52, titanium oxide (TiO_2) 0·60, phosphoric acid (P_2O_5) 0·22; the other combinations of elements thus form less than 1% of the crust.

These different combinations of the elements enter into further combinations with each other so as to produce the wide assortment of simple minerals (see MINERALOGY). Thus, silica and alumina are combined to form the aluminous silicates, which enter so largely into the composition of the crust of the earth. The silicates of magnesia, potash and soda constitute other important families of minerals. A mass of material composed of one, but more usually of more than one mineral, is known as a *rock*. Under this term geologists are accustomed to class not only solid stone, such as granite and limestone, but also less coherent materials such as clay, peat and even loose sand. The accessible portion of the earth's crust consists of various kinds of rocks, which differ from each other in structure, composition and origin, and are therefore susceptible of diverse classifications according to the point of view from which they are considered. The details of this subject will be found in the article PETROLOGY.

Classification of Rocks.—Various systems of classification of rocks have been proposed, but none of them is wholly satisfactory. The most useful arrangement for most purposes of the geologist is one based on the broad differences between them in regard to their mode of origin. From this point of view they may be ranged in three divisions:

1. In the first place, a large number of rocks may be described as original or underived, for it is not possible to trace them back to any earlier source. They belong to the primitive constitution of the planet, and, as they have all come up from below through the crust, they serve to show the nature of the material which lies immediately below the outer parts of that crust. They include the numerous varieties of lava, which have been poured out in a molten state from volcanic vents, also a great series of other rocks which, though they may never have been erupted to the surface, have been forced upward in a melted condition into the other rocks of the crust and have solidified there. From their mode of origin this great class of rocks has been called "igneous" or "eruptive." As they generally show no definite internal structure and as such as may result from joints, they have been termed "massive" or "unstratified," to distinguish them from those of the second division which are strongly marked out by the presence of a stratified structure. The igneous rocks present a considerable range in composition. For the most part they consist mainly of aluminous silicates, some of them being highly acid compounds with 75% or more of silica. But they also include highly basic varieties wherein the proportion of silica sinks to 40% and where magnesia greatly predominates over alumina. The textures of igneous rocks likewise comprise a wide series of varieties. On the one hand, some are completely vitreous, like obsidian, which is a natural glass. From this extreme every gradation may be traced through gradual increase of the products of devitrification, until the mass may become completely crystalline. Again, some crystalline igneous rocks are so fine in grain as not to show their component crystals save under the microscope, while in others the texture is so coarse as to present the component minerals in separate crystals an inch or more in length. These differences indicate that, at first, the materials of the rock may have been as completely molten as artificial glass, and that the crystalline condition has been subsequently developed by cooling, and the separation of the chemical constituents into definite crystalline minerals. Many of the characters of igneous rocks have been reproduced experimentally by fusing together their minerals, or the constituents of their minerals, in the proper proportion. But it has not yet been found possible to imitate the manufacture of such rocks as granite. Doubtless these rocks consolidated with extreme slowness at great depths below the surface, under vast pressures and probably in the presence of water or water-vapour—conditions which cannot be adequately imitated in experiment.

Though the igneous rocks occupy extensive areas in some countries, they nevertheless cover a much smaller part of the whole surface of the land than is taken up by the second division or stratified rocks. But they increase in quantity downwards and probably extend continuously round the globe below the other rocks. This important series brings before us the relations of the molten magma within the earth to the overlying crust and to the outer surface. On the one hand, it includes the oldest and most deep-seated extravasations of that magma, which have been brought to light by ruptures and upheavals of the crust and prolonged denudation. On the other, it presents to our study the varied outpourings of molten and fragmentary materials in the discharges of modern and ancient

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volcanoes. Between these two extremes of position and age, we find that the crust has been, as it were, riddled with injections of the magma from below. These features will be further noticed in Part V. of this article.

2. The "sedimentary" or "stratified rocks" form by much the larger part of the dry land of the globe, and they are prolonged to an unknown distance from the shores under the bed of the sea. They include those masses of mineral matter which, unlike the igneous rocks, can be traced back to a definite origin on the surface of the earth. Three distinct types may be recognized among them: (*a*) By far the largest proportion of them consists of different kinds of sediment derived from the disintegration of pre-existing rocks. In this "fragmental" group are placed all the varieties of shingle, gravel, sand, clay and mud, whether these materials remain in a loose incoherent condition, or have been compacted into solid stone. (*b*) Another group consists of materials that have been deposited by chemical precipitation from solution in water. The white sinter laid down by calcareous springs is a familiar example on a small scale. Beds of rock-salt, gypsum and dolomite have, in some regions, been accumulated to a thickness of many thousand feet, by successive precipitations of the salt contained in the water of inland seas. (*c*) An abundant and highly important series of sedimentary formations has been formed from the remains of plants and animals. Such accumulations may arise either from the transport and deposit of these remains, as in the case of sheets of drift-wood, and banks of drifted sea-shells, or from the growth and decay of the organisms on the spot, as happens in peat bogs and in coral-reefs.

As the sedimentary rocks have for the most part been laid down under water, and more especially on the sea-floor, they are often spoken of as "aqueous," in contradistinction to the igneous rocks. Some of them, however, are formed by the drifting action of wind upon loose materials, and are known as "æolian" formations. Familiar instances of such wind-formed deposits are the sand-dunes along many parts of the sea coast. Much more extensive in area are the sands of the great deserts in the arid regions of the globe.

It is from the sedimentary rocks that the main portion of geological history is derived. They have been deposited one over another in successive strata from a remote period in the development of the globe down to the present time. From this arrangement they have been termed "stratified," in contrast to the unstratified or igneous series. They have preserved memorials of the geographical revolutions which the surface of the earth has undergone; and above all, in the abundant fossils which they have enclosed, they furnish a momentous record of the various tribes of plants and animals which have successively flourished on land and sea. Their investigation is thus the most important task which devolves upon the geologist.

3. In the third place cones a series of rocks which are not now in their original condition, but have undergone such alteration as to have acquired new characters that more or less conceal their first structures. Some of them can be readily recognized as altered igneous masses; others are manifestly of sedimentary origin; while of many it is difficult to decide what may have been their pristine character. To this series the term "metamorphic" has been applied. Its members are specially distinguished by a prevailing fissile, or schistose, structure which they did not at first possess, and which differs from anything found in unaltered igneous or sedimentary rocks. This fissility is combined with a more or less pronounced crystalline structure. These changes are believed to be the result of movements within the crust of the earth, whereby the most solid rocks were crushed and sheared, while, at the same time, under the influence of a high temperature and the presence of water, they underwent internal chemical reactions, which led to a rearrangement and recomposition of their mineral constituents and the production of a crystalline structure (see METAMORPHISM).

Among the less altered metamorphic rocks of sedimentary origin, the successive laminae of deposit of the original sediment can be easily observed; but they are also traversed by a new set of divisional planes, along which they split across the original bedding. Together with this superinduced cleavage there have been developed in them minute hairs, scales and rudimentary crystals. Further stages of alteration are marked by the increase of mica-scales, flakes, garnets and other minerals, especially along the planes of cleavage, until the whole rock becomes crystalline, and displays its chief component minerals in successive discontinuous folia which merge into each other, and are often crumpled and puckered. Massive igneous rocks can be observed to have undergone intense crushing and cleavage, and to have ultimately assumed a crystalline foliated character. Rocks which present this aspect are known as schists (*q.v.*). They range from the fine micaceous slates, or phyllites, up to the coarsest gneisses, which in hand-specimens can hardly be distinguished from granites. There is indeed every reason to believe that such gneisses were probably originally true granites, and that their foliation and recrystallization have been the result of metamorphism.

The schists are more especially to be found in the heart of mountain-chains, and in regions where the lowest and oldest parts of the earth's crust have, in the course of geological revolutions, been exposed to the light of day. They have been claimed by some writers to be part of the original or primitive surface of our globe that first consolidated on the molten nucleus. But the progress of investigation all over the world has shown that this supposition cannot be sustained. The oldest known rocks present traces of the characters of molten material that has cooled and hardened in the air, like the various forms of recent lava. On the contrary, they possess many of the features characteristic of bodies of eruptive material that have been injected into the crust at some depth underground, and are now visible at the surface, owing to the removal by denudation of the rocks under which they consolidated. In their less foliated portions they can be recognized as true eruptive rocks. In many places gneisses that possess a thoroughly typical foliation have been found to pierce ancient sedimentary formations as intrusive bosses and veins.

PART IV.—DYNAMICAL GEOLOGY

This section of the science includes the investigation of those processes of change which are at present in progress upon the earth, whereby modifications are made on the structure and composition of the crust, on the relations between the interior and the surface, as shown by volcanoes, earthquakes and other terrestrial disturbances, on the distribution of oceans and continents, on the outlines of the land, on the form and depth of the sea-bottom, on climate, and on the races of plants and animals by which the earth is tenanted. It brings before us, in short, the whole range of activities which it is the province of geology to study, and leads us to precise notions regarding their relations to each other and the results which they achieve. A knowledge of this branch of the subject is thus the essential groundwork of a true and fruitful acquaintance with the principles of geology, seeing that it necessitates a study of the present order of nature, and thus provides a key for the interpretation of the past.

The whole range of operations included within the scope of inquiry in this branch of the science may be regarded as a vast cycle of change, into which we may break at any point, and round which we may travel, only to find ourselves brought back to our starting-point. It is a matter of comparatively small moment at what part of the cycle we begin our inquiries. We shall always find that the changes we see in action have resulted from some that preceded, and give place to others which follow them.

At an early time in the earth's history, anterior to any of the periods of which a record remains in the visible rocks, the chief sources of geological action probably lay within the earth itself. If, as is generally supposed, the planet still retained a great store of its initial heat, it was doubtless the theatre of great chemical changes, giving rise, perhaps, to manifestations of volcanic energy somewhat like those which have so marvellously roughened the surface of the moon. As the outer layers of the globe cooled, and the disturbances due to internal heat and chemical action became less marked, the conditions would arise in which the materials for geological history were accumulated. The influence of the sun, which must always have operated, would then stand out more clearly, giving rise to that wide circle of superficial changes wherein variations of temperature and the circulation of air and water over the surface of the earth come into play.

In the pursuit of his inquiries into the past history and into the present *régime* of the earth, the geologist must needs keep his mind ever open to the reception of evidence for kinds and especially for degrees of action which he had not before imagined. Human experience has been too short to allow him to assume that all the causes and modes of geological change have been definitively ascertained. On the earth itself there may remain for future discovery evidence of former operations by heat, magnetism, chemical change or otherwise, which may explain many of the phenomena with which geology has to deal. Of the influences, so many and profound, which the sun exerts upon our planet, we can as yet only perceive a little. Nor can we tell what other cosmical influences may have lent their aid in the evolution of geological changes.

Much useful information regarding many geological processes has been obtained from experimental research in laboratories and elsewhere, and much more may be confidently looked for

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from future extensions of this method of inquiry. The early experiments of Sir James Hall, already noticed, formed the starting-point for numerous subsequent researches, which have elucidated many points in the origin and history of rocks. It is true that we cannot hope to imitate those operations of nature which demand enormous pressures and excessively high temperatures combined with a long lapse of time. But experience has shown that in regard to a large number of processes, it is possible to imitate nature's working with sufficient accuracy to enable us to understand them, and so to modify and control the results as to obtain a satisfactory solution of some geological problems.

In the present state of our knowledge, all the geological energy upon and within the earth must ultimately be traced back to the primeval energy of the parent nebula or sun. There is, however, a certain propriety and convenience in distinguishing between that part of it which is due to the survival of some of the original energy of the planet and that part which arises from the present supply of energy received day by day from the sun. In the former case we have to deal with the interior of the earth, and its reaction upon the surface; in the latter, we deal with the surface of the earth and to some extent with its reaction on the interior. This distinction allows of a broad treatment of the subject under two divisions:

I. Hypogene or Plutonic Action: The changes within the earth caused by internal heat, mechanical movement and chemical rearrangements.

II. Epigene or Surface Action: The changes produced on the superficial parts of the earth, chiefly by the circulation of air and water set in motion by the sun's heat.

DIVISION I.—HYPOGENE OR PLUTONIC ACTION

In the discussion of this branch of the subject we must carry in our minds the conception of a globe still possessing a high internal temperature, radiating heat into space and consequently contracting in bulk. Portions of molten rocks from inside are from time to time poured out at the surface. Sudden shocks are generated by which destructive earthquakes are propagated through the diameter of the globe as well as to and along its surface. Wide geographical areas are pushed up or sink down. In the midst of these movements remarkable changes are produced upon the rocks of the crust; they are plicated, fractured, crushed, rendered crystalline and even fused.

(A) *Volcanoes and Volcanic Action.*

This subject is discussed in the article VOLCANO, and only a general view of its main features will be given here. Under the term volcanic action (vulcanism, vulcanicity) are embraced all the phenomena connected with the expulsion of heated materials from the interior of the earth to the surface. A volcano may be defined as a conical hill or mountain, built up wholly or mainly of materials which have been ejected from below, and which have accumulated around the central vent of eruption. As a rule its truncated summit presents a cup-shaped cavity, termed the crater, at the bottom of which is the opening of the main funnel or pipe whereby communication is maintained with the heated interior. From time to time, however, in large volcanoes rents are formed on the sides of the cone, whence steam and other hot vapours and also streams of molten lava are poured forth. On such rents smaller or parasitic cones are often formed, which imitate the operations of the parent cone and, after repeated eruptions, may rise to hills hundreds of feet in height. In course of centuries the result of the constant outpouring of volcanic materials may be to build up a large mountain like Etna, which towers above the sea to a height of 10,840 feet, and has some 200 minor cones along its flanks.

But all volcanic eruptions do not proceed from central orifices. In Iceland it has been observed that, from fissures opened in the ground and extending for long distances, molten material has issued in such abundance as to be spread over the surrounding country for many miles, while along the lines of fissure small cones or hillocks of fragmentary material have accumulated round more active parts of the rent. There is reason to believe that in the geological past this fissure-type of eruption has repeatedly been developed, as well as the more common form of central cones like Vesuvius or Etna.

In the operations of existing volcanoes only the superficial manifestations of volcanic action are observable. But when the rocks of the earth's crust are studied, they are found to enclose the relics of former volcanic eruptions. The roots of ancient volcanoes have thus been laid bare by geological revolutions; and some of the subterranean phases of volcanic action are thereby revealed which are wholly concealed in an active volcano. Hence to obtain as complete a conception as possible of the nature and history of volcanic action, regard must be had, not merely to modern volcanoes, but to the records of ancient eruptions which have been preserved within the crust.

The substances discharged from volcanic vents consist of—(1) Gases and vapours: which, dissolved in the molten magma of the interior, take the chief share in volcanic activity. They include in greatest abundance water-gas, which condenses into the clouds of steam so conspicuous in volcanic eruptions. Hydrochloric acid and sulphuretted hydrogen are likewise plentiful, together with many other substances which, sublimed by the high internal temperature, take a solid form on cooling at the surface. (2) Molten rock or lava: which ranges from the extremely acid type of the obsidians and rhyolites with 70% or more of silica, to the more basic and heavy varieties such as basalts and leucite-lavas with much iron, and sometimes no more than 45% of silica. The specific gravity of lavas varies between 2·37 and 3·22, and the texture ranges from nearly pure glass, like obsidian, to a coarse granitoid compound, as in some rhyolites. (3) Fragmentary materials, which are sometimes discharged in enormous quantity and dispersed over a wide extent of country, the finer particles being transported by upper air-currents for hundreds of miles. These materials arise either from the explosion of lava by the sudden expansion of the dissolved vapours and gases, as the molten rock rises to the surface, or from the breaking up and expulsion of portions of the walls of the vent, or of the lava, which happens to have solidified within these walls. They vary from the finest impalpable dust and ashes, through increasing stages of coarseness up to huge "bombs" torn from the upper surface of the molten rock in the vent, and large blocks of already solidified lava, or of non-volcanic rock detached from the sides of the pipe up which the eruptions take place.

Nothing is yet known as to the determining cause of any particular volcanic eruption. Some vents, like that of Stromboli, in the Mediterranean, are continually active, and have been so ever since man has observed them. Others again have been only intermittently in eruption, with intervals of centuries between their periods of activity. We are equally in the dark as to what has determined the sites on which volcanic action has manifested itself. There is reason, indeed, to believe that extensive fractures of the terrestrial crust have often provided passages up which the vapours, imprisoned in the internal magma, have been able to make their way, accompanied by other products. Where chains of volcanoes rise along definite lines, like those of Sumatra, Java, and many other tracts both in the Old and the New World, there appears to be little doubt that their linear distribution should be attributed to this cause. But where a volcano has appeared by itself, in a region previously exempt from volcanic action, the existence of a contributing fissure cannot be so confidently presumed. The study of certain ancient volcanoes, the roots of which have been exposed by long denudation, has shown an absence of any visible trace of their having availed themselves of fractures in the crust. The inference has been drawn that volcanic energy is capable of itself drilling an orifice through the crust, probably at some weaker part, and ejecting its products at the surface. The source of this energy is to be sought in the enormous expansive force of the vapours and gases dissolved in the magma. They are kept in solution by the enormous pressure within the earth; but as the lava approaches the surface and this pressure is relieved these dissolved vapours and gases rush out with explosive violence, blowing the upper part of the lava column into dust, and allowing portions of the liquid mass below to rise and escape, either from the crater or from some fissure which the vigour of explosion has opened on the side of the cone. So gigantic is the energy of these pent-up vapours, that, after a long period of volcanic quiescence, they sometimes burst forth with such violence as to blow off the whole of the upper part or even one side of a large cone. The history of Vesuvius, and the great eruptions of Krakatau in 1883 and of Bandaizan in 1888 furnish memorable examples of great volcanic convulsions. It has been observed that such stupendous discharges of aeriform and fragmentary matter may be attended with the emission of little or no lava. On the other hand, some of the largest outflows of lava have been accompanied by comparatively little fragmentary material. Thus, the great lava-floods of Iceland in 1783 spread for 40 m. away from their parent fissure, which was marked only by a line of little cones of slag.

The temperature of lava as it issues from underground has been measured more or less satisfactorily, and affords an indication of that existing within the earth. At Vesuvius it has been ascertained to be more than 2000° Fahr. It flows in molten rock glows with a white light, which rapidly reddens, and disappears under the rugged brown and black crust that forms on the surface. Underneath this badly conducting crust, the lava cools so slowly that columns of steam have been noticed rising from its surface more than 80 years after its eruption.

Considerable alteration in the topography of volcanic regions may be produced by successive eruptions. The fragmentary materials are sometimes discharged in such abundance as to cover the ground for many miles around with a deposit of loose ashes, cinders and slag. Such a deposit accumulating to a depth of many

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feet may completely bury valleys and water-courses, and thus greatly affect the drainage. The coarsest materials accumulate nearest to the vent that emits them. The finer dust is not infrequently hurled forth with such an impetus as to be carried for thousands of feet into the tracks of upper air-currents, whereby it may be borne for hundreds of miles away from the vent so as ultimately to fall to the ground in countries far removed from any active volcano. Outflows of lava, from their greater solidity and durability, produce still more serious and lasting changes in the external features of the ground over which they flow. As they naturally seek the lowest levels, they tend their way into the channels of streams. If they keep along the channels, they seal them up under a mass of compact stone which the running water, if not wholly diverted elsewhere, will take many long centuries to cut through. If, on the other hand, the lava encounters a stream, it forms a massive dam, above which the water is ponded back so as to form a lake.

As the result of prolonged activity a volcanic cone is gradually built up by successive outflows of lava and showers of dust and stones. These materials are arranged in beds, or sheets, that dip outwards from the central vent. On surrounding level ground the alternating beds are flat. In course of time, deep gullies are cut on the outer slopes of the cone by rain, and by the heavy showers that arise from the condensation of the copious discharges of steam during eruptions. Along the sides of these ravines instructive sections may be studied of the volcanic strata. The larger rivers of some volcanic regions have likewise eroded vast gorges in the more horizontal lavas and ashes of the flatter country, and in such places bare stupendous cliffs, along which the successive volcanic sheets can be seen piled above each other for many hundred feet. On a small scale, some of these features are well displayed among the rivers that drain the volcanic region of Central France; on a much larger scale, they are presented in the course of the Snake river, and other streams that traverse the great volcanic country of western North America. Similar volcanic scenery has been produced in western Europe by the action of denudation in dissecting the flat Tertiary lavas of Scotland, the Faeroe Isles and Iceland.

Of special interest to the geologist are those volcanoes which have taken their rise on the sea-bottom; for the volcanic intercalations among the stratified formations of the earth's crust are almost entirely of submarine origin. Many active volcanoes situated on islands have begun their eruptions below sea-level. Both Vesuvius and Etna sprang up on the floor of the Mediterranean sea, and have gradually built up their cones into conspicuous parts of the dry land. Examples of a similar history are to be found among the volcanic islands of the Pacific Ocean. In some of these cases a movement of elevation has carried the submarine lavas, tuffs and agglomerates above sea-level, and has furnished opportunities of examining them materials with those of recent subaerial origin, and also with the ancient records of submarine eruptions which have been preserved among the stratified formations. From the evidence thus supplied, it can be shown that the materials ejected from modern volcanic lands volcanic vents closely resemble those accumulated by subaerial volcanoes; that the dust, ashes and stones become intermingled or interstratified with coral-mud, or other non-volcanic deposit of the sea-bottom, that vesicular lavas are intercalated among them as on land, and that between the successive sheets of volcanic origin, layers of limestone may be laid down which are composed chiefly, or wholly, of the remains of calcareous marine organisms.

Those active volcanoes are widely distributed over the globe, and are especially abundant around the vast basin of the Pacific Ocean, they afford an incomplete picture of the extent to which volcanic action has displayed itself on the surface of our planet. When the rocks of the land are attentively studied they disclose proofs of that action in many districts where there is now no outward sign of it. Not only so, but they reveal that volcanoes have been in eruption in some of these districts during many different periods of the past, back to the beginnings of geological history. The British Islands furnish a remarkable example of such a series of ancient eruptions. From the Cambrian period all through Palaeozoic times there rose at intervals in that country a succession of volcanic centres from some of which thousands of feet of lavas and tuffs were discharged. Again in older Tertiary times the same region witnessed a stupendous outpouring of basalt, the surviving relics of which are more than 3000 ft. thick, and cover many hundreds of square miles. Similar evidence is supplied in other countries both in the Old and the New world. Hence it is proved that, in the geological past, volcanic action has been vigorous at long intervals on the same sites during a vast series of ages, though its active vents are not seen there now. The volcanoes now active form but a small proportion of the total number which has appeared on the surface of the earth.

With regard to the cause of volcanic action much has been speculated, but little can be confidently affirmed. That water in the form of occluded gas plays the chief part in forcing the lava column up a volcanic chimney, and in the violent explosions that accompany the rise of the molten material, is generally admitted. But opinions differ as to the source of this water. According to some investigators, it should be regarded as in large measure of meteoric origin, derived from the descent of rain into the earth, and its absorption by the molten magma in the interior. Others, contending that the supply so furnished, even if it could reach and be dissolved in the magma, would yet be insufficient to furnish the prodigious quantity of aqueous vapour discharged during an eruption, maintain that the water belongs to the magma itself. They point to the admitted fact that many substances, particularly metals in a state of fusion, can absorb large quantities of vapours and gases without chemical combination, and on cooling discharge them with eruptive phenomena somewhat like those of volcanoes. This question must be regarded as one of the still unsolved problems of geology.

(B) *Movements of the Earth's Crust.*

Among the hypogene forces in geological dynamics an important place must be assigned to movements of the terrestrial crust. Though the expression "the solid earth" has become proverbial, it appears singularly inappropriate in the light of the results obtained in recent years by the use of delicate instruments of observation. With the facilities supplied by these instruments (see SEISMOMETER), it has been ascertained that the ground beneath our feet is subject to continual slight tremors, and feeble pulsations of longer duration, some of which may be due to daily or seasonal variations of temperature, atmospheric pressure or other meteorological causes. The establishment of self-recording seismometers all over the world has led to the detection of many otherwise imperceptible shocks, over and above the appreciable earth-waves propagated from earthquake centres of disturbance. Moreover, it has been ascertained that some parts of the surface of the land are slowly rising, while others are falling with reference to the sea-level. From time to time the surface suffers calamitous devastation from earthquakes, when portions of the crust under great strain suddenly give way, lastly, at still longer intervals, probably separated from each by vast periods of time, the terrestrial crust undergoes intense plication and fracture, and is consequently ridged up into mountain-chains. No event of this kind has been witnessed since man began to record his experiences. But from the structure of mountains, as laid open by prolonged denudation, it is possible to form a vivid conception of the nature and effects of these most stupendous of all geological revolutions.

In considering this department of geological inquiry it will be convenient to treat it under the following heads: (1) Slow depression and upheaval; (2) Earthquakes; (3) Mountain-making; (4) Metamorphism of rocks.

1. *Slow Depression and Upheaval.*—On the west side of Japan the land is believed to be sinking below the sea, for fields are replaced by beaches of sand or shingle, while the depth of the sea off shore has perceptibly increased. A subsidence of the south of Sweden has taken place in comparatively recent times, for ancient sea-beaches and lines of houses at successive levels are found below high-water mark. The west coast of Greenland over an extent of more than 600 m. is sinking, and old settlements are now submerged. Proofs of submergence of land are furnished by "submerged forests," and beds of terrestrial peat now lying at various depths below the level of the sea, of which many examples have been collected along the shores of the British Isles, Holland and France. Interesting evidence that the coast of Europe now stands at a lower level than it did at a late geological period is supplied in the charts of the North Sea and Atlantic, which show that the valleys of the land are prolonged under the sea. These valleys have been eroded out of the rocks by the streams which flow in them, and the depth of their submerged portions below the sea level affords an indication of the extent of the subsidence.

The rise of land has been detected in various parts of the world. One of the most celebrated instances is that of the shores of the Gulf of Bothnia, where, at Stockholm, the elevation, between the years 1774 and 1875, appears to have been 48 centimetres (18½ in.) in a century. But on the west side of Sweden, fronting the Skager Rak, the coast, between the years 1820 and 1870, rose 30 centimetres, which is at the rate of 60 centimetres, or nearly 2 ft. in a century. In the region of the Great Lakes in the interior of Canada and the United States it has been ascertained that the land is undergoing a slow tilt towards the south-west, of which the mean rate appears to be rather less than 6 in. in a century. If this rate of change should continue the waters of Lake Michigan, owing to the progress of the tilt, will, in some 500 or 600 years, submerge the city of Chicago, and eventually the drainage of the lakes will be diverted into the basin of the Mississippi. Proof of recent emergence of land is supplied by what are called "raised beaches" or "strand-lines," that is, lines of former shores marked by sheets of littoral deposits, or platforms cut by shore-waves in rock and flanked by old sea-cliffs and lines of sea-worn caves. Admirable examples of these features are to be seen along the west coast of Europe from the south of England to the north of Norway. These lines of old beaches become fainter in proportion to their antiquity. In Britain they occur at various heights, the platforms at 25, 50 and 100 ft. being well marked.

The cause of these slow upward and downward movements of the crust of the earth is still imperfectly understood. Upheaval might conceivably be produced by an ascent of the internal magma, and the consequent expansion of the overlying crust by heat; while depression might follow any subsidence of the magma, or its displacement

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to another district. If, as is generally believed, the globe is still contracting, the shrinkage of the surface may cause both these movements. Subsidence will be in excess, but between subsiding tracts lateral thrust may suffice to push upward intervening more solid and stable ground; but no solution of the problem yet proposed is wholly satisfactory.

2. *Earthquakes.*—As this subject is discussed in a separate article it will be sufficient here to take note of its more important geological bearings. It was for many centuries taken for granted that earthquakes and volcanoes are due to a common cause. We have seen that in classical antiquity they were looked on as the results of the movements of wind imprisoned within the earth. Long after this notion was discarded, and a more scientific appreciation of volcanic action was reached, it was still thought that earthquakes should be regarded as manifestations of the same source of energy as that which displays itself in volcanic eruptions. It is true that earthquakes are frequent in districts of active volcanoes, and they may undoubtedly be often due there to the explosions of the magma, or to the rupture of rocks caused by its ascent towards the surface. But such shocks are comparatively local in their range and feeble in their effects. There is now a general agreement that between the great world-shaking earthquakes and volcanic phenomena, no immediate and intimate relationship can be traced, though they may be connected in ways which are not yet perceived. Some of the more recent great earthquakes on land have proved that the waves of shock are produced by the sudden rupture or collapse of rocks under great strain, either along lines of previous fracture or of new rents in the terrestrial crust; and that such ruptures may occur at a remote distance from any volcano. Thus the recent disastrous San Francisco earthquake has been recognized to have resulted from a slipping of ground along the line of an old fault, which has been traced for a long distance in California generally parallel to the coast. The position of this fault at the surface has long been clearly followed by its characteristic topography. After the earthquake these superficial features were found to have been removed by the same causes that had originated them. For some 300 m. on the track of this old fault-line a renewed slipping was seen to have taken place along one or both sides, and the ground at the surface was ruptured as well as displaced horizontally. Obviously, the jar occasioned by the sudden and simultaneous subsidence of a portion of the earth's crust several hundred miles long, must be far more serious than could be produced by an earthquake radiating from a single local volcanic focus.

From their disastrous effects on buildings and human lives, an exaggerated importance has been imputed to earthquakes as agents of geological change. Experience shows that even after a severe shock which may have destroyed numerous towns and villages, together with thousands of the inhabitants, the face of the country has suffered scarcely any perceptible change, and that, in the course of a year or two, when the ruined houses and prostrate trees have been cleared away, little or no obvious trace of the catastrophe may remain. Among the more enduring records of a great earthquake may be enumerated (*a*) landslips, which lay bare hillsides, and sometimes pond back the drainage of valleys so as to give rise to lakes; (*b*) alterations of the topography, as in fissuring of the ground, or in the production of inequalities whereby the drainage is affected in new valleys and new lakes may thus be formed, while previously existing lakes may be emptied; (*c*) permanent changes of level, either in an upward or downward direction.

3. *Mountain-making.*—This subject may be referred to here for the striking evidence which it supplies of the importance of movements of the earth's crust among geological processes. The structure of a great mountain-chain such as the Alps proves that the crust of the earth has been intensely plicated, crumpled and fractured. Vast piles of sedimentary strata have been folded to such an extent as to occupy now only half of their original horizontal extent. This compression in the case of the Alps has been computed to amount to as much as 120,000 metres or 74 English miles, so that two points on the opposite sides of that chain have been brought by so much nearer to each other than they were originally before the movements. Besides such intense plication, extensive rupturing of the crust has taken place in the same range of mountains. Not only have the most ancient rocks been squeezed up into the central axis of the chain, but huge slices of them have been torn away from the main body, and thrust forward for many miles, so as now actually to form the summits of mountains, which are almost entirely composed of much younger formations. Such colossal disturbances occurred rapidly, they would give rise to cataclysms of inconceivable magnitude over the surface of the globe. No record has been discovered of such accompanying devastation. But whether sudden and violent, or prolonged and gradual, such stupendous upturnings of the crust did undoubtedly take place, as is clearly revealed in innumerable natural sections, which have been laid open by the denudation of the crests and sides of the mountains.

4. *Metamorphism of Rocks* (see METAMORPHISM).—During the movements to which the crust of the earth has been subject, not only have the rocks been folded and fractured, but they have likewise, in many regions, acquired new internal structures, and have thus undergone a process of "regional metamorphism." This rearrangement of their substance has been governed by conditions which are probably not yet all recognized, but among them we should doubtless include a high temperature, intense pressure, mechanical movement resulting in crushing, shearing and foliation, and the presence of water in their pores. It is among igneous rocks that the progressive stages of metamorphism can be most easily traced. Their definite original structure and mineral composition afford a starting-point from which the investigation may be begun and pursued. Where an igneous rock has been invaded by metamorphic changes, it may be observed to have been first broken down into separate lenticles, the cores of which may still retain, with little or no alteration, the original characteristic minerals and crystalline structure of the rock. Between these lenticles, the intervening portions have been crushed down into a powder or paste, which seems to have been squeezed round and past them, and shows a laminated arrangement that resembles the flow-structure in lavas. As the degree of metamorphism increases, the lenticles diminish in size, and the intervening crushed and foliated matrix increases in amount, until at last it may form the entire mass of the rock. While the original minerals are thus broken down, new varieties make their appearance. Of these, among the earliest to present themselves are usually the micas, that impart their characteristic silvery sheen to the surfaces of the folia along which they spread. Younger felspars, as well as mica, are developed, and there arise also sillimanite, garnet, andalusite and many others. The texture becomes more coarsely crystalline, and the segregation of the constituent minerals more definite along the lines of foliation. From the finest silky phyllites a graduation may be traced through successively coarser mica-schists, until we reach the almost granitic texture of the coarsest gneisses.

Regional metamorphism has arisen in the heart of mountain-chains, and in any other district where the deformation of the crust has been sufficiently intense. There is another type of alteration termed "contact-metamorphism," which is developed around masses of igneous rock, especially where these have been intruded in large bosses among stratified formations. It is particularly displayed around masses of granite, where sandstones are found altered into quartzite, shales and grits into schistose compounds, and where sometimes fossils are still recognizable among the metamorphic minerals.

DIVISION II.—EPIGENE OR SUPERFICIAL ACTION

It is on the surface of the globe, and by the operation of agents working there, that at present the chief amount of visible geological change is effected. In considering this branch of inquiry, we are not involved in a preliminary difficulty regarding the very nature of the agencies as is the case in the investigation of plutonic action. On the contrary, the surface agents are carrying on their work under our very eyes. We can watch it in all its stages, measure its progress, and mark in many ways how accurately it represents similar changes which, for long ages previously, must have been effected by the same means. But in the systematic treatment of this subject we encounter a difficulty of another kind. We discover that while the operations to be discussed are numerous and readily observable, they are so interwoven into one great network that any separation of them under different subdivisions must to be more or less artificial and to convey an erroneous impression. While, therefore, under the unavoidable necessity of making use of such a classification of subjects, we must always bear in mind that it is employed merely for convenience, and that in nature superficial geological action must be continually viewed as a whole, since the work of each agent has constant reference to that of the others, and is not properly intelligible unless that connexion be kept in view.

The movements of the air; the evaporation from land and sea; the fall of rain, hail and snow; the flow of rivers and glaciers; the tides, currents and waves of the ocean; the growth and decay of organized existence, alike on land and in the depths of the sea;—in short, the whole circle of movement, which is continually in progress upon the surface of our planet, are the subjects now to be examined. It is desirable to adopt some general term to embrace the whole of this range of inquiry. For this end the word epigene (Gr. *ἐπί*, upon) has been suggested as a convenient term, and antithetical to hypogene (Gr. *ὑπό*, under), or subterranean action.

A simple arrangement of this part of Geological Dynamics is in three sections:

A. *Air.*—The influence of the atmosphere in destroying and forming rocks.

B. *Water.*—The geological functions of the circulation of water through the air and between sea and land, and the action of the sea.

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C. *Life.*—The part taken by plants and animals in preserving, destroying or reproducing geological formations.

The words destructive, reproductive and conservative, employed in describing the operations of the epigene agents, do not necessarily imply that anything useful to man is destroyed, reproduced or preserved. On the contrary, the destructive action of the atmosphere may turn barren rock into rich soil, while its reproductive effects sometimes turn rich land into barren desert. Again, the conservative influence of vegetation has sometimes for centuries retained as barren morass what might otherwise have become rich meadow or luxuriant woodland. The terms, therefore, are used in a strictly geological sense, to denote the removal and re-deposition of material, and its agency in preserving what lies beneath it.

(A) *The Air.*

As a geological agent, the air brings about changes partly by its component gases and partly by its movements. Its destructive action is both chemical and mechanical. The chemical changes are probably mainly, if not entirely, due to the moisture of the air, and particularly to the gases, vapours and organic matter which the moisture contains. Dry air seems to have little or no appreciable influence in promoting these reactions. As the changes in question are similar to those much more abundantly brought about by rain they are described in the following section under the division on rain.

Among the more recognizable mechanical changes effected by the atmosphere, one of considerable importance is to be seen in the result of great and rapid changes of temperature. Heat expands rocks, while cold contracts them. In countries with a great annual range of temperature, considerable difficulty is sometimes experienced in selecting building materials liable to be little affected by the alternate expansion and contraction, which prevents the joints of masonry from remaining close and tight. In dry tropical climates, where the days are intensely hot and the nights extremely cold, the rapid nocturnal contraction produces a strain so great as to rival frost in its influence upon the surface of exposed rocks, disintegrating them into sand, or causing them to crack or peel off in skins or irregular pieces. Dr Livingstone found in Africa (12° S. lat., 34° E. long.) that surfaces of rock which during the day were heated up to 137° Fahr., cooled so rapidly by radiation at night that, unable to sustain the strain of contraction, they split and threw off sharp angular fragments from a few ounces to 100 or 200 lb in weight. In temperate regions this action, though much less pronounced, still makes itself felt. In these climates, however, and still more in high latitudes, somewhat similar results are brought about by frost.

By its motion in wind the air drives fine sand over rocks, and in course of time abrades and smoothes them. "Desert polish" is the name given to the characteristic lustrous surface thus imparted. Holes are said to be drilled in window glass at Cape Cod by the same agency. Cavities are now and then hollowed out of rocks by the gyration in them of little fragments of stone or grains of sand kept in motion by the wind. Hurricanes form important geological agents upon land in uprooting trees, and thus sometimes impeding the drainage of a country and giving rise to the formation of peat mosses.

The reproductive action of the air arises partly from the effect of the chemical and mechanical disintegration involved in the process of "weathering," and partly from the transporting power of wind and of aerial currents. The layer of soil, which covers so much of the surface of the land, is the result of the decay of the underlying rocks, mingled with mineral matter blown over the ground by wind, or washed thither by rain, and with the mouldering remains of plants and animals. The extent to which fine dust may be transported over the surface of the land can hardly be realized in countries clothed with a covering of vegetation, though even there, in dry weather during spring, clouds of dust may often be seen blown away by wind from bare ploughed fields. Intercepted by the leaves of plants and washed down to their roots by rain, this dust goes to increase the soil below. In arid climates, where dust clouds are dense and frequent, enormous quantities of fine mineral particles are thus borne along and accumulated. The remarkable deposit of "Loess," which is sometimes more than 1500 ft. thick and covers extensive areas in China and other countries, is regarded as due to the drifting of dust by wind. Again the dunes of sand so often found along the inner side of sandy sea-beaches in many different parts of the world are attributable to the same action.

(B) *Water.*

In treating of the epigene action of water in geological processes it will be convenient to deal first with its operations in traversing the land, and then with those which it performs in the sea. The circulation of water from land to sea and again from sea to land constitutes the fundamental cause of most of the daily changes by which the surface of the land is affected.

1. *Rain.*—Rain effects two kinds of changes upon the surface of the land. It acts *chemically* upon soils and stones, and sinking under ground continues a great series of similar reactions there. It acts *mechanically*, by washing away loose materials, and thus powerfully affecting the contours of the land. Its chemical action depends mainly upon the nature and proportion of the substances which, in descending to the earth, it abstracts from the atmosphere. Rain always absorbs a little air, which, in addition to its nitrogen and oxygen, contains carbonic acid, and in minute proportions, sodium chloride, sulphuric acid and other ingredients, especially inorganic dust, organic particles and living germs. Probably the most generally efficient of these constituents are oxygen, carbonic acid and organic matter. Armed with these reagents, rain effects a chemical decomposition of the rocks on which it falls, and through which it sinks underground. The principal changes thus produced are as follows: (*a*) Oxidation.—Owing to the prominence of oxygen in rain-water, and its readiness to unite with any substance which can contain more of it, a thin oxidized pellicle is formed on the surface of many rocks on which rain falls, and this oxidized layer if not at once washed off, sinks deeper until a crust is formed over the stone. A familiar illustration of this action is afforded by the rust, or oxide, which forms on iron when exposed to moisture, though this iron may be kept long bright if allowed to remain screened from moist air and rain. (*b*) Deoxidation.—Organic matter having an affinity for more oxygen decomposes peroxides by depriving them of some part of their share of that element and reducing them to protoxides. These changes are especially noticeable among the iron oxides so abundantly diffused among rocks. Hence rain-water, in sinking through soil and obtaining such organic matter, becomes thereby a reducing agent. (*c*) Solution.—This may take place either by the simple action of the water, as in the solution of rock-salt, or by the influence of the carbonic acid present in the rain. (*d*) Formation of Carbonates.—A familiar example of the action of carbonic acid in rain is to be seen in the corrosion of exposed marble slabs. The carbonic acid dissolves some of the lime, which, as a bicarbonate, is held in solution in the carbonated water, but is deposited again when the water loses its carbonic acid on evaporation. It is not merely carbonates, however, which are liable to this kind of destruction. Even silicates of lime, potash and soda, combinations existing abundantly as constituents of rocks, are attacked; their silica is liberated, and their alkalis or alkaline earths, becoming carbonates, are removed in solution. (*e*) Hydration.—Some minerals, containing little or no water, and therefore called anhydrous, when exposed to the action of the atmosphere, absorb water, or become hydrous, and are then usually more prone to further change. Hence the rocks of which they form part become disintegrated.

Besides the reactions here enumerated, a considerable amount of decay may be observed as the result of the presence of sulphuric and nitric acid in the air, especially in that of large towns and manufacturing districts, where much coal is consumed. Metallic surfaces, as well as various kinds of stone, are there corroded, while the mortar of walls may often be observed to be slowly swelling out and dropping off, owing to the conversion of the lime into sulphate. Great injury is likewise done from a similar cause to marble monuments in exposed graveyards.

The general result of the disintegrating action of the air and of rain, including also that of plants and animals, to be noticed in the sequel, is denoted by the term "weathering." The amount of decay depends partly on conditions of climate, especially the range of temperature, the abundance of moisture, height above the sea and exposure to prevalent winds. Many rocks liable to be saturated with rain and rapidly dried under a warm sun are apt to disintegrate at the surface with comparative rapidity. The nature and progress of the weathering are mainly governed by the composition and texture of the rocks exposed to it. Rocks composed of particles liable to little chemical change from the influence of moisture are best fitted to resist weathering, provided they possess sufficient cohesion to withstand the mechanical processes of disintegration. Siliceous sandstones are excellent examples of this permanence. Consisting wholly or mainly of the durable mineral quartz, they are sometimes able so to withstand decay that buildings made of them still retain, after the lapse of centuries, the chisel-marks of the builders. Some rocks, which yield to comparatively little decay to the chemical attacks of moisture, may show little or no mark of disintegration on their surface. This is particularly the case with certain calcareous rocks. Limestone when pure is wholly soluble in acidulated water. Rain falling on such a rock dissolves some of it in solution, and will continue to do so until the whole is dissolved away. But where a limestone is full of impurities, a weathered crust of more or less insoluble particles remains after the solution of the calcareous part of the stone. Hence the relative purity of limestones may be roughly determined by examining their weathered surfaces, where, if they contain much sand, the grains will be seen projecting from the calcareous matrix, and where, should the rock be very ferruginous, the yellow hydrous peroxide, or ochre, will be found as a powdery crust. In limestones containing abundant encrinites, shells, or other organic remains, the weathered surface commonly presents the fossils standing out in relief. The crystalline arrangement of the lime in the organic structures enables them to resist disintegration better than the general mechanically aggregated matrix of the rock. An experienced fossil collector will always search well such weathered surfaces, for he often finds there, delicately

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picked out by the weather, minute and frail fossils which are wholly invisible on a freshly broken surface of the stone. Many rocks weather with a thick crust, or even decay inwards for many feet or yards. Basalt, for example, often shows a yellowish-brown ferruginous layer on its surface, formed by the conversion of its felspar into kaolin, and the removal of its calcium silicate as carbonate, by the hydration of its olivine and augite and their conversion into serpentine, or some other hydrous magnesian silicate, and by the conversion of its magnetite into limonite. Granite sometimes shows in a most remarkable way the distance to which weathering can reach. It may occasionally be dug into for a depth of 20 or 30 ft., the quartz crystals and veins retaining their original positions, while the felspar is completely kaolinized. It is to the endlessly varied effects of weathering that the abundant fantastic shapes assumed by crags and other rocky masses are due. Most varieties of rock have their own characteristic modes of weathering, whereby they may be recognized even from a distance. To some of these features reference will be made in Part VIII.

The mechanical action of rain, which is intimately bound up with its chemical action, consists in washing off the fine superficial particles of rocks which have been corroded and loosened by the process of weathering, and in thus laying open fresh portions to the same influences of decay. The detritus so removed is partly carried down into the soil which is thereby enriched, partly held in suspension in the little runnels into which the rain-drops gather as they begin to flow over the land, partly pushed downwards along the surface of sloping ground. A good deal of it finds its way into the nearest brooks and rivers, which are consequently made muddy by heavy rain.

It is natural that a casual consideration of the subject should lead to an impression that, though the general result of the fall of rain upon a land-surface must lead to some amount of disintegration and lowering of that surface, the process must be so slow and slight as hardly to be considered of much importance among geological operations. But further attention will show such an impression to be singularly erroneous. It loses sight of the fact that a change which may be hardly appreciable within a human lifetime, or even within the comparatively brief span of geological time embraced in the compass of human history, may nevertheless become gigantic in its results in the course of immensely protracted periods. An instructive lesson in the erosive action of rain may be found in the pitted and channelled surface of ground lying under the drip of the eaves of a cottage. The fragments of stone and pebbles of gravel that form part of the soil can there be seen sticking out of the ground, because being hard they resist the impetus of the falling drops, protecting for a time the earth beneath them, while that which surrounded and covered them is washed away. From this familiar illustration the observer may advance through every stage in the disappearance of material which once covered the surface, until he comes to examples where once continuous and thick sheets of solid rock have been reduced to a few fragments or have been entirely removed. Since the whole land surface over which rain falls is exposed to this waste, the superficial covering of decayed rock or soil, as Hutton insisted, is constantly, though imperceptibly, travelling outward and downward to the sea. In this process of transport rain is an important carrying agent, while at the same time it serves to connect the work of the other disintegrating forces, and to make it conducive to the general degradation of the land. Though this decay is general and constant, it is obviously not uniform. In some places where, from the nature of the rock, from the flatness of the ground, or from other causes, rain works under great difficulties, the rate of waste may be extremely slow. In other places it may be rapid enough to be appreciable from year to year. A survey of this department of geological activity shows how unequal wasting by rain, combined with the operations of brooks and rivers, has produced the details of the present relief of the land, those tracts where the destruction has been greatest forming hollows and valleys, others, where it has been less, rising into ridges and hills (Part VIII.).

Rain-action is not merely destructive, but is accompanied with reproductive effects, chief of which is the formation of soil. In favourable situations it has gathered together accumulations of loam and earth from neighbouring higher ground, such as the "brick-earth," "head," and "rain-wash" of the south of England—earthy deposits, sometimes full of angular stones, derived from the subaerial waste of the rocks of the neighbourhood.

2. *Underground Water.*—Of the rain which falls upon the land one portion flows off into brooks and rivers by which the water is conducted back to the ocean; the larger part, however, sinks into the ground and disappears. It is this latter part which has now to be considered. Over and above the proportion of the rainfall which is absorbed by living vegetation and by the soil, there is a continual filtering down of the water from the surface into the rocks that lie below, where it partly lodges in pores and interstices, and partly finds its way into subterranean joints and fissures, in which it performs an underground circulation, and ultimately issues once more at the surface in the form of springs (*q.v.*). In the course of this circulation the water performs an important geological task. Not only carrying down with it the substances which the rain has abstracted from the air, but obtaining more acids and organic matter from the soil, it is enabled to effect chemical changes in the rocks underneath, and especially to dissolve limestone and other calcareous formations. So considerable is the extent of this solution in some places that the springs which come to the surface, and begin there to evaporate and lose some of their carbonic acid, contain more dissolved lime than they can hold. They consequently deposit it in the form of calcareous tuff or sinter (*q.v.*). Other subterranean waters issue with a large proportion of iron-salts in solution which form deposits of ochre. The various mineral springs so largely made use of for the mitigation or cure of diseases owe their properties to the various salts which they have dissolved out of rocks underground. As the result of prolonged subterranean solution in limestone districts, passages and caves (*q.v.*), sometimes of great width and length, are formed. When these lie near the surface their roofs sometimes fall in and engulf brooks and rivers, which then flow for some way underground until the tunnels conduct them back again to daylight on some lower ground.

Besides its chemical activity water exerts among subterranean rocks a mechanical influence which leads to important changes in the topography of the surface. In removing the mineral matter, either in solution or as fine sediment, it sometimes loosens the support of overlying masses of rock which may ultimately give way on sloping ground, and rush down the declivities in the form of landslips. These destructive effects are specially frequent on the sides of valleys in mountainous countries and on lines of sea-cliff.

3. *Brooks and Rivers.*—As geological agents the running waters on the face of the land play an important part in epigene changes. Like rain and springs they have both a chemical and a mechanical action. The latter receives most attention, as it undoubtedly is the more important; but the former ought not to be omitted in any survey of the general waste of the earth's surface. The water of rivers must possess the powers of a chemical solvent like rain and springs, though its actual work in this respect can be less easily measured, seeing that river water is directly derived from rain and springs, and necessarily contains in solution mineral substances supplied to it by them and not by its own operation. Nevertheless, it is sometimes easy to prove that streams dissolve chemically the rocks of their channels. Thus, in limestone districts the base of the cliffs of river ravines may be found eaten away into tunnels, arches, and overhanging projections, presenting in their smooth surfaces a great contrast to the angular jointed faces of the same rock, where now exposed to the influence only of the weather on the higher parts of the cliff.

The mechanical action of rivers consists (*a*) in transporting mud, sand, gravel and blocks of stone from higher to lower levels; (*b*) in using these loose materials to widen and deepen their channels by erosion; (*c*) in depositing their load of detritus wherever possible and thus to make new geological formations.

(*a*) *Transporting Power.*—River-water is distinguished from that of springs by being less transparent, because it contains more or less mineral matter in suspension, derived mainly from what is washed down by rain, or carried in by brooks, but partly also from the abrasion of the water-channels by the erosive action of the rivers themselves. The progress of this burden of detritus may be instructively followed from the mountain-tributaries of a river down to the mouth of the main stream. In the high grounds the water-courses may be observed to be choked with large fragments of rock disengaged from the cliffs and crags on either side. Traced downwards the blocks are seen to become gradually smaller and more rounded. They are ground against each other, and upon the rocky sides and bottom of the channel, getting more and more reduced as they descend, and at the same time abrading the rocks over or against which they are driven. Hence a great deal of débris is produced, and is swept along by the onward and downward movement of the water. The finer portions, such as mud and fine sand, are carried in suspension, and impart the characteristic turbidity to river-water; the coarser sand and gravel are driven along the river-bottom. The proportion of suspended mineral matter has been ascertained with more or less precision for a number of rivers. As an illustrative example of a river draining a vast area with different climates, forms of surface and geological structure the Mississippi may be cited. The average proportion of sediment in its water was ascertained by Humphreys and Abbot to be $\frac{1}{1500}$ by weight or $\frac{1}{2900}$ by volume. These engineers found that, in addition to this suspended material, coarse detritus is constantly being pushed forward along the bed of the river into the Gulf of Mexico, to an amount which they estimated at about 750,000,000 cubic ft. of sand, earth and gravel; they concluded that the Mississippi carries into the gulf every year an amount of mechanically transported sediment sufficient to make a prism one square mile in area and 268 ft. in height.

(*b*) *Excavating Power.*—It is by means of the sand, gravel and stones which they drive against the sides and bottoms of their channels that streams have hollowed out the beds in which they flow. Not only is the coarse detritus reduced in size by the friction of the stones against each other, but, at the same time, these materials abrade the rocks against which they are driven by the current. Where, owing to the shape of the bottom of the channel, the stones are caught in eddies, and are kept whirling round there, they become more and more worn down themselves, and at the same time scour out basin-shaped cavities, or "pot-holes," in the solid rock below.

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The uneven bed of a swiftly flowing stream may in this way be honeycombed with eroded basins which coalesce and thus appreciably lower the surface of the bed. The steeper the channel, other conditions being equal, the more rapid will be the erosion. Geological structure also affects the character and rate of the excavation. Where the rocks are so arranged as to favour the formation and persistence of a waterfall, a long chasm may be hollowed out like that of the Niagara below the falls, where a hard thick bed of nearly flat limestone lies over a much more easily worn shale bed. The latter are scooped out from underneath the limestone, which from time to time breaks off in large masses and the waterfall gradually retreats up stream, while the ravine is proportionately lengthened. To the excavating power of streams the origin of valley systems of the dry land must be mainly assigned (see Part VIII.).

(*c*) *Reproductive Power.*—So long as a stream flows over a steep declivity its velocity suffices to keep the sediment in suspension, but when from any cause, such as a diminution of slope, its velocity is checked, the transporting power is lessened and the sediment begins to fall to the bottom and to remain there. Hence various river-formed or "alluvial" deposits are laid down. These sometimes cover considerable areas at the foot of mountains. The floors of valleys are strewn with detritus, and their level may thereby be sensibly raised. To floods the ground inundated on either side of a stream intercepts some part of the detritus, which is then spread over the flood-plain and gradually heightens it. At the same time the stream continues to erode the channel, and ultimately is unable to reach the old flood-plain. It consequently forms a new plain at a lower level, and thus, by degrees, it comes to be flanked on either side by a series of successive terraces or platforms, many of which mark the ancient flood-plains. Where a river enters a large body of water its current is checked. Some of its sediment is consequently dropped, and by slow accumulation forms a delta (*q.v.*). On land, every lake in mountain district is a conspicuous instances of this power of alluvium. But the most important deltas are those formed in the sea at the mouths of the larger rivers of the globe. Off many coastlines the detritus washed from the land gathers into bars, which enclose long strips of water more or less completely separated from the sea outside and known as lagoons. A chain of such lagoon-barriers stretches for hundreds of miles round the Gulf of Mexico and the eastern shores of the United States.

4. *Subsidence.*—These sheets of water, considered as a whole, do not belong to the normal system of drainage on the land whereby valleys are excavated. On the contrary they are exceptional to it; for the constant tendency of running water is to fill them up, or to drain them by wearing down the barrier that retains the water at the outflow. Some of them are referable to movements of the terrestrial crust whereby depressions arise on the surface of the land, as has been noted after earthquakes. Others have arisen from solution such as that of rock-salt or of gypsum, the removal of which by underground water causes a subsidence of the ground above. A third type of lake-basin occurs in regions that are now or have once been subject to the erosive action of glaciers (see under next subdivision, *Terrestrial Ice*). Many small lakes or tarns have been caused by the deposit of débris across a valley as by landslips or moraines. Considered from a geological point of view, lakes perform an important function in regulating the drainage of the ground below their outfall and diminishing the destructive effects of floods, by filtering the water received from their affluent streams, and in providing undisturbed areas of deposit in which thick and extensive lacustrine formations may be accumulated. In the inland basins of some dry climates the water is gradually evaporated to dryness, and their bottoms become the sites of chemical deposits, particularly of chlorides of sodium and magnesium, and calcium sulphate and carbonate.

5. *Terrestrial Ice.*—Each of the forms assumed by frozen water has its own characteristic action in geological processes. Frost has a powerful influence in breaking up damp soils and surfaces of stone in the pores or cracks of which moisture has lodged. The water in freezing expands, and in so doing pushes asunder the component particles of soil or stone, or widens the space between the walls of joints or crevices. When the ice melts the loosened grains remain apart ready to be washed away by rain or blown off by wind, while by the widening of joints large blocks of rock are detached from the faces of cliffs. Where rivers or lakes are frozen over the ice exerts a marked pressure on their banks; and when it breaks up large sheets of it are driven ashore, pushing up quantities of gravel and stones above the level of the water. Acting up of the earth as disrupted ice against obstructions in rivers ponds back the water, and often leads to destructive floods when the ice barriers break. Where the ice has formed round boulders in shallow water, or at the bottom ("anchor-ice"), it may lift these up when the frost gives way, and may transport them for some distance. Ice formed in the atmosphere, and descending to the ground in the form of hail, often causes great destruction to vegetation and not infrequently to animal life. Where the frozen moisture reaches the earth as snow, it serves to protect rock, soil and vegetation from the effects of frost; but on sloping ground it is apt to give rise to destructive avalanches or landslips, while indirectly, by its rapid melting, it may cause serious floods in rivers.

But the most striking geological work performed by terrestrial ice is that achieved by glaciers (*q.v.*) and ice-sheets. These vast masses of moving ice, when they descend from mountains where the steeper rocks are clear of snow, receive on their surface the débris detached by frost from the declivities above, and bear these materials to lower levels or to the sea. Enormous quantities of rock-rubbish are thus transported in the Alps and other high mountain ranges. When the ice retreats the boulders carried by it are dropped where it melts, and left there as memorials of the former extension of the glacier. Evidence of this nature proves the much greater extent of the Alpine ice at a comparatively recent geological date. It can also be shown that detritus from Scandinavia has been ice-borne to the south-east of England and far into the heart of Europe.

The ice, by means of grains of sand and pieces of stone which it drags along, scores, scratches and polishes the surfaces of rock underneath it, and, in this way, produces the abundant fine sediment that gives the characteristic milky appearance to the rivers that issue from glaciers. By such action, by such long-continued attrition the rocks are worn down, portions of them of softer nature, or where the ice acts with especial vigour, are hollowed out into cavities which, on the disappearance of the ice, may be filled with water and become tarns or lakes. Rocks over which land-ice has passed are marked by a peculiar smooth, flowing outline, which forms a contrast to the more rugged surface produced by ordinary weathering. They are covered with grooves, which range from the finest striae felt by sharp grains of sand to deep ruts graved out by blocks of stone. The trend of these markings shows the direction in which the ice flowed. By their evidence the position and movement of former glaciers in countries from which the ice has entirely vanished may be clearly determined (see GLACIAL PERIOD).

6. *The Sea.*—The physical features of the sea are discussed in separate articles (see OCEAN AND OCEANOGRAPHY). The sea must be regarded as the great regulator of temperature and climate over the globe, and as thus exerting a profound influence on the distribution of plant and animal life. Its distinctly geological work is partly erosive and partly reproductive. As an eroding agent it must to some extent effect chemical decompositions in the rocks and sediments over which it spreads; but these changes have not yet been satisfactorily studied. Undoubtedly, its chief destructive power is of a mechanical kind, and arises from the action of its waves in beating upon shore-cliffs. By the alternate compression and expansion of the air in crevices of the rock which heavy breakers fall, and by the hydraulic pressure which these masses of sea-water exert on the walls of the fissures into which they rush, large masses of rock are loosened and detached, and caves and tunnels are drilled along the face of sea-cliffs. Pebbles and other sediment, which by the blows of the loose shingle, which, caught up and hurled forward by the waves, falls with great force upon the shore rocks, battering them as with a kind of artillery until they are worn away. The smooth surfaces of the rocks within the tide-mark, the waterworn with their angular forms above that limit bear witness to the amount of waste, while the rounded forms of the boulders and shingle show that they too are being continually reduced in size. Thus the sea, by its erosion on the coasts, produces much sediment, which is swept away by its waves and currents and strewn over its floor. Besides this material, it is constantly receiving the fine silt and sand carried down by rivers. As the floor of the ocean is thus the final receptacle for the waste of the land, it becomes the great area on the surface of the globe for the accumulation of new stratified formations. And such has been one of its great functions since the beginning of geological time, as is proved by the rocks that form the visible part of the earth's crust, and consist in great part of marine deposits. Chemical precipitates take place more especially in enclosed parts of the sea, where concentration of the water by evaporation can take place, and where layers of sodium chloride, calcium sulphate and carbonate, and other salts are laid down. But the chief marine accumulations are of detrital origin. Near the land and for a variable distance extending sometimes to 200 or 300 m. from shore the deposits consist chiefly of sediments derived from the waste of the land, the finer silts being transported farthest from their source. At greater depths and distances the ocean floor receives a slow deposit of exceedingly fine clay, which is believed to be derived from the decomposition of pumice and volcanic dust from insular or submarine volcanoes. Wide tracts of the bottom are covered with various forms of ooze derived from the accumulation of the remains of minute organisms.

(C) *Life.*

Among the agents by which geological changes are carried on upon the surface of the globe living organisms must be enumerated. Both plants and animals co-operate with the inorganic agents in promoting the degradation of the land. In some cases, on the other hand, they protect rocks from destruction. They, which, by the accretion of their remains, they give rise to extensive formations both upon the land and in the sea. Their operations may hence be described as alike destructive, conservative and reproductive. Under this heading also the influence of Man as a geological agent deserves notice.

(*a*) *Plants.*—Vegetation promotes the disintegration of rocks and soil in the following ways: (1) By keeping the surfaces of stone moist, and thus promoting both mechanical and chemical dissolution, as is notably shown by liverworts, mosses and other moisture-loving plants. (2) By producing through their decay carbonic and

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other acids, which, together with decaying organic matter taken up by passing moisture, become potent in effecting the chemical decomposition of rocks and in promoting the disintegration of soils. (3) By inserting their roots or branches between joints of rock, which are thereby loosened, so that large slices may be eventually wedged off. (4) By attracting rain, as thick woods, forests and peat-bogs often do, and thus accelerating the general waste of a country by running water. (5) By promoting the decay of diseased and dead plants and animals, as when fungi overspread a damp rotting tree or the carcase of a dead animal.

That plants also exert a conservative influence on the surface of the land is shown in various ways. (1) The formation of a stratum of turf protects the soil and rocks underneath from being rapidly disintegrated and washed away by atmospheric agents. (2) Many plants, even without forming a layer of turf, serve by their roots or branches to protect the loose sand or soil on which they grow from being removed by wind. The common sand-carex and other arenaceous plants bind the loose sand-dunes of our coasts, and give them a permanence, which would at once be destroyed were the sand laid bare again to storms. The growth of shrubs and brushwood along the course of a stream not only keeps the alluvial banks from being so easily undermined and removed as would otherwise be the case, but serves to arrest the sediment in floods, filtering the water and thereby adding to the height of the flood plain. (3) Some marine plants, like the calcareous nullipores, afford protection to shore rocks by covering them with a hard incrustation. The tangle and smaller Fuci which grow abundantly on the littoral zone break the force of the waves or diminish the effects of ground swell. (4) Forests and brushwood protect the soil, especially on slopes, from being washed away by rain or loosened up by avalanches.

Plants contribute by the aggregation of their remains to the formation of stratified deposits. Some marine algae which secrete carbonate of lime not only encrust rocks but give rise to sheets of submarine limestone. An analogous part is played in fresh-water lakes by various lime-secreting plants, such as *Chara*. Long-continued growth of vegetation has, in some regions, produced thick accumulations of a dark loam, as in the black cotton soil (*regur*) of India, and the black earth (*chernozem*) of Russia. Peat-mosses are formed in temperate and arctic climates by the growth of marsh-loving plants, sometimes to a thickness of 40 or 50 ft. In tropical regions the mangrove swamps on low moist shores form a dense jungle, sometimes 20 m. broad, which protects these shores from the sea until, by the arrest of sediment and the constant contribution of decayed vegetation, the spongy ground is at last turned into firm soil. Some plants (diatoms) can abstract silica and build it into their framework, so that they form in siliceous mud or in siliceous ooze which covers spaces of the deep sea-floor estimated at more than ten millions of square miles in extent.

(b) *Animals.*—These exert a destructive influence in the following ways: (1) By seriously altering the composition and arrangement of the vegetable soil. Worms bring up the lower portions of the soil to the surface, and while thus promoting its fertility increase its liability to be washed away by rain. Burrowing animals, by throwing up the soil and subsoil, expose these to be carried off or blown away by the wind. At the same time their subterranean passages serve to drain off the superficial water and to injure the stability of the surface of the ground above them. In Britain the mole and rabbit are familiar examples. By interfering with the course of streams, by ing the flow of streams. Thus beaver-dams check the current of water-courses, intercept floating materials, and sometimes turn streams into new channels. The embankments of the Mississippi are sometimes weakened to such a degree by the burrowings of the crayfish as to give way and allow the river to inundate the surrounding country. Similar results have happened in Europe from subterranean operations of rats. (3) Some molluscs bore into stone or wood and by the number of contiguous perforations greatly weaken the material. (4) Many animals exercise a ruinously destructive influence upon vegetation. Of the numerous plagues of this kind the locust, phylloxera and Colorado beetle may be cited.

The most important geological function performed by animals is the formation of new deposits out of their remains. It is chiefly by the lower grades of the animal kingdom that this work is accomplished, especially by molluscs, corals and foraminifera. Shell-banks are formed abundantly in such comparatively shallow and enclosed basins as that of the North Sea, and on a much more extensive scale on the floor of the West Indian seas. By the coral polyps thick masses of limestones have been built up in the warmer seas of the globe (see CORAL REEFS). The floor of the Atlantic and other oceans is covered with a fine calcareous ooze derived mainly from the remains of foraminifera, while in other regions the bottom shows a siliceous ooze formed almost entirely of radiolaria. Vertebrate animals give rise to phosphatic deposits formed sometimes of their excrement, as in guano and coprolites, sometimes of an accumulation of their bones.

(c) *Man.*—No survey of the geological workings of plant and animal life upon the surface of the globe can be complete which does not take account of the influence of man—an influence of enormous and increasing consequence in physical geography, for man has introduced, as it were, an element of antagonism to nature. His interference shows itself in his relations to climate, where he has affected the meteorological conditions of different countries: (1) By removing forests, and laying bare to the sun and winds areas which were previously kept cool and damp under trees, or which, lying on the ice side, were protected from tempests. It is supposed that the wholesale destruction of the woodlands formerly existing in countries bordering the Mediterranean has been in part the cause of the present desiccation of these districts. (2) By drainage, whereby the discharged rainfall is rapidly removed, and the evaporation is lessened, with a consequent diminution of rainfall and some increase in the general temperature of a district. (3) By the other processes of agriculture, such as the transformation of moor and bog into cultivated land, and the clothing of bare hillsides with green crops or plantations of coniferous and hardwood trees.

Still more obvious are the results of human interference with the flow of water: (1) By increasing or diminishing the rainfall man directly affects the volume of rivers. (2) By his drainage operations he makes the rain to run off more rapidly than before, and thereby increases the magnitude of floods and of the destruction caused by them. (3) By wells, bores, mines, or other subterranean works he interferes with the underground waters, and consequently with the discharge of springs. (4) By embanking rivers he confines them to narrow channels, sometimes increasing their scour, and enabling them to carry their sediment further seaward, sometimes causing them to deposit it over the plains and raise their level. (5) By his engineering operations for water-supply he abstracts water from its natural basins and depletes the streams.

In many ways man alters the aspect of a country: (1) By changing forest into bare mountain, or clothing bare mountains with forest. (2) By promoting the growth or causing the removal of peat-mosses. (3) By ruthlessly uncovering subterranean rocks, and thereby set in motion a process of destruction which may convert hundreds of acres of fertile land into waste sand, or by prudently planting the dunes with sand-loving vegetation and thus arresting their landward progress. (4) By so guiding the course of rivers as to make them aid him in reclaiming waste land, and bringing it under cultivation. (5) By piers and bulwarks, whereby the ravages of the sea are stayed, or by the thoughtless removal from the beach of stones which the waves had themselves piled up, and which would have served for a time to protect the land. (6) By forming new deposits either designedly or incidentally. The roads, bridges, canals, railways, tunnels, villages and towns with which man has covered the surface of the land will in many cases form a permanent record of his presence. Under his hand the whole surface of civilized countries is very slowly covered with a stratum, either formed wholly by him or due in great measure to his operations and containing many relics of his power. The soil of ancient towns has been increased to a depth of many feet by their successive destructions and renovations.

Perhaps the most subtle of human influences are to be seen in the distribution of plant and animal life upon the globe. Some of man's doings in this domain are indeed plain enough, such as the extirpation of wild animals, the diminution or destruction of some forms of vegetation, the introduction of plants and animals useful to himself, and especially the enormous predominance given by him to the cereals and to the spread of sheep and cattle. But no such extensive disturbance of the normal conditions of the distribution of life can take place without carrying with it many secondary effects, and setting in motion a wide cycle of change and reaction in the animal and vegetable kindgoms. For example, the incessant warfare waged by man against birds and beasts of prey in districts given up to the chase leads sometimes to unforeseen results. The weak game is allowed to live, which would otherwise be killed off and give more room for the healthy remainder. Other animals which feed perhaps on the same materials as the game are by the same cause permitted to live unchecked, and thereby to act as a further hindrance to the spread of the protected species. But the indirect results of man's interference with the régime of plants and animals still require much prolonged observation.

PART V.—GEOTECTONIC OR STRUCTURAL GEOLOGY

From a study of the nature and composition of minerals and rocks, and an investigation of the different agencies by which they are formed and modified, the geologist proceeds to inquire how these materials have been put together so as to build up the visible part of the earth's crust. He soon ascertains that they have not been thrown together wholly at random, but that they show a recognizable order of arrangement. Some of them, especially those of most recent growth, remain in their original condition and position, but, in proportion to their antiquity, they generally present increasing alteration, until it may no longer be possible to tell what was their pristine state. As by far the largest accessible portion of the terrestrial crust consists of stratified rocks, and as these furnish clear evidence of most of the modifications to which they have been subjected in the long course of geological history, it is convenient to take them into

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consideration first. They possess a number of structures which belong to the original conditions in which they were accumulated. They present in addition other structures which have been superinduced upon them, and which they share with the unstratified or igneous rocks.

1. ORIGINAL STRUCTURES

(a) Stratified Rocks.—This extensive and important series is above all distinguished by possessing a prevailing stratified arrangement. Their materials have been laid down in laminae, layers and strata, or beds, pointing generally to the intermittent deposition of the sediments of which they consist. As this stratification was, as a rule, originally nearly or quite horizontal, it serves as a base from which to measure any subsequent disturbance which the rocks have undergone. The occurrence of false-bedding, *i.e.* bands of inclined layers between the normal planes of stratification, does not form any real exception; but indicates the action of shifting currents whereby the sediment was transported and thrown down. Other important records of the original conditions of deposit are supplied by ripple-marks, sun-cracks, rain-prints and concretions.

From the nature of the material further light is cast on the geographical conditions in which the strata were accumulated. Thus, conglomerates indicate the proximity of old shore-lines, sandstones mark deposits in comparatively shallow water, clays and shales point to the tranquil accumulation of fine silt at a greater depth and further from land, while fossiliferous limestones bear witness to clearer water in which organisms flourished at some distance from deposits of sand and mud. Again, the alternation of different kinds of sediment suggests a variability in the conditions of deposition, such as a shifting of the sediment-bearing currents and of the areas of muddy and clear water. A thick group of conformable strata, that is, a series of deposits which show no discordance in their stratification, may usually be regarded as having been laid down on a sea-floor that was gently sinking. Here and there evidence is obtainable of the limits or of the progress of the subsidence by what is called "overlap." Of the absolute length of time represented by any strata or groups of strata no satisfactory estimates can yet be formed. Certain general conclusions may indeed be drawn, and comparisons may be made between different series of rocks. Sandstones full of false-bedding were probably accumulated more rapidly than finely-laminated shales or clays. It is not uncommon in certain Carboniferous formations to find coniferous and other trunks embedded in sandstone. Some of these trees seem to have been carried along and to have sunk, their heavier or root end touching the bottom and their upper end slanting upward in the direction of the current, exactly as in the case of the snags of the Mississippi. In other cases the trees have been submerged while still in their positions of growth. The continuous deposit of sand at last rose above the level of the trunks and buried them. Either from the fact that the rate of deposit must have been sometimes sufficiently rapid to allow sand to accumulate to a depth of 30 ft. or more before the decay of the wood. Modern instances are known where, under certain circumstances, submerged trees may last for some centuries, but even the most durable must decay in what, after all, is a brief space of geological time. Since continuous layers of the same kind of deposit suggest a persistence of geological conditions, while numerous alternations of different kinds of sedimentary matter point to vicissitudes or alternations of conditions, it may be supposed that the time represented by a given thickness of similar strata was less than that shown by the same thickness of dissimilar strata, because the changes needed to bring new varieties of sediment into the area of deposit would usually require the lapse of some time for their completion. But this conclusion may often be erroneous. It will be best supported when, from the very nature of the rocks, wide variations in the character of the water-bottom can be established. Thus a group of shales followed by a fossiliferous limestone would almost always mark the lapse of a much longer period than an equal depth of sandy strata. A thick mass of limestone, made up of organic remains which lived and died upon the spot, and whose remains are crowded together generation about generation, must have demanded many years or centuries for its formation.

But in all speculations of this kind we must bear in mind that the length of time represented by a given depth of strata is not to be estimated merely from their thickness or lithological character. The interval between the deposit of two successive laminae of shale may have been as long as, or even longer than, that required for the formation of one of the laminae. In like manner the interval needed for the transition from one stratum or kind of strata to another may often have been more than equal to the time required for the formation of the strata on either side. But the relative chronological importance of the bars or lines in the geological record can seldom be satisfactorily discussed merely on lithological grounds. This must mainly be decided on the evidence of organic remains, as shown in Part VI., where the grouping of the stratified rocks into formations and systems is described.

(b) Igneous Rocks.—As part of the earth's crust these rocks present characters by which they are strongly differentiated from the stratified series. While the broad petrographical distinctions of their several varieties remain persistent, they present sufficient local variations of type to point to the existence of what have been called petrographic provinces, in each of which the eruptive masses are connected by a general family relationship, differing more or less from that of a neighbouring province. In each region presenting a long chronological series of eruptive rocks a petrographical sequence can be traced, which is observed to be not absolutely the same everywhere, though its general features may be persistent. The earliest manifestations of eruptive material in any district appear to have been most frequently of an intermediate type between acid and basic, passing thence into a thoroughly acid series and concluding with an effusion of basic material.

Considered as part of the architecture of the crust of the earth, igneous rocks are conveniently divisible into two great series: (1) those bodies of material which have been injected into the crust and have solidified there, and (2) those which have reached the surface and have been ejected there, either in a molten state as lava or in a fragmental form as dust, ashes and scoriae. The first of these divisions represents the plutonic, intrusive or subsequent phase of eruptivity; the second marks the volcanic, interstratified or contemporaneous phase.

1. The plutonic or intrusive rocks, which have been forced into the crust and have consolidated there, present a wide range of texture from the most coarse-grained granites to the most perfect natural glass. Seeing that they have usually cooled with extreme slowness underground, they are as a general rule more largely crystalline than the volcanic series. The form assumed by each individual body of intrusive material has depended upon the shape of the space into which it has been injected, and where it has cooled and become solid. This shape has been determined by the local structure of the earth's crust on the one hand and by the energy of the eruptive force on the other. It offers a convenient basis for the classification of the intrusive rocks, which, as part of the framework of the crust, may thus be grouped according to the shape of the cavity which received them, as bosses, sills, dikes and necks.

Bosses, or stocks, are the largest and most shapeless extravasations of erupted material. They include the great bodies of granite which, in most countries of the world have risen for many miles through the stratified formations and have altered the rocks around them by contact-metamorphism. Sills, or intrusive sheets, are bed-like masses which have been thrust between the planes of sedimentary or even of igneous rocks. The term laccolite has been applied to sills which are connected with boss-like intrusive mass differentiable from true contemporaneously intercalated lavas by not keeping always to the same platform, but breaking across and altering the contiguous strata, and by the closeness of the texture where they come in contact with the contiguous rocks, which, being cold, chilled the molten material and caused it to consolidate on its outer margins more rapidly than in its interior. Dikes or veins are vertical walls or ramifying branches of intrusive material which has consolidated in fissures or irregular clefts of the crust. Necks are volcanic chimneys which have been filled up with erupted material, and have now been exposed at the surface after prolonged denudation has removed not only the superficial volcanic masses originally associated with them, but also more or less of the upper part of the vents. Plutonic rocks do not present evidence of their precise geological age. All that can be certainly affirmed from them is that they must be younger than the rocks into which they have been intruded. From their internal structure, however, and from the evidence of the rocks associated with them, some more or less definite conjectures may be made as to the limits of time within which they were probably injected.

2. The interstratified or volcanic series is of special importance in geology, inasmuch as it contains the records of volcanic action during the past history of the globe. It was pointed out in Part I. that while towards the end of the 18th and at the beginning of the 19th century much attention was paid by Hutton and his followers to the proofs of intrusion afforded by what they called the "unerupted lavas" within the earth's crust, these observers lost sight of the possibility that some of these rocks might have been erupted at the surface, and might thus be chronicles of volcanic action in former geological periods. It is not always possible to satisfactorily discriminate between the two types of contemporaneously intercalated and subsequently injected material. But rocks of the former type have not broken into or involved the overlying strata, and they are usually marked by the characteristic structures of superficial lavas and by their association with volcanic tuffs. By

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means of the evidence which they supply, it has been ascertained that volcanic action has been manifested in the globe since the earliest geological periods. In the British Isles, for example, the volcanic record is remarkably full for the long series of ages from Cambrian to Permian time, and again for the older Tertiary period.

2. SUBSEQUENTLY INDUCED STRUCTURES

After their accumulation, whether as stratified or eruptive masses, all kinds of rocks have been subject to various changes, and have acquired in consequence a variety of superinduced structures. It has been pointed out in the part of this article dealing with dynamical geology that one of the most important forms of energy in the evolution of geological processes is to be found in the movements that take place within the crust of the earth. Some of these movements are so slight as to be only recognizable by means of delicate instruments; but from this inferior limit they range up to gigantic convulsions by which mountain-chains are upheaved. The crust must be regarded as in a perpetual state of strain, and its component materials are therefore subject to all the effects which flow from that condition. It is the one great object of the geotectonic division of geology to study the structures which have been developed in consequence of earth-movements, and to discover from this investigation the nature of the processes whereby the rocks of the crust have been brought into the condition and the positions in which we now find them. The details of this subject will be found in separate articles descriptive of each of the technical terms applied to the several kinds of superinduced structures. All that need be offered here is a general outline connecting the several portions of the subject together.

One of the most universal of these later structures is to be seen in the divisional planes, usually vertical or highly inclined, by which rocks are split into quadrangular or irregularly shaped blocks. To these planes the name of joints has been given. They are of prime importance from an industrial point of view, seeing that the art of quarrying consists mainly in detecting and making proper use of them. Their abundance in all kinds of rocks, from those of recent date up to those of the highest antiquity, affords a remarkable testimony to the strains which the terrestrial crust has suffered. They have arisen sometimes from tension, such as that caused by contraction from the drying and consolidation of an aqueous sediment or from the cooling of a molten mass; sometimes from torsion during movements of the crust.

Although the stratified rocks were originally deposited in a more or less nearly horizontal position on the floor of the sea, where now visible on the dry land they are seldom found to have retained their flatness. On the contrary, they are seen to have been generally tilted up at various angles, sometimes even placed on end (crop, dip, strike). When a sufficiently large area of ground is examined, the inclination into which the strata have been thrown may be observed not to continue far in the same direction, but to turn over to the opposite or another quarter. It can then be seen that in reality the rocks have been thrown into undulations. From the lowest and flattest arches where the departure from horizontality may be only trifling, every step may be followed up to intense curvature, where the strata have been compressed and plicated as if they had been piles of soft carpets (anticline, synchne, monocline, geo-anticline, geo-syncline, isoclinal, plication, curvature, qua-quaversal). It has further happened abundantly all over the surface of the globe that relief from internal strain in the crust has been obtained by fracture, and the consequent subsidence or elevation of one or both sides of the fissure. The differential movement between the two sides may be scarcely perceptible in the feeblest dislocation, but in the extreme cases it may amount to many thousand feet (fault, fissure, dislocation, fault, slickensides). The great faults in a country are among its most important structural features, and as they not infrequently continue to be lines of weakness in the crust along which sudden slipping may from time to time take place, they become the lines of origin of earthquakes. The San Francisco earthquake of 1906, already cited, affords a memorable illustration of this connexion.

It is in a great mountain-chain that the extraordinary complication of plicated and faulted structures in the crust of the earth can be most impressively beheld. The combination of overturned folds with rupture has been already referred to as a characteristic feature in the Alps (Part IV.). The gigantic folds have in many places been pushed over each other so as to lie almost flat, while the upper limb has not infrequently been driven for many miles beyond the lower by a rupture along the axis. In this way successive slices of a thick series of formations have been carried northwards on the northern slope of the Alps, and have been piled so abnormally above each other that some of their oldest members recur several times on different thrust-planes, the whole being underlain by Tertiary strata (see ALPS). Further proof of the colossal compression to which the rocks have been subjected is afforded by their intense crumpling and corrugation, and by the abundantly faulted and crushed condition to which they have been reduced. Similar evidence as to stresses in the terrestrial crust and the important changes which they produce among the rocks may also be obtained on a smaller scale in many non-mountainous countries.

Another marked result of the compression of the terrestrial crust has been induced in some rocks by the production of the fissile structure which is typically shown in roofing-slate (cleavage). Closely connected with this internal rearrangement has been the development of microscopic microlites or crystals (rutile, mica, &c.) in argillaceous slates which were undoubtedly originally fine marine mud and silt. From this incipient form of metamorphism successive stages may be traced through the various kinds of argillite and phyllite into mica-schist, and thence into more crystalline gneissoid varieties (foliation, slate, mica-schist, gneiss). The Alps afford excellent illustrations of these transformations.

The fissures produced in the crust are sometimes clean, sharply defined divisional planes, like cracks across a pane of glass. Much more usually, however, the rocks on either side have been broken up by the friction of movement, and the fault is marked by a variable breadth of this broken material. Sometimes the walls have separated and molten rock has risen from below and solidified between them as a dike. Occasionally the fissures have opened to the surface, and have been filled in from above with detritus, as in the sandstone-dikes of Colorado and California. In mineral districts the fissures have been filled with various spars and ores, forming what are known as mineral veins.

Where one series of rocks is covered by another without any break or discordance in the stratification they are said to be conformable. But where the older series has been tilted up or visibly denuded before being overlain by the younger, the latter is termed unconformable. This relation is one of the greatest value in structural geology, for it marks a gap in the geological record, which may represent a vast lapse of time not there recorded by strata.

PART VI.—PALAEONTOLOGICAL GEOLOGY

This division of the science deals with fossils, or the traces of plants and animals preserved in the rocks of the earth's crust, and endeavours to gather from them information as to the history of the globe and its inhabitants. The term "fossil" (Lat. *fossilis*, from *fodere*, to dig up), meaning literally anything "dug up," was formerly applied indiscriminately to any mineral substance taken out of the earth's crust, whether organized or not. Since the time of Lamarck, however, the meaning of the word has been restricted, so as to include only the remains or traces of plants and animals preserved in any natural formation whether hard rock or superficial deposit. It includes not merely the petrified structures of organisms, but whatever was directly connected with or produced by these organisms. Thus the resin which was exuded from trees of long-perished forests is as much a fossil as any portion of the stem, leaves, flowers or fruit, and in some respects is even more valuable to the geologist than more determinable remains of its parent trees, because it has often preserved in admirable perfection the insects which flitted about in the woodlands. The burrows and trails of a worm preserved in sandstone and shale claim recognition as fossils, and indeed are commonly the only indications to be met with of the existence of annelid life among old geological formations. The droppings of fishes and reptiles, called coprolites, are excellent fossils, and tell their tale as to the presence and food of vertebrate life in ancient waters. The little agglutinated cases of the caddis-worm remain as fossils in formations from which, perchance, most other traces of life may have passed away. Nay, the very handiwork of man, when preserved in any natural manner, is entitled to rank among fossils; as where his flint-implements have been dropped into the prehistoric gravels of river-valleys or where his canoes have been buried in the silt of lake-bottoms.

A study of the land-surfaces and sea-floors of the present time shows that there are so many chances against the conservation of the remains of either terrestrial or marine animals and plants that if, as is probable, the same conditions existed in former geological periods, we should regard the occurrence of organic remains among the stratified formations of the earth's crust as generally the result of various fortunate accidents.

Let us consider, in the first place, the chances for the preservation of remains of the present fauna and flora of a country. The surface of the land may be densely clothed with forest and abundantly peopled with animal life. But the trees die and moulder into soil.

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The animals, too, disappear, generation after generation, and leave few or no perceptible traces of their existence. If we were not aware from authentic records that central and northern Europe were covered with vast forests at the beginning of our era, how could we know this fact? What has become of the herds of wild oxen, the bears, wolves and other denizens of primeval Europe? How could we prove from the examination of the surface soil of any country that those creatures had once abounded there? The conditions for the preservation of any relics of the plant and animal life of a terrestrial surface must obviously be always exceptional. They are supplied only where the organic remains can be protected from the air and superficial decay. Such cases may be observed in (1) the deposits on the floors of lakes; (2) in peat-mosses; (3) in deltas at river-mouths; and (4) under the stalagmite of caverns in limestone districts. But in these and other favourable places a mere infinitesimal fraction of the fauna or flora of a land-surface is likely to be entombed or preserved.

In the second place, although in the sea the conditions for the preservation of organic remains are in many respects more favourable than on land, they are apt to be frustrated by many adverse circumstances. While the level of the land remains stationary, there can be but little effective entombment of marine organisms in littoral deposits; for only a limited accumulation of sediment will be formed until subsidence of the sea-floor takes place. In the drifting beds of sand or gravel thrown up on a stationary shore, only the harder and more durable forms of life, such as gastropods and lamellibranchs, which can withstand the triturating effects of the beach waves, are likely to remain unefaced.

Below tide-marks, along the margin of the land where sediment is gradually deposited, the conditions are more favourable for the preservation of marine organisms. In the sheets of sand and mud there laid down the harder parts of many forms of life may be entombed and protected from decay. But only a small proportion of the total marine fauna may be expected to appear in such deposits. At the best, merely littoral and shallow-water forms will occur, and, even under the most favourable circumstances, they will represent only a fraction of the whole assemblage of life in these juxta-terrestrial parts of the ocean. As we recede from the land the rate of deposition of sediment on the sea-floor must become feebler, until, in the remote central abysses, it reaches a hardly appreciable minimum. Except in these, therefore, where some kind of ooze or other deposit is accumulating in these more pelagic regions, the conditions must be on the whole unfavourable for the preservation of any adequate representation of the deep-sea fauna. Hard durable objects, such as the teeth and bones, may slowly accumulate, and be protected by a coating of peroxide of manganese, or of some of the silicates now forming here and there over the deep-sea bottom; or the rate of growth of the abyssal deposit may be so tardy that most of the remains of at least the larger animals will disappear, owing to decay, before they can be covered up and preserved. Any such deep-sea formation, if raised into land, would supply but a meagre picture of the whole life of the sea.

It would thus appear that the portion of the sea-floor best suited for receiving and preserving the most varied assemblage of marine organic remains is the area in front of the land, to which rivers and currents bring continual supplies of sediment. The most favourable conditions for the accumulation of a thick mass of marine fossiliferous strata will arise when the area of deposit is undergoing a gradual subsidence. If the rate of depression and that of deposit were equal, or nearly so, the movement might proceed for a vast period without producing any great apparent change in marine geography, and even without seriously affecting the distribution of life over the sea-floor within the area of subsidence. Hundreds or thousands of feet of sedimentary strata might in this way be heaped up round the old continents, containing a fragmentary series of organic remains belonging to those forms of comparatively shallow-water life which had hard parts capable of preservation. There can be little doubt that such has, in fact, been the history of the greater part of stratified formations in the earth's crust. By far the largest proportion of these piles of marine strata has unquestionably been laid down in water of no great depth within the area of deposit of terrestrial sediment. The enormous thickness to which they attain seems only explicable by prolonged and repeated movements of subsidence, interrupted, however, as we know, by other movements of a contrary kind.

Since the conditions for the preservation of organic remains exist more favourably under the sea than on land, marine organisms must be far more abundantly conserved than those of the land. This is true to-day, and has, as far as known, been true in all past geological time. Hence for the purposes of the geologist the fossil remains of marine forms of life far surpass all others in value. Among these there will necessarily be a gradation of importance, regulated chiefly by their relative abundance. Now, of all the marine tribes which live within the juxta-terrestrial belt of sedimentation, unquestionably the Mollusca stand in the place of pre-eminence as regards their aptitude for becoming fossils. They almost all possess a hard, durable shell, capable of resisting considerable abrasion and readily passing into a mineralized condition. They are extremely abundant both as to individuals and genera. They occur on the shore within tide mark, and range thence down into the abysses. Moreover, they appear to have possessed these qualifications from early geological times. In the marine Mollusca, therefore, we have a common ground of comparison between the stratified formations of different periods. They have been styled the alphabet of palaeontological inquiry.

There are two main purposes to which fossils may be put in geological research: (1) to throw light upon former conditions of physical geography, such as the presence of land, rivers, lakes and seas, in places where they do not now exist, changes of climate, and the former distribution of plants and animals; and (2) to furnish a guide in geological chronology whereby rocks may be classified according to relative date, and the facts of geological history may be arranged and interpreted as a connected record of the earth's progress.

1. As examples of the first of these two directions of inquiry reference may be made to (*a*) former land-surfaces revealed by the occurrence of layers of soil with tree-stumps and roots still in the position of growth (see PEBBLE-BED); (*b*) ancient lakes proved by beds of marl or limestone full of lacustrine shells; (*c*) old sea-bottoms marked by the occurrence of marine organisms; (*d*) variations in the quality of the water, such as freshness or saltness, indicated by changes in the size and shape of the fossils; (*e*) proximity to former land, suggested by the occurrence of abundant drift-wood in the strata; (*f*) former conditions of climate, different from the present, as evidenced by such organisms as tropical types of plants and animals intercalated among the strata of temperate or northern countries.

2. In applying fossils to the determination of geological chronology it is first necessary to ascertain the order of superposition of the rocks. Obviously, in a continuous series of undisturbed sedimentary deposits the lowest must necessarily be the oldest, and the rocks or animals which they contain must have lived and died before any of the organisms that occur in the overlying strata. This order of superposition having been settled in a series of formations, it is upon the evidence of the fossils at the base that we must quite the whole at the top of the series. Tracing the beds upward, we discover that species after species of the lowest platforms disappears, until perhaps not one of them is found. With the cessation of these older species there appear their entrance. Except in the case of a fault or dyke out, and to be replaced by newer forms. After patient examination of the rocks, it has been ascertained that every well-marked "formation," or group of strata, is characterized by its own species or types, or by a general assemblage, or *facies*, of organic forms. Such a generalization can only, of course, be determined by actual practical experience over an area of some size. When the typical fossils of a formation are known, they serve to identify that formation in its progress across a country. Thus, in cases where the true order of superposition cannot be determined, owing to the want of sections or to the disturbed condition of the rocks, fossils serve as a means of identification and furnish a guide to the succession of the rocks. They even demonstrate that in some mountain ground the beds have been turned completely upside down, where it can be shown that the fossils in what are now the uppermost strata ought properly to lie underneath those in the beds below them.

It is by their characteristic fossils that the stratified rocks of the earth's crust can be most satisfactorily subdivided into convenient groups of strata and classed in chronological order. Each "formation" is distinguished by its own peculiar assemblage of organic remains, by means of which it can be followed and recognized, even amid the crumplings and dislocations of a disturbed region. The same general succession of organic types can be observed over a large part of the world, though, of course, with important modifications in different countries. This similarity of succession has been termed *homotaxis*, a term which expresses the fact that the order in which the leading types of organized existence have appeared upon the earth's surface has been similar even in widely separated regions. It is evident that, in this way, a reliable method of comparison is furnished, whereby the stratified formations of different parts of the earth's crust can be brought into relation with each other. Had the geologist continued his researches in this direction, however, hampered by the limitations imposed by a reliance on mere lithological characters, he would have made little or no progress in deciphering the record of the successive phases of the history of the globe as chronicled in the crust. Just as, at the present time, sheets of gravel in one place are contemporaneous with sheets of mud at another, so in the past all kinds of sedimentation have been in progress simultaneously, and those of one period may not be distinguishable in themselves from those of another. Little or no reliance can be placed upon lithological resemblances or differences in comparing the sedimentary formations of different countries.

In making use of fossil evidence for the purpose of subdividing the stratified rocks of the earth's crust, it is found to be applicable to the smaller details of stratigraphy as well as to the definition of large groups of strata. Thus a particular stratum may be marked by the occurrence in it of various fossils, one or more of which may be distinctive, either from occurring in no other bed above and below or from special abundance in that stratum. One or more of these species is therefore used as a guide to the occurrence of the bed

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in question, which is called by the name of the most abundant species. In this way what is called a "geological horizon," or "zone," is marked off, and its exact position in the series of formations is fixed.

Perhaps the most distinctive feature in the progress of palaeontological geology during the last half century has been the recognition and wide application of this method of zonal stratigraphy, which, in itself, was only a further development of William Smith's famous idea, "Strata identified by organized fossils." It was first carried out in detail by various palaeontologists in reference to the Jurassic formations, notably by F. A. von Quenstedt and C. A. Oppel in Germany and A. D. d'Orbigny in France. The publication of Oppel's classic work *Die Juraformation England, Frankreichs und des südwestlichen Deutschlands* (1856–1858) marked an epoch in the development of stratigraphical geology. Combining what had been done by various observers with his own laborious researches in France, England, Württemberg, and Bavaria, he drew up a fine classification of the Jurassic system, grouping its several formations into zones each characterized by some distinctly predominant fossil after which it was named (see LIAS). The same method of classification was afterwards extended to the Cretaceous series by A. D. d'Orbigny, E. Hébert and others, until the whole Mesozoic rocks from the Trias to the top of the Chalk has now been partitioned into zones, each named after some characteristic species or genus of fossils. More recently the principle has been extended to the Palaeozoic formations, though as yet less fully than to the younger parts of the geological record. It has been successfully applied by Professor C. Lapworth to the investigation of the Silurian series (see SILURIAN; ORDOVICIAN SYSTEM). He found that the species of graptolites have each a comparatively narrow vertical range, and they may consequently be used for stratigraphical purposes. Applying the method, in the first instance, to the highly plicated Silurian rocks of the south of Scotland, he found by means of graptolites that he was able to work out the structure of the ground. Each great group of strata was seen to possess its own graptolitic zones, and by their means could be identified not only in the original complex Scottish area, but in England and Wales and in Ireland. It has also been ascertained that the succession of zones in Great Britain could be recognized on the Continent, in North America and even in Australia. The brachiopods and trilobites have likewise been made use of for zonal purposes among the oldest sedimentary formations. For most ancient of the Palaeozoic systems has as its fitting base the *Olenellus* zone.

Within undefined and no doubt variable geographical limits palaeontological zones have been found to be remarkably persistent. They follow each other in the same general order, but not always with equal definiteness. The type fossil may appear in some districts on a higher or a lower platform than it does in others. Only to a limited degree is there any coincidence between lithological variations in the strata and the sequence of the zones. In the Jurassic formations, indeed, where frequent alternations of different sedimentary materials are to be met with, it is in some cases possible to trace a definite upward or downward change from a zone limestone to shale change in the sedimentation, such as from limestone to shale. But such a precise demarcation is impossible where no distinct bands of different sediments are to be seen. The zones can then only be vaguely determined by finding their characteristic fossils at the horizon where these begin to appear in the strata and where they cease. It would seem, therefore, that the sequence of palaeontological zones, or life-horizons, has not depended merely upon changes in the nature of the conditions under which the organisms lived. We should naturally expect that these changes would have had a marked influence; that, for instance, a difference should be perceptible between the character of the fossils in a limestone and that of those in a shale or a sandstone. The environment, when a limestone was in course of deposition, would generally be one of clear water, favourable for a more vigorous and more varied fauna than where a shale series was accumulating, when the water would be discoloured, and only such animals would continue to live in it, or on the bottom, as could maintain themselves in the midst of mud. But no such lithological reason, betokening geographical changes that would affect living creatures, can be adduced as a universally applicable explanation of the occurrence and limits of the various zoological zones. One of these zones may be only a few inches, or feet or yards in vertical extent, and no obvious lithological or other cause can be seen why its specially characteristic fossils should not be found just as frequently in the similar strata that lie over and below. There is often little or no evidence of any serious change in the conditions of sedimentation, still less of any widespread physical disturbance, such as the catastrophes by which the older geologists explained the extinction of successive types of life.

It has been suggested that, where the life-zones are well defined, sedimentation has been extremely slow, and that though these zones follow each other with no break in the sedimentation, they were really separated by prolonged intervals of time during which organic evolution could come effectively into play. But it is not easy to explain how, for example in the Lower Lias, there could have been a succession of prodigious intervals, when practically no sediment was laid down, and yet that the strata should show no sign of contemporaneous disturbance or denudation, but succeed each other as if they had been accumulated by one continuous process of deposit. It must be admitted that the problem of life-zones in stratigraphical geology has not yet been solved.

As Darwin first cogently showed, the history of life has been very imperfectly registered in the stratified parts of the earth's crust. Apart from the fact that, even under the most favourable conditions, only a small proportion of the total flora and fauna of any period would be preserved in the fossil state, enormous gaps must there no record has survived at all. It is as if whole chapters and books were missing from a historical work. Some of these lacunae are sufficiently obvious. Thus, in some cases, powerful dislocations have thrown considerable portions of the rocks out of sight. Sometimes extensive metamorphism has so affected them that their original characters, including their organic contents, have been destroyed. Oftenest of all, denudation has come into play, and vast masses of fossiliferous rock have been carried away, as is demonstrated by the abundant unconformabilities in the structure of the earth's crust.

While the mere fact that one series of rocks lies unconformably on another proves the lapse of a considerable interval between their respective dates, the relative length of this interval may sometimes be proved by means of fossil evidence, and by this alone. Let us suppose, for example, that a certain group of formations has been disturbed, upraised, denuded and covered unconformably by a second group. In lithological characters the two may closely resemble each other, and there may be nothing to show that the gap represented by their unconformability is of an important character. In many districts, however, it would be quite impossible, except on any well-grounded judgment as to the amount of interval, even measured by the vague relative standards of geological chronology. But if each group contains a well-preserved suite of organic remains, it may not only be possible, but very easy, to say exactly how much of the geological record has been left out between the two sets of formations. By comparing the fossils with those obtained from regions where the geological record is more complete, it may be ascertained, perhaps, that the lower rocks belong to a certain division or stage in geological history which for our present purpose we may call D, and that the upper rocks can in like manner be paralleled with stage H. It would be then apparent that at this locality the chronicles of three great geological periods E, F, and G were wanting, which are elsewhere found to be intercalated between D and H. The lapse of time represented by this unconformability would thus be equivalent to that required for the accumulation of the three missing formations in those regions where sedimentation was more continuous.

Fossil evidence may be made to prove the existence of gaps which are not otherwise apparent. As has been already remarked, changes in organic forms must, on the whole, have been extremely slow in the geological past. The whole species of a sea-floor could not pass entirely away, and be replaced by other forms, without the lapse of long periods of time. If then among the conformable stratified formations of former ages we encounter sudden and abrupt changes in the facies of the fossils, we may safely assume certain that these must mark omissions in the record, which we may hope to fill in from a more perfect series elsewhere. The complete biological contrasts between the fossil contents of unconformable strata are sufficiently explicable. It is not so satisfactory a matter to account for those cases where, though the apparently undisturbed and continuous character of the original deposition of the strata, that the abrupt transition from the one *facies* of fossils to the other represents a long interval of time which has not been recorded by the deposit of strata. A. C. Ramsay, who called attention to these gaps, termed them "breaks in the succession of organic remains." He showed that they occur abundantly among the Palaeozoic and Secondary rocks of England. It is obvious, of course, that such breaks, though traceable over wide areas, were not general over the whole globe. There have never been any universal interruptions in the continuity of the chain of being, so far as geological evidence can show. But the physical changes which caused the breaks may have been practically over a provincial district or minor region. They no doubt often caused the complete extinction of genera and species which had a small geographical range.

From all these facts it is clear that the geological record, as it now exists, is at the best but an imperfect chronicle of geological history. In no country is it complete. The lacunae of one region must be supplied from another. Yet in proportion to the geographical distance between the localities where the gaps occur and those whence the missing intervals are supplied, the element of uncertainty in our reading of the record is increased. The most desirable method of research is to exhaust the evidence for each area or province, and to compare the general order of its successions as a whole with that which can be established for other provinces.

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Part VII.—Stratigraphical Geology

This branch of the science arranges the rocks of the earth's crust in the order of their appearance, and interprets the sequence of events of which they form the records. Its province is to cull from the other departments of geology the facts which may be needed to show what has been the progress of our planet, and of each continent and country, from the earliest times of which the rocks have preserved any memorial. Thus from mineralogy and petrography it contains information regarding the origin and subsequent mutations of minerals and rocks. From dynamical geology it learns by what agencies the materials of the earth's crust have been formed, altered, broken, upheaved and melted. From geotectonic geology it understands the various processes whereby these materials were put together so as to build up the complicated crust of the earth. From palaeontological geology it receives in well-determined fossil remains a clue by which to discriminate the different stratified formations, and to trace the grand onward march of organized existence upon this planet. Stratigraphical geology thus gathers up the sum of all that is made known by the other departments of the science, and makes it subservient to the interpretation of the geological history of the earth.

The leading principles of stratigraphy may be summed up as follows:

1. In every stratigraphical research the fundamental requisite is to establish the order of superposition of the strata. Until this is accomplished it is impossible to arrange the dates, and make out the sequence of geological history.

2. The stratified portion of the earth's crust, or what has been called the "geological record," can be subdivided into natural groups, or series of strata, characterized by distinctive organic remains and recognizable by these remains, in spite of great changes in lithological character from place to place. A bed, or a number of beds, linked together by containing one or more distinctive species or genera of fossils is termed a *zone* or *horizon*, and usually bears the name of one of its more characteristic fossils, as the *Planorbis*-zone of the Lower Lias, which is so called from the prevalence in it of the ammonite *Psiloceras planorbis*. Two or more such zones related to each other by the possession of a number of the same characteristic species or genera have been designated *beds* or an *assise*. Two or more sets of beds or assises similarly related form a *group* or *stage*; a number of groups or stages make a *series*, *formation* or *section*, and a succession of formations may be united into a *system*.

3. Some living species of plants and animals can be traced downwards through the more recent geological formations; but the number which can be so followed grows smaller as the examination is pursued into more ancient deposits. With their disappearance other species or genera present themselves which are no longer living. These in turn may be traced backward into earlier formations, till they too cease and their places are taken by yet older forms. It is thus shown that the stratified rocks contain the records of a gradual progression of organic forms. A species which has once died out does not seem ever to have reappeared.

4. When the order of succession of organic remains among the stratified rocks has been determined, they become an invaluable guide in the investigation of the relative age of rocks and the structure of the land. Each zone and formation, being characterized by its own species or genera, may be recognized by their means, and the true succession of strata may thus be confidently established even in a country wherein the rocks have been shattered by dislocation, folded, inverted or metamorphosed.

5. Though local differences exist in regard to the precise zone in which a given species of organism may make its first appearance, the general order of succession of the organic forms found in the rocks is never inverted. The record is nowhere complete in any region, but the portions represented, even though extremely imperfect, always follow each other in their proper chronological order, unless where disturbance of the crust has intervened to destroy the original sequence.

6. The relative chronological value of the divisions of the geological record is not to be measured by mere depth of strata. While it may be reasonably assumed that, in general, a great thickness of stratified rock must mark the passage of a long period of time, it cannot safely be affirmed that a much less thickness elsewhere must represent a correspondingly diminished period. The need for this caution may sometimes be made evident by an unconformability between two sets of rocks, as has already been explained. The total depth of both groups together may be, say 1000 ft. Elsewhere we may find a single unbroken formation reaching a depth of 10,000 ft.; but it would be unwarrantable to assume that the latter represents ten times the length of time indicated by the former two. So far from this being the case, it might not be difficult to show that the minor thickness of rock really denotes by far the longer geological interval. If, for instance, it could be proved that the upper part of both the sections lies on one and the same geological platform, but that the lower unconformable series in the one locality belongs to a far lower and older system of rocks than the base of the thick conformable series in the other, then it would be clear that the gap marked by the unconformability really indicates a longer period than the massive succession of deposits.

7. Fossil evidence furnishes the chief means of comparing the relative value of formations and groups of rock. A "break in the succession of organic remains," as already explained, marks an interval of time often unrepresented by strata at the place where the break is found. The relative importance of these breaks, and therefore, probably, the comparative intervals of time which they mark, may be estimated by the difference of the *facies* or general character of the fossils on each side. If, for example, in one case we find every species to be dissimilar above and below a certain horizon, while in another locality only half of the species on each side are peculiar, we naturally infer, if the total number of species seems large enough to warrant the inference, that the interval marked by the former break was much longer than that marked by the second. But we may go further and compare by means of fossil evidence the relation between breaks in the succession of organic remains and the depth of strata between them.

Three formations of fossiliferous strata, A, C, and H, may occur conformably above each other. By a comparison of the fossil contents of all parts of A, it may be ascertained that, while some species are peculiar to its lower, others to its higher portions, yet the majority extend throughout the formation. If now it is found that of the total number of species in the upper portion of A only one-third passes up into C, it may be inferred with some plausibility that the time represented by the break between A and C was really longer than that required for the accumulation of the whole of the formation A. It might even be possible to discover elsewhere a thick intermediate formation B filling up the gap between A and C. In like manner were it to be discovered that, while the whole of the formation C is characterized by a common suite of fossils, not one of the species and only one half of the genera pass up into H, the inference could hardly be resisted that the gap between the two formations marks the passage of a far longer interval than was needed for the deposition of the whole of C. And thus we reach the remarkable conclusion that, thick though the stratified formations of a country may be, in some cases they may not represent so long a total period of time as do the gaps in their succession,—in other words, that non-deposition was more frequent and prolonged than deposition, or that the intervals of time which have been recorded by strata have not been so long as those which have not been so recorded.

In all speculations of this nature, however, it is necessary to reason from as wide a basis of observation as possible, seeing that so much of the evidence is negative. Especially needful is it to bear in mind that the cessation of one or more species at a certain line among the rocks of a particular district may mean nothing more than that, onward from the time marked by that line, these species, owing to some change in the conditions of life, were compelled to migrate or became locally extinct or, from some alteration in the conditions of fossilization, were no longer imbedded and preserved as fossils. They may have continued to flourish abundantly in neighbouring districts for a long period afterward. Many examples of this obvious truth might be cited. Thus in a great succession of mingled marine, brackish-water and terrestrial strata, like that of the Carboniferous Limestone series of Scotland, corals, crinoids

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and brachiopods abound in the limestones and accompanying shales, but disappear as the sandstones, ironstones, clays, coals and bituminous shales supervene. An observer meeting for the first time with an instance of this disappearance, and remembering what he had read about breaks in succession, might be tempted to speculate about the extinction of these organisms, and their replacement by other and later forms of life, such as the ferns, lycopods, estuarine or fresh-water shells, ganoid fishes and other fossils so abundant in the overlying strata. But further research would show him that high above the plant-bearing sandstones and coals other limestones and shales might be observed, once more charged with the same marine fossils as before, and still farther overlying groups of sandstones, coals and carbonaceous beds followed by yet higher marine limestones. He would thus learn that the same organisms, after being locally exterminated, returned again and again to the same area. After such a lesson he would probably pause before too confidently asserting that the highest bed in which we can detect certain fossils marks their final appearance in the history of life. Some breaks in the succession may thus be extremely local, one set of organisms having been driven to a different part of the same region, while another set occupied their place until the first was enabled to return.

8. The geological record is at the best but an imperfect chronicle of the geological history of the earth. It abounds in gaps, some of which have been caused by the destruction of strata owing to metamorphism, denudation or otherwise, others by original non-deposition, as above explained. Nevertheless from this record alone can the progress of the earth be traced. It contains the registers of the appearance and disappearance of tribes of plants and animals which have from time to time flourished on the earth. Only a small proportion of the total number of species which have lived in past time have been thus chronicled, yet by collecting the broken fragments of the record an outline at least of the history of life upon the earth can be deciphered.

It cannot be too frequently stated, nor too prominently kept in view, that, although gaps occur in the succession of organic remains as recorded in the rocks, they do not warrant the conclusion that any such blank intervals ever interrupted the progress of plant and animal life upon the globe. There is every reason to believe that the march of life has been unbroken, onward and upward. Geological history, therefore, if its records in the stratified formations were perfect, ought to show a blending and gradation of epoch with epoch. But the progress has been constantly interrupted, now by upheaval, now by volcanic outbursts, now by depression. These interruptions serve as natural divisions in the chronicle, and enable the geologist to arrange his history into periods. As the order of succession among stratified rocks was first made out in Europe, and as many of the gaps in that succession were found to be widespread over the European area, the divisions which experience established for that portion of the globe came to be regarded as typical, and the names adopted for them were applied to the rocks of other and far distant regions. This application has brought out the fact that some of the most marked breaks in the European series do not exist elsewhere, and, on the other hand, that some portions of that series are much more complete than the corresponding sections in other regions. Hence, while the general similarity of succession may remain, different subdivisions and nomenclature are required as we pass from continent to continent.

The nomenclature adopted for the subdivisions of the geological record bears witness to the rapid growth of geology. It is a patch-work in which no system nor language has been adhered to, but where the influences by which the progress of the science has been moulded may be distinctly traced. Some of the earliest names are lithological, and remind us of the fact that mineralogy and petrography preceded geology in the order of birth—Chalk, Oolite, Greensand, Millstone Grit. Others are topographical, and often recall the labours of the early geologists of England—London Clay, Oxford Clay, Purbeck, Portland, Kimmeridge beds. Others are taken from local English provincial names, and remind us of the debt we owe to William Smith, by whom so many of them were first used—Lias, Gault, Crag, Cornbrash. Others of later date recognize an order of superposition as already established among formations—Old Red Sandstone, New Red Sandstone. By common consent it is admitted that names taken from the region where a formation or group of rocks is typically developed are best adapted for general use. Cambrian, Silurian, Devonian, Permian, Jurassic are of this class, and have been adopted all over the globe.

But whatever be the name chosen to designate a particular group of strata, it soon comes to be used as a chronological or homotaxial term, apart altogether from the stratigraphical character of the strata to which it is applied. Thus we speak of the Chalk or Cretaceous system, and embrace under that term formations which may contain no chalk; and we may describe as Silurian a series of strata utterly unlike in lithological characters to the formations in the typical Silurian country. In using these terms we unconsciously allow the idea of relative date to arise prominently before us. Hence such a word as "chalk" or "cretaceous" does not suggest so much to us the group of strata so called as the interval of geological history which these strata represent. We speak of the Cretaceous, Jurassic, and Cambrian periods, and of the Cretaceous fauna, the Jurassic flora, the Cambrian trilobites, as if these adjectives denoted simply epochs of geological time.

The stratified formations of the earth's crust, or geological record, are classified into five main divisions, which in their order of antiquity are as follows: (1) Archean or Pre-Cambrian, called also sometimes Azoic (lifeless) or Eozoic (dawn of life); (2) Palaeozoic (ancient life) or Primary; (3) Mesozoic (middle life) or Secondary; (4) Cainozoic (recent life) or Tertiary; (5) Quaternary or Post-Tertiary. These divisions are further ranged into systems, formations, groups or stages, assises and zones. Accounts of the various subdivisions named are given in separate articles under their own headings. In order, however, that the sequence of the formations and their parallelism in Europe and North America may be presented together a stratigraphical table is given on next page.

Part VIII.—Physiographical Geology

This department of geological inquiry investigates the origin and history of the present topographical features of the land. As these features must obviously be related to those of earlier time which are recorded in the rocks of the earth's crust, they cannot be satisfactorily studied until at least the main outlines of the history of these rocks have been traced. Hence physiographical research comes appropriately after the other branches of the science have been considered.

From the stratigraphy of the terrestrial crust we learn that by far the largest part of the area of dry land is built up of marine formations; and therefore that the present land is not an aboriginal portion of the earth's surface, but has been overspread by the sea in which its rocks were mainly accumulated. We further discover that this submergence of the land did not happen once only, but again and again in past ages and in all parts of the world. Yet although the terrestrial areas varied much from age to age in their extent and in their distribution, being at one time more continental, at another more insular, there is reason to believe that these successive diminutions and expansions have on the whole been effected within, or not far outside, the limits of the existing continents. There is no evidence that any portion of the present land ever lay under the deeper parts of the ocean. The abysmal deposits of the ocean-floor have no true representatives among the sedimentary formations anywhere visible on the land. Nor, on the other hand, can it be shown that any part of the existing ocean abysses ever rose above sea-level into dry land. Hence geologists have drawn the inference that the ocean basins have probably been always where they now are; and that although the continental areas have often been narrowed by submergence and by denudation, there has probably seldom or never been a complete

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The Geological Record or Order of Succession of the Stratified Formations of the Earth's Crust.

			Europe	North America.
Quaternary or Post-Tertiary.	Terrestrial, Fluvial, and Glacial of Historic Times.		Historic, up to the present time.	Similar to the European development, but with scantier traces of the presence of man
	Pleistocene or Glacial.		Prehistoric, comprising deposits of the Iron, Bronze, and later Stone Ages. Neolithic—alluvium, peat, lake-dwellings, loess, &c. Palæolithic—river gravels, cave-deposits, &c.	
			Older Loess and valley-gravels; cave-deposits. Strand-lines or raised beaches: youngest moraines. Upper Boulder-clays; eskers; marine sands and clays. Interglacial deposits. Lower boulder-clay or Till, with striated rock-surfaces below.	As in Europe, it is hardly possible as yet to define chronological place to each of the various deposits of this period, terrestrial and marine. They generally resemble the European series. The glacial, terrestrial marine, fluviatile and lacustrine terraces, which overlie the older drifts, have been classed as the Champlain Group.
Cainozoic or Tertiary	Pliocene.		Newer—English Forest-Bed Group; Red and Norwich Crag: Amstelien and Scaldesian groups of Belgium and Holland; Sicilian and Astian of France and Italy. Older:—English Coralline Crag; Diestian of Belgium; Plaisancian of southern France and Italy.	On the Atlantic border representing the marine Floridian series; in the interior by a subaerial and lacustrine series; and on the Pacific border by the thick marine series of San Francisco.
	Miocene.		Wanting in Britain; well developed in France, S. E. Europe and Italy; divisible into the following groups in descending order: (1) Pontian; (2) Sarmatian; (3) Tortonian; (4) Helvetian; (5) Langhian (burdigalian).	Represented in the Eastern States by a marine series (Yorktown of Chesapeake, Chipola and Chattahoochee groups), and in the interior by the lacustrine Loup Fork (Nebraska), Deep River, and John Day groups.
	Oligocene.		In Britain the "fluvio-marine series" of the Isle of Wight; also the volcanic plateaux of Antrim and Inner Hebrides and those of the Faroe Isles and Iceland. In continental Europe the following subdivisions have been established in descending order: (1) Aquitanian, (2) Stampian (Rupelian), (3) Tongrian (Sannoisian).	On the Atlantic border no equivalents have been satisfactorily recognized, but on the Pacific side there are marine deposits in N. W. Oregon, which may represent this division. In the interior the equivalent is believed to be the fresh-water White River series, including (1) *Protoceras* beds, (2) *Oreodon* beds, and (3) *Titanotherium* beds.
	Eocene.		Barton sands and clays; Ludian series of France. Bracklesham Beds; Lutetian (Calcaire grossier and Calkaseri) of Paris basin. London clay, Woolwich and Reading Beds; Thanet sands; Ypresian or Landenian of N. France and Belgium; Spamacian and Thanetian groups.	Woodstock and Aquia Creek groups of Potomac River; Vicksburg, Jackson, Claiborne, Buhrstone, and Lignitic groups of Mississippi.
Mesozoic or Secondary	Cretaceous. Upper.		Danian—wanting in Britain; uppermost limestone of Denmark. Senonian—Upper Chalk with Flints of England; Asturian and Emscherian stages on the European continent. Turonian—Middle Chalk with few flints, and comprising the Angoumian and Ligerian stages. Cenomanian—Lower Chalk and Chalk Marl. Albian—Upper Greensand and Gault. Aptian—Lower Greensand; Marls and limestones of Provence, &c.	On the Atlantic border both marine strata and others containing a terrestrial flora represent the Cretaceous series of formations. In the interior there is also a commingling of marine with lacustrine deposits. At the top lies the Laramie or Lignitic series with an abundant terrestrial flora, passing down into the lacustrine and brackish-water Montana series. Of older date, the Colorado series contains an abundant marine fauna, yet includes also some coal-seams. The Niobrara marls and limestones are likewise of marine origin, but the lower members of the series (Benton and Dakota) show another great representation of fresh-water sedimentation with lignites and coals. In California a vast succession of marine deposits (Shasta-Chico) represents the Cretaceous system, and in western British N. America coal-seams also occur.
		Lower.	Neocomian—Wealdclay and Hastingsand; Hauterrivian and Valanginian sub-stages of Switzerland and France	
	Jurassic.		Purbeckian—Purbeck beds; Münder Mergel; largely present in Westphalia. Portlandian—Portland group of England, represented in S. France by the thick Tithonian limestones. Kimmeridgian—Kimmeridge Clay of England; Virgulian and Pteroceran groups of N. France, represented by thick limestones in the Mediterranean basin.	Representatives of the Middle and lower Jurassic formations have been found in California and Oregon, and farther north among the Arctic islands. Strata containing Lower Jurassic marine fossils appear in Wyoming and Dakota; and above them come the *Atlantosaurus* and *Baptanodon* beds.

			Europe.	North America.
Mesozoic or Secondary—*continued.*	Jurassic—*continued.*		Corallian—Coral Rag, Coralline Oolite; Sequanian stages of the Continent, comprising the sub-stages of Astartian and Rauracian. Oxfordian—Oxford Clay; Argovian and Neuenyian stages. Callovian—Kelloway Rock, Divesian sub-stages of N. France.	which have yielded so large a variety of dentrosaurs and other vertebrates, and especially the remains of a number of genera of small mammals.
			Bathonian—series of English strata from Cornbrash down to Fuller's Earth. Bajocian—Inferior Oolite of England. Lias—divisible into (1) Upper Lias or Toarcian, (2) Middle Lias, Marlstone or Charmouthian, (3) Lower Lias of Somerset and Hettangian.	
	Triassic.		In Germany and western Europe this division represents the deposits of inland seas or lagoons, and is divisible into the following stages in descending order: (1) Rhætic, (2) Keuper, (3) Muschelkalk, (4) Bunter. In the eastern Alps and the Mediterranean basin the contemporaneous sedimentary formations are those of open clear sea, in which a thickness of many thousand feet of strata was accumulated.	In New York, Connecticut, New Brunswick, and Nova Scotia a series of red sandstone (Newark series) contains land-plants and labyrinthodonts like the lagoon type of central and western Europe. On the Pacific slope, however, marine equivalents occur representing the pelagic type of southeastern Europe.
Palæozoic or Primary	Permian.		Thuringian—Zechstein, Magnesian Limestone, named from its development in Thuringia; well represented also in Saxony, Bavaria and Bohemia. Saxonian—Rothliegenden Group; Red Sandstones, &c.	To this division of the geological record the Upper Barren Measures of the coal-fields of Pennsylvania, Prince Edward Island, Nova Scotia and New Brunswick have been referred.
			Autunian—where the strata present the lagoon facies, well displayed at Autun in France; where the marine type is predominant, as in Russia, the group has been termed Artinskian.	Farther south in Kansas, Texas, and Nebraska the representatives of the division have an abundant marine fauna.
	Carboniferous.		Stephanian or Uralian — represented in Russia by marine formations, and in central and western Europe by numerous small basins containing a peculiar flora and in some places a great variety of insects. Westphalian or Moscovian—Coal-measures, Millstone Grit. Culm or Dinantian—Carboniferous Limestone and Calciferous Sandstone series.	Upper productive Coal-measures. Lower Barren measures. Lower productive Coal-measures. Pottsville conglomerate. Mauch Chunk shales; limestones of Chester, St Louis, &c. Pocono series, Kinderhook limestone.
	Devonian and Old Red Sandstone.	Devonian type.		Old Red Sandstone type.	
		Upper.	Famennian. Frasnian.	Yellow and red sandstone with *Holoptychius, Bothriolepis, &c.*	Catskill red sandstone; Old Red Sandstone type: the strata below show the Devonian type. Chemung Group. Genesee "
		Middle.	Givetian. Eifelian.	Caithness Flagstones with *Osteolepis, Diplacanthus, Homosteus, &c.*	Hamilton Group. Marcellus "
		Lower.	Coblentzian. Gedinnian.	Red and purple sandstones and conglomerates with *Cephalaspis, Pterichthys, Pterygotus, &c.*	Corniferous Limestone. Onondaga Limestone. Oriskany Sandstone. Upper Helderberg Group.
	Silurian.		Upper	Ludlow Group. Wenlock " Llandovery "	Lower Helderberg Group. Water-Lime. Niagara Shale and Limestone. Clinton Group. " " Cincinnati Group. Utica " Trenton " Chazy " Calciferous "
			Lower (Ordovician)	Caradoc or Bala Group. Llandeilo " Arenig "	
	Cambrian		Upper or *Olenus* series—Tremadoc slates and *Lingula* Flags. Middle or *Paradoxides* series—Menevian Group. Lower or *Olenellus* series—Llanberis and Harlech Group, and *Olenellus*-zone.	Upper or Potsdam series with *Olenus* and *Dicellocephalus* fauna. Middle or Acadian series with *Paradoxides* fauna. Lower or Georgian series with *Olenellus* fauna.
Archæan, Pre-Cambrian Eozoic.			In Scotland, underneath the Cambrian *Olenellus* group, lies unconformably a mass of red sandstone and conglomerate (Torridonian) 6000 or 10,000 ft. thick, which rests with a strong unconformability on a series of coarse gneisses and schists (Lewisian). A thick series of slates and phyllites lies below the oldest Palæozoic rocks in central Europe, with coarse gneisses below.	In Canada and the Lake Superior region of the United States a vast succession of rocks of Pre-Cambrian age has been grouped into the following subdivisions in descending order: (1) Keweenawan, lying unconformably on (2) Animikie, separated by a strong unconformability from (3) Upper Huronian, (4) Lower Huronian with an unconformable base, (5) Goutchiching, (6) Laurentian. In the eastern part of Canada, Newfoundland, &c., and also in Montana, sedimentary formations of great thickness below the lowest Cambrian zone have been found to contain some obscure organisms.

disappearance of land. The fact that the sedimentary formations of each successive geological period consist to so large an extent of mechanically formed terrigenous detritus, affords good evidence of the coexistence of tracts of land as well as of extensive denudation.

From these general considerations we proceed to inquire how the existing topographical features of the land arose. Obviously the co-operation of the two great geological agencies of hypogene and epigene energy, which have been at work from the beginning of our globe's decipherable history, must have been the cause to which these features are to be assigned; and the task of the geologist is to ascertain, if possible, the part that has been taken by each. There is a natural tendency to see in a stupendous piece of scenery, such as a deep ravine, a range of hills, a line of precipice or a chain of mountains, evidence only of subterranean convulsion; and before the subject was taken up as a matter of strict scientific induction, an appeal to former cataclysms was considered a sufficient solution of the problems presented by such features of landscape. The rise of the modern Huttonian school, however, led to a more careful examination of these problems. The important share taken by erosion in the determination of the present features of landscape was then recognized, while a fuller appreciation of the relative parts played by the hypogene and epigene causes has gradually been reached.

1. The study of the progress of denudation at the present time has led to the conclusion that even if the rate of waste were not more rapid than it is to-day, it would yet suffice in a comparatively brief geological period to reduce the dry land to below the sea-level. But not only would the area of the land be diminished by denudation, it could hardly fail to be more or less involved in those widespread movements of subsidence, during which the thick sedimentary formations of the crust appear to have been accumulated. It is thus manifest that there must have been from time to time during the history of our globe upward movements of the crust, whereby the balance between land and sea was redressed. Proofs of such movements have been abundantly preserved among the stratified formations. We there learn that the uplifts have usually followed each other at long intervals between which subsidence prevailed, and thus that there has been a prolonged oscillation of the crust over the great continental areas of the earth's surface.

An examination of that surface lends to the recognition of two great types of upheaval. In the one, the sea-floor, with all its thick accumulations of sediment, has been carried upwards, sometimes for several thousand feet, so equably that the strata retain their original flatness with hardly any sensible disturbance for hundreds of square miles. In the other type the solid crust has been plicated, corrugated and dislocated, especially along particular lines, and has attained its most stupendous disruption in lofty chains of mountains. Between these two phases of uplift many intermediate stages have been developed, according to the direction and intensity of the subterranean force and the varying nature and disposition of the rocks of the crust.

(*a*) Where the uplift has extended over wide spaces, without appreciable deformation of the crust, the flat strata have given rise to low plains, or if the amount of uprise has been great enough, to high plains, plateaux or tablelands. The plains of Russia, for example, lie for the most part on such tracts of equably uplifted strata. The great plains of the western interior of the United States form a great plateau or tableland, 5000 or 6000 ft. above the sea, and many thousands of square miles in extent, on which the Rocky Mountains have been ridged up.

(*b*) It is in a great mountain-chain that the complicated structures developed during disturbances of the earth's crust can best be studied (see Parts IV. and V. of this article), and where the influence of these structures on the topography of the surface is most effectively displayed. Such a chain may be the result of one colossal disturbance; but those of high geological antiquity usually furnish proofs of successive uplifts with more or less intervening denudation. Formed along lines of continental displacement in the crust, they have again and again given relief from the strain of compression by fresh crumpling, fracture and uprise. The chief guide in tracing these successive stages of growth is supplied by unconformability. If, for example, a mountain-range consists of upraised Silurian rocks, upon the upturned and denuded edges of which the Carboniferous Limestone lies transgressively, it is clear that its original upheaval must have taken place in the period of geological time represented by the interval between the Silurian and the Carboniferous Limestone formations. If, as the range is followed along its course, the Carboniferous Limestone is found to be also highly inclined and covered unconformably by the Upper Coal-measures, a second uplift of that portion of the ground can be proved to have taken place between the time of the Limestone and that of the Upper Coal-measures. By this simple and obvious kind of evidence the relative ages of different mountain-chains may be compared. In most great chains, however, the rocks have been so intensely crumpled, and even inverted, that much labour may be required before their true relations can be determined.

The Alps furnish an instructive example of the long series of revolutions through which a great mountain-system may have passed before reaching its present development. The first beginnings of the chain may have been upraised before the oldest Palaeozoic formations were laid down. There are at least traces of land and shore-lines in the Carboniferous period. Subsequent submergences and uplifts appear to have occurred during the Mesozoic periods. There is evidence that thereafter the whole region sank deep under the sea, in which the older Tertiary sediments were accumulated, and which seems to have spread right across the heart of the Old World. But after the deposition of the Eocene formations came the gigantic disruptions whereby all the rocks of the Alpine region were folded over each other, crushed, corrugated, fractured and displaced, some of their older portions, including the fundamental gneisses and schists, being squeezed up, torn off, and pushed horizontally for many miles over the younger rocks. But this upheaval, though the most momentous, was not the last which the chain has undergone, for at a later epoch in Tertiary time renewed disturbance gave rise to a further series of ruptures and plications. The chain thus successively upheaved has been continuously exposed to denudation and has consequently lost much of its original height. That it has been left in a state of instability is indicated by the frequent earthquakes of the Alpine region, which doubtless arise from the sudden snapping of rocks under intense strain.

A distinct type of mountain due to direct hypogene action is to be seen in a volcano. It has been already pointed out (Part IV. sect. 1) that at the vents which maintain a communication between the molten magma of the earth's interior and the surface, eruptions take place whereby quantities of lava and fragmentary materials are heaped round each orifice of discharge. A typical volcanic mountain takes the form of a perfect cone, but as it grows in size and its main vent is choked, while the sides of the cone are unable to withstand the force of the explosions or the pressure of the ascending column of lava, eruptions take place laterally, and numerous parasitic cones arise on the flanks of the parent mountain. Where lava flows out from long fissures, it may pile up vast sheets of rock, and bury the surrounding country under several thousand feet of solid stone, covering many hundreds of square miles. In this way volcanic tablelands have been formed which, attacked by the denuding forces, are gradually trenched by valleys and ravines, until the original level surface of the lava-field may be almost or wholly lost. As striking examples of this physiographical type reference may be made to the plateau of Abyssinia, the Ghats of India, the plateaux of Antrim, the Inner Hebrides and Iceland, and the great lava-plains of the western territories of the United States.

2. But while the subterranean movements have upraised portions of the surface of the lithosphere above the level of the ocean, and have thus been instrumental in producing the existing tracts of land, the detailed topographical features of a landscape

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are not solely, nor in general even chiefly, attributable to these movements. From the time that any portion of the sea-floor appears above sea-level, it undergoes erosion by the various epigene agents. Each climate and geological region has its own development of these agents, which include air, aridity, rapid and frequent alternations of wetness and dryness or of heat and cold, rain, springs, frosts, rivers, glaciers, the sea, plant and animal life. In a dry climate subject to great extremes of temperature the character and rate of decay will differ from those of a moist or an arctic climate. But it must be remembered that, however much they may vary in activity and in the results which they effect, the epigene forces work without intermission, while the hypogene forces bring about the upheaval of land only after long intervals. Hence, trifling as the results during a human life may appear, if we realize the multiplying influence of time we are led to perceive that the apparently feeble superficial agents can, in the course of ages, achieve stupendous transformations in the aspect of the land. If this efficacy may be deduced from what can be seen to be in progress now, it may not less convincingly be shown, from the nature of the sedimentary rocks of the earth's crust, to have been in progress from the early beginnings of geological history. Side by side with the various upheavals and subsidences, there has been a continuous removal of materials from the land, and an equally persistent deposit of these materials under water, with the consequent growth of new rocks. Denudation has been aptly compared to a process of sculpturing wherein, while each of the implements employed by nature, like a special kind of graving tool, produces its own characteristic impress on the land, they all combine harmoniously towards the achievement of their one common task. Hence the present contours of the land depend partly on the original configuration of the ground, and the influence it may have had in guiding the operations of the erosive agents, partly on the vigour with which these agents perform their work, and partly on the varying structure and powers of resistance possessed by the rocks on which the erosion is carried on.

Where a new tract of land has been raised out of the sea by such an energetic movement as broke up the crust and produced the complicated structure and tumultuous external forms of a great mountain chain, the influence of the hypogene forces on the topography attains its highest development. But even the youngest existing chain has suffered so greatly from denudation that the aspect which it presented at the time of its uplift can only be dimly perceived. No more striking illustration of this feature can be found than that supplied by the Alps, nor one where the geotectonic structures have been so fully studied in detail. On the outer flanks of these mountains the longitudinal ridges and valleys of the Jura correspond with lines of anticline and syncline. Yet though the dominant topographical elements of the region have obviously been produced by the plication of the stratified formations, each ridge has suffered so large an amount of erosion that the younger rocks have been removed from its crest where the older members of the series are now exposed to view, while on every slope proofs may be seen of extensive denudation. If from these long wave-like undulations of the ground, where the relations between the disposition of the rocks below and the forms of the surface are so clearly traceable, the observer proceeds inwards to the main chain, he finds that the plications and displacements of the various formations assume an increasingly complicated character; and that although proofs of great denudation continue to abound, it becomes increasingly difficult to form any satisfactory conjecture as to the shape of the ground when the upheaval ended or any reliable estimate of the amount of material which has since then been removed. Along the central heights the mountains lift themselves towards the sky like the storm-swept crests of vast earth-billows. The whole aspect of the ground suggests intense commotion, and the impression thus given is often much intensified by the twisted and crumpled strata, visible from a long distance, on the crags and crests. On this broken-up surface the various agents of denudation have been ceaselessly engaged since it emerged from the sea. They have excavated valleys, sometimes along depressions provided for them by the subterranean disturbances, sometimes down the slopes of the disrupted blocks of ground. So powerful has been this erosion that valleys cut out along lines of anticline, which were natural ridges, have sometimes become more important than those in lines of syncline, which were structurally depressions. The same subaerial forces have eroded lake-basins, dug out corries or cirques, notched the ridges, splintered the crests and furrowed the slopes, leaving no part of the original surface of the uplifted chain unmodified.

It has often been noted with surprise that features of underground structure which, it might have been confidently anticipated, should have exercised a marked influence on the topography of the surface have not been able to resist the levelling action of the denuding agents, and do not now affect the surface at all. This result is conspicuously seen in coal-fields where the strata are abundantly traversed by faults. These dislocations, having sometimes a displacement of several hundred feet, might have been expected to break up the surface into a network of cliffs and plains; yet in general they do not modify the level character of the ground above. One of the most remarkable faults in Europe is the great thrust which bounds the southern edge of the Belgian coal-field and brings the Devonian rocks above the Coal-measures. It can be traced across Belgium into the Boulonnais, and may not improbably run beneath the Secondary and Tertiary rocks of the south of England. It is crossed by the valleys of the Meuse and other northerly-flowing streams. Yet so indistinctly is it marked in the Meuse valley that no one would suspect its existence from any peculiarity in the general form of the ground, and even an experienced geologist, until he had learned the structure of the district, would scarcely detect any fault at all.

Where faults have influenced the superficial topography, it is usually by giving rise to a hollow along which the subaerial agents and especially running water can act effectively. Such a hollow may be eventually widened and deepened into a valley. On bare crags and crests, lines of fault are apt to be marked by notches or clefts, and they thus help to produce the pinnacles and serrated outlines of these exposed uplands.

It was cogently enforced by Hutton and Playfair, and independently by Lamarck, that no co-operation of underground agency is needed to produce such topography as may be seen in a great part of the world, but that if a tract of sea-floor were upraised into a wide plain, the fall of rain and the circulation of water over its surface would in the end carve out such a system of hills and valleys as may be seen on the dry land now. No such plain would be a dead-level: It would have inequalities on its surface which would serve as channels to guide the drainage from the first showers of rain. And these channels would be slowly widened and deepened until they would become ravines and valleys, while the ground between them would be left projecting as ridges and hills. Nor would the erosion of such a system of water-courses require a long series of geological periods for its accomplishment. From measurements and estimates of the amount of erosion now taking place in the basin of the Mississippi river it has been computed that valleys 800 ft. deep might be carved out in less than a million years. In the vast tablelands of Colorado and other western regions of the United States an impressive picture is presented of the results of mere subaerial erosion on undisturbed and nearly level strata. Systems of stream-courses and valleys, river gorges unexampled elsewhere in the world for depth and length, vast winding lines of escarpment, like ranges of sea-cliffs, terraced slopes rising from plateau to plateau, huge buttresses and solitary stacks standing like islands out of the plains, great mountain-masses towering into picturesque peaks and pinnacles cleft by innumerable gullies, yet everywhere marked by the parallel bars of the horizontal strata out of which they have been carved—these are the orderly symmetrical characteristics of a country where the scenery is due entirely to the action of subaerial agents on the one hand and

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the varying resistance of perfectly regular stratified rocks on the other.

The details of the sculpture of the land have mainly depended on the nature of the materials on which nature's erosive tools have been employed. The joints by which all rocks are traversed have been especially serviceable as dominant lines down which the rain has filtered, up which the springs have risen and into which the frost wedges have been driven. On the high bare scarps of a lofty mountain the inner structure of the mass is laid open, and there the system of joints even more than faults is seen to have determined the lines of crest, the vertical walls of cliff and precipice, the forms of buttress and recess, the position of cleft and chasm, the outline of spire and pinnacle. On the lower slopes, even under the tapestry of verdure which nature delights to hang where she can over her naked rocks, we may detect the same pervading influence of the joints upon the forms assumed by ravines and crags. Each kind of stone, too, gives rise to its own characteristic form of scenery. Massive crystalline rocks, such as granite, break up along their joints and often decay into sand or earth along their exposed surfaces, giving rise to rugged crags with long talus slopes at their base. The stratified rocks besides splitting at their joints are especially distinguished by parallel ledges, cornices and recesses, produced by the irregular decay of their component strata, so that they often assume curiously architectural types of scenery. But besides this family feature they display many minor varieties of aspect according to their lithological composition. A range of sandstone hills, for example, presents a marked contrast to one of limestone, and a line of chalk downs to the escarpments formed by alternating bands of harder and softer clays and shales.

It may suffice here merely to allude to a few of the more important parts of the topography of the land in their relation to physiographical geology. A true mountain-chain, viewed from the geological side, is a mass of high ground which owes its prominence to a ridging-up of the earth's crust, and the intense plication and rupture of the rocks of which it is composed. But ranges of hills almost mountainous in their bulk may be formed by the gradual erosion of valleys out of a mass of original high ground, such as a high plateau or tableland. Eminences which have been isolated by denudation from the main mass of the formations of which they originally formed part are known as "outliers" or "hills of circumdenudation."

Tablelands, as already pointed out, may be produced either by the upheaval of tracts of horizontal strata from the sea-floor into land; or by the uprise of plains of denudation, where rocks of various composition, structure and age have been levelled down to near or below the level of the sea by the co-operation of the various erosive agents. Most of the great tablelands of the globe are platforms of little-disturbed strata which have been upraised bodily to a considerable elevation. No sooner, however, are they placed in that position than they are attacked by running water, and begin to be hollowed out into systems of valleys. As the valleys sink, the platforms between them grow into narrower and more definite ridges, until eventually the level tableland is converted into a complicated network of hills and valleys, wherein, nevertheless, the key to the whole arrangement is furnished by a knowledge of the disposition and effects of the flow of water. The examples of this process brought to light in Colorado, Wyoming, Nevada and the other western regions by Newberry, King, Hayden, Powell and other explorers, are among the most striking monuments of geological operations in the world.

Examples of ancient and much decayed tablelands formed by the denudation of much disturbed rocks are furnished by the Highlands of Scotland and of Norway. Each of these tracts of high ground consists of some of the oldest and most dislocated formations of Europe, which at a remote period were worn down into a plain, and in that condition may have lain long submerged under the sea and may possibly have been overspread there with younger formations. Having at a much later time been raised several thousand feet above sea-level the ancient platforms of Britain and Scandinavia have been since exposed to denudation, whereby each of them has been so deeply channeled into glens and fjords that it presents to-day a surface of rugged hills, either isolated or connected along the flanks, while only fragments of the general surface of the tableland can here and there be recognized amidst the general destruction.

Valleys have in general been hollowed out by the greater erosive action of running water along the channels of drainage. Their direction has been probably determined in the great majority of cases by irregularities of the surface along which the drainage flowed on the first emergence of the land. Sometimes these irregularities have been produced by folds of the terrestrial crust, sometimes by faults, sometimes by the irregularities on the surface of an uplifted platform of deposition or of denudation. Two dominant trends may be observed among them. Some are longitudinal and run along the line of flexures in the upraised tract of land, others are transverse where the drainage has flowed down the slopes of the ridges into the longitudinal valleys or into the sea. The forms of valleys have been governed partly by the structure and composition of the rocks, and partly by the relative potency of the different denuding agents. Where the influence of rain and frost has been slight, and the streams, supplied from distant sources, have had sufficient declivity, deep, narrow, precipitous ravines or gorges have been excavated. The canyons of the arid region of the Colorado are a magnificent example of this result. Where, on the other hand, ordinary atmospheric action has been more rapid, the sides of the river channels have been attacked, and open sloping glens and valleys have been hollowed out. A gorge or defile is usually due to the action of a waterfall, which, beginning with some abrupt declivity or precipice in the course of the river when it first commenced to flow, or caused by some hard rock crossing the channel, has eaten its way backward.

Lakes have been already referred to, and their modes of origin have been mentioned. As they are continually being filled up with the detritus washed into them from the surrounding regions they cannot be of any great geological antiquity, unless where by some unknown process their basins are from time to time widened and deepened.

In the general subaerial denudation of a country, innumerable minor features are worked out as the structure of the rocks controls the operations of the eroding agents. Thus, among comparatively undisturbed strata, a hard bed resting upon others of a softer kind is apt to form along its outcrop a line of cliff or escarpment. Though a long range of such cliffs resembles a coast that has been worn by the sea, it may be entirely due to mere atmospheric waste. Again, the more resisting portions of a rock may be seen projecting as crags or knolls. An igneous mass will stand out as a bold hill from amidst the more decomposable strata through which it has risen. These features often so marked on the lower grounds, attain their most conspicuous development among the higher and barer parts of the mountains, where subaerial disintegration is most rapid. The torrents tear out deep gullies from the sides of the declivities. Corries or cirques are scooped out on the one hand and naked precipices are left on the other. The harder bands of rock project as massive ribs down the slopes, shoot up into prominent *aiguilles*, or help to give to the summits the notched saw-like outlines they so often present.

The materials worn from the surface of the higher are spread out over the lower grounds. The streams as they descend begin to drop their freight of sediment when, by the lessening of their declivity, their carrying power is diminished. The great plains of the earth's surface are due to this deposit of gravel, sand and loam. They are thus monuments at once of the destructive and reproductive processes which have been in progress unceasingly since the first land rose above the sea and the first shower of rain fell. Every pebble and particle of their soil, once part of the distant mountains, has travelled slowly and fitfully to lower levels. Again and again have these materials been shifted, ever moving downward and sea-ward. For centuries, perhaps, they have taken their share in the fertility of the plains and

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have ministered to the nurture of flower and tree, of the bird of the air, the beast of the field and of man himself. But their destiny is still the great ocean. In that bourne alone can they find undisturbed repose, and there, slowly accumulating in massive beds, they will remain until, in the course of ages, renewed upheaval shall raise them into future land, there once more to pass through the same cycle of change. (A. Ge.)

LITERATURE.—*Historical*: The standard work is Karl A. von Zittel's *Geschichte der Geologie und Palaeontologie* (1899), of which there is an abbreviated, but still valuable, English translation: D'Archiac, *Histoire des progrès de la géologie*, deals especially with the period 1834–1850; Keferstein, *Geschichte und Literatur der Geognosie*, gives a summary up to 1840; while Sir A. Geikie's *Founders of Geology* (1897; 2nd ed., 1905) deals more particularly with the period 1750–1820. General treatises: Sir Charles Lyell's *Principles of Geology* is a classic. Of modern English works, Sir A. Geikie's *Text Book of Geology* (4th ed., 1903) occupies the first place; the work of T. C. Chamberlin and R. D. Salisbury, *Geology: Earth History* (3 vols., 1905–1906), is especially valuable for American geology. A. de Lapparent's *Traité de géologie* (5th ed., 1906), is the standard French work. H. Credner's *Elemente der Geologie* has gone through several editions in Germany. Dynamical and physiographical geology are elaborately treated by E. Suess, *Das Antlitz der Erde*, translated into English, with the title *The Face of the Earth*. The practical study of the science is treated of by F. von Richthofen, *Führer für Forschungsreisende* (1886); G. A. Cole, *Aids in Practical Geology* (5th ed., 1906); A. Geikie, *Outlines of Field Geology* (5th ed., 1900). The practical applications of Geology are discussed by J. V. Elsden, *Applied Geology* (1898–1899). The relations of Geology to scenery are dealt with by Sir A. Geikie, *Scenery of Scotland* (3rd ed., 1901); J. E. Marr, *The Scientific Study of Scenery* (1900); Lord Avebury, *The Scenery of Switzerland* (1896); *The Scenery of England* (1902); and J. Geikie, *Earth Sculpture* (1898). A detailed bibliography is given in Sir A. Geikie's *Text Book of Geology*. See also the separate articles on geological subjects for special references to authorities.

GEOMETRICAL CONTINUITY. In a report of the Institute prefixed to Jean Victor Poncelet's *Traité des propriétés projectives des figures* (Paris, 1822), it is said that he employed "ce qu'il appelle le principe de continuité." The law or principle thus named by him had, he tells us, been tacitly assumed as axiomatic by "les plus savans géomètres." It had in fact been enunciated as "lex continuationis," and "la loi de la continuité," by Gottfried Wilhelm Leibnitz (Oxf. N.E.D.), and previously under another name by Johann Kepler in cap. iv. 4 of his *Ad Vitellionem paralipomena quibus astronomiae pars optica traditur* (Francofurti, 1604). Of sections of the cone, he says, there are five species from the "recta linea" or line-pair to the circle. From the line-pair we pass through an infinity of hyperbolas to the parabola, and thence through an infinity of ellipses on to the circle. Related to the sections are certain remarkable points which have no name. Kepler calls them foci. The circle has one focus at the centre, an ellipse or hyperbola two foci equidistant from the centre. The parabola has one focus within it, and another, the "caecus focus," which may be imagined to be *at infinity* on the axis *within or without the curve*. The line from it to any point of the section is parallel to the axis. To carry out the analogy we must speak paradoxically, and say that the line-pair likewise has foci, which in this case coalesce as in the circle and fall upon the lines themselves; for our geometrical terms should be subject to analogy. Kepler dearly loves analogies, his most trusty teachers, acquainted with all the secrets of nature, "*omnium naturae arcanorum conscios*." And they are to be especially regarded in geometry as, by the use of "however absurd expressions," classing extreme limiting forms with an infinity of intermediate cases, and placing the whole essence of a thing clearly before the eyes.

Here, then, we find formulated by Kepler the doctrine of the concurrence of parallels at a single point at infinity and the principle of continuity (under the name analogy) in relation to the infinitely great. Such conceptions so strikingly propounded in a famous work could not escape the notice of contemporary mathematicians. Henry Briggs, in a letter to Kepler from Merton College, Oxford, dated "10 Cal. Martiis 1625," suggests improvements in the *Ad Vitellionem paralipomena*, and gives the following construction: Draw a line CBADC, and let an ellipse, a parabola, and a hyperbola have B and A for focus and vertex. Let CC be the other foci of the ellipse and the hyperbola. Make AD equal to AB, and with centres CC and radius in each case equal to CD describe circles. Then any point of the ellipse is equidistant from the focus B and one circle, and any point of the hyperbola from the focus B and the other circle. Any point P of the parabola, in which the second focus is missing or infinitely distant, is equidistant from the focus B and the line through D which we call the directrix, this taking the place of either circle when its centre C is at infinity, and every line CP being then parallel to the axis. Thus Briggs, and we know not how many "savans géomètres" who have left no record, had already taken up the new doctrine in geometry in its author's lifetime. Six years after Kepler's death in 1630 Girard Desargues, "the Monge of his age," brought out the first of his remarkable works founded on the same principles, a short tract entitled *Méthode universelle de mettre en perspective les objets donnés réellement ou en devis* (Paris, 1636); but "Le privilége étoit de 1630" (Poudra, *Œuvres de Des.*, i. 55). Kepler as a modern geometer is best known by his *New Stereometry of Wine Casks* (Lincii, 1615), in which he replaces the circuitous Archimedean method of exhaustion by a direct "royal road" of infinitesimals, treating a vanishing arc as a straight line and regarding a curve as made up of a succession of short chords. Some 2000 years previously one Antipho, probably the well-known opponent of Socrates, has regarded a circle in like manner as the limiting form of a many-sided inscribed rectilinear figure. Antipho's notion was rejected by the men of his day as unsound, and when reproduced by Kepler it was again stoutly opposed as incapable of any sort of geometrical demonstration—not altogether without reason, for it rested on an assumed law of continuity rather than on palpable proof.

To complete the theory of continuity, the one thing needful was the idea of imaginary points implied in the algebraical geometry of René Descartes, in which equations between variables representing co-ordinates were found often to have imaginary roots. Newton, in his two sections on "Inventio orbium" (*Principia* i. 4, 5), shows in his brief way that he is familiar with the principles of modern geometry. In two propositions he uses an auxiliary line which is supposed to cut the conic in X and Y, but, as he remarks at the end of the second (prop. 24), it may not cut it at all. For the sake of brevity he passes on at once with the observation that the required constructions are evident from the case in which the line cuts the trajectory. In the scholium appended to prop. 27, after saying that an asymptote is a tangent at infinity, he gives an unexplained general construction for the axes of a conic, which seems to imply that it has asymptotes. In all such cases, having equations to his loci in the background, he may have thought of elements of the figure as passing into the imaginary state in such manner as not to vitiate conclusions arrived at on the hypothesis of their reality.

Roger Joseph Boscovich, a careful student of Newton's works, has a full and thorough discussion of geometrical continuity in the third and last volume of his *Elementa universae matheseos* (ed. prim. Venet, 1757), which contains *Sectionum conicarum elementa nova quadam methodo concinnata et dissertationem de transformatione locorum geometricorum, ubi de continuitatis lege, et de quibusdam infiniti mysteriis*. His first principle is that all varieties of a defined locus have the same properties, so that what is demonstrable of one should be demonstrable in like manner of all, although some artifice may be required to bring out the underlying analogy between them. The opposite extremities of an infinite straight line, he says, are to be regarded as joined, as if the line were a circle having its centre at the infinity on either side of it. This leads up to the idea of a *veluti plus quam infinita extensio*, a line-circle containing, as we say, the line infinity. Change from the real to the imaginary state is contingent upon the passage of some element of a figure through zero or infinity and never takes place *per saltum*. Lines being some positive and some negative, there must be negative rectangles and negative squares, such as those of the exterior diameters of a hyperbola. Boscovich's first principle was that of Kepler, by whose *quantumvis absurdis locutionibus* the boldest

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applications of it are covered, as when we say with Poncelet that all concentric circles in a plane touch one another in two imaginary fixed points at infinity. In G. K. Ch. von Staudt's *Geometrie der Lage* and *Beitrdge zur C. der L.* (Nürnberg, 1847, 1856–1860) the geometry of position, including the extension of the field of pure geometry to the infinite and the imaginary, is presented as an independent science, "welche des Messens nicht bedarf." (See GEOMETRY: *Projective.*)

Ocular illusions due to distance, such as Roger Bacon notices in the *Opus majus* (i. 126, ii. 108, 497; Oxford, 1897), lead up to or illustrate the mathematical uses of the infinite and its reciprocal the infinitesimal. Specious objections can, of course, be made to the anomalies of the law of continuity, but they are inherent in the higher geometry, which has taught us so much of the "secrets of nature." Kepler's excursus on the "analogy" between the conic sections hereinbefore referred to is given at length in an article on "The Geometry of Kepler and Newton" in vol. xviii. of the *Transactions of the Cambridge Philosophical Society* (1900). It had been generally overlooked, until attention was called to it by the present writer in a note read in 1880 (*Proc. C.P.S.* iv. 14–17), and shortly afterwards in *The Ancient and Modern Geometry of Conics, with Historical Notes and Prolegomena* (Cambridge 1881). (C. T.*)

GEOMETRY, the general term for the branch of mathematics which has for its province the study of the properties of space. From experience, or possibly intuitively, we characterize existent space by certain fundamental qualities, termed axioms, which are insusceptible of proof; and these axioms, in conjunction with the mathematical entities of the point, straight line, curve, surface and solid, appropriately defined, are the premises from which the geometer draws conclusions. The geometrical axioms are merely conventions; on the one hand, the system may be based upon inductions from experience, in which case the deduced geometry may be regarded as a branch of physical science; or, on the other hand, the system may be formed by purely logical methods, in which case the geometry is a phase of pure mathematics. Obviously the geometry with which we are most familiar is that of existent space—the three-dimensional space of experience; this geometry may be termed Euclidean, after its most famous expositor. But other geometries exist, for it is possible to frame systems of axioms which definitely characterize some other kind of space, and from these axioms to deduce a series of non-contradictory propositions; such geometries are called non-Euclidean.

It is convenient to discuss the subject-matter of geometry under the following headings:

I. *Euclidean Geometry*: a discussion of the axioms of existent space and of the geometrical entities, followed by a synoptical account of Euclid's *Elements*.

II. *Projective Geometry*: primarily Euclidean, but differing from I. in employing the notion of *geometrical continuity* (*q.v.*)—points and lines at infinity.

III. *Descriptive Geometry*: the methods for representing upon planes figures placed in space of three dimensions.

IV. *Analytical Geometry*: the representation of geometrical figures and their relations by algebraic equations.

V. *Line Geometry*: an analytical treatment of the line regarded as the space element.

VI. *Non-Euclidean Geometry*: a discussion of geometries other than that of the space of experience.

VII. *Axioms of Geometry*: a critical analysis of the foundations of geometry.

Special subjects are treated under their own headings: *e.g.* PROJECTION, PERSPECTIVE; CURVE, SURFACE; CIRCLE, CONIC SECTION; TRIANGLE, POLYGON, POLYHEDRON; there are also articles on special curves and figures, *e.g.* ELLIPSE, PARABOLA, HYPERBOLA; TETRAHEDRON, CUBE, OCTAHEDRON, DODECAHEDRON, ICOSAHEDRON; CARDIOID, CATENARY, CISSOID, CONCHOID, CYCLOID, EPICYCLOID, LIMAÇON, OVAL, QUADRATRIX, SPIRAL, &c.

History.—The origin of geometry (Gr. γῆ, earth, μέτρον, a measure) is, according to Herodotus, to be found in the etymology of the word. Its birthplace was Egypt, and it arose from the need of surveying the lands inundated by the Nile floods. In its infancy it therefore consisted of a few rules, very rough and approximate, for computing the areas of triangles and quadrilaterals; and, with the Egyptians, it proceeded no further, the geometrical entities—the point, line, surface and solid—being only discussed in so far as they were involved in practical affairs. The point was realized as a mark or position, a straight line as a stretched string or the tracing of a pole, a surface as an area; but these units were not abstracted; and for the Egyptians geometry was only an art—an auxiliary to surveying.[1] The first step towards its elevation to the rank of a science was made by Thales (*q.v.*) of Miletus, who transplanted the elementary Egyptian mensuration to Greece. Thales clearly abstracted the notions of points and lines, founding the geometry of the latter unit, and discovering *per saltum* many propositions concerning areas, the circle, &c. The empirical rules of the Egyptians were corrected and developed by the Ionic School which he founded, especially by Anaximander and Anaxagoras, and in the 6th century B.C. passed into the care of the Pythagoreans. From this time geometry exercised a powerful influence on Greek thought. Pythagoras (*q.v.*), seeking the key of the universe in arithmetic and geometry, investigated logically the principles underlying the known propositions; and this resulted in the formulation of definitions, axioms and postulates which, in addition to founding a *science* of geometry, permitted a crystallization, fractional, it is true, of the amorphous collection of material at hand. Pythagorean geometry was essentially a geometry of areas and solids; its goal was the regular solids—the tetrahedron, cube, octahedron, dodecahedron and icosahedron—which symbolized the five elements of Greek cosmology. The geometry of the circle, previously studied in Egypt and much more seriously by Thales, was somewhat neglected, although this curve was regarded as the most perfect of all plane figures and the sphere the most perfect of all solids. The circle, however, was taken up by the Sophists, who made most of their discoveries in attempts to solve the classical problems of squaring the circle, doubling the cube and trisecting an angle. These problems, besides stimulating pure geometry, *i.e.* the geometry of constructions made by the ruler and compasses, exercised considerable influence in other directions. The first problem led to the discovery of the method of *exhaustion* for determining areas. Antiphon inscribed a square in a circle, and on each side an isosceles triangle having its vertex on the circle; on the sides of the octagon so obtained, isosceles triangles were again constructed, the process leading to inscribed polygons of 8, 16 and 32 sides; and the areas of these polygons, which are easily determined, are successive approximations to the area of the circle. Bryson of Heraclea took an important step when he circumscribed, in addition to inscribing, polygons to a circle, but he committed an error in treating the circle as the mean of the two polygons. The method of Antiphon, in assuming that by continued division a polygon can be constructed coincident with the circle, demanded that magnitudes are not infinitely divisible. Much controversy ranged about this point; Aristotle supported the doctrine of infinite divisibility; Zeno attempted to show its absurdity. The mechanical tracing of loci, a principle initiated by Archytas of Tarentum to solve the last two problems, was a frequent subject for study, and several mechanical curves were thus discovered at subsequent dates (cissoid, conchoid, quadratrix). Mention may be made of Hippocrates, who, besides developing the known methods, made a study of similar figures, and, as a consequence, of proportion. This step is important as bringing into line discontinuous number and continuous magnitude.

A fresh stimulus was given by the succeeding Platonists, who, accepting in part the Pythagorean cosmology, made the study of geometry preliminary to that of philosophy. The many discoveries made by this school were facilitated in no small measure by the clarification of the axioms and definitions, the logical sequence of propositions which was adopted, and, more especially, by the formulation of the analytic method, *i.e.* of assuming the truth of a proposition and then reasoning to a

[1] For Egyptian geometry see EGYPT, § *Science and Mathematics.*

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known truth. The main strength of the Platonist geometers lies in stereometry or the geometry of solids. The Pythagoreans had dealt with the sphere and regular solids, but the pyramid, prism, cone and cylinder were but little known until the Platonists took them in hand. Eudoxus established their mensuration, proving the pyramid and cone to have one-third the content of a prism and cylinder on the same base and of the same height, and was probably the discoverer of a proof that the volumes of spheres are as the cubes of their radii. The discussion of sections of the cone and cylinder led to the discovery of the three curves named the parabola, ellipse and hyperbola (see CONIC SECTION); it is difficult to over-estimate the importance of this discovery; its investigation marks the crowning achievement of Greek geometry, and led in later years to the fundamental theorems and methods of modern geometry.

The presentation of the subject-matter of geometry as a connected and logical series of propositions, prefaced by "Opoi or foundations, had been attempted by many; but it is to Euclid that we owe a complete exposition. Little indeed in the *Elements* is probably original except the arrangement; but in this Euclid surpassed such predecessors as Hippocrates, Leon, pupil of Neocleides, and Theudius of Magnesia, devising an apt logical model, although when scrutinized in the light of modern mathematical conceptions the proofs are riddled with fallacies. According to the commentator Proclus, the *Elements* were written with a twofold object, first, to introduce the novice to geometry, and secondly, to lead him to the regular solids; conic sections found no place therein. What Euclid did for the line and circle, Apollonius did for the conic sections, but there we have a discoverer as well as editor. These two works, which contain the greatest contributions to ancient geometry, are treated in detail in Section I. *Euclidean Geometry* and the articles EUCLID; CONIC SECTION; APOLLONIUS. Between Euclid and Apollonius there flourished the illustrious Archimedes, whose geometrical discoveries are mainly concerned with the mensuration of the circle and conic sections, and of the sphere, cone and cylinder, and whose greatest contribution to geometrical method is the elevation of the method of exhaustion to the dignity of an instrument of research. Apollonius was followed by Nicomedes, the inventor of the conchoid; Diocles, the inventor of the cissoid; Zenodorus, the founder of the study of isoperimetrical figures; Hipparchus, the founder of trigonometry; and Heron the elder, who wrote after the manner of the Egyptians, and primarily directed attention to problems of practical surveying.

Of the many isolated discoveries made by the later Alexandrian mathematicians, those of Menelaus are of importance. He showed how to treat spherical triangles, establishing their properties and determining their congruence; his theorem on the products of the segments in which the sides of a triangle are cut by a line was the foundation on which Carnot erected his theory of transversals. These propositions, and also those of Hipparchus, were utilized and developed by Ptolemy (*q.v.*), the expositor of trigonometry and discoverer of many isolated propositions. Mention may be made of the commentator Pappus, whose *Mathematical Collections* is valuable for its wealth of historical matter; of Theon, an editor of Euclid's *Elements* and commentator of Ptolemy's *Almagest*; of Proclus, a commentator of Euclid; and of Eutocius, a commentator of Apollonius and Archimedes.

The Romans, essentially practical and having no inclination to study science *qua* science, only had a geometry which sufficed for surveying; and even here there were abundant inaccuracies, the empirical rules employed being akin to those of the Egyptians and Heron. The Hindus, likewise, gave more attention to computation, and their geometry was either of Greek origin or in the form presented in trigonometry, more particularly connected with arithmetic. It had no logical foundations; each proposition stood alone; and the results were empirical. The Arabs more closely followed the Greeks, a plan adopted as a sequel to the translation of the works of Euclid, Apollonius, Archimedes and many others into Arabic. Their chief contribution to geometry is exhibited in their solution of algebraic equations by intersecting conics, a step already taken by the Greeks in isolated cases, but only elevated into a *method* by Omar al Hayyami, who flourished in the 11th century. During the middle ages little was added to Greek and Arabic geometry. Leonardo of Pisa wrote a *Practica geometriae* (1220), wherein Euclidean methods are employed; but it was not until the 14th century that geometry, generally Euclid's *Elements*, became an essential item in university curricula. There was, however, no sign of original development, other branches of mathematics, mainly algebra and trigonometry, exercising a greater fascination until the 16th century, when the subject again came into favour.

The extraordinary mathematical talent which came into being in the 16th and 17th centuries reacted on geometry and gave rise to all those characters which distinguish modern from ancient geometry. The first innovation of moment was the formulation of the principle of geometrical continuity by Kepler. The notion of infinity which it involved permitted generalizations and systematizations hitherto unthought of (see GEOMETRICAL CONTINUITY); and the method of indefinite division applied to rectification, and quadrature and cubature problems avoided the cumbrous method of exhaustion and provided more accurate results. Further progress was made by Bonaventura Cavalieri, who, in his *Geometria indivisibilibus continuorum* (1620), devised a method intermediate between that of exhaustion and the infinitesimal calculus of Leibnitz and Newton. The logical basis of his system was corrected by Roberval and Pascal; and their discoveries, taken in conjunction with those of Leibnitz, Newton, and many others in the fluxional calculus, culminated in the branch of our subject known as differential geometry (see INFINITESIMAL CALCULUS, CURVE; SURFACE).

A second important advance followed the recognition that conics could be regarded as projections of a circle, a conception which led at the hands of Desargues and Pascal to modern *projective geometry* and *perspective*. A third, and perhaps the most important, advance attended the application of algebra to geometry by Descartes, who thereby founded *analytical geometry*. The new fields thus opened up were diligently explored, but the calculus exercised the greatest attraction and relatively little progress was made in geometry until the beginning of the 19th century, when a new era opened.

Gaspard Monge was the first important contributor, stimulating analytical and differential geometry and founding *descriptive geometry* in a series of papers and especially in his lectures at the École polytechnique. Projective geometry, founded by Desargues, Pascal, Monge and L. N. M. Carnot, was crystallized by J. V. Poncelet, the creator of the modern methods. In his *Traité des propriétés des figures* (1822) the line and circular points at infinity, imaginaries, polar reciprocation, homology, cross-ratio and projection are systematically employed. In Germany, A. F. Möbius, J. Plücker and J. Steiner were making far-reaching contributions. Möbius, in his *Barycentrische Calcul* (1827), introduced homogeneous co-ordinates, and also the powerful notion of geometrical transformation, including the special cases of collineation and duality; Plücker, in his *Analytisch-geometrische Entwickelungen* (1828–1831), and his *System der analytischen Geometrie* (1835), introduced the abridged notation, line and plane co-ordinates, and the conception of generalized space elements; while Steiner, besides enriching geometry in numerous directions, was the first to systematically generate figures by projective pencils. We may also notice M. Chasles, whose *Aperçu historique* (1837) is a classic. Synthetic geometry, characterized by its fruitfulness and beauty, attracted most attention, and it so happened that its originally weak logical foundations became replaced by a more substantial set of axioms. These were found in the anharmonic ratio, a device leading to the liberation of synthetic geometry from metrical relations, and in involution, which yielded rigorous definitions of imaginaries. These innovations were made by K. J. C. von Staudt. Analytical geometry was stimulated by the algebra of invariants, a subject much developed by A. Cayley, G. Salmon, S. H. Aronhold, L. O. Hesse, and more particularly by R. F. A. Clebsch.

The introduction of the line as a space element, initiated by

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H. Grassmann (1844) and Cayley (1850), yielded at the hands of Plücker a new geometry, termed *line geometry*, a subject developed more notably by F. Klein, Clebsch, C. T. Reye and F. O. R. Sturm (see Section V., *Line Geometry*).

Non-euclidean geometries, having primarily their origin in the discussion of Euclidean parallels, and treated by Wallis, Saccheri and Lambert, have been especially developed during the 19th century. Four lines of investigation may be distinguished:—the naïve-synthetic, associated with Lobatschewski, Bolyai, Gauss; the metric differential, studied by Riemann, Helmholtz, Beltrami; the projective, developed by Cayley, Klein, Clifford; and the critical-synthetic, promoted chiefly by the Italian mathematicians Peano, Veronese, Burali-Forte, Levi Civitta, and the Germans Pasch and Hilbert. (C. E.*)

I. Euclidean Geometry

This branch of the science of geometry is so named since its methods and arrangement are those laid down in Euclid's *Elements*.

§ 1. *Axioms.*—The object of geometry is to investigate the properties of space. The first step must consist in establishing those fundamental properties from which all others follow by processes of deductive reasoning. They are laid down in the Axioms, and these ought to form such a system that nothing need be added to them in order fully to characterize space, and that nothing may be omitted without making the system incomplete. They must, in fact, completely "define" space.

§ 2. *Definitions.*—The axioms of Euclidean Geometry are obtained from inspection of existent space and of solids in existent space,—hence from experience. The same source gives us the notions of the geometrical entities to which the axioms relate, viz. solids, surfaces, lines or curves, and points. A solid is directly given by experience; we have only to abstract all material from it in order to gain the notion of a geometrical solid. This has shape, size, position, and may be moved. Its boundary or boundaries are called surfaces. They separate one part of space from another, and are said to have no thickness. Their boundaries are curves or lines, and these have length only. Their boundaries, again, are points, which have no magnitude but only position. We thus come in three steps from solids to points which have no magnitude; in each step we lose one extension. Hence we say a solid has three dimensions, a surface two, a line one, and a point none. Space itself, of which a solid forms only a part, is also said to be of three dimensions. The same thing is intended to be expressed by saying that a solid has length, breadth and thickness, a surface length and breadth, a line length only, and a point no extension whatsoever.

Euclid gives the essence of these statements as definitions:—

Def. 1, I. *A point is that which has no parts, or which has no magnitude.*

Def. 2, I. *A line is length without breadth.*

Def. 5, I. *A superficies is that which has only length and breadth.*

Def. 1, XI. *A solid is that which has length, breadth and thickness.*

It is to be noted that the synthetic method is adopted by Euclid; the analytical derivation of the successive ideas of "surface," "line," and "point" from the experimental realization of a "solid" does not find a place in his system, although possessing more advantages.

If we allow motion in geometry, we may generate these entities by moving a point, a line, or a surface, thus:—

The path of a moving point is a line.
The path of a moving line is, in general, a surface.
The path of a moving surface is, in general, a solid.

And we may then assume that the lines, surfaces and solids, as defined before, can all be generated in this manner. From this generation of the entities it follows again that the boundaries—the first and last position of the moving element—of a line are points, and so on; and thus we come back to the considerations with which we started.

Euclid points this out in his definitions,—Def. 3, I., Def. 6, I., and Def. 2, XI. He does not, however, show the connexion which these definitions have with those mentioned before. When points and lines have been defined, a statement like Def. 3, I., "The extremities of a line are points," is a proposition which either has to be proved, and then it is a theorem, or which has to be taken for granted, in which case it is an axiom. And so with Def. 6, I., and Def. 2, XI.

§ 3. Euclid's definitions mentioned above are attempts to describe, in a few words, notions which we have obtained by inspection of and abstraction from solids. A few more notions have to be added to these, principally those of the simplest line—the straight line, and of the simplest surface—the flat surface or plane. These notions we possess, but to define them accurately is difficult. Euclid's Definition 4, I., "A straight line is that which lies evenly between its extreme points," must be meaningless to any one who has not the notion of straightness in his mind. Neither does it state a property of the straight line which can be used in any further investigation. Such a property is given in Axiom 10, I. It is really this axiom, together with Postulates 2 and 3, which characterizes the straight line.

Whilst for the straight line the verbal definition and axiom are kept apart, Euclid mixes them up in the case of the plane. Here the Definition 7, I., includes an axiom. It defines a plane as a surface which has the property that every straight line which joins any two points in it lies altogether in the surface. But if we take a straight line and a point in such a surface, and draw all straight lines which join the latter to all points in the first line, the surface will be fully determined. This construction is therefore sufficient as a definition. That every other straight line which joins any two points in this surface lies altogether in it is a further property, and to assume it gives another axiom.

Thus a number of Euclid's axioms are hidden among his first definitions. A still greater confusion exists in the present editions of Euclid between the postulates and axioms so called, which is due to later editors and not to Euclid himself. The latter had the last three axioms put together with the postulates (*αἰτήματα*), so that these were meant to include all assumptions relating to space. The remaining assumptions, which relate to magnitudes in general, viz. the first eight "axioms" in modern editions, were called "common notions" (*κοιναὶ ἔννοιαι*). Of the latter a few may be said to be definitions. Thus the eighth might be taken as a definition of "equal," and the seventh of "halves." If we wish to collect the axioms used in Euclid's *Elements*, we have therefore to take the three postulates, the last three axioms as generally given, a few axioms hidden in the definitions, and an axiom used by Euclid in the proof of Prop. 4, I, and on a few other occasions, viz. that figures may be moved in space without change of shape or size.

§ 4. *Postulates.*—The assumptions actually made by Euclid may be stated as follows:—

(1) Straight lines exist which have the property that any one of them may be produced both ways without limit, that through any two points in space such a line may be drawn, and that any two of them coincide throughout their indefinite extensions as soon as two points in the one coincide with two points in the other. (This gives the contents of Def. 4, part of Def. 35, the first two Postulates, and Axiom 10.)

(2) Plane surfaces or planes exist having the property laid down in Def. 7, that every straight line joining any two points in such a surface lies altogether in it.

(3) Right angles, as defined in Def. 10, are possible, and all right angles are equal; that is to say, wherever in space we take a plane, and wherever in that plane we construct a right angle, all angles thus constructed will be equal, so that any one of them may be made to coincide with any other. (Axiom 11.)

(4) The 12th Axiom of Euclid. This we shall not state now, but only introduce it when we cannot proceed any further without it.

(5) Figures may be freely moved in space without change of shape or size. This is assumed by Euclid, but not stated as an axiom.

(6) In any plane a circle may be described, having any point in that plane as centre, and its distance from any other point in that plane as radius. (Postulate 3.)

The definitions which have not been mentioned are all "nominal definitions," that is to say, they fix a name for a thing described. Many of them overdetermine a figure.

§ 5. Euclid's *Elements* (see Euclid) are contained in thirteen books. Of these the first four and the sixth are devoted to "plane geometry," as the investigation of figures in a plane is generally called. The 5th book contains the theory of proportion

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which is used in Book VI. The 7th, 8th and 9th books are purely arithmetical, whilst the 10th contains a most ingenious treatment of geometrical irrational quantities. These four books will be excluded from our survey. The remaining three books relate to figures in space, or, as it is generally called, to "solid geometry." The 7th, 8th, 9th, 10th, 13th and part of the 11th and 12th books are now generally omitted from the school editions of the *Elements*. In the first four and in the 6th book it is to be understood that all figures are drawn in a plane.

BOOK I. OF EUCLID'S "ELEMENTS."

§ 6. According to the third postulate it is possible to draw in any plane a circle which has its centre at any given point, and its radius equal to the distance of this point from any other point given in the plane. This makes it possible (Prop. 1) to construct on a given line AB an equilateral triangle, by drawing first a circle with A as centre and AB as radius, and then a circle with B as centre and BA as radius. The point where these circles intersect—that they intersect Euclid quietly assumes—is the vertex of the required triangle. Euclid does not suppose, however, that a circle may be drawn which has its radius equal to the distance between any two points unless one of the points be the centre. This implies also that we are not supposed to be able to make any straight line equal to any other straight line, or to carry a distance about in space. Euclid therefore next solves the problem: It is required along a given straight line from a point in it to set off a distance equal to the length of another straight line given anywhere in the plane. This is done in two steps. It is shown in Prop. 2 how a straight line may be drawn from a given point equal in length to another given straight line not drawn from that point. And then the problem itself is solved in Prop. 3, by drawing first through the given point some straight line of the required length, and then about the same point as centre a circle having this length as radius. This circle will cut off from the given straight line a length equal to the required one. Nowadays, instead of going through this long process, we take a pair of compasses and set off the given length by its aid. This assumes that we may move a length about without changing it. But Euclid has not assumed it, and this proceeding would be fully justified by his desire not to take for granted more than was necessary, if he were not obliged at his very next step actually to make this assumption, though without stating it.

§ 7. We now come (in Prop. 4) to the first theorem. It is the fundamental theorem of Euclid's whole system, there being only a very few propositions (like Props. 13, 14, 15, I.), except those in the 5th book and the first half of the 11th, which do not depend upon it. It is stated very accurately, though somewhat clumsily, as follows:—

If two triangles have two sides of the one equal to two sides of the other, each to each, and have also the angles contained by those sides equal to one another, they shall also have their third sides equal, and the two triangles shall be equal; and their other angles shall be equal, each to each, namely, those to which the equal sides are opposite.

This is to say, the triangles are "identically" equal, and one may be considered as a copy of the other. The proof is very simple. The first triangle is taken up and placed on the second, so that the parts of the triangles which are known to be equal fall upon each other. It is then easily seen that all the remaining parts of one coincide with those of the other, and that they are therefore equal. This process of applying one figure to another Euclid scarcely uses again, though many proofs would be simplified by doing so. The process introduces motion into geometry, and includes, as already stated, the axiom that figures may be moved without change of shape or size.

If the last proposition be applied to an isosceles triangle, which has two sides equal, we obtain the theorem (Prop. 5), *if two sides of a triangle are equal, then the angles opposite these sides are equal.*

Euclid's proof is somewhat complicated, and a stumbling-block to many schoolboys. The proof becomes much simpler if we consider the isosceles triangle ABC (AB = AC) twice over, once as the triangle BAC, and once as a triangle CAB; and now remember that AB, AC in the first are equal respectively to AC, AB in the second, and the angles included by these sides are equal. Hence the triangles are equal, and the angles in the one are equal to those in the other, viz. those which are opposite equal sides, *i.e.* angle ABC in the first equals angle ACB in the second, as they are opposite the equal sides AC and AB in the two triangles.

There follows the converse theorem (Prop. 6). *If two angles in a triangle are equal, then the sides opposite them are equal,*—*i.e.* the triangle is isosceles. The proof given consists in what is called a *reductio ad absurdum*, a kind of proof often used by Euclid, and principally in proving the converse of a previous theorem. It assumes that the theorem to be proved is wrong, and then shows that this assumption leads to an absurdity, *i.e.* to a conclusion which is in contradiction to a proposition proved before—that therefore the assumption made cannot be true, and hence that the theorem is true. It is often stated that Euclid invented this kind of proof, but the method is most likely much older.

§ 8. It is next proved that *two triangles which have the three sides of the one equal respectively to those of the other are identically equal, hence that the angles of the one are equal respectively to those of the other, those being equal which are opposite equal sides.* This is Prop. 8, Prop. 7 containing only a first step towards its proof.

These theorems allow now of the solution of a number of problems, viz.:—

To bisect a given angle (Prop. 9).

To bisect a given finite straight line (Prop. 10).

To draw a straight line perpendicularly to a given straight line through a given point in it (Prop. 11), *and also through a given point not in it* (Prop. 12).

The solutions all depend upon properties of isosceles triangles.

§ 9. The next three theorems relate to angles only, and might have been proved before Prop. 4, or even at the very beginning. The first (Prop. 13) says, *The angles which one straight line makes with another straight line on one side of it either are two right angles or are together equal to two right angles.* This theorem would have been unnecessary if Euclid had admitted the notion of an angle such that its two limits are in the same straight line, and had besides defined the sum of two angles.

Its converse (Prop. 14) is of great use, inasmuch as it enables us in many cases to prove that two straight lines drawn from the same point are one the continuation of the other. So also is

Prop. 15. *If two straight lines cut one another, the vertical or opposite angles shall be equal.*

§ 10. Euclid returns now to properties of triangles. Of great importance for the next steps (though afterwards superseded by a more complete theorem) is

Prop. 16. *If one side of a triangle be produced, the exterior angle shall be greater than either of the interior opposite angles.*

Prop. 17. *Any two angles of a triangle are together less than two right angles*, is an immediate consequence of it. By the aid of these two, the following fundamental properties of triangles are easily proved:—

Prop. 18. *The greater side of every triangle has the greater angle opposite to it*;

Its converse, Prop. 19. *The greater angle of every triangle is subtended by the greater side, or has the greater side opposite to it*;

Prop. 20. *Any two sides of a triangle are together greater than the third side*;

And also Prop. 21. *If from the ends of the side of a triangle there be drawn two straight lines to a point within the triangle, these shall be less than the other two sides of the triangle, but shall contain a greater angle.*

§ 11. Having solved two problems (Props. 22, 23), he returns to two triangles which have two sides of the one equal respectively to two sides of the other. It is known (Prop. 4) that if the included angles are equal then the third sides are equal; and conversely (Prop. 8), if the third sides are equal, then the angles included by the first sides are equal. From this it follows that if the included angles are not equal, the third sides are not equal; and conversely, that if the third sides are not equal, the included angles are not equal. Euclid now completes this knowledge by proving, that "*if the included angles are not equal, then the third side in that triangle is the greater which contains the greater angle*"; and conversely, that "*if the third sides are unequal, that triangle contains the greater angle which contains the greater side.*" These are Prop. 24 and Prop. 25.

§ 12. The next theorem (Prop. 26) says that *if two triangles have one side and two angles of the one equal respectively to one side and two angles of the other, viz. in both triangles either the angles adjacent to the equal side, or one angle adjacent and one angle opposite it, then the two triangles are identically equal.*

This theorem belongs to a group with Prop. 4 and Prop. 8. Its first case might have been given immediately after Prop. 4, but the second case requires Prop. 16 for its proof.

§ 13. We come now to the investigation of parallel straight lines, *i.e.* of straight lines which lie in the same plane, and cannot be made to meet however far they be produced either way. The investigation which starts from Prop. 16, will become clearer if a few names be explained which are not all used by Euclid. If two straight lines be cut by a third, the latter is now generally called a "transversal" of the figure. It forms at the two points where it cuts the given lines four angles with each. Those of the angles which lie between the given lines are called interior angles, and of these, again, any two which lie on opposite sides of the transversal but one at each of the two points are called "alternate angles."

We may now state Prop. 16 thus:—*If two straight lines which meet are cut by a transversal, their alternate angles are unequal.* For the lines will form a triangle, and one of the alternate angles will be an exterior angle to the triangle, the other interior and opposite to it.

From this follows at once the theorem contained in Prop. 27. *If two straight lines which are cut by a transversal make alternate angles equal, the lines cannot meet, however far they be produced, hence they are parallel.* This proves the existence of parallel lines.

Prop. 28 states the same fact in different forms. *If a straight line, falling on two other straight lines, make the exterior angle equal to the interior and opposite angle on the same side of the line, or make*

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the interior angles on the same side together equal to two right angles, the two straight lines shall be parallel to one another.

Hence we know that, " if two straight lines which are cut by a transversal meet, their alternate angles are not equal "; and hence that, " if alternate angles are equal, then the lines are parallel."

The question now arises, Are the propositions converse to these true or not? That is to say, "If alternate angles are unequal, do the lines meet?" And "if the lines are parallel, are alternate angles necessarily equal?"

The answer to either of these two questions implies the answer to the other. But it has been found impossible to prove that the negation or the affirmation of either is true.

The difficulty which thus arises is overcome by Euclid assuming that the first question here put is to be answered in the affirmative. This gives his last axiom (12), which we quote in his own words.

Axiom 12.—*If a straight line meet two straight lines, so as to make the two interior angles on the same side of it taken together less than two right angles, these straight lines, being continually produced, shall at length meet on that side on which are the angles which are less than two right angles.*

The answer to the second of the above questions follows from this, and gives the theorem Prop. 29—*If a straight line fall on two parallel straight lines, it makes the alternate angles equal to one another, and the exterior angle equal to the interior and opposite angle on the same side, and also the two interior angles on the same side together equal to two right angles.*

§ 14. With this a new part of elementary geometry begins. The earlier propositions are independent of this axiom, and would be true even if a wrong assumption had been made in it. They all relate to figures in a plane. But it is only one among an infinite number of conceivable surfaces. We may draw figures on any one of them and study their properties. We may, for instance, take a sphere instead of the plane, and obtain "spherical" in the place of "plane" geometry. If on one of these surfaces lines and figures could be drawn, answering to all the definitions of our plane figures, and if the axioms with the exception of the last all hold, then all propositions up to the 28th will be true for these figures. This is the case in spherical geometry if we substitute "shortest line" or "great circle" for "straight line," "small circle" for "circle," and if, besides, we limit all figures to a part of the sphere which is less than a hemisphere, so that two points on it cannot be opposite ends of a diameter, and therefore determine always one and only one great circle.

For spherical triangles, therefore, all the important propositions 4, 8, 26; 5 and 6; and 18, 19 and 20 will hold good.

This result will be sufficient to show the impossibility of proving Euclid's last axiom, which would mean proving that this axiom is a consequence of the others, and hence that the theory of parallels would hold on a spherical surface, where the other axioms do hold, whilst parallels do not even exist.

It follows that the axiom in question states an inherent difference between the plane and other surfaces, and that the plane is only fully characterized when this axiom is added to the other assumptions.

§ 15. The introduction of the new axiom and of parallel lines leads to a new class of propositions.

After proving (Prop. 30) that "*two lines which are each parallel to a third are parallel to each other*," we obtain the new properties of triangles contained in Prop. 32. Of these the second part is the most important, viz. the theorem, *The three interior angles of every triangle are together equal to two right angles.*

As easy deductions now follow, Euclid but added by Simson follow the propositions about the angles in polygons; they are given in English editions as corollaries to Prop. 32.

These theorems do not hold for spherical figures. The sum of the interior angles of a spherical triangle is always greater than two right angles, and increases with the area.

§ 16. The theory of parallels as such may be said to be finished with Props. 33 and 34, which state properties of the parallelogram, i.e. of a quadrilateral formed by two pairs of parallels. They are—

Prop. 33. *The straight lines which join the extremities of two equal and parallel straight lines towards the same parts are themselves equal and parallel*; and

Prop. 34. *The opposite sides and angles of a parallelogram are equal to one another, and the diameter (diagonal) bisects the parallelogram, that is, divides it into two equal parts.*

§ 17. The rest of the first book relates to areas of figures.

The theory is made to depend on two pairs of theorems—

Prop. 35. *Parallelograms on the same base and between the same parallels are equal to one another*; and

Prop. 36. *Parallelograms on equal bases and between the same parallels are equal to one another.*

As each parallelogram is bisected by a diagonal, the last theorems hold also if the word parallelogram be replaced by "triangle," as is done in Props. 37 and 38.

It is to be remarked that Euclid proves these propositions only in the case when the parallelograms or triangles have their bases in the same straight line.

The theorems converse to the last form the contents of the next three propositions, viz.: Props. 40 and 41.—*Equal triangles, on the same or on equal bases, in the same straight line, and on the same side of it, are between the same parallels.*

That the two cases here stated are given by Euclid in two separate propositions proved separately is characteristic of his method.

§ 18. To compare areas of other figures, Euclid shows first, in Prop. 42, how *to draw a parallelogram which is equal in area to a given triangle, and has one of its angles equal to a given angle.* If the given angle is right, then the problem is solved *to draw a "rectangle" equal in area to a given triangle.*

Next this parallelogram is transformed into another parallelogram, *which has one of its sides equal to a given straight line*, whilst its angles remain unaltered. This may be done by aid of the theorem in

Prop. 43. *The complements of the parallelograms which are about the diameter of any parallelogram are equal to one another.*

Thus the problem (Prop. 44) is solved *to construct a parallelogram on a given line, which is equal in area to a given triangle, and which has one angle equal to a given angle* (generally a right angle).

As every polygon can be divided into a number of triangles, we can now construct a parallelogram having a given angle, say a right angle, and being equal in area to a given polygon. For each of the triangles into which the polygon has been divided, a parallelogram may be constructed, having one side equal to a given straight line and one angle equal to a given angle. If these parallelograms be placed side by side, they may be added together to form a single parallelogram, having still one side of the given length. This is done in Prop. 45.

Herewith a means is found to compare areas of different polygons. We need only construct two rectangles equal in area to the given polygons, and having each one side of given length. By comparing the unequal sides we are enabled to judge whether the areas are equal, or which is the greater. Euclid does not state this consequence, but the problem is taken up again at the end of the second book, where it is shown how to construct a square equal in area to a given polygon.

Prop. 46 is: *To describe a square on a given straight line.*

§ 19. The first book concludes with one of the most important theorems in the whole of geometry, and one which has been celebrated since the earliest times. It is stated, but on doubtful authority, that Pythagoras discovered it, and it has been called by his name. If we call that side in a right-angled triangle which is opposite the right angle the hypotenuse, we may state it as follows:—

Theorem of Pythagoras (Prop. 47).—*In every right-angled triangle the square on the hypotenuse is equal to the sum of the squares of the other sides.*

And conversely—

Prop. 48. *If the square described on one of the sides of a triangle be equal to the squares described on the other sides, then the angle contained by these two sides is a right angle.*

On this theorem (Prop. 47) almost all geometrical measurement depends, which cannot be directly obtained.

Book II.

§ 20. The propositions in the second book are very different in character from those in the first; they all relate to areas of rectangles and squares. Their true significance is best seen by stating them in an algebraic form. This is often done by expressing the lengths of lines by aid of numbers, which tell how many times a chosen unit is contained in the lines. If the unit be such that it is contained an exact number of times in each side of a rectangle, it is easily seen, and generally shown in the teaching of arithmetic, that the rectangle contains a number of unit squares equal to the product of the numbers which measure the sides, a unit square being the square on the unit line. If, however, no such unit can be found, this process requires that connexion between lines and numbers which is only established by aid of ratios of lines, and which is therefore at this stage altogether inadmissible. But there exists another way of connecting these propositions with algebra, based on modern notions which seem destined greatly to change and to simplify mathematics. We shall introduce here as much of it as is required for our present purpose.

At the beginning of the second book we find a definition according to which "a rectangle is said to be 'contained' by the two sides which contain one of its right angles"; in the text this phraseology is extended by speaking of rectangles contained by any two straight lines, meaning the rectangle which has two adjacent sides equal to the two straight lines.

We shall denote a finite straight line by a single small letter, *a*, *b*, *c*, ... *x*, and the area of the rectangle contained by two lines *a* and *b* by *ab*, and this we shall call the product of the two lines *a* and *b*. It will be understood that this definition has nothing to do with the definition of a product of numbers.

We define as follows:—

The *sum* of two straight lines *a* and *b* means a straight line *c* which may be divided in two parts equal respectively to *a* and *b*. This sum is denoted by $a+b$.

The *difference* of two lines *a* and *b* (in symbols, $a-b$) means a line *c* which when added to *b* gives *a*; that is,

$$a-b=c \text{ if } b+c=a.$$

The *product* of two lines *a* and *b* (in symbols, *ab*) means the area

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of the rectangle contained by the lines a and b. For aa, which means the square on the line a, we write a^2.

§ 21. The first ten of the fourteen propositions of the second book may then be written in the form of formulae as follows:—

Prop. 1. $a(b+c+d+\ldots)=ab+ac+ad+\ldots$
" 2. $ab+ac=a^2$ if $b+c=a$.
" 3. $a(a+b)=a^2+ab$.
" 4. $(a+b)^2=a^2+2ab+b^2$.
" 5. $(a+b)\,(a-b)+b^2=a^2$.
" 6. $(a+b)\,(a-b)+b^2=a^2$.
" 7. $a^2+(a-b)^2=2a(a-b)+b^2$.
" 8. $4(a+b)a+b^2=(2a+b)^2$.
" 9. $(a+b)^2+(a-b)^2=2a^2+2b^2$.
" 10. $(a+b)^2+(a-b)^2=2a^2+2b^2$.

It will be seen that 5 and 6, and also 9 and 10, are identical. In Euclid's statement they do not look the same, the figures being arranged differently.

If the letters $a, b, c, \ldots$ denoted numbers, it follows from algebra that each of these formulae is true. But this does not prove them in our case, where the letters denote lines, and their products are areas without any reference to numbers. To prove them we have to discover the laws which rule the operations introduced, viz. addition and multiplication of segments. This we shall do now; and we shall find that these laws are the same with those which hold in algebraical addition and multiplication.

§ 22. In a sum of numbers we may change the order in which the numbers are added, and we may also add the numbers together in groups and then add these groups. But this also holds for the sum of segments and for the sum of rectangles, as a little consideration shows. That the sum of rectangles has always a meaning follows from the Props. 43-45 in the first book. These laws about addition are reducible to the two—

$$a+b=b+a \quad . \quad . \quad . \quad (1),$$
$$a+(b+c)=a+b+c \quad . \quad . \quad . \quad (2);$$

or, when expressed for rectangles,

$$ab+ed=ed+ab \quad . \quad . \quad . \quad (3),$$
$$ab+(cd+ef)=ab+cd+ef \quad . \quad . \quad . \quad (4).$$

The brackets mean that the terms in the bracket have been added together before they are added to another term. The more general cases for more terms may be deduced from the above.

For the product of two numbers we have the law that it remains unaltered if the factors be interchanged. This also holds for our geometrical product. For if ab denotes the area of the rectangle which has a as base and b as altitude, then ba will denote the area of the rectangle which has b as base and a as altitude. But in a rectangle we may take either of the two lines which contain it as base, and then the other will be the altitude. This gives

$$ab=ba \quad . \quad . \quad . \quad (5).$$

In order further to multiply a sum by a number, we have in algebra the rule:—Multiply each term of the sum, and add the products thus obtained. That this holds for our geometrical products is shown by Euclid in his first proposition of the second book, where he proves that the area of a rectangle whose base is the sum of a number of segments is equal to the sum of rectangles which have these segments separately as bases. In symbols this gives, in the simplest case,

$$\left.\begin{aligned} a(b+c)&=ab+ac \\ (b+c)a&=ba+ca \end{aligned}\right\} \quad . \quad . \quad . \quad (6).$$

and

To these laws, which have been investigated by Sir William Hamilton and by Hermann Grassmann, the former has given special names. He calls the laws expressed in

(1) and (3) the commutative law for addition;
(5) " " multiplication;
(2) and (4) the associative laws for addition;
(6) the distributive law.

§ 23. Having proved that these six laws hold, we can at once prove every one of the above propositions in their algebraical form.

The first is proved geometrically, it being one of the fundamental laws. The next two propositions are only special cases of the first. Of the others we shall prove one, viz. the fourth:—

$$(a+b)^2=(a+b)\,(a+b)=(a+b)a+(a+b)b \quad \text{by (6).}$$
But $$(a+b)a=aa+ba \quad \text{by (6),}$$
$$=aa+ab \quad \text{by (5);}$$
and $$(a+b)b=ab+bb \quad \text{by (6).}$$
Therefore $$\left.\begin{aligned}(a+b)^2&=aa+ab+(ab+bb)\\&=aa+(ab+ab)+bb\\&=aa+2ab+bb\end{aligned}\right\} \quad \text{by (4).}$$

This gives the theorem in question.

In the same manner every one of the first ten propositions is proved.

It will be seen that the operations performed are exactly the same as if the letters denoted numbers.

Props. 5 and 6 may also be written thus—

$$(a+b)\,(a-b)=a^2-b^2.$$

Prop. 7, which is an easy consequence of Prop. 4, may be transformed. If we denote by c the line $a+b$, so that

$$c=a+b,\ a=c-b,$$

we get

$$c^2+(c-b)^2=2c(c-b)+b^2$$
$$=2c^2-2bc+b^2.$$

Subtracting c^2 from both sides, and writing a for c, we get

$$(a-b)^2=a^2-2ab+b^2.$$

In Euclid's *Elements* this form of the theorem does not appear, all propositions being so stated that the notion of subtraction does not enter into them.

§ 24. The remaining two theorems (Props. 12 and 13) connect the square on one side of a triangle with the sum of the squares on the other sides, in case that the angle between the latter is acute or obtuse. They are important theorems in trigonometry, where it is possible to include them in a single theorem.

§ 25. There are in the second book two problems, Props. 11 and 14.

If written in the above symbolic language, the former requires to find a line x such that $a(a-x)=x^2$. Prop. 11 contains, therefore, the solution of a quadratic equation, which we may write $x^2+ax=a^2$. The solution is required later on in the construction of a regular decagon.

More important is the problem in the last proposition (Prop. 14). It requires the construction of a square equal in area to a given rectangle, hence a solution of the equation

$$x^2=ab.$$

In Book I., 42-45, it has been shown how a rectangle may be constructed equal in area to a given figure bounded by straight lines. By aid of the new proposition we may therefore now determine a line such that the square on that line is equal in area to any given rectilinear figure, or we can *square* any such figure.

As of two squares that is the greater which has the greater side, it follows that now the comparison of two areas has been reduced to the comparison of two lines.

The problem of reducing other areas to squares is frequently met with among Greek mathematicians. We need only mention the problem of squaring the circle (see CIRCLE).

In the present day the comparison of areas is performed in a simpler way by reducing all areas to rectangles having a common base. Their altitudes give then a measure of their areas.

The construction of a rectangle having the base a, and being equal in area to a given rectangle, depends upon Prop. 43, I. This therefore gives a solution of the equation

$$ab=ax,$$

where x denotes the unknown altitude.

Book III.

§ 26. The third book of the *Elements* relates exclusively to properties of the circle. A circle and its circumference have been defined in Book I., Def. 15. We restate it here in slightly different words:—

Definition.—The circumference of a circle is a plane curve such that all points in it have the same distance from a fixed point in the plane. This point is called the "centre" of the circle.

Of the new definitions, of which eleven are given at the beginning of the third book, a few only require special mention. The first, which says that circles with equal radii are equal, is in part a theorem, but easily proved by applying the one circle to the other. Or it may be considered proved by aid of Prop. 24, equal circles not being used till after this theorem.

In the second definition is explained what is meant by a line which "touches" a circle. Such a line is now generally called a tangent to the circle. The introduction of this name allows us to state many of Euclid's propositions in a much shorter form.

For the same reason we shall call a straight line joining two points on the circumference of a circle a "chord."

Definitions 4 and 5 may be replaced with a slight generalization by the following:—

Definition.—By the distance of a point from a line is meant the length of the perpendicular drawn from the point to the line.

§ 27. From the definition of a circle it follows that every circle has a centre. Prop. 1 requires to find it when the circle is given, *i.e.* when the circumference is drawn.

To solve this problem a chord is drawn (that is, any two points in the circumference are joined), and through the point where this is bisected a perpendicular to it is erected. Euclid then proves, first, that no point off this perpendicular can be the centre, hence that the centre must lie in this line; and, secondly, that of the points on the perpendicular one only can be the centre, viz. the one which bisects the parts of the perpendicular bounded by the circle. In the second part Euclid silently assumes that the perpendicular there used does cut the circumference in two, and only in two points. The proof therefore is incomplete. The proof of the first part, however, is exact. By drawing two non-parallel chords, and the perpendiculars which bisect them, the centre will be found as the point where these perpendiculars intersect.

§ 28. In Prop. 2 it is proved that a chord of a circle lies altogether within the circle.

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What we have called the first part of Euclid's solution of Prop. 1 may be stated as a theorem:—

Every straight line which bisects a chord, and is at right angles to it, passes through the centre of the circle.

The converse to this gives Prop. 3, which may be stated thus:—

If a straight line through the centre of a circle bisect a chord, then it is perpendicular to the chord, and if it be perpendicular to the chord it bisects it.

An easy consequence of this is the following theorem, which is essentially the same as Prop. 4:—

Two chords of a circle, of which neither passes through the centre, cannot bisect each other.

These last three theorems are fundamental for the theory of the circle. It is to be remarked that Euclid never proves that a straight line cannot have more than two points in common with a circumference.

§ 29. The next two propositions (5 and 6) might be replaced by a single and a simpler theorem, viz:—

Two circles which have a common centre, and whose circumferences have one point in common, coincide.

Or, more in agreement with Euclid's form:—

Two different circles, whose circumferences have a point in common, cannot have the same centre.

That Euclid treats of two cases is characteristic of Greek mathematics.

The next two propositions (7 and 8) again belong together. They may be combined thus:—

If from a point in a plane of a circle, which is not the centre, straight lines be drawn to the different points of the circumference, then of all these lines one is the shortest, and one the longest, and these lie both in that straight line which joins the given point to the centre. Of all the remaining lines each is equal to one and only one other, and these equal lines lie on opposite sides of the shortest or longest, and make equal angles with them.

Euclid distinguishes the two cases where the given point lies within or without the circle, omitting the case where it lies in the circumference.

From the last proposition it follows that if from a point more than two equal straight lines can be drawn to the circumference, this point must be the centre. This is Prop. 9.

As a consequence of this we get

If the circumferences of the two circles have three points in common they coincide.

For in this case the two circles have a common centre, because from the centre of the one three equal lines can be drawn to points on the circumference of the other. But two circles which have a common centre, and whose circumferences have a point in common, coincide. (Compare above statement of Props. 5 and 6.)

This theorem may also be stated thus:—

Through three points only one circumference may be drawn; or, *Three points determine a circle.*

Euclid does not give the theorem in this form. He proves, however, *that the two circles cannot cut another in more than two points* (Prop. 10), and *that two circles cannot touch one another in more points than one* (Prop. 13).

§ 30. Propositions 11 and 12 assert that *if two circles touch, then the point of contact lies on the line joining their centres.* This gives two propositions, because the circles may touch either internally or externally.

§ 31. Propositions 14 and 15 relate to the length of chords. The first says *that equal chords are equidistant from the centre, and that chords which are equidistant from the centre are equal*;

Whilst Prop. 15 compares unequal chords, viz. *Of all chords the diameter is the greatest, and of other chords that is the greater which is nearer to the centre*; and conversely, *the greater chord is nearer to the centre.*

§ 32. In Prop. 16 the tangent to a circle is for the first time introduced. The proposition is meant to show that the straight line at the end point of the diameter and at right angles to it is a tangent. The proposition itself does not state this. It runs thus:—

Prop. 16. *The straight line drawn at right angles to the diameter of a circle, from the extremity of it, falls without the circle; and no straight line can be drawn from the extremity, between that straight line and the circumference, so as not to cut the circle.*

Corollary.—The straight line at right angles to a diameter drawn through the end point of it touches the circle.

The statement of the proposition and its whole treatment show the difficulties which the tangents presented to Euclid.

Prop. 17 solves the problem *through a given point, either in the circumference or without it, to draw a tangent to a given circle.*

Closely connected with Prop. 16 are Props. 18 and 19, which state (Prop. 18), *that the line joining the centre of a circle to the point of contact of a tangent is perpendicular to the tangent*; and conversely (Prop. 19), *that the straight line through the point of contact of, and perpendicular to, a tangent to a circle passes through the centre of the circle.*

§ 33. The rest of the book relates to angles connected with a circle, viz. angles which have the vertex either at the centre or on the circumference, and which are called respectively angles at the centre and angles at the circumference. Between these two kinds of angles exists the important relation expressed as follows:—

Prop. 20. *The angle at the centre of a circle is double of the angle at the circumference on the same base, that is, on the same arc.*

This is of great importance for its consequences, of which the two following are the principal:—

Prop. 21. *The angles in the same segment of a circle are equal to one another*;

Prop. 22. *The opposite angles of any quadrilateral figure inscribed in a circle are together equal to two right angles.*

Further consequences are:—

Prop. 23. *On the same straight line, and on the same side of it, there cannot be two similar segments of circles, not coinciding with one another.*

Prop. 24. *Similar segments of circles on equal straight lines are equal to one another.*

The problem Prop. 25. *A segment of a circle being given to describe the circle of which it is a segment*, may be solved much more easily by aid of the construction described in relation to Prop. 1, III., in § 27.

§ 34. There follow four theorems connecting the angles at the centre, the arcs into which they divide the circumference, and the chords subtending these arcs. They are expressed for angles, arcs and chords in equal circles, but they hold also for angles, arcs and chords in the same circle.

The theorems are:—

Prop. 26. *In equal circles equal angles stand on equal arcs, whether they be at the centres or circumferences*;

Prop. 27. (converse to Prop. 26). *In equal circles the angles which stand on equal arcs are equal to one another, whether they be at the centres or the circumferences*;

Prop. 28. *In equal circles equal straight lines* (equal chords) *cut off equal arcs, the greater equal to the greater, and the less equal to the less*;

Prop. 29 (converse to Prop. 28). *In equal circles equal arcs are subtended by equal straight lines.*

§ 35. Other important consequences of Props. 20-22 are:—

Prop. 31. *In a circle the angle in a semicircle is a right angle; but the angle in a segment greater than a semicircle is less than a right angle; and the angle in a segment less than a semicircle is greater than a right angle*;

Prop. 32. *If a straight line touch a circle, and from the point of contact a straight line be drawn cutting the circle, the angles which this line makes with the line touching the circle shall be equal to the angles which are in the alternate segments of the circle.*

§ 36. Propositions 30, 33, 34 contain problems which are solved by aid of the propositions preceding them:—

Prop. 30. *To bisect a given arc, that is, to divide it into two equal parts*;

Prop. 33. *On a given straight line to describe a segment of a circle containing an angle equal to a given rectilineal angle*;

Prop. 34. *From a given circle to cut off a segment containing an angle equal to a given rectilineal angle.*

§ 37. If we draw chords through a point A within a circle, they will each be divided by A into two segments. Between these segments the law holds that the rectangle contained by them has the same area on whatever chord through A the segments are taken. The value of this rectangle changes, of course, with the position of A.

A similar theorem holds if the point A be taken without the circle. On every straight line through A, which cuts the circle in two points B and C, we have two segments AB and AC, and the rectangles contained by them are again equal to one another, and equal to the square on a tangent drawn from A to the circle.

The first of these theorems gives Prop. 35, and the second Prop. 36, with its corollary, whilst Prop. 37, the last of Book III., gives the converse to Prop. 36. The first two theorems may be combined in one:—

If through a point A in the plane of a circle a straight line be drawn cutting the circle in B and C, then the rectangle AB.AC has a constant value so long as the point A be fixed; and if from A a tangent AD can be drawn to the circle, touching at D, then the above rectangle equals the square on AD.

Prop. 37 may be stated thus:—

If from a point A without a circle a line be drawn cutting the circle in B and C, and another line to a point D on the circle, and AB.AC = AD², then the line AD touches the circle at D.

It is not difficult to prove also the converse to the general proposition as above stated. This proposition and its converse may be expressed as follows:—

If four points ABCD be taken on the circumference of a circle, and if the lines AB, CD, produced if necessary, meet at E, then

$$EA.EB = EC.ED;$$

and conversely, if this relation holds then the four points lie on a circle, that is, the circle drawn through three of them passes through the fourth.

That a circle may always be drawn through three points, provided that they do not lie in a straight line, is proved only later on in Book IV.

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Book IV.

§ 38. The fourth book contains only problems, all relating to the construction of triangles and polygons inscribed in and circumscribed about circles, and of circles inscribed in or circumscribed about triangles and polygons. They are nearly all given for their own sake, and not for future use in the construction of figures, as are most of those in the former books. In seven definitions at the beginning of the book it is explained what is understood by figures inscribed in or described about other figures, with special reference to the case where one figure is a circle. Instead, however, of saying that one figure is described about another, it is now generally said that the one figure is circumscribed about the other. We may then state the definitions 3 and 4 thus:—

Definition.—A polygon is said to be inscribed in a circle, and the circle is said to be circumscribed about the polygon, if the vertices of the polygon lie in the circumference of the circle.

And definitions 5 and 6 thus:—

Definition.—A polygon is said to be circumscribed about a circle, and a circle is said to be inscribed in a polygon, if the sides of the polygon are tangents to the circle.

§ 39. The first problem is merely constructive. It requires to draw in a given circle a chord equal to a given straight line, which is not greater than the diameter of the circle. The problem is not a determinate one, inasmuch as the chord may be drawn from any point in the circumference. This may be said of almost all problems in this book, especially of the next two. They are:—

Prop. 2. *In a given circle to inscribe a triangle equiangular to a given triangle;*

Prop. 3. *About a given circle to circumscribe a triangle equiangular to a given triangle.*

§ 40. Of somewhat greater interest are the next problems, where the triangles are given and the circles to be found.

Prop. 4. *To inscribe a circle in a given triangle.*

The result is that the problem has always a solution, viz. the centre of the circle is the point where the bisectors of two of the interior angles of the triangle meet. The solution shows, though Euclid does not state this, that the problem has but one solution; and also,

The three bisectors of the interior angles of any triangle meet in a point, and this is the centre of the circle inscribed in the triangle.

The solutions of most of the other problems contain also theorems. Of these we shall state those which are of special interest; Euclid does not state any one of them.

§ 41. Prop. 5. *To circumscribe a circle about a given triangle.*

The one solution which always exists contains the following:—

The three straight lines which bisect the sides of a triangle at right angles meet in a point, and this point is the centre of the circle circumscribed about the triangle.

Euclid adds in a corollary the following property:—

The centre of the circle circumscribed about a triangle lies within, on a side of, or without the triangle, according as the triangle is acute-angled, right-angled or obtuse-angled.

§ 42. Whilst it is always possible to draw a circle which is inscribed in or circumscribed about a given triangle, this is not the case with quadrilaterals or polygons of more sides. Of those for which this is possible the regular polygons, *i.e.* polygons which have all their sides and angles equal, are the most interesting. In each of them a circle may be inscribed, and another may be circumscribed about it.

Euclid does not use the word regular, but he describes the polygons in question as *equiangular* and *equilateral*. We shall use the name regular polygon. The regular triangle is equilateral, the regular quadrilateral is the square.

Euclid considers the regular polygons of 4, 5, 6 and 15 sides. For each of the first three he solves the problems—(1) to inscribe such a polygon in a given circle; (2) to circumscribe it about a given circle; (3) to inscribe a circle in, and (4) to circumscribe a circle about, such a polygon.

For the regular triangle the problems are not repeated, because more general problems have been solved.

Props. 6, 7, 8 and 9 solve these problems for the square.

The general problem of inscribing in a given circle a regular polygon of n sides depends upon the problem of dividing the circumference of a circle into n equal parts, or what comes to the same thing, of drawing from the centre of the circle n radii such that the angles between consecutive radii are equal, that is, to divide the space about the centre into n equal angles. Thus, if it is required to inscribe a square in a circle, we have to draw four lines from the centre, making the four angles equal. This is done by drawing two diameters at right angles to one another. The ends of these diameters are the vertices of the required square. If, on the other hand, tangents be drawn at these ends, we obtain a square circumscribed about the circle.

§ 43. To construct a *regular pentagon*, we find it convenient first to construct a *regular decagon*. This requires to divide the space about the centre into ten equal angles. Each will be $\frac{1}{10}$th of a right angle, or $\frac{1}{5}$th of two right angles. If we suppose the decagon constructed, and if we join the centre to the end of one side, we get an isosceles triangle, where the angle at the centre equals $\frac{1}{5}$th of two right angles; hence each of the angles at the base will be $\frac{2}{5}$ths of two right angles, as all three angles together equal two right angles. Thus we have to construct an isosceles triangle, having the angle at the vertex equal to half an angle at the base. This is solved in Prop. 10, by aid of the problem in Prop. 11 of the second book. If we make the sides of this triangle equal to the radius of the given circle, then the base will be the side of the regular decagon inscribed in the circle. This side being known the decagon can be constructed, and if the vertices are joined alternately, leaving out half their number, we obtain the regular pentagon. (Prop. 11.)

Euclid does not proceed thus. He inscribes a pentagon before the decagon. This, however, does not change the real nature of his solution, nor does his solution become simpler by not mentioning the decagon.

Once the regular pentagon is inscribed, it is easy to circumscribe another by drawing tangents at the vertices of the inscribed pentagon. This is shown in Prop. 12.

Props. 13 and 14 teach how a circle may be inscribed in or circumscribed about any given regular pentagon.

§ 44. The *regular hexagon* is more easily constructed, as shown in Prop. 15. The result is that the side of the regular hexagon inscribed in a circle is equal to the radius of the circle.

For this polygon the other three problems mentioned are not solved.

§ 45. The book closes with Prop. 16. To inscribe a regular quindecagon in a given circle. If we inscribe a regular pentagon and a regular hexagon in the circle, having one vertex in common, then the arc from the common vertex to the next vertex of the pentagon is $\frac{1}{5}$th of the circumference, and to the next vertex of the hexagon is $\frac{1}{6}$th of the circumference. The difference between these arcs is, therefore, $\frac{1}{5} - \frac{1}{6} = \frac{1}{30}$th of the circumference. The latter may, therefore, be divided into thirty, and hence also in fifteen equal parts, and the regular quindecagon be described.

§ 46. We conclude with a few theorems about regular polygons which are not given by Euclid.

The straight lines perpendicular to and bisecting the sides of any regular polygon meet in a point. The straight lines bisecting the angles in the regular polygon meet in the same point. This point is the centre of the circle circumscribed about and inscribed in the regular polygon.

We can bisect any given arc (Prop. 30, III.). Hence we can divide a circumference into $2n$ equal parts as soon as it has been divided into n equal parts, or as soon as a regular polygon of n sides has been constructed. Hence—

If a regular polygon of n sides has been constructed, then a regular polygon of $2n$ sides, of $4n$, of $8n$ sides, &c., may also be constructed.

Euclid shows how to construct regular polygons of 3, 4, 5 and 15 sides. It follows that we can construct regular polygons of

3,	6, 12, 24 . . .	sides
4,	8, 16, 32 . . .	,,
5,	10, 20, 40 . . .	,,
15,	30, 60, 120 . . .	,,

The construction of any new regular polygon not included in one of these cases will give rise to a new theorem. Till the beginning of the 19th century nothing was added to the knowledge of regular polygons as given by Euclid. Then Gauss, in his celebrated *Arithmetic*, proved that every regular polygon of 2^n+1 sides may be constructed if this number 2^n+1 be prime, and that no others except those with $2^m(2^n+1)$ sides can be constructed by elementary methods. This shows that regular polygons of 7, 9, 13 sides cannot thus be constructed, but that a regular polygon of 17 sides is possible; for $17 = 2^4+1$. The next polygon is one of 257 sides. The construction becomes already rather complicated for 17 sides.

Book V.

§ 47. The fifth book of the *Elements* is not exclusively geometrical. It contains the theory of ratios and proportion of quantities in general. This treatment, as here given, is admirable, and in every respect superior to the algebraical method by which Euclid's theory is now generally replaced. We shall treat the subject in order to show why the usual algebraical treatment of proportion is not really sound. We begin by quoting a few definitions at the beginning of Book V. which are most important. These definitions have given rise to much discussion.

The only definitions which are essential for the fifth book are Defs. 1, 2, 3, 4, 5, 6 and 7. Of the remainder 3, 8 and 9 are more than useless, and probably not Euclid's, but additions of later editors, of whom Theon of Alexandria was the most prominent. Defs. 10 and 11 belong rather to the sixth book, whilst all the others are merely nominal. The really important ones are 4, 5, 6 and 7.

§ 48. To define a magnitude is not attempted by Euclid. The first two definitions state what is meant by a "part," that is, a submultiple or measure, and by a "multiple" of a given magnitude. The meaning of Def. 4 is that two given quantities can have a ratio to one another only in case that they are comparable as to their magnitude, that is, if they are of the same kind.

Def. 3, which is probably due to Theon, professes to define a ratio, but is as meaningless as it is uncalled for, for all that is wanted is given in Defs. 5 and 7.

In Def. 5 it is explained what is meant by saying that two magnitudes have the same ratio to one another as two other magnitudes,

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and *in* Def. 7 what we have to understand by a greater or a less ratio. The 6th definition is only nominal, explaining the meaning of the word *proportional*.

Euclid represents magnitudes by lines, and often denotes them either by single letters or, like lines, by two letters. We shall use only single letters for the purpose. If a and b denote two magnitudes of the same kind, their ratio will be denoted by $a : b$; if c and d are two other magnitudes of the same kind, but possibly of a different kind from a and b, then if c and d have the same ratio to one another as a and b, this will be expressed by writing—

$$a : b :: c : d.$$

Further, if m is a (whole) number, ma shall denote the multiple of a which is obtained by taking it m times.

§ 49. The whole theory of ratios is based on Def. 5.

Def. 5. *The first of four magnitudes is said to have the same ratio to the second that the third has to the fourth when, any equimultiples whatever of the first and the third being taken, and any equimultiples whatever of the second and the fourth, if the multiple of the first be less than that of the second, the multiple of the third is also less than that of the fourth; and if the multiple of the first is equal to that of the second, the multiple of the third is also equal to that of the fourth; and if the multiple of the first is greater than that of the second, the multiple of the third is also greater than that of the fourth.*

It will be well to show at once in an example how this definition can be used, by proving the first part of the first proposition in the sixth book. *Triangles of the same altitude are to one another as their bases*, or if a and b are the bases, and α and β the areas, of two triangles which have the same altitude, then $a : b :: \alpha : \beta$.

To prove this, we have, according to Definition 5, to show—

$$\text{if } ma > nb, \text{ then } m\alpha > n\beta,$$
$$\text{if } ma = nb, \text{ then } m\alpha = n\beta,$$
$$\text{if } ma < nb, \text{ then } m\alpha < n\beta.$$

That this is true is in our case easily seen. We may suppose that the triangles have a common vertex, and their bases in the same line. We set off the base a along the line containing the bases m times; we then join the different parts of division to the vertex, and get m triangles all equal to α. The triangle on ma as base equals, therefore, $m\alpha$. If we proceed in the same manner with the base b, setting it off n times, we find that the area of the triangle on the base nb equals $n\beta$, the vertex of all triangles being the same. But if two triangles have the same altitude, then their areas are equal if the bases are equal; hence $m\alpha = n\beta$ if $ma = nb$, and if their bases are unequal, then that has the greater area which is on the greater base; in other words, $m\alpha$ is greater than, equal to, or less than $n\beta$, according as ma is greater than, equal to, or less than nb, which was to be proved.

§ 50. It will be seen that even in this example it does not become evident what a ratio really is. It is still an open question whether ratios are magnitudes which we can compare. We do not know whether the ratio of two lines is a magnitude of the same kind as the ratio of two areas. Though we might say that Def. 5 defines *equal* ratios, still we do not know whether they are equal in the sense of the axiom, that two things which are equal to a third are equal to one another. That this is the case requires a proof, and until this proof is given we shall use the $::$ instead of the sign $=$, which, however, we shall afterwards introduce.

As soon as it has been established that all ratios are like magnitudes, it becomes easy to show that, in some cases at least, they are numbers. This step was never made by Greek mathematicians. They distinguished always most carefully between continuous magnitudes and the discrete series of numbers. In modern times it has become the custom to ignore this difference.

If, in determining the ratio of two lines, a common measure can be found, which is contained m times in the first, and n times in the second, then the ratio of the two lines equals the ratio of the two numbers $m : n$. This is shown by Euclid in Prop. 5, X. But the ratio of two numbers is, as a rule, a fraction, and the Greeks did not, as we do, consider fractions as numbers. Far less had they any notion of introducing irrational numbers, which are neither whole nor fractional, as we are obliged to do if we wish to say that all ratios are numbers. The incommensurable numbers which are thus introduced as ratios of incommensurable quantities are nowadays as familiar to us as fractions; but a proof is generally omitted that we may apply to them the rules which have been established for rational numbers only. As a rule, a fraction, and the Greeks did not, as we do, consider fractions as numbers. Far less had they any notion of introducing irrational numbers, which are neither whole nor fractional, as we are obliged to do if we wish to say that all ratios are numbers. The incommensurable numbers which are thus introduced as ratios of incommensurable quantities are nowadays as familiar to us as fractions; but a proof is generally omitted that we may apply to them the rules which have been established for rational numbers only. As a rule, a treatment of ratios avoids this difficulty. His definitions hold for commensurable as well as for incommensurable quantities. Even the notion of incommensurable quantities is avoided in Book V. But he proves that the more elementary rules of algebra hold for ratios. We shall state all his propositions in that algebraical form to which we are now accustomed. This may, of course, be done without changing the character of Euclid's method.

§ 51. Using the notation explained above we express the first propositions as follows:—

Prop. 1. If $a = ma'$, $b = mb'$, $c = mc'$,
then $a + b + c = m(a' + b' + c')$.

Prop. 2. If $a = mb$, and $c = md$,
$e = nb$, and $f = nd$,
then $a + e$ is the same multiple of b as $c + f$ is of d, viz.:—

$$a + e = (m + n)b, \text{ and } c + f = (m + n)d.$$

Prop. 3. If $a = mb$, $c = md$, then is na the same multiple of b that nc is of d, viz. $na = nmb$, $nc = nmd$.

Prop. 4. If $a : b :: c : d$,
then $ma : nb :: mc : nd$.

Prop. 5. If $a = mb$, and $c = md$,
then $a - c = m(b - d)$.

Prop. 6. If $a = mb$, $c = md$,
then are $a - nb$ and $c - nd$ either equal to, or equimultiples of, b and d, viz. $a - nb = (m - n)b$ and $c - nd = (m - n)d$, where $m - n$ may be unity.

All these propositions relate to *equimultiples*. Now follow propositions about ratios which are compared as to their magnitude.

§ 52. Prop. 7. If $a = b$, then $a : c :: b : c$ and $c : a :: c : b$.

The proof is simply this. As $a = b$ we know that $ma = mb$; therefore if $ma > nc$, then $mb > nc$,
if $ma = nc$, then $mb = nc$,
if $ma < nc$, then $mb < nc$,
therefore the first proportion holds by Definition 5.

Prop. 8. If $a > b$, then $a : c > b : c$,
and $c : a < c : b$.

The proof depends on Definition 7.

Prop. 9 (converse to Prop. 7). If
$a : c :: b : c$,
or if $c : a :: c : b$, then $a = b$.

Prop. 10 (converse to Prop. 8). If
$a : c > b : c$, then $a > b$
and if $c : a < c : b$, then $a < b$.

Prop. 11. If $a : b :: c : d$,
and $a : b :: e : f$,
then $c : d :: e : f$.

In words, *if two ratios are equal to a third, they are equal to one another*. After these propositions have been proved, we have a right to consider a ratio as a *magnitude*, for only now can we consider a ratio as something for which the axiom about magnitudes holds: things which are equal to a third are equal to one another.

We shall indicate this by writing in future the sign $=$ instead of $::$. The remaining propositions, which explain themselves, may then be stated as follows:

§ 53. Prop. 12. If $a : b = c : d = e : f$,
then $a + c + e : b + d + f = a : b$.

Prop. 13. If $a : b = c : d$, and $c : d > e : f$,
then $a : b > e : f$.

Prop. 14. If $a : b = c : d$, and $a > c$, then $b > d$.

Prop. 15. Magnitudes have the same ratio to one another that their equimultiples have—

$$ma : mb = a : b.$$

Prop. 16. If a, b, c, d are magnitudes of the same kind, and if
$a : b = c : d$,
then $a : c = b : d$.

Prop. 17. If $a + b : b = c + d : d$,
then $a : b = c : d$.

Prop. 18 (converse to 17). If
$a : b = c : d$
then $a + b : b = c + d : d$.

Prop. 19. If a, b, c, d are quantities of the same kind, and if
$a : b = c : d$,
then $a - c : b - d = a : b$.

§ 54. Prop. 20. *If there be three magnitudes, and another three, which have the same ratio, taken two and two, then if the first be greater than the third, the fourth shall be greater than the sixth; and if equal, equal; and if less, less.*

If we understand by

$$a : b : c : d : e : \ldots = a' : b' : c' : d' : e' : \ldots,$$

that the ratio of any two consecutive magnitudes on the first side equals that of the corresponding magnitudes on the second side, we may write this theorem in symbols, thus:—

If a, b, c be quantities of one, and d, e, f magnitudes of the same or any other kind, such that

$$a : b :: c : d :: e : f,$$
and if $a > c$, then $d > f$,
but if $a = c$, then $d = f$,
and if $a < c$, then $d < f$.

Prop. 21. If $a : b = e : f$ and $b : c = d : e$,
or if $a : b :: c = \frac{1}{f} : \frac{1}{e} : \frac{1}{d}$

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and if $a > c$, then $d > f$,
but if $a = c$, then $d = f$,
and if $a < c$, then $d < f$.

By aid of these two propositions the following two are proved.

§ 55. Prop. 22. *If there be any number of magnitudes, and as many others, which have the same ratio, taken two and two in order, the first shall have to the last of the first magnitudes the same ratio which the first of the others has to the last.*

We may state it more generally, thus:

If $a : b :: c : d :: e : \dots = a' : b' :: c' : d' :: e' : \dots$,

then not only have two consecutive, but any two magnitudes on the first side, the same ratio as the corresponding magnitudes on the other. For instance—

$$a : c = a' : c' ; b : e = b' : e', \text{ &c.}$$

Prop. 23 we state only in symbols, viz.:—

If $a : b :: c : d :: e : \dots = \frac{1}{a} : \frac{1}{b} :: \frac{1}{c} : \frac{1}{d} :: \frac{1}{e} \cdots$,

then $a : c = c' : a'$,
$b : e = e' : b'$,

and so on.

Prop. 24 comes to this: If $a : b = c : d$ and $e : b = f : d$, then $a + e : b = c + f : d$.

Some of the propositions which are considered in the above propositions have special names. These we have omitted, as being of no use, since algebra has enabled us to bring the different operations contained in the propositions under a common point of view.

§ 56. The last proposition in the fifth book is of a different character.

Prop. 25. *If four magnitudes of the same kind be proportional, the greatest and least of them together shall be greater than the other two together.* In symbols—

If a, b, c, d be magnitudes of the same kind, and if $a : b = c : d$, and if a is the greatest, hence d the least, then $a + d > b + c$.

§ 57. We return once again to the question, What is a ratio? We have seen that we may treat ratios as magnitudes, and that all ratios are magnitudes of the same kind, for we may compare any two as to their magnitude. It will presently be shown that ratios of lines may be considered as *quotients* of lines, so that a ratio appears as answer to the question, How often is one line contained in another? But the answer to this question is given by a number, at least in some cases, and in all cases if we admit incommensurable numbers. Considered from this point of view, we may say the fifth book of the *Elements* shows that some of the simpler algebraical operations hold for incommensurable numbers. In the ordinary algebraical treatment of numbers this proof is altogether omitted, or given by a process of limits which does not seem to be natural to the subject.

Book VI.

§ 58. The sixth book contains the theory of similar figures. After a few definitions requiring terms, the first proposition gives the first application of the theory of proportion.

Prop. 1. *Triangles and parallelograms of the same altitude are to one another as their bases.*

The proof has already been considered in § 49.

From this follows easily the important theorem

Prop. 2. *If a straight line be drawn parallel to one of the sides of a triangle it shall cut the other sides, or those sides produced, proportionally: and if the sides or the sides produced be cut proportionally, the straight line which joins the points of section shall be parallel to the remaining side of the triangle.*

§ 59. The next proposition, together with one added by Simson as Prop. A, may be expressed more conveniently if we introduce a modern phraseology, viz. if in a line AB we assume a point C between A and B, we shall say that C divides AB internally in the ratio AC : CB; but if C be taken in the line AB produced, we shall say that AB is divided externally in the ratio AC : CB.

The two propositions then come to this:

Prop. 3. *The bisector of an angle in a triangle divides the opposite side internally in a ratio equal to the ratio of the two sides including that angle;* and conversely, *if a line through the vertex of a triangle divide the base internally in the ratio of the two other sides, then that line bisects the angle at the vertex.*

Simson's Prop. A. *The line which bisects an exterior angle of a triangle divides the opposite side externally in the ratio of the other sides;* and conversely, *if a line through the vertex of a triangle divide the base externally in the ratio of the sides, then it bisects an exterior angle at the vertex of the triangle.*

If we combine both we have—

The two lines which bisect the interior and exterior angles at one vertex of a triangle divide the opposite side internally and externally in the same ratio, viz. in the ratio of the other two sides.

§ 60. The next four propositions contain the theory of similar triangles, of which four cases are considered. They may be stated together.

Two triangles are similar,—

1. (Prop. 4). *If the triangles are equiangular:*

2. (Prop. 5). *If the sides of the one are proportional to those of the other;*

3. (Prop. 6). *If two sides in one are proportional to two sides in the other, and if the angles contained by these sides are equal;*

4. (Prop. 7). *If two sides in one are proportional to two sides in the other, if the angles opposite homologous sides are equal, and if the angles opposite the other homologous sides are both acute, both right or both obtuse; homologous sides being in each case those which are opposite equal angles.*

An important application of these theorems is at once made to a right-angled triangle, viz.:—

Prop. 8. *In a right-angled triangle, if a perpendicular be drawn from the right angle to the base, the triangles on each side of it are similar to the whole triangle, and to one another.*

Corollary.—From this it is manifest that the perpendicular drawn from the right angle of a right-angled triangle to the base is a mean proportional between the segments of the base, and also that each of the sides is a mean proportional between the base and the segment of the base adjacent to that side.

§ 61. There follow four propositions containing problems, in language slightly different from Euclid's, viz.:—

Prop. 9. *To divide a straight line into a given number of equal parts.*

Prop. 10. *To divide a straight line in a given ratio.*

Prop. 11. *To find a third proportional to two given straight lines.*

Prop. 12. *To find a fourth proportional to three given straight lines.*

Prop. 13. *To find a mean proportional between two given straight lines.*

The last three may be written as equations with one unknown quantity—viz. if we call the given straight lines a, b, c, and the required line x, we have to find a line x so that

Prop. 11. $a : b = b : x$;
Prop. 12. $a : b = c : x$;
Prop. 13. $a : x = x : b$.

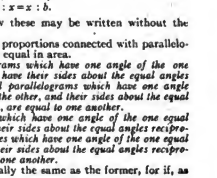
We shall see presently how these may be written without the signs of ratios.

§ 62. Euclid considers next proportions connected with parallelograms and triangles which are equal in area.

Prop. 14. *Equal parallelograms which have one angle of the one equal to one angle of the other have their sides about the equal angles reciprocally proportional; and parallelograms which have one angle of the one equal to one angle of the other, and their sides about the equal angles reciprocally proportional, are equal to one another.*

Prop. 15. *Equal triangles which have one angle of the one equal to one angle of the other, have their sides about the equal angles reciprocally proportional; and triangles which have one angle of the one equal to one angle of the other, and their sides about the equal angles reciprocally proportional, are equal to one another.*

The latter proposition is really the same as the former, for if, as in the accompanying diagram, in the figure belonging to the former the two equal parallelograms EB and BC be bisected by the lines DF and EG, and if EF be drawn, we get the figure belonging to the latter.



It is worth noticing that the lines FE and DG are parallel. We may state therefore the theorem—

If two triangles are equal in area, and have one angle in the one vertically opposite to one angle in the other, then the two straight lines which join the remaining two vertices of the one to those of the other triangle are parallel.

§ 63. A most important theorem is

Prop. 16. *If four straight lines be proportionals, the rectangle contained by the extremes is equal to the rectangle contained by the means; and if the rectangle contained by the extremes be equal to the rectangle contained by the means, the four straight lines are proportionals.*

In symbols, if a, b, c, d are the four lines, and

if $a : b = c : d$,
then $ad = bc$;
and conversely, if $ad = bc$,
then $a : b = c : d$,

where ad and bc denote (as in § 20), the areas of the rectangles contained by a and d and by b and c respectively.

This allows us to transform every proportion between four lines into an equation between two products.

It shows further that the operation of forming a product of two lines, and the operation of forming their ratio are each the inverse of the other.

If we now define a quotient $\frac{a}{b}$ of two lines as the *number* which multiplied into b gives a, so that

$$\frac{a}{b} b = a,$$

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we see that from the equality of two quotients

$$\frac{a}{b} = \frac{c}{d}$$

follows, if we multiply both sides by bd,

$$\frac{a}{b}b.d = \frac{c}{d}d.b,$$

$$ad = cb.$$

But from this it follows, according to the last theorem, that

$$a : b = c : d.$$

Hence we conclude that the quotient $\frac{a}{b}$ and the ratio $a : b$ are different forms of the same magnitude, only with this important difference that the quotient $\frac{a}{b}$ would have a meaning only if a and b have a common measure, until we introduce incommensurable numbers, while the ratio $a : b$ has always a meaning, and thus gives rise to the introduction of incommensurable numbers.

Thus it is really the theory of ratios in the fifth book which enables us to extend the geometrical calculus given before in connexion with Book II. It will also be seen that if we write the ratios in Book V. as quotients, or rather as fractions, then most of the theorems state properties of quotients or of fractions.

§ 64. Prop. 17. *If three straight lines are proportional the rectangle contained by the extremes is equal to the square on the mean*; and conversely, is only a special case of 16. After the problem, Prop. 18, *On a given straight line describe a rectilineal figure similar and similarly situated to a given rectilineal figure*, there follows another fundamental theorem:

Prop. 19. *Similar triangles are to one another in the duplicate ratio of their homologous sides.* In other words, the areas of similar triangles are to one another as the squares on homologous sides. This is generalized in:

Prop. 20. *Similar polygons may be divided into the same number of similar triangles, having the same ratio to one another that the polygons have; and the polygons are to one another in the duplicate ratio of their homologous sides.*

§ 65. Prop. 21. *Rectilineal figures which are similar to the same rectilineal figure are also similar to each other*, is an immediate consequence of the definition of similar figures. As similar figures may be said to be equal in "shape" but not in "size," we may state it also thus:

"Figures which are equal in shape to a third are equal in shape to each other."

Prop. 22. *If four straight lines be proportionals, the similar rectilineal figures similarly described on them shall also be proportionals; and if the similar rectilineal figures similarly described on four straight lines be proportionals, those straight lines shall be proportionals.*

This is essentially the same as the following:—

If $a : b = c : d$,

then $a^2 : b^2 = c^2 : d^2$.

§ 66. Now follows a proposition which has been much discussed with regard to Euclid's exact meaning in saying that a ratio is *compounded* of two other ratios, viz.:

Prop. 23. *Parallelograms which are equiangular to one another, have to one another the ratio which is compounded of the ratios of their sides.*

The proof of the proposition makes its meaning clear. In symbols the ratio $a : c$ is compounded of the two ratios $a : b$ and $b : c$, and if $a : b = a' : b'$, $b : c = b' : c'$, then $a : c$ is compounded of $a' : b'$ and $b' : c'$.

If we consider the ratios as numbers, we may say that the one ratio is the product of those of which it is compounded, or in symbols,

$$\frac{a}{c} = \frac{a}{b}.\frac{b}{c} = \frac{a'}{b'}.\frac{b'}{c'}, \text{ if } \frac{a}{b} = \frac{a'}{b'} \text{ and } \frac{b}{c} = \frac{b'}{c'}.$$

The theorem in Prop. 23 is the foundation of all mensuration of areas. From it we see at once that two rectangles have the ratio of their areas compounded of the ratios of their sides.

If A is the area of a rectangle contained by a and b, and B that of a rectangle contained by c and d, so that $A = ab$, $B = cd$, then $A : B = ab : cd$, and this is, the theorem says, compounded of the ratios $a : c$ and $b : d$. In forms of quotients,

$$\frac{a}{c}.\frac{b}{d} = \frac{ab}{cd}.$$

This shows how to multiply quotients in our geometrical calculus.

Further, *Two triangles have the ratios of their areas compounded of the ratios of their bases and their altitude.* For a triangle is equal in area to half a parallelogram which has the same base and the same altitude.

§ 67. To bring these theorems to the form in which they are usually given, we assume a straight line u as our unit of length (generally an inch, a foot, a mile, &c.), and determine the number a which expresses how often u is contained in a line a, so that a denotes the ratio $a : u$ whether commensurable or not, and that $a = au$. We call this number a the numerical value of a. If in the same manner β be the numerical value of a line b we have

$$a : b = a : \beta;$$

in words: *The ratio of two lines (and of two like quantities in general) is equal to that of their numerical values.*

This is easily proved by observing that $a = au$, $b = \beta u$, therefore $a : b = au : \beta u$, and this may without difficulty be shown to equal $a : \beta$.

If now a, b be base and altitude of one, a', b' those of another parallelogram, α, β and α', β' their numerical values respectively, and A, A′ their areas, then

$$\frac{A}{A'} = \frac{a}{a'}\frac{b}{b'} = \frac{a}{a'}\frac{\beta}{\beta'} = \frac{a\beta}{a'\beta'}.$$

In words: *The areas of two parallelograms are to each other as the products of the numerical values of their bases and altitudes.*

If especially the second parallelogram is the unit square, *i.e.* a square on the unit of length, then $a' = \beta' = 1$, $A' = u^2$, and we have

$$\frac{A}{A'} = a\beta \text{ or } A = a\beta.u^2.$$

This gives the theorem: The number of unit squares contained in a parallelogram equals the product of the numerical values of base and altitude, and similarly the number of unit squares contained in a triangle equals half the product of the numerical values of base and altitude.

This is often stated by saying that the area of a parallelogram is equal to the product of the base and the altitude, meaning by this product the product of the numerical values, and not the product as defined above in § 20.

§ 68. Propositions 24 and 26 relate to parallelograms about diagonals, such as are considered in Book I., 43. They are—

Prop. 24. *Parallelograms about the diameter of any parallelogram are similar to the whole parallelogram and to one another*; and its converse (Prop. 26), *If two similar parallelograms have a common angle, and be similarly situated, they are about the same diameter.*

Between these is inserted a problem.

Prop. 25. *To describe a rectilineal figure which shall be similar to one given rectilineal figure, and equal to another given rectilineal figure.*

§ 69. Prop. 27 contains a theorem relating to the theory of maxima and minima. We may state it thus:

Prop. 27. *If a parallelogram be divided into two by a straight line cutting the base, and if on half the base another parallelogram be constructed similar to one of those parts, then this third parallelogram is greater than the other part.*

Of far greater interest than this general theorem is a special case of it, where the parallelograms are changed into rectangles, and where one of the parts into which the parallelogram is divided is made a square; for then the theorem changes into one which is easily recognized to be identical with the following:—

Of all rectangles which have the same perimeter the square has the greatest area.

This may also be stated thus:—

Of all rectangles which have the same area the square has the least perimeter.

§ 70. The next three propositions contain problems which may be said to be solutions of quadratic equations. The first two are, like the last, involved in somewhat obscure language. We transcribe them as follows:

Problem.—To describe on a given base a parallelogram, and to divide it either internally (Prop. 28) or externally (Prop. 29) from a point on the base into two parallelograms, of which the one has a given size (is equal in area to a given figure), whilst the other has a given shape (is similar to a given parallelogram).

If we express this again in symbols, calling the given base a, the one part x, and the altitude y, we have to determine x and y in the first case from the equations

$$(a-x)y = k^2,$$

$$\frac{x}{y} = \frac{p}{q}.$$

k^2 being the given size of the first, and p and q the base and altitude of the parallelogram which determine the shape of the second of the required parallelograms.

If we substitute the value of y, we get

$$(a-x)x = \frac{pk^2}{q},$$

or,

$$ax - x^2 = b^2,$$

where a and b are known quantities, taking $b^2 = \frac{pk^2}{q}$.

The second case (Prop. 29) gives rise, in the same manner, to the quadratic

$$ax + x^2 = b^2.$$

The next problem—

Prop. 30. *To cut a given straight line in extreme and mean ratio*, leads to the equation

$$ax + x^2 = a^2,$$

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This is, therefore, only a special case of the last, and is, besides, an old acquaintance, being essentially the same problem as that proposed in II. 11.

Prop. 30 may therefore be solved in two ways, either by aid of Prop. 29 or by aid of II. 11. Euclid gives both solutions.

§ 71. Prop. 31 (Theorem). *In any right-angled triangle, any rectilineal figure described on the side subtending the right angle is equal to the similar and similarly-described figures on the sides containing the right angle,*—is a pretty generalization of the theorem of Pythagoras (I. 47).

Leaving out the next proposition, which is of little interest, we come to the last in this book.

Prop. 33. *In equal circles angles, whether at the centres or the circumferences, have the same ratio which the arcs on which they stand have to one another; so also have the sectors.*

Of this, the last pair relating to angles at the centre is of special importance; it enables us to measure angles by arcs.

With this closes that part of the *Elements* which is devoted to the study of figures in a plane.

Book XI.

§ 72. In this book figures are considered which are not confined to a plane, viz. first relations between lines and planes in space, and afterwards properties of solids.

Of new definitions we mention those which relate to the perpendicularity and the inclination of lines and planes.

Def. 3. *A straight line is perpendicular, or at right angles, to a plane when it makes right angles with every straight line meeting it in that plane.*

The definition of perpendicular planes (Def. 4) offers no difficulty. Euclid defines the inclination of lines to planes and of planes to planes (Defs. 5 and 6) by aid of plane angles, included by straight lines, with which we have been made familiar in the first books.

The other important definitions are those of parallel planes, which never meet (Def. 8), and of solid angles formed by three or more planes meeting in a point (Def. 9).

To these we add the definition of a line parallel to a plane as a line which does not meet the plane.

§ 73. Before we investigate the contents of Book XI., it will be well to recapitulate shortly what we know of planes and lines from the definitions and axioms of the first book. There a plane has been defined as a surface which has the property that every straight line which joins two points in it lies altogether in it. This is equivalent to saying that a straight line which has two points in a plane has all points in the plane. Hence, a straight line which does not lie in the plane cannot have more than one point in common with the plane. This is virtually the same as Euclid's Prop. 1, viz.:—

Prop. 1. *One part of a straight line cannot be in a plane and another part without it.*

It also follows, as was pointed out in § 3, in discussing the definitions of Book I., that a plane is determined already by one straight line and a point without it, viz. if all lines be drawn through the point, and cutting the line, they will form a plane.

This may be stated thus:—

A plane is determined—

1st, *By a straight line and a point which does not lie on it;*

2nd, *By three points which do not lie in a straight line*; for if two of these points be joined by a straight line we have case 1;

3rd, *By two intersecting straight lines*; for the point of intersection and two other points, one in each line, give case 2;

4th, *By two parallel lines* (Def. 35, I.).

The third case of this theorem is Euclid's

Prop. 2. *Two straight lines which cut one another are in one plane, and three straight lines which meet one another are in one plane.*

And the fourth is Euclid's

Prop. 7. *If two straight lines be parallel, the straight line drawn from any point in one to any point in the other is in the same plane with the parallels.* From the definition of a plane further follows

Prop. 3. *If two planes cut one another, their common section is a straight line.*

§ 74. Whilst these propositions are virtually contained in the definition of a plane, the next gives us a new and fundamental property of space, showing at the same time that it is possible to have a straight line perpendicular to a plane, according to Def. 3. It states—

Prop. 4. *If a straight line is perpendicular to two straight lines in a plane which it meets, then it is perpendicular to all lines in the plane which it meets, and hence it is perpendicular to the plane.*

Def. 3 may be stated thus: If a straight line is perpendicular to a plane, then it is perpendicular to every line in the plane which it meets. The converse to this would be

All straight lines which meet a given straight line in the same point, and are perpendicular to it, lie in a plane which is perpendicular to that line.

This Euclid states thus:

Prop. 5. *If three straight lines meet all at one point, and a straight line stands at right angles to each of them at that point, the three straight lines shall be in one and the same plane.*

§ 75. There follow theorems relating to the theory of parallel lines in space, viz.:—

Prop. 6. *Any two lines which are perpendicular to the same plane are parallel to each other*; and conversely

Prop. 8. *If of two parallel straight lines one is perpendicular to a plane, the other is so also.*

Prop. 7. *If two straight lines are parallel, the straight line which joins any point in one to any point in the other is in the same plane as the parallels.* (See above, § 73.)

Prop. 9. *Two straight lines which are each of them parallel to the same straight line, and not in the same plane with it, are parallel to one another*; where the words, "and not in the same plane with it," may be omitted, for they exclude the case of three parallels in a plane, which has been proved before; and

Prop. 10. *If two angles in different planes have the two limits of the one parallel to those of the other, then the angles are equal.* That their planes are parallel is shown later on in Prop. 15.

This theorem is not necessarily true, for the angles in question may be supplementary; but then the one angle will be equal to that which is adjacent and supplementary to the other, and this latter angle will also have its limits parallel to those of the first.

From this theorem it follows that if we take any two straight lines in space which do not meet, and if we draw through any point P in space two lines parallel to them, then the angle included by these lines will always be the same, whatever the position of the point P may be. This angle is in modern times been called the angle between the given lines:—

By the angles between two not intersecting lines we understand the angles which two intersecting lines include that are parallel respectively to the two given lines.

§ 76. It is now possible to solve the following two problems:—

To draw a straight line perpendicular to a given plane from a given point which lies

1. *Not in the plane* (Prop. 11).

2. *In the plane* (Prop. 12).

The second case is easily reduced to the first—viz. if by aid of the first we have drawn any perpendicular to the plane from some point without it, we need only draw through the given point in the plane a line parallel to it, in order to have the required perpendicular given. The solution of the first part is of interest in itself. It depends upon a construction which may be expressed as a theorem.

If from a point A without a plane a perpendicular AB be drawn to the plane, and if from the foot B of this perpendicular another perpendicular BC be drawn to any straight line in the plane, then the straight line joining A to the foot C of this second perpendicular will also be perpendicular to the line in the plane.

The theory of perpendiculars to a plane is concluded by the theorem—

Prop. 13. *Through any point in space, whether in or without a plane, only one straight line can be drawn perpendicular to the plane.*

§ 77. The next four propositions treat of parallel planes. It is shown *that planes which have a common perpendicular are parallel* (Prop. 14); *that two planes are parallel if two intersecting straight lines in the one are parallel respectively to two straight lines in the other plane* (Prop. 15); *that parallel planes are cut by any plane in parallel straight lines* (Prop. 16); and lastly, *that any two straight lines are cut proportionally by a series of parallel planes* (Prop. 17).

This last theory is made more complete by adding the following theorems, which are easy deductions from the last: *Two parallel planes have common perpendiculars* (converse to 14); and *Two planes which are parallel to a third plane are parallel to each other.*

It will be noted that Prop. 14 at once allows of the solution of the problem: "Through a given point to draw a plane parallel to a given plane." And it is also easily proved that this problem allows always of one, and only of one, solution.

§ 78. We come now to planes which are perpendicular to one another. Two theorems relate to them.

Prop. 18. *If a straight line be at right angles to a plane, every plane which passes through it shall be at right angles to that plane.*

Prop. 19. *If two planes which cut one another be each of them perpendicular to a third plane, their common section shall be perpendicular to the same plane.*

§ 79. If three planes pass through a common point, and if they bound each other, a solid angle of three faces, or a *trihedral* angle, is formed, and similarly by more planes a solid angle of more faces, or a *polyhedral* angle. These have many properties which are quite analogous to those of triangles and polygons in a plane. Euclid states some, viz.:—

Prop. 20. *If a solid angle be contained by three plane angles, any two of them are together greater than the third.*

But the next—

Prop. 21. *Every solid angle is contained by plane angles, which are together less than four right angles*—has no analogous theorem in the plane.

We may mention, however, that the theorems about triangles contained in the propositions of Book I., which do not depend upon the theory of parallels (that is all up to Prop. 27), have their corresponding theorems about trihedral angles. The latter are formed, if for "side of a triangle" we write "plane angle" or "face" of trihedral angle, and for "angle of triangle" we substitute "angle between two faces" where the planes containing the solid angle are called its *faces*. We get, for instance, from I. 4, the

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theorem, *If two trihedral angles have the angles of two faces in the one equal to the angles of two faces in the other, and have likewise the angles included by these faces equal, then the angles in the remaining faces are equal, and the angles between the other faces are equal each to each, viz. those which are opposite equal faces.* The solid angles themselves are not necessarily equal, for they may be only symmetrical like the right hand and the left.

The connexion indicated between triangles and trihedral angles will also be recognized in

Prop. 22. *If every two of three plane angles be greater than the third, and if the straight lines which contain them be all equal, a triangle may be made of the straight lines that join the extremities of those equal straight lines.*

And Prop. 23 solves the problem, *To construct a trihedral angle having the angles of its faces equal to three given plane angles, any two of them being greater than the third.* It is, of course, analogous to the problem of constructing a triangle having its sides of given length.

Two other theorems of this kind are added by Simson in his edition of Euclid's *Elements*.

§ 80. These are the principal properties of lines and planes in space, but before we go on to their applications it will be well to define the word *distance*. In geometry distance means always "shortest distance"; viz. the distance of a point from a straight line, or from a plane, is the length of the perpendicular from the point to the line or plane. The distance between two non-intersecting lines is the length of their common perpendicular, there being but one. The distance between two parallel lines or between two parallel planes is the length of the common perpendicular between the lines or the planes.

§ 81. *Parallelepipeds.*—The rest of the book is devoted to the study of the parallelepiped. In Prop. 24 the possibility of such a solid is proved, viz.:—

Prop. 24. *If a solid be contained by six planes two and two of which are parallel, the opposite planes are similar and equal parallelograms.*

Euclid calls this solid henceforth a parallelepiped, though he never defines the word. Either face of it may be taken as *base*, and its distance from the opposite face as *altitude*.

Prop. 25. *If a solid parallelepiped be cut by a plane parallel to two of its opposite planes, it divides the whole into two solids, the base of one of which shall be to the base of the other as the one solid is to the other.*

This theorem corresponds to the theorem (VI. 1) that parallelograms between the same parallels are to one another as their bases. A similar analogy is to be observed among a number of the remaining propositions.

§ 82. After solving a few problems we come to

Prop. 28. *If a solid parallelepiped be cut by a plane passing through the diagonals of two of the opposite planes, it shall be cut in two equal parts.*

In the proof of this, as of several other propositions, Euclid neglects the difference between solids which are symmetrical like the right hand and the left.

Prop. 31. *Solid parallelepipeds, which are upon equal bases, and of the same altitude, are equal to one another.*

Props. 29 and 30 contain special cases of this theorem leading up to the proof of the general theorem.

As consequences of this fundamental theorem we get

Prop. 32. *Solid parallelepipeds, which have the same altitude, are to one another as their bases*; and

Prop. 33. *Similar solid parallelepipeds are to one another in the triplicate ratio of their homologous sides.*

If we consider, as in § 67, the ratios of lines as numbers, we may also say—

The ratio of the volumes of similar parallelepipeds is equal to the ratio of the third powers of homologous sides.

Parallelepipeds which are not similar but equal are compared by aid of the theorem

Prop. 34. *The bases and altitudes of equal solid parallelepipeds and reciprocally proportional; and if the bases and altitudes be reciprocally proportional, the solid parallelepipeds are equal.*

§ 83. Of the following propositions the 37th and 40th are of special interest.

Prop. 37. *If four straight lines be proportionals, the similar solid parallelepipeds, similarly described from them, shall also be proportionals; and if the similar parallelepipeds similarly described from four straight lines be proportionals, the straight lines shall be proportionals.*

In symbols it says—

If $a:b=c:d$, then $a^3:b^3=c^3:d^3$.

Prop. 40 teaches how to compare the volumes of triangular prisms with those of parallelepipeds, by proving *that a triangular prism is equal in volume to a parallelepiped, which has its altitude and its base equal to the altitude and the base of the triangular prism.*

§ 84. From these propositions follow all results relating to the measuration of volumes. We shall state these as we did in the case of areas. The starting-point is the "rectangular" parallelepiped, which has every edge perpendicular to the planes it meets, and which takes the place of the rectangle in the plane. If this has all its edges equal we obtain the "cube."

If we take a certain line u as unit length, then the square on u is the unit of area, and the cube on u the unit of volume, that is to say, if we wish to measure a volume we have to determine how many unit cubes it contains.

A rectangular parallelepiped has, as a rule, the three edges unequal, which meet at a point. Every other edge is equal to one of these. If a, b, c be the three edges meeting at a point, then we may take the rectangle contained by two of them, say by b and c, as base and the third as altitude. Let V be its volume, V′ that of another rectangular parallelepiped which has the edges a', b, c, hence the same base as the first. It follows then easily, from Prop. 25 or 32, that $V:V'=a:a'$; or in words,

Rectangular parallelepipeds on equal bases are proportional to their altitudes.

If we have two rectangular parallelepipeds, of which the first has the volume V and the edges a, b, c, and the second, the volume V′ and the edges a', b', c', we may compare them by aid of two new ones which have respectively the edges a', b, c and a', b', c, and the volumes V_1 and V_2. We then have

$$V:V_1=a:a';\ V_1:V_2=b:b',\ V_2:V'=c:c'.$$

Compounding these, we have

$$V:V'=(a:a')\ (b:b')\ (c:c'),$$

or

$$\frac{V}{V'}=\frac{a}{a'}\cdot\frac{b}{b'}\cdot\frac{c}{c'}.$$

Hence, as a special case, making V′ equal to the unit cube U on u we get

$$\frac{V}{U}=\frac{a}{u}\cdot\frac{b}{u}\cdot\frac{c}{u}=\alpha.\beta.\gamma,$$

where α, β, γ are the numerical values of a, b, c; that is, *The number of unit cubes in a rectangular parallelepiped* is equal to the product of the numerical values of its three edges. This is generally expressed by saying the volume of a rectangular parallelepiped is measured by the product of its sides, or by the product of its base into its altitude, which in this case is the same.

Prop. 31 allows us to extend this to any parallelepipeds, and Props. 28 or 40, to triangular prisms.

The volume of any parallelepiped, or of any triangular prism, is measured by the product of base and altitude.

The consideration that any polygonal prism may be divided into a number of triangular prisms, which have the same altitude and the sum of their bases equal to the base of the polygonal prism, shows further that the same holds for any prism whatever.

Book XII.

§ 85. In the last part of Book XI. we have learnt how to compare the volumes of parallelepipeds and of prisms. In order to determine the volume of any solid bounded by plane faces we must determine the volume of pyramids, for every such solid may be decomposed into a number of pyramids.

As every pyramid may again be decomposed into triangular pyramids, it becomes only necessary to determine their volume. This is done by the

Theorem.—Every triangular pyramid is equal in volume to one third of a triangular prism having the same base and the same altitude as the pyramid.

This is an immediate consequence of Euclid's

Prop. 7. *Every prism having a triangular base may be divided into three pyramids that have triangular bases, and are equal to one another.*

The proof of this theorem is difficult, because the three triangular pyramids into which the prism is divided are by no means equal in size, and cannot be made to coincide. It is first to be proved that two triangular pyramids have equal volumes, if they have equal bases and equal altitudes. This Euclid does in the following manner. He first shows (Prop. 3) that a triangular pyramid may be divided into four parts, of which two are equal triangular pyramids similar to the whole pyramid, whilst the other two are equal triangular prisms, and further, that these two prisms together are greater than the two pyramids, hence more than half the given pyramid. He next shows (Prop. 4) that if two triangular pyramids are given, having equal bases and equal altitudes, and if each be divided as above, then the two triangular prisms in the one are equal to those in the other, and each of the remaining pyramids in the one has its base and altitude equal to the base and altitude of the remaining pyramids in the other. Hence to these pyramids the same process is again applicable. We are thus enabled to cut out of the two given pyramids equal parts, each greater than half the original pyramid. Of the remainder we can again cut out equal parts greater than half these remainders, and so on as far as we like. This process may be continued till the last remainder is smaller than any assignable quantity, however small. It follows, so we should conclude at present, that the two volumes must be equal, for they cannot differ by any assignable quantity.

To Greek mathematicians this conclusion offers far greater

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difficulties. They prove elaborately, by a *reductio ad absurdum*, that the volumes cannot be unequal. This proof must be read in the *Elements*. We must, however, state that we have in the above not proved Euclid's Prop. 5, but only a special case of it. Euclid does not suppose that the bases of the two pyramids to be compared are equal, and hence he proves that the volumes are as the bases. The reasoning of the proof becomes clearer in the special case, from which the general one may be easily deduced.

§ 86. Prop. 6 extends the result to pyramids with polygonal bases. From these results follow again the rules at present given for the mensuration of solids, viz. a pyramid is the third part of a triangular prism having the same base and the same altitude. And a triangular prism is equal in volume to a parallelepiped which has the same base and altitude. Hence if B is the base and h the altitude, we have

$$\text{Volume of prism} = Bh,$$
$$\text{Volume of pyramid} = \tfrac{1}{3}Bh,$$

statements which have to be taken in the sense that B means the number of square units in the base, h the number of units of length in the altitude, or that B and h denote the numerical values of base and altitude.

§ 87. A method similar to that used in proving Prop. 5 leads to the following results relating to solids bounded by simple curved surfaces:—

Prop. 10. *Every cone is the third part of a cylinder which has the same base, and is of an equal altitude with it.*

Prop. 11. *Cones or cylinders of the same altitude are to one another as their bases.*

Prop. 12. *Similar cones or cylinders have to one another the triplicate ratio of that which the diameters of their bases have.*

Prop. 13. *If a cylinder be cut by a plane parallel to its opposite planes or bases, it divides the cylinder into two cylinders, one of which is to the other as the axis of the first to the axis of the other*; which may also be stated thus:—

Cylinders on the same base are proportional to their altitudes.

Prop. 14. *Cones or cylinders upon equal bases are to one another as their altitudes.*

Prop. 15. *The bases and altitudes of equal cones or cylinders are reciprocally proportional, and if the bases and altitudes be reciprocally proportional, the cones or cylinders are equal to one another.*

These theorems again lead to results in mensuration, if we compare a cylinder with a prism having its base and altitude equal to the base and altitude of the cylinder. This may be done by the method of exhaustion. We get, then, the result that their bases are equal, and have, if B denotes the numerical value of the base, and h that of the altitude,

$$\text{Volume of cylinder} = Bh,$$
$$\text{Volume of cone} = \tfrac{1}{3}Bh.$$

§ 88. The remaining propositions relate to circles and spheres. Of the sphere only one property is proved, viz.:—

Prop. 18. *Spheres have to one another the triplicate ratio of that which their diameters have.* The mensuration of the sphere, like that of the circle, the cylinder and the cone, had not been settled in the time of Euclid. It was done by Archimedes.

Book XIII.

§ 89. The 13th and last book of Euclid's *Elements* is devoted to the regular solids (see POLYHEDRON). It is shown that there are five of them, viz.:—

1. The regular *tetrahedron*, with 4 triangular faces and 4 vertices;
2. The *cube*, with 8 vertices and 6 square faces;
3. The *octahedron*, with 6 vertices and 8 triangular faces;
4. The *dodecahedron*, with 12 pentagonal faces, 3 at each of the 20 vertices;
5. The *icosahedron*, with 20 triangular faces, 5 at each of the 12 vertices.

It is shown how to inscribe these solids in a given sphere, and how to determine the lengths of their edges.

§ 90. The 13th book, and therefore the *Elements*, conclude with the scholium, "that no other regular solid exists besides the five ones enumerated."

The proof is very simple. Each face is a regular polygon, hence the angles of the faces at any vertex must be angles in equal regular polygons, must be together less than four right angles (XI. 21), and must be three or more in number. Each angle in a regular triangle equals two-thirds of one right angle. Hence it is possible to form a solid angle with three, four or five regular triangles or faces. These give the solid angles of the tetrahedron, the octahedron and the icosahedron. The angle in a square (the regular quadrilateral) equals one right angle. Hence three will form a solid angle, that of the cube, and four will not. The angle in the regular pentagon equals $\frac{3}{5}$ of a right angle. Hence three of them equal $2\frac{4}{5}$ (*i.e.* less than 4) right angles, and form the solid angle of the dodecahedron. Three regular polygons of six or more sides cannot form a solid angle. Therefore no other regular solids are possible. (O. H.)

II. Projective Geometry

It is difficult, at the outset, to characterize projective geometry as compared with Euclidean. But a few examples will at least indicate the practical differences between the two.

In Euclid's *Elements* almost all propositions refer to the *magnitude* of lines, angles, areas or volumes, and therefore to measurement. The statement that an angle is right, or that two straight lines are parallel, refers to measurement. On the other hand, the fact that a straight line does or does not cut a circle is independent of measurement, it being dependent only upon the mutual "position" of the line and the circle. This difference becomes clearer if we project any figure from one plane to another (see PROJECTION). By this the length of lines, the magnitude of angles and areas, is altered, so that the projection, or shadow, of a square on a plane will not be a square; it will, however, be some quadrilateral. Again, the projection of a circle will not be a circle, but some other curve more or less resembling a circle. But one property may be stated at once—no straight line can cut the projection of a circle in more than two points, because no straight line can cut a circle in more than two points. There are, then, some properties of figures which do not alter by projection, whilst others do. To the latter belong nearly all properties relating to measurement, at least in the form in which they are generally given. The others are said to be projective properties, and their investigation forms the subject of projective geometry.

Different as are the kinds of properties investigated in the old and the new sciences, the methods followed differ in a still greater degree. In Euclid each proposition stands by itself; its connexion with others is never indicated; the leading ideas contained in its proof are not stated; general principles do not exist. In the modern methods, on the other hand, the greatest importance is attached to the leading thoughts which pervade the whole; and general principles, which bring whole groups of theorems under one aspect, are given rather than separate propositions. The whole tendency is towards generalization. A straight line is considered as given in its entirety, extending both ways to infinity, while Euclid never admits anything but finite quantities. The treatment of the infinite is in fact another fundamental difference between the two methods: Euclid avoids it; in modern geometry it is systematically introduced.

Of the different modern methods of geometry, we shall treat principally of the methods of projection and correspondence which have proved to be the most powerful. These have become independent of Euclidean Geometry, especially through the *Geometrie der Lage* of V. Staudt and the *Ausdehnungslehre* of Grassmann.

For the sake of brevity we shall presuppose a knowledge of Euclid's *Elements*, although we shall use only a few of his propositions.

§ 1. *Geometrical Elements.* We consider space as filled with points, lines and planes, and these we call the elements out of which our figures are to be formed, calling any combination of these elements a "figure."

By a line we mean a straight line in its entirety, extending both ways to infinity; and by a plane, a plane surface, extending in all directions to infinity.

We accept the three-dimensional space of experience—the space assumed by Euclid—which has for its properties (among others):—

Through any two points in space one and only one line may be drawn;

Through any three points which are not in a line, one and only one plane may be placed;

The intersection of two planes is a line;

A line which has two points in common with a plane lies in the plane, hence the intersection of a line and a plane is a single point; and

Three planes which do not meet in a line have one single point in common.

These results may be stated differently in the following form:—

1. A plane is determined—	A point is determined—
1. By three points which do not lie in a line;	1. By three planes which do not pass through a line;
2. By two intersecting lines;	2. By two intersecting lines;
3. By a line and a point which does not lie in it.	3. By a plane and a line which does not lie in it.
11. A line is determined—	
1. By two points;	2. By two planes.

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It will be observed that not only are planes determined by points, but also points by planes; that therefore the planes may be considered as elements, like points; and also that in any one of the above statements we may interchange the words point and plane, and we obtain again a correct statement, provided that these statements themselves are true. As they stand, we ought, in several cases, to add "if they are not parallel," or some such words, parallel lines and planes being evidently left altogether out of consideration. To correct this we have to reconsider the theory of parallels.

§ 2. *Parallels. Point at Infinity.*—Let us take in a plane a line p (fig. 1), a point S not in this line, and a line q drawn through S.

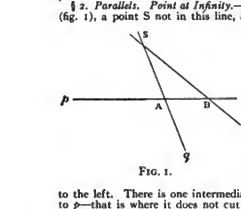

FIG. 1.

Then this line q will meet the line p in a point A. If we turn the line q about S towards q', its point of intersection with p will move along p towards B, passing, on continuing turning, to a greater and greater distance, until it is moved out of our reach. If we turn q still farther, its continuation will meet p, but now at the other side of A. The point of intersection has disappeared to the right and reappeared to the left. There is one intermediate position where q is parallel to p—that is where it does not cut p. In every other position it cuts p in some finite point. If, on the other hand, we move the point A to an infinite distance in p, then the line q which passes through A will be a line which does not cut p at any finite point. Thus we are led to say: *Every* line through S which joins it to any point at an infinite distance in p is parallel to p. But by Euclid's 12th axiom there is but one line parallel to p through S. The difficulty in which we are thus involved is due to the fact that we try to reason about infinity as if we, with our finite capabilities, could comprehend the infinite. To overcome this difficulty, we may say that all points at infinity in a line *appear* to us as one, and may be replaced by a single "ideal" point.

We may therefore now give the following definitions and axiom:—

Definition.—Lines which meet at infinity are called parallel.

Axiom.—All points at an infinite distance in a line may be considered as one single point.

Definition.—This ideal point is called the *point at infinity* in the line.

The axiom is equivalent to Euclid's Axiom 12, for it follows from either that through any point only one line may be drawn parallel to a given line.

This point at infinity in a line is reached whether we move a point in the one or in the opposite direction of a line to infinity. A line thus appears closed by this point, and we speak as if we could move a point along the line from one position A to another B in two ways, either through the point at infinity or through finite points only.

It must never be forgotten that this point at infinity is ideal; in fact, the whole notion of "infinity" is only a mathematical conception, and owes its introduction (as a method of research) to the working generalizations which it permits.

§ 3. *Line and Plane at Infinity.*—Having arrived at the notion of replacing all points at infinity in a line by one ideal point, there is no difficulty in replacing all points at infinity in a plane by one ideal line.

To make this clear, let us suppose that a line p, which cuts two fixed lines a and b in the points A and B, moves parallel to itself to a greater and greater distance. It will at last cut both a and b at their points at infinity, so that a line which joins the two points at infinity in two intersecting lines lies altogether at infinity. Every other line in the plane will meet it therefore at infinity, and thus it contains all points at infinity in the plane.

All points at infinity in a plane lie in a line, which is called the line at infinity *in the plane.*

It follows that parallel planes must be considered as planes having a common line at infinity, for any other plane cuts them in parallel lines which have a point at infinity in common.

If we next take two intersecting planes, then the point at infinity in their line of intersection lies in both planes, so that their lines at infinity meet. Hence the line at infinity meets every other line at infinity, and they are therefore all in one plane.

All points at infinity in space may be considered as lying in one ideal plane, which is called the plane at infinity.

§ 4. *Parallelism.*—We have now the following definitions:—

Parallel lines are lines which meet at infinity;
Parallel planes are planes which meet at infinity;
A line is parallel to a plane if it meets it at infinity.

Theorems like this—Lines (or planes) which are parallel to a third are parallel to each other—follow at once.

This view of parallels leads therefore to no contradiction of Euclid's *Elements.*

As immediate consequences we get the propositions:—
Every line meets a plane in one point, or it lies in it;
Every plane meets every other plane in a line;
Any two lines in the same plane meet.

§ 5. *Aggregates of Geometrical Elements.*—We have called points, lines and planes the elements of geometrical figures. We also say that an element of one kind contains one of the other if it lies in it or passes through it.

All the elements of one kind which are contained in one or two elements of a different kind form aggregates which have to be enumerated. They are the following:—

I. Of one dimension.
1. The *row*, or range, *of points* formed by all points in a line, which is called its base.
2. The *flat pencil* formed by all the lines through a point in a plane. Its base is the point in the plane.
3. The *axial pencil* formed by all planes through a line which is called its base or axis.

II. Of two dimensions.
1. The field of points and lines—that is, a plane with all its points and all its lines.
2. The pencil of lines and planes—that is, a point in space with all lines and all planes through it.

III. Of three dimensions.
The space of points—that is, all points in space.
The space of planes—that is, all planes in space.

IV. Of four dimensions.
The space of lines, or all lines in space.

§ 6. *Meaning of "Dimensions."*—The word dimension in the above needs explanation. If in a plane we take a row p and a pencil with centre Q, then through every point in p one line in the pencil will pass, and every ray in Q will cut p in one point, so that we are entitled to say a row contains as many points as a flat pencil lines, and, we may add, as an axial pencil planes, because an axial pencil is cut by a plane in a flat pencil.

The number of elements in the row, in the flat pencil, and in the axial pencil is, of course, infinite and indefinite too, but the same in all. This number may be denoted by ∞. Then a plane contains ∞^1 points and as many lines. To see this, take a flat pencil in a plane. It contains ∞ lines, and each line contains ∞ points, whilst each point in the plane lies on one of these lines. Similarly, in a plane each line cuts a fixed line in a point. But this line is cut at each point by ∞ lines and contains ∞ points; hence there are ∞^2 lines in a plane.

A pencil in space contains as many lines as a plane contains points and as many planes as a plane contains lines, for any plane cuts the pencil in a field of points and lines. Hence a pencil contains ∞^1 lines and ∞^1 planes. *The field and the pencil are of two dimensions.*

To count the number of points in space we observe that each point lies on some line in a pencil. But the pencil contains ∞^2 lines, and each line ∞ points; hence space contains ∞^3 points. Each plane cuts any fixed plane in a line. But a plane contains ∞^2 lines, and through each pass ∞ planes; therefore space contains ∞^1 planes.

Hence space contains as many planes as points, but it contains an infinite number of times more lines than points or planes. To count them, notice that every line cuts a fixed plane in one point. But ∞^2 lines pass through each point, and there are ∞^3 points in the plane. Hence there are ∞^5 lines in space. *The space of points and planes is of three dimensions, but the space of lines is of four dimensions.*

A field of points or lines contains an infinite number of rows and flat pencils; a pencil contains an infinite number of flat pencils and of axial pencils; space contains a triple infinite number of pencils and of fields, ∞^4 rows and axial pencils and ∞^3 flat pencils—or, in other words, each point is a centre of ∞^3 flat pencils.

§ 7. The above enumeration allows a classification of figures. Figures in a row consist of groups of points only, and figures in the flat or axial pencil consist of groups of lines or planes. In the plane we may draw polygons; and in the pencil or in the point, solid angles, and so on.

We may also distinguish the different measurements We have—
In the row, length of segment;
In the flat pencil, angles;
In the axial pencil, dihedral angles between two planes;
In the plane, areas;
In the pencil, solid angles;
In the space of points or planes, volumes.

SEGMENTS OF A LINE

§ 8. Any two points A and B in space determine on the line through them a finite part, which may be considered as being described by a point moving from A to B. This we shall denote by AB, and distinguish it from BA, which is supposed as being described by a point moving from B to A, and hence in a direction or in a "sense" opposite to AB. Such a finite line, which has a definite sense, we shall call a "segment," so that AB and BA denote different segments, which are said to be equal in length but of opposite sense. The one sense is often called positive and the other negative.

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In introducing the word "sense" for direction in a line, we have the word direction reserved for direction of the line itself, so that different lines have different directions, unless they be parallel, whilst in each line we have a positive and negative sense.

We may also say, with Clifford, that AB denotes the "step" of going from A to B.

§ 9. If we have three points A, B, C in a line (fig. 2), the step AB will bring us from A to B, and the step BC from B to C. Hence both steps are equivalent to the one step AC. This is expressed by saying that AC is the "sum" of AB and BC; in symbols—

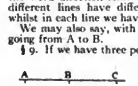

Fig. 2.

$$AB+BC=AC,$$

where account is to be taken of the sense.

This equation is true whatever be the position of the three points on the line. As a special case we have

$$AB+BA=0, \tag{1}$$

and similarly

$$AB+BC+CA=o, \tag{2}$$

which again is true for any three points in a line.

We further write

$$AB=-BA.$$

where − denotes negative sense.

We can then, just as in algebra, change subtraction of segments into addition by changing the sense, so that AB−CB is the same as AB+(−CB) or AB+BC. A figure will at once show the truth of this. The sense is, in fact, in every respect equivalent to the "sign" of a number in algebra.

§ 10. Of the many formulae which exist between points in a line we shall have to use only one more, which connects the segments between any four points A, B, C, D in a line. We have

$$BC=BD+DC,\ CA=CD+DA,\ AB=AD+DB;$$

or multiplying these by AD, BD, CD respectively, we get

$$BC\cdot AD=BD\cdot AD+DC\cdot AD=BD\cdot AD-CD\cdot AD$$
$$CA\cdot BD=CD\cdot BD+DA\cdot BD=CD\cdot BD-AD\cdot BD$$
$$AB\cdot CD=AD\cdot CD+DB\cdot CD=AD\cdot CD-BD\cdot CD.$$

It will be seen that the sum of the right-hand sides vanishes, hence that

$$BC\cdot AD+CA\cdot BD+AB\cdot CD=o \tag{3}$$

for any four points on a line.

§ 11. If C is any point in the line AB, then we say that C divides the segment AB in the ratio AC/CB, account being taken of the sense of the two segments AC and CB. If C lies between A and B the ratio is positive, as AC and CB have the same sense. But if C lies without the segment AB, *i.e.* if C divides AB externally, then the ratio is negative. To see how the value of this ratio changes with C, we will move C along the whole line (fig. 3), whilst A and B remain fixed. If C lies at the point A, then AC = 0, hence the ratio AC:CB vanishes. As C moves towards B, AC increases and CB decreases, so that our ratio increases, the middle point M of AB it assumes the value +1, and then increases till it reaches an infinitely large value, when C arrives at B. On passing beyond B the ratio becomes negative. If C is at P we have AC = AP = AB + BP, hence

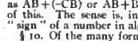

Fig. 3.

$$\frac{AC}{CB}=\frac{AB}{PB}+\frac{BP}{PB}=-\frac{AB}{BP}=1.$$

In the last expression the ratio AB:BP is positive, has its greatest value ∞ when C coincides with B, and vanishes when BC becomes infinite. Hence, as C moves from B to the right to the point at infinity, the ratio AC:CB varies from −∞ to −1.

If, on the other hand, C is to the left of A, say at Q, we have AC = AQ = AB + BQ = AB − QB, hence $\frac{AC}{CB}=\frac{AB}{QB}-1$.

Here AB < QB, hence the ratio AB:QB is positive and always less than one, so that the whole is negative and < 1. If C is at the point at infinity it is −1, and then increases as C moves to the right, till for C at A we get the ratio = 0. Hence—

"As C moves along the line from an infinite distance to the left to an infinite distance at the right, the ratio always increases; it starts with the value −1, reaches 0 at A, +1 at M, ∞ at B, now changes sign to −∞, and increases till at an infinite distance it reaches again the value −1. *It assumes therefore all possible values from −∞ to +∞, and each value only once, so that not only does every position of C determine a definite value of the ratio* AC:CB, *but also, conversely, to every positive or negative value of this ratio belongs one single point in the line* AB.

[Relations between segments of lines are interesting as showing an application of algebra to geometry. The genesis of such relations from algebraic identities is very simple. For example, if a, b, c, x be any four quantities, then

$$\frac{a}{(a-b)(a-c)(x-a)}+\frac{b}{(b-c)(b-a)(x-b)}+\frac{c}{(c-a)(c-b)(x-c)}+\frac{x}{(x-a)(x-b)(x-c)};$$

this may be proved, cumbrously, by multiplying up, or, simply, by decomposing the right-hand member of the identity into partial fractions. Now take a line ABCDX, and let AB = *a*, AC = *b*, AD = *c*, AX = *x*. Then obviously (*a*−*b*) = AB−AC = −BC, paying regard to signs; (*a*−*c*) = AB−AD = DB, and so on. Substituting these values in the identity we obtain the following relation connecting the segments formed by five points on a line:—

$$\frac{AB}{BC\cdot BD\cdot BX}+\frac{AC}{CD\cdot CB\cdot CX}+\frac{AD}{DB\cdot DC\cdot DX}+\frac{AX}{BX\cdot CX\cdot DX}=0.$$

Conversely, if a metrical relation be given, its validity may be tested by reducing to an algebraic equation, which is an identity if the relation be true. For example, if ABCDX be five collinear points, prove

$$\frac{AD\cdot AX}{AB\cdot AC}+\frac{BD\cdot BX}{BC\cdot BA}+\frac{CD\cdot CX}{CA\cdot CB}=1.$$

Clearing of fractions by multiplying throughout by AB . BC . CA, we have to prove

$$-AD.AX.BC-BD.BX.CA-CD.CX.AB=AB.BC.CA.$$

Take A as origin and let AB = *a*, AC = *b*, AD = *c*, AX = *x*. Substituting for the segments in terms of *a*, *b*, *c*, *x*, we obtain on simplification

$$a^2b-ab^2=-ab^2+a^2b,$$

an obvious identity.

An alternative method of testing a relation is illustrated in the following example:—If A, B, C, D, E, F be six collinear points, then

$$\frac{AE\cdot AF}{AB\cdot AC\cdot AD}+\frac{BE\cdot BF}{BC\cdot BD\cdot BA}+\frac{CE\cdot CF}{CD\cdot CA\cdot CB}+\frac{DE\cdot DF}{DA\cdot DB\cdot DC}=0.$$

Clearing of fractions by multiplying throughout by AB . BC . CD . DA, and reducing to a common origin O (calling OA = *a*, OB = *b*, &c.), an equation containing the second and lower powers of OA (= *a*), &c., is obtained. Calling OA = *x*, it is found that *x* = *b*, *x* = *c*, *x* = *d* are solutions. Hence the quadratic has three roots; consequently it is an identity.

The relations connecting five points which we have instanced above may be readily deduced from the six-point relation; the first by taking D at infinity, and the second by taking F at infinity, and then making the obvious permutations of the points.]

Projection and Cross-Ratios

§ 12. If we join a point A to a point S, then the point where the line SA cuts a fixed plane π is called the projection of A on the plane π from S as centre of projection. If we have two planes π and π' and a point S, we may project every point A in π to the other plane. If A′ is the projection of A, then A is also the projection of A′, so that the relations are reciprocal. To every figure in π we get as its projection a corresponding figure in π'.

We shall determine such properties of figures as remain true for the projection, and which are called projective properties. For this purpose it will be sufficient to consider at first only constructions in one plane.

Let us suppose we have given in a plane two lines p and p' and a centre S (fig. 4); we may then project the points in p from S to p'.

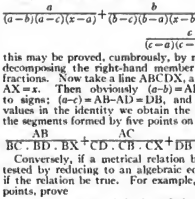

Fig. 4.

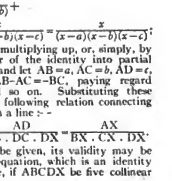

Fig. 5.

Let A′, B′ . . . be the projections of A, B . . ., the point at infinity in p which we shall denote by I will be projected into a finite point

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I′ in p', viz. into the point where the parallel to p through S cuts p'. Similarly one point J in p will be projected into the point J′ at infinity in p'. This point J is of course the point where the parallel to p' through S cuts p. We thus see that every point in p is projected into a single point in p'.

Fig. 5 shows that a segment AB will be projected into a segment A′B′ which is not equal to it, at least not as a rule; and also that the ratio AC:CB is not equal to the ratio A′C′:C′B′ formed by the projections. These ratios will become equal only if p and p' are parallel, for in this case the triangle SAB is similar to the triangle SA′B′. Between three points in a line and their projections there exists therefore in general no relation. But between four points a relation does exist.

§ 13. Let A, B, C, D be four points in p, A′, B′, C′, D′ their projections in p', then the ratio of the two ratios AC:CB and AD:DB into which C and D divide the segment AB is equal to the corresponding expression between A′, B′, C′, D′. In symbols we have

$$\frac{AC}{CB}:\frac{AD}{DB}=\frac{A'C'}{C'B'}:\frac{A'D'}{D'B'}.$$

This is easily proved by aid of similar triangles. Through the points A and B on p draw parallels to p', which cut the projecting rays in C_2, D_2, B_2 and A_2, C_1, D_1, as indicated in fig. 6. The two triangles ACC_2 and BCC_1 will be similar, as will also be the triangles ADD_2 and BDD_1.

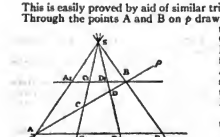

FIG. 6.

The proof is left to the reader.

This result is of fundamental importance.

The expression AC/CB:AD/DB has been called by Chasles the "anharmonic ratio of the four points A, B, C, D." Professor Clifford proposed the shorter name of "cross-ratio." We shall adopt the latter. We have then the

FUNDAMENTAL THEOREM.—*The cross-ratio of four points in a line is equal to the cross-ratio of their projections on any other line which lies in the same plane with it.*

§ 14. Before we draw conclusions from this result, we must investigate the meaning of a cross-ratio somewhat more fully.

If four points A, B, C, D are given, and we wish to form their cross-ratio, we have first to divide them into two groups of two, the points in each group being taken in a definite order. Thus, let A, B be the first, C, D the second pair, A and C being the first points in each pair. The cross-ratio is then the ratio AC:CB divided by AD:DB. This will be denoted by (AB, CD), so that

$$(AB, CD)=\frac{AC}{CB}:\frac{AD}{DB}.$$

This is easily remembered. In order to write it out, make first the two lines for the fractions, and put above and below these the letters A and B in their places, thus, $\frac{A}{B}:\frac{A}{B}$; and then fill up, crosswise, the first by C and the other by D.

§ 15. If we take the points in a different order, the value of the cross-ratio will change. We can do this in twenty-four different ways by forming all permutations of the letters. But of these twenty-four cross-ratios groups of four are equal, so that there are really only six different ones, and these six are reciprocals in pairs.

We have the following rules:—

I. If in a cross-ratio the two groups be interchanged, its value remains unaltered, *i.e.*

$$(AB, CD)=(CD, AB)=(BA, DC)=(DC, BA).$$

II. If in a cross-ratio the two points belonging to one of the two groups be interchanged, the cross-ratio changes into its reciprocal, *i.e.*

$$(AB, CD)=1/(AB, DC)=1/(BA, CD)=1/(CD, BA)=1/(DC, AB).$$

From I. and II. we see that eight cross-ratios are associated with (AB, CD).

III. If in a cross-ratio the two middle letters be interchanged, the cross-ratio a changes into its complement $1-a$, *i.e.* $(AB, CD)=1-(AC, BD)$.

§ 16. If $\lambda=(AB, CD)$, $\mu=(AC, DB)$, $\nu=(AD, BC)$, then λ, μ, ν and their reciprocals $1/\lambda$, $1/\mu$, $1/\nu$ are the values of the total number of twenty-four cross-ratios. Moreover, λ, μ, ν are connected by the relations

$$\lambda+1/\mu=\mu+1/\nu=\nu+1/\lambda=-\lambda\mu\nu=1;$$

this proposition may be proved by substituting for λ, μ, ν and reducing to a common origin. There are therefore four equations between three unknowns; hence if one cross-ratio be given, the remaining twenty-three are determinate. Moreover, two of the quantities λ, μ, ν are positive, and the remaining one negative.

The following scheme shows the twenty-four cross-ratios expressed in terms of λ, μ, ν.]

(AB, CD)	λ	$1-\mu$	$1/(1-\nu)$	(AC, DB)	$1/(1-\lambda)$	$1/\mu$	$(\nu-1)/\nu$
(CD, AB)				(CA, BD)			
(DC, BA)	$1/\lambda$	$1/(1-\mu)$	$1-\nu$	(DB, AC)	$(\lambda-1)/\lambda$	$\mu/(\mu-1)$	ν
(AB, DC)				(AD, BC)			
(BA, CD)				(BC, AD)			
(CD, BA)				(CB, DA)			
(DC, AB)	$1-\lambda$	μ	$\nu/(\nu-1)$	(DA, CB)	$\lambda/(\lambda-1)$	$(\mu-1)/\mu$	$1/\nu$
(AC, BD)				(AD, CB)			
(BD, AC)				(BC, DA)			
(CA, DB)				(CB, AD)			
(DB, CA)				(DA, BC)			

§ 17. If one of the points of which a cross-ratio is formed is the point at infinity in the line, the cross-ratio changes into a simple ratio. It is convenient to let the point at infinity occupy the last place in the symbolic expression for the cross-ratio. Thus if I is a point at infinity, we have (AB, CI) = −AC/CB, because AI:IB = −1.

Every common ratio of three points in a line may thus be expressed as a cross-ratio, by adding the point at infinity to the group of points.

HARMONIC RANGES

§ 18. If the points have special positions, the cross-ratios may have such a value that, of the six different ones, two and two become equal. If the first two shall be equal, we get $\lambda=1/\lambda$, or $\lambda^2=1$, $\lambda=\pm1$.

If we take $\lambda=+1$, we have (AB, CD) = 1, or AC/CB = AD/DB; that is, the points C and D coincide, provided that A and B are different.

If we take $\lambda=-1$, so that (AB, CD) = −1, we have AC/CB = −AD/DB. *Hence C and D divide* AB *internally and externally in the same ratio.*

The four points are in this case said to be *harmonic points*, and C and D *are said to be harmonic conjugates with regard to* A and B.

But we have also (CD, AB) = −1, so that A and B are harmonic conjugates with regard to C and D.

The principal property of harmonic points is that their cross-ratio remains unaltered if we interchange the two points belonging to one pair, viz.

$$(AB, CD)=(AB, DC)=(BA, CD).$$

For four harmonic points the six cross-ratios become equal two and two:

$$\lambda=-1,\ 1-\lambda=2,\ \frac{\lambda}{\lambda-1}=\frac{1}{2},\quad \frac{1}{\lambda}=-1,\ \frac{1}{1-\lambda}=\frac{1}{2},\ \frac{\lambda-1}{\lambda}=2.$$

Hence if we get four points whose cross-ratio is 2 or ½, then they are harmonic, but not arranged so that conjugates are paired. If this is the case the cross-ratio = −1.

§ 19. If we equate any two of the above six values of the cross-ratios, we get either $\lambda=1$, 0, ∞, or $\lambda=-1$, 2, ½, or else λ becomes a root of the equation $\lambda^2-\lambda+1=0$, that is, an imaginary cube root of −1. In this case the six values become three and three equal, so that only two different values remain. This case, though important in the theory of cubic curves, is for our purposes of no interest, whilst harmonic points are all-important.

§ 20. From the definition of harmonic points, and by aid of § 11, the following properties are easily deduced.

If C and D are harmonic conjugates with regard to A and B, then one of them lies in, the other without AB; it is impossible to move from A to B without passing either through C or through D; the one blocks the finite way, the other the way through infinity. This is expressed by saying A and B are "separated" by C and D.

For every position of C there will be one and only one point D which is its harmonic conjugate with regard to any point pair A, B.

If A and B are different points, and if C coincides with A or B, D does. But if A and B coincide, one of the points C or D, lying between them, coincides with them, and the other may be anywhere in the line. It follows that, *"if of four harmonic conjugates two coincide, then a third coincides with them, and the fourth may be any point in the line."*

If C is the middle point between A and B, then D is the point at infinity; for AC:CB = +1, hence AD:DB must be equal to −1. *The harmonic conjugate of the point at infinity in a line with regard to two points* A, B *is the middle point of* AB.

This important property gives a first example how metric properties are connected with projective ones.

§ 21. *Harmonic properties of the complete quadrilateral and quadrangle.*

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A figure formed by four lines in a plane is called a *complete quadrilateral*, or, shorter, a *four-side*. The four sides meet in six points, named the "vertices," which may be joined by three lines (other than the sides), named the "diagonals" or "harmonic lines." The diagonals enclose the "harmonic triangle of the quadrilateral." In fig. 7, A'B'C', B'AC, C'AB, CBA are the sides, A,A', B,B', C,C'

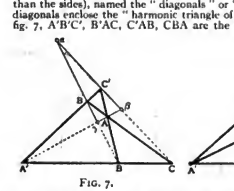

FIG. 7. FIG. 8.

the vertices, AA', BB', CC' the harmonic lines, and $\alpha\beta\gamma$ the harmonic triangle of the quadrilateral. A figure formed by four coplanar points is named a *complete quadrangle*, or, shorter, a *four-point*. The four points may be joined by six lines, named the "sides," which intersect in three other points, termed the "diagonal or harmonic points." The harmonic points are the vertices of the "harmonic triangle of the complete quadrangle." In fig. 8, AA', BB' are the points, AA', BB', A'B', B'A, AB, BA' are the sides, L, M, N are the diagonal points, and LMN is the harmonic triangle of the quadrangle.

The harmonic property of the complete quadrilateral is: Any diagonal or harmonic line is harmonically divided by the other two; and of a complete quadrangle: The angle at any harmonic point is divided harmonically by the joins to the other harmonic points. To prove the first theorem, we have to prove (AA', $\beta\gamma$), (BB', $\gamma\alpha$), (CC', $\alpha\beta$) are harmonic. Consider the cross-ratio (CC', $\alpha\beta$). Then projecting from A on BB' we have A(CC', $\alpha\beta$) = A(B'B, $\alpha\gamma$). Projecting from A' on BB', A'(CC', $\alpha\beta$) = A'(BB', $\alpha\gamma$). Hence (B'B, $\alpha\gamma$) = (BB', $\alpha\gamma$), *i.e.* the cross-ratio (BB', $\alpha\gamma$) equals that of its reciprocal; hence the range is harmonic.

The second theorem states that the pencils L(BA,NM), M(B'A,LN), N(BA, LM) are harmonic. Deferring the subject of harmonic pencils to the next section, it will suffice to state here that any transversal intersects an harmonic pencil in an harmonic range. Consider the pencil L(BA, NM), then it is sufficient to prove (BA', NM') is harmonic. This follows from the previous theorem by considering A'B as a diagonal of the quadrilateral ALB'M.]

This property of the complete quadrilateral allows the solution of the problem:

To construct the harmonic conjugate D *to a point* C *with regard to two given points* A *and* B.

Through A draw any two lines, and through C one cutting the former two in G and H. Join these points to B, cutting the former two lines in E and F. The point D where EF cuts AB will be the harmonic conjugate required.

This remarkable construction requires nothing but the drawing of lines, and is therefore independent of measurement. In a similar manner the harmonic conjugate of the line VA for two lines VC, VD is constructed with the aid of the property of the complete quadrangle.

§ 22. *Harmonic Pencils.*—The theory of cross-ratios may be extended from points in a row to lines in a flat pencil and to planes in an axial pencil. We have seen (§ 13) that if the lines which join four points A, B, C, D to any point S be cut by any other line in A', B', C', D', then (AB, CD) = (A'B', C'D'). In other words, four lines in a flat pencil are cut by every other line in four points whose cross-ratio is constant.

Definition.—By the cross-ratio of four rays in a flat pencil is meant the cross-ratio of the four points in which the rays are cut by any line. If *a*, *b*, *c*, *d* be the lines, then this cross-ratio is denoted by (*ab*, *cd*).

Definition.—By the cross-ratio of four planes in an axial pencil is understood the cross-ratio of the four points in which any line cuts the planes, or, what is the same thing, the cross-ratio of the four rays in which any plane cuts the four planes.

In order that this definition may have a meaning, it has to be proved that all lines cut the pencil in points which have the same cross-ratio. This is seen at once for two intersecting lines, as their plane cuts the axial pencil in a flat pencil, which is itself cut by the two lines. The cross-ratio of the four points on one line is therefore equal to that on the other, and equal to that of the four rays in the flat pencil.

If two non-intersecting lines *p* and *q* cut the four planes in A, B, C, D and A', B', C', D', draw a line *r* to meet both *p* and *q*, and let this line cut the planes in A', B', C', D'. Then (AB, CD) = (A'B', C'D'), for each is equal to (A'B', C'D').

§ 23. We may now also extend the notion of harmonic elements, viz.

Definition.—Four rays in a flat pencil and four planes in an axial pencil are said to be harmonic if their cross-ratio equals −1, that is, if they are cut by a line in four harmonic points.

If we understand by a "median line" of a triangle a line which joins a vertex to the middle point of the opposite side, and by a "median line" of a parallelogram a line joining middle points of opposite sides, we get as special cases of the last theorem:

The diagonals and median lines of a parallelogram form an harmonic pencil; and

At a vertex of any triangle, the two sides, the median line, and the line parallel to the base form an harmonic pencil.

Taking the parallelogram a rectangle, or the triangle isosceles, we get:

Any two lines and the bisections of their angles form an harmonic pencil. Or:

In an harmonic pencil, if two conjugate rays are perpendicular, then the other two are equally inclined to them; and, conversely, *if one ray bisects the angle between conjugate rays, it is perpendicular to its conjugate.*

This connects perpendicularity and bisection of angles with projective properties.

§ 24. We add a few theorems and problems which are easily proved or solved by aid of harmonics.

An harmonic pencil is cut by a line parallel to one of its rays in the three equidistant points.

Through a given point to draw a line such that the segment determined on it by a given angle is bisected at that point.

Having given two parallel lines, to bisect on either any given segment without using a pair of compasses.

Having given in a line a segment and its middle point, to draw through any given point in the plane a line parallel to the given line.

To draw a line which joins a given point to the intersection of two given lines which meet off the drawing paper (by aid of § 21).

CORRESPONDENCE. HOMOGRAPHIC AND PERSPECTIVE RANGES

§ 25. Two rows, *p* and *p'*, which are one the projection of the other (as in fig. 5), stand in a definite relation to each other, characterized by the following properties.

1. *To each point in either corresponds one point in the other*; that is, those points are said to correspond which are projections of one another.

2. *The cross-ratio of any four points in one equals that of the corresponding points in the other.*

3. *The lines joining corresponding points all pass through the same point.*

If we suppose corresponding points marked, and the rows brought into any other position, then the lines joining corresponding points will no longer meet in a common point, and hence the third of the above properties will not hold any longer; but we have still a correspondence between the points in the two rows possessing the first two properties. Such a correspondence has been called a *one-one correspondence*, whilst the two rows between which such correspondence has been established are said to be *projective* or *homographic*. Two rows which are each the projection of the other are therefore *projective*. We shall presently see, also, that any two projective rows can always be placed in such a position that one appears as the projection of the other. If they are in such a position the rows are said to be in *perspective position*, or simply to be in *perspective*.

§ 26. The notion of a one-one correspondence between rows may be extended to flat and axial pencils, viz. a flat pencil will be said to be projective to a flat pencil if to each ray in the first corresponds one ray in the second, and if the cross-ratio of four rays in one equals that of the corresponding rays in the second.

Similarly an axial pencil will be projective to an axial pencil. But a flat pencil may also be projective to an axial pencil, or either pencil may be projective to a row. The definition is the same in each case: there is a one-one correspondence between the elements, and four elements have the same cross-ratio as the corresponding ones.

§ 27. There is also in each case a special position which is called *perspective*, viz.

1. Two projective rows are perspective if they lie in the same plane, and if the one row is a projection of the other.

2. Two projective flat pencils are perspective—(1) if they lie in the same plane, and have a row as a common section; (2) if they lie in the same pencil (in space), and are both sections of the same axial pencil; (3) if they are in space and have a row as common section, or are both sections of the same axial pencil, one of the conditions involving the other.

3. Two projective axial pencils, if their axes meet, and if they have a flat pencil as a common section.

4. A row and a projective flat pencil, if the row is a section of the pencil, each point lying in its corresponding line.

5. A row and a projective axial pencil, if the row is a section of the pencil, each point lying in its corresponding plane.

6. A flat and a projective axial pencil, if the former is a section of the other, each ray lying in its corresponding plane.

That in each case the correspondence established by the position indicated is such as has been called projective follows at once from the definition. It is not so evident that the perspective position may always be obtained. We shall show in § 30 this for the first three

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cases. First, however, we shall give a few theorems which relate to the general correspondence, not to the perspective position.

§ 28. *Two rows or pencils, flat or axial, which are projective to a third are projective to each other*; this follows at once from the definitions.

§ 29. *If two rows, or two pencils, either flat or axial, or a row and a pencil, be projective, we may assume to any three elements in the one the three corresponding elements in the other, and then the correspondence is uniquely determined.*

For if in two projective rows we assume that the points A, B, C in the first correspond to the given points A', B', C' in the second, then to any fourth point D in the first will correspond a point D' in the second, so that

$$(AB, CD) = (A'B', C'D').$$

But there is only one point, D', which makes the cross-ratio (A'B', C'D') equal to the given number (AB, CD).

The same reasoning holds in the other cases.

§ 30. If two rows are perspective, then the lines joining corresponding points all meet in a point, the centre of projection; and the point in which the two bases of the rows intersect as a point in the first row coincides with its corresponding point in the second.

This follows from the definition. The converse also holds, viz.

If two projective rows have such a position that one point in the one coincides with its corresponding point in the other, then they are perspective, that is, the lines joining corresponding points all pass through a common point, and form a flat pencil.

For let A, B, C, D . . . be points in the one, and A', B', C', D' . . . the corresponding points in the other row, and let A be made to coincide with its corresponding point A'. Let S be the point where the lines BB' and CC' meet, and let us join S to the point D in the first row. This line will cut the second row in a point D'', so that A, B, C, D are projected from S into the points A, B', C', D''. The cross-ratio (AB, CD) is therefore equal to (AB', C'D''), and by hypothesis it is equal to (A'B', C'D'). Hence (A'B', C'D'') = (A'B', C'D'), that is, D'' is the same point as D'.

§ 31. If two projected flat pencils in the same plane are in perspective, then the intersections of corresponding lines form a row, and the line joining the two centres as a line in the first pencil corresponds to the same line as a line in the second. And conversely,

If two projective pencils in the same plane, but with different centres, have one line in the one coincident with its corresponding line in the other, then the two pencils are perspective, that is, the intersection of corresponding lines lie in a line.

The proof is the same as in § 30.

§ 32. If two projective flat pencils in the same point (pencil in space), but not in the same plane, are perspective, then the planes joining corresponding rays all pass through a line (they form an axial pencil), and the line common to the two pencils (in which their planes intersect) corresponds to itself. And conversely:—

If two flat pencils which have a common centre, but do not lie in a common plane, are placed so that one ray in the one coincides with its corresponding ray in the other, then they are perspective, that is, the planes joining corresponding lines all pass through a line.

§ 33. If two projective axial pencils are perspective, then the intersection of corresponding planes lie in a plane, and the plane common to the two pencils (in which the two axes lie) corresponds to itself. And conversely:—

If two projective axial pencils are placed in such a position that a plane in the one coincides with its corresponding plane, then the two pencils are perspective, that is, corresponding planes meet in lines which lie in a plane.

The proof again is the same as in § 30.

§ 34. These theorems relating to perspective position become illusory if the projective rows of pencils have a common base. We then have:—

In two projective rows on the same line—and also in two projective and concentric flat pencils in the same plane, or in two projective axial pencils with a common axis—every element in the one coincides with its corresponding element in the other as soon as three elements in the one coincide with their corresponding elements in the other.

Proof (in case of two rows).—Between four elements A, B, C, D and their corresponding elements A', B', C', D' exists the relation (ABCD) = (A'B'C'D'). If now A', B', C' coincide respectively with A, B, C, we get (AB, CD) = (AB, CD'), hence D and D' coincide.

The last theorem may also be stated thus:—

In two projective rows or pencils, which have a common base but are not identical, not more than two elements in the one can coincide with their corresponding elements in the other.

Thus two projective rows on the same line cannot have more than two pairs of coincident points unless every point coincides with its corresponding point.

It is easy to construct two projective rows on the same line, which have two pairs of corresponding points coincident. Let the points A, B, C as points belonging to the one row correspond to A, B, and C' as points in the second. Then A and B coincide with their corresponding points, but C does not. It is, however, not necessary that two such rows have twice a point coincident with its corresponding point; it is possible that this happens only once or not at all. Of this we shall see examples later.

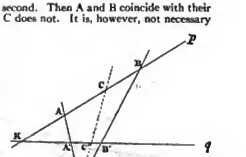

FIG. 9.

§ 35. If two projective rows or pencils are in perspective position, we know at once which element in one corresponds to any given element in the other. If p and q, (fig. 9) are two projective rows, so that K corresponds to itself, and if we know that to A and B in p correspond A' and B' in q, then the point S, where AA' meets BB', is the centre of projection, and hence, in order to find the point C' corresponding to C, we have only to join C to S; the point C', where this line cuts q, is the point required.

If two flat pencils, S_1 and S_2, in a plane are perspective (fig. 10), we need only to know two pairs, a, a' and b, b', of corresponding rays in order to find the axis s of projection. This being known, a ray c' in S_2, corresponding to a given ray c in S_1, is found by joining S_2 to the point where c cuts the axis s.

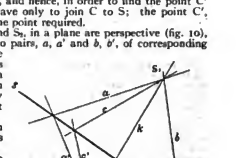

FIG. 10.

A similar construction holds in the other cases of perspective figures.

On this depends the solution of the following general problem.

§ 36. Three pairs of corresponding elements in two projective rows or pencils being given, to determine for any element in one the corresponding element in the other.

We solve this in the two cases of two projective rows and of two projective flat pencils in a plane.

Problem I.—Let a, b, c be three points in a row s, A', B', C' the corresponding points in a projective row s', both being in a plane; it is required to find for any point D in s the corresponding point D' in s'.

Problem II.—Let a, b, c be three rays in a pencil S, a', b', c' the corresponding rays in a projective pencil S', both being in the same plane; it is required to find for any ray d in S the corresponding ray d' in S'.

The solution is made to depend on the construction of an auxiliary row or pencil which is perspective to both the given ones. This is found as follows:—

Solution of Problem I.—On the line joining two corresponding points, say AA' (fig. 11), take any two points, S and S', as centres of auxiliary pencils. Join the intersection B_1 of SB and S'B' to the intersection C_1 of SC and S'C' by the line s_1. Then a row on s_1 will be perspective to s with S as centre of projection, and to s' with S' as centre. To find now the point D' on s' corresponding to a point D on s we have only to determine the point D_1, where the line SD cuts s_1, and to draw S'D_1; the point where this line cuts s' will be the required point D'.

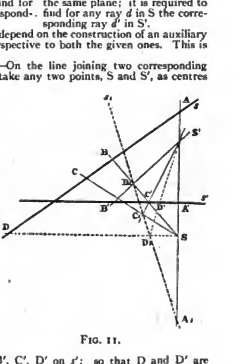

FIG. 11.

Proof.—The rows s and s' are both perspective to the row s_1, hence they are projective to one another. To A, B, C, D on s correspond A_1, B_1, C_1, D_1 on s_1, and to these correspond A', B', C', D' on s'; so that D and D' are corresponding points as required.

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Solution of Problem 11.—Through the intersection A of two corresponding rays a and a' (fig. 12), take two lines, s and s', as bases of auxiliary rows. Let S_1 be the point where the line b_1, which joins B and B′, cuts the line c_1, which joins C and C′. Then a pencil S_1 will be perspective to S with s as axis of projection. To find the ray d' in S′ corresponding to a given ray d in S, cut d by s at D; project this point from S_1 to D′ on s' and join D′ to S′. This will be the required ray.

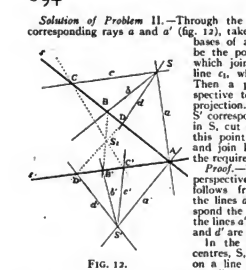

FIG. 12.

Proof.—That the pencil S_1 is perspective to S and also to S′ follows from construction. To the lines a_1, b_1, c_1, d_1 in S_1 correspond the lines a, b, c, d in S and the lines a', b', c', d' in S′, so that d and d' are corresponding rays.

In the first solution the two centres, S, S′, are *any* two points on a line joining any two corresponding points, so that the solution of the problem allows of a great many different constructions. *But whatever construction be used, the point* D′, *corresponding to* D, *must be always the same*, according to the theorem in § 29. This gives rise to a number of theorems which, however, we shall not enter. The same remarks hold for the second problem.

§ 37. *Homological Triangles.*—As a further application of the theorems about perspective rows and pencils we shall prove the following important theorem.

Theorem.—If ABC and A′B′C′ (fig. 13) be two triangles, such that the lines AA′, BB′, CC′ meet in a point S, then the intersections of BC and B′C′, of CA and C′A′, and of AB and A′B′ will lie in a line. Such triangles are said to be homological, or in perspective. The triangles are "co-axial" in virtue of the property that the meets of corresponding sides are collinear and copolar, since the lines joining corresponding vertices are concurrent.

Proof.—Let a, b, c denote the lines AA′, BB′, CC′, which meet at S. Then these may be taken as bases of projective rows, so that A, A′, S on a correspond to B, B′, S on b, and to C, C′, S on c. As the point S is common to all, any two of these rows will be perspective.

If S_1 be the centre of projection of rows b and c,

S_2 " " " c and a,

S_3 " " " a and b,

and if the line S_1S_2 cuts a in A_1, and b in B_1, and c in C_1, then A_1, B_1 will be corresponding points in a and b, both corresponding to C_1 in c. But a and b are perspective, therefore the line A_1B_1, that is S_1S_2, joining corresponding points must pass through the centre of projection S_3 of a and b. In other words, S_1, S_2, S_3 lie in a line. This is Desargues' celebrated theorem if we state it thus:—

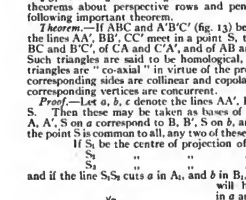

FIG. 13.

Theorem of Desargues.—If each of two triangles has one vertex on each of three concurrent lines, then the intersections of corresponding sides lie in a line, those sides being called corresponding which are opposite to vertices on the same line.

The converse theorem holds also, viz.

Theorem.—If the sides of one triangle meet those of another in three points which lie in a line, then the vertices lie on three lines which meet in a point.

The proof is almost the same as before.

§ 38. *Metrical Relations between Projective Rows.*—Every row contains one point which is distinguished from all others, viz. the point at infinity. In two projective rows, to the point I at infinity in one corresponds a point I′ in the other, and to the point J′ at infinity in the second corresponds a point J in the first. The points I′ and J are in general finite. If now A and B are any two points in the one, A′, B′ the corresponding points in the other row, then

$$(AB, JI) = (A'B', J'I'),$$

or

$$AJ/JB : AI/IB = A'J'/J'B' : A'I'/I'B'.$$

But, by § 17,

$$AI/IB = A'J'/J'B' = -1;$$

therefore the last equation changes into

$$AJ \cdot A'I' = BJ \cdot B'I',$$

that is to say—

Theorem.—The product of the distances of any two corresponding points in two projective rows from the points which correspond to the points at infinity in the other is constant, viz. $AJ \cdot A'I' = k$. Steiner has called this number k the *Power of the correspondence*.

[The relation $AJ \cdot A'I' = k$ shows that if J, I′ be given then the point A′ corresponding to a specified point A is readily found; hence A, A′ generate homographic ranges of which I and J′ correspond to the points at infinity on the ranges. If we take any two origins O, O′ on the ranges and reduce the expression $AJ \cdot A'I' = k$ to its algebraic equivalent, we derive an equation of the form $axx' + \beta x + \gamma x' + \delta = 0$. Conversely, if a relation of this nature holds, then points corresponding to solutions in x, x' form homographic ranges.]

§ 39. *Similar Rows.*—If the points at infinity in two projective rows correspond so that I′ and J are at infinity, this result loses its meaning. But if A, B, C be any three points in one, A′, B′, C′ the corresponding ones on the other row, we have

$$(AB, CI) = (A'B', C'I'),$$

which reduces to

$$AC/CB = A'C'/C'B' \text{ or } AC/A'C' = BC/B'C',$$

that is, corresponding segments are proportional. Conversely, if corresponding segments are proportional, then to the point at infinity in one corresponds the point at infinity in the other. If we call such rows *similar*, we may state the result thus—

Theorem.—Two projective rows are similar if to the point at infinity in one corresponds the point at infinity in the other, and conversely, if two rows are similar then they are projective, and the points at infinity are corresponding points.

From this the well-known propositions follow:—

Two lines are cut proportionally (in similar rows) by a series of parallels. The rows are perspective, with centre of projection at infinity.

If two similar rows are placed parallel, then the lines joining homologous points pass through a common point.

§ 40. If two flat pencils be projective, then there exists in either, one single pair of lines at right angles to one another, such that the corresponding lines in the other pencil are again at right angles.

To prove this, we place the pencils in perspective position (fig. 14) by making one ray coincident with its corresponding ray. Corresponding rays meet then on a line p. And now we draw the circle which has its centre O on p, and which passes through the centres S and S′ of the two pencils. This circle cuts p in two points H and K. The two pairs of rays, h, k, and h', k', joining these points to S and S′ will be pairs of corresponding rays at right angles. The construction gives in general but one circle, but if the line p is the perpendicular bisector of SS′, there exists an infinite number, and *to every right angle in the one pencil corresponds a right angle in the other.*

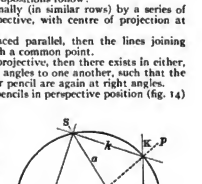

FIG. 14.

PRINCIPLE OF DUALITY

§ 41. It has been stated in § 1 that not only points, but also planes and lines, are taken as elements out of which figures are built up. We shall now see that the construction of one figure which possesses certain properties gives rise in many cases to the construction of another figure, by replacing, according to definite rules, elements of one kind by those of another. The new figure thus obtained will then possess properties which may be stated as soon as those of the original figure are known.

We obtain thus a principle, known as the *principle of duality* or of *reciprocity*, which enables us to construct to any figure not containing any measurement in its construction a *reciprocal* figure, as it is called, and to deduce from any theorem a *reciprocal* theorem, for which no further proof is needed.

It is convenient to print reciprocal propositions on opposite sides of a page broken into two columns, and this plan will occasionally be adopted.

We begin by repeating in this form a few of our former statements:—

Two points determine a line.	Two planes determine a line.
Three points which are not in a line determine a plane.	Three planes which do not pass through a line determine a point.
A line and a point without it determine a plane.	A line and a plane not through it determine a point.
Two lines in a plane determine a point.	Two lines through a point determine a plane.

These propositions show that it will be possible, when any figure is given, to construct a second figure by taking planes instead of points, and points instead of planes, but lines where we had lines.

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For instance, if in the first figure we take a plane and three points in it, we have to take in the second figure a point and three planes through it. The three points in the first, together with the three lines joining them two and two, form a triangle; the three planes in the second and their three lines of intersection form a trihedral angle. A triangle and a trihedral angle are therefore reciprocal figures.

Similarly, to any figure in a plane consisting of points and lines will correspond a figure consisting of planes and lines passing through a point S, and hence belonging to the pencil which has S as centre.

The figure reciprocal to four points in space which do not lie in a plane will consist of four planes which do not meet in a point. In this case each figure forms a tetrahedron.

§ 42. As other examples we have the following:—

To a row	is reciprocal	an axial pencil,
„ a flat pencil	„	a flat pencil,
„ a field of points and lines	„	a pencil of planes and lines,
„ the space of points	„	the space of planes.

For the row consists of a line and all the points in it, reciprocal to it therefore will be a line with all planes through it, that is, an axial pencil; and so for the other cases.

This correspondence of reciprocity breaks down, however, if we take figures which contain measurement in their construction. For instance, there is no figure reciprocal to two planes at *right angles*, because there is no segment in a row which has a magnitude as definite as a right angle.

We add a few examples of reciprocal propositions which are easily proved.

Theorem.—If A, B, C, D are any four points in space, and if the lines AB and CD meet, then all four points lie in a plane, hence also AC and BD, as well as AD and BC, meet.

Theorem.—If a, β, γ, δ are four planes in space, and if the lines αβ and γδ meet, then all four planes lie in a point (pencil), hence also αγ and βδ, as well as αδ and βγ, meet.

Theorem.—*If any number of lines every one meets every other, whilst all do not*

lie in a point, then all lie in a plane.

lie in a plane, then all lie in a point (pencil).

§ 43. Reciprocal figures as explained lie both in space of three dimensions. If the one is confined to a plane (is formed of elements which lie in a plane), then the reciprocal figure is confined to a pencil (is formed of elements which pass through a point).

But there is also a more special principle of duality, according to which figures are reciprocal which both in a plane or both in a pencil. In the plane we take points and lines as reciprocal elements, for they have this fundamental property in common, that two elements of one kind determine one of the other. In the pencil, on the other hand, lines and planes have to be taken as reciprocal, and here it holds again that two lines or planes determine one plane or line.

Thus, to one plane figure we can construct one reciprocal figure in the plane, and to each one reciprocal figure in a pencil. We mention a few of these. At first we explain a few names:—

A figure consisting of *n* points in a plane will be called an *n*-point.	A figure consisting of *n* lines in a plane will be called an *n*-side.
A figure consisting of *n* planes in a pencil will be called an *n*-flat.	A figure consisting of *n* lines in a pencil will be called an *n*-edge.

It will be understood that an *n*-side is different from a polygon of *n* sides. The latter has sides of finite length and *n* vertices, the former has sides all of infinite extension, and every point where two of the sides meet will be a vertex. A similar difference exists between a solid angle and an *n*-edge or an *n*-flat. We notice particularly—

A four-point has six sides, of which two and two are opposite, and three diagonal points, which are intersections of opposite sides.	A four-side has six vertices, of which two and two are opposite, and three diagonals, which join opposite vertices.
A four-flat has six edges, of which two and two are opposite, and three diagonal planes, which pass through opposite edges.	A four-edge has six faces, of which two and two are opposite, and three diagonal edges, which are intersections of opposite faces.

A four-side is usually called a complete quadrilateral, and a four-point a complete quadrangle. The above notation, however, seems better adapted for the statement of reciprocal propositions.

§ 44.

If a point moves in a plane it describes a plane curve.	If a line moves in a plane it envelopes a plane curve (fig. 15).
If a plane moves in a pencil it envelopes a cone.	If a line moves in a pencil it describes a cone.

A curve thus appears as generated either by points, and then we call it a "locus," or by lines, and then we call it an "envelope." In the same manner a cone, which means here a surface, appears either as the locus of lines passing through a fixed point, the "vertex" of the cone, or as the envelope of planes passing through the same point.

To a surface as locus of points corresponds, in the same manner, a surface as envelope of planes; and to a curve in space as locus of points corresponds a developable surface as envelope of planes.

It will be seen from the above that we may, by aid of the principle of duality, construct for every figure a reciprocal figure, and that to any property of the one a reciprocal property of the other will exist, as long as we consider only properties which depend upon nothing but the positions and intersections of the different elements and not upon measurement.

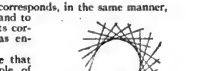

FIG. 15.

For such propositions it will therefore be unnecessary to prove more than one of two reciprocal theorems.

GENERATION OF CURVES AND CONES OF SECOND ORDER OR SECOND CLASS

§ 45. *Conics.*—If we have two projective pencils in a plane, corresponding rays will meet, and their point of intersection will constitute some locus which we have to investigate. Reciprocally, if two projective rows in a plane are given, then the lines which join corresponding points will envelope some curve. We prove first:—

Theorem.—If two projective flat pencils lie in a plane, but are neither in perspective nor concentric, then the locus of intersections of corresponding rays is a curve of the *second order*, that is, no line contains more than two points of the locus.

Theorem.—If two projective rows lie in a plane, but are neither in perspective nor on a common base, then the envelope of lines joining corresponding points is a curve of the *second class*, that is, through no point pass more than two of the enveloping lines.

Proof.—We draw any line *t*. This cuts each of the pencils in a row, so that we have on *t* two rows, and these are projective because the pencils are projective. If corresponding rays of the two pencils meet on the line *t*, their intersection will be a point in the one row which coincides with its corresponding point in the other. But two projective rows on the same base cannot have more than two points of one coincident with their corresponding points in the other (§ 34).

Proof.—We take any point T and join it to all points in each row. This gives two concentric pencils, which are projective because the rows are projective. If a line joining corresponding points in the two rows passes through T, it will be a line in the one pencil which coincides with its corresponding line in the other. But two projective concentric flat pencils in the same plane cannot have more than two lines of one coincident with their corresponding line in the other (§ 34).

It will be seen that the proofs are reciprocal, so that the one may be copied from the other by simply interchanging the words point and line, locus and envelope, row and pencil, and so on. We shall therefore in future prove seldom more than one of two reciprocal theorems, and often state one theorem only, the reader being recommended to go through the reciprocal proof by himself, and to supply the reciprocal theorems when not given.

§ 46. We state the theorems in the pencil reciprocal to the last, without proving them:—

Theorem.—If two projective flat pencils are concentric, but are neither perspective nor coplanar, then the envelope of the planes joining corresponding rays is a cone of the second class; that is, no line through the common centre contains more than two of the enveloping planes.

Theorem.—If two projective axial pencils lie in the same pencil (their axes meet in a point), but are neither perspective nor co-axial, then the locus of lines joining corresponding planes is a cone of the second order; that is, no plane in the pencil contains more than two of these lines.

§ 47. Of theorems about cones of second order and cones of second class we shall state only very few. We point out, however, the following connexion between the curves and cones under consideration:

The lines which join any point in space to the points on a curve of the second order form a cone of the second order.	Every plane section of a cone of the second order is a curve of the second order.
The planes which join any point in space to the lines enveloping a curve of the second class envelope themselves a cone of the second class.	Every plane section of a cone of the second class is a curve of the second class.

By its aid, or by the principle of duality, it will be easy to obtain theorems about them from the theorems about the curves.

We prove the first. A curve of the second order is generated by two projective pencils. These pencils, when joined to the point in space, give rise to two projective axial pencils, which generate the cone in question as the locus of the lines where corresponding planes meet.

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§ 48.

Theorem.—The curve of second order which is generated by two projective flat pencils passes through the centres of the two pencils.

Proof.—If S and S′ are the two pencils, then to the ray SS′ or p' in the pencil S′ corresponds in the pencil S a ray p_1 which is different from p', for the pencils are not perspective. But p and p' meet at S, so that S is a point on the curve, and similarly S′.

It follows that every line in one of the two pencils cuts the curve in two points, viz. once at the centre S of the pencil, and once where it cuts its corresponding ray in the other pencil. These two points, however, coincide, if the line is cut by its corresponding line at S itself. The line p in S, which corresponds to the line SS′ in S′, is therefore the only line through S which has but one point in common with the curve, or which cuts the curve in two *coincidenti* points. Such a line is called a *tangent* to the curve, touching the latter at the point S, which is called the "point of contact."

In the same manner we get in the reciprocal investigation the result that through every point in one of the rows, say in s, two tangents may be drawn to the curve, the one being s, the other the line joining the point to its corresponding point in s'. There is, however, one point P in s for which these two lines coincide. Such a point in one of the tangents is called the "point of contact" of the tangent. We thus get—

Theorem.—To the line joining the centres of the projective pencils as a line in one pencil corresponds in the other the tangent at its centre.

§ 49. Two projective pencils are determined if three pairs of corresponding lines are given. Hence if a_1, b_1, c_1 are three lines in a pencil S_1, and a_2, b_2, c_2 the corresponding lines in a projective pencil S_2, the correspondence and therefore the curve of the second order generated by the points of intersection of corresponding rays is determined. Of this curve we know the two centres S_1 and S_2, and the three points a_1a_2, b_1b_2, c_1c_2, hence five points in all. This and the reciprocal considerations enable us to solve the following two problems:

Problem.—To construct a curve of the second order, of which five points S_1, S_2, A, B, C are given.

In order to solve the left-hand problem, we take two of the given points, say S_1 and S_2, as centres of pencils. These we make projective by taking the rays a_1, b_1, c_1, which join S_1 to A, B, C respectively, as corresponding to the rays a_2, b_2, c_2, which join S_2 to A, B, C respectively, so that three rays meet their corresponding rays at the given points A, B, C. This determines the correspondence of the pencils which will generate a curve of the second order passing through A, B, C and through the centres S_1 and S_2, hence through the five given points. To find more points on the curve we have to construct for any ray in S_1 the corresponding ray in S_2. This has been done in § 36. But we repeat the construction in order to deduce further properties from it. We also solve the right-hand problem. Here we select two, viz. s_1, s_2 of the five given lines, s_1, s_2, a, b, c, as bases of two rows, and the points A_1, B_1, C_1 where a, b, c cut s_1 as corresponding to the points A_2, B_2, C_2 where a, b, c cut s_2.

We get then the following solutions of the two problems:

Solution.—Through the point A draw any two lines, u_1 and u_2 (fig. 16), the first u_1 to cut the pencil S_1 in a row AB_1C_1, the other u_2 to cut the pencil S_2 in a row AB_2C_2. These two rows will be perspective, as the point A corresponds to itself, and the centre of projection will be the point S, where the lines B_1B_2 and C_1C_2 meet. To find now for any ray d_1 in S_1 its corresponding ray d_2 in S_2, we determine the point D_1 where d_1 cuts u_1, project this point from S to D_2 on u_2, and join S_2 to D_2. This will be the required ray d_2 which cuts d_1 at some point D on the curve.

Theorem.—The envelope of second class which is generated by two projective rows contains the bases of these rows as enveloping lines or tangents.

Proof.—If s and s' are the two rows, then to the point ss' or P′ as a point in s' corresponds in s a point P, which is not coincident with P′, for the rows are not perspective. But P and P′ are joined by s, so that s is one of the enveloping lines, and similarly s'.

Problem.—To construct a curve of the second class, of which five tangents s_1, s_2, a, b, c are given.

Solution.—In the line a take any two points S_1 and S_2 as centres of pencils (fig. 17), the first S_1 $(A_1B_1C_1)$ to project the row s_1, the other S_2 $(A_2B_2C_2)$ to project the row s_2. These two pencils will be perspective, as the line S_1A_1 being the same as the corresponding line S_2A_2, and the axis of projection will be the line s, which joins the intersection of S_1B_1 and S_2B_2 to the intersection C of S_1C_1 and S_2C_2. To find now for any point D_1 in s_1 the corresponding point D_2 in s_2, we draw S_1D_1 and project the point D where this line cuts s from S_2 to s_2. This will give the required point D_2, and the line d joining D_1 to D_2 will be a new tangent to the curve.

§ 50. These constructions prove, when rightly interpreted, very important properties of the curves in question.

If in fig. 16 we draw in the pencil S_1 the ray k_1 which passes

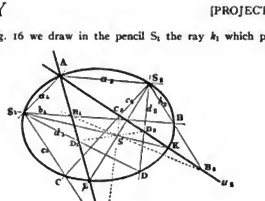

FIG. 16.

through the auxiliary centre S_3 it will be found that the corresponding ray k_2 cuts it on u_3. Hence—

Theorem.—In the above construction the bases of the auxiliary rows u_1 and u_2 cut the curve where they cut the rays S_3S and S_3S respectively.

As A is any given point on the curve, and u_1 any line through it, we have solved the problems:

Problem.—To find the second point in which any line through a known point on the curve cuts the curve.

If we determine in S_1 (fig. 16) the ray corresponding to the ray S_2S_3 in S_2, we get the tangent at S_2. Similarly, we can determine the point of contact of the tangents u_1 or u_2 in fig. 17.

Theorem.—In the above construction (fig. 17) the tangents to the curve from the centres of the auxiliary pencils S_3 and S_4 are the lines which pass through u_3u_4 and u_4u_3 respectively.

Problem.—To find the second tangent which can be drawn from any point in a given tangent to the curve.

§ 51. If five points are given, of which not three are in a line, then we can, as has just been shown, always draw a curve of the

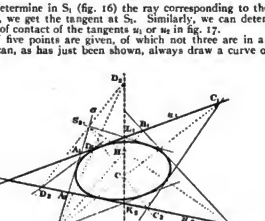

FIG. 17.

second order through them; we select two of the points as centres of projective pencils, and then one such curve is determined. It will be presently shown that we get always the same curve if two other points are taken as centres of pencils, that therefore five points *determine* one curve of the second order, and reciprocally, that five tangents determine one curve of the second class. Six points taken at random will therefore not lie on a curve of the second order. In order that this may be the case a certain condition has to be satisfied, and this condition is easily obtained from the construction in § 49, fig. 16. If we consider the conic determined by the five points A, S_1, S_2, K, L, then the point D will be on the curve if, and only if, the points on D_1, S, D_2 lie in a line.

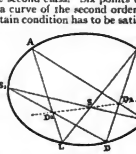

FIG. 18.

This may be stated differently if we take AKS_1DS_2L (figs. 16 and 18) as a hexagon inscribed in the conic, then AK and DS_2 will be opposite sides, so will be KS_1 and S_2L, as well as S_1D and LA. The first two meet in D_2, the others in S and D_1 respectively. We may therefore state the required condition, together with the reciprocal one, as follows:—

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Pascal's Theorem.—If a hexagon be inscribed in a curve of the second order, then the intersections of opposite sides are three points in a line.

Brianchon's Theorem.—If a hexagon be circumscribed about a curve of the second class, then the lines joining opposite vertices are three lines meeting in a point.

These celebrated theorems, which are known by the names of their discoverers, are perhaps the most fruitful in the whole theory of conics. Before we go over to their applications we have to show that we obtain the same curve if we take, instead of S_1, S_2, any two other points on the curve as centres of projective pencils.

§52. We know that the curve depends only upon the correspondence between the pencils S_1 and S_2, and not upon the special construction used for finding any new points on the curve. The curves (fig. 16 or 18), through which the two auxiliary rows u_1, u_2 were drawn, may therefore be changed to any other point on the curve. Let us now suppose the curve drawn, and keep the points S_1, S_2, K, L and D_1 and hence also the point S fixed, whilst we move A along the curve. Then the line AL will describe a pencil about L as centre, and the point D_2 a row on S_2D perspective to the pencil L. At the same time AK describes a pencil about K and D_2 a row perspective to it on S_1D. But by Pascal's theorem D_2 and D_1 will always lie in a line with S, so that the rows described by D_1 and D_2 are perspective. It follows that the pencils K and L will themselves be projective, corresponding rays meeting on the curve. This proves that we get the same curve whatever pair of the five given points we take as centres of projective pencils. Hence—

Only one curve of the second order can be drawn which passes through five given points.

Only one curve of the second class can be drawn which touches five given lines.

We have seen that if on a curve of the second order two points coincide at A, the line joining them becomes the tangent at A. If, therefore, a point on the curve and its tangent are given, this will be equivalent to having given two points on the curve. Similarly, if on the curve of second class a tangent and its point of contact are given, this will be equivalent to two given tangents.

We may therefore extend the last theorem:

Only one curve of the second order can be drawn, of which four points and the tangent at one of them, or three points and the tangents at two of them, are given.

Only one curve of the second class can be drawn, of which four tangents and the point of contact at one of them, or three tangents and the points of contact at two of them, are given.

§53. At the same time it has been proved:

If all points on a curve of the second order be joined to any two of them, then the two pencils thus formed are projective, those rays being corresponding which meet on the curve. Hence—

All tangents to a curve of second class are cut by any two of them in projective rows, those being corresponding points which lie on the same tangent. Hence—

The cross-ratio of four rays joining a point S on a curve of second order to four fixed points A, B, C, D in the curve is independent of the position of S, and is called the cross-ratio of the four points A, B, C, D.

The cross-ratio of the four points in which any tangent u is cut by four fixed tangents a, b, c, d is independent of the position of u, and is called the cross-ratio of the four tangents a, b, c, d.

If this cross-ratio equals -1 the four points are said to be four harmonic points.

If this cross-ratio equals -1 the four tangents are said to be four harmonic tangents.

We have seen that a curve of second order, as generated by projective pencils, has at the centre of each pencil one tangent; and further, that any point on the curve may be taken as centre of such pencil. Hence—

A curve of second order has at every point one tangent.

A curve of second class has on every tangent a point of contact.

§54. We return to Pascal's and Brianchon's theorems and their applications, and shall, as before, state the results both for curves of the second order and curves of the second class, but prove them only for the former.

Pascal's theorem may be used when five points are given to find more points on the curve, viz. it enables us to find the point where any line through one of the given points cuts the curve again. It is convenient, in making use of Pascal's theorem, to number the points, to indicate the order in which they are to be taken in forming a hexagon, which, by the way, may be done in 60 different ways. It will be seen that 1 2 (leaving out 3) 4 5 are opposite sides, so are 2 3 and (leaving out 4) 5 6, and also 3 4 and (leaving out 5) 6 1.

If the points 1 2 3 4 5 are given, and we want a 6th point on a line drawn through 1, we know all the sides of the hexagon with the exception of 5 6, and this is found by Pascal's theorem.

If this line should happen to pass through 1, then 6 and 1 coincide, or the line 6 1 is the tangent at 1. And always if two consecutive vertices of the hexagon approach nearer and nearer, then the side joining them will ultimately become a tangent.

We may therefore consider a pentagon inscribed in a curve of second order and the tangent at one of its vertices as a hexagon, and thus get the theorem:

Every pentagon inscribed in a curve of second order has the property that the intersections of two pairs of non-consecutive sides lie in a line with the point where the fifth side cuts the tangent at the opposite vertex.

Every pentagon circumscribed about a curve of the second class has the property that the lines which join two pairs of non-consecutive vertices meet on that line which joins the fifth vertex to the point of contact of the opposite side.

This enables us also to solve the following problems.

Given five points on a curve of second order to construct the tangent at any one of them.

Given five tangents to a curve of second class to construct the point of contact of any one of them.

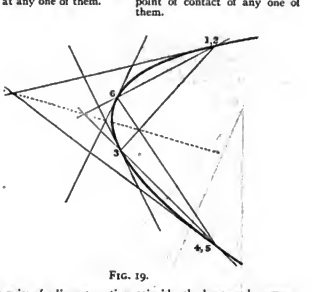

FIG. 19.

If two pairs of adjacent vertices coincide, the hexagon becomes a quadrilateral, with tangents at two vertices. These we take to be opposite, and get the following theorems:

If a quadrilateral be inscribed in a curve of second order, the intersections of opposite sides, and also the intersections of the tangents at opposite vertices, lie in a line (fig. 19).

If a quadrilateral be circumscribed about a curve of second class, the lines joining opposite vertices, and also the lines joining points of contact of opposite sides, meet in a point.

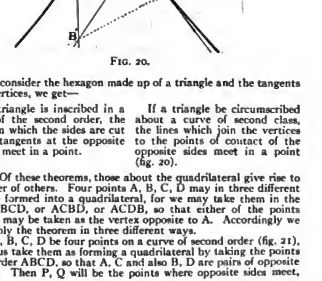

FIG. 20.

If we consider the hexagon made up of a triangle and the tangents at its vertices, we get—

If a triangle is inscribed in a curve of the second order, the points in which the sides are cut by the tangents at the opposite vertices meet in a point.

If a triangle be circumscribed about a curve of second class, the lines which join the vertices to the points of contact of the opposite sides meet in a point (fig. 20).

§55. Of these theorems, those about the quadrilateral give rise to a number of others. Four points A, B, C, D may in three different ways be formed into a quadrilateral, for we may take them in the order ABCD, or ACBD, or ACDB, so that either of the points B, C, D may be taken as the vertex opposite to A. Accordingly we may apply the theorem in three different ways.

Let A, B, C, D be four points on a curve of second order (fig. 21), and let us take them as forming a quadrilateral by taking the points in the order ABCD, so that A, C and also B, D are pairs of opposite vertices. Then P, Q will be the points where opposite sides meet,

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and E, F the intersections of tangents at opposite vertices. The four points P, Q, E, F lie therefore in a line. The quadrilateral ACBD gives us in the same way the four points Q, R, G, H in a line, and the quadrilateral ABDC a line containing the four points R, P, I, K. These three lines form a triangle PQR.

The relation between the points and lines in this figure may be expressed more clearly if we consider ABCD as a four-point inscribed in a conic, and the tangents at these points as a four-side circumscribed about it,—viz. it will be seen that P, Q, R are the diagonal points of the four-point ABCD, whilst the sides of the triangle PQR are the diagonals of the circumscribing four-side. Hence the theorem—

Any four-point on a curve of the second order and the four-side formed by the tangents at these points stand in this relation that the diagonal points of the four-point lie in the diagonals of the four-side. And conversely,

If a four-point and a circumscribed four-side stand in the above relation, then a curve of the second order may be described which passes through the four points and touches there the four sides of these figures.

That the last part of the theorem is true follows from the fact that the four points A, B, C, D and the line *a*, as tangent at A, deter-

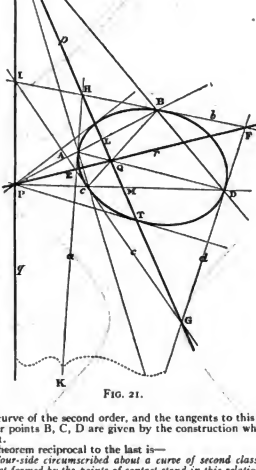

FIG. 21.

mine a curve of the second order, and the tangents to this curve at the other points B, C, D are given by the construction which leads to fig. 21.

The theorem reciprocal to the last is—

Any four-side circumscribed about a curve of second class and the four-point formed by the points of contact stand in this relation that the diagonals of the four-side pass through the diagonal points of the four-point. And conversely,

If a four-side and an inscribed four-point stand in the above relation, then a curve of the second class may be described which touches the sides of the four-side at the points of the four-point.

§ 56. The four-point and the four-side in the two reciprocal theorems are alike. Hence if we have a four-point ABCD and a four-side *abcd* related in the manner described, then not only may a curve of the second order be drawn, but also a curve of the second class, which both touch the lines *a*, *b*, *c*, *d* at the points A, B, C, D.

The curve of second order is already more than determined by the points A, B, C and the tangents *a*, *b*, *c* at A, B and C. The point D may therefore be *any* point on this curve, and *d* any tangent to the curve. On the other hand the curve of the second class is more than determined by the three tangents *a*, *b*, *c* and their points of contact A, B, C, so that *d* is any tangent to this curve. It follows that every tangent to the curve of second order is a tangent of a curve of the second class having the same point of contact. In other words, the curve of second order is a curve of second class, and *vice versa*. Hence the important theorems—

Every curve of second order is a curve of second class.

Every curve of second class is a curve of second order.

The curves of second order and of second class, having thus been proved to be identical, shall henceforth be called by the common name of *Conics*.

For these curves hold, therefore, all properties which have been proved for curves of second order or of second class. We may therefore now state Pascal's and Brianchon's theorem thus—

Pascal's Theorem.—If a hexagon be inscribed in a conic, then the intersections of opposite sides lie in a line.

Brianchon's Theorem.—If a hexagon be circumscribed about a conic, then the diagonals forming opposite centres meet in a point.

§ 57. If we suppose in fig. 21 that the point D together with the tangent *d* moves along the curve, whilst A, B, C and their tangents *a*, *b*, *c* remain fixed, then the ray DA will describe a pencil about A, the point Q a projective row on the fixed line BC, the point F the row *b*, and the ray EF a pencil about E. But EF passes always through Q. Hence the pencil described by AD is projective to the pencil described by EF, and therefore to the row described by F on *b*. At the same time the line BD describes a pencil about B projective to that described by AD (§ 53). Therefore the pencil BD and the row F on *b* are projective. Hence—

If on a conic a point A be taken and the tangent a at this point, then the cross-ratio of the four rays which join A to any four points on the curve is equal to the cross-ratio of the points in which the tangents at these points cut the tangent at A.

§ 58. There are theorems about cones of second order and second class in a pencil which are reciprocal to the above, according to § 43. We mention only a few of the more important ones.

The locus of intersections of corresponding planes in two projective axial pencils whose axes meet is a cone of the second order.

The envelope of planes which join corresponding lines in two projective flat pencils, not in the same plane, is a cone of the second class.

Cones of second order and cones of second class are identical.

Every plane cuts a cone of the second order in a conic.

A cone of second order is uniquely determined by five of its edges or by five of its tangent planes, or by four edges and the tangent plane at one of them, &c. &c.

Pascal's Theorem.—If a solid angle of six faces be inscribed in a cone of the second order, then the intersections of opposite faces are three lines in a plane.

Brianchon's Theorem.—If a solid angle of six edges be circumscribed about a cone of the second order, then the planes through opposite edges meet in a line.

Each of the other theorems about conics may be stated for cones of the second order.

§ 59. *Projective Definitions of the Conics.*—We now consider the shape of the conics. We know that any line in the plane of the conic, and hence that the line at infinity, either has no point in common with the curve, or one (counting for two coincident points) or two distinct points. If the line at infinity has no point on the curve the latter is altogether finite, and is called an *Ellipse* (fig. 21). If the line at infinity has only one point in common with the conic, the latter extends to infinity, and has the line at infinity a tangent. It is called a *Parabola* (fig. 22). If, lastly, the line at infinity cuts the curve in two points, it consists of two separate parts which each extend in two branches to the points at infinity where they meet. The curve is in this case called an *Hyperbola* (see fig. 20). The tangents at the two points at infinity are finite because the line at infinity is not a tangent. They are called *Asymptotes*. The branches of the hyperbola approach these lines indefinitely as a point on the curves moves to infinity.

FIG. 22.

§ 60. That the circle belongs to the curves of the second order is seen at once if we state in a slightly different form the theorem that in a circle all angles at the circumference standing upon the same arc are equal. If two points S_1, S_2 on a circle be joined to any other two points A and B on the circle, then the angle included by the rays S_1A and S_1B is equal to that between the rays S_2A and S_2B, so that as A moves along the circumference the rays S_1A and S_2A describe equal and therefore projective pencils. The circle can thus be generated by two projective pencils, and is a curve of the second order.

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If we join a point in space to all points on a circle, we get a (circular) cone of the second order (§ 43). Every plane section of this cone is a conic. This conic will be an ellipse, a parabola, or an hyperbola, according as the line at infinity in the plane has no, one or two points in common with the conic in which the plane at infinity cuts the cone. It follows that our curves of second order may be obtained as sections of a circular cone, and that they are identical with the "Conic Sections" of the Greek mathematicians.

§ 61. Any two tangents to a parabola are cut by all others in projective rows; but the line at infinity being one of the tangents, the points at infinity on the rows are corresponding points, and the rows therefore similar. Hence the theorem—

The tangents to a parabola cut each other proportionally.

Pole and Polar

§ 62. We return once again to fig. 21, which we obtained in § 55.

If a four-side be circumscribed about and a four-point inscribed in a conic, so that the vertices of the second are the points of contact of the sides of the first, then the triangle formed by the diagonals of the first is the same as that formed by the diagonal points of the other.

Such a triangle will be called a *polar-triangle* of the conic, so that PQR in fig. 21 is a polar-triangle. It has the property that on the side p opposite P meet the tangents at A and B, and also those at C and D. From the harmonic properties of four-points and four-sides it follows further that the points L, M, where it cuts the lines AB and CD, are harmonic conjugates with regard to AB and CD respectively.

If the point P is given, and we draw a line through it, cutting the conic in A and B, then the point Q harmonic conjugate to P with regard to AB, and the point H where the tangents at A and B meet, are determined. But they lie both on p, and therefore this line is determined. If we now draw a second line through P, cutting the conic in C and D, then the point M harmonic conjugate to P with regard to CD, and the point G where the tangents at C and D meet, must also lie on p. As the first line through P already determines p, the second may be any line through P. Now every two lines through P determine a four-point ABCD on the conic, and therefore a polar-triangle which has one vertex at P and its opposite side at p. This result, together with its reciprocal, gives the theorems—

All polar-triangles which have one vertex in common have also the opposite side in common.

All polar-triangles which have one side in common have also the opposite vertex in common.

§ 63. To any point P in the plane of, but not on, a conic corresponds thus one line p as the side opposite to P in all polar-triangles which have one vertex at P, and reciprocally to every line p corresponds one point P as the vertex opposite to p in all triangles which have p as one side.

We call the line p the *polar* of P, and the point P the *pole* of the line p with regard to the conic.

If a point lies on the conic, we call the tangent at that point its polar; and reciprocally we call the point of contact the pole of tangent.

§ 64. From these definitions and former results follow—

The polar of any point P not on the conic is a line p, which has the following properties:—

1. On every line through P which cuts the conic, the polar of P contains the harmonic conjugate of P with regard to those points on the conic.

2. If tangents can be drawn from P, their points of contact lie on p.

3. Tangents drawn at the points where any line through P cuts the conic meet on p; and conversely,

4. If from any point on p, tangents be drawn, their points of contact will lie in a line with P.

5. Any four-point on the conic which has one diagonal point at P has the other two lying on p.

The truth of 2 follows from 1. If T be a point where p cuts the conic, then one of the points where PT cuts the conic, and which are harmonic conjugates with regard to PT, coincides with T; hence the other does—that is, PT touches the curve at T.

That 4 is true follows thus: If we draw from a point H on the polar one tangent a to the conic, join its point of contact A to the pole P, determine the second point of intersection B of this line with the conic, and draw the tangent at B, it will pass through H, and will therefore be the second tangent which may be drawn from H to the curve.

§ 65. The second property of the polar or pole gives rise to the theorem—

From a point in the plane of a conic, two, one or no tangents may be drawn to the conic, according as its polar has two, one or no points in common with the curve.

A line in the plane of a conic has two, one or no points in common with the conic, according as two, one or no tangents can be drawn from its pole to the conic.

Of any point in the plane of a conic we say that it was *without*, on or within the curve according as two, one or no tangents to the curve pass through it. The points on the conic separate those within the conic from those without. That this is true for a circle is known from elementary geometry. That it also holds for other conics follows from the fact that every conic may be considered as the projection of a circle, which will be proved later on.

The fifth property of pole and polar stated in § 64 shows how to find the polar of any point and the pole of any line by aid of the straight-edge only. Practically it is often convenient to draw three secants through the pole, and to determine only one of the diagonal points for two of the four-points formed by pairs of these lines and the conic (fig. 22).

These constructions also solve the problem—

From a point without a conic, to draw the two tangents to the conic by aid of the straight-edge only.

For we need only draw the polar of the point in order to find the points of contact.

§ 66. The property of a polar-triangle may now be stated thus—

In a polar-triangle each side is the polar of the opposite vertex, and each vertex is the pole of the opposite side.

If P is one vertex of a polar-triangle, then the other vertices, Q and R, lie on the polar p of P. One of these vertices we may choose arbitrarily. For if from any point Q on the polar a secant be drawn cutting the conic in A and D (fig. 23), and if the lines joining these points to P cut the conic again at B and C, then the line BC will pass through Q. Hence P and Q are two of the vertices on the polar-triangle which is determined by the four-point ABCD. The third vertex R lies also on the line p. It follows, therefore, also—

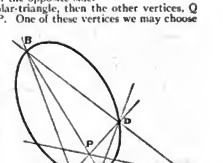

FIG. 23.

If Q is a point on the polar of P, then P is a point on the polar of Q; and reciprocally,

If q is a line through the pole of p, then p is a line through the pole of q.

This is a very important theorem. It may also be stated thus—

If a point moves along a line describing a row, its polar turns about the pole of the line describing a pencil.

This pencil is projective to the row, so that the cross-ratio of four poles in a row equals the cross-ratio of its four polars, which pass through the pole of the row.

To prove the last part, let us suppose that P, A and B in fig. 23 remain fixed, whilst Q moves along the polar p of P. This will make CD turn about P and move R along p, whilst QD and RD describe projective pencils about A and B. Hence Q and R describe projective rows, and hence PR, which is the polar of Q, describes a pencil projective to either.

§ 67. Two points, of which one, and therefore each, lies on the polar of the other, are said to be *conjugate with regard to the conic*; and two lines, of which one, and therefore each, passes through the pole of the other, are said to be *conjugate with regard to the conic*. Hence all points conjugate to a point P lie on the polar of P; all lines conjugate to a line p pass through the pole of p.

If the line joining two conjugate poles cuts the conic, then the poles are harmonic conjugates with regard to the points of intersection; hence one lies within the other without the conic, and all points conjugate to a point within a conic lie without it.

Of a pair-triangle any two vertices are conjugate poles, any two sides conjugate lines. If, therefore, one side cuts a conic, then one of the two vertices which lie on this side is within and the other without the conic. The vertex opposite this side lies also without, for it is the pole of a line which cuts the curve. In this case therefore one vertex lies within, the other two without. If, on the other hand, we begin with a side which does not cut the conic, then its pole lies within and the other vertices without. Hence—

Every polar-triangle has one and only one vertex within the conic.

We add, without a proof, the theorem—

The four points in which a conic is cut by two conjugate polars are four harmonic points in the conic.

§ 68. If two conics intersect in four points (they cannot have more points in common, § 52), there exists one and only one

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four-point which is inscribed in both, and therefore one polar-triangle common to both.

Theorem.—Two conics which intersect in four points have always one and only one common polar-triangle; and reciprocally,

Two conics which have four common tangents have always one and only one common polar-triangle.

DIAMETERS AND AXES OF CONICS

§ 69. *Diameters.*—The theorems about the harmonic properties of poles and polars contain, as special cases, a number of important metrical properties of conics. These are obtained if either the pole or the polar is moved to infinity,—it being remembered that the harmonic conjugate to a point at infinity, with regard to two points A, B, is the middle point of the segment AB. The most important properties are stated in the following theorems:—

The middle points of parallel chords of a conic lie in a line—viz. on the polar to the point at infinity on the parallel chords.

This line is called a *diameter.*

The polar of every point at infinity is a diameter.

The tangents at the end points of a diameter are parallel, and are parallel to the chords bisected by the diameter.

All diameters pass through a common point, the pole of the line at infinity.

All diameters of a parabola are parallel, the pole to the line at infinity being the point where the curve touches the line at infinity.

In case of the ellipse and hyperbola, the pole to the line at infinity is a finite point called the *centre* of the curve.

A centre of a conic bisects every chord through it.

The centre of an ellipse is within the curve, for the line at infinity does not cut the ellipse.

The centre of an hyperbola is without the curve, because the line at infinity cuts the curve.

From the centre of an hyperbola two tangents can be drawn to the curve which have their point of contact at infinity. These are called *Asymptotes* (§ 59).

To construct a diameter of a conic, draw two parallel chords and join their middle points.

To find the centre of a conic, draw two diameters; their intersection will be the centre.

§ 70. *Conjugate Diameters.*—A polar-triangle with one vertex at the centre will have the opposite side at infinity. The other two sides pass through the centre, and are called *conjugate diameters,* each being the polar of the point at infinity on the other.

Of two conjugate diameters, each bisects the chords parallel to the other, and if one cuts the curve, the tangents at its ends are parallel to the other diameter.

Further—

Every parallelogram inscribed in a conic has its sides parallel to two conjugate diameters; and

Every parallelogram circumscribed about a conic has as diagonals two conjugate diameters.

This will be seen by considering the parallelogram in the first case as an inscribed four-point, in the other as a circumscribed four-side, and determining in each case the corresponding polar-triangle. The first may also be enunciated thus—

The lines which join any point on an ellipse or an hyperbola to the ends of a diameter are parallel to two conjugate diameters.

§ 71. *If every diameter is perpendicular to its conjugate the conic is a circle.*

For the lines which join the ends of a diameter to any point on the curve include a right angle.

A conic which has more than one pair of conjugate diameters at right angles to each other is a circle.

Let AA' and BB' (fig. 24) be one pair of conjugate diameters at right angles to each other, CC' and DD' a second pair. If we draw through the end point A of one diameter a chord AP parallel to DD', and join P to A', then PA and PA' are, according to § 70, parallel to two conjugate diameters. But PA is parallel to DD', hence PA' is parallel to CC', and therefore PA and PA' are perpendicular. If we further draw the tangents to the conic at A and A', these will be perpendicular to AA', they being parallel to the conjugate diameter BB'. We know thus five points on the conic, viz. the points A and A' with their tangents, and the point P. Through these a circle may be drawn having AA' as diameter; and as through five points one conic only can be drawn, this circle must coincide with the given conic.

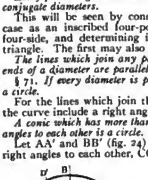

FIG. 24.

§ 72. *Axes.*—Conjugate diameters perpendicular to each other are called *axes,* and the points where they cut the curve *vertices* of the conic.

In a circle every diameter is an axis, every point on it is a vertex; and any two lines at right angles to each other may be taken as a pair of axes of any circle which has its centre at their intersection.

If we describe on a diameter AB of an ellipse or hyperbola a circle concentric to the conic, it will cut the latter in A and B (fig. 25). Each of the semicircles in which it is divided by AB will be partly within, partly without the curve, and must cut the latter therefore again in a point. The circle and the conic have thus four points one polar-triangle, in common (§ 68). Of this the centre is one vertex, for the line at infinity is the polar to this point, both with regard to the circle and the other conic. The other two sides are conjugate diameters of both, hence perpendicular to each other. This gives—

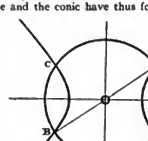

FIG. 25.

An ellipse as well as an hyperbola has one pair of axes.

This reasoning shows at the same time *how to construct the axis of an ellipse or of an hyperbola.*

A parabola has one axis, if we define an axis as a diameter perpendicular to the chords which it bisects. It is easily constructed. The line which bisects any two parallel chords is a diameter. Chords perpendicular to it will be bisected by a parallel diameter, and this is the axis.

§ 73. The first part of the right-hand theorem in § 64 may be stated thus: any two conjugate lines through a point P without a conic are harmonic conjugates with regard to the two tangents that may be drawn from P to the conic.

Let O be the centre of the hyperbola (fig. 26), *t* any secant which cuts the hyperbola in C,D and the asymptotes in E,F, then the line OM which bisects the chord CD is a diameter conjugate to the

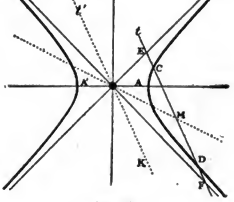

FIG. 26.

diameter OK which is parallel to the secant *t*, so that OK and OM are harmonic with regard to the asymptotes. The point M therefore bisects EF. But by construction M bisects CD. It follows that DF = EC, and ED = CF; or

On any secant of an hyperbola the segments between the curve and the asymptotes are equal.

If the chord is changed into a tangent, this gives—

The segment between the asymptotes on any tangent to an hyperbola is bisected by the point of contact.

The first part allows a simple solution of the problem to find any number of points on an hyperbola, of which the asymptotes and one point P are given. This is equivalent to three points and the tangents at two of them. This construction requires measurement.

§ 74. For the parabola, too, follow some metrical properties. A diameter PM (fig. 27) bisects every chord conjugate to it, and the pole P of such a chord BC lies on the diameter. But a diameter cuts the parabola once at infinity. Hence—

The segment PM *which joins the middle point* M *of a chord of a parabola to the pole* P *of the chord is bisected by the parabola at* A.

§ 75. Two asymptotes and any two tangents to an hyperbola may be considered as a quadrilateral circumscribed about the

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hyperbola. But in such a quadrilateral the intersections of the diagonals and the points of contact of opposite sides lie in a line (§ 54). If therefore DEFG (fig. 28) is such a quadrilateral, then the diagonals DF and GE will meet on the line which joins the points of contact of the asymptotes, that is, on the line at infinity; hence they are parallel. From this the following theorem is a simple deduction:

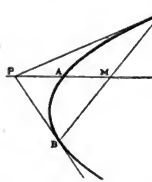

FIG. 27.

All triangles formed by a tangent and the asymptotes of an hyperbola are equal in area.

If we draw at a point P (fig. 28) on an hyperbola a tangent, the part HK between the asymptotes is bisected at P. The parallelogram PQOQ' formed by the asymptotes and lines parallel to them through P will be half the triangle OHK, and will therefore be constant. If we now take the asymptotes OX and OY as oblique

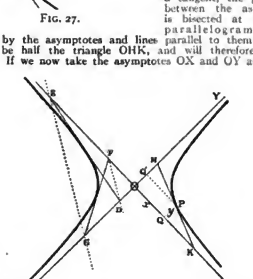

FIG. 28.

axes of co-ordinates, the lines OQ and QP will be the co-ordinates of P, and will satisfy the equation $xy = \text{const.} = a^2$.

For the asymptotes as axes of co-ordinates the equation of the hyperbola is $xy = \text{const.}$

INVOLUTION

§ 76. If we have two projective rows, ABC on u and A'B'C' on u', and place their bases on the same line, then each point in this line counts twice, once as a point in the row u and once as a point in the row u'. In fig. 29 we denote the points as points in the one row by letters above the line A, B, C . . ., and as points in the second row by A', B', C' . . . below the line. Let now A and B' be the same point, then to A will correspond a point A' in the second, and to B' a point B in the first row. In general these points A' and B will be different. It may, however, happen that they coincide. Then the correspondence is a peculiar one, as the following theorem shows:

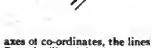

FIG. 29.

If two projective rows lie on the same base, and if it happens that to one point in the base the same point corresponds, whether we consider the point as belonging to the first or to the second row, then the same will happen for every point in the base—that is to say, to every point in the line corresponds the same point in the first as in the second row.

In order to determine the correspondence, we may assume three pairs of corresponding points in two projective rows. Let then A', B', C', in fig. 30, correspond to A, B, C, so that A and B', and also B and A', denote the same point. Let us further denote the point C' when considered as a point in the first row by D; then it is to be proved that the point D', which corresponds to D, is the same point as C. We know that the cross-ratio of four points is equal to that of the corresponding row. Hence

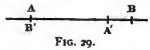

FIG. 30.

$$(AB, CD) = (A'B', C'D')$$

but replacing the dashed letters by those undashed ones which denote the same points, the second cross-ratio equals (BA, DD'), which, according to § 15, equals (AB, D'D); so that the equation becomes

$$(AB, CD) = (AB, D'D).$$

This requires that C and D' coincide.

§ 77. Two projective rows on the same base, which have the above property, that to every point, whether it be considered as a point in the one or in the other row, corresponds the same point, are said to be in *involution*, or to form an *involution* of points on the line.

We mention, but without proving it, that any two projective rows may be placed so as to form an involution.

An involution may be said to consist of a row of pairs of points, to every point A corresponding a point A', and to A' again the point A. These points are said to be conjugate, or, better, one point is termed the " mate " of the other.

From the definition, according to which an involution may be considered as made up of two projective rows, follow at once the following important properties:—

1. The cross-ratio of four points equals that of the four conjugate points.

2. If we call a point which coincides with its mate a " focus " or " double point " of the involution, we may say: An involution has either two foci, or one, or none, and is called respectively a hyperbolic, parabolic or elliptic involution (§ 34).

3. In a hyperbolic involution any two conjugate points are harmonic conjugates with regard to the two foci.

For if A, A' be two conjugate points, F_1, F_2 the two foci, then to the points F_1, F_2, A, A' in the one row correspond the points F_1, F_2, A', A in the other, each focus corresponding to itself. Hence $(F_1F_2, AA') = (F_1F_2, A'A)$, that is, we may interchange in two points AA' without altering the value of the cross-ratio, which is the characteristic property of harmonic conjugates (§ 18).

4. The point conjugate to the point at infinity is called the " centre " of the involution. Every involution has a centre, unless the point at infinity be a focus, in which case we may say that the centre is at infinity.

In an hyperbolic involution the centre is the middle point between the foci.

5. The product of the distances of two conjugate points A, A' from the centre O is constant: $OA \cdot OA' = c$.

For let A, A' and B, B' be two pairs of conjugate points, O the centre, I the point at infinity, then

$$(AB, OI) = (A'B', IO),$$

or

$$OA \cdot OA' = OB \cdot OB'.$$

In order to determine the distances of the foci from the centre, we write F for A and A' and get

$$OF^2 = c; \quad OF = \pm\sqrt{c}.$$

Hence if c is positive OF is real, and has two values, equal and opposite. The involution is hyperbolic.

If $c = 0$, $OF = 0$, and the two foci both coincide with the centre.

If c is negative, $\sqrt{c}$ becomes imaginary, and there are no foci. Hence we may write—

In an hyperbolic involution, $OA \cdot OA' = k^2$,
In a parabolic involution, $OA \cdot OA' = 0$,
In an elliptic involution, $OA \cdot OA' = -k^2$.

From these expressions it follows that conjugate points A, A' in an hyperbolic involution lie on the same side of the centre, and in an elliptic involution on opposite sides of the centre, and that in a parabolic involution one coincides with the centre.

Proof.—We have $OA \cdot OA' = OB \cdot OB' = k^2$ in case of an hyperbolic involution. Let A and B be the points in each pair which are nearer to the centre O. If now A, A' and B, B' lie on the same side of O, and if B is nearer to O than A, so that $OB < OA$, then $OB' > OA'$; hence B' lies farther away from O than A', or the segment AA' lies within BB'. And so on for the other cases.

6. An involution is determined—

(α) By two pairs of conjugate points. Hence also
(β) By one pair of conjugate points and the centre;
(γ) By the two foci;
(δ) By one focus and one pair of conjugate points;
(ε) By one focus and the centre.

7. The condition that A, B, C and A', B', C' may form an involution may be written in one of the forms—

$$(AB, CC') = (A'B', C'C),$$
or $$(AB, CA') = (A'B', CA),$$
or $$(AB, C'A') = (A'B', CA),$$

for each expresses that in the two projective rows in which A, B, C

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and A′, B′, C′ are conjugate points two conjugate elements may be interchanged.

8. Any three pairs, A, A′, B, B′, C, C′, of conjugate points are connected by the relations:

$$\frac{AB'.BC'.CA'}{A'B.B'C.C'A} = \frac{AB'.BC.C'A'}{A'B.B'C'.CA} = \frac{AB.B'C'.CA'}{A'B'.BC.CA} = -1.$$

These relations readily follow by working out the relations in (7) (above).

§ 78. *Involution of a quadrangle.—The sides of any four-point are cut by any line in six points in involution, opposite sides being cut in conjugate points.*

Let $A_1B_1C_1D_1$ (fig. 31) be the four-point. If its sides be cut by the line p in the points A, A′, B, B′, C, C′, if further, C_1D_1 cuts the line A_1B_1 in C_2, and if we project the row $A_1B_1C_2C$ into p once from D_1 and once from C_1, we get $(A'B', C'C) = (BA, C'C)$.

Interchanging in the last cross-ratio the letters in each pair we get $(A'B', C'C) = (AB, CC')$. Hence by § 77 (7) the points are in involution.

The theorem may also be stated thus:

The three points in which any line cuts the sides of a triangle and the projections, from any point in the plane, of the vertices of the triangle on to the same line are six points in involution.

Or again—

The projections from any point on to any line of the six vertices

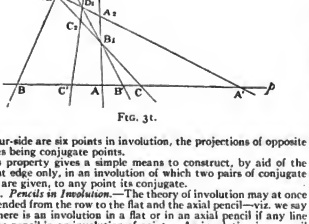

FIG. 31.

of a four-side are six points in involution, the projections of opposite vertices being conjugate points.

This property gives a simple means to construct, by aid of the straight edge only, in an involution of which two pairs of conjugate points are given, to any point its conjugate.

§ 79. *Pencils in Involution.*—The theory of involution may at once be extended from the row to the flat and the axial pencil—viz. we say that there is an involution in a flat or in an axial pencil if any line cuts the pencil in an involution of points. An involution in a pencil consists of pairs of conjugate rays or planes; it has two, one or no *focal rays* (double lines) or *planes*, but nothing corresponding to a centre.

An involution in a flat pencil contains always one, and in general only one, pair of conjugate rays which are perpendicular to one another. For in two projective flat pencils exist always two corresponding right angles (§ 40).

Each involution in an axial pencil contains in the same manner one pair of conjugate planes at right angles to one another.

As a rule, there exists but one pair of conjugate lines or planes at right angles to each other. But it is possible that there are more, and then there is an infinite number of such pairs. An involution in a flat pencil, in which every ray is perpendicular to its conjugate ray, is said to be *circular*. That such involution is possible is easily seen thus: if in two concentric flat pencils each ray on one is made to correspond to that ray on the other which is perpendicular to it, then the two pencils are projective, for if we turn the one pencil through a right angle each ray in one coincides with its corresponding ray in the other. But these two projective pencils are in involution.

A circular involution has no focal rays, because no ray in a pencil coincides with the ray perpendicular to it.

§ 80. *Every elliptical involution in a row may be considered as a section of a circular involution.*

In an elliptical involution any two segments AA′ and BB′ lie partly within and partly without each other (fig. 32). Hence two circles described on AA′ and BB′ as diameters will intersect in two points E and E′. The line EE′ cuts the base of the involution at a point O, which has the property that $OA.OA' = OB.OB'$, for each is equal to $OE.OE'$. The point O is therefore the centre of the involution. If we wish to construct to any point C the conjugate point C′, we may draw the circle through CEE′. This will cut the base in the required point C′ for $OC.OC' = OA.OA'$. But EC and EC′ are at right angles. Hence the involution which is obtained by joining E or E′ to the points in the given involution is circular. This may also be expressed thus:

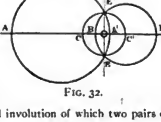

FIG. 32.

Every elliptical involution has the property that there are two definite points in the plane from which any two conjugate points are seen under a right angle.

At the same time the following problem has been solved:

To determine the centre and also the point corresponding to any given point in an elliptical involution of which two pairs of conjugate points are given.

§ 81. *Involution Range on a Conic.*—By the aid of § 53, the points on a conic may be made to correspond to those on a line, so that the row of points on the conic is projective to a row of points on a line. We may also have two projective rows on the same conic, and these will be in involution as soon as one point on the conic has the same point corresponding to it all the same to whatever row it belongs. An involution of points on a conic will have the property (as follows from its definition, and from § 53) that the lines which join conjugate points of the involution to any point on the conic are conjugate lines of an involution in a pencil, and that a fixed tangent is cut by the tangents at conjugate points on the conic in points which are again conjugate points of an involution on the fixed tangent. For such involution on a conic the following theorem holds:

The lines which join corresponding points in an involution on a conic all pass through a fixed point; and reciprocally, the points of intersection of conjugate lines in an involution among tangents to a conic lie on a line.

We prove the first part only. The involution is determined by two pairs of conjugate points, say by A, A′ and B, B′ (fig. 33). Let AA′ and BB′ meet in P. If we join the points in involution to any point on the conic, and the conjugate points to another point on the conic, we obtain two projective pencils. We take A and A′ as centres of these pencils, so that the pencils A(A′B′) and A′(AB′) are projective, and in perspective position, because AA′ corresponds to A′A. Hence corresponding rays meet in a line, of which two points are found by joining AB′ to A′B and AB to A′B′. It follows that the *axis* of perspective is the polar of the point P, where AA′ and BB′ meet. If we now wish to construct to any other point C on the conic the corresponding point C′, we join C to A′ and the point where this line cuts p to A. The latter line cuts the conic again in C′. But we know from the theory of pole and polar that the line CC′ passes through P. The point of concurrence is called the "pole of the involution," and the line of collinearity of the meets is called the "axis of the involution."

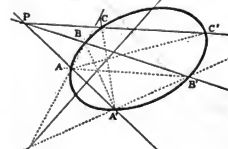

FIG. 33.

INVOLUTION DETERMINED BY A CONIC ON A LINE.—FOCI

§ 82. The polars, with regard to a conic, of points in a row p form a pencil P projective to the row (§ 66). This pencil cuts the base of the row p in a projective row.

If A is a point in the given row, A′ the point where the polar of A cuts p, then A and A′ will be corresponding points. If we take A′ a point in the first row, then the polar of A′ will pass through A, so that A corresponds to A′—in other words, the rows are in involution. The conjugate points in this involution are conjugate points with regard to the conic. Conjugate points coincide only if the polar of a point A passes through A—that is, if A lies on the conic. Hence—

A conic determines on every line in its plane an involution, in which those points are conjugate which are also conjugate with regard to the conic.

If the line cuts the conic the involution is hyperbolic, the points of intersection being the foci.

If the line touches the conic the involution is parabolic, the two foci coinciding at the point of contact.

If the line does not cut the conic the involution is elliptic, having no foci.

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If, on the other hand, we take a point P in the plane of a conic, we get to each line a through P one conjugate line which joins P to the pole of a. These pairs of conjugate lines through P form an involution in the pencil at P. The focal rays of this involution are the tangents drawn from P to the conic. This gives the theorem reciprocal to the last, viz:—

A conic determines in every pencil in its plane an involution, corresponding lines being conjugate lines with regard to the conic.

If the point is without the conic the involution is hyperbolic, the tangents from the points being the focal rays.

If the point lies on the conic the involution is parabolic, the tangent at the point counting for coincident focal rays.

If the point is within the conic the involution is elliptic, having no focal rays.

It will further be seen that the involution determined by a conic on any line p is a section of the involution, which is determined by the conic at the pole P of p.

§ 83. *Foci.*—The centre of a pencil in which the conic determines a circular involution is called a "focus" of the conic.

In other words, a focus is such a point that every line through it is perpendicular to its conjugate line. The polar to a focus is called a *directrix* of the conic.

From the definition it follows that *every focus lies on an axis*, for the line joining a focus to the centre of the conic is a diameter to which the conjugate lines are perpendicular; and *every line joining two foci is an axis*, for the perpendiculars to this line through the foci are conjugate to it. These conjugate lines pass through the pole of the line, the pole lies therefore at infinity, and the line is a diameter, hence by the last property an axis.

It follows that all *foci lie on one axis*, for no line joining a point in one axis to a point in the other can be an axis.

As the conic determines in the pencil which has its centre at a focus a circular involution, no tangents can be drawn from the focus to the conic. Hence *each focus lies within a conic*; and *a directrix does not cut the conic.*

Further properties are found by the following considerations:

§ 84. Through a point P one line p can be drawn, which is with regard to a given conic conjugate to a given line q, viz. that line which joins the point P to the pole of the line q. If the line q is made to describe a pencil about a point Q, then the line p will describe a pencil about P. These two pencils will be projective, for the line p passes through the pole of q, and whilst q describes the pencil Q, its pole describes a projective row, and this row is perspective to the pencil P.

We now take the point P on an axis of the conic, draw any line p through it, and from the pole of p draw a perpendicular q to p. Let q cut the axis in Q. Then, in the pencils of conjugate lines, which have their centres at P and Q, the lines p and q are conjugate lines at right angles to one another. Besides, to the axis as a ray in either pencil will correspond in the other the perpendicular to the axis (§ 72). The conic generated by the intersection of corresponding lines in the two pencils is therefore the circle on PQ as diameter, *so that every line in P is perpendicular to its corresponding line in Q.*

To every point P on an axis of a conic corresponds thus a point Q, such that conjugate lines through P and Q are perpendicular.

We shall show that these *point-pairs P, Q form an involution.* To do this let us move P along the axis, and with it the line p, keeping the latter parallel to itself. Then P describes a row, p a perspective pencil (of parallels), and the pole of p a projective row. At the same time the line q describes a pencil of parallels perpendicular to p, and perspective to the row formed by the pole of p. The point Q, therefore, where q cuts the axis, describes a row projective to the row of points P. The two points P and Q describe thus two projective rows on the axis; and not only does P as a point in the first row correspond to Q, but also Q as a point in the first corresponds to P. The two rows therefore form an involution. *The centre of this involution, it is easily seen, is the centre of the conic.*

A focus of this involution has the property that any two conjugate lines through it are perpendicular: hence, it is a focus to the conic.

Such involution exists on each axis. But only one of these can have foci, because all foci lie on the same axis. The involution on one of the axes is elliptic, and appears (§ 80) therefore as the section of two circular involutions in two pencils whose centres lie in the other axis. These centres are foci, hence the one axis contains two foci, the other axis none; *or every central conic has two foci which lie on one axis equidistant from the centre.*

The axis which contains the foci is called the *principal axis*; in case of an hyperbola it is the axis which cuts the curve, because the foci lie within the conic.

In case of the parabola there is but one axis. The involution on this axis has its centre at infinity. One focus is therefore at infinity, the one focus only is finite. *A parabola has only one focus.*

§ 85. If through any point P (fig. 34) on a conic the tangent PT and the normal PN (*i.e.* the perpendicular to the tangent through the point of contact) be drawn, these will be conjugate lines with regard to the conic, and at right angles to each other. They will therefore cut the principal axis in two points, which are conjugate in the involution considered in § 84; hence they are harmonic conjugates with regard to the foci. If therefore the two foci F_1 and F_2 be joined to P, these lines will be harmonic with regard to the

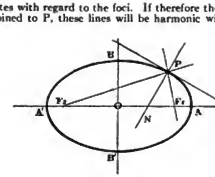

FIG. 34.

tangent and normal. As the latter are perpendicular, they will bisect the angles between the other pair. Hence—

The lines joining any point on a conic to the two foci are equally inclined to the tangent and normal at that point.

In case of the parabola this becomes—

The line joining any point on a parabola to the focus and the diameter through the point, are equally inclined to the tangent and normal at that point.

From the definition of a focus it follows that—

The segment of a tangent between the directrix and the point of contact is seen from the focus belonging to the directrix under a right angle, because the lines joining the focus to the ends of this segment are conjugate with regard to the conic, and therefore perpendicular.

With equal ease the following theorem is proved:

The two lines which join the points of contact of two tangents each to one focus, but not both to the same, are seen from the intersection of the tangents under equal angles.

§ 86. Other local properties of a conic are obtained by the following considerations:

Let F (fig. 35) be a focus to a conic, f the corresponding directrix, A and B the points of contact of two tangents meeting at T, and P the point where the line AB cuts the directrix. Then TF will be the polar of P (because A_1 polars of F and T meet at P). Hence TF and PF are conjugate lines through a focus, and therefore perpendicular. They are further harmonic conjugates with regard to FA and FB (§§ 64 and 13), so that they bisect the angles formed by these lines. This by the way proves—

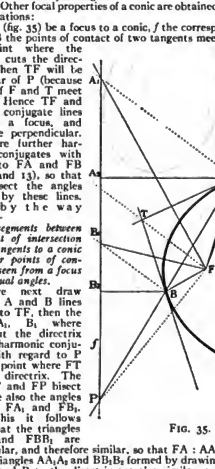

FIG. 35.

The segments between the point of intersection of two tangents to a conic and their points of contact are seen from a focus under equal angles.

If we next draw through A and B lines parallel to TF, then the points A_1, B_1 where these cut the directrix will be harmonic conjugates with regard to P and the point where FT cuts the directrix. The lines FT and FP bisect therefore also the angles between FA_1 and FB_1. From this it follows easily that the triangles FAA_1 and FBB_1 are equiangular, and therefore similar, so that $FA : AA_1 = FB : BB_1$.

The triangles AA_1A_2 and BB_1B_2 formed by drawing perpendiculars from A and B to the directrix are also similar, so that $AA_1 : AA_2 = BB_1 : BB_2$. This, combined with the above proportion, gives $FA : AA_2 = FB : BB_2$. Hence the theorem:

The ratio of the distances of any point on a conic from a focus and the corresponding directrix is constant.

To determine this ratio we consider its value for a vertex on the principal axis. In an ellipse the focus lies between the two vertices on this axis, hence the focus is nearer to a vertex than to the corresponding directrix. Similarly, in an hyperbola a vertex is nearer

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to the directrix than to the focus. In a parabola the vertex lies halfway between directrix and focus.

It follows in an ellipse the ratio between the distance of a point from the focus to that from the directrix is less than unity, in the parabola it equals unity, and in the hyperbola it is greater than unity.

It is here the same which focus we take, because the two foci lie symmetrical to the axis of the conic. If now P is any point on the conic having the distances r_1 and r_2 from the foci and the distances d_1 and d_2 from the corresponding directrices, then $r_1/d_1 = r_2/d_2 = e$, where e is constant. Hence also $\frac{r_1 + r_2}{d_1 + d_2} = e$.

In the ellipse, which lies between the directrices, $d_1 + d_2$ is constant, therefore also $r_1 + r_2$. In the hyperbola on the other hand $d_1 - d_2$ is constant, equal to the distance between the directrices, therefore in this case $r_1 - r_2$ is constant.

If we call the distances of a point on a conic from the focus its focal distances we have the theorem:

In an ellipse the sum of the focal distances is constant; and in an hyperbola the difference of the focal distances is constant.

This constant sum or difference equals in both cases the length of the principal axis.

Pencil of Conics

§ 87. Through four points A, B, C, D in a plane, of which no three lie in a line, an infinite number of conics may be drawn, viz. through these four points and any fifth one single conic. This system of conics is called a pencil of conics. Similarly, all conics touching four fixed lines form a system such that any fifth tangent determines one and only one conic. We have here the theorems:

The pairs of points in which any line is cut by a system of conics through four fixed points are in involution.

The pairs of tangents which can be drawn from a point to a system of conics touching four fixed lines are in involution.

We prove the first theorem only. Let ABCD (fig. 36) be the four-point, then any line l will cut two opposite sides AC, BD in

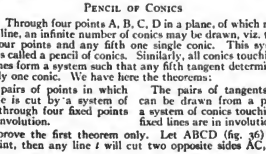

FIG. 36.

the points E, E', the pair AD, BC in points F, F', and any conic of the system in M, N, and we have A(CD, MN) = B(CD, MN).

If we cut these pencils by l we get

(EF, MN) = (F'E', MN)

or (EF, MN) = (E'F', NM).

But this is, according to § 77 (7), the condition that M, N are corresponding points in the involution determined by the point pairs E, E', F, F' in which the line l cuts pairs of opposite sides of the four-point ABCD. This involution is independent of the particular conic chosen.

§ 88. There follow several important theorems:

Through four points two, one, or no conics may be drawn which touch any given line, according as the involution determined by the given four-point on the line has real, coincident or imaginary foci.

Two, one, or no conics may be drawn which touch four given lines and pass through a given point, according as the involuton determined by the given four-side at the point has real, coincident or imaginary focal rays.

For the conic through four points which touches a given line has its point of contact at a focus of the involution determined by the four-point on the line.

As a special case we get, by taking the line at infinity:

Through four points of which none is at infinity either two or no parabolas may be drawn.

The problem of drawing a conic through four points and touching a given line is solved by determining the points of contact on the line, that is, by determining the foci of the involution in which the line cuts the sides of the four-point. The corresponding remark holds for the problem of drawing the conics which touch four lines and pass through a given point.

Ruled Quadric Surfaces

§ 89. We have considered hitherto projective rows which lie in the same plane, in which case lines joining corresponding points envelop a conic. We shall now consider projective rows whose bases do not meet. In this case, corresponding points will be joined by lines which do not lie in a plane, but on some surface, which like every surface generated by lines is called a *ruled* surface. This surface clearly contains the bases of the two rows.

If the points in either row be joined to the base of the other, we obtain two axial pencils which are also projective, those planes being corresponding which pass through corresponding points in the given rows. If A', A be two corresponding points, a, a' the planes in the axial pencils passing through them, then A, A' will be the line of intersection of the corresponding planes a, a' and also the line joining corresponding points in the rows.

If we cut the whole figure by a plane this will cut the axial pencils in two projective flat pencils, and the curve of the second order generated by these will be the curve in which the plane cuts the surface. Hence

The locus of lines joining corresponding points in two projective rows which do not lie in the same plane is a surface which contains the bases of the rows, and which can also be generated by the lines of intersection of corresponding planes in two projective axial pencils. This surface is cut by every plane in a curve of the second order, hence either in a conic or in a line-pair. No line which does not lie altogether on the surface can have more than two points in common with the surface, which is therefore said to be of the second order or is called a ruled quadric surface.

That no line which does not lie on the surface can cut the surface in more than two points is seen at once if a plane be drawn through the line, for this will cut the surface in a conic. It follows also that a line which contains more than two points of the surface lies altogether on the surface.

§ 90. Through any point in space one line can always be drawn cutting two given lines which do not themselves meet.

If therefore three lines in space be given of which no two meet, then through every point in either one line may be drawn cutting the other two.

If a line moves so that it always cuts three given lines of which no two meet, then it generates a ruled quadric surface.

Let a, b, c be the given lines, and $p, q, r \ldots$ lines cutting them in the points A, A', A'' . . . ; B, B', B'' . . . ; C, C', C'' . . . respectively; then the planes through a containing p, q, r, and the planes through b containing the same lines, may be taken as corresponding planes in two axial pencils which are projective, because both pencils cut the line c in the same row, C, C', C'' . . . ; the surface can therefore be generated by projective axial pencils.

Of the lines $p, q, r \ldots$ no two can meet, for otherwise the lines a, b, c which cut them would also lie in their plane. There is a single infinite number of them, for one passes through each point of a. These lines are said to form a *set* of lines on the surface.

If now three of the lines p, q, r be taken, then every line d cutting them will have three points in common with the surface, and will therefore lie altogether on it. This gives rise to a second set of lines on the surface. From what has been said the theorem follows:

A ruled quadric surface contains two sets of straight lines. Every line of one set cuts every line of the other, but no two lines of the same set meet.

Any two lines of the same set may be taken as bases of two projective rows, or of two projective pencils which generate the surface. They are cut by the lines of the other set in two projective rows.

The plane at infinity like every other plane cuts the surface either in a conic proper or in a line-pair. In the first case the surface is called an *Hyperboloid of one sheet*, in the second an *Hyperbolic Paraboloid*.

The latter may be generated by a line cutting three lines of which one lies at infinity, that is, cutting two lines and remaining parallel to a given plane.

Quadric Surfaces

§ 91. The conics, the cones of the second order, and the ruled quadric surfaces complete the figures which can be generated by projective rows or flat and axial pencils, that is, by those aggregates of elements which are of one dimension (§§ 5, 6). We shall now consider the simpler figures which are generated by aggregates of two dimensions. The space at our disposal will not, however, allow us to do more than indicate a few of the results.

§ 92. We establish a correspondence between the lines and planes in pencils in space, or reciprocally between the points and lines in two or more planes, but consider principally pencils.

In two pencils we may either make planes correspond to planes and lines to lines, or else planes to lines and lines to planes. If hereby the condition be satisfied that to a flat, or axial, pencil corresponds in the first case a projective flat, or axial, pencil, and in the second a projective axial, or flat, pencil, the pencils are said to be *projective* in the first case and *reciprocal* in the second.

For instance, two pencils which join two points S_1 and S_2 to the different points and lines in a given plane e are projective (and in perspective position), if those lines and planes be taken as

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corresponding which meet the plane π in the same point or in the same line. In this case every plane through both centres S_1 and S_2 of the two pencils will correspond to itself. If these pencils are brought into any other position they will be projective (but not perspective).

The correspondence between two projective pencils is uniquely determined, if to four rays (or planes) in the one the corresponding rays (or planes) in the other are given, provided that no three rays of either set lie in a plane.

Let a, b, c, d be four rays in the one, a', b', c', d' the corresponding rays in the other pencil. We shall show that we can find for every ray e in the first a single corresponding ray e' in the second. To the axial pencil $a\ (b, c, d \ldots)$ formed by the planes which join a to $b, c, d \ldots$ respectively corresponds the axial pencil $a'\ (b', c', d' \ldots)$, and this correspondence is determined. Hence, the plane ae' which corresponds to the plane ae is determined. Similarly the plane $b'e'$ may be found and hence we determine the ray e'.

Similarly the correspondence between two reciprocal pencils is determined if for four rays in the one the corresponding planes in the other are given.

§ 93. We may now combine—

1. Two reciprocal pencils.
   Each ray cuts its corresponding plane in a point, the locus of these points is a quadric surface.
2. Two projective pencils.
   Each plane cuts its corresponding plane in a line, but a ray as a rule does not cut its corresponding ray. The locus of points where a ray cuts its corresponding ray is a twisted cubic. The lines where a plane cuts its corresponding plane are secants.
3. Three projective pencils.
   The locus of intersection of corresponding planes is a cubic surface.

Of these we consider only the first two cases.

§ 94. If two pencils are reciprocal, then to a plane in either corresponds a line in the other, to a flat pencil an axial pencil, and so on. Every line cuts its corresponding plane in a point. If S_1 and S_2 be the centres of the two pencils, and P be a point where a line a_1 in the first cuts its corresponding plane a_2, *then the line b_2 in the pencil S_2 which passes through* P *will meet its corresponding plane β_1 in* P. For b_2 is a line in the plane a_2. The corresponding plane β_1 must therefore pass through the line a_1, hence through P.

The points in which the lines in S_1 cut the planes corresponding to them in S_2 are therefore the same as the points in which the lines in S_2 cut the planes corresponding to them in S_1.

The locus of these points is a surface which is cut by a plane in a conic or in a line-pair and by a line in not more than two points unless it lies altogether on the surface. The surface itself is therefore called a quadric surface, or a surface of the second order.

To prove this we consider any line p in space.

The flat pencil in S_1 which lies in the plane drawn through p and the corresponding axial pencil in S_2 determine on p two projective rows, and those points in these which coincide with their corresponding points lie on the surface. But there exist only two, or one, or no such points, unless every point coincides with its corresponding point. In the latter case the line lies altogether on the surface.

This proves also that a plane cuts the surface in a curve of the second order, as no line can have more than two points in common with it. To show that this is a curve of the same kind as those considered before, we have to show that it can be generated by projective flat pencils. We prove first that this is true for any plane through the centre of one of the pencils, and afterwards that every point on the surface may be taken as the centre of such pencil. Let then a_1 be a plane through S_1. To the flat pencil in S_1 which it contains corresponds in S_2 a projective axial pencil with axis a_2 and this cuts a_1 in a second flat pencil. These two flat pencils in a_1 are projective, and, in general, neither concentric nor perspective. They generate therefore a conic. But if the line p_2 passes through S_1 the pencils will have S_1 as common centre, and may therefore have two, or one, or no lines united with their corresponding lines. The section of the surface by the plane a_1 will be accordingly a line-pair or a single line, or the plane a_1 will have only the point S_1 in common with the surface.

Every line l_1 through S_1 cuts the surface in two points, viz. first in S_1 and then at the point where it cuts its corresponding plane. If now the corresponding plane passes through S_1, as in the case just considered, then the two points where l_1 cuts the surface coincide at S_1, and the line is called a *tangent* to the surface with S_1 as *point of contact*. Hence if l_1 be a tangent, it lies in that plane r_1 which corresponds to the line S_2S_1 as a line in the pencil S_2. The section of this plane has just been considered. It follows that—

All tangents to quadric surface at the centre of one of the reciprocal pencils lie in a plane which is called the tangent plane to the surface at that point as point of contact.

To the line joining the centres of the two pencils as a line in one corresponds in the other the tangent plane at its centre.

The tangent plane to a quadric surface either cuts the surface in two lines, or it has only a single line, or else only a single point in common with the surface.

In the first case the point of contact is said to be hyperbolic, in the second parabolic, in the third elliptic.

§ 95. It remains to be proved that every point S on the surface may be taken as centre of one of the pencils which generate the surface. Let S be any point on the surface Φ generated by the reciprocal pencils S_1 and S_2. We have to establish a reciprocal correspondence between the pencils S and S_1, so that the surface generated by them is identical with Φ. To do this we draw two planes α_1, β_1 through S_1, cutting the surface Φ in two conics which we also denote by α_1 and β_1. These conics meet at S_1, and at some other point T where the line of intersection of α_1 and β_1 cuts the surface.

In the pencil S we draw some plane a which passes through T, but not through S_1 or S_2. It will cut the two conics first at T, and therefore each at some other point which we call A and B respectively. These we join to S by lines a and b, and now establish the following correspondence between the pencils S and S_1 as follows:—To S_1T shall correspond the plane σ, to the plane α_1 the line a, and to β_1 the line b, hence to the flat pencil in α_1 the axial pencil a. These pencils are made projective by aid of the conic in α_1.

In the same manner the flat pencil in β_1 is made projective to the axial pencil b by aid of the conic in β_1, corresponding elements being those which meet on the conic. This determines the correspondence, for we know for more than four rays in S_1 the corresponding planes in S. The two pencils S and S_1 thus made reciprocal generate a quadric surface Φ', which passes through the point S and through the two conics α_1 and β_1.

The two surfaces Φ and Φ' have therefore the points S and S_1 and the conics α_1 and β_1 in common. To show that they are identical, we draw a plane through S and S_1, cutting each of the conics α_1 and β_1 in two points, which will always be possible. This plane cuts Φ and Φ' in two conics which have the point S and the points where it cuts α_1 and β_1 in common, that is five points in all. The conics therefore coincide.

This proves that all those points P on Φ' lie on Φ which have the property that the plane SS_1P cuts the conics α_1, β_1 in two points each. But the plane SS_1P has not this property, then we draw a plane SS_1P. This cuts each surface in a conic, and these conics have in common the points S, S_1, one point on each of the conics α_1, β_1, and one point on one of the conics through S and S_1 which lie on both surfaces, hence five points. They are therefore coincident, and our theorem is proved.

§ 96. The following propositions follow:—

A quadric surface has at every point a tangent plane.

Every plane section of a quadric surface is a conic or a line-pair.

Every line which has three points in common with a quadric surface lies on the surface.

Every conic which has five points in common with a quadric surface lies on the surface.

Through two conics which lie in different planes, but have two points in common, and through one external point always one quadric surface may be drawn.

§ 97. *Every plane which cuts a quadric surface in a line-pair is a tangent plane.* For every line in this plane through the centre of the line-pair (the point of intersection of the two lines) cuts the surface in two coincident points and is therefore a tangent to the surface, *the centre of the line-pair being the point of contact.*

If a quadric surface contains a line, then every plane through this line cuts the surface in a line-pair (or in two coincident lines). For this plane cannot cut the surface in a conic. Hence

If a quadric surface contains one line p then it contains an infinite number of lines, and through every point Q *on the surface, one line* q *can be drawn which cuts* p. For the plane through the point Q and the line p cuts the surface in a line-pair which must pass through Q and of which p is one line.

No two such lines q *on the surface can meet.* For as both meet p their plane would contain p and therefore cut the surface in a triangle.

Every line which cuts three lines q *will be on the surface*; for it has three points in common with it.

Hence the quadric surfaces which contain lines are the same as the ruled quadric surfaces considered in §§ 89–93, but with one important exception, that in the last investigation we have left out of consideration the possibility of a plane having only one line (two coincident lines) in common with a quadric surface.

§ 98. To investigate this case we suppose first that there is one point A on the surface through which two different lines a, b can be drawn, which lie altogether on the surface.

If P is any other point on the surface which lies neither on a nor b, then the plane through P and a will cut the surface in a second line of which pass through P and which cuts a. Similarly there is a line b' through P which cuts b. These two lines a' and b' may coincide, but then they must coincide with PA.

If this happens for one point P, it happens for every other point Q. For if two different lines could be drawn through Q, then by the same reasoning the line PQ would be altogether on the surface, hence two lines would be drawn through P against the assumption. From this follows:—

If there is one point on a quadric surface through which one, but only one, line can be drawn on the surface, then through every point one line

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can be drawn, and all these lines meet in a point. The surface is a cone of the second order.

If through one point on a quadric surface, two, and only two, lines can be drawn on the surface, then through every point two lines may be drawn, and the surface is a ruled quadric surface.

If through one point on a quadric surface no line on the surface can be drawn, then the surface contains no lines.

Using the definitions at the end of § 95, we may also say:—

On a quadric surface the points are all hyperbolic, or all parabolic, or all elliptic.

As an example of a quadric surface with elliptical points, we mention the sphere which may be generated by two reciprocal pencils, where to each line in one corresponds the plane perpendicular to it in the other.

§ 99. *Poles and Polar Planes.*—The theory of poles and polars with regard to a conic is easily extended to quadric surfaces.

Let P be a point in space not on the surface, which we suppose not to be a cone. On every line through P which cuts the surface in two points we determine the harmonic conjugate Q of P with regard to the points of intersection. Through one of these lines we draw two planes α and β. The locus of the points Q in α is a line a, the polar of P with regard to the conic in which α cuts the surface. Similarly the locus of points Q in β is a line b. This cuts a, because the line of intersection of α and β contains but one point Q. The locus of all points Q therefore is a plane. *This plane is called the polar plane of the point* P, *with regard to the quadric surface. If* P *lies on the surface we take the tangent plane of* P *as its polar.*

The following propositions hold:—

1. *Every point has a polar plane*, which is constructed by drawing the polars of the point with regard to the conics in which two planes through the point cut the surface.

2. *If* Q *is a point in the polar of* P, *then* P *is a point in the polar of* Q, because this is true with regard to the conic in which a plane through PQ cuts the surface.

3. *Every plane is the polar plane of one point, which is called the Pole of the plane.*

The pole to a plane is found by constructing the polar planes of three points in the plane. Their intersection will be the pole.

4. *The points in which the polar plane of* P *cuts the surface are points of contact of tangents drawn from* P *to the surface*, as is easily seen. Hence:—

5. *The tangents drawn from a point* P *to a quadric surface form a cone of the second order*, for the polar plane of P cuts it in a conic.

6. *If the pole describes a line* a, *its polar plane will turn about another line* a', as follows from 2. *These lines* a *and* a' *are said to be conjugate with regard to the surface.*

§ 100. The pole of the line at infinity is called the *centre* of the surface. If it lies at the infinity, the plane at infinity is a tangent plane, and the surface is called a *paraboloid*.

The polar plane to any point at infinity passes through the centre, and is called a diametrical plane.

A line through the centre is called a diameter. It is bisected at the centre. The line conjugate to it lies at infinity.

If a point moves along a diameter its polar plane turns about the conjugate line at infinity; that is, *it moves parallel to itself, its centre moving on the first line.*

The middle points of parallel chords lie in a plane, viz. in the polar plane of the point at infinity through which the chords are drawn.

The centres of parallel sections lie in a diameter which is a line conjugate to the line at infinity in which the planes meet.

Twisted Cubics

§ 101. If two pencils with centres S_1 and S_2 are made projective, then to a ray in one corresponds a ray in the other, to a plane a plane, to a flat or axial pencil a projective flat or axial pencil, and so on.

There is a double infinite number of lines in a pencil. We shall see that a single infinite number of lines in one pencil meets its corresponding ray, and that the points of intersection form a curve in space.

Of the double infinite number of planes in the pencils each will meet its corresponding plane. This gives a system of a double infinite number of lines in space. We know (§ 5) that there is a quadruple infinite number of lines in space. From among these we may select those which satisfy one or more given conditions. The systems of lines thus obtained were first systematically investigated and classified by Plücker, in his *Geometrie des Raumes*. He uses the following names:—

A *treble infinite* number of lines, that is, all lines which satisfy one condition, are said to form a *complex of lines*; *e.g.* all lines cutting a given line, or all lines touching a surface.

A *double infinite* number of lines, that is, all lines which satisfy two conditions, or which are common to two complexes, are said to form a *congruence of lines*; *e.g.* all lines in a plane, or all lines cutting two curves, or all lines cutting a given curve twice.

A *single infinite* number of lines, that is, all lines which satisfy three conditions, or which belong to three complexes, form a *ruled surface*; *e.g.* one set of lines on a ruled quadric surface, or developable surfaces which are formed by the tangents to a curve.

It follows that all lines in which corresponding planes in two projective pencils meet form a congruence. We shall see this congruence consists of all lines which cut a twisted cubic twice, or of all *secants* to a twisted cubic.

§ 102. Let l_1 be the line S_1S_2 as a line in the pencil S_1. To it corresponds a line l_2 in S_2. *At each of the centres two corresponding lines meet.* The two axial pencils with l_1 and l_2 as axes are projective, and, as their axes meet at S_1, the intersections of corresponding planes form a cone of the second order (§ 88), with S_1 as centre. If π_1 and π_2 be corresponding planes, then their intersection will be a line p_2 which passes through S_2. Corresponding to it in S_1 will be a line p_1 which lies in the plane π_1, and which therefore meets p_2 in some point P. Conversely, if p_1 be any line in S_1 which meets its corresponding line p_1 at a point P, then to the plane l_2p_2 will correspond the plane l_1p_1, that is, the plane S_1S_2P. These planes intersect in p_2, so that p_2 is a line on the quadric cone generated by the axial pencils l_1 and l_2. Hence:—

All lines in one pencil which meet their corresponding lines in the other form a cone of the second order which has its centre at the centre of the first pencil, and passes through the centre of the second.

From this follows that the points in which corresponding rays meet lie on two cones of the second order which have the ray joining their centres in common, and form therefore, together with the line S_1S_2 or l_1, the intersection of these cones. Any plane cuts each of the cones in a conic. These two conics have necessarily that point in common in which it cuts the line l_1, and therefore besides either one or three other points. It follows that the curve is of the *third order* as a plane may cut it in three, but not in more than three, points. Hence:—

The locus of points in which corresponding lines on two projective pencils meet is a curve of the third order or a "twisted cubic" k, which passes through the centres of the pencils, and which appears as the intersection of two cones of the second order, which have one line in common.

A line belonging to the congruence determined by the pencils is a secant of the cubic; it has two, or one, or no points in common with this cubic, and is called accordingly a bisecant, a proper, a tangent, or a secant improper of the cubic. A secant improper may be considered, to use the language of coordinate geometry, as a secant with imaginary points of intersection.

§ 103. If a_1 and a_2 be any two corresponding lines in the two pencils, then corresponding planes in the axial pencils having a_1 and a_2 as axes generate a ruled quadric surface. If P be any point on the cubic k and if p_1, p_2 be the corresponding rays in S_1 and S_2 which meet at P, then to the plane a_1p_1 in S_1 corresponds a_2p_2 in S_2. These therefore meet in a line through P.

This may be stated thus:—

Those secants of the cubic which cut a ray a_1, drawn through the centre S_1 of one pencil, form a ruled quadric surface which passes through both centres, and which contains the twisted cubic k. Of such surfaces an infinite number exists. Every ray through S_1 or S_2 which is not a secant determines one of them.

If, however, the rays a_1 and a_2 are secants meeting at A, then the ruled quadric surface becomes a cone of the second order, having A as centre. Or *all lines of the congruence which pass through a point on the twisted cubic k form a cone of the second order.* In other words, the projection of a twisted cubic from any point in the curve on to any plane is a conic.

If a_1 is not a secant, but made to pass through any point Q in space, the ruled quadric surface determined by a_1 will pass through Q. *There will therefore be one line of the congruence passing through Q, and only one.* For if two such lines pass through Q, then the lines S_1Q and S_2Q will be corresponding lines; hence Q will be a point on the cubic k, and an infinite number of secants will pass through it. Hence:—

Through every point in space not on the twisted cubic one and only one secant to the cubic can be drawn.

§ 104. The fact that all the secants through a point on the cubic form a quadric cone shows that the centres of the projective pencils generating the cubic are not distinguished from any other points on the cubic. If we take any two points S, S′ on the cubic, and draw the second cone through each of them, we obtain two conic cones, which have the line SS′ in common, and which intersect besides along the cubic. If we make these two pencils having S and S′ as centres projective by taking four rays on the one cone as corresponding to the four rays on the other which meet the first on the cubic, the correspondence is determined. These two pencils will generate a cubic, and the two cones of secants having S and S′ as centres will be identical with the above cones, for each has five rays in common with one of the first, viz. the line SS′ and the four lines determined for the correspondence; therefore these two cones intersect in the original cubic. This gives the theorem:—

On a twisted cubic any two points may be taken as centres of projective pencils which generate the cubic, corresponding planes being those which meet on the same secant.

Of the two projective pencils at S and S′ we may keep the first fixed, and move the centre of the other along the curve. The pencils will hereby remain projective, and a plane α in S will be cut by its corresponding plane α' always in the same secant a. Whilst S′ moves along the curve the plane α' will turn about a, describing an axial pencil.

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AUTHORITIES.—In this article we have given a purely geometrical theory of conics, cones of the second order, quadric surfaces, &c. In doing so we have followed, to a great extent, Reye's *Geometrie der Lage*, and to this excellent work those readers are referred who wish for a more exhaustive treatment of the subject. Other works especially valuable as showing the development of the subject are: Monge, *Géométrie descriptive*: Carnot, *Géométrie de position* (1803), containing a theory of transversals; Poncelet's great work *Traité des propriétés projectives des figures* (1822); Möbius, *Barycentrischer Calcul* (1826); Steiner, *Abhängigkeit geometrischer Gestalten* (1832), containing the first full discussion of the projective relations between rows, pencils, &c.; Von Staudt, *Geometrie der Lage* (1847) and *Beiträge zur Geometrie der Lage* (1856–1860), in which a system of geometry is built up from the beginning without any reference to number, so that ultimately a number itself gets a geometrical definition, and in which imaginary elements are systematically introduced into pure geometry; Chasles, *Aperçu historique* (1837), in which the author gives a brilliant account of the progress of modern geometrical methods, pointing out the advantages of the different purely geometrical methods as compared with the analytical ones, but without taking as much account of the German as of the French authors; Id., *Rapport sur les progrès de la géométrie* (1870), a continuation of the *Aperçu*; Id., *Traité de géométrie supérieure* (1852); Cremona, *Introduzione ad una teoria geometrica delle curve piane* (1862) and its continuation *Preliminari di una teoria geometrica delle superficie* (German translations by Curtze). As more elementary books, we mention: Cremona, *Elementi di Projettive Geometry*, translated from the Italian by C. Leudesdorf (2nd ed., 1894); J. W. Russell, *Pure Geometry* (2nd ed., 1905). (O. H.)

III. DESCRIPTIVE GEOMETRY

This branch of geometry is concerned with the methods for representing solids and other figures in three dimensions by drawings in one plane. The most important method is that which was invented by Monge towards the end of the 18th century. It is based on parallel projections to a plane by rays perpendicular to the plane. Such a projection is called orthographic (see PROJECTION, § 18). If the plane is horizontal the projection is called the plan of the figure, and if the plane is vertical the elevation. In Monge's method a figure is represented by its plan and elevation. It is therefore often called drawing in plan and elevation, and sometimes simply orthographic projection.

§ 1. We suppose then that we have two planes, one horizontal, the other vertical, and these we call the planes of plan and of elevation respectively, or the horizontal and the vertical plane, and denote them by the letters π_1 and π_2. Their line of intersection is called the axis, and will be denoted by xy.

As the surface of the drawing paper is taken as the plane of the plan, then the vertical plane will be the plane perpendicular to it through the axis xy. To bring this also into the plane of the drawing paper we turn it about the axis till it coincides with the horizontal plane. This process of turning one plane down till it coincides with another is called *rabatting* one to the other. Of course there is no necessity to have one of the two planes horizontal, but even when this is not the case it is convenient to retain the above names.

The whole arrangement will be better understood by referring to fig. 37. A point A in space is there projected by the perpendicular

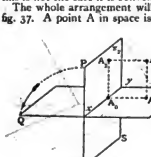

FIG. 37.

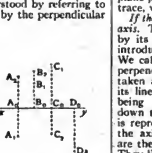

FIG. 38.

AA_1 and AA_2 to the planes π_1 and π_2 so that A_1 and A_2 are the horizontal and vertical projections of A.

If we remember that a line is perpendicular to a plane that is perpendicular to every line in the plane if only it is perpendicular to any two intersecting lines in the plane, we see that the axis which is perpendicular both to AA_1 and to AA_2 is also perpendicular to A_1A_2 and to A_2A_1 because these four lines are all in the same plane. Hence, if the plane π_2 be turned about the axis till it coincides with the plane π_1, then A_2A_1 will be the continuation of A_1A_2. This position of the planes is represented in fig. 38, in which the line A_1A_2 is perpendicular to the axis x.

Conversely any two points A_1, A_2 in a line perpendicular to the axis will be the projections of some point in space when the plane π_2 is turned about the axis till it is perpendicular to the plane π_1, because in this position the two perpendiculars to the planes π_1 and π_2 through the points A_1 and A_2 will be in a plane and therefore meet at some point A.

Representation of Points.—We have thus the following method of representing in a single plane the position of points in space:—*we take in the plane a line xy as the axis, and then any pair of points* A_1, A_2 *in the plane on a line perpendicular to the axis represent a point A in space.* If the line A_1A_2 cuts the axis at A_0, and if at A_1 a perpendicular $A_1A = A_2A_0$ be erected to the plane, then the point A will be in it at a height $A_1A = A_2A_0$ above the plane. This gives the position of the point A relative to the plane π_1. In the same way, if in a perpendicular to π_2 through A_2 a point A be taken such that $A_2A = A_1A_0$, this will give the point A relative to the plane π_2.

§ 2. The two planes π_1, π_2 in their original position divide space into four parts. These are called the four quadrants. We suppose that the plane π_2 is turned as indicated in fig. 39, so that the point P comes to Q and R to S, then the quadrant in which the point A lies is called the first, and we say that in the first quadrant a point lies above the horizontal and in front of the vertical plane. Now we go round the axis in the sense in which the plane π_2 is turned and come in succession to the second, third and fourth quadrant. In the second a point lies above the plane of the plan and behind the plane of elevation, and so on. In fig. 39, which represents a side view of the planes in fig. 37 the quadrants are marked, and in each a point with its projection is taken. Fig. 38 shows how these are represented when the plane π_2 is turned down. We see that

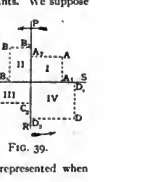

FIG. 39.

A point lies in the first quadrant if the plan lies below, the elevation above the axis; in the second if plan and elevation both lie above; in the third if the plan lies above, the elevation below; in the fourth if plan and elevation both lie below the axis.

If a point lies in the horizontal plane, its elevation lies in the axis and the plan coincides with the point itself. *If a point lies in the vertical plane*, its plan lies in the axis and the elevation coincides with the point itself. *If a point lies in the axis*, both its plan and elevation lie in the axis and coincide with it.

Of each of these propositions, which will easily be seen to be true, the converse holds also.

§ 3. *Representation of a Plane.*—As we are thus enabled to represent points in a plane, we can represent any finite figure by representing its separate points. It is, however, not possible to represent a plane in this way, for the projections of its points completely cover the planes π_1 and π_2, and no plane would appear different from any other. But any plane α cuts each of the planes π_1, π_2 in a line. These are called the traces of the plane. They cut each other in the axis at the point where the latter cuts the plane α.

A plane is determined by its two traces, which are two lines that meet on the axis, and, conversely, *any two lines which meet on the axis determine a plane.*

If the plane is parallel to the axis its traces are parallel to the axis. Of these one may be at infinity; then the plane will cut one of the planes of projection at infinity and will be parallel to it. Thus a plane parallel to the horizontal plane of the plan has only one finite trace, viz. that with the plane of elevation.

If the plane passes through the axis both its traces coincide with the axis. This is the only case in which the representation of the plane by its two traces fails. A third plane of projection is therefore introduced, which is best taken perpendicular to the other two. We call it simply the third plane and denote it by π_3. As it is perpendicular to π_1, it may be taken as the plane of elevation, its line of intersection γ with π_1 being the axis, and be turned down to coincide with π_1. This is represented in fig. 40. OC is the axis xy whilst OA and OB are the traces of the third plane. They lie in one line γ. The plane π is rabatted about γ to the horizontal plane. A plane α through the axis xy will then show in it a trace α_3. In fig. 40 the lines OC and OP will thus be the traces of a plane through the axis xy, which makes an angle POQ with the horizontal plane.

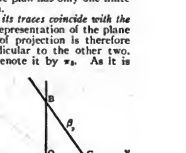

FIG. 40.

We can also find the trace which any other plane makes with π_3. In rabatting the plane π_3 its trace OB with the plane π_2 will come to the position OD. Hence a plane β having the traces CA and CB will have with the third plane the trace β_3, or AD if OD = OB.

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It also follows immediately that—

If a plane α is perpendicular to the horizontal plane, then every point in it has its horizontal projection in the horizontal trace of the plane, as all the rays projecting these points lie in the plane itself.

Any plane which is perpendicular to the horizontal plane has its vertical trace perpendicular to the axis.

Any plane which is perpendicular to the vertical plane has its horizontal trace perpendicular to the axis and the vertical projections of all points in the plane lie in this trace.

§ 4. *Representation of a Line.*—A line is determined either by two points in it or by two planes through it. We get accordingly two representations of it either by projections or by traces.

First.—*A line a is represented by its projections a_1 and a_2 on the two planes π_1 and π_2.* These may be any two lines, for, bringing the planes π_1, π_2 into their original position, the planes through these lines perpendicular to π_1, π_2 respectively will intersect in some line a which has a_1, a_2 as its projections.

Secondly.—*A line a is represented by its traces—that is, by the points in which it cuts the two planes π_1, π_2.* Any two points may be taken as the traces of a line in space, for it is determined when the planes are in their original position as the line joining the two traces. This representation becomes undetermined if the two traces coincide in the axis. In this case we again use a third plane, or else the projections of the line.

The fact that there are different methods of representing points and planes, and hence two methods of representing lines, suggests the principle of duality (section ii., *Projective Geometry*, § 41). It is worth while to keep this in mind. It is also worth remembering that traces of planes or lines always lie in the planes or lines which they represent. Projections do not as a rule do this excepting when the point or line projected lies in one of the planes of projection.

Having now shown how to represent points, lines and planes, we have to state the conditions which must hold in order that these elements may lie one in the other, or else that the figure formed by them may possess certain metrical properties. It will be found that the former are very much simpler than the latter.

Before we do this, however, we shall explain the notation used; for it is of great importance to have a systematic notation. We shall denote points in space by capitals A, B, C; planes in space by Greek letters α, β, γ; lines in space by small letters a, b, c; horizontal projections by suffixes 1, like A_1, a_1; vertical projections by suffixes 2, like A_2, a_2; traces by single and double dashes a' a'', a', a''. Hence P_1 will be the horizontal projection of a point P in space; a line a will have the projections a_1, a_2 and the traces a' and a''; a plane α has the traces a' and a''.

§ 5. *If a point lies in a line, the projections of the point lie in the projections of the line.*

If a line lies in a plane, the traces of the line lie in the traces of the plane.

These propositions follow at once from the definitions of the projections and of the traces.

If a point lies in two lines its projections must lie in the projections of both. Hence

If two lines, given by their projections, intersect, the intersection of their plans and the intersection of their elevations must lie in a line perpendicular to the axis, because they must be the projections of the point common to the two lines.

Similarly—*If two lines given by their traces lie in the same plane or intersect, then the lines joining their horizontal and vertical traces respectively must meet on the axis,* because they must be the traces of the plane through them.

§ 6. *To find the projections of a line which joins two points* A, B *given by their projections* A_1, A_2 *and* B_1, B_2, *we join* A_1, B_1 *and* A_2, B_2; these will be the projections required. For example, the traces of a line are two points in the line whose projections are known or at all events easily found. They are the traces themselves and the feet of the perpendiculars from them to the axis.

Hence *if a' a''* (fig. 41) *are the traces of a line a, and if the perpendiculars from them cut the axis in P and Q respectively, then the line $a'Q$ will be the horizontal and $a''P$ the vertical projection of the line.*

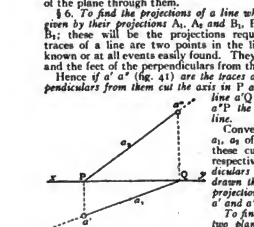

FIG. 41.

Conversely, if the projections a_1, a_2 of a line are given, and if these cut the axis in Q and P respectively, then *the perpendiculars Pa' and Qa'' to the axis drawn through these points cut the projections a_1 and a_2 in the traces a' and a''.*

To find the line of intersection of two planes, we observe that this line lies in both planes; its traces must therefore lie in the traces of both. Hence the points where the horizontal traces of the given planes meet will be the horizontal, and the point where the vertical traces meet the vertical trace of the line required.

§ 7. *To decide whether a point A, given by its projections, lies in a plane α, given by its traces,* we draw a line b by joining A to some point in the plane α and determine its traces. If these lie in the traces of the plane, then the line, and therefore the point A, lies in the plane; otherwise not. This is conveniently done by joining A_1 to some point p' in the trace a'; this gives p_1; and the point where the perpendicular from p' to the axis cuts the latter we join to A_2; this gives p_2. If the vertical trace of this line lies in the vertical trace of the plane, then, and then only, does the line p, and with it the point A, lie in the plane α.

§ 8. *Parallel planes have parallel traces,* because parallel planes are cut by any plane, hence also by π_1 and by π_2, in parallel lines.

Parallel lines have parallel projections, because points at infinity are projected to infinity.

To draw a plane through a line a and a point A without the line, we join the given point to any point in the line and determine the plane through this and the given line.

To draw a plane through three points which are not in a line, we draw any two of the lines which each join two of the given points and draw the plane through them. If the traces of all three lines AB, BC, CA be found, these must lie in two lines which meet on the axis.

§ 10. We have in the last example got more points, or can easily get more points, than are necessary for the determination of the figure required—in this case the traces of the plane. This will happen in a great many constructions and is of considerable importance. It may happen that some of the points or lines obtained are not convenient in the actual construction. The horizontal traces of the lines AB and AC may, for instance, fall very near together, in which case the joining them is not well defined. Or, one or both of them may fall beyond the drawing paper, so that they are practically non-existent for the construction. In this case the traces of the line BC may be used. Or, if the vertical traces of AB and AC are both in convenient position, so that the vertical trace of the required plane is found and one of the horizontal traces is not, then we may join the latter to the point where the vertical trace cuts the axis.

The draughtsman must remember that the lines which he draws are not mathematical lines without thickness, and therefore every construction is affected by some error. It is therefore very desirable to be able constantly to check the latter. Such checks always present themselves when the same result can be obtained by different constructions, or when, as in the above case, some lines must meet on the axis, or if three points must lie in a line. A careful draughtsman will always avail himself of these checks.

§ 11. *To draw a plane through a given point parallel to a given plane α,* we draw through the point two lines which are parallel to the traces of α, and determine the plane through them; or, as we know that the traces of the required plane are parallel to those of the given one (§ 8), we need only draw one line l through the point parallel to the plane and find one of its traces, say the vertical trace l''. Then through this parallel to the vertical trace of α will be the vertical trace β'' of the required plane β, and a line parallel to the horizontal trace of α meeting β'' on the axis will be the horizontal trace β'.

Let A_1 A_2 (fig. 42) be the given point, a' a'' the given plane, a line l_1 through A_1, parallel to a' and a horizontal line l_2 through A_2 will be the projections of a line l through A parallel to the plane α. Because the horizontal plane through this line will cut the plane α in a line c which has its horizontal projection c_1 parallel to a'.

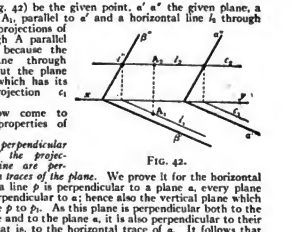

FIG. 42.

§ 12. We now come to the metrical properties of figures.

A line is perpendicular to a plane if the projections of the line are perpendicular to the traces of the plane. We prove it for the horizontal projection. If a line p is perpendicular to a plane α, every plane through p is perpendicular to α; hence also the vertical plane which projects the line p to p_2. As this plane is perpendicular both to the horizontal plane and to the plane α, it is also perpendicular to their intersection—that is, to the horizontal trace of α. It follows that every line in this projecting plane, therefore also p_1, the plan of p, is perpendicular to the horizontal trace of α.

To draw a plane through a given point A perpendicular to a given line p, we first draw through some point O in the axis lines γ_1', γ_2'' perpendicular respectively to the projections p_1 and p_2 of the given line. These will be the traces of a plane γ which is perpendicular to the given line. We next draw through the given point A a plane parallel to the plane γ; this will be the plane required.

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Other metrical properties depend on the determination of the real size or shape of a figure.

In general the projection of a figure differs both in size and shape from the figure itself. Subjecting the plane parallel to a plane of projection will be identical with their projections, and will thus be given in their true dimensions. In other cases there is the problem, constantly recurring, either to find the true shape and size of a plane figure when plan and elevation are given, or, conversely, to find the latter from the known true shape of the figure itself. To do this, the plane is turned about one of its traces till it is laid down into that plane of projection to which the trace belongs. This is technically called rabatting the plane respectively into the plane of the plan or the elevation. As there is no difference in the treatment of the two cases, we shall consider only the case of rabatting a plane a into the plane of the plan. The plan of the figure is a parallel (orthographic) projection of the figure itself. The results of parallel projection (see PERSPECTIVE, §§ 17 and 18) may therefore now be used. The trace a' will hereby take the place of what formerly was called the axis of projection. Hence we see that corresponding points in the plan and in the rabatted plane are joined by lines which are perpendicular to the trace a' and that corresponding lines meet on this trace. We also see that the correspondence is completely determined if we know for one point or one line in the plan the corresponding point or line in the rabatted plane.

Before, however, we treat of this we consider some special cases.

§ 13. *To determine the distance between two points A, B given by their projections A_1, B_1 and A_2, B_2, or, in other words, to determine the true length of a line the plan and elevation of which are given.*

Solution.—The two points A, B in space lie vertically above their plans A_1, B_1 (fig. 43) and $A_1A = A_2A_0$, $B_1B = B_2B_2$. The four points A, B, A_1, B_1 therefore form a plane quadrilateral on the base A_1B_1 and having right angles at the base. This plane we rabatt about A_1B_1 by drawing A_1A and B_1B perpendicular to A_1B_1 and making $A_1A = A_2A_0$, $B_1B = B_2B_2$. Then AB will give the length required.

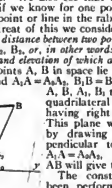

FIG. 43.

The construction might have been performed in the elevation by making $A_2A = A_1A_1$ and $B_2B = B_1B_1$ on lines perpendicular to A_2B_2. Of course AB must have the same length in both cases.

This figure may be turned into a model. Cut the paper along A_1A, AB and BB_1, and fold the piece A_1ABB_1 over along A_1B_1 till it stands upright at right angles to the horizontal plane. The points A, B will then be in their true position in space relative to π_1. Similarly if $B_1B_2AA_2$ be cut out and turned along A_2B_2 through a right angle we shall get AB in its true position relative to the plane π_2. Lastly we fold the whole sheet of the paper along the line x till the plane π_2 is at right angles to π_1. In this position the two sets of points AB will coincide if the drawing has been accurate.

Models of this kind can be made in many cases and their construction cannot be too highly recommended in order to realize orthographic projection.

§ 14. *To find the angle between two given lines a, b of which the projections a_1, b_1 and a_2, b_2 are given.*

Solution.—Let a_1, b_1 (fig. 44) meet in P_1, a_2, b_2 in T, then if the line P_1T is not perpendicular to the axis the two lines will not meet. In this case we draw a line parallel to b to meet the line a. This is easiest done by drawing first the line P_1P_2 perpendicular to the axis to meet a_2 in P_2, and then drawing through P_2 a line c_2 parallel to b_2; then b_1, c_2 will be the projections of a line c which is parallel to b and meets a in P. The plane a which these two lines determine we rabatt to the plan. We determine the traces a' and c' of the lines a and c; then $a'c'$ is the trace a' of their plane. On rabatting the point P comes to a point S on the line P_1Q perpendicular to $a'c'$, so that $QS = QP$. But QP is the hypotenuse of a triangle PP_1R with a right angle P_1. This we construct by making $QR = P_2P_1$; then $P_1R = PQ$. The lines $a'S$ and $c'S$ will therefore include angles equal to those made by the given lines. It is to be remembered that two lines include two angles which are supplementary. Which of these is to be taken in any special case depends upon the circumstances.

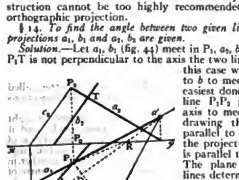

FIG. 44.

To determine the angle between a line and a plane, we draw through any point in the line a perpendicular to the plane (§ 12) and determine the angle between it and the given line. The complement of this angle is the required one.

To determine the angle between two planes, we draw through any point two lines perpendicular to the two planes and determine the angle between the latter as above.

In special cases it is simpler to determine at once the angle between the two planes by taking a plane section perpendicular to the intersection of the two planes and rabatt this. This is especially the case if one of the planes is the horizontal or vertical plane of projection.

Thus in fig. 45 the angle P_1QR is the angle which the plane a makes with the horizontal plane.

§ 15. We return to the general case of rabatting a plane a of which the traces a' a'' are given.

Here it will be convenient to determine first the position which the trace a''—which is a line in a—assumes when rabatted. Points in this line coincide with their elevations. Hence it is given in its true dimension, and we can measure off along it the true distance between two points in it. If therefore (fig. 45) P is any point in a'' originally coincident with its elevation P_2, and if O is the point where a'' cuts the axis xy, so that O is also in a', then the point P will after rabatting the plane assume such a position that $OP = OP_2$. At the same time the plan is an orthographic projection of the plane a. Hence the line joining P to the plan P_1 will after rabatting be perpendicular to a'. But P_1 is known; it is the foot of the perpendicular from P_2 to the axis xy. We draw therefore, to find P, from P_1 a perpendicular P_1Q to a' and find on it a point P such that $OP = OP_2$. Then the line OP will be the position of a'' when rabatted. This line corresponds therefore to the plan of a''—that is, to the axis xy, corresponding points on these lines being those which lie on a perpendicular to a'.

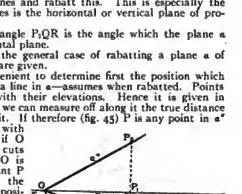

FIG. 45.

We have thus one pair of corresponding lines and can now find for any point B_1 in the plan the corresponding point B in the rabatted plane. We draw a line through B_1, say B_1P_1, cutting a' in C. To it corresponds the line CP, and the point where this is cut by the projecting ray through B_1, perpendicular to a', is the required point B.

Similarly any figure in the rabatted plane can be found when the plan is known; but this is usually found in a different manner without any reference to the general theory of parallel projection. As this method and the reasoning employed for it have their peculiar advantages, we give it also.

Supposing the planes π_1 and π_2 to be in their positions in space perpendicular to each other, we take a section of the whole figure by a plane perpendicular to the trace a' about which we are going to rabatt the plane a. Let this section pass through the point Q in a'. Its traces will then be the lines QP_1 and P_1P_2 (fig. 9). These will be at right angles, and will therefore, together with the section QP_2 of the plane a, form a right-angled triangle QP_1P_2 with the right angle at P_1, and having the sides P_1Q and P_1P_2 which both are given in their true lengths. This triangle we rabatt about its base P_1Q, making $P_1R = P_1P_2$. The line QR will then give the true length of the line QP in space. If now the plane a be turned about a' the point P will describe a circle about Q as centre with radius $QP = QR$, in a plane perpendicular to the trace a'. Hence when the plane a has been rabatted into the horizontal plane the point P will lie in the perpendicular P_1Q to a', so that $QP = QR$.

If A_1 is the plan of a point A in the plane a, and if A_1 lies in QP_1, then the point A will lie vertically above A_1 in the line QP. On turning down the triangle QP_1P_2, the point A will come to A_2, the line A_1A_2 being perpendicular to QP_1. Hence A will be a point in QP such that $QA = QA_2$.

If B_1 is the plan of another point, but such that A_1B_1 is parallel to a', then the corresponding line AB will also be parallel to a'. Hence, if through A a line AB be drawn parallel to a', and B_1 B perpendicular to a', then their intersection gives the point B. Thus of any point given in plan the real position in the plane a, when rabatted, can be found by this second method. This is the one most generally given in books on geometrical drawing. The first method explained is, however, in most cases preferable as it gives the draughtsman a greater variety of constructions. It requires a somewhat greater amount of theoretical knowledge.

If instead of our knowing the plan of a figure the latter is itself given, then the process of finding the plan is the reverse of the above and needs little explanation. We give an example.

§ 16. *It is required to draw the plan and elevation of a polygon of which the real shape and position in a given plane a are known.*

We first rabatt the plane a (fig. 46) as before so that P_1 comes to P, hence OP_1 to OP. Let the given polygon in a be the figure ABCDE. We project, not the vertices, but the sides. To project the line AB, we produce it to cut a' in F and OP in G, and draw GG_1 perpendicular to x'; then G_1 corresponds to G, therefore FG_1 to FG. In the same manner we might project all the other sides, at least

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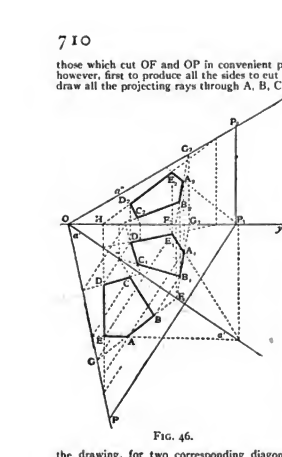

FIG. 46.

those which cut OF and OP in convenient points. It will be best, however, first to produce all the sides to cut OP and a' and then to draw all the projecting rays through A, B, C . . . perpendicular to a', and in the same direction the lines G, G_1, &c. By drawing FG we get the points A_1, B_1 on the projecting ray through A and B. We then join B to the point M where BC produced meets the trace a'. This gives C_1. So we go on till we have found E_1. The line $A_1 E_1$ must then meet AE in a', and this gives a check. If one of the sides cuts a' or OP beyond the drawing paper this method fails, but then we may easily find the projection of some other line, say of a diagonal, or directly the projection of a point, by the former methods. The diagonals may also serve to check the drawing, for two corresponding diagonals must meet in the trace a'.

Having got the plan we easily find the elevation. The elevation of G is above G_1 in a'_2, and that of F is at F_2 in the axis. This gives the elevation F_2G_2 of FG and in it we get A_2B_2 in the verticals through A_1 and B_1. As a check we have $OG = OG_2$. Similarly the elevation of the other sides and vertices are found.

§ 17. We proceed to give some applications of the above principles to the representation of solids and of the solution of problems connected with them.

Of a pyramid are given its base, the length of the perpendicular from the vertex to the base, and the point where this perpendicular cuts the base; it is required first to develop the whole surface of the pyramid into one plane, and second to determine its section by a plane which cuts the plane of the base in a given line and makes a given angle with it.

1. As the planes of projection are not given we can take them as we like, and we select them in such a manner that the solution becomes as simple as possible. We take the plane of the base as the horizontal plane and the vertical plane perpendicular to the plane of the section. Let then (fig. 47) ABCD be the base of the pyramid, V_1 the plan of the vertex, then the elevations of A, B, C, D will be in the axis at A_2, B_2, C_2, D_2, and the vertex at some point V_2 above V_1 at a known distance from the axis. The lines V_1A_1, V_1B_1, &c., will be the plans and the lines V_2A_2, V_2B_2, &c., the elevations of the edges of the pyramid, of which thus plan and elevation are known.

We develop the surface into the plane of the base by turning each lateral face about its lower edge into the horizontal plane by the method used in § 14. If one face has been turned down, say ABV to ABP, then the point Q to which the vertex of the next face BCV comes can be got more simply by finding on the line VQ perpendicular to BC the point Q such that BQ = BP, for these lines represent the same edge BV of the pyramid. Next R is found by making CR = CQ, and so on till we have got the last vertex —in this case S. The fact that AS must equal AP gives a convenient check.

2. The plane a whose section we have to determine has its horizontal trace given perpendicular to the axis, and its vertical trace makes the given angle with the axis. This determines it. To find the section of the pyramid by this plane there are two methods applicable: we find the sections of the plane either with the faces or with the edges of the pyramid. We use the latter.

As the plane a is perpendicular to the vertical plane, the trace a' contains the projection of every figure in it; the points E_2, F_2, G_2, H_2 where this trace cuts the elevations of the edges will therefore be the elevations of the points where the edges cut a. From these we find the plans E_1, F_1, G_1, H_1, and by joining them the plan of the section. If from E_1, F_1 lines be drawn perpendicular to AB, these will determine the points E, F on the developed face in which the plane a cuts it; hence also the line EF. Similarly on the other faces. Of course BF must be the same length on BP and on BQ. If the plane a be rabatted to the plan, we get the real shape of the section as shown in the figure in EFGH. This is done easily by making $F_3F = OF_2$, &c. If the figure representing the development of the pyramid, or better a copy of it, is cut out, and if the lateral faces be bent along the lines AB, BC, &c., we get a model of the pyramid with the section marked on its faces. This may be placed on its plan ABCD and the plane of elevation bent about the axis x. The pyramid stands then in front of its elevations. If next the plane a with a hole cut out representing the true section be bent along the trace a' till its edge coincides with a', the edges of the hole ought to coincide with the lines EF, FG, &c., on the faces.

§ 18. Polyhedra like the pyramid in § 17 are represented by the projections of their edges and vertices. But solids bounded by curved surfaces, or surfaces themselves, cannot be thus represented.

For a surface we may use, as in case of the plane, its traces—that is, the curves in which it cuts the planes of projection. We may also project points and curves on the surface. A ray cuts the surface generally in more than one point; hence it will happen that some of the rays touch the surface, if two of these points coincide. The points of contact of these rays will form some curve on the surface, and this will appear from the centre of projection as the boundary of the surface or of part of the surface. The outlines of all surfaces of solids which we see about us are formed by the points at which rays through our eye touch the surface. The projections of these contours are therefore best adapted to give an idea of the shape of a surface.

Thus the tangents drawn from any finite centre to a sphere form a right circular cone, and this will be cut by any plane in a conic.

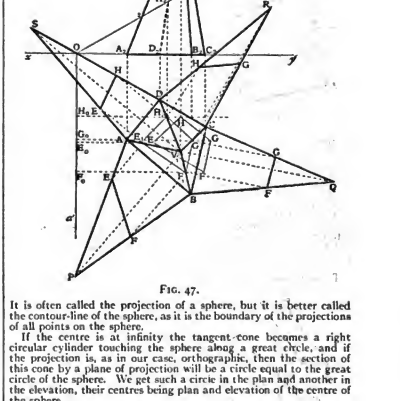

FIG. 47.

It is often called the projection of a sphere, but it is better called the contour-line of the sphere, as it is the boundary of the projections of all points on the sphere.

If the centre is at infinity the tangent-cone becomes a right circular cylinder touching the sphere along a great circle, and if the projection is, as in our case, orthographic, then the section of this cone by a plane of projection will be a circle equal to the great circle of the sphere. We get such a circle in the plan and another in the elevation, their centres being plan and elevation of the centre of the sphere.

Similarly the rays touching a cone of the second order will lie in two planes which pass through the vertex of the cone, the contour-line of the projection of the cone consists therefore of two lines meeting in the projection of the vertex. These may, however, be invisible if no real tangent rays can be drawn from the centre of projection; and this happens when the ray projecting the centre of the vertex lies within the cone. In this case the traces of the cone are of importance. Thus in representing a cone of revolution with a vertical axis we get in the plan a circular trace of the surface whose centre is the plan of the vertex of the cone, and in the elevation the contour, consisting of a pair of lines intersecting in the elevation of the vertex of the cone. The circle in the plan and the pair of lines in the elevation do not determine the surface, for an infinite number of surfaces might be conceived which pass through the circular trace and touch two planes through the contour lines in the vertical plane. The surface becomes only completely defined if we write down to the figure that it shall represent a cone. The same holds for all

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surfaces. Even a plane is fully represented by its traces only under the silent understanding that the traces are those of a plane.

§ 19. Some of the simpler problems connected with the representation of surfaces are the determination of plane sections and of the curves of intersection of two such surfaces. The former is constantly used in nearly all problems concerning surfaces. Its solution depends of course on the nature of the surface.

To determine the curve of intersection of two surfaces, we take a plane and determine its section with each of the two surfaces, rabatting this plane if necessary. This gives two curves which lie in the same plane and whose intersections will give us points on both surfaces. It must here be remembered that two curves in space do not necessarily intersect, hence that the points in which their projections intersect are not necessarily the projections of points common to the two curves. This will, however, be the case if the two curves lie in a common plane. By taking then a number of plane sections of the surfaces we can get as many points on their curve of intersection as we like. These planes have, of course, to be selected in such a way that the sections are curves as simple as the case permits of, and such that they can be easily and accurately drawn. Thus when possible the sections should be straight lines or circles. This not only saves time in drawing but determines all points on the sections, and therefore also the points where the two curves meet, with equal accuracy.

§ 20. We give a few examples how these sections have to be selected. A cone is cut by every plane through the vertex in lines, and if it is a cone of revolution by planes perpendicular to the axis in circles.

A cylinder is cut by every plane parallel to the axis in lines, and if it is a cylinder of revolution by planes perpendicular to the axis in circles.

A sphere is cut by every plane in a circle.

Hence in case of two cones situated anywhere in space we take sections through both vertices. These will cut both cones in lines. Similarly in case of two cylinders we may take sections parallel to the axis of both. In case of a sphere and a cone of revolution with vertical axis, horizontal sections cut both surfaces in circles, whose plans are circles and whose elevations are lines, whilst vertical sections through the vertex of the cone cut the latter in lines and the sphere in circles. To avoid drawing the projections of these circles, which would in general be ellipses, we rabatt the plane and then draw the circles in their real shape. And so on in other cases.

Special attention should in all cases be paid to those points in which the tangents to the projection of the curve of intersection are parallel or perpendicular to the axis x, or where these projections touch the contour of one of the surfaces. (*O. H.*)

IV. Analytical Geometry

1. In the name *geometry* there is a lasting record that the science had its origin in the knowledge that two distances may be compared by measurement, and in the idea that measurement must be effectual in the dissociation of different directions as well as in the comparison of distances in the same direction. The distance from an observer's eye of an object seen would be specified as soon as it was ascertained that a rod, straight to the eye and of length taken as known, could be given the direction of the line of vision, and had to be moved along it a certain number of times through lengths equal to its own in order to reach the object from the eye. Moreover, if a field had for two of its boundaries lines straight to the eye, one running from south to north and the other from west to east, the position of a point in the field would be specified if the rod, when directed west, had to be shifted from the point one observed number of times westward to meet the former boundary, and also, when directed south, had to be shifted another observed number of times southward to meet the latter. Comparison by measurement, the beginning of geometry, involved counting, the basis of arithmetic; and the science of number was marked out from the first as of geometrical importance.

But the arithmetic of the ancients was inadequate as a science of number. Though a length might be recognized as known when measurement certified that it was so many times a standard length, it was not every length which could be thus specified in terms of the same standard length, even by an arithmetic enriched with the notion of fractional number. The idea of possible incommensurability of lengths was introduced into Europe by Pythagoras; and the corresponding idea of irrationality of number was absent from a crude arithmetic, while there were great practical difficulties in the way of its introduction. Hence perhaps it arose that, till comparatively modern times, appeal to arithmetical aid in geometrical reasoning was in all possible ways restrained. Geometry figured rather as the helper of the more difficult science of arithmetic.

2. It was reserved for algebra to remove the disabilities of arithmetic, and to restore the earliest ideas of the land-measurer to the position of controlling ideas in geometrical investigation. This unified science of pure number made comparatively little headway in the hands of the ancients, but began to receive due attention shortly after the revival of learning. It expresses whole classes of arithmetical facts in single statements, gives to arithmetical laws the form of equations involving symbols which may mean any known or sought numbers, and provides processes which enable us to analyse the information given by an equation and derive from that equation other equations, which express laws that are in effect consequences or causes of a law started from, but differ greatly from it in form. Above all, for present purposes, it deals not only with integral and fractional number, but with number regarded as capable of continuous growth, just as distance is capable of continuous growth. The difficulty of the arithmetical expression of irrational number, a difficulty considered by the modern school of analysts to have been at length surmounted (see FUNCTION), is not vital to it. It can call the ratio of the diagonal of a square to a side, for instance, or that of the circumference of a circle to a diameter, a number, and let a or x denote that number, just as properly as it may allow either letter to denote any rational number which may be greater or less than the ratio in question by a difference less than any minute one we choose to assign.

Counting only, and not the counting of objects, is of the essence of arithmetic, and of algebra. But it is lawful to count objects, and in particular to count equal lengths by measure. The widened idea is that even when a or x is an irrational number we may speak of a or x unit lengths by measure. We may give concrete interpretation to an algebraical equation by allowing its terms all to mean numbers of times the same unit length, or the same unit area, or &c. and in any equation lawfully derived from the first by algebraical processes we may do the same. Descartes in his *Géométrie* (1637) was the first to systematize the application of this principle to the inherent first notions of geometry; and the methods which he instituted have become the most potent methods of all in geometrical research. It is hardly too much to say that, when known facts as to a geometrical figure have once been expressed in algebraical terms, all strictly consequential facts as to the figure can be deduced by almost mechanical processes. Some may well be unexpected consequences; and in obtaining those of which there has been suggestion beforehand the often bewildering labour of constant attention to the figure is obviated. These are the methods of what is now called *analytical*, or sometimes *algebraical*, *geometry*.

3. The modern use of the term "analytical" in geometry has obscured, but not made obsolete, an earlier use, one as old as Plato. There is nothing algebraical in this analysis, as distinguished from synthesis, of the Greeks, and of the expositors of pure geometry. It has reference to an order of ideas in demonstration, or, more frequently, in discovering means to effect the geometrical construction of a figure with an assigned special property. We have to suppose hypothetically that the construction has been performed, drawing a rough figure which exhibits it as nearly as is practicable. We then analyse or critically examine the figure, treated as correct, and ascertain other properties which it can only possess in association with the one in question. Presently one of these properties will often be found which is of such a character that the construction of a figure possessing it is simple. The means of effecting synthetically a construction such as was desired is thus brought to light by what Plato called *analysis*. Or again, being asked to prove a theorem A, we ascertain that it must be true if another theorem B is, that B must be if C is, and so on, thus eventually finding that the theorem A is the consequence, through a chain of intermediaries, of a theorem Z of which the establishment is easy. This geometrical analysis is not the subject of the present article; but in the reasoning from form to form of an equation or system

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of equations, with the object of basing the algebraical proof of a geometrical fact on other facts of a more obvious character, the same logic is utilized, and the name "analytical geometry" is thus in part explained.

4. In algebra real positive number was alone at first dealt with, and in geometry actual signless distance. But in algebra it became of importance to say that every equation of the first degree has a root, and the notion of negative number was introduced. The negative unit had to be defined as what can be added to the positive unit and produce the sum zero. The corresponding notion was readily at hand in geometry, where it was clear that a unit distance can be measured to the left or down from the farther end of a unit distance already measured to the right or up from a point O, with the result of reaching O again. Thus, to give full interpretation in geometry to the algebraically negative, it was only necessary to associate distinctness of sign with oppositeness of direction. Later it was discovered that algebraical reasoning would be much facilitated, and that conclusions as to the real would retain all their soundness, if a pair of imaginary units $\pm\sqrt{-1}$ of what might be called number were allowed to be contemplated, the pair being defined, though not separately, by the two properties of having the real sum 0 and the real product 1. Only in these two real combinations do they enter in conclusions as to the real. An advantage gained was that every quadratic equation, and not some quadratics only, could be spoken of as having two roots. These admissions of new units into algebra were final, as it admitted of proof that all equations of degrees higher than two have the full numbers of roots possible for their respective degrees in any case, and that every root has a value included in the form $a+b\sqrt{-1}$, with a, b, real. The corresponding enrichment could be given to geometry, with corresponding advantages and the same absence of danger, and this was done. On a line of measurement of distance we contemplate as existing, not only an infinite continuum of points at real distances from an origin of measurement O, but a doubly infinite continuum of points, all but the singly infinite continuum of real ones imaginary, and imaginary in conjugate pairs, a conjugate pair being at imaginary distances from O, which have a real arithmetic and a real geometric mean. To geometry enriched with this conception all algebra has its application.

5. Actual geometry is one, two or three-dimensional, *i.e.* lineal, plane or solid. In one-dimensional geometry positions and measurements on a single line only are admitted. Now descriptive constructions for points in a line are impossible without going out of the line. It has therefore been held that there is a sense in which no science of geometry strictly confined to one dimension exists. But an algebra of one variable can be applied to the study of distances along a line measured from a chosen point on it, so that the idea of construction as distinct from measurement is not essential to a one-dimensional geometry aided by algebra. In geometry of two dimensions, the flat of the land-measurer, the passage from one point O to any other point, can be effected by two successive marches, one east or west and one north or south, and, as will be seen, an algebra of two variables suffices for geometrical exploitation. In geometry of three dimensions, that of space, any point can be reached from a chosen one by three marches, one east or west, one north or south, and one up or down; and we shall see that an algebra of three variables is all that is necessary. With three dimensions actual geometry stops; but algebra can supply any number of variables. Four or more variables have been used in ways analogous to those in which one, two and three variables are used for the purposes of one, two and three-dimensional geometry, and the results have been expressed in quasi-geometrical language on the supposition that a higher space can be conceived of, though not realized, in which four independent directions exist, such that no succession of marches along three of them can effect the same displacement of a point as a march along the fourth; and similarly for higher numbers than four. Thus analytical, though not actual, geometries exist for four and more dimensions. They are in fact algebras furnished with nomenclature of a geometrical cast, suggested by convenient forms of expression which actual geometry has, in return for benefits received, conferred on algebras of one, two and three variables.

We will confine ourselves to the dimensions of actual geometry, and will devote no space to the one-dimensional, except incidentally as existing within the two-dimensional. The analytical method will now be explained for the cases of two and three dimensions in succession. The form of it originated by Descartes, and thence known as Cartesian, will alone be considered in much detail.

1. *Plane Analytical Geometry.*

6. *Coordinates.*—It is assumed that the points, lines and figures considered lie in one and the same plane, which plane therefore need not be in any way referred to. In the plane a point O, and two lines $x'Ox$, $y'Oy$, intersecting in O, are taken once for all, and regarded as fixed. O is called the origin, and $x'Ox$, $y'Oy$ the axes of x and y respectively. Other positions in the plane are specified in relation to this fixed origin and these fixed axes. From any point P we

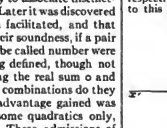

FIG. 48.

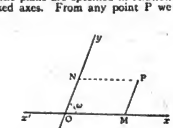

FIG. 49.

suppose PM drawn parallel to the axis of y to meet the axis of x in M, and may also suppose PN drawn parallel to the axis of x to meet the axis of y in N, so that OMPN is a parallelogram. The position of P is determined when we know OM (= NP) and MP (= ON). If OM is x times the unit of a scale of measurement chosen at pleasure, and MP is y times the unit, so that x and y have numerical values, we call x and y the (Cartesian) coordinates of P. To distinguish them we often speak of y as the ordinate, and of x as the abscissa.

It is necessary to attend to signs; x has one sign or the other according as the point P is on one side or the other of the axis of y, and y one sign or the other according as P is on one side or the other of the axis of x. Using the letters N, E, S, W, as in a map, and considering the plane as divided into four quadrants by the axes, the signs are usually taken to be:

x	y	For quadrant
+	+	N E
+	−	S E
−	+	N W
−	−	S W

A point is referred to as the point (a, b), when its coordinates are $x=a$, $y=b$. A point may be fixed, or it may be variable, *i.e.* be regarded for the time being as free to move in the plane. The coordinates (x, y) of a variable point are algebraic variables, and are said to be "current coordinates."

The axes of x and y are usually (as in fig. 48) taken at right angles to one another, and we then speak of them as rectangular axes, and of x and y as "rectangular coordinates" of a point P; OMPN is then a rectangle. Sometimes, however, it is convenient to use axes which are oblique to one another, so that (as in fig. 49) the angle xOy between their positive directions is some known angle ω distinct from right angle, and OMPN is always an oblique parallelogram with given angles; and we then speak of x and y as "oblique coordinates." The coordinates are as a rule taken to be rectangular in what follows.

7. *Equations and loci.* If (x, y) is the point P, and if we are given that $x=0$, we are told that, in fig. 48 or fig. 49, the point M lies at O, whatever value y may have, *i.e.* we are told the one fact that P lies on the axis of y. Conversely, if P lies anywhere on the axis of y, we have always $x=0$, *i.e.* $x=0$. Thus the equation $x=0$ is one satisfied by the coordinates (x, y) of every point in the axis of y, and not by those of any other point. We say that $x=0$ is the equation of the axis of y, and that the axis of y is the locus represented by the equation $x=0$. Similarly $y=0$ is the equation of the axis of x. An equation $x=a$, where a is a constant, expresses that P lies on a parallel to the axis of y through a point M on the axis of x such that $OM=a$. Every line parallel to the axis of y has an equation of this form. Similarly, every line parallel to the axis of x has an equation of the form $y=b$, where b is some definite constant.

These are simple cases of the fact that a single equation in the current coordinates of a variable point (x, y) imposes one limitation on the freedom of that point to vary. The coordinates of a point

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taken at random in the plane will, as a rule, not satisfy the equation, but infinitely many points, and in most cases infinitely many real ones, have coordinates which do satisfy it, and these points are exactly those which lie upon some locus of one dimension, a straight line or more frequently a curve, which is said to be represented by the equation. Take, for instance, the equation $y = mx$, where m is a given constant. It is satisfied by the coordinates of every point P, which is such that, in fig. 48, the distance MP, with its proper sign, is m times the distance OM, with its proper sign, *i.e.* the ordinates of every point in the straight line through O which we arrive at by making a line, originally coincident with $x'Ox$, revolve about O in the direction opposite to that of the hands of a watch through an angle of which m is the tangent, and by those only, are points. That line is the locus which it represents. Take, more generally, the equation $y = \phi(x)$, where $\phi(x)$ is any given non-ambiguous function of x. Choosing any point M on $x'Ox$ in fig. 1, and giving to x the value of the numerical measure of OM, the equation determines a single corresponding y, and so determines a single point P on the line through M parallel to $y'Oy$. This is one point whose coordinates satisfy the equation. Now let M move from the extreme left to the extreme right of the line $x'Ox$, regarded as extended both ways as far as we like, *i.e.* let x take all real values from $-\infty$ to ∞. With every value goes a point P, as above, on the parallel to $y'Oy$ through the corresponding M; and we thus find that there is a path from the extreme left to the extreme right of the figure, all points P along which are distinguished from other points by the exceptional property of satisfying the equation by their coordinates. This path is a locus; and the equation $y = \phi(x)$ represents it. More generally still, take an equation $f(x, y) = 0$, which involves both x and y under a functional form. Any particular value given to x in it produces from it an equation for the determination of a value or values of y, which go with that value of x in specifying a point or points (x, y), of which the coordinates satisfy the equation $f(x, y) = 0$. Here again, as x takes all values, the point or points describe a path or paths, which constitute a locus represented by the equation. Except when y enters to the first degree only in $f(x, y)$, it is not to be expected that all the values of y, determined as going with a chosen value of x, will be necessarily real; indeed it is not uncommon for all to be imaginary for some ranges of values of x. The locus may largely consist of continua of imaginary points; but the real parts of it constitute a real curve or curves. Note that we have to allow x to admit of all imaginary, as well as of all real, values, in order to obtain all imaginary parts of the locus.

A locus or curve may be algebraically specified in another way; viz. we may be given two equations $x = f(\theta)$, $y = F(\theta)$, which express the coordinates of any point of it as two functions of the same variable parameter θ to which all values are open. As θ takes all values in turn, the point (x, y) traverses the curve.

It is a good exercise to trace a number of curves, taken as defined by the equations which represent them. This, in simple cases, can be done approximately by plotting the values of y given by the equation of a curve as going with a considerable number of values of x, and connecting the various points (x, y) thus obtained. But methods exist for diminishing the labour of this tentative process.

Another problem, which will be more attended to here, is that of determining the equation of a curve of known interest, which is defined by geometrical properties. It is not a matter for surprise that the curves which have been most and longest studied geometrically are among those represented by equations of the simplest character.

8. *The Straight Line.*—This is the simplest type of locus. Also the simplest type of equation in x and y is $Ax + By + C = 0$, one of the first degree. Here the coefficients A, B, C are constants. They are, like the current coordinates, x, y, numerical. But, in giving interpretation to such an equation, we must of course refer to numbers Ax, By, C of unit magnitudes of the same kind, of units of counting for instance, or unit lengths or unit squares. It will

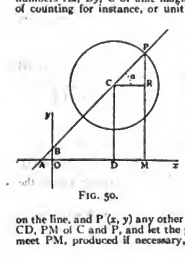

FIG. 50.

now be seen that every straight line has an equation of the first degree, and that every equation of the first degree represents a straight line.

It has been seen (§ 7) that lines parallel to the axes have equations of the first degree, free from one of the variables. Take now a straight line ABC inclined to both axes. Let it make a given angle a with the positive direction of the axis of x, *i.e.* in fig. 50 let this be the angle through which Ax must be revolved counter-clockwise about A in order to be made coincident with the line. Let C, of coordinates (h, k), be a fixed point on the line, and P (x, y) any other point upon it. Draw the ordinates CD, PM of C and P, and let the parallel to the axis of x through C meet PM, produced if necessary, in R. The right-angled triangle CRP tells us that, with the signs appropriate to their directions attached to CR and RP,

$$RP = CR \tan a, \textit{ i.e. } MP - DC = (OM - OD) \tan a,$$

and this gives that

$$y - k = \tan a\,(x - h),$$

an equation of the first degree satisfied by x and y. No point not on the line satisfies the same equation; for the line from C to any point off the line would make with CR some angle β different from a, and the point in question would satisfy an equation $y - k = \tan\beta(x - h)$, which is inconsistent with the above equation.

The equation of the line may also be written $y = mx + b$, where $m = \tan a$, and $b = k - h \tan a$. Here b is the value obtained for y from the equation when o is put for x, *i.e.* it is the numerical measure, with proper sign, of OB, the intercept made by the line on the axis of y, measured from the origin. For different straight lines, m and b may have any constant values we like.

Now the general equation of the first degree $Ax + By + C = 0$ may be written $y = -\frac{A}{B}x - \frac{C}{B}$, unless $B = 0$, in which case it represents a line parallel to the axis of y; and $-A/B$, $-C/B$ are values which can be given to m and b, so that every equation of the first degree represents a straight line. It is important to notice that the general equation, which in appearance contains three constants A, B, C, in effect depends on two only, the ratios of two of them to the third. In virtue of this last remark, we see that two distinct conditions suffice to determine a straight line. For instance, it is easy from the above to see that

$$\frac{x}{a} + \frac{y}{b} = 1$$

is the equation of a straight line determined by the two conditions that it makes intercepts OA, OB on the two axes, of which a and b are the numerical measures with proper signs: note that in fig. 50 a is negative. Again,

$$y - y_1 = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1),$$

i.e.

$$(y_1 - y_2)x - (x_1 - x_2)y + x_1y_2 - x_2y_1 = 0,$$

represents the line determined by the data that it passes through two given points (x_1, y_1) and (x_2, y_2). To prove this find m in the equation $y - y_1 = m(x - x_1)$ of a line through (x_1, y_1), from the condition that (x_2, y_2) lies on the line.

In this paragraph the coordinates have been assumed rectangular. Had they been oblique, the doctrine of similar triangles would have given the same results, except that in the forms of equation $y - k = m(x - h)$, $y = mx + b$, we should not have had $m = \tan a$.

9. *The Circle.*—It is easy to write down the equation of a given circle. Let (h, k) be its given centre C, and ρ the numerical measure of its given radius. Take P (x, y) any point on its circumference, and construct the triangle CRP, in fig. 50 as above. The fact that this is right-angled tells us that

$$CR^2 + RP^2 = CP^2,$$

and this at once gives the equation

$$(x - h)^2 + (y - k)^2 = \rho^2.$$

A point not upon the circumference of the particular circle is at some distance from (h, k) different from ρ, and satisfies an equation inconsistent with this one; which accordingly represents the circumference, or, as we say, the circle.

The equation is of the form

$$x^2 + y^2 + 2Ax + 2By + C = 0.$$

Conversely every equation of this form represents a circle: we have only to take $h = -B$, $A^2 + B^2 - C$ for h, k, ρ^2 respectively, to obtain the centre and radius. But this statement must appear too unrestricted. Ought we not to require $A^2 + B^2 - C$ to be positive? Certainly, if by circle we are only to mean the visible round circumference of the geometrical definition. Yet, analytically, we contemplate altogether imaginary circles, for which ρ^2 is negative, and circles, for which $\rho = 0$, with all their reality condensed into their centres. Even when ρ^2 is positive, so that a visible round circumference exists, we do not regard this as constituting the whole of the circle. Giving to x any value whatever in $(x - h)^2 + (y - k)^2 = \rho^2$, we obtain two values of y, real, coincident or imaginary, each of which goes with the abscissa x as the ordinate of a point, real or imaginary, on what is represented by the equation of the circle.

The doctrine of the imaginary on a circle, and in geometry generally, is of purely algebraical inception; but it has been in its entirety accepted by modern pure geometers, and signal success has attended the efforts of those who, like K. G. C. von Staudt, have striven to base its conclusions on principles not at all algebraical in form, though of course cognate to those adopted in introducing the imaginary into algebra.

A circle with its centre at the origin has an equation $x^2 + y^2 = \rho^2$.

In oblique coordinates the general equation of a circle is $x^2 + 2xy\cos\omega + y^2 + 2Ax + 2By + C = 0$.

10. The conic sections are the next simplest loci; and it will be seen later that they are the loci represented by equations of the second degree. Circles are particular cases of conic sections; and

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they have just been seen to have for their equations a particular class of equations of the second degree. Another particular class of such equations is that included in the form $(Ax+By+C)(A'x+B'y+C')=0$, which represents two straight lines, because the product on the left vanishes if, and only if, one of the two factors does, *i.e.* if, and only if, (x, y) lies on one or other of two straight lines. The condition that $ax^2+2hxy+by^2+2gx+2fy+c=0$, which is often written $(a, b, c, f, g, h)(x, y, 1)^2=0$, takes this form is $abc+2fgh-af^2-bg^2-ch^2=0$. Note that the two lines may, in particular cases, be parallel or coincident.

Any equation like $F_1(x, y)\,F_2(x, y)\,\ldots\,F_n(x, y)=0$, of which the left-hand side breaks up into factors, represents all the loci separately represented by $F_1(x, y)=0$, $F_2(x, y)=0$, . . . $F_n(x, y)=0$. In particular an equation of degree n which is free from x represents n straight lines parallel to the axis of x, and one of degree n which is homogeneous in x and y, *i.e.* one which upon division by x^n becomes an equation in the ratio y/x, represents n straight lines through the origin.

Curves represented by equations of the third degree are called cubic curves. The general equation of this degree will be written $(*)\ (x, y, 1)^3=0$.

11. *Descriptive Geometry.*—A geometrical proposition is either descriptive or metrical: in the former case the statement of it is independent of the idea of magnitude (length, inclination, &c.), and in the latter it has reference to this idea. The method of coordinates seems to be by its inception essentially metrical. Yet in dealing by this method with descriptive propositions we are eminently free from metrical considerations, because of our power to use general equations, and to avoid all assumption that measurements implied are any particular measurements.

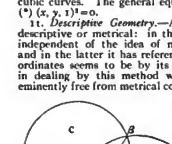

FIG. 51.

12. It is worth while to illustrate this by the instance of the well-known theorem of the radical centre of three circles. The theorem is that, given any three circles A, B, C (fig. 51), the common chords $\alpha\alpha'$, $\beta\beta'$, $\gamma\gamma'$ of the three pairs of circles meet in a point.

The geometrical proof is metrical throughout:—

Take O the point of intersection of $\alpha\alpha'$, $\beta\beta'$, and joining this with γ', suppose that γ'O does not pass through γ, but that it meets the circles A, B in two distinct points γ_1, γ_2 respectively. We have then the known metrical property of intersecting chords of a circle; viz. in circle C, where $\alpha\alpha'$, $\beta\beta'$, are chords meeting at a point O,

$$O\alpha.O\alpha'=O\beta.O\beta',$$

where, as well as in what immediately follows, Oα, &c., denote, of course, *lengths* or *distances*.

Similarly in circle A,

$$O\beta.O\beta'=O\gamma_1.O\gamma',$$

and in circle B,

$$O\alpha.O\alpha'=O\gamma_2.O\gamma'.$$

Consequently $O\gamma_1.O\gamma'=O\gamma_2.O\gamma'$, that is, $O\gamma_1=O\gamma_2$, or the points γ_1 and γ_2 coincide; that is, they each coincide with γ.

We contrast this with the analytical method:—

Here it only requires to be known that an equation $Ax+By+C=0$ represents a line, and an equation $x^2+y^2+Ax+By+C=0$ represents a circle. A, B, C have, in the two cases respectively, metrical significations; but these we are not concerned with. Using S to denote the function $x^2+y^2+Ax+By+C$, the equation of a circle is $S=0$. Let the equation of any other circle be S', $=x^2+y^2+A'x+B'y+C'=0$; the equation $S-S'=0$ is a linear equation $(S-S'$ is in fact $=(A-A')x+(B-B')y+C-C')$, and it thus represents a line: this equation is satisfied by the coordinates of each of the points of intersection of the two circles (for at each of these points $S=0$ and $S'=0$, therefore also $S-S'=0$); hence the equation $S-S'=0$ is that of the line joining the two points of intersection of the two circles, or say it is the equation of the common chord of the two circles. Considering then a third circle S'', $=x^2+y^2+A''x+B''y+C''=0$, the equations of the common chords are $S-S'=0$, $S-S''=0$, $S'-S''=0$ (each of these a linear equation), at the intersection of the first and second of these lines $S=S'$ and $S=S''$, therefore also $S'=S''$, or the equation of the third line is satisfied by the coordinates of the point in question; that is, the three chords intersect in a point O, the coordinates of which are determined by the equations $S=S'=S''$.

It further appears that if the two circles $S=0$, $S'=0$ do not intersect in any real points, they must be regarded as intersecting in two imaginary points, such that the line joining them is the real line represented by the equation $S-S'=0$; or that two circles, whether their intersections be real or imaginary, have always a real common chord (or radical axis), and that for *any* three circles the common chords intersect in a point (of course real) which is the radical centre. And by this very theorem, given two circles with imaginary intersections, we can, by drawing circles which meet each of them in real points, construct the radical axis of the first-mentioned two circles.

13. The principle employed in showing that the equation of the common chord of two circles is $S-S'=0$ is one of every extensive application, and some more illustrations of it may be given.

Suppose $S=0$, $S'=0$ are lines (that is, let S, S' now denote linear functions $Ax+By+C$, $A'x+B'y+C'$), then $S-kS'=0$ (k an arbitrary constant) is the equation of *any* line passing through the point of intersection of the two given lines. Such a line may be made to pass through any given point, say the point (x_0, y_0); *i.e.* if S_0, S'_0 are what S, S' respectively become on writing for (x, y) the values (x_0, y_0), then the value of k is $k=S_0\div S'_0$. The equation in fact is $SS'_0-S_0S'=0$; and starting from this equation we at once verify it *a posteriori*; the equation is a linear equation satisfied by the values of (x, y) which make $S=0$, $S'=0$; and satisfied also by the values (x_0, y_0); and it is thus the equation of the line in question.

If, as before, $S=0$, $S'=0$ represent circles, then (k being arbitrary) $S-kS'=0$ is the equation of any circle passing through the two points of intersection of the two circles; and to make this pass through a given point (x_0, y_0) we have again $k=S_0\div S'_0$. In the particular case $k=1$, the circle becomes the common chord (more accurately it becomes the common chord together with the line infinity: see § 23 below).

If S denote the general quadric function,

$$S=ax^2+2hxy+by^2+2fy+2gx+c,$$

then the equation $S=0$ represents a conic; assuming this, then, if $S'=0$ represents another conic, the equation $S-kS'=0$ represents *any* conic through the four points of intersection of the two conics.

14. The object still being to illustrate the mode of working with coordinates for descriptive purposes, we consider the theorem of the polar of a point in regard to a circle. Given a circle and a point O (fig. 52), we draw through O any two lines meeting the circle in the points A, A' and B, B' respectively, and then taking Q as the intersection of the lines AB' and A'B, the theorem is that the locus of the point Q is a right line depending only upon O and the circle, but independent of the particular lines OAA' and OBB'.

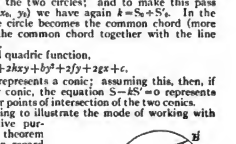

FIG. 52.

Taking O as the origin, and for the axes any two lines through O at right angles to each other, the equation of the circle will be

$$x^2+y^2+2Ax+2By+C=0;$$

and if the equation of the line OAA' is taken to be $y=mx$, then the points A, A' are found as the intersections of the straight line with the circle; or to determine x we have

$$x^2(1+m^2)+2x(A+Bm)+C=0.$$

If (x_1, y_1) are the coordinates of A, and (x_2, y_2) of A', then the roots of this equation are x_1, x_2, whence easily

$$\frac{1}{x_1}+\frac{1}{x_2}=-2\frac{A+Bm}{C}.$$

And similarly, if the equation of the line OBB' is taken to be $y=m'x$, and the coordinates of B, B' to be (x_3, y_3) and (x_4, y_4) respectively, then

$$\frac{1}{x_3}+\frac{1}{x_4}=-2\frac{A+Bm'}{C}.$$

We have then by § 8

$$\begin{aligned} &x(y_1-y_4)-y(x_1-x_4)+x_1y_4-x_4y_1=0,\\ &x(y_2-y_3)-y(x_2-x_3)+x_2y_3-x_3y_2=0, \end{aligned}$$

as the equations of the lines AB' and A'B respectively. Reducing by means of the relations $y_1=mx_1=0$, $y_3=mx_3=0$, $y_4=m'x_4=0$, $y_2=m'x_2=0$, we have the two equations become

$$\begin{aligned} &x(mx_1-m'x_4)-y(x_1-x_4)+(m'-m)x_1x_4=0,\\ &x(mx_2-m'x_3)-y(x_3-x_4)+(m'-m)x_2x_3=0, \end{aligned}$$

and if we divide the first of these equations by x_1x_4, and the second by x_2x_3, and then add, we obtain

$$x\left\{m\left(\frac{1}{x_3}+\frac{1}{x_4}\right)-m'\left(\frac{1}{x_1}+\frac{1}{x_2}\right)\right\}-y\left\{\frac{1}{x_3}+\frac{1}{x_4}-\left(\frac{1}{x_1}+\frac{1}{x_2}\right)\right\}+2m'-2m=0,$$

or, what is the same thing,

$$\left(\frac{1}{x_1}+\frac{1}{x_2}\right)(y-m'x)-\left(\frac{1}{x_3}+\frac{1}{x_4}\right)(y-mx)+2m'-2m=0,$$

which by what precedes is the equation of a line through the point Q.

Substituting herein for $\frac{1}{x_1}+\frac{1}{x_2}$, $\frac{1}{x_3}+\frac{1}{x_4}$ their foregoing values, the equation becomes

$$-(A+Bm)(y-m'x)+(A+Bm')(y-mx)+C(m'-m)=0;$$

that is,

$$(m-m')(Ax+By+C)=0;$$

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or finally it is $Ax+By+C=0$, showing that the point Q lies in a line the position of which is independent of the particular lines OA', OB' used in the construction. It is proper to notice that there is no correspondence to each other of the points A, A' and B, B'; the grouping might as well have been A, A' and B', B; and it thence appears that the line $Ax+By+C=0$ just obtained is in fact the line joining the point Q with the point R which is the intersection of AB and A'B'.

15. In § 8 it has been seen that two conditions determine the equation of a straight line, because in $Ax+By+C=0$ one of the coefficients may be divided out, leaving two parameters to be determined. Similarly five conditions instead of six determine an equation of the second degree $(a, b, c, f, g, h)(x, y, 1)^2=0$, and nine instead of ten determine a cubic (*) $(x, y, 1)^3=0$. It thus appears that a cubic can be made to pass through 9 given points, and that the cubic so passing through 9 given points is completely determined. There is, however, a remarkable exception. Considering two given cubic curves $S=0$, $S'=0$, these intersect in 9 points, and through these 9 points we have the whole series of cubics $S-kS'=0$, where k is an arbitrary constant: k may be determined so that the cubic shall pass through a given tenth point ($k=S_0\div S'_0$, if the coordinates are (x_0, y_0), and S_0, S'_0 denote the corresponding values of S, S'). The resulting curve $S-kS'=0$ may be regarded as the cubic determined by the conditions of passing through 8 of the 9 points and through the given point (x_0, y_0); and from the equation it thence appears that the curve passes through the remaining one of the 9 points. In other words, we have the theorem, any cubic curve which passes through 8 of the 9 intersections of two given cubic curves passes through the 9th intersection.

The applications of this theorem are very numerous; for instance, we derive from it Pascal's theorem of the inscribed hexagon. Consider a hexagon inscribed in a conic. The three alternate sides constitute a cubic, and the other three alternate sides another cubic. The cubics intersect in 9 points, being the 6 vertices of the hexagon, and the 3 Pascalian points, or intersections of the pairs of opposite sides of the hexagon. Drawing a line through two of the Pascalian points, the conic and this line constitute a cubic passing through 8 of the 9 points of intersection, and it therefore passes through the remaining point of intersection—that is, the third Pascalian point; and since obviously this does not lie on the conic, it must lie on the line—that is, we have the theorem that the three Pascalian points (or points of intersection of the pairs of opposite sides) lie on a line.

16. *Metrical Theory resumed. Projections and Perpendiculars.*—It is a metrical fact of fundamental importance, already used in § 8, that, if a finite line PQ be projected on any other line OO' by perpendiculars PP', QQ' to OO', the length of the projection P'Q' is equal to that of PQ multiplied by the cosine of the acute angle between the two lines. Also the algebraical sum of the projections of the sides of any closed polygon upon any line is zero, because as a point goes round the polygon, from any vertex A to A again, the point which is its projection on the line passes from A' the projection of A to A' again, *i.e.* traverses equal distances along the line in positive and negative senses. If we consider the polygon as consisting of two broken lines, each extending from the same initial to the same terminal point, the sum of the projections of the one upon which compose the one is equal, in sign and magnitude, to the sum of the projections of the lines composing the other. Observe that the projection on a line of a length perpendicular to the line is zero.

Let us hence find the equation of a straight line such that the perpendicular OD on it from the origin is of length ρ taken as positive, and is inclined to the axis of x at an angle $xOD=\alpha$, measured counter-clockwise from Ox. Take any point P (x, y) on the line, and construct OM and MP as in fig. 48. The sum of the projections of OM and MP on OD is OD itself; and this gives the equation of the line

$$x\cos\alpha+y\sin\alpha=\rho.$$

Observe that $\cos\alpha$ and $\sin\alpha$ here are the $\sin\alpha$ and $-\cos\alpha$, or the $-\sin\alpha$ and $\cos\alpha$ of § 8 according to circumstances.

We can write down an expression for the perpendicular distance from this line of any point (x', y') which does not lie upon it. If the parallel through (x', y') to the line meet OD in E, we have $x'\cos\alpha+y'\sin\alpha=$OE, and the perpendicular distance required is OD–OE, *i.e.* $\rho-x'\cos\alpha-y'\sin\alpha$; it is the perpendicular distance taken positively or negatively according as (x', y') lies on the same side of the line as the origin or not.

The general equation $Ax+By+C=0$ may be given the form $x\cos\alpha+y\sin\alpha-\rho=0$ by dividing it by $\sqrt{(A^2+B^2)}$. Thus $(Ax'+By'+C)\div\sqrt{(A^2+B^2)}$ is in absolute value the perpendicular distance of (x', y') from the line $Ax+By+C=0$. Remember, however, that there is an essential ambiguity of sign attached to a square root. The expression found gives the distance taken positively when (x', y') is on the origin side of the line, if the sign of C is given to $\sqrt{(A^2+B^2)}$.

17. *Transformation of Coordinates.*—We often need to adopt new axes of reference in place of old ones; and the above principle of projections readily expresses the old coordinates of any point in terms of the new.

Suppose, for instance, that we want to take for new origin the point O' of old coordinates $OA=h$, $AO'=k$, and for new axes of X and Y lines through O' obtained by rotating parallels to the old axes of x and y through an angle θ counter-clockwise. Construct (fig. 53) the old and new coordinates of any point P. Expressing that the projections, first on the old axis of x and secondly on the old axis of y, of OP are equal to the sums of the projections, on those axes respectively, of the parts of the broken line OO'M'P, we obtain:

$$x=h+X\cos\theta+Y\cos(\theta+\tfrac{1}{2}\pi)=h+X\cos\theta-Y\sin\theta,$$

and

$$y=k+X\cos(\tfrac{1}{2}\pi-\theta)+Y\cos\theta=k+X\sin\theta+Y\cos\theta.$$

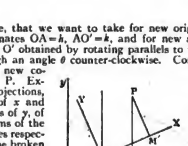

FIG. 53.

Be careful to observe that these formulae do not apply to every conceivable change of reference from one set of rectangular axes to another. It might have been required to take O'X, O'Y' for the positive directions of the new axes, so that the change of directions of the axes could not be effected by rotation. We must then write $-Y$ for Y in the above.

Were the new axes oblique, making angles α, β respectively with the old axis of x, and so inclined at the angle $\beta-\alpha$, the same method would give the formulae

$$x=h+X\cos\alpha+Y\cos\beta,\quad y=k+X\sin\alpha+Y\sin\beta.$$

18. *The Conic Sections.*—The conics, as they are now called, were at first defined as curves of intersection of planes and a cone; but Apollonius substituted a definition free from reference to space of three dimensions. This, in effect, is that a conic is the locus of a point the distance of which from a given point, called the focus, has a given ratio to its distance from a given line, called the directrix (see CONIC SECTION). If e : 1 is the ratio, e is called the eccentricity. The distances are considered sigless.

Take (h, k) for the focus, and $x\cos\alpha+y\sin\alpha-p=0$ for the directrix. The absolute values of $\sqrt{\{(x-h)^2+(y-k)^2\}}$ and $p-x\cos\alpha-y\sin\alpha$ are to have the ratio e : 1; and this gives

$$(x-h)^2+(y-k)^2=e^2(p-x\cos\alpha-y\sin\alpha)^2$$

as the general equation, in rectangular coordinates, of a conic.

It is of the second degree, and is the general equation of that degree. If, in fact, we multiply it by an unknown λ, we can, by solving six simultaneous equations in the six unknowns λ, h, k, e, ρ, α, so choose values for these as to make the coefficients in the equation equal to those in any equation of the second degree which may be given. There is no failure of this statement in the special case when the given equation represents two straight lines, as in § 10, but there is speciality: if the two lines intersect, the intersection and either bisector of the angle between them are a focus and directrix; if they are united in one line, any point on the line and a perpendicular to it through the point are; if they are parallel, the case is a limiting one to which e and h^2+k^2 have become infinite while $e^{-2}(h^2+k^2)$ remains finite. In the case (§ 9) of an equation such as represents a circle there is another instance of proceeding to a limit: e has to become 0, while ep remains finite: moreover α is indeterminate. The centre of a circle is its focus, and its directrix has gone to infinity, having no special direction. This last fact illustrates the necessity, which is also forced on plane geometry by three-dimensional considerations, of treating all points at infinity as alike as lying on a single straight line.

Sometimes, in reducing an equation to the above focus and directrix form, we find for h, k, e, ρ, $\tan\alpha$, or some of them, only imaginary values, as quadratic equations have to be solved; and we have in fact to contemplate the existence of entirely imaginary conics. For instance, no real values of x and y satisfy $x^2+2y^2+3=0$. Even when the locus represented is real, we obtain, as a rule, four sets of values of h, k, e, ρ, of which two sets are imaginary; a real conic has, however, also two real foci and corresponding directrices, two others that are imaginary.

In oblique as well as rectangular coordinates equations of the second degree represent conics.

19. *The three Species of Conics.*—A real conic, which does not degenerate into straight lines, is called an ellipse, parabola or hyperbola according as $e<$, $=$, or >1. To trace the three forms it is best so to choose the axes of reference as to simplify their equations.

In the case of a parabola, let $2c$ be the distance between the given focus and directrix, and take axes such that the focus is the point (c, o) and the line $x=-c$. The equation becomes $(x-c)^2+y^2=(x+c)^2$, *i.e.* $y^2=4cx$.

In the other cases, take a such that $a(e-e^{-1})$ is the distance of focus from directrix, and so choose axes that these are (ae, o) and $x=ae^{-1}$, thus getting the equation $(x-ae)^2+y^2=e^2(x-ae^{-1})^2$, *i.e.* $(1-e^2)x^2+y^2=a^2(1-e^2)$. When $e<1$, *i.e.* in the case of an ellipse, this may be written $x^2/a^2+y^2/b^2=1$, where $b^2=a^2(1-e^2)$; and when $e>1$, *i.e.* in the case of an hyperbola, $x^2/a^2-y^2/b^2=1$, where $b^2=a^2(e^2-1)$.

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The axes thus chosen for the ellipse and hyperbola are called the principal axes.

In figs. 54, 55, 56 in order, conics of the three species, thus referred, are depicted.

The oblique straight lines in fig. 56 are the *asymptotes* $x/a = \pm y/b$ of the hyperbola, lines to which the curve tends with unlimited

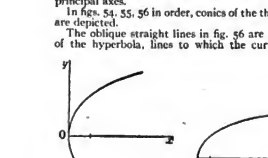

FIG. 54.

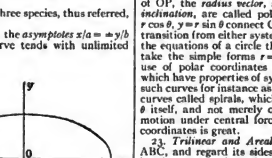

FIG. 55.

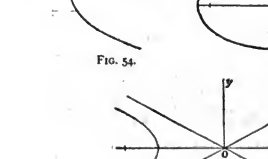

FIG. 56.

closeness as it goes to infinity. The hyperbola would have an equation of the form $xy = c$ if referred to its asymptotes as axes, the coordinates being then oblique, unless $a = b$, in which case the hyperbola is called rectangular. An ellipse has two imaginary asymptotes. In particular a circle $x^2 + y^2 = a^2$, a particular ellipse, has for asymptotes the imaginary lines $x = \pm iy\sqrt{-1}$. These run from the centre to the so-called circular points at infinity.

20. *Tangents and Curvature.*—Let (x', y') and $(x'+h, y'+k)$ be two neighbouring points P, P′ on a curve. The equation of the line on which both lie is $k(y-y') = h(x-x')$. Now keep P fixed, and let P′ move towards coincidence with it along the curve. The connecting line will tend towards a limiting position, to which it can never attain as long as P and P′ are distinct. The line which occupies this limiting position is the *tangent* at P. Now if we subtract the equation of the curve, with (x', y') for the coordinates in it, from the like equation in $(x'+h, y'+k)$, we obtain a relation in h and k, which will, as a rule, be of the form $0 = Ah + Bk +$ terms of higher degrees in h and k, where A, B and the other coefficients involve x' and y'. This gives $k/h = -A/B +$ terms which tend to vanish as h and k do, so that $-A : B$ is the limiting value tended to by $k : h$. Hence the equation of the tangent is $B(y-y') + A(x-x') = 0$.

The *normal* at (x', y') is the line through it at right angles to the tangent, and its equation is $A(y-y') - B(x-x') = 0$.

In the case of the conic (a, b, c, f, g, h) $(x, y, 1)^2 = 0$ we find that $A/B = (ax'+hy'+g)/(hx'+by'+f)$.

We can obtain the coordinates of Q, the intersection of the normals QP, QP′ at (x', y') and $(x'+h, y'+k)$, and then, using the limiting value of $k : h$, deduce those of its limiting position as P′ moves up to P. This is the *centre of curvature* of the curve at P (x', y'), and is so called because it is the centre of the circle of closest contact with the curve at that point. That it is so follows from the facts that the closest circle is the limit tended to by the circle which touches the curve at P and passes through P′, and that the arc from P to P′ of this circle lies between the circles of centre Q and radii QP, QP′, which circles tend, not to different limits as P′ moves up to P, but to one. The distance from P to the centre of curvature is the *radius of curvature*.

21. *Differential Plane Geometry.*—The language and notation of the differential calculus are very useful in the study of tangents and curvature. Denoting by (ξ, η) the current coordinates, we find, as above, that the tangent at a point (x, y) of a curve is $\eta - y = (\xi - x)\,dy/dx$, where dy/dx is found from the equation of the curve. If this be $f(x, y) = 0$ the tangent is $(\xi - x)\,(\partial f/\partial x) + (\eta - y)\,(\partial f/\partial y) = 0$. If α and (α, β) are the radius and centre of curvature at (x, y), we find that $q(\alpha - x) = -p(1 + p^2)$, $q(\beta - y) = 1 + p^2$, $q^2 p^2 = (1 + p^2)^3$, where p, q denote dy/dx, d^2y/dx^2 respectively. (See INFINITESIMAL CALCULUS.)

In any given case we can, at all events in theory, eliminate x, y between the above equations for $\alpha - x$ and $\beta - y$, and the equation of the curve. The resulting equation in (α, β) represents the locus of the centre of curvature. This is the *evolute* of the curve.

22. *Polar Coordinates.*—In plane geometry the distance of any point P from a fixed origin (or pole) O, and the inclination xOP of OP to a fixed line Ox, determine the point: r, the numerical measure of OP, the *radius vector*, and θ, the circular measure of xOP, the *inclination*, are called polar coordinates of P. The formulæ $x = r\cos\theta$, $y = r\sin\theta$ connect Cartesian and polar coordinates, and make transition from either system to the other easy. In polar coordinates the equations of a circle through O, and of a conic with O as focus, take the simple forms $r = 2a\cos(\theta - \alpha)$, $r\{1 - e\cos(\theta - \alpha)\} = l$. The use of polar coordinates is very convenient in discussing curves which have properties of symmetry akin to that of a regular polygon, such curves for instance as $r = a\cos n\theta$, such that n integral, and also the curves called spirals, which have equations giving r as functions of θ itself, and not merely of $\sin\theta$ and $\cos\theta$. In the geometry of motion under central forces the advantage of working with polar coordinates is great.

23. *Trilinear and Areal Coordinates.*—Consider a fixed triangle ABC, and regard its sides as produced without limit. Denote, as in trigonometry, by a, b, c the positive numbers of units of a chosen scale contained in the lengths BC, CA, AB, by A, B, C the angles, and by Δ the area, of the triangle. We might, as in § 6, take CA, CB as axes of x and y, inclined at an angle C. Any point P (x, y) in the plane is at perpendicular distances y sin C and x sin C from CA and CB. Call these β and α respectively. The signs of β and α are those of y and x, *i.e.* β is positive or negative according as P lies on the same side of CA as B does or the opposite, and similarly for α. An equation in (x, y) of any degree may, upon replacing in it x and y by a cosec C and β cosec C, be written as one of the same degree in (α, β). Now let γ be the perpendicular distance of P from the third side AB, taken as positive or negative as P is on the C side of AB or not. The geometry of the figure tells us that $a\alpha + b\beta + c\gamma = 2\Delta$. By means of this relation in α, β, γ we can give an equation considered among these forms, involving only α and β, or α, γ, in particular we may make it *homogeneous* in α, β, γ: to do this we have only to multiply the terms of every degree less than the highest present in the equation by a power of $(a\alpha + b\beta + c\gamma)/2\Delta$ just sufficient to raise them, in each case, to the highest degree.

We call (α, β, γ) *trilinear coordinates*, and an equation in them the trilinear equation of the locus represented. Trilinear equations are, as a rule, dealt with in their homogeneous forms. An advantage thus gained is that we need not mention Δ. For (α, β, γ) the actual measures of the perpendicular distances, but any properly signed numbers which have the same ratio two and two as these distances.

In place of α, β, γ it is lawful to use, as coordinates specifying the position of a point in the plane of a triangle of reference ABC, any given multiples of these. For instance, we may use $x = a\alpha/2\Delta$, $y = b\beta/2\Delta$, $z = c\gamma/2\Delta$, the properly signed ratios of the triangular areas PBC, PCA, PAB to the triangular area ABC. These are called the *areal coordinates* of P. Between them the relation $x + y + z = 1$ is the relation which enables us to make any equation homogeneous takes the simple form $x + y + z = 1$; and, as before, we need mean by x, y, z, in a homogeneous equation, only signed numbers in the right ratios.

Straight lines and conics are represented in trilinear and in areal, because in Cartesian, coordinates by equations of the first and second degrees respectively, and these degrees are preserved when the equations are made homogeneous. What must be said about points infinitely far off in order to make intelligible the statement, to which there is no exception as long as finite distances alone are considered, that *every* homogeneous equation of the first degree represents a straight line? Let the point of areal coordinates (x', y', z') move infinitely far off, and mean by α, β, γ the quantities in the ratios which x', y', z' tend to assume as they become infinite. The relation $x' + y' + z' = 1$ gives that the limiting state of things tended to is expressed by $x + y + z = 0$. This particular equation of the first degree is satisfied by any point at a finite distance: but we see the propriety of saying that it has to be taken as satisfied by all the points conceived of as actually at infinity. Accordingly the special property of these points is expressed by saying that they lie on a special straight line, of which the areal equation is $x + y + z = 0$. In trilinear coordinates this *line at infinity* has for equation $a\alpha + b\beta + c\gamma = 0$.

On the one special line at infinity parallel lines are treated as meeting. There are on it two special (imaginary) points, the circular points at infinity of § 19, through which all circles pass in the same sense. In fact if S = 0 be one circle, in areal coordinates, $S + (x + y + z)(lx + my + nz) = 0$ may, by proper choice of l, m, n, be made any other: since the added terms are once $(x + y + z)^2 = 0$, and so the generality of any expression like $a'x^2 + b'y^2 + c'z^2$ in Cartesian coordinates. Now these two circles intersect in the two points where either meets $x + y + z = 0$ as well as in two points on the radical axis $lx + my + nz = 0$.

24. *Areal* consider the perpendicular distance of a point $(\alpha', \beta', \gamma')$ from a line $l\alpha + m\beta + n\gamma$. We can take rectangular axes of Cartesian coordinates (for clearness as to equalities of angle it is best to choose an origin inside ABC), and refer to them, by putting expressions $\rho\cos\theta - y \sin\theta$, &c., for α &c.; we can then apply § 16 to get the perpendicular distance; and finally revert to the trilinear notation. The result is to find that the required distance is

$$\frac{(la' + mb' + nc')/|l, m, n|}{2\Delta},$$

where $|l, m, n|^2 = l^2 + m^2 + n^2 - 2mn\cos A - 2nl\cos B - 2lm\cos C$.

In areal coordinates the perpendicular distance between (x', y', z')

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to $lx+my+nz=0$ is $2\Delta(lx'+my'+nz')/|al, bm, cn|$. In both cases the coordinates are of course actual values.

Now let ξ, η, ζ be the perpendiculars on the line from the vertices A, B, C, *i.e.* the points (1, 0, 0), (0, 1, 0), (0, 0, 1), with signs in accord with a convention that oppositeness of sign implies distinction between one side of the line and the other. Three applications of the result above give

$$\xi/l = 2\Delta/|al, bm, cn| = \eta/m = \zeta/n;$$

and we thus have the important fact that $lx'+my'+nz'$ is the perpendicular distance between a point of areal coordinates $(x'y'z')$ and a line on which the perpendiculars from A, B, C are ξ, η, ζ respectively. We have also that $\xi x+\eta y+\zeta z=0$ is the areal equation of the line on which the perpendiculars are ξ, η, ζ; and, by equating the two expressions for the perpendiculars from (x', y', z') on the line, that in all cases $|a\xi, b\eta, c\zeta|^2 = 4\Delta^2$.

25. *Line-coordinates. Duality.*—A quite different order of ideas may be followed in applying analysis to geometry. The notion of a straight line specified may precede that of a point, and points may be dealt with as the intersections of lines. The specification of a line may be by means of coordinates, and that of a point by an equation, satisfied by the coordinates of lines which pass through it. Systems of *line-coordinates* will here be only briefly considered. Every such system is allied to some system of point-coordinates; and space will be saved by giving prominence to this fact, and not recommencing *ab initio*.

Suppose that any particular system of point-coordinates, in which $lx+my+nz=0$ may represent any straight line, is before us: notice that not only are trilinear and tangential coordinates such systems, but Cartesian coordinates also, since we may write x/z, y/z for the Cartesian x, y, and multiply through by z. The line is exactly assigned if l, m, n, or their mutual ratios, are known. Call (l, m, n) the *coordinates* of the line. Now keep x, y, z constant, and let the coordinates of the line vary, but always so as to satisfy the equation. This equation, which we now write $xl+ym+zn=0$, is satisfied by the coordinates of every line through a certain fixed point, and by those of no other line; it is the equation of that point in the line-coordinates l, m, n.

Line-coordinates are also called *tangential* coordinates. A curve is the envelope of lines which touch it, as well as the locus of points which lie on it. A homogeneous equation of degree above the first in l, m, n, is a relation connecting the coordinates of every line which touches some curve, and represents that curve, regarded as an envelope. For instance, the condition that the line of coordinates (l, m, n), *i.e.* the line of which the allied point-coordinate equation is $lx+my+nz=0$, may touch the conic $(a, b, c, f, g, h)(x, y, z)^2=0$, is readily found to be of the form $(A, B, C, F, G, H)(l, m, n)^2=0$, *i.e.* to be of the second degree in the line-coordinates. It is not hard to show that the *general* equation of the second degree in l, m, n thus represents a conic; but the degenerate conics of line-coordinates are not line-pairs, as in point-coordinates, but point-pairs.

The degree of the point-coordinate equation of a curve is the *order* of the curve, the number of points in which it cuts a straight line. That of the line-coordinate equation is its *class*, the number of tangents to it from a point. The order and class of a curve are generally different when either exceeds two.

26. The system of line-coordinates allied to the areal system of point-coordinates has special interest.

The l, m, n of this system are the perpendiculars ξ, η, ζ of § 24; and $x'\xi+y'\eta+z'\zeta=0$ is the equation of the point of areal coordinates (x', y', z'), *i.e.* is a relation which the perpendiculars from the vertices of the triangle of reference on every line through the point, but no other line, satisfy. Notice that a non-homogeneous equation of the first degree in ξ, η, ζ does not, as a homogeneous one does, represent a point, but a circle. In fact $x'\xi+y'\eta+z'\zeta=R$ expresses the constancy of the perpendicular distance of the fixed point $x'\xi+y'\eta+z'\zeta=0$ from the variable line (ξ, η, ζ), *i.e.* the fact that (ξ, η, ζ) touches a circle with the fixed point for centre. The relation in any ξ, η, ζ which enables us to make an equation homogeneous is not linear, as in point-coordinates, but quadratic, viz. it is the relation $|a\xi, b\eta, c\zeta|^2 = 4\Delta^2$ of § 24. Accordingly the homogeneous equation of the above circle is

$$4\Delta^2(x'\xi+y'\eta+z'\zeta)^2 = R^2|a\xi, b\eta, c\zeta|^2.$$

Every circle has an equation of this form in the present system of line-coordinates. Notice that the equation of any circle is satisfied by those coordinates of lines which satisfy both $x'\xi+y'\eta+z'\zeta=0$, the equation of its centre, and $|a\xi, b\eta, c\zeta|^2=0$. This last equation, of which the left-hand side satisfies the condition for breaking up into two factors, represents the two imaginary circular points at infinity, through which all circles and their asymptotes pass.

There is strict duality in descriptive geometry between point-line-locus and line-point-envelope theorems. But in metrical geometry duality is encumbered by the fact that there is in a plane one special line only, associated with distance, while of special points, associated with direction, there are two: moreover the line is real, and the points both imaginary.

II. *Solid Analytical Geometry.*

27. Any point in space may be specified by three coordinates. We consider three fixed planes of reference, and generally, as in all that follows, three which are at right angles, two and two. They intersect, two and two, in lines $x'Ox$, $y'Oy$, $z'Oz$, called the axes of x, y, z respectively, and divide all space into eight parts called octants. If from any point P in space we draw PN parallel to zOz' to meet the plane xOy in N, and then from N draw NM parallel

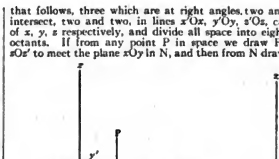

FIG. 57.

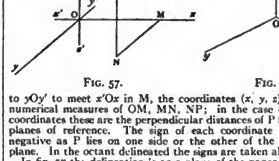

FIG. 58.

to yOy' to meet $x'Ox$ in M, the coordinates (x, y, z) of P are the numerical measures of OM, MN, NP; in the case of rectangular coordinates these are the perpendicular distances of P from the three planes of reference. The sign of each coordinate is positive or negative as P lies on one side or the other of the corresponding plane. In the octant delineated the signs are taken all positive.

In fig. 57 the delineation is on a plane of the paper taken parallel to the plane xOx, the points of a solid figure being projected on that plane by parallels to some chosen line through O in the positive octant. Sometimes it is clearer to delineate, as in fig. 58, by projection parallel to that line in the octant which is equally inclined to Ox, Oy, Oz upon a plane of the paper perpendicular to it. It is possible by parallel projection to delineate equal scales along Ox, Oy, Oz by scales having any ratios we like along lines in a plane having any mutual inclinations we like.

For the delineation of a surface of simple form it frequently suffices to delineate the sections by the coordinate planes; and, in particular, when the surface has symmetry about each coordinate plane, to delineate the quarter-sections belonging to a single octant. Thus fig. 59 conveniently represents an octant of the wave surface, which cuts each coordinate plane in a circle and an ellipse. Or we may delineate a series of contour lines, *i.e.* sections by planes parallel to xOy, or some other chosen plane; of course other sections may be indicated too for greater clearness. For the delineation of a curve a good method is to represent, as above, a series of points

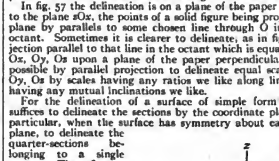

FIG. 59.

P thereof, each accompanied by its ordinate PN, which serves to refer it to the plane of xy. The employment of stereographic projection is also interesting.

28. In plane geometry, reckoning the line as a curve of the first order, we have only the point and the curve. In solid geometry, reckoning a line as a curve of the first order, and the plane as a surface of the first order, we have the point, the curve and the surface; but the increase of complexity is far greater than would hence at first sight appear. In plane geometry a curve is considered in connexion with lines (its tangents); but in solid geometry the curve is considered in connexion with lines and planes (its tangents and osculating planes), and the surface also in connexion with lines and planes (its tangent lines and tangent planes); there are surfaces arising out of the line—cones, skew surfaces, developables, doubly and triply infinite systems of lines, and whole classes of theories which have nothing analogous to them in plane geometry: it is thus a very small part indeed of the subject which can be even referred to in the present article.

In the case of a surface we have between the coordinates (x, y, z) a single, or say a onefold relation, which can be represented by a single relation $f(x, y, z)=0$; or we may consider the coordinates expressed each of them as a given function of two variable parameters p, q; the form $z=f(x, y)$ is a particular case of each of these modes of representation; in other words, we have in the first mode $f(x, y, z)=0=f(x, y)$, and in the second mode $x=p$, $y=q$ for the expression of two of the coordinates in terms of the parameters.

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In the case of a curve we have the coordinates (x, y, z) a twofold relation: two equations $f(x, y, z)=0$, $\phi(x, y, z)=0$ give such a relation; *i.e.* the curve is here considered as the intersection of two surfaces (but the curve is not always the complete intersection of two surfaces, and there are hence difficulties); or, again, the coordinates may be given each of them as a function of a single variable parameter. The form $y=\phi(x)$, $z=\psi(x)$, where two of the coordinates are given in terms of the third, is a particular case of each of these modes of representation.

29. The remarks under plane geometry as to descriptive and metrical propositions, and as to the non-metrical character of the method of coordinates when used for the proof of a descriptive proposition, apply also to solid geometry: and they might be illustrated in like manner by the instance of the theorem of the radical centre of four spheres. The proof is obtained from the consideration that S and S′ being each of them a function of the form $x^2+y^2+z^2+ax+by+cz+d$, the difference $S-S'$ is a mere linear function of the coordinates, and consequently that $S-S'=0$ is the equation of the plane containing the circle of intersection of the two spheres $S=0$ and $S'=0$.

30. *Metrical Theory.*—The foundation in solid geometry of the metrical theory is in fact the before-mentioned theorem that if a finite right line PQ be projected upon any other line OO′ by lines perpendicular to OO′, then the length of the projection PQ′ is equal to the length of PQ into the cosine of its inclination to PQ′—(in the form in which it is now convenient to state the theorem) the perpendicular distance PQ′ of two parallel planes is equal to the inclined distance PQ into the cosine of the inclination. The principle of § 16, that the algebraical sum of the projections of the sides of any closed polygon on any line is zero, or that the two sets of sides of the polygon which connect a vertex A and a vertex B have the same sum of projections on the line, in sign and magnitude, as we pass from A to B, is applicable when the sides do not all lie in one plane.

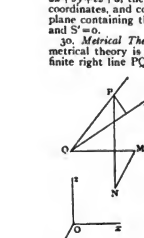

Fig. 60.

31. Consider the skew quadrilateral QMNP, the sides QM, MN, NP being respectively parallel to the three rectangular axes Oz, Oy, Ox; let the lengths of these sides be ξ, η, ζ, and that of the side QP be $=\rho$; and let the cosines of the inclinations (or say the cosine-inclinations) of ρ to the axes be α, β, γ: then projecting successively on the three sides and on QP we have

$$\xi, \eta, \zeta = \rho\alpha, \rho\beta, \rho\gamma,$$

and

$$\rho = \alpha\xi+\beta\eta+\gamma\zeta,$$

whence $\rho^2=\xi^2+\eta^2+\zeta^2$, which is the relation between a distance ρ and its projections ξ, η, ζ upon three rectangular axes. And from the same equations we obtain $\alpha^2+\beta^2+\gamma^2=1$, which is a relation connecting the cosine-inclinations of a line to three rectangular axes.

Suppose we have through Q any other line QT, and let the cosine-inclinations of this to the axes be α', β', γ', and δ be its cosine-inclination to QP; also let ρ be the length of the projection of QP upon QT; then projecting on QT we have

$$\rho = \alpha'\xi+\beta'\eta+\gamma'\zeta = \rho\delta.$$

And in the last equation substituting for ξ, η, ζ their values $\rho\alpha, \rho\beta, \rho\gamma$ we find

$$\delta = \alpha\alpha'+\beta\beta'+\gamma\gamma',$$

which is an expression for the mutual cosine-inclination of two lines, the cosine-inclinations of which to the axes are α, β, γ and α', β', γ' respectively. We have of course $\alpha^2+\beta^2+\gamma^2=1$ and $\alpha'^2+\beta'^2+\gamma'^2=1$; and hence also

$$1-\delta^2=(\alpha^2+\beta^2+\gamma^2)(\alpha'^2+\beta'^2+\gamma'^2)-(\alpha\alpha'+\beta\beta'+\gamma\gamma')^2,$$
$$=(\beta\gamma'-\beta'\gamma)^2+(\gamma\alpha'-\gamma'\alpha)^2+(\alpha\beta'-\alpha'\beta)^2;$$

so that the sine of the inclination can only be expressed as a square root. These formulae are the foundation of spherical trigonometry.

32. *Straight Lines, Planes and Spheres.*—The foregoing formulae give at once the equations of these loci.

For first, taking Q to be a fixed point, coordinates (a, b, c), and the cosine-inclinations (α, β, γ) to be constant, then P will be a point in the line through Q in the direction thus determined: or, taking (x, y, z) for its coordinates, these will be the current coordinates of a point in the line. The values of ξ, η, ζ then are $x-a, y-b, z-c$, and we thus have

$$\frac{x-a}{\alpha}=\frac{y-b}{\beta}=\frac{z-c}{\gamma}(=\rho),$$

which (omitting the last equation, $=\rho$) are the equations of the line through the point (a, b, c), the cosine-inclinations to the axes being α, β, γ, and these quantities being connected by the relation $\alpha^2+\beta^2+\gamma^2=1$. This equation may be omitted, and then α, β, γ, instead of being equal, will only be proportional, to the cosine-inclinations.

Using the last equation, and writing

$$x, y, z = a+a\rho,\ b+\beta\rho,\ c+\gamma\rho,$$

these are expressions for the current coordinates in terms of a parameter ρ, which is in fact the distance from the fixed point (a, b, c).

It is easy to see that, if the coordinates (x, y, z) are connected by any two linear equations, these equations can always be brought into the foregoing form, and hence that the two linear equations represent a line.

Secondly, taking for greater simplicity the point Q to be coincident with the origin, and α', β', γ', p to be constant, the point Q is the perpendicular distance of a plane from the origin, and α', β', γ' are the cosine-inclinations of this distance to the axes $(\alpha'^2+\beta'^2+\gamma'^2=1)$. P is any point in this plane, and taking its coordinates to be (x, y, z) then ξ, η, ζ are $=(x, y, z)$, and the foregoing equation $\rho=\alpha'\xi+\beta'\eta+\gamma'\zeta$ becomes

$$\alpha'x+\beta'y+\gamma'z=p,$$

which is the equation of the plane in question.

If, more generally, Q is not coincident with the origin, then, taking the coordinates to be (a, b, c), and writing ρ_1 instead of p, the equation

$$\alpha'(x-a)+\beta'(y-b)+\gamma'(z-c)=\rho_1;$$

and we thence have $\rho_1=p-(a\alpha'+b\beta'+c\gamma')$, which is an expression for the perpendicular distance of the point (a, b, c) from the plane in question.

It is obvious that any linear equation $Ax+By+Cz+D=0$ between the coordinates can always be brought into the foregoing form, and hence that such an equation represents a plane.

Thirdly, supposing Q to be a fixed point, coordinates (a, b, c), and the distance $QP=\rho$, to be constant, say this $=d$, then, as before, the values of ξ, η, ζ are $x-a, y-b, z-c$, and the equation $\xi^2+\eta^2+\zeta^2=\rho^2$ becomes

$$(x-a)^2+(y-b)^2+(z-c)^2=d^2,$$

which is the equation of the sphere, coordinates of the centre $=(a, b, c)$, and radius $=d$.

A quadric equation wherein the terms of the second order are $x^2+y^2+z^2$, viz. an equation

$$x^2+y^2+z^2+Ax+By+Cz+D=0,$$

can always, it is clear, be brought into the foregoing form; and it thus appears that this is the equation of a sphere, coordinates of the centre $=\frac{1}{2}A, -\frac{1}{2}B, -\frac{1}{2}C$, and squared radius $=\frac{1}{4}(A^2+B^2+C^2)-D$.

33. *Cylinders, Cones, ruled Surfaces.*—If the two equations of a straight line involve a parameter to which any value may be given, we have a singly infinite system of lines. They cover a surface, and the equation of the surface is obtained by eliminating the parameter between the two equations.

If the lines all pass through a given point, then the surface is a cone; and, in particular, if the lines are all parallel to a given line, then the surface is a cylinder.

Beginning with this last case, suppose the lines are parallel to the line $x=mz$, $y=nz$, the equations of a line of the system are $x=mz+a$, $y=nz+b$,—where a, b are supposed to be functions of the variable parameter, or, what is the same thing, there is between them a relation $f(a, b)=0$: we have $a=x-mz$, $b=y-nz$, and the result of the elimination of the parameter therefore is $f(x-mz, y-nz)=0$, which is thus the general equation of the cylinder the generating lines whereof are parallel to the line $x=mz$, $y=nz$. The equation of the section by the plane $z=0$ is $f(x, y)=0$, and conversely if the cylinder be determined by means of its curve of intersection with the plane $z=0$, then, taking the equation of this curve to be $f(x, y)=0$, the equation of the cylinder is $f(x-mz, y-nz)=0$. Thus, if the curve of intersection be the circle $(x-a)^2+(y-\beta)^2=\gamma^2$, we have $(x-mz-a)^2+(y-nz-\beta)^2=\gamma^2$ as the equation of an oblique cylinder on this base, and thus also $(x-a)^2+(y-\beta)^2=\gamma^2$ as the equation of the right cylinder.

If the lines all pass through a given point (a, b, c), then the equations of a line are $x-a=\alpha(z-c)$, $y-b=\beta(z-c)$, where α, β are functions of the variable parameter, or, what is the same thing, there exists between them an equation $f(\alpha, \beta)=0$: the elimination of the parameter gives, therefore, $f\left(\frac{x-a}{z-c}, \frac{y-b}{z-c}\right)=0$; and this equation, or, what is the same thing, any homogeneous equation $f(x-a, y-b, z-c)=0$, or, taking f to be a rational and integral function of the order n, say (*) $(x-a, y-b, z-c)^n=0$, is the general equation of the cone having the point (a, b, c) for its vertex. Taking the vertex to be at the origin, the equation is (*) $(x, y, z)^n=0$; and, in particular, (*) $(x, y, z)^2=0$ is the equation of a cone of the second order, or quadricone, having the origin for its vertex.

34. In the general case of a singly infinite system of lines, the locus is a ruled surface (or *regulus*). Now, when a line is changing its position in space, it may be looked upon as in a state of turning about some point in itself, while that point is, as a rule, in a state of moving out of the plane in which the turning takes place. If instantaneously it is only in a state of turning, it is usual, though not strictly accurate, to say that it intersects its consecutive position. A regulus such that consecutive lines in it do not intersect, in this sense, is called a skew surface, or *scroll*; one on which they do is called a developable surface or *torse*.

Suppose, for instance, that the equations of a line (depending on

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the variable parameter θ) are $\frac{x}{a}+\frac{z}{c}=\theta\left(1+\frac{y}{b}\right)$, $\frac{x}{a}-\frac{z}{c}=\frac{1}{\theta}\left(1-\frac{y}{b}\right)$; then, eliminating θ, we have $\frac{x^2}{a^2}-\frac{z^2}{c^2}=1-\frac{y^2}{b^2}$, or say $\frac{x^2}{a^2}+\frac{y^2}{b^2}-\frac{z^2}{c^2}=1$, the equation of a quadric surface, afterwards called the hyperboloid of one sheet; this surface is consequently a scroll. It is to be remarked that we have upon the surface a second singly infinite series of lines: the equations of a line of this second system (depending on the variable parameter ϕ) are

$$\frac{x}{a}+\frac{z}{c}=\phi\left(1-\frac{y}{b}\right),\ \frac{x}{a}-\frac{z}{c}=\frac{1}{\phi}\left(1+\frac{y}{b}\right).$$

It is easily shown that any line of the one system intersects every line of the other system.

Considering any curve (of double curvature) whatever, the tangent lines of the curve form a singly infinite system of lines, each line intersecting the consecutive line of the system,—that is, they form a developable, or torse; the curve and torse are thus inseparably connected together, forming a single geometrical figure. An osculating plane of the curve (see § 38 below) is a tangent plane of the torse all along a generating line.

35. *Transformation of Coordinates.*—There is no difficulty in changing the origin, and it is for brevity assumed that the origin remains unaltered. We have, then, two sets of rectangular axes, Ox, Oy, Oz, and Ox$_1$, Oy$_1$, Oz$_1$, the mutual cosine-inclinations being shown by the diagram—

	x	y	z
x_1	α	β	γ
y_1	α'	β'	γ'
z_1	α''	β''	γ''

that is, α, β, γ are the cosine-inclinations of Ox$_1$ to Ox, Oy, Oz; α', β', γ' those of Oy$_1$, &c.

And this diagram gives also the linear expressions of the coördinates (x_1, y_1, z_1) or (x, y, z) of either set in terms of those of the other set; we thus have

$$\begin{aligned} x_1&=\alpha\ x+\beta\ y+\gamma\ z, & x&=\alpha x_1+\alpha' y_1+\alpha'' z_1,\\ y_1&=\alpha' x+\beta' y+\gamma' z, & y&=\beta x_1+\beta' y_1+\beta'' z_1,\\ z_1&=\alpha'' x+\beta'' y+\gamma'' z, & z&=\gamma x_1+\gamma' y_1+\gamma'' z_1, \end{aligned}$$

which are obtained by projection, as above explained. Each of these equations is, in fact, nothing else than the before-mentioned equation $p=\alpha'\xi+\beta'\eta+\gamma'\zeta$ adapted to the problem in hand.

But we have to consider the relations between the nine coefficients. By what precedes, or by the consideration that we must have identically $x^2+y^2+z^2=x_1^2+y_1^2+z_1^2$, it appears that these satisfy the relations—

$$\begin{aligned} &\alpha^2+\beta^2+\gamma^2=1, & &\alpha^2+\alpha'^2+\alpha''^2=1,\\ &\alpha'^2+\beta'^2+\gamma'^2=1, & &\beta^2+\beta'^2+\beta''^2=1,\\ &\alpha''^2+\beta''^2+\gamma''^2=1, & &\gamma^2+\gamma'^2+\gamma''^2=1,\\ &\alpha'\alpha''+\beta'\beta''+\gamma'\gamma''=0, & &\beta\gamma+\beta'\gamma'+\beta''\gamma''=0,\\ &\alpha''\alpha+\beta''\beta+\gamma''\gamma=0, & &\gamma\alpha+\gamma'\alpha'+\gamma''\alpha''=0,\\ &\alpha\alpha'+\beta\beta'+\gamma\gamma'=0, & &\alpha\beta+\alpha'\beta'+\alpha''\beta''=0, \end{aligned}$$

either set of six equations being implied in the other set.

It follows that the square of the determinant

$$\begin{vmatrix} \alpha\ ,\ \beta\ ,\ \gamma \\ \alpha'\ ,\ \beta'\ ,\ \gamma' \\ \alpha''\ ,\ \beta''\ ,\ \gamma'' \end{vmatrix}$$

is $=1$; and hence that the determinant itself is $=\pm 1$. The distinction of the two cases is an important one: if the determinant is $=+1$, then the axes Ox$_1$, Oy$_1$, Oz$_1$ are such that they can by a rotation about O be brought to coincide with Ox, Oy, Oz respectively; if it is $=-1$, then they cannot. But in the latter case, by measuring x_1, y_1, z_1 in the opposite directions we change the signs of all the coefficients and so make the determinant to be $=+1$; hence the former case need alone be considered, and it is accordingly assumed that the determinant is $=+1$. This being so, it is found that we have the equality $\alpha=\beta'\gamma''-\beta''\gamma'$, and eight like ones, obtained from this by cyclical interchanges of the letters α, β, γ, and of unaccented, singly and doubly accented letters.

36. The nine cosine-inclinations above are, as has been seen, connected by six equations. It ought then to be possible to express them all in terms of three parameters. An elegant means of doing this has been given by Rodrigues, who has shown that the tabular expression of the formulæ of transformation may be written

	x	y	z
x_1	$1+\lambda^2-\mu^2-\nu^2$	$2(\lambda\mu-\nu)$	$2(\nu\lambda+\mu)$
y_1	$2(\lambda\mu+\nu)$	$1-\lambda^2+\mu^2-\nu^2$	$2(\mu\nu+\lambda)$
z_1	$2(\nu\lambda-\mu)$	$2(\mu\nu+\lambda)$	$1-\lambda^2-\mu^2+\nu^2$

$\div(1+\lambda^2+\mu^2+\nu^2)$,

the meaning being that the coefficients in the transformation are fractions, with numerators expressed as in the table, and the common denominator.

37. *The Species of Quadric Surfaces.*—Surfaces represented by equations of the second degree are called *quadric* surfaces. Quadric surfaces are either *proper* or *special*. The special ones arise when the coefficients in the general equation are limited to satisfy certain special equations; they comprise (1) plane-pairs, including in particular one plane twice repeated, and (2) cones, including in particular cylinders; there is but one form of cone, but cylinders may be elliptic, parabolic or hyperbolic.

A discussion of the general equation of the second degree shows that the *proper* quadric surfaces are of five kinds, represented respectively, when referred to the most convenient axes of reference, by equations of the five types (a and b positive):

(1) $z=\frac{x^2}{2a}+\frac{y^2}{2b}$, elliptic paraboloid.

(2) $z=\frac{x^2}{2a}-\frac{y^2}{2b}$, hyperbolic paraboloid.

(3) $\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=1$, ellipsoid.

(4) $\frac{x^2}{a^2}+\frac{y^2}{b^2}-\frac{z^2}{c^2}=1$, hyperboloid of one sheet.

(5) $\frac{x^2}{a^2}+\frac{y^2}{b^2}-\frac{z^2}{c^2}=-1$, hyperboloid of two sheets.

It is at once seen that these are distinct surfaces; and the equations also show very readily the general form and mode of generation of the several surfaces.

In the elliptic paraboloid (fig. 61) the sections by the planes of zx and zy are the parabolas

$$z=\frac{x^2}{2a}, z=\frac{y^2}{2b},$$

having the common axes Oz; and the section by any plane $z=\gamma$ parallel to that of xy is the ellipse

$$\gamma=\frac{x^2}{2a}+\frac{y^2}{2b};$$

so that the surface is generated by a variable ellipse moving parallel to itself along the parabolas as directrices.

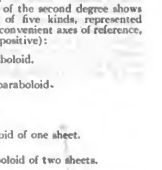

FIG. 61.

In the hyperbolic paraboloid (figs. 62 and 63) the sections by the planes of zx, zy are the parabolas $z=\frac{x^2}{2a}$, $z=-\frac{y^2}{2b}$, having the opposite axes Oz, Oz', and the section by a plane $z=\gamma$ parallel to that of xy is the hyperbola $\gamma=\frac{x^2}{2a}-\frac{y^2}{2b}$, which has its transverse axis parallel to Ox or Oy according as γ is positive or negative. The surface is thus generated by a variable hyperbola moving parallel to itself along the parabolas as directrices. The form is best seen from fig. 63, which represents the sections by planes parallel to the plane of xy, or say the contour lines; the continuous lines are the sections above the plane of xy, and the dotted lines the sections below this plane. The form is, in fact, that of a saddle.

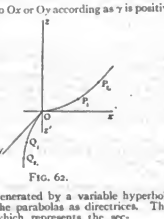

FIG. 62.

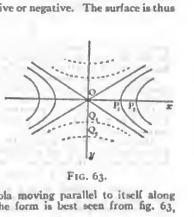

FIG. 63.

In the ellipsoid (fig. 64) the sections by the planes of zx, zy, and xy are each of them an ellipse, and the section by any parallel plane is also an ellipse. The surface may be considered as generated by an ellipse moving parallel to itself along two ellipses as directrices.

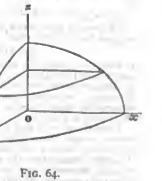

FIG. 64.

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In the hyperboloid of one sheet (fig. 65), the sections by the planes of zx, zy are the hyperbolas

$$\frac{x^2}{c^2}-\frac{z^2}{c^2}=1,\ \frac{y^2}{b^2}-\frac{z^2}{c^2}=1,$$

having a common conjugate axis zOz'; the section by the plane of x, y, and that by any parallel plane, is an ellipse; and the surface may be considered as generated by a variable ellipse moving parallel to itself along the two hyperbolas as directrices. If we imagine two equal and parallel circular disks, their points connected by strings of equal lengths, so that these are the generators of a right circular cylinder, and if we turn one of the disks about its centre through an angle in its plane, the strings in their new positions will be one system of generators of a hyperboloid of one sheet, for which $a=b$; and if we turn it through the same angle in the opposite direction,

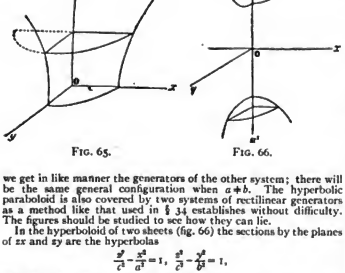

FIG. 65. FIG. 66.

we get in like manner the generators of the other system; there will be the same general configuration when $a \neq b$. The hyperbolic paraboloid is also covered by two systems of rectilinear generators as a method like that used in § 34 establishes without difficulty. The figures should be studied to see how they can lie.

In the hyperboloid of two sheets (fig. 66) the sections by the planes of zx and zy are the hyperbolas

$$\frac{y^2}{a^2}-\frac{x^2}{c^2}=1,\ \frac{z^2}{c^2}-\frac{y^2}{b^2}=1,$$

having a common transverse axis along zOz; the section by any plane $z=\pm\gamma$ parallel to that of xy is the ellipse

$$\frac{x^2}{a^2}+\frac{y^2}{b^2}=\frac{\gamma^2}{c^2}-1,$$

provided $\gamma^2>c^2$, and the surface, consisting of two distinct portions or sheets, may be considered as generated by a variable ellipse moving parallel to itself along the hyperbolas as directrices.

38. *Differential Geometry of Curves.*—For convenience consider the coordinates (x, y, z) of a point on a curve in space to be given as functions of a variable parameter θ, which may in particular be one of themselves. Use the notation x', x'' for $dx/d\theta$, $d^2x/d\theta^2$, and similarly as to y and z. Only a few formulae will be given. Call the current coordinates (ξ, η, ζ).

The *tangent* at (x, y, z) is the line tended to as a limit by the connector of (x, y, z) and a neighbouring point of the curve when the latter moves up to the former: its equations are

$$(\xi-x)/x'=(\eta-y)/y'=(\zeta-z)/z'.$$

The *osculating plane* at (x, y, z) is the plane tended to as a limit by that through (x, y, z) and two neighbouring points of the curve as these, remaining distinct, both move up to (x, y, z): its one equation is

$$(\xi-x)(y'z''-y''z')+(\eta-y)(z'x''-z''x')+(\zeta-z)(x'y''-x''y')=0.$$

The *normal plane* is the plane through (x, y, z) at right angles to the tangent line, *i.e.* the plane

$$x'(\xi-x)+y'(\eta-y)+z'(\zeta-z)=0.$$

It cuts the osculating plane in a line called the *principal normal*. Every line through (x, y, z) in the normal plane is a normal. The normal perpendicular to the osculating plane is called the *binormal*. A tangent, principal normal, and binormal are a convenient set of rectangular axes to use as those of reference, when the nature of a curve near a point on it is to be discussed.

Through (x, y, z) and three neighbouring points, all on the curve, passes a single sphere; and as the three points all move up to (x, y, z) continuing distinct, the sphere tends to a limiting size and position. The limit tended to is the sphere of closest contact with the curve at x, y, z); its centre and radius are called the centre and radius of *spherical curvature*. It cuts the osculating plane in a circle, called the *circle of absolute curvature*; and the centre and radius of this circle are the centre and radius of absolute curvature. The centre of absolute curvature is the limiting position of the point where the principal normal at (x, y, z) is cut by the normal plane at a neighbouring point, as that point moves up to (x, y, z).

39. *Differential Geometry of Surfaces.*—Let (x, y, z) be any chosen point on a surface $f(x, y, z)=0$. As a second point of the surface moves up to (x, y, z), its connector with (x, y, z) tends to a limiting position, a tangent line to the surface at (x, y, z). All these tangent lines at (x, y, z), obtained by approaching (x, y, z) from different directions on a surface, lie in one plane

$$\frac{\partial f}{\partial x}(\xi-x)+\frac{\partial f}{\partial y}(\eta-y)+\frac{\partial f}{\partial z}(\zeta-z)=0.$$

This plane is called the *tangent plane* at (x, y, z). One line through (x, y, z) is at right angles to the tangent plane. This is the *normal*

$$(\xi-x)\Big/\frac{\partial f}{\partial x}=(\eta-y)\Big/\frac{\partial f}{\partial y}=(\zeta-z)\Big/\frac{\partial f}{\partial z}.$$

The tangent plane is cut by the surface in a curve, real or imaginary, with a node or double point at (x, y, z). Two of the tangent lines touch this curve at the node. They are called the "chief tangents" (*Haupt-tangenten*) at (x, y, z); they have closer contact with the surface than any other tangents.

In the case of a quadric surface the curve of intersection of a tangent and the surface is of the second order and has a node, it must therefore consist of two straight lines. Consequently a quadric surface is covered by two sets of straight lines, a pair through every point on it; these are imaginary for the ellipsoid, hyperboloid of two sheets, and elliptic paraboloid.

A surface of any order is covered by two singly infinite systems of curves, a pair through every point, the tangents to which are all chief tangents at their respective points of contact. These are called *chief-tangent curves*; on a quadric surface they are the above straight lines.

40. The tangents at a point of a surface which bisect the angles between the chief tangents are called the *principal tangents* at the point. They are at right angles, and together with the normal constitute a convenient set of rectangular axes to which to refer the surface when its properties near the point are under discussion. At a normal point which is such that the chief tangents there run to the circular points at infinity in the tangent plane, the principal tangents are indeterminate; such a special point is called an *umbilic* of the surface.

There are two singly infinite systems of curves on a surface, a pair cutting one another at right angles through every point upon it, all tangents to which are principal tangents of the surface at their respective points of contact. These are called *lines of curvature*, because of a property next to be mentioned.

As a point Q moves in an arbitrary direction on a surface from coincidence with a chosen point P, the normal at it, as a rule, at once fails to meet the normal at P; but, if it takes the direction of a line of curvature through P, this is instantaneously not the case. We have thus on the normal two centres of curvature, and the distances of these from the point on the surface are the two *principal radii of curvature* of the surface at that point; these are also the radii of curvature of the sections of the surface by planes through the normal and the two principal tangents respectively; or say they are the radii of curvature of the normal sections through the two principal tangents respectively. Take at the point the axis of z in the direction of the normal, and those of x and y in the directions of the principal tangents respectively, then, if the radii of curvature be a, b (the signs being such that the coordinates of the two centres of curvature are $z=a$ and $z=b$ respectively), the surface has in the neighbourhood of the point the form of the paraboloid

$$z=\frac{x^2}{2a}+\frac{y^2}{2b},$$

and the chief-tangents are determined by the equation $o=\frac{x^2}{2a}+\frac{y^2}{2b}$.

The two centres of curvature may be on the same side of the point or on opposite sides; in the former case a and b have the same sign, the paraboloid is elliptic, and the chief-tangents are imaginary; in the latter case a and b have opposite signs, the paraboloid is hyperbolic, and the chief-tangents are real.

The normal sections of the surface and the paraboloid by the same plane have the same radius of curvature; and it thence readily follows that the radius of curvature of a normal section of the surface by a plane inclined at an angle θ to that of zx is given by the equation

$$\frac{1}{\rho}=\frac{\cos^2\theta}{a}+\frac{\sin^2\theta}{b}.$$

The section in question is that by a plane through the normal and a line in the tangent plane inclined at an angle θ to the principal tangent along the axis of x. To complete the theory, consider the section by a plane having the same trace upon the tangent plane, but inclined to the normal at an angle ϕ; then it is shown without difficulty (Meunier's theorem) that the radius of curvature of this inclined section of the surface is $=\rho\cos\phi$.

AUTHORITIES.—The above article is largely based on that by Arthur Cayley in the 9th edition of this work. Of early and important recent publications on analytical geometry, special mention

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(E. B. EL.)

V. Line Geometry

Line geometry is the name applied to those geometrical investigations in which the straight line replaces the point as element. Just as ordinary geometry deals primarily with points and systems of points, this theory deals in the first instance with straight lines and systems of straight lines. In two dimensions there is no necessity for a special line geometry, inasmuch as the straight line and the point are interchangeable by the principle of duality; but in three dimensions the straight line is its own reciprocal, and for the better discussion of systems of lines we require some new apparatus, *e.g.*, a system of coordinates applicable to straight lines rather than to points. The essential features of the subject are most easily elucidated by analytical methods: we shall therefore begin with the notion of line coordinates, and in order to emphasize the merits of the system of coordinates ultimately adopted, we first notice a system without these advantages, but often useful in special investigations.

In ordinary Cartesian coordinates the two equations of a straight line may be reduced to the form $y=rx+s$, $z=tx+u$, and r, s, t, u may be regarded as the four coordinates of the line. These coordinates lack symmetry: moreover, in changing from one base of reference to another the transformation is not linear, so that the degree of an equation is deprived of real significance. For purposes of the general theory we employ homogeneous coordinates: if $x_1y_1z_1w_1$ and $x_2y_2z_2w_2$ are two points on the line, it is easily verified that the six determinants of the array

$$\begin{vmatrix} x_1 & y_1 & z_1 & w_1 \\ x_2 & y_2 & z_2 & w_2 \end{vmatrix}$$

are in the same ratios for all point-pairs on the line, and further, that when the point coordinates undergo a linear transformation so also do these six determinants. We therefore adopt these six determinants for the coordinates of the line, and express them by the symbols l, λ, m, μ, n, ν where $l=x_1y_2-x_2y_1$, $\lambda=y_1z_2-y_2z_1$, &c. There is the further advantage that if $a_1b_1c_1d_1$ and $a_2b_2c_2d_2$ be two planes through the line, the six determinants

$$\begin{vmatrix} a_1 & b_1 & c_1 & d_1 \\ a_2 & b_2 & c_2 & d_2 \end{vmatrix}$$

are in the same ratios as the foregoing, so that except as regards a factor of proportionality we have $\lambda=b_1c_2-b_2c_1$, $l=c_1d_2-c_2d_1$, &c. The identical relation $l\lambda+m\mu+n\nu=0$ reduces the number of independent constants in the six coordinates to four, for we are only concerned with their mutual ratios; and the quadratic character of this relation marks an essential difference between point geometry and line geometry. The condition of intersection of two lines is

$$l\lambda'+l'\lambda+m\mu'+m'\mu+n\nu'+n'\nu=0$$

where the accented letters refer to the second line. If the coordinates are Cartesian and l, m, n are direction cosines, the quantity on the left is the mutual moment of the two lines.

Since a line depends on four constants, there are three distinct types of configurations arising in line geometry—those containing a triply-infinite, a doubly-infinite and a singly-infinite number of lines; they are called Complexes, Congruences, and Ruled Surfaces or Skews respectively. A *Complex* is thus a system of lines satisfying one condition—that is, the coordinates are connected by a single relation; and the degree of the complex is the degree of this equation supposing it to be algebraic. The lines of a complex of the nth degree which pass through any point lie on a cone of the nth degree, those which lie in any plane envelop a curve of the nth class and there are n lines of the complex in any plane pencil; the last statement combines the former two, for it shows that the cone of the nth degree and the curve is of the nth class. To find the lines common to four complexes of degrees n_1, n_2, n_3, n_4, we have to solve five equations, viz. the four complex equations together with the quadratic equation connecting the line coordinates, therefore the number of common lines is $2n_1n_2n_3n_4$. As an example of complexes we have the lines meeting a twisted curve of the nth degree, which form a complex of the nth degree.

A *Congruence* is the set of lines satisfying two conditions: thus a finite number m of the lines pass through any point, and a finite number n lie in any plane; these numbers are called the degree and class respectively, and the congruence is symbolically written (m, n).

The simplest example of a congruence is the system of lines constituted by all those that pass through m points and those that lie in n planes; through any other point there pass m of these lines, and in any other plane there lie n, therefore the congruence is of degree m and class n. It has been shown by G. H. Halphen that the number of lines common to two congruences is $mm'+nn'$, which may be verified by taking one of them to be of this simple type. The lines meeting two fixed lines form the $(1, 1)$ congruence; and the chords of a twisted cubic form the general type of a $(1, 3)$ congruence; Halphen's result shows that two twisted cubics have in general ten common chords. As regards the analytical treatment, a bit difficulty is of the same nature as that arising in the theory of curves in space, for a congruence is not in general the complete intersection of two complexes.

A *Ruled Surface*, *Regulus* or *Skew* is a configuration of lines which satisfy three conditions, and therefore depend on only one parameter. Such lines all lie on a surface, for we cannot draw one through an arbitrary point; only one line passes through a point of the surface; the simplest example, that of a quadric surface, is really two skews on the same surface.

The degree of a ruled surface *qua* line geometry is the number of its generating lines contained in a linear complex. Now the number which meets a given line is the degree of the surface *qua* point geometry, and as the lines meeting a line form a particular case of linear complex, it follows that the degree is the same from whichever point of view we regard it. The lines common to three complexes of degrees, $n_1n_2n_3$, form a ruled surface of degree $2n_1n_2n_3$; but not every ruled surface is the complete intersection of three complexes.

In the case of a complex of the first degree (or linear complex) the lines through a fixed point lie in a plane called the polar plane or nul-plane of that point, and those lying in a fixed plane pass through a point called the nul-point or pole of the plane. If the nul-plane of A pass through B, then the nul-plane of B will pass through A; the nul-planes of all points on a line l_1 pass through another line l_2. The relation between l_1 and l_2 is reciprocal; any line of the complex that meets one will also meet the other, and every line meeting both belongs to the complex. They are called conjugate or polar lines with respect to the complex. All these principles can be founded a theory of reciprocatioo with respect to a linear complex.

Linear complex.

This may be aptly illustrated by an elegant example due to A. Voss. Since a twisted cubic can be made to satisfy twelve conditions, it may be supposed that a finite number could be drawn to touch four given lines, but this is not the case. For, suppose one such can be drawn, theo its reciprocal with respect to any linear complex containing the four lines is a curve of the third class, *i.e.* another twisted cubic, touching the same four lines, which is quite unaltered in the process of reciprocation; as there is an infinite number of complexes containing the four lines, there is an infinite number of cubics touching the four lines, and the problem is poristic.

The following are some geometrical constructions relating to the unique linear complex that can be drawn to contain five arbitrary lines:

To construct the nul-plane of any point O, we observe that the two lines which meet any four of the given five lines determine lines of the complex, and the line drawn through O to meet them is therefore a ray of the complex; similarly, by choosing another four we can find another ray through O: these rays lie in the nul-plane, and as there is clearly a unique solved that the nul-plane so obtained all lie in one plane. A reciprocal construction will enable us to find the nul-point of any plane. Proceeding now to the metrical properties and the statical and dynamical applications, we remark that there is just one line such that the nul-plane of any point on it is perpendicular to it. This is called the central axis; if d be the shortest distance, θ the angle between it and a ray of the complex, then d tan $\theta=p$, where p is a constant called the pitch or parameter. Any system of forces can be reduced to a force R along a certain line, and a couple G perpendicular to that line; the lines of nul-moment

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for the system form a linear complex of which the given line is the central axis and the quotient G/R is the pitch. Any motion of a rigid body can be reduced to a screw motion about a certain line, *i.e.* to an angular velocity ω about that line combined with a linear velocity u along the line. The plane drawn through any point perpendicular to the direction of its motion is its nul-plane with respect to a linear complex having this line for central axis, and the quotient u/ω for pitch (cf. Sir R. S. Ball, *Theory of Screws*).

The following are some properties of a configuration of two linear complexes:

The lines common to the two-complexes also belong to an infinite number of linear complexes, of which two reduce to single straight lines. These two lines are conjugate lines with vanishing moment of the complexes, but they may coincide, and then some simple modifications are required. The locus of the central axis of this system of complexes is a surface of the third degree called the cylindroid, which plays a leading part in the theory of screws as developed synthetically by Ball. Since a linear complex has an invariant of the second degree in its coefficients, it follows that two linear complexes have a lineo-linear invariant. This invariant is fundamental: if the complexes be both straight lines its vanishing is the condition of their intersection as given above; if only one of them be a straight line, its vanishing is the condition that this line should belong to the other complex. When it vanishes for any two complexes they are said to be *in involution* or *polar*; the nul-points P, Q of any plane then divide harmonically the points in which the plane meets the common conjugate lines, and each complex is its own reciprocal with respect to the other. As regards a configuration of three linear complexes, the common lines form one system or the generators of a quadric, and the doubly infinite system of complexes containing the common lines, include an infinite number of straight lines which form the other system of generators of the same quadric.

General line coordinates.

If the equation of a linear complex is $A\delta+B\varepsilon+C\zeta+D\lambda+E\mu+F\nu=0$, then for a line not belonging to the complex we may regard the expression on the left-hand side as a multiple of the moment of the line with respect to the complex, the word moment being used in the statical sense; and we then see that when the coordinates are replaced by linear functions of themselves the new coordinates are multiples of the moments of the line with respect to six fixed complexes. The essential features of this coordinate system are the same as those of the original one, viz. there are six coordinates connected by a quadratic equation, but this relation has in general a different form. By suitable choice of the six fundamental complexes, as they may be called, this connection relation may be brought into either simple form of which we mention two: (i.) When the six are mutually in involution it can be reduced to $x_1^2+x_2^2+x_3^2+x_4^2+x_5^2+x_6^2=0$; (ii.) When the first four are in involution and the other two are the lines common to the first four it is $x_1^2+x_2^2+x_3^2+x_4^2+x_5x_6=0$. These quadratic coordinates might be explained without reference to actual magnitude, just as homogeneous point coordinates can be; the essential remark is that the equation of any coordinate to zero represents a linear complex, a point of view which includes our original one when for the equation of a coordinate to zero represents all the lines meeting an edge of the fundamental tetrahedron.

The system of coordinates referred to six complexes mutually in involution was introduced by Felix Klein, and in many cases is more useful than that derived directly from point coordinates; *e.g.* in the discussion of quadratic complexes: by means of it Klein has developed an analogy between line geometry and the geometry of spheres as treated by C. S. Lie, Darboux and others. In fact, in line geometry a point is represented by *five* coordinates, connected by a relation of the same type as the one just mentioned when the five fundamental spheres are mutually at right angles and the equation of a sphere is of the form $\Sigma(x-a)^2=0$. Extending this to five dimensions of space, we obtain an exact analogue of line geometry, in which (i.) a point corresponds to a line; (ii.) a linear complex to a hypersphere; (iii.) two linear complexes in involution to two orthogonal hyperspheres; (iv.) a linear complex and two conjugate lines to a hypersphere and two inverse points. Many results may be obtained by this principle, and more still are suggested by trying to extend the properties of circles to spheres in three and four dimensions. Thus the elementary theorem, that, given four lines, the circles circumscribed to the four triangles formed by them are concurrent, may be extended to six hyperplanes in four dimensions; and then we can derive a result in line geometry by translating the inverse of this theorem. Again, just as there is an infinite number of spheres touching a surface at a given point, two of them having contact of a closer nature, so there is an infinite number of linear complexes touching a non-linear complex at a given line, and *three* of these have contact of a closer nature (cf. Klein, *Math. Ann.* v. 278).

Sophus Lie has pointed out a different analogy with sphere geometry. Suppose, in fact, that the equation of a sphere of radius r is

$$x^2+y^2+z^2+2ax+2by+2cz+d=0$$

so that $r^2=a^2+b^2+c^2-d$; then introducing the quantity e to make this equation homogeneous, we may regard the sphere as given by the six coordinates a, b, c, d, e, r connected by the equation $a^2+b^2+c^2-r^2-de=0$, and it is easy to see that two spheres touch if the polar form $2aa_1+2bb_1+2cc_1-2rr_1-de_1-d_1e$ vanishes. Comparing this with the equation $x_1^2+x_2^2+x_3^2+x_4^2-2x_5x_6=0$ given above, it appears that this sphere geometry and line geometry are identical, for we may write $a=x_1$, $b=x_2$, $c=x_3$, $r=x_4$, $d=x_5$, $e=\frac{1}{2}x_6$; but it is to be noticed that a sphere is really replaced by two lines whose coordinates only differ in the sign of x_6, so that they are polar lines with respect to the complex $x_6=0$. Two spheres which touch correspond to two lines which intersect, or more accurately to two pairs of lines (p, p') and (q, q'), of which the pairs (p, q) and (p', q') both intersect. By this means the problem of describing a sphere to touch four given spheres is reduced to that of drawing a pair of lines (l, l') (of which l intersects one line of the four pairs (pp'), (qq'), (rr'), (ss'), and l' intersects the remaining four). We may, however, ignore the accented letters in translating theorems, for a configuration of lines and its polar with respect to a linear complex have the same projective properties. In Lie's transformation a linear complex corresponds to the totality of spheres cutting a given sphere at a given angle. A most remarkable result is that lines of curvature in the sphere geometry become asymptotic lines in the line geometry.

Some of the principles of line geometry may be brought into clearer light by admitting the ideas of space of four and five dimensions.

Thus, regarding the coordinates of a line as homogeneous coordinates in five dimensions, we may say that line geometry is equivalent to geometry on a quadric surface in five dimensions. A linear complex is represented by a hyperplane section; and if both linear complexes are in involution, the corresponding hyperplanes are conjugate with respect to the fundamental quadric. By projecting this quadric stereographically into space of four dimensions we obtain Klein's analogy. In the same way geometry in a linear complex is equivalent to geometry on a quadric in four dimensions; when two lines intersect the representative points are on the same generator of this quadric. Stereographic projection, therefore, converts a curve in a linear complex, *i.e.* one whose tangents all belong to the complex, into one whose tangents are intersect a fixed conic: when this conic is the imaginary circle at infinity the curve is what Lie calls a minimal curve. Curves in a linear complex have been extensively studied. The osculating plane at any point of such a curve is the nul-plane of the point with respect to the complex, and points of superosculation always coincide in pairs at the points of contact of stationary tangents. When a point of such a curve is given, the osculating plane is determined, hence all the curves through a given point with the same tangent have the same torsion.

The lines through a given point that belong to a complex of the nth degree lie on a cone of the nth degree: if this cone has a double line the point is said to be a singular point. Similarly, *Non-linear complexes.* a plane is said to be singular when the envelope of the complex lines in it has a double tangent. It is very remarkable that the same surface is the locus of the singular points and the envelope of the singular planes: this surface is called the singular surface, and both its degree and class are in general $2n(n-1)^2$, which is equal to four for the quadratic complex.

The singular lines of a complex $F=0$ are the lines common to F and the complex

$$\frac{\delta F}{\delta \lambda}\frac{\delta F}{\delta \varepsilon}+\frac{\delta F}{\delta m}\frac{\delta F}{\delta \mu}+\frac{\delta F}{\delta n}\frac{\delta F}{\delta \nu}=0.$$

As already mentioned, at each line l of a complex there is an infinite number of tangent linear complexes, and they all contain the lines adjacent to l. If now l be a singular line, these complexes all reduce to straight lines which form a plane pencil containing the line l. Suppose the vertex of the pencil is A, its plane a, and one of its lines ξ, then l' being a complex line near l, meets ξ, or more accurately the mutual moment of l', and is of the second order of small quantities. If P be a point on l, a line through P quite near l in the plane a meets ξ, and is therefore a line of the complex; hence the complex-cones of all points on l touch a and the complex-curves of all planes through l touch l at A. It follows that l is a double line of the complex-cone of A, and a double tangent of the complex-curve of a. Conversely, a double line of a cone-contact of a singular line, and a singular line clearly touches the curves of all planes through it in the same point. Suppose now that the consecutive line l' is also a singular line, λ' being the allied singular point, a' the singular plane and ξ' any line of the pencil (λ', a') so that ξ' is a tangent line at l' to the complex: the mutual moments of the pairs l', ξ and l, ξ are each of the second order; hence the plane a' meets the lines l and ξ' in two points very near A. This being true of all neighbouring planes, near a the contact of all with its envelope is in A, *i.e.* the locus of singular points is the same as the envelope of singular planes. Further, when a line touches a complex it touches the singular surface, for it belongs to a plane pencil like (λa), and thus in Klein's analogy the analogue of a plane of a hypersurface being a bitangent line of the complex is also a bitangent line of the singular surface. The theory of cosingular complexes is thus brought into line with that of confocal surfaces in four dimensions, and guided by these principles the existence of cosingular quadratic complexes can easily be established, the analysis required being almost the same as that invented for confocal cyclides by Darboux.

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and others. Of cosingular complexes of higher degree nothing is known.

Following J. Plücker, we give an account of the lines of a quadratic complex that meet a given line.

The cones whose vertices are on the given line all pass through eight fixed points and envelop a surface of the fourth degree; the conics whose planes contain the given line all lie on a surface of the fourth class and touch eight fixed planes. It is easy to see by elementary geometry that these two surfaces are identical. Further, the given line contains four singular points A_1, A_2, A_3, A_4, and four planes into which their cones degenerate are the eight common tangent planes mentioned above; similarly, there are four singular planes, a_1, a_2, a_3, a_4, through the line, and the eight points into which their conics degenerate are the eight common points above. The locus of the pole of the line with respect to all the conics in planes through it is a straight line called the *polar line* of the given one; and through this line passes the polar plane of the given line with respect to each of the cones. The same polar is applied in the ordinary analytical sense; any line has an infinite number of polar complexes with respect to the given complex, for the equation of the latter can be written in an infinite number of ways; one of these polars is a straight line, and is the polar line already introduced. The surface on which lie all the conics through a line l is called the Plücker surface of that line: from the known properties of (2, 2) correspondences it can be shown that the Plücker surface of l cuts l_1 in a range of the same cross ratio as that of the range in which the Plücker surface of l_1 cuts l. Applying this to the case in which l_1 is the polar of l, we find that the cross ratios of (A_1, A_2, A_3, A_4) and (a_1, a_2, a_3, a_4) are equal. The identity of the locus of the A's with the envelope of the a's follows at once; moreover, a line meets the singular surface in four points having the same cross ratio as that of the four tangent planes drawn through the line to touch the surface. The Plücker surface has eight nodes, eight singular tangent planes, and is a double line. The relation between a line and its polar line is not a reciprocal one with respect to the complex; but W. Stahl has pointed out that the relation *is* reciprocal as far as the singular surface is concerned.

Quadratic complexes.

To facilitate the discussion of the general quadratic complex we introduce Klein's canonical form. We have, in fact, to deal with two quadratic equations in six variables; and by suitable linear transformations these can be reduced to the form

$$\frac{a_1x_1^2+a_2x_2^2+a_3x_3^2+a_4x_4^2+a_5x_5^2+a_6x_6^2=0}{x_1^2+\quad x_2^2+\quad x_3^2+\quad x_4^2+\quad x_5^2+\quad x_6^2=0}$$

subject to certain exceptions, which will be mentioned later.

Taking the first equation to be that of the complex, we remark that both equations are unaltered by changing the sign of any coordinate; the geometrical meaning of this is, that the quadratic complex is its own reciprocal with respect to each of the six fundamental complexes, for changing the sign of a coordinate is equivalent to taking the polar of a line with respect to the corresponding fundamental complex. It is easy also to establish the existence of six systems of bitangent linear complexes, for the complex $l_1x_1+l_2x_2+l_3x_3+l_4x_4+l_5x_5+l_6x_6=0$ is a bitangent when

$$\frac{l_1^2}{a_1}+\frac{l_2^2}{a_2}+\frac{l_3^2}{a_3}+\frac{l_4^2}{a_4}+\frac{l_5^2}{a_5}+\frac{l_6^2}{a_6}=0,$$

and its lines of contact are conjugate lines with respect to the first fundamental complex. We therefore infer the existence of six systems of bitangent lines of the complex, of which the first is given by

$$x_1=0, \frac{x_2^2}{a_2-a_1}+\frac{x_3^2}{a_3-a_1}+\frac{x_4^2}{a_4-a_1}+\frac{x_5^2}{a_5-a_1}+\frac{x_6^2}{a_6-a_1}=0.$$

Each of these lines is a bitangent of the singular surface, which is therefore completely determined as being the focal surface of the two complexes $\Sigma ax^2=0$ and $\Sigma bx^2=0$ are cosingular if $b_r=a_rA+\mu a_r+\rho$.

The singular surface of the general quadratic complex is the famous quartic, with sixteen nodes and sixteen singular tangent planes, first discovered by E. E. Kummer.

We cannot give a full account of its properties here, but we deduce at once from the above that its bitangents break up into six (2, 2) congruences, and the six linear complexes containing these are mutually in involution. The nodes of the singular surface are pairs whose complex cones are coincident planes, and the complex conic in a singular tangent plane consists of two coincident points. This configuration of sixteen points and planes has many interesting properties; thus each plane contains six points which lie on a conic, while through each point there are six planes which touch a quadric cone. In many respects the Kummer quartic plays a part in three dimensions analogous to the general quartic curve in two; it further gives a natural representation of certain relations between hyperelliptic functions (cf. R. W. H. T. Hudson, *Kummer's Quartic*, 1905).

Classification of quadratic complexes.

As might be expected from the magnitude of a form in six variables, the number of projectivally distinct varieties of quadratic complexes is very great; and in fact Adolf Weiler, by whom the question was first systematically studied on lines indicated by Klein, enumerated no fewer than forty-nine different types. But the principle of the classification is so important, and withal so simple, that we give a brief sketch which indicates its essential features.

We have practically to study the intersection of two quadrics F and F′ in six variables, and to classify the different cases arising we make use of the results of Karl Weierstrass on the equivalence conditions of two pairs of quadratics. As far as at present required, they are as follows: Suppose that the factorized form of the determinantal equation $\mathrm{Disct}\,(F+\lambda F')=0$ is

$$(\lambda-a)^{s_1+1}\lambda^{s_2+1}\dots(\lambda-\beta)^{t_1+1}\lambda^{t_2+1}\dots,$$

where the root α occurs $s_1+s_2+s_3\dots$ times in the determinant, $s_2+s_3\dots$ times in every first minor, $s_3+\dots$ times in every second minor, and so on; the meaning of each exponent is then perfectly definite. Every factor of the type $(\lambda-\alpha)^s$ is called an *elementartheil* (elementary divisor) of the determinant, and the condition of equivalence of two pairs of quadratics is simply that their determinants have the same elementary divisors. We write the pair of forms symbolically thus $[(s_1s_2\dots),(t_1t_2\dots),\dots]$, letters in the inner brackets referring to the same factor. Returning now to the six quadratics representing the complex, the sum of the exponents will be six, and two complexes are put in the same class if they have the same symbolical expression; *i.e.* the actual values of the roots of the determinantal equation need not be the same for both, but their manner of occurrence, as far as here indicated, must be identical in the two. The enumeration of all possible cases is thus reduced to a simple question in combinatorial analysis, and the actual study of any particular case is much facilitated by a useful rule of Klein's for writing down in a simple form two quadratics belonging to a given class—one of which, of course, represents the equation connecting line coordinates, and the other the equation of the complex. The general complex is naturally the first; the conjunct (of tangent) to a quadric is $[(11), (111)]$ and that of lines meeting a conic is $[(22)]$. Full information will be found in Weiler's memoir, *Math. Ann.* vol. vii.

The detailed study of each variety of complex opens up a vast subject; we only mention two special cases, the harmonic complex and the tetrahedral complex.

The harmonic complex, first studied by Battaglini, is generated in an infinite number of ways by four homographic and quadrics harmonically. Taking the most general case, and referring the quadrics to their common self-conjugate tetrahedron, we can find its equation in a simple form, and verify that this complex really depends only on seventeen constants, so that it is not the most general quadratic complex. It belongs to the general type in so far as it is discussed above, but the roots of the determinant are in involution. The singular surface is the "tetrahedroid" discussed by Cayley. As a particular case, from a metrical point of view, we have L. F. Painvin's complex generated by the lines of intersection of perpendicular tangent planes of a quadric, the singular surface now being Fresnel's wave surface. The tetrahedral or Reye complex is the simplest and best known of the quadratic complexes. It is generated by the lines which meet the faces of a tetrahedron in a constant cross ratio, and therefore by those subtending the same cross ratio at the four vertices. The singular surface is made up of the faces of the tetrahedron counted twice; tetrahedrally, each edge of this tetrahedron is a double line of the complex. The complex was first discussed by K. T. Reye as the assemblage of lines joining corresponding points in a homographic transformation of space, and from this point of view leads to many important invariant properties. A (metrically) particular case of great interest is the complex generated by the normals to a family of confocal quadrics, and for many investigations it is convenient to deal with this complex referred to the principal axes. For example, Lie has developed the theory of curves in a Reye complex (*i.e.* curves whose tangents belong to the complex) as solutions of a differential equation of the form $(b-c)xdydz+(c-a)ydzdx+(a-b)zdxdy=0$, and we can simplify this equation by a logarithmic transformation. Many theorems connecting complexes with differential equations have been given by Lie and his school. A line complex, in fact, corresponds to a Mongian equation having ∞^4 line integrals.

As the coordinates of a line belonging to a congruence are functions of two independent parameters, the theory of congruences is analogous to that of surfaces, and we may regard it as a fundamental inquiry to find the simplest form of surface into which a given congruence can be transformed. Most of those whose properties have been extensively discussed can be represented on a plane by a birational transformation. But in addition to the difficulties of the theory of algebraic surfaces, a subject still in its infancy, the theory of congruences has other difficulties in that a congruence is seldom completely represented, even by two equations.

Congruences.

A fundamental theorem is that the lines of a congruence are in general bitangents of a surface; in fact, since the condition of intersection of two consecutive straight lines is $ldA+mdu+ndv=0$, a line l of the congruence meets two consecutive lines, say l_1 and l_2. Suppose l, l_1 lie in the plane pencil (A_1a_1) and l, l_2 in the plane pencil (A_2a_2), then the locus of the A's is the same as the envelope of the a's, but a_1 is the tangent plane at A_1 and a_1 at A_2. This surface is called the focal surface of the congruence, and to it all the lines l are bitangent. The distinctive property of the points A is that two of the congruence lines through them coincide, and in like manner the planes a each contain two coincident lines. The focal surface consists of two sheets, but one or both may degenerate into curves;

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thus, for example, the normals to a surface are bitangents of the surface of centres, and in the case of Dupin's cyclide this surface degenerates into two conics.

In the discussion of congruences it soon becomes necessary to introduce another number r, called the rank, which expresses the number of plane pencils each of which contains an arbitrary line and two lines of the congruence. The order of the focal surface is $2m(n-1)-2r$, and its class is $m(m-1)-2r$. Our knowledge of congruences is almost exclusively confined to those in which either m or n does not exceed two. We give a brief account of those of the second order without singular lines, those of order unity not being especially interesting. A congruence generally has singular points through which an infinite number of lines pass; a singular point is said to be of order r when the lines through it lie on a cone of the rth degree. By means of formulae connecting the number of singular points and their orders the class of quadratic congruence Kümmer proved that the class cannot exceed seven. The focal surface is of degree four and class $2m$; this kind of quartic surface has been extensively studied by Kümmer, Cayley, Rohn and others. The varieties (2, 2), (2, 3), (2, 4), (2, 5) all belong to at least one Reye complex; and so also does the most important class of (2, 6) congruences which includes all the above as special cases. The congruence (2, 2) belongs to a linear complex and forty different Reye complexes; as above remarked, the singular surface is Kümmer's sixteen-nodal quartic, and the same surface is focal for six different congruences of this variety. The theory of (2, 2) congruences is completely analogous to that of the surfaces called cyclides in three dimensions; the particulars regarding quadratic congruences will be found in Kümmer's memoir of 1866, and the second volume of Sturm's treatise. The properties of quadratic congruences having singular lines, *i.e.* degenerate focal surfaces, are not so interesting as those of the above class; they have been discussed by Kümmer, Sturm and others.

Since a ruled surface contains only ∞^1 elements, this theory is practically the same as that of curves. If a linear complex contains more than a generation of a ruled surface of the nth degree, it contains all the generators, hence for $n=2$ there are three linearly independent complexes, containing all the generators, and this is a well-known property of quadric surfaces. In ruled cubics the generators all meet a directrix, which may or may not coincide; these two cases correspond to the two main classes of cubics discussed by Cayley and Cremona. As regards ruled quartics, the generators must lie in one and may lie in two linear complexes. The first class is equivalent to a quartic in four dimensions and is always rational, but the latter class has to be subdivided into the elliptic and the rational, just like twisted quartic curves. A quintic skew may not lie in a linear complex, and then it is unicursal, while of sextics we have two distinct ones not in linear complex, viz. the elliptic variety, having thirty-six places when a linear complex contains six consecutive generators, and the rational, having six such places.

Ruled surfaces.

The general theory of skews in two linear complexes is identical with that of curves on a quadric in three dimensions and is known. But for skews lying in only one linear complex there are difficulties; the curve now lies in four dimensions, and we represent it in three by stereographic projection as a curve meeting a given plane in n points on a conic. To find the maximum deficiency for a given degree would probably be difficult, but as far as degree eight the space-curve theory of Halphen and Nöther can be translated into line geometry at once. When the skew does not lie in a linear complex at all the theory is more difficult still, and the general theory clearly cannot advance until further progress is made in the study of twisted curves.

REFERENCES.—The earliest works of a general nature are Plücker, *Neue Geometrie des Raumes* (Leipzig, 1868); and Kümmer, "Über die algebraischen Strahlensysteme," *Berlin Academy* (1866). Systematic development on purely synthetic lines will be found in the three volumes of Sturm, *Liniengeometrie* (Leipzig, 1892, 1893, 1896); vol. i. deals with the linear Reye complexes, vols. ii. and iii. with quadratic congruences and complexes respectively. For a highly suggestive review by Gino Loria see *Bulletin des sciences mathématiques* (1893, 1897). A shorter treatise, giving a very interesting account of Klein's contributions, is the work of Koenigs, *La Géométrie réglée et ses applications* (Paris, 1898). English treatises are C. M. Jessop, *Treatise on the Line Complex* (1903); R. W. H. T. Hudson, *Kümmer's Quartic* (1905). Many references to memoirs on line geometry will be found in Hagen, *Synopsis der höheren Mathematik*, ii. (Berlin, 1894); Loria, *Il passato ed il presente delle principali teorie geometriche* (Milan, 1897); a clear résumé of the principal results is contained in the very elegant volume of Pascal, *Repertorio di mathematiche superiori*, ii. (Milan, 1900). Another treatise dealing extensively with line geometry is Lie, *Geometrie der Berührungstransformationen* (Leipzig, 1896). Many memoirs on the subject have appeared in the *Mathematische Annalen*; a full list of these will be found in the index to the first fifty volumes, p. 115. Perhaps the two memoirs which have left most impression on the subsequent development of the subject are Klein, "Zur Theorie der Linien-complexe des ersten und zweiten Grades," *Math. Ann.* ii.; and Lie, "Über Complexe, insbesondere Linien- und Kugelcomplexe," *Math. Ann.* v.

(J. H. G.)

VI. Non-Euclidean Geometry

The various metrical geometries are concerned with the properties of the various types of congruence-groups, which are defined in the study of the *axioms of geometry* and of their immediate consequences. But this point of view of the subject is the outcome of recent research, and historically the subject has a different origin. Non-Euclidean geometry arose from the discussion, extending from the Greek period to the present day, of the various assumptions which are implicit in the traditional Euclidean system of geometry. In the course of these investigations it became evident that metrical geometries, each internally consistent but inconsistent in many respects with each other and with the Euclidean system, could be developed. A short historical sketch will explain this origin of the subject, and describe the famous and interesting progress of thought on the subject. But previously a description of the chief characteristic properties of elliptic and of hyperbolic geometries will be given, assuming the standpoint arrived at below under VII. *Axioms of Geometry*.

First assume the equation to the absolute (cf. *loc. cit.*) to be $x^2+y^2-z^2=0$. The absolute is then real, and the geometry is hyperbolic.

The distance (d_{12}) between the two points (x_1, y_1, z_1, w_1) and (x_2, y_2, z_2, w_2) is given by

$$\cosh\left(\frac{d_{12}}{r}\right)=\frac{(w_1w_2-x_1x_2-y_1y_2+z_1z_2)}{\sqrt{(w_1^2-x_1^2-y_1^2-z_1^2)}\sqrt{(w_2^2-x_2^2-y_2^2-z_2^2)}}. \quad (1)$$

The only points to which the metrical geometry applies are those within the region enclosed by the quadric; the other points are "improper ideal points." The angle (θ_{12}) between two planes, $l_1x+m_1y+n_1z+r_1w=0$ and $l_2x+m_2y+n_2z+r_2w=0$, is given by

$$\cos\theta_{12}=\frac{(l_1l_2+m_1m_2+n_1n_2-r_1r_2)}{\sqrt{(l_1^2+m_1^2+n_1^2-r_1^2)}\sqrt{(l_2^2+m_2^2+n_2^2-r_2^2)}}. \quad (2)$$

These planes only have a real angle of inclination if they possess a line of intersection within the actual space, *i.e.* if they intersect. Planes which do not intersect possess a shortest distance along a line which is perpendicular to both of them. If this shortest distance is δ_{12}, we have

$$\cosh\left(\frac{\delta_{12}}{r}\right)=\frac{(l_1l_2+m_1m_2+n_1n_2-r_1r_2)}{\sqrt{(l_1^2+m_1^2+n_1^2-r_1^2)}\sqrt{(l_2^2+m_2^2+n_2^2-r_2^2)}}.$$

Thus in the case of the two planes one and only one of the two, θ_{12} and δ_{12}, is real. The same considerations hold for coplane straight lines (see VII. *Axioms of Geometry*). Let O (fig. 67) be the point $(o, o, o, 1)$, OX the line $y=o$, $z=o$, OY the line $z=o$, $x=o$, and OZ the line $x=o$, $y=o$. These are the coordinate axes and are at right angles to each other. Let P be any point, and let ρ be the distance OP, θ the angle POZ, and ϕ the angle between the planes ZOX and ZOP. Then the coordinates of P can be taken to be

$$\sinh(\rho/r)\sin\theta\cos\phi,\ \sinh(\rho/r)\sin\theta\sin\phi,\ \sinh(\rho/r)\cos\theta,\ \cosh(\rho/r).$$

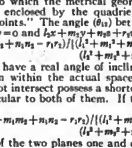

FIG. 67.

If ABC is a triangle, and the sides and angles are named according to the usual convention, we have

$$\sinh(a/r)/\sin A=\sinh(b/r)/\sin B=\sinh(c/r)/\sin C, \quad (4)$$

and also

$$\cosh(a/r)=\cosh(b/r)\cosh(c/r)-\sinh(b/r)\sinh(c/r)\cos A, \quad (5)$$

with two similar equations. The sum of the three angles of a triangle is always less than two right angles. The area of the triangle ABC is $\lambda^2(\pi-A-B-C)$. If the base BC of a triangle is kept fixed and the vertex A moves in the fixed plane ABC so that the area ABC is constant, then the locus of A is a line of equal distance from BC. This locus is not a straight line. The whole theory of similarity is inapplicable; two triangles are either congruent, or their angles are not equal two by two. Thus the elements of a triangle are determined when the three angles are given. By keeping A and B and the line BC fixed, but by making C move off to infinity along BC, the lines BC and AC become parallel, and the sides a and b become infinite. Hence from equation (5) above, it follows that two parallel lines (cf. Section VII. *Axioms of Geometry*) must be considered as making a zero angle with each other. Also if B be a right angle, from the equation (5), remembering that, in the limit, .

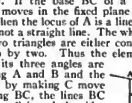

FIG. 68.

$$\cosh(a/r)/\cosh(b/r)=\cosh(a/r)/\sinh(b/r)=1,$$

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we have $\cos A = \tanh(\delta/\gamma)$ . . . . . (6).

The angle A is called by N. I. Lobatchewsky the "angle of parallelism."

The whole theory of lines and planes at right angles to each other is simply the theory of conjugate elements with respect to the absolute, where ideal lines and planes are introduced.

Thus if l and l' be any two conjugate lines with respect to the absolute (of which one of the two must be improper, say l'), then any plane through l' and containing proper points, and P is its pole, which is necessarily improper, then the lines through P are the normals to P. The equation of the sphere, centre (x_1, y_1, z_1, w_1) and radius ρ, is

$$(w_1^2 - x_1^2 - y_1^2 - z_1^2)\,(w^2 - x^2 - y^2 - z^2)\cosh^2(\rho/\gamma) = (w_1 w + x_1 x + y_1 y + z_1 z)^2 \quad (7).$$

The equation of the surface of equal distance (ε) from the plane $lx + my + nz + rw = 0$ is

$$(l^2 + m^2 + n^2 - r^2)\,(w^2 - x^2 - y^2 - z^2)\sinh^2(\varepsilon/\gamma) = (rw + lx + my + nz)^2 \quad (8).$$

A surface of equal distance is a sphere whose centre is improper; and both types of surface are included in the family

$$k^2(w^2 - x^2 - y^2 - z^2) = (ax + by + cz + dw)^2 \quad . \quad (9).$$

But this family also includes a third type of surfaces, which can be looked on either as the limits of spheres whose centres have approached the absolute, or as the limits of surfaces of equal distance whose central planes have approached a position tangential to the absolute. These surfaces are called limit-surfaces. Thus (9) denotes a limit-surface, if $a^2 - b^2 - c^2 = 0$. Two limit-surfaces only differ in position. Thus the two limit-surfaces which touch the plane YOZ at O, but have their concavities turned in opposite directions, have as their equations

$$w^2 - x^2 - y^2 - z^2 = (w = x)^2.$$

The geodesic geometry of a sphere is elliptic, that of a surface of equal distance is hyperbolic, and that of a limit-surface is parabolic (*i.e. Euclidean*). The equation of the surface (cylinder) of equal distance (δ) from the line OX is

$$(w^2 - x^2)\tanh^2(\delta/\gamma) - y^2 - z^2 = 0.$$

This is not a ruled surface. Hence in this geometry it is not possible for two straight lines to be at a constant distance from itself, forming a closed series. Thus there are two segments between any two points, together forming the whole line which contains them; one distance is associated with one segment, and the other distance with the other segment. The complete length of every straight line is ∞_γ.

The angle between the two planes $l_1x + m_1y + n_1z + r_1w = 0$ and $l_2x + m_2y + n_2z + r_2w = 0$ is

$$\cos\theta_{12} = (l_1l_2 + m_1m_2 + n_1n_2 + r_1r_2)/\{(l_1^2 + m_1^2 + n_1^2 + r_1^2)\,(l_2^2 + m_2^2 + n_2^2 + r_2^2)\}^{\frac{1}{2}} \quad (11).$$

The polar plane with respect to the absolute of the point (x_1, y_1, z_1, w_1) is the real plane $x_1x + y_1y + z_1z + w_1w = 0$, and the pole of the plane $l_1x + m_1y + n_1z + r_1w = 0$ is the point (l_1, m_1, n_1, r_1). Thus (from equations 10 and 11) it follows that the angle between the polar planes of the points $(x_1, \ldots)$ and $(x_2, \ldots)$ is θ_{12}/γ, and that the distance between the poles of the planes $(l_1, \ldots)$ and $(l_2, \ldots)$ is $\gamma\theta_{12}$. Thus there is complete correspondence between points and planes in respect to all properties. This complete reign of the principle of duality is one of the great beauties of this geometry. The theory of lines and planes at right angles is simply the theory of conjugate elements with respect to the absolute. A tetrahedron self-conjugate with respect to the absolute has all its intersecting elements (edges and planes) at right angles. If l and l' are two conjugate lines, the planes through one are the planes perpendicular to the other. If P is the pole of the plane ρ, the lines through P are the normals to the plane ρ. The distance from P to ρ is $\frac{1}{2}\pi\gamma$. Thus every sphere is also a surface of equal distance from the polar of its centre, and conversely. A plane does not divide space; for the line joining any two points P and Q only cuts the plane once, in L, say, then it is always possible to go from P to Q by the segment of the line PQ which does not contain L. But P and Q may be said to be separated by a plane ρ, if the point in which PQ cuts ρ lies on the shortest segment between P and Q. With this sense of "separation," it is possible[1] to find three points P, Q, R such that P and Q are separated by the plane ρ, but P and R are not separated by ρ, nor are Q and R.

Let A, B, C be any three non-collinear points, then four triangles are defined by these points. Thus if a, b, c and A, B, C are the elements of any one triangle, then the four triangles have as their elements:

(1)	a,	b,	c,	A,	B,	C.
(2)	a,	$\pi\gamma - b$,	$\pi\gamma - c$,	A,	$\pi - B$,	$\pi - C$.
(3)	$\pi\gamma - a$,	b,	$\pi\gamma - c$,	$\pi - A$,	B,	$\pi - C$.
(4)	$\pi\gamma - a$,	$\pi\gamma - b$,	c,	$\pi - A$,	$\pi - B$,	C.

The formulae connecting the elements are

$$\sin A/\sin(a/\gamma) = \sin B/\sin(b/\gamma) = \sin C/\sin(c/\gamma), \quad . \quad (12)$$

and

$$\cos(a/\gamma) = \cos(b/\gamma)\cos(c/\gamma) + \sin(b/\gamma)\sin(c/\gamma)\cos A, \quad (13)$$

with two similar equations.

Two cases arise, namely (I.) according as one of the four triangles has as its sides the shortest segments between the angular points, or (II.) according as this is not the case. When case I. holds there is said to be a "principal triangle."[2] If all the figures considered lie within a sphere of radius $\frac{1}{2}\pi\gamma$ only case I. can hold, and the principal triangle is the triangle wholly within this sphere, also the peculiarities in respect to the separation of points by a plane cannot then arise. The sum of the three angles of a triangle ABC is always greater than two right angles, and the area of the triangle is $\gamma^2(A + B + C - \pi)$. Thus as in hyperbolic geometry the theory of similarity does not hold, and the elements of a triangle are determined when its three angles are given. The coordinates of a point can be written in the form

$$\sin(\rho/\gamma)\sin\theta\cos\phi,\ \sin(\rho/\gamma)\sin\theta\sin\phi,\ \sin(\rho/\gamma)\cos\theta,\ \cos(\rho/\gamma),$$

where ρ, θ and ϕ have the same meanings as in the corresponding formulae in hyperbolic geometry. Again, suppose a watch is laid on the plane OXY, face upwards with its centre at O, and the line 12 to 6 (as marked on dial) along the line YOY. Let the watch be continually pushed along the plane along the line OX, that is, in the direction 9 to 3. Then the line XOX being of finite length, the watch will return to O, but at its first return it will be found to be face downwards on the other side of the plane, with the line 12 to 6 reversed in direction along the line YOY. This peculiarity was first pointed out by Felix Klein. The theory of parallels as it exists in hyperbolic space has no application in elliptic geometry. But another property of Euclidean parallel lines holds in elliptic geometry, and by the use of it parallel lines are defined. For the equation of the surface (cylinder) of equal distance (δ) from the line XOX is

$$(x^2 + w^2)\tan^2(\delta/\gamma) - (y^2 + z^2) = 0.$$

This is also the surface of equal distance, $\frac{1}{2}\pi\gamma - \delta$, from the line conjugate to XOX. Now from the form of the above equation this is a ruled surface, and through every point of it two generators pass. But these generators are lines of equal distance from XOX. Thus throughout every point of space two lines can be drawn which are lines of equal distance from a given line l. This property was discovered by W. K. Clifford. The two lines are called Clifford's right and left parallels to l through the point. This property of parallelism is reciprocal, so that if m is a left parallel to l, then l is a left parallel to m. Note also that two parallel lines l and m are not coplanar. Many of those properties of Euclidean parallels, which do not hold for Lobatchewsky's parallels in hyperbolic geometry, do hold for Clifford's parallels in elliptic geometry. The geodesic geometry of spheres is elliptic, the geodesic geometry of surfaces of equal distance from lines (cylinders) is Euclidean, and surfaces of revolution can be found[3] of which the geodesic geometry is hyperbolic. But it is to be noticed that the connectivity of these surfaces is different to that of a Euclidean plane. For instance there are only ∞^2 congruence transformations of the cylindrical surfaces of equal distance into themselves, instead of the ∞^4 for the ordinary plane. It would obviously be possible to state "axioms" which these geodesics satisfy, and thus to define independently, and not as loci, quasi-spaces of these peculiar types. The existence of such Euclidean quasi-geometries was first pointed out by Clifford.[4]

In both elliptic and hyperbolic geometry the spherical geometry, *i.e.* the relations between the angles formed by lines and planes passing through the same point, is the same as the "spherical trigonometry" in Euclidean geometry. The constant γ, which appears in the formulae both of hyperbolic and elliptic geometry, does not by its variation produce different types of geometry. There is only one type of elliptic geometry and one type of hyperbolic geometry; and the magnitude of the constant γ in each case simply depends upon the magnitude of the arbitrary unit of length in comparison with the natural unit of length

[1] Cf. A. N. Whitehead, *Universal Algebra*, Bk. vi. (Cambridge, 1898).

[2] Cf. A. N. Whitehead, *loc. cit.*

[3] Cf. A. N. Whitehead, "The Geodesic Geometry of Surfaces in non-Euclidean Space," *Proc. Lond. Math. Soc.* vol. xxix.

[4] Cf. Klein, "Zur nicht-Euklidischen Geometrie," *Math. Annal.* vol. xxxvii.

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which each particular instance of either geometry presents. The existence of a natural unit of length is a peculiarity common both to hyperbolic and elliptic geometries, and differentiates them from Euclidean geometry. It is the reason for the failure of the theory of similarity in them. If γ is very large, that is, if the natural unit is very large compared to the arbitrary unit, and if the lengths involved in the figures considered are not large compared to the arbitrary unit, then both the elliptic and hyperbolic geometries approximate to the Euclidean. For from formulae (4) and (5) and also from (12) and (13) we find, after retaining only the lowest powers of small quantities, as the formulae for any triangle ABC,

$$a/\sin A = b/\sin B = c/\sin C,$$

and

$$a^2 = b^2 + c^2 - 2bc\cos A,$$

with two similar equations. Thus the geometries of small figures are in both types Euclidean.

History.—"In pulcherrimo Geometriae corpore," wrote Sir Henry Savile in 1621, "duo sunt naevi, duae labes nec quod sciam plures, in quibus eluendis et emaculendis cum veterum tum recentiorum . . . vigilavit industria." These two blemishes are the theory of parallels and the theory of proportion. The "industry of the moderns," in both respects, has given rise to important branches of mathematics, while at the same time showing that Euclid is in these respects more free from blemish than had been previously credible. It was from endeavours to improve the theory of parallels that non-Euclidean geometry arose; and though it has now acquired a far wider scope, its historical origin remains instructive and interesting. Euclid's "axiom of parallels" appears as Postulate V. to the first book of his *Elements*, and is stated thus, "And that, if a straight line falling on two straight lines make the angles, internal and on the same side, less than two right angles, the two straight lines, being produced indefinitely, meet on the side on which are the angles less than two right angles." The original Greek is *καὶ ἐὰν εἰς δύο εὐθείας εὐθεῖα ἐμπίπτουσα τὰς ἐντὸς καὶ ἐπὶ τὰ αὐτὰ μέρη γωνίας δύο ὀρθῶν ἐλάσσονας ποιῇ, ἐκβαλλομένας τὰς δύο εὐθείας ἐπ' ἄπειρον συμπίπτειν, ἐφ' ἃ μέρη εἰσὶν αἱ τῶν δύο ὀρθῶν ἐλάσσονες.*

Theory of parallels before Gauss.

To Euclid's successors this axiom had signally failed to appear self-evident, and had failed equally to appear indemonstrable. Without the use of the postulate its converse is proved in Euclid's 28th proposition, and it was hoped that by further efforts the postulate itself could be also proved. The first step consisted in the discovery of equivalent axioms. Christoph Clavius in 1574 deduced the axiom from the assumption that a line whose points are all equidistant from a straight line is itself straight. John Wallis in 1663 showed that the postulate follows from the possibility of similar triangles on different scales. Girolamo Saccheri (1733) showed that it is sufficient to have a single triangle, the sum of whose angles is two right angles. Other equivalent forms may be obtained, but none shows any essential superiority to Euclid's. Indeed plausibility, which is chiefly aimed at, becomes a positive demerit where it conceals a real assumption.

A new method, which, though it failed to lead to the desired goal, proved in the end immensely fruitful, was invented by Saccheri, in a work entitled *Euclides ab omni naevo vindicatus* (Milan, 1733). If the postulate of parallels is involved in Euclid's other assumptions, contradictions must emerge when it is denied while the others are maintained. This led Saccheri to attempt a *reductio ad absurdum*, in which he mistakenly believed himself to have succeeded. What is interesting, however, is not his fallacious conclusion, but the non-Euclidean results which he obtains in the process. Saccheri distinguishes three hypotheses (corresponding to what are now known as Euclidean or parabolic, elliptic and hyperbolic geometry), and proves that some one of the three must be universally true. His three hypotheses are thus obtained: equal perpendiculars AC, BD are drawn from a straight line AB, and CD are joined. It is shown that the angles ACD, BDC are equal. The first hypothesis is that these are both right angles; the second, that they are both obtuse; and the third, that they are both acute. Many of the results afterwards obtained by Lobatchewsky and Bolyai are here developed. Saccheri fails to be the founder of non-Euclidean geometry only because he does not perceive the possible truth of his non-Euclidean hypotheses.

Saccheri.

Some advance is made by Johann Heinrich Lambert in his *Theorie der Parallellinien* (written 1766; posthumously published 1786). Though he still believed in the necessary truth of Euclidean geometry, he confessed that, in all his attempted proofs, something remained undemonstrated. He deals with the same three hypotheses as Saccheri, showing that the second holds on a sphere, while the third would hold on a sphere of purely imaginary radius. The second hypothesis he succeeds in condemning, since, like all who preceded Bernhard Riemann, he is unable to conceive of the straight line as finite and closed. But the third hypothesis, which is the same as Lobatchewsky's, is not even professedly refuted.[1]

Lambert.

Non-Euclidean geometry proper begins with Karl Friedrich Gauss. The advance which he made was rather philosophical than mathematical: it was he (probably) who first recognized that the postulate of parallels is possibly false, and should be empirically tested by measuring the angles of large triangles. The history of non-Euclidean geometry has been aptly divided by Felix Klein into three very distinct periods. The first—which contains only Gauss, Lobatchewsky and Bolyai—is characterized by its synthetic method and by its close relation to Euclid. The attempt at indirect proof of the disputed postulate would seem to have been the source of these three men's discoveries; but when the postulate had been denied, they found that the results, so far from showing contradictions, were just as self-consistent as Euclid. They inferred that the postulate, if true at all, can only be proved by observations and measurements. Only one kind of non-Euclidean space is known to them, namely, that which is now called hyperbolic. The second period is analytical, and is characterized by a close relation to the theory of surfaces. It begins with Riemann's inaugural dissertation, which regards space as a particular case of a *manifold*; but the characteristic standpoint of the period is chiefly emphasized by Eugenio Beltrami. The conception of measure of curvature is extended by Riemann from surfaces to spaces, and a new kind of space, finite but unbounded (corresponding to the second hypothesis of Saccheri and Lambert), is shown to be possible. As opposed to the second period, which is purely metrical, the third period is essentially projective in its method. It begins with Arthur Cayley, who showed that metrical properties are projective properties relative to a certain fundamental quadric, and that different geometries arise according as this quadric is real, imaginary or degenerate. Klein, to whom the development of Cayley's work is due, showed further that there are two forms of Riemann's space, called by him the elliptic and the spherical. Finally, it has been shown by Sophus Lie, that if figures are to be freely movable throughout all space in ∞^6 ways, no other three-dimensional spaces than the above four are possible.

Three periods of non-Euclidean geometry.

Gauss published nothing on the theory of parallels, and it was not generally known until after his death that he had interested himself in that theory from a very early date. In 1799 he announces that Euclidean geometry would follow from the assumption that a triangle can be drawn greater than any given triangle. Though unwilling to assume this, we find him in 1804 still hoping to prove the postulate of parallels. In 1830 he announces his conviction that geometry is not an a priori science; in the following year he explains that non-Euclidean geometry is free from contradictions, and that, in this system, the angles of a triangle diminish without limit when all the sides are increased. He also gives for the

Gauss.

[1] On the theory of parallels before Lobatchewsky, see Stäckel und Engel, *Theorie der Parallelinien von Euklid bis auf Gauss* (Leipzig, 1895). The foregoing remarks are based upon the materials collected in this work.

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circumference of a circle of radius r the formula $\pi k(e^{r/k}-e^{-r/k})$, where k is a constant depending upon the nature of the space. In 1832, in reply to the receipt of Bolyai's *Appendix*, he gives an elegant proof that the amount by which the sum of the angles of a triangle falls short of two right angles is proportional to the area of the triangle. From these and a few other remarks it appears that Gauss possessed the foundations of hyperbolic geometry, which he was probably the first to regard as perhaps true. It is not known with certainty whether he influenced Lobatchewsky and Bolyai, but the evidence we possess is against such a view.[1]

Lobatchewsky.

The first to publish a non-Euclidean geometry was Nicholas Lobatchewsky, professor of mathematics in the new university of Kazañ.[2] In the place of the disputed postulate he puts the following: "All straight lines which, in a plane, radiate from a given point, can, with respect to any other straight line in the same plane, be divided into two classes, the *intersecting* and the *non-intersecting*. The *boundary line* of the one and the other class is called *parallel to the given line*." It follows that there are two parallels to the given line through any point, each meeting the line at infinity, like a Euclidean parallel. (Hence a line has two distinct points at infinity, and not one only as in ordinary geometry.) The two parallels to a line through a point make equal acute angles with the perpendicular to the line through the point. If p be the length of the perpendicular, either of these angles is denoted by $\Pi(p)$. The determination of $\Pi(p)$ is the chief problem (cf. equation (6) above); it appears finally that, with a suitable choice of the unit of length,

$$\tan \tfrac{1}{2}\Pi(p) = e^{-p}.$$

Before obtaining this result it is shown that spherical trigonometry is unchanged, and that the normals to a circle or a sphere still pass through its centre. When the radius of the circle or sphere becomes infinite all these normals become parallel, but the circle or sphere does not become a straight line or plane. It becomes what Lobatchewsky calls a limit-line or limit-surface. The geometry on such a surface is shown to be Euclidean, limit-lines replacing Euclidean straight lines. (It is, in fact, a surface of zero measure of curvature.) By the help of these propositions Lobatchewsky obtains the above value of $\Pi(p)$, and thence the solution of triangles. He points out that his formulae result from those of spherical trigonometry by substituting ia, ib, ic, for the sides a, b, c.

Bolyai.

John Bolyai, a Hungarian, obtained results closely corresponding to those of Lobatchewsky. These he published in an appendix to a work by his father, entitled *Appendix Scientiam spatii absolute veram exhibens: a veritate aut falsitate Axiomatis XI. Euclidei (a priori haud unquam decidenda) independentem: adjecta ad casum falsitatis, quadratura circuli geometrica*.[3] This work was published in 1831, but its conception dates from 1823. It reveals a profounder appreciation of the importance of the new ideas, but otherwise differs little from Lobatchewsky's. Both men point out that Euclidean geometry as a limiting case of their own more general system, that the geometry of very small spaces is always approximately Euclidean, that no a priori grounds exist for a decision, and that observation can only give an approximate answer. Bolyai gives also, as his title indicates, a geometrical construction, in hyperbolic space, for the quadrature of the circle, and shows that the area of the greatest possible triangle, which has all its sides parallel and all its angles zero, is πi^2, where i is what we should now call the space-constant.

Riemann.

The works of Lobatchewsky and Bolyai, though known and valued by Gauss, remained obscure and ineffective until, in 1866, they were translated into French by J. Hoüel. But at this time Riemann's dissertation, *Über die Hypothesen, welche der Geometrie zu Grunde liegen*,[4] was already about to be published. In this work Riemann, without any knowledge of his predecessors in the same field, inaugurated a far more profound discussion, based on a far more general standpoint; and by its publication in 1867 the attention of mathematicians and philosophers was at last secured. (The dissertation dates from 1854, but owing to changes which Riemann wished to make in it, it remained unpublished until after his death.)

Definition of a manifold.

Riemann's work contains two fundamental conceptions, that of a manifold and that of the *measure of curvature* of a continuous manifold possessed of what he calls flatness in the smallest parts. By means of these conceptions space is made to appear as the end of a gradual series of more and more specialized conceptions. Conceptions of magnitude, he explains, are only possible where we have a general conception capable of determination in various ways. The manifold consists of all these various determinations, each of which is an element of the manifold. The passage from one element to another may be discrete or continuous; the manifold is called discrete or continuous accordingly. Where it is discrete two portions of it can be compared, as to magnitude, by counting; where continuous, by measurement. But measurement demands superposition, and consequently some magnitude independent of its place in the manifold. In passing, in a continuous manifold, from one element to another in a determinate way, we pass through a series of intermediate terms, which form a one-dimensional manifold. If this whole manifold be similarly caused to pass over into another, each of its elements passes through a one-dimensional manifold, and thus on the whole a two-dimensional manifold is generated. In this way we can proceed to n dimensions. Conversely, a manifold of n dimensions can be analysed into one of one dimension and one of $(n-1)$ dimensions. By repetitions of this process the position of an element may be at last determined by n magnitudes. We may here stop to observe that the above conception of a manifold is akin to that due to Hermann Grassmann in the first edition (1847) of his *Ausdehnungslehre*.[5]

Measure of curvature.

Both concepts have been elaborated and superseded by the modern procedure in respect to the axioms of geometry, and by the conception of abstract geometry involved therein. Riemann proceeds to specialize the manifold by considerations as to measurement. If measurement is to be possible, some magnitude, we saw, must be independent of position; let us consider manifolds in which lengths of lines are such magnitudes, so that every line is measurable by every other. The coordinates of a point being $x_1, x_2, \ldots x_n$, let us confine ourselves to lines along which the ratios $dx_1 : dx_2 : \ldots : dx_n$ alter continuously. Let us also assume that the element of length, ds, is unchanged (to the first order) when all its points undergo the same infinitesimal motion. Then if all the increments dx be altered in the same ratio, ds is also altered in this ratio. Hence ds is a homogeneous function of the first degree of the increments dx. Moreover, ds must be unchanged when all the dx change sign. The simplest possible case is, therefore, that in which ds is the square root of a quadratic function of the dx. This case includes space, and is alone considered in what follows. It is called the case of flatness in the smallest parts. Its further discussion depends upon the measure of curvature, the second of Riemann's fundamental conceptions. This conception, derived from the theory of surfaces, is applied as follows. Any one of the shortest lines which issue from a given point (say the origin) is completely determined by the initial ratios of the dx. Two such lines, defined by dx and δx say, determine a pencil, or one-dimensional series, of shortest lines, any one of which is defined

[1] See Stäckel und Engel, *op. cit.*, and "Gauss, die beiden Bolyai, und die nicht-Euklidische Geometrie," *Math. Annalen*, Bd. xlix.; also Engel's translation of Lobatchewsky (Leipzig, 1898), pp. 378 ff.

[2] Lobatchewsky's works on the subject are the following:—"On the Foundations of Geometry," *Kasañ Messenger*, 1829–1830; "New Foundations of Geometry, with a complete Theory of Parallels," *Proceedings of the University of Kasañ*, 1835 (both in Russian, but translated into German by Engel, Leipzig, 1898); "Géométrie imaginaire," *Crelle's Journal*, 1837; *Theorie der Parallellinien* (Berlin, 1840; 2nd ed., 1887; translated by Halsted, Austin, Texas, 1891). His results appear to have been set forth in a paper (now lost) which he read at Kasañ in 1826.

[3] Translated by Halsted (Austin, Texas, 4th ed., 1896).

[4] *Abhandlungen d. Königl. Ges. d. Wiss. zu Göttingen*, Bd. xiii.; *Ges. math. Werke*, pp. 254–269; translated by Clifford, *Collected Mathematical Papers*.

[5] Cf. *Gesamm. math. und phys. Werke*, vol. i. (Leipzig, 1894).

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by $\lambda ds + \mu \delta s$, where the parameter $\lambda : \mu$ may have any value. This pencil generates a two-dimensional series of points, which may be regarded as a surface, and for which we may apply Gauss's formula for the measure of curvature at any point. Thus at every point of our manifold there is a measure of curvature corresponding to every such pencil; but all these can be found when $n.n - 1/2$ of them are known. If figures are to be freely movable, it is necessary and sufficient that the measure of curvature should be the same for all points and all directions at each point. Where this is the case, it a be the measure of curvature, the linear element can be put into the form

$$ds = \sqrt{(\Sigma dx^2)}/(1+\tfrac{1}{4}a\Sigma x^2).$$

If a be positive, space is finite, though still unbounded, and every straight line is closed—a possibility first recognized by Riemann. It is pointed out that, since the possible values of a form a continuous series, observations cannot prove that our space is strictly Euclidean. It is also regarded as possible that, in the infinitesimal, the measure of curvature of our space should be variable.

There are four points in which this profound and epoch-making work is open to criticism or development—(1) the idea of a manifold requires more precise determination; (2) the introduction of coordinates is entirely unexplained and the requisite presuppositions are unanalysed; (3) the assumption that ds is the square root of a quadratic function of $dx_1, dx_2, \ldots$ is arbitrary; (4) the idea of superposition, or congruence, is not adequately analysed. The modern solution of these difficulties is properly considered in connexion with the general subject of the axioms of geometry.

The publication of Riemann's dissertation was closely followed by two works of Hermann von Helmholtz,[1] again undertaken in ignorance of the work of predecessors. In these a proof is attempted that ds must be a rational integral quadratic function of the increments of the coordinates. This proof has since been shown by Lie to stand in need of correction (see VII. *Axioms of Geometry*). Helmholtz's remaining works on the subject[2] are of almost exclusively philosophical interest. We shall return to them later.

Helmholtz.

The only other writer of importance in the second period is Eugenio Beltrami, by whom Riemann's work was brought into connexion with that of Lobatchewsky and Bolyai. As he gave, by an elegant method, a convenient Euclidean interpretation of hyperbolic plane geometry, his results will be stated at some length.[3] The *Saggio* shows that Lobatchewsky's plane geometry holds in Euclidean geometry on surfaces of constant negative curvature, straight lines being replaced by geodesics. Such surfaces are capable of a conformal representation on a plane, by which geodesics are represented by straight lines. Hence if we take, as coordinates on the surface, the Cartesian coordinates of corresponding points on the plane, the geodesics must have linear equations.

Beltrami.

Hence it follows that

$$ds^2 = R^2 w^{-2}\{(a^2-u^2)du^2 + 2uvdudv + (a^2-v^2)dv^2\}$$

where $w^2 = a^2 - u^2 - v^2$, and $-1/R^2$ is the measure of curvature of our surface (note that $k = \gamma a$ as used above). The angle between two geodesics $u = \text{const.}$, $v = \text{const.}$ is θ, where

$$\cos\theta = uv/\sqrt{\{(a^2-u^2)(a^2-v^2)\}},\ \sin\theta = a w/\sqrt{\{(a^2-u^2)(a^2-v^2)\}}.$$

Thus $u = o$ is orthogonal to all geodesics $v = \text{const.}$, and vice versa. In order that $\sin\theta$ may be real, w^2 must be positive; thus geodesics have no real intersection when the corresponding straight lines intersect outside the circle $u^2 + v^2 = a^2$. When they intersect on this circle, $\theta = o$. Thus Lobatchewsky's parallels are represented by straight lines intersecting on the circle. Again, transforming to polar coordinates $u = r\cos\mu$, $v = r\sin\mu$, and calling ρ the geodesic distance of u, v from the origin, we have, for a geodesic through the origin,

$$d\rho = R a dr/(a^2 - r^2),\ \rho = \tfrac{1}{2}R\log\frac{a+r}{a-r},\ r = a\tanh\frac{\rho}{R}.$$

Thus points on the surface corresponding to points in the plane on the limiting circle $r = a$, are all at an infinite distance from the origin. Again, considering r constant, the arc of a geodesic circle subtending an angle μ at the origin is

$$\sigma = R r\mu/\sqrt{(a^2 - r^2)} = \mu R\sin(\rho/R),$$

whence the circumference of a circle of radius ρ is $2\pi R\sin(\rho/R)$. Again, if α be the angle between any two geodesics

$$V - v = m(U - u),\ V - v = n(U - u),$$

then $\tan\alpha = a(n-m)w/\{(1+mn)a^2 - (v-mu)(v-nu)\}$.

Thus α is imaginary when u, v is outside the limiting circle, and is zero when, and only when, u, v is on the limiting circle. All these results agree with those of Lobatchewsky and Bolyai. The maximum triangle, whose angles are all zero, is represented in the auxiliary plane by a triangle inscribed in the limiting circle. The angle of parallelism is also easily obtained. The perpendicular to $v = o$ at a distance δ from the origin is $u = a\tanh(\delta/R)$, and the parallel to this through the origin is $u = v\sin(\delta/R)$. Hence $\Pi(\delta)$, the angle which this parallel makes with $v = o$, is given by

$$\tan\Pi(\delta).\sin(\delta/R) = 1, \text{ or } \tan\tfrac{1}{2}\Pi(\delta) = e^{-\delta/R}$$

which is Lobatchewsky's formula. We also obtain easily for the area of a triangle the formula $R^2(\pi - A - B - C)$.

Beltrami's treatment connects two curves which, in the earlier treatment, had no connexion. These are limit-lines and curves of constant distance from a straight line. Both may be regarded as circles, the first having an infinite, the second an imaginary radius. The equation to a circle of radius ρ and centre $u_0 v_0$ is

$$(a^2 - u u_0 - v v_0)^2 = \cosh^2(\rho/R).w^2 w_0^2 = C^2 w^2 \qquad \text{(say)}.$$

This equation remains real when ρ is a pure imaginary, and remains finite when $u_0 = o$, provided ρ becomes infinite in such a way that $v_0 \cosh(\rho/R)$ remains finite. In the latter case the equation represents a limit-line. In the former case, by giving different values to C, we obtain concentric circles with the imaginary centre $u_0 v_0$. One of these, obtained by putting $C = o$, is the straight line $a^2 - u u_0 - v v_0 = 0$. Hence the others are each throughout at a constant distance from this line. (It may be shown that all motions in a hyperbolic plane consist, in a general sense, of rotations; but three types must be distinguished according as the centre is real, imaginary or at infinity. All points describe, accordingly, one of the three types of circles.)

The above Euclidean interpretation fails for three or more dimensions. In the *Teoria fondamentale*, accordingly, where n dimensions are considered, Beltrami treats hyperbolic space in a purely analytical spirit. The paper shows that Lobatchewsky's space of any number of dimensions has, in Riemann's sense, a constant negative measure of curvature. Beltrami starts with the formula (analogous to that of the *Saggio*)

$$ds^2 = R^2 x^{-2}(dx^2 + dx_1^2 + dx_2^2 + \ldots + dx_n^2)$$

where $x^2 + x_1^2 + x_2^2 + \ldots + x_n^2 = a^2$.

He shows that geodesics are represented by linear equations between $x_1, x_2, \ldots, x_n$, and that the geodesic distance ρ between two points x and x' is given by

$$\cosh\frac{\rho}{R} = \frac{a^2 - x_1x_1' - x_2x_2' - \ldots - x_nx_n'}{\{(a^2 - x_1^2 - x_2^2 - \ldots - x_n^2)(a^2 - x_1'^2 - x_2'^2 - \ldots - x_n'^2)\}^{1/2}}$$

(a formula practically identical with Cayley's, though obtained by a very different method). In order to show that the measure of curvature is constant, we make the substitutions

$$x_1 = r\lambda_1,\ x_2 = r\lambda_2 \ldots x_n = r\lambda_n, \text{ where } \Sigma\lambda^2 = 1.$$

Hence
$$ds^2 = (R a dr/\sqrt{a^2 - r^2})^2 + R^2 r^2 d\lambda^2/(a^2 - r^2).$$

where
$$d\lambda^2 = \Sigma d\lambda^2.$$

Also calling ρ the geodesic distance from the origin, we have

$$\cosh(\rho/R) = \frac{a}{\sqrt{(a^2 - r^2)}},\ \sinh(\rho/R) = \frac{r}{\sqrt{(a^2 - r^2)}}.$$

Hence
$$ds^2 = d\rho^2 + (R\sinh(\rho/R))^2 d\lambda^2.$$

Putting
$$z_1 = \rho\lambda_1,\ z_2 = \rho\lambda_2, \ldots z_n = \rho\lambda_n,$$

we obtain

$$ds^2 = \Sigma dz^2 + \frac{1}{\rho^2}\left\{\left(\frac{R}{R}\sinh\frac{\rho}{R}\right)^2 - 1\right\}\Sigma(z_1dz_2 - z_2dz_1)^2.$$

Hence when ρ is small, we have approximately

$$ds^2 = \Sigma dz^2 + \frac{1}{3R^2}\Sigma(z_1dz_2 - z_2dz_1)^2 \quad . \quad (1).$$

Considering a surface element through the origin, we may choose our axes so that, for this element,

$$z_3 = z_4 = \ldots = z_n = 0.$$

Thus
$$ds^2 = dz_1^2 + dz_2^2 + \frac{1}{3R^2}(z_1dz_2 - z_2dz_1)^2 \quad . \quad (2).$$

Now the area of the triangle whose vertices are (o, o), (z_1, z_2), (dz_1, dz_2) is $\frac{1}{2}(z_1, dz_2 - z_2dz_1)$. Hence the quotient when the terms of the fourth order in (2) are divided by the square of this triangle is

[1] *Wiss. Abh.* vol. ii. pp. 610, 618 (1866, 1868).

[2] *Mind*, O.S., vols. i. and iii.; *Vorträge und Reden*, vol. ii. pp. 1, 256.

[3] His papers are "Saggio di interpretazione della geometria non-Euclidea," *Giornale di matematiche*, vol. vi. (1868); "Teoria fondamentale degli spazii di curvatura costante," *Annali di matematica*, vol. ii. (1868–1869). Both were translated into French by J. Hoüel. *Annales scientifiques de l'École Normale supérieure*, vol. vi. (1869).

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$4/3R^2$; hence, returning to general axes, the same is the quotient when the terms of the fourth order in (1) are divided by the square of the triangle whose vertices are $(o, o, \ldots o)$, $(s_1, s_2, s_3, \ldots s_n)$, $(ds_1, ds_2, ds_3 \ldots ds_n)$. But $-\frac{1}{4}$ of this quotient is defined by Riemann as the measure of curvature.[1] Hence the measure of curvature is $-1/R^2$, *i.e.* is constant and negative. The properties of parallels, triangles, &c., are as in the *Saggio*. It is also shown that the analogues of limit surfaces have zero curvature; and that spheres of radius ρ have constant positive curvature $1/R^2 \sin^2(\rho/R)$, so that spherical geometry may be regarded as contained in the pseudo-spherical (as Beltrami calls Lobachewsky's system).

Transition to the projective method.

The *Saggio*, as we saw, gives a Euclidean interpretation confined to two dimensions. But a consideration of the auxiliary plane suggests a different interpretation, which may be extended to any number of dimensions. If, instead of referring to the pseudosphere, we merely *define* distance and angle, in the Euclidean plane, as those functions of the coordinates which gave us distance and angle on the pseudosphere, we find that the geometry of our plane has become Lobatchewsky's. All the points of the limiting circle are now at infinity, and points beyond it are imaginary. If we give our circle an imaginary radius the geometry on the plane becomes elliptic. Replacing the circle by a sphere, we obtain an analogous representation for three dimensions. Instead of a circle or sphere we may take any conic or quadric. With this definition, if the fundamental quadric be $\Sigma_{rs}=0$, and if Σ_{rs}' be the polar form of Σ_{rs}, the distance ρ between x and x' is given by the projective formula

$$\cos(\rho/k) = \Sigma_{rs}/\{\Sigma_{rs}\Sigma_{r's'}\}^{\frac{1}{2}}.$$

That this formula is projective is rendered evident by observing that $e^{-i\rho/k}$ is the anharmonic of the range consisting of the two points and the intersections of the line joining them with the fundamental quadric. With this we are brought to the third or projective period. The method of this period is due to Cayley; its application to previous non-Euclidean geometry is due to Klein. The projective method contains a generalization of discoveries already made by Laguerre[2] in 1853 as regards Euclidean geometry. The arbitrariness of this procedure of deriving metrical geometry from the properties of conics is removed by Lie's theory of congruence. We then arrive at the stage of thought which finds its expression in the modern treatment of the axioms of geometry.

The two kinds of elliptic space.

The projective method leads to a discrimination, first made by Klein,[3] of two varieties of Riemann's space; Klein calls these elliptic and spherical. They are also called the polar and antipodal forms of elliptic space. The latter names will here be used. The difference is strictly analogous to that between the diameters and the points of a sphere. In the polar form two straight lines in a plane always intersect in one and only one point; in the antipodal form they intersect always in two points, which are antipodes. According to the definition of geometry adopted in section VII. (*Axioms of Geometry*), the antipodal form is not to be termed "geometry," since any pair of coplanar straight lines intersect each other in two points. It may be called a "quasi-geometry." Similarly in the antipodal form two diameters always determine a plane, but two points on a sphere do not determine a great circle when they are antipodes, and two great circles always intersect in two points. Again, a plane does not form a boundary among lines through a point: we can pass from any one such line to any other without passing through the plane. But a great circle does divide the surface of a sphere. So, in the polar form, a complete straight line does not divide a plane, and a plane does not divide space, and does not, like a Euclidean plane, have two sides.[4] But, in the antipodal form, a plane is, in these respects, like a Euclidean plane.

It is explained in section VII. in what sense the metrical geometry of the material world can be considered to be determinate and not a matter of arbitrary choice. The scientific question as to the best available evidence concerning the nature of this geometry is one beset with difficulties of a peculiar kind. We are obstructed by the fact that all existing physical science assumes the Euclidean hypothesis. This hypothesis has been involved in all actual measurements of large distances, and in all the laws of astronomy and physics. The principle of simplicity would therefore lead us, in general, where an observation conflicted with one or more of those laws, to ascribe this anomaly, not to the falsity of Euclidean geometry, but to the falsity of the laws in question. This applies especially to astronomy. On the earth our means of measurement are many and direct, and so long as no great accuracy is sought they involve few scientific laws. Thus we acquire, from such direct measurements, a very high degree of probability that the space-constant, if not infinite, is yet large as compared with terrestrial distances. But astronomical distances and triangles can only be measured by means of the received laws of astronomy and optics, all of which have been established by assuming the truth of the Euclidean hypothesis. It therefore remains possible (until a detailed proof of the contrary is forthcoming) that a large but finite space-constant, with different laws of astronomy and optics, would have equally explained the phenomena. We cannot, therefore, accept the measurements of stellar parallaxes, &c., as conclusive evidence that the space-constant is large as compared with stellar distances. For the present, on grounds of simplicity, we may rightly adopt this view; but it must remain possible that, in view of some hitherto undiscovered discrepancy, a slight correction of the sort suggested might prove the simplest alternative. But conversely, a finite parallax for very distant stars, or a negative parallax for any star, could not be accepted as conclusive evidence that our geometry is non-Euclidean, unless it were shown—and this seems scarcely possible—that no modification of astronomy or optics could account for the phenomenon. Thus although we may admit a probability that the space-constant is large in comparison with stellar distances, a conclusive proof or disproof seems scarcely possible.

Finally, it is of interest to note that, though it is theoretically possible to prove, by scientific methods, that our geometry is non-Euclidean, it is wholly impossible to prove by such methods that it is accurately Euclidean. For the unavoidable errors of observation must always leave a slight margin in our measurements. A triangle might be found whose angles were certainly greater, or certainly less, than two right angles; but to prove them *exactly* equal to two right angles must always be beyond our powers. If, therefore, any man cherishes a hope of proving the exact truth of Euclid, such a hope must be based, not upon scientific, but upon philosophical considerations.

BIBLIOGRAPHY.—The bibliography appended to section VII. should be consulted in this connexion. Also, in addition to the citations already made, the following works may be mentioned.

For Lobatchewsky's writings, cf. *Urkunden zur Geschichte der nichteuklidischen Geometrie*, i., *Nikolaj Iwanowitsch Lobatschefsky*, by F. Engel and P. Stäckel (Leipzig, 1898). For John Bolyai's Appendix cf. *Absolute Geometrie nach Johann Bolyai*, by J. Frischauf (Leipzig, 1872), and also the new edition of his father's large work, *Tentamen* . . . , published by the Mathematical Society of Budapest; the second volume contains the appendix. Cf. also J. Frischauf, *Elemente der absoluten Geometrie* (Leipzig, 1876); H. Liebmann, *Zur la géométrie non-Euclidienne* (thesis for doctorate) (Paris, 1892); de Tilly, *Essai sur les principes fondamentales de la géométrie et de la mécanique* (Bordeaux, 1879); Sir R. S. Ball, "On the Theory of Content," *Trans. Roy. Irish Acad.* vol. xxix. (1888); J. Lindemann, "Mechanik bei projectiver Maasbestimmung," *Math. Annal.* vol. vii.; W. K. Clifford, "Preliminary Sketch of Biquaternions," *Proc. of Lond. Math. Soc.* (1873), and *Coll. Works*; A. Buchheim, "On the Theory of Screws in Elliptic Space," *Proc. Lond. Math. Soc.* vols. xv., xvi., xvii.; H. Cox, "On the Application of Quaternions and Grassmann's Algebra to different Kinds of Uniform Space," *Trans. Camb. Phil. Soc.* (1882); M. Dehn, "Die Legendarischen Sätze über die Winkelsumme im Dreieck," *Math. Ann.* vol. 53 (1900), and "Über den Rauminhalt," *Math. Annal.* vol. 55 (1902).

For expositions of the whole subject, cf. F. Klein, *Nicht-Euklidische Geometrie* (Göttingen, 1893); R. Bonola, *La Geometria non-Euclidea* (Bologna, 1906); P. Barbarin, *La Géométrie non-Euclidienne* (Paris, 1902); W. Killing, *Die nicht-Euklidischen Raumformen in analytischer Behandlung* (Leipzig, 1885). The last-named work also deals with geometry of more than three dimensions; in this connexion cf. also G. Veronese, *Fondamenti di geometria a più dimensioni ed a più specie*

[1] Beltrami shows also that this definition agrees with that of Gauss.

[2] "Sur la théorie des foyers," *Nouv. Ann.* vol. xii.

[3] *Math. Annalen*, iv. vi., 1871–1872.

[4] For an investigation of these and similar properties, see Whitehead, *Universal Algebra* (Cambridge, 1898), bk. vi. ch. ii. The polar form was independently discovered by Simon Newcomb in 1877.

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di unità rettilinee . . (Padua, 1891, German translation, Leipzig, 1894); G. Fontené, *L'Hyperespace à (n − 1) dimensions* (Paris, 1892); and A. N. Whitehead, *loc. cit.* Cf. also E. Study, "Über nicht-Euklidische und Liniengeometrie," *Jahr. d. Deutsch. Math. Ver.* vol. xv. (1906); W. Burnside, "On the Kinematics of non-Euclidean Space," *Proc. Lond. Math. Soc.* vol. xxvi. (1894). A bibliography on the subject up to 1878 has been published by G. B. Halsted, *Amer. Journ. of Math.* vols. i. and ii.; and one up to 1900 by R. Bonola, *Index operum ad geometriam absolutam spectantium* . . . (1902, and Leipzig, 1903). (B. A. W. R.; A. N. W.)

VII. Axioms of Geometry

Until the discovery of the non-Euclidean geometries (Lobatchewsky, 1826 and 1829; J. Bolyai, 1832; B. Riemann, 1854), geometry was universally considered as being exclusively the science of existent space. (See section VI. *Non-Euclidean Geometry.*) In respect to the science, as thus conceived, two controversies may be noticed. First, there is the controversy respecting the absolute and relational theories of space. According to the absolute theory, which is the traditional view (held explicitly by Newton), space has an existence, in some sense whatever it may be, independent of the bodies which it contains. The bodies occupy space, and it is not intrinsically unmeaning to say that any definite body occupies *this* part of space, and not *that* part of space, without reference to other bodies occupying space. According to the relational theory of space, of which the chief exponent was Leibnitz,[1] space is nothing but a certain assemblage of the relations between the various particular bodies in space. The idea of space with no bodies in it is absurd. Accordingly there can be no meaning in saying that a body is *here* and not *there*, apart from a reference to the other bodies in the universe. Thus, on this theory, absolute motion is intrinsically unmeaning. It is admitted on all hands that in practice only relative motion is directly measurable. Newton, however, maintains in the *Principia* (scholium to the 8th definition) that it is indirectly measurable by means of the effects of "centrifugal force" as it occurs in the phenomena of rotation. This irrelevance of absolute motion (if there be such a thing) to science has led to the general adoption of the relational theory by modern men of science. But no decisive argument for either view has at present been elaborated.[2] Kant's view of space as being a form of perception at first sight appears to cut across this controversy. But he, saturated as he was with the spirit of the Newtonian physics, must (at least in both editions of the *Critique*) be classed with the upholders of the absolute theory. The form of perception has a type of existence proper to itself independently of the particular bodies which it contains. For example he writes:[3] "Space does not represent any quality of objects by themselves, or objects in their relation to one another, *i.e.* space does not represent any determination which is inherent in the objects themselves, and would remain, even if all subjective conditions of intuition were removed."

Theories of space.

The second controversy is that between the view that the axioms applicable to space are known only from experience, and the view that in some sense these axioms are given *a priori*. Both these views, thus broadly stated, are capable of various subtle modifications, and a discussion of them would merge into a general treatise on epistemology. The cruder forms of the *a priori* view have been made quite untenable by the modern mathematical discoveries. Geometers now profess ignorance in many respects of the exact axioms which apply to existent space, and it seems unlikely that a profound study of the question should thus obliterate *a priori* intuitions.

Axioms.

Another question irrelevant to this article, but with some relevance to the above controversy, is that of the derivation of our perception of existent space from our various types of sensation. This is a question for psychology.[4]

Definition of Abstract Geometry.—Existent space is the subject matter of only one of the applications of the modern science of abstract geometry, viewed as a branch of pure mathematics. Geometry has been defined[5] as "the study of series of two or more dimensions." It has also been defined[6] as "the science of cross classification." These definitions are founded upon the actual practice of mathematicians in respect to their use of the term "Geometry." Either of them brings out the fact that geometry is not a science with a determinate subject matter. It is concerned with any subject matter to which the formal axioms may apply. Geometry is not peculiar in this respect. All branches of pure mathematics deal merely with types of relations. Thus the fundamental ideas of geometry (*e.g.* those of *points* and of *straight lines*) are not ideas of determinate entities, but of any entities for which the axioms are true. And a set of formal geometrical axioms cannot in themselves be true or false, since they are not determinate propositions, in that they do not refer to a determinate subject matter. The axioms are propositional functions.[7] When a set of axioms is given, we can ask (1) whether they are consistent, (2) whether their "existence theorem" is proved, (3) whether they are independent. Axioms are consistent when the contradictory of any axiom cannot be deduced from the remaining axioms. Their existence theorem is the proof that they are true when the fundamental ideas are considered as denoting some determinate subject matter, so that the axioms are developed into determinate propositions. It follows from the logical law of contradiction that the proof of the existence theorem proves also the consistency of the axioms. This is the only method of proof of consistency. The axioms of a set are independent of each other when no axiom can be deduced from the remaining axioms of the set. The independence of a given axiom is proved by establishing the consistency of the remaining axioms of the set, together with the contradictory of the given axiom. The enumeration of the axioms is simply the enumeration of the hypotheses[8] (with respect to the undetermined subject matter) of which some at least occur in each of the subsequent propositions.

Any science is called a "geometry" if it investigates the theory of the classification of a set of entities (the points) into classes (the straight lines), such that (1) there is one and only one class which contains any given pair of the entities, and (2) every such class contains more than two members. In the two geometries, important from their relevance to existent space, axioms which secure an order of the points on any line also occur. These geometries will be called "Projective Geometry" and "Descriptive Geometry." In projective geometry any two straight lines in a plane intersect, and the straight lines are closed series which return into themselves, like the circumference of a circle. In descriptive geometry two straight lines in a plane do not necessarily intersect, and a straight line is an open series without beginning or end. Ordinary Euclidean geometry is a descriptive geometry; it becomes a projective geometry when the so-called "points at infinity" are added.

Projective Geometry.

Projective geometry may be developed from two undefined fundamental ideas, namely, that of a "point" and that of a "straight line." These undetermined ideas take different specific meanings for the various specific subject matters to which projective geometry can be applied. The number of the axioms is always to some extent arbitrary, being dependent upon the verbal forms of statement which are adopted. They will

[1] For an analysis of Leibnitz's ideas on space, cf. B. Russell, *The Philosophy of Leibnitz*, chs. viii.-x.

[2] Cf. Hon. Bertrand Russell, "Is Position in Time and Space Absolute or Relative?" *Mind*, n.s. vol. 10 (1901), and A. N. Whitehead, "Mathematical Concepts of the Material World," *Phil. Trans.* (1906), p. 205.

[3] Cf. *Critique of Pure Reason*, 1st section: "Of Space," conclusion A, Max Müller's translation.

[4] Cf. Ernst Mach, *Erkenntniss und Irrtum* (Leipzig); the relevant chapters are translated by T. J. McCormack, *Space and Geometry* (London, 1906); also A. Meinong, *Über die Stellung der Gegenstandstheorie im System der Wissenschaften* (Leipzig, 1907).

[5] Cf. Russell, *Principles of Mathematics*, § 352 (Cambridge, 1903).

[6] Cf. A. N. Whitehead, *The Axioms of Projective Geometry*, § 3 (Cambridge, 1906).

[7] Cf. Russell, *Princ. of Math.*, ch. i.

[8] Cf. Russell, *loc. cit.*, and G. Frege, "Über die Grundlagen der Geometrie," *Jahresber. der Deutsch. Math. Ver.* (1906).

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be presented[1] here as twelve in number, eight being "axioms of classification," and four being "axioms of order."

Axioms of Classification.—The eight axioms of classification are as follows:

1. Points form a class of entities with at least two members.

2. Any straight line is a class of points containing at least three members.

3. Any two distinct points lie in one and only one straight line.

4. There is at least one straight line which does not contain all the points.

5. If A, B, C are non-collinear points, and A′ is on the straight line BC, and B′ is on the straight line CA, then the straight lines AA′ and BB′ possess a point in common.

Definition.—If A, B, C are any three non-collinear points, the *plane* ABC is the class of points lying on the straight lines joining A with the various points on the straight line BC.

6. There is at least one plane which does not contain all the points.

7. There exists a plane α, and a point A not incident in α, such that any point lies in some straight line which contains both A and a point in α.

Definition.—Harm. (ABCD) symbolizes the following conjoint statements: (1) that the points A, B, C, D are collinear, and (2) that a quadrilateral can be found with one pair of opposite sides intersecting at A, with the other pair intersecting at C, and with its diagonals passing through B and D respectively. Then B and D are said to be "harmonic conjugates" with respect to A and C.

8. Harm. (ABCD) implies that B and D are distinct points.

In the above axioms 4 secures at least two dimensions, axiom 5 is the fundamental axiom of the plane, axiom 6 secures at least three dimensions, and axiom 7 secures at most three dimensions. From axioms 1-5 it can be proved that any two distinct points in a straight line determine that line, that any three non-collinear points in a plane determine that plane, that the straight line containing any two points in a plane lies wholly in that plane, and that any two straight lines in a plane intersect. From axioms 1-6 Desargues's well-known theorem on triangles in perspective can be proved.

The enunciation of this theorem is as follows: If ABC and A′B′C′ are two coplanar triangles such that the lines AA′, BB′, CC′ are concurrent, then the three points of intersection of BC and B′C′, of CA and C′A′, and of AB and A′B′ are collinear; and conversely if the three points of intersection are collinear, the three lines are concurrent. The proof which can be applied is the usual projective proof by which a third triangle A″B″C″ is constructed not coplanar with the other two, but in perspective with each of them.

It has been proved[2] that Desargues's theorem cannot be deduced from axioms 1-5, that is, if the geometry be confined to two dimensions. All the proofs proceed by the method of introducing a specification of "points" and "straight lines" which satisfies axioms 1-5, and such that Desargues's theorem does not hold.

It follows from axioms 1-5 that Harm. (ABCD) implies Harm. (ADCB) and Harm. (CBAD), and that, if A, B, C be any three distinct collinear points, there exists at least one point D such that Harm. (ABCD). But it requires Desargues's theorem, and hence axiom 6, to prove that Harm. (ABCD) and Harm. (ABCD′) imply the identity of D and D′.

The necessity for axiom 8 has been proved by G. Fano,[3] who has produced a three dimensional geometry of fifteen points, *i.e.* a method of cross classification of fifteen entities, in which each straight line contains three points, and each plane contains seven straight lines. In this geometry axiom 8 does not hold. Also from axioms 1-6 and 8 it follows that Harm. (ABCD) implies Harm. (BCDA).

Definitions.—When two plane figures can be derived from one another by a single projection they are said to be in *perspective*. When two plane figures can be derived one from the other by a finite series of perspective relations between intermediate figures, they are said to be *projectively* related. Any property of a plane figure which necessarily also belongs to any projectively related figure, is called a *projective* property.

The following theorem, known from its importance as "the fundamental theorem of projective geometry," cannot be proved[4] from axioms 1-8. The enunciation is: "A projective correspondence between the points on two straight lines is completely determined when the correspondents of three distinct points on one line are determined on the other." This theorem is equivalent[5] (assuming axioms 1-8) to another theorem, known as Pappus's Theorem, namely: "If *l* and *l′* are two distinct coplanar lines, and A, B, C are three distinct points on *l*, and A′, B′, C′ are three distinct points on *l′*, then the three points of intersection of AB′ and BC′, of A′B and CC′, of BB′ and C′A, are collinear." This theorem is obviously Pascal's well-known theorem respecting a hexagon inscribed in a conic, for the special case when the conic has degenerated into the two lines *l* and *l′*. Another theorem also equivalent (assuming axioms 1-8) to the fundamental theorem is the following:[6] If the three collinear pairs of points, A and A′, B and B′, C and C′, are such that the three pairs of opposite sides of a complete quadrangle pass respectively through them, *i.e.* one pair through A and A′ respectively, and so on, and if also the three sides of the quadrangle which pass through A, B, and C, are concurrent in one of the corners of the quadrangle, then another quadrangle can be found with the same relation to the three pairs of points, except that its three sides which pass through A, B, and C, are not concurrent.

Thus, if we choose to take any one of these three theorems as an axiom, all the theorems of projective geometry which do not require ordinal or metrical ideas for their enunciation can be proved. Also a conic can be defined as the locus of the points found by the usual construction, based upon Pascal's theorem, for points on the conic through five given points. But it is unnecessary to assume here any one of the suggested axioms; for the fundamental theorem can be deduced from the axioms of order together with axioms 1-8.

Axioms of Order.—It is possible to define (cf. Pieri, *loc. cit.*) the property upon which the order of points on a straight line depends. But to secure that this property does in fact range the points in a serial order, some axioms are required. A straight line is to be a closed series; thus, when the points are in order, if we take two points on the line to divide it into two distinct complementary segments, which do not overlap, and together form the whole line. Accordingly the problem of the definition of order reduces itself to the definition of these two segments formed by any two points on the line; and the axioms are stated relatively to these segments.

Definition.—If A, B, C are three collinear points, the points on the *segment ABC* are defined to be those points such as X, for which there exist two points Y and Y′ with the property that Harm. (AYCY′) and Harm. (BYXY′) both hold. The *supplementary segment ABC* is defined to be the rest of the points on the line. This definition is elucidated by noticing that with our ordinary geometrical ideas, if B and X are any two points between A and C, then the two pairs of points, A and C, B and X, define an involution with real double points, namely, the Y and Y′ of the above definition. The property of belonging to a segment ABC is projective, since the harmonic relation is projective.

The first three axioms of order (cf. Pieri, *loc. cit.*) are:

9. If A, B, C are three distinct collinear points, the supplementary segment ABC is contained within the segment BCA.

10. If A, B, C are three distinct collinear points, the common part of the segments BCA and CAB is contained in the supplementary segment ABC.

11. If A, B, C are three distinct collinear points, and D lies in the segment ABC, then the segment ADC is contained within the segment ABC.

From these axioms all the usual properties of a closed order follow. It will be noticed that, if A, B, C are any three collinear points, C is necessarily traversed in passing from A to B by one route along the line, and is not traversed in passing from A to B along the other route. Thus there is no meaning, as referred to closed straight lines, in the simple statement that C lies between A and B. But there may be a relation of separation between two pairs of collinear points, such as A and C, and B and D. The couple B and D is said to separate A and C, if

[1] This formulation—though not in respect to number—is in all essentials that of M. Pieri, cf. "I principii della Geometria di Posizione," *Accad. R. di Torino* (1898); also cf. Whitehead, *loc. cit.*

[2] Cf. G. Peano, "Sui fondamenti della Geometria," p. 73, *Rivista di matematica*, vol. iv. (1894), and D. Hilbert, *Grundlagen der Geometrie* (Leipzig, 1899); and R. F. Moulton, "A Simple non-Desarguesian Plane Geometry," *Trans. Amer. Math. Soc.*, vol. iii. (1902).

[3] Cf. "Sui postulati fondamentali della geometria projettiva," *Giorn. di matematica*, vol. xxx. (1892); also of Pieri, *loc. cit.*, and Whitehead, *loc. cit.*

[4] Cf. Hilbert, *loc. cit.*; for a fuller exposition of Hilbert's proof cf. K. T. Vahlen, *Abstrakte Geometrie* (Leipzig, 1905), also Whitehead, *loc. cit.*

[5] Cf. H. Wiener, *Jahresber. der Deutsch. Math. Ver.* vol. i. (1890); and F. Schur, "Über den Fundamentalsatz der projectiven Geometrie," *Math. Ann.* vol. li. (1899).

[6] Cf. Hilbert, *loc. cit.*, and Whitehead, *loc. cit.*

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the four points are collinear and D lies in the segment complementary to the segment ABC. The property of the separation of pairs of points by pairs of points is projective. Also it can be proved that Harm. (ABCD) implies that B and D separate A and C.

Definitions.—A series of entities arranged in a serial order, open or closed, is said to be *compact*, if the series contains no immediately consecutive entities, so that in traversing the series from any one entity to any other entity it is necessary to pass through a series distinct from either. It was the merit of R. Dedekind and of G. Cantor explicitly to formulate another fundamental property of series. The Dedekind property[1] as applied to an open series can be defined thus: An open series possesses the Dedekind property, if, however, it be divided into two mutually exclusive classes u and v, which (1) contain between them the whole series, and (2) are such that every member of u precedes in the serial order every member of v, there is always a member of the series, belonging to one of the two, u or v, which precedes every member of v (other than itself if it belong to v), and also succeeds every member of u (other than itself if it belong to u). Accordingly in an open series with the Dedekind property there is always a member of the series marking the junction of two classes such as u and v. An open series is *continuous* if it is compact and possesses the Dedekind property. A closed series can always be transformed into an open series by taking any arbitrary member as the first term and by taking one of the two ways round as the ascending order of the series. Thus the definitions of compactness and of the Dedekind property can be at once transferred to a closed series.

12. The last axiom of order is that there exists at least one straight line for which the point order possesses the Dedekind property.

It follows from axioms 1-12 by projection that the Dedekind property is true for all lines. Again the *harmonic system ABC*, where A, B, C are collinear points, is defined[2] thus: take the harmonic conjugates A', B', C' of each point with respect to the other two, again take the harmonic conjugates of each of the six points A, B, C, A', B', C' with respect to each pair of the remaining five, and proceed in this way by an unending series of steps. The set of points thus obtained is called the harmonic system ABC. It can be proved that a harmonic system is compact, and that every segment of the line containing it possesses members of it. Furthermore, it is easy to prove that the fundamental theorem holds for harmonic systems, in the sense that, if A, B, C are three points on a line l, and A', B', C' are three points on a line l', and if by any two distinct series of projections A, B, C are projected into A', B', C', then any point of the harmonic system ABC corresponds to the same point of the harmonic system A'B'C' according to both the projective relations which are thus established between l and l'. It now follows immediately that the fundamental theorem must hold for all the points on the lines l and l', since (as has been pointed out) harmonic systems are "everywhere dense" on their containing lines. Thus the fundamental theorem follows from the axioms of order.

A system of numerical coordinates can now be introduced, possessing the property that linear equations represent planes and straight lines. The outline of the argument by which this remarkable problem (in that "distance" is as yet undefined) is solved, will now be given. It is first proved that the points on any line can in a certain way be definitely associated with all the positive and negative real numbers, so as to form with them a one-one correspondence. The arbitrary elements in the establishment of this relation are the points on the line associated with 0, 1 and ∞.

This association[3] is most easily effected by considering a class of projective relations of the line with itself, called by F. Schur (*loc. cit.*) *prospectivities*.

Let l (fig. 69) be the given line, m and n any two lines intersecting at U on l, S and S' two points on n. Then a projective relation between l and itself is formed by projecting l from S on to m, and then by projecting m from S' back on to l. All such projective relations, however m, n, S and S' be varied, are called "prospectivities," and U is the double point of the prospectivity. If a point O on l is related to A by a prospectivity, then all prospectivities, which (1) have the same double point U, and (2) relate O to A, give the same correspondent (Q, in figure) to any point P on the line l; in fact they are all the same prospectivity, however m, n, S, and S' may have been varied subject to these conditions. Such a prospectivity will be denoted by $(OAU)^2$.

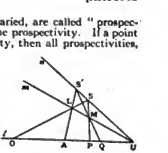

FIG. 69.

The sum of two prospectivities, written $(OAU^2)+(OBU^2)$, is defined to be that transformation of the line l into itself which is obtained by first applying the prospectivity (OAU^2) and then applying the prospectivity (OBU^2). Such a transformation, when the two summands have the same double point, is itself a prospectivity with that double point.

With this definition of addition it can be proved that prospectivities with the same double point satisfy all the axioms of magnitude. Accordingly they can be associated in a one-one correspondence with the positive and negative real numbers. Let E (fig. 70) be any point on l, distinct from O and U. Then the prospectivity (OEU^2) is associated with unity, the prospectivity (OOU^2) is associated with zero, and (OUU^2) with ∞. The prospectivities of the type (OPU^2), where P is any point on the segment OEU, correspond to the positive numbers; also if P' is the harmonic conjugate of P with respect to O and U, the prospectivity $(OP'U^2)$ is associated with the corresponding negative number. (The subjoined figure explains this relation of the positive and negative prospectivities.) Then any point P on l is associated with the same number as is the prospectivity (OPU^2).

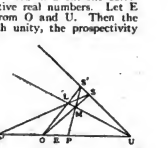

FIG. 70.

It can be proved that the order of the numbers in algebraic order of magnitude agrees with the order on the line of the associated points. Let the numbers, assigned according to the preceding specification, be said to be associated with the points according to the "numeration-system (OEU)." The introduction of a coordinate system for a plane is now managed as follows: Take any triangle OUV in the plane, and on the lines OU and OV establish the numeration systems (OE_1U) and (OE_2V), where E_1 and E_2 are arbitrarily chosen. Then (cf. fig. 71) if M and N are associated with the numbers x and y according to these systems, the coordinates of P are x and y. It then follows that the equation of a straight line is of the form $ax+by+c=0$. The coordinates of any point on the line UV are infinite. This can be avoided by introducing homogeneous coordinates X, Y, Z, where $x=X/Z$, and $y=Y/Z$, and $Z=0$ is the equation of UV.

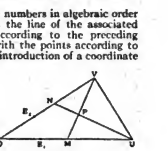

FIG. 71.

The procedure for three dimensions is similar. Let OUVW (fig. 72) be any tetrahedron, and associate points on OU, OV, OW with numbers according to the numeration systems (OE_1U), (OE_2V), and (OE_3W). Let the planes VWP, WUP, UVP cut OU, OV, OW in L, M, N respectively; and let x, y, z be the numbers associated with L, M, N respectively. Then P is the point (x, y, z). Also homogeneous coordinates can be introduced as before, thus avoiding the infinities on the plane UVW.

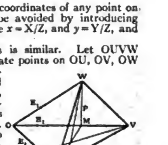

FIG. 72.

The cross ratio of a range of four collinear points can now be defined as a number characteristic of that range. Let the coordinates of any point P_r of the range P_1 P_2 P_3 P_4 be

$$\frac{\lambda_1 a+\mu_1 a'}{\lambda_1+\mu_1}, \quad \frac{\lambda_2 b+\mu_2 b'}{\lambda_2+\mu_2}, \quad \frac{\lambda_3 c+\mu_3 c'}{\lambda_3+\mu_3}, \quad (r=1, 2, 3, 4)$$

and let $(\lambda_r a_s)$ be written for $\lambda_r a_s - \lambda_s a_r$. Then the cross ratio $|P_1 P_2 P_3 P_4|$ is defined to be the number $(\lambda_1 a_3)(\lambda_2 a_4)/(\lambda_1 a_4)(\lambda_2 a_3)$. The equality of the cross ratios of the ranges $(P_1 P_2 P_3 P_4)$ and $(Q_1 Q_2 Q_3 Q_4)$ is proved to be the necessary and sufficient condition for their mutual projectivity. The cross ratios of all harmonic ranges are then easily seen to be all equal to -1, by comparing with the range $(OE_1UE'_1)$ on the axis of x.

Thus all the ordinary propositions of geometry in which distance and angular measure do not enter otherwise than in cross ratios can now be enunciated and proved. Accordingly the greater part of the analytical theory of conics and quadrics belongs to geometry

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at this stage. The theory of distance will be considered after the principles of descriptive geometry have been developed.

Descriptive Geometry.

Descriptive geometry is essentially the science of multiple order for open series. The first satisfactory system of axioms was given by M. Pasch.[1] An improved version is due to G. Peano.[2] Both these authors treat the idea of the class of points constituting the segment lying *between* two points as an undefined fundamental idea. Thus in fact there are in this system two fundamental ideas, namely, of points and of segments. It is then easy enough to define the prolongations of the segments, so as to form the complete straight lines. D. Hilbert's[3] formulation of the axioms is in this respect practically based on the same fundamental ideas. His work is justly famous for some of the mathematical investigations contained in it, but his exposition of the axioms is distinctly inferior to that of Peano. Descriptive geometry can also be considered [4] as the science of a class of relations, each relation being a two-termed serial relation, as considered in the logic of relations, ranging the points between which it holds into a linear open order. Thus the relations are the straight lines, and the terms between which they hold are the points. But a combination of these two points of view yields [5] the simplest statement of all. Descriptive geometry is then conceived as the investigation of an undefined fundamental relation between three terms (points); and when the relation holds between three points A, B, C, the points are said to be "in the [linear] order ABC."

O. Veblen's axioms and definitions, slightly modified, are as follows:—

1. If the points A, B, C are in the order ABC, they are in the order CBA.

2. If the points A, B, C are in the order ABC, they are not in the order BCA.

3. If the points A, B, C are in the order ABC, A is distinct from C.

4. If A and B are any two distinct points, there exists a point C such that A, B, C are in the order ABC.

Definition.—The *line* AB (A ≠ B) consists of A and B, and of all points X in one of the possible orders, ABX, AXB, XAB. The points X in the order AXB constitute the *segment* AB.

5. If points C and D (C ≠ D) lie on the line AB, then A lies on the line CD.

6. There exist three distinct points A, B, C not in any of the orders ABC, BCA, CAB.

7. If three distinct points A, B, C (fig. 73) do not lie on the same line, and D and E are two distinct points in the orders BCD and CEA, then a point F exists in the order AFB, and such that D, E, F are collinear.

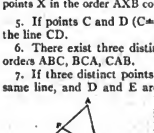

FIG. 73.

Definition.—If A, B, C are three non-collinear points, the *plane* ABC is the class of points which lie on any one of the lines joining any two of the points belonging to the boundary of the triangle ABC, the *boundary* being formed by the segments BC, CA and AB. The *interior* of the triangle ABC is formed by the points in segments such as PQ, where P and Q are points respectively on two of the segments BC, CA, AB.

8. There exists a plane ABC, which does not contain all the points.

Definition.—If A, B, C, D are four non-coplanar points, the space ABCD is the class of points which lie on any of the lines containing two points on the surface of the tetrahedron ABCD, the *surface* being formed by the interiors of the triangles ABC, BCD, DCA, DAB.

9. There exists a space ABCD which contains all the points.

10. The Dedekind property holds for the order of the points on any straight line.

It follows from axioms 1-9 that the points on any straight line are arranged in an open serial order. Also all the ordinary theorems respecting a point dividing a straight line into two parts, a straight line dividing a plane into two parts, and a plane dividing space into two parts, follow.

Again, in any plane α consider a line l and a point A (fig. 74).

Let any point B divide l into two half-lines l_1 and l_2. Then it can be proved that the set of half-lines, emanating from A and intersecting l_1 (such as m), are bounded by two half-lines, of which ABC is one. Let r be the other. Then it can be proved that r does not intersect l_1. Similarly for the half-line, such as n, intersecting l_2. Let s be its bounding half-line. Then two cases are possible. (1) The half-lines r and s are collinear, and together form one complete line. In this case, there is one and only one line (viz. $r+s$) through A and lying in α which does not intersect l. This is the Euclidean case, and the assumption that this case holds is the *Euclidean parallel axiom*. But (2) the half-lines r and s may not be collinear. In this case there will be an infinite number of lines, such as k for instance, containing A and lying in α, which do not intersect l. Then the lines through A in α are divided into two classes by reference to l, namely, the *secant* lines which intersect l, and the *non-secant* lines which do not intersect l. The two boundary non-secant lines, of which r and s are respectively halves, may be called the two parallels to l through A.

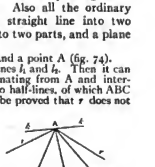

FIG. 74.

The perception of the possibility of case 2 constituted the starting-point from which Lobatchewsky constructed the first explicit consistent theory of non-Euclidean geometry, and thus created a revolution in the philosophy of the subject. For many centuries the speculations of mathematicians on the foundations of geometry were almost confined to hopeless attempts to prove the "parallel axiom" without the introduction of some equivalent axiom.[6]

Associated Projective and Descriptive Spaces.—A region of a projective space, such that one, and only one, of the two supplementary segments between any pair of points within it lies entirely within it, satisfies the above axioms (1-10) of descriptive geometry, where the points of the region are the descriptive points, and the portions of straight lines within the region are the descriptive lines. If the excluded part of the original projective space is a single plane, the Euclidean parallel axiom also holds, otherwise it does not hold for the descriptive space of the limited region. Again, conversely, starting from an original descriptive space an associated projective space can be constructed by means of the concept of *ideal points*.[7] These are also called *projective points*, where it is understood that the simple points are the points of the original descriptive space. An *ideal point* is the class of straight lines which is composed of two coplanar lines a and b, together with the lines of intersection of all pairs of intersecting planes which respectively contain a and b, together with the lines of intersection with the plane ab of all planes containing any one of the lines (other than a or b) already specified as belonging to the ideal point. It is evident that, if the two original lines a and b intersect, the corresponding ideal point is nothing else than the whole class of lines which are concurrent at the point ab. But the essence of the definition is that an ideal point has an existence when the lines a and b do not intersect, so long as they are coplanar. An ideal point is termed *proper*, if the lines composing it intersect; otherwise it is *improper*.

A theorem essential to the whole theory is the following: if any two of the three lines a, b, c are coplanar, but the three lines are not all coplanar, and similarly for the lines a, b, d, then c and d are coplanar. It follows that any two lines belonging to an ideal point can be used as the pair of guiding lines in the definition. An ideal point is said to be *coherent* with a plane, if any of the lines composing it lie in the plane. An *ideal line* is the class of ideal points each of which is coherent with two given planes.

[1] Cf. *loc. cit.*

[2] Cf. *I Principii di geometria* (Turin, 1889) and "Sui fondamenti della geometria," *Rivista di mat.* vol. iv. (1894).

[3] Cf. *loc. cit.*

[4] Cf. Vailati, *Rivista di mat.* vol. iv. and Russell, *loc. cit.* § 376.

[5] Cf. O. Veblen, "On the Projective Axioms of Geometry," *Trans. Amer. Math. Soc.* vol. iii. (1902).

[6] Cf. P. Stäckel and F. Engel, *Die Theorie der Parallellinien von Euklid bis auf Gauss* (Leipzig, 1895).

[7] Cf. Pasch, *loc. cit.*, and R. Bonola, "Sulla introduzione degli enti impropri in geometria projettive," *Giorn. di mat.* vol. xxxviii. (1900); and Whitehead, *Axioms of Descriptive Geometry* (Cambridge, 1907).

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If the planes intersect, the ideal line is termed *proper*, otherwise it is *improper*. It can be proved that any two planes, with which any two of the ideal points are both coherent, will serve as the guiding planes used in the definition. The ideal planes are defined as in projective geometry, and all the other definitions (for segments, order, &c.) of projective geometry are applied to the ideal elements. If an ideal plane contains some proper ideal points, it is called *proper*, otherwise it is *improper*. Every ideal plane contains some improper ideal points.

It can now be proved that all the axioms of projective geometry hold of the ideal elements as thus obtained; and also that the order of the ideal points as obtained by the projective method agrees with the order of the proper ideal points as obtained from that of the associated points of the descriptive geometry. Thus a projective space has been constructed out of the ideal elements, and the proper ideal elements correspond element by element with the associated descriptive elements. Thus the proper ideal elements form a region in the projective space within which the descriptive axioms hold. Accordingly, by substituting ideal elements, a descriptive space can always be considered as a region within a projective space. This is the justification for the ordinary use of the "points at infinity" in the ordinary Euclidean geometry; the reasoning has been transferred from the original descriptive space to the associated projective space of ideal elements; and with the Euclidean parallel axiom the improper ideal elements reduce to the ideal points on a single improper ideal plane, namely, the plane at infinity.[1]

Congruence and Measurement.—The property of physical space which is expressed by the term "measurability" has now to be considered. This property has often been considered as essential to the very idea of space. For example, Kant writes,[2] "Space is represented as an infinite given *quantity*." This quantitative aspect of space arises from the measurability of distances, of angles, of surfaces and of volumes. These four types of quantity depend upon the two first among them as fundamental. The measurability of space is essentially connected with the idea of *congruence*, of which the simplest examples are to be found in the proofs of equality by the method of superposition, as used in elementary plane geometry. The mere concepts of "part" and of "whole" must of necessity be inadequate as the foundation of measurement, since we require the comparison as to quantity of regions of space which have no portions in common. The idea of congruence, as exemplified by the method of superposition in geometrical reasoning, appears to be founded upon that of the "rigid body," which moves from one position to another with its internal spatial relations unchanged. But unless there is a previous concept of the metrical relations between the parts of the body, there can be no basis from which to deduce that they are unchanged.

It would therefore appear as if the idea of the congruence, or metrical equality, of two portions of space (as empirically suggested by the motion of rigid bodies) must be considered as a fundamental idea incapable of definition in terms of those geometrical concepts which have already been enumerated. This was in effect the point of view of Pasch.[3] It has, however, been proved by Sophus Lie[4] that congruence is capable of definition without recourse to a new fundamental idea. This he does by means of his theory of finite continuous groups (see GROUPS, THEORY OF), of which the definition is possible in terms of our established geometrical ideas, remembering that coordinates have already been introduced. The displacement of a rigid body is simply a mode of defining to the senses a one-one transformation of all space into itself. For at any point of space a particle may be conceived to be placed, and to be rigidly connected with the rigid body; and thus there is a definite correspondence of any point of space with the new point occupied by the associated particle after displacement. Again two successive displacements of a rigid body from position A to position B, and from position B to position C, are the same in effect as one displacement from A to C. But this is the characteristic "group" property. Thus the transformations of space into itself defined by displacements of rigid bodies form a group.

Call this group of transformations a congruence-group. Now according to Lie a congruence-group is defined by the following characteristics:—

1. A congruence-group is a finite continuous group of one-one transformations, containing the identical transformation.

2. It is a sub-group of the general projective group, *i.e.* of the group of which any transformation converts planes into planes, and straight lines into straight lines.

3. An infinitesimal transformation can always be found satisfying the condition that, at least throughout a certain enclosed region, any definite line and any definite point on the line are latent, *i.e.* correspond to themselves.

4. No infinitesimal transformation of the group exists, such that, at least in the region for which (3) holds, a straight line, a point on it, and a plane through it, shall all be latent.

The property enunciated by conditions (3) and (4), taken together, is named by Lie "Free mobility in the infinitesimal." Lie proves the following theorems for a projective space:—

1. If the above four conditions are only satisfied by a group throughout part of projective space, this part either (α) must be the region enclosed by a real closed quadric, or (β) must be the whole of the projective space with the exception of a single plane. In case (α) the corresponding congruence group is the continuous group for which the enclosing quadric is latent; and in case (β) an imaginary conic (with a real equation) lying in the latent plane is also latent, and the congruence group is the continuous group for which the plane and conic are latent.

2. If the above four conditions are satisfied by a group throughout the whole of projective space, the congruence group is the continuous group for which some imaginary quadric (with a real equation) is latent.

By a proper choice of non-homogeneous co-ordinates the equation of any quadrics of the types considered, either in theorem 1 (α), or in theorem 2, can be written in the form $1+c(x^2+y^2+z^2)=0$, where c is negative for a real closed quadric, and positive for an imaginary quadric. Then the general infinitesimal transformation is defined by the three equations:

$$\left.\begin{aligned} dx/dt &= u-w_3y+w_2z+cx(ux+vy+wz),\\ dy/dt &= v-w_1z+w_3x+cy(ux+vy+wz),\\ dz/dt &= w-w_2x+w_1y+cz(ux+vy+wz). \end{aligned}\right\} \quad (A)$$

In the case considered in theorem 1 (β), with the proper choice of co-ordinates the three equations defining the general infinitesimal transformation are:

$$\left.\begin{aligned} dx/dt &= u-w_3y+w_2z,\\ dy/dt &= v-w_1z+w_3x,\\ dz/dt &= w-w_2x+w_1y, \end{aligned}\right\} \quad (B)$$

In this case the latent plane is the plane for which at least one of x, y, z are infinite, that is, the plane $0.x+0.y+0.z+a=0$; and the latent conic is the conic in which the cone $x^2+y^2+z^2=0$ intersects the latent plane.

It follows from theorems 1 and 2 that there is not one unique congruence-group, but an indefinite number of them. There is one congruence-group corresponding to each closed real quadric, one to each imaginary quadric with a real equation, and one to each imaginary conic in a real plane and with a real equation. The quadric thus associated with each congruence-group is called the *absolute* for that group, and in the degenerate case of 1 (β) the absolute is the latent plane together with the latent imaginary conic. If the absolute is real, the congruence-group is *hyperbolic*; if imaginary, it is *elliptic*; if the absolute is a plane and imaginary conic, the group is parabolic. Metrical geometry is simply the theory of the properties of some particular congruence-group selected for study.

The definition of distance is connected with the corresponding congruence-group by two considerations in respect to a range of five points $(A_1, A_2, P_1, P_2, P_3)$, of which A_1 and A_2 are on the absolute.

Let $[A_1P_1A_2P_2]$ stand for the cross ratio (as defined above) of the range $(A_1P_1A_2P_2)$, with a similar notation for the other ranges. Then

$$(1) \qquad \log[A_1P_1A_2P_3] + \log[A_1P_2A_2P_3] = \log[A_1P_1A_2P_2],$$

and

(2), if the points A_1, A_2, P_1, P_2 are transformed into A'_1, A'_2, P'_1, P'_2 by any transformation of the congruence-group, (a) $[A_1P_1A_2P_2] = [A'_1P'_1A'_2P'_2]$, since the transformation is projective, and (β) A'_1, A'_2 are on the absolute since A_1 and A_2 are on it. Thus if we define

[1] The original idea (confined to this particular case) of ideal points is due to von Staudt (*loc. cit.*).

[2] Cf. *Critique*, "Trans. Aesth." Sect. 1.

[3] Cf. *loc. cit.*

[4] Cf. *Über die Grundlagen der Geometrie* (Leipzig, *Ber.*, 1890); and *Theorie der Transformationsgruppen* (Leipzig, 1893), vol. iii.

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the distance P_1P_2 to be $\frac{1}{2}k \log [A_1P_1A_2P_2]$, where A_1 and A_2 are the points in which the line P_1P_2 cuts the absolute, and k is some constant, the two characteristic properties of distance, namely, (1) the addition of consecutive lengths on a straight line, and (2) the invariability of distances during a transformation of the congruence-group, are satisfied. This is the well-known Cayley-Klein projective definition[1] of distance, which was elaborated in view of the addition property alone, previously to Lie's discovery of the theory of congruence-groups. For a hyperbolic group when P_1 and P_2 are in the region enclosed by the absolute, $\log [A_1P_1A_2P_2]$ is real, and therefore k must be real. For an elliptic group A_1 and A_2 are conjugate imaginaries, and $\log [A_1P_1A_2P_2]$ is a pure imaginary, and k is chosen to be κi, where κ is real and $i = \sqrt{-1}$.

Similarly the angle between two planes, p_1 and p_2, is defined to be $(1/2i) \log (l_1p_2l_2p_1)$, where l_1 and l_2 are tangent planes to the absolute through the line p_1p_2. The planes l_1 and l_2 are imaginary for an elliptic group, and also for an hyperbolic group when the planes p_1 and p_2 intersect at points within the region enclosed by the absolute. The development of the consequences of these metrical definitions is the subject of non-Euclidean geometry.

The definitions for the parabolic case can be arrived at as limits of those obtained in either of the other two cases by making k ultimately to vanish. It is also obvious that, if P_1 and P_2 be the points (x_1, y_1, z_1) and (x_2, y_2, z_2), it follows from equations (B) above that $[(x_1-z_1)^2+(y_1-y_2)^2+(z_1-z_2)^2]$ is unaltered by a congruence transformation and also satisfies the addition property for collinear distances. Also the previous definition of an angle can be adapted to this case, by making l_1 and l_2 to be the tangent planes through the line p_1p_2 to the imaginary conic. Similarly if p_1 and p_2 are intersecting lines, the same definition of an angle holds, where l_1 and l_2 are now the lines from the point p_1p_2 to the two points where the plane p_1p_2 cuts the imaginary conic. These points are in fact the "circular points at infinity" on the plane. The development of the consequences of these definitions for the parabolic case gives the ordinary Euclidean metrical geometry.

Thus the only metrical geometry for the whole of projective space is of the elliptic type. But the actual measure-relations (though not their general properties) differ according to the elliptic congruence-group selected for study. In a descriptive space a congruence-group should possess the four characteristics of such a group throughout the whole of the space. Then form the associated ideal projective space. The selected congruence-group for this ideal space must satisfy the four conditions throughout the region of the proper ideal points. Thus the boundary of this region is the absolute. Accordingly there can be no metrical geometry for the whole of a descriptive space unless its boundary (in the associated ideal space) is a closed quadric or a plane. If the boundary is a closed quadric, there is one possible congruence-group of the hyperbolic type. If the boundary is a plane (the plane at infinity), the possible congruence-groups are parabolic; and there is a congruence-group corresponding to each imaginary conic in this plane, together with a Euclidean metrical geometry corresponding to each such group. Owing to these alternative possibilities, it would appear to be more accurate to say that systems of quantities can be found in a space, rather than that space is a quantity.

Lie has also deduced[2] the same results with respect to congruence-groups from another set of defining properties, which explicitly assume the existence of a quantitative relation (the distance) between any two points, which is invariant for any transformation of the congruence-group.[3]

The above results, in respect to congruence and metrical geometry, considered in relation to existent space, have led to the doctrine[4] that it is intrinsically unmeaning to ask which system of metrical geometry is true of the physical world. Any one of these systems can be applied, and in an indefinite number of ways. The only question before us is one of convenience in respect to simplicity of statement of the physical laws. This point of view seems to neglect the consideration that science is to be relevant to the definite perceiving minds of men; and that (neglecting the ambiguity introduced by the invariable slight inexactness of observation which is not relevant to this special doctrine) we have, in fact, presented to our senses a definite set of transformations forming a congruence-group, resulting in a set of measure relations which are in no respect arbitrary. Accordingly our scientific laws are to be stated relevantly to that particular congruence-group. Thus the investigation of the type (elliptic, hyperbolic or parabolic) of this special congruence-group is a perfectly definite problem, to be decided by experiment. The consideration of experiments adapted to this object requires some development of non-Euclidean geometry (see section VI., *Non-Euclidean Geometry*). But if the doctrine means that, assuming some sort of objective reality for the material universe, beings can be imagined, to whom *either* all congruence-groups are equally important, *or* some other congruence-group is specially important, the doctrine appears to be an immediate deduction from the mathematical facts. Assuming a definite congruence-group, the investigation of surfaces (or three-dimensional loci in space of four dimensions) with geodesic geometries of the form of metrical geometries of other types of congruence-groups forms an important chapter of non-Euclidean geometry. Arising from this investigation there is a widely-spread fallacy, which has found its way into many philosophic writings, namely, that the possibility of the geometry of existent three-dimensional space being other than Euclidean depends on the physical existence of Euclidean space of four or more dimensions. The foregoing exposition shows the baselessness of this idea.

BIBLIOGRAPHY.—For an account of the investigations on the axioms of geometry during the Greek period, see M. Cantor, *Vorlesungen über die Geschichte der Mathematik*, Bd. i. and iii.; T. L. Heath, *The Thirteen Books of Euclid's Elements, a New Translation from the Greek, with Introductory Essays and Commentary, Historical, Critical, and Explanatory* (Cambridge, 1908)—this work is the standard source of information; W. B. Frankland, *Euclid, Book I., with a Commentary* (Cambridge, 1905)—the commentary contains copious extracts from the ancient commentators. The period of really substantive importance is that of the 18th century. The leading authors are: G. Saccheri, S.J., *Euclides ab omni naevo vindicatus* (Milan, 1733). Saccheri was an Italian Jesuit who unconsciously discovered non-Euclidean geometry in the course of his efforts to prove its impossibility. J. H. Lambert, *Theorie der Parallellinien* (1766); A. M. Legendre, *Éléments de géométrie* (1794). An adequate account of the above authors is given by F. Stäckel and F. Engel, *Die Theorie der Parallellinien von Euklid bis auf Gauss* (Leipzig, 1895). The next period of time (roughly from 1800 to 1870) contains two streams of thought, both of which are essential to the modern analysis of the subject. The first stream is that which produced the discovery and investigation of non-Euclidean geometries, the second stream is that which has produced the geometry of position, comprising both projective and descriptive geometry not very accurately discriminated. The leading authors on non-Euclidean geometry are K. F. Gauss, in private letters to Schumacher, G. Stäckel and Engel, *loc. cit.*; N. Lobatchewsky, rector of the university of Kazan, to whom the honour of the effective discovery of non-Euclidean geometry must be assigned. His first publication was at Kazan in 1826. His various memoirs have been re-edited by Engel; cf. *Urkunden zur Geschichte der nichteuklidischen Geometrie* by Stäckel and Engel, vol. i. "Lobatchewsky." J. Bolyai discovered non-Euclidean geometry apparently in independence of Lobatchewsky. His memoir was published in 1831 as an appendix to a work by his father W. Bolyai, *Tentamen juventutem*. . . . This memoir has been separately edited by J. Frischauf, *Absolute Geometrie nach J. Bolyai* (Leipzig, 1872); B. Riemann, *Über die Hypothesen, welche der Geometrie zu Grunde liegen* (1854); cf. *Gesamte Werke*, a translation in *The Collected Papers* of W. K. Clifford. This is a fundamental memoir on the subject and must rank with the work of Lobatchewsky. Riemann discovered elliptic metrical geometry, and Lobatchewsky hyperbolic geometry. A full account of Riemann's ideas, with the subsequent developments due to Clifford, F. Klein and W. Killing, will be found in *The Boston Colloquium for 1903* (New York, 1905), article "Forms of Non-Euclidean Space," by F. S. Woods. A. Cayley, *loc. cit.* (1859), and F. Klein, "Über die sogenannte nichteuklidische Geometrie," *Math. Annal.* vols. iv. and vi. (1871 and 1872), between them elaborated the projective theory of distance; H. Helmholtz, "Über die thatsächlichen Grundlagen der Geometrie" (1866), and "Über die Thatsachen, die der Geometrie zu Grunde liegen" (1868), both in his *Wissenschaftliche Abhandlungen*, vol. ii., and S. Lie, *loc. cit.* (1890 and 1893), between them elaborated the group theory of congruence.

The numberless works which have been written to suggest equivalent alternatives to Euclid's parallel axioms may be neglected as being of trivial importance, though many of them are marvels of geometric ingenuity.

The second stream of thought confined itself within the circle of ideas of Euclidean geometry. Its origin was mainly due to a

[1] Cf. A. Cayley, "A Sixth Memoir on Quantics," *Trans. Roy. Soc.*, 1859, and *Coll. Papers*, vol. ii.; and F. Klein, *Math. Ann.* vol. iv., 1871.

[2] Cf. *loc. cit.*

[3] For similar deductions from a third set of axioms, suggested in essence by Peano, *Riv. mat.* vol. iv. *loc. cit.* cf. Whitehead, *Desc. Geom. loc. cit.*

[4] Cf. H. Poincaré, *La Science et l'hypothèse*, ch. iii.

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succession of great French mathematicians, for example, G. Monge, *Géomitrie descriptive* (1800); J. V. Poncelet, *Traité des propriétés projectives des figures* (1822); M. Chasles, *Aperçu historique sur l'origine et le développement des méthodes en géométrie* (Bruxelles, 1837), and *Traité de géométrie supérieure* (Paris, 1852); and many others. But the works which have been, and are still, of decisive influence on thought as a store-house of ideas relevant to the foundations of geometry are K. G. C. von Staudt's two works, *Geometrie der Lage* (Nürnberg, 1847); and *Beiträge zur Geometrie der Lage* (Nürnberg, 1856, 3rd ed. 1860).

The final period is characterized by the successful production of exact systems of axioms, and by the final solution of problems which have occupied mathematicians for two thousand years. The successful analysis of the ideas involved in serial continuity is due to R. Dedekind, *Stetigkeit und irrationale Zahlen* (1872), and to G. Cantor, *Grundlagen einer allgemeinen Mannigfaltigkeitslehre* (Leipzig, 1883), and *Acta math.* vol. 2.

Complete systems of axioms have been stated by M. Pasch, *loc. cit.*; G. Peano, *loc. cit.*; M. Pieri, *loc. cit.*; B. Russell, *Principles of Mathematics*; O. Veblen, *loc. cit.*; and by G. Veronese in his treatise, *Fondamenti di geometrie* (Padua, 1891; German transl. by A. Schepp, *Grundzüge der Geometrie*, Leipzig, 1894). Most of the leading memoirs on special questions involved have been cited in the text; in addition there may be mentioned M. Pieri, "Nuovi principii di geometria projettiva complessa," *Trans. Accad. R. d. Sci.* (Turin, 1905); E. H. Moore, "On the Projective Axioms of Geometry," *Trans. Amer. Math. Soc.*, 1902; O. Veblen and W. H. Bussey, "Finite Projective Geometries," *Trans. Amer. Math. Soc.*, 1905; A. B. Kempe, "On the Relation between the Logical Theory of Classes and the Geometrical Theory of Points," *Proc. Lond. Math. Soc.*, 1890; J. Royce, "The Relation of the Principles of Logic to the Foundations of Geometry," *Trans. of Amer. Math. Soc.*, 1905; A. Schoenflies, "Über die Möglichkeit einer projectiven Geometrie bei transfiniter (nichtarchimedischer) Massbestimmung," *Deutsch. M.-V. Jahresb.*, 1906.

For general expositions of the bearings of the above investigations, cf. Hon. Bertrand Russell, *loc. cit.*; L. Couturat, *Les Principes des mathématiques* (Paris, 1905); H. Poincaré, *loc. cit.*; Russell and Whitehead, *Principia mathematica* (Cambridge, Univ. Press). The philosophers whose views on space and geometric truth deserve especial study are Descartes, Leibnitz, Hume, Kant and J. S. Mill. (A. N. W.)

GEOPONICI,[1] or *Scriptores rei rusticae*, the Greek and Roman writers on husbandry and agriculture. On the whole the Greeks paid less attention than the Romans to the scientific study of these subjects, which in classical times they regarded as a branch of economics. Thus Xenophon's *Oeconomicus* (see also *Memorabilia*, ii. 4) contains a eulogy of agriculture and its beneficial ethical effects, and much information is to be found in the writings of Aristotle and his pupil Theophrastus. About the same time as Xenophon, the philosopher Democritus of Abdera wrote a treatise Περὶ Γεωργίας, frequently quoted and much used by the later compilers of *Geoponica* (agricultural treatises). Greater attention was given to the subject in the Alexandrian period; a long list of names is given by Varro and Columella, amongst them Hiero II. and Attalus III. Philometor. Later, Cassius Dionysius of Utica translated and abridged the great work of the Carthaginian Mago, which was still further condensed by Diophanes of Nicaea in Bithynia for the use of King Deiotarus. From these and similar works Cassianus Bassus (*q.v.*) compiled his *Geoponica*. Mention may also be made of a little work Περὶ Γεωργικῶν by Michael Psellus (printed in Boissonade, *Anecdota Graeca*, i.).

The Romans, aware of the necessity of maintaining a numerous and thriving order of agriculturists, from very early times endeavoured to instil into their countrymen both a theoretical and a practical knowledge of the subject. The occupation of the farmer was regarded as next in importance to that of the soldier, and distinguished Romans did not disdain to practise it. In furtherance of this object, the great work of Mago was translated into Latin by order of the senate, and the elder Cato wrote his *De agri cultura* (extant in a very corrupt state), a simple record in homely language of the rules observed by the old Roman landed proprietors rather than a theoretical treatise. He was followed by the two Saserrae (father and son) and Gnaeus Tremellius Scrofa, whose works are lost. The learned Marcus Terentius Varro of Reate, when eighty years of age, composed his *Rerum rusticarum, libri tres*, dealing with agriculture, the rearing of cattle, and the breeding of fishes. He was the first to systematize what had been written on the subject, and supplemented the labours of others by practical experience gained during his travels. In the Augustan age Julius Hyginus wrote on farming and bee-keeping, Sabinus Tiro on horticulture, and during the early empire Julius Graecinus and Julius Atticus on the culture of vines, and Cornelius Celsus (best known for his *De medicina*) on farming. The chief work of the kind, however, is that of Lucius Junius Moderatus Columella (*q.v.*). About the middle of the 2nd century the two Quintilii, natives of Troja, wrote on the subject in Greek. It is remarkable that Columella's work exercised less influence in Rome and Italy than in southern Gaul and Spain, where agriculture became one of the principal subjects of instruction in the superior educational establishments that were springing up in those countries. One result of this was the preparation of manuals of a popular kind for use in the schools. In the 3rd century Gargilius Martialis of Mauretania compiled a *Geoponica* in which medical botany and the veterinary art were included. The *De re rustica* of Palladius (4th century), in fourteen books, which is almost entirely borrowed from Columella, is greatly inferior in style and knowledge of the subject. It is a kind of farmer's calendar, in which the different rural occupations are arranged in order of the months. The fourteenth book (on forestry) is written in elegiacs (85 distichs). The whole of Palladius and considerable fragments of Martialis are extant.

The best edition of the *Scriptores rei rusticae* is by J. G. Schneider (1794–1797), and the whole subject is exhaustively treated by A. Magdeleff, *Bilder aus der römischen Landwirtschaft* (1858–1863); see also Teuffel-Schwabe, *Hist. of Roman Literature*, 54; C. F. Bähr in Ersch and Gruber's *Allgemeine Encyklopädie*.

GEORGE, SAINT (d. 303), the patron saint of England, Aragon and Portugal. According to the legend given by Metaphrastes the Byzantine hagiologist, and substantially repeated in the Roman *Acta sanctorum* and in the Spanish breviary, he was born in Cappadocia of noble Christian parents, from whom he received a careful religious training. Other accounts place his birth at Lydda, but preserve his Cappadocian parentage. Having embraced the profession of a soldier, he rapidly rose under Diocletian to high military rank. In Persian Armenia he organized and energized the Christian community at Urmi (Urumiah), and even visited Britain on an imperial expedition. When Diocletian had begun to manifest a pronounced hostility towards Christianity, George sought a personal interview with him, in which he made deliberate profession of his faith, and, earnestly remonstrating against the persecution which had begun, resigned his commission. He was immediately laid under arrest, and after various tortures, finally put to death at Nicomedia (his body being afterwards taken to Lydda) on the 23rd of April 303. His festival is observed on that anniversary by the entire Roman Catholic Church as a semi-duplex, and by the Spanish Catholics as a duplex of the first class with an octave. The day is also celebrated as a principal feast in the Orthodox Eastern Church, where the saint is distinguished by the titles μεγαλομαρτυρ and τροπαιοφόρος.

The historical basis of the tradition is particularly unsound, there being two claimants to the name and honour. Eusebius, *Hist. eccl.* viii. 5, writes: "Immediately on the promulgation of the edict (of Diocletian) a certain man of no mean origin, but highly esteemed for his temporal dignities, as soon as the decree was published against the churches in Nicomedia, stimulated by a divine zeal and excited by an ardent faith, took it as it was openly placed and posted up for public inspection, and tore it to shreds as a most profane and wicked act. This, too, was done when the two Caesars were in the city, the first of whom was the eldest and chief of all and the other held fourth grade of the imperial dignity after him. But this man, as the first that was distinguished there in this manner, after enduring what was likely to follow an act so daring, preserved his mind, calm and serene, until the moment when his spirit fled." Rivalling this anonymous martyr, who is often supposed to have been St George, is an earlier martyr briefly mentioned in the *Chronicon Pascale*: "In the year 225 of the Ascension of our Lord a persecution of the Christians took place, and many

[1] The latinized form of a non-existent Γεωπονικὸς, used for convenience.

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suffered martyrdom, among whom also the Holy George was martyred."

Two Syrian church inscriptions bearing the name, one at Ezr'a and the other at Shaka, found by Burckhardt and Porter, and discussed by J. Hogg in the *Transactions of the Royal Literary Society*, may with some probability be assigned to the middle of the 4th century. Calvin impugned the saint's existence altogether, and Edward Reynolds (1599–1676), bishop of Norwich, like Edward Gibbon a century later, made him one with George of Laodicea, called "the Cappadocian," the Arian bishop of Alexandria (see GEORGE OF LAODICEA).

Modern criticism, while rejecting this identification, is not unwilling to accept the main fact that an officer named Georgios, of high rank in the army, suffered martyrdom probably under Diocletian. In the canon of Pope Gelasius (494) George is mentioned in a list of those "whose names are justly reverenced among men, but whose acts are known only to God," a statement which implies that legends had already grown up around his name. The caution of Gelasius was not long preserved; Gregory of Tours, for example, asserts that the saint's relics actually existed in the French village of Le Maine, where many miracles were wrought by means of them; and Bede, while still explaining that the *Gesta Georgii* are reckoned apocryphal, commits himself to the statement that the martyr was beheaded under Dacian, king of Persia, whose wife Alexandra, however, adhered to the Christian faith. The great fame of George, who is reverenced alike by Eastern and Western Christendom and by Mahommedans, is due to many causes. He was martyred on the eve of the triumph of Christianity, his shrine was reared near the scene of a great Greek legend (Perseus and Andromeda), and his relics when removed from Lydda, where many pilgrims had visited them, to Zorava in the Hauran served to impress his fame not only on the Syrian population, but on their Moslem conquerors, and again on the Crusaders, who in grateful memory of the saint's intervention on their behalf at Antioch built a new cathedral at Lydda to take the place of the church destroyed by the Saracens. This cathedral was in turn destroyed by Saladin.

The connexion of St George with a dragon, familiar since the *Golden Legend* of Jacobus de Voragine, can be traced to the close of the 6th century. At Arsuf or Joppa—neither of them far from Lydda—Perseus had slain the sea-monster that threatened the virgin Andromeda, and George, like many another Christian saint, entered into the inheritance of veneration previously enjoyed by a pagan hero.[1] The exploit thus attaches itself to the very common Aryan myth of the sun-god as the conqueror of the powers of darkness.

The popularity of St George in England has never reached the height attained by St Andrew in Scotland, St David in Wales or St Patrick in Ireland. The council of Oxford in 1222 ordered that his feast should be kept as a national festival; but it was not until the time of Edward III. that he was made patron of the kingdom. The republics of Genoa and Venice were also under his protection.

See P. Heylin, *The History of . . . S. George of Cappadocia* (1631); S. Baring-Gould, *Curious Myths of the Middle Ages*; Fr. Görres, "Der Ritter St Georg in der Geschichte, Legende und Kunst" (*Zeitschrift für wissenschaftliche Theologie*, xxx., 1887, Heft 1.); E. A. W. Budge, *The Martyrdom and Miracles of St George of Cappadocia* (the Coptic texts edited with an English translation (1888); Bolland, *Acta Sancti*, iii. 101; E. O. Gordon, *Saint George* (1907); M. H. Bulley, *St George for Merrie England* (1908).

[1] G. A. Smith (*Hist. Geog. of Holy Land*, p. 164) points out another coincidence. "The Mahommedans who usually identify St George with the prophet Elijah, at Lydda confound his legend with one about Christ himself. Their name for Antichrist is Dajjal, and they have a tradition that Jesus will slay Antichrist by the gate of Lydda. The notion sprang from an ancient bas-relief of George and the Dragon on the Lydda church. But Dajjal may be derived, by a very common confusion between *n* and *l*, from Dagon, whose name two neighbouring villages bear to this day, while one of the gates of Lydda used to be called the Gate of Dagon. It is a curious process by which the monster that symbolized heathenism conquered by Christianity has been evolved out of the first great rival of the God of Israel.

GEORGE I. [George Louis] (1660–1727), king of Great Britain and Ireland, born in 1660, was heir through his father Ernest Augustus to the hereditary lay bishopric of Osnabrück, and to the duchy of Calenberg, which formed one portion of the Hanoverian possessions of the house of Brunswick, whilst he secured the reversion of the other portion, the duchy of Celle or Zell, by his marriage (1682) with the heiress, his cousin Sophia Dorothea. The marriage was not a happy one. The morals of German courts in the end of the 17th century took their tone from the splendid profligacy of Versailles. It became the fashion for a prince to amuse himself with a mistress or more frequently with many mistresses simultaneously, and he was often content that the mistresses whom he favoured should be neither beautiful nor witty. George Louis followed the usual course. Count Königsmark—a handsome adventurer—seized the opportunity of paying court to the deserted wife. Conjugal infidelity was held at Hanover to be a privilege of the male sex. Count Königsmark was assassinated. Sophia Dorothea was divorced in 1694, and remained in seclusion till her death in 1726. When George IV., her descendant in the fourth generation, attempted in England to call his wife to account for sins of which he was himself notoriously guilty, free-spoken public opinion reprobated the offence in no measured terms. But in the Germany of the 17th century all free-spoken public opinion had been crushed out by the misery of the Thirty Years' War, and it was understood that princes were to arrange their domestic life according to their own pleasure.

The prince's father did much to raise the dignity of his family. By sending help to the emperor when he was struggling against the French and the Turks, he obtained the grant of a ninth electorate in 1692. His marriage with Sophia, the youngest daughter of Elizabeth the daughter of James I. of England, was not one which at first seemed likely to confer any prospect of advancement to his family. But though there were many persons whose birth gave them better claims than she had to the English crown, she found herself, upon the death of the duke of Gloucester, the next Protestant heir after Anne. The Act of Settlement in 1701 secured the inheritance to herself and her descendants. Being old and unambitious she rather permitted herself to be burthened with the honour than thrust herself forward to meet it. Her son George took a deeper interest in the matter. In his youth he had fought with determined courage in the wars of William III. Succeeding to the electorate on his father's death in 1698, he had sent a welcome reinforcement of Hanoverians to fight under Marlborough at Blenheim. With prudent persistence he attached himself closely to the Whigs and to Marlborough, refusing Tory offers of an independent command, and receiving in return for his fidelity a guarantee by the Dutch of his succession to England in the Barrier treaty of 1709. In 1714 when Anne was growing old, and Bolingbroke and the more reckless Tories were coquetting with the son of James II., the Whigs invited George's eldest son, who was duke of Cambridge, to visit England in order to be on the spot in case of need. Neither the elector nor his mother approved of a step which was likely to alienate the queen, and which was specially distasteful to himself, as he was on very bad terms with his son. Yet they did not set themselves against the strong wish of the party to which they looked for support, and it is possible that troubles would have arisen from any attempt to carry out the plan, if the deaths, first of the electress (May 28) and then of the queen (August 1, 1714), had not laid open George's way to the succession without further effort of his own.

In some respects the position of the new king was not unlike that of William III. a quarter of a century before. Both sovereigns were foreigners, with little knowledge of English politics and little interest in English legislation. Both sovereigns arrived at a time when party spirit had been running high, and when the task before the ruler was to still the waves of contention. In spite of the difference between an intellectually great man and an intellectually small one, in spite too of the difference between the king who began by choosing his ministers from both parties and the king who persisted in choosing his minister

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from only one, the work of pacification was accomplished by George even more thoroughly than by William.

George I. was fortunate in arriving in England when a great military struggle had come to an end. He had therefore no reason to call upon the nation to make great sacrifices. All that he wanted was to secure for himself and his family a high position which he hardly knew how to occupy, to fill the pockets of his German attendants and his German mistresses, to get away as often as possible from the uncongenial islanders whose language he was unable to speak, and to use the strength of England to obtain petty advantages for his German principality. In order to do this he attached himself entirely to the Whig party, though he refused to place himself at the disposal of its leaders. He gave his confidence, not to Somers and Wharton and Marlborough, but to Stanhope and Townshend, the statesmen of the second rank. At first he seemed to be playing a dangerous game. The Tories, whom he rejected, were numerically superior to their adversaries, and were strong in the support of the country gentlemen and the country clergy. The strength of the Whigs lay in the towns and in the higher aristocracy. Below both parties lay the mass of the nation, which cared nothing for politics except in special seasons of excitement, and which asked only to be let alone. In 1715 a Jacobite insurrection in the north, supported by the appearance of the Pretender, the son of James II., in Scotland, was suppressed, and its suppression not only gave to the government a character of stability, but displayed its adversaries in an unfavourable light as the disturbers of the peace.

Even this advantage, however, would have been thrown away if the Whigs in power had continued to be animated by violent party spirit. What really happened was that the Tory leaders were excluded from office, but that the principles and prejudices of the Tories were admitted to their full weight in the policy of the government. The natural result followed. The leaders to whom no regard was paid continued in opposition. The rank and file, who would personally have gained nothing by a party victory, were conciliated into quiescence.

This mingling of two policies was conspicuous both in the foreign and the domestic actions of the reign. In the days of Queen Anne the Whig party had advocated the continuance of war with a view to the complete humiliation of the king of France, whom they feared as the protector of the Pretender, and in whose family connexion with the king of Spain they saw a danger for England. The Tory party, on the other hand, had been the authors of the peace of Utrecht, and held that France was sufficiently depressed. A fortunate concurrence of circumstances enabled George's ministers, by an alliance with the regent of France, the duke of Orleans, to pursue at the same time the Whig policy of separating France from Spain and from the cause of the Pretender, and the Tory policy of the maintenance of a good understanding with their neighbour across the Channel. The same eclecticism was discernible in the proceedings of the home government. The Whigs were conciliated by the repeal of the Schism Act and the Occasional Conformity Act, whilst the Tories were conciliated by the maintenance of the Test Act in all its vigour. The satisfaction of the masses was increased by the general well-being of the nation.

Very little of all that was thus accomplished was directly owing to George I. The policy of the reign is the policy of his ministers. Stanhope and Townshend from 1714 to 1717 were mainly occupied with the defence of the Hanoverian settlement. After the dismissal of the latter in 1717, Stanhope in conjunction with Sunderland took up a more decided Whig policy. The Occasional Conformity Act and the Schism Act were repealed in 1719. But the wish of the liberal Whigs to modify if not to repeal the Test Act remained unsatisfied. In the following year the bursting of the South Sea bubble, and the subsequent deaths of Stanhope in 1721 and of Sunderland in 1722, cleared the way for the accession to power of Sir Robert Walpole, to whom and not to the king was due the conciliatory policy which quieted Tory opposition by abstaining from pushing Whig principles to their legitimate consequences.

Nevertheless something of the honour due to Walpole must be reckoned to the king's credit. It is evident that at his accession his decisions were by no means unimportant. The royal authority was still able within certain limits to make its own terms. This support was so necessary to the Whigs that they made no resistance when he threw aside their leaders on his arrival in England. When by his personal intervention he dismissed Townshend and appointed Sunderland, he had no such social and parliamentary combination to fear as that which almost mastered his great-grandson in his struggle for power. If such a combination arose before the end of his reign it was owing more to his omitting to fulfil the duties of his station than from the necessity of the case. As he could talk no English, and his ministers could talk no German, he absented himself from the meetings of the cabinet, and his frequent absences from England and his want of interest in English politics strengthened the cabinet in its tendency to assert an independent position. Walpole at last by his skill in the management of parliament rose as a subject into the almost royal position denoted by the name of prime minister. In connexion with Walpole the force of wealth and station established the Whig aristocracy in a point of vantage from which it was afterwards difficult to dislodge them. Yet, though George had allowed the power which had been exercised by William and Anne to slip through his hands, it was understood to the last that if he chose to exert himself he might cease to be a mere cipher in the conduct of affairs. As late as 1727 Bolingbroke gained over one of the king's mistresses, the duchess of Kendal; and though her support of the fallen Jacobite took no effect, Walpole was not without fear that her reiterated entreaties would lead to his dismissal. The king's death in a carriage on his way to Hanover, in the night between 10th and 11th June in the same year, put an end to these apprehensions.

His only children were his successor George II. and Sophia Dorothea (1687–1757), who married in 1706 Frederick William, crown prince (afterwards king) of Prussia. She was the mother of Frederick the Great. (S. R. G.)

See the standard English histories. A recent popular work is L. Melville's *The First George in Hanover and England* (1908).

GEORGE II. [George Augustus] (1683–1760), king of Great Britain and Ireland, the only son of George I., was born in 1683. In 1705 he married Wilhelmina Caroline of Anspach. In 1706 he was created earl of Cambridge. In 1708 he fought bravely at Oudenarde. At his father's accession to the English throne he was thirty-one years of age. He was already on bad terms with his father. The position of an heir-apparent is in no case an easy one to fill with dignity, and the ill-treatment of the prince's mother by his father was not likely to strengthen in him a reverence for paternal authority. It was most unwillingly that, on his first journey to Hanover in 1716, George I. appointed the prince of Wales guardian of the realm during his absence. In 1717 the existing ill-feeling ripened into an open breach. At the baptism of one of his children, the prince selected one godfather whilst the king persisted in selecting another. The young man spoke angrily, was ordered into arrest, and was subsequently commanded to leave St James's and to be excluded from all court ceremonies. The prince took up his residence at Leicester House, and did everything in his power to support the opposition against his father's ministers.

When therefore George I. died in 1727, it was generally supposed that Walpole would be at once dismissed. The first direction of the new king was that Sir Spencer Compton would draw up the speech in which he was to announce to the privy council his accession. Compton, not knowing how to set about his task, applied to Walpole for aid. Queen Caroline took advantage of this evidence of incapacity, advocated Walpole's cause with her husband and procured his continuance in office. This curious scene was indicative of the course likely to be taken by the new sovereign. His own mind was incapable of rising above the merest details of business. He made war in the spirit of a drill-sergeant, and he economized his income with the minute regularity of a clerk. A blunder of a master of the ceremonies

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in marshalling the attendants on a levee put him out of temper. He took the greatest pleasure in counting his money piece by piece, and he never forgot a date. He was above all things methodical and regular. "He seems," said one who knew him well, "to think his having done a thing to-day an unanswerable reason for his doing it to-morrow."

Most men so utterly immersed in details would be very impracticable to deal with. They would obstinately refuse to listen to a wisdom and prudence which meant nothing in their ears, and which brought home to them a sense of their own inferiority. It was the happy peculiarity of George II. that he was exempt from this failing. He seemed to have an instinctive understanding that such and such persons were either wiser or even stronger than himself, and when he had once discovered that, he gave way with scarcely a struggle. Thus it was that, though in his domestic relations he was as loose a liver as his father had been, he allowed himself to be guided by the wise but unobtrusive counsels of his wife until her death in 1737, and that when once he had recognized Walpole's superiority he allowed himself to be guided by the political sagacity of the great minister. It is difficult to exaggerate the importance of such a temper upon the development of the constitution. The apathy of the nation in all but the most exciting political questions, fostered by the calculated conservatism of Walpole, had thrown power into the hands of the great landowners. They maintained their authority by supporting a minister who was ready to make use of corruption, wherever corruption was likely to be useful, and who could veil over the baseness of the means which he employed by his talents in debate and in finance. To shake off a combination so strong would not have been easy. George II. submitted to it without a struggle.

So strong indeed had the Whig aristocracy grown that it began to lose its cohesion. Walpole was determined to monopolize power, and he dismissed from office all who ventured to oppose him. An opposition formidable in talents was gradually formed. In its composite ranks were to be found Tories and discontented Whigs, discarded official hacks who were hungry for the emoluments of office, and youthful purists who fancied that if Walpole were removed, bribes and pensions would cease to be attractive to a corrupt generation. Behind them was Bolingbroke, excluded from parliament but suggesting every party move. In 1737 the opposition acquired the support of Frederick, prince of Wales. The young man, weak and headstrong, rebelled against the strict discipline exacted by his father. His marriage in 1736 to Augusta of Saxony brought on an open quarrel. In 1737, just as the princess of Wales was about to give birth to her first child, she was hurried away by her husband from Hampton Court to St James's Palace at the imminent risk of her life, simply in order that the prince might show his spite to his father who had provided all necessary attendance at the former place. George ordered his son to quit St James's, and to absent himself from court. Frederick in disgrace gave the support of his name, and he had nothing else to give, to the opposition. Later in the year 1737, on the 20th of November, Queen Caroline died. In 1742 Walpole, weighed down by the unpopularity both of his reluctance to engage in a war with Spain and of his supposed remissness in conducting the operations of that war, was driven from office. His successors formed a composite ministry in which Walpole's old colleagues and Walpole's old opponents were alike to be found.

The years which followed settled conclusively, at least for this reign, the constitutional question of the power of appointing ministers. The war between Spain and England had broken out in 1739. In 1741 the death of the emperor Charles VI. brought on the war of the Austrian succession. The position of George II. as a Hanoverian prince drew him to the side of Maria Theresa through jealousy of the rising Prussian monarchy. Jealousy of France led England in the same direction, and in 1741 a subsidy of £300,000 was voted to Maria Theresa. The king himself went to Germany and attempted to carry on the war according to his own notions. Those notions led him to regard the safety of Hanover as of far more importance than the wishes of England. Finding that a French army was about to march upon his German states, he concluded with France a treaty of neutrality for a year without consulting a single English minister. In England the news was received with feelings of disgust. The expenditure of English money and troops was to be thrown uselessly away as soon as it appeared that Hanover was in the slightest danger. In 1742 Walpole was no longer in office. Lord Wilmington, the nominal head of the ministry, was a mere cipher. The ablest and most energetic of his colleagues, Lord Carteret (afterwards Granville), attached himself specially to the king, and sought to maintain himself in power by his special favour and by brilliant achievements in diplomacy.

In part at least by Carteret's mediation the peace of Breslau was signed, by which Maria Theresa ceded Silesia to Frederick (July 28, 1742). Thus relieved on her northern frontier, she struck out vigorously towards the west. Bavaria was overrun by her troops. In the beginning of 1743 one French army was driven across the Rhine. On June 27th another French army was defeated by George II. in person at Dettingen. Victory brought elation to Maria Theresa. Her war of defence was turned into a war of vengeance. Bavaria was to be annexed. The French frontier was to be driven back. George II. and Carteret after some hesitation placed themselves on her side. Of the public opinion of the political classes in England they took no thought. Hanoverian troops were indeed to be employed in the war, but they were to be taken into British pay. Collisions between British and Hanoverian officers were frequent. A storm arose against the preference shown to Hanoverian interests. After a brief struggle Carteret, having become Lord Granville by his mother's death, was driven from office in November 1744.

Henry Pelham, who had become prime minister in the preceding year, thus saw himself established in power. By the acceptance of this ministry, the king acknowledged that the function of choosing a ministry and directing a policy had passed from his hands. In 1745 indeed he recalled Granville, but a few days were sufficient to convince him of the futility of his attempt, and the effort to exclude Pitt at a later time proved equally fruitless.

Important as were the events of the remainder of the reign, therefore, they can hardly be grouped round the name of George II. The resistance to the invasion of the Young Pretender in 1745, the peace of Aix-la-Chapelle in 1748, the great war ministry of Pitt at the close of the reign, did not receive their impulse from him. He had indeed done his best to exclude Pitt from office. He disliked him on account of his opposition in former years to the sacrifices demanded by the Hanoverian connexion. When in 1756 Pitt became secretary of state in the Devonshire administration, the king bore the yoke with difficulty. Early in the next year he complained of Pitt's long speeches as being above his comprehension, and on April 5, 1757, he dismissed him, only to take him back shortly after, when Pitt, coalescing with Newcastle, became master of the situation. Before Pitt's dismissal George II. had for once an opportunity of placing himself on the popular side, though, as was the case of his grandson during the American war, it was when the popular side happened to be in the wrong. In the true spirit of a martinet, he wished to see Admiral Byng executed. Pitt urged the wish of the House of Commons to have him pardoned. "Sir," replied the king, "you have taught me to look for the sense of my subjects in another place than in the House of Commons." When George II. died in 1760, he left behind him a settled understanding that the monarchy was one of the least of the forces by which the policy of the country was directed. To this end he had contributed much by his disregard of English opinion in 1743; but it may fairly be added that, but for his readiness to give way to irresistible adversaries, the struggle might have been far more bitter and severe than it was.

Of the connexion between Hanover and England in this reign two memorials remain more pleasant to contemplate than the records of parliamentary and ministerial intrigues. With the support of George II., amidst the derision of the English fashionable world, the Hanoverian Handel produced in England those

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masterpieces which have given delight to millions, whilst the foundation of the university of Göttingen by the same king opened a door through which English political ideas afterwards penetrated into Germany.

George II. had three sons,—Frederick Louis (1707–1751); George William (1717–1718); and William Augustus, duke of Cumberland (1721–1765); and five daughters, Anne (1709–1759), married to William, prince of Orange, 1734; Amelia Sophia Eleonora (1711–1786); Elizabeth Caroline (1713–1757); Mary (1723–1772), married to Frederick, landgrave of Hesse-Cassel, 1740; Louisa (1724–1751), married to Frederick V., king of Denmark, 1743. (S. R. G.)

See Lord Hervey, *Memoirs of the Reign of George II.*, ed. by J. W. Croker (3 vols., London, 1884); Horace Walpole, *Mem. of the Reign of George II.*, with notes by Lord Holland (3 vols., 2nd ed., 1847).

GEORGE III. [George William Frederick] (1738–1820), king of Great Britain and Ireland, son of Frederick, prince of Wales, and grandson of George II., whom he succeeded in 1760, was born on the 4th of June 1738. After his father's death in 1751 he had been educated in seclusion from the fashionable world under the care of his mother and of her favourite counsellor the earl of Bute. He had been taught to revere the maxims of Bolingbroke's "Patriot King," and to believe that it was his appointed task in life to break the power of the Whig houses resting upon extensive property and the influence of patronage and corruption. That power had already been gravely shaken. The Whigs from their incompetency were obliged when the Seven Years' War broke out to leave its management in the hands of William Pitt. The nation learned to applaud the great war minister who succeeded where others had failed, and whose immaculate purity put to shame the ruck of barterers of votes for places and pensions.

In some sort the work of the new king was the continuation of the work of Pitt. But his methods were very different. He did not appeal to any widely spread feeling or prejudice; nor did he disdain the use of the arts which had maintained his opponents in power. The patronage of the crown was to be really as well as nominally his own; and he calculated, not without reason, that men would feel more flattered in accepting a place from a king than from a minister. The new Toryism of which he was the founder was no recurrence to the Toryism of the days of Charles II. or even of Anne. The question of the amount of toleration to be accorded to Dissenters had been entirely laid aside. The point at issue was whether the crown should be replaced in the position which George I. might have occupied at the beginning of his reign, selecting the ministers and influencing the deliberations of the cabinet. For this struggle George III. possessed no inconsiderable advantages. With an inflexible tenacity of purpose, he was always ready to give way when resistance was really hopeless. As the first English-born sovereign of his house, speaking from his birth the language of his subjects, he found a way to the hearts of many who never regarded his predecessors as other than foreign intruders. The contrast, too, between the pure domestic life which he led with his wife Charlotte, whom he married in 1761, and the habits of three generations of his house, told in his favour with the vast majority of his subjects. Even his marriage had been a sacrifice to duty. Soon after his accession he had fallen in love with Lady Sarah Lennox, and had been observed to ride morning by morning along the Kensington Road, from which the object of his affections was to be seen from the lawn of Holland House making hay, or engaged in some other ostensible employment. Before the year was over Lady Sarah appeared as one of the queen's bridesmaids, and she was herself married to Sir Charles Bunbury in 1762.

At first everything seemed easy to him. Pitt had come to be regarded by his own colleagues as a minister who would pursue war at any price, and in getting rid of Pitt in 1761 and in carrying on the negotiations which led to the peace of Paris in 1762, the king was able to gather round him many persons who would not be willing to acquiesce in any permanent change in the system of government. With the signature of the peace his real difficulties began. The Whig houses, indeed, were divided amongst themselves by personal rivalries. But they were none of them inclined to let power and the advantages of power slip from their hands without a struggle. For some years a contest of influence was carried on without dignity and without any worthy aim. The king was not strong enough to impose upon parliament a ministry of his own choice. But he gathered round himself a body of dependants known as the king's friends, who were secure of his favour, and who voted one way or the other according to his wishes. Under these circumstances no ministry could possibly be stable; and yet every ministry was strong enough to impose some conditions on the king. Lord Bute, the king's first choice, resigned from a sense of his own incompetency in 1763. George Grenville was in office till 1765; the marquis of Rockingham till 1766; Pitt, becoming earl of Chatham, till illness compelled him to retire from the conduct of affairs in 1767, when he was succeeded by the duke of Grafton. But a struggle of interests could gain no real strength for any government, and the only chance the king had of effecting a permanent change in the balance of power lay in the possibility of his associating himself with some phase of strong national feeling, as Pitt had associated himself with the war feeling caused by the dissatisfaction spread by the weakness and ineptitude of his predecessors.

Such a chance was offered by the question of the right to tax America. The notion that England was justified in throwing on America part of the expenses caused in the late war was popular in the country, and no one adopted it more pertinaciously then George III. At the bottom the position which he assumed was as contrary to the principles of parliamentary government as the encroachments of Charles I. had been. But it was veiled in the eyes of Englishmen by the prominence given to the power of the British parliament rather than to the power of the British king. In fact the theory of parliamentary government, like most theories after their truth has long been universally acknowledged, had become a superstition. Parliaments were held to be properly vested with authority, not because they adequately represented the national will, but simply because they were parliaments. There were thousands of people in England to whom it never occurred that there was any good reason why a British parliament should be allowed to levy a duty on tea in the London docks and should not be allowed to levy a duty on tea at the wharves of Boston. Undoubtedly George III. derived great strength from his honest participation in this mistake. Contending under parliamentary forms, he did not wound the susceptibilities of members of parliament, and when at last in 1770 he appointed Lord North—a minister of his own selection—prime minister, the object of his ambition was achieved with the concurrence of a large body of politicians who had nothing in common with the servile band of the king's friends.

As long as the struggle with America was carried on with any hope of success they gained that kind of support which is always forthcoming to a government which shares in the errors and prejudices of its subjects. The expulsion of Wilkes from the House of Commons in 1760, and the refusal of the House to accept him as a member after his re-election, raised a grave constitutional question in which the king was wholly in the wrong; and Wilkes was popular in London and Middlesex. But his case roused no national indignation, and when in 1774 those sharp measures were taken with Boston which led to the commencement of the American rebellion in 1775, the opposition to the course taken by the king made little way either in parliament or in the country. Burke might point out the folly and inexpedience of the proceedings of the government. Chatham might point out that the true spirit of English government was to be representative, and that that spirit was being violated at home and abroad. George III., who thought that the first duty of the Americans was to obey himself, had on his side the mass of unreflecting Englishmen who thought that the first duty of all colonists was to be useful and submissive to the mother-country. The natural dislike of every country engaged in war to see itself defeated was on his side, and when the news of Burgoyne's surrender at Saratoga arrived

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in 1777, subscriptions of money to raise new regiments poured freely in.

In March 1778 the French ambassador in London announced that a treaty of friendship and commerce had been concluded between France and the new United States of America. Lord North was anxious to resign power into stronger hands, and begged the king to receive Chatham as his prime minister. The king would not hear of it. He would have nothing to say to "that perfidious man" unless he would humble himself to enter the ministry as North's subordinate. Chatham naturally refused to do anything of the kind, and his death in the course of the year relieved the king of the danger of being again overruled by too overbearing a minister. England was now at war with France, and in 1779 she was also at war with Spain.

George III. was still able to control the disposition of office. He could not control the course of events. His very ministers gave up the struggle as hopeless long before he would acknowledge the true state of the case. Before the end of 1779, two of the leading members of the cabinet, Lords Gower and Weymouth, resigned rather than bear the responsibility of so ruinous an enterprise as the attempt to overpower America and France together. Lord North retained office, but he acknowledged to the king that his own opinion was precisely the same as that of his late colleagues.

The year 1780 saw an agitation rising in the country for economical reform, an agitation very closely though indirectly connected with the war policy of the king. The public meetings held in the country on this subject have no unimportant place in the development of the constitution. Since the presentation of the Kentish petition in the reign of William III. there had been from time to time upheavings of popular feeling against the doings of the legislature, which kept up the tradition that parliament existed in order to represent the nation. But these upheavings had all been so associated with ignorance and violence as to make it very difficult for men of sense to look with displeasure upon the existing emancipation of the House of Commons from popular control. The Sacheverell riots, the violent attacks upon the Excise Bill, the no less violent advocacy of the Spanish War, the declamations of the supporters of Wilkes at a more recent time, and even in this very year the Gordon riots, were not likely to make thoughtful men anxious to place real power in the hands of the classes from whom such exhibitions of folly proceeded. But the movement for economical reform was of a very different kind. It was carried on soberly in manner, and with a definite practical object. It asked for no more than the king ought to have been willing to concede. It attacked useless expenditure upon sinecures and unnecessary offices in the household, the only use of which was to spread abroad corruption amongst the upper classes. George III. could not bear to be interfered with at all, or to surrender any element of power which had served him in his long struggle with the Whigs. He held out for more than another year. The news of the capitulation of Yorktown reached London on the 25th of November 1781. On the 20th of March 1782 Lord North resigned.

George III. accepted the consequences of defeat. He called the marquis of Rockingham to office at the head of a ministry composed of pure Whigs and of the disciples of the late earl of Chatham, and he authorized the new ministry to open negotiations for peace. Their hands were greatly strengthened by Rodney's victory over the French fleet, and the failure of the combined French and Spanish attack upon Gibraltar; and before the end of 1782 a provisional treaty was signed with America, preliminaries of peace with France and Spain being signed early in the following year. On the 3rd of September 1783 the definitive treaties with the three countries were simultaneously concluded. "Sir," said the king to John Adams, the first minister of the United States of America accredited to him, "I wish you to believe, and that it may be understood in America, that I have done nothing in the late contest but what I thought myself indispensably bound to do by the duty which I owed to my people. I will be very frank with you. I was the last to consent to the separation: but the separation having been made and having become inevitable, I have always said, as I say now, that I would be the first to meet the friendship of the United States as an independent power."

Long before the signature of the treaties Rockingham died (July 1, 1782). The king chose Lord Shelburne, the head of the Chatham section of the government, to be prime minister. Fox and the followers of Rockingham refused to serve except under the duke of Portland, a minister of their own selection, and resigned office. The old constitutional struggle of the reign was now to be fought out once more. Fox, too weak to obtain a majority alone, coalesced with Lord North, and defeated Shelburne in the House of Commons on the 27th of February 1783. On the 2nd of April the coalition took office, with Portland as nominal prime minister, and Fox and North the secretaries of state as its real heads.

This attempt to impose upon him a ministry which he disliked made the king very angry. But the new cabinet had a large majority in the House of Commons, and the only chance of resisting it lay in an appeal to the country against the House of Commons. Such an appeal was not likely to be responded to unless the ministers discredited themselves with the nation. Goerge III. therefore waited his time. Though a coalition between men bitterly opposed to one another in all political principles and drawn together by nothing but love of office was in itself discreditable, it needed some more positive cause of dissatisfaction to arouse the constituencies, which were by no means so ready to interfere in political disputes at that time as they are now. Such dissatisfaction was given by the India Bill, drawn up by Burke. As soon as it had passed through the Commons the king hastened to procure its rejection in the House of Lords by his personal intervention with the peers. He authorized Lord Temple to declare in his name that he would count any peer who voted for the bill as his enemy. On the 17th of December 1783 the bill was thrown out. The next day ministers were dismissed. William Pitt became prime minister. After some weeks' struggle with a constantly decreasing majority in the Commons, the king dissolved parliament on the 25th of March 1784. The country rallied round the crown and the young minister, and Pitt was firmly established in office.

There can be no reasonable doubt[1] that Pitt not only took advantage of the king's intervention in the Lords, but was cognizant of the intrigue before it was actually carried out. It was upon him, too, that the weight of reconciling the country to an administration formed under such circumstances lay. The general result, so far as George III. was concerned, was that to all outward appearance he had won the great battle of his life. It was he who was to appoint the prime minister, not any clique resting on a parliamentary support. But the circumstances under which the victory was won were such as to place the constitution in a position very different from that in which it would have been if the victory had been gained earlier in the reign. Intrigue there was indeed in 1783 and 1784 as there had been twenty years before. Parliamentary support was conciliated by Pitt by the grant of royal favours as it had been in the days of Bute. The actual blow was struck by a most questionable message to individual peers. But the main result of the whole political situation was that George III. had gone a long way towards disentangling the reality of parliamentary government from its accidents. His ministry finally stood because it had appealed to the constituencies against their representatives. Since then it has properly become a constitutional axiom that no such appeal should be made by the crown itself. But it may reasonably be doubted whether any one but the king was at that time capable of making the appeal. Lord Shelburne, the leader of the ministry expelled by the coalition, was unpopular in the country, and the younger Pitt had not had time to make his great abilities known beyond a limited circle. The real question for the constitutional historian to settle is not whether under ordinary circumstances a king is the proper person to place himself really as well as nominally at the head of the government; but whether under the special circumstances

[1] See Lord Fitzmaurice's *Life of Shelburne*, iii. 393.

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which existed in 1783 it was not better that the king should call upon the people to support him, than that government should be left in the hands of men who rested their power on close boroughs and the dispensation of patronage, without looking beyond the walls of the House of Commons for support.

That the king gained credit far beyond his own deserts by the glories of Pitt's ministry is beyond a doubt. Nor can there be any reasonable doubt that his own example of domestic propriety did much to strengthen the position of his minister. It is true that that life was insufferably dull. No gleams of literary or artistic taste lightened it up. The dependants of the court became inured to dull routine unchequered by loving sympathy. The sons of the household were driven by the sheer weariness of such an existence into the coarsest profligacy. But all this was not visible from a distance. The tide of moral and religious improvement which had set in in England since the days of Wesley brought popularity to a king who was faithful to his wife, in the same way that the tide of manufacturing industry and scientific progress brought popularity to the minister who in some measure translated into practice the principles of the *Wealth of Nations*.

Nor were there wanting subjects of importance beyond the circle of politics in which George III. showed a lively interest. The voyages of discovery which made known so large a part of the islands and coasts of the Pacific Ocean received from him a warm support. In the early days of the Royal Academy, its finances were strengthened by liberal grants from the privy purse. His favourite pursuit, however, was farming. When Arthur Young was issuing his *Annals of Agriculture*, he was supplied with information by the king, under the assumed name of Mr Ralph Robinson, relating to a farm at Petersham.

The life of the king was suddenly clouded over. Early in his reign, in 1765, he had been out of health, and—though the fact was studiously concealed at the time—symptoms of mental aberration were even then to be perceived. In October 1788 he was again out of health, and in the beginning of the following month his insanity was beyond a doubt. Whilst Pitt and Fox were contending in the House of Commons over the terms on which the regency should be committed to the prince of Wales, the king was a helpless victim to the ignorance of physicians and the brutalities of his servants. At last Dr Willis, who had made himself a name by prescribing gentleness instead of rigour in the treatment of the insane, was called in. Under his more humane management the king rapidly recovered. Before the end of February 1789 he was able to write to Pitt thanking him for his warm support of his interests during his illness. On the 23rd of April he went in person to St Paul's to return thanks for his recovery.

The popular enthusiasm which burst forth around St Paul's was but a foretaste of a popularity far more universal. The French Revolution frightened the great Whig landowners till they made their peace with the king. Those who thought that the true basis of government was aristocratical were now of one mind with those who thought that the true basis of government was monarchical; and these two classes were joined by a far larger multitude which had no political ideas whatever, but which had a moral horror of the guillotine. As Elizabeth had once been the symbol of resistance to Spain, George was now the symbol of resistance to France. He was not, however, more than the symbol. He allowed Pitt to levy taxes and incur debt, to launch armies to defeat, and to prosecute the English imitators of French revolutionary courses. At last, however, after the Union with Ireland was accomplished, he learned that Pitt was planning a scheme to relieve the Catholics from the disabilities under which they laboured. The plan was revealed to him by the chancellor, Lord Loughborough, a selfish and intriguing politician who had served all parties in turn, and who sought to forward his own interests by falling in with the king's prejudices. George III. at once took up the position from which he never swerved. He declared that to grant concessions to the Catholics involved a breach of his coronation oath. No one has ever doubted that the king was absolutely convinced of the serious nature of the objection. Nor can there be any doubt that he had the English people behind him. Both in his peace ministry and in his war ministry Pitt had taken his stand on royal favour and on popular support. Both failed him alike now, and he resigned office at once. The shock to the king's mind was so great that it brought on a fresh attack of insanity. This time, however, the recovery was rapid. On the 14th of March 1801 Pitt's resignation was formally accepted, and the late speaker, Mr Addington, was installed in office as prime minister.

The king was well pleased with the change. He was never capable of appreciating high merit in any one; and he was unable to perceive that the question on which Pitt had resigned was more than an improper question, with which he ought never to have meddled. "Tell him," he said, in directing his physician to inform Pitt of his restoration to health, "I am now quite well, quite recovered from my illness; but what has he not to answer for, who has been the cause of my having been ill at all?" Addington was a minister after his own mind. Thoroughly honest and respectable, with about the same share of abilities as was possessed by the king himself, he was certainly not likely to startle the world by any flights of genius. But for one circumstance Addington's ministry would have lasted long. So strong was the reaction against the Revolution that the bulk of the nation was almost as suspicious of genius as the king himself. Not only was there no outcry for legislative reforms, but the very idea of reform was unpopular. The country gentlemen were predominant in parliament, and the country gentlemen as a body looked upon Addington with respect and affection. Such a minister was therefore admirably suited to preside over affairs at home in the existing state of opinion. But those who were content with inaction at home would not be content with inaction abroad. In time of peace Addington would have been popular for a season. In time of war even his warmest admirers could not say that he was the man to direct armies in the most terrible struggle which had ever been conducted by an English government.

For the moment this difficulty was not felt. On the 1st of October 1801, preliminaries of peace were signed between England and France, to be converted into the definitive peace of Amiens on the 27th of March 1802. The ruler of France was now Napoleon Bonaparte, and few persons in England believed that he had any real purpose of bringing his aggressive violence to an end. "Do you know what I call this peace?" said the king; "an experimental peace, for it is nothing else. But it was unavoidable."

The king was right. On the 18th of May 1803 the declaration of war was laid before parliament. The war was accepted by all classes as inevitable, and the French preparations for an invasion of England roused the whole nation to a glow of enthusiasm only equalled by that felt when the Armada threatened its shores. On the 26th of October the king reviewed the London volunteers in Hyde Park. He found himself the centre of a great national movement with which he heartily sympathized, and which heartily sympathized with him.

On the 12th of February 1804 the king's mind was again affected. When he recovered, he found himself in the midst of a ministerial crisis. Public feeling allowed but one opinion to prevail in the country—that Pitt, not Addington, was the proper man to conduct the administration in time of war. Pitt was anxious to form an administration on a broad basis, including Fox and all prominent leaders of both parties. The king would not hear of the admission of Fox. His dislike of him was personal as well as political, as he knew that Fox had had a great share in drawing the prince of Wales into a life of profligacy. Pitt accepted the king's terms, and formed an administration in which he was the only man of real ability. Eminent men, such as Lord Grenville, refused to join a ministry from which the king had excluded a great statesman on purely personal grounds.

The whole question was reopened on Pitt's death on the 23rd of January 1806. This time the king gave way. The ministry of All the Talents, as it was called, included Fox amongst its members. At first the king was observed to appear depressed at the necessity of surrender. But Fox's charm of manner soon

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gained upon him. "Mr Fox," said the king, "I little thought that you and I should ever meet again in this place; but I have no desire to look back upon old grievances, and you may rest assured I never shall remind you of them." On the 13th of September Fox died, and it was not long before the king and the ministry were openly in collision. The ministry proposed a measure enabling all subjects of the crown to serve in the army and navy in spite of religious disqualifications. The king objected even to so slight a modification of the laws against the Catholics and Dissenters, and the ministers consented to drop the bill. The king asked more than this. He demanded a written and positive engagement that this ministry would never, under any circumstances, propose to him "any measure of concession to the Catholics, or even connected with the question." The ministers very properly refused to bind themselves for the future. They were consequently turned out of office, and a new ministry was formed with the duke of Portland as first lord of the treasury and Mr Perceval as its real leader. The spirit of the new ministry was distinct hostility to the Catholic claims. On the 27th of April 1807 a dissolution of parliament was announced, and a majority in favour of the king's ministry was returned in the elections which speedily followed.

The elections of 1807, like the elections of 1784, gave the king the mastery of the situation. In other respects they were the counterpart of one another. In 1784 the country declared, though perhaps without any clear conception of what it was doing, for a wise and progressive policy. In 1807 it declared for an unwise and retrogressive policy, with a very clear understanding of what it meant. It is in his reliance upon the prejudices and ignorance of the country that the constitutional significance of the reign of George III. appears. Every strong government derives its power from its representative character. At a time when the House of Commons was less really representative than at any other, a king was on the throne who represented the country in its good and bad qualities alike, in its hatred of revolutionary violence, its moral sturdiness, its contempt of foreigners, and its defiance of all ideas which were in any way strange. Therefore it was that his success was not permanently injurious to the working of the constitution as the success of Charles I. would have been. If he were followed by a king less English than himself, the strength of representative power would pass into other hands than those which held the sceptre.

The overthrow of the ministry of All the Talents was the last political act of constitutional importance in which George III. took part. The substitution of Perceval for Portland as the nominal head of the ministry in 1809 was not an event of any real significance, and in 1811 the reign practically came to an end. The king's reason finally broke down after the death of the princess Amelia, his favourite child; and the prince of Wales (see GEORGE IV.) became prince regent. The remaining nine years of George III.'s life were passed in insanity and blindness, and he died on the 29th of January 1820.

His wife, Charlotte Sophia (1744–1818), was a daughter of Charles Louis of Mecklenburg-Strelitz (d. 1816), and was married to the king in London on the 8th of September 1761. After a peaceful and happy married life the queen died at Kew on the 17th of November 1818.

George III. had nine sons. After his successor came Frederick, duke of York and Albany (1763–1827); William Henry, duke of Clarence, afterwards King William IV. (1765–1837); Edward Augustus, duke of Kent (1767–1825), father of Queen Victoria; Ernest Augustus, duke of Cumberland, afterwards king of Hanover (1771–1851); Augustus Frederick, duke of Sussex (1773–1843); Adolphus Frederick, duke of Cambridge (1774–1850); Octavius (1779–1783); Alfred (1780–1782). He had also six daughters—Charlotte Augusta (1766–1828), married in 1797 to Frederick, afterwards king of Württemberg; Augusta Sophia (1768–1840); Elizabeth (1770–1840), married Frederick, landgrave of Hesse-Homburg, 1818; Mary (1776–1857), married to William Frederick, duke of Gloucester, 1816; Sophia (1777–1848); Amelia (1783–1810). (S. R. G.)

The numerous contemporary memoirs and diaries are full of the best material for a picture of George III.'s reign, apart from the standard histories. Thackeray's *Four Georges* must not be trusted so far as historical judgment is concerned; Jesse's *Memoirs of the Life and Reign of George III.* (2nd ed., 1867) is chiefly concerned with personalities. See also Beckles Willson, *George III., as Man, Monarch and Statesman* (1907).

GEORGE IV. [George Augustus Frederick] (1762–1830), king of Great Britain and Ireland, eldest son of George III., was born at St James's Palace, London, on the 12th of August 1762. He was naturally gifted, was well taught in the classics, learnt to speak French, Italian and German fluently, and had considerable taste for music and the arts; and in person he was remarkably handsome. His tutor, Bishop Richard Hurd, said of him when fifteen years old that he would be "either the most polished gentleman or the most accomplished blackguard in Europe—possibly both"; and the latter prediction was only too fully justified. Reaction from the strict and parsimonious style of his parents' domestic life, which was quite out of touch with the gaiety and extravagance of London "society," had its natural effect in plunging the young prince of Wales, flattered and courted as he was, into a whirl of pleasure-seeking. At the outset his disposition was brilliant and generous, but it was essentially unstable, and he started even before he came of age on a career of dissipation which in later years became wholly profligate. He had an early amour with the actress Mary ("Perdita") Robinson, and in the choice of his friends he opposed and annoyed the king, with whom he soon became (and always remained) on the worst of terms, by associating himself with Fox and Sheridan and the Whig party. When in 1783 he came of age, a compromise between the coalition ministry and the king secured him an income of £50,000 from the Civil List, and £60,000 was voted by parliament to pay his debts and start his separate establishment at Carlton House. There, under the auspices of C. J. Fox and Georgiana, duchess of Devonshire, he posed as a patron of Whig politics and a leader in all the licence and luxury of gay society—the "First gentleman in Europe," as his flatterers described him as years went on. And at this early age he fell seriously in love with the famous Mrs Fitzherbert.

His long connexion with this lady may most conveniently be summarized here. It was indeed for some time the one redeeming and restraining factor in his life, though her devotion and self-sacrificing conduct were in marked contrast with his unscrupulousness and selfishness. Mary Anne (or as she always called herself, Maria) Fitzherbert (1756–1837) was the daughter of Walter Smythe, the second son of Sir John Smythe, Bart., of Acton Burnell Park, Shropshire, and came of an old Roman Catholic family. Educated at a French convent, she married first in 1775 Edward Weld, who died within the year, and secondly in 1778 Thomas Fitzherbert, who died in 1781, leaving his widow with a comfortable fortune. A couple of years later she became a prominent figure in London society, and her beauty and charm at once attracted the young prince, who wooed her with all the ardour of a violent passion. She herself was distracted between her desire to return his love, her refusal to contemplate becoming his mistress, and her knowledge that state reasons made a regular marriage impossible. The Act of Settlement (1689) entailed his forfeiture of the succession if he married a Roman Catholic, apart from the fact that the Royal Marriage Act of 1772 made any marriage illegal without the king's consent, which was out of the question. But after trying for a while to escape his attentions, her scruples were overcome. In Mrs Fitzherbert's eyes the state law was, after all, not everything. To a Roman Catholic, and equally to any member of the Christian church, a formal marriage ceremony would be ecclesiastically and sacramentally binding; and after a period of passionate importunacy on his part they were secretly married by the Rev. R. Burt, a clergyman of the Church of England, on the 15th of December 1785.[1] There is no doubt as to Mrs Fitzherbert's belief, supported by ecclesiastical considerations, in her correct

[1] For a discussion of the ecclesiastical validity of the marriage see W. H. Wilkins, *Mrs Fitzherbert and George IV* (1905), chs. vi. and vii.

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and binding, though admittedly illegal, relationship to the prince as his canonical wife; and though that relationship was not, and for political reasons could not be, publicly admitted, it was in fact treated by their intimates on the footing of a morganatic marriage. The position nevertheless was inevitably a false one; Mrs Fitzherbert had promised not to publish the evidence of the marriage (which, according to a strict interpretation of the Act of Settlement might have barred succession to the crown), and the rumours which soon got about led the prince to allow it to be disavowed by his political friends. He lived in the most extravagant way, became heavily involved in debt, and as the king would not assist him, shut up Carlton House, and went to live with Mrs Fitzherbert at Brighton. In 1787 a proposal was brought before the House of Commons by Alderman Newnham for a grant in relief of his embarrassments. It was on this occasion that Fox publicly declared in the House of Commons, as on the prince's own authority, in answer to allusions to the marriage, that the story was a malicious falsehood. A little later Sheridan, in deference to Mrs Fitzherbert's pressure and to the prince's own compunction, made a speech guardedly modifying Fox's statement; but though in private the denial was understood, it effected its object, the House voting a grant of £221,000 to the prince and the king adding £10,000 to his income; and Mrs Fitzherbert, who at first thought of severing her connexion with the prince, forgave him. Their union—there was no child of the marriage—was brutally broken off in June 1794 by the prince, when further pressure of debts (and the influence of a new Egeria in Lady Jersey) made him contemplate his official marriage with princess Caroline; in 1800, however, it was renewed, after urgent pleading on the prince's part, and after Mrs Fitzherbert had obtained a formal decision from the pope pronouncing her to be his wife, and sanctioning her taking him back; her influence over him continued till shortly before the prince became regent, when his relations with Lady Hertford brought about a final separation. For the best years of his life he had at least had in Mrs Fitzherbert the nearest approach to a real wife, and this was fully recognized by the royal family.[1] But his dissolute nature was entirely selfish, and his various liaisons ended in the dominance of Lady Conyngham, the "Lady Steward" of his household, from 1821 till his death.

Notorious as the prince of Wales had become by 1788, it was in that year that his father's first attack of insanity made his position in the state one of peculiar importance. Fox maintained and Pitt denied that the prince of Wales, as the heir-apparent, had a right to assume the regency independently of any parliamentary vote. Pitt, with the support of both Houses, proposed to confer upon him the regency with certain restrictions. The recovery of the king in February 1789 put an end, however, to the prince's hopes. In 1794 the prince consented to a marriage with a German Protestant princess, because his father would not pay his debts on any other terms, and his cousin, Princess Caroline of Brunswick, was brought over from Germany and married to him in 1795. Her behaviour was light and flippant, and he was brutal and unloving. The ill-assorted pair soon parted, and soon after the birth of their only child, the princess Charlotte, they were formally separated. With great unwillingness the House of Commons voted fresh sums of money to pay the prince's debts.

In 1811 he at last became prince regent in consequence of his father's definite insanity. No one doubted at that time that it was in his power to change the ministry at his pleasure. He had always lived in close connexion with the Whig opposition, and he now empowered Lord Grenville to form a ministry. There soon arose differences of opinion between them on the answer to be returned to the address of the Houses, and the prince regent then informed the prime minister, Mr Perceval, that he should continue the existing ministry in office. The ground alleged by him for this desertion of his friends was the fear lest his father's recovery might be rendered impossible if he should come to hear of the advent of the opposition to power. Lord Wellesley's resignation in February 1812 made the reconstruction of the ministry inevitable. As there was no longer any hope of the king's recovery, the former objection to a Whig administration no longer existed. Instead of taking the course of inviting the Whigs to take office, he asked them to join the existing administration. The Whig leaders, however, refused to join, on the ground that the question of the Catholic disabilities was too important to be shelved, and that their difference of opinion with Mr Perceval was too glaring to be ignored. The prince regent was excessively angry, and continued Perceval in office till that minister's assassination on the 11th of May, when he was succeeded by Lord Liverpool, after a negotiation in which the proposition of entering the cabinet was again made to the Whigs and rejected by them. In the military glories of the following years the prince regent had no share. When the allied sovereigns visited England in 1814, he played the part of host to perfection. So great was his unpopularity at home that hisses were heard in the streets as he accompanied his guests into the city. The disgust which his profligate and luxurious life caused amongst a people suffering from almost universal distress after the conclusion of the war rapidly increased. In 1817 the windows of the prince regent's carriage were broken as he was on his way to open parliament.

The death of George III. on the 29th of January 1820, gave to his son the title of king without in any way altering the position which he had now held for nine years. Indirectly, however, this change brought out a manifestation of popular feeling such as his father had never been subjected to even in the early days of his reign, when mobs were burning jack-boots and petticoats. The relations between the new king and his wife unavoidably became the subject of public discussion. In 1806 a charge against the princess of having given birth to an illegitimate child had been conclusively disproved, and the old king had consequently refused to withdraw her daughter, the princess Charlotte, from her custody. When in the regency the prince was able to interfere, and prohibited his wife from seeing her daughter more than once a fortnight. On this, in 1813, the princess addressed to her husband a letter setting forth her complaints, and receiving no answer published it in the *Morning Chronicle*. The prince regent then referred the letter, together with all papers relating to the inquiry of 1806, to a body of twenty-three privy councillors for an opinion whether it was fit that the restrictions on the intercourse between the princess Charlotte and her mother should continue in force. All except two answered as the regent wished them to answer. But if the official leaning was towards the husband, the leaning of the general public was towards the wife of a man whose own life had not been such as to justify him in complaining of her whom he had thrust from him without a charge of any kind. Addresses of sympathy were sent up to the princess from the city of London and other public bodies. The discord again broke out in 1814 in

[1] Mrs Fitzherbert herself, after her final separation from the prince, with an annuity of £6000 a year, lived an honoured and more or less retired life mainly at Brighton, a town which owed its rapid development in fashionable popularity and material wealth to its selection by the prince and herself as a residence from the earliest years of their union; and there she died, seven years after the death of George IV., in 1837. William IV. on his accession offered to create her a duchess, but she declined; she accepted, however, his permission to put her servants in royal livery. William IV. in fact, to all he could, short of a public acknowledgment (which the duke of Wellington opposed on state grounds), to recognize her position as his brother's widow. Charles Greville, writing of her after her death, says in his *Diary*, "She was not a clever woman, but she was a noble spirit, disinterested, generous, honest and affectionate." The actual existence of a marriage tie and the documentary evidence of her rights were not definitely established for many years; but in 1905 a sealed packet, deposited at Coutts's bank in 1833, was, at length opened by royal permission, and the marriage certificate and other conclusive proofs therein contained were published in Mr W. H. Wilkins's *Mrs Fitzherbert and George IV.* In 1796 the prince had made a remarkable will in Mrs Fitzherbert's favour, which he gave her in 1799, and it is included among these documents (now in the private archives at Windsor). In this he speaks of her emphatically throughout as "my wife." It also contained directions that at his death a locket with her miniature, which he always wore, should be interred with him; and Mrs Fitzherbert was privately assured, on the duke of Wellington's authority, that when the king was buried at Windsor the miniature was on his breast.

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consequence of the exclusion of the princess from court during the visit of the allied sovereigns. In August in that year she left England, and after a little time took up her abode in Italy. The accession of George IV. brought matters to a crisis. He ordered that no prayer for his wife as queen should be admitted into the Prayer Book. She at once challenged the accusation which was implied in this omission by returning to England. On the 7th of June she arrived in London. Before she left the continent she had been informed that proceedings would be taken against her for adultery if she landed in England. Two years before, in 1818, commissioners had been sent to Milan to investigate charges against her, and their report, laid before the cabinet in 1819, was made the basis of the prosecution. On the day on which she arrived in London a message was laid before both Houses recommending the criminating evidence to parliament. A secret committee in the House of Lords after considering this evidence brought in a report on which the prime minister founded a Bill of Pains and Penalties to divorce the queen and to deprive her of her royal title. The bill passed the three readings with diminished majorities, and when on the third reading it obtained only a majority of nine, it was abandoned by the Government. The king's unpopularity, great as it had been before, was now greater than ever. Public opinion, without troubling itself to ask whether the queen was guilty or not, was roused to indignation by the spectacle of such a charge being brought by a husband who had thrust away his wife to fight the battle of life alone, without protection or support, and who, whilst surrounding her with spies to detect, perhaps to invent, her acts of infidelity, was himself notorious for his adulterous life. In the following year (1821) she attempted to force her way into Westminster Abbey to take her place at the coronation. On this occasion the popular support failed her; and her death in August relieved the king from further annoyance.

Immediately after the death of the queen, the king set out for Ireland. He remained there but a short time, and his effusive declaration that rank, station, honours were nothing compared with the exalted happiness of living in the hearts of his Irish subjects gained him a momentary popularity which was beyond his attainment in a country where he was better known. His reception in Dublin encouraged him to attempt a visit to Edinburgh in the following year (August 1822). Since Charles II. had come to play the sorry part of a covenanting king in 1650 no sovereign of the country had set foot on Scottish soil. Sir Walter Scott took the leading part in organizing his reception. The enthusiasm with which he was received equalled, if it did not surpass, the enthusiasm with which he had been received in Dublin. But the qualities which enabled him to fix the fleeting sympathies of the moment were not such as would enable him to exercise the influence in the government which had been indubitably possessed by his father. He returned from Edinburgh to face the question of the appointment of a secretary of state which had been raised by the death of Lord Londonderry (Castlereagh). It was upon the question of the appointment of ministers that the battle between the Whigs and the king had been fought in the reign of George III. George IV. had neither the firmness nor the moral weight to hold the reins which his father had grasped. He disliked Canning for having taken his side very much as his father had disliked Fox for taking his own. But Lord Liverpool insisted on Canning's admission to office, and the king gave way. Tacitly and without a struggle the constitutional victory of the last reign was surrendered. What was not surrendered to the same foe as that from which it had been won. The coalition ministry in 1784 rested on the landowners and the proprietors of rotten boroughs. Lord Liverpool's ministry had hitherto not been very enlightened, but supported itself to a great extent upon a narrow constituency.

But it did appeal to public opinion in a way that the king did not, and what it wanted itself to popular support he was supplied by its successors. What one king had gained by a clique another gave up to the nation. Once more, on Lord Liverpool's death in 1827, the same question was tried and the same result. The king not only disliked Canning personally, but he was opposed to Canning's policy. Yet after some hesitation he accepted Canning as prime minister; and when, after Canning's death and the short ministry of Lord Goderich, the king in 1828 authorized the duke of Wellington to form a ministry, he was content to lay down the principle that the members of it were not expected to be unanimous on the Catholic question. When in 1829 the Wellington ministry unexpectedly proposed to introduce a Bill to remove the disabilities of the Catholics, he feebly strove against the proposal and quickly withdrew his opposition. The worn-out debauchee had neither the merit of acquiescing in the change nor the courage to resist it.

George IV. died on the 26th of June 1830, and was succeeded by his brother, the duke of Clarence, as William IV. His only child by Queen Caroline, the princess Charlotte Augusta, was married in 1816 to Leopold of Saxe-Coburg, afterwards king of the Belgians, and died in childbirth on the 6th of November 1817.

George IV. was a bad king, and his reign did much to disgust the country with the Georgian type of monarchy; but libertine and profligate as he became, the abuse which has been lavished on his personal character has hardly taken into sufficient consideration the loose morals of contemporary society, the political position of the Whig party, and his own ebullient temperament. Thackeray, in his *Four Georges*, is frequently unfair in this respect. The just condemnation of the moralist and satirist requires some qualification in the light of the picture of the period handed down in the memoirs and diaries of the time, such as Greville's, Croker's, Creevey's, Lord Holland's, Lord Malmesbury's, &c. Among later works see *The First Gentleman of Europe*, by Lewis Melville (1906), a book for the general reader. (S. R. G.; H. Ch.)

GEORGE V. [GEORGE FREDERICK ERNEST ALBERT], king of Great Britain and Ireland and of the British Dominions beyond the Seas, emperor of India (1865–), second son of King Edward VII., was born at Marlborough House, London, on the 3rd of June 1865. When four years old, he and his elder brother, Prince Albert Victor, two years his senior, were placed under the tutorship of John Neale Dalton, then curate of Sandringham. In 1877 the two princes became naval cadets on the "Britannia" at Spithead, where they passed through the ordinary curriculum, and in 1879 they joined H.M.S. "Bacchante" under the command of Captain Lord Charles Scott, making a voyage to the West Indies, in the course of which they were rated midshipmen. After a month at home in 1880 they returned to the ship to make another prolonged cruise in H.M.S. "Bacchante," in the course of which they visited South America, South Africa, Australia, the Fiji Islands, Japan, Ceylon, Egypt, Palestine and Greece. A narrative of this voyage, *The Cruise of H.M.S. "Bacchante,"* compiled from the letters, diaries and notebooks of the princes, was published in 1886. At the close of this tour in 1882 the brothers separated. Prince George, who remained in the naval service, was appointed to H.M.S. "Canada," commanded by Captain Durrant, on the North American and West Indian station, and was promoted sub-lieutenant. On his return home he passed through the Royal Naval College at Greenwich and the gunnery and torpedo schools, being promoted lieutenant in 1885. A year later he was appointed to H.M.S. "Thunderer" of the Mediterranean squadron, and was subsequently transferred to H.M.S. "Dreadnought" and H.M.S. "Alexandra." In 1889 he joined the flagship of the Channel squadron, H.M.S. "Northumberland," and in that year was in command of torpedo boat No. 79 for the naval manœuvres. In 1890 he was put in command of the gunboat H.M.S. "Thrush" for service on the North American and West Indian station. After his promotion as commander in 1891 he commissioned H.M.S. "Melampus," the command of which he relinquished on the death of his brother, Albert Victor, the duke of Clarence, in January 1892, since his duties as eventual heir to the crown precluded him from devoting himself exclusively to the navy. He was promoted captain in 1893, rear-admiral in 1901, and vice-admiral in 1903. He was created duke of York, earl of Inverness, and Baron Killarney in 1892, and on the 6th of July 1893 he married Princess Victoria Mary (b. 26th May 1867), daughter of Francis, duke of Teck,

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and Princess Mary Adelaide, duchess of Teck, daughter of Adolphus Frederick, duke of Cambridge. Their eldest son, Prince Edward Albert, was born at White Lodge, Richmond, on the 23rd of June 1894; Prince Albert Frederick George was born at Sandringham on the 14th of December 1895; Princess Victoria Alexandra on the 25th of April 1897; Prince Henry William Frederick Albert on the 31st of March 1900; Prince George Edward Alexander Edmund on the 20th of December 1902; and Prince John Charles Francis on the 12th of July 1905. The duke and duchess of York visited Ireland in 1899, and it had been arranged before the death of Queen Victoria that they should make a tour in the colonies. On the accession of King Edward VII. (1901) this plan was confirmed. They sailed in the "Ophir" on the 16th of March 1901, travelling by the ordinary route, and landed at Melbourne in May, when they opened the first parliament of the Commonwealth. They then proceeded to New Zealand, returning by way of South Africa and Canada. An official account of the tour was published by Sir Donald Mackenzie Wallace as *The Web of Empire* (1902). In November 1901 the duke was created prince of Wales. On the death of Edward VII. (May 6, 1910) he succeeded to the Crown as George V., his consort taking the style of Queen Mary.

GEORGE V., king of Hanover (1819–1878), was the only son of Ernest Augustus, king of Hanover and duke of Cumberland, and consequently a grandson of the English king George III. Born in Berlin on the 27th of May 1819, his youth was passed in England and in Berlin until 1837, when his father became king of Hanover and he took up his residence in that country. He lost the sight of one eye during a childish illness, and the other by an accident in 1833. Being thus totally blind there were doubts whether he was qualified to succeed to the government of Hanover; but his father decided that he should do so, as the law of the dissolved empire only excluded princes who were born blind. This decision was a fatal one to the dynasty. Both from his father and from his maternal uncle, Charles Frederick, prince of Mecklenburg-Strelitz (1785–1837), one of the most influential men at the Prussian court, George had learned to take a very high and autocratic view of royal authority. His blindness prevented him from acquiring the shrewdness and knowledge of the world which had assisted his father, and he easily fell into the hands of unwise, and perhaps dishonest and disloyal, advisers. A man of deep religious feeling, he formed a fantastic conception of the place assigned to the house of Guelph in the divine economy, and had ideas of founding a great Guelph state in Europe. It is, therefore, not surprising that from the time of his accession in November 1851 he was constantly engaged in disputes with his *Landtag* or parliament, and was consequently in a weak and perilous position when the crisis in the affairs of Germany came in 1866. Having supported Austria in the diet of the German confederation in June 1866, he refused, contrary to the wishes of his parliament, to assent to the Prussian demand that Hanover should observe an unarmed neutrality during the war. As a result his country and his capital were at once occupied by the Prussians, to whom his army surrendered on the 29th of June 1866, and in the following September Hanover was formally annexed by Prussia. From his retreat at Hietzing near Vienna, George appealed in vain to the powers of Europe; and supported by a large number of his subjects, an agitation was carried on which for a time caused some embarrassment to Prussia. All these efforts, however, to bring about a restoration were unavailing, and the king passed the remainder of his life at Gmünden in Austria, or in France, refusing to the last to be reconciled with the Prussian government. Whilst visiting Paris for medical advice he died in that city on the 12th of June 1878, and was buried in St George's chapel, Windsor. In February 1843 he had married Marie, daughter of Joseph, duke of Saxe-Altenburg, by whom he left a son and two daughters. His son, Ernest Augustus, duke of Cumberland (b. 1845), continued to maintain the claim of his house to the kingdom of Hanover.

By the capitulation of 1866 the king was allowed to retain his personal property, which included money and securities equal to nearly £1,500,000, which had been sent to England before the Prussian invasion of Hanover. The crown jewels had also been secretly conveyed to England. His valuable plate, which had been hidden at Herrenhausen, was restored to him in 1867; his palace at Herrenhausen, near Hanover, was reserved as his property; and in 1867 the Prussian government agreed to compensate him for the loss of his landed estates, but owing to his continued hostility the payment of the interest on this sum was suspended in the following year (see HANOVER).

See O. Klopp, *König Georg V.* (Hanover, 1878); O. Theodor, *Erinnerungen an Georg V.* (Bremerhaven, 1878); and O. Meding, *Memoiren zur Zeitgeschichte* (Leipzig, 1881–1884).

GEORGE I., king of the Hellenes (1845–), second son of King Christian IX. of Denmark, was born at Copenhagen on the 24th of December 1845. After the expulsion of King Otho in 1862, the Greek nation, by a plebiscite, elected the British prince, Alfred, duke of Edinburgh (subsequently duke of Coburg), to the vacant throne, and on his refusal the national assembly requested Great Britain to nominate a candidate. The choice of the British government fell on Prince Christian William Ferdinand Adolphus George of Schleswig-Holstein-Sonderburg-Glücksburg, whose election as king of the Hellenes, with the title George I., was recognized by the powers (6th of June 1863). The sister of the new sovereign, Princess Alexandra, had a few months before (10th March) married the prince of Wales, afterwards King Edward VII., and his father succeeded to the crown of Denmark in the following November. Another sister, Princess Dagmar, subsequently married the grand duke Alexander Alexandrovitch, afterwards Emperor Alexander III. of Russia. On his accession, King George signed an act resigning his right of succession to the Danish throne in favour of his younger brother Prince Waldemar. He was received with much enthusiasm by the Greeks. Adopting the motto, "My strength is the love of my people," he ruled in strict accordance with constitutional principles, though not hesitating to make the fullest use of the royal prerogative when the intervention of the crown seemed to be required by circumstances. For the events of his reign see GREECE: *History*.

King George married, on the 27th of October 1867, the grand duchess Olga Constantinovna of Russia, who became distinguished in Greece for her activity on behalf of charitable objects. Their children were Prince Constantine, duke of Sparta (b. 1868), who married in 1889 Princess Sophia of Prussia, daughter of the emperor Frederick, and granddaughter of Queen Victoria; Prince George (b. 1869), from November 1898 to October 1906 high commissioner of the powers in Crete; Prince Nicholas (b. 1872), who married in 1902 the grand duchess Helen-Vladimirovna of Russia; Prince Andrew (b. 1882), who married in 1903 Princess Alice of Battenberg; Prince Christopher (b. 1888); and a daughter, Princess Marie (b. 1876), who married in 1900 the grand duke George Michailovich of Russia.

GEORGE, king of Saxony (1832–1904), the youngest son of King John of Saxony (d. 1873) and Queen Amelia, was born at Dresden on the 8th of August 1832. From an early age he received a careful scientific and military training, and in 1846 entered the active army as a lieutenant of artillery. In 1849–1850 he was a student at the university of Bonn, but soon returned to military life, for which he had a predilection. In the Austro-Prussian War of 1866 he commanded a Saxon cavalry brigade, and in the early part of the war of 1870–71 a division, but later succeeded to the supreme command of the XII. (Saxon) army corps in the room of his brother, the crown prince Albert (afterwards king) of Saxony. His name is inseparably associated with this campaign, during which he showed undoubted military ability and an intrepidity which communicated itself to all ranks under his command, notably at the battles of St Privat and Beaumont, in which he greatly distinguished himself. On his brother succeeding to the throne he became commander-in-chief of the Saxon army, and was in 1888 made a Prussian field marshal by the emperor William I. He married in 1859 the infanta Maria, sister of King Louis of Portugal, and King

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Albert's marriage being childless, succeeded on his death in 1902 to the throne of Saxony. He died on the 15th of October 1904, at Pillnitz.

GEORGE OF LAODICEA in Syria, often called "the Cappadocian," from 356 to 361 Arian archbishop of Alexandria, was born about the beginning of the 4th century. According to Ammianus (xxii. 11), he was a native of Epiphania, in Cilicia. Gregory Nazianzen tells us that his father was a fuller, and that he himself soon became notorious as a parasite of so mean a type that he would "sell himself for a cake." After many wanderings, in the course of which he seems to have amassed a considerable fortune, first as an army-contractor and then as a receiver of taxes, he ultimately reached Alexandria. It is not known how or when he obtained ecclesiastical orders; but, after Athanasius had been banished in 356, George was promoted by the influence of the then prevalent Arian faction to the vacant see. His theological attitude was that known as semi-Arian or Homoiousian, and his associates were Eustathius of Sebaste and Basil of Ancyra. At George's instigation the second Sirmian formula (promulgated by the third council of Sirmium 357), which was conciliatory towards strict Arianism, was opposed at the council of Ancyra in 358 (Harnack, *Hist. of Dogma*, iv. 76). His persecutions and oppressions of the orthodox ultimately raised a rebellion which compelled him to flee for his life; but his authority was restored, although with difficulty, by a military demonstration. Untaught by experience, he resumed his course of selfish tyranny over Christians and heathen alike, and raised the irritation of the populace to such a pitch that when, on the accession of Julian, his downfall was proclaimed and he was committed to prison, they dragged him thence and killed him, finally casting his body into the sea (24th of December 361). With much that was sordid and brutal in his character George combined a highly cultivated literary taste, and in the course of his chequered career he had found the means of collecting a splendid library, which Julian ordered to be conveyed to Antioch for his own use. An anonymous work against the Manicheans discovered by Lagarde in 1859 in a MS. of Titus of Bostra has been attributed to him.

The original sources for the facts of the life of George of Laodicea are Ammianus, Gregory Nazianzen, Epiphanius and Athanasius. His character has been drawn with graphic fidelity by Gibbon in the 23rd chapter of the *Decline and Fall*; but the theory, accepted by Gibbon, which identifies him with the patron saint of England is now rejected (see GEORGE, SAINT). See C. S. Hulst, *St George of Cappadocia in Legend and History* (1910).

GEORGE OF TREBIZOND (1395–1484), Greek philosopher and scholar, one of the pioneers of the revival of letters in the Western world, was born in the island of Crete, and derived his surname Trapezuntios from the fact that his ancestors were from Trebizond. At what period he came to Italy is not certain; according to some accounts he was summoned to Venice about 1430 to act as amanuensis to Francesco Barbaro, who appears to have already made his acquaintance; according to others he did not visit Italy till the time of the council of Florence (1438–1439). He learned Latin from Vittorino da Feltre, and made such rapid progress that in three years he was able to teach Latin literature and rhetoric. His reputation as a teacher and a translator of Aristotle was very great, and he was selected as secretary by Pope Nicholas V., an ardent Aristotelian. The needless bitterness of his attacks upon Plato (in the *Comparatio Aristotelis et Platonis*), which drew forth a powerful response from Bessarion (*q.v.*), and the manifestly hurried and inaccurate character of his translations of Plato, Aristotle and other classical authors, combined to ruin his fame as a scholar, and to endanger his position as a teacher of philosophy. The indignation against him on account of his first-named work was so great that he would probably have been compelled to leave Italy had not Alphonso V. given him protection at the court of Naples. He subsequently returned to Rome, where he died in great poverty on the 12th of August 1484. He had long outlived his reputation, and towards the end of his life his intellect failed him. From all accounts he was a man of very disagreeable character, conceited and quarrelsome.

See G. Voigt, *Die Wiederbelebung des klassischen Alterthums* (1893), and article by C. F. Bähr in Ersch and Gruber's *Allgemeine Encyklopädie*. For a complete list of his numerous works, consisting of translations from Greek into Latin (Plato, Aristotle and the Fathers) and original essays in Greek (chiefly theological) and Latin (grammatical and rhetorical), see Fabricius, *Bibliotheca Graeca* (ed. Harles), xii.

GEORGE THE MONK [GEORGIOS MONACHOS], called Hamartolos (Greek for "sinner"), Byzantine chronicler, lived during the reign of Michael III. (842–867). He wrote a *Chronicle* of events, in four books, from the creation of the world to the death of the emperor Theophilus (842), whose widow Theodora restored the worship of images in the same year. It is the only original contemporary authority for the years 813–842, and therefore so far indispensable; the early parts of the work are merely a compilation. In the introduction the author disclaims all pretensions to literary style, and declares that his only object was to relate such things as were "useful and necessary" with a strict adherence to truth. Far too much attention, however, is devoted to religious matters; the iconoclasts are fiercely attacked, and the whole is interlarded with theological discussions and quotations from the fathers. The work was very popular, and translations of it served as models for Slavonic writers. The MSS. give a continuation down to 948, the author of which is indicated simply as "the logothete," by whom probably Symeon Metaphrastes (second half of the 10th century) is meant. In this religious questions are relegated to the background, more attention is devoted to political history, and the language is more popular. Still further continuations of little value go down to 1143. The large circulation of the work and its subsequent reissues, with alterations and interpolations, make it very difficult to arrive at the original text.

EDITIONS: E. de Muralt (St Petersburg, 1859); J. P. Migne, *Patrologia Graeca*, ex.; C. de Boor (in Teubner series, 1904–). See F. Hirsch, *Byzantinische Studien* (1876); C. de Boor in *Historische Untersuchungen* (in honour of Arnold Schäfer, Bonn, 1882); C. Krumbacher, *Geschichte der byzantinischen Litteratur* (1897).

GEORGE THE SYNCELLUS [GEORGIOS SYNKELLOS], of Constantinople, Byzantine chronicler and ecclesiastic, lived at the end of the 8th and the beginning of the 9th century A.D. He was the *syncellus* (cell-mate, the confidential companion assigned to the patriarchs, sometimes little more than a spy; see SYNCELLUS) or private secretary of Tara(u)sius, patriarch of Constantinople (784–806), after whose death he retired to a convent, and wrote his *Chronicle* of events from Adam to Diocletian (283). At his earnest request, the work, which he doubtless intended to bring down to his own times, was continued after his death by his friend Theophanes Confessor. The *Chronicle*, which, as its title implies, is rather a chronological table (with notes) than a history, is written with special reference to pre-Christian times and the introduction of Christianity, and exhibits the author as a staunch upholder of orthodoxy. But in spite of its religious bias and dry and uninteresting character, the fragments of ancient writers and apocryphal books preserved in it render it specially valuable. For instance, considerable portions of the original text of the *Chronicle* of Eusebius have been restored by the aid of Syncellus. His chief authorities were Annianus of Alexandria (5th century) and Panodorus, an Egyptian monk, who wrote about the year 400 and drew largely from Eusebius, Dexippus and Julius Africanus.

Editio princeps, by J. Goar (1652); in Bonn *Corpus scriptorum hist. Byz.*, by W. Dindorf (1829). See also H. Gelzer, *Sextus Julius Africanus*, ii. 1 (1885); C. Krumbacher, *Geschichte der byzantinischen Litteratur* (1897).

GEORGE, HENRY (1839–1897), American author and political economist, was born in Philadelphia, Penn., on the 2nd of September 1839. He settled in California in 1858; removed to New York, 1880; was first a printer, then an editor, but finally devoted all his life to economic and social questions. In 1871 he published *Our Land Policy*, which, as further developed in 1879 under the title of *Progress and Poverty*, speedily attracted the widest attention both in America and in Europe. In 1886 he published *Protection or Free Trade*. Henry George had no political ambition, but in 1886 he received an independent nomination as mayor of New York City, and became so popular

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that it required a coalition of the two strongest political parties to prevent his election. He received 68,000 votes, against 90,000 for the coalition candidate. His death on the 29th of October 1897 was followed by one of the greatest demonstrations of popular feeling and general respect that ever attended the funeral of any strictly private citizen in American history. The fundamental doctrine of Henry George, the equal right of all men to the use of the earth, did not originate with him; but his clear statement of a method by which it could be enforced, without increasing state machinery, and indeed with a great simplification of government, gave it a new form. This method he named the *Single Tax*. His doctrine may be condensed as follows: The land of every country belongs of right to all the people of that country. This right cannot be alienated by one generation, so as to affect the title of the next, any more than men can sell their yet unborn children for slaves. Private ownership of land has no more foundation in morality or reason than private ownership of air or sunlight. But the private occupancy and use of land are right and indispensable. Any attempt to divide land into equal shares is impossible and undesirable. Land should be, and practically is now, divided for private use in parcels among those who will pay the highest price for the use of each parcel. This price is now paid to some persons annually, and it is called *rent*. By applying the rent of land, exclusive of all improvements, to the equal benefit of the whole community, absolute justice would be done to all. As rent is always more than sufficient to defray all necessary expenses of government, those expenses should be met by a tax upon rent alone, to be brought about by the gradual abolition of all other taxes. Landlords should be left in undisturbed possession and nominal ownership of the land, with a sufficient margin over the tax to induce them to collect their rents and pay the tax. They would thus be transformed into mere land agents. Obviously this would involve absolute free trade, since all taxes on imports, manufactures, successions, documents, personal property, buildings or improvements would disappear. Nothing made by man would be taxed at all. The right of private property in all things made by man would thus be absolute, for the owner of such things could not be divested of his property, without full compensation, even under the pretence of taxation. The idea of concentrating all taxes upon ground-rent has found followers in Great Britain, North America, Australia and New Zealand. In practical politics this doctrine is confined to the "Single Tax Limited," which proposes to defray only the needful public expenses from ground-rent, leaving the surplus, whatever it may be, in the undisturbed possession of land-owners.

The principal books by Henry George are: *Progress and Poverty* (1879), *The Irish Land Question* (1881), *Social Problems* (1884), *Protection or Free Trade* (1886), *The Condition of Labor* (1891), *A Perplexed Philosopher* (1892), *Political Economy* (1898). His son, Henry George (b. 1862), has written a *Life* (1900). For the Single Tax theory see Sharman's *Natural Taxation* (1899). (T. G. S.)

GEORGE PISIDA [GEORGIOS PISIDES], Byzantine poet, born in Pisidia, flourished during the 7th century A.D. Nothing is known of him except that he was a deacon and chartophylax (keeper of the records) of the church of St Sophia. His earliest work, in three cantos (ἀκροάσεις), on the campaign of the emperor Heraclius against the Persians, seems to be the work of an eye-witness. This was followed by the *Avarica*, an account of a futile attack on Constantinople by the Avars (626), said to have been repulsed by the aid of the Virgin Mary; and by the *Heraclias*, a general survey of the exploits of Heraclius both at home and abroad down to the final overthrow of Chosroes in 627. George Pisida was also the author of a didactic poem, *Hexaëmeron* or *Cosmourgia*, upon the creation of the world; a treatise on the vanity of life, after the manner of *Ecclesiastes*; a controversial composition against Severus, bishop of Antioch; two short poems upon the resurrection of Christ and on the recovery of the sacred crucifix stolen by the Persians. The metre chiefly used is the iambic. As a versifier Pisida is correct and even elegant; as a chronicler of contemporary events he is exceedingly useful; and later Byzantine writers enthusiastically compared him with, and even preferred him to Euripides. Recent criticism, however, characterizes his compositions as artificial and almost uniformly dull.

Complete works in J. P. Migne, *Patrologia Graeca*, xcii.; see also *De Georgii Pisidae apud Theophanem aliosque historicos reliquiis*, (1900), by S. L. Sternbach, who has edited several new poems for the first time from a Paris MS. in *Wiener Studien*, xiii., xiv. (1891–1892); C. Krumbacher, *Geschichte der byzantinischen Litteratur* (1897); C. F. Bähr in Ersch and Gruber's *Allgemeine Encyklopädie*.

GEORGE, LAKE, a lake in the E. part of New York, U.S.A., among the S.E. foothills of the Adirondack Mountains. It extends from N.N.E. to S.S.W. about 34 m., and varies in width from 2 to 4 m. It has a maximum depth of about 400 ft., and is 323 ft. above the sea and 227 ft. above Lake Champlain, into which it has an outlet to the northward through a narrow channel and over falls and rapids. The lake is fed chiefly by mountain brooks and submerged springs; its bed is for the most part covered with a clean sand; its clear water is coloured with beautiful tints of blue and green; and its surface is studded with about 220 islands and islets, all except nineteen of which belong to the state and constitute a part of its forest reserve. Near the head of the lake is Prospect Mountain, rising 1736 ft. above the sea, while several miles farther down the shores is Black Mountain, 2661 ft. in height. Lake George has become a favourite summer resort. Lake steamers ply between the village of Lake George (formerly Caldwell) at the southern end of the lake and Baldwin, whence there is rail connexion with Lake Champlain steamers.

Lake George was formed during the Glacial period by glacial drift which clogged a pre-existing valley. According to Prof. J. F. Kemp the valley occupied by Lake George was a low pass before the Glacial period; a dam of glacial drift at the southern end and of lacustrine clays at the northern end formed the lake which has submerged the pass, leaving higher parts as islands. Before the advent of the white man the lake was a part of the war-path over which the Iroquois Indians frequently made their way northward to attack the Algonquins and the Hurons, and during the struggle between the English and the French for supremacy in America, waterways being still the chief means of communication, it was of great strategic importance (see CHAMPLAIN, *Lake*). Father Isaac Jogues, René Goupil and Guillaume Couture seem to have been the first white men to see the lake (on the 9th of August 1642) as they were being taken by their Iroquois captors from the St Lawrence to the towns of the Mohawks, and in 1646 Father Jogues, having undertaken a half-religious, half-political mission to the Mohawks, was again at the lake, to which, in allusion to his having reached it on the eve of Corpus Christi, he gave the name Lac Saint Sacrement. This name it bore until the summer of 1755, when General William Johnson renamed it Lake George in honour of King George II.

General Johnson was at this time in command of a force of colonists and Indians sent against the French at Crown Point on Lake Champlain. The expedition, however, had proceeded no farther than to the head of Lake George when Johnson was informed that a force of French and Indians under Baron Ludwig August Dieskau was pushing on from Crown Point to Fort Lyman (later Fort Edward), 14 m. to the S. of their encampment. Accordingly, on the morning of the 8th of September a detachment of 1000 colonials under Colonel Ephraim Williams (1715–1755) and 200 Indians under Hendrick, a Mohawk chief, was sent to aid Fort Lyman, but when about 3 m. S. of the lake this detachment fell into an ambuscade prepared for it by Dieskau and both Williams and Hendrick were killed. The survivors were pursued to their camp, and then followed on the same day the main battle of Lake George, in which 1000 colonials fighting at first behind a hastily prepared barricade defeated about 1400 French and Indians. Both commanders were wounded; Dieskau was captured; the French lost about 300; and the colonials nearly the same (including those who fell earlier in the day). Johnson now built on the lake shore, near the battlefield, a fort of gravel and logs and called it Fort William Henry (the site was occupied by the Fort William Henry Hotel till it was burned in 1909). In the meantime the French entrenched themselves at Ticonderoga at the foot of the lake. In March 1757 Fort William Henry successfully withstood an attack of 1600

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men sent out by the marquis de Vaudreuil, governor of Canada, but on the 9th of August of the same year its garrison, after being reduced to desperate straits, surrendered to the marquis de Montcalm. By the terms of surrender the garrison was to be allowed to march out with the honours of war and was to be escorted to Fort Edward, but the guard provided by Montcalm was inadequate to protect them from his Indian allies and on the day following the surrender many were massacred or taken prisoners. The fort was razed to the ground. In 1758 General James Abercrombie proceeded by way of Lake George against Fort Ticonderoga, and in 1759 Baron Jeffrey Amherst, while on his way to co-operate with General James Wolfe against Quebec, built near the site of Fort William Henry one bastion of a fort since known as Fort George, the ruins of which still remain.

A monument commemorative of the battle of Lake George was unveiled on the 8th of September 1903, on the site of the battle, and within the state reservation of 35 acres known as Fort George Battle Park. Horicon is a name that was given to the lake by James Fenimore Cooper. The Indian name of the lake was Andia-ta-roc-te.

See Francis Parkman, *Montcalm and Wolfe* (Boston, 1884); and E. E. Seelye, *Lake George in History* (Lake George, 1897).

GEORGE JUNIOR REPUBLIC, an American industrial institution, situated near the small village of Freeville, in Tompkins county, New York, U.S.A., 9 m. E.N.E. of Ithaca, at the junction of the Sayre-Auburn and the Elmira-Cortland branches of the Lehigh Valley railway. The George Junior Republic forms a miniature state whose economic, civic and social conditions, as nearly as possible, reproduce those of the United States, and whose citizenship is vested in young people, especially those who are neglected or wayward, who are thus taught self-reliance, self-control and morality. The founder, William Reuben George (b. 1866), was a native of West Dryden, a village near Freeville, who as a business man in New York City became interested in the Fresh Air Fund charity supervised by the New York *Tribune*, took charge of summer outings for city children (1890–1894), and, becoming convinced that such charities tended to promote pauperism and crime among the object of their protégés, devised first (1894) the plan of requiring payment by the children in labour for all they received during these summer jaunts, then (1895) self-government for a summer colony near Freeville, and finally a permanent colony, in which the children stay for several years. The Republic was founded on the 10th of July 1895; the only check on the powers of executive, representative and judicial branches of the government lies in the veto of the superintendent. "Nothing without labour" is the motto of the community, so strictly carried out that a girl or boy in the Republic who has not money[1] to pay for a night's lodging must sleep in jail and work the next day for the use of the cell. The legislative body, originally a House of Representatives and a Senate, in 1899 became more like the New England town meeting. The respect for the law that follows its enactment by the citizens themselves is remarkable in a class so largely of criminal tendencies; and it is particularly noticeable that positions on the police force are eagerly coveted. Fifteen is the age of majority; suffrage is universal, children under fifteen must be in charge of a citizen guardian. The average age of citizens was seventeen in 1908. The proportion of girls to boys was originally small, but gradually increased; in 1908 there were about 70 girls and 90 boys. The tendency is to admit only those aged at least sixteen and physically well equipped. In the Republic's earlier years the citizens lived in boarding-houses of different grades, but later in family groups in cottages (there were in 1910 twelve cottages) under the care of "house-mothers." The labour of the place is divided into sewing, laundry work, cooking and domestic service for the girls, and furniture making, carpentry, farm work, baking bread and wafers (the business of an Auburn biscuit factory was bought in 1903), plumbing and printing for the boys. Masonry and shoe and harness making were tried for a few years. There is an efficient preparatory and high school, from which students enter directly leading colleges. The religious influence is strong, wholesome and unsectarian; students in Auburn Theological Seminary have assisted in the religious work; Roman Catholic and Hebrew services are also held; and attendance at church services is compulsory only on convicts and prisoners.

There are "Woman's Aid" societies in New York City, Ithaca, Syracuse, Buffalo, Boston and elsewhere, to promote the work of the Republic. A "republic" for younger boys, begun at Freeville, was established in Litchfield, Connecticut; and a National Junior Republic near Annapolis Junction, Maryland, and a Carter Junior Republic at Readington, near Easton, Pennsylvania, are modelled on the George Junior Republic. In 1908–1910 new "states" were established at Chino, California, Grove City, Pennsylvania, and Flemington Junction, New Jersey. In February 1908 the National Association of Junior Republics was formed with Mr George (its founder) as its director, its aims being to establish at least one "republic" in each state of the Union, and in other countries similar institutions for youth and miniature governments modelled on that of the country in which each "state" is established, and to establish colonies for younger children, to be sent at the age of fifteen to the Junior Republic. At the time of its formation the National Association included the "states" at Freeville, N.Y., Litchfield, Conn., and Annapolis Junction, Md.; others joined the federation later.

See William R. George, *The Junior Republic: its History and Ideals* (New York, 1910); *The Junior Republic Citizen* (Freeville, 1895 seq.), written and printed by "citizens"; *Nothing Without Labor, George Junior Republic* (7th ed., Freeville, 1900), a manual; J. R. Commons, "The Junior Republic," in *The American Journal of Sociology* (1898); D. F. Lincoln, "The George Junior Republic," in *The Coming Age* (1900); and Lyman Abbott, "A Republic within a Republic," in the *Outlook* for February 15, 1908.

GEORGETOWN, the capital of British Guiana (see GUIANA), and the seat of the colonial government, situated on the left bank of the Demerara river at its mouth, in 6° 29′ 24″ N. and 58° 9′ 30″ W. It was known during the Dutch occupation as Stabroek, and was established as the seat of government of the combined colonies of Essequibo and Demerara (now with Berbice forming the three counties of British Guiana) in 1784, its name being changed to Georgetown in 1812. It is one of the finest towns in this part of the world, the streets being wide and straight, intersecting each other at right angles, several having double roadways with lily-covered canals in the centre, the grass banks on either side carrying rows of handsome shade trees. In Main Street, the finest street in Georgetown, the canal has been filled in to form a broad walk, an obvious precedent for the treatment of the other canals, which (however beautiful) are useless and merely act as breeding grounds for mosquitoes. The principal residences, standing in their own gardens surrounded by foliage and flowers, are scattered over the town, as are also the slums, almost the worst of which abut on the best residential quarters. Water Street, the business centre, runs parallel to the river for about 2½ m. and contains the stores of the wholesale and retail merchants, their wharves running out into the river to allow steamers to come alongside. Most of the houses and public buildings are constructed of wood, the former generally raised on brick pillars some 4 ft. to 10 ft. from the ground, the bright colouring of the wooden walls, jalousies and roofs adding to the beauty of the best streets. The large structure known as the Public Buildings in the centre of the city, containing the offices of the executive government and the hall of the court of policy, was erected between 1829 and 1834. It is a handsome, E-shaped, brick-plastered building of considerable size, with deep porticos and marble-paved galleries carried on cast-iron columns. The law courts, built in the 'eighties, have a ground floor of concrete and iron, the upper storey being of hardwood. Among other public buildings are the town hall, the Anglican and Roman Catholic cathedrals, several handsome churches, the local banks and insurance offices, and the almshouse. The public hospital consists of several large blocks. The Royal

[1] The "government" issued its own currency in tin and later in aluminium, and "American" money could not be passed within the 48 acres of the Republic until 1906, when depreciation forced the Republic's coinage out of use and "American" coin was made legal tender.

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Agricultural and Commercial Society has a large reading-room and lending library. The assembly rooms, above and owned by the Georgetown club, has a good stage and is admirably adapted to dramatic and musical entertainments. A museum (free), belonging to the Royal Agricultural and Commercial Society, is chiefly devoted to the fauna of British Guiana, but also contains an instructive collection of local economic, mineralogical and botanical exhibits, a miscellaneous collection of foreign birds and mammals, and an interesting series of views of the colony. The botanical gardens to the east of the city are of considerable extent and admirably laid out. The nurseries cover a large area and are devoted chiefly to the raising of plants of economic importance which can be purchased at nominal rates. The collections of ferns and orchids are very fine. In the gardens are also located the fields of the board of agriculture, where experimental work in the growth of sugar-cane, rice, cotton and all tropical plants of economic importance is carried on. Other popular resorts are the sea wall and the promenade gardens in the centre of the city.

The local government of Georgetown is vested in a mayor and town council elected under a very restricted franchise. The city is divided into fourteen wards each with one representative. A councillor must possess, either personally or through his wife, premises within the city of the appraised value of at least $1500. A voter must either own house property of the appraised value of $250 or occupy premises of an annual rental of $240. There are indeed only 297 municipal voters in a population of nearly 50,000. The revenue, just over £50,000 annually, is mainly derived from a direct rate on house property. The colonial government pays rates on its property and also gives a grant-in-aid towards the upkeep of the streets. The expenditure is principally on sanitation, fire brigade, streets, water-supply, street lighting and drainage. Street lighting is carried out under contract by the Demerara Electric Company, which has a monopoly of private lighting and works an excellent tram service. Water for public and domestic purposes is taken from the conservancy of the east coast and is delivered by pumping throughout the city, but drinking-water is collected in tanks attached to the dwellings from the rain falling on the roofs. The fire brigade is a branch of the police force, half the cost being borne by the rates and half by the general revenue. There is an excellent service of telephones, a branch of the post office, and halfpenny postage within the city boundaries. There are in Georgetown two well-equipped foundries, a dry dock, and factories for the manufacture of rice, cigars, soap, boots, chocolate, candles, aerated waters and ice. Georgetown is connected by rail and ferry with New Amsterdam, by ferry and rail with the west coast of Demerara, and by steamer with all the country districts along the coast and up the navigable reaches of the principal rivers. (A. G. B.*)

GEORGETOWN, formerly a city of the District of Columbia, U.S.A., and now part (sometimes called West Washington) of the city of Washington, U.S.A., at the confluence of the Potomac river and Rock Creek, and on the Chesapeake and Ohio Canal, about 2½ m. W.N.W. of the National Capitol. Pop. (1890) 14,046; (1900) 14,549. The streets are old-fashioned, narrow and well shaded. On the "Heights" are many fine residences with beautiful gardens; the Monastery and Academy (for girls) of Visitation, founded in 1799 by Leonard Neale, second archbishop of Baltimore; and the college and the astronomical observatory (1842) of Georgetown University. The university was founded as a Roman Catholic Academy in 1789, was opened in 1791, transferred to the Society of Jesus in 1805, authorized in 1815 by Congress to confer college or university degrees, and by the Holy See in 1833 to confer degrees in philosophy and theology, incorporated as Georgetown College by Act of Congress in 1844, and began graduate work about 1856. The college library includes the historical collection of James Gilmary Shea. A school of medicine was opened in 1851, a dental school in 1901 and a school of law in 1870. In 1909–1910 the university had an enrolment of 859 students. Rising in terraces from Rock Creek is Oak Hill Cemetery, a beautiful burying-ground containing the graves of John Howard Payne, the author of "Home, Sweet Home," Edwin McMasters Stanton and Joseph Henry. On the bank of the Potomac is a brick house which was for several years the home of Francis Scott Key, author of "The Star-Spangled Banner"; on Analostan Island in the river was a home of James Murray Mason; Georgetown Heights was the home of the popular novelist, Mrs Emma Dorothy Eliza Nevitte Southworth (1819–1899). Before the advent of railways Georgetown had an important commerce by way of the Chesapeake and Ohio Canal, by which considerable coal as well as some grain is still brought hither, and of which Georgetown is now a terminus; the canal formerly crossed the Potomac at this point on an aqueduct bridge (1446 ft. long), but in 1887 the crossing was abandoned and the old bridge was purchased by the United States government, which in 1889 constructed a new steel bridge upon the old masonry piers. Chief among the manufactories are several large flour mills—Georgetown flour was long noted for its excellence. There is a very large fish-market here. Georgetown was settled late in the 17th century, was laid out as a town in 1751, chartered as a city in 1789, merged in the District of Columbia in 1871, and annexed to the city of Washington in 1878. In the early days of Washington it was a social centre of some importance, where many members of Congress as well as some cabinet officers and representatives of foreign countries lived and the President gave state dinners; and here were the studio, for two years, of Gilbert Stuart, and "Kalorama," the residence of Joel Barlow.

GEORGETOWN, a city and the county-seat of Scott county, Kentucky, U.S.A., about 11 miles N. of Lexington. Pop. (1900) 3823 (1677 negroes); (1910) 4533. Georgetown is served by the Cincinnati Southern (Queen & Crescent Route), the Frankfort & Cincinnati, and the Southern railways, and is connected with Lexington by an electric line. It is the seat of Georgetown College (Baptist, co-educational), chartered in 1829 as the successor of Rittenhouse Academy, which was founded in 1798. Georgetown is situated in the Blue Grass region of Kentucky, and the surrounding country is devoted to agriculture and stock-raising. One of the largest independent oil refineries in the country (that of the Indian Refining Co.) is in Georgetown, and among manufactures are bricks, flour, ice, bagging and hemp. The remarkable "Royal Spring," which rises near the centre of the city, furnishes about 200,000 gallons of water an hour for the city's water supply, and for power for the street railway and for various industries. The first settlement was made in 1775, and was named McClellan's, that name being changed to Lebanon a few years afterwards. In 1790 the place was incorporated as a town under its present name (adopted in honour of George Washington), and Georgetown was chartered as a city of the fourth class in 1804. Bacon College, which developed into Kentucky (now Transylvania) University (see LEXINGTON, Ky.), was established here by the Disciples of Christ in 1836, but in 1839 was removed to Harrodsburg.

GEORGETOWN, a city, a port of entry and the county-seat of Georgetown county, South Carolina, U.S.A., at the head of Winyah Bay, and at the mouth of the Pedee river, about 15 m. from the Atlantic Ocean, and about 55 m. N.E. of Charleston. Pop. (1890) 2895; (1900) 4138 (2718 negroes); (1910) 5530. Georgetown is served by the Georgetown & Western railway, has steamship communication with Charleston, Wilmington, New York City and other Atlantic ports, and, by the Pedee river and its tributaries (about 1000 m. of navigable streams), has trade connexions with a large area of South Carolina and part of North Carolina. The principal public buildings are the post office and custom house. Among the city's manufactures are lumber, foundry and machine-shop products, naval stores and oars; and there are shad and sturgeon fisheries. The growing of cotton and truck-gardening are important industries in the neighbouring region, and there is considerable trade in such products. The first settlement here was made about 1700; and the town was laid out a short time before 1734. The Winyah Indigo Society grew out of a social club organized about 1740, and was founded in 1757 by a group of planters interested in

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raising indigo; it long conducted a school (discontinued during the Civil War) which eventually became part of the city's public school system. In 1780 Georgetown was occupied by a body of Loyalist troops, with whom the American troops had several skirmishes, but on the 10th of August 1781 General Francis Marion forced the evacuation of the town and took possession of it. A few days later, an American named Manson, who had joined the British forces, attacked the town from an armed vessel, and burned about forty houses, the small body of militia being unable to make an effective resistance. General Lafayette first landed on American soil at Georgetown on the 24th of April 1777. Georgetown was incorporated as a town in 1805, and was chartered as a city in 1895.

GEORGETOWN, a city and the county-seat of Williamson county, Texas, U.S.A., on the San Gabriel river, about 25 m. N. by E. of Austin. Pop. (1890) 2447; (1900) 2790 (608 negroes); (1910) 3096. The city is served by the International & Great Northern, and the Missouri, Kansas & Texas railways. Georgetown is the seat of the Southwestern University (Methodist Episcopal, South, co-educational), formed in 1873 (chartered 1875) by the combination of Rutervile College (Methodist Episcopal, at Rutervile, Texas, chartered in 1840, and closed in 1850), McKenzie College (at Clarksville, Texas, founded in 1841 and closed in 1872), Wesleyan College at San Augustine (chartered in 1844, burned a few years later, and not rebuilt), and Soule University at Chapel Hill (chartered in 1856, but closed in 1870). The university includes a fitting school at Georgetown, and a medical department at Dallas, Texas; in 1909 it had an enrolment of 1037 students. The principal manufactures of Georgetown are cotton and cotton-seed oil, and planing-mill products. In Page Park are mineral springs, whose waters have medicinal qualities similar to the famous Karlsbad waters. The first settlement was made here in 1848; and Georgetown was incorporated as a town in 1866, and was chartered as a city in 1890.

GEORGIA, a southern state of the United States of America, one of the thirteen original states, situated between 30° 31′ 30″ and 35° N., and between 81° and 85° 53′ 38″ W. It is bounded N. by Tennessee and North Carolina, E. by South Carolina and the Atlantic Ocean, S. by Florida, and W. by Alabama. The total area of the state is 59,265 sq. m., of which 540 sq. m. are water surface.

The surface of Georgia is divided into five physiographic zones. From the sea coast, which is skirted by fertile, semi-tropical islands, a plain 35,000 sq. m., known as South Georgia, extends northward to the "fall-line" passing from Augusta, through Milledgeville and Macon, to Columbus. This is a part of the great Atlantic Coastal Plain. For 20 m. from the coast its elevation is 10 ft., then it rises abruptly 70 ft. higher, and 20 m. farther N. another elevation begins, which reaches 575 ft. at Milledgeville, the average elevation of the entire region being 250 ft. North of the line mentioned, and collectively known as North Georgia, are the four other regions, each with well-defined characteristics. The largest and southernmost, a broad belt extending from the "fall-line" to a line passing through Clarkesville, Habersham county, Cartersville, Bartow county and Buchanan, Haralson county (approximately), is known as the Piedmont Belt or Plateau, having a region of faint relief eroded on highly complicated crystalline rocks. The Blue Ridge escarpment, a striking topographic feature in Virginia and the Carolinas, extends into Georgia along the north-eastern border of this belt, but is less strongly developed here than elsewhere, dying out entirely towards the south-west. North of the Piedmont Belt lie the Appalachian Mountains Region and the Great Valley Region, the former to the east, the latter to the west of a dividing line from Cartersville northward. The former region consists of detached mountain masses of crystalline rocks, not yet eroded down to the level of the Piedmont Belt. In Towns county, in the Appalachian Region, is the highest point in the state, Brasstown Bald, also called Enota Mountain (4768 ft.). The Great Valley Region consists of folded sedimentary rocks, extensive erosion having removed the soft layers to form valleys, leaving the hard layers as ridges, both layers running in a N.E.-S.W. direction. In the extreme north-west corner of the state is a small part of the Cumberland Plateau, represented by Lookout and Sand Mts.

On the Blue Ridge escarpment near the N.E. corner of the state is a water-parting separating the waters which find their way respectively N.W. to the Tennessee river, S.W. to the Gulf of Mexico and S.E. to the Atlantic Ocean; indeed, according to B. M. and M. R. Hall (*Water Resources of Georgia*, p. 2), "there are three springs in north-east Georgia within a stone's throw of each other that send out their waters to Savannah, Ga., to Apalachicola, Fla., and to New Orleans, La." The water-parting between the waters flowing into the Atlantic and those flowing into the Gulf extends from this point first S.E. for a few miles, then turns S.W. to Atlanta, and from there extends S.S.E. to the Florida line. West of where the escarpment dies out, the Great Valley Region and a considerable portion of the Appalachian Mountains Region are drained by the Coosa, the Tallapoosa and their tributaries, into Mobile Bay, but the Cumberland Plateau, like that part of the Appalachian Mountains Region which lies directly N. of the Blue Ridge escarpment, constitutes a part of the Tennessee Basin. The principal rivers of the state are the Chattahoochee and the Flint, which unite in the S.W. corner to form the Apalachicola; the Ocmulgee (whose western tributary, the Towaliga, falls 96 ft. in less than a quarter of a mile), and the Oconee, which unite in the S.E. to form the Altamaha; and the Savannah, which forms the boundary between Georgia and South Carolina. All of these rise in the upper part of the Piedmont Plateau, through which they pursue a rapid course over rocky beds, and are navigable only south of the "fall-line," at which and north of which they furnish an abundance of water-power. The upper Savannah river first flows S.W., then turns abruptly S.E., while the Chattahoochee river rises near this point and continues S.W. This is because the upper Savannah[1] was formerly part of the Chattahoochee, but was captured and turned S.E. by headward growth of the Savannah. As a result of the capture there is a deep gorge along the upper Savannah, especially along the branch called the Tallulah river; and the upper Tallulah, in a series of cascades, 2¼ m. long, falls 525 ft. from the former higher level down to the main bed of the upper Savannah, at Tallulah Falls, a summer resort.

The fauna and flora have no distinctive features. [See UNITED STATES.]

Climate and Soils.—The climate of Georgia, though temperate, differs considerably in different parts of the state. All the nine climate belts in the United States, except that of southern Florida, are represented within its borders. The lowest mean annual temperature, 40° F. and below, is that of some of the mountain tops of northern Georgia; from the mountain-sides to the Piedmont Plateau this mean temperature varies from 45° to 60°; on the Piedmont Plateau from 60° to 65°; and on the Coastal Plain from 60° to 70°. The July isotherm of 80° crosses the state a little N. of Augusta and Macon, touching the W. boundary at West Point, Troup county. The mean July temperature for the whole state is 81·8°; for the part S. of the 80° isotherm the average temperature for July is between 80° and 85°. The average rainfall for the state is 49·3 in.; the maximum is 71·7 in., at Rabun Gap in the extreme N.E. part of the state; the minimum is 39·4 at Swainsboro, Emanuel county, a little S.E. of the centre of the state.

Georgia is also notable for the variety of its soils. In the Cumberland Plateau and Great Valley Regions are a red or brown loam, rich in decomposed limestone and calcareous shales, and sandy or gravelly loams. In the Piedmont Plateau and Appalachian Mountains Regions the surface soil is generally sandy, but in considerable areas the subsoil is a red clay derived largely from the decomposition of hornblende. By far the greatest variety of soils is found in the Coastal Plain Region. Here the Central Cotton Belt, extending from the "fall-line" as far S. as a line bisecting Early county in the W. and passing through Baker, Worth, Dooly, Dodge, Laurens, Johnson, Jefferson and Burke counties, has three distinct kinds of soil; a sand, forming what is known as the sand-hill region; red clay derived from silicious rock in the red hills; and grey, sandy soils with a subsoil of yellow loam. South of the Cotton Belt is the Lime Sink Region, which includes Miller, Baker, Mitchell, Colquitt and Worth counties, the northern portions of Decatur, Grady, Thomas, Brooks and Lowndes, the eastern parts of Dooly and Lee, and the eastern portions of Berrien, Irwin, Wilcox, Dodge, and some parts of Burke, Screven and Bulloch. The soft limestone underlying this region is covered, in the uplands, with grey, sandy soils, which have a subsoil of loam; in the lowlands the surface soils are loams, the subsoils clays. Adjoining this region are the pine barrens, which extend S. to a line passing through the northern portions of Pierce, Wayne, Liberty, Bryan

[1] According to the usual nomenclature, the branch flowing S.W. is called the Chattooga; this unites with the Tallulah to form the Tugaloo, which in turn unites with the Kiowee to form the Savannah proper.

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and Effingham counties. Here the prevailing soils are grey and sandy with a subsoil of loam, but they are less fertile than those of the Lime Sink or Cotton Belts. The coast counties of the S.E. and generally those on the Florida frontier are not suitable for cultivation, on account of the numerous marshes and swamps, Okefinokee Swamp being 45 m. long and approximately 30 m. wide; but the southern portions of Decatur, Grady, Thomas and Brooks counties are sufficiently elevated for agriculture, and the islands off the coast are exceedingly productive.

Minerals.—The mineral resources of Georgia are as varied as its climate and soils, a total of thirty-nine different mineral products being found within its borders. The most important is stone: in 1905 the value of the granite quarried in the state was $971,000 (Georgia ranking fifth in the United States), of the marble $774,550 (Georgia ranking third in the United States, Vermont and New York being first and second); in 1908 the granite was valued at $970,832 (Georgia ranking fifth in the United States), and the marble at $916,281 (Georgia ranking second in the United States, Vermont being first). Generally more than one-fourth of the granite is used for paving; curb, building and monument stone are next in importance in the order named. Stone Mountain (1686 ft.) in De Kalb county near Atlanta is a remarkable mass of light-coloured muscovite granite, having a circumference at its base of 7 m. Stone Mountain granite was first quarried about 1850; it is extensively used as building material in Georgia and other states of the South. A laminated granite, otherwise like the Stone Mountain granite, is found in De Kalb, Rockdale and Gwinnett counties, and is used for curbing and building. Biotite granites, which take a good polish and are used for monuments and for decoration, are quarried in Oglethorpe and Elbert counties. Georgia marble was first quarried on a large scale in Pickens county in 1884; the pure white marble of this county had been worked for tombstones near Tate, the centre of the marble belt, in 1840; after its commercial exploitation it was used in the capitol buildings of Georgia, Rhode Island, Mississippi and Minnesota, in the Corcoran Art Gallery, Washington, D.C., and in St Luke's Hospital, New York City. It is sometimes used for the entire building, and sometimes only for decoration. Other colours than the snowy white are found in the main marble belt of the state, which runs from Canton, Cherokee county, 60 m. generally N. to the northern boundary of the state. Other deposits, less well known, are the dark brown and light grey marbles of Whitfield county, which resemble the stone quarried in eastern Tennessee. Limestone and slate are quarried at Rock Mart, Polk county, and there are cement quarries at Cement, near Kingston, Bartow county. Iron deposits occur in Bartow, Polk and Floyd counties, where are the more important brown ores, and (red ores) in Walker and Chattooga counties. The quantity of iron ore mined in Georgia declined from 1890 to 1900; it was 200,842 long tons in 1905 and 321,060 long tons in 1908, when $193,836 grey marbles of Whitfield county, and went thence to Habersham and Lumpkin counties. Dahlonega and Auraria, the latter named by John C. Calhoun, who owned a mine there, were the centres of this early gold mining. Work was summarily stopped by Federal troops enforcing the governor's proclamation in 1831, because of the disorder in the mining region; but it was soon renewed and a mint was established at Dahlonega in 1838. After the discovery of gold in California, mining in Georgia was not renewed on anything but the smallest scale until the early 'eighties. In 1908 the gold product was valued at $56,207 (it was $66,910 in 1905) and the silver product at $106. Up to 1909 the gold product of Georgia (see State Geol. Survey *Bulletin 19*) was about $17,500,000. Extensive placer deposits occur in all parts of the state, and are remarkable for their comparative freedom from impurities and for their high fusion point; the most valuable are sedimentary, and form a belt several miles wide across the middle of the state from Augusta to Columbus. In 1908 the clay products of the state were valued at $1,928,611. More asbestos has been found in Georgia than in any other state of the Union; it occurs in the amphibole form throughout the N. part of the state, and most of the country's domestic supply comes from the Sall Mountain mine in White county. Manganese ores, found in Bartow, Polk and Floyd counties, were formerly important; in 1896 4096 long tons were mined, in 1905 only 150 tons, and in 1908 none. Bauxite was found in Georgia first of the United States, near Rome, in 1887; the output, principally from Floyd, Bartow and Polk counties, was the entire product of the United States until 1891, and in 1902 was more than half the country's product, but in 1908, even when combined with the Alabama output, was less than the amount mined in Arkansas. Coal is not extensively found, but the mine on Sand Mountain, in Walker county, was one of the first opened S. of the Ohio river; in 1908 the value of the coal mined in the state was $364,279 (264,822 short tons), the value of coke in the ovens was $137,524 (39,422 short tons), and the value of ammonium sulphate, coal tar, illuminating gas and gas coke was more than $800,000. Copper was mined in Fannin and Cherokee counties before the Civil War. In 1906 the copper mined was valued at $5057. Corundum was discovered on Laurel Creek in Rabun county in 1871, and was worked there and at Trackrock, Union county, especially between 1880 and 1893, but in later years low prices closed most of the mines. The limestone formations furnished most of the lime for domestic use. Sandstone, ochre, slate, soapstone, graphite are also mined, and lead, zinc, barytes, gypsum and even diamonds have been discovered but not exploited.

Agriculture.—The principal occupation in Georgia is agriculture, which in 1900 engaged seven-tenths of the land surface of the state and the labour of three-fifths of the population, ten years old and over, who are employed in profitable occupations. The products are so diversified that, with the exception of some tropical fruits of California and Florida, almost everything cultivated in the United States can be produced. The chief staple is cotton, of which a valuable hybrid called the Floradora, a cross of long and short staple, has been singularly successful. Cotton is raised in all counties of the state except Rabun, Towns and Fannin in the extreme north, and about one-third of the total cultivated land of the state was devoted to it in 1900–1907. In 1899–1904 the crop exceeded that of the other cotton-producing states except Texas, and in 1899, 1900 and 1903 Mississippi, averaging 1,467,121 commercial bales per annum; the last crop in 1902 was 1,091,719 bales, and in 1907–1908 the crop was 1,815,834 bales, second only to the crop of Texas. The cause of this extensive cultivation of cotton is not a high average yield per acre, but the fact that before 1860 "Cotton was King," and that the market value of the staple when the Civil War closed was so high that farmers began to cultivate it to the exclusion of the cereals, whose production, Indian corn excepted, showed a decline during each decade from 1879 to 1899. But in the 'nineties the price of the cotton fell below the cost of production, owing to the enormous supply, and this was accompanied by economic depression. These conditions have caused some diversification of crops, and successful experiments in cattle-raising, movements encouraged by the Department of Agriculture and the leading newspapers.

The principal cereals cultivated are Indian corn (product, 53,750,000 bushels in 1908) and wheat; the cultivation of the latter, formerly remunerative, declined on account of the competition of the Western States, but revived after 1899, largely owing to the efforts of the Georgia Wheat Growers' Association (organized in 1897), and in 1908 the yield was 2,208,000 bushels. The sugar-cane crop declined in value after 1890, and each year more of it was made into syrup. In 1908 the tobacco crop was 2,705,625 lb, and the average farm price was 35 cents, being nearly as high as that of the Florida crop; Sumatra leaf for wrappers is grown successfully. The acreage and product of tobacco and peanuts increased from 1890 to 1900 respectively 188% and 319·7%, and 92·6% and 129·9%, and in the production of sweet potatoes Georgia was in 1899 surpassed only by North Carolina. Alfalfa and grasses grow well. Truck farming and the cultivation of orchard and small fruits have long been remunerative occupations; the acreage devoted to peaches doubled between 1890 and 1900. Pecan nuts are an increasingly important crop.

Agriculture in Georgia was in a state of transition at the beginning of the 20th century. Owing to the abundance of land and to negro slavery, exploitative methods of cultivation were employed before the Civil War, and such methods, by which lands after being worked to exhaustion are deserted for new fields, had not yet been altogether abandoned. One reason for this was that, according to the census of 1900, 36·9% of the farms were operated by negroes, of whom 86% were tenants who desired to secure the greatest possible product without regard to the care of the soil. Consequently there were large tracts of untilled "waste" land; but these rapidly responded to fertilization and rotation of crops, often yielding 800 to 1200 lb of cotton per acre, and Georgia in 1899 used more fertilizers than any other state in the Union. Another feature of agriculture in Georgia was the great increase in the number of farms, the average size of plantations having declined from 440 acres in 1860 to 117·5 in 1900, or almost 75%, while the area in cultivation increased only 13·6% between 1850 and 1900. The tenantry system was also undergoing a change—the share system which developed in the years succeeding the Civil War being replaced by a system of cash rental.

Manufactures.—Although excelled by Alabama in the

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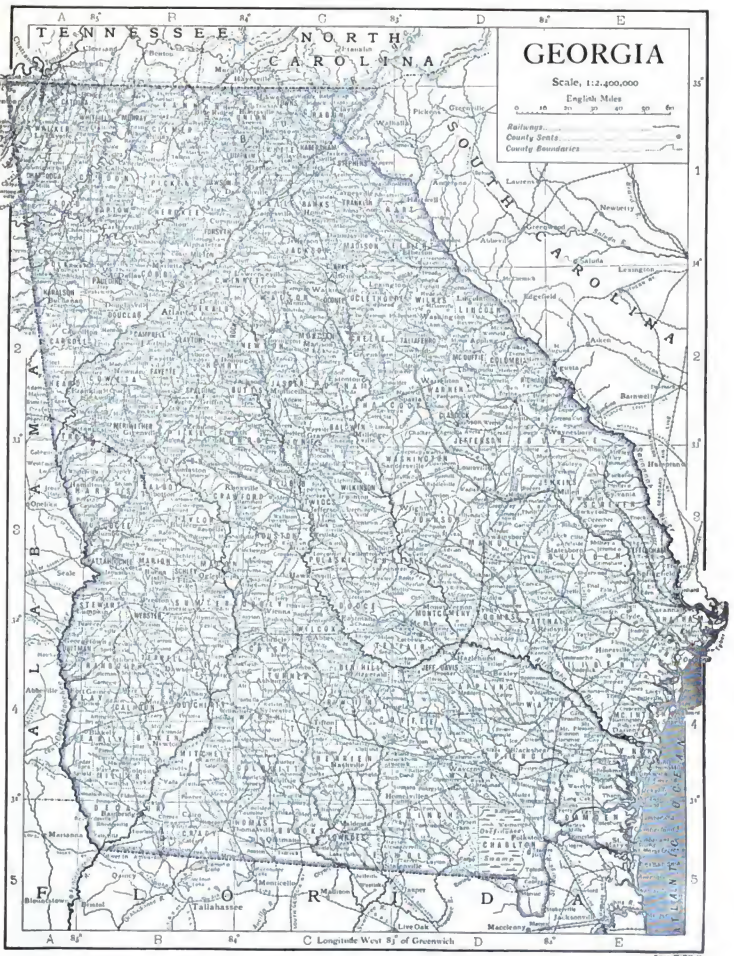

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manufacture of mineral products, and by North Carolina and South Carolina in the number and output of cotton mills, in 1900 and in 1905 Georgia surpassed each of those states in the total value of factory products, which was, however, less than the value of the factory products of Louisiana and Virginia among the southern states. The chief features of this industrial activity are its early beginning and steady, constant development. As far back as 1850 there were 1522 manufacturing establishments (35 of which were cotton mills) in the state, whose total product was valued at $7,082,075. Despite the Civil War, there was some advance during each succeeding decade, the most prosperous relatively being that from 1880 to 1890. In 1900 the number of establishments was 7504, an increase of 75·1% over the number in 1890; the capital invested was $89,786,656, an increase of 57·7%, and the value of products ($106,654,527) was 54·8% more than in 1890. Of the 7504 establishments in 1900, 3015 were conducted under the "factory system," and had a capital of $79,303,316 and products valued at $94,532,368. In 1905 there were 3219 factories, with a capital of $135,211,551 (an increase of 70·5% over 1900), and a gross product valued at $151,040,455 (59·8% greater than the value of the factory product in 1900).

The most important manufacturing industries are those that depend upon cotton for raw material, with a gross product in 1900 valued at $26,521,795. In that year[1] there were 67 mills engaged in the manufacture of cotton goods, with a capital of $24,158,159, and they yielded a gross product valued at $18,457,645; the increase between 1900 and 1905 was actually much larger (and proportionately very much larger) than between 1890 and 1900; the number of factories in 1905 was 103 (an increase of 53·7% over 1900); their capital was $42,349,618 (75·3% more than in 1900); and their gross product was valued at $35,174,248 (an increase of 90·6% since 1900). The rank of Georgia among the cotton manufacturing states was seventh in 1900 and fourth in 1905. Cotton-seed oil and cake factories increased in number from 17 to 43 from 1890 to 1900, and to 112 in 1905, and the value of their product increased from $1,670,196 to $8,064,112, or 382·8% in 1890–1900, and to $13,440,899 in 1905, or an increase of 67·9% over 1900, and in 1900 and in 1905 the state ranked second (to Texas) in this industry in the United States. This growth in cotton manufactures is due to various causes, among them being the proximity of raw material, convenient water-power, municipal exemption from taxation and the cheapness of labour. The relation between employer and employee is in the main far more personal and kindly than in the mills of the Northern States.

The forests of Georgia, next to the fields, furnish the largest amount of raw material for manufactures. The yellow pines of the southern part of the state, which have a stand of approximately 13,778,000 ft., yielded in 1900 lumber and turpentine valued at $8,110,468 (more than the product of any other state in the Union) and in 1905 valued at $7,705,643 (second only to the product of Florida). From the same source was derived most of the lumber product valued[2] in 1900 at $1,341,160 (more than double what it was in 1890) and in 1905 at $16,716,594. The other important woods are cypress, oak and poplar.

Fourth in value in 1905 (first, cotton goods; second, lumber and timber; third, cotton-seed oil and cake) were fertilizers, the value of which increased from $3,367,353 in 1900 to $9,461,415 in 1905, when the state ranked first of the United States in this industry; in 1900 it had ranked sixth.

Communications.—Means of transportation for these products are furnished by the rivers, which are generally navigable as far north as the "fall line" passing through Augusta, Milledgeville, Macon and Columbus; by ocean steamship lines which have piers at St Mary's, Brunswick, Darien and Savannah; and by railways whose mileage in January 1909 was 6,87[1]·8 m. The most important of the railways are the Central of Georgia, the Southern, the Atlantic Coast Line, the Seaboard Air Line, the Georgia and the Georgia Southern & Florida. In 1878 a state railway commission was established which has mandatory power for the settlement of all traffic problems and makes annual reports.

Population.—The population of Georgia in 1880 was 1,542,180; in 1890 1,837,353, an increase of 19·1%; in 1900 2,216,331, a further increase of 20·6%[3], in 1910, 2,609,121. Of the 1900 population, 53·3% were whites and 46·7% were negroes,[4] the centre of the black population being a little south of the "fall line." Here the negroes increased, from 1890 to 1900, faster than the whites in eighteen counties, but in northern Georgia, where the whites are in the majority, the negro population declined in twelve counties. Also the percentage of negro illiteracy is higher in northern Georgia than in other parts of the state, the percentage of negro male illiterates of voting age being 38·3% in Atlanta in 1900, and in Savannah only 30·7%. The population of Georgia has a very slight foreign-born element (·6% in 1900) and a small percentage (1·7% in 1900) of people of foreign parentage. The urban population (*i.e.* the population in places of 2500 inhabitants and over) was 15·6% of the total in 1900, and the number of incorporated cities, towns and villages was 372. Of these only forty had a population exceeding 2000, and thirteen exceeding 5000. The largest city in 1900 was Atlanta, the capital since 1868 (Louisville, Jefferson county, was the capital in 1795–1804, and Milledgeville in 1804–1868), with 89,872 inhabitants. Savannah ranked second with 54,244, and Augusta third with 39,441. In 1900 the other cities in the state with a population of more than 5000 were: Macon (23,272), Columbus (17,614), Athens (10,245), Brunswick (9081), Americus (7674), Rome (7291), Griffin (6857), Waycross (5919), Valdosta (5613), and Thomasville (5322).

The total membership of the churches in 1906 was about 1,029,037, of whom 506,310 were Baptists, 349,079 were Methodists, 24,040 were Presbyterians, 19,273 were Roman Catholics, 12,703 were Disciples of Christ, 9790 were Protestant Episcopalians, and 5581 were Congregationalists.

Government.—The present constitution, which was adopted in 1877,[5] provides for a system of government similar in general to that of the other states (see UNITED STATES). The executive officials are elected for a term of two years, and the judges of the Supreme Court and of the court of appeals for six years, while those of the superior court and of the ordinaries and the justices of the peace are chosen every four years. Before 1909 all male citizens of the United States at least twenty-one years of age (except those mentioned below), who had lived in the state for one year immediately preceding an election and in the county six months, and had paid their taxes, were entitled to vote. From the suffrage and the holding of office are excluded idiots and insane persons and all those who have been convicted of treason, embezzlement, malfeasance in office, bribery or larceny, or any crime involving moral turpitude and punishable under the laws of the state by imprisonment in the penitentiary—this last disqualification, however, is removable by a pardon for the offence. Before 1909 there was no constitutional discrimination aimed against the exercise of the suffrage by the negro, but in fact the negro vote had in various ways been greatly reduced. By a constitutional amendment adopted by a large majority at a special election in October 1908, new requirements for suffrage, designed primarily to exclude negroes, especially illiterate negroes, were imposed (supplementary to the requirements mentioned above concerning age, residence and the payment of taxes), the amendment coming into effect on the 1st of January 1909: in brief this amendment requires that the voter shall have served in land or naval forces of the United States or of the Confederate States or of the state of Georgia in time of war, or be lawfully descended from some one who did so serve; or that he be a person of good character who proves to the satisfaction of the registrars of elections that he understands the duties and obligations of a citizen; or that he read correctly in English and (unless physically disabled) write any paragraph of the Federal or state constitution; or that he own 40 acres of land or property valued at $500 and assessed for

[1] The manufacturing statistics for 1900 which follow are not those given in the Twelfth Census, but are taken from the *Census of Manufactures, 1905*, the 1900 figures here given being only for "establishments on a factory basis," and thus being comparable with those of 1905. In 1890 there were 53 mills with a capital of $17,661,675 and a product valued at $12,035,629.

[2] In these valuations for 1900 and for 1905 the rough lumber dressed or remanufactured in planing mills enters twice into the value of the product.

[3] The population of the state was 82,548 in 1790, 162,686 in 1800, 252,433 in 1810, 340,989 in 1820, 516,823 in 1830, 691,392 in 1840, 906,185 in 1850, 1,057,286 in 1860, and 1,184,100 in 1870.

[4] This negro percentage includes 211 Chinese, Japanese and Indians.

[5] The state has had four other constitutions—those of 1777, 1789, 1798 and 1868.

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taxation. After the 1st of January 1915 no one may qualify as a voter under the first or second of these clauses (the "grandfather" and "understanding" clauses); but those who shall have registered under their requirements before the 1st of January 1915 thus become voters for life.

The governor, who receives a salary of $5000, must be at least thirty years old, must at the time of his election have been a citizen of the United States for fifteen years and of the state for six years, and "shall not be eligible to re-election after the expiration of a second term, for the period of four years." In case of his "death, removal or disability," the duties of his office devolve in the first instance upon the president of the Senate, and in the second upon the speaker of the House of Representatives. The governor's power of veto extends to separate items in appropriation bills, but in every case his veto may be overriden by a two-thirds vote of the legislature. An amendment to the constitution may be proposed by a two-thirds vote of the legislature, and comes into effect on receiving a majority of the popular vote. Members of the Senate must be at least twenty-five years old, must be citizens of the United States, and must, at the time of their election, have been citizens of the state for four years, and of the senatorial district for one year; representatives must be at least twenty-one years old, and must, at the time of their election, have been citizens of the state for two years. By law, in Georgia, lobbying is a felony.

Habitual intoxication, wilful desertion for three years, cruel treatment, and conviction for an offence the commission of which involved moral turpitude and for which the offender has been sentenced to imprisonment for at least two years, are recognized as causes for divorce. All petitions for divorce must be approved by two successive juries, and a woman holds in her own name all property acquired before and after marriage. Marriage between the members of the white and negro races is prohibited by law.

As the result of the general campaign against child labour, an act was passed in 1906 providing that no child under 10 shall be employed or allowed to labour in or about any factory, under any circumstances; after the 1st of January 1907 no child under 12 shall be so employed, unless an orphan with no other means of support, or unless a widowed mother or disabled or aged father is dependent on the child's labour, in which case a certificate to the facts, holding good for one year only, is required; after the 1st of January 1908 no child under 14 shall be employed in a factory between the hours of 7 P.M. and 6 A.M.; after the same date no child under 14 shall be employed in any factory without a certificate of school attendance for 12 weeks (of which 6 weeks must be consecutive) of the preceding year; no child shall be employed without the filing of an affidavit as to age. Making a false affidavit as to age or as to other facts required by the act, and the violation of the act by any agent or representative of a factory or by any parent or guardian of a child are misdemeanours.

In 1907 a state law was passed prohibiting after the 1st of January 1908 the manufacture or sale of intoxicating liquors; nine-tenths of the counties of the state, under local option laws, were already "dry" at the passage of this bill. The law permits druggists to keep for sale no other form of alcoholic drink than pure alcohol; physicians prescribing alcohol must fill out a blank, specifying the patient's ailment, and certifying that alcohol is necessary; the prescription must be filled the day it is dated, must be served directly to the physician or to the patient, must not call for more than a pint, and may not be refilled.[1]

The state supports four benevolent institutions: a lunatic asylum for the whites and a similar institution for the negroes, both at Milledgeville, an institute for the deaf and dumb at Cave Spring, and an academy for the blind at Macon. There are also a number of private charitable institutions, the oldest being the Bethesda orphan asylum, near Savannah, founded by George Whitefield in 1739. The Methodist, Baptist, Roman Catholic and Protestant Episcopal Churches, and the Hebrews of the state also support homes for orphans. A penitentiary was established in 1817 at Milledgeville. In 1866 the lease system was introduced, by which the convicts were leased for a term of years to private individuals. In 1897 this was supplanted by the contract system, by which a prison commission accepted contracts for convict labour, but the prisoners were cared for by state officials. But the contract system for convicts and the peonage system (under which immigrants were held in practical slavery while they "worked out" advances made for passage-money, &c.) were still sources of much injustice. State laws made liable to prosecution for misdemeanour any contract labourer who, having received advances, failed for any but good cause to fulfil the contract; or any contract labourer who made a second contract without giving notice to his second employer of a prior and unfulfilled contract; or any employer of a labourer who had not completed the term of a prior contract. In September 1908, after an investigation which showed that many wardens had been in the pay of convict lessees and that terrible cruelty had been practised in convict camps, an extra session of the legislature practically put an end to the convict lease or contract system; the act then passed provided that after the 31st of March 1909, the date of expiration of leases in force, no convicts may be leased for more than twelve months and none may be leased at all unless there are enough convicts to supply all demands for convict labour on roads made by counties, each county to receive its *pro rata* share on a population basis, and to satisfy all demands made by municipalities which thus secure labour for $100 per annum (per man) paid into the state treasury, and all demands made by the state prison farm and factory established by this law.

Education.—Georgia's system of public instruction was not instituted until 1870, but as early as 1817 the legislature provided a fund for the education in the private schools of the state of children of indigent parents. The constitution of 1868 authorized "a thorough system of general education, to be for ever free to all children of the State," and in 1870 the first public school law was enacted. Education, however, has never been made compulsory. The constitution, as amended in 1905, provides that elections on the question of local school taxes for counties or for school districts may be called upon a petition signed by one-fourth of the qualified voters of the county, or district, in question; under this provision several counties and a large number of school districts are supplementing the general fund. But the principal source of the annual school revenue is a state tax; the fund derived from this tax, however, is not large enough. In 1908 the common school fund approximated $3,786,830, of which amount the state paid $2,163,200 and about $1,010,680 was raised by local taxation. In 1908 69% of the school population (79% of whites; 58% of negroes) were enrolled in the schools; in 1902 it was estimated that the negroes, 52·3% of whom (10 years of age and over) were illiterates (*i.e.* could not write or could neither read nor write) in 1900 (81·6% of them were illiterate in 1880), received the benefit of only about a fifth of the school fund. Of the total population, 10 years of age and over, 30·5% were illiterates in 1900—49·9% were illiterates in 1880—and as regards the whites of native birth alone, Georgia ranked ninth in illiteracy, in 1900, among the states and territories of the Union. Of the illiterates about four-fifths were negroes in 1900. In addition to the public schools, the state also supports the University of Georgia; and in 1906 $235,000 was expended for the support of higher education. In 1906–1907 eleven agricultural and mechanical arts colleges were established, one in each congressional district of the state. Of the colleges of the university, Franklin was the first state college chartered in America (1785); the Medical College of Georgia, at Augusta, was opened in 1829; the State College of Agriculture and Mechanic Arts was established at Athens in 1872; the North Georgia Agricultural College, at

[1] Owing to the custom which holds in Georgia of choosing state senators in rotation from each of the counties making up a senatorial district, it happened in 1907 that few cities were represented directly by senators chosen from municipalities. It is believed that this fact contributed to the passage of the prohibition law.

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Dahlonega, was opened in 1873; the Georgia School of Technology, at Atlanta, in 1888; the Georgia Normal and Industrial College (for women), in Milledgeville, in 1890; the Georgia State Normal School, at Athens, in 1895; the Georgia State Industrial College for Coloured Youth, near Savannah, in 1890; the School of Pharmacy, at Athens, in 1903; and the School of Forestry, and the Georgia State College of Agriculture, at Athens, in 1906. Affiliated with the university, but not receiving state funds, are three preparatory schools, the South Georgia Military and Agricultural College at Thomasville, the Middle Georgia Military and Agricultural College at Milledgeville, and the West Georgia Agricultural and Mechanical College at Hamilton. Among the institutions generally grouped as denominational are—Baptist: Mercer University, at Macon (Penfield, 1837; Macon, 1871), Shorter College (1877) at Rome, Spelman Seminary (1881) in Atlanta for negro women and girls, and Bessie Tift College, formerly Monroe College (1849) for women, at Forsyth; Methodist Episcopal: Emory College (1836), at Oxford, and Wesleyan Female College (1836) at Macon, both largely endowed by George Ingraham Seney (1837–1893), and the latter one of the earliest colleges for women in the country; Methodist Episcopal Church, South: Young Harris College (1855) at Young Harris, Andrew Female College (1854) at Cuthbert, and Dalton Female College (1872) at Dalton; Presbyterian: Agnes Scott College at Decatur; and African Methodist Episcopal: Morris Brown College (1885) at Atlanta. A famous school for negroes is the non-sectarian Atlanta University (incorporated in 1867, opened in 1869), which has trained many negroes for teaching and other professions. Non-sectarian colleges for women are: Lucy Cobb Institute (1858) at Athens, Cox College (1843) at College Park, near Atlanta, and Brenau College Conservatory (1878) at Gainesville.

Finance.—The assessed value of taxable property in 1910 was about $735,000,000. A general property tax, which furnishes about four-fifths of the public revenue, worked so inequitably that a Board of Equalization was appointed in 1901. By the Constitution the tax rate is limited to $5 on the thousand, and, as the rate of taxation has increased faster than the taxable property, the state has been forced to contract several temporary loans since 1901, none of which has exceeded $200,000, the limit for each year set by the Constitution. On the 1st of January 1910 the bonded debt was $6,944,000, mainly incurred by the extravagance of the Reconstruction administration (see *History*, below). Each year $100,000 of this debt is paid off, and there are annual appropriations for the payment of interest (about $303,260 in 1910). The state owns the Western & Atlantic railway (137 m. long) from Chattanooga, Tennessee, to Atlanta, which has valuable terminal facilities in both cities, and which in 1910 was estimated to be worth $8,400,240 (more than the amount of the bonded debt); this railway the state built in 1841–1850, and in 1890 leased for 29 years, at an annual rental of $420,012, to the Nashville, Chattanooga & St Louis railway.

Banking in Georgia is in a prosperous condition. The largest class of depositors are the farmers, who more and more look to the banks for credit, instead of to the merchants and cotton speculators. Hence the number of banks in agricultural districts is increasing. The state treasurer is the bank examiner, and to him all banks must make a quarterly statement and submit their books for examination twice a year. The legal rate of interest is 7%, but by contract it may be 8%.

History.—Georgia derives its name from King George II. of Great Britain. It was the last to be established of the English colonies in America. Its formation was due to a desire of the British government to protect South Carolina from invasion by the Spaniards from Florida and by the French from Louisiana, as well as to the desire of James Edward Oglethorpe (*q.v.*) to found a refuge for the persecuted Protestant sects and the unfortunate but worthy indigent classes of Europe. A charter was granted in 1732 to "the Trustees for establishing the colony of Georgia in America," and parliament gave £10,000 to the enterprise. The first settlement was made at Savannah in 1733 under the personal supervision of Oglethorpe. The early colonists were German Lutherans (Salzburgers), Piedmontese, Scottish Highlanders, Swiss, Portuguese Jews and Englishmen; but the main tide of immigration, from Virginia and the Carolinas, did not set in until 1752. As a bulwark against the Spanish, the colony was successful, but as an economic experiment it was a failure. The trustees desired that there should be grown in the colony wine grapes, hemp, silk and medical plants (barilla, kali, cubeb, caper, madder, &c.) for which England was dependent upon foreign countries; they required the settlers to plant mulberry trees, and forbade the sale of rum, the chief commercial staple of the colonies. They also forbade the introduction of negro slaves. Land was leased by military tenure, and until 1739 grants were made only in male tail and alienations were forbidden. The industries planned for the colony did not thrive, and as sufficient labour could not be obtained, the importation of slaves was permitted under certain conditions in 1740. About the same time the House of Commons directed the trustees to remove the prohibition on the sale of rum. In 1753 the charter of the trustees expired and Georgia became a royal province.

Under the new regime the colony was so prosperous that Sir James Wright (1716–1785), the last of the royal governors, declared Georgia to be "the most flourishing colony on the continent." The people were led to revolt against the mother country through sympathy with the other colonies rather than through any grievance of their own. The centre of revolutionary ideas was St John's Parish, settled by New Englanders (chiefly from Dorchester, Massachusetts). The Loyalist sentiment was so strong that only five of the twelve parishes sent representatives to the First Provincial Congress, which met on the 18th of January 1775, and its delegates to the Continental Congress therefore did not claim seats in that assembly. But six months later all the parishes sent representatives to another Provincial Congress which met on the 4th of July 1775. Soon afterward the royal government collapsed and the administration of the colony was assumed by a council of safety.

The war that followed was really a severe civil conflict, the Loyalist and Revolutionary parties being almost equal in numbers. In 1778 the British seized Savannah, which they held until 1782, meanwhile reviving the British civil administration, and in 1779 they captured Augusta and Sunbury; but after 1780 the Revolutionary forces were generally successful. Civil affairs also fell into confusion. In 1777 a state constitution was adopted, but two factions soon appeared in the government, led by the governor and the executive council respectively, and harmony was not secured until 1781.

Georgia's policy in the formation of the United States government was strongly national. In the constitutional convention of 1787 its delegates almost invariably gave their support to measures designed to strengthen the central government. Georgia was the fourth state to ratify (January 2, 1788), and one of the three that ratified unanimously, the Federal Constitution. But a series of conflicts between the Federal government and the state government caused a decline of this national sentiment and the growth of States Rights theories.

First of these was the friction involved in the case, before the Supreme Court of the United States, of *Chisolm v. Georgia*, by which the plaintiff, one Alexander Chisolm, a citizen of South Carolina, secured judgment in 1793 against the state of Georgia (see 2 Dallas Reports 419). In protest, the Georgia House of Representatives, holding that the United States Supreme Court had no constitutional power to try suits against a sovereign state, resolved that any Federal marshal who should attempt to execute the court's decision would be "guilty of felony, and shall suffer death, without benefit of clergy, by being hanged." No effort was made to execute the decision, and in 1798 the Eleventh Amendment to the Federal Constitution was adopted, taking from Federal courts all jurisdiction over any suit brought "against one of the United States by citizens of another state, or by citizens or subjects of any foreign state."

The position of Congress and of the Supreme Court with reference to Georgia's policy in the Yazoo Frauds also aroused distrust of the Federal government. In 1795 the legislature granted for $500,000 the territory extending from the Alabama and Coosa rivers to the Mississippi river and between 35° and 31° N. lat. (almost all of the present state of Mississippi and more than half of the present state of Alabama) to four land companies, but in the following year a new legislature rescinded the contracts

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on the ground that they had been fraudulently and corruptly made, as was probably the case, and the rescindment was embodied in the Constitution of 1798. In the meantime the United States Senate had appointed a committee to inquire into Georgia's claim to the land in question, and as this committee pronounced that claim invalid, Congress in 1800 established a Territorial government over the region. The legislature of Georgia remonstrated but expressed a willingness to cede the land to the United States, and in 1802 the cession was ratified, it being stipulated among other things that the United States should pay to the state $1,250,000, and should extinguish "at their own expense, for the use of Georgia, as soon as the same can be peaceably obtained on reasonable terms," the Indian title to all lands within the state of Georgia. Eight years later the Supreme Court of the United States decided in the case of *Fletcher* v. *Peck* (6 Cranch 87) that such a rescindment as that in the new state constitution was illegal, on the ground that a state cannot pass a law impairing the obligation of contracts; and at an expense of more than four millions of dollars the Federal government ultimately extinguished all claims to the lands.

This decision greatly irritated the political leaders of Georgia, and the question of extinguishing the Indian titles, on which there had long been a disagreement, caused further and even more serious friction between the Federal and state authorities. The National government, until the administration of President Jackson, regarded the Indian tribes as sovereign nations with whom it alone had the power to treat, while Georgia held that the tribes were dependent communities with no other right to the soil than that of tenants at will. In 1785 Georgia made treaties with the Creeks by which those Indians ceded to the state their lands S. and W. of the Altamaha river and E. of the Oconee river, but after a remonstrance of one of their half-breed chiefs Congress decided that the cessions were invalid, and the National government negotiated, in 1790, a new treaty which ceded only the lands E. of the Oconee. The state appealed to the National government to endeavour to secure further cessions, but none had been made when, in 1802, the United States assumed its obligation to extinguish all Indian titles within the state. Several cessions were made between 1802 and 1824, but the state in the latter year remonstrated in vigorous terms against the dilatory manner in which the National government was discharging its obligation, and the effect of this was that in 1825 a treaty was negotiated at Indian Springs by which nearly all the Lower Creeks agreed to exchange their remaining lands in Georgia for equal territory beyond the Mississippi. But President J. Q. Adams, learning that this treaty was not approved by the entire Creek nation, authorized a new one, signed at Washington in 1826, by which the treaty of 1825 was abrogated and the Creeks kept certain lands W. of the Chattahoochee. The Georgia government, under the leadership of Governor George M. Troup (1780–1856), had proceeded to execute the first treaty, and the legislature declared the second treaty illegal and unconstitutional. In reply to a communication of President Adams early in 1827 that the United States would take strong measures to enforce its policy, Governor Troup declared that he felt it his duty to resist to the utmost any military attack which the government of the United States should think proper to make, and ordered the military companies to prepare to resist "any hostile invasion of the territory of this state." But the strain produced by these conditions was relieved by information that new negotiations had been begun for the cession of all Creek lands in Georgia. These negotiations were completed late in the year.

There was similar conflict in the relation of the United States and Georgia with the Cherokees. In 1785 the Cherokees of Georgia placed themselves under the protection of the Federal government, and in 1823 their chiefs, who were mostly half-breeds, declared: "It is the fixed and unalterable determination of this nation never again to cede one foot more of land," and that they could not "recognize the sovereignty of any state within the limits of their territory"; in 1827 they framed a constitution and organized a representative government. President Monroe and President J. Q. Adams treated the Cherokees with the courtesy due to a sovereign nation, and held that the United States had done all that was required to meet the obligation assumed in 1802. The Georgia legislature, however, contended that the United States had not acted in good faith, declared that all land within the boundaries of the state belonged to Georgia, and in 1828 extended the jurisdiction of Georgia law to the Cherokee lands. Then President Jackson, holding that Georgia was in the right on the Indian question, informed the Cherokees that their only alternative to submission to Georgia was emigration. Thereupon the chiefs resorted to the United States Supreme Court, which in 1832 declared that the Cherokees formed a distinct community "in which the laws of Georgia have no force," and annulled the decision of a Georgia court that had extended its jurisdiction into the Cherokee country (*Worcester* v. *Georgia*). But the governor of Georgia declared that the decision was an attempt at usurpation which would meet with determined resistance, and President Jackson refused to enforce the decree. The President did, however, work for the removal of the Indians, which was effected in 1838.

On account of these conflicts a majority of Georgians adopted the principles of the Democratic-Republican party, and early in the 19th century the people were virtually unanimous in their political ideas. Local partisanship centred in two factions: one, led by George M. Troup, which represented the interests of the aristocratic and slave-holding communities; the other, formed by John Clarke (1766–1832) and his brother Elijah, found support among the non-slave-holders and the frontiersmen. The cleavage of these factions was at first purely personal; but by 1832 it had become one of principle. Then the Troup faction under the name of States Rights party, endorsed the nullification policy of South Carolina, while the Clarke faction, calling itself a Union party, opposed South Carolina's conduct, but on the grounds of expediency rather than of principle. On account, however, of its opposition to President Jackson's attitude toward nullification, the States Rights party affiliated with the new Whig party, which represented the national feeling in the South, while the Union party was merged into the Democratic party, which emphasized the sovereignty of the states.

The activity of Georgia in the slavery controversy was important. As early as 1835 the legislature adopted a resolution which asserted the legality of slavery in the Territories, a principle adopted by Congress in the Kansas Bill in 1854, and in 1847 ex-Governor Wilson Lumpkin (1783–1870) advocated the organization of the Southern states to resist the aggression of the North. Popular opinion at first opposed the Compromise of 1850, and some politicians demanded immediate secession from the Union; and the legislature had approved the Alabama Platform of 1848. But Congressmen Robert Toombs, Alexander H. Stephens, Whigs, and Howell Cobb, a Democrat, upon their return from Washington, contended that the Compromise was a great victory for the South, and in a campaign on this issue secured the election of such delegates to the state convention (at Milledgeville) of 1850 that that body adopted on the 10th of December, by a vote of 237 to 19, a series of conciliatory resolutions, since known as the "Georgia Platform," which declared in substance: (1) that, although the state did not wholly approve of the Compromise, it would "abide by it as a permanent adjustment of this sectional controversy," to preserve the Union, as the thirteen original colonies had found compromise necessary for its formation; (2) that the state "will and ought to resist, even (as a last resort) to the disruption of every tie that binds her to the Union," any attempt to prohibit slavery in the Territories or a refusal to admit a slave state. The adoption of this platform was accompanied by a party reorganization, those who approved it organizing the Constitutional Union party, and those who disapproved, mostly Democrats, organizing the Southern Rights party; the approval in other states of the Georgia Platform in preference to the Alabama Platform (see ALABAMA) caused a reaction in the South against secession. The reaction was followed for a short interval by a return to approximately the former party alignment, but in 1854 the rank

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and file of the Whigs joined the American or Know-Nothing party while most of the Whig leaders went over to the Democrats. The Know-Nothing party was nearly destroyed by its crushing defeat in 1856 and in the next year the Democrats by a large majority elected for governor Joseph Emerson Brown (1821–1894), who by three successive re-elections was continued in that office until the close of the Civil War. Although Governor Brown represented the poorer class of white citizens he had taken a course in law at Yale College, had practised law, and at the time of his election was judge of a superior court; although he had never held slaves he believed that the abolition of slavery would soon result in the ruin of the South, and he was a man of strong convictions. The Kansas question and the attitude of the North toward the decision in the Dred Scott case were arousing the South when he was inaugurated the first time, and in his inaugural address he clearly indicated that he would favour secession in the event of any further encroachment on the part of the North. In July 1859 Senator Alfred Iverson (1798–1874) declared that in the event of the election of a Free-Soil president in 1860 he would favour the establishment of an independent confederacy; later in the same year Governor Brown expressed himself to a similar effect and urged the improvement of the military service. On the 7th of November following the election of President Lincoln the governor, in a special message to the legislature, recommended the calling of a convention to decide the question of secession, and Alexander H. Stephens was about the only prominent political leader who contended that Lincoln's election was insufficient ground for such action. On the 17th of November the legislature passed an act directing the governor to order an election of delegates on the 2nd of January 1861 and their meeting in a convention on the 16th. On the 19th this body passed an ordinance of secession by a vote of 208 to 89. Already the first regiment of Georgia Volunteers, under Colonel Alexander Lawton (1818–1896) had seized Fort Pulaski at the mouth of the Savannah river and now Governor Brown proceeded to Augusta and seized the Federal arsenal there. Toward the close of the same year, however, Federal warships blockaded Georgia's ports, and early in 1862 Federal forces captured Tybee Island, Fort Pulaski, St Mary's, Brunswick and St Simon Island. Georgia had responded freely to the call for volunteers, but when the Confederate Congress had passed, in April 1862, the Conscript Law which required all white men (except those legally exempted from service) between the ages of 18 and 35 to enter the Confederate service, Governor Brown, in a correspondence with President Davis which was continued for several months, offered serious objections, his leading contentions being that the measure was unnecessary as to Georgia, unconstitutional, subversive of the state's sovereignty, and therefore "at war with the principles for the support of which Georgia entered into this revolution."

In 1863 north-west Georgia was involved in the Chattanooga campaign. In the following spring Georgia was invaded from Tennessee by a Federal army under General William T. Sherman; the resistance of General Joseph E. Johnston and General J. B. Hood proved ineffectual; and on the 1st of September Atlanta was taken. Then Sherman began his famous "march to the sea," from Atlanta to Savannah, which revealed the weakness of the Confederacy. In the spring of 1865, General J. H. Wilson with a body of cavalry entered the state from Alabama, seized Columbus and West Point on the 16th of April, and on the 10th of May captured Jefferson Davis, president of the Confederacy, at Irwinville in Irwin county.

In accord with President Andrew Johnson's plan for reorganizing the Southern States, a provisional governor, James Johnson, was appointed on the 17th of June 1865, and a state convention reformed the constitution to meet the new conditions, rescinding the ordinance of secession, abolishing slavery and formally repudiating the state debt incurred in the prosecution of the war. A governor and legislature were elected in November 1865, the legislature ratified the Thirteenth Amendment on the 9th of December and five days later the governor-elect was inaugurated. But both the convention and legislature incurred the suspicion and ill-will of Congress; the convention had congratulated the president on his policy, memorialized him on behalf of Jefferson Davis, and provided pensions for disabled Confederate soldiers and the widows of those who had lost their lives during the war, while the legislature passed apprenticeship, labour and vagrancy laws to protect and regulate the negroes, and rejected the Fourteenth Amendment. Although the civil rights were conferred upon the freedmen, Congress would not tolerate the political incapacity and social inferiority which the legislature had assigned to them, and therefore Georgia was placed under military government, as part of the third military district, by the Reconstruction Act of the 2nd of March 1867. Under the auspices of the military authorities registration of electors for a new state convention was begun and 95,168 negroes and 96,333 whites were registered. The acceptance of the proposition to call the convention and the election of many conscientious and intelligent delegates were largely due to the influence of ex-Governor Brown, who was strongly convinced that the wisest course for the South was to accept quickly what Congress had offered. The convention met in Atlanta on the 9th of December 1867 and by March 1868 had revised the constitution to meet the requirements of the Reconstruction Acts. The constitution was duly adopted by popular vote, and elections were held for the choice of a governor and legislature. Rufus Brown Bullock (b. 1834), Republican, was chosen governor, the Senate had a majority of Republicans, but in the House of Representatives a tie vote was cast for the election of a speaker. On the 21st of July the Fourteenth Amendment was ratified, and a section of the state constitution (which denied the power of state courts to entertain against any resident of the state suits founded on contracts existing on the 15th of June 1865) was repealed by the legislature in pursuance of the congressional "Omnibus Bill" of the 25th of June 1868, and as evidence of the restoration of Georgia to the Union the congressmen were seated on the 25th of July in that year.

But in September of the same year the Democrats in the state legislature, being assisted by some of the white Republicans, expelled the 27 negro members and seated their defeated white contestants, relying upon the legal theory that the right to hold office belonged only to those citizens designated by statute, the common law or custom. In retaliation the 41st Congress excluded the state's representatives on a technicality, and, on the theory that the government of Georgia was a provisional organization, passed an act requiring the ratification of the Fifteenth Amendment before the admission of Georgia's senators and representatives. The war department now concluded that the state was still subject to military authority, and placed General A. H. Terry in command. With his aid, and that of Congressional requirements that all members of the legislature must take the Test Oath and none be excluded on account of colour, a Republican majority was secured for both houses, and the Fifteenth Amendment was ratified. Georgia was now finally admitted to the Union by Act of Congress, on the 15th of July 1870.

The Reconstruction period in Georgia is remarkable for its comparative moderation. Although there was great political excitement, there was not as much extravagance in public administration as there was in other Southern States, the state debt increasing approximately from $6,600,000 to $16,000,000. The explanation lies in the fact that there were comparatively few "carpet-baggers" or adventurers in the state, and that a large number of conservative citizens, under the leadership of ex-Governor Brown, supported the Reconstruction policy of Congress and joined the Republican party.

The election of 1871 gave the Democrats a majority in the legislature; Governor Bullock, fearing impeachment, resigned, and at a special election James M. Smith was chosen to fill the unexpired term. After that the control of the Democrats was complete. In 1891 the Populist party was organized, but it never succeeded in securing a majority of the votes in the state.

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LIST OF GOVERNORS

I. *Administration of the Trustees.*

James Edward Oglethorpe [1]	1732–1743
William Stephens [2]	1743–1751
Henry Parker [3]	1751–1753
Patrick Graham [2]	1753–1754

II. *Royal Administration.*

John Reynolds	1754–1757
Henry Ellis	1757–1760
Sir James Wright	1760–1782

III. *Provincial Administration.*

William Ewen [3]	1775
Archibald Bulloch [4]	1776
Button Gwinnett [4]	1777
Jonathan Bryan [4]	1777

IV. *Georgia as a State.*

John A. Treutlen [5]	1777–1778	
John Houston	1778–1779	
John Wereat [6]	1779	
George Walton	1779–1780	
Richard Hawley	1780	
Stephen Heard [6]	1780–1781	
Myrick Davies [6]	1781	
Nathan Brownson	1781–1782	
John Martin	1782–1783	
Lyman Hall	1783–1785	
Samuel Elbert	1785–1786	
Edward Telfair	1786–1787	
George Matthews	1787–1788	
George Handley	1788–1789	
George Walton	1789–1790	Democratic-Republican
Edward Telfair	1790–1793	" "
George Matthews	1793–1796	" "
Jared Irwin	1796–1798	" "
James Jackson	1798–1801	" "
David Emanuel	1801	" "
Josiah Tattnall	1801–1802	" "
John Milledge	1802–1806	" "
Jared Irwin	1806–1809	" "
David B. Mitchell	1809–1813	" "
Peter Early	1813–1815	" "
David B. Mitchell	1815–1817	" "
William Rabun [7]	1817–1819	" "
Matthew Talbot [7]	1819	" "
John Clarke	1819–1823	" "
George M. Troup	1823–1827	" "
John Forsyth	1827–1829	" "
George R. Gilmer	1829–1831	National Republican
Wilson Lumpkin	1831–1835	Democratic-Republican
William Schley	1835–1837	Union
George Gilmer	1837–1839	Democrat
Charles J. McDonald	1839–1843	Union
George W. Crawford	1843–1847	Whig
George W. B. Towns	1847–1851	Democrat
Howell Cobb	1851–1853	Constitutional Union
Herschell V. Johnson	1853–1856	Democrat
Joseph E. Brown	1857–1865	"
James Johnson [8]	1865	"
Charles J. Jenkins	1865–1868	"
Thomas H. Ruger	1868	"
Rufus B. Bullock	1868–1871	Republican
Benjamin Conley [9]	1871–1872	"
James M. Smith	1872–1876	Democrat
Alfred H. Colquitt	1876–1882	"
Alexander H. Stephens	1882–1883	"
James S. Boynton [7]	1883	"
Henry D. McDaniel	1883–1886	"
John B. Gordon	1886–1890	"
W. J. Northen	1890–1894	"
W. Y. Atkinson	1894–1898	"
A. D. Candler	1898–1902	"
Joseph M. Terrell	1902–1907	"
Hoke Smith	1907–1909	"
Joseph M. Brown	1909–1911	"
Hoke Smith	1911–	"

A brief bibliography, chiefly of historical materials, is given by U. B. Phillips in his monograph "Georgia and State Rights," in vol. ii. of the *Annual Report of the American Historical Association for 1901* (Washington, 1902). Valuable information concerning the resources and products of the state is given in the publications of the Department of Agriculture, which include weekly and monthly *Bulletins*, biennial *Reports* and a volume entitled *Georgia, Historical and Industrial* (Atlanta, 1901). The Reports of the United States Census (especially the Twelfth Census for 1900 and the special census of manufactures for 1905) should be consulted, and *Memoirs of Georgia* (2 vols., Atlanta, Ga., 1895) contains chapters on industrial conditions.

The principal sources for public administration are the annual reports of the state officers, philanthropic institutions, the prison commission and the railroad commission, and the revised Code of Georgia (Atlanta, 1896), adopted in 1895; see also L. F. Schmeckebier's "Taxation in Georgia" (*Johns Hopkins University Studies*, vol. xviii.) and "Banking in Georgia" (*Banker's Magazine*, vol. xlviii.). Education and social conditions are treated in C. E. Jones's *History of Education in Georgia* (Washington, 1890), the Annual Reports of the School Commissioner, and various magazine articles, such as "Georgia Cracker in the Cotton Mill" (*Century Magazine*, vol. xix.) and "A Plea for Light" (*South Atlantic Quarterly*, vol. iii.). The view of slavery given in Frances A. Kemble's *Journal of a Residence on a Georgia Plantation in 1838–1839* (New York, 1863) should be compared with R. Q. Mallard's *Plantation Life before Emancipation* (Richmond, Va., 1892), and with F. L. Olmsted's *A Journey in the Seaboard Slave States* (New York, 1856).

The best book for the entire field of Georgia history is Lawton B. Evans's *A Student's History of Georgia* (New York, 1898), a text-book for schools. This should be supplemented by C. C. Jones's *Antiquities of the Southern Indians, particularly of the Georgia Tribes* (New York, 1873), for the aborigines; W. B. Stevens's *History of Georgia to 1798* (2 vols., Philadelphia, 1847–1859) and C. C. Jones, jun., *History of Georgia* (2 vols., Boston, 1883) for the Colonial and Revolutionary periods; C. H. Haskins's *The Yazoo Land Companies* (Washington, 1891); the excellent monograph (mentioned above) by U. B. Phillips for politics prior to 1860; Miss Annie H. Abel's monograph "The History of Events Resulting in Indian Consolidation West of the Mississippi," in vol. ii. of the *Annual Report of the American Historical Association for 1906* (Washington, 1908), for a good account of the removal of the Indians from Georgia; the judicious monograph by E. C. Woolley, *Reconstruction in Georgia* (New York, 1901); and L. W. Avery's *History of Georgia from 1850 to 1881* (New York, 1881), which is marred by prejudice but contains material of value. *The Confederate Records of the State of Georgia* were published at Atlanta in 1909. See also: E. J. Harden's *Life of George M. Troup* (Savannah, 1849); R. M. Johnston and W. H. Browne, *Life of Alexander H. Stephens* (Philadelphia, 1878), and Louis Pendleton, *Life of Alexander H. Stephens* (Philadelphia, 1907); P. A. Stovall's *Robert Toombs* (New York, 1892); H. Fielder's *Life, Times and Speeches of Joseph E. Brown* (Springfield, Mass., 1883); and C. C. Jones, jun., *Biographical Sketches of Delegates from Georgia to the Continental Congress* (New York, 1891). There is much valuable material, also, in the publications (beginning with 1840) of the Georgia Historical Society (see the list in vol. ii. of the *Report of the American Historical Association for 1905*).

GEORGIA, a former kingdom of Transcaucasia, which existed historically for more than 2000 years. Its earliest name was Karthli or Kartheli; the Persians knew it as Gurjistan, the Romans and Greeks as Iberia, though the latter placed Colchis also in the west of Georgia. Vrastan is the Armenian name and Gruzia the Russian. Georgia proper, which included Karthli and Kakhetia, was bounded on the N. by Ossetia and Daghestan, on the S. by the principalities of Erivan and Kars, and on the W. by Guria and Imeretia; but the kingdom also included at different times Guria, Mingrelia, Abkhasia, Imeretia and Daghestan, and extended from the Caucasus range on the N. to the Aras or Araxes on the S. It is now divided between the Russian governments of Tiflis and Kutais, under which headings further geographical particulars are given. (See also CAUCASIA.)

History.—According to traditional accounts, the Georgian (Karthlian), Kakhetian, Lesghian, Mingrelian and other races of Transcaucasia are the descendants of Thargamos, great-grandson of Japheth, son of Noah, though Gen. x. 3 makes Togarmah to be the son of Gomer, who was the son of Japheth. These various races were subsequently known under the general name of Thargamosides. Karthlos, the second son of Thargamos, is the eponymous king of his race, their country being called Karthli after him. Mtskhethos, son of Karthlos, founded the city of Mtskhetha (the modern Mtskhet) and made it the capital of his kingdom. We come, however, to firmer historic ground when we read that Georgia was conquered by Alexander the Great, or rather by one of his generals. The Macedonian yoke was shaken off by Pharnavaz or Pharnabazus, a prince of the royal race, who ruled from 302 to 237 B.C. All through its history Georgia, being on the outskirts of Armenia and Persia, both of

[1] *De facto.*
[2] President of the Council of Safety.
[3] First Governor under a State Constitution.
[4] President Executive Council and *de facto* Governor.
[5] President of Senate.
[6] President of the Colony.
[7] President of Georgia.
[8] Provisional.

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them more powerful neighbours than itself, was at times more or less closely affected by their destinies. In this way it was sometimes opposed to Rome, sometimes on terms of friendship with Byzantium, according as these were successively friendly or hostile to the Armenians and the Persians. In the end of the 2nd century B.C. the last Pharnavazian prince was dethroned by his own subjects and the crown given to Arsaces, king of Armenia, whose son Arshag, ascending the throne of Georgia in 93 B.C., established there the Arsacid dynasty. This close association with Armenia brought upon the country an invasion (65 B.C.) by the Roman general Pompey, who was then at war with Mithradates, king of Pontus and Armenia; but Pompey did not establish his power permanently over Iberia. A hundred and eighty years later the Emperor Trajan penetrated (A.D. 114) into the heart of the country, and chastised the Georgians; yet his conquest was only a little more permanent than Pompey's. During one of the internecine quarrels, which were not infrequent in Georgia, the throne fell to Mirhan or Mirian (265–342), a son of the Persian king, who had married a daughter of Asphagor, the last sovereign of the Arsacid dynasty.

With Mirian begins the Sassanian dynasty. He and his subjects were converted to Christianity by a nun Nuno (Nino), who had escaped from the religious persecutions of Tiridates, king of Armenia. Mirian erected the first Christian church in Georgia on the site now occupied by the cathedral of Mtskhet. In or about the year 371 Georgia was overrun by the Persian king Shapur or Sapor II., and in 379 a Persian general built the stronghold of Tphilis (afterwards Tiflis) as a counterpoise to Mtskhet. The Persian grasp upon Georgia was loosened by Tiridates, who reigned from 393 to 405. One of Mirian's successors, Vakhtang (446–499), surnamed Gurgaslan or Gurgasal, the Wolf-Lion, established a patriarchate at Mtskhet and made Tphilis his capital. This sovereign, having conquered Mingrelia and Abkhasia, and subdued the Ossetes, made himself master of a large part of Armenia. Then, co-operating for once with the king of Persia, he led an army into India; but towards the end of his reign there was enmity between him and the Persians, against whom he warred unsuccessfully. His son Dachi or Darchil (499–514) upon ascending the throne transferred the seat of government permanently from Mtskhet to Tphilis (Tiflis). Again Persia stretched out her hand over Georgia, and proved a formidable menace to the existence of the kingdom, until, owing to the severe pressure of the Turks on the one side and of the Byzantine Greeks on the other, she found it expedient to relax her grasp. The Georgians, seizing the opportunity, appealed (571) to the Byzantine emperor, Justin II. who gave them a king in the person of Guaram, a prince of the Bagratid family of Armenia, conferring upon him the title, not of king, but of viceroy. Thus began the dynasty of the Bagratids, who ruled until 1803.

This was not, however, the first time that Byzantine influence had been effectively exercised in Georgia. As early as the reign of Mirian, in the 3rd century, the organizers of the early Georgian church had looked to Byzantium, the leading Christian power in the East, for both instruction and guidance, and the connexion thus begun had been strengthened as time went on. From this period until the Arab (*i.e.* Mahommedan) invasions began, the authority of Byzantium was supreme in Georgia. Some seventy years after the Bagratids began to rule in Georgia the all-conquering Arabs appeared on the frontiers of the country, and for the next one hundred and eighty years they frequently devastated the land, compelling its inhabitants again and again to accept Islam at the sword's point. But it was not until the death of the Georgian king Ashod (787–826) that they completely subdued the Caucasian state and imposed their will upon it. Nevertheless they were too much occupied elsewhere or too indifferent to its welfare to defend it against alien aggressors, for in 842 Bogha, a Turkish chief, invaded the country, and early in the 10th century the Persians again overran it. But a period of relief from these hostile incursions was afforded by the reign of Bagrat III. (980–1014). During his father's lifetime he had been made king of Abkhasia, his mother belonging to the royal house of that land, and after ascending the Georgian throne he made his power felt far beyond the frontiers of his hereditary dominions, until his kingdom extended from the Black Sea to the Caspian, while Armenia, Azerbaijan and Kirman all paid him tribute. Not only did he encourage learning and patronize the fine arts, but he built, in 1003, the cathedral at Kutais, one of the finest examples extant of Georgian architecture. During the reign of Bagrat IV. (1027–1072) the Seljuk Turks more than once burst, after 1048, into the country from Asia Minor, but they were on the whole successfully repulsed, although they plundered Tiflis. During the reign of the next king, George II., they again devastated Tiflis. But once more fortune changed after the accession of David II. (1089–1125), surnamed the Renovator, one of the greatest of Georgian kings. With the help of the Kipchaks, a Mongol or Turkish race, from the steppe lands to the north of the Caucasus, whom he admitted into his country, David drove the Seljuks out of his domains and forced them back over the Armenian mountains. Under George III. (1156–1184), a grandson of David II., Armenia was in part conquered, and Ani, one of its capitals, taken. George's daughter Thamar or Tamara, who succeeded him, reigned over the kingdom as left by David II. and further extended her power over Trebizond, Erzerum, Tovin (in Armenia) and Kars. These successes were continued by her son George IV. (1212–1223), who conquered Ganja (now Elisavetpol) and repulsed the attacks of the Persians; but in the last years of his reign there appeared (1220 and 1222) the people who were to prove the ruin of Georgia, namely the Mongol hosts of Jenghiz Khan, led by his sons. George IV. was succeeded by his sister Rusudan, whose capital was twice captured by the Persians and her kingdom overrun and fearfully devastated by the Mongols in 1236. Then, after a period of wonderful recovery under George V. (1318–1346), who conquered Imeretia and reunited it to his crown, Georgia was again twice (1386 and 1393–1394) desolated by the Mongols under Timur (Tamerlane), prince of Samarkand, who on the second occasion laid waste the entire country with fire and sword, and crushed it under his relentless heel until the year 1403. Alexander I. (1413–1442) freed his country from the last of the Mongols, but at the end of his reign divided his territory between his three sons, whom he made sovereigns of Imeretia, Kakhetia and Karthli (Georgia) respectively. The first mentioned remained a separate state until its annexation to Russia in 1810; the other two were soon reunited.

Political relations between Russia and Georgia began in the end of the same century, namely in 1492, when the king of Kakhetia sought the protection of Ivan III. during a war between the Turks and the Persians. In the 17th century the two states were brought into still closer relationship. In 1619, when Georgia was harried by Shah Abbas of Persia, Theimuraz (1629–1634), king of Georgia, appealed for help to Michael, the first of the Romanov tsars of Russia, and his example was followed later in the century by the rulers of other petty Thargamosid or Caucasian states, namely Imeretia and Guria. In 1638 the prince of Mingrelia took the oath of allegiance to the Russian tsar, and in 1650 the same step was taken by the prince of Imeretia. Vakhtang VI. of Georgia put himself under the protection of Peter the Great early in the 18th century. When Persia fell into the grip of the Afghans early in the 18th century the Turks seized the opportunity, and, ousting the Persians from Georgia, captured Tiflis and compelled Vakhtang to abdicate. But in 1735 they renounced all claim to supremacy over the Caucasian states. This left Persia with the predominating influence, for though Peter the Great extorted from Persia (1722) her prosperous provinces beside the Caspian, he left the mountaineers to their own dynastic quarrels. Heraclius II. of Georgia declared himself the vassal of Russia in 1783, and when, twelve years later, he was hard pressed by Agha Mahommed, shah of Persia, who seized Tiflis and laid it in ruins, he appealed to Russia for help. The appeal was again renewed by the next king of Georgia, George XIII., in 1798, and in the following year he renounced his crown in favour of the tsar, and in 1801 Georgia was converted into a Russian province. The state of Guria submitted to Russia in 1829. (J. T. Bs.)

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Ethnology.—Of the three main groups into which the Caucasian races are now usually divided, the Georgian is in every respect the most important and interesting. It has accordingly largely occupied the attention of Orientalists almost incessantly from the days of Klaproth. Yet such are the difficulties connected with the origin and mutual relations of the Caucasian peoples that its affinities are still far from being clearly established. Anton von Schiefner and P. V. Uslar, however, arrived at some negative conclusions valuable as starting-points for further research. In their papers, published in the *Memoirs* of the St Petersburg Imperial Academy of Sciences and elsewhere (1850 et seq.), they finally disposed of the views of Bopp and Brosset (1836), who attempted on linguistic grounds to connect the Georgians with the Indo-European family. They also clearly show that Max Müller's "Turanian" theory is untenable, and they go a long way towards proving that the Georgian, with all the other Caucasian languages except the Ossetian, forms a distinct linguistic family absolutely independent of all others. This had already been suspected by Klaproth, and the same conclusion was arrived at by Fr. Müller and Zagarelli.

Uslar's "Caucasian Family" comprises the following three great divisions:

1. Western Group. Typical races: Circassians and Abkhasians.
2. Eastern Group. Typical races: Chechens and Leshians.
3. Southern Group. Typical race: Georgians.

Here the term "family" must be taken in a far more elastic sense than when applied, for instance, to the Indo-European, Semitic or Eastern Polynesian divisions of mankind. Indeed the three groups present at least as wide divergences as are found to exist between the Semitic and Hamitic linguistic families. Thus, while the Abkhasian of group 1 is still at the agglutinating, the Lesghian of group 2 has fairly reached the inflecting stage, and the Georgian seems still to waver between the two. In consequence of these different stages of development, Uslar hesitated finally to fix the position of Georgian in the family, regarding it as possibly a connecting link between groups 1 and 2, but possibly also radically distinct from both.

Including all its numerous ramifications, the Georgian or southern group occupies the greater part of Transcaucasia, reaching from about the neighbourhood of Batum on the Black Sea eastwards to the Caspian, and merging southwards with the Armenians of Aryan stock. It comprises altogether nine subdivisions, as in the subjoined table:

1. The GEORGIANS PROPER, who are the Iberians of the ancients and the Grusians of the Russians, but who call themselves Karthlians, and who in medieval times were masters of the Rion and Upper Kura as far as its confluence with the Alazan.
2. The IMERETIANS, west of the Suram mountains as far as the river Tskheniz-Tskhali.
3. The GURIANS, between the Rion and Lazistan.
4. The LAZIS of Lazistan on the Black Sea.
5. The SVANETIANS, SHVANS or SWANIANS, on the Upper Ingur and Tskheniz-Tskhali rivers.
6. The MINGRELIANS, between the rivers Tskheniz-Tskhali, Rion, Ingur and the Black Sea.
7. The TUSHES or MOSOKS . . } about the headstreams of the
8. The PSHAVS or PH'CHAVY . } Alazan and Yora rivers.
9. The KHEVSURS . . . . . }

The representative branch of the race has always been the Karthlians. It is now pretty well established that the Georgians are the descendants of the aborigines of the Pambak highlands, and that they found their way to their present homes from the south-east some four or five thousand years ago, possibly under pressure from the great waves of Aryan migration flowing from the Iranian tableland westwards to Asia Minor and Europe. The Georgians proper are limited on the east by the Alazan, on the north by the Caucasus, on the west by the Meskes hills, separating them from the Imeretians, and on the south by the Kura river and Kara-dagh and Pambak mountains. Southwards, however, no hard and fast ethnical line can be drawn, for even immediately south of Tiflis, Georgians, Armenians and Tatars are found intermingled confusedly together.

The Georgian race, which represents the oldest elements of civilization in the Caucasus, is distinguished by some excellent mental qualities, and is especially noted for personal courage and a passionate love of music. The people, however, are described as fierce and cruel, and addicted to intemperance, though Max von Thielmann (*Journey in the Caucasus*, &c., 1875) speaks of them as "rather hard drinkers than drunkards." Physically they are a fine athletic race of pure Caucasian type; hence during the Moslem ascendancy Georgia supplied, next to Circassia, the largest number of female slaves for the Turkish harems and of recruits for the Osmanli armies, more especially for the select corps of the famous Mamelukes.

The social organization rested on a highly aristocratic basis, and the lowest classes were separated by several grades of vassalage from the highest. But since their incorporation with the Russian empire, these relations have become greatly modified, and a more sharply defined middle class of merchants, traders and artisans has been developed. The power of life and death, formerly claimed and freely exercised by the nobles over their serfs, has also been expressly abolished. The Georgians are altogether at present in a fairly well-to-do condition, and under Russian administration they have become industrious, and have made considerable moral and material progress.

Missionaries sent by Constantine the Great introduced Christianity about the beginning of the 4th century. Since that time the people have, notwithstanding severe pressure from surrounding Mahommedan communities, remained faithful to the principles of Christianity, and are still amongst the most devoted adherents of the Orthodox Greek Church. Indeed it was their attachment to the national religion that caused them to call in the aid of the Christian Muscovites against the proselytizing attempts of the Shiite Persians—a step which ultimately brought about their political extinction.

As already stated, the Karthli language is not only fundamentally distinct from the Indo-European linguistic family, but cannot be shown to possess any clearly ascertained affinities with either of the two northern Caucasian groups. It resembles them chiefly in its phonetic system, so that according to Rosen (*Sprache der Lazen*) all the languages of central and western Caucasus might be adequately rendered by the Georgian alphabet. Though certainly not so harsh as the Avar, Lesghian and other Daghestan languages, it is very far from being euphonious, and the frequent recurrence of such sounds as *ts*, *ds*, *tkz*, *kh*, *khh*, *gh* (Arab. ﺥ), *q* (Arab. ﻕ), for all of which there are distinct characters, renders its articulation rather more energetic and rugged than is agreeable to ears accustomed to the softer tones of the Iranian and western Indo-European tongues. It presents great facilities for composition, the laws of which are very regular. Its peculiar morphology, standing midway between agglutination and true inflexion, is well illustrated by its simple declension common to noun, adjective and pronoun, and its more intricate verbal conjugation, with its personal endings, seven tenses and incorporation of pronominal subject and object, all showing decided progress towards the inflecting structure of the Indo-European and Semitic tongues.

Georgian is written in a native alphabet obviously based on the Armenian, and like it attributed to St Mesropius (Mesrop), who flourished in the 5th century. Of this alphabet there are two forms, differing so greatly in outline and even in the number of the letters that they might almost be regarded as two distinct alphabetic systems. The first and oldest, used exclusively in the Bible and liturgical works, is the square or monumental Khutsuri, *i.e.* "sacerdotal," consisting of 38 letters, and approaching the Armenian in appearance. The second is the Mkhedróli khéli, *i.e.* "soldier's hand," used in ordinary writing, and consisting of 40 letters, neatly shaped and full of curves, hence at first sight not unlike the modern Burmese form of the Pali.

Of the Karthli language there are several varieties; and, besides those comprised in the above table, mention should be made of the Kakhetian current in the historic province of Kakhetia. A distinction is sometimes drawn between the Karthlians proper and the Kakhetians, but it rests on a purely political basis, having originated with the partition in 1424 of the ancient Iberian

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estates into the three new kingdoms of Karthlinia, Kakhetia and Imeretia. On the other hand, both the Laz of Lazistan and the Svanetian present such serious structural and verbal differences from the common type that they seem to stand rather in the relation of sister tongues than of dialects to the Georgian proper. All derive obviously from a common source, but have been developed independently of each other. The Tusb or Mosok appears to be fundamentally a Kistinian or Chechen idiom affected by Georgian influences.

The Bible is said to have been translated into Georgian as early as the 5th century. The extant version, however, dates only from the 8th century, and is attributed to St Euthymius. But even so, it is far the most ancient work known to exist in the language. Next in importance is, perhaps, the curious poem entitled *The Amours of Turiel and Nestan Darejan*, or *The man clothed in the panther's skin*, attributed to Rustevel, who lived during the prosperous reign of Queen Thamar (11th century). Other noteworthy compositions are the national epics of the *Baramiani* and the *Rostomiani*, and the prose romances of *Visramiani* and *Darejaniani*, the former by Sarg of Tbmogvi, the latter by Mosi of Khoni. Apart from these, the great bulk of Georgian literature consists of ecclesiastical writings, hymns sacred and profane, national codes and chronicles.

BIBLIOGRAPHY.—The standard authority on the history is M. F. Brosset's translation of the Georgian chronicles under the title of *Histoire de la Géorgie* (5 vols., St Petersburg, 1849–1858); but compare also Khakanov, *Histoire de Géorgie* (Paris, 1900). See further A. Leist, *Das georgische Volk* (Dresden, 1903); M. de Villeneuve, *La Géorgie* (Paris, 1870); O. Wardrop, *The Kingdom of Georgia* (London, 1888); and Langlois, *Numismatique georgienne* (Paris, 1860). For the philology see Zagarelli, *Examen de la littérature relative à la grammaire géorgienne* (1873); *Friedrich Muller, Grundriss der Sprachwissenschaft* (1887), iii. 2; Leist, *Georgische Dichter* (1887); Erskert, *Sprachen des kaukasischen Stammes* (1895). For other points as to anthropology, Michel Smirnow's paper in *Revue d'anthropologie* (April 15, 1878); Chantre, *Recherches anthropologiques dans le Caucase* (1885–1887); and Erckert, *Der Kaukasus und seine Volker* (1887).

GEORGIAN BAY, the N.E. section of Lake Huron, separated from it by Manitoulin Island and the peninsula comprising the counties of Grey and Bruce, Ontario. It is about 100 m. long and 50 m. wide, and is said to contain 30,000 islands. It receives numerous rivers draining a large extent of country; of these the chief are the French river draining Lake Nipissing, the Maganatawan draining a number of small lakes, the Muskoka draining the Muskoka chain of lakes (Muskoka, Rosseau, Joseph, &c.) and the Severn draining Lake Simcoe. Into its southern extremity; known as Nottawasaga Bay, flows the river of the same name. The Trent valley canal connects Georgian Bay with the Bay of Quinte and Lake Ontario, and a canal system has long been projected to Montreal by way of the French and Ottawa rivers and Lake Nipissing.

GEORGSWALDE, a town of Bobemia, Austria, 115 m. N.E. of Prague by rail. Pop. (1900) 8131, including Neu-Georgswalde, Wiesenthal and Philippsdorf, which form together a single commune. Georgswalde is one of the oldest industrial places of Bohemia, and together with the neighbouring town of Rumburg is the principal centre of the linen industry. The village of Philippsdorf, now incorporated with Georgswalde, bas become since 1866 a famous place of pilgrimage, owing to the miracles attributed to an image of the Virgin, placed now in a magnificent new church (1885).

GEPHYREA, the name used for several groups of worm-like animals with certain resemblances but of doubtful affinity. In the article "Annelida" in the 9th edition of this Encyclopaedia, W. C. McIntosh followed the accepted view in associating in this group the *Echiuridae*, *Sipunculidae* and *Priapulidae*. E. Ray Lankester, in the preface to the English translation of C. Gegenbaur's *Comparative Anatomy* (1878), added the *Phoronidae* to these forms. Afterwards the same author (article "Zoology," *Ency. Brit.*, 9th ed.) recognized that the *Phoronidae* had other affinities, and placed the other "gephyreans" in association with the Polyzoa as the two classes of a phylum *Podazonia*. In the present state of knowledge the old group *Gephyrea* is broken up into *Echiuroidea* (*q.v.*) or *Gephyrea armata*, which are certainly Annelids; the *Sipunculoidea* (*q.v.*) or *Gephyrea achaeta*, an independent group, certainly coelomate, but of doubtful affinity; the *Priapuloidea* (*q.v.*), equally of doubtful affinity; and the *Phoronidea* (*q.v.*), which are almost certainly *Hemichordata*.

GERA, a town of Germany, capital of the principality of Reuss-Schleiz (called also Reuss younger line), situated in a valley on the banks of the White Elster, 45 m. S.S.W. of Leipzig on the railway to Probstzella. Pop. (1885) 34,152; (1905) 47,455. It has been mostly rebuilt since a great fire in 1780, and the streets are in general wide and straight, and contain many handsome houses. There are three Evangelical churches and one Roman Catholic. Among other noteworthy buildings are the handsome town-hall (1576, afterwards restored) and the theatre (1902). Its educational establishments include a gymnasium, a commercial and a weaving school. The castle of Osterstein, the residence of the princes of Reuss, dates from the 9th century, but bas been almost entirely rebuilt in modern times. Gera is noted for its industrial activity. Its industries include wool-weaving and spinning, dyeing, iron-founding, the manufacture of cotton and silk goods, machinery, sewing machines and machine oil, leather and tobacco, and printing (books and maps) and flower gardening.

Gera (in ancient chronicles *Geraha*) was raised to the rank of a town in the 11th century, at which time it belonged to the counts of Groitch. In the 12th century it came into the possession of the lords of Reuss. It was stormed and sacked by the Bohemians in 1450, was two-thirds burned down by the Swedes in 1630 during the Thirty Years' War, and suffered afterwards from great conflagrations in 1686 and 1780, being in the latter year almost completely destroyed.

GERALDTON, a town in the district of Victoria, West Australia, on Champion Bay, 306 m. by rail N.W. of Perth. Pop. (1901) 2593. It is the seat of a Roman Catholic bishop, an important seaport carrying on a considerable trade with the surrounding gold-fields and agricultural districts, the centre of a considerable railway system and an increasingly popular seaside resort. The harbour is safe and extensive, having a pier affording accommodation for large steamers. The chief exports are gold, copper, lead, wool and sandalwood.

GÉRANDO, MARIE JOSEPH DE (1772–1842), French philosopher, was born at Lyons on the 29th of February 1772. When the city was besieged in 1793 by the armies of the Republic, de Gérando took up arms, was made prisoner and with difficulty escaped with his life. He took refuge in Switzerland, whence he afterwards fled to Naples. In 1796 the establishment of the Directory allowed him to return to France. At the age of twenty-five he enlisted as a private in a cavalry regiment. About this time the Institute proposed as a subject for an essay this question, —" What is the influence of symbols on the faculty of thought ?" De Gérando gained the prize, and heard of his success after the battle of Zürich, in which he had distinguished himself. This literary triumph was the first step in his upward career. In 1799 he was attached to the ministry of the interior by Lucien Bonaparte; in 1804 he became general secretary under Champagny; in 1805 he accompanied Napoleon into Italy; in 1808 he was nominated master of requests; in 1811 he received the title of councillor of state; and in the following year he was appointed governor of Catalonia. On the overthrow of the empire, de Gérando was allowed to retain this office; but having been sent during the hundred days into the department of the Moselle to organize the defence of that district, he was punished at the second Restoration by a few months of neglect. He was soon after, however, readmitted into the council of state, where he distinguished himself by the prudence and conciliatory tendency of his views. In 1819 he opened at the law-school of Paris a class of public and administrative law, which in 1822 was suppressed by government, but was reopened six years later under the Martignac ministry. In 1837 he was made a baron. He died at Paris on the 9th of November 1842.

De Gérando's best-known work is his *Histoire comparée des systèmes de philosophie relativement aux principes des connaissances humaines* (Paris, 1804, 3 vols.). The germ of this work

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had already appeared in the author's *Mémoire de la génération des connaissances humaines* (Berlin, 1802), which was crowned by the Academy of Berlin. In it de Gérando, after a rapid review of ancient and modern speculations on the origin of our ideas, singles out the theory of primary ideas, which he endeavours to combat under all its forms. The latter half of the work, devoted to the analysis of the intellectual faculties, is intended to show how all human knowledge is the result of experience; and reflection is assumed as the source of our ideas of substance, of unity and of identity. It is divided into two parts, the first of which is purely historical, and devoted to an exposition of various philosophical systems; in the second, which comprises fourteen chapters of the entire work, the distinctive characters and value of these systems are compared and discussed. In spite of the disadvantage that it is impossible to separate advantageously the history and critical examination of any doctrine in the arbitrary manner which de Gérando chose, the work has great merits. In correctness of detail and comprehensiveness of view it was greatly superior to every work of the same kind that had hitherto appeared in France. During the Empire and the first years of the Restoration, de Gérando found time to prepare a second edition (Paris, 1822, 4 vols.), which is enriched with so many additions that it may pass for an entirely new work. The last chapter of the part published during the author's lifetime ends with the revival of letters and the philosophy of the 15th century. The second part, carrying the work down to the close of the 18th century, was published posthumously by his son in 4 vols. (Paris, 1847). Twenty-three chapters of this were left complete by the author in manuscript; the remaining three were supplied from other sources, chiefly printed but unpublished memoirs.

His essay *Du perfectionnement moral et de l'éducation de soi-même* was crowned by the French Academy in 1825. The fundamental idea of this work is that human life is in reality only a great education, of which perfection is the aim.

Besides the works already mentioned, de Gérando left many others, of which we may indicate the following:—*Considérations sur diverses méthodes d'observation des peuples sauvages* (Paris, 1801); *Éloge de Dumarsais,—discours qui a remporté le prix proposé par la seconde classe de l'Institut National* (Paris, 1805); *Le Visiteur de pauvre* (Paris, 1820); *Instituts du droit administratif* (4 vols., Paris, 1830); *Cours normal des instituteurs primaires ou directions relatives à l'éducation physique, morale, et intellectuelle dans les écoles primaires* (Paris, 1832); *De l'éducation des sourds-muets* (2 vols., Paris, 1832); *De la bienfaisance publique* (4 vols., 1838). A detailed analysis of the *Histoire comparée des systèmes* will be found in the *Fragments philosophiques* of M. Cousin. In connexion with his psychological studies, it is interesting that in 1884 the French Anthropological Society reproduced his instructions for the observation of primitive peoples, and modern students of the beginnings of speech in children and the cases of deaf-mutes have found useful matter in his works. See also J. P. Damiron, *Essai sur la philosophie en France au XIXe siècle.*

GERANIACEAE, in botany, a small but very widely distributed natural order of Dicotyledons belonging to the subclass Polypetalae, containing about 360 species in 11 genera. It is represented in Britain by two genera, *Geranium* (crane's-bill) and *Erodium* (stork's-bill), to which belong nearly two-thirds of the total number of species. The plants are mostly herbs, rarely becoming shrubby, with generally simple glandular hairs on the stem and leaves. The opposite or alternate leaves have a pair of small stipules at the base of the stalk and a palminerved blade. The flowers, which are generally arranged in a cymose inflorescence, are hermaphrodite, hypogynous, and, except in *Pelargonium*, regular. The parts are arranged in fives. There are five free sepals, overlapping in the bud, and, alternating with these, five free petals. In *Pelargonium* the flower is zygomorphic with a spurred posterior sepal and the petals differing in size or shape. In *Geranium* the stamens are obdiplostemonous, *i.e.* an outer whorl of five opposite the petals alternates with an inner whorl of five opposite the sepals; at the base of each of the antisepalous stamens is a honey-gland. In *Erodium* the members of the outer whorl are reduced to scale-like structures (staminodes), and in *Pelargonium* from two to seven only are fertile. There is no satisfactory explanation of this break in the regular alternation of successive whorls; the outer whorl of stamens arises in course of development before the inner, so that there is no question of subsequent displacement. There are five, or sometimes fewer, carpels, which unite to form an ovary with as many chambers, in each of which are one or two, rarely more, pendulous anatropous ovules, attached to the central column in such a way that the micropyle points outwards and the raphe is turned towards the placenta. The long beak-like style divides at the top into a corresponding number of slender stigmas.

The larger-flowered species of *Geranium* are markedly protandrous, the outer stamens, inner stamens and stigmas becoming functional in succession. For instance, in meadow crane's-bill *G. pratense*, each whorl of stamens ripens in turn, becoming erect and shedding their pollen; as the anthers wither the filaments bend outwards, and when all the anthers have diverged the stigmas become mature and ready for pollination. By this

Meadow Crane's-bill, *Geranium pratense*. (After Curtis, *Flora Londinensis.*)

1, Flower after removal of petals. 2, Fruit after splitting. 1 and 2 about natural size. 3, Floral diagram, the dots opposite the inner stamens represent honey-glands.

arrangement self-pollination is prevented and cross-pollination ensured by the visits of bees which come for the honey secreted by the glands at the base of the inner stamens.

In species with smaller and less conspicuous flowers, such as *G. molle*, the flowers of which are only ¼ to ⅓ in. in diameter, self-pollination is rendered possible, since the divisions of the stigma begin to separate before the outer stamens have shed all their pollen; the nearness of the stigmas to the dehiscing anthers favours self-pollination.

In the ripe fruit the carpels separate into five one-seeded portions (*cocci*), which break away from the central column, either rolling elastically outwards and upwards or becoming spirally twisted. In most species of *Geranium* the cocci split open on the inside and the seeds are shot out by the elastic uptwisting (fig. 1); in *Erodium* and *Pelargonium* each coccus remains closed, and the long twisted upper portion separates from the central column, forming an awn, the distribution of which is favoured by the presence of bristles or hairs. The embryo generally fills the seed, and the cotyledons are rolled or folded on each other.

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Geranium is the most widely distributed genus; it has 160 species and is spread over all temperate regions with a few species in the tropics. Three British species—*G. sylvaticum*, *G. pratense* and *G. Robertianum* (herb-Robert)—reach the arctic zone, while *G. patagonicum* and *G. magellanicum* are found in the antarctic. *Erodium* contains 50 species (three are British), most of which are confined to the Mediterranean region and west Asia, though others occur in America, in South Africa and West Australia. *Pelargonium*, with 175 species, has its centre in South Africa; the well-known garden and greenhouse "geraniums" are species of *Pelargonium* (see GERANIUM).

GERANIUM, the name of a genus of plants, which is taken by botanists as the type of the natural order Geraniaceae. The name, as a scientific appellation, has a much more restricted application than when taken in its popular sense. Formerly the genus *Geranium* was almost conterminous with the order Geraniaceae. Then as now the geranium was very popular as a garden plant, and the species included in the original genus became widely known under that name, which has more or less clung to them ever since, in spite of scientific changes which have removed the larger number of them to the genus *Pelargonium*. This result has been probably brought about in some degree by an error of the nurserymen, who seem in many cases to have acted on the conclusion that the group commonly known as *Scarlet Geraniums* were really geraniums and not pelargoniums, and were in consequence inserted under the former name in their trade catalogues. In fact it may be said that, from a popular point of view, the pelargoniums of the botanist are still better known as geraniums than are the geraniums themselves, but the term "zonal Pelargonium" is gradually making its way amongst the masses.

The species of *Geranium* consist mostly of herbs, of annual or perennial duration, dispersed throughout the temperate regions of the world. They number about 160, and bear a considerable family resemblance. The leaves are for the most part palmately-lobed, and the flowers are regular, consisting of five sepals, five imbricating petals, alternating with five glandules at their base, ten stamens and a beaked ovary. Eleven species are natives of the British Isles and are popularly known as crane's-bill. *G. Robertianum* is herb-Robert, a common plant in hedgebanks. *G. sanguineum*, with flowers a deep rose colour, is often grown in borders, as are also the double-flowered varieties of *G. pratense*. Many others of exotic origin form handsome border plants in our gardens of hardy perennials; amongst these *G. armenum*, *G. Endressi*, *G. ibericum* and its variety *platypetalum* are conspicuous.

From these regular-flowered herbs, with which they had been mixed up by the earlier botanists, the French botanist L'Heritier in 1787 separated those plants which have since borne the name of *Pelargonium*, and which, though agreeing with them in certain points of structure, differ in others which are admitted to be of generic value. One obvious distinction of *Pelargonium* is that the flowers are irregular, the two petals which stand uppermost being different—larger, smaller or differently marked—from the other three, which latter are occasionally wanting. This difference of irregularity the modern florist has done very much to annul, for the increased size given to the flowers by high breeding has usually been accompanied by the enlargement of the smaller petals, so that a very near approach to regularity has been in some cases attained. Another well-marked difference, however, remains in *Pelargonium:* the back or dorsal sepal has a hollow spur, which spur is adnate, *i.e.* joined for its whole length with the flower-stalk; while in *Geranium* there is no spur. This peculiarity is best seen by cutting clean through the flower-stalk just behind the flower, when in *Pelargonium* there will be seen the hollow tube of the spur, which in the case of *Geranium* will not be found, but the stalk will appear as a solid mass. There are other characters which support those already pointed out, such as the absence of the glandules, and the declination of the stamens; but the features already described offer the most ready and obvious distinctions.

To recapitulate, the geraniums properly so-called are regular-flowered herbs with the flower-stalks solid, while many geraniums falsely so-called in popular language are really pelargoniums, and may be distinguished by their irregular flowers and hollow flower-stalks. In a great majority of cases too, the pelargoniums so commonly met with in greenhouses and summer parterres are of shrubby or sub-shrubby habit.

The various races of pelargoniums have sprung from the intermixture of some of the species obtained from the Cape. The older show-flowered varieties have been gradually acquired through a long series of years. The fancy varieties, as well as the French spotted varieties and the market type, have been evolved from them. The zonal or bedding race, on the other hand, has been more recently perfected; they are supposed to have arisen from hybrids between *Pelargonium inquinans* and *P. zonale*. In all the sections the varieties are of a highly ornamental character, but for general cultivation the market type is preferable for indoor purposes, while the zonals are effective either in the greenhouse or flower garden. Some of the Cape species are still in cultivation—the leaves of many of them being beautifully subdivided, almost fern-like in character, and some of them are deliciously scented; *P. quercifolium* is the oak-leaf geranium. The ivy-leaf geranium, derived from *P. peltatum*, has given rise to an important class of both double- and single-flowered forms adapted especially for pot culture, hanging baskets, window boxes and the greenhouse. Of late years the ivy-leaf "geraniums" have been crossed with the "zonals," and a new race is being gradually evolved from these two distinct groups.

The best soil for pelargoniums is a mellow fibrous loam with good well-rotted stable manure or leaf-mould in about the proportion of one-fifth; when used it should not be sifted, but pulled to pieces by the hand, and as much sand should be added as will allow the water to pass freely through it. The large-flowered and fancy kinds cannot bear so much water as most soft-wooded plants, and the latter should have a rather lighter soil.

All the pelargoniums are readily increased by cuttings made from the shoots when the plants are headed down after flowering, or in the spring, when they will root freely in a temperature of 65° to 70°. They must not be kept too close, and must be very moderately watered. When rooted they may be moved into well-drained 3-in. pots, and when from 6 to 8 in. high, should have the points pinched out in order to induce them to push out several shoots nearer the base. These shoots are, when long enough, to be trained in a horizontal direction; and when they have made three joints they should have the points again pinched out. These early-struck plants will be ready for shifting into 6-in. pots by the autumn, and should still be trained outwards. The show varieties after flowering should be set out of doors in a sunny spot to ripen their wood, and should only get water enough to keep them from flagging. In the course of two or three weeks they will be ready to cut back within two joints of where these were last stopped, when they should be placed in a frame or pit, and kept close and dry until they have broken. When they have pushed an inch or so, turn them out of their pots, shake off the old soil, trim the straggling roots, and repot them firmly in smaller pots if practicable; keep them near the light, and as the shoots grow continue to train them outwardly. They require to be kept in a light house, and to be set well up to the glass; the night temperature should range about 45°; and air should be given on all mild days, but no cold currents allowed, nor more water than is necessary to keep the soil from getting parched. The young shoots should be topped about the end of October, and when they have grown an inch or two beyond this, they may be shifted into 7-in. pots for flowering. The shoots must be kept tied out so as to be fully exposed to the light. If required to flower early they should not be stopped again; if not until June they may be stopped in February.

The zonal varieties, which are almost continuous bloomers, are of much value as decorative subjects; they seldom require much pruning after the first stopping. For winter flowering,

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young plants should be raised from cuttings about March, and grown on during the summer, but should not be allowed to flower. When blossoms are required, they should be placed close up to the glass in a light house with a temperature of 65°, only just as much water being given as will keep them growing. For bedding purposes the zonal varieties are best struck towards the middle of August in the open air, taken up and potted or planted in boxes as soon as struck, and preserved in frames or in the greenhouse during winter.

The fancy varieties root best early in spring from the half-ripened shoots; they are slower growers, and rather more delicate in constitution than the zonal varieties, and very impatient of excess of water at the root.

GERARD (d. 1108), archbishop of York under Henry I., began his career as a chancery clerk in the service of William Rufus. He was one of the two royal envoys who, in 1095, persuaded Urban II. to send a legate and Anselm's pallium to England. Although the legate disappointed the king's expectations, Gerard was rewarded for his services with the see of Hereford (1096). On the death of Rufus he at once declared for Henry I., by whom he was nominated to the see of York. He made difficulties when required to give Anselm the usual profession of obedience; and it was perhaps to assert the importance of his see that he took the king's side on the question of investitures. He pleaded Henry's cause at Rome with great ability, and claimed that he had obtained a promise, on the pope's part, to condone the existing practice of lay investiture. But this statement was contradicted by Paschal, and Gerard incurred the suspicion of perjury. About 1103 he wrote or inspired a series of tracts which defended the king's prerogative and attacked the oecumenical pretensions of the papacy with great freedom of language. He changed sides in 1105, becoming a stanch friend and supporter of Anselm. Gerard was a man of considerable learning and ability; but the chroniclers accuse him of being lax in his morals, an astrologer and a worshipper of the devil.

See the *Tractatus Eboracenses* edited by H. Boehmer in *Libelli de lite Sacerdotii et Imperii*, vol. iii. (in the *Monumenta hist. Germaniae*, quarto series), and the same author's *Kirche und Staat in England und in der Normandie* (Leipzig, 1899). (H. W. C. D.)

GERARD (*c.* 1040–1120), variously surnamed TUM, TUNC, TENQUE or THOM, founder of the order of the knights of St John of Jerusalem (*q.v.*), was born at Amalfi about the year 1040. According to other accounts Martigues in Provence was his birthplace, while one authority even names the Château d'Avesnes in Hainaut. Either as a soldier or a merchant, he found his way to Jerusalem, where a hospice had for some time existed for the convenience of those who wished to visit the holy places. Of this institution Gerard became guardian or provost at a date not later than 1100; and here he organized that religious order of St John which received papal recognition from Paschal II. in 1113, by a bull which was renewed and confirmed by Calixtus II. shortly before the death of Gerard in 1120.

GERARD OF CREMONA (*c.* 1114–1187), the medieval translator of Ptolemy's Astronomy, was born at Cremona, Lombardy, in or about 1114. Dissatisfied with the meagre philosophies of his Italian teachers, he went to Toledo to study in Spanish Moslem schools, then so famous as depositories and interpreters of ancient wisdom; and, having thus acquired a knowledge of the Arabic language, he appears to have devoted the remainder of his life to the business of making Latin translations from its literature. The date of his return to his native town is uncertain, but he is known to have died there in 1187. His most celebrated work is the Latin version by which alone Ptolemy's *Almagest* was known to Europe until the discovery of the original Μεγάλη Σύνταξις. In addition to this, he translated various other treatises, to the number, it is said, of sixty-six; among these were the *Tables* of "Arzakhel," or Al Zarkala of Toledo, Al Farabi *On the Sciences* (*De scientiis*), Euclid's *Geometry*, Al Farghani's *Elements of Astronomy*, and treatises on algebra, arithmetic and astrology. In the last-named latitudes are reckoned from Cremona and Toledo. Some of the works, however, with which he has been credited (including the *Theoria* or *Theorica planetarum*, and the versions of Avicenna's *Canon of Medicine*—the basis of the numerous subsequent Latin editions of that well-known work—and of the *Almansorius* of Ahu Bakr Razi) are probably due to a later Gerard, of the 13th century, also called Cremonensis but more precisely de Sabloneta (Sabbionetta). This writer undertook the task of interpreting to the Latin world some of the best work of Arabic physicians, and his translation of Avicenna is said to have been made by order of the emperor Frederic II.

See Pipini, "Cronica," in Muratori, *Script. rer. Ital.* vol. ix.; Nicol. Antonio, *Bibliotheca Hispana vetus*, vol. ii.; Tiraboschi, *Storia della letteratura Italiana*, vols. iii. (333) and iv.; Arisi, *Cremona literata*; Jourdain, *Recherches sur . . . . l'origine des traductions latines d'Aristote*; Chasles, *Aperçu historique des méthodes en géométrie*, and in *Comptes rendus de l'Académie des Sciences*, vol. xiii. p. 506; J. T. Reinaud, *Géographie d'Aboulféda*, introduction, vol. i. pp. ccxlvi.-ccxlviii.; Boncompagni, *Della vita e delle opere di Gherardo Cremonese e di Gherardo da Sabbionetta* (Rome, 1851). Much of the work of both the Gerards remains in manuscript, as in Paris, National Library, MSS. Lat. 7400, 7421; MSS. Suppl. Lat. 49; Rome, Vatican library, 4083, and Ottobon. 1826; Oxford, Bodleian library, Digby, 47, 61. The Vatican MS. 2392 is stated to contain a eulogy of "Gerard of Cremona" and a list of "his" translations, apparently confusing the two scholars. The former's most valuable work was in astronomy; the latter's in medicine. (C. R. B.)

GÉRARD, ÉTIENNE MAURICE, COUNT (1773–1852), French general, was born at Damvilliers (Meuse), on the 4th of April 1773. He joined a battalion of volunteers in 1791, and served in the campaigns of 1792–1793 under Generals Dumouriez and Jourdan. In 1795 he accompanied Bernadotte as aide-de-camp. In 1799 he was promoted *chef d'escadron*, and in 1800 colonel. He distinguished himself at the battles of Austerlitz and Jena, and was made general of brigade in November 1806, and for his conduct in the battle of Wagram he was created a baron. In the Spanish campaign of 1810 and 1811 he gained special distinction at the battle of Fuentes d'Onor; and in the expedition to Russia he was present at Smolensk and Valutina, and displayed such bravery and ability in the battle of Borodino that he was made general of division. He won further distinction in the disastrous retreat from Moscow. In the campaign of 1813, in command of a division, he took part in the battles of Lützen and Bautzen and the operations of Marshal Macdonald, and at the battle of Leipzig (in which he commanded the XI. corps) he was dangerously wounded. After the battle of Bautzen he was created by Napoleon a count of the empire. In the campaign of France of 1814, and especially at La Rothière and Montereau, he won still greater distinction. After the first restoration he was named by Louis XVIII. grand cross of the Legion of Honour and chevalier of St Louis. In the Hundred Days Napoleon made Gérard a peer of France and placed him in command of the IV. corps of the Army of the North. In this capacity Gérard took a brilliant part in the battle of Ligny (see WATERLOO CAMPAIGN), and on the morning of the 18th of June he was foremost in advising Marshal Grouchy to march to the sound of the guns. Gérard retired to Brussels after the fall of Napoleon, and did not return to France till 1817. He sat as a member of the chamber of deputies in 1822–1824, and was re-elected in 1827. He took part in the revolution of 1830, after which he was appointed minister of war and named a marshal of France. On account of his health he resigned the office of war minister in the October following, but in 1831 he took the command of the northern army, and was successful in thirteen days in driving the army of Holland out of Belgium. In 1832 he commanded the besieging army in the famous scientific siege of the citadel of Antwerp. He was again chosen war minister in July 1834, but resigned in the October following. In 1836 he was named grand chancellor of the Legion of Honour in succession to Marshal Mortier, and in 1838 commander of the National Guards of the Seine, an office which he held till 1842. He became a senator under the empire in 1852, and died on the 17th of April in the same year.

GÉRARD, FRANÇOIS, BARON (1770–1837), French painter, was born on the 4th of May 1770, at Rome, where his father occupied a post in the house of the French ambassador. At the age of twelve Gérard obtained admission into the Pension du Roi at Paris. From the Pension he passed to the studio of

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Pajou (sculptor), which he left at the end of two years for that of the painter Brenet, whom he quitted almost immediately to place himself under David. In 1789 he competed for the Prix de Rome, which was carried off by his comrade Girodet. In the following year (1790) he again presented himself, but the death of his father prevented the completion of his work, and obliged him to accompany his mother to Rome. In 1791 he returned to Paris; but his poverty was so great that he was forced to forgo his studies in favour of employment which should bring in immediate profit. David at once availed himself of his help, and one of that master's most celebrated pictures—Le Pelletier de St Fargeau—may owe much to the hand of Gérard. This painting was executed early in 1793, the year in which Gérard, at the request of David, was named a member of the revolutionary tribunal, from the fatal decisions of which he, however, invariably absented himself. In 1794 he obtained the first prize in a competition, the subject of which was "The Tenth of August," and, further stimulated by the successes of his rival and friend Girodet in the Salons of 1793 and 1794, Gérard (nobly aided by Isabey the miniaturist) produced in 1795 his famous "Bélisaire." In 1796 a portrait of his generous friend (in the Louvre) obtained undisputed success, and the money received from Isabey for these two works enabled Gérard to execute in 1797 his "Psyché et l'Amour." At last, in 1799, his portrait of Madame Bonaparte established his position as one of the first portrait-painters of the day. In 1808 as many as eight, in 1810 no less than fourteen portraits by him, were exhibited at the Salon, and these figures afford only an indication of the enormous numbers which he executed yearly; all the leading figures of the empire and of the restoration, all the most celebrated men and women of Europe, sat to Gérard. This extraordinary vogue was due partly to the charm of his manner and conversation, for his *salon* was as much frequented as his studio; Madame de Staël, Canning, Talleyrand, the duke of Wellington, have all borne witness to the attraction of his society. Rich and famous, Gérard was stung by remorse for earlier ambitions abandoned; at intervals he had indeed striven to prove his strength with Girodet and other rivals, and his "Bataille d'Austerlitz" (1810) showed a breadth of invention and style which are even more conspicuous in "L'Entrée d'Henri IV" (Versailles)—the work with which in 1817 he did homage to the Bourbons. After this date Gérard declined, watching with impotent grief the progress of the Romantic school. Loaded with honours—baron of the empire, member of the Institute, officer of the legion of honour, first painter to the king—he worked on sad and discouraged; the revolution of 1830 added to his disquiet; and on the 11th of January 1837, after three days of fever, he died. By his portraits Gérard is best remembered; the colour of his paintings has suffered, but his drawings show in uninjured delicacy the purity of his line; and those of women are specially remarkable for a virginal simplicity and frankness of expression.

M. Ch. Lenormant published in 1846 *Essai de biographie et de critique sur François Gérard*, a second edition of which appeared in 1847; and M. Delécluze devoted several pages to the same subject in his work *Louis David, son école et son temps*.

GÉRARD, JEAN IGNACE ISIDORE (1803–1847), French caricaturist, generally known by the pseudonym of Grandville—the professional name of his grandparents, who were actors—was born at Nancy on the 13th of September 1803. He received his first instruction in drawing from his father, a miniature painter, and at the age of twenty-one came to Paris, where he soon afterwards published a collection of lithographs entitled *Les Tribulations de la petite propriété*. He followed this by *Les Plaisirs de toutâge* and *La Sibylle des salons*; but the work which first established his fame was *Métamorphoses du jour*, published in 1828, a series of seventy scenes in which individuals with the bodies of men and faces of animals are made to play a human comedy. These drawings are remarkable for the extraordinary skill with which human characteristics are represented in animal features. The success of this work led to his being engaged as artistic contributor to various periodicals, such as *La Silhouette*, *L'Artiste*, *La Caricature*, *Le Charivari*; and his political caricatures, which were characterized by marvellous fertility of satirical humour, soon came to enjoy a general popularity. Besides supplying illustrations for various standard works, such as the songs of Béranger, the fables of La Fontaine, *Don Quixote*, *Gulliver's Travels*, *Robinson Crusoe*, he also continued the issue of various lithographic collections, among which may be mentioned *La Vie privée et publique des animaux*, *Les Cent Proverbes*, *L'Autre Monde* and *Les Fleurs animées*. Though the designs of Gérard are occasionally unnatural and absurd, they usually display keen analysis of character and marvellous inventive ingenuity, and his humour is always tempered and refined by delicacy of sentiment and a vein of sober thoughtfulness. He died of mental disease on the 17th of March 1847.

A short notice of Gérard, under the name of Grandville, is contained in Théophile Gautier's *Portraits contemporains*. See also Charles Blanc, *Grandville* (Paris, 1855).

GERARD, JOHN (1545–1612), English herbalist and surgeon, was born towards the end of 1545 at Nantwich in Cheshire. He was educated at Wisterson, or Willaston, 2 m. from Nantwich, and eventually, after spending some time in travelling, took up his abode in London, where he exercised his profession. For more than twenty years he also acted as superintendent of the gardens in London and at Theobalds, in Hertfordshire, of William Cecil, Lord Burghley. In 1596 he published a catalogue of plants cultivated in his own garden in Holborn, London, 1030 in number, inclusive of varieties of the same species. Their English as well as their Latin names are given in a revised edition of the catalogue issued in 1599. In 1597 appeared Gerard's well-known *Herball*, described by him in its preface as "the first fruits of these mine own labours," but more truly an adaptation of the *Stirpium historiae pemptades* of Rembert Dodoens (1518–1585), published in 1583, or rather of a translation of the whole or part of the same by Dr Priest, with M. Lobel's arrangement. Of the numerous illustrations of the *Herball* sixteen appear to be original, the remainder are mostly impressions from the wood blocks employed by Jacob Theodorus Tabernaemontanus in his *Icones stirpium*, published at Frankfort in 1590. A second edition of the *Herball*, with considerable improvements and additions, was brought out by Thomas Johnson in 1633, and reprinted in 1636. Gerard was elected a member of the court of assistants of the barber-surgeons in 1595, by which company he was appointed an examiner in 1598, junior warden in 1605, and master in 1608. He died in February 1612, and was buried at St Andrews, Holborn.

See Johnson's preface to his edition of the *Herball*; and *A Catalogue of Plants cultivated in the Garden of John Gerard in the years 1596–1599. edited with Notes, References to Gerard's Herball, the Addition of modern Names, and a Life of the Author, by Benjamin Daydon Jackson, F.L.S.*, privately printed (London, 1876, 4to).

GÉRARDMER, a town of north-eastern France, in the department of Vosges, 33 m. E.S.E. of Epinal by rail. Pop. (1906) of the town, 3993; of the commune, 10,041. Gérardmer is beautifully situated at a height of 2200 ft. at the eastern end of the small Lake of Gérardmer (285 acres in extent) among forest-clad mountains. It is the chief summer-resort of the French Vosges and is a centre for excursions, among which may be mentioned those to the Hôhneck (4481 ft.), the second highest summit in the Vosges, the Schluch, the mountain pass from France to Germany, and, nearer the town, the picturesque defile of Granges, watered by the Vologne, which at one point forms the cascade known as the Saut des Cuves. The town itself, in which the chief object of interest is the huge lime-tree in the market-place, carries on cloth-weaving, bleaching, wood-sawing and the manufacture of wooden goods; there is trade in the cheeses (*gérômés*) manufactured in the neighbourhood. Gérardmer is said to owe its name to Gerard of Alsace, 1st duke of Lorraine, who in the 11th century built a tower on the bank of the lake or *mer*, near which, in 1285, a new town was founded.

GERASA (mod. *Gerash* or *Jerash*), a city of Palestine, and a member of the league known as the Decapolis (*q.v.*), situated amid the mountains of Gilead, about 1757 ft. above the sea, 20 m. from the Jordan and 21 m. N. of Philadelphia. Of its origin nothing is known; it has been suggested that it represents the biblical Ramoth Gilead. From Josephus we learn that it

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was captured by Alexander Jannaeus (*c.* 83 B.C.), rebuilt by the Romans (*c.* A.D. 63), burned by the Jews in revenge for the massacre at Caesarea, and again plundered and depopulated by Annius, the general of Vespasian; but, in spite of these disasters, it was still in the 2nd and 3rd centuries of the Christian era one of the wealthiest and most flourishing cities of Palestine. It was a centre of Greek civilization, devoted especially to the worship of Artemis, and producing famous teachers, of whom Stephen the Byzantine mentions Ariston, Kerykos and Plato. As late as 1121 the soldiers of Baldwin II. found it defended by a castle built by a king of Damascus; but at the beginning of the following century the Arabian geographer Yaqut speaks of it as deserted and overthrown. The ruins of Jerash, discovered about 1806, and since then frequently visited and described, still attest the splendour of the Roman city. They are distributed along both banks of the Kerwan, a brook which flows south through the Wadi-ed-Dēr to join the Zerka or Jabbok; but all the principal buildings are situated on the level ground to the right of the stream. The town walls, which can still be traced and indeed are partly standing, had a circuit of not more than 2 m., and the main street was less than half a mile in length; but remains of buildings on the road for fully a mile beyond the south gate, show that the town had outgrown the limit of its fortifications. The most striking feature of the ruins is the profusion of columns, no fewer than 230 being even now in position; the main street is a continuous colonnade, a large part of which is still entire, and it terminates to the south in a forum of similar formation. Among the public buildings still recognizable are a theatre capable of accommodating 6000 spectators, a naumachia (circus for naval combats) and several temples, of which the largest was probably the grandest structure in the city, possessing a portico of Corinthian pillars 38 ft. high. The desolation of the city is probably due to earthquake; and the absence of Moslem erections or restorations seems to show that the disaster took place before the Mahommedan period.

The town is now occupied by a colony of Circassians, whose houses have been built with materials from the earlier buildings, and there has been much destruction of the interesting ruins. "The country of the Gerasenes" (Matt. viii. 28 and parallels; other readings, Gadarenes, Gergesenes) must be looked for in another quarter—on the E. coast of the Sea of Galilee, probably in the neighbourhood of the modern Khersa (C. W. Wilson in *Recovery of Jerusalem*, p. 369). (R. A. S. M.)

GÉRAULT-RICHARD, ALFRED LÉON (1860–), French journalist and politician, was born at Bonnétable in the department of Sarthe, of a peasant family. He began life as a working upholsterer, first at Mans, then at Paris (1880), where his peasant and socialist songs soon won him fame in the Montmartre quarter. Lissagaray, the communist, offered him a position on *La Bataille*, and he became a regular contributor to the advanced journals, especially to *La Petite République*, of which he became editor-in-chief in 1897. In 1893 he founded *Le Chambard*, and was imprisoned for a year (1894) on account of a personal attack upon the president, Casimir-Périer. In January 1895 he was elected to the chamber as a Socialist for the thirteenth arrondissement of Paris. He was defeated at the elections of 1898 at Paris, but was re-elected in 1902 and in 1906 by the colony of Guadeloupe.

GERBER, ERNST LUDWIG (1746–1819), German musician, author of a famous dictionary of musicians, was born at Sondershausen in the principality of Schwarzburg-Sondershausen on the 29th of September 1746. His father, Henry Nicolas Gerber (1702–1775), a pupil of J. S. Bach, was an organist and composer of some distinction, and under his direction Ernst Ludwig at an early age had made great progress in his musical studies. In 1765 he went to Leipzig to study law, but the claims of music, which had gained additional strength from his acquaintanceship with J. A. Hiller, soon came to occupy almost his sole attention. On his return to Sondershausen he was appointed music teacher to the children of the prince, and in 1775 he succeeded his father as court organist. Afterwards he devoted much of his time to the study of the literature and history of music, and with this view he made himself master of several modern languages. His *Historisch-biographisches Lexikon der Tonkünstler* appeared in 1790 and 1792 in two volumes; and the first volume of what was virtually an improved and corrected edition of this work was published in 1810 under the title *Neues historisch-biographisches Lexikon der Tonkünstler*, followed by other three volumes in 1812, 1813 and 1814. Gerber also contributed a number of papers to musical periodicals, and published several minor musical compositions. He died at Sondershausen on the 30th of June 1819.

GERBERON, GABRIEL (1628–1711), French Jansenist monk, was born on the 12th of August 1628 at St Calais, in the department of Sarthe. At the age of twenty he took the vows of the Benedictine order at the abbey of St Melaine, Rennes, and afterwards taught rhetoric and philosophy in several monasteries. His open advocacy of Jansenist opinions, however, caused his superiors to relegate him to the most obscure houses of the order, and finally to keep him under surveillance at the abbey of St Germain-des-Prés at Paris. Here he wrote a defence of the doctrine of the Real Presence against the Calvinists in the form of an apology for Rupert, abbot of Deutz (*Apologia pro Ruperto abbate Tuitensi*, Paris, 1669). In 1676 he published at Brussels, under the name of "Sieur Flore de Ste Foi" his *Miroir de la piété chrétienne*, an enlarged edition of which appeared at Liége in the following year. This was condemned by certain archbishops and theologians as the repetition of the five condemned propositions of Jansen, and Gerberon defended it, under the name of "Abbé Valentin" in *Le Miroir sans tache* (Paris, 1680). He had by this time aroused against him the full fury of the Jesuits, and at their instigation a royal provost was sent to Corbie to arrest him. He had, however, just time to escape, and fled to the Low Countries, where he lived in various towns. He was invited by the Jansenist clergy to Holland, where he wrote another controversial work against Protestants: *Défense de l'Église Romain contre la calomnie des Protestants* (Cologne, 1688–1691). This produced unpleasantness with the Reformed clergy, and feeling himself no longer safe he returned to Brussels. In 1700 he published his history of Jansenism (*Histoire générale du Jansénisme*), a dry work, by which, however, he is best remembered. He adhered firmly to the Augustinian doctrine of Predestination, and on the 30th of May 1703 he was arrested at Brussels at the instance of the archbishop of Malines, and ordered to subscribe the condemnation of the five sentences of Jansen. On his refusal, he was handed over to his superiors and imprisoned in the citadel of Amiens and afterwards at Vincennes. Every sort of pressure was brought to bear upon him to make his submission, and at last, broken in health and spirit, he consented to sign a formula which the cardinal de Noailles claimed as a recantation. Upon this he was released in 1710. The first use he made of his freedom was to write a work (which, however, his friends prudently prevented him from publishing), *Le Vaine Triomphe du cardinal de Noailles*, containing a virtual withdrawal of the compulsory recantation. He died at the abbey of St Denis on the 29th of March 1711.

GERBERT, MARTIN (1720–1793), German theologian, historian and writer on music, belonged to the noble family of Gerbert von Hornau, and was born at Horb on the Neckar, Württemberg, on the 12th (or 11th or 13th) of August 1720. He was educated at Freiburg in the Breisgau, at Klingenau in Switzerland and at the Benedictine abbey of St Blasien in the Black Forest, where in 1737 he took the vows. In 1744 he was ordained priest, and immediately afterwards appointed professor, first of philosophy and later of theology. Between 1754 and 1764 he published a series of theological treatises, their main tendency being to modify the rigid scholastic system by an appeal to the Fathers, notably Augustine; from 1759 to 1762 he travelled in Germany, Italy and France, mainly with a view to examining the collections of documents in the various monastic libraries. In 1764 he was elected prince-abbot of St Blasien, and proved himself a model ruler both as abbot and prince. His examination of archives during his travels had awakened in him a taste for historical research, and under his rule St

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Blasien became a notable centre of the methodical study of history; it was here that Marquard Herrgott wrote his *Monumenta domus Austriacae*, of which the first two volumes were edited, for the second edition, by Gerbert, who also published a *Codex epistolaris Rudolphi I., Romani regis* (1772) and *De Rudolpho Suevico comite de Rhinfelden, duce et rege, deque ejus familia* (1785). It was, however, in sacramental theology, liturgiology, and notably ecclesiastical music that Gerbert was mainly interested. In 1774 he published two volumes *De cantu et musica sacra*; in 1777, *Monumenta veteris liturgiae Alemannicae*; and in 1784, in three volumes, *Scriptores ecclesiastici de musica sacra*, a collection of the principal writers on church music from the 3rd century till the invention of printing. The materials for this work he had gathered during his travels, and although it contains many textual errors, its publication has been of great importance for the history of music, by preserving writings which might either have perished or remained unknown. His interest in music led to his acquaintance with the composer Gluck, who became his intimate friend.

As a prince of the Empire Gerbert was devoted to the interests of the house of Austria; as a Benedictine abbot he was opposed to Joseph II.'s church policy. In the Febronian controversy (see FEBRONIANISM) he had early taken a mediating attitude, and it was largely due to his influence that Bishop Hontheim had been induced to retract his extreme views.

In 1768 the abbey of St Blasien, with the library and church, was burnt to the ground, and the splendid new church which rose on the ruins of the old (1783) remained until its destruction by fire in 1874, at once a monument of Gerbert's taste in architecture and of his Habsburg sympathies. It was at his request that it was made the mausoleum of all the Austrian princes buried outside Austria, whose remains were solemnly transferred to its vaults. In connexion with its consecration he published his *Historia Nigrae Silvae, ordinis S. Benedicti coloniae* (3 vols., St Blasien, 1783).

Gerbert, who was beloved and respected by Catholics and Protestants alike, died on the 3rd of May 1703.

See Joseph Bader, *Das ehemalige Kloster St Blasien und seine Gelehrtenakademie* (Freiburg-im-Breisgau, 1874), which contains a chronological list of Gerbert's works.

GERBIL, or GERBILLE, the name of a group of small, elegant, large-eyed, jumping rodents typified by the North African *Gerbillus aegyptiacus* (or *gerbillus*), and forming a special subfamily, *Gerbillinae*, of the rat tribe or *Muridae*. They are found over the desert districts of both Asia and Africa, and are classed in the genera *Gerbillus* (or *Tatera*), *Pachyuromys*, *Meriones*, *Psammomys* and *Rhombomys*, with further divisions into subgenera. They have elongated hind-limbs and long hairy tails; and progress by leaps, in the same manner as jerboas, from which they differ in having five hind-toes. The cheek-teeth have transverse plates of enamel on the crowns; the number of such plates diminishing from three in the first tooth to one or one and a half in the third. The upper incisor teeth are generally marked by grooves. Gerbils are inhabitants of open sandy plains, where they dwell in burrows furnished with numerous exits, and containing large grass-lined chambers. The Indian *G. indicus* produces at least a dozen young at a birth. All are more or less completely nocturnal.

GERENUK, the Somali name of a long-necked aberrant gazelle, commonly known as Waller's gazelle (*Lithocranius walleri*), and ranging from Somaliland to Kilimanjaro. The long neck and limbs, coupled with peculiarities in the structure of the skull, entitle the gerenuk, which is a large species, to represent a genus. The horns of the bucks are heavy, and have a peculiar forward curvature at the tips; the colour of the coat is red-fawn, with a broad brown band down the back. Gerenuk are browsing ruminants, and, in Somaliland, are found in small family-parties, and feed more by browsing on the branches and leaves of trees and shrubs than by grazing. Frequently they raise themselves by standing on their hind-legs with the fore-feet resting against the trunk of the tree on which they are feeding. Their usual pace is an awkward trot, not unlike that of a camel; and they seldom break into a gallop. The Somali form has been separated as *L. sclateri*, but is not more than a local race. (See ANTELOPE.)

GERGOVIA (mod. *Gergovie*), in ancient geography, the chief town of the Arverni, situated on a hill in the Auvergne, about 8 m. from the Puy de Dôme, France. Julius Caesar attacked it in 52 B.C., but was beaten off; some walls and earthworks seem still to survive from this period. Later, when Gaul had been subdued, the place was dismantled and its Gaulish inhabitants resettled 4 m. away in the plain at the new Roman city of Augustonemētum (mod. *Clermont-Ferrand*).

GERHARD, FRIEDRICH WILHELM EDUARD (1795–1867), German archaeologist, was born at Posen on the 29th of November 1795, and was educated at Breslau and Berlin. The reputation he acquired by his *Lectiones Apollonianae* (1816) led soon afterwards to his being appointed professor at the gymnasium of Posen. On resigning that office in 1819, on account of weakness of the eyes, he went in 1822 to Rome, where he remained for fifteen years. He contributed to Platner's *Beschreibung der Stadt Rom*, then under the direction of Bunsen, and was one of the principal originators and during his residence in Italy director of the *Instituto di corrispondenza archeologica*, founded at Rome in 1828. Returning to Germany in 1837 he was appointed archaeologist at the Royal Museum of Berlin, and in 1844 was chosen a member of the Academy of Sciences, and a professor in the university. He died at Berlin on the 12th of May 1867.

Besides a large number of archaeological papers in periodicals, in the *Annali* of the Institute of Rome, and in the Transactions of the Berlin Academy, and several illustrated catalogues of Greek, Roman and other antiquities in the Berlin, Naples and Vatican Museums, Gerhard was the author of the following works: *Antike Bildwerke* (Stuttgart, 1827–1844); *Auserlesene griech. Vasenbilder* (1839–1858); *Etruskisch. Spiegel* (1839–1863); *Hyperboreisch-röm. Studien* (vol. i., 1833; vol. ii., 1852); *Prodromus mythol. Kunstdeutung* (Stuttgart and Tübingen, 1828); and *Griech. Mythologie* (1854–1855). His *Gesammelte akademische Abhandlungen und kleine Schriften* were published posthumously in 2 vols., Berlin, 1867.

GERHARD, JOHANN (1582–1637), Lutheran divine, was born in Quedlinburg on the 17th of October 1582. In his fifteenth year, during a dangerous illness, he came under the personal influence of Johann Arndt, author of *Das wahre Christenthum*, and resolved to study for the church. He entered the university of Wittenberg in 1599, and first studied philosophy. He also attended lectures in theology, but, a relative having persuaded him to change his subject, he studied medicine for two years. In 1603, however, he resumed his theological reading at Jena, and in the following year received a new impulse from J. W. Winckelmann (1551–1626) and Balthasar Mentzer (1565–1627) at Marburg. Having graduated and begun to give lectures at Jena in 1605, he in 1606 accepted the invitation of John Casimir, duke of Coburg, to the superintendency of Heldburg and mastership of the gymnasium; soon afterwards he became general superintendent of the duchy, in which capacity he was engaged in the practical work of ecclesiastical organization until 1616, when he became theological professor at Jena, where the remainder of his life was spent. Here, with Johann Major and Johann Himmel, he formed the "Trias Johannea." Though still comparatively young, Gerhard had already come to be regarded as the greatest living theologian of Protestant Germany; in the numerous "disputations" of the period he was always protagonist, while on all public and domestic questions touching on religion or morals his advice was widely sought. It is recorded that during the course of his lifetime he had received repeated calls to almost every university in Germany (*e.g.* Giessen, Altdorf, Helmstädt, Jena, Wittenberg), as well as to Upsala in Sweden. He died in Jena on the 20th of August 1637.

His writings are numerous, alike in exegetical, polemical, dogmatic and practical theology. To the first category belong the *Commentarius in harmoniam historiae evangelicae de passione Christi* (1617), the *Comment, super priorem D. Petri epistolam* (1641), and also his commentaries on Genesis (1637) and on Deuteronomy (1658). Of a controversial character are the *Confessio Catholica* (1633–1637), an extensive work which seeks to prove the evangelical and catholic character of the doctrine of the Augsburg Confession from the writings of approved Roman Catholic authors; and the *Loci communes theologici* (1610–1622), his principal contribution to science, in which Lutheranism is expounded "nervose, solide,

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et copiose," in fact with a fulness of learning, a force of logic and a minuteness of detail that had never before been approached. The *Meditationes sacrae* (1606), a work expressly devoted to the uses of Christian edification, has been frequently reprinted in Latin and has been translated into most of the European languages, including Greek. The English translation by R. Winterton (1631) has passed through at least nineteen editions. There is also an edition by W. Papillon in English blank verse (1801). His life, *Vita Joh. Gerhardi*, was published by E. E. Fischer in 1723, and by C. J. Böttcher, *Das Leben Dr Johann Gerhards*, in 1858. See also W. Gass, *Geschichte der protestantischen Dogmatik* (1854–1867), and the article in the *Allgemeine deutsche Biographie*.

GERHARDT, CHARLES FRÉDÉRIC (1816–1856), French chemist, was born at Strassburg on the 21st of August 1816. After attending the gymnasium at Strassburg and the polytechnic at Karlsruhe, he was sent to the school of commerce at Leipzig, where he studied chemistry under Otto Erdmann. Returning home in 1834 he entered his father's white lead factory, but soon found that business was not to his liking, and after a sharp disagreement with his father enlisted in a cavalry regiment. In a few months military life became equally distasteful, and he purchased his discharge with the assistance of Liebig, with whom, after a short interval at Dresden, he went to study at Giessen in 1836. But his stay at Giessen was also short, and in 1837 he re-entered the factory. Again, however, he quarrelled with his father, and in 1838 went to Paris with introductions from Liebig. There he attended Jean Baptiste Dumas' lectures and worked with Auguste Cahours (1813–1891) on essential oils, especially cumin, in Michel Eugène Chevreul's laboratory, while he earned a precarious living by teaching and making translations of some of Liebig's writings. In 1841, by the influence of Dumas, he was charged with the duties of the chair of chemistry at the Montpellier faculty of sciences, becoming titular professor in 1844. In 1842 he annoyed his friends in Paris by the matter and manner of a paper on the classification of organic compounds, and in 1845 he and his opinions were the subject of an attack by Liebig, unjustifiable in its personalities but not altogether surprising in view of his wayward disregard of his patron's advice. The two were reconciled in 1850, but his faculty for disagreeing with his friends did not make it easier for him to get another appointment after resigning the chair at Montpellier in 1851, especially as he was unwilling to go into the provinces. He obtained leave of absence from Montpellier in 1848 and from that year till 1855 resided in Paris. During that period he established an "École de chimie pratique" of which he had great hopes; but these were disappointed, and in 1855, after refusing the offer of a chair of chemistry at the new Zürich Polytechnic in 1854, he accepted the professorships of chemistry at the Faculty of Sciences and the École Polytechnique at Strassburg, where he died on the 19th of August in the following year. Although Gerhardt did some noteworthy experimental work—for instance, his preparation of acid anhydrides in 1852—his contributions to chemistry consist not so much in the discovery of new facts as in the introduction of new ideas that vitalized and organized an inert accumulation of old facts. In particular, with his fellow-worker Auguste Laurent (1807–1853), he did much to reform the methods of chemical formulation by insisting on the distinction between atoms, molecules and equivalents; and in his unitary system, directly opposed to the dualistic doctrines of Berzelius, he combined Dumas' substitution theory with the old radicle theory and greatly extended the notion of types of structure. His chief works were *Précis de chimie organique* (1844–1845), and *Traité de chimie organique* (1853–1856).

See *Charles Gerhardt, sa vie, son œuvre, sa correspondance*, by his son, Charles Gerhardt, and E. Grimaux (Paris, 1900).

GERHARDT, PAUL (*c.* 1606–1676), German hymn-writer, was born of a good middle-class family at Gräfenhainichen, a small town on the railway between Halle and Wittenberg, in 1606 or 1607—some authorities, indeed, give the date March 12, 1607, but neither the year nor the day is accurately known. His education appears to have been retarded by the troubles of the period, the Thirty Years' War having begun about the time he reached his twelfth year. After completing his studies for the church he is known to have lived for some years at Berlin as tutor in the family of an advocate named Berthold, whose daughter he subsequently married, on receiving his first ecclesiastical appointment at Mittelwald (a small town in the neighbourhood of Berlin) in 1651. In 1657 he accepted an invitation as "diaconus" to the Nicolaikirche of Berlin; but, in consequence of his uncompromising Lutheranism in refusing to accept the elector Frederick William's "syncretistic" edict of 1664, he was deprived in 1666. Though absolved from submission and restored to office early in the following year, on the petition of the citizens, his conscience did not allow him to retain a post which, as it appeared to him, could only be held on condition of at least a tacit repudiation of the Formula Concordiae, and for upwards of a year he lived in Berlin without fixed employment. In 1668 he was appointed archdeacon of Lübben in the duchy of Saxe-Merseburg, where, after a somewhat sombre ministry of eight years, he died on the 7th of June 1676. Gerhardt is the greatest hymn-writer of Germany, if not indeed of Europe. Many of his best-known hymns were originally published in various church hymn-books, as for example in that for Brandenburg, which appeared in 1658; others first saw the light in Johann Crüger's *Geistliche Kirchenmelodien* (1649) and *Praxis pietatis melica* (1656). The first complete set of them is the *Geistliche Andachten*, published in 1666–1667 by Ebeling, music director in Berlin. No hymn by Gerhardt of a later date than 1667 is known to exist.

The life of Gerhardt has been written by Roth (1829), by Langbecker (1841), by Schultz (1842), by Wildenhahn (1845) and by Bachmann (1863); also by Kraft in Ersch u. Gruber's *Allg. Encycl.* (1855). The best modern edition of the hymns, published by Wackernagel in 1843, has often been reprinted. There is an English translation by Kelly (*Paul Gerhardt's Spiritual Songs*, 1867).

GÉRICAULT, JEAN LOUIS ANDRÉ THÉODORE (1791–1824), French painter, the leader of the French realistic school, was born at Rouen in 1791. In 1808 he entered the studio of Charles Vernet, from which, in 1810, he passed to that of Guérin, whom he drove to despair by his passion for Rubens, and by the unorthodox manner in which he chose to interpreting nature. At the Salon of 1812 Géricault attracted attention by his "Officier de Chasseurs à Cheval" (Louvre), a work in which he personified the cavalry in its hour of triumph, and turned to account the solid training received from Guérin in rendering a picturesque point of view which was in itself a protest against the cherished convictions of the pseudo-classical school. Two years later (1814) he re-exhibited this work accompanied with the reverse picture "Cuirassier blessé" (Louvre), and in both subjects called attention to the interest of contemporary aspects of life, treated neglected types of living form, and exhibited that mastery of and delight in the horse which was a feature of his character. Disconcerted by the tempest of contradictory opinion which arose over these two pictures, Géricault gave way to his enthusiasm for horses and soldiers, and enrolled himself in the *mousquetaires*. During the Hundred Days he followed the king to Belhune, but, on his regiment being disbanded, eagerly returned to his profession, left France for Italy in 1816, and at Rome nobly illustrated his favourite animal by his great painting "Course des Chevaux Libres." Returning to Paris, Géricault exhibited at the Salon of 1819 the "Radeau de la Méduse" (Louvre), a subject which not only enabled him to prove his zealous and scientific study of the human form, but contained those elements of the heroic and pathetic, as existing in situations of modern life, to which he had appealed in his earliest productions. Easily depressed or elated, Géricault took to heart the hostility which this work excited, and passed nearly two years in London, where the "Radeau" was exhibited with success, and where he executed many series of admirable lithographs now rare. At the close of 1822 he was again in Paris, and produced a great quantity of projects for vast compositions, models in wax, and a horse *écorché*, as preliminary to the production of an equestrian statue. His health was now completely undermined by various kinds of excess, and on the 26th of January 1824 he died, at the age of thirty-three.

Géricault's biography, accompanied by a *catalogue raisonné* of his works, was published by M. C. Clément in 1868.

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GERIZIM, a mountain in the hill-country of Samaria, 2849 ft. above the sea-level, and enclosing, with its companion Ebal, the valley in which lies the town of Nâblus (Shechem). It is the holy place of the community of the Samaritans, who hold that it was the scene of the sacrifice of Isaac—a tradition accepted by Dean Stanley but no other western writers of importance. Here, on the formal entrance of the Israelites into the possession of the Promised Land, were pronounced the blessings connected with a faithful observance of the law (Josh. viii. 33, 34; cf. Deut. xi. 29, 30, xxvii. 12-26), the six tribes, Simeon, Levi, Judah, Issachar, Joseph and Benjamin, standing here for the purpose while the remaining tribes stood on Ebal to accept the curses attached to specific violations thereof. Gerizim was probably chosen as the mount of blessing as being on the right hand, the fortunate side, of a spectator facing east. The counter-suggestion of Eusebius and Jerome that the Ebal and Gerizim associated with this solemnity were not the Shechem mountains at all, but two small hills near Jericho, is no longer considered important. From this mountain Jotham spoke his parable to the elders of Shechem (Judg. ix. 7). Manasseh, the son of the Jewish high-priest in the days of Nehemiah, married the daughter of Sanballat and, about 432 B.C., erected on this mountain a temple for the Samaritans; it was destroyed by Hyrcanus about 300 years afterwards. Its site is a small level plateau a little under the summit of the mountain. Close to this is the place where the Passover is still annually celebrated in exact accordance with the rites prescribed in the Pentateuch. On the summit of the mountain, which commands a view embracing the greater part of Palestine, are a small Moslem shrine and the ruins of a castle probably dating from Justinian's time. There was an octagonal Byzantine church here, but the foundations alone remain. Josephus describes it as the highest of the mountains of Samaria, but Ebal and Tell Azur are both higher. (R. A. S. M.)

GERLACHE, ÉTIENNE CONSTANTIN, Baron de (1785–1871), Belgian politician and historian, was born at Biourge, Luxemburg, on the 24th of December 1785. He studied law in Paris and practised there for some time, but settled at Liége after the establishment of the kingdom of the Netherlands. As member of the states-general he was an energetic member of the opposition, and, though he repudiated an ultramontane policy, he supported the alliance of the extreme Catholics with the Liberal party, which paved the way for the revolution of 1830. On the outbreak of disturbance in August 1830 he still, however, thought the Orange-Nassau dynasty and the union with the Dutch states essential; but his views changed, and, after holding various offices in the provisional government, he became president of congress, and brought forward the motion inviting Leopold of Saxe-Coburg to become king of the Belgians. In 1832 he was president of the chamber of representatives, and for thirty-five years he presided over the court of appeal. He presided over the Catholic congresses held at Malines between 1863 and 1867. That his early Liberal views underwent some modification is plain from the Conservative principles enunciated in his *Essai sur le mouvement des partis en Belgique* (Brussels, 1852). As an historian his work was strongly coloured by his anti-Dutch prejudices and his Catholic predilections. His *Histoire des Pays-Bas depuis 1814 jusqu'en 1830* (Brussels, 2 vols., 1839), which reached a fourth edition in 1875, was a piece of special pleading against the Dutch domination. The most important of his other works were his *Histoire de Liége* (Brussels, 1843) and his *Études sur Sulluste et sur quelques-uns des principaux historiens de l'antiquité* (Brussels, 1847).

A complete edition of his works (6 vols., Brussels, 1874–1875) contains a biography by M. Thonissen.

GERLE, CHRISTOPHE ANTOINE (1736–*c.* 1801), French revolutionist and mystic, was born at Riom in Auvergne. Entering the Carthusian order early in life, he became prior of Laval-Dieu in Perche, and afterwards of Pont-Sainte-Marie at Moulins. Elected deputy to the states-general in 1789, Gerle became very popular, and though he had no seat in the assembly until after the Tennis Court oath, being only deputy *suppléant*, he is represented in David's classic painting as taking part in it. In 1792 he was chosen elector of Paris. In the revolutionary turmoil Gerle developed a strong vein of mysticism, mingled with ideas of reform, and in June 1790 the prophetic powers of Suzanne Labrousse (1747–1821), a visionary who had predicted the Revolution ten years before, were brought by him to the notice of the Convention. In Paris, where he lived first with a spiritualistic doctor and afterwards, like Robespierre, at the house of a cabinetmaker, his mystical tendencies were strengthened. The insane fancies of Catherine Théot, a convent servant turned prophetess, who proclaimed herself the Virgin, the "Mother of God" and the "new Eve," were eminently attractive to Gerle; in the person of Robespierre he recognized the Messiah, and at the meetings of the Théotists he officiated with the aged prophetess as co-president. But the activities of Catherine and her adepts were short-lived. The Théotists' cult of Robespierre was a weapon in the hands of his opponents; and shortly after the festival of the Supreme Being, Vadier made a report to the Convention calling for the prosecution of Catherine, Gerle and others as fanatics and conspirators. They were arrested, thrown into prison and, in the confusion of Robespierre's fall, apparently forgotten. Catherine died in prison, but Gerle, released by the Directory, became one of the editors of the *Messager du soir*, and was afterwards in the office of Pierre Bénézech (1775–1802), minister of the interior. Having renounced his monastic vows in Paris, he is thought to have married, towards the close of his life, Christine Raffet, aunt of the artist Denis Raffet. The date of his death is uncertain.

GERMAN BAPTIST BRETHREN, or German Brethren, a sect of American Baptists which originated in Germany, and whose members are popularly known in the United States as "Dunkers," "Dunkards" or "Tunkers," corruptions of the German verb *tunken*, "to dip," in recognition of the sect's continued adherence to the practice of trine immersion. The sect was the outcome of one of the many Pietistic movements of the 17th century, and was founded in 1708 by Andrew Mack of Swartzenau, Germany, and seven of his followers, upon the general issue that both the Lutheran and Reformed churches were taking liberties with the literal teachings of the Scriptures. The new sect was scarcely organized in Germany when its members were compelled by persecution to take refuge in Holland, whence they emigrated to Pennsylvania, in small companies, between 1719 and 1729. The first congregation in America was organized on Christmas Day 1723 by Peter Becker at Germantown, Pennsylvania, and here in 1743 Christopher Sauer, one of the sect's first pastors, and a printer by trade, printed the first Bible (a few copies of which are still in existence) published in a European language in America. From Pennsylvania the sect spread chiefly westward, and, after various vicissitudes, caused by defections and divisions due to doctrinal differences, in 1908 were most numerous in Pennsylvania, Maryland, Virginia, Ohio, Indiana, Illinois, Iowa, Missouri, Nebraska, Kansas and North Dakota.

There is much uncertainty about the early theological history of the sect, but it is probable that Mack and his followers were influenced by both the Greek Catholics and the Waldensians. P. H. Bashor in his historical sketch, read before the World's Fair Congress of the Brethren Church (1894), says: "From the history of extended labour by Greek missionaries, from the active propaganda of doctrine by scattered Waldensian refugees, through parts of Germany and Bavaria, from the credence that may generally be given to local tradition, and from the strong similarity between the three churches in general features of circumstantial service, the conclusion, without additional evidence, is both reasonable and natural that the founders of the new church received their teaching, their faith and much of their church idea from intimate acquaintance with the established usages of both societies, and from their amplification and enforcement by missionaries and pastors. . . . In doctrine the church has been from the first contentious for believers' baptism, holding that nowhere in the New Testament can be found any authority even by inference, precept or example for the baptism of infants. On questions of fundamental doctrine they held to the belief

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in one self-existing supreme ruler of the Universe—the Divine Godhead—the Father, the Son and the Holy Spirit—the tri-personality." Hence their practice of triple immersion, which provides that the candidate shall kneel in the water and be immersed, face first, three times—in the name of the Father, the Son and the Holy Spirit. (From this practice the sect received the less commonly used nickname "Dompelaers," meaning "tumblers.") They accept implicitly and literally the New Testament as the infallible guide in spiritual matters, holding it to be the inspired word of God, revealed through Jesus Christ and, by inspiration, through the Apostles. They also believe in the inspiration of the Old Testament. In their celebration of the communion service they aim exactly to imitate the forms observed by Christ. It is celebrated in the evening, and is accompanied by the ancient love feast (partaken by all communicants seated at a common table), by the ceremony of the washing of feet and by the salutation of the holy kiss, the three last-named ceremonies being observed by the sexes separately. They pray over their sick and, when so requested, anoint them with oil. They are rigid non-resistants, and will not bear arms or study the art of war; they refuse to take oaths, and discountenance going to law over issues that can possibly be settled out of the courts. The taking of interest was at first forbidden, but that prohibition is not now insisted upon. They "testify" against the use of intoxicating liquor and tobacco, and advocate simplicity in dress. In its earlier history the sect opposed voting or taking any active part in political affairs, but these restrictions have quite generally disappeared. Similarly the earlier prejudice against higher education, and the maintenance of institutions for that purpose, has given place to greater liberality along those lines. In 1782 the sect forbade slaveholding by its members.

The church officers (generally unpaid) comprise bishops (or ministers), elders, teachers, deacons (or visiting brethren) and deaconesses—chiefly aged women who are permitted at times to take leading parts in church services. The bishops are chosen from the teachers; they are itinerant, conduct marriage and funeral services, and are present at communions, at ordinations, when deacons are chosen or elected, and at trials for the excommunication of members. The elders are the first or oldest teachers of congregations, for which there is no regular bishop. They have charge of the meetings of such congregations, and participate in excommunication proceedings, besides which they preach, exhort, baptize, and may, when needed, take the offices of the deacons. The teachers, who are chosen by vote, may also exhort or preach, when their services are needed for such purposes, and may, at the request of a bishop, perform marriage or baptismal ceremonies. The deacons have general oversight of the material affairs of the congregation, and are especially charged with the care of poor widows and their children. In the discharge of these duties they are expected to visit each family in the congregation at least once a year. The government of the church is chiefly according to the congregational principle, and the women have an equal voice with the men; but annual meetings, attended by the bishops, teachers and other delegates from the several congregations are held, and at these sessions the larger questions involving church polity are considered and decided by a committee of five bishops.

An early secession from the general body of Dunkers was that of the Seventh Day Dunkers, whose distinctive principle was that the seventh day was the true Sabbath. Their founder was Johann Conrad Beissel (1690–1768), a native of Eberbach and one of the first emigrants, who, after living as a hermit for several years on Mill Creek, Lancaster county, Pennsylvania, founded the sect (1725), then again lived as a hermit in a cave (formerly occupied by another hermit, one Elimelech) on the Cocalico Creek in Pennsylvania, and in 1732–1735 established a semi-monastic community (the "Order of the Solitary") with a convent (the "Sister House") and a monastery (the "Brother House") at Ephrata, in what is now Lancaster county, about 55 m. W. by N. from Philadelphia. Among the industries of the men were printing (in both English and German), bookbinding, tanning, quarrying, and the operation of a saw mill, a bark mill, and perhaps a pottery; the women did embroidery, quilting, and engrossing in a beautiful but peculiar hand, known as Fracturschrift.[1] The monastic feature was gradually abandoned, and in 1814 the Society was incorporated as the Seventh Day Baptists, its affairs being placed in the hands of a board of trustees. More important in the history of the modern church was the secession, in the decade between 1880 and 1890, of the Old Order Brethren, who opposed Sunday Schools and the missionary work of the Brethren, in Asia Minor and India, and in several European countries; and also in 1882 of the radicals, or Progressives, who objected to a distinctive dress and to the absolute supremacy of the yearly conferences. Higher education was long forbidden and is consistently opposed by the Old Order. The same element in the Brethren opposed a census, but according to Howard Miller's census of 1880 (*Record of the Faithful*) the number of Dunkers was 59,749 in that year; by the United States census of 1890 it was then 73,795; the figures for 1904 are given by Henry King Carroll in his "Statistics of the Churches" in the *Christian Advocate* (Jan. 5, 1905): Conservatives, or German Baptist Brethren, 95,000; Old Order, 4000; Progressives or Brethren, 15,000; Seventh Day, 194; total, 114,194. In 1909 the German Baptist Brethren had an estimated membership of approximately 100,000, and the Brethren of 18,000. The main body, or Conservatives, support schools at Huntingdon, Pennsylvania; Mt. Morris, Illinois; Lordsburg, California; McPherson, Kansas; Bridgewater, Virginia; Canton, Ohio; Chicago, Illinois; North Manchester, Indiana; Plattsburg, Missouri; Elizabethtown, Pennsylvania; Union Bridge, Maryland; and Fruitdale, Alabama. They have a publishing house at Elgin, Illinois, and maintain missions in Denmark, Sweden, France, Italy, India and China. The Progressives have a college, a theological seminary and a publishing house at Ashland, Ohio; and they carry on missionary work in Canada, South America and Persia.

AUTHORITIES.—Lamech and Agrippa, *Chronicon Ephratense*, in German (Ephrata, Penn., 1786) and in English (Lancaster, 1889); G. N. Falkenstein, "The German Baptist Brethren, or Dunkers," part 8 of "Pennsylvania: The German Influence in its Settlement and Development," in vol. x. of the *Pennsylvania German Society, Proceedings and Addresses* (Lancaster, Penn., 1900); Julius Friedrich Sachse, *The German Sectarians of Pennsylvania, 1742–1800: A Critical and Legendary History of the Ephrata Cloister and the Dunkers* (Philadelphia, 1900); and John Lewis Gillin, *The Dunkers: A Sociological Interpretation* (New York, 1906), a doctor's dissertation, with full bibliography.

GERMAN CATHOLICS (*Deutschkatholiken*), the name assumed in Germany towards the close of 1844 by certain dissentients from the Church of Rome. The most prominent leader of the German Catholic movement was Johann Ronge, a priest who in the *Sächsische Vaterlandsblätter* for the 15th of October 1844 made a vigorous attack upon Wilhelm Arnoldi, bishop of Trier since 1842, for having ordered (for the first time since 1810) the exposition of the "holy coat of Trier," alleged to be the seamless robe of Christ, an event which drew countless pilgrims to the cathedral. Ronge, who had formerly been chaplain at Grottkau, was then a schoolmaster at Laurahütte near the Polish border. The article made a great sensation, and led to Ronge's excommunication by the chapter of Breslau in December 1844. The ex-priest received a large amount of public sympathy, and a dissenting congregation was almost immediately formed at Breslau with a very simple creed, in which the chief articles were belief in God the Father, creator and ruler of the universe;

[1] Beissel (known in the community as "Friedsam") was their leader until his death; he published several collections of hymns. The stone over his grave bears the inscription: "Here rests an outstanding lover of the love of God, 'Friedsam,' a Solitary Brother, afterwards a leader of the Solitary and the Congregation of Grace in and around Ephrata . . . Fell asleep July 6, 1768, in the 52nd year of his spiritual life, but the 72nd year and fourth month of his natural life." The borough of Ephrata was separated from the township in 1891. Pop. (1900) of the borough, 2451; of the township, 2390. The "Brother House" and the "Sister House" are still standing (though in a dilapidated condition). In 1777, after the battle of Brandywine, many wounded American soldiers were nursed here by the Sisters, and about 200 are buried here.

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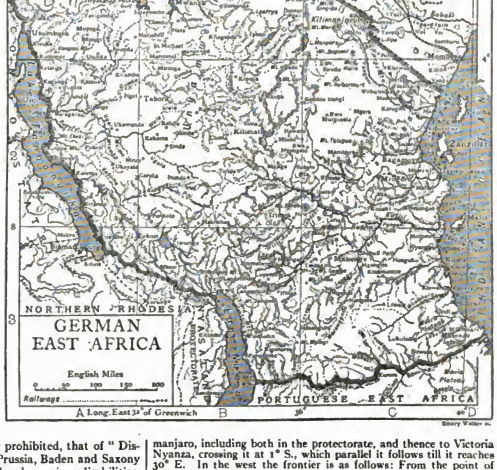
in Jesus Christ the Saviour, who delivers from the bondage of sin by his life, doctrine and death; in the operation of the Holy Ghost; in a holy, universal, Christian church; in forgiveness of sins and the life everlasting. The Bible was made the sole rule, and all external authority was barred. Within a few weeks similar communities were formed at Leipzig, Dresden, Berlin, Offenbach, Worms, Wiesbaden and elsewhere; and at a "council" convened at Leipzig at Easter 1845, twenty-seven congregations were represented by delegates, of whom only two or at most three were in clerical orders.

Even before the beginning of the agitation led by Ronge, another movement fundamentally distinct, though in some respects similar, had been originated at Schneidemühl, Posen, under the guidance of Johann Czerski (1813–1893), also a priest, who had come into collision with the church authorities on the then much discussed question of mixed marriages, and also on that of the celibacy of the clergy. The result had been his suspension from office in March 1844; his public withdrawal, along with twenty-four adherents, from the Roman communion in August; his excommunication; and the formation, in October, of a "Christian Catholic" congregation which, while rejecting clerical celibacy, the use of Latin in public worship, and the doctrines of purgatory and transubstantiation, retained the Nicene theology and the doctrine of the seven sacraments. Czerski had been at some of the sittings of the "German Catholic" council of Leipzig; but when a formula somewhat similar to that of Breslau had been adopted, he refused his signature because the divinity of Christ had been ignored, and he and his congregation continued to retain by preference the name of "Christian Catholics," which they had originally assumed. Of the German Catholic congregations which had been represented at Leipzig some manifested a preference for the fuller and more positive creed of Schneidemühl, but a great majority continued to accept the comparatively rationalistic position of the Breslau school. The number of these rapidly increased, and the congregations scattered over Germany numbered nearly 200. External and internal checks, however, soon limited this advance. In Austria, and ultimately also in Bavaria, the use of the name German Catholics was officially prohibited, that of "Dissidents" being substituted, while in Prussia, Baden and Saxony the adherents of the new creed were laid under various disabilities, being suspected both of undermining religion and of encouraging the revolutionary tendencies of the age. Ronge himself was a foremost figure in the troubles of 1848; after the dissolution of the Frankfort parliament he lived for some time in London, returning in 1861 to Germany. He died at Vienna on the 26th of October 1887. In 1850 some of the German Catholics entered into corporate union with the "Free Congregations," an association of free-thinking communities that had since 1844 been gradually withdrawing from the orthodox Protestant Church, when the united body took the title of "The Religious Society of Free Congregations." Before that time many of the congregations which were formed in 1844 and the years immediately following had been dissolved, including that of Schneidemühl itself, which ceased to exist in 1857. There are now only about 2000 strict German Catholics, all in Saxony. The movement has been superseded by the Old Catholic (*q.v.*) organization.

See G. G. Gervinus, *Die Mission des Deutschkatholicismus* (1846); F. Kampe, *Das Wesen des Deutschkatholicismus* (1860); Findel, *Der Deutschkatholicismus in Sachsen* (1895); Carl Mirbt, in Herzog-Hauck's *Realencyk. für prot. Theol.* iv. 583.

GERMAN EAST AFRICA, a country occupying the east-central portion of the African continent. The colony extends at its greatest length north to south from 1° to 11° S., and west to east from 30° to 40° E. It is bounded E. by the Indian Ocean (the coast-line extending from 4° 20′ to 10° 40′ S.), N.E. and N. by British East Africa and Uganda, W. by Belgian Congo, S.W. by British Central Africa and S. by Portuguese East Africa.

Area and Boundaries.—On the north the boundary line runs N.W. from the mouth of the Umba river to Lake Jipe and Mount Kili-



manjaro, including both in the protectorate, and thence to Victoria Nyanza, crossing it at 1° S., which parallel it follows till it reaches 30° E. In the west the frontier is as follows: From the point of intersection of 1° S. and 30° E., a line running S. and S.W. to the north-west end of Lake Kivu, thence across that lake near its western shore, and along the river Rusizi, which issues from it, to the spot where the Rusizi enters the north end of Lake Tanganyika; along the middle line of Tanganyika to near its southern end, when it is deflected eastward to the point where the river Kalambo enters the lake (thus leaving the southern end of Tanganyika to Great Britain). From this point the frontier runs S.E. across the plateau between Lakes Tanganyika and Nyasa, in its southern section following the course of the river Songwe. Thence it goes down the middle of Nyasa as far as 11° 30′ S. The southern frontier goes direct from the last-named point eastward to the Rovuma river, which separates German and Portuguese territory. A little before the Indian Ocean is reached the frontier is deflected south so as to leave the mouth of the Rovuma in German East Africa. These boundaries include an area of about 364,000 sq. m. (nearly double the size of Germany), with a population estimated in 1910 at 8,000,000. Of

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these above 10,000 were Arabs, Indians, Syrians and Goanese, and 3000 Europeans (over 2000 being Germans). The island of Mafia (see below) is included in the protectorate.

Physical Features.—The coast of German East Africa (often spoken of as the Swahili coast, after the inhabitants of the seaboard) is chiefly composed of coral, is little indented, and is generally low, partly sandy, partly rich alluvial soil covered with dense bush or mangroves. Where the Arabs have established settlements the coco-palm and mango tree introduced by them give variety to the vegetation. The coast plain is from 10 to 30 m. wide and 620 m. long; it is bordered on the west by the precipitous eastern side of the interior plateau of German Africa. This plateau, considerably tilted from its horizontal position, attains its highest elevation north of Lake Nyasa (see LIVINGSTONE MOUNTAINS), where several peaks rise over 7000 ft., one to 9600, while its mean altitude is about 3000 to 4000 ft. From this region the country slopes towards the north-west, and is not distinguished by any considerable mountain ranges. A deep narrow gorge, the so-called "eastern rift-valley," traverses the middle of the plateau in a meridional direction. In the northern part of the country it spreads into several side valleys, from one of which rises the extinct volcano Kilimanjaro (*q.v.*), the highest mountain in Africa (19,321 ft.). Its glaciers send down a thousand rills which combine to form the Pangani river. About 40 m. west of Kilimanjaro is Mount Meru (14,958 ft.), another volcanic peak, with a double crater. The greater steepness of its sides makes Meru in some aspects a more striking object than its taller neighbour. South-east of Mount Kilimanjaro are the Pare Mountains and Usambara highlands, separated from the coast by a comparatively narrow strip of plain. To the south of the Usambara hills, and on the eastern edge of the plateau, are the mountainous regions of Nguru (otherwise Unguru), Useguha and Usagara. As already indicated, the southern half of Victoria Nyanza and the eastern shores, in whole or in part, of Lakes Kivu, Tanganyika and Nyasa, are in German territory. (The lakes are separately described.) Several smaller lakes occur in parts of the eastern rift-valley. Lake Rukwa (*q.v.*) north-east of Nyasa is presumably only the remnant of a much larger lake. Its extent varies with the rainfall of each year. North-west of Kilimanjaro is a sheet of water known as the Natron Lake from the mineral alkali it contains. In the northern part of the colony Victoria Nyanza is the dominant physical feature. The western frontier coincides with part of the eastern wall of another depression, the Central African or Albertine rift-valley, in which lie Tanganyika, Kivu and other lakes. Along the north-west frontier north of Kivu are volcanic peaks (see MFUMBIRO).

The country is well watered, but with the exception of the Rufiji the rivers, save for a few miles from their mouths, are unnavigable. The largest streams are the Rovuma, and Rufiji (*q.v.*), both rising in the central plateau and flowing to the Indian Ocean. Next in importance is the Pangani river, which, as stated above, has its head springs on the slopes of Kilimanjaro. Flowing in a south-easterly direction it reaches the sea after a course of some 250 m. The Wami and Kingani, smaller streams, have their origin in the mountainous region fringing the central plateau, and reach the ocean opposite the island of Zanzibar. Of inland river systems there are four—one draining to Victoria Nyanza, another to Lake Tanganyika, a third to Nyasa and a fourth to Rukwa. Into Victoria Nyanza are emptied, on the east, the waters of the Mori and many smaller streams; on the west, the Kagera (*q.v.*), besides smaller rivers. Into Tanganyika flows the Malagarasi, a considerable river with many affluents, draining the west-central part of the plateau. The Kalambo river, a comparatively small stream near the southern end of Tanganyika, flows in a south-westerly direction. Not far from its mouth there is a magnificent fall, a large volume of water falling 600 ft. sheer over a rocky ledge of horse-shoe shape. Of the streams entering Nyasa the Songwe has been mentioned. The Ruhuhu, which enters Nyasa in 10° 30′ S., and its tributaries drain a considerable area west of Lake Nyasa. The chief feeders of Lake Rukwa are the Saisi and the Rupa-Songwe.

Mafia Island lies off the coast immediately north of 8° N. It has an area of 200 sq. m. The island is low and fertile, and extensively planted with coco-nut palms. It is continued westwards by an extensive reef, on which stands the chief village, Chobe, the residence of a few Arabs and Banyan traders. Chobe stands on a shallow creek almost inaccessible to shipping.

Geology.—The narrow coast-plateau of British East Africa broadens out to the south of Bagamoyo to a width of over 100 m. This is covered to a considerable extent by rocks of recent and late Tertiary ages. Older Tertiary rocks form the bluffs of Lindi. Cretaceous marls and limestones appear in places, extending as a narrow belt to the edge of the upper plateau, and are extensively developed on the Makonde plateau. They are underlain by Jurassic rocks, from beneath which sandstones and shales yielding *Glossopteris browniana* var. *indica*, and therefore of Lower Karroo age, appear in the south but are overlapped on the north by Jurassic strata. The central plateau consists almost entirely of metamorphic rocks with extensive tracts of granite in Unyamwezi. In the vicinity of Lakes Nyasa and Tanganyika, sandstones and shales of Lower Karroo age and yielding seams of coal are considered to owe their position and preservation to being let down by rift faults into hollows of the crystalline rocks. In Karagwe certain quartzites, slates and schistose sandstones resemble the ancient gold-bearing rocks of South Africa.

The volcanic plateau of British East Africa extends over the boundary in the region of Kilimanjaro. Of the sister peaks, Kibo and Mawenzi, the latter is far the oldest and has been greatly denuded, while Kibo retains its crateriform shape intact. The rift-valley faults continue down the depression, marked by numerous volcanoes, in the region of the Natron Lake and Lake Manyara; while the steep walls of the deep depression of Tanganyika and Nyasa represent the western rift system at its maximum development.

Fossil remains of saurians of gigantic size have been found; one thigh bone measures 6 ft. 10 in., the same bone in the *Diplodocus Carnegii* measuring only 4 ft. 11 in.

Climate.—The warm currents setting landwards from the Indian Ocean bring to the coast both moisture and heat, so that the Swahili coast has a higher temperature and heavier rainfall than the Atlantic seaboard under the same parallels of latitude. The mean temperature on the west and east coasts of Africa is 72° and 80° Fahr. respectively, the average rainfall in Angola 36 in., in Dar-es-Salaam 60 in. On the Swahili coast the south-east monsoon begins in April and the north-east monsoon in November. In the interior April brings south-east winds, which continue until about the beginning of October. During the rest of the year changing winds prevail. These winds are charged with moisture, which they part with on ascending the precipitous side of the plateau. Rain comes with the south-east monsoon, and on the northern part of the coast the rainy season is divided into two parts—the great and the little Masika: the former falls in the months of September, October, November; the latter in February and March. In the interior the climate has a more continental character, and is subject to considerable changes of temperature; the rainy season sets in a little earlier than in the farther parts of the region, and is well marked, the rain beginning in November and ending in April; the rest of the year is dry. On the highest parts of the plateau the climate is almost European, the nights being sometimes cold. Kilimanjaro has a climate peculiar of its own; the west and south sides of the mountain receive the greatest rainfall, while the east and north sides are dry nearly all the year. Malarial diseases are rather frequent, more so on the coast than farther inland. Cases of blackwater fever are rare. Smallpox is endemic. Small-pox is frequent on the coast, but is diminishing before vaccination; other epidemic diseases are extremely rare.

Flora and Fauna.—The character of the vegetation varies with and depends on moisture, temperature and soil. On the low littoral zone the coast produced a rich tropical bush, in which the mangrove is very prominent. Coco-palms and mango trees have been planted in great numbers, and also many varieties of bananas. The bush in groups or in copses on meadow land produces, of course tall trees. The river banks are lined with belts of dense forest, in which useful timber occurs. The *Hyphaene* palm is frequent, as well as various kinds of gum-producing mimosas. The slopes of the plateau which face the rain-bringing monsoon are in some places covered with primeval forest, in which timber is plentiful. The silk-cotton tree (*Bombax ceiba*), miomba, tamarisk, copal tree (*Hymenaea courbaril*) are frequent, besides sycamores, banyan trees (*Ficus indica*) and the deleb palm (*Hyphaene thebaica*). It is here we find the *Landolphia florida*, which yields the best rubber. The plateau is partly grass land without bush and forest, partly steppe covered with mimosa bush, which sometimes is almost impenetrable. Mount Kilimanjaro and Mount Meru exhibit on a vertical scale the various forms of vegetation which characterize East Africa (see KILIMANJARO).

East Africa is rich in all kinds of antelope, and the elephant, rhinoceros and hippopotamus are still plentiful in parts. Characteristic are the giraffe, the chimpanzee and the ostrich. Buffaloes and zebras occur in two or three varieties. Lions and leopards are found throughout the country. Crocodiles are numerous in all the larger rivers. Snakes, many venomous, abound. Of birds there are comparatively few on the steppe, but by rivers, lakes and swamps they are found in thousands. Locusts occasion much damage, and ants of various kinds are often a plague. The tsetse fly (*Glossina morsitans*) infests several districts; the sand-flea has been imported from the west coast. Land and water turtles are numerous.

Inhabitants.—On the coast and at the chief settlements inland are Arab and Indian immigrants, who are merchants and agriculturists. The Swahili (*q.v.*) are a mixed Bantu and Semitic race inhabiting the seaboard. The inhabitants of the interior may be divided into two classes, those namely of Bantu and those of Hamitic stock. What may be called the indigenous population consists of the older Bantu races. These tribes have been subject to the intrusion from the south of more recent Bantu folk, such as the Yao, belonging to the Ama-Zulu branch of the race, while from the north there has been an immigration of Hamito-Negroid peoples. Of these the Masai and Wakuafi are found in the region between Victoria Nyanza and Kilimanjaro. The Masai (*q.v.*) and allied tribes are nomads and cattle raisers. They are warlike,

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and live in square mud-plastered houses called *tembe* which can be easily fortified and defended. The Bantu tribes are in general peaceful agriculturists, though the Bantus of recent immigration retain the warlike instincts of the Zulus. The most important group of the Bantus is the Wanyamwezi (see UNYAMWEZI), divided into many tribes. They are spread over the central plains, and have for neighbours on the south-east, between Nyasa and the Rufiji, the warlike Wahehe. The Wangoni (Angoni), a branch of the Ama-Zulu, are widely spread over the central and Nyasa regions. Other well-known tribes are the Wasambara, who have given their name to the highlands between Kilimanjaro and the coast, and the Warundi, inhabiting the district between Tanganyika and the Kagera. In Karagwe, a region adjoining the south-west shores of Victoria Nyanza, the Bahima are the ruling caste. Formerly Karagwe under its Bahima kings was a powerful state. Many different dialects are spoken by the Bantu tribes, Swahili being the most widely known (see BANTU LANGUAGES). Their religion is the worship of spirits, ancestral and otherwise, accompanied by a vague and undefined belief in a Supreme Being, generally regarded as indifferent to the doings of the people.

The task of civilizing the natives is undertaken in various ways by the numerous Protestant and Roman Catholic missions established in the colony, and by the government. The slave trade has been abolished, and though domestic slavery is allowed, all children of slaves born after the 31st of December 1905 are free. For certain public works the Germans enforce a system of compulsory labour. Efforts are made by instruction in government and mission schools to spread a knowledge of the German language among the natives, in order to fit them for subordinate posts in administrative offices, such as the customs. Native chiefs in the interior are permitted to help in the administration of justice. The Mission du Sacré Cœur in Bagamoyo, the oldest mission in the colony, has trained many young negroes to be useful mechanics. The number of native Christians is small. The Moslems have vigorous and successful missions.

Chief Towns.—The seaports of the colony are Tanga (pop. about 6000), Bagamoyo 5000 (with surrounding district some 18,000), Dar-es-Salaam 24,000, Kilwa 5000, (these have separate notices), Pangani, Sadani, Lindi and Mikindani. Pangani (pop. about 3500) is situated at the mouth of the river of the same name; it serves a district rich in tropical products, and does a thriving trade with Zanzibar and Pemba. Sadani is a smaller port midway between Pangani and Bagamoyo. Lindi (10° 0′ S., 39° 40′ E.) is 80 m. north of Cape Delgado. Lindi (Swahili for "The Deep Bay") bay runs inland 6 m. and is 3 m. across, affording deep anchorage. Hills to the west of the bay rise over 1000 ft. The town (pop. about 4000) is picturesquely situated on the north side of the bay. The Arab fortress, constructed in 1800, has been built by the Germans, who have retained the fine sculptured gateway. Formerly a rendezvous for slave caravans Lindi now has a more legitimate trade in white ivory, Mikindani is the most southern port in the colony. Owing to the prevalence of malaria there, few Europeans live at the town, and trade is almost entirely in the hands of Banyans.

Inland the principal settlements are Korogwe, Mrogoro, Kilossa, Mpapua and Tabora. Korogwe is in the Usambara hills, on the north bank of the Pangani river, and is reached by railway from Tanga. Mrogoro is some 140 m. due west of Dar-es-Salaam, and is the first important station on the road to Tanganyika. Kilossa and Mpapua are farther inland on the same caravan route. Tabora (pop. about 3,000), the chief town of the Wanyamwezi tribes, occupies an important position on the central plateau, being the meeting-place of the trade routes from Tanganyika, Victoria Nyanza and the coast. In the railway development of the colony Tabora is destined to become the central junction of lines going north, south, east and west.

On Victoria Nyanza there are various settlements. Mwanza, on the southern shore, is the lake terminus of the route from Bagamoyo; Bukoba is on the western shore, and Nassigi on the eastern shore; both situated a little south of the British frontier. On the German coast of Tanganyika are Ujiji (*q.v.*), pop. about 14,000, occupying a central position; Usumbura, at the northern end of the lake where is a fort built by the Germans; and Bismarckburg, near the southern end. On the shores of the lake between Ujiji and Bismarckburg are four stations of the Algerian "White Fathers," all possessing churches, schools and other stone buildings. Langenburg is a settlement on the north-east side of Lake Nyasa. The government station, called New Langenburg, occupies a higher and more healthy site north-west of the lake. Wiedhafen is on the east side of Nyasa at the mouth of the Ruhuhu, and is the terminus of the caravan route from Kilwa.

Productions.—The chief wealth of the country is derived from agriculture and the produce of the forests. From the forests are obtained rubber, copal, bark, various kinds of fibre, and timber (teak, mahogany, &c.). The cultivated products include coffee, the coco-nut palm, tobacco, sugar-cane, cotton, vanilla, sorghum, earth-nuts, sesame, maize, rice, beans, peas, bananas (in large quantities), yams, manioc and hemp. Animal products are ivory, hides, tortoise-shell and pearls. On the plateaus large numbers of cattle, goats and sheep are reared. The natives have many small smithies. Gold, coal, iron, graphite, copper and salt have been found. Garnets are plentiful in the Lindi district, and agates, topaz, moonsne and other precious stones are found in the colony. The chief gold and iron deposits are near Victoria Nyanza. In the Mwanza district are conglomerate rocks of great extent. Mining began in 1905. Mica is mined near Mrogoro. The chief exports are sisal fibre, rubber, hides and skins, wax, ivory, copra, coffee, ground-nuts and cotton. The imports are chiefly articles of food, textiles, and metals and hardware. More than half the entire trade, both export and import, is with Zanzibar. Germany takes about 30% of the trade. In the ten years 1896–1905 the value of the external trade increased from about £600,000 to over £1,100,000. In 1907 the imports were valued at £1,190,000, the exports at £625,000.

Numerous companies are engaged in developing the resources of the country by trading, planting and mining. The most important is the *Deutsch-Ostafrikanische Gesellschaft*, founded in 1885, which has trading stations in each seaport, and flourishing plantations in various parts of the country. It is the owner of a vast tract of land. From 1890 to 1903 this company was in possession of extensive mining, railway, banking and coining rights, but in the last-named year, by agreement with the German government, it became a land company purely. The company has a right to a fifth part of the land within a zone of 10 m. on either side of any railway built in the colony previously to 1935. In addition to the companies a comparatively large number of private individuals have laid out plantations, Usambara and Pare having become favourite districts for agricultural enterprise. In the delta of the Rufiji and in the Kilwa district cotton-growing was begun in 1901. The plantations are all worked by native labour. The government possesses large forest reserves.

Communications.—Good roads for foot traffic have been made from the seaports to the trading stations on Lakes Nyasa, Tanganyika and Victoria. Caravans from Dar-es-Salaam to Tanganyika take 60 days to do the journey. The railway has largely removed communication hindered the development of the colony and led to economic crises (1898–1902), which were intensified, and in part created, by the building of a railway in the adjacent British protectorate from Mombasa to Victoria Nyanza. The British line securing the trade with the lake. At that time the only railway in the country was a line from Tanga to the Usambara highlands. This railway passes through Korogwe (52 m. from Tanga) and is continued via Mombo to Wilhelmsthal, a further 56 m. The building of a trunk line from Dar-es-Salaam to Mrogoro (140 m.), and ultimately to Ujiji by way of Tabora, was begun in 1905. Another proposed line would run from Kilwa to Wiedhafen on Lake Nyasa. This railway would give the quickest means of access to British Central Africa and the southern part of Belgian Congo. On each of the three lakes is a government steamer. British steamers on Victoria Nyanza maintain communication between the German stations and the lake terminus of the Uganda railway. The German East Africa Line of Hamburg runs a fleet of first-class steamers to East Africa, which touch at Tanga, Dar-es-Salaam and Zanzibar. There is a submarine cable from Dar-es-Salaam to Zanzibar, and an overland line connecting all the coast stations.

Administration, Revenue, &c.—For administrative purposes the country is divided into districts (*Bezirksämter*), and stations (*Stationsbezirke*). Each station has a chief, who is subordinate to the official of his district, these in their turn being under the governor, who resides in Dar-es-Salaam. The governor is commander of the colonial force, which consists of natives under white officers. District councils are constituted, on which the European merchants and planters are represented. Revenue is raised by taxes on imports and exports, on licences for the sale of land and spirituous liquors, and for wood-cutting, by harbour and other dues, and a hut tax on natives. The deficiency between revenue and expenditure is met by a subsidy from the imperial government. In no case during the first twenty-one years' existence of the colony had the local revenue reached 60% of the local expenditure, which in normal years amounted to about £500,000. In 1909, however, only the expenditure necessary for military purposes (£183,500) was received by way of subsidy.

History.—Until nearly the middle of the 19th century only the coast lands of the territory now forming German East Africa were known either to Europeans or to the Arabs. When at the beginning of the 16th century the Portuguese obtained possession of the towns along the East African coast, they had been, for periods extending in some cases fully five hundred years, under Arab dominion. After the final withdrawal of the Portuguese in the early years of the 18th century, the coast towns north of Cape Delgado fell under the sway of the Muscat Arabs, passing

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from them to the sultan of Zanzibar. From about 1830, or a little earlier, the Zanzibar Arabs began to penetrate inland, and by 1850 had established themselves at Ujiji on the eastern shore of Lake Tanganyika. The Arabs also made their way south to Nyasa. This extension of Arab influence was accompanied by vague claims on the part of the sultan of Zanzibar to include all these newly opened countries in his empire. How far from the coast the real authority of the sultan extended was never demonstrated. Zanzibar at this time was in semi-dependence on India, and British influence was strong at the court of Bargash, who succeeded to the sultanate in 1870. Bargash in 1877 offered to Sir (then Mr) William Mackinnon a lease of all his mainland territory. The offer, made in the year in which H. M. Stanley's discovery of the course of the Congo initiated the movement for the partition of the continent, was declined. British influence was, however, still so powerful in Zanzibar that the agents of the German Colonization Society, who in 1884 sought to secure for their country territory on the east coast, deemed it prudent to act secretly, so that both Great Britain and Zanzibar might be confronted with accomplished facts. Making their way inland, three young Germans, Karl Peters, Joachim Count Pfeil and Dr Jühlke, concluded a "treaty" in November 1884 with a chieftain in Usambara who was declared to be independent of Zanzibar. Other treaties followed, and on the 17th of February 1885, the German emperor granted a charter of protection to the Colonization Society. The German acquisitions were resented by Zanzibar, but were acquiesced in by the British government (the second Gladstone administration). The sultan was forced to acknowledge their validity, and to grant a German company a lease of his mainland territories south of the mouth of the Umba river, a British company formed by Mackinnon taking a lease of the territories north of that point. The story of the negotiations between Great Britain, Germany and France which led to this result is told elsewhere (see AFRICA, section 5). By the agreement of the 1st of July 1890, between the British and German governments, and by agreements concluded between Germany and Portugal in 1886 and 1894, and Germany and the Congo Free State in 1884 and later dates, the German sphere of influence attained its present area. On the 28th of October 1890 the sultan of Zanzibar ceded absolutely to Germany the mainland territories already leased to a German company, receiving as compensation £200,000.

While these negotiations were going on, various German companies had set to work to exploit the country, and on the 16th of August 1888 the German East African Company, the lessee of the Zanzibar mainland strip, took over the administration from the Arabs. This was followed, five days later, by a revolt of all the coast Arabs against German rule—the Germans, raw hands at the task of managing Orientals, having aroused intense hostility by their brusque treatment of the dispossessed rulers. The company being unable to quell the revolt, Captain Hermann Wissmann—subsequently Major Hermann von Wissmann (1853–1905)—was sent out by Prince Bismarck as imperial commissioner. Wissmann, with 1000 soldiers, chiefly Sudanese officered by Germans, and a German naval contingent, succeeded by the end of 1889 in crushing the power of the Arabs. Wissmann remained in the country until 1891 as commissioner, and later (1895–1896) was for eighteen months governor of the colony—as the German sphere had been constituted by proclamation (1st of January 1897). Towards the native population Wissmann's attitude was conciliatory, and under his rule the development of the resources of the country was pushed on. Equal success did not attend the efforts of other administrators; in 1891–1892 Karl Peters had great trouble with the tribes in the Kilimanjaro district and resorted to very harsh methods, such as the execution of women, to maintain his authority. In 1896 Peters was condemned by a disciplinary court for a misuse of official power, and lost his commission. After 1891, in which year the Waheche tribe ambushed and almost completely annihilated a German military force of 350 men under Baron von Zelewski, there were for many years no serious risings against German authority, which by the end of 1898 had been established over almost the whole of the hinterland. The development of the country was, however, slow, due in part to the disinclination of the Reichstag to vote supplies sufficient for the building of railways to the fertile lake regions. Count von Götzen (governor 1901–1906) adopted the policy of maintaining the authority of native rulers as far as possible, but as over the greater part of the colony the natives have no political organizations of any size, the chief burden of government rests on the German authorities. In August 1905 serious disturbances broke out among the Bantu tribes in the colony. The revolt was due largely to resentment against the restrictions enforced by the Germans in their efforts at civilization, including compulsory work on European plantations in certain districts. Moreover, it is stated that the Herero in rebellion in German South-west Africa sent word to the east coast natives to follow their example, an instance of the growing solidarity of the black races of Africa. Though the revolt spread over a very large area, the chief centre of disturbance was the region between Nyasa and the coast at Kilwa and Lindi. Besides a number of settlers a Roman Catholic bishop and a party of four missionaries and nuns were murdered in the Kilwa hinterland, while nearer Nyasa the warlike Wangoni held possession of the country. The Germans raised levies of Masai and Sudanese, and brought natives from New Guinea to help in suppressing the rising, besides sending naval and military contingents from Germany. In general, the natives, when encountered, were easily dispersed, but it was not until March 1906 that the coast regions were again quiet. In July following the Wangoni were beaten in a decisive engagement. It was officially stated that the death-roll for the whole war was not below 120,000 men, women and children. In 1907 a visit was paid to the colony by Herr B. Dernburg, the colonial secretary. As a result of this visit more humane methods in the treatment of the natives were introduced, and measures taken to develop more fully the economic resources of the country.

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GERMAN EVANGELICAL SYNOD OF NORTH AMERICA, a Protestant church dating from October 1840, and known, in its early years, as the German Evangelical Association of the West. It was formed by six German ministers who had been ordained in Prussia and were engaged in missionary and pioneer work in Missouri and Illinois. The original organization was strengthened in 1838 by amalgamation with the German Evangelical Church Association of Ohio, and later by the inclusion of the German United Evangelical Synod of the East (1860), the Evangelical Synod of the North-West (1872) and the United Evangelical Synod of the East (1872). The church bases its position on the Bible as interpreted by the symbols of the Lutheran and Reformed churches so far as they are in agreement, points of difference being left to "that liberty of conscience which, as a component part of the basis of man's ultimate

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responsibility to God himself, is the inalienable privilege of every believer." The church, which has (1909) 985 ministers and some 238,000 communicant members, is divided into seventeen districts, with officers responsible to the General Synod, which meets every four years. There are boards for home and foreign missions, the latter operating chiefly in the Central Provinces of India. The literature of the church is mainly in German, though English is rapidly gaining ground.

GERMANIC LAWS, EARLY. Of those Germanic laws of the early middle ages which are known as *leges barbarorum*, we here deal with the principal examples other than Frankish, viz. (1) *Leges Wisigothorum*, (2) *Lex Burgundionum*, (3) *Pactus Alamannorum* and *Lex Alamannorum*, (4) *Lex Bajuvariorum*, (5) *Lex Saxonum*, (6) *Lex Frisionum*, (7) *Lex Angliorum et Werinorum, hoc est, Thuringorum*, and (8) *Leges Langobardorum*. All these laws may in general be described as codes of procedure and tariffs of compositions. They present somewhat similar features with the Salic law, but often differ from it in the date of compilation, the amount of fines, the number and nature of the crimes, the number, rank, duties and titles of the officers, &c. For the Salic law and other Frankish laws, see SALIC LAW, and for the edict of Theodoric I., which was applicable to the Ostrogoths and Romans, see ROMAN LAW.

For the whole body of the Germanic laws see P. Canciani, *Barbarorum leges antiquae* (Venice, 1781–1789); F. Walter, *Corpus juris germanici antiqui* (Berlin, 1824); *Monumenta Germaniae historica, Leges*. For further information on the codes in general, see H. M. Zöpfl, *Deutsche Rechtsgeschichte* (4th ed., Heidelberg, 1871–1876); J. E. O. Stobbe, *Geschichte der deutschen Rechtsquellen* (Brunswick, 1860–1864); Paul Viollet, *Histoire du droit civil français* (2nd ed., Paris, 1893); H. Brunner, *Deutsche Rechtsgeschichte* (2nd ed., Leipzig, 1906).

1. *Leges Wisigothorum.*—Karl Zeumer's edition of these laws in the 4to series of the *Mon. Germ. Hist.* throws new light on all questions relating to their date and composition. It is now certain that the earliest written code of the Visigoths dates back to King Euric (466–485). Besides his own constitutions, Euric included in this collection constitutions of his predecessors, Theodoric I. (410–451), Thorismund (451–453), and Theodoric II. (453–466), and he arranged the whole in a logical order. Of this code fragments of chapters cclxxii to cccxxxvi.[1] have been discovered in a palimpsest MS. in the Bibliothèque Nationale at Paris (Latin coll., No. 12161), a fact which proves that the code ran over a large area. Euric's code was used for all cases between Goths, and between them and Romans; in cases between Romans, Roman law was used. At the instance of Euric's son, Alaric II., an examination was made of the Roman laws in use among Romans in his dominions, and the resulting compilation was approved in 506 at an assembly at Aire, in Gascony, and is known as the Breviary of Alaric, and sometimes as the *Liber Aniani*, from the fact that the authentic copies bear the signature of the *referendarius* Anian.

Euric's code remained in force among the Visigoths of Spain until the reign of Leovigild (568–586), who made a new one, improving upon that of his predecessor. This work is lost, and we have no direct knowledge of any fragment of it. In the 3rd codification, however, many provisions have been taken from the 2nd, and these are designated by the word "*antiqua*"; by means of these "*antiqua*" we are enabled in a certain measure to reconstruct the work of Leovigild.

After the reign of Leovigild the legislation of the Visigoths underwent a transformation. The new laws made by the kings were declared to be applicable to all the subjects in the kingdom, of whatever race—in other words, they became territorial; and this principle of territoriality was gradually extended to the ancient code. Moreover, the conversion of Reccared I. (586–601) to orthodoxy effaced the religious differences among his subjects, and all subjects, *qua* Christians, had to submit to the canons of the councils, which were made obligatory by the kings. After this change had been accepted, Recceswinth (649–672) made a new code, which was applicable to Visigoths and Romans alike. This code, known as the *Liber judiciorum*, is divided into 12 books, which are subdivided into *tituli* and chapters (*aerae*). It comprises 324 constitutions taken from Leovigild's collection, a few of the laws of Reccared and Sisebut, 99 laws of Chindaswinth (642–653), and 87 of Recceswinth. A recension of this code of Recceswinth was made in 681 by King Erwig (680–687), and is known as the *Lex Wisigothorum renovata*; and, finally, some additamenta were made by Egica (687–702). In Zeumer's edition of the *Leges Wisigothorum* the versions of Recceswinth and Erwig, where they differ from each other, are shown in parallel columns, and the laws later than Erwig are denoted by the sign "*nov.*"

For further information see the preface to Zeumer's edition; H. Brunner, *Deutsche Rechtsgeschichte* (2nd ed., Leipzig, 1906); Ureña y Smenyaud, *La Legislacion Gotico-hispana* (Madrid, 1905).

2. *Lex Burgundionum.*—This code was compiled by King Gundobald (474–516), very probably after his defeat by Clovis in 500. Some additamenta were subsequently introduced either by Gundobald himself or by his son Sigismund. This law bears the title of *Liber Constitutionum*, which shows that it emanated from the king; it is also known as the *Lex Gundobada* or *Lex Gombata*. It was used for cases between Burgundians, but was also applicable to cases between Burgundians and Romans. For cases between Romans, however, Gundobald compiled the *Lex Romana Burgundionum*, called sometimes, through a misreading of the MSS., the *Liber Papiani* or simply *Papianus*. The barbarian law of the Burgundians shows strong traces of Roman influence. It recognizes the will and attaches great importance to written deeds, but on the other hand sanctions the judicial duel and the *cojuratores* (sworn witnesses). The vehement protest made in the 9th century by Agobard, bishop of Lyons, against the *Lex Gundobada* shows that it was still in use at that period. So late as the 10th and even the 11th centuries we find the law of the Burgundians invoked as personal law in Cluny charters, but doubtless these passages refer to accretions of local customs rather than to actual paragraphs of the ancient code.

The text of the *Lex Burgundionum* has been published by F. Bluhme in the *Mon. Germ. hist., Leges*, iii. 525; by Karl Binding in the *Fontes rerum Bernensium* (vol. i., 1880); by J. E. Valentin Smith (Paris, 1889 seq.); and by von Salis (1892) in the 4to series of the *Mon. Germ. hist.* Cf. R. Dareste, "La Loi Gombette," in the *Journal des savants* (July 1891).

3. *Pactus Alamannorum* and *Lex Alamannorum.*—Of the laws of the Alamanni, who dwelt between the Rhine and the Lech, and spread over Alsace and what is now Switzerland to the south of Lake Constance, we possess two different texts. The earlier text, of which five short fragments have come down to us, is known as the *Pactus Alamannorum*, and from the persistent recurrence of the expression "et sic convenit" was most probably drawn up by an official commission. The reference to affranchisement *in ecclesia* shows that it was composed at a period subsequent to the conversion of the Alamanni to Christianity. There is no doubt that the text dates back to the reign of Dagobert I., *i.e.* to the first half of the 7th century. The later text, known as the *Lex Alamannorum*, dates from a period when Alamannia was independent under national dukes, but recognized the theoretical suzerainty of the Frankish kings. There seems no reason to doubt the St Gall MS., which states that the law had its origin in an agreement between the great Alamannic lords and Duke Landfrid, who ruled the duchy from 709 to 730. The two texts have been published by J. Merkel in the *Mon. Germ. hist., Leges*, iii., and by Karl Lehmann in the 4to series of the same collection.

4. *Lex Bajuvariorum.*—We possess an important law of the Bavarians, whose duchy was situated in the region east of the Lech, and was an outpost of Germany against the Huns, known later as Avars. Parts of this law have been taken directly from the Visigothic law of Euric and from the law of the Alamanni. The Bavarian law, therefore, is later than that of the Alamanni. It dates unquestionably from a period when the Frankish authority was very strong in Bavaria, when the dukes were vassals of the Frankish kings. Immediately after the revolt of Bavaria in 743 the Bavarian duke Odilo was forced to submit to Pippin and Carloman, the sons of Charles Martel, and to

[1] The lacunae in these fragments have been filled in by the aid of the law of the Bavarians, where the chief provisions are reproduced.

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recognize the Frankish suzerainty. About the same period, too, the church of Bavaria was organized by St Boniface, and the country divided into several bishoprics; and we find frequent references to these bishops (in the plural) in the law of the Bavarians. On the other hand, we know that the law is anterior to the reign of Duke Tassilo III. (749–788). The date of compilation must, therefore, be placed between 743 and 749.

There is an edition of the *Lex Baiuvariorum* by J. Merkel in the *Mon. Germ. hist., Leges*, iii. 183, and another was undertaken by E. von Schwind for the 4to series of the same collection. Cf. von Schwind's article in the *Neues Archiv*, vol. xxxi.

5. *Lex Saxonum.*—Germany comprised two other duchies, Saxony and Frisia, of each of which we possess a text of law. The *Lex Saxonum* has come down to us in two MSS. and two old editions (those of B. J. Herold and du Tillet), and the text has been edited by Karl von Richthofen in the *Mon. Germ. hist., Leges*, v. The law contains ancient customary enactments of Saxony, and, in the form in which it has reached us, is later than the conquest of Saxony by Charlemagne. It is preceded by two capitularies of Charlemagne for Saxony—the *Capitulatio de partibus Saxoniae* (A. Boretius i. 68), which dates undoubtedly from 782, and is characterized by great severity, death being the penalty for every offence against the Christian religion; and the *Capitulare Saxonicum* (A. Boretius i. 71), of the 28th of October 797, in which Charlemagne shows less brutality and pronounces simple compositions for misdeeds which formerly entailed death. The *Lex Saxonum* apparently dates from 803, since it contains provisions which are in the *Capitulare legi Ribuariae additum* of that year. The law established the ancient customs, at the same time eliminating anything that was contrary to the spirit of Christianity; it proclaimed the peace of the churches, whose possessions it guaranteed and whose right of asylum it recognized.

6. *Lex Frisionum.*—This consists of a medley of documents of the most heterogeneous character. Some of its enactments are purely pagan—thus one paragraph allows the mother to kill her new-born child, and another prescribes the immolation to the gods of the defiler of their temple; others are purely Christian, such as those which prohibit incestuous marriages and working on Sunday. The law abounds in contradictions and repetitions, and the compositions are calculated in different moneys. From this it would appear that the documents were merely materials collected from various sources and possibly with a view to the compilation of a homogeneous law. These materials were apparently brought together at the beginning of the 9th century, at a time of intense legislative activity at the court of Charlemagne.

There are no MSS. of the document extant; our knowledge of it is based upon B. J. Herold's edition (*Originum ac Germanicarum antiquitatum libri*, Basel, 1557), which has been reproduced by Karl von Richthofen in the *Mon. Germ. hist., Leges*, iii. 631.

7. *Lex Angliorum et Werinorum, hoc est, Thuringorum.*—In early times there dwelt in Thuringia, south of the river Unstrut, the Angli, who gave their name to the *pagus Engili*, and to the east, between the Saale and the Elster, the Warni (Werini, or Varini), whose name is seen in Werenofeld. In the 9th century, however, this region (then called Werenofeld) was occupied by the Sorabi, and the Warni and Angli either coalesced with the Thuringi or sought an asylum in the north of Germany. A collection of laws has come down to us bearing the name of these two peoples, the *Lex Angliorum et Werinorum, hoc est, Thuringorum.* This text is a collection of local customs arranged in the same order as the law of the Ripuarians. Parts of it are based on the *Capitulare legi Ribuariae additum* of 803, and it seems to have been drawn up in the same conditions and circumstances as the law of the Saxons. There is an edition of this code by Karl von Richthofen in the *Mon. Germ. hist., Leges*, v. 103. The old opinion that the law originated in south Holland is entirely without foundation.

8. *Leges Langobardorum.*—We possess a fair amount of information on the origin of the last barbarian code, the laws of the Lombards. The first part, consisting of 388 chapters, is known as the *Edictus Langobardorum*, and was promulgated by King Rothar at a diet held at Pavia on the 22nd of November 643. This work, composed at one time and arranged on a systematic plan, is very remarkable. The compilers knew Roman law, but drew upon it only for their method of presentation and for their terminology; and the document presents Germanic law in its purity. Rothar's edict was augmented by his successors: Grimoald (668) added nine chapters; Liutprand (713–735), fifteen volumes, containing a great number of ecclesiastical enactments; Ratchis (746), eight chapters; and Aistulf (755), thirteen chapters. After the union of the Lombards to the Frankish kingdom, the capitularies made for the entire kingdom were applicable to Italy. There were also special capitularies for Italy, called *Capitula Italica*, some of which were appended to the edict of Rothar.

At an early date compilations were formed in Italy for the use of legal practitioners and jurists. Eberhard, duke and margrave of Rhaetia and Friuli, arranged the contents of the edict with its successive additamenta into a *Concordia de singulis causis* (829–832). In the 10th century a collection was made of the capitularies in use in Italy, and this was known as the *Capitulare Langobardorum.* Then appeared, under the influence of the school of law at Pavia, the *Liber legis Langobardorum*, also called *Liber Papiensis* (beginning of 11th century), and the *Lombarda* (end of 11th century) in two forms—that given in a Monte Cassino MS. and known as the *Lombarda Casinensis*, and the *Lombarda Vulgata.*

There are editions of the *Edictus*, the *Concordia*, and the *Liber Papiensis* by F. Bluhme and A. Boretius in the *Mon. Germ. hist., Leges*, iv. Bluhme also gives the rubrics of the *Lombardae*, which were published by F. Lindenberg in his *Codex legum antiquarum* in 1613. For further information on the laws of the Lombards see J. Merkel, *Geschichte des Langobardenrechts* (1850); A. Boretius, *Die Kapitularien im Langobardenreich* (1865); and C. Kier, *Edictus Rotari* (Copenhagen, 1898). Cf. R. Dareste in the *Nouvelle Revue historique de droit français et étranger* (1900, p. 143). (C. Pf.)

GERMANICUS CAESAR (15 B.C.–A.D. 19), a Roman general and provincial governor in the reign of Tiberius. The name Germanicus, the only one by which he is known in history, he inherited from his father, Nero Claudius Drusus, the famous general, brother of Tiberius and stepson of Augustus. His mother was the younger Antonia, daughter of Marcus Antonius and niece of Augustus, and he married Agrippina, the granddaughter of the same emperor. It was natural, therefore, that he should be regarded as a candidate for the purple. Augustus, it would seem, long hesitated whether he should name him as his successor, and as a compromise required his uncle Tiberius to adopt him, though Tiberius had a son of his own. Of his early years and education little is known. That he possessed considerable literary abilities, and that these were carefully trained, we gather, both from the speeches which Tacitus puts into his mouth, and from the reputation he left as an orator, as attested by Suetonius and Ovid, and from the extant fragments of his works.

At the age of twenty he served his apprenticeship as a soldier under Tiberius, and was rewarded with the triumphal insignia for his services in crushing the revolt in Dalmatia and Pannonia. In A.D. 11 he accompanied Tiberius in his campaign on the Rhine, undertaken, in consequence of the defeat of Varus, with the object of securing the German frontier. In 12 he was made consul, and increased his popularity by appearing as an advocate in the courts of justice, and by the celebration of brilliant games. Soon afterwards he was appointed by Augustus to the important command of the eight legions on the Rhine. The news of the emperor's death (14) found Germanicus at Lugdunum (Lyons), where he was superintending the census of Gaul. Close upon this came the report that a mutiny had broken out among his legions on the lower Rhine. Germanicus hurried back to the camp, which was now in open insurrection. The tumult was with difficulty quelled, partly by well-timed concessions, for which the authority of the emperor was forged, but chiefly owing to his personal popularity. Some of the insurgents actually proposed that he should put himself at their head and secure the empire for himself, but their offer was rejected with indignation. In order to calm the excitement Germanicus determined at once on an active campaign. Crossing the Rhine, he attacked and routed the Marsi, and laid waste the valley of the Ems.

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In the following year he marched against Arminius, the conqueror of Varus, and performed the last rites over the remains of the Roman soldiers that still lay there unburied, erecting a barrow to mark the spot. Arminius, however, favoured by the marshy ground, was able to hold his own, and it required another campaign before he was finally defeated. A masterly combined movement by land and water enabled Germanicus to concentrate his forces against the main body of the Germans encamped on the Weser, and to crush them in two obstinately contested battles. A monument erected on the field proclaimed that the army of Tiberius had conquered every tribe between the Rhine and the Elbe. Great, however, as the success of the Roman arms had been, it was not such as to justify this boastful inscription; we read of renewed attacks from the barbarians, and plans of a fourth campaign for the next summer.

But the success of Germanicus had already stirred the jealousy and fears of Tiberius, and he was reluctantly compelled to return to Rome. On the 26th of May 17 he celebrated a triumph. The enthusiasm with which he was welcomed, not only by the populace, but by the emperor's own praetorians, was so great that the earliest pretext was seized to remove him from the capital. He was sent to the East with extraordinary powers to settle a disputed succession in Parthia and Armenia. At the same time Gnaeus Calpurnius Piso, one of the most violent and ambitious of the old nobility, was sent as governor of Syria to watch his movements. Germanicus proceeded by easy stages to his province, halting on his way in Dalmatia, and visiting the battle-field of Actium, Athens, Ilium, and other places of historic interest. At Rhodes he met his coadjutor Piso, who was seeking everywhere to thwart and malign him. When at last he reached his destination, he found little difficulty in effecting the settlement of the disturbed provinces, notwithstanding Piso's violent and persistent opposition. At Artaxata Zeno, the popular candidate for the throne, was crowned king of Armenia. To the provinces of Cappadocia and Commagene Roman governors were assigned; Parthia was conciliated by the banishment of the dethroned king Vonones.

After wintering in Syria Germanicus started for a tour in Egypt. The chief motive for his journey was love of travel and antiquarian study, and it seems never to have occurred to him, till he was warned by Tiberius, that he was thereby transgressing an unwritten law which forbade any Roman of rank to set foot in Egypt without express permission. On his return to Syria he found that all his arrangements had been upset by Piso. Violent recriminations followed, the result of which, it would seem, was a promise on the part of Piso to quit the province. But at this juncture Germanicus was suddenly attacked at Epidaphne near Antioch by a violent illness, which he himself and his friends attributed to poison administered by Plancina, the wife of Piso, at the instigation of Tiberius. Whether these suspicions were true is open to question; it seems more probable that his death was due to natural causes. His ashes were brought to Rome in the following year (20) by his wife Agrippina, and deposited in the grave of Augustus. He had nine children, six of whom, three sons and three daughters, survived him, amongst them the future emperor Gaius and the notorious Agrippina, the mother of Nero. The news of his death cast a gloom over the whole empire. Nor was Germanicus unworthy of this passionate devotion. He had wiped out a great national disgrace; he had quelled the most formidable foe of Rome. His private life had been stainless, and he possessed a singularly attractive personality. Yet there were elements of weakness in his character which his short life only half revealed: an impetuosity which made him twice threaten to take his own life; a superstitious vein which impelled him to consult oracles and shrink from bad omens; an amiable dilettantism which led him to travel in Egypt while his enemy was plotting his ruin; a want of nerve and resolution which prevented him from coming to an open rupture with Piso till it was too late.

He possessed considerable literary abilities; his speeches and Greek comedies were highly spoken of by his contemporaries. But the only specimen of his work that has come down to us is the translation in Latin hexameters (generally attributed to him, although some consider Domitian the author), together with scholia, of the *Phaenomena* of Aratus, which is superior to those of Cicero and Avienus (best edition by A. Breysig, 1867; 1899, without the scholia). A few extant Greek and Latin epigrams also bear the name Germanicus.

In addition to monographs by A. Zingerle (Trent, 1867) and A. Breysig (Erfurt, 1892), there are treatises on the German campaigns by E. von Wietersheim (1850), P. Höfer (1884), F. Knoke (1887, 1889), W. Fricke (1886), A. Taramelli (1891), Dahm (1902).

See Tacitus, *Annals*, i.-iv. (ed. Furneaux); Suetonius, *Augustus*, *Tiberius*; J. C. Tarver, *Tiberius* (1902); Merivale, *Hist. of the Romans under the Empire*, chs. 42, 43; H. Schiller, *Geschichte der römischen Kaiserzeit*, i. 1 (1883), pp. 227, 258, 261-266, 270-276; M. Schanz, *Geschichte der römischen Litteratur*, pt. ii. (2nd ed., 1901), and Teuffel-Schwabe, *Hist. of Roman Literature* (Eng. tr., 1900), 275.

GERMANIUM (symbol Ge, atomic weight 72·5); one of the metallic elements included in the same natural family as carbon, silicon, tin and lead. It was discovered in 1886 by C. Winkler in argyrodite, a mineral found at Freiberg in Saxony. On examination of the metal and its salts it was shown to be identical with the hypothetical element *ekasilicon*, whose properties had been predicted by D. Mendeléeff many years previously. The element is of extremely rare occurrence, being met with only in argyrodite and, to a very small extent, in euxenite. It may be obtained from argyrodite by heating the mineral in a current of hydrogen; or by heating the dioxide to redness with carbon. It forms grey coloured octahedra of specific gravity 5·496 at 20° C., melting at 900° C.; it burns at a red heat, is insoluble in hydrochloric acid, but dissolves in *aqua regia*, and is also soluble in molten alkalis. Two oxides of germanium are known, the *dioxide*, GeO_2, being obtained by roasting the sulphide and treatment with nitric acid. It is a white powder, very slightly soluble in water, and possesses acid properties. By heating with a small quantity of magnesium it is converted into *germanious oxide*, GeO. By heating the metal with chlorine, *germanic chloride*, $GeCl_4$, is obtained as a colourless fuming liquid boiling at 86-87° C., it is decomposed by water forming a hydrated germanium dioxide. *Germanium dichloride*, $GeCl_2$, and *germanium chloroform*, $GeHCl_3$, have also been described.

Germanium compounds on fusion with alkaline carbonates and sulphur form salts known as *thiogermanates*. If excess of a mineral acid be added to a solution of an alkaline thiogermanate a white precipitate of *germanium disulphide*, GeS_2, is obtained. It can also be obtained by passing sulphuretted hydrogen through a solution of the dioxide in hydrochloric acid. It is appreciably soluble in water, and also in solutions of the caustic alkalis and alkaline sulphides. By heating the disulphide in a current of hydrogen, *germanious sulphide*, GeS, is formed. It sublimes in thin plates of a dark colour and metallic lustre, and is soluble in solutions of the caustic alkalis. Alkyl compounds of germanium such as *germanium-tetr-ethyl*, $Ge(C_2H_5)_4$, a liquid boiling at 160° C., have been obtained. The germanium salts are most readily recognized by the white precipitate of the disulphide, formed in acid solutions, on passing sulphuretted hydrogen. The atomic weight of the element was determined by C. Winkler by analysis of the pure chloride $GeCl_4$, the value obtained being 72·32, whilst Lecoq de Boisbaudran (*Comptes rendus*, 1886, 103, 452), by a comparison of the lines in the spark spectrum of the element, deduced the value 72·3.

GERMAN LANGUAGE. Together with English and Frisian, the German language forms part of the West Germanic group of languages. To this group belongs also Langobardian, a dialect which died out in the 9th or 10th century, while Burgundian, traces of which are not met with later than the 5th century, is usually classed with the East Germanic group. Both these tongues were at an early stage crushed out by Romance dialects, a fate which also overtook the idiom of the Western Franks, who, in the so-called *Strassburg Oaths*[1] of 842, use the Romance tongue, and are addressed in that tongue by Louis the German.

Leaving English and Frisian aside, we understand by *Deutsche*

[1] K. Müllenhoff and W. Scherer, *Denkmäler deutscher Poesie und Prosa*, 3rd ed., by E. Steinmeyer, 1892, No. lxvii.

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Sprache the language of those West Germanic tribes, who, at their earliest appearance in history, spoke a Germanic tongue, and still speak it at the present day. The chief of these tribes are: the Saxons, the Franks (but with the restriction noted above), the Chatti (Hessians), Thuringians, Alemannians and Bavarians. This definition naturally includes the languages spoken in the Low Countries, Flemish and Dutch, which are offsprings of the Low Franconian dialect, mixed with Frisian and Saxon elements; but, as the literary development of these languages has been in its later stages entirely independent of that of the German language, they are excluded from the present survey.

The German language, which is spoken by about seventy-one millions, and consequently occupies in this respect the third place among European languages, borders, in the west and south, on Romance languages (French, Italian), and also to some extent on Slavonic. On Italian and Slovenian territory there are several German-speaking "islands," notably the Sette and Tredici Communi, east and north-east of the Lake of Garda, and the "Gottschee Ländchen" to the south of Laibach. The former of these is, however, on the point of dying out. Neighbours on the east, where the boundary line runs by no means as straight as on the west or south, are the Magyars and again Slavonic races. Here, too, there are numerous "islands" on Hungarian and Slavonic territory. Danes and Frisians join hands with the Germans in the north.[1]

In the west and south the German language has, compared with its status in earlier periods, undoubtedly lost ground, having been encroached upon by Romance tongues. This is the case in French Flanders, in Alsace and Lorraine, at any rate before the war of 1870, in the valleys south of Monte Rosa and in southern Tirol; in Styria and Carinthia the encroachment is less marked, but quite perceptible. On the east, on the other hand, German steadily spread from the days of Charles the Great down to recent times, when it has again lost considerable ground in Bohemia, Moravia and Livonia. At the time of Charles the Great the eastern frontier extended very little beyond the lower Elbe, following this river beyond Magdeburg, whence it passed over to the Saale, the Bohemian forest and the river Enns (cf. the map in F. Dahn, *Urgeschichte der germanischen und romanischen Völker*, vol. iii.). Partly as a result of victories gained by the Germans over the Avars and Slavs, partly owing to peaceful colonization, the eastern boundary was pushed forward in subsequent centuries; Bohemia was in this way won for the German tongue by German colonists in the 13th century, Silesia even a little earlier; in Livonia German gained the upper hand during the 13th century, while about the same time the country of the Prussians was conquered and colonized by the knights of the Teutonic order. The dialect which these colonists and knights introduced bore the Middle German character; and this, in various modifications, combined with Low German and other Dutch elements, formed the German spoken in these newly-won territories. In the north (Schleswig), where at the time of Charles the Great the river Eider formed the linguistic boundary, German has gained and is still gaining on Danish.

Before considering the development of the language spoken within these boundaries, a word of explanation is perhaps necessary with regard to the word *deutsch*. As applied to the language, *deutsch* first appears in the Latin form *theotiscus*, *lingua theotisca*, *teutisca*, in certain Latin writings of the 8th and 9th centuries, whereas the original Old High German word *thiudisc*, *tiutisc* (from *thiot*, *diot*, "people," and the suffix *-isc*) signified only "appertaining to the people," "in the manner of the people." Cf. also Gothic *þiudisko* as a translation of ἐθνικῶς (Gal. ii. 14). It, therefore, seems probable that if the application of the word to the language (*lingua theotisca*) was not exactly an invention of Latin authors of German nationality, its use in this sense was at least encouraged by them in order to distinguish their own vernacular (*lingua vulgaris*) from Latin as well as from the *lingua romana*.[2]

In the 8th and 9th centuries German or "Deutsch" first appears as a written language in the dialects of Old High German and Old Low German. Of an "Urdeutsch" or primitive German, *i.e.* the common language from which these sharply distinguished dialects of the earliest historical period must have developed, we have no record; we can only infer its character—and it was itself certainly not free from dialectic variations—by a study of the above-named and other Germanic dialects. It is usual to divide the history of the German language from this earliest period, when it appears only in the form of proper names and isolated words as glosses to a Latin text, down to the present day, into three great sections: (1) Old High German (*Althochdeutsch* and Old Low German (Old Saxon; *Altniederdeutsch*, *Altsächsisch*); (2) Middle High German (*Mittelhochdeutsch*) and Middle Low German (*Mittelniederdeutsch*); and (3) Modern High German and Modern Low German (*Neuhochdeutsch* and *Neuniederdeutsch*). It is more difficult to determine the duration of the different periods, for it is obvious that the transition from one stage of a language to another takes place slowly and gradually.

The first or Old High German period is commonly regarded as extending to about the year 1100. The principal characteristic of the change from Old High German to Middle High German is the weakening of the unaccented vowels in final syllables (cf. O.H.G. *tagâ*, *gesti*, *geban*, *gâbum* and M.H.G. *tage*, *geste*, *geben*, *gâben*). But it must be remembered that this process began tentatively as early as the 10th century in Low German, and also that long, unaccented vowels are preserved in the Alemannic dialect as late as the 14th century and even later. Opinion is more at variance with regard to the division between the second and third periods. Some would date Modern High German from the time of Luther, that is to say, from about 1500. But it must be noted that certain characteristics attributed to the Modern German vowel system, such as lengthening of Middle High German short vowels, the change from Middle High German *i*, *ü*, *iu* to Modern High German *ei*, *au*, *eu* (*öu*), of Middle High German *ie*, *uo*, *üe* to Modern High German *i*, *u*, *ü*, made their appearance long before 1500. Taking this fact into consideration, others distinguish a period of classical Middle High German extending to about 1250, and a period of transition (sometimes called *Frühneuhochdeutsch*, or Early Modern High German) from 1250 to 1650. The principal characteristics of Modern High German would then consist in a greater stability of the grammatical and syntactical rules, due to the efforts of earlier grammarians, such as Schottelius, Gottsched and others, and the substitution of a single vowel sound for the varying vowels of the singular and plural of the preterite of strong verbs (cf. Middle High German *schreib*, *schriben*, and Modern High German *schrieb*, *schrieben*, &c.). The much debated question of the origins of Modern High German has been recently reopened by O. Behaghel (*Geschichte der deutschen Sprache*, *l.c.* 661), who hopes that a more satisfactory solution may be arrived at by the study of certain syntactical peculiarities to be seen in the dialects of more recent periods.

As the middle ages did not produce a German *Schriftsprache* or literary language in the modern sense of the word, which—as is undoubtedly the case in Modern German—might have influenced the spoken language (*Umgangssprache*), the history of the language in its earlier stages is a history of different dialects. These dialects will, therefore, claim our attention at some length.

It may be assumed that the languages of the different West Germanic tribes enumerated above were, before the appearance of the tribes in history, distinguished by many dialectic variations;

[1] For a detailed description of the boundary line cf. O. Behaghel's article in Paul's *Grundriss*, 2nd ed., pp. 652-657, where there is also a map, and a very full bibliography relative to the changes in the boundary.

[2] Cf. J. Grimm, *Deutsche Grammatik*, 3rd ed., i. p. 13; F. Kluge, *Etymologisches Wörterbuch*, 6th ed., pp. 75 ff.; K. Luick, "Zur Geschichte des Wortes 'deutsch,'" in *Anzeiger für deutsches Altertum*, xv., pp. 135, 248; H. Fischer, "Theotiscus, Deutsch," in Paul and Braune's *Beiträge*, xviii. p. 203; H. Paul, *Deutsches Wörterbuch* (1897), p. 93.

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this was certainly the case immediately after the Migrations, when the various races began to settle down. But these differences, consisting presumably in matters of phonology and vocabulary, were nowhere so pronounced as to exclude a mutual understanding of individuals belonging to different tribes. One might compare the case of the Poles and Czechs of the present day. During the 6th century, however, a phonological process set in, which ultimately resulted in the separation of Germany into two great linguistic divisions, south and north, or, as the languages are called, High and Low German. This fundamental change, which is known as the second or High German Soundshifting (*Lautverschiebung*), spread northward from the mountainous districts in the south, and, whatever its cause may have been,[1] left behind it clear and easily recognizable effects on the Germanic voiced stop *d*, which became changed to *t*, and more especially on the voiceless stops *t*, *p* and *k*. Dialects which have shifted initial *t* and *tt* in the middle of a word to the affricate *tz* (written *z*, *tz*) and *p* and *k* in corresponding positions to the affricates *pf* and *kx* (written *ch*), further, *t*, *p* and *k* in the middle of words between vowels, to the double spirant *ss* (now written *ss*, *ss*), *ff*, *hh* (written *ch*),are called High German; those in which these changes have not taken place form the Low German group, this group agreeing in this respect with English and Frisian.

Of these sound changes, that of *t* to *tz* and *ss* (*ss*) is the most universal, extending over the whole region in which shifting occurs; that of *k* to *kx* (*ch*), the most restricted, being only found in Old Bavarian, and in the Swiss pronunciation, *e.g.* in *chind*. The remaining dialects occupy positions between the two extremes of complete shifting and the absence of shifting. Some Franconian dialects, for instance, leave *p* unchanged under certain conditions, and in one dialect at least, Middle Franconian, *t* has remained after vowels in certain pronominal forms (*dat*, *wat*, *allet*, &c.). On this ground a subdivision has been made in the High German dialects into (*a*) an Upper German (*Oberdeutsch*) and (*b*) a Middle German (*Mitteldeutsch*) group; and this subdivision practically holds good for all periods of the language, although in Old High German times the Middle German group is only represented, as far as the written language is concerned, by Franconian dialects.

As the scientific study of the German language advanced there arose a keen revival of interest—and that not merely on the part of scholars—in the dialects which were so long held in contempt as a mere corruption of the *Schriftsprache*.[2] We are still in the midst of a movement which, under the guidance of scholars, has during the last three decades, bestowed great care on many of the existing dialects; phonological questions have received most attention, but problems of syntax have also not been neglected. Monumental works like Wenker's *Sprachatlas des deutschen Reiches* and dialect dictionaries are either in course of publication or preparing;[3] while the difficult questions concerned with defining the boundaries of the various dialects and explaining the reasons for them form the subject of many monographs.[4]

Beginning in the north we shall now pass briefly in review the dialects spoken throughout the German-speaking area.

A. The Low German Dialects

The Low German dialects, as we have seen, stand nearest to the English and Frisian languages, owing to the total absence of the consonantal shifting which characterizes High German, as well as to other peculiarities of sounds and inflections, *e.g.* the loss of the nasals *m* and *n* before the spirants *f*, *s* and *þ*. Cf. Old Saxon *fif* (five), *us* (us), *hūd* (cf. uncouth). The boundary-line between Low and High German, the so-called *Benrather Linie*, may roughly be indicated by the following place-names, on the understanding, however, that the Ripuarian dialect (see below) is to be classed with High German: Montjoie (French border-town), Eupen, Aachen, Benrath, Düsseldorf, north of Siegen, Cassel, Helligenstadt, Harzgerode, to the Elbe south of Magdeburg; this river forms the boundary as far as Wittenberg, whence the line passes to Lübben on the Spree, Fürstenwald on the Oder and Birnbaum near the river Warthe. Beyond this point the Low Germans have Slavs as their neighbours. Compared with the conditions in the 13th century, it appears that Low Gennan has lost ground; down to the 14th and 15th centuries several towns, such as Mansfeld, Eisleben, Merseburg, Halle, Dessau and Wittenberg, spoke Low Germian.

Low German falls into two divisions, a western division, namely, Low Franconian, the parent, as we have already said, of Flemish and Dutch, and an eastern division, Low Saxon (*Plattdeutsch*, or, as it is often simply called, Low German). The chief characteristic of the division is to be sought in the ending of the first and third person plural of the present indicative of verbs, this being in the former case *-en*, in the latter *-et*. Inasmuch as this south-eastern part of Low Franconian—inclusive of Cleldernish and Limburgish—shifts final *t* to *ch* (*e.g. ich, mich, auch, -lich*), it must obviously be separated from the rest, and in this respect be grouped with High German. Low Saxon is usually divided into Westphalian (to the west of the Weser) and Low Saxon proper, between Weser and Elbe. The south-eastern part of the latter has the verbal ending *-en* and further shows the peculiarity that the personal pronoun has the same form in the dative and accusative (*mik, dik*), whereas the remainder, as well as the Westphalian, has *mi, di* in the dative, but *mik, dik* in the accusative. To these Low German dialects must also be added those spoken east of the Elbe on what was originally Slavonic territory; they have the ending *-en* in the first and third person plural of verbs.[5]

B. The High German Dialects

1. *The Middle German Group.*—This group, which comprises the dialects of the Middle Rhine, of Hesse, Thuringia, Upper Saxony (Meissen), Silesia and East Prussia to the east of the lower Vistula between Bischofswerder, Marienburg, Elbing, Wormditt and Wartenberg—a district originally separated from Silesia—may be most conveniently divided into an East and a West Middle German group. A common characteristic of all these dialects is the diminutive suffix *-chen*, as compared to the Low German form *-ken* and the Upper German *-lein* (O.H.G. *-lîn*). East Middle German dialects, there is Silesian, Upper Saxon and Thuringian,[6] together with the linguistic colony in East Prussia. While these dialects have shifted initial Germanic *p* to *pf*, or even to *f* (*fert* = *Pferd*), the West Middle German dialects (roughly speaking to the west of the watershed of Werra and Fulda) have retained it. If, following a convincing article in the *Zeitschrift für deutsches Altertum* (37, 288 ff.) by F. Wrede, we class East and South Franconian—both together may be called High Franconian—with the Upper, German dialects, there only remain in the West Middle German group:[7] (*a*) Middle

[1] Cf. P. Kretschmer, *Einleitung in die Geschichte der griechischen Sprache* (Göttingen, 1896), who holds the mingling of Celtic and Germanic elements in southern and south-western Germany responsible for the change. It might also be mentioned here that H. Meyer (*Zeitschrift f. deut. Altertum*, xlv. pp. 101 ff.) endeavours to explain the first soundshifting by the change of abode of the Germanic tribes from the lowlands to the highlands of the Carpathian Mountains.

[2] Of writers who have made extensive use of dialects, it must suffice to mention here the names of J. H. Voss, Hebel, Klaus Groth, Fritz Reuter, Usteri, G. D. Arnold, Holtei, Castelli, J. G. Seidl and Anzengruber, and in our own days G. Hauptmann.

[3] Cf. F. Staub and L. Tobler, *Schweizerisches Idiotikon* (1881 ff.); E. Martin and H. Lienhart, *Wörterbuch der elsässischen Mundarten* (Strassburg, 1899 ff.); H. Fischer, *Schwäbisches Wörterbuch* (Tübingen, 1901 ff.). Earlier works, which are already completed, are J. A. Schmeller, *Bayrisches Wörterbuch* (2nd ed., 2 vols., Munich, 1872–1877); J. B. Schöpf, *Tiroler Idiotikon* (Innsbruck, 1866); M. Lexer, *Kärntisches Wörterbuch* (1862); H. Gradl, *Egerländer Wörterbuch*, i. (Eger, 1883); A. F. C. Vilmar, *Idiotikon von Kurhessen* (Marburg, 1883) (with supplements by H. von Pfister); W. Crecelius, *Oberhessisches Wörterbuch* (Darmstadt, 1890–1896). Professor J. Franck is responsible for a *Rheinisches Wörterbuch* for the Prussian Academy.

[4] Cf. the article "Mundarten" by R. Loewe in R. Bethge, *Ergebnisse und Fortschritte der germanistischen Wissenschaft* (Leipzig, 1902), pp. 75-88; and F. Mentz, *Bibliographie der deutschen Mundartforschung* (Leipzig, 1892). Of periodicals may be mentioned *Deutsche Mundarten* (Vienna, J. W. Nagl (Vienna, 1896 ff.); *Zeitschrift für hochdeutsche Mundarten*, by O. Heilig and Ph. Lenz (Heidelberg, 1900 ff.), continued as *Zeitschrift f. deutsche Mundarten*, Verlag des Allgemeinen Deutschen Sprachvereins. Owing to its importance as a model for subsequent monographs J. Kintzler's *Die Kerenzer Mundart des Kantons Glarus* (Leipzig, 1876) should not be passed unnoticed.

[5] Cf. especially H. Tümpel, "Die Mundarten des alten niedersächsischen Gebietes zwischen 1300 und 1500" (Paul und Braune's *Beiträge*, ix. pp. 1-129); and *Niederdeutsche Studien*, by the same writer (Bielefeld, 1898); Bahnke, "Über Sprach- und Gaugrenzen zwischen Elbe und Weser" (*Jahrbuch des Vereins für niederdeutsche Sprachforschung*, vii. p. 77).

[6] Upper Saxon and Thuringian are sometimes taken as a separate group.

[7] Cf. W. Braune, "Zur Kenntnis des Fränkischen" (*Beiträge*, i. pp. 1-56); O. Böhme, *Zur Kenntnis des Oberfränkischen im 13. 14. und 15. Jahrh.* (Dissertation) (Leipzig, 1893), where a good account of the differences between the Rhenish Franconian and South Franconian dialects will be found.

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Franconian and (*b*) Rhenish Franconian. The former of these,[1] which with its *dat, wat, allet,* &c. (cf. above) and its retention of the voiced spirant *b* (written *v*) represents a kind of transition dialect to Low German, is itself divided into (*a*) Ripuarian or Low Rhenish with Cologne and Aachen (Aix-la-Chapelle) as centres, and (*β*) Moselle Franconian[2] with Trier (Treves) as principal town. The latter is distinguished by the fact that in the Middle High German period it shifts Germanic *-rp-* and *-rd-*, which are retained in (*a*), to *-rf-* and *-rt-* (cf. *werfen, hirtin* with *werpen, hirdin*).[3] The Rhenish Franconian dialect is spoken in the Rhenish palatinate, in the northern part of Baden (Heidelberg), Hesse[4] and Nassau, and in the German-speaking part of Lorraine. A line drawn from Falkenberg at the French frontier to Siegen on the Lahn, touching the Rhine at Bonn-Boppard, roughly indicates the division between Middle and Rhenish Franconian.

2. *The Upper German Group.*—The Upper German dialects, which played the most important part in the literature of the early periods, may be divided into (*a*) a Bavarian-Austrian group and (*b*) a High Franconian-Alemannic group. Of all the German dialects the Bavarian-Austrian has carried the soundshifting to its furthest extreme; here only do we find the labial voiced stop *b* written *p* in the middle of a word, viz old Bavarian *kâpamês*, old Alemannic *kâbamês* (" we gave "); here too, in the 12th century, we find the first traces of that broadening of *i, ü, u* (*ü*) to *ei, au, eu*, a change which, even at the present day, is still foreign to the greater part of the Alemannic dialects. Only in Bavarian do we still find the old pronominal dual forms *ez* and *enk* (for *ihr* and *euch*). Finally, Bavarian forms diminutives in *-el* and *-erl* (*Mädel, Mäderl*), while the Franconian-Alemannic forms are and *-le* (*Mädle*). Other, on the other hand, the pronunciation of *-s* as *-sch*, especially *-st* as *-scht* (cf. *Last, Haspel*, pronounced *Lascht, Haschpel*), may be mentioned as characteristic of the Alemannic, just as the *fortis* pronunciation of initial *t* is characteristic of High Franconian, while the other Franconian and Upper German dialects employ the *lenis*.

The Alemannic dialect which, roughly speaking, is separated from Bavaria by the Lech and borders on Italian territory in the south and on French in the west, is subdivided into: (*a*) Swabian, the dialect of the kingdom of Württemberg and the north-western part of Tirol (cf. H. Fischer, *Geographie der schwäbischen Mundart*, 1895); (*b*) High Alemannic (Swiss), including the German dialects of Switzerland, of the southern part of the Black Forest (the Basel-Breisgau dialect), and that of Vorarlberg; (*c*) Low Alemannic, comprising the dialects of Alsace and part of Baden (to the north of the Feldberg and south of Rastatt), as the germans call the town of Basel. Only Swabian has taken part in the change of *i* to *ei*, &c., mentioned above, while initial Germanic *k* has been shifted to *ch* (χ) only in High Alemannic (cf. *chalt, chind, chorn*, for *kalt, kind, korn*). The pronunciation of *ü* as *ü*, *ü* (*Hüs* for *Haus*) is peculiar to Alsatian.

The High Franconian dialects, that is to say, east and south (or south-Rhenish) Franconian, which are separated broadly speaking by the river Neckar, comprise the language spoken in a part of Baden, the dialects of the Main valley from Würzburg upwards to Bamberg, the dialect of Nuremberg and probably of the Vogtland (Plauen) and Egerland. During the older historical period the principal difference between East and South Franconian is apparent in the fact that initial Germanic *d* was retained in the latter dialect, while East Franconian shifted it to *t*. Both, like Bavarian and Alemannic, shift initial Germanic *p* to the affricate *pf*.

Finally, the Bavarian-Austrian dialect is spoken throughout the greater part of the kingdom of Bavaria (*i.e.* east of the Lech and a line drawn from the point where the Lech joins the Danube to the sources of the rivers Elster and Mulde, this being the East Franconian border-line), in Austria, Styria, Bohemia, and in the German linguistic "islands" embedded in Hungary, in Gottschee and the Sette and Tredici Communi (cf. above).[5]

The Old High German Period

The language spoken during the Old High German period, that is to say, down to about the year 1050, is remarkable for the fulness and richness of its vowel-sounds in word-stems as well as in inflections. Cf. *elslenti, Elend*; *luginari, Lügner*; *karkari, Kerker*; *menniskono slahta, Menschengeschlecht*; *herzono, Herzen* (gen. pl.); *furisto, vorderste*; *harlost, (am) härtesten*; *sibunzug, siebzig*; *siohemes, (wir) sehen*; *salbota, (er) sallte*; *gauorahtos, (du) wirktest*, &c. Of the consonantal changes which took place during this period that of the spirant *th* (preserved only in English) to *d* (*werthan, werdan*; *theob, deob*) deserves mention. It spread from Upper Germany, where it is noticeable as early as the 8th century to Middle and finally, in the 11th and 12th centuries, to Low Germany. Further, the initial *h* in *hl, hn, hr, hw* (cf. *hwer, wer*; *hreini rein*; *hlahhan, lachen*) and *w* in *wr* (*wreccea, Recke*) disappeared, this change also setting in in Upper Germany and spreading slowly north. The most important vowel-change is the so-called mutation (*Umlaut*),[6] that is to say, the qualitative change of a vowel (except *i*) in a stem-syllable, owing to the influence of *a* or *j* in the following syllable. This process commenced in the north where it seems to have been already fully developed in Low German as early as the 8th century. It is to be found, it may be noted, in Anglo-Saxon, as early as the 6th century. It gradually worked its way southwards to Middle and Upper Germany where, however, certain consonants seem to have protected the stem syllable from the influence of *i* in a following syllable. Cf., for instance, Modern High German *drucken* and *drücken*; *glauben, kaufen, Haupt*, words which in Middle German dialects show mutation. Orthography does not, however, in this case is, during the first period, only to be seen in the change of *â* to *e*; from the 10th century onwards there are, it is true, some traces of other changes, and vowels like *â, ô, ou* must have already been affected, otherwise we could not account for the mutation of these vowels at a period when the cause of it, the *i* or *j*, no longer existed. A no less important change, for it helped to differentiate High from Low German, was that of Germanic *ê* (a closed *ê*-sound) and *ô* diphongs in Old High German, which were retained in Old Low German. Cf. O.H.G. *hêr, hear, hiar*, O.L.G. *hêr*; O.H.G. *fuoz*, O.L.G. *fôt*. The final result was that in the 10th century *se* (older forms, *ia, ea*) and *uo* (older *ua, oa* in Alemannic, *ue* in South Franconian) had asserted themselves throughout all the High German dialects. Again while in Old High German the older diphthongs *ei* and *au* were preserved as *ei* and *ou*, unless they happened to stand at the end of a word or were followed by certain consonants (*h, w, r* in the one case, and *t, s, f, n, d, l, z, r* in the other; cf. *zeh* (*ten*), *zehan, zehanzug, zehanzo, zehan, verlôs*, &c.), the Old Low German shows throughout the monophthongs *ê* (in Middle Low German a closed sound) and *ô* (cf. O.L.G. *stên, ôga*). These monophthongs are also to be heard in Rhenish Franconian, the greater part of East Franconian and the Upper Saxon and Silesian dialects of modern times (cf. *Stein*: *Steen* or *Stan*; *laufen*: *lofen* or *lopen*).

Of the dialects enumerated above, Bavarian and Alemannic, High and Rhenish Franconian as well as Old Saxon are more or less represented in the literature of the first period. But this literature, the chief monuments of which are Otfrid's *Evangelienbuch* (in South Franconian), the Old Saxon *Heliand* (a life of Christ in alliterative verse), the translation of Tatian's *Harmony* (East Franconian) and that of a theological tract by Bishop Isidore of Seville and of parts of the Bible (Rhenish Franconian), is almost exclusively theological and didactic in character. One is consequently inclined to attach more value to the scanty remains of the *Hildebrandslied* and some interesting and ancient charms. The didactic spirit again pervades the translations and commentaries of Notker of St Gall in the early part of the 11th century, as well as a paraphrase of the *Song of Songs* by an abbot William of Elsenberg a little later. Latin, however, reigned supreme throughout this period, it being the language of the charters, the lawbooks (there is nothing in Germany to compare with the laws of the Anglo-Saxons), of science, medicine, and even poetry. It is thus needless to say that there was no recognized literary language (*Schriftsprache*) during this period, nor even any attempt to form one; at most, we might speak of schools in the large monasteries, such as Reichenau, St Gall, Fulda, which contributed to the spread and acceptance of certain orthographical rules.

The Middle High German Period

The following are the chief changes in sounds and forms which mark the development of the language in the Middle High German period. The orthography of the MSS. reveals a much more extensive employment of mutation (*Umlaut*) than was the case in the first period; we find, for instance, as the mutation of *o, ô*, of *ô, œ, of ü, ü* (ü), of *uo, ue*, of *ou, öu*, and *eu* (cf. *höler, hœse, güete, bäume*), although many scribes, and more especially those of Middle and Low German districts, have no special signs for the mutation of *ü, ü*, and *o*. Of special interest is the so-called "later (or weaker)

[1] Cf. C. Nörrenberg, "Lautverschiebungsstufe des Mittelfränkischen" (*Beiträge*, ix. 371 ff.); R. Heinzel, *Geschichte der niederfränkischen Geschäftsprache* (Paderborn, 1874).

[2] This is also the dialect of the so-called Siebenbürger Sachsen.

[3] Cf. E. Sievers, *Oxforder Benediktinerregel* (Halle, 1887), p. xvi.; J. Meier, *Jolande* (1887), pp. vii. ff.; O. Böhme, *l.c.* p. 60.

[4] Lower Hesse (the northern and eastern parts) goes, however, in many respects its own way.

[5] On the High German dialects cf. K. Weinhold, *Alemannische Grammatik* (Berlin, 1863); F. Kauffmann, *Geschichte der schwäbischen Mundart* (Strassburg, 1870); E. Haendcke, *Die mundartlichen Elemente in den elsässischen Urkunden* (Strassburg, 1894); K. Weinhold, *Bairische Grammatik* (1867); J. A. Schmeller, *Die Mundarten Bairens* (Munich, 1821); J. v. Schwäbl, *Die albbairischen Mundarten* (München, 1903); O. Brenner, *Mundarten und Schriftsprache in Bayern* (Bamberg, 1890); J. Schatz, *Die Mundart von Imst* (Strassburg, 1897); J. W. Nagl, *Der Vocalismus der bairisch-österreichischen Mundarten* (1890–1891); W. Gradl, *Die Mundarten Westböhmens* (Munich, 1896); P. Lessiak, "Die Mundart von Pernegg in Kärnten" (Paul and Braune, *Beiträge*, vol. xxvii.).

[6] Cf., for a hypothesis of two *Umlaut*s *perioden* during the Old High German time, F. Kauffmann, *Geschichte der schwäbischen Mundart* (Strassburg, 1890), S. 152.

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mutation " *(jüngerer oder schwächerer Umlaut)* of *á* to a very open *e* sound, which is often written *ä*. Cf. *mähte* (O.H.G. *mahti*), *mägede* (O.H.G. *magadi*). The earlier mutation of this sound produced an *é(ê)*, a closed sound (*i.e.* nearer i). Cf. *geste* (O.H G. *gesti*).

The various Old High German vowels in unstressed syllables were either weakened to an indifferent (e sound *geben*, O.H.G. *geban*) *bote*, O.H.G. *boto*; *sige*, O.H.G. *sigu*) or disappeared altogether. The latter phenomenon is to be observed after *i* and *r*, and partly after *n* and *m* (cf. *ar(e)*, O.H.G. *aro*; *sal*, O.H.G. *salo*; *wundern*, O.H.G. *wuntarôn*, &c.; but it by no means took place consistently even in the same degree and at the same time. It has been already noted that the Alemannic dialect (as well as the archaic poets of the German national epic) retained at least the long unstressed vowels until as late as the 14th century (*gemeret*, *gerwegete*, &c.), and Low and Middle German preserved the weakened *e* sound in many cases where Upper German dropped it. In this period the beginnings are also to be seen in Low and Middle German (Heinrich von Veldeke) shows the first traces of it) of a process, which took place of great importance for the formation of the Modern German literary language. This is the lengthening of originally short vowels in open syllables,[1] for example, in Modern High German *Täges*, *Wèges*, *lôbe* (Middle High German *tâges*, *wæges*, *lôbe*). In Austria, on the other hand, there began as far back as the first half of the 12th century another movement of equal importance for Modern High German, namely, the conversion of the long vowels, *î*, *û*, *iu*, into *ei* (*ou*), *au*, *eu* (*äu*). It is, therefore, in MSS. written in the south-east that we find forms like *zeit*, *lauter* (*lûter*), *heute*, &c., for the first time. With the exception of Low German and Alemannic—Swabian, however, follows in this respect the majority—all the German dialects participated in this change between the 13th and 16th centuries, although not all to the same degree. The change was perhaps assisted by the influence of the literary language which had recognized the new sounds. In England the same process has led to the modern pronunciation of *I*, *house*, &c., and in Holland to that of *hijd*, *huis*, &c. F. Wrede (*Zeitschrift für deutsche Alterton* xxix. 257 ff.) has suggested that the explanation of the change is to be sought in the apocope and syncope of the final *e*, and the greatest stress which was in consequence put on the stem-syllable. The tendency be a change in the opposite direction, namely, the narrowing of diphthongs to monophthongs, is to be noticed in Middle German dialects, *i.e.* in dialects which resisted the apocope of the final *e*, where *ie*, *uo*, *ie* become *î*, *û*, *iu*; thus we have for *Brief*, *brîf*, for *huon*, *hun*, for *briuder*, *brûder*, and this no was taken over into the Modern High German literary language.[2]

No consonantal change was so widespread during this period as that of initial *t* to *tsch* before *l*, *n*, *m*, *w*, *p* and *t*. Cf. *stingen*, *schlingen*; *twer* (*e*) *n*, *schwirren*, &c. The forms *tschl-* and *tschn-* are also to be met with in Alemannic MSS., but they were discarded again, although modern German recognizes the pronunciation *schp*, *scht*.[3] With regard to changes affecting the inflections of verbs and nouns, it must suffice here to point out that the weakening or disappearance of vowels in unstressed syllables necessarily affected the characteristic endings of the older language; groups of verbs and substantives which in Old High German were distinct now become confused. This is best seen in the case of the weak verbs, where the four Old High German classes (cf. *nerien*, *salbôn*, *dagên*) were fused into one. Similarly in the declensions we find an increasing tendency of certain forms to influence substantives belonging to other classes; there is, for instance, an increase in the number of neuter nouns taking *-er* (*-ir*) in the plural, and of those which show mutation in the plural on the model of the *i*- stems (O.H.G. *gast*, pl. *gesti*; cf. forms like *ban*, *benne*; *halt*, *helze*; *wald*, *welde*). Of changes in syntax the gradual decay in the use of the genitive case dependent on a noun or governed by a verb (cf. constructions like *eine brunne rotes goldes*, or *des todes wünschen*) towards the end of the period, and also the disappearance of the Old High German sequence of tenses ought at least to be mentioned.

In the Middle High German period, the first classical period of German poetry, the German language made great advances as a vehicle of literary expression; its power of expression was increased and it acquired a beauty of style hitherto unknown. This was the period of the *Minnesang* and the great popular and court epics, of Walther von der Vogelweide, Hartmann von Aue, Wolfram von Eschenbach and Gottfried von Strassburg; it was a period when literature enjoyed the fostering care of the courts and the nobility. At the same time German prose celebrated its first triumphs in the sermons of Berthold von Regensburg, and in the mystic writings and sermons of Meister Eckhart, Tauler and others. History (Eike von Repkow's *Wellichronik*) and law (*Sachsenspiegel*, *Schwabenspiegel*) no longer despised the vernacular, and from about the middle of the 13th century German becomes, in an ever-increasing percentage, the language of deeds and charters.

It has been a much debated question how far Germany in Middle High German times possessed or aspired to possess a *Schriftsprache* or literary language.[4] About the year 1200 there was undoubtedly a marked tendency towards a unification of the literary language on the part of the more careful poets like Walther von der Vogelweide, Hartmann von Aue and Gottfried von Strassburg; they avoid more particularly in their rhymes, dialectic peculiarities, such as the Bavarian dual forms *es* and *enk*, or the long vowels in unstressed syllables, retained in Alemannic, and they do not make use of archaic words or forms. We have also a right to speak, in the case of Middle High German literary language in the widest sense of the word, at least of a Middle High German *Dichtersprache* or poetic language, on an Alemannic-Franconian basis. Whether, or in how far, this may have affected the Middle High German speech of the courts, is a matter of conjecture; but it had an undeniable influence on Middle and Low German poets, who endeavoured at least to use High German forms in their rhymes. Attempts were also made in Low German districts, though to a later stage of this period, to purify the dialects and raise them to the level of an accepted literary language. It will be shown later why these attempts were unsuccessful. Unfortunately, however, the efforts of the High German poets to form a uniform language were also shortlived; by the end of the 13th century the *Dichtersprache* had disappeared, and the dialects again reigned supreme.

Modern High German

Although the Middle High German period had thus not succeeded in effecting any permanent advance in the direction of a uniform literary language, the desire for a certain degree of uniformity was never again entirely lost. At the close of the 13th century literature had passed from the hands of the nobility to those of the middle classes of the towns; the number of writers who used the German tongue rapidly increased; later the invention of printing, the increased efficiency of the schools, and above all the religious movement of the Reformation, contributed to awakening the desire of being understood not only by those who dwelt outside the dialectic community of the individual. A single authoritative form of writing and spelling was felt on all sides to be particularly necessary. This was found in the language used officially by the various chanceries (*Kanzleien*), and more especially the Saxon chancery since the days of Charles IV. (1347–1378) the latter had striven after a certain uniform language in the documents it issued, and by the time of Maximilian I. (1493–1519) all its official documents were characterized by pretty much the same phonology, forms and vocabulary, in whatever part of Germany they originated. And under Maximilian's successor, Charles V., the conditions remained pretty much the same. The fact that the seat of the imperial chancery had for a long time been in Prague, led to a mingling of Upper and Middle German sounds and inflections; but when the crown came with Frederick III. (1440–1493) to the Habsburgs, the Upper German elements were considerably increased. The chancery of the Saxon electorate, whose territory was exclusively Middle German, had to contend, under the influence of the imperial chancery, allowed Upper German characteristics to influence its official language. This is clearly marked in the second half of the 15th century, and about the year 1500 there was no essential difference in the language used in the two chanceries. Thuringia, Silesia and Brandenburg soon followed suit, and even Low German could not ultimately resist the accepted High German notation (*ô*, *ê*, *û*, *î*, *ê*, *iu*, &c.). We have here very favourable conditions for the creation of a uniform literary language, and, as has already been said, the tendency to follow these authorities is clearly marked.

In the midst of this development arose the imposing figure of Luther who, although by no means the originator of a common High German speech, helped very materially to establish it. He deliberately chose (cf. the often quoted passage in his *Tischreden*, ch. 69) the language of the Saxon chancery as the vehicle of his Bible translation and subsequently of his own writings. The differences between Luther's usage and that of the chancery, in phonology and inflection, are small; still he shows, in his writings subsequent to 1524, a somewhat more pronounced tendency towards Middle German. But it is noteworthy that he, like the chancery, maintained the old vowel-change in the singular and plural of the preterite of the strong verbs (*i.e. steig*, *stigen*; *starb*, *sturben*), although before Luther's time the uniformity of the modern preterite had already begun to show itself here and there. The adoption of the language

[1] Cf. W. Wilmanns, *Deutsche Grammatik*, i. (2nd edition) pp. 300-304.

[2] Wilmanns, *l.c.* pp. 273-280. It might be mentioned that, in Modern High German, these new diphthongs are neither in spelling nor in educated pronunciation distinguished from the older ones.

[3] Cf. Wilmanns, pp. 280-284.

[4] *Ibid.* pp. 129-132.

[5] Cf. K. Lachmann, *Kleinere Schriften*, i. p. 161 ff.; Müllenhoff and Scherer's *Denkmäler* (3rd ed.), i. p. xxvii.; H. Paul, *Gab es eine mhd. Schriftsprache?* (Halle, 1873); E. Behaghel, *Zur Frage nach einer mhd. Schriftsprache* (Basel, 1886) (Cf. Paul and Braune's *Beiträge*, xiii. p. 464 ff.); A. Socin, *Schriftsprache und Dialekte* (Heilbronn, 1888); H. Fischer, *Zur Geschichte des Mittelhochdeutschen* (Tübingen, 1889); O. Behaghel, *Schriftsprache und Mundart* (Giessen, 1896); K. Zwierzina, *Beobachtungen zum Reimgebrauch Hartmanns und Wolframs* (Halle, 1898); S. Singer, *Die mhd. Schriftsprache* (1900); C. Kraus, *Heinrich von Veldeke und die mhd. Dichtersprache* (Halle, 1899); G. Roethe, *Die Reimvorreden des Sachsenspiegels* (Berlin, 1899); H. Tümpel, *Niederdeutsche Studien* (1898).

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of the chancery gave rise to the mixed character of sounds and forms which is still a feature of the literary language of Germany. Thus the use of the monophthongs *i*, *u*, and *ü*, instead of the old diphthongs *ie*, *uo* and *üe*, comes from Middle Germany; the forms of the words and the gender of the nouns follow Middle rather than Upper German usage, whereas, on the other hand, the consonantal system (*p* to *pf*; *d* to *t*) betrays in its main features its Upper German (Bavarian-Austrian) origin.

The language of Luther no doubt shows greater originality in its style and vocabulary (cf. its influence on Goethe and the writers of the *Sturm und Drang*), for in this respect the chancery could obviously afford him but scanty help. His vocabulary is drawn to a great extent from his own native Middle German dialect, and the fact that, since the 14th century, Middle German literature (cf. for instance, the writings of the German mystics, at the time of and subsequent to Eckhart) had exercised a strong influence over Upper Germany, stood him in good stead. Luther is, therefore, strictly speaking, not the father of the modern German literary language, but he forms the most important link in a chain of development which began long before him, and did not reach its final stage until long after him. To idefine that Luther's language made any rapid conquest of Germany would not be correct. It was, of course, immediately acceptable to the eastern part of the Middle German district (Thuringia and Silesia), and it did not find any great difficulty in penetrating into Low Germany, at least into the towns and districts lying to the east of the Saale and Elbe (Magdeburg, Hamburg). One may say that about the middle of the 16th century Luther's High German was the language of the chanceries, about 1600 the language of the pulpit (the last Low German was pronounced heretical at Goslar in 1621) and the printing presses. Thus the aspirations of Low Germany to have a literary language of its own were at an early stage crushed. Protestant Switzerland, on the other hand, resisted the "uncommon new German" well into the 17th century. It was also natural that the Catholic Lower Rhine (Cologne) and Catholic South Germany held out against it, for to adopt the language of the reformer would have seemed tantamount to offering a helping hand to Protestant ideas. At the same time, geographical and political conditions, as well as the pronounced character of the Upper German dialects, formed an important obstacle to a speedy unification. South German grammarians of the 16th century, such as Laurentius Albertus, raise a warning voice against those who although far distant from the proper use of words and the true pronunciation, venture to teach *nos puriores Germanos*, namely, the Upper Germans.

In 1593 J. Helber, a Swiss schoolmaster and notary, spoke of three separate dialects as being in use by the printing presses:[1] (1) *Mitteldeutsch* (the language of the printers in Leipzig, Erfurt, Nuremberg, Würzburg, Frankfort, Mainz, Spires, Strassburg and Cologne); at the last mentioned place in the event of their attempting to print *Ober-Teutsch*); (2) *Donawisch* (the printers' language in South Germany, but limited to Bavaria and Swabia proper—here more particularly the Augsburg idiom, which was considered to be particularly *sierlich*);[2] (3) *Oestlich Reinisch*, which corresponds to Swiss German. Thus in the 16th century Germany was still far from real unity in its language; but to judge from the number and the geographical position of the towns which printed in *Mitteldeutsch* it is pretty clear which idiom would ultimately predominate. During the 17th century men like M. Opitz (*Buch von der deutschen Poeterey*) and J. G. Schottelius (*Teutsche Sprachkunst*, 1641, and *Von der teutschen Sprachkunst*, 1663), together with linguistic societies like the *Fruchtbringende Gesellschaft* of Nuremberg or *Pegnitzschäfer* did a great deal to purify the German language from foreign (especially French) elements; they insisted on the claims of the vernacular to a place beside and even above Latin (in 1687 Christian Thomasius held for the first time lectures in the German language at the university of Leipzig), and they established a firm grammatical basis for Luther's common language, which especially in the hymnals had become modernized and more uniform. About the middle of the 17th century the disparity between the vowels of the singular and plural of the preterite of the strong verbs practically ceases; under East Middle German influence the final *e* is restored to words like *Knabe*, *Jude*, *Pfaffe*, which in South German had been *Knab*, &c.; the mixed declension (*Herr*, *Ehrer*, *Schmerz*, *Schmerzen*) was established, and the plural in *-er* was extended to some masculine nouns (*Wald*, *Wälder*);[3] the use of the mutated sound has now become the rule as a plural sign (*Väter*, *Bäume*). How difficult, even in the first half of the 18th century, it was for a Swiss to write the literary language which Luther had established is to be seen from the often quoted words of Haller (1708–1777): "I am a Swiss, the German language is strange to me, and its choice of words was almost unknown to me." The Catholic south clung firmly to its own literary language, based on the idiom of the imperial chancery, which was still an influential force in the 17th century or on local dialects. This is apparent in the writings of Abraham a Sancta Clara,[4] who died in 1709, or in the attacks of the Benedictine monk, Augustin Dornblüth, on the *Meissner Schriftsprache* in 1755.

In the 18th century, to which these names have introduced us, the grammatical writings of J. C. Gottsched (*Deutsche Sprachkunst*, 1748) and J. C. Adelung (*Grammatisch-kritisches Wörterbuch der hochdeutschen Mundart*, 1774–1786) exercised a decisive and far-reaching influence. Gottsched took as his basis the spoken language (*Umgangssprache*) of the educated classes of Upper Saxony (Meissen), which at this time approximated as nearly as possible to the literary language. His *Grammar* did enormous services to the cause of unification, ultimately winning over the resisting south; but he carried his purism to pedantic lengths, he would tolerate no archaic or dialectical words, no unusual forms or constructions, and consequently made the language unsuited for poetry. Meanwhile an interest in Old German literature was being awakened by Bodmer; Herder drew a better ideas on the nature of language, and insisted on the value of native idioms; and the *Sturm und Drang* led by Goethe encouraged all individualistic tendencies. All this gave rise to a movement counter to Gottsched's absolutism, which resulted in the rejection of many obsolete forms and usages, these being drawn partly from Luther's Bible translation (cf. V. Hehn, "Goethe und die Sprache der Bibel," in the *Goethe-Jahrbuch*, viii. p. 187 ff.), partly from the older language and partly from the vocabulary peculiar to the different social ranks.[4] The latter class is still a source of linguistic innovations. German literary style underwent a similar rejuvenation, for we are on the threshold of the second classical period of German literature. It had strengthened Gottsched's hand as a linguistic reformer that the earlier leaders of German literature, such as Gellert, Klopstock and Lessing, were Middle Germans; now Wieland's influence, which was particularly strong in South Germany, helped materially towards the establishment of the accepted literary language throughout all German-speaking countries; and the movement reaches its culmination with Goethe and Schiller. At the same time this unification did not imply the creation of an unalterable standard; for, just as the language of Opitz and Schottelius differs from that of Luther, so—although naturally in a lesser degree—the literary language of our day differs from that of the classic writers of the 18th century. Local peculiarities are still to be met with, as is to be seen in the modern German literature that emanates from Switzerland or Austria.

But this unity, imperfect as it is, is limited to the literary language. The differences are much more sharply accentuated in the *Umgangssprache* whereby we understand the language as it is spoken by educated people throughout Germany; that is not only the case with regard to pronunciation, although it is naturally most noticeable here, but also with regard to the choice of words and the construction of sentences. Compared with the time of Goethe and Schiller a certain advance towards unification has undoubtedly been made, but the differences between north and south are still very great. This is particularly noticeable in the pronunciation of *r*—either the uvular *r* or the dental *r* produced by the tip of the tongue; of the voiced and voiceless stops, *b*, *p*, *d*, *t*, *g* and *k*; of the sounds of the diphthongs; of the long vowels *ē* and *ō*e, &c. (cf. W. Vietor, *German Pronunciation*, 2nd ed., 1890). The question as to whether a unified pronunciation is desirable (*Einheitsaussprache*) or even possible has occupied the attention of academies, scholars and the educated public during recent years, and in 1898 a commission made up of scholars and theatre directors drew up a scheme of pronunciation which was first adopted by the royal theatres of Berlin, and since been recommended to all German theatres by the German *Bühnenverein*. Desirable as such a uniform pronunciation is for the national theatre, it is a much debated question how far it should be adopted in the ordinary speech of every-day life. Some scholars, such as W. Braune, declared themselves strongly in favour of its adoption;[5] Braune's

[1] For literature bearing on the complicated question of the *Druckersprachen*, readers are referred to the article "Neuhochdeutsche Schriftsprache," by W. Scheel, in Bethge's *Ergebnisse . . . der germanistischen Wissenschaft* (1901), pp. 47, 50 ff. Cf. also K. von Bahder, *Grundlagen des nhd. Lautsystems* (1890), pp. 15 ff.

[2] A German *Priamel* mentions as an essential quality in a beautiful woman: "die red dort her von Swaben."

[3] Cf. for a detailed discussion of the noun declension, K. Boiunga, *Die Entwickelung der mhd. Substantivflexion* (Leipzig, 1890); and, more particularly for the masculine and neuter nouns, two articles by H. Molz, "Die Substantivflexion seit mhd. Zeit," in Paul and Braune's *Beiträge*, xxvii. p. 209 ff. and xxxi. 277 ff. For the changes in the gender of nouns, A. Polzin, *Geschlechtswandel der Substantiva im Deutschen* (Hildesheim, 1903).

[4] Cf. C. Blanckenburg, *Studien über die Sprache Abrahams a S. Clara* (Halle, 1897); H. Strigl, "Einiges über die Sprache des P. Abraham a Sancta Clara (*Zeitschr. f. deutsche Wortforschung*, viii. 206 ff.).

[5] Cf. F. Kluge, *Etymologisches Wörterbuch* (6th ed.), pp. 508 ff. One can speak of: *Studenten-*, *Soldaten-*, *Weidmanns-*, *Bergmanns-*, *Drucker-*, *Juristen-*, und *Zigeunersprache*, und *Rotwelsch*. Cf. F. Kluge, *Die deutsche Studentensprache* (Strassburg, 1894); *Rotwelsch* i. (Strasburg, 1901); R. Bethge, *Ergebnisse*, &c., pp. 55 f.

[6] Cf. H. Wunderlich, *Unsere Umgangssprache* (Weimar, 1894).

[7] Cf. Th. Siebs, *Deutsche Buhnenaussprache* (2nd ed., Berlin, 1901), and the same writer's *Grundzüge der Bühnensprache* (1900).

[8] W. Braune, *Über die Einigung der deutschen Aussprache* (Halle, 1905); and the review by O. Brenner, in the *Zeitschrift des allgemeinen deutschen Sprachvereins*, Beihefte iv. 27, pp. 228-232.

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argument being that the system of modern pronunciation is based on the spelling, not on the sounds produced in speaking. The latter, he holds, is only responsible for the pronunciation of *-chs-* as *-ks-* in *wachsen, Ochse*, &c., or for that of *sp-* and *st-* in *spielen, stehen*, &c. Other scholars, again, such as Sievers and O. Brenner, warn against any such attempts to create a living language on an artificial basis;[1] the *Bühnendeutsch* or "stage-German" they regard as little more than an abstract ideal. Thus the decision must be left to time.

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Mention must also be made of the work of the German commission of the Royal Prussian Academy, which in 1904 drew up plans for making an inventory of all German literary MSS. dating from before the year 1600 and for the publication of Middle High German and early Modern High German texts. This undertaking, which has made considerable progress, promises rich material for the study of the somewhat neglected period between the 14th and 16th centuries; at the same time it provides a basis on which a monumental history of Modern High German may be built up, as well as for a *Thesaurus linguae germanicae*. (R.Pr.)

[1] Cf. K. Luick, *Deutsche Lautlehre mit besonderer Berücksichtigung der Sprechweise Wiens und der österreichischen Alpenländer* (1904); O. Brenner, "Zur Aussprache des Hochdeutschen," *l.c.*, pp. 218-228.

GERMAN LITERATURE. Compared with other literatures, that of the German-speaking peoples presents a strangely broken and interrupted course; it falls into more or less isolated groups, separated from each other by periods which in intellectual darkness and ineptitude are virtually without a parallel in other European lands. The explanation of this irregularity of development is to be sought less in the chequered political history of the German people—although this was often reason enough—than in the strongly marked, one might almost say, provocative character of the national mind as expressed in literature. The Germans were not able, like their partially latinized English cousins—or even their Scandinavian neighbours—to adapt themselves to the various waves of literary influence which emanated from Italy and France and spread with irresistible power over all Europe; their literary history has been rather a struggle for independent expression, a constant warring against outside forces, even when the latter—like the influence of English literature in the 18th century and of Scandinavian at the close of the 19th—were hailed as friendly and not hostile. It is a peculiarity of German literature that in those ages when, owing to its own poverty and impotence, it was reduced to borrowing its ideas and its poetic forms from other lands, it sank to the most servile imitation; while the first sign of returning health has invariably been the repudiation of foreign influence and the assertion of the right of genius to untrammelled expression. Thus Germany's periods of literary efflorescence rarely coincide with those of other nations, and great European movements, like the Renaissance, passed over her without producing a single great poet.

This chequered course, however, renders the grouping of German literature and the task of the historian the easier. The first and simplest classification is that afforded by the various stages of linguistic development. In accordance with the three divisions in the history of the High German language, there is an Old High German, a Middle High German and a New High German or Modern High German literary epoch. It is obvious, however, that the last of these divisions covers too enormous a period of literary history to be regarded as analogous to the first two. The present survey is consequently divided into six main sections:

I. The Old High German Period, including the literature of the Old Saxon dialect, from the earliest times to the middle of the 11th century.

II. The Middle High German Period, from the middle of the 11th to the middle of the 14th century.

III. The Transition Period, from the middle of the 14th century to the Reformation in the 16th century.

IV. The Period of Renaissance and Pseudo-classicism, from the end of the 16th century to the middle of the 18th.

V. The Classical Period of Modern German literature, from the middle of the 18th century to Goethe's death in 1832.

VI. The Period from Goethe's death to the present day.

I. The Old High German Period (*c.* 750–1050)

Of all the Germanic races, the tribes with which we have more particularly to deal here were the latest to attain intellectual maturity. The Goths had, centuries earlier, under their famous bishop Ulfilas or Wulfila, possessed the Bible in their vernacular, the northern races could point to their *Edda*, the Germanic tribes in England to a rich and virile Old English poetry, before a written German literature of any consequence existed at all. At the same time, these continental tribes, in the epoch that lay between the Migrations of the 5th century and the age of Charles the Great, were not without poetic literature of a kind, but it was not committed to writing, or, at least, no record of such a poetry has come down to us. Its existence is vouched for by indirect historical evidence, and by the fact that the sagas, out of which the German national epic was welded at a later date, originated in the great upheaval of the 5th century. When the vernacular literature began to emerge from an unwritten state in the 8th century, it proved to be merely a weak reflection of the ecclesiastical writings of the monasteries; and this, with

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very few exceptions, Old High German literature remained. Translations of the liturgy, of Tatian's *Gospel Harmony* (*c.* 835), of fragments of sermons, form a large proportion of it. Occasionally, as in the so-called *Monsee Fragments*, and at the end of the period, in the prose of Notker Labeo (d. 1022), this ecclesiastical literature attains a surprising maturity of style and expression. But it had no vitality of its own; it virtually sprang into existance at the command of Charlemagne, whose policy with regard to the use of the vernacular in place of Latin was liberal and far-seeing; and it docilely obeyed the tastes of the rulers that followed, becoming severely orthodox under Louis the Pious, and consenting to immediate extinction when the Saxon emperors withdrew their favour from it. Apart from a few shorter poetic fragments of interest, such as the *Merseburg Charms* (*Zaubersprüche*), an undoubted relic of pre-Christian times, the *Wessobrunn Prayer* (*c.* 780), the *Muspilli*, an imaginative description of the Day of Judgment, and the *Ludwigslied* (881), which may be regarded as the starting point for the German historical ballad, the only High German poem of importance in this early period was the *Gospel Book* (*Liber evangeliorum*) of Otfrid of Weissenburg (*c.* 800–870). Even this work is more interesting as the earliest attempt to supersede alliteration in German poetry by rhyme, than for such poetic life as the monk of Weissenburg was able to instil into his narrative. In fact, for the only genuine poetry of this epoch we have to look, not to the High German but to the Low German races. They alone seemed able to give literary expression to the memories handed down in oral tradition from the 5th century; to Saxon tradition we owe the earliest extant fragment of a national saga, the *Lay of Hildebrand* (*Hildebrandslied*, *c.* 800), and a Saxon poet was the author of a vigorous alliterative version of the Gospel story, the *Heliand* (*c.* 830), and also of part of the Old Testament (*Genesis*). This alliterative epic—for epic it may be called—is the one poem of this age in which the Christian tradition has been adapted to German poetic needs. Of the existence of a lyric poetry we only know by hearsay; and the drama had nowhere in Europe yet emerged from its earliest purely liturgic condition. Such as it was, the vernacular literature of the Old High German period enjoyed but a brief existence, and in the 10th and 11th centuries darkness again closed over it. The dominant "German" literature in these centuries is in Latin; but that literature is not without national interest, for it shows in what direction the German mind was moving. The *Lay of Walter* (*Waltharilied*, *c.* 930), written in elegant hexameters by Ekkehard of St Gall, the moralizing dramas of Hrosvitha (Roswitha) of Gandersheim, the *Ecbasis captivi* (*c.* 940), earliest of all the Beast epics, and the romantic adventures of *Ruodlieb* (*c.* 1030), form a literature which, Latin although it is, foreshadows the future developments of German poetry.

II. THE MIDDLE HIGH GERMAN PERIOD (1050–1350)

(*a*) *Early Middle High German Poetry.*—The beginnings of Middle High German literature were hardly less tentative than those of the preceding period. The Saxon emperors, with their Latin and even Byzantine tastes, had made it extremely difficult to take up the thread where Notker let it drop. Williram of Ebersberg, the commentator of the *Song of Songs* (*c.* 1063), did certainly profit by Notker's example, but he stands alone. The Church had no helping hand to offer poetry, as in the more liberal epoch of the great Charles; for, at the middle of the 11th century, when the linguistic change from Old to Middle High German was taking place, a movement of religious asceticism, originating in the Burgundian monastery of Cluny, spread across Europe, and before long all the German peoples fell under its influence. For a century there was no room for any literature that did not place itself unreservedly at the service of the Church, a service which meant the complete abnegation of the brighter side of life. Repellent in their asceticism are, for instance, poems like *Memento mori* (*c.* 1050), *Vom Glauben*, a verse commentary on the creed by a monk Hartmann (*c.* 1120), and a poem on "the remembrance of death" (*Von des todes gehugede*) by Heinreich von Melk (*c.* 1150); only rarely, as in a few narrative poems on Old Testament subjects, are the poets of this time able to forget for a time their lugubrious faith. In the *Ezzolied* (*c.* 1060), a spirited lay hy a monk of Bamberg on the life, miracles and death of Christ, and in the *Annolied* (*c.* 1080), a poem in praise of the archbishop Anno of Cologne, we find, however, some traces of a higher poetic imagination.

The transition from this rigid ecclesiastic spirit to a freer, more imaginative literature is to be seen in the lyric poetry inspired by the Virgin, in the legends of the saints which bulk so largely in the poetry of the 12th century, and in the general trend towards mysticism. Andreas, Pilatus, Aegidius, Albanius are the heroes of monkish romances of that age, and the stories of Sylvester and Crescentia form the most attractive parts of the *Kaiserchronik* (*c.* 1130–1150), a long, confused chronicle of the world which contains many elements common to later Middle High German poetry. The national sagas, of which the poet of the *Kaiserchronik* had not been oblivious, soon began to assert themselves in the popular literature. The wandering *Spielleute*, the lineal descendants of the jesters and minstrels of the dark ages, who were now rapidly becoming a factor of importance in literature, were here the innovators; to them we owe the romance of *König Rother* (*c.* 1160), and the kindred stories of *Orendel*, *Oswald* and *Salomon und Markolf* (*Salman und Morolf*). All these poems bear witness to a new element, which in these years kindled the German imagination and helped to counteract the austerity of the religious faith—the Crusades. With what alacrity the Germans revelled in the wonderland of the East is to be seen especially in the *Alexanderlied* (*c.* 1130), and in *Herzog Ernst* (*c.* 1180), romances which point out the way to another important development of German medieval literature, the Court epic. The latter type of romance was the immediate product of the social conditions created by chivalry and, like chivalry itself, was determined and influenced by its French origin; so also was the version of the *Chanson de Roland* (*Rolandslied*, *c.* 1135), which we owe to another priest, Konrad of Regensburg, who, with considerable probability, has been identified with the author of the *Kaiserchronik*.

The Court epic was, however, more immediately ushered in by Eilhart von Oberge, a native of the neighbourhood of Hildesheim who, in his *Tristant* (*c.* 1170), chose that Arthurian type of romance which from now on was especially cultivated by the poets of the Court epic; and of equally early origin is a knightly romance of *Floris und Blanchefiur*, another of the favourite love stories of the middle ages. In these years, too, the Beast epic, which had been represented by the Latin *Ecbasis captivi*, was reintroduced into Germany by an Alsatian monk, Heinrich der Glichezære, who based his *Reinhart Fuchs* (*c.* 1180) on the French *Roman de Renart*. Lastly, we have to consider the beginning of the *Minnesang*, or lyric, which in the last decades of the 12th century burst out with extraordinary vigour in Austria and South Germany. The origins are obscure, and it is still debatable how much in the German Minnesang is indigenous and national, how much due to French and Provençal influence; for even in its earliest phases the Minnesang reveals correspondences with the contemporary lyric of the south of France. The freshness and originality of the early South German singers, such as Kürenberg, Dietmar von Eist, the Burggraf of Rietenburg and Meinloh von Sevelingen, are not, however, to be questioned; in spite of foreign influence, their verses make the impression of having been a spontaneous expression of German lyric feeling in the 12th century. The *Spruchdichtung*, a form of poetry which in this period is represented by at least two poets who call themselves Herger and "Der Spervogel," was less dependent on foreign models; the pointed and satirical strophes of these poets were the forerunners of a vast literature which did not reach its highest development until after literature had passed from the hands of the noble-born knight to those of the burgher of the towns.

(*b*) *The Flourishing of Middle High German Poetry.*—Such was the preparation for the extraordinarily brilliant, although brief epoch of German medieval poetry, which corresponded to the reigns of the Hohenstaufen emperors, Frederick I.

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Barbarossa, Henry VI. and Frederick II. These rulers, by their ambitious political aspirations and achievements, filled the German peoples with a sense of "world-mission," as the leading political power in medieval Europe. Docile pupils of French chivalry, the Germans had no sooner learned their lesson than they found themselves in the position of being able to dictate to the world of chivalry. In the same way, the German poets, who, in the 12th century, had been little better than clumsy translators of French romances, were able, at the beginning of the 13th, to substitute for French *chansons de geste* epics based on national sagas, to put a completely German imprint on the French Arthurian romance, and to sing German songs before which even the lyric of Provence paled. National epic, Court epic and Minnesang—these three types of medieval German literature, to which may be added as a subordinate group didactic poetry comprise virtually all that has come down to us in the Middle High German tongue. A Middle High German prose hardly existed, and the drama, such as it was, was still essentially Latin.

The first place among the National or Popular epics belongs to the *Nibelungenlied*, which received its present form in Austria about the turn of the 12th and 13th centuries. Combining, as it does, elements from various cycles of sagas—the lower Rhenish legend of Siegfried, the Burgundian saga of Gunther and Hagen, the Gothic saga of Dietrich and Etzel—it stands out as the most representative epic of German medieval life. And in literary power, dramatic intensity and singleness of purpose its eminence is no less unique. The vestiges of gradual growth—of irreconcilable elements imperfectly welded together—may not have been entirely effaced, but they in no way lessen the impression of unity which the poem leaves behind it; whoever the welder of the sagas may have been, he was clearly a poet of lofty imagination and high epic gifts (see NIBELUNGENLIED). Less imposing as a whole, but in parts no less powerful in its appeal to the modern mind, is the second of the German national epics, *Gudrun*, which was written early in the 13th century. This poem, as it has come down to us, is the work of an Austrian, but the subject belongs to a cycle of sagas which have their home on the shores of the North Sea. It seems almost a freak of chance that Siegfried, the hero of the Rhineland, should occupy so prominent a position in the *Nibelungenlied*, whereas Dietrich von Bern (*i.e.* of Verona), the name under which Theodoric the Great had been looked up to for centuries by the German people as their national hero, should have left the stamp of his personality on no single epic of the intrinsic worth of the *Nibelungenlied*. He appears, however, more or less in the background of a number of romances—*Die Rabenschlacht, Dietrichs Flucht. Alpharts Tod, Biterolf und Dietlieb, Laurin*, &c.—which make up what is usually called the *Heldenbuch*. It is tempting, indeed, to see in this very unequal collection the basis for what, under more favourable circumstances, might have developed into an epic even more completely representative of the German nation than the *Nibelungenlied*.

While the influence of the romance of chivalry is to be traced on all these popular epics, something of the manlier, more primitive ideals that animated German national poetry passed over to the second great group of German medieval poetry, the Court epic. The poet who, following Eilhart von Oberge's tentative beginnings, established the Court epic in Germany was Heinrich von Veldeke, a native of the district of the lower Rhine; his *Eneit*, written between 1173 and 1186, is based on a French original. Other poets of the time, such as Herbort von Fritzlar, the author of a *Liet von Troye*, followed Heinrich's example, and selected French models for German poems on antique themes; while Albrecht von Halberstadt translated about the year 1210 the *Metamorphoses* of Ovid into German verse. With the three masters of the Court epic, Hartmann von Aue, Wolfram von Eschenbach and Gottfried von Strassburg—all of them contemporaries—the Arthurian cycle became the recognized theme of this type of romance, and the accepted embodiment of the ideals of the knightly classes. Hartmann was a Swabian, Wolfram a Bavarian, Gottfried presumably a native of Strassburg. Hartmann, who in his *Erec* and *Iwein*, *Gregorius* and *Der arme Heinrich* combined a tendency towards religious asceticism with a desire to imbue the worldly life of the knight with a moral and religious spirit, provided the Court epic of the age with its best models; he had, of all the medieval court poets, the most delicate sense for the formal beauty of poetry, for language, verse and style. Wolfram and Gottfried, on the other hand, represent two extremes of poetic temperament. Wolfram's *Parzival* is filled with mysticism and obscure spiritual significance; its flashes of humour irradiate, although they can hardly be said to illumine, the gloom; its hero is, unconsciously, a symbol and allegory of much which to the poet himself must have been mysterious and inexplicable; in other words, *Parzival*—and Wolfram's other writings, *Willehalm* and *Titurel*, point in the same direction—is an instinctive or, to use Schiller's word, a "naïve" work of genius. Gottfried, again, is hardly less gifted and original, but he is a poet of a wholly different type. His *Tristan* is even more lucid than Hartmann's *Iwein*, his art is more objective; his delight in it is that of the conscious artist who sees his work growing under his hands. Gottfried's poem, in other words, is free from the obtrusion of those subjective elements which are in so high a degree characteristic of *Parzival*; in spite of the tragic character of the story, *Tristan* is radiant and serene, and yet uncontaminated by that tone of frivolity which the Renaissance introduced into love stories of this kind.

Parzival and *Tristan* are the two poles of the German Court epic, and the subsequent development of that epic stands under the influence of the three poets, Hartmann, Wolfram and Gottfried; according as the poets of the 13th century tend to imitate one or other of these, they fall into three classes. To the followers and imitators of Hartmann belong Ulrich von Zatzikhoven, the author of a *Lanzelet* (*c.* 1195); Wirnt von Gravenberg, a Bavarian, whose *Wigalois* (*c.* 1205) shows considerable imaginative power; the versatile Spielmann, known as "Der Stricker,"; and Heinrich von dem Türlin, author of an unwieldy epic, *Die Krone* ("the crown of all adventures," *c.* 1220). The fascination of Wolfram's mysticism is to be seen in *Der jüngere Titurel* of a Bavarian poet, Albrecht von Scharfenberg (*c.* 1270), and in the still later *Lohengrin* of an unknown poet; whereas Gottfried von Strassburg dominates the *Flore und Blanscheflur* of Konrad Fleck (*c.* 1220) and the voluminous romances of the two chief poets of the later 13th century, Rudolf von Ems, who died in 1254, and Konrad von Würzburg, who lived till 1287. Of these, Konrad alone carried on worthily the traditions of the great age, and even his art, which excels within the narrow limits of romances like *Die Herzemoere* and *Engelhard*, becomes diffuse and wearisome on the unlimited canvas of *Der Trojanerkrieg* and *Partonopier und Meliur*.

The most conspicuous changes which came over the narrative poetry of the 13th century were, on the one hand, a steady encroachment of realism on the matter and treatment of the epic, and, on the other, a leaning to didacticism. The substitution of the "history" of the chronicle for the confessedly imaginative stories of the earlier poets is to be seen in the work of Rudolf von Ems, and of a number of minor chroniclers like Ulrich von Eschenbach, Berthold von Holle and Jans Enikel; while for the growth of realism we may look to the *Pfaffe Amis*, a collection of comic anecdotes by "Der Stricker," the admirable peasant romance *Meier Helmbrecht*, written between 1236 and 1250 by Wernher der Gartenaere in Bavaria, and to the adventures of Ulrich von Lichtenstein, as described in his *Frauendienst* (1255) and *Frauenbuch* (1257).

More than any single poet of the Court epic, more even than the poet of the *Nibelungenlied*, Walther von der Vogelweide summed up in himself all that was best in the group of poetic literature with which he was associated—the Minnesang. The early Austrian singers already mentioned, poets like Heinrich von Veldeke, who in his lyrics, as in his epic, introduced the French conception of *Minne*, or like the manly Friedrich von Hausen, and the Swiss imitator of Provençal measures, Rudolf von Fenis appear only in the light of forerunners. Even more

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original poets, like Heinrich von Morungen and Walther's own master, Reinmar von Hagenau, the author of harmonious but monotonously elegiac verses, or among immediate contemporaries, Hartmann von Aue and Wolfram von Eschenbach, whose few lyric strophes are as deeply stamped with his individuality as his epics—seem only tributary to the full rich stream of Walther's genius. There was not a form of the German Minnesang which Walther did not amplify and deepen; songs of courtly love and lowly love, of religious faith and delight in nature, patriotic songs and political *Sprüche*—in all he was a master. Of Walther's life we are somewhat better informed than in the case of his contemporaries: he was born about 1170 and died about 1230; his art he learned in Austria, whereupon he wandered through South Germany, a welcome guest wherever he went, although his vigorous championship of what he regarded as the national cause in the political struggles of the day won him foes as well as friends. For centuries he remained the accepted exemplar of German lyric poetry; not merely the Minnesänger who followed him, but also the Meistersinger of the 15th and 16th centuries looked up to him as one of the founders and lawgivers of their art. He was the most influential of all Germany's lyric poets, and in the breadth, originality and purity of his inspiration one of her greatest (see WALTHER VON DER VOGELWEIDE).

The development of the German Minnesang after Walther's death and under his influence is easily summed up. Contemporaries had been impressed by the dual character of Walther's lyric; they distinguished a higher courtly lyric, and a lower more outspoken form of song, free from the constraint of social or literary conventions. The later Minnesang emphasized this dualism. Amongst Walther's immediate contemporaries, high-born poets, whose lives were passed at courts, naturally cultivated the higher lyric; but the more gifted and original singers of the time rejoiced in the freedom of Walther's poetry of *niedere Minne*. It was, in fact, in accordance with the spirit of the age that the latter should have been Walther's most valuable legacy to his successors; and the greatest of these, Neidhart von Reuental (*c.* 1180–*c.* 1250), certainly did not allow himself to be hampered by aristocratic prejudices. Neidhart sought the themes of his *höfische Dorfpoesie* in the village, and, as the mood happened to dictate, depicted the peasant with humorous banter or biting satire. The lyric poets of the later 13th century were either, like Burkart von Hohenfels, Ulrich von Winterstetten and Gottfried von Neifen, echoes of Walther von der Vogelweide and of Neidhart, or their originality was confined to some particular form of lyric poetry in which they excelled. Thus the singer known as "Der Tannhäuser" distinguished himself as an imitator of the French *pastourelle*; Reinmar von Zweter was purely a *Spruchdichter*. More or less common to all is the consciousness that their own ideas and surroundings were no longer in harmony with the aristocratic world of chivalry, which the poets of the previous generation had glorified. The solid advantages, material prosperity and increasing comfort of life in the German towns appealed to poets like Steinmar von Klingenau more than the unworldly ideals of self-effacing knighthood which Ulrich von Lichtenstein and Johann Hadlaub of Zürich clung to so tenaciously and extolled so warmly. On the whole, the *Spruchdichter* came best out of this ordeal of changing fashions; and the increasing interest in the moral and didactic applications of literature favoured the development of this form of verse. The confusion of didactic purpose with the lyric is common to all the later poetry, to that of the learned Marner, of Boppe, Rumezland and Heinrich von Meissen, who was known to later generations as "Frauenlob." The *Spruchdichtung*, in fact, was one of the connecting links between the Minnesang of the 13th and the lyric and satiric poetry of the 15th and 16th centuries.

The disturbing and disintegrating element in the literature of the 13th century was thus the substitution of a utilitarian didacticism for the idealism of chivalry. In the early decades of that century, poems like *Der Winsbeke*, by a Bavarian, and *Der welsche Gast*, written in 1215–1216 by Thomasin von Zirclaere (Zirclaria), a native of Friuli, still teach with uncompromising idealism the duties and virtues of the knightly life. But in the *Bescheidenheit* (*c.* 1215–1230) of a wandering singer, who called himself Freidank, we find for the first time an active antagonism to the unworldly code of chivalry and an unmistakable reflection of the changing social order, brought about by the rise of what we should now call the middle class. Freidank is the spokesman of the *Bürger*, and in his terse, witty verses may be traced the germs of German intellectual and literary development in the coming centuries—even of the Reformation itself. From the advent of Freidank onwards, the satiric and didactic poetry went the way of the epic; what it gained in quantity it lost in quality and concentration. The satires associated with the name of Seifried Helbling, an Austrian who wrote in the last fifteen years of the 13th century, and *Der Renner* by Hugo von Trimberg, written at the very end of the century, may be taken as characteristic of the later period, where terseness and incisive wit have given place to diffuse moralizing and allegory.

There is practically no Middle High German literature in prose; such prose as has come down to us—the tracts of David of Augsburg, the powerful sermons of Berthold von Regensburg (d. 1272), Germany's greatest medieval preacher, and several legal codes, as the *Sachsenspiegel* and *Schwabenspiegel*—only prove that the Germans of the 13th century had not yet realized the possibilities of prose as a medium of literary expression.

III. THE TRANSITION PERIOD (1350–1600)

(*a*) *The Fourteenth and Fifteenth Centuries.*—As is the case with all transitional periods of literary history, this epoch of German literature may be considered under two aspects: on the one hand, we may follow in it the decadence and disintegration of the literature of the Middle High German period; on the other, we may study the beginnings of modern forms of poetry and the preparation of that spiritual revolution, which meant hardly less to the Germanic peoples than the Renaissance to the Latin races—the Protestant Reformation.

By the middle of the 14th century, knighthood with its chivalric ideals was rapidly declining, and the conditions under which medieval poetry had flourished were passing away. The social change rendered the courtly epic of Arthur's Round Table in great measure incomprehensible to the younger generation, and made it difficult for them to understand the spirit that actuated the heroes of the national epic; the tastes to which the lyrics of the great Minnesingers had appealed were vitiated by the more practical demands of the rising middle classes. But the stories of chivalry still appealed as stories to the people, although the old way of telling them was no longer appreciated. The feeling for beauty of form and expression was lost; the craving for a moral purpose and didactic aim had to be satisfied at the cost of artistic beauty; and sensational incident was valued more highly than fine character-drawing or inspired poetic thought. Signs of the decadence are to be seen in the *Karlmeinet* of this period, stories from the youth of Charlemagne, in a continuation of *Parzival* by two Alsatians, Claus Wisse and Philipp Colin (*c.* 1335), in an *Apollonius von Tyrus* by Heinrich von Neuenstadt (*c.* 1315), and a *Königstochter von Frankreich* by Hans von Bühel (*c.* 1400). The story of Siegfried was retold in a rough ballad, *Das Lied von hürnen Seyfried*, the *Heldenbuch* was recast in *Knittlevers* or doggerel (1472), and even the Arthurian epic was parodied. A no less marked symptom of decadence is to be seen in a large body of allegorical poetry analogous to the *Roman de la rose* in France; Heinzelein of Constance, at the end of the 13th, and Hadamar von Laber and Hermann von Sachsenheim, about the middle of the 15th century, were representatives of this movement. As time went on, prose versions of the old stories became more general, and out of these developed the *Volksbücher*, such as *Loher und Maller*, *Die Haimonskinder*, *Die schöne Magelone*, *Melusine*, which formed the favourite reading of the German people for centuries. As the last monuments of the decadent narrative literature of the middle ages, we may regard the *Buch der Abenteuer* of Ulrich Füetrer, written at the end of the 15th century, and *Der Weisskönig* and *Teuerdank* by the emperor Maximilian I. (1459–1519)

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printed in the early years of the 16th. At the beginning of the new epoch the Minnesang could still point to two masters able to maintain the great traditions of the 13th century, Hugo von Montfort (1357–1423) and Oswald von Wolkenstein (1367–1445); but as the lyric passed into the hands of the middle-class poets of the German towns, it was rapidly shorn of its essentially lyric qualities; *die Minne* gave place to moral and religious dogmatism, emphasis was laid on strict adherence to the rules of composition, and the simple forms of the older lyric were superseded by ingenious metrical distortions. Under the influence of writers like Heinrich von Meissen (" Frauenlob," *c.* 1250–1318) and Heinrich von Mügeln in the 14th century, like Muskatblut and Michael Beheim (1416–*c.* 1480) in the 15th, the Minnesang thus passed over into the Meistergesang. In the later 15th and in the 16th centuries all the south German towns possessed flourishing Meistersinger schools in which the art of writing verse was taught and practised according to complicated rules, and it was the ambition of every gifted scholar to rise through the various grades from *Schüler* to *Meister* and to distinguish himself in the " singing contests " instituted by the schools.

Such are the decadent aspects of the once rich literature of the Middle High German period in the 14th and 15th centuries. Turning now to the more positive side of the literary movement, we have to note a revival of a popular lyric poetry—the Volkslied—which made the futility and artificiality of the Meistergesang more apparent. Never before or since has Germany been able to point to such a rich harvest of popular poetry as is to be seen in the Volkslieder of these two centuries. Every form of popular poetry is to be found here—songs of love and war, hymns and drinking-songs, songs of spring and winter, historical ballads, as well as lyrics in which the old motives of the Minnesang reappear stripped of all artificiality. More obvious ties with the literature of the preceding age are to be seen in the development of the *Schwank* or comic anecdote. Collections of such stories, which range from the practical jokes of *Till Eulenspiegel* (1515), and the coarse witticisms of the *Pfaffe vom Kalenberg* (end of 14th century) and *Peter Leu* (1550), to the religious and didactic anecdotes of J. Pauli's *Schimpf und Ernst* (1522) or the more literary *Rollwagenbuchlein* (1555) of Jörg Wickram and the *Wendunmut* (1563 ff.) of H. W. Kirchhoff—these dominate in large measure the literature of the 15th and 16th centuries; they are the literary descendants of the medieval *Pfaffe Amis*, *Markolf* and *Reinhart Fuchs*. An important development of this type of popular literature is to be seen in the *Narrenschiff* of Sebastian Brant (1457–1521), where the humorous anecdote became a vehicle of the bitterest satire; Brant's own contempt for the vulgarity of the ignorant, and the deep, unsatisfied craving of all strata of society for a wider intellectual horizon and a more humane and dignified life, to which Brant gave voice, make the *Narrenschiff*, which appeared in 1494, a landmark on the way that led to the Reformation. Another form—the Beast fable and Beast epic—which is but sparingly represented in earlier times, appealed with peculiar force to the new generation. At the very close of the Middle High German period, Ulrich Boner had revived the Aesopic fable in his *Edelstein* (1349), translations of Aesop in the following century added to the popularity of the fable (*q.v.*), and in the century of the Reformation it became, in the hands of Burkard Waldis (*Esopus*, 1548) and Erasmus Alberus (*Buch von der Tugend und Weisheit*, 1550), a favourite instrument of satire and polemic. A still more attractive form of the Beast fable was the epic of *Reinke de Vos*, which had been cultivated by Flemish poets in the 13th and 14th centuries and has come down to us in a Low Saxon translation, published at Lübeck in 1498. This, too, like Brant's poem, is a powerful satire on human folly, and is also, like the *Narrenschiff*, a harbinger of the coming Reformation.

A complete innovation was the drama (*q.v.*), which, as we have seen, had practically no existence in Middle High German times. As in all European literatures, it emerged slowly and with difficulty from its original subservience to the church liturgy. As time went on, the vernacular was substituted for the original Latin, and with increasing demands for pageantry, the scene of the play was removed to the churchyard or the market-place; thus the opportunity arose in the 14th and 15th centuries for developing the *Weihnachtsspiel*, *Osterspiel* and *Passionsspiel* on secular lines. The enlargement of the scope of the religious play to include legends of the saints implied a further step in the direction of a complete separation of the drama from ecclesiastical ceremony. The most interesting example of this encroachment of the secular spirit is the *Spiel von Frau Jutten*—Jutta being the notorious Pope Joan—by an Alsatian, Dietrich Schernberg, in 1480. Meanwhile, in the 15th century, a beginning had been made of a drama entirely independent of the church. The mimic representations—originally allegorical in character—with which the people amused themselves at the great festivals of the year, and more especially in spring, were interspersed with dialogue, and performed on an improvised stage. This was the beginning of the *Fastnachtsspiel* or Shrovetide-play, the subject of which was a comic anecdote similar to those of the many collections of *Schwänke*. Amongst the earliest cultivators of the *Fastnachtsspiel* were Hans Rosenplüt (fl. *c.* 1460) and Hans Folz (fl. *c.* 1510), both of whom were associated with Nuremberg.

(*b*) *The Age of the Reformation.*—Promising as were these literary beginnings of the 15th century, the real significance of the period in Germany's intellectual history is to be sought outside literature, namely, in two forces which immediately prepared the way for the Reformation—mysticism and humanism. The former of these had been a more or less constant factor in German religious thought throughout the middle ages, but with Meister Eckhart (? 1260–1327), the most powerful and original of all the German mystics, with Heinrich Seuse or Suso (*c.* 1300–1366), and Johannes Tauler (*c.* 1300–1361), it became a clearly defined mental attitude towards religion; it was an essentially personal interpretation of Christianity, and, as such, was naturally conducive to the individual freedom which Protestantism ultimately realized. It is thus not to be wondered at that we should owe the early translations of the Bible into German—one was printed at Strassburg in 1466—to the mystics. Johann Geiler von Kaisersberg (1445–1510), a pupil of the humanists and a friend of Sebastian Brant, may be regarded as a link between Eckhart and the earlier mysticists and Luther. Humanism was transplanted to German soil with the foundation of the university of Prague in 1348, and it made even greater strides than mysticism. Its immediate influence, however, was restricted to the educated classes; the pre-Reformation humanists despised the vernacular and wrote and thought only in Latin. Thus although neither Johann Reuchlin of Pforzheim (1455–1522), nor even the patriotic Alsatian, Jakob Wimpfeling (or Wimpheling) (1450–1528)—not to mention the great Dutch humanist Erasmus of Rotterdam (1466–1536)—has a place in the history of German literature, their battle for liberalism in thought and scholarship against the narrow orthodoxy of the Church cleared the way for a healthy national literature among the German-speaking peoples. The incisive wit and irony of humanistic satire—we need only instance the *Epistolae obscurorum virorum* (1515–1517)—prevented the German satirists of the Reformation age from sinking entirely into that coarse brutality to which they were only too prone. To the influence of the humanists we also owe many translations from the Latin and Italian dating from the 15th century. Prominent among the writers who contributed to the group of literature were Niklas von Wyl, chancellor of Württemberg, and his immediate contemporary Albrecht von Eyb (1420–1475).

Martin Luther (1483–1546), Germany's greatest man in this age of intellectual new-birth, demands a larger share of attention in a survey of literature than his religious and ecclesiastical activity would in itself justify, if only because the literary activity of the age cannot be regarded apart from him. From the Volkslied and the popular *Schwank* to satire and drama, literature turned exclusively round the Reformation which had been inaugurated on the 31st of October 1517 by Luther's publication of the *Theses against Indulgences* in Wittenberg. In his three tracts, *An den christlichen Adel deutscher Nation*, *De captivitate*

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Babylonica ecclesiae, and *Von der Freiheit eines Christenmenschen* (1520). Luther laid down his principles of reform, and in the following year resolutely refused to recant his heresies in a dramatic scene before the Council of Worms. Luther's Bible (1522–1534) had unique importance not merely for the religious and intellectual welfare of the German people, but also for their literature. It is in itself a literary monument, a German classic, and the culmination and justification of that movement which had supplanted the medieval knight by the burgher and swept away Middle High German poetry. Luther, well aware that his translation of the Bible must be the keystone to his work, gave himself endless pains to produce a thoroughly German work—German both in language and in spirit. It was important that the dialect into which the Bible was translated should be comprehensible over as wide an area as possible of the German-speaking world, and for this reason he took all possible care in choosing the vocabulary and forms of his *Gemeindeutsch*. The language of the Saxon chancery thus became, thanks to Luther's initiative, the basis of the modern High German literary language. As a hymn-writer (*Geistliche Lieder*, 1564), Luther was equally mindful of the importance of adapting himself to the popular tradition; and his hymns form the starting-point for a vast development of German religious poetry which did not reach its highest point until the following century.

The most powerful and virile literature of this age was the satire with which the losing side retaliated on the Protestant leaders. Amongst Luther's henchmen, Philipp Melanchthon (1497–1560), the "praeceptor Germaniae," and Ulrich von Hutten (1488–1523) were powerful allies in the cause, but their intellectual sympathies were with the Latin humanists; and with the exception of some vigorous German prose and still more vigorous German verse by Hutten, both wrote in Latin. The satirical dramas of Niklas Manuel, a Swiss writer and the polemical fables of Erasmus Alberus (*c.* 1500–1553), on the other hand, were insignificant compared with the fierce assault on Protestantism by the Alsatian monk, Thomas Murner (1475–1537). The most unscrupulous of all German satirists, Murner shrank from no extremes of scurrility, his attacks on Luther reaching their culmination in the gross personalities of *Von dem lutherischen Narren* (1522). It was not until the following generation that the Protestant party could point to a satirist who in genius and power was at all comparable to Murner, namely, to Johann Fischart (*c.* 1550–*c.* 1591); but when Fischart's Rabelaisian humour is placed by the side of his predecessor's work, we see that, in spite of counter-reformations, the Protestant cause stood in a very different position in Fischart's day from that which it had occupied fifty years before. Fischart took his stand on the now firm union between humanism and Protestantism. His chief work, the *Affentheuerlich Naupengeheurliche Geschichtklitterung* (1575), a Germanization of the first book of Rabelais' satire, is a witty and ingenious monstrosity, a satirical comment on the life of the 16th century, not the virulent expression of party strife. The day of a personal and brutal type of satire was clearly over, and the writers of the later 16th century reverted more and more to the finer methods of the humanists. The satire of Bartholomaeus Ringwaldt (1530–1599) and of Georg Rollenhagen (1542–1609), author of the *Froschmeuseler* (1595), was more "literary" and less actual than even Fischart's.

On the whole, the form of literature which succeeded best in emancipating itself from the trammels of religious controversy in the 16th century was the drama. Protestantism proved favourable to its intellectual and literary development, and the humanists, who had always prided themselves on their imitations of Latin comedy, introduced into it a sense for form and proportion. The Latin school comedy in Germany was founded by J. Wimpfeling with his *Stylpho* (1479) and by J. Reuchlin with his witty adaptation of *Maître Patelin* in his *Henno* (1498). In the 16th century the chief writers of Latin dramas were Thomas Kirchmair or Naogeorgus (1511–1563), Caspar Brülow (1585–1627), and Nikodemus Frischlin (1547–1590), who also wrote dramas in the vernacular. The work of these men bears testimony in its form and its choice of subjects to the close relationship between Latin and German dramain the 16th century. One of the earliest focusses for a German drama inspired by the Reformation was Switzerland. In Basel, Pamphilus Gengenbach produced moralizing *Fastnachtsspiele* in 1515–1516; Niklas Manuel of Bern (1484–1530)—who has just been mentioned—employed the same type of play as a vehicle of pungent satire against the Mass and the sale of indulgences. But it was not long before the German drama benefited by the humanistic example: the *Parabell vam vorlorn Szohn* by Burkard Waldis (1527), the many dramas on the subject of *Susanna*—notably those of Sixt Birck (1532) and Paul Rebhun (1535)—and Frischlin's German plays are attempts to treat Biblical themes according to classic methods. In another of the important literary centres of the 16th century, however, in Nuremberg, the drama developed on indigenous lines. Hans Sachs (1494–1576), the Nuremberg cobbler and Meistersinger, the most productive writer of the age, went his own way; a voracious reader and an unwearied storyteller, he left behind him a vast literary legacy, embracing every form of popular literature from *Spruch* and *Schwank* to complicated *Meistergesang* and lengthy drama. He laid under contribution the rich Renaissance literature with which the humanistic translators had flooded Germany, and he became himself an ardent champion of the "Wittembergisch Nachtigall" Luther. But in the progressive movement of the German drama he played an even smaller rôle than his Swiss and Saxon contemporaries; for his tragedies and comedies are deficient in all dramatic qualities; they are only stories in dialogue. In the *Fastnachtsspiele*, where dramatic form is less essential than anecdotal point and brevity, he is to be seen at his best. Rich as the 16th century was in promise, the conditions for the development of a national drama were unfavourable. At the close of the century the influence of the English drama—brought to Germany by English actors—introduced the deficient dramatic and theatrical force into the humanistic and "narrative" drama which has just been considered. This is to be seen in the work of Jakob Ayrer (d. 1605) and Duke Henry Julius of Brunswick (1564–1613). But unfortunately these beginnings had hardly made themselves felt when the full current of the Renaissance was diverted across Germany, bringing in its train the Senecan tragedy. Then came the Thirty Years' War, which completely destroyed the social conditions indispensable for the establishment of a theatre at once popular and national.

The novel was less successful than the drama in extricating itself from satire and religious controversy. Fischart was too dependent on foreign models and too erratic—at one time adapting Rabelais, at another translating the old heroic romance of *Amadis de Gaula*—to create a national form of German fiction in the 16th century; the most important novelist was a much less talented writer, the Alsatian Meistersinger and dramatist Jörg Wickram (d. *c.* 1560), who has been already mentioned as the author of a popular collection of anecdotes, the *Rollwagenbüchlein*. His longer novels, *Der Knabenspiegel* (1554) and *Der Goldfaden* (1557), are in form, and especially in the importance they attach to psychological developments, the forerunners of the movement to which we owe the best works of German fiction in the 18th century. But Wickram stands alone. So inconsiderable, in fact, is the fiction of the Reformation age in Germany that we have to regard the old *Volksbücher* as its equivalent; and it is significant that of all the prose writings of this age, the book which affords the best insight into the temper and spirit of the Reformation was just one of these crude *Volksbücher*, namely, the famous story of the magician *Doctor Johann Faust*, published at Frankfort in 1587.

IV. The Renaissance (1500–1740)

The 17th century in Germany presents a complete contrast to its predecessor; the fact that it was the century of the Thirty Years' War, which devastated the country, crippled the prosperity of the towns, and threw back by many generations the social development of the people, explains much, but it can hardly be held entirely responsible for the intellectual apathy, the slavery

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to foreign customs and foreign ideas, which stunted the growth of the nation. The freedom of Lutheranism degenerated into a paralyzing Lutheran orthodoxy which was as hostile to the "Freiheit eines Christenmenschen" as that Catholicism it had superseded; the idealism of the humanists degenerated in the same way into a dry, pedantic scholasticism which held the German mind in fetters until, at the very close of the century, Leibnitz set it free. Most disheartening of all, literature which in the 16th century had been so full of promise and had conformed with such aptitude to the new ideas, was in all its higher manifestations blighted by the dead hand of pseudo-classicism. The unkempt literature of the Reformation age admittedly stood in need of guidauce and discipline, but the 17th century made the fatal mistake of trying to impose the laws and rules of Romance literatures on a people of a purely Germanic stock.

There were, however, some branches of German poetry which escaped this foreign influence. The church hymn, continuing the great Lutheran traditions, rose in the 17th century to extraordinary richness both in quality and quantity. Paul Gerhardt (1607–1676), the greatest German hymn-writer, was only one of many Lutheran pastors who in this age contributed to the German hymnal. On the Catholic side, Angelus Silesius, or Johann Scheffler (1624–1677) showed what a wealth of poetry lay in the mystic speculations of Jakob Boehme, the gifted shoemaker of Görlitz (1575–1624), and author of the famous *Aurora, oder Morgenröte im Aufgang* (1612); while Friedrich von Spee (1591–1635), another leading Catholic poet of the century, cultivated the pastoral allegory of the Renaissance. The revival of mysticism associated with Boehme gradually spread through the whole religious life of the 17th century, Protestant as well as Catholic, and in the more specifically Protestant form of pietism, it became, at the close of the period, a force of moment in the literary revival. Besides the hymn, the Volkslied, which amidst the struggles and confusion of the great war bore witness to a steadily growing sense of patriotism, lay outside the domain of the literary theorists and dictators, and developed in its own way. But all else—if we except certain forms of fiction, which towards the end of the 17th century rose into prominence—stood completely under the sway of the Latin Renaissance.

The first focus of the movement was Heidelberg, which had been a centre of humanistic learning in the sixteenth century. Here, under the leadership of J. W. Zincgref (1591–1635), a number of scholarly writers carried into practice that interest in the vernacular which had been shown a little earlier by the German translator of Marot, Paul Schede or Melissus, librarian in Heidelberg. The most important forerunner of Opitz was G. R. Weckherlin (1584–1653), a native of Württemberg who had spent the best part of his life in England; his *Oden und Gesänge* (1618–1619) ushered in the era of Renaissance poetry in Germany with a promise that was but inadequately fulfilled by his successors. Of these the greatest, or at least the most influential, was Martin Opitz (1597–1639). He was a native of Silesia and, as a student in Heidelberg, came into touch with Zincgref's circle; subsequently, in the course of a visit to Holland, a more definite trend was given to his ideas by the example of the Dutch poet and scholar, Daniel Heinsius. As a poet, Opitz experimented with every form of recognized Renaissance poetry from ode and epic to pastoral romance and Senecan drama; but his poetry is for the most part devoid of inspiration; and his extraordinary fame among his contemporaries would be hard to understand, were it not that in his *Buch von der deutschen Poeterey* (1624) he gave the German Renaissance its theoretical textbook. In this tract, in which Opitz virtually reproduced in German the accepted dogmas of Renaissance theorists like Scaliger and Ronsard, he not merely justified his own mechanical verse-making, but also gave Germany a law-book which regulated her literature for a hundred years.

The work of Opitz as a reformer was furthered by another institution of Latin origin, namely, literary societies modelled on the *Accademia della Crusca* in Florence. These societies, of which the chief were the *Fruchtbringende Gesellschaft* or *Palmenorden* (founded 1617), the *Elbschwanenorden* in Hamburg and the *Gekrönter Blumenorden an der Pegnitz* or *Gesellschaft der Pegnitzschäfer* in Nuremberg, were the centres of literary activity during the unsettled years of the war. Although they produced much that was trivial—such as the extraordinary *Nürnberger Trichter* (1647–1653) by G. P. Harsdörffer (1607–1658), a treatise which professed to turn out a fully equipped German poet in the space of six hours—these societies also did German letters an invaluable service by their attention to the language, one of their chief objects having been to purify the German language from foreign and un-German ingredients. J. G. Schottelius (1612–1676), for instance, wrote his epoch-making grammatical works with the avowed purpose of furthering the objects of the *Fruchtbringende Gesellschaft*. Meanwhile the poetic centre of gravity in Germany had shifted from Heidelberg to the extreme north-east, to Königsberg, where a group of academic poets gave practical expression to the Opitzian theory. Chief among them was Simon Dach (1605–1659), a gentle, elegiac writer on whom the laws of the *Buch von der deutschen Poeterey* did not lie too heavily. He, like his more manly and vigorous contemporary Paul Fleming (1609–1640), showed, one might say, that it was possible to write good and sincere poetry notwithstanding Opitz's mechanical rules.

In the previous century the most advanced form of literature had been satire, and under the new conditions the satiric vein still proved most productive; but it was no longer the full-blooded satire of the Reformation, or even the rich and luxuriant satiric fancy of Fischart, which found expression in the 17th century. Satire pure and simple was virtually only cultivated by two Low German poets, J. Lauremberg (1590–1658) and J. Rachel (1618–1669), of whom at least the latter was accepted by the Opitzian school; but the satiric spirit rose to higher things in the powerful and scathing sermons of J. B. Schupp (1610–1661), an outspoken Hamburg preacher, and in the scurrilous wit of the Viennese monk Abraham a Sancta Clara (1644–1709), who had inherited some of his predecessor Murner's intellectual gifts. Best of all are the epigrams of the most gifted of all the Silesian group of writers, Friedrich von Logau (1604–1655). Logau's three thousand epigrams (*Deutsche Sinngedichte*, 1654) afford a key to the intellectual temper of the 17th century; they are the epitome of their age. Here are to be seen reflected the vices of the time, its aping of French customs and its contempt for what was national and German; Logau held up to ridicule the vain bloodshed of the war in the interest of Christianity, and, although he praised Opitz, he was far from prostrating himself at the dictator's feet. Logau is an epigrammatist of the first rank, and perhaps the most remarkable product of the Renaissance movement in Germany.

Opitz found difficulty in providing Germany with a drama according to the classic canon. He had not himself ventured beyond translations of Sophocles and Seneca, and Johann Rist (1607–1667) in Hamburg, one of the few contemporary dramatists, had written plays more in the manner of Duke Heinrich Julius of Brunswick than of Opitz. It was not until after the latter's death that the chief dramatist of the Renaissance movement came forward in the person of Andreas Gryphius (1616–1664). Like Opitz, Gryphius also was a Silesian, and a poet of no mean ability, as is to be seen from his lyric poetry; but his tragedies, modelled on the stiff Senecan pattern, suffered from the lack of a theatre, and from his ignorance of the existence of a more highly developed drama in France, not to speak of England. As it was, he was content with Dutch models. In the field of comedy, where he was less hampered by theories of dramatic propriety, he allowed himself to benefit by the freedom of the Dutch farce and the comic effects of the English actors in Germany; in his *Horribilicribrifax* and *Herr Peter Squentz*—the latter an adaptation of the comic scenes of the *Midsummer Night's Dream*—Grvphius has produced the best German plays of the 17th century.

The German novel of the 17th century was, as has been already indicated, less hampered by Renaissance laws than other forms of literature, and although it was none the less at the mercy of foreign influence, that influence was more varied and manifold in its character. *Don Quixote* had been partly

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translated early in the 17th century, the picaresque romance had found its way to Germany at a still earlier date; while H. M. Moscherosch (1601–1669) in his *Gesichte Philanders von Sittewald* (1642–1643) made the *Sueños* of Quevedo the basis for vivid pictures of the life of the time, interspersed with satire. The best German novel of the 17th century, *Der abenteurliche Simplicissimus* (1669) by H. J. Christoffel von Grimmelshausen (*c* 1625–1676), is a picaresque novel, but one that owed little more than its form to the Spaniards. It is in great measure the autobiography of its author, and describes with uncompromising realism the social disintegration and the horrors of the Thirty Years' War. But this remarkable book stands alone; Grimmelshausen's other writings are but further contributions to the same theme, and he left no disciples worthy of carrying on the tradition he had created. Christian Weise (1642–1708), rector of the Zittau gymnasium, wrote a few satirical novels, but his realism and satire are too obviously didactic. He is seen to better advantage in his dramas, of which he wrote more than fifty for performance by his scholars.

The real successor of *Simplicissimus* in Germany was the English *Robinson Crusoe*, a novel which, on its appearance, was immediately translated into German (1721); it called forth an extraordinary flood of imitations, the so-called "Robinsonaden," the vogue of which is even still kept alive by *Der schweizerische Robinson* of J. R. Wyss (1812 ff.). With the exception of J. G. Schnabel's *Insel Felsenburg* (1731–1743), the literary value of these imitations is slight. They represented, however, a healthier and more natural development of fiction than the "galant" romances which were introduced in the train of the Renaissance movement, and cultivated by writers like Philipp von Zesen (1619–1689), Duke Anton Ulrich of Brunswick (1633–1714), A. H. Buchholtz (1607–1671), H. A. von Ziegler (1653–1697)—author of the famous *Asiatische Banise* (1688)—and D. C. von Lohenstein (1635–1683), whose *Arminius* (1689–1690) is on the whole the most promising novel of this group. The last mentioned writer and Christian Hofmann von Hofmannswaldau (1617–1679) are sometimes regarded as the leaders of a "second Silesian school," as opposed to the first school of Opitz. As the cultivators of the bombastic and Euphuistic style of the Italians Guarini and Marini, and of the Spanish writer Gongora, Lohenstein and Hofmannswaldau touched the lowest point to which German poetry ever sank.

But this aberration of taste was happily of short duration. Although socially the recovery of the German people from the desolation of the war was slow and laborious, the intellectual life of Germany was rapidly recuperating under the influence of foreign thinkers. Samuel Pufendorf (1632–1694), Christian Thomasius (1655–1728), Christian von Wolff (1679–1754) and, above all, Gottfried Wilhelm Leibnitz (1646–1716), the first of the great German philosophers, laid the foundations of that system of rationalism which dominated Germany for the better part of the 18th century; while German religious life was strengthened and enriched by a revival of pictism, under mystic thinkers like Philipp Jakob Spener (1635–1705), a revival which also left its traces on religious poetry. Such hopeful signs of convalescence could not but be accompanied by an improvement in literary taste, and this is seen in the first instance in a substitution for the bombast and conceits of Lohenstein and Hofmannswaldau, of poetry on the stricter and soberer lines laid down by Boileau. The so-called "court poets" who opposed the second Silesian school, men like Rudolf von Canitz (1654–1699), Johann von Besser (1654–1729) and Benjamin Neukirch (1665–1729), were not inspired, but they had at least a certain "correctness" of taste; and from their midst sprang one gifted lyric genius, Johann Christian Günther (1695–1723), who wrote love-songs such as had not been heard in Germany since the days of the Minnesang. The methods of Hofmannswaldau had obtained considerable vogue in Hamburg, where the Italian opera kept the decadent Renaissance poetry alive. Here, however, the incisive wit of Christian Wernigke's (1661–1725) epigrams was an effective antidote, and Barthold Heinrich Brockes (1680–1747), a native of Hamburg, who had been deeply impressed by the appreciation of nature in English poetry, gave the artificialities of the Silesians their death-blow. But the influence of English literature was not merely destructive in these years; in the translations and imitations of the English *Spectator*, *Tatler* and *Guardian*—the so-called *moralische Wochenschriften*—it helped to regenerate literary taste, and to implant healthy moral ideas in the German middle classes.

The chief representative of the literary movement inaugurated by the Silesian "court poets" was Johann Christoph Gottsched (1700–1766), who between 1724 and 1740 succeeded in establishing in Leipzig, the metropolis of German taste, literary reforms modelled on the principles of French 17th-century classicism. He reformed and purified the stage according to French ideas, and provided it with a repertory of French origin; in his *Kritische Dichtkunst* (1730) he laid down the principles according to which good literature was to be produced and judged. As Opitz had reformed German letters with the help of Ronsard, so now Gottsched took his standpoint on the principles of Boileau as interpreted by contemporary French critics and theorists. With Gottsched, whose services in purifying the German language have stood the test of time better than his literary or dramatic reforms, the period of German Renaissance literature reaches its culmination and at the same time its close. The movement of the age advanced too rapidly for the Leipzig dictator; in 1740 a new epoch opened in German poetry and he was soon left hopelessly behind.

V. The Classical Period of Modern German Literature (1740–1832)

(a) From the Swiss Controversy to the "Sturm und Drang."—Between Opitz and Gottsched German literature passed successively through the various stages characteristic of all Renaissance literatures—from that represented by Trissino and the French Pléiade, by way of the aberrations of Marini and the *estilo culto*, to the *art poétique* of Boileau. And precisely as in France, the next advance was achieved in a battle between the "ancients" and the "moderns," the German "ancients" being represented by Gottsched, the "moderns" by the Swiss literary reformers, J. J. Bodmer (1698–1783) and J. J. Breitinger (1701–1776). The latter in his *Kritische Dichtkunst* (1739) maintained doctrines which were in opposition to Gottsched's standpoint in his treatise of the same name, and Bodmer supported his friend's initiative; a pamphlet war ensued between Leipzig and Zurich, with which in 1740–1741 the classical period of modern German literature may be said to open. The Swiss, men of little originality, found their theories in the writings of Italian and English critics; and from these they learned how literature might be freed from the fetters of pseudo-classicism. Basing their arguments on Milton's *Paradise Lost*, which Bodmer had translated into prose (1732), they demanded room for the play of genius and inspiration; they insisted that the imagination should not be hindered in its attempts to rise above the world of reason and common sense. Their victory was due, not to the skill with which they presented their arguments, but to the fact that literature itself was in need of greater freedom. It was in fact a triumph, not of personalities or of leaders, but of ideas. The effects of the controversy are to be seen in a group of Leipzig writers of Gottsched's own school, the *Bremer Beiträger* as they were called after their literary organ. These men—C. F. Gellert (1715–1769), the author of graceful fables and tales in verse, G. W. Rabener (1714–1771), the mild satirist of Saxon provinciality, the dramatist J. Elias Schlegel (1719–1749), who in more ways than one was Lessing's forerunner, and a number of minor writers—did not set themselves up in active opposition to their master, but they tacitly adopted many of the principles which the Swiss had advocated. And in the *Bremer Beiträge* there appeared in 1748 the first instalment of an epic by F. G. Klopstock (1724–1803), *Der Messias*, which was the best illustration of that lawlessness against which Gottsched had protested. More effectively than Bodmer's dry and uninspired theorizing, Klopstock's *Messias*, and in a still higher degree, his *Odes*, laid the foundations of modern German literature in the 18th century.

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His immediate followers, it is true, did not help to advance matters; Bodmer and J. K. Lavater (1741–1801), whose "physiognomic" investigations interested Goethe at a later date, wrote dreary and now long forgotten epics on religious themes. Klopstock's rhapsodic dramas, together with Macpherson's *Ossian*, which in the 'sixties awakened a widespread enthusiasm throughout Germany, were responsible for the so-called "bardic" movement; but the noisy rhapsodies of the leaders of this movement, the "bards" H. W. von Gerstenberg (1737–1823), K. F. Kretschmann (1738–1809) and Michael Denis (1729–1800), had little of the poetic inspiration of Klopstock's *Odes*.

The indirect influence of Klopstock as the first inspired poet of modern Germany and as the realization of Bodmer's theories can, however, hardly be over-estimated. Under Frederick the Great, who, as the docile pupil of French culture, had little sympathy for unregulated displays of feeling, neither Klopstock nor his imitators were in favour in Berlin, but at the university of Halle considerable interest was taken in the movement inaugurated by Bodmer. Here, before Klopstock's name was known at all, two young poets, J. L. Pyra (1715–1744) and S. G. Lange (1711–1781), wrote *Freundschaftliche Lieder* (1737), which were direct forerunners of Klopstock's rhymeless lyric poetry; and although the later Prussian poets, J. W. L. Gleim (1719–1803), J. P. Uz (1720–1796) and J. N. Götz (1721–1781), who were associated with Halle, and K. W. Ramler (1725–1798) in Berlin, cultivated mainly the Anacreontic and the Horatian ode—artificial forms, which kept strictly within the classic canon—yet Friedrich von Hagedorn (1708–1754) in Hamburg showed to what perfection even the Anacreontic and the lighter *vers de société* could be brought. The Swiss physiologist Albrecht von Haller (1708–1777) was the first German poet to give expression to the beauty and sublimity of Alpine scenery (*Die Alpen*, 1734), and a Prussian officer, Ewald Christian von Kleist (1715–1759), author of *Der Frühling* (1749), wrote the most inspired nature-poetry of this period. Klopstock's supreme importance lay, however, in the fact that he was a forerunner of the movement of *Sturm und Drang*. But before turning to that movement we must consider two writers who, strictly speaking, also belong to the age under consideration—Lessing and Wieland.

As Klopstock had been the first of modern Germany's inspired poets, so Gotthold Ephraim Lessing (1729–1781) was the first critic who brought credit to the German name throughout Europe. He was the most liberal-minded exponent of 18th-century rationalism. Like his predecessor Gottsched, whom he vanquished more effectually than Bodmer had done, he had unwavering faith in the classic canon, but "classic" meant for him, as for his contemporary, J. J. Winckelmann (1717–1768), Greek art and literature, and not the products of French pseudo-classicism, which it had been Gottsched's object to foist on Germany. He went, indeed, still further, and asserted that Shakespeare, with all his irregularities, was a more faithful observer of the spirit of Aristotle's laws, and consequently a greater poet, than were the French classic writers. He looked to England and not to France for the regeneration of the German theatre, and his own dramas were pioneer-work in this direction. *Miss Sara Sampson* (1755) is a *bürgerliche Tragödie* on the lines of Lillo's *Merchant of London*, *Minna von Barnhelm* (1767), a comedy in the spirit of Farquhar; in *Emilia Galotti* (1772), again with English models in view, he remoulded the "tragedy of common life" in a form acceptable to the *Sturm und Drang*; and finally in *Nathan der Weise* (1779) he won acceptance for iambic blank verse as the medium of the higher drama. His two most promising disciples—J. F. von Cronegk (1731–1758) and J. W. von Brawe (1738–1758)—unfortunately died young, and C. F. Weisse (1726–1804) was not gifted enough to advance the drama in its literary aspects. Lessing's name is associated with Winckelmann's in *Laokoon* (1766), a treatise in which he set about defining the boundaries between painting, sculpture and poetry, and with those of the Jewish philosopher, Moses Mendelssohn (1729–1786) and the Berlin bookseller C. F. Nicolai (1733–1811) in the famous *Literaturbriefe*. Here Lessing identified himself with the best critical principles of the rationalistic movement—principles which, in the later years of his life, he employed in a fierce onslaught on Lutheran orthodoxy and intolerance.

To the widening and deepening of the German imagination C. M. Wieland (1733–1813) also contributed, but in a different way. Although no enemy of pseudo-classicism, he broke with the stiff dogmatism of Gottsched and his friends, and tempered the pietism of Klopstock by introducing the Germans to the lighter poetry of the south of Europe. With the exception of his fairy epic *Oberon* (1780), Wieland's work has fallen into neglect; he did, however, excellent service to the development of German prose fiction with his psychological novel, *Agathon* (1766–1767), which may be regarded as a forerunner of Goethe's *Wilhelm Meister*, and with his humorous satire *Die Abderiten* (1774). Wieland had a considerable following, both among poets and prose writers; he was particularly looked up to in Austria, towards the end of the 18th century, where the literary movement advanced more slowly than in the north. Here Aloys Blumauer (1755–1789) and J. B. von Alxinger (1755–1797) wrote their travesties and epics under his influence. In Saxony, M. A. von Thümmel (1738–1817) showed his adherence to Wieland's school in his comic epic in prose, *Wilhelmine* (1764), and in the general tone of his prose writings; on the other hand, K. A. Kortum (1745–1824), author of the most popular comic epic of the time, *Die Jobsiade* (1784), was but little influenced by Wieland. The German novel owed much to the example of *Agathon*, but the groundwork and form were borrowed from English models; Gellert had begun by imitating Richardson in his *Schwedische Gräfin* (1747–1748), and he was followed by J. T. Hermes (1738–1821), by Wieland's friend Sophie von Laroche (1730–1807), by A. von Knigge (1752–1796) and J. K. A. Musäus (1735–1787), the last mentioned being, however, best known as the author of a collection of *Volksmärchen* (1782–1786). Meanwhile a rationalism, less materialistic and strict than that of Wolff, was spreading rapidly through educated middle-class society in Germany. Men like Knigge, Moses Mendelssohn, J. G. Zimmermann (1728–1795), T. G. von Hippel (1741–1796), Christian Garve (1742–1798), J. J. Engel (1741–1802), as well as the educational theorists J. B. Basedow (1723–1790) and J. H. Pestalozzi (1746–1827), wrote books and essays on "popular philosophy" which were as eagerly read as the *moralische Wochenschriften* of the preceding epoch; and with this group of writers must also be associated the most brilliant of German 18th-century satirists, G. C. Lichtenberg (1742–1799).

Such was the *milieu* from which sprang the most advanced pioneer of the classical epoch of modern German literature, J. G. Herder (1744–1803). The transition from the popular philosophers of the *Aufklärung* to Herder was due in the first instance to the influence of Rousseau; and in Germany itself that transition is represented by men like Thomas Abbt (1738–1766) and J. G. Hamann (1730–1788). The revolutionary nature of Herder's thought lay in that writer's antipathy to hard and fast systems, to laws imposed upon genius; he grasped, as no thinker before him, the idea of historical evolution. By regarding the human race as the product of a slow evolution from primitive conditions, he revolutionized the methods and standpoint of historical science and awakened an interest—for which, of course, Rousseau had prepared the way—in the early history of mankind. He himself collected and published the *Volkslieder* of all nations (1778–1779), and drew attention to those elements in German life and art which were, in the best and most precious sense, national—elements which his predecessors had despised as inconsistent with classic formulae and systems. Herder is thus not merely the forerunner, but the actual founder of the literary movement known as *Sturm und Drang*. New ground was broken in a similar way by a group of poets, who show the results of Klopstock's influence on the new literary movement: the Göttingen "Bund" or "Hain," a number of young students who met together in 1772, and for several years published their poetry in the *Göttinger Musenalmanach*. With the exception of the two brothers, Ch. zu Stolberg (1748–1821) and F. L. zu Stolberg (1750–1819), who occupied a somewhat peculiar position

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in the "Bund," the members of this coterie were drawn from the peasant class of the lower *bourgeoisie*; J. H. Voss (1751–1826), the leader of the "Bund," was a typical North German peasant, and his idyll, *Luise* (1784), gives a realistic picture of German provincial life. L. H. C. Hölty (1748–1776) and J. M. Miller (1750–1814), again, excelled in simple lyrics in the tone of the *Volkslied*. Closely associated with the Göttingen group were M. Claudius (1740–1815), the *Wandsbecker Bote*—as he was called after the journal he edited—an even more unassuming and homely representative of the German peasant in literature than Voss, and G. A. Bürger (1748–1794) who contributed to the *Göttinger Musenalmanach* ballads, such as the famous *Lenore* (1774), of the very first rank. These ballads were the best products of the Göttingen school, and, together with Goethe's Strassburg and Frankfort songs, represent the highest point touched by the lyric and ballad poetry of the period.

But the Göttingen "Bund" stood somewhat aside from the main movement of literary development in Germany; it was only a phase of *Sturm und Drang*, and quieter, less turbulent than that on which Goethe had set the stamp of his personality. Johann Wolfgang Goethe (1749–1832) had, as a student in Leipzig (1765–1768), written lyrics in the Anacreontic vein and dramas in alexandrines. But in Strassburg, where he went to continue his studies in 1770–1771, he made the personal acquaintance of Herder, who won his interest for the new literary movement. Herder imbued him with his own ideas of the importance of primitive history and Gothic architecture and inspired him with a pride in German nationality; Herder convinced him that there was more genuine poetry in a simple Volkslied than in all the ingenuity of the German imitators of Horace or Anacreon; above all, he awakened his enthusiasm for Shakespeare. The pamphlet *Von deutscher Art und Kunst* (1773), to which, besides Goethe and Herder, the historian Justus Möser (1720–1794) also contributed, may be regarded as the manifesto of the *Sturm und Drang*. The effect on Goethe of the new ideas was instantaneous; they seemed at once to set his genius free, and from 1771 to 1775 he was extraordinarily fertile in poetic ideas and creations. His *Götz von Berlichingen* (1771–1773), the first drama of the *Sturm und Drang*, was followed within a year by the first novel of the movement, *Werthers Leiden* (1774); he dashed off *Clavigo* and *Stella* in a few weeks in 1774 and 1775, and wrote a large number of *Singspiele*, dramatic satires and fragments—including *Faust* in its earliest form (the so-called *Urfaust*)—not to mention love-songs which at last fulfilled the promise of Klopstock. Goethe's lyrics were no less epoch-making than his first drama and novel, for they put an end to the artificiality which for centuries had fettered German lyric expression. In all forms of literature he set the fashion to his time; the Shakespearian restlessness of *Götz von Berlichingen* found enthusiastic imitators in J. M. R. Lenz (1751–1792), whose *Anmerkungen übers Theater* (1774) formulated theoretically the laws, or defiance of laws, of the new drama, in F. M. von Klinger (1752–1831), J. A. Leisewitz (1752–1806), H. L. Wagner (1747–1779) and Friedrich Müller, better known as Maler Müller (1749–1825). The dramatic literature of the *Sturm und Drang* was its most characteristic product—indeed, the very name of the movement was borrowed from a play by Klinger; it was inspired, as *Götz von Berlichingen* had been, by the desire to present upon the stage figures of Shakespearian grandeur impelled and tortured by gigantic passions, all considerations of plot, construction and form being regarded as subordinate to the development of character. The fiction of the *Sturm und Drang*, again, was in its earlier stages dominated by *Werthers Leiden*, as may be seen in the novels of F. H. Jacobi (1743–1819) and J. M. Miller, who has been already mentioned. Later, in the hands of J. J. W. Heinse (1749–1803), author of *Ardinghello* (1787), Klinger, K. Ph. Moritz (1757–1793), whose *Anton Reiser* (1785) clearly foreshadows *Wilhelm Meister*, it reflected not merely the sentimentalism, but also the philosophic and artistic ideas of the period.

With the production of *Die Räuber* (1781) by Johann Friedrich Schiller (1759–1805), the drama of the *Sturm und Drang* entered upon a new development. Although hardly less turbulent in spirit than the work of Klinger and Leisewitz, Schiller's tragedy was more skilfully adapted to the exigencies of the theatre; his succeeding dramas, *Fiesco* and *Kabale und Liebe*, were also admirable stage-plays, and in *Don Carlos* (1787) he abandoned prose for the iambic blank verse which Lessing had made acceptable in *Nathan der Weise*. The "practical" character of the new drama is also to be seen in the work of Schiller's contemporary, O. von Gemmingen (1755–1836), the imitator of Diderot, in the excellent domestic dramas of the actors F. L. Schröder (1744–1816) and A. W. Iffland (1759–1814), and even in the popular medieval plays, the so-called *Ritterdramen* of which *Götz von Berlichingen* was the model. Germany owes to the *Sturm und Drang* her national theatre; permanent theatres were established in these years at Hamburg, Mannheim, Gotha, and even at Vienna, which, as may be seen from the dramas of C. H. von Ayrenhoff (1733–1819), had hardly then advanced beyond Gottsched's ideal of a national literature. The Hofburgtheater of Vienna, the greatest of all the German stages, was virtually founded in 1776.

(*b*) *German Classical Literature.*—The energy of the *Sturm und Drang*, which was essentially iconoclastic in its methods, soon exhausted itself. For Goethe this phase in his development came to an end with his departure for Weimar in 1775, while, after writing *Don Carlos* (1787), Schiller turned from poetry to the study of history and philosophy. These subjects occupied his attention almost exclusively for several years, and not until the very close of the century did he, under the stimulus of Goethe's friendship, return to the drama. The first ten years of Goethe's life in Weimar were comparatively unproductive; he had left the *Sturm und Drang* behind him; its developments, for which he himself had been primarily responsible, were distasteful to him; and he had not yet formed a new creed. Under the influence of the Weimar court, where classic or even pseudo-classic tastes prevailed, he was gradually finding his way to a form of literary art which should reconcile the humanistic ideals of the 18th century with the poetic models of ancient Greece. But he did not arrive at clearness in his ideas until after his sojourn in Italy (1786–1788), an episode of the first importance for his mental development. Italy was, in the first instance, a revelation to Goethe of the antique; he had gone to Italy to find realized what Winckelmann had taught, and here he conceived that ideal of a classic literature, which for the next twenty years dominated German literature and made Weimar its metropolis. In Italy he gave *Iphigenie auf Tauris* (1787) its final form, he completed *Egmont* (1788)—like the exactly contemporary *Don Carlos* of Schiller, a kind of bridge from *Sturm und Drang* to classicism—and all but finished *Torquato Tasso* (1790). *Wilhelm Meisters Lehrjahre* (1795–1796) bears testimony to the clear and decisive views which he had acquired on all questions of art and of the practical conduct of life.

Long before *Wilhelm Meister* appeared, however, German thought and literature had arrived at that stability and self-confidence which are the most essential elements in a great literary period. In the year of Lessing's death, 1781, Immanuel Kant (1724–1804), the great philosopher, had published his *Kritik der reinen Vernunft*, and this, together with the two later treatises, *Kritik der praktischen Vernunft* (1788) and *Kritik der Urteilskraft* (1790), placed the Germans in the front rank of thinking nations. Under the influence of Kant, Schiller turned from the study of history to that of philosophy and more especially aesthetics. His philosophic lyrics, his treatises on *Anmut und Würde*, on the *Ästhetische Erziehung des Menschen* (1795), and *Über naive und sentimentalische Dichtung* (1795) show, on the philosophic and the critical side, the movement of the century from the irresponsible subjectivity of *Sturm und Drang* to the calm idealism of classic attainment. In the same way, German historical writing had in these years, under the leadership of men like Justus Möser, Thomas Abbt, I. Iselin, F. C. Schlosser, Schiller himself and, greatest of all, Johannes von Müller (1752–1809), advanced from disconnected, unsystematic chronicling to a clearly thought-out philosophic and scientific method. J. G.

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A. Forster (1754–1794), who had accompanied Cook round the world, and Alexander von Humboldt (1769–1859), gave Germany models of clear and lucid descriptive writing. In practical politics and economics, when once the unbalanced vagaries of undiluted Rousseauism had fallen into discredit, Germany produced much wise and temperate thinking which prevented the spread of the French Revolution to Germany, and provided a practical basis on which the social and political fabric could be built up anew, after the Revolution had made the old régime impossible in Europe. Men like Wilhelm von Humboldt (1767–1835) and the philosopher J. G. Fichte (1762–1814) were, in two widely different spheres, representative of this type of intellectual eminence.

Meanwhile, in 1794, that friendship between Goethe and Schiller had begun, which lasted, unbroken, until the younger poet's death in 1805. These years mark the summit of Goethe and Schiller's classicism, and the great epoch of Weimar's history as a literary focus. Schiller's treatises had provided a theoretical basis; his new journal, *Die Horen*, might be called the literary organ of the movement—although in this respect the subsequent *Musenalmanach*, in which the two poets published their magnificent ballad poetry, had more value. Goethe, as director of the ducal theatre, could to a great extent control dramatic production in Germany. Under his encouragement, Schiller turned from philosophy to poetry and wrote the splendid series of classic dramas beginning with the trilogy of *Wallenstein* and closing with *Wilhelm Tell* and the fragment of *Demetrius*; while to Goethe we owe, above all, the epic of *Hermann und Dorothea*. Less important were the latter's severely classical plays *Die natürliche Tochter* and *Pandora*; but it must not be forgotten that it was chiefly owing to Schiller's stimulus that in those years Goethe brought the first part of *Faust*(1808)to a conclusion.

Although acknowledged leaders of German letters, Goethe and Schiller had considerable opposition to contend with. The *Sturm und Drang* had by no means exhausted itself, and the representatives of the once dominant rationalistic movement were particularly arrogant and overbearing. The literature associated with both *Sturm und Drang* and rationalism was at this period palpably decadent; no comparison could be made between the magnificent achievements of Goethe and Schiller, or even of Herder and Wieland with the "family" dramas of Iffland, still less with the extraordinarily popular plays of A. von Kotzebue (1761–1819), or with those bustling medieval *Ritterdramen*, which were especially cultivated in south Germany. There is a wide gap between Moritz's *Anton Reiser* or the philosophic novels which Klinger wrote in his later years, and Goethe's *Meister*; nor can the once so fervently admired novels of Jean Paul Richter (1763–1825) take a very high place. Neither the fantastic humour nor the penetrating thoughts with which Richter's books are strewn make up for their lack of artistic form and interest; they are essentially products of *Sturm und Drang*. Lastly, in the province of lyric and epic poetry, it is impossible to regard poets like the gentle F. von Matthisson (1761–1831), or the less inspired G. L. Kosegarten (1758–1818) and C. A. Tiedge (1752–1841), as worthily seconding the masterpieces of Goethe and Schiller. Thus when we speak of the greatness of Germany's classical period, we think mainly of the work of her two chief poets; the distance that separated them from their immediate contemporaries was enormous. Moreover, at the very close of the 18th century a new literary movement arose in admitted opposition to the classicism of Weimar, and to this movement, which first took definite form in the Romantic school, the sympathies of the younger generation turned. Just as in the previous generation the *Sturm und Drang* had been obliged to make way for a return to classic and impersonal principles of literary composition, so now the classicism of Goethe and Schiller, which had produced masterpieces like *Wallenstein* and *Hermann und Dorothea*, had to yield to a revival of individualism and subjectivity, which, in the form of Romanticism, profoundly influenced the literature of the whole 19th century.

(*c*) *The Romantic Movement.*—The first Romantic school, however, was founded, not as a protest against the classicism of Weimar, with which its leaders were in essential sympathy, but against the shallow, utilitarian rationalism of Berlin. Ludwig Tieck (1773–1853), a leading member of the school, was in reality a belated *Stürmer und Dränger*, who in his early years had chafed under the unimaginative tastes of the Prussian capital, and sought for a positive faith to put in their place. Friedrich Hölderlin (1770–1843), one of the most gifted poets of this age, demonstrates no less clearly than Tieck the essential affinity between *Sturm und Drang* and Romanticism; he, too, forms a bridge from the one individualistic movement to the other. The theoretic basis of Romanticism was, however, established by the two brothers, August Wilhelm and Friedrich Schlegel (1767–1845 and 1772–1829), who, accepting, in great measure, Schiller's aesthetic conclusions, adapted them to the needs of their own more subjective attitude towards literature. While Schiller, like Lessing before him, insisted on the critic's right to sit in judgment according to a definite code of principles, these Romantic critics maintained that the first duty of criticism was to understand and appreciate; the right of *genius*, to follow its natural bent was sacred. The *Herzensergiessungen eines kunstliebenden Klosterbruders* by Tieck's school-friend W. H. Wackenroder (1773–1798) contained the Romantic art-theory, while the hymns and fragmentary novels of Friedrich von Hardenberg (known as Novalis, 1772–1801), and the dramas and fairy tales of Tieck, were the characteristic products of Romantic literature. The universal sympathies of the movement were exemplified by the many admirable translations—greatest of all, Schlegel's *Shakespeare* (1797–1810)—which were produced under its auspices. Romanticism was essentially conciliatory in its tendencies, that is to say, it aimed at a reconciliation of poetry with other provinces of social and intellectual life; the hard and fast boundaries which the older critics had set up as to what poetry might and might not do, were put aside, and the domain of literature was regarded as co-extensive with life itself; painting and music, philosophy and ethics, were all accepted as constituent elements of or aids to Romantic poetry. Fichte, and to a much greater extent, F. W. J. von Schelling (1775–1854) were the exponents of the Romantic doctrine in philosophy, while the theologian F. E. D. Schleiermacher (1768–1834) demonstrated how vital the revival of individualism was for religious thought.

The Romantic school, whose chief members were the brothers Schlegel, Tieck, Wackenroder and Novalis, was virtually founded in 1798, when the Schlegels began to publish their journal the *Athenaeum*; but the actual existence of the school was of very short duration. Wackenroder and Novalis died young, and by the year 1804 the other members were widely separated. Two years later, however, another phase of Romanticism became associated with the town of Heidelberg. The leaders of this second or younger Romantic school were K. Brentano (1778–1842), L. A. von Arnim (1781–1831) and J. J. von Görres (1776–1848), their organ, corresponding to the *Athenaeum*, was the *Zeitung für Einsiedler*, or *Trost-Einsamkeit*, and their most characteristic production the collection of *Volkslieder*, published under the title *Des Knaben Wunderhorn* (1805–1808). Compared with the earlier school the Heidelberg writers were more practical and realistic, more faithful to nature and the commonplace life of everyday. They, too, were interested in the German past and in the middle ages, but they put aside the idealizing glasses of their predecessors and kept to historic truth; they wrote historical novels, not stories of an imaginary medieval world as Novalis had done, and when they collected *Volkslieder* and *Volksbücher*, they refrained from decking out the simple tradition with musical effects, or from heightening the poetic situation by "Romantic irony." Their immediate influence on German intellectual life was consequently greater; they stimulated and deepened the interest of the German people in their own past; and we owe to them the foundations of the study of German philology and medieval literature, both the brothers Jakob and Wilhelm Grimm (1785–1863 and 1786–1850) having been in touch with this circle in their early days. Again, the Heidelberg poets strengthened the national and patriotic spirit

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of their people; they prepared the way for the rising against Napoleon, which culminated in the year 1813, and produced that outburst of patriotic song, associated with E. M. Arndt (1769–1860), K. Th. Körner (1791–1813) and M. von Schenkendorf (1783–1817).

The subsequent history of Romanticism stands in close relation to the Heidelberg school, and when, about 1809, the latter broke up, and Arnim and Brentano settled in Berlin, the Romantic movement followed two clearly marked lines of development, one north German, the other associated with Württemberg. The Prussian capital, botbed of rationalism as it was, had, from the first, been intimately associated with Romanticism; the first school had virtually been founded there, and north Germans, like Heinrich von Kleist (1777–1811) and Zacharias Werner (1768–1823) had done more for the development of the Romantic drama than had the members of either Romantic school. These men, and more especially Kleist, Prussia's greatest dramatic poet, showed how the capricious Romantic ideas could be brought into harmony with the classic tradition established by Schiller, how they could be rendered serviceable to the national theatre. At the same time, Berlin was not a favourable soil for the development of Romantic ideas, and the circle of poets which gathered round Arnim and Brentano there, either themselves demonstrated the decadence of these ideas, or their work contained elements which in subsequent years hastened the downfall of the movement. Friedrich de la Motte Fouqué (1777–1843), for instance, shows how easy it was for the medieval tastes of the Romanticists to degenerate into mediocre novels and plays, hardly richer in genuine poetry than were the productions of the later *Sturm und Drang*; and E. T. A. Hoffmann (1776–1822), powerful genius though he was, cultivated with preference in his stories a morbid supernaturalism, which was only a decadent form of the early Romantic delight in the world of fairies and spirits. The lyric was less sensitive to baleful influences, but even here the north German Romantic circle could only point to one lyric poet of the first rank, J. von Eichendorff (1788–1857); while in the poetry of A. von Chamisso (1781–1838) the volatile Romantic spirituality is too often wanting. Others again, like Friedrich Rückert (1788–1866), sought the inspiration which Romanticism was no longer able to give, in the East; still another group, of which Wilhelm Müller (1794–1827) is the chief representative, followed Byron's example and awakened German sympathy for the oppressed Greeks and Poles.

Apart from Eichendorff, the vital lyric poetry of the third and last phase of Romanticism must be looked for in the Swabian school, which gathered round Uhland. Ludwig Uhland (1787–1862) was himself a disciple of the Heidelberg poets, and, in his lyrics and especially in his ballads, he succeeded in grafting the lyricism of the Romantic school on to the traditions of German ballad poetry which had been handed down from Bürger, Schiller and Goethe. But, as was the case with so many other disciples of the Heidelberg Romanticists, Uhland's interest in the German past was the serious interest of the scholar rather than the purely poetic interest of the earlier Romantic poets. The merit of the Swabian circle, the chief members of which were J. Kerner (1786–1862), G. Schwab (1792–1850), W. Waiblinger (1804–1830), W. Hauff (1802–1827) and, most gifted of all, E. Mörike (1804–1875) was that these writers preserved the Romantic traditions from the disintegrating influences to which their north German contemporaries were exposed. They introduced few new notes into lyric poetry, but they maintained the best traditions intact, and when, a generation later, the anti-Romantic movement of "Young Germany" had run its course, it was to Württemberg Germany looked for a revival of the old Romantic ideas.

Meanwhile, in the background of all these phases of Romantic evolution, through which Germany passed between 1798 and 1832, stands the majestic and imposing figure of Goethe. Personally he had in the early stages of the movement been opposed to that reversion to subjectivity and lawlessness which the first Romantic school seemed to him to represent; to the end of his life he regarded himself as a "classic," not a "romantic" poet. But, on the other hand, he was too liberal-minded a thinker and critic to be oblivious to the fruitful influence of the new movement. Almost without exception he judged the young poets of the new century fairly, and treated them sympathetically and kindly; he was keenly alive to the new—and for the most part "unclassical"—development of literature in England, France and Italy; and his own published work, above all, the first part of *Faust* (1808), *Die Wahlverwandtschaften* (1809), *Dichtung und Wahrheit* (1811–1814, a final volume in 1833), *Westöstlicher Divan* (1819), *Wilhelm Meisters Wanderjahre* (1821–1829) and the second part of *Faust* (published in 1832 after the poet's death), stood in no antagonism to the Romantic ideas of their time. One might rather say that Goethe was the bond between the two fundamental literary movements of the German classical age; that his work achieved that reconciliation of "classic" and "romantic" which, rightly regarded, was the supreme aim of the Romantic school itself.

VI. German Literature since Goethe (1832–1906)

(*a*) *Young Germany.*—With Goethe's death a great age in German poetry came to a close. Long before 1832 Romanticism had, as we have seen, begun to lose ground, and the July revolution of 1830, the effects of which were almost as keenly felt in Germany as in France, gave the movement its death-blow. Meanwhile the march of ideas in Germany itself had not been favourable to Romanticism. Schelling had given place to G. W. F. Hegel (1770–1831), now the dominant force in German philosophy, and the Hegelian metaphysics proved as unfruitful an influence on literature as that of Fichte and Schelling had been fruitful. The transference of Romantic ideas to the domain of practical religion and politics had proved reactionary in its effects; Romanticism became the cloak for a kind of Neo-catholicism, and Romantic politics, as enunciated by men like F. von Gentz (1764–1832) and Adam Müller (1779–1829), served as an apology for the Metternich régime in Austria. Only at the universities—in Göttingen, Heidelberg and Berlin—did the movement continue, in the best sense, to be productive; German philology, German historical science and German jurisprudence benefited by Romantic ideas, long after Romantic poetry had fallen into decay. The day of Romanticism was clearly over; but a return to the classic and humanitarian spirit of the 18th century was impossible. The social condition of Europe had been profoundly altered by the French Revolution; the rise of industrialism had created new economic problems, the march of science had overturned old prejudices. And in a still higher degree were the ideas which lay behind the social upheaval of the July revolution incompatible with a reversion in Germany to the conditions of Weimar classicism. There was, moreover, no disguising the fact that Goethe himself did not stand high with the younger generation of German writers who came into power after his death.

"Young Germany" did not form a school in the sense in which the word was used by the early Romanticists; the bond of union was rather the consequence of political persecution. In December 1835 the German "Bund" issued a decree suppressing the writings of the "literary school" known as "Young Germany," and mentioned by name Heinrich Heine, Karl Gutzkow, Ludolf Wienbarg, Theodor Mundt and Heinrich Laube. Of these men, Heine (1797–1856) was by far the most famous. He had made his reputation in 1826 and 1827 with *Die Harzreise* and *Das Buch der Lieder*, both of which books show how deeply he was immersed in the Romantic traditions. But Heine felt perhaps more acutely than any other man of his time how the ground was slipping away from beneath his feet; he repudiated the Romantic movement and hailed the July revolution as the first stage in the "liberation of humanity"; while ultimately he sought in France the freedom and intellectual stimulus which Germany withheld from him. Heine suffered from having been born in an age of transition; he was unable to realize in a wholehearted way all that was good in the new movement, which he had embraced so warmly; his optimism was counteracted by doubts as to whether, after all, life had not been better in that

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old Romantic Germany of his childhood for which, to the last, he retained so warm an affection. Personal disappointments and unhappiness added to the bitterness of Heine's nature, and the supremely gifted lyric poet and the hardly less gifted satirist were overshadowed by the cynic from whose biting wit nothing was safe.

Heine's contemporary and—although he was not mentioned in the decree against the school—fellow-fighter, Ludwig Börne (1786–1837), was a more characteristic representative of the "Young German" point of view; for he was free from Romantic prejudices. Börne gave vent to his enthusiasm for France in eloquent *Briefe aus Paris* (1830–1833), which form a landmark of importance in the development of German prose style. With Karl Gutzkow (1811–1878), who was considerably younger than either Heine or Börne, the more positive aspects of the "Young German" movement begin to be apparent. He, too, had become a man of letters under the influence of the July revolution, and with an early novel, *Wally, die Zweiflerin* (1835), which was then regarded as atheistic and immoral, he fought in the battle for the new ideas. His best literary work, however, was the comedies with which he enriched the German stage of the 'forties, and novels like *Die Ritter vom Geiste* (1850–1851), and *Der Zauberer von Rom* (1858–1861), which have to be considered in connexion with the later development of German fiction. Heinrich Laube (1806–1884), who, as the author of lengthy social novels, and *Reisenovellen* in the style of Heine's *Reisebilder*, was one of the leaders of the new movement, is now only remembered as Germany's greatest theatre-director. Laube's connexion (1850–1867) with the Burgtheater of Vienna forms one of the most brilliant periods in the history of the modern stage. Heine and Börne, Gutzkow and Laube—these were the leading spirits of "Young Germany"; in their train followed a host of lesser men, who to the present generation are hardly even names. In the domain of scholarship and learning the "Young German" movement was associated with the supremacy of Hegelianism, the leading spirits being D. F. Strauss (1808–1874), author of the *Leben Jesu* (1835), the historians G. G. Gervinus (1805–1871) and W. Menzel (1798–1873), and the philosopher L. A. Feuerbach (1804–1872), who, although a disciple of Hegel, ultimately helped to destroy the latter's influence.

Outside the immediate circle of "Young Germany," other tentative efforts were made to provide a substitute for the discredited literature of Romanticism. The historical novel, for instance, which Romanticists like Arnim had cultivated, fell at an early date under the influence of Sir Walter Scott; Wilhelm Hauff, Heinrich Zschokke (1771–1848) and K. Spindler (1796–1855) were the most prominent amidst the many imitators of the Scottish novelist. The drama, again, which since Kleist and Werner had been without definite principles, was, partly under Austrian influence, finding its way back to a condition of stability. In Germany proper, the men into whose hands it fell were, on the one hand, undisciplined geniuses such as C. D. Grabbe (1801–1836), or, on the other, poets with too little theatrical blood in their veins like K. L. Immermann (1796–1840), or with too much, like E. von Raupach (1784–1852), K. von Holtei (1798–1880) and Adolf Müllner (1774–1829)—the last named being the chief representative of the so-called *Schicksalstragödie*. In those years the Germans were more seriously interested in their opera, which, under C. M. Weber, H. A. Marschner, A. Lortzing and O. Nicolai, remained faithful to the Romantic spirit. In Austria, however, the drama followed lines of its own; here, at the very beginning of the century, H. J. von Collin (1771–1811) attempted in *Regulus* and other works to substitute for the lifeless pseudo-classic tragedy of Ayrenhoff the classic style of Schiller. His attempt is the more interesting, as the long development that had taken place in Germany between Gottsched and Schiller was virtually unrepresented in Austrian literature. M. von Collin (1779–1824), a younger brother of H. J. von Collin, did a similar service for the Romantic drama. Franz Grillparzer (1791–1872), Austria's greatest poet, began in the school of Müllner with a "fate drama," but soon won an independent place for himself; more successfully than any other dramatist of the century, he carried out that task which Kleist had first seriously faced, the reconciliation of the classicism of Goethe and Schiller with the Romantic and modern spirit of the 19th century. It is from this point of view that works like *Das goldene Vliess* (1820), *König Ottokars Glück und Ende* (1825), *Der Traum, ein Leben* (1834) and *Des Meeres und der Liebe Wellen* (1831) must be regarded. As far as the poetic drama was concerned, Grillparzer stood alone, for E. F. J. von Münch-Bellinghausen (1806–1871), his most promising contemporary, once so popular under the pseudonym of Friedrich Halm, soon fell back into the trivial sentimentality of the later Romanticists. In other forms of dramatic literature Austria could point to many distinguished writers, notably the comedy-writer, E. von Bauernfeld (1802–1890), while a host of playwrights, chief of whom were F. Raimund (1700–1836) and J. Nestroy (1801–1862), cultivated the popular Viennese farce and fairy-play. Thus, in spite of Metternich's censorship of the drama, the Viennese theatre was, in the first half of the 19th century, in closer touch with literature than that of any other German centre.

The transitional character of the age is best illustrated by two eminent writers whom outward circumstances rather than any similarity of character and aim have classed together. These were K. L. Immermann, who has been already mentioned, and A. von Platen-Hallermund (1796–1835). Immermann's dramas were of little practical value to the theatre, but one at least, *Merlin* (1832), is a dramatic poem of great beauty. In his novels, however, *Die Epigonen* (1836) and *Münchhausen* (1838–1839),[1] Immermann was the spokesman of his time. He looked backwards rather than forwards; he saw himself as the belated follower of a great literary age rather than as the pioneer of a new one. The bankruptcy of Romanticism and the poetically arid era of "Young Germany" left him little confidence in the future. Platen, on the other hand, went his own way; he, too, was the antagonist both of Romanticism and "Young Germany," and with Immermann himself he came into sharp conflict. But in his poetry he showed himself indifferent to the strife of contending literary schools. He began as an imitator of the German oriental poets—the only Romanticists with whom he had any personal sympathy—and with his matchless *Sonette aus Venedig* (1825) he stands out as a master in the art of verse-writing and as the least subjective of all German lyric poets. In the imitation of Romance metres he sought a refuge from the extravagances and excesses of the Romantic decadence.

Meanwhile the political side of the "Young German" movement, which the German Bund aimed at stamping out, gained rapidly in importance under the influence of the unsettled political conditions between the revolutions of 1830 and 1848. The early 'forties were in German literature marked by an extraordinary outburst of political poetry, which may be aptly compared with the national and patriotic lyric evoked by the year 1813. The principles which triumphed in France at the revolution of 1848 were, to a great extent, fought out by the German singers of 1841 and 1842. Begun by mediocre talents like N. Becker (1809–1845) and R. E. Prutz (1816–1872), the movement found a vigorous champion in Georg Herwegh (1817–1875), who in his turn succeeded in winning for Ferdinand Freiligrath (1810–1876) for the revolutionary cause. Others joined in the cry for freedom—F. Dingelstedt (1814–1881), A. H. Hoffmann von Fallersleben (1798–1874), and a number of Austrians, who had even more reason for rebellion and discontent than the north Germans. But the best Austrian political poetry, the *Spaziergänge eines Wiener Poeten*, 1831, by "Anastasius Grün" (Graf A. A. von Auersperg, 1806–1876), belonged to a decade earlier. The political lyric culminated in and ended with the year 1848; the revolutionists of the 'forties were, if not appeased, at least silenced by the revolution which in their eyes had effected so little. If Freiligrath be excepted, the chief lyric poets of this epoch stood aside from the revolutionary movement; even E. Geibel (1815–1884), the representative poet of the succeeding age, was only temporarily interested in the political

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movement, and his best work is of a purely lyric character. M. von Strachwitz's (1822–1847) promising talent did not flourish in the political atmosphere; Annette von Droste-Hülshoff (1797–1848), and the Austrian, Nikolaus Lenau (1802–1850), both stand far removed from the world of politics; they are imbued with that pessimistic resignation which is, more or less, characteristic of all German literature between 1850 and 1870.

(*b*) *Mid-Century Literature.*—When once the revolution of 1848 was over, a spirit of tranquillity came over German letters; but it was due rather to the absence of confidence in the future than to any hopefulness or real content. The literature of the middle of the century was not wanting in achievement, but there was nothing buoyant or youthful about it; most significant of all, the generation between 1848 and 1880 was either oblivious or indifferent to the good work and to the new and germinating ideas which it produced. Hegel, who held the earlier half of the 19th century in his ban, was still all-powerful in the universities, but his power was on the wane in literature and public life. The so-called "Hegelian Left" had advanced so far as to have become incompatible with the original Hegelianism; the new social and economic theories did not fit into the scheme of Hegelian collectivism; the interest in natural science—fostered by the popular books of J. Moleschott (1822–1893), Karl Vogt (1817–1895) and Ludwig Büchner (1824–1899)—created a healthy antidote to the Hegelian metaphysics. In literature and art, on which Hegel, as we have seen, had exerted so blighting an influence, his place was taken by the chief exponent of philosophic pessimism, Arthur Schopenhauer (1788–1860). Schopenhauer's antagonism to Hegelianism was of old standing, for his chief work, *Die Welt als Wille und Vorstellung*, had appeared as far back as 1819; but the century was more than half over before the movement of ideas had, as it were, caught up with him, before pessimism became a dominant force in intellectual life.

The literature produced between 1850 and 1870 was pre-eminently one of prose fiction. The beginnings which the "Young German" school had made to a type of novel dealing with social problems—the best example is Gutzkow's *Ritter vom Geiste*—developed rapidly in this succeeding epoch. Friedrich Spielhagen (born 1829) followed immediately in Gutzkow's footsteps, and in a series of romances from *Problematische Naturen* (1860) to *Sturmflut* (1876), discussed in a militant spirit that recalls Laube and Gutzkow the social problems which agitated German life in these decades. Gustav Freytag (1816–1895), although an older man, freed himself more successfully from the "Young German" tradition; his romance of German commercialism, *Soll und Haben* (1855), is the masterpiece of mid-century fiction of this class. Less successful was Freytag's subsequent attempt to transfer his method to the *milieu* of German academic life in *Die verlorene Handschrift* (1864). As was perhaps only natural in an age of social and political interests, the historical novel occupies a subordinate place. The influence of Scott, which in the earlier period had been strong, produced only one writer, Wilhelm Häring ("Willibald Alexis," 1798–1871), who was more than a mere imitator of the Scottish master. In the series of six novels, from *Der Roland von Berlin to Dorothe*, which Alexis published between 1840 and 1856, he gave Germany, and more particularly Prussia, a historical fiction which might not unworthily be compared with the *Waverley Novels*. But Alexis had no successor, and the historical novel soon made way for a type of fiction in which the accurate reproduction of remote conditions was held of more account than poetic inspiration or artistic power. Such are the "antiquarian" novels of ancient Egyptian life by Georg Ebers (1837–1898), and those from primitive German history by Felix Dahn (born 1834). The vogue of historical fiction was also transferred to some extent, as in English literature, to novels of American life and adventure, of which the chief German cultivators were K. A. Postl, who wrote under the pseudonym of Charles Sealsfield (1793–1864) and Friedrich Gerstäcker (1816–1872).

Of greater importance was the fiction which owed its inspiration to the Romantic traditions that survived the "Young German" age. To this group belongs the novel of peasant and provincial life, of which Immermann had given an excellent example in *Der Oberhof*, a story included in the arabesque of *Münchhausen*. A Swiss pastor, Albrecht Bitzius, better known by his pseudonym "Jeremias Gotthelf" (1797–1854), was, however, the real founder of this class of romance; and his simple, unvarnished and naïvely didactic stories of the Swiss peasant were followed not long afterwards by the more famous *Schwarzwälder Dorfgeschichten* (1843–1854) of Berthold Auerbach (1812–1882). Auerbach is not by any means so naïve and realistic as Gotthelf, nor is his work free from tendencies and ideas which recall "Young German" rationalism rather than the unsophisticated life of the Black Forest; but the *Schwarzwälder Dorfgeschichten* exerted a decisive influence; they were the forerunners of a large body of peasant literature which described with affectionate sympathy and with a liberal admixture of dialect, south German village life. With this group of writers may also be associated the German Bohemian, A. Stifter (1805–1868), who has called up unforgettable pictures and impressions of the life and scenery of his home.

Meanwhile, the Low German peoples also benefited by the revival of an interest in dialect and peasant life; it is to the credit of Fritz Reuter (1810–1874) that he brought honour to the Plattdeutsch of the north, the dialects of which had played a fitful, but by no means negligible rôle in the earlier history of German letters. His Mecklenburg novels, especially *Ut de Franzosentid* (1860), *Ut mine Festungstid* (1863) and *Ut mine Stromtid* (1862–1864), are a faithful reflection of Mecklenburg life and temperament, and hold their place beside the best German fiction of the period. What Reuter did for Plattdeutsch prose, his contemporaty, Klaus Groth (1819–1899), the author of *Quickborn* (1852), did for its verse. We owe, however, the best German prose fiction of these years to two writers, whose affinity with the older Romanticists was closer. The north German, Theodor Storm (1817–1888) is the author of a series of short stories of delicate, lyric inspiration, steeped in that elegiac Romanticism which harmonized so well with mid-century pessimism in Germany. Gottfried Keller (1819–1890), on the other hand, a native of Zürich, was a modern Romanticist of a robuster type; his magnificent autobiographical novel, *Der grüne Heinrich* (1854–1855), might be described as the last in the great line of Romantic fiction that had begun with *Wilhelm Meister*, and the short stories, *Die Leute von Seldwyla* (1856–1874) and *Züricher Novellen* (1878) are masterpieces of the first rank.

In the dramatic literature of these decades, at least as it was reflected in the repertories of the German theatres, there was little promise. French influence was, in general, predominant; French translations formed the mainstay of the theatre-directors, while successful German playwrights, such as R. Benedix (1811–1873) and Charlotte Birch-Pfeiffer (1800–1868), have little claim to consideration in a literary survey. Gustav Freytag's admirable comedy, *Die Journalisten* (1852), was one of the rare exceptions. But the German drama of this epoch is not to be judged solely by the theatres. At the middle of the century Germany could point to two writers who, each in his way, contributed very materially to the development of the modern drama. These were Friedrich Hebbel (1813–1863) and Otto Ludwig (1813–1865). Both of these men, as a later generation discovered, were the pioneers of that dramatic literature which at the close of the century accepted the canons of realism and aimed at superseding outward effects by psychological conflicts and problems of social life. Hebbel, especially, must be regarded as the most original and revolutionary German dramatist of the 19th century. Unlike his contemporary Grillparzer, whose aim had been to reconcile the "classic" and the "romantic" drama with the help of Spanish models, Hebbel laid the foundations of a psychological and social drama, of which the most modern interpreter has been Henrik Ibsen. Hebbel's first tragedy, *Judith*, appeared in 1840, his masterpieces, *Herodes*

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und Marianne, Agnes Bernauer, Gyges und sein Ring, and the trilogy of *Die Nibelungen* between 1850 and 1862.

In this period of somewhat confused literary striving, there is, however, one body of writers who might be grouped together as a school, although the designation must be regarded rather as an outward accident of union than as implying conformity of aims. This is the group which Maximilian II. of Bavaria gathered round him in Munich between 1852 and 1860. A leading spirit of the group was Emanuel Geibel, who, as we have seen, set a model to the German lyric in this age; F. von Bodenstedt (1819–1892), the popular author of *Mirza Schaffy*; and J. V. von Scheffel (1826–1886), who, in his verse-romance, *Der Trompeter von Säckingen* (1854), broke a lance for a type of literature which had been cultivated somewhat earlier, but with no very conspicuous success, by men like O. von Redwitz (1823–1891) and G. Kinkel (1815–1882). The romance was, in fact, one of the favourite vehicles of poetic expression of the Munich school, its most successful exponents being J. Wolff (b. 1834) and R. Baumbach (1840–1905); while others, such as H. Lingg (1820–1905) and R. Hamerling (1830–1889) devoted themselves to the more ambitious epic. The general tone of the literary movement was pessimistic, the hopelessness of the spiritual outlook being most deeply engrained in the verse of H. Lorm (pseudonym for Heinrich Landesmann, 1821–1902) and H. Leuthold (1827–1870). On the whole, the most important member of the Munich group is Paul Heyse (b. 1830), who, as a writer of "Novellen" or short stories, may be classed with Storm and Keller. An essentially Latin genius, Heyse excels in stories of Italian life, where his lightness of touch and sense of form are shown to best advantage; but he has also written several long novels. Of these, *Kinder der Welt* (1873) and, in a lesser degree, *Im Paradiese* (1875), sum up the spirit and tendency of their time, just as, in earlier decades, *Die Ritter vom Geiste*, *Problematische Naturen* and *Soll und Haben* were characteristic of the periods which produced them.

(*c*) *German Literature after 1870.*—In the years immediately following the Franco-German War, the prevailing conditions were unfavourable to literary production in Germany, and the re-establishment of the empire left comparatively little trace on the national literature. All minds were for a time engrossed by the *Kulturkampf*, by the financial difficulties—the so-called *Gründertum*—due to unscrupulous speculation, and, finally, by the rapid rise of social democracy as a political force. The intellectual basis of the latter movement was laid by Ferdinand Lassalle (1825–1864) and Karl Marx (1818–1883), author of *Das Kapital* (vol. i, 1867). But even had such disturbing elements been wanting, the general tone of German intellectual life at that time was not buoyant enough to inspire a vigorous literary revival. The influence of Hegel was still strong, and the "historical" method, as enunciated in *Der alte und der neue Glaube* (1872) by the Hegelian D. F. Strauss, was generally accepted at the German universities. To many the compromise which H. Lotze (1817–1881) had attempted to establish between science and metaphysics, came as a relief from the Hegelian tradition, but in literature and art the dominant force was still, as before the war, the philosophy of Schopenhauer. In his *Philosophie des Unbewussten* (1869), E. von Hartmann (1842–1906) endeavoured to bring pessimism into harmony with idealism. In lyric poetry, the dull monotony was broken by the excitement of the war, and the singers of the revolution of 1848 were among the first to welcome the triumph and unification of Germany. At the same time, men of the older generation, like Herwegh, Freiligrath and Geibel could ill conceal a certain disappointment with the new régime; the united Germany of 1871 was not what they had dreamed of in their youth, when all hopes were set on the Frankfort parliament.

The novel continued to be what it was before 1870, the most vigorous form of German literature, but the novelists who were popular in the early 'seventies were all older men. Laube, Gutzkow and Auerbach were still writing; Fritz Reuter was a universal favourite; while among the writers of short stories, Storm, who, between 1877 and 1888, put the crown to his work with his *Chroniknovellen*, and Paul Heyse were the acknowledged masters. It was not until at least a decade later that the genius of Gottfried Keller was generally recognized. The historical novel seemed, in those days, beyond hope of revival. Gustav Freytag, it is true, had made the attempt in *Die Ahnen* (1872–1881), a number of independent historical romances linked together to form an ambitious prose epic; but there was more of the spirit of Ebers and Dahn in Freytag's work than of the spacious art of Scott, or of Scott's disciple, Willibald Alexis.

The drama of the 'seventies was in an even less hopeful condition than during the preceding period. The classical iambic tragedy was cultivated by the Munich school, by A. Wilbrandt (b. 1837), A. Lindner (1831–1888), H. Kruse (1815–1902), by the Austrian F. Nissel (1831–1893), and A. Fitger (b. 1840); but it was characteristic of the time that Halm was popular, while Hebbel and Grillparzer were neglected, it might even be said ignored. The most gifted German dramatist belonging exclusively to the decade between 1870 and 1880 was an Austrian, Ludwig Anzengruber (1839–1889), whose *Pfarrer von Kirchfeld* (1870) recalled the controversies of the *Kulturkampf*. This was Anzengruber's first drama, and it was followed by a series of powerful plays dealing with the life of the Austrian peasant; Anzengruber was, indeed, one of the ablest exponents of that village life, which had attracted so many gifted writers since the days of Gotthelf and Auerbach. But the really popular dramatists of this epoch were either writers who, like Benedix in the older generation, cultivated the *bourgeoise* comedy—A. L'Arronge (b. 1838), G. von Moser (1825–1903), F. von Schönthan (b. 1849) and O. Blumenthal (b. 1852)—or playwrights, of whom P. Lindau (b. 1839) may be regarded as representative, who imitated French models. The only sign of progress in the dramatic history of this period was the marked improvement of the German stage, an improvement due, on the one hand, to the artistic reforms introduced by the duke of Meiningen in the Court theatre at Meiningen, and, on the other hand, to the ideals of a national theatre realized at Bayreuth by Richard Wagner (1813–1883). The greatest composer of the later 19th century is also one of Germany's leading dramatists; and the first performance of the trilogy *Der Ring der Nibelungen* at Bayreuth in the summer of 1876 may be said to have inaugurated the latest epoch in the history of the German drama.

The last fifteen or twenty years of the 19th century were distinguished in Germany by a remarkable literary activity. Among the younger generation, which was growing up as citizens of the united German empire, a more hopeful and optimistic spirit prevailed. The influence of Schopenhauer was on the wane, and at the universities Hegelianism had lost its former hold. The sponsor of the new philosophic movement was Kant, the master of 18th-century "enlightenment," and under the influence of the "neo-Kantian" movement, not merely German school philosophy, but theology also, was imbued with a healthier spirit. L. von Ranke (1795–1886) was still the dominant force in German historical science, and between 1881 and 1888 nine volumes appeared of his last great work, *Weltgeschichte*. Other historians of the period were H. von Sybel (1817–1895) and H. von Treitschke (1834–1896), the latter a vigorous and inspiring spokesman of the new political conditions; while J. Burckhardt (1818–1897), author of the masterly *Kultur der Renaissance in Italien* (1860) and the friend of Nietzsche, exerted an influence on German thought which was not confined to academic circles. Literary criticism perhaps benefited most of all by the dethronement of Hegel and the more objective attitude towards Schopenhauer; it seemed as if in this epoch the Germans first formed definite ideas—and ideas which were acceptable and accepted outside Germany—as to the rank and merits of their great poets. A marked change came over the nation's attitude towards Goethe, a poet to whom, as we have seen, neither the era of Hegel nor that of Schopenhauer had been favourable; Schiller was regarded with less national prejudice, and—most important of all—amends were made by the new generation for the earlier neglect of Kleist, Grillparzer, Hebbel and Keller.

The thinker and poet who most completely embodies the spirit

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of this period—who dealt the Hegelian metaphysics its death-blow as far as its wider influence was concerned—was Friedrich Nietzsche (1844–1900). Nietzsche had begun as a disciple of Schopenhauer and a friend of Wagner, and he ultimately became the champion of an individualistic and optimistic philosophy which formed the sharpest possible contrast to mid-century pessimism. The individual, not the race, the *Herrenmensch*, not the slave, self-assertion, not self-denying renunciation—these are some of the ideas round which this new optimistic ethics turns. Nietzsche looked forward to the human race emerging from an effete culture, burdened and clogged by tradition, and re-establishing itself on a basis that is in harmony with man's primitive instincts. Like Schopenhauer before him, Nietzsche was a stylist of the first rank, and his literary masterpiece, *Also sprach Zarathustra* (1883–1891), is to be regarded as the most important imaginative work of its epoch.

Nietzschean individualism was only one of many factors which contributed to the new literary development. The realistic movement, as it had manifested itself in France under Flaubert, the Goncourts, Zola and Maupassant, in Russia under Dostoievsky and Tolstoi, and in Norway under Ibsen and Björnson, was, for a time, the dominant force in Germany, and the younger generation of critics hailed it with undisguised satisfaction; most characteristic and significant of all, the centre of this revival was Berlin, which, since it had become the imperial capital, was rapidly establishing its claim to be also the literary metropolis. It was the best testimony to the vitality of the movement that it rarely descended to slavish imitation of the realistic masterpieces of other literatures; realism in Germany was, in fact, only an episode of the 'eighties, a stimulating influence rather than an accepted principle or dogma. And its suggestive character is to be seen not merely in the writings of the young *Stürmer und Dränger* of this time, but also in those of the older generation who, in temperament, were naturally more inclined to the ideals of a past age.

Of the novelists of the latter class, A. Wilbrandt, who has already been mentioned as a dramatist, has shown, since about 1890, a remarkable power of adapting himself, if not to the style and artistic methods of the younger school, at least to the ideas by which it was agitated; F. Spielhagen's attitude towards the realistic movement has been invariably sympathetic, while a still older writer, Theodor Fontane (1819–1898), wrote between 1880 and 1898 a series of works in which the finer elements of French realism were grafted on the German novel. To the older school belong Wilhelm Jensen (b. 1837), and that fine humorist, Wilhelm Raabe (b. 1831), with whom may be associated as other humorists of this period, H Seidel (1842–1906) and W. Busch (1832–1908). Some of the most interesting examples of recent German fiction come, however, from Austria and Switzerland. The two most eminent Austrian authors, Marie von Ebner-Eschenbach (b. 1830), and Ferdinand von Saar (1833–1906), both excel as writers of Novellen or short stories—the latter especially being an exponent of that pessimism which is Austria's peculiar heritage from the previous generation of her poets. Austrians too, are Peter Rosegger (b. 1843), who has won popularity with his novels of peasant life, K. E. Franzos (1848–1904) and L. von Sacher-Masoch (1835–1895). German prose fiction is, in Switzerland, represented by two writers of the first rank: one of these, Gottfried Keller, has already been mentioned; the other, Konrad Ferdinand Meyer (1825–1898), turned to literature or, at least, made his reputation, comparatively late in life. Although, like Keller, a writer of virile, original verse, Meyer is best known as a novelist; he, too, was a master of the short story. His themes are drawn by preference from the epoch of the Renaissance, and his method is characterized by an objectivity of standpoint and a purity of style exceptional in German writers.

The realistic novels of the period were written by H. Conradi (1862–1890), Max Kretzer (b. 1854), M. G. Conrad (b. 1846), H. Heiberg (b. 1840), K. Bleibtreu (b. 1850), K. Alberti (pseudonym for Konrad Sittenfeld, b. 1862) and Hermann Sudermann (b. 1857). A want of stability was, however, as has been already indicated, characteristic of the realistic movement in Germany; the idealistic trend of the German mind proved itself ill-adapted to the uncompromising realism of the French school, and the German realists, whether in fiction or in drama, ultimately sought to escape from the logical consequences of their theories. Even Sudermann, whose *Frau Sorge* (1887), *Der Katzensteg* (1889), and the brilliant, if somewhat sensational romance, *Es war* (1894), are among the best novels of this period, has never been a consistent realist. It is consequently not surprising to find that, before long, German fiction returned to psychological and emotional problems, to the poetical or symbolical presentation of life, which was more in harmony with the German temperament than was the robuster realism of Flaubert or Zola. This trend is noticeable in the work of Gustav Frenssen (b. 1863), whose novel *Jörn Uhl* (1901) was extraordinarily popular; it is also to be seen in the studies of child life and educational problems which have proved so attractive to the younger writers of the present day, such as Hermann Hesse (b. 1877), Emil Strauss (b. 1866), Rudolf Huch (b. 1862) and Friedrich Huch (b. 1873). One might say, indeed, that at the beginning of the 20th century the traditional form of German fiction, the *Bildungsroman*, had come into its ancient rights again. Mention ought also to be made of J. J. David (1859–1907), E. von Keyserling (b. 1858), W. Hegeler (b. 1870), G. von Ompteda (b. 1863), J. Wassermann (b. 1873), Heinrich Mann (b. 1871) and Thomas Mann (b. 1875). *Buddenbrooks* (1902) by the last mentioned is one of the outstanding novels of the period. Some of the best fiction of the most recent period is the work of women, the most distinguished being Helene Böhlau (b. 1859), Gabriele Reuter (b. 1859), Clara Viebig (C. Cohn-Viebig, b. 1860) and Ricarda Huch (b. 1864). Whether the latest movement in German poetry and fiction, which, under the catch-word *Heimatkunst*, has favoured the province rather than the city, the dialect in preference to the language of the educated classes, will prove a permanent gain, it is still too soon to say, but the movement is at least a protest against the decadent tendencies of naturalism.

At no period of German letters were literature and the theatre in closer touch than at the end of the 19th and the beginning of the 20th centuries; more than at any previous time has the theatre become the arena in which the literary battles of the day are fought out. The general improvement in the artistic, technical and economic conditions of the German stage have already been indicated; but it was not until 1889 that the effects of these improvements became apparent in dramatic literature. Before that date, it is true, Ernst von Wildenbruch (1845–1909) had attempted to revive the historical tragedy, but the purely literary qualities of his work were handicapped by a too effusive patriotism and a Schillerian pathos; nor did the talent of Richard Voss (b. 1851) prove strong enough to effect any lasting reform. In October 1889, however, Gerhart Hauptmann's play, *Vor Sonnenaufgang*, was produced on the then recently founded *Freie Bühne* in Berlin; and a month later, *Die Ehre* by Hermann Sudermann met with a more enthusiastic reception in Berlin than had fallen to the lot of any German play for more than a generation.

Hauptmann (b. 1862), the most original of contemporary German writers, stands, more or less, alone. His early plays, the most powerful of which is *Die Weber* (1892), were written under the influence either of an uncompromising realism, or of that modified form of realism introduced from Scandinavia; but in *Hanneles Himmelfahrt* (1893) he combined realism with the poetic mysticism of a child's dream, in *Florian Geyer* (1895) he adapted the methods of realism to an historical subject, and in the year 1896 he, to all appearance, abandoned realism to write an allegorical dramatic poem, *Die versunkne Glocke*. Hauptmann's subsequent work has oscillated between the extremes marked out by these works—from the frank naturalism of *Fuhrmann Henschel* (1898) and *Rose Berndt* (1903), to the fantastic mysticism of *Der arme Heinrich* (1902) and *Und Pippa tanzt!* (1906).

The dramatic talent of Hermann Sudermann has developed

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on more even lines; the success of *Die Ehre* was due in the first instance to the ability which Sudermann had shown in adapting the ideas of his time and the new methods of dramatic presentation to the traditional German *bürgerliches Drama*. This is the characteristic of the majority of the many plays which followed of which *Heimat* (1893), *Das Glück im Winkel* (1896) and *Es lebe das Leben!* (1902) may be mentioned as typical. With less success Sudermann attempted in *Johannes* (1898) a tragedy on lines suggested by Hebbel. A keen observer, a writer of brilliant and suggestive ideas, Sudermann is, above all, the practical playwright; but it is unfortunate that the theatrical element in his work too often overshadows its literary qualities.

Since 1889, the drama has occupied the foreground of interest in Germany. The permanent repertory of the German theatre has not, it is true, been much enriched, but it is at least to the credit of contemporary German playwrights that they are unwilling to rest content with their successes and are constantly experimenting with new forms. Besides Hauptmann and Sudermann, the most talented dramatists of the day are Max Halbe (b. 1865), O. E. Hartleben (1864–1905), G. Hirschfeld (b. 1873), E. Rosmer (pseudonym for Elsa Bernstein, b. 1866), Ludwig Fulda (b. 1862), Max Dreyer (b. 1862), Otto Ernst (pseudonym for O. E. Schmidt, b. 1862) and Frank Wedekind (b. 1864). In Austria, not withstanding the preponderant influence of Berlin, the drama has retained its national characteristics, and writers like Arthur Schnitzler (b. 1862), Hermann Bahr (b. 1863), Hugo von Hofmannsthal (b. 1874) and R. Beer-Hofmann (b. 1866) have introduced symbolistic elements and peculiarly Austrian problems, which are foreign to the theatre of north Germany.

The German lyric of recent years shows a remarkable variety of new tones and pregnant poetic ideas; it has, as a natural, been more influenced by the optimism of Nietzsche—himself a lyric poet of considerable gifts—than has either novel or drama. Detlev von Liliencron (1844–1909) was one of the first to break with the traditions of the lyric as handed down from the Romantic epoch and cultivated with such facility by the Munich poets. An anthology of specifically modern lyrics, *Moderne Dichtercharaktere* (1885) by W. Arent (b. 1864), may be regarded as the manifesto of the movement in lyric poetry corresponding to the period of realism in fiction and the drama. Representative poets of this movement are Richard Dehmel (b. 1863), K. Henckell (b. 1864), J. H. Mackay (b. 1864 at Greenock), G. Falke (b. 1853), F. Avenarius (b. 1856), F. Evers (b. 1871), F. Dörmann (b. 1870) and K. Busse (b. 1872). A later development of the lyric—a return to mysticism and symbolism—is to be seen in the poetry of Hofmannsthal, already mentioned as a dramatist, and especially in Stefan George (b. 1868). Epic poetry, although little in harmony with the spirit of a realistic age, has not been altogether neglected. Heinrich Hart (1855–1906), one of the leading critics of the most advanced school, is also the author of an ambitious *Lied der Menschheit* (vols. 1-3, 1888–1896); more conservative, on the other hand, is *Robespierre* (1894), an epic in the style of Hamerling by an Austrian, Marie delle Grazie (b. 1864). Attention may also be drawn to the popularity which, for a few years, the so-called *Überbrettl* or cabaret enjoyed, a popularity which has left its mark on the latest developments of the lyric. Associated with this movement are O. J. Bierbaum (1865–1910), whose lyrics, collected in *Der Irrgarten der Liebe* (1901), have been extraordinarily popular, E. von Wolzogen (b. 1855) and the dramatist F. Wedekind, who has been already mentioned.

Whether or not the work that has been produced in such rich measure since the year 1889—or however much of it—is to be regarded as a permanent addition to the storehouse of German national literature, there can be no question of the serious artistic earnestness of the writers; the conditions for the production of literature in the German empire in the early years of the 20th century were eminently healthy, and herein lies the best promise for the future.

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GERMAN REED ENTERTAINMENT. The dramatic and musical entertainment which for many years was known in London by the title of "German Reed" was a form of theatrical enterprise deserving of commemoration in connexion with those who made it successful. Mr THOMAS GERMAN REED (born in Bristol in 1817, died 1888) married in 1844 Miss PRISCILLA HORTON (1818–1895), and in 1855 they started their entertainment at the "Gallery of Illustration," in Waterloo Place, London. From 1866 to 1877 they were assisted by JOHN ORLANDO PARRY (1810–1879), an accomplished pianoforte player, mimic, parodist and humorous singer; and the latter created a unique type of musical and dramatic monologue which became very popular. His tradition was carried on after 1870 by Mr CORNEY GRAIN (1844–1895), who, as a clever, refined, and yet highly humorous society entertainer (originally a barrister), was one of the best-known figures of his day. After the retirement of the elder German Reeds, their son, ALFRED GERMAN REED (1846–1895), himself a capital actor, carried on the business in partnership with Corney Grain. The "German Reed Entertainment," which was always patronized by a large class of people, many of whom objected on principle to going or taking their children to a regular theatre or a music-hall—retained its vogue for forty years at Waterloo Place and at the St George's Hall, Regent Street. But the death of Mr Corney Grain almost simultaneously with Mr Alfred German Reed, in 1895, together with the changed public attitude towards the regular theatre, ended its career.

GERMAN SILVER or **NICKEL SILVER**, an alloy of copper, nickel and zinc, prepared either by melting the copper and nickel together in a crucible, and adding piece by piece the previously heated zinc, or by heating the finely divided metals under a layer of charcoal. To destroy its crystalline structure and so render it fit for working, it is heated to dull redness, and then allowed to cool. German silver is harder than silver4 it resembles that metal in colour, but is of a greyer tinge. Exposed to the air it tarnishes slightly yellow, and with vinegar affords a crust of verdigris. At a bright red heat it melts, losing its zinc by oxidation unless protected from the atmosphere. At a heat above dull redness it becomes exceedingly brittle. German silver in various modifications of composition is much used in the arts. Alloys, of which about 50% is copper and the residue zinc and nickel in about equal proportions take a fine polish, and are used as imitation silver for knives and forks. With a somewhat higher proportion of copper an alloy is formed suitable for rolling and for wire. In Chinese *white silver* or *packfong* (paktong) the amount of copper is smaller, about 40%, with about 32% of nickel, 25 of zinc, and 2 or 3 of iron. German silver for casting contains 2 or 3% of lead, which like iron increases the whiteness of the alloy. German silver, having a high specific resistance and a low temperature coefficient, has been used for electrical resistance coils, and these qualities are possessed in a still greater degree in *manganin*, which contains manganese in place of zinc, its composition being 84% of copper, 12 of manganese and 4 of nickel. The addition of a trace of tungsten to German silver, as in *platinoid*, also largely increases the resistance.

GERMAN SOUTH-WEST AFRICA. This German possession is bounded W. by the Atlantic, N. by Angola, S. by the Cape province, E. by Bechuanaland and Rhodesia, and is the only German dependency in Africa suited to white colonization. It has an area of about 322,450 sq. m., and a population of Bantu Negroes and Hottentots estimated in 1903 at 200,000.[1] The European inhabitants, in addition to the military, numbered 7110 in 1907, of whom the majority were German.

Area and Boundaries.—The boundary separating the German protectorate from the Portuguese possessions of Angola is the lower course of the Kunene to its mouth in 17° 18′ S., 11° 40′ E. to the limit of navigability from the sea, thence in a direct line, corresponding roughly to the lat. of 17° 20′ S., to the river Okavango, which it follows eastwards until the stream turns abruptly south (towards Lake Ngami). From this point a strip of German territory 300 m. long and about 50 m. broad, projects eastward until it reaches the Zambezi a little above the Victoria Falls. On the south this narrow strip of land (known as the Caprivi enclave) is separated from southern Rhodesia by the Kwando or Chobe river. On the east the frontier between British and German territory is in northern half the 21st degree of E. longitude, in its southern half the 20th degree. This frontier is drawn through desert country. The southern frontier is the Orange river from its mouth to the 20° E. The coast-line between the Kunene and Orange rivers is not at all wholly desert. Just north of the tropic of Capricorn is the British enclave of Walfish Bay (*q.v.*). The northern part of the protectorate is known as Ovamboland, the central portion as Damara (or Herero) land; the southern portion as Great Namaqualand. Which names are derived from those of the dominant native races inhabiting the country.

Physical Features.—The coast-line is generally low and little broken by bays or promontories. In its entire length of about 800 m. it has no good natural harbour, and its bays—Walfish Bay, otherwise Lüderitz Bay, Sierra Bay, Sandwich Harbour—are in danger of being filled with sand by the strong, cold, northerly coast current. Swakopmund is an artificial harbour at the mouth of the river Swakop. The small islands which off the coast north and south of Angra Pequena belong to Great Britain. The coast-line is bordered by a belt of sand-dunes and desert, which, about 35 m. wide in the south, narrows towards the north. This coast belt is flanked by a mountain range, which attains its highest elevation in Mount Omatako (8972 ft.), in about 21° 15′ S., 16° 40′ E. N.E. of Omatako is the Omboroko range, otherwise known as the Waterberg. South of Omboroko, occupying the centre of the country, the range attains its highest average altitude. The following massifs with their highest points may be distinguished: Gans (7664 ft.), Nu-ubeb (7480 ft.), Onyati (7201 ft.), Awas (6988 ft.), Komas (5331 ft.) and Ganab (4002 ft.). In the S.E. are the Karas mountains, which attain an elevation of 6570 ft. The mountains for the most part form the escarpment of the great Kalahari plateau, which, gently rising from the interior towards the west, slopes again towards the south and north from the point of its highest elevation. The Kalahari plateau changes the undulating character it has in the west to a perfect plain in the far east, where the watered and habitable country merges into the sterile Kalahari desert. In the northern half of the country the central plateau contains much rich grass-land, while in the north-eastern region the Omaheke desert has all the characteristics of the Kalahari.

There are no rivers of importance wholly within German South-West Africa. The Kunene (*q.v.*) has but a small portion of the southern bank in the colony, and similarly only part of the northern

[1] As the result of wars with the natives, the population greatly decreased. The number of adult (native) males in the colony at the beginning of 1908 was officially estimated at 19,000, a figure indicating a total population of little more than 100,000.

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bank of the Orange river (*q.v.*) is in German territory. Several streams run south into the Orange; of those the chief is the Great Fish river, which has a course of nearly 500 m. Both the Kunene and the Orange carry water all the year round, but are not navigable. Neither is the Great Fish river, which, however, is rarely dry. The Okavango, which comes from the north and runs towards Ngami (*q.v.*), is perennial, but like the Kunene and Orange, belongs only partly to the hydrographic system of the country. From the inner slopes of the coast chain they stretch up N.E. to join the Okavango. They cross the Omaheke waste and are usually dry. Ovamboland has a hydrographic system connected with the Kunene, and, in seasons of great flood, with that of Ngami. Before the Kunene breaks through the outer edge of the plateau, it sends divergent channels south-east to a large marsh or lake called Etosha, which is cut by 17° E. and 19° S. Of these channels the Kwamatuo or Okipoko, which is perennial, enters Etosha at its N.W. corner. The lake when full extends about 80 m. W. to E. and 50 m. N. to S. From its E. corner issues the Omuramba, which divides into two branches, known respectively as the Omaheke and the Ovampo. These streams have an easterly direction, their beds, often dry, joining the Okavango. The river-runs of the protectorate have as a rule plenty of water in their upper courses in the rainy season, though some river beds are dry for years together. After a heavy thunderstorm such a river bed will be suddenly filled with a turbid current half a mile wide. The water is, however, before long absorbed by the thirsty land. Only in exceptionally rainy years do the streams which cross the sand belt carry water to the ocean. But in the sand which fills the river beds water may be obtained by digging. Of rivers running direct to the Atlantic the Little Fish river enters the sea at Angra Pequena and the Kuisip in Walfish Bay. The Swakop rises in the hills near the Waterberg, and north of it is the Omaruru, which carries water for the greater part of the year. Hot springs are numerous, and it is remarkable that those of Windhoek flow more copiously during the dry than the rainy season. There are also many cold springs, and wells which contain water all the year.

Geology.—Gneiss and schist, with intrusive granites and porphyries, overlain to a great extent by sand and laterite deposits, occupy the coast belt, coast mountains and the plateau of Damaraland. In the Huib and Han-ami plateaus of Great Namaqualand the crystalline rocks are overlain by sandstones, slates, quartzites and jasper rocks, and these in turn by dolomites. They are probably equivalent to the Transvaal and Free State system (see TRANSVAAL: *Geology*). The next oldest rocks are of recent geological date. The Kalahari Kalk, which extends over large areas to the south-east of Ovamposland, may be of Miocene age, but it has not yielded fossils. Extensive tracts of alluvium occur in the country round Ovampo, while the dunes and sand-tracts of the Kalahari occupy the eastern regions.

Climate.—On the coast the mean temperature is low, and there is little rainfall. Moisture is supplied by dense fogs, which rise almost daily. South-west winds prevail. Inland the climate is temperate rather than tropical, with bracing, clear atmosphere. There are considerable differences of temperature between day and night, and two well-marked seasons, one cold and dry from May to September, the other hot and rainy from October to April. In winter ice frequently forms during the night on open water on the plateau, but it never remains all day. The yearly rainfall is about 20 in. in the Damara Hills; there is more rain in the north than in the south, and in the east than in the west. In the greater part of the colony the climate is favourable for European settlement.

Flora and Fauna.—The vegetation corresponds exactly with the climate. In the dry littoral region are plants able to exist with the minimum of moisture they derive from the daily fog—*Arctopus echinatus*, *Sarcocaula*, *Aloe dichotoma*, *Aristida subacaulis* and the wonderful *Welwitschia*. Farther inland are plants which spring up and disappear with the rain, and others whose roots reach permanent water. The former are chiefly grasses, the latter exist almost solely in or near river-beds. Amongst the fine trees often seen here, the ana tree (*Acacia albida*) is the most noteworthy, its seeds being favourite fodder for all domestic animals. *Acacia giraffae*, *Ac. horrida*, *Adansonia sternculia*, under the Kunene the *Hyphaene ventricosa*, deserve special notice. The vegetation in the mountain valleys is luxuriant, and towards the north is of a tropical character. The palm zone extends a considerable distance south of the Kunene, and here vegetation spreads over the sand-dunes of the coast plain, which are covered with grasses.

Large game, formerly abundant, especially pachyderms, is scarce. Of antelopes the following species are plentiful in parts: springbok, steenbok, kudu, rietbok, eenlah; of monkeys, the *Cynocephalus porcarius* is frequent. Various kinds of hyenas and jackals with fine fur (*Canis mesomelas*), also *Felis caracal*, abound. The springhare (*Pedetesa caffer*) and rock-rabbit (*Hyrax capensis*) may often be observed. Of birds there are 728 species. Crocodiles, turtles and snakes are numerous.

Inhabitants.—Among the natives of German South-West Africa three classes may be distinguished. In the first class are the Namaqua (Hottentots) and Bushmen. The Namaqua probably came from the south, while the Bushmen may be looked upon as an indigenous race. The Hottentots, the purest existing types of that race, are divided into numerous tribes, independent of one another, such as the Witbois, Swartzbois, Bondelzwarts. The Bushmen are found scattered over the eastern parts of the country (see HOTTENTOTS and BUSHMEN). The second class consists of the mountain Damara (Hau-Khoin), a race of doubtful affinities, probably of Bantu-Negro origin, but speaking the Hottentot language. The third class belongs to the Bantu-Negro stock, and came from the north-east, expelling and enslaving the mountain Damara, and settling in various parts of the country under different names. The most prominent are the Herero, thorough nomads and cattle-breeders; while the Ovampo (Ovambo or Ambo), in the northern part of the protectorate, are agriculturists. The Herero (*q.v.*) are also known by the Hottentot name Damara, and by this name their country is generally called. The Bastaards, who live in Namaqualand, are a small tribe originating from a mingling of Cape Boers with Hottentots. They are Christians, and able to read and write. The other natives are spirit-worshippers, save for the comparatively few converts of the Protestant missions established in the country. Of white races represented the chief are Germans and Boers. In the S.E. Boer settlers form the bulk of the white population. There are also numbers of British colonists in this region—emigrants from the Cape. The immigration of Germans is encouraged by subsidies and in other ways.

Towns.—The chief port is Swakopmund, built on the northern bank of the Swakop river (the southern bank belonging to the British territory of Walfish Bay). The harbour is partially protected by a breakwater. There are also settlements at Lüderitz Bay (white pop. 1904, over 1000) and at Sandwich Harbour. Swakopmund is connected by a narrow gauge railway with Windhoek, the administrative capital of the colony, situated in a hilly district 180 m. due east of the port, but 237 m. by the railway. Karibib is the only place of consequence on the line. Otyimbingue is a government station 70 m. W.N.W. of Windhoek, and Tsumeb a mining centre 240 m. N.N.E. of the same place. Olukonda is a government post in Ovampoland. In the S.E. corner of the colony, 30 m. N. of the Orange river, is the town of Warmbad. Keetmanshoop, 200 m. N.E. of Warmbad and 180 m. E. of Lüderitz Bay, is the centre of a small mining industry. Gibeon is a government station and missionary settlement about midway between Keetmanshoop and Windhoek. Besides these places there are numbers of small mining towns at which live a few white traders and missionaries. The missionaries have given Biblical names to several of their stations, such as Bethany and Beersheba in Namaqualand, and Rehoboth in Damaraland. In the Ugnivi enclave are a Government residency and the site of the town of Linyante, once the capital of the Makololo dynasty of Barotseland (see BAROTSE).

Industries.—Agriculture is followed by the natives in the northern districts, but the chief industry is stock-raising. The scarcity of water in the southern parts is not favourable for agricultural pursuits, while the good grazing lands offer splendid pasturage for cattle, which the Herero raise in numbers amounting to many hundred thousands. Horses, sheep and goats thrive well. Horses are also imported from the Cape. Unfortunately the climate does not suit them everywhere, and they are subject to a virulent distemper. Cattle and sheep also suffer from the diseases which are common in the Cape Colony. Camels have been imported, and are doing well. Wheat, maize and sorghum are the chief crops raised, though not enough is grown to meet even local requirements. Near the coast the natives collect the kernels of the nara, a wild-growing cucurbit, which, in the words of an early traveller, C. J. Anderson, "are eaten by oxen, mice, men, ostriches and lions." About half the European settlers are engaged in agriculture. They raise maize, wheat, tobacco, fruit and vegetables. Cotton cultivation and viticulture are carried on in some districts.

Minerals, especially copper, are plentiful in the country. The chief copper deposits are at Tsumeb, which is 4230 ft. above the sea, in the Otavi district. Diamonds are found on and near the surface of the soil in the Lüderitz Bay district, and diamonds have also been found in the neighbourhood of Gibeon. A little pottery is made, and the Hottentot women are clever in making fur cloths. In the north the Ovampo do a little smith-work and grass-plaiting. The external trade of the country was of slow growth. The exports, previous to the opening up of the Otavi mines, consisted chiefly of live stock—sent mainly to Cape Colony—guano, ivory, horns, hides and ostrich feathers. The chief imports are food stuffs, textiles and metals, and hardware. In 1903 the value of the exports was £168,560, that of the imports £388,210. The war which followed (see below, *History*) led to a great shrinking of exports, rendering the figures for the period 1904–1907 useless for purposes of comparison. About 85% of the imports are from Germany.

Communications.—The economic development of the country is largely dependent on transport facilities. The railway from

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Swakopmund to Windhoek, mentioned above, was begun in 1897, and was opened for traffic in July 1902. It cost nearly £700,000 to build. Another narrow gauge railway, to serve the Otavi copper mines, was begun in 1904 and completed in 1908. It starts from Swakopmund and is 400 m. long, the terminus being at Grootfontein, 40 m. S.E. of Tsumeb. The highest point on this line is 5213 ft. above the sea. In 1906–1908 a railway, 180 m. long, was built from Lüderitz Bay to Keetmanshoop. This line is of the standard South African gauge (3 ft. 6 in.), that gauge being adopted in view of the eventual linking up of the line with the British railway systems at Kimberley. A branch from Seeheim on the Keetmanshoop line runs S.E. to Kalkfontein.

Besides railways, roads have been made between the chief centres of population. Along these, in the desert districts, wells have been dug. Across the Awas Mountains, separating Windhoek from the central plateau, a wide road has been cut. In 1903 the colony was placed in telegraphic communication with Europe and Cape Colony by the laying of submarine cables having their terminus at Swakopmund. There is a fairly complete inland telegraphic service.

There is regular steamship communication between Hamburg and Swakopmund, Walfish Bay and Lüderitz Bay. Regular communication is also maintained between Cape Town and the ports of the colony.

Administration.—At the head of the administration is an imperial governor, responsible to the colonial office in Berlin, who is assisted by a council consisting of chiefs of departments. The country is divided into various administrative districts. In each of these there is a *Bezirksamtmann*, with his staff of officials and police force. In each district is a law court, to whose jurisdiction not alone the whites, but also the Bastaards are subject. As in all German colonies, there is a court of appeal at the residence of the governor. The government maintains schools at the chief towns, but education is principally in the hands of missionaries. The armed force consists of regular troops from Germany and a militia formed of Bastaards. The local revenue for some years before 1903 was about £130,000 per annum, the expenditure about £400,000, the difference between local receipts and expenditure being made good by imperial subsidies. In 1908 local revenue had risen to £250,000, but the imperial authorities incurred an expenditure of over £2,000,000, largely for military purposes. On articles of export, such as feathers and hides, 5% *ad valorem* duty has to be paid; on cattle and horses an export tax per head. There is a 10% *ad valorem* duty on all imports, no difference being made between German and foreign goods. The sale of spirituous liquors is subject to a licence.

History.—The coast of south-west Africa was discovered by Bartholomew Diaz in 1487, whilst endeavouring to find his way to the Indies. He anchored in a bay which by reason of its smallness he named Angra Pequena. Portugal, however, took no steps to acquire possession of this inhospitable region, which remained almost unvisited by Europeans until the early years of the 19th century. At this time the country was devastated by a Hottentot chief known as Afrikander, who had fled thither with a band of outlaws after murdering his master, a Boer farmer by whom he had been ill-treated, in 1796. In 1805 some missionaries (of German nationality) went into Namaqualand in the service of the London Missionary Society, which society subsequently transferred its missions in this region to the Rhenish mission, which had had agents in the country since about 1840. The chief station of the missionaries was at a Hottentot settlement renamed Bethany (1820), a place 125 m. E. by Angra Pequena. The missionaries had the satisfaction of stopping Afrikander's career of bloodshed. He became a convert, a great friend of the mission, and took the name of Christian. The proximity of Great Namaqualand to Cape Colony led to visits from British and Dutch farmers and hunters, a few of whom settled in the country, which thus became in some sense a dependency of the Cape.

In 1867 the islands along the coast north and south of Angra Pequena, on which were valuable guano deposits, were annexed to Great Britain. At this time a small trade between the natives and the outside world was developed at Angra Pequena, the merchants engaged in it being British and German. The political influence of the Cape spread meantime northward to the land of the Herero (Damara). The Herero had been subjugated by Jonker Afrikander, a son of Christian Afrikander, who followed the early footsteps of his sire and had renounced Christianity, but in 1865 they had recovered their independence. The Rhenish missionaries appealed (1868) to the British government for protection, and asked for the annexation of the country. This request, although supported by the Prussian government, was refused. In 1876, however, a special commissioner (W. Coates Palgrave) was sent by the Cape government "to the tribes north of the Orange river." The commissioner concluded treaties with the Namaqua and Damara which fixed the limits of the territories of the two races and placed the whole country now forming German South-West Africa within the sphere of British influence. In the central part of Damaraland an area of some 35,000 sq. m. was marked out as a British reservation. The instrument by which this arrangement was made was known as the treaty of Okahandya. Neither it nor the treaty relating to Great Namaqualand was ratified by the British government, but at the request of Sir Bartle Frere, then high commissioner for South Africa, Walfish Bay (the best harbour along the coast) was in 1878 annexed to Great Britain.

German rule established.

In 1880 fighting between the Namaqua, who were led by Jan Afrikander, son of Jonker and grandson of Christian Afrikander, and the Damara broke out afresh, and was not ended until the establishment of European rule. In 1883 F. A. E. Lüderitz (1834–1886), a Bremen merchant, with the approval of Prince Bismarck, established a trading station at Angra Pequena. This step led to the annexation of the whole country to Germany (see AFRICA, § 5) with the exception of Walfish Bay and the islands actually British territory. On the establishment of German rule Jonker Afrikander's old headquarters were made the seat of administration and renamed Windhock. The Hottentots, under a chieftain named Hendrik Witboi, offered a determined opposition to the Germans, but after a protracted war peace was concluded in 1894 and Hendrik became the ally of the Germans. Thereafter, notwithstanding various local risings, the country enjoyed a measure of prosperity, although, largely owing to economic conditions, its development was very slow.

Herero war.

In October 1903 the Bondelzwarts, who occupy the district immediately north of the Orange river, rose in revolt. This act was the beginning of a struggle between the Germans and the natives which lasted over four years, and cost Germany the lives of some 5000 soldiers and settlers, and entailed an expenditure of £15,000,000. Abuses committed by white traders, the brutal methods of certain officials and the occupation of tribal lands were among the causes of the war, but impatience of white rule was believed to be the chief reason for the revolt of the Herero, the most formidable of the opponents of the Germans. The Herero had accepted the German protectorate by treaty—without fully comprehending that to which they had agreed. To crush the Bondelzwarts, an object attained by January 1904, the governor, Colonel Theodor Leutwein, had denuded Damaraland of troops, and advantage was taken of this fact by the Herero to begin a long-planned and well-prepared revolt. On the 12th of January 1904 most of the German farmers in Damaraland were attacked, and settlers and their families murdered and the farms devastated. Reinforcements were sent from Germany, and in June General von Trotha arrived and took command of the troops. On the 11th of August von Trotha attacked the Herero in their stronghold, the Waterberg, about 200 m. N. of Windhoek, and inflicted upon them a severe defeat. The main body of the enemy escaped, however, from the encircling columns of the Germans, and thereafter the Herero, who were under the leadership of Samuel Maherero, maintained a guerrilla warfare, rendering the whole countryside unsafe. The Germans found pursuit almost hopeless, being crippled by the lack of water and the absence of means of transport. To add to their troubles a Herero bastard named Morenga, with a following of Hottentots, had, in July, recommenced hostilities in the south. On the 2nd of October 1904 von Trotha, exasperated at his want of success in crushing the enemy, issued a proclamation in which he said: "Within the German frontier every Herero with or without a rifle, with or without cattle, will be shot. I will not take over any more women and children. But I will either drive them back to your people or have them fired on." In a later order von Trotha instructed his soldiers not to fire into, but to fire over the heads of the women and children, and Prince Bülow ordered the general to repeal the

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whole proclamation. Whenever they had the chance, however, the Germans hunted down the Herero, and thousands perished in the Omaheke desert, across which numbers succeeded in passing to British territory near Ngami.

On the day following the issue of von Trotha's proclamation to the Herero, *i.e.* on the 3rd of October 1904, Hendrik Witboi sent a formal declaration of war to the Germans. Hendrik had helped to suppress the Bondelzwarts rising, and had received a German decoration for his services, and his hostility is said to have been kindled by the supersession of Colonel Leutwein, for whom he entertained a great admiration. The Witbois were joined by other Hottentot tribes, and their first act was to murder some sixty German settlers in the Gibeon district. Both British and Boer farmers were spared—the Hottentots in this matter following the example of the Herero. In November, considerable reinforcements having come from Germany, the Witbois were attacked, and Hendrik's headquarters, Reitmont, captured. Another defeat was inflicted on Hendrik in January 1905, but, lacking ammunition and water, the Germans could not follow up their victory. As in Damaraland, the warfare in Namaqualand now assumed a guerrilla character, and the Germans found it almost impossible to meet their elusive enemy, while small detachments were often surprised and sometimes annihilated. In May 1905 von Trotha tried the effect on the Hottentots of another of his proclamations. He ordered them to surrender, adding that in the contrary event all rebels would be exterminated. A price was at the same time put on the heads of Hendrik Witboi and other chiefs. This proclamation was unheeded by the Hottentots, who were in fact continuing the war with rifles and ammunition seized from the Germans, and replenishing their stock with cattle taken from the same source. In the north, however, Samuel Maherero had fled to British territory, and the resistance of the Herero was beginning to collapse. Concentration camps were established in which some thousands of Herero women and children were cared for. Meanwhile, the administration of von Trotha, who had assumed the governorship as well as the command of the troops, was severely criticized by the civilian population, and the non-success of the operations against the Hottentots provoked strong military criticism. In August 1905 Colonel (afterwards General) Leutwein, who had returned to Germany, formally resigned the governorship of the protectorate, and Herr von Lindequist, late German consul-general at Cape Town, was nominated as his successor. Von Trotha, who had publicly criticized Prince Bülow's order to repeal the Herero proclamation, was superseded. He had in the summer of 1905 instituted a series of "drives" against the Witbois, with no particular results. Hendrik always evaded the columns and frequently attacked them in the rear.

In November 1905 von Lindequist arrived at Windhoek. The new governor issued a general amnesty to the Herero, and set aside two large reserves for those who surrendered. His conciliatory policy was in the end successful, and the Ovampo, who threatened to give trouble, were kept in hand. The task of pacifying Damaraland was continued throughout 1906, and by the close of that year about 16,000 Herero had been established in the reserves. Some 3000 had sought refuge in British territory, while the number who had perished may be estimated at between 20,000 and 30,000.

The Hottentots subdued.

In Namaqualand von Lindequist found an enemy still unbroken. On the 3rd of November, however, Hendrik Witboi died, aged seventy-five, and his son and successor Samuel Isaac Witboi shortly afterwards surrendered, and the hostility of the tribe ceased. Morenga now became the chief of the rebel Hottentots, and "drives" against him were organized. Early in May 1906 an encounter between Morenga and a German column was fought close to the British frontier of the Bechuanaland protectorate. Morenga fled, was pursued across the frontier, and wounded, but escaped. On the 16th of May he was found hiding by British patrols and interned. Other Hottentot chiefs continued the conflict, greatly aided by the immense difficulty the Germans had in transporting supplies; to remedy which defect the building of a railway from Lüderitz Bay to Kubub was begun early in 1906. A camel transport corps was also organized, and Boer auxiliaries engaged. Throughout the later half of 1906 the Hottentots maintained the struggle, the Karas mountains forming a stronghold from which their dislodgment was extremely difficult. Many of their leaders and numbers of the tribesmen had a considerable strain of white (chiefly Dutch) blood and were fairly educated men, with a knowledge not only of native, but European ways; facts which helped to make them formidable opponents. Gradually the resistance of the Hottentots was overcome, and in December 1906 the Bondelzwarts again surrendered. Other tribes continued the fight for months longer, but by March 1907 it was found possible to reduce the troops in the protectorate to about 5000 men. At the height of the campaign the Germans had 19,000 men in the field.

In August 1907 renewed alarm was created by the escape of Morenga from British territory. The Cape government, regarding the chief as a political refugee, had refused to extradite him and he had been assigned a residence near Upington. This place he left early in August and, eluding the frontier guards, re-entered German territory. In September, however, he was again on the British side of the border. Meantime a force of the Cape Mounted Police under Major F. A. H. Eliott had been organized to effect his arrest. Summoned to surrender, Morenga fled into the Kalahari Desert. Eliott's force of sixty men pursued him through a waterless country, covering 80 m. in 24 hours. When overtaken (September 21st), Morenga, with ten followers, was holding a kopje and fired on the advancing troops. After a sharp engagement the chief and five of his men were killed, the British casualties being one killed and one wounded. The death of Morenga removed a serious obstacle to the complete pacification of the protectorate. Military operations continued, however, during 1908. Herr von Lindequist, being recalled to Berlin to become under-secretary in the colonial office, was succeeded as governor (May 1907) by Herr von Schuckmann. In 1908 steps were taken to establish German authority in the Caprivi enclave, which up to that time had been neglected by the colonial authorities.

Discovery of diamonds.

The discovery of diamonds in the Lüderitz Bay district in July 1908 caused a rush of treasure-seekers. The diamonds were found mostly on the surface in a sandy soil and were of small size. The stones resemble Brazilian diamonds. By the end of the year the total yield was over 30,000 carats. One of the difficulties encountered in developing the field was the great scarcity of fresh water. During 1909 various companies were formed to exploit the diamondiferous area. The first considerable packet of diamonds from the colony reached Germany in April 1909. The output for the year was valued at over £1,000,000.

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The Okavango River (1861) and *Notes of Travel* (1875). See also Sir J. E. Alexander, *An Expedition of Discovery into the Interior of Africa* (London, 1838). Reports on the German colonies are published by the British foreign office. The *Kriegskarte von Deutsch-Südwestafrika* (Berlin, 1904), in nine sheets on a scale of 1 : 800,000, will be found useful. (F. R. C.)

GERMANTOWN, a residential district and former suburb, now the Twenty-second Ward, of Philadelphia, Pennsylvania, U.S.A., on Wissahickon Creek, in the N. part of the city. It is served by the Pennsylvania and the Philadelphia & Reading railways. There are many old colonial houses and handsome modern residences along Main Street (the old Germantown Road or Avenue). Prominent among the historic houses is Cliveden, or the "Chew House," built about 1761 by Benjamin Chew (1722–1810), who was chief-justice of Pennsylvania in 1774–1777 and was imprisoned as a Loyalist in 1777, and whose home during the battle of Germantown (see below) was occupied by British troops. The well-preserved Morris House (1772) was the headquarters of General Howe at the close of the battle, and in 1793, when Germantown, owing to the yellow fever in Philadelphia, was the temporary capital of the United States, it was occupied by President Washington. Three doors above stood until 1904 the Ashmead House, used for a time by Count Nicholas Lewis Zinzendorf and his daughters for their Moravian school, which was removed to Bethlehem. In the same street, opposite Indian Queen Lane, is the old Wister Mansion, built as a country-seat in 1744 and occupied by British officers during the War of Independence. In another old house (now Nos. 5275–5277), John Fanning Watson (1779–1860), the annalist of Philadelphia, did most of his literary work. Just outside the ward limits, in what has since become a part of Fairmount Park, is the house in which David Rittenhouse, the astronomer, was born; it stands on Monoshore Creek or Paper Mill Run, in what was long called Roxborough (now the 21st ward of Philadelphia). In this vicinity the first paper mill in America was erected in 1690 by a company of which William Rittenhouse, David's great-grandfather, was the leading member. The King of Prussia Inn, built about 1740, and the Mermaid Hotel, as old or older, are interesting survivals of the inns and taverns of old Germantown. The Germantown Academy was built in 1760, and after the battle of Germantown was used by the British as a hospital. In Germantown are also a Friends' (orthodox) school, a Friends' free library, and the Germantown branch of the Philadelphia public library. The first school in Germantown was established about 1701, and for the first eighteen years was under the mastership of Francis Daniel Pastorius (1651–1719), the leader in founding the town, who lived in a house that stood on the site of the present First Methodist Episcopal church, High Street and Main Street. He compiled a primer which was the first school book produced in the state; with three others he drafted and signed in 1688 what seems to have been the first public protest made in America against slavery; and he is celebrated in Whittier's *Pennsylvania Pilgrim*. Later the same school passed to Christopher Dock (d. 1771), who in 1770 published an essay on teaching (written in 1750), which is said to have been the first book on pedagogy published in America. The first Bible printed in America in any European language was published in Germantown in 1743 by Christopher Sauer (d. 1758), a preacher of the German Baptist Brethren, who in 1739 established Germantown's first newspaper, *The High German Pennsylvania Historian, or Collection of Important News from the Kingdom of Nature and of the Church*. His grandsons are said to have cast about 1772 the first American printing type. The Friends were the first sect to erect a meeting-house of their own (about 1693). The Mennonites built a log meeting-house in 1709, and their present stone church was built in 1770. The town hall of Germantown was used as a hospital during the last three years of the Civil War. In Market Square a soldiers' monument was erected in 1883. The Site and Relic Society of Germantown maintains a museum of relics. Many of the early settlers were linen weavers, and Germantown still manufactures textiles, knit goods and yarns.

Germantown was founded in October 1683 by thirteen families from Crefeld, Germany, under the leadership of Francis Daniel Pastorius. The township, as originally laid out, contained four distinct villages known as Germantown, Cresheim, Sommerhousen and Crefeld. Cresheim was later known as Mount Airy, and Sommerhousen and Crefeld became known as Chestnut Hill. The borough of Germantown was incorporated in 1689. For many years it was a straggling village extending about 2 m. along Main Street. Its growth was more rapid from the middle of the 18th century. In 1789 a motion for the permanent location of the national capital at Germantown was carried in the Senate, and the same measure passed the House, amended only with respect to the temporary government of the ceded district; but the Senate killed the bill by voting to postpone further consideration of it until the next session. Germantown was annexed to Philadelphia in 1854.

Battle of Germantown.—This famous encounter in the American War of Independence was fought on the 4th of October 1777. After the battle of Brandywine (*q.v.*) and the occupation of Philadelphia, the British force commanded by Sir W. Howe encamped at Germantown, where Washington determined to attack them. The Americans advanced by two roads, General Sullivan leading the column on the right and General Greene that on the left. Washington himself accompanied Sullivan, with whom were Stirling (an officer who claimed to be earl of that name) and Anthony Wayne. The right at first met with success, driving the British advanced troops back on the main body near the Chew House. Colonel Musgrave, of the 40th Foot, threw a portion of his regiment into this house, and General Agnew came up with his command. The Americans under Stirling attempted to dislodge Musgrave, thus losing time and alarming part of Sullivan's advance who had pushed farther forward in the fog. General Greene on the left was even less fortunate. Meeting with unexpected opposition at the first point of attack his troops were thrown into confusion and compelled to retreat. One of his brigades extended itself to the right wing, and by opening fire on the Chew House caused Wayne to retreat, and presently both of the American columns retired rapidly in the direction of their camp. The surprise had failed, with the loss to Washington's army of 673 men as against 500 on the side of the British. The British General Agnew and the American General Nash were both mortally wounded. In December Washington went into winter quarters at Valley Forge, 40 m. west of Philadelphia. The British wintered in and around the city.

See N. H. Keyser, "Old Historic Germantown," in the *Proceedings and Addresses of the Pennsylvania-German Society* (Lancaster, 1906); S. W. Pennypacker, *The Settlement of Germantown, Pennsylvania, and the Beginning of German Emigration to North America* (Philadelphia, 1899), and S. F. Hotchkin, *Ancient and Modern Germantown, Mount Airy and Chestnut Hill* (Philadelphia, 1889).

GERMANY (Ger. *Deutschland*), or, more properly, THE GERMAN EMPIRE (*Deutsches Reich*), a country of central Europe. The territories occupied by peoples of distinctively Teutonic race and language are commonly designated as German, and in this sense may be taken to include, besides Germany proper (the subject of the present article), the German-speaking sections of Austria, Switzerland and Holland. But Germany, or the German empire, as it is now understood, was formed in 1871 by virtue of treaties between the North German Confederation and the South German states, and by the acquisition, in the peace of Frankfort (May 10, 1871), of Alsace-Lorraine, and embraces all the countries of the former German Confederation, with the exception of Austria, Luxemburg, Limburg and Liechtenstein. The sole addition to the empire proper since that date is the island of Heligoland, ceded by Great Britain in 1890, but Germany has acquired extensive colonies in Africa and the Pacific (see below, *Colonies*).

The German empire extends from 47° 16′ to 55° 53′ N., and from 5° 52′ to 22° 52′ E. The eastern provinces project so far that the extent of German territory is much greater from south-west to north-east than in any other direction. Tilsit is 815 m. from Metz, whereas Hadersleben, in Schleswig, is only 540 m. from the Lake of Constance. The actual difference in time between the eastern and western points is 1 hour and 8 minutes,

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but the empire observes but one time—1 hour E. of Greenwich. The empire is bounded on the S.E. and S. by Austria and Switzerland (for 1659 m.), on the S.W. by France (242 m.), on the W. by Luxemburg, Belgium and Holland (together 558 m.). The length of German coast on the North Sea or German Ocean is 293 m., and on the Baltic 927 m., the intervening land boundary on the north of Schleswig being only 47 m. The eastern boundary is with Russia 843 m. The total length of the frontiers is thus 4569 m. The area, including rivers and lakes but not the *haffs* or lagoons on the Baltic coast, is 208,830 sq. m., and the population (1905) 60,641,278. In respect of its area, the German empire occupied in 1909 the third place among European countries, and in point of population the second, coming in point of area immediately after Russia and Austria-Hungary, and in population next to Russia.

Political Divisions.—The empire is composed of the following twenty-six states and divisions: the kingdoms of Prussia, Bavaria, Saxony and Württemberg; the grand-duchies of Baden, Hesse, Mecklenburg-Schwerin, Mecklenburg-Strelitz, Oldenburg and Saxe-Weimar; the duchies of Anhalt, Brunswick, Saxe-Altenburg, Saxe-Coburg-Gotha and Saxe-Meiningen; the principalities of Lippe-Detmold, Reuss-Greiz, Reuss-Schleiz, Schaumburg-Lippe, Schwarzburg-Rudolstadt, Schwarzburg-Sondershausen and Waldeck-Pyrmont; the free towns of Bremen, Hamburg and Lübeck, and the imperial territory of Alsace-Lorraine.

Besides these political divisions there are certain parts of Germany which, not conterminous with political boundaries, retain appellations derived either from former tribal settlements or from divisions of the old Holy Roman Empire. These are Franconia (Franken), which embraces the districts of Bamberg, Schweinfurt and Würzburg on the upper Main; Swabia (Schwaben), in which is included Württemberg, parts of Bavaria and Baden and Hohenzollern; the Palatinate (Pfalz), embracing Bavaria west of the Rhine and the contiguous portion of Baden; Rhineland, applied to Rhenish Prussia, Nassau, Hesse-Darmstadt and parts of Bavaria and Baden; Vogtland,[1] the mountainous country lying in the south-west corner of the kingdom of Saxony; Lusatia (Lausitz), the eastern portion of the kingdom of Saxony and the adjacent portion of Prussia watered by the upper Spree; Thuringia (Thüringen), the country lying south of the Harz Mountains and including the Saxon duchies; East Friesland (Ost Friesland), the country lying between the lower course of the Weser and the Ems, and Westphalia (Westfalen), the fertile plain lying north and west of the Harz Mountains and extending to the North Sea and the Dutch frontier.

Coast and Islands.—The length of the coast-line is considerably less than the third part of the whole frontier. The coasts are shallow, and deficient in natural ports, except on the east of Schleswig-Holstein, where wide bays encroach upon the land, giving access to the largest vessels, so that the great naval harbour could be constructed at Kiel. With the exception of those on the east coast of Schleswig-Holstein, all the important trading ports of Germany are river ports, such as Emden, Bremen, Hamburg, Lübeck, Stettin, Danzig, Königsberg, Memel. A great difference, however, is to be remarked between the coasts of the North Sea and those of the Baltic. On the former, where the sea has broken up the ranges of dunes formed in bygone times, and divided them into separate islands, the mainland has to be protected by massive dikes, while the Frisian Islands are being gradually washed away by the waters. On the coast of East Friesland there are now only seven of these islands, of which Norderney is best known, while of the North Frisian Islands, on the western coast of Schleswig, Sylt is the most considerable. Besides the ordinary waste of the shores, there have been extensive inundations by the sea within the historic period, the gulf of the Dollart having been so caused in the year 1276. Sands surround the whole coast of the North Sea to such an extent that the entrance to the ports is not practicable without the aid of pilots. Heligoland is a rocky island, but it also has been considerably reduced by the sea. The tides rise to the height of 12 or 13 ft. in the Jade Bay and at Bremerhaven, and 6 or 7 ft. at Hamburg. The coast of the Baltic, on the other hand, possesses few islands, the chief being Alsen and Fehmarn off the coast of Schleswig-Holstein, and Rügen off Pomerania. It has no extensive sands, though on the whole very flat. The Baltic has no perceptible tides; and a great part of its coast-line is in winter covered with ice, which also so blocks up the harbours that navigation is interrupted for several months every year. Its *haffs* fronting the mouths of the large rivers must be regarded as lagoons or extensions of the river beds, not as bays. The Pommersche or Oder Haff is separated from the sea by two islands, so that the river flows out by three mouths, the middle one (Swine) being the most considerable. The Frische Haff is formed by the Nogat, a branch of the Vistula, and by the Pregel, and communicates with the sea by means of the Pillauer Tief. The Kurische Haff receives the Memel, called Niemen in Russia, and has its outlet in the extreme north at Memel. Long narrow alluvial strips called *Nehrungen*, lie between the last two haffs and the Baltic. The Baltic coast is further marked by large indentations, the Gulf of Lübeck, that of Pomerania, east of Rügen, and the semicircular Bay of Danzig between the promontories of Rixhöft and Brüsterort. The German coasts are well provided with lighthouses.

Surface.—In respect of physical structure Germany is divided into two entirely distinct portions, which bear to one another a ratio of about 3 to 4. The northern and larger part may be described as a uniform plain. South and central Germany, on the other hand, is very much diversified in scenery. It possesses large plateaus, such as that of Bavaria, which stretches away from the foot of the Alps, fertile low plains like that intersected by the Rhine, mountain chains and isolated groups of mountains, comparatively low in height, and so situated as not seriously to interfere with communication either by road or by railway.

Mountains and plateaus.

Bavaria is the only division of the country that includes within it any part of the Alps, the Austro-Bavarian frontier running along the ridge of the Northern Tirolese or Bavarian Alps. The loftiest peak of this group, the Zugspitze (57 m. S. of Munich), is 9738 ft. in height, being the highest summit in the empire. The upper German plain sloping northwards from the Bavarian Alps is watered by the Lech, the Isar and the Inn, tributaries of the Danube, all three rising beyond the limits of German territory. This plain is separated on the west from the Swiss plain by the Lake of Constance (Bodensee, 1306 ft. above sea-level), and on the east from the undulating grounds of Austria by the Inn. The average height of the plain may be estimated at about 1800 ft., the valley of the Danube on its north border being from 1540 ft. (at Ulm) to 920 ft. (at Passau). The plain is not very fertile. In the upper part of the plain, towards the Alps, there are several lakes, the largest being the Ammersee, the Würmsee or Starnberger See and the Chiemsee. Many portions of the plain are covered by moors and swamps of large extent, called *Moose*. The left or northern bank of the Danube from Regensburg downwards presents a series of granitic rocks called the Bavarian Forest (Bayrischer Wald), which must be regarded as a branch of the Bohemian Forest (Böhmer Wald). The latter is a range of wooded heights on the frontier of Bavaria and Bohemia, occupying the least known and least frequented regions of Germany. The summits of the Bayrischer Wald rise to the height of about 4000 ft., and those of the Böhmer Wald to 4800 ft., Arber being 4872 ft. The valley of the Danube above Regensburg is flanked by plateaus sloping gently to the Danube, but precipitous towards the valley of the Neckar. The centre of this elevated tract is the Rauhe Alb, so named on account of the harshness of the climate. The plateau continuing to the north-east and then to the north, under the name of the Franconian Jura, is crossed by the valley of the white Altmühl, and extends to the Main. To the west extensive undulating grounds or low plateaus occupy the area between the Main and the Neckar.

The south-western corner of the empire contains a series of better defined hill ranges. Beginning with the Black Forest (Schwarzwald), we find its southern heights decline to the valley of the Rhine, above Basel, and to the Jura. The summits are rounded and covered with wood, the highest being the Feldberg (10 m. S.E. of Freiburg, 4898 ft.). Northwards the Black Forest passes into the plateau of the Neckarberglad (average height, 1000 ft.). The heights between the lower Neckar and the Main form the Odenwald (about 1700 ft.); and the Spessart, which is watered by the Main on three sides, is nothing but a continuation of the Odenwald. West of this range of hills lies the valley of the upper Rhine, extending about 180 m. from south to north, and with a width of only 20 to 25 m. In the upper parts the Rhine is rapid, and therefore navigable with difficulty; this explains why the towns there are not along the banks of the river, but some 5 to 10 m. off. But from Spires (Speyer) town

[1] *i.e.* the territory once under the jurisdiction of an imperial *Vogt* or *advocatus* (see ADVOCATE).

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succeeds town as far down as Düsseldorf. The western boundary of this valley is formed in the first instance by the Vosges, where granite summits rise from under the surrounding red Triassic rocks (Sulzer Belchen, 4669 ft.). To the south the range is not continuous with the Swiss Jura, the valley of the Rhine being connected here with the Rhone system by low ground known as the Gate of Mülhausen. The crest of the Vosges is pretty high and unbroken, the first convenient pass being near Zabern, which is followed by the railway from Strasburg to Paris. On the northern side the Vosges are connected with the Hardt sandstone plateau (Kalmit, 2241 ft.), which rises abruptly from the plain of the Rhine. The mountains south of Mainz, which are mostly covered by vineyards, are lower, the Donnersberg, however, raising its head to 2254 ft. These hills are bordered on the west by the high plain of Lorraine and the coalfields of Saarbrücken, the former being traversed by the river Mosel. The larger part of Lorraine belongs to France, but the German part possesses great mineral wealth in its rich layers of ironstone (siderite) and in the coal-fields of the Saar. The tract of the Hunsrück, Taunus and Eifel is an extended plateau, divided into separate sections by the river valleys. Among these the Rhine valley from Bingen to Bonn, and that of the Moselle from Trier to Coblenz, are winding gorges excavated by the rivers. The Eifel presents a sterile, thinly-peopled plateau, covered by extensive moors in several places. It passes westwards imperceptibly into the Ardennes. The hills on the right bank of the Rhine, on the one hand, lie chiefly in a flat character, without wood; the Westerwald (about 2000 ft.), which separates the valleys of the Sieg and Lahn, is particularly so. The northern and southern limits of the Niederrheinische Gebirge present a striking contrast to the latter section. In the south the mountains of the Taunus (2890 ft.) are marked by the occurrence of mineral springs, as at Ems on the Lahn, Nauheim, Homburg, Soden, Wiesbaden, &c., and by the vineyards which produce the best Rhine wines. To the north of this system, on the other hand, lies the great coal-basin of Westphalia, the largest in Germany. In the south of the hilly duchy of Hesse rise the isolated mountain groups of the Vogelsberg (2536 ft.) and the Rhön (3117 ft.), separated by the valley of the Fulda, which uniting farther north with the Werra forms the Weser. To the east of Hesse lies Thuringia, a province consisting of the far-stretching wooded ridge of the Thuringian Forest (Thüringerwald; with three peaks upwards of 3000 ft. high), and an extensive elevated plain to the north. Its rivers are the Saale and Unstrut. The plateau is bounded on the east by the Harz, an isolated group of mountains, rich in minerals, with its highest elevation in the bare summit of the Brocken (3747 ft.). To the west of the Harz a series of hilly tracts is comprised under the name of the Hercynian Mountains, out of which above Minden the province of Weser bursts by the Porta Westphalica. A narrow ridge, the Teutoburger Wald (1300 ft.), extends between the Weser and the Ems as far as the neighbourhood of Osnabrück.

To the east of the Thuringian Forest is connected by the plateau of the Frankenwald with the Fichtelgebirge. This group of mountains, occupying what may be regarded as ethnologically the centre of Germany, forms a hydrographical centre, whence the Saale flows southward to the Danube, the Main westward to the Rhine, the Eger eastward to the Elbe, and the Saale northward, also into the Elbe. In the north-east the Fichtelgebirge connects itself directly with the Erzgebirge, which forms the northern boundary of Bohemia. The southern sides of the mountains comparatively steep, while to the north it slopes gently down to the plains of Leipzig, but is intersected by the deep valleys of the Elster and Mulde. Although by no means fertile, the Erzgebirge is very thickly peopled, as various branches of industry have taken root in the numerous valleys. Around Zwickau there are productive coal-fields, and mining for metals is carried on near Freiberg. In the east a tableland of sandstone, called Saxon Switzerland, from the picturesque outlines into which it has been eroded, adjoins the Erzgebirge; one of its most notable features is the deep ravine by which the Elbe escapes from it. Numerous quarries, which supply the North German cities with stone for buildings and monuments, have been opened along the valley. The sandstone ridges of the Elbe unite on the east with the low Lusatian group, along the east of which runs the best road from northern Germany to Bohemia. Then comes a range of lesser hills clustering together to form the frontier between Silesia and Bohemia. The most western point is the Isergebirge, and its next the Riesengebirge, a narrow ridge of about 20 miles' length, with bare summits. Excluding the Alps, the Schneekoppe (5266 ft.) is the highest peak in Germany; and the southern declivities of this range contain the sources of the Elbe. The hills north and north-east of it are termed the Silesian Mountains. Here one of the minor coal-fields gives employment to a population grouped round a number of comparatively small centres. One of the main roads into Bohemia (the pass of Landeck) runs along the eastern base of the Riesengebirge. Still farther to the east the mountains are grouped around the hollow of Glatz, whence the Neisse forces its way towards the north. This hollow is shut in on the east by the Sudetic group, in which the Altvater rises to almost 4900 ft. The eastern portion of the group, called the Gesenke, slopes gently away to the valley of the Oder, which affords an open route for the international traffic, like that through the Mülhausen Gate in Alsace. Geographers style this the Moravian Gate.

The North German plain presents little variety, yet is not absolutely uniform. A row of low hills runs generally parallel to the mountain ranges already noticed, at a distance of 20 to 30 m. to the north. To these belongs the upper Silesian coal-basin, which occupies a considerable area in south-eastern Silesia. North of the middle districts of the Elbe country the heights are called the Fläming hills. Westward lies an the last link of this series the Lüneburger Heide or Heath, between the Weser and Elbe, north of Hanover, a second tract, of somewhat greater elevation, around the Baltic, without, however, approaching its shores. This plateau contains a considerable number of lakes, and is divided into three portions by the Vistula and the Oder. The most eastward is the so-called Prussian Seenplatte. Spiritdingese (430 ft. above sea-level and 46 sq. m. in area) and Mauersee are the largest lakes; they are situated in the centre of the plateau, and give rise to the Pregel. Some peaks near the Russian frontier attain to 1000 ft. The Pomeranian lake-region, between the Vistula and the Oder, extends from S.W. to N.E., its greatest elevation being in the neighbourhood of Danzig (Turmberg, 1086 ft.). The Seenplatte of Mecklenburg, on the other hand, stretches from S.E. to N.W., and most of its lakes, of which the Müritz is the largest, drain their waters towards the Elbe. The finely wooded heights which surround the bays of the east coast of Holstein and Schleswig may be regarded as a continuation of these Baltic elevations. The lowest parts, therefore, of the North German plain, excluding the sea-coasts, are the central districts from about 52° to 53° N. lat., where the Vistula, Netze, Warthe, Oder, Spree and Havel form vast swampy lowlands (in German called *Brüche*), which have been considerably reduced by the construction of canals and by extensive improvements due in large measure to Frederick the Great. The Spreewald, S.E. of Berlin, is one of the most remarkable districts of Germany. As the Spree divides itself there into innumerable branches, enclosing thickly wooded islands, boats form the only means of communication. West of Berlin the Havel widens into what are called the Havel lakes, to which the environs of Potsdam owe their charms. In general the soil of the North German plain cannot be termed fertile the cultivation being nearly everywhere requiring severe and constant labour. Long stretches of ground are covered with heaths, moors, and turf-cutting forms the principal occupation of the inhabitants. The greatest extent of moorland is found in the westernmost parts of the plain, in Oldenburg and East Friesia. The plain contains, however, a few districts of the utmost fertility, particularly the tracts on the central Elbe, and the marsh lands on the west coast of Holstein and the north coast of Hanover, Oldenburg and East Frisia, which, within the last two centuries, the inhabitants have reclaimed from the sea by means of immense dikes.

Rivers.—Nine independent river-systems may be distinguished: those of the Memel, Pregel, Vistula (Weichsel), Oder, Elbe, Weser, Ems, Rhine and Danube. To these the Pregel, Weser and Ems belong entirely, and the Oder mostly, to the German empire. The Danube has its sources on German soil; but only a fifth part of its course is German. Its total length is 1750 m., and the Bavarian frontier at Passau, where the Inn joins it, is only 350 m. distant from its sources. It is navigable as far as Ulm, above Passau; and its tributaries the Lech, Isar, Inn and Altmühl are also navigable. The Rhine is the most important river of Germany, and, taking neither its sources nor its mouths are within the limits of the empire. From the Lake of Constance to Basel (122 m.) the Rhine forms the boundary between the German empire and Switzerland; the canton of Schaffhausen, however, is situated on the northern bank of the river. From Basel to below Emmerich the Rhine belongs to the German empire almost 470 m. of four-seventhes of its whole course. It is navigable all this distance as are also the Neckar from Esslingen, the Main from Bamberg, the Lahn, the Lippe, the Ruhr, the Mosel from Metz, with its affluents the Saar and Sauer. Sea-going vessels sail up the Ems as far as Halte, and river craft as far as Greven, and the river is connected with a widely branching system of canals, as the Ems-Jade and Dortmund-Ems canals. The Fulda, navigable for 63 m., and the Werra, 38 m., above the point where they unite, form by their confluence the Weser, which has a course of 271 m., and receives as navigable tributaries the Aller, the Leine from Hanover, and some smaller streams. Ocean-going steamers, however, cannot get as far as Bremen, and unload at Brenerhaven. The Elbe, after a course of 250 m., enters German territory near Bodenbach, 490 m. from its mouth. It is navigable above this point through its tributary, the Moldau, to Prague. Hamburg may be reached by vessels of 17 ft. draught. The navigable tributaries of the Elbe are the Saale (below Naumburg), the Havel, Spree, Elde, Sude and some others. The Oder begins to be navigable almost on the frontier at Ratibor, 480 m. from its mouth, receiving as navigable tributaries the Glatz Neisse and the Warthe. Only the lower course of the Vistula belongs to the German empire, within which it is a broad, navigable stream of considerable volume. On the Pregel ships of 3000 tons reach Konigsberg, and river barges reach Insterburg; the Alle, its tributary, may also be navigated. The Memel is navigable in its course of 113 m. from the Russian frontier. Germany is thus a country abounding in natural waterways, the total length of them being estimated at 7000 m. But it is only the Rhine, in its middle course, that has at all times sufficient volume of water to meet the requirements of a good navigable river.

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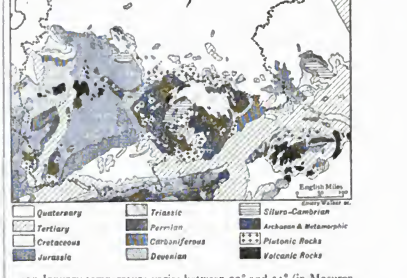
Lakes.—The regions which abound in lakes have already been pointed out. The Lake of Constance or Bodensee (2043 sq. m.) is on the frontier of the empire, portions of the northern banks belonging severally to Bavaria, Württemberg and Baden. In the south the largest lakes are the Chiemsee (33 sq. m.); the Ammersee and the Würmsee. A good many smaller lakes are to be found in the Bavarian Alps. The North German plain is dotted with upwards of 500 lakes, covering an area of about 2500 sq. m. The largest of these are the three Haffs—the Oder Haff covering 370 sq. m., the Frische Haff, 132, and the Kurische Haff, 676. The lakes of the Prussian and Pomeranian provinces, in Mecklenburg and in Holstein, and those of the Havel, have already been mentioned. In the west the only lakes of importance are the Steinhuder Meer, 14 m. northwest of Hanover, and the Dümmersee on the southern frontier of Oldenburg. (P. A.)

Geology.—Germany consists of a floor of folded Palaeozoic rocks upon which rest unconformably the comparatively little disturbed beds of the Mesozoic systems, while in the North German plain a covering of modern deposits conceals the whole of the older strata from view, excepting some scattered and isolated outcrops of Cretaceous and Tertiary beds. The rocks which compose the ancient floor are thrown into folds which run approximately from W.S.W. to E.N.E. They are exposed on the one hand in the neighbourhood of the Rhine and on the other hand in the Bohemian *massif*. With the latter must be included the Frankenwald, the Thüringerwald, and even the Harz. The older rocks, belonging to the Armorican system, occur in the south, forming the Vosges and the Black Forest in the west, and the greater part of the Bohemian *massif*, including the Erzgebirge, in the east. They consist chiefly of gneiss and schist, with granite and other eruptive rocks. Farther north, in the Hunsrück, the Taunus, the Eifel and Westerwald, the Harz and the Frankenwald, the ancient floor is composed mainly of Devonian beds. Other Palaeozoic systems are, however, included in the folds. The Cambrian, for example, is exposed at Lehmitz near Hof in the Frankenwald, and the important coalfield of the Saar lies on the southern side of the Hunsrück, while Ordovician and Silurian beds have been found in several localities. Along the northern border of the folded belt lies the coal basin of the Ruhr in Westphalia, which is the continuation of the Belgian coal-field, and bears much the same relation to the Rhenish Devonian area that the coal basin of Liége bears to the Ardennes. Carboniferous and Devonian beds are also found south-east of the Bohemian *massif*, where lies the extensive coal-field of Silesia. The Permian, as in England, is not involved in the folds which have affected the older beds, and in general lies unconformably upon them. It occurs chiefly around the masses of ancient rock, and one of the largest areas is that of the Saar.

Between the old rocks of the Rhine on the west and the ancient *massif* of Bohemia on the east a vast area of Triassic beds extends from Hanover to Basel and from Metz to Bayreuth. Over the greater part of this region the Triassic beds are free from folding and are nearly horizontal, but faulting is by no means absent, especially along the margins of the Bohemian and Rhenish hills. The Triassic beds must indeed have covered a large part of these old rock masses, but they have been ground only where they are now faulted down to a lower level. Along the southern margin of the Triassic area there is a long band of Jurassic beds dipping towards the Danube; and at its eastern extremity this band is continuous with a synclinal of Jurassic beds, running parallel to the western border of the Bohemian *massif*, but separated from it by a narrow strip of Triassic beds. Towards the north, in Hanover and Westphalia, the Triassic beds are followed by Jurassic and Cretaceous deposits, the latter being here chiefly important. As in the south of England, the lower beds of the Cretaceous are of estuarine origin and the Upper Cretaceous overlaps the Lower, lying in the valley of the Ruhr directly upon the Palaeozoic rocks. In Saxony also the upper Cretaceous beds rest directly upon the Palaeozoic or Archaean rocks. Still more to the east, in the province of Silesia, both Jurassic and Cretaceous beds are again met with, but they are to a large extent concealed by the recent accumulations of the great plain. The Eocene system is unknown in Germany except in the foothills of the Alps; but the Oligocene and Miocene are widely spread, especially in the great plain and in the depression of the Danube. The Oligocene is generally marine. Marine Miocene occurs in N.W. Germany and the Miocene of the Danube valley is also in part marine, but in central Germany it is of fluviatile or lacustrine origin. The lignites of Hesse, Cassel, &c., are interstratified with basaltic lava-flows which form the greater part of the Vogelsberg and other hills. The trachytes of the Siebengebirge are probably of slightly older date. The precise age of the volcanoes of the Eifel, many of which are in a very perfect state of preservation, is not clear, but they are certainly Tertiary or Post-tertiary. Leucite and nepheline lavas are here abundant. In the Siebengebirge the little crater of Roderberg, with its lavas and scoriae of leucite-basalt, is posterior to some of the Pleistocene river deposits.

A glance at a geological map of Germany will show that the greater part of Prussia and of German Poland is covered by Quaternary deposits. These are in part of glacial origin, and contain Scandinavian boulders; but fluviatile and aeolian deposits also occur. Quaternary beds also cover the floor of the broad depression through which the Rhine meanders from Basel to Mainz, and occupy a large part of the plain of the Danube. The depression of the Rhine is a trough lying between two faults or system of faults. The very much broader depression of the Danube is associated with the formation of the Alps, and was flooded by the sea during a part of the Miocene period. (P. Lx.)

Climate.—The climate of Germany is to be regarded as intermediate between the oceanic and continental climates of western and eastern Europe respectively. It has nothing in common with the Mediterranean climate of southern Europe, being entirely separated from that region by the lofty barrier of the Alps. Although there are very considerable differences in the range of temperature and the amount of rainfall throughout Germany, these are not so great as they would be were it not for the elevated plateaux and mountain chains that are in the south, while the north is occupied by low-lying plains. In the west no chain of hills intercepts the warmer and moister winds which blow from the Atlantic, and these accordingly influence at times even the eastern regions of Germany. The mean annual temperature of south-western Germany, or the Rhine and Danube basins, is about 52° to 54° F., that of central Germany 48° to 50°, and that of the northern plain 46° to 48°. In Pomerania and West Prussia it is only 44° to 45°, and in East Prussia 42° to 44°. The



mean January temperature varies between 22° and 34° (in Masuren and Cologne respectively); the mean July temperature, between 61° in north Schleswig and 68° at Cologne. The extremes of cold and heat are, as recorded in the ten years 1895–1905, 7° in Königsberg and 93° in Heidelberg (the hottest place in Germany). The difference in the mean annual temperature between the south-west and north-west of Germany amounts to about 3°. The contrasts of heat and cold are furnished by the valley of the Rhine above Mainz, which has the greatest mean heat, the mildest winter and the highest summer temperature, and the lake plateau of East Prussia, where Arys on the Spirdingsee has a like winter temperature to the Brocken at 3300 ft. The Baltic has the lowest spring temperature, and the autumn there is also not characterized by an appreciably higher degree of warmth. In central Germany the high plateaus of the Erz and Fichtelgebirge are the coldest regions. In south Germany the upper Bavarian plain experiences an inclement winter and a cold summer. In Alsace-Lorraine the Vosges and the plateau of Lorraine are also remarkable for low temperatures. The warmest districts of the German empire are the northern parts of the Rhine plain, from Karlsruhe downwards, especially the Rheintal; these are scarcely 200 ft. above the sea-level, and are protected by mountainous tracts of land. The same holds true of the valleys of the Neckar, Main and Mosel. Hence the vine is everywhere cultivated in these districts. The mean summer temperature there is 66° and upwards, while the average temperature of January does not descend to the freezing point (32°). The climate of north-western Germany (west of the Elbe) shows a predominating oceanic character, the summers not being too hot (mean summer temperature 60° to 62°), and snow in winter remaining but a short time on the ground. West of the Weser the average temperature of January exceeds 32°; to the east it sinks to 30°, and therefore the Elbe is generally covered with ice for some months of the year, as are also its tributaries. The farther

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one proceeds to the east the greater are the contrasts of summer and winter. While the average summer warmth of Germany is 60° to 62°, the January temperature falls as low as 26° to 28° in West Prussia, Posen and Silesia, and 22° to 26° in East Prussia and upper Silesia. The navigation of the rivers is regularly interrupted by frost. Similarly the upper basin of the Danube, or the Bavarian plain, has a rather inclement climate in winter, the average for January being 25° to 26°.

As regards rainfall, Germany belongs to those regions where precipitation takes place at all seasons, but chiefly in the form of summer rains. In respect to the quantity of rain the empire takes a middle position between the humidity of north-western Europe and the aridity of the east. There are considerable differences between particular places. The rainfall is greatest in the Bavarian tableland and the hilly regions of western Germany. For the Eifel, Sauerland, Harz, Thuringian Forest, Rhön, Vogelsberg, Spessart, the Black Forest, the Vosges, &c., the annual average may be stated at 34 in. or more, while in the lower terrace in north-western Germany, as in the Erzgebirge and the Sudetic range, it is estimated at 30 to 32 in. only. The same average obtains also on the humid north-west coast of Germany as far as Bremen and Hamburg. In the remaining parts of western Germany, on the shores of farther Pomerania, and in East Prussia, it amounts to upwards of 24 in. In western Germany there is a district famous for the scarcity of rain and for producing the best kind of wine: in the valley of the Rhine below Strassburg, in the Palatinate, and also in the valley of the Main, no more than from 16 to 20 in. fall. Mecklenburg, Brandenburg and Lusatia, Saxony and the plateau of Thuringia, West Prussia, Posen and lower Silesia are also to be classed among the more arid regions of Germany, the annual rainfall being 16 to 20 in. Thunderstorms are most frequent in July, and vary between fifteen and twenty-five in the central districts, descending in the eastern provinces of Prussia to ten annually.

Flora.—The flora of Germany comprises 3413 species of phanerogamic and 4306 cryptogamic plants. The country forms a section of the central European zone, and its flora is largely under the influence of the Baltic and Alpine elements, which to a great degree here coalesce. All plants peculiar to the temperate zone abound. Wheat, rye, barley and oats are cultivated everywhere, but spelt only in the south and buckwheat in the north and north-west. Maize only ripens in the south. Potatoes grow in every part of the country, those of the sandy plains in the north being of excellent quality. All the common sorts of fruit—apples, pears, cherries, &c.—grow everywhere, but the more delicate kinds, such as figs, apricots and peaches, are confined to the warmer districts. The vine flourishes as far as the 51° N., but only yields good wine in the districts of the Rhine and upper Danube. Flax is grown in the north, and hemp more particularly in the central districts. Rape can be produced everywhere when the soil permits. Tobacco is cultivated on the upper Rhine and in the valley of the Oder. The northern plain, especially in the province of Saxony, produces beet (for sugar), and hops are largely grown in Bavaria, Württemberg, Alsace, Baden and the Prussian province of Posen.

Speaking generally, northern Germany is not nearly so well wooded as central and southern Germany, where indeed most of the lower mountains are covered with timber, as is indicated by the frequent use of the termination *wald* affixed to the names of the mountain ranges (as Schwarzwald, Thüringerwald, &c.). The "Seenplatten" are less wooded than the hill country, but the eastern portion of the northern lowlands is well provided with timber. A narrow strip along the shores of the Baltic is covered with oaks and beeches; farther inland, and especially east of the Elbe, coniferous trees are the most prevalent, praticularly the Scotch fir; birches are also abundant. The mountain forests consist chiefly of firs, pines and larches, but contain also silver firs, beeches and oaks. Chestnuts and walnuts appear on the terraces of the Rhine valley and in Swabia and Franconia. The whole north-west of Germany is destitute of wood, but to compensate for this the people have ample supplies of fuel in the extensive stretches of turf.

Forests.

Fauna.—The number of wild animals in Germany is not very great. Foxes, martens, weasels, badgers and otters are to be found everywhere; bears are found in the Alps, wolves are rare, but they find their way sometimes from French territory to the western provinces, or from Poland to Prussia and Posen. Among the rodents the hamster and the field-mouse are a scourge to agriculture. Of game there are the roe, stag, boar and hare; the fallow deer and the wild rabbit are less common. The elk is to be found in the forests of East Prussia. The feathered tribes are everywhere abundant in the fields, woods and marshes. Wild geese and ducks, grouse, partridges, snipe, woodcock, quails, widgeons and teal are plentiful all over the country, and in recent years preserves have been largely stocked with pheasants. The length of time that birds of passage remain in Germany differs considerably with the different species. The stork is seen for about 170 days, the house-swallow 160, the snow-goose 160, the snipe 120, in northern Germany these birds arrive from twenty to thirty days later than in the south.

The waters of Germany abound with fish; but the genera and species are few. The carp and salmon tribes are the most abundant; after them rank the pike, the eel, the shad, the roach, the perch and the lamprey. The Oder and some of the tributaries of the Elbe abound in crayfish, and in the stagnant lakes of East Prussia leeches are bred. In addition to frogs, Germany has few varieties of Amphibia. Of serpents there are only two poisonous kinds, the common viper and the adder (*Kreuzotter*).

Area and Population of the German States.

States of the Empire.	Area English Sq. m.	Population. 1871.	1875.	1900.	1905.	Density per Sq. m.
Kingdoms—						
Prussia	134,616	24,691,433	25,742,404	34,472,509	37,293,324	277·3
Bavaria	29,292	4,863,450	5,022,390	6,176,057	6,524,372	222·7
Saxony	5,789	2,556,244	2,760,586	4,202,216	4,508,601	778·8
Württemberg	7,534	1,818,539	1,881,505	2,169,480	2,302,179	305·5
Grand-Duchies—						
Baden	5,823	1,461,562	1,507,179	1,867,944	2,010,728	345·3
Hesse	2,966	852,894	884,218	1,119,893	1,209,175	407·6
Mecklenburg-Schwerin	5,068	557,807	553,785	607,770	625,093	123·4
Saxe-Weimar	1,397	286,183	292,933	362,873	388,095	277·8
Mecklenburg-Strelitz	1,131	96,982	95,673	102,602	103,451	91·5
Oldenburg	2,482	314,459	319,314	399,180	438,856	176·8
Duchies—						
Brunswick	1,418	311,764	327,493	464,333	485,958	342·5
Saxe-Meiningen	953	187,957	194,494	250,731	268,916	282·2
Saxe-Altenburg	511	142,122	145,844	194,914	206,508	404·1
Saxe-Coburg-Gotha	764	174,339	182,599	229,550	242,493	317·3
Anhalt	888	203,437	213,565	316,085	328,029	369·4
Principalities—						
Schwarzburg-Sondershausen	333	75,523	76,676	80,898	85,152	255·7
Schwarzburg-Rudolstadt	363	67,191	67,480	93,059	96,835	266·7
Waldeck	433	56,224	54,743	57,918	59,127	136·5
Reuss-Greiz	122	45,094	46,985	68,396	70,603	578·7
Reuss-Schleiz	319	89,032	92,375	139,210	144,584	453·2
Schaumburg-Lippe	131	32,059	33,133	43,132	44,992	343·4
Lippe	469	111,135	112,452	138,952	145,577	310·4
Free Towns—						
Lübeck	115	52,158	56,912	96,775	105,857	920·5
Bremen	99	122,402	142,200	224,882	263,440	2661·0
Hamburg	160	338,974	388,618	768,349	874,878	5467·9
Imperial Territory—						
Alsace-Lorraine	5,604	1,549,738	1,531,804	1,719,470	1,814,564	323·8
German Empire	208,780	41,058,792	42,727,360	56,367,178	60,641,278	290·4

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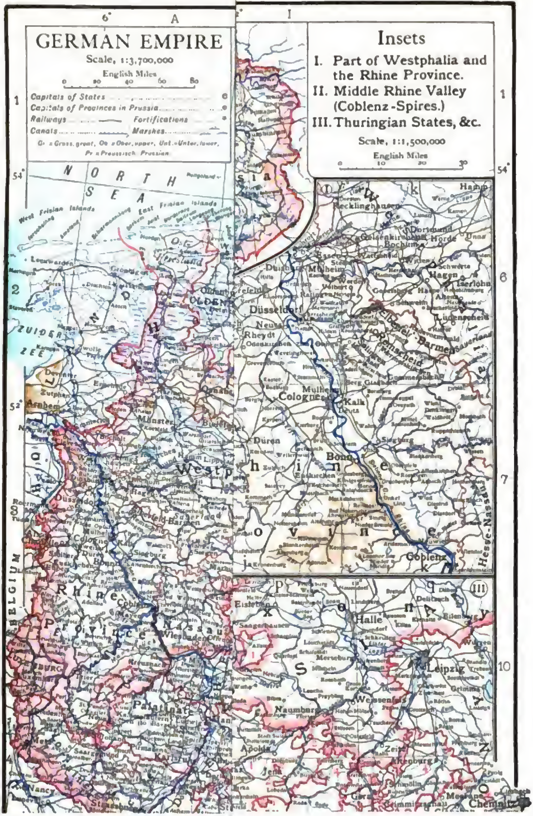

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The population of the empire has thus increased, since 1871, by 19,582,486 or 47·6%. The increase of population during 1895–1900 was greatest in Hamburg, Bremen, Lübeck, Saxony, Prussia and Baden, and least in Mecklenburg-Strelitz and Waldeck. Of the total population in 1900, 53·3% was urban (*i.e.* living in towns of 2000 inhabitants and above), leaving 46·7 % to be classified as rural. On the 1st of December 1905, of the total population 29,884,681 were males and 30,756,597 females; and it is noticeable that the male population shows of late years a larger relative increase than the female, the male preponderance in the last two years increased by 2,147,434 and the female by only 2,126,666. The greater increase in the male population is attributable to diminished emigration and to the large increase in immigrants, who are mostly males. In 1905, 485,906 marriages were contracted in Germany, being at the rate of 8·0 per thousand inhabitants. In the same year the total number of births was 2,048,453. Of these, 61,300 were stillborn and 174,494 illegitimate, being at the rate, respectively, of 3% and 8·5% of the total. Illegitimacy is highest in Bavaria (about 15%). Berlin (14%), and over 12% in Saxony, Mecklenburg-Schwerin and Saxe-Meiningen. It is lowest in the Rhine Province and Westphalia (3·9 and 2·6 respectively). Divorce is steadily on the increase, being in 1904, 11·1 per 10,000 marriages, as against 8·1, 8·1, 9·3 and 10·1 for the four preceding years. The average deaths for the years 1901–1905 amounted to 1,227,903; the rate was thus 20·2 per thousand inhabitants, but the death-rate has materially decreased, the total number of deaths in 1907 standing at 1,218,319; the births for the same year were 2,060,974. In connexion with suicides, it is interesting to observe that the highest rates prevail in some of the smaller and more prosperous states of the empire—for example, in Saxe-Weimar, Saxe-Coburg-Gotha, and Saxe-Altenburg (on a three years' average of figures), while the Roman Catholic country Bavaria, and the impoverished Prussian province of Posen show the most favourable statistics. For Prussia the rate is 20, and for Saxony it is as high as 32 per 100,000 inhabitants. The large cities, notably Berlin, Hamburg, Breslau and Dresden, show, however, relatively the largest proportion.

In 1900 the German-speaking population of the empire amounted to 51,883,131. Of the inhabitants speaking other languages there were: Polish, 3,086,489; French (chiefly Lorraine), 211,679; Masurian, 142,049; Danish, 141,661; Lithuanian, 106,305; Cassubian, 100,213; Wendish, 93,032; Dutch, 80,361; Italian, 65,961; Moravian, 64,382; Czech, 43,016; Frisian, 20,810; English, 20,217; Walloon, 11,841. In 1905 there were resident within the empire 1,028,560 subjects of foreign states, as compared with 778,698 in 1900. Of these 17,293 were subjects of Great Britain and Ireland, 17,183 of the United States of America and 20,584 of France. The bulk of the other foreigners residing in the country belonged to countries lying contiguous, such as Austria, which claimed nearly the half, Russia and Italy.

Languages.—The German-speaking nations in their various branches and dialects, if we include the Dutch and the Walloons, extend in a compact mass along the shores of the Baltic and of the North Sea, from Memel in the east to a point between Gravelines and Calais near the Straits of Dover. On this northern line the Germans come in contact with the Slavs who inhabit the northern parts of Schleswig within the limits of the German empire. A line from Flensburg south-westward to Joldelund and thence north-westward to Bayer will nearly give the boundary between the two idioms.[1] The German-French frontier traverses Belgium from west to east, touching the towns of St Omer, Courtrai and Maastricht. Near Eupen, south of Aix-la-Chapelle, it turns southward, and near Arlon south-east as far as the crest of the Vosges mountains, where it follows up to Belfort, traversing there the watershed of the Rhine and the Douba. In the Swiss territory the line of demarcation passes through Bienne, Fribourg, Saanen, Leuk and Monte Rosa. In the south the Germans come into contact with Rhaeto-Romans and Italians, the former inhabiting the valley of the Vorder-Rhein and the Engadine, while the latter have settled on the southern slopes of the Alps, and are continually advancing up the valley of the Adige. Carinthia and Styria are inhabited by German people, except the valley of the Drave towards Klagenfurt. Their eastern neighbours there are first the Magyars, then the northern Slavs and the Poles. The whole eastern frontier is very much broken, and cannot be described in a few words. Besides detached German colonies in Hungary proper, there is a considerable and compact German (Saxon) population in Transylvania. The river March is the frontier north of the Danube from Pressburg as far as Brünn, to the north of which the German regions begin near Olmütz, the interior of Bohemia and Moravia being occupied by Czechs and Moravians. In these countries the Slav language has been steadily superseding the German. In the Prussian provinces of Silesia and Posen the eastern parts are mixed territories, the German language progressing very slowly among the Poles. In Bromberg and Thorn, in the valley of the Vistula, German is prevalent. In West Prussia some parts of the interior, and in East Prussia a small region along the Russian frontier, are occupied by Poles (Cassubians in West Prussia, Masurians in East Prussia). The total number of German-speaking people, within the boundaries wherein they constitute the compact mass of the population, may be estimated, if the Dutch and Walloons be included, at 65 millions.

The geographical limits of the German language thus do not quite coincide with the German frontiers. The empire contains about 3½ millions of persons who do not make use of German in everyday life, not counting the resident foreigners.

Apart from the foreigners above mentioned, German subjects speaking a tongue other than German are found only in Prussia, Saxony and Alsace-Lorraine. The following table shows roughly the distribution of German-speaking people in the world outside the German empire:—

Austria-Hungary	12,000,000	Other European Countries	2,300,000
Netherlands (Dutch)	5,200,000	America	13,000,000
Belgium (Walloon)	4,000,000	Asia	100,000
Luxemburg	200,000	Africa	600,000
Switzerland	2,300,000	Australia	150,000
France	500,000		

According to the census of the 1st of December 1900 there were 51,634,378 persons speaking commonly one language and 248,374 speaking two languages. In the kingdom of Saxony, according to the census of 1900, there were 48,000 Wends, mostly in Lusatia. With respect to Alsace-Lorraine, detailed estimates (but no census) gave the number of French in the territory of Lorraine at about 170,000, and in that of Alsace at about 46,000.

The Poles have increased very much, owing to a greater surplus of births than in the case of the German people in the eastern provinces of Prussia, to immigration from Russia, and to the Polonization of many Germans through clerical and other influences (see *History*). The Poles are in the majority in upper Silesia (Government district of Oppeln, 55%) and the province of Posen (60%). They are numerous also in West Prussia (34%) and East Prussia (14%).

The Wends are decreasing in number, as are also the Lithuanians on the eastern border of East Prussia, Czechs are only found in Silesia on the confines of Bohemia.

Russians flocked to Germany in thousands after the Russo-Japanese War and the insurrections in Russia, and the figures given for 1900 had been doubled in 1907. Males preponderate among the various nationalities, with the exception of the British, the larger proportion of whom are females either in domestic service or engaged in tuition.

Chief Towns.—According to the results of the census of the 1st of December 1905 there were within the empire 41 towns with populations exceeding 100,000, viz.:—

	State.	Population.
Berlin	Prussia	2,040,148
Hamburg	Hamburg	802,793
Munich	Bavaria	538,393
Dresden	Saxony	516,996
Leipzig	"	502,570
Breslau	Prussia	470,751
Cologne	"	428,593
Frankfort-on-Main	"	334,951
Nuremberg	Bavaria	294,344
Düsseldorf	Prussia	253,099
Hanover	"	250,932
Stuttgart	Württemberg	249,443
Chemnitz	Saxony	244,405
Magdeburg	Prussia	240,661
Charlottenburg	"	239,812
Essen	"	231,396
Stettin	"	224,078
Königsberg	"	219,862
Bremen	Bremen	214,953
Duisburg	Prussia	192,227
Dortmund	"	175,575
Halle	"	169,899
Altona	"	168,301
Strassburg	Alsace-Lorraine	167,342
Kiel	Prussia	163,710
Elberfeld	"	162,682
Mannheim	Baden	162,607
Danzig	Prussia	159,685
Barmen	"	156,148
Rixdorf	"	153,650
Gelsenkirchen	"	147,037
Aix-la-Chapelle	"	143,906
Schöneberg	"	140,992
Brunswick	Brunswick	136,423
Posen	Prussia	137,067
Cassel	"	129,446
Bochum	"	118,455
Karlsruhe	Baden	111,200
Crefeld	Prussia	110,347
Plauen	Saxony	105,182
Wiesbaden	Prussia	100,953

[1] The question, much disputed between Germans and Danes, is exhaustively treated by P. Lauridsen in F. de Jessen's *La Question de Slesvig* (Copenhagen, 1906), pp. 114 et seq.

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Density of Population.—In respect of density of population, Germany with (1900) 269·9 and (1905) 290·4 inhabitants to the square mile is exceeded in Europe only by Belgium, Holland and England. Apart from the free cities, Hamburg, Bremen and Lübeck, the kingdom of Saxony is the most, and Mecklenburg-Strelitz the least, closely peopled state of the empire. The most thinly populated districts are found, not as might be expected in the mountain regions, but in some parts of the plains. Leaving out of account the small centres, Germany may be roughly divided into two thinly and two densely populated parts. In the former division has to be classed all the North German plain. There it is only in the valleys of the larger navigable rivers and on the southern border of the plain that the density exceeds 200 inhabitants per square mile, in some places, indeed, it is far greater, *e.g.* at the mouths of the Elbe and the Weser, in East Holstein, in the delta of the Memel and the environs of Hamburg. This region is bordered on the south by a densely peopled district, the northern boundary of which may be defined by a line from Coburg via Cassel to Münster, for in this part there are not only very fertile districts, such as the *Goldene Aue* in Thuringia, but also centres of industry. The population is thickest in upper Silesia around Beuthen (coal-fields), around Ratibor, Neisse and Waldenburg (coal-fields), around Zittau (kingdom of Saxony), in the Elbe valley around Dresden, in the districts of Zwickau and Leipzig as far as the Saale, on the northern slopes of the Harz and around Bielefeld in Westphalia. In all these the density exceeds 400 inhabitants to the square mile, and in the case of Saxony rises to 750. The third division of Germany comprises the basin of the Danube and Franconia, where around Nuremberg, Bamberg and Würzburg the population is thickly clustered. The fourth division embraces the valleys of the upper Rhine and Neckar and the district of Düsseldorf on the lower Rhine. In this last the proportion exceeds 1200 inhabitants to the square mile.

Emigration.—There have been great oscillations in the actual emigration by sea. It first exceeded 100,000 soon after the Franco-German War (1872, 126,000), and this occurred again in the years 1880 to 1892. Germany lost during these thirteen years more than 1,700,000 inhabitants by emigration. The total number of those who sailed for the United States from 1820 to 1900 may be estimated at more than 4,500,000. The number of German emigrants to Brazil between 1870 and 1900 was about 52,000. The greater number of the more recent emigrants was from the agricultural provinces of northern Germany—West Prussia, Posen, Pomerania, Mecklenburg, Schleswig-Holstein and Hanover, and sometimes the emigration reached 1% of the total population of these provinces. In subsequent years the emigration of native Germans greatly decreased, in 1903 amounting only to 28,075. To this number must be added 284,787 foreigners who in that year were shipped from German ports (notably Hamburg and Bremen) to distant parts. Of the above given numbers of purely German emigrants 16,007 sailed for the United States of America; 243 to Canada; 333 to Brazil; 674 to the Argentine Republic; 7 to other parts of America; 57 to Africa; and 84 to Australia.

Agriculture.—Despite the enormous development of industries and commerce, agriculture and cattle-rearing still represent in Germany a considerable portion of its economic wealth. Almost two-thirds of the soil is occupied by arable land, pastures and meadows, and of the whole area, in 1900, 91% was classed as productive. Of the total area 47·67% was occupied by land under tillage, 0·89% by gardens, 11·02% by meadow-land, 5·01% by pastures, and 0·25% by vineyards. The largest estates are found in the Prussian provinces of Pomerania, Posen and Saxony, and in East and West Prussia, while in the Prussian Rhine province, in Baden and Württemberg small farms are the rule.

The same kinds of cereal crops are cultivated in all parts of the empire, but in the south and west wheat is predominant, and in the north and east rye, oats and barley. In these in some districts are added spelt, buckwheat, millet, spelt-wheat, Emmer spelt and maize. In general the soil is remarkably well cultivated. The three years' rotation formerly in use, where autumn and spring-sown grain and fallow succeeded each other, has now been abandoned, except in some districts, where the system has been modified and improved. In south Germany the so-called *Fruchtwechsel* is practised, the fields being sown with grain crops every second year, and with pease or beans, grasses, potatoes, turnips, &c., in the intermediate years. In north Germany the mixed *Koppelwechselschaft* is the rule, by which system, after several years of grain crops, the ground is for two or three seasons in pasture.

Taking the average of the six years 1900–1905, the crop of wheat amounted to 3,550,033 tons (metric), rye to 9,296,616 tons, barley to 3,102,883 tons, and oats to 7,160,883 tons. But, in spite of this considerable yield in cereals, Germany cannot cover her home consumption, and imported on the average of the six years 1900–1905 about 43 million tons of cereals to supply the deficiency. The potato is largely cultivated, not merely for food, but for distillation into spirits. This manufacture is prosecuted especially in eastern Germany. The number of distilleries throughout the German empire was, in 1905–1906, 68,405. The common beet (*Beta vulgaris*) is largely grown in some districts for the production of sugar, which has greatly increased of recent years. There are two centres of the beet sugar production: Magdeburg for the districts Prussian Saxony, Hanover, Brunswick, Anhalt and Thuringia, and Frankfort-on-Oder at the centre of the group Silesia, Brandenburg and Pomerania. Flax and hemp are cultivated, though not so much as formerly, for manufacture into linen and canvas, and also rape seed for the production of oil. The home supply of the former no longer suffices for the native demand. The cultivation of hops is in a very thriving condition in the southern states of Germany. The soil occupied by hops was estimated in 1905 at 98,000 acres—a larger area than in Great Britain, which had in the same year about 48,000 acres. The total production of hops was estimated in 1905, and of this over 25,000 were grown in Bavaria, Württemberg, Baden and Alsace-Lorraine. Almost the whole yield in hops is consumed in the country by the great breweries.

Tobacco forms a most productive and profitable object of culture in many districts. The total extent under this crop in 1905 was about 35,000 acres, of which 45% was in Baden, 12% in Bavaria, 30% in Prussia, and the rest in Alsace and Hesse-Darmstadt. In the north this plant is cultivated principally in Pomerania, Brandenburg and East and West Prussia. Of late years the production has somewhat diminished, owing to the extensive tobacco manufacturing industries of Bremen and Hamburg, which import almost exclusively foreign leaves.

Ulm, Nuremberg, Quedlinburg, Erfurt, Strassburg and Guben are famed for their vegetables and garden seeds. Berlin is noted for its flower nurseries, the Rhine valley, Württemberg and the Elbe valley near Dresden for fruit, and Frankfort-on-Main for cider.

The culture of the vine is almost confined to southern and western Germany, and especially to the Rhine district. The northern limits of its growth extend from Bonn in a north-easterly direction as far as through Cassel to the foot of the Harz, crossing 52° N. on the Elbe, running then east some miles to the north of that parallel, and finally turning sharply towards the south-west on the Warthe. In the valley of the Saale and Elbe (near Dresden), and in lower Silesia (near Guben and Grünberg), the number of vineyards is small, and the wines of inferior quality; but along the Rhine from Basel to Coblenz, in Alsace, Baden, the Palatinate and Hesse, and above all in the province of Nassau, the lower slopes of the hills are literally covered with vines. Here are produced the celebrated Rüdesheimer, Hochheimer and Johannisberger. The vines of the lower Main, particularly those of Würzburg, are the best kinds; those of the upper Main and the valley of the Neckar are rather inferior. The Moselle wines are lighter and more acid than those of the Rhine. The total annual amount produced in Germany is estimated at 1000 million gallons, of a value of £4,000,000; Alsace-Lorraine turning out 400 millions; Baden, 175; Bavaria, Württemberg and Hesse together, 300; while the remainder, which though small in quantity is in quality the best, is produced by Prussia. *Vine.*

The cultivation of grazing lands in Germany has been greatly improved in recent times and is in a highly prosperous condition. The provinces of Schleswig-Holstein, Pomerania, Hanover (especially the marsh-lands near the sea) and the grand-duchy of Mecklenburg-Schwerin are particularly remarkable in this respect. The best meadow-lands of Bavaria are in the province of Franconia and in the outer slopes of the Alps, and those of Saxony in the Erzgebirge. Württemberg, Hesse and Thuringia also yield cattle of excellent quality. These large cattle-rearing centres not only supply the home markets but export live stock in considerable quantities to England and France. Butter is also largely exported to England from the North Sea districts and from Schleswig-Holstein and Mecklenburg. The breeding of horses has attained a great perfection. The main centre is in East and West Prussia, then follow the marsh districts on the Elbe and Weser, some parts of Westphalia, Oldenburg, Lippe, Saxony and upper Silesia, lower Bavaria and Alsace-Lorraine. Of the stud farms Trakehnen in East Prussia and Graditz in the Prussian province of Saxony enjoy a European-wide reputation. The comparative number of sheep shows a considerable falling off, and the rearing of them is mostly carried on only on large estates, the number showing only 9,692,501 in 1900, and 7,907,200 in 1904, as against 28,000,000 in 1860. As a rule, sheep-farming is resorted to where the soil is of inferior quality and unsuitable for tillage and the breeding of cattle. Far more attention is accordingly given to sheep-farming in northern and north-eastern Germany than in Schleswig-Holstein, Westphalia, the Rhineland and south Germany. The native demand for wool is not covered by the home production, and in this article the export from the United Kingdom to Germany is steadily rising, having amounted in 1905 to a value of £1,691,035, as against £742,632 in 1900. The largest stock of pigs is in central Germany and Saxony, in Westphalia, on the lower Rhine, in Lorraine and Hesse. Central Germany (especially Gotha and Brunswick) exports sausages and hams largely, as well as Westphalia, but here again considerable importation takes place from other countries. Goats are found everywhere, but especially in the hilly districts. Poultry farming is a considerable industry, the geese of Pomerania and the fowls of Thuringia and Lorraine being in especial favour. Bee-keeping is of considerable importance, particularly in north Germany and Silesia. *Live stock.*

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On the whole, despite the prosperous condition of the German live-stock farming, the consumption of meat exceeds the amount rendered available by home production, and prices can only be kept down by a steady increase in the imports from abroad.

Fisheries.—The German fisheries, long of little importance, have been carefully fostered within recent years. The deep-sea fishing in the North Sea, thanks to the exertions of the German fishing league (*Deutscher Fischereiverein*) and to government support, is extremely active. Trawlers are extensively employed, and steamers bring the catches directly to the large fish markets at Geestemünde and Altona, whence facilities are afforded by the railways for the rapid transport of fish to Berlin and other centres. The fish mostly caught are cod, haddock and herrings, while Heligoland yields lobsters, and the islands of Föhr, Amrum and Sylt oysters of good quality. The German North Sea fishing fleet numbered in 1905 618 boats, with an aggregate crew of 5441 hands. Equally well developed are the Baltic fisheries, the chief ports engaged in which are Danzig, Eckernförde, Kolberg and Travemünde. The principal catch is haddock and herrings. The catch of the North Sea and Baltic fisheries in 1906 was valued at over £700,000, exclusive of herrings for salting. The fisheries do not, however, supply the demand for fish, and fresh, salt and dried fish is imported largely in excess of the home yield.

Mines and Minerals.—Germany abounds in minerals, and the extraordinary industrial development of the country since 1870 is largely due to its mineral wealth. Having left France much behind in this respect, it now rivals Great Britain and the United States.

Germany produces more silver than any other European state, and the quantity is annually increasing. It is extracted from the ores in the mines of Freiburg (Saxony), the Harz Mountains, upper Silesia, Merseburg, Aix-la-Chapelle, Wiesbaden and Arnsberg. Gold is found in the sand of the rivers Isar, Inn and Rhine, and also, to a limited extent, on the Harz. The quantity yielded in 1905 was, of silver, about 400 tons of a value of £1,600,000, and gold, about 4 tons, valued at about £548,000.

Lead is produced in considerable quantities in upper Silesia, the Harz Mountains, in the Prussian province of Nassau, in the Saxon Erzgebirge and in the Sauerland. The yield in 1905 amounted to about 153,000 tons, of which 20,000 tons were exported.

Copper is found principally in the Mansfeld district of the Prussian province of Saxony and near Arnsberg in the Sauerland, the ore yielding 31,713 tons in 1905, of which 5000 tons were exported.

About 90% of the zinc produced in Europe is yielded by Belgium and Germany. It is mostly found in upper Silesia, around Beuthen, and in the districts of Wiesbaden and Aix-la-Chapelle. In 1905 no less than 198,000 tons of block zinc were produced, of which 16,500 tons were exported.

Of other minerals (with the exceptions of coal, iron and salt treated below) nickel and antimony are found in the upper Harz; cobalt in the hilly districts of Hesse and the Saxon Erzgebirge; arsenic in the Riesengebirge; quicksilver in the Sauerland and in the spurs of the Saarbrücken coal hills; graphite in Bavaria; porcelain clay in Saxony and Silesia; amber along the whole Baltic coast; and lime and gypsum in almost all parts.

Coal.

Coal-mining appears to have been first practised in the 14th century at Zwickau (Saxony) and on the Ruhr. There are six large coal-fields, occupying an area of about 3600 sq. m., of which the most important occupies the basin of the Ruhr, its extent being estimated at 2800 sq. m. Here there are more than 60 beds, of a total thickness of 150 to 200 ft. of coal; and the amount in the pits has been estimated at 45,000 millions of tons. Smaller fields are found near Osnabrück, Ibbenbüren and Minden, and a larger one near Aix-la-Chapelle. The Saar coal-field, within the area enclosed by the rivers Saar, Nahe and Blies (460 sq. m.), is of great importance. The thickness of 80 beds amounts to 250 ft., and the total mass of coal is estimated at 45,400 million tons. The greater part of the basin belongs to Prussia, the rest to Lorraine. A still larger field exists in the upper Silesian basin, on the borderland between Austria and Poland, containing about 50,000 million tons. Beuthen is the chief centre. The Silesian coal-fields have a second centre in Waldenburg, east of the Riesengebirge. The Saxon coal-fields stretch eastwards for some miles from Zwickau. Deposits of less consequence are found in upper Bavaria, upper Franconia, Baden, the Harz and elsewhere.

The following table shows the rapidly increasing development of the coal production. That of lignite is added, the provinces of Saxony and Brandenburg being rich in this product:—

Production of Coal and Lignite.

Year.	Coal.			Lignite.		
	Quantities.	Value.	Hands.	Quantities.	Value.	Hands.
	Mill. Tons.	Mill. Mks.		Mill. Tons.	Mill. Mks.	
1871	29·4	218·4	..	8·5	26·2	..
1881	48·7	252·3	186,000	12·8	38·1	25,600
1891	73·7	589·5	283,000	20·5	54·2	35,700
1899	101·6	789·6	379,000	34·2	78·4	44,700
1900	109·3	966·1	414,000	40·5	98·5	50,900
1905	121·2	1049·9	490,000	52·5	122·2	52,800

This production permits a considerable export of coal to the west and south of the empire, but the distance from the coal-fields to the German coast is such that the import of British coal cannot yet be dispensed with (1905, over 7,000,000 tons). Besides this, from 7,000,000 to 8,000,000 tons of lignite come annually from Bohemia. In north Germany peat is also of importance as a fuel; the area of the peat moors in Prussia is estimated at 8000 sq. m., of which 2000 are in the north of Hanover.

The iron-fields of Germany fall into three main groups: those of the lower Rhine and Westphalia, of which Dortmund and Düsseldorf are the centres; those of Lorraine and the Saar; and those of upper Silesia. The output of the ore has enormously increased of recent years, and the production of pig iron, as given for 1905, amounted to 10,875,000 tons of a value of £28,900,000.

Germany possesses abundant salt deposits. The actual production not only covers the home consumption, but also allows a yearly increasing exportation, especially to Russia, Austria and Scandinavia. The provinces of Saxony and Hanover, with Thuringia and Anhalt, produce half the whole amount. A large salt-work is found at Strzalkowo (Posen), and smaller ones near Dortmund, Lippstadt and Minden (Westphalia). In south Germany salt abounds most in Württemberg (Hall, Heilbronn, Rottweil); the principal Bavarian works are at the foot of the Alps near Freilassing and Rosenheim. Hesse and Baden, Lorraine and the upper Palatinate have also salt-works. The total yield of mined salt amounted in 1905 to 6,209,000 tons, including 1,165,000 tons of rock salt. The production has made great advance, having in 1850 been only 5 million cwts.

Manufactures.—In no other country of the world has the manufacturing industry made such rapid strides within recent years as in Germany. This extraordinary development of industrial energy embraces practically all classes of manufactured articles. In a general way the chief manufactures may be geographically distributed as follows. Prussia, Alsace-Lorraine, Bavaria and Saxony are the chief seats of the iron manufacture. Steel is produced in Rhenish Prussia. Saxony is predominant in the production of textiles, though Silesia and Westphalia manufacture linen. Cotton goods are largely produced in Baden, Bavaria, Alsace-Lorraine and Württemberg, woollens and worsteds in Saxony and the Rhine province, silk in Rhenish Prussia (Elberfeld), Alsace and Baden. Glass and porcelain are largely produced in Bavaria; lace in Saxony; tobacco in Bremen and Hamburg; chemicals in the Prussian province of Saxony; watches in Saxony (Glashütte) and Nuremberg; toys in Bavaria; gold and silver filagree in Berlin and Aschaffenburg; and beer in Bavaria and Prussia.

Iron industry.

It is perhaps more in respect of its iron industry than of its other manufactures that Germany has attained a leading position in the markets of the world. Its chief centres are in Westphalia and the Rhine province (*auf roter Erde*), in upper Silesia, in Alsace-Lorraine and in Saxony. Of the total production of pig iron in 1905 amounting to over 10,000,000 tons, more than the half was produced in the Rhineland and Westphalia. Huge blast furnaces are in constant activity, and the output of rolled iron and steel is constantly increasing. In the latter the greatest advance has been made. The greater part of it is produced at or around Essen, where are the famous Krupp works, and Bochum. Many states have been for a considerable time supplied by Krupp with steel guns and battleship plates. The export of steel (railway) rails and bridges from this part is steadily on the increase.

Hardware also, the production of which is centred in Solingen, Heilbronn, Esslingen, &c., is largely exported. Germany stands second to Great Britain in the manufacture of machines and engines. There are in many large cities of north Germany extensive establishments for this purpose, but the industry is not limited to the large cities. In agricultural machinery Germany is a serious competitor with England. The locomotives and wagons for the German railways are almost exclusively built in Germany; and Russia, as well as Austria, receives large supplies of railway plant from German works. In shipbuilding, likewise, Germany is practically independent, yards having been established for the construction of the largest vessels.

Cotton and textiles.

Before 1871 the production of cotton fabrics in France exceeded that in Germany, but as the cotton manufacture is pursued largely in Alsace, the balance is now against the former country. In 1905 there were about 9,000,000 spindles in Germany. The export of the goods manufactured amounted in this year to an estimated value of £19,600,000. Cotton spinning and weaving are not confined to one district, but are prosecuted in upper Alsace (Mülhausen, Gebweiler, Colmar), in Saxony (Zwickau, Chemnitz, Annaberg), in Silesia (Breslau, Liegnitz), in the Rhine province (Düsseldorf, Münster, Cologne), in Erfurt and Hanover, in Württemberg (Reutlingen, Cannstatt), in Baden, Bavaria (Augsburg, Bamberg, Bayreuth) and in the Palatinate.

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Although Germany produces wool, flax and hemp, the home production of these materials is not sufficient to meet the demand of manufactures, and large quantities of them have to be imported. In 1895 almost a million persons (half of them women) were employed in this branch of industry, and in 1897 the value of the cloth, buckskin and flannel manufacture was estimated at £18,000,000. The chief seats of this manufacture are the Rhenish districts of Aix-la-Chapelle, Düren, Eupen and Lennep, Brandenburg, Saxony, Silesia and lower Lusatia, the chief centres in this group being Berlin, Cottbus, Spremberg, Sagan and Sommerfeld.

The manufacture of woollen and half-woollen dress materials centres mainly in Saxony, Silesia, the Rhine province and in Alsace. Furniture covers, table covers and plush are made in Elberfeld and Chemnitz, in Westphalia and the Rhine province (notably in Elberfeld and Barmen); shawls in Berlin and the Bavarian Vogtland; carpets in Berlin, Barmen and Silesia. In the town of Schmiedeberg in the last district, as also in Cottbus (Lusatia), oriental patterns are successfully imitated. The chief seats of the stocking manufacture are Chemnitz and Zwickau in Saxony, and Apolda in Thuringia. The export of woollen goods from Germany in 1905 amounted to a value of £13,000,000.

Although linen was formerly one of her most important articles of manufacture, Germany is now left far behind in this industry by Great Britain, France and Austria-Hungary. This branch of textile manufacture has its principal centres in Silesia, Westphalia, Saxony and Württemberg, while Hirschberg in Silesia, Bielefeld in Westphalia and Zittau in Saxony are noted for the excellence of their productions. The goods manufactured, now no longer, as formerly, coarse in texture, vie with the finer and more delicate fabrics of Belfast. In the textile industry for flax and hemp there were, in 1905, 276,000 fine spindles, 22,300 hand-looms and 17,600 power-looms in operation, and, in 1905, linen and jute materials were exported of an estimated value of over £2,000,000. The jute manufacture, the principal centres of which are Berlin, Bonn, Brunswick and Hamburg, has of late attained considerable dimensions.

Raw silk can scarcely be reckoned among the products of the empire, and the annual demand of this has to be provided for by importation. The main centre of the silk industry is Crefeld and its neighbourhood; then come Elberfeld and Barmen, Aix-la-Chapelle, as well as Berlin, Bielefeld, Chemnitz, Stuttgart and the district around Müllhausen in Alsace.

The manufacture of paper is prosecuted almost everywhere in the empire. There were 1020 mills in operation in 1895, and the exports in 1905 amounted to more than £3,700,000 sterling, as against imports of a value of over £700,000. The manufacture is carried on to the largest extent in the Rhine province, in Saxony and in Silesia. Wall papers are produced chiefly in Rhenish Prussia, Berlin and Hamburg; the finer sorts of letter-paper in Berlin, Leipzig and Nuremberg; and printing-paper (especially for books) in Leipzig, Berlin and Frankfort-on-Main. **Paper.**

The chief seat of the leather industry is Hesse-Darmstadt, in which Mainz and Worms produce excellent material. In Prussia large factories are in operation in the Rhine province, in Westphalia and Silesia (Breslau, Brieg). Boot and shoe manufactures are carried on everywhere; but the best goods are produced by Mainz and Pirmasens. Gloves for export are extensively made in Württemberg, and Offenbach and Aschaffenburg are renowned for fancy leather wares, such as purses, satchels and the like. **Leather.**

Berlin and Mainz are celebrated for the manufacture of furniture; Bavaria for toys; the Black Forest for clocks; Nuremberg for pencils; Berlin and Frankfort-on-Main for various perfumes; and Cologne for the famous eau-de-Cologne.

The beetroot sugar manufacture is very considerable. It centres mainly in the Prussian province of Saxony, where Magdeburg is the chief market for the whole of Germany, in Anhalt, Brunswick and Silesia. The number of factories was, in 1905, 376, and the amount of raw sugar and molasses produced amounted to 2,643,531 metric tons, and of refined sugar 1,711,063 tons. **Sugar.**

Beer is produced throughout the whole of Germany. The production is relatively greatest in Bavaria. The *Brautzwangbezirk* (beer excise district) embraces all the states forming the Zollverein, with the exception of Bavaria, Württemberg, Baden and Alsace-Lorraine, in which countries the excise duties are separately collected. The total number of breweries in the beer excise district was, in 1905–1906, 5995, which produced 1017 million gallons; in Bavaria nearly 6000 breweries with 392 million gallons; in Baden over 700 breweries with 68 million gallons; in Württemberg over 5000 breweries with 81 million gallons; and in Alsace-Lorraine 95 breweries with about 29 million gallons. The amount brewed per head of the population amounted, in 1905, roughly to 160 imperial pints in the excise district; to 450 in Bavaria; 280 in Württemberg; 260 in Baden; and 122 in Alsace-Lorraine. It may be remarked that the beer brewed in Bavaria is generally of darker colour than that produced in other states, and extra strong brews are exported largely into the beer excise district and abroad. **Beer.**

Commerce.—The rapid development of German trade dates from the *Zollverein* (customs union), under the special rules and regulations of which it is administered. The Zollverein emanates from a convention originally entered into, in 1828, between Prussia and Hesse, which, subsequently joined by the Bavarian customs-league, by the kingdom of Saxony and the Thuringian states, came into operation, as regards the countries concerned, on the 1st of January 1834. With progressive territorial extensions during the ensuing fifty years, and embracing the grand-duchy of Luxemburg, it had in 1871, when the German empire was founded, an area of about 209,281 sq. m., with a population of 40,678,000. The last important addition was in October 1888, when Hamburg and Bremen were incorporated. Included within it, besides the grand-duchy of Luxemburg, are the Austrian communes of Jungholz and Mittelberg; while, outside, lie the little free-port territories of Hamburg, Cuxhaven, Bremerhaven and Geestemünde, Heligoland, and small portions of the districts of Constance and Waldshut, lying on the Baden Swiss frontier. Down to 1879 Germany was, in general, a free-trade country. In this year, however, a rigid protective system was introduced by the *Zolltarifgesetz*, since modified by the commercial treaties between Germany and Austria-Hungary, Italy, Switzerland and Belgium, of the 1st of February 1892, and by a customs tariff law of the 25th of December 1902. The foreign commercial relations of Germany were again altered by the general and conventional customs tariff, which came into force on the 1st of March 1906. The Zolltarifgesetz of the 15th of July 1879, while restricting the former free import, imposed considerable duties. Exempt from duty were now only refuse, raw products, scientific instruments, ships and literary and artistic objects; forty-four articles —notably beer, vinegar, sugar, herrings, cocoa, salt, fish oils, ether, alum and soda—were unaffected by the change, while duties were henceforth levied upon a large number of articles which had previously been admitted duty free, such as pig iron, machines and locomotives, grain, building timber, tallow, horses, cattle and sheep; and, again, the tariff law further increased the duties leviable upon numerous other articles. Export duties were abolished in 1865 and transit dues in 1861. The law under which Great Britain enjoyed the "most favoured nation treatment" expired on the 31st of December 1905, but its provisions were continued by the *Bundesrat* until further notice. The average value of each article is fixed annually in Germany under the direction of the Imperial Statistical Office, by a commission of experts, who receive information from chambers of commerce and other sources. There are separate valuations for imports and exports. The price fixed is that of the goods at the moment of crossing the frontier. For imports the declared value include customs duties, cost of transport, insurance, warehousing, &c., incurred after the frontier is passed. For exports, the price includes all charges within the territory, but drawbacks and bounties are not taken into account. The quantities are determined according to obligatory declarations, and, for imports, the fiscal authorities may actually weigh the goods. For packages an official tax is deducted. The countries whence goods are imported and the ultimate destination of exports are registered. The import dues amounted in the year 1906, the first year of the revised tariff, to about £31,630,000, or about 10s. 5d. per head of population.

Statistics relating to the foreign trade of the Empire are necessarily confined to comparatively recent times. The quantities of such imported articles as are liable to duty have, indeed, been known for many years; and in 1872 official tables were compiled showing the value both of imports and of exports. But when the results of these tables proved the importation to be very much greater than the exportation, the conviction arose that the valuation of the exports was erroneous and below the reality. In 1872 the value of the imports was placed at £173,490,000 and that of the exports at £124,700,000. In 1905 the figures were—imports, £371,000,000, and exports, £292,000,000, including precious metals.

Table A following shows the classification of goods adopted before the tariff revision of 1906. From 1907 a new classification has been adopted, and the change thus introduced is so great that it is impossible to make any comparisons between the statistics of years subsequent to and preceding the year 1906. Table B shows imports and exports for 1907 and 1908 according to the new classification adopted.

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TABLE A.—*Classes of Imports and Exports, 1905.*

	Import.	Export.
Refuse	£6,866,250	£1,170,200
Cotton and cottons	23,488,750	22,949,600
Lead and by-products	996,300	979,400
Brush and sieve makers' goods	102,400	515,450
Drugs, chemists' and oilmen's colours	15,896,900	23,196,250
Iron and iron goods	3,156,500	33,126,400
Ores, precious metals, asbestos, &c.	28,834,050	9,899,450
Flax and other vegetable spinning materials except cotton	6,794,100	1,235,700
Grain and agricultural produce	59,136,200	7,496,500
Glass	538,050	2,743,900
Hair, feathers, bristles	3,218,600	1,848,150
Skins	18,965,500	9,548,450
Wood and wooden wares	16,940,850	6,056,150
Hops	913,150	2,135,600
Instruments, machines, &c.	4,351,500	17,898,250
Calendars	34,300	74,700
Caoutchouc, &c.	7,379,600	4,616,400
Clothes, body linen, millinery	739,000	7,321,050
Copper and copper goods	8,273,400	10,307,050
Hardware, &c.	2,042,400	12,610,550
Leather and leather goods	3,507,950	9,665,300
Linens	1,750,100	1,904,950
Candles	11,150	42,350
Literary and works of art	3,066,050	9,025,500
Groceries and confectionery	41,446,400	17,585,000
Fats and oils	12,510,600	2,631,600
Paper goods	1,086,800	7,158,800
Furs	265,700	720,200
Petroleum	5,036,600	132,300
Silks and silk goods	9,523,300	8,886,000
Soap and perfumes	151,600	768,250
Playing cards	400	18,950
Stone goods	2,822,000	2,110,550
Coal, lignite, coke and peat	10,136,800	15,096,450
Straw and hemp goods	561,650	262,100
Tar, pitch, resin	2,504,400	834,100
Animals, and animal products	9,926,200	590,700
Earthenware goods	391,650	5,076,350
Cattle	11,366,200	725,100
Oilcloth	43,150	177,300
Wools and woollen textiles	25,290,200	21,562,900
Zinc and zinc goods	682,250	2,413,600
Tin and japanned goods	1,770,550	744,100
Goods insufficiently declared		806,300
Total	£352,317,250	£284,626,900

TABLE B.—*Classes of Imports and Exports, 1907 and 1908.*

Groups of Articles.	Imports. Value in £1000.		Exports. Value in £1000.	
	1907.	1908.[1]	1907.	1908.[1]
Agricultural and forest produce[2]	215,532	205,512	45,796	50,324
Agricultural produce[3]	93,253	102,954	10,369	15,168
Colonial produce and substitutes for the same	12,151	12,328	84	108
Southern fruit and fruit peel	3,214	3,262	20	23
Forest produce	28,166	26,299	4,666	3,967
Resins	8,216	8,209	2,500	2,325
Animals and animal products[2]	63,283	61,794	9,607	9,676
Hides and skins	16,920	17,699	5,383	5,453
Meat, oil, sugar, beverages	21,523	20,404	20,284	20,048
Mineral and fossil raw materials, mineral oils	47,575	45,540	26,166	26,208
Earths and stones	6,541	7,542	3,250	3,006
Ores, slag, cinders	16,465	15,451	1,497	1,266
Mineral fuel	16,895	14,910	19,445	20,020
Mineral oils and other fossil raw materials	7,168	7,209	558	491
Coal-tar, coal-tar oils	506	428	1,506	1,485

[1] Provisional figures only.
[2] Excluding vegetable and animal textile materials.
[3] Excluding vegetable textile materials.

Groups of Articles.	Imports. Value in £1000.		Exports. Value in £1000.	
	1907.	1908.[4]	1907.	1908.[4]
Chemical and pharmaceutical products, colours	14,784	14,850	28,116	26,845
Chemical primary materials, acids, salts	9,226	9,550	9,661	9,832
Colours and dyeing materials	951	879	11,630	10,518
Varnish, lacquer	189	158	206	221
Ether, alcohol not included elsewhere, essential oils, perfumery and cosmetics	1,979	1,918	1,118	1,004
Artificial manures	992	1,001	1,303	1,236
Explosives of all kinds	86	74	1,612	1,269
Other chemical and pharmaceutical products	1,361	1,270	2,586	2,765
Animal and vegetable textile materials and wares thereof	98,540	92,105	78,086	70,343
Silk and silk goods	13,533	13,704	13,324	11,364
Wool	33,260	31,195	27,114	24,918
Unworked wool	10,975	19,309	2,647	2,561
Worked wool	4,625	4,961	3,799	3,393
Wares of spun wool	8,660	6,925	20,668	18,964
Cotton	38,543	34,456	29,004	26,201
Unworked cotton	27,705	26,167	3,264	2,987
Worked cotton	960	950	912	891
Cotton wares	9,858	7,338	24,828	22,324
Other vegetable textile materials	10,783	10,411	3,777	3,471
Unworked	7,923	7,819	1,125	1,211
Worked	166	168	122	137
Wares thereof	2,685	2,423	2,531	2,124
Leather and leather wares, furriers' wares	6,695	6,657	16,778	17,835
Leather	2,658	2,804	7,503	8,328
Leather wares	1,332	1,176	4,016	3,867
Furriers' wares	2,698	2,672	5,237	5,616
Caoutchouc wares	694	754	3,328	2,325
Wares of soft caoutchouc	670	735	1,694	1,723
Hardened caoutchouc and wares thereof	24	19	634	602
Wares of animal or vegetable material for carving or moulding	2,448	2,068	4,260	4,131
Wooden wares	859	769	1,707	1,666
Paper, cardboard and wares thereof	1,349	1,205	9,342	9,111
Books, pictures, paintings	1,992	2,036	4,667	4,765
Earthenware	467	377	5,224	4,612
Glass and glassware	747	728	5,671	5,149
Precious metals and wares thereof	13,281	21,243	18,629	6,858
Gold	11,616	19,295	15,898	6,151
Gold	11,184	18,873	11,071	2,897
Gold wares	432	422	4,827	3,254
Silver	1,665	1,948	2,731	2,707
Silver	1,434	1,716	1,206	1,418
Silver wares	231	232	1,525	1,289
Base metals and wares thereof	26,035	26,398	57,146	58,895
Iron and iron wares	5,903	4,472	38,899	40,162
Pig iron (including non-malleable alloys)	1,601	912	966	905
Iron wares	4,302	3,560	37,933	39,257
Aluminium and aluminium wares	546	453	368	273
Raw aluminium	529	433	152	77
Aluminium wares	17	20	216	196
Lead and lead wares	1,438	1,484	945	985
Raw lead (including waste)	1,427	1,470	525	568
Lead wares	11	14	420	417
Zinc and zinc wares	727	847	2,433	2,489
Raw zinc (including waste)	706	825	1,631	1,784
Zinc wares	21	22	802	705
Tin and tin wares	2,405	2,629	1,380	1,236
Raw tin (including waste)	2,357	2,581	787	688
Tin wares	48	48	593	548
Nickel and nickel wares	400	540	246	298
Raw nickel	375	527	160	233

[4] Provisional figures only.

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Groups of Articles.	Imports. Value in £1000.		Exports. Value in £1000.	
	1907.	1908.[1]	1907.	1908.[1]
Nickel wares	25	13	86	65
Copper and copper wares	13,803	15,088	7,998	8,470
Raw copper (including copper coin, brass, tombac, &c.)	12,995	14,192	2,204	2,014
Copper wares	808	896	5,794	6,456
Instruments of precision	813	885	4,877	4,982
Machinery, vehicles	7,093	5,489	33,117	34,653
Machinery	4,090	3,451	19,041	20,684
Electro-technical products	411	451	8,227	9,107
Vehicles and vessels	2,562	1,587	5,849	4,862
Firearms, clocks, musical instruments, toys	1,732	1,424	8,704	7,505
Clocks and watches	1,382	1,134	1,296	1,210
Musical instruments	223	170	3,176	2,780
Toys	39	35	3,949	3,273
Total	442,663	429,636	349,114	336,347

[1] Provisional figures only.

The following table shows the commercial intercourse in imports and exports, exclusive of bullion and coin, between Germany and the chief countries of the world in 1905, 1906 and 1907.

Imports.

Country.	1905. Value in £1000.	1905. Percentage of Germany's Total Imports.	1906. Value in £1000.	1906. Percentage of Germany's Total Imports.	1907. Value in £1000.	1907. Percentage of Germany's Total Imports.
Belgium	13,439	3·8	14,315	3·6	14,586	3·4
Denmark	5,986	1·7	6,302	1·6	6,050	1·4
France	19,772	5·6	21,306	5·4	22,302	5·2
United Kingdom	35,320	10·1	40,531	10·3	48,014	11·2
Italy	10,350	3	11,851	3	14,030	3·3
Netherlands	12,077	3	11,864	3	11,187	2·6
Austria-Hungary	36,974	10·6	39,814	10·1	39,939	9·3
Rumania	4,568	1·3	5,774	1·5	7,365	1·7
Russia	47,816	13·6	52,528	13·4	54,447	12·7
Sweden	5,887	1·7	7,359	1·9	8,457	2
Switzerland	8,980	2·6	10,659	2·9	10,366	2·4
Spain	5,742	1·6	7,410	1·9	6,878	1·6
British South Africa	1,769	0·5	1,766	0·4	2,258	0·5
Dominion of Canada	481	0·1	463	0·1	483	0·1
New Zealand	75	...	87	...	94	...
British West Africa	2,562	0·7	2,731	0·7	3,601	0·8
British India	13,657	3·9	15,842	4	20,016	4·7
Dutch Indies	5,848	1·7	7,002	1·8	9,199	2·1
Argentine Republic	18,150	5·2	18,302	4·7	21,756	5·1
Brazil	8,454	2·4	9,246	2·4	9,636	2·2
Chile	6,536	1·9	7,131	1·8	7,074	1·6
United States	48,770	13·9	60,787	15·4	64,864	15·1
Commonwealth of Australia	7,690	2·2	8,619	2·2	11,209	2·6

Exports.

Country.	1905. Value in £1000.	1905. Percentage of Germany's Total Exports.	1906. Value in £1000.	1906. Percentage of Germany's Total Exports.	1907. Value in £1000.	1907. Percentage of Germany's Total Exports.
Belgium	15,364	5·5	17,509	5·6	16,861	5
Denmark	8,668	3·1	9,699	3·1	10,182	3
France	14,420	5·1	18,815	6	22,080	6·6
United Kingdom	51,253	18·2	52,473	16·8	52,135	15·5
Italy	8,045	2·9	11,354	3·6	14,893	4·4
Netherlands	21,295	7·6	21,799	7	22,232	6·6
Norway	3,447	1·2	3,573	1·2	4,211	1·3
Austria-Hungary	28,526	10·1	31,926	10·2	35,231	10·5
Rumania	2,144	0·8	3,140	1	3,372	1
Russia	17,027	6	19,962	6·4	21,531	6·4
Sweden	7,653	2·7	8,675	2·8	9,177	2·7
Switzerland	17,649	6·3	18,367	5·9	21,948	6·5
Spain	2,609	0·9	2,838	0·9	3,228	1
British South Africa	1,687	0·6	1,607	0·5	1,422	0·4
Dominion of Canada	1,071	0·4	1,203	0·4	1,456	0·4
New Zealand	227	0·1	244	0·1	263	0·1
Turkey	3,484	1·3	3,357	1·1	4,011	1·2
British India	4,226	1·5	5,011	1·6	4,868	1·4
China	4,727	1·3	3,331	1·1	3,105	0·9
Japan	4,158	1·5	4,328	1·4	5,036	1·5
Argentine Republic	6,463	2·3	8,367	2·7	8,810	2·6
Brazil	3,525	1·3	4,364	1·4	5,118	1·5
Chile	2,632	0·9	3,561	1·2	4,167	1·2
United States	26,660	9·5	31,281	10	32,070	9·5
Commonwealth of Australia	2,264	0·8	2,863	0·9	3,004	0·9

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The commerce of Germany shows an upward tendency, which progresses *pari passu* with its greatly increased production. The export of ships from the United Kingdom to the empire decreased during two years, 1903 (£305,682) and 1904 (£365,062), almost to a vanishing point, German yards being able to cope with the demands made upon them for the supply of vessels of all classes, including mercantile vessels and ships of war. In 1905 and subsequent years, however, the degree of employment in German yards increased to such an extent, principally owing to the placing of the Admiralty contracts with private builders, that the more urgent orders for mercantile vessels were placed abroad.

The following tables give the value of trade between the United Kingdom and Germany in 1900 and 1905:—

Staple Imports into the United Kingdom from Germany.	1900.	1905.
	£	£
Sugar	9,164,573	10,488,085
Glass and manufactures	1,078,648	1,108,117
Eggs	1,017,119	764,966
Cottons and yarn	992,244	1,476,385
Woollens and yarn	1,312,671	1,984,475
Iron and steel and manufactures	1,012,376	379,479
Machinery	411,178	735,536
Paper	523,544	528,306
Musical instruments	660,777	676,391
Toys	644,690	714,628
Zinc and manufactures	461,023	673,602
Wood and manufactures	1,470,839	1,119,385
Chemicals	513,200	735,830

Principal Articles exported by Great Britain to Germany.	1900.	1905.
	£	£
Cottons and yarn	3,843,917	4,941,017
Woollens and yarn	3,743,842	3,795,591
Alpaca, &c., yarn	1,022,289	1,325,519
Wool	742,632	1,691,033
Ironwork	2,937,055	1,500,414
Herrings	1,651,441	2,042,483
Machinery	2,040,797	2,102,835
Coals, cinders	4,267,172	3,466,535
New ships	1,592,865	1,377,081

Navigation.—The seamen of Frisia are among the best in the world, and the shipping of Bremen and Hamburg had won a respected name long before a German mercantile marine, properly so called, was heard of. Many Hamburg vessels sailed under charter of English and other houses in foreign, especially Chinese, waters. Since 1868 all German ships have carried a common flag—black, white, red; but formerly Oldenburg, Hanover, Bremen, Hamburg, Lübeck, Mecklenburg and Prussia had each its own flag, and Schleswig-Holstein vessels sailed under the Danish flag. The German mercantile fleet occupies, in respect of the number of vessels, the fourth place—after Great Britain, the United States of America and Norway; but in respect of tonnage it stands third—after Great Britain and the United States only.

The following table shows its distribution on the 1st of January of the two years 1905 and 1908:—

	Baltic Ports.		North Sea Ports.		Total Shipping.	
	Number.	Tonnage.	Number.	Tonnage.	Number.	Tonnage.
1905—						
Sailing vessels	386	19,067	2181	559,436	2567	578,503
Steamers	486	236,509	1171	1,537,563	1657	1,774,072
Totals	872	255,576	3352	2,096,999	4224	2,352,575
1908—						
Sailing vessels	394	17,472	2255	516,180	2649	533,652
Steamers	521	274,952	1401	1,981,831	1922	2,256,783
Totals	915	292,424	3656	2,498,011	4571	2,790,435

In 1905, 2136 vessels of 283,171 tons, and in 1908, 2218 vessels of 284,081 tons, belonged to Prussian ports, and the number of sailors of the mercantile marine was 60,616 in 1905 and 71,853 in 1908.

The chief ports are Hamburg, Stettin, Bremen, Kiel, Lübeck, Flensburg, Bremerhaven, Danzig (Neufahrwasser), Geestemünde and Emden; and the number and tonnage of vessels of foreign nationality entering and clearing the ports of the empire, as compared with national shipping, were in 1906:—

Foreign Ships.	Number entered in Cargo.	Tonnage.	Number cleared in Cargo.	Tonnage.
Danish	5917	1,589,346	5059	1,219,388
British	5327	5,129,017	3211	2,552,268
Swedish	4891	1,164,431	3317	747,656
Dutch	2181	458,401	1973	316,562
Norwegian	1565	817,483	720	347,811
Russian	720	250,564	439	143,983

The ports of Hamburg and Bremen, which are the chief outlets for emigration to the United States of America, carry on a vast commercial trade with all the chief countries of the world, and are the main gates of maritime intercourse between the United Kingdom and Germany.

The inland navigation is served by nearly 25,000 river, canal and coasting vessels, of a tonnage of about 4,000,000.

Railways.—The period of railway construction was inaugurated in Germany by the opening of the line (4 m. in length) from Nuremberg to Fürth in 1835, followed by the main line (71 m.) between Leipzig and Dresden, opened throughout in 1830. The development of the railway system was slow and was not conceived on any uniform plan. The want of a central government operated injuriously, for it often happened that intricate negotiations and solemn treaties between several sovereign states were required before a line could be constructed; and, moreover, the course it was to take was often determined less by the general exigencies of commerce than by many trifling interests or desires of neighbouring states. The state which was most self-seeking in its railway politics was Hanover, which separated the eastern and western parts of the kingdom of Prussia. The difficulties arising to Prussia from this source were experienced in a still greater degree by the seaports of Bremen and Hamburg, which were severely hampered by the particularism displayed by Hanover.

The making of railways was from the outset regarded by some German states as exclusively a function of the government. The South German states, for example, have only possessed state railways. In Prussia numerous private companies, in the first instance, constructed their systems, and the state contented itself for the most part with laying lines in such districts only as were not likely to attract private capital.

The development of the German railway system falls conveniently into four periods. The first, down in 1840, embraces the beginnings of railway enterprise. The next, down to 1848, shows the linking-up of various existing lines and the establishment of inter-connexion between the chief towns. The third, down to 1881, shows the gradual establishment of state control in Prussia, and the formation of direct trunk lines. The fourth begins from 1881 with the purchase of practically all the railways in Prussia by the government, and the introduction of a uniform system of interworking between the various state systems. The purchase of the railways by the Prussian government was on the whole equably carried out, but there were several hard cases in the expropriation of some of the smaller private lines.

The majority of the German railways are now owned by the state governments. Out of 34,470 m. of railway completed and open for traffic in 1906, only 2570 m. were the property of private undertakings, and of these about 150 were worked by the state. The bulk of the railways are of the normal 4 ft. 8½ in. gauge. Narrow-gauge (2½ ft.) lines—or light railways—extended over 1218 m. in 1903, and of these 537 m. were worked by the state.

The board responsible for the imperial control over the whole railway system in Germany is the *Reichseisenbahnamt*

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in Berlin, the administration of the various state systems residing, in Prussia, in the ministry of public works; in Bavaria in the ministry of the royal house and of the exterior; in Württemberg in the ministry of the exterior; in Saxony in the ministry of the interior; in Baden and Hesse-Darmstadt in commissions of the ministry of finance; and in Alsace-Lorraine in the imperial ministry of railways.

The management of the Prussian railway system is committed to the charge of twenty "directions," into which the whole network of lines is divided, being those of Altona, Berlin, Breslau, Bromberg, Danzig, Elberfeld, Erfurt, Essen a.d. Ruhr, Frankfort-on-Main, Halle a.d. Saale, Hanover, Cassel, Kattowitz, Cologne, Königsberg, Magdeburg, Münster, Posen, Saarbrücken and Stettin. The entire length of the system was in 1906 20,835 m., giving an average of about 950 m. to each "direction." The smallest mileage controlled by a "direction" is Berlin, with 380 m., and the greatest, Königsberg, with 1200 m.

The Bavarian system embraces 4642 m., and is controlled and managed, apart from the "general direction" in Munich, by ten traffic boards, in Augsburg, Bamberg, Ingolstadt, Kempten, Munich, Nuremberg, Regensburg, Rosenheim, Weiden and Würzburg.

The system of the kingdom of Saxony has a length of 1616 m., and is controlled by the general direction in Dresden.

The length of the Württemberg system is 1141 m., and is managed by a general direction in Stuttgart.

Baden (state) controls 1233, Oldenburg (state) 382, Mecklenburg-Schwerin 726 and Saxe-Weimar 257 m. respectively. Railways lying within the other smaller states are mostly worked by Prussia.

Alsace-Lorraine has a separate system of 1085 m., which is worked by the imperial general direction in Strassburg.

By the linking-up of the various state systems several grand trunk line routes have been developed—notably the lines Berlin-Vienna-Budapest; Berlin-Cologne-Brussels and Paris; Berlin-Halle-Frankfort-on-Main-Basel; Hamburg-Cassel-Munich and Verona; and Breslau-Dresden-Bamberg-Geneva. Until 1907 no uniform system of passenger rates had been adopted, each state retaining its own fares—a condition that led to much confusion. From the 1st of May 1907 the following tariff came into force. For ordinary trains the rate for first class was fixed at 1½d. a mile; for second class at ·7d.; for third class at ¾d., and for fourth class at ½d. a mile. For express trains an extra charge is made of 2s. for distances exceeding 93 m. (150 kils.) in the two superior classes, and 1s. for a lesser distance, and of 1s. and 6d. respectively in the case of third and class tickets. Fourth class passengers are not conveyed by express trains. The above rates include government duty; but the privilege of free luggage (as up to 56 lb) has been withdrawn, and all luggage other than hand baggage taken into the carriages is charged for. In 1903 371,084,000 metric tons of goods, including animals, were conveyed by the German railways, yielding £68,085,000 sterling, and the number of passengers carried was 957,684,000, yielding £29,500,000.

The passenger ports of Germany affording oversea communications to distant lands are mainly those of Bremen (Bremerhaven) and Hamburg (Cuxhaven) both of which are situate on the North Sea. From these great steamship lines, notably the North German Lloyd, the Hamburg-American, the Hamburg South American and the German East African steamship companies, maintain express mail and other services with North and South America, Australia, the Cape of Good Hope and the Far East. London and other English ports, French, Italian and Levant coast towns are also served by passenger steamboat sailings from the two great North Sea ports. The Baltic ports, such as Lübeck, Stettin, Danzig (Neufahrwasser) and Königsberg, principally provide communication with the coast towns of the adjacent countries, Russia and Sweden.

Waterways.—In Germany the waterways are almost solely in the possession of the state. Of ship canals the chief is the Kaiser Wilhelm canal (1887–1895), 61 m. long, connecting the North Sea and the Baltic; it was made with a breadth at bottom of 72 ft. and at the surface of 213 ft., and with a depth of 29 ft. 6 in., but in 1908 work was begun for doubling the bottom width and increasing the depth to 36 ft. In respect of internal navigation, the principal of the greater undertakings are the Dortmund-Ems and the Elbe-Trave canals. The former, constructed in 1892–1899, has a length of 150 m. and a mean depth of 8 ft. The latter, constructed 1895–1900, has a length of 43 m. and a mean depth of about 7½ ft. A project was sanctioned in 1905 for a canal, adapted for vessels up to 600 tons, from the Rhine to the Weser at Hanover, utilizing a portion of the Dortmund-Ems canal; for a channel accommodating vessels of similar size between Berlin and Stettin; for improving the waterway between the Oder and the Vistula, so as to render it capable of accommodating vessels of 400 tons; and for the canalization of the upper Oder.

On the whole, Germany cannot be said to be rich in canals. In South Germany the Ludwigs canal was, until the annexation of Alsace-Lorraine, the only one of importance. It was constructed by King Louis I. of Bavaria in order to unite the German Ocean and the Black Sea, and extends from the Main at Bamberg to Kelheim on the Danube. Alsace-Lorraine had canals for connecting the Rhine with the Rhone and the Marne, a branch serving the collieries of the Saar valley. The North German plain has, in the east, a canal by which Russian grain is conveyed to Königsberg, joining the Pregel to the Memel, and the upper Silesian coalfield is in communication with the Oder by means of the Klodnitz canal. The greatest number of canals is found around Berlin; they serve to join the Spree to the Oder and Elbe, and include the Teltow canal opened in 1906. The canals in Germany (including ship canals through lakes) have a total length of about 2600 m. Navigable and canalized rivers, to which belong the great water-systems of the Rhine, Elbe and Oder, have a total length of about 6000 m.

Roads.—The construction of good highways has been well attended to in Germany only since the Napoleonic wars. The separation of the empire into small states was favourable to road-making, inasmuch as it was principally the smaller governments that expended large sums for their network of roads. Hanover and Thuringia have long been distinguished for the excellence of their roads, but some districts suffer even still from the want of good highways. The introduction of railways for a time diverted attention from road-making, but this neglect has of late been to some extent remedied. In Prussia the districts (*Kreise*) have undertaken the charge of the construction of the roads; but they receive a subsidy from the public funds of the several provinces. Turnpikes were abolished in Prussia in 1874 and in Saxony in 1885. The total length of the public roads is estimated at 80,000 m.

Posts and Telegraphs.—With the exception of Bavaria and Württemberg, which have administrations of their own, all the German states belong to the imperial postal district (*Reichspostgebiet*). Since 1874 the postal and telegraphic departments have been combined. Both branches of administration have undergone a surprising development, especially since the reduction of the postal rates. Germany, including Bavaria and Württemberg, constitutes with Austria-Hungary a special postal union (Deutsch-Österreichischer Postverband), besides forming part of the international postal union. There are no statistics of posts and telegraphs before 1867, for it was only when the North German union was formed that the lesser states resigned their right of carrying mails in favour of the central authority. Formerly the prince of Thurn-and-Taxis was postmaster-general of Germany, but only some of the central states belonged to his postal territory. The seat of management was Frankfort-on-Main.

The following table shows the growth in the number of post offices for the whole empire:—

Year.	Post Offices.	Men employed.
1872	7,518	..
1880	9,460	..
1890	24,952	128,687
1899	36,388	206,945
1904	38,658	261,985
1907	40,083	319,026

In 1872 there were 2359 telegraph offices; in 1880, 9980; in 1890, 17,200; and in 1907, 37,309. There were 188 places provided with telephone service in 1888, and 13,175 in 1899. The postal receipts amounted for the whole empire in 1907 to £33,789,460, and the expenditure to £31,096,944, thus showing a surplus of £2,692,516.

Constitution.—The constitution of the German empire is, in all essentials, that of the North German Confederation, which came into force on the 7th of June 1867. Under this the presidency (*Praesidium*) of the confederation was vested in the king of Prussia and his heirs. As a result of the Franco-German war of 1870 the South German states joined the confederation; on the 9th of December 1870 the diet of the confederation accepted the treaties and gave to the new confederation the name of German Empire (*Deutsche Reich*), and on the 18th of January 1871 the king of Prussia was proclaimed German

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emperor (*Deutscher Kaiser*) at Versailles. This was a change of style, not of functions and powers. The title is "German emperor," not "emperor of Germany," being intended to show that the Kaiser is but *primus inter pares* in a confederation of territorial sovereigns; his authority as territorial sovereign (*Landesherr*) extends over Prussia, not over Germany.

The imperial dignity is hereditary in the line of Hohenzollern, and follows the law of primogeniture. The emperor exercises the imperial power in the name of the confederated states. In his office he is assisted by a federal council (*Bundesrat*), which represents the governments of the individual states of Germany. The members of this council, 58 in number, are appointed for each session by the governments of the individual states. The legislative functions of the empire are vested in the emperor, the Bundesrat, and the Reichstag or imperial Diet. The members of the latter, 397 in number, are elected for a space of five years by universal suffrage. Vote is by ballot, and one member is elected by (approximately) every 150,000 inhabitants.

As regards its legislative functions, the empire has supreme and independent control in matters relating to military affairs and the navy, to the imperial finances, to German commerce, to posts and telegraphs, and also to railways, in so far as these affect the common defence of the country. Bavaria and Württemberg, however, have preserved their own postal and telegraphic administration. The legislative power of the empire also takes precedence of that of the separate states in the regulation of matters affecting freedom of migration (*Freizügigkeit*), domicile, settlement and the rights of German subjects generally, as well as in all that relates to banking, patents, protection of intellectual property, navigation of rivers and canals, civil and criminal legislation, judicial procedure, sanitary police, and control of the press and of associations.

The executive power is in the emperor's hands. He represents the empire internationally, and can declare war if defensive, and make peace as well as enter into treaties with other nations; he also appoints and receives ambassadors. For declaring offensive war the consent of the federal council must be obtained. The separate states have the privilege of sending ambassadors to the other courts; but all consuls abroad are officials of the empire and are named by the emperor.

Both the Bundesrat and the Reichstag meet in annual sessions convoked by the emperor who has the right of proroguing and dissolving the Diet; but the prorogation must not exceed 60 days, and in case of dissolution new elections must be ordered within 60 days, and the new session opened within 90 days. All laws for the regulation of the empire must, in order to pass, receive the votes of an absolute majority of the federal council and the Reichstag.

Alsace-Lorraine is represented in the Bundesrat by four commissioners (*Kommissäre*), without votes, who are nominated by the Statthalter (imperial lieutenant).

The fifty-eight members of the Bundesrat are nominated by the governments of the individual states for each session; while the members of the Reichstag are elected by universal suffrage and ballot for the term of five years. Every German who has completed his twenty-fifth year is prima facie entitled to the suffrage in the state within which he has resided for one year. Soldiers and those in the navy are not thus entitled, so long as they are serving under the colours. Excluded, further, are persons under tutelage, bankrupts and paupers, as also any person who have been deprived of civil rights, during the time of such deprivation. Every German citizen who has completed his twenty-fifth year and has resided for a year in one of the federal states is eligible for election in any part of the empire, provided he has not been, as in the cases above, excluded from the right of suffrage. The secrecy of the ballot is ensured by special regulations passed on the 28th of April 1903. The voting-paper, furnished with an official stamp, must be placed in an envelope by the elector in a compartment set apart for the purpose in the polling room, and, thus enclosed, be handed by him to the presiding officer. An absolute majority of votes decides the election. If (as in the case of several candidates) an absolute majority over all the others has not been declared, a test election (*Stichwahl*) takes place between the two candidates who have received the greatest number of votes. In case of an equal number of votes being cast for both candidates, the decision is by lot.

The subjoined table gives the names of the various states composing the empire and the number of votes which the separate states have in the federal council. Each state may appoint as many members to the federal council as it has votes. The table also gives the number of the deputies in the Reichstag.

States of the Empire.	No. of Members in Bundesrat.	No. of Members in Reichstag.
Kingdom of Prussia	17	236
,, Bavaria	6	48
,, Saxony	4	23
,, Württemberg	4	17
Grand duchy of Baden	3	14
,, Hesse	3	9
,, Mecklenburg-Schwerin	2	6
,, Saxe-Weimar	1	3
,, Mecklenburg-Strelitz	1	1
,, Oldenburg	1	3
Duchy of Brunswick	2	3
,, Saxe-Meiningen	1	2
,, Saxe-Altenburg	1	1
,, Saxe-Coburg-Gotha	1	2
,, Anhalt	1	2
Principality of Schwarzburg-Sondershausen	1	1
,, Schwarzburg-Rudolstadt	1	1
,, Waldeck	1	1
,, Reuss-Greiz	1	1
,, Reuss-Schleiz	1	1
,, Schaumburg-Lippe	1	1
,, Lippe	1	1
Free town of Lübeck	1	1
,, Bremen	1	1
,, Hamburg	1	3
Imperial territory of Alsace-Lorraine	..	15
Total	58	397

The Reichstag must meet at least once in each year. Since November 1906 its members have been paid (see PAYMENT OF MEMBERS).

The following table shows its composition after the elections of 1903 and 1907:—

Parties.	1903.	1907.
Centre	100	108
Social Democrats	81	43
Conservatives	51	60
National Liberals	49	57
Freisinnige Volkspartei	27	33
Reichspartei	19	22
Alsatians, Guelphs and Danes	18	5
Poles	16	20
Wirtschaftliche Vereinigung (Reform Partei)	12	21
Freisinnige Vereinigung	9	16
(Wilde [un-party])	9	5
Bund der Landwirte	3	6
Bauernbund	3	1

All the German states have separate representative assemblies, except Alsace-Lorraine and the two grand-duchies of Mecklenburg. The six larger states have adopted the two-chamber system, but in the composition of the houses great differences are found. The lesser states also have chambers of representatives numbering from 12 members (in Reuss-Greiz) to 48 members (in Brunswick), and in most states the different classes, as well as the cities and the rural districts, are separately represented. The free towns have legislative assemblies, numbering from 120 to 200 members.

Imperial measures, after passing the Bundesrat and the Reichstag, must obtain the sanction of the emperor in order to become law, and must be countersigned, when promulgated, by the chancellor of the empire (*Reichskanzler*). All members of the federal council are entitled to be present at the deliberations of the Reichstag. The Bundesrat, acting under the direction of the chancellor of the empire, is also a supreme administrative and consultative board, and as such it has nine standing committees, viz.: for army and fortresses; for naval purposes; for tariffs, excise and taxes; for trade and commerce; for railways, posts and telegraphs; for civil and criminal law; for financial accounts; for foreign affairs; and for Alsace-Lorraine. Each committee includes representatives of at least four states of the empire.

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For the several branches of administration a considerable number of imperial offices have been gradually created. All of them, however, either are under the immediate authority of the chancellor of the empire, or are separately managed under his responsibility. The most important are the chancery office, the foreign office and the general post and telegraph office. But the heads of these do not form a cabinet.

The Chancellor of the Empire (Reichskanzler).—The Prussian plenipotentiary to the Bundesrat is the president of that assembly; he is appointed by the emperor, and bears the title Reichskanzler. This head official can be represented by any other member of the Bundesrat named in a document of substitution. The Reichskanzler is the sole responsible official, and conducts all the affairs of the empire, with the exception of such as are of a purely military character, and is the intermediary between the emperor, the Bundesrat and the Reichstag. All imperial rescripts require the counter-signature of the chancellor before attaining validity. All measures passed by the Reichstag require the sanction of the majority of the Bundesrat, and only become binding on being proclaimed on behalf of the empire by the chancellor, which publication takes place through the *Reichsgesetzblatt* (the official organ of the chancellor).

Government Offices.—The following imperial offices are directly responsible to the chancellor and stand under his control:—

1. The foreign office, which is divided into three departments: (i.) the political and diplomatic; (ii.) the political and commercial; (iii.) the legal. The chief of the foreign office is a secretary of state, taking his instructions immediately from the chancellor.

2. The colonial office (under the direction of a secretary of state) is divided into (i.) a civil department; (ii.) a military department; (iii.) a disciplinary court.

3. The ministry of the interior or home office (under the conduct of a secretary of state). This office is divided into four departments, dealing with (i.) the business of the Bundesrat, the Reichstag, the elections, citizenship, passports, the press, and military and naval matters, so far as the last concern the civil authorities; (ii.) purely social matters, such as old age pensions, accident insurance, migration, settlement, poor law administration, &c.; (iii.) sanitary matters, patents, canals, steamship lines, weights and measures; and (iv.) commercial and economic relations—such as agriculture, industry, commercial treaties and statistics.

4. The imperial admiralty (*Reichsmarineamt*), which is the chief board for the administration of the imperial navy, its maintenance and development.

5. The imperial ministry of justice (*Reichsjustizamt*), presided over by a secretary of state. This office, not to be confused with the *Reichsgericht* (supreme legal tribunal of the empire) in Leipzig, deals principally with the drafting of legal measures to be submitted to the Reichstag.

6. The imperial treasury (*Reichsschatzamt*), or exchequer, is the head financial office of the empire. Presided over by a secretary of state, its functions are principally those appertaining to the control of the national debt and its administration, together with such as in the United Kingdom are delegated to the board of inland revenue.

7. The imperial railway board (*Reichseisenbahnamt*), the chief official of which has the title of "president," deals exclusively with the management of the railways throughout the empire, in so far as they fall under the control of the imperial authorities in respect of laws passed for their harmonious interworking, their tariffs and the safety of passengers conveyed.

8. The imperial post office (*Reichspostamt*), under a secretary of state, controls the post and telegraph administration of the empire (with the exception of Bavaria and Württemberg), as also those in the colonies and dependencies.

9. The imperial office for the administration of the imperial railways in Alsace-Lorraine, the chief of which is the Prussian minister of public works.

10. The office of the accountant-general of the empire (*Rechnungshof*), which controls and supervises the expenditure of the sums voted by the legislative bodies, and revises the accounts of the imperial bank (*Reichsbank*).

11. The administration of the imperial invalid fund, *i.e.* of the fund set apart in 1871 for the benefit of soldiers invalided in the war of 1870–71; and

12. The imperial bank (*Reichsbank*), supervised by a committee of four under the presidency of the imperial chancellor, who is a fifth and permanent member of such committee.

The heads of the various departments or state do not form, as in England, the nucleus of a cabinet. In so far as they are secretaries of state, they are directly responsible to the chancellor, who represents all the offices in his person, and, as has been said, is the medium of communication between the emperor and the Bundesrat and Reichstag.

Colonies.—The following table gives some particulars of the dependencies of the empire:—

Name.	Date of Acquisition.	Area (estimated) sq. m.	Pop. (estimated).
In Africa—			
Togoland	1884	33,700	1,000,000
Cameroon	1884	190,000	3,500,000
S.W. Africa	1884	322,450	200,000
East Africa	1885	364,000	7,000,000
Total in Africa		910,150	11,700,000
In the Pacific—			
German New Guinea	1884	70,000	110,000(?)
Bismarck Archipelago	1884	20,000	188,000
Caroline, Pelew and Mariana Islands	1899	800	41,600
Solomon Islands	1886	4,200	45,000
Marshall Islands	1885	160	15,000
Samoan Islands	1899	985	33,000
Total in Pacific		96,145	432,600
In Asia—			
Kiao-chow	1897	117	60,000
Total dependencies	1884–1899	1,006,412	12,192,600

Except Kiao-chow, which is controlled by the admiralty, the dependencies of the empire are under the direction of the colonial office. This office, created in 1907, replaced the colonial department of the foreign office which previously had had charge of colonial affairs. The value of the trade of the colonies with Germany in 1906 was: imports into Germany, £1,028,000; exports from Germany, £2,236,000. For 1907 the total revenue from the colonies was £849,000; the expenditure of the empire on the colonies in the same year being £4,362,000. (See the articles on the various colonies.)

Local Government.—In the details of its organization local self-government differs considerably in the various states of the German empire. The general principle on which it is based, however, is that which has received its most complete expression in the Prussian system: government by experts, checked by lay criticism and the power of the purse, and effective control by the central authorities. In Prussia at least the medieval system of local self-government had succumbed completely to the centralizing policy of the monarchy, and when it was revived it was at the will and for the purposes of the central authorities, as subsidiary to the bureaucratic system. This fact determined its general characteristics. In England the powers of the local authorities are defined by act of parliament, and within the limits of these powers they have a free hand. In Germany general powers are granted by law, subject to the approval of the central authorities, with the result that it is the government departments that determine what the local elected authorities may do, and that the latter regard themselves as commissioned to carry out, not so much the will of the locality by which they are elected, as that of the central government. This attitude is, indeed, inevitable from the double relation in which they stand. A *Bürgermeister*, once elected, becomes a member of the bureaucracy and is responsible to the central administration; even the headman of a village commune is, within the narrow limits of his functions, a government official. Moreover, under the careful classification of affairs into local and central, many things which in England are regarded as local (*e.g.* education, sanitary administration, police) are regarded as falling under the sphere of the central government, which either administers them directly or by means of territorial delegations consisting either of individuals or of groups of individuals. These may be purely official (*e.g.* the Prussian *Regierung*), a mixture of officials and of elected non-official members approved by the government (*e.g.* the *Bezirksausschuss*), or may consist wholly of authorities elected for another purpose, but made to act as the agents of the central departments (*e.g.* the *Kreisausschuss*). That this system works without friction is due to the German habit of discipline; that it is, on the whole, singularly effective is a result of the

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peculiarly enlightened and progressive views of the German bureaucracy.[1]

The unit of the German system of local government is the commune (*Gemeinde*, or more strictly *Ortsgemeinde*). These are divided into rural communes (*Landgemeinden*) and urban communes (*Stadtgemeinden*), the powers and functions of which, though differing widely, are based upon the same general principle of representative local self-government. The higher organs of local government, so far as these are representative, are based on the principle of a group or union of communes (*Gemeindeverband*). Thus, in Prussia, the representative assembly of the Circle (*Kreistag*) is composed of delegates of the rural communes, as well as of the large landowners and the towns, while the members of the provincial diet (*Provinziallandtag*) are chosen by the *Kreistage* and by such towns as form separate *Kreise*.

In Prussia the classes of administrative areas are as follows: (1) the province, (2) the government district (*Regierungsbezirk*), (3) the rural circle (*Landkreis*) and urban circle (*Stadtkreis*), (4) the official district (*Amtsbezirk*), (5) the town commune (*Stadtgemeinde*) and rural commune (*Landgemeinde*). Of these areas the provinces, circles and communes are for the purposes both of the central administration and of local self-government, and the bodies by which they are governed are corporations. The *Regierungsbezirke* and *Amtsbezirke*, on the other hand, are for the purposes of the central administration only and are not incorporated. The Prussian system is explained in greater detail in the article PRUSSIA (*q.v.*). Here it must suffice to indicate briefly the general features of local government in the other German states, as compared with that in Prussia. The province, which usually covers the area of a formerly independent state (*e.g.* Hanover) is peculiar to Prussia. The *Regierungsbezirk*, however, is common to the larger states under various names, *Regierungsbezirk* in Bavaria, *Kreishauptmannschaft* in Saxony, *Kreis* in Württemberg. Common to all is the president (*Regierungspräsident, Kreishauptmann* in Saxony), an official who, with a committee of advisers, is responsible for the oversight of the administration of the circles and communes within his jurisdiction. Whereas in Prussia, however, the *Regierung* is purely official, with no representative element, the *Regierungsbezirk* in Bavaria has a representative body, the *Landrat*, consisting of delegates of the district assemblies, the towns, large landowners, clergy and—in certain cases—the universities; the president is assisted by a committee (*Landratsausschuss*) of six members elected by the *Landrat*. In Saxony the *Kreishauptmann* is assisted by a committee (*Kreisausschuss*).

Below the *Regierungsbezirk* is the *Kreis*, or Circle, in Prussia, Baden and Hesse, which corresponds to the *Distrikt* in Bavaria, the *Oberamt* in Württemberg[2] and the *Amtshauptmannschaft* in Saxony. The representative assembly of the Circle (*Kreistag, Distriktsrat* in Bavaria, *Amtsversammlung* in Württemberg, *Bezirksversammlung* in Saxony) is elected by the communes, and is presided over by an official, either elected or, as in the case of the Prussian *Landrat*, nominated from a list submitted by the assembly. So far as their administrative and legislative functions are concerned the German *Kreistage* have been compared to the English county councils or the Hungarian *comitatus*. Their decisions, however, are subject to the approval of their official chiefs. To assist the executive a small committee (*Kreisausschuss, Distriktsausschuss*, &c.) is elected subject to official approval. The official district (*Amtsbezirk*), a subdivision of the circle for certain administrative purposes (notably police), is peculiar to Prussia.

Rural Communes.—As stated above, the lowest administrative area is the commune, whether urban or rural. The laws as to the constitution and powers of the rural communes vary much in the different states. In general the commune is a body corporate, its assembly consisting either (in small villages) of the whole body of the qualified inhabitants (*Gemeindeversammlung*), or of a representative assembly (*Gemeindevertretung*) elected by them (in communes where there are more than forty qualified inhabitants). At its head is an elected headman (*Schulze, Dorfvorsteher*, &c.), with a small body of assistants (*Schöffen*, &c.). He is a government official responsible, *inter alia*, for the policing of the commune. Where there are large estates these sometimes constitute communes of themselves. For common purposes several communes may combine, such combinations being termed in Württemberg *Bürgermeistereien*, in the Rhine province *Amtsverbände*. In general the communes are of slight importance. Where the land is held by small peasant proprietors, they display a certain activity; where there are large ground landlords, these usually control them absolutely.

Towns.—The constitution of the towns (*Städteverfassung*) varies more greatly in the several states than that of the rural communes. According to the so-called *Stein'sche Städteverfassung* (the system introduced in Prussia by Stein in 1808), which, to differentiate between it and other systems, is called the *Magistratsverfassung* (or magisterial constitution), the municipal communes enjoy a greater degree of self-government than do the rural. In the magisterial constitution of larger towns and cities, the members of the *Magistrat*, *i.e.* the executive council (also called *Stadtrat, Gemeinderat*), are elected by the representative assembly of the citizens (*Stadtverordnetenversammlung*) out of their own body.

In those parts of Germany which come under the influence of French legislation, the constitution of the towns and that of the rural communes (the so-called *Bürgermeistereiverfassung*) is identical, in that the members of the communal executive body are, in the same way as those of the communal assembly, elected to office immediately by the whole body of municipal electors.

The government of the towns is regulated in the main by municipal codes (*Städteordnungen*), largely based upon Stein's reform of 1808. This, superseding the autonomy severally enjoyed by the towns and cities since the middle ages (see COMMUNE), aimed at welding the citizens, who had hitherto been divided into classes and gilds, into one corporate whole, and giving them all an active share in the administration of public affairs, while reserving to the central authorities the power of effective control.

The system which obtains in all the old Prussian provinces (with the exception of Rügen and Vorpommern or Hither Pomerania) and in Westphalia is that of Stein, modified by subsequent laws—notably those of 1853 and 1856—which gave the state a greater influence, while extending the powers of the citizens. In Vorpommern and Rügen, and thus in the towns of Greifswald, Stralsund and Bergen, among others, the old civic constitutions remain unchanged. In the new Prussian provinces, Frankfort-on-Main received a special municipal constitution in 1867 and the towns of Schleswig-Holstein in 1869. The province of Hanover retains its system as emended in 1858, and Hesse-Nassau, with the exception of Frankfort-on-Main, received a special corporate system in 1897. The municipal systems of Bavaria, Württemberg and Saxony are more or less based on that of Stein, but with a wider sphere of self-government. In Mecklenburg there is no uniform system. In Saxe-Coburg, the towns of Coburg and Neustadt have separate and peculiar municipal constitutions. In almost all the other states the system is uniform. The free cities of Lübeck, Hamburg and Bremen, as sovereign states, form a separate class. Their constitutions are described in the articles on them.

Where the "magisterial" constitution prevails, the members of the *Magistrat*, *i.e.* the executive council (also called variously *Stadtrat, Gemeindevorstand*, &c.), are as a rule elected by the representative assembly of the burgesses (*Stadtverordnetenversammlung*; also *Gemeinderat, städtischer Ausschuss, Kollegium der Bürgervorsteher, Stadtälesten*, &c.). The *Magistrat* consists of the chief burgomaster (*Erster Bürgermeister* or *Stadtschultheiss*, and in the large cities *Oberbürgermeister*), a second burgomaster or assessor, and in large towns of a number of paid and unpaid town councillors (*Ratsherren, Senatoren, Schöffen, Ratsmänner, Magistratsräte*), together with certain salaried members selected for specific purposes (*e.g. Baurat*, for building). Over this executive body the *Stadtverordneten*, who are elected by the whole body of citizens and unpaid, exercise a general control, their assent being necessary to any measures of importance, especially those involving any considerable outlay. They are elected for from three to six years; the members of the *Magistrat* are chosen for six, nine or twelve years, sometimes even for life. In the large towns the burgomasters must be jurists, and are paid. The police are under the control of the *Magistrat*, except in certain large cities, where they are under a separate state department.

The second system mentioned above (*Bürgermeistereiverfassung*) prevails in the Rhine province, the Bavarian Palatinate, Hesse, Saxe-Weimar, Anhalt, Waldeck and the principalities of Reuss and Schwarzburg. In Württemberg, Baden and Hesse-Nassau the system is a compromise between the two; both the town and rural communes have a mayor (*Bürgermeister* or *Schultheiss*, as the case may be) and a *Gemeinderat* for administrative purposes, the citizens exercising control through a representative *Gemeindeausschuss* (communal committee).

Justice.—By the Judicature Act—*Gerichtsverfassungsgesetz*—of 1879, the so-called "regular litigious" jurisdiction of the

[1] See the comparative study in Percy Ashley's *Local and Central Government* (London, 1906).

[2] The *Kreis* in Württemberg corresponds to the *Regierungsbezirk* elsewhere.

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courts of law was rendered uniform throughout the empire, and the courts are now everywhere alike in character and composition; and with the exception of the *Reichsgericht* (supreme court of the empire), immediately subject to the government of the state in which they exercise jurisdiction, and not to the imperial government. The courts, from the lowest to the highest, are *Amtsgericht*, *Landgericht*, *Oberlandesgericht* and *Reichsgericht*. There are, further, *Verwaltungsgerichte* (administrative courts) for the adjustment of disputes between the various organs of local government, and other special courts, such as military, consular and arbitration courts (*Schiedsgericht*). In addition to litigious business the courts also deal with non-litigious matters, such as the registration of titles to land, guardianship and the drawing up and custody of testamentary dispositions, all which are almost entirely within the province of the *Amtsgerichte*. There are uniform codes of criminal law (*Strafgesetzbuch*), commercial law and civil law (*Bürgerliches Gesetzbuch*), the last of which came into force on the 1st of January 1900. The criminal code, based on that of Prussia anterior to 1870, was gradually adopted by all the other states and was generally in force by 1872. It has, however, been frequently emended and supplemented.

The lowest courts of first instance are the *Amtsgerichte*, each presided over by a single judge, and with jurisdiction in petty criminal and civil cases, up to 300 marks (£15). They are also competent to deal with all disputes as to wages, and letting and hiring, without regard to the value of the object in dispute. Petty criminal cases are heard by the judge (*Amtsrichter*) sitting with two *Schöffen*—assessors—selected by lot from the jury lists, who are competent to try prisoners for offences punishable with a fine, not exceeding 600 marks (£30) or corresponding confinement, or with imprisonment not exceeding three months. The *Landgerichte* revise the decisions of the *Amtsgerichte*, and have also an original jurisdiction in criminal and civil cases and in divorce proceedings. The criminal chamber of the *Landgericht* is composed of five judges, and a majority of four is required for a conviction. These courts are competent to try cases of felony punishable with a term of imprisonment not exceeding five years. The preliminary examination is conducted by a judge, who does not sit on the bench at the trial. Jury courts (*Schwurgerichte*) are not permanent institutions, but are periodically held. They are formed of three judges of the *Landgericht* and a jury of twelve; and a two-thirds majority is necessary to convict. There are 173 *Landgerichte* in the empire, being one court for every 325,822 inhabitants. The first court of second instance is the *Oberlandesgericht*, which has an original jurisdiction in grave offences and is composed of seven judges. There are twenty-eight such courts in the empire. Bavaria alone has an *Oberster Landesgericht*, which exercises a revising jurisdiction over the *Oberlandesgerichte* in the state. The supreme court of the German empire is the *Reichsgericht*, having its seat at Leipzig. The judges, numbering ninety-two, are appointed by the emperor on the advice of the federal council (*Bundesrat*). This court exercises an appellate jurisdiction in civil cases remitted, for the decision of questions of law, by the inferior courts and also in all criminal cases referred to it. It sits in four criminal and six civil senates, each consisting of seven judges, one of whom is the president. The judges are styled *Reichsgerichtsräte* (counsellors of the imperial court).

In the *Amtsgericht* a private litigant may conduct his own case; but where the object of the litigation exceeds 300 marks (£15), and in appeals from the *Amtsgericht* to the *Landgericht*, the plaintiff (and also the defendant) must be represented by an advocate—*Rechtsanwalt*.

A *Rechtsanwalt*, having studied law at a university for four years and having passed two state examinations, if desiring to practise must be admitted as "defending counsel" by the *Amtsgericht* or *Landgericht*, or by both. These advocates are not state officials, but are sworn to the due execution of their duties. In case a client has suffered damage owing to the negligence of the advocate, the latter can be made responsible. In every district of the *Oberlandesgericht*, the *Rechtsanwälte* are formed into an *Anwaltskammer* (chamber of advocates), and the council of each chamber, sitting as a court of honour, deals with and determines matters affecting the honour of the profession. An appeal lies from this to a second court of honour, consisting of the president, three judges of the *Reichsgericht* and of three lawyers admitted to practice before that court.

Criminal prosecutions are conducted in the name of the crown by the *Staatsanwalte* (state attorneys), who form a separate branch of the judicial system, and initiate public prosecutions or reject evidence as being insufficient to procure conviction. The proceedings in the courts are, as a rule, public. Only in exceptional circumstances are cases heard *in camera*.

Military offences come before the military court and serious offences before the *Kriegsgericht*. The court-martial is, in every case, composed of the commander of the district as president, and four officers, assisted by a judge-advocate (*Kriegsgerichtsrat*), who conducts the case and swears the judges and witnesses. In the most serious class of cases, three officers and two judge-advocates are the judges. The prisoner is defended by an officer, whom he may himself appoint, and can be acquitted by a simple majority, but only be condemned by a two-thirds majority. There are also *Kaufmanns-* and *Gewerbegerichte* (commercial and industrial courts), composed of persons belonging to the classes of employers and employees, under the presidency of a judge of the court. Their aim is the effecting of a reconciliation between the parties. From the decision of these courts an appeal lies to the *Landgericht* where the amount of the object in dispute exceeds 100 marks (£5).

The following table shows the number of criminal cases tried before the courts of first instance, with the number and sex of convicted persons, and the number of the latter per 10,000 of the civil population over twelve years of age:—

Year.	Cases tried.		Persons convicted.		Total.	Convictions per 10,000 inhabitants.
	Amtsgericht.	*Landgericht.*	Males.	Females.		
1900	1,143,687	94,241	396,975	72,844	469,819	119·5
1901	1,205,558	101,471	419,592	77,718	497,310	125·6
1902	1,221,080	104,434	431,257	81,072	512,329	127·3
1903	1,251,662	105,241	424,813	80,540	505,353	123·4
1904	1,287,686	105,457	435,191	81,785	516,976	124·2

Of those convicted in 1904, 225,326 had been previously convicted.

Poor Law.—A law passed by the North German Confederation of the 6th of June 1870, and subsequently amended by an imperial law of the 12th of March 1894, laid down rules for the relief of the destitute in all the states composing the empire, with the exception of Bavaria and Alsace-Lorraine. According to the system adopted, the public relief of the poor is committed to the care of local unions (*Ortsarmenverbände*) and provincial unions (*Landarmenverbände*), the former corresponding, generally, to the commune, and the latter to a far wider area, a circle or a province. Any person of eighteen years, who has continuously resided with a local union for the space of two years, there acquires his domicile. But any destitute German subject must be relieved by the local union in which he happens to be at the time, the cost of the relief being defrayed by the local or provincial union in which he has his domicile. The wife and children have also their domicile in the place where the husband or father has his.[1]

Relief of the poor is one of the chief duties of the organs of local self-government. The moneys for the purpose are mainly derived from general taxation (poor rates *per se* being but rarely directly levied), special funds and voluntary contributions. In some German states and communes certain dues (such as the dog tax in Saxony), death duties and particularly dues payable in respect of public entertainments and police court fines, are assigned to the poor-relief chest. In some large towns the Elberfeld system of unpaid district visitors and the interworking of public and private charity is in force. The imperial laws which introduced the compulsory insurance of all the humbler workers within the empire, and gave them, when incapacitated by sickness, accident and old age, an absolute right to pecuniary assistance, have greatly reduced pauperism and crime.

Workmen's Insurance.—On June 15, 1883, the Reichstag, as the result of the policy announced by the emperor William I. in his speech from the throne in 1881, passed an act making insurance against sickness, accident, and incapacity compulsory on all workers in industrial pursuits. By further laws, in 1885 and 1892, this obligation was extended to certain other classes of workers, and the system was further modified by acts passed in 1900 and 1903. Under this system every person insured has a right to assistance in case of sickness, accident, or incapacity, while in case of death his widow and children receive an annuity.

1. Insurance against sickness is provided for under these laws partly by the machinery already existing, *i.e.* the sick benefit societies,

[1] The system of compulsory registration, which involves a notification to the police of any change of address (even temporary), of course makes it easy to determine the domicile in any given case.

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partly by new machinery devised to meet the new obligation imposed. The sick-funds (*Krankenkassen*) are thus of seven kinds: (1) free assistance funds (*Freie Hilfskassen*), either registered under the law of 1876, as modified in 1884 (*Eingeschriebene Hilfskassen*), or established under the law of the separate states (*landesrechtliche Hilfskassen*); (2) *Betriebs- or Fabrikkrankenkassen*, funds established by individual factory-owners; (3) *Baukrankenkasse*, a fund established for workmen engaged on the construction (*Bau*) of particular engineering works (canal-digging, &c.), by individual contractors; (4) guild sick funds (*Innungskrankenkassen*), established by the guilds for the workmen and apprentices of their members; (5) miners' sick fund (*Knappschaftskasse*); (6) local sick fund (*Ortskrankenkasse*), established by the commune for particular crafts or classes of workmen; (7) *Gemeindekrankenversicherung*, i.e. funds established for members of the commune as such, in the event of their not subscribing to any of the other funds. Of these, 2, 3, 6 and 7 were created under the above-mentioned laws.

The number of such funds amounted in 1903 to 23,271, and included 10,224,297 workmen. The *Ortskrankenkassen*, with 4,975,322 members, had the greatest, and the *Baukrankenkassen*, with 16,459, the smallest number of members. The *Ortskrankenkassen*, which endeavour to include workmen of a like trade, belong to a great extent, especially in Saxony, fallen under the control of the Social Democrats. The appointment of permanent doctors (*Kassenärzte*) at a fixed salary has given rise to much difference between the medical profession and this local sick fund, and the insistence on "freedom of choice" in doctors, which has been made by the members and threatens to militate against the interest of the profession, has been met on the part of the medical body by the appointment of a commission to investigate cases of undue influence in the selection.

According to the statistics furnished in the *Vierteljahreshefte zur Statistik des deutschen Reiches* for 1905, the receipts amounted to upwards of £10,000,000 for 1903, and the expenditure to somewhat less than this sum. Administrative changes were credited with nearly £600,000, and the invested funds totalled £9,000,000. The workmen contribute at the rate of two-thirds and the employers at the rate of one-third; the sum payable in respect of each worker varying from 1½-3% of the earnings in the "communal sick fund" to at most 1½-4% in the others.

2. Insurance against old age and invalidity comprehends all persons who have entered upon their 17th year, and who belong to one of the following classes of wage-earners: artisans, apprentices, domestic servants, dressmakers, charwomen, laundresses, seamstresses, housekeepers, foremen, engineers, journeymen, clerks and apprentices in shops (excepting assistants and apprentices in chemists' shops), schoolmasters, schoolmistresses, teachers and governesses, provided the earnings do not exceed £100 per annum. The insured are arranged in five classes, according to the amount of their yearly earnings: viz. £17, 10s.; £17, 10s.-£47, 10s.; £47, 10s.-£67, 10s. and £100. The contributions, affixed to a "pension book" in stamps, are payable each week, and amount, in English money, to 1·54d., 2·34d., 2·82d., 3·30d. and 4·23d. Of the contribution one half is paid by the employer and the other by the employee, whose duty it is to see that the amount has been properly entered in the pension book. The pensions, in case of invalidity, amount (including a state subsidy of £2, 10s. for each) respectively to £8, 8s.; £11, 5s.; £13, 10s.; £15, 15s. and £18. The old-age pension (beginning at 70 years) amount to £5, 10s.; £7; £8, 10s.; £10; and £11, 10s. The old-age and invalid insurance is carried out by thirty-one large territorial offices, to which must be added nine special unions. The income of the forty establishments was, in 1903, £8,500,000 (including £1,700,000 imperial subsidy). The capital collected was upwards of £50,000,000.

It may be added that employees in mercantile and trading houses, who have not exceeded the age of 40 years and whose income is below £150, are allowed voluntarily to share in the benefits of this insurance.

3. *Accident Insurance* (*Unfallversicherung*).—The insurance of workmen and the lesser officials against the risks of accident is effected not through the state or the commune, but through associations formed *ad hoc*. These associations are composed of members following the same or allied occupations (*e.g.* foresters, seamen, smiths, &c.), and hence are called "professional associations" (*Berufsgenossenschaften*). They are empowered, subject to the limits set by the law, to regulate their own business by means of a general meeting and of elected committees. The greater number of these associations cover a very wide field, generally the whole empire; in such cases they are empowered to divide their spheres into sections, and to establish agents in different centres to inquire into cases of accident, and to see to the carrying out of the rules prescribed by the association for the avoidance of accidents. Those associations, of which the area of operations extends beyond any single state, are subordinate to the control of the imperial insurance bureau (*Reichsversicherungsamt*) at Berlin; those that are confined to a single state (as generally in the case of foresters and husbandmen) are under the control of the state insurance bureau (*Landesversicherungsamt*).

So far as their earnings do not exceed £150 per annum, the following classes are under the legal obligation to insure: labourers in mines, quarries, dockyards, wharves, manufactories and breweries; bricklayers and navvies; post-office, railway, and naval and military servants and officials; carters, raftsmen and canal hands; cellarmen, warehousemen; stevedores; and agricultural labourers. Each of these groups forms an association, which within a certain district embraces all the establishments with which it is connected. The funds for covering the compensation payable in respect of accidents are raised by payments based, in agriculture, on the taxable capital, and in other trades and industries on the earnings of the insured. Compensation in respect of injury or death is not paid if the accident was brought about through the culpable negligence or other delict of the insured. In case of injury, involving incapacity for more than thirteen weeks (for the earlier period the *Krankenkassen* provide), the weekly sum payable during complete or permanent incapacity is fixed at the ratio of two-thirds of the earnings during the year preceding the accident, and in case of partial disablement, at such a proportion of the earnings as corresponds to the loss through disablement. In certain circumstances (*e.g.* need for paid nursing) the sum may be increased to the full rate of the previous earnings. In case of death, as a consequence of injury, the following payments are made: (1) a sum of at least £2, 10s. to defray the expenses of interment; (2) a monthly allowance of one-fifth of the annual earnings as above to the widow and each child up to the age of 15.

Life Insurance.—There were forty-six companies in 1900 for the insurance of life. The number of persons insured was 1,446,249 at the close of that year, the insurances amounting to roughly £320,000,000. Besides these are sixty-one companies—of which forty-six are comprised in the above life insurance companies—paying subsidies in case of death or of military service, endowments, &c. None of these companies are industrial. The transactions of all these companies included in 1900 over 4,179,000 persons, and the amount of insurances effected was £80,000,000.

Religion.—So far as the empire as a whole is concerned there is no state religion, each state being left free to maintain its own establishment. Thus while the emperor, as king of Prussia, is *summus episcopus* of the Prussian Evangelical Church, as emperor he enjoys no such ecclesiastical headship. In the several states the relations of church and state differ fundamentally according as these states are Protestant or Catholic. In the latter these relations are regulated either by concordats between the governments and the Holy See, or by bulls of circumscription issued by the pope after negotiation. The effects of concordats and bulls alike are tempered by the exercise by the civil power of certain traditional reserved rights, *e.g.* the *placetum regium*, *recursus ab abusu*, *nominatio regia*, and that of vetoing the nomination of *personae minus gratae*. In the Protestant states the ecclesiastical authority remains purely territorial, and the sovereign remains effective head of the established church. During the 19th century, however, a large measure of ecclesiastical self-government (by means of general synods, &c.) was introduced, *pari passu* with the growth of constitutional government in the state; and in effect, though the theoretical supremacy of the sovereign survives in the church as in the state, he cannot exercise it save through the general synod, which is the state parliament for ecclesiastical purposes. Where a sovereign rules over a state containing a large proportion of both Catholics and Protestants, which is usually the case, both systems coexist. Thus in Prussia the relations of the Roman Catholic community to the Protestant state are regulated by arrangement between the Prussian government and Rome; while in Bavaria the king, though a Catholic, is legally *summus episcopus* of the Evangelical Church.

According to the religious census of 1900 there were in the German empire 35,231,104 Evangelical Protestants, 20,327,913 Roman Catholics, 6472 Greek Orthodox, 203,678 Christians belonging to other confessions, 586,948 Jews, 11,597 members of sects and 5938 unclassified. The Christians belonging to other confessions include Moravian Brethren, Mennonites, Baptists, Methodists and Quakers, German Catholics, Old Catholics, &c. The table on following page shows the distribution of the population according to religious beliefs as furnished by the census of 1900.

Almost two-thirds of the population belong to the Evangelical Church, and rather more than a third to the Church of Rome; the actual figures (based on the census of 1900) being 63·1 Evangelical Protestants, 62·5; Roman Catholics, 36·1; Dissenters and others, ·043, and Jews, 1·0. The Protestants have not increased proportionately in number since 1890, while the Roman Catholics show a small relative increase. Three states in Germany have a decidedly predominant Roman Catholic population, viz. Alsace-Lorraine, Bavaria and Baden; and in four states the Protestant element prevails, but with from 24 to 34% of Roman Catholics; viz. Prussia, Württemberg, Hesse and Oldenburg. In Saxony and

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States.	Evangelicals.	Catholics.	Other Christians.	Jews.
Prussia	21,817,577	12,113,670	139,127	392,322
Bavaria	1,749,206	4,363,178	7,607	54,928
Saxony	3,072,065	198,265	19,103	12,416
Württemberg	1,497,299	650,392	9,426	11,916
Baden	704,058	1,131,639	5,563	26,132
Hesse	746,201	341,570	7,368	24,486
Mecklenburg-Schwerin	597,268	8,182	487	1,763
Saxe-Weimar	347,144	14,158	161	1,188
Mecklenburg-Strelitz	100,568	1,612	62	331
Oldenburg	309,510	86,920	1,334	1,359
Brunswick	436,976	24,175	1,271	1,824
Saxe-Meiningen	244,810	4,170	295	1,351
Saxe-Altenburg	189,885	4,723	206	99
Saxe-Coburg-Gotha	225,074	3,330	515	608
Anhalt	301,953	11,699	794	1,605
Schwarzburg-Sondershausen	79,593	1,110	27	166
Schwarzburg-Rudolstadt	92,298	676	37	48
Waldeck	55,285	1,831	164	637
Reuss-Greiz	66,860	1,043	444	48
Reuss-Schleiz	135,958	2,579	466	178
Schaumburg-Lippe	41,908	785	177	257
Lippe	132,708	5,157	205	879
Lübeck	93,671	2,190	213	670
Bremen	208,815	13,500	876	1,409
Hamburg	712,338	30,903	3,149	17,949
Alsace-Lorraine	372,078	1,310,450	4,301	32,379
Total	35,231,104	20,327,913	203,678	586,948

the eighteen minor states the number of Roman Catholics is only from 0·3 to 3·3 % of the population.

From the above table little can be inferred as to the geographical distribution of the two chief confessions. On this point it must be borne in mind that the population of the larger towns, on account of the greater mobility of the population since the introduction of railways and the abolition of restrictions upon free settlement, has become more mixed—Berlin, Leipzig, Hamburg, &c., showing proportionally more Roman Catholics, and Cologne, Frankfort-on-Main, Munich more Protestants than formerly. Otherwise the geographical limits of the confessions have been but little altered since the Thirty Years' War. In the mixed territories those places which formerly belonged to Roman Catholic princes are Roman Catholic still, and *vice versa*. Hence a religious map of South Germany looks like an historical map of the 17th century. The number of localities where the two confessions exist side by side is small. Generally speaking, South Germany is predominantly Roman Catholic. Some districts along the Danube (province of Bavaria, Upper Palatinate, Swabia), southern Württemberg and Baden, and in Alsace-Lorraine are entirely so. These territories are bordered by a broad stretch of country on the north, where Protestantism has maintained its hold since the time of the Reformation, including Bayreuth or eastern upper Franconia, middle Franconia, the northern half of Württemberg and Baden, with Hesse and the Palatinate. Here the average proportion of Protestants to Roman Catholics is two to one. The basin of the Main is again Roman Catholic from Bamberg to Aschaffenburg (western upper Franconia and lower Franconia). In Prussia the western and south-eastern provinces are mostly Roman Catholic, especially the Rhine provinces, together with the government districts of Münster and Arnsberg. The territories of the former principality of Cleves and of the countship of Mark (comprising very nearly the basin of the Ruhr), which went to Brandenburg in 1609, must, however, be excepted. North of Münster, Roman Catholicism is still prevalent in the territory of the former bishopric of Osnabrück. In the east, East Prussia (Ermeland excepted) is purely Protestant. Roman Catholicism was predominant a hundred years ago in all the frontier provinces acquired by Prussia in the days of Frederick the Great, but since then the German immigrants have widely propagated the Protestant faith in these districts. A prevailingly Roman Catholic population is still found in the district of Oppeln and the countship of Glatz, in the province of Posen, in the Polish-speaking *Kreise* of West Prussia, and in Ermeland (East Prussia). In all the remaining territory the Roman Catholic creed is professed only in the Eichsfeld on the southern border of the province of Hanover and around Hildesheim.

The adherents of Protestantism are divided by their confessions into Reformed and Lutheran. To unite these the "church union" has been introduced in several Protestant states, as for example in Prussia and Nassau in 1817, in the Palatinate in 1818 and in Baden in 1822. Since 1817 the distinction has accordingly been ignored in Prussia, and Christians are there enumerated only as Evangelical or Roman Catholic. The union, however, has not remained wholly unopposed—a section of the more rigid Lutherans who separated themselves from the state church being now known as Old Lutherans. In 1866 Prussia annexed Hanover and Schleswig-Holstein, where the Protestants were Lutherans, and Hesse, where the Reformed Church had the preponderance. The inhabitants of these countries opposed the introduction of the union, but could not prevent their being subordinated to the Prussian *Oberkirchenrat* (high church-council), the supreme court of the state church. A synodal constitution for the Evangelical State Church was introduced in Prussia in 1875. The *Oberkirchenrat* retains the right of supreme management. The ecclesiastical affairs of the separate provinces are directed by consistorial boards. The parishes (*Pfarreien*) are grouped into dioceses (*Sprengel*), presided over by superintendents, who are subordinate to the superintendent-general of the province. Prussia has sixteen superintendents-general. The ecclesiastical administration is similarly regulated in the other countries of the Protestant creed. Regarding the number of churches and chapels Germany has no exact statistics.

Protestant Church.

Roman Catholic Church.

There are five archbishoprics within the German empire: Gnesen-Posen, Cologne, Freiburg (Baden), Munich-Freising and Bamberg. The twenty bishoprics are: Breslau (where the bishop has the title of "prince-bishop"), Ermeland (seat at Frauenburg, East Prussia), Kulm (seat at Pelplin, West Prussia), Fulda, Hildesheim, Osnabrück, Paderborn, Münster, Limburg, Trier, Metz, Strassburg, Spires, Würzburg, Regensburg, Passau, Eichstätt, Augsburg, Rottenburg (Württemberg) and vicariates exist in Dresden (for Saxony), and others for Anhalt and the northern missions.

The Old Catholics (*q.v.*), who seceded from the Roman Church in consequence of the definition of the dogma of papal infallibility, number roughly 50,000, with 54 clergy.

Jews.

It is in the towns that the Jewish element is chiefly to be found. They belong principally to the mercantile class, and are to a very large extent dealers in money. Their wealth has grown to an extraordinary degree. They are increasingly numerous in Hamburg, Berlin, Frankfort-on-Main, Breslau, Königsberg, Posen, Cologne, Nuremberg and Fürth. As a rule their numbers are proportionately greater in Prussia than elsewhere within the empire. But, since 1871, the Jewish population of Germany shows a far smaller increase than that of the Christian confessions, and even in the parts of the country where the Jewish population is densest it has shown a tendency to diminish. It is relatively greatest in the province of Posen, where the numbers have fallen from 61,982 (39·1 per thousand) in 1871 to 35,327 (18·7 per thousand) in 1900. The explanation is twofold—the extraordinary increase (1) in their numbers in Berlin and the province of Brandenburg, and (2) in the number of conversions to the Christian faith. In this last regard it may be remarked that the impulse is less from religious conviction than from a desire to associate on more equal terms with their neighbours. Though still, in fact at least, if not by law, excluded from many public offices, especially from commands in the army, they nevertheless are very powerful in Germany, the press being for the most part in their hands, and they furnish in many cities fully one-half of the lawyers and the members of the corporation. It should be mentioned, as a curious fact, that the numbers of the Jewish persuasion in the kingdom of Saxony increased from 3338 (1·3 per thousand) in 1871 to 12,416 (3 per thousand) in 1900.

Education.—In point of educational culture Germany ranks high among all the civilized great nations of the world (see EDUCATION: *Germany*). Education is general and compulsory throughout the empire, and all the states composing it have, with minor modifications, adopted the Prussian system providing for the establishment of elementary schools—*Volksschulen*—in every town and village. The school age is from six to fourteen, and parents can be compelled to send their children to a *Volksschule*, unless, to the satisfaction of the authorities, they are receiving adequate instruction in some other recognized school or institution.

The total number of primary schools was 60,584 in 1906–1907; teachers, 166,597; pupils, 9,737,262—an average of about one *Volksschule* to every 900 inhabitants. The annual expenditure was over £26,000,000, of which sum £7,500,000 was provided by state subventions. There were also in Germany in the same year 643 private schools, giving instruction similar to that of the elementary schools, with 41,000 pupils. A good criterion of the progress of education is obtained from the diminishing number of illiterate army recruits, as shown by the following

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Years.	Number of Recruits.	Unable to Read or Write.	
		Total.	Per 1000 Recruits.
1875–1876	139,855	3311	23·7
1880–1881	151,180	2406	15·9
1885–1886	152,933	1657	10·8
1890–1891	193,318	1035	5·4
1895–1896	250,287	374	1·5
1898–1899	252,382	173	0·7
1900–1901	253,000	131	0·45

Of the above 131 illiterates in 1900–1901, 114 were in East and West Prussia, Posen and Silesia.

Universities and Higher Technical Schools.—Germany owes its large number of universities, and its widely diffused higher education to its former subdivision into many separate states. Only a few of the universities date their existence from the 19th century; the majority of them are very much older. Each of the larger provinces, except Posen, has at least one university, the entire number being 21. All have four faculties except Münster, which has no faculty of medicine. As regards theology, Bonn, Breslau and Tübingen have both a Protestant and a Catholic faculty; Freiburg, Munich, Münster and Würzburg are exclusively Catholic; and all the rest are Protestant.

The following table gives the names of the 21 universities, the dates of their respective foundations, the number of their professors and other teachers for the winter half-year 1908–1909, and of the students attending their lectures during the winter half-year of 1907–1908:

	Date of Foundation.	Professors and Teachers.	Students.				Total.
			Theology.	Law.	Medicine.	Philosophy.	
Berlin	1809	493	326	2747	1153	3934	8220
Bonn	1818	190	395	833	282	1609	3209
Breslau	1811	189	330	617	284	840	2071
Erlangen	1743	77	155	323	355	225	1058
Freiburg	1457	150	219	373	580	642	1814
Giessen	1607	100	63	204	331	546	1144
Göttingen	1737	161	102	441	188	1126	1857
Greifswald	1456	105	68	188	186	361	803
Halle	1694	174	331	450	217	1239	2237
Heidelberg	1385	177	55	385	265	870	1676
Jena	1558	116	48	267	265	795	1375
Kiel	1665	121	35	271	239	480	1025
Königsberg	1544	152	68	317	218	502	1105
Leipzig	1409	234	303	1013	606	2419	4341
Marburg	1527	117	133	400	261	876	1670
Munich	1826	239	169	1892	1903	1979	5943
Münster	1902	95	278	458	...	870	1606
Rostock	1418	65	48	67	211	322	648
Strassburg	1872	167	241	369	255	844	1709
Tübingen	1477	111	464	467	263	384	1578
Würzburg	1582	102	106	331	625	320	1382

Not included in the above list is the little academy—Lyceum Hosianum—at Braunsberg in Prussia, having faculties of theology (Roman Catholic) and philosophy, with 13 teachers and 150 students. In all the universities the number of matriculated students in 1907–1908 was 46,471, including 320 women, of whom studied theology, 14 law, 150 philosophy and 154 medicine. There were also, within the same period, 5653 non-matriculated *Hörer* (hearers), including 2486 women.

Ten schools, technical high schools, or *Polytechnica*, rank with the universities, and have the power of granting certain degrees. They have departments of architecture, building, civil engineering, chemistry, metallurgy and, in some cases, anatomy. These schools are as follows: Berlin (Charlottenburg), Munich, Darmstadt, Karlsruhe, Hanover, Dresden, Stuttgart, Aix-la-Chapelle, Brunswick and Danzig; in 1908 they were attended by 14,149 students (2531 foreigners), and had a teaching staff of 753. Among the remaining higher technical schools may be mentioned the three mining academies of Berlin, Clausthal, in the Harz, and Freiberg in Saxony. For instruction in agriculture there are agricultural schools attached to several universities—notably Berlin, Halle, Göttingen, Königsberg, Jena, Poppelsdorf near Bonn, Munich and Leipzig. Noted academies of forestry are those of Tharandt (in Saxony), Eberswalde, Münden on the Weser, Hohenheim near Stuttgart, Brunswick, Eisenach, Giessen and Karlsruhe. Other technical schools are again the five veterinary academies of Berlin, Hanover, Munich, Dresden and Stuttgart, the commercial colleges (*Handelshochschulen*) of Leipzig, Aix-la-Chapelle, Hanover, Frankfort-on-Main and Cologne, in addition to 424 commercial schools of a lesser degree, 100 schools for textile manufactures and numerous schools for special metal industries, wood-working, ceramic industries, naval architecture and engineering and navigation. For military science there are the academies of war (*Kriegsakademien*) in Berlin and Munich, a naval academy in Kiel, and various cadet and non-commissioned officers' schools.

Libraries.—Mental culture and a general diffusion of knowledge are extensively promoted by means of numerous public libraries established in the capital, the universities and other towns. The most celebrated public libraries are those of Berlin (1,000,000 volumes and 30,000 MSS.); Munich (1,000,000 volumes, 40,000 MSS.); Heidelberg (563,000 volumes, 8000 MSS.); Göttingen (503,000 volumes, 6000 MSS.); Strassburg (760,000 volumes); Dresden (500,000 volumes, 6000 MSS.); Hamburg (municipal library, 600,000 volumes, 5000 MSS.); Stuttgart (400,000 volumes, 3500 MSS.); Leipzig (university library, 500,000 volumes, 5000 MSS.); Würzburg (350,000 volumes); Tübingen (340,000 volumes); Rostock (318,000 volumes); Breslau (university library, 300,000 volumes, 7000 MSS.); Freiburg-im-Breisgau (250,000 volumes); Bonn (265,000 volumes); and Königsberg (230,000 volumes, 1100 MSS.). There are also famous libraries at Gotha, Wolfenbüttel and Celle.

Learned Societies.—There are numerous societies and unions, some of an exclusively scientific character and others designed for the popular diffusion of useful knowledge. Foremost among German academies is the Academy of Sciences (*Akademie der Wissenschaften*) in Berlin, founded in 1700 on Leibnitz's great plan and opened in 1711. After undergoing various vicissitudes, it was reorganized by Frederick the Great on the French model and received its present constitution in 1812. It has four sections: physical, mathematical, philosophical and historical. The members are (1) ordinary (50 in number, each receiving a yearly dotation of £30), and (2) extraordinary, consisting of honorary and corresponding (foreign) members. It has published since 1811 a selection of treatises furnished by its most eminent men, among whom must be reckoned Schleiermacher, the brothers Humboldt, Grimm, Savigny, Böckh, Ritter and Lachmann, and has promoted philological and historical research by helping the production of such works as *Corpus inscriptionum Graecarum*; *Corpus inscriptionum Latinarum*; *Monumenta Germaniae historica*, the works of Aristotle, Frederick the Great's works and Kant's collected works. Next in order come (1) the Academy of Sciences at Munich, founded in 1759, divided into three classes, philosophical, historical and physical, and especially famous for its historical research; (2) the Society of Sciences (*Gesellschaft der Wissenschaften*) in Göttingen, founded in 1742; (3) that of Erfurt, founded 1758; (4) Görlitz (1779) and (5) the "Royal Saxon Society of Sciences" (*Königliche sächsische Gesellschaft der Wissenschaften*), founded in Leipzig in 1846. Ample provision is made for scientific collections of all kinds in almost all places of any importance, either at the public expense or through private munificence.

Observatories.—These have in recent years been considerably augmented in number. There are 19 observatories in the empire, viz. at Bamberg, Berlin (2), Bonn, Bothkamp in Schleswig, Breslau, Düsseldorf, Gotha, Göttingen, Hamburg, Heidelberg, Jena, Kiel, Königsberg, Leipzig, Munich, Potsdam, Strassburg and Wilhelmshaven.

Book Trade.—This branch of industry, from the important position it has gradually acquired since the time of the Reformation, is to be regarded as at once a cause and a result of the mental culture of Germany. Leipzig, Berlin and Stuttgart are the chief centres of the trade. The number of booksellers in Germany was not less than 10,000 in 1907, among whom were approximately 6000 publishers. The following figures will show the recent progress of German literary production, in so far as published works are concerned:

Year .	1570	1600	1618	1650	1700	1750	1800	1840	1884	1902
Books .	229	791	1293	725	951	1219	3335	6904	15,607	26,902

Newspapers.—While in England a few important newspapers have an immense circulation, the newspapers of Germany are much more numerous, but on the whole command a more limited sale.

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Some large cities, notably Berlin, Cologne, Hamburg, Dresden, Leipzig and Munich, have, however, newspapers with a daily circulation of over 100,000 copies, and in the case of some papers in Berlin a million copies is reached. Most readers receive their newspapers through the post office or at their clubs, which may help to explain the smaller number of copies sold.

Fine Arts.—Perhaps the chief advantage which Germany has derived from the survival of separate territorial sovereignties within the empire has been the decentralisation of culture. Patronage of art is among the cherished traditions of the German princes; and even where—as for instance at Cassel—there is no longer a court, the artistic impetus given by the former sovereigns has survived their fall. The result has been that there is in Germany no such concentration of the institutions for the encouragement and study of the fine arts as there is in France or England. Berlin has no practical monopoly, such as is possessed by London or Paris, of the celebrated museums and galleries of the country. The picture galleries of Dresden, Munich and Cassel still rival that at Berlin, though the latter is rapidly becoming one of the richest in the world in works of the great masters, largely at the cost of the private collections of England. For the same reason the country is very well provided with excellent schools of painting and music. Of the art schools the most famous are those of Munich, Düsseldorf, Dresden and Berlin, but there are others, *e.g.* at Karlsruhe, Weimar and Königsberg. These schools are in close touch with the sovereigns and the governments, and the more promising pupils are thus from the first assured of a career, especially in connexion with the decoration of public buildings and monuments. To this fact is largely due the excellence of the Germans in grandiose decorative painting and sculpture, a talent for the exercise of which plenty of scope has been given them by the numerous public buildings and memorials raised since the war of 1870. Perhaps for this very reason, however, the German art schools have had no such cosmopolitan influence as that exercised by the schools of Paris, the number of foreign students attending them being comparatively small. It is otherwise with the schools of music, which exercise a profound influence far beyond the borders of Germany. Of these the most important are the conservatoires of Leipzig, Dresden, Berlin, Munich and Frankfort-on-Main. The fame of Weimar as a seat of musical education, though it possesses an excellent conservatoire, is based mainly on the tradition of the abbé Liszt, who gathered about him here a number of distinguished pupils, some of whom have continued to make it their centre. Music in Germany also receives a great stimulus from the existence, in almost every important town, of opera-houses partly supported by the sovereigns or by the civic authorities. Good music being thus brought within the reach of all, appreciation of it is very wide-spread in all classes of the population. The imperial government maintains institutes at Rome and Athens which have done much for the advancement of archaeology. (T. A. A.)

Army.—The system of the "nation in arms" owes its existence to the reforms in the Prussian army that followed Jena. The "nation in arms" itself was the product of the French Revolutionary and Napoleonic wars, but it was in Prussia that was seen the systematization and the economical and effective application of the immense forces of which the revolutionary period had demonstrated the existence (see also ARMY; CONSCRIPTION; FRENCH REVOLUTIONARY WARS, &c.). It was with an army and a military system that fully represented the idea of the "nation in arms" that Prussia created the powerful Germany of later days, and the same system was extended by degrees over all the other states of the new empire. But these very successes contained in themselves the germ of new troubles. Increased prosperity, a still greater increase in population and the social and economic disturbances incidental to the conversion of an agricultural into a manufacturing community, led to the practical abandonment of the principle of *universal* service. More men came before the recruiting officer than there was money to train; and in 1805 the period of service with the colours was reduced from three to two years—a step since followed by other military powers, the idea being that with the same peace effective and financial grants half as many men again could be passed through the ranks as before.

In 1907 the recruiting statistics were as follows:

Number of young men attaining service age (including those who had voluntarily enlisted before their time)		556,772
Men belonging to previous years who had been put back for re-examination, &c., still borne on the lists		657,753
		1,214,525
Deduct—Physically unfit, &c.	35,802	
Struck off	860	
Voluntarily enlisted in the army and navy, on or before attaining service age	57,739	
Assigned as recruits to the navy	10,374	
Put back, &c.	684,193	
		788,968
Available as army recruits, fit		425,557
Of these, (a) Assigned to the active army for two or three years' service with the colours		212,661
(b) Assigned to the Ersatz-Reserve of the army and navy } *untrained*		89,877
(c) Assigned to the 1st levy of Landsturm }		123,019
		425,557

Thus only half the men on whom the government has an effective hold go to the colours in the end. Moreover few of the men "put back, &c.," who figure on both sides of the account for any one year, and seem to average 600,000, are really "put back." They are in the main those who have failed or fail to present themselves, and whose names are retained on the liability lists against the day of their return. Many of these have emigrated.

By the constitution of the 16th of April 1871 every German is liable to service and no substitution is allowed. Liability begins at the age of seventeen, and actual service, as a rule, from the age of twenty. The men serve in the active army and army reserve for seven years, of which two years (three in the case of cavalry and horse artillery recruits) are spent with the colours. During his four or five years in the reserve, the soldier is called out for training with his corps twice, for a maximum of eight weeks (in practice usually for six). After quitting the reserve the soldier is drafted into the first ban of the *Landwehr* for five years more, in which (except in the cavalry, which is not called out in peace time) he undergoes two trainings of from eight to fourteen days. Thence he passes into the second ban and remains in it until he has completed his thirty-ninth year—*i.e.* from six to seven years more, the whole period of army and Landwehr service being thus nineteen years. Finally, all soldiers are passed into the *Landsturm*, in the first ban of which they remain until the completion of their forty-fifth year. The second ban consists of untrained men between the ages of thirty-nine and forty-five. Young men who reach a certain standard of education, however, are only obliged to serve for one year in the active army. They are called One-Year Volunteers (*Einjährig-Freiwilligen*), defray their own expenses and are the chief source of supply of reserve and Landwehr officers. That proportion of the annual contingents which is dismissed untrained goes either to the Ersatz-Reserve or to the 1st ban of the Landsturm (the Landwehr, it will be observed, contains only men who have served with the colours). The Ersatz consists exclusively of young men, who would in war time be drafted to the regimental depots and thence sent, with what training circumstances had in the meantime allowed, to the front. Some men of the Ersatz receive a short preliminary training in peace time.

In 1907 the average height of the private soldiers was 5 ft. 6 in., that of the non-commissioned officers 5 ft. 6¼ in., and that of the one-year volunteers 5 ft. 9½ in. A much greater proportion of the country recruits were accepted as "fit" than of those coming from the towns. Voluntary enlistments of men who desired to become non-commissioned officers were most frequent in the provinces of the old Prussian monarchy, but in Berlin itself and in Westphalia the enlistments fell far short of the number of non-commissioned officers required for the territorial regiments of the respective districts. Above all, in Alsace-Lorraine one-eighth only of the required numbers were obtained.

Peace and War Strengths.—German military policy is revised every five years; thus a law of April 1905 fixes the strength and establishments to be attained on March 31, 1910, the necessary augmentations, &c., being carried out gradually in the intervening years. The peace strength for the latter date was fixed at 505,839 men (not including officers, non-commissioned officers and one-year volunteers), forming—

633 battalions infantry.
510 squadrons cavalry.
574 batteries field and horse artillery.
40 battalions foot artillery.
29 battalions pioneers.
12 battalions communication troops.
23 train battalions, &c.

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The addition of about 25,000 officers and 85,000 non-commissioned officers, one-year men, &c., brings the peace footing of the German army in 1910 to a total of about 615,000 of all ranks.

As for war, the total fighting strength of the German nation (including the navy) has been placed at as high a figure as 11,000,000. Of these 7,000,000 have received little or no training, owing to medical unfitness, residence abroad, failure to appear, surplus of annual contingents, &c., as already explained, and not more than 3,000,000 of these would be available for the field military resources of Germany, untrained and trained, are thus about 7,000,000, of whom 4,000,000 have at one time or another done a continuous period of service with the colours.[1] This is of course for a war of defence *à outrance*. For an offensive war, only the active army, the reserve, the Ersatz and the 1st levy of the Landwehr would be really available.

A rough calculation of the number of these who go to form or to reinforce the field armies and the mobilized garrisons may be given:

Cadres of officers and non-commissioned officers	100,000
From 7 annual contingents of recruits (*i.e.* active army and reserve)	1,200,000
From 5 contingents of Landwehr (1st ban)	600,000
From 7 classes of Ersatz reserve called to the depots, able-bodied men	400,000
One-year volunteers recalled to the colours or serving as reserve and Landwehr officers	100,000
	2,400,000

These again would divide into a first line army of 1,350,000 and a second of 1,050,000. It is calculated that the field army would consist, in the third week of a great war, of 633 battalions, 410 squadrons and 574 batteries, with technical, departmental and medical troops (say 630,000 bayonets, 60,000 sabres and 3444 guns, or 750,000 men), and that these could be reinforced in three or four weeks by 350 fresh battalions. Behind these forces there would shortly become available for secondary operations about 460 battalions of the 1st ban Landwehr, and 200 squadrons and about 220 batteries of the reserve and Landwehr. In addition, each would leave behind depot troops to form the nucleus on which the 2nd ban Landwehr and the Landsturm would eventually be built up. The total number of units of the three arms in all branches may be stated approximately at 2200 battalions, 780 squadrons and 950 batteries.

Command and Organization.—By the articles of the constitution the whole of the land forces of the empire form a united army in war and peace under the orders of the emperor. The sovereigns of the chief states are entitled to nominate the lower grades of officers, and the king of Bavaria has reserved to himself the special privilege of superintending the general distribution of the three Bavarian army corps; but all appointments are made subject to the emperor's approval. The emperor is empowered to erect fortresses in any part of the empire. It is the almost invariable practice of the kings of Prussia to command their troops in person on the annual manœuvres, too, are generally held by leaders of royal or princely rank. The natural corollary to this is the assignment of special advisory duties to a responsible chief of staff. The officers are recruited either from the Cadet Corps or from the universities, and undergo, of sufficient social standing, who join the ranks as "avantageurs," with a view to obtaining commissions. Reserve and Landwehr officers are drawn from among officers and selected non-commissioned officers retired from the active army, and one-year volunteers who have passed a special examination. All candidates, from whatever source they come, are subject to approval or rejection by their brother officers before being definitively commissioned. Promotion in the German army is slow, even in the senior subalterns having eighteen to twenty years' commissioned service and the senior captains sometimes thirty. The number of officers on the active list is about 25,000. The under-officers number about 84,000.

The German army is organized in twenty-three army corps stationed and recruited in the various provinces and states as follows: Guard, Berlin (general recruiting); I. Königsberg (East Prussia); II. Stettin (Pomerania); III. Berlin (Brandenburg); IV. Magdeburg (Prussian Saxony); V. Posen (Polish and part of Silesia); VI. Breslau (Silesia); VII. Münster (Westphalia); VIII. Coblenz (Rhineland); IX. Altona (Hanse Towns and Schleswig-Holstein); X. Hanover (Hanover); XI. Cassel (Hesse-Cassel); XII. Dresden (Saxony); XIII. Stuttgart (Würtemberg); XIV. Karlsruhe (Baden); XV. Strassburg (Alsace); XVI. Metz (Lorraine); XVII. Danzig (West Prussia); XVIII. Frankfurt-am-Main (Hesse Darmstadt, Main country); XIX. Leipzig (Saxony); I. Bavarian Corps, Munich; II. Bavarian Corps, Würzburg; III. Bavarian Corps, Nuremberg. The formation of a XX. army corps out of the extra division of the XIV. corps at Colmar in Alsace, with the addition of two regiments from Westphalia and drafts of the XV. and XVI. corps, was announced in 1908 as the final step of the programme for the period 1906–1910. The normal composition of an army corps on war is (*a*) staff, (*b*) 2 infantry divisions, each of 2 brigades (4 regiments or 12 battalions), 2 regiments of field artillery (comprising 9 batteries of field-guns and 3 of field howitzers, 72 pieces in all), 3 squadrons of cavalry, 1 or 2 companies of pioneers, a bridge train and 1 or 2 bearer companies; (*c*) corps troops, 1 battalion rifles, telegraph troops, bridge train, ammunition columns, train (supply) battalion, field bakeries, bearer companies and field hospitals, &c., with, as a rule, one or two batteries of heavy field howitzers or mortars and a machine-gun group. The remainder of the cavalry and heavy artillery attached to the army corps in peace goes in war to form the cavalry divisions. Certain corps have an increased effective; thus the Guard has a whole cavalry division, and the I. corps (Königsberg) has three divisions. Several corps possess an extra infantry brigade of two 3-battalion regiments, but these, unless stationed on the frontiers, are gradually absorbed into new divisions and army corps. In war several army corps, cavalry divisions and reserve divisions are grouped in two or more "armies," and in peace the army corps are divided for purposes of superior control amongst several "army inspections."

The cavalry is organized in regiments of cuirassiers, dragoons, lancers, hussars and mounted rifles,[2] the regiments having four service and one depot squadrons. Troopers are armed with lance, sword and carbine (for which in 1908 the substitution of a short rifle with bayonet was suggested). In peace time the highest permanent organization is the brigade of two regiments or eight squadrons, but in war and at manœuvres divisions of three brigades, with horse artillery attached, are formed.

The infantry consists of 216 regiments, mostly of three battalions each. These are numbered, apart from the eight Guard regiments and the Bavarians, serially throughout the army. Certain regiments are styled grenadiers and fusiliers. In addition there are eighteen chasseur or rifle battalions (*Jäger*). The battalion has always four companies, each, at war strength, 250 strong. The armament of the infantry is the model 1898 magazine rifle and bayonet (see RIFLE).

The field (including horse) artillery consists in peace of 94 regiments subdivided into two or three groups (*Abteilungen*), each of two or three 6-gun batteries. The field gun in use is the quick-firing gun 96/N.A. (see ORDNANCE: *Field Equipments*).

The foot artillery is intended for siege and fortress warfare, and to furnish the heavy artillery of the field army. It consists of forty battalions. Machine gun detachments, resembling 4-gun batteries and belonging as artillery, were formed in the spring of sixteen in 1904–1906. These are intended to work with the cavalry divisions. Afterwards it was decided to form additional small groups of two guns each, less fully horsed, to assist the infantry, and a certain number of these were created in 1906–1907.

The engineers are a technical body, not concerned with field warfare or with the command of troops. On the other hand, the pioneers (29 battalions) are assigned to the field army, with duties corresponding roughly to those of field companies R.E. in the British service. Other branches represented in Great Britain by the Royal Engineers are known in Germany by the title "communication troops," and comprise railway, telegraph and airship and balloon battalions. The Train is charged with the duties of supply and transport. There is one battalion to each army corps.

Remounts.—The peace establishment in horses is approximately 108,000. Horses serve eight to nine years in the artillery and nine to ten in the cavalry, after which, in the autumn of each year, they are sold, and their places taken by remounts. The latter are bought at horse-fairs and private sales, unbroken, and sent to the 25 remount depots, whence, when fit for the service, they are sent to the various units, as a rule in the early summer. Most of the cavalry and artillery riding horses come from Prussia proper. The Polish districts produce swift Hussar horses of a semi-eastern type. Hanover is second only to East Prussia in output of horses. Bavaria, Saxony and Würtemberg do not produce enough horses for their own armies and have to draw on Prussia. Thirteen thousand four hundred and forty-five young horses were bought by the army authorities during 1907. The average price was about £51 for field artillery draught horses, £65 for heavy draught horses, and £46 for riding horses.

The military expenditure of Germany, according to a comparative table furnished to the House of Commons by the British war office in 1907, varied between £36,000,000 and £44,000,000 per annum in the period 1899–1902, and between £42,000,000 and £51,000,000 per annum in that of 1905–1909.

Colonial Troops.—In 1906 these, irrespective of the brigade of occupation then maintained in north China and of special reinforcements sent to S.W. Africa during the Herrero war, consisted of the *German East Africa* troops, 220 Europeans and 1470 natives; the *Cameroon* troops, 145 European and 1170 natives; *S.W. African troops*, entirely European and normally consisting of 606 officers

[1] Actually between 1883 and 1908 over five million recruits passed through the drill sergeant's hands, as well as perhaps 210,000 one-year volunteers.

[2] These last have a curious history. They were formed from about 1890 onwards, by individual squadrons, two or three being voted each year. Ostensibly raised for the duties of mounted orderlies, at a time when it would have been impolitic to ask openly for more cavalry, they were little by little trained in real cavalry work, then combined in provisional regiments for disciplinary purposes and at last frankly classed as cavalry.

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and men active and a reserve of ex-soldier settlers; the Kiao-Chau garrison (chiefly marines), numbering 2687 officers and men; and various small police forces in Togo, New Guinea, Samoa, &c.

Fortresses.—The fixed defences maintained by the German empire (apart from naval ports and coast defences) belong to two distinct epochs in the military policy of the state. In the first period (roughly 1871–1899), which is characterized by the development of the offensive spirit, the fortresses, except on the French and Russian frontiers, were reduced to a minimum. In the interior only Spandau, Cüstrin, Magdeburg, Ingolstadt and Ulm were maintained as defensive supporting points, and similarly on the Rhine, which was formerly studded with fortresses from Basel to Emmerich, the defences were limited to New Breisach, Germersheim, Mainz, Coblenz, Cologne and Wesel, all of a "barrier" character and not organized specially as centres of activity for field armies. The French frontier, and to a less extent the Russian, were organized offensively. Metz, already surrounded by the French with a girdle of forts, was extended and completed (see FORTIFICATION AND SIEGE-CRAFT) as a great entrenched camp, and Strassburg, which in 1870 possessed no outlying works, was similarly expanded, though the latter was regarded an instrument of defence more than of attack. On the Russian frontier Königsberg, Danzig, Thorn, Posen, Glogau (and on a smaller scale Boyen in East Prussia and Graudenz on the Vistula) were modernized and improved.

From 1899, however, Germany began to pay more attention to her fixed defences, and in the next years a long line of fortifications came into existence on the French frontier, the positions and strength of which were regulated with special regard to a new strategic disposition of the field armies and to the number and sites of the "strategic railway stations" which were constructed about the same time. Thus, the creation of a new series of forts extending from Thionville (Diedenhofen) to Metz and thence south-eastward was coupled with the construction of twelve strategic railway stations between Cologne and the Belgian frontier, and later—the so-called "fundamental plan" of operations against France having apparently undergone modification in consequence of changes in the foreign relations of the German government—an immense strategical railway station was undertaken at Saarburg, on the right rear of Thionville and well away from the French frontier, and many important new works both of fortification and of railway construction were begun in Upper Alsace, between Colmar and Basel.

The coast defences include, besides the great naval ports of Wilhelmshaven on the North Sea and Kiel on the Baltic, Danzig, Pillau, Memel, Friedrichsort, Cuxhaven, Geestemünde and Swinemünde. (C. F. A.)

Navy.—The German navy is of recent origin. In 1848 the German people urged the construction of a fleet. Money was collected, and a few men-of-war were fitted out; but these were subsequently sold, the German *Bundestag* (federal council) not being in sympathy with the aspirations of the nation. Prussia however, began laying the foundations of a small navy. To meet the difficulty arising from the want of good harbours in the Baltic, a small extent of territory near Jade Bay was bought from Oldenburg in 1854, for the purpose of establishing a war-port there. Its construction was completed at enormous expense, and it was opened for ships by the emperor in June 1869 under the name of Wilhelmshaven. In 1864 Prussia, in annexing Holstein, obtained possession of the excellent port of Kiel, which has since been strongly fortified. From the time of the formation of the North German Confederation the navy has belonged to the common federal interest. Since 1st October 1867 all its ships have carried the same flag, of the national colours—black, white, red, with the Prussian eagle and the iron cross.

From 1848 to 1868 the increase of the navy was slow. In 1851 it consisted of 51 vessels, including 36 small gunboats of 2 guns each. In 1868 it consisted of 45 steamers (including 2 ironclads) and 44 sailing vessels, but during the various wars of the period 1848–1871, only a few minor actions were fought at sea, and for many years after the French War the development of the navy did not keep pace with that of the empire's commercial interests beyond the seas, or compete seriously with the naval power of possible rivals. But towards the end of the 19th century Germany started on a new naval policy, by which her fleet was largely and rapidly increased. Details of this development will be found in the article NAVY (see also *History* below, *ad fin.*). It will be sufficient here to give the statistics relating to the beginning of the year 1900, reference being made only to ships effective at that date and to ships authorized in the construction programme of 1907:

Modern battleships . . .	20 effective, 4 approaching completion.
Old battleships and coast defence ships . . .	11 effective (4 non-effective).
Armoured cruisers . . .	9 effective, 1 approaching completion.
Protected cruisers . . .	31 effective, 2 approaching completion.
Torpedo craft of modern types	130 effective, 3 approaching completion.

Administration.—In 1889 the administration was transferred from the ministry of war to the imperial admiralty (*Reichsmarineamt*), at the head of which is the naval secretary of state. The chief command was at the same time separated from the administration and vested in a naval officer, who controls the movements of the fleet, its personnel and training, while the maintenance of the arsenals and dockyards, victualling and clothing and all matters immediately affecting the *matériel*, fall within the province of the secretary of state. The navy is divided between the Baltic (Kiel) and North Sea (Wilhelmshaven) stations, which are strategically linked by the Kaiser Wilhelm Canal (opened in 1895), across the Schleswig-Holstein peninsula. Danzig, Cuxhaven and Sonderburg have also been made naval bases.

Personnel.—The German navy is manned by the obligatory service of the essentially maritime population—such as sailors, fishermen and others, as well as by volunteers, who elect for naval service in preference to that in the army. It is estimated that the total seafaring population of Germany amounts to 80,000. The active naval personnel was, in 1906, 2631 officers (including engineers, marines, medical, &c.) and 51,138 under-officers and men, total 53,769. In addition, there is a reserve of more than 100,000 officers and men. (P. A. A.)

Finance.—The imperial budget is voted every year by the Reichstag. The "extraordinary funds," from which considerable sums appear annually in the budget, were created after the Franco-German War. Part of the indemnity was invested for definite purposes. The largest of these investments served for paying the pensions of the invalided, and amounted originally to £28,000,000. Every year, not only the interest, but part of the capital is expended in paying these pensions, and the capital sum was thus reduced in 1903 to £15,100,000, and in 1904 to £13,200,000. Another fund, of about £5,200,000, serves for the construction and armament of fortresses; while £6,000,000, known as the *Reichskriegsschatz*—or "war treasure fund"—is not laid out at interest, but is stored in coined gold and bullion in the Juliusturm at Spandau. In addition to these, the railways in Alsace-Lorraine, which France bought of the Eastern Railway Company for £13,000,000, in order to transfer them to the control of Germany, are also the property of the empire.

During the years 1908 and 1909 considerable public discussion and political activity were devoted to the reorganization of German imperial finance, and it is only possible here to deal historically with the position up to that time, since further developments of an important nature were already foreshadowed.

In 1871 the system accepted was that the imperial budget should be financed substantially by its reliance on the revenue from what were the obvious imperial resources—customs and excise duties, stamp duties, post and telegraph receipts, and among minor sources the receipts from the Alsace-Lorraine railways. But it was also provided that, for the purpose of deficits, the states should, in addition, if required by the imperial minister of finance, contribute their quotas according to population—*Matrikular Beiträge*. It was not expected that these would become chronic, but in a few years, and emphatically by the early 'eighties, they were found to be an essential part of the financial system, owing to regular deficits. It had been intended that, in return for the *Matrikular Beiträge*, regular assignments (*Überweisungen*) should be returned to the states, in relief of their own taxation, which would practically wipe out the contribution; but instead of these the *Überweisungen* were considerably less. Certain reorganizations were made in 1887 and 1902, but the excess of the *Matrikular Beiträge* over the *Überweisungen* continued; the figures in 1905 and 1908 being as follows (in millions of marks):—

	Matrikular-Beiträge.	Überweisungen.	Excess.
1905	213	189	24
1908	340	195	150

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These figures show how natural it was to desire to relieve the states by increasing the direct imperial revenue.

Meanwhile, in spite of the "matricular contributions," the calls on imperial finance had steadily increased, and up to 1908 were continually met to a large extent by loans, involving a continual growth of the imperial debt, which in 1907 amounted to 3643 millions of marks. The imperial budget, like that of most European nations, is divided into two portions, the ordinary and the extraordinary; and the increase under both heads (especially for army and navy) became a recurrent factor. A typical situation is represented by the main figures for 1905 and 1906 (in millions of marks):

	Expenditure.		Revenue.	Raised by Loan.
	Ordinary.	Extra-ordinary.		
1905	2002	193	2053	341
1906	2157	235	2118	258

The same process went on in 1907 and 1908, and it was necessarily recognized that the method of balancing the imperial budget by a regular increase of debt could not be satisfactory in a country where the general increase of wealth and taxable capacity had meanwhile been conspicuous. And though the main proposals made by the government for new taxation, including new direct taxes, resulted in a parliamentary deadlock in 1909, and led to Prince von Bülow's resignation as chancellor, it was already evident that some important reorganization of the imperial financial system was inevitable.

Currency.—The German empire adopted a gold currency by the law of the 4th of December 1871. Subsequently the old local coinages (*Landesmünzen*) began to be called in and replaced by new gold and silver coins. The old gold coins, amounting to £4,550,000, had been called in as early as 1873; and the old silver coins have since been successively put out of circulation, so that none actually remains as legal tender but the thaler (3s.). The currency reform was at first facilitated by the French indemnity, a great part of which was paid in gold. But later on that metal became scarcer; the London gold prices ran higher and higher, while silver prices declined. The average rate per ounce of standard silver in 1866–1870 was 60¼d., in January 1875 only 57¼d., in July 1876 as low as 49d. It rose in January 1877 to 57¼d., but again declined, and in September 1878 it was 50½d. While the proportion of like weights of fine gold and fine silver in 1866–1870 averaged 1 to 15·55, it was 1 to 17·79 in 1876, 1 to 17·18 in 1877, and, in 1902, in consequence of the heavy fall in silver, the ratio became as much as 1 to 39. By the currency law of the 9th of July 1873, the present coinage system was established and remains, with certain minor modifications, now in force as then introduced. The unit is the mark (= shilling)—the tenth part of the imperial *gold coin* (Krone = crown), of which last 139½ are struck from a pound of pure gold. Besides these ten-mark pieces, there are Doppelkronen (double crowns), about equivalent in value to an English sovereign (the average rate of exchange being 20 marks 42 pfennige per £1 sterling), and, formerly, half-crowns (halbe Kronen = 5 marks) in gold were also issued, but they have been withdrawn from circulation. Silver coins are 5, 2 and 1 mark pieces, equivalent to 5, 2 and 1 shillings respectively, and 50 pfennige pieces = 6d. Nickel coins are 10 and 5 pfennige pieces, and there are bronze coins of 2 and 1 pfennige. The system is decimal; thus 100 pfennige = 1 mark, 1000 pfennige = the gold krone (or crown), and 1d. English amounts roughly to 8 pfennige.

Banking.—A new banking law was promulgated for the whole empire on the 14th of March 1875. Before that date there existed thirty-two banks with the privilege of issuing notes, and on the 31st of December 1872, £67,100,000 in all was in circulation, £25,100,000 of that sum being uncovered. The banking law was designed to reduce this circulation of notes; £19,250,000 was fixed as an aggregate maximum of uncovered notes of the banks. The private banks were at the same time obliged to erect branch offices in Berlin or Frankfort-on-Main for the payment of their notes. In consequence of this regulation numerous banks resigned the privilege of issuing notes, and at present there are in Germany but the following private note banks issuing private notes, viz. the Bavarian, the Saxon, the Württemberg, the Baden and the Brunswick, in addition to the Imperial Bank. The Imperial Bank (Reichsbank) ranks far above the others in importance. It took the place of the Prussian Bank in 1876, and is under the superintendence and management of the empire, which shares in the profits. Its head office is in Berlin, and it is entitled to erect branch offices in any part of the empire. It has a capital of £9,000,000 divided into 40,000 shares of £150 each, and 60,000 shares of £50 each. The Imperial Bank is privileged to issue bank-notes, which must be covered to the extent of 1s. 3d. in coined money, bullion or bank-notes, the remainder in bills at short sight. Of the net profits, a dividend of 3½% is first payable to the shareholders, 20% of the remainder is transferred to the reserve until this has reached a total of £3,000,000, and of the remainder again a quarter is apportioned to the shareholders and three-quarters falls to the imperial exchequer. If the net profits do not reach 3½%, the balance must be made good from the reserve. Private note banks are not empowered to do business outside the state which has conceded them the privilege to issue notes, except under certain limitations. One of these is that they agree that their privilege to issue private notes may be withdrawn at one year's notice without compensation. But this condition has not been enforced in the case of such banks as have agreed to accept as binding the official rate of discount of the Reichsbank after this has reached or when it exceeds 4%. At other times they are not to discount at more than ½% below the official rate of the Reichsbank, or in case the Reichsbank itself discounts at a lower rate than the official rate, at more than ½% below that rate.

The following table shows the financial condition of the note-issuing banks, in thousands of marks, over a term of years:

Liabilities.

Year.	Banks.	Capital.	Reserve.	Notes in Circulation.	Total, including other Liabilities.
1900	8	219,672	48,329	1,313,855	2,237,017
1901	7	231,672	54,901	1,345,436	2,360,453
1902	6	216,000	56,684	1,373,482	2,353,951
1903	6	216,000	60,131	1,394,336	2,365,256
1904	6	216,000	64,385	1,433,421	2,378,845

Assets.

Year.	Banks.	Coin and Bullion.	Notes of State and other Banks.	Bills.	Total.
1900	8	899,630	51,931	1,036,961	2,230,564
1901	7	990,562	60,770	990,950	2,360,355
1902	6	1,052,391	54,389	901,408	2,354,253
1903	6	973,953	54,231	984,604	2,356,511
1904	6	996,601	66,372	947,358	2,379,234

The total turnover of the Imperial Bank was, in the first year of its foundation, 1¼ milliards pounds sterling; and, in 1899, 90 milliards. Eighty-five per cent of its bank-notes have been, on the average, covered by metal reserve.

The total value of silver coins is not to exceed 10 marks, and that of copper and nickel 2½ marks per head of the population. While the coinage of silver, nickel and copper is reserved to the state, the coinage of gold pieces can be undertaken by the state for the account of private individuals on payment of a fixed charge. The coinage takes place in the six mints belonging to the various states—thus Berlin (Prussia), Munich (Bavaria), Dresden (in the Muldenerhütte near Freiberg, Saxony), Stuttgart (Württemberg), Karlsruhe (Baden) and Hamburg (for the state of Hamburg). Of the thalers, the Vereinsthaler, coined until 1867 in Austria, was by ordinance of the Bundesrat declared illegal tender since the 1st of January 1903. No one can be compelled to accept more than 20 marks in silver or more than 1 mark in nickel and copper coin; but, on the other hand, the Imperial Bank accepts imperial silver coin in payment to any amount.

The total value of thalers, which, with the exception of the Vereinsthaler, are legal tender, was estimated in 1894 at about £20,000,000.

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ARCHAEOLOGY

From an archaeological point of view Germany is very far from being a homogeneous whole. Not only has the development of the south differed from that of the north, and the west been subjected to other influences than those affecting the east, but even where the same influences have been at work the period of their operation has often varied widely in the different districts, so that in a general sketch of the whole country the chronology can only be a very rough approximation. In this article the dates assigned to the various periods in south Germany are those given by Sophus Müller, on the lines first laid down by Montelius. As regards north Germany, Müller puts the Northern Bronze age 500 years later than the Southern, but a recent find in Sweden bears out Montelius's view that southern influence made itself rapidly felt in the North. The conclusions of Montelius and Müller are disputed by W. Ridgeway, who maintains that the Iron age originated in central Europe, and that iron must consequently have been worked in those regions as far back as *c.* 2000 B.C.

Older Palaeolithic Period.—The earliest traces of man's handiwork are found either at the end of the pre-Glacial epoch, or in an inter-Glacial period, but it is a disputed point whether the latter is the first of a series of such periods. A typical German find is at Taubach, near Weimar, where almond-shaped stone wedges, small flint knives, and roughly-backed pieces of porphyry and quartz are found, together with the remains of elephants. There are also bone implements, which are not found in the earliest periods in France.

Palaeolithic Transition Period (*Solutré*).—More highly developed forms are found when the mammoth has succeeded the elephant. Implements of chipped stone for the purposes of boring and scraping suggest that man worked hides for clothing. Ornaments of perforated teeth and shells are found.

Later Palaeolithic Period (*La Madeleine*).—The next period is marked by the presence of reindeer. In the Hohlefels in the Swabian Achthal there is still no trace of earthenware, and we find the skull of a reindeer skilfully turned into a drinking-vessel. Saws, needles, awls and bone harpoons are found. It is to be noticed that none of the German finds (mostly in the south and west) show any traces of the highly developed artistic sense so characteristic of the dwellers in France at this period.

The gap in our knowledge of the development of Palaeolithic into Neolithic civilization has recently been partially filled in by discoveries in north Germany and France of objects showing rather more developed forms than those of the former period, but still unaccompanied by earthenware. It is a disputed point whether the introduction of Neolithic civilization is due to a new ethnological element.

Neolithic Age (in south Germany till *c.* 2000 B.C.).—Neolithic man lived under the same climatic conditions as prevail to-day, but amidst forests of fir. He shows advance in every direction, and by the end of the later Neolithic period he is master of the arts of pottery and spinning, is engaged in agricultural pursuits, owns domestic animals, and makes weapons and tools of fine shape, either ground and polished or beautifully chipped. Traces of Neolithic settlements have been found chiefly in the neighbourhood of Worms, in the Main district and in Thuringia. These dwellings are usually holes in the ground, and presumably had thatched roofs. Our knowledge of the later Neolithic age, as of the succeeding periods, is largely gained from the remains of lake-dwellings, represented in Germany chiefly by Bavarian finds. The lake-dwellings in Mecklenburg, Pomerania and East Prussia are of a different type, and it is not certain that they date back to the Stone age. Typical Neolithic cemeteries are found at Hinkelstein, Alzey and other places in the neighbourhood of Worms. In these graves the skeletons lie flat, while in other cemeteries, as at Flomborn in Rhine-Hessen, and near Heilbronn, they are in a huddled position (hence the name *Hockergräber*). Necklaces and bracelets of Mediterranean shells point to a considerable amount of commerce. Other objects found in the graves are small flint knives, stone axes, flint and lumps of pyrites for obtaining fire, and, in the women's graves, hand-mills for grinding corn. The earthenware vessels usually have rounded bottoms. The earliest ornamentation consists of finger-imprints. Later we find two periods of zigzag designs in south Germany with an intermediate stage of spirals and wavy lines, while in north and east Germany the so-called string-ornamentation predominates. Towards the end of the period the inhabitants of north Germany erect megalithic graves, and in Hanover especially the passage-graves.

Bronze Age (in south Germany from *c.* 2000–1000 B.C.).—In the later Stone age we note the occasional use of copper, and then the gradual appearance of bronze. The bronze civilization of the Aegean seems to have had direct influence along the basins of the Danube and Elbe, while the culture of the western parts of central Germany was transmitted through Italy and France. No doubt the pre-eminence of the north, and especially of Denmark, at this period, was due to the amber trade, causing southern influence to penetrate up the basin of the Elbe to Jutland. The earlier period is characterized by the practice of inhumation in barrows made of clays, stones or sand, according to the district. Bronze is cast, whereas at a later time it shows signs of the hammer. From the finds in Bavarian graves it appears that the chief weapons were the dagger and the long pointed *Palstab* (palstave), while a short dagger fixed like an axe on a long shaft is characteristic of the North. The women wore two bronze pins, a bracelet on each arm, amber ornaments and a necklace of bronze tubes in spirals. One or two vases are found in each barrow, ornamented with finger-imprints, "string" decoration, &c. The later period is characterized by the practice of cremation, though the remains are still placed in barrows. Swords make their appearance. The women wear more and more massive ornaments. The vases are highly polished and of elegant form, with zigzag decoration.

Hallstatt Period (in Germany 8th–5th century B.C.).—The Hallstatt stage of culture, named after the famous cemetery in upper Austria, is marked by the introduction of iron (see HALLSTATT). In Germany its centre is Bavaria, Baden and Württemberg, with the Thuringian forest as the northern boundary. In Brandenburg, Lusatia, Silesia, Posen and Saxony, where there was no strong Bronze age tradition, Hallstatt influence is very noticeable. In west Prussia the urns with human faces deserve notice. The dead are either buried in barrows or cremated, the latter especially in north and east Germany. In Bavaria both practices are resorted to, as at Hallstatt. The pottery develops beautiful form and colour. Fibulae, often of the "kettle-drum" form, take the place of the Bronze age pin.

La Tène Period (4th–1st century B.C.).—Down to this time there is very little evidence concerning the racial affinities of the population. When our records first begin the western and southern portions of Germany seem to have been inhabited by Celtic peoples (see below "Ethnography"). La Tène, in Switzerland, has given its name to the period, of which the earlier part corresponds to the time of Celtic supremacy. It is interesting to note how the Celts absorb Roman and still more Greek culture, even imitating foreign coins, and pass on their new arts to their Teutonic neighbours; but in spite of the strong foreign influence

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the Celtic civilization can in some sort be termed national. Later it has a less rich development, betraying the political decay of the race. Its centres in Germany are the southern districts as far as Thuringia, and the valleys of the Main and Saar. The ornamentation is of the conventionalized plant type: gold is freely used, and enamel, of a kind different from the Roman enamel used later in Germany, is applied to weapons and ornaments. Chariots are used in war, and fortified towns are built, though we must still suppose the houses to have consisted of a wooden framework coated with clay. In these districts La Tène influence is contemporary with the use of tumuli, but in the (non-Celtic) coast districts it must be sought in urn-cemeteries.

Roman Period (from the 1st century A.D.).—The period succeeding to La Tène ought rather to be called Romano-Germanic, the relation of the Teutonic races to the Roman civilization being much the same as that of the Celts to classical culture in the preceding period. The Rhine lands were of course the centre of Roman civilization, with Roman roads, fortresses, stone and tiled houses and marble temples. By this time the Teutonic peoples had probably acquired the art of writing, though the origin of their national (Runic) alphabet is still disputed. The graves of the period contain urns of earthenware or glass, cremation being the prevalent practice, and the objects found include one or more coins in accordance with Roman usage.

Period of National Migrations (A.D. 300–500).—The grave-finds do not bear out the picture of a period of ceaseless war painted by the Roman historians. On the contrary, weapons are seldom found, at any rate in graves, the objects in which bear witness to a life of extraordinary luxury. Magnificent drinking-vessels, beautifully ornamented dice and draughtsmen, masses of gay beads, are among the commonest grave-finds. A peculiarity of the period is the development of decoration inspired by animal forms, but becoming more and more tortuous and fantastic. Only those eastern parts of Germany which were now occupied by Slavonic peoples remained uninfluenced by this rich civilization.

The Merovingian Period (A.D. 500–800) sees the completion of the work of converting the German tribes to Christianity. *Reihengräber*, containing objects of value, but otherwise like modern cemeteries, with the dead buried in rows (*Reihen*), are found over all the Teutonic part of Germany, but some tribes, notably the Alamanni, seem still to have buried their dead in barrows. Among the Franks and Burgundians we find monolithic sarcophagi in imitation of the Romans, and in other districts sarcophagi were constructed out of several blocks of stone—the so-called *Plattengräber*. The weapons are the *spatha*, or double-bladed German sword, the *scax* (a short sword or long knife, *semispathium*), the knife, shield, and the favourite German axe, though this latter is not found in Bavaria. The ornaments are beads, earrings, brooches, rings, bracelets, &c., thickly studded with precious stones.

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Ethnography and Early History

Our direct knowledge of Germany begins with the appointment of Julius Caesar as governor of Gaul in 59 B.C. Long before that time there is evidence of German communication with southern civilization, as the antiquities prove, and occasional travellers from the Mediterranean had made their way into those regions (*e.g.* Pytheas, towards the end of the 4th century), but hardly any records of their journeys survive. The first Teutonic peoples whom the Romans are said to have encountered are the Cimbri and Teutoni, probably from Denmark, who invaded Illyria, Gaul and Italy towards the end of the 2nd century B.C. When Caesar arrived in Gaul the westernmost part of what is now Germany was in the possession of Gaulish tribes. The Rhine practically formed the boundary between Gauls and Germans, though one Gaulish tribe, the Menapii, is said to have been living beyond the Rhine at its mouth, and shortly before the arrival of Caesar an invading force of Germans had seized and settled down in what is now Alsace, 72 B.C. At this time the Gauls were being pressed by the Germans along the whole frontier, and several of Caesar's campaigns were occupied with operations, either against the Germans, or against Gaulish tribes set in motion by the Germans. Among these we may mention the campaign of his first year of office, 58 B.C., against the German king Ariovistus, who led the movement in Alsace, and that of 55 B.C. in which he expelled the Usipetes and Tencteri who had crossed the lower Rhine. During the period of Caesar's government he succeeded in annexing the whole of Gaul as far as the Rhine. (For the campaigns see CAESAR, JULIUS.)

Julius Caesar in Germany.

After peace had been established in Italy by Augustus, attempts were made to extend the Roman frontier beyond the Rhine. The Roman prince Nero Claudius Drusus (q.v.) in the year 12 B.C. annexed what is now the kingdom of the Netherlands, and constructed a canal (Fossa Drusiana) between the Rhine and the lake Flevo (Lacus Flevus), which partly corresponded to the Zuyder Zee, though the topography of the district has greatly altered. He also penetrated into regions beyond and crossed the Weser, receiving the submission of the Bructeri, Chatti and Cherusci. After Drusus' death in 9 B.C., while on his return from an expedition which reached the Elbe, the German command was twice undertaken by Tiberius, who in A.D. 5 received the submission of all the tribes in this quarter, including the Chauci and the Langobardi. A Roman garrison was left in the conquered districts between the Rhine and the Elbe, but the reduction was not thoroughly completed. About the same time the Roman fleet voyaged along the northern coast apparently as far as the north of Jutland, and received the nominal submission of several tribes in that region, including the Cimbri and the Charudes. In A.D. 9 Quintilius Varus, the successor of Tiberius, was surprised in the *Saltus Teutobergensis* between the Lippe and the Weser by a force raised by Arminius, a chief of the Cherusci, and his army consisting of three legions was annihilated. Germanicus Caesar, during his tenure of the command of the Roman armies on the Rhine, made repeated attempts to recover the Roman position in northern Germany and exact vengeance for the death of Varus, but without real success, and after his recall the Rhine formed for the greater part of its course the boundary of the Empire. A standing army was kept up on the Rhine, divided into two commands, upper and lower Germany, the headquarters of the former being at Mainz, those of the latter at Vetera, near Xanten. A number of important towns grew up, among which we may mention Trier (Augusta Trevirorum), Cologne (Colonia Agrippinensis), Bonn (Bonna), Worms (Borbetomagus), Spires (Noviomagus), Strassburg (Argentoratum) and Augsburg (Augusta Vindelicorum).

The campaigns of other Roman leaders.

At a later date, however, probably under the Flavian emperors, the frontier of upper Germany was advanced somewhat beyond the Rhine, and a fortification, the *Pfahlgraben*, constructed to protect it. It led from Hönningen on the Rhine, about half-way between Bonn and Coblenz, to Mittenberg above Aschaffenburg on the Main, thence southwards to Lorch in Württemberg, whence it turned east to the junction of the Altmühl with the Danube at Kelheim.

During the wars of Drusus, Tiberius and Germanicus the Romans had ample opportunity of getting to know the tribal

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geography of Germany, especially the western part, and though most of our authorities lived at a somewhat later period, it is probable that they derived their information very largely from records of that time. It will be convenient, therefore, to give an account of the tribal geography of Germany in the time of Augustus, as our knowledge of the subject is much more complete for his reign than for several centuries later.

Of the Gaulish tribes west of the Rhine, the most important was the Treveri, inhabiting the basin of the Moselle, from whom the city of Trier (Trèves) derives its name. The Rauraci probably occupied the south of Alsace. To the south of the Treveri lay the Mediomatrici, and to the west of them lay the important tribe of the Sequani, who had called in Arioviștus. The Treveri claimed to be of German origin, and the same claim was made by a number of tribes in Belgium, the most powerful of which were the Nervii. The meaning of this claim is not quite clear, as there is some obscurity concerning the origin of the name Germani. It appears to be a Gaulish term, and there is no evidence that it was ever used by the Germans themselves. According to Tacitus it was first applied to the Tungri, whereas Caesar records that four Belgic tribes, namely, the Condrusi, Eburones, Caeraesi and Paemani, were collectively known as Germani. There is no doubt that these tribes were all linguistically Celtic, and it is now the prevailing opinion that they were not of German origin ethnologically, but that the ground for their claim was that they had come from over the Rhine (cf. Caesar, *De Bello Gallico* ii. 4). It would therefore seem that the name Germani originally denoted certain Celtic tribes to the east of the Rhine, and that it was then transferred to the Teutonic tribes which subsequently occupied the same territory.

The German tribes.

There is little doubt that during the last century before the Christian era the Celtic peoples had been pushed considerably farther west by the Teutonic peoples, a process which was still going on in Caesar's time, when we hear of the overthrow of the Menapii, the last Gaulish tribe beyond the Rhine. In the south the same process can be observed. The Boii were expelled from their territories in Bohemia by the Marcomanni in the time of Augustus, and the Helvetii are also recorded to have occupied formerly lands east of the Rhine, in what is now Baden and Württemberg. Caesar also mentions a Gaulish tribe named Volcae Tectosages as living in Germany in his time. The Volcae Arecomici in the south of France and the Tectosages of Galatia were in all probability offshoots of this people. The name of the tribe was adopted in the Teutonic languages as a generic term for all Celtic and Italian peoples (O.H.G. *Walha*, A.S. *Wealas*), from which it is probably to be inferred that they were the Celtic people with whom the Teutonic races had the closest association in early times. It has been thought that they inhabited the basin of the Weser, and a number of place-names in this district are supposed to be of Celtic origin. Farther to the south and west Ptolemy mentions a number of place-names which are certainly Celtic, *e.g.* Mediolanion, Aregelia, Lougidounon, Lokoriton, Segodounon. There is therefore great probability that a large part of western Germany east of the Rhine had formerly been occupied by Celtic peoples. In the east a Gaulish people named Cotini are mentioned, apparently in the upper basin of the Oder, and Tacitus speaks of a tribe in the same neighbourhood, the Osi, who he says spoke the Pannonian language. It is probable, therefore, that in other directions also the Germans had considerably advanced their frontier southwards at a comparatively recent period.

Their movements.

Coming now to the Germans proper, the basin of the Rhine between Strassburg and Mainz was inhabited by the Tribocci, Nemetes and Vangiones, farther down by the Mattiaci about Wiesbaden, and the Ubii in the neighbourhood of Cologne; beyond them were the Sugambri, and in the Rhine delta the Batavi and other smaller tribes. All these tribes remained in subjection to the Romans. Beyond them were the Tencteri, probably about the basin of the Lahn, and the Usipetes about the basin of the Ruhr. The basin of the Lippe and the upper basin of the Ems were inhabited by the Bructeri, and in the same neighbourhood were the Ampsivarii, who derive their name from the latter river. East of them lay the Chasuarii, presumably in the basin of the Hase. The upper basin of the Weser was inhabited by the Chatti, whose capital was Mattium, supposed to be Maden on the Eder. To the north-west of them were situated the Marsi, apparently between the Diemel and the Lippe, while the central part of the basin of the Weser was inhabited by the Cherusci, who seem to have extended considerably eastward. The lower part of the river-basin was inhabited by the Angrivarii. The coastlands north of the mouth of the Rhine were occupied by the Canninefates, beyond them by the Frisii as far as the mouth of the Ems, thence onward to the mouth of the Elbe by the Chauci. As to the affinities of all these various tribes we have little definite information, but it is worth noting that the Batavi in Holland are said to have been a branch of the Chatti, from whom they had separated owing to a *seditio domestica*. The basin of the Elbe was inhabited by Suebic tribes, the chief of which were the Marcomanni, who seem to have been settled on the Saale during the latter part of the 1st century B.C., but moved into Bohemia before the beginning of the Christian era, where they at once became a formidable power under their king Marobodiuus. The Quadi were settled somewhat farther east about the source of the Elbe. The Hermunduri in the basin of the Saale were in alliance with the Romans and occupied northern Bavaria with their consent. The Semnones apparently dwelt below the junction of the Saale and Elbe. The Langobardi (see LOMBARDS) possessed the land between the territory of the Semnones and the mouth of the river. Their name is supposed to be preserved in Bardengau, south of Hamburg. From later evidence it is likely that another division of the Suebi inhabited western Holstein. The province of Schleswig (perhaps only the west coast) and the islands adjacent were inhabited by the Saxons, while the east coast, at least in later times, was occupied by the Angli. The coast of Mecklenburg was probably inhabited by the Varini (the later Warni). The eastern part of Germany was much less known to the Romans, information being particularly deficient as to the populations of the coast districts, though it seems probable that the Rugii inhabited the eastern part of Pomerania, where a trace of them is preserved in the name Rügenwalde. The lower part of the basin of the Oder was probably occupied by the Burgundiones, and the upper part by a number of tribes collectively known as Lugii, who seem to correspond to the Vandals of later times, though the early Roman writers apparently used the word Vandilii in a wider sense, embracing all the tribes of eastern Germany. Among the Lugii we may probably include the Silingae, who afterwards appear among the Vandals in Spain, and whose name is preserved in Slavonic form in that of the province Silesia. The Goths (Gotones) apparently inhabited the basin of the Vistula about the middle of its course, but the lower part of the basin was inhabited by non-Teutonic peoples, among whom we may mention the Galindi, probably Prussians, and the Aestii, either Prussian or Esthonian, in the coastlands at the mouth of the river, who are known especially in connexion with the amber trade. To the east of the Vistula were the Slavonic tribes (Veneti), and amongst them, perhaps rather to the north, a Finnish population (Fenni), which disappeared in later times.

Tribes in the west and north.

In the time of Augustus by far the most powerful ruler in Germany was Marobodiius, king of the Marcomanni. His supremacy extended over all the Suebic tribes (except perhaps the Hermunduri), and most of the peoples of eastern Germany, including apparently the Lugii and Goths. But in the year A.D. 17 he became involved in an unsuccessful campaign against Arminius, prince of the Cherusci, in which the Semnones and Langobardi revolted against him, and two years later he was deprived of his throne by a certain Catualda. The latter, however, was soon expelled by Vibilius, king of the Hermunduri, and his power was transferred to Vannius, who belonged to the Quadi. About the same time Arminius met his death while trying to make himself king of the

Domestic wars of the Germans.

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Cherusci. In the year 28 the Frisians revolted from the Romans, and though they submitted again in the year 47, Claudius immediately afterwards recalled the Roman troops to the left bank of the Rhine. In the year 50 Vannius, king of the Suebi, was driven from the throne by Vibilius, king of the Hermunduri, and his nephews Vangio and Sido obtained his kingdom. In the year 58 the Chatti suffered a serious disaster in a campaign against the Hermunduri. They seem, however, to have recovered very soon, and at the end of the 1st century had apparently extended their power at the expense of the Cherusci. During the latter part of the 1st century the Chauci seem to have been enlarging their territories: as early as the year 47 we find them raiding the Roman lands on the lower Rhine, and in 58 they expelled the Ampsivarii, who after several vain attempts to acquire new possessions were annihilated by the neighbouring tribes. During the last years of the 1st century the Angrivarii are found moving westwards, probably under pressure from the Chauci, and the power of the Bructeri was almost destroyed by their attack. In 69 the Roman territory on the lower Rhine was disturbed by the serious revolt of Claudius Civilis, a prince of the Batavi who had served in the Roman army. He was joined by the Bructeri and other neighbouring tribes, but being defeated by Petilius Cerealis (afterwards consular legate in Britain) at Vetera and in other engagements gave up the struggle and arranged a capitulation in A.D. 70. By the end of the 1st century the Chauci and Chatti seem to have become by far the most powerful tribes in western Germany, though the former are seldom mentioned after this time.

After the time of Tacitus our information regarding German affairs becomes extremely meagre. The next important conflict with the Romans was the Marcomannic War (166–180), in which all the Suebic tribes together with the Vandals (apparently the ancient Lugii) and the Sarmatian Iazyges seem to have taken part. Peace was made by the emperor Commodus in A.D. 180 on payment of large sums of money.

About the beginning of the 3rd century we find a forward movement in south-west Germany among a group of tribes known collectively as Alamanni (*q.v.*) who came in conflict with the emperor Caracalla in the year 213. About the same time the Goths also made their first appearance in the south-east and soon became the most formidable antagonists of Rome. In the year 251 they defeated and slew the emperor Decius, and in the reign of Gallienus their fleets setting out from the north of the Black Sea worked great havoc on the coast of the Aegean (see Goths). It is not to be supposed, however, that they had quitted their own lands on the Vistula by this time. In this connexion we hear also of the Heruli (*q.v.*), who some twenty years later, about 289, make their appearance in the western seas. In 286 we hear for the first time of maritime raids by the Saxons in the same quarter. About the middle of the 3rd century the name Franks (*q.v.*) makes its first appearance, apparently a new collective term for the tribes of north-west Germany from the Chatti to the mouth of the Rhine.

The Alemanni, the Goths and the Franks.

In the 4th century the chief powers in western Germany were the Franks and the Alamanni, both of whom were in constant conflict with the Romans. The former were pressed in their rear by the Saxons, who at some time before the middle of the 4th century appear to have invaded and conquered a considerable part of north-west Germany. About the same time great national movements seem to have been taking place farther east. The Burgundians made their appearance in the west shortly before the end of the 3rd century, settling in the basin of the Main, and it is probable that some portions of the north Suebic peoples, perhaps the ancient Semnones, had already moved westward. By the middle of the 4th century the Goths had become the dominant power in eastern Germany, and their King Hermanaric held a supremacy which seems to have stretched from the Black Sea to Holstein. At his death, however, the supremacy of eastern Germany passed to the Huns, an invading people from the east, whose arrival seems to have produced a complete displacement of population in this region. With regard to the course of events in eastern Germany we have no knowledge, but during the 5th century several of the peoples previously settled there appear to have made their way into the lands south of the Carpathians and Riesengebirge, amongst whom (besides the Goths) may be especially mentioned the Rugii and the Gepides, the latter perhaps originally a branch of the Goths. According to tradition the Vandals had been driven into Pannonia by the Goths in the time of Constantine. We do not know how far northward the Hunnish power reached in the time of Attila, but the invasion of this nation was soon followed by a great westward movement of the Slavs.

Arrival of the Huns.

In the west the Alamanni and the descendants of the Marcomanni, now called Baiouarii (Bavarians), had broken through the frontiers of the Roman provinces of Vindelicia and Noricum at the beginning of the 5th century, while the Vandals together with some of the Suebi and the non-Teutonic Alani from the east crossed the Rhine and invaded Gaul in 406. About 435–440 the Burgundians were overthrown by Attila, and their king Gunthacarius (Gundahar) killed. The remains of the nation shortly afterwards settled in Gaul. About the same time the Franks overran and occupied the modern Belgium, and in the course of the next half-century their dominions were enormously extended towards the south (see Franks). After the death of Attila in 453 the power of the Huns soon collapsed, but the political divisions of Germany in the ensuing period are far from clear.

The Burgundians and other tribes.

In the 6th century the predominant peoples are the Franks, Frisians, Saxons, Alamanni, Bavarians, Langobardi, Heruli and Warni. By the beginning of this century the Saxons seem to have penetrated almost, if not quite, to the Rhine in the Netherlands. Farther south, however, the old land of the Chatti was included in the kingdom of Clovis. Northern Bavaria was occupied by the Franks, whose king Clovis subdued the Alamanni in 495. To the east of the Franks between the Harz, the Elbe and the Saale lay the kingdom of the Thuringi, the origin of whom is not clear. The Heruli also had a powerful kingdom, probably in the basin of the Elbe, and to the east of them were the Langobardi. The Warni apparently now dwelt in the regions about the mouth of the Elbe, while the whole coast from the mouth of the Weser to the west Scheldt was in the hands of the Frisians. By this time all the country east of the lower Elbe seems to have been Slavonic. In the north, perhaps in the province of Schleswig, we hear now for the first time of the Danes. Theodoric, king of the Ostrogoths, endeavoured to form a confederacy with the Thuringi, Heruli and Warni against Clovis in order to protect the Visigoths in the early years of the 6th century, but very shortly afterwards the king of the Heruli was slain by the Langobardi and their existence as an independent power came to an end. In 531 the Thuringian kingdom was destroyed by the Frankish king Theodoric, son of Clovis, with whom the Saxons were in alliance.

The Franks and others to the 6th century.

During the 6th and 7th centuries the Saxons were intermittently under Frankish supremacy, but their conquest was not complete until the time of Charlemagne. Shortly after the middle of the 6th century the Franks were threatened with a new invasion by the Avars. In 567–568 the Langobardi, who by this time had moved into the Danube basin, invaded Italy and were followed by those of the Saxons who had settled in Thuringia. Their lands were given by the Frankish king Sigeberht to the north Suebi and other tribes who had come either from the Elbe basin or possibly from the Netherlands. About the same time Sigeberht was defeated by the Avars, and though the latter soon withdrew from the Frankish frontiers, their course was followed by a movement of the Slavs, who occupied the basin of the Elster and penetrated to that of the Main.

The Saxons and the Franks.

By the end of the 6th century the whole basin of the Elbe except the Saxon territory near the mouth had probably become Slavonic. To the east of the Saale were the Sorbs (Sorabi), and beyond them the Dalemînci and Siusli. To the east of the

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Saxons were the Polabs (Polabi) in the basin of the Elbe, and beyond them the Hevelli about the Havel. Farther north in Mecklenburg were the Warnabi, and in eastern Holstein the Obotriti and the Wagri. To the east of the Warnabi were the Liutici as far as the Oder, and beyond that river the Pomerani. To the south of the Oder were the Milcieni and the Lusici, and farther east the Poloni with their centre in the basin of the Vistula. The lower part of the Vistula basin, however, was in possession of Prussian tribes, the Prussi and Lithuani.

The Warni now disappear from history, and from this time the Teutonic peoples of the north as far as the Danish boundary about the Eider are called Saxons. The conquest of the Frisians by the Franks was begun by Pippin (Pepin) of Heristal in 680 and practically completed by Charles Martel, though they were not entirely brought into subjection until the time of Charlemagne. The great overthrow of the Saxons took place about 772–773, and by the end of the century Charlemagne had extended his conquests to the border of the Danes. By this time the whole of the Teutonic part of Germany had been finally brought under his government.

AUTHORITIES.—Caesar, *De bello Gallico*, especially i. 31 ff., iv. 1–19, vi. 21 ff.; Velleius Paterculus, especially ii. 105 ff.; Strabo, especially pp. 193 ff., 290 ff.; Pliny, *Natural History*, iv. §§ 99 ff., 106; Tacitus, *Annales*, i. 38 ff., ii. 5 ff., 44 ff., 62 f., 88; *Germania*, passim; *Histories*, iv.; Ptolemy ii. 9, §§ 2 ff., 11, iii. 5, §§ 19 ff.; Dio Cassius, passim; Julius Capitolinus; Claudius Mamertinus; Ammianus Marcellinus, passim; Zosimus; Jordanes, *De origine Getarum*; Procopius, *De bello Gothico*; K. Zeuss, *Die Deutschen und die Nachbarstamme*; O. Bremer in Paul's *Grundriss d. germ. Philologie* (2nd ed.), vol. iii. pp. 735 ff. (F. G. M. B.)

Medieval and Modern History

When Clovis, or Chlodovech, became king of a tribe of the Salian Franks in 481, five years after the fall of the Western empire, the region afterwards called Germany was divided into five main districts, and its history for the succeeding three centuries is mainly the history of the tribes inhabiting these districts. In the north-east, dwelling between the Rhine and the Elbe, were the Saxons (*q.v.*), to the east and south of whom stretched the extensive kingdom of Thuringia (*q.v.*). In the south-west the Alamanni occupied the territory afterwards called Swabia (*q.v.*), and extended along the middle Rhine until they met the Ripurian Franks, then living in the northern part of the district which at a later period was called after them, Franconia (*q.v.*); and in the south-east were the Bavarians, although it was some time before their country came to be known as Bavaria (*q.v.*).

Divisions of Germany.

Clovis was descended from Chlogio, or Clodion, who had ruled over a branch of the Salian Franks from 427 to 447, and whose successors, following his example, had secured an influential position for their tribe. Having obtained possession of that part of Gaul which lay between the Seine and the Loire, Clovis turned his attention to his eastern neighbours, and was soon engaged in a struggle with the Alamanni which probably arose out of a quarrel between them and the Ripuarian Franks for the possession of the middle Rhine. When in 496, or soon afterwards, the Alamanni were defeated, they were confined to what was afterwards known as Swabia, and the northern part of their territory was incorporated with the kingdom of the Franks. Clovis had united the Salian Franks under his rule, and he persuaded, or compelled, the Ripuarian Franks also to accept him as their king; but on his death in 511 his kingdom was divided, and the Ripuarian, or Rhenish, Franks as they are sometimes called, together with some of the Alamanni, came under the rule of his eldest son Theuderich or Theodoric I. This was the first of the many partitions which effectually divided the kingdom of the Franks into an eastern and a western portion, that is to say, into divisions which eventually became Germany and France respectively, and the district ruled by Theuderich was almost identical with that which afterwards bore the name of Austrasia. In 531 Theuderich killed Hermannfried, king of the Thuringians, a former ally, with whom he had quarrelled, conquered his kingdom, and added its southern portion to his own possessions. His son and successor, Theudebert I., exercised a certain supremacy over the Alamanni and the Bavarians, and even claimed authority over various Saxon tribes between whom and the Franks there had been some fighting. After his death in 548, however, the Frankish power in Germany sank to very minute proportions, a result due partly to the spirit of tribal independence which lingered among the German races, but principally to the paralysing effect of the unceasing rivalry between Austrasia and Neustria. From 548 the Alamanni were ruled by a succession of dukes who soon made themselves independent; and in 555 a duke of the Bavarians, who exercised his authority without regard for the Frankish supremacy, is first mentioned. In Thuringia, which now only consisted of the central part of the former kingdom, King Dagobert I. set up in 634 a duke named Radulf who soon asserted his independence of Dagobert and of his successor, Sigebert III. The Saxons for their part did not own even a nominal allegiance to the Frankish kings, whose authority on the right bank of the Rhine was confined to the district actually occupied by men of their own name, which at a later date became the duchy of Franconia. During these years the eastern border of Germany was constantly ravaged by various Slavonic tribes. King Dagobert sent troops to repel these marauders from time to time, but the main burden of defence fell upon the Saxons, Bavarians and Thuringians. The virtual independence of these German tribes lasted until the union of Austrasia and Neustria in 687, an achievement mainly due to the efforts of Pippin of Heristal, who soon became the actual, though not the nominal, ruler of the Frankish realm. Pippin and his son Charles Martel, who was mayor of the palace from 717 to 741, renewed the struggle with the Germans and were soon successful in re-establishing the central power which the Merovingian kings had allowed to slip from their grasp. The ducal office was abolished in Thuringia, a series of wars reduced the Alamanni to strict dependence, and both countries were governed by Frankish officials. Bavaria was brought into subjection about the same time; the Bavarian law, committed to writing between 730 and 748, strongly emphasizes the supremacy of the Frankish king, whose authority it recognizes as including the right to appoint and even to depose the duke of Bavaria. The Saxons, on the other hand, succeeded in retaining their independence as a race, although their country was ravaged in various campaigns and some tribes were compelled from time to time to pay tribute. The rule of Pippin the Short, both before and after his coronation as king, was troubled by constant risings on the part of his East Frankish or German subjects, but aided by his brother Carloman, who for a time administered this part of the Frankish kingdom, Pippin was generally able to deal with the rebels.

The wars of Clovis.

After all, however, even these powerful Frankish conquerors had but imperfect success in Germany. When they were present with their formidable armies, they could command obedience; when engaged, as they often were, in distant parts of the vast Frankish territory, they could not trust to the fulfilment of the fair promises they had exacted. One of the chief causes of their ill-success was the continued independence of the Saxons. Ever since they had acquired the northern half of Thuringia, this warlike race had been extending its power. They were still heathens, cherishing bitter hatred towards the Franks, whom they regarded as the enemies both of their liberties and of their religion; and their hatred found expression, not only in expeditions into Frankish territory, but in help willingly rendered to every German confederation which wished to throw off the Frankish yoke. Hardly any rebellion against the dukes of the Franks, or against King Pippin, took place in Germany without the Saxons coming forward to aid the rebels. This was perfectly understood by the Frankish rulers, who tried again and again to put an end to the evil by subduing the Saxons. They could not, however, attain their object. An occasional victory was gained, and some border tribes were from time to time compelled to pay tribute; but the mass of the Saxons remained unconquered. This was partly due to the fact that the Saxons had not, like the other German confederations, a duke who, when beaten, could be held responsible

The Saxons remain independent.

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for the engagements forced upon him as the representative of his subjects. A Saxon chief who made peace with the Franks could undertake nothing for the whole people. As a conquering race, they were firmly compact; conquered, they were in the hands of the victor a rope of sand.

It was during the time of Pippin of Heristal and his son and grandson that the conversion of the Germans to Christianity was mainlyeffected. Some traces of Roman Christianity still lingered in the Rhine valley and in southern Germany, but the bulk of the people were heathen, in spite of the efforts of Frank and Irish missionaries and the command of King Dagobert I. that all his subjects should be baptized. Rupert, bishop of Worms, had already made some progress in the work of converting the Bavarians and Alamanni, as had Willibrord among the Thuringians when St Boniface appeared in Germany in 717. Appointed bishop of the Germans by Pope Gregory II., and supported by Charles Martel, hepreached with much success in Bavaria and Thuringia, notwithstanding some hostility from the clergy who disliked the influence of Rome. He founded or restored bishoprics in Bavaria, Thuringia and elsewhere, and in 742 presided over the first German council. When he was martyred in 755 Christianity was professed by all the German races except the Saxons, and the church, organized and wealthy, had been to a large extent brought under the control of the papacy. The old pagan faith was not yet entirely destroyed, and traces of its influence may still be detected in popular beliefs and customs. But still Christianity was dominant, and soon became an important factor in the process of civilization, while the close alliance of the German church with the papacy was followed by results of the utmost consequence for Germany.

Christianity in Germany.

The reign of Charlemagne is a period of great importance in the history of Germany. Under his rule the first signs of national unity and a serious advance in the progress of order and civilization may be seen. The long struggle, which ended in 804 with the submission of the Saxons to the emperor, together with the extension of a real Frankish authority over the Bavarians, brought the German races for the first time under a single ruler; while war and government, law and religion, alike tended to weld them into one people. The armies of Charlemagne contained warriors from all parts of Germany; and although tribal law was respected and codified, legislation common to the whole empire was also introduced. The general establishment of the Frankish system of government and the presence of Frankish officials helped to break down the barriers of race, and the influence of Christianity was in the same direction. With the conversion of the Saxons the whole German race became nominally Christian; and their ruler was lavish in granting lands and privileges to prelates, and untiring in founding bishoprics, monasteries and schools. Measures were also taken for the security and good government of the country. Campaigns against the Slavonic tribes, if sometimes failing in their immediate object, taught those peoples to respect the power of the Frankish monarch; and the establishment of a series of marches along the eastern frontier gave a sense of safety to the neighbouring districts. The tribal dukes had all disappeared, and their duchies were split up into districts ruled by counts (*q.v.*), whose tendencies to independence the emperor tried to check by the visits of the *missi dominici* (*q.v.*). Some of the results of the government of Charlemagne were, however, less beneficial. His coronation as Roman emperor in 800, although it did not produce at the time so powerful an impression in Germany as in France, was fraught with consequences not always favourable for the former country. The tendencies of the tribe to independence were crushed as their ancient popular assemblies were discouraged; and the liberty of the freemen was curtailed owing to the exigencies of military service, while the power of the church was rarely directed to the highest ends.

The work of Charlemagne.

The reign of the emperor Louis I. was marked by a number of abortive schemes for the partition of his dominions among his sons, which provoked a state of strife that was largely responsible for the increasing weakness of the Empire. The mild nature of his rule, however, made Louis popular with his German subjects, to whose support mainly he owed his restoration to power on two occasions. When in 825 his son Louis, afterwards called "the German," was entrusted with the government of Bavaria and from this centre gradually extended his authority over the Carolingian dominions east of the Rhine, a step was taken in the process by which East Francia, or Germany, was becoming a unit distinguishable from other portions of the Empire; a process which was carried further by the treaty of Verdun in August 843, when, after a struggle between Louis the German and his brothers for their father's inheritance, an arrangement was made by which Louis obtained the bulk of the lands east of the Rhine together with the districts around Mainz, Worms and Spires on the left bank. Although not yet a single people, the German tribes had now for the first time a ruler whose authority was confined to their own lands, and from this time the beginnings of national life may be traced. For fifty years the main efforts of Louis were directed to defending his kingdom from the inroads of his Slavonic neighbours, and his detachment from the rest of the Empire necessitated by these constant engagements towards the east, gradually gave both him and his subjects a distinctive character, which was displayed and emphasized when, in ratifying an alliance with his half-brother, the West-Frankish king, Charles the Bald, the oath was sworn in different tongues. The East and West Franks were unable to understand each other's speech, so Charles took the oath in a Romance, and Louis in a German dialect.

Louis I. and his sons.

Important as is the treaty of Verdun in German history, that of Mersen, by which Louis and Charles the Bald settled in 870 their dispute over the kingdom of Lothair, second son of the emperor Lothair I., is still more important. The additional territory which Louis then obtained gave to his dominions almost the proportions which Germany maintained throughout the middle ages. They were bounded on the east by the Elbe and the Bohemian mountains, and on the west beyond the Rhine they included the districts known afterwards as Alsace and Lorraine. His jurisdiction embraced the territories occupied by the five ancient German tribes, and included the five archbishoprics of Mainz, Treves (Trier), Cologne, Salzburg and Bremen. When Louis died in 876 his kingdom was divided among his three sons, but as the two elder of these soon died without heirs, Germany was again united in 882 under his remaining son Charles, called "the Fat," who soon became ruler of almost the whole of the extensive domains of Charlemagne. There was, however, no cohesion in the restored empire, the disintegration of which, moreover, was hastened by the ravages of the Northmen, who plundered the cities in the valley of the Rhine. Charles attempted to buy off these redoubtable invaders, a policy which aroused the anger of his German subjects, whose resentment was accentuated by the king's indifference to their condition, and found expression in 887 when Arnulf, an illegitimate son of Carloman, the eldest son of Louis the German, led an army of Bavarians against him. Arnulf himself was recognized as German or East-Frankish king, although his actual authority was confined to Bavaria and its neighbourhood. He was successful in freeing his kingdom for a time from the ravages of the Northmen, but was not equally fortunate in his contests with the Moravians. After his death in 899 his kingdom came under the nominal rule of his young son Louis "the Child," and in the absence of firm rule and a central authority became the prey of the Magyars and other hordes of invaders.

Louis the German and his successors.

During these wars feudalism made rapid advance in Germany. The different peoples compelled to attend to their own defence appointed dukes for special military services (see DUKE); and these dukes, chosen often from members of the old ducal families, succeeded without much difficulty in securing a more permanent position for themselves and their descendants. In Saxony, for example, we hear of Duke Otto the Illustrious, who also ruled over Thuringia; and during the early years of the 10th century dukes

Feudalism in Germany.

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appear in Franconia, Bavaria, Swabia and Lorraine. These dukes acquired large tracts of land of which they gave grants on conditions of military service to persons on whom they could rely; while many independent landowners sought their protection on terms of vassalage. The same process took place in the case of great numbers of freemen of a lower class, who put themselves at the service of their more powerful neighbours in return for protection. In this manner the feudal tenure of land began to prevail in almost all parts of Germany, and the elaborate social system which became known as feudalism was gradually built up. The dukes became virtually independent, and when Louis the Child died in 911, the royal authority existed in name only.

Conrad I.

While Louis the Child lived the German dukes were virtually kings in their duchies, and their natural tendency was to make themselves absolute rulers. But, threatened as they were by the Magyars, with the Slavs and Northmen always ready to take advantage of their weakness, they could not afford to do without a central government. Accordingly the nobles assembled at Forchheim, and by the advice of Otto the Illustrious, duke of Saxony, Conrad of Franconia was chosen German king. The dukes of Bavaria, Swabia and Lorraine were displeased at this election, probably because Conrad was likely to prove considerably more powerful than they wished. Rather than acknowledge him, the duke of Lotharingia, or Lorraine, transferred his allegiance to Charles the Simple of France; and it was in vain that Conrad protested and despatched armies into Lorraine. With the help of the French king the duke maintained his ground, and for the time his country was lost to Germany. Bavaria and Swabia yielded, but, mainly through the fault of the king himself, their submission was of brief duration. The rise of the dukes had been watched with extreme jealousy by the leading prelates. They saw that the independence they had hitherto enjoyed would be much more imperilled by powerful local governors than by a sovereign who necessarily regarded it as part of his duty to protect the church. Hence they had done everything they could to prevent the dukes from extending their authority, and as the government was carried on during the reign of Louis the Child mainly by Hatto I., archbishop of Mainz, they had been able to throw considerable obstacles in the way of their rivals. They had now induced Conrad to quarrel with both Swabia and Bavaria, and also with Henry, duke of Saxony, son of the duke to whom he chiefly owed his crown. In these contests the German king met with indifferent success, but the struggle with Saxony was not very serious, and when dying in December 919 Conrad recommended the Franconian nobles to offer the crown to Henry, the only man who could cope with the anarchy by which he had himself been baffled.

Henry the Fowler.

The nobles of Franconia acted upon the advice of their king, and the Saxons were very willing that their duke should rise to still higher honours. Henry I., called "the Fowler," who was chosen German king in May 919, was one of the best of German kings, and was a born statesman and warrior. His ambition was of the noblest order, for he sank his personal interests in the cause of his country, and he knew exactly when to attain his objects by force, and when by concession and moderation. Almost immediately he overcame the opposition of the dukes of Swabia and Bavaria; some time later, taking advantage of the troubled state of France, he accepted the homage of the duke of Lorraine, which for many centuries afterwards remained a part of the German kingdom.

Henry and the Magyars.

Having established internal order, Henry was able to turn to matters of more pressing moment. In the first year of his reign the Magyars, who had continued to scourge Germany during the reign of Conrad, broke into Saxony and plundered the land almost without hindrance. In 924 they returned, and this time by good fortune one of their greatest princes fell into the hands of the Germans. Henry restored him to his countrymen on condition that they made a truce for nine years; and he promised to pay yearly tribute during this period. The barbarians accepted his terms, and faithfully kept their word in regard to Henry's own lands, although Bavaria, Swabia and Franconia they occasionally invaded as before. The king made admirable use of the opportunity he had secured, confining his efforts, however, to Saxony and Thuringia, the only parts of Germany over which he had any control.

Henry's work in Saxony.

In the southern and western German lands towns and fortified places had long existed; but in the north, where Roman influence had only been feeble, and where even the Franks had not exercised much authority until the time of Charlemagne, the people still lived as in ancient times, either on solitary farms or in exposed villages. Henry saw that, while this state of things lasted, the population could never be safe, and began the construction of fortresses and walled towns. Of every group of nine men one was compelled to devote himself to this work, while the remaining eight cultivated his fields and allowed a third of their produce to be stored against times of trouble. The necessities of military discipline were also a subject of attention. Hitherto the Germans had fought mainly on foot, and, as the Magyars came on horseback, the nation was placed at an immense disadvantage. A powerful force of cavalry was now raised, while at the same time the infantry were drilled in new and more effective modes of fighting. Although these preparations were carried on directly under Henry's supervision, only in Saxony and Thuringia the neighbouring dukes were stimulated to follow his example. When he was ready he used his new troops, before turning them against their chief enemy, the Magyars, to punish refractory Slavonic tribes; and he brought under temporary subjection nearly all the Slavs between the Elbe and the Oder. He proceeded also against the Bohemians, whose duke was compelled to do homage.

The Magyars return.

The truce with the Magyars was not renewed, whereupon in 933 a body of invaders crossed, as in former years, the frontier of Thuringia. Henry prudently waited until dearth of provisions forced the enemy to divide into two bands. He then swept down upon the weaker force, annihilated it, and rapidly advanced against the remaining portion of the army. The second battle was more severe than the first, but not less decisive. The Magyars, unable to cope with a disciplined army, were cut down in great numbers, and those who survived rode in terror from the field. The exact scenes of these conflicts are not known, although the date of the second encounter was the 15th of March 933; but few more important battles have ever been fought. The power of the Magyars was not indeed destroyed, but it was crippled, and the way was prepared for the effective liberation of Germany from an intolerable plague. While the Magyars had been troubling Germany on the east and south, the Danes had been irritating her on the north. Charlemagne had established a march between the Eider and the Schlei; but in course of time the Danes had not only seized this territory, but had driven the German population beyond the Elbe. The Saxons had been slowly reconquering the lost ground, and now Henry, advancing with his victorious army into Jutland, forced Gorm, the Danish king, to become his vassal and regained the land between the Eider and the Schlei. But Henry's work concerned the duchy of Saxony rather than the kingdom of Germany. He concentrated all his energies on the government and defence of northern and eastern Germany, leaving the southern and western districts to profit by his example, while his policy of refraining from interference in the affairs of the other duchies tended to diminish the ill-feeling which existed between the various German tribes and to bring peace to the country as a whole. It is in these directions that the reign of Henry the Fowler marks a stage in the history of Germany.

When this great king died in July 936 every land inhabited by a German population formed part of the German kingdom, and none of the duchies were at war either with him or among themselves. Along the northern and eastern frontier were tributary races, and the country was for the time rid of an enemy which, for nearly a generation, had kept it in perpetual fear. Great as were these results, perhaps Henry did even greater service

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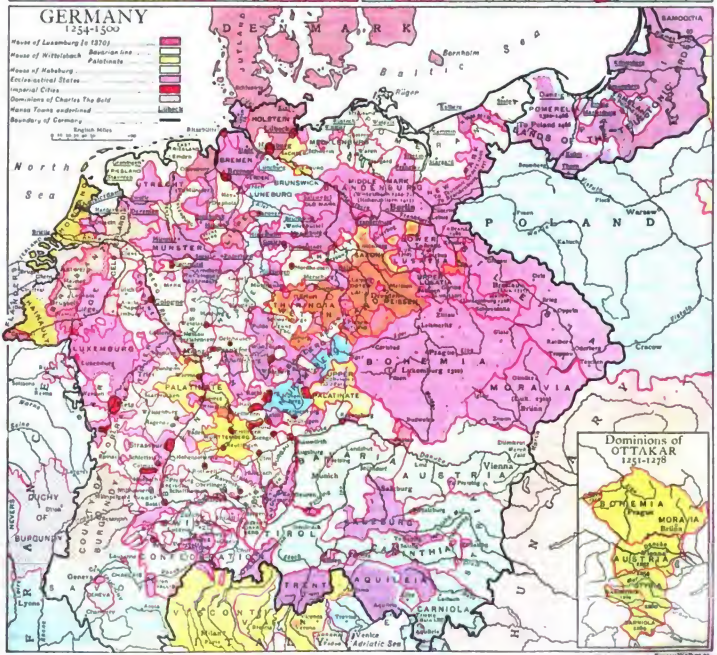

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in beginning the growth of towns throughout north Germany. Not content with merely making them places of defence, he decreed that they should be centres for the administration of justice, and that in them should be held all public festivities and ceremonies; he also instituted markets, and encouraged traders to take advantage of the opportunities provided for them. A strong check was thus imposed upon the tendency of freemen to become the vassals of great lords. This movement had become so powerful by the troubles of the epoch that, had no other current of influence set in, the entire class of freemen must soon have disappeared. As they now knew that they could find protection without looking to a superior, they had less temptation to give up their independence, and many of them settled in the towns where they could be safe and free. Besides maintaining a manly spirit in the population, the towns rapidly added to their importance by the stimulus they gave to all kinds of industry and trade.

The growth of towns.

Before his death Henry obtained the promise of the nobles at a national assembly, or diet, at Erfurt to recognize his son Otto as his successor, and the promise was kept, Otto being chosen German king in July 936. Otto I. the Great began his reign under the most favourable circumstances. He was twenty-four years of age, and at the coronation festival, which was held at Aix-la-Chapelle, the dukes performed for the first time the nominally menial offices known as the arch-offices of the German kingdom. But these peaceful relations soon came to an end. Reversing his father's policy, Otto resolved that the dukes should act in the strictest sense as his vassals, or lose their dignities. At the time of his coronation Germany was virtually a federal state; he wished to transform it into a firm and compact monarchy. This policy speedily led to a formidable rebellion, headed by Thankmar, the king's half-brother, a fierce warrior, who fancied that he had a prior claim to the crown, and who secured a number of followers in Saxony. He was joined by Eberhard, duke of Franconia, and it was only by the aid of the duke of Swabia, whom the duke of Franconia had offended, that the rising was put down. This happened in 938, and in 939 a second rebellion, led by Otto's brother Henry, was supported by the duke of Franconia and by Giselbert, duke of Lorraine. Otto again triumphed, and derived immense advantages from his success. The duchy of Franconia he kept in his own hands, and in 944 he granted Lorraine to Conrad the Red, an energetic and honourable count, whom he still further attached to himself by giving him his daughter for his wife. Bavaria, on the death of its duke in 947, was placed under his brother Henry, who, having been pardoned, had become a loyal subject. The duchy of Swabia was also brought into Otto's family by the marriage of his son Ludolf with Duke Hermann's daughter, and by these means Otto made himself master of the kingdom. For the time, feudalism in truth meant that lands and offices were held on condition of service; the king was the genuine ruler, not only of freemen, but of the highest vassals in the nation.

Otto the Great.

In the midst of these internal troubles Otto was attacked by the French king, Louis IV., who sought to regain Lorraine. However, the German king was soon able to turn his arms against his new enemy; he marched into France and made peace with Louis in 942. Otto's subsequent interventions in the affairs of France were mainly directed towards making peace between Louis and his powerful and rebellious vassal, Hugh the Great, duke of the Franks, both of whom were married to sisters of the German king. Much more important than Otto's doings in France were his wars with his northern and eastern neighbours. The duke of Bohemia, after a long struggle, was brought to submission in 950. Among the Slavs between the Elbe and the Oder the king was represented by Margrave Gero, a warrior well fitted for the rough work he had to do, loyal to his sovereign, but capable of any treachery towards his enemies, who conquered much of the country north of Bohemia between the Oder and the upper and middle Elbe. Margrave Billung, who looked after the Abotrites on the lower Elbe, was less fortunate, mainly because of the neighbourhood of the Danes, who, after the death of King Henry, often attacked the hated Germans, but some progress was made in bringing this district under German influence. Otto, having profound faith in the power of the church to reconcile conquered peoples to his rule, provided for the benefit of the Danes the bishoprics of Schleswig, Ripen and Aarhus; and among those which he established for the Slavs were the important bishoprics of Brandenburg and Havelberg. In his later years he set up the archbishopric of Magdeburg, which took in the sees of Meissen, Zeitz and Merseburg.

Otto's wars with France and with the Slavs.

Having secured peace in Germany and begun the real conquest of the border races, Otto was by far the greatest sovereign in Europe; and, had he refused to go beyond the limits within which he had hitherto acted, it is probable that he would have established a united monarchy. But a decision to which he soon came deprived posterity of the results which might have sprung from the policy of his earlier years. About 951 Adelaide, widow of Lothair, son of Hugh, king of Italy, having refused to marry the son of Berengar, margrave of Ivrea, was cast into prison and cruelly treated. She appealed to Otto; other reasons called him in the same direction, and in 951 he crossed the Alps and descended into Lombardy. He displaced Berengar, and was so fascinated by Queen Adelaide that within a few weeks he was married to her at Pavia. But Otto's son, Ludolf, who had received a promise of the German crown, saw his rights threatened by this marriage. He went to an old enemy of his father, Frederick, archbishop of Mainz, and the two plotted together against the king, who, hearing of their proceedings, returned to Germany in 952, leaving Duke Conrad of Lorraine as his representative in Italy. Otto, who did not suspect how deep were the designs of the conspirators, paid a visit to Maintz, where he was seized and was compelled to take certain solemn pledges which, after his escape, he repudiated.

Otto in Italy.

War broke out in 953, and the struggle was the most serious in which he had been engaged. In Lorraine, of which duchy Otto made his brother Bruno, archbishop of Cologne, administrator, his cause was triumphant; but everywhere else dark clouds gathered over his head. Conrad the Red hurried from Italy and joined the rebels; in Swabia, in Bavaria, in Franconia and even in Saxony, the native land of the king, many sided with them. It is extremely remarkable that this movement acquired so quickly such force and volume. The explanation, according to some historians, is that the people looked forward with alarm to the union of Germany with Italy. There were still traditions of the hardships inflicted upon the common folk by the expeditions of Charlemagne, and it is supposed that they anticipated similar evils in the event of his empire being restored. Whether or not this be the true explanation, the power of Otto was shaken to its foundations. At last he was saved by the presence of an immense external peril. The Magyars were as usual stimulated to action by the disunion of their enemies; and Conrad and Ludolf made the blunder of inviting their help, a proceeding which disgusted the Germans, many of whom fell away from their side and rallied to the head and protector of the nation. In a very short time Conrad and the archbishop of Mainz submitted, and although Ludolf held out a little longer he soon asked for pardon. Lorraine was given to Bruno; but Conrad, its former duke, although thus punished, was not disgraced, for Otto needed his services in the war with the Magyars. The great battle against these foes was fought on the 10th of August 955 on the Lechfeld near Augsburg. After a fierce and obstinate fight, in which Conrad and many other nobles fell, the Germans were victorious; the Magyars were even more thoroughly scourged than in the battles in which Otto's father had given them their first real check. The deliverance of Germany was complete, and from this time, notwithstanding certain wild raids towards the east, the Magyars began to settle in the land they still occupy, and to adapt themselves to the conditions of civilized life.

The civil war.

Defeat of Magyars.

Entreated by Pope John XII., who needed a helper against

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Berengar, Otto went a second time to Italy, in 961; and on this occasion he received from the pope at Rome the imperial crown. In 966 he was again in Italy, where he remained six years, exercising to the full his imperial rights in regard to the papacy, but occupied mainly in an attempt to make himself master of the southern, as well as of the northern half of the peninsula.

Otto crowned emperor.

By far the most important act of Otto's eventful life was his assumption of the Lombard and the imperial crowns. His successors steadily followed his example, and the sovereign crowned at Aix-la-Chapelle claimed as his right coronation by the pope in Rome. Thus grew up the Holy Roman Empire, that strange state which, directly descending through the empire of Charlemagne, from the empire of the Caesars, contained so many elements foreign to ancient life. We are here concerned with it only as it affected Germany. Germany itself never until our own day became an empire. It is true that at last the Holy Roman Empire was in reality confined to Germany; but in theory it was something quite different. Like France, Germany was a kingdom, but it differed from France in this, that its king was also king in Italy and Roman emperor. As the latter title made him nominally the secular lord of the world, it might have been expected to excite the pride of his German subjects; and doubtless, after a time, they did learn to think highly of themselves as the imperial race. But the evidence tends to show that at first at least they had no wish for this honour, and would have preferred their ruler to devote himself entirely to his own people.

Connexion of Germany with the Empire.

There are signs that during Otto's reign they began to have a distinct consciousness of national life, their use of the word "deutsch" to indicate the whole people being one of these symptoms. Their common sufferings, struggles and triumphs, however, account far more readily for this feeling than the supposition that they were elated by their king undertaking obligations which took him for years together away from his native land. So solemn were the associations of the imperial title that, after acquiring it, Otto probably looked for more intimate obedience from his subjects. They were willing enough to admit the abstract claims of the Empire; but in the world of feudalism there was a multitude of established customs and rights which rudely conflicted with these claims, and in action, remote and abstract considerations gave way before concrete and present realities. Instead of strengthening the allegiance of the Germans towards their sovereign, the imperial title was the means of steadily undermining it. To the connexion of their kingdom with the Empire they owe the fact that for centuries they were the most divided of European nations, and that they have only recently begun to create a genuinely united state. France was made up of a number of loosely connected lands, each with its own lord, when Germany, under Otto, was to a large extent moved by a single will, well organized and strong. But the attention of the French kings was concentrated on their immediate interests, and in course of time they brought their unruly vassals to order. The German kings, as emperors, had duties which often took them away for long periods from Germany. This alone would have shaken their authority, for, during their absence, the great vassals seized rights which were afterwards difficult to recover. But the emperors were not merely absent, they had to engage in struggles in which they exhausted the energies necessary to enforce obedience at home; and, in order to obtain help, they were sometimes glad to concede advantages to which, under other conditions, they would have tenaciously clung. Moreover, the greatest of all their struggles was with the papacy; so that a power outside their kingdom, but exercising immense influence within it, was in the end always prepared to weaken them by exciting dissension among their people. Thus the imperial crown was the most fatal gift that could have been offered to the German kings; apparently giving them all things, it deprived them of nearly everything. And in doing this it inflicted on many generations incalculable and needless suffering.

By the policy of his later years Otto did much to prepare the way for the process of disintegration which he rendered inevitable by restoring the Empire. With the kingdom divided into five great duchies, the sovereign could always have maintained at least so much unity as Henry the Fowler secured; and, as the experience of Otto himself showed, there would have been chances of much greater centralization. Yet he threw away this advantage. Lorraine was divided into two duchies, Upper Lorraine and Lower Lorraine. In each duchy of the kingdom he appointed a count palatine, whose duty was to maintain the royal rights; and after Margrave Gero died in 965 his territory was divided into three marches, and placed under margraves, each with the same powers as Gero. Otto gave up the practice of retaining the duchies either in his own hands or in those of relatives. Even Saxony, his native duchy and the chief source of his strength, was given to Margrave Billung, whose family kept it for many years. To combat the power of the princes, Otto, especially after he became emperor and looked upon himself as the protector of the church, immensely increased the importance of the prelates. They received great gifts of land, were endowed with jurisdiction in criminal as well as civil cases, and obtained several other valuable sovereign rights. The emperor's idea was that, as church lands and offices could not be hereditary, their holders would necessarily favour the crown. But he forgot that the church had a head outside Germany, and that the passion for the rights of an order may be not less intense than that for the rights of a family. While the Empire was at peace with the popes the prelates did strongly uphold it, and their influence was unquestionably, on the whole, higher than that of rude secular nobles. But with the Empire and the Papacy in conflict, they could not but abide, as a rule, by the authority which had the most sacred claims to their loyalty. From all these circumstances it curiously happened that the sovereign who did more than almost any other to raise the royal power, was also the sovereign who, more than any other, wrought its decay.'

Otto and the duchies.

Otto II. had been crowned German king at Aix-la-Chapelle and emperor at Rome during his father's lifetime. Becoming sole ruler in May 973, his troubles began in Lorraine, but were more serious in Bavaria, which was now a very important duchy. Its duke, Henry, the brother of Otto I., had died in 955 and had been succeeded by a young son, Henry, whose turbulent career subsequently induced the Bavarian historian Aventinus to describe him as *rixosus*, or the Quarrelsome. In 973 Burchard II., duke of Swabia, died, and the new emperor refused to give this duchy to Henry, further irritating this duke by bestowing it upon his enemy, Otto, a grandson of the emperor Otto I. Having collected allies Henry rebelled, and in 976 the emperor himself marched against him and drove him into Bohemia. Bavaria was taken from him and given to Otto of Swabia, but it was deprived of some of its importance. The southern part, Carinthia, which had hitherto been a march district, was separated from it and made into a duchy, and the church in Bavaria was made dependent upon the king and not upon the duke. Having arrived at this settlement Otto marched against the Bohemians, but while he was away from Germany war was begun against him by Henry, the new duke of Carinthia, who, forgetting the benefits he had just received, rose to avenge the wrongs of his friend, the deposed duke Henry of Bavaria. The emperor made peace with the Bohemians and quickly put down the rising. Henry of Bavaria was handed over to the keeping of the bishop of Utrecht and Carinthia received another duke.

Otto II.

In his anxiety to obtain possession of southern Italy, Otto I. had secured as a wife for his son and successor Theophano, daughter of the East Roman emperor, Romanus II., the ruler of much of southern Italy. Otto II., having all his father's ambition with much of his strength and haughtiness, longed to get away from Germany and to claim these remoter districts. But he was detained for some time owing to the sudden invasion of Lower Lorraine by Lothair, king of France, in 978. So stealthily did the invader

Otto and France.

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advance that the emperor had only just time to escape from Aix-la-Chapelle before the town was seized and plundered. As quickly as possible Otto placed himself at the head of a great army and marched to Paris, but he was compelled to retreat without taking the city, and in 980 peace was made.

At last, after an expedition against the Poles, Otto was able to fulfil the wish of his heart; he went to Italy in 980 and never returned to Germany. His claims to southern Italy were vehemently opposed, and in July 982 he suffered a disastrous defeat at the hands of the East Roman emperor's subjects and their Saracen allies. The news of this crushing blow cast a gloom over Germany, which was again suffering from the attacks of her unruly neighbours. The Saxons were able to cope with the Danes and the German boundary was pushed forward in the south-east; but the Slavs fought with such courage and success that during the reigns of the emperors Otto II. and Otto III. much of the work effected by the margraves Hermann Billung and Gero was undone, and nearly two centuries passed before they were driven back to the position which they had perforce occupied under Otto the Great. Such were the first-fruits of the assumption of the imperial crown.

Otto in Italy.

About six months before his death in Rome, in December 983, Otto held a diet at Verona which was attended by many of the German princes, who recognized his infant son Otto as his successor. Otto was then taken to Germany, and after his father's death he was crowned at Aix-la-Chapelle on Christmas Day 983. Henry of Bavaria was released from his confinement and became his guardian; but as this restless prince showed an inclination to secure the crown for himself, the young king was taken from him and placed in the care of his mother Theophano. Henry, however, gained a good deal of support both within and without Germany and caused much anxiety to Otto's friends, but in 985 peace was made and he was restored to Bavaria. While Theophano acted as regent, the chief functions of government were discharged by Willigis, archbishop of Mainz (d. 1011), a vigorous prelate who had risen from a humble rank to the highest position in the German Church. He was aided by the princes, each of whom claimed a voice in the administration, and, during the lifetime of Theophano at least, a stubborn and sometimes a successful resistance was offered to the attacks of the Slavs. But under the prevalent conditions a vigorous rule was impossible, and during Otto's minority the royal authority was greatly weakened. In Saxony the people were quickly forgetting their hereditary connexion with the successors of Henry the Fowler; in Bavaria, after the death of Duke Henry in 995, the nobles, heedless of the royal power, returned to the ancient German custom and chose Henry's son Henry as their ruler.

Otto III.

In 995 Otto III. was declared to have reached his majority. He had been so carefully trained in all the learning of the time that he was called the "wonder of the world," and a certain fascination still belongs to his imaginative and fantastic nature. Imbued by his mother with the extravagant ideas of the East Roman emperors he introduced into his court an amount of splendour and ceremonial hitherto unknown in western Europe. The heir of the western emperors and the grandson of an eastern emperor, he spent most of his time in Rome, and fancied he could unite the world under his rule. In this vague design he was encouraged by Gerbert, the greatest scholar of the day, whom, as Silvester II., he raised to the papal throne. Meanwhile Germany was suffering severely from internal disorders and from the inroads of her rude neighbours; and when in the year 1000 Otto visited his northern kingdom there were hopes that he would smite these enemies with the vigour of his predecessors. But these hopes were disappointed; on the contrary, Otto seems to have released Boleslaus, duke of the Poles, from his vague allegiance to the German kings, and he founded an archbishopric at Gnesen, thus freeing the Polish sees from the authority of the archbishop of Magdeburg.

The character of Otto.

When Otto III. died in January 1002 there remained no representative of the elder branch of the imperial family, and several candidates came forward for the vacant throne.

Henry II.

Among these candidates was Henry of Bavaria, son of Duke Henry the Quarrelsome and a great-grandson of Henry the Fowler, and at Mainz in June 1002 this prince was chosen German king as Henry II. Having been recognized as king by the Saxons, the Thuringians and the nobles of Lorraine, the new king was able to turn his attention to the affairs of government, but on the whole his reign was an unfortunate one for Germany. For ten years civil war raged in Lorraine; in Saxony much blood was shed in petty quarrels; and Henry made expeditions against his turbulent vassals in Flanders and Friesland. He also interfered in the affairs of Burgundy, but the acquisition of this kingdom was the work of his successor, Conrad II. During nearly the whole of this reign the Germans were fighting the Poles. Boleslaus of Poland, who was now a very powerful sovereign, having conquered Lusatia and Silesia, brought Bohemia also under his rule and was soon at variance with the German king. Anxious to regain these lands Henry allied himself with some Slavonic tribes, promising not to interfere with the exercise of their heathen religion, while Boleslaus found supporters among the discontented German nobles. The honours of the ensuing war were with Henry, and when peace was made in 1006 Boleslaus gave up Bohemia, but the struggle was soon renewed and neither side had gained any serious advantage when peace was again made in 1013. A third Polish war broke out in 1015. Henry led his troops in person and obtained assistance from the Russians and the Hungarians; peace was concluded in 1018, the Elbe remaining the north-east boundary of Germany. Henry made three journeys to Italy, being crowned king of the Lombards at Pavia in 1004 and emperor at Rome ten years later. Before the latter event, in order to assert his right of sovereignty over Rome, he called himself king of the Romans, a designation which henceforth was borne by his successors until they received the higher title from the pope. Hitherto a sovereign crowned at Aix-la-Chapelle had been "king of the West Franks," or "king of the Franks and Saxons." Henry was generous to the church, to which he looked for support, but he maintained the royal authority over the clergy. Although generally unsuccessful he strove hard for peace, and during this reign the principle of inheritance was virtually established with regard to German fiefs.

After Henry's death the nobles met at Kamba, near Oppenheim, and in September 1024 elected Conrad, a Franconian count, to the vacant throne. Although favoured by the German clergy the new king, Conrad II., had to face some opposition; this, however, quickly vanished and he received the homage of the nobles in the various duchies and seemed to have no reason to dread internal enemies. Nevertheless, he had soon to battle with a conspiracy headed by his stepson, Ernest II., duke of Swabia. This was caused primarily by Conrad's avowed desire to acquire the kingdom of Burgundy, but other reasons for dissatisfaction existed, and the revolting duke found it easy to gather around him the scattered forces of discontent. However, the king was quite able to deal with the rising, which, indeed, never attained serious proportions, although Ernest gave continual trouble until his death in 1030. With regard to the German duchies Conrad followed the policy of Otto the Great. He wished to control, not to abolish them. In 1026, when Duke Henry of Bavaria died, he obtained the duchy for his son Henry, afterwards the emperor Henry III.; later, despite the opposition of the nobles, he invested the same prince with Swabia, where the ducal family had died out. Franconia was in the hands of Conrad himself; thus Saxony, Thuringia, Carinthia and Lorraine were the only duchies not completely dependent upon the king.

Conrad II.

When Conrad ascended the throne the safety of Germany was endangered from three different points. On the north was Denmark ruled by Canute the Great; on the east was the wide Polish state whose ruler, Boleslaus, had just taken the title of king; and on the south-east was Hungary, which under its king,

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St Stephen, was rapidly becoming an organized and formidable power. Peace was maintained with Canute, and in 1035 a treaty was concluded and the land between the Eider and the Schlei was ceded to Denmark. In 1030 Conrad waged a short war against Hungary, but here also he was obliged to assent to a cession of territory. In Poland he was more fortunate. After the death of Boleslaus in 1025 the Poles plunged into a civil war, and Conrad was able to turn this to his own advantage. In 1031 he recovered Lusatia and other districts, and in 1033 the Polish duke of Mesislaus did homage to him at Merseburg. His authority was recognized by the Bohemians, and two expeditions taught the Slavonic tribes between the Elbe and the Oder to respect his power.

The neighbouring countries.

In Italy, whither he journeyed in 1026 and 1036, Conrad was not welcomed. Although as emperor and as king of the Lombards he was the lawful sovereign of that country, the Germans were still regarded as intruders and could only maintain their rights by force. The event which threw the greatest lustre upon this reign was the acquisition of the kingdom of Burgundy, or Arles, which was bequeathed to Conrad by its king, Rudolph III., the uncle of his wife, Gisela. Rudolph died in 1032, and in 1033 Conrad was crowned king at Peterlingen, being at once recognized by the German-speaking population. For about two years his rival, Odo, count of Champagne, who was supported by the Romance-speaking inhabitants, kept up the struggle against him, but eventually all opposition was overcome and the possession of Burgundy was assured to the German king.

Conrad in Italy.

This reign is important in the history of Germany because it marks the beginning of the great imperial age, but it has other features of interest. In dealing with the revolt of Ernest of Swabia Conrad was aided by the reluctance of the vassals of the great lords to follow them against the king. This reluctance was due largely to the increasing independence of this class of landholders, who were beginning to learn that the sovereign, and not their immediate lord, was the protector of their liberties; the independence in its turn arose from the growth of the principle of heredity. In Germany Conrad did not definitely decree that fiefs should pass from father to son, but he encouraged and took advantage of the tendency in this direction, a tendency which was, obviously, a serious blow at the power of the great lords over their vassals. In 1037 he issued from Milan his famous edict for the kingdom of Italy which decreed that upon the death of a landholder his fief should descend to his son, or grandson, and that no fiefholder should be deprived of his fief without the judgment of his peers. In another direction Conrad's policy was to free himself as king from dependence upon the church. He sought to regain lands granted to the church by his predecessors; prelates were employed on public business much less frequently than heretofore. He kept a firm hand over the church, but his rule was purely secular; he took little or no interest in ecclesiastical affairs. During this reign the centre and basis of the imperial power in Germany was moved southwards. Saxony, the home of the Ottos, became less prominent in German politics, while Bavaria and the south were gradually gaining in importance.

The nobles and the land.

Henry III., who had been crowned German king and also king of Burgundy during his father's lifetime, took possession of his great inheritance without the slightest sign of opposition in June 1039. He was without the impulsiveness which marred Conrad's great qualities, but he had the same decisive judgment, wide ambition and irresistible will as his father. During the late king's concluding years a certain Bretislaus, who had served Conrad with distinction in Lusatia, became duke of Bohemia and made war upon the disunited Poles, easily bringing them into subjection. Thus Germany was again threatened with the establishment of a great and independent Slavonic state upon her eastern frontier. To combat this danger Henry invaded Bohemia, and after two reverses compelled Bretislaus to appear before him as a suppliant at Regensburg. The German king treated his foe generously and was rewarded by receiving to the end of his reign the service of a loyal vassal; he also gained the goodwill of the Poles by helping to bring about the return of their duke, Casimir I., who willingly did homage for his land. The king of Denmark, too, acknowledged Henry as his feudal lord. Moreover, by several campaigns in Hungary the German king brought that country into the position of a fief of the German crown. This war was occasioned by the violence of the Hungarian usurper, Aba Samuel, and formed Henry's principal occupation from 1041 to 1045.

Henry III.

In Germany itself Henry acquired, during the first ten years of his rule, an authority which had been unknown since the days of Otto the Great. Early in his reign he had made a determined enemy of Godfrey the Bearded, duke of upper Lorraine, who, in 1044, conspired against him and who found powerful allies in Henry I., king of France, in the counts of Flanders and Holland, and in certain Burgundian nobles. However, Godfrey and his friends were easily worsted, and when the dispossessed duke again tried the fortune of war he found that the German king had detached Henry of France from his side and was also in alliance with the English king, Edward the Confessor. While thus maintaining his authority in the north-east corner of the country by alliances and expeditions, Henry was strong enough to put the laws in motion against the most powerful princes and to force them to keep the public peace. Under his severe but beneficent rule, Germany enjoyed a period of internal quiet such as she had probably never experienced before, but even Henry could not permanently divert from its course the main political tendency of the age, the desire of the great feudal lords for independence.

Henry's internal policy.

Cowed, but unpacified and discontented, the princes awaited their opportunity, while the king played into their hands by allowing the southern duchies, Swabia, Bavaria and Carinthia, to pass from under his own immediate control. His position was becoming gradually weaker when in 1051 he invaded Hungary, where a reaction against German influence was taking place. After a second campaign in 1052 the Hungarian king, Andrew, was compelled to make peace and to own himself the vassal of the German king. Meanwhile Saxony and Bavaria were permeated by the spirit of unrest, and Henry returned from Hungary just in time to frustrate a widespread conspiracy against him in southern Germany. Encouraged by the support of the German rebels, Andrew of Hungary repudiated the treaty of peace and the German supremacy in that country came to a sudden end. Among the causes which undermined Henry's strength was the fact that the mediate nobles, who had stood loyally by his father, Conrad, were not his friends; probably his wars made serious demands upon them, and his strict administration of justice, especially his insistence upon the maintenance of the public peace, was displeasing to them.

Henry's wars.

At the beginning of Henry's reign the church all over Europe was in a deplorable condition. Simony was universally practised and the morality of the clergy was very low. The Papacy, too, had sunk to a degraded condition and its authority was annihilated, not only by the character of successive popes, but by the fact that there were at the same time three claimants for the papal throne. Henry, a man of deep, sincere and even rigorous piety, regarded these evils with sorrow; he associated himself definitely with the movement for reform which proceeded from Cluny, and commanded his prelates to put an end to simony and other abuses. Then moving farther in the same direction he resolved to strike at the root of the evil by the exercise of his imperial authority. In 1046 he entered Italy at the head of an army which secured for him greater respect than had been given to any German ruler since Charlemagne, and at Sutri and in Rome he deposed the three rival popes. He then raised to the papal see Suidger, bishop of Bamberg, who, as Pope Clement II., crowned him emperor; after Clement three other German popes —Damasus II., Leo IX. and Victor II.—owed their elevation to Henry. Under these popes a new era began for the church, and in thus reforming the Papacy Henry III. fulfilled what was regarded as the noblest duty of his imperial office, but he also

Henry and the church.

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sharpened a weapon whose keen edge was first tried against his son.

The last years of Henry III. form a turning-point in German history. Great kings and emperors came after him, but none of them possessed the direct, absolute authority which he freely wielded; even in the case of the strongest the forms of feudalism more and more interposed themselves between the monarch and the nation, and at last the royal authority virtually disappeared. During this reign the towns entered upon an age of prosperity, and the Rhine and the Weser became great avenues of trade.

When Henry died in October 1056 the decline of the royal authority was accelerated by the fact that his successor was a child. Henry IV., who had been crowned king in 1054, was at first in charge of his mother, the empress Agnes, whose weak and inefficient rule was closely watched by Anno, archbishop of Cologne. In 1062, however, Anno and other prominent prelates and laymen, perhaps jealous of the influence exercised at court by Henry, bishop of Augsburg (d. 1063), managed by a clever trick to get possession of the king's person. Deserted by her friends Agnes retired, and forthwith Anno began to rule the state. But soon he was compelled to share his duties with Adalbert, archbishop of Bremen, and a year or two later Adalbert became virtually the ruler of Germany, leaving Anno to attend to affairs in Italy. Adalbert's rule was very successful. Compelling King Solomon to own Henry's supremacy he restored the influence of Germany in Hungary; in internal affairs he restrained the turbulence of the princes, but he made many enemies, especially in Saxony, and in 1066 Henry, who had just been declared of age, was compelled to dismiss him. The ambitious prelate, however, had gained great influence over Henry, who had grown up under the most diverse influences. The young king was generous and was endowed with considerable intellectual gifts; but passing as he did from Anno's gloomy palace at Cologne to Adalbert's residence in Bremen, where he was petted and flattered, he became wayward and wilful.

The minority of Henry IV.

Henry IV. assumed the duties of government soon after the fall of Adalbert and quickly made enemies of many of the chief princes, including Otto of Nordheim, the powerful duke of Bavaria, Rudolph, duke of Swabia, and Berthold of Zähringen, duke of Carinthia. In Saxony, where, like his father, he frequently held his court, he excited intense hostility by a series of injudicious proceedings. While the three Ottos were pursuing the shadow of imperial greatness in Italy, much of the crown land in this duchy had been seized by the nobles and was now held by their descendants. Henry IV. insisted on the restoration of these estates and encroached upon the rights of the peasants. Moreover, he built a number of forts which the people thought were intended for prisons; he filled the land with riotous and overbearing Swabians; he kept in prison Magnus, the heir to the duchy; and is said to have spoken of the Saxons in a tone of great contempt. All classes were thus combined against him, and when he ordered his forces to assemble for a campaign against the Poles the Saxons refused to join the host. In 1073 the universal discontent found expression in a great assembly at Wormesleben, in which the leading part was taken by Otto of Nordheim, by Werner, archbishop of Magdeburg, and by Burkhard II., bishop of Halberstadt. Under Otto's leadership the Thuringians joined the rising, which soon spread far and wide. Henry was surprised by a band of rebels in his fortress at the Harzburg; he fled to Hersfeld and appealed to the princes for support, but he could not compel them to aid him and they would grant him nothing. After tedious negotiations he was obliged to yield to the demands of his enemies, and peace was made at Gerstungen in 1074. Zealously carrying out the conditions of the peace, the peasants not only battered down the detested forts, they even destroyed the chapel at the Harzburg and committed other acts of desecration. These proceedings alarmed the princes, both spiritual and secular, and Henry, who had gained support from the cities of the Rhineland, was able to advance with a formidable army into Saxony in 1075. He gained a decisive victory, rebuilt the forts and completely restored the authority of the crown.

Henry's personal rule.

In 1073, while Germany was in this confused state, Hildebrand had become pope as Gregory VII., and in 1075 he issued his famous decree against the marriage of the clergy and against their investiture by laymen. To the latter decree it was impossible for any sovereign to submit, and in Germany there were stronger reasons than elsewhere for resistance. A large part of the land of the country was held by the clergy, and most of it had been granted to them because it was supposed that they would be the king's most efficient helpers. Were the feudal tie broken, the crown must soon vanish, and the constitution of medieval society undergo a radical change. Henry, who hitherto had treated the new pope with excessive respect, now announced his intention of going to Rome and assuming the imperial title. The pope, to whom the Saxons had been encouraged to complain, responded by sending back certain of Henry's messengers, with the command that the king should do penance for the crimes of which his subjects accused him. Enraged by this unexpected arrogance, Henry summoned a synod of German bishops to Worms in January 1076, and Hildebrand was declared deposed. The papal answer was a bull excommunicating the German king, dethroning him and liberating his subjects from their oath of allegiance.

Pope Gregory VII.

Never before had a pope ventured to take so bold a step. It was within the memory even of young men that a German king had dismissed three popes, and had raised in turn four of his own prelates to the Roman see. And now a pope attempted to drag from his throne the successor of this very sovereign. The effect of the bull was tremendous; no other was ever followed by equally important results. The princes had long been chafing under the royal power; they had shaken even so stern an autocrat as Henry III., and the authority of Henry IV. was already visibly weakened. At this important stage in their contest with the crown a mighty ally suddenly offered himself, and with indecent eagerness they hastened to associate themselves with him. Their vassals and subjects, appalled by the invisible powers wielded by the head of the church, supported them in their rebellion. The Saxons again rose in arms and Otto of Nordheim succeeded in uniting the North and South German supporters of the pope. Henry had looked for no such result as this; he did not understand the influences which lay beneath the surface and was horrified by his unexpected isolation. At a diet in Tribur he humbled himself before the princes, but in vain. They turned from him and decided that the pope should be asked to judge Henry; that if, within a year, the sentence of excommunication were not removed, the king should lose his crown; and that in the meantime he should live in retirement.

Effect of Henry's excommunication.

Next came the strange scene at Canossa which burned itself into the memory of Europe. For three days the representative of the Caesars entreated to be admitted into the pope's presence. No other mode of escape than complete subjection to Gregory had suggested itself, or was perhaps possible; but it did not save him. Although the pope forgave him, the German princes, resolved not to miss the chance which fortune had given them, met in March 1077, and deposed him, electing Rudolph, duke of Swabia, as his successor. But Henry's bitter humiliations transformed his character; they brought out all his latent capacities of manliness.

Scene at Canossa.

The war of investitures that followed was the opening of the tremendous struggle between the Empire and the Papacy, which is the central fact of medieval history and which, after two centuries of conflict, ended in the exhaustion of both powers. Its details belong more to the history of Italy than to that of Germany, where it took the form of a fight between two rival kings, but in Germany its effects were more deeply felt. The nation now plucked bitter fruit from the seed planted by Otto the Great in assuming the imperial crown and by a long line of kings and emperors in lavishing worldly power upon the church. In the

The struggle over investitures.

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ambition of the spiritual and the secular princes the pope had an immensely powerful engine of offence against the emperor, and without the slightest scruple this was turned to the best advantage.

When this struggle began it may be said in general that Henry was supported by the cities and the lower classes, while Rudolph relied upon the princes and the opponents of a united Germany; or, to make another division, Henry's strength lay in the duchies of Franconia and Bavaria, Rudolph's in Swabia and Saxony. In the Rhineland and in southern Germany the cities had been steadily growing in wealth and power, and they could not fail to realize that they had more to fear from the princes than from the crown. Hence when Henry returned to Germany in 1078 Worms, Spires and many other places opened their gates to him and contributed freely to his cause; nevertheless his troops were beaten in three encounters and Pope Gregory thundered anew against him in March 1080. However, the fortune of war soon turned, and in October 1080 Rudolph of Swabia was defeated and slain. Henry then carried the war into Italy; in 1084 he was crowned emperor in Rome by Wibert, archbishop of Ravenna, whom, as Clement III., he had set up as an anti-pope, and in 1085 Gregory died an exile from Rome. Meanwhile in Germany Henry's opponents had chosen Hermann, count of Luxemburg, king in succession to Rudolph of Swabia. Hermann, however, was not very successful, and when Henry returned to Germany in 1084 he found that his most doughty opponent, Otto of Nordheim, was dead, and that the anti-king had few friends outside Saxony. This duchy was soon reduced to obedience and was treated with consideration, and when the third anti-king, Egbert, margrave of Meissen, was murdered in 1090 there would have been peace if Germany had followed her own impulses.

Henry IV. and the anti-kings.

In the Papacy, however, Henry had an implacable foe; and again and again when he seemed on the point of a complete triumph the smouldering embers of revolt were kindled once more into flame. In Italy his son, Conrad, was stirred up against him and in 1093 was crowned king at Monza; then ten years later, when Germany was more peaceful than it had been for years and when the emperor's authority was generally acknowledged, his second son, Henry, afterwards the emperor Henry V., was induced to head a dangerous rebellion. The Saxons and the Thuringians were soon in arms, and they were joined by those warlike spirits of Germany to whom an age of peace brought no glory and an age of prosperity brought no gain. After some desultory fighting Henry IV. was taken prisoner and compelled to abdicate; he had, however, escaped and had renewed the contest when he died in August 1106.

Henry and the Papacy.

During this reign the first crusade took place, and the German king suffered severely from the pious zeal which it expressed and intensified. The movement was not in the end favourable to papal supremacy, but the early crusaders, and those who sympathized with them, regarded the enemies of the pope as the enemies of religion.

The First Crusade.

The early years of Henry V.'s reign were spent in campaigns in Flanders, Bohemia, Hungary and Poland, but the new king was soon reminded that the dispute over investitures was unsettled. Pope Paschal II. did not doubt, now that Henry IV. was dead, that he would speedily triumph; but he was soon undeceived. Henry V., who with unconscious irony had promised to treat the pope as a father, continued, like his predecessors, to invest prelates with the ring and the staff, and met the expostulations of Paschal by declaring that he would not surrender a right which had belonged to all former kings. Lengthened negotiations took place but they led to no satisfactory result, while the king's enemies in Germany, taking advantage of the deadlock, showed signs of revolt. One of the most ardent of these enemies was Lothair of Supplinburg, whom Henry himself had made duke of Saxony upon the extinction of the Billung family in 1106. Lothair was humbled in 1112, but he took advantage of the emperor's difficulties to rise again and again, the twin pillars of his strength being the Saxon hatred of the Franconian emperors and an informal alliance with the papal see. Henry's chief friends were his nephews, the two Hohenstaufen princes, Frederick and Conrad, to whose father Frederick the emperor Henry IV. had given the duchy of Swabia when its duke Rudolph became his rival. The younger Frederick succeeded to this duchy in 1105, while ten years later Conrad was made duke of Franconia, a country which for nearly a century had been under the immediate government of the crown. The two brothers were enthusiastic imperialists, and with persistent courage they upheld the cause of their sovereign during his two absences in Italy.

Henry V. in Germany.

At last, in September 1122, the investiture question was settled by the concordat of Worms. By this compromise, which exhaustion forced upon both parties, the right of electing prelates was granted to the clergy, and the emperor surrendered the privilege of investing them with the ring and the staff. On the other hand it was arranged that these elections should take place in the presence of the emperor or his representative, and that he should invest the new prelate with the sceptre, thus signifying that the bishop, or abbot, held his temporal fiefs from him and not from the pope. In Germany the victory remained with the emperor, but it was by no means decisive. The Papacy was far from realizing Hildebrand's great schemes; yet in regard to the question in dispute it gained solid advantage, and its general authority was incomparably more important than it had been half a century before. During this period it had waged war upon the emperor himself. Instead of acknowledging its inferiority as in former times it had claimed to be the higher power; it had even attempted to dispose of the imperial crown as if the Empire were a papal fief; and it had found out that it could at any time tamper, and perhaps paralyse, the imperial authority by exciting internal strife in Germany. Having thus settled this momentous dispute Henry spent his later years in restoring order in Germany, and in planning to assist his father-in-law, Henry I. of England, in France. During this reign under the lead of Otto, bishop of Bamberg (*c.* 1063–1139), Pomerania began to come under the influence of Germany and of Christianity.

The concordat of Worms.

The Franconian dynasty died out with Henry V. in May 1125, and after a protracted contest Lothair, duke of Saxony, the candidate of the clergy, was chosen in the following August to succeed him. The new king's first enterprise was a disastrous campaign in Bohemia, but before this occurrence he had aroused the enmity of the Hohenstaufen princes by demanding that they should surrender certain lands which had formerly been the property of the crown. Lothair's rebuff in Bohemia stiffened the backs of Frederick and Conrad, and in order to contend with them the king secured a powerful ally by marrying his daughter Gertrude to Henry the Proud, a grandson of Welf, whom Henry IV. had made duke of Bavaria, a duchy to which Henry himself had succeeded in 1126. Henry was perhaps the most powerful of the king's subjects, nevertheless the dukes of Swabia and Franconia withstood him, and a long war desolated South Germany. This was ended by the submission of Frederick in 1134 and of Conrad in the following year. Lothair's position, which before 1130 was very weak, had gradually become stronger. He had put down the disorder in Bavaria, in Saxony and in Lorraine; a diet held at Magdeburg in 1135 was attended by representatives from the vassal states of Denmark, Hungary, Bohemia and Poland; and in 1136, when he visited Italy for the second time, Germany was in a very peaceful condition. In June 1133 during the king's first visit to Italy he had received from Pope Innocent II. the imperial crown and also the investiture of the extensive territories left by Matilda, marchioness of Tuscany; and at this time the pope seems to have claimed the emperor as his vassal, a statement to this effect (*post homo fit papae, sumit quo dante coronam*) being inscribed in the audience hall of the Lateran at Rome.

The reign of Lothair the Saxon.

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Nothing could indicate more clearly than this fact how much of their old power the German kings had lost. It was not past hope that even yet some of their former splendour might be restored, and for a brief period monarchy did again stand high. Still, its foundations were sapped. Incessant war, both at home and in Italy, had deprived it of its force; it had lost moral influence by humiliations, of which the scene at Canossa was an extreme type. Steadily, with unwearied energy, letting no opportunity escape, the princes had advanced towards independence, and they might well look forward to such a bearing in regard to the kings as the kings had formerly adopted in regard to them.

Decay of the royal power.

Henry the Proud was confident that he would succeed Lothair, who had died on his return from Italy in December 1137; but, by a hasty and irregular election, Conrad of Hohenstaufen, duke of Franconia, was chosen king in March 1138. Henry the Proud rebelled and was declared to have forfeited his two duchies, Saxony and Bavaria, the former being given to Albert the Bear, margrave of Brandenburg, and the latter to Leopold IV., margrave of Austria. Henry defended his rights with vigour and once again Germany was ravaged by war, for although he was unpopular in Bavaria he was strongly supported by the Saxons, who, since the time of Henry IV., had always been ready to join in an attack on the monarchy, and he had little difficulty in driving Albert the Bear from the land. However, in October 1139 Henry died suddenly, but his young son, Henry the Lion, was recognized at once as duke of Saxony, while his brother, Welf, upheld the fortunes of his house in Bavaria. The struggle went on until May 1142, when peace was made at Frankfort. Saxony, with the assent of Albert the Bear, was granted by Conrad to Henry the Lion, and Bavaria was given to Henry Jasomirgott, who had just succeeded his brother Leopold as margrave of Austria. But this was only a lull in the civil strife, which was renewed after the king had made a successful expedition into Bohemia. The princes clerical and lay were fighting against each other, and the Bavarians were at war with the Hungarians, who gained a great victory in 1146. Notwithstanding the many sources of confusion Conrad was persuaded by the passionate eloquence of Bernard of Clairvaux to take part in the second crusade; he left for the East in 1147 and returned to Germany in 1149, to find Welf again in arms and Henry the Lion claiming Bavaria. The king had done nothing to stem the rising tide of disorder when he died at Bamberg in February 1152. During this reign the work of conquering and Germanizing the Slavonic tribes east of the Elbe was seriously taken in hand under the lead of Albert the Bear and Henry the Lion, and the foundation of the margraviate of Brandenburg by Albert tended to make life and property more secure in the north-east of Germany.

Conrad III.

After Conrad's death Germany passed under the rule of one of the greatest of her sovereigns, Frederick I., called Barbarossa, nephew of the late king and son of Frederick, that duke of Swabia who had fought along with Conrad against Henry the Proud. Frederick himself had also been closely associated with Conrad, who advised the princes to choose his nephew as his successor. This was done, and the new king was crowned at Aix-la-Chapelle in March 1152. Allied through his mother to the Welfs of Bavaria, and anxious to put an end to the unrest which dominated Germany, especially to the strife between the families of Welf and Hohenstaufen, Frederick began his reign by promising to secure for Henry the Lion the duchy of Bavaria, and by appeasing Henry's uncle, Count Welf, by making him duke of Spoleto and margrave of Tuscany. But the new king had another, and perhaps a more potent, reason for wishing to see peace restored in Germany. For his adventurous and imaginative spirit Italy and the imperial title had an irresistible charm, and in 1154, two years after he had ascended the throne, he crossed the Alps, being crowned emperor at Rome in June 1155. After this event the best years of his life were spent in Italy, where, in his long and obstinate struggle with the Lombard cities and with Pope Alexander III., he chiefly acquired his fame. Although on the emperor's side this struggle was conducted mainly with German troops it falls properly under the history of Italy. In that country the record of this reign is a blood-stained page, while in the history of Germany, on the contrary, Frederick's name is associated with a peaceful and prosperous period.

Frederick I. becomes king.

The promise that Bavaria should be granted to Henry the Lion was not easily fulfilled, as Henry Jasomirgott refused to give up the duchy. At last, however, in 1156, after his return from his first expedition to Italy, Frederick reconciled the latter prince by making Austria into a duchy with certain special privileges, an important step in the process by which that country became the centre of a powerful state. Henry Jasomirgott then renounced Bavaria, and Henry the Lion became its duke. It was, however, in his other duchy of Saxony that the latter duke's most important work was done. Although he often gave offence by his haughty and aggressive disposition, few German princes have earned so thoroughly the goodwill of posterity. Since the death of Otto the Great the Slavonic lands to the east of the Elbe had been very imperfectly held in subjection by the Germans. Devoting himself to the conquest of the lands lying along the shore of the Baltic, Henry succeeded as no one before him had ever done. But he was not only a conqueror. He built towns and encouraged those which already existed; he founded and restored bishopries in his new territories; and between the Elbe and the Oder he planted bodies of industrious colonists. While he was thus at work a similar task was being performed to the south-east of Saxony by Albert the Bear, the first margrave of Brandenburg, who, by his energetic rule was preparing this country for its great destinies.

Bavaria and Saxony.

Early in his reign, by settling a dispute over the crown of Denmark, Frederick brought the king of that country once more into the position of a German vassal. Having spent the year 1156 in settling the Bavarian question and in enforcing order in the Rhineland and elsewhere, the emperor marched into Poland in 1157, compelled its ruler, Boleslaus IV., to do the homage which he had previously refused to perform, and in return for services rendered during the campaign and for promises of future aid, raised the duke of Bohemia to the rank of a king, a change which in no way affected his duties to the German crown, but which gave him a certain precedence over other vassal princes. The king of Hungary, too, although no attempt was made to subdue him, became a useful ally. Thus the fame of Germany in the neighbouring countries, which had been nearly destroyed during the confusion of Henry IV.'s reign, was to a large extent restored. Frederick asserted his authority in Burgundy or, as it was sometimes called, Franche Comté. In Germany itself internal order was established by a strict appliance of the existing laws against those who broke the peace, fresh orders for its observance were issued, and in Frederick the robber nobles found a most implacable enemy. The cities, too, flourished during this reign. The emperor attached them to himself by granting to many of them the very liberties which, by a strained interpretation of his imperial rights, he withheld from the cities of Lombardy. Yet, notwithstanding his policy, in these directions the German nobles appear to have been enthusiastically devoted to Frederick. Time after time they followed him to Italy, enduring serious losses and hardships in order that he might enforce claims which were of no advantage to them, and which, previously, had been a curse to their nation. Their loyalty is well illustrated by the famous scene at Besançon in October 1157. During a meeting of the diet a papal legate read a letter from Pope Adrian IV., which seemed to imply that the Empire was a papal fief. Indignant murmurs rose from the assembled nobles, and the life of the legate was only saved from their fury by the intervention of the emperor himself. The secret of Frederick's great popularity was partly the national pride excited by his foreign achievements, partly the ascendance over other minds which his genius gave him, and partly the conviction that while he would forego none of his rights he would demand from his vassals nothing more than was sanctioned by the laws of the Empire.

Frederick in Poland and Germany.

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Having suppressed a rising at Mainz Frederick set out in the autumn of 1163 for Italy, which country was now distracted by a papal schism. This incident was bound to affect German politics. After the death of Adrian IV. in 1159 the imperial party put forward an anti-pope, Victor IV., against Alexander III., who had been canonically elected. The emperor made stupendous efforts to secure for Victor and then for his successor, Paschal III., recognition by the sovereigns of Europe, but in vain; and almost the only support which the anti-pope received came from the German clergy. In May 1165 Frederick held a diet at Würzburg, where the princes lay and clerical swore to be faithful to Paschal and never to recognize Alexander. But Alexander soon found partisans among the German clergy, hitherto the most loyal of the emperor's friends; and Frederick retaliated by driving the offending prelates from their sees, a proceeding which tended to disturb the peace of the land. Then in August 1167, in the midst of the struggle in Italy, came the pestilence which destroyed the imperial army in Rome, and drove the emperor as a fugitive across the Alps. After this humiliation Frederick remained for six years in Germany. He was fully occupied in restoring order in Saxony, in the diocese of Salzburg and elsewhere; in adding to his hereditary lands; in negotiating for a better understanding with France and England; and in reminding the vassal states, Hungary, Poland and Bohemia, of their duties towards the Empire. The success with which he carried out this work shows clearly that, in Germany at least, the disaster at Rome had not seriously affected his prestige. Again in Italy in 1174 the contest with the Papacy was abruptly ended by Frederick's overwhelming defeat at Legnano in May 1176, and by the treaty of Venice made about a year later with Alexander III.

Frederick and Alexander III.

In the later years of his reign the emperor's chief enemy was Henry the Lion. Rendered arrogant by success and confident that his interests were in northern, and not in southern Europe, the Saxon duke refused to assist Frederick in the campaign which ended so disastrously at Legnano. Ascribing his defeat to Henry's defection, Frederick returned to Germany full of anger against the Saxon duke and firmly resolved to punish him. The immediate cause of Henry's downfall, however, was not his failure to appear in Italy, but his refusal to restore some lands to the bishop of Halberstadt, and it was on this charge that he was summoned before the diet. Three times he refused to appear, and early in 1180 sentence was pronounced against him; he was condemned to lose all his lands and to go into banishment. For some time he resisted, but at length the emperor in person marched against him and he was forced to submit; the only favour he could secure when peace was made at Erfurt in November 1181 was permission to retain Brunswick and Lüneburg, which have remained in the possession of his descendants until our own day. Bavaria was granted to Otto of Wittelsbach, but it lost some of its importance because Styria was taken from it and made into a separate duchy. The extensive duchy of Saxony was completely dismembered. The name was taken by the small portion of the former duchy which was given to Bernard, son of Albert the Bear, the founder of a new Saxon line, and the extensive western part was added to the archbishopric of Cologne. The chief prelates of Saxony and many of the late duke's most important feudatories were made virtually independent of all control save that of the crown. Frederick's object in thus breaking up the two greatest duchies in his kingdom was doubtless to strengthen the imperial authority. But in reality he made it certain that the princes would one day shake off the imperial power altogether; for it was perhaps more difficult for the sovereign to contend with scores of petty nobles than with two or three great princes.

Frederick and Henry the Lion.

Less serious than the struggle with Henry the Lion was Frederick's struggle with Philip of Heinsberg, archbishop of Cologne (d. 1191), on whom he had just conferred a great part of Saxony. When the emperor went to Italy in 1184 he left the government of Germany to his son Henry, afterwards the emperor Henry VI., who had been crowned German king in 1169. On all sides, but especially in the north-west, Henry was faced with incipient revolution, and while he was combating this the quarrel between Frederick and the Papacy broke out again in Italy. At this juncture Philip of Cologne united the German and the Italian oppositions. Several princes rallied to his standard and foreign powers promised aid, but although very formidable in appearance the combination had no vestige of popular support. The greater part of the German clergy again proved their loyalty to Frederick, who hurried to Germany only to see the opposition vanish before him. In March 1188 Philip of Cologne submitted at Mainz.

Frederick and Philip of Heinsberg.

Germany was now at peace. With the accession of Gregory VIII. pope and emperor were reconciled, and by the marriage of his son Henry with Constance, daughter of Roger I., king of Sicily, the emperor had reason to hope that the Empire would soon include Naples and Sicily. Resolving that the sunset of his life should be even more splendid than its dawn he decided to go on crusade, and in 1189 he started with a great army for the Holy Land. When the news reached Germany that he had been drowned, an event which took place in Cilicia in June 1190, men felt that evil days were coming upon the country, for the elements of discord would no longer be controlled by the strong hand of the great emperor.

Frederick's death.

Evil days did not, however, come in the time of Henry VI., who, although without his father's greatness, had some of his determination and energy, and was at least his equal in ambition. Having in 1190 reduced Henry the Lion once more to submission, the new king set out to take possession of his Sicilian kingdom, being on the way crowned emperor at Rome. At the end of 1191 he returned to Germany, where he was soon faced by two serious risings. The first of these centred round the restless and unruly Welfs; after a time these insurgents were joined by their former enemies, the rulers of Saxony, of Thuringia and of Meissen, who were angered by Henry's conduct. The Welfs also gained the assistance of Canute VI., king of Denmark. Equally dangerous was a rebellion in the Lower Rhineland, where the emperor made many foes by appointing, regardless of their fitness, his own candidates to vacant bishoprics. At Liége this led to serious complications; and when Bishop Albert, who had been chosen against Henry's wish, was murdered at Reims in November 1192, the emperor was openly accused of having instigated the crime. At once the rulers of Brabant, of Limburg and of Flanders, with the archbishops of Cologne and Trier, were in arms. In the east of Germany Ottakar I. of Bohemia joined the circle of Henry's enemies, and the southern duchies, Bavaria, Swabia and Austria, were too much occupied with internal quarrels to send help to the harassed emperor. But formidable as were these risings they were crushed, although not entirely by force of arms. In 1193 Richard I. of England passed as a prisoner into Henry's keeping, and with rare skill the emperor used him as a means of compelling his enemies to come to terms. Henry the Lion was the last to submit. He made his peace in 1194, when his son Henry was promised the succession to the Rhenish Palatinate. Returning from another visit to Sicily, the emperor was now so powerful that, in pursuance of his plan for making himself the head of a great world monarchy, he put forward the suggestion that the imperial crown should be declared hereditary in his family. This proposal aroused much opposition, but Henry persisted with it; he promised important concessions to the princes, many of whom were induced to consent, and but for his sudden death, which occurred in Sicily in September 1197, it is probable that he would have attained his end.

Henry VI.

Great as was Henry's authority many of the princes, chief among them being Adolph, archbishop of Cologne (d. 1220), refused to recognize his son, Frederick, who had been chosen king of the Romans in 1196. This attitude was possibly owing to the fact that Frederick was young and inexperienced; it was, however, more probably due to a revival of the fear that the German princes would be entangled in Italian politics. For a time Adolph and his friends, who were mainly princes of the Rhineland,

Philip of Swabia and Otto of Brunswick.

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sought in vain for a new king. While they were thus employed the friends of the house of Hohenstaufen, convinced that Frederick's kingship was not possible, chose the late emperor's brother, Philip, duke of Swabia, to fill the vacant throne; soon afterwards the enemies of the house found a candidate in the person of Henry the Lion's son, Otto of Brunswick, who was also chosen German king. Thus the struggle between Welf and Hohenstaufen was renewed and civil war broke out at once. Philip's supporters were the nobles of southern and eastern Germany, while a few cities in the west owned his authority; Otto's friends were found mainly in the north and the north-west of the country. The number of available warriors was increased by the return of many crusaders, among them being the famous soldier, Henry von Kalden, who was mainly responsible for the success of Philip's cause in 1199. If Germany had been unconnected with the Papacy, or even if the Papacy had been as weak as in the days of Henry VI., the issue of the strife would almost certainly have been an early victory for Philip. A majority of the princes were on his side and the French king Philip Augustus was his ally, while his personal character commanded general respect. Otto, whose chief supporter outside Germany was his uncle Richard I. of England, on the other hand was a harsh and violent man. But unfortunately for Germany the papal chair at this time was occupied by Innocent III., a pope who emulated Hildebrand in ambition and in statesmanship. At first vacillating, but by no means indifferent, Innocent was spurred to action when a number of princes met at Spires in May 1200, declared Philip to be the lawful king, and denied the right of the pope to interfere. He was also annoyed by Philip's attitude with regard to a vacancy in the archbishopric of Cologne, and in March 1201 he declared definitely for Otto. The efforts of the pope helped to rekindle the expiring flames of war, and for a year or two success completely deserted Philip. He lost the support of Ottakar of Bohemia and of Hermann I., landgrave of Thuringia; he was driven from North Germany into Swabia and Otto's triumph seemed assured. From 1204 onwards, however, fortune again veered round, and Philip's prospects began to improve. Deserted by Ottakar and even by Adolph of Cologne and his own brother Henry, count palatine of the Rhine, Otto was forced to take refuge in Brunswick, his last line of defence, and was only saved by Philip's murder, which occurred at Bamberg in June 1208. A feature of this struggle was the reckless way in which the rival kings gave away the property of the crown in order to gain adherents, thus enriching the princes and weakening the central government.

Otto was now again chosen German king, and to aid and mark the general reconciliation he was betrothed to the murdered king's daughter Beatrix. Nearly all the princes acknowledged him, and as pope and king were at peace, Germany enjoyed a period of comparative quiet. This however, did not last long. Having secured his coronation at Rome in October 1209, Otto repudiated the many pledges he had made to Innocent and began to act in defiance of the papal wishes. To punish him the pope put forward his own ward, Henry VI.'s son Frederick, who was living in Sicily, as a rival king. While Otto was warring in Italy a number of influential princes met at Nuremberg, at the instigation of Innocent and of his ally Philip Augustus of France, and invited Frederick to come to Germany. Otto then left Italy hurriedly, but he was quickly followed by his young rival, who in the warfare which had already broken out proved himself a formidable opponent. Seeking to mend his failing fortunes, the Welf went to France to support his ally, the English king John, against Philip Augustus, and at the battle of Bouvines (July 27, 1214) memorable in the history alike of Germany, of England and of France, his fate was sealed, although until his death in May 1218 he maintained a desultory warfare against Frederick.

Otto IV. becomes sole king.

Frederick II. was, if not the strongest, certainly the most brilliant of German kings. With the medieval passion for adventure he combined the intellectual culture and freedom of a modern gentleman. A lover of poetry, of art and of science, he was also a great statesman; he knew how to adapt his policy to changing circumstances and how to move men by appealing at one time to their selfishness and weakness and at another time to the nobler qualities of human nature. For outward splendour his position was never surpassed, and before he died he possessed six crowns, those of the Empire, Germany, Sicily, Lombardy, Burgundy and Jerusalem. But Germany profited neither by his gifts nor by his prestige. After Bouvines he purchased the assistance of Valdemar II., king of Denmark, by ceding to him a large stretch of land along the Baltic coast; and, promising to go on crusade, he secured his coronation at Aix-la-Chapelle in July 1215. Then being generally recognized as king he was able to do something to quell disturbances in various parts of the country, and, in April 1220, to bring about the election of his young son Henry as king of the Romans. But for this favour he had been compelled to pay a high price. Seven years before, at Eger in July 1213, he had made extensive concessions to the church, undertaking to take no part in episcopal elections, thus surrendering the advantages gained by the concordat of Worms, and to allow to German bishops the right of appeal to Rome. Proceeding a step farther in the same direction, he now promised to erect no new toll-centre, or mint, on the lands of the spiritual princes, and to allow no towns to be built thereon. Thus the prelates possessed nearly all the rights of sovereigns, and regarded the pope in Italy and not the king in Germany as their head, a state of affairs which was fatal to the unity, nay, even to the existence of the Empire.

Frederick II.

Having made peace with Henry, count palatine of the Rhine and brother of Otto IV., and settled a dispute about the lands of the extinct family of Zähringen in the south-west of the country, Frederick left Germany in August 1220; engaged in his bitter contest with the Papacy and the Lombard cities, in ruling Sicily, and, after several real or imaginary delays, in fulfilling his crusading vow, he did not return to it for fifteen years. During this period he was represented by his son Henry, in whose name the government of Germany was carried on by the regent Engelbert, archbishop of Cologne. While Engelbert lived the country was in a fairly peaceable condition, although, thanks to the emperor's concessions, the spiritual princes were predominant, and all possible means were taken to check the growth of the towns, whose interests and aspirations were not favourable to this state of affairs. There was, moreover, a struggle between Valdemar of Denmark and some neighbouring German nobles. But after Engelbert's murder (November 1225) there was a change for the worse, and the only success which can be placed to the credit of the German arms during the next few years was the regaining of the lands ceded to Denmark in 1215, lands which included the cities of Hamburg and Lübeck. Under the rule of the new regent, Louis I., duke of Bavaria, confusion reigned supreme, and civil war prevailed in nearly every part of the country.

Germany in Frederick's absence.

After the treaty of San Germano, which was made with Pope Gregory in 1230, and the consequent lull in the struggle with the Papacy, Frederick was able to devote some little attention to Germany, and in 1231 he sanctioned the great Privilege of Worms. This was a reward to the princes for their efforts in bringing about the peace, and an extension of the concessions made in 1220. The princes, now for the first time referred to officially as *domini terrae*, were given full rights of jurisdiction over their lands and all the inferior officers of justice were made subservient to them. Practically they became independent sovereigns, and to make their victory more complete serious restraints were laid upon the freedom of the towns. Before this date King Henry had begun to take a personal part in the government and was already involved in a quarrel with Otto II., duke of Bavaria. He disliked the Privilege of Worms and, favouring the towns against the princes, his policy was diametrically opposed to that of the emperor; however, in 1232 he went to Italy and promised to

Rebellion of King Henry.

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obey his father's commands. But in 1234, at a time of great and increasing disorder in Germany, he rebelled; he appealed publicly to the princes for support, gained some followers, especially in his own duchy of Swabia, and made an alliance with the Lombard cities. Confident of his strength Frederick entered Germany with a few attendants in the middle of 1235, and his presence had the anticipated effect of quelling the insurrection; Henry was sent a prisoner to Italy and disappeared from history. Then, in August 1235, amid surroundings of great splendour, the emperor held a diet at Mainz, which was attended by a large number of princes. This diet is very important in the legal history of Germany, because here was issued that great "land peace" (*Landfrieden*) which became the model for all subsequent enactments of the kind. By it private war was declared unlawful, except in cases where justice could not be obtained; a chief justiciar was appointed for the Empire; all tolls and mints erected since the death of Henry VI. were to be removed; and other provisions dealt with the maintenance of order.

Frederick in Germany.

In 1236, during another short stay in Germany, Frederick in person led the imperial army against Frederick II., duke of Austria, who had defied and overcome his representatives; having taken possession of Vienna and the Austrian duchies he there secured the election of his son Conrad, who had already succeeded his brother as duke of Swabia, as king of the Romans (May 1237). But in spite of these imposing displays of power the princes looked with suspicion upon an emperor who was almost a stranger to their country and who was believed to be a renegade from their faith, and soon after Frederick's return to Italy the gulf between him and his German subjects was widened by his indifference to a great danger which threatened them. This came from the Mongols who ravaged the eastern frontiers of the country, but the peril was warded off by the efforts of Henry II., duke of Silesia, who lost his life in a fight against these foes near Liegnitz in April 1241, and of Wenceslaus I., king of Bohemia.

Frederick and the pope.

The emperor's attitude with regard to the Mongol invasion is explained by events in Italy where Frederick was engaged in a new and, if possible, a more virulent struggle with the Lombard cities and with Gregory IX. As usual, the course of politics in Germany, which at this time was ruled by King Conrad and by the regent Siegfried, archbishop of Mainz (d. 1249), was influenced by this quarrel. Frederick of Austria had allied himself with Wenceslaus of Bohemia, and spurred on by the papal emissary had tried to set up a rival king; but both the Danish and the French princes who were asked to accept this thankless position declined the invitation, and Frederick and Wenceslaus made their peace, the former receiving back his duchies. After the defeat of the Mongols, however, there was again the danger of a rebellion based upon a union between the princes and the pope. Siegfried of Mainz deserted his master, and visiting Germany in 1242 Frederick found it necessary to purchase the support of the towns by a grant of extensive privileges; but, although this had the desired effect, Conrad could make but little headway against the increasing number of his enemies. At last the Papacy found an anti-king. Having declared Frederick deposed at the council of Lyons in 1245, Gregory's successor, Innocent IV., induced a number of princes to choose as their king the landgrave of Thuringia, Henry Raspe, who had served as regent of Germany. This happened in May 1246, and the conduct of the struggle against the *Pfaffenkönig*, as Henry was called, was left to Conrad, who was aided by the Bavarians, until February 1247, when the anti-king died. The papal party then elected William II., count of Holland, as Henry Raspe's successor, and during the state of anarchy which now prevailed in Germany the emperor died in Italy in December 1250.

Conrad IV.

Upon his father's death Conrad IV. was acknowledged by many as king in Germany, but in 1251 he went to Italy, where he was fully occupied in fighting against the enemies of his house until his death in May 1254. The struggle to maintain the position of the Hohenstaufen in Italy was continued after this event; but in October 1268, by the execution of Conrad's son Conradin, the family became extinct.

The Interregnum.

After Conrad's death William of Holland received a certain allegiance, especially in the north of the country, and was recognized by the Rhenish cities which had just formed a league for mutual protection, a league which for a short time gave promise of great strength and usefulness. In January 1256, however, William was killed, and in the following year there was a double election for the German crown, Alphonso X., king of Castile, a grandson of Philip of Swabia, and Richard, earl of Cornwall, brother of the English king Henry III., being each chosen by parties of electors. Richard was crowned in May 1257, but the majority of his subjects were probably ignorant of his very name; Alphonso did not even visit the country over which he claimed to rule.

The Teutonic Order in Prussia.

During the reign of Frederick II. Prussia was conquered for Christianity and civilization by the knights of the Teutonic Order, who here built up the state which was later, in association with Brandenburg, deeply to influence the course of history. This work was begun in 1230. Knights eager to win fame by engaging in the war against the heathen Prussians flocked hither from all lands; towns, Königsberg, Thorn, Kulm and others, were founded; and in alliance with the Brothers of the Sword, the order was soon pressing farther eastwards. Courland and Livonia were brought into subjection, and into these lands also Christian institutions were introduced and German settlers brought the arts of peace.

Period of Hohenstaufen dynasty.

The age of the Hohenstaufen emperors is, in many respects, the most interesting in the medieval history of Germany. It was a period of great men and great ideas, of dramatic contrasts of character and opinion—on the one side a broad humanitarianism combined with a gay enjoyment of the world, on the other side an almost superhuman spirituality which sought its ideal in the rejection of all that the world could give. It saw the new-birth of poetry and of art; it witnessed the rise of the friars. The contest between Empire and Papacy was more than a mere struggle for supremacy between two world-powers; it was a war to the death between two fundamentally opposite conceptions of life, which in many respects anticipated and prepared the way for the Renaissance and the Reformation. The emperor Frederick II. himself stands out as the type of the one tendency; Innocent III., Francis of Assisi and Dominic, in their various degrees, are types of the other. Frederick himself, of course, was Italian rather than German, akin to the despots of the Renaissance in his many-sided culture, his tolerant scepticism and his policy of "cruelty well applied." The culture of which he was the supreme representative, that of Italy and of Provence, took a more serious shade when it penetrated into Germany. The German *Minnesinger* and romance-writers, whose golden age corresponded with that of the Hohenstaufen, were not content only to sing the joy of life or the chivalrous virtues of courage, courtesy and reverence for women; they in some sort anticipated the underlying ideas of the Reformation by championing the claims of the German nation against the papal monarchy and pure religion, as they conceived it, against the arrogance and corruption of the clergy. In them the medieval lay point of view became articulate, finding perhaps its most remarkable expression in the ideas of religious toleration proclaimed by Walther von der Vogelweide and Wolfram von Eschenbach. In Germany, as elsewhere, the victory of the Papacy was the victory of obscurantism. German culture, after a short revival, perished once more amid the smoke of the fires kindled by Conrad of Marburg and his fellow inquisitors.

In architecture, as in literature, this period was also one of great achievement in Germany. Of the noble palaces which it produced the castle of the Wartburg (*q.v.*) remains a perfect specimen, while the many magnificent churches dating from this time that still survive, prove the taste, wealth and piety

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of the burghers. For the science of government, too, much was done, partly by the introduction from Italy of the study of Roman law, partly by the collection of native customs in the *Sachsenspiegel* compiled by Eike von Repgow early in the 13th century, and the less valuable *Deutschenspiegel* and *Schwabenspiegel*. Altogether, Germany has seen no more fascinating epoch, none more full of life, movement and colour.

Political character of Germany settled.

Yet it was in this age that the German nation utterly lost its political strength. Even after Lothair the Saxon, a line of sovereigns rigidly confining themselves to their own kingdom might have mastered the many influences which were making for disunion. But the Hohenstaufen family, like their Saxon and Franconian predecessors, would be content with nothing short of universal dominion; and thus the crown which had once been significant of power and splendour gradually sank into contempt. Under the strong rule of Frederick Barbarossa and his son this process was temporarily stopped, but only to advance more rapidly when they were gone. During the confusion of the civil war carried on by Otto IV. and Philip, the princes, being subject to hardly any check, freely obtained crown lands and crown rights, and the mischief was too extensive to be undone by Frederick II. In 1220, in order to secure the adhesion of the church to his son Henry, he formally confirmed the spiritual princes in their usurpations; seven years later at Worms still more extensive advantages were granted to the princes, both spiritual and secular, and these formal concessions formed the lawful basis of the independence of the princely class. Such authority as the emperor reserved for himself he could exercise but feebly from a distant land in which his energies were otherwise occupied. His immediate successors can hardly be said to have exercised any authority whatever; and they lost hold of the border countries which had hitherto been dependent upon or connected with Germany. Thenceforth Denmark and Poland rendered no homage to the German crown, and Burgundy was gradually absorbed by France.

Classes of the population.

The country was not now divided into a few duchies which, with skilful management, might still in times of emergency have been made to act together. The age of the great duchies was past. As we have seen, Bavaria was shorn of extensive lands, over which new dukes were placed, and the duchy of Saxony was altogether broken up. Swabia and Franconia ceased to have dukes, and Lorraine gave place to the duchy of Brabant and other smaller states. Thus there were archbishops, bishops, abbots, dukes, margraves, landgraves, counts—forming together a large body—each of whom claimed to have no superior save the emperor, whose authority they and their predecessors had slowly destroyed. All immediate nobles were not princes; but even petty knights or barons, who possessed little more than the rude towers from which they descended upon passing travellers, if their only lord was the emperor, recognized no law save their own will. Another independent element of the state was composed of the imperial cities. So long as the emperor really reigned, they enjoyed only such liberties as they could wring from him, or as he voluntarily conferred. But when the sovereign's power decayed, the imperial cities were really free republics, governing themselves according to their own ideas of law and justice (see COMMUNE). Besides the imperial cities, and the princes and other immediate nobles, there were the mediate nobles, the men who held land in fief of the highest classes of the aristocracy, and who, in virtue of this feudal relation, looked down upon the allodial proprietors or freemen, and upon the burghers. There were also mediate towns, acknowledging the supremacy of some lord other than the sovereign. Beneath all these, forming the mass of the agricultural population, were the peasantry and the serfs, the latter attached to the land, the former ground down by heavy taxes. There was another class, large and increasing in number, which was drawn from various sections of society. This was composed of men who, being without land, attached themselves to the emperor or to some powerful noble; they performed services, generally of a military nature, for their lord, and were called *Dienstmannen* (*ministeriales*). They were often transformed into "free knights" by the grant of a fief, and the class ultimately became absorbed in that of the knights.

The electors.

The period from the death of Conrad IV. to the election of Rudolph of Habsburg in 1273 is generally called the Great Interregnum, and it was used by the princes to extend their territories and to increase their authority. On several occasions it had seemed as if the German crown would become hereditary, but it had been kept elective by a variety of causes, among them being the jealousy of the Papacy and the growing strength of the aristocracy. In theory the election of each king needed the sanction of the whole of the immediate nobles, but in practice the right to choose the king had passed into the hands of a small but varying number of the leading princes. During the 13th century several attempts were made to enumerate these princes, and at the contested election of 1257 seven of them took part. This was the real beginning of the electoral college whose members at this time were the archbishops of Mainz, Cologne and Trier, the duke of Saxony, the duke of Bavaria, who was also count palatine of the Rhine, the margrave of Brandenburg and the king of Bohemia. After this event the electors became a distinct element in the state. They were important because they could maintain the impotence of the crown to check disorder by imposing conditions upon candidates for the throne, and by taking care that no prince powerful enough to be dangerous to themselves should be elected to this position.

Divisions of the princely lands.

Until the time of the interregnum the territories of a prince were rarely divided among his descendants, the reason being that, although the private fiefs of the nobles were hereditary, their offices—margrave, count and the like —were in theory at the disposal of the king. There was now a tendency to set this principle aside. Otto II., duke of Bavaria, a member of the Wittelsbach family, had become by marriage ruler of the Rhenish Palatinate, and after his death these extensive lands were ruled in common by his two sons; but in 1255 a formal division took place and the powerful family of Wittelsbach was divided into two branches. About the same time the small duchy of Saxony was divided into two duchies, those of Wittenberg and Lauenburg, the former to the south and the latter to the north of the great mark of Brandenburg, and there were similar divisions in the less important states. It was thus practically settled that the offices and territories, as well as the private fiefs, of the princes were hereditary, to be disposed of by them at their pleasure. This being thoroughly established it would have been hard, perhaps impossible, even for a sovereign of the greatest genius, to reassert in anything like its full extent the royal authority. The process of division and subdivision which steadily went on broke up Germany into a bewildering multitude of principalities; but as a rule the members of each princely house held together against common enemies, and ultimately they learned to arrange by private treaties that no territory should pass from the family while a single representative survived.

The cities.

The consolidation of the power of the princes was contemporary with the rise of the cities into new importance. Several of them, especially Mainz, Worms and Spires, had received valuable rights from the kings and other lords; they were becoming self-governing and to some extent independent communities and an important and growing element in the state. The increase of trade and a system of taxation provided the governing body with funds, which were used to fortify the city and in other ways to make life and property more secure. The destruction of imperial authority compelled them to organize their resources, so as to be at all times prepared against ambitious neighbours. They began to form leagues which the greatest princes and combinations of princes could not afford to despise. Of these leagues the chief at this time was the Rhenish Confederation, which has been already mentioned. Great importance was also acquired by the Hanseatic League, which had originated during the interregnum in a treaty of alliance between Lübeck

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and Hamburg. It ultimately included more than eighty cities and became one of the greatest commercial powers in Europe (see HANSEATIC LEAGUE).

A political system which allowed the princes to do as they pleased was very much to their liking, and if they had followed their own impulse it is possible that they would never have placed a king over their country. But the pope intervened. He found from his troubles in Italy and from his diminished revenues from Germany that it would be still convenient to have in the latter country a sovereign who, like some of his predecessors, would be the protector of the church. Therefore, after the death of Richard of Cornwall in April 1272, Pope Gregory X., ignoring the absent Alphonso of Castile, told the electors that if they did not choose a king he himself would appoint one. The threat was effective. In September 1273 the electors met and raised to the throne a Swabian noble, Rudolph, count of Habsburg, who proved to possess more energy than they had imagined possible. For some time before this event the most powerful prince in Germany had been Ottakar II., king of Bohemia, who by marriage and conquest had obtained large territories outside his native kingdom, including the duchy of Austria and other possessions of the extinct family of Babenberg. Having himself cherished some hopes of receiving the German crown Ottakar refused to do homage to the new sovereign; after a time war broke out between them, and in August 1278 in a battle at Dürnkrut on the March Ottakar was defeated and slain, his lands, save Bohemia, passing into the possession of the victor. Rudolph had been able to give his whole attention to this enterprise owing to the good understanding which had been reached between himself and the pope, to whom he had promised to allow a free hand in Italy.

Rudolph of Habsburg.

Rudolph has often been called the restorer of the German kingdom, but he has little real claim to this honourable title. He marched once or twice against law-breakers, but in all the German duchies there were frequent disturbances which he did very little to check. In his later years he made some attempts to maintain the public peace, and he distinguished himself by the vigour with which he punished robber barons in Thuringia; he also won back some of the crown lands and dues which had been stolen during the interregnum. But he made no essential change in the condition of Germany. There seemed to be only one way in which a king could hope to overcome the arrogance of the princes, and that was to encourage the towns by forming with them a close and enduring alliance. Rudolph, however, almost invariably favoured the princes and not the towns. The latter had a class of burgher called *Pfahlbürger*, men who lived in the open country outside the *Pfahle*, or palisades of the town, but who could claim the protection of the municipal authorities. By becoming *Pfahlbürger* men were able of escape from the tyranny of the large landholders, and consequently the princes strongly opposed the right of the towns to receive them. Not only did the king take the part of the princes in this important struggle, but he harassed the towns by subjecting them to severe imposts, a proceeding which led to several risings. About this time the princes were gaining influence in another direction. Their assent to all important acts of state, especially to grants of crown property, was now regarded as necessary and was conveyed by means of *Willebriefe*; henceforward they were not merely the advisers of the king, they were rather partners with him in the business of government.

His reign.

Rudolph had all the sympathies and prejudices of the noble class, and the supreme object of his life was not to increase the power of the state but to add to the greatness of his own family, a policy which was perhaps justified by the condition of the German kingdom, the ruler of which had practically no strength save that which he derived from his hereditary lands. In this he was very successful. Four years after the fall of Ottakar he obtained from the princes a tardy and reluctant assent to the granting of Austria, Styria and Carniola to his own sons, Rudolph and Albert. In 1286 Carinthia was given to Meinhard, count of Tirol, on condition that when his male line became extinct it should pass to the Habsburgs. Thus Rudolph made himself memorable as the real founder of the house of Habsburg.

The Habsburg family.

It was in vain that Rudolph sought to obtain the succession to the crown for one of his sons; the electors would not take a step which might endanger their own rights, and nearly a year after the king's death in July 1291 they chose Adolph, count of Nassau, and not Rudolph's surviving son Albert, as their sovereign. Adolph, an insignificant prince, having been obliged to reward his supporters richly, wished to follow the lines laid down by his predecessor and to secure an extensive territory for his family. Meissen, which he claimed as a vacant fief of the Empire, and Thuringia, which he bought from the landgrave Albert II., seemed to offer a favourable field for this undertaking, and he spent a large part of his short reign in a futile attempt to carry out his plan. In his foreign policy Adolph allied himself with Edward I. of England against Philip IV. of France, but after declaring war on France in August 1294 he did nothing to assist his ally. At home he relieved the cities of some of their burdens and upheld them in the quarrel about the *Pfahlbürger*; and he sought to isolate Albert of Habsburg, who was treating with Philip of France. But many of the princes were disgusted with him and, led by Albert of Habsburg, Gerhard, archbishop of Mainz, and Wenceslaus II., king of Bohemia, they decided to overthrow him, and at Mainz in June 1298 he was declared deposed. He resisted the sentence, but Albert, who had been chosen his successor, marched against him, and in July 1298, at Göllheim near Worms, Adolph was defeated and killed.

Adolph of Nassau.

After Adolph's death Albert was again chosen German king, and was crowned at Aix-la-Chapelle in August 1298. Like his father Rudolph, the new king made it the principal object of his reign to increase the power of his house, but he failed in his attempts to add Bohemia and Thuringia to the hereditary lands of the Habsburgs, and he was equally unsuccessful in his endeavour to seize the countries of Holland and Zealand as vacant fiefs of the Empire. In other directions, however, he was more fortunate. He recovered some of the lost crown lands and sought to abolish new and unauthorized tolls on the Rhine; he encouraged the towns and took measures to repress private wars; he befriended the serfs and protected the persecuted Jews. For a time Albert allied himself with Philip IV. of France against Pope Boniface VIII., who had refused to recognize him as king, but in 1303 he made peace with the pope, a step which enabled him to turn his attention to Bohemia and Thuringia. The greatest danger which he had to face during his reign came from a league which was formed against him in 1300 by the four Rhenish electors—the three archbishops and the count palatine of the Rhine—who disliked his foreign policy and resented his action with regard to the tolls. Albert, however, supported by the towns, was victorious; and the revolting electors soon made their peace.

Albert I.

After Albert's murder, which took place in May 1308, Henry, count of Luxemburg, a brother of Baldwin (1285–1354), the powerful archbishop of Trier, became king as Henry VII. Although fortunate enough to obtain for his son John the crown of Bohemia, the aggrandizement of his family was not the main object of this remarkable sovereign, the last German king of the old, ambitious type. It was the memory of the Empire which stirred his blood; from the beginning of his reign he looked forward to securing the Lombard and the imperial crowns. His purpose to cross the Alps at the head of a great force was hailed with delight by the Ghibellines, whose aspirations found utterance in Dante's noble prose, but his life was too short for him to fulfil the hopes of his friends. Having restored the Rhine tolls to the Rhenish archbishops and made his peace with the Habsburgs, Henry went to Italy in the autumn of 1310, not, however, with a large army, and remained in the peninsula until his death in August 1313. As in former times the effect of the connexion of Germany with Italy was altogether mischievous, because to expedite his Italian journey the king

Henry VII.

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had added to the great privileges of the princes and had repressed the energies of the towns.

After Henry's death the electors, again fearing lest the German crown should become hereditary, refused to choose the late king's young son, John of Bohemia, as their ruler, although the candidature of this prince was supported by the powerful archbishops Baldwin of Trier and Peter of Mainz. They failed, in fact, to agree upon any one candidate, and after a long delay there was a double election for the throne. This took place in October 1314, when the larger party chose Louis IV., duke of Upper Bavaria, while the smaller party gave their votes to Frederick the Fair, duke of Austria, a son of King Albert I. Although related to each other, Louis and Frederick had come to blows before this event; they represented two rival houses, those of Wittelsbach and Habsburg, and the election only served to feed the flame of their antagonism. A second time war broke out between them. The struggle, marked by numerous raids, sieges and skirmishes, lasted for nine years, being practically ended by Frederick's decisive defeat at Mühldorf in September 1322. The vanquished king remained in captivity until 1325, when, during the contest between the Empire and the Papacy, Louis came to terms with him. Frederick acknowledged his rival, and later the suggestion was put forward that they should rule Germany jointly, but this arrangement aroused much opposition and it came to nothing. Frederick returned into an honourable captivity and died in January 1330.

Louis the Bavarian and Frederick of Austria.

The success of Louis in his war with Frederick was to some extent due to the imperial cities, which supported him from the first. Not only did they pay high taxes, but they made splendid voluntary contributions, thus enabling the sovereign of their choice to continue the fight. But Louis was perhaps still more indebted for his victory to the memorable conflict between the Swiss and the Habsburgs, the defeat of Leopold of Austria at Morgarten in 1315 striking a heavy blow at his position. Thus this struggle for freedom, although belonging properly to the history of Switzerland, exercised much influence on the course of German history.

Causes of the success of Louis.

Had Louis been wise and prudent, it would have been fairly easy for him to attain a strong position after his victory at Mühldorf. But he threw away his advantages. He offended John of Bohemia, who had aided him at Mühldorf, thus converting a useful friend into a formidable foe, and his other actions were hardly more judicious. John was probably alarmed at the increase in the power of the German king, and about the same time a similar fear had begun to possess Pope John XXII. and Charles IV. of France. About 1323 Louis had secured the mark of Brandenburg for his son Louis, and he was eager to aggrandize his family in other directions. It was just at the time when he had estranged John of Bohemia that the pope made his decisive move. Asserting that the German crown could only be worn by one who had received the papal approbation he called upon Louis to lay it down; the answer was an indignant refusal, and in 1324 the king was declared deposed and excommunicate. Thus the ancient struggle between the Papacy and the Empire was renewed, a struggle in which the pen, wielded by Marsiglio of Padua, William of Occam, John of Jandun and others, played an important part, and in which the new ideas in religion and politics worked steadily against the arrogant papal claim. The pope and his French ally, Charles IV., whom it was proposed to seat upon the German throne, had completely misread the signs of the times, and their schemes met with very little favour in Germany. No longer had the princes as in former years any reason to dread the designs of an ambitious king; the destinies of the kingdom were in their own hands and they would not permit them to be controlled by an alien power. Such was the attitude of most of the temporal princes, and many spiritual princes took the same view. As for the electors, they had the strongest possible motive for resisting the papal claim, because if this were once admitted they would quickly lose their growing importance in the state.

Louis IV. and the pope.

Lastly, the cities which had stood behind the Empire in the most difficult crises of its contest with Rome were not likely to desert it now.

Thus encouraged, or rather driven forward, by the national sentiment Louis continued to assert the independence of the crown against the pope. In 1327 he marched into Italy, where he had powerful and numerous friends in the Ghibelline party, the Visconti family and others; in January 1328 he was crowned emperor at Rome, and after this event he declared Pope John deposed and raised Peter of Corvara to the papal chair as Nicholas V. The concluding stages of this expedition were not favourable to the new emperor, but his humiliation was only slight and it did not appreciably affect the conditions of the controversy.

Louis in Italy.

For a short time after the emperor's return to Germany there was peace. But this was soon broken by a dispute over the succession to the duchy of Carinthia and the county of Tirol, then ruled by Henry V., who was without sons, and whose daughter, Margaret Maultasch, was married to John Henry, margrave of Moravia, a son of John of Bohemia. Upon these lands the three great families in Germany, those of Wittelsbach, of Habsburg and of Luxemburg, were already casting covetous eyes; Carinthia, moreover, was claimed by the Habsburgs in virtue of an arrangement made in 1286. Thus a struggle between the Luxemburgs and the Habsburgs appeared certain, and Louis, anxious to secure for his house a share of the spoil, hesitated for a time between these rivals. In 1335 Duke Henry died and the emperor adjudged his lands to the Habsburgs; wars broke out, and the result was that John Henry secured Tirol while the other contending family added Carinthia to its Austrian possessions.

Louis in Germany.

During this time Louis had been negotiating continually with Pope John and with his successor Benedict XII. to regain the favour of the church, and so to secure a free hand for his designs in Germany. But the pope was not equally complaisant, and in 1337 the emperor allied himself with Edward III. of England against Philip VI. of France, whom he regarded as primarily responsible for the unyielding attitude of the Papacy. This move was very popular in Germany, and the papal party received a further rebuff in July 1338 when the electors met at Rense and declared that in no possible manner could they allow any control over, or limitation of, their electoral rights. As a sequel to this declaration the diet, meeting at Frankfort a month later, asserted that the imperial power proceeded from God alone and that the individual chosen by a majority of the electors to occupy this high station needed no confirmation from the pope, or from any one else, to make his election valid. Contrary opinions they denounced as *pestifera dogmata*.

The pope and the electors.

But in spite of this support Louis threw away his advantages; he abandoned Edward III. in 1341, although this step did not win for him, as he desired, the goodwill of the pope, and he was soon involved in a more serious struggle with John of Bohemia and the Luxemburgs. With his Bohemian followers John Henry had made himself very unpopular in Tirol, where his wife soon counted herself among his enemies, and in 1341 he was driven from the land, while Margaret announced her intention of repudiating him and marrying the emperor's son Louis, margrave of Brandenburg. The emperor himself entered heartily into this scheme for increasing the power of his family; he declared the marriage with John Henry void, and bestowed upon his son and his bride Margaret not only Tirol, but also Carinthia, now in the hands of the Habsburgs. Nothing more was needed to unite together all the emperor's foes, including Pope Clement VI., who, like his predecessors, had rejected the advances of Louis; but in 1345, before the gathering storm broke, the emperor took possession of the counties of Holland, Zealand and Friesland, which had been left without a ruler by the death of his brother-in-law, Count William IV. By this time John of Bohemia and his allies had completed their plans. In July 1346 five of the electors met, and, having declared Louis deposed, they raised John's

Louis and the Luxemburgs.

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son Charles, margrave of Moravia, to the German throne. For a time no serious steps were taken against Louis, but after King John had met his death at Crécy Charles, who succeeded him as king of Bohemia, began to make vigorous preparations for war, and only the sudden death of the emperor (October 1347) saved Germany from civil strife.

The domestic policy of Louis.

Notwithstanding the defects of Louis's personal character his reign is one of the most important in German history. The claim of the Papacy to political supremacy received in his time its death-blow, and the popes themselves sowed the seeds of the alienation from Rome which was effected at the Reformation. With regard to the public peace Louis persistently followed the lines laid down by Albert I. He encouraged the princes to form alliances for its maintenance, and at the time of his death such alliances existed in all parts of the country. To the cities he usually showed himself a faithful friend. In many of them there had been for more than a century a struggle between the old patrician families and the democratic gilds. Louis could not always follow his own impulses, but whenever he could he associated himself with the latter party. Thus in his day the government of the imperial cities became more democratic and industry and trade flourished as they had never before done. The steady dislike of the princes was the best proof of the importance of the cities. They contained elements capable of enormous development; and had a great king arisen he might even yet, by their means, have secured for Germany a truly national life.

Charles IV. becomes king.

In January 1349 the friends of the late emperor elected Günther, count of Schwarzburg, as their king, but before this occurrence Charles of Moravia, by a liberal use of gifts and promises, had won over many of his enemies, prominent among whom were the cities. In a few months Günther himself abandoned the struggle, dying shortly afterwards, and about the same time his victorious rival was recognized by Louis of Brandenburg, the head of the Wittelsbach family. As king of Bohemia Charles was an enlightened and capable ruler, but he was indifferent towards Germany, although this country never stood in more urgent need of a strong and beneficent sovereign. In the early years of the reign the people, especially in the south and west, attacked and plundered the Jews; and the consequent disorder was greatly increased by the ravages of the Black Death and by the practices and preaching of the Flagellants, both events serving to spur the maddened populace to renewed outrages on the Jews. In dealing with this outburst of fanaticism many of the princes, both spiritual and secular, displayed vigour and humanity, but Charles saw only in the sufferings of this people an excuse for robbing them of their wealth.

The Golden Bull.

Charles's most famous achievement was the issue of the Golden Bull (q.v.). Although the principle of election had long been admitted and practised with regard to the German crown, yet it was surrounded by many practical difficulties. For instance, if the territory belonging to an electoral family were divided, as was often the case, it had never been settled whether all the ruling princes were to vote, or, if one only were entitled to this privilege, by what principle the choice was to be made. Over these and other similar points many disputes had arisen, and, having been crowned emperor at Rome in April 1355, Charles decided to set these doubts at rest. The Golden Bull, promulgated in January 1356 and again after some tedious negotiations in December of the same year, fixed the number of electors at seven, Saxe-Wittenberg and not Saxe-Lauenburg obtaining the Saxon vote, and the vote of the Wittelsbachs being given to the ruler of the Rhenish Palatinate and not to the duke of Bavaria. The votes of a majority of the electors were held to make an election valid. In order that there might be no possibility of dispute between the princes of a single house, the countries ruled by the four secular electors—Bohemia, the Rhenish Palatinate, Saxony and Brandenburg—were declared to be indivisible and to be heritable only by the accepted rules of primogeniture. The electors were granted full sovereign rights over their lands, and their subjects were allowed to appeal to the royal or the imperial tribunals only in case they could not obtain justice elsewhere. A blow was struck at the cities, which were forbidden to form leagues or to receive *Pfahlbürger*.

Fehmic Courts.

If the Golden Bull be excepted, the true interest of this reign is in the movements beyond the range of the emperor's influence. It is significant that at this time the *Femgerichte*, or Fehmic Courts (q.v.), vastly extended the sphere of their activities, and that in the absence of a strong central authority they were respected as a check upon the lawlessness of the princes. The cities, notwithstanding every kind of discouragement, formed new associations for mutual defence or strengthened those which already existed. The Hanseatic League carried on war with Valdemar V., king of Denmark, and his ally, the king of Norway, seventy-seven towns declaring war on these monarchs in 1367, and emerged victorious from the struggle, while its commerce extended to nearly all parts of the known world. In 1376 some Swabian towns formed a league which, in spite of the imperial prohibition, soon became powerful in south-west Germany and defeated the forces of the count of Württemberg at Reutlingen in May 1377. The emperor, meanwhile, was occupied in numerous intrigues to strengthen his personal position and to increase the power of his house. In these he was very fortunate, managing far more than his predecessors to avoid conflicts with the Papacy and the princes. The result was that when he died in November 1378 he wore the crowns of the Empire, of Germany, of Bohemia, of Lombardy and of Burgundy; he had added Lower Lusatia and parts of Silesia to Bohemia; he had secured the mark of Brandenburg for his son Wenceslaus in 1373; and he had bought part of the Upper Palatinate and territories in all parts of Germany.

Wenceslaus.

After the death of Charles, his son Wenceslaus, who had been crowned German king in July 1376, was recognized by the princes as their ruler, but the new sovereign was careless and indolent and in a few years he left Germany to look after itself. During his reign the struggle between the princes and the cities reached its climax. Following the example set by the electors at Rense both parties formed associations for protection, prominent among these being the Swabian League on the one side and the League of the Lion (*Löwenbund*)[1] on the other. The result was that the central authority was almost entirely disregarded. Wenceslaus favoured first one of the antagonists and then the other, but although he showed some desire to put an end to the increasing amount of disorder he was unable, or unwilling, to take a strong and definite line of action. The cities entered upon the approaching contest at a considerable disadvantage. Often they were separated one from the other by large stretches of territory under the rule of a hostile prince and their trade was peculiarly liable to attack by an adventurous body of knights. The citizens, who were called upon to fight their battles, were usually unable to contend successfully with men whose whole lives had been passed in warfare; the isolation of the cities was not favourable to the creation or mobilization of an active and homogeneous force; and, moreover, at this time many of them were disturbed by internal troubles. However, they minimized this handicap by joining league to league; in 1381 the Swabian and the Rhenish cities formed an alliance for three years, while the Swabian League obtained promises of help from the Swiss.

General disorder in Germany.

The Swiss opened the fight. Attacked by the Habsburgs they defeated and killed Duke Leopold of Austria at Sempach in July 1386 and gained another victory at Näfels two years later; but their allies, the Swabian cities, were not equally prompt or equally fortunate. The decisive year was 1388, when the strife became general all over south-west Germany. In August 1388 the princes, under Count Eberhard of Württemberg, completely defeated their foes at Döffingen, while in the following November Rupert II., elector palatine of the Rhine, was equally successful in his attack on the forces of the Rhenish cities near Worms.

[1] So called from the badge worn by the knights (*Löwenritter*) who composed it.

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Exhaustion soon compelled the combatants to come to terms, and greatly to the disadvantage of the cities peace was made in 1389. The main result of this struggle was everywhere to strengthen the power of the princes and to incite them to fresh acts of aggression. During the same time the Hanse towns were passing through a period of difficulty. They were disturbed by democratic movements in many of the cities and they were threatened by the changing politics of the three northern kingdoms, Norway, Sweden and Denmark, and by their union in 1397; their trading successes had raised up powerful enemies and had embroiled them with England and with Flanders, and the Teutonic Order and neighbouring princes were not slow to take advantage of their other difficulties.

Towards the close of the century the discontent felt at the incompetent and absent German king took a decided form.

Rupert chosen king.

The movement was led by the four Rhenish electors, and after some preliminary proceedings these princes met in August 1400; having declared Wenceslaus dethroned they chose one of their number, the elector palatine Rupert III., in his stead, and the deposed monarch accepted the sentence almost without demur. Rupert was an excellent elector, and under more favourable circumstances would have made a good king, but so serious were the jealousies and divisions in the kingdom that he found little scope for his energies outside the Palatinate. In spite of the peace of 1389 the cities had again begun to form leagues for peace; but, having secured a certain amount of recognition in the south and west of Germany, the new king turned aside from the pressing problems of government and in 1401 made a futile attempt to reach Rome, an enterprise which covered him with ridicule. After his return to Germany he had to face the hostility of many of the princes, and this contest, together with vain attempts to restore order, occupied him until his death in May 1410.

Sigismund is chosen king.

After's Rupert's death two cousins, Jobst, margrave of Moravia, and Sigismund, king of Hungary, were in the autumn of 1410 both chosen to fill the vacant throne by opposing parties; and the position was further complicated by the fact that the deposed king, Wenceslaus, was still alive. Jobst, however, died in January 1411, and in the succeeding July Sigismund, having come to terms with Wenceslaus, was again elected king and was generally recognized. The commanding questions of this reign were ecclesiastical. It was the age of the great schism, three popes claiming the allegiance of Christendom, and of the councils of Constance and of Basel; in all ranks of the Church there was an urgent cry for reform. Unfortunately the council of Constance, which met mainly through the efforts of Sigismund in 1414, marred its labours by the judicial murders of John Huss and of Jerome of Prague. This act greatly incensed the Bohemians, who broke into revolt in 1419, and a new and fiercer outburst occurred in 1420 when Sigismund, who had succeeded his brother Wenceslaus as king of Bohemia in the preceding August, announced his intention of crushing the Hussites. Led by their famous general, John Žižka, the Bohemians won several battles and spread havoc and terror through the neighbouring German lands. During the progress of this revolt Germany was so divided and her king was so poor that it was impossible to collect an army of sufficient strength to crush the malcontents. At the diet of Nuremberg in 1422 and at that of Frankfort in 1427 Sigismund endeavoured to raise men and money by means of contributions from the estates, but the plan failed owing to mutual jealousies and especially to the resistance of the cities. He secured some help from Frederick of Brandenburg, from Albert of Austria, afterwards the German king Albert II., and from Frederick of Meissen, to whom he granted the electoral duchy of Saxe-Wittenberg; but it was only when the Hussites were split into two factions, and when Žižka was dead, that Germany was in any way relieved from a crushing and intolerable burden.

The continual poverty which hindered the successful prosecution of the war against the Hussites, and which at times placed Sigismund in the undignified position of having to force himself as an unwelcome guest upon princes and cities, had, however, one good result. In 1415 he granted, or rather sold, the mark of Brandenburg to his friend Frederick of Hohenzollern, burgrave of Nuremberg, this land thus passing into the hands of the family under whom it was destined to develop into the kingdom of Prussia. During this reign the princes, especially the electors, continued their endeavours to gain a greater share in the government of Germany, and to some extent they succeeded. Sigismund, on his part, tried to enforce peace upon the country by forming leagues of the cities, but to no purpose; in fact all his plans for reform came to nothing.

Brandenburg and the Hohenzollerns.

Sigismund, who died in December 1437, was succeeded on the German throne and also in Hungary and Bohemia by his son-in-law Albert of Austria, and from this time, although remaining in theory elective, the German crown was always conferred upon a member of the house of Habsburg until the extinction of the male line of this family in 1740. The reign of Albert II. was too short to enable him to do more than indicate his good intentions; he acted in general with the electors in observing a neutral attitude with regard to the dispute between the council of Basel and Pope Eugenius IV., and he put forward a scheme to improve the administration of justice. He died in October 1439, and was succeeded by his kinsman Frederick, duke of Styria, who became German king as Frederick IV. and, after his coronation at Rome in 1452, emperor as Frederick III.

Albert II.

The first concern of the new king was with the papal schism. The council of Basel was still sitting, and had elected an anti-pope, Felix V., in opposition to Eugenius IV., while the electors, adhering to their neutral attitude, sought to bring Frederick into line with them on this question. Some years were occupied in negotiations, but the king soon showed himself anxious to come to terms with Eugenius, and about 1446 the electors ceased to act together. At length peace was made. The consent of several of the electors having been purchased by concessions, Frederick signed with Pope Nicholas V., the successor of Eugenius, in February 1448 the concordat of Vienna, an arrangement which bound the German Church afresh to Rome and perpetuated the very evils from which earnest churchmen had been seeking deliverance. Thus Germany lost the opportunity of reforming the Church from within, and the upheaval of the 16th century was rendered inevitable.

Frederick III. and the Papacy.

Frederick's reign is one of great importance in the history of Austria and of the house of Habsburg, but under him the fortunes of Germany sank to the lowest possible point. Without any interference from the central authority wars were waged in every part of the country, and disputes of every kind were referred to the decision of the sword. The old enmity between the cities and the princes blazed out afresh; grievances of every kind were brought forward and many struggles were the result. Perhaps the most famous of these was one between a confederation of Franconian and Swabian cities under the leadership of Nuremberg on the one side, and Albert Achilles, afterwards elector of Brandenburg, and a number of princes on the other. The war was carried on with great barbarity for about four years (1449–1453), and was in every respect a critical one. If the cities had gained the day they might still have aimed at balancing the power of the princes, but owing partly to their imperfect union, partly to the necessity of fighting with hired troops, they did not gain any serious advantage. On the whole, indeed, in spite of temporary successes, they decidedly lost ground, and on the conclusion of peace there was no doubt that the balance of power in the state inclined to the princes. Frederick meanwhile was involved in wars with the Swiss, with his brother Albert and his Austrian subjects, and later with the Hungarians. He had no influence in Italy; in Burgundy he could neither stop Duke Philip the Good from adding Luxemburg to his possessions, nor check the towering ambition of Charles the Bold; while after the death of Charles in 1477 he was equally unable to prevent the king of

Germany under Frederick.

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France from seizing a large part of his lands. Torn by dissensions the Teutonic Order was unsuccessful in checking the encroachments of the Poles, and in 1466 the land which it had won in the north-east of Germany passed under the suzerainty of Poland, care being taken to root out all traces of German influence therein. Another loss took place in 1460, when Schleswig and Holstein were united with Denmark. In Germany itself the king made scarcely any pretence of exercising the supreme authority; for nearly thirty years he never attended the imperial diet, and the suggestions which were made for his deposition failed only because the electors could not agree upon a successor. In his later years he became more of a recluse than ever, and even before February 1486, when his son Maximilian was chosen German king, he had practically ceased to take any part in the business of the Empire, although he survived until August 1493.

During the reign of Frederick the electors and the greater princes continued the process of consolidating and increasing their power. Lands under their rule, which were technically imperial fiefs, were divided and devised by them at will like other forms of private property; they had nearly all the rights of a sovereign with regard to levying tolls, coining money, administering justice and granting privileges to towns; they were assisted in the work of government by a privy council, while their courts with their numerous officials began to resemble that of the king or emperor. They did not, however, have everything their own way. During this century their power was limited by the formation of diets in many of the principalities. These bodies were composed of the mediate prelates, the mediate nobles and representatives of the mediate cities. They were not summoned because the princes desired their aid, but because arms could only be obtained from the nobles and money from the cities, at least on an adequate scale. Once having been formed these local diets soon extended their functions. They claimed the right of sanctioning taxation; they made their voice heard about the expenditure of public money; they insisted, although perhaps not very effectually, on justice being administered. Such institutions as these were clearly of the highest importance, and for two centuries they did something to atone for the lack of a genuine monarchy.

The power of the princes.

During this reign the conditions of warfare began to change. The discovery of gunpowder made small bodies of men, adequately armed, more than a match for great forces equipped in medieval fashion. Hence the custom of hiring mercenary troops was introduced, and a prince could never be certain, however numerous his vassals might be, that the advantage would not rest with his opponent. This fact, added to the influence of the local diets, made even the princes weary of war, and a universal and continuous demand arose for some reform of the machinery of government. Partly at the instance of the emperor a great Swabian confederation was formed in 1488. This consisted of both princes and cities and was intended to enforce the public peace in the south-western parts of Germany. Its effects were excellent; but obviously no partial remedy was sufficient. It was essential that there should be some great reform which would affect every part of the kingdom, and for the present this was not to be secured.

Methods of warfare.

Maximilian came to the throne in 1486 with exceptional advantages. He was heir to the extensive Austrian lands, and as the widowed husband of Charles the Bold's daughter Mary he administered the Netherlands. Although he soon gave up these provinces to his son Philip, the fact that they were in the possession of his family added to his influence, and this was further increased when Philip married Joanna, the heiress of the Spanish kingdoms. From Maximilian's accession the Empire exercised in the affairs of Europe an authority which had not belonged to it for centuries. The reason for this was not that the Empire was stronger, but that its crown was worn by a succession of princes who were great sovereigns in their own right.

Maximilian I.

Having in 1490 driven the Hungarians from Vienna and recovered his hereditary lands, and having ordered the affairs of the Netherlands, Maximilian turned his attention to Italy, whither he was drawn owing to the invasion of that country by Charles VIII. of France in 1494. But before he could take any steps to check the progress of Charles pecuniary necessities compelled him to meet the diet. At this time the German, or imperial, diet consisted of three colleges, one of the electors, another of the princes, both spiritual and secular, and a third of representatives of the free cities, who had, however, only just gained the right to sit beside the other two estates. The diet was an extremely clumsy instrument of government, and it was perhaps never more discredited or more impotent than when it met Maximilian at Worms in March 1495. But in spite of repeated rebuffs the party of reform was vigorous and undaunted; its members knew that their case was overwhelmingly strong. Although disappointed in the hope which they had nourished until about 1490 that Maximilian himself would lead them, they had found a capable head in Bertold, elector of Mainz. The king lost no time in acquainting the diet with his demands. He wished for men and money to encounter the French in Italy and to resist the Turks. Bertold retorted that redress of grievances must precede supply, and Maximilian and the princes were soon discussing the proposals put forward by the sagacious elector. His first suggestion that a council nominated by the estates should be set up with the power of vetoing the acts of the king was abandoned because of the strenuous opposition of Maximilian; but Bertold was successful in getting the diet to proclaim an eternal *Landfriede*, that is, to forbid private war without any limitation of time, and it was agreed that the diet should meet annually to advise the king on matters of moment. The idea of a council, however, was not given up although it took a different form. An imperial court of justice, the *Reichskammergericht*, was established; this consisted of sixteen members nominated by the estates and a president appointed by the king. Its duties were to judge between princes of the Empire and to act as the supreme court of appeal in cases where humbler persons were concerned. Partly to provide for the expenses of this court, partly to furnish Maximilian with the promised monetary aid, a tax called the common penny was instituted, this impost taking the form both of a property tax and of a poll tax. Such in outline were the reforms effected by the important diet of Worms.

Reforms in Germany. 1495.

The practical difficulties of the reformers, however, were only just beginning. Although Maximilian took some interest in the collection of the common penny it was difficult, and from some classes impossible, to obtain payment of this tax, and the king was persistently hostile to the imperial court of justice, his hostility and the want of money being indeed successful in preventing that institution for a time from doing any real service to Germany. In 1497 he set up a new Aulic council or *Hofrat*, the members of which were chosen by himself, and to this body he gave authority to deal with all the business of the Empire. Thus he undermined the foundations of the *Reichskammergericht* and stole a march upon Bertold and his friends. A series of diets between 1495 and 1499 produced only mutual recriminations, and then Maximilian met with a serious rebuff. The Swiss refused to pay the common penny and to submit to the jurisdiction of the imperial court of justice. Consequently, in 1499, Maximilian sent such troops as he could collect against them, but his forces were beaten, and by the peace of Basel he was forced to concede all the demands made by the Swiss, who became virtually independent of the Empire. Heartened by this circumstance Bertold and his followers returned to the attack when the diet met at Augsburg in 1500. The common penny as a means of taxation fell into the background, and in its place a scheme was accepted which it was thought would provide the king with an army of about 30,000 men. But more important perhaps was the administrative council, or *Reichsregiment*, which was established by the diet at this time. A revival of the idea put forward by the elector of Mainz at Worms in 1495, this council was to consist of twenty members appointed by the electors and other princes and by representatives of the cities, with a president named by the king. Its work was practically that of

Difficulties and further reforms.

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governing Germany, and it was the most considerable encroachment which had yet been made on the power of the king. It is not surprising therefore that Maximilian hated the new body, to the establishment of which he had only consented under great pressure.

In 1500 the *Reichsregiment* met at Nuremberg and began at once to treat for peace with France. Maximilian was not slow to resent this interference; he refused to appoint a president, and soon succeeded in making the meetings of the council impossible. The relations between the king and the princes were now very strained. Bertold called the electors together to decide upon a plan of campaign; Maximilian on his part tried to destroy the electoral union by winning over individual members. The result was that when the elector of Mainz died in 1504 the king's victory was complete. The *Reichskammergericht* and the *Reichsregiment* were for all practical purposes destroyed, and greater authority had been given to the *Hofrat*. Henceforward it was the king who put forward schemes of reform and the diet which modified or rejected them. When the diet met at Cologne in 1505 Maximilian asked for an army and the request was granted, the necessary funds being raised by the old plan of a levy on the estates. At Constance, two years later, the diet raised men and money in a similar fashion, and on this occasion the imperial court of justice was restored, with some slight alteration in the method of appointing its members. After Maximilian had taken the bold step of assuming the title of Roman emperor at Trent in 1508 the last of the reforming diets met at Cologne in 1512. In 1500 Germany had been divided into six circles (*Kreise*) or districts, for the purpose of sending representatives to the *Reichsregiment*. These circles were now increased in number to ten and an official (*Hauptmann*) was placed over each, his duties being to enforce the decisions of the *Reichskammergericht*. But it was some time before the circles came into working order; the only permanent reform of the reign was the establishment of the imperial court of justice, and even this was not entirely satisfactory, Maximilian's remaining diets loudly denouncing it for delay and incompetence. The period marked by the attempted reform of Bertold of Mainz was that of the last struggle between the supporters of a united Germany and those who preferred a loose confederation of states. Victory remained with the latter party. Maximilian himself had done a great deal to promote the unity of his Austrian lands and, incidentally, to cut them off from the remainder of the German kingdom, and other princes were following his example. This movement spelled danger to the small principalities and to the free cities, but it gave a powerful impetus to the growth of Brandenburg, of Saxony, of Bavaria and of the Palatinate, and the future of the country seemed likely to remain with the particularist and not with the national idea.

Maximilian hampers the reformers.

During the period of these constitutional struggles the king's chief energies were spent in warring against the French kings Charles VIII. and Louis XII. in Italy, where he hoped to restore the claims, dormant, perhaps even extinct, of the German kings. In 1508 he helped to promote the league of Cambrai, formed to despoil Venice, but he soon returned to his former policy of waging war against France, and he continued to do this until peace was made in 1516. The princes of Germany showed themselves singularly indifferent to this struggle, and their king's battles were largely fought with mercenary troops. Maximilian gained his most conspicuous success in his own kingdom in 1504, when he interfered in a struggle over the succession to the duchy of Bavaria-Landshut. He gained some additions of territory, but his victory was more important because it gave him the prestige which enabled him to break down the opposition of the princes and to get his own way with regard to his domestic policy.

Maximilian's wars in Italy.

In many respects the reign of Maximilian must be regarded as the end of the middle ages. The feudal relation between the king and the princes and between the princes and their vassals had become purely nominal. No real control was exerted by the crown over the heads of the various states, and, now that war was carried on mainly by mercenary troops, the mediate nobles did not hold their lands on condition of military service. The princes were sovereigns, not merely feudal lords; and by the institution of local diets in their territories an approach was made to modern conceptions of government. The age of war was far indeed from being over, but men were at least beginning to see that unnecessary bloodshed is an evil, and that the true outlet for the mass of human energies is not conflict but industry. By the growth of the cities in social, if not in political, importance the products of labour were more and more widely diffused; and it was easier than at any previous time for the nation to be moved by common ideas and impulses. The discovery of America, the invention of printing, the revival of learning and many other causes had contributed to effect a radical change in the point of view from which the world was regarded; and the strongest of all medieval relations, that of the nation to the Church, was about to pass through the fiery trial of the Reformation. This vast movement, which began in the later years of Maximilian, definitely severed the medieval from the modern world.

Decay of feudal relations.

The seeds of the Reformation were laid during the time of the great conflict between the Papacy and the Empire. The arrogance and the ambition of the popes then stamped upon the minds of the people an impression that was never effaced. During the struggle of Louis IV. with the popes of his day the feeling revived with fresh intensity; all classes, clerical as well as lay, looked upon resistance to papal pretensions as a necessity imposed by the national honour. At the same time the spiritual teaching of the mystics awakened in many minds an aspiration which the Church, in its corrupt state, could not satisfy, and which was in any case unfavourable to an external authority. The Hussite movement further weakened the spell of the Church. Still more powerful, because touching other elements of human nature and affecting a more important class, was the influence of the Renaissance, which, towards the end of the 15th century, passed from Italy to the universities of Germany. The men of the new learning did not sever themselves from Christianity, but they became indifferent to it; its conceptions seemed to them dim and faded, while there was a constantly increasing charm in literature, in philosophy and in art. No kind of effort was made by the Church to prepare for the storm. The spiritual princes, besides displaying all the faults of the secular princes, had special defects of their own; and as simony was universally practised, the lives of multitudes of the inferior clergy were a public scandal, while their services were cold and unimpressive. The moral sense was outraged by such a pope as Alexander VI.; and neither the military ambition of Julius II. nor the refined paganism of Leo X. could revive the decaying faith in the spirituality of their office. Pope Leo, by his incessant demands for money and his unscrupulous methods of obtaining it, awakened bitter hostility in every class of the community.

The Reformation.

The popular feeling for the first time found expression when Luther, on All Saints' day 1517, nailed to a church door in Wittenberg the theses in which he contested the doctrine which lay at the root of the scandalous traffic in indulgences carried on in the pope's name by Tetzel and his like. This episode, derided at first at Rome as the act of an obscure Augustinian friar intent on scoring a point in a scholastic disputation, was in reality an event of vast significance, for it brought to the front, as the exponent of the national sentiment, one of the mightiest spirits whom Germany has produced. Under the influence of Luther's strong personality the most active and progressive elements of the nation were soon in more or less open antagonism to the Papacy.

Luther.

When Maximilian died in January 1519 his throne was competed for by his grandson Charles, king of Spain, and by Francis I. of France, and after a long and costly contest the former was chosen in the following June. By the time Charles reached Germany and was crowned at Aix-la-Chapelle (October 1520)

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Luther had confronted the cardinal legate Cajetan, had passed through his famous controversy at Leipzig with Johann Eck, and was about to burn the bull of excommunication. After this daring step retreat was impossible, and with keen excitement both the reformer's followers and his enemies waited for the new sovereign to declare himself on one side or on the other. Charles soon made up his mind about the general lines of his policy, although he was completely ignorant of the strength of the feeling which had been aroused. He fancied that he had to deal with a mere monkish quarrel; at one time he even imagined that a little money would set the difficulty at rest. It was not likely, however, in any case that he would turn against the Roman Church, and that for various reasons. He was by far the most important ruler of the time, and the peoples under his direct sway were still adherents of the old faith. He was king of Spain, of Sicily, of Naples and of Sardinia; he was lord of the Netherlands, of the free county of Burgundy and of the Austrian archduchies; he had at his command the immense resources of the New World; and he had been chosen king of Germany, thus gaining a title to the imperial crown. Following the example set by Maximilian he called himself emperor without waiting for the formality of a coronation at Rome. Now the protection of the Church had always been regarded as one of the chief functions of the emperors; Charles could not, therefore, desert it when it was so greatly in need of his services. Like his predecessors he reserved to himself the right to resist it in the realm of politics; in the realm of faith he considered that he owed to it his entire allegiance. Moreover, he intended to undertake the subjugation of northern Italy, a task which had baffled his imperial grandfather, and in order to realize this scheme it was of the highest importance that he should do nothing to offend the pope. Thus it came about that at the diet of Worms, which met in January 1521, without any thorough examination of Luther's position, Charles issued the famous edict, drawn up by Cardinal Aleandro, which denounced the reformer and his followers. This was accepted by the diet and Luther was placed under the imperial ban.

Charles V. and Luther.

When Charles was chosen German king he was obliged to make certain promises to the electors. Embodied in a *Wahlkapitulation*, as it was called, these were practically the conditions on which the new sovereign was allowed to take the crown, and the precedent was followed at subsequent elections. At the diet of Worms steps were taken to carry these promises into effect. By his *Wahlkapitulation* Charles had promised to respect the freedom of Germany, for the princes looked upon him as a foreigner. He was neither to introduce foreign troops into the country, nor to allow a foreigner to command German soldiers; he must use the German language and every diet must meet on German soil. An administrative council, a new *Reichsregiment*, must be established, and other reforms were to be set on foot. The constitution and powers of this *Reichsregiment* were the chief subject of difference between Charles and the princes at the diet. Eventually it was decided that this council should consist of twenty-two members with a president named by the emperor; but it was only to govern Germany during the absence of the sovereign, at other times its functions were merely advisory. The imperial chamber was restored on the lines laid down by Bertold of Mainz in 1495 (it survived until the dissolution of the Empire in 1806), and the estates undertook to aid the emperor by raising and paying an army. In April 1521 Charles invested his brother Ferdinand, afterwards the emperor Ferdinand I., with the Austrian archduchies, and soon afterwards he left Germany to renew his long struggle with Francis I. of France.

Charles and the movement for reform.

While the emperor was thus absent great disturbances took place in Germany. Among Luther's friends was one, Ulrich von Hutten, at once penetrated with the spirit of the Renaissance and emphatically a man of action. The class to which Hutten and his friend, Franz von Sickingen, a daring and ambitious Rhenish baron, belonged, was that of the small feudal tenants in chief, the *Ritterschaft* or knights of the Empire. This class was subject only to the emperor, but its members lacked the territorial possessions which gave power to the princes; they were partly deprived of their employment owing to the suppression of private wars, and they had suffered through the substitution of Roman law for the ancient feudal laws and customs. They had no place in the constitution or in the government of Germany, and they had already paralysed the administration by refusing to pay the taxes. They were intensely jealous of the princes, and it occurred to Hutten and Sickingen that the Reformation might be used to improve the condition of the knights and to effect a total change in the constitution of the Empire. No general reform, they maintained, either in church or state, could be secured while the country was divided into a number of principalities, and their plan was to combine with all those who were discontented with the existing order to attack the princes and to place the emperor at the head of a united nation. Sickingen, who has been compared to Wallenstein, and who doubtless hoped to secure a great position for himself, had already collected a large army, which by its very presence had contributed somewhat to the election of Charles at Frankfort in 1519. He had also earned renown by carrying on feuds with the citizens of Worms and of Metz, and now, with a view to realizing his larger ambitions, he opened the campaign (August 1522) by attacking the elector of Trier, who, as a spiritual prince, would not, it was hoped, receive any help from the religious reformers. For a moment it seemed as if Hutten's dream would be realized, but it was soon evident that it was too late to make so great a change. Luther and other persons of influence stood aloof from the movement; on the other hand, several princes, including Philip, landgrave of Hesse, united their forces against the knights, and in May 1523 Sickingen was defeated and slain. A few weeks later Hutten died on an island in the lake of Zürich.

Sickingen's rising.

This war was followed by another of a much more serious nature. The German peasants had grievances compared with which those of the knights and lesser barons were imaginary. For about a century several causes had tended to make their condition worse and worse. While taxes and other burdens were increasing the power of the king to protect them was decreasing; with or without the forms of law they were plundered by every other class in the community; their traditional privileges were withdrawn and, as in the case of the knights, their position had suffered owing to the introduction of Roman law into Germany. In the west and south-west of the country especially, opportunities of migration and of expansion had been gradually reduced, and to provide for their increasing numbers they were compelled to divide their holdings again and again until these patches of land became too small for the support of a household. Thus, solely under the influence of social and economic conditions, various risings of the peasants had taken place during the latter part of the 15th century, the first one being in 1461, and at times the insurgents had combined their forces with those of the lower classes in the towns, men whose condition was hardly more satisfactory than their own. In the last decade of the 15th and the first decade of the 16th century there were several insurrections in the south-west of Germany, each of which was called a *Bundschuh*, a shoe fastened upon a pole serving as the standard of revolt. In 1514 Württemberg was disturbed by the rising of "poor Conrad," but these and other similar revolts in the neighbourhood were suppressed by the princes. These movements, however, were only preludes to the great revolution, which is usually known as the Peasants' War (*Bauernkrieg*).

The causes of the Peasants' War.

The Renaissance and the Reformation were awakening extravagant hopes in the minds of the German peasants, and it is still a matter of controversy among historians to what extent Luther and the reformers were responsible for their rising. It may, however, be stated with some certainty that their condition was sufficiently wretched to drive them to revolt without any serious pressure from outside. The rising was due primarily neither to religious nor to political,

The Peasants' War.

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but to economic causes. The Peasants' War, properly so called, broke out at Stühlingen in June 1522. The insurgents found a leader in Hans Müller of Bulgenbach, who gained some support in the surrounding towns, and soon all Swabia was in revolt. Quickly the insurrection became general all over central and southern Germany. In the absence of the emperor and of his brother, the archduke Ferdinand, the authorities in these parts of the country were unable to check the movement and, aided by many knights, prominent among whom was Götz von Berlichingen, the peasants were everywhere victorious, while another influential recruit, Ulrich, the dispossessed duke of Württemberg, joined them in the hope of recovering his duchy. Ulrich's attempt, which was made early in 1525, was, however, a failure, and about the same time the peasants drew up twelve articles embodying their demands. These were sufficiently moderate. They asked for a renewal of their ancient rights of fishing and hunting freely, for a speedier method of obtaining justice, and for the removal of new and heavy burdens. In many places the lords yielded to these demands, among those who granted concessions being the elector palatine of the Rhine, the bishops of Bamberg and of Spires, and the abbots of Fulda and of Hersfeld. But meanwhile the movement was spreading through Franconia to northern Germany and was especially formidable in Thuringia, where it was led by Thomas Münzer. Here again success attended the rebel standards. But soon the victorious peasants became so violent and so destructive that Luther himself urged that they should be sternly punished, and a number of princes, prominent among whom was Philip of Hesse, banded themselves together to crush the rising. Münzer and his followers were defeated at Frankenhausen in May, the Swabian League gained victories in the area under its control, successes were gained elsewhere by the princes, and with much cruelty the revolt of the peasants was suppressed. The general result was that the power of the territorial lords became greater than ever, although in some cases, especially in Tirol and in Baden, the condition of the peasants was somewhat improved. Elsewhere, however, this was not the case; many of the peasants suffered still greater oppression and some of the immediate nobles were forced to submit to a detested yoke.

Before the suppression of this rising the *Reichsregiment* had met with very indifferent success in its efforts to govern Germany.

The Reichsregiment.

Meeting at Nuremberg early in 1522 it voted some slight assistance for the campaign against the invading Turks, but the proposals put forward for raising the necessary funds aroused much opposition, an opposition which came mainly from the large and important cities. The citizens appealed to Charles V., who was in Spain, and after some hesitation the emperor decided against the *Reichsregiment*. Under such disheartening conditions it is not surprising that this body was totally unable to cope with Sickingen's insurrection, and that a few weeks after its meeting at Nuremberg in 1524 it succumbed to a series of attacks and disappeared from the history of Germany. But the *Reichsregiment* had taken one step, although this was of a negative character. It had shown some sympathy with the reformers and had declined to put the edict of Worms into immediate execution. Hardly less lukewarm, the imperial diet ordered the edict to be enforced, but only as far as possible, and meanwhile the possibilities of accommodation between the two great religious parties were becoming more and more remote. A national assembly to decide the questions at issue was announced to meet at Spires, but the emperor forbade this gathering. Then the Romanists, under the guidance of Cardinal Campeggio and the archduke Ferdinand, met at Regensburg and decided to take strong and aggressive measures to destroy Lutheranism, while, on the other hand, representatives of the cities met at Spires and at Ulm, and asserted their intention of forwarding and protecting the teaching of the reformed doctrines. All over the country and through all classes of the people men were falling into line on one side or the other, and everything was thus ready for a long and bitter religious war.

During these years the religious and political ideas of the Reformation were rapidly gaining ground, and, aided by a vigorous and violent polemic literature, opposition to Rome was growing on every side. Instigated by George of Saxony the Romanist princes formed a defensive league at Dessau in 1525; the reforming princes took a similar step at Gotha in 1526. Such were the prevailing conditions when the diet met at Spires in June 1526 and those who were still loyal to the Roman Church clamoured for repressive measures. But on this occasion the reformers were decidedly in the ascendant. Important ecclesiastical reforms were approved, and instructions forbidding all innovations and calling upon the diet to execute the edict of Worms, sent by the emperor from Spain, were brushed aside on the ground that in the preceding March when this letter was written Charles and the pope were at peace, while now they were at war. Before its dissolution the diet promulgated a decree providing that, pending the assembly of a national council, each prince should order the ecclesiastical affairs of his own state in accordance with his own conscience, a striking victory for the reformers and incidentally for separatist ideas. The three years which elapsed between this diet and another important diet which met in the same city are full of incident. Guided by Luther and Melanchthon, the principal states and cities in which the ideas of the reformers prevailed—electoral Saxony, Brandenburg, Hesse and the Rhenish Palatinate, Strassburg, Nuremberg, Ulm and Augsburg—began to carry out measures of church reform. The Romanists saw the significance of this movement and, fortunately for them, were able to profit by the dissensions which were breaking out in the ranks of their opponents, especially the doctrinal differences between the followers of Luther and those of Zwingli. Persecutions for heresy had begun, the feeling between the two great religious parties being further embittered by some revelations made by Otto von Pack (*q.v.*) to Philip of Hesse. Pack's stories, which concerned the existence of a powerful league for the purpose of making war upon the reformers, were proved to be false, but the soreness occasioned thereby remained. The diet met in February 1529 and soon received orders from the emperor to repeal the decree of 1526. The supporters of the older faith were now predominant and, although they were inclined to adopt a somewhat haughty attitude towards Charles, they were not averse from taking strong measures against the reformers. The decree of the diet, formulated in April, forbade the reformers to make further religious changes, while the toleration which was conceded to Romanists in Lutheran states was withheld from Lutherans in Romanist states. This decree was strongly resented by the reforming princes and cities. They drew up a formal protest against it (hence the name "Protestant"), which they presented to the archduke Ferdinand, setting forward the somewhat novel theory that the decree of 1526 could not be annulled by a succeeding diet unless both the parties concerned assented thereto. By this decree they declared their firm intention to abide.

Progress of the Reformation.

The diet of Augsburg.

The unifying efforts of Philip of Hesse to unite the two wings of the Protestant forces met with very little success, and the famous conference at Marburg in the autumn of 1529, for which he was responsible, revealed the fact that it was practically impossible for the Lutherans and the Zwinglians to act together even when threatened by a common danger, while a little later the alliance between the Lutheran states of north Germany and the Zwinglian cities of the south was destroyed by differences upon points of doctrine. In 1530 the emperor, flushed with success in Italy and at peace with his foreign foes, came to Germany with the express intention of putting an end to heresy. In June he opened the diet at Augsburg, and here the Lutherans submitted a summary of their doctrines, afterwards called the Augsburg Confession. Drawn up by Melanchthon, this pronouncement was intended to widen the breach between the Lutherans and the Zwinglians, and to narrow that between the Lutherans and the Romanists; from this time it was regarded as the chief standard of the Lutheran faith. Four Zwinglian cities, Strassburg, Constance, Lindau and Memmingen, replied with a confession of their own and the Romanists also drew up an answer. The period of

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negotiation which followed served only to show that no accommodation was possible. Charles himself made no serious effort to understand the controversy; he was resolved, whether the Lutherans had right on their side or not, that they should submit, and he did not doubt but that he would be able to awe them into submission by an unwonted display of power. But to his surprise the Lutheran princes who attended the diet refused to give way. They were, however, outnumbered by their enemies, and it was the Romanist majority which dictated the terms of the decree, which was laid before the diet in September, enjoining a return to religious conformity within seven months. The Protestant princes could only present a formal protest and leave Augsburg. Finally the decree of the diet, promulgated in November, ordered the execution of the edict of Worms, the restoration of all church property, and the maintenance of the jurisdiction of the bishops. The duty of enforcing the decree was especially entrusted to the *Reichskammergericht*; thus by the processes of law the Protestant princes were to be deprived of much of their property, and it seemed probable that if they did not submit the emperor would have recourse to arms.

The league of Schmalkalden.

For the present, however, fresh difficulties with France and an invasion by the Turks, who had besieged Vienna with an immense army in the autumn of 1529, forced Charles to mask his designs. Meanwhile some of the Lutherans, angered and alarmed by the decisions of the *Reichskammergericht*, abandoned the idea that resistance to the imperial authority was unlawful and, meeting in December 1530, laid the foundation of the important league of Schmalkalden, among the first members of the confederation being the rulers of Saxony and Hesse and the cities of Bremen and Magdeburg. The league was soon joined by other strong cities, among them Strassburg, Ulm, Constance, Lübeck and Goslar; but it was not until after the defeat and death of Zwingli at Kappel in October 1531 that it was further strengthened by the adhesion of those towns which had hitherto looked for leadership to the Swiss reformer. About this time the military forces of the league were organized, their heads being the elector of Saxony and the landgrave of Hesse. But the league had a political as well as a religious aspect. It was an alliance between the enemies of the house of Habsburg, and on this side it gained the support of the duke of Bavaria and treated with Francis I. of France. To this its rapid growth was partly due, but more perhaps to the fact that the Reformation in Germany was above all things a popular movement, and thus many princes who would not have seceded from the Roman Church of their own accord were compelled to do so from political motives. They had been strong enough to undermine the imperial power; they were not strong enough to resist the pressure put upon them by a majority of their subjects. It was early in 1532, when faced with the necessity of resisting the Turkish advance, that Charles met the diet at Regensburg. He must have men and money for this purpose even at the price of an arrangement with the Protestants. But the Lutherans were absent from the diet, and the Romanists, although they voted help, displayed a very uncompromising temper towards their religious foes. Under these circumstances the emperor took the matter into his own hands, and his negotiations with the Protestants resulted in July 1532 in the religious peace of Nuremberg, a measure which granted temporary toleration to the Lutherans and which was repeatedly confirmed in the following years. Charles's reward was substantial and immediate. His subjects vied with each other in hurrying soldiers to his standard, and in a few weeks the great Turkish host was in full retreat.

Internal affairs of Germany.

While the probability of an alliance between Pope Clement VII. and Francis I. of France, together with other international complications, prevented the emperor from following up his victory over the Turks, or from reducing the dissenters from the Roman religion to obedience, Protestantism was making substantial progress in the states, notably in Anhalt and in Pomerania, and in the cities, and in January 1534 the Protestant princes were bold enough to declare that they did not regard the decisions of the *Reichskammergericht* as binding upon them. About this time Germany witnessed three events of some importance. Through the energy of Philip of Hesse, who was aided by Francis I., Ulrich of Württemberg was forcibly restored to his duchy. The members of the Romanist league recently founded at Halle would not help the Habsburgs, and in June 1534, by the treaty of Cadan, King Ferdinand was forced to recognize the restoration as a *fait accompli*; at the same time he was compelled to promise that he would stop all proceedings of the *Reichskammergericht* against the members of the league of Schmalkalden. The two other events were less favourable for the new religion, or rather for its orthodox manifestations. After a struggle, the Anabaptists obtained control of Münster and for a short time governed the town in accordance with their own peculiar ideas, while at Lübeck, under the burgomaster Jürgen Wullenweber, a democratic government was also established. But the bishop of Münster and his friends crushed the one movement, and after interfering in the affairs of Denmark the Lübeckers were compelled to revert to their former mode of government. The outbreak of the war between the Empire and France in 1536 almost coincided with the enlargement of the league of Schmalkalden, the existence of which was prolonged for ten years. All the states and cities which subscribed to the confession of Augsburg were admitted to it, and thus a large number of Protestants, including the duchies of Württemberg and Pomerania and the cities of Augsburg and Frankfort, secured a needful protection against the decrees of the *Reichskammergericht*, which the league again repudiated. Among the new members of the confederation was Christian III., king of Denmark. About the same time (May 1536) an agreement between the Lutherans and the Zwinglians was arranged by Martin Bucer, and was embodied in a document called the Concord of Wittenberg, and for the present the growing dissensions between the heads of the league, John Frederick, elector of Saxony, and Philip of Hesse, were checked. Thus strengthened the Protestant princes declared against the proposed general council at Mantua, while as a counterpoise to the league of Schmalkalden the imperial envoy, Mathias Held (d. 1563), persuaded the Romanist princes in June 1538 to form the league of Nuremberg. But, although he had made a truce with France at Nice in this very month, Charles V. was more conciliatory than some of his representatives, and at Frankfort in April 1539 he came to terms with the Protestants, not, however, granting to them all their demands. In 1530, too, the Protestants received a great accession of strength, the Lutheran prince Henry succeeding his Romanist brother George as duke of Saxony. Ducal Saxony was thus completely won for the reformed faith, and under the politic elector Joachim II. the same doctrines made rapid advances in Brandenburg. Thus practically all North Germany was united in supporting the Protestant cause.

Successes of the Protestants.

In 1542, when Charles V. was again involved in war with France and Turkey, who were helped by Sweden, Denmark and Scotland, the league of Schmalkalden took advantage of his occupations to drive its stubborn foe, Henry, duke of Brunswick-Wolfenbüttel, from his duchy and to enthrone Protestantism completely therein. But this was not the only victory gained by the Protestants about this time. The citizens of Regensburg accepted their doctrines, which also made considerable progress in the Palatinate and in Austria, while the archbishop of Cologne, Hermann von Wied, and William, duke of Gelderland, Cleves and Juliers, announced their secession from the Roman religion. The Protestants were now at the height of their power, but their ascendancy was about to be destroyed, and that rather by the folly and imprudence of their leaders than by the skill and valour of their foes. The unity and the power of the league of Schmalkalden were being undermined by two important events, the bigamy of Philip of Hesse, which for political reasons was condoned by the Lutheran divines, and the dissensions between John Frederick, the ruler of electoral, and Maurice, the new ruler of ducal Saxony. To save himself from the

Their defeats.

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consequences of his double marriage, which had provided him with powerful enemies, Philip in June 1541 came to terms with the emperor, who thus managed to spike the guns of the league of Schmalkalden, although the strength of this confederation did not fail until after the campaign against Henry of Brunswick. But while on the whole the fortunes of the European war, both in the east and in the west, were unfavourable to the imperialists, Charles V. found time in 1543 to lead a powerful force against William of Gelderland, who had joined the circle of his foreign foes. William was completely crushed; Gelderland was added to the hereditary lands of the Habsburgs, while the league of Schmalkalden impotently watched the proceedings. This happened about a year after war between the two branches of the Saxon house had only been averted by the mediation of Luther and of Philip of Hesse. The emperor, however, was unable, or unwilling, to make a more general attack on the Protestants. In accordance with the promises made to them at Frankfort in 1539, conferences between the leaders of the two religious parties were held at Hagenau, at Worms and at Regensburg, but they were practically futile. The diets at Regensburg and at Nuremberg gave very little aid for the wars, and did nothing to solve the religious difficulties which were growing more acute with repeated delays. At the diet of Spires in 1544 Charles purchased military assistance from the Protestants by making lavish promises to them. With a new army he marched against the French, but suddenly in September 1544 he concluded the treaty of Crépy with Francis I. and left himself free to begin a new chapter in the history of Germany.

Victory of Charles over the league of Schmalkalden.

Charles was now nearly ready to crush the Protestants, whose influence and teaching had divided Germany and weakened the imperial power, and were now endangering the supremacy of the Habsburgs in the Netherlands and in Alsace. His plan was to bring about the meeting of a general council to make the necessary reforms in the church, and then at whatever cost to compel the Protestants to abide by its decisions. While Pope Paul III., somewhat reluctantly, summoned the council which ultimately met at Trent, Charles made vigorous preparations for war. Having made peace with the Turks in October 1545 he began to secure allies. Assistance was promised by the pope; the emperor purchased the neutrality of Duke William of Bavaria, and at a high price the active aid of Maurice of Saxony; he managed to detach from the league of Schmalkalden those members who were without any enthusiasm for the Protestant cause and also those who were too timid to enter upon a serious struggle. Meanwhile the league was inactive. Its chiefs differed on questions of policy, one section believing that the emperor did not intend to proceed to extremities, and for some time no measures were taken to meet the coming peril. At last, in June 1546, during the meeting of the diet at Regensburg, Philip and John Frederick of Saxony realized the extent of the danger and began to muster their forces. They were still much more powerful than the emperor, but they did not work well together, or with Sebastian Schärtlin von Burtenbach, who led their troops in South Germany. In July 1546 they were placed under the imperial ban, and the war began in the valley of the Danube. Charles was aided by soldiers hurried from Italy and the Netherlands, but he did not gain any substantial successes until after October 1546, when his ally Maurice invaded electoral Saxony and forced John Frederick to march northwards to its defence. The Lutheran cities of southern and central Germany, among them Strassburg, Augsburg, Ulm and Frankfort, now submitted to the emperor, while Ulrich of Württemberg and the elector palatine of the Rhine, Frederick II., followed their example. Having restored Roman Catholicism in the archbishopric of Cologne and seen Henry of Brunswick settled in his duchy early in 1547, Charles led his men against his principal enemies, Philip of Hesse and John Frederick, who had quickly succeeded in driving Maurice from his electorate. At Mühlberg in April 1547 he overtook the army of the Saxon elector. His victory was complete. John Frederick was taken prisoner, and a little later Philip of Hesse, after vainly prolonging the struggle, was induced to surrender. The rising in the other parts of northern Germany was also put down, and the two leaders of political Lutheranism were prisoners in the emperor's hands.

The "Interim."

Unable to shake the allegiance of John Frederick to the Lutheran faith, Charles kept him and Philip of Hesse in captivity and began to take advantage of his triumph, although Magdeburg was still offering a stubborn resistance to his allies. By the capitulation of Wittenberg the electorate of Saxony was transferred to Maurice, and in the mood of a conqueror the emperor met the diet at Augsburg in September 1547. His proposals to strengthen and reform the administration of Germany were, however, not acceptable to the princes, and the main one was not pressed; but the Netherlands were brought under the protection of the Empire and some minor reforms were carried through. A serious quarrel with the pope, who had moved the council from Trent to Bologna, only increased the determination of Charles to establish religious conformity. In consultation with both Romanist and Lutheran divines a confession of faith called the *Interim* was drawn up; this was in the nature of a compromise and was issued as an edict in May 1548, but owing to the opposition of the Romanist princes it was not made binding upon them, only upon the Lutherans. There was some resistance to the *Interim*, but force was employed against Augsburg and other recalcitrant cities, and soon it was generally accepted. Thus all Germany seemed to lie at the emperor's feet. The Reformation had enabled him to deal with the princes and the imperial cities in a fashion such as no sovereign had dealt with them for three centuries.

The imperial succession.

Being now at the height of his power Charles wished to secure the succession to the imperial throne to his son Philip, afterwards Philip II. of Spain. This intention produced dissensions among the Habsburgs, especially between the emperor and his brother Ferdinand, and other causes were at work, moreover, to undermine the former's position. The Romanist princes were becoming alarmed at his predominance, the Protestant princes resented his arbitrary measures and disliked the harsh treatment meted out to John Frederick and to Philip of Hesse; all alike, irritated by the presence of Spanish soldiers in their midst, objected strongly to take Philip for their king and to any extension of Spanish influence in Germany. Turkey and France were again threatening war, and although the council had returned to Trent it seemed less likely than ever to satisfy the Protestants. The general discontent found expression in the person of Maurice of Saxony, a son-in-law of Philip of Hesse, whose services to Charles against the league of Schmalkalden had made him very unpopular in his own country. Caring little or nothing about doctrinal disputes, but a great deal about increasing his own importance, Maurice now took the lead in plotting against the emperor. He entered into an alliance with John, margrave of Brandenburg-Cüstrin, with another Hohenzollern prince, Albert Alcibiades of Bayreuth, and with other Lutheran leaders, and also with Henry II. of France, who eagerly seized this opportunity of profiting by the dissensions in the Empire and who stipulated for a definite reward. Charles knew something of these proceedings, but his recent victory had thrown him partly off his guard. The treaty with France was signed in January 1552; in March Henry II. invaded Germany as the protector of her liberties, while Maurice seized Augsburg and marched towards Innsbruck, where the emperor was residing, with the intention of making him a prisoner. An attempt at accommodation failed; Charles fled into Carinthia; and at one stroke all the advantages which he had gained by his triumph at Mühlberg were lost. Masters of the situation, Maurice and his associates met their opponents at Passau in May 1552 and arranged terms of peace, although the emperor did not assent to them until July. The two captive princes were released, but the main point agreed upon was that a diet should be called for the purpose of settling the religious difficulty, and that in the meantime the Lutherans were to enjoy full religious liberty.

The revolt of Maurice of Saxony.

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Delayed by the war with France and Turkey, the diet for the settlement of the religious difficulty did not meet at Augsburg until February 1555. Ferdinand represented his brother, and after a prolonged discussion conditions of peace were arranged. Romanists and Lutherans were placed upon an equal footing, but the toleration which was granted to them was not extended to the Calvinists. Each secular prince had the right to eject from his land all those who would not accept the form of religion established therein; thus the principle of *cujus regio ejus religio* was set up. Although the Lutherans did not gain all their demands, they won solid advantages and were allowed to keep all ecclesiastical property secularized before the peace of Passau. A source of trouble, however, was the clause in the treaty usually called the ecclesiastical reservation. This required an ecclesiastical prince, if he accepted the teaching of the confession of Augsburg, or in other words became a Lutheran, forthwith to resign his principality. The Lutherans denied the validity of this clause, and notwithstanding the protests of the Roman Catholics several prelates became Lutheran and kept their territories as secular possessions. The peace of Augsburg can hardly be described as a satisfactory settlement. Individual toleration was not allowed, or only allowed in unison with exile, and in the treaty there was abundant material for future discord.

The peace of Augsburg.

After Maurice of Saxony had made terms with Charles at Passau he went to help Ferdinand against the Turks, but one of his allies, Henry II. of France, continued the war in Germany while another, Albert Alcibiades, entered upon a wild campaign of plunder in Franconia. The French king seized Metz, which was part of the spoil promised to him by his allies, and Charles made an attempt to regain the city. For this purpose he took Albert Alcibiades into his service, but after a stubborn fight his troops were compelled to retreat in January 1553. Albert then renewed his raids, and these became so terrible that a league of princes, under Maurice of Saxony, was formed to crush him; although Maurice lost his life at Sievershausen in July 1553, this purpose was accomplished, and Albert was driven from Germany. After the peace of Augsburg, which was published in September 1555, the emperor carried out his intention of abdicating. He entrusted Spain and the Netherlands to Philip, while Ferdinand took over the conduct of affairs in Germany, although it was not until 1558 that he was formally installed as his brother's successor.

End of the reign.

Ferdinand I., who like all the German sovereigns after him was recognized as emperor without being crowned by the pope, made it a prime object of his short reign to defend and enforce the religious peace of Augsburg for which he was largely responsible. Although in all probability numerically superior at this time to the Romanists, the Protestants were weakened by divisions, which were becoming daily more pronounced and more serious, and partly owing to this fact the emperor was able to resist the demands of each party and to moderate their excesses. He was continually harassed by the Turks until peace was made in 1562, and connected therewith were troubles in Bohemia and especially in Hungary, two countries which he had acquired through marriage, while North Germany was disturbed by the wild schemes of Wilhelm von Grumbach (*q.v.*) and his associate John Frederick, duke of Saxony. With regard to the religious question efforts were made to compose the differences among the Protestants; but while these ended in failure the Roman Catholics were gaining ground. Ferdinand sought earnestly to reform the church from within, and before he died in July 1564 the Counter-Reformation, fortified by the entrance of the Jesuits into Germany and by the issue of the decrees of the council of Trent, had begun.

Ferdinand I.

Under Ferdinand's rule there were some changes in the administration of the Empire. Lutherans sat among the judges of the *Reichskammergericht*, and the Aulic Council, or *Hofrat*, established by Maximilian I. for the Austrian lands, extended its authority over the Empire and was known as the *Reichshofrat*. Side by side with these changes the imperial diet was becoming more useless and unwieldy, and the electors were gaining power, owing partly to the *Wahlkapitulation*, by which on election they circumscribed the power of each occupant of the imperial throne.

Administrative changes.

Ferdinand's son and successor, the emperor Maximilian II., was a man of tolerant views; in fact at one time he was suspected of being a Lutheran, a circumstance which greatly annoyed the Habsburgs and delayed his own election as king of the Romans. However, having given to the electors assurances of his fidelity to the Roman Church, he was chosen king in November 1562, and became ruler of Germany on his father's death nearly two years later. Like other German sovereigns Maximilian pursued the phantom of religious union. His first diet, which met at Augsburg in 1566, was, however, unable, or unwilling, to take any steps in this direction, and while the Roman Catholics urged the enforcement of the decrees of the council of Trent the serious differences among the Protestants received fresh proof from the attempt made to exclude the Calvinist prince Frederick III., elector palatine of the Rhine, from the benefits of the peace of Augsburg. After this Frederick and the Calvinists looked for sympathy more and more to the Protestants in France and the Netherlands, whom they assisted with troops, while the Lutherans, whose chief prince was Augustus, elector of Saxony, adopted a more cautious policy and were anxious not to offend the emperor. There were, moreover, troubles of a personal and private nature between these two electors and their families, and these embittered their religious differences. But these divergences of opinion were not only between Roman Catholic and Lutheran or between Lutheran and Calvinist, they were, in electoral and ducal Saxony at least, between Lutheran and Lutheran. Thus the Protestant cause was weakened just when it needed strengthening, as, on the other side, the Roman Catholics, especially Albert, duke of Bavaria, were eagerly forwarding the progress of the older faith, which towards the end of this reign was restored in the important abbey of Fulda. In secular affairs Maximilian had, just after his accession, to face a renewal of the Turkish war. Although his first diet voted liberal assistance for the defence of the country, and a large and splendid army was collected, he had gained no advantage when the campaign ended. The diet of Spires, which met in 1570, was mainly occupied in discussing measures for preventing the abuses caused by the enlistment by foreigners of German mercenary troops, but nothing was done to redress this grievance, as the estates were unwilling to accept proposals which placed more power in the emperor's hands. Maximilian found time to make earnest but unavailing efforts to mediate between his cousin, Philip II. of Spain, and the revolted Netherlands, and also to interfere in the affairs of Poland, where a faction elected him as their king. He was still dealing with this matter and hoping to gain support for it from the diet of Regensburg when he died (October 1576).

Maximilian II.

Maximilian's successor was his son, Rudolph II., who had been chosen king of the Romans in October 1575, and who in his later years showed marked traces of insanity. The new emperor had little of his father's tolerant spirit, and under his feeble and erratic rule religious and political considerations alike tended to increase the disorder in Germany. The death of the Calvinist leader, the elector palatine Frederick III., in October 1576 and the accession of his son Louis, a prince who held Lutheran opinions, obviously afforded a favourable opportunity for making another attempt to unite the Protestants. Under the guidance of Augustus of Saxony a Lutheran confession of faith, the *Formula concordiae*, was drawn up; but, although this was accepted by 51 princes and 35 towns, others—like the landgraves of Hesse and the cities of Madgeburg and Strassburg—refused to sign it, and thus it served only to emphasize the divisions among the Protestants. Moreover, the friendship between the Saxon and the Palatine houses was soon destroyed; for, when the elector Louis died in 1583, he was succeeded by a minor, his son Frederick IV., who was under the guardianship of his uncle John Casimir

Rudolph II.

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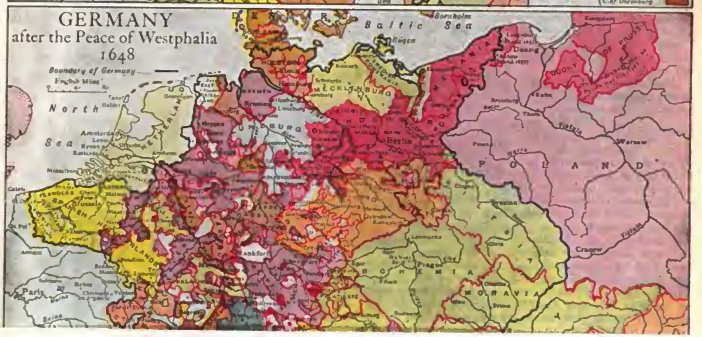

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(1543–1592), a prince of very marked Calvinist sympathies and of some military experience. Just before this time much unrest in the north-west of Germany had been caused by the settlement there of a number of refugees from the Netherlands. Spreading their advanced religious views, these settlers were partly responsible for two serious outbreaks of disorder. At Aix-la-Chapelle the Protestants, not being allowed freedom of worship, took possession of the city in 1581. The matter came before the diet, which was opened at Augsburg in July 1582, but the case was left undecided; afterwards, however, the *Reichshofrat* declared against the insurgents, although it was not until 1598 that Protestant worship was abolished and the Roman Catholic governing body was restored. At Cologne the archbishop, Gebhard Truchsess von Waldburg, married and announced his intention of retaining his spiritual office. Had this proceeding passed unchallenged, the Protestants, among whom Gebhard now counted himself, would have had a majority in the electoral college. The Roman Catholics, however, secured the deposition of Gebhard and the election in his stead of Ernest, bishop of Liége, and war broke out in 1583. Except John Casimir, the Protestant princes showed no eagerness to assist Gebhard, who in a short time was driven from his see, and afterwards took up his residence in Strasshurg, where also he instigated a rebellion on a small scale. Thus these quarrels terminated in victories for the Roman Catholics, who were successful about this time in restoring their faith in the bishoprics of Würzburg, Salzburg, Bamberg, Paderhorn, Minden and Osnahrück. Another dispute also ended in a similar way. This was the claim made by the administrator of the archbishopric of Magdeburg, a Hohenzollern prince, Joachim Frederick, afterwards elector of Brandenburg, to sit and vote in the imperial diet; it was not admitted, and the administrator retired from Augshurg, a similar fate befalling a similar claim made by several other administrators some years later.

After the death of Augustus of Saxony in February 1586 there was another brief alliance between the Protestant parties, although on this occasion the lead was taken not by the Saxon, but hy the Palatine prince. Less strict in his adherence to the tenets of Lutheranism than Augustus, the new elector of Saxony, Christian I., fell under the influence of John Casimir. The result was that Protestant princes, including the three temporal electors, united in placing their grievances before the emperor; obtaining no redress they met at Torgau in 1591 and offered help to Henry IV. of France, a proceding which was diametrically opposed to the past policy of Saxony. But this alliance, like its forerunner, was of very short duration. Christian I. died in 1591, and under Christian II. electoral Saxony re-established a rigid Lutheranism at home and pursued a policy of moderation and neutrality ahroad. A short time afterwards the militant party among the Protestants suffered a heavy loss by the death of their leader, John Casimir, whose policy, however, was continued by his nephew and pupil, the elector Frederick IV. But neither desertion nor death was ahle to crush entirely the militant Protestants, among whom Christian, prince of Anhalt (1568–1630), was rapidly becoming the most prominent figure. They made themselves very troublesome at the diet of Regensburg in 1593, and also at the diet held in the same city four years later, putting forward various demands for greater religious freedom and seeking to hinder, or delay, the payment of the grant for the Turkish war. Moreover, in 1598 they put forward the theory that the vote of a majority in the diet was not hinding upon the minority; they took up the same position at Regensburg in 1603, when they raised strong objections to the decisions of the *Reichshofrat* and afterwards withdrew from the diet in a body. Thus, under Maximilian of Bavaria and Christian of Anhalt respectively the two great parties were gaining a better idea of their own needs and of each other's aims and were watching vigilantly the position in the duchies of Cleves, Jülich and Berg, where a dispute over the succession was impending. While wars and rumours of wars were disturhing the peace in the west of Germany the Turks were again harassing the east.

The Protestant grievances.

The war between them and the Empire, which was renewed in 1593, lasted almost without interruption until Novemher 1606, when peace was made, the trihute long paid hy the emperor to the sultan heing abandoned. This peace was concluded not by Rudolph, hut by his hrother, the archduke Matthias, who owing to the emperor's mental incapacity had just been declared hy his kinsman the head of the house of Habsburg. Rudolph resented this indignity very greatly, and until his death in January 1612 the relations between the hrothers were very strained, hut this mainly concerns the history of Hungary and of Bohemia, which were sensibly affected hy the fraternal discord.

By this time however, there were signs of substantial progress on the part of the great Catholic reaction, which was to have important consequences for Germany. This was due mainly to the persistent zeal of the Jesuits. For a long time the Protestants had absorbed the intellectual strength of the country, hut now many ahle scholars and divines among the Jesuits could hold their own with their antagonists. These devoted missionaries of the church gave their attention mainly to the young, and during the reign of Rudolph II. they were fortunate enough to make a deep impression upon two princes, each of whom was destined to play a great part in the events of his time. These princes were Maximilian, duke of Bavaria, and Ferdinand, archduke of Styria, the former a member of the house of Wittelsbach, and the latter of the house of Habsburg. Maximilian became prominent in 1607 by executing an imperial mandate against the free city of Donauwörth, where a religious riot had taken place, and afterwards treating it as his own. Rendered suspicious by this arhitrary act, the Protestant princes in 1608 formed a confederation known as the Evangelical Union, and in response the Roman Catholics, under the guidance of Maximilian, united in a similar confederation afterwards called the Catholic League. This was founded at Munich in July 1609. As the Union was headed hy the elector palatine of the Rhine, Frederick IV., who was a Calvinist, many Lutherans, among them the elector of Saxony, were hy no means enthusiastic in its support. It acquired, however, immense importance through its alliance with Henry IV. of France, who, like Henry II., wished to profit by the quarrels in Germany, and who interfered in the disputed succession to the duchies of Cleves and Jülich. War seemed about to break out between the two confederations and their foreign allies over this question, hut after the murder of the French king in May 1610 the Union did not venture to fight.

The Counter-Reformation.

Ferdinand was even more vigorous than Maximilian in defence of his religion. On assuming the government of Styria he set to work to extirpate Protestantism, which had made considerahle progress in the Austrian arch-duchies. Soon afterwards he was selected by the Habshurgs as the heir of the childless emperor Matthias, and on coming to Vienna after the death of that sovereign in March 1619 he found himself in the midst of hopeless confusion. The Bohemians refused to acknowledge him as their king and elected in his stead Frederick V., the elector palatine of the Rhine, a son-in-law of the English king James I., and the Hungarians and the Austrians were hardly less disaffected. As Ferdinand II., however, he succeeded in ohtaining the imperial crown in August 1619, and from that time he was dominated by a fixed resolve to secure the triumph of his church throughout the Empire, a resolve which cost Germany the Thirty Years' War.

Ferdinand II.

He began with Bohemia. Although supported hy Spain he could not ohtain from this quarter an army sufficiently strong to crush the Bohemians, and for some time he remained powerless and inactive in Vienna. Then at the beginning of 1620 he came to terms with Maximilian of Bavaria, who, after carefully securing his own interests, placed the army of the League, commanded hy the celebrated Tilly, at his disposal. Conditionally the Union promised assistance to Frederick, hut he wasted several months and vaguely hoped that the English king would help him out of his emharrassments. Meanwhile Tilly advanced into Bohemia, and in November 1620 Frederick's army was utterly routed at

The congress in Bohemia.

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the battle of the White Hill, near Prague, and the unfortunate elector had just time to escape from the kingdom he had rashly undertaken to govern. Ferdinand drove to the uttermost the advantages of his victory. The Union being destroyed and the Bohemian revolution crushed, attention was turned to the hereditary lands of the elector palatine. The Spanish troops and the army of the League invaded the Rhenish Palatinate, which was defended by Frederick's remaining adherents, Christian of Brunswick and Count Ernst von Mansfeld, but after several battles it passed completely into the possession of the imperialists. Having been placed under the imperial ban Frederick became an exile from his inheritance, and the electorate which he was declared to have forfeited was conferred on Maximilian.

Thus ended the first stage of the Thirty Years' War, although some desultory fighting continued between the League and its opponents. The second began in 1625 with the formation, after much fruitless negotiation, of a Protestant combination, which had the support of England, although its leading member was Christian IV., king of Denmark, who as duke of Holstein was a prince of the Empire, and who like other Lutherans was alarmed at the emperor's successes. It was in this war that Europe first became familiar with the great name of Wallenstein. Unable himself to raise and equip a strong army, and restive at his dependence on the League, Ferdinand gladly accepted Wallenstein's offer to put an army into the field at no cost to himself. After Wallenstein had beaten Mansfeld at the bridge of Dessau in April 1626, and Tilly had defeated Christian of Denmark at Lutter in the succeeding August, the two generals united their forces. Denmark was invaded, and Wallenstein, now duke of Friedland, was authorized to govern the conquered duchies of Mecklenburg and Pomerania; but his ambitious scheme of securing the whole of the south coast of the Baltic was thwarted by the resistance of the city of Stralsund, which for five months he vainly tried to take. Denmark, however, was compelled to conclude peace at Lübeck in May 1629.

Danish interference in the war.

Intoxicated by success, Ferdinand had issued two months before the famous Edict of Restitution. This ordered the restoration of all ecclesiastical lands which had come into the possession of the Protestants since the peace of Passau in 1552, and, as several archbishoprics and bishoprics had become Protestant, it struck a tremendous blow at the emperor's foes and stirred among them intense and universal opposition. A little later, yielding to Maximilian and his colleagues in the League, Ferdinand dismissed Wallenstein, whose movements had aroused their resentment, from his service. A more inauspicious moment could not have been chosen for these two serious steps, because in the summer of 1630 Gustavus Adolphus left Sweden at the head of a strong army for the purpose of sustaining the Protestant cause in Germany. At first this great king was coldly received by the Protestants, who were ignorant of his designs and did not want a stranger to profit by the internal disputes of their country. A mistake at the outset would probably have been fatal to him, but he saw the dangers of his position and moved so warily that in less than a year he had obtained the alliance of the elector of Saxony, a consequence of the terrible sack of Magdeburg by the imperialists in May 1631 and of the devastation of the electorate by Tilly. He had also obtained on his own terms the assistance of France, and was ready to enter upon his short but brilliant campaign.

Dismissal of Wallenstein.

Having captured Frankfort-on-Oder and forced the hesitating elector of Brandenburg, George William, to grant him some assistance, Gustavus Adolphus added the Saxon army to his own, and in September 1631 he met Tilly, at the head of nearly the whole force of the League, at Breitenfeld, near Leipzig, where he gained a victory which placed North Germany entirely at his feet. So utterly had he shattered the emperor's power that he could doubtless have marched straight to Vienna; be preferred, however, to proceed through central into southern Germany, while his Saxon ally, the elector John George, recovered Silesia and Lusatia and invaded Bohemia. Würzburg and Frankfort were among the cities which opened their gates to the Swedish king as the deliverer of the Protestants; several princes sought his alliance, and, making the captured city of Mainz his headquarters, he was busily engaged for some months in resting and strengthening his army and in negotiating about the future conduct of the war. Early in 1632 he led his troops into Bavaria. In April he defeated Tilly at the crossing of the Lech, the imperialist general being mortally wounded during this fight, and then he took possession of Augsburg and of Munich. Before these events Ferdinand had realized how serious had been his mistake in dismissing Wallenstein, and after some delay his agents persuaded the great general to emerge from his retirement. The conditions, however, upon which Wallenstein consented to come to the emperor's aid were remarkably onerous, but Ferdinand had perforce to assent to them. He obtained sole command of the imperial armies, with the power of concluding treaties and of granting pardons, and he doubtless insisted on the withdrawal of the Edict of Restitution, although this is not absolutely certain; in brief, the only limits to his power were the limits to the strength of his army. Having quickly assembled this, he drove the Saxons from Bohemia, and then marched towards Franconia, with the intention of crossing swords with his only serious rival, Gustavus Adolphus, who had left Munich when he heard that this foe had taken the field. The Swedes and their allies occupied Nuremberg, while the imperialists fortified a great camp and blockaded the city. Gustavus made an attempt to storm these fortifications, but he failed to make any impression on them; he failed also in inducing Wallenstein to accept battle, and he was forced to abandon Nuremberg and to march to the protection of Saxony. Wallenstein followed, and the two armies faced each other at Lützen on the 16th of November 1632. Here the imperialists were beaten, but the victory was even more disastrous to the Protestant cause than a defeat, for the Swedish king was among the slain.

The campaign of Gustavus Adolphus.

The Swedes, whose leader was now the chancellor Oxenstjerna, were stunned by this catastrophe, but in a desultory fashion they maintained the struggle, and in April 1633 a new league was formed at Heilbronn between them and the representatives of four of the German circles, while by a new agreement France continued to furnish monetary aid. Of this alliance Sweden was the predominant member, but the German allies had a certain voice in the direction of affairs, the military command being divided between the Swedish general Horn and Bernhard, duke of Saxe-Weimar. About this time some discontent arose in the allied army, and to allay this Bernhard was granted the bishoprics of Würzburg and of Bamberg, with the title of duke of Franconia, but on the strange condition that he should hold the duchy as the vassal of Sweden, not as a vassal of the Empire. The war, thus revived, was waged principally in the valleys of the Danube and the Rhine, the Swedes, seizing Alsace while Bernhard captured Regensburg. Meanwhile Wallenstein was again arousing the suspicions of his nominal allies. Instead of attacking the enemy with his accustomed vigour, he withdrew into Bohemia and was engaged in lengthy negotiations with the Saxon soldier and diplomatist, Hans Georg von Arnim (1581–1641), his object being doubtless to come to terms with Saxony and Brandenburg either with or without the emperor's consent. His prime object was, however, to secure for himself a great territorial position, possibly that of king of Bohemia, and it is obvious that his aims and ambitions were diametrically opposed to the ends desired by Ferdinand and by his Spanish and Bavarian allies. At length he set his troops in motion. Having gained some successes in the north-east of Germany he marched to succour the hardly pressed elector of Bavaria; then suddenly abandoning this purpose he led his troops back to Bohemia and left Bernhard of Saxe-Weimar in possession of the Danube valley. It is not surprising that a cry, louder than ever, now arose for his dismissal. Ferdinand did as he was required. In January 1634 he declared Wallenstein deposed from his command, but he was still at the head of an army when he was

The league of Heilbronn and the death of Wallenstein.

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murdered in the following month at Eger. Commanded now by the king of Hungary, afterwards the emperor Ferdinand III., the imperialists retook Regensburg and captured Donauwörth; then, aided by some Spanish troops, they gained a victory at Nördlingen in September 1634, the results of which were as decisive and as satisfactory for them as the results of Breitenfeld had been for their foes two years before.

The demoralization of the Swedes and their allies, which was a consequence of the defeat at Nördlingen, was the opportunity of France. Having by clever diplomacy placed garrisons in several places in Alsace and the Palatinate, the king of France, or rather Cardinal Richelieu, now entered the field as a principal, made a definite alliance with Sweden at Compiègne in April 1635, and in the following month declared war and put four armies in motion. But the thoughts of many had already turned in the direction of peace, and in this manner John George of Saxony took the lead, signing in May 1635 the important treaty of Prague with the emperor. The vexed and difficult question of the ownership of the ecclesiastical lands was settled by fixing November 1627 as the deciding date; those who were in possession then were to retain them for forty years, during which time it was hoped a satisfactory arrangement would be reached. The Saxon elector gained some additions of territory and promised to assist Ferdinand to recover any lands which had been taken from him by the Swedes, or by other foes. For this purpose a united army was to serve under an imperial general, and all leagues were to be dissolved. In spite of the diplomatic efforts of Sweden the treaty of Prague was accepted almost at once by the elector of Brandenburg, the duke of Württemberg and other princes, and also by several of the most important of the free cities. It was only, in fact, the failure of Saxony and Sweden to come to terms which prevented a general peace in Germany. The Thirty Years' War now took a different form. Its original objects were almost forgotten and it was continued mainly to further the ambitions of France, thus being a renewal of the great fight between the houses of Habsburg and of Bourbon, and to secure for Sweden some recompense for the efforts which she had put forward.

France takes part in the war.

While the signatories of the peace of Prague were making ready to assist the emperor the only Germans on the other side were found in the army under Bernhard of Saxe-Weimar. The final stage of the war opened with considerable Swedish successes in the north of Germany, especially the signal victory gained by them over the imperialists and the Saxons at Wittstock in October 1636. At the same time good fortune was attending the operations of the French in the Rhineland, where they were aided by Bernhard of Saxe-Weimar, a satisfactory financial arrangement between these parties having been reached in the autumn of 1635. The year 1638 was an especially fortunate one for France and her allies. Bernhard's capture of Rheinfelden and of Breisach gave them possession of the surrounding districts, but dissensions arose concerning the division of the spoil; these, however, were stopped by the death of Bernhard in July 1639, when France took his army into her pay. Thus the war continued, but the desire for peace was growing stronger, and this was reflected in the proceedings of the diet which met at Regensburg in 1640. Under Count Torstenssen the Swedes defeated the imperialists at Breitenfeld in 1642; three years later they gained another victory at Jankau and advanced almost to Vienna, and then the last decisive move of the war was made by the great French general, Turenne. Having been successful in the Rhineland, where he had captured Philippsburg and Worms, Turenne joined his forces to those of Sweden under Wrangel and advanced into Bavaria. Ravaging the land, they compelled the elector Maximilian to sign a truce and to withdraw his troops from the imperial army. When, however, the allied army had retired Maximilian repented of his action. Again he joined the emperor, but his punishment was swift and sure, as Turenne and Wrangel again marched into the electorate and defeated the Bavarians at Zusmarshausen, near Augsburg, in May 1648. A few minor operations followed, and then came the welcome news of the conclusion of the treaty of Westphalia.

Bernhard of Saxe-Weimar.

The preliminary negotiations for peace were begun at Hamburg and Cologne before the death of the emperor Ferdinand II. in 1637. But a treaty signed at Hamburg in December 1641 it was agreed that peace conferences should meet at Münster and at Osnabrück in March 1642, the emperor treating with France in the former, and with Sweden in the latter city. The Roman Catholic princes of the Empire were to be represented at Münster and the Protestants at Osnabrück. Actually the conferences did not meet until 1645, when the elector of Brandenburg had made, and the elector of Saxony was about to make, a truce with Sweden, these two countries being withdrawn from the ravages of the war. In three years the many controversial questions were discussed and settled, and in October 1648 the treaty of Westphalia was signed and the Thirty Years' War was at an end.

The peace of Westphalia.

The Thirty Years' War settled once for all the principle that men should not be persecuted for their religious faith. It is true that the peace of Westphalia formally recognized only the three creeds, Catholicism, Lutheranism and Calvinism, but so much suffering had been caused by the interference of the state with individual conviction, that toleration in the largest sense, so far as law was concerned, was virtually conceded. This was the sole advantage gained from the war by the Protestants. The Catholics insisted at first on keeping all the ecclesiastical lands which had been taken from them before the Edict of Restitution in 1629. The Protestants responded by demanding that they should lose nothing which they had held before 1618, when the war began. A compromise was at last effected by both parties agreeing to the date 1624, an arrangement which secured to the Catholics their gains in Bohemia and the other territories of the house of Habsburg. The restoration of the elector palatine to part of his lands, and his reinstatement in the electoral office, were important concessions; but on the other hand, the duke of Bavaria kept the Upper Palatinate, the elector palatine becoming the eighth and junior member of the electoral college.

Effects of the Thirty Years' War.

The country suffered enormous territorial losses by the war. Up to this time the possession of Metz, Toul and Verdun by France had never been officially recognized; now these bishoprics were formally conceded to her. She also received as much of Alsace as belonged to Austria. To the Swedes were granted Western Pomerania, with Stettin, and the archbishopric of Bremen and the bishopric of Verden. These acquisitions, which surpassed the advantages Gustavus Adolphus had hoped to win, gave Sweden the command both of the Baltic and of the North Sea. In virtue of her German possessions Sweden became a member of the Empire; but France obtained absolute control of her new territories. There was a further diminution of Germany by the recognition of the independence of Switzerland and the United Provinces. Both had long been virtually free; they now for the first time took the position of distinct nations.

Loss of territory.

In the political constitution of Germany the peace of Westphalia did not so much make changes as sanction those already effected. The whole tendency of the Reformation had been to relax the bonds which united the various elements of the state to each other and to their head. It divided the nation into two hostile parties, and the emperor was not able to assume towards them a perfectly impartial position. His imperial crown imposed upon him the necessity of associating himself with the Roman Catholics; so that the Protestants had a new and powerful reason for looking upon him with jealousy, and trying to diminish his authority. The Roman Catholics, while maintaining their religion, were willing enough to co-operate with them for this object; and Germany often saw the strange spectacle of princes rallying round the emperor for the defence of the church, and at the same time striking deadly blows at his political influence. The diet was a scene of perpetual quarrelling between the two factions, and their differences made it impossible for the imperial

The Reformation and the political constitution.

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chamber to move beyond the region of official routine. Thus before the Thirty Years' War the Empire had virtually ceased to exist, Germany having become a loose confederation of principalities and free cities. For a moment the emperor Ferdinand appeared to have touched the ideal of Charles V. in so far, at least, as it related to Germany, but only for a moment. The stars in their courses fought against him, and at the time of his death he saw how far beyond his power were the forces with which even Charles had been unable to contend. The state of things which actually existed the peace of Westphalia made legal. So nearly complete was the independence of the states that each received the right to form alliances with any of the others, or with foreign powers, nominally on condition that their alliances should not be injurious to the emperor or to the Empire. Any authority which still lawfully belonged to the emperor was transferred to the diet. It alone had now the power of making laws, of concluding treaties in the name of Germany, and of declaring war and re-establishing peace. No one, however, expected that it would be of any real service. From 1663 it became a permanent body, and was attended only by the representatives of the princes and the cities; and from that time it occupied itself mainly with trifles, leaving the affairs of each state to be looked after by its own authorities, and those of the country generally to such fortunes as chance should determine.

Continuance of the empire.

It would not have been strange if so shadowy an Empire had been brought altogether to an end. Some slight bond of connexion was, however, necessary for defence against common dangers; and the Empire had existed so long, and so many great associations were connected with it, that it seemed to all parties preferable to any other form of union. Moreover, Sweden, and other states which were now members of the Empire, warmly supported it; and the house of Habsburg, on which it reflected a certain splendour, would not willingly have let it die. An Austrian ruler, even when he spoke only in the name of Austria, derived authority from the fact that as emperor he represented many of the greatest memories of European history.

National life.

The effect of the Thirty Years' War on the national life was disastrous. It had not been carried on by disciplined armies, but by hordes of adventurers whose sole object was plunder. The cruelties they inflicted on their victims are almost beyond conception. Before the war the population was nearly twenty millions; after it the number was probably about six millions. Whole towns and villages were laid in ashes, and vast districts turned into deserts. Churches and schools were closed by hundreds, and to such straits were the people often reduced that cannibalism is said to have been not uncommon. Industry and trade were so completely paralysed that in 1633 the Hanseatic League was virtually broken up, because the members, once so wealthy, could not meet the necessary expenditure. The population was not only impoverished and reduced in numbers but broken in spirit. It lost confidence in itself, and for a time effected in politics, literature, art and science little that is worthy of serious study.

The princes.

The princes knew well how to profit by the national prostration. The local diets, which, as we have seen, formed a real check on petty tyranny, and kept up an intimate relation between the princes and their subjects, were nearly all destroyed. Those which remained were injurious rather than beneficial, since they often gave an appearance of lawfulness to the caprices of arbitrary sovereigns. After the Thirty Years' War it became fashionable for the heirs of principalities to travel, and especially to spend some time at the court of France. Here they readily imbibed the ideas of Louis XIV., and in a short time nearly every petty court in Germany was a feeble imitation of Versailles. Before the Reformation, and even for some time after it, the princes were thorough Germans in sympathies and habits; they now began to be separated by a wide gulf from their people. Instead of studying the general welfare, they wrung from exhausted states the largest possible revenue to support a lavish and ridiculous expenditure. The pettiest princeling had his army, his palaces, his multitudes of household officers; and most of them pampered every vulgar appetite without respect either to morality or to decency. Many nobles, whose lands had been wasted during the war, flocked to the little capitals to make their way by contemptible court services. Beneath an outward gloss of refinement these nobles were, as a class, coarse and selfish, and they made it their chief object to promote their own interests by fostering absolutist tendencies. Among the people there was no public opinion to discourage despotism; the majority accepted their lot as inevitable, and tried rather to reproduce than to restrain the vices of their rulers. Even the churches offered little opposition to the excesses of persons in authority, and in many instances the clergy, both Protestant and Catholic, acquired an unenviable notoriety for their readiness to overlook or condone actions which outraged the higher sentiments of humanity. In the free imperial cities there was more manliness of tone than elsewhere, but there was little of the generous rivalry among the different classes which had once raised them to a high level of prosperity. Most of them resigned their liberties into the hands of oligarchies, and others allowed themselves to be annexed by ambitious princes. (A. W. H.*)

The cities.

Ferdinand III.

Ferdinand III. succeeded to the throne when the fortunes of his house were at a low ebb, and he continued the Thirty Years' War, not in the hope of re-establishing the Roman Catholic religion or of restoring the imperial authority, but of remedying as far as he could the havoc caused by his father's recklessness. After the conclusion of peace nothing happened to make his reign memorable. *His son Leopold I. was a man of narrow intellect and weak will; yet Germany seldom so keenly felt the need of a strong emperor, for she had during two generations to contend with a watchful and grasping rival. For more than a century it had been the policy of France to strengthen herself by fostering the internal dissensions of Germany. This was now easy, and Louis XIV. made unscrupulous use of the advantages his predecessors had helped to gain for him. Germany, as a whole, could not for a long time be induced to resist him. His schemes directly threatened the independence of the princes; but they were too indolent to unite against his ambition. They grudged even the contributions necessary for the maintenance of the frontier fortresses, and many of them stooped to accept the bribes he offered them on condition that they should remain quiet. In his war with the United Provinces and Spain, begun in 1672, he was joined by the emperor as ruler of Austria, and by Frederick William, the elector of Brandenburg; and in 1675 the latter gained a splendid victory at Fehrbellin over his allies, the Swedes. At the end of the war, in 1678, by the peace of Nijmwegen, Louis took care that Frederick William should be deprived of the fruits of his victory, and Austria had to resign Freiburg im Breisgau to the French. Under the pretence that when France gained the Austrian lands in Alsace she also acquired a right to all places that had ever been united to them, Louis began a series of systematic robberies of German towns and territories. "Chambers of Reunion" were appointed to give an appearance of legality to these proceedings, which culminated, in 1681, in the seizure of Strassburg. Germans of all states and ranks were indignant at so gross a humiliation, but even the loss of Strassburg did not suffice to move the diet. The emperor himself might probably have interfered, but Louis had provided him with ample employment by stirring up against him the Hungarians and the Turks. So complete was his hold over the majority of the princes that when the Turks, in 1683, surrounded Vienna, and appeared not unlikely to advance into the heart of Germany, they looked on indifferently, and allowed the emperor to be saved by the promptitude and courage of John Sobieski, king of Poland. At last, when, in 1680, on the most frivolous pretext, Louis poured into southern Germany armies which were guilty of shameful outrages, a number of princes came forward and aided the emperor. This time France was sternly opposed by the league of which William III. of England was the moving spirit;*

Leopold I.

Louis XIV. of France.

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and although at the end of the war he kept Strassburg, he had to give up Freiburg, Philipsburg, Breisach, and the places he had seized because of their former connexion with Alsace. In the War of the Spanish Succession two powerful princes, the elector of Bavaria and the elector of Cologne, joined Louis; but as the states of the Empire declared war against him in 1702, the other princes, more or less loyally, supported the emperor and his allies. Leopold died during the progress of this war, but it was vigorously continued by his son Joseph I.

War of Spanish Succession.

Joseph's brother and successor, Charles VI., also went on with it; and such were the blows inflicted on France by the victories of Blenheim, Ramillies and Malplaquet that the war was generally expected to end in her utter discomfiture. But the conclusion of the treaty of Utrecht by England, in 1713, so limited the military power of Charles VI. that he was obliged to resign the claims of Austria to the Spanish throne, and to content himself with the Spanish Netherlands, Milan, Naples and Sardinia. He cared so little for Germany, as distinguished from Austria, that he allowed Louis to compel the diet to cede the imperial fortress of Landau. At a later stage in his reign he was guilty of an act of even grosser selfishness; for after the War of the Polish Succession, in which he supported the claims of Augustus III., elector of Saxony, he yielded Lorraine to Stanislaus Leszczynski, whose claims had been defended by France, and through whom France ultimately secured this beautiful German province. Having no son, Charles drew up in 1713 the pragmatic sanction, which ordained that, in the event of an Austrian ruler being without male heirs, his hereditary lands and titles should pass to his nearest female relative. The aim of his whole policy was to secure for this measure, which was proclaimed as a fundamental law in 1724, the approval of Europe; and by promises and threats he did at last obtain the guarantee of the states of the Empire and the leading European powers.

Charles VI.

Pragmatic sanction.

Germany was now about to be aroused from the torpor into which she had been cast by the Thirty Years' War; but her awakening was due, not to the action of the Empire, which was more and more seen to be practically dead, but to the rivalry of two great German states, Austria and Prussia. The latter had long been laying the foundations of her power. Brandenburg, the centre of the Prussian kingdom, was, as we have seen, granted in the 15th century by the emperor Sigismund to Frederick, count of Hohenzollern. In his hands, and in those of his prudent successors, it became one of the most flourishing of the North-German principalities. At the time of the Reformation Albert, a member of a subordinate branch of the house of Hohenzollern, happened to be grand master of the Teutonic Order. He became a Protestant, dissolved the order, and received in fief of the king of Poland the duchy of Prussia. In 1611 this duchy fell by inheritance to the elector of Brandenburg, and by the treaty of Wehlau, in 1657, in the time of Frederick William, the Great Elector, it was declared independent of Poland. By skill, foresight and courage Frederick William managed to add largely to his territories; and in an age of degenerate sovereigns he was looked upon as an almost model ruler. His son, Frederick, aspired to royal dignity, and in 1701, having obtained the emperor's assent, was crowned king of Prussia. The extravagance of Frederick drained the resources of his state, but this was amply atoned for by the rigid economy of Frederick William I., who not only paid off the debts accumulated by his father, but amassed an enormous treasure. He so organized all branches of the public service that they were brought to a point of high efficiency, and his army was one of the largest, best appointed and best trained in Europe (see PRUSSIA: *History*). He died in 1740, and within six months, when Frederick II. was on the Prussian throne, Maria Theresa claimed, in virtue of the pragmatic sanction, the lands and hereditary titles of her father Charles VI.

Growth of Prussia.

Maria Theresa.

Frederick II., a young, ambitious and energetic sovereign, longed not only to add to his dominions but to play a great part in European politics. His father had guaranteed the pragmatic sanction, but as the conditions on which the guarantee had been granted had not been fulfilled by Charles VI., Frederick did not feel bound by it, and revived some old claims of his family on certain Silesian duchies. Maria Theresa would not abate her rights, but before she could assert them Frederick had entered Silesia and made himself master of it. Meanwhile, the elector of Bavaria had come forward and disputed Maria Theresa's right to the succession, and the elector of Saxony had also put in a claim to the Austrian lands. Taking advantage of these disputes, France formed an alliance with the two electors and with the king of Prussia against Austria; and in the war which followed the allies were at first so successful that the elector of Bavaria, through the influence of France, was crowned emperor as Charles VII. (1742–1745). Maria Theresa, a woman of a noble and undaunted spirit, appealed, with her infant son, afterwards Joseph II., in her arms, to the Hungarian diet, and the enthusiastic Magyars responded chivalrously to her call. To be more at freedom she concluded peace with Frederick, and ceded Silesia to him, although greatly against her will. Saxony also was pacified and retired from the struggle. After this Maria Theresa, supported by England, made way so rapidly and so triumphantly that Frederick became alarmed for his new possessions; and in 1742 he once more proclaimed war against her, nominally in aid of the emperor. Charles VII. ultimately, in 1748, she was able to conclude an honourable peace at Aix-la-Chapelle; but she had been forced, as before, to rid herself of Frederick by confirming him in the sovereignty of the territory he had seized.

Frederick the Great.

First Silesian war.

Charles VII.

Second Silesian war.

After the death of Charles VII., Francis, grand duke of Tuscany, Maria Theresa's husband, was elected emperor. Francis I. (1745–1765), an amiable nonentity, with the instincts of a shopkeeper, made no pretence of discharging important imperial duties, and the task of ruling the hereditary possessions of the house of Habsburg fell wholly to the empress-queen. She executed it with discretion and vigour, so that Austria in her hands was known to be one of the most formidable powers in the world. Her rival, Frederick II., was, if possible, still more active. It did not occur to him, any more than to the other German sovereigns of the 18th century, to associate his people with him in the government of the country; he was in every respect a thoroughly absolute sovereign. But he shared the highest ideas of the age respecting the responsibilities of a king, and throughout his long reign acted in the main faithfully as "the first servant of the state." The army he always kept in readiness for war; but he also encouraged peaceful arts, and diffused throughout his kingdom so much of his own alert and aggressive spirit that the Prussians became more intelligent and more wealthy than they had ever before been. He excited the admiration of the youth of Germany, and it was soon the fashion among the petty princes to imitate his methods of government. As a rule, they succeeded only in raising far larger armies than the taxpayers could afford to maintain.

Francis I.

Maria Theresa never gave up the hope of winning back Silesia, and, in order to secure this object, she laid aside the jealousies of her house, and offered to conclude an alliance with France. Frederick had excited the envy of surrounding sovereigns, and had embittered them against him by stinging sarcasms. Not only France, therefore, but Russia, Saxony and ultimately Sweden, willingly came to terms with Austria, and the aim of their union was nothing short of the partition of Prussia. Frederick, gaining knowledge of the plot, turned to England, which had in the previous war helped Austria. At the close of 1755 his offer of an alliance was acceded to; and in the following year, hoping by vigorously taking the initiative to prevent his enemies from united action, he invaded Saxony, and began the Seven Years' War (*q.v.*), the result of which was to confirm Prussia in the possession of Silesia.

The Seven Years' War, 1756–1763.

Prussia now took rank as one of the leading European powers, and by her rise a new element was introduced into the political

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life of Germany. Austria, although associated with the Empire, could no longer feel sure of her predominance, and it was inevitable that the jealousies of the two states should lead to a final conflict for supremacy. Even before the Seven Years' War there were signs that the German people were beginning to tire of incessant imitation of France, for in literature they welcomed the early efforts of Klopstock, Wieland and Lessing; but the movement received a powerful impulse from the great deeds of Frederick. The nation, as a whole, was proud of him, and began, for the first time since the Thirty Years' War, to feel that it might once more assume a commanding place in the world.

In 1772 the necessities of Frederick's position compelled him to join Russia and Austria in the deplorable partition of Poland, whereby he gained West Prussia, exclusive of Danzig and Thorn, and Austria acquired West Silesia. After this he had to watch closely the movements of the emperor Joseph II., who, although an ardent admirer of Frederick, was anxious to restore to Austria the greatness she had partially lost. The younger branch of the Wittelsbach line, which had hitherto possessed Bavaria, having died out in 1777, Joseph asserted claims to part of its territory. Frederick intervened, and although no battle was fought in the nominal war which followed, the emperor was obliged to content himself with a very unimportant concession. He made a second attempt in 1785, but Frederick again came forward. This time he formed a league (*Fürstenbund*) for the defence of the imperial constitution, and it was joined by the majority of the small states. The memory of this league was almost blotted out by the tremendous events which soon absorbed the attention of Germany and the world, but it truly indicated the direction of the political forces which were then at work beneath the surface, and which long afterwards triumphed. The formation of the league was a distinct attempt on the part of Prussia to make herself the centre for the national aspirations both of northern and of southern Germany.

Partition of Poland.

Joseph II.

The French Revolution was hailed by many of the best minds of Germany as the opening of a new era. Among the princes it excited horror and alarm, and in 1792 the emperor Leopold II. and Frederick William II., the unworthy successor of Frederick the Great, met at Pillnitz, and agreed to support by arms the cause of the French king. A more important resolution was never taken. It plunged Europe into a conflict which cost millions of lives, and which overthrew the entire states system of the continent. Germany herself was the principal sufferer. The structure which the princes had so laboriously built up crumbled into ruins, and the mistakes of centuries were expiated in an agony of disaster and humiliation.

French Revolution.

The states of the Empire joined Austria and Prussia, and, had there been hearty co-operation between the allies, they could scarcely have failed of success. While the war was in progress, in 1793, Prussia joined Russia in the second partition of Poland. Austria considered herself overreached, and began negotiations with Russia for the third and final partition, which was effected by the three powers in 1795. Prussia, irritated by the proceedings of her rival, did as little as possible in the war with France; and in 1795 she retired from the struggle, and by the treaty of Basel ceded to the French republic her possessions on the left bank of the Rhine. The war was continued by Austria, but her power was so effectually shattered by blow after blow that in 1797 she was forced to conclude the peace of Campo Formio. Napoleon Bonaparte, to whose genius the triumph of France was mainly due, began separate negotiations with the states of the Empire at Rastadt; but, before terms could be agreed upon, war again began in 1799, Austria acting on this occasion as the ally of Great Britain and Russia. She was beaten, and the peace of Lunéville added fresh humiliations to those imposed upon her by the previous war. France now obtained the whole of the left bank of the Rhine, the dispossessed princes being compensated by grants of secularized church lands and of mediatized imperial cities (1803). The contempt of Napoleon for the Empire was illustrated by his occupation of Hanover in 1803, and by his seizure of the duke of Enghien on imperial territory in 1804. In 1805 Austria once more appealed to arms in association with her former allies, but in vain. By the peace of Presburg she accepted more disastrous terms than ever, and for the moment it seemed as if she could not again hope to rise to her former splendour. In this war she was opposed not only by France, but by Bavaria, Württemberg and Baden, all of which were liberally rewarded for their services, the rulers of the two former countries being proclaimed kings. The degradation of Germany was completed by the formation, in 1806, of the Confederation of the Rhine, which was composed of the chief central and southern states. The welfare of the Empire was asserted to be its object, but a body of which Napoleon was the protector existed, of course, for no other purpose than to be a menace to Austria and Prussia. Francis II., who had succeeded Leopold II. in 1792 and in 1804 had proclaimed himself hereditary emperor of Austria, as Francis I., now resigned the imperial crown, and thus the Holy Roman Empire and the German kingdom came to an end. The various states, which had for centuries been virtually independent, were during the next few years not connected even by a nominal bond. (J. St.)

End of the Holy Roman Empire.

Frederick William III. (1797–1840) of Prussia, the successor of Frederick William II., had held aloof from the struggle of Austria with France. This attitude had been dictated partly by his constitutional timidity, partly by the desire to annex Hanover, to which Austria and Russia would never have assented, but which Napoleon was willing to concede in return for a Prussian alliance. The Confederation of the Rhine, however, was a menace to Prussia too serious to be neglected; and Frederick William's hesitations were suddenly ended by Napoleon's contemptuous violation of Prussian territory in marching three French brigades through Ansbach without leave asked. The king at once concluded a convention with the emperor Alexander I. of Russia and declared war on France. The campaign that ended in the disastrous battle of Jena (October 14, 1806) followed; and the prestige of the Prussian arms, created by Frederick the Great, perished at a blow. With the aid of Russia Frederick William held out a while longer, but after Napoleon's decisive victory at Friedland (June 14, 1807) the tsar came to terms with the French emperor, sacrificing the interests of his ally. By the treaty of Tilsit (July 9) the king of Prussia was stripped of the best part of his dominions and more than half his subjects.

Prussia defeated at Jena.

Germany now seemed fairly in the grip of Napoleon. Early in November 1806 he had contemptuously deposed the elector of Hesse and added his dominions to Jerome's kingdom of Westphalia; on the 21st of the same month he issued from Berlin the famous decree establishing the "continental system," which, by forbidding all trade with England, threatened German commerce with ruin. His triumph seemed complete when, on the 11th of October 1807, Metternich signed at Fontainebleau, on behalf of Austria, a convention that conceded all his outstanding claims, and seemed to range the Habsburg monarchy definitely on his side. There was, however, to be one final struggle before Napoleon's supremacy was established. The submission of Austria had been but an expedient for gaining time; under Count Stadion's auspices she set to work increasing and reorganizing her forces; and when it became clear from Napoleon's resentment that he was meditating fresh designs against her she declared war (1809). The campaign ended in the crushing defeat of Wagram (July 6) and the humiliating treaty of peace dictated by Napoleon at the palace of Schönbrunn in Vienna (October 14). Austria, shorn of her fairest provinces, robbed of her oversea commerce, bankrupt and surrounded on all sides by the territories of the French emperor and his allies, seemed to exist only on sufferance, and had ceased to have any effective authority in Germany—now absolutely in the power of Napoleon, who proved this in 1810 by annexing the whole of the northern coast as far as the Elbe to his empire.

Napoleon in power.

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The very completeness of the humiliation of Germany was the means of her deliverance. She had been taught self-respect by Frederick II., and by her great writers in literature and philosophy; it was felt to be intolerable that in politics she should do the bidding of a foreign master. Among a large section of the community patriotism became for the first time a consuming passion, and it was stimulated by the counsels of several manly teachers, among whom the first place belongs to the philosopher Fichte. The governments cautiously took advantage of the national movement to strengthen their position. Even in Austria, where on the 8th of October 1809 Metternich had become minister for foreign affairs and the dominant influence in the councils of the empire, some timely concessions were made to the various populations. Prussia, under the guidance of her great minister Stein, reorganized her entire administration. She abolished serfdom, granted municipal rights to the cities, established an admirable system of elementary and secondary education, and invited all classes to compete for civil offices; and ample means were provided for the approaching struggle by drastic military reform. Napoleon had extracted an engagement that the Prussian army should be limited to 42,000 men. This was fulfilled in the letter, but in spirit set aside, for one body of men was trained after another until the larger part of the male population were in a position, when a fitting opportunity should occur, to take up arms for their country.

Revival of Germany.

The disastrous retreat of the French from Moscow in 1812 gave Germany the occasion she desired. In 1813 King Frederick William, after an agony of hesitation, was forced by the patriotic initiative of General Yorck, who concluded with the Russians the convention of Tauroggen on his own responsibility, and by the pressure of public opinion supported by Queen Louise and by Hardenberg, to enter into an alliance with Russia. All now depended on the attitude of Austria; and this was for some time doubtful. The diplomacy of Metternich (*q.v.*), untouched by the patriotic fervour which he disliked and distrusted, was directed solely to gaining time to enable Austria to intervene with decisive effect and win for the Habsburg monarchy the position it had lost. When the time came, after the famous interview with Napoleon at Dresden, and the breakdown of the abortive congress of Prague, Austria threw in her lot with the allies. The campaign that followed, after some initial reverses, culminated in the crushing victory of the allies at Leipzig (October 16–18, 1813), and was succeeded by the joint invasion of France, during which the German troops wreaked vengeance on the unhappy population for the wrongs and violences of the French rule in Germany.

War of Liberation.

Long before the issue of the War of Liberation had been finally decided, diplomacy had been at work in an endeavour to settle the future constitution of Germany. In this matter, as in others, the weakness of the Prussian government played into the hands of Austria. Metternich had been allowed to take the initiative in negotiating with the princes of the Confederation of the Rhine, and the price of their adhesion to the cause of the allies had been the guarantee by Austria of their independent sovereignty. The guarantee had been willingly given; for Metternich had no desire to see the creation of a powerful unified German empire, but aimed at the establishment of a loose confederation of weak states over which Austria, by reason of her ancient imperial prestige and her vast non-German power, would exercise a dominant influence. This, then, was the view that prevailed, and by the treaty of Chaumont (March 1, 1814) it was decided that Germany should consist of a confederation of sovereign states.

The new constitution of Germany, as embodied in the Final Act of the congress of Vienna (June 9, 1815) was based on this principle. It was the work of a special committee of the congress, presided over by Metternich; and, owing to the panic created by Napoleon's return from Elba (March 5), it remained a mere sketch, the hasty output of a few hurried sessions, of which the elaboration was reserved for the future. In spite of the clamour of the mediatized princes for the restoration of their "liberties," no attempt was made to reverse the essential changes in the territorial disposition of Germany made during the revolutionary epoch. Of the 300 odd territorial sovereignties under the Holy Empire only 30 survived, and these were readjusted on the traditional principles of "compensations," "rectification of frontiers" and "balance of power." The most fateful arrangements were naturally those that affected the two leading powers, Austria and Prussia. The latter had made strenuous efforts, supported by Alexander I. of Russia, to obtain the annexation of the whole of Saxony, a project which was defeated by the opposition of Great Britain, Austria and France, an opposition which resulted in the secret treaty of the 3rd of January 1815 for eventual armed intervention. She received, however, the northern part of Saxony, Swedish Pomerania, Posen and those territories—formerly part of the kingdom of Westphalia—which constitute her Rhine provinces. While Prussia was thus established on the Rhine, Austria, by exchanging the Netherlands for Lombardo-Venetia and abandoning her claims to the former Habsburg possessions in Swabia, definitively resigned to Prussia the task of defending the western frontier of Germany, while she strengthened her power in the south-east by recovering from Bavaria, Salzburg, Vorarlberg and Tirol. Bavaria, in her turn, received back the greater part of the Palatinate on the left bank of the Rhine, with a strip of territory to connect it with the main body of her dominions. For the rest the sovereigns of Württemberg and Saxony retained the title of king bestowed upon them by Napoleon, and this title was also given to the elector of Hanover; the dukes of Weimar, Mecklenburg and Oldenburg became grand dukes; and Lübeck, Bremen, Hamburg and Frankfort were declared free cities.

The German confederation.

As the central organ of this confederation (*Bund*) was established the federal diet (*Bundestag*), consisting of delegates of the several states. By the terms of the Final Act this diet had very wide powers for the development of the mutual relations of the governments in all matters of common interest. It was empowered to arrange the fundamental laws of the confederation; to fix the organic institutions relating to its external, internal and military arrangements; to regulate the trade relations between the various federated states. Moreover, by the famous Article 13, which enacted that there were to be "assemblies of estates" in all the countries of the *Bund*, the constitutional liberties of the German people seemed to be placed under its aegis. But the constitution of the diet from the first condemned its debates to sterility. In the so-called narrower assembly (*Engere Versammlung*), for the transaction of ordinary business, Austria, Prussia, Bavaria, Saxony, Hanover, Württemberg, Baden, Hesse-Cassel, Hesse-Darmstadt, Holstein and Luxemburg had one vote each; while the remaining twenty-eight states were divided into six *curiae*, of which each had but a single vote. In this assembly a vote of the majority decided. Questions of more than usual importance were, however, to be settled in the general assembly (*Plenum*) where a two-thirds majority was necessary to carry a resolution. In this assembly the voting power was somewhat differently distributed; but the attempt to make it bear some proportion to the importance of the various states worked out so badly that Austria had only four times the voting power of the tiny principality of Liechtenstein. Finally it was laid down by Article 7 that a unanimous vote was necessary for changing "fundamental laws, organic institutions, individual rights, or in matters of religion," a formula wide enough to embrace every question of importance with which the diet might be called upon to deal. Austria, in virtue of her tradition, received the perpetual presidency of the diet. It was clear that in such a governing body neither Austria nor Prussia would be content with her constitutional position, and that the internal politics of Germany would resolve themselves into a diplomatic duel for ascendancy between the two powers, for which the diet would merely serve as a convenient arena.

The federal diet.

In this duel the victory of Austria was soon declared. The Prussian government believed that the effective government

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of Germany could only be secured by a separate understanding between the two great powers; and the indiscretion of the Prussian plenipotentiary revealed to the diet a plan for what meant practically the division of Germany into Prussian and Austrian spheres of influence. This threw the lesser princes, already alarmed at the growth of Prussian military power, into the arms of Austria, which thus secured a permanent majority in the diet. To avoid any possible modification of a situation so satisfactory, Count Buol, the Austrian president of the diet, was instructed to announce that the constitution as fixed by the Final Act, and guaranteed by Europe, must be regarded as final; that it might be interpreted, but not altered.

The conception of the diet as a sort of international board of control, responsible in the last resort not to Germany but to Europe, exactly suited Metternich's policy, in which the interests of Germany were subordinate to the wider ambitions of the Habsburg monarchy. It was, moreover, largely justified by the constituent elements of the diet itself. Of the German states represented in it even Prussia, by the acquisition of Posen, had become a non-German power; the Habsburg monarchy was predominantly non-German; Hanover was attached to the crown of Great Britain, Holstein to that of Denmark, Luxemburg to that of the Netherlands. The diet, then, properly controlled, was capable of being converted into an effective instrument for furthering the policy of "stability" which Metternich sought to impose upon Europe. Its one effort to make its authority effective as the guardian of the constitution, in the matter of the repudiation of the Westphalian debt and of the sale of the domains by the elector of Hesse, was crushed by the indignant intervention of Austria. Henceforth its sole effective function was to endorse and promulgate the decrees of the government of Vienna.

In this respect the diet fairly reflected the place of Germany in Europe. The constitution was the work of the powers, which in all matters arising out of it constituted the final court of appeal. The result was not wholly one-sided. Until the congress of Troppau in 1820 "Jacobinism" was still enthroned in high places in the person of Alexander I. of Russia, whose "divine mission," for the time, included a not wholly disinterested advocacy of the due carrying out of Article 13 of the Final Act. It was not to Russia's interest to see Austrian influence supreme in the confederation. The lesser German princes, too, were quick to grasp at any means to strengthen their position against the dominant powers, and to this end they appealed to the Liberal sentiment of their peoples. Not that this sentiment was very deep or widespread. The mass of the people, as Metternich rightly observed, wished for rest, not constitutions; but the minority of thoughtful men—professors, students, officials, many soldiers—resented the dashing of the hopes of German unity aroused by the War of Liberation, and had drunk deep of the revolutionary inspiration. This sentiment, since it could not be turned to the uses of a united Germany, might be made to serve the purposes of particularism. Prussia, in spite of the promises of Frederick William in the hour of need, remained without a central constitution; all the more reason why the states of second rank should provide themselves with one. Charles Augustus, the enlightened grand duke of Weimar, set the example, from the best of motives. Bavaria, Baden, Württemberg and others followed, from motives less disinterested. Much depended on the success of these experiments.

The question of constitutions.

To Metternich they were wholly unwelcome. In spite of the ring-fence of censors, and custom-house officers, there was danger of the Liberal infection spreading to Austria, with disintegrating results; and the pose of the tsar as protector of German liberties was a perpetual menace. The zeal and inexperience of German Liberals played into his hands. The patriotism and Pan-Germanism of the gymnastic societies (*Turnvereine*) and students' associations (*Burschenschaften*) expressed themselves with more noise than discretion; in the South-German parliaments the platitudes and catchwords of the Revolution were echoed. Soon, in Baden in Württemberg, in Bavaria, the sovereigns and the chambers were at odds, united only in a common opposition to the central authority. To sovereigns whose nerves had been shattered by the vicissitudes of the revolutionary epoch these symptoms were in the highest degree alarming; and Metternich was at pains to exaggerate their significance. The "Wartburg festival" of October 1818, which issued in nothing worse than the solemn burning, in imitation of Dr Martin Luther, of Kamptz's police law, a corporal's cane and an uhlan's stays, was magnified into a rebellion; drew down upon the grand duke of Weimar a collective protest of the powers; and set in motion the whole machinery of reaction. The murder of the dramatist Kotzebue, as an agent of this reaction, in the following year, by a fanatical student named Karl Sand, clinched the matter; it became obvious to the governments that a policy of rigorous repression was necessary if a fresh revolution were to be avoided. In October, after a preliminary meeting between Metternich and Hardenberg, in the course of which the latter signed a convention pledging Prussia to Austria's system, a meeting of German ministers was held at Carlsbad, the discussion of which issued in the famous Carlsbad Decrees (October 17, 1819). These contained elaborate provisions for supervising the universities and muzzling the press, laying down that no constitution "inconsistent with the monarchical principle" should be granted, and setting up a central commission at Mainz to inquire into the machinations of the great revolutionary secret society which existed only in the imagination of the authorities. The Carlsbad Decrees, hurried through the diet under Austrian pressure, excited considerable opposition among the lesser sovereigns, who resented the claim of the diet to interfere in the internal concerns of their states, and whose protests at Frankfort had been expunged from the records. The king of Württemberg, ever the champion of German "particularism," gave expression to his feelings by issuing a new constitution to his kingdom, and appealed to his relative, the emperor Alexander, who had not yet been won over by Metternich to the policy of war *à outrance* against reform, and took this occasion to issue a fresh manifesto of his Liberal creed.

The Wartburg festival, 1818.

At the conference of ministers which met at Vienna, on the 20th of November, for the purpose of "developing and completing the Federal Act of the congress of Vienna," Metternich found himself face to face with a more formidable opposition than at Carlsbad. The "middle" states, headed by Württemberg, had drawn together, to form the nucleus of an inner league of "pure German States" against Austria and Prussia, and of "Liberal particularism" against the encroachments of the diet. With Russia and, to a certain extent, Great Britain sympathetic, it was impossible to ignore their opposition. Moreover, Prussia was hardly prepared to endorse a policy of greatly strengthening the authority of the diet, which might have been fatal to the Customs Union of which she was laying the foundation. Metternich realized the situation, and yielded so gracefully that he gave his temporary defeat the air of a victory. The result was that the Vienna Final Act (May 15, 1820), which received the sanction of the diet on the 8th of June, was not unsatisfactory to the lesser states while doing nothing to lessen Austrian prestige. This instrument merely defined more clearly the principles of the Federal Act of 1815. So far from enlarging the powers of the diet, it reaffirmed the doctrine of non-intervention; and, above all, it renewed the clause forbidding any fundamental modification of the constitution without a unanimous vote. On the vexed question of the interpretation of Article 13 Metternich recognized the inexpediency of requiring the South German states to revise their constitutions in a reactionary sense. By Articles 56 and 57, however, it was laid down that constitutions could only be altered by constitutional means; that the complete authority of the state must remain united in its head; and that the sovereign could be bound to co-operate with the estates only in the exercise of particular rights. These provisions, in fact, secured for Metternich all that was necessary for the success of his policy: the maintenance of the *status quo*. So long as the repressive machinery instituted by the Carlsbad

Metternich and the constitutions.

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Decrees worked smoothly, Germany was not likely to be troubled by revolutions.

The period that followed was one, outwardly at least, of political stagnation. The Mainz Commission, though hampered by the jealousy of the governments (the king of Prussia refused to allow his subjects to be haled before it), was none the less effective enough in preventing all free expression of opinion; while at the universities the official "curators" kept Liberal enthusiasts in order. The exuberance of the epoch of Liberation gave place to a dull lethargy in things political, relieved only by the Philhellenism which gave voice to the aspirations of Germany under the disguise of enthusiasm for Greece. Even the July revolution of 1830 in Paris reacted but partially and spasmodically on Germany. In Hanover, Brunswick, Saxony and Hesse-Cassel popular movements led to the granting of constitutions, and in the states already constitutional Liberal concessions were made or promised. But the governments of Prussia and Austria were unaffected; and when the storm had died down Metternich was able, with the aid of the federal diet, to resume his task of holding "the Revolution" in check. No attempt was, indeed, made to restore the deposed duke of Brunswick, who by universal consent had richly deserved his fate; but the elector of Hesse could reckon on the sympathy of the diet in his struggle with the chambers (see HESSE-CASSEL), and when, in 1837, King Ernest Augustus of Hanover inaugurated his reign by restoring the old illiberal constitution abolished in 1831, the diet refused to interfere. It was left to the seven professors of Göttingen to protest; who, deprived of their posts, became as famous in the constitutional history of Germany as the seven bishops in that of England.

Revolutions of 1830.

Yet this period was by no means sterile in developments destined to produce momentous results. In Prussia especially the government continued active in organizing and consolidating the heterogeneous elements introduced into the monarchy by the settlement of 1815. The task was no easy one. There was no sense of national unity between the Catholics of the Rhine provinces, long submitted to the influence of liberal France, and the Lutheran squires of the mark of Brandenburg, the most stereotyped class in Europe; there was little in common between either and the Polish population of the province of Posen. The Prussian monarchy, the traditional champion of Protestant orthodoxy, found the new Catholic elements difficult to assimilate; and premonitory symptoms were not wanting of a revival of the secular contest between the spiritual and temporal powers which was to culminate after the promulgation of the dogma of papal infallibility (1870) in the *Kulturkampf*. These conditions formed the excuse for the continual postponement of the promised constitution. But the narrow piety of Frederick William III. was less calculated to promote the success of a benevolent despotism than the contemptuous scepticism of Frederick the Great, and a central parliament would have proved a safety valve for jarring passions which the mistaken efforts of the king to suppress, by means of royal decrees and military coercion, only served to embitter. Yet the conscientious tradition of Prussian officialism accomplished much in the way of administrative reform.

The Prussian system.

Above all it evolved the Customs-Union (*Zollverein*), which gradually attached the smaller states, by material interests if not by sympathy, to the Prussian system. A reform of the tariff conditions in the new Prussian monarchy had been from the first a matter of urgent necessity, and this was undertaken under the auspices of Baron Heinrich von Bülow (1792–1846), minister in the foreign department for commerce and shipping, and Karl Georg Maassen (1769–1834), the minister of finance. When they took office there were in Prussia sixty different tariffs, with a total of nearly 2800 classes of taxable goods: in some parts importation was free, or all but free; in others there was absolute prohibition, or duties so heavy as to amount to practical prohibition. Moreover, the long and broken line of the Prussian frontier, together with the numerous enclaves, made the effective enforcement of a high tariff impossible. In these circumstances it was decided to introduce a system of comparative free trade; raw materials were admitted free; a uniform import of 10% was levied on manufactured goods, and 20% on "colonial wares," the tax being determined not by the estimated value, but by the weight of the articles. It was soon realized, however, that to make this system complete the neighbouring states must be drawn into it; and a beginning was made with those which were enclaves in Prussian territory, of which there were no less than thirteen. Under the new tariff laws light transit dues were imposed on goods passing through Prussia; and it was easy to bring pressure to bear on states completely surrounded by Prussian territory by increasing these dues or, if need were, by forbidding the transit altogether. The small states, though jealous of their sovereign independence, found it impossible to hold out. Schwarzburg-Sondershausen was the first to succumb (1819); Schwarzburg-Rudolstadt (1822), Saxe-Weimar and Anhalt-Bernburg (1823), Lippe-Detmold and Mecklenburg-Schwerin (1826) followed suit so far as their "enclaved" territories were concerned; and in 1826 Anhalt-Dessau and Anhalt-Cöthen, after several years' resistance, joined the Prussian Customs-Union. In 1828 Hesse-Cassel entered into a commercial treaty with Prussia. Meanwhile, alarmed at this tendency, and hopeless of obtaining any general system from the federal diet, the "middle" states had drawn together; by a treaty signed on the 18th of January 1828 Württemberg and Bavaria formed a tariff union, which was joined in the following year by the Hohenzollern principalities; and on the 24th of September 1828 was formed the so-called "Middle German Commercial Union" (*Handelsverein*) between Hanover, Hesse-Cassel, the Saxon duchies, Brunswick, Nassau, the principalities of Reuss and Schwarzburg, and the free cities of Frankfort and Bremen, the object of which was to prevent the extension of the Prussian system and, above all, any union of the northern Zollverein with that of Bavaria and Württemberg. It was soon, however, found that these separate systems were unworkable; on the 27th of May 1829 Prussia signed a commercial treaty with the southern union; the *Handelsverein* was broken up, and one by one the lesser states joined the Prussian Customs-Union. Finally, on the 22nd of March 1833, the northern and southern unions were amalgamated; Saxony and the Thuringian states attached themselves to this union in the same year; and on the 1st of January 1834 the German Customs- and Commercial-Union (*Deutscher Zoll- und Handelsverein*) came into existence, which included for tariff purposes within a single frontier the greater part of Germany. Outside this, though not in hostility to it, Hanover, Brunswick, Oldenburg and Schaumburg-Lippe formed a separate customs-union (*Steuerverein*) by treaties signed on the 1st of May 1834 and the 7th of May 1836, and to this certain Prussian and Hessian enclaves were attached. Subsequently other states, *e.g.* Baden and Nassau (1836), Frankfort and Luxemburg (1842), joined the Prussian Zollverein, to which certain of the members of the Steuerverein also transferred themselves (Brunswick and Lippe, 1842). Finally, as a countermove to the Austrian efforts to break up the Zollverein, the latter came to terms with the Steuerverein, which, on the 1st of January 1854, was absorbed in the Prussian system. Hamburg was to remain outside until 1883; but practically the whole of what now is Germany was thus included in a union in which Prussia had a predominating influence, and to which, when too late, Austria in vain sought admission.[1]

The Prussian Zollverein.

Even in the earlier stages of its development the Zollverein had a marked effect on the condition of the country. Its growth coincided with the introduction of railways, and enabled the nation to derive from them the full benefit; so that, in spite of the confusion of political powers, material prosperity increased, together with the consciousness of national unity and a tendency to look to Berlin rather than to Vienna as the centre of this unity.

[1] The best account, in English, of the development of the Zollverein is in Percy Ashley's *Modern Tariff History* (London, 1904)

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This tendency was increased by the accession to the throne of Prussia, in 1840, of Frederick William IV., a prince whose conspicuous talents and supposed "advanced" views raised the hopes of the German Liberals in the same degree as they excited the alarm and contempt of Metternich. In the end, however, the fears were more justified than the hopes. The reign began well, it is true, notably in the reversal of the narrow ecclesiastical policy of Frederick William III. But the new king was a child of the romantic movement, with no real understanding of, and still less sympathy with, the modern Liberal point of view. He cherished the idea of German unity, but could conceive of it only in the form of the restored Holy Empire under the house of Hapsburg; and so little did he understand the growing nationalist temper of his people that he seriously negotiated for a union of the Lutheran and Anglican churches, of which the sole premature offspring was the Protestant bishopric of Jerusalem.

Frederick William IV.

Meanwhile the Unionist and Liberal agitation was growing in strength, partly owing to the very efforts made to restrain it. The emperor Nicholas I. of Russia, kept informed by his agents of the tendencies of opinion, thought it right to warn his kinsman of Prussia of the approach of danger. But Frederick William, though the tsar's influence over him was as great as over his father, refused to be convinced. He even thought the time opportune for finishing "the building begun by Papa" by summoning the central assembly of the diets, and wrote to the tsar to this effect (December 31, 1843); and he persevered in this intention in spite of the tsar's paternal remonstrances. On the 13th of February 1847 was issued a patent summoning the united diet of Prussia. But, as Metternich had prophesied, this only provided an organ for giving voice to larger constitutional aspirations. The result was a constitutional dead-lock; for the diet refused to sanction loans until its "representative" character was recognized; and the king refused to allow "to come between Almighty God in heaven and this land a blotted parchment, to rule us with paragraphs, and to replace the ancient, sacred bond of loyalty." On the 26th of June the diet was dissolved, nothing having been done but to reveal the widening gulf between the principle of monarchy and the growing forces of German Liberalism.

The strength of these forces was revealed when the February revolution of 1848 in Paris gave the signal for the outbreak of popular movements throughout Europe. The effect of the revolution in Vienna, involving the fall of Metternich (May 13) and followed by the nationalist movements in Hungary and Bohemia, was stupendous in Germany. Accustomed to look to Austria for guidance and material support; the princes everywhere found themselves helpless in face of the popular clamour. The only power which might have stemmed the tide was Prussia. But Frederick William's emotional and kindly temperament little fitted him to use "the mailed fist"; though the riot which broke out in Berlin on the 15th of March was suppressed by the troops with but little bloodshed, the king shrank with horror from the thought of fighting his "beloved Berliners," and when on the night of the 18th the fighting was renewed, he entered into negotiation with the insurgents, negotiations that resulted in the withdrawal of the troops from Berlin. The next day, Frederick William, with characteristic histrionic versatility, was heading a procession round the streets of Berlin, wrapped in the German tricolour, and extolling in a letter to the indignant tsar the consummation of "the glorious German revolution."

The collapse of the Prussian autocracy involved that of the lesser German potentates. On the 30th of March the federal diet boisted the German tricolour and authorized the assembling of the German national parliament at Frankfort. Arrangements for this had already been made without official sanction. A number of deputies, belonging to different legislative assemblies, taking it upon themselves to give voice to the national demands, had met at Heidelberg, and a committee appointed by them had invited all Germans who then were, or who had formerly been, members of diets, as well as some other public men, to meet at Frankfort for the purpose of considering the question of national reform. About 500 representatives accepted the invitation. They constituted themselves a preliminary parliament (*Vorparlament*), and at once began to provide for the election of a national assembly. It was decided that there should be a representative for every group of 50,000 inhabitants, and that the election should be by universal suffrage. A considerable party wished that the preliminary parliament should continue to act until the assembly should be formed, but this was overruled, the majority contenting themselves with the appointment of a committee of 50, whose duty it should be in the interval to guard the national interests. Some of those who were discontented with this decision retired from the preliminary parliament, and a few of them, of republican sympathies, called the population of Upper Baden to arms. The rising was put down by the troops of Baden, but it did considerable injury by awakening the fears of the more moderate portion of the community. Great hindrances were put in the way of the elections, but, as the Prussian and Austrian governments were too much occupied with their immediate difficulties to resist to the uttermost, the parliament was at last chosen, and met at Frankfort on the 18th May. The old diet, without being formally dissolved, (an omission that was to have notable consequences) broke up, and the national representatives had before them a clear field. Their task would in any case have been one of extreme difficulty. The new-born sentiment of national unity disguised a variety of conflicting ideals, as well as deep-seated traditional local antagonisms; the problem of constructing a new Germany out of states, several of which, and those the most powerful, were largely composed of non-German elements, was sure to lead to international complications; moreover, the military power of the monarchies had only been temporarily paralysed, not destroyed. Yet, had the parliament acted with promptitude and discretion it might have been successful. Neither Austria nor Prussia was for some time in a position to thwart it, and the sovereigns of the smaller states were too much afraid of the revolutionary elements manifested on all sides to oppose its will. But the Germans had had no experience of free political life. Nearly every deputy had his own theory of the course which ought to be pursued, and felt sure that the country would go to ruin if it were not adopted. Learned professors and talkative journalists insisted on delivering interminable speeches and on examining in the light of ultimate philosophical principles every proposal laid before the assembly. Thus precious time was lost, violent antagonisms were called forth, the patience of the nation was exhausted, and the reactionary forces were able to gather strength for once more asserting themselves. The very first important question brought out the weaknesses of the deputies. This related to the nature of the central provisional executive. A committee appointed to discuss the matter suggested that there should be a directory of three members, appointed by the German governments, subject to the approval of the parliament, and ruling by means of ministers responsible to the latter body. This elaborate scheme found favour with a large number of members, but others insisted that there should be a president or a central committee, appointed by the parliament, while another party pleaded that the parliament itself should exercise executive as well as legislative functions. At last, after a vast amount of tedious and useless discussion, it was agreed that the parliament should appoint an imperial vicar (*Reichsverweser*) who should carry on the government by means of a ministry selected by himself; and on the motion of Heinrich von Gagern the archduke John of Austria was chosen by a large majority for the office. With as little delay as possible he formed an imperial cabinet, and there were hopes that, as his appointment was generally approved both by the sovereigns and the people, more rapid progress would be made with the great and complicated work in hand. Unfortunately, however, it was necessary to enter upon the discussion of the fundamental laws, a subject

German nationalism.

Frankfort parliament.

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presenting many opportunities for the display of rhetoric and intellectual subtlety. It was soon obvious that beneath all varieties of individual opinion there were two bitterly hostile tendencies—republican and constitutionalist. These two parties attacked each other with constantly growing animosity, and in a few weeks sensible men outside the parliament gave up all hope of their dealing satisfactorily with the problem they had been appointed to solve.

In the midst of these disputes the attention of the nation was occupied by a question which had arisen before the outbreak of the revolutionary movements—the so-called "Schleswig-Holstein question" (*q.v.*). In 1846 Christian VIII. of Denmark had officially proclaimed that Schleswig and the greater part of Holstein were indissolubly connected with the Danish monarchy. This excited vehement opposition among the Germans, on the ground that Holstein, although subject to the king of Denmark, was a member of the German confederation, and that in virtue of ancient treaties it could not be severed from Schleswig. In 1848 the German party in the duchies, headed by Prince Frederick of Augustenburg, rose against the Danish government. Frederick VII., who had just succeeded Christian VIII., put down the rebellion, but Prussia, acting in the name of the confederation, despatched an army against the Danes, and drove them from Schleswig. The Danes, who were supported by Russia, responded by blockading the Baltic ports, which Germany, having no navy, was unable effectually to defend. By the mediation of Great Britain an armistice was concluded, and the Prussian troops evacuated the northern districts of Schleswig. As the Danes soon afterwards took possession of Schleswig again, the Prussians once more drove them back, but, in view of the threatening attitude of the powers, Frederick William summoned up courage to flout the opinion of the German parliament, and on the 26th of August, without the central government being consulted, an armistice of seven months was agreed upon at Malmoe.

Schleswig-Holstein.

The full significance of this event was not at once realized. To indignant patriots it seemed no more than a piece of perfidy, for which Prussia should be called to account by united Germany. The provisional government of the duchies appealed from Prussia to the German regent; and the Frankfort parliament hotly took up its cause. A large majority voted an order countermanding the withdrawal of the Prussian troops, in spite of the protest of the ministry, who saw that it would be impossible to make it effective. The ministry resigned, but no other could be found to take its place; and the majority began to realize the situation. The central government depended ultimately on the armed support of the two great powers; to quarrel with those would be to ruin the constitution, or at best to play into the hands of the extreme revolutionists. On the 14th of September the question of the convention of Malmoe again came up for discussion, and was angrily debated. The democrats called their adherents to arms against the traitors who were preparing to sell the Schleswig-Holsteiners. The Moderates took alarm; they had no stomach for an open war with the governments; and in the end the convention was confirmed by a sufficient majority. The result was civil war in the streets of Frankfort; two deputies were murdered; and the parliament, which could think of no better way of meeting the crisis than by continuing "with imposing calm" to discuss "fundamental rights," was only saved from the fury of the mob by Prussian troops. Its existence was saved, but its prestige had vanished; and the destinies of the German people were seen to be in the hands that held the sword.

Disputes in the Frankfort assembly.

While these events were in progress, it seemed not impossible that the Austrian empire would fall to pieces. Bohemia and the Italian states were in revolt, and the Hungarians strove with passionate earnestness for independence. Towards the end of 1848 Vienna was completely in the hands of the revolutionary party, and it was retaken only after desperate fighting. A reactionary ministry, headed by Prince Schwarzenberg, was then raised to power, and in order that a strong policy might be the more vigorously pushed forward, the emperor Ferdinand resigned, and was succeeded by his nephew, Francis Joseph.

The revolution in Austria.

The prospects of reform were not much more favourable in Prussia. The assembly summoned amid the revolutionary excitement of March met on the 22nd of May. Demands for a constitutional system were urged with great force, and they would probably have been granted but for the opposition due to the violence of politicians out of doors. The aristocratic class saw ruin before it if the smallest concession were made to popular wishes, and it soon recovered from the terror into which it had been plunged at the outbreak of the revolution. Extreme antagonism was excited by such proposals as that the king should no longer be said to wear his crown "by the grace of God"; and the animosity between the liberal and the conservative sections was driven to the highest pitch by the attack of the democratic majority of the diet on the army and the attempt to remodel it in the direction of a national militia. Matters came to a crisis at the end of October when the diet passed a resolution calling on the king to intervene in favour of the Viennese revolutionists. When, on the evening of the 30th, a mob surrounded the palace, clamouring for the king to give effect to this resolution, Frederick William lost patience, ordered General Wrangel to occupy Berlin with troops, and on the 2nd of November placed Count Brandenburg, a scion of the royal house and a Prussian of the old school, at the head of a new ministry. On the pretext that fair deliberation was impossible in the capital, the assembly was now ordered to meet in Brandenburg, while troops were concentrated near Berlin and a state of siege was proclaimed. In vain the assembly protested and continued its sittings, going even so far as to forbid the payment of taxes while it was subjected to illegal treatment. It was forced in the end to submit. But the discussions in Brandenburg were no more successful than those in Berlin; and at last, on the 5th of December, the king dissolved the assembly, granted a constitution about which it had not been consulted, and gave orders for the election of a representative chamber.

Reform in Prussia.

About the time that the Prussian parliament was thus created, and that the emperor Ferdinand resigned, the Frankfort parliament succeeded in formulating the fundamental laws, which were duly proclaimed to be those of Germany as it was now to be constituted. The principal clauses of the constitution then began to be discussed. By far the most difficult question was the relation in which Austria should stand to the Germany of the future. There was a universal wish that the Austrian Germans should be included in the German state; on the other hand, it was felt that if all the various nationalities of Austria formed a united monarchy, and if this monarchy as a whole were included in the confederation, it would necessarily overshadow Germany, and expose her to unnecessary external dangers. It was therefore resolved that, although a German country might be under the same ruler as non-German lands, it could not be so joined to them as to form with them a single nation. Had the parliament adopted this resolution at once, instead of exhausting itself by pedantic disquisitions on the abstract principles of jurisprudence, it might have hoped to triumph; but Austria was not likely to submit to so severe a blow at the very time when she was strong enough to appoint a reactionary government, and had nearly re-established her authority, not only in Vienna, but in Bohemia and in Italy. Prince Schwarzenberg took the earliest opportunity to declare that the empire could not assent to any weakening of its influence. Bitter strife now broke out in the parliament between the Great German (*Gross-Deutsch*) and Little German (*Klein-Deutsch*) parties. Two of the ministers resigned, and one of those who took their place, Heinrich von Gagern (*q.v.*), proposed that, since Austria was to be a united state, she should not enter the confederation, but that her relations to Germany should be regulated by a special act of union. This of course meant that Prussia should be at the head of Germany, and recommended itself to the majority of the

The question of the constitution.

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constitutional party. It was resisted by the Austrian members, who were supported by the ultramontanes and the democrats, both of whom disliked Prussia, the former because of her Protestantism, the latter because of her bureaucratic system. Gagern's proposal was, however, adopted. Immediately afterwards the question as to the character of the executive was raised. Some voted that a directory of princes should be appointed, others that there should be a president, eligible from the whole German nation; but the final decision was that the headship of the state should be offered by the parliament to some particular German prince, and that he should bear the title of German emperor.

Proposed empire.

The whole subject was as eagerly discussed throughout the country as in Frankfort. Austria firmly opposed the idea of a united German state, insisting that the Austrian emperor could not consent to be subordinate to any other prince. She was supported by Bavaria, but on the other side were Prussia, Brunswick, Baden, Nassau, Mecklenburg and various other countries, besides the Hanseatic towns. For some time Austria offered no counter scheme, but she ultimately proposed that there should be a directory of seven princes, the chief place being held alternately by a Prussian and an Austrian imperial vicar. Nothing came of this suggestion, and in due time the parliament proceeded to the second reading of the constitution. It was revised in a democratic sense, but the imperial title was maintained, and a narrow majority decided that it should be hereditary. Frederick William IV. of Prussia was then chosen emperor.

All Germany awaited with anxiety the reply of Frederick William. It was thought not improbable that he would accept the honour offered him, for in the early part of his reign he had spoken of German unity as enthusiastically as of liberty, and, besides, the opportunity was surprisingly favourable. The larger number of the North-German states were at least not unwilling to submit to the arrangement; and Austria, whose opposition in ordinary circumstances would have been fatal, was paralysed by her struggle with Hungary. Frederick William, however, whose instincts were far from democratic, refused "to pick up a crown out of the gutter"; and the deputation which waited upon him was dismissed with the answer that he could not assume the imperial title without the full sanction of the princes and the free cities.

End of Frankfort parliament.

This answer was in reality a death-blow to the hopes of German patriots, but the parliament affected to believe that its cause was not yet lost, and appointed a committee to see that the provisions of the constitution were carried out. A vigorous agitation began in the country for the acceptance of the constitution by the governments. The king of Württemberg was forced to accede to it; and in Saxony, Baden and Rhenish Bavaria armed multitudes kept the sovereigns in terror. Prussia, which, following the example of Austria, had recalled her representatives from Frankfort, sent her troops to put down these risings, and on the 21st of May 1849 the larger number of the deputies to the parliament voluntarily resigned their seats. A few republican members held on by it, and transferred the sittings to Stuttgart. Here they even elected an imperial government, but they had no longer any real influence, and on the 18th of June they were forcibly dispersed by order of the Württemberg ministry.

The Prussian Union.

Although Frederick William had refused to become emperor, he was unwilling to miss altogether the opportunity afforded by the difficulties of Austria. He invited the states to send representatives to Berlin to discuss the condition of Germany; and he concluded a treaty with the kings of Saxony and Hanover. Two days afterwards the three allies agreed upon a constitution which was in many respects identical with that drawn up by the Frankfort parliament. The functions of the executive were, however, extended, the electoral law was made less democratic, and it was decided that, instead of an emperor, there should be merely a supreme chief aided by a college of princes. This constitution was accepted by a number of states, which assumed the name of "The Union," and on the 20th of March 1850 a parliament consisting of two houses met in Erfurt. Both houses accepted the constitution; and, immediately after they broke up, the members of the Union assembled in Berlin, and a provisional college of princes was elected. By that time, however, the whole situation of Germany had changed. In the autumn of 1849 Austria had succeeded, by the help of Russia, in quelling the Hungarian insurrection, and she was then in no mood to let herself be thrust aside by Prussia. Encouraged by her, Hanover and Saxony had severed themselves from the Union, and Saxony, Württemberg and Bavaria arrived at an understanding as to a wholly new constitution. Afterwards all four states, with several others, accepted the invitation of Austria to consider the propriety of re-establishing the Confederation. The representatives of the states favourable to this proposal, *i.e.* Austria, Luxemburg, Denmark and the four kingdoms, came together in Frankfort on the 4th of September 1850, constituted themselves a *Plenum* of the old diet and refused to admit the other states except under the terms of the act of 1815.

Policy of Austria.

Thus the issue to which the events of about a century had been pointing was apparently raised; Germany was divided into two hostile parties, one set of states grouping themselves around Austria, another around Prussia. A difficulty which arose in Hesse-Cassel almost compelled the powers to bring their differences to the test of war. In this small state the liberal movement of 1848 had been followed by reaction, and the elector ventured to replace Hassenpflug, the unpopular minister who had been driven from power. Hassenpflug, being detested by the chamber, dissolved it in June 1850; but the new one was not less hostile, and refused to sanction the collection of the taxes until it had considered the budget. For this offence it also was dissolved, and orders were issued for the raising of the taxes without its consent. Many officials refused to obey; the judges remained loyal to the constitution; and when attempts were made to solve the difficulty by the army, the officers instructed to act resigned in a body. Meanwhile, Hassenpflug had appealed to the representatives in Frankfort who claimed to be the restored diet, and under the influence of Austria they resolved to support him. Prussia, on the other hand, announced its determination to carry out the principles of the Union and to maintain the Hessian constitution. Austrian and Bavarian troops having entered Hesse, a Prussian army immediately occupied Cassel, and war appeared to be imminent. Prussia, however, was wholly unprepared for war; and, when this was realized, Radowitz, the foreign minister, who had so far pursued a vigorous policy, retired, and was replaced by Manteuffel, who, although the whole Prussian army was mobilized, began by making concessions. The Union was dissolved; and after Austria had despatched an ultimatum formulating her demands, Baron Manteuffel met Prince Schwarzenberg at Olmütz, and, by a convention signed on the 29th of November 1850, virtually yielded everything he insisted upon. The difficulty in Hesse was to be left to the decision of the German governments; and as soon as possible ministerial conferences were to be held in Dresden, with a view to the settlement of the German constitution.

Disturbance in Hesse-Cassel.

The Austrian government strove to secure the appointment of a stronger executive than had hitherto existed; but its proposals met with steady opposition from Prussia. Every Prussian scheme was in like manner resisted by Austria. Thus, from the sheer inability of the assembled ministers to devise a plan on which all could agree, Prussia and the states that had joined her in the Union were compelled to recognize the Frankfort diet. From the 12th of June 1851 its sittings went on as if nothing had occurred since it was dispersed.

Diet restored.

This wretched fiasco was hardly less satisfactory to the majority of Germans than the manner in which the national claims in Schleswig-Holstein were maintained. The armistice of Malmoe having expired in March 1849, the war with Denmark was resumed. A considerable army was despatched against

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the Danes by the Frankfort government, but on the 10th of July an armistice was signed at Berlin for six months, and a year afterwards Prussia concluded peace. The inhabitants of the duchies, however, continued the war. During the interview at Olmütz between Manteuffel and Schwarzenberg it was agreed that, like the affairs of Hesse-Cassel, those of Schleswig-Holstein should be submitted to the decision of all German states, but that, in the meantime, Prussia and Austria should act together. By the intervention of Austrian troops peace was restored; and when, early in 1852, the government of Denmark, in providing a constitution for the whole monarchy, promised to appoint separate ministers for Schleswig and Holstein, and to do equal justice to the German and the Danish populations, the two powers declared themselves satisfied and the Austrian forces were withdrawn. The diet also, after some delay, professed to be content with this arrangement. While it was discussing the subject, a conference of the European powers met in London, and by the protocol of May 28, 1852, settled that Frederick VII. of Denmark should be succeeded by Christian, duke of Glücksburg, and that the duchies should be indissolubly united to the Danish monarchy. Austria and Prussia accepted the protocol, but it was not signed by the diet.

In all these later events the first place had been taken by Austria. The temporary dissolution of the Zollverein in 1851 gave her an opportunity of trying to extend her influence; she demanded that a union should be formed of which she should be the leading member. A congress of all German states, with the exception of Prussia and one or two states which sympathized with her, was held in Vienna; and it was followed by several other congresses favourable to Austrian pretensions. Prussia, however, being here on strong ground, refused to give way; and not only was the customs union restored in accordance with her wishes, but Austria concluded with her in 1853 a treaty of commerce which embodied some important concessions.

Austria and the Zollverein.

Germany had now fairly entered a period which, although it did not last very long, was, in some respects, as humiliating as any in her history. The popular movement, from which great things had been hoped, had on some occasions almost touched its goal; and, as might have been expected, a reaction set in, which the princes knew how to turn to the fullest advantage. The Austrian government, after the subjection of Hungary, withdrew every concession it had made under pressure, and established a thorough despotism by trampling upon the rights of the individual nationalities, and forcing all its subjects into a common political mould. In Prussia the parliament, summoned by the king on the 5th of December 1848, met early in the following year. Although the democrats had declined to vote, it was not conservative enough for the court, and not till the 31st of January 1850 was an understanding arrived at respecting the constitution. The system thus established was repeatedly revised, and always with the same object—to reduce to a minimum the power of the national representatives, and to exalt and extend that of the government. At the same time the ministry persecuted the press, and allowed hardly a whisper of discontent to pass unpunished. The smaller states followed with alacrity in the steps of the two leading powers. The Liberal ministries of 1848 were dismissed, the constitutions were changed or abolished, and new chambers were elected under a severely restricted suffrage. Had the battle been fairly fought out between the governments and the people, the latter would still have triumphed; but the former had now, in the Frankfort diet, a mightier instrument than ever against freedom. What it could do was seen too clearly from the case of Hesse-Cassel. After the settlement of Olmütz, federal troops occupied that country, and federal execution was carried out with shameful harshness. Martial law was everywhere proclaimed; officers, and all classes of officials who had incurred the displeasure of the government, were subjected to arbitrary penalties; and such was the misery of the people that multitudes of them were compelled to emigrate.

Political reaction.

The constitution having been destroyed by the *Bund*, the elector proclaimed one of his own making; but even the chamber elected under the provisions of this despotic scheme could not tolerate his hateful tyranny, and there were incessant disputes between it and the government. The *Bund* interfered in a like spirit in Hanover, although with less disastrous results, after the accession of George V. in 1851. For the whole of Germany this was emphatically the period of petty despotism; and not only from Hesse, but from all parts of the country there was a vast stream of emigration, mainly to the New World.

The outbreak of the Crimean War profoundly moved the German nation. The sympathies of Austria were necessarily with the Western powers, and in Prussia the majority of the people took the same side; but the Prussian government, which was at this time completely under the control of Russia, gave its moral support to the tsar. It did, indeed, assent to a treaty—afterwards signed on behalf of the confederation—by which Prussia and Austria guaranteed each other, but it resolutely opposed the mobilization of the confederate army. The Prussian people were keenly irritated by the cordial relations between their court and the most despotic power in Europe. They felt that they were thus most unjustly separated from the main stream of Western progress.

Crimean War.

During the Crimean War the political reaction continued with unabated force. In Prussia the government appeared resolved to make up for its temporary submission to the popular will by the utmost violence on which it could venture. A general election took place in the autumn of 1855, and so harshly was the expression of opinion restrained that a chamber was returned with scarcely a single liberal element of serious importance. The feudalists called for a still further revision of the constitution, and urged that even the reforms effected by Stein should be undone. In Bavaria a chamber elected about the same time as that of Prussia was rather less docile; but the government shared to the full the absolutist tendencies of the day, and energetically combated the party which stood up for law and the constitution. The Hanoverian government, backed by the Frankfort diet, was still more successful in its warfare with the moderate reformers whom it was pleased to treat as revolutionists; and in Austria the feudalists so completely gained the upper hand that on the 18th of August 1855 the government signed a concordat, by which the state virtually submitted itself to the control of the church.

The German people seemed to have lost both the power and the will to assert their rights; but in reality they were deeply dissatisfied. And it was clear to impartial observers that, in the event of any great strain upon the power of the governments, the absolutist system would break down. The first symptom that the reaction had attained its utmost development displayed itself in Prussia, whose attention was for a time distracted from home politics by a quarrel with Switzerland. The Swiss authorities had imprisoned some foolish royalists of Neuchâtel, in which the house of Hohenzollern had never resigned its rights. War was threatened by Prussia, but when the prisoners were set free, the two states entered upon negotiations, and in the summer of 1857 King Frederick William withdrew all claims to the principality.

Prussia and Switzerland.

Soon after this, the mental condition of the king made it necessary that his duties should be undertaken by a substitute, and his brother William, the prince of Prussia, took his place for three months. In October 1858 the prince became regent. The accession to power of the new regent was universally recognized as involving a change of system. The temper of William, in contradistinction to that of his brother, was pre-eminently practical; and he had the reputation of a brave, piously orthodox Prussian soldier. The nickname "cartridge-prince" (*Kartätschenprinz*) bestowed upon him during the troubles of '48 was undeserved; but he was notoriously opposed to Liberalism and, had he followed his own instincts, he would have modified the constitution in a reactionary sense. Fortunately, however, he was singularly open to conviction,

Regency of William of Prussia.

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and Otto von Bismarck, though not yet in office, was already in his confidence. Bismarck realized that, in the struggle with Austria which he foresaw, Prussia could only be weakened were she to take up an attitude of opposition to the prevailing Liberal sentiment, and that to tamper with the constitution would not only be inexpedient, but useless, since special measures could always be resorted to, to meet special circumstances. The interests of Prussia, he urged, had been too often sacrificed to abstract ideas. William listened and was convinced. He not only left the constitution intact, but he dismissed Manteuffel's "feudal" ministry and replaced it with moderate Liberals.

The change was more revolutionary in appearance than in reality. Manteuffel and his policy were associated in the regent's mind with the humiliation of Olmütz, and the dismissal of the ministry symbolized the reversal of this policy. William believed with his whole soul in the unification of Germany, and in Prussia as its instrument; and, if he doubted, it was only as to the how and when. Of one thing he was certain—that whoever aspired to rule over Germany must be prepared to seize it (letter to von Natzmer, May 20, 1849). This attitude had little in common with the Liberal appeal to the voice of the people. Such a revolutionary foundation might be good enough for the ephemeral empires of France; the appeal of Prussia should be to the God of battles alone.

Prussia and the Austro-Italian War.

The antagonism between these conflicting principles was not long in revealing itself. In Germany the relations between Austria and Prussia were becoming unpleasantly strained in the question of the admission of the Habsburg monarchy to the Zollverein, in that of the election of Hesse and his parliament, in that of the relation of the Elbe duchies to the crown of Denmark. But for the outbreak of the Italian war of 1859 the struggle of 1866 might have been anticipated. The outcome of the war increased the prestige of Prussia. She had armed, not with the idea of going to the aid of a German power in difficultles, but in order, at the right moment, to cast her sword into the scale wherein her own interests might for the time lie. At the menace of her armaments, concentrated on the Rhine, Napoleon had stopped dead in the full career of victory; Austria, in the eyes of German men, had been placed under an obligation to her rival; and Italy realized the emergence of a new military power, whose interests in antagonism to Austria were identical with her own.

Military reforms and constitutional crisis in Prussia.

So striking an object lesson was not lost on the Prussian regent, and he entered on a vigorous policy of reforming and strengthening the army, General von Roon being appointed minister of war for this purpose. To the Liberal ministers, however, and to the Liberal majority in the Prussian diet, this was wholly objectionable. Schemes were under discussion for reforming the constitution of the Confederation and drawing the German states closer together on a Liberal basis; the moment seemed singularly inopportune for Prussia, which had not shown herself particularly zealous for the common interests, to menace the other German governments by increasing her separate armaments. When, therefore, on the 10th of February 1860, the bills necessary for carrying out the reform of the army were introduced into the diet, they met with so strenuous an opposition that they had to be withdrawn. Supplies were, however, granted for fourteen months, and the regent took this as justifying him in proceeding with his plans. On the 1st of January 1861 the standards of the new regiments were solemnly blessed; on the next day Frederick William IV. died, and the new king was face to face with a constitutional crisis.

Austria, meanwhile, had been making the first tentative essays in constitutional concession, which culminated, in May 1861, in the establishment at Vienna of a *Reichsrat* for the whole empire, including Hungary. The popularity she thus gained among German Liberals and Nationalists was helped by the course of events at Berlin. The Prussian diet of 1862 was no whit more tractable than its predecessor, but fell to attacking the professional army and advocating the extension of the militia (*Landwehr*) system; on the 11th of March the king dissolved it in disgust, whereupon the Liberal ministry resigned, and was succeeded by the Conservative cabinet of Prince Hohenlohe. Public opinion was now violently excited against the government; the new elections resulted (May 6) in the return of a yet larger Liberal majority; on the 22nd of August the army estimates were thrown out. Hohenlohe now declared himself incapable of carrying on the government, and King William entrusted it to Otto von Bismarck.

Bismarck.

In choosing this man of iron will as his instrument during the actual crisis the king's instinct had not betrayed him. For nine years Prussian delegate at the diet of Frankfort, Bismarck was intimately acquainted with all the issues of the German problem; with his accustomed calculated bluntness he had more than once openly asserted that this problem could only be settled by Austria ceasing to influence the German courts and transferring "her centre of gravity towards Budapest"; with equal bluntness he told the committee on the budget, on the 30th of September 1862, that the problem could not be solved "by parliamentary decrees," but only "by blood and iron." For the supreme moment of this solution he was determined that Prussia should be fully prepared; and this meant that he must defy the majority within the diet and public opinion without. Some sort of constitutional pretence was given to the decision of the government to persevere with the military reforms by the support of the Upper House, and of this Bismarck availed himself to raise the necessary taxes without the consent of the popular assembly. He regretted the necessity for flouting public opinion, which he would have preferred to carry with him; in due course he would make his peace with Liberal sentiment, when success should have justified his defiance of it. His plans were singularly helped by international developments. The Polish rising of 1863 came just in time to prevent a threatened Franco-Russian alliance; the timid and double-faced attitude of both France and Austria during the revolt left them isolated in Europe, while Bismarck's ready assistance to Russia assured at least the benevolent neutrality in the coming struggle with the Habsburg power.

Views as to German unity.

Meanwhile, among the German people the object lesson of the Italian war had greatly stimulated the sentiment of national unity. As to the principle, however, on which this unity was to be based, the antagonism that had been fatal in 1849 still existed. The German National Union (*Deutscher Nationalverein*), organized in the autumn of 1859, favoured the exclusion of Austria and the establishment of a federation under the hegemony of Prussia; it represented the views of the so-called "Gothaer," the political heirs of the rump of the Frankfort parliament which had reassembled at Gotha in June 1849, and supported the Prussian Union and the Erfurt parliament. To counteract this, a conference of five hundred "Great Germans" assembled at Frankfort and, on the 22nd of October 1862, founded the German Reform Union (*Deutscher Reformverein*), which, consisting mainly of South German elements, supported the policy of Austria and the smaller states. The constitutional crisis in Prussia, however, brought both societies into line, and in 1863 the National Union united with the Reform Union in an attempt to defeat Prussian policy in the Schleswig-Holstein question.

The "Fürstentag" of Frankfort.

This anti-Prussian feeling Austria now tried to exploit for her own advantage. On the 2nd of August the emperor Francis Joseph proposed to King William, during a meeting at Gastein, to lay before an assembly of the German princes a scheme for the reconstitution of the *Bund*. The king neither accepted nor refused; but, without waiting for his assent, invitations were sent out to the other princes, and on the 14th the congress (*Fürstentag*) opened at Frankfort. Of the German sovereign states but four were unrepresented—Anhalt-Bernburg, Holstein, Lippe and Prussia; but the absence of Prussia was felt to be fatal; the minor princes existed by reason of the balance between the two great powers, and objected as strongly to the exclusion of the one as of the other from the Confederation; an invitation to King William was therefore signed by all present and carried by the King of Saxony

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in person to Berlin. Bismarck, however, threatened to resign if the king accepted; and the congress had to do the best it could without Prussian co-operation. On the 1st of September it passed, with some slight modifications, the Austrian proposals for the reconstruction of the *Bund* under a supreme Directory, an assembly of delegates from the various parliaments, a federal court of appeal and periodical conferences of sovereigns. Everything now depended on the attitude of Prussia, and on the 22nd her decision was received. "In any reform of the *Bund*," it ran, "Prussia, equally with Austria, must have the right of vetoing war; she must be admitted, in the matter of the presidency, to absolute equality with Austria; and, finally, she will yield no tittle of her rights save to a parliament representing the whole German nation."

Prussia thus made a bid for the sympathy of the democracy at the same time as she declared war against the dynasties; and her power was revealed by the fact that her veto was sufficient to wreck a proposal seconded by the all but unanimous vote of the German sovereigns. The Austrian stroke had failed, and worse than failed, for Napoleon III., who had been filled with alarm at this attempt to create on his flank an "empire of 70,000,000," saw in Prussia's attitude no more than a determination to maintain for her own ends the division and weakness of Germany; and this mistaken diagnosis of the situation determined his attitude during the crisis that followed.

The Schleswig-Holstein question, 1863.

This crisis was due to the reopening of a fresh acute phase of the Schleswig-Holstein question by the accession of the "protocol-king" Christian IX. to the throne of Denmark (November 15, 1863), and his adhesion to the new constitution, promulgated two days before, which embodied the principle of the inalienable union of the Elbe duchies with the Danish body politic. The news of this event caused vast excitement in Germany; and the federal diet was supported by public opinion in its decision to uphold the claims of Prince Frederick of Augustenburg to the succession of the duchies. An agitation in his favour had already begun in Holstein and, after the promulgation of the new Danish constitution, this was extended to Schleswig. On the 24th of December Saxon and Hanoverian troops occupied Holstein in the name of the German Confederation, and supported by their presence and the favour of the population the prince of Augustenburg, as Duke Frederick VIII., assumed the government.

From these proceedings Prussia and Austria held rigorously aloof. Both had signed the protocol of 1852, and both realized that, if the European powers were to be given no excuse to intervene, their attitude must be scrupulously "correct"; and this involved the recognition of King Christian's rights in the duchies. On the other hand, the constitution of the 13th of November had been in flat contradiction to the protocol of London, which recognized the separate rights of the duchies; and if the two great German powers chose to make this violation of an agreement to which they had been parties a *casus belli*, Europe would have no right to interfere. Prussia had begun to mobilize in November; and Austria also soon realized that action must speedily be taken if the lesser German governments were not to be allowed to get out of hand. Russia and Great Britain had already protested against the occupation of Holstein and the support given to the Augustenburg claimant; and now Beust, the Saxon minister, was proposing that the federal diet, which had been no party to the protocol, should formally recognize his claim. Bismarck, then, had no difficult task in persuading Austria that the time for action had come. A last attempt of the two powers to carry the diet with them in recognizing the protocol having failed, they formally announced that they would act in the matter as independent European powers. On the 16th of January 1864 the agreement between them was signed, an article, drafted by Austria, intended to safeguard the settlement of 1852, being replaced at the instance of Prussia by another, which stated that the contracting powers would decide only in concert upon the relations of the duchies, and that in no case would they determine the succession save by mutual consent. A clause was also inserted provisionally recognizing the principle of the integrity of Denmark.

Austro-Prussian alliance.

Whatever Austria's ulterior views may have been, Bismarck certainly from the first had but one aim before him. He saw clearly what the possession of the duchies would mean to Germany, their vast importance for the future of German sea-power; already he had a vision of the great war-harbour of Kiel and the canal connecting the Baltic and the North seas; and he was determined that these should be, if not wholly Prussian, at least wholly under Prussian control. Annexation was the goal which from the beginning he kept steadily before his eyes (*Reminiscences*, ii. 10). As for treaties to the contrary, he was to avow in his *Reminiscences* that these have little force when no longer reinforced by the interests of the contracting parties. His main fear was that the Danes might refuse to fight and appeal instead to a European congress; and, to prevent this, he led the Copenhagen government to believe that Great Britain had threatened to intervene in the event of Prussia going to war, "though, as a matter of fact, England did nothing of the kind." This sufficed to provoke the defiance of the Danes, and on the 1st of February 1864 the Austrian and Prussian troops crossed the Eider. The issue of a war between powers so ill-matched was a foregone conclusion; the famous rampart of the Dannewerk (*q.v.*), on which the Danish defence chiefly relied, was turned, and after a short campaign, in which the Danes fought with distinguished courage, peace was concluded by the treaty of Vienna (August 1, 1864), by which Schleswig, Holstein and Lauenburg were ceded to Austria and Prussia jointly.

Danish War of 1864.

Austria, Prussia and the Zollverein.

The Austro-Prussian alliance had been only an interlude in the great drama in which the two powers were playing rival parts. To the other causes of friction between them had been added, just before the war, a renewed quarrel as to Austria's relation to the Zollverein. In 1862, in the name of the customs union, Prussia had concluded with France a commercial treaty, based mainly on free trade principles. This treaty most of the small states refused to sign, and they were supported in their objections by Austria, which loudly complained that Prussia had given to a foreign power what she had denied to a sister state of the *Bund*. Prussia, however, remained firm, and declared that, were the treaty rejected, she would break up the Zollverein. After the war Bismarck in fact succeeded in obtaining the signature of the smaller states to the treaty; and Austria, her protests having proved unavailing, was fain to sign a commercial treaty with the Zollverein, essentially the same as that of 1853. Treaties concluded with Great Britain and Belgium, about the same time, also tended to enhance Prussian prestige.

Convention of Gastein.

Austria now sought in the question of the Elbe duchies an occasion for re-establishing her influence in Germany. The ambitions of Prussia were notorious, and Austria had no wish to see her rival still further strengthened by the annexation of the duchies. In this attitude she was sure of the support of the German princes, and of German public opinion, which was enthusiastically in favor of the Augustenburg claimant. She therefore took up the cause of Duke Frederick, and under her influence a small majority of the federal diet decided to request the two powers to invest him with the sovereignty of Holstein. Bismarck's reply was to deny the competency of the diet to interfere; and in the Prussian parliament the minister of war moved for a special grant for the creation of a war-harbour at Kiel. Against this Austria protested, as having the same right as Prussia to Kiel; an angry correspondence followed; but neither power was quite prepared for war, and on the 20th of August 1865 the convention of Gastein, to use Bismarck's phrase, "papered over the cracks." Pending a settlement, Schleswig was to be occupied and administered by Prussia, Holstein by Austria; while Lauenburg was made over absolutely to Prussia in return for a money payment. This was so far a diplomatic victory for Prussia, as it ignored entirely the claims of the duke of Augustenburg.

Bismarck had consented to the convention of Gastein in order

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to gain time to prepare the ground for the supreme struggle with Austria for the hegemony of Germany. He had no intention of postponing the issue long; for the circumstances of the two powers were wholly favourable to Prussia. The Prussian army had attained an unprecedented excellence of organization and discipline; the Prussian people, in spite of the parliamentary deadlock, were loyal and united; while in Austria army and state were alike disorganized by nationalist discontent and the breakdown of the centralized system. But there were other factors to be considered. The attitude of Napoleon was dubious; the active alliance of Italy was necessary to the certainty of Prussian success; and the policy of Italy depended ultimately upon that of France. Lastly, the conscience of King William, though since the acquisition of Lauenburg he had "developed a taste for conquest," shrank from provoking war with a German power. The news of the convention of Gastein, which seemed to re-cement the union of Germany, had been received in France with clamorous indignation; and on the 29th of August, under pressure of public opinion, the French government issued a circular note denouncing it as an outrage on national liberty and European law, the protest being backed by note of the 14th of September circulated by Lord John Russell on behalf of the British government. But Napoleon was himself little inclined to use the warlike tone of his people; and Bismarck found it easy to win him over to his views by explaining the temporary nature of the convention, and by dropping hints at the famous interview at Biarritz (September 30, 1865) of possible "compensations" to France in the event of a Prussian victory over Austria; the probability of a prolonged struggle in Germany between two powers apparently evenly matched, moreover, held out to the French emperor the prospect of his being able to intervene at the proper moment with overwhelming effect.

Hostile attitude of France.

Napoleon having been successfully hoodwinked, Bismarck turned to Italy. His previous advances had been interrupted by the Gastein convention, which seemed to the Italian government a betrayal of the Italian cause. Italy attempted to negotiate with Austria for the purchase of Venetia; but the offer was curtly refused by the emperor Francis Joseph, and the counter-proposal of a commercial *rapprochement* was forestalled by Prussia, which with the aid of most of the lesser states, angered by the betrayal of their interests by Austria at Gastein, arranged a commercial treaty between Italy and the Zollverein, an act which involved the recognition of the Italian kingdom. The counter-stroke of Austria was to embarrass Prussia by allowing full play in Holstein to the agitation in favour of the Augustenburg claimant. To the protests of Prussia, Austria replied that she had a full right to do what she liked in the duchy, and that she still adhered to the declaration of the princes, made on the 28th of May 1864, in favour of Duke Frederick. This "perfidy" removed the last scruples of King William; and the Austro-Prussian alliance came to an end with the declaration of Bismarck that Prussia "must win full freedom for her own entire policy" and his refusal to continue the correspondence.

End of the Austro-Prussian understanding.

War, though still postponed, was now certain; and with this certainty the desire of the Italians for the Prussian alliance, now recommended by Napoleon, revived. By the 16th of March 1866 the Austrian war preparations were so far advanced that Count Mensdorff thought it safe to send an ultimatum to Prussia and, at the same time, a circular note to the princes declaring that, in the event of an evasive reply, Austria would move in the diet for the mobilization of the federal forces. On the 24th Bismarck in his turn issued a circular note stating that, in view of the Austrian war preparations, Prussia must take measures for her defence; at the same time he laid before the princes the outline of the Prussian scheme for the reform of the Confederation, a scheme which included a national parliament to be elected by universal suffrage, "as offering surer guarantees for conservative action than limitations that seek to determine the majority beforehand." Clearly Prussia meant war, and the Italian government thought it safe to sign, on the 8th of April 1866, a treaty of alliance. By this instrument it was agreed that in the event of her proposals for the reform of the federal constitution being rejected by the German princes, Prussia should declare war "in order to give effect to her proposals," and that, in that case, Italy would also declare war against Austria. As a result of the war Venetia was to be added to Italy and an equivalent amount of territory in North Germany to Prussia. The agreement, however, was only to hold good if war broke out within three months.

Prusso-Italian alliance.

On the day after the signature of the treaty the Prussian project of reform was presented to the federal diet. It was, however, no more than a bid for the support of public opinion on the part of Bismarck; for even while it was under discussion an angry correspondence was being carried on between Berlin and Vienna on the question of armaments, and by the beginning of May both powers were making undisguised preparations for war. On the 21st of April, the very day when the discussion of the Prussian proposals began in the diet, Austria, alarmed at a threatened attack by Garibaldi on Venetia, began to mobilize in defiance of an agreement just arrived at with Prussia. Five days later, in spite of this, she sent an ultimatum to Berlin, demanding the continuance of the Prussian disarmament and an immediate settlement of the Schleswig-Holstein question. The supreme issue was, however, delayed for a few weeks by the intervention of Napoleon, who, urged on by the loud alarm of the French people at the prospective aggrandizement of Prussia, attempted to detach Italy from the Prussian alliance by persuading Austria to a cession of Venetia. The negotiations broke down on the refusal of Italy to throw over her ally, and Napoleon's proposal of a European congress, to reconsider the whole settlement under the treaties of 1815, proved equally abortive. Meanwhile the preparations for war had been continued, and on the 1st of June Austria flung down the gage by declaring her intention of submitting the whole question of the duchies to the federal diet and of summoning a meeting of the Holstein estates. This was denounced by Bismarck in a circular note to the powers as a breach of the convention of Gastein and of the treaty of January 16, 1864, by which Austria and Prussia had agreed to govern the duchies in common. At the same time he handed in the formal protest of Prussia to the federal diet. Prussia, he said, would only recognize the right of a reformed federal power to settle the Schleswig-Holstein question, and this power must be based on a German parliament, which alone could guarantee Prussia that any sacrifices she might make would be for the good of Germany and not of the dynasties. The Prussian plan of reform laid before the diet included the exclusion of Austria from the Confederation; the creation of a federal navy; the division of the supreme command of the army between Prussia and Bavaria; a parliament elected by manhood suffrage; the regulation of the relations between the Confederation and Austria by a special treaty. In the event of the actual constitution of the *Bund* being shattered by war, the German states were asked whether they would be prepared to join this new organization. On the 9th of June Prussian troops had already marched into Holstein, the Austrians, with Duke Frederick, falling back on Altona. On the 14th the Prussian scheme of reform was laid before the diet, together with Austria's counter-proposal for a decree of federal execution against Prussia. In the event of the rejection of Prussia's motion, Bismarck had made it clear that Prussia would withdraw from the Confederation, and that in the event of her being victorious in the ensuing war those states of northern Germany that voted against her would cease to exist. In spite of this, the Austrian motion was carried by nine votes to six. The Prussian delegate at once withdrew from the diet, and on the following day (June 15) the Prussian troops advanced over the Saxon frontier.

Prussian scheme for the reform of the "Bund."

Prussia withdraws from the "Bund."

The war that followed, conveniently called the Seven Weeks' War (q.v.), culminated before a month had passed, on the 3rd of July, in the crushing Prussian victory of Königgrätz. The rapidity and overwhelming character of the Prussian success

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ensured the triumph of Bismarck's policy. The intervention which Napoleon had planned resolved itself into diplomatic *pourparlers* of which the result was wholly insignificant; and even before the war was ended Bismarck was preparing for an understanding with Austria and with the South German states that should minimize the risk of a French attack. By the preliminary treaty of peace signed at Nikolsburg on the 26th of July the great objects for which Prussia had fought were fully secured. By Article I. the integrity of the Austrian monarchy was preserved, with the exception of Lombardo-Venetia; by Article II. Austria consented to "a new organization of Germany without the participation of the empire of Austria," consented to "the closer union" to be founded by the king of Prussia to the north of the Main, and to the German states south of the Main entering into a union, the national relations of which with the North German Confederation were to be "the subject of an ulterior agreement between the two parties"; by Article III. Austria transferred all her rights in Schleswig and Holstein to Prussia, reserving the right of the people of north Schleswig to be again united to Denmark should they "express a desire to be so by a vote freely given"; by Article V. the territory of Saxony was to remain intact. These Articles, enbodying the more important terms, were included with slight verbal alterations in the treaty of peace signed at Prague on the 23rd of August. Separate treaties of peace had been signed with Württemberg on the 13th, with Baden on the 17th and with Bavaria on the 22nd of August; treaties with Hesse-Darmstadt followed on the 3rd of September, with Saxe-Meiningen on the 8th of October and with Saxony on the 21st. The other unfortunate North German states which had sided with Austria were left to their fate, and on the 20th of September King William issued a decree annexing Hanover, Hesse-Cassel, Nassau and the free city of Frankfort to the Prussian monarchy, and bringing them under the Prussian constitution.

Austro-Prussian War of 1866.

Treaty of Prague. August 23.

Aggrandisement of Prussia.

The return of King William to his capital had been a triumphal progress; and Bismarck had shared to the full the new-born popularity of his master. He seized the occasion to make his peace with Liberal sentiment, and the bill of indemnity for past ministerial breaches of the constitution was carried in the new Prussian diet with enthusiasm. On the 24th of February 1867 the constituent diet of the confederation, elected by universal suffrage and the ballot, met in Berlin, and soon accepted in its essential features the constitution submitted to it. It was arranged that the headship of the confederation should be hereditary, that it should belong to the king of Prussia, and that legislative functions should be exercised by a federal council (*Bundesrat*), representative of the various governments, and by a diet (*Bundestag*) elected by the whole people.

Federal constitution.

The federal parliament began at once the task of consolidating the new institutions. In the sessions of 1869 and 1870 it established a supreme tribunal of commerce, sitting in Leipzig, and passed a new penal code. Great as were these results, they did not satisfy the aspirations of patriotic Germans, who, having so suddenly and so unexpectedly approached unity, longed that the work should be completed. A party called the National Liberals was formed, whose main object was to secure the union of South with North Germany, and it at once entered into peculiar relations with Bismarck, who, in spite of his native contempt for parliaments and parliamentary government, was quite prepared to make use of any instruments he found ready to his hand. There was, indeed, plentiful need for some show of concession to Liberal sentiment, if a union of hearts was to be established between the South and North Germans. The states south of the Main had issued from the war as sovereign and independent powers, and they seemed in no great haste to exchange this somewhat precarious dignity either for a closer alliance among each other or with the North German Confederation. The peoples, too, fully shared the dislike of their rulers to the idea of a closer union with North Germany. The democrats hated Prussia as "the land of the corporal's stick," and Bismarck as the very incarnation of her spirit. The Roman Catholics hated her as the land *par excellence* of Protestantism and free thought. Nothing but the most powerful common interests could have drawn the dissevered halves of Germany together. This sense of common interests it was Bismarck's study to create. An important step was taken in 1867 by the conclusion of a treaty with the southern states, by which it was agreed that all questions of customs should be decided by the federal council and the federal diet, and that, for the consideration of such questions, the southern states should send representatives to Berlin. In reality, however, the customs parliament (*Zollparlament*) was of little service beyond the limits of its special activity. In the election to the customs parliament in 1868, Württemberg did not return a single deputy who was favourable to the national cause; in Bavaria the anti-nationalists had a large majority; and even in Baden and Hesse-Darmstadt, where the opposition to Prussia was less severe, a powerful minority of the deputies had no liking for Bismarck and his ways. Thus the customs parliament was kept rigidly to the objects for which it was founded, greatly to the disappointment of patriots who had not doubted that it would become an effective instrument for the attainment of far larger purposes. Had the completion of unity depended wholly on internal causes, it certainly would not have been soon achieved; but other forces, not altogether unexpectedly, came to Bismarck's aid. France had been irritated by the enormous increase of Prussian power, and even before the treaty of Prague was signed the emperor Napoleon III. indicated a wish to be "compensated" with the left bank of the Rhine. This was a claim exactly calculated to play into Bismarck's hands. The communication of the French emperor's original proposals to the South German governments, whose traditional policy had been to depend on France to save them from the ambitions of the German great powers, was enough to throw them into the arms of Prussia. The treaties of peace between Prussia and the South German states were accompanied by secret treaties of offensive and defensive alliance, under which the supreme command in war was to be given to the Prussian king. A common war against a common enemy now appeared the surest means of welding the dissevered halves of Germany together, and for this war Bismarck steadily prepared. There were soon plentiful signs of where this enemy was to be sought. On the 14th of March 1867 Thiers in the French Chamber gave voice to indignation of France at the bungling policy that had suffered the aggrandizement of Prussia. The reply of Bismarck was to publish (March 19) the secret treaties with the South German states. War was now only a question of time, and the study of Bismarck was to bring it on at the moment most favourable to Germany, and by a method that should throw upon France the appearance of being the aggressor. The European situation was highly favourable. France was hampered by the Roman question, which divided her own counsels while it embroiled her with Italy; the Luxemburg question, arising out of her continued demand for "compensation," had only served to isolate her still further in Europe. French patriotic feeling, suspicious, angry and alarmed, needed only a slight provocation to cause it to blaze up into an uncontrollable fever for war.

National Liberals.

Customs parliament.

South German hostility to union.

Irritation of France.

The provocation was supplied at the right moment by the candidature of the prince of Hohenzollern for the vacant crown of Spain. To bring the Peninsula under French influence had been for centuries the ambition of French statesmen; it was intolerable that it should fall to a "Prussian" prince and that France should be threatened by this new power not only from the east but from the south. High language was used at Paris; and the French ambassador, Count Benedetti, was instructed to demand from the king of Prussia the withdrawal of the Hohenzollern candidature. The demand was politely but firmly refused, and Bismarck, judging that the moment had come for applying the match to

The Hohenzollern candidature.

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the powder magazine, published an "edited" version of the telegram from the king describing the episode, a version which "without the addition of a single word" turned the refusal into an insult. The "Ems telegram" made the continuance of peace impossible; on the 14th of July Napoleon III. signed the declaration of war; and on the 2nd of August the affair of Saarbrücken opened the struggle which was to cause the downfall of the French and the creation of the German empire (see FRANCO-GERMAN WAR). On the 18th of January 1871, ten days before the capitulation of Paris, William I., king of Prussia, was proclaimed German emperor in the great hall of the palace of Versailles, on the initiative of the king of Bavaria, the most powerful of the South German sovereigns, the traditional ally of France. The cession of Alsace and the greater part of Lorraine, wrested two centuries before by Louis XIV. from the Holy Empire, was the heaviest part of the price that France had to pay for peace (treaty of Frankfort, May 10, 1871). (W. A. P.)

Franco-German War.

Proclamation of the German empire.

The foundation of the empire in 1871 begins a new era in the history of Germany. The rivalry of the dynasties to which for so long the interests of the nation had been sacrificed now ceased. By the treaties of Versailles the kingdoms of Bavaria and Württemberg, and the grand-duchy of Baden, as well as the southern provinces of the grand-duchy of Hesse, were added to the North German Confederation. Henceforward all the German states that had survived the struggle of 1866, with the exception of the empire of Austria, the grand-duchy of Luxemburg, and the principality of Liechtenstein, were incorporated in a permanent federal state under the leadership of Prussia. The revision in 1871 made no important alterations in the constitution of 1867. The states retained their autonomy except in those matters which were expressly transferred to the imperial authorities; the princes retained their sovereignty; the king of Prussia, though he now took the title of German emperor, was only *primus inter pares*; he was president of the confederation, but had no suzerainty over the other princes. None the less, from this time the acts of the state governments and parliaments have ceased to have more than a local importance; the history of the nation is centred in Berlin, in the Bundesrat or federal council, in which the interests of the individual states are represented; in the Reichstag, in which the feelings and wishes of the nation are expressed. And above all, in the Prussian government and imperial executive.

The new empire, 1871.

The new constitution has stood the test. The number of states of which the empire consists has remained unaltered;[1] occasional disputes have been settled harmoniously in a legal manner. The special rights reserved to Bavaria and Württemberg have not proved, as was feared, a danger to the stability of the empire. Much apprehension had been caused by the establishment of a permanent committee for foreign affairs in the Bundesrat, over which the Bavarian representative was to preside; but the clause remained a dead letter. There is no record that the committee ever met until July 1900, when it was summoned to consider the situation in China; and on that occasion it probably formed a useful support to the government, and helped to still apprehension lest a too adventurous policy should be pursued. Another clause determined that in a division in the Reichstag on any law which did not concern the whole empire, the representatives of those states which were not concerned should not vote. This, had it been retained, would have destroyed the coherence of the Reichstag as representative of the whole nation. It was repealed in 1873. The permission to maintain diplomatic missions has been equally harmless: most of the states have recalled all their diplomatic representatives; Saxony, Bavaria and Württemberg have maintained only those at Vienna, the Vatican and at St Petersburg. Bavaria has even voluntarily adopted many imperial laws from which it was legally exempted; for instance, the laws of settlement.

The empire and the states.

If the states have been loyal to the empire, the imperial government has also respected the constitutional privileges of the states. The harmonious working of the constitution depends on the union of policy between the empire and Prussia, for it is the power of Prussia which gives strength to the empire. This was practically secured by the fact that the emperor, who is king of Prussia, appoints the chancellor, and the chancellor is generally president of the Prussian ministry as well as minister of foreign affairs—in his person the government of the two is identified. For twenty years the double office was held by Bismarck, who, supported as he was by the absolute confidence of the emperor, and also of the allied princes, held a position greater than that ever attained by any subject in modern Europe since the time of Richelieu. For ten months in 1873 he, indeed, resigned the office of minister-president to Roon; and in the same way Caprivi, during the years 1893–1894, held the chancellorship alone; but in neither case was the experiment successful, and Hohenlohe and Bülow adhered to the older plan. So important is the practical co-operation of the imperial administration and the Prussian government, that it has become customary to appoint to seats in the Prussian ministry the more important of the secretaries of state who administer imperial affairs under the chancellor. Delbrück, head of the imperial chancery, had held this position since 1868; in 1877 Bülow, secretary of state for foreign affairs, was appointed Prussian minister, and this has become the ordinary practice. One result of this is to diminish the control which the Prussian parliament is able to maintain over the Prussian ministry.

Prussia and the empire.

In the federal council Prussian policy nearly always prevails, for though Prussia has only seventeen votes out of fifty-eight, the smaller states of the North nearly always support her; practically she controls the vote of Waldeck and since 1885 those of Brunswick. A definite defeat of Prussia on an important question of policy must bring about a serious crisis; it is generally avoided because, as the meetings are secret, an arrangement or compromise can be made. Bismarck, knowing that nothing would more impede the consolidation of the empire than an outbreak of local patriotism, always so jealous of its rights, generally used his influence to avoid constitutional disputes, and discouraged the discussion of questions which would require an authoritative interpretation of the constitution. It was, however, opposition in the Bundesrat which obliged him to abandon his scheme for imperial railways, and when, in 1877, it was necessary to determine the seat of the new supreme court of justice, the proposal of the government that Berlin should be chosen was out-voted by thirty to twenty-eight in favour of Leipzig. On this occasion Bismarck accepted the decision, but when important interests were at stake he showed himself as ready to crush opposition as in the older days, as in the case of Hamburg and Bremen.

The great personal qualities of the reigning emperors and the widely extended family connexions of the house of Hohenzollern have enabled them to hold with ease their position as leaders among the ruling families. So far as is known, with one or two unimportant exceptions, the other princes loyally accepted their new position. It is only as regards the house of Brunswick that the older dynastic questions still have some political importance.

The other princes who were dispossessed in 1866 have all been reconciled to Prussia. The elector of Hesse and the duke of Nassau have formally relinquished their claims. In 1883 the daughter of the duke of Augustenburg, the former claimant to the duchies of Schleswig and Holstein, married the heir to the Prussian throne, who became William II. On the other hand, the royal family of Hanover has never ceased to protest against the acts by which they were deprived of their dominions. King George to the end of his days, whether in Austria or in France, still regarded himself as in a state of war with Prussia. As he had used his large personal property to organize a regiment in order to regain his possessions, the Prussian

Hanover.

[1] The only formal change is that the duchy of Lauenburg, which since 1865 had been governed by the king of Prussia as a separate principality (but without a vote in the Bundesrat), was in 1876 incorporated in the Prussian province of Schleswig-Holstein.

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government had sequestrated that part of his income, amounting to some £50,000, over which they had control, and used it as secret service money chiefly for controlling the press; to this fund the name "Welfen-Fond" was commonly given. After 1870 the Hanoverian regiment was disbanded, but the sequestration continued. The death of the old king in 1878 made no difference, for his son in a letter to the king of Prussia announced that he assumed and maintained all his father's rights, and that he did not recognize the legal validity of the acts by which he was, as a matter of fact, prevented from enjoying them. His protest was supported by a considerable number of his former subjects, who formed a party in the Reichstag. The marriage of the duke of Cumberland (the title by which the king called himself till he could come into his possessions) with Princess Thyra of Denmark in the same year was made the occasion of a great demonstration, at which a deputation of the Hanoverian nobility assured the duke of their continued attachment to his house.

After Bismarck's retirement the emperor attempted to bring about a reconciliation with the duke and the Hanoverians. His attention had been drawn to the bad moral effect of the use to which the Welfen-Fond was applied, and on the duke of Cumberland writing him a letter, in which, while maintaining his claims to the throne of Hanover, he recognized the empire and undertook not to support any enterprise against the empire or Prussia, with the consent of the Prussian parliament the sequestration of his property was removed. The attitude of passive resistance is, however, still maintained, and has affected the position of the duchy of Brunswick.

In 1884 William, duke of Brunswick, died after a reign of fifty-four years. The younger son of the duke who fell at Quatre Bras, he had been called to the throne in 1831 to take the place of his elder brother Charles, who had been deposed. Duke Charles had died at Geneva in 1873, and as both brothers were childless the succession went to the duke of Cumberland as head of the younger branch of the house of Brunswick-Lüneburg. Duke William before his death had arranged that the government should be carried on by a council of regency so long as the heir was prevented from actually assuming the government; at the end of a year a regent was to be chosen from among the non-reigning German princes. He hoped in this way to save his duchy, the last remnant of the dominions of his house, from being annexed by Prussia. As soon as he died the town was occupied by the Prussian troops already stationed therein; the duke of Cumberland published a patent proclaiming his succession; the council of state, however, declared, in agreement with the Bundesrat, that the relations in which he stood to the kingdom of Prussia were inconsistent with the alliances on which the empire was based, and that therefore he could not assume the government. The claim of the duke of Cambridge as the only male heir of full age was referred to the Bundesrat, but the duke refused to bring it before that body, and after a year the Brunswick government elected as regent Prince Albert of Hohenzollern, to hold office so long as the true heir was prevented from entering on his rights. On the death of Prince Albert in September 1906, the Brunswick diet petitioned the Bundesrat to allow the youngest son of the duke of Cumberland to succeed to the duchy on renouncing his personal claims to the crown of Hanover. This was refused, and on the 28th of May 1907 Duke John Albert of Mecklenburg-Schwerin was elected regent by the diet. Under the regency of Prince Albert, Brunswick, which had hitherto steadily opposed all attempts to assimilate and subordinate its institutions to those of Prussia, though it retained formal independence, was brought into very close dependence upon Prussia, as is the case with all the other northern states. In them the armies are incorporated in the Prussian army; the railways are generally merged in the Prussian system; indirect taxation, post office, and nearly the whole of the judicial arrangements are imperial. None, however, has yet imitated the prince of Waldeck, who in 1867, at the wish of his own subjects, transferred the administration of his principality to Prussia. The local estates still meet, and the principality still forms a separate administrative district, but it is managed by a director appointed by Prussia. The chief reason for this act was that the state could not meet the obligations laid upon it under the new system, and the responsibility for any deficit now rests with Prussia.

Duchy of Brunswick.

Waldeck.

A curious difficulty, a relic of an older state of society, arose in the principality of Lippe, in consequence of the extinction of the elder ruling line and a dispute as to the succession (see LIPPE). Some political importance attached to the case, for it was not impossible that similar difficulties might occur elsewhere, and the open support given by the emperor to the prince of Schaumburg-Lippe, who had married his sister, caused apprehension of Prussian aggression.

Lippe.

A much more serious question of principle arose from the peculiar circumstances of Mecklenburg. The grand-duchies, which, though divided between two lines of the ducal house, had a common constitution, were the only state in Germany in which the parliament still took the form of a meeting of the estates—the nobility and the cities—and had not been altered by a written constitution. Repeated attempts of the grand-dukes to bring about a reform were stopped by the opposition of the Ritterschaft. Büfling, one of the Mecklenburg representatives in the Reichstag, therefore proposed to add to the imperial constitution a clause that in every state of the confederation there should be a parliamentary assembly. This was supported by all the Liberal party and carried repeatedly; of course it was rejected by the Bundesrat, for it would have established the principle that the constitution of each state could be revised by the imperial authorities, which would have completely destroyed their independence. It is noticeable that in 1894 when this motion was introduced it was lost; a striking instance of the decay of Liberalism.

The Mecklenburg constitution.

The public political history of Germany naturally centres around the debates in the Reichstag, and also those in the Prussian parliament. In the Prussian parliament are discussed questions of education, local government, religion and direct taxation, and though of course it is only concerned with Prussian affairs, Prussia is so large a part of Germany that its decisions have a national importance. A very large number of the members of the Reichstag and of the Prussian parliament sit in both, and the parties in the two are nearly identical. In fact, the political parties in the Reichstag are generally directly descended from the older Prussian parties.

Public affairs: political parties.

The first place belongs to the Conservatives, who for twenty years had been the support of the Prussian government. The party of the feudal aristocracy in North Germany, they were strongest in the agricultural districts east of the Elbe; predominantly Prussian in origin and in feeling, they had great influence at court and in the army, and desired to maintain the influence of the orthodox Lutheran Church. To them Bismarck had originally belonged, but the estrangement begun in 1866 constantly increased for the next ten years. A considerable number of the party had, however, seceded in 1867 and formed a new union, to which was given the name of the *Deutsche Reichspartei* (in the Prussian House they were called the *Frei Conservativen*). These did not include any prominent parliamentary leaders, but many of the most important ministers and officials, including Moltke and some of the great nobles. They were essentially a government party, and took no part in the attacks on Bismarck, which came from the more extreme Conservatives, the party of the *Kreuzzeitung*.

Conservatives.

The events of 1866 had brought about a similar division among the Progressives. A large section, including the most important leaders, determined to support Bismarck in his national policy and to subordinate to this, though not to surrender, the struggle after constitutional development. Under the name of *National-Liberal-Partei* they became in numbers as in ability the strongest party both in Prussia and the empire. Essentially a German, not a Prussian, party, they were joined by the Nationalists from the annexed provinces of Hanover and Hesse; in 1871 they were greatly

National Liberals.

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strengthened by the addition of the National representatives from the southern states; out of fourteen representatives from Baden twelve belonged to them, seventeen out of eighteen Württemberger, and a large majority of the Bavarians. It was on their support that Bismarck depended in building up the institutions of the empire. The remainder of the Progressives, the *Fortschrittspartei*, maintained their protest against the military and monarchical elements in the state; they voted against the constitution in 1867 on the ground that it did not provide sufficient guarantees for popular liberty, and in 1871 against the treaty with Bavaria because it left too much independence to that state. Their influence was strongest in Berlin, and in the towns of East Prussia; they have always remained characteristically Prussian.

These great parties were spread over the whole of Germany, and represented the great divisions of political thought. To them must be added others which were more local, as the *Volkspartei* or People's party in Württemberg, which kept alive the extreme democratic principles of 1848, but was opposed to Socialism. They had been opposed to Prussian supremacy, and in 1870 for the time completely lost their influence, though they were to regain it in later years.

Of great importance was the new party of the Centre. Till the year 1863 there had been a small party of Catholics in the Prussian parliament who received the name of the *Centrum*, from the part of the chamber in which they sat. They had diminished during the years of conflict and disappeared in 1866. In December 1870 it was determined to found a new party which, while not avowedly Catholic, practically consisted entirely of Catholics. The programme required the support of a Christian-Conservative tendency; it was to defend positive and historical law against Liberalism, and the rights of the individual states against the central power. They were especially to maintain the Christian character of the schools. Fifty-four members of the Prussian parliament at once joined the new party, and in the elections for the Reichstag in 1871 they won sixty seats. Their strength lay in Westphalia and on the Rhine, in Bavaria and the Polish provinces of Prussia. The close connexion with the Poles, the principle of federalism which they maintained, the support given to them by the Bavarian "patriots," their protest against the "revolution from above" as represented equally by the annexation of Hanover and the abolition of the papal temporal power, threw them into strong opposition to the prevailing opinion, an opposition which received its expression when Hermann von Mallinckrodt (1821–1874), the most respected of their parliamentary leaders, declared that "justice was not present at the birth of the empire." For this reason they were generally spoken of by the Nationalist parties as *Reichsfeindlich*.

The Centre.

This term may be more properly applied to those who still refuse to recognize the legality of the acts by which the empire was founded. Of these the most important were the so-called Guelphs (*Welfen*), described by themselves as the *Hannoverische Rechtspartei*, member of the old Hanoverian nobility who represented the rural districts of Hanover and still regarded the deposed King George V. and, after his death, the duke of Cumberland as their lawful sovereign. In the elections of 1898 they still returned nine members to the Reichstag, but in those of 1903 their representation had sunk to six, and in 1907 it had practically disappeared. A similar shrinkage has been displayed in the case of the protesting Alsace-Lorrainers, who returned only two deputies in 1907. A pleasant concession to Hanoverian feeling was made in 1899, when the emperor ordered that the Hanoverian regiments in the Prussian army should be allowed to assume the names and so continue the traditions of the Hanoverian army which was disbanded in 1866.

The government has also not succeeded in reconciling to the empire the alien races which have been incorporated in the kingdom of Prussia. From the Polish districts of West Prussia, Posen and Silesia a number of representatives have continued to be sent to Berlin to protest against their incorporation in the empire. Bismarck, influenced by the older Prussian traditions, always adopted towards them an attitude of uncompromising opposition. The growth of the Polish population has caused much anxiety; supported by the Roman Catholic Church, the Polish language has advanced, especially in Silesia, and this is only part of the general tendency, so marked throughout central Europe, for the Slavs to gain ground upon the Teutons. The Prussian government has attempted to prevent this by special legislation and severe administrative measures. Thus in 1885 and 1886 large numbers of Austrian and Russian Poles who had settled in these provinces were expelled. Windthorst thereupon raised the question in the Reichstag, but the Prussian government refused to take any notice of the interpolation on the ground that there was no right in the constitution for the imperial authority to take cognizance of acts of the Prussian government. In the Prussian parliament Bismarck introduced a law taking out of the hands of the local authorities the whole administration of the schools and giving them to the central authority, so as to prevent instruction being given in Polish. A further law authorized the Prussian government to spend £5,000,000 in purchasing estates from Polish families and settling German colonists on the land. The commission, which was appointed for the purpose, during the next ten years bought land to the amount of about 200,000 acres and on it settled more than 2000 German peasants. This policy has not, however, produced the intended effect; for the Poles founded a society to protect their own interests, and have often managed to profit by the artificial value given to their property. It has merely caused great bitterness among the Polish peasants, and the effect on the population is also counteracted by the fact that the large proprietors in purely German districts continue to import Polish labourers to work on their estates.

Poles.

In the general change of policy that followed after the retirement of Bismarck an attempt was made by the emperor to conciliate the Poles. Concessions were made to them in the matter of schools, and in 1891 a Pole, Florian von Stablewski (1841–1906), who had taken a prominent part in the Kulturkampf, was accepted by the Prussian government as archbishop of Posen-Gnesen. A moderate party arose among the Poles which accepted their position as Prussian subjects, gave up all hopes of an immediate restoration of Polish independence, and limited their demands to that free exercise of the religion and language of their country which was enjoyed by the Poles in Austria. They supported government bills in the Reichstag, and won the commendation of the emperor. Unfortunately, for reasons which are not apparent, the Prussian government did not continue a course of conciliation; in 1901 administrative edicts still further limited the use of the Polish language; even religious instruction was to be given in German, and an old royal ordinance of 1817 was made the pretext for forbidding private instruction in Polish.

All these efforts have been in vain. The children in the schools became the martyrs of Polish nationality. Religious instruction continued to be given to them in German, and when they refused to answer questions which they did not understand, they were kept in and flogged. In 1906, as a protest, the school children to the number of 100,000 struck throughout Prussian Poland; and, as a result of a pastoral issued by the archbishop, Polish parents withdrew their children from religious instruction in the schools. The government responded by fining and imprisoning the parents. The efforts of the government were not confined to the forcible Germanization of the children. Polish newspapers were confiscated and their editors imprisoned, fines were imposed for holding Polish meetings, and peasants were forbidden to build houses on their own land. The country gentlemen could not have a garden party without the presence of a commissary of police.

The climax, however, was reached in 1907 when Prince Bülow, on the 26th of November, introduced into the Prussian parliament a bill to arm the German Colonization Committee in Posen with powers of compulsory expropriation. He pointed out that though the commission had acquired 815,000 acres of land and settled upon it some 100,000 German colonists, nearly 250,000

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acres more had passed from German into Polish hands. He proposed, therefore, to set aside a credit of £17,500,000 for this purpose. On the 26th of February 1908 the discussion on this bill was continued, Count Arnim defending it on the ground that "conciliation had failed and other measures must now be tried!" The Poles were aiming at raising their standard of civilization and learning and thus gradually expelling the Germans, and this, together with the rapid growth of the Polish population, constituted a grave danger. These arguments were reinforced by an appeal of Prince Bülow to the traditions of Bismarck, and in spite of a strenuous and weighty opposition, the bill with certain modifications passed by 143 votes to 111 in the Upper House, and was accepted by the Lower House on the 13th of March. A bill forbidding the use of any language but German at public meetings, except by special permission of the police, had been laid before the Reichstag in 1907 by Prince Bülow at the same time as he had introduced the Expropriation Bill into the Prussian parliament. The bill, with certain drastic amendments limiting its scope, passed the House on the 8th of April by a majority of 200 to 179. This law gave increased freedom in the matter of the right of association and public meeting; but in the case of the Poles it was applied with such rigidity that, in order to evade it they held "mute" public meetings, resolutions being written up in Polish on a blackboard and passed by show of hands, without a word being said.[1]

Compared with the Polish question, that of the Danes in North Schleswig is of minor importance; they number less than 150,000, and there is not among them, as among the Poles, the constant encroachment along an extended line of frontier; there is also no religious question involved. These Danish subjects of Germany have elected one member to the Reichstag, whose duty is to demand that they should be handed over to Denmark. Up to the year 1878 they could appeal to the treaty of Prague; one clause in it determined that the inhabitants of selected districts should be allowed to vote whether they should be Danish or German. This was inserted merely to please Napoleon; after his fall there was no one to demand its execution. In 1878, when the Triple Alliance was concluded, Bismarck, in answer to the Guelphic demonstration at Copenhagen, arranged with Austria, the other party to the treaty of Prague, that the clause should lapse. Since then the Prussian government, by prohibiting the use of Danish in the schools and public offices, and by the expulsion from the country of the numerous Danish optants who had returned to Schleswig, has used the customary means for compelling all subjects of the king to become German in language and feeling.[2]

Danes.

The attempt to reconcile the inhabitants of Alsace-Lorraine to their condition proved equally difficult. The provinces had been placed under the immediate rule of the emperor and the chancellor, who was minister for them; laws were to be passed by the Reichstag. In accordance with the treaty of Frankfort, the inhabitants were permitted to choose between French and German nationality, but all who chose the former had to leave the country; before the 1st of October 1872, the final day, some 50,000 had done so. In 1874, for the first time, the provinces were enabled to elect members for the Reichstag; they used the privilege to send fifteen *Elsasser*, who, after delivering a formal protest against the annexation, retired from the House; they joined no party, and took little part in the proceedings except on important occasions to vote against the government. The same spirit was shown in the elections for local purposes. It seemed to be the sign of a change when a new party, the *Autonomisten*, arose, who demanded as a practical concession that the dictatorship of the chancellor should cease and local self-government be granted. To some extent this was done in 1879; a resident governor or *Statthalter* was appointed, and a local representative assembly, which was consulted as to new laws. All the efforts of Field marshal Edwin von Manteuffel, the first governor, to win the confidence of the people failed; the anti-German feeling increased; the party of protestors continued in full numbers. The next governor, Prince Hohenlohe, had to use more stringent measures, and in 1888, to prevent the agitation of French agents, an imperial decree forbade any one to cross the frontier without a passport. Since 1890 there has been, especially in the neighbourhood of Strassburg, evidence of a spread of national German feeling, probably to a great extent due to the settlement of Germans from across the Rhine.

Alsace-Lorraine.

The presence of these anti-German parties, amounting sometimes to one-tenth of the whole, in the Reichstag added greatly to the difficulty of parliamentary government. Gradually, however, as a new generation grew up their influence declined. In the Reichstag of 1907, Guelphs, Alsace-Lorrainers and Danes together could muster only five members.

The period 1870 to 1878.

The great work since 1870 has been that of building up the institutions of the empire. For the first time in the history of Germany there has been a strong administration ordering, directing and arranging the life of the whole nation. The unification of Germany was not ended by the events of 1866 and 1871; it was only begun. The work has throughout been done by Prussia; it has been the extension of Prussian principles and Prussian administrative energy over the whole of Germany. It naturally falls into two periods; the first, which ends in 1878, is that in which Bismarck depended on the support of the National Liberals. They were the party of union and uniformity. The Conservatives were attached to the older local diversities, and Bismarck had therefore to turn for help to his old enemies, and for some years an alliance was maintained, always precarious but full of results.

Legal reform.

The great achievement of the first period was legal reform. In nothing else was legislation so much needed. Forty-six districts have been enumerated, each of which enjoyed a separate legal system, and the boundaries of these districts seldom coincided with the frontiers of the states. Everywhere the original source of law was the old German common law, but in each district it had been wholly or partly superseded by codes, text-books and statutes to a great extent founded on the principles of the Roman civil law. Owing to the political divisions, however, this legislation, which reached back to the 14th century, had always been carried out by local authorities. There had never been any effective legislation applicable to the whole nation. There was not a state, not the smallest principality, in which some authoritative but imperfect law or code had not been published. Every free city, even an imperial-village, had its own "law," and these exist down to the present time. In Bremen the foundation of the civil code was still the statutes of 1433; in Munich, those of 1347. Most of the states by which these laws had been published had long ago ceased to exist; probably in every case their boundaries had changed, but the laws remained valid (except in those cases in which they had been expressly repealed) for the whole of the district for which they had been originally promulgated. Let us take a particular case. In 1501 a special code was published for the upper county of Katzellenbogen. More than a hundred years ago Katzellenbogen was divided between the neighbouring states. But till the end of the 19th century this code still retained its validity for those villages in Hesse, and in the Prussian province of Hesse, which in old days had been parts of Katzellenbogen. The law, however, had to be interpreted so as to take into consideration later legislation by the kingdom of Westphalia, the electorate of Hesse, and any other state (and they are several) in which for a short time some of these villages might have been incorporated.

In addition to these earlier imperfect laws, three great codes have been published, by which a complete system was applied to a large district: the Prussian Code of 1794, the Austrian Code of 1811 and the Code Napoléon, which applied to all Germany left of the Rhine; for neither Prussia, nor Bavaria, nor Hesse had ever ventured to interfere with the French law. In Prussia therefore the older provinces came under the Prussian

[1] See *Annual Register* (1908), pp. 289 et seq.

[2] The whole question is exhaustively treated from the Danish point of view in *La Question de Slesvig* (Copenhagen, 1906), a collective work edited by F. de Jessens.

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Code, the Rhine provinces had French law, the newly annexed provinces had endless variety, and in part of Pomerania considerable elements of Swedish law still remained, a relic of the long Swedish occupation. On the other hand, some districts to which the Prussian Code applied no longer belonged to the kingdom of Prussia—for instance, Anspach and Bayreuth, which are now in Bavaria. In other parts of Bavaria in the same way Austrian law still ran, because they had been Austrian in 1811. In two states only was there a more or less uniform system: in Baden, which had adopted a German translation of the Code Napoléon; and in Saxony, which had its own code, published in 1865. In criminal law and procedure there was an equal variety. In one district was trial by jury in an open court; in another the old procedure by written pleadings before a judge. In many districts, especially in Mecklenburg and some of the Prussian provinces, the old feudal jurisdiction of the manorial courts survived.

The constant changes in the law made by current legislation in the different states really only added to the confusion, and though imperial laws on these points with which the central government was qualified to deal superseded the state laws, it is obvious that to pass occasional acts on isolated points would have been only to introduce a further element of complication. It was therefore convenient, so far as was possible, to allow the existing system to continue until a full and complete code dealing with the whole of one department of law could be agreed upon, and thus a uniform system (superseding all older legislation) be adopted. Legislation, therefore, has generally taken the form of a series of elaborate codes, each of which aims at scientific completeness, and further alterations have been made by amendments in the original code. The whole work has been similar in character to the codification of French law under Napoleon; in most matters the variety of the older system has ceased, and the law of the empire is now comprised in a limited number of codes.

A beginning had been made before the foundation of the empire; as early as 1861 a common code for trade, commerce and banking had been agreed upon by the states included in the Germanic Confederation. It was adopted by the new confederation of 1869. In 1897 it was replaced by a new code. In 1869 the criminal law had been codified for the North German Confederation, and in 1870 there was passed the *Gewerbeordnung*, an elaborate code for the regulation of manufactures and the relations of masters to workmen. These were included in the law of the empire, and the work was vigorously continued.

In 1871 a commission was appointed to draw up regulations for civil and criminal procedure, and also to frame regulations for the organization of the law courts. The draft code of civil procedure, which was published in December 1872, introduced many important reforms, especially by substituting public and verbal procedure for the older German system, under which the proceedings were almost entirely carried on by written documents. It was very well received. The drafts for the other two laws were not so successful. Protests, especially in South Germany, were raised against the criminal procedure, for it was proposed to abolish trial by jury and substitute over the whole empire the Prussian system, and a sharp conflict arose as to the method of dealing with the press. After being discussed in the Reichstag, all three projects were referred to a special commission, which after a year reported to the diet, having completely remodelled the two latter laws. After further amendment they were eventually accepted, and became law in 1877. By these and other supplementary laws a uniform system of law courts was established throughout the whole empire; the position and pay of the judges, the regulations regarding the position of advocates, and costs, were uniform, and the procedure in every state was identical. To complete the work a supreme court of appeal was established in Leipzig, which was competent to hear appeals not only from imperial law, but also from that of the individual states.

By the original constitution, the imperial authorities were only qualified to deal with criminal and commercial law; the whole of the private law, in which the variety was greatest, was withdrawn from their cognizance. Lasker, to remedy this defect, proposed, therefore, an alteration in the constitution, which, after being twice carried against the opposition of the Centre, was at last accepted by the Bundesrat. A commission was then appointed to draw up a civil code. They completed the work by the end of 1887; the draft which they then published was severely criticized, and it was again submitted for revision to a fresh commission, which reported in 1895. In its amended form this draft was accepted by the Reichstag in 1896, and it entered into force on the 1st of January 1900. The new Civil Code deals with nearly all matters of law, but excludes those concerning or arising out of land tenure and all matters in which private law comes into connexion with public law; for instance, the position of government officials, and the police: it excludes also the relations of master and servant, which in most points are left to the control of individual states. It was accompanied by a revision of the laws for trade and banking.

Commercial reform.

Equal in importance to the legal was the commercial reform, for this was the condition for building up the material prosperity of the country. Germany was a poor country, but the poverty was to a great extent the result of political causes. Communication, trade, manufactures, were impeded by the political divisions, and though the establishment of a customs union had preceded the foundation of the empire, the removal of other barriers required imperial legislation. A common system of weights and measures was introduced in 1868. The reform of the currency was the first task of the empire. In 1871 Germany still had seven different systems; the most important was the *Thaler* and the *Groschen*, which prevailed over most of North Germany, but even within this there were considerable local differences. Throughout the whole of the south of Germany and in some North German states the gulden and kreuzer prevailed. Then there were other systems in Hamburg and in Bremen. Everywhere, except in Bremen, the currency was on a silver basis. In addition to this each state had its own paper money, and there were over 100 banks with the right of issuing bank-notes according to regulations which varied in each state. In 1871 a common system for the whole empire was established, the unit being the *Mark* (= 11¾d.), which was divided into a hundred *Pfennige*: a gold currency was introduced (*Doppel-Kronen* = 20 *M.*; *Kronen* = 10 *M.*); no more silver was to be coined, and silver was made a legal tender only up to the sum of twenty marks. The gold required for the introduction of the new coinage was provided from the indemnity paid by France. Great quantities of thalers, which hitherto had been the staple of the currency, were sold. The right of coinage was, however, left to the individual states, and as a special concession it was determined that the rulers of the states should be permitted to have their head placed on the reverse of the gold coins. All paper currency, except that issued by the empire, ceased, and in 1873 the Prussian Bank was converted into the Imperial Bank (Reichsbank).

Banking laws.

Closely connected with the reform of the currency and the codification of the commercial law was the reform of the banking laws. Here the tendency to substitute uniform imperial laws for state laws is clearly seen. Before 1870 there had been over 100 banks with the right of issue, and the conditions on which the privilege was granted varied in each state. By the Bank Act of March 14, 1875, which is the foundation of the existing system, the right of granting the privilege is transferred from the governments of the states to the Bundesrat. The existing banks could not be deprived of the concessions they had received, but unless they submitted to the regulations of the new law their notes were not to be recognized outside the limits of the state by which the concession had been granted. All submitted to the conditions except the Brunswick Bank, which remained outside the banking system of the empire until the Bank Act of June 5, 1906, was passed, when it surrendered its right to issue notes. The experience of Germany in this matter has been different from that of England, for nearly all the private banks have now

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surrendered their privilege, and there remain only five banks, including the Reichsbank, which still issue bank notes. The other four are situated in Bavaria, Saxony, Württemberg and Baden. The total note-issue was fixed by the law of 1875, a proposal being assigned to each bank. Any part of this issue assigned to private banks which might be withdrawn from circulation, owing to a deficiency in the legal reserve funds, was to be transferred to the Reichsbank. The result has been the tendency of the latter gradually to absorb the whole note-issue. By the law of 1906 the Reichsbank was authorized to issue 20 M. and 50 M. notes. Treasury notes (*Reichs-Kassenscheine*) for these amounts were no longer to be issued; but the state reserved the right to circulate notes of the value of 5 M. and 10 M.

The organization of the imperial post-office was carried out with great success by Herr von Stephan (*q.v.*), who remained at the head of this department from its creation till his death in 1897. Proposals were also made to Bavaria and Württemberg to surrender their special rights, but these were not accepted.

Railways.

The unification of the railways caused greater difficulties. Nearly every state had its own system; there was the greatest variety in the methods of working and in the tariffs, and the through traffic, so important for the commercial prosperity of the country, was very ineffective. In Baden, Württemberg and Hanover the railways were almost entirely the property of the state, but in all other parts public and private lines existed side by side, an arrangement which seemed to combine the disadvantages of both systems. In 1871 three-quarters of the railway lines belonged to private companies, and the existence of these powerful private corporations, while they were defended by many of the Liberals, was, according to the national type of thought, something of an anomaly. Bismarck always attached great importance to the improvement of the railway service, and he saw that uniformity of working and of tariffs was very desirable. In the constitution of the empire he had introduced several clauses dealing with it. The independent administration of its lines by each state was left, but the empire received the power of legislating on railway matters; it could build lines necessary for military purposes even against the wish of the state in whose territory they lay, and the states bound themselves to administer their lines as part of a common system. In order to carry out these clauses a law was passed on the 27th of June 1873 creating an imperial railway office (*Reichseisenbahnamt*) for the purpose of exercising a general control over the railways. This office has done much in the matter of unifying the systems of various railways and of regulating their relations to the military, postal and telegraph organizations; it also took a leading part in the framing of the international laws regarding goods traffic; but the imperial code of railway law which it drafted has never been laid before the Reichstag. It effectively controls only the privately owned lines in Prussia. Yet, in setting it up, Bismarck had in mind the ultimate acquisition of all the railways by the empire. He found, however, that it was impossible to carry any Bill enforcing this. He therefore determined to begin by transferring to the imperial authority the Prussian state railways; had he been able to carry this out the influence of the imperial railways would have been so great that they would gradually have absorbed those of the other states. The Bill was carried through the Prussian parliament, but the opposition aroused in the other states was so great that he did not venture even to introduce in the Bundesrat a law empowering the empire to acquire the Prussian railways. In many of the state parliaments resolutions were carried protesting against the system of imperial railways, and from that time the preservation of the local railway management has been the chief object towards which, in Saxony, Bavaria and Württemberg, local feeling has been directed. The only imperial railways are those in Alsace-Lorraine.

The result of the legal reform and other laws has been greatly to diminish the duties of the state governments, for every new imperial law permanently deprives the local parliaments of part of their authority. Generally there remains to them the control of education and religion—their most important duty—police, all questions connected with land tenure, local government, the raising of direct taxes, and, in the larger states, the management of railways. The introduction of workmen's insurance, factory legislation, and other measures dealing with the condition of the working classes by imperial legislation, was at a later period still further to limit the scope of state legislation.

Army organization.

Meanwhile the government was busy perfecting the administration of the national defences. From the war indemnity large sums had been expended on coast defence, on fortifications and on replacing the equipment and stores destroyed during the war. A special fund, producing annually about a million pounds, was put aside, from which pensions to the wounded, and to the widows and orphans of those who had fallen, should be provided. It was also desirable to complete the military organization. It must be remembered that technically there is no German army, as there is no German minister of war. Each state, however small, maintains its own contingent, subject to its own prince, who has the right and the obligation of administering it according to the provisions of the treaty by which he entered the federation. Practically they are closely tied in every detail of military organization. The whole of the Prussian military system, including not only the obligation to military service, but the rules for recruiting, organization, drill and uniforms, has to be followed in all the states; all the contingents are under the command of the emperor, and the soldiers have to swear obedience to him in addition to the oath of allegiance to their own sovereign. It is therefore not surprising that, having so little freedom in the exercise of their command, all the princes and free cities (with the exception of the three kings) arranged separate treaties with the king of Prussia, transferring to him (except for certain formal rights) the administration of their contingents, which are thereby definitely incorporated in the Prussian army. The first of these treaties was arranged with Saxe-Coburg Gotha in 1861; those with the other North German states followed at short intervals after 1866. The last was that with Brunswick, which was arranged in 1885; Duke William had always refused to surrender the separate existence of his army. Owing to the local organization, this does not prevent the contingent of each state from preserving its separate identity; it is stationed in its own district, each state contributing so many regiments.

The Septennat.

In 1872 a common system of military jurisprudence was introduced for the whole empire except Bavaria (a revised code of procedure in military courts was accepted by Bavaria in 1898); finally, in February 1874, an important law was laid before the Reichstag codifying the administrative rules. This superseded the complicated system of laws and royal ordinances which had accumulated in Prussia during the fifty years that had elapsed since the system of short service had been introduced; the application to other states of course made a clearer statement of the laws desirable. Most of this was accepted without opposition or debate. On one clause a serious constitutional conflict arose. In 1867 the peace establishment had been provisionally fixed by the constitution at 1% of the population, and a sum of 225 thalers (£33, 15s.) had been voted for each soldier. This arrangement had in 1871 been again continued to the end of 1874, and the peace establishment fixed at 401,659. The new law would have made this permanent. If this had been done the power of the Reichstag over the administration would have been seriously weakened; its assent would no longer have been required for either the number of the army or the money. The government attached great importance to the clause, but the Centre and the Liberal parties combined to throw it out. A disastrous struggle was averted by a compromise suggested by Bennigsen. The numbers were fixed for the next seven years (the so-called *Septennat*); this was accepted by the government, and carried against the votes of the Centre and some of the Progressives. On this occasion the Fortschrittpartei, already much diminished, split up into two sections. The principle then established has since been maintained; the periodical votes on the army have become the occasion for formally testing the strength of the Government.

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The influence of Liberalism, which served the government so well in this work of construction, brought about also the conflict with the Roman Catholic Church which distracted Germany for many years. The causes were, indeed, partly political. The Ultramontane party in Austria, France and Bavaria had, after 1866, been hostile to Prussia; there was some ground to fear that it might still succeed in bringing about a Catholic coalition against the empire, and Bismarck lived in constant dread of European coalitions. The Polish sympathies of the Church in Germany made him regard it as an anti-German power, and the formation of the Catholic faction in parliament, supported by Poles and Hanoverians, appeared to justify his apprehensions. But besides these reasons of state there was a growing hostility between the triumphant National parties and the Ultramontanes, who taught that the pope was greater than the emperor and the Church than the nation. The conflict had already begun in Baden. As in every other country, the control of the schools was the chief object of contention, but the government also claimed a control over the education and training of the clergy. With the formation of the empire the conflict was transferred from Baden to Prussia, where there had been for thirty years absolute peace, a peace gained, indeed, by allowing to the Catholics complete freedom; the Prussian constitution ensured them absolute liberty in the management of ecclesiastical affairs; in the ministry for religion and education there was a separate department for Catholic affairs, and (owing to the influence of the great family of the Radziwills) they enjoyed considerable power at court.

Kulturkampf.

The latent opposition was aroused by the Vatican decrees. A small number of Catholics, including several men of learning and distinction, refused to accept Papal Infallibility. They were encouraged by the Bavarian court, which maintained the Febronian tradition and was jealous of any encroachment of the Papacy (see FEBRONIANISM); but besides this the Protestants throughout Germany and all opponents of the Papacy joined in the agitation. They made on the occasion for an attack on the Jesuits; even in 1869 there had been almost a riot in Berlin when a chapel belonging to a religious order was opened there. During 1870 and 1871 meetings were held by the Gustavus Adolphus Verein, and a great Protestant conference was called, at which resolutions were passed demanding the expulsion of the Jesuits and condemning the Vatican decrees. As the leaders in these meetings were men like Virchow and Bluntschli, who had been lifelong opponents of Catholicism in every form, the result was disastrous to the Liberal party among the Catholics, for a Liberal Catholic would appear as the ally of the bitterest enemies of the Church; whatever possibility of success the Old Catholic movement might have had was destroyed by the fact that it was supported by those who avowedly wished to destroy the influence of Catholicism. No bishop joined it in Germany or in Austria, and few priests, though the governments were ready to protect them in the enjoyment of the privileges secured to Catholics, and to maintain them in the use of the temporalities. There was no great following among the people; it was only in isolated places that priests and congregation together asserted their rights to refuse to accept the decrees of the Church. Without the help of the bishops, the leaders had no legal basis; unsupported by the people, they were generals without an army, and the attempt to use the movement for political purposes failed.

Old Catholics.

None the less this was the occasion for the first proceedings against the Catholics, and curiously enough the campaign began in Bavaria. The archbishop of Munich had published the Vatican decrees without the *Regium placetum*, which was required by the constitution, and the government continued to treat Old Catholics as members of the Church. In the controversy which ensued, Lutz, the chief member of the ministry, found himself confronted by an Ultramontane majority, and the priests used their influence to stir up the people. He therefore turned for help to the imperial government, and at his instance a clause was added to the penal code forbidding priests in their official capacity to deal with political matters. (This law, which still exists, is popularly known as the Kanzlei or Pulpit-paragraph.) It was of course opposed by the Centre, who declared that the Reichstag had no right to interfere in what was after all a religious question, and the Bavarian Opposition expressed much indignation that their government should turn for help to the Protestants of the North in order to force upon the Catholics of Bavaria a law which they could not have carried in that state.

For twenty years the Old Catholics continued to be a cause of contention in Bavaria, until the struggle ended in the victory of the Ultramontanes. In 1875 the parliament which had been elected in 1869 for six years came to an end. In order to strengthen their position for the new elections, the Liberal ministry, who owed their position chiefly to the support of the king, by royal ordinance ordered a redistribution of seats. By the constitution this was within their power, and by clever manipulation of the constituencies they brought it about that the Ultramontane majority was reduced to two. It does not appear that this change represented any change of feeling in the majority of the people. The action of the government, however, caused great indignation, and in a debate on the address an amendment was carried petitioning the king to dismiss his ministry. They offered their resignation, but the king refused to accept it, publicly expressed his confidence in them, and they continued in office during the lifetime of the king, although in 1881 the growing reaction gave a considerable majority to the Ultramontane party. After the death of the king the prince-regent, Luitpold, still retained the old administration, but several concessions were made to the Catholics in regard to the schools and universities, and in 1890 it was decided that the claim of the Old Catholics to be regarded officially as members of the Church should no longer be recognized.

Meanwhile at Berlin petitions to the Reichstag demanded the expulsion of the Jesuits, and in 1872 an imperial law to this effect was carried; this was again a serious interference with the control over religious matters reserved to the states. In Prussia the government, having determined to embark on an anti-Catholic policy, suppressed the Catholic division in the ministry, and appointed a new minister, Falk, a Liberal lawyer of uncompromising character. A law was carried placing the inspection of schools entirely in the hands of the state; hitherto in many provinces it had belonged to the clergy, Catholic or Protestant. This was followed by the measures to which the name *Kulturkampf* really applied (an expression used first by Virchow to imply that it was a struggle of principle between the teaching of the Church and that of modern society). They were measures in which the state no longer, as in the school inspection law or in the introduction of civil marriage, defended its prerogatives against the Church, but assumed itself a direct control over ecclesiastical matters.

May Laws.

At the end of 1872 and the beginning of 1873 Falk laid before the Prussian Lower House the draft of four laws. Of these, one forbade ministers of religion from abusing ecclesiastical punishment; the second, which was the most important, introduced a law already adopted in Baden, that no one should be appointed to any office in the Church except a German, who must have received his education in a German gymnasium, have studied for three years in a German university, and have passed a state examination in philosophy, history, German literature and classics; all ecclesiastical seminaries were placed under the control of the state, and all seminaries for boys were forbidden. Moreover, every appointment to an ecclesiastical benefice was to be notified to the president of the province, and the confirmation could be refused on the ground that there were facts which could support the assumption that the appointment would be dangerous to public order. The third law appointed a court for trying ecclesiastical offences, to which was given the right of suspending both priests and bishops, and a fourth determined the procedure necessary for those who wished to sever their connexion with the Roman Catholic Church.

As these laws were inconsistent with those articles of the Prussian constitution which guaranteed to a religious corporation

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the independent management of its own affairs, it was therefore necessary to alter the constitution. This was done, and a later law in 1875 repealed the articles altogether.

The opposition of the bishops to these laws was supported even by many Protestants, especially by the more orthodox Lutherans, who feared the effect of this increased subjection of all churches to the state; they were opposed also by the Conservative members of the Upper House. All, however, was unavailing. Bismarck in this case gave the Liberals a free hand, and the laws eventually were carried and proclaimed on the 15th of May 1873; hence they got the name of the May laws, by which they are always known. The bishops meanwhile had held a meeting at Fulda, at the tomb of St Boniface, whence they addressed a protest to the king, and declared that they would be unable to recognize the laws as valid. They were supported in this by the pope, who addressed a protest personally to the emperor. The laws were put into force with great severity. Within a year six Prussian bishops were imprisoned, and in over 1300 parishes the administration of public worship was suspended. The first sufferer was the cardinal archbishop of Posen, Count Ledochowski. He refused to report to the president of the province appointments of incumbents; he refused also to allow the government commissioners to inspect the seminaries for priests, and when he was summoned before the new court refused to appear. He was then deprived of the temporalities of his office; but the Polish nobles continued to support him, and he continued to act as bishop. Heavy fines were imposed upon him, but he either could not or would not pay them, and in March 1874 he was condemned to imprisonment for two years, and dismissed from his bishopric. The bishop of Trier, the archbishop of Cologne, and other bishops soon incurred a similar fate. These measures of the government, however, did not succeed in winning over the Catholic population, and in the elections for the Reichstag in January 1874 the party of the Centre increased in number from 63 to 91; 1,443,170 votes were received by them. In Bavaria the Ultramontanes won a complete victory over the more moderate Catholics. The Prussian government proceeded to further measures. According to the ordinary practice towards parties in opposition, public meetings were broken up on the smallest pretence, and numerous prosecutions for insult to government officials (*Beamtenbeleidigung*) were brought against members of the party. The Catholic agitation was, however, carried on with increased vigour throughout the whole empire; over a hundred newspapers were founded (three years before there had been only about six Catholic papers in the whole of Germany), and great numbers of pamphlets and other polemical works were published. The bishops from their prisons continued to govern the dioceses; for this purpose they appointed representatives, to whom they transferred their rights as ordinary and secretly authorized priests to celebrate services and to perform the other duties of an incumbent. To meet this a further law was passed in the Prussian parliament, forbidding the exercise of ecclesiastical offices by unauthorized persons, and it contained a provision that any one who had been convicted under the law could be deprived of his rights of citizenship, ordered to live in a particular district, or even expelled from the kingdom. The result was that in numerous parishes the police were occupied in searching for the priest who was living there among the people; although his habitation was known to hundreds of people, the police seldom succeeded in arresting him. Bismarck confesses that his doubts as to the wisdom of this legislation were raised by the picture of heavy but honest *gens d'armes* pursuing light-footed priests from house to house. This law was followed by one authorizing the government to suspend, in every diocese where the bishop continued recalcitrant, the payment of that contribution to the Roman Catholic Church which by agreement had been given by the state since 1817. The only result of this was that large sums were collected by voluntary contribution among the Roman Catholic population.

The government tried to find priests to occupy the vacant parishes; few consented to do so, and the *Staatskatholiken* who consented to the new laws were avoided by their parishioners. Men refused to attend their ministrations; in some cases they were subjected to what was afterwards called boycotting, and it was said that their lives were scarcely safe. Other laws excluded all religious orders from Prussia, and civil marriage was made compulsory; this law, which at first was confined to Prussia, was afterwards passed also in the Reichstag.

These laws were all peculiar to Prussia, but similar legislation was carried out in Baden and in Hesse, where in 1871, after twenty-one years of office, the particularist and Conservative government of Dalwigk[1] had come to an end and after the interval of a year been succeeded by a Liberal ministry. In Württemberg alone the government continued to live peaceably with the bishops.

The government had used all its resources; it had alienated millions of the people; it had raised up a compact party of nearly a hundred members in parliament. The attempt of the Liberals to subjugate the Church had given to the Papacy greater power than it had had since the time of Wallenstein.

Reaction against Liberalism.

The ecclesiastical legislation and other Liberal measures completed the alienation between Bismarck and the Conservatives. In the Prussian parliament seventy-three members broke off from the rest, calling themselves the "old Conservatives"; they used their position at court to intrigue against him, and hoped to bring about his fall; Count Arnim (*q.v.*) was looked upon as his successor. In 1876, however, the party in Prussia reunited on a programme which demanded the maintenance of the Christian character of the schools, cessation of the Kulturkampf, limitation of economic liberty, and repression of social democracy, and this was accepted also by the Conservatives in the Reichstag. This reunion of the Conservatives became the nucleus of a great reaction against Liberalism. It was not confined to any one department of life, but included Protection as against Free Trade, State Socialism as against individualism, the defence of religion as against a separation of Church and State, increased stress laid on the monarchical character of the state, continued increase of the army, and colonial expansion.

The causes of the change in public opinion, of which this was to be the beginning, are too deep-seated to be discussed here. We must note that it was not peculiar to Germany; it was part of that great reaction against Liberal doctrine which marked the last quarter of the 19th century in so many countries. In Germany, however, it more rapidly attained political importance than elsewhere, because Bismarck used it to carry out a great personal policy. He had long been dissatisfied with his position. He was much embarrassed by the failure of his ecclesiastical policy. The alliance with the Liberals had always been half-hearted, and he wished to regain his full freedom of action; he regarded as an uncontrollable bondage all support that was not given unconditionally. The alliance had been of the nature of a limited co-operation between two hostile powers for a definite object; there had always been suspicion and jealousy on either side, and a rupture had often been imminent, as in the debates on the military bill and the law reform. Now that the immediate object had been attained, he wished to pass on to other projects in which they could not follow him. Political unity had been firmly established; he desired to use the whole power of the imperial government in developing the material resources of the country. In doing this he placed himself in opposition to both the financial and the economic doctrines of the Liberals.

Official changes.

The new period which now begins was introduced by some alterations in the official organization. Hitherto almost the whole of the internal business had been concentrated in the imperial chancery (*Reichskanzleramt*), and Bismarck had allowed great freedom of action to Delbrück, the head of the office. Delbrück, however, had resigned in 1876, justly foreseeing that a change of policy was imminent

[1] Reinhard Karl Friedrich von Dalwigk (1802–1880). Though a Lutheran, he had been accused in 1854 of an excessive subserviency to the Roman Catholic Church. He was responsible for the policy which threatened to involve the grand-duchy of Hesse in the fate of the Electorate in 1866. But it was due to his diplomatic skill that Upper Hesse was saved for the grand-duke.

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in which he could no longer co-operate with Bismarck. The work of the office was then divided between several departments, at the head of each of which was placed a separate official, the most important receiving the title of secretary of state. Bismarck, as always, refused to appoint ministers directly responsible either to the emperor or to parliament; the new officials in no way formed a collegiate ministry or cabinet. He still retained in his own hands, as sole responsible minister, the ultimate control over the whole imperial administration. The more important secretaries of state, however, are political officials, who are practically almost solely responsible for their department; they sit in the Bundesrat, and defend their policy in the Reichstag, and they often have a seat in the Prussian ministry. Moreover, a law of 1878, the occasion of which was Bismarck's long absence from Berlin, empowered the chancellor to appoint a substitute or representative (*Stellvertreter*) either for the whole duties of his office or for the affairs of a particular department. The signature of a man who holds this position gives legal validity to the acts of the emperor.

This reorganization was a sign of the great increase of work which had already begun to fall on the imperial authorities, and was a necessary step towards the further duties which Bismarck intended to impose upon them.

Meanwhile the relations with the National Liberals reached a crisis. Bismarck remained in retirement at Varzin for nearly a year; before he returned to Berlin, at the end of 1877, he was visited by Bennigsen, and the Liberal leader was offered the post of vice-president of the Prussian ministry and vice-president of the Bundesrat. The negotiations broke down, apparently because Bennigsen refused to accept office unless he received a guarantee that the constitutional rights of the Reichstag should be respected, and unless two other members of the party, Forckenbeck and Stauffenberg, were given office. Bismarck would not assent to these conditions, and, even if he had been willing to do so, could hardly have overcome the prejudices of the emperor. On the other hand, Bennigsen refused to accept Bismarck's proposal for a state monopoly of tobacco. From the beginning the negotiations were indeed doomed to failure, for what Bismarck appears to have aimed at was to detach Bennigsen from the rest of his party and win his support for an anti-Liberal policy.

The session of 1878, therefore, opened with a feeling of great uncertainty. The Liberals were very suspicious of Bismarck's intentions. Proposals for new taxes, especially one on tobacco, were not carried. Bismarck took the opportunity of avowing that his ideal was a monopoly of tobacco, and this statement was followed by the resignation of Camphausen, minister of finance. It was apparent that there was no prospect of his being able to carry through the great financial reform which he contemplated. He was looking about for an opportunity of appealing to the country on some question which would enable him to free himself from the control of the Liberal majority. The popular expectations were expressed in the saying attributed to him, that he would "crush the Liberals against the wall." The opportunity was given by the Social Democrats.

Period after 1878.

The constant increase of the Social Democrats had for some years caused much uneasiness not only to the government, but also among the middle classes. The attacks on national feeling, the protest against the war of 1870, the sympathy expressed for the *Communards*, had offended the strongest feelings of the nation, especially as the language used was often very violent; the soldiers were spoken of as murderers, the generals as cut-throats. Attacks on religion, though not an essential part of the party programme, were common, and practically all avowed Social Democrats were hostile to Christianity. These qualities, combined with the open criticism of the institutions of marriage, of monarchy, and of all forms of private property, joined to the deliberate attempt to stir up class hatred, which was indeed an essential part of their policy, caused a widespread feeling that the Social Democrats were a serious menace to civilization. They were looked upon even by many Liberals as an enemy to be crushed; much more was this the case with the government. Attempts had already been made to check the growth of the party. Charges of high treason were brought against some. In 1872 Bebel and Liebknecht were condemned to two years' imprisonment. In 1876 Bismarck proposed to introduce into the Criminal Code a clause making it an offence punishable with two years' imprisonment "to attack in print the family, property, universal military service, or other foundation of public order, in a manner which undermined morality, feeling for law, or the love of the Fatherland." The opposition of the Liberals prevented this from being carried. Lasker objected to these "elastic paragraphs," an expression for which in recent years there has been abundant use. The ordinary law was, however, sufficient greatly to harass the Socialists. In nearly every state there still existed, as survivals of the old days, laws forbidding the union of different political associations with one another, and all unions or associations of working men which followed political, socialistic or communistic ends. It was possible under these to procure decisions in courts of justice dissolving the General Union of Workers and the coalitions and unions of working men. The only result was, that the number of Socialists steadily increased. In 1874 they secured nine seats in the Reichstag, in 1877 twelve, and nearly 500,000 votes were given to Socialist candidates.

Social democracy.

Legislation against the Socialists.

There was then no ground for surprise that, when in April 1878 an attempt was made on the life of the emperor, Bismarck used the excuse for again bringing in a law expressly directed against the Socialists. It was badly drawn up and badly defended. The National Liberals refused to vote for it, and it was easily defeated. The Reichstag was prorogued; six days later a man named Nobiling again shot at the emperor, and this time inflicted dangerous injuries. It is only fair to say that no real proof was brought that the Socialists had anything to do with either of these crimes, or that either of the men was really a member of the Socialist party; nevertheless, a storm of indignation rose against them. The government seized the opportunity. So great was the popular feeling, that a repressive measure would easily have been carried; Bismarck, however, while the excitement was at its height, dissolved the Reichstag, and in the elections which took place immediately, the Liberal parties, who had refused to vote for the first law, lost a considerable number of seats, and with them their control over the Reichstag.

The first use which Bismarck made of the new parliament was to deal with the Social Democrats. A new law was introduced forbidding the spread of Socialistic opinions by books, newspapers or public meetings, empowering the police to break up meetings and to suppress newspapers. The Bundesrat could proclaim a state of siege in any town or district, and when this was done any individual who was considered dangerous by the police could be expelled. The law was carried by a large majority, being opposed only by the Progressives and the Centre. It was applied with great severity. The whole organization of newspapers, societies and trades unions was at once broken up. Almost every political newspaper supported by the party was suppressed; almost all the pamphlets and books issued by them were forbidden; they were thereby at once deprived of the only legitimate means which they had for spreading their opinions. In the autumn of 1878 the minor state of siege was proclaimed in Berlin, although no disorders had taken place and no resistance had been attempted, and sixty-seven members of the party were excluded from the city. Most of them were married and had families; money was collected in order to help those who were suddenly deprived of their means of subsistence. Even this was soon forbidden by the police. At elections every kind of agitation, whether by meetings of the party or by distribution of literature, was suppressed. The only place in Germany where Socialists could still proclaim their opinions was in the Reichstag. Bismarck attempted to exclude them from it also. In this, however, he failed. Two members who had been expelled from Berlin appeared in the city for the meeting of the Reichstag at the end of 1878. The government at once asked permission that they should be charged with breaking the law.

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The constitution provided that no member of the House might be brought before a court of justice without the permission of the House, a most necessary safeguard. In this case the permission was almost unanimously refused. Nor did they assent to Bismarck's proposal that the Reichstag should assume power to exclude from the House members who were guilty of misusing the liberty of speech which they enjoyed there. Bismarck probably expected, and it is often said that he hoped, to drive the Socialists into some flagrant violation of the law, of such a kind that it would be possible for him completely to crush them. This did not happen. There were some members of the party who wished to turn to outrage and assassination. Most, a printer from Leipzig, who had been expelled from Berlin, went to London, where he founded the *Freiheit*, a weekly paper, in which he advocated a policy of violence. He was thereupon excluded from the party, and after the assassination of the emperor Alexander II. of Russia had to leave England for Chicago. A similar expulsion befell others who advocated union with the Anarchists. As a whole, however, the party remained firm in opposition to any action which would strengthen the hands of their opponents. They carried on the agitation as best they could, chiefly by distributing reports of speeches made in the Reichstag. A weekly paper, the *Social-Democrat*, was established at Zürich. Its introduction into Germany was of course forbidden, but it was soon found possible regularly to distribute thousands of copies every week in every part of the country, and it continued to exist till 1887 at Zürich, and till 1890 in London. In August of 1880 a congress of Socialists was held at the castle of Wyden, in Switzerland, at which about eighty members of the party met, discussed their policy, and separated before the police knew anything of it. Here it was determined that the members of the Reichstag, who were protected by their position, should henceforward be the managing committee of the party, and arrangements were made for contesting the elections of 1881. A similar meeting was held in 1883 at Copenhagen, and in 1887 at St Gallen, in Switzerland. Notwithstanding all the efforts of the government, though every kind of public agitation was forbidden, they succeeded in winning twelve seats in 1881. The law, which had obviously failed, was renewed in 1881; the state of siege was applied to Hamburg, Leipzig and Stettin, but all to no purpose; and though the law was twice more renewed, in 1886 and in 1888, the feeling began to grow that the Socialists were more dangerous under it than they had been before.

The elections of 1878, by weakening the Liberal parties, enabled Bismarck also to take in hand the great financial reform which he had long contemplated.

At the foundation of the North German Confederation it had been arranged that the imperial exchequer should receive the produce of all customs duties and also of excise. It depended chiefly on the taxes on salt, tobacco, brandy, beer and sugar. So far as the imperial expenses were not covered by these sources of revenue, until imperial taxes were introduced, the deficit had to be covered by "matricular" contributions paid by the individual states in proportion to their population. All attempts to introduce fresh imperial taxes had failed. Direct taxation was opposed by the governments of the states, which did not desire to see the imperial authorities interfering in those sources of revenue over which they had hitherto had sole control; moreover, the whole organization for collecting direct taxes would have had to be created. At the same time, owing to the adoption of free trade, the income from customs was continually diminishing. The result was that the sum to be contributed by the individual states constantly increased, and the amount to be raised by direct taxation, including local rates, threatened to become greater than could conveniently be borne. Bismarck had always regarded this system with disapproval, but during the first four or five years he had left the care of the finances entirely to the special officials, and had always been thwarted in his occasional attempts to introduce a change. His most cherished project was a large increase in the tax on tobacco, which at this time paid, for home-grown tobacco, the nominal duty of four marks per hundred kilo. (about a farthing a pound), and on imported tobacco twenty-four marks. Proposals to increase it had been made in 1869 and in 1878, and on the latter occasion Bismarck for the first time publicly announced his desire for a state monopoly, a project which he never gave up, but for which he never was able to win any support. Now, however, he was able to take up the work. At his invitation a conference of the finance ministers met in July at Heidelberg; they agreed to a great increase in the indirect taxes, but refused to accept the monopoly on tobacco. At the beginning of the autumn session a union of 204 members of the Reichstag was formed for the discussion of economic questions, and they accepted Bismarck's reforms. In December he was therefore able to issue a memorandum explaining his policy; it included a moderate duty, about 5%, on all imported goods, with the exception of raw material required for German manufactures (this was a return to the old Prussian principle); high finance duties on tobacco, beer, brandy and petroleum; and protective duties on iron, corn, cattle, wood, wine and sugar. The whole of the session of 1870 was occupied with the great struggle between Free Trade and Protection, and it ended with a decisive victory for the latter. On the one side were the seaports, the chambers of commerce, and the city of Berlin, the town council of which made itself the centre of the opposition. The victory was secured by a coalition between the agricultural interests and the manufacturers; the latter promised to vote for duties on corn if the landlords would support the duties on iron. In the decisive vote the duty on iron was carried by 218 to 88, on corn by 226 to 109. The principle of protection was thus definitely adopted, though considerable alterations have been made from time to time in the tariff. The result was that the income from customs and excise rose from about 230 million marks in 1878–1879 to about 700 millions in 1898–1899, and Bismarck's object in removing a great burden from the states was attained.

Financial reform.

Protection.

The natural course when the new source of income had been obtained would have been simply to relieve the states of part or all of their contribution. This, however, was not done. The Reichstag raised difficulties on the constitutional question. The Liberals feared that if the government received so large a permanent source of revenue it would be independent of parliament; the Centre, that if the contributions of the states to the imperial exchequer ceased, the central government would be completely independent of the states. Bismarck had to come to an agreement with one party or the other; he chose the Centre, probably for the reason that the National Liberals were themselves divided on the policy to be pursued, and therefore their support would be uncertain; and he accepted an amendment, the celebrated *Franckenstein Clause*, proposed by Georg Arbogast Freiherr von Franckenstein (1825–1890), one of the leaders of the Centre, by which all proceeds of customs and the tax on tobacco above 130 million marks should be paid over to the individual states in proportion to their population. Each year a large sum would be paid to the states from the imperial treasury, and another sum as before paid back to meet the deficit in the form of state contributions. From 1871 to 1879 the contribution of the states had varied from 94 to 67 million marks; under the new system the surplus of the contributions made by the states over the grant by the imperial treasury was soon reduced to a very small sum, and in 1884–1885 the payments of the empire to the states exceeded the contributions of the states to the empire by 20 million marks, and this excess continued for many years; so that there was, as it were, an actual grant in relief of direct taxation. In Prussia, by the Lex Huene, from 1885 to 1895, all that sum paid to Prussia, so far as it exceeded 15 million marks, was handed over to the local authorities in relief of rates. The increased expenditure on the navy after 1897 again caused the contributions required from the states to exceed the grants to them from the imperial exchequer. In 1903 Baron von Stengel, who succeeded Baron von Thielmann as finance minister in this year, proposed that the matricular contributions of the several states, instead of varying as heretofore with the exigencies of the annual budget,

State contributions.

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should be fixed by law. This plan, originally suggested by Dr von Miquel, was adopted by the Reichstag in May 1904. The deficits in the imperial budget, however, continued. In 1909 the whole system of German imperial finance was once more in the melting-pot, and, in spite of the undoubted wealth of the country, the conflict of state and party interests seemed to make it practically impossible to remould it on a satisfactory basis.

Party changes.

The acceptance by Bismarck of the principle of Protection and his alliance with the Catholic Centre were followed by the disruption of the National Liberal party and a complete change in the parliamentary situation. Already the Liberal ministers, Falk and Hobrecht, had resigned, as well as Max von Forckenbeck the president, and Stauffenberg the vice-president of the Reichstag; in their place there were chosen a Conservative, and the Catholic Baron von Franckenstein. The whole party had voted against the Franckenstein Clause, but a few days later fifteen of the right wing left the party and transferred their support to the government. For another year the remainder kept together, but there was no longer any real harmony or co-operation; in 1880 nineteen, including most of the ablest leaders, Lasker, Forckenbeck, Bamberger and Bunsen, left the party altogether. The avowed cause of difference was commercial policy; they were the Free Traders, but they also justly foresaw that the reaction would extend to other matters. They took the name of the *Liberale Vereinigung*, but were generally known as the *Secessionisten*; they hoped to become the nucleus of a united Liberal party in which all sections should join together on the principles of Free Trade and constitutional development. At the elections of 1881 they secured forty-seven seats, but they were not strong enough to maintain themselves, and with great reluctance in 1884 formed a coalition with the Progressives (*Freisinnigen*), who had gained greatly in strength owing to the breach among the government parties. They did so reluctantly, because they would thereby condemn themselves to assume that attitude of purely negative criticism which, during the great days of their prosperity, they had looked down upon with contempt, and were putting themselves under the leadership of Eugen Richter, whom they had long opposed. The new party, the *Deutschfreisinnige*, had no success; at the election of 1884 they secured only sixty-seven seats, a loss of thirty-nine; they were subjected to all inconveniences which belonged to opposition; socially, they were boycotted by all who were connected with the court or government; they were cut off from all hope of public activity, and were subjected to constant accusations for *Bismarck Beleidigung*. Their only hope was in the time when the crown prince, who had shown great sympathy with them, should succeed. They were popularly known as the crown prince's party. Lasker soon died; others, such as Forckenbeck and Bunsen, retired from public life, unable to maintain their position at a time when the struggle of class interests had superseded the old conflicts of principle. At the election of 1887 they lost more than half their seats, and in 1893 the party again broke up.

Secessionists.

Freisinnige.

The remainder of the National Liberals only won forty-five seats in 1881, and during the next three years they were without influence on the government; and even Bennigsen, unable to follow Bismarck in his new policy, disgusted at the proposals for biennial budgets and the misuse of government influence at the elections, retired from political life. In 1884 a new development took place: under the influence of Miquel a meeting was held at Heidelberg of the South German members of the party, who accepted the commercial and social policy of the government, including the Socialist law; their programme received Bismarck's approval, and was accepted by the rest of the party, so that they henceforward were taken into favour by the government; but they had won the position by sacrificing almost all the characteristics of the older Liberalism· the hope of a reunion for all the different sections which had hitherto kept the name of Liberal was at an end.

These events had a very unfortunate effect on the character of the parliament. From 1878 to 1887 there was no strong party on which Bismarck could depend for support. After 1881 the parties of opposition were considerably strengthened. Alsatians and Poles, Guelphs, Clericals and Radicals were joined in a common hostility to the government. Parliamentary history took the form of a hostile criticism of the government proposals, which was particularly bitter because of the irreconcilable opposition of the Free Traders. Few of the proposals were carried in their entirety, many were completely lost; the tobacco monopoly and the brandy monopoly were contemptuously rejected by enormous majorities; even an increase of the tax on tobacco was refused; the first proposals for a subsidy to the Norddeutsche Lloyd were rejected. The personal relations of the chancellor to Parliament were never so bitter. At the same time, in Prussia there was a tendency to make more prominent the power of the king and to diminish the influence of the parliament. A proposal to introduce biennial budgets was for this reason regarded with great suspicion by the Opposition as a reactionary measure, and rejected. The old feelings of suspicion and jealousy were again aroused; the hostility which Bismarck encountered was scarcely less than in the old days of the conflict. After the elections of 1881 a protest was raised against the systematic influence exercised by Prussian officials. Puttkammer, who had now become minister of the interior, defended the practice, and a royal edict of 4th January 1882 affirmed the monarchical character of the Prussian constitution, the right of the king personally to direct the policy of the state, and required those officials who held appointments of a political nature to defend the policy of the government, even at elections.

Political reaction.

One result of the new policy was a reconciliation with the Centre. Now that Bismarck could no longer depend on the support of the Liberals, it would be impossible to carry on the government if the Catholics maintained their policy of opposition to all government measures. They had supported him in his commercial reform of 1878, but by opposing the Septennate in 1880 they had shown that he could not depend upon them. It was impossible to continue to treat as enemies of the state a party which had supplied one of the vice-presidents to the Reichstag, and which after the election of 1881 outnumbered by forty votes any other single party. Moreover, the government, which was now very seriously alarmed at the influence of the Social Democrats, was anxious to avail itself of every influence which might be used against them. In the struggle to regain the adherence of the working men, Bismarck viewed as though religion would be the most valuable ally, and it was impossible to ignore the fact that the Roman Catholic priests had alone been able to form an organization in which hundreds of thousands of working men had been enlisted. It was therefore for every reason desirable to remedy a state of things by which so many parishes were left without incumbents, a condition the result of which must be either to diminish the hold of Christianity over the people, or to confirm in them the belief that the government was the real enemy of Christianity. It was not easy to execute this change of front with dignity, and impossible to do so without forsaking the principles on which they had hitherto acted. Ten years were to pass before the work was completed. But the cause of the conflict had been rather in the opinions of the Liberals than in the personal desire of Bismarck himself. The larger political reasons which had brought about the conflict were also no longer valid; the fears to which the Vatican decrees had given rise had not been fulfilled; the failure of the Carlists in Spain and of the Legitimists in France, the consolidation of the new kingdom in Italy, and the alliance with Austria had dispelled the fear of a Catholic league. The growth of the Catholic democracy in Germany was a much more serious danger, and it proved to be easier to come to terms with the pope than with the parliamentary Opposition. It would clearly be impossible to come to any agreement on the principles. Bismarck hoped, indeed, putting all questions of principle aside, to establish a *modus vivendi*; but even this was difficult to attain. An opportunity was given by the death of the pope in 1878. Leo XIII. notified his accession to the Prussian government in

End of the Kulturkampf.

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a courteous despatch; the interchange of letters was followed by a confidential discussion between Bismarck and Cardinal Franchi at Kissingen during the summer of 1878. The hope that this might bring about some agreement was frustrated by the sudden death of the cardinal, and his successor was more under the influence of the Jesuits and the more extreme party. Bismarck, however, was not discouraged.

The resignation of Falk in July 1879 was a sign of the change of policy; he was succeeded by Puttkammer, who belonged to the old-fashioned Prussian Conservatives and had no sympathy with the Liberal legislation. The way was further prepared by a lenient use of the penal laws. On the 24th of February 1880 the pope, in a letter to the ex-archbishop of Cologne, said he was willing to allow clerical appointments to be notified if the government withdrew the obnoxious laws. In 1880 a provisional Bill was submitted to parliament giving the crown discretionary power not to enforce the laws. It was opposed by the Liberals on the ground that it conceded too much, by the Clericals that it granted too little, but, though carried only in a mutilated form, it enabled the priests who had been ejected to appoint substitutes, and religious worship was restored in nearly a thousand parishes. In the elections of 1881 the Centre gained five more seats, and in 1883 a new law was introduced prolonging and extending that of 1881. Meanwhile a Prussian envoy had again been appointed at the Vatican; all but three of the vacant bishoprics were filled by agreement between the pope and the king, and the sequestrated revenues were restored. Finally, in 1886, a fresh law, besides other concessions, did away with the *Kultur Examen*, and exempted seminaries from state control. It also abolished the ecclesiastical court, which, in fact, had proved to be almost unworkable, for no priests would appeal to it. By this, the real Kulturkampf, the attempt of the state to control the intellect and faith of the clergy, ceased. A further law of 1887 permitted the return to Prussia of those orders which were occupied in charitable work.

As permanent results of the conflict there remain only the alteration in the Prussian constitution and the expulsion of the Jesuits; the Centre continued to demand the repeal of this, and to make it the price of their support of government measures; in 1897 the Bundesrat permitted the return of the Redemptorists, an allied order. With these exceptions absolute religious peace resulted; the Centre to a great extent succeeded to the position which the National Liberals formerly held; in Bavaria, in Baden, in Prussia they obtained a dominant position, and they became a government party.

Meanwhile Bismarck, who was not intimidated by the parliamentary opposition, irritating and embarrassing though it was, resolutely proceeded with his task of developing the material resources of the empire. In order to do so the better, he undertook, in addition to his other offices, that of Prussian minister of commerce. He was now able to carry out, at least partially, his railway schemes, for he could afford to ignore Liberal dislike to state railways, and if he was unable to make all the lines imperial, he could make most of them Prussian. The work was continued by his successors, and by the year 1896 there remained only about 2000 kilometres of private railways in Prussia, of these none except those in East Prussia belonged to companies of any great importance. More than this, Bismarck was able to obtain Prussian control of the neighbouring states; in 1886 the Brunswick railways were acquired by the Prussian government, and in 1895 the private lines in Thuringia. The imperial railways in Alsace-Lorraine are managed in close connexion with the Prussian system, and in 1895 an important step was taken towards extending Prussian influence in the south. A treaty was made between Prussia and Hesse by which the two states together bought up the Hesse-Ludwig railway (the most important private company remaining in Germany), and in addition to this agreed that they would form a special union for the joint administration of all the lines belonging to either state. What this means is that the Hessian lines are managed by the Prussian department, but Hesse has the right of appointing one director, and the expenses and profits are divided between the two states in proportion to their population. Thus a nucleus and precedent has been formed similar to that by which the *Zollverein* was begun, and it was hoped that it might be possible to arrange similar agreements with other states, so that in this way a common management for all lines might be established. There is, however, strong opposition, especially in South Germany, and most of the states cling to the separate management of their own lines. Fearful that Prussia might obtain control over the private lines, they have imitated Prussian policy and acquired all railways for the state, and much of the old opposition to Prussia is revived in defence of the local railways.

Nationalisation of railways.

A natural supplement to the nationalization of railways was the development of water communication. This is of great importance in Germany, as all the chief coal-fields and manufacturing districts—Silesia, Saxony, Westphalia and Alsace—are far removed from the sea. The most important works were the canal from Dortmund to the mouth of the Ems, and the Jade canal from the Ems to the Elbe, which enables Westphalian coal to reach the sea, and so to compete better with English coal. In addition to this, however, a large number of smaller works were undertaken, such as the canalization of the Main from Frankfort to the Rhine, and a new canal from the Elbe to Lübeck. The great ship canal from Kiel to the Elbe, which was begun in 1887 and completed in 1896, has perhaps even more importance for naval than for commercial purposes. The Rhine, so long the home of romance, has become one of the great arteries of traffic, and lines of railways on both sides have caused small villages to become large towns. The Prussian government also planned a great scheme by which the Westphalian coal-fields should be directly connected with the Rhine in one direction and the Elbe in the other by a canal which would join together Minden, Hanover and Magdeburg. This would give uninterrupted water communication from one end of the country to the other, for the Elbe, Oder and Vistula are all navigable rivers connected by canals. This project, which was a natural continuation of Bismarck's policy, was, however, rejected by the Prussian parliament in 1899. The opposition came from the Agrarians and extreme Conservatives, who feared that it would enable foreign corn to compete on better terms with German corn; they were also jealous of the attention paid by the government to commercial enterprise in which they were not immediately interested. The project was again laid by the government before the Prussian *Landtag* on the 14th of April 1901 and was again rejected. In 1904 it was once more introduced in the modified form of a proposal of a canal from the Rhine to Leine in Hanover, with a branch from Datteln to Ham, and also of a canal from Berlin to Stettin. This bill was passed in February 1905.

Canals.

Equally important was the action of the government in developing foreign trade. The first step was the inclusion of Hamburg and Bremen in the *Zollverein*; this was necessary if German maritime enterprise was to become a national and not merely a local concern, for the two Hansa cities practically controlled the whole foreign trade and owned three-quarters of the shipping; but so long as they were excluded for the Customs Union their interests were more cosmopolitan than national. Both cities, but especially Hamburg, were very reluctant to give up their privileges and the commercial independence which they had enjoyed almost since their foundation. As a clause in the constitution determined that they should remain outside the Customs Union until they voluntarily offered to enter it, there was some difficulty in overcoming their opposition. Bismarck, with characteristic energy, proposed to take steps, by altering the position of the imperial customs stations, which would practically destroy the commerce of Hamburg, and some of his proposals which seemed contrary to the constitution aroused a very sharp resistance in the Bundesrat. It was, however, not necessary to go to extremities, for in 1881 the senate of Hamburg accepted an agreement which, after a keen struggle, was ratified by the citizens. By this Hamburg was to enter the *Zollverein*; a part of the

Hamburg and Bremen.

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harbour was to remain a free port, and the empire contributed two million pounds towards rearranging and enlarging the harbour. A similar treaty was made with Bremen, the free port of that city being situated near the mouth of the Weser at Bremerhaven; and in 1888, the necessary works having been completed, the cities entered the Customs Union. They have had no reason to regret the change, for no part of the country profited so much by the great prosperity of the following years, notwithstanding the temporary check caused by the serious outbreak of cholera at Hamburg in 1892.

During the first years of the empire Bismarck had occasionally been asked to interest himself in colonial enterprise. He had refused, for he feared that foreign complications might ensue, and that the country might weaken itself by dissipation of energy. He was satisfied that the Germans should profit by the commercial liberty allowed in the British colonies. Many of the Germans were, however, not contented with this, and disputes regarding the rights of German settlers in Fiji caused some change of feeling. The acquisition of German colonies was really the logical and almost necessary sequel of a protective policy. For that reason it was always opposed by the extreme Liberal party. *Colonies.*

The failure of the great Hamburg house of Godefroy in 1879 threatened to ruin the growing German industries in the South Seas, which it had helped to build up. Bismarck therefore consented to apply to the Reichstag for a state guarantee to a company which would take over its great plantations in Samoa. This was refused, chiefly owing to the influence of the Liberal party. Bismarck therefore, who took this rebuff much to heart, said he would have nothing more to do with the matter, and warned those interested in colonies that they must depend on self-help; he could do nothing for them. By the support of some of the great financial firms they succeeded in forming a company, which carried on the business and undertook fresh settlements on the islands to the north of New Guinea. This event led also to the foundation of a society, the *Deutscher Kolonial Verein*, under the presidency of the prince of Hohenlohe-Langenburg, to educate public opinion. Their immediate object was the acquisition of trading stations. The year 1884 brought a complete change. Within a few months Germany acquired extended possessions in several parts both of Africa and the South Seas. This was rendered possible owing to the good understanding which at that time existed between Germany and France. Bismarck therefore no longer feared, as he formerly had, to encounter the difficulties with Great Britain which would be the natural result of a policy of colonial expansion.

His conversion to the views of the colonial party was gradual, as was seen in his attitude to the proposed acquisition of German stations in South-West Africa. In Namaqualand and Damaraland, British influence, exercised from Cape Colony, had long been strong, but the British government had refused to annex the country even when asked so to do by the German missionaries who laboured among the natives. In 1882 F. A. Lüderitz, a Bremen tobacco merchant, approached Bismarck on the question of establishing a trading station on the coast at Angra Pequeña. The chancellor, while not discouraging Lüderitz, acted with perfect fairness to Great Britain, and throughout 1883 that country might have acted had she known her mind. She did not, and in the summer of 1884 Bismarck decided no longer to await her pleasure, and the south-west coast of Africa from the frontier of the Portuguese possessions to the Orange river, with the exception of Walfish Bay, was taken under German protection. During the same year Dr Nachtigal was despatched to the west coast, and stealing a march on his British and French rivals he secured not only Togoland but Cameroon for the Germans. On the east coast Bismarck acted decisively without reference to British interests. A company, the *Gesellschaft für deutsche Kolonisation*, was founded early in 1884 by Dr Carl Peters, who with two companions went off to the east coast of Africa and succeeded in November of that year in negotiating treaties with various chiefs on the mainland who were alleged to be independent of Zanzibar. *Africa.*

In this region British opposition had to be considered, but in February 1885 a German protectorate over the territory acquired by Peters was proclaimed.

Similar events took place in the South Seas. The acquisition of Samoa, where German interests were most extensive, was prevented (for the time being) by the arrangement made in 1879 with Great Britain and the United States. But in 1884 and 1885 the German flag was hoisted on the north of New Guinea (to which the name Kaiser Wilhelmsland has been given), on several parts of the New Britain Archipelago (which afterwards became the Bismarck Archipelago), and on the Caroline Islands. The last acquisition was not kept. The Spanish government claimed the islands, and Bismarck, in order to avoid a struggle which would have been very disastrous to monarchical government in Spain, suggested that the pope should be asked to mediate. Leo XIII. accepted the offer, which was an agreeable reminiscence of the days when popes determined the limits of the Spanish colonial empire, all the more gratefully that it was made by a Protestant power. He decided in favour of Spain, Germany being granted certain rights in the islands. The loss of the islands was amply compensated for by the political advantages which Bismarck gained by this attention to the pope, and, after all, not many years elapsed before they became German. *The Pacific.*

Bismarck in his colonial policy had repeatedly explained that he did not propose to found provinces or take over for the government the responsibility for their administration; he intended to leave the responsibility for their material development to the merchants, and even to entrust to them the actual government. He avowedly wished to imitate the older form of British colonization by means of chartered companies, which had been recently revived in the North Borneo Company; the only responsibility of the imperial government was to be their protection from foreign aggression. In accordance with this policy, the territories were not actually incorporated in the empire (there would also have been constitutional difficulties in doing that), and they were officially known as Protectorates (*Schutzgebiete*), a word which thus acquired a new signification. In 1885 two new great companies were founded to undertake the government. The *Deutsch-Ost-Afrika Gesellschaft*, with a capital of £200,000, took over the territories acquired by Dr Peters, and for the South Seas the *Neu-Guinea Gesellschaft*, founded by an amalgamation of a number of firms in 1884, received a charter in 1885. It was not, however, possible to limit the imperial responsibility as Bismarck intended. In East Africa the great revolt of the Arabs in 1888 drove the company out of all their possessions, with the exception of the port of Dar-es-Salam. The company was not strong enough to defend itself; troops had to be sent out by the emperor under Captain Wissmann, who as imperial commissioner took over the government. This, which was at first a temporary arrangement, was afterwards made permanent.

The New Guinea Company had less formidable enemies to contend with, and with the exception of a period of three years between 1889 and 1892, they maintained a full responsibility for the administration of their territory till the year 1899, when an agreement was made and ratified in the Reichstag, by which the possession and administration was transferred to the empire in return for a subsidy of £20,000 a year to be continued for ten years. The whole of the colonies have therefore now come under the direct administration of the empire. They were at first placed under the direction of a special department of the Foreign Office, and in 1890 a council of experts on colonial matters was instituted, while in 1907 a separate office for colonial affairs was created. In 1887 the two chief societies for supporting the colonial movement joined under the name of the *Deutsche Kolonialgesellschaft*. This society takes a great part in forming public opinion on colonial matters.

This new policy inevitably caused a rivalry of interests with other countries, and especially with Great Britain. In every spot at which the Germans acquired territory they found themselves in opposition to British interests. The settlement of Angra

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Pequeña caused much ill-feeling in Cape Colony, which was, however, scarcely justified, for the Cape ministry was equally responsible with the British government for the dilatoriness which led to the loss of what is now German South-West Africa. In Togoland and Cameroon British traders had long been active, and the proclamation of British sovereignty was impending when the German flag was hoisted. The settlement in East Africa menaced the old-established British influence over Zanzibar, which was all the more serious because of the close connexion between Zanzibar and the rulers of the Persian Gulf; and Australia saw with much concern the German settlement in New Guinea, especially as a British Protectorate (which in the view of Australians should have included the whole of what Germany was allowed to take) had previously been established in the island. In Africa Britain and France proceeded to annex territory adjacent to the German acquisitions, and a period followed during which the boundaries of German, French and British possessions were determined by negotiation. The overthrow of Jules Ferry and the danger of war with France made a good understanding with Great Britain of more importance. Bismarck, by summoning a conference to Berlin (1884–1885) to discuss African questions, secured for Germany a European recognition which was very grateful to the colonial parties; and in 1888, by lending his support to the anti-slavery movement of Cardinal Lavigerie, he won the support of the Centre, who had hitherto opposed the colonial policy. Finally a general agreement for the demarcation of Africa was made in 1890 (see AFRICA, § 5). A similar agreement had been made in 1886 regarding the South Seas. It was made after Bismarck had retired from office, and he, as did the colonial party, severely criticized the details; for the surrender of Zanzibar and Witu cut short the hopes which had been formed of building up a great German empire controlling the whole of East Africa. Many of the colonial party went further, and criticized not only the details, but the principle. They were much offended by Caprivi's statement that no greater injury could be done to Germany than to give her the whole of Africa, and they refused to accept his contention that "the period of flag-hoisting was over," and that the time had come for consolidating their possessions. It must, however, be recognized that a continuation of the ambitious policy of the last few years might easily have involved Germany in dangerous disputes.

Germany and Great Britain.

It appeared a small compensation that Great Britain surrendered to Germany the island of Heligoland, which she had taken from the Danes in the Napoleonic wars. It was annexed to Prussia; the natives born before the year 1880 were exempted from military service, and till the year 1901 no additional import duties were to be imposed. It has been strongly fortified and made a naval station.

Heligoland.

It was easy for the Opposition to criticize the colonial policy. They could point out that, with the exception of parts of South-West Africa, no territory had been acquired in which any large number of German emigrants could live and rear families. They went as a rule to the United States and South America, or to territories under the British flag. As markets for German products the colonies remained of small importance; in 1907 the whole value of the trade, import and export, between Germany and her colonies was less than £3,300,000, and the cost of administration, including the grant to the shipping companies, often exceeded the total trade. Many mistakes were made in the administration, and cases of misconduct by individual officials formed the text for attacks on the whole system. Generally, however, these criticisms were premature; it was surely wise, while the opportunity was still open, to take care that Germany, in the partition of the world among European races, should not alone go entirely without a share. The lack of colonial experience, and, often, the lack of sympathy with, or understanding of, the negro and other races over whom they had assumed a protectorate, were contributory causes in the slow development of Germany's African colonies. The unwillingness of the Reichstag to sanction the expenditure of any large sums on railways and other public works also hindered the exploitation of the economic resources of very large areas. Yet at the close of the first twenty-five years' existence of the colonial empire it might be said that the initial difficulties had been overcome, and sufficient knowledge gained to ensure Germany a return fairly commensurate with the efforts she had put forth. The necessity to enlist the interests of the natives on the side of the government, if any progress was to be made in industry or trade, was a lesson slowly learned. After the Arab opposition had been crushed on the east coast of Africa, there still remained the native states to be dealt with, and few tribes voluntarily submitted to European control. There was a serious rising in 1905–1906, when thousands of lives were lost. In Togoland there were disturbances of a comparatively minor character; in the Cameroon hinterland campaigns were undertaken against the Fulu and Bornuese princes. It was, however, in South-West Africa that the Germans had their chief and most bitter experience in colonial warfare. Though "annexed" in 1884 it was not till ten years later, after protracted fighting, that the Hottentots of Namaqualand recognized Germany. After another decade of comparative peace war again broke out (1903) and spread from the Hottentots to the Herero. The Anglo-Boer War had then but recently ended, and in Germany generally, and especially in military circles, it had provoked much adverse criticism on the inability of the British to bring the contest to a speedier conclusion. To their surprise the Germans now found that, against an inferior foe operating in a more restricted area, they were unable to do as well as the British army had done. The story of the war is told elsewhere (see GERMAN SOUTH-WEST AFRICA); it lasted well into 1908 and the Germans were indebted to the Cape Mounted Police for material help in bringing it to an end. As it progressed the Germans adopted many of the methods employed by the British in their colonial wars, and they learned to appreciate more accurately the immensity of the task which Lord Kitchener accomplished in overcoming the guerrilla warfare in the Boer republics.

Progress of German colonial expansion.

Colonial wars. The Herero rising.

It was obviously little use acquiring colonies and creating manufactures if German foreign trade was to be in the hands of other nations. As early as 1881 the government had published a proposal for a subvention to German shipping; it was criticized with peculiar energy by Bamberger and the Free Traders; a Bill introduced in 1884 was abandoned, but in 1885 Bismarck succeeded in carrying a vote by which, for fifteen years, four million marks could annually be devoted to helping a line of mail steamers to the Pacific and Australia and a branch line in the Mediterranean. An agreement was made with the Norddeutsche Lloyd, one clause of which was that all the new steamers were to be built in Germany; in 1890 a further vote was passed for a line to Delagoa Bay and Zanzibar. This far from exhausts the external activity of the nation and the government: the establishment of studentships for the study of oriental languages enabled Germans to make their way in the Turkish and Persian empires, and to open up a fresh market for German goods; by the great excavations at Pergamum and Olympia Germany entered with great distinction on a field in which the way had been shown by France and Great Britain. The progress of technical studies and industrial enterprise enabled Germany to take a leading place in railway and shipbuilding, in the manufacture of military weapons, in chemical experiments, and in electrical work.

Enlarged industrial policy.

It was a part of the new policy not only to combat Social Democracy by repression, but to win the confidence of the working men by extending to them the direct protection of the state. Recent legislation, culminating in the *Gewerbeordnung* of 1869, had, in accordance with the principles of the Liberal Economists, or, as the Germans called it, the Manchester School, instituted freedom from state control in the relations between employers and workmen. The old gilds had been destroyed, compulsory apprenticeship had ceased; little protection, however, was given to the working men, and the restrictions on the employment of women and children were of little use, as there was no efficient system of factory inspection.

Social reforms.

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It was difficult for the men by their own exertions to improve their condition, for the masters had full liberty of association, which the law refused to the workmen. Even before 1870 a protest was raised against this system among the Roman Catholics, who were chiefly concerned for the preservation of family life, which was threatened by the growth of the factory system and also by the teaching of the Social Democrats. Baron von Ketteler, archbishop of Mainz, had maintained that it was the duty of the state to secure working men work and provision during sickness and old age. The general interest of the Church in the social question was recognized by a congress of the bishops at Fulda. Ketteler's work was continued by Canon Moufang, and Catholics brought forward motions in the Reichstag demanding new factory legislation. The peculiar importance of the Catholic movement is that it alone was able to some extent to meet the Socialists on their own ground. The Catholics formed societies which were joined by large numbers of workmen. Originated by Father Kolping on the Rhine, they soon spread over the whole of Catholic Germany. Herr von Schorlemer-Ast, a Catholic landed proprietor from Westphalia, formed similar associations among the peasants. The result of this has been that the Social Democrats have failed to conquer the Catholic as they have the Protestant districts. A similar movement began among the Protestants after the commercial crisis of 1873, which forms an epoch in German thought, since it was from that year that men first began to question the economic doctrines of Liberalism, and drew attention to the demoralization which seemed to arise from the freedom of speculation and the influence of the stock exchange—a movement which in later years led to some remarkable attempts to remedy the evil by legislation. A minister, Rudolph Todt, and Rudolph Meyer criticized the moral and economic doctrines of Liberalism; his writings led to the foundation of the *Christlich-Soziale-Arbeiterverein*, which for a few years attained considerable notoriety under the leadership of Adolph Stöcker. The Protestant movement has not succeeded in attaining the same position as has the Catholic among the working men; but it received considerable support among the influential classes at court, and part of the programme was adopted by the Conservative party, which in 1876 demanded restriction of industrial liberty and legislation which would prevent the ruin of the independent artizans.

Christian socialism.

In a country where learned opinion has so much influence on public affairs it was of especial importance that several of the younger teachers separated themselves from the dominant Manchester School and asserted the duty of the state actively to promote the well-being of the working classes. At a congress held in Erfurt in 1873, Schmoller, Wagner, Brentano and others founded the *Verein für Sozial-Politik*, which by its publications has had much influence on German thought.

The peculiar social conditions brought it about that in many cases the Christian Social movement took the form of Anti-Semitism (*q.v.*). Nearly all the bankers and stock-brokers in Germany were Jews. Many of the leaders of the Liberal parties, *e.g.* Bamberger and Lasker, were of Jewish origin; the doctrines of Liberalism were supported by papers owned and edited by Jews; hence the wish to restore more fully the avowedly Christian character of the state, coinciding with the attack on the influence of finance, which owed so much to the Liberal economic doctrines, easily degenerated into attacks on the Jews. The leader in this was Stöcker. During the years 1879 to 1881 the anti-Semite agitation gained considerable importance in Berlin, Breslau and other Prussian cities, and it culminated in the elections of that year, leading in some cases to riots and acts of violence.

Anti-Semites.

So long as the government was under the influence of the National Liberals, it was indifferent if not hostile to these movements. The Peasants' Union had actually been forbidden by the police; Bismarck himself was violently attacked for his reputed connexion with a great Jewish firm of bankers. He had, however, kept himself informed regarding these movements, chiefly by means of Hermann Wagener, an old editor of the *Kreuzzeitung*, and in the year 1878 he felt himself free to return in this matter to his older opinions. The new policy suggested in that year was definitely announced at the opening of the session in the spring of 1881, and at the meeting of the new Reichstag in November 1881. It was explained in a speech from the throne, which, as the emperor could not be present, became an imperial message. This is generally spoken of as the beginning of a new era. The help of the Reichstag was asked for "healing social evils by means of legislation . . . based on the moral foundation of Christianity." Compulsory insurance, the creation of corporate unions among working men under the protection of the state, and the introduction of indirect taxes, were the chief elements in the reform.

The condition of parties was such that Bismarck could not hope to win a majority for his schemes, especially as he could not obtain the monopoly on tobacco on which he depended to cover the expense. The first reform was the restoration of the gilds, to which the Conservatives attached great importance. Since 1869 they continued to exist only as voluntary associations with no public duties; many had been dissolved, and this is said to have brought about bad results in the management of lodging-houses, the condition of apprentices, support during illness, and the maintenance of labour bureaus. It was supposed that, if they could be restored, the corporate spirit would prevent the working men from falling under the influence of the Socialists. The law of 1881, while it left membership voluntary, gave to them many duties of a semi-public nature, especially that of arbitration between masters and men. These were extended by a further law in 1884.

The really important element was the scheme for a great imperial system by which all working men and women should be provided for in case of sickness, accident or old age. Bismarck hoped by this to relieve the parishes of the burden of the poor-rate, which would be transferred to the empire; at the same time the power of the government would be greatly extended. The first proposal in March 1881 was for compulsory insurance against accidents. Every one employed on railways, mines and factories was to be insured in an imperial office; the premium was to be divided equally between masters, workmen and the state. It was bitterly opposed by the Liberals, especially by Bamberger; all essential features were altered by the Reichstag, and it was withdrawn by the government after it had passed the third reading.

Compulsory insurance.

In 1882 a fresh scheme was laid before the newly elected Reichstag dealing with insurance against accident and against sickness. The two parts were separated by the Reichstag; the second, which was the necessary prelude to the other, was passed in 1883. The law was based on an old Prussian principle; insurance was made compulsory, but the state, instead of doing the work itself, recognized the existing friendly and other societies; they were still to enjoy their corporate existence and separate administration, but they were placed under state control, and for this purpose an imperial insurance department was created in the office of the secretary of state for the interior. Uniform regulations were to be followed in all trades and districts; one-third of the premium was paid by the employer, two-thirds by the workmen.

The Accident Law of 1883 was rejected, for it still included the state contribution to which the Reichstag would not assent, and also contributions from the workmen. A new law, drafted according to their wishes, was passed in 1884. It applied only to those occupations, mines and factories, in which the use of machinery was common; it threw the whole burden of compensation on to the masters; but, on the other hand, for the first thirteen weeks after an accident the injured workman received compensation from the sick fund, so that the cost only fell on the masters in the more serious cases. The masters were compelled to insure themselves against the payments for which they might become liable, and for this purpose had to form trades associations, self-governing societies, which in each district included all the masters for each particular trade. The application of this law was subsequently extended to other trades.

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It was not till 1889 that the greatest innovation, that of insurance against old age, was carried. The obligation to insure rested on all who were in receipt of wages of not more than two pounds a week. Half the premium, according to the wages received, was paid by the master. The pension began at the age of seventy, the amount varying by very complicated rules, but the state paid a fixed sum of two pounds ten shillings annually in addition to the pension. These measures worked well. They were regarded with satisfaction by masters and men alike. Alterations have been made in detail, and further alterations demanded, but the laws have established themselves in practice. The large amount of self-administration has prevented an undue increase of bureaucratic power. The co-operation of masters and men in the administration of the societies has a good effect on the relations of the classes.

Except in the matter of insurance, the total result, however, for the moment was small. The demands repeatedly made by the Centre and the Conservatives for effective factory legislation and prohibition of Sunday labour were not successful. Bismarck did not wish to lay heavier burdens on the capitalists, and it was not till a later period that they were carried out.

Foreign affairs: the Triple Alliance.

During all this period Bismarck's authority was so great, that in the conduct of foreign affairs he was freed from the criticism and opposition which so often hampered him in his internal policy, and he was able to establish that system of alliances on which for so many years the political system of Europe depended. The close union of the three empires which had existed since the meeting of the emperors in 1872 did not survive the outbreak of disturbances in the East. Bismarck had maintained an attitude of neutrality, but after the congress of Berlin he found himself placed between the alternatives of friendship with Austria or Russia. Movements of Russian troops on the western frontier threatened Austria, and the tsar, in a letter to the German emperor, stated that peace could only be maintained if Germany gave her support to Russia. Bismarck, now that the choice was forced upon him, determined in favour of Austria, and during a visit to Vienna in October, arranged with Count Andrássy an alliance by which in the event of either being attacked by Russia the other was to assist; if either was attacked by any power other than Russia, the other was to preserve benevolent neutrality unless the attacking power was helped by Russia. The effect of this was to protect Austria from attack by Russia, and Germany from the danger of a combined attack by France and Russia. Bismarck with some difficulty procured the consent of the emperor, who by arranging a meeting with the tsar had attempted to preserve the old friendship. From that time the alliance with Austria has continued. In 1883 it was joined by Italy, and was renewed in 1887, and in 1891 for six years, and if not then denounced, for twelve.

In 1882, after the retirement of Gorchakov, the relations with Russia again improved. In 1884 there was a meeting of the three emperors, and at the same time Bismarck came to a close understanding with France on colonial questions. The period of quiet did not last long. The disaster in Tongking brought about a change of ministry in France, and Bulgarian affairs again alienated Austria and Russia. Bismarck with great skill used the growing foreign complications as a means of freeing himself from parliamentary difficulties at the same time that he secured the position of Germany in Europe.

Elections of 1887.

To meet the increase in the French army, and the open menaces in which the Russian press indulged, a further increase in the German army seemed desirable. The Septennate would expire in 1888. In the autumn of 1886 a proposal was laid before the Reichstag to increase the peace establishment for the next seven years to 468,400 men. The Reichstag would not assent to this, but the opposition parties offered to vote the required increase for three years. Bismarck refused to accept this compromise, and the Reichstag was dissolved. Under his influence the Conservatives and National Liberals formed a coalition or *Cartel* by which each agreed to support the candidates of the other. The elections caused greater excitement than any which had taken place since 1870. The numbers who went to the poll were much larger, and all the opposition parties, except the Catholics, including even the Socialists, suffered severe loss. Bismarck, in order to win the support of the Centre, appealed directly to the pope, but Windthorst took the responsibility of refusing to obey the pope's request on a matter purely political. The National Liberals again became a government party, but their position was much changed. They were no longer, as in the old days, the leading factor. They had to take the second place. They were subordinate to the Conservatives. They could no longer impose their will upon the government. In the new parliament the government proposals were accepted by a majority of 223 to 48 (seven members of the Centre voted for it, the others abstained). The opposition consisted chiefly of Socialists and Radicals (*Freisinnigen*).

Relations with Russia.

The fall of Boulanger removed the immediate danger from France, but for the rest of the year the relations with Russia caused serious apprehensions. Anti-German articles appeared in Russian newspapers. The growth of the Nationalist party in Russia led to measures injurious to German trade and German settlers in Russia. German vessels were forbidden to trade on the Niemen. The increase of the duties on iron injured German trade. Stringent measures were taken to stamp out German nationality in the Baltic provinces, similar to those used by the Germans against the Poles. Foreigners were forbidden to hold land in Russia. The German government retaliated by a decree of the Reichsbank refusing to deal with Russian paper. Large accumulations of troops on the western frontier excited alarm in Germany and Austria. During a short visit paid by the emperor of Russia to Berlin in November Bismarck discovered that forged despatches misrepresenting the policy of Germany in the Eastern Question had been communicated to him. This did not seem to remove all danger, and in February 1888 the government introduced an amendment to the imperial Military Law extending the obligation for service from twelve to eighteen years. In this way it was possible to increase the war establishment, excluding the Landsturm, by about half a million men without adding to the burden in time of peace. Another law authorized a loan of £14,000,000 for military equipment. At the same time the text of the Triple Alliance was published. The two laws were adopted without opposition. Under the effect of one of Bismarck's speeches, the Military Bill was unanimously passed almost without debate.

Secret treaty with Russia.

It was probably at the meeting of 1884 that a secret treaty, the existence of which was not known for many years, was arranged between Germany and Russia. The full text has never been published, and the exact date is uncertain. Either state pledged itself to observe benevolent neutrality in case the other were attacked by a third power. Apparently the case of an attack by France on Germany, or by Austria on Russia, was expressly mentioned. The treaty lapsed in 1890, and owing to Bismarck's dismissal was not renewed. Caprivi refused to renew it because it was doubtful whether by increasing the number of treaties the value of them was not diminished. Under this system it was to be apprehended that if war broke out between Austria and Russia, Austria would claim the support of Germany under the Triple Alliance, Russia neutrality under this treaty. The decision of Germany would theoretically have to depend on the question which party was the aggressor—a question which notoriously is hardly ever capable of an answer. (For this treaty see the debate in the Reichstag of the 16th of November 1896; the *Hamburger Nachrichten* of 24th October in the same year; and Schulthess, *Europäisches Geschichtskalendar*, 1896.)

Reign of Frederick III.

The emperor William died on the 9th of March 1888. He was succeeded by his son, who took the title of Frederick III. In Italy the older title of king of Piedmont has been absorbed in the newer kingdom of Italy; this is not the case in Germany, where the title German emperor is merely attached to and not substituted for that of king of Prussia. The events of this short reign, which lasted

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only ninety-nine days, have chiefly a personal interest, and are narrated under the articles FREDERICK III. and BISMARCK. The illness and death of the emperor, however, destroyed the last hope of the Liberals that they might at length succeed to power. For a generation they had waited for his accession, and bitter was their disappointment, for it was known that his son was more inclined to follow the principles of Bismarck than those of his own father. The emperor, crippled and dying though he was, showed clearly how great a change he would, had he lived, have introduced in the spirit of the government. One of his first acts was severely to reprimand Puttkammer for misusing government influence at elections. The minister sent in his resignation, which was accepted, and this practice, which had been deliberately revived during the last ten years, was thereby publicly disavowed. Bismarck's own position would naturally have been seriously affected by the fall of a colleague with whom he was closely connected, and another point of internal policy showed also how numerous were the differences between the chancellor and the emperor. Laws had been passed prolonging the period of both the Prussian and Imperial parliaments from three to five years; when they were laid before the emperor for his signature he said that he must consider them. Bismarck then pointed out that the constitution of the empire did not authorize the emperor to withhold his assent from a law which had passed both the Reichstag and the Bundesrat; he could as king of Prussia oppose it by his representatives in the federal council, but when it had been accepted there, it was his duty as emperor to put the law into execution. The emperor accepted this exposition of the constitution, and after some delay eventually gave his consent also to the Prussian law, which he was qualified to reject.

He was succeeded by his eldest son, William II. (q.v.). The first year of the new reign was uneventful. In his public speeches the emperor repeatedly expressed his reverence for the memory of his grandfather, and his determination to continue his policy; but he also repudiated the attempt of the extreme Conservatives to identify him with their party. He spent much time on journeys, visiting the chief courts of Europe, and he seemed to desire to preserve close friendship with other nations, especially with Russia and Great Britain. Changes were made in the higher posts of the army and civil service, and Moltke resigned the office of chief of the staff, which for thirty years he had held with such great distinction.

William II.

The beginning of the year 1890 brought a decisive event. The period of the Reichstag elected in 1887 expired, and the new elections, the first for a quinquennial period, would take place. The chief matter for decision was the fate of the Socialist law; this expired on the 30th of September 1890. The government at the end of 1889 introduced a new law, which was altered in some minor matters, and which was to be permanent. The Conservatives were prepared to vote for it; the Radicals and Centre opposed it: the decision rested with the National Liberals, and they were willing to accept it on condition that the clause was omitted which allowed the state governments to exclude individuals from districts in which the state of siege had been proclaimed. The final division took place on the 25th of February 1890. An amendment had been carried omitting this clause, and the National Liberals therefore voted for the bill in its amended form. The Conservatives were ready to vote as the government wished; if Bismarck was content with the amended bill, they would vote for it, and it would be carried; no instructions were sent to the party; they therefore voted against the bill, and it was lost. The House was immediately dissolved. It was to have been expected that, as in 1878, the government would appeal to the country to return a Conservative majority willing to vote for a strong law against the Socialists. Instead of this, the emperor, who was much interested in social reform, published two proclamations. In one addressed to the chancellor he declared his intention, as emperor, of bettering the lot of the working classes; for this purpose he proposed to call an international congress to consider the possibility of meeting the requirements and wishes of the working men; in the other, which he issued as king of Prussia, he declared that the regulation of the time and conditions of labour was the duty of the state, and the council of state was to be summoned to discuss this and kindred questions. Bismarck, who was less hopeful than the emperor, and did not approve of this policy, was thereby prevented from influencing the elections as he would have wished to do; the coalition parties, in consequence, suffered severe loss; Socialists, Centre and Radicals gained numerous seats. A few days after the election Bismarck was dismissed from office. The difference of opinion between him and the emperor was not confined to social reform; beyond this was the more serious question as to whether the chancellor or the emperor was to direct the course of the government. The emperor, who, as Bismarck said, intended to be his own chancellor, required Bismarck to draw up a decree reversing a cabinet order of Frederick William IV., which gave the Prussian minister-president the right of being the sole means of communication between the other ministers and the king. This Bismarck refused to do, and he was therefore ordered to send in his resignation.

Fall of Bismarck.

Among those more immediately connected with the government his fall was accompanied by a feeling of relief which was not confined to the Opposition, for the burden of his rule had pressed heavily upon all. There was, however, no change in the principles of government or avowed change in policy; some uncertainty of direction and sudden oscillations of policy showed the presence of a less experienced hand. Bismarck's successor, General von Caprivi, held a similar combination of offices, but the chief control passed now into the hands of the emperor himself. He aspired by his own will to direct the policy of the state; he put aside the reserve which in modern times is generally observed even by absolute rulers, and by his public speeches and personal influence took a part in political controversy. He made very evident the monarchical character of the Prussian state, and gave to the office of emperor a prominence greater than it had hitherto had.

Chancellorship of Count von Caprivi.

One result of this was that it became increasingly difficult in political discussions to avoid criticizing the words and actions of the emperor. Prosecutions for *lèse-majesté* became commoner than they were in former reigns, and the difficulty was much felt in the conduct of parliamentary debate. The rule adopted was that discussion was permitted on those speeches of the emperor which were officially published in the *Reichsanzeiger*. It was, indeed, not easy to combine that respect and reverence which the emperor required should be paid to him, with that open criticism of his words which seemed necessary (even for self-defence) when the monarch condescended to become the censor of the opinions and actions of large parties and classes among his subjects. The attempts to combine personal government with representative institutions was one of much interest; it was more successful than might have been anticipated, owing to the disorganization of political parties and the absence of great political leaders; in Germany, as elsewhere, the parliaments had not succeeded in maintaining public interest, and it is worth noting that even the attendance of members was very irregular. There was below the surface much discontent and subdued criticism of the exaggeration of the monarchical power, which the Germans called *Byzantinismus*; but after all the nation seemed to welcome the government of the emperor, as it did that of Bismarck. The uneasiness which was caused at first by the unwonted vigour of his utterances subsided, as it became apparent how strong was his influence for peace, and with how many-sided an activity he supported and encouraged every side of national life. Another result of the personal government by the emperor was that it was impossible, in dealing with recent history, to determine how far the ministers of state were really responsible for the measures which they defended, and how far they were the instruments and mouthpieces of the policy of the emperor.

The first efforts of the "New course," as the new administration was termed, showed some attempt to reconcile to the government those parties and persons whom Bismarck had kept in opposition. The continuation of social reform was to win over the allegiance of the working men to the person of the emperor;

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an attempt was made to reconcile the Guelphs, and even the Poles were taken into favour; Windthorst was treated with marked distinction. The Radicals alone, owing to their ill-timed criticism on the private relations of the imperial family, and their continued opposition to the army, were excluded. The attempt, however, to unite and please all parties failed, as did the similar attempt in foreign policy. Naturally enough, it was social reform on which at first activity was concentrated, and the long-delayed factory legislation was now carried out. In 1887 and 1888 the Clerical and Conservative majority had carried through the Reichstag laws restricting the employment of women and children and prohibiting labour on Sundays. These were not accepted by the Bundesrat, but after the International Congress of 1890 an important amendment and addition to the *Gewerbeordnung* was carried to this effect. It was of even greater importance that a full system of factory inspection was created. A further provision empowered the Bundesrat to fix the hours of labour in unhealthy trades; this was applied to the bakeries by an edict of 1895, but the great outcry which this caused prevented any further extension.

Factory laws.

These acts were, however, accompanied by language of great decision against the Social Democrats, especially on the occasion of a great strike in Westphalia, when the emperor warned the men that for him every Social Democrat was an enemy to the empire and country. None the less, all attempts to win the working men from the doctrinaire Socialists failed. They continued to look on the whole machinery of government, emperor and army, church and police, as their natural enemies, and remained completely under the bondage of the abstract theories of the Socialists, just as much as fifty years ago the German bourgeois were controlled by the Liberal theories. It is strange to see how the national characteristics appeared in them. What began as a great revolutionary movement became a dogmatic and academic school of thought; it often almost seemed as though the orthodox interpretation of Marx's doctrine was of more importance than an improvement in the condition of the working men, and the discussions in the annual Socialist Congress resemhled the arguments of theologians rather than the practical considerations of politicians. The party, however, prospered, and grew in strength beyond all anticipation. The repeal of the Socialist law was naturally welcome to them as a great personal triumph over Bismarck; in the elections of 1890 they won thirty-five, in 1893 forty-four, in 1898 fifty-six seats. Their influence was not confined to the artisans; among their open or secret adherents were to be found large numbers of government employés and clerks. In the autumn of 1890 they were able, for the first time, to hold in Germany a general meeting of delegates, which was continued annually. In the first meetings it appeared that there were strong opposing tendencies within the party which for the first time could be brought to public discussion. On the one side there was a small party, *die Jungen*, in Berlin, who attacked the parliamentary leaders on the ground that they had lent themselves to compromise and had not maintained the old *intransigeant* spirit. In 1891, at Erfurt, Werner and his followers were expelled from the party; some of them drifted into anarchism, others disappeared. On the other hand, there was a large section, the leader of whom was Herr von Vollmar, who maintained that the social revolution would not come suddenly, as Bebel and the older leaders had taught, but that it would he a gradual evolution; they were willing to co-operate with the government in remedial measures by which, within the existing social order, the prosperity and freedom of the working classes might he advanced; their position was very strong, as Vollmar had succeeded in extending Socialism even in the Catholic parts of Bavaria. An attempt to treat them as not genuine Socialists was frustrated, and they continued in co-operation with the other branch of the party. Their position would have been easier were it not for the repeated attempts of the Prussian government to crush the party by fresh legislation and the supervision exercised by the police. It was a sign of most serious import for the future that in 1897 the electoral law in the kingdom of Saxony was altered with the express purpose of excluding the Socialists from the Saxon Landtag. This and other symptoms caused serious apprehension that some attempt might be made to alter the law of universal suffrage for the Reichstag, and it was policy of this kind which maintained and justified the profound distrust of the governing classes and the class hatred on which Social democracy depends. On the other hand, there were signs of a greater willingness among the Socialists to co-operate with their old enemies the Liherals.

Progress of Socialism.

In foreign affairs a good understanding with Great Britain was maintained, hut the emperor failed at that time to preserve the friendship of Russia. The close understanding between France and Russia, and the constant increase in the armies of these states, made a still further increase of the German army desirable. In 1890, while the Septennate had still three more years to run, Caprivi had to ask for an additional 20,000 men. It was the first time that an increase of this kind had been necessary within the regular period. When, in 1893, the proposals for the new period were made, they formed a great change. Compulsory service was to he made a reality; no one except those absolutely unfit was to escape it. To make enlistment of so large an additional number of recruits possihle, the period of service with the colours was reduced to two years. The parliamentary discussion was very confused; the government eventually accepted an amendment giving them 557,093 for five and a half years instead of the 570,877 asked for; this was rejected by 210 to 162, the greater part of the Centre and of the Radicals voting against it. Parliament was at once dissolved. Before the elections the Radical party broke up, as about twenty of them determined to accept the compromise. They took the name of the *Freisinnige Vereinigung*, the others who remained under the leadership of Richter forming the *Freisinnige Volkspartei*. The natural result of this split was a great loss to the party. The Liberal opposition secured only twenty-three seats instead of the sixty-seven they had held before. It was, so far as now can be foreseen, the final collapse of the old Radical party. Notwithstanding this the hill was only carried hy sixteen votes, and it would have been thrown out again had not the Poles for the first time voted for the government, since the whole of the Centre voted in opposition.

Military legislation.

This vote was a sign of the increasing disorganization of parties and of growing parliamentary difficulties which were even more apparent in the Prussian Landtag. Miquel, as minister of finance, succeeded indeed in carrying a reform hy which the proceeds of the tax on land and buildings were transferred to the local government authorities, and the loss to the state exchequer made up by increased taxation of larger incomes and industry. The series of measures which began in 1891, and were completed in 1895, won a more general approhation than is usual, and Miquel in this successfully carried out his policy of reconciling the growing jealousies arising from class interests.

Caprivi's administration was further remarkahle for the arrangement of commercial treaties. In 1892 treaties with Austria-Hungary, Italy, Belgium and Switzerland for twelve years bound together the greater part of the continent, and opened a wide market for German manufactures; the idea of this policy was to secure, by a more permanent union of the middle European states, a stahle market for the goods which were being excluded owing to the great growth of Protection in France, Russia and America. These were followed by similar treaties with Rumania and Servia, and in 1894, after a period of sharp customs warfare, with Russia. In all these treaties the general principle was a reduction of the import duties on corn in return for advantages given to German manufactures, and it is this which brought about the struggle of the government with the Agrarians which after 1894 took the first place in party politics.

Commercial treaties.

The agricultural interests in Germany had during the middle of the 19th century been in favour of Free Trade. The reason of this was that, till some years after the foundation of the empire, the production of corn and food-stuffs was more than sufficient for the population; as long as they exported corn, potatoes and cattle, they required no protection

Agrarians.

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from foreign competition, and they enjoyed the advantages of being able to purchase colonial goods and manufactured articles cheaply. Mecklenburg and Hanover, the purely agricultural states, had, until their entrance into the Customs Union, followed a completely Free Trade policy. The first union of the Agrarian party, which was formed in 1876 under the name of the Society for the Reform of Taxation, did not place protection on their programme; they laid stress on bimetallism, on the reform of internal taxation, especially of the tax on land and buildings, and on the reform of the railway tariff, and demanded an increase in the stamp duties. These last three points were all to some extent attained. About this time, however, the introduction of cheap corn from Russia began to threaten them, and it was in 1879 that, probably to a great extent influenced by Bismarck, they are first to be found among those who ask for protection.

After that time there was a great increase in the importation of food-stuffs from America. The increase of manufactures and the rapid growth of the population made the introduction of cheap food from abroad a necessity. In the youth of the empire the amount of corn grown in Germany was sufficient for the needs of its inhabitants; the amount consumed in 1899 exceeded the amount produced by about one-quarter of the total. At the same time the price, making allowance for the fluctuations owing to bad harvests, steadily decreased, notwithstanding the duty on corn. In twenty years the average price fell from about 235 to 135 marks the 1000 kilo. There was therefore a constant decrease in the income from land, and this took place at a time when the great growth of wealth among the industrial classes had made living more costly. The agriculturists of the north and east saw themselves and their class threatened with loss, and perhaps ruin; their discontent, which had long been growing, broke out into open fire during the discussion of the commercial treaties. As these would inevitably bring about a large increase in the importation of corn from Rumania and Russia, a great agitation was begun in agricultural circles, and the whole influence of the Conservative party was opposed to the treaties. This brought about a curious situation, the measures being only carried by the support of the Centre, the Radicals, and the Socialists, against the violent opposition of those classes, especially the landowners in Prussia, who had hitherto been the supporters of the government. In order to prevent the commercial treaty with Russia, a great agricultural league was founded in 1893, the *Bund der Landwirte*; some 7000 landowners joined it immediately. Two days later the Peasants' League, or *Deutsche Bauernbund*, which had been founded in 1885 and included some 44,000 members, chiefly from the smaller proprietors in Pomerania, Posen, Saxony and Thuringia, merged itself in the new league. This afterwards gained very great proportions. It became, with the Social Democrats, the most influential society which had been founded in Germany for defending the interests of a particular class; it soon numbered more than 200,000 members, including landed proprietors of all degrees. Under its influence a parliamentary union, the *Wirtschaftsvereinigung*, was founded to ensure proper consideration for agricultural affairs; it was joined by more than 100 members of the Reichstag; and the Conservative party fell more and more under the influence of the Agrarians.

Having failed to prevent the commercial treaties, Count Kanitz introduced a motion that the state should have a monopoly of all imported corn, and that the price at which it was to be sold should be fixed by law. On the first occasion, in 1894, only fifty members were found to vote for this, but in the next year ninety-seven supported the introduction of the motion, and it was considered worth while to call together the Prussian council of state for a special discussion. The whole agitation was extremely inconvenient to the government. The violence with which it was conducted, coming, as it did, from the highest circles of the Prussian nobility, appeared almost an imitation of Socialist methods; but the emperor, with his wonted energy, personally rebuked the leaders, and warned them that the opposition of Prussian nobles to their king was a monstrosity. Nevertheless they were able to overthrow the chancellor, who was specially obnoxious to them. In October 1894 he was dismissed suddenly, without warning, and almost without cause, while the emperor was on a visit to the Eulenburgs, one of the most influential families of the Prussian nobility.

Fall of Caprivi.

Caprivi's fall, though it was occasioned by a difference between him and Count Eulenburg, and was due to the direct act of the emperor, was rendered easier by the weakness of his parliamentary position. There was no party on whose help he could really depend. The Military Bill had offended the prejudices of conservative military critics; the British treaty had alienated the colonial party; the commercial treaties had only been carried by the help of Poles, Radicals and Socialists; but it was just these parties who were the most easily offended by the general tendencies of the internal legislation, as shown in the Prussian School Bill. Moreover, the bitter and unscrupulous attacks of the Bismarckian press to which Caprivi was exposed made him unpopular in the country, for the people could not feel at ease so long as they were governed by a minister of whom Bismarck disapproved. There was therefore no prospect of forming anything like a stable coalition of parties on which he could depend.

Chancellor Prince v. Hohenlohe.

The emperor was fortunate in securing as his successor Prince Chlodwig von Hohenlohe. Though the new chancellor once more united with this office that of Prussian minister-president, his age, and perhaps also his character, prevented him from exercising that constant activity and vigilance which his two predecessors had displayed. During his administration even the secretary of state for foreign affairs, Baron Marschall von Bieberstein, and afterwards Count von Bülow, became the ordinary spokesman of the government, and in the management of other departments the want of a strong hand at the head of affairs was often missed. Between the emperor, with whom the final direction of policy rested, and his subordinates, the chancellor often appeared to evade public notice. The very first act of the new chancellor brought upon him a severe rebuff. At the opening of the new buildings which had been erected in Berlin for the Reichstag, cheers were called for the emperor. Some of the Socialist members remained seated. It was not clear that their action was deliberate, but none the less the chancellor himself came down to ask from the House permission to bring a charge of *lèse-majesté* against them, a request which was, of course, almost unanimously refused.

The Agrarians still maintained their prominent position in Prussia. They opposed all bills which would appear directly or indirectly to injure agricultural interests. They looked with suspicion on the naval policy of the emperor, for they disliked all that helps industry and commerce. They would only give their support to the Navy Bills of 1897 and 1900 in return for large concessions limiting the importation of margarine and American preserved meat, and the removal of the *Indemnitäts Nachweis* acted as a kind of bounty on the export of corn. They successfully opposed the construction of the great canal from Westphalia to the Elbe, on the ground that it would facilitate the importation of foreign corn. They refused to accept all the compromises which Miquel, who was very sympathetic towards them, suggested, and thereby brought about his retirement in May 1901.

The opposition of the Agrarians was for many reasons peculiarly embarrassing. The franchise by which the Prussian parliament is elected gave the Conservatives whom they controlled a predominant position. Any alteration of the franchise was, however, out of the question, for that would admit the Socialists. It was, moreover, the tradition of the Prussian court and the Prussian government (and it must be remembered that the imperial government is inspired by Prussian traditions) that the nobility and peasants were in a peculiar way the support of the crown and the state. The old distrust of the towns, of manufacturers and artisans, still continued. The preservation of a peasant class was considered necessary in the interests of the army. Besides, intellectual and social prejudices required a strong Conservative party. In the south and west of Germany, however, the Conservative party was practically non-existent. In these parts,

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owing to the changes introduced at the revolution, the nobility, who hold little land, are, comparatively speaking, without political importance. In the Catholic districts the Centre had become absolutely master, except so far as the Socialists threaten their position. Those of the great industrialists who belonged to the National Liberals or the Moderate Conservatives did not command that influence which men of their class generally hold in Great Britain, because the influence of Social Democracy banded together the whole of the working men in a solid phalanx of irreconcilable opposition, the very first principle of which was the hostility of classes. The government, therefore, were compelled to turn for support to the Centre and the Conservatives, the latter being almost completely under the influence of the old Prussian nobility from the north-east. But every attempt to carry out the policy supported by these parties aroused an opposition most embarrassing to the government.

Exchange regulations.

The Conservatives distrusted the financial activity which centred round the Exchanges of Berlin and other towns, and in this they had the sympathy of Agrarians and Anti-Semites, as well as of the Centre. The Agrarians believed that the Berlin Exchange was partly responsible for the fall of prices in corn; the Anti-Semites laid stress on the fact that many of the financiers were of Jewish extraction; the Centre feared the moral effects of speculation. This opposition was shown in the demand for additional duties on stamps (this was granted by Bismarck), in the opposition to the renewal of the Bank Charter, and especially in the new regulations for the Exchange which were carried in 1896. One clause in this forbade the dealing in "futures" in corn, and at the same time a special Prussian law required that there should be representatives of agriculture on the managing committee of the Exchange. The members of the Exchanges in Berlin and other towns refused to accept this law. When it came into effect they withdrew and tried to establish a private Exchange. This was prevented, and after two years they were compelled to submit and the Berlin Bourse was again opened.

Political bargaining.

Political parties now came to represent interests rather than principles. The government, in order to pass its measures, was obliged to purchase the votes by class legislation, and it bought those with whom it could make the best bargain—these being generally the Centre, as the ablest tacticians, and the Conservatives, as having the highest social position and being boldest in declaring their demands. No great parliamentary leader took the place of Windthorst, Lasker and Bennigsen; the extra-parliamentary societies, less responsible and more violent, grew in influence. The Anti-Semites gained in numbers, though not in reputation. The Conservatives, hoping to win votes, even adopted an anti-Semite clause in their programme. The general tendency among the numerous societies of Christian Socialism, which broke up almost as quickly as they appeared, was to drift from the alliance with the ultra-Conservatives and to adopt the economic and many of the political doctrines of the Social Democrats. The *National-Sozialer Verein* defended the union of Monarchy and Socialism. Meanwhile the extreme spirit of nationality was fostered by the *All-deutscher Verein*, the policy of which would quickly involve Germany in war with every other nation. More than once the feelings to which they gave expression endangered the relations of Germany and Austria-Hungary. The persecution of the Poles in Prussia naturally aroused indignation in Austria, where the Poles had for long been among the strongest elements on which the government depended; and it was not always easy to prevent the agitation on behalf of the Germans in Bohemia from assuming a dangerous aspect.

In the disintegration of parties the Liberals suffered most. The unity of the Conservatives was preserved by social forces and the interests of agriculture; the decay of the Liberals was the result of universal suffrage. Originally the opponents of the landed interest and the nobility, they were the party of the educated middle class, of the learned, of the officials and finance. They never succeeded in winning the support of the working men. They had identified themselves with the interests of the capitalists, and were not even faithful to their own principles. In the day of their power they showed themselves as intolerant as their opponents had been. They resorted to the help of the government in order to stamp out the opinions with which they disagreed, and the claims of the artisans to practical equality were rejected by them, as in earlier days the claims of the middle class had been by the nobles.

The Centre alone maintained itself. Obliged by their constitution to regard equally the material interests of all classes—for they represent rich and poor, peasants and artisans—they were the natural support of the government when it attempted to find a compromise between the clamour of opposing interests. Their own demands were generally limited to the defence of order and religion, and to some extent coincided with the wishes of the emperor; but every attempt to introduce legislation in accordance with their wishes led to a conflict with the educated opinion of the country, which was very detrimental to the authority of the government. In the state parliaments of Bavaria, Baden and Hesse their influence was very great. There was, moreover, a tendency for local parties to gain in numbers and influence—the *Volkspartei* in Württemberg, the Anti-Semites in Hesse, and the *Bauernbund* (Peasants' League) in Bavaria. The last demanded that the peasants should be freed from the payment to the state, which represented the purchase price for the remission of feudal burdens. It soon lost ground, however, partly owing to personal reasons, and partly because the Centre, in order to maintain their influence among the peasants, adopted some features of their programme.

Mittelstand-politik.

Another class which, seeing itself in danger from the economic changes in society, agitated for special legislation was the small retail traders of the large towns. They demanded additional taxation on the vast shops and stores, the growth of which in Berlin, Munich and other towns seemed to threaten their interests. As the preservation of the smaller middle class seemed to be important as a bulwark against Socialism, they won the support of the Conservative and Clerical parties, and laws inspired by them were passed in Bavaria, Württemberg and Prussia. This *Mittelstand-Politik*, as it is called, was very characteristic of the attitude of mind which was produced by the policy of Protection. Every class appealed to the government for special laws to protect itself against the effects of the economic changes which had been brought about by the modern industrial system. Peasants and landlords, artisans and tradesmen, each formed their own league for the protection of their interests, and all looked to the state as the proper guardian of their class interests.

Moral and religious policy.

After the fall of Caprivi the tendency of the German government to revert to a strong Conservative policy in matters of religion, education, and in the treatment of political discussions became very marked. The complete alienation of the working classes from Christianity caused much natural concern, combined as it was with that indifference to religion which marks the life of the educated classes in the large towns, and especially in Berlin. A strong feeling arose that social and political dangers could only be avoided by an increase in religious life, and the emperor gave the authority of his name to a movement which produced numerous societies for home mission work, and (at least in Berlin) led to the erection of numerous churches. Unfortunately, this movement was too often connected with political reaction, and the working classes were inclined to believe that the growth of religion was valued because it afforded an additional support to the social and political order. The situation was somewhat similar to that which existed during the last years of Frederick William IV., when the close association of religion with a Conservative policy made orthodoxy so distasteful to large sections of society. The government, which had not taken warning by the fate of the School Bill, attempted to carry other measures of the same kind. The emperor had returned to Bismarck's policy of joining social reform with repressive legislation. In a speech at Königsberg in November 1894, he summoned the nobles of Prussia to support him in the struggle for religion, for morality,

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for order, against the parties of *Umsturz*, or Revolution, and shortly afterwards an amendment of the Criminal Code, commonly called the *Umsturz-Vorlage*, was introduced, containing provisions to check attempts to undermine the loyalty of the soldiers, and making it a crime punishable with three years' imprisonment to attack religion, monarchy, marriage, the family or property by abusive expressions in such a manner as to endanger public peace. The discussion of this measure occupied most of the session of 1895; the bill was amended by the Centre so as to make it even more strongly a measure for the defence of religion; and clauses were introduced to defend public morality, by forbidding the public exhibition of pictures or statues, or the sale of writings, which, "without being actually obscene, might rudely offend the feeling of modesty." These Clerical amendments aroused a strong feeling of indignation. It was represented that the freedom of art and literature was being endangered, and the government was obliged to withdraw the bill. The tendency towards a stricter censorship was shown by a proposal which was carried through the Prussian parliament for controlling the instruction given at the universities by the *Privatdozenten*. Some of the Conservative leaders, especially Baron von Stumm, the great manufacturer (one of Bismarck's chief advisers on industrial matters), demanded protection against the teaching of some of the professors with whose economic doctrines they did not agree; pastors who took part in the Christian-Social movement incurred the displeasure of the government; and Professor Delbrück was summoned before a disciplinary court because, in the *Preussische Jahrbücher*, which he edited, he had ventured to criticize the policy of the Prussian government towards the Danes in Schleswig. All the discontent and suspicion caused by this policy broke out with greater intensity when a fresh attempt was made in 1900 to carry those clauses of the old *Umsturz-Vorlage* which dealt with offences against public morality. The gross immoralities connected with prostitution in Berlin had been disclosed in the case of a murderer called Heinze in 1891; and a bill to strengthen the criminal law on the subject was introduced but not carried. The measure continued, however, to be discussed, and in 1900 the government proposed to incorporate with this bill (which was known as the *Lex Heinze*) the articles from the *Umsturz-Vorlage* subjecting art and literature to the control of the criminal law and police. The agitation was renewed with great energy. A *Goethe-Verein* was founded to protect *Kultur*, which seemed to be in danger. In the end the obnoxious clauses were only withdrawn when the Socialists used the forms of the House to prevent business from being transacted. It was the first time that organized obstruction had appeared in the Reichstag, and it was part of the irony of the situation that the representatives of art and learning owed their victory to the Socialists, whom they had so long attacked as the great enemies of modern civilization.

Umsturz-Vorlage.

Lex Heinze.

These were not the only cases in which the influence of the parties of reaction caused much discontent. There was the question of the right of combination. In nearly every state there still existed old laws forbidding political societies to unite with one another. These laws had been passed in the years immediately after the revolution of 1848, and were quite out of place under modern conditions. The object of them was to prevent a network of societies from being formed extending over large districts, and so acquiring political power. In 1895 the Prussian police used a law of 1850 as a pretext for dissolving the Socialist organization in Berlin, as had been done twenty years before. A large majority of the Reichstag demanded that an imperial law should be passed repealing these laws and establishing the right of combination, and they refused to pass the revised Civil Code until the chancellor promised that this should be done. Instead of this course being adopted, however, special laws were introduced in most of the states, which, especially in Prussia and Saxony, while they gave the right of combination, increased the power of the police to forbid assemblies and societies. It was apparent that large and influential parties still regarded political meetings as something in themselves dangerous and demoralizing, and hence the demand of the Conservatives that women and young persons should be forbidden to attend. In Prussia a majority of the Upper House and a very large minority of the Lower House (193 to 206) voted for an amendment expressly empowering the police to break up meetings in which anarchistic, socialistic or communistic doctrines were defended in such a manner as to be dangerous to society; the Saxon Conservatives demanded that women at least should be forbidden to attend socialistic meetings, and it remained illegal for any one under twenty-one years of age to be present at a political meeting. In consequence of the amendments in the Upper House the Prussian law was lost; and at last, in 1899, a short imperial law was carried to the effect that "societies of every kind might enter into union with one another." This was at once accepted by the chancellor; it was the time when the Navy Bill was coming on, and it was necessary to win votes. The general feeling of distrust which this prolonged controversy aroused was, however, shown by the almost contemptuous rejection in 1899 of a Bill to protect artisans who were willing to work against intimidation or violence (the *Zuchthaus-Vorlage*), a vote which was the more significant as it was not so much occasioned by the actual provisions of the bill, but was an expression of the distrust felt for the motives by which the government was moved and the reluctance to place any further powers in their hands.

Law of combination.

Meanwhile the emperor had set himself the task of doing for the German fleet what his grandfather had done for the army. The acquisition of Heligoland enabled a new naval station to be established off the mouth of the Elbe; the completion of the canal from Kiel to the mouth of the Elbe, by enabling ships of war to pass from the Baltic to the North Sea greatly increased the strategic strength of the fleet. In 1890 a change in the organization separated the command of the fleet from the office of secretary of state, who was responsible for the representation of the admiralty in the Reichstag, and the emperor was brought into more direct connexion with the navy. During the first five years of the reign four line-of-battle ships were added and several armoured cruisers for the defence of commerce and colonial interests. With the year 1895 began a period of expansion abroad and great naval activity. The note was given in a speech of the emperor's on the twenty-fifth anniversary of the foundation of the empire, in which he said, "the German empire has become a world empire." The ruling idea of this new *Welt-Politik* was that Germany could no longer remain merely a continental power; owing to the growth of population she depended for subsistence on trade and exports; she could not maintain herself amid the rivalry of nations unless the government was able actively to support German traders in all parts of the world. The extension of German trade and influence has, in fact, been carried out with considerable success. There was no prospect of further territory in Equatorial Africa, and the hope of bringing about a closer union with the South African Republic was not fulfilled. On the Pacific, however, there were great gains;[1] long-established plans for obtaining a port in China which might serve as a base for the growing trade at Tientsin were carried out at the end of 1897; the murder of two Catholic missionaries was made the pretext for landing troops in the bay of Kiao-chau; and in amends China granted the lease of some 50 sq. m. of territory, and also a concession for building railways. The emperor showed his strong personal interest by sending his brother, Prince Henry, in command of a squadron to take possession of this territory, and the visit of a German prince to the emperor of China strongly appealed to the popular imagination. The emperor's characteristically rhetorical speeches on this occasion—particularly his identification of his brother with the "mailed fist" of Germany—excited considerable comment.

Welt-Politik.

The "mailed fist."

[1] In 1899, following the Spanish-American War, Germany purchased the Caroline, Pelew and Marianne Islands from Spain; in 1899–1900 by agreement with Great Britain and America she acquired the two largest of the Samoan islands, renouncing in favour of Britain her protectorate over certain of the Solomon islands.

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In Turkey the government, helped again by the personal interest of the emperor, who himself visited the sultan at Constantinople, gained important concessions for German influence and German commerce. The Turkish armies were drilled and commanded by German officers, and in 1899 a German firm gained an important concession for building a railway to Baghdad. In Brazil organized private enterprise established a considerable settlement of German emigrants, and though any political power was for the time impossible, German commerce increased greatly throughout South America.

Encouraged by the interest which the events in China had aroused, a very important project was laid before the Reichstag in November 1897, which would enable Germany to take a higher place among the maritime powers. A completely new procedure was introduced. Instead of simply proposing to build a number of new ships, the bill laid down permanently the number of ships of every kind of which the navy was to consist. They were to be completed by 1904; and the bill also specified how often ships of each class were to be replaced. The plan would establish a normal fleet, and the Reichstag, having once assented, would lose all power of controlling the naval budget. The bill was strongly opposed by the Radicals; the Centre was divided; but the very strong personal influence of the emperor, supported by an agitation of the newly-formed *Flottenverein* (an imitation of the English Navy League), so influenced public opinion that the opposition broke down. A general election was imminent, and no party dared to go to the country as the opponents of the fleet.

Naval programme, 1897.

Scarcely had the bill been carried when a series of events took place which still more fully turned public attention to colonial affairs, and seemed to justify the action of the government. The war between the United States and Spain showed how necessary an efficient fleet was under modern conditions, and also caused some feeling of apprehension for the future arising from the new policy of extension adopted by the United States. And the brewing of the storm in South Africa, where the Boers were preparing to resist British suzerainty, helped to make the nation regret that their fleet was not sufficiently strong to make German sympathies effective. The government used with great address the bitter irritation against Great Britain which had become one of the most deep-seated elements in modern German life. This feeling had its origin at first in a natural reaction against the excessive admiration for English institutions which distinguished the Liberals of an older generation. This reaction was deliberately fostered during Bismarck's later years for internal reasons; for, as Great Britain was looked upon as the home of parliamentary government and Free Trade, a less favourable view might weaken German belief in doctrines and institutions adopted from that country. There also existed in Germany a curious compound of jealousy and contempt, natural in a nation the whole institutions of which centred round the army and compulsory service, for a nation whose institutions were based not on military, but on parliamentary and legal institutions. It came about that in the minds of many Germans the whole national regeneration was regarded as a liberation from British influence. This feeling was deliberately fostered by publicists and historians, and was intensified by commercial rivalry, since in the struggle for colonial expansion and trade Germans naturally came to look on Great Britain, who held the field, as their rival. The sympathy which the events of 1896 and 1899 awakened for the Boers caused all these feelings, which had long been growing, to break out in a popular agitation more widespread than any since the foundation of the empire. It was used by the Nationalist parties, in Austria as well as in Germany, to spread the conception of Pan-Germanism; the Boers as Low Germans were regarded as the representatives of Teutonic civilization, and it seemed possible that the conception might be used to bring about a closer friendship, and even alliance, with Holland. In 1896 the emperor, by despatching a telegram of congratulation to President Kruger after the collapse of the Jameson Raid, had appeared to identify himself with the national feeling. When war broke out in 1899 it was obviously impossible to give any efficient help to the Boers, but the government did not allow the moment to pass without using it for the very practical purpose of getting another bill through the Reichstag by which the navy was to be nearly doubled. Some difficulties which arose regarding the exercise by the British government of the right of search for contraband of war were also used to stimulate public feeling. The Navy Bill was introduced in January 1900. There were some criticisms of detail, but the passing of the bill was only a matter of bargaining. Each party wished in return for its support to get some concessions from the government. The Agrarians asked for restrictions on the importation of food; the Centre for the Lex Heinze and the repeal of the Jesuit law; the Liberals for the right of combination.

Hostility to England.

Pro-Boer movement.

Navy Bill, 1900.

The murder of the German ambassador, Baron von Ketteler, at Peking in 1900 compelled the government to take a leading part in the joint expedition of the powers to China. A force of over 20,000 men was organized by voluntary enlistment from among the regular army; and the supreme command was obtained by the emperor for Count von Waldersee, who had succeeded Moltke as chief of the staff. The government was, however, sharply criticized for not first consulting the Reichstag in a matter involving the first military expedition since the foundation of the empire. It was desirable in such circumstances that a younger and more vigorous statesman than Prince Hohenlohe should be placed at the head of affairs before the Reichstag met; and on the 17th of October he resigned, and was succeeded as chancellor by Herr von Bülow, the foreign secretary. (J. W. HE.; W. A. P.)

Von Bülow, chancellor.

It remains only to sketch the main features of German history in later years. In spite of the denunciation by the Social Democratic leaders of what they stigmatized as a "policy of brag," the general popularity of the idea of establishing a strong sea power was proved by the rapid extension of the Navy League, which in 1904 had already 3595 branches. For an increase in the navy there was, indeed, sufficient excuse in the enormous expansion of German over-sea commerce and the consequent growth of the mercantile marine; the value of foreign trade, which in 1894 was £365,000,000, had risen in 1904 to £610,000,000, and in the same period the tonnage of German merchant shipping had increased by 234%. In the session of 1901 Admiral von Tirpitz, the minister of marine, admitted in answer to a Socialist interpellation that the naval programme of 1900 would have to be enlarged. In 1903 Count Bülow declared in the Reichstag that the government was endeavouring to pursue a middle course between "the extravagant aspirations of the Pan-Germans and the parochial policy of the Social Democrats, which forgets that in a struggle for life and death Germany's means of communication might be cut off." At the same time the emperor presented to the Reichstag a comparative table, drawn up by his own hand, showing the relative strength of the British and German navies. An inspired article in the *Grenzboten* declared the object of this to be to moderate at once the aggressive attitude of the Pan-Germans towards Great Britain and British alarms at the naval development of Germany. This gave a fresh impetus to the naval agitation and counter-agitation. In 1904 Count Bülow again found it necessary, in reply to the Socialist leader Bebel, to declare that the German naval armaments were purely defensive. "I cannot conceive," he said, "that the idea of an Anglo-German war should be seriously entertained by sensible people in either country." On the 16th of November 1905 a new Navy Bill amplifying the programme of 1900 was accepted by the Federal Diet. The Navy League, encouraged by its success, now redoubled its exertions and demanded that the whole programme should be completed by 1912 instead of 1917. Bebel denounced this agitation as obviously directed against England; and the government thought it expedient to disavow the action of its too zealous allies. A telegram addressed by the emperor William to the presidents of the League, Generals Keim and Menges, led to

Naval progress.

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their resignation; but the effect of this was largely counteracted by the presence of Prince Henry of Prussia and the king of Württemberg at the annual congress of the League at Stuttgart in May, while at the Colonial Congress in the autumn the necessity for a powerful navy was again one of the main themes of discussion. That the government was, in fact, at one with the League as to the expediency of pushing on the naval programme was proved by the revelations of the first lord of the admiralty, Mr McKenna, in the debate on the naval estimates in the British parliament of 1909. From these it was clear that the German government had for some time past been pressing on its naval armaments with little regard to the ostensible programme, and that in the matter of the newest types of battleships, Great Britain had to reckon with the fact that, before the date fixed for the completion of the programme, Germany might establish at least an equality.

Foreign policy.

The same determined spirit which characterized German naval policy was evident also in her relations with the other powers. The suspicions as to the stability of the Triple Alliance produced, indeed, for some years a kind of nervousness in the attitude of the government, whose determination to assert for Germany a leading international rôle tended to isolate her in Europe. This nervousness was, in 1903 and 1904, especially evident in the efforts to weaken the Franco-Russian alliance by the policy of what Bebel denounced as Germany "crawling on her stomach before Russia." Germany not only backed up Russian policy in the East, and at the outbreak of the Russo-Japanese War took up towards her an attitude of more than benevolent neutrality, but the cabinets of Berlin and St Petersburg entered into an agreement under which political offenders against either government were to be treated as traitors to both. This arrangement, which made the Prussian police the active allies of the Third Section in the persecution of political suspects, created vast indignation among all shades of Liberal opinion in Germany, an indignation which culminated with the famous Königsberg trial.

The Königsberg trial.

This was a prosecution of nine German subjects for sedition, conspiracy and *lèse-majesté* against the Russian emperor, and for the circulation of books and pamphlets attacking him and his government. The defendants were poor smugglers from the Esthonian border marshes, who in the course of their ordinary avocations had carried bales of revolutionary tracts into Russia without troubling as to their contents. The trial, which took place in July 1904, excited widespread attention. The prosecution was conducted with all the force of the government; the defence was undertaken by some of the most brilliant Liberal advocates of Germany and developed in effect into an elaborate indictment, supported by a great weight of first-hand evidence, of the iniquities of the Russian régime. The verdict of the court was a serious rebuff for the government; after a preliminary investigation of nine months, and a public trial of a fortnight, the major charges against the prisoners were dismissed, and six of them were condemned only to short terms of imprisonment for conspiracy.

The progress of the Russo-Japanese War, however, soon relieved Germany of all anxiety as to the safety of her eastern frontiers, and produced a corresponding change in her attitude. The Russian disasters in Manchuria at the beginning of 1905 were followed by an extraordinary demonstration of the emperor William's ideas as to "the world-wide dominion of the Hohenzollerns," in a sort of imperial progress in the East, made for the purpose of impressing the Mahommedan world with the power of Germany. In 1904 the German attitude towards Great Britain had been in the highest degree conciliatory; the Anglo-French agreement as to Egypt was agreed to at Berlin; a visit of King Edward VII. to Kiel was reciprocated by that of the German squadron to Plymouth; in July a treaty of arbitration was signed between the two countries, while in the Reichstag the chancellor declared that, Germany's interests in Morocco being purely commercial, the understanding between France and England as to that country, embodied in the convention of the 8th of April 1904, did not immediately concern her. This attitude was now changed. On the 31st of March 1905 the emperor William landed at Tangier, and is reported on this occasion to have used language which in effect amounted to a promise to support the sultan of Morocco in resisting French control. His visit to the Holy Land and the solemn pilgrimage to Jerusalem were, in the same way, a striking *coup de théâtre* designed to strengthen the influence won by Germany in the councils of the Ottoman empire, an influence which she had been careful not to weaken by taking too active a part in the concert of the powers engaged in pressing on the question of Macedonian reform.

Meanwhile pressure was being put upon France to admit the German claim to a voice in the affairs of North Africa, a claim fortified by the mission of Count von Tattenbach, German minister at Lisbon, to Fez for the purpose of securing from the sherifian government special privileges for Germany. This aggressive policy was firmly resisted by M. Delcassé, the French minister of foreign affairs, and for a while war seemed to be inevitable. At Berlin powerful influences, notably that of Herr von Holstein—that mysterious omnipotence behind the throne—were working for this end; the crippling of Russia seemed too favourable an opportunity to be neglected for crushing the menace of French armaments. That an actual threat of war was conveyed to the French government (through the German ambassador at Rome, it is said) there can be no doubt. That war was prevented was due partly to the timidity of French ministers, partly to the fact that at the last moment Herr von Holstein shrank from the responsibility of pressing his arguments to a practical conclusion. The price of peace, however, was the resignation of M. Delcassé, who had been prepared to maintain a bold front. Germany had perhaps missed an opportunity for putting an end for ever to the rivalry of France; but she had inflicted a humiliation on her rival, and proved her capacity to make her voice heard in the councils of Europe.[1] The proceedings of the conference of Algeciras (see MOROCCO) emphasized the restored confidence of Germany in her international position. It was notably the part played by Austria in supporting the German point of view throughout at the conference that strengthened the position of Germany in Europe, by drawing closer the bonds of sympathy between the two empires. How strong this position had become was demonstrated during the crisis that arose after the revolution in Turkey and the annexation of Bosnia and Herzegovina by Austria in October 1908. The complete triumph of Baron von Aehrenthal's policy, in the face of the opposition of most of the European powers, was due to German support, and Germany suddenly appeared as the arbiter of the affairs of the European continent (see EUROPE: *History*). German nervousness, which had seen British intrigues everywhere, and suspected in the beneficent activities of King Edward VII. a Machiavellian plan for isolating Germany and surrounding her with a net of hostile forces, gave way to a spirit of confidence which could afford to laugh at the terror of Germany which, to judge from the sensational reports of certain popular British journals, had seized upon Great Britain.

Internal difficulties.

The great position gained by the German empire in these years was won in the face of great and increasing internal difficulties. These difficulties were, in the main, the outcome of the peculiar constitution of the empire, of the singular compromise which it represented between the traditional medieval polity and the organization of a modern state, and of the conflicts of ideals and of interests to which this gave rise; these being complicated by the masterful personality of the emperor William, and his tendency to confuse his position as German emperor by the will of the princes with his position as king of Prussia by the grace of God.

In general, Germany had passed since the war through a social and economic revolution similar to that undergone by Great Britain during the earlier half of the 19th century, though on a greater scale and at a much accelerated pace. A country

[1] The elevation of Count Bülow to the rank of prince immediately after the crisis was significantly compared with the same honour bestowed on Bismarck at Versailles in 1871.

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mainly agricultural, and in parts purely feudal, was changed into one of vast industries and of great concentrations of population; and for the ferment created by this change there was no such safety-valve in the representative system as had existed in England since the Reform Bill. In spite of the election of the Reichstag by manhood suffrage, there existed, as Count Bülow pointed out in 1904, no real parliamentary system in Germany, and "owing to the economic, political, social and religious structure of the nation" there could never be one. Of the numerous groups composing the German parliament no one ever secured a majority, and in the absence of such a majority the imperial government, practically independent of parliament, knew how to secure its assent to its measures by a process of bargaining with each group in turn. This system had curious and very far-reaching results. The only group which stood outside it, in avowed hostility to the whole principle on which the constitution was based, was that of the Social Democrats, "the only great party in Germany which," so the veteran Mommsen declared in 1901, "has any claim to political respect." The consequence was the rapid extension and widening of the chasm that divided the German people. The mass of the working-class population in the Protestant parts of Germany belonged to the Social Democracy, an inclusive term covering variations of opinion from the doctrinaire system of Marx to a degree of Radicalism which in England would not be considered a bar to a peerage. To make head against this, openly denounced by the emperor himself as a treasonable movement, the government was from time to time forced to make concessions to the various groups which placed their sectional interests in the forefront of their programmes. To conciliate the Catholic Centre party, numerically the strongest of all, various concessions were from time to time made to the Roman Catholic Church, *e.g.* the repeal in 1904 of the clause of the Anti-Jesuit Law forbidding the settlement of individual members of the order in Germany. The Conservative Agrarians were conciliated by a series of tariff acts placing heavy duties on the importation of agricultural produce and exempting from duty agricultural implements.

The first of these tariffs, which in order to overcome Socialist obstruction was passed *en bloc* on December 13-14, 1902, led to an alarming alteration in the balance of parties in the new Reichstag of 1903, the Socialists—who had previously numbered 58—winning 81 seats, a gain of 23. Of the other groups only one, and that hostile to the government—the Poles—had gained a seat. This startling victory of the Social Democracy, though to a certain extent discounted by the dissensions between the two wings of the party which were revealed at the congress at Dresden in the same year, was in the highest degree disconcerting to the government; but in the actual manipulation of the Reichstag it facilitated the work of the chancellor by enabling him to unite the other groups more readily against the common enemy. The most striking effect of the development of this antagonism was the gradual disappearance as a factor in politics of the Liberals, the chief builders of the Empire. Their part henceforth was to vote blindly with the Conservative groups, in a common fear of the Social Democracy, or to indulge in protests, futile because backed by no power inside or outside the parliament; their impotence was equally revealed when in December 1902 they voted with the Agrarians for the tariff, and in May 1909 when they withdrew in dudgeon from the new tariff committee, and allowed the reactionary elements a free hand. The political struggle of the future lay between the Conservative and Clerical elements in the state, alike powerful forces, and the organized power of the Social Democracy. In the elections of 1907, indeed, the Social Democratic party, owing to the unparalleled exertion of the government, had a set-back, its representation in parliament sinking to 43; but at the International Socialist Congress, which met at Stuttgart on the 18th of August, Herr Bebel was able to point out that, in spite of its defeat at the polls, the Socialist cause had actually gained strength in the country, their total poll having increased from 3,010,771 in 1903 to 3,250,000.

Social Democracy.

In addition to the political strife and anxiety due to this fundamental cleavage within the nation, Germany was troubled during the first decade of the 20th century by friction and jealousies arising out of the federal constitution of the Empire and the preponderant place in it of Prussia. In the work of pressing on the national and international expansion of Germany the interests and views of the lesser constituent states of the Empire were apt to be overlooked or overridden; and in the southern states there was considerable resentment at the unitarian tendency of the north, which seemed to aim at imposing the Prussian model on the whole nation. This resentment was especially conspicuous in Bavaria, which clings more tenaciously than the other states to its separate traditions. When, on the 1st of April 1902, a new stamp, with the superscription "Deutsches Reich," was issued for the Empire, including Württemberg, Bavaria refused to accept it, retaining the stamp with the Bavarian lion, thus emphasizing her determination to retain her separate postal establishment. On the 23rd of October 1903 Baron Podevils, the new premier, addressing the Bavarian diet, declared that his government "would combat with all its strength" any tendency to assure the future of the Empire on any lines other than the federative basis laid down in the imperial constitution.

Prussia and the Empire.

This protest was the direct outcome of an instance of the tendency of the emperor to interfere in the affairs of the various governments of the Empire. In 1902 the Clerical majority in the Bavarian diet had refused to vote £20,000 asked by the government for art purposes, whereupon the emperor had telegraphed expressing his indignation and offering to give the money himself, an offer that was politely declined. Another instance of the emperor's interference, constitutionally of more importance as directly affecting the rights of the German sovereigns, was in the question of the succession to the principality of Lippe (see LIPPE). The impulsive character of the emperor, which led him, with the best intentions and often with excellent effect, to interfere everywhere and in everything and to utter opinions often highly inconvenient to his ministers, was the subject of an interpellation in the Reichstag on the 20th of January 1903 by the Socialist Herr von Vollmar, himself a Bavarian. Count Bülow, in answer to his criticisms, declared that "the German people desired, not a shadow, but an emperor of flesh and blood." None the less, the continued "indiscretions" of the emperor so incensed public opinion that, five years later, the chancellor himself was forced to side with it in obtaining from the emperor an undertaking to submit all his public utterances previously to his ministers for approval (see WILLIAM II., German emperor).

Personal intervention of the emperor.

Meanwhile, the attempt to complete the Germanization of the frontier provinces of the Empire by conciliation or repression continued. In this respect progress was made especially in Alsace-Lorraine. In May 1902, in return for the money granted by the *Reichsländer* for the restoration of the imperial castle of Hohekönigsburg in the Vosges, the emperor promised to abolish the *Diktaturparagraphen*; the proposal was accepted by the Reichstag, and the exceptional laws relating to Alsace-Lorraine were repealed. Less happy were the efforts of the Prussian government at the Germanization of Prussian Poland and Schleswig. In the former, in spite of, or perhaps because of, the attempt to crush the Polish language and spirit, the Polish element continuously increased, reinforced by immigrants from across the frontier; in the latter the Danish language more than held its own, for similar reasons, but the treaty signed on the 11th of January 1907 between Prussia and Denmark, as to the status of the Danish "optants" in the duchies, removed the worst grievance from which the province was suffering (see SCHLESWIG-HOLSTEIN QUESTION).

The non-German nationalities.

Of more serious import were the yearly and increasing deficits in the imperial budget, and the consequent enormous growth of the debt. This was partly due to the commercial and industrial depression of the early years of the century, partly was another outcome of the federal constitution, which made it difficult to

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adjust the budget to the growing needs of the Empire without disarranging the finances of its constituent states. The crisis became acute when the estimates for the year 1909 showed that some £25,000,000 would have to be raised by additional taxes, largely to meet the cost of the expanded naval programme. The budget presented to the Reichstag by Prince Bülow, which laid new burdens upon the landed and capitalist classes, was fiercely opposed by the Agrarians, and led to the break-up of the Liberal-Conservative *bloc* on whose support the chancellor had relied since the elections of 1906. The budget was torn to pieces in the committee selected to report on it; the Liberal members, after a vain protest, seceded; and the Conservative majority had a free hand to amend it in accordance with their views. In the long and acrimonious debates that followed in the Reichstag itself the strange spectacle was presented of the chancellor fighting a coalition of the Conservatives and the Catholic Centre with the aid of the Socialists and Liberals. The contest was from the first hopeless, and, but for the personal request of the emperor that he would pilot the Finance Bill through the House in some shape or other, Prince Bülow would have resigned early in the year. So soon as the budget was passed he once more tendered his resignation, and on the 14th of July a special edition of the *Imperial Gazette* announced that it had been accepted by the emperor. The post of imperial chancellor was at the same time conferred on Theobald von Bethmann-Hollweg, the imperial secretary of state for the interior.[1] (W. A. P.)

Resignation of Prince von Bülow.

Bibliography of German History.—Although the authorities for the history of Germany may be said to begin with Caesar, it is Tacitus who is especially useful, his *Germania* being an invaluable mine of information about the early inhabitants of the country. In the dark and disordered centuries which followed there are only a few scanty notices of the Germans, mainly in the works of foreign writers like Gregory of Tours and Jordanes; and then the 8th and 9th centuries, the time of the revival of learning which is associated with the name of Charlemagne, is reached. By the end of this period Christianity had been firmly established among most of the German tribes; the monks were the trustees of the new learning, and we must look mainly, although not exclusively, to the monasteries for our authorities. The work of the monks generally took the form of *Annales* or *Chronica*, and among the numerous German monasteries which are famous in this connexion may be mentioned Fulda, Reichenau, St Gall and Lorsch. For contemporary history and also for the century or so which preceded the lifetimes of their authors these writings are fairly trustworthy, but beyond this they are little more than collections of legends. There are also a large number of lives of saints and churchmen, in which the legendary element is still more conspicuous.

With regard to the *Annales* and *Chronica* three important considerations must be mentioned. They are local, they are monastic, and they are partisan. The writer in the Saxon abbey of Corvey, or in the Franconian abbey of Fulda, knows only about events which happened near his own doors; he records, it is true, occurrences which rumour has brought to his ears, but in general he is trustworthy only for the history of his own neighbourhood. The Saxon and the Franconian annalists know nothing of the distant Bavarians; there is even a gulf between the Bavarian and the Swabian. Then the Annals are monastic. To their writers the affairs of the great world are of less importance than those of the monastery itself. The Saxon Widukind, for instance, gives more space to the tale of the martyrdom of St Vitus than he does to several of the important campaigns of Henry the Fowler. Lastly, the annalist is a partisan. One is concerned to glorify at all costs the Carolingian house; another sacrifices almost everything to attack the emperor Henry IV. and to defend the Papacy; while a third holds a brief for some king or emperor, like Louis the Pious or Otto the Great.

Two difficulties are met with in giving an account of the sources of German history. In the 7th, 8th and 9th centuries it is hard, if not impossible, to disentangle the history of Germany from that of the rest of the Frankish empire of which it formed part; in fact it is not until the time of the dissensions between the sons of the emperor Louis I. that there are any signs of demarcation between the East and the West Franks, or, in other words, any separate history of Germany. The second difficulty arises later and is due to the connexion of Germany with the Empire. Germany was always the great pillar of the imperial power; for several centuries it was the Empire in everything but in name, and yet its political history is often overshadowed by the glamour of events in Italy. While the chroniclers were recording the deeds of Frederick I. and of Frederick II. in the peninsula, the domestic history of Germany remained to a large extent unwritten.

Among the early German chroniclers the Saxon Widukind, the author of the *Res gestae Saxonicae*, is worthy of mention. He was a monk of Corvey, and his work is the best authority for the early history of Saxony. Lambert, a monk of Hersfeld, and Widukind's countryman, Bruno, in his *De bello Saxonico*, tell the story of the great contest between the emperor Henry IV. and Pope Gregory VII., with special reference to the Saxon part of the struggle. But perhaps the ablest and the most serviceable of these early writers is Otto of Freising, a member of the Babenberg family. Otto was also related to the great house of Hohenstaufen, a relationship which gave him access to sources of information usually withheld from the ordinary monastic annalist, and his work is very valuable for the earlier part of the career of Frederick I. Something is learned, too, from biographies written by the monks, of which Einhard's *Vita Karoli Magni* is the greatest and the best, and Wipo's life of the emperor Conrad II. is valuable, while another Carolingian courtier, Nithard, has a special interest as, almost alone among these early chroniclers, being a soldier and not a monk.

The monastic writers remain our chief authorities until the great change brought about by the invention of printing, although a certain amount of work was done by clerical writers attached to the courts of various rulers. Parallel with this event the revival of learning was producing a great number of men who could write, and, more important still, of men who were throwing off the monastic habits of thought and passing into a new intellectual atmosphere. The Renaissance was followed by the fierce controversies aroused by the Reformation, and the result was the output of an enormous mass of writings covering every phase of the mighty combat and possessing every literary virtue save that of impartiality. But apart from these polemical writings, many of which had only an ephemeral value, the Renaissance was the source of another stream of historical literature. Several princes and other leading personages, foremost among whom was the emperor Maximilian I., had spent a good deal of time and money in collecting the manuscripts of the medieval chroniclers, and these now began to be printed. The chronicle of Otto of Freising, which appeared in 1515, and the *Vita* of Einhard, which appeared six years later, are only two among the many printed at this time. The publication of collections of chronicles began in 1529, and the uncritical fashion in which these were reproduced made forgeries easy and frequent. There was, indeed, more than a zeal for pure learning behind this new movement; for both parties in the great religious controversy of the time used these records of the past as a storehouse of weapons of offence. The Protestants eagerly sought out the writings which exposed and denounced the arrogance of the

[1] He was born on November 29, 1856, the son of a wealthy Rhenish landowner, and grandson of Moritz August von Bethmann-Hollweg (1795–1877), professor of law at Bonn, ennobled in 1840, and from 1858 to 1862 minister of education and religion at Berlin. Herr von Bethmann-Hollweg studied law at Strassburg, Leipzig and Berlin, entered the Prussian civil service in 1882, and, passing successfully through the various stages of a German administrative career, became governor (Oberpräsident) of the province of Brandenburg in 1899. In 1905 he became Prussian minister of the interior. Two years later he succeeded Count Posadowsky as imperial secretary of state for the interior and representative of the imperial chancellor, and was at the same time made vice-president of the council of Prussian ministers, an office and title which had been in abeyance for some years and were now again suppressed.

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popes, while the Romanists attempted to counter them with the numerous lives of the saints.

But before the raw material of history thus began to increase enormously in bulk, it had already begun to change its character and to assume its modern form. The *Chronicle* still survived as a medium of conveying information, though more often than not this was now written by a layman; but new stores of information were coming into existence, or rather the old stores were expanding and taking a different form. Very roughly these may be divided into six sections. (1) Official documents issued by the emperors and other German rulers. (2) Treaties concluded between Germany and other powers and also between one German state and another. (3) Despatches sent to England, Spain and other countries by their representatives in various parts of Germany. (4) Controversial writings or treatises written to attack or defend a given position, largely the product of the Reformation period. (5) The correspondence of eminent and observant persons. (6) An enormous mass of personal impressions taking the form of Commentaries, Memoirs and Diaries (*Tagebücher*). Moreover, important personages still find eulogistic biographers and defenders, *e.g.* the fanciful writings about the emperor Maximilian I. or Pufendorf's *De rebus gestis Friderici Wilhelmi Magni electoris Brandenburgici*.

Through the dust aroused by the great Reformation controversy appear the dim beginnings of the scientific spirit in the writing of history, and in this connexion the name of Aventinus, "the Bavarian Herodotus," may be mentioned. But for many years hardly any progress was made in this direction. Even if they possessed the requisite qualifications the historiographers attached to the courts of the emperor Charles V. and of lesser potentates could not afford to be impartial. Thus new histories were written and old ones unearthed, collected and printed, but no attempt was made to criticize and collate the manuscripts of the past, or to present two sides of a question in the writings of the present. Among the collections of authorities made during the 16th and 17th centuries those of J. Pistorius (Frankfort, 1583–1607), of E. Lindenbrog (Frankfort, 1609) and of M. Freher (Frankfort, 1600–1611), may be noticed, although these were only put together and printed in the most haphazard and unconnected fashion. Passing thus through these two centuries we reach the beginning of the 18th century and the work done for German historical scholarship by the philosopher Leibnitz, who sought to do for his own country what Muratori was doing for Italy. For some years it had been recognized that the collection and arrangement of the authorities for German history was too great an undertaking for any one man, and societies under very influential patronage were founded for this purpose. But very slight results attended these elaborate schemes, although their failure did not deter Leibnitz from pursuing the same end. The two chief collections which were issued by the philosopher are the *Accessiones historicae* (1698–1700) and the *Scriptores rerum Brunsvicensium*; the latter of these, containing documents centring round the history of the Welf family, was published in three volumes at Hanover (1707–1711). Leibnitz worked at another collection, the *Origines Guelficae*, which was completed and issued by his pupils (Hanover, 1750–1780), and also at *Annales imperii occidentis Brunsvicenses*, which, although the most valuable collection of the kind yet made, was not published until edited by G. H. Pertz (Hanover, 1843–1846). Other collections followed those of Leibnitz, among which may be mentioned the *Corpus historicum medii aevi* of J. G. Eccard (Leipzig, 1723) and the *Scriptores rerum Germanicarum* of J. B. Mencke (Leipzig, 1728). But these collections are merely heaps of historical material, good and bad; the documents therein were not examined and they are now quite superseded. They give, however, evidence of the great industry of their authors, and are the foundations upon which modern German scholarship has built.

In the 19th century the scientific spirit received a great impetus from the German system of education, one feature of which was that the universities began to require original work for some of their degrees. In this field of scientific research the Germans were the pioneers, and in it they are still pre-eminent, with Ranke as their most famous name and the *Monumenta Germaniae historica* as their greatest production. The *Monumenta* is a critical and ordered collection of documents relating to the history of Germany between 500 and 1500. It owes its origin mainly to the efforts of the statesman Stein, who was responsible for the foundation of the *Gesellschaft für ältere deutsche Geschichtskunde*, under the auspices of which the work was begun. The *Gesellschaft* was established in 1819, and, the editorial work having been entrusted to G. H. Pertz, the first volume of the *Monumenta* was published in 1826. The work was divided into five sections: *Scriptores*, *Leges*, *Diplomata*, *Epistolae* and *Antiquitates*, but it was many years before anything was done with regard to the two last-named sections. In the three remaining ones, however, folio volumes were published regularly, and by 1909 thirty folio volumes of *Scriptores*, five of *Leges* and one of *Diplomata imperii* had appeared. But meanwhile a change of organization had taken place. When Pertz resigned his editorial position in 1874 and the *Gesellschaft* was dissolved, twenty-four folio volumes had been published. The Prussian Academy of Sciences now made itself responsible for the continuance of the work, and a board of direction was appointed, the presidents of which were successively G. Waitz, W. Wattenbach, E. Dümmler and O. Holder-Egger. Soon afterwards as money became more plentiful the scope of work was extended; the production of the folio volumes continued, but the five sections were subdivided and in each of these a series of quarto volumes was issued. The titles of these new sections give a sufficient idea of their contents. The *Scriptores* are divided into *Auctores antiquissimi*, *Scriptores rerum Merovingicarum*, *Scriptores rerum Langobardicarum et Italicarum*, *Libelli de lite imperatorum et pontificum*, *Gesta pontificum Romanorum* and *Deutsche Chroniken*, or *Scriptores qui vernacula lingua usi sunt*. The *Leges* are divided into *Leges nationum Germanicarum*, *Capitularia regum Francorum*, *Concilia*, *Constitutiones imperatorum et regum* and *Formulae*. Three quarto volumes of *Diplomata regum et imperatorum Germaniae* and one of *Diplomata Karolingorum* had been published by 1909. Work was also begun upon the *Antiquitates* and the *Epistolae*. The sections of the former are *Poëtae Latini medii aevi*, *Libri confraternitatum* and *Necrologia Germaniae*, and of the latter *Epistolae saeculi XIII.* and *Epistolae Merovingici et Karolini aevi*. Meanwhile the publication of the *Scriptores* proper continues, although the thirty-first and subsequent volumes are in quarto and not in folio, and the number of volumes in the whole undertaking is continually being increased. The archives of the *Gesellschaft* have been published in twelve volumes, and a large number of volumes of the *Neues Archiv* have appeared. Some of the MSS. have been printed in facsimile, and an index to the *Monumenta*, edited by O. Holder-Egger and K. Zeumer, appeared in 1890. The writings of the more important chroniclers have been published separately, and many of them have been translated into German.

It will thus be seen that the ground covered by the *Monumenta* is enormous. The volumes of the *Scriptores* contain not only the domestic chroniclers, but also selections from the work of foreign writers who give information about the history of Germany—for example, the Englishman Matthew Paris. In the main these writings are arranged in chronological order. Each has been edited by an expert, and the various introductions give evidence of the number of MSS. collated and the great pains taken to ensure textual accuracy on the part of the different editors, among whom may be mentioned Mommsen and Lappenberg. Other great names in German historical scholarship have also assisted in this work. In addition to Waitz the *Leges* section has enjoyed the services of F. Bluhme and of H. Brunner, and the *Diplomata* section of T. Sickel, H. Bresslau and E. Mühlbacher.

The progress of the *Monumenta* stimulated the production of other works of a like nature, and among the smaller collections of authorities which appeared during the 19th century two are worthy of mention. These are the *Fontes rerum Germanicarum*, edited by J. F. Böhmer (Stuttgart, 1843–1868), a collection of sources of the 12th, 13th and 14th centuries, and the *Bibliotheca*

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rum Germanicarum, edited by Ph. Jaffé (Berlin, 1864–1873). Another development followed the production of the *Monumenta*; this being the establishment in most of the German states of societies the object of which was to foster the study of local history. Reference may be made to a *Verein* for this purpose in Saxony and to others in Silesia and in Mecklenburg. Much has also been done in Prussia, in Brandenburg, in Bavaria, in Hanover, in Württemberg and in Baden, and collections of authorities have been made by competent scholars, of which the *Geschichtsquellen der Provinz Sachsen und angrenzender Gebiete* (Halle, 1870, fol.), which extends to forty volumes, the smaller *Scriptores rerum Prussicarum* (Leipzig, 1861–1874), and the seventy-seven volumes of the *Publikationen aus den königlichen preussischen Staatsarchiven, veranlasst und unterstützt durch die königliche Archiververwaltung* (Leipzig, 1878, fol.), may be cited as examples. The cities have followed the same path and their archives are being thoroughly examined. In 1876 an *Urkundenbuch* of Frankfort was published, and this example has been widely followed, the work done in Cologne, in Bremen and in Mainz being perhaps specially noticeable. Moreover an historical commission at Munich has published twenty-eight volumes in the series *Die Chroniken der deutschen Städte vom 14. bis ins 16. Jahrhundert* (Leipzig, 1862, fol.). Lastly, many documents relating to the great families of Germany, among them those of Hohenzollern and of Wittelsbach, have been carefully edited and given to the world.

With this great mass of material collected, sifted and edited by scholars of the highest standing it is not surprising that modern works on the history of Germany are stupendous in number and are generally of profound learning, and this in spite of the fact that some German historians—Gregorovius, Pauli and Lappenberg, for example—have devoted their time to researches into the history of foreign lands.

The earliest period is dealt with by K. Zeuss in *Die Deutschen und die Nachbarstämme* (Munich, 1837; new ed., Göttingen, 1904); and then by F. Dahn in his *Urgeschichte der germanischen und romanischen Völker* (Berlin, 1880–1889) and his *Die Könige der Germanen*, volumes of which have appeared at intervals between 1861 and 1909.

The Carolingian time is covered by E. Dümmler in *Geschichte des ostfränkischen Reichs* (Leipzig, 1887–1888), and then follow Ranke's *Jahrbücher des deutschen Reichs unter dem sachsischen Hause* (Berlin, 1837–1840), W. von Giesebrecht's *Geschichte der deutschen Kaiserzeit* (1855–1888), and F. Kaumer's *Geschichte der Hohenstaufen*.

For the reigns of Lothair the Saxon and Conrad III. P. Jaffé's books, *Geschichte des deutschen Reiches unter Lothar dem Sachsen* (Berlin, 1843) and *Geschichte des deutschen Reiches unter Conrad III.* (Hanover, 1845), may be consulted.

The chief histories on the period between the fall of the Hohenstaufen and the Renaissance are: T. Lindner, *Deutsche Geschichte unter den Habsburgern und Luxemburgern* (Stuttgart, 1888–1893); O. Lorenz, *Deutsche Geschichte im 13. und 14. Jahrhundert* (Vienna, 1863–1867); J. Aschbach, *Geschichte Kaiser Sigmunds* (Hamburg, 1838–1845); K. Fischer, *Deutsches Leben und deutsche Zustände vor dem Hohenstaufischen Interregnum* (Leipzig, 1861–1863); V. von Kraus, *Deutsche Geschichte im Ausgange des Mittelalters* (Stuttgart, 1888–1905), and A. Bachmann, *Deutsche Reichsgeschichte im Zeitalter Friedrichs III. und Maximilians I.* (Leipzig, 1884–1894).

The two greatest works on the Reformation period are L. von Ranke's *Deutsche Geschichte im Zeitalter der Reformation* (Leipzig, 1882) and J. Janssen's *Geschichte des deutschen Volkes seit dem Ausgang des Mittelalters* (1897–1903). Other works which may be mentioned are: F. B. von Mehrfeld, *Geschichte der Regierung Ferdinands I.* (Vienna, 1831–1838); C. Egelhaaf, *Deutsche Geschichte im Zeitalter der Reformation* (Berlin, 1893), and F. von Bezold, *Geschichte der deutschen Reformation* (Berlin, 1890).

For the years after the Reformation we have Ranke, *Zur deutschen Geschichte—Vom Religionsfrieden bis zum 30jährigen Kriege* (Leipzig, 1888); M. Ritter, *Deutsche Geschichte im Zeitalter der Gegenreformation und des dreissigjährigen Krieges* (Stuttgart, 1887, fol.); G. Droysen, *Geschichte der Gegenreformation* (Berlin, 1893), and Gindely, *Rudolf II. und seine Zeit* (Prague, 1862–1868) and *Geschichte des dreissigjährigen Krieges* (Prague, 1869–1880). Gindely's book is, of course, only one among an enormous number of works on the Thirty Years' War.

For the period leading up to the time of Frederick the Great we have B. Erdmannsdörffer, *Deutsche Geschichte vom Westfälischen Frieden bis zum Regierungsantritt Friedrichs des Grossen* (Berlin, 1892–1893); and then follow Ranke, *Zur Geschichte von Österreich und Preussen zwischen den Friedentschlüssen von Aachen und Hubertusburg* (Leipzig, 1875) and *Die deutschen Mächte und der Fürstenbund* (Leipzig, 1871–1872); K. Biedermann, *Deutschland im 18. Jahrhundert* (Leipzig, 1854–1880); W. Oncken, *Das Zeitalter Friedrichs des Grossen* (Berlin, 1880–1882); A. von Arneth, *Geschichte Maria Theresias* (Vienna, 1863–1879); L. Häusser, *Deutsche Geschichte vom Tode Friedrichs des Grossen bis zur Gründung des Deutschen Bundes* (Berlin, 1861–1863), and K. T. von Heigel, *Deutsche Geschichte vom Tode Friedrichs des Grossen bis zur Auflösung des alten Reichs* (Stuttgart, 1899, fol.).

For the 19th century we may mention: H. von Treitschke, *Deutsche Geschichte im 19. Jahrhundert* (Leipzig, 1879–1894); H. von Sybel, *Die Begründung des deutschen Reiches durch Wilhelm I.* (Munich, 1889–1894); G. Kaufmann, *Politische Geschichte Deutschlands im 19. Jahrhundert* (Berlin, 1902), and H. von Zwiedeneck-Südenhorst, *Deutsche Geschichte von der Auflösung des alten bis zur Gründung des neuen Reiches* (Stuttgart, 1897–1905). These are perhaps the most important, but there are many others of which the following is a selection: K. Fischer, *Die Nation und der Bundestag* (Leipzig, 1880); K. Klüpfel, *Geschichte der deutschen Einheitsbestrebungen bis zu ihrer Erfüllung* (Berlin, 1872–1873); H. Blum, *Die deutsche Revolution 1848–1849* (Florence, 1897) and *Das deutsche Reich zur Zeit Bismarcks* (Leipzig, 1893); Max Schwarzkopf, *Gründung des deutschen Reiches* (Leipzig, 1892); H. Friedjung, *Der Kampf um die Vorherrschaft in Deutschland 1859–1866* (Stuttgart, 1897); C. von Kaltenborn, *Geschichte der deutschen Bundesverhältnisse und Einheitsbestrebungen von 1806–1856* (Berlin, 1857); J. Jastrow, *Geschichte des deutschen Einheitstraumes und seiner Erfüllung* (Berlin, 1885), and P. Klöppel, *Dreissig Jahre deutscher Verfassungsgeschichte* (Leipzig, 1900).

For the most recent developments of German politics see H. Schulthess, *Europäischer Geschichtskalender* (Nördlingen, 1861, fol., a work similar to the English *Annual Register*); W. Müller and K. Wippermann, *Politische Geschichte der Gegenwart* (Berlin, 1868, fol.); the *Statistisches Jahrbuch des deutschen Reichs* and A. L. Lowell, *Governments and Parties in Continental Europe* (1896).

A good general history of Germany is the *Bibliothek deutscher Geschichte*, edited by H. von Zwiedeneck-Südenhorst (Stuttgart, 1876, fol.). Other general histories, although on a smaller scale, are K. Lamprecht, *Deutsche Geschichte* (Berlin, 1891–1896); O. Kämmel, *Deutsche Geschichte* (Dresden, 1889); K. Biedermann, *Deutsche Volks- und Kulturgeschichte* (Breslauen, 1886); T. Lindner, *Geschichte des deutschen Volks* (Stuttgart, 1894); the *Handbuch der deutschen Geschichte*, edited by B. Gebhardt (Stuttgart, 1901), and K. W. Nitzsch, *Geschichte des deutschen Volkes bis zum Augsburger Religionsfrieden* (Leipzig, 1883–1885).

Special reference is deservedly made to three works of the highest value. These are J. G. Droysen's great *Geschichte der preussischen Politik* (Berlin, 1855–1886); the *Deutsche Reichstagsakten*, the first series of which was published at Munich in 1867, fol., and the second at Gotha (1893–1901); and the collection known as the *Regesta imperii*, which owes its existence to the labours of J. F. Böhmer. Nearly the whole of the period between 751 and 1347 is covered by these volumes; the charters and other documents of some of the German kings being edited by Böhmer himself, and new and enlarged editions of certain sections have been brought out by J. Ficker, E. Winkelmann and others. Much useful information on the history of different periods is contained in the lives of individual emperors and others. Among these are H. Prutz, *Kaiser Friedrich I.* (Danzig, 1871–1874); F. W. Schirrmacher, *Kaiser Friedrich II.* (Göttingen, 1859–1865); H. Ulmann, *Kaiser Maximilian I.* (Stuttgart, 1884–1891); E. von Furtenberg, *Geschichte Kaiser Karls V.* (Schaffhausen, 1857–1864), and H. Blum, *Fürst Bismarck und seine Zeit* (Munich, 1895). There is also the great series of volumes, primary and supplementary, forming the *Allgemeine deutsche Biographie* (Leipzig, 1875–1912), in which the word *deutsche* is interpreted in the widest possible sense.

Apart from political histories there are useful collections of laws and other official documents of importance, and also a large number of valuable works on the laws and constitutions of the Germans and on German institutions generally. Among the collections are M. Goldast, *Collectio constitutionum imperialium* (1613; new and enlarged edition, 1673); the *Capitulationes imperatorum et regum Romanorum* (Strasburg, 1628); the *Corpus juris Germanici* (1824), and the *Corpus juris Germanici antiqui* (Berlin, 1824) of F. Walter. Collections dealing with more recent history are J. C. Glaser's *Archiv des norddeutschen Bundes. Sammlung aller Gesetze, Verträge und Aktenstücke, die Verhältnisse des norddeutschen Bundes betreffend* (Berlin 1867); W. Jungermann's *Archiv des deutschen Reiches* (Berlin, 1873, fol.), and the *Acta Borussica. Denkmaler der preussischen Staatsverwaltung im 18. Jahrhundert* (Berlin, 1892, fol.). Mention may also be made of the collections of C. C. Hennyey's *Nachsiegespiegel* and L. A. von Lassberg's edition of the *Schwabenspiegel*; the many volumes of Wallenstein's letters and papers; the eighteen volumes of the *Urkunden und Aktenstücke zur Geschichte des Kurfürsten Friedrich Wilhelm von Brandenburg* (Berlin, 1864, fol.); and the thirty volumes of the *Politische Korrespondenz Friedrichs des Grossen* (Berlin, 1879–1905). Modern writers on these subjects distinguished for their learning are G. Waitz (*Deutsche Verfassungsgeschichte*, Kiel and Berlin, 1844, fol.) and C. L. von Maurer (*Geschichte der Städteverfassung in Deutschland*, Erlangen, 1869–1871, and other cognate writings), their works being valuable not only for the early institutions

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of the Germans, but also for those of other Teutonic peoples. Other works on the German constitution and German laws are K. F. Eichhorn, *Deutsche Staats- und Rechtsgeschichte* (Göttingen, 1843–1844); R. Schröder, *Lehrbuch der deutschen Rechtsgeschichte* (Leipzig, 1889 and again 1902); H. Brunner, *Deutsche Rechtsgeschichte* (Leipzig, 1887–1892), and *Grundzüge der deutschen Rechtsgeschichte* (Leipzig, 1901–1903), and E. Mayer, *Deutsche und französische Verfassungsgeschichte vom 9.–11. Jahrhundert* (Leipzig, 1899).

Manners and customs are dealt with in J. Scherr's *Deutsche Kulturund Sittengeschichte* (Leipzig, 1852–1853); L. Kippert's *Deutsche Sittengeschichte* (Vienna and Prague, 1889); O. Henne am Rhyn's *Kulturgeschichte des deutschen Volkes* (Berlin, 1886); the *Geschichte des deutschen Volkes und seiner Kultur im Mittelalter* (Leipzig, 1891–1898) of H. Gerdes, and J. Janssen's *Geschichte des deutschen Volkes im Mittelalter* (Munich, 1891–1894). Among the works on husbandry may be mentioned: K. Bücher, *Die Entstehung der Volkswirtschaft* (Tübingen, 1893); K. T. von Inama-Sternegg, *Deutsche Wirtschaftsgeschichte* (Leipzig, 1879–1901), and K. Lamprecht, *Deutsches Wirtschaftsleben im Mittelalter* (Leipzig, 1886). For antiquities see M. Heyne, *Fünf Bücher deutscher Hausaltertümer von den ältesten geschichtlichen Zeiten bis zum 16. Jahrhundert* (Leipzig, 1899–1903), and L. Landenschmit, *Handbuch der deutschen Altertumskunde* (Brunswick, 1880–1889). For the history of the German church see A. Hauck, *Kirchengeschichte Deutschlands* (Leipzig, 1887–1903); F. W. Rettberg, *Kirchengeschichte Deutschlands* (Göttingen, 1846–1848), and J. Friedrich, *Kirchengeschichte Deutschlands* (Bamberg, 1867–1869). For finance see K. D. Hüllmann, *Deutsche Finanzgeschichte des Mittelalters* (1805); for the administration of justice, O. Franklin, *Das Reichshofgericht im Mittelalter* (Weimar, 1867–1869), and A. Schäffel, *Die Entwickelung der Gerichtsverfassung in deutschen Territorien* (Stuttgart, 1872); for the towns and their people see J. Jastrow, *Die Volkszahl deutscher Städte zu Ende des Mittelalters und zu Beginn der Neuzeit* (Berlin, 1886); F. W. Barthold, *Geschichte der deutschen Städte und des deutschen Bürgertums* (Leipzig, 1850–1854), and K. Hegel, *Städte und Gilden der germanischen Völker im Mittelalter* (Leipzig, 1891); and for manufactures and commerce see J. Falke, *Die Geschichte des deutschen Handels* (Leipzig, 1859–1860); H. A. Mascher, *Das deutsche Gewerbewesen von der frühesten Zeit bis auf die Gegenwart* (Potsdam, 1866); F. W. Stahl, *Das deutsche Handwerk* (Giessen, 1874); the numerous writings on the history of the Hanseatic League and other works. The nobles and the other social classes have each their separate historians. Among these being C. F. F. von Strantz, *Geschichte des deutschen Adels* (Breslau, 1845), and K. H. Roth von Schreckenstein, *Die Ritterwürde und der Ritterstand* (Freiburg, 1866).

The Germans have produced some excellent historical atlases, among them K. von Spruner's *Historisch-geographischer Handatlas* (Gotha, 1853); a new edition of this by T. Menke called *Handatlas für die Geschichte des Mittelalters und der neueren Zeit* (Gotha, 1880), and G. Droysen's *Allgemein's Handatlas* (Bielefeld and Leipzig, 1886). The historical geography of Germany is dealt with in B. Knüll's *Historische Geographie Deutschlands im Mittelalter* (Breslau, 1903); in F. H. Müller's *Die deutschen Stämme und ihre Fürsten* (Hamburg, 1852), and in many other works referring to the different parts of the country.

English books on the history of Germany are not very numerous. There is a short *History of Germany* by James Sime (1874), another by E. F. Henderson (1902), and *A History of Germany 1715–1815* by W. C. T. Atkinson (1909). H. A. L. Fisher's *Medieval Empire* (1898) is very useful for the earlier period, and J. Bryce's *Holy Roman Empire* is indispensable. There is a translation of Janssen's *Geschichte* by M. A. Mitchell and A. M. Christie (1896–1905), and there are useful chapters in the different volumes of the *Cambridge Modern History*. Two English historians have distinguished themselves by their work on special periods: Carlyle with his *History of Friedrich II., called the Great* (1872–1873), and W. Robertson with his *History of the Reign of Charles V.* (1820). There is also E. Armstrong's *Charles V.* (London, 1902). Among German historical periodicals are the *Historische Zeitschrift*, long associated with the name of H. von Sybel, and the *Historisches Jahrbuch*.

In guides to the historical sources and to modern historical works Germany is well served. There is the *Quellenkunde der deutschen Geschichte* (Leipzig, 1906) of Dahlmann-Waitz, a most compendious volume, and the learned *Deutschlands Geschichtsquellen im Mittelalter* (Berlin, 1893–1894) of W. Wattenbach; A. Potthast's *Bibliotheca historica medii aevi* (Berlin, 1896), and the *Deutschlands Geschichtsquellen seit der Mitte des 13. Jahrhunderts* (Berlin, 1886–1887) of O. Lorenz and A. Goldmann.

GERMERSHEIM, a fortified town of Germany in Rhenish Bavaria, at the confluence of the Queich and the Rhine, 8 m. S.W. of Speyer. Pop. (1905) 5914. It possesses a Roman Catholic and an Evangelical church, a synagogue, a progymnasium and a hospital. The industries include fishing, shipbuilding and brewing. Germersheim existed as a Roman strongbold under the name of *Vicus Julius*. The citadel was rebuilt by the emperor Conrad II., but the town itself was founded in 1276 by the emperor Rudolph I., who granted it the rights of a free imperial city. From 1330 to 1622, when it was conquered by Austria, the town formed part of the Palatinate of the Rhine. From 1644 to 1650 it was in the possession of France; but on the conclusion of the peace of Westphalia it was again joined to the Palatinate. In 1674 it was captured and devastated by the French under Turenne, and after the death of the elector Charles (1685) it was claimed by the French as a dependency of Alsace. As a consequence there ensued the disastrous Germersheim war of succession, which lasted till the peace of Ryswick in 1697. Through the intervention of the pope in 1702, the French, on payment of a large sum, agreed to vacate the town, and in 1715 its fortifications were rebuilt. On the 3rd of July 1744 the French were defeated there by the imperial troops, and on the 19th and 22nd of July 1793 by the Austrians. In 1835 the new town was built, and the present fortifications begun.

See Probst, *Geschichte der Stadt und Festung Germersheim* (Speyer, 1898).

GERMISTON, a town of the Transvaal, 9 m. E. of Johannesburg. Pop. of the municipality (1904) 29,477, of whom 9123 were whites. It lies 5478 ft. above the sea, in the heart of the Witwatersrand gold-mining district, and is an important railway junction. The station, formerly called Elandsfontein Junction, is the meeting-point of lines from the ports of the Cape and Natal, and from Johannesburg, Pretoria and Delagoa Bay. Though possessing a separate municipality, Germiston is practically a suburb of Johannesburg (*q.v.*).

GERMONIUS, ANASTASIUS [ANASTASE GERMON] (1551–1627), canon lawyer, diplomatist and archbishop of Tarantaise, belonged to the family of the marquises of Ceve, in Piedmont, where he was born. As archdeacon at Turin he was a member of the commission appointed by Pope Clement VIII. to edit the *Liber septimus decretalium*; and he also wrote *Paratilla* on the five books of the *Decretals of Gregory IX.* He represented the duke of Savoy at the court of Rome under Clement VIII. and Paul V., and was ambassador to Spain under Kings Philip III. and IV. He died on the 4th of August 1627. Germonius is best known for his treatise on ambassadors, *De legatis principum et populorum libri tres* (Rome, 1627). The book is diffuse, pedantic and somewhat heavy in style, but valuable historically as written by a theorist who was also an expert man of affairs. (See DIPLOMACY.)

GERO (*c.* 900–965), margrave of the Saxon east mark, was probably a member of an influential Saxon family. In 937 he was entrusted by the German king Otto, afterwards the emperor Otto the Great, with the defence of the eastern frontier of Saxony against the Wends and other Slavonic tribes; a duty which he discharged with such ability and success that in a few years he extended the Saxon frontier almost to the Oder, and gained the chief credit for the suppression of a rising of the conquered peoples in a great victory on the 16th of October 955. In 963 he defeated the Lusatians, compelled the king of the Poles to recognize the supremacy of the German king, and extended the area of his mark so considerably that after his death it was partitioned into three, and later into five marks. Gero, who is said to have made a journey to Rome, died on the 20th of May 965, and was buried in the convent of Gernrode which he had founded on his Saxon estates. He is referred to by the historian Widukind as a *preses*, and is sometimes called the "great margrave." He has been accused of treachery and cruelty, is celebrated in song and story, and is mentioned as the "margrave Gêre" in the *Nibelungenlied*.

See Widukind, "Res gestae Saxonicae," in the *Monumenta Germaniae historica. Scriptores*, Band iii.; O. von Heinemann, *Markgraf Gero* (Brunswick, 1860).

GEROLSTEIN, a village and climatic health resort of Germany, in the Prussian Rhine Province, attractively situated on the Kyll, in the Eifel range, 1200 ft. above the sea, 58 m. W. of Andernach by rail, and at the junction of lines to Trèves and St Vith. The castle of Gerolstein, built in 1115 and now in ruins, affords a fine view of the Kyllthal. Gerolstein is celebrated for its lithia waters, which are largely exported. Pop. (1900) 1308.

GÉRÔME, JEAN LÉON (1824–1904), French painter, was born on the 11th of May 1824 at Vesoul (Haute-Saône). He went to Paris in 1841 and worked under Paul Delaroche, whom he

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accompanied to Italy (1844–1845). On his return he exhibited "The Cock-fight," which gained him a third-class medal in the Salon of 1847. "The Virgin with Christ and St John" and "Anacreon, Bacchus and Cupid" took a second-class medal in 1848. He exhibited "Bacchus and Love, Drunk," a "Greek Interior" and "Souvenir d'Italie," in 1851; "Paestum" (1852); and "An Idyll" (1853). In 1854 Gérôme made a journey to Turkey and the shores of the Danube, and in 1857 visited Egypt. To the exhibition of 1855 he contributed a "Pifferaro," a "Shepherd," "A Russian Concert" and a large historical canvas, "The Age of Augustus and the Birth of Christ." The last was somewhat confused in effect, but in recognition of its consummate ability the State purchased it. Gérôme's reputation was greatly enhanced at the Salon of 1857 by a collection of works of a more popular kind: the "Duel: after a Masquerade," "Egyptian Recruits crossing the Desert," "Memnon and Sesostris" and "Camels Watering," the drawing of which was criticized by Edmond About. In "Caesar" (1859) Gérôme tried to return to a severer class of work, but the picture failed to interest the public. "Phryne before the Areopagus," "Le Roi Candaule" and "Socrates finding Alcibiades in the House of Aspasia" (1861) gave rise to some scandal by reason of the subjects selected by the painter, and brought down on him the bitter attacks of Paul de Saint-Victor and Maxime Ducamp. At the same Salon he exhibited the "Egyptian chopping Straw," and "Rembrandt biting an Etching," two very minutely finished works. Gérôme's best paintings are of Eastern subjects; among these may be named the "Turkish Prisoner" and "Turkish Butcher" (1863); "Prayer" (1865); "The Slave Market" (1867); and "The Harem out Driving" (1869). He often illustrated history, as in "Louis XIV. and Molière" (1863); "The Reception of the Siamese Ambassadors at Fontainebleau" (1865); and the "Death of Marshal Ney" (1868). Gérôme was also successful as a sculptor; he executed, among other works, "Omphale" (1887), and the statue of the duc d'Aumale which stands in front of the château of Chantilly (1899). His "Bellona" (1892), in ivory, metal, and precious stones, which was also exhibited in the Royal Academy of London, attracted great attention. The artist then began an interesting series of "Conquerors," wrought in gold, silver and gems—"Bonaparte entering Cairo" (1897); "Tamerlane" (1898); and "Frederick the Great" (1899). Gérôme was elected member of the Institut in 1865. He died in 1904.

GERONA, a maritime frontier province in the extreme north-east of Spain, formed in 1833 of districts taken from Catalonia, and bounded on the N. by France, E. and S.E. by the Mediterranean Sea, S.W. and W. by Barcelona, and N.W. by Lérida. Pop. (1900) 209,287; area, 2262 sq. m. In the north-west a small section of the province, with the town of Llivia, is entirely isolated and surrounded by French territory; otherwise Gerona is separated from France by the great range of the Pyrenees. Its general aspect is mountainous, especially in the western districts. Most of the lower chains are covered with splendid forests of oak, pine and chestnut. There are comparatively level tracts of arable land along the lower course of the three main rivers—the Ter, Muga and Fluvia, which rise in the Pyrenees and flow in a south-easterly direction to the sea. The coast-line is not deeply indented, but includes one large bay, the Gulf of Rosas. Its two most conspicuous promontories, Capes Creus and Bagur, are the easternmost points of the Iberian Peninsula. The climate is generally temperate and rainy during several months in the valleys and near the coast, but cold in the Cerdaña district and other mountainous regions during eight months, while Gerona, La Bisbal and Santa Coloma are quite Mediterranean in their hot summers and mild winters. Agriculture is backward, but there are profitable fisheries and fish-curing establishments along the whole seaboard, notably at the ports of Llansá, Rosas, Palamós, San Feliu de Guixols and Blanes. Next in importance is the cork industry at San Feliu de Guixols, Palafrugell and Cassa. More than one hundred mineral springs are scattered over the province, and in 1903 twenty mines were at work, although their total output, which included antimony, coal, copper, lead, iron and other ores, was valued at less than £7000. There are also important hydraulic cement and ochre works, and no fewer than twenty-two of the towns are centres of manufactures of linen, cotton, woollen stuffs, paper, cloth, leather, steel and furniture. The commerce of the province is important, Port Bou (or Portbou) being, after Irun, the most active outlet for the trade by railway not only with France but with the rest of the continent. The main railway from Barcelona to France runs through the province, and several branch railways, besides steam and electric tramways, connect the principal towns. Gerona, the capital (pop. 1900, 15,787), and Figueras (10,714), long a most important frontier fortress, are described in separate articles; the only other towns with more than 7000 inhabitants are San Feliu de Guixols (11,333), Olot (7038) and Palafrugell (7087). The inhabitants of the province are, like most Catalans, distinguished for their enterprise, hardiness and keen local patriotism; but emigration, chiefly to Barcelona, kept their numbers almost stationary during the years 1875–1905. The percentage of illegitimate births (1·5) is lower than in any other part of Spain. (See also CATALONIA.)

GERONA, the capital of the province of Gerona, in north-eastern Spain, on the railway from Barcelona to Perpignan in France, and on the right bank of the river Ter, at its confluence with the Oña, a small right-hand tributary. Pop. (1900) 15,787. The older part of the town occupies the steep slope of the Montjuich, or Hill of the Capuchins, and with its old-fashioned buildings presents a picturesque appearance against a background of loftier heights; the newer portion stretches down into the plain and beyond the Oña, which is here crossed by a bridge of three arches. The old city walls and their bastions still remain, though in a dilapidated state; and the hill is crowned by what were at one time very strong fortifications, now used as a prison. Gerona is the seat of a bishop, has a seminary, a public library and a theatre, and carries on the manufacture of paper and cotton and woollen goods. Its churches are of exceptional interest. The cathedral is one of the grandest specimens of Gothic architecture in Spain, the nave being the widest pointed vault in Christendom, as it measures no less than 73 ft. from side to side, while Albi, the next in size, is only 58 ft., and Westminster Abbey is only 38. The old cathedral on the same site was used as a mosque by the Moors, and on their expulsion in 1015 it appears to have been very greatly modified, if not entirely rebuilt. During the 14th century new works were again carried out on an extensive scale, but it was not till the beginning of the 15th that the proposal to erect the present magnificent nave was originated by the master of the works, Guillermo Bofiy. The general appearance of the exterior is rather ungainly, but there is a fine approach by a flight of 86 steps to the façade, which rises in tiers and terminates in an oval rose-window. Among the tombs may be mentioned those of Bishop Berenger or Berenguer (d. 1408), Count Ramon Berenger II. (d. 1082) and the countess Ermesinda (d. 1057). The collegiate church of San Felfu (St Felix) is mainly of the 14th century, but it was considerably modified in the 16th, and its façade dates from the 18th. It is one of the few Spanish churches that can boast of a genuine spire, and it thus forms a striking feature in the general view of the town. The Benedictine church of San Pedro de Galligans (or de los Gallos) is an interesting Romanesque building of early date. It is named from the small river Galligans, an affluent of the Oña, which flows through the city. In the same neighbourhood is a small church worthy of notice as a rare Spanish example of a transverse triapsal plan.

Gerona is the ancient Gerunda, a city of the Auscetani. It claims to be the place in which St Paul and St James first rested when they came to Spain; and it became the see of a bishop about 247. For a considerable period it was in the hands of the Moors, and their emir, Suleiman, was in alliance with Pippin the Short, king of the Franks, about 759. It was taken by Charlemagne in 785; but the Moors regained and sacked it in 795, and it was not till 1015 that they were finally expelled. At a later date it gave the title of count to the king of Aragon's eldest son. It has been besieged no fewer than twenty-five times in all, and only four

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of the sieges have resulted in its capture. The investment by the French under Marshal Hocquincourt in 1653, that of 1684 by the French under Marshal Bellefonds, and the successful enterprise of Marshal Noailles in 1604 are the three great events of its history in the 17th century. Surrendered by the French at the peace of Ryswick, it was again captured by the younger Marshal Noailles in 1706, after a brilliant defence; and in 1717 it held out against the Austrians. But its noblest resistance was yet to be made. In May 1800 it was besieged by the French, with 35,000 troops, under J. A. Verdier, P. F. Augereau and Gouvion St Cyr; forty batteries were erected against it and a heavy bombardment maintained; but under the leadership of Mariano Alvarez de Castro it held out till famine and fever compelled a capitulation on the 12th of December. The French, it is said, had spent 20,000 bombs and 60,000 cannon balls, and their loss was estimated at 15,000 men.

See Juan Gaspar Roig y Jalpi, *Resumen de las Grandezas*, &c. (Barcelona, 1678); J. A. Nieto y Samaniego, *Memorias* (Tarragona, 1810); G. E. Street, *Gothic Architecture in Spain* (London, 1869).

GEROUSIA (Gr. γερουσία, Doric γερωία), the ancient council of elders at Sparta, corresponding in some of its functions to the Athenian Boulê. In historical times it numbered twenty-eight members, to whom were added *ex officio* the two kings and, later, the five ephors. Candidates must have passed their sixtieth year, *i.e.* they must no longer be liable to military service, and they were possibly restricted to the nobility. Vacancies were filled by the Apella, that candidate being declared elected whom the assembly acclaimed with the loudest shouts—a method which Aristotle censures as childish (*Polit.* ii. 9, p. 1271 a 9). Once elected, the *gerontes* held office for life and were irresponsible. The functions of the council were among the most important in the state. It prepared the business which was to be submitted to the Apella, and was empowered to set aside, in conjunction with the kings, any "crooked" decision of the people. Together with the kings and ephors it formed the supreme executive committee of the state, and it exercised also a considerable criminal and political jurisdiction, including the trial of kings; its competence extended to the infliction of a sentence of exile or even of death. These powers, or at least the greater part of them, were transferred by Cleomenes III. to a board of *patronomi* (Pausanias ii. 9. 1); the gerousia, however, continued to exist at least down to Hadrian's reign, consisting of twenty-three members annually elected, but eligible for re-election (*Sparta Museum Catalogue*, Nos. 210, 610, and Introduction § 17).

Fuller discussions of the gerousia will be found in Aristotle, *Politics*, ii. 9, 17-19; Plutarch, *Lycurgus*, 5, 26; G. F. Schömann, *Antiquities of Greece: The State* (Eng. trans.), p. 230 ff.; G. Gilbert, *Constitutional Antiquities of Sparta and Athens* (Eng. trans.), p. 49 ff.; C. O. Müller, *History and Antiquities of the Doric Race* (Eng. trans.), iii. c. 6, §§ 1-3; G. Busolt, *Die griechischen Staats- und Rechtsalterthümer* (Iwan Müller's *Handbuch der klassischen Alterthumswissenschaft*, iv. 1), § 89; *Griechische Geschichte*, 2te Auflage i. 350 ff.; A. H. J. Greenidge, *Handbook of Greek Constitutional History*, 100 ff.; H. Gabriel, *De magistratibus Lacedaemoniorum*, 31 ff. (M. N. T.)

GERRESHEIM, a town of Germany, in the Prussian Rhine Province, 6 m. by rail E. of Düsseldorf. It contains a fine Romanesque church, dating from the 13th century, which forms a portion of an ancient nunnery (founded in the 10th century and secularized in 1806), and has extensive glass manufactures and wire factories. Pop. (1905) 14,434.

GERRHA (Arab. *al-Jar'a*), an ancient city of Arabia, on the west side of the Persian Gulf, described by Strabo (Bk. xvi.) as inhabited by Chaldean exiles from Babylon, who built their houses of salt and repaired them by the application of salt water. Pliny (*Hist. Nat.* vi. 32) says it was 5 m. in circumference with towers built of square blocks of salt. Various identifications of the site have been attempted, J. P. B. D'Anville choosing El Katif, C. Niebuhr preferring Kuwet and C. Forster suggesting the ruins at the head of the bay behind the islands of Bahrein.

See A. Sprenger, *Die alte Geographie Arabiens* (Bern, 1875), pp. 135-137.

GERRÚS, a small province of Persia, situated between Khamseh and Azerbaijan in the N., Kurdistan in the W. and Hamadan in the S. Its population is estimated at 80,000, and its capital, Bíjár, 180 m. from Hamadan, has a population of about 4000 and post and telegraph offices. The province is fief of the chief of the Gerrús Kurds, pays a yearly revenue of about £3000, and supplies a battalion of infantry (the 34th) to the army.

GERRY, ELBRIDGE (1744–1814), American statesman, was born in Marblehead, Massachusetts, on the 17th of July 1744, the son of Thomas Gerry (d. 1774), a native of Newton, England, who emigrated to America in 1730, and became a prosperous Marblehead merchant. The son graduated at Harvard in 1762 and entered his father's business. In 1772 and 1773 he was a member of the Massachusetts General Court, in which he identified himself with Samuel Adams and the patriot party, and in 1773 he served on the Committee of Correspondence, which became one of the great instruments of intercolonial resistance. In 1774–1775 he was a member of the Massachusetts Provincial Congress. The passage of a bill proposed by him (November 1775) to arm and equip ships to prey upon British commerce, and for the establishment of a prize court, was, according to his biographer, Austin, "the first actual avowal of offensive hostility against the mother country, which is to be found in the annals of the Revolution." It is also noteworthy, says Austin, as "the first effort to establish an American naval armament." From 1776 to 1781 Gerry was a member of the Continental Congress, where he early advocated independence, and was one of those who signed the Declaration after its formal signing on the 2nd of August 1776, at which time he was absent. He was active in debates and committee work, and for some time held the chairmanship of the important standing committee for the superintendence of the treasury, in which capacity he exercised a predominating influence on congressional expenditures. In February 1780 he withdrew from Congress because of its refusal to respond to his call for the yeas and nays. Subsequently he laid his protest before the Massachusetts General Court which voted its approval of his action. On his return to Massachusetts, and while he was still a member of Congress, he was elected under the new state constitution (1780) to both branches of the state legislature, but accepted only his election to the House of Representatives. On the expiration of his congressional term, he was again chosen a delegate by the Massachusetts legislature, but it was not until 1783 that he resumed his seat. During the second period of his service in Congress, which lasted until 1785, he was a member of the committee to consider the treaty of peace with Great Britain, and chairman of two committees appointed to select a permanent seat of government. In 1784 he bitterly attacked the establishment of the order of the Cincinnati on the ground that it was a dangerous menace to democratic institutions. In 1786 he served in the state House of Representatives. Not favouring the creation of a strong national government he declined to attend the Annapolis Convention in 1786, but in the following year, when the assembling of the Constitutional Convention was an assured fact, although he opposed the purpose for which it was called, he accepted an appointment as one of the Massachusetts delegates, with the idea that he might personally help to check too strong a tendency toward centralization. His exertions in the convention were ceaseless in opposition to what he believed to be the wholly undemocratic character of the instrument, and eventually he refused to sign the completed constitution. Returning to Massachusetts, he spoke and wrote in opposition to its ratification, and although not a member of the convention called to pass upon it, he laid before this convention, by request, his reasons for opposing it, among them being that the constitution contained no bill of rights, that the executive would unduly influence the legislative branch of the government, and that the judiciary would be oppressive. Subsequently he served as an Anti-Federalist in the national House of Representatives in 1789–1793, taking, as always, a prominent part in debates and other legislative concerns. In 1797 he was sent by President John Adams, together with John Marshall and Charles Cotesworth Pinckney, on a mission to France to obtain from the government of the Directory a treaty embodying a settlement of several long-standing disputes. The discourteous and underhanded treatment of this embassy by Talleyrand and his agents,

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who attempted to obtain their ends by bribery, threats and duplicity, resulted in the speedy retirement of Marshall and Pinckney. The episode is known in American history as the "X Y Z Affair." Gerry, although despairing of any good results, remained in Paris for some time in the vain hope that Talleyrand might offer to a known friend of France terms that had been refused to envoys whose anti-French views were more than suspected. This action of Gerry's brought down upon him from Federalist partisans a storm of abuse and censure, from which he never wholly cleared himself. In 1810–1812 he was governor of Massachusetts. His administration, which was marked by extreme partisanship, was especially notable for the enactment of a law by which the state was divided into new senatorial districts in such a manner as to consolidate the Federalist vote in a few districts, thus giving the Democratic-Republicans an undue advantage. The outline of one of these districts, which was thought to resemble a salamander, gave rise in 1812, through a popular application of the governor's name, to the term "Gerrymander" (*q.v.*). In 1812, Gerry, who was an ardent advocate of the war with Great Britain, was elected vice-president of the United States, on the ticket with James Madison. He died in office at Washington on the 23rd of November 1814.

See J. T. Austin, *Life of Elbridge Gerry, with Contemporary Letters* (2 vols., Boston, 1828–1829).

GERRYMANDER (usually pronounced "jerrymander," but the g was originally pronounced hard), an American expression which has taken root in the English language, meaning to arrange election districts so as to give an unfair advantage to the party in power by means of a redistribution act, and so to manipulate constituencies generally, or arrange any political measure, with a view to an unfair party advantage. The word is derived from the name of the American politician Elbridge Gerry (*q.v.*). John Fiske, in his *Civil Government in the United States* (1890), says that in 1812, when Gerry was governor of Massachusetts, the Democratic state legislature (in order, according to Winsor, to secure an increased representation of the Democratic party in the state senate) "redistributed the districts in such wise that the shapes of the towns forming a single district in Essex county gave to the district a somewhat dragon-like contour. This was indicated upon a map of Massachusetts which Benjamin Russell, an ardent Federalist and editor of the *Centinel*, hung up over the desk in his office. The painter, Gilbert Stuart, coming into the office one day and observing the uncouth figure, added with his pencil a head, wings and claws, and exclaimed, 'That will do for a salamander!' 'Better say a Gerrymander,' growled the editor; and the outlandish name, thus duly coined, soon came into general currency." It was, however, only the name that was new. Fiske (who also refers to Winsor's *Memorial History of Boston*, iii. 212, and Bryce's *American Commonwealth*, i. 121) says that gerrymandering, as a political dodge, "seems to have been first devised in 1788, by the enemies of the Federal constitution in Virginia, in order to prevent the election of James Madison to the first Congress, and fortunately it was unsuccessful." But it was really earlier than that, and in the American colonial period political advantage was often obtained by changing county lines. In 1709 the Pennsylvania counties of Bucks, Chester and Philadelphia formed a combination for preventing the city of Philadelphia from securing its proportionate representation; and in 1732 George Burrington, royal governor of North Carolina, divided the voting precincts of the province for his own advantage. Gerry was not the originator of the Massachusetts law of 1812, which was probably drafted by Samuel Dana or by Judge Story. The law resulted in 29 seats being secured in Massachusetts by 50,164 Democratic votes, while 51,766 Federalist votes only returned 11 members; and Essex county, which, undivided, sent 5 Federalists to the Senate, returned 3 Democrats and 2 Federalists after being "gerrymandered." Stuart's drawing (reproduced in Fiske's book) was contrived so as to make the back line of the creature's body form a caricature of Gerry's profile. The law of 1812 was repealed in 1813, when the Federalists had again gained control of the Massachusetts legislature.

See also Elmer C. Griffith, *The Rise and Development of the Gerrymander* (Chicago, 1907); John W. Dean, "History of the Gerrymander," in *New England Historical and Genealogical Register*, vol. xlvi. (Boston, 1892).

GERS, a department of south-western France, composed of the whole or parts of certain districts of Gascony, viz. Armagnac, Astarac, Fezensac, Pardiac, Pays de Gaure, Lomagne, Comminges, Condomois and of a small portion of Agenais. It is bounded N. by the department of Lot-et-Garonne, N.E. by Tarn-et-Garonne, E. and S.E. by Haute-Garonne, S. by Hautes-Pyrénées, S.W. by Basses-Pyrénées and W. by Landes. Pop. (1906) 231,088. Area, 2428 sq. m. The department consists of a plateau sloping from south to north and traversed by numerous rivers, most of them having their source close together in the Plateau de Lannemezan (Hautes-Pyrénées), from which point they diverge in the shape of a fan to the north-west, north and north-east. In the south several summits exceed 1100 ft. in height. Thence the descent towards the north is gradual till on the northern limit of the department the lowest point (less than 200 ft.) is reached. The greater part of the department belongs to the basin of the Garonne, while a small portion in the west is drained by the Adour. The chief affluents of the former are the Save, Gimone, Arrats, Gers and Baïse, which derive their waters in great part from the Canal de la Neste in the department of Hautes-Pyrénées; and of the latter, the Arros, Midou and Douze, the last two uniting and taking the name of Midouze before joining the Adour. The climate is temperate; its drawbacks are the unwholesome south-east wind and the destructive hail-storms which sometimes occur in spring. There is seldom any snow or frost. Over the greater portion of the department the annual rainfall varies between 28 and 32 in. Gers is primarily agricultural. The south-western district is the most productive, but the valleys generally are fertile and the grain produced is more than sufficient for local consumption. Wheat, maize and oats are the principal cereals. About one-third of the wine produced is used for home consumption, and the remainder is chiefly manufactured into brandy, known by the name of Armagnac, second only to Cognac in reputation. The natural pastures are supplemented chiefly by crops of sainfoin and clover; horses, cattle, sheep and swine are reared in considerable numbers; turkeys, geese and other poultry are abundant. There are mineral springs at Aurenson, Barbotan and several other places in the department. The mineral production and manufactures are unimportant. Building stone and clay are obtained. Flour-mills, saw-mills, tanneries, brick-works and cask-works are the chief industrial establishments.

Gers is divided into the arrondissements of Auch, Lectoure, Mirande, Condom and Lombez, with 29 cantons and 466 communes. The chief town is Auch, the seat of an archbishopric. The department falls within the circumscription of the appeal-court of Agen, and the region of the XVII. army corps. It forms part of the académie (educational circumscription) of Toulouse. Auch, Condom, Lectoure and Mirande are the principal towns. The following are also of interest: Lombez, with its church of Sainte-Marie, once a cathedral, dating from the 14th century, when the bishopric was created; Flaran, with an abbey-church of the last half of the 12th century; La Romieu, with a church of the same period and a beautiful cloister; Simorre, with a fortified abbey-church of the 14th century; and Fleurance, with a handsome church, also of the 14th century, containing stained glass of the 16th century.

GERSON, JOHN (1363–1420), otherwise JEAN CHARLIER DE GERSON, French scholar and divine, chancellor of the university of Paris, and the ruling spirit in the oecumenical councils of Pisa and Constance, was born at the village of Gerson, in the bishopric of Reims and department of Ardennes, on the 14th of December 1363. His parents, Arnulph Charlier and Elizabeth de la Chardenière, "a second Monica," were pious peasants, and seven of their twelve children, four daughters and three sons, devoted themselves to a religious life. Young Gerson was sent to Paris to the famous college of Navarre when fourteen years of age. After a five years' course he obtained the degree of licentiate of

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arts, and then began his theological studies under two very celebrated teachers, Gilles des Champs (Aegidius Campensis) and Pierre d'Ailly (Petrus de Alliaco), rector of the college of Navarre, chancellor of the university, and afterwards bishop of Puy, archbishop of Cambrai and cardinal. Pierre d'Ailly remained his life-long friend, and in later life the pupil seems to have become the teacher (see pref. to *Liber de vita Spir. Animae*).

Gerson very soon attracted the notice of the university. He was elected procurator for the French "nation" in 1383, and again in 1384, in which year he graduated bachelor of theology. Three years later a still higher honour was bestowed upon him; he was sent along with the chancellor and others to represent the university in a case of appeal taken to the pope. John of Montson (Monzon de Montesono), an Aragonese Dominican who had recently graduated as doctor of theology at Paris, had in 1387 been condemned by the faculty of theology because he had taught that the Virgin Mary, like other ordinary descendants of Adam, was born in original sin; and the Dominicans, who were fierce opponents of the doctrine of the immaculate conception, were expelled the university. John of Montson appealed to Pope Clement VII. at Avignon, and Pierre d'Ailly, Gerson and the other university delegates, while they personally supported the doctrine of the immaculate conception, were content to rest their case upon the legal rights of the university to test in its own way its theological teachers. Gerson's biographers have compared his journey to Avignon with Luther's visit to Rome. It is certain that from this time onwards he was zealous in his endeavours to spiritualize the universities, to reform the morals of the clergy, and to put an end to the schism which then divided the church. In 1392 Gerson became doctor of theology, and in 1395, when Pierre d'Ailly was made bishop of Puy, he was, at the early age of thirty-two, elected chancellor of the university of Paris, and made a canon of Notre Dame. The university was then at the height of its fame, and its chancellor was necessarily a man prominent not only in France but in Europe, sworn to maintain the rights of his university against both king and pope, and entrusted with the conduct and studies of a vast crowd of students attracted from almost every country in Europe. Gerson's writings bear witness to his deep sense of the responsibilities, anxieties and troubles of his position. He was all his days a man of letters, and an analysis of his writings is his best biography. His work has three periods, in which he was engaged in reforming the university studies, maturing plans for overcoming the schism (a task which after 1404 absorbed all his energies), and in the evening of his life writing books of devotion.

Gerson wished to banish scholastic subtleties from the studies of the university, and at the same time to put some evangelical warmth into them. He was called at this period of his life Doctor Christianissimus; later his devotional works brought him the title Doctor Consolatorius. His plan was to make theology plain and simple by founding it on the philosophical principles of nominalism. His method was a clear exposition of the principles of theology where clearness was possible, with a due recognition of the place of mystery in the Christian system of doctrine. Like the great nominalist William of Occam, he saved himself from rationalism by laying hold on mysticism—the Christian mysticism of the school of St Victor. He thought that in this way he would equally guard against the folly of the old scholasticism, and the seductions of such Averroistic pantheism as was preached by heretics like Amalric of Bena. His plans for the reformation of university studies may be learned from his *Tract. de examinatione doctrinarum* (*Opp.* i. 7), *Epistolae de reform. theol.* (i. 121), *Epistolae ad studentes Collegii Navarrae, quid et qualiter studere debeat novus theologiae auditor, et contra curiositatem studentium* (i. 106), and *Lectiones duae contra vanam curiositatem in negotio fidei* (i. 86). The study of the Bible and of the fathers was to supersede the idle questions of the schools, and in his *Tract. contra romantiam de rosa* (iii. 297) he warns young men against the evil consequences of romance-reading. He was oftentimes weary of the chancellorship,—it involved him in strife and in money difficulties; he grew tired of public life, and longed for learned leisure. To obtain it he accepted the deanery of Bruges from the duke of Burgundy, but after a short sojourn he returned to Paris and to the chancellorship.

Gerson's chief work was what he did to destroy the great schism. Gregory XI. had died in 1378, one year after Gerson went to the college of Navarre, and since his death the church had had two popes, which to the medieval mind meant two churches and a divided Christ. The schism had practically been brought about by France. The popes had been under French influence so long that it appeared to France a political necessity to have her own pope, and pious Frenchmen felt themselves somewhat responsible for the sins and scandals of the schism. Hence the melancholy piety of Gerson, Pierre d'Ailly and their companions, and the energy with which they strove to bring the schism to an end. During the lifetime of Clement VII. the university of Paris, led by Pierre d' Ailly, Gerson and Nicolas of Clamenges,[1] met in deliberation about the state of Christendom, and resolved that the schism could be ended in three ways,—by cession, if both popes renounced the tiara unconditionally, by arbitration or by a general council. Clement died. The king of France, urged by the university, sent orders that no new pope should be elected. The cardinals first elected, and then opened the letter. In the new elections, however, both at Rome and Avignon, the influence of Paris was so much felt that each of the new popes swore to "cede" if his rival would do so also.

Meanwhile in 1395 the national assembly of France and the French clergy adopted the programme of the university—cession or a general council. The movement gathered strength. In 1398 most of the cardinals and most of the crowned heads in Europe had given their adhesion to the plan. During this period Gerson's literary activity was untiring, and the throb of public expectancy, of hope and fear, is revealed in his multitude of pamphlets. At first there were hopes of a settlement by way of cession. These come out in *Protest. super statum ecclesiae* (ii. 1), *Tract. de modo habendi se tempore schismatis*, *De schismate*, &c. But soon the conduct of the popes made Europe impatient, and the desire for a general council grew strong—see *De concilio generali unius obedientiae* (ii. 24). The council was resolved upon. It was to meet at Pisa, and Gerson poured forth tract after tract for its guidance. The most important are—*Trilogus in materia schismatis* (ii. 83), and *De unitate Ecclesiae* (ii. 113), in which, following Pierre d' Ailly (see Tschackert's *Peter v. Ailli*, p. 153), Gerson demonstrates that the ideal unity of the church, based upon Christ, destroyed by the popes, can only be restored by a general council, supreme and legitimate, though unsummoned by a pope. The council met, deposed both antipopes, and elected Alexander V. Gerson was chosen to address the new pope on the duties of his office. He did so in his *Sermo coram Alexandro Papa in die ascensionis in concilio Pisano* (ii. 131). All hopes of reformation, however, were quenched by the conduct of the new pope. He had been a Franciscan, and loved his order above measure. He issued a bull which laid the parish clergy and the universities at the mercy of the mendicants. The great university of Paris rose in revolt, headed by her chancellor, who wrote a fierce pamphlet—*Censura professorum in theologia circa bullam Alexandri V.* (ii. 442). The pope died soon after, and one of the most profligate men of that time, Pope John XXIII. (Baldassare Cossa), was elected his successor. The council of Pisa had not brought peace; it had only added a third pope. Pierre d'Ailly despaired of general councils (see his *De difficultate reformationis in concilio universali*), but Gerson struggled on. Another matter too had roused him. The feuds between the houses of Orleans and Burgundy had long distracted France. The duke of Orleans had been treacherously murdered by the followers of the duke of Burgundy, and a theologian, Jean Petit (*c.* 1360–1411), had publicly and unambiguously justified the murder. His eight verities, as he called them—his apologies for the murder—had been, mainly through the influence of Gerson, condemned by the university of Paris, and by the

[1] Born *c.* 1360; rector of the university of Paris 1393; afterwards treasurer of Langres and archdeacon of Bayeux; died at Paris in 1437.

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archbishop and grand inquisitor, and his book had been publicly burned before the cathedral of Notre Dame. Gerson wished a council to confirm this sentence. His literary labours were as untiring as ever. He maintained in a series of tracts that a general council could depose a pope; he drew up indictments against the reigning pontiffs, reiterated the charges against Jean Petit, and exposed the sin of schism—in short, he did all he could to direct the public mind towards the evils in the church and the way to heal them. His efforts were powerfully seconded by the emperor Sigismund, and the result was the council of Constance (see CONSTANCE, COUNCIL OF). Gerson's influence at the council was supreme up to the election of a new pope. It was he who dictated the form of submission and cession made by John XXIII., and directed the process against Huss. Many of Gerson's biographers have found it difficult to reconcile his proceedings against Huss with his own opinions upon the supremacy of the pope; but the difficulty has arisen partly from misunderstanding Gerson's position, partly from supposing him to be the author of a famous tract—*De modis uniendi ac reformandi Ecclesiam in concilio universali*. All Gerson's high-sounding phrases about the supremacy of a council were meant to apply to some time of emergency. He was essentially a trimmer, and can scarcely be called a reformer, and he hated Huss with all the hatred the trimmer has of the reformer. The three bold treatises, *De necessitate reformationis Ecclesiae, De modis uniendi ac reformandi Ecclesiam*, and *De difficultate reformationis in concilio universali*, long ascribed to Gerson, were proved by Schwab in his *Johannes Gerson* not to be his work, and have since been ascribed to Abbot Andreas of Randuf, and with more reason to Dietrich of Nieheim (see NIEM, DIETRICH OF).

The council of Constance, which revealed the eminence of Gerson, became in the end the cause of his downfall. He was the prosecutor in the case of Jean Petit, and the council, overawed by the duke of Burgundy, would not affirm the censure of the university and archbishop of Paris. Petit's justification of murder was declared to be only a moral and philosophical opinion, not of faith. The utmost length the council would go was to condemn one proposition, and even this censure was annulled by the new pope, Martin V., on a formal pretext. Gerson dared not return to France, where, in the disturbed state of the kingdom, the duke of Burgundy was in power. He lay hid for a time at Constance and then at Rattenberg in Tirol, where he wrote his famous book *De consolatione theologiae*. On returning to France he went to Lyons, where his brother was prior of the Celestines. It is said that he taught a school of boys and girls in Lyons, and that the only fee he exacted was to make the children promise to repeat the prayer, "Lord, have mercy on thy poor servant Gerson." His later years were spent in writing books of mystical devotion and hymns. He died at Lyons on the 12th of July 1429. Tradition declares that during his sojourn there he translated or adapted from the Latin a work upon eternal consolation, which afterwards became very famous under the title of *The Imitation of Christ*, and was attributed to Thomas à Kempis. It has, however, been proved beyond a doubt that the famous *Imitatio Christi* was really written by Thomas, and not by John Gerson or the abbot Gerson.

The literature on Gerson is very abundant. See Dupin, *Gersoniana*, including *Vita Gersoni*, prefixed to the edition of Gerson's works in 5 vols. fol., from which quotations have been made; Charles Schmidt, *Essai sur Jean Gerson, chancelier de l'Université de Paris* (Strassburg, 1839); J. B. Schwab, *Johannes Gerson* (Würzburg, 1859); H. Jadart, *Jean Gerson, son origine, son village natal et sa famille* (Reims, 1882). On the relations between Gerson and D'Ailly see Paul Tschackert, *Peter von Ailli* (Gotha, 1877). On Gerson's public life see also histories of the councils of Pisa and Constance, especially Herm. v. der Hardt, *Con. Constantiensis liber.* (1698–1699). The best editions of his works are those of Paris (3 vols., 1606) and Antwerp (5 vols., 1706). See also Ulysse Chevalier, *Répertoire des sources hist. Bio-bibliographie* (Paris, 1905, &c.), *s.v.* "Gerson." (T. M. L.; X.)

GERSONIDES, or BEN GERSON (GERSHON), **LEVI,** known also as RALBAG (1288–1344), Jewish philosopher and commentator, was born at Bagnols in Languedoc, probably in 1288. As in the case of the other medieval Jewish philosophers little is known of his life. His family had been distinguished for piety and exegetical skill, but though he was known in the Jewish community by commentaries on certain books of the Bible, he never seems to have accepted any rabbinical post. Possibly the freedom of his opinions may have put obstacles in the way of his preferment. He is known to have been at Avignon and Orange during his life, and is believed to have died in 1344, though Zacuto asserts that he died at Perpignan in 1370. Part of his writings consist of commentaries on the portions of Aristotle then known, or rather of commentaries on the commentaries of Averroes. Some of these are printed in the early Latin editions of Aristotle's works. His most important treatise, that by which he has a place in the history of philosophy, is entitled *Milḥamoth 'Adonai* (The Wars of God), and occupied twelve years in composition (1317–1329). A portion of it, containing an elaborate survey of astronomy as known to the Arabs, was translated into Latin in 1342 at the request of Clement VI. The *Milḥamoth* is throughout modelled after the plan of the great work of Jewish philosophy, the *Morch Nebuhim* of Moses Maimonides, and may be regarded as an elaborate criticism from the more philosophical point of view (mainly Averroistic) of the syncretism of Aristotelianism and Jewish orthodoxy as presented in that work. The six books pass in review (1) the doctrine of the soul, in which Gersonides defends the theory of impersonal reason as mediating between God and man, and explains the formation of the higher reason (or acquired intellect, as it was called) in humanity,—his view being thoroughly realist and resembling that of Avicebron; (2) prophecy; (3) and (4) God's knowledge of facts and providence, in which is advanced the curious theory that God does not know individual facts, and that, while there is general providence for all, special providence only extends to those whose reason has been enlightened; (5) celestial substances, creating of the strange spiritual hierarchy which the Jewish philosophers of the middle ages accepted from the Neoplatonists and the pseudo-Dionysius, and also giving, along with astronomical details, much of astrological theory; (6) creation and miracles, in respect to which Gerson deviates widely from the position of Maimonides. Gersonides was also the author of a commentary on the Pentateuch and other exegetical and scientific works.

A careful analysis of the *Milḥamoth* is given in Rabbi Isidore Weil's *Philosophie religieuse de Lévi-Ben-Gerson* (Paris, 1868). See also Munk, *Mélanges de phil. juive et arabe*; and Joel, *Religionsphilosophie d. L. Ben-Gerson* (1862). The *Milḥamoth* was published in 1560 at Riva di Trento, and has been published at Leipzig, 1866. (I. A.)

GERSOPPA, FALLS OF, a cataract on the Sharavati river in the North Kanara district of Bombay. The falls are considered the finest in India. The river descends in four separate cascades called the Raja or Horseshoe, the Roarer, the Rocket and the Dame Blanche. The cliff over which the river plunges is 830 ft. high, and the pool at the base of the Raja Fall is 132 ft. deep. The falls are reached by boat from Honavar, or by road from Gersoppa village, 18 m. distant. Near the village are extensive ruins (the finest of which is a cruciform temple) of Nagarbastikere, the capital of the Jain chiefs of Gersoppa. Their family was established in power in 1409 by the Vijayanagar kings, but subsequently became practically independent. The chieftaincy was several times held by women, and on the death of the last queen (1608) it collapsed, having been attacked by the chief of Bednur. Among the Portuguese the district was celebrated for its pepper, and they called its queen "Regina da pimenta" (queen of pepper).

GERSTÄCKER, FRIEDRICH (1816–1872), German novelist and writer of travels, was born at Hamburg on the 10th of May 1816, the son of Friedrich Gerstäcker (1790–1825), a celebrated opera singer. After being apprenticed to a commercial house he learnt farming in Saxony. In 1837, however, having imbibed from *Robinson Crusoe* a taste for adventure, he went to America and wandered over a large part of the United States, supporting himself by whatever work came to hand. In 1843 he returned to Germany, to find himself, to his great surprise, famous as an author. His mother had shown his diary, which he regularly

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sent home, and which contained descriptions of his adventures in the New World, to the editor of the *Rosen*, who published them in that periodical. These sketches having found favour with the public, Gerstäcker issued them in 1844 under the title *Streif-und Jagdzüge durch die Vereinigten Staaten Nordamerikas*. In 1845 his first novel, *Die Regulatoren in Arkansas*, appeared, and henceforth the stream of his productiveness flowed on uninterruptedly. From 1849 to 1852 Gerstäcker travelled round the world, visiting North and South America, Polynesia and Australia, and on his return settled in Leipzig. In 1860 he again went to South America, chiefly with a view to inspecting the German colonies there and reporting on the possibility of diverting the stream of German emigration in this direction. The result of his observations and experiences he recorded in *Achtzehn Monate in Südamerika* (1862). In 1862 he accompanied Duke Ernest of Saxe-Coburg-Gotha to Egypt and Abyssinia, and on his return settled at Coburg, where he wrote a number of novels descriptive of the scenes he had visited. In 1867–1868 Gerstäcker again undertook a long journey, visiting North America, Venezuela and the West Indies, and on his return lived first at Dresden and then at Brunswick, where he died on the 31st of May 1872. His genial and straightforward character made him personally beloved; and his works, dealing as they did with the great world hitherto hidden from the narrow "parochialism" of German life, obtained an immense popularity. This was not due to any graces of style, in which they are singularly lacking; but the unstudied freshness of the author's descriptions, and his sturdy humour, appealed to the wholesome instincts of the public. Many of his books were translated into foreign languages, notably into English, and became widely known on both sides of the Atlantic. His best works, from a literary point of view, are, besides the above-mentioned *Regulatoren*, his *Flusspiraten des Mississip* (1848); the novel *Tramin* (1854); his Australian romance *Die beiden Sträflinge* (1857); *Aus dem Matrosenleben* (1857); and *Blau Wasser* (1858). His *Travels* exist in an English translation.

Gerstäcker's *Gesammelte Schriften* were published at Jena in 44 vols. (1872–1879); a selection, edited by D. Theden in 24 vols. (1889–1890). See A. Karl, *Friedrich Gerstäcker, der Weltgereiste. Ein Lebensbild* (1873).

GERSTENBERG, HEINRICH WILHELM VON (1737–1823), German poet and critic, was born at Tondern in Schleswig on the 3rd of January 1737. After studying law at Jena he entered the Danish military service and took part in the Russian campaign of 1762. He spent the next twelve years in Copenhagen, where he was intimate with Klopstock. From 1775 to 1783 he represented Denmark's interests as "Danish Resident" at Lübeck, and in 1786 received a judicial appointment at Altona, where he died on the 1st of November 1823. In the course of his long life Gerstenberg passed through many phases of his nation's literature. He began as an imitator of the Anacreontic school (*Tändeleien*, 1759); then wrote, in imitation of Gleim, *Kriegslieder eines dänischen Grenadiers* (1762); with his *Gedicht eines Skalden* (1766) he joined the group of "bards" led by Klopstock. His *Ariadne auf Naxos* (1767) is the best cantata of the 18th century; he translated Beaumont and Fletcher's *Maid's Tragedy* (1767), and helped to usher in the *Sturm und Drang* period with a gruesome but powerful tragedy, *Ugolino* (1768). But he did perhaps even better service to the new literary movement with his *Briefe über Merkwürdigkeiten der Literatur* (1766–1770), in which the critical principles of the *Sturm und Drang*—and especially its enthusiasm for Shakespeare,—were first definitely formulated. In later life Gerstenberg lost touch with literature, and occupied himself mainly with Kant's philosophy.

His *Vermischte Schriften* appeared in 3 vols. (1815). The *Briefe über Merkwürdigkeiten der Literatur* were republished by A. von Weilen (1888), and a selection of his poetry, including *Ugolino*, by R. Hamel, will be found in Kürschner's *Deutsche Nationallitteratur*, vol. 48 (1884).

GÉRUZEZ, NICOLAS EUGÈNE (1799–1865), French critic, was born on the 6th of January 1799 at Reims. He was assistant professor at the Sorbonne, and in 1852 he became secretary to the faculty of literature. He wrote a *Histoire de l'éloquence politique et religieuse en France aux XIVe, XVe et XVIe siècles* (1837–1838); an admirable *Histoire de la littérature française depuis les origines jusqu'à la Révolution* (1852), which he supplemented in 1859 by a volume bringing down the history to the close of the revolutionary period; and some miscellaneous works. Géruzez died on the 29th of May 1865 in Paris. A posthumous volume of *Mélanges et pensées* appeared in 1877.

GERVAIS, PAUL (1816–1879), French palaeontologist, was born on the 26th of September 1816 at Paris, where he obtained the diplomas of doctor of science and of medicine, and in 1835 he began palaeontological research as assistant in the laboratory of comparative anatomy at the Museum of Natural History. In 1841 he obtained the chair of zoology and comparative anatomy at the Faculty of Sciences in Montpellier, of which he was in 1856 appointed dean. In 1848–1852 appeared his important work *Zoologie et paléontologie françaises*, supplementary to the palaeontological publications of G. Cuvier and H. M. D. de Blainville; of this a second and greatly improved edition was issued in 1859. In 1865 he accepted the professorship of zoology at the Sorbonne, vacant through the death of L. P. Gratiolet; this post he left in 1868 for the chair of comparative anatomy at the Paris museum of natural history, the anatomical collections of which were greatly enriched by his exertions. He died in Paris on the 10th of February 1870.

He also wrote *Histoire naturelle des mammifères* (1853, &c.); *Zoologie médicale* (1859, with P. J. van Beneden); *Recherches sur l'ancienneté de l'homme et la période quaternaire*, 19 pl. (1867); *Zoologie et paléontologie générales* (1867); *Ostéographie des cétacés* (1869, &c., with van Beneden).

GERVASE OF CANTERBURY (d. *c.* 1210), English monk and chronicler, entered the house of Christchurch, Canterbury, at an early age. He made his profession and received holy orders in 1163; but we have no further clue to the date of his birth. We know nothing of his life beyond what may be gathered from his own writings. Their evidence suggests that he died in or shortly after 1210, and that he had resided almost continuously at Canterbury from the time of his admission. The only office which we know him to have held is that of sacrist, which he received after 1190 and laid down before 1197. He took a keen interest in the secular quarrels of the Canterbury monks with their archbishops, and his earlier literary efforts were controversial tracts upon this subject. But from 1188 he applied his mind to historical composition. About that year he began the compilation of his *Chronica*, a work intended for the private reading of his brethren. Beginning with the accession of Stephen he continued his narrative to the death of Richard I. Up to 1188 he relies almost entirely upon extant sources; but from that date onwards is usually an independent authority. A second history, the *Gesta Regum*, is planned on a smaller scale and traces the fortunes of Britain from the days of Brutus to the year 1209. The latter part of this work, covering the years 1199–1209, is perhaps an attempt to redeem the passing, which he had made in the epilogue to the *Chronica*, of a continuation dealing with the reign of John. This is the only part of the *Gesta* which deserves much attention. The work was continued by various hands to the year 1328. From the *Gesta* the indefatigable Gervase turned to a third project, the history of the see of Canterbury from the arrival of Augustine to the death of Hubert Walter (1205). A topographical work, with the somewhat misleading title *Mappa mundi*, completes the list of his more important writings. The *Mappa mundi* contains a useful description of England shire by shire, giving in particular a list of the castles and religious houses to be found in each. The industry of Gervase was greater than his insight. He took a narrow and monastic view of current politics; he was seldom in touch with the leading statesmen of his day. But he appears to be tolerably accurate when dealing with the years 1188–1209; and sometimes he supplements the information provided by the more important chronicles.

See the introductions and notes in W. Stubbs's edition of the *Historical Works of Gervase of Canterbury* (Rolls edition, 2 vols., 1879–1880). (H. W. C. D.)

GERVASE OF TILBURY (fl. 1211), Anglo-Latin writer of the late 12th and early 13th centuries, was a kinsman and schoolfellow of Patrick, earl of Salisbury, but lived the life of a scholarly

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adventurer, wandering from land to land in search of patrons. Before 1177 he was a student and teacher of law at Bologna; in that year he witnessed the meeting of the emperor Frederic I. and Pope Alexander III. at Venice. He may have hoped to win the favour of Frederic, who in the past had found useful instruments among the civilians of Bologna. But Frederic ignored him; his first employer of royal rank was Henry fitz Henry, the young king of England (d. 1183), for whom Gervase wrote a jest-book which is no longer extant. Subsequently we hear of Gervase as a clerk in the household of William of Champagne, cardinal archbishop of Reims (d. 1202). Here, as he himself confesses, he basely accused of heretical opinions a young girl, who had rejected his advances, with the result that she was burned to death. He cannot have remained many years at Reims; before 1189 he attracted the favour of William II. of Sicily, who had married Joanna, the sister of Henry fitz Henry. William took Gervase into his service and gave him a country-house at Nola. After William's death the kingdom of Sicily offered no attractions to an Englishman. The fortunes of Gervase suffered an eclipse until, some time after 1198, he found employment under the emperor Otto IV., who by descent and political interest was intimately connected with the Plantagenets. Though a clerk in orders Gervase became marshal of the kingdom of Arles, and married an heiress of good family. For the delectation of the emperor he wrote, about 1211, his *Otia Imperialia* in three parts. It is a farrago of history, geography, folklore and political theory—one of those books of table-talk in which the literature of the age abounded. Evidently Gervase coveted but ill deserved a reputation for encyclopaedic learning. The most interesting of his dissertations are contained in the second part of the *Otia*, where he discusses, among other topics, the theory of the Empire and the geography and history of England. We do not know what became of Gervase after the downfall of Otto IV. But he became a canon; and may perhaps be identified with Gervase, provost of Ebbeksdorf, who died in 1235.

See the *Otia Imperialia* in G. Leibnitz's *Scriptores rerum Brunsvicensium*, vols. i. and ii. (Hanover, 1707); extracts in J. Stevenson's edition of *Coggeshall* (Rolls series, 1875). Of modern accounts the best are those by W. Stubbs in his edition of *Gervase of Canterbury*, vol. i. introd. (Rolls series, 1879), and by R. Pauli in *Nachrichten der Gesellschaft der Wissenschaften zu Göttingen* (1882). In the older biographers the *Dialogus de scaccario* of Richard Fitz Neal (*q.v.*) is wrongly attributed to Gervase. (H. W. C. D.)

GERVEX, HENRI (1852–), French painter, was born in Paris on the 10th of December 1852, and studied painting under Cabanel, Brisset and Fromentin. His early work belonged almost exclusively to the mythological genre which served as an excuse for the painting of the nude—not always in the best of taste; indeed, his "Rolla" of 1878 was rejected by the jury of the Salon *pour immoralité*. He afterwards devoted himself to representations of modern life and achieved signal success with his "Dr Péan at the Salpêtrière," a modernized paraphrase, as it were, of Rembrandt's "Anatomy Lesson." He was entrusted with several important official paintings and the decoration of public buildings. Among the first are "The Distribution of Awards (1889) at the Palais de l'Industrie" (now in the Versailles Museum), "The Coronation of Nicolas II." (Moscow, May 14, 1896), "The Mayors' Banquet" (1900), and the portrait group "La République Française"; and among the second, the ceiling for the Salle des Fêtes at the hôtel de ville, Paris, and the decorative panels painted in conjunction with Blanchon for the mairie of the 19th arrondissement, Paris. He also painted, with Alfred Stevens, a panorama, "The History of the Century" (1889). At the Luxembourg is his painting "Satyrs playing with a Bacchante," as well as the large "Members of the Jury of the Salon" (1885). Other pictures of importance, besides numerous portraits in oils and pastel, are "Communion at Trinity Church," "Return from the Ball," "Diana and Endymion," "Job," "Civil Marriage," "At the Ambassadeurs," "Yachting in the Archipelago," "Nana" and "Maternity."

GERVINUS, GEORG GOTTFRIED (1805–1871), German literary and political historian, was born on the 20th of May 1805 at Darmstadt. He was educated at the gymnasium of the town, and intended for a commercial career, but in 1825 he became a student of the university of Giessen. In 1826 he went to Heidelberg, where he attended the lectures of the historian Schlosser, who became henceforth his guide and his model. In 1828 he was appointed teacher in a private school at Frankfort-on-Main, and in 1830 *Privatdozent* at Heidelberg. A volume of his collected *Historische Schriften* procured him the appointment of professor extraordinarius; while the first volume of his *Geschichte der poëtischen Nationallitteratur der Deutschen* (1835–1842, 5 vols., subsequently entitled *Geschichte der deutschen Dichtung*; 5th edition, by K. Bartsch, 1871–1874) brought him the appointment to a regular professorship of history and literature at Göttingen. This work is the first comprehensive history of German literature written both with scholarly erudition and literary skill. In the following year he wrote his *Grundzüge der Historik*, which is perhaps the most thoughtful of his philosophico-historical productions. The same year brought his expulsion from Göttingen in consequence of his manly protest, in conjunction with six of his colleagues, against the unscrupulous violation of the constitution by Ernest Augustus, king of Hanover and duke of Cumberland. After several years in Heidelberg, Darmstadt and Rome, he settled permanently in Heidelberg, where, in 1844, he was appointed honorary professor. He zealously took up in the following year the cause of the German Catholics, hoping it would lead to a union of all the Christian confessions, and to the establishment of a national church. He also came forward in 1846 as a patriotic champion of the Schleswig-Holsteiners, and when, in 1847, King Frederick William IV. promulgated the royal decree for summoning the so-called "United Diet" (vereinigter Landtag), Gervinus hoped that this event would form the basis of the constitutional development of the largest German state. He founded, together with some other patriotic scholars, the *Deutsche Zeitung*, which certainly was one of the best-written political journals ever published in Germany. His appearance in the political arena secured his election as deputy for the Prussian province of Saxony to the National Assembly sitting in 1848 at Frankfort. Disgusted with the failure of that body, he retired from all active political life.

Gervinus now devoted himself to literary and historical studies, and between 1849 and 1852 published his work on *Shakespeare* (4 vols., 4th ed. 2 vols., 1872; Eng. trans. by F. E. Bunnett, 1863, new ed. 1877). He also revised his *History of German Literature*, for a fourth edition (1853), and began at the same time to plan his *Geschichte des neunzehnten Jahrhunderts* (8 vols., 1854–1860), which was preceded by an *Einleitung in die Geschichte des neunzehnten Jahrhunderts* (1853). The latter caused some stir in the literary and political world, owing to the circumstance that the government of Baden imprudently instituted a prosecution against the author for high treason. In 1868 appeared *Händel und Shakespeare, zur Ästhetik der Tonkunst*, in which he drew an ingenious parallel between his favourite poet and his favourite composer, showing that their intellectual affinity was based on the Teutonic origin common to both, on their analogous intellectual development and character. The ill-success of this publication, and the indifference with which the latter volumes of his *History of the 19th Century* were received by his countrymen, together with the feeling of disappointment that the unity of Germany had been brought about in another fashion and by other means than he wished to see employed, embittered his later years. He died at Heidelberg on the 18th of March 1871.

Gervinus's autobiography (*G. G. Gervinus' Leben, von ihm selbst*) was published by his widow in 1893. It does not, however, go beyond the year 1836. See E. Lehmann, *Gervinus, Versuch einer Charakteristik* (1871); R. Gosche, *Gervinus* (1871); J. Dörfel, *Gervinus als historischer Denker* (1904).

GERYON (GERYONES, GERYONEUS), in Greek mythology, the son of Chrysaor and Callirrhoë, daughter of Oceanus, and king of the island of Erytheia. He is represented as a monster with three heads or three bodies (*triformis, trigeminus*), sometimes with wings, and as the owner of herds of red cattle, which were

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tended by the giant shepherd Eurytion and the two-headed dog Orthrus. To carry off these cattle to Greece was one of the twelve "labours" imposed by Eurystheus upon Heracles. In order to get possession of them, Heracles travelled through Europe and Libya, set up the two pillars in the Straits of Gibraltar to show the extent of his journey, and reached the great river Oceanus. Having crossed Oceanus and landed on the island, Heracles slew Orthrus together with Eurytion, who in vain strove to defend him, and drove off the cattle. Geryon started in pursuit, but fell a victim to the arrows of Heracles, who, after various adventures, succeeded in getting the cattle safe to Greece, where they were offered in sacrifice to Hera by Eurystheus. The geographical position of Erytheia is unknown, but all ancient authorities agree that it was in the far west. The name itself (= red) and the colour of the cattle suggest the fiery aspect of the disk of the setting sun; further, Heracles crosses Oceanus in the golden cup or boat of the sun-god Helios. Geryon (from γηρύω, the howler or roarer) is supposed to personify the storm, his father Chrysaor the lightning, his mother Callirrhoë the rain. The cattle are the rain-clouds, and the slaying of their keepers typifies the victory of the sun over the clouds, or of spring over winter. The euhemeristic explanation of the struggle with the triple monster was that Heracles fought three brothers in succession.

See Apollodorus ii. 5. 10; Hesiod, *Theogony*, 287; Diod. Sic. iv. 17; Herodotus iv. 8; F. Wieseler in Ersch and Gruber, *Allgemeine Encyclopädie*; F. A. Voigt in Roscher's *Lexikon der Mythologie*; L. Preller, *Griechische Mythologie*; article "Hercules" in Daremberg and Saglio, *Dictionnaire des antiquités*.

GESENIUS, HEINRICH FRIEDRICH WILHELM (1786–1842), German orientalist and biblical critic, was born at Nordhausen, Hanover, on the 3rd of February 1786. In 1803 he became a student of philosophy and theology at the university of Helmstädt, where Heinrich Henke (1752–1809) was his most influential teacher; but the latter part of his university course was taken at Göttingen, where J. G. Eichhorn and T. C. Tychsen (1758–1834) were then at the height of their popularity. In 1806, shortly after graduation, he became *Repetent* and *Privatdozent* in that university; and, as he was fond of afterwards relating, had Neander for his first pupil in Hebrew. In 1810 he became professor extraordinarius in theology, and in 1811 ordinarius, at the university of Halle, where, in spite of many offers of bigh preferment elsewhere, he spent the rest of bis life. He taught with great regularity for upward of thirty years, the only interruptions being that of 1813–1814 (occasioned by the War of Liberation, during which the university was closed) and those occasioned by two prolonged literary tours, first in 1820 to Paris, London and Oxford with his colleague Johann Karl Thilo (1794–1853) for the examination of rare oriental manuscripts, and in 1835 to England and Holland in connexion with his Phoenician studies. He soon became the most popular teacher of Hebrew and of Old Testament introduction and exegesis in Germany; during his later years his lectures were attended by nearly five hundred students. Among his pupils the most eminent were Peter von Bohlen (1796–1840), A. G. Hofmann (1769–1864), Hermann Hupfeld, Emil Rödiger (1801–1874), J. F. Tuch (1806–1867), W. Vatke (1806–1882) and Theodor Benfey (1809–1881). In 1827, after declining an invitation to take Eichborn's place at Göttingen, Gesenius was made a *Consistorialrath*; but, apart from the violent attacks to which he, along with bis friend and colleague Julius Wegscheider, was in 1830 subjected by E. W. Hengstenberg and his party in the *Evangelische Kirchenzeitung*, on account of his rationalism, bis life was uneventful. He died at Halle on the 23rd of October 1842. To Gesenius belongs in a large measure the credit of having freed Semitic philology from the trammels of theological and religious prepossession, and of inaugurating the strictly scientific (and comparative) method which bas since been so fruitful. As an exegete be exercised a powerful, and on the whole a beneficial, influence on theological investigation.

Of his many works, the earliest, published in 1810, entitled *Versuch über die maltesische Sprache*, was a successful refutation of the widely current opinion that the modern Maltese was of Punic origin. In the same year appeared the first volume of the *Hebräisches u. Chaldäisches Handwörterbuch*, completed in 1812. Revised editions of this appear periodically in Germany, *e.g.* that of H. Zimmern and F. Buhl (1905). The publication of a new English edition was started in 1892 under the editorship of Professors C. A. Briggs, S. R. Driver and F. Brown. The *Hebräische Grammatik*, published in 1813 (27th edition by E. Kautzsch; English translation from 25th and 26th German editions by G. W. Collins and A. E. Cowley, 1898), was followed in 1815 by the *Geschichte der hebräischen Sprache* (now very rare), and in 1817 by the *Ausführliches Lehrgebäude der hebräischen Sprache*. The first volume of his well-known commentary on Isaiah (*Der Prophet Jesaja*), with a translation, appeared in 1821; but the work was not completed until 1829. The *Thesaurus philologico-criticus linguae Hebraicae et Chaldaicae* began in 1829, he did not live to complete; the latter part of the third volume is edited by E. Rödiger (1858). Other works: *De Pentateuchi Samaritani origine, indole, et auctoritate* (1815), supplemented in 1822 and 1824 by the treatise *De Samaritanorum theologia*, and by an edition of *Carmina Samaritana*; *Palaeographische Studien über phönizische u. punische Schrift* (1835), a pioneering work which he followed up in 1837 by his collection of Phoenician monuments (*Scripturae linguaeque Phoeniciae monumenta quotquot supersunt*); an Aramaic lexicon (1834–1839); and a treatise on the Himyaritic language written in conjunction with E. Rödiger in 1841. Gesenius also contributed extensively to Ersch and Gruber's *Encyclopädie*, and entitled the German translation of J. L. Burckhardt's *Travels in Syria and the Holy Land* with valuable geographical notes. For many years he also edited the Halle *Allgemeine Litteraturzeitung*. A sketch of his life was published anonymously in 1843 (*Gesenius: eine Erinnerung für seine Freunde*), and another by H. Gesenius, *Wilhelm Gesenius, ein Erinnerungsblatt an den hundertjährigen Geburtstag*, in 1886. See also the article in the *Allgemeine deutsche Biographie*.

GESNER, ABRAHAM (1797–1864), Canadian geologist, was born in Nova Scotia in 1797. He qualified as a doctor of medicine in London in 1827. Returning to the Dominion, he published in 1836 *Remarks on the Geology and Mineralogy of Nova Scotia*, and continuing his researches he was enabled in 1843 to bring before the Geological Society of London "A Geological Map of Nova Scotia, with an accompanying Memoir" (*Proc. Geol. Soc.* iv. 186). In 1849 he issued a volume on the industrial resources of the country. He dealt also with the geology and mineralogy of New Brunswick and Prince Edward's Island. Devoting himself to the economic side of geology in various parts of North America, he was enabled to bring out in 1861 *A Practical Treatise on Coal, Petroleum and other Distilled Oils*. He died at Halifax, N.S., on the 20th of April 1864.

GESNER, JOHANN MATTHIAS (1691–1761), German classical scholar and schoolmaster, was born at Roth near Ansbach on the 9th of April 1691. He studied at the university of Jena, and in 1714 published a work on the *Philopatris* ascribed to Lucian. In 1715 he became librarian and conrector (vice-principal) at Weimar, in 1729 rector of the gymnasium at Ansbach, and in 1730 rector of the Thomas school at Leipzig. On the foundation of the university of Göttingen he became professor of rhetoric (1734) and subsequently librarian. He died at Göttingen on the 3rd of August 1761. His special merit lies in the attention be devoted to the explanation and illustration of the subject matter of the classical authors.

His principal works are: editions of the *Scriptores rei rusticae*, of Quintilian, Claudian, Pliny the Younger, Horace and the Orphic poems (published after his death); *Primae lineae isagoges in eruditionem universalem* (1756); an edition of B. Faber's *Thesaurus eruditionis scholasticae* (1726), afterwards continued under the title *Novus linguae et eruditionis Romanae thesaurus* (1749); *Opuscula minora varii argumenti* (1743–1745); *Thesaurus epistolicus Gesnerianus* (ed. Klotz, 1768–1770); *Index etymologicus latinitatis* (1749). See J. A. Ernesti, *Opuscula oratoria* (1762), p. 305; H. Sauppe, *Göttinger Professoren* (1872); C. H. Pölnert, *J. M. Gesner und sein Verhältnis zum Philanthropinismus und Neuhumanismus* (1898), a contribution to the history of pedagogy in the 18th century; articles by F. A. Eckstein in *Allgemeine deutsche Biographie* ix.; and Sandys, *Hist. of Class. Schol.* iii. (1908), 3-9.

GESNER [improperly GESSNER; in Latin, GESNERUS], **KONRAD VON** (1516–1565), German-Swiss writer and naturalist, called "the German Pliny" by Cuvier, was born at Zürich on the 26th of March 1516. The son of a poor furrier, he was educated in that town, but fell into great need after the death of his father at the battle of Kappel (1531). He had good friends, however, in his old master, Myconius, and subsequently in Heinrich Bullinger, and he was enabled to continue his studies at the

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universities of Strassburg and Bourges (1532–1533); he found also a generous patron in Paris (1534), in the person of Joh. Steiger of Berne. In 1535 the religious troubles drove him back to Zürich, where he made an imprudent marriage. His friends again came to his aid, enabled him to study at Basel (1536), and in 1537 procured for him the professorship of Greek at the newly founded academy of Lausanne (then belonging to Berne). Here he had leisure to devote himself to scientific studies, especially botany. In 1540–1541 he visited the famous medical university of Montpellier, took his degree of doctor of medicine (1541) at Basel, and then settled down to practise at Zürich, where he obtained the post of lecturer in physics at the Carolinum. There, apart from a few journeys to foreign countries, and annual summer botanical journeys in his native land, he passed the remainder of his life. He devoted himself to preparing works on many subjects of different sorts. He died of the plague on the 13th of December 1565. In the previous year he had been ennobled.

To his contemporaries he was best known as a botanist, though his botanical MSS. were not published till long after his death (at Nuremberg, 1751–1771, 2 vols. folio), he himself issuing only the *Enchiridion historiae plantarum* (1541) and the *Catalogus plantarum* (1542) in four tongues. In 1545 he published his remarkable *Bibliotheca universalis* (ed. by J. Simler, 1574), a catalogue (in Latin, Greek and Hebrew) of all writers who had ever lived, with the titles of their works, &c. A second part, under the title of *Pandectarium sive partitionum universalium Conradi Gesneri Ligurini libri xxi.*, appeared in 1548; only nineteen books being then concluded. The 21st book, a theological encyclopaedia, was published in 1549, but the 20th, intended to include his medical work, was never finished. His great zoological work, *Historia animalium*, appeared in 4 vols. (quadrupeds, birds, fishes) folio, 1551–1558, at Zürich, a fifth (snakes) being issued in 1587 (there is a German translation, entitled *Thierbuch*, of the first 4 vols., Zürich, 1563): this work is the starting-point of modern zoology. Not content with such vast works, Gesner put forth in 1555 his book entitled *Mithridates de differentiis linguis*, an account of about 130 known languages, with the Lord's Prayer in 22 tongues, while in 1556 appeared his edition of the works of Aelian. To non-scientific readers, Gesner will be best known for his love of mountains (below the snow-line) and for his many excursions among them, undertaken partly as a botanist, but also for the sake of mere exercise and enjoyment of the beauties of nature. In 1541 he prefixed to a singular little work of his (*Libellus de lacte et operibus lactariis*) a letter addressed to his friend, J. Vogel, of Glarus, as to the wonders to be found among the mountains, declaring his love for them, and his firm resolve to climb at least one mountain every year, not only to collect flowers, but in order to exercise his body. In 1555 Gesner issued his narrative (*Descriptio Montis Fracti sive Montis Pilati*) of his excursion to the Gnepfstein (6200 ft.), the lowest point in the Pilatus chain, and therein explains at length how each of the senses of man is refreshed in the course of a mountain excursion.

Lives by J. Hanhart (Winterthur, 1824) and J. Simler (Zürich, 1566); see also Lebert's *Gesner als Arzt* (Zürich, 1854). A part of his unpublished writing, edited by Prof. Schmiedel, was published at Nuremberg in 1753.

GESSNER, SOLOMON (1730–1788), Swiss painter and poet, was born at Zürich on the 1st of April 1730. With the exception of some time (1740–1750) spent in Berlin and Hamburg, where he came under the influence of Ramler and Hagedorn, he passed the whole of his life in his native town, where he carried on the business of a bookseller. He died on the 2nd of March 1788. The first of his writings that attracted attention was his *Lied eines Schweizers an sein bewaffnetes Mädchen* (1751). Then followed *Daphnis* (1754), *Idyllen* (1756 and 1772), *Inkel and Yariko* (1756), a version of a story borrowed from the *Spectator* (No. 11, 13th of March 1711) and already worked out by Gellert and Bodmer, and *Der Tod Abels* (1758), a sort of idyllic pastoral. It is somewhat difficult for us now to understand the reason of Gesner's universal popularity, unless it was the taste of the period for the conventional pastoral. His writings are marked by sweetness and melody, qualities which were warmly appreciated by Lessing, Herder and Goethe. As a painter Gesner represented the conventional classical landscape.

Collected editions of Gessner's works were repeatedly published (2 vols. 1777–1778, finally 2 vols. 1841, both at Zürich). They were translated into French (3 vols., Paris, 1786–1793), and versions of the *Idyllen* appeared in English, Dutch, Portuguese, Spanish, Swedish and Bohemian. Gessner's life was written by Hottinger (Zürich, 1796), and by H. Wölfflin (Frauenfeld, 1889); see also his *Briefwechsel mit seinem Sohn* (Bern and Zürich, 1801).

GESSO, an Italian word (Lat. *gypsum*), for "plaster of Paris" especially when used as a ground for painting, or for modelling or sculpture.

GESTA ROMANORUM, a Latin collection of anecdotes and tales, probably compiled about the end of the 13th century or the beginning of the 14th. It still possesses a twofold literary interest, first as one of the most popular books of the time, and secondly as the source, directly or indirectly, of later literature, in Chaucer, Gower, Shakespeare and others. Of its authorship nothing certain is known; and there is little but gratuitous conjecture to associate it either with the name of Helinandus or with that of Petrus Berchorius (Pierre Bercheure). - It is even a matter of debate whether it took its rise in England, Germany or France. The work was evidently intended as a manual for preachers, and was probably written by one who himself belonged to the clerical profession. The name, *Deeds of the Romans*, is only partially appropriate to the collection in its present form, since, besides the titles from Greek and Latin history and legend, it comprises fragments of very various origin, oriental and European. The unifying element of the book is its moral purpose. The style is barbarous, and the narrative ability of the compiler contrasts to vary with his sources; but he has managed to bring together a considerable variety of excellent material. He gives us, for example, the germ of the romance of "Guy of Warwick"; the story of "Darius and his Three Sons," versified by Occleve; part of Chaucer's "Man of Lawes' Tale"; a tale of the emperor Theodosius, the same in its main features as that of Shakespeare's *Lear*; the story of the "Three Black Crows"; the "Hermit and the Angel," well known from Parnell's version, and a story identical with the *Fridolin* of Schiller. Owing to the loose structure of the book, it was easy for a transcriber to insert any additional story into his own copy, and consequently the MSS. of the *Gesta Romanorum* exhibit considerable variety. Oesterley recognizes an English group of MSS. (written always in Latin), a German group (sometimes in Latin and sometimes in German), and a group which is represented by the vulgate or common printed text. The earliest editions are supposed to be those of Ketelaer and de Lecompt at Utrecht, of Arnold Ter Hoenen at Cologne, and of Ulrich Zell at Cologne; but the exact date is in all three cases uncertain.

An English translation, probably based directly on the MS. Harl. 5369, was published by Wynkyn de Worde about 1510–1515, the only copy of which known to exist is preserved in the library of St John's College, Cambridge. In 1577 Richard Robinson published a revised edition of Wynkyn de Worde, and the book proved highly popular. Between 1648 and 1703 at least eight impressions were issued. In 1703 appeared the first vol. of a translation by B. P., probably Bartholomew Pratt, "from the Latin edition of 1514." A translation by the Rev. C. Swan, first published in 2 vols. in 1824, forms part of Bohn's antiquarian library, and was re-edited by Wynnard Hooper in 1877 (see also the latter's *Mediaeval Tales*). The German translation was first printed at Augsburg, 1489. A French version, under the title of *Le Violier des histoires romaines moralisés*, appeared in the early part of the 16th century, and went through a number of editions; it has been reprinted by G. Brunet (Paris, 1858). Critical editions of the Latin text have been produced by A. Keller (Stuttgart, 1842) and Oesterley (Berlin, 1872). See also Warton, "On the Gesta Romanorum," dissertation iii., prefixed to the *History of English Poetry*; Douce, *Illustrations of Shakespeare*, vol. ii.; Frederick Madden, Introduction to the Roxburghe Club edition of *The Old English Versions of the Gesta Romanorum* (1838).

GETA, PUBLIUS SEPTIMIUS (189–212), younger son of the Roman emperor Septimius Severus, was born at Mediolanum (Milan). In 198 he received the title of Caesar, and in 209 those of Imperator and Augustus. Between him and his brother Caracalla

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there existed from their early years a keen rivalry and antipathy. On the death of their father in 211 they were proclaimed joint emperors; and after the failure of a proposed arrangement for the division of the empire, Caracalla pretended a desire for reconciliation. He arranged a meeting with his brother in his mother's apartments, and had him murdered in her arms by some centurions.

Dio Cassius lxxvii. 2; Spartianus, *Caracalla*, 2; Herodian iv. 1.

GETAE, an ancient people of Thracian origin, closely akin to the Daci (see DACIA). Their original home seems to have been the district on the right bank of the Danube between the rivers Oescus (Iskr) and Iatrus (Yantra). The view that the Getae were identical with the Goths has found distinguished supporters, but it is not generally accepted. Their name first occurs in connexion with the expedition of Darius Hystaspis (515 B.C.) against the Scythians, in the course of which they were brought under his sway, but they regained their freedom on his return to the East. During the 5th century, they appear as furnishing a contingent of cavalry to Sitalces, king of the Odrysae, in his attack on Perdiccas II., king of Macedon, but the decay of the Odrysian kingdom again left them independent. When Philip II. of Macedon in 342 reduced the Odrysae to the condition of tributaries, the Getae, fearing that their turn would come next, made overtures to the conqueror. Their king Cothelas undertook to supply Philip with soldiers, and his daughter became the wife of the Macedonian. About this time, perhaps being hard pressed by the Triballi and other tribes, the Getae crossed the Danube. Alexander the Great, before transporting his forces into Asia, decided to make his power felt by the Macedonian dependencies. His operations against the Triballi not having met with complete success, he resolved to cross the Danube and attack the Getae. The latter, unable to withstand the phalanx, abandoned their chief town, and fled to the steppes (*Ferία ἡ ἔσχατος*, north of the Danube delta), whither Alexander was unwilling to follow them. About 326, an expedition conducted by Zopyrion, a Macedonian governor of Thrace, against the Getae, failed disastrously. In 292, Lysimachus declared war against them, alleging as an excuse that they had rendered assistance to certain barbarous Macedonian tribes. He penetrated to the plains of Bessarabia, where his retreat was cut off and he was forced to surrender. Although the people clamoured for his execution, Dromichaetes, king of the Getae, allowed him to depart unharmed, probably on payment of a large ransom, great numbers of gold coins having been found near Thordа, some of them bearing the name of Lysimachus. When the Gauls made their way into eastern Europe, they came into collision with the Getae, whom they defeated and sold in large numbers to the Athenians as slaves. From this time the Getae seem to have been usually called Daci; for their further history see DACIA.

The Getae are described by Herodotus as the most valiant and upright of the Thracian tribes; but what chiefly struck Greek inquirers was their belief in the immortality of the soul (hence they were called *ἀθανατίζοντες*) and their worship of Zalmoxis (or Zamolxis), whom the euhemerists of the colonies on the Euxine made a pupil of Pythagoras. They were very fond of music, and it was the custom for their ambassadors the priests to present themselves clad in white, playing the lyre and singing songs. They were experts in the use of the bow and arrows while on horseback.

See E. R. Rösler, "Die Geten und ihre Nachbarn," in *Sitzungsberichte der k. Akad. der Wissenschaften, philosophisch-historische Classe*, xliv. (1863), and *Romänische Studien* (Leipzig, 1871); W. Tomaschek, "Die alten Thraker," in above *Sitzungsberichte*, cxxviii. (Vienna, 1893); W. Bessel, *De rebus Geticis* (Göttingen, 1854); C. Müllenhoff in Ersch and Gruber's *Allgemeine Encyclopädie*; T. Mommsen, *Hist. of Rome* (Eng. trans.), bk. v. ch. 7.

GETHSEMANE (Hebr. for "oil-press"), the place to which Jesus and His disciples withdrew on the eve of the Crucifixion. It was evidently an enclosed piece of ground, a plantation rather than a garden in our sense of the word. It lay east of the Kidron and on the lower slope of the mount of Olives, at the foot of which is the traditional site dating from the 4th century and now possessed by the Franciscans. The Grotto of the Agony, a few hundred yards farther north, is an ancient cave-cistern, now a Latin sanctuary. (See further JERUSALEM.)

GETTYSBURG, a borough and the county-seat of Adams county, Pennsylvania, U.S.A., about 35 m. S.W. of Harrisburg. Pop. (1900) 3495; (1910) 4030. It is served by the Western Maryland and the Gettysburg & Harrisburg railways. The site of the borough is a valley about 1½ m. wide; the neighbouring country abounds in attractive scenery. Katalysine Spring in the vicinity was once a well-known summer resort; its waters contain lithia in solution. Gettysburg has several small manufacturing establishments and is the seat of Pennsylvania College (opened in 1832, and the oldest Lutheran college in America), which had 312 students (68 in the preparatory department) in 1907–1908, and of a Lutheran theological seminary, opened in 1826 on Seminary Ridge; but the borough is best known as the scene of one of the most important battles of the Civil War. Very soon after the battle a soldiers' national cemetery was laid out here, in which the bodies of about 3600 Union soldiers have been buried; and at the dedication of this cemetery, in November 1863, President Lincoln delivered his celebrated "Gettysburg Address." In 1864 the Gettysburg Battle-Field Memorial Association was incorporated, and the work of this association resulted in the conversion of the battle-field into a National Park, an act for the purpose being passed by Congress in 1895. Within the park the lines of battle have been carefully marked, and about 600 monuments, 1000 markers, and 500 iron tablets have been erected by states and regimental associations. Hundreds of cannon have been mounted, and five observation towers have been built. From 1816 to 1840 Gettysburg was the home of Thaddeus Stevens. Gettysburg was settled about 1740, was laid out in 1787, was made the county-seat in 1800, and was incorporated as a borough in 1806.

Battle of Gettysburg.—The battle of the 1st, 2nd and 3rd of July 1863 is often regarded as the turning-point of the American Civil War (*q.v.*) although it arose from a chance encounter. Lee, the commander of the Confederate Army of Northern Virginia, had merely ordered his scattered forces to concentrate there, while Meade, the Federal commander, held the town with a cavalry division, supported by two weak army corps, to screen the concentration of his Army of the Potomac in a selected position on Pipe Creek to the south-eastward. On the 1st of July the leading troops of General A. P. Hill's Confederate corps approached Gettysburg from the west to meet Ewell's corps, which was to the N. of the town, whilst Longstreet's corps followed Hill. Lee's intention was to close up Hill, Longstreet and Ewell before fighting a battle. But Hill's leading brigades met a strenuous resistance from the Federal cavalry division of General John Buford, which was promptly supported by the infantry of the I. corps under General J. F. Reynolds. The Federals so far held their own that Hill had to deploy two-thirds of his corps for action, and the western approaches of Gettysburg were still held when Ewell appeared to the northward. Reynolds had already fallen, and the command of the Federals, after being held for a time by Gen. Abner Doubleday, was taken over by Gen. O. O. Howard, the commander of the XI. corps, which took post to bar the way to Ewell on the north side. But Ewell's attack, led by the fiery Jubal Early, swiftly drove back the XI. corps to Gettysburg; the I. corps, with its flank thus laid open, fell back also, and the remnants of both Federal corps retreated through Gettysburg to the Cemetery Hill position. They had lost severely in the struggle against superior numbers, and there had been some disorder in the retreat. Still a formidable line of defence was taken up on Cemetery Hill and both Ewell and Lee refrained from further attacks, for the Confederates had also lost heavily during the day and their concentration was not complete. In the meanwhile Meade had sent forward General W. S. Hancock, the commander of the Federal II. corps, to examine the state of affairs, and on Hancock's report he decided to fight on the Cemetery Hill position. Two corps of his army were still distant, but the XII. arrived before night, the III. was near, and Hancock moved the II. corps on his own initiative. Headquarters and the artillery reserve started for Gettysburg on the night of the 1st.

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On the other side, the last divisions of Hill's and Ewell's corps formed up opposite the new Federal position, and Longstreet's corps prepared to attack its left.

Owing, however, to misunderstandings between Lee and Longstreet (*q.v.*), the Confederates did not attack early on the morning of the 2nd, so that Meade's army had plenty of time to make its dispositions. The Federal line at this time occupied the horse-shoe ridge, the right of which was formed by Culp's Hill, and the centre by the Cemetery hill, whence the left wing stretched southward, the III. corps on the left, however, being thrown forward considerably. The XII. held Culp's, the remnant of the I. and XI. the Cemetery hills. On the left was the II., and in its advanced position—the famous "Salient"—the III., soon to be supported by the V.; the VI., with the reserve artillery, formed the general reserve. It was late in the day when the Confederate attack was made, and valuable time had been lost, but Longstreet's troops advanced with great spirit. The III.

corps Salient was the scene of desperate fighting; and the "Peach Orchard" and the "Devil's Den" became as famous as the "Bloody Angle" of Spottsylvania or the "Hornets' Nest" of Shiloh. While the Confederate attack was developing, the important positions of Round Top and Little Round Top were unoccupied by the defenders—an omission which was repaired only in the nick of time by the commanding engineer of the army, General G. K. Warren, who hastily called up troops of the V. corps. The attack of a Confederate division was, after a hard struggle, repulsed, and the Federals retained possession of the Round Tops. The III. corps in the meantime, furiously attacked by troops of Hill's and Longstreet's corps, was steadily pressed back, and the Confederates actually penetrated the main line of the defenders, though for want of support the brigades which achieved this were quickly driven out. Ewell, on the Confederate left, waited for the sound of Longstreet's guns, and thus no attack was made by him until late in the day. Here Culp's Hill was carried with ease by one of Ewell's divisions, most of the Federal XII. corps having been withdrawn to aid in the fight on the other wing; but Early's division was repulsed in its efforts to storm Cemetery Hill, and the two divisions of the centre (one of Hill's, one of Ewell's corps) remained inactive.

That no decisive success had been obtained by Lee was clear to all, but Ewell's men on Culp's Hill, and Longstreet's corps below Round Top, threatened to turn both flanks of the Federal position, which was no longer a compact horseshoe but had been considerably prolonged to the left; and many of the units in the Federal army had been severely handled in the two days' fighting. Meade, however, after discussing the eventuality of a retreat with his corps commanders, made up his mind to hold his ground. Lee now decided to alter his tactics. The broken ground near Round Top offered so many obstacles that he decided not to press Longstreet's attack further. Ewell was to resume his attack on Meade's extreme right, while the decisive blow was to be given in the centre (between Cemetery Hill and Trostle's) by an assault delivered in the Napoleonic manner by the fresh troops of Pickett's division (Longstreet's corps). Meade, however, was not disposed to resign Culp's Hill, and with it the command of the Federal line of retreat, to Ewell, and at early dawn on the 3rd a division of the XII. corps, well supported by artillery, opened the Federal counter-attack; the Confederates made a strenuous resistance, but after four hours' hard fighting the other division of the XII. corps, and a brigade of the VI., intervened with decisive effect, and the Confederates were driven off the hill. The defeat of Ewell did not, however, cause Lee to alter his plans. Pickett's division was to lead in the great assault, supported by part of Hill's corps (the latter, however, had already been engaged). Colonel E. P. Alexander, Longstreet's chief of artillery, formed up one long line of seventy-five guns, and sixty-five guns of Hill's corps came into action on his left. To the converging fire of these 140 guns the Federals, cramped for space, could only oppose seventy-seven. The attacking troops formed up before 9 A.M., yet it was long before Longstreet could bring himself to order the advance, upon which so much depended, and it was not till about 1 P.M. that the guns at last opened fire to prepare the grand attack. The Federal artillery promptly replied, but after thirty minutes' cannonade its commander, Gen. H. J. Hunt, ordered his batteries to cease fire in order to reserve their ammunition to meet the infantry attack. Ten minutes later Pickett asked and received permission to advance, and the infantry moved forward to cross the 1800 yds. which separated them from the Federal line. Their own artillery was short of ammunition, the projectiles of that day were not sufficiently effective to cover the advance at long ranges, and thus the Confederates, as they came closer to the enemy, met a tremendous fire of unshaken infantry and artillery.

The charge of Pickett's division is one of the most famous episodes of military history. In the teeth of an appalling fire from the rifles of the defending infantry, who were well sheltered, and from the guns which Hunt had reserved for the crisis, the Virginian regiments pressed on, and with a final effort broke Meade's first line. But the strain was too great for the supporting brigades, and Pickett was left without assistance. Hancock made a fierce counterstroke, and the remnant of the Confederates retreated. Of Pickett's own division over three-quarters, 3303 officers and men out of 4500, were left on the field, two of his three brigadiers were killed and the third wounded, and of fifteen regimental commanders ten were killed and five wounded. One regiment lost 90% of its numbers. The failure of this assault practically ended the battle; but Lee's line was so formidable that Meade did not in his turn send forward the Army of the Potomac. By the morning of the 5th of July Lee's army was in full retreat for Virginia. He had lost about 30,000 men in killed, wounded and missing out of a total force of perhaps 75,000. Meade's losses were over 23,000 out of about 82,000 on the field. The main body of the cavalry on both sides was absent from the field, but a determined cavalry action was fought on the 3rd of July between the Confederate cavalry under J. E. B. Stuart and that of the Federals under D. McM. Gregg some miles E. of the battlefield, and other Federal cavalry made a dashing charge in the broken ground south-west of Round Top on the third day, inflicting thereby, though at great loss to themselves, a temporary check on the right wing of Longstreet's infantry.

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GEULINCX, ARNOLD (1624–1669), Belgian philosopher, was born at Antwerp on the 31st of January 1624. He studied philosophy and medicine at the university of Louvain, where he remained as a lecturer for several years. Having given offence by his unorthodox views, he left Louvain, and took refuge in Leiden, where he appears to have been in the utmost distress. He entered the Protestant Church, and in 1663, through the influence of his friend Abraham Heidanus, who had assisted him in his greatest need, he obtained a poorly paid lectureship at the university. He died at Leiden in November 1669. His most important works were published posthumously. The *Metaphysica vera* (1691), and the *Τνῶθι σεαυτόν, sive Ethica* (under the pseudonym "Philaretus," 1675), are the works by which he is chiefly known. Mention may also be made of *Physica vera* (1688), *Logica restituta* (1662) and *Annotata in Principia philosophiae R. Cartesii* (1691).

Geulincx principally deals with the question, left in an obscure and unsatisfactory state by Descartes, of the relation between soul and body. Whereas Descartes made the union between them a violent collocation, Geulincx practically called it a miracle. Extension and thought, the essences of corporeal and spiritual natures, are absolutely distinct, and cannot act upon one another. External facts are not the causes of mental states, nor are mental states the causes of physical facts. So far as the physical universe is concerned, we are merely spectators; the only action that remains for us is contemplation. The influence we seem to exercise over bodies by will is only apparent; volition and action only accompany one another. Since true activity consists in knowing what one does and how one does it, I cannot be the author of any state of which I am unconscious; I am not conscious of the mechanism by which bodily motion is produced, hence I am not the author of bodily motion ("Quod nescis quomodo fiat, id non facis"). Body and mind are like two clocks which act together, because both have been set together by God. A physical occurrence is but the occasion (opportunity, occasional cause) on which God excites in me a corresponding mental state; the exercise of my will is the occasion on which God moves my body. Every operation in which mind and matter are both concerned is an effect of neither, but the direct act of God. Geulincx was thus the first definitely to systematize the theory called Occasionalism, which had already been propounded by Géraud de Cordemoy (d. 1684), a Parisian lawyer, and Louis de la Forge, a physician of Saumur. But the principles on which the theory was founded compelled a further advance. God, who is the cause of the concomitance of bodily and mental facts, is in truth the sole cause in the universe. No fact contains in itself the ground of any other; the existence of the facts is due to God, their sequence and coexistence are also due to him. He is the ground of all that is. My desires, volitions and thoughts are thus the desires, volitions and thoughts of God. Apart from God, the finite being has no reality, and we only have the idea of it from God. Descartes had left untouched, or nearly so, the difficult problem of the relation between the universal element or thought and the particular desires or inclinations. All these are regarded by Geulincx as modes of the divine thought and action, and accordingly the end of human endeavour is the end of the divine will or the realization of reason. The love of right reason is the supreme virtue, whence flow the cardinal virtues, diligence, obedience, justice and humility. Since it is impossible for us to make any alteration in the world of matter, all we can do is to submit. Chief of the cardinal virtues is humility, a confession of our own helplessness and submission to God. Geulincx's idea of life is "a resigned optimism."

Geulincx carried out to their extreme consequences the irreconcilable elements in the Cartesian metaphysics, and his works have the peculiar value attaching to the vigorous development of a one-sided principle. The abrupt contradictions to which such development leads of necessity compels revision of the principle itself. He was thus important as the precursor of Malebranche and Spinoza.

Edition of his philosophical works by J. P. N. Land (1891–1893, for which a recently discovered MS. was consulted); see also the same editor's *Arnold Geulincx und seine Philosophie* (1895), and article (translated) in *Mind*, xvi. 223 sq.; V. van der Haeghen, *Geulincx. Étude sur sa vie, sa philosophie, et ses ouvrages* (Ghent, 1886); E. Grimm, *A. Geulincx' Erkenntnisstheorie und Occasionalismus* (1875); E. Pfleiderer, *A. G. als Hauptvertreter der okkasionalistischen Metaphysik und Ethik* (1882); G. Samtleben, *Geulincx, ein Vorgänger Spinozas* (1885); also Falckenberg, *Hist of Mod. Philos.* (Eng. trans., 1895), ch. iii.; G. Monchamp, *Hist. du Cartésianisme en Belgique* (Brussels, 1886); H. Höffding, *Hist. of Mod. Philos.* (Eng. trans., 1900), i. 245.

GEUM, in botany, a genus of hardy perennial herbs (natural order Rosaceae) containing about thirty species, widely distributed in temperate and arctic regions. The erect flowering shoots spring from a cluster of radical leaves, which are deeply cut or lobed, the largest division being at the top of the leaf. The flowers are borne singly on long stalks at the end of the stem or its branches. They are white, yellow or red in colour, and shallowly cup-shaped. The fruit consists of a number of dry achenes, each of which bears a hook formed from the persistent lower portion of the style, and admirably adapted for ensuring distribution. Two species occur in Britain under the popular name "avens." *G. urbanum* is a very common hedge-bank plant with small yellow flowers; *G. rivale* (water avens) is a rarer plant found by streams, and has larger yellow flowers an inch or more across. The species are easy to cultivate and well adapted for borders or the rock-garden. They are propagated by seeds or by division. The most popular garden species are *G. chiloense* and its varieties, *G. coccineum* and *G. montanum*.

GEVELSBERG, a town of Germany, in the Prussian Rhine Province, 6 m. S.W. from Hagen, on the railway to Düsseldorf. It has two churches, schools and a hospital, and considerable manufactures of cutlery. Pop. (1905) 15,838.

GEX, a town of eastern France, chief town of an arrondissement in the department of Ain, 10 m. N.W. of Geneva and 3 m. from the Swiss frontier. Pop. (1906) town, 1385; commune, 2727. The town is beautifully situated 2000 ft. above sea-level at the base of the most easterly and highest chain of the Jura. It is the seat of a subprefect and has a tribunal of first instance, and carries on considerable trade in wine, cheese and other provisions, chiefly with Geneva. It gives its name to the old Pays de Gex, situated between the Alps and the Jura, which was at various times under the protection of the Swiss, the Genevese and the counts of Savoy, until in 1601 it came into the possession of France, retaining, however, until the Revolution its old independent jurisdiction, with Gex as its chief town. The Pays de Gex is isolated by the Jura from the rest of French territory, and comes within the circumscription of the Swiss customs, certain restrictions being imposed on its products by the French customs.

GEYSER, GEISER, or GEISIR, a natural spring or fountain which discharges into the air, at more or less regular intervals of time, a column of heated water and steam; it may consequently be regarded as an intermittent hot spring. The word is the Icelandic *geysir*, gusher or rager, from the verb *geysa*, a derivative of *gjosa*, to gush. In native usage it is the proper name of the Great Geyser, and not an appellative—the general term *hver*, a hot spring, making the nearest approach to the European sense of the word (see Cleasby and Vigfusson, *Icelandic English Dictionary*, s.v.).

Any hot spring capable of depositing siliceous material by the evaporation of its water may in course of time transform itself into a geyser, a tube being gradually built up as the level of the basin is raised, much in the same manner as a volcanic cone is produced. Every geyser continuing to deposit siliceous material is preparing its own destruction; for as soon as the tube becomes deep enough to contain a column of water sufficiently heavy to prevent the lower strata attaining their boiling points, the whole mechanism is deranged. The deposition of the sinter is due in part to the cooling and evaporation of the siliceous waters, and in part to the presence of living algae. In geyser districts it is easy to find thermal springs busy with the construction of the tube; warm pools, or *laugs*, as the Icelanders call them, on the top of siliceous mounds, with the mouth of

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the shaft still open in the middle; and dry basins from which the water has receded with their shafts now choked with rubbish.

Geysers exist at the present time in many volcanic regions, as in the Malay Archipelago, Japan and South America; but the three localities where they attain their highest development are Iceland, New Zealand and the Yellowstone Park, U.S.A. The very name by which we call them indicates the historical priority of the Iceland group.

The Iceland geysers, mentioned by Saxo Grammaticus, are situated about 30 m. N.W. of Hecla, in a broad valley at the foot of a range of hills from 300 to 400 ft. in height. Within a circuit of about 2 m., upwards of one hundred hot springs may be counted, varying greatly both in character and dimensions. The Great Geyser in its calm periods appears as a circular pool about 60 ft. in diameter and 4 ft. in depth, occupying a basin on the summit of a mound of siliceous concretion; and in the centre of the basin is a shaft, about 10 ft. in diameter and 70 ft. in depth, lined with the same siliceous material. The clear sea-green water flows over the eastern rim of the basin in little runnels. On the surface it has a temperature of from 76° to 89° C., or from 168° to 188° F. Within the shaft there is of course a continual shifting both of the average temperature of the column and of the relative temperatures of the several strata. The results of the observations of Bunsen and A. L. O. Descloizeaux in 1847 were as follows (cf. *Pogg. Ann.*, vol. 72 and *Comptes rendus*, vol. 19): About three hours after a great eruption on July 6, the temperature 6 metres from the bottom of the shaft was 121·6° C., at 9·50 metres, 122·1°; at 16·93 metres, 100° (?); and at 19·70 metres, 95° (?). About nine hours after a great eruption on July 6, at about 0·3 metres from the bottom, it was 123°; at 4·8 metres it was 122·7°; at 9·6 metres, 113°; at 14·4 metres, 85·8°; at 19·2 metres, 82·6°. On the 7th, there having been no eruption since the previous forenoon, the temperature at the bottom was 127·5°; at 5 metres from the bottom, 123°; at 9 metres, 120·4°; at 14·75 metres, 106·4°; and at 19 metres, 55°. About three hours after a small eruption, which took place at forty minutes past three o'clock in the afternoon of the 7th, the temperature at the bottom was 126·5°; at 6·85 metres up it was 121·8°; at 14·75 metres, 110°; and at 19 metres, 55°. Thus, continues Bunsen, it is evident that the temperature of the column diminishes from the bottom upwards; that, leaving out of view small irregularities, the temperature in all parts of the column is found to be steadily on the increase in proportion to the time that has elapsed since the previous eruption; that even a few minutes before the great eruption the temperature at no point of the water column reached the boiling point corresponding to the atmospheric pressure at that part; and finally, that the temperature about half-way up the shaft made the nearest approach to the appropriate boiling point, and that this approach was closer in proportion as an eruption was at hand. The Great Geyser has varied very much in the nature and frequency of its eruptions since it began to be observed. In 1809 and 1810, according to Sir W. J. Hooker and Sir George S. Mackenzie, its columns were 100 or 90 ft. high, and rose at intervals of 30 hours, while, according to Henderson, in 1815 the intervals were of 6 hours and the altitude from 80 to 150 ft.

About 100 paces from the Great Geyser is the *Strokkr* or churn, which was first described by Stanlay in 1789. The shaft in this case is about 44 ft. deep, and, instead of being cylindrical, is funnel-shaped, having a width of about 8 ft. at the mouth, but contracting to about 10 in. near the centre. By casting stones or turf into the shaft so as to stopper the narrow neck, eruptions can be accelerated, and they often exceed in magnitude those of the Great Geyser itself. During quiescence the column of water fills only the lower part of the shaft, its surface usually lying from 9 to 12 ft. below the level of the soil. Unlike that of the Great Geyser, it is always in ebullition, and its temperature is subject to comparatively slight differences. On the 8th of July 1847 Bunsen found the temperature at the bottom 112·9° C.; at 3 metres from the bottom, 111·4°; and at 6 metres, 108°; the whole depth of water was on that occasion 10·15 metres. On the 6th, at 2·90 metres from the bottom it was 114·2°; and at 6·20 metres, 109·3°. On the 10th, at 0·35 metres from the bottom, the reading gave 113·9°; at 4·65 metres, 113·7°; and at 8·85 metres, 99·9°.

The great geyser-district of New Zealand is situated in the south of the province of Auckland in or near the upper basin of the Waikato river, to the N.E. of Lake Taupo. The scene presented in various parts of the districts is far more striking and beautiful than anything of the same kind to be found in Iceland, but this is due not so much to the grandeur of the geysers proper as to the bewildering profusion of boiling springs, steam-jets and mud-volcanoes, and to the fantastic effects produced on the rocks by the siliceous deposits and by the action of the boiling water. In about 1880 the geysers were no longer active, and this condition prevailed until the Tarawera eruption of 1886, when seven gigantic geysers came into existence; water, steam, mud and stones were discharged to a height of 600 to 800 ft. for a period of about four hours, when quieter conditions set in. Waikite near Lake Rotorua throws the column to a height of 30 or 35 ft.

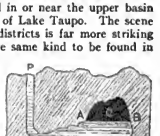

FIG. 1.

In the Yellowstone National Park, in the north-west corner of Wyoming, the various phenomena of the geysers can be observed on the most portentous scale. The geysers proper are about one hundred in number; the non-eruptive hot springs are much more numerous, there being more than 3000. The dimensions and activity of several of the geysers render those of Iceland and New Zealand almost insignificant in comparison. The principal groups are situated along the course of that tributary of the Upper Madison which bears the name of Fire Hole River. Many of the individual geysers have very distinctive characteristics in the form and colour of the mound, in the style of the eruption and in the shape of the column. The "Giantess" lifts the main column to a height of only 50 or 60 ft., but shoots a thin spire to no less than 250 ft. The "Castle" varies in height from 10 or 15 to 250 ft.; and on the occasions of greatest effort the noise is appalling, and shakes the ground like an earthquake. "Old Faithful" owes its name to the regularity of its action. Its eruptions rise the water to a height of 100 or 150 ft., last for about five minutes, and recur every hour or thereabouts. The "Beehive" sometimes attains a height of 219 ft.; and the water, instead of falling back into the basin, is dissipated in spray and vapour. Very various accounts are given of the "Giant." F. V. Hayden saw it playing for an hour and twenty minutes, and reaching a height of 140 ft., and Doane says it continued in action for three hours and a half, and had a maximum of 200 ft.; but at the earl of Dunraven's visit the eruption lasted only a few minutes.

FIG. 2.

Theory of Geysers.—No satisfactory explanation of the phenomena of geysers was advanced till near the middle of the 19th century, when Bunsen elucidated their nature. Sir George Mackenzie, in his *Travels in Iceland* (2nd ed., 1812), submitted a theory which partially explained the phenomena met with. "Let us suppose a cavity C (fig. 1), communicating with the pipe PQ, filled with boiling water to the height AB, and that the steam above this line is confined so that it sustains the water to the height P. If we suppose a sudden addition of heat to be applied under the cavity C, a quantity of steam will be produced which, owing to the great pressure, will be evolved in starts, causing the noises like discharges of artillery and the shaking of the ground." He admitted that this could be only a partial explanation of the facts of the case, and that he was unable

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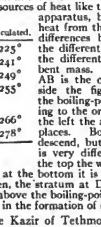
to account for the frequent and periodical production of the necessary heat; but he has the credit of hitting on what is certainly the proximate cause—the sudden evolution of steam. By Bunsen's theory the whole difficulty is solved, as it beautifully demonstrated by the artificial geyser designed by J. H. J. Müller of Freiburg (fig. 2). If the tube *ab* be filled with water and heated at two points, first at *a* and then at *b*, the following succession of changes is produced. The water at *a* beginning to boil, the superincumbent column is consequently raised, and the stratum of water which was on the point of boiling at *b* being raised to *d* is there subjected to a diminished pressure; a sudden evolution of steam accordingly takes place at *d*, and the superincumbent water is violently ejected. Received in the basin *c*, the air-cooled water sinks back into the tube, and the temperature of the whole column is consequently lowered; but the under strata of water are naturally those which are least affected by the cooling process; the boiling begins again at *a*, and the same succession of events is the result (see R. Bunsen, "Physikalische Beobachtungen über die hauptsächlichsten Geisire Islands," *Pogg. Ann.*, 1847, vol. 72; and Müller, "Über Bunsen's Geysertheorie," *ibid.*, 1850, vol. 79).



The principal difference between the artificial and the natural geyser-tube is that in the latter the effect is not necessarily produced by two distinct sources of heat like the two fires of the experimental apparatus, but by the continual influx of heat from the bottom of the shaft, and the differences between the boiling-points of the different parts of the column owing to the different pressures of the superincumbent mass. This may be thus illustrated: AB is the column of water; on the right side the figures represent approximately the boiling-points (Fahr.) calculated according to the ordinary laws, and the figures on the left the actual temperature of the same places. Both gradually increase as we descend, but the relation between the two is very different at different heights. At the top the water is still 39° from its boiling-point, and even at the bottom it is 19°; but at D the deficiency is only 4°. If, then, the stratum at D be suddenly lifted as high as C, it will be 2° above the boiling-point there, and will consequently expend those 2° in the formation of steam.

GEZER (the Kazir of Tethmosis [Thothmes] III.'s list of Palestinian cities and the Gazri of the Amarna tablets), a royal Canaanite city on the boundary of Ephraim, in the maritime plain (Josh. xvi. 3-10), and near the Philistine border (2 Sam. v. 25). It was allotted to the Levites, but its original inhabitants were not driven out until the time of Solomon, when "Pharaoh, king of Egypt" took the city and gave it as a dowry to his daughter, Solomon's wife (1 Kings ix. 16). Under the form Gazera it is mentioned (1 Macc. iv. 15) as being in the neighbourhood of Emmaus-Nicopolis ('Amwâs) and Jamnia (Yebnah). Throughout the history of the Maccabean wars Gezer or Gazara plays the part of an important frontier post. It was first taken from the Syrians by Simon the Asmonean (1 Macc. xiv. 7). Josephus also mentions that the city was "naturally strong" (*Antiq.* viii. 6. 1). The position of Gezer is defined by Jerome (*Onomasticon*, s.v.) as four Roman miles north (*contra septentrionem*) of Nicopolis ('Amwâs). This points to the mound of debris called *Tell-el-Jezari* near the village of Abû Shûsheh. The site is naturally very strong, the town standing on an isolated hill, commanding the western road to Jerusalem just where it begins to enter the mountains of Judea. This identification has been confirmed by the discovery of a series of boundary inscriptions, apparently marking the limit of the city's lands, which have been found cut in rock—outcrops partly surrounding the site. They read in every case "[1]29, "the boundary of Gezer," with the name *Alkios* in Greek, probably that of the governor under whom the inscriptions were cut. The site has been partially excavated by the Palestine Exploration Fund, and an enormous mass of material for the history of Palestine recovered from it, including remains of a pre-Semitic aboriginal race, a remarkably perfect High Place, the castle built by Simon, and other remains of the first importance.

See R. A. S. Macalister's reports in *Palestine Exploration Fund Quarterly Statement* (October 1902 onwards). Also *Bible Sidelights from the Mound of Gezer*, by the same writer. (R. A. S. M.)

GFRÖRER, AUGUST FRIEDRICH (1803–1861), German historian, was born at Calw, Württemberg, on the 5th of March 1803, and at the close of his preliminary studies at the seminary of Blaubeuren entered the university of Tübingen in 1821 as a student of evangelical theology. After passing his final examinations in 1825, he spent a year in Switzerland, during part of the time acting as companion and secretary to C. von Bonstetten (1745–1832); the year 1827 was spent chiefly in Rome. Returning to Württemberg in 1828, he first undertook the duties of repetent or theological tutor in Tübingen, and afterwards accepted a curacy in Stuttgart; but having in 1830 received an appointment in the royal public library at Stuttgart, he thenceforth gave himself exclusively to literature and historical science. His first work on Philo (*Philo u. die jüdisch-alexandrinische Theosophie*, Stuttgart, 1831) was rapidly followed by an elaborate biography, in two volumes, of Gustavus Adolphus (*Gustav Adolf, König von Schweden, und seine Zeit*, Stuttgart, 1835–1837), and by a critical history of primitive Christianity (*Kritische Geschichte des Urchristenthums*, 3 vols., Stuttgart, 1838). Here Gfrörer had manifested opinions unfavourable to Protestantism, which, however, were not openly avowed until fully developed in his church history (*Allgemeine Kirchengeschichte bis Beginn des 14ten Jahrhunderts*, Stuttgart, 1841–1846). In the autumn of 1846 he was appointed to the chair of history in the university of Freiburg, where he continued to teach until his death at Carlsbad on the 6th of July 1861. In 1848 he sat as a representative in the Frankfort parliament, where he supported the "High German" party, and in 1853 he publicly went over to the Church of Rome. He was a bitter opponent of Prussia and an ardent controversialist.

Among his later historical works the most important is the *Geschichte der ost- u. westfränkischen Karolinger* (Freiburg, 1848); but those on the pseudo-Isidorian Decretals (*Untersuchung über Alter, Ursprung, u. Werth der Decretalen des falschen Isidorus*, 1848), on the primitive history of mankind (*Urgeschichte des menschlichen Geschlechts*, 1855), on Hildebrand (*Papst Gregorius VII. u. sein Zeitalter*, 7 vols., 1859–1861), on the history of the 18th century (*Geschichte des 18ten Jahrhunderts*, 1862–1873), on German popular rights (*Zur Geschichte deutscher Volksrechte im Mittelalter*, Basel, 1865–1866) and on Byzantine history (*Byzantinische Geschichten*, 1872–1874), are also of real value.

GHADAMES, GADAMES or RHADÂMES, a town in an oasis of the same name, in that part of the Sahara which forms part of the Turkish vilayet of Tripoli. It is about 300 m. S.W. of the city of Tripoli and some 10 m. E. of the Algerian frontier. According to Gerhard Rohlfs, the last form given to the word most correctly represents the Arabic pronunciation, but the other forms are more often used in Europe. The streets of the town are narrow and vaulted and have been likened to the bewildering galleries of a coalpit. The roofs are laid out as gardens and preserved for the exclusive use of the women. The Ghadamsi merchants have been known for centuries as keen and adventurous traders, and their agents are to be found in the more important places of the western and central Sudan, such as Kano, Katsena, Kanem, Bornu, Timbuktu, as well as at Ghat and Tripoli. Ghadames itself is the centre of a large number of caravan routes, and in the early part of the 19th century about 30,000 laden camels entered its markets every year. The caravan trade was created by the Ghadamsi merchants who, aided by their superior intelligence, capacity and honesty, long enjoyed a monopoly. In 1873 Tripolitan merchants began to compete with them. In 1803 came the invasion of Bornu by Rabah, and the total stoppage of this caravan route for nearly ten years to the great detriment of the merchants of Ghadames. The caravans from Kano were also frequently pillaged by the Tuareg, so that the prosperity of the town declined. Later on, the opening of rapid means of transport from Kano and other cities to the Gulf of Guinea also affected Ghadames, which, however, maintains a considerable trade. The chief articles brought by the caravans are ostrich feathers, skins and ivory and one of the principal imports is tea. In 1845 the population was estimated at 3000, of whom about 500 were slaves and strangers, and upwards of 1200 children; in 1905 it amounted in round numbers to 7000. The inhabitants are chiefly Berbers and Arabs. A Turkish garrison is maintained in the town.

Before the Christian era Ghadames was a stronghold of the

[1] So written, with a medial *mem* (ם) instead of the final (ם).

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Garamantes whose power was overthrown in the days of Augustus by L. Cornelius Balbus Minor, who captured Ghadames (Cydamus). It is not unlikely that Roman settlers may have been attracted to the spot by the presence of the warm springs which still rise in the heart of the town, and spread fertility in the surrounding gardens. In the 7th century Ghadames was conquered by the Arabs. It appears afterwards to have fallen under the power of the rulers of Tunisia, then to a native dynasty which reigned at Tripoli, and in the 16th century it became part of the Turkish vilayet of Tripoli. It has since then shared the political fortunes of that country. In the first half of the 19th century it was visited by several British explorers and later by German and French travellers.

See J. Richardson, *Travels in the Great Desert of Sahara in 1845–1846 . . . including a Description of . . . Ghadames* (London, 1848); G. Rohlfs, *Reise durch Marokko . . . und Reise durch die Grosse Wüste über Rhadames nach Tripoli* (Bremen, 1868).

GHAT, or RHAT, an oasis and town, forming part of the Turkish vilayet of Tripoli. Ghat is an important centre of the caravan trade between the Nigerian states and the seaports of the Mediterranean (see TRIPOLI).

GHATS, or GHAUTS (literally "the Landing Stairs" from the sea, or "Passes"), two ranges of mountains extending along the eastern and western shores of the Indian peninsula. The word properly applies to the passes through the mountains, but from an early date was transferred by Europeans to the mountains themselves.

The Eastern Ghats run in fragmentary spurs and ranges down the Madras coast. They begin in the Orissa district of Balasore, pass southwards through Cuttack and Puri, enter the Madras presidency in Ganjam, and sweep southwards through the districts of Vizagapatam, Godavari, Nellore, Chingleput, South Arcot, Trichinopoly and Tinnevelly. They run at a distance of 50 to 150 m. from the coast, except in Ganjam and Vizagapatam, where in places they almost abut on the Bay of Bengal. Their geological formation is granite, with gneiss and mica slate, with clay slate, hornblende and primitive limestone overlying. The average elevation is about 1500 ft., but several hills in Ganjam are between 4000 and 5000 ft. high. For the most part there is a broad expanse of low land between their base and the sea, and their line is pierced by the Godavari, Kistna and Cauvery rivers.

The Western Ghats (Sahyadri in Sanskrit) start from the south of the Tapti valley, and run south through the districts of Khandesh, Nasik, Thana, Satara, Ratnagiri, Kanara and Malabar, and the states of Cochin and Travancore, meeting the Eastern Ghats at an angle near Cape Comorin. The range of the Western Ghats extends uninterruptedly, with the exception of a gap or valley 25 m. across, known as the Palghat gap, through which runs the principal railway of the south of India. The length of the range is 800 m. from the Tapti to the Palghat gap, and south of this about 200 m. to the extreme south of the peninsula. In many parts there is only a narrow strip of coast between the hills and the sea; at one point they rise in magnificent precipices and headlands out of the ocean. The average elevation is 3000 ft., precipitous on the western side facing the sea, but with a more gradual slope on the east to the plains below. The highest peaks in the northern section are Kalsubai, 5427 ft.; Harischandragarh, 4691 ft.; and Mahableshwar, where is the summer capital of the government of Bombay, 4700 ft. South of Mahableshwar the elevation diminishes, but again increases, and attains its maximum towards Coorg, where the highest peaks vary from 5500 to 7000 ft., and where the main range joins the interior Nilgiri hills. South of the Palghat gap, the peaks of the Western Ghats rise as high as 8000 ft. The geological formation is trap in the northern and gneiss in the southern section.

GHAZĀLĪ [Muḥammad ibn Muḥammad Abū Ḥāmid al-Ghazālī] (1058–1111), Arabian philosopher and theologian, was born at Tūs, and belonged to a family of Ghazāla (near Tūs) distinguished for its knowledge of canon law. Educated at first in Tūs, then in Jorjān, and again in Tūs, he went to college at Nishāpūr, where he studied under Juwainī (known as the Imām ul-Ḥaramain) until 1085, when he visited the celebrated vizier Niẓām ul-Mulk, who appointed him to a professorship in his college at Bagdad in 1091. Here he was engaged in writing against the Ismā'ilites (Assassins). After four years of this work he suddenly gave up his chair, left home and family and gave himself to an ascetic life. This was due to a growing scepticism, which caused him much mental unrest and which gradually gave way to mysticism. Having secured his chair for his brother he went to Damascus, Jerusalem, Hebron, Mecca, Medina and Alexandria, studying, meditating and writing in these cities. In 1106 he was tempted to go to the Yūsuf, where the Moravid (Almoravid) reformation was being led by Yūsuf ibn Tāshfin, with whom he had been in correspondence earlier. Yūsuf, however, died in this year, and Ghazālī abandoned his idea. At the wish of the sultan Malik Shah he again undertook professorial work, this time in the college of Niẓām ul-Mulk at Nishāpūr, but returned soon after to Tūs, where he died in December 1111.

Sixty-nine works are ascribed to Ghazālī (cf. C. Brockelmann's *Gesch. d. arabischen Litteratur*, i. 421-426, Weimar, 1898). The most important of those which have been published are: a treatise on eschatology called *Ad-durra al-fākhira* ("The precious pearl"), ed. L. Gautier (Geneva, 1878); the great work, *Ihyā' ul-'Ulūm* ("Revival of the sciences") (Bulaq, 1872; Cairo, 1889); see a commentary by al-Murtaḍa called the *Itḥāf*, published in 13 vols. at Fez, 1884–1887, and in 10 vols. at Cairo, 1893; the *Bidāyat ul-Hidāya* (Bulaq, 1870, and often at Cairo); a compendium of ethics, *Miẓān ul-'Amal*, translated into Hebrew, ed. J. Goldenthal (Paris, 1839); a more popular treatise on ethics, the *Kimiya us-Sa'āda*, published at Lucknow, Bombay and Constantinople, ed. H. A. Homes as *The Alchemy of Happiness* (Albany, N.Y., 1873); the ethical work *O Child*, ed. by Hammer-Purgstall in Arabic and German (Vienna, 1838); the *Destruction of Philosophers* (*Tahāfut al-Falāsifa*) (Cairo, 1885, and Bombay, 1887). Of this work a French translation was begun by Carra de Vaux in *Muséon*, vol. xviii. (1899); the *Maqāṣid ul-Falāsifa*, of which the first part on logic was translated into Latin by Dom. Gundisalvi (Venice, 1506), ed. with notes by G. Beer (Leiden, 1888); the *Kitāb ul-Munqid*, giving an account of the changes in his philosophical ideas, ed. by F. A. Schmölders in his *Essai sur les écoles philosophiques chez les Arabes* (Paris, 1842), also printed at Constantinople, 1876, and translated into French by Carra de Meynard in the *Journal asiatique* (1877, i. 1-93); answers to questions asked of him ed. in Arabic and Hebrew, with German translation and notes by H. Malter (Frankfort, 1896); Eng. trans., *Deliverance of al-Ghazzali*, by Claud Field (1909).

For Ghazālī's life see Mc'r. de Slane's translation of Ibn Khallikān, ii. 621 ff.; R. Gösche's *Über Ghazzali's Leben und Werke* (Berlin, 1859); D. B. Macdonald's "Life of al-Ghazzali," in *Journal of American Oriental Society*, vol. xx. (1899), and Carra de Vaux's *Gazali* (Paris, 1902); see ARABIAN PHILOSOPHY. (G. W. T.)

GHAZI (an Arabic word, from *ghazā*, to fight), the name given to Mahommedans who have vowed to exterminate unbelievers by the sword. It is also used as a title of honour, generally translated "the Victorious," in the Ottoman empire for military officers of high rank, who have distinguished themselves in the field against non-Moslem enemies; thus it was conferred on Osman Pasha after his famous defence of Plevna.

GHAZIABAD, a town of British India in Meerut district of the United Provinces, 12 m. from Delhi and 28 m. from Meerut. Pop. (1901) 11,275. The town was founded in 1740 by Ghazi-uddin, son of Azaf Jah, first nizam of the Deccan, and takes its name from its founder. It has considerably risen in importance as the point of junction of the East Indian, the North-Western and the Oudh & Rohilkhand railway systems. The town has a trade in grain and hides.

GHAZIPUR, a town and district of British India, in the Benares division of the United Provinces. The town stands on the left bank of the Ganges, 44 m. E. of Benares. It is the headquarters of the government opium department, where all the opium from the United Provinces is collected and manufactured under a monopoly. There are also scent distilleries, using the produce of the rose-gardens in the vicinity. Lord Cornwallis, governor-general of India, died at Ghazipur in 1805, and a domed monument and marble statue (by Flaxman) are erected over his grave. Pop. (1901) 39,429.

The district of Ghazipur has an area of 1389 sq. m. It forms part of the great alluvial plain of the Ganges, which divides it into two unequal portions. The northern subdivision lies

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between the Gumti and the Gogra, whose confluences with the main stream mark its eastern and western limits respectively. The southern tract is a much smaller strip of country, enclosed between the Karamnasa and the great river itself. There are no hills in the district. A few lakes are scattered here and there, formed where the rivers have deserted their ancient channels. The largest is that of Suraha, once a northern bend of the Ganges, but now an almost isolated sheet of water, 5 m. long by about 4 broad. Ghazipur is said to be one of the hottest and dampest districts in the United Provinces. In 1901 the population was 913,818, showing a decrease of 11% in the decade. Sugar refining is the chief industry, and provides the principal article of export. The main line of the East Indian railway traverses the southern portion of the district, with a branch to the Ganges bank opposite Ghazipur town; the northern portion is served by the Bengal & North-Western system.

GHAZNI, a famous city in Afghanistan, the seat of an extensive empire under two medieval dynasties, and again of prominent interest in the modern history of British India. Ghazni stands on the high tableland of central Afghanistan, in 68° 18′ E. long., 33° 44′ N. lat., at a height of 7280 ft. above the sea, and on the direct road between Kandahar and Kabul, 221 m. by road N.E. from the former, and 92 m. S.W. from the latter. A very considerable trade in fruit, wool, skins, &c., is carried on between Ghazni and India by the Povindah kafilas, which yearly enter India in the late autumn and pass back again to the Afghan highlands in the early spring. The Povindah merchants invariably make use of the Gomal pass which leads to the British frontier at Dera Ismail Khan. The opening up of this pass and the British occupation of Wana, by offering protection to the merchants from Waziri blackmailing, largely increased the traffic.

Ghazni, as it now exists, is a place in decay, and probably does not contain more than 4000 inhabitants. It stands at the base of the terminal spur of a ridge of hills, an offshoot from the Gul-Koh, which forms the watershed between the Arghandáb, and Tarnak rivers. The castle stands at the northern angle of the town next the hills, and is about 150 ft. above the plain. The town walls stand on an elevation, partly artificial, and form an irregular square, close on a mile in circuit (including the castle), the walls being partly of stone or brick laid in mud, and partly of clay built in courses. They are flanked by numerous towers. There are three gates. The town consists of dirty and very irregular streets of houses several stories high, but with two straighter streets of more pretension, crossing near the middle of the town. Of the strategical importance of Ghazni there can hardly be a question. The view to the south is extensive, and the plain in the direction of Kandahar stretches to the horizon. It is bare except in the vicinity of the river, where villages and gardens are tolerably numerous. Abundant crops of wheat and barley are grown, as well as of madder, besides minor products. The climate is notoriously cold,—snow lying 2 or 3 ft. deep for about three months, and tradition speaks of the city as having been more than once overwhelmed by snowdrift. Fuel is scarce, consisting chiefly of prickly shrubs. In summer the heat is not like that of Kandahar or Kabul, but the radiation from the bare heights renders the nights oppressive, and constant dust-storms occur. It is evident that the present restricted walls cannot have contained the vaunted city of Mahmud. Probably the existing site formed the citadel only of his city. The remarks of Ibn Batuta (*c.* 1332) already suggest the present state of things, viz. a small town occupied, a large space of ruin; for a considerable area to the N.E. is covered with ruins, or rather with a vast extent of shapeless mounds, which are pointed out as Old Ghazni. The only remains retaining architectural character are two remarkable towers rising to the height of about 140 ft., and some 400 yds. apart from each other. They are similar, but whether identical, in design, is not clearly recorded. They belong, on a smaller and far less elaborate scale, to the same class as the Kutb Minar at Delhi (*q.v.*). Arabic inscriptions in Cufic characters show the most northerly to have been the work of Mahmud himself, the other that of his son Masa'ud. On the Kabul road, a mile beyond the Minaret of Mahmud, is a village called Rauzah ("the Garden," a term often applied to garden-mausoleums). Here, in a poor garden, stands the tomb of the famous conqueror. It is a prism of white marble standing on a plinth of the same, and bearing a Cufic inscription praying the mercy of God on the most noble Amir, the great king, the lord of church and state, Abul Kasim Mahmud, son of Sabuktagin. The tomb stands in a rude chamber, covered with a dome of clay, and hung with old shawls, ostrich eggs, tiger-skins and so forth. The village stands among luxuriant gardens and orchards, watered by a copious aqueduct. Sultan Baber celebrates the excellence of the grapes of Rauzah.

There are many holy shrines about Ghazni surrounded by orchards and vineyards. Baber speaks of them, and tells how he detected and put a stop to the imposture of a pretended miracle at one of them. These sanctuaries make Ghazni a place of Moslem pilgrimage, and it is said that at Constantinople much respect is paid to those who have worshipped at the tomb of the great Ghazi. To test the genuineness of the boast, professed pilgrims are called on to describe the chief *notabilia* of the place, and are expected to name all those detailed in certain current Persian verses.

History.—The city is not mentioned by any narrator of Alexander's expedition, nor by any ancient author so as to admit of positive recognition. But it is very possibly the *Gasaca* which Ptolemy places among the *Paropamisadae*, and this may not be inconsistent with Sir H. Rawlinson's identification of it with *Gazos*, an Indian city spoken of by two obscure Greek poets as an impregnable place of war. The name is probably connected with the Persian and Sanskrit *ganj* and *ganja*, a treasury (whence the Greek and Latin *Gaza*). We seem to have positive evidence of the existence of the city before the Mahommedan times (644) in the travels of the Chinese pilgrim, Hsuan Tsang, who speaks of *Ho-si-na* (*i.e.* probably *Ghazni*) as one of the capitals of *Tsaukuta* or Arachosia, a place of great strength. In early Mahommedan times the country adjoining Ghazni was called *Zábul*. When the Mahommedans first invaded that region Ghazni was a wealthy entrepot of the Indian trade. Of the extent of this trade some idea is given by Ibn Haukal, who states that at Kabul, then a mart of the same trade, there was sold yearly indigo to the value of two million dinars (£1,000,000). The enterprise of Islam underwent several ebbs and flows over this region. The provinces on the Helmund and Lower Ghaznì were invaded as early as the caliphate of Moáwiya (662–680). The arms of Yaqub b. Laith swept over Kabul and Arachosia (Al-Rukhaj) about 871, and the people of the latter country were forcibly converted. Though the Hindu dynasty of Kabul held a part of the valley of Kabul river till the time of Mahmud, it is probably to the period just mentioned that we must refer the permanent Mahommedan occupation of Ghazni. Indeed, the building of the fort and city is ascribed by a Mahommedan historian to Amr b. Laith, the brother and successor of Ya'kub (d. 901), though the facts already stated discredit this. In the latter part of the 9th century the family of the Samanid, sprung from Samarkand, reigned in splendour at Bokhara. Alptagin, originally a Turkish slave, and high in the service of the dynasty, about the middle of the 10th century, losing the favour of the court, wrested Ghazni from its chief (who is styled Abu Bakr Lawik, wali of Ghazni), and established himself there. His government was recognized from Bokhara, and held till his death. In 977 another Turk slave, Sabuktagin, who had married the daughter of his master Alptagin, obtained rule in Ghazni. He made himself lord of nearly all the present territory of Afghanistan and of the Punjab. In 997 Mahmud, son of Sabuktagin, succeeded to the government, and with his name Ghazni and the Ghaznevid dynasty have beome perpetually associated. Issuing forth year after year from that capital, Mahmud (*q.v.*) carried fully seventeen expeditions of devastation through northern India and Gujarat, as well as others to the north and west. From the borders of Kurdistan to Samarkand, from the Caspian to the Ganges, his authority was acknowledged.

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The wealth brought back to Ghazni was enormous, and contemporary historians give glowing descriptions of the magnificence of the capital, as well as of the conqueror's munificent support of literature. Mahmud died in 1030, and some fourteen kings of his house came after him; but though there was some revival of importance under Ibrahim (1059–1099), the empire never reached anything like the same splendour and power. It was overshadowed by the Seljuks of Persia, and by the rising rivalry of Ghor (*q.v.*), the hostility of which it had repeatedly provoked. Bahram Shah (1118–1152) put to death Kutbuddin, one of the princes of Ghor, called king of the Jibal or Hill country, who had withdrawn to Ghazni. This prince's brother, Saifuddin Suri, came to take vengeance, and drove out Bahram. But the latter recapturing the place (1149) paraded Saifuddin and his vizier ignominiously about the city, and then hanged them on the bridge. Ala-uddin of Ghor, younger brother of the two slain princes, then gathered a great host, and came against Bahram, who met him on the Helmund. The Ghori prince, after repeated victories, stormed Ghazni, and gave it over to fire and sword. The dead kings of the house of Mahmud, except the conqueror himself and two others, were torn from their graves and burnt, whilst the bodies of the princes of Ghor were solemnly disinterred and carried to the distant tombs of their ancestors. It seems certain that Ghazni never regained the splendour that perished then (1152). Ala-uddin, who from this deed became known in history as *Jahān-sōz* (*Brûlemonde*), returned to Ghor, and Bahram reoccupied Ghazni; he died in 1157. In the time of his son Khusru Shah, Ghazni was taken by the Turkish tribes called Ghuzz (generally believed to have been what are now called Turkomans). The king fled to Lahore, and the dynasty ended with his son. In 1173 the Ghuzz were expelled by Ghiyasuddin sultan of Ghor (nephew of Ala-uddin Jahansoz), who made Ghazni over to his brother Muizuddin. This famous prince, whom the later historians call Mahommed Ghori, shortly afterwards (1174–1175) invaded India, taking Multan and Uchh. This was the first of many successive inroads on western and northern India, in one of which Lahore was wrested from Khusru Malik, the last of Mahmud's house, who died a captive in the hills of Ghor. In 1191 Prithvi Rai or Pithora (as the Moslem writers call him), the Chauhan king of Ajmere, being defeated and slain near Thanewar, the whole country from the Himalaya to Ajmere became subject to the Ghori king of Ghazni. On the death of his brother Ghiyasuddin, with whose power he had been constantly associated, and of whose conquests he had been the chief instrument, Muizuddin became sole sovereign over Ghor and Ghazni, and the latter place was then again for a brief period the seat of an empire nearly as extensive as that of Mahmud the son of Sabuktagin. Muizuddin crossed the Indus once more to put down a rebellion of the Khokhars in the Punjab, and on his way back was murdered by a band of them, or, as some say, by one of the *Mulāhidah* or Assassins. The slave lieutenants of Muizuddin carried on the conquest of India, and as the rapidly succeeding events broke their dependence on any master, they established at Delhi that monarchy of which, after it had endured through many dynasties, and had culminated with the Mogul house of Baber, the shadow perished in 1857. The death of Muizuddin was followed by struggle and anarchy, ending for a time in the annexation of Ghazni to the empire of Khwarizm by Mahommed Shah, who conferred it on his famous son, Jelaluddin, and Ghazni became the headquarters of the latter. After Jenghiz Khan had extinguished the power of his family in Turkestan, Jelaluddin defeated the army sent against him by the Mongol at Parwan, north of Kabul. Jenghiz then advanced and drove Jelaluddin across the Indus, after which he sent Ogdai his son to besiege Ghazni. Henceforward Ghazni is much less prominent in Asiatic history. It continued subject to the Mongols, sometimes to the house of Hulagu in Persia, and sometimes to that of Jagatai in Turkestan. In 1326, after a battle between Amir Hosain, the viceroy of the former house in Khorasan, and Tarmashirin, the reigning khan of Jagatai, the former entered Ghazni and once more subjected it to devastation, and this time the tomb of Mahmud to desecration.

Ibn Batuta (*c.* 1332) says the greater part of the city was in ruins, and only a small part continued to be a town. Timur seems never to have visited Ghazni, but we find him in 1401 bestowing the government of Kabul, Kandahar, and Ghazni on Pir Mahommed, the son of his son Jahangir. In the end of the century it was still in the hands of a descendant of Timur, Ulugh Beg Mirza, who was king of Kabul and Ghazni. The illustrious nephew of this prince, Baber, got peaceful possession of both cities in 1505, and has left notes on both in his own inimitable Memoirs. His account of Ghazni indicates how far it had now fallen. "It is," he says, "but a poor mean place, and I have always wondered how its princes, who possessed also Hindustan and Khorasan, could have chosen such a wretched country for the seat of their government, in preference to Khorasan." He commends the fruit of its gardens, which still contribute largely to the markets of Kabul. Ghazni remained in the hands of Baber's descendants, reigning at Delhi and Agra, till the invasion of Nadir Shah (1738), and became after Nadir's death a part of the new kingdom of the Afghans under Ahmad Shah Durani. We know of but two modern travellers who have recorded visits to the place previous to the war of 1839. George Forster passed as a disguised traveller with a qafila in 1783. "Its slender existence," he says, "is now maintained by some Hindu families, who support a small traffic, and supply the wants of the few Mahommedan residents." Vigne visited it in 1836, having reached it from Multan with a caravan of Lohani merchants, travelling by the Gomal pass. The historical name of Ghazni was brought back from the dead, as it were, by the news of its capture by the British army under Sir John Keane, 23rd July 1839. The siege artillery had been left behind at Kandahar; escalade was judged impracticable; but the project of the commanding engineer, Captain George Thomson, for blowing in the Kabul gate with powder in bags, was adopted, and carried out successfully, at the cost of 182 killed and wounded. Two years and a half later the Afghan outbreak against the British occupation found Ghazni garrisoned by a Bengal regiment of sepoys, but neither repaired nor provisioned. They held out under great hardships from the 16th of December 1841 to the 6th of March 1842, when they surrendered. In the autumn of the same year General Nott, advancing from Kandahar upon Kabul, reoccupied Ghazni, destroyed the defences of the castle and part of the town, and carried away the famous gates of Somnath (*q.v.*).

GHEE (Hindostani *ghi*), a kind of clarified butter made in the East. The best is prepared from butter of the milk of cows, the less esteemed from that of buffaloes. The butter is melted over a slow fire, and set aside to cool; the thick, opaque, whitish, and more fluid portion, or ghee, representing the greater bulk of the butter, is then removed. The less liquid residue, mixed with ground-nut oil, is sold as an inferior kind of ghee. It may be obtained also by boiling butter over a clear fire, skimming it the while, and, when all the water has evaporated, straining it through a cloth. Ghee which is rancid or tainted, as is often that of the Indian bazaars, is said to be rendered sweet by boiling with leaves of the *Moringa pterygosperma* or horse-radish tree. In India ghee is one of the commonest articles of diet, and indeed enters into the composition of everything eaten by the Brahmans. It is also extensively used in Indian religious ceremonies, being offered as a sacrifice to idols, which are at times bathed in it. Sanskrit treatises on therapeutics describe ghee as cooling, emollient and stomachic, as capable of increasing the mental powers, and of improving the voice and personal appearance, and as useful in eye-diseases, tympanitis, painful dyspepsia, wounds, ulcers and other affections. Old ghee is in special repute among the Hindus as a medicinal agent, and its efficacy as an external application is believed by them to increase with its age. Ghee more than ten years old, the *purāna ghrita* of Sanskrit materia medicas, has a strong odour and the colour of lac. Some specimens which have been much longer preserved—and "clarified butter a hundred years old is often heard of"—have an earthy look, and are quite dry and hard, and nearly inodorous. Medicated ghee is made by warming ordinary ghee

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to remove contained water, melting, after the addition of a little turmeric juice, in a metal pan at a gentle heat, and then boiling with the prepared drugs till all moisture is expelled, and straining through a cloth.

GHEEL, or GEEL, a town of Belgium, about 30 m. E. of Antwerp and in the same province. Pop. (1904) 14,087. It is remarkable on account of the colony of insane persons which has existed there for many centuries. The legend reads that in the year 600 Dymphna, an Irish princess, was executed here by her father, and in consequence of certain miracles she had effected she was canonized and made the patron saint of the insane. The old Gothic church is dedicated to her, and in the choir is a shrine, enclosing her relics, with fine panel paintings representing incidents in her life hy, probably, a contemporary of Memling. The colony of the insane is established in the farms and houses round the little place within a circumference of 30 m. and is said to have existed since the 13th century. This area is divided into four sections, each having a doctor and a superintendent attached to it. The Gheel system is regarded as the most humane method of dealing with the insane who have no homicidal tendencies, as it keeps up as long as possible their interest in life.

GHENT (Flem. *Gent*, Fr. *Gand*), the capital of East Flanders, Belgium, at the junction of the Scheldt and the Lys (Ley). Pop. (1880) 131,431, (1904) 162,482. The city is divided hy the rivers (including the small streams Lieve and Moere) and hy canals, some navigable, into numerous islands connected by over 200 bridges of various sorts. Within the limits of the town, which is 6 m. in circumference, are many gardens, meadows and promenades; and, though its characteristic lanes are gloomy and narrow, there are also broad new streets and fine quays and docks. The most conspicuous building in the city is the cathedral of St Bavon[1] (Sint Baafs), the rich interior of which contrasts strongly with its somewhat heavy exterior. Its crypt dates from 941, the choir from 1274–1300, the Late Gothic choir chapels from the 15th century, and the nave and transept from 1533–1554. Among the treasures of the church is the famous "Worship of the Lamb" by Hubert and Jan van Eyck. Of the original 12 panels, taken to France during the Revolutionary Wars, only 4 are now here, 6 being in the Berlin museum and two in that of Brussels. Among the other 55 churches may be mentioned that of St Nicholas, an Early Gothic building, the oldest church in date of foundation in Ghent, and that of St Michael, completed in 1480, with an unfinished tower. In the centre of the city stands the unfinished Belfry (*Beffroi*), a square tower some 300 ft. high, built 1183–1339. It has a cast-iron steeple (restored in 1854), on the top of which is a gold dragon which, according to tradition, was brought from Constantinople either by the Varangians or hy the emperor Baldwin after the Latin conquest. Close to it is the former Cloth-hall, a Gothic huilding of 1325. The hôtel-de-ville consists of two distinct parts. The northern façade, a magnificent example of Flamboyant Gothic, was erected between 1518 and 1533, restored in 1829 and again some fifty years later. The eastern façade overlooking the market-place was built in 1595–1628, in the Renaissance style, with three tiers of columns. It contains a valuable collection of archives, from the 13th century onwards. On the left bank of the Lys is the Oudeburg (s'Gravenstein, Château des Contes), the former castle of the first counts of Flanders, dating from 1180 and now restored. The château of the later counts, in which the emperor Charles V. was born, is commemorated only in the name of a street, the Cours des Princes.

To the north of the Oudeburg, on the other side of the Lys, is the Marché du Vendredi, the principal square of the city. This was the centre of the life of the medieval city, the scene of all great public functions, such as the homage of the burghers to the counts, and of the auto-da-fés under the Spanish regime. In it stands a bronze statue of Jacob van Artevelde, by Devigne-Quyo, erected in 1863. At a corner of the square is a remarkable cannon, known as *Dulle Griete* (Mad Meg), 19 ft. long and 11 ft. in circumference. It is ornamented with the arms of Philip the Good, duke of Burgundy, and must have been cast between 1419 and 1467. On the Scheldt, near the Place Laurent, is the Geerard-duivelsteen (château of Gerard the Devil), a 13th-century tower formerly belonging to one of the patrician families, now restored and used as the office of the provincial records. Of modern buildings may be mentioned the University (1826), the Palais de Justice (1844), and the new theatre (1848), all designed hy Roelandt, and the Institut des Sciences (1890) by A. Pauli. In the park on the site of the citadel erected by Charles V. are some ruins of the ancient abbey of St Bavon and of a 12th-century octagonal chapel dedicated to St Macharius. In the park is also situated the Museum of Fine Arts, completed in 1902.

One of the most interesting institutions of Ghent is the great Béguinage (Begynhof) which, originally established in 1234 by the Bruges gate, was transferred in 1874 to the suburb of St Amandsberg. It constitutes a little town of itself, surrounded by walls and a moat, and contains numerous small houses, 18 convents and a church. It is occupied by some 700 Beguines, women devoted to good works (see BEGUINES). Near the station is a second Béguinage with 400 inmates. In addition to these there were in Ghent in 1901 fifty religious houses of various orders.

As a manufacturing centre Ghent, though not so conspicuous as it was in the middle ages, is of considerable importance. The main industries are cotton-spinning, flax-spinning, cotton-printing, tanning and sugar refining; in addition to which there are iron and copper foundries, machine-building works, breweries and factories of soap, paper, tobacco, &c. As a trading-centre the city is even more important. It has direct communication with the sea by a ship-canal, greatly enlarged and deepened since 1895, which connects the Grand Basin, stretching along the north side of the city, with a spacious harbour excavated at Terneuzen on the Scheldt, 21½ m. to the north, thus making Ghent practically a sea-port; while a second canal, from the Lys, connects the city via Bruges with Ostende.

Among the educational establishments is the State University, founded by King William I. of the Netherlands in 1816. With it are connected a school of engineering, a school of arts and industries and the famous library (about 300,000 printed volumes and 2000 MSS.) formerly belonging to the city. In addition there are training schools for teachers, an episcopal seminary, a conservatoire and an art academy with a fine collection of pictures mainly taken from the religious houses of the city on their suppression in 1795. The oldest Belgian newspaper, the *Gazet van Gent*, was founded here in 1667.

History.—The history of the city is closely associated with that of the countship of Flanders (*q.v.*), of which it was the seat. It is mentioned so early as the 7th century and in 868 Baldwin of the Iron Arm, first count of Flanders, who had been entrusted by Charles the Bald with the defence of the northern marches, built a castle here against the Normans raiding up the Scheldt. This was captured in 949 by the emperor Otto I. and was occupied by an imperial burgrave for some fifty years, after which it was retaken by the counts of Flanders. Under their protection, and favoured by its site, the city rapidly grew in wealth and population, the zenith of its power and prosperity being reached between the 13th and 15th centuries, when it was the emporium of the trade of Germany and the Low Countries, the centre of a great cloth industry, and could put some 20,000 armed citizens into the field. The wealth of the burghers during this period was equalled by their turbulent spirit of independence; feuds were frequent,—against the rival city of Bruges, against the counts, or, within the city itself, between the plebeian crafts and the patrician governing class. Of these risings the most notable was that, in the earlier half of the 14th century, against Louis de Crécy, count of Flanders, under the leadership of Jacob van Artevelde (*q.v.*).

[1] Bavo, or Allowin (*c.* 589–*c.* 653), patron saint of Ghent, was a nobleman converted by St Amandus, the apostle of Flanders. He lived first as an anchorite in the forest of Mendonk, and afterwards in the monastery founded with his assistance by Amandus at Ghent.

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The earliest charter to the citizens of Ghent was that granted by Count Philip of Flanders between 1160 and 1191. It did little more than arrange for the administration of justice by nominated jurats (*scabini*) under the count's *bailli*. Far more comprehensive was the second charter, granted by Philip's widow Mathilda, after his death on crusade in 1191, as the price paid for the faithfulness of the city to her cause. The magistrates of the city were still nominated *scabini* (fixed at thirteen), but their duties and rights were strictly defined and the liberties of the citizens safe-guarded; the city, moreover, received the right to fortify itself and even individuals within it to fortify their houses. This charter was confirmed and extended by Count Baldwin VIII. when he took over the city from Mathilda, an important new provision being that general rules for the government of the city were only to be made by arrangement between the count or his officials and the common council of the citizens. The burghers thus attained to a very considerable measure of self-government. A charter of 1212 of Count Ferdinand (of Portugal) and his wife Johanna introduced a modified system of election for the *scabini*; a further charter (1228) fixed the executive at 39 members, including *scabini* and members of the commune, and ordained that the *bailli* of the count and his *servientes*, like the *podestàs* of Italian cities, were not to be natives of Ghent.

Thus far the constitution of the city had been wholly aristocratic; in the 13th century the patricians seem to have been united into a gild (*Commun-gulde*) from whose members the magistrates were chosen. By the 14th century, however, the democratic craft gilds, notably that of the weavers, had asserted themselves; the citizens were divided for civic and military purposes into three classes; the rich (*i.e.* those living on capital), the weavers and the members of the 52 other gilds. In the civic executive, as it existed to the time of Charles V., the deans of the two lower classes sat with the *scabini* and councillors.

The constitution and liberties of the city, which survived its incorporation in Burgundy, were lost for a time as a result of the unsuccessful rising against Duke Philip the Good (1450). The citizens, however, retained their turbulent spirit. After the death of Mary of Burgundy, who had resided in the city, they forced her husband, the archduke Maximilian, to conclude the treaty of Arras (1482). They were less fortunate in their opposition to Maximilian's son, the emperor Charles V. In 1539 they refused, on the plea of their privileges, to contribute to a general tax laid on Flanders, and when Charles's sister Mary, the governess of the Netherlands, seized some merchants as bail for the payment, they retaliated by driving out the nobles and the adherents of Charles's government. The appearance of Charles himself, however, with an overwhelming force quelled the disturbance; the ringleaders were executed, and all the property and privileges of the city were confiscated. In addition, a fine of 150,000 golden gulden was levied on the city, and used to build the "Spanish Citadel" on the site of what is now the public park.

In the long struggle of the Netherlands against Spain, Ghent took a conspicuous part, and it was here that, on the 8th of November 1576, was signed the instrument, known as the Pacification of Ghent, which established the league against Spanish tyranny. In 1584, however, the city had to surrender on onerous terms to the prince of Parma.

The horrors of war and of religious persecution, and the consequent emigration or expulsion of its inhabitants, had wrecked the prosperity of Ghent, the recovery of which was made impossible by the closing of the Scheldt. The city was captured by the French in 1678, 1708 and 1745. After 1714 it formed part of the Austrian Netherlands, and in 1794 became the capital of the French department of the Scheldt. In 1814 it was incorporated in the kingdom of the United Netherlands, and it was here that Louis XVIII. of France took refuge during the Hundred Days. Here too was signed (December 24, 1814) the treaty of peace between Great Britain and the United States of America. After 1815 Ghent was for a time the centre of Catholic opposition to Dutch rule, as it is now that of the Flemish movement in Belgium. During the 19th century its prosperity rapidly increased. In 1866–1867, however, a serious outbreak of cholera again threatened it with ruin; but improved sanitation, the provision of a supply of pure water and the demolition of a mass of houses unfit for habitation soon effected a radical cure.

See L. A. Warnkönig, *Flandrische Staats- und Rechtsgeschichte bis 1305* (3 vols., Tübingen, 1835–1842), and Gueldorf, *Hist. de Gand*, translated from Warnkönig, with corrections and additions (Brussels, 1946); F. de Potter, *Gent van den oudsten tijd tot heden* (6 vols., Ghent, 1883–1891); Van Duyse, *Gand monumental et pittoresque* (Brussels, 1886); de Vlaminck, *Les Origines de la ville de Gand* (Brussels, 1891); *Annales Gandenses*, ed. G. Funck-Brentano (Paris, 1895); Vuylsteke, *Oorkondenboek der stad Gent* (Ghent, 1900, &c.); Karl Hegel, *Städte und Gilden* (Leipzig, 1891), vol. ii. p. 175, where further authorities are cited. For a comprehensive bibliography, including monographs and published documents, see Ulysse Chevalier, *Répertoire des sources hist. Topo-bibliogr.*, s.v. "Gand."

GHETTO, formerly the street or quarter of a city in which Jews were compelled to live, enclosed by walls and gates which were locked each night. The term is now used loosely of any locality in a city or country where Jews congregate. The derivation of the word is doubtful. In documents of the 11th century the Jew-quarters in Venice and Salerno are styled "Judaca" or "Judacaria." At Capua in 1375 there was a place called San Nicolo ad Judaicam, and later elsewhere a quarter San Martino ad Judaicam. Hence it has been suggested Judaicam became Italian Giudeica and thence became corrupted into ghetto. Another theory traces it to "gietto," the common foundry at Venice near which was the first Jews' quarters of that city. More probably the word is an abbreviation of Italian *borghetto* diminutive of *borgo* a "borough."

The earliest regular ghettos were established in Italy in the 11th century, though Prague is said to have had one in the previous century. The ghetto at Rome was instituted by Paul IV. in 1556. It lay between the Via del Pianto and Ponte del Quattro Capi, and comprised a few narrow and filthy streets. It lay so low that it was yearly flooded by the Tiber. The Jews had to sue annually for permission to live there, and paid a yearly tax for the privilege. This formality and tax survived till 1850. During three centuries there were constant changes in the oppressive regulations imposed upon the Jews by the popes. In 1814 Pius VII. allowed a few Jews to live outside the ghetto, and in 1847 Pius IX. decided to destroy the gates and walls, but public opinion hindered him from carrying out his plans. In 1870 the Jews petitioned Pius IX. to abolish the ghetto; but it was to Victor Emmanuel that this reform was finally due. The walls remained until 1885.

During the middle ages the Jews were forbidden to leave the ghetto after sunset when the gates were locked, and they were also imprisoned on Sundays and all Christian holy days. Where the ghetto was too small for the carrying on of their trades, a site beyond its wall was granted them as a market, *e.g.* the Jewish *Tandelmarkt* at Prague. Within their ghettos the Jews were left much to their own devices, and the more important ghettos, such as that at Prague, formed cities within cities, having their own town halls and civic officials, hospitals, schools and rabbinical courts. Fires were common in ghettos and, owing to the narrowness of the streets, generally very destructive, especially as from fear of plunder the Jews themselves closed their gates on such occasions and refused assistance. On the 14th of June 1711 a fire, the largest ever known in Germany, destroyed within twenty-four hours the ghetto at Frankfort-on-Main. Other notable ghetto fires are that of Bari in 1030 and Nikolsburg in 1719. The Jews were frequently expelled from their ghettos, the most notable expulsions being those of Vienna (1670) and Prague (1744–1745). This latter exile was during the war of the Austrian Succession, when Maria Theresa, on the ground that "they were fallen into disgrace," ordered Jews to leave Bohemia. The empress was, however, induced by the protests of the powers, especially of England and Holland, to revoke the decree. Meantime the Jews, ignorant of the revocation, petitioned to be allowed to return in payment of a yearly tax. This tax the Bohemian Jews paid until 1846. The most important ghettos were those at Venice, Frankfort, Prague and Trieste. By the middle of the 19th century the ghetto system

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was moribund, and with the disappearance of the ghetto at Rome in 1870 it became obsolete.

See D. Philipson, *Old European Jewries* (Philadelphia, 1894); Israel Abrahams, *Jewish Life in the Middle Ages* (1896); S. Kahn, article "Ghetto" in *Jewish Encyclopedia*, v. 652.

GHIBERTI, LORENZO (1378–1455), Italian sculptor, was born at Florence in 1378. He learned the trade of a goldsmith under his father Ugoccione, commonly called Cione, and his stepfather Bartoluccio; but the goldsmith's art at that time included all varieties of plastic arts, and required from those who devoted themselves to its higher branches a general and profound knowledge of design and colouring. In the early stage of his artistic career Ghiberti was best known as a painter in fresco, and when Florence was visited by the plague he repaired to Rimini, where he executed a highly prized fresco in the palace of the sovereign Pandolfo Malatesta. He was recalled from Rimini to his native city by the urgent entreaties of his stepfather Bartoluccio, who informed him that a competition was to be opened for designs of a second bronze gate in the baptistery, and that he would do wisely to return to Florence and take part in this great artistic contest. The subject for the artists was the sacrifice of Isaac; and the competitors were required to observe in their work a certain conformity to the first bronze gate of the baptistery, executed by Andrea Pisano about 100 years previously. Of the six designs presented by different Italian artists, those of Donatello, Brunelleschi and Ghiberti were pronounced the best, and of the three Brunelleschi's and Ghiberti's superior to the third, and of such equal merit that the thirty-four judges with whom the decision was left entrusted the execution of the work to the joint labour of the two friends. Brunelleschi, however, withdrew from the contest. The first of his two bronze gates for the baptistery occupied Ghiberti twenty years.

Ghiberti brought to his task a deep religious feeling and the striving after a high poetical ideal which are not to be found in the works of Donatello, though in power of characterization the second sculptor often stands above the first. Like Donatello, he seized every opportunity of studying the remains of ancient art; but he sought and found purer models for imitation than Donatello, through his excavations and studies in Rome, had been able to secure. The council of Florence, which met during the most active period of Ghiberti's artistic career, not only secured him the patronage of the pontiff, who took part in the council, but enabled him, through the important connexions which he then formed with the Greek prelates and magnates assembled in Florence, to obtain from many quarters of the Byzantine empire the precious memorials of old Greek art, which he studied with untiring zeal. The unbounded admiration called forth by Ghiberti's first bronze gate led to his receiving from the chiefs of the Florentine gilds the order for the second, of which the subjects were likewise taken from the Old Testament. The Florentines gazed with especial pride on these magnificent creations, which must still have shone with all the brightness of their original gilding when, a century later, Michelangelo pronounced them worthy to be the gates of paradise. Next to the gates of the baptistery Ghiberti's chief works still in existence are his three statues of St John the Baptist, St Matthew and St Stephen, executed for the church of Or San Michele. In the bas-relief of the coffin of St Zenobius, in the Florence cathedral, Ghiberti put forth much of his peculiar talent, and though he did not, as is commonly stated, execute entirely the painted glass windows in that edifice, he furnished several of the designs, and did the same service for a painted glass window in the church of Or San Michele. He died at the age of 77.

We are better acquainted with Ghiberti's theories of art than with those of most of his contemporaries, for he left behind him a commentary, in which, besides his notices of art, he gives much insight into his own personal character and views. Every page attests the religious spirit in which he lived and worked. Not only does he aim at faithfully reflecting Christian truths in his creations, he regards the old Greek statues with a kindred feeling, as setting forth the highest intellectual and moral attributes of human nature. He appears to have cared as little as Donatello for money.

Benvenuto Cellini's criticism on Ghiberti that in his creations of plastic art he was more successful in small than in large figures, and that he always exhibited in his works the peculiar excellences of the goldsmith's quite as much as those of the sculptor's art, is after all no valid censure, for it merely affirms that Ghiberti faithfully complied with the peculiar conditions of the task imposed upon him. More frequent have been the discussions as to the part played by perspective in his representations of natural scenery. These acquired a fresh importance since the discovery of the data, from which it appeared that Paolo Uccello, who had commonly been regarded as the first great master of perspective, worked for several years in the studio or workshop of Ghiberti, so that it became difficult to determine to what extent Uccello's successful innovations in perspective were due to Ghiberti's teaching.

Cicognara's criticism on Ghiberti, in his *History of Sculpture*, has supplied the chief materials for the illustrative text of Lasinio's series of engravings of the three bronze gates of the baptistery. They consist of 42 plates in folio, and were published at Florence by Bardi in 1821. Still more vivid representations are the reproductions on a very large scale by the photographic establishment of Alinari. Both C. C. Perkins, in his *History of Tuscan Sculpture* (1864), and A. F. Rio, in his *Art chrétien* (1861–1867), have treated Ghiberti's works with much fulness, and in a spirit of sound appreciation. See also the chapter expressly devoted to the history of the competition for the baptistery gates in Hans Semper, *Donatello* (1887); the article by Adolf Rosenberg in Dohme's *Kunst und Künstler des Mittelalters* (Leipzig, 1877): Leader Scott, *Ghiberti and Donatello* (1882). In the *Sammlung ausgewählter Biographien Vasari*, ed. Carl Frey, vol. iii. (1886), is given Ghiberti's commentary on art.

GHICA, Ghika or Ghyka, a family which played a great part in the modern development of Rumania, many of its members being princes of Moldavia and Walachia. According to Rumanian historians the Ghicas were of very humble origin, and came from Kiupru in Albania.

1. George or Gheorghe (*c.* 1600–1664), the founder of the family, is said to have been a playmate of another Albanian known in history as Küpruli Aga, the famous vizier, who recognized George while he was selling melons in the streets of Constantinople, and helped him on to high positions. George became prince of Moldavia in 1658 and prince of Walachia in 1659–1660. He moved the capital from Tirgovishtea to Bucharest. From him are derived the numerous branches of the family which became so conspicuous in the history of Moldavia and Walachia.

2. The Walachian branch starts afresh from the great ban Demetrius or Dumitru Ghica (1718–1803), who was twice married and had fourteen children (see Rumania: *History*). One of these, Gregory (Grigorie), prince of Walachia 1822–1828, starts a new era of civilization, by breaking with the traditions of the Phanariot (Greek) period and assisting in the development of a truly national Rumanian literature. His brother, Prince Alexander Ghica, appointed jointly by Turkey and Russia (1834–1842) as hospodar of Walachia, died in 1862. Under him the so-called *règlement organique* had been promulgated; an attempt was made to codify the laws in conformity with the institutions of the country and to secure better administration of justice. Prince Demetrius Ghica, who died as president of the Rumanian senate in 1897, was the son of the Walachian prince Gregory.

3. Another Gregory Ghica, prince of Moldavia from 1775 to 1777, paid with his life for the opposition he offered when the Turks ceded the province of Bukovina to Austria.

4. Michael (Michail) (1794–1850) was the father of Elena (1827–1888), a well-known novelist, who wrote under the name of Dora d'Istria. Brought up, as was customary at the time, under Greek influences, she showed premature intelligence and literary power. She continued her education in Germany and married a Russian prince, Koltsov Mazalskiy, in 1849, but the marriage was an unhappy one, and in 1855 she left St Petersburg for Florence, where she died in 1888. In that city she developed her literary talent and published a number of works characterized by lightness of touch and brilliance of description, such as

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Pèlerinage au tombeau de Dante, La Vie monastique dans les églises orientales (1844), *La Suisse allemande*, &c. One of her last works was devoted to the history of her own family, *Gli Albanesi in Roumenia: Storia dei Principi Ghika nei secoli XVII-XIX* (Florence, 1873). Her sister was Sophia, Countess O'Rourke.

5. Scarlat Ghica (1750–1802) was twice prince of Walachia. His grandson John (Ioan) Ghica (1817–1897), a lifelong friend of Turkey, was educated in Bucharest and in the West, and studied engineering and mathematics in Paris from 1837 to 1840; returning to Moldavia he was involved in the conspiracy of 1841, which was intended to bring about the union of Walachia and Moldavia under one native prince (Michael Sturdza). The conspiracy failed and John Ghica became a lecturer on mathematics at the university which was founded by Prince Sturdza in Jassy. In 1848 he joined the party of revolution and in the name of a provisional government then established in Bucharest went to Constantinople to approach the Turkish government. Whilst there he was appointed Bey of Samos (1853–1859), where he extirpated piracy, rampant in that island. In 1859 after the union of Moldavia and Walachia had been effected Prince Cuza induced John Ghica to return. He was the first prime minister under Prince (afterwards King) Charles of Hohenzollern. His restless nature made him join the anti-dynastic movement of 1870–1871. In 1881 he was appointed Rumanian minister in London and retained this office until 1889. He died on the 7th of May 1897 in Gherghani. Besides his political distinction John Ghica earned a literary reputation by his "Letters to Alexandri" (2nd edition, 1887), his lifelong friend, written from London and describing the ancient state of Rumanian society, fast fading away. He was also the author of *Amintiri din pribegie*, "Recollections of Exile in 1848" (Bucharest, 1890) and of *Convorbiri Economice*, discussions on economic questions (Bucharest, 1866–1873). He was the first to advocate the establishment of national industry and commerce, and also, to a certain extent, principles of "exclusive dealing." (M. G.)

GHILZAI, a large and widespread Afghan tribe, who extend from Kalat-i-Ghilzai on the S. to the Kabul river on the N., and from the Gul Koh range on the W. to the Indian border on the E., in many places overflowing these boundaries. The popular theory of the origin of the Ghilzais traces them to the Turkish tribe of Kilji, once occupying districts bordering the upper course of the Syr Darya (Jaxartes), and affirms that they were brought into Afghanistan by the Turk Sabuktagin in the 10th century. However that may be, the Ghilzai clans now rank collectively as second to none in strength of military and commercial enterprise. They are a fine, manly race of people, and it is from some of their most influential clans (Suliman Khel, Nasir Khel, Kharotis, &c.) that the main body of povindah merchants is derived.

GHIRLANDAJO, DOMENICO (1449–1494), Florentine painter. His full name is given as Domenico di Tommaso Curradi di Doffo Bigordi; it appears therefore that his father's surname was Curradi, and his grandfather's Bigordi. The painter is generally termed Domenico Bigordi, but some authors give him, and apparently with reason, the paternal surname Curradi. Ghirlandajo (garland-maker) was only a nickname, coming to Domenico from the employment of his father (or else of his earliest instructor), who was renowned for fashioning the metallic garlands worn by Florentine damsels; he was not, however, as some have said, the inventor of them. Tommaso was by vocation a jeweller on the Ponte Vecchio, or perhaps a broker. Domenico, the eldest of eight children, was at first apprenticed to a jeweller or goldsmith, probably enough his own father; in his shop he was continually making portraits of the passers-by, and it was thought expedient to place him with Alessio Baldovinetti to study painting and mosaic. His youthful years were, however, entirely undistinguished, and at the age of thirty-one he had not a fixed abode of his own. This is remarkable, as immediately afterwards, from 1480 onwards to his death at a comparatively early age in 1494, he became the most proficient painter of his time, incessantly employed, and condensing into that brief period of fourteen years fully as large an amount of excellent work as any other artist that could be named; indeed, we should properly say eleven years, for nothing of his is known of a later date than 1491.

In 1480 Ghirlandajo painted a "St Jerome" and other frescoes in the church of Ognissanti, Florence, and a life-sized "Last Supper" in its refectory, noticeable for individual action and expression. From 1481 to 1485 he was employed upon frescoes in the Sala dell' Orologio in the Palazzo Vecchio; he painted the apotheosis of St Zenobius, a work beyond the size of life, with much architectural framework, figures of Roman heroes and other detail, striking in perspective and structural propriety. While still occupied here, he was summoned to Rome by Pope Sixtus IV. to paint in the Sixtine chapel; he went thither in 1483. In the Sixtine he executed, probably before 1484, a fresco which has few rivals in that series, "Christ calling Peter and Andrew to their Apostleship,"—a work which, though somewhat deficient in colour, has greatness of method and much excellence of finish. The landscape background, in especial, is very superior to anything to be found in the works, which had no doubt been zealously studied by Ghirlandajo, of Masaccio and others in the Brancacci chapel. He also did some other works in Rome, now perished. Before 1485 he had likewise produced his frescoes in the chapel of S. Fina, in the Tuscan town of S. Gimignano, remarkable for grandeur and grace,—two pictures of Fina, dying and dead, with some accessory work. Sebastian Mainardi assisted him in these productions in Rome and in S. Gimignano; and Ghirlandajo was so well pleased with his co-operation that he gave him his sister in marriage.

He now returned to Florence, and undertook in the church of the Trinita, and afterwards in S. Maria Novella, the works which have set the seal on his celebrity. The frescoes in the Sassetti chapel of S. Trinita are six subjects from the life of St Francis, along with some classical accessories, dated 1485. Three of the principal incidents are "St Francis obtaining from Pope Honorius the approval of the Rules of his Order"; his "Death and Obsequies," and the Resuscitation, by the intercession of the beatified St Francis, of a child of the Spini family, who had been killed by falling out of a window. In the first work is a portrait of Lorenzo de' Medici; and in the third the painter's own likeness, which he introduced also into one of the pictures in S. Maria Novella, and in the "Adoration of the Magi" in the hospital of the Innocenti. The altar-piece of the Sassetti chapel, the "Adoration of the Shepherds," is now in the Florentine Academy. Immediately after disposing of this commission, Ghirlandajo was asked to renew the frescoes in the choir of S. Maria Novella. This choir formed the chapel of the Ricci family, but the Tornabuoni and Tornaquinci families, then much more opulent than the Ricci, undertook the cost of the restoration, under conditions, as to preserving the arms of the Ricci, which gave rise in the end to some amusing incidents of litigation. The work, in the execution of which Domenico had many assistants, are in four courses along the three walls,—the leading subjects being the lives of the Madonna and of the Baptist. Besides their general richness and dignity of art, these works are particularly interesting as containing many historical portraits—a method of treatment in which Ghirlandajo was pre-eminently skilled.

There are no less than twenty-one portraits of the Tornabuoni and Tornaquinci families; in the subject of the "Angel appearing to Zacharias," those of Politian, Marsilio Ficino and others; in the "Salutation of Anna and Elizabeth," the beautiful Ginevra de' Benci; in the "Expulsion of Joachim from the Temple," Mainardi and Baldovinetti (or the latter figure may perhaps be Ghirlandajo's father). The Ricci chapel was reopened and completed in 1490; the altar-piece, now removed from the chapel, was probably executed with the assistance of Domenico's brothers, David and Benedetto, painters of ordinary calibre; the painted window was from Domenico's own design. Other distinguished works from his hand are an altar-piece in tempera of the "Virgin adored by Sts Zenobius, Justus and others," painted for the church of St Justus, but now in the Uffizi gallery, a remarkable masterpiece; "Christ in glory with Romuald and

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other Saints," in the Badia of Volterra; the "Adoration of the Magi," in the church of the Innocenti (already mentioned), perhaps his finest panel-picture (1488); and the "Visitation," in the Louvre, bearing the latest ascertained date (1491) of all his works. Ghirlandajo did not often attempt the nude; one of his pictures of this character, "Vulcan and his Assistants forging Thunderbolts," was painted for Lo Spedaletto, but (like several others specified by Vasari) it exists no longer. Two portraits by him are in the National Gallery, London. The mosaics which he produced date before 1491; one, of especial celebrity, is the "Annunciation," on a portal of the cathedral of Florence.

In general artistic attainment Ghirlandajo may fairly be regarded as exceeding all his precursors or competitors; though the names of a few, particularly Giotto, Masaccio, Lippo Lippi and Botticelli, stand higher for originating power. His scheme of composition is grand and decorous; his chiaroscuro excellent, and especially his perspectives, which he would design on a very elaborate scale by the eye alone; his colour is more open to criticism, but this remark applies much less to the frescoes than the tempera-pictures, which are sometimes too broadly and crudely bright. He worked in these two methods alone—never in oils; and his frescoes are what the Italians term "buon fresco," without any finishing in tempera. A certain hardness of outline, not unlike the character of bronze sculpture, may attest his early training in metal work. He first introduced into Florentine art that mixture of the sacred and the profane which had already been practised in Siena. His types in figures of Christ, the Virgin and angels are not of the highest order; and a defect of drawing, which has been often pointed out, is the meagreness of his hands and feet. It was one of his maxims that "painting is designing." Ghirlandajo was an insatiate worker, and expressed a wish that he had the entire circuit of the walls of Florence to paint upon. He told his shop-assistants not to refuse any commission that might offer, were it even for a lady's petticoat-panniers: if they would not execute such work, *he* would. Not that he was in any way grasping or sordid in money-matters, as is proved by the anecdote of the readiness with which he gave up a bonus upon the stipulated price of the Ricci chapel frescoes, offered by the wealthy Tornabuoni in the first instance, but afterwards begrudged. Vasari says that Ghirlandajo was the first to abandon in great part the use of gilding in his pictures, representing by genuine painting any objects supposed to be gilded; yet this does not hold good without some considerable exceptions—the high lights of the landscape, for instance, in the "Adoration of the Shepherds," now in the Florence Academy, being put in in gold. Many drawings and sketches by this painter are in the Uffizi gallery, remarkable for vigour of outline. One of the great glories of Ghirlandajo is that he gave some early art-education to Michelangelo, who cannot, however, have remained with him long. F. Granacci was another of his pupils.

This renowned artist died of pestilential fever on the 11th of January 1494, and was buried in S. Maria Novella. He had been twice married, and left six children, three of them being sons. He had a long and honourable line of descendants, which came to a close in the 17th century, when the last members of the race entered monasteries. It is probable that Domenico died poor; he appears to have been gentle, honourable and conscientious, as well as energetically diligent.

The biography of Ghirlandajo is carefully worked out in Crowe and Cavalcaselle's book. A recent German work on the subject is that of Ernst Steinmann (1897). See also *Codex Escurialensis, ein Skizzenbuch aus der Werkstatt Domenico Ghirlandajos* (texts and plates), by Chr. Hülsen, Adolf Michaelis and Hermann Egger in the *Sonderschriften des österr. archäol. Instituts in Wien* (2 vols., 1906); and cf. T. Ashby in *Classical Quarterly* (April 1909). (W. M. R.)

GHIRLANDAJO, RIDOLFO (1483–1560), son of Domenico Ghirlandajo, Florentine painter, was born on the 14th of February 1483, and, being less than eleven years old when his father died, was brought up by his uncle David. To this second-rate artist he owed less in the way of professional training than to Granacci, Piero di Cosimo and perhaps Cosimo Rosselli. It has been said that Ridolfo studied also under Fra Bartolommeo, but this is not clearly ascertained. He was certainly one of the earliest students of the famous cartoons of Leonardo da Vinci and Michelangelo. His works between the dates 1504 and 1508 show a marked influence from Fra Bartolommeo and Raphael, with the latter of whom he was on terms of familiar friendship; hence he progressed in selection of form and in the modelling and relief of his figures. Raphael, on reaching Rome in 1508, wished Ridolfo to join him; but the Florentine painter was of a particularly home-keeping humour, and he neglected the opportunity. He soon rose to the head of the Florentine oil-painters of his time; and, like his father, accepted all sorts of commissions, of whatever kind. He was prominent in the execution of vast scenic canvases for various public occasions, such as the wedding of Giuliano de' Medici, and the entry of Leo X. into Florence in 1515. In his prime he was honest and conscientious as an artist; but from about 1527 he declined, having already accumulated a handsome property, more than sufficient for maintaining in affluence his large family of fifteen children, and his works became comparatively mannered and self-repeating. His sons traded in France and in Ferrara; he himself took a part in commercial affairs, and began paying some attention to mosaic work, but it seems that, after completing one mosaic, the "Annunciation" over the door of the Annunziata, patience failed him for continuing such minute labours. In his old age Ridolfo was greatly disabled by gout. He appears to have been of a kindly, easy-going character, much regarded by his friends and patrons.

The following are some of his leading works, the great majority of them being oil-pictures:—

"Christ and the Maries on the road to Calvary," now in the Palazzo Antinori, Florence, an early example, with figures of half life-size. An "Annunciation" in the Abbey of Montoliveto near Florence, Leonardesque in style. In 1504, the "Coronation of the Virgin," now in the Louvre. A "Nativity," very carefully executed, now in the Hermitage, St Petersburg, and ascribed in the catalogue to Granacci. A "Predella," in the oratory of the Bigallo, Florence, five panels, representing the Nativity and other subjects, charmingly finished. In 1514, on the ceiling of the chapel of St Bernard in the Palazzo Pubblico, Florence, a fresco of the "Trinity," with heads of the twelve apostles and other accessories, and the "Annunciation"; also the "Assumption of the Virgin, who bestows her girdle on St Thomas," in the choir loft of Prato cathedral. Towards the same date, a picture showing his highest skill, complete with expression, vigorous life, and firm accomplished pictorial method, now in the gallery of the Uffizi, "St Zenobius resuscitating a child"; also the translation of the remains of the same Saint. The "Virgin and various saints," at S. Pier Maggiore, Pistoja. In 1521, the "Pietà," at S. Agostino, Colle di Valdelsa, life-sized. Towards 1526, the "Assumption," now in the Berlin Museum, containing the painter's own portrait. An excellent portrait of "Cosimo de' Medici" (the Great) in youth. In 1543, a series of frescoes in the monastery of the Angeli. In the National Gallery, London, is "The Procession to Calvary." A great number of altar-pieces were executed by Ghirlandajo, with the assistance of his favourite pupil, currently named Michele di Ridolfo. Another of his pupils was Mariano da Pescia. (W. M. R.)

GHOR, or GHUR, an ancient kingdom of Afghanistan. The name of Ghor was in the middle ages, and indeed locally still is, applied to the highlands east of Herat, extending eastward to the upper Helmund valley, or nearly so. Ghor is the southern portion of that great peninsula of strong mountain country which forms the western part of modern Afghanistan. The northern portion of the peninsula was in the middle ages comprehended under the names of *Gharjistān* (on the west), and *Juzjānā* (on the east), whilst the basin of the Herat river, and all south of it, constituted Ghor. The name as now used does not include the valley of the Herat river; on the south the limit seems to be the declivity of the higher mountains dominating the descent to the lower Helmund, and the road from Farah to Kandahar. It is in Ghor that rise all those affluents of the closed basin of Seistan, the Hari-rud, the Farah-rud, the Khash-rud, besides other considerable streams joining the Helmund above Girishk.

Ghor is mentioned in the Shahnama of Firdousi (A.D. 1010), and in the Arab geographers of that time, though these latter fail in details almost as much as we moderns, thus indicating how little accessible the country has been through all ages. Ibn Haukal's map of Khorasan (*c.* 976) shows *Jibāl-al-Ghūr*, "the

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hill-country of Ghor," as a circle ring-fenced with mountains. His brief description speaks of it as a land fruitful in crops, cattle and flocks, inhabited by infidels, except a few who passed for Mahommedans, and indicates that, like other pagan countries surrounded by Moslem populations, it was regarded as a store of slaves for the faithful. The boundary of Ghor in ascending the valley of the Hari-rud was six and a half easy marches from Herat, at Chist, two marches above Obeh.

The chief part of the present population of Ghor are Taimanis, belonging to the class of nomad or semi-nomad clans called Aimāk, intermingled with Zuris and Tajiks.

The people and princes of Ghor first become known to us in connexion with the Ghaznevid dynasty, and the early medieval histories of Ghor and Ghazni are so intertwined that little need be added on that subject to what will be found under GHAZNI (*q.v.*). What we read of Ghor shows it as a country of lofty mountains and fruitful valleys, and of numerous strongholds held by a variety of hill-chieftains ruling warlike clans whose habits were rife with feuds and turbulence,—indeed, in character strongly resembling the tribes of modern Afghanistan, though there seems no good reason to believe that they were of Afghan race. It is probable that they were of old Persian blood, like the older of those tribes which still occupy the country. It is possibly a corroboration of this that, in the 14th century, when one of the Ghori kings, of the Kurt dynasty reigning in Herat, had taken to himself some of the insignia of independent sovereignty, an incensed Mongol prince is said to have reviled him as "an insolent *Tajik*." Sabuktagin of Ghazni, and his famous son Mahmud, repeatedly invaded the mountain country which so nearly adjoined their capital, subduing its chiefs for the moment, and exacting tribute; but when the immediate pressure was withdrawn, the yoke was thrown off and the tribute withheld. In 1020 Masa'ud, the son of Mahmud, being then governor of Khorasan, made a systematic invasion of Ghor from the side of Herat, laying siege to its strongholds one after the other, and subduing the country more effectually than ever before. About a century later one of the princely families of Ghor, deriving the appellation of Shansabi, or Shansabaniah, from a certain ancestor Shansab, of local fame, and of alleged descent from Zohak, acquired predominance in all the country, and at the time mentioned Malik 'Izzuddin al Hosain of this family came to be recognized as lord of Ghor. He was known afterwards as "the Father of Kings," from the further honour to which several of his seven sons rose. Three of these were—(1) Amir Kutbuddin Mahommed, called the lord of the Jibal or mountains; (2) Sultan Saifuddin Suri, for a brief period master of Ghazni,—both of whom were put to death by Bahram the Ghaznevid; and (3) Sultan Alauddin Jahansoz, who wreaked such terrible vengeance upon Ghazni. Alauddin began the conquests which were afterwards immensely extended both in India and in the west by his nephews Ghiyasuddin Mahommed b. Sam and Mahommed Ghori (Muizuddin b. Sam or Shahabuddin b. Sam), and for a brief period during their rule it was boasted, with no great exaggeration, that the public prayer was read in the name of the Ghori from the extremity of India to the borders of Babylonia, and from the Oxus to the Straits of Ormus. After the death of Mahommed Ghori, Mahmud the son of Ghiyasuddin was proclaimed sovereign (1200) throughout the territories of Ghor, Ghazni and Hindustan. But the Indian dominion, from his uncle's death, became entirely independent, and his actual authority was confined to Ghor, Seistan and Herat. The whole kingdom fell to pieces before the power of Mahommed Shah of Khwarizm and his son Jelaluddin (*c.* 1214–1215), a power in its turn to be speedily shattered by the Mongol flood.

Besides the thrones of Ghor and Ghazni, the Shansabaniah family, in the person of Fakhruddin, the eldest of the seven sons of Malik 'Izzuddin, founded a kingdom in the Oxus basin, having its seat at BAMIAN (*q.v.*), which endured for two or three generations, till extinguished by the power of Khwarizm (1214). And the great Mussulman empire of Delhi was based on the conquests of Muizuddin the Ghorian, carried out and consolidated by his Turki freedmen, Kutbuddin Aibak and his successors. The princes of Ghor experienced, about the middle of the 13th century, a revival of power, which endured for 140 years. This later dynasty bore the name of Kurt or Kārt. The first of historical prominence was Malik Shamsuddin Kurt, descended by his mother from the great king Ghiyasuddin Ghori, whilst his other grandfather was that prince's favourite minister. In 1245 Shamsuddin held the lordship of Ghor in some kind of alliance with, or subordination to, the Mongols, who had not yet definitively established themselves in Persia; and in 1248 he received from the Great Khan Mangu an investiture of all the provinces from Merv to the Indus, including by name Sijistan (or Seistan), Kabul, Tirah (adjoining the Khyber pass), and Afghanistan (a very early occurrence of this name), which he ruled from Herat. He stood well with Hulagu, and for a long time with his son Abaka, but at last incurred the latter's jealousy, and was poisoned when on a visit to the court at Tabrīz (1276). His son Rukuuddin Kurt was, however, invested with the government of Khorasan (1278), but after some years, mistrusting his Tatar suzerains, he withdrew into Ghor, and abode in his strong fortress of Kaissar till his death there in 1305. The family held on through a succession of eight kings in all, sometimes submissive to the Mongol, sometimes aiming at independence, sometimes for a series of prosperous years adding to the strength and splendour of Herat, and sometimes sorely buffeted by the hosts of masterless Tatar brigands that tore Khorasan and Persia in the decline of the dynasties of Hulagu and Jagatai. It is possible that the Kurts might have established a lasting Tajik kingdom at Herat, but in the time of the last of the dynasty, Ghiyasuddin Pir-'Ali, Tatardom, reorganized and re-embodied in the person of Timur, came against Herat, and carried away the king and the treasures of his dynasty (1380). A revolt and massacre of his garrison provoked Timur's vengeance; he put the captive king to death, came against the city a second time, and showed it no mercy (1383). Ghor has since been obscure in history.

The capital of the kingdom of Ghor, when its princes were rising to dominion in the 12th century, was Firoz Koh, where a city and fortress were founded by Saifuddin Suri. The exact position of Firoz Koh is difficult to determine, unless it be represented by the ruins of one or other of the ancient cities in the upper Murghab valley, the habitat of the Firoz Kohi section of the Chahar Aimāk, which were visited by the surveyors of the Russo-Afghan boundary delimitation of 1884–1885. Extensive ruins were also found at Taiwara on one of the main affluents of the Farah Rud, where walls and terraces still existing support the local tradition that this place was the ancient capital of Ghor. The valleys of the Taimani tribes though narrow are fertile and well cultivated, and there are many walled villages and forts about Parjuman and Zarni in the south-eastern districts. The peak of "Chalap Dalan" (described by Ferrier as "one of the highest in the world") is the Koh-i-Kaisar, which is a trifle over 13,000 ft. in height. All the country now known as Ghor was mapped during the progress of the Russo-Afghan boundary delimitation.

See the "Tabakāt-i-Nāsiri," in the *Bibl. Indica*, transl. by Raverty; *Journal asiatique*, ser. v. tom. xvii.; "Ibn Haukal," in *J. As. Soc. Beng.* vol. xxii.; Ferrier's *Caravan Journeys*; Hammer's *Ilkhans*, &c.

GHOST (a word common to the W. Teutonic languages; O.E. *gast*, Dutch, *geest*, Ger. *Geist*), in the sense now prevailing, the spirit of a dead person considered as appearing in some visible or sensible form to the living (see APPARITIONS; PSYCHICAL RESEARCH, "PHANTASMS OF THE DEAD"; SPIRITUALISM). In the earlier and wider sense of spirit in general, or of the principle of life, the word is practically obsolete. The language of the Authorized Version of the Bible, however, has preserved the phrase "to give up the ghost," still sometimes used of dying. The Spirit of God, too, the third person of the Trinity, is still called, not in the technical language of theology only, the Holy Ghost. The adjective "ghostly" is still occasionally used for "spiritual" (cf. the Ger. *geistlich*) as contrasted with "bodily," especially in such combinations as "ghostly counsel," "ghostly comfort." We may even speak of a "ghostly adviser," though not without a touch of affectation; on the other hand, the phrase

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"ghostly man" for a clergyman (cf. the Ger. *Geistlicher*) is an archaism the use of which could only be justified by poetic licence, as in Tennyson's *Elaine* (1094). The word "ghost," from the shadowy and unsubstantial quality attributed to the apparitions of the dead, has come also to be commonly used to emphasize the want of force or substance generally, in such phrases as "not the ghost of a chance," "not the ghost of an idea." It is also applied to those literary and artistic "hacks" who are paid to do work for which others get the credit.

GHOST DANCE, an American-Indian ritual dance, sometimes called the Spirit Dance, the dancers wearing a white cloak. It is connected with the doctrine of a Messiah, which arose in Nevada among the Paiute Indians in 1888 and spread to other tribes. A young Paiute Indian medicine-man, known as Wovoka, and called Jack Wilson by the whites, proclaimed that he had had a revelation, and that, if this ghost dance and other ceremonies were duly performed, the Indians would be rid of the white men. The movement led to a sort of craze among the Indian tribes, and in 1890 it was one of the causes of the Sioux outbreak.

See J. Mooney, *14th Report* (1890) *of Bureau of American Ethnology.*

GIACOMETTI, PAOLO (1816–1882), Italian dramatist, born at Novi Ligure, was educated inlaw at Genoa, but at the age of twenty had some success with his play *Rosilda* and then devoted himself to the stage. Depressed circumstances made him attach himself as author to various touring Italian companies, and his output was considerable; moreover, such actors as Ristori, Rossi and Salvini made many of these plays great successes. Among the best of them were *La Donna* (1850), *La Donna in seconde nozze* (1851), *Giuditta* (1857), *Sofocle* (1860). *La Morte civile* (1880). A collection of his works was published at Milan in eight volumes (1859 et seq.)

GIAMBELLI (or GIANIBELLI), **FEDERIGO,** Italian military engineer, was born at Mantua about the middle of the 16th century. Having had some experience as a military engineer in Italy, he went to Spain to offer his services to Philip II. His proposals were, however, lukewarmly received, and as he could obtain from the king no immediate employment, he took up his residence at Antwerp, where he soon gained considerable reputation for his knowledge in various departments of science. He is said to have vowed to be revenged for his rebuff at the Spanish court; and when Antwerp was besieged by the duke of Parma in 1584, he put himself in communication with Queen Elizabeth, who, having satisfied herself of his abilities, engaged him to aid by his counsels in its defence. His plans for provisioning the town were rejected by the senate, but they agreed to a modification of his scheme for destroying the famous bridge which closed the entrance to the town from the side of the sea, by the conversion of two ships of 60 and 70 tons into infernal machines. One of these exploded, and, besides destroying more than 1000 soldiers, effected a breach in the structure of more than 200 ft. in width, by which, but for the hesitation of Admiral Jacobzoon, the town might at once have been relieved. After the surrender of Antwerp Giambelli went to England, where he was engaged for some time in fortifying the river Thames; and when the Spanish Armada was attacked by fireships in the Calais roads, the panic which ensued was very largely due to the conviction among the Spaniards that the fireships were infernal machines constructed by Giambelli. He is said to have died in London, but the year of his death is unknown.

See Motley's *History of the United Netherlands*, vols. i. and ii.

GIANNONE, PIETRO (1676–1748), was born at Ischitella, in the province of Capitanata, on the 7th of May 1676. Arriving in Naples at the age of eighteen, he devoted himself to the study of law, but his legal pursuits were much surpassed in importance by his literary labours. He devoted twenty years to the composition of his great work, the *Storia civile del regno di Napoli*, which was ultimately published in 1723. Here in his account of the rise and progress of the Neapolitan laws and government, he warmly espoused the side of the civil power in its conflicts with the Roman Catholic hierarchy. His merit lies in the fact that he was the first to deal systematically with the question of Church and State, and the position thus taken up by him, and the manner in which that position was assumed, gave rise to a lifelong conflict between Giannone and the Church; and in spite of his retractation in prison at Turin, he deserves the palm—as he certainly endured the sufferings—of a confessor and martyr in the cause of what he deemed historical truth. Hooted by the mob of Naples, and excommunicated by the archbishop's court, he was forced to leave Naples and repair to Vienna. Meanwhile the Inquisition had attested after its own fashion the value of his history by putting it on the *Index*. At Vienna the favour of the emperor Charles VI. and of many leading personages at the Austrian court obtained for him a pension and other facilities for the prosecution of his historical studies. Of these the most important result was *Il Triregno, ossia del regno del cielo, della terra, e del papa.* On the transfer of the Neapolitan crown to Charles of Bourbon, Giannone lost his Austrian pension and was compelled to remove to Venice. There he was at first most favourably received. The post of consulting lawyer to the republic, in which he might have continued the special work of Fra Paolo Sarpi, was offered to him, as well as that of professor of public law in Padua; but he declined both offers. Unhappily there arose a suspicion that his views on maritime law were not favourable to the pretensions of Venice, and this suspicion, notwithstanding all his efforts to dissipate it, together with clerical intrigues, led to his expulsion from the state. On the 23rd of September 1735 he was seized and conveyed to Ferrara. After wandering under an assumed name for three months through Modena, Milan and Turin, he at last reached Geneva, where he enjoyed the friendship of the most distinguished citizens, and was on excellent terms with the great publishing firms. But in an evil hour he was induced to visit a Catholic village within Sardinian territory in order to hear mass on Easter day, where he was kidnapped by the agents of the Sardinian government, conveyed to the castle of Miolans and thence successively transferred to Ceva and Turin. In the fortress of Turin he remained immured during the last twelve years of his life, although part of his time was spent in composing a defence of the Sardinian interests as opposed to those of the papal court, and he was led to sign a retractation of the statements in his history most obnoxious to the Vatican (1738). But after his recantation his detention was made less severe and he was allowed many alleviations. He died on the 7th of March 1748, in his seventy-second year.

Giannone's style as an Italian writer has been pronounced to be below a severe classical model; he is often inaccurate as to the facts, for he did not always work from original authorities (see A. Manzoni, *Storia della colonna infame*), and he was sometimes guilty of unblushing plagiarism. But his very ease and freedom have helped to make his volumes more popular than many works of greater classical renown. In England the just appreciation of his labours by Gibbon, and the ample use made of them in the later volumes of *The Decline and Fall*, early secured him his rightful place in the estimation of English scholars.

The story of his life has been recorded in the *Vita* by L. Panzini, which is based on Giannone's unpublished *Autobiografia* and printed in the Milan edition of the historian's works (1823); whilst a more complete estimate of his literary and political importance may be formed by the perusal of the collected edition of the works written by him in his Turin prison, published in Turin in 1859—under the care of the distinguished statesman Pasquale Stanislao Mancini, universally recognized as one of the first authorities in Italy on questions relating to the history of his native Naples, and especially of the conflicts between the civil power and the Church. See also R. Mariano, "Giannone e Vico," in the *Rivista contemporanea* (1865); G. Ferrari, *La Mente di Pietro Giannone* (1868). G. Bonacci's *Saggio sulla Storia civile del Giannone* (Florence, 1903) is a bitter attack on Giannone, and although the writer's remarks on the plagiarisms in the *Storia civile* are justified, the charge of servility is greatly exaggerated.

GIANNUTRI (Gr. *Ἀρτεμίσιον*, Lat. *Dianium*), an island of Italy, about 1 sq. m. in total area, 10 m. S.E. of Giglio and about 10 m. S. of the promontory of Monte Argentario (see ORBETELLO). The highest point is 305 ft. above sea-level. It contains the ruins of a large Roman villa, near the Cala Maestra on the E. coast of the island. The buildings may be divided into five groups: (1) a large cistern in five compartments, each measuring 39 by 17 ft.; (2) habitations both for the owners and for slaves, and

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store-rooms; (3) baths; (4) habitations for slaves; (5) belvedere. The brick-stamps found begin in the Flavian and end with the Hadrianic period. The villa may have belonged to the Domitii Ahenobarbi, who certainly under the republic had property in the island of Igilium (Giglio) and near Cosa.

See G. Pellegrini in *Notizie degli scavi* (1900), 609 seq.

GIANT (O.E. *geant*, through Fr. *géant*, O.Fr. *gaiant*, *jaiant*, *jéant*, med. pop. Lat. *gagante*—cf. Ital. *gigante*—by assimilation from *gigantem*, acc. of Lat. *gigas*, Gr. γίγας). The idea conveyed by the word in classic mythology is that of beings more or less manlike, but monstrous in size and strength. Figures like the Titans and the Giants whose birth from Heaven and Earth is sung by Hesiod in the *Theogony*, such as can heap up mountains to scale the sky and war beside or against the gods, must be treated, with other like monstrous figures of the wonder-tales of the world, as belonging altogether to the realms of mythology. But there also appear in the legends of giants some with historic significance. The ancient and commonly repeated explanation of the Greek word γίγας, as connected with or derived from γηγενής, or "earth-born," is etymologically doubtful, but at any rate the idea conveyed by it was familiar to the ancient Greeks, that the giants were earth-born or indigenous races (see Welcker, *Griechische Götterlehre*, i. 787). The Bible (the English reader must be cautioned that the word giant has been there used ambiguously, from the Septuagint downwards) touches the present matter in so far as it records the traditions of the Israelites of fighting in Palestine with tall races of the land such as the Anakim (Numb. xiii. 33; Deut. ii. 10, iii. 11; 1 Sam. xvii. 4). When reading in Homer of "the Cyclopes and the wild tribes of the Giants," or of the adventures of Odysseus in the cave of Polyphemus (Homer, *Odyss.* vii. 206; ix.), we seem to come into view of dim traditions, exaggerated through the mist of ages, of pre-Hellenic barbarians, godless, cannibal, skin-clothed, hurling huge stones in their rude warfare. Giant-legends of this class are common in Europe and Asia, where the big and stupid giants would seem to have been barbaric tribes exaggerated into monsters in the legends of those who dispossessed and slew them. In early times it was usual for cities to have their legends of giants. Thus London had Gog and Magog, whose effigies (14 ft. high) still stand in the Guildhall (see Gog); Antwerp had her Antigonus, 40 ft. high; Douai had Gayant, 22 ft. high, and so on.

Besides the conception of giants, as special races distinct from mankind, it was a common opinion of the ancients that the human race had itself degenerated, the men of primeval ages having been of so far greater stature and strength as to be in fact gigantic. This, for example, is received by Pliny (*Hist. Nat.* vii. 16), and it becomes a common doctrine of theologians such as Augustine (*De civitate Dei*, xv. 9), lasting on into times so modern that it may be found in Cruden's *Concordance*. Yet so far as can be judged from actual remains, it does not appear that giants, in the sense of tribes of altogether superhuman stature, ever existed, or that the men of ancient time were on the whole taller than those now living. It is now usual to apply the word giant not to superhuman beings but merely to unusually tall men and women. In every race of mankind the great mass of individuals do not depart far from a certain mean or average height, while the very tall or very short men become less and less numerous as they depart from the mean standard, till the utmost divergence is reached in a very few giants on the one hand, and a very few dwarfs on the other. At both ends of the scale, the body is usually markedly out of the ordinary proportions; thus a giant's head is smaller and a dwarf's head larger than it would be if an average man had been magnified or diminished. The principle of the distribution of individuals of different sizes in a race or nation has been ably set forth by Quetelet (*Physique sociale*, vol. ii.; *Anthropométrie*, books iii. and iv.). Had this principle been understood formerly, we might have been spared the pains of criticizing assertions as to giants 20 ft. high, or even more, appearing among mankind. The appearance of an individual man 20 ft. high involves the existence of the race he is an extreme member of, whose mean stature would be at least 12 to 14 ft., which is a height no human being has been proved on sufficient evidence to have approached (*Anthropom.* p. 302). Modern statisticians cannot accept the loose conclusion in Buffon (*Hist. nat.*, ed. Sonnini, iv. 134) that there is no doubt of giants having been 10, 12, and perhaps 15 ft. high. Confidence is not even to be placed in ancient asserted measurements, as where Pliny gives to one Gabbaras, an Arabian, the stature of 9 ft. 9 in. (about 9 ft. 5⅜ in. English), capping this with the mention of Posio and Secundilla, who were half a foot higher. That two persons should be described as both having this same extraordinary measure suggests to the modern critic the notion of a note jotted down on the philosopher's tablets, and never tested afterwards.

Under these circumstances it is worth while to ask how it is that legend and history so abound in mentions of giants outside all probable dimensions of the human frame. One cause is that, when the story-teller is asked the actual stature of the huge men who figure in his tales, he is not sparing of his inches and feet. What exaggeration can do in this way may be judged from the fact that the Patagonians, whose average height (5 ft. 11 in.) is really about that of the Chirnside men in Berwickshire, are described in Pigafetta's *Voyage round the World* as so monstrous that the Spaniards' heads hardly reached their waists. It is reasonable to suppose, with Professor Nilsson (*Primitive Inhabitants of Scandinavia*, chap. vi.), that in the traditions of early Europe tribes of savages may have thus, if really tall, expanded into giants, or, if short, dwindled into dwarfs. Another cause which is clearly proved to have given rise to giant-myths of yet more monstrous type has been the discovery of great fossil bones, as of mammoth or mastodon, which were formerly supposed to be bones of giants (see Tylor, *Early History of Mankind*, chap. xi.; *Primitive Culture*, chap. x.). A tooth weighing 4¼ lb and a thigh-bone 17 ft. long having been found in New England in 1712 (they were probably mastodon), Dr Increase Mather thereupon communicated to the Royal Society of London his theory of the existence of men of prodigious stature in the antediluvian world (see the *Philosophical Transactions*, xxiv. 85; D. Wilson, *Prehistoric Man*, i. 54). The giants in the streets of Basel and supporting the arms of Lucerne appear to have originated from certain fossil bones found in 1577, examined by the physician Felix Plater, and pronounced to have belonged to a giant some 16 or 19 ft. high. These bones have since been referred to a very different geological genus, but Plater's giant skeleton was accepted early in the 19th century as a genuine relic of the giants who once inhabited Switzerland. Of giants in real life whose stature has been authentically recorded Quetelet gives the palm to Frederick the Great's Scotch giant, who measured about 8 ft. 3 in. But since his time there have been several giants who have equalled or surpassed this figure. Patrick Cotier, an Irishman, who died at Clifton, Bristol, in 1802, was 8 ft. 7 in. high. The famous "Irish giant" O'Brien (Charles Byrne), whose skeleton is preserved in the museum of the Royal College of Surgeons, London, was 8 ft. 4 in. Chang (Chang-woo-goo), who appeared in London in 1865–1866 and again in 1880, was 8 ft. 2 in. Josef Winkelmaier, an Austrian, exhibited in London on the 10th of January 1887, was 8 ft. 9 in.; while Elizabeth Lyska, a Russian child of twelve, when shown in London in 1889, had already reached 6 ft. 8 in. Machnow, a Russian, born at Charkow, was exhibited in London in his twenty-third year in 1905; he then stood 9 ft. 3 in., and weighed 360 lb (25 st. 10 lb). From his wrist to the top of his second finger he measured 2 ft. (see *The Times*, 10th February 1905).

The whole subject of giant myths and the now entirely exploded theory that mankind has, as far as stature is concerned, degenerated since prehistoric times, has been ably dealt with in a volume published by MM. P. E. Lamois and P. Roy, entitled *Etudes biologiques sur les géans* (Paris, 1904). See also E. J. Wood, *Giants and Dwarfs* (1860).

GIANT'S CAUSEWAY, a promontory of columnar basalt, situated on the north coast of county Antrim, Ireland. It is divided by whin-dykes into the Little Causeway, the Middle Causeway or "Honeycomb," as it is locally termed, and the Larger or Grand Causeway. The pillars composing it are

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close-fitting and for the most part somewhat irregular hexagons, made up of articulated portions varying from a few inches to some feet in depth, and concave or convex at the upper and lower surfaces. In diameter the pillars vary from 15 to 20 in., and in height some are as much as 20 ft. The Great Causeway is chiefly from 20 to 30, and for a few yards in some places nearly 40 ft. in breadth, exclusive of outlying broken pieces of rock. It is highest at its narrowest part. At about half a dozen yards from the cliff, widening and becoming lower, it extends outwards into a platform, which has a slight seaward inclination, but is easy to walk upon, and for nearly 100 yds. is always above water. At the distance of about 150 yds. from the cliff it turns a little to the eastward for 20 or 30 yds., and then sinks into the sea. The neighbouring cliffs exhibit in many places columns similar to those of the Giant's Causeway, a considerable exposure of them being visible at a distance of 500 to 600 yds. in the bay to the east. A group of these columns, from their arrangement, have been fancifully named the "Giant's Organ." The most remarkable of the cliffs is the Pleaskin, the upper pillars of which have the appearance of a colonnade, and are 60 ft. in height; beneath these is a mass of coarse black amygdaloid, of the same thickness, underlain by a second range of basaltic pillars, from 40 to 50 ft. in height. The view eastward over Bengore and towards Fair Head is magnificent. Near the Giant's Causeway are the ruins of the castles of Dunseverick and Dunluce, situated high above the sea on isolated crags, and the swinging bridge of Carrick-a-Rede, spanning a chasm 80 ft. deep, and connecting a rock, which is used as a salmon-fishing station, with the mainland. In 1883 an electric railway, the first in the United Kingdom, was opened for traffic, connecting the Causeway with Portrush and Bushmills. After a protracted lawsuit (1897–1898) the Causeway, and certain land in the vicinity, were declared to be private property, and a charge is made for admission.

GIANT'S KETTLE, GIANT'S CAULDRON or POT-HOLE, in physical geography, the name applied to cavities or holes which appear to have been drilled in the surrounding rocks by eddying currents of water bearing stones, gravel and other detrital matter. The size varies from a few inches to several feet in depth and diameter. The commonest occurrence is in regions where glaciers exist or have existed; a famous locality is the Gletscher Garten of Lucerne, where there are 32 giant's kettles, the largest being 26 ft. wide and 30 ft. deep; they are also common in Germany, Norway and in the United States. It appears that water, produced by the thawing of the ice and snow, forms streams on the surface of the glacier, which, having gathered into their courses a certain amount of morainic débris, are finally cast down a crevasse as a swirling cascade or *moulin*. The sides of the crevasse are abraded, and a vertical shaft is formed in the ice. The erosion may be continued into the bed of the glacier, and, the ice having left the district, the giant's kettle so formed is seen as an empty shaft, or as a pipe filled with gravel, sand or boulders. Such cavities and pipes afford valuable evidence as to the former extent of glaciers (see J. Geikie, *The Great Ice Age*). Similar holes are met with in river beds at the foot of cascades, and under some other circumstances. The term "pot-hole" is also sometimes used synonymously with "swallow-hole" (*q.v.*).

GIAOUR (a Turkish adaptation of the Pers. *gâwr* or *gŏr*, an infidel), a word used by the Turks to describe all who are not Mahommedans, with especial reference to Christians. The word, first employed as a term of contempt and reproach, has become so general that in most cases no insult is intended in its use; similarly, in parts of China, the term "foreign devil" has become void of offence. A strict analogy to *giaour* is found in the Arabic *kaffir*, or unbeliever, which is so commonly in use as to have become the proper name of peoples and countries.

GIB, ADAM (1714–1788), Scottish divine and leader of the Antiburgher section of the Scottish Secession Church, was born on the 14th of April 1714 in the parish of Muckhart, Perthshire, and, on the completion of his literary and theological studies at Edinburgh and Perth, was licensed as a preacher in 1740. His eldest brother being a prodigal he succeeded to the paternal estate, but threw the will into the fire on his brother's promising to reform. In 1741 he was ordained minister of the large Secession congregation of Bristo Street, Edinburgh. In 1745 he was almost the only minister of Edinburgh who continued to preach against rebellion while the troops of Charles Edward were in occupation of the town. When in 1747 "the Associate Synod," by a narrow majority, decided not to give full immediate effect to a judgment which had been passed in the previous year against the lawfulness of the "Burgess Oath," Gib led the protesting minority, who separated from their brethren and formed the Antiburgher Synod (April 10th) in his own house in Edinburgh. It was chiefly under his influence that it was agreed by this ecclesiastical body at subsequent meetings to summon to the bar their "Burgher" brethren, and finally to depose and excommunicate them for contumacy. Gib's action in forming the Antiburgher Synod led, after prolonged litigation, to his exclusion from the building in Bristo Street where his congregation had met. In 1765 he made a vigorous and able reply to the General Assembly of the Church of Scotland, which had stigmatized the Secession as "threatening the peace of the country." From 1753 till within a short period of his death, which took place on the 18th of June 1788, he preached regularly in Nicolson Street church, which was constantly filled with an audience of two thousand persons. His dogmatic and fearless attitude in controversy earned for him the nickname "Pope Gib."

Principal publications: *Tables for the Four Evangelists* (1770, and with author's name, 1800); *The Present Truth, a Display of the Secession Testimony* (2 vols., 1774); *Vindiciae dominicae* (Edin., 1780). See Chambers's *Eminent Scotsmen*; also article UNITED PRESBYTERIAN CHURCH.

GIBARA, or JIBARA (once "Punta del Yarey" and "Yarey de Gibara"), a north-coast city of Oriente Province, Cuba, 80 m. N.W. of Santiago de Cuba. Pop. (1907) 6170. It is served by railway to the S.S.W., to Holguín and Cacocum (where it connects with the main line between Santiago and Havana), and is a port of call for the American Munson Line. It lies on a circular harbour, about 1 m. in diameter, which, though open to the N., affords fair shelter. At the entrance to the harbour is San Fernando, an old fort (1817), and the city is very quaint in appearance. At the back of the city are three stone-topped hills, Silla, Pan and Tabla, reputed to be those referred to by Columbus in his journal of his first voyage. Enclosing the town is a stone wall, built by the Spaniards as a defence against attack during the rebellion of 1868–1878. Gibara is the port of Holguín. It exports cedar, mahogany, tobacco, sugar, tortoise-shell, Indian corn, cattle products, coco-nuts and bananas; and is the centre of the banana trade with the United States. Gibara is an old settlement, but it did not rise above the status of a petty village until after 1817; its importance dates from the opening of the port to commerce in 1827.

GIBBON, EDWARD (1737–1794), English historian, was descended, be tells us in his autobiography, from a Kentish family of considerable antiquity; among his remoter ancestors he reckons the lord high treasurer Fiennes, Lord Say and Sele, whom Shakespeare has immortalized in his *Henry VI.* His grandfather was a man of ability, an enterprising merchant of London, one of the commissioners of customs under the Tory ministry during the last four years of Queen Anne, and, in the judgment of Lord Bolingbroke, as deeply versed in the "commerce and finances of England" as any man of his time. He was not always wise, however, either for himself or his country; for he became deeply involved in the South Sea Scheme, in the disastrous collapse of which (1720) he lost the ample wealth he had amassed. As a director of the company, moreover, he was suspected of fraudulent complicity, taken into custody and heavily fined; but £10,000 was allowed him out of the wreck of his estate, and with this his skill and enterprise soon constructed a second fortune. He died at Putney in 1736, leaving the bulk of his property to his two daughters—nearly disinheriting his only son, the father of the historian, for having married against his wishes. This son (by name Edward) was educated

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at Westminster[1] and Cambridge, but never took a degree, travelled, became member of parliament, first for Petersfield (1734), then for Southampton (1741), joined the party against Sir Robert Walpole, and (as his son confesses, not much to his father's honour) was animated in so doing by "private revenge" against the supposed "oppressor" of his family in the South Sea affair. If so, revenge, as usual, was blind; for Walpole had sought rather to moderate than to inflame public feeling against the projectors.

The historian was born at Putney, Surrey, April 27 (Old Style), 1737. His mother, Judith Porten, was the daughter of a London merchant. He was the eldest of a family of six sons and a daughter, and the only one who survived childhood; his own life in youth hung by so mere a thread as to be again and again despaired of. His mother, between domestic cares and constant infirmities (which, however, did not prevent an occasional plunge into fashionable dissipation in compliance with her husband's wishes), did but little for him. The "true mother of his mind as well as of his health" was a maiden aunt—Catherine Porten by name—with respect to whom he expresses himself in language of the most grateful remembrance. "Many anxious and solitary days," says Gibbon, "did she consume with patient trial of every mode of relief and amusement. Many wakeful nights did she sit by my bedside in trembling expectation that each hour would be my last." As circumstances allowed, she appears to have taught him reading, writing and arithmetic—acquisitions made with so little of remembered pain that "were not the error corrected by analogy," he says, "I should be tempted to conceive them as innate." At seven he was committed for eighteen months to the care of a private tutor, John Kirkby by name, and the author, among other things, of a "philosophical fiction" entitled the *Life of Automathes*. Of Kirkby, from whom he learned the rudiments of English and Latin grammar, he speaks gratefully, and doubtless truly, so far as he could trust the impressions of childhood. With reference to *Automathes* he is much more reserved in his praise, denying alike its originality, its depth and its elegance; but, he adds, "the book is not devoid of entertainment or instruction."

In his ninth year (1746), during a "lucid interval of comparative health," he was sent to a school at Kingston-upon-Thames; but his former infirmities soon returned, and his progress, by his own confession, was slow and unsatisfactory. "My timid reserve was astonished by the crowd and tumult of the school; the want of strength and activity disqualified me for the sports of the play-field. . . . By the common methods of discipline, at the expense of many tears and some blood, I purchased the knowledge of the Latin syntax," but manifestly, in his own opinion, the *Arabian Nights*, Pope's *Homer*, and Dryden's *Virgil*, eagerly read, had at this period exercised a much more powerful influence on his intellectual development than Phaedrus and Cornelius Nepos, "painfully construed and darkly understood."

In December 1747 his mother died, and he was taken home. After a short time his father removed to the "rustic solitude" of Buriton (Hants), but young Gibbon lived chiefly at the house of his maternal grandfather at Putney, where, under the care of his devoted aunt, he developed, he tells us, that passionate love of reading "which he would not exchange for all the treasures of India," and where his mind received its most decided stimulus. Of 1748 he says, "This year, the twelfth of my age, I shall note as the most propitious to the growth of my intellectual stature." After detailing the circumstances which unlocked for him the door of his grandfather's "tolerable library," he says, "I turned over many English pages of poetry and romance, of history and travels. Where a title attracted my eye, without fear or awe I snatched the volume from the shelf." In 1749, in his twelfth year, he was sent to Westminster, still residing, however, with his aunt, who, rendered destitute by her father's bankruptcy, but unwilling to live a life of dependence, had opened a boarding-house for Westminster school. Here in the course of two years (1749–1750), interrupted by danger and debility, he "painfully climbed into the third form"; but it was left to his riper age to "acquire the beauties of the Latin and the rudiments of the Greek tongue." The continual attacks of sickness which had retarded his progress induced his aunt, by medical advice, to take him to Bath; but the mineral waters had no effect. He then resided for a time in the house of a physician at Winchester; the physician did as little as the mineral waters; and, after a further trial of Bath, he once more returned to Putney, and made a last futile attempt to study at Westminster. Finally, it was concluded that he would never be able to encounter the discipline of a school; and casual instructors, at various times and places, were provided for him. Meanwhile his indiscriminate appetite for reading had begun to fix itself more and more decidedly upon history: and the list of historical works devoured by him during this period of chronic ill-health is simply astonishing. It included, besides Hearne's *Ductor historicus* and the successive volumes of the *Universal History*, which was then in course of publication, Littlebury's *Herodotus*, Spelman's *Xenophon*, Gordon's *Tacitus*, an anonymous translation of Procopius; "many crude lumps of Speed, Rapin, Mezeray, Davila, Machiavel, Father Paul, Bower, &c., were hastily gulped. I devoured them like so many novels; and I swallowed with the same voracious appetite the descriptions of India and China, of Mexico and Peru." His first introduction to the historic scenes the study of which afterwards formed the passion of his life took place in 1751, when, while along with his father visiting a friend in Wiltshire, he discovered in the library "a common book, the continuation of Echard's *Roman History*." "To me the reigns of the successors of Constantine were absolutely new; and I was immersed in the passage of the Goths over the Danube, when the summons of the dinner bell reluctantly dragged me from my intellectual feast." Soon afterwards his fancy kindled with the first glimpses into Oriental history, the wild "barbaric" charm of which he never ceased to feel. Ockley's book on the Saracens "first opened his eyes" to the striking career of Mahomet and his hordes; and with his characteristic ardour of literary research, after exhausting all that could be learned in English of the Arabs and Persians, the Tatars and Turks, he forthwith plunged into the French of D'Herbelot, and the Latin of Pocock's version of Abulfaragius, sometimes understanding them, but oftener only guessing their meaning. He soon learned to call to his aid the subsidiary sciences of geography and chronology, and before he was quite capable of reading them had already attempted to weigh in his childish balance the competing systems of Scaliger and Petavius, of Marsham and Newton. At this early period he seems already to have adopted in some degree the plan of study he followed in after life and recommended in his *Essai sur l'étude*—that is, of letting his subject rather than his author determine his course, of suspending the perusal of a book to reflect, and to compare the statements with those of other authors—so that he often read portions of many volumes while mastering one.

Towards his sixteenth year he tell us "nature displayed in his favour her mysterious energies," and all his infirmities suddenly vanished. Thenceforward, while never possessing or abusing the insolence of health, he could say "few persons have been more exempt from real or imaginary ills." His unexpected recovery revived his father's hopes for his education, hitherto so much neglected if judged by ordinary standards; and accordingly in January 1752 he was placed at Esher, Surrey, under the care of Dr Francis, the well-known translator of Horace. But Gibbon's friends in a few weeks discovered that the new tutor preferred the pleasures of London to the instruction of his pupils, and in this perplexity decided to send him prematurely to Oxford, where he was matriculated as a gentleman commoner of Magdalen College, 3rd April 1752. According to his own testimony he arrived at the university "with a stock of information which might have puzzled a doctor, and a degree of ignorance of which a schoolboy might be ashamed." And indeed his huge wallet of scraps stood him in little stead at the trim banquets to which

[1] The celebrated William Law had been for some time the private tutor of this Edward Gibbon, who is supposed to have been the original of the rather clever sketch of "Flatus" in the *Serious Call*.

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ne was invited at Oxford, while the wandering habits by which he had filled it absolutely unfitted him to be a guest. He was not well grounded in any of the elementary branches, which are essential to university studies and to all success in their prosecution. It was natural, therefore, that he should dislike the university, and as natural that the university should dislike him. Many of his complaints of the system were certainly just; but it may be doubted whether any university system would have been profitable to him, considering his antecedents. He complains especially of his tutors, and in one case with abundant reason; but, by his own confession, they might have recriminated with justice, for he indulged in gay society, and kept late hours. His observations, however, on the defects of the English university system, some of which have only very recently been removed, are acute and well worth pondering, however little relevant to his own case. He remained at Magdalen about fourteen months. "To the university of Oxford," he says, "I acknowledge no obligation; and she will as cheerfully renounce me for a son as I am willing to disclaim her for a mother. I spent fourteen months at Magdalen College; they proved the fourteen months the most idle and unprofitable of my whole life."

But thus "idle" though he may have been as a "student," he already meditated authorship. In the first long vacation—during which he, doubtless with some sarcasm, says that "his taste for books began to revive"—he contemplated a treatise on the age of Sesostris, in which (and it was characteristic) his chief object was to investigate not so much the events as the probable epoch of the reign of that semi-mythical monarch, whom he was inclined to regard as having been contemporary with Solomon. "Unprovided with original learning, unformed in the habits of thinking, unskilled in the arts of composition, I resolved to write a book"; but the discovery of his own weakness, he adds, was the first symptom of taste. On his first return to Oxford the work was "wisely relinquished," and never afterwards resumed. The most memorable incident, however, in Gibbon's stay at Oxford was his temporary conversion to the doctrines of the church of Rome. The bold criticism of Middleton's recently (1749) published *Free Enquiry into the Miraculous Powers which are supposed to have subsisted in the Christian Church* appears to have given the first shock to his Protestantism, not indeed by destroying his previous belief that the gift of miraculous powers had continued to subsist in the church during the first four or five centuries of Christianity, but by convincing him that within the same period most of the leading doctrines of popery had been already introduced both in theory and in practice. At this stage he was introduced by a friend (Mr Molesworth) to Bossuet's *Variations of Protestantism* and *Exposition of Catholic Doctrine* (see Gibbon, *Decline and Fall*, c. xv., note 70). "These works," says he, "achieved my conversion, and I surely fell by a noble hand." In bringing about this "fall," however, Parsons the Jesuit appears to have had a considerable share; at least Lord Sheffield has recorded that on the only occasion on which Gibbon talked with him on the subject he imputed the change in his religious views principally to that vigorous writer, who, in his opinion, had urged all the best arguments in favour of Roman Catholicism. But be this as it may, he had no sooner adopted his new creed than he resolved to profess it; "a momentary glow of enthusiasm" had raised him above all temporal considerations, and accordingly, on June 8, 1753, he records that having "privately abjured the heresies" of his childhood before a Catholic priest of the name of Baker, a Jesuit, in London, he announced the same to his father in an elaborate controversial epistle which his spiritual adviser much approved, and which he himself afterwards described to Lord Sheffield as having been "written with all the pomp, the dignity, and self-satisfaction of a martyr."

The elder Gibbon heard with indignant surprise of this act of juvenile apostasy, and, indiscreetly giving vent to his wrath, precipitated the expulsion of his son from Oxford, a punishment which the culprit, in after years at least, found no cause to deplore. In his *Memoirs* he speaks of the results of his "childish revolt against the religion of his country" with undisguised self-gratulation. It had delivered him for ever from the "port and prejudice" of the university, and led him into the bright paths of philosophic freedom. That his conversion was sincere at the time, that it marked a real if but a transitory phase of genuine religious conviction, we have no reason to doubt, notwithstanding the scepticism he has himself expressed. "To my present feelings it seems incredible that I should ever believe that I believed in transubstantiation," he indeed declares; but his incredulous astonishment is not unmixed with undoubting pride. "I could not blush that my tender mind was entangled in the sophistry which had reduced the acute and manly understandings of a Chillingworth or a Bayle." Nor is the sincerity of the Catholicism he professed in these boyish days in any way discredited by the fact of his subsequent lack of religion. Indeed, as one of the acutest and most sympathetic of his critics has remarked, the deep and settled grudge he has betrayed towards every form of Christian belief, in all the writings of his maturity, may be taken as evidence that he had at one time experienced in his own person at least some of the painful workings of a positive faith.

But little time was lost by the elder Gibbon in the formation of a new plan of education for his son, and in devising some method which if possible might effect the cure of his "spiritual malady." The result of deliberation, aided by the advice and experience of Lord Eliot, was that it was almost immediately decided to fix Gibbon for some years abroad under the roof of M. Pavilliard, a Calvinist minister at Lausanne. In as far as regards the instructor and guide thus selected, a more fortunate choice could scarcely have been made. From the testimony of his pupil, and the still more conclusive evidence of his own correspondence with the father, Pavilliard seems to have been a man of singular good sense, temper and tact. At the outset, indeed, there was one considerable obstacle to the free intercourse of tutor and pupil: M. Pavilliard appears to have known little of English, and young Gibbon knew practically nothing of French. But this difficulty was soon removed by the pupil's diligence; the very exigencies of his situation were of service to him in calling forth all his powers, and he studied the language with such success that at the close of his five years' exile he declares that he "spontaneously thought" in French rather than in English, and that it had become more familiar to "ear, tongue and pen." It is well known that in after years he had doubts whether he should not compose his great work in French; and it is certain that his familiarity with that language, in spite of considerable efforts to counteract its effects, tinged his style to the last.

Under the judicious regulations of his new tutor a methodical course of reading was marked out, and most ardently prosecuted; the pupil's progress was proportionably rapid. With the systematic study of the Latin, and to a slight extent also of the Greek classics, he conjoined that of logic in the prolix system of Crousaz; and he further invigorated his reasoning powers, as well as enlarged his knowledge of metaphysics and jurisprudence, by the perusal of Locke, Grotius and Montesquieu. He also read largely, though somewhat indiscriminately, in French literature, and appears to have been particularly struck with Pascal's *Provincial Letters*, which he tells us he reperused almost every year of his subsequent life with new pleasure, and which he particularly mentions as having been, along with Bleterie's *Life of Julian* and Giannone's *History of Naples*, a book which probably contributed in a special sense to form the historian of the Roman empire. The comprehensive scheme of study included mathematics also, in which he advanced as far as the conic sections in the treatise of L'Hôpital. He assures us that his tutor did not complain of any inaptitude on the pupil's part, and that the pupil was as happily unconscious of any on his own; but here he broke off. He adds, what is not quite clear from one who so frankly acknowledges his limited acquaintance with the science, that he had reason to congratulate himself that he knew no more. "As soon," he says, "as I understood the principles, I relinquished for ever the pursuit of the mathematics; nor can I lament that I desisted before my mind was hardened by the habit of rigid demonstration, so destructive

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of the finer feelings of moral evidence, which must, however, determine the action and opinions of our lives."

Under the new influences which were brought to bear on him, he in less than two years resumed his Protestantism. "He is willing," he says, to allow M. Pavilliard a "handsome share in his reconversion," though he maintains, and no doubt rightly, that it was principally due "to his own solitary reflections." He particularly congratulated himself on having discovered the "philosophical argument" against transubstantiation, "that the text of Scripture which seems to inculcate the real presence is attested only by a single sense—our sight, while the real presence itself is disproved by three of our senses—the sight, the touch, and the taste." Before a similar mode of reasoning, all the other distinctive articles of the Romish creed "disappeared like a dream"; and "after a full conviction," on Christmas day, 1754, he received the sacrament in the church of Lausanne. Although, however, he adds that at this point he suspended his religious inquiries, "acquiescing with implicit belief in the tenets and mysteries which are adopted by the general consent of Catholics and Protestants," his readers will probably do him no great injustice if they assume that even then it was rather to the negations than to the affirmations of Protestantism that he most heartily assented.

With all his devotion to study at Lausanne[1] (he read ten or twelve hours a day), he still found some time for the acquisition of some of the lighter accomplishments, such as riding, dancing, drawing, and also for mingling in such society as the place had to offer. In September 1755 he writes to his aunt: "I find a great many agreeable people here, see them sometimes, and can say upon the whole, without vanity, that, though I am the Englishman here who spends the least money, I am he who is most generally liked." Thus his "studious and sedentary life" passed pleasantly enough, interrupted only at rare intervals by boyish excursions of a day or a week in the neighbourhood, and by at least one memorable tour of Switzerland, by Basel, Zürich, Lucerne and Bern, made along with Pavilliard in the autumn of 1755. The last eighteen months of this residence abroad saw the infusion of two new elements—one of them at least of considerable importance—into his life. In 1757 Voltaire came to reside at Lausanne; and although he took but little notice of the young Englishman of twenty, who eagerly sought and easily obtained an introduction, the establishment of the theatre at Monrepos, where the brilliant versifier himself declaimed before select audiences his own productions on the stage, had no small influence in fortifying Gibbon's taste for the French theatre, and in at the same time abating that "idolatry for the gigantic genius of Shakespeare which is inculcated from our infancy as the first duty of an Englishman." In the same year—apparently about June—he saw for the first time, and forthwith loved, the beautiful, intelligent and accomplished Mademoiselle Susan Curchod, daughter of the pasteur of Crassier. That the passion which she inspired in him was tender, pure and fitted to raise to a higher level a nature which in some respects was much in need of such elevation will be doubted by none but the hopelessly cynical; and probably there are few readers who can peruse the paragraph in which Gibbon "approaches the delicate subject of his early love" without discerning in it a pathos much deeper than that of which the writer was himself aware. During the remainder of his residence at Lausanne he had good reason to "indulge his dream of felicity"; but on his return to England, "I soon discovered that my father would not hear of this strange alliance, and that without his consent I was myself destitute and helpless. After a painful struggle I yielded to my fate; I sighed as a lover, I obeyed as a son; my wound was insensibly healed by time, absence, and the habits of a new life."[2]

In 1758 he returned with mingled joy and regret to England, and was kindly received at home. But he found a stepmother there; and this apparition on his father's hearth at first rather appalled him. The cordial and gentle manners of Mrs Gibbon, however, and her unremitting care for his happiness, won him from his first prejudices, and gave her a permanent place in his esteem and affection. He seems to have been much indulged, and to have led a very pleasant life of it; he pleased himself in moderate excursions, frequented the theatre, mingled, though not very often, in society; was sometimes a little extravagant, and sometimes a little dissipated, but never lost the benefits of his Lausanne exile; and easily settled into a sober, discreet, calculating Epicurean philosopher, who sought the *summum bonum* of man in temperate, regulated and elevated pleasure. The first two years after his return to England he spent principally at his father's country seat at Buriton, in Hampshire, only nine months being given to the metropolis. He has left an amusing account of his employments in the country, where his love of study was at once inflamed by a large and unwonted command of books and checked by the necessary interruptions of his otherwise happy domestic life. After breakfast "he was expected," he says, to spend an hour with Mrs Gibbon; after tea his father claimed his conversation; in the midst of an interesting work he was often called down to entertain idle visitors; and, worst of all, he was periodically compelled to return the well-meant compliments. He mentions that he dreaded the "recurrence of the full moon," which was the period generally selected for the more convenient accomplishment of such formidable excursions.

His father's library, though large in comparison with that he commanded at Lausanne, contained, he says, "much trash"; but a gradual process of reconstruction transformed it at length into that "numerous and select" library which was "the foundation of his works, and the best comfort of his life both at home and abroad." No sooner had he returned home than he began the work of accumulation, and records that, on the receipt of his first quarter's allowance, a large share was appropriated to his literary wants. "He could never forget," he declares, "the joy with which he exchanged a bank note of twenty pounds for the twenty volumes of the *Memoirs* of the Academy of Inscriptions," an Academy which has been well characterized (by Sainte-Beuve) as Gibbon's intellectual father-land. It may not be uninteresting here to note the principles which guided him both now and afterwards in his literary purchases. "I am not conscious," says he, "of having ever bought a book from a motive of ostentation; every volume, before it was deposited on the shelf, was either read or sufficiently examined"; he also mentions that he soon adopted the tolerating maxim of the elder Pliny, that no book is ever so bad as to be absolutely good for nothing.

In London he seems to have seen but little select society—partly from his father's taste, "which had always preferred the highest and lowest company," and partly from his own reserve and timidity, increased by his foreign education, which had made English habits unfamiliar, and the very language

[1] The *Journal* for 1755 records that during that year, besides writing and translating a great deal in Latin and French, he had read, amongst other works, Cicero's *Epistolae ad familiares*, his *Brutus*, all his *Orationes*, his dialogues and the epistola and *De senectute*, Terence (twice), and Pliny's *Epistles*. In January 1756 he says: "I determined to read over the Latin authors in order, and read this year Virgil, Sallust, Livy, Velleius Paterculus, Valerius Maximus, Tacitus, Suetonius, Quintus Curtius, Justin, Florus, Plautus, Terence and Lucretius. I also read and meditated Locke *Upon the Understanding*." Again in January 1757 he writes: "I began to study algebra under M. de Traytorrens, went through the elements of algebra and geometry, and the three first books of the Marquis de l'Hôpital's *Conic Sections*. I also read Tibullus, Catullus, Propertius, Horace (with Dacier's and Torrentius's notes), Virgil, Ovid's *Epistles*, with Mezriac's commentary, the *Ars amandi* and the *Elegies*; likewise the *Augustus* and *Tiberius* of Suetonius, and a Latin translation of Dion Cassius from the death of Julius Caesar to the death of Augustus. I also continued my correspondence, begun last year, with M. Allamand of Bex, and the Professor Breitinger of Zürich, and opened a new one with the Professor Gesner of Göttingen. *N.B.*—Last year and this I read St John's Gospel, with part of Xenophon's *Cyropaedia*, the *Iliad*, and Herodotus; but, upon the whole, I rather neglected my Greek."

[2] The affair, however, was not finally broken off till 1763. Mdlle Curchod soon afterwards became the wife of Necker, the famous financier; and Gibbon and the Neckers frequently afterwards met on terms of mutual friendship and esteem.

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in some degree strange. And thus he was led to draw that interesting picture of the literary recluse among the crowds of London: "While coaches were rattling through Bond Street, I have passed many a solitary evening in my lodging with my books. My studies were sometimes interrupted with a sigh, which I breathed towards Lausanne; and on the approach of spring I withdrew without reluctance from the noisy and extensive scene of crowds without company, and dissipation without pleasure." He renewed former acquaintance, however, with the "poet" Mallet, and through him gained access to Lady Hervey's circle, where a congenial admiration, not to say affectation, of French manners and literature made him a welcome guest. It ought to be added that in each of the twenty-five years of his subsequent acquaintance with London "the prospect gradually brightened," and his social as well as his intellectual qualities secured him a wide circle of friends. In one respect Mallet gave him good counsel in those early days. He advised him to addict himself to an assiduous study of the more idiomatic English writers, such as Swift and Addison—with a view to unlearn his foreign idiom and recover his half-forgotten vernacular—a task, however, which he never perfectly accomplished. Much as he admired these writers, Hume and Robertson were still greater favourites, as well from their subject as for their style. Of his admiration of Hume's style, of its nameless grace of simple elegance, he has left us a strong expression, when he tells us that it often compelled him to close the historian's volumes with a mixed sensation of delight and despair.

In 1761 Gibbon, at the age of twenty-four, after many delays, and with many flutterings of hope and fear, gave to the world, in French, his maiden publication, an *Essai sur l'étude de la littérature*, which he had composed two years before. It was published partly in compliance with his father's wishes, who thought that the proof of some literary talent might introduce him favourably to public notice, and secure the recommendation of his friends for some appointment in connexion with the mission of the English plenipotentiaries to the congress at Augsburg which was at that time in contemplation. But in yielding to paternal authority, Gibbon frankly owns that he "complied, like a pious son, with the wish of his own heart."

The subject of this youthful effort was suggested, its author says, by a refinement of vanity—"the desire of justifying and praising the object of a favourite pursuit," namely, the study of ancient literature. Partly owing to its being written in French, partly to its character, the *Essai* excited more attention abroad than at home. Gibbon has criticized it with the utmost frankness, not to say severity; but, after every abatement, it is unquestionably a surprising effort for a mind so young, and contains many thoughts which would not have disgraced a thinker or a scholar of much maturer age. His account of its first reception and subsequent fortunes in England deserves to be cited as a curious piece of literary history. "In England," he says, "it was received with cold indifference, little read, and speedily forgotten. A small impression was slowly dispersed; the bookseller murmured, and the author (had his feelings been more exquisite) might have wept over the blunders and baldness of the English translation. The publication of my history fifteen years afterwards revived the memory of my first performance, and the essay was eagerly sought in the shops. But I refused the permission which Becket solicited of reprinting it; the public curiosity was imperfectly satisfied by a pirated copy of the booksellers of Dublin; and when a copy of the original edition has been discovered in a sale, the primitive value of half-a-crown has risen to the fanciful price of a guinea or thirty shillings."[1]

[1] The *Essai*, in a good English translation, now appears in the *Miscellaneous Works*. Villemain finds in it "peu de vues, nulle originalité surtout, mais une grande passion littéraire, l'amour des recherches savantes et du beau langage." Sainte-Beuve's criticism is almost identical with Gibbon's own; but though he finds that "la lecture en est assez difficile et parfois obscure, la liaison des idées échappe souvent par trop de concision et par le désir qu'a eu le jeune auteur d'y faire entrer, d'y condenser la plupart de ses notes," he adds, "il y a, chemin faisant, des vues neuves et qui sentent l'historien."

Some time before the publication of the essay, Gibbon had entered a new and, one might suppose, a very uncongenial scene of life. In an hour of patriotic ardour he became (June 12, 1759) a captain in the Hampshire militia, and for more than two years (May 10, 1760, to December 23, 1762) led a wandering life of "military servitude." Hampshire, Kent, Wiltshire and Dorsetshire formed the successive theatres of what he calls his "bloodless and inglorious campaigns." He complains of the busy idleness in which his time was spent; but, considering the circumstances, so adverse to study, one is rather surprised that the military student should have done so much, than that he did so little; and never probably before were so many hours of literary study spent in a tent. In estimating the comparative advantages and disadvantages of this wearisome period of his life, he has summed up with the impartiality of a philosopher and the sagacity of a man of the world. Irksome as were his employments, grievous as was the waste of time, uncongenial as were his companions, solid benefits were to be set off against these things; his health became robust, his knowledge of the world was enlarged, he wore off some of his foreign idiom, got rid of much of his reserve; he adds—and perhaps in his estimate it was the benefit to be most prized of all—"the discipline and evolutions of a modern battalion gave me a clearer notion of the phalanx and the legion, and the captain of the Hampshire grenadiers (the reader may smile) has not been useless to the historian of the Roman empire."

It was during this period that he read Homer and Longinus, having for the first time acquired some real mastery of Greek; and after the publication of the *Essai*, his mind was full of projects for a new literary effort. The Italian expedition of Charles VIII. of France, the crusade of Richard I., the wars of the barons, the wits and comparisons of Henry V. and the emperor Titus, the history of the Black Prince, the life of Sir Philip Sidney, that of Montrose, and finally that of Sir W. Raleigh, were all of them seriously contemplated and successively rejected. By their number they show how strong was the impulse to literature, and by their character, how determined the bent of his mind in the direction of history; while their variety makes it manifest also that he had then at least no special purpose to serve, no preconceived theory to support, no particular prejudice or belief to overthrow.

The militia was disbanded in 1762, and Gibbon joyfully shook off his bonds; but his literary projects were still to be postponed. Following his own wishes, though with his father's consent, he had early in 1760 projected a Continental tour as the completion "of an English gentleman's education." This had been interrupted by the episode of the militia; now, however, he resumed his purpose, and left England in January 1763. Two years were "loosely defined as the term of his absence," which he exceeded by half a year—returning June 1765. He first visited Paris, where he saw a good deal of d'Alembert, Diderot, Barthélemy, Raynal, Helvétius, Baron d'Holbach and others of that circle, and was often a welcome guest in the saloons of Madame Geoffrin and Madame du Deffand.[2] Voltaire was at Geneva, Rousseau at Montmorency, and Buffon he neglected to visit; but so congenial did he find the society for which his education had so well prepared him, and into which some literary reputation had already preceded him, that he declared, "Had I been rich and independent, I should have prolonged and perhaps have fixed my residence at Paris."

From France he proceeded to Switzerland, and spent nearly a year at Lausanne, where many old friendships and studies were resumed, and new ones begun. His reading was largely designed to enable him fully to profit by the long-contemplated Italian tour which began in April 1764 and lasted somewhat more than a year. He has recorded one or two interesting notes on Turin, Genoa, Florence and other towns at which halt was made on his route; but Rome was the great object of his pilgrimage, and the words in which he has alluded to the feelings with which he

[2] Her letters to Walpole about Gibbon contain some interesting remarks by this "aveugle clairvoyante," as Voltaire calls her; but they belong to a later period (1777).

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approached it are such as cannot be omitted from any sketch of Gibbon, however brief. "My temper is not very susceptible of enthusiasm, and the enthusiasm which I do not feel I have ever scorned to affect. But at the distance of twenty-five years I can neither forget nor express the strong emotions which agitated my mind as I first approached and entered the Eternal City. After a sleepless night, I trod with a lofty step the ruins of the forum; each memorable spot, where Romulus stood, or Tully spoke, or Caesar fell, was at once present to my eye; and several days of intoxication were lost or enjoyed before I could descend to a cool and minute investigation." Here at last his long yearning for some great theme worthy of his historic genius was gratified. The first conception of the *Decline and Fall* arose as he lingered one evening amidst the vestiges of ancient glory. "It was at Rome, on the 15th of October 1764, as I sat musing amidst the ruins of the Capitol, while the barefooted friars were singing vespers in the temple of Jupiter, that the idea of writing the decline and fall of the city first started to my mind."

The five years and a half which intervened between his return from this tour, in June 1765, and the death of his father, in November 1770, seem to have formed the portion of his life which "he passed with the least enjoyment and remembered with the least satisfaction." He attended every spring the meetings of the militia at Southampton, and rose successively to the rank of major and lieutenant-colonel commandant; but was each year "more disgusted with the inn, the wine, the company, and the tiresome repetition of annual attendance and daily exercise." From his own account, however, it appears that other and deeper causes produced this discontent. Sincerely attached to his home, he yet felt the anomaly of his position. At thirty, still a dependant, without a settled occupation, without a definite social status, he often regretted that he had not "embraced the lucrative pursuits of the law or of trade, the chances of civil office or India adventure, or even the fat slumbers of the church." From the emoluments of a profession he "might have derived an ample fortune, or a competent income instead of being stinted to the same narrow allowance, to be increased only by an event which he sincerely deprecated." Doubtless the secret fire of a consuming, but as yet ungratified, literary ambition also troubled his repose. He was still contemplating "at an awful distance" *The Decline and Fall*, and meantime revolved some other subjects, that seemed more immediately practicable. Hesitating for some time between the revolutions of Florence and those of Switzerland, he consulted M. Deyverdun, a young Swiss with whom he had formed a close and intimate friendship during his first residence at Lausanne, and finally decided in favour of the land which was his "friend's by birth" and "his own by adoption." He executed the first book in French; it was read (in 1767), as an anonymous production, before a literary society of foreigners in London, and condemned. Gibbon sat and listened unobserved to their strictures. It never got beyond that rehearsal; Hume, indeed, approved of the performance, only deprecating as unwise the author's preference for French; but Gibbon sided with the majority.

In 1767 also he joined with M. Deyverdun in starting a literary journal under the title of *Mémoires littéraires de la Grande-Bretagne*. But its circulation was limited, and only the second volume had appeared (1768) when Deyverdun went abroad. The materials already collected for a third volume were suppressed. It is interesting, however, to know, that in the first volume is a review by Gibbon of Lord Lyttelton's *History of Henry II.*, and that the second volume contains a contribution by Hume on Walpole's *Historic Doubts*.

The next appearance of the historian made a deeper impression. It was the first distinct print of the lion's foot. "Ex ungue leonem" might have been justly said, for he attacked, and attacked successfully, the redoubtable Warburton. Of the many paradoxes in the *Divine Legation*, few are more extravagant than the theory that Virgil, in the sixth book of his *Aeneid*, intended to allegorize, in the visit of his hero and the Sibyl to the shades, the initiation of Aeneas, as a lawgiver, into the Eleusinian mysteries. This theory Gibbon completely exploded in his *Critical Observations* (1770)—no very difficult task, indeed, but achieved in a style, and with a profusion of learning, which called forth the warmest commendations both at home and abroad. Warburton never replied; and few will believe that he would not, if he had not thought silence more discreet. Gibbon, however, regrets that the style of his pamphlet was too acrimonious; and this regret, considering his antagonist's slight claims to forbearance, is creditable to him. "I cannot forgive myself the contemptuous treatment of a man who, with all his faults, was entitled to my esteem; and I can less forgive, in a personal attack, the cowardly concealment of my name and character."

Soon after his "release from the fruitless task of the Swiss revolution" in 1768, he had gradually advanced from the wish to the hope, from the hope to the design, from the design to the execution of his great historical work. His preparations were indeed vast. The classics, "as low as Tacitus, Pliny the Younger and Juvenal," had been long familiar. He now "plunged into the ocean of the Augustan history," and "with pen almost always in hand," pored over all the original records, Greek and Latin, between Trajan and the last of the Western Caesars. "The subsidiary rays of medals and inscriptions, of geography and chronology, were thrown on their proper objects; and I applied the collections of Tillemont, whose inimitable accuracy almost assumes the character of genius, to fix and arrange within my reach the loose and scattered atoms of historical information." The Christian apologists and their pagan assailants; the Theodosian Code, with Godefroy's commentary; the *Annals and Antiquities* of Muratori, collated with "the parallel or transverse lines" of Sigonius and Maffei, Pagi and Baronius, were all critically studied. Still following the wise maxim which he had adopted as a student, "multum legere potius quam multa," he reviewed again and again the immortal works of the French and English, the Latin and Italian classics. He deepened and extended his acquaintance with Greek, particularly with his favourite authors Homer and Xenophon; and, to crown all, he succeeded in achieving the third perusal of Blackstone's *Commentaries*.

The course of his study was for some time seriously interrupted by his father's illness and death in 1770, and by the many distractions connected with the transference of his residence from Buriton to London. It was not, indeed, until October 1772 that he found himself at last independent, and fairly settled in his house and library, with full leisure and opportunity to set about the composition of the first volume of his history. Even then it appears from his own confession that he long brooded over the chaos of materials he had amassed before light dawned upon it. At the commencement, he says, "all was dark and doubtful"; the limits, divisions, even the title of his work were undetermined; the first chapter was composed three times, and the second and third twice, before he was satisfied with his efforts. This prolonged meditation on his design and its execution was ultimately well repaid by the result: so methodical did his ideas become, and so readily did his materials shape themselves, that, with the above exceptions, the original MS. of the entire six quartos was sent uncopied to the printers. He also says that not a sheet had been seen by any other eyes than those of author and printer, a statement indeed which must be taken with a small deduction; or rather we must suppose that a few chapters had been submitted, if not to the "eyes," to the "ears" of others; for he elsewhere tells us that he was "soon disgusted with the modest practice of reading the manuscript to his friends." Such, however, were his preliminary difficulties that he confesses he was often "tempted to cast away the labour of seven years"; and it was not until February 1776 that the first volume was published. The success was instant, and, for a quarto, probably unprecedented. The entire impression was exhausted in a few days; a second and a third edition were scarcely adequate to the demand. The author might almost have said, as Lord Byron after the publication of *Childe Harold*,

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that "he awoke one morning and found himself famous." In addition to public applause, he was gratified by the more select praises of the highest living authorities in that branch of literature: "the candour of Dr Robertson embraced his disciple"; Hume's letter of congratulation "overpaid the labour of ten years." The latter, however, with his usual sagacity, anticipated the objections which he saw could be urged against the famous fifteenth and sixteenth chapters. "I think you have observed a very prudent temperament; but it was impossible to treat the subject so as not to give grounds of suspicion against you, and you may expect that a clamour will arise."

The "clamour" thus predicted was not slow to make itself heard. Within two years the famous chapters had elicited what might almost be called a library of controversy. The only attack, however, to which Gibbon deigned to make any reply was that of Davies, who had impugned his accuracy or good faith. His *Vindication* appeared in February 1779; and, as Milman remarks, "this single discharge from the ponderous artillery of learning and sarcasm laid prostrate the whole disorderly squadron" of his rash and feeble assailants.[1]

Two years before the publication of this first volume Gibbon was elected member of parliament for Liskeard (1774). His political duties did not suspend his prosecution of his history, except on one occasion, and for a little while, in 1779, when he undertook, on behalf of the ministry, a task which, if well performed, was also, it must be added, well rewarded. The French government had issued a manifesto preparatory to a declaration of war, and Gibbon was solicited by Chancellor Thurlow and Lord Weymouth, secretary of state, to answer it. In compliance with this request he produced the able *Mémoire justificatif*, composed in French, and delivered to the courts of Europe; and shortly afterwards be received a seat at the Board of Trade and Plantations—little more than a sinecure in itself, but with a very substantial salary of nearly £800 per annum. His acceptance displeased some of his former political associates, and he was accused of "deserting his party." In his *Memoir*, indeed, Gibbon denies that he had ever enlisted with the Whigs. A note of Fox, however, on the margin of a copy of *The Decline and Fall* records a very distinct remembrance of the historian's previous vituperation of the ministry; within a fortnight of the date of his acceptance of office, he is there alleged to have said that "there was no salvation for this country until six heads of the principal persons in administration were laid upon the table." Lord Sheffield merely replies, somewhat weakly it must be said, that his friend never intended the words to be taken literally. More to the point is the often-quoted passage from Gibbon's letter to Deyverdun, where the frank revelation is made: "You have not forgotten that I went into parliament without patriotism and without ambition, and that all my views tended to the convenient and respectable place of a lord of trade."

In April 1781 the second and third quartos of his *History* were published. They excited no controversy, and were comparatively little talked about—so little, indeed, as to have extorted from him a half murmur about "coldness and prejudice." The volumes, however, were bought and read with silent avidity. Meanwhile public events were developing in a manner that had a considerable influence upon the manner in which the remaining years of the historian's life were spent. At the general election in 1780 he had lost his seat for Liskeard, but had subsequently been elected for Lymington. The ministry of Lord North, however, was tottering, and soon after fell; the Board of Trade was abolished by the passing of Burke's bill in 1782, and Gibbon's salary vanished with it—no trifle, for his expenditure had been for three years on a scale somewhat disproportionate to his private fortune. He did not like to depend on statesmen's promises, which are proverbially uncertain of fulfilment; he as little liked to retrench; and he was wearied of parliament, where he had never given any but silent votes. Urged by such considerations, he once more turned his eyes to the scene of his early exile, where he might live on his decent patrimony in a style which was impossible in England, and pursue unembarrassed his literary studies. He therefore resolved to fix himself at Lausanne.

A word only is necessary on his parliamentary career. Neither nature nor acquired habits qualified him to be an orator; his late entrance on public life, his natural timidity, his feeble voice, his limited command of idiomatic English, and even, as he candidly confesses, his literary fame, were all obstacles to success. "After a fleeting, illusive hope, prudence condemned me to acquiesce in the humble station of a mute.[2] . . . I was not armed by nature and education with the intrepid energy of mind and voice—'Vincentem strepitus et natum rebus agendis.' Timidity was fortified by pride, and even the success of my pen discouraged the trial of my voice." His repugnance to public life had been strongly expressed to his father in a letter of a very early date, in which he begged that the money which a seat in the House of Commons would cost might be expended in a mode more agreeable to him. Gibbon was eight-and-thirty when he entered parliament; and the obstacles which even at an earlier period he had not had courage to encounter were hardly likely to be vanquished then. Nor had he much political sagacity. He was better skilled in investigating the past than in divining the future. While Burke and Fox and so many great statesmen proclaimed the consequences of the collision with America, Gibbon saw nothing but colonies in rebellion, and a paternal government justly incensed. His silent votes were all given on that hypothesis. In a similar manner, while he abhorred the French Revolution when it came, he seems to have had no apprehension, like Chesterfield, Burke, or even Horace Walpole, of its approach; nor does he appear to have at all suspected that it had had anything to do with the speculations of the philosophic coteries in which he had taken such delight. But while it may be doubted whether his presence in parliament was of any direct utility to the legislative business of the country, there can be no question of the present advantage which he derived from it in the prosecution of the great work of his life—an advantage of which he was fully conscious when he wrote: "The eight sessions that I sat in parliament were a school of civil prudence, the first and most essential virtue of an historian."

Having sold all his property except his library—to him equally a necessary and a luxury—Gibbon repaired to Lausanne in September 1783, and took up his abode with his early friend Deyverdun, now a resident there. Perfectly free from every engagement but those which his own tastes imposed, easy in his circumstances, commanding just as much society, and that as select, as he pleased, with the noblest scenery spread out at his feet, no situation can be imagined more favourable for the

[1] For a very full list of publications in answer to Gibbon's attack on Christianity reference may be made to the *Bibliographer's Manual*, pp. 885-886 (1858). Of these the earliest were Watson's *Apology* (1776), Salisbury's *Strictures* (1776) and Chelsum's (anonymous) *Remarks* (1776). In 1778 the *Few Remarks* by a Gentleman (Francis Eyre), the *Reply* of Loftus, the *Letters* of Apthorpe and the *Examination* of Davies appeared. Gibbon's *Vindication* (1779) called forth a *Reply* by Davies (1779), and *A Short Appeal to the Public* by Francis Eyre (1779). Laughton's polemical treatise was published in 1780, and those of Milner and Taylor in 1781. Chelsum returned to the attack in 1785 (*A Reply to Mr Gibbon's Vindication*), and Sir David Dalrymple (*An Inquiry into the Secondary Causes*, &c.) made his first appearance in the controversy in 1786. Travis's *Letters on* 1 John v. 7 are dated 1784, and *Confessione del- l' esame del Cristianismo fatto da Gibbon* was published at Rome (2 vols. 4to) in the same year. It is impossible not to concur in almost every point with Gibbon's own estimate of his numerous assailants. Their crude productions, for the most part, were conspicuous rather for insolence and abusiveness than for logic or learning. Those of Bishop Watson and Lord Hailes were the best, but simply because they contented themselves with a dispassionate exposition of the general argument in favour of Christianity. The most foolish and discreditable was certainly that of Davies; his unworthy attempt to depreciate the great historian's learning, and his captious, cavilling, acrimonious charges of petty inaccuracies and discreditable falsification gave the object of his attack an easy triumph.

[2] In 1775 he writes to Holroyd: "I am still a mute; it is more tremendous than I imagined; the great speakers fill me with despair; the bad ones with terror."

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prosecution of his literary enterprise; a hermit in his study as long as he chose, be found the most delightful recreation always ready for him at the threshold. "In London," says he, "I was lost in the crowd; I ranked with the first families in Lausanne, and my style of prudent expense enabled me to maintain a fair balance of reciprocal civilities. . . . Instead of a small bouse between a street and a stable-yard, I began to occupy a spacious and convenient mansion, connected on the north side with the city, and open on the south to a beautiful and boundless horizon. A garden of four acres had been laid out by the taste of M. Deyverdun: from the garden a rich scenery of meadows and vineyards descends to the Leman Lake, and the prospect far beyond the lake is crowned by the stupendous mountains of Savoy." In this enviable retreat, it is no wonder that a year sbould have been suffered to roll round before be vigorously resumed his great work—and with many men it would never bave been resumed in such a paradise. We may remark in passing tbat the retreat was often enlivened, or invaded, by friendly tourists from England, whose "frequent incursions" into Switzerland our recluse seems half to lament as an evil. Among his more valued visitors were M. and Mme Necker; Mr Fox also gave him two welcome "days of free and private society" in 1788. Differing as they did in politics, Gibbon's testimony to the genius and character of the great statesman is bighly honourable to both: "Perhaps no human being," he says, "was ever more perfectly exempt from the taint of malevolence, vanity, or falsebood."

When once fairly reseated at his task, he proceeded in this delightful retreat leisurely, yet rapidly, to its completion. The fourtb volume, partly written in 1782, was completed in June 1784; the preparation of the fiftb volume occupied less than two years; while tbe sixtb and last, begun 18th May 1786, was finisbed in thirteen months. The feelings with which he brought his labours to a close must be described in his own inimitable words: "It was on the day, or ratber night, of the 27th of June 1787, between the bours of eleven and twelve, tbat I wrote the last lines of tbe last page in a summer bouse in my garden. After laying down my pen, I took several turns in a *berceau*, or covered walk of acacias, which commands a prospect of the country, the lake, and the mountains. The air was temperate, the sky was serene, the silver orb of the moon was reflected from the waters, and all nature was silent. I will not dissemble the first emotions of joy on the recovery of my freedom, and, perhaps, the establishment of my fame. But my pride was soon humbled, and a sober melancholy was spread over my mind by the idea tbat I had taken an everlasting leave of an old and agreeable companion, and that whatsoever might be the future date of my *History*, the life of the historian must be short and precarious."

Taking the manuscript with him, Gibbon, after an absence of four years, once more visited London in 1787; and tbe 51st anniversary of the author's birthday (27th April 1788) witnessed the publication of the last three volumes of *The Decline and Fall*. They met with a quick and easy sale, were very extensively read, and very liberally and deservedly praised for the unflagging industry and vigour they displayed, though just exception, if only on the score of good taste, was taken to the scoffing tone he continued to maintain in all passages where the Christian religion was specially concerned, and much fault was found with the indecency of some of his notes.[1]

He returned to Switzerland in July 1788, cherishing vague schemes of fresh literary activity; but genuine sorrow caused by the death of his friend Deyverdun interfered with steady work, nor was it easy for him to fix on a new subject which should be at once congenial and proportioned to his powers; while the premonitory mutterings of the great thunderstorm of the French Revolution, which reverberated in hollow echoes even through the quiet valleys of Switzerland, further troubled his repose. For some months be found amusement in tbe preparation of the delightful *Memoirs* (1789) from which most of our knowledge of his personal history is derived; but bis letters to friends in England, written between 1788 and 1793 occasionally betray a slight but unmistakable tone of ennui. In April 1793 he unexpectedly received tidings of the death of Lady Sheffield; and the motive of friendship thus supplied combined with the pressure of public events to urge him homewards. He arrived in England in the following June, and spent the summer at Sheffield Place, where his presence was even more highly prized than it bad ever before been. Returning to London early in November, he found it necessary to consult his physicians for a symptom wbich, neglected since 1761, had gradually become complicated witb hydrocele, and was now imperatively demanding surgical aid; but the painful operations which bad to be performed did not interfere with his customary cheerfulness, nor did they prevent him from paying a Christmas visit to Sheffield Place. Here, however, fever made its appearance; and a removal to London (January 6, 1794) was considered imperative. Another operation brought him some relief; but a relapse occurred during the nigbt of the 15th, and on the following day he peacefully breathed his last. His remains were laid in the burial place of the Sheffield family, Fletching, Sussex, where an epitaph by Dr Parr describes his character and work in the language at once of elegance, of moderation and of truth.

The personal appearance of Gibbon as a lad of sixteen is brought before us somewhat dimly in M. Pavilliard's description of the "thin little figure, with a large head, disputing and arguing, with the greatest ability, all the best arguments that had ever been used in favour of popery." Wbat he afterwards became has been made more vividly familiar by the clever silhouette prefixed to the *Miscellaneous Works* (Gibbon bimself, at least, we know, did not regard it as a caricature), and by Sir Joshua Reynolds's portrait so often engraved. It is hardly fair perhaps to add a reference to Suard's highly-coloured description of the short Silenus-like figure, not more than 56 in. in height, the slim legs, tbe large turned-in feet, the shrill piercing voice; but almost every one will remember, from Croker's *Boswell*, Colman's account of the great historian "tapping his snuff-box, smirking and smiling, and rounding his periods" from that mellifluous mouth. It has already been seen that Gibbon's early ailments all left him on the approach of manhood; thenceforward, "till admonished by the gout," be could truly boast of an immunity well-nigh perfect from every bodily complaint; an exceptionally vigorous brain, and a stomach "almost too good," united to bestow upon him a vast capacity alike for work and for enjoyment. This capacity he never abused so as to burden bis conscience or depress his spirits. "The madness of superfluous health I have never known." To illustrate the intensity of the pleasure he found alike in the solitude of bis study and in the relaxations of genial social intercourse, almost any page taken at random, either from the *Life* or from the *Letters*, would suffice; and many incidental touches show that he was not a stranger to the delights of quiet contemplation of the beauties and grandeurs of nature. His manners, if formal, were refined; bis conversation, when he felt himself at home, interesting and unaffected; and that he was capable alike of feeling and inspiring a very constant friendship there are many witnesses to sbow. That his temperament at the same time was frigid and comparatively passionless cannot be denied; but neither ought this to be imputed to him as a fault; hostile criticisms upon the grief for a father's death, that "was soothed by the conscious satisfaction that I bad discharged all the duties of filial piety," seem somewbat out of place. His most ardent admirers, however, are constrained to admit that he was deficient in large-hearted benevolence; that he was destitute of any "enthusiasm of humanity"; and that so far as every sort of religious yearning or aspiration is concerned, his poverty was almost unique. Gibbon was such a man as Horace might bave been, had the Roman Epicurean

[1] An anonymous pamphlet, entitled *Observations on the three last volumes of the Roman History*, appeared in 1788; Disney's *Sermon, with Strictures*, in 1790; and Whitaker's *Review*, in 1791. With regard to the second of the above complaints, surprise will probably be felt that it was not extended to portions of the text as well as to the notes.

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been fonder of hard intellectual work, and less prone than he was to the indulgence of emotion. (H. Ro.; J. S. Bl.)

Gibbon's literary art, the sustained excellence of his style, his piquant epigrams and his brilliant irony, would perhaps not secure for his work the immortality which it seems likely to enjoy, if it were not also marked by ecumenical grasp, extraordinary accuracy and striking acuteness of judgment. It is needless to say that in many points his statements and conclusions must now be corrected. He was never content with secondhand accounts when the primary sources were accessible; "I have always endeavoured," he says, "to draw from the fountainhead; my curiosity, as well as a sense of duty, has always urged me to study the originals; and if they have sometimes eluded my search, I have carefully marked the secondary evidence on whose faith a passage or a fact were reduced to depend." Since he wrote, new authorities have been discovered or rendered accessible; works in Greek, Latin, Slavonic, Armenian, Syriac, Arabic and other languages, which he was unable to consult, have been published. Again, many of the authorities which he used have been edited in superior texts. The relative weights of the sources have been more nicely determined by critical investigation. Archaeology has become a science. In the immense region which Gibbon surveyed there is hardly a section which has not been submitted to the microscopic examination of specialists.

But apart from the inevitable advances made in the course of a century during which historical research entered upon a new phase, the reader of Gibbon must be warned against one capital defect. In judging the *Decline and Fall* it should carefully be observed that it falls into two parts which are heterogeneous in the method of treatment. The first part, a little more than five-eighths of the work, supplies a very *full* history of 460 years (A.D. 180–641); the second and smaller part is a summary history of about 800 years (A.D. 641–1453) in which certain episodes are selected for fuller treatment and so made prominent. To the first part unstinted praise must be accorded; it may be said that, with the materials at the author's disposition, it hardly admitted of improvement, except in trifling details. But the second, notwithstanding the brilliancy of the narrative and the masterly art in the grouping of events, suffers from a radical defect which renders it a misleading guide. The author designates the story of the later empire at Constantinople (after Heraclius) as "a uniform tale of weakness and misery," a judgment which is entirely false; and in accordance with this doctrine, he makes the empire, which is his proper subject, merely a string for connecting great movements which affected it, such as the Saracen conquests, the Crusades, the Mongol invasions, the Turkish conquests. He failed to bring out the momentous fact that up to the 12th century the empire was the bulwark of Europe against the East, nor did he appreciate its importance in preserving the heritage of Greek civilization. He compressed into a single chapter the domestic history and policy of the emperors from the son of Heraclius to Isaac Angelus; and did no justice to the remarkable ability and the indefatigable industry shown in the service of the state by most of the sovereigns from Leo III. to Basil II. He did not penetrate into the deeper causes underlying the revolutions and palace intrigues. His eye rested only on superficial characteristics which have served to associate the name "Byzantine" with treachery, cruelty, bigotry and decadence. It was reserved for Finlay to depict, with greater knowledge and a juster perception, the lights and shades of Byzantine history. Thus the later part of the *Decline and Fall*, while the narrative of certain episodes will always be read with profit, does not convey a true idea of the history of the empire or of its significance in the history of Europe. It must be added that the pages on the Slavonic peoples and their relations to the empire are conspicuously insufficient; but it must be taken into account that it was not till many years after Gibbon's death that Slavonic history began to receive due attention, in consequence of the rise of competent schoiars among the Slavs themselves.

The most famous chapters of the *Decline and Fall* are the fifteenth and sixteenth, in which the historian traces the early progress of Christianity and the policy of the Roman government towards it. The flavour of these chapters is due to the irony which Gibbon has employed with consummate art and felicity. There was a practical motive for using this weapon. An attack on Christianity laid a writer open to prosecution and penalties under the statutes of the realm (9 and 10 William III. c. 22, still unrepealed). Gibbon's stylistic artifice both averted the peril of prosecution and rendered the attack more telling. In his *Autobiography* he alleges that he learned from the *Provincial Letters* of Pascal "to manage the weapon of grave and temperate irony, even on subjects of ecclesiastical solemnity." It is not easy, however, to perceive much resemblance between the method of Pascal and that of Gibbon, though in particular passages we may discover the influence which Gibbon acknowledges. For instance, the well-known description (in chap. xlviii.) of the preposition "in" occurring in a theological dogma as a "momentous particle which the memory rather than the understanding must retain" is taken directly from the first Provincial Letter. The main points in the general conclusions of these chapters have been borne out by subsequent research. The account of the causes of the expansion of Christianity is chiefly to be criticized for its omissions. There were a number of important contributory conditions (enumerated in Harnack's *Mission und Ausbreitung des Christentums*) which Gibbon did not take into account. He rightly insisted on the facilities of communication created by the Roman empire, but did not emphasize the diffusion of Judaism. And he did not realize the importance of the kinship between Christian doctrine and Hellenistic syncretism, which helped to promote the reception of Christianity. He was ignorant of another fact of great importance (which has only in recent years been fully appreciated through the researches of F. Cumont), the wide diffusion of the Mithraic religion and the close analogies between its doctrines and those of Christianity. In regard to the attitude of the Roman government towards the Christian religion, there are questions still *sub judice*; but Gibbon had the merit of reducing the number of martyrs within probable limits.

Gibbon's verdict on the history of the middle ages is contained in the famous sentence, "I have described the triumph of barbarism and religion." It is important to understand clearly the criterion which he applied; it is frequently misapprehended. He was a son of the 18th century; he had studied with sympathy Locke and Montesquieu; no one appreciated more keenly than he did political liberty and the freedom of an Englishman. This is illustrated by his love of Switzerland, his intense interest in the fortunes of that country, his design of writing "The History of the Liberty of the Swiss"—a theme, he says "from which the dullest stranger would catch fire." Such views and sentiments are incompatible with the idealization of a benevolent despotism. Yet in this matter Gibbon has been grossly misapprehended and misrepresented. For instance, Mirabeau wrote thus to Sir Samuel Romilly: "I have never been able to read the work of Mr Gibbon without being astounded that it should ever have been written in English; or without being tempted to turn to the author and say, 'You an Englishman? No, indeed.' That admiration for an empire of more than two hundred millions of men, where not one had the right to call himself free; that effeminate philosophy which has more praise for luxury and pleasures than for all the virtues; that style always elegant and never energetic, reveal at the most the elector of Hanover's slave." This criticism is based on a perverse misreading of the historian's observations on the age of Trajan, Hadrian and the Antonines. He enlarges, as it was his business to do, on the tranquillity and prosperity of the empire in that period, but he does not fail to place his finger on the want of political liberty as a fatal defect. He points out that under this benevolent despotism, though men might be happy, their happiness was unstable, because it depended on the character of a single man; and the highest praise he can give to those virtuous princes is that they "deserved the honour of restoring the republic, had the Romans of their days been capable of a rational freedom." The criterion by which

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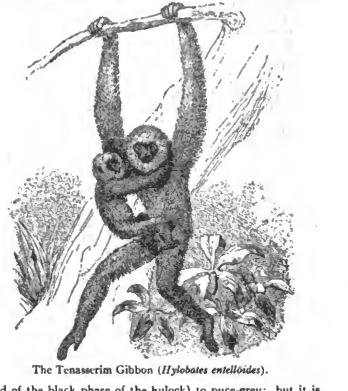
Gibbon judged civilization and progress was the measure in which the happiness of men is secured, and of that happiness he considered political freedom an essential condition. He was essentially humane; and it is worthy of notice that he was in favour of the abolition of slavery, while humane men like his friend Lord Sheffield, Dr Johnson and Boswell were opposed to the anti-slavery movement.

BIBLIOGRAPHY.—Of the original quarto edition of *The Decline and Fall*, vol. i. appeared, as has already been stated, in 1776, vols. ii. and iii. in 1781 and vols. iv.-vi. (inscribed to Lord North) in 1788. In later editions vol. i. was considerably altered by the author; the others hardly at all. The number of modern reprints has been very considerable. For many years the most important and valuable English edition was that of Milman (1839 and 1845), which was reissued with many critical additions by Dr W. Smith (8 vols. 8vo, 1854 and 1872). This has now been superseded by the edition, with copious notes, by Professor J. B. Bury (7 vols. 8vo, 1896-1900). The edition in Bohn's British Classics (7 vols., 1853) deserves mention. See also the essay on Gibbon in Sir Spencer Walpole's *Essays and Biographies* (1907). As a curiosity of literature Boscher's edition, "adapted to the use of families and young persons," by the expurgation of "the indecent expressions and all allusions of an improper tendency" (5 vols. 8vo, 1825), may be noticed. The French translation of Le Clerc de Septchênes, continued by Démeunier, Boulard and Cantwell (1788-1795), has been frequently reprinted in France. It seems to be certain that the portion usually attributed to Septchênes was, in part at least, the work of his distinguished pupil, Louis XVI. A new edition of the complete translation, prefaced by a letter on Gibbon's life and character, from the pen of Suard, and annotated by Guizot, appeared in 1812 (and again in 1828). There are at least two German translations of *The Decline and Fall*, one by Wenck, Schreiter and Beck (1805-1807) and a second by Johann C. Sporschil (1837, new ed. 1862). The Italian translation (alluded to by Gibbon himself) was, along with Spedalieri's *Confutazione*, reprinted at Milan in 1823. There is a Russian translation by Yevtodomski (7 parts, Moscow, 1883-1886), and an Hungarian version of cc. 1-38 by K. Hegyessy (Pest, 1868-1869). Gibbon's *Miscellaneous Works, with Memoirs of his Life and Writings, composed by himself; illustrated from his Letters, with occasional Notes and Narrative*, published by Lord Sheffield in two volumes in 1796, has been often reprinted. The new edition in five volumes (1814) contained some previously unpublished matter, and in particular the fragment on the revolutions of Switzerland. A French translation of the *Miscellaneous Works* by Marigné appeared at Paris in 1798. There is also a German translation (Leipzig, 1801). It may be added that a special translation of the chapter on Roman Law (*Gibbon's historische Übersicht des römischen Rechts*) was published by Hugo at Göttingen in 1839, and has frequently been used as a text-book in German universities. This chapter has also appeared in Polish (Cracow, 1843) and Greek (Athens, 1840). The centenary of Gibbon's death was celebrated in 1894 under the auspices of the Royal Historical Society: *Proceedings of the Gibbon Commemoration, 1794-1894*, by R. H. T. Ball (1895). (J. B. B.)

GIBBON, the collective title of the smaller man-like apes of the Indo-Malay countries, all of which may be included in the single genus *Hylobates*. Till recently these apes have been generally included in the same family (*Simiidae*) with the chimpanzee, gorilla and orang-utan, but they are now regarded by several naturalists as representing a family by themselves—the *Hylobatidae*. One of the distinctive features of this family is the presence of small naked callosities on the buttocks; another being a difference in the number of vertebrae and ribs as compared with those of the *Simiidae*. The extreme length of the limbs and the absence of a tail are other features of these small apes, which are thoroughly arboreal in their habits, and make the woods resound with their unearthly cries at night. In agility they are unsurpassed; in fact they are stated to be so swift in their movements as to be able to capture birds on the wing with their paws. When they descend to the ground—which they must often do in order to obtain water—they frequently walk in the upright posture, either with the hands crossed behind the neck, or with the knuckles resting on the ground. Their usual food consists of leaves and fruits. Gibbons may be divided into two groups, the one represented by the siamang, *Hylobates* (*Symphalangus*) *syndactylus*, of Sumatra and the Malay Peninsula, and the other by a number of closely allied species. The union of the index and middle fingers by means of a web extending as far as the terminal joints is the distinctive feature of the siamang, which is the largest of the group, and black in colour with a white frontal band. Black or puce-grey is the prevailing colour in the second group, of which the hulock (*H. hulock*) of Assam, *H. lar* of Arakan and Pegu, *H. entellöides* of Tenasserim (fig.), and *H. agilis* of Sumatra are well-known representatives. A female of the Hainan gibbon (*H. hainanus*) in confinement changed from uniform sooty-black (without the white frontal



The Tenasserim Gibbon (*Hylobates entellöides*).

band of the black phase of the hulock) to puce-grey; but it is probable that this was only an individual, or at most a sexual, peculiarity. The range of the genus extends from the southern bank of the Bramaputra in Assam to southern China, the Malay Peninsula, Java, Sumatra and Borneo. (R. L.*)

GIBBONS, GRINLING (1648-1721), English wood-carver, was born in 1648, according to some authorities of Dutch parents at Rotterdam, and according to others of English parents at London. By the former he is said to have come to London after the great fire in 1666. He early displayed great cleverness and ingenuity in his art, on the strength of which he was recommended by Evelyn to Charles II., who employed him in the execution both of statuary and of ornamental carving in wood. In the early part of the 18th century he worked for Sir Christopher Wren. In statuary one of his principal works is a life-size bronze statue in the court of Whitehall, representing James II. in the dress of a Roman emperor, and he also designed the base of the statue of Charles I. at Charing Cross. It is, however, chiefly as a sculptor in wood that he is famous. He was employed to execute the ornamental carving for the chapel at Windsor, the foliage and festoons in the choir of St Paul's, the baptismal fonts in St James's, and an immense quantity of ornamental work at Burleigh, Chatsworth, and other aristocratic mansions. The finest of all his productions in this style is believed to be the ceiling which he devised for a room at Petworth. His subjects are chiefly birds, flowers, foliage, fruit and lace, and many of his works, for delicacy and elaboration of details, and truthfulness of imitation, have never been surpassed. He, however, sometimes wasted his ingenuity on trifling subjects; many of his flowers used to move on their stems like their natural prototypes when shaken by a breeze. In 1714 Gibbons was appointed master carver in wood to George I. He died at London on the 3rd of August 1721.

GIBBONS, JAMES (1834-), American Roman Catholic cardinal and archbishop, was born in Baltimore, Maryland, on the 23rd of July 1834, and was educated at St Charles College, Ellicott City, Maryland, and St Mary's Seminary, Baltimore, where he finished his theological training and was ordained priest

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on the 30th of June 1861. After a short time spent on the missions of Baltimore, he was called to be secretary to Archbishop Martin J. Spalding and assistant at the cathedral. When in 1866 the Second Plenary Council of Baltimore considered the matter of new diocesan developments, he was selected to organize the new Vicariate Apostolic of North Carolina; and was consecrated bishop in August 1868. During the four successful years spent in North Carolina he wrote, for the benefit of his mission work, *The Faith of our Fathers*, a brief presentation of the doctrines of the Roman Catholic Church, especially intended to reach Protestants; the books passed through more than forty editions in America and about seventy in England, and an answer was made to it in *Faith of our Forefathers* (1879), by Edward J. Stearns. Gibbons was transferred to the see of Richmond, Virginia, in 1872, and in 1877 was made coadjutor, with the right of succession, to the Archbishop (James R. Bayley) of Baltimore. In October of the same year he succeeded to the archbishopric. Pope Leo XIII. in 1883 selected him to preside over the Third Plenary Council in Baltimore (1884), and on the 30th of June 1886 created him a cardinal priest, with the title of Santa Maria Trastevere. His simplicity of life, foresight and prudence made him a power in the church. Thoroughly American, and a lover of the people, he greatly altered the attitude of the Roman Catholic Church toward the Knights of Labor and other labour organizations, and his public utterances displayed the true instincts of a popular leader. He contributed frequently to periodicals, but as an author is known principally by his works on religious subjects, including *Our Christian Heritage* (1889) and *The Ambassador of Christ* (1896). For many years an ardent advocate of the establishment of a Catholic university, at the Third Plenary Council of Baltimore (1884) he saw the realization of his desires in the establishment of the Catholic University of America at Washington, of which he became first chancellor and president of the board of trustees.

GIBBONS, ORLANDO (1583–1625), English musical composer, was the most illustrious of a family of musicians all more or less able. We know of at least three generations, for Orlando's father, William Gibbons, having been one of the waits of Cambridge, may be assumed to have acquired some proficiency in the art. His three sons and at least one of his grandsons inherited and further developed his talent. The eldest, Edward, was made bachelor of music at Cambridge, and successively held important musical appointments at the cathedrals of Bristol and Exeter; Ellis, the second son, was organist of Salisbury cathedral, and is the composer of two madrigals in the collection known as the *The Triumphs of Oriana*. Orlando Gibbons, the youngest and by far the most celebrated of the brothers, was born at Cambridge in 1583. Where and under whom he studied is not known, but in his twenty-first year he was sufficiently advanced and celebrated to receive the important post of organist of the Chapel Royal. His first published composition "Fantasies in three parts, composed for viols," appeared in 1610. It seems to have been the first piece of music printed in England from engraved plates, or "cut in copper, the like not heretofore extant." In 1622 he was created doctor of music by the university of Oxford. For this occasion he composed an anthem for eight parts, *O clap your Hands*, still extant. In the following year he became organist of Westminster Abbey. Orlando Gibbons died before the beginning of the civil war, or it may be supposed that, like his eldest brother, he would have been a staunch royalist. In a different sense, however, he died in the cause of his master; for having been summoned to Canterbury to produce a composition written in celebration of Charles's marriage, he there fell a victim to smallpox on the 5th of June 1625.

For a full list of his compositions, see Grove's *Dictionary of Music*. His portrait may be found in Hawkins's well-known *History*. His vocal pieces, madrigals, motets, canons, &c., are admirable, and prove him to have been a great master of pure polyphony. We have also some specimens of his instrumental music, such as the six pieces for the virginals published in *Parthenia*, a collection of instrumental music produced by Gibbons in conjunction with Dr Bull and Byrd.

GIBBS, JOSIAH WILLARD (1839–1903), American mathematical physicist, the fourth child and only son of Josiah Willard Gibbs (1790–1861), who was professor of sacred literature in Yale Divinity School from 1824 till his death, was born at New Haven on the 11th of February 1839. Entering Yale College in 1854 he graduated in 1858, and continuing his studies there was appointed tutor in 1863. He taught Latin in the first two years, and natural philosophy in the third. He then went to Europe, studying in Paris in 1866–1867, in Berlin in 1867 and in Heidelberg in 1868. Returning to New Haven in 1869, he was appointed professor of mathematical physics in Yale College in 1871, and held that position till his death, which occurred at New Haven on the 28th of April 1903. His first contributions to mathematical physics were two papers published in 1873 in the *Transactions* of the Connecticut Academy on "Graphical Methods in the Thermodynamics of Fluids," and "Method of Geometrical Representation of the Thermodynamic Properties of Substances by means of Surfaces." His next and most important publication was his famous paper "On the Equilibrium of Heterogeneous Substances" (in two parts, 1876 and 1878), which, it has been said, founded a new department of chemical science that is becoming comparable in importance to that created by Lavoisier. This work was translated into German by W. Ostwald (who styled its author the "founder of chemical energetics") in 1891 and into French by H. le Chatelier in 1899. In 1881 and 1884 he printed some notes on the elements of vector analysis for the use of his students; these were never formally published, but they formed the basis of a text-book on *Vector Analysis* which was published by his pupil, E. B. Wilson, in 1901. Between 1882 and 1889 a series of papers on certain points in the electromagnetic theory of light and its relation to the various elastic solid theories appeared in the *American Journal of Science*, and his last work, *Elementary Principles in Statistical Mechanics*, was issued in 1902. The name of Willard Gibbs, who was the most distinguished American mathematical physicist of his day, is especially associated with the "Phase Rule," of which some account will be found in the article ENERGETICS. In 1901 the Copley medal of the Royal Society of London was awarded him as being "the first to apply the second law of thermodynamics to the exhaustive discussion of the relation between chemical, electrical and thermal energy and capacity for external work."

A biographical sketch will be found in his collected *Scientific Papers* (2 vols., 1906).

GIBBS, OLIVER WOLCOTT (1822–1908), American chemist, was born at New York on the 21st of February 1822. His father, Colonel George Gibbs, was an ardent mineralogist; the mineral gibbsite was named after him, and his collection was finally bought by Yale College. Entering Columbia College in 1837, Wolcott (the Oliver he dropped at an early date) graduated in 1841, and, having assisted Robert Hare at Pennsylvania University for several months, he next entered the College of Physicians and Surgeons in New York, qualifying as a doctor of medicine in 1845. Leaving America he studied in Germany with K. F. Rammelsberg, H. Rose and J. von Liebig, and in Paris with A. Laurent, J.B. Dumas, and H. V. Regnault, returning in 1848. In that year he became professor of chemistry at the Free Academy, now the College of the City of New York, and in 1863 he obtained the Rumford professorship in Harvard University, a post retained until his retirement in 1887 as professor emeritus. He died on the 9th of December 1908. Gibbs' researches were mainly in analytical and inorganic chemistry, the cobaltammines, platinum metals and complex acids being especially investigated. He was an excellent teacher, and contributed many articles to scientific journals.

See the Memorial Lecture by F. W. Clarke in the *J.C.S.* (1909), p. 1299.

GIBEON, a town in Palestine whose inhabitants wrested a truce from Joshua by a trick (Josh. ix., x.); where the champions of David fought those of Ish-bosheth (2 Sam. ii. 12-32); where Joab murdered Amasa (*ib.* xx. 8-10); and where Johanan went against Ishmael to avenge the murder of Gedaliah (Jer. xli. 12).

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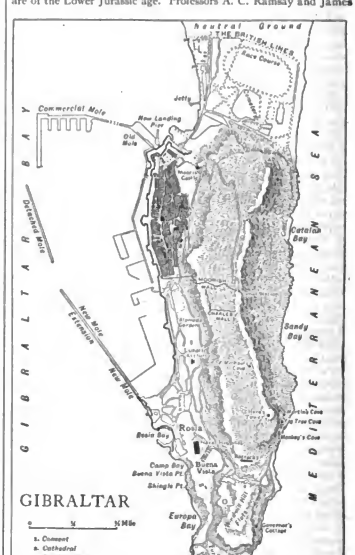
Here was an important high place (1 Kings iii. 4) where for a time the tabernacle was deposited (2 Chron. i. 3). The present name is *El-Jîb*; this is a small village about 5 m. N.W. of Jerusalem, standing on an isolated hill above a flat corn valley. The village is famous for its springs, and the reputation seems ancient (cf. 2 Sam. ii. 13; Jer. xli. 12). The principal spring issues from under a cliff on the south-east side of the hill, and the water runs to a reservoir lower down. The sides of the hill are rocky, and remarkable for the regular stratification of the limestone, which gives the hill at a distance the appearance of being terraced. Scattered olive groves surround the place. (R. A. S. M.)

GIBEONITES, the inhabitants of Gibeon, an Amorite or Hivite stronghold, the modern El-Jîb, 5 m. N.W. from Jerusalem. According to Joshua xviii. 25 it was one of the cities of Benjamin. When the Israelites, under Joshua, invaded Canaan, the Gibeonites by a crafty ruse escaped the fate of Jericho and Ai and secured protection from the invaders (Joshua ix.). Cheyne thinks this story the attempt of a later age to explain the long independence of Gibeon and the use of the Gibeonites as slaves in Solomon's temple. An attempt on the part of Saul to exterminate the clan is mentioned in 2 Sam. xxi., and this slaughter may possibly be identified with the massacre at Nob recorded in 1 Sam. xxii. 17-19 (see *Ency. Bib.* col. 1717). The place is also associated with the murders of Asahel (2 Sam. ii. 12), Amasa (2 Sam. xx. 8) and Gedaliah (Jer. xli. 12), and with the wrathful intervention of Yahweh referred to by Isaiah (xxviii. 21), which we may identify with the memorable victory of David over the Philistines recorded in 2 Sam. v. 25 (reading Gibeon for Geba). Gibeon was the seat of an old Canaanitish sanctuary afterwards used by the Israelites; it was here that Solomon, immediately after his coronation, went to consult the oracles and had the dream in which he chose the gift of wisdom (1 Kings iii.).

GIBRALTAR, a British fortress and crown colony at the western entrance to the Mediterranean. The whole territory is rather less than 3 m. in length from north to south and varies in width from ¼ to ¾ m. Gibraltar is called after Tariq (or Tarik) ben Zaid, its name being a corruption of Jebel Tariq (Mount Tariq). Tariq invaded Andalusia in A.D. 711 with an army of 12,000 Arabs and Berbers, and in the last days of July of that year destroyed the Gothic power in a three days' fight on the banks of the river Guadalete near where Jerez de la Frontera now stands. In order to secure his communications with Africa he ordered the building of a strong castle upon the Rock, known to the Romans as Mons Calpe. This work, begun in the year of the great battle, was completed in 742. It covered a wide area, reaching from the shores of the bay to a point half-way up the north-western slope of the rock; here the keep, a massive square tower, still stands and is known as the Moorish castle.

The Rock itself is about 2½ m. in length, and at its northern end rises almost perpendicularly from the strip of flat sandy ground which connects it with the Spanish mainland. At the north end, on the crest of the Rock 1200 ft. above sea-level, is the Rock gun, famous in the great siege. Some six furlongs to the south is the signal station (1255 ft.), through which the names and messages of passing ships are cabled to all parts of the world. Rather less than ¾ m. south of the signal station is O'Hara's Tower (1408 ft.), the highest point of the Rock. South of O'Hara's Tower the ground falls steeply to Windmill Hill, a fairly even surface about ¼ of a sq. m. in area, and sloping from 400 to 300 ft. above the sea-level. South of Windmill Hill are Europa Flats, a wall-like cliff 200 ft. or more in height dividing them. Europa Flats, sloping south, end in cliffs 50 ft. high, which at and around Europa Point plunge straight down into deep water. Europa Point is the most southern point of the Rock, and is distant 11½ nautical miles from the opposite African coast. On Europa Point is the lighthouse in 5° 21′ W. and 36° 6′ 30″ N. On the Mediterranean side the Rock is almost as steep and inaccessible as it is from the north. Below the signal station, at the edge of the Mediterranean, lies Catalan Bay, where there is a little village chiefly inhabited by fishermen and others who make their living upon the waters; but Catalan Bay can only be approached by land from the north or by a tunnel through the Rock from the dockyard; from Catalan Bay to Europa Point the way is barred by impassable cliffs. On the west side of the Rock the slopes are less steep, especially as they near the sea, and on this side lie the town, the Alameda or public gardens, the barracks and the dockyard.

Geology.—The rock of Gibraltar consists, for the most part, of pale grey limestone of compact and sometimes crystalline structure, generally stratified but in places apparently amorphous. Above the limestone are found layers of dark grey-blue shales with intercalated beds of grit, mudstone and limestone. Both limestone and shales are of the Lower Jurassic age. Professors A. C. Ramsay and James



Geikie (*Quarterly Journal of the Geological Society*, London, August 1878) found also in the superficial formations of the Rock various features of interest to the students of Pleistocene geology, including massive accumulations of limestone breccia or agglomerate, bone breccias, deposits of calcareous sandstone, raised beaches and loose sands. The oldest of these superficial formations is the limestone breccia of Buena Vista, devoid of fossils and apparently formed under the stress of hard frosts, indicating conditions of climate of great severity. To account for frosts like these, it is suggested that the surface of the Rock must have been raised to an elevation much greater than its present height. In that case Europe and Africa would probably have been connected by an isthmus across some part of the present site of the Straits, and there would have been a wider area of low ground round the base of the Rock. The low ground at this, and probably at a later period, must have been clothed with a rich vegetation, necessary for the support of a varied mammalian fauna, whose remains have been found in the Genista caves. After this there would seem to have been a subsidence to a depth of some

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700 ft. below the existing level. This would account for the ledges and platforms which have been formed by erosion of the sea high above the present sea-level, and for the deposits of calcareous sandstone containing sea shells of existing Mediterranean species. The extent of some of these eroded ledges shows that pauses of long duration intervened between the periods of depression. The Rock seems after this to have been raised to a level considerably above that at which it now stands; Europe and Africa would then again have been united. At a later date still the Rock sank once more to its present level.

Many caves, some of them of great extent, penetrate the interior of the rock: the best known of these are the Genista and St Michael's caves. St Michael's cave, about 1100 ft. above sea-level at its mouth, slopes rapidly down and extends over 400 ft. into the Rock; its extreme limits have not, however, been fully explored. It consists of a series of five or more chambers of considerable extent, connected by narrow and crooked passages. The outermost cave is 70 ft. in height and 200 in length, with massive pillars of stalactite reaching from roof to floor. The second cave was named the Victoria cave by its discoverer Captain Brome; beyond these are three caves known as the Leonora caves. "Nothing," writes Captain Brome, "can exceed the beauty of the stalactites; they form clusters of every imaginable shape—statuettes, pillars, foliages, figures," and he adds that American visitors have admitted that even the Mammoth cave itself could not rival these giant stalactites in picturesque beauty.

The mammalian remains of the Genista cave have been described by G. Busk ("Quarternary Fauna of Gibraltar" in *Trans. of Zool. Soc.* vol. x. p. 2, 1877). They were found to contain remains of a bear, probably *Ursus fossilis* of Goldfuss; of a hyena, *H. crocuta* or *spelaea*; of cats varying from a leopard to a wild cat in size; of a rhinoceros, resembling in species remains found in the Thames valley; two forms of fiber; the hare and rabbit. No trace has been found as yet of *Rhinoceros tschorinus*, of *Ursus spelaeus* or of the reindeer; and of the elephant only a molar tooth of *Elephas antiquus*.

Further details may be found in the *Quarterly Journ. of Geol. Soc.* (James Smith of Jordanhill), vol. ii. and in vol. xxi. (*Fossil Contents of the Genista Cave*, G. Busk and Hugh Falconer; reprinted in *Palaeontological Memoirs*, H. Falconer, London, 1868).

Flora.—The upper part of the Rock is in summer burnt up and brown, but after the first autumn rains and during the whole spring and early summer, it abounds in wild flowers and shrubs. In the public and other gardens on the lower ground, where there is a greater depth of soil, the vegetation is luxuriant and is only limited by the supply of water available for summer irrigation. Dr E. F. Kelaart (*Flora Calpensis*, London, 1846) enumerates more than four hundred varieties of plants and ferns indigenous to Gibraltar, and about fifty more which have been introduced from abroad. Of the former a few are said to be species peculiar to the Rock. The stone-pine and wild-olive are perhaps the only trees found growing in a natural state. In the public and private gardens and by the roadside may be seen the pepper tree, the plane, the white poplar, the acacia, the bella-sombra (*Pepinoya dodoea*), the eucalyptus or blue gum tree, and palms of different species; and, of fruit trees, the orange, lemon, fig, pomegranate, loquat and almond. The aloe, flowering aloe and prickly pear are common, and on the eastern side of the Rock the palmito or dwarf palm (*Chamaerops humilis*) is abundant.

Fauna.—The fauna of Gibraltar, from want of space, is necessarily scanty. The Barbary apes, said to be the only wild monkeys in Europe, are still to be found on the upper part of the Rock, but in very reduced numbers; about the beginning of the 20th century four or five only remained, which were said to be all females; a young male, however, was brought from Africa. The last male of the original stock, an old patriarch, who had died shortly before this, is believed to have killed and, it is said, eaten all the young males. A small variety of pigeon breeds in the steep cliffs at the north end of the Rock. A few red-legged partridges, some rabbits, two or three foxes and a badger or two will complete the list.

Climate.—The climate of Gibraltar is pleasant and healthy, mild in winter, and only moderately hot in summer; but the heat, though not excessive, is lasting. The three months of June, July and August are almost always without rain, and it is not often that rain falls in the months of May and September. The first autumn rains, however, which sometimes begin in September, are usually heavy. From October to May the climate is for the most part delightful, warm sunshine prevailing, tempered by cool breezes; the spells of bad weather, although blustering enough at times, are seldom of more than a few days' duration. The thermometer in summer does not often reach 90° F. in the shade; from 83° to 85° may be taken to be the average maximum for July and August, and these are the hottest months of the year. The average yearly rainfall is 34·4 in., and in fifty years from 1857 to 1906 the greatest recorded rainfall was 59·35 in., and the smallest 16·75 in. The water-supply for drinking and cooking purposes is almost wholly derived from rain-water stored chiefly in underground tanks; there are very few good wells. Many of the better class of houses have their own rain-water tanks, and there are large tanks belonging to the naval and military authorities. Large storage tanks have been constructed by the sanitary commissioners with specially prepared collecting areas high up the Rock. The collecting areas cover 16 acres, and the storage tanks have a capacity of over six million gallons. The tanks are excavated in the solid rock, whereby the water is kept in the dark and cool. A large quantity of brackish water for flushing purposes and baths is pumped from the sandy flats of the north front on the Spanish side of the Rock.

The Town.—The modern town of Gibraltar is of comparatively recent date, nearly all the older buildings having been destroyed during the great siege (1779–1783). The town lies, with most of its buildings crowded together, at the north-western corner of the Rock, and covers only about one-ninth part of the whole area; only a small part of it is on level ground, and those of its narrow streets and lanes which are at right angles to the line wall, or sea front, are for the most part, except at their western ends, little more than ramps or rough stairs formed of rubble stones, contracting in places into stone steps.

The public buildings present few, if any, features of general interest. The "Convent" rebuilt upon the remains of an old Franciscan monastery is the official residence of the governor. The Anglican cathedral is a poor imitation of Moorish architecture. The garrison library has excellent reading rooms and a large number of volumes of miscellaneous interest. The civil hospital is a well-planned and roomy modern building. The court-house and exchange buildings are suited to the needs of the town. The antiquary may here and there find the remains of a Moorish bath forming part of a stable, or fragments of a sculptured stone gateway bearing the arms of Castile or of Aragon built into the wall of a modern barrack. In a small disused graveyard, near Southport gate, lie buried a number of those who fell at Trafalgar. To the south of the town are the Alameda parade and gardens, a lunatic asylum, the dockyard, graving docks and the naval and military hospitals.

Population.—The inhabitants of Gibraltar are of mixed race; after the capture of the town by the British nearly the whole of the former Spanish population emigrated in a body and founded, 6 m. away, the little town of San Roque. Most of the native inhabitants are of Italian or Genoese descent; there are also a number of Maltese, and between two and three thousand Jews. The Jews never intermarry with other races and form a distinct society of their own. The language of the people is Spanish, not very correctly spoken. English is learnt as a foreign language and is rarely, if ever, spoken by the people in their own homes. Gibraltar being primarily a fortress and naval base, every effort, in view of war contingencies, is made by the authorities to prevent the natural increase of the population. Sanitary and building regulations, modelled upon English statutes designed with quite different objects, are administered with some ingenuity and not a little severity. In this way the house room available for the poorer classes is steadily reduced. The poor are thus being gradually pushed across the frontier into the neighbouring Spanish town of La Linea de la Concepcion, itself a mere suburb of Gibraltar, whose population, however, is nearly double that of the parent city. A large army of workers come daily from "the Lines" into Gibraltar, returning at "first evening gunfire" shortly after sunset, at which time the gates are closed and locked for the night. Aliens are not allowed to reside in Gibraltar without a special permit, which must be renewed at short intervals. By an order in council, taking effect from November 1900, the like disabilities were extended to British subjects not previously resident.

The recorded births, marriages and deaths over a period of 23 years are as follows:—

Yearly Average.	Births.	Marriages.	Deaths.
1883–1885 . .	621	177	513
1886–1890 . .	603	167	514
1891–1895 . .	626	186	460
1896–1900 . .	641	201	498
1901–1905 . .	629	201	477

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The numbers of the population from causes which have been referred to are almost stationary, showing a slight tendency to decrease. There are no available statistics later than those of a census taken in 1901, from which it appeared that the population then numbered 27,460, of whom the garrison and its families amounted to 6595, the civil population, being British subjects, to 17,818, and aliens resident under permits to 3047. The latter are chiefly working men and domestic servants.

Constitution.—Gibraltar is a crown colony. Of local government properly so called there is none. There is a sanitary commission which is vested with large powers of spending and with the control of buildings and streets and other matters managed by local authorities in England. Its members are appointed by the governor. An appeal from their decisions, so far as they affect individuals, lies to the supreme court. Apart from the garrison and civil officials there are comparatively few members of the Anglican Church. The great majority of the people belong to the Church of Rome. The Jews have four synagogues. The Protestant dissenters have two places of worship, Presbyterian and Wesleyan. Education is not compulsory for the civil population, but most of the children, if not all, receive a fair education in private or private aided schools. The number of the children on the rolls of the private and private aided schools was in 1905: boys, 1504; girls, 1733; total 3237.

Commerce.—Except in respect of alcoholic liquors and tobacco Gibraltar has been a free port since the year 1705—a distinction due, it is said, to the refusal of a sultan of Morocco to allow of much-needed exports from Morocco to Gibraltar if full liberty of trade were not granted to his subjects. During the great wars of the beginning of the 19th century trade was most active in Gibraltar, and some large fortunes were made; but trade on a large scale has almost disappeared. At the point of contact of two continents, on the direct line of ocean trade with the far East, in regular steam communication with all the great ports of Europe and with North and South America, Gibraltar, by its position, is fitted to be a trade centre of the world, but the unrest and suspicion engendered in Morocco by the intrigues and designs of the European powers, and excessive protective duties and maladministration in Spain, have done much to extinguish the trade of Gibraltar. There are, however, no trustworthy statistics of imports and exports. Before the year 1898 wine, beer and spirits were the only goods which paid duty. In that year a duty of 1d. per lb was for the first time put upon tobacco and produced £1444; the duty was, however, in force only for a part of the year; in 1899 the duty, at the same rate, produced £7703. In 1902 the duty on tobacco was raised to 2d. per lb and produced £29,311. In 1905 this duty produced £24,575. The chief business of Gibraltar is the coaling of passing steamers; this gives work to several thousand men. Goods are also landed for re-export to Morocco, but the bulk of the Morocco trade, much of which formerly came to Gibraltar, is now done by lines of steamers trading to and from Morocco direct to British, German or French ports. Nearly all the fresh meat consumed in Gibraltar comes from Morocco, also large quantities of poultry and eggs. A fair amount of retail business is done with the passengers of ocean steamers which call on their way to and from the East and from North and South America.

The steam tonnage cleared annually since 1883 is shown in the following table:—

Yearly Average.	British.	Foreign.	Total.
1883–1885 . .	3,525,135	817,926	4,343,061
1886–1890 . .	4,507,101	908,419	5,415,520
1891–1895 . .	3,710,856	975,390	4,686,246
1896–1900 . .	3,281,165	1,063,367	4,344,532
1901–1905 . .	2,810,849	1,309,649	4,120,498

The main sources of revenue are (i.) duties upon wine, spirits, malt liquors and tobacco; (ii.) port and harbour dues; (iii.) tavern and other licences; (iv.) post and telegraph; (v.) ground and other rents; (vi.) stamps and miscellaneous. The returns before 1898 were made in pesetas ($5 = £1$). In the following table these have been converted into sterling at an average of exchange $30 = £1$.

Yearly Average.	i.	ii.	iii.	iv.	v.	vi.	Total.
1886–1890	9,692	17,070	5387	6,805	6185	2,873	48,312
1891–1895	9,750	13,157	4275	7,833	6208	10,113	50,836
1896–1900	14,071	8,435	4136	10,016	5924	14,460	57,042
1901–1905	35,900	6,628	3905	12,091	6945	15,859	80,728
Year 1905	36,554	5,872	4050	16,551	7489	17,007	87,523

The money, weights and measures in legal use are British. Before 1898 Spanish money only was in use. The great depreciation of the Spanish currency during the war with the United States led in 1898 to the reintroduction of British currency as the legal tender money of Gibraltar. Notwithstanding this change the Spanish dollar still remains in current use; much of the retail business of the town being done with persons resident in Spain, the dollar fully holds its own.

Harbour and Fortifications.—Great changes were made in the defences of Gibraltar early in the 20th century. Guns of the newest types replaced those of older patterns. The heavier pieces instead of being at or near the sea-level, are now high up, many of them on the crest line of the Rock; their lateral range and fire area has thereby been greatly increased and their efficiency improved in combination with an elaborate system of range finding.

With the completion of the new dockyard works the value of Gibraltar as a naval base has greatly increased. It can now undertake all the ordinary repairs and coaling of a large fleet. There is an enclosed harbour in which a fleet can safely anchor secure from the attacks of torpedo boats. A mole, at first intended for commercial purposes, closes the north end of the new harbour. The Admiralty, however, soon found that their needs had outgrown the first design and the so-called Commercial Mole has been taken over for naval purposes, plans for a new commercial mole being prepared. The funds for these extensive works were provided by the Naval Works Loan Acts of 1895 and subsequent years.

The land space available for the purposes of dockyard extension being very limited, a space of about 64 acres was reclaimed from the sea in front of the Alameda and the road to Rosia; some of the land reclaimed was as much as 40 ft. under water. The large quantity of material required for this purpose was obtained by tunnelling the Rock from W. to E. and from quarries above Catalan Bay village, to which access was gained through the tunnel. The graving docks occupy the dug-out site of the former New Mole Parade. There are three of these docks, 850, 550 and 450 ft. in length respectively. The largest dock is divisible by a central caisson so that four ships can be docked at one time. The docks are all 95 ft. wide at the entrance with 35½ ft. of water over the sills at low-water spring tides. The pumping machinery can empty the largest dock, 105,000 tons of water, in five hours. There are two workshops for the chief constructor's and chief engineer's departments, each 407 ft. long and 322 broad. For the staff captain's department and stores there are buildings with 250,000 ft. of floor space. At the north end of the yard are the administrative offices, slipways for destroyers, a slip for small craft, an ordnance wharf and a boat camber. The reclaimed area is faced with a wharf wall of concrete blocks for an unbroken length of 1600 ft. with 33 ft. of water alongside at low tide; on this wharf are powerful shears and cranes.

The enclosed harbour covers 440 acres, 250 of which have a minimum depth of 30 ft. at low water. It is closed on the S. and S.W. by the New Mole (1400 ft.) and the New Mole extension (2700 ft.), together 4100 ft.; on the W. by the Detached Mole (2720 ft.) and on the N. by the Commercial Mole.

The New Mole, so called to distinguish it from the Old Mole and its later extension the Devil's Tongue at the north end of the town, is said to have been begun by the Spaniards in 1620. It was successfully assaulted by landing parties from the British fleet under Sir George Rooke at the capture of Gibraltar by the British in 1704. It was extended at different times, and before the beginning of the new works was 1400 ft. in length. The New Mole, with its latest extension, has a width at top of 102 ft. It is formed of rubble stone floated into position in barges. It has a continuous wharf wall on the harbour side 3500 ft. long, with water alongside 30 to 35 ft. deep. On the outer side coal is stacked in sheds extending nearly the whole length of the mole.

The Detached Mole is a vertical wall formed of concrete blocks, each block weighing 28 tons. These blocks were built together on the sloping block system upon a rubble

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foundation of stone deposited by barges and levelled by divers for the reception of the concrete blocks.

The Commercial Mole is now chiefly used by the navy as a convenient wharf for destroyers. It encloses the harbour to the north and extends westward from the end of the Devil's Tongue. At the end nearest the town are large stores; there is also a small wharf on its outer side which is used by the tenders of ocean steamers and by the small boats which ply to Algeciras.

This mole is built of rubble, and at its western end it has an arm about 1600 ft. long running S. in the direction of the Detached Mole. Parallel with and inside the western arm are five jetties. The jetties and western arm have extensive coal sheds and are faced with a concrete wharf wall of a total length of 7000 ft. with 20 to 30 ft. of water alongside. The Devil's Tongue was an extension of the Old Mole, constructed during the great siege 1779–1783 in order to bring a flanking fire to bear upon part of the Spanish lines. It owes its name to the success with which it played its destined part. (H. M.*)

History.—Gibraltar was known to the Greek and Roman geographers as Calpe or Alybe, the two names being probably corruptions of the same local (perhaps Phoenician) word. The eminence on the African coast near Ceuta which bears the modern English name of Apes' Hill was then designated Abyla; and Calpe and Abyla, at least according to an ancient and widely current interpretation, formed the renowned Pillars of Hercules (*Herculis columnae*, Ἡρακλέους στῆλαι), which for centuries were the limits of enterprise to the seafaring peoples of the Mediterranean world. The military history of the Rock begins with its capture and fortification by Tariq in 711. In 1309 it was retaken by Alonzo Perez de Guzman for Ferdinand IV. of Castile and Leon, who, in order to attract inhabitants to the spot, offered an asylum to thieves and murderers, and promised to levy no taxes on the import or export of goods. The attack of Ismail ben Ferez in 1315 (2nd siege) was frustrated; but in 1333 Vasco Perez de Meyra, having allowed the fortifications and garrison to decay, was obliged to capitulate to Mohomet IV. (3rd siege) after a defence of five months. Alonzo's attempts to recover possession (4th siege) were futile, though pertinacious and heroic; but after his successful attack on Algeciras in 1344 he was encouraged to try his fortune again at Gibraltar. In 1349 he invested the Rock, but the siege (5th siege) was brought to an untimely close by his death in March 1350. The next or 6th siege resulted simply in the transference of the position from the hands of the king of Morocco to those of Yussef III. of Granada (1411), and the 7th, undertaken by the Spanish count of Niebla, Enrique de Guzman, proved fatal to the besieger and his forces (1435). In 1462, however, success attended the efforts of Alonzo de Arcos (8th siege), and in August the Rock passed once more under Christian sway. The duke of Medina Sidonia, a powerful grandee who had assisted in its capture, was anxious to get possession of the fortress, and though Henry IV. at first managed to maintain the claims of the crown, the duke ultimately made good his ambition by force of arms (9th siege), and in 1469 the king was constrained to declare his son and his heirs perpetual governors of Gibraltar. In 1479 Ferdinand and Isabella made the second duke marquess of Gibraltar, and in 1492 the third duke, Don Juan, was reluctantly allowed to retain the fortress. At length in 1502 it was formally incorporated with the domains of the crown. Don Juan tried in 1506 to recover possession, and added a 10th to the list of sieges. In 1540 the garrison had to defend itself against a much more formidable attack (11th siege)—the pirates of Algiers having determined to recover the Rock for Mahomet and themselves. The conflict was severe, but resulted in the repulse of the besiegers. After this the Spaniards made great efforts to strengthen the place, and they succeeded so well that throughout Europe Gibraltar was regarded as impregnable, the engineer Daniel Speckle (1536–1589) being chiefly responsible for the design of the fortifications.

Gibraltar was taken by the allied British and Dutch forces, after a three days' siege, on the 24th of July 1704 (see SPANISH SUCCESSION, WAR OF THE). The capture was made, as the war was being fought, in the interests of Charles, archduke of Austria, but Sir George Rooke (*q.v.*), the British admiral, on his own responsibility caused the British flag to be hoisted, and took possession in name of Queen Anne, whose government ratified the occupation. A great number of the inhabitants of the town of Gibraltar abandoned their homes rather than recognize the authority of the invaders. The Spaniards quickly assembled an army to recapture the place, and a new siege opened in October 1704 by troops of France and Spain under the marquess of Villadarias. The activity of the British admiral, Sir John Leake, and of the military governor, Prince George of Hesse-Darmstadt (who had commanded the land forces in July), rendered the efforts of the besiegers useless. A notable incident of this siege was the gallant attempt made by 500 chosen volunteers to surprise the garrison (31st of October), an attempt which, at first successful, in the end failed disastrously. Finally, in April 1705 the French marshal de Tessé, who had replaced Villadarias, gave up the siege and retired. During the next twenty years there were endless negotiations for the peaceful surrender of the fortress, varied in 1720 by an abortive attempt at a *coup de main*, which was thwarted by the resourcefulness of the governor of Minorca (Colonel Kane), who threw reinforcements and supplies into Gibraltar at the critical moment. In 1726 the Spaniards again appealed to arms. But the count of las Torres, who had the chief command, succeeded no better than his predecessors. The place had been strengthened since 1705, and the defence of the garrison under Brigadier Clayton, the lieutenant-governor, Brigadier Kane of Minorca, and the governor, the earl of Portmore, who arrived with reinforcements, was so effective that the armistice of the 12th of June practically put a close to the siege, though two years elapsed before the general pacification ensued.

Siege of Gibraltar (1779–1783).

Neither in the War of the Austrian Succession nor in that of 1762 did Spain endeavour to besiege the rock, but the War of American Independence gave her better opportunities, and the great siege of 1779–1783 is justly regarded as one of the most memorable sieges of history. The governor, General Sir George Augustus Elliot (afterwards Lord Heathfield), was informed from England on the 6th of July 1779 that hostilities had begun. A short naval engagement in the straits took place on the 11th, and General Elliot made every preparation for resistance. It was not, however, until the month of August that the Spaniards became threatening. The method of the besiegers appeared to be starvation, but the interval between strained relations and war had been well employed by the ships, and supplies were, for the time at any rate, sufficient. While the Spanish siege batteries were being constructed the fortress fired, and many useful artillery experiments were carried out by the garrison at this time and subsequently throughout the siege. On the 14th of November there took place a spirited naval action in which the privateer "Buck," Captain Fagg, forced her way into the harbour. This was one of many such incidents, which usually arose from the attempts made from time to time by vessels to introduce supplies from Tangier and elsewhere. December 1779, indeed, was a month of privation for the garrison, though of little actual fighting. In January 1780, on the rumour of an approaching convoy, the price of foods "fell more than two-thirds," and Admiral Sir George Rodney won a great victory over De Langara and entered the harbour. Prince William Henry (afterwards King William IV.) served on board the British fleet as a midshipman during this expedition. Supplies and reinforcements were thrown into the fortress by Rodney, and the whole affair was managed with the greatest address both by the home government and the royal navy. "The garrison," in spite of the scurvy, "might now be considered in a perfect state of defence," says Drinkwater.

On the 7th of June took place an attack by Spanish fireships, which were successfully dealt with by the naval force in the bay under Captain Lesley of H.M. frigate "Enterprise." Up to October the state of things within the fortress was much what it had been after Rodney's success. "The enemy's operations on the land side had been for many months so unimportant as scarcely to merit our attention" (Drinkwater). Scurvy was, however, prevalent (see Drinkwater, p. 121), and the supply

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question had again become acute. Though the enemy's batteries did not open fire, the siege works steadily progressed, in spite of the fire from the fortress, and there were frequent small engagements at sea in which the English were not always successful. Further, the expulsion, with great harshness, of the English residents of Barbary territory put an end to a service of supply and information which had been of the greatest value to Elliot (January 1781). Three more months passed in forced inaction, which the garrison, stinted as it was, endured calmly. Then, on the 12th of April 1781, on the arrival of a British relieving squadron under Admiral Darby, the whole of the Spanish batteries opened fire. Stores were landed in the midst of a heavy bombardment, and much damage was done both to the fortifications and military buildings and to the town. At this time there was a good deal of indiscipline in the garrison, with which General Elliot dealt severely. This was in the last degree necessary, for the bombardment continued up to the 1st of June, after which the rate of the enemy's fire decreased to 500 rounds per day. By the 12th of July it had almost ceased. In September the firing again became intense and the casualties increased, the working parties suffering somewhat heavily. In October there was less expenditure of ammunition, as both sides were now well covered, and in November the governor secretly prepared a great counterstroke. The sortie made on the night of the 26th-27th of November was brilliantly successful, and the Spanish siege works were mostly destroyed. At the close of the year the garrison was thus again in an excellent position.

Early in 1782 a new form of gun-carriage wheel, allowing of a large angle of depression being given, was invented by an officer of the Royal Artillery, and indeed throughout the siege many experiments (such as would nowadays be carried out at a school of gunnery) were made with guns, mountings, ammunition, methods of fire, &c., both in Gibraltar and in the Spanish camp. The gun-carriage referred to enabled 93% of hits to be obtained at 1400 yds. range. In April grates for heating shot were constructed by order of the governor; these were destined to be famous. At the same time it was reported that the duc de Crillon was now to command the besiegers (French and Spaniards) with D'Arçon as his chief engineer. The grand attack was now imminent, and preparations were made to repel it (July 1782). The chief feature of the attack was to be, as reported on the 26th of July, ten ships "fortified 6 or 7 ft. thick . . . with green timber bolted with iron, cork and raw hides; which were to carry guns of heavy metal and be bomb-proof on the top with a descent for the shells to slide off; that these vessels . . . were to be moored within half gunshot of the walls," &c. On the other side many of the now existing rock galleries were made about this time. The count of Artois and another French prince arrived in the French lines in August to witness the culminating effort of the besiegers, and some polite correspondence passed between Crillon and the governor (reprinted in Drinkwater, p. 267). The garrison made a preliminary trial of the red-hot shot on the 8th of September, and the success of the experiment not only elated the garrison but was partly instrumental in causing Crillon to hasten the main attack. After a preliminary bombardment the famous battering ships took up their positions in broad daylight on the 13th and opened fire. The British solid shot seem to have failed absolutely to penetrate the massive wooden armour on the sides and the roofs of the battering ships, and about noon the ships had settled down to their work and were shooting coolly and accurately. But between 1 and 2 P.M. the British artillerymen began to use the red-shot freely. All day the artillery duel went on, the shore guns, though inferior in number, steadily gaining the upper hand, and the battering ships were in great distress by nightfall. The struggle continued in the dark, the garrison now shooting rapidly and well, and one by one the ten ships were set on fire. Before noon on the 14th the attack had come to an end by the annihilation of the battering fleet, every ship having been blown up or burnt to the water's edge. Upwards of 8300 rounds were expended by the garrison though less than a hundred pieces were in action. The enemy's bombardment was, however, resumed and partial engagements continued up to the third naval relief of the fortress by Lord Howe, who won a great victory at sea over the Spaniards. The long siege came to an end on the 6th of February 1783, when the duc de Crillon informed Elliot that the preliminaries of peace had been signed. On the 31st of March the duke visited the fortress, and many courtesies passed between the late enemies. Captain (afterwards Colonel) John Drinkwater (1762–1844), the historian of the siege, first published his work in 1785. A new edition of *A History of the Siege of Gibraltar* was published in 1905. The history of the four eventful years' siege is fully detailed also in the Memoir, attached to Green's *Siege of Gibraltar* (1784), of its gallant defender Sir George Augustus Elliot, afterwards Lord Heathfield, whose military skill and moral courage place him among the best soldiers and noblest men of his time.

Since 1783 the history of Gibraltar has been comparatively uneventful. In the beginning of 1801 there were rumours of a Spanish and French attack, but the Spanish ships were defeated off Algeciras in June by Admiral Saumarez. Improvements in the fortifications, maintenance of military discipline and legislation in regard to trade and smuggling, are the principal matters of recent interest.

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GIBSON, CHARLES DANA (1867–), American artist and illustrator, was born at Roxbury, Massachusetts, on the 14th of September 1867. After a year's study at the schools of the Art Students' League, he began with some modest little drawings for the humorous weekly *Life*. These he followed up with more serious work, and soon made a place for himself as the delineator of the American girl, at various occupations, particularly those out of doors. These obtained an enormous vogue, being afterwards published in book form, running through many editions. The "Gibson Girl" stood for a type of healthy, vigorous, beautiful and refined young womanhood. Some book illustrations followed, notably for *The Prisoner of Zenda*. He was imitated by many of the younger draughtsmen, copied by amateurs, and his popularity was shown in his engagement by *Collier's Weekly* to furnish weekly for a year a double page, receiving for the fifty-two drawings the sum of $50,000, said to have been the largest amount ever paid to an illustrator for such a commission. These drawings covered various local themes and were highly successful, being drawn with pen and ink with masterly facility and great directness and economy of line. So popular was one series, "The Adventures of Mr Pipp," that a successful play was modelled on it. In 1906, although besieged with commissions, Gibson withdrew from illustrative work, determining to devote himself to portraiture in oil, in which direction he had already made some successful experiments; but in a few years he again returned to illustration.

GIBSON, EDMUND (1669–1748), English divine and jurist, was born at Bampton in Westmorland in 1669. In 1686 he was entered a scholar at Queen's College, Oxford, where in 1692 he published a valuable edition of the *Saxon Chronicle* with a Latin translation, indices and notes. This was followed in 1693 by an annotated edition of the *De institutione oratoria* of Quintilian, and in 1695 by a translation in two volumes folio

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of Camden's *Britannia*, " with additions and improvements," in the preparation of which he had been largely assisted by William Lloyd, John Smith and other English antiquaries. Shortly after Thomas Tenison's elevation to the see of Canterbury in 1694 Gibson was appointed chaplain and librarian to the archbishop, and in 1703 and 1710 respectively he became rector of Lambeth and archdeacon of Surrey. In the discussions which arose during the reigns of William and Anne relative to the rights and privileges of the Convocation, Gibson took a very active part, and in a series of pamphlets warmly argued for the right of the archbishop to continue or prorogue even the lower house of that assembly. The controversy suggested to him the idea of those researches which resulted in the famous *Codex juris ecclesiastici Anglicani*, published in two volumes folio in 1713,—a work which discusses more learnedly and comprehensively than any other the legal rights and duties of the English clergy, and the constitution, canons and articles of the English Church. In 1716 Gibson was presented to the see of Lincoln, whence he was in 1720 translated to that of London, where for twenty-five years he exercised an immense influence, being regularly consulted by Sir Robert Walpole on all ecclesiastical affairs. While a conservative in church politics, and declaredly opposed to methodism, he was no persecutor, and indeed broke with Walpole on the Quakers' Relief Bill of 1736. He exercised a vigilant oversight over the morals of his diocese; and his fearless denunciation of the licentious masquerades which were popular at court finally lost him the royal favour. Among the literary efforts of his later years the principal were a series of *Pastoral Letters* in defence of the " gospel revelation," against " lukewarmness " and " enthusiasm," and on various topics of the day; also the *Preservative against Popery*, in 3 vols. folio (1738), a compilation of numerous controversial writings of eminent Anglican divines, dating chiefly from the period of James II. Gibson died on the 6th of September 1748.

A second edition of the *Codex juris*, " revised and improved, with large additions by the author," was published at Oxford in 1761. Besides the works already mentioned, Gibson published a number of *Sermons*, and other works of a religious and devotional kind. The *Vita Thomae Bodleii* with the *Historia Bibliothecae Bodleianae* in the *Catalogi librorum manuscriptorum* (Oxford, 1697), and the *Reliquiae Spelmannianae* (Oxford, 1698), are also from his pen.

GIBSON, JOHN (1790–1866), English sculptor, was born near Conway in 1790, his father being a market gardener. To his mother, whom he described as ruling his father and all the family, he owed, like many other great men, the energy and determination which carried him over every obstacle. When he was nine years old the family were on the point of emigrating to America, but Mrs Gibson's determination stopped this project on their arrival at Liverpool, and there John was sent to school. The windows of the print shops of Liverpool riveted his attention, and, having no means to purchase the commonest print, he acquired the habit of committing to memory the outline of one figure after another, drawing it on his return home. Thus early he formed the system of observing, remembering and noting, sometimes even a month later, scenes and momentary actions from nature. In this way he, by degrees, transferred from the shop window to his paper at home the chief figures from David's picture of Napoleon crossing the Alps, which, by particular request, he copied in bright colours as a frontispiece to a little schoolfellow's new prayer-book, for sixpence. At fourteen years of age Gibson was apprenticed to a firm of cabinetmakers,—portrait and miniature painters in Liverpool requiring a premium which his father could not give. This employment so disgusted him that after a year (being interesting and engaging then apparently as in after-life) he persuaded his masters to change his indentures, and bind him to the wood-carving with which their furniture was ornamented. This satisfied him for another year, when an introduction to the foreman of some marble works, and the sight of a small head of Bacchus, unsettled him again. He had here caught a glimpse of his true vocation, and in his leisure hours began to model with such success that his efforts found their way to the notice of Mr Francis, the proprietor of the marble works. The wood-carving now, in turn, became his aversion; and having in vain entreated his masters to set him free, he instituted a strike. He was every day duly at his post, but did no work. Threats, and even a blow, moved him not. At length the offer of £70 from Francis for the rebellious apprentice was accepted, and Gibson found himself at last bound to a master for the art of sculpture. Francis paid the lad 6s. a week, and received good prices for his works,—sundry early works by the youthful sculptor, which exist in Liverpool and the neighbourhood, going by the name of Francis to this day. It was while thus apprenticed that Gibson attracted the notice of William Roscoe, the historian. For him Gibson executed a basso rilievo in terra-cotta, now in the Liverpool museum. Roscoe opened to the sculptor the treasures of his library at Allerton, by which he became acquainted with the designs of the great Italian masters.

A cartoon of the Fall of the Angels marked this period,—now also in the Liverpool museum. We must pass over his studies in anatomy, pursued gratuitously by the kindness of a medical man, and his introductions to families of refinement and culture in Liverpool. Roscoe was an excellent guide to the young aspirant, pointing to the Greeks as the only examples for a sculptor. Gibson here found his true vocation. A basso rilievo of Psyche carried by the Zephyrs was the result. He sent it to the Royal Academy, where Flaxman, recognizing its merits, gave it an excellent place. Again he became unsettled. The ardent young breast panted for " the great university of Art "—Rome; and the first step to the desired goal was to London. Here he stood between the opposite advice and influence of Flaxman and Chantrey—the one urging him to Rome as the highest school of sculpture in the world, the other maintaining that London could do as much for him. It is not difficult to guess which was Gibson's choice. He arrived in Rome in October 1817, at a comparatively late age for a first visit. There he immediately experienced the charm and goodness of the true Italian character in the person of Canova, to whom he had introductions,—the Venetian putting not only his experience in art but his purse at the English student's service. Up to this time, though his designs show a fire and power of imagination in which no teaching is missed, Gibson had had no instruction, and had studied at no Academy. In Rome he first became acquainted with rules and technicalities, in which the merest tyro was before him. Canova introduced him into the Academy supported by Austria, and, as is natural with a mind like Gibson's, the first sense of his deficiencies in common matters of practice was depressing to him. He saw Italian youths already excelling, as they all do, in the drawing of the figure. But the tables were soon turned. His first work in marble—a " Sleeping Shepherd " modelled from a beautiful Italian boy—has qualities of the highest order. Gibson was soon launched, and distinguished patrons, first sent by Canova, made their way to his studio in the Via Fontanella. His aim, from the first day that he felt the power of the antique, was purity of character and beauty of form. He very seldom declined into the prettiness of Canova, and if he did not often approach the masculine strength which redeems the faults of Thorwaldsen, he more than once surpassed him even in that quality. We allude specially to his " Hunter and Dog," and to the grand promise of his " Theseus and Robber," which take rank as the highest productions of modern sculpture. He was essentially classic in feeling and aim, but here the habit of observation we have mentioned enabled him to snatch a grace beyond the reach of a mere imitator. His subjects were gleaned from the free actions of the splendid Italian people noticed in his walks, and afterwards baptized with such mythological names as best fitted them. Thus a girl kissing a child, with a sudden wring of the figure, over her shoulder, became a " Nymph and Cupid "; a woman helping her child with his foot on her hand on to her lap, a " Bacchante and Faun "; his " Amazon thrown from her Horse," one of his most original productions, was taken from an accident he witnessed to a female rider in a circus; and the " Hunter holding in his Dog " was also the result of a street scene. The prominence he gave among his favourite subjects to the little god " of soft tribulations" was no less owing to his facilities

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for observing the all but naked Italian children, in the hot summers he spent in Rome.

In monumental and portrait statues for public places, necessarily represented in postures of dignity and repose, Gibson was very happy. His largest effort of this class—the group of Queen Victoria supported by Justice and Clemency, in the Houses of Parliament—was his finest work in the round. Of noble character also in execution and expression of thought is the statue of Huskisson with the bared arm; and no less, in effect of aristocratic ease and refinement, the seated figure of Dudley North. But great as he was in the round, Gibson's chief excellence lay in basso rilievo, and in this less-disputed sphere he obtained his greatest triumphs. His thorough knowledge of the horse, and his constant study of the Elgin marbles—casts of which are in Rome—resulted in the two matchless bassi rilievi, the size of life, which belong to Lord Fitzwilliam—the "Hours leading the Horses of the Sun," and "Phaëthon driving the Chariot of the Sun." Most of his monumental works are also in basso rilievo. Some of these are of a truly refined and pathetic character, such as the monument to the countess of Leicester, that to his friend Mrs Huskisson in Chichester cathedral, and that of the Bonomi children. Passion, either indulged or repressed, was the natural impulse of his art: repressed as in the "Hours leading the Horses of the Sun," and as in the "Hunter and Dog"; indulged as in the meeting of Hero and Leander, a drawing executed before he left England. Gibson was the first to introduce colour on his statues,—first, as a mere border to the drapery of a portrait statue of the queen, and by degrees extended to the entire flesh, as in his so-called "tinted" Venus, and in the "Cupid tormenting the Soul," in the Holford collection.

Gibson's individuality was too strongly marked to be affected by any outward circumstances. In all worldly affairs and business of daily life he was simple and guileless in the extreme; but he was resolute in matters of principle, determined to walk straight at any cost of personal advantage. Unlike most artists, he was neither nervous nor irritable in temperament. It was said of him that he made the heathen mythology his religion; and indeed in serenity of nature, feeling for the beautiful, and a certain philosophy of mind, he may be accepted as a type of what a pure-minded Greek pagan, in the zenith of Greek art, may have been. Gibson was elected R.A. in 1836, and bequeathed all his property and the contents of his studio to the Royal Academy, where his marbles and casts are open to the public. He died at Rome on the 27th of January 1866.

The letters between Gibson and Mrs Henry Sandbach, granddaughter of Mr Roscoe, and a sketch of his life that lady induced him to write, furnish the chief materials for his biography. See his *Life*, edited by Lady Eastlake. (E. E.)

GIBSON, THOMAS MILNER (1806–1884), English politician, who came of a good Suffolk family, was born in Trinidad, where his father, an officer in the army, was serving. He went to Trinity College, Cambridge, and in 1837 was elected to parliament as Conservative member for Ipswich, but resigned two years later, having adopted Liberal views, and became an ardent supporter of the free-trade movement. As one of Cobden's chief allies, he was elected for Manchester in 1841, and from 1846 to 1848 he was vice-president of the board of trade in Lord John Russell's ministry. Though defeated in Manchester in 1857, he found another seat for Ashton-under-Lyne; and he sat in the cabinets from 1859 to 1866 as president of the board of trade. He was the leading spirit in the movement for the repeal of "taxes on knowledge," and his successful efforts on behalf of journalism and advertising were recognized by a public testimonial in 1862. He retired from political life in 1868, but he and his wife, whose salon was a great Liberal centre, were for many years very influential in society. Milner Gibson was a sportsman and a typical man of the world, who enjoyed life and behaved liberally to those connected with him.

GIBSON, WILLIAM HAMILTON (1850–1896), American illustrator, author and naturalist, was born in Sandy Hook, Connecticut, on the 5th of October 1850. The failure and (in 1868) death of his father, a New York broker, put an end to his studies in the Brooklyn Polytechnic Institute and made it necessary for him to earn his own living. From the life insurance business, in Brooklyn, he soon turned to the study of natural history and illustration,—he had sketched flowers and insects when he was only eight years old, had long been interested in botany and entomology, and had acquired great skill in making wax flowers,—and his first drawings, of a technical character, were published in 1870. He rapidly became an expert illustrator and a remarkably able wood-engraver, while he also drew on stone with great success. He drew for *The American Agriculturist*, *Hearth and Home*, and Appleton's *American Cyclopaedia*; for *The Youth's Companion* and *St Nicholas*; and then for various Harper publications, especially *Harper's Monthly Magazine*, where his illustrations first gained popularity. He died of apoplexy, brought on by overwork, on the 16th of July 1896 at Washington, Connecticut, where he had had a summer studio, and where in a great boulder is inset a relief portrait of him by H. K. Bush-Brown. He was an expert photographer, and his drawings had a nearly photographic and almost microscopic accuracy of detail which slightly lessened their artistic value, as a poetic and sometimes humorous quality somewhat detracted from their scientific worth. Gibson was perfectly at home in black-and-white, but rarely (and feebly) used colours. He was a popular writer and lecturer on natural history; in his best-known lecture, on "Cross-Fertilization," he used ingenious charts and models.

Gibson illustrated S. A. Drake's *In the Heart of the White Mountains*, C. D. Warner's *New South*, and E. P. Roe's *Nature's Serial Story*; and his own books, *The Complete American Trapper* (1876; revised, 1880, as *Camp Life in the Woods*); *Pastoral Days: or, Memories of a New England Year* (1880); *Highways and Byways* (1882); *Happy Hunting Grounds* (1886); *Strolls by Starlight and Sunshine* (1891); *Sharp Eyes: a Rambler's Calendar* (1891); *Our Edible Mushrooms and Toadstools* (1895); *Eye Spy: Afield with Nature among Flowers and Animate Things* (1897); and *My Studio Neighbours* (1898).

See John C. Adams, *William Hamilton Gibson, Artist, Naturalist Author* (New York, 1901).

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F. R. C.	FRANK R. CANA. Author of *South Africa from the Great Trek to the Union*.	Gold Coast.
F. S. P.	FRANCIS SAMUEL PHILBRICK, A.M., PH.D. Formerly Scholar and Resident Fellow of Harvard University. Member of American Historical Association.	Hamilton, Alexander.
F. W. R.*	FREDERICK WILLIAM RUDLER, I.S.O., F.G.S. Curator and Librarian of the Museum of Practical Geology, London, 1879–1902. President of the Geologists' Association, 1887–1889.	Gypsum; Haematite.
G. A. Gr.	GEORGE ABRAHAM GRIERSON, C.I.E., PH.D., D.LITT. (Dublin). Member of the Indian Civil Service, 1873–1903. In charge of Linguistic Survey of India, 1898–1902. Gold Medallist, Royal Asiatic Society, 1909. Vice-President of the Royal Asiatic Society. Formerly Fellow of Calcutta University. Author of *The Languages of India*; &c.	Gujarati and Rajasthani.
G. C. M.	GEORGE CAMPBELL MACAULAY, M.A. Lecturer in English in the University of Cambridge. Formerly Professor of English Language and Literature in the University of Wales. Editor of the *Works* of John Gower; &c.	Gower, John.
G. C. W.	GEORGE CHARLES WILLIAMSON, LITT.D. Chevalier of the Legion of Honour. Author of *Portrait Miniatures*; *Life of Richard Cosway, R.A.*; *George Engleheart*; *Portrait Drawings*; &c. Editor of new edition of Bryan's *Dictionary of Painters and Engravers*.	Greco, El.
G. F. Z.	GEORGE FREDERICK ZIMMER, A.M.INST.C.E. Author of *Mechanical Handling of Material*.	Granaries.
G. G.	SIR ALFRED GEORGE GREENHILL, M.A., F.R.S. Formerly Professor of Mathematics in the Ordnance College, Woolwich. Examiner in the University of Wales. Member of the Aeronautical Committee. Author of *Notes on Dynamics*; *Hydrostatics*; *Differential and Integral Calculus, with Applications*; &c.	Gyroscope and Gyrostat.
G. Sn.	GRANT SHOWERMAN, A.M., PH.D. Professor of Latin in the University of Wisconsin. Member of the Archaeological Institute of America. Member of American Philological Association. Author of *With the Professor*; *The Great Mother of the Gods*; &c.	Great Mother of the Gods.
G. S. C.	SIR GEORGE SYDENHAM CLARKE, G.C.M.G., G.C.I.E., F.R.S. Governor of Bombay. Author of *Imperial Defence*; *Russia's Great Sea Power*; *The Last Great Naval War*; &c.	Greco-Turkish War, 1897.
G. W. E. R.	RT. HON. GEORGE WILLIAM ERSKINE RUSSELL, P.C., M.A., LL.D. Under-Secretary of State for the Home Department, 1894–1895; for India, 1892–1894. M.P. for Aylesbury, 1880–1885; for North Beds., 1892–1895. Author of *Life of W. E. Gladstone*; *Collections and Recollections*; &c.	Gladstone, W. E.
G. W. T.	REV. GRIFFITHS WHEELER THATCHER, M.A., B.D. Warden of Camden College, Sydney, N.S.W. Formerly Tutor in Hebrew and Old Testament History at Mansfield College, Oxford.	Hājjī Khalīfa; Hamadhānī; Handānī; Hammād ar-Rāwiya; Harīrī.
H. A. de C.	HENRY ANSELM DE COLYAR, K.C. Author of *The Law of Guarantees and of Principal and Surety*; &c.	Guarantee.
H. B. Wo.	HORACE BOLINGBROKE WOODWARD, F.R.S., F.G.S. Formerly Assistant Director of the Geological Survey of England and Wales. President, Geologists' Association, 1893–1894. Wollaston Medallist, 1908.	Haldinger, W. K.
H. Ch.	HUGH CHISHOLM, M.A. Formerly Scholar of Corpus Christi College, Oxford. Editor of the 11th edition of the *Encyclopaedia Britannica*; co-editor of the 10th edition.	Goschen, 1st Viscount; Granville, 2nd Earl; Hamilton, Alexander (*in part*); Harcourt, Sir William.
H. De.	HIPPOLYTE DELEHAYE, S. J. Assistant in the compilation of the Bollandist publications: *Analecta Bollandiana* and *Acta sanctorum*.	Giles, St; Hagiology.
H. G. H.	HORATIO GORDON HUTCHINSON. Amateur Golf Champion, 1886–1887. Author of *Hints on Golf*; *Golf* (Badminton Library); *Book of Golf and Golfers*; &c.	Golf.

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H. J. P.	HARRY JAMES POWELL, F.C.S. Of Messrs James Powell & Sons, Whitefriars Glass Works, London. Member of Committee of six appointed by Board of Education to prepare the scheme for the re-arrangement of the Art Collection of the Victoria and Albert Museum. Author of *Glass Making*; &c.	**Glass.**
H. Lb.	HORACE LAMB, M.A., LL.D., D.Sc., F.R.S. Professor of Mathematics, University of Manchester. Formerly Fellow and Assistant Tutor of Trinity College, Cambridge. Member of Council of Royal Society, 1894–1896. Royal Medallist, 1902. President of London Mathematical Society, 1902–1904. Author of *Hydrodynamics*; &c.	**Harmonic Analysis.**
H. L. H.	HARRIET L. HENNESSY, L.R.C.S.I., L.R.C.P.I., M.D. (Brux.)	**Gynaecology.**
H. M. C.	HECTOR MUNRO CHADWICK, M.A. Librarian and Fellow of Clare College, Cambridge. Author of *Studies on Anglo-Saxon Institutions*.	**Goths:** *Gothic Language.*
H. M. Wo.	HAROLD MELLOR WOODCOCK, D.Sc. Assistant to the Professor of Proto-Zoology, London University. Fellow of University College, London. Author of *Haemoflagellates* in Sir E. Ray Lankester's *Treatise of Zoology*, and of various scientific papers	**Gregarines; Haemosporidia.**
H. R.	HENRY REEVE, D.C.L. See the biographical article, REEVE, HENRY.	**Guizot** (*in part*).
H. Sw.	HENRY SWEET, M.A., PH.D., LL.D. University Reader in Phonetics, Oxford. Member of the Academies of Munich, Berlin, Copenhagen and Helsingfors. Author of *A History of English Sounds since the Earliest Period*; *A Handbook of Phonetics*; &c.	**Grimm, J. L C.; Grimm, Wilhelm Carl.**
H. S.-K.	SIR HENRY SETON-KARR, C.M.G., M.A. M.P. for St. Helen's, 1885–1906. Author of *My Sporting Holidays*; &c.	**Gun.**
H. W. C. D.	HENRY WILLIAM CARLESS DAVIS, M.A. Fellow and Tutor of Balliol College, Oxford. Fellow of All Souls College, Oxford, 1895–1902. Author of *England under the Normans and Angevins*; *Charlemagne*.	**Gilbert, Folliot; Gloucester, Robert, Earl of; Grosseteste.**
H. W. R.*	REV. HENRY WHEELER ROBINSON, M.A. Professor of Church History in Rawdon College, Leeds. Senior Kennicott Scholar, Oxford University, 1901. Author of *Hebrew Psychology in Relation to Pauline Anthropology* (in *Mansfield College Essays*); &c.	**Habakkuk.**
I. A.	ISRAEL ABRAHAMS, M.A. Reader in Talmudic and Rabbinic Literature, University of Cambridge. President, Jewish Historical Society of England. Author of *A Short History of Jewish Literature*; *Jewish Life in the Middle Ages*.	**Graetz; Habdala; Halakha; Halevi; Haptara; Harizi.**
J. A. F. M.	JOHN ALEXANDER FULLER MAITLAND, M.A., F.S.A. Musical Critic of *The Times*. Author of *Life of Schumann*; *The Musician's Pilgrimage*; *Masters of German Music*; *English Music in the Nineteenth Century*; *The Age of Bach and Handel*. Editor of new edition of Grove's *Dictionary of Music*; &c.	**Grove, Sir George.**
J. A. H.	JOHN ALLEN HOWE, B.Sc. Curator and Librarian of the Museum of Practical Geology, London. Author of *The Geology of Building Stones*.	**Glacial Period; Greensand.**
J. A. S.	JOHN ADDINGTON SYMONDS, LL.D. See the biographical article, SYMONDS, J. A.	**Guarini.**
J. Bl.	JAMES BLYTH, M.A., LL.D. Formerly Professor of Natural Philosophy, Glasgow and West of Scotland Technical College. Editor of Ferguson's *Electricity*.	**Graduation.**
J. Bt.	JAMES BARTLETT. Lecturer on Construction, Architecture, Sanitation, Quantities, &c., King's College, London. Member of Society of Architects, Institute of Junior Engineers, Quantity Surveyors' Association. Author of *Quantities*.	**Glazing.**
J. D. B.	JAMES DAVID BOURCHIER, M.A., F.R.G.S. King's College, Cambridge. Correspondent of *The Times* in South-Eastern Europe. Commander of the Orders of Prince Danilo of Montenegro and of the Saviour of Greece, and Officer of the Order of St Alexander of Bulgaria.	**Greece:** *Geography and History: Modern;* **Greek Literature: III.** *Modern.*
J. E. S.*	JOHN EDWIN SANDYS, M.A., LITT.D., LL.D. Public Orator in the University of Cambridge. Fellow of St John's College, Cambridge. Fellow of the British Academy. Author of *History of Classical Scholarship*; &c.	**Greek Law.**
J. Fi.	JOHN FISKE. See the biographical article, FISKE, J.	**Grant, Ulysses S.**
J. G. C. A.	JOHN GEORGE CLARK ANDERSON, M.A. Censor and Tutor of Christ Church, Oxford. Formerly Fellow of Lincoln College. Craven Fellow (Oxford), 1896. Conington Prizeman, 1893.	**Gordium.**
J. G. R.	JOHN GEORGE ROBERTSON, M.A., PH.D. Professor of German Language and Literature, University of London. Author of *History of German Literature*; *Schiller after a Century*; &c. Editor of the *Modern Language Journal*.	**Goethe; Grillparzer.**
J. H. F.	JOHN HENRY FREESE, M.A. Formerly Fellow of St John's College, Cambridge.	**Gracchus; Gratian; Hadrian** (*in part*).

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J. H. H.	JOHN HENRY HESSELS, M.A. Author of *Gutenberg: an Historical Investigation.*	**Gloss; Gutenberg.**
J. H. P.	JOHN HENRY POYNTING, D.Sc., F.R.S. Professor of Physics and Dean of the Faculty of Science in the University of Birmingham. Formerly Fellow of Trinity College, Cambridge. Joint-author of *Text-Book of Physics.*	**Gravitation** (*in part*).
J. Hl. R.	JOHN HOLLAND ROSE, M.A., LITT.D. Lecturer on Modern History to the Cambridge University Local Lectures Syndicate. Author of *Life of Napoleon I.*; *Napoleonic Studies*; *The Development of the European Nations*; *The Life of Pitt*; &c.	**Gourgaud, Baron.**
J. L. W.	MISS JESSIE LAIDLAY WESTON. Author of *Arthurian Romances unrepresented in Malory.*	**Grail, The Holy; Guenevere.**
J. M. M.	JOHN MALCOLM MITCHELL. Sometime Scholar of Queen's College, Oxford. Lecturer in Classics, East London College (University of London). Joint-editor of Grote's *History of Greece.*	**Grote; Hamilton, Sir William, Bart.** (*in part*); **Harem.**
J. S. F.	JOHN SMITH FLETT, D.Sc., F.G.S. Petrographer to the Geological Survey. Formerly Lecturer on Petrology in Edinburgh University. Neill Medallist of the Royal Society of Edinburgh. Bigsby Medallist of the Geological Society of London.	**Glaucolite; Gneiss; Granite; Granulite; Gravel; Greisen; Greywacke.**
J. T. Be.	JOHN T. BEALBY. Joint author of Stanford's *Europe.* Formerly Editor of the *Scottish Geographical Magazine.* Translator of Sven Hedin's *Through Asia, Central Asia and Tibet*; &c.	**Gobi.**
J. T. S.*	JAMES THOMSON SHOTWELL, PH.D. Professor of History in Columbia University, New York City.	**Golden Rose** (*in part*); **Goliad; Guizot** (*in part*).
K. G. J.	KINGSLEY GARLAND JAYNE. Sometime Scholar of Wadham College, Oxford. Matthew Arnold Prizeman, 1903. Author of *Vasco da Gama and his Successors.*	**Goa.**
K. Kr.	KARL KRUMBACHER. See the biographical article, KRUMBACHER, CARL.	**Greek Literature: II.** *Byzantine.*
K. S.	MISS KATHLEEN SCHLESINGER. Editor of the *Portfolio of Musical Archaeology.* Author of *The Instruments of the Orchestra*; &c.	**Glockenspiel; Gong; Guitar; Guitar Fiddle; Gusla; Harmonica; Harmonichord; Harmonium** (*in part*).
L. D.*	LOUIS DUCHESNE. See the biographical article, DUCHESNE, L. M. O.	**Gregory:** *Popes*, **II.-VI.**
L. F. D.	LEWIS FOREMAN DAY, F.S.A. (1845–1909). Formerly Vice-President of the Society of Arts. Past Master of the Art Workers' Guild. Author of *Windows, a book about Stained Glass*; &c.	**Glass, Stained.**
L. F. V.-H.	LEVESON FRANCIS VERNON-HARCOURT, M.A., M.INST.C.E. (1839–1907). Formerly Professor of Civil Engineering at University College, London. Author of *Rivers and Canals*; *Harbours and Docks*; *Civil Engineering as applied in Construction*; &c.	**Harbour.**
L. J. S.	LEONARD JAMES SPENCER, M.A. Assistant in the Department of Mineralogy, British Museum. Formerly Scholar of Sidney Sussex College, Cambridge, and Harkness Scholar. Editor of the *Mineralogical Magazine.*	**Goniometer; Göthite; Graphite** (*in part*); **Greenockite.**
L. R. F.	LEWIS RICHARD FARNELL, M.A., LITT.D. Fellow and Senior Tutor of Exeter College, Oxford; University Lecturer in Classical Archaeology; Wilde Lecturer in Comparative Religion. Author of *Cults of the Greek States*; *Evolution of Religion.*	**Greek Religion.**
M.	LORD MACAULAY. See the biographical article, MACAULAY, T. B. M., Baron.	**Goldsmith, Oliver.**
M. G.	MOSES GASTER, PH.D. Chief Rabbi of the Sephardic Communities of England. Vice-President, Zionist Congress, 1898, 1899, 1900. Ilchester Lecturer at Oxford on Slavonic and Byzantine Literature, 1886 and 1892. President, Folk-lore Society of England. Vice-President, Anglo-Jewish Association. Author of *History of Rumanian Popular Literature*; &c.	**Gipsies.**
M. H. S.	MARION H. SPIELMANN, F.S.A. Formerly Editor of the *Magazine of Art.* Member of Fine Art Committee of International Exhibitions of Brussels, Paris, Buenos Aires, Rome and the Franco-British Exhibition, London. Author of *History of "Punch"*; *British Portrait Painting to the opening of the Nineteenth Century*; *Works of G. F. Watts, R.A.*; *British Sculpture and Sculptors of To-day*; *Henriette Ronner*; &c.	**Gilbert, Alfred; Greenaway, Kate.**
M. Ja.	MORRIS JASTROW, JUN., PH.D. Professor of Semitic Languages, University of Pennsylvania, U.S.A. Author of *Religion of the Babylonians and Assyrians*; &c.	**Gilgamesh, Epic of; Gula.**
M. M.	MAX ARTHUR MACAULIFFE. Formerly Divisional Judge in the Punjab. Author of *The Sikh Religion, its Gurus, Sacred Writings and Authors*; &c. Editor of *Life of Guru Nanak*, in the Punjabi language.	**Granth.**

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M. N. T.	MARCUS NIEBUHR TOD, M.A. Fellow and Tutor of Oriel College, Oxford. University Lecturer in Epigraphy. Joint-author of *Catalogue of the Sparta Museum*	**Gythium**
M. O. B. C.	MAXIMILIAN OTTO BISMARCK CASPARI, M.A. Reader in Ancient History at London University. Lecturer in Greek at Birmingham University, 1905–1908.	**Greece:** *History: 146 B.C. 1800 A.D.*; **Hamilcar Barca; Hannibal.**
M. P.	MARK PATTISON. See the biographical article, PATTISON, MARK.	**Grotius.**
M. P.*	LEON JACQUES MAXIME PRINET. Formerly Archivist to the French National Archives. Auxiliary of the Institute of France (Academy of Moral and Political Sciences).	**Gouffier; Harcourt.**
O. Ba.	OSWALD BARRON, F.S.A. Editor of *The Ancestor*, 1902–1905. Hon. Genealogist to Standing Council of the Honourable Society of the Baronetage.	**Girdle.**
P. A.	PAUL DANIEL ALPHANDÉRY. Professor of the History of Dogma, École Pratique des Hautes Études, Sorbonne, Paris. Author of *Les Idées morales chez les hétérodoxes latines au début du XIIe siècle.*	**Gonzalo de Berceo.**
P. A. A.	PHILIP A. ASHWORTH, M.A., DOC. JURIS. New College, Oxford. Barrister-at-Law. Translator of H. R. von Gneist's *History of the English Constitution.*	**Gneist.**
P. C. Y.	PHILIP CHESNEY YORKE, M.A. Magdalen College, Oxford.	**Gunpowder Plot; Halifax, 1st Marquess of; Hamilton, 1st Duke of.**
P. G.	PERCY GARDNER, M.A. See the biographical article, GARDNER, PERCY.	**Greek Art.**
P. Gi.	PETER GILES, M.A., LL.D., LITT.D. Fellow and Classical Lecturer of Emmanuel College, Cambridge, and University Reader in Comparative Philology. Formerly Secretary of the Cambridge Philological Society. Author of *Manual of Comparative Philology.*	**Greek Language; H.**
P. G. K.	PAUL GEORGE KONODY. Art Critic of the *Observer* and the *Daily Mail*. Formerly Editor of *The Artist*. Author of *The Art of Walter Crane*; *Velasquez, Life and Work*; &c.	**Hals, Frans.**
P. G. T.	PETER GUTHRIE TAIT, LL.D. See the biographical article, TAIT, PETER GUTHRIE.	**Hamilton, Sir William Rowan.**
P. La.	PHILIP LAKE, M.A., F.G.S. Lecturer on Physical and Regional Geography in Cambridge University. Formerly of the Geological Survey of India. Author of *Monograph of British Cambrian Trilobites.* Translator and Editor of Kayser's *Comparative Geology.*	**Greece:** *Geology.*
P. McC.	PRIMROSE MCCONNELL, F.G.S. Member of the Royal Agricultural Society. Author of *Diary of a Working Farmer*; &c.	**Grass and Grassland.**
R. A. W.	COLONEL ROBERT ALEXANDER WAHAB, C.B., C.M.G., C.I.E. Formerly H. M. Commissioner, Aden Boundary Delimitation. Served with Tirah Expeditionary Force, 1897–1898, and on the Anglo-Russian Boundary Commission, Pamirs, 1895.	**Hadramut.**
R. A. S. M.	ROBERT ALEXANDER STEWART MACALISTER, M.A., F.S.A. St John's College, Cambridge. Director of Excavations for the Palestine Exploration Fund.	**Gilead; Gilgal; Goshen.**
R. C. J.	SIR RICHARD CLAVERHOUSE JEBB, L.L.D., D.C.L. See the biographical article, JEBB, SIR R. C.	**Greek Literature: I. *Ancient.***
R. J. M.	RONALD JOHN MCNEILL, M.A. Christ Church, Oxford. Barrister-at-Law. Formerly Editor of the *St James's Gazette*, London.	**Gowrie, 3rd Earl of; Grafton, Henry; Green Ribbon Club; Gymnastics; Harcourt, 1st Viscount; Hardwicke, 1st Earl of.**
R. L.*	RICHARD LYDEKKER, M.A., F.R.S., F.G.S., F.Z.S. Member of the Staff of the Geological Survey of India, 1874–1882. Author of *Catalogues of Fossil Mammals, Reptiles and Birds in British Museum*; *The Deer of all Lands*; *The Game Animals of Africa*; &c.	**Giraffe; Glutton; Clyptodon; Goat; Gorilla; Hamster; Hare.**
R. N. B.	ROBERT NISBET BAIN (d. 1909). Assistant Librarian, British Museum, 1883–1909. Author of *Scandinavia, the Political History of Denmark, Norway and Sweden, 1513–1900*; *The First Romanovs, 1613–1725*; *Slavonic Europe, the Political History of Poland and Russia from 1469 to 1709*; &c.	**Golitsuin, Boris, Dmitry, and Vasily; Golovin, Count; Golovkin, Count; Görtz, Baron von; Griffenfeldt, Count; Gustavus I., and IV. Gyllenstjerna; Hall, C. C.**
R. S. T.	RALPH STOCKMAN TARR. Professor of Physical Geography, Cornell University.	**Grand Canyon.**

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R. We.	RICHARD WEBSTER, A.M. (Princeton). Formerly Fellow in Classics, Princeton University. Editor of *The Elegies of Maximianus*; &c.	**Great Awakening.**
S. A. C.	STANLEY ARTHUR COOK, M.A. Editor for Palestine Exploration Fund. Lecturer in Hebrew and Syriac, and formerly Fellow, Gonville and Caius College, Cambridge. Examiner in Hebrew and Aramaic, London University, 1904–1908. Author of *Glossary of Aramaic Inscriptions*; *The Laws of Moses and the Code of Hammurabi*; *Critical Notes on Old Testament History*; *Religion of Ancient Palestine*; &c.	**Gideon.**
S. Bl.	SIGFUS BLÖNDAL. Librarian of the University of Copenhagen.	**Hallgrimsson.**
S. C.	SIDNEY COLVIN, LL.D. See the biographical article, COLVIN, SIDNEY.	**Giorgione; Giotto.**
St. C.	VISCOUNT ST. CYRES. See the biographical article, IDDESLEIGH, 1ST EARL OF.	**Guyon, Madame.**
S. N.	SIMON NEWCOMB, LL.D., D.Sc. See the biographical article, NEWCOMB, SIMON.	**Gravitation** (*in part*).
T. As.	THOMAS ASHBY, M.A., D.Litt., F.S.A. Director of the British School of Archaeology at Rome. Corresponding Member of the Imperial German Archaeological Institute. Formerly Scholar of Christ Church, Oxford. Craven Fellow, Oxford, 1897. Autnor of *The Classical Topography of the Roman Campagna*; &c.	**Girgenti; Gnatia; Grottaferrata; Grumentum; Gubbio; Hadria; Halaesa.**
T. A. J.	THOMAS ATHOL JOYCE, M.A. Assistant in Department of Ethnography, British Museum. Hon. Sec., Royal Anthropological Institute.	**Hamitic Races (I.).**
T. Ba.	SIR THOMAS BARCLAY, M.P. Member of the Institute of International Law. Member of the Supreme Council of the Congo Free State. Officer of the Legion of Honour. Author of *Problems of International Practice and Diplomacy*; &c. M.P. for Blackburn, 1910.	**Guerrilla.**
T. E. H.	THOMAS ERSKINE HOLLAND, K.C., D.C.L., LL.D. Fellow of the British Academy. Fellow of All Souls College, Oxford. Professor of International Law in the University of Oxford, 1874–1910. Bencher of Lincoln's Inn. Author of *Studies in International Law*; *The Elements of Jurisprudence*; *Alberici Gentilis de jure belli*; *The Laws of War on Land*; *Neutral Duties in a Maritime War*; &c.	**Hall, William E.**
T. F. C.	THEODORE FREYLINGHUYSEN COLLIER, PH.D. Assistant Professor of History, Williams College, Williamstown, Mass., U.S.A.	**Gregory: *Popes*, XIII.—XV.**
T. H. H.*	SIR THOMAS HUNGERFORD HOLDICH, K.C.M.G., K.C.I.E., D.Sc., F.R.G.S. Colonel in the Royal Engineers. Superintendent Frontier Surveys, India, 1892–1898. Gold Medallist, R.G.S. (London), 1887. H.M. Commissioner for the Persia-Beluch Boundary, 1896. Author of *The Indian Borderland*; *The Gates of India*; &c.	**Gilgit; Hari-Rud.**
T. K.	THOMAS KIRKUP, M.A., LL.D. Author of *An Inquiry into Socialism*; *Primer of Socialism*; &c.	**Hadrian** (*in part*).
T. Se.	THOMAS SECCOMBE, M.A. Lecturer in History, East London and Birkbeck Colleges, University of London. Stanhope Prizeman, Oxford, 1887. Formerly Assistant Editor of *Dictionary of National Biography*, 1891–1901. Author of *The Age of Johnson*; &c.; Joint-author of *The Bookman History of English Literature*.	**Gilbert, Sir W. S.**
V. H. S.	REV. VINCENT HENRY STANTON, M.A., D.D. Ely Professor of Divinity in the University of Cambridge. Canon of Ely and Fellow of Trinity College, Cambridge. Author of *The Gospels as Historical Documents*; *The Jewish and the Christian Messiahs*; &c.	**Gospel.**
W. A. B. C.	REV. WILLIAM AUGUSTUS BREVOORT COOLIDGE, M.A., F.R.G.S., PH.D. (Bern). Fellow of Magdalen College, Oxford. Professor of English History, St David's College, Lampeter, 1880–1881. Author of *Guide du Haut Dauphiné*; *The Range of the Tods*; *Guide to Grindelwald*; *Guide to Switzerland*; *The Alps in Nature and in History*; &c. Editor of *The Alpine Journal*, 1880–1889; &c.	**Glarus; Goldast Ab Haiminsfeld; Grasse; Grenoble; Grindelwald; Grisons; Gruner, G. S.; Gruyère.**
W. A. P.	WALTER ALISON PHILLIPS, M.A. Formerly Exhibitioner of Merton College and Senior Scholar of St John's College, Oxford. Author of *Modern Europe*; &c.	**Girondists; Goethe: *Descendants of*; Greek Independence, War of.**
W. Bo.	WILHELM BOUSSET, D.TH. Professor of New Testament Exegesis in the University of Göttingen. Author of *Das Wesen der Religion*; *The Antichrist Legend*; &c.	**Gnosticism.**
W. Bu.	WILLIAM BURNSIDE, M.A., D.Sc., LL.D., F.R.S. Professor of Mathematics, Royal Naval College, Greenwich. Hon. Fellow of Pembroke College, Cambridge. Author of *The Theory of Groups of Finite Order*.	**Groups, Theory of.**
W. F. C.	WILLIAM FELDEN CRAIES, M.A. Barrister-at-Law, Inner Temple. Lecturer on Criminal Law, King's College, London. Author of *Craies on Statute Law*. Editor of Archbold's *Criminal Pleading* (23rd edition).	**Habeas Corpus; Hanging.**
W. G. M.	WALTER GEORGE MCMILLAN, F.C.S., M.I.M.E. (d. 1904). Formerly Secretary of the Institute of Electrical Engineers and Lecturer on Metallurgy, Mason College, Birmingham. Author of *A Treatise on Electro-Metallurgy*.	**Graphite** (*in part*).

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W. Hu.	Rev. William Hunt, M.A., Litt.D. President of Royal Historical Society, 1905–1909. Author of *History of English Church, 597–1066*; *The Church of England in the Middle Ages*; *Political History of England 1760–1801*.	**Green, J. R.**
W. H. Be.	William Henry Bennett, M.A., D.D., D.Litt. (Cantab.). Professor of Old Testament Exegesis in New and Hackney Colleges, London. Formerly Fellow of St John's College, Cambridge. Lecturer in Hebrew at Firth College, Sheffield. Author of *Religion of the Post-Exilic Prophets*; &c.	**Gomer; Ham.**
W. H. F.*	William Henry Fairbrother, M.A., Formerly Fellow and Lecturer, Lincoln College, Oxford. Author of *Philosophy of Thomas Hill Green*.	**Green, Thomas Hill.**
W. J. F.	William Justice Ford (d. 1904). Formerly Scholar of St John's College, Cambridge. Headmaster of Leamington College.	**Grace, W. G.**
W. McD.	William McDougall, M.A. Reader in Mental Philosophy in the University of Oxford. Author of *A Primer of Physiological Psychology*; *An Introduction to Social Psychology*; &c.	**Hallucination.**
W. M. M.	W. Max Müller, Ph.D. Professor of Exegesis in the R.E. Seminary, Philadelphia. Author of *Asien und Europa nach den Aegptischen Denkmälern*; &c.	**Hamitic Races: II. *Languages*.**
W. M. R.	William Michael Rossetti. See the biographical article, Rossetti, Dante G.	**Giulio Romano; Gozzoli; Guido Reni.**
W. P. A	Lieut.-Colonel William Patrick Anderson, M.Inst.C.E., F.R.G.S. Chief Engineer, Department of Marine and Fisheries of Canada. Member of the Geographic Board of Canada. Past President of Canadian Society of Civil Engineers.	**Great Lakes.**
W. P. R.	Hon. William Pember Reeves. Director of London School of Economics. Agent-General and High Commissioner for New Zealand, 1896–1909. Minister of Education, Labour and Justice, New Zealand, 1891–1896. Author of *The Long White Cloud: a History of New Zealand*; &c.	**Grey, Sir George.**
W. R.	Whitelaw Reid, LL.D. See the biographical article, Reid, Whitelaw.	**Greeley, Horace.**
W. Ri.	William Ridgeway, M.A., D.Sc. Professor of Archaeology, Cambridge University, and Brereton Reader in Classics, Fellow of Gonville and Caius College, Cambridge. Fellow of the British Academy. President of Royal Anthropological Institute, 1908. President of Anthropological Section, British Association, 1908. Author of *The Early Age of Greece*; &c.	**Hallstatt.**
W. Rn.	W. Rosenhain, D.Sc. Superintendent of the Metallurgical Department, National Physical Laboratory.	**Glass (*in part*).**
W. R. D.	Wyndham Rowland Dunstan, M.A., LL.D., F.R.S., F.C.S. Director of the Imperial Institute. President of the International Association of Tropical Agriculture. Member of the Advisory Committee for Tropical Agriculture, Colonial Office.	**Gutta-Percha.**
W. R. E. H.	William Richard Eaton Hodgkinson, Ph.D., F.R.S. (Edin.), F.C.S. Professor of Chemistry and Physics, Ordnance College, Woolwich. Formerly Professor of Chemistry and Physics, R.M.A., Woolwich. Part-author of Valentin-Hodgkinson's *Practical Chemistry*; &c.	**Gun Cotton; Gunpowder.**
W. R. S.	William Robertson Smith, LL.D. See the biographical article, Smith, William Robertson.	**Haggai (*in part*).**
W. R. S. R.	William Ralston Shedden-Ralston, M.A. Assistant in the Department of Printed Books, British Museum. Author of *Russian Folk Tales*; &c.	**Gogol.**
W. W. R.*	William Walker Rockwell, Lic.Theol. Assistant Professor of Church History, Union Theological Seminary, New York.	**Gregory XVI.**

PRINCIPAL UNSIGNED ARTICLES

Gilding.
Ginger.
Gironde.
Gladiators.
Glasgow.
Glastonbury.
Gloucestershire.
Glove.
Glucose.
Glue.
Glycerin.
Goat.
Gold.
Goldbeating.
Gotland.
Gourd.
Government.
Grain Trade.
Granada.
Grasses.
Great Salt Lake.
Griqualand East and West.
Guanches.
Guards.
Guatemala.
Guelphs and Ghibellines.
Guiacum.
Guillotine.
Guise, House of
Gum.
Gwalior.
Haddingtonshire.
Hair.
Haiti.
Halo.
Hamburg.
Hamlet.
Hampshire.
Hampton Roads.
Hanover.

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ENCYCLOPÆDIA BRITANNICA

ELEVENTH EDITION

VOLUME XII

GICHTEL, JOHANN GEORG (1638–1710), German mystic, was born at Regensburg, where his father was a member of senate, on the 14th of March 1638. Having acquired at school an acquaintance with Greek, Hebrew, Syriac and even Arabic, he proceeded to Strassburg to study theology; but finding the theological prelections of J. S. Schmidt and P. J. Spener distasteful, he entered the faculty of law. He was admitted an advocate, first at Spires, and then at Regensburg; but having become acquainted with the baron Justinianus von Weltz (1621–1668), a Hungarian nobleman who cherished schemes for the reunion of Christendom and the conversion of the world, and having himself become acquainted with another world in dreams and visions, he abandoned all interest in his profession, and became an energetic promoter of the "*Christerbauliche Jesusgesellschaft*," or Christian Edification Society of Jesus. The movement in its beginnings provoked at least no active hostility; but when Gichtel began to attack the teaching of the Lutheran clergy and church, especially upon the fundamental doctrine of justification by faith, he exposed himself to a prosecution which resulted in sentence of banishment and confiscation (1663). After many months of wandering and occasionally romantic adventure, he reached Holland in January 1667, and settled at Zwolle, where he co-operated with Friedrich Breckling (1629–1711), who shared his views and aspirations. Having become involved in the troubles of this friend, Gichtel, after a period of imprisonment, was banished for a term of years from Zwolle, but finally in 1668 found a home in Amsterdam, where he made the acquaintance of Antoinette Bourignon (1616–1680), and in a state of poverty (which, however, never became destitution) lived out his strange life of visions and day-dreams, of prophecy and prayer. He became an ardent disciple of Jakob Boehme, whose works he published in 1682 (Amsterdam, 2 vols.); but before the time of his death, on the 21st of January 1710, he had attracted to himself a small band of followers known as Gichtelians or Brethren of the Angels, who propagated certain views at which he had arrived independently of Boehme. Seeking ever to hear the authoritative voice of God within them, and endeavouring to attain to a life altogether free from carnal desires, like that of "the angels in heaven, who neither marry nor are given in marriage," they claimed to exercise a priesthood "after the order of Melchizedek," appeasing the wrath of God, and ransoming the souls of the lost by sufferings endured vicariously after the example of Christ. While, however, Boehme "desired to remain a faithful son of the Church," the Gichtelians became Separatists (cf. J. A. Dorner, *History of Protestant Theology*, ii. p. 185).

Gichtel's correspondence was published without his knowledge by Gottfried Arnold, a disciple, in 1701 (2 vols.), and again in 1708 (3 vols.). It has been frequently reprinted under the title *Theosophia practica*. The seventh volume of the Berlin edition (1768) contains a notice of Gichtel's life. See also G. C. A. von Harless, *Jakob Böhme und die Alchimisten* (1870, 2nd ed. 1882); article in *Allgemeine deutsche Biographie*.

GIDDINGS, JOSHUA REED (1795–1864), American statesman, prominent in the anti-slavery conflict, was born at Tioga Point, now Athens, Bradford county, Pennsylvania, on the 6th of October 1795. In 1806 his parents removed to Ashtabula county, Ohio, then sparsely settled and almost a wilderness. The son worked on his father's farm, and, though he received no systematic education, devoted much time to study and reading. For several years after 1814 he was a school teacher, but in February 1821 he was admitted to the Ohio bar and soon obtained a large practice, particularly in criminal cases. From 1831 to 1837 he was in partnership with Benjamin F. Wade. He served in the lower house of the state legislature in 1826–1828, and from December 1838 until March 1859 was a member of the national House of Representatives, first as a Whig, then as a Free-soiler, and finally as a Republican. Recognizing that slavery was a state institution, with which the Federal government had no authority to interfere, he contended that slavery could only exist by a specific state enactment, that therefore slavery in the District of Columbia and in the Territories was unlawful and should be abolished, that the coastwise slave-trade in vessels flying the national flag, like the international slave-trade, should be rigidly suppressed, and that Congress had no power to pass any act which in any way could be construed as a recognition of slavery as a national institution. His attitude in the so-called "Creole Case" attracted particular attention. In 1841 some slaves who were being carried in the brig "Creole" from Hampton Roads, Virginia, to New Orleans, revolted, killed the captain, gained possession of the vessel, and soon afterwards entered the British port of Nassau. Thereupon, according to British law, they became free. The minority who had taken an active part in the revolt were arrested on a charge of murder, and the others were liberated. Efforts were made by the United States government to recover the slaves. Daniel Webster, then secretary of state, asserting that on an American ship they were under the jurisdiction of the United States and that they were legally property. On the 21st of March 1842, before the case

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was settled, Giddings introduced in the House of Representatives a series of resolutions, in which he asserted that "in resuming their natural rights of personal liberty" the slaves "violated no law of the United States." For offering these resolutions Giddings was attacked with rancour, and was formally censured by the House. Thereupon he resigned, appealed to his constituents, and was immediately re-elected by a large majority. In 1859 he was not renominated, and retired from Congress after a continuous service of more than twenty years. From 1861 until his death, at Montreal, on the 27th of May 1864, he was U.S. consul-general in Canada. Giddings published a series of political essays signed "Pacificus" (1843); *Speeches in Congress* (1853); *The Exiles of Florida* (1858); and a *History of the Rebellion: Its Authors and Causes* (1864).

See *The Life of Joshua R. Giddings* (Chicago, 1892), by his son-in-law, George Washington Julian (1817–1899), a Free-soil leader and a representative in Congress in 1849–1851, a Republican representative in Congress in 1861–1871, a Liberal Republican in the campaign of 1872, and afterwards a Democrat.

GIDEON (in Hebrew, perhaps "hewer" or "warrior"), liberator, reformer and "judge" of Israel, was the son of Joash, of the Manassite clan of Abiezer, and had his home at Ophrah near Shechem. His name occurs in Heb. xi. 32, in a list of those who became heroes by faith; but, except in Judges vi.–viii., is not to be met with elsewhere in the Old Testament. He lived at a time when the nomad tribes of the south and east made inroads upon Israel, destroying all that they could not carry away. Two accounts of his deeds are preserved (see JUDGES). According to one (Judges vi. 11-24) Yahweh appeared under the holy tree which was in the possession of Joash and summoned Gideon to undertake, in dependence on supernatural direction and help, the work of liberating his country from its long oppression, and, in token that he accepted the mission, he erected in Ophrah an altar which he called "Yahweh-Shalom" (Yahweh is peace). According to another account (vi. 25-32) Gideon was a great reformer who was commanded by Yahweh to destroy the altar of Baal belonging to his father and the *ashērah* or sacred post by its side. The townsmen discovered the sacrilege and demanded his death. His father, who, as guardian of the sacred place, was priest of Baal, enjoined the men not to take up Baal's quarrel, for "if Baal be a god, let him contend (*rîb*) for himself." Hence Gideon received the name Jerubbaal.[1] From this latter name appearing regularly in the older narrative (cf. ix.), and from the varying usage in vi.-viii., it has been held that stories of two distinct heroes (Gideon and Jerubbaal) have been fused in the complicated account which follows.[2]

The great gathering of the Midianites and their allies on the north side of the plain of Jezreel; the general muster first of Abiezer, then of all Manasseh, and lastly of the neighbouring tribes of Asher, Zebulun and Naphtali; the signs by which the wavering faith of Gideon was steadied; the methods by which an unwieldy mob was reduced to a small but trusty band of energetic and determined men; and the stratagem by which the vast army of Midian was surprised and routed by the handful of Israelites descending from "above Endor," are indicated fully in the narratives, and need not be detailed here. The difficulties in the account of the subsequent flight of the Midianites appear to have arisen from the composite character of the narratives, and there are signs that in one of them Gideon was accompanied only by his own clansmen (vi. 34). So, when the Midianites are put to flight, according to one representation, the Ephraimites are called out to intercept them, and the two chiefs, Oreb ("raven") and Zeeb ("wolf"), in making for the fords of the Jordan, are slain at "the raven's rock" and "the wolf's press" respectively. As the sequel of this we are told that the Ephraimites quarrelled with Gideon because their assistance had not been invoked earlier, and their anger was only appeased by his tactful reply (viii. 1-3; contrast xii. 1-6). The other narrative speaks of the pursuit of the Midianite chiefs Zebah and Zalmunna[3] across the northern end of Jordan, past Succoth and Penuel to the unidentified place Karkor. Having taken relentless vengeance on the men of Penuel and Succoth, who had shown a timid neutrality when the patriotic struggle was at its crisis, Gideon puts the two chiefs to death to avenge his brothers whom they had killed at Tabor.[4] The overthrow of Midian (cf. Is. ix. 4, x. 26; Ps. lxxxiii. 9-12) induced "Israel" to offer Gideon the kingdom. It was refused—out of religious scruples (viii. 22 seq.; cf. 1 Sam. viii. 7, x. 19, xii. 12, 17, 19), and the ephod idol which he set up at Ophrah in commemoration of the victory was regarded by a later editor (v. 27) as a cause of apostasy to the people and a snare to Gideon and his house; see, however, EPHOD. Gideon's achievements would naturally give him a more than merely local authority, and after his death the attempt was made by one of his sons to set himself up as chief (see ABIMELECH).

See further JEWS, section 1; and the literature to the book of Judges. (S. A. C.)

GIEBEL, CHRISTOPH GOTTFRIED ANDREAS (1820–1881), German zoologist and palaeontologist, was born on the 13th of September 1820 at Quedlinburg in Saxony, and educated at the university of Halle, where he graduated Ph. D. in 1845. In 1858 he became professor of zoology and director of the museum in the university of Halle. He died at Halle on the 14th of November 1881. His chief publications were *Palaözoologie* (1846); *Fauna der Vorwelt* (1847–1856); *Deutschlands Petrefacten* (1852); *Odontographie* (1855); *Lehrbuch der Zoologie* (1857); *Thesaurus ornithologiae* (1872–1877).

GIEN, a town of central France, capital of an arrondissement in the department of Loiret, situated on the right bank of the Loire, 30 m. E.S.E. of Orleans by rail. Pop. (1906) 6325. Gien is a picturesque and interesting town and has many curious old houses. The Loire is here crossed by a stone bridge of twelve arches, built by Anne de Beaujeu, daughter of Louis XI., about the end of the 15th century. Near it stands a statue of Vercingetorix. The principal building is the old castle used as a law-court, constructed of brick and stone arranged in geometrical patterns, and built in 1494 by Anne de Beaujeu. The church of St Pierre possesses a square tower dating from the end of the 15th century. Porcelain is manufactured.

GIERS, NICHOLAS KARLOVICH DE (1820–1895), Russian statesman, was born on the 21st of May 1820. Like his predecessor, Prince Gorchakov, he was educated at the lyceum of Tsarskoye Selo, near St Petersburg, but his career was much less rapid, because he had no influential protectors, and was handicapped by being a Protestant of Teutonic origin. At the age of eighteen he entered the service of the Eastern department of the ministry of foreign affairs, and spent more than twenty years in subordinate posts, chiefly in south-eastern Europe, until he was promoted in 1863 to the post of minister plenipotentiary in Persia. Here he remained for six years, and, after serving as a minister in Switzerland and Sweden, he was appointed in 1875 director of the Eastern department and assistant minister for foreign affairs under Prince Gorchakov, whose niece he had married. So sooner had he entered on his new duties than his great capacity for arduous work was put to a severe test. Besides events in central Asia, to which he had to devote much attention, the Herzegovinian insurrection had broken out, and he could perceive from secret official papers that the incident had far-reaching ramifications unknown to the general public. Soon this became apparent to all the world. While the Austrian officials in Dalmatia, with hardly a pretence of concealment, were assisting the insurgents, Russian volunteers were flocking to Servia with the connivance of the Russian and Austrian governments, and General Ignatiev, as ambassador in

[1] "Baal contends" (or Jeru-baal, "Baal founds," cf. Jeru-el), but artificially explained in the narrative to mean "let Baal contend against him," or "let Baal contend for himself," v. 31. In 2 Sam. xi. 21 he is called Jerubbesheth, in accordance with the custom explained in the article BAAL.

[2] See, on this, Cheyne, *Ency. Bib.* col. 1719 seq.; Ed. Meyer, *Die Israeliten*, pp. 482 seq.

[3] The names are vocalized to suggest the fanciful interpretations "victim" and "protection withheld."

[4] As the account of this has been lost and the narrative is concerned not with the plain of Jezreel but rather with Shechem, it has been inferred that the episode implies the existence of a distinct story wherein Gideon's pursuit is such an act of vengeance.

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Constantinople, was urging his government to take advantage of the palpable weakness of Turkey for bringing about a radical solution of the Eastern question. Prince Gorchakov did not want a radical solution involving a great European war, but he was too fond of ephemeral popularity to stem the current of popular excitement. Alexander II., personally averse from war, was not insensible to the patriotic enthusiasm, and halted between two opinions. M. de Giers was one of the few who gauged the situation accurately. As an official and a man of non-Russian extraction he had to be extremely reticent, but to his intimate friends he condemned severely the ignorance and light-hearted recklessness of those around him. The event justified his sombre previsions, but did not cure the recklessness of the so-called patriots. They wished to defy Europe in order to maintain intact the treaty of San Stefano, and again M. de Giers found himself in an unpopular minority. He had to remain in the background, but all the influence he possessed was thrown into the scale of peace. His views, energetically supported by Count Shuvalov, finally prevailed, and the European congress assembled at Berlin. He was not present at the congress, and consequently escaped the popular odium for the concessions which Russia had to make to Great Britain and Austria. From that time he was practically minister of foreign affairs, for Prince Gorchakov was no longer capable of continued intellectual exertion, and lived mostly abroad. On the death of Alexander II. in 1881 it was generally expected that M. de Giers would be dismissed as deficient in Russian nationalist feeling, for Alexander III. was credited with strong anti-German Slavophil tendencies. In reality the young tsar had no intention of embarking on wild political adventures, and was fully determined not to let his hand be forced by men less cautious than himself. What he wanted was a minister of foreign affairs who would be at once vigilant and prudent, active and obedient, and who would relieve him from the trouble and worry of routine work while allowing him to control the main lines, and occasionally the details, of the national policy. M. de Giers was exactly what he wanted, and accordingly the tsar not only appointed him minister of foreign affairs on the retirement of Prince Gorchakov in 1882, but retained him to the end of his reign in 1894. In accordance with the desire of his august master, M. de Giers followed systematically a pacific policy. Accepting as a *fait accompli* the existence of the triple alliance, created by Bismarck for the purpose of resisting any aggressive action on the part of Russia and France, he sought to establish more friendly relations with the cabinets of Berlin, Vienna and Rome. To the advances of the French government he at first turned a deaf ear, but when the *rapprochement* between the two countries was effected with little or no co-operation on his part, he utilized it for restraining France and promoting Russian interests. He died on the 26th of January 1895, soon after the accession of Nicholas II. (D. M. W.)

GIESEBRECHT, WILHELM VON (1814–1889), German historian, was a son of Karl Giesebrecht (d. 1832), and a nephew of the poet Ludwig Giesebrecht (1792–1873). Born in Berlin on the 5th of March 1814, he studied under Leopold von Ranke, and his first important work, *Geschichte Ottos II.*, was contributed to Ranke's *Jahrbücher des deutschen Reichs unter dem sächsischen Hause* (Berlin, 1837–1840). In 1841 he published his *Jahrbücher des Klosters Altaich*, a reconstruction of the lost *Annales Altahenses*, a medieval source of which fragments only were known to be extant, and these were obscured in other chronicles. The brilliance of this performance was shown in 1867, when a copy of the original chronicle was found, and it was seen that Giesebrecht's text was substantially correct. In the meantime he had been appointed *Oberlehrer* in the Joachimsthaler Gymnasium in Berlin; had paid a visit to Italy, and as a result of his researches there had published *De litterarum studiis apud Italos primis medii aevi seculis* (Berlin, 1845), a study upon the survival of culture in Italian cities during the middle ages, and also several critical essays upon the sources for the early history of the popes. In 1851 appeared his translation of the *Historiae* of Gregory of Tours, which is the standard German translation. Four years later appeared the first volume of his great work, *Geschichte der deutschen Kaiserzeit*, the fifth volume of which was published in 1888. This work was the first in which the results of the scientific methods of research were thrown open to the world at large. Largeness of style and brilliance of portrayal were joined to an absolute mastery of the sources in a way hitherto unachieved by any German historian. Yet later German historians have severely criticized his glorification of the imperial era with its Italian entanglements, in which the interests of Germany were sacrificed for idle glory. Giesebrecht's history, however, appeared when the new German empire was in the making, and became popular owing both to its patriotic tone and its intrinsic merits. In 1857 he went to Königsberg as professor ordinarius, and in 1862 succeeded H. von Sybel as professor of history in the university of Munich. The Bavarian government honoured him in various ways, and he died at Munich on the 17th of December 1889. In addition to the works already mentioned, Giesebrecht published a good monograph on Arnold of Brescia (Munich, 1873), a collection of essays under the title *Deutsche Reden* (Munich, 1871), and was an active member of the group of scholars who took over the direction of the *Monumenta Germaniae historica* in 1875. In 1895 B. von Simson added a sixth volume to the *Geschichte der deutschen Kaiserzeit*, thus bringing the work down to the death of the emperor Frederick I. in 1190.

See S. Riezler, *Gedächtnisrede auf Wilhelm von Giesebrecht* (Munich, 1891); and Lord Acton in the *English Historical Review*, vol. v. (London, 1890).

GIESELER, JOHANN KARL LUDWIG (1792–1854), German writer on church history, was born on the 3rd of March 1792 at Petershagen, near Minden, where his father, Georg Christof Friedrich, was preacher. In his tenth year he entered the orphanage at Halle, whence he duly passed to the university, his studies being interrupted, however, from October 1813 till the peace of 1815 by a period of military service, during which he was enrolled as a volunteer in a regiment of chasseurs. On the conclusion of peace (1815) he returned to Halle, and, having in 1817 taken his degree in philosophy, he in the same year became assistant head master (*Conrector*) in the Minden gymnasium, and in 1818 was appointed director of the gymnasium at Cleves. Here he published his earliest work (*Historisch-kritischer Versuch über die Entstehung u. die frühesten Schicksale der schriftlichen Evangelien*), a treatise which had considerable influence on subsequent investigations as to the origin of the gospels. In 1819 Gieseler was appointed a professor ordinarius in theology in the newly founded university of Bonn, where, besides lecturing on church history, he made important contributions to the literature of that subject in Ernst Rosenmüller's *Repertorium*, K. F. Stäudlin and H. G. Tschirner's *Archiv*, and in various university "programs." The first part of the first volume of his well-known *Church History* appeared in 1824. In 1831 he accepted a call to Göttingen as successor to J. G. Planck. He lectured on church history, the history of dogma, and dogmatic theology. In 1837 he was appointed a *Consistorialrath*, and shortly afterwards was created a knight of the Guelphic order. He died on the 8th of July 1854. The fourth and fifth volumes of the *Kirchengeschichte*, embracing the period subsequent to 1814, were published posthumously in 1855 by E. R. Redepenning (1810–1883); and they were followed in 1856 by a *Dogmengeschichte*, which is sometimes reckoned as the sixth volume of the *Church History*. Among church historians Gieseler continues to hold a high place. Less vivid and picturesque in style than Karl Hase, conspicuously deficient in Neander's deep and sympathetic insight into the more spiritual forces by which church life is pervaded, he excels these and all other contemporaries in the fulness and accuracy of his information. His *Lehrbuch der Kirchengeschichte*, with its copious references to original authorities, is of great value to the student: "Gieseler wished that each age should speak for itself, since only by this means can the peculiarity of its ideas be fully appreciated" (Otto Pfleiderer, *Development of Theology*, p. 284). The work, which has passed through several editions in Germany, has partially appeared also in two English translations. That

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published in New York (*Text Book of Ecclesiastical History*, 5 vols.) brings the work down to the peace of Westphalia, while that published in " Clark's Theological Library " (*Compendium of Ecclesiastical History*, Edinburgh, 5 vols.) closes with the beginning of the Reformation. Giesseler was not only a devoted student but also an energetic man of business. He frequently held the office of pro-rector of the university, and did much useful work as a member of several of its committees.

GIESSEN, a town of Germany, capital of the province of Upper Hesse, in the grand-duchy of Hesse-Darmstadt, is situated in a beautiful and fruitful valley at the confluence of the Wieseck with the Lahn, 41 m. N.N.W. of Frankfort-on-Main on the railway to Cassel, and at the junction of important lines to Cologne and Coblenz. Pop. (1885) 18,836; (1905) 20,149. In the old part of the town the streets are narrow and irregular. Besides the university, the principal buildings are the Stadtkirche, the provincial government offices, comprising a portion of the old castle dating from the 12th century, the arsenal (now barracks) and the town-hall (containing an historical collection). The university, founded in 1607 by Louis V , landgrave of Hesse, has a large and valuable library, a botanic garden, an observatory, medical schools, a museum of natural history, a chemical laboratory which was directed by Justus von Liebig, professor here from 1824 to 1852, and an agricultural college. The industries include the manufacture of woollen and cotton cloth of various kinds, machines, leather, candles, tobacco and beer.

Giessen, the name of which is probably derived from the streams which pour (*giessen*) their waters here into the Lahn, was formed in the 12th century out of the villages Selters, Aster and Kroppach, for whose protection Count William of Gleiberg built the castle of Giessen. Through marriage the town came, in 1203, into the possession of the count palatine, Rudolph of Tübingen, who sold it in 1265 to the landgrave Henry of Hesse. It was surrounded with fortifications in 1530, which were demolished in 1547, but rebuilt in 1560. In 1805 they were finally pulled down, and their site converted into promenades.

See O. Buchner, *Führer für Giessen und das Lahntal* (1891); and *Aus Giessens Vergangenheit* (1885).

GIFFARD, GODFREY (*c.* 1235–1302), chancellor of England and bishop of Worcester, was a son of Hugh Giffard of Boyton, Wiltshire. Having entered the church he speedily obtained valuable preferments owing to the influence of his brother Walter, who became chancellor of England in 1265. In 1266 Godfrey became chancellor of the exchequer, succeeding Walter as chancellor of England when, in the same year, the latter was made archbishop of York. In 1268 he was chosen bishop of Worcester, resigning the chancellorship shortly afterwards; and both before and after 1279, when he inherited the valuable property of his brother the archbishop, he was employed on public business by Edward I. His main energies, however, were devoted to the affairs of his see. He had one long dispute with the monks of Worcester, another with the abbot of Westminster, and was vigilant in guarding his material interests. The bishop died on the 26th of January 1302, and was buried in his cathedral. Giffard, although inclined to nepotism, was a benefactor to his cathedral, and completed and fortified the episcopal castle at Hartlebury.

See W. Thomas, *Survey of Worcester Cathedral; Episcopal Registers; Register of Bishop Godfrey Giffard*, edited by J. W. Willis-Bund (Oxford, 1898–1899); and the Annals of Worcester in the *Annales monastici*, vol. iv., edited by H. R. Luard (London, 1869).

GIFFARD, WALTER (d. 1279), chancellor of England and archbishop of York, was a son of Hugh Giffard of Boyton, Wiltshire, and after serving as canon and archdeacon of Wells, was chosen bishop of Bath and Wells in May 1264. In August 1265 Henry III. appointed him chancellor of England, and he was one of the arbitrators who drew up the *dictum de Kenilworth* in 1266. Later in this year Pope Clement IV. named him archbishop of York, and having resigned the chancellorship he was an able and diligent ruler of his see, although in spite of his great wealth he was frequently in pecuniary difficulties. When Henry III. died in November 1272 the archbishopric of Canterbury was vacant, and consequently the great seal was delivered to the archbishop of York, who was the chief of the three regents who successfully governed the kingdom until the return of Edward I. in August 1274. Having again acted in this capacity during the king's absence in 1275, Giffard died in April 1279, and was buried in his cathedral.

See *Fasti Eboracenses*, edited by J. Raine (London, 1863). Giffard's *Register* from 1266 to 1279 has been edited for the Surtees Society by W. Brown.

GIFFARD, WILLIAM (d. 1129), bishop of Winchester, was chancellor of William II. and received his see, in succession to Bishop Walkelin, from Henry I. (1100). He was one of the bishops elect whom Anselm refused to consecrate (1101) as having been nominated and invested by the lay power. During the investitures dispute Giffard was on friendly terms with Anselm, and drew upon himself a sentence of banishment through declining to accept consecration from the archbishop of York (1103). He was, however, one of the bishops who pressed Anselm, in 1106, to give way to the king. He was consecrated after the settlement of 1107. He became a close friend of Anselm, aided the first Cistercians to settle in England, and restored Winchester cathedral with great magnificence.

See Eadmer, *Historia novorum*, edited by M. Rule (London, 1884); and S. H. Cass, *Bishops of Winchester* (London, 1827).

GIFFEN, SIR ROBERT (1837–1910), British statistician and economist, was born at Strathaven, Lanarkshire. He entered a solicitor's office in Glasgow, and while in that city attended courses at the university. He drifted into journalism, and after working for the *Stirling Journal* he went to London in 1862 and joined the staff of the *Globe*. He also assisted Mr John (afterwards Lord) Morley, when the latter edited the *Fortnightly Review*. In 1868 he became Walter Bagehot's assistant-editor on the *Economist*; and his services were also secured in 1873 as city-editor of the *Daily News*, and later of *The Times*. His high reputation as a financial journalist and statistician, gained in these years, led to his appointment in 1876 as head of the statistical department in the Board of Trade, and subsequently he became assistant secretary (1882) and finally controller-general (1892), retiring in 1897. In connexion with his position as chief statistical adviser to the government, he was constantly employed in drawing up reports, giving evidence before commissions of inquiry, and acting as a government auditor, besides publishing a number of important essays on financial subjects. His principal publications were *Essays on Finance* (1879 and 1884), *The Progress of the Working Classes* (1884), *The Growth of Capital* (1890), *The Case against Bimetallism* (1892), and *Economic Inquiries and Studies* (1904). He was president of the Statistical Society (1882–1884); and after being made a C.B. in 1891 was created K.C.B. in 1895. In 1892 he was elected a Fellow of the Royal Society. Sir Robert Giffen continued in later years to take a leading part in all public controversies connected with finance and taxation, and his high authority and practical experience were universally recognized. He died somewhat suddenly in Scotland on the 12th of April 1910.

GIFFORD, ROBERT SWAIN (1840–1905), American marine and landscape painter, was born on Naushon Island, Massachusetts, on the 23rd of December 1840. He studied art with the Dutch marine painter Albert van Beest, who had a studio in New Bedford, and in 1864 he opened a studio for himself in Boston, subsequently settling in New York, where he was elected an associate of the National Academy of Design in 1867 and an academician in 1878. He was also a charter member of the American Water Color Society and the Society of American Artists. From 1878 until 1896 he was teacher of painting and chief master of the Woman's Art School of Cooper Union, New York, and from 1896 until his death he was director. Gifford painted longshore views, sand dunes and landscapes generally, with charm and poetry. He was an etcher of considerable reputation, a member of the Society of American Etchers, and an honorary member of the Society of Painter-Etchers of London. He died in New York on the 13th of January 1905.

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GIFFORD, SANDFORD ROBINSON (1823–1880), American landscape painter, was born at Greenfield, New York, on the 10th of July 1823. He studied (1842–1845) at Brown University, then went to New York, and entered the art schools of the National Academy of Design, of which organization he was elected an associate in 1851, and an academician in 1854. Subsequently he studied in Paris and Rome. He was one of the best known of the Hudson River school group, though it was at Lake George that he found most of his themes. In his day he enjoyed an enormous popularity, and his canvases are in many well-known American collections. He died in New York City on the 29th of August 1880.

GIFFORD, WILLIAM (1756–1826), English publicist and man of letters, was born at Ashburton, Devon, in April 1756. His father was a glazier of indifferent character, and before he was thirteen William had lost both parents. The business was seized by his godfather, on whom William and his brother, a child of two, became entirely dependent. For about three months William was allowed to remain at the free school of the town. He was then put to follow the plough, but after a day's trial he proved unequal to the task, and was sent to sea with the Brixham fishermen. After a year at sea his godfather, driven by the opinion of the townsfolk, put the boy to school once more. He made rapid progress, especially in mathematics, and began to assist the master. In 1772 he was apprenticed to a shoemaker, and when he wished to pursue his mathematical studies, he was obliged to work his problems with an awl on beaten leather. By the kindness of an Ashburton surgeon, William Cooksley, a subscription was raised to enable him to return to school. Ultimately he proceeded in his twenty-third year to Oxford, where he was appointed a Bible clerk in Exeter College. Leaving the university shortly after graduation in 1782, he found a generous patron in the first Earl Grosvenor, who undertook to provide for him, and sent him on two prolonged continental tours in the capacity of tutor to his son, Lord Belgrave. Settling in London, Gifford published in 1794 his first work, a clever satirical piece, after Persius, entitled the *Baviad*, aimed at a coterie of second-rate writers at Florence, then popularly known as the Della Cruscans, of which Mrs Piozzi was the leader. A second satire of a similar description, the *Maeviad*, directed against the corruptions of the drama, appeared in 1795. About this time Gifford became acquainted with Canning, with whose help he in August 1797 originated a weekly newspaper of Conservative politics entitled the *Anti-Jacobin*, which, however, in the following year ceased to be published. An English version of Juvenal, on which he had been for many years engaged, appeared in 1802; to this an autobiographical notice of the translator, reproduced in Nichol's *Illustrations of Literature*, was prefixed. Two years afterwards Gifford published an annotated edition of the plays of Massinger; and in 1809, when the *Quarterly Review* was projected, he was made editor. The success which attended the *Quarterly* from the outset was due in no small degree to the ability and tact with which Gifford discharged his editorial duties. He took, however, considerable liberties with the articles he inserted, and Southey, who was one of his regular contributors, said that Gifford looked on authors as Izaak Walton did on worms. His bitter opposition to Radicals and his onslaughts on new writers, conspicuous among which was the article on Keats's *Endymion*, called forth Hazlitt's *Letter to W. Gifford* in 1819. His connexion with the *Review* continued until within about two years of his death, which took place in London on the 31st of December 1826. Besides numerous contributions to the *Quarterly* during the last fifteen years of his life, he wrote a metrical translation of Persius, which appeared in 1821. Gifford also edited the dramas of Ben Jonson in 1816, and his edition of Ford appeared posthumously in 1827. His notes on Shirley were incorporated in Dyce's edition in 1833. His political services were acknowledged by the appointments of commissioner of the lottery and paymaster of the gentleman pensioners. He left a considerable fortune, the bulk of which went to the son of his first benefactor, William Cooksley.

GIFT (a common Teutonic word, cf. Ger. *die Gift*, gift, *das Gift*, poison, formed from the Teut. stem *gab-*, to give, cf. Dutch *geven*, Ger. *geben*; in O. Eng. the word appears with initial *y*, the guttural of later English is due to Scandinavian influence), a general English term for a present or thing bestowed, *i.e.* an alienation of property otherwise than for a legal consideration, although in law it is often used to signify alienation with or without consideration. By analogy the terms "gift" and "gifted" are also used to signify the natural endowment of some special ability, or a miraculous power, in a person, as being not acquired in the ordinary way. The legal effect of a gratuitous gift only need be considered here. Formerly in English law property in land could be conveyed by one person to another by a verbal gift of the estate accompanied by delivery of possession. The Statute of Frauds required all such conveyances to be in writing, and a later statute (8 & 9 Vict. c. 106) requires them to be by deed. Personal property may be effectually transferred from one person to another by a simple verbal gift accompanied by delivery. If A delivers a chattel to B, saying or signifying that he does so by way of gift, the property passes, and the chattel belongs to B. But unless the actual thing is bodily handed over to the donee, the mere verbal expression of the donor's desire or intention has no legal effect whatever. The persons are in the position of parties to an agreement which is void as being without consideration. When the nature of the thing is such that it cannot be bodily handed over, it will be sufficient to put the donee in such a position as to enable him to deal with it as the owner. For example, when goods are in a warehouse, the delivery of the key will make a verbal gift of them effectual; but it seems that part delivery of goods which are capable of actual delivery will not validate a verbal gift of the part undelivered. So when goods are in the possession of a warehouseman, the handing over of a delivery order might, by special custom (but not otherwise, it appears), be sufficient to pass the property in the goods, although delivery of a bill of lading for goods at sea is equivalent to an actual delivery of the goods themselves.

GIFU (IMAIZUMI), a city of Japan, capital of the *ken* (government) of Central Nippon, which comprises the two provinces of Mino and Hida. Pop. about 41,000. It lies E. by N. of Lake Biwa, on the Central railway, on a tributary of the river Kiso, which flows to the Bay of Miya Uro. Manufactures of silk and paper goods are carried on. The *ken* has an area of about 4000 sq. m. and is thickly peopled, the population exceeding 1,000,000. The whole district is subject to frequent earthquakes.

GIG, apparently an onomatopoeic word for any light whirling object, and so used of a top, as in Shakespeare's *Love's Labour's Lost*, v. i. 70 ("Goe whip thy gigge"), or of a revolving lure made of feathers for snaring birds. The word is now chiefly used of a light two-wheeled cart or carriage for one horse, and of a narrow, light, ship's boat for oars or sails, and also of a clinker-built rowing-boat used for rowing on the Thames. "Gig" is further applied, in mining, to a wooden chamber or box divided in the centre and used to draw miners up and down a pit or shaft, and to a textile machine, the "gig-mill" or "gigging machine," which raises the nap on cloth by means of teazels. A "gig" or "fish-gig" (properly "fiz-gig," possibly an adaptation of Span. *fisga*, harpoon) is an instrument used for spearing fish.

GIGLIO (anc. *Igilium*), an island of Italy, off the S.W. coast of Italy, in the province of Grosseto, 11 m. to the W. of Monte Argentario, the nearest point on the coast. It measures about 5 m. by 3 and its highest point is 1634 ft. above sea-level. Pop. (1901) 2062. It is partly composed of granite, which was quarried here by the Romans, and is still used; the island is fertile, and produces wine and fruit, the cultivation of which has taken the place of the forests of which Rutilius spoke (*Itin.* i. 325, "eminus Igilii silvosa cacumina miror"). Julius Caesar mentions its sailors in the fleet of Domitius Ahenobarbus. In Rutilius's time it served as a place of refuge from the barbarian invaders. Charlemagne gave it to the abbey of Tre Fontane at Rome. In the 14th century it belonged to Pisa, then to Florence,

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then, after being seized by the Spanish fleet, it was ceded to Antonio Piccolomini, nephew of Pius II. In 1558 it was sold to the wife of Cosimo I. of Florence.

See Archduke Ludwig Salvator, *Die Insel Giglio* (Prague, 1900).

GIJÓN, a seaport of northern Spain, in the province of Oviedo; on the Bay of Biscay, and at the terminus of railways from Avilés, Oviedo and Langreo. Pop. (1900) 47,544. The older parts of Gijón, which are partly enclosed by ancient walls, occupy the upper slopes of a peninsular headland, Santa Catalina Point; while its more modern suburbs extend along the shore to Cape Torres, on the west, and Cape San Lorenzo, on the east. These suburbs contain the town-hall, theatre, markets, and a bull-ring with seats for 12,000 spectators. Few of the buildings of Gijón are noteworthy for any architectural merit, except perhaps the 15th-century parish church of San Pedro, which has a triple row of aisles on each side, the palace of the marquesses of Revillajigedo (or Revilla Gigedo), and the Asturian Institute or Jovellanos Institute. The last named has a very fine collection of drawings by Spanish and other artists, a good library and classes for instruction in seamanship, mathematics and languages. It was founded in 1797 by the poet and statesman Gaspar Melchor de Jovellanos (1744–1811). Jovellanos, a native of Gijón, is buried in San Pedro.

The Bay of Gijón is the most important roadstead on the Spanish coast between Ferrol and Santander. Its first quay was constructed by means of a grant from Charles V. in 1552–1554; and its arsenal, added in the reign of Philip II. (1556–1598), was used in 1588 as a repairing station for the surviving ships of the Invincible Armada. A new quay was built in 1766–1768, and extended in 1859; the harbour was further improved in 1864, and after 1892, when the Musel harbour of refuge was created at the extremity of the bay. It was, however, the establishment of railway communication in 1884 which brought the town its modern prosperity, by rendering it the chief port of shipment for the products of Langreo and other mining centres in Oviedo. A rapid commercial development followed. Besides large tobacco, glass and porcelain factories, Gijón possesses iron foundries and petroleum refineries; while its minor industries include fisheries, and the manufacture of preserved foods, soap, chocolate, candles and liqueurs. In 1903 the harbour accommodated 2189 vessels of 358,375 tons. In the same year the imports, consisting chiefly of machinery, iron, wood and food-stuffs, were valued at £666,889; while the exports, comprising zinc, copper, iron and other minerals, with fish, nuts and farm produce, were valued at £100,041.

Gijón is usually identified with the *Gigia* of the Romans, which, however, occupied the site of the adjoining suburb of Cima de Villa. Early in the 8th century Gijón was captured and strengthened by the Moors, who used the stones of the Roman city for their fortifications, but were expelled by King Pelayo (720–737). In 844 Gijón successfully resisted a Norman raid; in 1395 it was burned down; but thenceforward it gradually rose to commercial importance.

GÍLÁN (GHILAN, GUILAN), one of the three small but important Caspian provinces of Persia, lying along the south-western shore of the Caspian Sea between 48° 50′ and 50° 30′ E. with a breadth varying from 15 to 50 m. It has an area of about 5000 sq. m. and a population of about 250,000. It is separated from Russia by the little river Astara, which flows into the Caspian, and bounded W. by Azerbáijān, S. by Kazvin and E. by Mazandaran. The greater portion of the province is a lowland region extending inland from the sea to the base of the mountains of the Elburz range and, though the Sefíd Rúd (White river), which is called Kizil Uzain in its upper course and has its principal sources in the hills of Persian Kurdistan, is the only river of any size, the province is abundantly watered by many streams and an exceptionally great rainfall (in some years 50 in.).

The vegetation is very much like that of southern Europe, but in consequence of the great humidity and the mild climate almost tropically luxuriant, and the forests from the shore of the sea up to an altitude of nearly 5000 ft. on the mountain slopes facing the sea are as dense as an Indian jungle. The prevailing types of trees are the oak, maple, hornbeam, beech, ash and elm. The box tree comes to rare perfection, but in consequence of indiscriminate cutting for export during many years, is now becoming scarce. Of fruit trees the apple, pear, plum, cherry, medlar, pomegranate, fig, quince, as well as two kinds of vine, grow wild; oranges, sweet and bitter, and other Aurantiaceae thrive well in gardens and plantations. The fauna also is well represented, but tigers which once were frequently seen are now very scarce; panther, hyena, jackal, wild boar, deer (*Cervus maral*) are common; pheasant, woodcock, ducks, teal, geese and various waterfowl abound; the fisheries are very productive and are leased to a Russian firm. The ordinary cattle of the province is the small humped kind, *Bos indicus*, and forms an article of export to Russia, the humps, smoked, being much in demand as a delicacy. Rice of a kind not much appreciated in Persia, but much esteemed in Gilán and Russia, is largely cultivated and a quantity valued at about £120,000 was exported to Russia during 1904–1905. Tea plantations, with seeds and plants from Assam, Ceylon and the Himalayas, were started in the early part of 1900 on the slopes of the hills south of Resht at an altitude of about 1000 ft. The results were excellent and very good tea was produced in 1904 and 1905, but the Persian government gave no support and the enterprise was neglected. The olive thrives well at Rúdbár and Manjíl in the Sefíd Rúd valley and the oil extracted from it by a Provençal for some years until 1896, when he was murdered, was of very good quality and found a ready market at Baku. Since then the oil has been, as before, only used for the manufacture of soap. Tobacco from Turkish seed, cultivated since 1875, grows well, and a considerable quantity of it is exported. The most valuable produce of the province is silk. In 1866 it was valued at £743,000 and about two-thirds of it was exported. The silk-worm disease appeared in 1864 and the crops decreased in consequence until 1893 when the value of the silk exported was no more than £6500. Since then there has been a steady improvement, and in 1905–1906 the value of the produce was estimated at £300,000 and that of the quantity exported at £200,000. The eggs of the silk-worms, formerly obtained from Japan, are now imported principally from Brusa by Greeks under French protection and from France.

There is only one good road in the province, that from Enzeli to Kazvin by way of Resht; in other parts communication is by narrow and frequently impassable lanes through the thick forest, or by intricate pathways through the dense undergrowth.

The province is divided into the following administrative districts: Resht (with the capital and its immediate neighbourhood), Fumen (with Tulam and Mesula, where are iron mines), Gesker, Talish (with Shandarman, Kerganrud, Asalim, Gil-Dulab, Talish-Dulab), Enzeli (the port of Resht), Sheft, Manjíl (with Rahmetabad and Amarlu), Lahijan (with Langarud, Rúdsar and Ranehkuh), Dilman and Lashtnisha. The revenue derived from taxes and customs is about £80,000. The crown lands have been much neglected and the revenue from them amounts to hardly £3000 per annum. The value of the exports and imports from and into Gilán, much of them in transit, is close upon £2,000,000.

Gilán was an independent khanate until 1567 when Khan Ahmed, the last of the Kargia dynasty, which had reigned 205 years, was deposed by Tahmasp I., the second Safawid shah of Persia (1524–1576). It was occupied by a Russian force in the early part of 1723; and Tahmasp III., the tenth Safawid shah (1722–1731), then without a throne and his country occupied by the Afghans, ceded it, together with Mazandaran and Astarabad, to Peter the Great by a treaty of the 12th of September of the same year. Russian troops remained in Gilán until 1734, when they were compelled to evacuate it.

The derivation of the name Gilán from the modern Persian word *gil* meaning mud (hence "land of mud") is incorrect. It probably means "land of the Gil," an ancient tribe which classical writers mention as the Gelae. (A. H.-S.)

GILBART, JAMES WILLIAM (1794–1863), English writer on banking, was born in London on the 21st of March 1794. From

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1813 to 1825 he was clerk in a London bank. After a two years' residence in Birmingham, he was appointed manager of the Kilkenny branch of the Provincial Bank of Ireland, and in 1829 he was promoted to the Waterford branch. In 1834 he became manager of the London and Westminster Bank; and he did much to develop the system of joint-stock banking. On more than one occasion he rendered valuable services to the joint-stock banks by his evidence before committees of the House of Commons; and, on the renewal of the bank charter in 1844, he procured the insertion of a clause granting to joint-stock banks the power of suing by their public officer, and also the right of accepting bills at less than six months' date. In 1846 he was elected a fellow of the Royal Society. He died in London on the 8th of August 1863. The Gilbart lectures on banking at King's College are called after him.

The following are his principal works on banking, most of which have passed through more than one edition: *Practical Treatise on Banking* (1827); *The History and Principles of Banking* (1834); *The History of Banking in America* (1837); *Lectures on the History and Principles of Ancient Commerce* (1847); *Logic for the Million* (1851); and *Logic of Banking* (1857).

GILBERT, ALFRED (1854–), British sculptor and goldsmith, born in London, was the son of Alfred Gilbert, musician. He received his education mainly in Paris (École des Beaux-Arts, under Cavelier), and studied in Rome and Florence where the significance of the Renaissance made a lasting impression upon him and his art. He also worked in the studio of Sir J. Edgar Boehm, R.A. His first work of importance was the charming group of the "Mother and Child," then "The Kiss of Victory," followed by "Perseus Arming" (1883), produced directly under the influence of the Florentine masterpieces he had studied. Its success was great, and Lord Leighton forthwith commissioned "Icarus," which was exhibited at the Royal Academy in 1884, along with a remarkable "Study of a Head," and was received with general applause. Then followed "The Enchanted Chair," which, along with many other works deemed by the artist incomplete or unworthy of his powers, was ultimately broken by the sculptor's own hand. The next year Mr Gilbert was occupied with the Shaftesbury Memorial Fountain, in Piccadilly, London, a work of great originality and beauty, yet shorn of some of the intended effect through restrictions put upon the artist. In 1888 was produced the statue of H.M. Queen Victoria, set up at Winchester, in its main design and in the details of its ornamentation the most remarkable work of its kind produced in Great Britain, and perhaps, it may be added, in any other country in modern times. Other statues of great beauty, at once novel in treatment and fine in design, are those set up to Lord Reay in Bombay, and John Howard at Bedford (1898), the highly original pedestal of which did much to direct into a better channel what are apt to be the eccentricities of what is called the "New Art" School. The sculptor rose to the full height of his powers in his "Memorial to the Duke of Clarence," and his fast developing fancy and imagination, which are the main characteristics of all his work, are seen in his "Memorial Candelabrum to Lord Arthur Russell" and "Memorial Font to the son of the 4th Marquess of Bath." Gilbert's sense of decoration is paramount in all he does, and although in addition to the work already cited he produced busts of extraordinary excellence of Cyril Flower, John R. Clayton (since broken up by the artist—the fate of much of his admirable work), G. F. Watts, Sir Henry Tate, Sir George Birdwood, Sir Richard Owen, Sir George Grove and various others, it is on his goldsmithery that the artist would rest his reputation; on his mayoral chain for Preston, the epergne for Queen Victoria, the figurines of "Victory" (a statuette designed for the orb in the hand of the Winchester statue), "St Michael" and "St George," as well as smaller objects such as seals, keys and the like. Mr Gilbert was chosen associate of the Royal Academy in 1887, full member in 1892 (resigned 1909), and professor of sculpture (afterwards resigned) in 1900. In 1889 he won the *Grand Prix* at the Paris International Exhibition. He was created a member of the Victorian Order in 1897. (See SCULPTURE.)

See *The Life and Work of Alfred Gilbert, R.A., M.V.O., D.C.L.*, by Joseph Hatton (*Art Journal* Office, 1903). (M. H. S.)

GILBERT, ANN (1821–1904), American actress, was born at Rochdale, Lancashire, on the 21st of October 1821, her maiden name being Hartley. At fifteen she was a pupil at the ballet school connected with the Haymarket theatre, conducted by Paul Taglioni, and became a dancer on the stage. In 1846 she married George H. Gilbert (d. 1866), a performer in the company of which she was a member. Together they filled many engagements in English theatres, moving to America in 1849. Mrs Gilbert's first success in a speaking part was in 1857 as Wichavenda in Brougham's *Pocahontas*. In 1869 she joined Daly's company, playing for many years wives to James Lewis's husbands, and old women's parts, in which she had no equal. Mrs. Gilbert held a unique position on the American stage, on account of the admiration, esteem and affection which she enjoyed both in front and behind the footlights. She died at Chicago on the 2nd of December 1904.

See *Mrs Gilbert's Stage Reminiscences* (1901).

GILBERT, GROVE KARL (1843–), American geologist, was born at Rochester, N.Y., on the 6th of May 1843. In 1869 he was attached to the Geological Survey of Ohio and in 1879 he became a member of the United States Geological Survey, being engaged on parts of the Rocky Mountains, in Nevada, Utah, California and Arizona. He is distinguished for his researches on mountain-structure and on the Great Lakes, as well as on glacial phenomena, recent earth movements, and on topographic features generally. His report on the *Geology of the Henry Mountains* (1877), in which the volcanic structure known as a laccolite was first described; his *History of the Niagara River* (1890) and *Lake Bonneville* (1891—the first of the Monographs issued by the United States Geological Survey) are specially important. He was awarded the Wollaston medal by the Geological Society of London in 1900.

GILBERT, SIR HUMPHREY (*c.* 1539–1583), English soldier, navigator and pioneer colonist in America, was the second son of Otho Gilbert, of Compton, near Dartmouth, Devon, and step-brother of Sir Walter Raleigh. He was educated at Eton and Oxford; intended for the law; introduced at court by Raleigh's aunt, Catherine Ashley, and appointed (July 1566) captain in the army of Ireland under Sir Henry Sidney. In April 1566 he had already joined with Antony Jenkinson in a petition to Elizabeth for the discovery of the North-East Passage; in November following he presented an independent petition for the discovery and entering of a passage to Cathay to Cataia.[1] In October 1569 he became governor of Munster; on the 1st of January 1570 he was knighted; in 1571 he was returned M.P. for Plymouth; in 1572 he campaigned in the Netherlands against Spain without much success; from 1573 to 1578 he lived in retirement at Limehouse, devoting himself especially to the advocacy of a North-West Passage (his famous *Discourse* on this subject was published in 1576). Gilbert's arguments, widely circulated even before 1575, were apparently of weight in promoting the Frobisher enterprises of 1576–1578. On the 11th of June 1578, Sir Humphrey obtained his long-coveted charter for North-Western discovery and colonization, authorizing him, his heirs and assigns, to discover, occupy and possess such remote "heathen lands not actually possessed of any Christian prince or people, as should seem good to him or them." Disposing not only of his patrimony but also of the estates in Kent which he had through his wife, daughter of John Aucher of Ollerden, he fitted out an expedition which left Dartmouth on the 23rd of September 1578, and returned in May 1579, having accomplished nothing. In 1579 Gilbert aided the government in Ireland; and in 1583, after many struggles—illustrated by his appeal to Walsingham on the 11th of July 1582, for the payment of moneys due to him from government, and by his agreement with the Southampton venturers—he succeeded in equipping another fleet for "Western Planting." On the 11th of June 1583, he sailed from Plymouth with five ships and the queen's blessing; on the 13th of July the "Ark Raleigh," built and manned at his brother's expense, deserted

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the fleet; on the 30th of July he was off the north coast of Newfoundland; on the 3rd of August he arrived off the present St John's, and selected this site as the centre of his operations; on the 5th of August he began the plantation of the first English colony in North America. Proceeding southwards with three vessels, exploring and prospecting, he lost the largest near Cape Breton (20th of August); immediately after (31st of August) he started to return to England with the "Golden Hind" and the "Squirrel," of forty and ten tons respectively. Obstinately refusing to leave the "frigate" and sail in his "great ship," he shared the former's fate in a tempest off the Azores. "Monday the 9th of September," reports Hayes, the captain of the "Hind," "the frigate was near cast away, ... yet at that time recovered; and, giving forth signs of joy, the general, sitting abaft with a book in his hand, cried out unto us in the 'Hind,' 'We are as near to heaven by sea as by land.' ... The same Monday night, about twelve, the frigate being ahead of us in the 'Golden Hind,' suddenly her lights were out, ... in that moment the frigate was devoured and swallowed up of the sea."

See Hakluyt, *Principal Navigations* (1599), vol. iii. pp. 135-181; Gilbert's *Discourse of a Discovery for a New Passage to Catata*, published by George Gascoigne in 1576, with additions, probably without Gilbert's authority; Hooker's *Supplement* to Holinshed's *Irish Chronicle*; Roger Williams, *The Actions of the Low Countries* (1618); *State Papers, Domestic* (1577–1583); Wood's *Athenae Oxonienses*; *North British Review*, No. 45; Fox Bourne's *English Seamen under the Tudors*; Carlos Slafter, *Sir H. Gylberte and his Enterprise* (Boston, 1903), with all important documents. Gilbert's interesting writings on the need of a university for London, anticipating in many ways not only the modern London University but also the British Museum library and its compulsory sustenance through the provisions of the Copyright Act, have been printed by Furnivall (*Queen Elizabeth's Achademy*) in the Early English Text Society Publications, extra series, No. viii.

GILBERT, JOHN (1810–1889), American actor, whose real name was Gibbs, was born in Boston, Massachusetts, on the 27th of February 1810, and made his first appearance there as Jaffier in *Venice Preserved*. He soon found that his true vein was in comedy, particularly in old-men parts. When in London in 1847 he was well received both by press and public, and played with Macready. He was the leading actor at Wallack's from 1861–1888. He died on the 17th of June 1889.

See William Winter's *Life of John Gilbert* (New York, 1890).

GILBERT, SIR JOHN (1817–1897), English painter and illustrator, one of the eight children of George Felix Gilbert, a member of a Derbyshire family, was born at Blackheath in the 21st of July 1817. He was at school there, and even in childhood displayed an extraordinary fondness for drawing and painting. Nevertheless, his father's lack of means compelled him to accept employment for the boy in the office of Messrs Dickson & Bell, estate agents, in Charlotte Row, London. Yielding, however, to his natural bent, his parents agreed that he should take up art in his own way, which included but little advice from others, his only teacher being Haydon's pupil, George Lance, the fruit painter. This artist gave him brief instructions in the use of colour. In 1836 Gilbert appeared in public for the first time. This was at the gallery of the Society of British Artists, where he sent drawings, the subjects of which were characteristic, being "The Arrest of Lord Hastings," from Shakespeare, and "Abbot Boniface," from *The Monastery* of Scott. "Inez de Castro" was in the same gallery in the next year; it was the first of a long series of works in the same medium, representing similar themes, and was accompanied, from 1837, by a still greater number of works in oil which were exhibited at the British Institution. These included "Don Quixote giving advice to Sancho Panza," 1841; "Brunette and Phillis," from *The Spectator*, 1844; "The King's Artillery at Marston Moor," 1860; and "Don Quixote comes back for the last time to his Home and Family," 1867. In that year the Institution was finally closed. Gilbert exhibited at the Royal Academy from 1838, beginning with the "Portrait of a Gentleman," and continuing, except between 1851 and 1867, till his death to exhibit there many of his best and more ambitious works. These included such capital instances as "Holbein painting the Portrait of Anne Boleyn," "Don Quixote's first Interview with the Duke and Duchess," 1842, "Charlemagne visiting the Schools," 1846. "Touchstone and the Shepherd," and "Rembrandt," a very fine piece, were both there in 1867; and in 1873 "Naseby," one of his finest and most picturesque designs, was also at the Royal Academy. Gilbert was elected A.R.A. 29th January 1872, and R.A. 29th June 1876. Besides these mostly large and powerful works, the artist's true arena of display was undoubtedly the gallery of the Old Water Colour Society, to which from 1852, when he was elected an Associate exhibitor, till he died forty-five years later, he contributed not fewer than 270 drawings, most of them admirable because of the largeness of their style, massive coloration, broad chiaroscuro, and the surpassing vigour of their designs. These qualities induced the leading critics to claim for him opportunities for painting mural pictures of great historic themes as decorations of national buildings. "The Trumpeter," "The Standard-Bearer," "Richard II. resigning his Crown" (now at Liverpool), "The Drug Bazaar at Constantinople," "The Merchant of Venice" and "The Turkish Water-Carrier" are but examples of that wealth of art which added to the attractions of the gallery in Pall Mall. There Gilbert was elected a full Member in 1855, and president of the Society in 1871, shortly after which he was knighted. As an illustrator of books, magazines and periodicals of every kind he was most prolific. To the success of the *Illustrated London News* his designs lent powerful aid, and he was eminently serviceable in illustrating the *Shakespeare* of Mr Howard Staunton. He died on the 6th of October 1897.

(F.G.S.)

GILBERT, SIR JOSEPH HENRY (1817–1901), English chemist, was born at Hull on the 1st of August 1817. He studied chemistry first at Glasgow under Thomas Thomson; then at University College, London, in the laboratory of A. T. Thomson (1778–1849), the professor of medical jurisprudence, also attending Thomas Graham's lectures; and finally at Giessen under Liebig. On his return to England from Germany he acted for a year or so as assistant to his old master A. T. Thomson at University College, and in 1843, after spending a short time in the study of calico dyeing and printing near Manchester, accepted the directorship of the chemical laboratory at the famous experimental station established by Sir J. B. Lawes at Rothamsted, near St Albans, for the systematic and scientific study of agriculture. This position he held for fifty-eight years, until his death on the 23rd of December 1901. The work which he carried out during that long period in collaboration with Lawes was of a most comprehensive character, involving the application of many branches of science, such as chemistry, meteorology, botany, animal and vegetable physiology, and geology; and its influence in improving the methods of practical agriculture extended all over the civilized world. Gilbert was chosen a fellow of the Royal Society in 1860, and in 1867 was awarded a royal medal jointly with Lawes. In 1880 he presided over the Chemical Section of the British Association at its meeting at Swansea, and in 1882 he was president of the London Chemical Society, of which he had been a member almost from its foundation in 1841. For six years from 1884 he filled the Sibthorpian chair of rural economy at Oxford, and he was also an honorary professor at the Royal Agricultural College, Cirencester. He was knighted in 1893, the year in which the jubilee of the Rothamsted experiments was celebrated.

GILBERT, MARIE DOLORES ELIZA ROSANNA ["Lola Montez"] (1818–1861), dancer and adventuress, the daughter of a British army officer, was born at Limerick, Ireland, in 1818. Her father dying in India when she was seven years old, and her mother marrying again, the child was sent to Europe to be educated, subsequently joining her mother at Bath. In 1837 she made a runaway match with a Captain James of the Indian army, and accompanied him to India. In 1842 she returned to England, and shortly afterwards her husband obtained a decree *nisi* for divorce. She then studied dancing, making an unsuccessful first appearance at Her Majesty's theatre, London, in 1843, billed as "Lola Montez, Spanish dancer." Subsequently

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she appeared with considerable success in Germany, Poland and Russia. Thence she went to Paris, and in 1847 appeared at Munich, where she became the mistress of the old king of Bavaria, Ludwig I.; she was naturalized, created comtesse de Landsfeld, and given an income of £2000 a year. She soon proved herself the real ruler of Bavaria, adopting a liberal and anti-Jesuit policy. Her political opponents proved, however, too strong for her, and in 1848 she was banished. In 1849 she came to England, and in the same year was married to George Heald, a young officer in the Guards. Her husband's guardian instituted a prosecution for bigamy against her on the ground that her divorce from Captain James had not been made absolute, and she fled with Heald to Spain. In 1851 she appeared at the Broadway theatre, New York, and in the following year at the Walnut Street theatre, Philadelphia. In 1853 Heald was drowned at Lisbon, and in the same year she married the proprietor of a San Francisco newspaper, but did not live long with him. Subsequently she appeared in Australia, but returned, in 1857, to act in America, and to lecture on gallantry. Her health having broken down, she devoted the rest of her life to visiting the outcasts of her own sex in New York, where, stricken with paralysis, she died on the 17th of January 1861.

See E. B. D'Auvergne, *Lola Montez* (New York, 1909).

GILBERT, NICOLAS JOSEPH LAURENT (1751–1780), French poet, was born at Fontenay-le-Château in Lorraine in 1751. Having completed his education at the college of Dôle, he devoted himself for a time to a half-scholastic, half-literary life at Nancy, but in 1774 he found his way to the capital. As an opponent of the Encyclopaedists and a panegyrist of Louis XV., he received considerable pensions. He died in Paris on the 12th of November 1780 from the results of a fall from his horse. The satiric force of one or two of his pieces, as *Mon Apologie* (1778) and *Le Dix-huitième Siècle* (1775), would alone be sufficient to preserve his reputation, which has been further increased by modern writers, who, like Alfred de Vigny in his *Stello* (chaps. 7-13), considered him a victim to the spite of his philosophic opponents. His best-known verses are the *Ode imitée de plusieurs psaumes*, usually entitled *Adieux à la vie.*

Among his other works may be mentioned *Les Familles de Darius et d'Eridame, histoire persane* (1770), *Le Carnaval des auteurs* (1773), *Odes nouvelles et patriotiques* (1775). Gilbert's *Œuvres complètes* were first published in 1788, and they have since been edited by Mastrella (Paris, 1823), by Charles Nodier (1817 or 1825), and by M. de Lescure (1882).

GILBERT (or GYLBERDE), **WILLIAM** (1544–1603), the most distinguished man of science in England during the reign of Queen Elizabeth, and the father of electric and magnetic science, was a member of an ancient Suffolk family, long resident in Clare, and was born on the 24th of May 1544 at Colchester, where his father, Hierome Gilbert, became recorder. Educated at Colchester school, he entered St John's College, Cambridge, in 1558, and after taking the degrees of B.A. and M.A. in due course, graduated M.D. in 1569, in which year he was elected a senior fellow of his college. Soon afterwards he left Cambridge, and after spending three years in Italy and other parts of Europe, settled in 1573 in London, where he practised as a physician with "great success and applause." He was admitted to the College of Physicians probably about 1576, and from 1581 to 1590 was one of the censors. In 1587 he became treasurer, holding the office till 1592, and in 1589 he was one of the committee appointed to superintend the preparation of the *Pharmacopoeia Londinensis* which the college in that year decided to issue, but which did not actually appear till 1618. In 1597 he was again chosen treasurer, becoming at the same time consiliarius, and in 1599 he succeeded to the presidency. Two years later he was appointed physician to Queen Elizabeth, with the usual emolument of £100 a year. After this time he seems to have removed to the court, vacating his residence, Wingfield House, which was on Peter's Hill, between Upper Thames Street and Little Knightrider Street, and close to the house of the College of Physicians. On the death of the queen in 1603 he was reappointed by her successor; but he did not long enjoy the honour, for he died, probably of the plague, on the 30th of November (10th of December, N.S.) 1603, either in London or in Colchester. He was buried in the latter town, in the chancel of Holy Trinity church, where a monument was erected to his memory. To the College of Physicians he left his books, globes, instruments and minerals, but they were destroyed in the great fire of London.

Gilbert's principal work is his treatise on magnetism, entitled *De magnete, magneticisque corporibus, et de magno magnete tellure* (London, 1600; later editions—Stettin, 1628, 1633; Frankfort, 1629, 1638). This work, which embodied the results of many years' research, was distinguished by its strict adherence to the scientific method of investigation by experiment, and by the originality of its matter, containing, as it does, an account of the author's experiments on magnets and magnetical bodies and on electrical attractions, and also his great conception that the earth is nothing but a large magnet, and that it is this which explains, not only the direction of the magnetic needle north and south, but also the variation and dipping or inclination of the needle. Gilbert's is therefore not merely the first, but the most important, systematic contribution to the sciences of electricity and magnetism. A posthumous work of Gilbert's was edited by his brother, also called William, from two MSS. in the possession of Sir William Boswell; its title is *De mundo nostro sublunari philosophia nova* (Amsterdam, 1651). He is the reputed inventor besides of two instruments to enable sailors "to find out the latitude without seeing of sun, moon or stars," an account of which is given in Thomas Blondeville's *Theoriques of the Planets* (London, 1602). He was also the first advocate of Copernican views in England, and he concluded that the fixed stars are not all at the same distance from the earth.

It is a matter of great regret for the historian of chemistry that Gilbert left nothing on that branch of science, to which he was deeply devoted, "attaining to great exactness therein." So at least says Thomas Fuller, who in his *Worthies of England* prophesied truly how he would be afterwards known: "Mahomet's tomb at Mecca," he says, "is said strangely to hang up, attracted by some invisible loadstone; but the memory of this doctor will never fall to the ground, which his incomparable hook *De magnete* will support to eternity."

An English translation of the *De magnete* was published by P. F. Mottelay in 1893, and another, with notes by S. P. Thompson, was issued by the Gilbert Club of London in 1900.

GILBERT, SIR WILLIAM SCHWENK (1836–), English playwright and humorist, son of William Gilbert (a descendant of Sir Humphrey Gilbert), was born in London on the 18th of November 1836. His father was the author of a number of novels, the best-known of which were *Shirley Hall Asylum* (1863) and *Dr Austin's Guests* (1866). Several of these novels—which were characterized by a singular acuteness and lucidity of style, by a dry, subacid humour, by a fund of humanitarian feeling and by a considerable medical knowledge, especially in regard to the psychology of lunatics and monomaniacs—were illustrated by his son, who developed a talent for whimsical draughtsmanship. W. S. Gilbert was educated at Boulogne, at Ealing and at King's College, graduating B.A. from the university of London in 1856. The termination of the Crimean War was fatal to his project of competing for a commission in the Royal Artillery, but he obtained a post in the education department of the privy council office (1857–1861). Disliking the routine work, he left the Civil Service, entered the Inner Temple, was called to the bar in November 1864, and joined the northern circuit. His practice was inconsiderable, and his military and legal ambitions were eventually satisfied by a captaincy in the volunteers and appointment as a magistrate for Middlesex (June 1891). In 1861 the comic journal *Fun* was started by H. J. Byron, and Gilbert became from the first a valued contributor. Failing to obtain an *entrée* to *Punch*, he continued sending excellent comic verse to *Fun*, with humorous illustrations, the work of his own pen, over the signature of "Bab." A collection of these lyrics, in which deft craftsmanship unites a titillating satire on the deceptiveness of appearances with the irrepressible nonsense of a Lewis Carroll, was issued separately in 1869 under the title of *Bab Ballads*, and was followed by *More Bab Ballads.* The

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two collections and *Songs of a Savoyard* were united in a volume issued in 1898, with many new illustrations. The best of the old cuts, such as those depicting the "Bishop of Rum-ti-Foo" and the "Discontented Sugar Broker," were preserved intact.

While remaining a staunch supporter of *Fun*, Gilbert was soon immersed in other journalistic work, and his position as dramatic critic to the *Illustrated Times* turned his attention to the stage. He had not to wait long for an opportunity. Early in December 1866 T. W. Robertson was asked by Miss Herbert, lessee of the St James's theatre, to find some one who could turn out a bright Christmas piece in a fortnight, and suggested Gilbert; the latter promptly produced *Dulcamara*, a burlesque of *L'Elisire d'amore*, written in ten days, rehearsed in a week, and duly performed at Christmas. He sold the piece outright for £30, a piece of rashness which he had cause to regret, for it turned out a commercial success. In 1870 he was commissioned by Buckstone to write a blank verse fairy comedy, based upon *Le Palais de la vérité*, the novel by Madame de Genlis. The result was *The Palace of Truth*, a fairy drama, poor in structure but clever in workmanship, which served the purpose of Mr and Mrs Kendal in 1870 at the Haymarket. This was followed in 1871 by *Pygmalion and Galatea*, another three-act "mythological comedy," a clever and effective but artificial piece. Another fairy comedy, *The Wicked World*, written for Buckstone and the Kendals, was followed in March 1873 by a burlesque version, in collaboration with Gilbert à Beckett, entitled *The Happy Land*. Gilbert's next dramatic ventures inclined more to the conventional pattern, combining sentiment and a cynical humour in a manner strongly reminiscent of his father's style. Of these pieces, *Sweethearts* was given at the Prince of Wales's theatre, 7th November 1874; *Tom Cobb* at the St James's, 24th April 1875; *Broken Hearts* at the Court, 9th December 1875; *Dan'l Druce* (a drama in darker vein, suggested to some extent by *Silas Marner*) at the Haymarket, 11th September 1876; and *Engaged* at the Haymarket, 3rd October 1877. The first and last of these proved decidedly popular. *Gretchen*, a verse drama in four acts, appeared in 1879. A one-act piece, called *Comedy and Tragedy*, was produced at the Lyceum, 26th January, 1884. Two dramatic trifles of later date were *Foggerty's Fairy* and *Rozenkrantz and Guildenstern*, a travesty of *Hamlet*, performed at the Vaudeville in June 1891. Several of these dramas were based upon short stories by Gilbert, a number of which had appeared from time to time in the Christmas numbers of various periodicals. The best of them have been collected in the volume entitled *Foggerty's Fairy, and other Stories*. In the autumn of 1871 Gilbert commenced his memorable collaboration (which lasted over twenty years) with Sir Arthur Sullivan. The first two comic operas, *Thespis; or The Gods grown Old* (26th September 1871) and *Trial by Jury* (Royalty, 25th March 1875) were merely essays. Like one or two of their successors, they were, as regards plot, little more than extended "Bab Ballads." Later (especially in the *Yeomen of the Guard*), much more elaboration was attempted. The next piece was produced at the Opera Comique (17th November 1877) as *The Sorcerer*. At the same theatre were successfully given *H.M.S. Pinafore* (25th May 1878), *The Pirates of Penzance; or The Slave of Duty* (3rd April 1880), and *Patience; or Bunthorne's Bride* (23rd April 1881). In October 1881 the successful *Patience* was removed to a new theatre, the Savoy, specially built for the Gilbert and Sullivan operas by Richard D'Oyly Carte. *Patience* was followed, on 25th November 1882, by *Iolanthe; or The Peer and the Peri*; and then came, on 5th January 1884, *Princess Ida; or Castle Adamant*, a re-cast of a charming and witty fantasia which Gilbert had written some years previously, and had then described as a "respectful perversion of Mr. Tennyson's exquisite poem." The impulse reached its fullest development in the operas that followed next in order—*The Mikado; or The Town of Titipu* (14th March 1885); *Ruddigore* (22nd January 1887); *The Yeomen of the Guard* (3rd October 1888); and *The Gondoliers* (7th December 1889). After the appearance of *The Gondoliers* a coolness occurred between the composer and librettist, owing to Gilbert's considering that Sullivan had not supported him in a business disagreement with D'Oyly Carte. But the estrangement was only temporary. Gilbert wrote several more librettos, and of these *Utopia Limited* (1893) and the exceptionally witty *Grand Duke* (1896) were written in conjunction with Sullivan. As a master of metre Gilbert had shown himself consummate, as a dealer in quips and paradoxes and ludicrous dilemmas, unrivalled. Even for the music of the operas he deserves some credit, for the rhythms were frequently his own (as in "I have a Song to Sing, O"), and the metres were in many cases invented by himself. One or two of his librettos, such as that of *Patience*, are virtually flawless. Enthusiasts are divided only as to the comparative merit of the operas. *Princess Ida* and *Patience* are in some respects the daintiest. There is a genuine vein of poetry in *The Yeomen of the Guard*. Some of the drollest songs are in *Pinafore* and *Ruddigore*. *The Gondoliers* shows the most charming lightness of touch, while with the general public *The Mikado* proved the favourite. The enduring popularity of the Gilbert and Sullivan operas was abundantly proved by later revivals. Among the birthday honours in June 1907 Gilbert was given a knighthood. In 1909 his *Fallen Fairies* (music by Edward German) was produced at the Savoy. (T. Se.)

GILBERT DE LA PORRÉE, frequently known as Gilbertus Porretanus or Pictaviensis (1070–1154), scholastic logician and theologian, was born at Poitiers. He was educated under Bernard of Chartres and Anselm of Laon. After teaching for about twenty years in Chartres, he lectured on dialectics and theology in Paris (from 1137), and in 1141 returned to Poitiers, being elected bishop in the following year. His heterodox opinions regarding the doctrine of the Trinity drew upon his works the condemnation of the church. The synod of Reims in 1148 procured papal sanction for four propositions opposed to certain of Gilbert's tenets, and his works were condemned until they should be corrected in accordance with the principles of the church. Gilbert seems to have submitted quietly to this judgment; he yielded assent to the four propositions, and remained on friendly terms with his antagonists till his death on the 4th of September 1154. Gilbert is almost the only logician of the 12th century who is quoted by the greater scholastics of the succeeding age. His chief logical work, the treatise *De sex principiis*, was regarded with a reverence almost equal to that paid to Aristotle, and furnished matter for numerous commentators, amongst them Albertus Magnus. Owing to the fame of this work, he is mentioned by Dante as the *Magister ex principiorum*. The treatise itself is a discussion of the Aristotelian categories, specially of the six subordinate modes. Gilbert distinguishes in the ten categories two classes, one essential, the other derivative. Essential or inhering (*formae inhaerentes*) in the objects themselves are only *substance*, *quantity*, *quality* and *relation* in the stricter sense of that term. The remaining six, *when*, *where*, *action*, *passion*, *position* and *habit*, are relative and subordinate (*formae assistentes*). This suggestion has some interest, but is of no great value, either in logic or in the theory of knowledge. More important in the history of scholasticism are the theological consequences to which Gilbert's realism led him. In the commentary on the treatise *De Trinitate* (erroneously attributed to Boëtius) he proceeds from the metaphysical notion that pure or abstract being is prior in nature to that which is. This pure being is God, and must be distinguished from the triune God as known to us. God is incomprehensible, and the categories cannot be applied to determine his existence. In God there is no distinction or difference, whereas in all substances or things there is duality, arising from the element of matter. Between pure being and substances stand the ideas or forms, which subsist, though they are not substances. These forms, when materialized, are called *formae substantiales* or *formae nativae*; they are the essences of things, and in themselves have no relation to the accidents of things. Things are temporal, the ideas perpetual, God eternal. The pure form of existence, that by which God is God, must be distinguished from the three persons who are God by participation in this form. The form or essence is one, the persons or substances three. It was this distinction between Deitas or

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Divinitas and Deus that led to the condemnation of Gilbert's doctrine.

De sex principiis and commentary on the *De Trinitate* in Migne, *Patrologia Latina*, lxiv. 1255 and clxxxviii. 1257; see also Abbé Berthaud, *Gilbert de la Porrée* (Poitiers, 1892); B. Haurëau, *De la philosophie scolastique*, pp. 294-318; R. Schmid's article "Gilbert Porretanus" in Herzog-Hauck, *Realencyk. f. protest. Theol.* (vol. 6, 1899); Prantl, *Geschichte d. Logik*, ii. 215; Bach, *Dogmengeschichte*, ii. 133; article SCHOLASTICISM.

GILBERT OF SEMPRINGHAM, ST, founder of the Gilbertines, the only religious order of English origin, was born at Sempringham in Lincolnshire, *c.* 1083–1089. He was educated in France, and ordained in 1123, being presented by his father to the living of Sempringham. About 1135 he established there a convent for nuns; and to perform the heavy work and cultivate the fields he formed a number of labourers into a society of lay brothers attached to the convent. Similar establishments were founded elsewhere, and in 1147 Gilbert tried to get them incorporated in the Cistercian order. Failing in this, he proceeded to form communities of priests and clerics to perform the spiritual ministrations needed by the nuns. The women lived according to the Benedictine rule as interpreted by the Cistercians; the men according to the rule of St Augustine, and were canons regular. The special constitutions of the order were largely taken from those of the Premonstratensian canons and of the Cistercians. Like Fontevrault (*q.v.*) it was a double order, the communities of men and women living side by side; but, though the property all belonged to the nuns, the superior of the canons was the head of the whole establishment, and the general superior was a canon, called "Master of Sempringham." The general chapter was a mixed assembly composed of two canons and two nuns from each house; the nuns had to travel to the chapter in closed carts. The office was celebrated together in the church, a high stone screen separating the two choirs of canons and nuns. The order received papal approbation in 1148. By Gilbert's death (1189) there were nine double monasteries and four of canons only, containing about 700 canons and 1000 nuns in all. At the dissolution there were some 25 monasteries, whereof 4 ranked among the greater monasteries (see list in F. A. Gasquet's *English Monastic Life*). The order never spread beyond England. The habit of the Gilbertines was black, with a white cloak.

See Bollandists' *Acta Sanctorum* (4th of Feb.); William Dugdale, *Monasticon* (1846); Helyot, *Hist. des ordres religieux* (1714), ii. c. 29. The best modern account is *St Gilbert of Sempringham, and the Gilbertines*, by Rose Graham (1901). The art. in *Dictionary of National Biography* gives abundant information on St Gilbert, but is unsatisfactory on the order, as it might easily convey the impression that the canons and nuns lived together, whereas they were most carefully separated; and altogether undue prominence is given to a single scandal. Miss Graham declares that the reputation of the order was good until the end. (E. C. B.)

GILBERT POLIOT (d. 1187), bishop of Hereford, and of London, is first mentioned as a monk of Cluny, whence he was called in 1136 to plead the cause of the empress Matilda against Stephen at the Roman court. Shortly afterwards he became prior of Cluny; then prior of Abbéville, a house dependent upon Cluny. In 1139 he was elected abbot of Gloucester. The appointment was confirmed by Stephen, and from the ecclesiastical point of view was unexceptionable. But the new abbot proved himself a valuable ally of the empress, and her ablest controversialist. Gilbert's reputation grew rapidly. He was respected at Rome; and he acted as the representative of the primate, Theobald, in the supervision of the Welsh church. In 1148, on being nominated by the pope to the see of Hereford, Gilbert with characteristic wariness sought confirmation both from Henry of Anjou and from Stephen. But he was an Angevin at heart, and after 1154 was treated by Henry II. with every mark of consideration. He was Becket's rival for the primacy, and the only bishop who protested against the king's choice. Becket, with rare forbearance, endeavoured to win his friendship by procuring for him the see of London (1163). But Gilbert evaded the customary profession of obedience to the primate, and apparently aspired to make his see independent of Canterbury. On the questions raised by the Constitutions of Clarendon he sided with the king, whose confessor he had now become. He urged Becket to yield, and, when this advice was rejected, encouraged his fellow-bishops to repudiate the authority of the archbishop. In the years of controversy which followed Becket's flight the king depended much upon the bishop's skill as a disputant and diplomatist. Gilbert was twice excommunicated by Becket, but both on these and on other occasions he showed great dexterity in detaching the pope from the cause of the exile. To him it was chiefly due that Henry avoided an open conflict with Rome of the kind which John afterwards provoked. Gilbert was one of the bishops whose excommunication in 1170 provoked the king's knights to murder Becket; but he cannot be reproached with any share in the crime. His later years were uneventful, though he enjoyed great influence with the king and among his fellow-bishops. Scholarly, dignified, ascetic in his private life, devoted to the service of the Church, he was nevertheless more respected than loved. His nature was cold; he made few friends; and the taint of a calculating ambition runs through his whole career. He died in the spring of 1187.

See Gilbert's *Letters*, ed. J. A. Giles (Oxford, 1845); *Materials for the History of Thomas Becket*, ed. J. C. Robertson (Rolls series, 1875–1885); and Miss K. Norgate's *England under the Angevin Kings* (1887). (H. W. C. D.)

GILBERT (KINGSMILL) **ISLANDS,** an extensive archipelago belonging to Great Britain in the mid-western Pacific Ocean, lying N. and S. of the equator, and between 170° and 180° E. There are sixteen islands, all coral reefs or atolls, extending in crescent form over about five degrees of latitude. The principal is Taputenea or Drummond Island. The soil, mostly of coral sand, is productive of little else than the coco-nut palm, and the chief source of food supply is the sea. The population of these islands presents a remarkable phenomenon; in spite of adverse conditions of environment and complete barbarism it is exceedingly dense, in strong contradistinction to that of many other more favoured islands. The land area of the group is only 166 m., yet the population is about 30,000. The Gilbert islanders are a dark and coarse type of the Polynesian race, and show signs of much crossing. They are tall and stout, with an average height of 5 ft. 8 in., and are of a vigorous, energetic temperament. They are nearly always naked, but wear a conical hat of pandanus leaf. In war they have an armour of plaited coco-nut fibres. They are fierce fighters, their chief weapon being a sword armed with sharks' teeth. Their canoes are well made of coco-nut wood boards sewn neatly together and fastened on frames. British and American missionary work has been prosecuted with some success. The large population led to the introduction of natives from these islands into Hawaii as labourers in 1878–1884, but they were not found satisfactory. The islands were discovered by John Byron in 1765 (one of them bearing his name); Captains Gilbert and Marshall visited them in 1788; and they were annexed by Great Britain in 1892.

GILBEY, SIR WALTER, 1ST BART. (1831–), English wine-merchant, was born at Bishop Stortford, Herfordshire, in 1831. His father, the owner and frequently the driver of the daily coach between Bishop Stortford and London, died when he was eleven years old, and young Gilbey was shortly afterwards placed in the office of an estate agent at Tring, subsequently obtaining a clerkship in a firm of parliamentary agents in London. On the outbreak of the Crimean War, Walter Gilbey and his younger brother, Alfred, volunteered for civilian service at the front, and were employed at a convalescent hospital on the Dardanelles. Returning to London on the declaration of peace, Walter and Alfred Gilbey, on the advice of their eldest brother, Henry Gilbey, a wholesale wine-merchant, started in the retail wine and spirit trade. The heavy duty then levied by the British government on French, Portuguese and Spanish wines was prohibitive of a sale among the English middle classes, and especially lower middle classes, whose usual alcoholic beverage was accordingly beer. Henry Gilbey was of opinion that these classes would gladly drink wine if they could get it at a moderate price, and by his advice Walter and Alfred determined to push the sales of colonial, and particularly of Cape, wines, on which

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the duty was comparatively light. Backed by capital obtained through Henry Gilbey, they accordingly opened in 1857 a small retail business in a basement in Oxford Street, London. The Cape wines proved popular, and within three years the brothers had 20,000 customers on their books. The creation of the off-licence system by Mr Gladstone, then chancellor of the exchequer, in 1860, followed by the large reduction in the duty on French wines effected by the commercial treaty between England and France in 1861, revolutionized their trade and laid the foundation of their fortunes. Three provincial grocers, who had been granted the new off-licence, applied to be appointed the Gilbeys' agents in their respective districts, and many similar applications followed. These were granted, and before very long a leading local grocer was acting as the firm's agents in every district in England. The grocer who dealt in the Gilbeys' wines and spirits was not allowed to sell those of any other firm, and the Gilbeys in return handed over to him all their existing customers in his district. This arrangement was of mutual advantage, and the Gilbeys' business increased so rapidly that in 1864 Henry Gilbey abandoned his own undertaking to join his brothers. In 1867 the three brothers secured the old Pantheon theatre and concert hall in Oxford Street for their headquarters. In 1875 the firm purchased a large claret-producing estate in Médôc, on the banks of the Gironde, and became also the proprietors of two large whisky-distilleries in Scotland. In 1893 the business was converted, for family reasons, into a private limited liability company, of which Walter Gilbey, who in the same year was created a baronet, was chairman. Sir Walter Gilbey also became well known as a breeder of shire horses, and he did much to improve the breed of English horses (other than race-horses) generally, and wrote extensively on the subject. He became president of the Shire Horse Society, of the Hackney Horse Society, and of the Hunters' Improvement Society, and he was the founder and chairman of the London Cart Horse Parade Society. He was also a practical agriculturist, and president of the Royal Agricultural Society.

GILDAS, or GILDUS (*c.* 516–570), the earliest of British historians (see CELT: *Literature*, "Welsh"), surnamed by some Sapiens, and by others Badonicus, seems to have been born in the year 516. Regarding him little certain is known, beyond some isolated particulars that may be gathered from hints dropped in the course of his work. Two short treatises exist, purporting to be lives of Gildas, and ascribed respectively to the 11th and 12th centuries; but the writers of both are believed to have confounded two, if not more, persons that had borne the name. It is from an incidental remark of his own, namely, that the year of the siege of Mount Badon—one of the battles fought between the Saxons and the Britons—was also the year of his own nativity, that the date of his birth has been derived; the place, however, is not mentioned. His assertion that he was moved to undertake his task mainly by "zeal for God's house and for His holy law," and the very free use he has made of quotations from the Bible, leave scarcely a doubt that he was an ecclesiastic of some order or other. In addition, we learn that he went abroad, probably to France, in his thirty-fourth year, where, after 10 years of hesitation and preparation, he composed, about 560, the work bearing his name. His materials, he tells us, were collected from foreign rather than native sources, the latter of which had been put beyond his reach by circumstances. The *Cambrian Annals* give 570 as the year of his death.

The writings of Gildas have come down to us under the title of *Gildae Sapientis de excidio Britanniae liber querulus*. Though at first written consecutively, the work is now usually divided into three portions,—a preface, the history proper, and an epistle,—the last, which is largely made up of passages and texts of Scripture brought together for the purpose of condemning the vices of his countrymen and their rulers, being the least important, though by far the longest of the three. In the second he passes in brief review the history of Britain from its invasion by the Romans till his own times. Among other matters reference is made to the introduction of Christianity in the reign of Tiberius; the persecution under Diocletian; the spread of the Arian heresy; the election of Maximus as emperor by the legions in Britain, and his subsequent death at Aquileia; the incursions of the Picts and Scots into the southern part of the island; the temporary assistance rendered to the harassed Britons by the Romans; the final abandonment of the island by the latter; the coming of the Saxons and their reception by Guortigern (Vortigern); and, finally, the conflicts between the Britons, led by a noble Roman, Ambrosius Aurelianus, and the new invaders. Unfortunately, on almost every point on which he touches, the statements of Gildas are vague and obscure. With one exception already alluded to, no dates are given, and events are not always taken up in the order of their occurrence. These faults are of less importance during the period when Greek and Roman writers notice the affairs of Britain; but they become more serious when, as is the case from nearly the beginning of the 5th century to the date of his death, Gildas's brief narrative is our only authority for most of what passes current as the history of our island during those years. Thus it is on his sole, though in this instance perhaps trustworthy, testimony that the famous letter rests, said to have been sent to Rome in 446 by the despairing Britons, commencing:—"To Agitius (Aetius), consul for the third time, the groans of the Britons."

Gildas's treatise was first published in 1525 by Polydore Vergil, but with many avowed alterations and omissions. In 1568 John Josselinc, secretary to Archbishop Parker, issued a new edition of it more in conformity with manuscript authority; and in 1691 a still more carefully revised edition appeared at Oxford by Thomas Gale. It was frequently reprinted on the Continent during the 16th century, and once or twice since. The next English edition, described by Potthast as *editio pessima*, was that published by the English Historical Society in 1838, and edited by the Rev. J. Stevenson. The text of Gildas founded on Gale's edition collated with two other MSS., with elaborate introductions, is included in the *Monumenta historica Britannica*, edited by Petrie and Sharpe (London, 1848). Another edition is in A. W. Haddan and W. Stubbs, *Councils and Eccles. Documents* relating to Great Britain (Oxford, 1869); the latest edition is that by Theodor Mommsen in *Monum. Germ. hist. auct. antiq.* xiii. (Chronica min. iii.), 1894.

GILDER, RICHARD WATSON (1844–1909), American editor and poet, was born in Bordentown, New Jersey, on the 8th of February 1844, a brother of William Henry Gilder (1838–1900), the Arctic explorer. He was educated at Bellevue Seminary, an institution conducted by his father, the Rev. William Henry Gilder (1812–1864), in Flushing, Long Island. After three years (1865–1868) on the Newark, New Jersey, *Daily Advertiser*, he founded, with Newton Crane, the Newark *Morning Register*. In 1869 he became editor of *Hours at Home*, and in 1870 assistant editor of *Scribner's Monthly* (eleven years later re-named *The Century Magazine*), of which he became editor in 1881. He was one of the founders of the Free Art League, of the International Copyright League, and of the Authors' Club; was chairman of the New York Tenement House Commission in 1894; and was a prominent member of the National Institute of Arts and Letters, of the Council of the National Civil Service Reform League, and of the executive committee of the Citizens' Union of New York City. His poems, which are essentially lyrical, have been collected in various volumes, including *Five Books of Song* (1894), *In Palestine and other Poems* (1898), *Poems and Inscriptions* (1901), and *In the Heights* (1905). A complete edition of his poems was published in 1908. He also edited "*Sonnets from the Portuguese*" *and other Poems by Elizabeth Barrett Browning*; "*One Word More*" *and other Poems by Robert Browning* (1905). He died in New York on the 18th of November 1909. His wife, Helena de Kay, a grand-daughter of Joseph Rodman Drake, assisted, with Saint Gaudens and others, in founding the Society of American Artists, now merged in the National Academy, and the Art Students' League of New York. She translated Sensier's biography of Millet, and painted, before her marriage in 1874, studies in flowers and ideal heads, much admired for their feeling and delicate colouring.

GILDERSLEEVE, BASIL LANNEAU (1831–), American classical scholar, was born in Charleston, South Carolina, on the 23rd of October 1831, son of Benjamin Gildersleeve (1791–1875,) a Presbyterian evangelist, and editor of the Charleston *Christian Observer* in 1826–1845, of the Richmond (Va.) *Watchman and*

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Observer in 1845–1856, and of *The Central Presbyterian* in 1856–1860. The son graduated at Princeton in 1840, studied under Franz in Berlin, under Friedrich Ritschl at Bonn and under Schneidewin at Göttingen, where he received his doctor's degree in 1853. From 1856 to 1876 he was professor of Greek in the University of Virginia, holding the chair of Latin also in 1861–1866; and in 1876 he became professor of Greek in the newly founded Johns Hopkins University. In 1880 *The American Journal of Philology*, a quarterly published by the Johns Hopkins University, was established under his editorial charge, and his strong personality was expressed in the department of the *Journal* headed " Brief Report " or " Lanx Satura," and in the earliest years of its publication every petty detail was in his hands. His style in it, as elsewhere, is in striking contrast to that of the typical classical scholar, and accords with his conviction that the true aim of scholarship is " that which is." He published a *Latin Grammar* (1867; revised with the co-operation of Gonzalez B. Lodge, 1894 and 1899) and a Latin Series for use in secondary schools (1875), both marked by lucidity of order and mastery of grammatical theory and methods. His edition of *Persius* (1875) is of great value. But his bent was rather toward Greek than Latin. His special interest in Christian Greek was partly the cause of his editing in 1877 *The Apologies of Justin Martyr*, " which " (to use his own words) " I used unblushingly as a repository for my syntactical formulae." Gildersleeve's studies under Franz had no doubt quickened his interest in Greek syntax, and his logic, untrammelled by previous categories, and his marvellous sympathy with the language were displayed in this most unlikely of places. His *Syntax of Classic Greek* (Part I., 1900, with C. W. E. Miller) collects these formulae. Gildersleeve edited in 1885 *The Olympian and Pythian Odes of Pindar*, with a brilliant and valuable introduction. His views on the function of grammar were summarized in a paper on *The Spiritual Rights of Minute Research* delivered at Bryn Mawr on the 16th of June 1895. His collected contributions to literary periodicals appeared in 1890 under the title *Essays and Studies Educational and Literary*.

GILDING, the art of spreading gold, either by mechanical or by chemical means, over the surface of a body for the purpose of ornament. The art of gilding was known to the ancients. According to Herodotus, the Egyptians were accustomed to gild wood and metals; and gilding by means of gold plates is frequently mentioned in the Old Testament. Pliny informs us that the first gilding seen at Rome was after the destruction of Carthage, under the censorship of Lucius Mummius, when the Romans began to gild the ceilings of their temples and palaces, the Capitol being the first place on which this enrichment was bestowed. But he adds that luxury advanced on them so rapidly that in a little time you might see all, even private and poor persons, gild the walls, vaults, and other parts of their dwellings. Owing to the comparative thickness of the gold-leaf used in ancient gilding, the traces of it which yet remain are remarkably brilliant and solid. Gilding has in all times occupied an important place in the ornamental arts of Oriental countries; and the native processes pursued in India at the present day may be taken as typical of the arts as practised from the earliest periods. For the gilding of copper, employed in the decoration of temple domes and other large works, the following is an outline of the processes employed. The metal surface is thoroughly scraped, cleaned and polished, and next heated in a fire sufficiently to remove any traces of grease or other impurity which may remain from the operation of polishing. It is then dipped in an acid solution prepared from dried unripe apricots, and rubbed with pumice or brick powder. Next, the surface is rubbed over with mercury which forms a superficial amalgam with the copper, after which it is left some hours in clean water, again washed with the acid solution, and dried. It is now ready for receiving the gold, which is laid on in leaf, and, on adhering, assumes a grey appearance from combining with the mercury, but on the application of heat the latter metal volatilizes, leaving the gold a dull greyish hue. The colour is brought up by means of rubbing with agate burnishers. The weight of mercury used in this process is double that of the gold laid on, and the thickness of the gilding is regulated by the circumstances or necessities of the case. For the gilding of iron or steel, the surface is first scratched over with chequered lines, then washed in a hot solution of green apricots, dried and heated just short of red-heat. The gold-leaf is then laid on, and rubbed in with agate burnishers, when it adheres by catching into the prepared scratched surface.

Modern gilding is applied to numerous and diverse surfaces and by various distinct processes, so that the art is prosecuted in many ways, and is part of widely different ornamental and useful arts. It forms an important and essential part of frame-making (see CARVING AND GILDING); it is largely employed in connexion with cabinet-work, decorative painting and house ornamentation; and it also bulks largely in bookbinding and ornamental leather work. Further, gilding is much employed for coating baser metals, as in button-making, in the gilt toy trade, in electro-gilt reproductions and in electro-plating; and it is also a characteristic feature in the decoration of pottery, porcelain and glass. The various processes fall under one or other of two heads—mechanical gilding and gilding by chemical agency.

Mechanical Gilding embraces all the operations by which gold-leaf is prepared (see GOLDBEATING), and the several processes by which it is mechanically attached to the surface it is intended to cover. It thus embraces the burnish or water-gilding and the oil-gilding of the carver and gilder, and the gilding operations of the house decorator, the sign-painter, the bookbinder, the paper-stainer and several others. Polished iron, steel and other metals are gilt mechanically by applying gold-leaf to the metallic surface at a temperature just under red-heat, pressing the leaf on with a burnisher and reheating, when additional leaf may be laid on. The process is completed by cold burnishing.

Chemical Gilding embraces those processes in which the gold used is at some stage in a state of chemical combination. Of these the following are the principal:—

Cold Gilding.—In this process the gold is obtained in a state of extremely fine division, and applied by mechanical means. Cold gilding on silver is performed by a solution of gold in aqua-regia, applied by dipping a linen rag into the solution, burning it, and rubbing the black and heavy ashes on the silver with the finger or a piece of leather or cork. *Wet gilding* is effected by means of a dilute solution of chloride of gold with twice its quantity of ether. The liquids are agitated and allowed to rest, when the ether separates and floats on the surface of the acid. The whole mixture is then poured into a funnel with a small aperture, and allowed to rest for some time, when the acid is run off and the ether separated. The ether will be found to have taken up all the gold from the acid, and may be used for gilding iron or steel, for which purpose the metal is polished with the finest emery and spirits of wine. The ether is then applied with a small brush, and as it evaporates it deposits the gold, which can now be heated and polished. For small delicate figures a pen or a fine brush may be used for laying on the ether solution. *Fire-gilding or Water-gilding* is a process by which an amalgam of gold is applied to metallic surfaces, the mercury being subsequently volatilized, leaving a film of gold or an amalgam containing from 13 to 16% of mercury. In the preparation of the amalgam the gold must first be reduced to thin plates or grains, which are heated red hot, and thrown into mercury previously heated, till it begins to smoke. Upon stirring the mercury with an iron rod, the gold totally disappears. The proportion of mercury to gold is generally as six or eight to one. When the amalgam is cold it is squeezed through chamois leather for the purpose of separating the superfluous mercury; the gold, with about twice its weight of mercury, remains behind, forming a yellowish silvery mass of the consistence of butter. When the article to be gilt is wrought or chased, it ought to be covered with mercury before the amalgam is applied, that this may be more easily spread; but when the surface of the metal is plain, the amalgam may be applied to it directly. When no such preparation is applied, the surface to be gilded is simply bitten and cleaned with nitric acid. A deposit of mercury is obtained on a metallic surface by means of " quicksilver water," a solution of nitrate of mercury,—the nitric acid attacking the metal to which it is applied, and thus leaving a film of free metallic mercury. The amalgam being equally spread over the prepared surface of the metal, the mercury is then sublimed by a heat just sufficient for that purpose; for, if it is too great, part of the gold may be driven off, or it may run together and leave some of the surface of the metal bare. When the mercury has evaporated, which is known by the surface having entirely become of a dull yellow colour, the metal must undergo other operations, by which the fine gold colour is given to it. First, the gilded surface is rubbed with a scratch brush of brass wire, until its surface be smooth; then it is covered over with a composition called " gilding wax," and again exposed to the fire until the wax is burnt off. This wax is composed of beeswax mixed with some of the following substances,

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viz. red ochre, verdigris, copper scales, alum, vitriol, borax. By this operation the colour of the gilding is heightened; and the effect seems to be produced by a perfect dissipation of some mercury remaining after the former operation. The dissipation is well effected by this equable application of heat. The gilt surface is then covered over with nitre, alum or other salts, ground together, and mixed up into a paste with water or weak ammonia. The piece of metal thus covered is exposed to a certain degree of heat, and then quenched in water. By this method its colour is further improved and brought nearer to that of gold, probably by removing any particles of copper that may have been on the gilt surface. This process, when skilfully carried out, produces gilding of great solidity and beauty; but owing to the exposure of the workmen to mercurial fumes, it is very unhealthy, and further there is much loss of mercury. Numerous contrivances have been introduced to obviate these serious evils. Gilt brass buttons used for uniforms are gilt by this process, and there is an act of parliament (1796) yet unrepealed which prescribes 5 grains of gold as the smallest quantity that may be used for the gilding of 12 dozen of buttons 1 in. in diameter.

Gilding of Pottery and Porcelain.—The quantity of gold consumed for these purposes is very large. The gold used is dissolved in aqua-regia, and the acid is driven off by heat, or the gold may be precipitated by means of sulphate of iron. In this pulverulent state the gold is mixed with $\frac{1}{13}$th of its weight of oxide of bismuth, together with a small quantity of borax and gum water. The mixture is applied to the articles with a camel's hair pencil, and after passing through the fire the gold is of a dingy colour, but the lustre is brought out by burnishing with agate and bloodstone, and afterwards cleaning with vinegar or white-lead.

GILDS, or GUILDS. Medieval gilds were voluntary associations formed for the mutual aid and protection of their members. Among the gildsmen there was a strong spirit of fraternal co-operation or Christian brotherhood, with a mixture of worldly and religious ideals—the support of the body and the salvation of the soul. Early meanings of the root *gild* or *geld* were expiation, penalty, sacrifice or worship, feast or banquet, and contribution or payment; it is difficult to determine which is the earliest meaning, and we are not certain whether the gildsmen were originally those who contributed to a common fund or those who worshipped or feasted together. Their fraternities or societies may be divided into two classes: religious or benefit, merchant and craft gilds. The last two categories, which do not become prominent anywhere in Europe until the 12th century, had, like all gilds, a religious tinge, but their aims were primarily worldly, and their functions were mainly of an economic character.

1. *Origin.*—Various theories have been advanced concerning the origin of gilds. Some writers regard them as a continuation of the Roman *collegia* and *sodalitates*, but there is little evidence to prove the unbroken continuity of existence of the Roman and Germanic fraternities. A more widely accepted theory derives gilds wholly or in part from the early Germanic or Scandinavian sacrificial banquets. Much influence is ascribed to this heathen element by Lujo Brentano, Karl Hegel, W. E. Wilda and other writers. This view does not seem to be tenable, for the old sacrificial carousals lack two of the essential elements of the gilds, namely corporative solidarity or permanent association and the spirit of Christian brotherhood. Dr Max Pappenheim has ascribed the origin of Germanic gilds to the northern "foster-brotherhood" or "sworn-brotherhood," which was an artificial bond of union between two or more persons. After intermingling their blood in the earth and performing other peculiar ceremonies, the two contracting parties with grasped hands swore to avenge any injury done to either of them. The objections to this theory are fully stated by Hegel (*Städte und Gilden*, i. 250-253). The foster-brotherhood seems to have been unknown to the Franks and the Anglo-Saxons, the nations in which medieval gilds first appear; and hence Dr Pappenheim's conclusions, if tenable at all, apply only to Denmark or Scandinavia.

No theory on this subject can be satisfactory which wholly ignores the influence of the Christian church. Imbued with the idea of the brotherhood of man, the church naturally fostered the early growth of gilds and tried to make them displace the old heathen banquets. The work of the church was, however, directive rather than creative. Gilds were a natural manifestation of the associative spirit which is inherent in mankind. The same needs produce in different ages associations which have striking resemblances, but those of each age have peculiarities which indicate a spontaneous growth. It is not necessary to seek the germ of gilds in any antecedent age or institution. When the old kin-bond or *maegth* was beginning to weaken or dissolve, and the state did not yet afford adequate protection to its citizens, individuals naturally united for mutual help.

Gilds are first mentioned in the Carolingian capitularies of 779 and 789, and in the enactments made by the synod of Nantes early in the 9th century, the text of which has been preserved in the ecclesiastical ordinances of Hincmar of Rheims (A.D.852). The capitularies of 805 and 821 also contain vague references to sworn unions of some sort, and a capitulary of 884 prohibits villeins from forming associations "vulgarly called gilds" against those who have despoiled them. The Carolingians evidently regarded such "conjurations" as "conspirations" dangerous to the state. The gilds of Norway, Denmark and Sweden are first mentioned in the 11th, 12th and 14th centuries respectively; those of France and the Netherlands in the 11th.

Many writers believe that the earliest references to gilds come from England. The laws of Ine speak of *gegildan* who help each other pay the *wergeld*, but it is not entirely certain that they were members of gild fraternities in the later sense. These are more clearly referred to in England in the second half of the 9th century, though we have little information concerning them before the 11th century. To the first half of that century belong the statutes of the fraternities of Cambridge, Abbotsbury and Exeter. They are important because they form the oldest body of gild ordinances extant in Europe. The thanes' gild at Cambridge afforded help in blood-feuds, and provided for the payment of the *wergeld* in case a member killed any one. The religious element was more prominent in Orcy's gild at Abbotsbury and in the fraternity at Exeter; their ordinances exhibit much solicitude for the salvation of the brethren's souls. The Exeter gild also gave assistance when property was destroyed by fire. Prayers for the dead, attendance at funerals of gildsmen, periodical banquets, the solemn entrance oath, fines for neglect of duty and for improper conduct, contributions to a common purse, mutual assistance in distress, periodical meetings in the gildhall,—in short, all the characteristic features of the later gilds already appear in the statutes of these Anglo-Saxon fraternities. Some continental writers, in dealing with the origin of municipal government throughout western Europe, have, however, ascribed too much importance to the Anglo-Saxon gilds, exaggerating their prevalence and contending that they form the germ of medieval municipal government. This view rests almost entirely on conjecture; there is no good evidence to show that there was any organic connexion between gilds and municipal government in England before the coming of the Normans. It should also be noted that there is no trace of the existence of either craft or merchant gilds in England before the Norman Conquest. Commerce and industry were not yet sufficiently developed to call for the creation of such associations.

2. *Religious Gilds after the Norman Conquest.*—Though we have not much information concerning the religious gilds in the 12th century, they doubtless flourished under the Anglo-Norman kings, and we know that they were numerous, especially in the boroughs, from the 13th century onward. In 1388 parliament ordered that every sheriff in England should call upon the masters and wardens of all gilds and brotherhoods to send to the king's council in Chancery, before the 2nd of February 1389, full returns regarding their foundation, ordinances and property. Many of these returns were edited by J. Toulmin Smith (1816–1869), and they throw much light on the functions of the gilds. Their ordinances are similar to those of the above-mentioned Anglo-Saxon fraternities. Each member took an oath of admission, paid an entrance-fee, and made a small annual contribution to the common fund. The brethren were aided in old age, sickness and poverty, often also in cases of loss by robbery, shipwreck and conflagration; for example, any member of the gild of St Catherine, Aldersgate, was to be assisted if he "fall into poverty or be injured through age, or through fire or water, thieves or sickness." Alms were often

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given even to non-gildsmen; lights were supported at certain altars; feasts and processions were held periodically; the funerals of brethren were attended; and masses for the dead were provided from the common purse or from special contributions made by the gildsmen. Some of the religious gilds supported schools, or helped to maintain roads, bridges and town-walls, or even came, in course of time, to be closely connected with the government of the borough; but, as a rule, they were simply private societies with a limited sphere of activity. They are important because they played a prominent rôle in the social life of England, especially as eleemosynary institutions, down to the time of their suppression in 1547. Religious gilds, closely resembling those of England, also flourished on the continent during the middle ages.

3. *The Gild Merchant.*—The merchant and craft fraternities are particularly interesting to students of economic and municipal history. The gild merchant came into existence in England soon after the Norman Conquest, as a result of the increasing importance of trade, and it may have been transplanted from Normandy. Until clearer evidence of foreign influence is found, it may, however, be safer to regard it simply as a new application of the old gild principle, though this new application may have been stimulated by continental example. The evidence seems to indicate the pre-existence of the gild merchant in Normandy, but it is not mentioned anywhere on the continent before the 11th century. It spread rapidly in England, and from the reign of John onward we have evidence of its existence in many English boroughs. But in some prominent towns, notably London, Colchester, Norwich and the Cinque Ports, it seems never to have been adopted. In fact it played a more conspicuous rôle in the small boroughs than in the large ones. It was regarded by the townsmen as one of their most important privileges. Its chief function was to regulate the trade monopoly conveyed to the borough by the royal grant of *gilda mercatoria*. A grant of this sort implied that the gildsmen had the right to trade freely in the town, and to impose payments and restrictions upon others who desired to exercise that privilege. The ordinances of a gild merchant thus aim to protect the brethren from the commercial competition of strangers or non-gildsmen. More freedom of trade was allowed at all times in the selling of wares by wholesale, and also in retail dealings during the time of markets and fairs. The ordinances were enforced by an alderman with the assistance of two or more deputies, or by one or two masters, wardens or keepers. The *Morwenspeches* were periodical meetings at which the brethren feasted, revised their ordinances, admitted new members, elected officers and transacted other business.

It has often been asserted that the gild merchant and the borough were identical, and that the former was the basis of the whole municipal constitution. But recent research has discredited this theory both in England and on the continent. Much evidence has been produced to show that gild and borough, gildsmen and burgesses, were originally distinct conceptions, and that they continued to be discriminated in most towns throughout the middle ages. Admission to the gild was not restricted to burgesses; nor did the brethren form an aristocratic body having control over the whole municipal polity. No good evidence has, moreover, been advanced to prove that this or any other kind of gild was the germ of the municipal constitution. On the other hand, the gild merchant was certainly an official organ or department of the borough administration, and it exerted considerable influence upon the economic and corporative growth of the English municipalities.

Historians have expressed divergent views regarding the early relations of the craftsmen and their fraternities to the gild merchant. One of the main questions in dispute is whether artisans were excluded from the gild merchant. Many of them seem to have been admitted to membership. They were regarded as merchants, for they bought raw material and sold the manufactured commodity; no sharp line of demarcation was drawn between the two classes in the 12th and 13th centuries. Separate societies of craftsmen were formed in England soon after the gild merchant came into existence; but at first they were few in number. The gild merchant did not give birth to craft fraternities or have anything to do with their origin; nor did it delegate its authority to them. In fact, there seems to have been little or no organic connexion between the two classes of gilds. As has already been intimated, however, many artisans probably belonged both to their own craft fraternity and to the gild merchant, and the latter, owing to its great power in the town, may have exercised some sort of supervision over the craftsmen and their societies. When the king bestowed upon the tanners or weavers or any other body of artisans the right to have a gild, they secured the monopoly of working and trading in their branch of industry. Thus with every creation of a craft fraternity the gild merchant was weakened and its sphere of activity was diminished, though the new bodies were subsidiary to the older and larger fraternity. The greater the commercial and industrial prosperity of a town, the more rapid was the multiplication of craft gilds, which was a natural result of the ever-increasing division of labour. The old gild merchant remained longest intact and powerful in the smaller boroughs, in which, owing to the predominance of agriculture, few or no craft gilds were formed. In some of the larger towns the crafts were prominent already in the 13th century, but they became much more prominent in the first half of the 14th century. Their increase in number and power was particularly rapid in the time of Edward III., whose reign marks an era of industrial progress. Many master craftsmen now became wealthy employers of labour, dealing extensively in the wares which they produced. The class of dealers or merchants, as distinguished from trading artisans, also greatly increased and established separate fraternities. When these various unions of dealers and of craftsmen embraced all the trades and branches of production in the town, little or no vitality remained in the old gild merchant; it ceased to have an independent sphere of activity. The tendency was for the single organization, with a general monopoly of trade, to be replaced by a number of separate organizations representing the various trades and handicrafts. In short, the function of guarding and supervising the trade monopoly split up into various fragments, the aggregate of the crafts superseding the old general gild merchant. This transference of the authority of the latter to a number of distinct bodies and the consequent disintegration of the old organization was a gradual spontaneous movement,—a process of slow displacement, or natural growth and decay, due to the play of economic forces,—which, generally speaking, may be assigned to the 14th and 15th centuries, the very period in which the craft gilds attained the zenith of their power. While in most towns the name and the old organization of the gild merchant thus disappeared and the institution was displaced by the aggregate of the crafts towards the close of the middle ages, in some places it survived long after the 15th century either as a religious fraternity, shorn of its old functions, or as a periodical feast, or as a vague term applied to the whole municipal corporation.

On the continent of Europe the medieval gild merchant played a less important rôle than in England. In Germany, France and the Netherlands it occupies a less prominent place in the town charters and in the municipal polity, and often corresponds to the later fraternities of English dealers established either to carry on foreign commerce or to regulate a particular part of the local trade monopoly.

4. *Craft Gilds.*—A craft gild usually comprised all the artisans in a single branch of industry in a particular town. Such a fraternity was commonly called a "mistery" or "company" in the 15th and 16th centuries, though the old term "gild" was not yet obsolete. "Gild" was also a common designation in north Germany, while the corresponding term in south Germany was *Zunft*, and in France *métier*. These societies are not clearly visible in England or on the continent before the early part of the 12th century. With the expansion of trade and industry the number of artisans increased, and they banded together for mutual protection. Some German writers have maintained that these craft organizations emanated from

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manorial groups of workmen, but strong arguments have been advanced against the validity of this theory (notably by F. Keutgen). It is unnecessary to elaborate any profound theory regarding the origin of the craft gilds. The union of men of the same occupation was a natural tendency of the age. In the 13th century the trade of England continued to expand and the number of craft gilds increased. In the 14th century they were fully developed and in a flourishing condition; by that time each branch of industry in every large town had its gild. The development of these societies was even more rapid on the continent than in England.

Their organization and aims were in general the same throughout western Europe. Officers, commonly called wardens in England, were elected by the members, and their chief function was to supervise the quality of the wares produced, so as to secure good and honest workmanship. Therefore, ordinances were made regulating the hours of labour and the terms of admission to the gild, including apprenticeship. Other ordinances required members to make periodical payments to a common fund, and to participate in certain common religious observances, festivities and pageants. But the regulation of industry was always paramount to social and religious aims; the chief object of the craft gild was to supervise the processes of manufacture and to control the monopoly of working and dealing in a particular branch of industry.

We have already called attention to the gradual displacement of the gild merchant by the craft organizations. The relations of the former to the latter must now be considered more in detail. There was at no time a general struggle in England between the gild merchant and the craft gilds, though in a few towns there seems to have been some friction between merchants and artisans. There is no exact parallel in England to the conflict between these two classes in Scotland in the 16th century, or to the great continental revolution of the 13th and 14th centuries, by which the crafts threw off the yoke of patrician government and secured more independence in the management of their own affairs and more participation in the civic administration. The main causes of these conflicts on the continent were the monopoly of power by the patricians, acts of violence committed by them, their bad management of the finances and their partisan administration of justice. In some towns the victory of the artisans in the 14th century was so complete that the whole civic constitution was remodelled with the craft fraternities as a basis. A widespread movement of this sort would scarcely be found in England, where trade and industry were less developed than on the continent, and where the motives of a class conflict between merchants and craftsmen were less potent. Moreover, borough government in England seems to have been mainly democratic until the 14th or 15th century; there was no oligarchy to be depressed or suppressed. Even if there had been motives for uprisings of artisans such as took place in Germany and the Netherlands, the English kings would probably have intervened. True, there were popular uprisings in England, but they were usually conflicts between the poor and the rich; the crafts as such seldom took part in these tumults. While many continental municipalities were becoming more democratic in the 14th century, those of England were drifting towards oligarchy, towards government by a close "select body." As a rule the craft gilds secured no dominant influence in the boroughs of England, but remained subordinate to the town government. Whatever power they did secure, whether as potent subsidiary organs of the municipal polity for the regulation of trade, or as the chief or sole medium for the acquisition of citizenship, or as integral parts of the common council, was, generally speaking, the logical sequence of a gradual economic development, and not the outgrowth of a revolutionary movement by which oppressed craftsmen endeavoured to throw off the yoke of an arrogant patrician gild merchant.

Two new kinds of craft fraternities appear in the 14th century and become more prominent in the 15th, namely, the merchants' and the journeymen's companies. The misteries or companies of merchants traded in one or more kinds of wares. They were pre-eminently dealers, who sold what others produced. Hence they should not be confused with the old gild merchant, which originally comprised both merchants and artisans, and had the whole monopoly of the trade of the town. In most cases, the company of merchants was merely one of the craft organizations which superseded the gild merchant.

In the 14th century the journeymen or yeomen began to set up fraternities in defence of their rights. The formation of these societies marks a cleft within the ranks of some particular class of artisans—a conflict between employers, or master artisans, and workmen. The journeymen combined to protect their special interests, notably as regards hours of work and rates of wages, and they fought with the masters over the labour question in all its aspects. The resulting struggle of organized bodies of masters and journeymen was widespread throughout western Europe, but it was more prominent in Germany than in France or England. This conflict was indeed one of the main features of German industrial life in the 15th century. In England the fraternities of journeymen, after struggling a while for complete independence, seem to have fallen under the supervision and control of the masters' gilds; in other words, they became subsidiary or affiliated organs of the older craft fraternities.

An interesting phenomenon in connexion with the organization of crafts is their tendency to amalgamate, which is occasionally visible in England in the 15th century, and more frequently in the 16th and 17th. A similar tendency is visible in the Netherlands and in some other parts of the continent already in the 14th century. Several fraternities—old gilds or new companies, with their respective cognate or heterogeneous branches of industry and trade—were fused into one body. In some towns all the crafts were thus consolidated into a single fraternity; in this case a body was reproduced which regulated the whole trade monopoly of the borough, and hence bore some resemblance to the old gild merchant.

In dealing briefly with the modern history of craft gilds, we may confine our attention to England. In the Tudor period the policy of the crown was to bring them under public or national control. Laws were passed, for example in 1503, requiring that new ordinances of "fellowships of crafts or misteries" should be approved by the royal justices or by other crown officers; and the authority of the companies to fix the price of wares was thus restricted. The statute of 5 Elizabeth, c. 4, also curtailed their jurisdiction over journeymen and apprentices (see APPRENTICESHIP).

The craft fraternities were not suppressed by the statute of 1547 (1 Edward VI.). They were indeed expressly exempted from its general operation. Such portions of their revenues as were devoted to definite religious observances were, however, appropriated by the crown. The revenues confiscated were those used for "the finding, maintaining or sustentation of any priest or of any anniversary, or obit, lamp, light or other such things." This has been aptly called "the disendowment of the religion of the misteries." Edward VI.'s statute marks no break of continuity in the life of the craft organizations. Even before the Reformation, however, signs of decay had already begun to appear, and these multiplied in the 16th and 17th centuries. The old gild system was breaking down under the action of new economic forces. Its dissolution was due especially to the introduction of new industries, organized on a more modern basis, and to the extension of the domestic system of manufacture. Thus the companies gradually lost control over the regulation of industry, though they still retained their old monopoly in the 17th century, and in many cases even in the 18th. In fact, many craft fraternities still survived in the second half of the 18th century, but their usefulness had disappeared. The medieval form of association was incompatible with the new ideas of individual liberty and free competition, with the greater separation of capital and industry, employers and workmen, and with the introduction of the factory system. Intent only on promoting their own interests and disregarding the welfare of the community, the old companies had become an unmitigated evil. Attempts have been made to find in them the progenitors of the trades

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unions, but there seems to be no immediate connexion between the latter and the craft gilds. The privileges of the old fraternities were not formally abolished until 1835; and the substantial remains or spectral forms of some are still visible in other towns besides London.

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GILEAD (*i.e.* "hard" or "rugged," a name sometimes used, both in earlier and in later writers, to denote the whole of the territory occupied by the Israelites eastward of Jordan, extending from the Arnon to the southern base of Hermon (Deut. xxxiv. 1; Judg. xx. 1; Jos. *Ant.* xii. 8. 3, 4). More precisely, however, it was the usual name of that picturesque hill country which is bounded on the N by the Hieromax (Yarmuk), on the W. by the Jordan, on the S. by the Arnon, and on the E. by a line which may be said to follow the meridian of Ammân (Philadelphia or Rabbath-Ammon). It thus lies wholly within 31° 25′ and 32° 42′ N. lat. and 35° 34′ and 36° E. long., and is cut in two by the Jabbok. Excluding the narrow strip of low-lying plain along the Jordan, it has an average elevation of 2500 ft. above the Mediterranean; but, as seen from the west, the relative height is very much increased by the depression of the Jordan valley. The range from the same point of view presents a singularly uniform outline, having the appearance of an unbroken wall; in reality, however, it is traversed by a number of deep ravines (wadis), of which the most important are the Yâbis, the Ajlûn, the Râjib, the Zerka (Jabbok), the Hesban, and the Zerka Ma'în. The great mass of the Gilead range is formed of Jura limestone, the base slopes being sandstone partly covered by white marls. The eastern slopes are comparatively bare of trees; but the western are well supplied with oak, terebinth and pine. The pastures are everywhere luxuriant, and the wooded heights and winding glens, in which the tangled shrubbery is here and there broken up by open glades and flat meadows of green turf, exhibit a beauty of vegetation such as is hardly to be seen in any other district of Palestine.

The first biblical mention of "Mount Gilead" occurs in connexion with the reconcilement of Jacob and Laban (Genesis xxxi.). The composite nature of the story makes an identification of the exact site difficult, but one of the narrators (E) seems to have in mind the ridge of what is now known as Jebel Ajlûn, probably not far from Mahneh (Mahanaim), near the head of the wadi Yâbis. Some investigators incline to Sûf, or to the Jebel Kafkafa. At the period of the Israelite conquest the portion of Gilead northward of the Jabbok (Zerka) belonged to the dominions of Og, king of Bashan, while the southern half was ruled by Sihon, king of the Amorites, having been at an earlier date wrested from Moab (Numb. xxi. 24; Deut. iii. 12-16). These two sections were allotted respectively to Manasseh and to Reuben and Gad, both districts being peculiarly suited to the pastoral and nomadic character of these tribes. A somewhat wild Bedouin disposition, fostered by their surroundings, was retained by the Israelite inhabitants of Gilead to a late period of their history, and seems to be to some extent discernible in what we read alike of Jephthah, of David's Gadites, and of the prophet Elijah. As the eastern frontier of Palestine, Gilead bore the first brunt of Syrian and Assyrian attacks.

After the close of the Old Testament history the word Gilead seldom occurs. It seems to have soon passed out of use as a precise geographical designation; for though occasionally mentioned by Apocryphal writers, by Josephus, and by Eusebius, the allusions are all vague, and show that those who made them had no definite knowledge of Gilead proper. In Josephus and the New Testament the name Peraea or *πέραν τοῦ Ἰορδάνου* is most frequently used; and the country is sometimes spoken of by Josephus as divided into small provinces called after the capitals in which Greek colonists had established themselves during the reign of the Seleucidae. At present Gilead south of the Jabbok alone is known by the name of Jebel Jilad (Mount Gilead), the northern portion between the Jabbok and the Yarmuk being called Jebel Ajlûn. Jebel Jilad includes Jebel Osha, and has for its capital the town of Es-Salt. The cities of Gilead expressly mentioned in the Old Testament are Ramoth, Jabesh and Jazer. The first of these has been variously identified with Es-Salt, with Reimun, with Jerash or Gerasa, with er-Remtha, and with Salhad. Opinions are also divided on the question of its identity with Mizpeh-Gilead (see *Encyc. Biblica*, art. "Ramoth-Gilead"). Jabesh is perhaps to be found at Meriamin, less probably at ed-Deir; Jazer, at Yajuz near Jogbehah, rather than at Sar. The city named Gilead (Judg. x. 17, xii. 7; Hos. vi. 8, xii. 11) has hardly been satisfactorily explained; perhaps the text has suffered.

The "balm" (Heb. *ṣori*) for which Gilead was so noted (Gen. xlvii. 11; Jer. viii. 22, xlvi. 11; Ezek. xxvii. 17), is probably to be identified with mastic (Gen. xxxvii. 25, R.V. marg.) *i.e.* the resin yielded by the *Pistachia Lentiscus*. The modern "balm of Gilead" or "Mecca balsam," an aromatic gum produced by the *Balsamodendron opobalsamum*, is more likely the Hebrew *mōr*, which the English Bible wrongly renders "myrrh."

See G. A. Smith, *Hist. Geog.* xxiv. foll. (R. A. S. M.)

GILES (Gil, Gilles), **ST**, the name given to an abbot whose festival is celebrated on the 1st of September. According to the legend, he was an Athenian (Αἰγίδιος, Aegidius) of royal descent. After the death of his parents he distributed his possessions among the poor, took ship, and landed at Marseilles. Thence he went to Arles, where he remained for two years with St Caesarius. He then retired into a neighbouring desert, where he lived upon herbs and upon the milk of a hind which came to him at stated hours. He was discovered there one day by Flavius, the king of the Goths, who built a monastery on the place, of which he was the first abbot. Scholars are very much divided as to the date of his life, some holding that he lived in the 6th century, others in the 7th or 8th. It may be regarded as certain that St Giles was buried in the hermitage which he had founded in a spot which was afterwards the town of St-Gilles (diocese of Nîmes, department of Gard). His reputation for sanctity attracted many pilgrims. Important gifts were made to the church which contained his body, and a monastery grew up hard by. It is probable that the Visigothic princes who were in possession of the country protected and enriched this monastery, and that it was destroyed by the Saracens at the time of their invasion in 721. But there are no authentic data before the 9th century concerning his history. In 808 Charlemagne took the abbey of St-Gilles under his protection, and it is mentioned among the monasteries from which only prayers for the prince and the state were due. In the 12th century the pilgrimages to St-Gilles are cited as among the most celebrated of the time. The cult of the saint, who came to be regarded as the special patron of lepers, beggars and cripples, spread very extensively over Europe, especially in England, Scotland, France, Belgium and Germany. The church of St Giles, Cripplegate, London, was built about 1090, while the hospital for lepers at St Giles-in-the-Fields (near New Oxford Street) was

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founded by Queen Matilda in 1117. In England alone there are about 150 churches dedicated to this saint. In Edinburgh the church of St Giles could boast the possession of an arm-bone of its patron. Representations of St Giles are very frequently met with in early French and German art, but are much less common in Italy and Spain.

See *Acta Sanctorum* (September), i. 284-299; Devic and Vaissete, *Histoire générale de Languedoc*, pp. 514-522 (Toulouse, 1876); E. Rembry, *Saint Gilles, sa vie, ses reliques, son culte en Belgique et dans le nord de la France* (Bruges, 1881); F. Arnold-Forster, *Studies in Church Dedications, or England's Patron Saints*, ii. 46-51, iii. 15, 363-365 (1899); A. Jameson, *Sacred and Legendary Art*, 768-770 (1896); A. Bell, *Lives and Legends of the English Bishops and Kings, Medieval Monks, and other later Saints*, pp. 61, 70, 74-78, 84, 197 (1904). (H. Dr.)

GILFILLAN, GEORGE (1813–1878), Scottish author, was born on the 30th of January 1813, at Comrie, Perthshire, where his father, the Rev. Samuel Gilfillan, the author of some theological works, was for many years minister of a Secession congregation. After an education at Glasgow University, in March 1836 he was ordained pastor of a Secession congregation in Dundee. He published a volume of his discourses in 1839, and shortly afterwards another sermon on "Hades," which brought him under the scrutiny of his co-presbyters, and was ultimately withdrawn from circulation. Gilfillan next contributed a series of sketches of celebrated contemporary authors to the *Dumfries Herald*, then edited by Thomas Aird; and these, with several new ones, formed his first *Gallery of Literary Portraits*, which appeared in 1846, and had a wide circulation. It was quickly followed by a *Second* and a *Third Gallery*. In 1851 his most successful work, the *Bards of the Bible*, appeared. His aim was that it should be "a poem on the Bible"; and it was far more rhapsodical than critical. His *Martyrs and Heroes of the Scottish Covenant* appeared in 1832, and in 1856 he produced a partly autobiographical, partly fabulous, *History of a Man*. For thirty years he was engaged upon a long poem, on *Night*, which was published in 1867, but its theme was too vast, vague and unmanageable, and the result was a failure. He also edited an edition of the *British Poets*. As a lecturer and as a preacher he drew large crowds, but his literary reputation has not proved permanent. He died on the 13th of August 1878. He had just finished a new life of Burns designed to accompany a new edition of the works of that poet.

GILGAL (Heb. for "circle" of sacred stones), the name of several places in Palestine, mentioned in the Old Testament. The name is not found east of the Jordan.

1. The first and most important was situated "in the east border of Jericho" (Josh. iv. 19), on the border between Judah and Benjamin (Josh. xv. 7). Josephus (*Ant.* v. 1. 4) places it 50 stadia from Jordan and 10 from Jericho (the New Testament site). Jerome (*Onomasticon*, s.v. "Galgal") places Gilgal 2 Roman miles from Jericho, and speaks of it as a deserted place held in wonderful veneration ("miro cultu") by the natives. This site, which in the middle ages appears to have been lost—Gilgal being shown farther north—was in 1865 recovered by a German traveller (Hermann Zschokke), and fixed by the English survey party, though not beyond dispute. It is about 2 m. east of the site of Byzantine Jericho, and 1 m. from modern er-Riha. A fine tamarisk, traces of a church (which is mentioned in the 8th century), and a large reservoir, now filled up with mud, remain. The place is called Jiljûlieh, and its position north of the valley of Achor (Wadi Kelt) and east of Jericho agrees well with the biblical indications above mentioned. A tradition connected with the fall of Jericho is attached to the site (see C. R. Conder, *Tent Work*, 203 ff.). This sanctuary and camp of Israel held a high place in the national regard, and is often mentioned in Judges and Samuel. But whether this is the Gilgal spoken of by Amos and Hosea in connexion with Bethel is by no means certain [see (3) below].

2. Gilgal, mentioned in Josh. xii. 23 in connexion with Dor, appears to have been situated in the maritime plain. Jerome (*Onomasticon*, s.v. "Gelgel") speaks of a town of the name 6 Roman miles north of Antipatris (Ras el 'Ain). This is apparently the modern Kalkilia, but about 4 m. north of Antipatris is a large village called Jiljûlieh, which is more probably the biblical town.

3. The third Gilgal (2 Kings iv. 38) was in the mountains (compare 1 Sam. vii. 16, 2 Kings ii. 1-3) near Bethel. Jerome mentions this place also (*Onomasticon*, s.v. "Galgala"). It appears to be the present village of Jiljilia, about 7 English miles north of Beitin (Bethel). It may have absorbed the old shrine of Shiloh and been the sanctuary famous in the days of Amos and Hosea.

4. Deut. xi. 30 seems to imply a Gilgal near Gerizim, and there is still a place called Juleijil on the plain of Makhna, 2½ m. S. E. of Shechem. This may have been Amos's Gilgal and was almost certainly that of 1 Macc. ix. 2.

5. The Gilgal described in Josh. xv. 7 is the same as the Beth-Gilgal of Neh. xii. 29; its site is not known. (R. A. S. M.)

GILGAMESH, EPIC OF, the title given to one of the most important literary products of Babylonia, from the name of the chief personage in the series of tales of which it is composed.

Though the Gilgamesh Epic is known to us chiefly from the fragments found in the royal collection of tablets made by Assur-bani-pal, the king of Assyria (668–626 B.C.) for his palace at Nineveh, internal evidence points to the high antiquity of at least some portions of it, and the discovery of a fragment of the epic in the older form of the Babylonian script, which can be dated as 2000 B.C., confirms this view. Equally certain is a second observation of a general character that the epic originating as the greater portion of the literature in Assur-bani-pal's collection in Babylonia is a composite product, that is to say, it consists of a number of independent stories or myths originating at different times, and united to form a continuous narrative with Gilgamesh as the central figure. This view naturally raises the question whether the independent stories were all told of Gilgamesh or, as almost always happens in the case of ancient tales, were transferred to Gilgamesh as a favourite popular hero. Internal evidence again comes to our aid to lend its weight to the latter theory.

While the existence of such a personage as Gilgamesh may be admitted, he belongs to an age that could only have preserved a dim recollection of his achievements and adventures through oral traditions. The name[1] is not Babylonian, and what evidence as to his origin there is points to his having come from Elam, to the east of Babylonia. He may have belonged to the people known as the Kassites who at the beginning of the 18th century B.C. entered Babylonia from Elam, and obtained control of the Euphrates valley. Why and how he came to be a popular hero in Babylonia cannot with our present material be determined, but the epic indicates that he came as a conqueror and established himself at Erech. In so far we have embodied in the first part of the epic dim recollections of actual events, but we soon leave the solid ground of fact and find ourselves soaring to the heights of genuine myth. Gilgamesh becomes a god, and in certain portions of the epic clearly plays the part of the sun-god of the spring-time, taking the place apparently of Tammuz or Adonis, the youthful sun-god, though the story shows traits that differentiate it from the ordinary Tammuz myths. A separate stratum in the Gilgamesh epic is formed by the story of Eabani—introduced as the friend of Gilgamesh, who joins him in his adventures. There can be no doubt that Eabani, who symbolizes primeval man, was a figure originally entirely independent of Gilgamesh, but his story was incorporated into the epic by that natural process to be observed in the national epics of other peoples, which tends to connect the favourite hero with all kinds of tales that for one reason or the other become embedded in the popular mind. Another stratum is represented by the story of a favourite of the gods known as Ut-Napishtim, who is saved from a destructive storm and flood that destroys

[1] The name of the hero, written always ideographically, was for a long time provisionally read *Izdubar*; but a tablet discovered by T. G. Pinches gave the equivalent *Gilgamesh* (see Jastrow, *Religion of Babylonia and Assyria*, p. 468).

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his fellow-citizens of Shurippak. Gilgamesh is artificially brought into contact with Ût-Napishtim, to whom he pays a visit for the purpose of learning the secret of immortal life and perpetual youth which he enjoys. During the visit Ut-Napishtim tells Gilgamesh the story of the flood and of his miraculous escape. Nature myths have been entwined with other episodes in the epic and finally the theologians took up the combined stories and made them the medium for illustrating the truth and force of certain doctrines of the Babylonian religion. In its final form, the outcome of an extended and complicated literary process, the Gilgamesh Epic covered twelve tablets, each tablet devoted to one adventure in which the hero plays a direct or indirect part, and the whole covering according to the most plausible estimate about 3000 lines. Of all twelve tablets portions have been found among the remains of Assur-bani-pal's library, but some of the tablets are so incomplete as to leave even their general contents in some doubt. The fragments do not all belong to one copy. Of some tablets portions of two, and of some tablets portions of as many as four, copies have turned up, pointing therefore to the great popularity of the production. The best preserved are Tablets VI. and XI., and of the total about 1500 lines are now known, wholly or in part, while of those partially preserved quite a number can be restored. A brief summary of the contents of the twelve may be indicated as follows:

In the 1st tablet, after a general survey of the adventures of Gilgamesh, his rule at Erech is described, where he enlists the services of all the young able-bodied men in the building of the great wall of the city. The people sigh under the burden imposed, and call upon the goddess Aruru to create a being who might act as a rival to Gilgamesh, curb his strength, and dispute his tyrannous control. The goddess consents, and creates Eabani, who is described as a wild man, living with the gazelles and the beasts of the field. Eabani, whose name, signifying "Ea creates," points to the tradition which made Ea (*q.v.*) the creator of humanity, symbolizes primeval man. Through a hunter, Eabani and Gilgamesh are brought together, but instead of becoming rivals, they are joined in friendship. Eabani is induced by the snares of a maiden to abandon his life with the animals and to proceed to Erech, where Gilgamesh, who has been told in several dreams of the coming of Eabani, awaits him. Together they proceed upon several adventures, which are related in the following four tablets. At first, indeed, Eabani curses the fate which led him away from his former life, and Gilgamesh is represented as bewailing Eabani's dissatisfaction. The sun-god Shamash calls upon Eabani to remain with Gilgamesh, who pays him all honours in his palace at Erech. With the decision of the two friends to proceed to the forest of cedars in which the goddess Irnina—a form of Ishtar—dwells, and which is guarded by Khumbaba, the 2nd tablet ends. In the 3rd tablet, very imperfectly preserved, Gilgamesh appeals through a Shamash priestess Kimat-Belit to the sun-god Shamash for his aid in the proposed undertaking. The 4th tablet contains a description of the formidable Khumbaba, the guardian of the cedar forest. In the 5th tablet Gilgamesh and Eabani reach the forest. Encouraged by dreams, they proceed against Khumbaba, and despatch him near a specially high cedar over which he held guard. This adventure against Khumbaba belongs to the Eabani stratum of the epic, into which Gilgamesh is artificially introduced. The basis of the 6th tablet is the familiar nature-myth of the change of seasons, in which Gilgamesh plays the part of the youthful solar god of the springtime, who is wooed by the goddess of fertility, Ishtar. Gilgamesh, recalling to the goddess the sad fate of those who fall a victim to her charms, rejects the offer. In the course of his recital snatches of other myths are referred to, including he famous Tammuz-Adonis tale, in which Tammuz, the youthful bridegroom, is slain by his consort Ishtar. The goddess, enraged at the insult, asks her father Anu to avenge her. A divine bull is sent to wage a contest against Gilgamesh, who is assisted by his friend Eabani. This scene of the fight with the bull is often depicted on seal cylinders. The two friends by their united force succeed in killing the bull, and then after performing certain votive and purification rites return to Erech, where they are hailed with joy In this adventure it is clearly Eabani who is artificially introduced in order to maintain the association with Gilgamesh. The 7th tablet continues the Eabani stratum. The hero is smitten with sore disease, but the fragmentary condition of this and the succeeding tablet is such as to envelop in doubt the accompanying circumstances, including the cause and nature of his discase. The 8th tablet records the death of Eabani. The 9th and 10th tablets, exclusively devoted to Gilgamesh, describe his wanderings in quest of Ut-Napishtim, from whom he hopes to learn how he may escape the fate that has overtaken his friend Eabani. He goes through mountain passes and encounters lions. At the entrance to the mountain Mashu, scorpion-men stand guard, from one of whom he receives advice as to how to pass through the Mashu district. He succeeds in doing so, and finds himself in a wonderful park, which lies along the sea coast. In the 10th tablet the goddess Sabitu, who, as guardian of the sea, first bolts her gate against Gilgamesh, after learning of his quest, helps him to pass in a ship across the sea to the "waters of death." The ferry-man of Ut-Napishtim brings him safely through these waters, despite the difficulties and dangers of the voyage, and at last the hero finds himself face to face with Ut-Napishtim. In the 11th tablet, Ut-Napishtim tells the famous story of the Babylonian flood, which is so patently attached to Gilgamesh in a most artificial manner. Ut-Napishtim and his wife are anxious to help Gilgamesh to new life. He is sent to a place where he washes himself clean from impurity. He is told of a weed which restores youth to the one grown old. Scarcely has he obtained the weed when it is snatched away from him, and the tablet closes somewhat obscurely with the prediction of the destruction of Erech. In the 12th tablet Gilgamesh succeeds in obtaining a view of Eabani's shade, and learns through him of the sad fate endured by the dead. With this description, in which care of the dead is inculcated as the only means of making their existence in Aralu, where the dead are gathered, bearable, the epic, so far as we have it, closes.

The reason why the flood episode and the interview with the dead Eabani are introduced is quite clear. Both are intended as illustrations of doctrines taught in the schools of Babylonia; the former to explain that only the favourites of the gods can hope under exceptional circumstances to enjoy life everlasting; the latter to emphasize the impossibility for ordinary mortals to escape from the inactive shadowy existence led by the dead, and to inculcate the duty of proper care for the dead. That the astro-theological system is also introduced into the epic is clear from the division into twelve tablets, which correspond to the yearly course of the sun, while throughout there are indications that all the adventures of Gilgamesh and Eabani, including those which have an historical background, have been submitted to the influence of this system and projected on to the heavens. This interpretation of the popular tales, according to which the career of the hero can be followed in its entirety and in detail in the movements in the heavens, in time, with the growing predominance of the astral-mythological system, overshadowed the other factors involved, and it is in this form, as an astral myth, that it passes through the ancient world and leaves its traces in the folk-tales and myths of Hebrews, Phoenicians, Syrians, Greeks and Romans throughout Asia Minor and even in India.

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GILGIT, an outlying province in the extreme north-west of India, over which Kashmir has reasserted her sovereignty. Only a part of the basin of the river Gilgit is included within its political boundaries. There is an intervening width of

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mountainous country, represented chiefly by glaciers and ice-fields, and intersected by narrow sterile valleys, measuring some 100 to 150 m. in width, to the north and north-east, which separates the province of Gilgit from the Chinese frontier beyond the Muztagh and Karakoram. This part of the Kashmir borderland includes Kanjut (or Hunza) and Ladakh. To the north-west, beyond the sources of the Yasin and Ghazar in the Shandur range (the two most westerly tributaries of the Gilgit river) is the deep valley of the Yarkhun or Chitral. Since the formation of the North-West Frontier Province in 1901, the political charge of Chitral, Dir and Swat, which was formerly included within the Gilgit agency, has been transferred to the chief commissioner of the new province, with his capital at Peshawar. Gilgit proper now forms a *wazarat* of the Kashmir state, administered by a *wazir*. Gilgit is also the headquarters of a British political agent, who exercises some supervision over the *wazir*, and is directly responsible to the government of India for the administration of the outlying districts or petty states of Hunza, Nagar, Ashkuman, Yasin and Ghizar, the little republic of Chilas, &c. These states acknowledge the suzerainty of Kashmir, paying an annual tribute in gold or grain, but they form no part of its territory.

Within the wider limits of the former Gilgit agency are many mixed races, speaking different languages, which have all been usually classed together under the name Dard. The Dard, however, is unknown beyond the limits of the Kohistan district of the Indus valley to the south of the Hindu Koh, the rest of the inhabitants of the Indus valley belonging to Shin republics, or Chilas. The great mass of the Chitral population are Kho (speaking Khowar), and they may be accepted as representing the aboriginal population of the Chitral valley. (See HINDU KUSH.) Between Chitral and the Indus the "Dards" of Dardistan are chiefly Yeshkuns and Shins, and it would appear from the proportions in which these people occupy the country that they must have primarily moved up from the valley of the Indus in successive waves of conquest, first the Yeshkuns, and then the Shins. No one can put a date to these invasions, but Biddulph is inclined to class the Yeshkuns with the Yuechi who conquered the Bactrian kingdom about 120 B.C. The Shins are obviously a Hindu race (as is testified by their veneration for the cow), who spread themselves northwards and eastwards as far as Baltistan, where they collided with the aboriginal Tatar of the Asiatic highlands. But the ethnography of "Dardistan," or the Gilgit agency (for the two are, roughly speaking, synonymous), requires further investigation, and it would be premature to attempt to frame anything like an ethnographical history of these regions until the neighbouring provinces of Tangir and Darel have been more fully examined. The *wazarat* of Gilgit contains a population (1901) of 60,885, all Mahommedans, mostly of the Shiah sect, but not fanatical. The dominant race is that of the Shins, whose language is universally spoken. This is one of the so-called Pisacha languages, an archaic Aryan group intermediate between the Iranian and the Sanskritic.

In general appearance and dress all the mountain-bred peoples extending through these northern districts are very similar. Thick felt coats reaching below the knee, loose "pyjamas" with cloth "putties" and boots (often of English make) are almost universal, the distinguishing feature in their costume being the felt cap worn close to the head and rolled up round the edges. They are on the whole a light-hearted, cheerful race of people, but it has been observed that their temperament varies much with their habitat—those who live on the shadowed sides of mountains being distinctly more morose and more serious in disposition than the dwellers in valleys which catch the winter sunlight. They are, at the same time, bloodthirsty and treacherous to a degree which would appear incredible to a casual observer of their happy and genial manners, exhibiting a strange combination (as has been observed by a careful student of their ways) of "the monkey and the tiger." Addicted to sport of every kind, they pursue no manufacturing industries whatsoever, but they are excellent agriculturists, and show great ingenuity in their local irrigation works and in their efforts to bring every available acre of cultivable soil within the irrigated area. Gold washing is more or less carried on in most of the valleys north of the river Gilgit, and gold dust (contained in small packets formed with the petals of a cup-shaped flower) is an invariable item in their official presents and offerings. Gold dust still constitutes part of the annual tribute which, strangely enough, is paid by Hunza to China, as well as to Kashmir.

Routes in the Gilgit Agency.—One of the oldest recorded routes through this country is that which connects Mastuj in the Chitral valley with Gilgit, passing across the Shandur range (12,250). It now forms the high-road between Gilgit and Chitral, and has been pronounced into a passable route. From the north three great glacier-bred affluents make their way to the river of Gilgit, joining it at almost equal intervals, and each of them affords opportunity for a rough passage northwards. (1) The Yasin river, which follows a fairly straight course from north to south for about 40 m. from the foot of the Darkôt pass across the Shandur range (15,000) to its junction with the river Gilgit, close to the little fort of Gupis, on the Gilgit-Mastuj road. Much of this valley is cultivated and extremely picturesque. At the head of it is a grand group of glaciers, one of which leads up to the well-known pass of Darkôt. (2) 25 m. (by map measurement) below Gupis the Gilgit receives the Ashkuman affluent from the north. The little Lake of Karumbar is held to be its source, as it lies at the head of the river. The same lake is sometimes called the source of the river Yarkhun or Chitral; and it seems possible that a part of its waters may be deflected in each direction. The Karumbar, or Ashkuman, is nearly twice the length of the Yasin, and the upper half of the valley is encompassed by glaciers, rendering the route along it uncertain and difficult. (3) 40 m. or so below the Ashkuman junction, and nearly opposite the little station of Gilgit, the river receives certain further contributions from the north which are collected in the Hunza and Nagar basins. These basins include a system of glaciers of such gigantic proportions that they are probably unrivalled in any pact of the world. The glacial head of the Hunza is not far from that of the Karumbar, and, like the Karumbar, the river commences with a wide sweep eastwards, following a course nearly parallel to the crest of the Hindu Kush (under whose southern slopes it lies close) for about 40 m. Then striking south for another 40 m., it twists amidst the barren feet of gigantic rock-bound spurs which reach upwards to the Muztagh peaks on the east and to a mass of glaciers and snow-fields on the west, hidden amidst the upper folds of mountains towering to an average of 25,000 ft. The next great bend is again to the west for 30 m., before a final change of direction to the south at the historical position of Nilt, and a comparatively straight run of 25 m. to a junction with the Gilgit. The valley of Hunza lies some 10 m. from the point of this westerly bend, and 20 (as the crow flies) from Chalt. Much has been written of the magnificence of Hunza valley scenery, surrounded as it is by a stupendous ring of snow-capped peaks and brightened with all the radiant beauty that cultivation adds to these mountain valleys; but such scenery must be regarded as exceptional in these northern regions.

Glaciers and Mountains.—Conway and Godwin Austen have described the glaciers of Nagar which, enclosed between the Muztagh spurs on the north-east and the frontier peaks of Kashmir (terminating with Rakapushi) on the south-west, and massing themselves in an almost uninterrupted series from the Hunza valley to the base of those gigantic peaks which stand about Mount Godwin Austen, seem to be set like an ice-sea to define the farthest bounds of the Himalaya. From its uttermost head to the foot of the Hispar, overhanging the valley above Nagar, the length of the glacial ice-bed known under the name of Biafo is said to measure about 90 m. Throughout the mountain region of Kanjut (or Hunza) and Nagar the valleys are deeply sunk between mountain ranges, which are nowhere less than 15,000 ft. in altitude, and which must average above 20,000 ft. As a rule, these valleys are bare of vegetation. Where the summits of the loftier ranges are not buried beneath snow and ice they are bare, bleak and splintered, and the nakedness of the rock scenery extends down their rugged spurs to the very base of them. On the lower slopes of tumbled débris the sun in summer beats with an intensity which is unmitigated by the cloud drifts which form in the moister atmosphere of the monsoon-swept summits of the Himalaya. Sunbaked in summer and frost-riven in winter, the mountain sides are but immense ramps of loose rock débris, only awaiting the yearly melting of the upper snow-fields, or the advent of a casual rainstorm, to be swept downwards in an avalanche of mud and stones into the gorges below. There it becomes piled and massed together, till the pressure of accumulation forces it out into the main valleys, where it spreads in alluvial fans and silts up the plains. This formation is especially marked throughout the high level valleys of the Gilgit basin.

Passes.—Each of these northern affluents of the main stream is headed by a pass, or a group of passes, leading either to the Pamir region direct, or into the upper Yarkhun valley from which a Pamir route diverges. The Yasin valley is headed by the Darkôt pass (15,000 ft.), which drops into the Yarkhun not far from the foot of

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the Baroghil group over the main Hindu Kush watershed. The Ashkuman is headed by the Gazar and Kora Bohrt passes, leading to the valley of the Ab-i-Punja; and the Hunza by the Kilik and Mintaka, the connecting links between the Taghdumbash Pamir and the Gilgit basin. They are all about the same height—15,000 ft. All are passable at certain times of the year to small parties, and all are uncertain. In no case do they present insuperable difficulties in themselves, glaciers and snow-fields and mountain staircases being common to all; but the gorges and precipices which distinguish the approaches to them from the south, the slippery sides of shelving spurs whose feet are washed by raging torrents, the perpetual weary monotony of ascent and descent over successive ridges multiplying the gradient indefinitely—these form the real obstacles blocking the way to these northern passes.

Gilgit Station.—The pretty little station of Gilgit (4890 ft. above sea) spreads itself in terraces above the right bank of the river nearly opposite the opening leading to Hunza, almost nestling under the cliffs of the Hindu Kob, which separates it on the south from the savage mountain wilderness of Darel and Kohistan. It includes a residency for the British political officer, with about half a dozen homes for the accommodation of officials, barracks suitable for a battalion of Kashmir troops, and a hospital. Evidences of Buddhist occupation are not wanting in Gilgit, though they are few and unimportant. Such as they are, they appear to prove that Gilgit was once a Buddhist centre, and that the old Buddhist route between Gilgit and the Peshawar plain passed through the gorges and clefts of the unexplored Darel valley to Thakot under the northern spurs of the Black Mountain.

Connexion with India.—The Gilgit river joins the Indus a few miles above the little post of Bunji, where an excellent suspension bridge spans the river. The valley is low and hot, and the scenery betweer. Gilgit and Bunji is monotonous; but the road is now maintained in excellent condition. A little below Bunji the Astor river joins the Indus from the north-east, and this deep pine-clad valley indicates the continuation of the highroad from Gilgit to Kashmir via the Tragbal and Burzil passes. Another well-known route connecting Gilgit with the Abbottabad frontier of the Punjab lies across the Babusar pass (13,000 ft.), linking the lovely Punyal valley of Kaghan to Chilas; Chilas (4150 ft.) being on the Indus, some 50 m. below Bunji. This is a more direct connexion between Gilgit and the plains of the Punjab than that afforded by the Kashmir route via Gurais and Astor, which latter route involves two considerable passes—the Tragbal (11,400) and the Burzil (13,500); but the intervening strip of absolutely independent territory (independent alike of Kashmir and the Punjab), which includes the hills bordering the road from Babusar pass to Chilas, renders it a risky route for travellers unprotected by a military escort. Like the Kashmir route, it is now defined by a good military road.

History.—The Dards are located by Ptolemy with surprising accuracy (*Daradae*) on the west of the Upper Indus, beyond the head-waters of the Swat river (*Soastus*), and north of the *Gandarae*, *i.e.* the Gandharis, who occupied Peshawar and the country north of it. The *Dardas* and *Chinas* also appear in many of the old Pauranic lists of peoples, the latter probably representing the *Shin* branch of the Dards. This region was traversed by two of the Chinese pilgrims of the early centuries of our era, who have left records of their journeys, viz. Fahien, coming from the north, *c.* 400, and Hsüan Tsang, ascending from Swat, *c.* 631. The latter says: "Perilous were the roads, and dark the gorges. Sometimes the pilgrim had to pass by loose cords, sometimes by light stretched iron chains. Here there were ledges hanging in mid-air; there flying bridges across abysses; elsewhere paths cut with the chisel, or footings to climb by." Yet even in these inaccessible regions were found great convents, and miraculous images of Buddha. How old the name of *Gilgit* is we do not know, but it occurs in the writings of the great Mahommedan savant al-Biruni, in his notices of Indian geography. Speaking of Kashmir, he says: "Leaving the ravine by which you enter Kashmir and entering the plateau, then you have for a march of two more days on your left the mountains of Bolor and Shamilan, Turkish tribes who are called *Bhattavaryan*. Their king has the title Bhatta-Shah. Their towns are *Gilgit*, Aswira and Shiltash, and their language is the Turkish. Kashmir suffers much from their inroads" (Trs. Sachau, i. 207). There are difficult matters for discussion here. It is impossible to say what ground the writer had for calling the people *Turks*. But it is curious that the *Shins* say they are all of the same race as the Moguls of India, whatever they may mean by that. Gilgit, as far back as tradition goes, was ruled by rajas of a family called Trakane. When this family became extinct the valley was desolated by successive invasions of neighbouring rajas, and in the 20 or 30 years ending with 1842 there had been five dynastic revolutions. The most prominent character in the history was a certain Gaur Rahman or Gauhar Aman, chief of Yasin, a cruel savage and man-seller, of whom many evil deeds are told. Being remonstrated with for selling a *mullah*, he said, "Why not? The Koran, the word of God, is sold; why not sell the expounder thereof?" The Sikhs entered Gilgit about 1842, and kept a garrison there. When Kashmir was made over to Maharaja Gulab Singh of Jammu in 1846, by Lord Hardinge, the Gilgit claims were transferred with it. And when a commission was sent to lay down boundaries of the tracts made over, Mr Vans Agnew (afterwards murdered at Multan) and Lieut. Ralph Young of the Engineers visited Gilgit, the first Englishmen who did so. The Dogras (Gulab Singh's race) had much ado to hold their ground, and in 1852 a catastrophe occurred, parallel on a smaller scale to that of the English troops at Kabul. Nearly 2000 men of theirs were exterminated by Gaur Rahman and a combination of the Dards; only one person, a soldier's wife, escaped, and the Dogras were driven away for eight years. Gulab Singh would not again cross the Indus, but after his death (in 1857) Maharaja Ranbir Singh longed to recover lost prestige. In 1860 he sent a force into Gilgit. Gaur Rahman just then died, and there was little resistance. The Dogras after that took Yasin twice, but did not hold it. They also, in 1866, invaded Darel, one of the most secluded Dard states, to the south of the Gilgit basin, but withdrew again. In 1889, in order to guard against the advance of Russia, the British government, acting as the suzerain power of Kashmir, established the Gilgit agency; in 1901, on the formation of the North-West Frontier province, the rearrangement was made as stated above.

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GILL, JOHN (1697–1771), English Nonconformist divine, was born at Kettering, Northamptonshire. His parents were poor and he owed his education chiefly to his own perseverance. In November 1716 he was baptized and began to preach at Higham Ferrers and Kettering, until the beginning of 1719, when he became pastor of the Baptist congregation at Horsleydown Southwark. There he continued till 1757, when he removed to a chapel near London Wall. From 1729 to 1756 he was Wednesday evening lecturer in Great Eastcheap. In 1748 he received the degree of D.D. from the university of Aberdeen. He died at Camberwell on the 14th of October 1771. Gill was a great Hebrew scholar, and in his theology a sturdy Calvinist.

His principal works are *Exposition of the Song of Solomon* (1728); *The Prophecies of the Old Testament respecting the Messiah* (1728); *The Doctrine of the Trinity* (1731); *The Cause of God and Truth* (4 vols., 1731); *Exposition of the Bible* (in 10 vols. 1746–1766), in preparing which he formed a large collection of Hebrew and Rabbinical books and MSS.; *The Antiquity of the Hebrew Language—Letters, Vowel Points, and Accents* (1767); *A Body of Doctrinal Divinity* (1767); *A Body of Practical Divinity* (1770); and *Sermons and Tracts*, with a memoir of his life (1773). An edition of his *Exposition of the Bible* appeared in 1816 with a memoir by John Rippon, which has also appeared separately.

GILL. (1) One of the *branchiae* which form the breathing apparatus of fishes and other animals that live in the water. The word is also applied to the *branchiae* of some kinds of worm and arachnids, and by transference to objects resembling the *branchiae* of fishes, such as the wattles of a fowl, or the radiating films on the under side of fungi. The word is of obscure origin. Danish has *giselle*, and Swedish *gäl* with the same meaning. The root which appears in "yawn," "chasm," has been suggested. If this be correct, the word will be in origin the same as "gill," often spelled "ghyll," meaning a glen or ravine, common in northern English dialects and also in Kent and Surrey. The *g* in both these words is hard. (2) A liquid measure usually holding

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one-fourth of a pint. The word comes through the O. Fr. *gelle*, from Low Lat. *gello* or *gillo*, a measure for wine. It is thus connected with "gallon." The g is soft. (3) An abbreviation of the feminine name Gillian, also often spelled Jill, as it is pronounced. Like Jack for a boy, with which it is often coupled, as in the nursery rhyme, it is used as a homely generic name for a girl.

GILLES DE ROYE, or EGIDIUS DE ROYA (d. 1478), Flemish chronicler, was born probably at Montdidier, and became a Cistercian monk. He was afterwards professor of theology in Paris and abbot of the monastery of Royaumont at Asnières-sur-Oise, retiring about 1458 to the convent of Notre Dame des Dunes, near Furnes, and devoting his time to study. Gilles wrote the *Chronicon Dunense* or *Annales Belgici*, a résumé and continuation of the work of another monk, Jean Brandon (d. 1428), which deals with the history of Flanders, and also with events in Germany, Italy and England from 702 to 1478.

The Chronicle was published by F. R. Sweert in the *Rerum Belgicarum annales* (Frankfort, 1620); and the earlier part of it by C. B. Kervyn de Lettenhove in the *Chroniques relatives à l'histoire de la Belgique* (Brussels, 1870).

GILLES LI MUISIS, or LE MUISET (*c.* 1272–1352), French chronicler, was born probably at Tournai, and in 1289 entered the Benedictine abbey of St Martin in his native city, becoming prior of this house in 1327, and abbot four years later. He only secured the latter position after a contest with a competitor, but he appears to have been a wise ruler of the abbey. Gilles wrote two Latin chronicles, *Chronicon majus* and *Chronicon minus*, dealing with the history of the world from the creation until 1349. This work, which was continued by another writer to 1352, is valuable for the history of northern France, and Flanders during the first half of the 14th century. It is published by J. J. de Senet in the *Corpus chronicorum Flandriae*, tome ii. (Brussels, 1841). Gilles also wrote some French poems, and these *Poésies de Gilles li Muisis* have been published by Baron Kervyn de Lettenhove (Louvain, 1882).

See A. Molinier, *Les Sources de l'histoire de France*, tome iii. (Paris, 1903).

GILLESPIE, GEORGE (1613–1648), Scottish divine, was born at Kirkcaldy, where his father, John Gillespie, was parish minister, on the 21st of January 1613, and entered the university of St Andrews as a "presbytery bursar" in 1629. On the completion of a brilliant student career, he became domestic chaplain to John Gordon, 1st Viscount Kenmure (d. 1634), and afterwards to John Kennedy, earl of Cassillis, his conscience not permitting him to accept the episcopal ordination which was at that time in Scotland an indispensable condition of induction to a parish. While with the earl of Cassillis he wrote his first work, *A Dispute against the English Popish Ceremonies obtruded upon the Church of Scotland*, which, opportunely published shortly after the "Jenny Geddes" incident (but without the author's name) in the summer of 1637, attracted considerable attention, and within a few months had been found by the privy council to be so damaging that by their orders all available copies were called in and burnt. In April 1638, soon after the authority of the bishops had been set aside by the nation, Gillespie was ordained minister of Wemyss (Fife) by the presbytery of Kirkcaldy, and in the same year was a member of the famous Glasgow Assembly, before which he preached (November 21st) a sermon against royal interference in matters ecclesiastical so pronounced, as to call for some remonstrance on the part of Argyll, the lord high commissioner. In 1642 Gillespie was translated to Edinburgh; but the brief remainder of his life was chiefly spent in the conduct of public business in London. Already, in 1640, he had accompanied the commissioners of the peace to England as one of their chaplains; and in 1643 he was appointed by the Scottish Church one of the four commissioners to the Westmins er Assembly. Here, though the youngest member of the Assembly, he took a prominent part in almost all the protracted discussions on church government, discipline and worship, supporting Presbyterianism by numerous controversial writings, as well as by an unusual fluency and readiness in debate. Tradition long preserved and probably enhanced the record of his victories in debate, and especially of his encounter, with John Selden on Matt. xviii. 15-17. In 1645 he returned to Scotland, and is said to have drawn the act of assembly sanctioning the directory of public worship. On his return to London he had a hand in drafting the Westminster confession of faith, especially chap. i. Gillespie was elected moderator of the Assembly in 1648, but the laborious duties of that office (the court continued to sit from the 12th of July to the 12th of August) told fatally on an overtaxed constitution; he fell into consumption, and, after many weeks of great weakness, he died at Kirkcaldy on the 17th of December 1648. In acknowledgment of his great public services, a sum of £1000 Scots was voted, though destined never to be paid, to his widow and children by the committee of estates. A simple tombstone, which had been erected to his memory in Kirkcaldy parish church, was in 1661 publicly broken at the cross by the hand of the common hangman, but was restored in 1746.

His principal publications were controversial and chiefly against Erastianism: Three sermons against Thomas Coleman; *A Sermon before the House of Lords* (August 27th), on Matt. iii. 2, *Nikil Respondent* and *Male Audis*; *Aaron's Rod Blossoming, or the Divine Ordinance of Church-government vindicated* (1646), which is deservedly regarded as a really able statement of the case for an exclusive spiritual jurisdiction in the church; *One Hundred and Eleven Propositions concerning the Ministry and Government of the Church* (Edinburgh, 1647). The following were posthumously published by his brother: *A Treatise of Miscellany Questions* (1649); *The Ark of the New Testament* (2 vols., 1661–1667); *Notes of Debates and Proceedings of the Assembly of Divines at Westminster, from February 1644 to January 1645*. See *Works*, with memoir, published by Hetherington (Edinburgh, 1843–1846).

GILLESPIE, THOMAS (1708–1774), Scottish divine, was born at Clearburn, in the parish of Duddingston, Midlothian, in 1708. He was educated at the university of Edinburgh, and studied divinity first at a small theological seminary at Perth, and afterwards for a brief period under Philip Doddridge at Northampton, where he received ordination in January 1741. In September of the same year he was admitted minister of the parish of Carnock, Fife, the presbytery of Dunfermline agreeing not only to sustain as valid the ordination he had received in England, but also to allow a qualification of his subscription to the church's doctrinal symbol, so far as it had reference to the sphere of the civil magistrate in matters of religion. Having on conscientious grounds persistently absented himself from the meetings of presbytery held for the purpose of ordaining one Andrew Richardson, an unacceptable presentee, as minister of Inverkeithing, he was, after an unobtrusive but useful ministry of ten years, deposed by the Assembly of 1752 for maintaining that the refusal of the local presbytery to act in this case was justified. He continued, however, to preach, first at Carnock, and afterwards in Dunfermline, where a large congregation gathered round him. His conduct under the sentence of deposition produced a reaction in his favour, and an effort was made to have him reinstated; this he declined unless the policy of the church were reversed. In 1761, in conjunction with Thomas Boston of Jedburgh and Collier of Colinsburgh, he formed a distinct communion under the name of "The Presbytery of Relief," —relief, that is to say, "from the yoke of patronage and the tyranny of the church courts." The Relief Church eventually became one of the communions combining to form the United Presbyterian Church. He died on the 19th of January 1774, His only literary efforts were an *Essay on the Continuation of Immediate Revelations in the Church*, and a *Practical Treatise on Temptation*. Both works appeared posthumously (1774). In the former he argues that immediate revelations are no longer vouchsafed to the church, in the latter he traces temptation to the work of a personal devil.

See Lindsay's *Life and Times of the Rev. Thomas Gillespie*; Smithers's *History of the Relief Church*; for the Relief Church see UNITED PRESBYTERIAN CHURCH.

GILLIE (from the Gael. *gille*, Irish *gille* or *giolla*, a servant or boy), an attendant on a Gaelic chieftain; in this sense its use, save historically, is rare. The name is now applied in the Highlands of Scotland to the man-servant who attends a sportsman in shooting or fishing. A *gillie-wetfoot*, a term now obsolete (a translation of *gillie-casfliuch*, from the Gaelic *cas*, foot, and

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flauch, wet), was the gillie whose duty it was to carry his master over streams. It became a term of contempt among the Lowlanders for the "tail" (as his attendants were called) of a Highland chief.

GILLIES, JOHN (1747–1836), Scottish historian and classical scholar, was born at Brechin, in Forfarshire, on the 18th of January 1747. He was educated at Glasgow University, where, at the age of twenty, he acted for a short time as substitute for the professor of Greek. In 1784 he completed his *History of Ancient Greece, its Colonies and Conquests* (published 1786). This work, valuable at a time when the study of Greek history was in its infancy, and translated into French and German, was written from a strong Whig bias, and is now entirely superseded (see GREECE: *Ancient History*, "Authorities"). On the death of William Robertson (1721–1703), Gillies was appointed historiographer-royal for Scotland. In his old age he retired to Clapham, where he died on the 15th of February 1836.

Of his other works, none of which are much read, the principal are: *View of the Reign of Frederic II. of Prussia, with a Parallel between that Prince and Philip II. of Macedon* (1789), rather a panegyric than a critical history; translations of Aristotle's *Rhetoric* (1823) and *Ethics and Politics* (1786–1797); of the *Orations* of Lysias and Isocrates (1778); and *History of the World from Alexander to Augustus* (1807), which, although deficient in style, was commended for its learning and research.

GILLINGHAM, a market town in the northern parliamentary division of Dorsetshire, England, 105 m. W.S.W. from London by the London & South-Western railway. Pop. (1901) 3380. The church of St Mary the Virgin has a Decorated chancel. There is a large agricultural trade, and manufactures of bricks and tiles, cord, sacking and silk, brewing and bacon-curing are carried on. The rich undulating district in which Gillingham is situated was a forest preserved by King John and his successors, and the site of their lodge is traceable near the town.

GILLINGHAM, a municipal borough of Kent, England, in the parliamentary borough of Chatham and the mid-division of the county, on the Medway immediately east of Chatham, on the South-Eastern & Chatham railway. Pop. (1891) 27,809; (1901) 42,530. Its population is largely industrial, employed in the Chatham dockyards, and in cement and brick works in the neighbourhood. The church of St Mary Magdalene ranges in date from Early English to Perpendicular, retaining also traces of Norman work and some early brasses. A great battle between Edmund Ironside and Canute, *c.* 1016, is placed here; and there was formerly a palace of the archbishops of Canterbury. Gillingham was incorporated in 1903, and is governed by a mayor, 6 aldermen and 18 councillors. The borough includes the populous districts of Brompton and New Brompton. Area, 4355 acres.

GILLOT, CLAUDE (1673–1722), French painter, best known as the master of Watteau and Lancret, was born at Langres. His sportive mythological landscape pieces, with such titles as "Feast of Pan" and "Feast of Bacchus," opened the Academy of Painting at Paris to him in 1715; and he then adapted his art to the fashionable tastes of the day, and introduced the decorative *fêtes champêtres*, in which he was afterwards surpassed by his pupils. He was also closely connected with the opera and theatre as a designer of scenery and costumes.

GILLOTT, JOSEPH (1799–1873), English pen-maker, was born at Sheffield on the 11th of October 1799. For some time he was a working cutler there, but in 1821 removed to Birmingham, where he found employment in the "steel toy" trade, the technical name for the manufacture of steel buckles, chains and light ornamental steel-work generally. About 1830 he turned his attention to the manufacture of steel pens by machinery, and in 1831 patented a process for placing elongated points on the nibs of pens. Subsequently he invented other improvements, getting rid of the hardness and lack of flexibility, which had been a serious defect in nibs, by cutting, in addition to the centre slit, side slits, and cross grinding the points. By 1859 he had built up a very large business. Gillott was a liberal art-patron, and one of the first to recognize the merits of J. M. W. Turner. He died at Birmingham on the 5th of January 1873. His collection of pictures, sold after his death, realized £170,000.

GILLOW, ROBERT (d. 1773), the founder at Lancaster of a distinguished firm of English cabinet-makers and furniture designers whose books begin in 1731. He was succeeded by his eldest son Richard (1734–1811), who after being educated at the Roman Catholic seminary at Douai was taken into partnership about 1757, when the firm became Gillow & Barton, and his younger sons Robert and Thomas, and the business was continued by his grandson Richard (1778–1866). In its early days the firm of Gillow were architects as well as cabinet-makers, and the first Richard Gillow designed the classical Custom House at Lancaster. In the middle of the 18th century the business was extended to London, and about 1761 premises were opened in Oxford Street on a site which was continuously occupied until 1906. For a long period the Gillows were the best-known makers of English furniture—Sheraton and Heppelwhite both designed for them, and replicas are still made of pieces from the drawings of Robert Adam. Between 1760 and 1770 they invented the original form of the billiard-table; they were the patentees (about 1800) of the telescopic dining-table which has long been universal in English houses; for a Captain Davenport they made, if they did not invent, the first writing-table of that name. Their vogue is indicated by references to them in the works of Jane Austen, Thackeray and the first Lord Lytton, and more recently in one of Gilbert and Sullivan's comic operas.

GILLRAY, JAMES (1757–1815), English caricaturist, was born at Chelsea in 1757. His father, a native of Lanark, had served as a soldier, losing an arm at Fontenoy, and was admitted first as an inmate, and afterwards as an outdoor pensioner, at Chelsea hospital. Gillray commenced life by learning letter-engraving, in which he soon became an adept. This employment, however, proving irksome, he wandered about for a time with a company of strolling players. After a very checkered experience he returned to London, and was admitted a student in the Royal Academy, supporting himself by engraving, and probably issuing a considerable number of caricatures under fictitious names. Hogarth's works were the delight and study of his early years. "Paddy on Horseback," which appeared in 1779, is the first caricature which is certainly his. Two caricatures on Rodney's naval victory, issued in 1782, were among the first of the memorable series of his political sketches. The name of Gillray's publisher and printseller, Miss Humphrey—whose shop was first at 227 Strand, then in New Bond Street, then in Old Bond Street, and finally in St James's Street—is inextricably associated with that of the caricaturist. Gillary lived with Miss (often called Mrs) Humphrey during all the period of his fame. It is believed that he several times thought of marrying her, and that on one occasion the pair were on their way to the church, when Gillray said: "This is a foolish affair, methinks, Miss Humphrey. We live very comfortably together; we had better let well alone." There is no evidence, however, to support the stories which scandalmongers invented about their relations. Gillray's plates were exposed in Humphrey's shop window, where eager crowds examined them. A number of his most trenchant satires are directed against George III., who, after examining some of Gillray's sketches, said, with characteristic ignorance and blindness to merit, "I don't understand these caricatures." Gillray revenged himself for this utterance by his splendid caricature entitled, "A Connoisseur Examining a Cooper," which he is doing by means of a candle on a "save-all"; so that the sketch satirizes at once the king's pretensions to knowledge of art and his miserly habits.

The excesses of the French Revolution made Gillray conservative; and he issued caricature after caricature, ridiculing the French and Napoleon, and glorifying John Bull. He is not, however, to be thought of as a keen political adherent of either the Whig or the Tory party; he dealt his blows pretty freely all round. His last work, from a design by Bunbury, is entitled "Interior of a Barber's Shop in Assize Time," and is dated 1811. While he was engaged on it he became mad, although he had occasional intervals of sanity, which he employed on his last work. The approach of madness must have been hastened by his intemperate habits. Gillray died on

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the 1st of June 1815, and was buried in St James's churchyard, Piccadilly.

The times in which Gillray lived were peculiarly favourable to the growth of a great school of caricature. Party warfare was carried on with great vigour and not a little bitterness; and personalities were freely indulged in on both sides. Gillray's incomparable wit and humour, knowledge of life, fertility of resource, keen sense of the ludicrous, and beauty of execution, at once gave him the first place among caricaturists. He is honourably distinguished in the history of caricature by the fact that his sketches are real works of art. The ideas embodied in some of them are sublime and poetically magnificent in their intensity of meaning; while the coarseness by which others are disfigured is to be explained by the general freedom of treatment common in all intellectual departments in the 18th century. The historical value of Gillray's work has been recognized by accurate students of history. As has been well remarked: "Lord Stanhope has turned Gillray to account as a veracious reporter of speeches, as well as a suggestive illustrator of events." His contemporary political influence is borne witness to in a letter from Lord Bateman, dated November 3, 1798. "The Opposition," he writes to Gillray, "are as low as we can wish them. You have been of infinite service in lowering them, and making them ridiculous." Gillray's extraordinary industry may be inferred from the fact that nearly 1000 caricatures have been attributed to him; while some consider him the author of 1600 or 1700. He is invaluable to the student of English manners as well as to the political student. He attacks the social follies of the time with scathing satire; and nothing escapes his notice, not even a trifling change of fashion in dress. The great tact Gillray displays in hitting on the ludicrous side of any subject is only equalled by the exquisite finish of his sketches—the finest of which reach an epic grandeur and Miltonic sublimity of conception.

Gillray's caricatures are divided into two classes, the political series and the social. The political caricatures form really the best history extant of the latter part of the reign of George III. They were circulated not only over Britain but throughout Europe, and exerted a powerful influence. In this series, George III., the queen, the prince of Wales, Fox, Pitt, Burke and Napoleon are the most prominent figures. In 1788 appeared two fine caricatures by Gillray. "Blood on Thunder fording the Red Sea" represents Lord Thurlow carrying Warren Hastings through a sea of gore; Hastings looks very comfortable, and is carrying two bags of money. "Market-Day" pictures the ministerialists of the time as horned cattle for sale. Among Gillray's best satires on the king are: "Farmer George and his Wife," two companion plates, in one of which the king is toasting muffins for breakfast, and in the other the queen is frying sprats; "The Anti-Saccharites," where the royal pair propose to dispense with sugar, to the great horror of the family; "A Connoisseur Examining a Cooper"; "Temperance enjoying a Frugal Meal"; "Royal Affability"; "A Lesson in Apple Dumplings"; and "The Pigs Possessed." Among his other political caricatures may be mentioned: "Britannia between Scylla and Charybdis," a picture in which Pitt, so often Gillray's butt, figures in a favourable light; "The Bridal Night"; "The Apotheosis of Hoche," which concentrates the excesses of the French Revolution in one view; "The Nursery with Britannia reposing in Peace"; "The First Kiss these Ten Years" (1803), another satire on the peace, which is said to have greatly amused Napoleon; "The Handwriting upon the Wall"; "The Confederated Coalition," a fling at the coalition which superseded the Addington ministry; "Uncorking Old Sherry"; "The Plum-Pudding in Danger"; "Making Decent," &c. "Broad-Bottom Elevating into the Grand Costume"; "Comforts of a Bed of Roses"; "View of the Hustings in Covent Garden"; "Phaëthon Alarmed"; and "Pandora opening her Box." The miscellaneous series of caricatures, although they have scarcely the historical importance of the political series, are more readily intelligible, and are even more amusing. Among the finest are: "Shakespeare Sacrificed"; "Flemish Characters" (two plates); "Twopenny Whist"; "Oh! that this too solid flesh would melt"; "Sandwich Carrots"; "The Gout"; "Comfort to the Corns"; "Begone Dull Care"; "The Cow-Pock," which gives humorous expression to the popular dread of vaccination; "Dilletanti Theatricals"; and "Harmony before Matrimony" and "Matrimonial Harmonics"—two exceedingly good sketches in violent contrast to each other.

A selection of Gillray's works appeared in parts in 1818; but the first good edition was Thomas M'Lean's, which was published, with a key, in 1830. "A somewhat bitter attack, not only on Gillray's character, but even on his genius, appeared in the *Athenaeum* for October 1, 1831, which was successfully refuted by J. Landseer in the *Athenaeum* a fortnight later. In 1851 Henry G. Bohn put out an edition, from the original plates, in a handsome folio, the coarser sketches being published in a separate volume. For this edition Thomas Wright and R. H. Evans wrote a valuable commentary, which is a good history of the times embraced by the caricatures. The next edition, entitled *The Works of James Gillray, the Caricaturist: with the Story of his Life and Times* (Chatto & Windus, 1874), was the work of Thomas Wright, and, by its popular exposition and narrative, introduced Gillray to a very large circle formerly ignorant of him. This edition, which is complete in one volume, contains two portraits of Gillray, and upwards of 400 illustrations. Mr J. J. Cartwright, in a letter to the *Academy* (Feb. 28, 1874), drew attention to the existence of a MS. volume, in the British Museum, containing letters to and from Gillray, and other illustrative documents. The extracts he gave were used in a valuable article in the *Quarterly Review* for April 1874. See also the *Academy* for Feb. 21 and May 16, 1874.

There is a good account of Gillray in Wright's *History of Caricature and Grotesque in Literature and Art* (1865). See also the article CARICATURE.

GILLYFLOWER, a popular name applied to various flowers, but principally to the clove, *Dianthus Caryophyllus*, of which the carnation is a cultivated variety, and to the stock, *Matthiola incana*, a well-known garden favourite. The word is sometimes written gilliflower or gilloflower, and is reputedly a corruption of July-flower, "so called from the month they blow in." Henry Phillips (1775–1838), in his *Flora historica*, remarks that Turner (1568) "calls it geloure, to which he adds the word stock, as we would say geloures that grow on a stem or stock, to distinguish them from the clove-geloures and the wall-geloures. Gerard, who succeeded Turner, and after him Parkinson, calls it gillo-flower, and thus it travelled from its original orthography until it was called July-flower by those who knew not whence it was derived." Dr Prior, in his useful volume on the *Popular Names of British Plants*, very distinctly shows the origin of the name. He remarks that it was "formerly spelt gyllofer and gilofre in Anglo-Saxon, from the French *girofle*, Italian *girofolo* (M. Lat. *gariofilum*), corrupted from the Latin *Caryophyllum*, and referring to the spicy odour of the flower, which seems to have been used in flavouring wine and other liquors to replace the more costly clove of India. The name was originally given in Italy to plants of the pink tribe, especially the carnation, but has in England been transferred of late years to several cruciferous plants." The gillyflower of Chaucer and Spenser and Shakespeare was, as in Italy, *Dianthus Caryophyllus*; that of later writers and of gardeners, *Matthiola*. Much of the confusion in the names of plants has doubtless arisen from the vague use of the French terms *giroflée*, *œillet* and *violette*, which were all applied to flowers of the pink tribe, but in England were subsequently extended and finally restricted to very different plants. The use made of the flowers to impart a spicy flavour to ale and wine is alluded to by Chaucer, who writes:

> "And many a clove gilofre
> To put in ale";

also by Spenser, who refers to them by the name of sops in wine, which was applied in consequence of their being steeped in the liquor. In both these cases, however, it is the clove-gillyflower which is intended, as it is also in the passage from Gerard, in which he states that the conserve made of the flowers with sugar "is exceeding cordiall, and wonderfully above measure doth comfort the heart, being eaten now and then." The principal other plants which bear the name are the wallflower, *Cheiranthus Cheiri*, called wall-gillyflower in old books; the dame's violet, *Hesperis matronalis*, called variously the queen's, the rogue's and the winter gillyflower; the ragged-robin, *Lychnis Flos-cuculi*, called marsh-gillyflower and cuckoo-gillyflower; the water-violet, *Hottonia palustris*, called water-gillyflower; and the thrift, *Armeria vulgaris*, called sea-gillyflower. As a separate designation it is nowadays usually applied to the wallflower.

GILMAN, DANIEL COIT (1831–1908), American educationist, was born in Norwich, Connecticut, on the 6th of July 1831. He graduated at Yale in 1852, studied in Berlin, was assistant librarian of Yale in 1856–1858 and librarian in 1858–1865, and was professor of physical and political geography in the Sheffield Scientific School of Yale University and a member of the

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Governing Board of this School in 1863–1872. From 1856 to 1860 he was a member of the school board of New Haven, and from August 1865 to January 1867 secretary of the Connecticut Board of Education. In 1872 he became president of the University of California at Berkeley. On the 30th of December 1874 he was elected first president of Johns Hopkins University (*q.v.*) at Baltimore. He entered upon his duties on the 1st of May 1875, and was formally inaugurated on the 22nd of February 1876. This post he filled until 1901. From 1901 to 1904 he was the first president of the Carnegie Institution at Washington, D.C. He died at Norwich, Conn., on the 13th of October 1908. He received the honorary degree of LL.D. from Harvard, St John's, Columbia, Yale, North Carolina, Princeton, Toronto, Wisconsin and Clark Universities, and William and Mary College. His influence upon higher education in America was great, especially at Johns Hopkins, where many wise details of administration, the plan of bringing to the university as lecturers for a part of the year scholars from other colleges, the choice of a singularly brilliant and able faculty, and the marked willingness to recognize workers in new branches of science were all largely due to him. To the organization of the Johns Hopkins hospital, of which he was made director in 1889, he contributed greatly. He was a singularly good judge of men and an able administrator, and under him Johns Hopkins had an immense influence, especially in the promotion of original and productive research. He was always deeply interested in the researches of the professors at Johns Hopkins, and it has been said of him that his attention as president was turned inside and not outside the university. He was instrumental in determining the policy of the Sheffield Scientific School of Yale University while he was a member of its governing board; on the 28th of October 1897 he delivered at New Haven a semi-centennial discourse on the school, which appears in his *University Problems*. He was a prominent member of the American Archaeological Society and of the American Oriental Society; was one of the original trustees of the John F. Slater Fund (for a time he was secretary, and from 1893 until his death was president of the board); from 1891 until his death was a trustee of the Peabody Educational Fund (being the vice-president of the board); and was an original member of the General Education Board (1902) and a trustee of the Russell Sage Foundation for Social Betterment (1907). In 1896–1897 he served on the Venezuela Boundary Commission appointed by President Cleveland. In 1901 he succeeded Carl Schurz as president of the National Civil Service Reform League and served until 1907. Some of his papers and addresses are collected in a volume entitled *University Problems in the United States* (1888). He wrote, besides, *James Monroe* (1883), in the American Statesmen Series; a *Life of James D. Dana*, the geologist (1899); *Science and Letters at Yale* (1901), and *The Launching of a University* (1906), an account of the early years of Johns Hopkins.

GILMORE, PATRICK SARSFIELD (1829–1892), American bandmaster, was born in Ireland, and settled in America about 1850. He had been in the band of an Irish regiment, and he had great success as leader of a military band at Salem, Massachusetts, and subsequently (1859) in Boston. He increased his reputation during the Civil War, particularly by organizing a monster orchestra of massed bands for a festival at New Orleans in 1864; and at Boston in 1869 and 1872 he gave similar performances. He was enormously popular as a bandmaster, and composed or arranged a large variety of pieces for orchestra. He died at St Louis on the 24th of September 1892

GILPIN, BERNARD (1517–1583), the "Apostle of the North," was descended from a Westmorland family, and was born at Kentmere in 1517. He was educated at Queen's College, Oxford, graduating B.A. in 1540, M.A. in 1542 and B.D. in 1549. He was elected fellow of Queen's and ordained in 1542; subsequently he was elected student of Christ Church. At Oxford he first adhered to the conservative side, and defended the doctrines of the church against Hooper; but his confidence was somewhat shaken by another public disputation which he had with Peter Martyr. In 1552 he preached before King Edward VI. a sermon on sacrilege, which was duly published, and displays the high ideal which even then he had formed of the clerical office; and about the same time he was presented to the vicarage of Norton, in the diocese of Durham, and obtained a licence, through William Cecil, as a general preacher throughout the kingdom as long as the king lived. On Mary's accession he went abroad to pursue his theological investigations at Louvain, Antwerp and Paris; and from a letter of his own, dated Louvain, 1554, we get a glimpse of the quiet student rejoicing in an "excellent library belonging to a monastery of Minorites." Returning to England towards the close of Queen Mary's reign, he was invested by his mother's uncle, Tunstall, bishop of Durham, with the archdeaconry of Durham, to which the rectory of Easington was annexed. The freedom of his attacks on the vices, and especially the clerical vices, of his times excited hostility against him, and he was formally brought before the bishop on a charge consisting of thirteen articles. Tunstall, however, not only dismissed the case, but presented the offender with the rich living of Houghton-le-Spring; and when the accusation was again brought forward, he again protected him. Enraged at this defeat, Gilpin's enemies laid their complaint before Bonner, bishop of London, who secured a royal warrant for his apprehension. Upon this Gilpin prepared for martyrdom; and, having ordered his house-steward to provide him with a long garment, that he might "goe the more comely to the stake," he set out for London. Fortunately, however, for him, he broke his leg on the journey, and his arrival was thus delayed till the news of Queen Mary's death freed him from further danger. He at once returned to Houghton, and there he continued to labour till his death on the 4th of March 1583. When the Roman Catholic bishops were deprived he was offered the see of Carlisle; but he declined this honour and also the provostship of Queen's, which was offered him in 1560. At Houghton his course of life was a ceaseless round of benevolent activity. In June 1560 he entertained Cecil and Dr Nicholas Wotton on their way to Edinburgh. His hospitable manner of living was the admiration of all. His living was a comparatively rich one, his house was better than many bishops' palaces, and his position was that of a clerical magnate. In his household he spent "every fortnight 40 bushels of corn, 20 bushels of malt and an ox, besides a proportional quantity of other kinds of provisions." Strangers and travellers found a ready reception; and even their horses were treated with so much care that it was humorously said that, if one were turned loose in any part of the country, it would immediately make its way to the rector of Houghton. Every Sunday from Michaelmas till Easter was a public day with Gilpin. For the reception of his parishioners he had three tables well covered—one for gentlemen, the second for husbandmen, the third for day-labourers; and this piece of hospitality he never omitted, even when losses or scarcity made its continuance difficult. He built and endowed a grammar-school at a cost of upwards of £500, educated and maintained a large number of poor children at his own charge, and provided the more promising pupils with means of studying at the universities. So many young people, indeed, flocked to his school that there was not accommodation for them in Houghton, and he had to fit up part of his house as a boarding establishment. Grieved at the ignorance and superstition which the remissness of the clergy permitted to flourish in the neighbouring parishes, he used every year to visit the most neglected parts of Northumberland, Yorkshire, Cheshire, Westmorland and Cumberland; and that his own flock might not suffer, he was at the expense of a constant assistant. Among his parishioners he was looked up to as a judge, and did great service in preventing law-suits amongst them. If an industrious man suffered a loss, he delighted to make it good; if the harvest was bad, he was liberal in the remission of tithes. The boldness which he could display at need is well illustrated by his action in regard to duelling. Finding one day a challenge-glove stuck up on the door of a church where he was to preach, he took it down with his own hand, and proceeded to the pulpit to inveigh against the unchristian custom. His theological position was not in accord with any of

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the religious parties of his age, and Gladstone thought that the catholicity of the Anglican Church was better exemplified in his career than in those of more prominent ecclesiastics (pref. to A. W. Hutton's edition of S. R. Maitland's *Essays on the Reformation*). He was not satisfied with the Elizabethan settlement, had great respect for the Fathers, and was with difficulty induced to subscribe. Archbishop Sandys' views on the Eucharist horrified him; but on the other hand he maintained friendly relations with Bishop Pilkington and Thomas Lever, and the Puritans had some hope of his support.

A life of Bernard Gilpin, written by George Carleton, bishop of Chichester, who had been a pupil of Gilpin's at Houghton, will be found in Bates's *Vitae selectorum aliquot virorum*, &c. (London, 1681). A translation of this sketch by William Freake, minister, was published at London, 1629; and in 1852 it was reprinted in Glasgow, with an introductory essay by Edward Irving. It forms one of the lives in Christopher Wordsworth's *Ecclesiastical Biography* (vol. iii., 4th ed.), having been compared with Carleton's Latin text. Another biography of Gilpin, which, however, adds little to Bishop Carleton's, was written by William Gilpin, M.A., prebendary of Alnbury (London, 1753 and 1854). See also *Dict. Nat. Biog.*

GILSONITE (so named after S. H. Gilson of Salt Lake City), or UINTAHITE, or UINTAITE, a description of asphalt occurring in masses several inches in diameter in the Uinta (or Uintah) valley, near Fort Duchesne, Utah. It is of black colour; its fracture is conchoidal, and it has a lustrous surface. When warmed it becomes plastic, and on further heating fuses perfectly. It has a specific gravity of 1·065 to 1·070. It dissolves freely in hot oil of turpentine. The output amounted to 10,916 short tons for the year 1905, and the value was $4·31 per ton.

GILYAKS, a hybrid people, originally widespread throughout the Lower Amur district, but now confined to the Amur delta and the north of Sakhalin. They have been affiliated by some authorities to the Ainu of Sakhalin and Yezo; but they are more probably a mongrel people, and Dr A. Anuchin states that there are two types, a Mongoloid with sparse beard, high cheek-bones and flat face, and a Caucasic with bushy beard and more regular features. The Chinese call them *Yupitatse*, "Fish-skin-clad people," from their wearing a peculiar dress made from salmon skin.

See E. G. Ravenstein, *The Russians on the Amur* (1861); Dr A. Anuchin, *Mem. Imp. Soc. Nat. Sc.* xx., Supplement (Moscow, 1877); H. von Siebold, *Über die Ainos* (Berlin, 1881); J. Deniker in *Revue d'ethnographie* (Paris, 1884); L. Schrenck, *Die Völker des Amurlandes* (St Petersburg, 1891).

GIMBAL, a mechanical device for hanging some object so that it should keep a horizontal and constant position, while the body from which it is suspended is in free motion, so that the motion of the supporting body is not communicated to it. It is thus used particularly for the suspension of compasses or chronometers and lamps at sea, and usually consists of a ring freely moving on an axis, within which the object swings on an axis at right angles to the ring.

The word is derived from the O. Fr. *gemel*, from Lat. *gemellus*, diminutive of *geminus*, a twin, and appears also in *gimmel* or *jimbel* and as *gemel*, especially as a term for a ring formed of two hoops linked together and capable of separation, used in the 16th and 17th centuries as betrothal and keepsake rings. They sometimes were made of three or more hoops linked together.

GIMLET (from the O. Fr. *guimbelet*, probably a diminutive of the O.E. *wimble*, and the Scandinavian *wammle*, to bore or twist; the modern French is *gibelet*), a tool used for boring small holes. It is made of steel, with a shaft having a hollow side, and a screw at the end for boring the wood; the handle of wood is fixed transversely to the shaft. A gimlet is always a small tool. A similar tool of large size is called an "auger" (see TOOL).

GIMLI, in Scandinavian mythology, the great hall of heaven whither the righteous will go to spend eternity.

GIMP, or GYMP. (1) (Of somewhat doubtful origin, but probably a nasal form of the Fr. *guipure*, from *guiper*, to cover or "whip" a cord over with silk), a stiff trimming made of silk or cotton woven around a firm cord, often further ornamented by a metal cord running through it. It is also sometimes covered with bugles, beads or other glistening ornaments. The trimming employed by upholsterers to edge curtains, draperies, the seats of chairs, &c., is also called gimp; and in lace work it is the firmer or coarser thread which outlines the pattern and strengthens the material. (2) A shortened form of gimple (the O.E. *wimple*), the kerchief worn by a nun around her throat, sometimes also applied to a nun's stomacher.

GIN, an aromatized or compounded potable spirit, the characteristic flavour of which is derived from the juniper berry. The word "gin" is an abbreviation of Geneva, both being primarily derived from the Fr. *genièvre* (juniper). The use of the juniper for flavouring alcoholic beverages may be traced to the invention, or perfecting, by Count de Morret, son of Henry IV. of France, of juniper wine. It was the custom in the early days of the spirit industry, in distilling spirit from fermented liquors, to add in the working some aromatic ingredients, such as ginger, grains of paradise, &c., to take off the nauseous flavour of the crude spirits then made. The invention of juniper wine, no doubt, led some one to try the juniper berry for this purpose, and as this flavouring agent was found not only to yield an agreeable beverage, but also to impart a valuable medicinal quality to the spirit, it was generally made use of by makers of aromatized spirits thereafter. It is probable that the use of grains of paradise, pepper and so on, in the early days of spirit manufacture, for the object mentioned above, indirectly gave rise to the statements which are still found in current text-books and works of reference as to the use of Cayenne pepper, *cocculus indicus*, sulphuric acid and so on, for the purpose of adulterating spirits. It is quite certain that such materials are not used nowadays, and it would indeed, in view of modern conditions of manufacture and of public taste, be hard to find a reason for their use. The same applies to the suggestions that such substances as acetate of lead, alum or sulphate of zinc are employed for the fining of gin.

There are two distinct types of gin, namely, the Dutch *genevа* or *hollands* and the British gin. Each of these types exists in the shape of numerous sub-varieties. Broadly speaking, British gin is prepared with a highly rectified spirit, whereas in the manufacture of Dutch gin a preliminary rectification is not an integral part of the process. The old-fashioned Hollands is prepared much after the following fashion. A mash consisting of about one-third of malted barley or bere and two-thirds rye-meal is prepared, and infused at a somewhat high temperature. After cooling, the whole is set to ferment with a small quantity of yeast. After two to three days the attenuation is complete, and the wash so obtained is distilled, and the resulting distillate (the low wines) is redistilled, with the addition of the flavouring matter (juniper berries, &c.) and a little salt. Originally the juniper berries were ground with the malt, but this practice no longer obtains, but some distillers, it is believed, still mix the juniper berries with the wort and subject the whole to fermentation. When the redistillation over juniper is repeated, the product is termed *double* (*genevа*, &c.). There are numerous variations in the process described, wheat being frequently employed in lieu of rye. In the manufacture of British gin,[1] a highly rectified spirit (see SPIRITS) is redistilled in the presence of the flavouring matter (principally juniper and coriander), and frequently this operation is repeated several times. The product so obtained constitutes the "dry" gin of commerce. Sweetened or cordialized gin is obtained by adding sugar and

[1] The precise origin of the term "Old Tom," as applied to unsweetened gin, appears to be somewhat obscure. In the English case of *Boord & Son* v. *Huddart* (1903), in which the plaintiffs established their right to the "Cat Brand" trade-mark, it was proved before Mr Justice Swinfen Eady that this term had first adopted about 1849 the punning association of the picture of a Tom cat on a barrel with the name of "Old Tom"; and it was at one time supposed that this was due to a tradition that a cat had fallen into one of the vats, the gin from which was highly esteemed. But the term "Old Tom" had been known before that, and Messrs Boord & Son inform us that previously "Old Tom" had been a man, namely "old Thomas Chamberlain of Hodge's distillery"; an old label book in their possession (1099) shows a label and bill-head with a picture of "Old Tom" the man on it, and another label shows a picture of a sailor lad on shipboard described as "Young Tom."

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flavouring matter (juniper, coriander, angelica, &c.) to the dry variety. Inferior qualities of gin are made by simply adding essential oils to plain spirit, the distillation process being omitted. The essential oil of juniper is a powerful diuretic, and gin is frequently prescribed in affections of the urinary organs.

GINDELY, ANTON (1829–1892), German historian, was the son of a German father and a Slavonic mother, and was born at Prague on the 3rd of September 1829. He studied at Prague and at Olmütz, and, after travelling extensively in search of historical material, became professor of history at the university of Prague and archivist for Bohemia in 1862. He died at Prague on the 24th of October 1892. Gindely's chief work is his *Geschichte des dreissigjährigen Krieges* (Prague, 1869–1880), which has been translated into English (New York, 1884); and his historical work is mainly concerned with the period of the Thirty Years' War. Perhaps the most important of his numerous other works are: *Geschichte der böhmischen Brüder* (Prague, 1857–1858); *Rudolf II. und seine Zeit* (1862–1868), and a criticism of Wallenstein, *Waldstein während seines ersten Generalats* (1886). He wrote a history of Bethlen Gabor in Hungarian, and edited the *Monumenta historicae Bohemica*. Gindely's posthumous work, *Geschichte der Gegenreformation in Böhmen*, was edited by T. Tupetz (1894).

See the *Allgemeine deutsche Biographie*, Band 49 (Leipzig, 1904).

GINGALL, or JINGAL (Hindostani *jonjal*), a gun used by the natives throughout the East, usually a light piece mounted on a swivel; it sometimes takes the form of a heavy musket fired from a rest.

GINGER (Fr. *gingembre*, Ger. *Ingwer*), the rhizome or underground stem of *Zingiber officinale* (nat. ord. Zingiberaceae), a perennial reed-like plant growing from 3 to 4 ft. high. The flowers and leaves are borne on separate stems, those of the former being shorter than those of the latter, and averaging from 6 to 12 in. The flowers themselves are borne at the apex of the stems in dense ovate-oblong cone-like spikes from 2 to 3 in. long, composed of obtuse strongly-imbricated bracts with membranous margins, each bract enclosing a single small sessile flower. The leaves are alternate and arranged in two rows, bright green, smooth, tapering at both ends, with very short stalks and long sheaths which stand away from the stem and end in two small rounded auricles. The plant rarely flowers and the fruit is unknown. Though not found in a wild state, it is considered with very good reason to be a native of the warmer parts of Asia, over which it has been cultivated from an early period and the rhizome imported into England. From Asia the plant has spread into the West Indies, South America, western tropical Africa, and Australia. It is commonly grown in botanic gardens in Britain.

The use of ginger as a spice has been known from very early times; it was supposed by the Greeks and Romans to be a product of southern Arabia, and was received by them by way of the Red Sea; in India it has also been known from a very remote period, the Greek and Latin names being derived from the Sanskrit. Flückiger and Hanbury, in their *Pharmacographia*, give the following notes on the history of ginger. On the authority of Vincent's *Commerce and Navigation of the Ancients*, it is stated that in the list of imports from the Red Sea into Alexandria, which in the second century of our era were there liable to the Roman fiscal duty, ginger occurs among other Indian spices. So frequent is the mention of ginger in similar lists during the middle ages, that it evidently constituted an important item in the commerce between Europe and the East. It thus appears in the tariff of duties levied at Acre in Palestine about 1173, in that of Barcelona in 1221, Marseilles in 1228 and Paris in 1296. Ginger seems to have been well known in England even before the Norman Conquest, being often referred to in the Anglo-Saxon leech-books of the 11th century. It was very common in the 13th and 14th centuries, ranking next in value to pepper, which was then the commonest of all spices, and costing on an average about 1s. 7d. per lb. Three kinds of ginger were known among the merchants of Italy about the middle of the 14th century: (1) *Belledi* or *Baladi*, an Arabic name, which, as applied to ginger, would signify country or wild, and denotes common ginger; (2) *Colombino*, which refers to Columbum, Kolam or Quilon, a port in Travancore, frequently mentioned in the middle ages; and (3) *Micchino*, a name which denoted that the spice had been brought from or by way of Mecca. Marco Polo seems to have seen the ginger plant both in India and China between 1280 and 1290. John of Montecorvino, a missionary friar who visited India about 1292, gives a description of the plant, and refers to the fact of the root being dug up and transported. Nicolo di Conto, a Venetian merchant in the early part of the 15th century, also describes the plant and the collection of the root, as seen by him in India. Though the Venetians received ginger by way of Egypt, some of the superior kinds were taken from India overland by the Black Sea. The spice is said to have been introduced into America

From Bentley & Trimen's *Medicinal Plants*, by permission of J. & A. Churchill.

Ginger (*Zingiber officinale*), about ½ nat. size, with leafy and flowering stem; the former cut off short.

1. Flower.
2. Flower in vertical section.
3. Fertile stamen, enveloping the style which projects above it.
4. Piece of leafy stem, 1-3 enlarged.
s. Sepals.
p. Petals.
l. Labellum, representing two barren stamens.
st. Fertile stamen.
y. Staminode.
x. Tip of style bearing the stigma.
z. Style.
gl. Honey-secreting glands.

by Francisco de Mendoça, who took it from the East Indies to New Spain. It seems to have been shipped for commercial purposes from San Domingo as early as 1585, and from Barbados in 1654; so early as 1547 considerable quantities were sent from the West Indies to Spain.

Ginger is known in commerce in two distinct forms, termed respectively coated and uncoated ginger, as having or wanting the epidermis. For the first, the pieces, which are called "races" or "hands," from their irregular palmate form, are washed and simply dried in the sun. In this form ginger presents a brown, more or less irregularly wrinkled or striated surface, and when broken shows a dark brownish fracture, hard, and sometimes horny and resinous. To produce uncoated ginger the rhizomes are washed, scraped and sun-dried, and are often subjected to a system of bleaching, either from the fumes of burning sulphur or by immersion for a short time in a solution of chlorinated lime. The whitewashed appearance that much of the ginger has, as seen in the shops, is due to the fact of its being washed in whiting and water, or even coated with sulphate of

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lime. This artificial coating is supposed by some to give the ginger a better appearance; it often, however, covers an inferior quality, and can readily be detected by the ease with which it rubs off, or by its leaving a white powdery substance at the bottom of the jar in which it is contained. Uncoated ginger, as seen in trade, varies from single joints an inch or less in length to flattish irregularly branched pieces of several joints, the "races" or "hands," and from 3 to 4 in. long; each branch has a depression at its summit showing the former attachment of a leafy stem. The colour, when not whitewashed, is a pale buff; it is somewhat rough or fibrous, breaking with a short mealy fracture, and presenting on the surfaces of the broken parts numerous short bristly fibres.

The principal constituents of ginger are starch, volatile oil (to which the characteristic odour of the spice is due) and resin (to which is attributed its pungency). Its chief use is as a condiment or spice, but as an aromatic and stomachic medicine it is also used internally. "The stimulant, aromatic and carminative properties render it of much value in atonic dyspepsia, especially if accompanied with much flatulence, and as an adjunct to purgative medicines to correct griping." Externally applied as a rubefacient, it has been found to relieve headache and toothache. The rhizomes, collected in a young green state, washed, scraped and preserved in syrup, form a delicious preserve, which is largely exported both from the West Indies and from China. Cut up into pieces like lozenges and preserved in sugar, ginger also forms a very agreeable sweetmeat.

GINGHAM, a cotton or linen cloth, for the name of which several origins are suggested. It is said to have been made at Guingamp, a town in Brittany; the *New English Dictionary* derives the word from Malay *ging-gang*, meaning "striped." The cloth is now of a light or medium weight, and woven of dyed or white yarns either in a single colour or different colours, and in stripes, checks or plaids. It is made in Lancashire and in Glasgow, and also to a large extent in the United States. Imitations of it are obtained by calico-printing. It is used for dresses, &c.

GINGI, or GINGEE, a rock fortress of southern India, in the South Arcot district of Madras. It consists of three hills, connected by walls enclosing an area of 7 sq. m., and practically impregnable to assault. The origin of the fortress is shrouded in legend. When occupied by the Mahrattas at the end of the 17th century, it withstood a siege of eight years against the armies of Aurangzeb. In 1750 it was captured by the French, who held it with a strong force for eleven years. It surrendered to the English in 1761, in the words of Orme, "terminated the long hostilities between the two rival European powers in Coromandel, and left not a single ensign of the French nation avowed by the authority of its government in any part of India."

GINGUENÉ, PIERRE LOUIS (1748–1815), French author, was born on the 27th of April 1748 at Rennes, in Brittany. He was educated at a Jesuit college in his native town, and came to Paris in 1772. He wrote criticisms for the *Mercure de France*, and composed a comic opera, *Pomponin* (1777). The *Satire des satires* (1778) and the *Confession de Zulmé* (1779) followed. The *Confession* was claimed by six or seven different authors, and though the value of the piece is not very great, it obtained great success. His defence of Piccini against the partisans of Gluck made him still more widely known. He hailed the first symptoms of the Revolution, joined Giuseppe Cerutti, the author of the *Mémoire pour le peuple français* (1788), and others in producing the *Feuille villageoise*, a weekly paper addressed to the villages of France. He also celebrated in an indifferent ode the opening of the states-general. In his *Lettres sur les confessions de J.-J. Rousseau* (1791) he defended the life and principles of his author. He was imprisoned during the Terror, and only escaped with life by the downfall of Robespierre. Some time after his release he assisted, as director-general of the "commission exécutive de l'instruction publique," in reorganizing the system of public instruction, and he was an original member of the Institute of France. In 1797 the directory appointed him minister plenipotentiary to the king of Sardinia. After fulfilling his duties for seven months, very little to the satisfaction of his employers, Ginguené retired for a time to his country house of St Prix, in the valley of Montmorency. He was appointed a member of the tribunate, but Napoleon, finding that he was not sufficiently tractable, had him expelled at the first "purge," and Ginguené returned to his literary pursuits. He was one of the commission charged to continue the *Histoire littéraire de la France*, and he contributed to the volumes of this series which appeared in 1814, 1817 and 1820. Ginguené's most important work is the *Histoire littéraire d'Italie* (14 vols., 1811–1835). He was putting the finishing touches to the eighth and ninth volumes when he died on the 11th of November 1815. The last five volumes were written by Francesco Salfi and revised by Pierre Daunou.

In the composition of his history of Italian literature he was guided for the most part by the great work of Girolamo Tiraboschi, but he avoids the prejudices and party views of his model.

Ginguené edited the *Décade philosophique, politique et littéraire* till it was suppressed by Napoleon in 1807. He contributed largely to the *Biographie universelle*, the *Mercure de France* and the *Encyclopédie méthodique*; and he edited the works of Chamfort and of Lebrun. Among his minor productions are an opera, *Pomponin ou le tuteur mystifié* (1777); *La Satire des satires* (1778); *De l'autorité de Rabelais dans la révolution présente* (1791); *De M. Necker* (1795); *Fables nouvelles* (1810); *Fables inédites* (1814). See "Eloge de Ginguené" by Dacier, in the *Mémoires de l'institut*, tom. vii.; "Discours" by M. Daunou, prefixed to the 2nd ed. of the *Hist. litt. d'Italie*; D. J. Garat, *Notice sur la vie et les ouvrages de P. L. Guingené*, prefixed to a catalogue of his library (Paris, 1817).

GINKEL, GODART VAN (1630–1703), 1st earl of Athlone, Dutch general in the service of England, was born at Utrecht in 1630. He came of a noble family, and bore the title of Baron van Reede, being the eldest son of Godart Adrian van Reede, Baron Ginkel. In his youth he entered the Dutch army, and in 1688 he followed William, prince of Orange, in his expedition to England. In the following year he distinguished himself by a memorable exploit—the pursuit, defeat and capture of a Scottish regiment which had mutinied at Ipswich, and was marching northward across the fens. It was the alarm excited by this mutiny that facilitated the passing of the first Mutiny Act. In 1690 Ginkel accompanied William III. to Ireland, and commanded a body of Dutch cavalry at the battle of the Boyne. On the king's return to England General Ginkel was entrusted with the conduct of the war. He took the field in the spring of 1691, and established his headquarters at Mullingar. Among those who held a command under him was the marquis of Ruvigny, the recognized chief of the Huguenot refugees. Early in June Ginkel took the fortress of Ballymore, capturing the whole garrison of 1000 men. The English lost only 8 men. After reconnoitring the fortifications of Ballymore the army marched to Athlone, then one of the most important of the fortified towns of Ireland. The Irish defenders of the place were commanded by a distinguished French general, Saint-Ruth. The firing began on June 19th, and on the 30th the town was stormed, the Irish army retreating towards Galway, and taking up their position at Aughrim. Having strengthened the fortifications of Athlone and left a garrison there, Ginkel led the English, on July 12th, to Aughrim. An immediate attack was resolved on, and, after a severe and at one time doubtful contest, the crisis was precipitated by the fall of Saint-Ruth, and the disorganized Irish were defeated and fled. A horrible slaughter of the Irish followed the struggle, and 4000 corpses were left unburied on the field, besides a multitude of others that lay along the line of the retreat. Galway next capitulated, its garrison being permitted to retire to Limerick. There the viceroy Tyrconnel was in command of a large force, but his sudden death early in August left the command in the hands of General Sarsfield and the Frenchman D'Usson. The English came in sight of the town on the day of Tyrconnel's death, and the bombardment was immediately begun. Ginkel, by a bold device, crossed the Shannon and captured the camp of the Irish cavalry. A few days later he stormed the fort on Thomond Bridge, and after difficult negotiations a capitulation was signed, the terms of which were divided into a civil and a military treaty. Thus was completed the conquest or pacification of Ireland, and the services of the Dutch general were amply recognized and rewarded. He received the formal thanks of the House of Commons, and was

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created by the king 1st earl of Athlone and baron of Aughrim. The immense forfeited estates of the earl of Limerick were given to him, but the grant was a few years later revoked by the English parliament. The earl continued to serve in the English army, and accompanied the king to the continent in 1693. He fought at the sieges of Namur and the battle of Neerwinden, and assisted in destroying the French magazine at Givet. In 1702, waiving his own claims to the position of commander-in-chief, he commanded the Dutch serving under the duke of Marlborough. He died at Utrecht on the 11th of February 1703, and was succeeded by his son the 2nd earl (1668–1719), a distinguished soldier in the reigns of William III. and Anne. On the death of the 9th earl without issue in 1844, the title became extinct.

GINSBURG, CHRISTIAN DAVID (1831–), Hebrew scholar, was born at Warsaw on the 25th of December 1831. Coming to England shortly after the completion of his education in the Rabbinic College at Warsaw, Dr Ginsburg continued his study of the Hebrew Scriptures, with special attention to the Megilloth. The first result of these studies was a translation of the Song of Songs, with a commentary historical and critical, published in 1857. A similar translation of Ecclesiastes, followed by treatises on the Karaites, on the Essenes and on the Kabbala, kept the author prominently before biblical students while he was preparing the first sections of his *magnum opus*, the critical study of the Massorah. Beginning in 1867 with the publication of Jacob ben Chajim's Introduction to the Rabbinic Bible, Hebrew and English, with notices, and the Massoreth Ha-Massoreth of Elias Levita, in Hebrew, with translation and commentary, Dr Ginsburg took rank as an eminent Hebrew scholar. In 1870 he was appointed one of the first members of the committee for the revision of the English version of the Old Testament. His life-work culminated in the publication of the Massorah, in three volumes folio (1880–1886), followed by the Masoretico-critical edition of the Hebrew Bible (1894), and the elaborate introduction to it (1897). Dr Ginsburg had one predecessor in the field, the learned Jacob ben Chajim, who in 1524–1525 published the second Rabbinic Bible, containing what has ever since been known as the Massorah; but neither were the materials available nor was criticism sufficiently advanced for a complete edition. Dr Ginsburg took up the subject almost where it was left by those early pioneers, and collected portions of the Massorah from the countless MSS. scattered throughout Europe and the East. More recently Dr Ginsburg has published *Facsimiles of Manuscripts of the Hebrew Bible* (1897 and 1898), and *The Text of the Hebrew Bible in Abbreviations* (1903), in addition to a critical treatise "on the relationship of the so-called Codex Babylonicus of A.D. 916 to the Eastern Recension of the Hebrew Text" (1899, for private circulation). In the last-mentioned work he seeks to prove that the St Petersburg Codex, for so many years accepted as the genuine text of the Babylonian school, is in reality a Palestinian text carefully altered so as to render it conformable to the Babylonian recension. He subsequently undertook the preparation of a new edition of the Hebrew Bible for the British and Foreign Bible Society. He also contributed many articles to J. Kitto's *Encyclopaedia*, W. Smith's *Dictionary of Christian Biography* and the *Encyclopaedia Britannica*.

GINSENG, the root of a species of *Panax* (*P. Ginseng*), native of Manchuria and Korea, belonging to the natural order Araliaceae, used in China as a medicine. Other roots are substituted for it, notably that of *Panax quinquefolium*, distinguished as American ginseng, and imported from the United States. At one time the ginseng obtained from Manchuria was considered to be the finest quality, and in consequence became so scarce that an imperial edict was issued prohibiting its collection. That prepared in Korea is now the most esteemed variety. The root of the wild plant is preferred to that of cultivated ginseng, and the older the plant the better is the quality of the root considered to be. Great care is taken in the preparation of the drug. The account given by Koempfer of the preparation of nindsin, the root of *Sium ninsi*, in Korea, will give a good idea of the preparation of ginseng, ninsi being a similar drug of supposed weaker virtue, obtained from a different plant, and often confounded with ginseng. "In the beginning of winter nearly all the population of Sjansai turn out to collect the root, and make preparations for sleeping in the fields. The root, when collected, is macerated for three days in fresh water, or water in which rice has been boiled twice; it is then suspended in a closed vessel over the fire, and afterwards dried, until from the base to the middle it assumes a hard, resinous and translucent appearance, which is considered a proof of its good quality."

Ginseng of good quality generally occurs in hard, rather brittle, translucent pieces, about the size of the little finger, and varying in length from 2 to 4 in. The taste is mucilaginous, sweetish and slightly bitter and aromatic. The root is frequently forked, and it is probably owing to this circumstance that medicinal properties were in the first place attributed to it, its resemblance to the body of a man being supposed to indicate that it could restore virile power to the aged and impotent. In prise it varies from 6 or 12 dollars to the enormous sum of 300 or 400 dollars an ounce.

Lockhart gives a graphic description of a visit to a ginseng merchant. Opening the outer box, the merchant removed several paper parcels which appeared to fill the box, but under them was a second box, or perhaps two small boxes, which, when taken out, showed the bottom of the large box and all the intervening space filled with more paper parcels. These parcels, he said, "contained quicklime, for the purpose of absorbing any moisture and keeping the boxes perfectly dry, the lime being packed in paper for the sake of cleanliness. The smaller box, which held the ginseng, was lined with sheet-lead; the ginseng further enclosed in silk wrappers was kept in little silken-covered boxes. Taking up a piece, he would request his visitor not to breathe upon it, nor handle it; he would dilate upon the many merits of the drug and the cures it had effected. The cover of the root, according to its quality, was silk, either embroidered or plain, cotton cloth or paper." In China the ginseng is often sent to friends as a valuable present; in such cases, "accompanying the medicine is usually given a small, beautifully-finished double kettle, in which the ginseng is prepared as follows. The inner kettle is made of silver, and between this and the outside vessel, which is a copper jacket, is a small space for holding water. The silver kettle, which fits on a ring near the top of the outer covering, has a cup-like cover in which rice is placed with a little water; the ginseng is put in the inner vessel with water, a cover is placed over the whole, and the apparatus is put on the fire. When the rice in the cover is sufficiently cooked, the medicine is ready, and is then eaten by the patient, who drinks the ginseng tea at the same time." The dose of the root is from 60 to 90 grains. During the use of the drug tea-drinking is forbidden for at least a month, but no other change is made in the diet. It is taken in the morning before breakfast, from three to eight days together, and sometimes it is taken in the evening before going to bed.

The action of the drug appears to be entirely psychic, and comparable to that of the mandrake of the Hebrews. There is no evidence that it possesses any pharmacological or therapeutic properties.

See Christopher Smith, *Chinese Materia Medica*, p. 103; *Reports on Trade at the Treaty Ports of China* (1868), p. 63; Lockhart, *Med. Missionary in China* (2nd ed.), p. 107; *Bull. de la Société Impériale de Nat. de Moscou* (1865), No. 1, pp. 70-76; *Pharmaceutical Journal* (2), vol. iii. pp. 197, 333, (2), vol. ix. p. 71; Lewis, *Materia Medica*, p. 324; Geoffroy, *Trad. de matière médicale*, t. ii. p. 112; Kaempfer, *Amoenitates exoticae*, p. 824.

GIOBERTI, VINCENZO (1801–1852), Italian philosopher, publicist and politician, was born in Turin on the 5th of April 1801. He was educated by the fathers of the Oratory with a view to the priesthood and ordained in 1825. At first he led a very retired life; but gradually took more and more interest in the affairs of his country and the new political ideas as well as in the literature of the day. Partly under the influence of Mazzini, the freedom of Italy became his ruling motive in life,—its emancipation, not only from foreign masters, but from modes of thought alien to its genius, and detrimental to its European authority. This authority was in his mind connected with papal supremacy, though in a way quite novel—intellectual rather than political. This must be remembered in considering nearly all his writings, and also in estimating his position, both in relation to the ruling clerical party—the Jesuits—and also to the politics of the court of Piedmont after the accession of Charles Albert in 1831. He was now noticed by the king and made one of his chaplains. His popularity and private influence, however, were reasons enough for the court party to mark him

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for exile; he was not one of them, and could not be depended on. Knowing this, he resigned his office in 1833, but was suddenly arrested on a charge of conspiracy, and, after an imprisonment of four months, was banished without a trial. Gioberti first went to Paris, and, a year later, to Brussels, where he remained till 1845, teaching philosophy, and assisting a friend in the work of a private school. He nevertheless found time to write many works of philosophical importance, with special reference to his country and its position. An amnesty having been declared by Charles Albert in 1846, Gioberti (who was again in Paris) was at liberty to return to Italy, but refused to do so till the end of 1847. On his entrance into Turin on the 29th of April 1848 he was received with the greatest enthusiasm. He refused the dignity of senator offered him by Charles Albert, preferring to represent his native town in the Chamber of Deputies, of which he was soon elected president. At the close of the same year, a new ministry was formed, headed by Gioberti; but with the accession of Victor Emmanuel in March 1849, his active life came to an end. For a short time indeed he held a seat in the cabinet, though without a portfolio; but an irreconcilable disagreement soon followed, and his removal from Turin was accomplished by his appointment on a mission to Paris, whence he never returned. There, refusing the pension which had been offered him and all ecclesiastical preferment, he lived frugally, and spent his days and nights as at Brussels in literary labour. He died suddenly, of apoplexy, on the 26th of October 1852.

Gioberti's writings are more important than his political career. In the general history of European philosophy they stand apart. As the speculations of Rosmini-Serbati, against which he wrote, have been called the last link added to medieval thought, so the system of Gioberti, known as "Ontologism," more especially in his greater and earlier works, is unrelated to other modern schools of thought. It shows a harmony with the Catholic faith which has caused Cousin to declare that "Italian philosophy was still in the bonds of theology," and that Gioberti was no philosopher. Method is with him a synthetic, subjective and psychological instrument. He reconstructs, as he declares, ontology, and begins with the "ideal formula," "the *Ens* creates *ex nihilo* the existent." God is the only being (*Ens*); all other things are merely existences. God is the origin of all human knowledge (called *l'idea*, thought), which is one and so to say identical with God himself. It is directly beheld (intuited) by reason, but in order to be of use it has to be reflected on, and this by means of language. A knowledge of being and existences (concrete, not abstract) and their mutual relations, is necessary as the beginning of philosophy. Gioberti is in some respects a Platonist. He identifies religion with civilization, and in his treatise *Del primato morale e civile degli Italiani* arrives at the conclusion that the church is the axis on which the well-being of human life revolves. In it he affirms the idea of the regeneration of Italy, brought about by the restoration of the papacy as a moral dominion, founded on religion and public opinion. In his later works, the *Rinnovamento* and the *Protologia*, he is thought by some to have shifted his ground under the influence of events. His first work, written when he was thirty-seven, had a personal reason for its existence. A young fellow-exile and friend, Paolo Pallia, having many doubts and misgivings as to the reality of revelation and a future life, Gioberti at once set to work with *La Teorica del soprannaturale*, which was his first publication (1838). After this, philosophical treatises followed in rapid succession. The *Teorica* was followed by *Introduzione allo studio della filosofia* in three volumes (1839–1840). In this work he states his reasons for requiring a new method and new terminology. Here he brings out the doctrine that religion is the direct expression of the *idea* in this life, and is one with true civilization in history. Civilization is a conditioned mediate tendency to perfection, to which religion is the final completion if carried out; it is the end of the second cycle expressed by the second formula, the Ens redeems' existences. Essays (not published till 1846) on the lighter and more popular subjects, *Del bello* and *Del buono*, followed the *Introduzione*. *Del primato morale e civile degli Italiani* and the *Prolegomeni* to the same, and soon afterwards his triumphant exposure of the Jesuits, *Il Gesuita moderno*, no doubt hastened the transfer of rule from clerical to civil hands. It was the popularity of these semi-political works, increased by other occasional political articles, and his *Rinnovamento civile d'Italia*, that caused Gioberti to be welcomed with such enthusiasm on his return to his native country. All these works were perfectly orthodox, and aided in drawing the liberal clergy into the movement which has resulted since his time in the unification of Italy. The Jesuits, however, closed round the pope more firmly after his return to Rome, and in the end Gioberti's writings were placed on the *Index* (see J. Kleutgen, *Über die Verurtheilung des Ontologismus durch den heiligen Stuhl*, 1867). The remainder of his works, especially *La Filosofia della Rivelazione* and the *Protologia*, give his mature views on many points. The entire writings of Gioberti, including those left in manuscript, have been edited by Giuseppe Massari (Turin, 1856–1861).

See Massari, *Vita de V. Gioberti* (Florence, 1848); A. Rosmini-Serbati, *V. Gioberti e il panteismo* (Milan, 1848); C. B. Smyth, *Christian Metaphysics* (1851); B. Spaventa, *La Filosofia di Gioberti* (Naples, 1854); A. Mauri, *Della vita e delle opere di V. Gioberti* (Genoa, 1853); G. Prisco, *Gioberti e l' ontologismo* (Naples, 1867); P. Luciani, *Gioberti e la filosofia nuova italiana* (Naples, 1866–1872); D. Berti, *Di V. Gioberti* (Florence, 1881); see also L. Ferri, *L'Histoire de la philosophie en Italie au XIXe siècle* (Paris, 1869); C. Werner, *Die italienische Philosophie des 19. Jahrhunderts*, ii. (1885); appendix to Ueberweg's *Hist. of Philosophy* (Eng. tr.); art. in *Brownson's Quarterly Review* (Boston, Mass.), xxi.; R. Mariano, *La Philosophie contemporaine en Italie* (1866); R. Seydel's exhaustive article in Erech and Gruber's *Allgemeine Encyclopädie*. The centenary of Gioberti called forth several monographs in Italy.

GIOIOSA-IONICA, a town of Calabria, Italy, in the province of Reggio Calabria, from which it is 65 m. N.E. by rail, and 38 m. direct, 492 ft. above sea-level. Pop. (1901) town, 9072; commune, 11,200. Near the station, which is on the E. coast of Calabria 3 m. below the town to the S.E., the remains of a theatre belonging to the Roman period were discovered in 1883; the orchestra was 46 ft. in diameter (*Notizie degli scavi*, 1883, p. 423). The ruins of an ancient building called the Naviglio, the nature of which does not seem clear, are described (*ib.* 1884, p. 252).

GIOJA, MELCHIORRE (1767–1829), Italian writer on philosophy and political economy, was born at Piacenza, on the 20th of September 1767. Originally intended for the church, he took orders, but renounced them in 1796 and went to Milan, where he devoted himself to the study of political economy. Having obtained the prize for an essay on "the kind of free government best adapted to Italy" he decided upon the career of a publicist. The arrival of Napoleon in Italy drew him into public life. He advocated a republic under the dominion of the French in a pamphlet *I Tedeschi, i Francesi, ed i Russi in Lombardia*, and under the Cisalpine Republic he was named historiographer and director of statistics. He was several times imprisoned, once for eight months in 1820 on a charge of being implicated in a conspiracy with the Carbonari. After the fall of Napoleon he retired into private life, and does not appear to have held office again. He died on the 2nd of January 1829. Gioja's fundamental idea is the value of statistics or the collection of facts. Philosophy itself is with him classification and consideration of ideas. Logic he regarded as a practical art, and his *Esercizioni logici* has the further title, *Art of deriving benefit from ill-constructed books*. In ethics Gioja follows Bentham generally, and his large treatise *Del merito e delle ricompense* (1818) is a clear and systematic view of social ethics from the utilitarian principle. In political economy this avidity for facts produced better fruits. The *Nuovo Prospetto delle scienze economiche* (1815–1817), although long to excess, and overburdened with classifications and tables, contains much valuable material. The author prefers large properties and large commercial undertakings to small ones, and strongly favours association as a means of production. He defends a restrictive policy and insists on the necessity of the action of the state as a regulating power in the industrial world. He was an opponent of ecclesiastical domination. He must be credited with the finest and most original treatment of division of labour since the *Wealth of Nations*. Much of what Babbage taught later on the subject of combined work is anticipated by Gioja. His theory of production is also deserving of attention from the fact that it takes into account and gives due prominence to immaterial goods. Throughout the work there is continuous opposition to Adam Smith. Gioja's latest work *Filosofia della statistica* (2 vols., 1826; 4 vols., 1829–1830) contains in brief compass the essence of his ideas on human life, and affords the clearest insight into his aim and method in philosophy both theoretical and practical.

See monographs by G. D. Romagnosi (1829), F. Falco (1866); G. Pecchio, *Storia dell' economia pubblica in Italia* (1829), and article in Erach and Gruber's *Allgemeine Encyclopädie*; for Gioja's philosophy, L. Ferri, *Essai sur l'histoire de la philosophie en Italie au XIXe siècle* (1869); Ueberweg's *Hist. of Philosophy* (Eng. tr., appendix ii.); A. Rosmini-Serbati, *Opuscoli filosofici*, iii. (1844) (containing an attack on Gioja's "sensualism"); for his political

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economy, list of works in J. Conrad's *Handwörterbuch der Staatswissenschaften* (1892); L. Cossa, *Introd. to Pol. Econ.* (Eng. trans., p. 488). Gioja's complete works were published at Lugano (1832–1849). He was one of the founders of the *Annali universali di statistica*.

GIOLITTI, GIOVANNI (1842–), Italian statesman, was born at Mondovì on the 27th of October 1842. After a rapid career in the financial administration he was, in 1882, appointed councillor of state and elected to parliament. As deputy he chiefly acquired prominence by attacks on Magliani, treasury minister in the Depretis cabinet, and on the 9th of March 1889 was himself selected as treasury minister by Crispi. On the fall of the Rudinì cabinet in May 1892, Giolitti, with the help of a court clique, succeeded to the premiership. His term of office was marked by misfortune and misgovernment. The building crisis and the commercial rupture with France had impaired the situation of the state banks, of which one, the Banca Romana, had been further undermined by maladministration. A bank law, passed by Giolitti failed to effect an improvement. Moreover, he irritated public opinion by raising to senatorial rank the director-general of the Banca Romana, Signor Tanlongo, whose irregular practices had become a byword. The senate declined to admit Tanlongo, whom Giolitti, in consequence of an interpellation in parliament upon the condition of the Banca Romana, was obliged to arrest and prosecute. During the prosecution Giolitti abused his position as premier to abstract documents bearing on the case. Simultaneously a parliamentary commission of inquiry investigated the condition of the state banks. Its report, though acquitting Giolitti of personal dishonesty, proved disastrous to his political position, and obliged him to resign. His fall left the finances of the state disorganized, the pensions fund depleted, diplomatic relations with France strained in consequence of the massacre of Italian workmen at Aigues-Mortes, and Sicily and the Lunigiana in a state of revolt, which he had proved impotent to suppress. After his resignation he was impeached for abuse of power as minister, but the supreme court quashed the impeachment by denying the competence of the ordinary tribunals to judge ministerial acts. For several years he was compelled to play a passive part, having lost all credit. But by keeping in the background and giving public opinion time to forget his past, as well as by parliamentary intrigue, he gradually regained much of his former influence. He made capital of the Socialist agitation and of the repression to which other statesmen resorted, and gave the agitators to understand that were he premier they would be allowed a free hand. Thus he gained their favour, and on the fall of the Pelloux cabinet he became minister of the Interior in Zanardelli's administration, of which he was the real head. His policy of never interfering in strikes and leaving even violent demonstrations undisturbed at first proved successful, but indiscipline and disorder grew to such a pitch that Zanardelli, already in bad health, resigned, and Giolitti succeeded him as prime minister (November 1903). But during his tenure of office he, too, had to resort to strong measures in repressing some serious disorders in various parts of Italy, and thus he lost the favour of the Socialists. In March 1905, feeling himself no longer secure, he resigned, indicating Fortis as his successor. When Sonnino became premier in February 1906, Giolitti did not openly oppose him, but his followers did, and Sonnino was defeated in May, Giolitti becoming prime minister once more.

GIORDANO, LUCA (1632–1705), Italian painter, was born in Naples, son of a very indifferent painter, Antonio, who imparted to him the first rudiments of drawing. Nature predestined him for the art, and at the age of eight he painted a cherub into one of his father's pictures, a feat which was at once noised abroad, and induced the viceroy of Naples to recommend the child to Ribera. His father afterwards took him to Rome, to study under Pietro da Cortona. He acquired the nickname of Luca Fa-presto (Luke Work-fast). One might suppose this nickname to be derived merely from the almost miraculous celerity with which from an early age and throughout his life he handled the brush; but it is said to have had a more express origin. The father, we are told, poverty-stricken and greedy of gain, was perpetually urging his boy to exertion with the phrase, "Luca, fà presto." The youth obeyed his parent to the letter, and would actually not so much as pause to snatch a hasty meal, but received into his mouth, while he still worked on, the food which his father's hand supplied. He copied nearly twenty times the "Battle of Constantine" by Julio Romano, and with proportionate frequency several of the great works of Raphael and Michelangelo. His rapidity, which belonged as much to invention as to mere handiwork, and his versatility, which enabled him to imitate other painters deceptively, earned for him two other epithets, "The Thunderbolt" (Fulmine), and "The Proteus," of Painting. He shortly visited all the main seats of the Italian school of art, and formed for himself a style combining in a certain measure the ornamental pomp of Paul Veronese and the contrasting compositions and large schemes of chiaroscuro of Pietro da Cortona. He was noted also for lively and showy colour. Returning to Naples, and accepting every sort of commission by which money was to be made, he practised his art with so much applause that Charles II. of Spain towards 1687 invited him over to Madrid, where he remained thirteen years. Giordano was very popular at the Spanish court, being a sprightly talker along with his other marvellously facile gifts, and the king created him a cavaliere. One anecdote of his rapidity of work is that the queen of Spain having one day made some inquiry about his wife, he at once showed Her Majesty what the lady was like by painting her portrait into the picture on which he was engaged. Soon after the death of Charles in 1700 Giordano, gorged with wealth, returned to Naples. He spent large sums in acts of munificence, and was particularly liberal to his poorer brethren of the art. He again visited various parts of Italy, and died in Naples on the 12th of January 1705, his last words being "O Napoli, sospiro mio" (O Naples, my heart's love!). One of his maxims was that the good painter is the one whom the public like, and that the public are attracted more by colour than by design.

Giordano had an astonishing readiness and facility, in spite of the general commonness and superficiality of his performances. He left many works in Rome, and far more in Naples. Of the latter one of the most renowned is "Christ expelling the Traders from the Temple," in the church of the Padri Girolamini, a colossal work, full of expressive lazzaroni; also the frescoes of S. Martino, and those in the Tesoro della Certosa, including the subject of "Moses and the Brazen Serpent"; and the cupola-paintings in the Church of S. Brigida, which contains the artist's own tomb. In Spain he executed a surprising number of works, continuing in the Escorial the series commenced by Cambiasi, and painting frescoes of the "Triumphs of the Church," the "Genealogy and Life of the Madonna," the stories of Moses, Gideon, David and Solomon, and the "Celebrated Women of Scripture," all works of large dimensions. His pupils, Aniello Rossi and Matteo Pacelli, assisted him in Spain. In Madrid he worked more in oil-colour, a Nativity there being one of his best productions. Other superior examples are the "Judgment of Paris" in the Berlin Museum, and "Christ with the Doctors in the Temple," in the Corsini Gallery of Rome. In Florence, in his closing days, he painted the Cappella Corsini, the Galleria Riccardi and other works. In youth he etched with considerable skill some of his own paintings, such as the "Slaughter of the Priests of Baal." He also painted much on the crystal borderings of looking-glasses, cabinets, &c., seen in many Italian palaces, and was, in this form of art, the master of Pietro Garofolo. His best pupil, in painting of the ordinary kind, was Paolo de Matteis.

Bellori, in his *Vite de' pittori moderni*, is a leading authority regarding Luca Giordano. P. Benvenuto (1882) has written a work on the Riccardi paintings.

GIORGIONE (1477–1510), Italian painter, was born at Castelfranco in 1477. In contemporary documents he is always called (according to the Venetian manner of pronunciation and spelling) Zorzi, Zorzo or Zorzon of Castelfranco. A tradition, having its origin in the 17th century, represented him as the natural son of some member of the great local family of the Barbarelli, by a peasant girl of the neighbouring village of Vedelago; consequently he is commonly referred to in histories and

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catalogues under the name of Giorgio Barbarelli or Barbarella. This tradition has, however, on close examination been proved baseless. On the other hand mention has been found in a contemporary document of an earlier Zorzon, a native of Vedelago, living in Castelfranco in 1460. Vasari, who wrote before the Barbarella legend had sprung up, says that Giorgione was of very humble origin. It seems probable that he was simply the son or grandson of the afore-mentioned Zorzon the elder; that the after-claim of the Barbarelli to kindred with him was a mere piece of family vanity, very likely suggested by the analogous case of Leonardo da Vinci; and that, this claim once put abroad, the peasant-mother of Vedelago was invented on the ground of some dim knowledge that his real progenitors came from that village.

Of the facts of his life we are almost as meagrely informed as of the circumstances of his birth. The little city, or large fortified village, for it is scarcely more, of Castelfranco in the Trevisan stands in the midst of a rich and broken plain at some distance from the last spurs of the Venetian Alps. From the natural surroundings of Giorgione's childhood was no doubt derived his ideal of pastoral scenery, the country of pleasant copses, glades, brooks and hills amid which his personages love to wander or recline with lute and pipe. How early in boyhood he went to Venice we do not know, but internal evidence supports the statement of Ridolfi that he served his apprenticeship there under Giovanni Bellini; and there he made his fame and had his home. That his gifts were early recognized we know from the facts, recorded in contemporary documents, that in 1500, when he was only twenty-three (that is if Vasari gives rightly the age at which he died), he was chosen to paint portraits of the Doge Agostino Barberigo and the condottiere Consalvo Ferrante; that in 1504 he was commissioned to paint an altarpiece in memory of Matteo Costanzo in the cathedral of his native town, Castelfranco; that in 1507 he received at the order of the Council of Ten part payment for a picture (subject not mentioned) on which he was engaged for the Hall of the Audience in the ducal palace; and that in 1507–1508 he was employed, with other artists of his own generation, to decorate with frescoes the exterior of the newly rebuilt Fondaco dei Tedeschi or German merchants' hall at Venice, having already done similar work on the exterior of the Casa Soranzo, the Casa Grimani alli Servi and other Venetian palaces. Vasari gives also as an important event in Giorgione's life, and one which had influence on his work, his meeting with Leonardo da Vinci on the occasion of the Tuscan master's visit to Venice in 1500. In September or October 1510 he died of the plague then raging in the city, and within a few days of his death we find the great art-patroness and amateur, Isabella d'Este, writing from Mantua and trying in vain to secure for her collection a night-piece by his hand of which the fame had reached her.

All accounts agree in representing Giorgione as a personage of distinguished and romantic charm, a great lover, a great musician, made to enjoy in life and to express in art to the uttermost the delight, the splendour, the sensuous and imaginative grace and fulness, not untinged with poetic melancholy, of the Venetian existence of his time. They represent him further as having made in Venetian painting an advance analogous to that made in Tuscan painting by Leonardo more than twenty years before; that is as having released the art from the last shackles of archaic rigidity and placed it in possession of full freedom and the full mastery of its means. He also introduced a new range of subjects. Besides altarpieces and portraits he painted pictures that told no story, whether biblical or classical, or if they professed to tell such, neglected the action and simply embodied in form and colour moods of lyrical or romantic feeling, much as a musician might embody them in sounds. Innovating with the courage and felicity of genius, he had for a time an overwhelming influence on his contemporaries and immediate successors in the Venetian school, including Titian, Sebastian del Piombo, the elder Palma, Cariani and the two Campagnolas, and not a little even on seniors of long-standing fame such as Giovanni Bellini. His name and work have exercised, and continue to exercise, no less a spell on posterity. But to identify and define, among the relics of his age and school, precisely what that work is, and to distinguish it from the kindred work of other men whom his influence inspired, is a very difficult matter. There are inclusive critics who still claim for Giorgione nearly every painting of the time that at all resembles his manner, and there are exclusive critics who pare down to some ten or a dozen the list of extant pictures which they will admit to be actually his.

To name first those which are either certain or command the most general acceptance, placing them in something like an approximate and probable order of date. In the Uffizi at Florence are two companion pieces of the "Trial of Moses" and the "Judgment of Solomon," the latter the finer and better preserved of the two, which pass, no doubt justly, as typical works of Giorgione's youth, and exhibit, though not yet ripely, his special qualities of colour-richness and landscape romance, the peculiar facial types of his predilection, with the pure form of forehead, fine oval of cheek, and somewhat close-set eyes and eyebrows, and the intensity of that still and brooding sentiment with which, rather than with dramatic life and movement, he instinctively invests his figures. Probably the earliest of the portraits by common consent called his is the beautiful one of a young man at Berlin. His earliest devotional picture would seem to be the highly finished "Christ bearing his Cross" (the head and shoulders only, with a peculiarly serene and high-bred cast of features) formerly at Vicenza and now in the collection of Mrs Gardner at Boston. Other versions of this picture exist, and it has been claimed that one in private possession at Vienna is the true original: erroneously in the judgment of the present writer. Another "Christ bearing the Cross," with a Jew dragging at the rope round his neck, in the church of San Rocco at Venice, is a ruined but genuine work, quoted by Vasari and Ridolfi, and copied with the name of Giorgione appended, by Van Dyck in that master's Chatsworth sketch-book. (Vasari gives it to Giorgione in his first and to Titian in his second edition.) The composition of a lost early picture of the birth of Paris is preserved in an engraving of the "Teniers Gallery" series, and an old copy of part of the same picture is at Budapest. In the Giovanelli Palace at Venice is that fascinating and enigmatical mythology or allegory, known to the Anonimo Morelliano, who saw it in 1530 in the house of Gabriel Vendramin, simply as "the small landscape with the storm, the gipsy woman and the soldier"; the picture is conjecturally interpreted by modern authorities as illustrating a passage in Statius which describes the meeting of Adrastus with Hypsipyle when she was serving as nurse with the king of Nemea. Still belonging to the earlier part of the painter's brief career is a beautiful, virginally pensive Judith at St Petersburg, which passed under various alien names, as Raphael, Moretto, &c., until its kindred with the unquestioned work of Giorgione was in late years firmly established. The great Castelfranco altarpiece, still, in spite of many restorations, one of the most classically pure and radiantly impressive works of Renaissance painting, may be taken as closing the earlier phase of the young master's work (1504). It shows the Virgin loftily enthroned on a plain, sparely draped stone structure with St Francis and a warrior saint (St Liberale) standing in attitudes of great simplicity on either side of the foot of the throne, a high parapet behind them, and a beautiful landscape of the master's usual type seen above it. Nearly akin to this masterpiece, not in shape or composition but by the type of the Virgin and the very Bellinesque St Francis, is the altarpiece of the Madonna with St Francis and St Roch at Madrid. Of the master's fully ripened time is the fine and again enigmatical picture formerly in the house of Taddeo Contarini at Venice, described by contemporary witnesses as the "Three Philosophers," and now, on slender enough grounds, supposed to represent Evander showing Aeneas the site of Troy as narrated in the eighth Aeneid. The portrait of a knight of Malta in the Uffizi at Florence has more power and authority, if less sentiment, than the earlier example at Berlin, and may be taken to be of the

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master's middle time. Most entirely central and typical of all Giorgione's extant works is the Sleeping Venus at Dresden, first recognized by Morelli, and now universally accepted, as being the same as the picture seen by the Anonimo and later by Ridolfi in the Casa Marcello at Venice. An exquisitely pure and severe rhythm of line and contour chastens the sensuous richness of the presentment: the sweep of white drapery on which the goddess lies, and of glowing landscape that fills the space behind her, most harmoniously frame her divinity. It is recorded that the master left this piece unfinished and that the landscape, with a Cupid which subsequent restoration has removed, were completed after his death by Titian. The picture is the prototype of Titian's own Venus at the Uffizi and of many more by other painters of the school; but none of them attained the quality of the first exemplar. Of such small scenes of mixed classical mythology and landscape as early writers attribute in considerable number to Giorgione, there have survived at least two which bear strong evidences of his handiwork, though the action is in both of unwonted liveliness, namely the Apollo and Daphne of the Seminario at Venice and the Orpheus and Eurydice of Bergamo. The portrait of Antonio Grocardo at Budapest represents his fullest and most penetrating power in that branch of art. In his last years the purity and relative slenderness of form which mark his earlier female nudes, including the Dresden Venus, gave way to ideals of ampler mould, more nearly approaching those of Titian and his successors in Venetian art; as is proved by those last remaining fragments of the frescoes on the Grand Canal front of the Fondaco dei Tedeschi which were seen and engraved by Zanetti in 1760, but have now totally disappeared. Such change of ideal is apparent enough in the famous "Concert" or "Pastoral Symphony" of the Louvre, probably the latest, and certainly one of the most characteristic and harmoniously splendid, of Giorgione's creations that has come down to us, and has caused some critics too hastily to doubt its authenticity.

We pass now to pictures for which some affirm and others deny the right to bear Giorgione's name. As youthful in style as the two early pictures in the Uffizi, and closely allied to them in feeling, though less so in colour, is an unexplained subject in the National Gallery, sometimes called for want of a better title the "Golden Age"; this is officially and by many critics given only to the "school of" Giorgione, but may not unreasonably be claimed for his own work (No. 1173). There is also in England a group of three paintings which are certainly by one hand, and that a hand very closely related to Giorgione if not actually his own, namely the small oblong "Adoration of the Magi" in the National Gallery (No. 1160), the "Adoration of the Shepherds" belonging to Lord Allendale (with its somewhat inferior but still attractive replica at Vienna), and the small "Holy Family" in the collection of Mr R. H. Benson. The type of the Madonna in all these three pieces is different from that customary with the master, but there seems no reason why he should not at some particular moment have changed his model. The sentiment and gestures of the figures, the cast of draperies, the technical handling, and especially, in Lord Allendale's picture, the romantic richness of the landscape, all incline us to accept the group as original, notwithstanding the deviation of type already mentioned and certain weaknesses of drawing and proportion which we should have hardly looked for. Better known to European students in general are the two fine pictures commonly given to the master at the Pitti gallery in Florence, namely the "Three Ages" and the "Concert." Both are very Giorgionesque, the "Three Ages" leaning rather towards the early manner of Lorenzo Lotto, to whom by some critics it is actually given. The "Concert" is held on technical grounds by some of the best judges rather to bear the character of Titian at the moment when the inspiration of Giorgione was strongest on him, at least so far as concerns the extremely beautiful and expressive central figure of the monk playing on the clavichord with reverted head, a very incarnation of musical rapture and yearning—the other figures are too much injured to judge.

There are at least two famous single portraits as to which critics will probably never agree whether they are among the later works of Giorgione or among the earliest of Titian under his influence: these are the jovial and splendid half-length of Catherine Cornaro (or a stout lady much resembling her) with a bas-relief, in the collection of Signor Crespi at Milan, and the so-called "Ariosto" from Lord Darnley's collection acquired for the National Gallery in 1904. Ancient and half-effaced inscriptions, of which there is no cause to doubt the genuineness, ascribe them both to Titian; both, to the mind of the present writer at least, are more nearly akin to such undoubted early Titians as the "Man with the Book" at Hampton Court and the "Man with the Glove" at the Louvre than to any authenticated work of Giorgione. At the same time it should be remembered that Giorgione is known to have actually enjoyed the patronage of Catherine Cornaro and to have painted her portrait. The Giorgionesque influence and feeling, to a degree almost of sentimental exaggeration, encounter us again in another beautiful Venetian portrait at the National Gallery which has sometimes been claimed for him, that of a man in crimson velvet with white pleated shirt and a background of bays, long attributed to the elder Palma (No. 636). The same qualities are present with more virility in a very striking portrait of a young man at Temple Newsam, which stands indeed nearer than any other extant example to the Brocardo portrait at Budapest. The full-face portrait of a woman in the Borghese gallery at Rome has the marks of the master's design and inspiration, but in its present sadly damaged condition can hardly be claimed for his handiwork. The head of a boy with a pipe at Hampton Court, a little over life size, has been enthusiastically claimed as Giorgione's workmanship, but is surely too slack and soft in handling to be anything more than an early copy of a lost work, analogous to, though better than, the similar copy at Vienna of a young man with an arrow, a subject he is known to have painted. The early records prove indeed that not a few such copies of Giorgione's more admired works were produced in his own time or shortly afterwards. One of the most interesting and unmistakable such copies still extant is the picture formerly in the Manfrin collection at Venice, afterwards in that of Mr Barker in London, and now at Dresden, which is commonly called "The Horoscope," and represents a woman seated near a classic ruin with a young child at her feet, an armed youth standing looking down at them, and a turbaned sage seated near with compasses, disk and book. Of important subject pictures belonging to the debatable borderland between Giorgione and his imitators are the large and interesting unfinished "Judgment of Solomon" at Kingston Lacy, which must certainly be the same that Ridolfi saw and attributed to him in the Casa Grimani at Venice, but has weaknesses of design and drawing sufficiently baffling to criticism; and the "Woman taken in Adultery" in the public gallery at Glasgow, a picture truly Giorgionesque in richness of colour, but betraying in its awkward composition, the relative coarseness of its types and the insincere, mechanical animation of its movements, the hand of some lesser master of the school, almost certainly (by comparison with his existing engravings and woodcuts) that of Domenico Campagnola. It seems unnecessary to refer, in the present notice, to any of the numerous other and inferior works which have been claimed for Giorgione by a criticism unable to distinguish between a living voice and its echoes.

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GIOTTINO (1324–1357), an early Florentine painter. Vasari is the principal authority in regard to this artist; but it is not by any means easy to bring the details of his narrative into harmony with such facts as can now be verified. It would appear that there was a painter of the name of Tommaso (or Maso) di Stefano

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termed Giottino; and the Giottino of Vasari is said to have been born in 1324, and to have died early, of consumption, in 1357,—dates which must be regarded as open to considerable doubt. Stefano, the father of Tommaso, was himself a celebrated painter in the early revival of art; his naturalism was indeed so highly appreciated by contemporaries as to earn him the appellation of "Scimia della Natura" (ape of nature). He, it seems, instructed his son, who, however, applied himself with greater predilection to studying the works of the great Giotto, formed his style on these, and hence was called Giottino. It is even said that Giottino was really the son (others say the great-grandson) of Giotto. To this statement little or no importance can be attached. To Maso di Stefano, or Giottino, Vasari and Ghiberti attribute the frescoes in the chapel of S. Silvestro (or of the Bardi family) in the Florentine church of S. Croce; these represent the miracles of Pope S. Silvestro as narrated in the "Golden Legend," one conspicuous subject being the sealing of the lips of a malignant dragon. These works are animated and firm in drawing, with naturalism carried further than by Giotto. From the evidence of style, some modern connoisseurs assign to the same hand the paintings in the funeral vault of the Strozzi family, below the Cappella degli Spagnuoli in the church of S. Maria Novella, representing the crucifixion and other subjects. Vasari ascribes also to his Giottino the frescoes of the life of St Nicholas in the lower church of Assisi. This series, however, is not really in that part of the church which Vasari designates, but is in the chapel of the Sacrament; and the works in that chapel are understood to be by Giotto di Stefano, who worked in the second half of the 14th century—very excellent productions of their period. They are much damaged, and the style is hardly similar to that of the Sylvester frescoes. It might hence be inferred that two different men produced the works which are unitedly fathered upon the half-legendary "Giottino," the consumptive youth, solitary and melancholic, but passionately devoted to his art. A large number of other works have been attributed to the same hand; we need only mention an "Apparition of the Virgin to St Bernard," in the Florentine Academy; a lost painting, very popular in its day, commemorating the expulsion, which took place in 1343, of the duke of Athens from Florence; and a marble statue erected on the Florentine campanile. Vasari particularly praises Giottino for well-blended chiaroscuro.'

GIOTTO [GIOTTO DI BONDONE[1]] (1267?–1337), Italian painter, was born at Vespignano in the Mugello, a few miles north of Florence, according to one account in 1276, and according to another, which from the few known circumstances of his life seems more likely to be correct, in 1266 or 1267. His father was a land-owner at Colle in the commune of Vespignano, described in a contemporary document as *vir praeclarus*, but by biographers both early and late as a poor peasant; probably therefore a peasant proprietor of no large possessions but of reputable stock and descent. It is impossible to tell whether there is any truth in the legend of Giotto's boyhood which relates how he first showed his disposition for art, and attracted the attention of Cimabue, by being found drawing one of his father's sheep with a sharp stone on the face of a smooth stone or slate. With his father's consent, the story goes on, Cimabue carried off the boy to be his apprentice, and it was under Cimabue's tuition that Giotto took his first steps in the art of which he was afterwards to be the great emancipator and renovator. The place where these early steps can still, according to tradition, be traced, is in the first and second, reckoning downwards, of the three courses of frescoes which adorn the walls of the nave in the Upper Church of St Francis at Assisi. These frescoes represent subjects of the Old and New Testament, and great labour, too probably futile, has been spent in trying to pick out those in which the youthful handiwork of Giotto can be discerned, as it is imagined, among that of Cimabue and his other pupils. But the truth is that the figure of Cimabue himself, in spite of Dante's testimony to his having been the foremost painter of Italy until Giotto arose, has under the search-light of modern criticism melted into almost mythical vagueness. His accepted position as Giotto's instructor and the pioneer of reform in his art has been attacked from several sides as a mere invention of Florentine writers for the glorification of their own city. One group of critics maintain that the real advance in Tuscan painting before Giotto was the work of the Sienese school and not of the Florentine. Another group contend that the best painting done in Italy down to the last decade of the 13th century was not done by Tuscan hands at all, but by Roman craftsmen trained in the inherited principles of Italo-Byzantine decoration in mosaic and fresco, and that from such Roman craftsmen alone could Giotto have learnt anything worth his learning. The debate thus opened is far from closed, and considering how scanty, ambiguous and often defaced are the materials existing for discussion, it is perhaps never likely to be closed. But there is no debate as to the general nature of the reform effected by the genius of Giotto himself. He was the great humanizer of painting; it is his glory to have been the first among his countrymen to breathe life into wall-pictures and altar-pieces, and to quicken the dead conventionalism of inherited practice with the fire of natural action and natural feeling. Upon yet another point there is no question; and that is that the reform thus effected by Giotto in painting had been anticipated in the sister art of sculpture by nearly a whole generation. About the middle of the 13th century Nicola Pisano had renewed that art, first by strict imitation of classical models, and later by infusing into his work a fresh spirit of nature and humanity, perhaps partly caught from the Gothic schools of France. His son Giovanni had carried the same re-vitalising of sculpture a great deal further; and hence to some critics it would seem that the real inspirer and precursor of Giotto was Giovanni Pisano the sculptor, and not any painter or wall-decorator, whether of Florence, Siena or Rome.

In this division of opinion it is safer to regard the revival of painting in Giotto's hands simply as part of the general awakening of the time, and to remember that, as of all Italian communities Florence was the keenest in every form of activity both intellectual and practical, so it was natural that a son of Florence should be the chief agent in such an awakening. And in considering his career the question of his possible participation in the primitive frescoes of the upper courses at Assisi is best left out of account, the more so because of the deplorable condition in which they now exist. But with reference to the lowest course of paintings on the same walls, those illustrating the life of St Francis according to the narrative of St Bonaventura, no one has any doubt, at least in regard to nineteen or twenty of the twenty-eight subjects which compose the series, that Giotto himself was their designer and chief executant. In these, sadly as they too have suffered from time and wholesale repair, there can nevertheless be discerned the unmistakable spirit of the young Florentine master as we know him in his other works—his shrewd realistic and dramatic vigour, the deep sincerity and humanity of feeling which he knows how to express in every gesture of his figures without breaking up the harmony of their grouping or the grandeur of their linear design, qualities inherited from the earlier schools of impressive but lifeless heratic decoration. The "Renunciation of the Saint by his Father," the "Pope's Dream of the Saint upholding the tottering Church," the "Saint before the Sultan," the "Miracle of the Spring of Water," the "Death of the Nobleman of Celano," the "Saint preaching before Pope Honorius"—these are some of the most noted and best preserved examples of the painter's power in this series. Where doubt begins again is as to the relations of date and sequence which the series bears to other works by the master executed at Assisi and at Rome in the same early period of his career, that is, probably between 1295 and 1300. Giotto's remaining undisputed works at Assisi are the four celebrated allegorical compositions in honour of St Francis in the vaulting of the Lower Church,—the "Marriage of St Francis to Poverty," the "Allegory of Chastity," the "Allegory of Obedience" and the "Vision of St Francis in Glory." These works are scarcely at all retouched, and relatively little dimmed by time; they are of a singular beauty, at once severe and tender, both

[1] Not to be confused with Giotto di Buondone, a contemporary citizen and politician of Siena.

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in colour and design; the compositions, especially the first three, fitted with admirable art into the cramped spaces of the vaulting, the subjects, no doubt in the main dictated to the artist by his Franciscan employers, treated in no cold or mechanical spirit but with a full measure of vital humanity and original feeling. Had the career and influence of St Francis had no other of their vast and far-reaching effects in the world than that of inspiring these noble works of art, they would still have been entitled to no small gratitude from mankind. Other works at Assisi which most modern critics, but not all, attribute to Giotto himself are three miracles of St Francis and portions of a group of frescoes illustrating the history of Mary Magdalene, both in the Lower Church; and again, in one of the transepts of the same Lower Church, a series of ten frescoes of the Life of the Virgin and Christ, concluding with the Crucifixion. It is to be remarked as to this transept series that several of the frescoes present not only the same subjects, but with a certain degree of variation the same compositions, as are found in the master's great series executed in the Arena chapel at Padua in the fullness of his powers about 1306; and that the versions in the Assisi transept show a relatively greater degree of technical accomplishment than the Paduan versions, with a more attractive charm and more abundance of accessory ornament, but a proportionately less degree of that simple grandeur in composition and direct strength of human motive which are the special notes of Giotto's style. Therefore a minority of critics refuse to accept the modern attribution of this transept series to Giotto himself, and see in it later work by an accomplished pupil softening and refining upon his master's original creations at Padua. Others, insisting that these unquestionably beautiful works must be by the hand of Giotto and none but Giotto, maintain that in comparison with the Paduan examples they illustrate a gradual progress, which can be traced in other of his extant works, from the relatively ornate and soft to the austerely grand and simple. This argument is enforced by comparison with early work of the master's at Rome as to the date of which we have positive evidence. In 1298 Giotto completed for Cardinal Stefaneschi for the price of 2200 gold ducats a mosaic of Christ saving St Peter from the waves (the celebrated "Navicella"); this is still to be seen, but in a completely restored and transformed state, in the vestibule of St Peter's. For the same patron he executed, probably just before the "Navicella," an elaborate ciborium or altar-piece for the high altar of St Peter's, for which he received 800 ducats. It represents on the principal face a colossal Christ enthroned with adoring angels beside him and a kneeling donor at his feet, and the martyrdoms of St Peter and St Paul on separate panels to right and left; on the reverse is St Peter attended by St George and other saints, receiving from the donor a model of his gift, with stately full-length figures of two apostles to right and two to left, besides various accessory scenes and figures in the predellas and the margins. The separated parts of this altar-piece are still to be seen, in a quite genuine though somewhat tarnished condition, in the sacristy of St Peter's. A third work by the master at Rome is a repainted fragment at the Lateran of a fresco of Pope Boniface VIII. proclaiming the jubilee of 1300. The "Navicella" and the Lateran fragment are too much ruined to argue from; but the ciborium panels, it is contended, combine with the aspects of majesty and strength a quality of ornate charm and suavity such as is remarked in the transept frescoes of Assisi. The sequence proposed for these several works is accordingly, first the St Peter's ciborium, next the allegories in the vaulting of the Lower Church, next the three frescoes of St Francis' miracles in the north transept, next the St Francis series in the Upper Church; and last, perhaps after an interval and with the help of pupils, the scenes from the life of Mary Magdalene in her chapel in the Lower Church. This involves a complete reversal of the prevailing view, which regards the unequal and sometimes clumsy compositions of this St Francis series as the earliest independent work of the master. It must be admitted that there is something paradoxical in the idea of a progress from the manner of the Lower Church transept series of the life of Christ to the much ruder manner of the Upper Church series of St Francis.

A kindred obscurity and little less conflict of opinion await the inquirer at almost all stages of Giotto's career. In 1841 there were partially recovered from the whitewash that had overlain them a series of frescoes executed in the chapel of the Magdalene, in the Bargello or Palace of the Podestà at Florence, to celebrate (as was supposed) a pacification between the Black and White parties in the state effected by the Cardinal d'Acquasparta as delegate of the pope in 1302. In them are depicted a series of Bible scenes, besides great compositions of Hell and Paradise, and in the Paradise are introduced portraits of Dante, Brunetto Latini and Corso Donato. These recovered fragments, freely "restored" as soon as they were disclosed, were acclaimed as the work of Giotto and long held in especial regard for the sake of the portrait of Dante. Latterly it has been shown that if Giotto ever executed them at all, which is doubtful, it must have been at a later date than the supposed pacification, and that they must have suffered grievous injury in the fire which destroyed a great part of the building in 1332, and been afterwards repainted by some well-trained follower of the school. To about 1302 or 1303 would belong, if there is truth in it, the familiar story of Giotto's O. Pope Benedict XI., the successor of Boniface VIII., sent, as the tale runs, a messenger to bring him proofs of the painter's powers. Giotto would give no other sample of his talent than an O drawn with a free sweep of the brush from the elbow; but the pope was satisfied and engaged him at a great salary to go and adorn with frescoes the papal residence at Avignon. Benedict, however, dying at this time (1303), nothing came of this commission; and the remains of Italian 14th-century frescoes still to be seen at Avignon are now recognized as the work, not, as was long supposed, of Giotto, but of the Sienese Simone Martini and his school.

At this point in Giotto's life we come to the greatest by far of his undestroyed and undisputed enterprises, and one which can with some certainty be dated. This is the series of frescoes with which he decorated the entire internal walls of the chapel built at Padua in honour of the Virgin of the Annunciation by a rich citizen of the town, Enrico Scrovegni, perhaps in order to atone for the sins of his father, a notorious usurer whom Dante places in the seventh circle of hell. The building is on the site of an ancient amphitheatre, and is therefore generally called the chapel of the Arena. Since it is recorded that Dante was Giotto's guest at Padua, and since we know that it was in 1306 that the poet came from Bologna to that city, we may conclude that to the same year, 1306, belongs the beginning of Giotto's great undertaking in the Arena chapel. The scheme includes a Saviour in Glory over the altar, a Last Judgment, full of various and impressive incident, occupying the whole of the entrance wall, with a series of subjects from the Old and New Testament and the apocryphal Life of Christ painted in three tiers on either side wall, and lowest of all a fourth tier with emblematic Virtues and Vices in monochrome; the Virtues being on the side of the chapel next the incidents of redemption in the entrance fresco of the Last Judgment, the Vices on the side next the incidents of perdition. A not improbable tradition asserts that Giotto was helped by Dante in the choice and disposition of the subjects. The frescoes, though not free from injury and retouching, are upon the whole in good condition, and nowhere else can the highest powers of the Italian mind and hand at the beginning of the 14th century be so well studied as here. At the close of the middle ages we find Giotto laying the foundation upon which all the progress of the Renaissance was afterwards securely based. In his day the knowledge possessed by painters of the human frame and its structure rested only upon general observation and not upon detailed or scientific study; while to facts other than those of humanity their observation had never been closely directed. Of linear perspective they possessed but elementary and empirical ideas, and their endeavours to express aerial perspective and deal with the problems of light and shade were rare and partial. As far as painting could possibly be carried under these conditions, it was carried by Giotto. In its choice of

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subjects, his art is entirely subservient to the religious spirit of his age. Even in its mode of conceiving and arranging those subjects it is in part still trammelled by the rules and consecrated traditions of the past. Many of those truths of nature to which the painters of succeeding generations learned to give accurate and complete expression, Giotto was only able to express by way of imperfect symbol and suggestion. But among the elements of art over which he has control he maintains so just a balance that his work produces in the spectator less sense of imperfection than that of many later and more accomplished masters. In some particulars his mature painting, as we see it in the Arena chapel, has never been surpassed—in mastery of concise and expressive generalized line and of inventive and harmonious decorative tint; in the judicious division of the field and massing and scattering of groups; in the combination of high gravity with complete frankness in conception, and the union of noble dignity in the types with direct and vital truth in the gestures of the personages.

The frescoes of the Arena chapel must have been a labour of years, and of the date of their termination we have no proof. Of many other works said to have been executed by Giotto at Padua, all that remains consists of some scarce recognizable traces in the chapter-house of the great Franciscan church of St Antonio. For twenty years or more we lose all authentic data as to Giotto's doings and movements. Vasari, indeed, sends him on a giddy but in the main evidently fabulous round of travels, including a sojourn in France, which it is certain he never made. Besides Padua, he is said to have resided and left great works at Ferrara, Ravenna, Urbino, Rimini, Faenza, Lucca and other cities; in some of them paintings of his school are still shown, but nothing which can fairly be claimed to be by his hand. It is recorded also that he was much employed in his native city of Florence; but the vandalism of later generations has effaced nearly all that he did there. Among works whitewashed over by posterity were the frescoes with which he covered no less than five chapels in the church of Santa Croce. Two of these, the chapels of the Bardi and the Peruzzi families, were scraped in the early part of the 19th century, and very important remains were uncovered and immediately subjected to a process of restoration which has robbed them of half their authenticity. But through the ruins of time we can trace in some of these Santa Croce frescoes all the qualities of Giotto's work at an even higher and more mature development than in the best examples at Assisi or Padua. The frescoes of the Bardi chapel tell again the story of St Francis, to which so much of his best power had already been devoted; those of the Peruzzi chapel deal with the lives of St John the Baptist and St John the Evangelist. Such scenes as the Funeral of St Francis, the Dance of Herodias's Daughter, and the Resurrection of St John the Evangelist, which have to some extent escaped the disfigurements of the restorer, are among acknowledged classics of the world's art. The only clues to the dates of any of these works are to be found in the facts that among the figures in the Bardi chapel occurs that of St Louis of Toulouse, who was not canonized till 1317, therefore the painting must be subsequent to that year, and that the "Dance of Salome" must have been painted before 1331, when it was copied by the Lorenzetti at Siena. The only other extant works of Giotto at Florence are a fine "Crucifix," not undisputed, at San Marco, and the majestic but somewhat heavy altar-piece of the Madonna, probably an early work, which is placed in the Academy beside a more primitive Madonna supposed to be the work of Cimabue.

Towards the end of Giotto's life we escape again from confused legend, and from the tantalizing record of works which have not survived for us to verify, into the region of authentic document and fact. It appears that Giotto had come under the notice of Duke Charles of Calabria, son of King Robert of Naples, during the visits of the duke to Florence which took place between 1326 and 1328, in which year he died. Soon afterwards Giotto must have gone to King Robert's court at Naples, where he was enrolled as an honoured guest and member of the household by a royal decree dated the 20th of January 1330. Another document shows him to have been still at Naples two years later. Tradition says much about the friendship of the king for the painter and the freedom of speech and jest allowed him; much also of the works he carried out at Naples in the Castel Nuovo, the Castel dell' Uovo, and the church and convent of Sta Chiara. Not a trace of these works remains; and others which later criticism have claimed for him in a hall which formerly belonged to the convent of Sta Chiara have been proved not to be his.

Meantime Giotto had been advancing, not only in years and worldly fame, but in prosperity. He was married young, and had, so far as is recorded, three sons, Francesco, Niccola and Donato, and three daughters, Bice, Caterina and Lucia. He had added by successive purchases to the plot of land inherited from his father at Vespignano. His fellow-citizens of all occupations and degrees delighted to honour him. And now, in his sixty-eighth year (if we accept the birth-date 1266/7), on his return from Naples by way of Gaeta, he received the final and official testimony to the esteem in which he was held at Florence. By a solemn decree of the *Priori* on the 12th of April 1334, he was appointed master of the works of the cathedral of Sta Reparata (later and better known as Sta Maria del Fiore) and official architect of the city walls and the towns within her territory. What training as a practical architect his earlier career had afforded him we do not know, but his interest in the art from the beginning is made clear by the carefully studied architectural backgrounds of many of his frescoes. Dying on the 8th of January 1336 (old style 1337), Giotto only enjoyed his new dignities for two years. But in the course of them he had found time not only to make an excursion to Milan, on the invitation of Azzo Visconti and with the sanction of his own government, but to plan two great architectural works at Florence and superintend the beginning of their execution, namely the west front of the cathedral and its detached campanile or bell-tower. The unfinished enrichments of the cathedral front were stripped away in a later age. The foundation-stone of the Campanile was laid with solemn ceremony in the presence of a great concourse of magistrates and people on the 18th of July 1334. Its lower courses seem to have been completed from Giotto's design, and the first course of its sculptured ornaments (the famous series of primitive Arts and Industries) actually by his own hand, before his death. It is not clear what modifications of his design were made by Andrea Pisano, who was appointed to succeed him, or again by Francesco Talenti, to whom the work was next entrusted; but the incomparable structure as we now see it stands justly in the world's esteem as the most fitting monument to the genius who first conceived and directed it.

The art of painting, as re-created by Giotto, was carried on throughout Italy by his pupils and successors with little change or development for nearly a hundred years, until a new impulse was given to art by the combined influences of naturalism and classicism in the hands of men like Donatello and Masaccio. Most of the anecdotes related of the master are probably inaccurate in detail, but the general character both as artist and man which tradition has agreed in giving him can never be assailed. He was from the first a kind of popular hero. He is celebrated by the poet Petrarch and by the historian Villani. He is made the subject of tales and anecdotes by Boccaccio and by Franco Sacchetti. From these notices, as well as from Vasari, we gain a distinct picture of the man, as one whose nature was in keeping with his country origin; whose sturdy frame and plain features corresponded to a character rather distinguished for shrewd and genial strength than for sublimer or more ascetic qualities; a master craftsman, to whose strong combining and inventing powers nothing came amiss; conscious of his own deserts, never at a loss either in the things of art or in the things of life, and equally ready and efficient whether he has to design the scheme of some great spiritual allegory in colour or imperishable monument in stone, or whether he has to show his wit in the encounter of practical jest and repartee. From his own hand we have a contribution to literature which helps to substantiate this conception of his character. A large part of Giotto's fame as painter was won in the service of the Franciscans, and in the pictorial celebration of the life and ordinances of

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their founder. As is well known, it was a part of the ordinances of Francis that his disciples should follow his own example in worshipping and being wedded to poverty,—poverty idealized and personified as a spiritual bride and mistress. Giotto, having on the commission of the order given the noblest pictorial embodiment to this and other aspects of the Franciscan doctrine, presently wrote an ode in which his own views on poverty are expressed; and in this he shows that, if on the one hand his genius was at the service of the ideals of his time, and his imagination open to their significance, on the other hand his judgment was shrewdly and humorously awake to their practical dangers and exaggerations.

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GIPSIES, or GYPSIES, a wandering folk scattered through every European land, over the greater part of western Asia and Siberia; found also in Egypt and the northern coast of Africa, in America and even in Australia. No correct estimate of their numbers outside of Europe can be given, and even in Europe the information derived from official statistics is often contradictory and unreliable. The only country in which the figures have been given correctly is Hungary. In 1893 there were 274,940 in Transleithania, of whom 243,432 were settled, 20,406 only partly settled and 8938 nomads. Of these 91,603 spoke the Gipsy language in 1890, but the rest had already been assimilated. Next in numbers stands Rumania, the number varying between 250,000 and 200,000 (1895). Turkey in Europe counted 117,000 (1903), of whom 51,000 were in Bulgaria and Eastern Rumelia, 22,000 in the vilayet of Adrianople and 2500 in the vilayet of Kossovo. In Asiatic Turkey the estimates vary between 67,000 and 200,000. Servia has 41,000; Bosnia and Herzegovina, 18,000; Greece, 10,000; Austria (Cisleithania), 16,000, of whom 13,500 are in Bohemia and Moravia; Germany, 2000; France, 2000 (5000?); Basque Provinces, 500 to 700; Italy, 32,000; Spain, 40,000; Russia, 58,000; Poland, 15,000; Sweden and Norway, 1500; Denmark and Holland, 5000; Persia, 15,000; Transcaucasia, 3000. The rest is mere guesswork. For Africa, America and Australia the numbers are estimated between 135,000 and 166,000. The estimate given by Miklosich (1878) of 700,000 fairly agrees with the above statistics. No statistics are forthcoming for the number in the British Isles. Some estimate their number at 12,000.

The Gipsies are known principally by two names, which have been modified by the nations with whom they came in contact, but which can easily be traced to either the one or the other of these two distinct stems. The one group, embracing the majority of Gipsies in Europe, the compact masses living in the Balkan Peninsula, Rumania and Transylvania and extending also as far as Germany and Italy, are known by the name *Atsigan* or *Atsigan*, which becomes in time Tshingian (Turkey and Greece), Tsigan (Bulgarian, Servian, Rumanian), Czigany (Hungarian), Zigeuner (Germany), Zingari (Italian), and it is not unlikely that the English word Tinker or Tinkler (the latter no doubt due to a popular etymology connecting the gaudy gipsy with the tinkling coins or the metal wares which he carried on his back as a smith and tinker) may be a local transformation of the German *Zigeuner*. The second name, partly known in the East, where the word, however, is used as an expression of contempt, whilst Zigan is not felt by the gipsies as an insult, is *Egyptian*; in England, Gipsy; in some German documents of the 16th century *Aegypter*; Spanish *Gitano*; modern Greek *Gyphtos*. They are also known by the parallel expressions *Faraon* (Rumanian) and *Pharao Nephka* (Hungarian) or Pharaoh's people, which are only variations connected with the Egyptian origin. In France they are known as *Bohémiens*, a word the importance of which will appear later. To the same category belong other names bestowed upon them, such as Walachi, Saraceni, Agareni, Nubiani, &c. They were also known by the name of Tartars, given to them in Germany, or as "Heathen," *Heydens*. All these latter must be considered as nicknames without thereby denoting their probable origin. The same may have now been the case with the first name with which they appear in history, *Atsigan*. Much ingenuity has been displayed in attempts to explain the name, for it was felt that a true explanation might help to settle the question of their origin and the date of their arrival in Europe. Here again two extreme theories have been propounded, the one supported by Bataillard, who connected them with the Sigynnoi of Herodotus and identified them with the Komodromoi of the later Byzantine writers, known already in the 6th century. Others bring them to Europe as late as the 14th century; and the name has also been explained by de Goeje from the Persian *Chang*, a kind of harp or zither, or the Persian *Zang*, black, swarthy. Rienzi (1832) and Trumpp (1872) have connected the name with the Changars of North-East India, but all have omitted to notice that the real form was Atzigan or (more correct) Atzingan and not Tsigan. The best explanation remains that suggested by Miklosich, who derives the word from the Athinganoi, a name originally belonging to a peculiar heretical sect living in Asia Minor near Phrygia and Lycaonia, known also as the Melki-Zedekites. The members of this sect observed very strict rules of purity, as they were afraid to be defiled by the touch of other people whom they considered unclean. They therefore acquired the name of Athinganoi (*i.e.* "Touch-me-nots"). Miklosich has collected seven passages where the Byzantine historians of the 9th century describe the Athinganoi as soothsayers, magicians and serpent-charmers. From these descriptions nothing definite can be proved as to the identity of the Athinganoi with the Gipsies, or the reason why this name was given to soothsayers, charmers, &c. But the inner history of the Byzantine empire of that period may easily give a clue to it and explain how it came about that such a nickname was given to a new sect or to a new race which suddenly appeared in the Greek Empire at that period. In the history of the Church we find them mentioned in one breath with the Paulicians and other heretical sects which were transplanted in their tens of thousands from Asia Minor to the Greek empire and settled especially in Rumelia, near Adrianople and Philippopolis. The Greeks called these heretical sects by all kinds of names, derived from ancient Church traditions, and gave to each sect such names as first struck them, on the scantiest of imaginary similarities. One sect was called Paulician, another Melki-Zedekite; so also these were called Athinganoi, probably being considered the descendants of the outcast Samer, who, according to ancient tradition, was a goldsmith and the maker of the Golden Calf in the desert. For this sin Samer was banished and compelled to live apart from human beings and even to avoid their touch (Athinganos: "Touch-me-not"). Travelling from East to West these heretical sects obtained different names in different countries, in accordance with the local traditions or to imaginary origins. The Bogomils and Patarenes became Bulgarians in France, and so the gypsies Bohémiens, a name which was also connected with the heretical sect of the Bohemian brothers (*Böhmische Brüder*). Curiously enough the Kutzo-Vlachs living in Macedonia (q.v.) and Rumelia are also known by the nickname Tsintsari, a word that has not yet been explained. Very likely it stands in close connexion with Zingari, the name having been transferred from one people to the other without the justification of any common ethnical origin, except that the Kutzo-Vlachs, like the Zingari, differed from their Greek neighbours in race, as in language, habits and customs; while they probably followed similar pursuits to those of the Zingari, as smiths, &c. As to the other name, Egyptians, this is derived from a peculiar tale which the gipsies spread when appearing in the west of Europe. They alleged that they had come from a country of their own called Little Egypt, either a confusion between Little Armenia and Egypt or the Peloponnesus.

Attention may be drawn to a remarkable passage in the Syriac version of the apocryphal Book of Adam, known as the *Cave of Treasures* and compiled probably in the 6th century: "And

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of the seed of Canaan were as I said the Aegyptians; and, lo, they were scattered all over the earth and served as slaves of slaves" (ed. Bezold, German translation, p. 25). No reference to such a scattering and serfdom of the Egyptians is mentioned anywhere else. This must have been a legend, current in Asia Minor, and hence probably transferred to the swarthy Gipsies.

A new explanation may now be ventured upon as to the name which the Gipsies of Europe give to themselves, which, it must he emphasized, is not known to the Gipsies outside of Europe. Only those who starting from the ancient Byzantine empire have travelled westwards and spread over Europe, America and Australia call themselves by the name of Rom, the woman being Romni and a stranger Gaži. Many etymologies have been suggested for the word Rom. Paspati derived it from the word Droma (Indian), and Miklosich had identified it with Doma or Domba, a "low caste musician," rather an extraordinary name for a nation to call itself by. Having no home and no country of their own and no political traditions and no literature, they would naturally try to identify themselves with the people in whose midst they lived, and would call themselves by the same name as other inhabitants of the Greek empire, known also as the Empire of New Rom, or of the Romaioi, Romeliots, Romanoi, as the Byzantines used to call themselves before they assumed the prouder name of Hellenes. The Gipsies would therefore call themselves also Rom, a much more natural name, more flattering to their vanity, and geographically and politically more correct than if they called themselves "low caste musicians." This Greek origin of the name would explain why it is limited to the European Gipsies, and why it is not found among that stock of Gipsies which has migrated from Asia Minor southwards and taken a different route to reach Egypt and North Africa.

Appearance in Europe.—Leaving aside the doubtful passages in the Byzantine writers where the Athinganoi are mentioned, the first appearance of Gipsies in Europe cannot be traced positively further back than the beginning of the 14th century. Some have hitherto believed that a passage in what was erroneously called the Rhymed Version of Genesis of Vienna, but which turns out to he the work of a writer before the year 1122, and found only in the Klagenfurt manuscript (edited by Ditmar, 1862), referred to the Gipsies. It runs as follows: Gen. xiii. 15—"Hagar had a son from whom were born the Chaltsmide. When Hagar had that child, she named it Ismael, from whom the Ismaelites descend who journey through the land, and we call them Chaltsmide, may evil befall them! They sell only things with blemishes, and for whatever they sell they always ask more than its real value. They cheat the people to whom they sell. They have no home, no country, they are satisfied to live in tents, they wander over the country, they deceive the people, they cheat men but rob no one noisily."

This reference to the Chaltsmide (not goldsmiths, but very likely ironworkers, smiths) has wrongly been applied to the Gipsies. For it is important to note that at least three centuries before historical evidence proves the immigration of the genuine Gipsy, there had been wayfaring smiths, travelling from country to country, and practically paving the way for their successors, the Gipsies, who not only took up their crafts but who probably have also assimilated a good proportion of these vagrants of the west of Europe. The name given to the former, who probably were Oriental or Greek smiths and pedlars, was then transferred to the new-comers. The Komodromoi mentioned by Theophanes (758–818), who speaks under the date 554 of one hailing from Italy, and by other Byzantine writers, are no doubt the same as the Chaltsmide of the German writer of the 12th century translated hy Ducange as *Chaudroneurs*. We are on surer ground in the 14th century. Hopf has proved the existence of Gipsies in Corfu before 1326. Before 1346 the empress Catherine de Valois granted to the governor of Corfu authority to reduce to vassalage certain vagrants who came from the mainland; and in 1386, under the Venetians, they formed the Feudum Acindanorum, which lasted for many centuries. About 1378 the Venetian governor of Nauplia confirmed to the "Acingani" of that colony the privileges granted by his predecessor to their leader John. It is even possible to identify the people described by Friar Simon in his *Itinerarium*, who, speaking of his stay in Crete in 1322, says: "We saw there a people outside the city who declare themselves to be of the race of Ham and who worship according to the Greek rite. They wander like a cursed people from place to place, not stopping at all or rarely in one place longer than thirty days; they live in tents like the Arabs, a little oblong black tent." But their name is not mentioned, and although the similarity is great between these "children of Ham" and the Gipsies, the identification has only the value of an hypothesis. By the end of the 15th century they must have been settled for a sufficiently long time in the Balkan Peninsula and the countries north of the Danube, such as Transylvania and Walachia, to have been reduced to the same state of serfdom as they evidently occupied in Corfu in the second half of the 14th century. The voivode Mircea I. of Walachia confirms the grant made by his uncle Vladislav Voivode to the monastery of St Anthony of Voditsa as to forty families of "Atsigane," for whom no taxes should be paid to the prince. They were considered crown property. The same gift is renewed in the year 1424 by the voivode Dan, who repeats the very same words (i Acigâne, m, čeliudi. da su slobodni ot vstkih rabot i dankov) (Hâjdău, *Arhiva*, i. 20). At that time there must already have been in Walachia settled Gipsies treated as serfs, and migrating Gipsies plying their trade as smiths, musicians, dancers, soothsayers, horse-dealers, &c., for we find the voivode Alexander of Moldavia granting these Gipsies in the year 1478 "freedom of air and soil to wander about and free fire and iron for their smithy." But a certain portion, probably the largest, became serfs, who could be sold, exchanged, hartered and inherited. It may be mentioned here that in the 17th century a family when sold fetched forty Hungarian florins, and in the 18th century the price was sometimes as high as 700 Rumanian piastres, about £8, 10s. As late as 1845 an auction of 200 families of Gipsies took place in Bucharest, where they were sold in batches of no less than 5 families and offered at a "ducat" cheaper per head than elsewhere. The Gipsies followed at least four distinct pursuits in Rumania and Transylvania, where they lived in large masses. A goodly proportion of them were tied to the soil; in consequence their position was different from that of the Gipsies who had started westwards and who are nowhere found to have obtained a permanent abode for any length of time, or to have been treated, except for a very short period, with any consideration of humanity.

Their appearance in the West is first noted by chroniclers early in the 15th century. In 1414 they are said to have already arrived in Hesse. This date is contested, but for 1417 the reports are unanimous of their appearance in Germany. Some count their number to have been as high as 1400, which of course is exaggeration. In 1418 they reached Hamburg, 1419 Augsburg, 1428 Switzerland. In 1427 they had already entered France (Provence). A troupe is said to have reached Bologna in 1422, whence they are said to have gone to Rome, on a pilgrimage alleged to have been undertaken for some act of apostasy. After this first immigration a second and larger one seems to have followed in its wake, led by Zumbel. The Gipsies spread over Germany, Italy and France between the years 1438 and 1512. About 1500 they must have reached England. On the 5th of July 1505 James IV. of Scotland gave to "Antonius Gaginae," count of Little Egypt, letters of recommendation to the king of Denmark; and special privileges were granted by James V. on the 15th of February 1540 to "oure louit johnne Faw Lord and Erle of Litill Egypt," to whose son and successor he granted authority to hang and punish all Egyptians within the realm (May 26, 1540).

It is interesting to hear what the first writers who witnessed their appearance have to tell us; for ever since the Gipsies have remained the same. Albert Krantzius (Krantz), in his *Saxonia* (xl. 2), was the first to give a full description, which was afterwards repeated by Munster in his *Cosmographia* (iii. 5).

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He says that in the year 1417 there appeared for the first time in Germany a people uncouth, black, dirty, barharous, called in Italian "Ciani," who indulge specially in thieving and cheating. They had among them a count and a few knights well dressed, others followed afoot. The women and children travelled in carts. They also carried with them letters of safe-conduct from the emperor Sigismund and other princes, and they professed that they were engaged on a pilgrimage of expiation for some act of apostasy.

The guilt of the Gipsies varies in the different versions of the story, but all agree that the Gipsies asserted that they came from their own country called "Litill Egypt," and they had to go to Rome, to obtain pardon for that alleged sin of their forefathers. According to one account it was because they had not shown mercy to Joseph and Mary when they had sought refuge in Egypt from the persecution of Herod (*Basel Chronicle*). According to another, because they had forsaken the Christian faith for a while (*Rhaetia*, 1656), &c. But these were fables, no douht connected with the legend of Cartaphylus or the Wandering Jew.

Krantz's narrative continues as follows: This people have no country and travel through the land. They live like dogs and have no religion although they allow themselves to be baptized in the Christian faith. They live without care and gather unto themselves also other vagrants, men and women. Their old women practise fortune-telling, and whilst they are telling men of their future they pick their pockets. Thus far Krantz. It is curious that he should use the name hy which these people were called in Italy, "Ciani." Similarly Crusius, the author of the *Annales Suevici*, knows their Italian name *Zigani* and the French *Bohémiens*. Not one of these oldest writers mentions them as coppersmiths or farriers or musicians. The immunity which they enjoyed during their first appearance in western Europe is due to the letter of safe-conduct of the emperor. As it is of extreme importance for the history of civilization as well as the history of the Gipsies, it may find a place here. It is taken from the compilation of Felix Oefelius, *Rerum Boicarum scriptores* (Augsburg, 1763), ii. 15, who reproduces the "Diarium sexennale" of "Andreas Presbyter," the contemporary of the first appearance of the Gipsies in Germany.

"Sigismundus Dei gratia Romanorum Rex semper Augustus, ac Hungariae, Bohemiae, Dalmatiae, Croatiae, &c. Rex Fidelibus nostris universis Nobilibus, Militibus, Castellanis, Officialibus, Tributariis, civitatibus liberis, opidis et eorum iudicihus in Regno et sub domino nostro constitutis ex existentibus salutem cum dilectione. Fideles nostri adierunt in praesentiam personaliter Ladislaus Wayuoda Ciganorum cum aliis ad ipsum spectantibus, nobis humilimas porrexerunt supplicationes, huc in sepus in nostra praesentia supplicationum precum cum instantiâ, ut ipsis gratiâ nostra uberiori providere dignaremur. Unde nos illorum supplicatione illecti eisdem hanc libertatem duximus concedendam, qua re quandocunque idem Ladislaus Wayuoda et sua gens ad dicta nostra dominia videlicet civitates vel oppida pervenerint, ex tunc vestris fidelitatibus praesentibus firmiter committimus et mandamus ut eosdem Ladislaum Wayuodam et Ciganos sihi subiectos omni sine impedimento ac perturbatione aliquali fovere ac conservare deheatis, immo ab omnihus impetitionibus seu offensionihus tueri velitis: Si autem inter ipsos aliqua Zizania seu perturbatio evenerit ex parte, quorumcunque ex tunc non vos nec aliquis alter vestrum, sed idem Ladislaus Wayuoda iudicandi et liberandi habeat facultatem. Praesentes autem post earum lecturam semper reddi iubemus praesentanti.

"Datum in Sepsus Dominica die ante festum St Georgii Martyris Anno Domini MCCCCXXIII., Regnorum nostrorum anno Hungar. XXXVI., Romanorum vero XII., Bohemiae tertio."

Freely translated this reads: "We Sigismund by the grace of God emperor of Rome, king of Hungary, Bohemia, &c. unto all true and loyal subjects, nohle soldiers, commanders, castellans, open districts, free towns and their judges in our kingdom established and under our sovereignty, kind greetings. Our faithful voivode of the Tsigani with others belonging to him has humbly requested us that we might graciously grant them our abundant favour. We grant them their supplication, we have vouchsafed unto them this liberty. Whenever therefore this voivode Ladislaus and his people should come to any part of our realm in any town, village or place, we commit them by these presents, strongly to your loyalty and we command you to protect in every way the same voivode Ladislaus and the Tsigani his subjects without hindrance, and you should show kindness unto them and you should protect them from every trouble and persecution. But should any trouble or discord happen among them from whichever side it may be, then none of you nor anyone else belonging to you should interfere, but this voivode Ladislaus alone should have the right of punishing and pardoning. And we moreover command you to return these presents always after having read them. Given in our court on Sunday the day before the Feast of St George in the year of our Lord 1423. The 36th year of our kingdom of Hungary, the 12th of our being emperor of Rome and the 3rd of our being king of Bohemia."

There is no reason to douht the authenticity of this document, which is in no way remarkable considering that at that time the Gipsies must have formed a very considerable portion of the inhabitants of Hungary, whose king Sigismund was. They may have presented the emperor's grant of favours to Alexander prince of Moldavia in 1472, and obtained from him safe-conduct and protection, as mentioned above.

No one has yet attempted to explain the reason why the Gipsies should have started in the 14th and especially in the first half of the 15th century on their march westwards. But if, as has been assumed above, the Gipsies had lived for some length of time in Rumelia, and afterwards spread thence across the Danube and the plains of Transylvania, the incursion of the Turks into Europe, their successive occupation of those very provinces, the overthrow of the Servian and Bulgarian kingdoms and the dislocation of the native population, would account to a remarkable degree for the movement of the Gipsies: and this movement increases in volume with the greater successes of the Turks and with the peopling of the country by immigrants from Asia Minor. The first to be driven from their homes would no douht be the nomadic element, which felt itself ill at ease in its new surroundings, and found it more profitahle first to settle in larger numbers in Walachia and Transylvania and thence to spread to the western countries of Europe. But their immunity from persecution did not last long.

Later History.—Less than fifty years from the time that they emerge out of Hungary, or even from the date of the Charter of the emperor Sigismund, they found themselves exposed to the fury and the prejudices of the people whose good faith they had abused, whose purses they had lightened, whose barns they had emptied, and on whose credulity they had lived with ease and comfort. Their inborn tendency to roaming made them the terror of the peasantry and the despair of every legislator who tried to settle them on the land. Their foreign appearance, their unknown tongue and their unscrupulous habits forced the legislators of many countries to class them with rogues and vagabonds, to declare them outlaws and felons and to treat them with extreme severity. More than one judicial murder has been committed against them. In some places they were suspected as Turkish spies and treated accordingly, and the murderer of a Gipsy was often regarded as innocent of any crime.

Weissenbruch describes the wholesale murder of a group of Gipsies, of whom five men were broken on the wheel, nine perished on the gallows, and three men and eight women were decapitated. This took place on the 14th and 15th of November 1726. Acts and edicts were issued in many countries from the end of the 15th century onwards sentencing the "Egyptians" to exile under pain of death. Nor was this an empty threat. In Edinhurgh four "Faas" were hanged in 1611 "for abyding within the kingdome, they being Egiptienis," and in 1636 at Haddington the Egyptians were ordered "the men to be hangied and the weomen to be drowned, and suche of the weomen as hes children to be scourgit throw the burg and burnt in the cheeks." The burning on the cheek or on the back was a common penalty.

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In 1692 four Estremadura Gipsies caught by the Inquisition were charged with cannibalism and made to own that they had eaten a friar, a pilgrim and even a woman of their own tribe, for which they suffered the penalty of death. And as late as 1782, 45 Hungarian Gipsies were charged with a similar monstrous crime, and when the supposed victims of a supposed murder could not be found on the spot indicated by the Gipsies, they owned under torture and said on the rack, "We ate them." Of course they were forthwith beheaded or hanged. The emperor Joseph II., who was also the author of one of the first edicts in favour of the Gipsies, and who abolished serfdom throughout the Empire, ordered an inquiry into the incident; it was then discovered that no murder had been committed, except that of the victims of this monstrous accusation.

The history of the legal status of the Gipsies, of their treatment in various countries and of the penalties and inflictions to which they have been subjected, would form a remarkable chapter in the history of modern civilization. The materials are slowly accumulating, and it is interesting to note as one of the latest instances, that not further back than the year 1907 a "drive" was undertaken in Germany against the Gipsies, which fact may account for the appearance of some German Gipsies in England in that year, and that in 1904 the Prussian Landtag adopted unanimously a proposition to examine anew the question of granting peddling licences to German Gipsies; that on the 17th of February 1906 the Prussian minister issued special instructions to combat the Gipsy nuisance; and that in various parts of Germany and Austria a special register is kept for the tracing of the genealogy of vagrant and sedentary Gipsy families.

Different has been the history of the Gipsies in what originally formed the Turkish empire of Europe, notably in Rumania, *i.e.* Walachia and Moldavia, and a careful search in the archives of Rumania would offer rich materials for the history of the Gipsies in a country where they enjoyed exceptional treatment almost from the beginning of their settlement. They were divided mainly into two classes, (1) *Robi* or Serfs, who were settled on the land and deprived of all individual liberty, being the property of the nobles and of churches or monastic establishments, and (2) the Nomadic vagrants. They were subdivided into four classes according to their occupation, such as the Lingurari (woodcarvers; lit. "spoonmakers"), Caldarari (tinkers, coppersmiths and ironworkers), Ursari (lit. "bear drivers") and Rudari (miners), also called Aurari (gold-washers), who used formerly to wash the gold out of the auriferous river-sands of Walachia. A separate and smaller class consisted of the Gipsy *Ldeshi* or *Vatrashi* (settled on a homestead or "having a fireplace" of their own). Each *shatra* or Gipsy community was placed under the authority of a judge or leader, known in Rumania as *jude*, in Hungary as *aga*; these officials were subordinate to the *bulubasha* or *voivod*, who was himself under the direct control of the *yuzbasha* (or governor appointed by the prince from among his nobles). The *yuzbasha* was responsible for the regular income to be derived from the vagrant Gipsies, who were considered and treated as the prince's property. These voivodi or yuzbashi who were not Gipsies by origin often treated the Gipsies with great tyranny. In Hungary down to 1648 they belonged to the aristocracy. The last Polish *Krolestvo cyganskie* or Gipsy king died in 1790. The *Robi* could be bought and sold, freely exchanged and inherited, and were treated as the negroes in America down to 1856, when their final freedom in Moldavia was proclaimed. In Hungary and in Transylvania the abolition of servitude in 1781–1782 carried with it the freedom of the Gipsies. In the 18th and 19th centuries many attempts were made to settle and to educate the roaming Gipsies; in Austria this was undertaken by the empress Maria Theresa and the emperor Francis II. (1761–1783), in Spain by Charles III. (1788). In Poland (1791) the attempt succeeded. In England (1827) and in Germany (1830) societies were formed for the reclamation of the Gipsies, but nothing was accomplished in either case. In other countries, however, definite progress was made. Since 1866 the Gipsies have become Rumanian citizens, and the latest official statistics no longer distinguish between the Rumanians and the Gipsies, who are becoming thoroughly assimilated, forgetting their language, and being slowly absorbed by the native population. In Bulgaria the Gipsies were declared citizens, enjoying equal political rights in accordance with the treaty of Berlin in 1878, but through an arbitrary interpretation they were deprived of that right, and on the 6th of January 1906 the first Gipsy Congress was held in Sofia, for the purpose of claiming political rights for the Turkish Gipsies or Gopti as they call themselves. Ramadan Alief, the *tsari-bashi* (*i.e.* the head of the Gipsies in Sofia), addressed the Gipsies assembled; they decided to protest and subsequently sent a petition to the Sobranye, demanding the recognition of their political rights. A curious reawakening, and an interesting chapter in the history of this peculiar race.

Origin and Language of the Gipsies.—The real key to their origin is, however, the Gipsy language. The scientific study of that language began in the middle of the 19th century with the work of Pott, and was brought to a high state of perfection by Miklosich. From that time on monographs have multiplied and minute researches have been carried on in many parts of the world, all tending to elucidate the true origin of the Gipsy language. It must remain for the time being an open question whether the Gipsies were originally a pure race. Many a strange element has contributed to swell their ranks and to introduce discordant elements into their vocabulary. Ruediger (1782), Grellmann (1783) and Marsden (1783) almost simultaneously and independently of one another came to the same conclusion, that the language of the Gipsies, until then considered a thieves' jargon, was in reality a language closely allied with some Indian speech. Since then the two principal problems to be solved have been, firstly, to which of the languages of India the original Gipsy speech was most closely allied, and secondly, by which route the people speaking that language had reached Europe and then spread westwards. Despite the rapid increase in our knowledge of Indian languages, no solution has yet been found to the first problem, nor is it likely to be found. For the language of the Gipsies, as shown now by recent studies of the Armenian Gipsies, has undergone such a profound change and involves so many difficulties, that it is impossible to compare the modern Gipsy with any modern Indian dialect owing to the inner developments which the Gipsy language has undergone in the course of centuries. All that is known, moreover, of the Gipsy language, and all that rests on reliable texts, is quite modern, scarcely earlier than the middle of the 19th century. Followed up in the various dialects into which that language has split, it shows such a thorough change from dialect to dialect, that except as regards general outlines and principles of inflexion, nothing would be more misleading than to draw conclusions from apparent similarities between Gipsy, or any Gipsy dialect, and any Indian language; especially as the Gipsies must have been separated from the Indian races for a much longer period than has elapsed since their arrival in Europe and since the formation of their European dialects. It must also be borne in mind that the Indian languages have also undergone profound changes of their own, under influences totally different from those to which the Gipsy language has been subjected. The problem would stand differently if by any chance an ancient vocabulary were discovered representing the oldest form of the common stock from which the European dialects have sprung; for there can be no doubt of the unity of the language of the European Gipsies. The question whether Gipsy stands close to Sanskrit or Prakrit, or shows forms more akin to Hindi dialects, specially those of the North-West frontier, or Dardestan and Kafiristan, to which may be added now the dialects of the Pisaca language (Grierson, 1906), is affected by the fact established by Fink that the dialect of the Armenian Gipsies shows much closer resemblance to Prakrit than the language of the European Gipsies, and that the dialects of Gipsy spoken throughout Syria and Asia Minor differ profoundly in every respect from the European Gipsy, taken as a whole spoken. The only explanation possible is that the European Gipsy represents the first wave of the Westward movement of an Indian tribe or caste which, dislocated

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at a certain period by political disturbances, had travelled through Persia, making a very short stay there, thence to Armenia staying there a little longer, and then possibly to the Byzantine Empire at an indefinite period between 1100 and 1300; and that another clan had followed in their wake, passing through Persia, settling in Armenia and then going farther down to Syria, Egypt and North Africa. These two tribes though of a common remote Indian origin must, however, be kept strictly apart from one another in our investigation, for they stand to each other in the same relation as they stand to the various dialects in India. The linguistic proof of origin can therefore now not go further than to establish the fact that the Gipsy language is in its very essence an originally Indian dialect, enriched in its vocabulary from the languages of the peoples among whom the Gipsies had sojourned, whilst in its grammatical inflection it has slowly been modified, to such an extent that in some cases, like the English or the Servian, barely a skeleton has remained.

Notwithstanding the statements to the contrary, a Gipsy from Greece or Rumania could no longer understand a Gipsy of England or Germany, so profound is the difference. But the words which have entered into the Gipsy language, borrowed as they were from the Greeks, Hungarians, Rumanians, &c., are not only an indication of the route taken—and this is the only use that has hitherto been made of the vocabulary—but they are of the highest importance for fixing the time when the Gipsies had come in contact with these languages. The absence of Arabic is a positive proof that not only did the Gipsies not come via Arabia (as maintained by De Goeje) before they reached Europe, but that they could not even have been living for any length of time in Persia after the Mahommedan conquest, or at any rate that they could not have come in contact with such elements of the population as had already adopted Arabic in addition to Persian. But the form of the Persian words found among European Gipsies, and similarly the form of the Armenian words found in that language, are a clear indication that the Gipsies could not have come in contact with these languages before Persian had assumed its modern form and before Armenian had been changed from the old to the modern form of language. Still more strong and clear is the evidence in the case of the Greek and Rumanian words. If the Gipsies had lived in Greece, as some contend, from very ancient times, some at least of the old Greek words would be found in their language, and similarly the Slavonic words would be of an archaic character, whilst on the contrary we find medieval Byzantine forms, nay, modern Greek forms, among the Gipsy vocabulary collected from Gipsies in Germany or Italy, England or France; a proof positive that they could not have been in Europe much earlier than the approximate date given above of the 11th or 12th century. We then find from a grammatical point of view the same deterioration, say among the English or Spanish Gipsies, as has been noticed in the Gipsy dialect of Armenia. It is no longer Gipsy, but a corrupt English or Spanish adapted to some remnants of Gipsy inflections. The purest form has been preserved among the Greek Gipsies and to a certain extent among the Rumanian. Notably through Miklosich's researches and comparative studies, it is possible to follow the slow change step by step and to prove, at any rate, that, as far as Europe is concerned, the language of these Gipsies was one and the same, and that it was slowly split up into a number of dialects (13 Miklosich, 14 Colocci) which shade off into one another, and which by their transitional forms mark the way in which the Gipsies have travelled, as also proved by historical evidence. The Welsh dialect, known by few, has retained, through its isolation, some of the ancient forms.

Religion, Habits and Customs.—Those who have lived among the Gipsies will readily testify that their religious views are a strange medley of the local faith, which they everywhere embrace, and some old-world superstitions which they have in common with many nations. Among the Greeks they belong to the Greek Church, among the Mahommedans they are Mahommedans, in Rumania they belong to the National Church. In Hungary they are mostly Catholics, according to the faith of the inhabitants of that country. They have no ethical principles and they do not recognize the obligations of the Ten Commandments. There is extreme moral laxity in the relation of the two sexes, and on the whole they take life easily, and are complete fatalists. At the same time they are great cowards, and they play the rôle of the fool or the jester in the popular anecdotes of eastern Europe. There the poltroon is always a Gipsy, but he is good-humoured and not so malicious as those Gipsies who had endured the hardships of outlawry in the west of Europe.

There is nothing specifically of an Oriental origin in their religious vocabulary, and the words *Devla* (God), *Bang* (devil) or *Trushul* (Cross), in spite of some remote similarity, must be taken as later adaptations, and not as remnants of an old Sky-worship or Serpent-worship. In general their beliefs, customs, tales, &c. belong to the common stock of general folklore, and many of their symbolical expressions find their exact counterpart in Rumanian and modern Greek, and often read as if they were direct translations from these languages. Although they love their children, it sometimes happens that a Gipsy mother will hold her child by the legs and beat the father with it. In Rumania and Turkey among the settled Gipsies a good number are carriers and bricklayers; and the women take their full share in every kind of work, no matter how hard it may be. The nomadic Gipsies carry on the ancient craft of coppersmiths, or workers in metal; they also make sieves and traps, but in the East they are seldom farriers or horse-dealers. They are far-famed for their music, in which art they are unsurpassed. The Gipsy musicians belong mostly to the class who originally were serfs. They were retained at the courts of the boyars for their special talent in reciting old ballads and love songs and their deftness in playing, notably the guitar and the fiddle. The former was used as an accompaniment to the singing of either love ditties and popular songs or more especially in recital or heroic ballads and epic songs; the latter for dances and other amusements. They were the troubadours and minstrels of eastern Europe; the largest collection of Rumanian popular ballads and songs was gathered by G. Dem. Teodorescu from a Gipsy minstrel, Petre Sholkan; and not a few of the songs of the guslars among the Servians and other Slavonic nations in the Balkans come also from the Gipsies. They have also retained the ancient tunes and airs, from the dreamy "doina" of the Rumanian to the fiery "czardas" of the Hungarian or the stately "hora" of the Bulgarian. Liszt went so far as to ascribe to the Gipsies the origin of the Hungarian national music. This is an exaggeration, as seen by the comparison of the Gipsy music in other parts of south-east Europe; but they undoubtedly have given the most faithful expression to the national temperament. Equally famous is the Gipsy woman for her knowledge of occult practices. She is the real witch; she knows charms to injure the enemy or to help a friend. She can break the charm if made by others. But neither in the one case nor in the other, and in fact as little as in their songs, do they use the Gipsy language. It is either the local language of the natives as in the case of charms, or a slightly Romanized form of Greek, Rumanian or Slavonic. The old Gipsy woman is also known for her skill in palmistry and fortune-telling by means of a special set of cards, the well-known Tarok of the Gipsies. They have also a large stock of fairy tales resembling in each country the local fairy tales, in Greece agreeing with the Greek, and in Rumania with the Rumanian fairy tales. It is doubtful, however, whether they have contributed to the dissemination of these tales throughout Europe, for a large number of Gipsy tales can be shown to have been known in Europe long before the appearance of the Gipsies, and others are so much like those of other nations that the borrowing may be by the Gipsy from the Greek, Slav or Rumanian. It is, however, possible that playing-cards might have been introduced to Europe through the Gipsies. The oldest reference to cards is found in the Chronicle of Nicolaus of Cavellazzo, who says that the cards were first brought into Viterbo in 1379 from the land of the Saracens, probably from Asia Minor or the Balkans. They spread very quickly, but no one has been able as yet to trace definitely the source whence they were first brought. Without

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entering here into the history of the playing-cards and of the different forms of the faces and of the symbolical meaning of the different designs, one may assume safely that the cards, before they were used for mere pastime or for gambling, may originally have had a mystical meaning and been used as *sortes* in various combinations. To this very day the oldest form is known by the hitherto unexplained name of Tarock, played in Bologna at the beginning of the 15th century and retained by the French under the form Tarot, connected direct with the Gipsies, " Le Tarot des Bohémiens." It was noted above that the oldest chronicler (Presbyter) who describes the appearance of the Gipsies in 1416 in Germany knows them by their Italian name " Cianos," so evidently he must have known of their existence in Italy previous to any date recorded hitherto anywhere, and it is therefore not impossible that coming from Italy they brought with them also their book of divination.

Physical Characteristics.—As a race they are of small stature, varying in colour from the dark tan of the Arab to the whitish hue of the Servian and the Pole. In fact there are some white-coloured Gipsies, especially in Servia and Dalmatia, and these are often not easily distinguishable from the native peoples, except that they are more lithe and sinewy, better proportioned and more agile in their movements than the thick-set Slavs and the mixed race of the Rumanians. By one feature, however, they are easily distinguishable and recognize one another, viz. by the lustre of their eyes and the whiteness of their teeth. Some are well built; others have the features of a mongrel race, due no doubt to intermarriage with outcasts of other races. The women age very quickly and the mortality among the Gipsies is great, especially among children; among adults it is chiefly due to pulmonary diseases. They love display and Oriental showiness, bright-coloured dresses, ornaments, bangles, &c., red and green are the colours mostly favoured by the Gipsies in the East. Along with a showy handkerchief or some shining gold coins round their necks, they will wear torn petticoats and no covering on their feet. And even after they have been assimilated and have forgotten their own language they still retain some of the prominent features of their character, such as the love of inordinate display and gorgeous dress; and their moral defects not only remain for a long time as glaring as among those who live the life of vagrants, but even become more pronounced. The Gipsy of to-day is no longer what his forefathers have been. The assimilation with the nations in the near East and the steps taken for the suppression of vagrancy in the West, combine to denationalize the Gipsy and to make " Romani Chib " a thing of the past.

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IV. *Folklore, Tales, Songs, &c.*—Many songs and tales are found

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in the books enumerated above, where they are mostly accompanied by literal translations. See also Ch. G. Leland, E. H. Palmer and T. Tuckey, *English Gipsy Songs in Romany, with Metrical English Translation* (London, 1875); G. Smith, *Gipsy Life, &c.* (London, 1880); M. Rosenfeld, *Lieder der Zigeuner* (1882); Ch. G. Leland, *The Gypsies* (Boston, Mass., 1882), *Gypsy Sorcery and Fortune-Telling* (London, 1891); H. von Wlislocki, *Märchen und Sagen der transsilvanischen Zigeuner* (Berlin, 1886)—containing 63 tales, very freely translated; *Volksdichtungen der siebenbürgischen und südungarischen Zigeuner* (Vienna, 1890)—songs, ballads, charms, proverbs and 100 tales; *Vom wandernden Zigeunervolke* (Hamburg, 1890); *Wesen und Wirkungskreis der Zauberfrauen bei den siebenbürgischen Zigeuner* (1891); "Aus dem inneren Leben der Zigeuner," in *Ethnologische Mitteilungen* (Berlin, 1892); R. Pischel, *Bericht über Wlislocki vom wandernden Zigeunervolke* (Göttingen, 1890)—a strong criticism of Wlislocki's method, &c.; F. H. Groome, *Gypsy Folk-Tales* (London, 1899), with historical introduction and a complete and trustworthy collection of 76 gipsy tales from many countries; Katadă, *Contes gitanos* (Logroño, 1907); M. Gaster, *Zigeunermärchen aus Rumänien* (1881); "Tiganii, &c.," in *Revista pentru Istorie, &c.*, i. p. 469 ff. (Bucharest, 1883); "Gypsy Fairy-Tales" in *Folklore*. The *Journal of the Gipsy-Lore Society* (Edinburgh, 1888–1892) was revived in Liverpool in 1907.

V. *Legal Status.*—A few of the books in which the legal status of the Gipsies (either alone or in conjunction with "vagrants") is treated from a juridical point of view are here mentioned, also the history of the trial in 1726. J. B. Weissenbruch, *Ausführliche Relation von der famosen Zigeuner-Diebes-Mord und Räuber* (Frankfurt and Leipzig, 1727); A. Ch. Thomasius, *Tractatio juridica de vagabundo, &c.* (Leipzig, 1731); F. Ch. B. Avé-Lallemant, *Das deutsche Gaunertum, &c.* (Leipzig, 1858–1862); V. de Rochas, *Les Parias de France et d'Espagne* (Paris, 1876); P. Chuchul, *Zum Kampfe gegen Landstreicher und Bettler* (Kassel, 1881); R. Breithaupt, *Die Zigeuner und der deutsche Staat* (Würzburg, 1907); G. Steinhausen, *Geschichte der deutschen Kultur* (Leipzig and Vienna, 1904).
(M. G.)

GIRAFFE, a corruption of *Zarāfah*, the Arabic name for the tallest of all mammals, and the typical representative of the family *Giraffidae*, the distinctive characters of which are given in the article PECORA, where the systematic position of the group is indicated. The classic term "camelopard," probably introduced when these animals were brought from North Africa to the Roman amphitheatre, has fallen into complete disuse.

In common with the okapi, giraffes have skin-covered horns on the head, but in these animals, which form the genus *Giraffa*, these appendages are present in both sexes; and there is often an unpaired one in advance of the pair on the forehead. Among other characteristics of these animals may be noticed the great length of the neck and limbs, the complete absence of lateral toes and the long and tufted tail. The tongue is remarkable for its great length, measuring about 17 in. in the dead animal, and for its great elasticity and power of muscular contraction while living. It is covered with numerous large papillae, and forms, like the trunk of the elephant, an admirable organ for the examination and prehension of food. Giraffes are inhabitants of open country, and owing to their length of neck and long flexible tongues are enabled to browse on tall trees, mimosas being favourites. To drink or graze they are obliged to straddle the fore-legs apart; but they seldom feed on grass and are capable of going long without water. When standing among mimosas they so harmonize with their surroundings that they are difficult of detection. Formerly giraffes were found in large herds, but persecution has reduced their number and led to their extermination from many districts. Although in late Tertiary times widely spread over southern Europe and India, giraffes are now confined to Africa south of the Sahara.

Apart from the distinct Somali giraffe (*Giraffa reticulata*), characterized by its deep liver-red colour marked with a very coarse network of fine white lines, there are numerous local forms of the ordinary giraffe (*Giraffa camelopardalis*). The northern races, such as the Nubian *G. c. typica* and the Kordofan *G. c. antiquorum*, are characterized by the large frontal horn of the bulls, the white legs, the network type of coloration and the pale tint. The latter feature is specially developed in the Nigerian *G. c. peralta*, which is likewise of the northern type. The Baringo *G. c. rothschildi* also has a large frontal horn and white legs, but the spots in the bulls are very dark and those of the females jagged. In the Kilimanjaro *G. c. tippelskirchi* the frontal horn is often developed in the bulls, but the legs are frequently spotted to the fetlocks. Farther south the frontal horn tends to disappear more or less completely, as in the Angola *G. c. angolensis*, the Transvaal *G. c. wardi* and the Cape *G. c. capensis*, while the legs are fully spotted and the colour-pattern on the body (especially in the last-named) is more of a blotched type, that

The North African or Nubian Giraffe (*Giraffa camelopardalis*).

is to say, consists of dark blotches on a fawn ground, instead of a network of light lines on a dark ground.

For details, see a paper on the subspecies of *Giraffa camelopardalis*, by R. Lydekker in the *Proceedings of the Zoological Society of London* for 1904. (R. L.*)

GIRALDI, GIGLIO GREGORIO [LILIUS GREGORIUS GYRALDUS] (1479–1552), Italian scholar and poet, was born on the 14th of June 1479, at Ferrara, where he early distinguished himself by his talents and acquirements. On the completion of his literary course he removed to Naples, where he lived on familiar terms with Jovianus Pontanus and Sannazaro; and subsequently to Lombardy, where he enjoyed the favour of the Mirandola family. At Milan in 1507 he studied Greek under Chalcondylas; and shortly afterwards, at Modena, he became tutor to Ercole (afterwards Cardinal) Rangone. About the year 1514 he removed to Rome, where, under Clement VII., he held the office of apostolic protonotary; but having in the sack of that city (1527), which almost coincided with the death of his patron Cardinal Rangone, lost all his property, he returned in poverty once more to Mirandola, whence again he was driven by the troubles consequent on the assassination of the reigning prince in 1533. The rest of his life was one long struggle with ill-health, poverty and neglect; and he is alluded to with sorrowful regret by Montaigne in one of his *Essais* (i. 34), as having, like Sebastian Castalio, ended his days in utter destitution. He died at Ferrara in February 1552; and his epitaph makes touching and graceful allusion to the sadness of his end. Giraldi was a man of very

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extensive erudition; and numerous testimonies to his profundity and accuracy have been given both by contemporary and by later scholars. His *Historia de diis gentium* marked a distinctly forward step in the systematic study of classical mythology; and by his treatises *De annis et mensibus*, and on the *Calendarium Romanum et Graecum*, he contributed to bring about the reform of the calendar, which was ultimately effected by Pope Gregory XIII. His *Progymnasma adversus literas et literatos* deserves mention at least among the curiosities of literature; and among his other works to which reference is still occasionally made are *Historiae poëtarum Graecorum ac Latinorum*; *De poëtis suorum temporum*; and *De sepultura ac vario sepeliendi ritu*. Giraldi was also an elegant Latin poet.

His *Opera omnia* were published at Leiden in 1696.

GIRALDI, GIOVANNI BATTISTA (1504–1573), surnamed CYNTHIUS, CINTHIO or CINTIO, Italian novelist and poet, born at Ferrara in November 1504, was educated at the university of his native town, where in 1525 he became professor of natural philosophy, and, twelve years afterwards, succeeded Celio Calcagnini in the chair of belles-lettres. Between 1542 and 1560 he acted as private secretary, first to Ercole II. and afterwards to Alphonso II. of Este; but having, in connexion with a literary quarrel in which he had got involved, lost the favour of his patron in the latter year, he removed to Mondovi, where he remained as a teacher of literature till 1568. Subsequently, on the invitation of the senate of Milan, he occupied the chair of rhetoric at Pavia till 1573, when, in search of health, he returned to his native town, where on the 30th of December he died. Besides an epic entitled *Ercole* (1557), in twenty-six cantos, Giraldi wrote nine tragedies, the best known of which, *Orbecche*, was produced in 1541. The sanguinary and disgusting character of the plot of this play, and the general poverty of its style, are, in the opinion of many of its critics, almost fully redeemed by occasional bursts of genuine and impassioned poetry; of one scene in the third act in particular it has even been affirmed that, if it alone were sufficient to decide the question, the *Orbecche* would be the finest play in the world. Of the prose works of Giraldi the most important is the *Hecatommithi* or *Ecatomiti*, a collection of tales told somewhat after the manner of Boccaccio, but still more closely resembling the novels of Giraldi's contemporary Bandello, only much inferior in workmanship to the productions of either author in vigour, liveliness and local colour. Something, but not much, however, may be said in favour of their professed claim to represent a higher standard of morality. Originally published at Monteregale, Sicily, in 1565, they were frequently reprinted in Italy, while a French translation by Chappuys appeared in 1583 and one in Spanish in 1590. They have a peculiar interest to students of English literature, as having furnished, whether directly or indirectly, the plots of *Measure for Measure* and *Othello*. That of the latter, which is to be found in the *Hecatommithi* (iii. 7), is conjectured to have reached Shakespeare through the French translation; while that of the former (*Hecat.* viii. 5) is probably to be traced to Whetstone's *Promos and Cassandra* (1578), an adaptation of Cinthio's story, and to his *Heptamerone* (1582), which contains a direct English translation. To Giraldi also must be attributed the plot of Beaumont and Fletcher's *Custom of the Country*.

GIRALDUS CAMBRENSIS (1146?–1220), medieval historian, also called GERALD DE BARRI, was born in Pembrokeshire. He was the son of William de Barri and Augharat, a daughter of Gerald, the ancestors of the Fitzgeralds and the Welsh princess, Nesta, formerly mistress of King Henry I. Falling under the influence of his uncle, David Fitzgerald, bishop of St David's, he determined to enter the church. He studied at Paris, and his works show that he had applied himself closely to the study of the Latin poets. In 1172 he was appointed to collect tithe in Wales, and showed such vigour that he was made archdeacon. In 1176 an attempt was made to elect him bishop of St David's, but Henry II. was unwilling to see any one with powerful native connexions a bishop in Wales. In 1180, after another visit to Paris, he was appointed commissary to the bishop of St David's, who had ceased to reside. But Giraldus threw up his post, indignant at the indifference of the bishop to the welfare of his see. In 1184 he was made one of the king's chaplains, and was elected to accompany Prince John on his voyage to Ireland. While there he wrote a *Topographia Hibernica*, which is full of information, and a strongly prejudiced history of the conquest, the *Expugnatio Hibernica*. In 1186 he read his work with great applause before the masters and scholars of Oxford. In 1188 he was sent into Wales with the primate Baldwin to preach the Third Crusade. Giraldus declares that the mission was highly successful; in any case it gave him the material for his *Itinerarium Cambrense*, which is, after the *Expugnatio*, his best known work. He accompanied the archbishop, who intended him to be the historian of the Crusade, to the continent, with the intention of going to the Holy Land. But in 1189 he was sent back to Wales by the king, who knew his influence was great, to keep order among his countrymen. Soon after he was absolved from his crusading vow. According to his own statements, which often tend to exaggeration, he was offered both the sees of Bangor and Llandaff, but refused them. From 1192 to 1198 he lived in retirement at Lincoln and devoted himself to literature. It is probably during this period that he wrote the *Gemma ecclesiastica* (discussing disputed points of doctrine, ritual, &c.) and the *Vita S. Remigii*. In 1198 he was elected bishop of St David's. But Hubert Walter, the archbishop of Canterbury, was determined to have in that position no Welshman who would dispute the metropolitan pretensions of the English primates. The king, for political reasons, supported Hubert Walter. For four years Giraldus exerted himself to get his election confirmed, and to vindicate the independence of St David's from Canterbury. He went three times to Rome. He wrote the *De jure Meneviensis ecclesiae* in support of the claims of his diocese. He made alliances with the princes of North and South Wales. He called a general synod of his diocese. He was accused of stirring up rebellion among the Welsh, and the justiciar proceeded against him. At length in 1202 the pope annulled all previous elections, and ordered a new one. The prior of Llanthony was finally elected. Gerald was immediately reconciled to the king and archbishop; the utmost favour was shown to him; even the expenses of his unsuccessful election were paid. He spent the rest of his life in retirement, though there was some talk of his being made a cardinal. He certainly survived John.

The works of Giraldus are partly polemical and partly historical. His value as a historian is marred by his violent party spirit; some of his historical tracts, such as the *Liber de instructione principum* and the *Vita Galfridi Archiepiscopi Eborecensis*, seem to have been designed as political pamphlets. Henry II., Hubert Walter and William Longchamp, the chancellor of Richard I., are the objects of his worst invectives. His own pretensions to the see of St David are the motive of many of his misrepresentations. But he is one of the most vivid and witty of our medieval historians.

See the Rolls edition of his works, ed. J. S. Brewer, J. F. Dimock and G. F. Warner in 8 vols. (London, 1861–1891), some of which have valuable introductions.

GIRANDOLE (from the Ital. *girandola*), an ornamental branched candlestick of several lights. It came into use about the second half of the 17th century, and was commonly made and used in pairs. It has always been, comparatively speaking, a luxurious appliance for lighting, and in the great 18th-century period of French house decoration the famous *ciseleurs* designed some exceedingly beautiful examples. A great variety of metals has been used for the purpose—sometimes, as in the case of the candlestick, girandoles have been made in hard woods. Gilded bronze has been a very frequent medium, but for table purposes silver is still the favourite material.

GIRARD, JEAN BAPTISTE (known as "Le Père Girard" or "Le Père Gregoire") (1765–1850), French-Swiss educationalist, was born at Fribourg and educated for the priesthood at Lucerne. He was the fifth child in a family of fourteen, and his gift for teaching was early shown at home in helping his mother with the

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younger children; and after passing through his noviciate he spent some time as an instructor in convents, notably at Würzburg (1785–1788). Then for ten years he was busy with religious duty. In 1798, full of Kantian ideas, he published an essay outlining a scheme of national Swiss education; and in 1804 he began his career as a public teacher, first in the elementary school at Fribourg (1805–1823), then (being driven away by Jesuit hostility) in the gymnasium at Lucerne till 1834, when he retired to Fribourg and devoted himself with the production of his books on education, *De l'enseignement régulier de la langue maternelle* (1834, 9th ed. 1894; Eng. trans. by Lord Ebrington, *The Mother Tongue*, 1847), and *Cours éducatif* (1844–1846). Father Girard's reputation and influence as an enthusiast in the cause of education became potent not only in Switzerland, where he was hailed as a second Pestalozzi, but in other countries. He had a genius for teaching, his method of stimulating the intelligence of the children at Fribourg and interesting them actively in learning, and not merely cramming them with rules and facts, being warmly praised by the Swiss educationalist François Naville (1784–1846) in his treatise on public education (1832). His undogmatic method and his Liberal Christianity brought him into conflict with the Jesuits, but his aim was, in all his teaching, to introduce the moral idea into the minds of his pupils hy familiarizing them with the right or wrong working of the facts he brought to their attention, and thus to elevate character all through the educational curriculum.

GIRARD, PHILIPPE HENRI DE (1775–1845), French mechanician, was born at Lourmarin, Vaucluse, on the 1st of February 1775. He is chiefly known in connexion with flax-spinning machinery. Napoleon having in 1810 decreed a reward of one million francs to the inventor of the best machine for spinning flax, Girard succeeded in producing what was required. But he never received the promised reward, although in 1853, after his death, a comparatively small pension was voted to his heirs, and having relied on the money to pay the expenses of his invention he got into serious financial difficulties. He was obliged, in 1815, to abandon the flax mills he had established in France, and at the invitation of the emperor of Austria founded a flax mill and a factory for his machines at Hirtenberg. In 1825, at the invitation of the emperor Alexander I. of Russia, he went to Poland, and erected near Warsaw a flax manufactory, round which grew up a village which received the name of Girardow. In 1818 he built a steamer to run on the Danube. He did not return to Paris till 1844, where he still found some of his old creditors ready to press their claims, and he died in that city on the 26th of August 1845. He was also the author of numerous minor inventions.

GIRARD, STEPHEN (1750–1831), American financier and philanthropist, founder of Girard College in Philadelphia, was born in a suburb of Bordeaux, France, on the 20th of May 1750. He lost the sight of his right eye at the age of eight and had little education. His father was a sea captain, and the son cruised to the West Indies and back during 1764–1773, was licensed captain in 1773, visited New York in 1774, and thence with the assistance of a New York merchant began to trade to and from New Orleans and Port au Prince. In May 1776 he was driven into the port of Philadelphia by a British fleet and settled there as a merchant; in June of the next year he married Mary (Polly) Lum, daughter of a shipbuilder, who, two years later, after Girard's becoming a citizen of Pennsylvania (1778), built for him the "Water Witch," the first of a fleet trading with New Orleans and the West Indies—most of Girard's ships being named after his favourite French authors, such as "Rousseau," "Voltaire," "Helvétius" and "Montesquieu." His beautiful young wife became insane and spent the years from 1790 to her death in 1815 in the Pennsylvania Hospital. In 1810 Girard used about a million dollars deposited by him with the Barings of London for the purchase of shares of the much depreciated stock of the Bank of the United States—a purchase of great assistance to the United States government in bolstering European confidence in its securities. When the Bank was not rechartered the building and the cashier's house in Philadelphia were purchased at a third of the original cost by Girard, who in May 1812 established the Bank of Stephen Girard. He subscribed in 1814 for about 95% of the government's war loan of $5,000,000, of which only $20,000 besides had been taken, and he generously offered at par shares which upon his purchase had gone to a premium. He pursued his business vigorously in person until the 12th of February 1830, when he was injured in the street by a truck; he died on the 26th of December 1831. His public spirit had been shown during his life not only financially but personally; in 1703, during the plague of yellow fever in Philadelphia, he volunteered to act as manager of the wretched hospital at Bush Hill, and with the assistance of Peter Helm had the hospital cleansed and its work systematized; again during the yellow fever epidemic of 1797–1798 he took the lead in relieving the poor and caring for the sick. Even more was his philanthropy shown in his disposition hy will of his estate, which was valued at about $7,500,000, and doubtless the greatest fortune accumulated by any individual in America up to that time. Of his fortune he bequeathed $116,000 to various Philadelphia charities, $500,000 to the same city for the improvement of the Delaware water front, $300,000 to Pennsylvania for internal improvements, and the hulk of his estate to Philadelphia, to be used in founding a school or college, in providing a better police system, and in making municipal improvements and lessening taxation. Most of his bequest to the city was to be used for building and maintaining a school "to provide for such a number of poor male white orphan children . . . a better education as well as a more comfortable maintenance than they usually receive from the application of the public funds." His will planned most minutely for the erection of this school, giving details as to the windows, doors, walls, &c.; and it contained the following phrase: "I enjoin and require that no ecclesiastic, missionary or minister of any sect whatsoever, shall ever hold or exercise any duty whatsoever in the said college; nor shall any such person ever be admitted for any purpose, or as a visitor, within the premises appropriated to the purposes of the said college. . . . I desire to keep the tender minds of orphans . . . free from the excitements which clashing doctrines and sectarian controversy are so apt to produce." Girard's heirs-at-law contested the will in 1836, and they were greatly helped by a public prejudice aroused by the clause cited; in the Supreme Court of the United States in 1844 Daniel Webster, appearing for the heirs, made a famous plea for the Christian religion, but Justice Joseph Story handed down an opinion adverse to the heirs (*Vidals* v. *Girard's Executors*). Webster was opposed in this suit by John Sergeant and Horace Binney. Girard specified that those admitted to the college must be white male orphans, of legitimate birth and good character, between the ages of six and ten; that no boy was to be permitted to stay after his eighteenth year; and that as regards admissions preference was to be shown, first to orphans born in Philadelphia, second to orphans born in any other part of Pennsylvania, third to orphans born in New York City, and fourth to orphans born in New Orleans. Work upon the buildings was begun in 1833, and the college was opened on the 1st of January 1848, a technical point of law making instruction conditioned upon the completion of the five buildings, of which the principal one, planned by Thomas Ustick Walter (1804–1887), has been called "the most perfect Greek temple in existence." To a sarcophagus in this main building the remains of Stephen Girard were removed in 1851. In the 40 acres of the college grounds there were in 1909 18 buildings (valued at $3,350,000), 1513 pupils, and a total "population," including students, teachers and all employes, of 1907. The value of the Girard estate in the year 1907 was $35,000,000, of which $550,000 was devoted to other charities than Girard College. The control of the college was under a board chosen by the city councils until 1869, when by act of the legislature it was transferred to trustees appointed by the Common Pleas judges of the city of Philadelphia. The course of training is partly industrial—for a long time graduates were indentured till they came of age—but it is also preparatory to college entrance.

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See H. A. Ingram, *The Life and Character of Stephen Girard* (Philadelphia, 1884), and George P. Rupp, "Stephen Girard—Merchant and Mariner," in *1848–1898: Semi-Centennial of Girard College* (Philadelphia, 1898).

GIRARDIN, DELPHINE DE (1804–1855), French author, was born at Aix-la-Chapelle on the 26th of January 1804. Her mother, the well-known Madame Sophie Gay, brought her up in the midst of a brilliant literary society. She published two volumes of miscellaneous pieces, *Essais poétiques* (1824) and *Nouveaux Essais poétiques* (1825). A visit to Italy in 1827, during which she was enthusiastically welcomed by the literati of Rome and even crowned in the capitol, was productive of various poems, of which the most ambitious was *Napoline* (1833). Her marriage in 1831 to Émile de Girardin (see below) opened up a new literary career. The contemporary sketches which she contributed from 1836 to 1839 to the feuilleton of *La Presse*, under the *nom de plume* of Charles de Launay, were collected under the title of *Lettres parisiennes* (1843), and obtained a brilliant success. *Contes d'une vieille fille à ses neveux* (1832), *La Canne de Monsieur de Balzac* (1836) and *Il ne faut pas jouer avec la douleur* (1853) are among the best-known of her romances; and her dramatic pieces in prose and verse include *L'École des journalistes* (1840), *Judith* (1843), *Cléopâtre* (1847), *Lady Tartufe* (1853), and the one-act comedies, *C'est la faute du mari* (1851), *La Joie fait peur* (1854), *Le Chapeau d'un horloger* (1854) and *Une Femme qui déteste son mari*, which did not appear till after the author's death. In the literary society of her time Madame Girardin exercised no small personal influence, and among the frequenters of her drawing-room were Théophile Gautier and Balzac, Alfred de Musset and Victor Hugo. She died on the 29th of June 1855. Her collected works were published in six volumes (1860–1861).

See Sainte-Beuve, *Causeries du lundi*, t. iii.; G. de Molènes, "Les Femmes poètes," in *Revue des deux mondes* (July 1842); Taxile Delord, *Les Matinées littéraires* (1860); *L'Esprit de Madame Girardin, avec une préface par M. Lamartine* (1862); G. d'Heilly, *Madame de Girardin, sa vie et ses œuvres* (1868); Imbert de Saint Amand, *Mme de Girardin* (1875).

GIRARDIN, ÉMILE DE (1802–1881), French publicist, was born, not in Switzerland in 1806 of unknown parents, but (as was recognized in 1837) in Paris in 1802, the son of General Alexandre de Girardin and of Madame Dupuy, wife of a Parisian advocate. His first publication was a novel, *Émile*, dealing with his birth and early life, and appeared under the name of Girardin in 1827. He became inspector of fine arts under the Martignac ministry just before the revolution of 1830, and was an energetic and passionate journalist. Besides his work on the daily press he issued miscellaneous publications which attained an enormous circulation. His *Journal des connaissances utiles* had 120,000 subscribers, and the initial edition of his *Almanach de France* (1834) ran to a million copies. In 1836 he inaugurated cheap journalism in a popular Conservative organ, *La Presse*, the subscription to which was only forty francs a year. This undertaking involved him in a duel with Armand Carrel, the fatal result of which made him refuse satisfaction to later opponents. In 1839 he was excluded from the Chamber of Deputies, to which he had been four times elected, on the plea of his foreign birth, but was admitted in 1842. He resigned early in February 1847, and on the 24th of February 1848 sent a note to Louis Philippe demanding his resignation and the regency of the duchess of Orleans. In the Legislative Assembly he voted with the Mountain. He pressed eagerly in his paper for the election of Prince Louis Napoleon, of whom he afterwards became one of the most violent opponents. In 1856 he sold *La Presse*, only to resume it in 1862, but its vogue was over, and Girardin started a new journal, *La Liberté*, the sale of which was forbidden in the public streets. He supported Émile Ollivier and the Liberal Empire, but plunged into vehement journalism again to advocate war against Prussia. Of his many subsequent enterprises the most successful was the purchase of *Le Petit Journal*, which served to advocate the policy of Thiers, though he himself did not contribute. The crisis of the 16th of May 1877, when Jules Simon fell from power, made him resume his pen to attack MacMahon and the party of reaction in *La France* and in *Le Petit Journal*. Émile de Girardin married in 1831 Delphine Gay (see above), and after her death in 1855 Guillemette Joséphine Brunold, countess von Tieffenbach, widow of Prince Frederick of Nassau. He was divorced from his second wife in 1872.

The long list of his social and political writings includes: *De la presse périodique au XIXe siècle* (1837); *De l'instruction publique* (1838); *Études politiques* (1838); *De la liberté de la presse et du journalisme* (1842); *Le Droit au travail au Luxembourg et à l'Assemblée Nationale* (2 vols., 1848); *Les Cinquante-deux* (1849, &c.), a series of articles on current parliamentary questions; *La Politique universelle, décrets de l'avenir* (Brussels, 1852); *Le Condamné du 6 mars* (1867), an account of his own differences with the government in 1867 when he was fined 5000 fr. for an article in *La Liberté*; *Le Dossier de la guerre* (1877), a collection of official documents; *Questions de mon temps, 1836 à 1856*, articles extracted from the daily and weekly press (12 vols., 1858).

GIRARDON, FRANÇOIS (1628–1715), French sculptor, was born at Troyes on the 17th of March 1628. As a boy he had for master a joiner and wood-carver of his native town, named Baudesson, under whom he is said to have worked at the château of Liébault, where he attracted the notice of Chancellor Séguier. By the chancellor's influence Girardon was first removed to Paris and placed in the studio of François Anguier, and afterwards sent to Rome. In 1652 he was back in France, and seems at once to have addressed himself with something like ignoble subserviency to the task of conciliating the court painter Charles Le Brun. Girardon is reported to have declared himself incapable of composing a group, whether with truth or from motives of policy it is impossible to say. This much is certain, that a very large proportion of his work was carried out from designs by Le Brun, and shows the merits and defects of Le Brun's manner—a great command of ceremonial pomp in presenting his subject, coupled with a large treatment of forms which if it were more expressive might be imposing. The court which Girardon paid to the "premier peintre du roi" was rewarded. An immense quantity of work at Versailles was entrusted to him, and in recognition of the successful execution of four figures for the Bains d'Apollon, Le Brun induced the king to present his protégé personally with a purse of 300 louis, as a distinguishing mark of royal favour. In 1650 Girardon was made member of the Academy, in 1659 professor, in 1674 "adjoint au recteur," and finally in 1695 chancellor. Five years before (1690), on the death of Le Brun, he had also been appointed "inspecteur général des ouvrages de sculpture"—a place of power and profit. In 1699 he completed the bronze equestrian statue of Louis XIV., erected by the town of Paris on the Place Louis le Grand. This statue was melted down during the Revolution, and is known to us only by a small bronze model (Louvre) finished by Girardon himself. His Tomb of Richelieu (church of the Sorbonne) was saved from destruction by Alexandre Lenoir, who received a bayonet thrust in protecting the head of the cardinal from mutilation. It is a capital example of Girardon's work, and the theatrical pomp of its style is typical of the funeral sculpture of the reigns of Louis XIV. and Louis XV.; but amongst other important specimens yet remaining may also be cited the Tomb of Louvois (St Eustache), that of Bignon, the king's librarian, executed in 1656 (St Nicolas du Chardonneret), and decorative sculptures in the Galerie d'Apollon and Chambre du roi in the Louvre. Mention should not be omitted of the group, signed and dated 1699, "The Rape of Proserpine" at Versailles, which also contains the "Bull of Apollo." Although chiefly occupied at Paris Girardon never forgot his native Troyes, the museum of which town contains some of his best works, including the marble busts of Louis XIV. and Maria Theresa. In the hôtel de ville is still shown a medallion of Louis XIV., and in the church of St Rémy a bronze crucifix of some importance—both works by his hand. He died in Paris in 1715.

See Corrard de Breban, *Notice sur la vie et les œuvres de Girardon* (1850).

GIRART DE ROUSSILLON, an epic figure of the Carolingian cycle of romance. In the genealogy of romance he is a son of Doon de Mayence, and he appears in different and irreconcilable

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circumstances in many of the *chansons de geste*. The legend of Girart de Roussillon is contained in a *Vita Girardi de Roussillon* (ed. P. Meyer, in *Romania*, 1878), dating from the beginning of the 12th century and written probably by a monk of the abbey of Pothières or of Vezelai, both of which were founded in 860 by Girart; in *Girart de Roussillon*, a *chanson de geste* written early in the 12th century in a dialect midway between French and Provençal, and apparently based on an earlier Burgundian poem; in a 14th century romance in alexandrines (ed. T. J. A. P. Mignard, Paris and Dijon, 1878); and in a prose romance by Jehan Wauquelin in 1447 (ed. L. de Montille, Paris, 1880). The historical Girard, son of Leuthard and Grimildis, was a Burgundian chief who was count of Paris in 837, and embraced the cause of Lothair against Charles the Bald. He fought at Fontenay in 841, and doubtless followed Lothair to Aix. In 855 he became governor of Provence for Lothair's son Charles, king of Provence (d. 863). His wife Bertha defended Vienne unsuccessfully against Charles the Bald in 870, and Girard, who had perhaps aspired to be the titular ruler of the northern part of Provence, which he had continued to administer under Lothair II. until that prince's death in 869, retired with his wife to Avignon, where he died probably in 877, certainly before 879. The tradition of his piety, of the heroism of his wife Bertha, and of his wars with Charles passed into romance; but the historical facts are so distorted that in *Girart de Roussillon* the *trouvère* makes him the opponent of Charles Martel, to whom he stands in the relation of brother-in-law. He is nowhere described in authentic historic sources as of Roussillon. The title is derived from his castle built on Mount Lassois, near Châtillon-sur-Seine. Southern traditions concerning Count Girart, in which he is made the son of Garin de Monglane, are embodied in *Girart de Viane* (13th century) by Bertrand de Bar-sur-l'Aube, and in the *Aspramonte* of Andrea da Barberino, based on the French *chanson of Aspremont*, where he figures as Girart de Frete or de Fratte.[1] *Girart de Viane* is the recital of a siege of Vienne by Charlemagne, and in *Aspramonte* Girart de Fratte leads an army of infidels against Charlemagne. *Girart de Roussillon* was long held to be of Provençal origin, and to be a proof of the existence of an independent Provençal epic, but its Burgundian origin may be taken as proved.

See F. Michel, *Gerard de Rossillon . . . publié en français et en provençal d'après les MSS. de Paris et de Londres* (Paris, 1856); P. Meyer, *Girart de Roussillon* (1884), a translation in modern French with a comprehensive introduction. For *Girart de Viane* (ed. P. Tarlé, Reims, 1850) see L. Gautier, *Epopées françaises*, vol. iv.; F. A. Wulff, *Notice sur les sagas de Magus et de Geirard* (Lund, 1874).

GIRAUD, GIOVANNI, COUNT (1776–1834), Italian dramatist, of French origin, was born at Rome, and showed a precocious passion for the theatre. His first play, *L'Onestà non si vince*, was successfully produced in 1798. He took part in politics as an active supporter of Pius VI., but was mainly occupied with the production of his plays, and in 1809 became director-general of the Italian theatres. He died in Naples in 1834. Giraud's comedies, the best of which are *Gelosie per equivoco* (1807) and *L'Ajo nell' imbarazzo* (1824), were bright and amusing on the stage, but of no particular literary quality.

His collected comedies were published in 1823 and his *Teatro domestico* in 1825.

GIRDLE (O. Eng. *gyrdel*, from *gyrdan*, to gird; cf. Ger. *Gürtel*, Dutch *gordel*, from *gürten* and *gorden*; "gird" and its doublet "girth" together with the other Teutonic cognates have been referred by some to the root *ghar*—to seize, enclose, seen in Gr. χείρ, hand, Lat. *hortus*, garden, and also English yard, garden, garth, &c.), a band of leather or other material worn round the waist, either to confine the loose and flowing outer robes so as to allow freedom of movement, or to fasten and support the garments of the wearer. Among the Romans it was used to confine the *tunica*, and it formed part of the dress of the soldier; when a man quitted military service he was said, *cingulum deponere*, to lay aside the girdle. Money being carried in the girdle, *zonam perdere* signified to lose one's purse, and, among the Greeks, to cut the girdle was to rob a man of his money.

Girdles and girdle-buckles are not often found in Gallo-Roman graves, but in the graves of Franks and Burgundians they are constantly present, often ornamented with bosses of silver or bronze, chased or inlaid. Sidonius Apollinaris speaks of the Franks as belted round the waist, and Gregory of Tours in the 6th century says that a dagger was carried in the Frankish girdle.

In the Anglo-Saxon dress the girdle makes an unimportant figure, and the Norman knights, as a rule, wore their belts under their hauberks. After the Conquest, however, the artificers gave more attention to a piece whose buckle and tongue invited the work of the goldsmith. Girdles of varying richness are seen on most of the western medieval effigies. That of Queen Berengaria lets the long pendant hang below the knee, following a fashion which frequently reappears.

In the latter part of the 13th century the knight's surcoat is girdled with a narrow cord at the waist, while the great belt, which had become the pride of the well-equipped cavalier, loops across the hips carrying the heavy sword aslant over the thighs or somewhat to the left of the wearer.

But it is in the second half of the following century that the knightly belt takes its most splendid form. Under the year 1356 the continuator of the chronicle of Nangis notes that the increase of jewelled belts had mightily enhanced the price of pearls. The belt is then worn, as a rule, girdling the hips at some distance below the waist, being probably supported by hooks as is the belt of a modern infantry soldier. The end of the belt, after being drawn through the buckle, is knotted or caught up after the fashion of the tang of the Garter. The waist girdle either disappears from sight or as a narrow and ornamented strap is worn diagonally to help in the support of the belt. A mass of beautiful ornament covers the whole belt, commonly seen as an unbroken line of bosses enriched with curiously worked roundels or lozenges which, when the loose strap-end is abandoned, meet in a splendid morse or clasp on which the enameller and jeweller had wrought their best. About 1420 this fashion tends to disappear, the loose tahards worn over armour in the jousting-yard hindering its display. The belt never regains its importance as an ornament, and, at the beginning of the 16th century, sword and dagger are sometimes seen hanging at the knight's sides without visible support.

In civil dress the magnificent belt of the 14th century is worn by men of rank over the hips of the tight short-skirted coat, and in that century and in the 15th and 16th there are sumptuary laws to check the extravagance of rich girdles worn by men and women whose humble station made them unseemly. Even priests must be rebuked for their silver girdles with baselards hanging from them. Purses, daggers, keys, penners and inkhorns, beads and even books, dangled from girdles in the 15th and early 16th centuries. Afterwards the girdle goes on as a mere strap for holding up the clothing or as a sword-belt. At the Restoration men contrasted the fashion of the court, a light rapier hung from a broad shoulder-belt, with the fashion of the countryside, where a heavy weapon was supported by a narrow waistbelt. Soon afterwards both fashions disappeared. Sword-hangers were concealed by the skirt, and the belt, save in certain military and sporting costumes, has no more been in sight in England. Even as a support for breeches or trousers, the use of braces has gradually supplanted the girdle during the past century.

In most of those parts of the Continent—Brittany, for example—where the peasantry maintains old fashions in clothing, the belt or girdle is still an important part of the clothing. Italian non-commissioned officers find that the Sicilian recruit's main objection to the first bath of his life-time lies in the fact that he must lay down the cherished belt which carries his few valuables. With the Circassian the belt still buckles on an arsenal of pistols and knives.

[1] It is of interest to note that Freta was the old name for the town of Saint Remy, and that it is close to the site of the ancient town of Glanum, the name of which is possibly preserved in Garin de Monglane, the ancestor of the heroes of the cycle of Guillaume d'Orange.

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Folklore and ancient custom are much concerned with the girdle. Bankrupts at one time put it off in open court; French law refused courtesans the right to wear it; Saint Guthlac casts out devils by buckling his girdle round a possessed man; an earl is "a belted earl" since the days when the putting on of a girdle was part of the ceremony of his creation; and fairy tales of half the nations deal with girdles which give invisibility to the wearer. (O. Ba.)

GIRGA, or GIRGEH, a town of Upper Egypt on the W. bank of the Nile, 313 m. S.S.E. of Cairo by rail and about 10 m. N.N.E. of the ruins of Abydos. Pop. (1907) 19,853, of whom about one-third are Copts. The town presents a picturesque appearance from the Nile, which at this point makes a sharp bend. A ruined mosque with a tall minaret stands by the river-brink. Many of the houses are of brick decorated with glazed tiles. The town is noted for the excellence of its pottery. Girga is the seat of a Coptic bishop. It also possesses a Roman Catholic monastery, considered the most ancient in the country. As lately as the middle of the 18th century the town stood a quarter of a mile from the river, but is now on the bank, the intervening space having been washed away, together with a large part of the town, by the stream continually encroaching on its left bank.

GIRGENTI (anc. *Agrigentum*, *q.v.*), a town of Sicily, capital of the province which bears its name, and an episcopal see, on the south coast, 58 m. S. by E. of Palermo direct and 84½ m. by rail. Population (1901) 25,024. The town is built on the western summit of the ridge which formed the northern portion of the ancient site; the main street runs from E. to W. on the level, but the side streets are steep and narrow. The cathedral occupies the highest point in the town; it was not founded till the 13th century, taking the place of the so-called temple of Concord. The campanile still preserves portions of its original architecture, but the interior has been modernized. In the chapter-house a famous sarcophagus, with scenes illustrating the myth of Hippolytus, is preserved. There are other scattered remains of 13th-century architecture in the town, while, in the centre of the ancient city, close to the so-called oratory of Phalaris, is the Norman church of S. Nicolo. A small museum in the town contains vases, terra-cottas, a few sculptures, &c. The port of Girgenti, 5½ m. S.W. by rail, now known as Porto Empedocle (population in 1901, 11,529), as the principal place of shipment for sulphur, the mining district beginning immediately north of Girgenti. (T. As.)

GIRISHK, a village and fort of Afghanistan. It stands on the right bank of the Helmund 78 m. W. of Kandahar on the road to Herat; 3641 ft. above the sea. The fort, which is garrisoned from Kandahar and is the residence of the governor of the district (Pusht-i-Rud), has little military value. It commands the fords of the Helmund and the road to Seistan, from which it is about 100 m. distant; and it is the centre of a rich agricultural district. Girishk was occupied by the British during the first Afghan War; and a small garrison of sepoys, under a native officer, successfully withstood a siege of nine months by an overwhelming Afghan force. The Dasht-i-Bakwa stretches beyond Girishk towards Farah, a level plain of considerable width, which tradition assigns as the field of the final contest for supremacy between Russia and England.

GIRNAR, a sacred hill in Western India, in the peninsula of Kathiawar, 10 m. E. of Junagarh town. It consists of five peaks, rising about 3500 ft. above the sea, on which are numerous old Jain temples, much frequented by pilgrims. At the foot of the hill is a rock, with an inscription of Asoka (2nd century B.C.), and also two other inscriptions (dated 150 and 455 A.D.) of great historical importance.

GIRODET DE ROUSSY, ANNE LOUIS (1767–1824), French painter, better known as Girodet-Trioson, was born at Montargis on the 5th of January 1767. He lost his parents in early youth, and the care of his fortune and education fell to the lot of his guardian, M. Trioson, "médecin de mesdames," by whom he was in later life adopted. After some preliminary studies under a painter named Luquin, Girodet entered the school of David, and at the age of twenty-two he successfully competed for the Prix de Rome. At Rome he executed his "Hippocrate refusant les présents d'Artaxerxès" and "Endymion dormant" (Louvre), a work which was hailed with acclamation at the Salon of 1792. The peculiarities which mark Girodet's position as the herald of the romantic movement are already evident in his "Endymion." The firm-set forms, the grey cold colour, the hardness of the execution are proper to one trained in the school of David, but these characteristics harmonize ill with the literary, sentimental and picturesque suggestions which the painter has sought to render. The same incongruity marks Girodet's "Danaë" and his "Quatre Saisons," executed for the king of Spain (repeated for Compiègne), and shows itself to a ludicrous extent in his "Fingal" (St Petersburg, Leuchtenberg collection), executed for Napoleon I. in 1802. This work unites the defects of the classic and romantic schools, for Girodet's imagination ardently and exclusively pursued the ideas excited by varied reading both of classic and of modern literature, and the impressions which he received from the external world afforded him little stimulus or check; he consequently retained the mannerisms of his master's practice whilst rejecting all restraint on choice of subject. The credit lost by "Fingal" Girodet regained in 1806, when he exhibited "Scène de Déluge" (Louvre), to which (in competition with the "Sabines" of David) was awarded the decennial prize. This success was followed up in 1808 by the production of the "Reddition de Vienne" and "Atala au Tombeau"—a work which went far to deserve its immense popularity, by a happy choice of subject, and remarkable freedom from the theatricality of Girodet's usual manner, which, however, soon came to the front again in his "Révolte de Caire" (1810). His powers now began to fail, and his habit of working at night and other excesses told upon his constitution; in the Salon of 1812 he exhibited only a "Tête de Vierge"; in 1819 "Pygmalion et Galatée" showed a still further decline of strength; and in 1824—the year in which he produced his portraits of Cathelineau and Bonchamps—Girodet died on the 9th of December.

He executed a vast quantity of illustrations, amongst which may be cited those to the Didot *Virgil* (1798) and to the Louvre *Racine* (1801–1805). Fifty-four of his designs for *Anacreon* were engraved by M. Chatillon. Girodet wasted much time on literary composition, his poem *Le Peintre* (a string of commonplaces), together with poor imitations of classical poets, and essays on *Le Génie* and *La Grâce*, were published after his death (1829), with a biographical notice by his friend M. Coupin de la Couperie: and M. Delécluze, in his *Louis David et son temps*, has also a brief life of Girodet.

GIRONDE, a maritime department of south-western France, formed from four divisions of the old province of Guyenne, viz. Bordelais, Bazadais, and parts of Périgord and Agenais. Area, 4140 sq. m. Pop. (1906) 813,025. It is bounded N. by the department of Charente-Inférieure, E. by those of Dordogne and Lot-et-Garonne, S. by that of Landes, and W. by the Bay of Biscay. It takes its name from the river or estuary of the Gironde formed by the union of the Garonne and Dordogne. The department divides itself naturally into a western and an eastern portion. The former, which is termed the *Landes* (*q.v.*), occupies more than a third of the department, and consists chiefly of morass or sandy plain, thickly planted with pines and divided from the sea by a long line of dunes. These dunes are planted with pines, which, by binding the sand together with their roots, prevent it from drifting inland and afford a barrier against the sea. On the east the dunes are fringed for some distance by two extensive lakes, Carcans and Lacanau, communicating with each other and with the Bay of Arcachon, near the southern extremity of the department. The Bay of Arcachon contains numerous islands, and on the land side forms a vast shallow lagoon, a portion of which, however, has been drained and converted into arable land. The eastern portion of the department consists chiefly of a succession of hill and dale, and, especially in the valley of the Gironde, is very fertile. The estuary of the Gironde is about 45 m. in length, and varies in breadth from 2 to 6 m. It presents a succession of islands and mud banks which divide it into two channels and render navigation somewhat difficult. It is, however, well

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buoyed and lighted, and has a mean depth of 21 ft. There are extensive marshes on the right bank to the north of Blaye, and the shores on the left are characterized, especially towards the mouth, by low-lying polders protected by dikes and composed of fertile salt marshes. At the mouth of the Gironde stands the famous tower of Cordouan, one of the finest lighthouses of the French coast. It was built between the years 1585 and 1611 by the architect and engineer Louis de Foix, and added to towards the end of the 18th century. The principal affluent of the Dordogne in this department is the Isle. The feeders of the Garonne are, with the exception of the Dropt, all small. West of the Garonne the only river of importance is the Leyre, which flows into the Bay of Arcachon. The climate is humid and mild and very hot in summer. Wheat, rye, maize, oats and tobacco are grown to a considerable extent. The corn produced, however, does not meet the wants of the inhabitants. The culture of the vine is by far the most important branch of industry carried on (see WINE), the vineyards occupying about one-seventh of the surface of the department. The wine-growing districts are the Médoc, Graves, Côtes, Palus, Entre-deux-Mers and Sauternes. The Médoc is a region of 50 m. in length by about 6 m. in breadth, bordering the left banks of the Garonne and the Gironde between Bordeaux and the sea. The Graves country forms a zone 30 m. in extent, stretching along the left bank of the Garonne from the neighbourhood of Bordeaux to Barsac. The Sauternes country lies to the S.E. of the Graves. The Côtes lie on the right bank of the Dordogne and Gironde, between it and the Garonne, and on the left bank of the Garonne. The produce of the Palus, the alluvial land of the valleys, and of the Entre-deux-Mers, situated on the left bank of the Dordogne, is inferior. Fruits and vegetables are extensively cultivated, the peaches and pears being especially fine. Cattle are extensively raised, the Bazadais breed of oxen and the Bordelais breed of milch-cows being well known. Oyster-breeding is carried on on a large scale in the Bay of Arcachon. Large supplies of resin, pitch and turpentine are obtained from the pine woods, which also supply vine-props, and there are well-known quarries of limestone. The manufactures are various, and, with the general trade, are chiefly carried on at Bordeaux (*q.v.*), the chief town and third port in France. Pauillac, Blaye, Libourne and Arcachon are minor ports. Gironde is divided into the arrondissements of Bordeaux, Blaye, Lesparre, Libourne, Bazas and La Réole, with 49 cantons and 554 communes. The department is served by five railways, the chief of which are those of the Orleans and Southern companies. It forms part of the circumscription of the archbishopric, the appeal-court and the *académie* (educational division) of Bordeaux, and of the region of the XVIII. army corps, the headquarters of which are at that city. Besides Bordeaux, Libourne, La Réole, Bazas, Blaye, Arcachon, St Emilion and St Macaire are the most noteworthy towns and receive separate treatment. Among the other places of interest the chief are Cadillac, on the right bank of the Garonne, where there is a castle of the 16th century, surrounded by fortifications of the 14th century; Labrède, with a feudal château in which Montesquieu was born and lived; Villandraut, where there is a ruined castle of the 13th century; Uzeste, which has a church begun in 1310 by Pope Clement V.; Mazères with an imposing castle of the 14th century; La Sauve, which has a church (11th and 12th centuries) and other remains of a Benedictine abbey; and Ste Foy-la-Grande, a bastide created in 1255 and afterwards a centre of Protestantism, which is still strong there. La Teste (pop. in 1906, 5699) was the capital in the middle ages of the famous lords of Buch.

GIRONDISTS (Fr. *Girondins*), the name given to a political party in the Legislative Assembly and National Convention during the French Revolution (1791–1793). The Girondists were, indeed, rather a group of individuals holding certain opinions and principles in common than an organized political party, and the name was at first somewhat loosely applied to them owing to the fact that the most brilliant exponents of their point of view were deputies from the Gironde. These deputies were twelve in number, six of whom—the lawyers Vergniaud, Guadet, Gensonné, Grangeneuve and Jay, and the tradesman Jean François Ducos—sat both in the Legislative Assembly and the National Convention. In the Legislative Assembly these represented a compact body of opinion which, though not as yet definitely republican, was considerably more advanced than the moderate royalism of the majority of the Parisian deputies. Associated with these views was a group of deputies from other parts of France, of whom the most notable were Condorcet, Fauchet, Lasource, Isnard, Kersaint, Henri Larivière, and, above all, Jacques Pierre Brissot, Roland and Pétion, elected mayor of Paris in succession to Bailly on the 16th of November 1791. On the spirit and policy of the Girondists Madame Roland, whose *salon* became their gathering-place, exercised a powerful influence (see ROLAND); but such party cohesion as they possessed they owed to the energy of Brissot (*q.v.*), who came to be regarded as their mouthpiece in the Assembly and the Jacobin Club. Hence the name *Brissotins*, coined by Camille Desmoulins, which was sometimes substituted for that of *Girondins*, sometimes closely coupled with it. As strictly party designations these first came into use after the assembling of the National Convention (September 20th, 1792), to which a large proportion of the deputies from the Gironde who had sat in the Legislative Assembly were returned. Both were used as terms of opprobrium by the orators of the Jacobin Club, who freely denounced "the Royalists, the Federalists, the Brissotins, the Girondins and all the enemies of the democracy" (F. Aulard, *Soc. des Jacobins*, vi. 531).

In the Legislative Assembly the Girondists represented the principle of democratic revolution within and of patriotic defiance to the European powers without. They were all-powerful in the Jacobin Club (see JACOBINS), where Brissot's influence had not yet been ousted by Robespierre, and they did not hesitate to use this advantage to stir up popular passion and intimidate those who sought to stay the progress of the Revolution. They compelled the king in 1792 to choose a ministry composed of their partisans—among them Roland, Dumouriez, Clavière and Servan; and it was they who forced the declaration of war against Austria. In all this there was no apparent line of cleavage between "La Gironde" and the Mountain. *Montagnards* and Girondists alike were fundamentally opposed to the monarchy; both were democrats as well as republicans; both were prepared to appeal to force in order to realize their ideals; in spite of the accusation of "federalism" freely brought against them, the Girondists desired as little as the Montagnards to break up the unity of France. Yet from the first the leaders of the two parties stood in avowed opposition, in the Jacobin Club as in the Assembly. It was largely a question of temperament. The Girondists were idealists, doctrinaires and theorists rather than men of action; they encouraged, it is true, the "armed petitions" which resulted, to their dismay, in the *émeute* of the 20th of June; but Roland, turning the ministry of the interior into a publishing office for tracts on the civic virtues, while in the provinces riotous mobs were burning the châteaux unchecked, is more typical of their spirit. With the ferocious fanaticism or the ruthless opportunism of the future organizers of the Terror they had nothing in common. As the Revolution developed they trembled at the anarchic forces they had helped to unchain, and tried in vain to curb them. The overthrow of the monarchy on the 10th of August and the massacres of September were not their work, though they claimed credit for the results achieved.

The crisis of their fate was not slow in coming. It was they who proposed the suspension of the king and the summoning of the National Convention; but they had only consented to overthrow the kingship when they found that Louis XVI. was impervious to their counsels, and, the republic once established, they were anxious to arrest the revolutionary movement which they had helped to set in motion. As Daunou shrewdly observes in his *Mémoires*, they were too cultivated and too polished to retain their popularity long in times of disturbance, and were therefore the more inclined to work for the establishment of order, which would mean the guarantee of their own

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power.[1] Thus the Girondists, who had been the Radicals of the Legislative Assembly, became the Conservatives of the Convention. But they were soon to have practical experience of the fate that overtakes those who attempt to arrest in mid-career a revolution they themselves have set in motion. The ignorant populace, for whom the promised social millennium had by no means dawned, saw in an attitude seemingly so inconsistent obvious proof of corrupt motives, and there were plenty of prophets of misrule to encourage the delusion—orators of the clubs and the street corners, for whom the restoration of order would have meant well-deserved obscurity. Moreover, the *Septembriseurs*—Robespierre, Danton, Marat and their lesser satellites—realized that not only their influence but their safety depended on keeping the Revolution alive. Robespierre, who hated the Girondists, whose lustre had so long obscured his own, had proposed to include them in the proscription lists of September; the Mountain to a man desired their overthrow.

The crisis came in March 1793. The Girondists, who had a majority in the Convention, controlled the executive council and filled the ministry, believed themselves invincible. Their orators had no serious rivals in the hostile camp; their system was established in the purest reason. But the Montagnards made up by their fanatical, or desperate, energy and boldness for what they lacked in talent or in numbers. They had behind them the revolutionary Commune, the Sections and the National Guard of Paris, and they had gained control of the Jacobin club, where Brissot, absorbed in departmental work, had been superseded by Robespierre. And as the motive power of this formidable mechanism of force they could rely on the native suspiciousness of the Parisian populace, exaggerated now into madness by famine and the menace of foreign invasion. The Girondists played into their hands. At the trial of Louis XVI. the bulk of them had voted for the "appeal to the people," and so laid themselves open to the charge of "royalism"; they denounced the domination of Paris and summoned provincial levies to their aid, and so fell under suspicion of "federalism," though they rejected Buzot's proposal to transfer the Convention to Versailles. They strengthened the revolutionary Commune by decreeing its abolition, and then withdrawing the decree at the first sign of popular opposition; they increased the prestige of Marat by prosecuting him before the Revolutionary Tribunal, where his acquittal was a foregone conclusion. In the suspicious temper of the times this vacillating policy was doubly fatal. Marat never ceased his denunciations of the "*faction des hommes d'État*," by which France was being betrayed to her ruin, and his parrot cry of "*Nous sommes trahis!*" was re-echoed from group to group in the streets of Paris. The Girondists, for all their fine phrases, were sold to the enemy, as Lafayette, Dumouriez and a hundred others—once popular favourites—had been sold.

The hostility of Paris to the Girondists received a fateful advertisement by the election, on the 15th of February 1793, of the ex-Girondist Jean Nicolas Pache (1746–1823) to the mayoralty. Pache had twice been minister of war in the Girondist government; but his incompetence had laid him open to strong criticism, and on the 4th of February he had been superseded by a vote of the Convention. This was enough to secure him the suffrages of the Paris electors ten days later, and the Mountain was strengthened by the accession of an ally whose one idea was to use his new power to revenge himself on his former colleagues. Pache, with Chaumette, *procureur* of the Commune, and Hébert, deputy *procureur*, controlled the armed organization of the Paris Sections, and prepared to turn this against the Convention. The abortive *émeute* of the 10th of March warned the Girondists of their danger, but the Commission of Twelve appointed on the 18th of May, the arrest of Marat and Hébert, and other precautionary measures, were defeated by the popular risings of the 27th and 31st of May, and, finally, on the 2nd of June, Hanriot with the National Guards purged the Convention of the Girondists. Isnard's threat, uttered on the 25th of May, to march France upon Paris had been met by Paris marching upon the Convention.

The list drawn up by Hanriot, and endorsed by a decree of the intimidated Convention, included twenty-two Girondist deputies and ten members of the Commission of Twelve, who were ordered to be detained at their lodgings "under the safeguard of the people." Some submitted, among them Gensonné, Guadet, Vergniaud, Pétion, Birotteau and Boyer-Fonfrède. Others, including Brissot, Louvet, Buzot, Lasource, Grangeneuve, Larivière and Bergoing, escaped from Paris and, joined later by Guadet, Pétion and Birotteau, set to work to organize a movement of the provinces against the capital. This attempt to stir up civil war determined the wavering and frightened Convention. On the 13th of June it voted that the city of Paris had deserved well of the country, and ordered the imprisonment of the detained deputies, the filling up of their places in the Assembly by their *suppléants*, and the initiation of vigorous measures against the movement in the provinces. The excuse for the Terror that followed was the imminent peril of France, menaced on the east by the advance of the armies of the Coalition, on the west by the Royalist insurrection of La Vendée, and the need for preventing at all costs the outbreak of another civil war. The assassination of Marat by Charlotte Corday (*q.v.*) only served to increase the unpopularity of the Girondists and to seal their fate. On the 28th of July a decree of the Convention proscribed, as traitors and enemies of their country, twenty-one deputies, the final list of those sent for trial comprising the names of Antiboul, Boilleau the younger, Boyer-Fonfrède, Brissot, Carra, Duchastel, the younger Ducos, Dufriche de Valazé, Duprat, Fauchet, Gardien, Gensonné, Lacaze, Lasource, Lauze-Deperret, Lehardi, Lesterpt-Beauvais, the elder Minvielle, Sillery, Vergniaud and Viger, of whom five were deputies from the Gironde. The names of thirty-nine others were included in the final *acte d'accusation*, accepted by the Convention on the 24th of October, which stated the crimes for which they were to be tried as their perfidious ambition, their hatred of Paris, their "federalism" and, above all, their responsibility for the attempt of their escaped colleagues to provoke civil war.

The trial of the twenty-one, which began before the Revolutionary Tribunal on the 24th of October, was a mere farce, the verdict a foregone conclusion. On the 31st they were borne to the guillotine in five tumbrils, the corpse of Dufriche de Valazé—who had killed himself—being carried with them. They met death with great courage, singing the refrain "*Plutôt la mort que l'esclavage!*" Of those who escaped to the provinces the greater number, after wandering about singly or in groups, were either captured and executed or committed suicide, among them Barbaroux, Buzot, Condorcet, Grangeneuve, Guadet, Kersaint, Pétion, Rabaut de Saint-Étienne and Rebecqui. Roland had killed himself at Rouen on the 15th of November, a week after the execution of his wife. Among the very few who finally escaped was Jean Baptiste Louvet, whose *Mémoires* give a thrilling picture of the sufferings of the fugitives. Incidentally they prove, too, that the sentiment of France was for the time against the Girondists, who were proscribed even in their chief centre, the city of Bordeaux. The survivors of the party made an effort to re-enter the Convention after the fall of Robespierre, but it was not until the 5th of March 1795 that they were formally reinstated. On the 3rd of October of the same year (11 Vendémiaire, year III.) a solemn fête in honour of the Girondist "martyrs of liberty" was celebrated in the Convention. See also the article FRENCH REVOLUTION and separate biographies.

Of the special works on the Girondists Lamartine's *Histoire des Girondins* (2 vols., Paris, 1847, new ed. 1902, in 6 vols.) is rhetoric rather than history and is untrustworthy; the *Histoire des Girondins*, by A. Gramier de Cassagnac (Paris, 1860) led to the publication of a *Protestation* by J. Guadet, a nephew of the Girondist orator, which was followed by his *Les Girondins, leur vie privée, leur vie publique, leur proscription et leur mort* (2 vols., Paris, 1861, new ed. 1890); with which cf. Alary, *Les Girondins par Guadet* (Bordeaux, 1863); also Charles Vatel, *Charlotte de Corday et les Girondins; pièces classées et annotées* (3 vols., Paris, 1864–1872); *Recherches historiques*

[1] Daunou, "Mémoires pour servir à l'hist. de la Convention Nationale," p. 409, vol. xii. of M. Fr. Barrière, *Bibl. des mém. rel à l'hist. de la France*, &c. (Paris, 1863).

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sur les Girondins (2 vols., *ib.* 1873); Ducos, *Les Trois Girondines* (Madame Roland, Charlotte Corday, Madame Bouquey) *et les Girondins* (*ib.* 1896); Edmond Biré, *La Légende des Girondins* (Paris, 1881, new ed. 1896); also Helen Maria Williams, *State of Manners and Opinions in the French Republic towards the close of the 18th Century* (2 vols., London, 1801). Memoirs or fragments of memoirs also exist by particular Girondists, *e.g.* Barbaroux, Pétion, Louvet, Madame Roland. See, further, the bibliography to the article FRENCH REVOLUTION. (W. A. P.)

GIRTIN, THOMAS (1775–1802), English painter and etcher, was the son of a well-to-do cordage maker in Southwark, London. His father died while Thomas was a child, and his widow married Mr Vaughan, a pattern-draughtsman. Girtin learnt drawing as a boy, and was apprenticed to Edward Doyes (1763–1804), the mezzotint engraver, and he soon made J. M. W. Turner's acquaintance. His architectural and topographical sketches and drawings soon established his reputation, his use of water-colour for landscapes being such as to give him the credit of having created modern water-colour painting, as opposed to mere "tinting." His etchings also were characteristic of his artistic genius. His early death from consumption (9th of November 1802) led indeed to Turner saying that "had Tom Girtin lived I should have starved." From 1794 to his death he was an exhibitor at the Royal Academy; and some fine examples of his work have been bequeathed by private owners to the British Museum and the Victoria and Albert Museum.

GIRVAN, a police burgh, market and fishing town of Ayrshire, Scotland, at the mouth of the Girvan, 21 m. S.W. of Ayr, and 63 m. S.W. of Glasgow by the Glasgow & South-Western railway. Pop. (1901) 4024. The principal industry was weaving, but the substitution of the power-loom for the hand-loom nearly put an end to it. The herring fishery has developed to considerable proportions, the harbour having been enlarged and protected by piers and a breakwater. Moreover, the town has grown in repute as a health and holiday resort, its situation being one of the finest in the west of Scotland. There is excellent sea-bathing, and a good golf-course. The vale of Girvan, one of the most fertile tracts in the shire, is made so by the Water of Girvan, which rises in the loch of Girvan Eye, pursues a very tortuous course of 36 m. and empties into the sea. Girvan is the point of communication with Ailsa Craig. About 13 m. S.W. at the mouth of the Stinchar is the fishing village of Ballantrae (pop. 521).

GIRY (JEAN MARIE JOSEPH), **ARTHUR** (1848–1899), French historian, was born at Trévoux (Ain) on the 29th of February 1848. After rapidly completing his classical studies at the *lycée* at Chartres, he spent some time in the administrative service and in journalism. He then entered the École des Chartes, where, under the influence of J. Quicherat, he developed a strong inclination to the study of the middle ages. The lectures at the École des Hautes Études, which he attended from its foundation in 1868, revealed his true bent; and henceforth he devoted himself almost entirely to scholarship. He began modestly by the study of the municipal charters of St Omer. Having been appointed assistant lecturer and afterwards full lecturer at the École des Hautes Études, it was to the town of St Omer that he devoted his first lectures and his first important work, *Histoire de la ville de Saint-Omer et de ses institutions jusqu'au XIVe siècle* (1877). He, however, soon realized that the charters of one town can only be understood by comparing them with those of other towns, and he was gradually led to continue the work which Augustin Thierry had broadly outlined in his studies on the *Tiers État*. A minute knowledge of printed books and a methodical examination of departmental and communal archives furnished him with material for a long course of successful lectures, which gave rise to some important works on municipal history and led to a great revival of interest in the origins and significance of the urban communities in France. Giry himself published *Les Établissements de Rouen* (1883–1885), a study, based on very minute researches, of the charter granted to the capital of Normandy by Henry II., king of England, and of the diffusion of similar charters throughout the French dominions of the Plantagenets; a collection of *Documents sur les relations de la royauté avec les villes de France de 1180 à 1314* (1885); and *Étude sur les origines de la commune de Saint-Quentin* (1887).

About this time personal considerations induced Giry to devote the greater part of his activity to the study of diplomatic, which had been much neglected at the École des Chartes, but had made great strides in Germany. As assistant (1883) and successor (1885) to Louis de Mas Latrie, Giry restored the study of diplomatic, which had been founded in France by Dom Jean Mabillon, to its legitimate importance. In 1894 he published his *Manuel de diplomatique*, a monument of lucid and well-arranged erudition, which contained the fruits of his long experience of archives, original documents and textual criticism; and his pupils, especially those at the École des Hautes Études, soon caught his enthusiasm. With their collaboration he undertook the preparation of an inventory and, subsequently, of a critical edition of the Carolingian diplomas. By arrangement with E. Mühlbacher and the editors of the *Monumenta Germaniae historica*, this part of the joint work was reserved for Giry. Simultaneously with this work he carried on the publication of the annals of the Carolingian epoch on the model of the German *Jahrbücher*, reserving for himself the reign of Charles the Bald. Of this series his pupils produced in his lifetime *Les Derniers Carolingiens* (by F. Lot, 1891), *Eudes, comte de Paris et roi de France* (by E. Favre, 1893), and *Charles le Simple* (by Eckel, 1899). The biographies of Louis IV. and Hugh Capet and the history of the kingdom of Provence were not published until after his death, and his own unfinished history of Charles the Bald was left to be completed by his pupils. The preliminary work on the Carolingian diplomas involved such lengthy and costly researches that the Académie des Inscriptions et Belles-Lettres took over the expenses after Giry's death.

In the midst of these multifarious labours Giry found time for extensive archaeological researches, and made a special study of the medieval treatises dealing with the technical processes employed in the arts and industries. He prepared a new edition of the monk Theophilus's celebrated treatise, *Diversarum artium schedula*, and for several years devoted his Saturday mornings to laboratory research with the chemist Aimé Girard at the Conservatoire des Arts et Métiers, the results of which were utilized by Marcellin Berthelot in the first volume (1894) of his *Chimie au moyen âge*. Giry took an energetic part in the *Collection de textes relatifs à l'histoire du moyen âge*, which was due in great measure to his initiative. He was appointed director of the section of French history in *La Grande Encyclopédie*, and contributed more than a hundred articles, many of which, *e.g.* "Archives" and "Diplomatique," were original works. In collaboration with his pupil André Réville, he wrote the chapters on "L'Émancipation des villes, les communes et les bourgeoisies" and "Le Commerce et l'industrie au moyen âge" for the *Histoire générale* of Lavisse and Rambaud. Giry took a keen interest in politics, joining the republican party and writing numerous articles in the republican newspapers, mainly on historical subjects. He was intensely interested in the Dreyfus case, but his robust constitution was undermined by the anxieties and disappointments occasioned by the Zola trial and the Rennes court-martial, and he died in Paris on the 13th of November 1899.

For details of Giry's life and works see the funeral orations published in the *Bibliothèque de l'École des Chartes*, and afterwards in a pamphlet (1899). See also the biography by Ferdinand Lot in the *Annuaire de l'École des Hautes Études* for 1901; and the bibliography of his works by Henry Maistre in the *Correspondance historique et archéologique* (1899 and 1900).

GISBORNE, a seaport of New Zealand, in Cook county, provincial district of Auckland, on Poverty Bay of the east coast of North Island. Pop. (1901) 2733; (1906) 5664. Wool, frozen mutton and agricultural produce are exported from the rich district surrounding. Petroleum has been discovered in the neighbourhood, and about 40 m. from the town there are warm medicinal springs. Near the site of Gisborne Captain Cook landed in 1769, and gave Poverty Bay its name from his inability to obtain supplies owing to the hostility of the natives. Young Nick's Head, the southern horn of the bay, was named from Nicholas Young, his ship's boy, who first observed it.

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GISLEBERT (or GILBERT) **OF MONS** (*c.* 1150–1225), Flemish chronicler, became a clerk, and obtained the positions of provost of the churches of St Germanus at Mons and St Alban at Namur, in addition to several other ecclesiastical appointments. In official documents he is described as chaplain, chancellor or notary, of Baldwin V., count of Hainaut (d. 1195), who employed him on important business. After 1200 Gislebert wrote the *Chronicon Hanoniense*, a history of Hainaut and the neighbouring lands from about 1050 to 1195, which is specially valuable for the latter part of the 12th century, and for the life and times of Baldwin V.

The chronicle is published in Band xxi. of the *Monumenta Germaniae historica* (Hanover, 1826 fol.); and separately with introduction by W. Arndt (Hanover, 1869). Another edition has been published by L. Vanderkindere in the *Recueil de textes pour servir à l'étude de l'histoire de Belgique* (Brussels, 1904); and there is a French translation by G. Menilglaise (Tournai, 1874).

See W. Meyer, *Das Werk des Kanzlers Gislebert von Mons als verfassungsgeschichtliche Quelle* (Königsberg, 1888); K. Huygens, *Sur la valeur historique de la chronique Gislebert de Mons* (Ghent, 1889); and W. Wattenbach, *Deutschlands Geschichtsquellen*, Band ii. (Berlin, 1894).

GISORS, a town of France, in the department of Eure, situated in the pleasant valley of the Epte, 44 m. N.W. of Paris on the railway to Dieppe. Pop. (1906) 4345. Gisors is dominated by a feudal stronghold built chiefly by the kings of England in the 11th and 12th centuries. The outer enceinte, to which is attached a cylindrical donjon erected by Philip Augustus, king of France, embraces an area of over 7 acres. On a mound in the centre of this space rises an older donjon, octagonal in shape, protected by another enceinte. The outer ramparts and the ground they enclose have been converted into promenades. The church of St Gervais dates in its oldest parts—the central tower, the choir and parts of the aisles—from the middle of the 13th century, when it was founded by Blanche of Castile. The rest of the church belongs to the Renaissance period. The Gothic and Renaissance styles mingle in the west façade, which, like the interior of the building, is adorned with a profusion of sculptures; the fine carving on the wooden doors of the north and west portals is particularly noticeable. The less interesting buildings of the town include a wooden house of the Renaissance era, an old convent now used as an hôtel de ville, and a handsome modern hospital. There is a statue of General de Blanmont, born at Gisors in 1770. Among the industries of Gisors are felt manufacture, bleaching, dyeing and leather-dressing.

In the middle ages Gisors was capital of the Vexin. Its position on the frontier of Normandy caused its possession to be hotly contested by the kings of England and France during the 12th century, at the end of which it and the dependent fortresses of Neaufles and Dangu were ceded by Richard Cœur de Lion to Philip Augustus. During the wars of religion of the 16th century it was occupied by the duke of Mayenne on behalf of the League, and in the 17th century, during the Fronde, by the duke of Longueville. Gisors was given to Charles Auguste Fouquet in 1718 in exchange for Belle-Ile-en-Mer and made a duchy in 1742. It afterwards came into the possession of the count of Eu and the duke of Penthièvre.

GISSING, GEORGE ROBERT (1857–1903), English novelist, was born at Wakefield on the 22nd of November 1857. He was educated at the Quaker boarding-school of Alderley Edge and at Owens College, Manchester. His life, especially its earlier period, was spent in great poverty, mainly in London, though he was for a time also in the United States, supporting himself chiefly by private teaching. He published his first novel, *Workers in the Dawn*, in 1880. *The Unclassed* (1884) and *Isabel Clarendon* (1886) followed. *Demos* (1886), a novel dealing with socialistic ideas, was, however, the first to attract attention. It was followed by a series of novels remarkable for their pictures of lower middle class life. Gissing's own experiences had preoccupied him with poverty and its brutalizing effects on character. He made no attempt at popular writing, and for a long time the sincerity of his work was appreciated only by a limited public. Among his more characteristic novels were: *Thyrza* (1887), *A Life's Morning* (1888), *The Nether World* (1889), *New Grub Street* (1891), *Born in Exile* (1892), *The Odd Women* (1893), *In the Year of Jubilee* (1894), *The Whirlpool* (1897). Others, *e.g. The Town Traveller* (1901), indicate a humorous faculty, but the prevailing note of his novels is that of the struggling life of the shabby-genteel and lower classes and the conflict between education and circumstances. The quasi-autobiographical *Private Papers of Henry Rycroft* (1903) reflects throughout Gissing's studious and retiring tastes. He was a good classical scholar and had a minute acquaintance with the late Latin historians, and with Italian antiquities; and his posthumous *Veranilda* (1904), a historical romance of Italy in the time of Theodoric the Goth, was the outcome of his favourite studies. Gissing's powers as a literary critic are shown in his admirable study on Charles Dickens (1898). A book of travel, *By the Ionian Sea*, appeared in 1901. He died at St Jean de Luz in the Pyrenees on the 28th of December 1903.

See also the introductory essay by T. Seccombe to *The House of Cobwebs* (1906), a posthumous volume of Gissing's short stories.

GITSCHIN (Czech *Jičín*), a town of Bohemia, Austria, 65 m. N.E. of Prague by rail. Pop. (1900) 9700, mostly Czech. The parish church was begun by Wallenstein after the model of the pilgrims' church of Santiago de Compostela in Spain, but not completed till 1655. The castle, which stands next to the church, was built by Wallenstein and finished in 1630. It was here that the emperor Francis I. of Austria signed the treaty of 1813 by which he threw in his lot with the Allies against Napoleon. Wallenstein was interred at the neighbouring Carthusian monastery, but in 1630 the head and right hand were taken by General Banér to Sweden, and in 1702 the other remains were removed by Count Vincent of Waldstein to his hereditary burying ground at Münchengrätz. Gitschin was originally the village of Zidinêves and received its present name when it was raised to the dignity of a town by Wenceslaus II. in 1302. The place belonged to various noble Bohemian families, and in the 17th century came into the hands of Wallenstein, who made it the capital of the duchy of Friedland and did much to improve and extend it. His murder, and the miseries of the Thirty Years' War, brought it very low; and it passed through several hands before it was bought by Prince Trauttmannsdorf, to whose family it still belongs. On the 29th of June 1866 the Prussians gained here a great victory over the Austrians. This victory made possible the junction of the first and second Prussian army corps, and had as an ultimate result the Austrian defeat at Königgrätz.

GIUDICI, PAOLO EMILIANO (1812–1872), Italian writer, was born in Sicily. His *History of Italian Literature* (1844) brought him to the front, and in 1848 he became professor of Italian literature at Pisa, but after a few months was deprived of the chair on account of his liberal views in politics. On the re-establishment of the Italian kingdom he became professor of aesthetics (resigning 1862) and secretary of the Academy of Fine Arts at Florence, and in 1867 was elected to the chamber of deputies. He held a prominent place as an historian, his works including a *Storia del teatro* (1860), and *Storia dei comuni italiani* (1861), besides a translation of Macaulay's *History of England* (1856). He died at Tonbridge in England, on the 8th of September 1872.

A *Life* appeared at Florence in 1874.

GIULIO ROMANO, or GIULIO PIPPI (*c.* 1492–1546), the head of the Roman school of painting in succession to Raphael. This prolific painter, modeller, architect and engineer receives his common appellation from the place of his birth—Rome, in the Macello de' Corbi. His name in full was Giulio di Pietro de Filippo de' Giannuzzi—Giannuzzi being the true family name, and Pippi (which has practically superseded Giannuzzi) being an abbreviation from the name of his grandfather Filippo. The date of Giulio's birth is a little uncertain. Vasari (who knew him personally) speaks of him as fifty-four years old at the date of his death, 1st November 1546; thus he would have been born in 1492. Other accounts assign 1498 as the date of birth. This would make Giulio young indeed in the early and in such case most precocious stages of his artistic career, and

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would show him as dying, after an infinity of hard work, at the comparatively early age of forty-eight.

Giulio must at all events have been quite youthful when he first became the pupil of Raphael, and at Raphael's death in 1520 he was at the utmost twenty-eight years of age. Raphael had loved him as a son, and had employed him in some leading works, especially in the Loggie of the Vatican; the series there popularly termed "Raphael's Bible" is done in large measure by Giulio,—as for instance the subjects of the "Creation of Adam and Eve," "Noah's Ark," and "Moses in the Bulrushes." In the saloon of the "Incendio del Borgo," also, the figures of "Benefactors of the Church" (Charlemagne, &c.) are Giulio's handiwork. It would appear that in subjects of this kind Raphael simply furnished the design, and committed the execution of it to some assistant, such as Giulio,—taking heed, however, to bring it up, by final retouching, to his own standard of style and type. Giulio at a later date followed out exactly the same plan; so that in both instances inferiorities of method, in the general blocking-out and even in the details of the work, are not to be precisely charged upon the *caposcuola*. Amid the multitude of Raphael's pupils, Giulio was eminent in pursuing his style, and showed universal aptitude; he did, among other things, a large amount of architectural planning for his chief. Raphael bequeathed to Giulio, and to his fellow-pupil Gianfrancesco Penni ("Il Fattore"), his implements and works of art; and upon them it devolved to bring to completion the vast fresco-work of the "Hall of Constantine" in the Vatican—consisting, along with much minor matter, of the four large subjects, the "Battle of Constantine," the "Apparition of the Cross," the "Baptism of Constantine" and the "Donation of Rome to the Pope." The two former compositions were executed by Pippi, the two latter by Penni. The whole of this onerous undertaking was completed within a period of only three years,—which is the more remarkable as, during some part of the interval since Raphael's decease, the Fleming, Adrian VI., had been pope, and his anti-aesthetic pontificate had left art and artists almost in a state of inanition. Clement VII. had now, however, succeeded to the popedom. By this time Giulio was regarded as the first painter in Rome; but his Roman career was fated to have no further sequel.

Towards the end of 1524 his friend the celebrated writer Baldassar Castiglione seconded with success the urgent request of the duke of Mantua, Federigo Gonzaga, that Giulio should migrate to that city, and enter the duke's service for the purpose of carrying out his projects in architecture and pictorial decoration. These projects were already considerable, and under Giulio's management they became far more extensive still. The duke treated his painter munificently as to house, table, horses and whatever was in request; and soon a very cordial attachment sprang up between them. In Pippi's multifarious work in Mantua three principal undertakings should be noted. (1) In the Castello he painted the "History of Troy," along with other subjects. (2) In the suburban ducal residence named the Palazzo del Te (this designation being apparently derived from the form of the roads which led towards the edifice) he rapidly carried out a rebuilding on a vastly enlarged scale,—the materials being brick and terra-cotta, as there is no local stone,—and decorated the rooms with his most celebrated works in oil and fresco painting—the story of Psyche, Icarus, the fall of the Titans, and the portraits of the ducal horses and hounds. The foreground figures of Titans are from 12 to 14 ft. high; the room, even in its structural details, is made to subserve the general artistic purpose, and many of its architectural features are distorted accordingly. Greatly admired though these pre-eminent works have always been, and at most times even more than can now be fully ratified, they have suffered severely at the hands of restorers, and modern eyes see them only through a dull and deadening fog of renovation. The whole of the work on the Palazzo del Te, which is of the Doric order of architecture, occupied about five years. (3) Pippi recast and almost rebuilt the cathedral of Mantua; erected his own mansion, replete with numerous antiques and other articles of vertu; reconstructed the street architecture to a very large extent, and made the city, sapped as it is by the shallows of the Mincio, comparatively healthy; and at Marmiruolo, some 5 m. distant from Mantua, he worked out other important buildings and paintings. He was in fact, for nearly a quarter of a century, a sort of Demiurgus of the arts of design in the Mantuan territory.

Giulio's activity was interrupted but not terminated by the death of Duke Federigo. The duke's brother, a cardinal who became regent, retained him in full employment. For a while he went to Bologna, and constructed the façade of the church of S. Petronio in that city. He was afterwards invited to succeed Antonio Sangallo as architect of St Peter's in Rome,—a splendid appointment, which, notwithstanding the strenuous opposition of his wife and of the cardinal regent, he had almost resolved to accept, when a fever overtook him, and, acting upon a constitution somewhat enfeebled by worry and labour, caused his death on the 1st of November 1546. He was buried in the church of S. Barnaba in Mantua. At the time of his death Giulio enjoyed an annual income of more than 1000 ducats, accruing from the liberalities of his patrons. He left a widow, and a son and daughter. The son, named Raffaello, studied painting, but died before he could produce any work of importance; the daughter, Virginia, married Ercole Malatesta.

Wide and solid knowledge of design, combined with a promptitude of composition that was never at fault, formed the chief motive power and merit of Giulio Romano's art. Whatever was wanted, he produced it at once, throwing off, as Vasari says, a large design in an hour; and he may in that sense, though not equally so when an imaginative or ideal test is applied, be called a great inventor. It would be difficult to name any other artist who, working as an architect, and as the plastic and pictorial embellisher of his architecture, produced a total of work so fully and homogeneously his own; hence he has been named "the prince of decorators." He had great knowledge of the human frame, and represented it with force and truth, though sometimes with an excess of movement; he was also learned in other matters, especially in medals, and in the plans of ancient buildings. In design he was more strong and emphatic than graceful, and worked a great deal from his accumulated stores of knowledge, without consulting nature direct. As a general rule, his designs are finer and freer than his paintings, whether in fresco or in oil—his easel pictures being comparatively few, and some of them the reverse of decent; his colouring is marked by an excess of blackish and heavy tints.

Giulio Romano introduced the style of Raphael into Mantua, and established there a considerable school of art, which surpassed in development that of his predecessor Mantegna, and almost rivalled that of Rome. Very many engravings—more than three hundred are mentioned—were made contemporaneously from his works; and this not only in Italy, but in France and Flanders as well. His plan of entrusting principally to assistants the pictorial execution of his cartoons has already been referred to; Primaticcio was one of the leading coadjutors. Rinaldo Mantovano, a man of great ability who died young, was the chief executant of the "Fall of the Giants"; he also co-operated with Benedetto Pagni da Pescia in painting the remarkable series of horses and hounds, and the story of Psyche. Another pupil was Fermo Guisoni, who remained settled in Mantua. The oil pictures of Giulio Romano are not generally of high importance; two leading ones are the "Martyrdom of Stephen," in the church of that saint in Genoa, and a "Holy Family" in the Dresden Gallery. Among his architectural works not already mentioned is the Villa Madama in Rome, with a fresco of Polyphemus, and boys and satyrs; the Ionic façade of this building may have been sketched out by Raphael.

Vasari gives a pleasing impression of the character of Giulio. He was very loving to his friends, genial, affable, well-bred, temperate in the pleasures of the table, but liking fine apparel and a handsome scale of living. He was good-looking, of middle height, with black curly hair and dark eyes, and an ample beard; his portrait, painted by himself, is in the Louvre.

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Besides Vasari, Lanzi and other historians of art, the following works may be mentioned: C. D. Arco, *Vita di G. Pippi* (1828); G. C. von Murr, *Notice sur les estampes gravées après dessins de Jules Romain* (1865); R. Sanzio, two works on *Etchings and Paintings* (1800, 1836). (W. M. R.)

GIUNTA PISANO, the earliest Italian painter whose name is found inscribed on an extant work. He is said to have exercised his art from 1202 to 1236. He may perhaps have been born towards 1180 in Pisa, and died in or soon after 1236; but other accounts give 1202 as the date of his birth, and 1258 or thereabouts for his death. There is some ground for thinking that his family name was Capiteno. The inscribed work above referred to, one of his earliest, is a "Crucifix," long in the kitchen of the convent of St Anne in Pisa. Other Pisan works of like date are very harbarous, and some of them may be also from the hand of Giunta. It is said that he painted in the upper church of Assisi,—in especial a "Crucifixion" dated 1236, with a figure of Father Elias, the general of the Franciscans, embracing the foot of the cross. In the sacristy is a portrait of St Francis, also ascribed to Giunta; but it more probably belongs to the close of the 13th century. He was in the practice of painting upon cloth stretched on wood, and prepared with plaster.

GIURGEVO (*Giurgiu*), the capital of the department of Vlashca, Rumania; situated amid mud-flats and marshes on the left bank of the Danube. Pop. (1900) 13,977. Three small islands face the town, and a larger one shelters its port, Smarda, 2½ m. E. The rich corn-lands on the north are traversed by a railway to Bucharest, the first line opened in Rumania, which was built in 1869 and afterwards extended to Smarda. Steamers ply to Rustchuk, 2½ m. S.W. on the Bulgarian shore, linking the Rumanian railway system to the chief Bulgarian line north of the Balkans (Rustchuk-Varna). Thus Giurgevo, besides having a considerable trade with the home ports lower down the Danube, is the headquarters of commerce between Bulgaria and Rumania. It exports timber, grain, salt and petroleum; importing coal, iron and textiles. There are also large saw-mills.

Giurgevo occupies the site of Theodorapolis, a city built by the Roman emperor Justinian (A.D. 483–565). It was founded in the 14th century by Genoese merchant adventurers, who established a bank, and a trade in silks and velvets. They called the town, after the patron saint of Genoa, San Giorgio (St George); and hence comes its present name. As a fortified town, Giurgevo figured often in the wars for the conquest of the lower Danube; especially in the struggle of Michael the Brave (1593–1601) against the Turks, and in the later Russo-Turkish Wars. It was burned in 1659. In 1829, its fortifications were finally razed, the only defence left being a castle on the island of Slobosia, united to the shore by a bridge.

GIUSTI, GIUSEPPE (1809–1850), Tuscan satirical poet, was born at Monsummano, a small village of the Valdinievole, on the 12th of May 1809. His father, a cultivated and rich man, accustomed his son from childhood to study, and himself taught him, among other subjects, the first rudiments of music. Afterwards, in order to curb his too vivacious disposition, he placed the boy under the charge of a priest near the village, whose severity did perhaps more evil than good. At twelve Giusti was sent to school at Florence, and afterwards to Pistoia and to Lucca; and during those years he wrote his first verses. In 1826 he went to study law at Pisa; but, disliking the study, he spent eight years in the course, instead of the customary four. He lived gaily, however, though his father kept him short of money, and learned to know the world, seeing the vices of society, and the folly of certain laws and customs from which his country was suffering. The experience thus gained he turned to good account in the use he made of it in his satire.

His father had in the meantime changed his place of abode to Pescia; but Giuseppe did worse there, and in November 1832, his father having paid his debts, he returned to study at Pisa, seriously enamoured of a woman whom he could not marry, but now commencing to write in real earnest in behalf of his country. With the poem called *La Ghigliottina* (the guillotine), Giusti began to strike out a path for himself, and thus revealed his great genius. From this time he showed himself the Italian Béranger, and even surpassed the Frenchman in richness of language, refinement of humour and depth of satirical conception. In Béranger there is more feeling for what is needed for popular poetry. His poetry is less studied, its vivacity perhaps more boisterous, more spontaneous; but Giusti, in both manner and conception, is perhaps more elegant, more refined, more penetrating. In 1834 Giusti, having at last entered the legal profession, left Pisa to go to Florence, nominally to practise with the advocate Capoquadri, but really to enjoy life in the capital of Tuscany. He fell seriously in love a second time, and as before was abandoned by his love. It was then he wrote his finest verses, by means of which, although his poetry was not yet collected in a volume, but for some years passed from hand to hand, his name gradually became famous. The greater part of his poems were published clandestinely at Lugano, at no little risk, as the work was destined to undermine the Austrian rule in Italy. After the publication of a volume of verses at Bastia, Giusti thoroughly established his fame by his *Gingillino*, the best in moral tone as well as the most vigorous and effective of his poems. The poet sets himself to represent the vileness of the treasury officials, and the base means they used to conceal the necessities of the state. The *Gingillino* has all the character of a classic satire. When first issued in Tuscany, it struck all as too impassioned and personal. Giusti entered heart and soul into the political movements of 1847 and 1848, served in the national guard, sat in the parliament for Tuscany; but finding that there was more talk than action, that to the tyranny of princes had succeeded the tyranny of demagogues, he began to fear, and to express the fear, that for Italy evil rather than good had resulted. He fell, in consequence, from the high position he had held in public estimation, and in 1848 was regarded as a reactionary. His friendship for the marquis Gino Capponi, who had taken him into his house during the last years of his life, and who published after Giusti's death a volume of illustrated proverbs, was enough to compromise him in the eyes of such men as Guerrazzi, Montanelli and Niccolini. On the 31st of May 1850 he died at Florence in the palace of his friend.

The poetry of Giusti, under a light trivial aspect, has a lofty civilizing significance. The type of his satire is entirely original, and it had also the great merit of appearing at the right moment, of wounding judiciously, of sustaining the part of the comedy that "castigat ridendo mores." Hence his verse, apparently jovial, was received by the scholars and politicians of Italy in all seriousness. Alexander Manzoni in some of his letters showed a hearty admiration of the genius of Giusti; and the weak Austrian and Bourbon governments regarded them as of the gravest importance.

His poems have often been reprinted, the best editions being those of Le Monnier, Carducci (1859; 3rd ed., 1879), Fioretti (1876) and Bragi (1890). Besides the poems and the proverbs already mentioned, we have a volume of select letters, full of vigour and written in the best Tuscan language, and a fine critical discourse on Giuseppe Parini, the satirical poet. In some of his compositions the elegiac rather than the satirical poet is seen. Many of his verses have been excellently translated into German by Paul Heyse. Good English translations were published in the *Athenaeum* by Mrs T. A. Trollope, and some by W. D. Howells are in his *Modern Italian Poets* (1887).

GIUSTINIANI, the name of a prominent Italian family which originally belonged to Venice, but established itself subsequently in Genoa also, and at various times had representatives in Naples, Corsica and several of the islands of the Archipelago.

In the Venetian line the following are most worthy of mention:—

1. LORENZO (1380–1465), the Laurentius Justinianus of the Roman calendar, at an early age entered the congregation of the canons of St George in Alga, and in 1433 became general of that order. About the same time he was made by Eugenius IV. bishop of Venice; and his episcopate was marked by considerable activity in church extension and reform. On the removal of the patriarchate from Grado to Venice by Nicholas V. in 1451, Giustiniani was promoted to that dignity, which he held for fourteen years. He died on January 8, 1465, was canonized by Pope Alexander VIII., his festival (semi-duplex)

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being fixed by Innocent XII. for September 5th, the anniversary of his elevation to the bishopric. His works, consisting of sermons, letters and ascetic treatises, have been frequently reprinted,—the best edition being that of the Benedictine P. N. A. Giustiniani, published at Venice in 2 vols. folio, 1751. They are wholly devoid of literary merit. His life has been written by Bernard Giustiniani, by Maffei and also by the Bollandists.

2. LEONARDO (1388–1446), brother of the preceding, was for some years a senator of Venice, and in 1443 was chosen procurator of St Mark. He translated into Italian Plutarch's *Lives of Cinna and Lucullus*, and was the author of some poetical pieces, amatory and religious—*strambotti* and *canzonetti*—as well as of rhetorical prose compositions. Some of the popular songs set to music by him became known as *Giustiniani*.

3. BERNARDO (1408–1489), son of Leonardo, was a pupil of Guarino and of George of Trebizond, and entered the Venetian senate at an early age. He served on several important diplomatic missions both to France and Rome, and about 1485 became one of the council of ten. His orations and letters were published in 1492; but his title to any measure of fame he possesses rests upon his history of Venice, *De origine urbis Venetiarum rebusque ab ipsa gestis historia* (1492), which was translated into Italian by Domenichi in 1545, and which at the time of its appearance was undoubtedly the best work upon the subject of which it treated. It is to be found in vol. i. of the *Thesaurus* of Graevius.

4. PIETRO, also a senator, lived in the 16th century, and wrote on *Historia rerum Venetarum* in continuation of that of Bernardo. He was also the author of chronicles *De gestis Petri Mocenigi* and *De bello Venetorum cum Carolo VIII.* The latter has been reprinted in the *Script. rer. Ital.* vol. xxi.

Of the Genoese branch of the family the most prominent members were the following:—

5. PAOLO, DI MONIGLIA (1444–1502), a member of the order of Dominicans, was, from a comparatively early age, prior of their convent at Genoa. As a preacher he was very successful, and his talents were fully recognized by successive popes, by whom he was made master of the sacred palace, inquisitor-general for all the Genoese dominions, and ultimately bishop of Scio and Hungarian legate. He was the author of a number of Biblical commentaries (no longer extant), which are said to have been characterized by great erudition.

6. AGOSTINO (1470–1536) was born at Genoa, and spent some wild years in Valencia, Spain. Having in 1487 joined the Dominican order, he gave himself with great energy to the study of Greek, Hebrew, Chaldee and Arabic, and in 1514 began the preparation of a polyglot edition of the Bible. As bishop of Nebbio in Corsica, he took part in some of the earlier sittings of the Lateran council (1516–1517), but, in consequence of party complications, withdrew to his diocese, and ultimately to France, where he became a pensioner of Francis I., and was the first to occupy a chair of Hebrew and Arabic in the university of Paris. After an absence from Corsica for a period of five years, during which he visited England and the Low Countries, and became acquainted with Erasmus and More, he returned to Nebbio, about 1522, and there remained, with comparatively little intermission, till in 1536, when, while returning from a visit to Genoa, he perished in a storm at sea. He was the possessor of a very fine library, which he bequeathed to the republic of Genoa. Of his projected polyglot only the Psalter was published (*Psalterium Hebraeum, Graecum, Arabicum, et Chaldaicum*, Genoa, 1616). Besides the Hebrew text, the LXX. translation, the Chaldee paraphrase, and an Arabic version, it contains the Vulgate translation, a new Latin translation by the editor, a Latin translation of the Chaldee, and a collection of scholia. Giustiniani printed 2000 copies at his own expense, including fifty in vellum for presentation to the sovereigns of Europe and Asia; but the sale of the work did not encourage him to proceed with the New Testament, which he had also prepared for the press. Besides an edition of the book of Job, containing the original text, the Vulgate, and a new translation, he published a Latin version of the *Moreh Nevochim* of Maimonides (*Director dubitantium aut perplexorum*, 1520), and also edited in Latin the *Aureus libellus* of Aencas Platonicus, and the *Timaeus* of Chalcidius. His annals of Genoa (*Castigatissimi annali di Genova*) were published posthumously in 1537.

The following are also noteworthy:—

7. POMPEIO (1569–1616), a native of Corsica, who served under Alessandro Farnese and the marquis of Spinola in the Low Countries, where he lost an arm, and, from the artificial substitute which he wore, came to be known by the sobriquet Bras de Fer. He also defended Crete against the Turks; and subsequently was killed in a reconnaissance at Friuli. He left in Italian a personal narrative of the war in Flanders, which has been repeatedly published in a Latin translation (*Bellum Belgicum*, Antwerp, 1609).

8. GIOVANNI (1513–1556), born in Candia, translator of Terence's *Andria* and *Eunuchus*, of Cicero's *In Verrem*, and of Virgil's *Aeneid*, viii.

9. ORSATTO (1538–1603), Venetian senator, translator of the *Oedipus Tyrannus* of Sophocles and author of a collection of *Rime*, in imitation of Petrarch. He is regarded as one of the latest representatives of the classic Italian school.

10. GERONIMO, a Genoese, flourished during the latter half of the 16th century. He translated the *Alcestis* of Euripides and three of the plays of Sophocles; and wrote two original tragedies, *Jephte* and *Christo in Passione*.

11. VINCENZO, who in the beginning of the 17th century built the Roman palace and made the art collection which are still associated with his name (see *Galleria Giustiniana*, Rome, 1631). The collection was removed in 1807 to Paris, where it was to some extent broken up. In 1815 all that remained of it, about 170 pictures, was purchased by the king of Prussia and removed to Berlin, where it forms a portion of the royal museum.

GIUSTO DA GUANTO [JODOCUS, or JUSTUS, OF GHENT] (fl. 1465–1475), Flemish painter. The public records of the city of Ghent have been diligently searched, but in vain, for a clue to the history of Justus or Jodocus, whom Vasari and Guicciardini called Giusto da Guanto. Flemish annalists of the 16th century have enlarged upon the scanty statements of Vasari, and described Jodocus as a pupil of Hubert Van Eyck. But there is no source to which this fable can be traced. The registers of St Luke's gild at Ghent comprise six masters of the name of Joos or Jodocus who practised at Ghent in the 15th century. But none of the works of these masters has been preserved, and it is impossible to compare their style with that of Giusto. It was between 1465 and 1474 that this artist executed the "Communion of the Apostles" which Vasari has described, and modern critics now see to the best advantage in the museum of Urbino. It was painted for the brotherhood of Corpus Christi at the bidding of Frederick of Montefeltro, who was introduced into the picture as the companion of Caterino Zeno, a Persian envoy at that time on a mission to the court of Urbino. From this curious production it may be seen that Giusto, far from being a pupil of Hubert Van Eyck, was merely a disciple of a later and less gifted master, who took to Italy some of the peculiarities of his native schools, and forthwith commingled them with those of his adopted country. As a composer and draughtsman Giusto compares unfavourably with the better-known painters of Flanders; though his portraits are good, his ideal figures are not remarkable for elevation of type or for subtlety of character and expression. His work is technically on a level with that of Gerard of St John, whose pictures are preserved in the Belvedere at Vienna. Vespasian, a Florentine bookseller who contributed much to form the antiquarian taste of Frederick of Montefeltro, states that this duke sent to the Netherlands for a capable artist to paint a series of "ancient worthies" for a library recently erected in the palace of Urbino. It has been conjectured that the author of these "worthies," which are still in existence at the Louvre and in the Barberini palace at Rome, was Giusto. Yet there are notable divergences between these pictures and the "Communion of the Apostles." Still, it is not beyond the range of probability that Giusto should have been able, after a certain

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time, to temper his Flemish style by studying the masterpieces of Santi and Melozzo, and so to acquire the mixed manner of the Flemings and Italians which these portraits of worthies display. Such an assimilation, if it really took place, might justify the Flemings in the indulgence of a certain pride, considering that Raphael not only admired these worthies, but copied them in the sketch-book which is now the ornament of the Venetian Academy. There is no ground for presuming that Giusto ad Guanto is identical with Justus d'Allamagna who painted the "Annunciation" (1451) in the cloisters of Santa Maria di Castello at Genoa. The drawing and colouring of this wall painting shows that Justus d'Allamagna was as surely a native of south Germany as his homonym at Urbino was a born Netherlander.

GIVET, a town of northern France, in the department of Ardennes, 40 m. N. by E. of Mézières on the Eastern railway between the town and Namur. Pop. (1906) town, 5110; commune, 7468. Givet lies on the Meuse about 1 m. from the Belgian frontier, and was formerly a fortress of considerable importance. It is divided into three portions—the citadel called Charlemont and Grand Givet on the left bank of the river, and on the opposite bank Petit Givet, connected with Grand Givet by a stone bridge of five arches. The fortress of Charlemont, situated at the top of a precipitous rock 705 ft. high, was founded by the emperor Charles V. in the 16th century, and further fortified by Vauban at the end of the 17th century; it is the only survival of the fortifications of the town, the rest of which were destroyed in 1892. In Grand Givet there are a church and a town-hall built by Vauban, and a statue of the composer Étienne Méhul stands in the fine square named after him. Petit Givet, the industrial quarter, is traversed by a small tributary of the Meuse, the Houille, which is bordered by tanneries and glue factories. Pencils and tobacco-pipes are also manufactured. The town has considerable river traffic, consisting chiefly of coal, copper and stone. There is a chamber of arts and manufactures.

GIVORS, a manufacturing town of south-eastern France, in the department of Rhône, on the railway between Lyons and St Étienne, 14 m. S. of Lyon. Pop. (1906) 11,444. It is situated on the right bank of the Rhone, here crossed by a suspension bridge, at its confluence with the Gier and the canal of Givors, which starts at Grand Croix on the Gier, some 13 m. distant. The chief industries are metal-working, engineering-construction and glass-working. There are coal mines in the vicinity. On the hill overlooking the town are the ruins of the château of St Gerald, and of the convent of St Ferréol, remains of the old town destroyed in 1504.

GJALLAR, in Scandinavian mythology, the horn of Heimdall, the guardian of the rainbow bridge by which the gods pass and repass between earth and heaven. This horn had to be blown whenever a stranger approached the bridge.

GLABRIO. 1. MANIUS ACILIUS GLABRIO, Roman statesman and general, member of a plebeian family. When consul in 191 B.C. he defeated Antiochus the Great of Syria at Thermopylae, and compelled him to leave Greece. He then turned his attention to the Aetolians, who had persuaded Antiochus to declare war against Rome, and was only prevented from crushing them by the intercession of T. Quinctius Flamininus. In 189 Glabrio was a candidate for the censorship, but was bitterly opposed by the nobles. He was accused by the tribunes of having concealed a portion of the Syrian spoils in his own house; his legate gave evidence against him, and he withdrew his candidature. It is probable that he was the author of the law which left it to the discretion of the pontiffs to insert or omit the intercalary month of the year.

Censorinus, *De die natali*, xx.; Macrobius, *Saturnalia*, i. 13; index to Livy; Appian, *Syr.* 17-21.

2. MANIUS ACILIUS GLABRIO, Roman statesman and general, grandson of the famous jurist P. Mucius Scaevola. When praetor urbanus (70 B.C.) he presided at the trial of Verres. According to Dio Cassius (xxxvi. 38), in conjunction with L. Calpurnius Piso, his colleague in the consulship (67), he brought forward a severe law (Lex Acilia Calpurnia) against illegal canvassing at elections. In the same year he was appointed to supersede L. Lucullus in the government of Cilicia and the command of the war against Mithradates, but as he did absolutely nothing and was unable to control the soldiery, he was in turn superseded by Pompey according to the provisions of the Manilian law. Little else is known of him except that he declared in favour of the death punishment for the Catilinarian conspirators.

Dio Cassius xxxvi. 14, 16. 24; Cicero, *Pro lege Manilia*, 2. 9; Appian, *Mithrid.* 90.

GLACE BAY, a city and port of entry of Cape Breton county, Nova Scotia, Canada, on the Atlantic Ocean, 14 m. E. of Sydney, with which it is connected both by steam and electric railway. It is the centre of the properties of the Dominion Coal Company (founded 1893), which produce most of the coal of Nova Scotia. Though it has a fair harbour, most of the shipping is done from Sydney in summer and from Louisburg in winter. Pop. (1892) 2000; (1901) 6945; (1906) 13,000.

GLACIAL PERIOD, in geology, the name usually given, by English and American writers, to that comparatively recent time when all parts of the world suffered a marked lowering of temperature, accompanied in northern Europe and North America by glacial conditions, not unlike those which now characterize the Polar regions. This period, which is also known as the "Great Ice Age" (German *Die Eiszeit*), is synchronous with the Pleistocene period, the earlier of the Post-Tertiary or Quaternary divisions of geological time. Although "Glacial period" and "Pleistocene" (*q.v.*) are often used synonymously it is convenient to consider them separately, inasmuch as not a few Pleistocene formations have no causal relationship with conditions of glaciation. Not until the beginning of the 19th century did the deposits now generally recognized as the result of ice action receive serious attention; the tendency was to regard such superficial and irregular material as mere rubbish. Early ideas upon the subject usually assigned floods as the formative agency, and this view is still not without its supporters (see Sir H. H. Howorth, *The Glacial Nightmare and the Flood*). Doubtless this attitude was in part due to the comparative rarity of glaciers and ice-fields where the work of ice could be directly observed. It was natural therefore that the first scientific references to glacial action should have been stimulated by the Alpine regions of Switzerland, which called forth the writings of J. J. Scheuchzer, B. F. Kuhn, H. B. de Saussure, F. G. Hugi, and particularly those of J. Venetz, J. G. von Charpentier and L. Agassiz. Canon Rendu, J. Forbes and others had studied the cause of motion of glaciers, while keen observers, notably Sir James Hall, A. Brongniart and J. Playfair, had noted the occurrence of travelled and scratched stones.

The result of these efforts was the conception of great ice-sheets flowing over the land, grinding the rock surfaces and transporting rock debris in the manner to be observed in the existing glaciers. However, before this view had become established Sir C. Lyell evolved the "drift theory" to explain the widely spread phenomenon of transported blocks, boulder clay and the allied deposits; in this he was supported by Sir H. de la Beche, Charles Darwin, Sir R. I. Murchison and many others. According to the drift theory, the transport and distribution of "erratic blocks," &c., had been effected by floating icebergs; this view naturally involved a considerable and widespread submergence of the land, an assumption which appeared to receive support from the occasional presence of marine shells at high levels in the "drift" deposits. So great was the influence of those who favoured the drift theory that even to-day it cannot be said to have lost complete hold; we still speak of "drift" deposits in England and America, and the belief in one or more great submergences during the Glacial period is still held more firmly by certain geologists than the evidence would seem to warrant. The case against the drift theory was most clearly expressed by Sir A. C. Ramsay for England and Scotland, and by the Swedish scientist Otto Torell. Since then the labours of Professor James Geikie, Sir Archibald Geikie, Professor P. Kendall and

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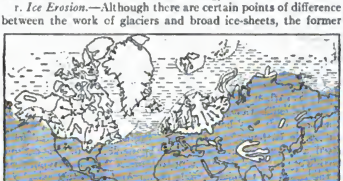
others in England; von Verendt, H. Credner, de Geer, E. Geinitz, A. Helland, Jentzsch, K. Keilhack, A. Penck, H. Schröder, F. Wahnschaffe in Scandinavia and Germany; T. C. Chamberlin, W. Upham, G. F. Wright in North America, have all tended to confirm the view that it is to the movement of glaciers and ice-sheets that we must look as the predominant agent of transport and abrasion in this period. The three stages through which our knowledge of glacial work has advanced may thus be summarized: (1) the diluvial hypothesis, deposits formed by floods; (2) the drift hypothesis, deposits formed mainly by icebergs and floating ice; (3) the ice-sheet hypothesis, deposits formed directly or indirectly through the agency of flowing ice.

Evidences.—The evidence relied upon by geologists for the former existence of the great ice-sheets which traversed the northern regions of Europe and America is mainly of two kinds: (1) the peculiar erosion of the older rocks by ice and ice-borne stones, and (2) the nature and disposition of ice-borne rock débris. After having established the criteria by which the work of moving ice is to be recognized in regions of active glaciation, the task of identifying the results of earlier glaciation elsewhere has been carried on with unabated energy.

1. *Ice Erosion.*—Although there are certain points of difference between the work of glaciers and broad ice-sheets, the former



Map showing the maximum extension of the Ice Sheets in the Glacial Period

being more or less restricted laterally by the valleys in which they flow, the general results of their passage over the rocky floor are essentially similar. Smooth rounded outlines are imparted to the rocks, markedly contrasting with the pinnacled and irregular surfaces produced by ordinary weathering; where these rounded surfaces have been formed on a minor scale the well-known features of *roches moutonnées* (German *Rundhöcker*) are created; on a larger scale we have the erosion-form known as "crag and tail," when the ice-sheet has overridden ground with more pronounced contours, the side of the hill facing the advancing ice being rounded and gently curved (German *Stossseite*), and the opposite side (*Leeseite*) steep, abrupt and much less smooth. Such features are never associated with the erosion of water. The rounding of rock surfaces is regularly accompanied by grooving and striation (German *Schrammen*, *Schliffe*) caused by the grinding action of stones and boulders embedded in the moving ice. These "glacial striae" are of great value in determining the latest path of the vanished ice-sheets (see map). Several other erosion-features are generally associated with ice action; such are the circular-headed valleys, "cirques" or "corries" (German *Zirkus*) of mountain districts; the pot-holes, giants' kettles (*Strudellöcher, Riesentöpfe*), familiarly exemplified in the Gletschergarten near Lucerne; the "rock-basins" (*Felsseebecken*) of mountainous regions are also believed to be assignable to this cause on account of their frequent association with other glacial phenomena, but it is more than probable that the action of running water (waterfalls, &c.)—influenced no doubt by the disposition of the ice—has had much to do with these forms of erosion. As regards rock-basins, geologists are still divided in opinion: Sir A. C. Ramsay, J. Geikie, Tyndall, Helland, H. Hess, A. Penck, and others have expressed themselves in favour of a glacial origin; while A. Heim, F. Stapff, T. Kjerulf, L. Rütimeyer and many others have strongly opposed this view.

2. Glacial deposits may be roughly classified in two groups: those that have been formed directly by the action of the ice, and those formed through the agency of water flowing under, upon, and from the ice-sheets, or in streams and lakes modified by the presence of the ice. To differentiate in practice between the results of these two agencies is a matter of some difficulty in the case of unstratified deposits; but the boulder clay may be taken as the typical formation of the glacier or ice-sheet, whether it has been left as a *terminal moraine* at the limit of glaciation or as a *ground moraine* beneath the ice. A stratified form of boulder clay, which not infrequently rests upon, and is therefore younger than, the more typical variety, is usually regarded as a deposit formed by water from the material (*englacial, innenmorän*) held in suspension within the ice, and set free during the process of melting. Besides the innumerable boulders, large and small, embedded in the boulder clay, isolated masses of rock, often of enormous size, have been borne by ice-sheets far from their original home and stranded when the ice melted. These "erratic blocks," "perched blocks" (German *Findlinge*) are familiar objects in the Alpine glacier districts, where they have frequently received individual names, but they are just as easily recognized in regions from which the glaciers that brought them there have long since been banished. Not only did the ice transport blocks of hard rock, granite and the like, but huge masses of stratified rock were torn from their bed by the same agency; the masses of chalk in the cliffs near Cromer are well known; near Berlin, at Firkenwald, there is a transported mass of chalk estimated to be at least 2,000,000 cubic metres in bulk, which has travelled probably 15 kilometres from its original site; a block of Lincolnshire oolite is recorded by C. Fox-Strangways near Melton in Leicestershire, which is 300 yds. long and 100 yds. broad if no more; and instances of a similar kind might be multiplied.

When we turn to the "fluvio-glacial" deposits we find a bewildering variety of stratified and partially bedded deposits of gravel, sand and clay, occurring separately or in every conceivable condition of association. Some of these deposits have received distinctive names; such are the "Kames" of Scotland, which are represented in Ireland by "Eskers," and in Scandinavia by "Åsar." Another type of hillocky deposit is exemplified by the "drums" or "drumlins." Everywhere beyond the margin of the advancing or retreating ice-sheets these deposits were being formed; streams bore away coarse and fine materials and spread them out upon alluvial plains or upon the floors of innumerable lakes, many of which were directly caused by the damming of the ordinary water-courses by the ice. As the level of such lakes was changed new beach-lines were produced, such as are still evident in the great lake region of North America, in the parallel roads of Glen Roy, and the "Strandlinien" of many parts of northern Europe.

Viewed in relation to man's position on the earth, no geological changes have had a more profound importance than those of the Glacial period. The whole of the glaciated region bears evidence of remarkable modification of topographic features; in parts of Scotland or Norway or Canada the old rocks are bared of soil, rounded and smoothed as far as the eye can see. The old soil and subsoil, the product of ages of ordinary weathering, were removed from vast areas to be deposited and concentrated in others. Old valleys were filled—often to a great depth, 300-400 ft.; rivers were diverted from their old courses, never to return; lakes of vast size were caused by the damming of old outlets (Lake Lahontan, Lake Agassiz, &c., in North America), while an infinite number of shifting lakelets—with their deposits—played an important part along the ice-front at all stages of its career. The influence of this period upon the present

distribution of plant and animal life in northern latitudes can hardly be overestimated.

Much stress has been laid upon supposed great changes in the level of the land in northern regions during the Glacial period. The occurrence of marine shells at an elevation of 1350 ft. at Moel Tryfaen in north Wales, and at 1200 ft. near Macclesfield in Cheshire, has been cited as evidence of profound submergence by some geologists, though others see in these and similar occurrences only the transporting action of ice-sheets that have traversed the floor of the adjoining seas. Marine shells in stratified materials have been found on the coast of Scotland at 100 ft. and over, in S. Scandinavia at 600 to 800 ft., and in the "Champlain" deposits of North America at various heights. The dead shells of the "Yoldia clay" cover wide areas at the bottom of the North Atlantic at depths from 500 to 1300 fathoms, though the same mollusc is now found living in Arctic seas at the depth of 5 to 15 fathoms. This has been looked upon as a proof that in the N.W. European region the lithosphere stood about 2600 ft. higher than it does now (Brögger, Nansen, &c.), and it has been suggested that a union of the mainland of Europe with that of North America—forming a northern continental mass, "Prosarctis"—may have been achieved by way of Iceland, Jan Mayen Land and Greenland. The pre-glacial valleys and fjords of Norway and Scotland, with their deeply submerged seaward ends, are regarded as proofs of former elevation. The great depth of alluvium in some places (236 metres at Bremen) points in the same direction. Evidences of changes of level occur in early, middle and late Pleistocene formations, and the nature of the evidence is such that it is on the whole safer to assume the existence only of the more moderate degree of change.

The Cause of the Glacial Period.—Many attempts have been made to formulate a satisfactory hypothesis that shall conform with the known facts and explain the great change in climatic conditions which set in towards the close of the Tertiary era, and culminated during the Glacial period. Some of the more prominent hypotheses may be mentioned, but space will not permit of a detailed analysis of theories, most of which rest upon somewhat unsubstantial ground. The principal facts to be taken into consideration are (1) the great lowering of temperature over the whole earth; (2) the localization of extreme glaciation in north-west Europe and north-east America; and (3) the local retrogression of the ice-sheets, once or more times repeated.

Some have suggested the simple solution of a change in the earth's axis, and have indicated that the pole may have travelled through some 15° to 20° of latitude; thus, the polar glaciation, as it now exists, might have been in this way transferred to include north-west Europe and North America; but modern views on the rigidity of the earth's body, together with the lack of any evidence of the correlative movement of climatic zones in other parts of the world, render this hypothesis quite untenable. On similar grounds a change in the earth's centre of gravity is unthinkable. Theories based upon the variations in the obliquity of the ecliptic or eccentricity of the earth's orbit, or on the passage of the solar system through cold regions of space, or upon the known variations in the heat emitted by the sun, are all insecure and unsatisfactory. The hypothesis elaborated by James Croll (*Phil. Mag.*, 1864, 28, p. 121; *Climate and Time*, 1875; and *Discussion on Climate and Cosmology*, 1886) was founded upon the assumption that with the earth's eccentricity at its maximum and winter in the north at aphelion, there would be a tendency in northern latitudes for the accumulation of snow and ice, which would be accentuated indirectly by the formation of fogs and a modification of the trade winds. The shifting of the thermal equator, and with it the direction of the trade winds, would divert some of the warm ocean currents from the cold regions, and this effect was greatly enhanced, he considered, by the configuration of the Atlantic Ocean. Croll's hypothesis was supported by Sir R. Ball (*The Cause of the Great Ice Age*, 1893), and it met with very general acceptance; but it has been destructively criticized by Professor S. Newcomb (*Phil. Mag.*, 1876, 1883, 1884) and by E. P. Culverwell (*Phil. Mag.*, 1894, p. 541, and *Geol. Mag.*, 1895, pp. 3 and 55). The difficulties in the way of Croll's theory are: (1) the fundamental assumption, that midwinter and midsummer temperatures are directly proportional to the sun's heat at those periods, is not in accordance with observed facts; (2) the glacial periods would be limited in duration to an appropriate fraction of the precessional period (21,000 years), which appears to be too short a time for the work that was actually done by ice agency; and (3) Croll's glacial periods would alternate between the northern and southern hemispheres, affecting first one then the other. Sir C. Lyell and others have advocated the view that great elevation of the land in polar regions would be conducive to glacial conditions; this is doubtless true, but the evidence that the Glacial period was primarily due to this cause is not well established. Other writers have endeavoured to support the elevation theory by combining with it various astronomical and meteorological agencies. More recently several hypotheses have been advanced to explain the glacial period as the result of changes in the atmosphere; F. W. Harmer ("The Influence of Winds upon the Climate during the Pleistocene Epoch," *Q.J.G.S.*, 1901, 57, p. 405) has shown the importance of the influence of winds in certain circumstances; Marsden Manson ("The Evolution of Climate," *American Geologist*, 1899, 24, p. 93) has laid stress upon the influence of clouds; but neither of these theories grapples successfully with the fundamental difficulties. Others again have requisitioned the variability in the amount of the carbon dioxide in the atmosphere—hypotheses which depend upon the efficiency of this gas as a thermal absorbent. The supply of carbon dioxide may be increased from time to time, as by the emanations from volcanoes (S. Arrhenius and A. G. Högböm), or it may be decreased by absorption into sea-water, and by the carbonation of rocks. Professor T. C. Chamberlin based a theory of glaciation on the depletion of the carbon dioxide of the air ("An Attempt to frame a Working Hypothesis of the cause of Glacial Periods on an Atmospheric Basis," *Jl. Geol.*, 1899, vii. 752-771; see also Chamberlin and Salisbury, *Geology*, 1906, ii. 674 and iii. 432). The outline of this hypothesis is as follows: The general conditions for glaciation were (1) that the oceanic circulation was interrupted by the existence of land; (2) that vertical circulation of the atmosphere was accelerated by continental and other influences; (3) that the thermal blanketing of the earth was reduced by a depletion of the moisture and carbon dioxide in the atmosphere, and that hence the average temperature of the surface of the earth and of the body of the ocean was reduced, and diversity in the distribution of heat and moisture introduced. The localization of glaciation is assignable to the two great areas of permanent atmospheric depression that have their present centres near Greenland and the Aleutian Islands respectively. The periodicity of glacial advances and retreats, demanded by those who believe in the validity of so-called "interglacial" epochs, is explained by a series of complicated processes involving the alternate depletion and completion of the normal charge of carbon dioxide in the air.

Whatever may be the ultimate verdict upon this difficult subject, it is tolerably clear that no simple cause of glacial conditions is likely to be discovered, but rather it will appear that these conditions resulted from the interaction of a complicated series of factors; and further, until a greater degree of unanimity can be approached in the interpretation of observed facts, particularly as regards the substantiality of interglacial epochs, the very foundations of a sound working hypothesis are wanting.

Classification of Glacial Deposits—Interglacial Epochs.—Had the deposits of glaciated regions consisted solely of boulder clay little difficulty might have been experienced in dealing with their classification. But there are intercalated in the boulder clays those irregular stratified and partially stratified masses of sand, gravel and loam, frequently containing marine or freshwater shells and layers of peat with plant remains, which have given rise to the conception of "interglacial epochs"—

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pauses in the rigorous conditions of glaciation, when the ice-sheets dwindled almost entirely away, while plants and animals re-established themselves on the newly exposed soil. Glacialists may be ranged in two schools: those who believe that one or more phases of milder climatic conditions broke up the whole Glacial period into alternating epochs of glaciation and "deglaciation"; and those who believe that the intercalated deposits represent rather the *localized* recessional movements of the ice-sheets within one single period of glaciation. In addition to the stratified deposits and their contents, important evidence in favour of interglacial epochs occurs in the presence of weathered surfaces on the top of older boulder clays, which are themselves covered by younger glacial deposits.

The cause of the interglacial hypothesis has been most ardently championed in England by Professor James Geikie; who has endeavoured to show that there were in Europe six distinct glacial epochs within the Glacial period, separated by five epochs of more moderate temperature. These are enumerated below:

6th Glacial epoch, Upper Turbarian, indicated by the deposits of peat which underlie the lower raised beaches.

5th *Interglacial epoch, Upper Forestian.*

5th Glacial epoch, Lower Turbarian, indicated by peat deposits overlying the lower forest-bed, by the raised beaches and carse-clays of Scotland, and in part by the *Littorina*-clays of Scandinavia.

4th *Interglacial epoch, Lower Forestian*, the lower forests under peat beds, the *Ancylus*-beds of the great freshwater Baltic lake and the *Littorina*-clays of Scandinavia.

4th Glacial epoch, Mecklenburgian, represented by the moraines of the last great Baltic glacier, which reach their southern limit in Mecklenburg; the 100-ft. terrace of Scotland and the *Yoldia*-beds of Scandinavia.

3rd *Interglacial epoch, Neudeckian*, intercalations of marine and freshwater deposits in the boulder clays of the southern Baltic coasts.

3rd Glacial epoch, Polandian, glacial and fluvio-glacial formations of the minor Scandinavian ice-sheet; and the "upper boulder clay" of northern and western Europe.

2nd *Interglacial epoch, Helvetian*, interglacial beds of Britain and lignites of Switzerland.

2nd Glacial epoch, Saxonian, deposits of the period of maximum glaciation when the northern ice-sheet reached the low ground of Saxony, and the Alpine glaciers formed the outermost moraines.

1st *Interglacial epoch, Norfolkian*, the forest-bed series of Norfolk.

1st Glacial epoch, Scanian, represented only in the south of Sweden, which was overridden by a Baltic glacier. The Chillesford clay and Weybourne crag of Norfolk and the oldest moraines and fluvio-glacial gravels of the Arctic lands may belong to this epoch.

In a similar manner Professor Chamberlin and other American geologists have recognized the following stages in the glaciation of North America:

The Champlain, marine substage.
The Glacio-lacustrine substage.
The later Wisconsin (6th glacial).
The fifth interglacial.
The earlier Wisconsin (5th glacial).
The Peorian (4th interglacial).
The Iowan (4th glacial).
The Sangamon (3rd interglacial).
The Illinoian (3rd glacial).
The Yarmouth or Buchanan (2nd interglacial).
The Kansan (2nd glacial).
The Aftonian (1st interglacial).
The sub-Aftonian or Jerseyan (1st glacial).

Although it is admitted that no strict correlation of the European and North American stages is possible, it has been suggested that the Aftonian may be the equivalent of the Helvetian; the Kansan may represent the Saxonian; the Iowan, the Polandian; the Jerseyan, the Scanian; the early Wisconsin, the Mecklenburgian. But considering how fragmentary is much of the evidence in favour of these stages both in Europe and America, the value of such attempts at correlation must be infinitesimal. This is the more evident when it is observed that there are other geologists of equal eminence who are unable to accept so large a number of epochs after a close study of the local circumstances; thus, in the sub-joined scheme for north Germany, after H. W. Munthe, there are three glacial and two interglacial epochs.

Post-Glacial epoch	The *Mya* time = beech-time.	
	The *Littorina* time = oak-time.	
	The *Ancylus* time = pine- and birch-time.	
3rd Glacial "	Including the upper boulder clay,	
	" younger Baltic moraine " with the	
	Yoldia or *Dryas* phase in the retrogressive stage.	

2nd *Interglacial* epoch including the *Cyprina*-clay.
2nd Glacial epoch, the maximum glaciation.
1st *Interglacial epoch.*
1st Glacial epoch, "older boulder clay."

Again, in the Alps four interglacial epochs have been recognized; while in England there are many who are willing to concede one such epoch, though even for this the evidence is not enough to satisfy all glacialists (G. W. Lamplugh, Address, Section C, *Brit. Assoc.*, York, 1906).

This great diversity of opinion is eloquent of the difficulties of the subject; it is impossible not to see that the discovery of interglacial epochs bears a close relationship to the origin of certain hypotheses of the cause of glaciation; while it is significant that those who have had to do the actual mapping of glacial deposits have usually greater difficulty in finding good evidence of such definite ameliorations of climate, than those who have founded their views upon the examination of numerous but isolated areas.

Extent of Glacial Deposits.—From evidence of the kind cited above, it appears that during the glacial period a series of great ice-sheets covered enormous areas in North America and north-west Europe. The area covered during the maximum extension of the ice has been reckoned at 20 million square kilometres (nearly 8 million sq. m.) in North America and 6½ million square kilometres (about 2½ million sq. m.) in Europe.

In Europe three great centres existed from which the ice-streams radiated; foremost in importance was the region of Fennoscandia (the name for Scandinavia with Finland as a single geological region); from this centre the ice spread out far into Germany and Russia and westward, across the North Sea, to the shores of Britain. The southern boundary of the ice extended from the estuary of the Rhine in an irregular series of lobes along the Schiefergebirge, Harz, Thüringerwald, Erzgebirge and Riesengebirge, and the northern flanks of the Carpathian towards Cracow. Down the valley of the Dniepер a lobe of the ice-sheet projected as far as 49° 50′ N.; another lobe extended down the Don valley as far as 48° N.; thence the boundary runs north-easterly towards the Urals and the Kara Sea. The British Islands constituted the centre next in importance; Scotland, Ireland and all but the southern part of England were covered by a moving ice-cap. On the west the ice-sheets reached out to sea; on the east they were conterminous with those from Scandinavia. The third European centre was the Alpine region; it is abundantly clear from the masses of morainic detritus and perched blocks that here, in the time of maximum glaciation, the ice-covered area was enormously in excess of the shrivelled remnants, which still remain in the existing glaciers. All the valleys were filled with moving ice; thus the Rhone glacier at its maximum filled Lake Geneva and the plain between the Bernese Oberland and the Jura; it even overrode the latter and advanced towards Besançon. Extensive glaciation was not limited to the aforesaid regions, for all the areas of high ground had their independent glaciers strongly developed: the Pyrenees, the central highlands of France, the Vosges, Black Forest, Apennines and Caucasus were centres of minor but still important glaciation.

The greatest expansion of ice-sheets was located on the North American continent; here, too, there were three principal centres of outflow: the "Cordilleran" ice-sheet in the N.W., the "Keewatin" sheet, radiating from the central Canadian plains, and the eastern "Labrador" or "Laurentide" sheet. From each of these centres the ice poured outwards in every direction, but the principal flow in each case was towards the south-west. The southern boundary of the glaciated area runs an irregular line along the 49° parallel in the western part of the continent, thence it follows the Mississippi valley down to its junction with the Ohio (southern limit 37° 30′ N.), eastward it follows the direction of that river and turns north-eastward in the direction of New Jersey. As in Europe, the mountainous regions of North America produced their own local glaciers; in the Rockies, the Olympics and Sierras, the Bighorn Mountains of Wyoming, the Uinta Mountains of Utah, &c. Although it was in the northern hemisphere that the most extensive glaciation took place, the effects of a general lowering of temperature seem to have been felt in the mountainous regions of all parts; thus in South America, New Zealand, Australia and Tasmania glaciers reached down the valleys far below their existing limits, and even where none are now to be found. In Asia the evidences of a former extension of glaciation are traceable in the Himalayas, and northward in the high ranges of China and Eastern Siberia. The same is true of parts of Turkestan and Lebanon. In Africa also, in British East Africa mountains are discovered 5400 ft. below their modern limit. In Iceland and Greenland, and even in the Antarctic, there appears to be evidence of a former greater extension of the ice. It is of interest to note that Alaska seems to be free from excessive glaciation, and that a remarkable "driftless" area lies in Wisconsin. The maximum glaciation of the Glacial period was clearly centred around the North Atlantic.

Glacial Epochs in the Older Geological Periods.—Since Ramsay drew attention in 1855 (*Q. J. G. S.*, pp. 185-205), a good deal of attention has been paid to such formations. It is now generally acknowledged that the Permo-carboniferous conglomerates with striated boulders and polished rock surfaces, such as are found in the Karoo formation of South Africa, the Talchir conglomerates of the Salt Range in India, and the corresponding formations in Australia, represent undeniable

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glacial conditions at that period on the great Indo-Australian continent. A glacial origin has been suggested for numerous other conglomeratic formations, such as the Pre-Cambrian Torridonian of Scotland, and "Geisachichten" of Norway; the basal Carboniferous conglomerate of parts of England; the Permian breccias of England and parts of Europe; the Trias of Devonshire; the coarse conglomerates in the Tertiary Flysch in central Europe; and the Miocene conglomerates of the Ligurian Apennines. In regard to the glacial nature of all these formations there is, however, great divergence of opinion (see A. Heim, "Zur Frage der exotischen Blöcke in Flysch," *Eclogæ geologicæ Helvetiæ*, vol. ix. No. 3, 1907, pp. 413-424).

AUTHORITIES.—The literature dealing directly with the Glacial period has reached enormous dimensions; in addition to the works already mentioned the following may be taken as a guide to the general outline of the subject: J. Geikie, *The Great Ice Age* (3rd ed., London, 1894), also *Earth Sculpture* (1898); G. F. Wright, *The Ice Age in North America* (4th ed., New York, 1905) and *Man and the Glacial Period* (1892); F. E. Geinitz, *Die Eiszeit* (Braunschweig, 1906); A. Penck and E. Brückner, *Die Alpen im Eiszeitalter* (Leipzig, 1901-1906, uncompleted). Many references to the literature will be found in Sir A. Geikie's *Textbook of Geology*, vol. ii. (4th ed., 1903); Chamberlin and Salisbury, *Geology*, vol. iii. (1906). As an example of glacial theories carried beyond the usual limits, see M. Gugenhan, *Die Erdeischerung der Erde von Pol zu Pol* (Berlin, 1906). See also *Zeitschrift für Gletscherkunde* (Berlin, 1906 and onwards quarterly); Sir H. H. Howorth (opposing accepted glacial theories), *The Glacial Nightmare and the Flood*, i., ii. (London, 1893), *Ice and Water*, i., ii. (London, 1905), *The Mammoth and the Flood* (London, 1887).

(J. A. H.)

GLACIER (adopted from the French; from *glace*, ice, Lat. *glacies*), a mass of compacted ice originating in a snow-field. Glaciers are formed on any portion of the earth's surface that is permanently above the snow-line. This line varies locally in the same latitudes, being in some places higher than in others, but in the main it may be described as an elliptical shell surrounding the earth with its longest diameter in the tropics and its shortest in the polar regions, where it touches sea-level. From the extreme regions of the Arctic and Antarctic circles this cold shell swells upwards into a broad dome, from 15,000 to 18,000 ft. high over the tropics, truncating, as it rises, a number of peaks and mountain ranges whose upper portions like all regions above this thermal shell receive all their moisture in the form of snow. Since the temperature above the snow-line is below freezing point evaporation is very slight, and as the snow is solid it tends to accumulate in snow-fields, where the snow of one year is covered by that of the next, and these are wrapped over many deeper layers that have fallen in previous years. If these piles of snow were rigid and immovable they would increase in height until the whole field rose above the zone of ordinary atmospheric precipitation, and the polar ice-cap would add a load to these regions that would produce far-reaching results. The mountain regions also would rise some miles in height, and all their features would be buried in domes of snow some miles in thickness. When, however, there is sufficient weight the mass yields to pressure and flows outwards and downwards. Thus a balance of weight and height is established, and the ice-field is disintegrated principally at the edges, the surplus in polar regions being carried off in the form of icebergs, and in mountain regions by streams that flow from the melting ends of the glaciers.

Formation.—The formation of glaciers is in all cases due to similar causes, namely, to periodical and intermittent falls of snow. After a snow-fall there is a period of rest during which the snow becomes compacted by pressure and assumes the well-known granular character seen in banks and patches of ordinary snow that lie longest upon the ground when the snow is melting. This is the *firn* or *névé*. The next fall of snow covers and conceals the névé, but the light fresh crystals of this new snow in turn become compacted to the coarsely crystalline granular form of the underlying layer and become névé in turn. The process goes on continually; the lower layers become subject to greater and greater pressure, and in consequence become gradually compacted into dense clear ice, which, however, retains its granular crystalline texture throughout. The upper layers of névé are usually stratified, owing to some individual peculiarity in the fall, or to the accumulation of dust or débris upon the surface before it is covered by fresh snow. This stratification is often visible on the emerging glacier, though it is to be distinguished from the foliation planes caused by shearing movement in the body of the glacier ice.

Types.—The snow-field upon which a glacier depends is always formed when snow-fall is greater than snow-waste. This occurs under varying conditions with a differently resulting type of glacier. There are limited fields of snow in many mountain regions giving rise to long tongues of ice moving slowly down the valleys and therefore called "valley glaciers." The greater part of Greenland is covered by an ice-cap extending over nearly 400,000 sq. m., forming a kind of enormous continuous glacier on its lower slopes. The Antarctic ice region is believed to extend over more than 3,000,000 sq. m. Each of these continental fields, besides producing block as distinguished from tongue glaciers, sends into the sea a great number of ice-bergs during the summer season. These ice-caps covering great regions are by far the most important types. Between these "polar" or "continental glaciers" and the "alpine" type there are many grades. Smaller detached ice-caps may rest upon high plateaus as in Iceland, or several tongues of ice coming down neighbouring valleys may splay out into convergent lobes on lower ground and form a "piedmont glacier" such as the Malaspina Glacier in Alaska. When the snow-field lies in a small depression the glacier may remain suspended in the hollow and advance no farther than the edge of the snow-field. This is called a "cliff-glacier," and is not uncommon in mountain regions. The end of a larger glacier, or the edge of an ice-sheet, may reach a precipitous cliff, where the ice will break from the edge of the advancing mass and fall in blocks to the lower ground, where a "reconstructed glacier" will be formed from the fragments and advance farther down the slope.

When a glacier originates upon a dome-shaped or a level surface the ice will deploy radially in all directions. When a snow-field is formed above steep valleys separated by high ridges the ice will flow downwards in long streams. If the valleys under the snow-fields are wide and shallow the resultant glaciers will broaden out and partially fill them, and in all cases, since the conditions of glacier formation are similar, the resultant form and the direction of motion will depend upon the amount of ice and the form of the surface over which the glacier flows. A glacier flowing down a narrow gorge to an open valley, or on to a plain, will spread at its foot into a fan-shaped lobe as the ice spreads outwards while moving downwards. An ice-cap is in the main thickest at the centre, and thins out at the edges. A valley glacier is thickest at some point between its source and its end, but nearer to its source than to its termination, but its thickness at various portions will depend upon the contour of the valley floor over which the glacier rides, and may reach many hundreds of feet. At its centre the Greenland ice-cap is estimated to be over 5000 ft. thick. In all cases the glacier ends where the waste of ice is greater than the supply, and since the relationship varies in different years, or cycles of years, the end of a glacier may advance or retreat in harmony with greater or less snow-fall or with cooler or hotter summers. There seems to be a cycle of inclusive contraction and expansion of from 35 to 40 or 50 years. At present the ends of the Swiss glaciers are cradled in a mass of moraine-stuff due to former extension of the glaciers, and investigations in India show that in some parts of the Himalayas the glaciers are retreating as they are in North America and even in the southern hemisphere (*Nature*, January 2, 1908, p. 201).

Movement.—The fact that a glacier moves is easily demonstrated; the cause of the movement is pressure upon a yielding mass; the nature of the movement is still under discussion. Rows of stakes or stones placed in line across a glacier are found to change their position with respect to objects on the bank and also with regard to each other. The posts in the centre of the ice-stream gradually move away from those at the side, proving that the centre moves faster than the sides. It has also been proved that the surface portions move more rapidly than the deeper layers and that the motion is slowest at the sides and bottom where friction is greatest.

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The rate of motion past the same spot is not uniform. Heat accelerates it, cold arrests it, and the pressure of a large amount of water stimulates the flow. The rate of flow under the same conditions varies at different parts of the glacier directly as the thickness of ice, the steepness of slope and the smoothness of rocky floor. Generally speaking, the rate of motion depends upon the amount of ice that forms the "head" pressure, the slope of the under surface and of the upper surface, the nature of the floor, the temperature and the amount of water present in the ice. The ordinary rate of motion is very slow. In Switzerland it is from 1 or 2 in. to 4 ft. per day, in Alaska 7 ft., in Greenland 50 to 60 ft., and occasionally 100 ft. per day in the height of summer under exceptional conditions of quantity of ice and of water and slope. Measurements of Swiss glaciers show that near the ice foot where wastage is great there is very little movement, and observations upon the inland border of Greenland ice show that it is almost stationary over long distances. In many aspects the motion of a body of ice resembles that of a body of water, and an alpine glacier is often called an ice-river, since like a river it moves faster in the centre than at the sides and at the top faster than at the bottom. A glacier follows a curve in the same way as a river, and there appear to be ice swirls and eddies as well as an upward creep on shelving curves recalling many features of stream action. The rate of motion of both ice-stream and river is accelerated by quantity and steepness of slope and retarded by roughness of bed, but here the comparison ends, for temperature does not affect the rate of water motion, nor will a liquid crack into crevasses as a glacier does, or move upwards over an adverse slope as a glacier always does when there is sufficient "head" of ice above it. So that although in many respects ice behaves as a viscous fluid the comparison with such a fluid is not perfect. The cause of glacier motion must be based upon some more or less complex considerations. The flakes of snow are gradually transformed into granules because the points and angles of the original flakes melt and evaporate more readily than the more solid central portions, which become aggregated round some master flake that continues to grow in the névé at the expense of its smaller neighbours, and increases in size until finally the glacier ice is composed of a mass of interlocked crystalline granules, some as large as a walnut, closely compacted under pressure with the principal crystalline axes in various directions. In the upper portions of the glacier movement due to pressure probably takes place by the gliding of one granule over another. In this connexion it must be noted that pressure lowers the melting point of ice while tension raises it, and at all points of pressure there is therefore a tendency to momentary melting, and also to some evaporation due to the heat caused by pressure, and at the intermediate tension spaces between the points of pressure this resultant liquid and vapour will be at once re-frozen and become solid. The granular movement is thus greatly facilitated, while the body of ice remains in a crystalline solid condition. In this connexion it is well to remember that the pressure of the glacier upon its floor will have the same result, but the effect here is a mass-effect and facilitates the gliding of the ice over obstacles, since the friction produces heat and the pressure lowers the melting point, so that the two causes tend to liquefy the portion where pressure is greatest and so to "lubricate" the prominences and enable the glacier to slide more easily over them, while the liquid thus produced is re-frozen when the pressure is removed.

In polar regions of very low temperature a very considerable amount of pressure must be necessary before the ice granules yield to momentary liquefaction at the points of pressure, and this probably accounts for the extreme thickness of the Arctic and Antarctic ice-caps where the slopes are moderate, for although equally low temperatures are found in high Alpine snow-fields the slopes there are exceedingly steep and motion is therefore more easily produced.

Observations made upon the Greenland glaciers indicate a considerable amount of "shearing" movement in the lower portions of a glacier. Where obstacles in the bed of the glacier arrest the movement of the ice immediately above it, or where the lower portion of the glacier is choked by débris, the upper ice glides over the lower in shearing planes that are sometimes strongly marked by débris caught and pushed forwards along these planes of foliation. It must be remembered that there is a solid push from behind upon the lower portion of a glacier, quite different from the pressure of a body of water upon any point, for the pressure of a fluid is equal in all directions, and also that this push will tend to set the crystalline granules in positions in which their crystalline axes are parallel along the gliding planes. The production of gliding planes is in some cases facilitated by the descent into the glacier of water melted during summer, where it expands in freezing and pushes the adjacent ice away from it, forming a surface along which movement is readily established.

If under all circumstances the glacier melted under pressure at the bottom, glacial abrasion would be nearly impossible, since every small stone and fragment of rock would rotate in a liquid shell as the ice moved forward, but since the pressure is not always sufficient to produce melting, the glacier sometimes remains dry at its base; rock fragments are held firmly; and a dry glacier may thus become a graving tool of enormous power. Whatever views may be adopted as to the causes of glacier motion, the peculiar character of glacier ice as distinct from homogeneous river or pond ice must be kept in view, as well as the characteristic tendency of water to expand in freezing, the lowering of the melting point of ice under pressure, the raising of the melting point under tension, the production of gliding or shearing planes under pressure from above, the presence in summer of a considerable quantity of water in the lower portions of the glacier which are thus loosened, the cracking of ice (as into crevasses), under sudden strain, and the regelation of ice in contact. A result of this last process is that fissures are not permanent, but having been produced by the passage of ice over an obstruction, they subsequently become healed when the ice proceeds over a flatter bed. Finally it must be remembered that although glacier ice behaves in some sense like a viscous fluid its condition is totally different, since "a glacier is a crystalline rock of the purest and simplest type, and it never has other than the crystalline state."

Characteristics.—The general appearance of a glacier varies according to its environment of position and temperature. The upper portion is hidden by névé and often by freshly fallen snow, and is smooth and unbroken. During the summer, when little snow falls, the body of the glacier moves away from the snow-field and a gaping crevasse of great depth is usually established called the *bergschrund*, which is sometimes taken as the upper limit of the glacier. The glacier as it moves down the valley may become "loaded" in various ways. Rock-falls send periodical showers of stones upon it from the heights, and these are spread out into long lines at the glacier sides as the ice moves downwards carrying the rock fragments with it. These are the "lateral moraines." When two or more glaciers descending adjacent valleys converge into one glacier one or more sides of the higher valleys disappear, and the ice that was contained in several valleys is now carried by one. In the simplest case where two valleys converge into one the two inner lateral moraines meet and continue to stream down the larger valley as one "median moraine." Where several valleys meet there are several such parallel median moraines, and so long as the ice remains unbroken these will be carried upon the surface of the glacier and finally tipped over the end. There is, however, differential heating of rock and ice, and if the stones carried are thin they tend to sink into the ice because they absorb heat readily and melt the ice under them. Dust has the same effect and produces "dust wells" that honeycomb the upper surface of the ice with holes into which the dust sinks. If the moraine rocks are thick they prevent the ice under them from melting in sunlight, and isolated blocks often remain supported upon ice-pillars in the form of ice tables, which finally collapse, so that such rocks may be scattered out of the line of the moraine. As the glacier descends into

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the lower valleys it is more strongly heated, and surface streams are established in consequence that flow into channels caused by unequal melting of the ice and finally plunge into crevasses. These crevasses are formed by strains established as the central parts drag away from the sides of the glacier and the upper surface from the lower, and more markedly by the tension due to a sudden bend in the glacier caused by an inequality in its bed which must be over-ridden. These crevasses are developed at right angles to the strain and often produce intersecting fissures in several directions. The morainic material is gradually dispersed by the inequalities produced, and is further distributed by the action of superficial streams until the whole surface is strewn with stones and débris, and presents, as in the lower portions of the Mer de Glace, an exceedingly dirty appearance. Many blocks of stone fall into the gaping crevasses and much loose rock is carried down as "englacial material" in the body of the glacier. Some of it reaches the bottom and becomes part of the "ground moraine" which underlies the glacier, at least from the *bergschrund* to the "snout," where much of it is carried away by the issuing stream and spread finally on to the plains below. It appears that a very considerable amount of degradation is caused under the *bergschrund* by the mass of ice "plucking" and dragging great blocks of rock from the side of the mountain valley where the great head of ice rests in winter and whence it begins to move in summer. These blocks and many smaller fragments are carried downwards wedged in the ice and cause powerful abrasion upon the rocky floor, rasping and scoring the channel, producing conspicuous striae, polishing and rounding the rock surfaces, and grinding the contained fragments as well as the surface over which it passes into small fragments and fine powder, from which "boulder clay," or "till" is finally produced. Emerging, then, from the snow-field as pure granular ice the glacier gradually becomes strewn and filled with foreign material, not only from above but also, as is very evident in some Greenland glaciers, occasionally from below by masses of fragments that move upwards along gliding planes, or are forced upwards by slow swirls in the ice itself.

As a glacier is a very brittle body any abrupt change in gradient will produce a number of crevasses, and these, together with those produced by dragging strains, will frequently wedge the glacier into a mass of pinnacles or *séracs* that may be partially healed but are usually evident when the melting end of the glacier emerges suddenly from a steep valley. Here the streams widen the weaker portions and the moraine rocks fall from the end to produce the "terminal" moraine, which usually lies in a crescentic heap encircling the glacier snout, whence it can only be moved by a further advance of the glacier or by the ordinary slow process of atmospheric denudation.

In cases where no rock falls upon the surface there is a considerable amount of englacial material due to upturning either over accumulated ground débris or over structural inequalities in the rock floor. This is well seen at the steep sides and ends of Greenland glaciers, where material frequently comes to the surface of the melting ice and produces median and lateral moraines, besides appearing in enormous "eyes" surrounded in the glacial body by contorted and foliated ice and sometimes producing heaps and embankments as it is pushed out at the end of the melting ice.

The environment of temperature requires consideration. At the upper or dorsal portion of the glacier there is a zone of variable (winter and summer) temperature, beneath which, if the ice is thick enough, there is a zone of constant temperature which will be about the mean annual temperature of the region of the snow-field. Underlying this there is a more or less constant ventral or ground temperature, depending mainly upon the internal heat of the earth, which is conducted to the under surface of the glacier where it slowly melts the ice, the more readily because the pressure lowers the melting point considerably, so that streams of water run constantly from beneath many glaciers, adding their volume to the springs which issue from the rock. The middle zone of constant temperature is wedge-shaped in "alpine" glaciers, the apex pointing downwards to the zone of waste. The upper zone of variable temperature is thinnest in the snow-field where the mean temperature is lowest, and entirely dominant in the snout end of the glacier where the zone of constant temperature disappears. Two temperature wedges are thus superposed base to point, the one being thickest where the other is thinnest, and both these lie upon the basal film of temperature where the escaping earth-heat is strengthened by that due to friction and pressure. The cold wave of winter may pass right through a thin glacier, or the constant temperature may be too low to permit of the ice melting at the base, in which cases the glacier is "dry" and has great eroding power. But in the lower warmer portions water running through crevasses will raise the temperature, and increase the strength of the downward heat wave, while the mean annual temperature being there higher, the combined result will be that the glacier will gradually become "wet" at the base and have little eroding power, and it will become more and more wet as it moves down the lower valley zone of ice-waste, until at last the balance is reached between waste and supply and the glacier finally disappears.

If the mean annual temperature be 20° F., and the mean winter temperature be − 12° F., as in parts of Greenland, all the ice must be considerably below the melting point, since the pressure of ice a mile in depth lowers the melting point only to 30° F., and the earth-heat is only sufficient to melt ¾ in. of ice in a year. Therefore in these regions, and in snow-fields and high glaciers with an equal or lower mean temperature than 20° F., the glacier will be "dry" throughout, which may account for the great eroding power stated to exist near the *bergschrund* in glaciers of an alpine type, which usually have their origin on precipitous slopes.

A considerable amount of ice-waste takes place by water-drainage, though much is the result of constant evaporation from the ice surface. The lower end of a glacier is in summer flooded by streams of water that pour along cracks and plunge into crevasses, often forming "pot-holes" or *moulins* where stones are swirled round in a glacial "mill" and wear holes in the solid rock below. Some of these streams issue in a spout half way up the glacier's end wall, but the majority find their way through it and join the water running along the glacial floor and emerging where the glacier ends in a large glacial stream.

Results of Glacial Action.—A glacier is a degrading and an aggrading agent. Much difference of opinion exists as to the potency of a glacier to alter surface features, some maintaining that it is extraordinarily effective, and considering that a valley glacier forms a pronounced *cirque* at the region of its origin and that the cirque is gradually cut backward until a long and deep valley is formed (which becomes evident, as in the Rocky Mountains, in an upper valley with "reversed grade" when the glacier disappears), and also that the end of a glacier plunging into a valley or a fjord will gouge a deep basin at its region of impact. The Alaskan and Norwegian fjords and the rock basins of the Scottish lochs are adduced as examples. Other writers maintain that a glacier is only a modifying and not a dominant agent in its effects upon the land-surface, considering, for example, that a glacier coming down a lateral valley will preserve the valley from the atmospheric denudation which has produced the main valley over which the lateral valley "hangs," a result which the believers in strong glacial action hold to be due to the more powerful action of the main glacier as contrasted with the weaker action of that in the lateral valley. Both the advocates and the opponents of strenuous ice action agree that a V-shaped valley of stream erosion is converted to a U-shaped valley of glacial modification, and that rock surfaces are rounded into *roches moutonnées*, and are grooved and striated by the passage of ice shod with fragments of rock, while the subglacial material is ground into finer and finer fragments until it becomes mud and "rock-flour" as the glacier proceeds. In any case striking results are manifest in any formerly glaciated region. The high peaks rise into pinnacles, and ridges with "house-roof" structure,

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above the former glacier, while below it the contours are all rounded and typically subdued. A landscape that was formerly completely covered by a moving ice-cap has none but these rounded features of dome-shaped hills and U-shaped valleys that at least bear evidence to the great modifying power that a glacier has upon a landscape.

There is no conflict of opinion with regard to glacial aggradation and the distribution of superglacial, englacial and subglacial material, which during the active existence of a glacier is finally distributed by glacial streams that produce very considerable alluviation. In many regions which were covered by the Pleistocene ice-sheet the work of the glacier was arrested by melting before it was half done. Great deposits of till and boulder clay that lay beneath the glaciers were abandoned *in situ*, and remain as an unsorted mixture of large boulders, pebbles and mingled fragments, embedded in clay or sand. The lateral, median and terminal moraines were stranded where they sank as the ice disappeared, and together with perched blocks (*roches perchées*) remain as a permanent record of former conditions which are now found to have existed temporarily in much earlier geological times. In glaciated North America lateral moraines are found that are 500 to 1000 ft. high and in northern Italy 1500 to 2000 ft. high. The surface of the ground in all these places is modified into the characteristic glaciated landscape, and many formerly deep valleys are choked with glacial débris either completely changing the local drainage systems, or compelling the reappearing streams to cut new channels in a superposed drainage system. Kames also and eskers (*q.v.*) are left under certain conditions, with many puzzling deposits that are clearly due to some features of ice-work not thoroughly understood.

See L. Agassiz, *Études sur les glaciers* (Neuchâtel, 1840) and *Nouvelles Études* . . . (Paris, 1847); N. S. Shaler and W. M. Davis, *Glaciers* (Boston, 1881); A. Penck, *Die Begletscherung der deutschen Alpen* (Leipzig, 1882); J. Tyndall, *The Glaciers of the Alps* (London, 1896); T. G. Bonney, *Ice-Work, Past and Present* (London, 1896); I. C. Russell, *Glaciers of North America* (Boston, 1897); E. Richter, *Neue Ergebnisse und Probleme der Gletscherforschung* (Vienna, 1899); F. Forel, *Essai sur les variations périodiques des glaciers* (Geneva, 1881 and 1900); H. Hess, *Die Gletscher* (Brunswick, 1904). (E. C. Sp.)

GLACIS, in military engineering (see FORTIFICATION AND SIEGECRAFT), an artificial slope of earth in the front of works, so constructed as to keep an assailant under the fire of the defenders to the last possible moment. On the natural ground-level, troops attacking any high work would be sheltered from its fire when close up to it; the ground therefore is raised to form a glacis, which is swept by the fire of the parapet. More generally, the term is used to denote any slope, natural or artificial, which fulfils the above requirements.

GLADBACH, the name of two towns in Germany distinguished as Bergisch-Gladbach and München-Gladbach.

1. BERGISCH-GLADBACH is in Rhenish Prussia, 8 m. N.E. of Cologne by rail. Pop. (1905) 13,210. It possesses four large paper mills and among its other industries are paste-board, powder, percussion caps, nets and machinery. Ironstone, peat and lime are found in the vicinity. The town has four Roman Catholic churches and one Protestant. The Stundenthalshöhe, a popular resort, is in the neighbourhood, and near Gladbach is Altenberg, with a remarkably fine church, built for the Cistercian abbey at this place.

2. MÜNCHEN-GLADBACH, also in Rhenish Prussia, 16 m. W.S.W. of Düsseldorf on the main line of railway to Aix-la-Chapelle. Pop. (1885) 44,230; (1905) 60,714. It is one of the chief manufacturing places in Rhenish Prussia, its principal industries being the spinning and weaving of cotton, the manufacture of silks, velvet, ribbon and damasks, and dyeing and bleaching. There are also tanneries, tobacco manufactories, machine works and foundries. The town possesses a fine park and has statues of the emperor William I. and of Prince Bismarck. There are ten Roman Catholic churches here, among them being the beautiful minster, with a Gothic choir dating from 1250, a nave dating from the beginning of the 13th century and a crypt of the 8th century. The town has two hospitals, several schools, and is the headquarters of important insurance societies. Gladbach existed before the time of Charlemagne, and a Benedictine monastery was founded near it in 793. It was thus called München-Gladbach or Monks' Gladbach, to distinguish it from another town of the same name. The monastery was suppressed in 1802. It became a town in 1336; weaving was introduced here towards the end of the 18th century, and having belonged for a long time to the duchy of Juliers it came into the possession of Prussia in 1815.

See Strauss, *Geschichte der Stadt München-Gladbach* (1805); and G. Eckertz, *Das Verbrüderungs- und Todtenbuch der Abtei Gladbach* (1881).

GLADDEN, WASHINGTON (1836–), American Congregational divine, was born in Pottsgrove, Pennsylvania, on the 11th of February 1836. He graduated at Williams College in 1850, preached in churches in Brooklyn, Morrisania (New York City), North Adams, Massachusetts, and Springfield, Massachusetts, and in 1882 became pastor of the First Congregational Church of Columbus, Ohio. He was an editor of the *Independent* in 1871–1875, and a frequent contributor to it and other periodicals. He consistently and earnestly urged in pulpit and press the need of personal, civil and, particularly, social righteousness; and in 1900–1902 was a member of the city council of Columbus. Among his many publications, which include sermons, occasional addresses, &c., are: *Plain Thoughts on the Art of Living* (1868); *Workingmen and their Employers* (1876); *The Christian Way* (1877); *Things New and Old* (1884); *Applied Christianity* (1887); *Tools and the Man—Property and Industry under the Christian Law* (1893); *The Church and the Kingdom* (1894), arguing against a confusion and misuse of these two terms; *Seven Puzzling Bible Books* (1897); *How much is Left of the Old Doctrines* (1899); *Social Salvation* (1901); *Witnesses of the Light* (1903); the William Belden Noble Lectures (Harvard), being addresses on Dante, Michelangelo, Fichte, Hugo, Wagner and Ruskin; *The New Idolatry* (1905); *Christianity and Socialism* (1906) and *The Church and Modern Life* (1908). In 1909 he published his *Recollections*.

GLADIATORS (from Lat. *gladius*, sword), professional combatants who fought to the death in Roman public shows. That this form of spectacle, which is almost peculiar to Rome and the Roman provinces, was originally borrowed from Etruria is shown by various indications. On an Etruscan tomb discovered at Tarquinii there is a representation of gladiatorial games; the slaves employed to carry off the dead bodies from the arena wore masks representing the Etruscan Charon; and we learn from Isidore of Seville (*Origines*, x.) that the name for a trainer of gladiators (*lanista*) is an Etruscan word meaning butcher or executioner. These gladiatorial games are evidently a survival of the practice of immolating slaves and prisoners on the tombs of illustrious chieftains, a practice recorded in Greek, Roman and Scandinavian legends, and traceable even as late as the 19th century as the Indian *suttee*. Even at Rome they were for a long time confined to funerals, and hence the older name for gladiators was *bustuarii*; but in the later days of the republic their original significance was forgotten, and they formed as indispensable a part of the public amusements as the theatre and the circus.

The first gladiators are said, on the authority of Valerius Maximus (ii. 4. 7), to have been exhibited at Rome in the Forum Boarium in 264 B.C. by Marcus and Decimus Brutus at the funeral of their father. On this occasion only three pairs fought, but the taste for these games spread rapidly, and the number of combatants grew apace. In 174 Titus Flaminius celebrated his father's obsequies by a three-days' fight, in which 74 gladiators took part. Julius Caesar engaged such extravagant numbers for his aedileship that his political opponents took fright and carried a decree of the senate imposing a certain limit of numbers, but notwithstanding this restriction he was able to exhibit no less than 300 pairs. During the later days of the republic the gladiators were a constant element of danger to the public peace. The more turbulent spirits among the nobility had each his band of gladiators to act as a bodyguard, and the armed troops of Clodius, Milo and Catiline played the same part

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in Roman history as the armed retainers of the feudal barons or the condottieri of the Italian republics. Under the empire, notwithstanding sumptuary enactments, the passion for the arena steadily increased. Augustus, indeed, limited the shows to two a year, and forbade a praetor to exhibit more than 120 gladiators, yet allusions in Horace (*Sat.* ii. 3. 85) and Persius (vi. 48) show that 100 pairs was the fashionable number for private entertainments; and in the Marmor Ancyranum the emperor states that more than 10,000 men had fought during his reign. The imbecile Claudius was devoted to this pastime, and would sit from morning till night in his chair of state, descending now and then to the arena to coax or force the reluctant gladiators to resume their bloody work. Under Nero senators and even well-born women appeared as combatants; and Juvenal (viii. 199) has handed down to eternal infamy the descendant of the Gracchi who appeared without disguise as a *retiarius*, and begged his life from the *secutor*, who blushed to conquer one so noble and so vile.[1] Titus, whom his countrymen surnamed the Clement, ordered a show which lasted 100 days; and Trajan, in celebration of his triumph over Decebalus, exhibited 5000 pairs of gladiators. Domitian at the Saturnalia of A.D. 90 arranged a battle between dwarfs and women. Even women of high birth fought in the arena, and it was not till A.D. 200 that the practice was forbidden by edict. How widely the taste for these sanguinary spectacles extended throughout the Roman provinces is attested by monuments, inscriptions and the remains of vast amphitheatres. From Britain to Syria there was not a town of any size that could not boast its arena and annual games. After Italy, Gaul, North Africa and Spain were most famous for their amphitheatres; and Greece was the only Roman province where the institution never thoroughly took root.

Gladiators were commonly drawn either from prisoners of war, or slaves or criminals condemned to death. Thus in the first class we read of tattooed Britons in their war chariots, Thracians with their peculiar bucklers and scimitars, Moors from the villages round Atlas and negroes from central Africa, exhibited in the Colosseum. Down to the time of the empire only greater malefactors, such as brigands and incendiaries, were condemned to the arena; but by Caligula, Claudius and Nero this punishment was extended to minor offences, such as fraud and peculation, in order to supply the growing demand for victims. For the first century of the empire it was lawful for masters to sell their slaves as gladiators, but this was forbidden by Hadrian and Marcus Aurelius. Besides these three regular classes, the ranks were recruited by a considerable number of freedmen and Roman citizens who had squandered their estates and voluntarily took the *auctoramentum gladiatorium*, by which for a stated time they bound themselves to the *lanista*. Even men of birth and fortune not seldom entered the lists, either for the pure love of fighting or to gratify the whim of some dissolute emperor; and one emperor, Commodus, actually appeared in person in the arena.

Gladiators were trained in schools (*ludi*) owned either by the state or by private citizens, and though the trade of a *lanista* was considered disgraceful, to own gladiators and let them out for hire was reckoned a legitimate branch of commerce. Thus Cicero, in his letters to Atticus, congratulates his friend on the good bargain he had made in purchasing a band, and urges that he might easily recoup himself by consenting to let them out twice. Men recruited mainly from slaves and criminals, whose lives hung on a thread, must have been more dangerous characters than modern galley slaves or convicts; and, though highly fed and carefully tended, they were of necessity subject to an iron discipline. In the school of gladiators discovered at Pompeii, of the sixty-three skeletons buried in the cells many were in irons. But hard as was the gladiators' lot,—so hard that special precautions had to be taken to prevent suicide,—it had its consolations. A successful gladiator enjoyed far greater fame than any modern prize-fighter or athlete. He was presented with broad pieces, chains and jewelled helmets, such as may be seen in the museum at Naples; poets like Martial sang his prowess; his portrait was multiplied on vases, lamps and gems; and high-born ladies contended for his favours. Mixed, too, with the lowest dregs of the city, there must have been many noble barbarians condemned to the vile trade by the hard fate of war. There are few finer characters in Roman history than the Thracian Spartacus, who, escaping with seventy of his comrades from the school of Lentulus at Capua, for three years defied the legions of Rome; and after Antony's defeat at Actium, the only part of his army that remained faithful to his cause were the gladiators whom he had enrolled at Cyzicus to grace his anticipated victory.

There were various classes of gladiators, distinguished by their arms or modes of fighting. The Samnites fought with the national weapons—a large oblong shield, a vizor, a plumed helmet and a short sword. The Thraces had a small round buckler and a dagger curved like a scythe; they were generally pitted against the Mirmillones, who were armed in Gallic fashion with helmet, sword and shield, and were so called from the fish (*μορμύλος* or *μορμύρος*) which served as the crest of their helmet. In like manner the Retiarius was matched with the Secutor: the former had nothing on but a short tunic or apron, and sought to entangle his pursuer, who was fully armed, with the cast-net (*jaculum*) that he carried in his right hand; and if successful, he despatched him with the trident (*iridens*, *fuscina*) that he carried in his left. We may also mention the Andabatae who are generally believed to have fought on horseback and wore helmets with closed vizors; the Dimachaeri of the later empire, who carried a short sword in each hand; the Essedarii, who fought from chariots like the ancient Britons; the Hoplomachi, who wore a complete suit of armour; and the Laquearii, who tried to lasso their antagonists.

Gladiators also received special names according to the time or circumstances in which they exercised their calling. The Busturarii have already been mentioned; the Catervarii fought, not in pairs, but in bands; the Meridiani came forward in the middle of the day for the entertainment of those spectators who had not left their seats; the Ordinarii fought only in pairs, in the regular way; the Fiscales were trained and supported at the expense of the imperial treasury; the Paegniarii used harmless weapons, and their exhibition was a sham one; the Postulatícii were those whose appearance was asked as a favour from the giver of the show, in addition to those already exhibited.

The shows were announced some days before they took place by hills affixed to the walls of houses and public buildings, copies of which were also sold in the streets. These bills gave the names of the chief pairs of competitors, the date of the show, the name of the giver and the different kinds of combats. The spectacle began with a procession of the gladiators through the arena, after which their swords were examined by the giver of the show. The proceedings opened with a sham fight (*praelusio*, *prolusio*) with wooden swords and javelins. The signal for real fighting was given by the sound of the trumpet, those who showed fear being driven on to the arena with whips and red-hot irons. When a gladiator was wounded, the spectators shouted *Habet* (he is wounded); if he was at the mercy of his adversary, he lifted up his forefinger to implore the clemency of the people, with whom (in the later times of the republic) the giver left the decision as to his life or death. If the spectators were in favour of mercy, they waved their handkerchiefs; if they desired the death of the conquered gladiator, they turned their thumbs downwards.[2] The reward of victory consisted of branches of palm, sometimes of money. Gladiators who had exercised their calling for a long time, or such as displayed special skill and bravery, were presented with a wooden sword (*rudis*), and discharged from further service.

[1] See A. E. Housman on the passage in *Classical Review* (November 1904).

[2] A different account is given by Mayor on Juvenal iii. 36, who says: "Those who wished the death of the conquered gladiator turned their thumbs towards their breasts, as a signal to his opponents to stab him; those who wished him to be spared, turned their thumbs downwards, as a signal for dropping the sword."

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Both the estimation in which gladiatorial games were held by Roman moralists, and the influence that they exercised upon the morals and genius of the nation, deserve notice. The Roman was essentially cruel, not so much from spite or vindictiveness as from callousness and defective sympathies. This element of inhumanity and brutality must have been deeply ingrained in the national character to have allowed the games to become popular, but there can be no doubt that it was fed and fostered by the savage form which their amusements took. That the sight of bloodshed provokes a love of bloodshed and cruelty is a commonplace of morality. To the horrors of the arena we may attribute in part, not only the brutal treatment of their slaves and prisoners, but the frequency of suicide among the Romans. On the other hand, we should be careful not to exaggerate the effects to be drawn from such inferences from the prevalence of this degrading amusement. Human nature is happily illogical; and we know that many of the Roman statesmen who gave these games, and themselves enjoyed these sights of blood, were in every other department of life irreproachable—indulgent fathers, humane generals and mild rulers of provinces. In the present state of society it is difficult to conceive how a man of taste can have endured to gaze upon a scene of human butchery. Yet we should remember that it is not so long since bear-baiting was prohibited in England, and we are only now attaining that stage of morality in respect of cruelty to animals that was reached in the 5th century, by the help of Christianity, in respect of cruelty to men. We shall not then be greatly surprised if hardly one of the Roman moralists is found to raise his voice against this amusement, except on the score of extravagance. Cicero in a well-known passage commends the gladiatorial games as the best discipline against the fear of death and suffering of pain when presented to the eyes. The younger Pliny, who perhaps of all Romans approaches nearest to our ideal of a cultured gentleman, speaks approvingly of them. Marcus Aurelius, though he did much to mitigate their horrors, yet in his writings condemns the monotony rather than the cruelty. Seneca is indeed a splendid exception, and his letter to Lentulus is an eloquent protest against this inhuman sport. But it is without a parallel till we come to the writings of the Christian fathers, Tertullian, Lactantius, Cyprian and Augustine. In the *Confessions* of the last there occurs a narrative which is worth quoting as a proof of the strange fascination which the games exercised even on a religious man and a Christian. He tells us how his friend Alipius was dragged against his will to the amphitheatre, how he strove to quiet his conscience by closing his eyes, how at some exciting crisis the shouts of the whole assembly aroused his curiosity, how he looked and was lost, grew drunk with the sight of blood, and returned again and again, knowing his guilt yet unable to abstain. The first Christian emperor was persuaded to issue an edict abolishing gladiatorial games (325), yet in 404 we read of an exhibition of gladiators to celebrate the triumph of Honorius over the Goths, and it is said that they were not totally extinct in the West till the time of Theodoric.

Gladiators formed admirable models for the sculptor. One of the finest pieces of ancient sculpture that has come down to us is the "Wounded Gladiator," of the Capitoline Museum at Naples. The so-called "Fighting Gladiator" of the Borghese collection, now in the Museum of the Louvre, and the "Dying Gladiator" of the Capitoline Museum, which inspired the famous stanza of *Childe Harold*, have been pronounced by modern antiquaries to represent, not gladiators, but warriors. In this connexion we may mention the admirable picture of Gérome which bears the title, "Ave, Caesar, morituri te salutant."

The attention of archaeologists has been recently directed to the tesserae of gladiators. These tesserae, of which about sixty exist in various museums, are small oblong tablets of ivory or bone, with an inscription on each of the four sides. The first line contains a name in the nominative case, presumably that of the gladiator; the second line a name in the genitive, that of the *patronus* or *dominus*; the third line begins with the letters SP (for *spectatus* =approved), which shows that the gladiator had passed his preliminary trials; this is followed by a day of a Roman month; and in the fourth line are the names of the consuls of a particular year.

AUTHORITIES.—All needful information on the subject will be found in L. Friedländer's *Darstellungen aus der Sittengeschichte Roms*, (part ii., 6th ed., 1889), and in the section by him on "The Games" in Marquardt's *Römische Staatsverwaltung*, iii. (1885) p. 554; see also article by G. Lafaye in Daremberg and Saglio, *Dictionnaire des antiquités*. See also F. W. Ritschl, *Tesserae gladiatoriae* (1864) and P. J. Meier, *De gladiatura* by a day of a Roman month; and in the fourth line are the names of the consuls of a particular year.

GLADIOLUS, a genus of monocotyledonous plants, belonging to the natural order Iridaceae. They are herbaceous plants growing from a solid fibrous-coated bulb (or corm), with long narrow plaited leaves and a terminal one-sided spike of generally bright-coloured irregular flowers. The segments of the limb of the perianth are very unequal, the perianth tube is curved, funnel-shaped and widening upwards, the segments equalling or exceeding the tube in length. There are about 150 known species, a large number of which are South African, but the genus extends into tropical Africa, forming a characteristic feature of the mountain vegetation, and as far north as central Europe and western Asia. One species *G. illyricus* (sometimes regarded as a variety of *G. communis*) is found wild in England, in the New Forest and the Isle of Wight. Some of the species have been cultivated for a long period in English flower-gardens, where both the introduced species and the modern varieties bred from them are very ornamental and popular. *G. segetum* has been cultivated since 1596, and *G. byzantinus* since 1629, while many additional species were introduced during the latter half of the 18th century. One of the earlier of the hybrids originated in gardens was the beautiful *G. Colvillei*, raised in the nursery of Mr Colville of Chelsea in 1823 from *G. tristis* fertilized by *G. cardinalis*. In the first decade of the 19th century, however, the Hon. and Rev. W. Herbert had successfully crossed the showy *G. cardinalis* with the smaller but more free-flowering *G. blandus*, and the result was the production of a race of great beauty and fertility. Other crosses were made with *G. tristis*, *G. oppositiflorus*, *G. hirsutus*, *G. alatus* and *G. psittacinus*; but it was not till after the production of *G. gandavensis* that the gladiolus really became a general favourite in gardens. This fine hybrid was raised in 1837 by M. Bedinghaus, gardener to the duc d'Aremberg, at Enghien, crossing *G. psittacinus* and *G. cardinalis*. There can, however, be little doubt that before the *gandavensis* type had become fairly fixed the services of other species were brought into force, and the most likely of these were *G. oppositiflorus* (which shows in the white forms), *G. blandus* and *G. ramosus*. Other species may also have been used, but in any case the *gandavensis* gladiolus, as we now know it, is the result of much crossing and inter-crossing between the best forms as they developed (J. Weathers, *Practical Guide to Garden Plants*). Since that time innumerable varieties have appeared only to sink into oblivion upon being replaced by still finer productions.

The modern varieties of gladioli have almost completely driven the natural species out of gardens, except in botanical collections. The most gorgeous groups—in addition to the *gandavensis* type—are those known under the names of *Lemoinei*, *Childsi*, *nanceianus* and *brenchleyensis*. The last-named was raised by a Mr Hooker at Brenchley in 1848, and although quite distinct in appearance from *gandavensis*, it undoubtedly had that variety as one of its parents. Owing to the brilliant scarlet colour of the flowers, this is always a great favourite for planting in beds. The *Lemoinei* forms originated at Nancy, in France, by fertilizing *G. purpureo-auratus* with pollen from *G. gandavensis*, the first flower appearing in 1877, and the plants being put into commerce in 1880. The *Childsi* gladioli first appeared in 1882, having been raised at Baden-Baden by Herr Max Leichtlin from the best forms of *G. gandavensis* and *G. Saundersi*. The flowers of the best varieties are of great size and substance, often measuring 7 to 9 in. across, while the range of colour is marvellous, with shades of grey, purple, scarlet, salmon, crimson, rose, white, pink, yellow, &c., often beautifully mottled and blotched in the throat. The plants are vigorous in growth, often reaching a height of 4 to 5 ft. *G. nanceianus* was raised at Nancy by MM. Lemoine and were first put into commerce in 1889. Next to the *Childsi* group they are the most beautiful, and have the blood of the best forms of *G. Saundersi* and *G. Lemoinei* in their veins. The plants are quite as hardy as the *gandavensis* hybrids, and the colours of the flowers are almost as brilliant and varied in hue as those of the *Childsi* section.

A deep and rather stiff sandy loam is the best soil for the gladiolus, and this should be trenched up in October and enriched with well-decomposed manure, consisting partly of cow dung, the manure being disposed altogether below the corms, a layer at the bottom of the upper trench, say 9 in. from the surface, and another layer at double that depth. The corms should be planted in succession at intervals of two or three weeks through the months of March, April and May; about 3 to 5 in. deep and at least 1 ft. apart, a little pure soil or sand being laid over each before the earth is closed in about them, an

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arrangement which may be advantageously followed with bulbous plants generally. In hot summer weather they should have a good mulching of well-decayed manure, and, as soon as the flower spikes are produced, liquid manure may occasionally be given them with advantage.

The gladiolus is easily raised from seeds, which should be sown in March or April in pots of rich soil placed in slight heat, the pots being kept near the glass after they begin to grow, and the plants being gradually hardened to permit their being placed out-of-doors in a sheltered spot for the summer. Modern growers often grow the seeds in the open in April on a nicely prepared bed in drills about 6 in. apart and ½ in. deep, covering them with finely sifted gritty mould. The seed bed is then pressed down evenly and firmly, watered occasionally and kept free from weeds during the summer. In October they will have ripened off, and must be taken out of the soil, and stored in paper bags in a dry room secure from frost. They will have made little bulbs from the size of a hazel nut downwards, according to their vigour. In the spring they should be planted like the old bulbs, and the larger ones will flower during the season, while the smaller ones must be again harvested and planted out as before. The time occupied from the sowing of the seed until the plant attains its full strength is from three to four years. The approved sorts, which are identified by name, are multiplied by means of bulblets or offsets or "spawn," which form around the principal bulb or corm; but in this they vary greatly, some kinds furnishing abundant increase and soon becoming plentiful, while others persistently refuse to yield offsets. The stately habit and rich glowing colours of the modern gladioli render them exceedingly valuable as decorative plants during the late summer months. They are, moreover, very desirable and useful flowers for cutting for the purpose of room decoration, for while the blossoms themselves last fresh for some days if cut either early in the morning or late in the evening, the undeveloped buds open in succession, if the stalks are kept in water, so that a cut spike will go on blooming for some time.

GLADSHEIM (Old Norse *Gladsheimr*), in Scandinavian mythology, the region of joy and home of Odin. Valhalla, the paradise whither the heroes who fell in battle were escorted, was situated there.

GLADSTONE, JOHN HALL (1827–1902), English chemist, was born at Hackney, London, on the 7th of March 1827. From childhood he showed great aptitude for science; geology was his favourite subject, but since this in his father's opinion did not afford a career of promise, he devoted himself to chemistry, which he studied under Thomas Graham at University College, London, and Liebig at Giessen, where he graduated as Ph.D. in 1847. In 1850 he became chemical lecturer at St Thomas's hospital, and three years later was elected a fellow of the Royal Society at the unusually early age of twenty-six. From 1858 to 1861 he served on the royal commission on lighthouses, and from 1864 to 1868 was a member of the war office committee on gun-cotton. From 1874 to 1877 he was Fullerian professor of chemistry at the Royal Institution, in 1874 he was chosen first president of the Physical Society, and in 1877–78 he was president of the Chemical Society. In 1897 the Royal Society recognized his fifty years of scientific work by awarding him the Davy medal. Dr Gladstone's researches were large in number and wide in range, dealing to a great extent with problems that lie on the border-line between physics and chemistry. Thus a number of his inquiries, and those not the least important, were partly chemical, partly optical. He determined the optical constants of hundreds of substances, with the object of discovering whether any of the elements possesses more than one atomic refraction. Again, he investigated the connexion between the optical behaviour, density and chemical composition of ethereal oils, and the relation between molecular magnetic rotation and the refraction and dispersion of nitrogenous compounds. So early as 1856 he showed the importance of the spectroscope in chemical research, and he was one of the first to notice that the Fraunhofer spectrum at sunrise and sunset differs from that at midday, his conclusion being that the earth's atmosphere must be responsible for many of its absorption lines, which indeed were subsequently traced to the oxygen and water-vapour in the air. Another portion of his work was of an electro-chemical character. His studies, with Alfred Tribe (1840–1885) and W. Hibbert, in the chemistry of the storage battery, have added largely to our knowledge, while the "copper-zinc couple," with which his name is associated together with that of Tribe, among other things, afforded a simple means of preparing certain organo-metallic compounds, and thus promoted research in branches of organic chemistry where those bodies are especially useful. Mention may also be made of his work on phosphorus, on explosive substances, such as iodide of nitrogen, gun-cotton and the fulminates, on the influence of mass in the process of chemical reactions, and on the effect of carbonic acid on the germination of plants. Dr Gladstone always took a great interest in educational questions, and from 1873 to 1894 he was a member of the London School Board. He was also a member of the Christian Evidence Society, and an early supporter of the Young Men's Christian Association. His death occurred suddenly in London on the 6th of October 1902.

GLADSTONE, WILLIAM EWART (1809–1898), British statesman, was born on the 29th of December 1809 at No. 62 Rodney Street, Liverpool. His forefathers were Gledstanes of Gledstanes, in the upper ward of Lanarkshire; or in Scottish phrase, Gledstanes of that Ilk. As years went on their estates dwindled, and by the beginning of the 17th century Gledstanes was sold. The adjacent property of Arthurshiel remained in the hands of the family for nearly a hundred years longer. Then the son of the last Gledstanes of Arthurshiel removed to Biggar, where he opened the business of a maltster. His grandson, Thomas Gladstone (for so the name was modified), became a corn-merchant at Leith. He happened to send his eldest son, John, to Liverpool to sell a cargo of grain there, and the energy and aptitude of the young man attracted the favourable notice of a leading corn-merchant of Liverpool, who recommended him to settle in that city. Beginning his commercial career as a clerk in his patron's house, John Gladstone lived to become one of the merchant-princes of Liverpool, a baronet and a member of parliament. He died in 1851 at the age of eighty-seven. Sir John Gladstone was a pure Scotsman, a Lowlander by birth and descent. He married Anne, daughter of Andrew Robertson of Stornoway, sometime provost of Dingwall. Provost Robertson belonged to the Clan Donachie, and by this marriage the robust and business-like qualities of the Lowlander were blended with the poetic imagination, the sensibility and fire of the Gael.

John and Anne Gladstone had six children. The fourth son, William Ewart, was named after a merchant of Liverpool who was his father's friend. He seems to have been a remarkably good child, and much beloved at home. In 1818 or 1819 Mrs Gladstone, who belonged to the Evangelical school, said in a letter to a friend, that she believed her son William had been "truly converted to God." After some tuition at the vicarage of Seaforth, a watering-place near Liverpool, the boy went to Eton in 1821. His tutor was the Rev. Henry Hartopp Knapp. His brothers, Thomas and Robertson Gladstone, were already at Eton. Thomas was in the fifth form, and William, who was placed in the middle remove of the fourth form, became his eldest brother's fag. He worked hard at his classical lessons, and supplemented the ordinary business of the school by studying mathematics in the holidays. Mr Hawtrey, afterwards headmaster, commended a copy of his Latin verses, and "sent him up for good"; and this experience first led the young student to associate intellectual work with the ideas of ambition and success. He was not a fine scholar, in that restricted sense of the term which implies a special aptitude for turning English into Greek and Latin, or for original versification in the classical languages. "His composition," we read, "was stiff," but he was imbued with the substance of his authors; and a contemporary who was in the sixth form with him recorded that "when there were thrilling passages of Virgil or Homer, or difficult passages in the *Scriptores Graeci*, to translate, he or Lord Arthur Hervey was generally called up to edify the class with quotation or translation." By common consent he was pre-eminently God-fearing, orderly and conscientious. "At Eton," said Bishop Hamilton of Salisbury, "I was a thoroughly idle boy, but I was saved from some worse things by getting to know Gladstone." His most intimate friend was Arthur Hallam, by universal acknowledgment the most remarkable Etonian of his day; but he was not

Childhood and education.

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generally popular or even widely known. He was seen to the greatest advantage, and was most thoroughly at home, in the debates of the Eton Society, learnedly called "The Literati," and vulgarly "Pop," and in the editorship of the *Eton Miscellany*. He left Eton at Christmas 1827. He read for six months with private tutors, and in October 1828 went up to Christ Church, where, in the following year, he was nominated to a studentship.

At Oxford Gladstone read steadily, but not laboriously, till he neared his final schools. During the latter part of his undergraduate career he took a brief but brilliant share in the proceedings of the Union, of which he was successively secretary and president. He made his first speech on the 11th of February 1830. Brought up in the nurture and admonition of Canning, he defended Roman Catholic emancipation, and thought the duke of Wellington's government unworthy of national confidence. He opposed the removal of Jewish disabilities, arguing, we are told by a contemporary, "on the part of the Evangelicals," and pleaded for the gradual extinction, in preference to the immediate abolition, of slavery. But his great achievement was a speech against the Whig Reform Bill. One who heard this famous discourse says: "Most of the speakers rose, more or less, above their usual level, but when Mr Gladstone sat down we all of us felt that an epoch in our lives had occurred. It certainly was the finest speech of his that I ever heard." Bishop Charles Wordsworth said that his experience of Gladstone at this time "made me (and I doubt not others also) feel no less sure than of my own existence that Gladstone, our then Christ Church undergraduate, would one day rise to be prime minister of England." In December 1831 Gladstone crowned his career by taking a double first-class. Lord Halifax (1800–1885) used to say, with reference to the increase in the amount of reading requisite for the highest honours: "My double-first must have been a better thing than Peel's; Gladstone's must have been better than mine."

Now came the choice of a profession. Deeply anxious to make the best use of his life, Gladstone turned his thoughts to holy orders. But his father had determined to make him a politician. Quitting Oxford in the spring of 1832, Gladstone spent six months in Italy, learning the language and studying art. In the following September he was suddenly recalled to England, to undertake his first parliamentary campaign. The fifth duke of Newcastle was one of the chief potentates of the High Tory party. His frank claim to "do what he liked with his own" in the representation of Newark has given him a place in political history. But that claim had been rudely disputed by the return of a Radical lawyer at the election of 1831. The Duke was anxious to obtain a capable candidate to aid him in regaining his ascendancy over the rebellious borough. His son, Lord Lincoln, had heard Gladstone's speech against the Reform Bill delivered in the Oxford Union, and had written home that "a man had uprisen in Israel." At his suggestion the duke invited Gladstone to stand for Newark in the Tory interest against Mr Serjeant Wilde, afterwards Lord Chancellor Truro. The last of the Unreformed parliaments was dissolved on the 3rd of December 1832. Gladstone, addressing the electors of Newark, said that he was bound by the opinions of no man and no party, but felt it a duty to watch and resist that growing desire for change which threatened to produce "along with partial good a melancholy preponderance of mischief." The first principle to which he looked for national salvation was, that the duties of governors are strictly and peculiarly religious, and that legislatures, like individuals, are bound to carry throughout their acts the spirit of the high truths they have acknowledged." The condition of the poor demanded special attention; labour should receive adequate remuneration; and he thought favourably of the "allotment of cottage grounds." He regarded slavery as sanctioned by Holy Scripture, but the slaves ought to be educated and gradually emancipated. The contest resulted in his return at the head of the poll.

Entry into parliament.

The first Reformed parliament met on the 29th of January 1833, and the young member for Newark took his seat for the first time in an assembly which he was destined to adorn, delight and astonish for more than half a century. His maiden speech was delivered on the 3rd of June in reply to what was almost a personal challenge. The colonial secretary, Mr Stanley, afterwards Lord Derby, brought forward a series of resolutions in favour of the extinction of slavery in the British colonies. On the first night of the debate Lord Howick, afterwards Lord Grey, who had been under-secretary for the Colonies, and who opposed the resolutions as proceeding too gradually towards abolition, cited certain occurrences on Sir John Gladstone's plantation in Demerara to illustrate his contention that the system of slave-labour in the West Indies was attended by great mortality among the slaves. Gladstone in his reply—his first speech in the House—avowed that he had a pecuniary interest in the question, "and, if he might say so much without exciting suspicion, a still deeper interest in it as a question of justice, of humanity and of religion." If there had recently been a high mortality on his father's plantation, it was due to the age of the slaves rather than to any peculiar hardship in their lot. It was true that the particular system of cultivation practised in Demerara was more trying than some others; but then it might be said that no two trades were equally conducive to health. Steel-grinding was notoriously unhealthy, and manufacturing processes generally were less favourable to life than agricultural. While strongly condemning cruelty, he declared himself an advocate of emancipation, but held that it should be effected gradually, and after due preparation. The slaves must be religiously educated, and stimulated to profitable industry. The owners of emancipated slaves were entitled to receive compensation from parliament, because it was parliament that had established this description of property. "I do not," said Gladstone, "view property as an abstract thing; it is the creature of civil society. By the legislature it is granted, and by the legislature it is destroyed." On the following day King William IV. wrote to Lord Althorp: "The king rejoices that a young member has come forward in so promising a manner as Viscount Althorp states Mr W. E. Gladstone to have done." In the same session Gladstone spoke on the question of bribery and corruption at Liverpool, and on the temporalities of the Irish Church. In the session of 1834 his most important performance was a speech in opposition to Hume's proposal to throw the universities open to Dissenters.

The question of slavery.

On the 10th of November 1834 Lord Althorp succeeded to his father's peerage, and thereby vacated the leadership of the House of Commons. The prime minister, Lord Melbourne, submitted to the king a choice of names for the chancellorship of the exchequer and leadership of the House of Commons; but his majesty announced that, having lost the services of Lord Althorp as leader of the House of Commons, he could feel no confidence in the stability of Lord Melbourne's government, and that it was his intention to send for the duke of Wellington. The duke took temporary charge of affairs, but Peel was felt to be indispensable. He had gone abroad after the session, and was now in Rome. As soon as he could be brought back he formed an administration, and appointed Gladstone to a junior lordship of the treasury. Parliament was dissolved on the 29th of December. Gladstone was returned unopposed, this time in conjunction with the Liberal lawyer whom he had beaten at the last election. The new parliament met on the 19th of February 1835. The elections had given the Liberals a considerable majority. Immediately after the meeting of parliament Gladstone was promoted to the under-secretaryship for the colonies, where his official chief was Lord Aberdeen. The administration was not long-lived. On the 30th of March Lord John Russell moved a resolution in favour of an inquiry into the temporalities of the Irish Church, with the intention of applying the surplus to general education without distinction of religious creed. This was carried against ministers by a majority of thirty-three. On the 8th of April Sir Robert Peel resigned, and the under-secretary for the colonies of course followed his chief into private life.

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Released from the labours of office, Gladstone, living in chambers in the Albany, practically divided his time between his parliamentary duties and study. Then, as always, his constant companions were Homer and Dante, and it is recorded that he read the whole of St Augustine, in twenty-two octavo volumes. He used to frequent the services at St James's, Piccadilly, and Margaret chapel, since better known as All Saints', Margaret Street. On the 20th of June 1837 King William IV. died, and Parliament, having been prorogued by the young queen in person, was dissolved on the 17th of the following month. Simply on the strength of his parliamentary reputation Gladstone was nominated, without his consent, for Manchester, and was placed at the bottom of the poll; but, having been at the same time nominated at Newark, was again returned. The year 1838 claims special note in a record of Gladstone's life, because it witnessed the appearance of his famous work on *The State in its Relations with the Church*. He had left Oxford just before the beginning of that Catholic revival which has transfigured both the inner spirit and the outward aspect of the Church of England. But the revival was now in full strength. The *Tracts for the Times* were saturating England with new influences. The movement counted no more enthusiastic or more valuable disciple than Gladstone. Its influence had reached him through his friendships, notably with two Fellows of Merton—Mr James Hope, who became Mr Hope-Scott of Abbotsford, and the Rev. H. E. Manning, afterwards cardinal archbishop. *The State in its Relations with the Church* was his practical contribution to a controversy in which his deepest convictions were involved. He contended that the Church, as established by law, was to be "maintained for its truth," and that this principle, if good for England, was good also for Ireland.

Literary work.

On the 25th of July 1839 Gladstone was married at Hawarden to Miss Catherine Glynne, sister, and in her issue heir, of Sir Stephen Glynne, ninth and last baronet of that name. In 1840 he published *Church Principles considered in their Results*.

Parliament was dissolved in June 1841. Gladstone was again returned for Newark. The general election resulted in a Tory majority of eighty. Sir Robert Peel became prime minister, and made the member for Newark vice-president of the Board of Trade. An inevitable change is from this time to be traced in the topics of Gladstone's parliamentary speaking. Instead of discoursing on the corporate conscience of the state and the endowments of the Church, the importance of Christian education, and the theological unfitness of the Jews to sit in parliament, he is solving business-like problems about foreign tariffs and the exportation of machinery; waxing eloquent over the regulation of railways, and a graduated tax on corn; subtle on the monetary merits of half-farthings, and great in the mysterious lore of *quassia* and *cocculus indicus*. In 1842 he had a principal hand in the preparation of the revised tariff, by which duties were abolished or sensibly diminished in the case of 1200 duty-paying articles. In defending the new scheme he spoke incessantly, and amazed the House by his mastery of detail, his intimate acquaintance with the commercial needs of the country, and his inexhaustible power of exposition. In 1843 Gladstone, succeeding Lord Ripon as president of the Board of Trade, became a member of the cabinet at the age of thirty-three. He has recorded the fact that "the very first opinion which he ever was called upon to give in cabinet" was an opinion in favour of withdrawing the bill providing education for children in factories, to which vehement opposition was offered by the Dissenters, on the ground that it was too favourable to the Established Church.

Enters the cabinet.

At the opening of the session of 1845 the government, in pursuance of a promise made to Irish members that they would deal with the question of academical education in Ireland, proposed to establish non-sectarian colleges in that country and to make a large addition to the grant to the Roman Catholic College of Maynooth. Gladstone resigned office, in order, as he announced in the debate on the address, to form "not only an honest, but likewise an independent and an unsuspected judgment," on the plan to be submitted by the government with respect to Maynooth. His subsequent defence of the proposed grant, on the ground that it would be improper and unjust to exclude the Roman Catholic Church in Ireland from a "more indiscriminating support" which the state might give to various religious beliefs, was regarded by men of less sensitive conscience as only proving that there had been no adequate cause for his resignation. Before he resigned he completed a second revised tariff, carrying considerably further the principles on which he had acted in the earlier revision of 1842.

Maynooth grant: resignation.

In the autumn of 1845 the failure of the potato crop in Ireland threatened a famine, and convinced Sir Robert Peel that all restrictions on the importation of food must be at once suspended. He was supported by only three members of the cabinet, and resigned on the 5th of December. Lord John Russell, who had just announced his conversion to total and immediate repeal of the Corn Laws, declined the task of forming an administration, and on the 20th of December Sir Robert Peel resumed office. Lord Stanley refused to re-enter the government, and his place as secretary of state for the colonies was offered to and accepted by Gladstone. He did not offer himself for re-election at Newark, and remained outside the House of Commons during the great struggle of the coming year. It was a curious irony of fate which excluded him from parliament at this crisis, for it seems unquestionable that he was the most advanced Free Trader in Sir Robert Peel's Cabinet. The Corn Bill passed the House of Lords on the 28th of June 1846, and on the same day the government were beaten in the House of Commons on an Irish Coercion Bill. Lord John Russell became prime minister, and Gladstone retired for a season into private life. Early in 1847 it was announced that one of the two members for the university of Oxford intended to retire at the general election, and Gladstone was proposed for the vacant seat. The representation of the university had been pronounced by Canning to be the most coveted prize of public life, and Gladstone himself confessed that he "desired it with an almost passionate fondness." Parliament was dissolved on the 23rd of July 1847. The nomination at Oxford took place on the 29th of July, and at the close of the poll Sir Robert Inglis stood at the head, with Gladstone as his colleague.

Free trade.

The three years 1847, 1848, 1849 were for Gladstone a period of mental growth, of transition, of development. A change was silently proceeding, which was not completed for twenty years. "There have been," he wrote in later days to Bishop Wilberforce, "two great deaths, or transmigrations of spirit, in my political existence—one, very slow, the breaking of ties with my original party." This was now in progress. In the winter of 1850–1851 Gladstone spent between three and four months at Naples, where he learned that more than half the chamber of deputies, who had followed the party of Opposition, had been banished or imprisoned; that a large number, probably not less than 20,000, of the citizens had been imprisoned on charges of political disaffection, and that in prison they were subjected to the grossest cruelties. Having made careful investigations, Gladstone, on the 7th of April 1851, addressed an open letter to Lord Aberdeen, bringing an elaborate, detailed and horrible indictment against the rulers of Naples, especially as regards the arrangements of their prisons and the treatment of persons confined in them for political offences. The publication of this letter caused a wide sensation in England and abroad, and profoundly agitated the court of Naples. In reply to a question in the House of Commons, Lord Palmerston accepted and adopted Gladstone's statement, expressed keen sympathy with the cause which he had espoused, and sent a copy of his letter to the queen's representative at every court of Europe. A second letter and a third followed, and their effect, though for a while retarded, was unmistakably felt in the subsequent revolution which created a free and united Italy.

Naples prisons.

In February 1852 the Whig government was defeated on a Militia Bill, and Lord John Russell was succeeded by Lord Derby, formerly Lord Stanley, with Mr Disraeli, who now

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entered office for the first time, as chancellor of the exchequer and leader of the House of Commons. Mr Disraeli introduced and carried a makeshift budget, and the government tided over the session, and dissolved parliament on the 1st of July 1852. There was some talk of inducing Gladstone to join the Tory government, and on the 29th of November Lord Malmesbury dubiously remarked, "I cannot make out Gladstone, who seems to me a dark horse." In the following month the chancellor of the exchequer produced his second budget. The government redeemed their pledge to do something for the relief of the agricultural interest by reducing the duty on malt. This created a deficit, which they repaired by doubling the duty on inhabited houses. The voices of criticism were heard simultaneously on every side. The debate waxed fast and furious. In defending his proposals Mr Disraeli gave full scope to his most characteristic gifts; he pelted his opponents right and left with sarcasms, taunts and epigrams. Gladstone delivered an unpremeditated reply, which has ever since been celebrated. Tradition says that he "foamed at the mouth." The speech of the chancellor of the exchequer, he said, must be answered "on the moment." It must be "tried by the laws of decency and propriety." He indignantly rebuked his rival's language and demeanour. He tore his financial scheme to ribbons. It was the beginning of a duel which lasted till death removed one of the combatants from the political arena. "Those who had thought it impossible that any impression could be made upon the House after the speech of Mr Disraeli had to acknowledge that a yet greater impression was produced by the unprepared reply of Mr Gladstone." The House divided, and the government were left in a minority of nineteen. Lord Derby resigned.

Gladstone and Disraeli.

The new government was a coalition of Whigs and Peelites. Lord Aberdeen became prime minister, and Gladstone chancellor of the exchequer. Having been returned again for the university of Oxford, he entered on the active duties of a great office for which he was pre-eminently fitted by an unique combination of financial, administrative and rhetorical gifts. His first budget was introduced on the 18th of April 1853. It tended to make life easier and cheaper for large and numerous classes; it promised wholesale remissions of taxation; it lessened the charges on common processes of business, on locomotion, on postal communication, and on several articles of general consumption. The deficiency thus created was to be met by a "succession-duty," or application of the legacy-duty to real property; by an increase of the duty on spirits; and by the extension of the income-tax, at 5d. in the pound, to all incomes between £100 and £150. The speech in which these proposals were introduced held the House spell-bound. Here was an orator who could apply all the resources of a burnished rhetoric to the elucidation of figures; who could sweep the widest horizon of the financial future, and yet stoop to bestow the minutest attention on the microcosm of penny stamps and post-horses. Above all, the chancellor's mode of handling the income-tax attracted interest and admiration. It was a searching analysis of the financial and moral grounds on which the impost rested, and a historical justification and eulogy of it. Yet, great as had been the services of the tax at a time of national danger, Gladstone could not consent to retain it as a part of the permanent and ordinary finances of the country. It was objectionable on account of its unequal incidence, of the harassing investigation into private affairs which it entailed, and of the frauds to which it inevitably led. Therefore, having served its turn, it was to be extinguished in 1860. The scheme astonished, interested and attracted the country. The queen and Prince Albert wrote to congratulate the chancellor of the exchequer. Public authorities and private friends joined in the chorus of eulogy. The budget demonstrated at once its author's absolute mastery over figures and the persuasive force of his expository gift. It established the chancellor of the exchequer as the paramount financier of his day, and it was only the first of a long series of similar performances, different, of course, in detail, but alike in their bold outlines and brilliant handling. Looking back on a long life of strenuous exertion, Gladstone declared that the work of preparing his proposals about the succession-duty and carrying them through Parliament was by far the most laborious task which he ever performed.

Chancellor of the exchequer.

War between Great Britain and Russia was declared on the 27th of March 1854, and it thus fell to the lot of the most pacific of ministers, the devotee of retrenchment, and the anxious cultivator of all industrial arts, to prepare a war budget, and to meet as well as he might the exigencies of a conflict which had so cruelly dislocated all the ingenious devices of financial optimism. No amount of skill in the manipulation of figures, no ingenuity in shifting fiscal burdens, could prevent the addition of forty-one millions to the national debt, or could countervail the appalling mismanagement at the seat of war. Gladstone declared that the state of the army in the Crimea was a "matter for weeping all day and praying all night." As soon as parliament met in January 1855 J. A. Roebuck, the Radical member for Sheffield, gave notice that he would move for a select committee "to inquire into the condition of our army before Sevastopol, and into the conduct of those departments of the government whose duty it has been to minister to the wants of that army." On the same day Lord John Russell, without announcing his intention to his colleagues, resigned his office as president of the council sooner than attempt the defence of the government. Gladstone, in defending the government against Roebuck, rebuked in dignified and significant terms the conduct of men who, "hoping to escape from punishment, ran away from duty." On the division on Mr Roebuck's motion the government was beaten by the unexpected majority of 157.

Lord Palmerston became prime minister. The Peelites joined him, and Gladstone resumed office as chancellor of the exchequer. A shrewd observer at the time pronounced him indispensable. "Any other chancellor of the exchequer would be torn in bits by him." The government was formed on the understanding that Mr Roebuck's proposed committee was to be resisted. Lord Palmerston soon saw that further resistance was useless; his Peelite colleagues stuck to their text, and, within three weeks after resuming office, Gladstone, Sir James Graham and Mr Sidney Herbert resigned. Gladstone once said of himself and his Peelite colleagues, during the period of political isolation, that they were like roving icebergs on which men could not land with safety, but with which ships might come into perilous collision. He now applied himself specially to financial criticism, and was perpetually in conflict with the chancellor of the exchequer, Sir George Cornewall Lewis.

In 1858 Lord Palmerston was succeeded by Lord Derby at the head of a Conservative administration, and Gladstone accepted the temporary office of high commissioner extraordinary to the Ionian Islands. Returning to England for the session of 1859, he found himself involved in the controversy which arose over a mild Reform Bill introduced by the government. They were defeated on the second reading of the bill, Gladstone voting with them. A dissolution immediately followed, and Gladstone was again returned unopposed for the university of Oxford. As soon as the new parliament met a vote of want of confidence in the ministry was moved in the House of Commons. In the critical division which ensued Gladstone voted with the government, who were left in a minority. Lord Derby resigned. Lord Palmerston became prime minister, and asked Gladstone to join him as chancellor of the exchequer. To vote confidence in an imperilled ministry, and on its defeat to take office with the rivals who have defeated it, is a manœuvre which invites the reproach of tergiversation. But Gladstone risked the reproach, accepted the office and had a sharp tussle for his seat. He emerged from the struggle victorious, and entered on his duties with characteristic zeal. The prince consort wrote: "Gladstone is now the real leader in the House of Commons, and works with an energy and vigour altogether incredible."

The budget of 1860 was marked by two distinctive features. It asked the sanction of parliament for the commercial treaty which Cobden had privately arranged with the emperor Napoleon, and it proposed to abolish the duty on paper. The French treaty

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was carried, but the abolition of the paper-duty was defeated in the House of Lords. Gladstone justly regarded the refusal to remit a duty as being in effect an act of taxation, and therefore as an infringement of the rights of the House of Commons. The proposal to abolish the paper-duty was revived in the budget of 1861, the chief proposals of which, instead of being divided, as in previous years, into several bills, were included in one. By this device the Lords were obliged to acquiesce in the repeal of the paper-duty.

Budget of 1860.

During Lord Palmerston's last administration, which lasted from 1859 to 1865, Gladstone was by far the most brilliant and most conspicuous figure in the cabinet. Except in finance, he was not able to accomplish much, for he was met and thwarted at every turn by his chief's invincible hostility to change; but the more advanced section of the Liberal party began to look upon him as their predestined leader. In 1864, in a debate on a private member's bill for extending the suffrage, he declared that the burden of proof lay on those "who would exclude forty-nine fiftieths of the working-classes from the franchise." In 1865, in a debate on the condition of the Irish Church Establishment, he declared that the Irish Church, as it then stood, was in a false position, inasmuch as it ministered only to one-eighth or one-ninth of the whole community. But just in proportion as Gladstone advanced in favour with the Radical party he lost the confidence of his own constituents. Parliament was dissolved in July 1865, and the university elected Mr Gathorne Hardy in his place.

Gladstone at once turned his steps towards South Lancashire, where he was returned with two Tories above him. The result of the general election was to retain Lord Palmerston's government in power, but on the 18th of October the old prime minister died. He was succeeded by Lord Russell, and Gladstone, retaining the chancellorship of the exchequer, became for the first time leader of the House of Commons. Lord Russell, backed by Gladstone, persuaded his colleagues to consent to a moderate Reform Bill, and the task of piloting this measure through the House of Commons fell to Gladstone. The speech in which he wound up the debate on the second reading was one of the finest, if not indeed the very finest, which he ever delivered. But it was of no practical avail. The government were defeated on an amendment in committee, and thereupon resigned. Lord Derby became prime minister, with Disraeli as chancellor of the exchequer and leader of the House of Commons. On the 18th of March 1867 the Tory Reform Bill, which ended in establishing Household Suffrage in the boroughs, was introduced, and was read a second time without a division. After undergoing extensive alterations in committee at the hands of the Liberals and Radicals, the bill became law in August.

Leader of House of Commons.

At Christmas 1867 Lord Russell announced his final retirement from active politics, and Gladstone was recognized by acclamation as leader of the Liberal party. Nominally he was in Opposition; but his party formed the majority of the House of Commons, and could beat the government whenever they chose to mass their forces. Gladstone seized the opportunity to give effect to convictions which had long been forming in his mind. Early in the session he brought in a bill abolishing compulsory church-rates, and this passed into law. On the 10th of March, in a debate raised by an Irish member, he declared that in his judgment the Irish Church, as a State Church, must cease to exist. Immediately afterwards he embodied this opinion in a series of resolutions concerning the Irish Church Establishment, and carried them against the government. Encouraged by this triumph, he brought in a Bill to prevent any fresh appointments in the Irish Church, and this also passed the Commons, though it was defeated in the Lords. Parliament was dissolved on the 11th of November. A single issue was placed before the country—Was the Irish Church to be, or not to be, disestablished? The response was an overwhelming affirmative. Gladstone, who had been doubly nominated, was defeated in Lancashire, but was returned for Greenwich. He chose this moment for publishing a *Chapter of Autobiography*, in which he explained and justified his change of opinion with regard to the Irish Church.

Leader of Liberal party.

On the 2nd of December Disraeli, who had succeeded Lord Derby as premier in the preceding February, announced that he and his colleagues, recognizing their defeat, had resigned without waiting for a formal vote of the new parliament. On the following day Gladstone was summoned to Windsor, and commanded by the queen to form an administration. The great task to which the new prime minister immediately addressed himself was the disestablishment of the Irish Church. The queen wrote to Archbishop Tait that the subject of the Irish Church "made her very anxious," but that Mr Gladstone "showed the most conciliatory disposition." "The government can do nothing that would tend to raise a suspicion of their sincerity in proposing to disestablish the Irish Church, and to withdraw all state endowments from all religious communions in Ireland; but, were these conditions accepted, all other matters connected with the question might, the queen thinks, become the subject of discussion and negotiation." The bill was drawn and piloted on the lines thus indicated, and became law on the 26th of July. In the session of 1870 Gladstone's principal work was the Irish Land Act, of which the object was to protect the tenant against eviction as long as he paid his rent, and to secure to him the value of any improvements which his own industry had made. In the following session Religious Tests in the universities were abolished, and a bill to establish secret voting was carried through the House of Commons. This was thrown out by the Lords, but became law a year later. The House of Lords threw out a bill to abolish the purchase of commissions in the army. Gladstone found that purchase existed only by royal sanction, and advised the queen to issue a royal warrant cancelling, on and after the 1st of November following, all regulations authorizing the purchase of commissions.

Prime Minister: Irish Church disestablishment.

In 1873 Gladstone set his hand to the third of three great Irish reforms to which he had pledged himself. His scheme for the establishment of a university which should satisfy both Roman Catholics and Protestants met with general disapproval. The bill was thrown out by three votes, and Gladstone resigned. The queen sent for Disraeli, who declined to take office in a minority of the House of Commons, so Gladstone was compelled to resume. But he and his colleagues were now, in Disraelitish phrase, "exhausted volcanoes." Election after esection went wrong. The government had lost favour with the public, and was divided against itself. There were resignations and rumours of resignations. When the session of 1873 had come to an end Gladstone took the chancellorship of the exchequer, and, as high authorities contended, vacated his seat by doing so. The point was obviously one of vital importance; and we learn from Lord Selborne, who was lord chancellor at the time, that Gladstone "was sensible of the difficulty of either taking his seat in the usual manner at the opening of the session, or letting . . . . the necessary arrangements for business in the House of Commons be made in the prime minister's absence. A dissolution was the only escape." On the 23rd of January 1874 Gladstone announced the dissolution in an address to his constituents, declaring that the authority of the government had now "sunk below the point necessary for the due defence and prosecution of the public interest." He promised that, if he were returned to power, he would repeal the income-tax. This bid for popularity failed, the general election resulting in a Tory majority of forty-six. Gladstone kept his seat for Greenwich, but was only second on the poll. Following the example of Disraeli in 1868, he resigned without meeting parliament.

Dissolution of 1874.

For some years he had alluded to his impending retirement from public life, saying that he was "strong against going on in politics to the end." He was now sixty-four, and his life had been a continuous experience of exhausting labour. On the 12th of March 1874 he informed Lord Granville that he could give only occasional attendance in the House of Commons during the current session, and that he must "reserve his entire freedom to divest himself of all the

Temporary retirement.

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responsibilities of leadership at no distant date." His most important intervention in the debates of 1874 was when he opposed Archbishop Tait's Public Worship Bill. This was read a second time without a division, but in committee Gladstone enjoyed some signal triumphs over his late solicitor-general, Sir William Harcourt, who had warmly espoused the cause of the government and the bill. At the beginning of 1875 Gladstone carried into effect the resolution which he had announced a year before, and formally resigned the leadership of the Liberal party. He was succeeded by Lord Hartington, afterwards duke of Devonshire. The learned leisure which Gladstone had promised himself when released from official responsibility was not of long duration. In the autumn of 1875 an insurrection broke out in Bulgaria, and the suppression of it by the Turks was marked by massacres and outrages. Public indignation was aroused by what were known as the "Bulgarian atrocities," and Gladstone flung himself into the agitation against Turkey with characteristic zeal. At public meetings, in the press, and in parliament he denounced the Turkish government and its champion, Disraeli, who had now become Lord Beaconsfield. Lord Hartington soon found himself pushed aside from his position of titular leadership. For four years, from 1876 to 1880, Gladstone maintained the strife with a courage, a persistence and a versatility which raised the enthusiasm of his followers to the highest pitch. The county of Edinburgh, or Midlothian, which he contested against the dominant influence of the duke of Buccleuch, was the scene of the most astonishing exertions. As the general election approached the only question submitted to the electors was—Do you approve or condemn Lord Beaconsfield's foreign policy? The answer was given at Easter 1880, when the Liberals were returned by an overwhelming majority over Tories and Home Rulers combined. Gladstone was now member for Midlothian, having retired from Greenwich at the dissolution.

Midlothian campaign.

When Lord Beaconsfield resigned, the queen sent for Lord Hartington, the titular leader of the Liberals, but he and Lord Granville assured her that no other chief than Gladstone would satisfy the party. Accordingly, on the 23rd of April he became prime minister for the second time. His second administration, of which the main achievement was the extension of the suffrage to the agricultural labourers, was harassed by two controversies, relating to Ireland and Egypt, which proved disastrous to the Liberal party. Gladstone alienated considerable masses of English opinion by his efforts to reform the tenure of Irish land, and provoked the Irish people by his attempts to establish social order and to repress crime. A bill to provide compensation for tenants who had been evicted by Irish landlords passed the Commons, but was shipwrecked in the Lords, and a ghastly record of outrage and murder stained the following winter. A Coercion Bill and a Land Bill passed in 1881 proved unsuccessful. On the 6th of May 1882 the newly appointed chief secretary for Ireland, Lord Frederick Cavendish, and his under-secretary, Mr Burke, were stabbed to death in the Phoenix Park at Dublin. A new Crimes Act, courageously administered by Lord Spencer and Sir George Trevelyan, abolished exceptional crime in Ireland, but completed the breach between the British government and the Irish party in parliament.

The bombardment of the forts at Alexandria and the occupation of Egypt in 1882 were viewed with great disfavour by the bulk of the Liberal party, and were but little congenial to Gladstone himself. The circumstances of General Gordon's untimely death awoke an outburst of indignation against those who were, or seemed to be, responsible for it. Frequent votes of censure were proposed by the Opposition, and on the 8th of June 1885 the government were beaten on the budget. Gladstone resigned. The queen offered him the dignity of an earldom, which he declined. He was succeeded by Lord Salisbury.

The general election took place in the following November. When it was over the Liberal party was just short of the numerical strength which was requisite to defeat the combination of Tories and Parnellites. A startling surprise was at hand. Gladstone had for some time been convinced of the expediency of conceding Home Rule to Ireland in the event of the Irish constituencies giving unequivocal proof that they desired it. His intentions were made known only to a privileged few, and these, curiously, were not his colleagues. The general election of 1885 showed that Ireland, outside Ulster, was practically unanimous for Home Rule. On the 17th of December an anonymous paragraph was published, stating that if Mr Gladstone returned to office he was prepared to "deal in a liberal spirit with the demand for Home Rule." It was clear that if Gladstone meant what he appeared to mean, the Parnellites would support him, and the Tories must leave office. The government seemed to accept the situation. When parliament met they executed, for form's sake, some confused manœuvres, and then they were beaten on an amendment to the address in favour of Municipal Allotments. On the 1st of February 1886 Gladstone became, for the third time, prime minister. Several of his former colleagues declined to join him, on the ground of their absolute hostility to the policy of Home Rule; others joined on the express understanding that they were only pledged to consider the policy, and did not fetter their further liberty of action. On the 8th of April Gladstone brought in his bill for establishing Home Rule, and eight days later the bill for buying out the Irish landlords. Meanwhile two members of his cabinet, feeling themselves unable to support these measures, resigned. Hostility to the bills grew apace. Gladstone was implored to withdraw them, or substitute a resolution in favour of Irish autonomy; but he resolved to press at least the Home Rule Bill to a second reading. In the early morning of the 8th of June the bill was thrown out by thirty. Gladstone immediately advised the queen to dissolve parliament. Her Majesty strongly demurred to a second general election within seven months; but Gladstone persisted, and she yielded. Parliament was dissolved on the 26th of June. In spite of Gladstone's skilful appeal to the constituencies to sanction the principle of Home Rule, as distinct from the practical provisions of his late bill, the general election resulted in a majority of considerably over 100 against his policy, and Lord Salisbury resumed office. Throughout the existence of the new parliament Gladstone never relaxed his extraordinary efforts, though now nearer eighty than seventy, on behalf of the cause of self-government for Ireland. The fertility of argumentative resource, the copiousness of rhetoric, and the physical energy which he threw into the enterprise, would have been remarkable at any stage of his public life; continued into his eighty-fifth year they were little less than miraculous. Two incidents of domestic interest, one happy and the other sad, belong to this period of political storm and stress. On the 25th of July 1889 Gladstone celebrated the fiftieth anniversary of his marriage, and on the 4th of July 1891 his eldest son, William Henry, a man of fine character and accomplishments, died, after a lingering illness, in his fifty-second year.

First Home Rule Bill.

The crowning struggle of Gladstone's political career was now approaching its climax. Parliament was dissolved on the 28th of June 1892. The general election resulted in a majority of forty for Home Rule, heterogeneously composed of Liberals, Labour members and Irish. As soon as the new parliament met a vote of want of confidence in Lord Salisbury's government was moved and carried. Lord Salisbury resigned, and on the 15th of August 1892 Gladstone kissed hands as first lord of the treasury. He was the first English statesman that had been four times prime minister. Parliament reassembled in January 1893. Gladstone brought in his new Home Rule Bill on the 13th of February. It passed the House of Commons, but was thrown out by the House of Lords on the second reading on the 8th of September 1893. Gladstone's political work was now, in his own judgment, ended. He made his last speech in the House of Commons on the 1st of March 1894, acquiescing in some amendments introduced by the Lords into the Parish Councils Bill; and on the 3rd of March he placed his resignation in the queen's hands. He never set foot again in the House of Commons, though he remained a member of it till the dissolution of 1895. He paid

Second Home Rule Bill.

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occasional visits to friends in London, Scotland and the south of France; but the remainder of his life was spent for the most part at Hawarden. He occupied his leisure by writing a rhymed translation of the *Odes* of Horace, and preparing an elaborately annotated edition of Butler's *Analogy* and *Sermons*. He had also contemplated some addition to the Homeric studies which he had always loved, but this design was never carried into effect, for he was summoned once again from his quiet life of study and devotion to the field of public controversy. The Armenian massacres in 1894 and 1895 revived all his ancient hostility to "the governing Turk." He denounced the massacres and their perpetrators at public meetings held at Chester on the 6th of August 1895, and at Liverpool on the 24th of September 1896. In March 1897 he recapitulated the hideous history in an open letter to the duke of Westminster.

But the end, though not yet apprehended, was at hand. Since his retirement from office Gladstone's physical vigour, up to that time unequalled, had shown signs of impairment. Towards the end of the summer of 1897 he began to suffer from an acute pain, which was attributed to facial neuralgia, and in November he went to Cannes. In February 1898 he returned to England and went to Bournemouth. There he was informed that the pain had its origin in a disease which must soon prove fatal. He received the information with simple thankfulness, and only asked that he might die at home. On the 22nd of March he returned to Hawarden, and there he died on the 19th of May 1898. During the night of the 25th of May his body was conveyed from Hawarden to London and the coffin was placed on a bier in Westminster Hall. Throughout the 26th and 27th a vast train of people, officially estimated at 250,000, and drawn from every rank and class, moved in unbroken procession past the bier. On the 28th of May the coffin, preceded by the two Houses of Parliament and escorted by the chief magnates of the realm, was carried from Westminster Hall to Westminster Abbey. The heir-apparent and his son, the prime minister and the leader of the House of Commons, were among those who bore the pall. The body was buried in the north transept of the abbey, where, on the 19th of June 1900, Mrs Gladstone's body was laid beside it.

Death.

Mr and Mrs Gladstone had four sons and four daughters, of whom one died in infancy. The eldest son, W. H. Gladstone (1840–1891), was a member of parliament for many years, and married the daughter of Lord Blantyre, his son William (b. 1885) inheriting the family estates. The fourth son, Herbert John (b. 1854), sat in parliament for Leeds from 1880 to 1910, and filled various offices, being home secretary 1905–1910; in 1910 he was created Viscount Gladstone, on being appointed governor-general of united South Africa. The eldest daughter, Agnes, married the Rev. E. C. Wickham, headmaster of Wellington, 1873–1893, and later Dean of Lincoln. Another daughter married the Rev. Harry Drew, rector of Hawarden. The youngest, Helen, was for some years vice-principal of Newnham College, Cambridge.

Family.

After a careful survey of Mr Gladstone's life, enlightened by personal observation, it is inevitable to attempt some analysis of his character. First among his moral attributes must be placed his religiousness. From those early days when a fond mother wrote of him as having been "truly converted to God," down to the verge of ninety years, he lived in the habitual contemplation of the unseen world, and regulated his private and public action by reference to a code higher than that of mere prudence or worldly wisdom. A second characteristic, scarcely less prominent than the first, was his love of power. His ambition had nothing in common with the vulgar eagerness for place and pay and social standing. Rather it was a resolute determination to possess that control over the machine of state which should enable him to fulfil without let or hindrance the political mission with which he believed that Providence had charged him. The love of power was supported by a splendid fearlessness. No dangers were too threatening for him to face, no obstacles too formidable, no tasks too laborious, no heights too steep. The love of power and the supporting courage were allied with a marked imperiousness. Of this quality there was no trace in his manner, which was courteous, conciliatory and even deferential; nor in his speech, which breathed an almost exaggerated humility. But the imperiousness showed itself in the more effectual form of action; in his sudden resolves, his invincible insistence, his recklessness of consequences to himself and his friends, his habitual assumption that the civilized world and all its units must agree with him, his indignant astonishment at the bare thought of dissent or resistance, his incapacity to believe that an overruling Providence would permit him to be frustrated or defeated. He had by nature what he himself called a "vulnerable temper and impetuous moods." But so absolute was his lifelong self-mastery that he was hardly ever betrayed into saying that which, on cooler reflection, needed to be recalled. It was easy enough to see the "vulnerable temper" as it worked within, but it was never suffered to find audible expression. It may seem paradoxical, but it is true, to say that Mr Gladstone was by nature conservative. His natural bias was to respect things as they were. In his eyes, institutions, customs, systems, so long as they had not become actively mischievous, were good because they were old. It is true that he was sometimes forced by conviction or fate or political necessity to be a revolutionist on a large scale; to destroy an established Church; to add two millions of voters to the electorate; to attack the parliamentary union of the kingdoms. But these changes were, in their inception, distasteful to their author. His whole life was spent in unlearning the prejudices in which he was educated. His love of freedom steadily developed, and he applied its principles more and more courageously to the problems of government. But it makes some difference to the future of a democratic state whether its leading men are eagerly on the look-out for something to revolutionize, or approach a constitutional change by the gradual processes of conviction and conversion.

Character.

Great as were his eloquence, his knowledge and his financial skill, Gladstone was accustomed to say of himself that the only quality in which, so far as he knew, he was distinguished from his fellow-men was his faculty of concentration. Whatever were the matter in hand, he so concentrated himself on it, and absorbed himself in it, that nothing else seemed to exist for him.

A word must be said about physical characteristics. In his prime Gladstone was just six feet high, but his inches diminished as his years increased, and in old age the unusual size of his head and breadth of his shoulders gave him a slightly top-heavy appearance. His features were strongly marked; the nose trenchant and hawk-like, and the mouth severely lined. His flashing eyes were deep-set, and in colour resembled the onyx with its double band of brown and grey. His complexion was of an extreme pallor, and, combined with his jet-black hair, gave in earlier life something of an Italian aspect to his face. His dark eyebrows were singularly flexible, and they perpetually expanded and contracted in harmony with what he was saying. He held himself remarkably upright, and even from his school-days at Eton had been remarked for the rapid pace at which he habitually walked. His voice was a baritone, singularly clear and far-reaching. In the Waverley Market at Edinburgh, which is said to hold 20,000 people, he could be heard without difficulty; and as late as 1892 he said to the present writer: "What difference does it make to me whether I speak to 400 or 4000 people?" His physical vigour in old age earned him the popular nickname of the Grand Old Man.

Lord Morley of Blackburn's *Life of Gladstone* was published in 1903. (G. W. E. R.)

GLADSTONE, a seaport of Clinton county, Queensland, Australia, 328 m. by rail N.E. of Brisbane. Pop. (1901) 1566. It possesses a fine, well-sheltered harbour reputed one of the best in Queensland, at the mouth of the river Boyne. Gold, manganese, copper and coal are found in the neighbourhood. Gladstone, founded in 1847, became a municipality in 1863.

See J. F. Hogan, *The Gladstone Colony* (London, 1898).

GLAGOLITIC, an early Slavonic alphabet: also the liturgy written therein, and the people (Dalmatians and Roman Catholic

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Montenegrins) among whom it has survived by special licence of the Pope (see SLAVS for table of letters).

GLAIR (from Fr. *glaire*, probably from Lat. *clarus*, clear, bright), the white of an egg, and hence a term used for a preparation made of this and used, in bookbinding and in gilding, to retain the gold and as a varnish. The adjective "glairy" is used of substances having the viscous and transparent consistency of the white of an egg.

GLAISHER, JAMES (1809–1903), English meteorologist and aeronaut, was born in London on the 7th of April 1809. After serving for a few years on the Ordnance Survey of Ireland, he acted as an assistant at the Cambridge and Greenwich observatories successively, and when the department of meteorology and magnetism was formed at the latter, he was entrusted with its superintendence, which he continued to exercise for thirty-four years, until his retirement from the public service. In 1845 he published his well-known dew-point tables, which have gone through many editions. In 1850 he established the Meteorological Society, acting as its secretary for many years, and in 1866 he assisted in the foundation of the Aeronautical Society of Great Britain. He was appointed a member of the royal commission on the warming and ventilation of dwellings in 1875, and for twelve years from 1880 acted as chairman of the executive committee of the Palestine Exploration Fund. But his name is best known in connexion with the series of balloon ascents which he made between 1862 and 1866, mostly in company with Henry Tracey Coxwell. Many of these ascents were arranged by a committee of the British Association, of which he was a member, and were strictly scientific in character, the object being to carry out observations on the temperature, humidity, &c., of the atmosphere at high elevations. In one of them, that which took place at Wolverhampton on the 5th of September 1862, Glaisher and his companion attained the greatest height that had been reached by a balloon carrying passengers. As no automatically recording instruments were available, and Glaisher was unable to read the barometer at the highest point owing to loss of consciousness, the precise altitude can never be known, but it is estimated at about 7 m. from the earth. He died on the 7th of February 1903 at Croydon.

GLAMIS, a village and parish of Forfarshire, Scotland, 5¼ m. W. by S. of Forfar by the Caledonian railway. Pop. of parish (1901) 1351. The name is sometimes spelled Glammis and the *i* is mute: it is derived from the Gaelic, *glamhus*, "a wide gap," "a vale." The chief object in the village is the sculptured stone, traditionally supposed to be a memorial of Malcolm II., although Fordun's statement that the king was slain in the castle is now rejected. About a mile from the station stands Glamis Castle, the seat of the earl of Strathmore and Kinghorne, a fine example of the Scottish Baronial style, enriched with certain features of the French château. In its present form it dates mostly from the 17th century, but the original structure was as old as the 11th century, for Macbeth was Thane of Glamis. Several of the early Scots kings, especially Alexander III., used it occasionally as a residence. Robert II. bestowed the thanedom on John Lyon, who had married the king's second daughter by Elizabeth Mure and was thus the founder of the existing family. Patrick Lyon became hostage to England for James I. in 1424. When, in 1537, Janet Douglas, widow of the 6th Lord Glamis, was burned at Edinburgh as a witch, for conspiring to procure James V.'s death, Glamis was forfeited to the crown, but it was restored to her son six years later when her innocence had been established. The 3rd earl of Strathmore entertained the Old Chevalier and eighty of his immediate followers in 1715. After discharging the duties of hospitality the earl joined the Jacobites at Sheriffmuir and fell on the battlefield. Sir Walter Scott spent a night in the "hoary old pile" when he was about twenty years old, and gives a striking relation of his experiences in his *Demonology and Witchcraft*. The hall has an arched ceiling and several historical portraits, including those of Claverhouse, Charles II. and James II. of England. At Cossans, in the parish of Glamis, there is a remarkable sculptured monolith, and other examples occur at the Hunters' Hill and in the old kirkyard of Eassie.

GLAMORGANSHIRE (Welsh *Morgannwg*), a maritime county occupying the south-east corner of Wales, and bounded N.W. by Carmarthenshire, N. by Carmarthenshire and Breconshire, E. by Monmouthshire and S. and S.W. by the Bristol Channel and Carmarthen Bay. The contour of the county is largely determined by the fact that it lies between the mountains of Breconshire and the Bristol Channel. Its extreme breadth from the sea inland is 29 m., while its greatest length from east to west is 53 m. Its chief rivers, the Rhymney, Taff, Neath (or Nedd) and Tawe or Tawy, have their sources in the Breconshire mountains, the two first trending towards the south-east, while the two last trend to the south-west, so that the main body of the county forms a sort of quarter-circle between the Taff and the Neath. Near the apex of the angle formed by these two rivers is the loftiest peak in the county, the great Pennant scarp of Craig y Llyn or Carn Moesyn, 1976 ft. high, which in the Glacial period diverted the ice-flow from the Beacons into the valley on either side of it. To the south and south-east of this peak extend the great coal-fields of mid-Glamorgan, their surface forming an irregular plateau with an average elevation of 600 to 1200 ft. above sea-level, but with numerous peaks about 1500 ft. high, or more; Mynydd y Caerau, the second highest being 1823 ft. Out of this plateau have been carved, to the depth of 500 to 800 ft. below its general level, three distinct series of narrow valleys, those in each series being more or less parallel. The rivers which give their names to these valleys include the Cynon, the Great and Lesser Rhondda (tributaries of the Taff) and the Ely flowing to the S.E., the Ogwr or Ogmore (with its tributaries the Garw and Llynfi) flowing south through Bridgend, and the Avan bringing the waters of the Corwg and Gwynfi in the south-west into Swansea Bay at Aberavon. To the south of this central hill country, which is wet, cold and sterile, and whose steep slopes form the southern edge of the coal-field, there stretches out to the sea a gently undulating plain, compendiously known as the "Vale of Glamorgan," but in fact consisting of a succession of small vales of such fertile land and with such a mild climate that it has been styled, not inaptly, the "Garden of Wales." To the east of the central area referred to and divided from it by a spur of the Brecknock mountains culminating in Carn Bugail, 1570 ft. high, is the Rhymney, which forms the county's eastern boundary. On the west other spurs of the Beacons divide the Neath from the Tawe (which enters the sea at Swansea), and the Tawe from the Loughor, which, with its tributary the Amman, separates the county on the N.W. from Carmarthenshire, in which it rises, and falling into Carmarthen Bay forms what is known as the Burry estuary, so called from a small stream of that name in the Gower peninsula. The rivers are all comparatively short, the Taff, in every respect the chief river, being only 33 m. long.

Down to the middle of the 19th century most of the Glamorgan valleys were famous for their beautiful scenery, but industrial operations have since destroyed most of this beauty, except in the so-called "Vale of Glamorgan," the Vale of Neath, the "combes" and limestone gorges of Gower and the upper reaches of the Taff and the Tawe. The Vale of Neath is *par excellence* the waterfall district of South Wales, the finest falls being the Cilhepste fall, the Sychnant and the three Clungwyns on the Mellte and its tributaries near the Vale of Neath railway from Neath to Hirwaun, Scwd Einon Gam and Scwd Gladys on the Pyrddin on the west side of the valley close by, with Melin Court and Abergarwed still nearer Neath. There are also several cascades on the Dulais, and in the same district, though in Breconshire, is Scwd Henrhyd on the Llech near Colbren Junction. Almost the only part of the county which is now well timbered is the Vale of Neath. There are three small lakes, Llyn Fawr and Llyn Fach near Craig y Llyn and Kenfig Pool amid the sand-dunes of Margam. The rainfall of the county varies from an average of about 25 in. at Porthcawl and other parts of the Vale of Glamorgan to about 37 in. at Cardiff, 40 in. at Swansea and to upwards of 70 in. in the northern part of the county.

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the fall being still higher in the adjoining parts of Breconshire whence Cardiff, Swansea, Merthyr and a large area near Neath draw their main supplies of water.

The county has a coast-line of about 83 m. Its two chief bays are the Burry estuary and Swansea, one on either side of the Gower Peninsula, which has also a number of smaller inlets with magnificent cliff scenery. The rest of the coast is fairly regular, the chief openings being at the mouths of the Ogmore and the Taff respectively. The most conspicuous headlands are Whiteford Point, Worms Head and Mumbles Head in Gower, Nash Point and Lavernock Point on the eastern half of the coast.

Geology.—The Silurian rocks, the oldest in the county, form a small inlier about 2 sq. m. in area at Rumney and Pen-y-lan, north of Cardiff, and consist of mudstones and sandstones of Wenlock and Ludlow age; a feeble representative of the Wenlock Limestone also is present. They are conformably succeeded by the Old Red Sandstone which extends westwards as far as Cowbridge as a deeply-eroded anticline largely concealed by Trias and Lias. The Old Red Sandstone consists in the lower parts of red marls and sandstones, while the upper beds are quartzitic and pebbly, and form bold scarps which dominate the low ground formed by the softer beds below. Cefn-y-bryn, another anticline of Old Red Sandstone (including small exposures of Silurian rocks), forms the prominent backbone of the Gower peninsula. The next formation is the Carboniferous Limestone which encircles and underlies the great South Wales coal-field, on the south of which, west of Cardiff, it forms a bold escarpment of steeply-dipping beds surrounding the Old Red Sandstone anticline. It shows up through the Trias and Lias in extensive inliers near Bridgend, while in Gower it dips away from the Old Red Sandstone of Cefn-y-bryn. On the north of the coal-field it is just reached near Merthyr Tydfil. The Millstone Grit, which consists of grits, sandstones and shales, crops out above the limestone and serves to introduce the Coal Measures, which in the form of a great trough extending east and west across the county and occupying most of its surface. The coal seams are most numerous in the lower part of the series; the Pennant Sandstone succeeds and contains the inner parts of the basin, forming the elevated moorland region deeply trenched by the teeming valleys (*e.g.* the Rhondda) which cross the coal-field from north to south. Above the Pennant Sandstone still higher coals come in. Taken generally, the coals are bituminous in the south-east and anthracitic in the north-west.

After the Coal Measures had been deposited, the southern part of the region was subjected to powerful folding; the resulting anticlines were worn down during a long period of denudation, and then submerged slowly beneath a Triassic lake in which accumulated the Keuper conglomerates and marls which spread over the district west of Cardiff and are traceable on the coast of Gower. The succeeding Rhaetic and Lias within the area of the coastal plain (the fertile Vale of Glamorgan) from Penarth to near Bridgend were laid down by the Jurassic sea. A well-marked raised beach is traceable in Gower. Sand-dunes are present locally around Swansea Bay. Moraines, chiefly formed of sand and clay, occur in many of the Glamorgan valleys; and these, together with the striated surfaces which may be observed at higher levels, are clearly glacial in origin. In the Coal Measures and the newer Limestones and Triassic, Rhaetic and Liassic conglomerates, marls and shales, many interesting fossils have been disinterred: these include the remains of an air-breathing reptile (*Anthracosteon*). Bones of the cave-bear, lion, mammoth, reindeer, rhinoceros, along with flint weapons and tools, have been discovered in some caves of the Gower peninsula.

Agriculture.—The low-lying land on the south from Caerphilly to Margam is very fertile, the soil being a deep rich loam; and here the standard of agriculture is fairly high, and there prevails a well-defined tenant-right custom, supposed to be of ancient origin but probably dating only from the beginning of the 19th century. Everywhere on the Coal Measures the soil is poor, while vegetation is also injured by the smoke from the works, especially copper smoke. Leland (*c.* 1535) describes the lowlands as growing corn and grass but little wood, while the mountains had "redde dere, kiddes plenty, oxen and sheep." The land even in the "Vale" seems to have been open and unenclosed till the end of the 15th or beginning of the 16th century, while enclosure spread to the uplands still later. About one-fifth of the total area is still common land, more than half of which is unsuitable for cultivation. The total area under cultivation in 1905 was 269,271 acres or about one-half of the total are a of the county. The chief crops raised (giving the acreage under each of their respective acreages) are oats, barley, turnips and swedes, wheat, potatoes and mangolds. A steady decrease of the acreage under grain-crops, green-crops and clover has been accompanied by an increase in the area of pasture. Dairying has been largely abandoned for stock-raising, and very little "Caerphilly cheese" is now made in that district. In 1905 Glamorgan had the largest number of horses in agriculture of any Welsh county except those of Carmarthen and Cardigan. Good sheep and ponies are reared in the hill-country. Pig-keeping is much neglected, and despite the mild climate very little fruit is grown. The average size of holdings in 1905 was 47·3 acres, there being only 46 holdings above 300 acres, and 1719 between 50 and 500 acres.

Mining and Manufactures.—Down to the middle of the 18th century the county had no industry of any importance except agriculture. The coal which underlies practically the whole surface of the county except the Vale of Glamorgan and West Gower was little worked till about 1755, when it began to be used instead of charcoal for the smelting of iron. By 1811, when there were 25 blast furnaces in the county, the demand for coal for this purpose had much increased, but it was in the most active period of railway construction that it reached its maximum. Down to about 1850, if not later, the chief collieries were owned by the ironmasters and were worked for their own requirements, but when the suitability of the lower seams in the district north of Cardiff for steam purposes was realized, an export trade sprang up and soon assumed enormous proportions, so that "the ports of Cardiff, including Barry and Penarth), from which the bulk of the steam coal was shipped, became the first port in the world for the shipment of coal. The development of the anthracite coal-field lying to the north and west of Swansea (from which port it is mostly shipped) dates mainly from the closing years of the 19th century, when the demand for this coal grew rapidly. There are still large areas in the Rhymney Valley on the east, and in the districts of Neath and Swansea on the west, whose development has only recently been undertaken. In connexion with the coal industry, patent fuel (made from small coal and tar) is largely manufactured at Cardiff, Port Talbot and Swansea, the shipments from Swansea being the largest in the kingdom. Next in importance to the coal are the iron and tin-plate industries, and in the Swansea district the smelting of copper and a variety of other ores.

The manufacture of iron and steel is carried on at Dowlais, Merthyr Tydfil, Cardiff, Port Talbot, Briton Ferry, Pontardawe, Swansea, Gorseinon and Gowerton. During the last quarter of the 19th century the use of the native ironstone was almost wholly given up, and the necessary ore is now imported, mainly from Spain. As a result several of the older iron works, such as those of Aberdare, Ystalyfera and Brynaman have been abandoned, and new works have been established on or near the sea-board; *e.g.* the Dowlais company in 1891 opened large works at Cardiff. The tin-plate industry is mainly confined to the West of the county, Swansea being the chief port for the shipment of tin-plates, though there are works near Llantrisant and at Melin Griffith near Cardiff, the latter being the oldest in the county. Copper-smelting is carried on on a large scale in the west of the county at Port Talbot, Cwmavon, Neath and Swansea, and on a small scale at Cardiff, the earliest works having been established at Neath in 1584 and at Swansea in 1717. There are nickel works at Clydach near Swansea, the nickel being imported in the form of "matte" from Canada. Swansea has almost a monopoly of the manufacture of spelter or zinc. Lead, silver and a number of other metals or their by-products are treated in or near Swansea, which is often styled the "metallurgical capital of Wales." Limestone and silica quarries are worked, while sandstone and clay are also raised. Swansea and Nantgarw were formerly famous for their china, coarse ware is still made chiefly at Ewenny and terra-cotta at Pencoed. Large numbers of people are employed in engineering works and in the manufacture of machines, chains, conveyances, tools, paper and chemicals. The textile factories are few and unimportant.

Fisheries.—Fisheries exist all along the coast; by lines, draughtnets, dredging, trawling, fixed nets and by hand. There is a fleet of trawlers at Swansea. The principal fish caught are cod, herring, pollock, whiting, flukes, brill, plaice, soles, turbot, oysters, mussels, limpets, cockles, shrimps, crabs and lobsters. There are good fish-markets at Swansea and Cardiff.

Communications.—The county has ample dock accommodation. The various docks of Cardiff amount to 210 acres, including timber ponds; Penarth has a dock and basin of 26 acres and a tidal harbour of 55 acres; Barry docks cover 74 acres; Swansea has 147 acres including its new King's Dock; and Port Talbot 90 acres. There are also docks at Briton Ferry and Porthcawl, but they are not capable of admitting deep-draft vessels.

Besides the ports, Glamorgan has abundant means of transit in many railways, of which the Great Western is the chief. Its trunk line traversing the country between the mountains and the sea passes through Cardiff, Bridgend and Landore (on the outskirts of Swansea), and throws off numerous branches to the north. The Taff Vale railway serves all the valley of the Taff and its tributaries, and has also extensions to Barry and (through Llantrisant and Cowbridge) to Aberthaw. The Rhymney railway likewise serves the Rhymney Valley, and has a joint service with the Great Western between Cardiff and Merthyr Tydfil—the latter town being also the terminus of the Brecon and Merthyr and a branch of the North-Western from Abergavenny. The Barry railway visits Cardiff and then travels in a north-westerly direction to Pontypridd and Porth, while it sends another branch along the coast through Llantwit Major to Bridgend. Swansea is connected with Merthyr by the Great Western, with Brecon by the Midland, with Craven Arms and Mid-Wales generally by the London & North-Western, with the Rhondda Valley by the Rhondda and Swansea Bay (now worked by the Great Western) and with Mumbles by the Mumbles railway. The Port Talbot

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railway runs to Blaengarw, and the Neath and Brecon railway (starting from Neath) joins the Midland at Colbren Junction. The canals of the county are the Glamorgan canal from Cardiff to Merthyr Tydfil (25¾ m.), with a branch (7 m.) to Aberdare, the Neath canal (13 m.) from Briton Ferry to Abernant, Glyn Neath (whence a tramway formerly connected it with Aberdare), the Tennant canal connecting the rivers Neath and Tawe, and the Swansea canal (16¼ m.), running up the Swansea Valley from Swansea to Abercraw in Breconshire. Comparatively little use is now made of these canals, excepting the lower portions of the Glamorgan canal.

Population and Administration.—The area of the ancient county with which the administrative county is conterminous is 518,863 acres, with a population in 1901 of 859,931 persons. In the three decades between 1831 and 1861 it increased 35·2, 35·4 and 37·1 % respectively, and in 1881–1891, 34·4, its average increase in the other decennial periods subsequent to 1861 being about 25%. The county is divided into five parliamentary divisions (viz. Glamorganshire East, South and Middle, Gower and Rhondda); it also includes the Cardiff district of boroughs (consisting of Cardiff, Cowbridge and Llantrisant), which has one member; the greater part of the parliamentary borough of Merthyr Tydfil (which mainly consists of the county borough of Merthyr, the urban district of Aberdare and part of Mountain Ash), and returns two members; and the two divisions of Swansea District returning one member each, one division consisting of the major part of Swansea town, the other comprising the remainder of Swansea and the boroughs of Aberavon, Kenfig, Llwchwr and Neath. There are six municipal boroughs: Aberavon (pop. in 1901, 7553), Cardiff (164,333), Cowbridge (1202), Merthyr Tydfil (69,228), Neath (13,720) and Swansea (94,537). Cardiff (which in 1905 was created a city), Merthyr Tydfil and Swansea are county boroughs. The following are urban districts: Aberdare (43,365), Barry (27,030), Bridgend (6062), Briton Ferry (6973), Caerphilly (6,835), Glyncorrwg (12,000), Maesteg (15,012), Mountain Ash (9014), Mountain Ash (31,093), Ogmore and Garw (19,907), Ystermouth (4461), Penarth (14,228), Pontypridd (32,316), Porthcawl (1872) and Rhondda, previously known as Ystradyfodwg (113,735). Glamorgan is in the S. Wales circuit, and both assizes and quarter-sessions are held at Cardiff and Swansea alternately. All the municipal boroughs have separate commissions of the peace, and Cardiff and Swansea have also separate courts of quarter-sessions. The county has thirteen other petty sessional divisions, Cardiff, the Rhondda (with Pontypridd) and the Merthyr and Aberdare district have stipendiary magistrates. There are 165 civil parishes. Excepting the districts of Gower and Kilvey, which are in the diocese of St David's, the whole county is in the diocese of Llandaff. There are 159 ecclesiastical parishes or districts situated wholly or partly within the county.

History.—The earliest known traces of man within the area of the present county are the human remains found in the famous bone-caves of Gower, though they are scanty as compared with the huge deposits of still earlier animal remains. To a later stage, perhaps in the Neolithic period, belongs a number of complete skeletons discovered in 1903 in sand-blown tumuli at the mouth of the Ogmore, where many flint implements were also found. Considerably later, and probably belonging to the Bronze Age (though finds of bronze implements have been scanty), are the many cairns and tumuli, mainly on the hills, such as on Garth Mountain near Cardiff, Crug-yr-avan and a number east of the Tawe; the stone circle often found in association with the tumuli, that of Carn Llechart near Penmaendare being one of the most complete in Wales; and the fine cromlechs of Cefn Bryn in Gower (known as Arthur's Stone), of St Nicholas and of St Lythan's near Cardiff.

In Roman times the country from the Neath to the Wye was occupied by the Silures, a pre-Celtic race, probably governed at that time by Brythonic Celts. West of the Neath and along the fringe of the Brecknock Mountains were probably remnants of the earlier Goidelic Celts, who have left traces in the place-names of the Swansea valley (*e.g. llwch*, "a lake") and in the illegible Ogham inscription at Loughor, the only other Ogham stone in the county being at Kenfig, a few miles to the east of the Neath estuary. The conquest of the Silures by the Romans was begun about A.D. 50 by Ostorius Scapula and completed some 25 years later by Julius Frontinus, who probably constructed the great military road, called Via Julia Maritima, from Gloucester to St David's, with stations at Cardiff, Bovium (variously identified with Boverton, Cowbridge and Ewenny), Nidum (identified with Neath) and Leucarum or Loughor. The important station of Gaer on the Usk near Brecon was connected by two branch roads, one running from Cardiff through Gelligaer (where there was a strong hill fort) and Merthyr Tydfil, and another from Neath through Capel Colbren. Welsh tradition credits Glamorgan with being the first home of Christianity, and Llandaff the earliest bishopric in Britain, the name of three reputed missionaries of the 2nd century being preserved in the names of parishes in south Glamorgan. What is certain, however, is that the first two bishops of Llandaff, St Dubricius and St Teilo, lived during the first half of the 6th century, to which period also belongs the establishment of the great monastic settlements of Llancarvan by Cadoc, of Llandough by Oudoceus and of Llantwit Major by Illtutus, the last of which flourished as a seat of learning down to the 12th century. A few moated mounds such as at Cardiff indicate that, after the withdrawal of the Romans, the coasts were visited by sporadic bands of Saxons, hut the Scandinavians who came in the 9th and succeeding centuries left more abundant traces both in the place-names of the coast and in such camps as that on Sully Island, the Bulwarks at Porthkerry and Hardings Down in Gower. Meanwhile the native tribes of the district had regained their independence under a line of Welsh chieftains, whose domain was consolidated into a principality known as Glywyssing, till about the end of the 10th century when it acquired the name of Morganwg, that is the territory of Morgan, a prince who died in A.D. 980; it then comprised the whole country from the Neath to the Wye, practically corresponding to the present diocese of Llandaff. Gwlad Morgan, later softened into Glamorgan, never had much vogue and meant precisely the same as Morganwg, though the two terms became differentiated a few centuries later.

The Norman conquest of Morganwg was effected in the closing years of the 11th century by Robert Fitzhamon, lord of Gloucester. His followers settled in the low-lying lands of the "Vale," which became known as the "body" of the shire, while in the hill country, which consisted of ten "members," corresponding to its ancient territorial divisions, the Welsh retained their customary laws and much of their independence. Glamorgan, whose bounds were now contracted between the Neath and the Rhymney, then became a lordship marcher, its status and organization being that of a county palatine; its lord possessed *jura regalia*, and his chief official was from the first a *vice-comes*, or sheriff, who presided over a county court composed of his lord's principal tenants. The inhabitants of Cardiff in which, as the *caput baroniae*, this court was held (though sometimes ambulatory), were soon granted municipal privileges, and in time Cowbridge, Kenfig, Llantrisant, Aberavon and Neath also became chartered market-towns. The manorial system was introduced throughout the "Vale," the manor in many cases becoming the parish, and the owner building for its protection first a castle and then a church. The church itself became Normanized, and monasteries were established—the Cistercian abbey of Neath and Margam in 1129 and 1147 respectively, the Benedictine priory of Ewenny in 1141 and that of Cardiff in 1147. Dominican and Franciscan houses were also founded at Cardiff in the following century.

Gower (with Kilvey) or the country west of the morass between Neath and Swansea had a separate history. It was conquered about 1100 by Henry de Newburgh, 1st earl of Warwick, by whose descendants and the powerful family of De Breos it was successively held as a marcher lordship, organized to some extent on county lines, till 1469. Swansea (which was the *caput baroniae* of Gower) and Loughor received their earlier charters from the lords of Gower (see GOWER).

For the first two centuries after Fitzhamon's time the lordship of Glamorgan was held by the earls of Gloucester, a title conferred by Henry I. on his natural son Robert, who acquired Glamorgan by marrying Fitzhamon's daughter. To the 1st earl's patronage of Geoffrey of Monmouth and other men of letters, at Cardiff Castle of which he was the builder, is probably due the large place which Celtic romance, especially the Arthurian cycle, won for itself in medieval literature. The lordship passed by descent through the families of Clare (who held it from 1217 to 1317), Despenser, Beauchamp and Neville to Richard III., on whose fall it escheated to the crown. From time to time, the Welsh of the hills, often joined by their countrymen from other

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parts, raided the Vale, and even Cardiff Castle was seized about 1153 by Ivor Bach, lord of Senghenydd, who for a time held its lord a prisoner. At last Caerphilly Castle was built to keep them in check, but this provoked an invasion in 1270 by Prince Llewelyn ap Griffith, who besieged the castle and refused to retire except on conditions. In 1316 Llewelyn Bren headed a revolt in the same district, but being defeated was put to death by Despenser, whose great unpopularity with the Welsh made Glamorgan less safe as a retreat for Edward II. a few years later. In 1404 Glendower swept through the county, burning castles and laying waste the possessions of the king's supporters. By the Act of Union of 1535 the county of Glamorgan was incorporated as it now exists, by the addition to the old county of the lordship of Gower and Kilvey, west of the Neath. By another act of 1542 the court of great sessions was established, and Glamorgan, with the counties of Brecon and Radnor, formed one of its four Welsh circuits from thence till 1830, when the English assize system was introduced into Wales. In the same year the county was given one parliamentary representative, increased to two in 1832 and to five in 1885. The boroughs were also given a member. In 1832 Cardiff (with Llantrisant and Cowbridge), the Swansea group of boroughs and the parliamentary borough of Merthyr Tydfil were given one member each, increased to two, in the case of Merthyr Tydfil in 1867. In 1885 the Swansea group was divided into two constituencies with a member each.

The lordship of Glamorgan, shorn of its quasi-regal status, was granted by Edward VI. to William Herbert, afterwards 1st earl of Pembroke, from whom it has descended to the present marquess of Bute.

The rule of the Tudors promoted the rapid assimilation of the inhabitants of the county, and by the reign of Elizabeth even the descendants of the Norman knights had largely become Welsh both in speech and sentiment. Welsh continued to be the prevalent speech almost throughout the county, except in the peninsular part of Gower and perhaps Cardiff, till the last quarter of the 19th century. Since then it has lost ground in the maritime towns and the south-east corner of the county generally, while fairly holding its own, despite much English migration, in the industrial districts to the north. In 1901 about 56% of the total population above three years of age was returned as speaking English only, 37% as speaking both English and Welsh, and about 6¾% as speaking Welsh only.

In common with the rest of Wales the county was mainly Royalist in the Civil War, and indeed stood foremost in its readiness to pay ship-money, but when Charles I. visited Cardiff in July 1645 he failed to recruit his army there, owing to the dissatisfaction of the county, which a few months later declared for the parliament. There was, however, a subsequent Royalist revolt in Glamorgan in 1648, but it was signally crushed by Colonel Horton at the battle of St Fagan's (8th of May).

The educational gap caused by final disappearance of the great university of Llantwit Major, founded in the 6th century, and by the dissolution of the monasteries was to some extent filled by the foundation, by the Stradling family, of a grammar school at Cowbridge which, refounded in 1685 by Sir Leoline Jenkins, is still carried on as an endowed school. The only other ancient grammar school is that of Swansea, founded by Bishop Gore in 1682, and now under the control of the borough council. Besides the University College of South Wales and Monmouthshire established at Cardiff in 1883, and a technical college at Swansea, there is a Church of England theological college (St Michael's) at Llandaff (previously at Aberdare), a training college for school-mistresses at Swansea, schools for the blind at Cardiff and Swansea and for the deaf at Cardiff, Swansea and Pontypridd.

Antiquities.—The antiquities of the county not already mentioned include an unusually large number of castles, all of which, except the castles of Morlais (near Merthyr Tydfil), Castell Coch and Llantrisant, are between the hill country and the sea. The finest specimen is that of Caerphilly, but there are also more or less imposing ruins at Oystermouth, Coity, Newcastle (at Bridgend), Llanblethian, Pennard and Swansea. Among the restored castles, resided in by their present owners, are St Donat's, "the latest and most complete of the structures built for defence," Cardiff, the residence of the marquess of Bute, St Fagan's, Dunraven, Fonmon and Penrice. Of the monastic buildings, that of Ewenny is best preserved, Neath and Margam are mere ruins, while all the others have disappeared. Almost all the older churches possess towers of a somewhat military character, and most of them, except in Gower, retain some Norman masonry. Coity, Coychurch and Ewenny (all near Bridgend) are fine examples of cross churches with embattled towers characteristic of the county. There are interesting monumental effigies at St Mary's, Swansea, Oxwich, Ewenny, Llantwit Major, Llantrisant, Coity and other churches in the Vale. There are from twenty-five to thirty sculptured stones, of which some sixteen are both ornamented and inscribed, five of the latter being at Margam and three at Llantwit Major, and dating from the 9th century if not earlier.

AUTHORITIES.—The records of the *Curia comitatus* or County Court of Glamorgan are supposed to have perished, so also have the records of Neath. With these exceptions, the records of the county have been well preserved. A collection edited by G. T. Clark under the title *Cartae et alia munimenta quae ad dominium de Glamorgan pertinent* was privately printed by him in four volumes (1885–1893). *A Descriptive Catalogue of the Penrice and Margam Abbey MSS. in the Possession of Miss Talbot of Margam* (6 vols.) was privately issued (1893–1905) under the editorship of Dr de Gray Birch, who has also published histories of Abbeys of Neath and Margam. *The Book of Llan Dâf* (edited by Dr Gwenogvryn Evans, 1903) contains documents illustrative of the early history of the diocese of Llandaff. Cardiff has published its *Records* in 5 vols., and there is a volume of Swansea charters. There is no complete history of the county, except a modest but useful one in Welsh—*Hanes Morganwg*, by D. W. Jones (Dafydd Morganwg) (1874); the chief contributions are Rice Merrick's *Booke of Glamorgan's Antiquities*, written in 1578; *The Land of Morgan* (1883) (a history of the lordship of Glamorgan), by G. T. Clark, whose *Genealogies of Glamorgan* (1886) and *Medieval Military Architecture* (1884) are also indispensable; see also T. Nicholas, *Annals and Antiquities of the Counties and County Families of Wales* (2 vols., 1872). For Gower, see GOWER. (D. LL. T.)

GLANDERS, or FARCY (*Equinia*), a specific infective and contagious disease, caused by a tissue parasite (*Bacillus mallei*), to which certain animals, chiefly the horse, ass and mule, are liable, and which is communicable from them to man. Glanders in the domesticated animals is dealt with under VETERINARY SCIENCE; it is happily a rare form of disease in man, there being evidently less affinity for its development in the human subject than in the equine species. For the pathology see the article PARASITIC DISEASES. It occurs chiefly among those who from their occupation are frequently in contact with horses, such as grooms, coachmen, cavalry soldiers, veterinary surgeons, &c.; the bacillus is communicated from a glandered animal either through a wound or scratch or through application to the mucous membrane of the nose or mouth. A period of incubation, lasting from two days to five days, generally follows the introduction of the virus into the human system. This period, however, appears sometimes to be of much longer duration, especially where there has been no direct inoculation of the poison. The first symptoms are a general feeling of illness, accompanied with pains in the limbs and joints resembling those of acute rheumatism. If the disease has been introduced by means of an abraded surface, pain is felt at that point, and inflammatory swelling takes place there, and extends along the neighbouring lymphatics. An ulcer is formed at the point of inoculation which discharges an offensive ichor, and blebs appear in the inflamed skin, along with diffuse abscesses, as in phlegmonous erysipelas. Sometimes the disease stops short with these local manifestations, but more commonly goes on rapidly accompanied with symptoms of grave constitutional disturbance. Over the whole surface of the body there appear numerous red spots or pustules, which break and discharge a thick mucous or sanguineous fluid. Besides these there are larger swellings lying deeper in the subcutaneous tissue, which at first are extremely hard and painful, and to which the term farcy "buds" or "buttons" is applied. These ultimately open and become extensive sloughing ulcers.

The mucous membranes participate in the same lesions as

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are present in the skin, and this is particularly the case with the interior of the nose, where indeed, in many instances, the disease first of all shows itself. This organ becomes greatly swollen and inflamed, while from one or both nostrils there exudes a copious discharge of highly offensive purulent or sanguineous matter. The lining membrane of the nostrils is covered with papules similar in character to those on the skin, which form ulcers, and may lead to the destruction of the cartilaginous and bony textures of the nose. The diseased action extends into the throat, mouth and eyes, while the whole face becomes swollen and erysipelatous, and the lymphatic glands under the jaws inflame and suppurate. Not unfrequently the bronchial tubes become affected, and cough attended with expectoration of matter similar to that discharged from the nose is the consequence. The general constitutional symptoms are exceedingly severe, and advance with great rapidity, the patient passing into a state of extreme prostration. In the acute form of the disease recovery rarely if ever occurs, and the case generally terminates fatally in a period varying from two or three days to as many weeks.

A chronic form of glanders and farcy is occasionally met with, in which the symptoms, although essentially the same as those above described, advance much more slowly, and are attended with relatively less urgent constitutional disturbance. Cases of recovery from this form are on record; but in general the disease ultimately proves fatal by exhaustion of the patient, or by a sudden supervention, which is apt to occur, of the acute form. On the other hand, acute glanders is never observed to become chronic.

In the treatment of this malady in human beings reliance is mainly placed on the maintenance of the patient's strength by strong nourishment and tonic remedies. Cauterization should be resorted to if the point of infection is early known. Abscesses may be opened and antiseptic lotions used. In all cases of the outbreak of glanders it is of the utmost consequence to prevent the spread of the disease by the destruction of affected animals and the cleansing and disinfection of infected localities.

GLANVILL (or GLANVIL), **JOSEPH** (1636–1680), English philosopher, was born at Plymouth in 1636, and was educated at Exeter and Lincoln colleges, Oxford, where he graduated as M.A. in 1658. After the Restoration he was successively rector of Wimbush, Essex, vicar of Frome Selwood, Somersetshire, rector of Streat and Walton. In 1666 he was appointed to the abbey church, Bath; in 1678 he became prebendary of Worcester Cathedral, and acted as chaplain in ordinary to Charles II. from 1672. He died at Bath in November 1680. Glanvill's first work (a passage in which suggested the theme of Matthew Arnold's *Scholar Gipsy*), *The Vanity of Dogmatising, or Confidence in Opinions, manifested in a Discourse of the shortness and uncertainty of our Knowledge, and its Causes, with Reflexions on Peripateticism, and an Apology for Philosophy* (1661), is interesting as showing one special direction in which the new method of the Cartesian philosophy might be developed. Pascal had already shown how philosophical scepticism might be employed as a bulwark for faith, and Glanvill follows in the same track. The philosophic endeavour to cognize the whole system of things by referring all events to their causes appears to him to be from the outset doomed to failure. For if we inquire into this causal relation we find that though we know isolated facts, we cannot perceive any such connexion between them as that the one should give rise to the other. In the words of Hume, "they seem conjoined but never connected." All causes then are but secondary, *i.e.* merely the occasions on which the one first cause operates. It is singular enough that Glanvill who had not only shown, but even exaggerated, the infirmity of human reason, himself provided an example of its weakness; for, after having combated scientific dogmatism, he not only yielded to vulgar superstitions, but actually endeavoured to accredit them both in his revised edition of the *Vanity of Dogmatising*, published as *Scepsis scientifica* (1665, ed. Rev. John Owen, 1883), and in his *Philosophical Considerations concerning the existence of Sorcerers and Sorcery* (1666). The latter work appears to have been based on the story of the drum which was alleged to have been heard every night in a house in Wiltshire (Tedworth, belonging to a Mr Mompesson), a story which made much noise in the year 1663, and which is supposed to have furnished Addison with the idea of his comedy the *Drummer*. At his death Glanvill left a piece entitled *Saducismus Triumphatus* (printed in 1681, reprinted with some additions in 1682, German trans. 1701). He had there collected twenty-six relations or stories of the same description as that of the drum, in order to establish, by a series of facts, the opinion which he had expressed in his *Philosophical Considerations*. Glanvill supported a much more honourable cause when he undertook the defence of the Royal Society of London, under the title of *Plus Ultra, or the Progress and Advancement of Science since the time of Aristotle* (1668), a work which shows how thoroughly he was imbued with the ideas of the empirical method.

Besides the works already noticed, Glanvill wrote *Lux orientalis* (1662); *Philosophia pia* (1671); *Essays on Several Important Subjects in Philosophy and Religion* (1676); *An Essay concerning Preaching*; and *Sermons*. See C. Rémusat, *Hist. de la phil. en Angleterre*, bk. iii. ch. xi.; W. E. H. Lecky, *Rationalism in Europe* (1865), i. 120-128; Hallam's *Literature of Europe*, iii. 358-362; Tulloch's *Rational Theology*, ii. 443-455.

GLANVILL, RANULF DE (sometimes written GLANVIL, GLANVILLE) (d. 1190), chief justiciar of England and reputed author of a book on English law, was born at Stratford in Suffolk, but in what year is unknown. There is but little information regarding his early life. He first comes to the front as sheriff of Yorkshire from 1163 to 1170. In 1173 he became sheriff of Lancashire and custodian of the honour of Richmond. In 1174 he was one of the English leaders at the battle of Alnwick, and it was to him that the king of the Scots, William the Lion, surrendered. In 1175 he was reappointed sheriff of Yorkshire, in 1176 he became justice of the king's court and a justice itinerant in the northern circuit, and in 1180 chief justiciar of England. It was with his assistance that Henry II. completed his judicial reforms, though the principal of them had been carried out before he came into office. He became the king's right-hand man, and during Henry's frequent absences was in effect viceroy of England. After the death of Henry in 1189, Glanvill was removed from his office by Richard I., and imprisoned till he had paid a ransom, according to one authority, of £15,000. Shortly after obtaining his freedom he took the cross, and he died at the siege of Acre in 1190. At the instance, it may be, of Henry II., Glanvill wrote or superintended the writing of the *Tractatus de legibus et consuetudinibus regni Angliae*, which is a practical treatise on the forms of procedure in the king's court. As the source of our knowledge regarding the earliest form of the *curia regis*, and for the information it affords regarding ancient customs and laws, it is of great value to the student of English history. It is now generally agreed that the work of Glanvill is of earlier date than the Scottish law book known from its first words as *Regiam Majestatem*, a work which bears a close resemblance to his.

The treatise of Glanvill was first printed in 1554. An English translation, with notes and introduction by John Beames, was published at London in 1812. A French version is found in various MSS., but has not yet been printed. (See also ENGLISH LAW: *History of.*)

GLAPTHORNE, HENRY (fl. 1635–1642), English poet and dramatist, wrote in the reign of Charles I. All that is known of him is gathered from his own work. He published *Poëms* (1639), many of them in praise of an unidentified "Lucinda"; a poem in honour of his friend Thomas Beedome, whose *Poems Divine and Humane* he edited in 1641; and *Whitehall* (1642), dedicated to his "noble friend and gossip, Captain Richard Lovelace." The first volume contains a poem in honour of the duke of York, and *Whitehall* is a review of the past glories of the English court, containing abundant evidences of the writer's devotion to the royal cause. *Argalus and Parthenia* (1639) is a pastoral tragedy founded on an episode in Sidney's *Arcadia*; *Albertus Wallenstein* (1639), his only attempt at historical tragedy, represents Wallenstein as a monster of pride and cruelty. His

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other plays are *The Hollander* (written 1635; printed 1640), a romantic comedy of which the scene is laid in Genoa; *Wit in a Constable* (1640), which is probably a version of an earlier play, and owes something to Shakespeare's *Much Ado about Nothing*; and *The Ladies Priviledge* (1640). *The Lady Mother* (1635) has been identified (Fleay, *Biog. Chron. of the Drama*) with *The Noble Trial*, one of the plays destroyed by Warburton's cook, and Mr A. H. Bullen prints it in vol. ii. of his *Old English Plays* as most probably Glapthorne's work. *The Paraside, or Revenge for Honour* (1654), entered at Stationers' Hall in 1653 as Glapthorne's, was printed in the next year with George Chapman's name on the title-page. It should probably be included among Glapthorne's plays, which, though they hardly rise above the level of contemporary productions, contain many felicitous isolated passages.

The *Plays and Poems of Henry Glapthorne* (1874) contains an unsigned memoir, which, however, gives no information about the dramatist's life. There is no reason for supposing that the George Glapthorne of whose trial details are given was a relative of the poet.

GLARUS (Fr. *Glaris*), one of the Swiss cantons, the name being taken from that of its chief town. Its area is 266·8 sq. m., of which 173·1 sq. m. are classed as "productive" (forests covering 41 sq. m.), but it also contains 13·9 sq. m. of glaciers, ranking as the fifth Swiss canton in this respect. It is thus a mountain canton, the loftiest point in it being the Tödi (11,887 ft.), the highest summit that rises to the north of the upper Aar and Vorder Rhine valleys. It is composed of the upper valley of the Linth, that is the portion which lies to the south of a line drawn from the Lake of Zürich to the Walensee. This river rises in the glaciers of the Tödi, and has carved out for itself a deep bed, so that the floor of the valley is comparatively level, and therefore is occupied by a number of considerable villages. Glacier passes only lead from its head to the Grisons, save the rough footpath over the Kisten Pass, while a fine new carriage road over the Klausen Pass gives access to the canton of Uri. The upper Linth valley is sometimes called the Grossthal (main valley) to distinguish it from its chief (or south-eastern) tributary, the Sernf valley or Kleinthal, which joins it at Schwanden, a little above Glarus itself. At the head of the Kleinthal a mule track leads to the Grisons over the Panixer Pass, as also a footpath over the Segnes Pass. Just below Glarus town, another glen (coming from the south-west) joins the main valley, and is watered by the Klön, while from its head the Pragel Pass (a mule path, converted into a carriage road) leads over to the canton of Schwyz. The Klön glen (uninhabited save in summer) is separated from the main glen by the fine bold mass of the Glärnisch (9580 ft.), while the Sernf valley is similarly cut off from the Grossthal by the high ridge running northwards from the Hausstock (10,342 ft.) over the Kärpfstock (9177 ft.). The principal lakes, the Klönthalersee and the Muttensee, are of a thoroughly Alpine character, while there are several fine waterfalls near the head of the main valley, such as those formed by the Sandbach, the Schrelenbach and the Fätschbach. The Pantenbrücke, thrown over the narrow cleft formed by the Linth, is one of the grandest sights of the Alps below the snow-line. There is a sulphur spring at Stachelberg, near Linthal village, and an iron spring at Elm, while in the Sernf valley there are the Plattenberg slate quarries, and just south of Elm those of the Tschingelberg, whence a terrific landslip descended to Elm (11th September 1881), destroying many houses and killing 115 persons. A railway runs through the whole canton from north to south past Glarus to Linthal village (16½ m.), while from Schwanden there is an electric line (opened in 1905) up to Elm (8¼ m.).

In 1900 the population of the canton was 32,349 (a decrease on the 33,825 of 1888, this being the only Swiss canton which shows a decrease), of whom 31,797 were German-speaking, while there were 24,403 Protestants, 7018 Romanists (many in Näfels) and 3 Jews. After the capital, Glarus (*q.v.*), the largest villages are Näfels (2557 inhabitants), Ennenda (2404 inhabitants, opposite Glarus, of which it is practically a suburb), Netstal (2003 inhabitants), Mollis (1912 inhabitants) and Linththal (1894 inhabitants). The slate industry is now the most important as the cotton manufacture has lately very greatly fallen off, this being the real reason of the diminution in the number of the population. There is little agriculture, for it is a pastoral region (owing to its height) and contains 87 mountain pastures (though the finest of all within the limits of the canton, the Urnerboden, or the Glarus side of the Klausen Pass, belongs to Uri), which can support 8054 cows, and are of an estimated capital value of about £246,000. One of the most characteristic products (though inferior qualities are manufactured elsewhere in Switzerland) is the cheese called *Schabsieger*, *Kräuterkäse*, or green cheese, made of skim milk (*Zieger* or *strac*), whether of goats or cows, mixed with buttermilk and coloured with powdered *Steinklee* (*Melilotus officinalis*) or *blauer Honigklee* (*Melilotus caerulea*). The curds are brought down from the huts on the pastures, and, after being mixed with the dried powder, are ground in a mill, then put into shapes and pressed. The cheese thus produced is ripe in about a year, keeps a long time and is largely exported, even to America. The ice formed on the surface of the Klönthalersee in winter is stored up on its shore and exported. A certain number of visitors come to the canton in the summer, either to profit by one or other of the mineral springs mentioned above, or simply to enjoy the beauties of nature, especially at Obstalden, above the Walensee. The canton forms but a single administrative district and contains 28 communes. It sends to the Federal *Ständerath* 2 representatives (elected by the *Landsgemeinde*) and 2 also to the Federal *Nationalrath*. The canton still keeps its primitive democratic assembly or *Landsgemeinde* (meeting annually in the open air at Glarus on the first Sunday in May), composed of all male citizens of 20 years of age. It acts as the sovereign body, so that no "referendum" is required, while any citizen can submit a proposal. It names the executive of 6 members, besides the Landammann or president, all holding office for three years. The communes (forming 18 electoral circles) elect for three years the *Landrath*, a sort of standing committee composed of members in the proportion of 1 for every 500 inhabitants or fraction over 250. The present constitution dates from 1887.

(W. A. B. C.)

GLARUS (Fr. *Glaris*), the capital of the Swiss canton of the same name. It is a clean, modern little town, built on the left bank of the Linth (opposite it is the industrial suburb of Ennenda on the right bank), at the north-eastern foot of the imposing rock peak of the Vorder Glärnisch (7648 ft.), while on the east rises the Schild (6400 ft.). It now contains but few houses built before 1861, for on the 10/11 May 1861 practically the whole town was destroyed by fire that was fanned by a violent *Föhn* or south wind, rushing down from the high mountains through the natural funnel formed by the Linth valley. The total loss is estimated at about half a million sterling, of which about £100,000 were made up by subscriptions that poured in from every side. It possesses the broad streets and usual buildings of a modern town, the parish church being by far the most stately and well-situated building; it is used in common by the Protestants and Romans. Zwingli, the reformer, was parish priest here from 1506 to 1516, before he became a Protestant. The town is 1578 ft. above the sea-level, and in 1900 had a population of 4877, almost all German-speaking, while 1248 were Romanists. For the Linth canals (1811 and 1816) see LINTH.

The DISTRICT OF GLARUS is said to have been converted to Christianity in the 6th century by the Irish monk, Fridolin, whose special protector was St Hilary of Poitiers; the former was the founder, and both were patrons, of the Benedictine nunnery of Säckingen, on the Rhine between Constance and Basel, that about the 9th century became the owner of the district which was then named after St Hilary. The Habsburgs, protectors of the nunnery, gradually drew to themselves the exercise of all the rights of the nuns, so that in 1352 Glarus joined the Swiss Confederation. But the men of Glarus did not gain their complete freedom till after they had driven back the Habsburgs in the glorious battle of Näfels (1388), the complement of Sempach, so that the Habsburgers gave up their rights

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in 1308, while those of Säckingen were bought up in 1395, on condition of a small annual payment. Glarus early adopted Protestantism, but there were many struggles later on between the two parties, as the chief family, that of Tschudi, adhered to the old faith. At last it was arranged that, besides the common *Landsgemeinde*, each party should have its separate *Landsgemeinde* (1623) and tribunals (1683), while it was not till 1798 that the Protestants agreed to accept the Gregorian calendar. The slate-quarrying industry appeared early in the 17th century, while cotton-spinning was introduced about 1714, and calico-printing by 1750. In 1798, in consequence of the resistance of Glarus to the French invaders, the canton was united to other districts under the name of canton of the Linth, though in 1803 it was reduced to its former limits. In 1799 it was traversed by the Russian army, under Suworoff, coming over the Pragel Pass, but blocked by the French at Näfels, and so driven over the Panixer to the Grisons. The old system of government was set up again in 1814. But in 1836 by the new Liberal constitution one single *Landsgemeinde* was restored, despite the resistance (1837) of the Romanist population at Näfels.

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GLAS, GEORGE (1725–1765), Scottish seaman and merchant adventurer in West Africa, son of John Glas the divine, was born at Dundee in 1725, and is said to have been brought up as a surgeon. He obtained command of a ship which traded between Brazil, the N.W. coasts of Africa and the Canary Islands. During his voyages he discovered on the Saharan seaboard a river navigable for some distance inland, and here he proposed to found a trading station. The exact spot is not known with certainty, but it is plausibly identified with Gueder, a place in about 29° 10′ N., possibly the haven where the Spaniards had in the 15th and 16th centuries a fort called Santa Cruz de Mar Pequeña. Glas made an arrangement with the Lords of Trade whereby he was granted £15,000 if he obtained free cession of the port he had discovered to the British crown; the proposal was to be laid before parliament in the session of 1765. Having chartered a vessel, Glas, with his wife and daughter, sailed for Africa in 1764, reached his destination and made a treaty with the Moors of the district. He named his settlement Port Hillsborough, after Wills Hill, earl of Hillsborough (afterwards marquis of Downshire), president of the Board of Trade and Plantations, 1763–1765. In November 1764 Glas and some companions, leaving his ship behind, went in the longboat to Lanzarote, intending to buy a small barque suitable for the navigation of the river on which was his settlement. From Lanzarote he forwarded to London the treaty he had concluded for the acquisition of Port Hillsborough. A few days later he was seized by the Spaniards, taken to Teneriffe and imprisoned at Santa Cruz. In a letter to the Lords of Trade from Teneriffe, dated the 15th of December 1764, Glas said he believed the reason for his detention was the jealousy of the Spaniards at the settlement at Port Hillsborough "because from thence in time of war the English might ruin their fishery and effectually stop the whole commerce of the Canary Islands." The Spaniards further looked upon the settlement as a step towards the conquest of the islands. "They are therefore contriving how to make out a claim to the port and will forge old manuscripts to prove their assertion" (*Calendar of Home Office Papers*, 1760–1765). In March 1765 the ship's company at Port Hillsborough was attacked by the natives and several members of it killed. The survivors, including Mrs and Miss Glas, escaped to Teneriffe. In October following, through the representations of the British government, Glas was released from prison. With his wife and child he set sail for England on board the barque "Earl of Sandwich." On the 30th of November Spanish and Portuguese members of the crew, who had learned that the ship contained much treasure, mutinied, killing the captain and passengers. Glas was stabbed to death, and his wife and daughter thrown overboard. (The murderers were afterwards captured and hanged at Dublin.) After the death of Glas the British government appears to have taken no steps to carry out his project.

In 1764 Glas published in London *The History of the Discovery and Conquest of the Canary Islands*, which he had translated from the MS. of an Andalusian monk named Juan Abreu de Galindo, then recently discovered at Palma. To this Glas added a description of the islands, a continuation of the history and an account of the manners, customs, trade, &c., of the inhabitants, displaying considerable knowledge of the archipelago.

GLAS, JOHN (1695–1773), Scottish divine, was born at Auchtermuchty, Fife, where his father was parish minister, on the 5th of October 1695. He was educated at Kinclaven and the grammar school, Perth, graduated A.M. at the university of St Andrews in 1713, and completed his education for the ministry at Edinburgh. He was licensed as a preacher by the presbytery of Dunkeld, and soon afterwards ordained by that of Dundee as minister of the parish of Tealing (1719), where his effective preaching soon secured a large congregation. Early in his ministry he was "brought to a stand" while lecturing on the "Shorter Catechism" by the question "How doth Christ execute the office of a king?" This led to an examination of the New Testament foundation of the Christian Church, and in 1725, in a letter to Francis Archibald, minister of Guthrie, Forfarshire, he repudiated the obligation of national covenants. In the same year his views found expression in the formation of a society "separate from the multitude" numbering nearly a hundred, and drawn from his own and neighbouring parishes. The members of this *ecclesiola in ecclesia* pledged themselves "to join together in the Christian profession, to follow Christ the Lord as the righteousness of his people, to walk together in brotherly love, and in the duties of it, in subjection to Mr Glas as their overseer in the Lord, to observe the ordinance of the Lord's Supper once every month, to submit themselves to the Lord's law for removing offences," &c. (Matt. xviii. 15–20). From the scriptural doctrine of the essentially spiritual nature of the kingdom of Christ, Glas in his public teaching drew the conclusions: (1) that there is no warrant in the New Testament for a national church; (2) that the magistrate as such has no function in the church; (3) that national covenants are without scriptural grounds; (4) that the true Reformation cannot be carried out by political and secular weapons but by the word and spirit of Christ only.

This argument is most fully exhibited in a treatise entitled *The Testimony of the King of Martyrs* (1729). For the promulgation of these views, which were confessedly at variance with the doctrines of the standards of the national church of Scotland, he was summoned (1726) before his presbytery, where in the course of the investigations which followed he affirmed still more explicitly his belief that "every national church established by the laws of earthly kingdoms is antichristian in its constitution and persecuting in its spirit," and further declared opinions upon the subject of church government which amounted to a repudiation of Presbyterianism and an acceptance of the puritan type of Independency. For these opinions he was in 1728 suspended from the discharge of ministerial functions, and finally deposed in 1730. The members of the society already referred to, however, for the most part continued to adhere

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to him, thus constituting the first "Glassite" or "Glasite" church. The seat of this congregation was shortly afterwards transferred to Dundee (whence Glas subsequently removed to Edinburgh), where he officiated for some time as an "elder." He next laboured in Perth for a few years, where he was joined by Robert Sandeman (see GLASITES), who became his son-in-law, and eventually was recognized as the leader and principal exponent of Glas's views; these he developed in a direction which laid them open to the charge of antinomianism. Ultimately in 1730 Glas returned to Dundee, where the remainder of his life was spent. He introduced in his church the primitive custom of the "osculum pacis" and the "agape" celebrated as a common meal with broth.' From this custom his congregation was known as the "kail kirk." In 1739 the General Assembly, without any application from him, removed the sentence of deposition which had been passed against him, and restored him to the character and function of a minister of the gospel of Christ, but not that of a minister of the Established Church of Scotland, declaring that he was not eligible for a charge until he should have renounced principles inconsistent with the constitution of the church.

A collected edition of his works was published at Edinburgh in 1761 (4 vols. 8vo), and again at Perth in 1782 (5 vols., 8vo). He died in 1773.

Glas's published works bear witness to his vigorous mind and scholarly attainments. His reconstruction of the *True Discourse of Celsus* (1753), from Origen's reply to it, is a consistent and logical piece of work. The *Testimony of the King of Martyrs concerning His Kingdom* (1729) is a classic repudiation of erastianism and defence of the spiritual autonomy of the church under Jesus Christ. His common sense appears in his rejection of Hutchinson's attempt to prove that the Bible supplies a complete system of physical science, and his shrewdness in his *Notes on Scripture Texts* (1747). He published a volume of Christian Songs (Perth, 1784). (D. MN.)

GLASER, CHRISTOPHER, a pharmaceutical chemist of the 17th century, was a native of Basel, became demonstrator of chemistry at the Jardin du Roi in Paris and apothecary to Louis XIV. and to the duke of Orleans. He is best known by his *Traité de la chymie* (Paris, 1663), which went through some ten editions in about five-and-twenty years, and was translated into both German and English. It has been alleged that he was an accomplice in the notorious poisonings carried out by the marchioness de Brinvilliers, but the extent of his complicity is doubtful. He appears to have died some time before 1676. The *sal polychrestum Glaseri* is normal potassium sulphate which he prepared and used medicinally.

GLASGOW, a city, county of a city, royal burgh and port of Lanarkshire, Scotland, situated on both banks of the Clyde, 40½ m. N.W. of London by the West Coast railway route, and 47 m. W.S.W. of Edinburgh by the North British railway. The valley of the Clyde is closely confined by hills, and the city extends far over these, the irregularity of its site making for picturesqueness. The commercial centre of Glasgow, with the majority of important public buildings, lies on the north bank of the river, which traverses the city from W.S.W. to E.N.E., and is crossed by a number of bridges. The uppermost is Dalmarnock Bridge, dating from 1891, and next below it is Rutherglen Bridge, rebuilt in 1896, and superseding a structure of 1775. St Andrew's suspension bridge gives access to the Green to the inhabitants of Hutchesontown, a district which is approached also by Albert Bridge, a handsome erection, leading from the Saltmarket. Above this bridge is the tidal dam and weir. Victoria Bridge, of granite, was opened in 1856, taking the place of the venerable bridge erected by Bishop Rae in 1345, which was demolished in 1847. Then follows a suspension bridge (dating from 1853) by which foot-passengers from the south side obtain access to St Enoch Square and, finally, the most important bridge of all is reached, variously known as Glasgow, Jamaica Street, or Broomielaw Bridge, built of granite from Telford's designs and first used in 1835. Towards the close of the century it was reconstructed, and reopened in 1899. At the busier periods of the day it bears a very heavy traffic. The stream is spanned between Victoria and Albert Bridges by a bridge belonging to the Glasgow & South-Western railway and by two bridges carrying the lines of the Caledonian railway, one below Dalmarnock Bridge and the other a massive work immediately west of Glasgow Bridge.

Buildings.—George Square, in the heart of the city, is an open space of which every possible advantage has been taken. On its eastern side stand the municipal buildings, a palatial pile in Venetian renaissance style, from the designs of William Young, a native of Paisley. They were opened in 1889 and cost nearly £600,000. They form a square block four storeys high and carry a domed turret at each end of the western façade, from the centre of which rises a massive tower. The entrance hall and grand staircase, the council chamber, banqueting hall and reception rooms are decorated in a grandiose style, not unbecoming to the commercial and industrial metropolis of Scotland. Several additional blocks have been built or rented for the accommodation of the municipal staff. Admirably equipped sanitary chambers were opened in 1897, including a bacteriological and chemical laboratory. Up till 1810 the town council met in a hall adjoining the old tolbooth. It then moved to the fine classical structure at the foot of the Saltmarket, which is now used as court-houses. This was vacated in 1842 for the county buildings in Wilson Street. Growth of business compelled another migration to Ingram Street in 1875, and, fourteen years later, it occupied its present quarters. On the southern side of George Square the chief structure is the massive General Post Office. On the western side stand two ornate Italian buildings, the Bank of Scotland and the Merchants' House, the head of which (the dean of gild), along with the head of the Trades' House (the deacon-convener of trades) has been *de facto* member of the town council since 1711, an arrangement devised with a view to adjusting the frequent disputes between the two gilds. The Royal Exchange, a Corinthian building with a fine portico of columns in two rows, is an admired example of the work of David Hamilton (1768–1843), a native of Glasgow, who designed several of the public buildings and churches, and gained the second prize for a design for the Houses of Parliament. The news-room of the exchange is a vast apartment, 130 ft. long, 60 ft. wide, 130 ft. high, with a richly-decorated roof supported by Corinthian pillars. Buchanan Street, the most important and handsome street in the city, contains the Stock Exchange, the Western Club House (by David Hamilton) and the offices of the *Glasgow Herald*. In Sauchiehall Street are the Fine Art Institute and the former Corporation Art Gallery. Argyll Street, the busiest thoroughfare, mainly occupied with shops, leads to Trongate, where a few remains of the old town are now carefully preserved. On the south side of the street, spanning the pavement, stands the Tron Steeple, a stunted spire dating from 1637. It is all that is left of St Mary's church, which was burned down in 1793 during the revels of a notorious body known as the Hell Fire Club. On the opposite side, at the corner of High Street, stood the ancient tolbooth, or prison, a turreted building, five storeys high, with a fine Jacobean crown tower. The only remnant of the structure is the tower known as the Cross Steeple.

Although almost all the old public buildings of Glasgow have been swept away, the cathedral remains in excellent preservation. It stands in the north-eastern quarter of the city, at a height of 104 ft. above the level of the Clyde. It is a beautiful example of Early English work, impressive in its simplicity. Its form is that of a Latin cross, with imperfect transepts. Its length from east to west is 319 ft., and its width 63 ft.; the height of the choir is 93 ft., and of the nave 85 ft. At the centre rises a fine tower, with a short octagonal spire, 225 ft. high. The choir, locally known as the High Church, serves as one of the city churches, and the extreme east end of it forms the Lady chapel. The rich western doorway is French in design but English in details. The chapter-house projects from the north-eastern corner and somewhat mars the harmony of the effect. It was built in the 15th century and has a groined roof supported by a pillar 20 ft. high. Many citizens have contributed towards filling the windows with stained glass, executed at Munich, the government providing the eastern

St Mungo's Cathedral.

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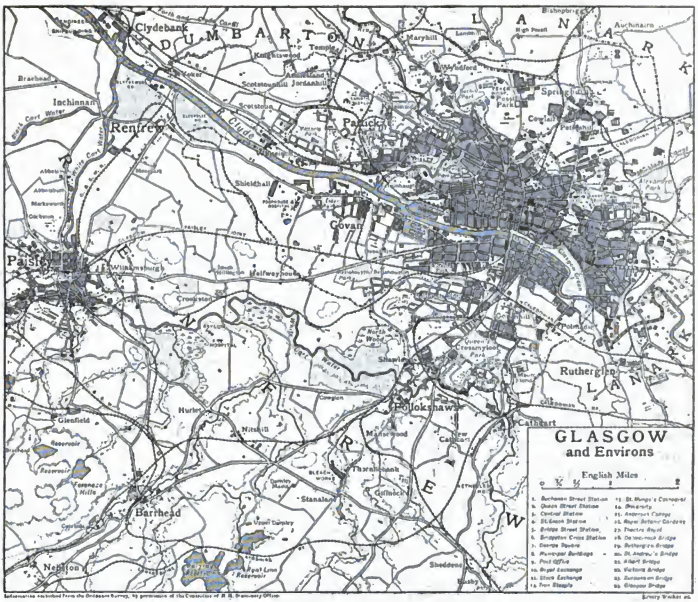

window in recognition of their enterprise. The crypt beneath the choir is not the least remarkable part of the edifice, being without equal in Scotland. It is borne on 65 pillars and lighted by 41 windows. The sculpture of the capitals of the columns and bosses of the groined vaulting is exquisite and the whole is in excellent preservation. Strictly speaking, it is not a crypt, but a lower church adapted to the sloping ground of the right bank of the Molendinar burn. The dripping aisle is so named from the constant dropping of water from the roof. St Mungo's Well in the south-eastern corner was considered to possess therapeutic virtues, and in the crypt a recumbent effigy, headless and handless, is faithfully accepted as the tomb of Kentigern. The cathedral contains few monuments of exceptional merit, but the surrounding graveyard is almost completely paved with tombstones. In 1115 an investigation was ordered by David, prince of Cumbria, into the lands and churches belonging to the bishopric, and from the deed then drawn up it is clear that at that date a cathedral had already been endowed. When David ascended the throne in 1124 he gave to the see of Glasgow the lands of Partick, besides restoring many possessions of which it had been deprived. Jocelin (d. 1199), made bishop in 1174, was the first great bishop, and is memorable for his efforts to replace the cathedral built in 1136 by Bishop John Achaius, which had been destroyed by fire. The crypt is his work, and he began the choir, Lady chapel, and central tower. The new structure was sufficiently advanced to be dedicated in 1197. Other famous bishops were Robert Wishart (d. 1316), appointed in 1272, who was among the first to join in the revolt of Wallace, and received Robert Bruce when he lay under the ban of the church for the murder of Comyn; John Cameron (d. 1446), appointed in 1428, under whom the building as it stands was completed; and William Turnbull (d. 1454), appointed in 1447, who founded the university in 1450. James Beaton or Bethune (1517–1603) was the last Roman Catholic archbishop. He fled to France at the reformation in 1560, and took with him the treasures and records of the see, including the Red Book of Glasgow dating from the reign of Robert III. The documents were deposited in the Scots College in Paris, were sent at the outbreak of the Revolution for safety to St Omer, and were never recovered. This loss explains the paucity of the earlier annals of the city. The zeal of the Reformers led them to threaten to mutilate the cathedral, but the building was saved by the prompt action of the craftsmen, who mustered in force and dispersed the fanatics.

Churches.

Excepting the cathedral, none of the Glasgow churches possesses historical interest; and, speaking generally, it is only the buildings that have been erected since the beginning of the 19th century that have pronounced architectural merit. This was due largely to the long survival of the severe sentiment of the Covenanters, who discouraged, if they did not actually forbid, the raising of temples of beautiful

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design. Representative examples of later work are found in the United Free churches in Vincent Street, in Caledonia Road and at Queen's Park, designed by Alexander Thomson (1817–1875), an architect of distinct originality; St George's church, in West George Street, a remarkable work by William Stark, erected in the beginning of the 19th century; St Andrew's church in St Andrew's Square off the Saltmarket, modelled after St Martin's-in-the-Fields, London, with a fine Roman portico; some of the older parish churches, such as St Enoch's, dating from 1780, with a good spire (the saint's name is said to be a corruption of Tanew, mother of Kentigern); the episcopal church of St Mary (1870), in Great Western Road, by Sir G. G. Scott; the Roman Catholic cathedral of St Andrew, on the river-bank between Victoria and Broomielaw bridges; the Barony church, replacing the older kirk in which Norman Macleod ministered; and several admirable structures, well situated, on the eastern confines of Kelvingrove Park.

The principal burying-ground is the Necropolis, occupying Fir Park, a hill about 300 ft. high in the northern part of the city. It provides a not inappropriate background to the cathedral, from which it is approached by a bridge, known as the "Bridge of Sighs," over the Molendinar ravine. The ground, which once formed portion of the estate of Wester Craigs, belongs to the Merchants' House, which purchased it in 1650 from Sir Ludovic Stewart of Minto. A Doric column to the memory of Knox, surmounted by a colossal statue of the reformer, was erected by public subscription on the crown of the height in 1824, and a few years later the idea arose of utilizing the land as a cemetery. The Jews have reserved for their own people a detached area in the north-western corner of the cemetery.

Education.—The university, founded in 1450 by Bishop Turnbull under a bull of Pope Nicholas V., survived in its old quarters till far in the 19th century. The *paedagogium*, or college of arts, was at first housed in Rottenrow, but was moved in 1460 to a site in High Street, where Sir James Hamilton of Cadzow, first Lord Hamilton (d. 1479), gave it four acres of land and some buildings. Queen Mary bestowed upon it thirteen acres of contiguous ground, and her son granted it a new charter and enlargcd the endowments. Prior to the Revolution its fortunes fluctuated, but in the 18th century it became very famous. By the middle of the 19th century, however, its surroundings had deteriorated, and in 1860 it was decided to rebuild it elsewhere. The ground had enormously increased in value and a railway company purchased it for £100,000. In 1864 the university bought the Gilmore Hill estate for £65,000, the adjacent property of Dowan Hill for £16,000 and the property of Clayslaps for £17,400. Sir G. G. Scott was appointed architect and selected as the site of the university buildings the ridge of Gilmore Hill—the finest situation in Glasgow. The design is Early English with a suggestion in parts of the Scots-French style of a much later period. The main structure is 540 ft. long and 300 ft. broad. The principal front faces southwards and consists of a lofty central tower with spire and corner blocks with turrets, between which are buildings of lower height. Behind the tower lies the Bute hall, built on cloisters, binding together the various departments and smaller halls, and dividing the massive edifice into an eastern and western quadrangle, on two sides of which are ranged the class-rooms in two storeys. The northern façade comprises two corner blocks, besides the museum, the library and, in the centre, the students' reading-room on one floor and the Hunterian museum on the floor above. On the south the ground falls in terraces towards Kelvingrove Park and the Kelvin. On the west, but apart from the main structure, stand the houses of the principal and professors. The foundation stone was laid in 1868 and the opening ceremony was held in 1870. The total cost of the university buildings amounted to £500,000, towards which government contributed £120,000 and public subscription £250,000. The third marquess of Bute (1847–1900) gave £40,000 to provide the Bute or common hall, a room of fine proportions fitted in Gothic style and divided by a beautiful Gothic screen from the Randolph hall, named after another benefactor, Charles Randolph (1809–1878), a native of Stirling, who had prospered as shipbuilder and marine engineer and left £60,000 to the university. The graceful spire surmounting the tower was provided from the bequest of £5000 by Mr A. Cunningham, deputy town-clerk, and Dr John M'Intyre erected the Students' Union at a cost of £5000, while other donors completed the equipment so generously that the senate was enabled to carry on its work, for the first time in its history, in almost ideal circumstances. The library includes the collection of Sir William Hamilton, and the Hunterian museum, bequeathed by William Hunter, the anatomist, is particularly rich in coins, medals, black-letter books and anatomical preparations. The observatory on Dowan Hill is attached to the chair of astronomy. An interesting link with the past are the exhibitions founded by John Snell (1629–1679), a native of Colmonell in Ayrshire, for the purpose of enabling students of distinction to continue their career at Balliol College, Oxford. Amongst distinguished exhibitioners have been Adam Smith, John Gibson Lockhart, John Wilson ("Christopher North"), Archbishop Tait, Sir William Hamilton and Professor Shairp. The curriculum of the university embraces the faculties of arts, divinity, medicine, law and science. The governing body includes the chancellor, elected for life by the general council, the principal, also elected for life, and the lord rector elected triennially by the students voting in "nations" according to their birthplace (*Glottiana*, natives of Lanarkshire; *Transforthana*, of Scotland north of the Forth; *Rothseiana*, of the shires of Bute, Renfrew and Ayr; and *Loudonia*, all others). There are a large number of well-endowed chairs and lectureships and the normal number of students exceeds 2000. The university of Glasgow and Aberdeen unite to return one member to parliament. Queen Margaret College for women, established in 1883, occupies a handsome building close to the botanic gardens, has an endowment of upwards of £25,000, and was incorporated with the university in 1893. Muirhead College is another institution for women.

Glasgow University.

Elementary instruction is supplied at numerous board schools. Higher, secondary and technical education is provided at several well-known institutions. There are two educational endowments boards which apply a revenue of about £10,000 a year mainly to the foundation of bursaries. Anderson College in George Street perpetuates the memory of its founder, John Anderson (1726–1796), professor of natural philosophy in the university, who opened a class in physics for working men, which he conducted to the end of his life. By his will he provided for an institution for the instruction of artisans and others unable to attend the university. The college which bears his name began in 1796 with lectures on natural philosophy and chemistry by Thomas Garnett (1766–1802). Two years later mathematics and geography were added. In 1799 Dr George Birkbeck (1776–1841) succeeded Garnett and began those lectures on mechanics and applied science which, continued elsewhere, ultimately led to the foundation of mechanics' institutes in many towns. In later years the college was further endowed and its curriculum enlarged by the inclusion of literature and languages, but ultimately it was determined to limit the scope of its work to medicine (comprising, however, physics, chemistry and botany also). The lectures of its medical school, incorporated in 1887 and situated near the Western Infirmary, are accepted by Glasgow and other universities. The Glasgow and West of Scotland Technical College, formed in 1886 out of a combination of the arts side of Anderson College, the College of Science and Arts, Allan Glen's Institution and the Atchison institution, is subsidized by the corporation and the endowments board, and is especially concerned with students desirous of following an industrial career. St Mungo's College, which has developed from an extra-mural school in connexion with the Royal Infirmary, was incorporated in 1889, with faculties of medicine and law. The United Free Church College, finely situated near Kelvingrove Park, the School of Art and Design, and the normal schools for the training of teachers, are institutions with distinctly specialized objects.

Schools and colleges.

The High school in Elmbank is the successor of the grammar school (long housed in John Street) which was founded in the 14th century as an appanage of the cathedral. It was placed under the jurisdiction of the school board in 1873. Other secondary schools include Glasgow Academy, Kelvinside Academy and the girls' and boys' schools endowed by the Hutcheson trust. Several of the schools under the board are furnished with secondary departments or equipped as science schools, and the Roman Catholics maintain elementary schools and advanced academies.

Art Galleries, Libraries and Museums.—Glasgow merchants and

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manufacturers alike have been constant patrons of art, and their liberality may have had some influence on the younger painters who, towards the close of the 19th century, broke away from tradition and, stimulated by training in the studios of Paris, became known as the "Glasgow school." The art gallery and museum in Kelvingrove Park, which was built at a cost of £250,000 (partly derived from the profits of the exhibitions held in the park in 1888 and 1901), is exceptionally well appointed. The collection originated in 1854 in the purchase of the works of art belonging to Archibald M'Lellan, and was supplemented from time to time by numerous donations of important pictures. It was housed for many years in the Corporation galleries in Sauchiehall Street. The Institute of Fine Arts, in Sauchiehall Street, is mostly devoted to periodical exhibitions of modern art. There are also pictures on exhibition in the People's Palace on Glasgow Green, which was built by the corporation in 1898 and combines an art gallery and museum with a conservatory and winter garden, and in the museum at Camphill, situated within the bounds of Queen's Park. The library and Hunterian museum in the university are mostly reserved for the use of students. The faculty of procurators possess a valuable library which is housed in their hall, an Italian Renaissance building, in West George Street. In Bath Street there are the Mechanics' and the Philosophical Society's libraries, and the Physicians' is in St Vincent Street. Miller Street contains the headquarters of the public libraries. The premises once occupied by the water commission have been converted to house the Mitchell library, which grew out of a bequest of £10,000 by Stephen Mitchell, largely reinforced by further gifts of libraries and funds, and now contains upwards of 100,000 volumes. It is governed by the city council and has been in use since 1877. Another building in this street accommodates the Stirling and the Baillie libraries. The Stirling, with some 50,000 volumes, is particularly rich in tracts of the 16th and 17th centuries, and the Baillie was endowed by George Baillie, a solicitor who, in 1863, gave £18,000 for educational objects. The Athenaeum in St George's Place, an institution largely concerned with evening classes in various subjects, contains an excellent library and reading-room.

Charities.—The old Royal Infirmary, designed by Robert Adam and opened in 1794, adjoining the old hospital, occupied the site of the archiepiscopal palace, the last portion of which was removed towards the close of the 18th century. The chief architectural feature of the infirmary is the central dome forming the roof of the operating theatre. On the northern side are the buildings of the medical school attached to the institution. The new infirmary commemorates the Diamond Jubilee of Queen Victoria. A little farther north, in Castle Street, is the blind asylum. The Western Infirmary is to some extent used for the purposes of clinical instruction in connexion with the university, to which it stands in immediate proximity. Near it is the Royal hospital for sick children. To the south of Queen's Park is Victoria Infirmary, and close to it the deaf and dumb institution. On the bank of the river, not far from the south-eastern boundary of the city, is the Belvedere hospital for infectious diseases, and at Ruchill, in the north, is another hospital of the same character opened in 1900. The Royal asylum at Gartnavel is situated near Jordanhill station, and the District asylum at Gartloch (which a branch at West Muckroft) lies in the parish of Cadder beyond the north-eastern boundary. There are numerous hospitals exclusively devoted to the treatment of special diseases, and several nursing institutions and homes. Glasgow Royal Hospital, designed by David Hamilton and adorned with statues of the founders, is situated in Ingram Street, and by the increase in the value of its lands has become a very wealthy body. George Hutcheson (1580–1639), a lawyer in the Trongate near the collegiate church, who served the Duke of Lennox's castle, which stood close to the spot where the Kelvin enters the Clyde, founded the hospital for poor old men. His brother Thomas (1589–1641) established in connexion with it a school for the lodging and education of orphan boys, the sons of burgesses. The trust, through the growth of its funds, has been enabled to extend its educational scope and to subsidize schools apart from the charity.

Monuments.—Most of the statues have been erected in George Square. They are grouped around a fluted pillar 80 ft. high, surmounted by a colossal statue of Sir Walter Scott by John Ritchie (1809–1850), erected in 1837, and include Queen Victoria and the Prince Consort (both equestrian) by Baron Marochetti; James Watt by Chantrey; Sir Robert Peel, by Thomas Campbell; the poet Burns, was born in Glasgow, and David Livingstone, all by John Mossman; Sir John Moore, a native of Glasgow, by Flaxman, erected in 1819; James Oswald, one of the first member returned to parliament for the city after the Reform Act of 1832; Lord Clyde (Sir Colin Campbell), also a natives, by Foley, erected in 1868; Dr Thomas Graham, master of the mint, another native, by Brodie; Robert Burns by G. E. Ewing, erected in 1877, subscribed for in shillings by the working men of Scotland; and William Ewart Gladstone by Hamo Thornycroft, unveiled by Lord Rosebery in 1902. In front of the Royal Exchange stands the equestrian monument of the duke of Wellington. In Cathedral Square are the statues of Norman Macleod, James White and James Arthur, and in front of the Royal infirmary is that of Sir James Lumsden, lord provost and benefactor. Nelson is commemorated by an obelisk 143 ft. high on the Green, which was erected in 1806 and is said to be a copy of that in the Piazza del Popolo at Rome. One of the most familiar statues is the equestrian figure of William III. in the Trongate, which was presented to the town in 1735 by James Macrae (1677–1744), a poor Ayrshire lad who had amassed a fortune in India, where he was governor of Madras from 1725 to 1730.

Recreations.—Of the theatres the chief are the King's in Bath Street, the Royal and the Grand in Cowcaddens, the Royalty and Gaiety in Sauchiehall Street, and the Princess's in Main Street. Variety theatres, headed by the Empire in Sauchiehall Street, are found in various parts of the town. There is a circus in Waterloo Street, a hippodrome in Sauchiehall Street and a zoological garden in New City Road. The principal concert halls are the great hall of the St Andrew's Halls, a group of rooms belonging to the corporation; the City Hall in Candleriggs, the People's Palace on the Green, and Queen's Rooms close to Kelvingrove Park. Throughout winter enormous crowds throng the football grounds of the Queen's Park, the leading amateur club, and the Celtic, the Rangers, the Third Lanark and other prominent professional clubs.

Parks and Open Spaces.—The oldest open space is the Green (140 acres), on the right bank of the river, adjoining a densely-populated district. It once extended farther west, but a portion was built over at a time when public rights were not vigilantly guarded. It is a favourite area for popular demonstrations, and sections have been reserved for recreation or laid out in flower-beds. Kelvingrove Park, in the west end, has exceptional advantages, for the Kelvin burn flows through it and the ground is naturally terraced, while its situation is beautified by the adjoining Gilmore Hill with the university on its summit. The park was laid out under the direction of Sir Joseph Paxton, and contains the Stewart fountain, erected to commemorate the labours of Lord Provost Stewart and his colleagues in the promotion of the Loch Katrine water scheme. The other parks on the right bank are, in the north, Ruchill (53 acres), acquired in 1891, and Springburn (53½ acres), acquired in 1892, and, in the east, Alexandra Park (120 acres), in which is laid down a nine-hole golf-course, and Tollcross (82½ acres), beyond the municipal boundary, acquired in 1897. On the left bank Queen's Park (130 acres), occupying a commanding site, was laid out by Sir Joseph Paxton, and considerably enlarged in 1894 by the enclosure of the grounds of Camphill. The other southern parks are Richmond (44 acres), acquired in 1898, and named after Lord Provost Sir David Richmond, who opened it in 1899; Maxwell, which was taken over on the annexation of Pollokshields in 1891; Bellahouston (176 acres), acquired in 1895; and Victoria (82½ acres), also beyond the south-eastern boundary, presented to the city in 1886 by James Dick, a manufacturer, containing "Queen Mary's stone," a point which commands a view of the lower valley of the Clyde. In the north-western district of the town 40 acres between Great Western Road and the Kelvin are devoted to the Royal Botanic Gardens, which became public property in 1891. They are beautifully laid out, and contain a great range of hothouses. The gardens owed much to the late William Hooker, who was regius professor of botany in Glasgow University before his appointment to the directorship of Kew Gardens.

Communications.—The North British railway terminus is situated in Queen Street, and consists of a high-level station (main line) and a low-level station, used in connexion with the City & District line, largely underground, serving the northern side of the town, opened in 1886. The Great Northern and North-Eastern railways use the high-level line of the N.B. system, accompanying it to the East Coast Joint Service. The Central terminus of the Caledonian railway in Gordon Street, served by the West Coast system (in which the London & North-Western railway shares), also comprises a high-level station for the main line service and a low-level station for the Cathcart District railway, completed in 1886 and made circular for the southern side and suburbs in 1894, and also for the connexion between Maryhill and Rutherglen, which is mostly underground. In both the underground lines communicate with certain branches of the main line, either directly or by change of carriage. The older terminus of the Caledonian railway in Buchanan Street now takes the northern and eastern traffic. The terminus of the Glasgow & South-Western railway company in St Enoch Square serves the country indicated in its title, and also gives the Midland railway of England access to the west coast and Glasgow. The Glasgow Subway—an underground cable passenger line, 6½ m. long, consisting of two tunnels and passing below the Clyde twice—was opened in 1896. Since no more bridge-building will be sanctioned west of the railway bridge at the Broomielaw, there are at certain points steam ferry boats or floating bridges for conveying vehicles and foot passengers across the river, as well as a subway for foot and wheeled traffic. Steamers, carrying both goods and passengers, constantly leave the Broomielaw quay for the piers and ports on the river and firth, and the islands and sea lochs of Argyllshire. The city is admirably served by railways which concentrate every populous district and cross the river by Glasgow and Albert bridges.

Trade.—Natural causes, such as proximity to the richest field of coal and ironstone in Scotland and the vicinity of hill streams of pure water, account for much of the great development of trade in Glasgow. It was in textiles that the city showed its earliest predominance, which, however, has not been maintained, owing, it is alleged, to the shortage of female labour. Several cotton mills are still worked, but the leading feature in the trade has always been the manufacture

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of such light textures as plain, striped and figured muslins, ginghams and fancy fabrics. Thread is made on a considerable scale, but jute and silk are of comparatively little importance. The principal varieties of carpets are woven. Some factories are exclusively devoted to the making of lace curtains. The allied industries of bleaching, printing and dyeing, on the other hand, have never declined. The use of chlorine in bleaching was first introduced in Great Britain at Glasgow in 1787, on the suggestion of James Watt, whose father-in-law was a bleacher; and it was a Glasgow bleacher, Charles Tennant, who first discovered and made bleaching powder (chloride of lime). That discovery was begun about 1798 by Tennant and David Dale and George M'Intosh, and the colour was long known locally as Dale's red. A large quantity of grey cloth continues to be sent from Lancashire and other mills to be bleached and printed in Scottish works. These works gave a powerful impetus to the manufacture of chemicals, and the works at St Rollox developed rapidly. Among prominent chemical industries are to be reckoned the alkali trades—including soda, bleaching powder and soap-making—the preparation of alum and various products of petroleum, the manufacture of potash, white lead and other pigments, dynamite and gunpowder. Glass-making and paper-making are also carried on, and there are several breweries and distilleries, besides factories for the making of aerated waters, starch, japan and matches. Many miscellaneous trades flourish, such as clothing, confectionery, cabinet-making, bread and biscuit making, boot and shoe making, flour mills and saw mills, pottery and indiarubber. Since the days of the brothers Robert Foulis (1707–1776) and their sons Andrew (1712–1775), printing, both letterpress and colour, has been identified with Glasgow, though in a lesser degree than with Edinburgh. The tobacco trade still flourishes, though much lessened. But the great industry is iron-founding. From the discovery of the Black-land Ironstone, till then regarded as useless "wild coal," by David Mushet (1772–1847), and Neilson's invention of the hot-air blast threw the control of the Scottish iron trade into the hands of Glasgow ironmasters, although the furnaces themselves were chiefly placed in Lanarkshire and Ayrshire. The expansion of the industry was such that, in 1859, one-third of the total output in the United Kingdom was Scottish. During the following years, however, the trade seemed to have lost its elasticity, the annual production averaging about one million tons of pig-iron. Mild steel is manufactured extensively, and some crucible cast steel is made. In addition to brass foundries there are works for the extraction of copper and the smelting of lead and zinc. With such resources every branch of engineering is well represented. Locomotive engines are built for every country where railways are employed, and all kinds of builder's ironwork is forged in enormous quantities, and the sewing-machine factories in the neighbourhood are important. Boiler-making and marine engine works, in many cases in direct connection with the shipbuilding yards, are numerous. Shipbuilding, indeed, is the greatest of the industries of Glasgow, and in some years more than half of the total tonnage in the United Kingdom has been launched on the Clyde, the yards which extend from the harbour to Dumbarton on one side and Greenock on the other side of the river and firth. Excepting a trifling proportion of wooden ships, the Clyde-built vessels are of iron and steel, the trade having owed its immense expansion to the prompt adoption of this material. Every variety of craft is turned out, from battleships and great liners to dredging-plant and hopper barges.

The Port.—The harbour extends from Glasgow Bridge to the point where the Kelvin joins the Clyde, and occupies 206 acres. For the most part it is lined by quays and wharves, which have a total length of 81 m., and from the harbour to the sea vessels drawing 26 ft. can go up or down on one tide. It is curious to remember that in the middle of the 18th century the river was fordable on foot at Dumbuck, 12 m. below Glasgow and 13 m. S.E. of Dumbarton. Even within the limits of the present harbour Smeaton reported to the town council in 1740 that at Pointhouse ford, just east of the mouth of the Kelvin, the depth at low water was but 15 in. and at high water 39 in. The transformation effected within a century and a half is due to the energy and enterprise of the Clyde Navigation Trust. The earliest shipping-port of Glasgow was Irvine in Ayrshire, but lighterage was found to be land carriage costly; and in 1658 the civic authorities endeavoured to purchase a site for a spacious harbour at Dunbarton. Being thwarted by the magistrates of that burgh, however, in 1662 they secured 13 acres on the southern bank at a spot some 2 m. above Greenock, which became known as Port Glasgow, where they built harbours and constructed the first graving dock in Scotland. Sixteen years later the Broomielaw quay was built, but it was not until the tobacco merchants appreciated the necessity of bringing their wares into the heart of the city that serious consideration was paid to schemes for deepening the waterway. Smeaton's suggestion of a lock and dam 4 m. below the Broomielaw was happily not accepted. In 1768 John Golborne advised the narrowing of the river and the increasing of the scour by the construction of rubble jetties and the dredging of sandbanks and shoals. After James Watt's report in 1769 on the ford at Dunbuck, Golborne succeeded in 1775 in deepening the ford to 6 ft. at low water with a width of 300 ft. By Rennie's advice in 1799, following up Golborne's recommendation, as many as 200 jetties were built between Glasgow and Bowling, some old ones were shortened and low rubble walls carried from point to point of the jetties, and thus the channel was made more uniform and much land reclaimed. By 1836 there was a depth of 7 or 8 ft. at the Broomielaw at low water, and in 1840 the whole duty of improving the navigation was devolved upon the Navigation Trust. Steam dredgers were kept constantly at work, shoals were removed and rocks blasted away. Two million cubic yards of matter are lifted every year and dumped in Loch Long. By 1900 the channel had been deepened to a minimum of 22 ft., and, as already indicated, the largest vessels make the open sea in one tide, whereas in 1840 it took ships drawing only 15 ft. two and even three tides to reach the sea. The total the Trust amounts to £6,000,000, and the annual revenue to £450,000. Long before these great results had been achieved, however, the shipping trade had been revolutionized by the application of steam to navigation, and later by the use of iron and steel in shipbuilding, in both respects enormously enhancing the industry and commerce of Glasgow. From 1812 to 1820 Henry Bell's "Comet," 30 tons, driven by an engine of 3 horse-power, plied between Glasgow and Greenock, until she was wrecked, being the first steamer to run regularly on any river in the Old World. Thus since the appearance of that primitive vessel phenomenal changes had taken place on the Clyde. When the quays and wharves ceased to be able to accommodate the growing traffic, the construction of docks became imperative. In 1867 Kingston Dock on the south side, of 5½ acres, was opened, but soon proved inadequate, and in 1880 Queen's Dock (two basins) at Stobcross, on the north side, of 30 acres, was completed. Although this could accommodate one million tons of shipping, more dock space was speedily called for, and in 1897 Prince's Dock (three basins) on the opposite side, of 72 acres, was opened, fully equipped with hydraulic and steam cranes and all the latest dock appliances. There are, besides, three graving docks, the longest of which (880 ft.) can be made at will into two docks of 417 ft. and 457 ft. in length. The Caledonian and Glasgow & South-Western railways have access to the harbour for goods and minerals at the Terminus Quay to the south of Kingston Dock, and a general dock has been constructed by the Trust at Clydebank, about 3½ m. below the harbour. The shipping attains to colossal proportions. The imports consist chiefly of flour, fruit, timber, iron ore, live stock and wheat; and the exports primarily of cotton manufactures, manufactured iron and steel, machinery, whisky, cotton yarn, linen fabrics, coal, jute, jam and foods, and woollen manufactures.

Government.—By the Local Government (Scotland) Act 1889 the city was placed entirely in the county of Lanark, the districts then transferred having previously belonged to the shires of Dumbarton and Renfrew. In 1891 the boundaries were enlarged to include six suburban burghs and a number of suburban districts, the area being increased from 6111 acres to 11,861 acres. The total area of the city and the conterminous burghs of Govan, Partick and Kinning Park—which, though they successfully resisted annexation in 1891, are practically part of the city—is 15,659 acres. The extreme length from north to south and from east to west is about 8 m. each way, and the circumference measures 27 m. In 1893 the municipal burgh was constituted a county of a city. Glasgow is governed by a corporation consting of 77 members, including 14 bailies and the lord provost. The only all the powers which the town council exercised as police commissioners and trustees for parks, markets, water and the like were consolidated and conferred upon the corporation. Three years later the two parish councils of the city and burgh of Govan, which administered the poor law over the greater part of the city north of the Clyde, were amalgamated as the parish council of Glasgow, with 31 members. As a county of a city Glasgow has a lieutenancy (successive lords provost holding the office) and a court of quarter sessions, which is the appeal court from the magistrates sitting as licensing authority. Under the corporation municipal ownership has reached a remarkable development, the corporation owning the supplies of water, gas and electric power, tramways and numerous lodging-houses. The latter undertaking has recently been brought its work prominently into notice, not only in the United Kingdom, but in the United States of America and elsewhere. In 1859 water was conveyed by aqueducts and tunnels from Loch Katrine (364 ft. above sea-level), giving a pressure of 70 or 80 ft. above the highest point in the city) to the reservoir at Mugdock (with a capacity of 500,000,000 gallons), a distance of 27 m., whence after filtration it was distributed by pipes to Glasgow, a further distance of 7 m., or 34 m. in all. During the next quarter of a century it became evident that this supply would require to be augmented, and powers were accordingly obtained in 1895 to raise Loch Katrine 5 ft. and to connect with it by tunnel Loch Arklet (455 ft. above the sea), with storage for 2,050,000,000 gallons, the two lochs together possessing a capacity of twelve thousand million gallons. The entire works between the loch and the city were duplicated over a distance of 23½ m., and an additional reservoir, holding 694,000,000 gallons, was constructed, increasing the supply held in reserve from 12½days' to 30¼ days'. In 1909 the building of a dam was undertaken 1¼ m. west of the lower end of Loch Arklet, designed to create a sheet of water 2¼ m. long and to increase the water-supply of the city by ten million gallons a day. The water committee supplies hydraulic power to manufacturers and merchants. In 1869 the corporation acquired the gasworks, the productive capacity

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of which exceeds 70 million cub. ft. a day. In 1893 the supply of electric light was also undertaken, and since that date the city has been partly lighted by electricity. The corporation also laid down the tramways, which were leased by a company for twenty-three years at a rental of £150 a mile per annum. When the lease expired in 1894 the town council took over the working of the cars, substituting overhead electric traction for horse-power. One of the most difficult problems that the corporation has had to deal with was the housing of the poor. By the lapse of time and the congestion of population, certain quarters of the city, and of Glasgow especially, had become slums and rookeries of the worst description. The condition of the town was rapidly growing into a by word, when the municipality obtained parliamentary powers in 1866 enabling it to condemn for purchase certain districts, to borrow money and levy rates. The scheme of reform contemplated the demolition of 10,000 insanitary dwellings occupied by 50,000 persons, but the corporation was required to provide accommodation for the dislodged wherever the numbers exceeded 500. In point of fact they never needed to build, as private enterprise more than kept pace with the operations of the improvement. The work was carried out promptly and effectually, and when the act expired in 1881 whole localities had been recreated and nearly 40,000 persons properly housed. Under the amending act of 1887 the corporation began in 1888 to build tenement houses in which the poor could rent one or more rooms at the most moderate rentals; lodging-houses for men and women followed, and in 1896 a home was erected for the accommodation of families in certain circumstances. The powers of the improvement trustees were practically exhausted in 1896, when it appeared that during twenty-nine years £1,955,550 had been spent in buying and improving land and buildings, and £231,500 in building tenements and lodging-houses; while, on the other side, ground had been sold for £1,072,000, and the trustees owned heritable property valued at £692,000, showing a deficiency of £423,050. Assessment of ratepayers for the purposes of the trust had yielded £593,000, and it was estimated that these operations, beneficial to the city in a variety of ways, had cost the citizens £24,000 a year. In 1897 an act was obtained for dealing in similar fashion with insanitary and congested areas in the centre of the city, and on the south side of the river, and for acquiring not more than 25 acres of land, within or without the city, for dwellings for the poorest classes. Along with these later improvements the drainage system was entirely remodelled, the area being divided into three sections each distinct, with separate works for the disposal of its own sewage. One section (authorized in 1891 and doubled in 1901) comprises 11 sq. m.—one-half within the city north of the river, and the other in the district in Lanarkshire known as Dalmarnock. Another section (authorized in 1896) includes the area on the north bank not provided for in 1891, as well as the burghs of Partick and Clydebank and intervening portions of the shires of Renfrew and Dumbarton, the total area consisting of 14 sq. m. with works at Dalmuir, 7 m. below Glasgow; and the third section (authorized in 1898) embraces the whole municipal area on the south side of the river, the burghs of Rutherglen, Pollokshaws, Kinning Park and Govan, and certain districts in the counties of Renfrew and Lanarkshire, 11 sq. m. in all, which may be extended by the inclusion of the burghs of Renfrew and Paisley—with works at Braehead, 1 m. east of Renfrew. Among other works in which it has interests there may be mentioned its representation on the board of the Clyde Navigation Trust and the governing body of the West of Scotland Technical College. In respect of parliamentary representation the Reform Act of 1832 gave two members to Glasgow, a third was added in 1868 (though each elector had only two votes), and in 1885 the city was split up into seven divisions, each returning one member.

Population.—Throughout the 19th century the population grew prodigiously. Only 77,385 in 1801, it was nearly doubled in twenty years, being 147,043 in 1821, already outstripping Edinburgh. It had become 395,503 in 1861, and in 1881 it was 511,415. In 1891, prior to extension of the boundary, it was 565,839, and, after extension, 658,198, and in 1901 it stood at 761,709. The birth-rate averages 33, and the death-rate (at present 1000, but the mortality before the city improvement scheme was carried out was as high as 33 per 1000. Owing to its being convenient of access from the Highlands, a very considerable number of Gaelic-speaking persons live in Glasgow, while the great industries attract an enormous number of persons from other parts of Scotland. The valuation of the city, which in 1878–1879 was £3,420,697, now exceeds £5,000,000.

History.—There are several theories as to the origin of the name of Glasgow. One holds that it comes from Gaelic words meaning "dark glen," descriptive of the narrow ravine through which the Molendinar flowed to the Clyde. But the more generally accepted version is that the word is the Celtic *Cleschu*, afterwards written Glesco or Glasghu, meaning "dear green spot" (*glas*, green; *cu* or *ghu*, dear), which is supposed to have been the name of the settlement that Kentigern found here when he came to convert the Britons of Strathelyde. Mungo became the patron-saint of Glasgow, and the motto and arms of the city are wholly identified with him—"Let Glasgow Flourish by the Preaching of the Word," usually shortened to "Let Glasgow Flourish." It is not till the 12th century, however, that the history of the city becomes clear. About 1178 William the Lion made the town by charter a burgh of barony, and gave it a market with freedom and customs. Amongst more or less isolated episodes of which record has been preserved may be mentioned the battle of the Bell o' the Brae, on the site of High Street, in which Wallace routed the English under Percy in 1300; the betrayal of Wallace to the English in 1305 in a barn situated, according to tradition, in Robroyston, just beyond the north-eastern boundary of the city; the ravages of the plague in 1350 and thirty years later; the regent Arran's siege, in 1544, of the bishop's castle, garrisoned by the earl of Glencairn, and the subsequent fight at the Butts (now the Gallowgate) when the terms of surrender were dishonoured, in which the regent's men gained the day. Most of the inhabitants were opposed to Queen Mary and many actively supported Murray in the battle of Langside—the site of which is now occupied by the Queen's Park—on the 13th of May 1568, in which she lost crown and kingdom. A memorial of the conflict was erected on the site in 1887. Under James VI. the town became a royal burgh in 1636, with freedom of the river from the Broomielaw to the Cloch. But the efforts to establish episcopacy aroused the fervent anti-prelatical sentiment of the people, who made common cause with the Covenanters to the end of their long struggle. Montrose mulcted the citizens heavily after the battle of Kilsyth in 1645, and three years later the provost and bailies were deposed for contumacy to their sovereign lord. Plague and famine devastated the town in 1649, and in 1652 a conflagration laid a third of the burgh in ashes. Even after the restoration its sufferings were acute. It was the headquarters of the Whiggamores of the west and its prisons were constantly filled with rebels for conscience' sake. The government scourged the townsfolk with an army of Highlanders, whose brutality only served to strengthen the resistance at the battles of Drumclog and Bothwell Brig. With the Union, hotly resented as it was at the time, the dawn of almost unbroken prosperity arose. By the treaty of Union Scottish ports were placed, in respect of trade, on the same footing as English ports, and the situation of Glasgow enabled it to acquire a full share of the ever-increasing Atlantic trade. Its commerce was already considerable and in population it was now the second town in Scotland. It enjoyed a practical monopoly of the sale of raw and refined sugars, had the right to distil spirits from molasses free of duty, dealt largely in cured herring and salmon, sent hides to English tanners and manufactured soap and linen. It challenged the supremacy of Bristol in the tobacco trade—fetching cargoes from Virginia, Maryland and Carolina in its own fleet—so that by 1772 its importations of tobacco amounted to more than half of the whole quantity brought into the United Kingdom. The tobacco merchants built handsome mansions and the town rapidly extended westwards. With the surplus profits new industries were created, which helped the city through the period of the American War. Most, though not all, of the manufactures in which Glasgow has always held a foremost place date from this period. It was in 1764 that James Watt succeeded in repairing a hitherto unworkable model of Newcomen's fire (steam) engine in his small workshop within the college precincts. Shipbuilding on a colossal scale and the enormous developments in the iron industries and engineering were practically the growth of the 19th century. The failure of the Western bank in 1857, the Civil War in the United States, the collapse of the City of Glasgow bank in 1878, among other disasters, involved heavy losses and distress, but recovery was always rapid.

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GLASITES, or SANDEMANIANS,[1] a Christian sect, founded in Scotland by John Glas (*q.v.*). It spread into England and America, but is now practically extinct. Glas dissented from the Westminster Confession only in his views as to the spiritual nature of the church and the functions of the civil magistrate. But his son-in-law Robert Sandeman added a distinctive doctrine as to the nature of faith which is thus stated on his tombstone: " That the bare death of Jesus Christ without a thought or deed on the part of man, is sufficient to present the chief of sinners spotless before God." In a series of letters to James Hervey, the author of *Theron and Aspasia*, he maintained that justifying faith is a simple assent to the divine testimony concerning Jesus Christ, differing in no way in its character from belief in any ordinary testimony. In their practice the Glasite churches aimed at a strict conformity with the primitive type of Christianity as understood by them. Each congregation had a plurality of elders, pastors or bishops, who were chosen according to what were believed to be the instructions of Paul, without regard to previous education or present occupation, and who enjoy a perfect equality in office. To have been married a second time disqualified for ordination, or for continued tenure of the office of bishop. In all the action of the church unanimity was considered to be necessary; if any member differed in opinion from the rest, he must either surrender his judgment to that of the church, or be shut out from its communion. To join in prayer with any one not a member of the denomination was regarded as unlawful, and even to eat or drink with one who had been excommunicated was held to be wrong. The Lord's Supper was observed weekly; and between forenoon and afternoon service every Sunday a love feast was held at which every member was required to be present. Mutual exhortation was practised at all the meetings for divine service, when any member who had the gift of speech (χάρισμα) was allowed to speak. The practice of washing one another's feet was at one time observed; and it was for a long time customary for each brother and sister to receive new members, on admission, with a holy kiss. " Things strangled " and " blood " were rigorously abstained from; the lot was regarded as sacred; the accumulation of wealth they held to be unscriptural and improper, and each member considered his property as liable to be called upon at any time to meet the wants of the poor and the necessities of the church. Churches of this order were founded in Paisley, Glasgow, Edinburgh, Leith, Arbroath, Montrose, Aberdeen, Dunkeld, Cupar, Galashiels, Liverpool and London, where Michael Faraday was long an elder. Their exclusiveness in practice, neglect of education for the ministry, and the antinomian tendency of their doctrine contributed to their dissolution. Many Glasites joined the general body of Scottish Congregationalists, and the sect may now be considered extinct. The last of the Sandemanian churches in America ceased to exist in 1890.

See James Ross, *History of Congregational Independency in Scotland* (Glasgow, 1900). (M.M.)

GLASS (O.E. *glæs*, cf. Ger. *Glas*, perhaps derived from an old Teutonic root *gla-*, a variant of *glo-*, having the general sense of shining, cf. " glare," " glow "), a hard substance, usually transparent or translucent, which from a fluid condition at a high temperature has passed to a solid condition with sufficient rapidity to prevent the formation of visible crystals. There are many varieties of glass differing widely in chemical composition and in physical qualities. Most varieties, however, have certain qualities in common. They pass through a viscous stage in cooling from a state of fluidity; they develop effects of colour when the glass mixtures are fused with certain metallic oxides; they are, when cold, bad conductors both of electricity and heat, they are easily fractured by a blow or shock and show a conchoidal fracture; they are but slightly affected by ordinary solvents, but are readily attacked by hydrofluoric acid.

The structure of glass has been the subject of repeated investigations. The theory most widely accepted at present is that glass is a quickly solidified solution, in which silica, silicates, borates, phosphates and aluminates may be either solvents or solutes, and metallic oxides and metals may be held either in solution or in suspension. Long experience has fixed the mixtures, so far as ordinary furnace temperatures are concerned, which produce the varieties of glass in common use. The essential materials of which these mixtures are made are, for English flint glass, sand, carbonate of potash and red lead; for plate and sheet glass, sand, carbonate or sulphate of soda and carbonate of lime; and for Bohemian glass, sand, carbonate of potash and carbonate of lime. It is convenient to treat these glasses as " normal " glasses, but they are in reality mixtures of silicates, and cannot rightly be regarded as definite chemical compounds or represented by definite chemical formulae.

The knowledge of the chemistry of glass-making has been considerably widened by Dr F. O. Schott's experiments at the Jena glass-works. The commercial success of these works has demonstrated the value of pure science to manufactures.

The recent large increase in the number of varieties of glass has been chiefly due to developments in the manufacture of optical glass. Glasses possessing special qualities have been required, and have been supplied by the introduction of new combinations of materials. The range of the specific gravity of glasses from 2·5 to 5·0 illustrates the effect of modified compositions. In the same way glass can be rendered more or less fusible, and its stability can be increased both in relation to extremes of temperature and to the chemical action of solvents.

The fluidity of glass at a high temperature renders possible the processes of ladelling, pouring, casting and stirring. A mass of glass in a viscous state can be rolled with an iron roller like dough; can be rendered hollow by the pressure of the human breath or by compressed air; can be forced by air pressure, or by a mechanically driven plunger, to take the shape and impression of a mould; and can be almost indefinitely extended as solid rod or as hollow tube. So extensible is viscous glass that it can be drawn out into a filament sufficiently fine and elastic to be woven into a fabric.

Glasses are generally transparent but may be translucent or opaque. Semi-opacity due to crystallization may be induced in many glasses by maintaining them for a long period at a temperature just insufficient to cause fusion. In this way is produced the crystalline, devitrified material, known as Réaumur's porcelain. Semi-opacity and opacity are usually produced by the addition to the glass-mixtures of materials which will remain in suspension in the glass, such as oxide of tin, oxide of arsenic, phosphate of lime, cryolite or a mixture of felspar and fluorspar.

Little is known about the actual cause of colour in glass beyond the fact that certain materials added to and melted with certain glass-mixtures will in favourable circumstances produce effects of colour. The colouring agents are generally metallic oxides. The same oxide may produce different colours with different glass-mixtures, and different oxides of the same metal may produce different colours. The purple-blue of cobalt, the chrome green or yellow of chromium, the dichroic canary-colour of uranium and the violet of manganese, are constant. Ferrous oxide produces an olive green or a pale blue according to the glass with which it is mixed. Ferric oxide gives a yellow colour, but requires the presence of an oxidizing agent to prevent

[1] The name Glasites or Glassites was generally used in Scotland; in England and America the name Sandemanians was more common.

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reduction to the ferrous state. Lead gives a pale yellow colour. Silver oxide, mixed as a paint and spread on the surface of a piece of glass and heated, gives a permanent yellow stain. Finely divided vegetable charcoal added to a soda-lime glass gives a yellow colour. It has been suggested that the colour is due to sulphur, but the effect can be produced with a glass mixture containing no sulphur, free or combined, and by increasing the proportion of charcoal the intensity of the colour can be increased until it reaches black opacity. Selenites and selenates give a pale pink or pinkish yellow. Tellurium appears to give a pale pink tint. Nickel with a potash-lead glass gives a violet colour, and a brown colour with a soda-lime glass. Copper gives a peacock-blue which becomes green if the proportion of the copper oxide is increased. If oxide of copper is added to a glass mixture containing a strong reducing agent, a glass is produced which when first taken from the crucible is colourless but on being reheated develops a deep crimson-ruby colour. A similar glass, if its cooling is greatly retarded, produces throughout its substance minute crystals of metallic copper, and closely resembles the mineral called avanturine. There is also an intermediate stage in which the glass has a rusty red colour by reflected light, and a purple-blue colour by transmitted light. Glass containing gold behaves in almost precisely the same way, but the ruby glass is less crimson than copper ruby glass. J. E. C. Maxwell Garnett, who has studied the optical properties of these glasses, has suggested that the changes in colour correspond with changes effected in the structure of the metals as they pass gradually from solution in the glass to a state of crystallization.

Owing to impurities contained in the materials from which glasses are made, accidental coloration or discoloration is often produced. For this reason chemical agents are added to glass mixtures to remove or neutralize accidental colour. Ferrous oxide is the usual cause of discoloration. By converting ferrous into ferric oxide the green tint is changed to yellow, which is less noticeable. Oxidation may be effected by the addition to the glass mixture of a substance which gives up oxygen at a high temperature, such as manganese dioxide or arsenic trioxide. With the same object, red lead and saltpetre are used in the mixture for potash-lead glass. Manganese dioxide not only acts as a source of oxygen, but develops a pink tint in the glass, which is complementary to and neutralizes the green colour due to ferrous oxide.

Glass is a bad conductor of heat. When boiling water is poured into a glass vessel, the vessel frequently breaks, on account of the unequal expansion of the inner and outer layers. If in the process of glass manufacture a glass vessel is suddenly cooled, the constituent particles are unable to arrange themselves and the vessel remains in a state of extreme tension. The surface of the vessel may be hard, but the vessel is liable to fracture on receiving a trifling shock. M. de la Bastie's process of "toughening" glass consisted in dipping glass, raised to a temperature slightly below the melting-point, into molten tallow. The surface of the glass was hardened, but the inner layers remained in unstable equilibrium. Directly the crust was pierced the whole mass was shattered into minute fragments. In all branches of glass manufacture the process of "annealing," *i.e.* cooling the manufactured objects sufficiently slowly to allow the constituent particles to settle into a condition of equilibrium, is of vital importance. The desired result is obtained either by moving the manufactured goods gradually away from a constant source of heat, or by placing them in a heated kiln and allowing the heat gradually to die out.

The furnaces (fig. 15) employed for melting glass are usually heated with gas on the "Siemens," or some similar system of regenerative heating. In the United States natural gas is used wherever it is available. In some English works coal is still employed for direct heating with various forms of mechanical stokers. Crude petroleum and a thin tar, resulting from the process of enriching water-gas with petroleum, have been used both with compressed air and with steam with considerable success. Electrical furnaces have not as yet been employed for ordinary glass-making on a commercial scale, but the electrical plants which have been erected for melting and moulding quartz suggest the possibility of electric heating being employed for the manufacture of glass. Many forms of apparatus have been tried for ascertaining the temperature of glass furnaces. It is usually essential that some parts of the apparatus shall be made to acquire a temperature identical with the temperature to be measured. Owing to the physical changes produced in the material exposed prolonged observations of temperature are impossible. In the Féry radiation pyrometer this difficulty is obviated, as the instrument may be placed at a considerable distance from the furnace. The radiation passing out from an opening in the furnace falls upon a concave mirror in a telescope and is focused upon a thermoelectric couple. The hotter the furnace the greater is the rise of temperature of the couple. The electromotive force thus generated is measured by a galvanometer, the scale of which is divided and figured so that the temperature may be directly read. (See THERMOMETRY.)

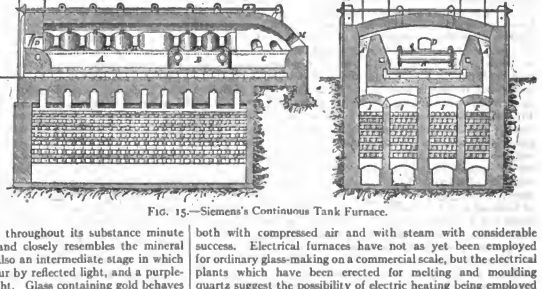

FIG. 15.—Siemens's Continuous Tank Furnace.

In dealing with the manufacture of glass it is convenient to group the various branches in the following manner:

Manufactured Glass.

I. Optical Glass

II. Blown Glass

A. Table glass. B. Tube. Special glasses for thermometers, and other special glasses. C. Sheet and crown glass. D. Bottles.

III. Mechanically Pressed Glass

A. Plate and rolled plate glass. B. Pressed table glass.

I. OPTICAL GLASS.—As regards both mode of production and essential properties optical glass differs widely from all other varieties. These differences arise primarily from the fact that glass for optical uses is required in comparatively large and thick pieces, while for most other purposes glass is used in the form of comparatively thin sheets; when, therefore, as a consequence

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of Dollond's invention of achromatic telescope objectives in 1757, a demand first arose for optical glass, the industry was unable to furnish suitable material. Flint glass particularly, which appeared quite satisfactory when viewed in small pieces, was found to be so far from homogeneous as to be useless for lens construction. The first step towards overcoming this vital defect in optical glass was taken by P. L. Guinand, towards the end of the 18th century, by introducing the process of stirring the molten glass by means of a cylinder of fireclay. Guinand was induced to migrate from his home in Switzerland to Bavaria, where he worked at the production of homogeneous flint glass, first with Joseph von Utzschneider and then with J. Fraunhofer; the latter ultimately attained considerable success and produced telescope disks up to 28 centimetres (11 in.) diameter. Fraunhofer further initiated the specification of refraction and dispersion in terms of certain lines of the spectrum, and even attempted an investigation of the effect of chemical composition on the relative dispersion produced by glasses in different parts of the spectrum. Guinand's process was further developed in France by Guinand's sons and subsequently by Bontemps and E. Feil. In 1848 Bontemps was obliged to leave France for political reasons and came to England, where he initiated the optical glass manufacture at Chance's glass works near Birmingham, and this firm ultimately attained a considerable reputation in the production of optical glass, especially of large disks for telescope objectives. Efforts at improving optical glass had, however, not been confined to the descendants and successors of Guinand and Fraunhofer. In 1824 the Royal Astronomical Society of London appointed a committee on the subject, the experimental work being carried out by Faraday. Faraday independently recognized the necessity for mechanical agitation of the molten glass in order to ensure homogeneity, and to facilitate his manipulations he worked with dense lead borate glasses which are very fusible, but have proved too unstable for ordinary optical purposes. Later Mâes of Clichy (France) exhibited some "zinc crown" glass in small plates of optical quality at the London Exhibition of 1851; and another French glass-maker, Lamy, produced a dense thallium glass in 1867. In 1834 W. V. Harcourt began experiments in glass-making, in which he was subsequently joined by G. G. Stokes. Their object was to pursue the inquiry begun by Fraunhofer as to the effect of chemical composition on the distribution of dispersion. The specific effect of boric acid in this respect was correctly ascertained by Stokes and Harcourt, but they mistook the effect of titanic acid. J. Hopkinson, working at Chance's glass works, subsequently made an attempt to produce a titanium silicate glass, but nothing further resulted.

The next and most important forward step in the progress of optical glass manufacture was initiated by Ernst Abbe and carried out jointly by him and O. Schott at Jena in Germany. Aided by grants from the Prussian government, these workers systematically investigated the effect of introducing a large number of different chemical substances (oxides) into vitreous fluxes. As a result a whole series of glasses of novel composition and optical properties were produced. A certain number of the most promising of these, from the purely optical point of view, had unfortunately to be abandoned for practical use owing to their chemical instability, and the problem of Fraunhofer, viz. the production of pairs of glasses of widely differing refraction and dispersion, but having a similar distribution of dispersion in the various regions of the spectrum, was not in the first instance solved. On the other hand, while in the older crown and flint glasses the relation between refraction and dispersion had been practically fixed, dispersion and refraction increasing regularly with the density of the glass, in some of the new glasses introduced by Abbe and Schott this relation is altered and a relatively low refractive index is accompanied by a relatively high dispersion, while in others a high refractive index is associated with low dispersive power.

The initiative of Abbe and Schott, which was greatly aided by the resources for scientific investigation available at the Physikalische Reichsanstalt (Imperial Physical Laboratory), led to such important developments that similar work was undertaken in France by the firm of Mantois, the successors of Feil, and somewhat later by Chance in England. The manufacture of the new varieties of glass, originally known as "Jena" glasses, is now carried out extensively and with a considerable degree of commercial success in France, and also to a less extent in England, but none of the other makers of optical glass has as yet contributed to the progress of the industry to anything like the same extent as the Jena firm.

The older optical glasses, now generally known as the "ordinary" crown and flint glasses, are all of the nature of pure silicates, the basic constituents being, in the case of crown glasses, lime and soda or lime and potash, or a mixture of both, and in the case of flint glasses, lead and either (or both) soda and potash. With the exception of the heavier flint (lead) glasses, these can be produced so as to be free both from noticeable colour and from such defects as bubbles, opaque inclusions or "striae," but extreme care in the choice of all the raw materials and in all the manipulations is required to ensure this result. Further, these glasses, when made from properly proportioned materials, possess a very considerable degree of chemical stability, which is amply sufficient for most optical purposes. The newer glasses, on the other hand, contain a much wider variety of chemical constituents, the most important being the oxides of barium, magnesium, aluminium and zinc, used either with or without the addition of the bases already named in reference to the older glasses, and—among acid bodies—boric anhydride (B_2O_3) which replaces the silica of the older glasses to a varying extent. It must be admitted that, by the aid of certain of these new constituents, glasses can be produced which, as regards purity of colour, freedom from defects and chemical stability are equal or even superior to the best of the "ordinary" glasses, but it is a remarkable fact that when this is the case the optical properties of the new glass do not fall very widely outside the limits set by the older glasses. On the other hand, the more extreme the optical properties of these new glasses, *i.e.* the further they depart from the ratio of refractive index to dispersive power found in the older glasses, the greater the difficulty found in obtaining them of either sufficient purity or stability to be of practical use. It is, in fact, admitted that some of the glasses, most useful optically, the dense barium crown glasses, which are so widely used in modern photographic lenses, cannot be produced entirely free either from noticeable colour or from numerous small bubbles, while the chemical nature of these glasses is so sensitive that considerable care is required to protect the surfaces of lenses made from them if serious tarnishing is to be avoided. In practice, however, it is not found that the presence either of a decidedly greenish-yellow colour or of numerous small bubbles interferes at all seriously with the successful use of the lenses for the majority of purposes, so that it is preferable to sacrifice the perfection of the glass in order to secure valuable optical properties.

It is a further striking fact, not unconnected with those just enumerated, that the extreme range of optical properties covered even by the relatively large number of optical glasses now available is in reality very small. The refractive indices of all glasses at present available lie between 1·46 and 1·90, whereas transparent minerals are known having refractive indices lying considerably outside these limits; at least one of these, fluorite (calcium fluoride), is actually used by opticians in the construction of certain lenses, so that probably progress is to be looked for in a considerable widening of the limits of available optical materials; possibly such progress may lie in the direction of the artificial production of large mineral crystals.

The qualities required in optical glasses have already been partly referred to, but may now be summarized:—

1. *Transparency and Freedom from Colour.*—These qualities can be readily judged by inspection of the glass in pieces of considerable thickness, and they may be quantitatively measured by means of the spectro-photometer.

2. *Homogeneity.*—The optical desideratum is uniformity of refractive index and dispersive power throughout the mass of the glass. This is probably never completely attained, variations in the sixth

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significant figure of the refractive index being observed in different parts of single large blocks of the most perfect glass. While such minute and gradual variations are harmless for most optical purposes, sudden variations which generally take the form of striae or veins are fatal defects in all optical glass. In their coarsest forms such striae are readily visible to the unaided eye, but finer ones escape detection unless special means are taken for rendering them visible; such special means conveniently take the form of an apparatus for examining the glass in a beam of parallel light, when the striae scatter the light and appear as either dark or bright lines according to the position of the eye. Plate glass of the usual quality, which appears to be perfectly homogeneous when looked at in the ordinary way, is seen to be a mass of fine striae, when a considerable thickness is examined in parallel light. Plate glass is, nevertheless, considerably used for the cheaper forms of lenses, where the scattering of the light and loss of definition arising from these fine striae is not readily recognized.

Bubbles and enclosures of opaque matter, although more readily observed, do not constitute such serious defects; their presence in a lens, to a moderate extent, does not interfere with its performance (see above).

3. *Hardness and Chemical Stability.*—These properties contribute to the durability of lenses, and are specially desirable in the outer members of lens combinations which are likely to be subjected to frequent handling or are exposed to the weather. As a general rule, to which, however, there are important exceptions, both these qualities are found to a greater degree, the lower the refractive index of the glass. The chemical stability, *i.e.* the power of resisting the disintegrating effects of atmospheric moisture and carbonic acid, depends largely upon the quantity of alkali contained in the glass and their proportion to the lead, lime or barium present, the stability being generally less the higher the proportion of alkali. A high silica-content tends towards both hardness and chemical stability, and this can be further increased by the addition of small proportions of boric acid; in larger quantities, however, the latter constituent produces the opposite effect.

4. *Absence of Internal Strain.*—Internal strain in glass arises from the unequal contraction of the outer and inner portions of masses of glass during cooling. Processes of annealing, or very gradual cooling, are intended to relieve these strains, but such processes are only completely effective when the cooling, particularly through those ranges of temperature where the glass is just losing the last traces of plasticity, is extremely gradual, a rate measured in hours per degree Centigrade being required. The existence of internal strains in glass can be readily recognized by examination in polarized light, any signs of double refraction indicating the existence of strain. If the glass is very badly annealed, the lenses made from it may fly to pieces during or after manufacture, but apart from such extreme cases the optical effects of internal strain are not readily observed except in large optical apparatus. Very perfectly annealed optical glass is now, however, readily obtainable.

5. *Refraction and Dispersion.*—The purely optical properties of refractiona and dispersion, although of the greatest importance, cannot be dealt with in any detail here, for an account of the optical properties required in glasses for various forms of lenses see the articles LENS and ABERRATION: II. *In Optical Systems.* As typical of the range of modern optical glasses Table I. is given, which constituted the list of optical glasses exhibited by Messrs Chance at the Optical Convention in London in 1905. In this table n is the refractive index of the glass for sodium light (the D line of the solar spectrum), while the letters C, F and G′ refer to lines in the hydrogen spectrum by which dispersion is now generally specified. The symbol ν represents the inverse of the dispersive power, its value being $(n_D-1)/(C-F)$. The very much longer lists of German and French firms contain only a few types not represented in this table.

Manufacture of Optical Glass.—In its earlier stages, the process for the production of optical glass closely resembles that used in the production of any other glass of the highest quality. The raw materials are selected with great care to assure chemical purity, but whereas in most glasses the only impurities to be dreaded are those that are either infusible or produce a colouring effect upon the glass, for optical purposes the admixture of other glass-forming bodies than those which are intended to be present must be avoided on account of their effect in modifying the optical constants of the glass. Constancy of composition of the raw materials and their careful and thorough admixture in constant proportions are therefore essential to the production of the required glasses. The materials are generally used in the form either of oxides (lead, zinc, silica, &c.) or of salts readily decomposed by heat, such as the nitrates or carbonates. Fragments of glass of the same composition as that aimed at are generally incorporated to a limited extent with the mixed raw materials to facilitate their fusion. The crucibles or pots used for the production of optical glass very closely resemble those used in the manufacture of flint glass for other purposes; they are "covered" and the molten materials are thus protected from the action of the furnace gases by the interposition of a wall of fireclay, but as crucibles for optical glass are used for only one fusion and are then broken up, they are not made so thick and heavy as those used in flint-glass making, since the latter remain in the furnace for many weeks. On the other hand, the chemical and physical nature of the fireclays used in the manufacture of such crucibles requires careful attention in order to secure the best results. The furnace used for the production of optical glass is generally constructed to take one crucible only, so that the heat of the furnace may be accurately adjusted to the requirements of the particular glass under treatment. These small furnaces are frequently arranged for direct coal firing, but regenerative gas-fired furnaces are also employed. The empty crucible, having first been gradually dried and heated to a bright red heat in a subsidiary furnace, is taken up by means of massive iron tongs and introduced into the previously heated furnace, the temperature of which is then gradually raised. When a suitable temperature for the fusion of the particular glass in question has been attained, the mixture of raw materials is introduced in comparatively small quantities at a time. In this way the crucible is gradually filled with a mass of molten glass, which is, however,

TABLE I.—*Optical Properties.*

Factory Number.	Name.	n_D.	ν.	Medium Dispersion. C–F.	Partial and Relative Partial Dispersions. C-D.	C–D / C–F.	D–F.	D–F / C–F.	F–G′.	F–G′ / C–F.
C. 644	Extra Hard Crown	1·4959	64·4	·00770	·00228	·296	·00542	·704	·00431	·560
B. 646	Boro-silicate Crown	1·5096	60·3	·00803	·00236	·294	·00562	·700	·00446	·555
A. 615	Hard Crown	1·5175	60·5	·00856	·00252	·294	·00604	·706	·00484	·584
C. 577	Medium Barium Crown	1·5738	57·9	·00990	·00293	·296	·00697	·704	·00552	·557
C. 579	Densest Barium Crown	1·6065	57·9	·01046	·00308	·294	·00738	·705	·00589	·563
A. 560	Soft Crown	1·5152	56·1	·00906	·00264	·291	·00642	·708	·00517	·570
B. 563	Medium Barium Crown	1·5660	56·3	·01006	·00297	·295	·00709	·704	·00576	·572
B. 535	Barium Light Flint	1·5452	53·5	·01020	·00298	·292	·00722	·701	·00582	·570
A. 490	Extra Light Flint	1·5316	49·0	·01085	·00313	·288	·00772	·711	·00630	·580
A. 485	Extra Light Flint	1·5333	48·5	·01092	·00322	·293	·00777	·707	·00649	·582
C. 474	Boro-silicate Flint	1·5623	47·4	·01187	·00343	·289	·00844	·711	·00693	·584
B. 466	Barium Light Flint	1·5833	46·6	·01251	·00362	·288	·00889	·711	·00721	·576
B. 458	Soda Flint	1·5482	45·8	·01195	·00343	·287	·00852	·713	·00690	·577
A. 458	Light Flint	1·5472	45·8	·01196	·00348	·291	·00848	·709	·00707	·591
A. 432	Light Flint	1·5610	43·2	·01299	·00372	·287	·00927	·713	·00770	·593
A. 410	Light Flint	1·5760	41·0	·01404	·00402	·286	·01002	·713	·00840	·598
B. 407	Light Flint	1·5787	40·7	·01420	·00404	·284	·01016	·715	·00840	·591
A. 370	Dense Flint	1·6118	36·9	·01657	·00470	·284	·01187	·716	·01004	·606
A. 361	Dense Flint	1·6214	36·1	·01722	·00491	·285	·01231	·715	·01046	·608
A. 360	Dense Flint	1·6225	36·0	·01729	·00493	·286	·01236	·715	·01054	·609
A. 337	Extra Dense Flint	1·6469	33·7	·01917	·00541	·285	·01376	·720	·01170	·655
A. 299	Densest Flint	1·7129	29·9	·02384	·00670	·281	·01714	·789	·01661	·678

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full of bubbles of all sizes. These bubbles arise partly from the air enclosed between the particles of raw materials and partly from the gaseous decomposition products of the materials themselves. In the next stage of the process, the glass is raised to a high temperature in order to render it sufficiently fluid to allow of the complete elimination of these bubbles; the actual temperature required varies with the chemical composition of the glass, a bright red heat sufficing for the most fusible glasses, while with others the utmost capacity of the best furnaces is required to attain the necessary temperature. With these latter glasses there is, of course, considerable risk that the partial fusion and consequent contraction of the fireclay of the crucible may result in its destruction and the entire loss of the glass. The stages of the process so far described generally occupy from 36 to 60 hours, and during this time the constant care and watchfulness of those attending the furnace is required. This is still more the case in the next stage. The examination of small test-pieces of the glass withdrawn from the crucible by means of an iron rod having shown that the molten mass is free from bubbles, the stirring process may be begun, the object of this manipulation being to render the glass as homogeneous as possible and to secure the absence of veins or striae in the product. For this purpose a cylinder of fireclay, provided with a square axial hole at the upper end, is heated in a small subsidiary furnace and is then introduced into the molten glass. Into the square axial hole fits the square end of a hooked iron bar which projects several yards beyond the mouth of the furnace; by means of this bar a workman moves the fireclay cylinder about in the glass with a steady circular sweep. Although the weight of the iron bar is carried by a support, such as an overhead chain or a swivel roller, this operation is very laborious and trying, more especially during the earlier stages when the heat radiated from the open mouth of the crucible is intense. The men who manipulate the stirring bars are therefore changed at short intervals, while the bars themselves have also to be changed at somewhat longer intervals, as they rapidly become oxidized, and accumulated scale would tend to fall off them, thus contaminating the glass below. The stirring process is begun when the glass is perfectly fluid at a temperature little short of the highest attained in its fusion, but as the stirring proceeds the glass is allowed to cool gradually and thus becomes more and more viscous until finally the stirring cylinder can scarcely be moved. When the glass has acquired this degree of consistency it is supposed that no fresh movements can occur within its mass, so that if homogeneity has been attained the glass will preserve it permanently. The stirring is therefore discontinued and the clay cylinder is either left embedded in the glass, or by the exercise of considerable force it may be gradually withdrawn. The crucible with the semi-solid glass which it contains is now allowed to cool considerably in the melting furnace, or it may be removed to another slightly heated furnace. When the glass has cooled so far as to become hard and solid, the furnace is hermetically sealed up and allowed to cool very gradually to the ordinary temperature. If the cooling is very gradual—occupying several weeks—it sometimes happens that the entire contents of a large crucible, weighing perhaps 1000 lb, are found intact as a single mass of glass, but more frequently the mass is found broken up into a number of fragments of various sizes. From the large masses great lenses and mirrors may be produced, while the smaller pieces are used for the production of the disks and slabs of moderate size, in which the optical glass of commerce is usually supplied. In order to allow of the removal of the glass, the cold crucible is broken up and the glass carefully separated from the fragments of fireclay. The pieces of glass are then examined for the detection of the grosser defects, and obviously defective pieces are rejected. As the fractured surfaces of the glass in this condition are unsuitable for delicate examination a good deal of glass that passes this inspection has yet ultimately to be rejected. The next stage in the preparation of the glass is the process of moulding and annealing. Lumps of glass of approximately the right weight are chosen, and are heated to a temperature just sufficient to soften the glass, when the lumps are caused to assume the shape of moulds made of iron or fireclay either by the natural flow of the softened glass under gravity, or by pressure from suitable tools or presses. The glass, now in its approximate form, is placed in a heated chamber where it is allowed to cool very gradually—the minimum time of cooling from a dull red heat being six days, while for "fine annealing" a much longer period is required (see above). At the end of the annealing process the glass issues in the shape of disks or slabs slightly larger than required by the optician in each case. The glass is, however, by no means ready for delivery, since it has yet to be examined with scrupulous care, and all defective pieces must be rejected entirely or at least the defective part must be cut out and the slab remoulded or ground down to a smaller size. For the purpose of rendering this minute examination possible, opposite plane surfaces of the glass are ground approximately flat and polished, the faces to be polished being so chosen as to allow of a view through the greatest possible thickness of glass; thus in slabs the narrow edges are polished.

It will be readily understood from the above account of the process of production that optical glass, relatively to other kinds of glass, is very expensive, the actual price varying from 3s. to 30s. per lb in small slabs or disks. The price, however, rapidly increases with the total bulk of perfect glass required in one piece, so that large disks of glass suitable for telescope objectives of wide aperture, or blocks for large prisms, become exceedingly costly. The reason for this high cost is to be found partly in the fact that the yield of optically perfect glass even in large and successful meltings rarely exceeds 20% of the total weight of glass melted. Further, all the subsequent processes of cutting, moulding and annealing become increasingly difficult, owing to the greatly increased risk of breakage arising from either external injury or internal strain, as the dimensions of the individual piece of glass increase. Nevertheless, disks of optical glass, both crown and flint, have been produced up to 39 in. in diameter.

II. BLOWN GLASS. (A) *Table-ware and Vases.*—The varieties of glass used for the manufacture of table-ware and vases are the potash-lead glass, the soda-lime glass and the potash-lime glass. These glasses may be colourless or coloured. Venetian glass is a soda-lime glass; Bohemian glass is a potash-lime glass. The potash-lead glass, which was first used on a commercial scale in England for the manufacture of table-ware, and which is known as "flint" glass or "crystal," is also largely used in France, Germany and the United States. Table II. shows the typical composition of these glasses.

TABLE II.

	SiO_2.	K_2O.	PbO.	Na_2O.	CaO.	MgO.	Fe_2O_3 and Al_2O_3.
Potash-lead (flint) glass	53·17	13·88	32·95	..	..	..	..
Soda-lime (Venetian) glass	73·40	..	..	18·58	5·06	..	2·48
Potash-lime (Bohemian) glass	71·70	12·70	..	2·50	10·30	..	0·90

For melting the leadless glasses, open, bowl-shaped crucibles are used, ranging from 12 to 40 in. in diameter. Glass mixtures containing lead are melted in covered, beehive-shaped crucibles holding from 12 to 18 cwt. of glass. They have a hooded opening on one side near the top. This opening serves for the introduction of the glass-mixture, for the removal of the melted glass and as a source of heat for the processes of manipulation.

The Venetian furnaces in the island of Murano are small low structures heated with wood. The heat passes from the melting furnace into the annealing kiln. In Germany, Austria and the United States, gas furnaces are generally used. In England directly-heated coal furnaces are still in common use, which in many cases are stoked by mechanical feeders. There are two systems of annealing. The manufactured goods are either removed gradually from a constant source of heat by means of a train of small iron trucks drawn along a tramway by an

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endless chain, or are placed in a heated kiln in which the fire is allowed gradually to die out. The second system is especially used for annealing large and heavy objects. The manufacture of table-ware is carried on by small gangs of men and boys. In England each "gang" or "chair" consists of three men and one boy. In works, however, in which most of the goods are moulded, and where less skilled labour is required, the proportion of boy labour is increased. There are generally two shifts of workmen, each shift working six hours, and the work is carried on continuously from Monday morning until Friday morning. Directly work is suspended the glass remaining in the crucibles is ladled into water, drained and dried. It is then mixed with the glass mixture and broken glass ("cullet"), and replaced in the

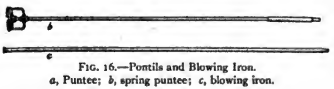

FIG. 16.—Pontils and Blowing Iron.
a, Puntee; *b*, spring puntee; *c*, blowing iron.

crucibles. The furnaces are driven to a white heat in order to fuse the mixture and expel hubbles of gas and air. Before work begins the temperature is lowered sufficiently to render the glass viscous. In the viscous state a mass of glass can be coiled upon the heated end of an iron rod, and if the rod is hollow can be blown into a hollow bulb. The tools used are extremely primitive —hollow iron blowing-rods, solid rods for holding vessels during manipulation, spring tools, resembling sugar-tongs in shape, with steel or wooden blades for fashioning the viscous glass, callipers, measure-sticks, and a variety of moulds of wood, carbon, cast iron, gun-metal and plaster of Paris (figs. 16 and 17). The most important tool, however, is the bench or "chair" on which the workman sits, which serves as his lathe. He sits

FIG. 17.—Shaping and Measuring Tools.
d, "Sugar-tongs" tool with wooden ends.
e, *e*, "Sugar-tongs" tools with cutting edges.
f, Pincers.
g, Scissors.
h, Battledore.
i, Marking compass.

between two rigid parallel arms, projecting forwards and backwards and sloping slightly from back to front. Across the arms he balances the iron rod to which the glass bulb adheres, and rolling it backwards and forwards with the fingers of his left hand fashions the glass between the blades of his sugar-tongs tool, grasped in his right hand. The hollow bulb is worked into the shape it is intended to assume, partly by blowing, partly by gravitation, and partly by the workman's tool. If the blowing iron is held vertically with the bulb uppermost the bulb becomes flattened and shallow, if the bulb is allowed to hang downwards it becomes elongated and reduced in diameter, and if the end of the bulb is pierced and the iron is held horizontally and sharply trundled, as a mop is trundled, the bulb opens out into a flattened disk.

During the process of manipulation, whether on the chair or whilst the glass is being reheated, the rod must be constantly and gently trundled to prevent the collapse of the bulb or vessel. Every natural development of the spherical form can be obtained by blowing and fashioning by hand. A non-spherical form can only be produced by blowing the hollow bulb into a mould of the required shape. Moulds are used both for giving shape to vessels and also for impressing patterns on their suface. Although spherical forms can be obtained without the use of moulds, moulds are now largely used for even the simplest kinds of table-ware in order to economize time and skilled labour. In France, Germany and the United States it is rare to find a piece of table-ware which has not received its shape in a mould. The old and the new systems of making a wine-glass illustrate almost all the ordinary processes of glass working. Sufficient glass is first "gathered" on the end of a blowing iron to form the bowl of the wine-glass. The mere act of coiling an exact weight of molten glass round the end of a rod 4 ft. in length requires considerable skill. The mass of glass is rolled on a polished slab of iron, the "marvor," to solidify it, and it is then slightly hollowed by blowing. Under the old system the form of the bowl is gradually developed by blowing and by shaping the hulb with the sugar-tongs tool. The leg is either pulled out from the substance of the base of the bowl, or from a small lump of glass added to the base. The foot starts as a small independent bulb on a separate blowing iron. One extremity of this bulb is made to adhere to the end of the leg, and the other extremity is broken away from its blowing iron. The fractured end is heated, and by the combined action of heat and centrifugal force opens out into a flat foot. The bowl is now severed from its blowing iron and the unfinished wine-glass is supported by its foot, which is attached to the end of a working rod hy a metal clip or hy a seal of glass. The fractured edge of the bowl is heated, trimmed with scissors and melted so as to be perfectly smooth and even, and the bowl itself receives its final form from the sugar-tongs tool.

Under the new system the bowl is fashioned by blowing the slightly hollowed mass of glass into a mould. The leg is formed and a small lump of molten glass is attached to its extremity to form the foot. The blowing iron is constantly trundled, and the small lump of glass is squeezed and flattened into the shape of a foot, either between two slabs of wood hinged together, or hy pressure against an upright board. The bowl is severed from the blowing iron, and the wine-glass is sent to the annealing oven with a bowl, longer than that of the finished glass, and with a rough fractured edge. When the glass is cold the surplus is removed either hy grinding, or hy applying heat to a line scratched with a diamond round the bowl. The fractured edge is smoothed by the impact of a gas flame.

In the manufacture of a wine-glass the ductility of glass is illustrated on a small scale hy the process of pulling out the leg. It is more strikingly illustrated in the manufacture of glass cane and tube. Cane is produced from a solid mass of molten glass, tube from a mass hollowed hy blowing. One workman holds the blowing iron with the mass of glass attached to it, and another fixes an iron rod by means of a seal of glass to the extremity of the mass. The two workmen face each other and walk backwards. The diameter of the cane or tube is regulated hy the weight of glass carried, and hy the distance covered by the two workmen. It is a curious property of viscous glass that whatever form is given to the mass of glass before it is drawn out is retained by the finished cane or tube, however small its section may be. Owing to this property, tubes or canes can be produced with a square, oblong, oval or triangular section. Exceedingly fine canes of milk-white glass play an important part in the masterpieces produced by the Venetian glass-makers of the 16th century. Vases and drinking cups were produced of extreme lightness, in the walls of which were embedded patterns rivalling lace-work in fineness and intricacy. The canes from which the patterns are formed are either simple or complex. The latter are made hy dipping a small mass of molten colourless glass into an iron cup around the inner wall of which short lengths of white cane have been arranged at

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regular intervals. The canes adhere to the molten glass, and the mass is first twisted and then drawn out into fine cane, which contains white threads arranged in endless spirals. The process can be almost indefinitely repeated and canes formed of extreme complexity. A vase decorated with these simple or complex canes is produced by embedding short lengths of the cane on the surface of a mass of molten glass and blowing and fashioning the mass into the required shape.

Table-ware and vases may be wholly coloured or merely decorated with colour. Touches of colour may be added to vessels in course of manufacture by means of seals of molten glass, applied like sealing-wax; or by causing vessels to wrap themselves round with threads or coils of coloured glass. By the application of a pointed iron hook, while the glass is still ductile, the parallel coils can be distorted into bends, loops or zigzags. The surface of vessels may be spangled with gold or platinum by rolling the hot glass on metallic leaf, or iridescent, by the deposition of metallic tin, or by the corrosion caused by the chemical action of acid fumes. Gilding and enamel decoration are applied to vessels when cold, and fixed by heat.

Cutting and *engraving* are mechanical processes for producing decorative effects by abrading the surface of the glass when cold. The abrasion is effected by pressing the glass against the edge of wheels, or disks, of hard material revolving on horizontal spindles. The spindles of cutting wheels are driven by steam or electric power. The wheels for making deep cuts are made of iron, and are fed with sand and water. The wheels range in diameter from 18 in. to 3 in. Wheels of carborundum are also used. Wheels of fine sandstone fed with water are used for making slighter cuts and for smoothing the rough surface left by the iron wheels. Polishing is effected by wooden wheels fed with wet pumice-powder and rottenstone and by brushes fed with moistened putty-powder. Patterns are produced by combining straight and curved cuts. Cutting brings out the brilliancy of glass, which is one of its intrinsic qualities. At the end of the 18th century English cut glass was unrivalled for design and beauty. Gradually, however, the process was applied without restraint and the products lost all artistic quality. At the present time cut glass is steadily regaining favour.

Engraving is a process of drawing on glass by means of small copper wheels. The wheels range from $\frac{1}{16}$ in. to 2 in. in diameter, and are fed with a mixture of fine emery and oil. The spindles to which the wheels are attached revolve in a lathe worked by a foot treadle. The true use of engraving is to add interest to vessels by means of coats of arms, crests, monograms, inscriptions and graceful outlines. The improper use of engraving is to hide defective material. There are two other processes of marking patterns on glass, but they possess no artistic value. In the "sandblast" process the surface of the glass is exposed to a stream of sharp sand driven by compressed air. The parts of the surface which are not to be blasted are covered by adhesive paper. In the "etching" process the surface of the glass is etched by the chemical action of hydrofluoric acid, the parts which are not to be attacked being covered with a resinous paint. The glass is first dipped in this protective liquid, and when the paint has set the pattern is scratched through it with a sharp point. The glass is then exposed to the acid.

Glass stoppers are fitted to bottles by grinding. The mouth of the bottle is ground by a revolving iron cone, or mandrel, fed with sand and water and driven by steam. The head of the stopper is fastened in a chuck and the peg is ground to the size of the mouth of the bottle by means of sand and water pressed against the glass by bent strips of thin sheet iron. The mouth of the bottle is then pressed by hand on the peg of the stopper, and the mouth and peg are ground together with a medium of very fine emery and water until an air-tight joint is secured.

The revival in recent years of the craft of glass-blowing in England must be attributed to William Morris and T. G. Jackson, R.A. (Pl. II. figs. 11 and 12). They, at any rate, seem to have been the first to grasp the idea that a wine-glass is not merely a bowl, a stem and a foot, but that, whilst retaining simplicity of form, it may nevertheless possess decorative effect. They, moreover, suggested the introduction for the manufacture of table-glass of a material similar in texture to that used by the Venetians, both colourless and tinted.

The colours previously available for English table-glass were ruby, canary-yellow, emerald-green, dark peacock-green, light peacock-blue, dark purple-blue and a dark purple. About 1870 the "Jackson" table-glass was made in a light, dull green glass. The dull green was followed successively by amber, white opal, blue opal, straw opal, sea-green, hora colour and various pale tints of soda-lime glass, ranging from yellow to blue. Experiments were also tried with a violet-coloured glass, a violet opal, a transparent black and with glasses shading from red to blue, red to amber and blue to green.

In the Paris Exhibition of 1900 surface decoration was the prominent feature of all the exhibits of table-glass. The carved or "cameo" glass, introduced by Thomas Webb of Stourbridge in 1878, had been copied with varying success by glass-makers of all nations. In many specimens there were three or more layers of differently coloured glass, and curious effects of blended colour were obtained by cutting through, or partly through, the different layers. The surface of the glass had usually been treated with hydrofluoric acid so as to have a satin-like gloss. Some vases of this character, shown by Emile Gallé and Daum Frères of Nancy, possessed considerable beauty. The "Favrile" glass of Louis C. Tiffany of New York (Pl. II. fig. 13) owes its effect entirely to surface colour and lustre. The happiest specimens of this glass almost rival the wings of butterflies in the brilliancy of their iridescent colours. The vases of Karl Koepping of Berlin are so fantastic and so fragile that they appear to be creations of the lamp rather than of the furnace. An illustration is also given of some of Powell's "Whitefriars" glass, shown at the St Louis Exhibition, 1904 (Pl. II. fig. 14). The specimens of "pâte de verre" exhibited by A. L. Dammouse, of Sèvres, in the Musée des Arts décoratifs in Paris, and at the London Franco-British Exhibition in 1908, deserve attention. They have a semi-opaque body with an "egg-shell" surface and are delicately tinted with colour. The shapes are exceedingly simple, but some of the pieces possess great beauty. The material and technique suggest a close relationship to porcelain.

(B) *Tube.*—The process of making tube has already been described. Although the bore of the thermometer-tube is exceedingly small, it is made in the same way as ordinary tube. The white line of enamel, which is seen in some thermometers behind the bore, is introduced before the mass of glass is pulled out. A flattened cake of viscous glass-enamel is welded on to one side of the mass of glass after it has been hollowed by blowing. The mass, with the enamel attached, is dipped into the crucible and covered with a layer of transparent glass; the whole mass is then pulled out into tube. If the section of the finished tube is to be a triangle, with the enamel and bore at the base, the molten mass is pressed into a V-shaped mould before it is pulled out.

In modern thermometry instruments of extreme accuracy are required, and researches have been made, especially in Germany and France, to ascertain the causes of variability in mercurial thermometers, and how such variability is to be removed or reduced. In all mercurial thermometers there is a slight depression of the ice-point after exposure to high temperatures; it is also not uncommon to find that the readings of two thermometers between the ice- and boiling-points fail to agree at any intermediate temperature, although the ice- and boiling-points of both have been determined together with perfect accuracy, and the intervening spaces have been equally divided. It has been proved that these variations depend to a great extent on the chemical nature of the glass of which the thermometer is made. Special glasses have therefore been produced by Tonnelot in France and at the Jena glass-works in Germany expressly for the manufacture of thermometers for accurate physical measurements; the analyses of these are shown in Table III.

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TABLE III.

	SiO_2.	Na_2O.	K_2O.	CaO.	Al_2O_3.	MgO.	B_2O_3.	ZnO.	Depression of Ice-point.
Tonnelot's " Verre dur "	70·96	12·02	0·56	14·40	1·44	0·40	..	..	0·07
Jena glass—									
XVI.–111 . .	67·5	14·0	..	7·0	2·5	..	2·0	7·0	0·05
59–111 . .	72·0	11·0	..	5·0	5·0	..	12·0	..	0·02

Since the discovery of the Röntgen rays, experiments have been made to ascertain the effects of the different constituents of glass on the transparency of glass to X-rays. The oxides of lead, barium, zinc and antimony are found perceptibly to retard the rays. The glass tubes, therefore, from which the X-ray bulbs are to be fashioned, must not contain any of these oxides, whereas the glass used for making the funnel-shaped shields, which direct the rays upon the patient and at the same time protect the hands of the operator from the action of the rays, must contain a large proportion of lead.

Among the many developments of the Jena Works, not the least important are the glasses made in the form of a tube, from which gas-chimneys, gauge-glasses and chemical apparatus are fashioned, specially adapted to resist sudden changes of temperature. One method is to form the tube of two layers of glass, one being considerably more expansible than the other.

(C) *Sheet and Crown-glass.*—Sheet-glass is almost wholly a soda-lime-silicate glass, containing only small quantities of iron, alumina and other impurities. The raw materials used in this manufacture are chosen with considerable care, since the requirements as to the colour of the product are somewhat stringent. The materials ordinarily employed are the following: sand, of good quality, uniform in grain and free from any notable quantity of iron oxide; carbonate of lime, generally in the form of a pure variety of powdered limestone; and sulphate of soda. A certain proportion of soda ash (carbonate of soda) is also used in some works in sheet-glass mixtures, while " decolorizers " (substances intended to remove or reduce the colour of the glass) are also sometimes added, those most generally used being manganese dioxide and arsenic. Another essential ingredient of all glass mixtures containing sulphate of soda is some form of carbon, which is added either as coke, charcoal or anthracite coal; the carbon so introduced aids the reducing substances contained in the atmosphere of the furnace in bringing about the reduction of the sulphate of soda to a condition in which it combines more readily with the silicic acid of the sand. The proportions in which these ingredients are mixed vary according to the exact quality of glass required and with the form and temperature of the melting furnace employed. A good quality of sheet-glass should show, on analysis, a composition approximating to the following: silica (SiO_2), 72%; lime (CaO), 13%; soda (Na_2O), 14%; and iron and alumina (Fe_2O_3,Al_2O_3), 1%. The actual composition, however, of a mixture that will give a glass of this composition cannot be directly calculated from these figures and the known composition of the raw materials, owing to the fact that considerable losses, particularly of alkali, occur during melting.

The fusion of sheet-glass is now generally carried out in gas-fired regenerative tank furnaces. The glass in process of fusion is contained in a basin or tank built up of large blocks of fire-clay and is heated by one or more powerful gas flames which enter the upper part of the furnace chamber through suitable apertures or " ports." In Europe the gas burnt in these furnaces is derived from special gas-producers, while in some parts of America natural gas is utilized. With producer gas it is necessary to pre-heat both the gas and the air which is supplied for its combustion by passing both through heated regenerators (for an account of the principles of the regenerative furnace see article FURNACE). In many respects the glass-melting tank resembles the open-hearth steel furnace, but there are certain interesting differences. Thus the dimensions of the largest glass tanks greatly exceed those of the largest steel furnaces; glass furnaces containing up to 250 tons of molten glass have been successfully operated, and owing to the relatively low density of glass this involves very large dimensions. The temperature required in the fusion of sheet-glass and of other glasses produced in tank furnaces is much lower than that attained in steel furnaces, and it is consequently possible to work glass-tanks continuously for many months together; on the other hand, glass is not readily freed from foreign bodies that may become admixed with it, so that the absence of detachable particles is much more essential in glass than in steel melting. Finally, fluid steel can be run or poured off, since it is perfectly fluid, while glass cannot be thus treated, but is withdrawn from the furnace by means of either a ladle or a gatherer's pipe, and the temperature required for this purpose is much lower than that at which the glass is melted. In a sheet-glass tank there is therefore a gradient of temperature and a continuous passage of material from the hotter end of the furnace where the raw materials are introduced to the cooler end where the glass, free from bubbles and raw material, is withdrawn by the gatherers. For the purpose of the removal of the glass, the cooler end of the furnace is provided with a number of suitable openings, provided with movable covers or shades. The " gatherer " approaches one of these openings, removes the shade and introduces his previously heated " pipe." This instrument is an iron tube, some 5 ft. long, provided at one end with an enlarged butt and at the other with a wooden covering acting as handle and mouthpiece. The gatherer dips the butt of the pipe into the molten " metal " and withdraws upon it a small ball of viscous glass, which he allows to cool in the air while constantly rotating it so as to keep the mass as nearly spherical in shape as he can. When the first ball or " gathering " has cooled sufficiently, the whole is again dipped into the molten glass and a further layer adheres to the pipe-end, thus forming a larger ball. This process is repeated, with slight modifications, until the gathering is of the proper size and weight to yield the sheet which is to be blown. When this is the case the gathering is carried to a block or half-open mould in which it is rolled and blown until it acquires, roughly, the shape of a hemisphere, the flat side being towards the pipe and the convexity away from it; the diameter of this hemisphere is so regulated as to be approximately that of the cylinder which is next to be formed of the viscous mass. From the hemispherical shape the mass of glass is now gradually blown into the form of a short cylinder, and then the pipe with the adherent mass of glass is handed over to the blower proper. This workman stands upon a platform in front of special furnaces which, from their shape and purpose, are called " blowing holes." The blower repeatedly heats the lower part of the mass of glass and keeps it distended by blowing while he swings it over a deep trench which is provided next to his working platform. In this way the glass is extended into the form of a long cylinder closed at the lower end. The size of cylinder which can be produced in this way depends chiefly upon the dimensions of the working platform and the weight which a man is able to handle freely. The lower end of the cylinder is opened, in the case of small and thin cylinders, by the blower holding his thumb over the mouthpiece of the pipe and simultaneously warming the end of the cylinder in the furnace, the expansion of the imprisoned air and the softening of the glass causing the end of the cylinder to burst open. The blower then heats the end of the cylinder again and rapidly spins the pipe about its axis; the centrifugal effect is sufficient to spread the soft glass at the end to a radius equal to that of the rest of the cylinder. In the case of large and thick cylinders, however, another process of opening the ends is generally employed: an assistant attaches a small lump of hot glass to the domed end, and the heat of this added glass softens the cylinder sufficiently to enable the assistant to cut the end open with a pair of shears; subsequently the open end is spun out to the diameter of the whole as described above. The finished cylinder

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is next carried to a rack and the pipe detached from it by applying a cold iron to the neck of thick hot glass which connects pipe-butt and cylinder, the neck cracking at the touch. Next, the rest of the connecting neck is detached from the cylinder by the application of a heated iron to the chilled glass. This leaves a cylinder with roughly parallel ends; these ends are cut by the use of a diamond applied internally and then the cylinder is split longitudinally by the same means. The split cylinder is passed to the flattening furnace, where it is exposed to a red heat, sufficient to soften the glass; when soft the cylinder is laid upon a smooth flat slab and flattened down upon it by the careful application of pressure with some form of rubbing implement, which frequently takes the form of a block of charred wood. When flattened, the sheet is moved away from the working opening of the furnace, and pushed to a system of movable grids, by means of which it is slowly moved along a tunnel, away from a source of heat nearly equal in temperature to that of the flattening chamber. The glass thus cools gradually as it passes down the tunnel and is thereby adequately annealed.

The process of sheet-glass manufacture described above is typical of that in use in a large number of works, but many modifications are to be found, particularly in the furnaces in which the glass is melted. In some works, the older method of melting the glass in large pots or crucibles is still adhered to, although the old-fashioned coal-fired furnaces have nearly everywhere given place to the use of producer gas and regenerators. For the production of coloured sheet-glass, however, the employment of pot furnaces is still almost universal, probably because the quantities of glass required of any one tint are insufficient to employ even a small tank furnace continuously; the exact control of the colour is also more readily attained with the smaller bulk of glass which has to be dealt with in pots. The general nature of the colouring ingredients employed, and the colour effects produced by them, have already been mentioned. In coloured sheet-glass, two distinct kinds are to be recognized: in one kind the colouring matter is contained in the body of the glass itself, while in the other the coloured sheet consists of ordinary white glass covered upon one side with a thin coating of intensely coloured glass. The latter kind is known as "flashed," and is universally employed in the case of colouring matters whose effect is so intense that in any usual thickness of glass they would cause almost entire opacity. Flashed glass is produced by taking either the first or the last gathering in the production of a cylinder out of a crucible containing the coloured "metal," the other gatherings being taken out of ordinary white sheet-glass. It is important that the thermal expansion of the two materials which are thus incorporated should be nearly alike, as otherwise warping of the finished sheet is liable to result.

Mechanical Processes for the Production of Sheet-glass.—The complicated and indirect process of sheet-glass manufacture has led to numerous inventions aiming at a direct method of production by more or less mechanical means. All the earlier attempts in this direction failed on account of the difficulty of bringing the glass to the machines without introducing air-bells, which are always formed in molten glass when it is ladled or poured from one vessel into another. More modern inventors have therefore adopted the plan of drawing the glass direct from the furnace. In an American process the glass is drawn direct from the molten mass in the tank in a cylindrical form by means of an iron ring previously immersed in the glass, and is kept in shape by means of special devices for cooling it rapidly as it leaves the molten bath. In this process, however, the entire operations of splitting and flattening are retained, and although the mechanical process is said to be in successful commercial operation, it has not as yet made itself felt as a formidable rival to hand-made sheet-glass. An effort at a more direct mechanical process is embodied in the inventions of Foucault which are at present being developed in Germany and Belgium; in this process the glass is drawn from the molten bath in the shape of flat sheets, by the aid of a bar of iron, previously immersed in the glass, the glass receiving its form by being drawn through slots in large fire-bricks, and being kept in shape by rapid chilling produced by the action of air-blasts. The mechanical operation is quite successful for thick sheets, but it is not as yet available for the thinner sheets required for the ordinary purposes of sheet-glass, since with these excessive breakage occurs, while the sheets generally show grooves or lines derived from small irregularities of the drawing orifice. For the production of thick sheets which are subsequently to be polished the process may thus claim considerable success, but it is not as yet possible to produce satisfactory sheet-glass by such means.

Crown-glass has at the present day almost disappeared from the market, and it has been superseded by sheet-glass, the more modern processes described above being capable of producing much larger sheets of glass, free from the knob or "bullion" which may still be seen in old crown-glass windows. For a few isolated purposes, however, it is desirable to use a glass which has not been touched upon either surface and thus preserves the lustre of its "fire polish" undiminished; this can be attained in crown-glass but not in sheet, since one side of the latter is always more or less marked by the rubber used in the process of flattening. One of the few uses of crown-glass of this kind is the glass slides upon which microscopic specimens are mounted, as well as the thin glass slips with which such preparations are covered. A full account of the process of blowing crown-glass will be found in all older books and articles on the subject, so that it need only be mentioned here that the glass, instead of being blown into a cylinder, is blown into a flattened sphere, which is caused to burst at the point opposite the pipe and is then, by the rapid spinning of the glass in front of a very hot furnace-opening, caused to expand into a flat disk of large diameter. This only requires to be annealed and is then ready for cutting up, but the lump of glass by which the original globe was attached to the pipe remains as the bullion in the centre of the disk of glass.

Coloured Glass for Mosaic Windows.—The production of coloured glass for "mosaic" windows has become a separate branch of glass-making. Charles Winston, after prolonged study of the coloured windows of the 13th, 14th and 15th centuries, convinced himself that no approach to the colour effect of these windows could be made with glass which is thin and even in section, homogeneous in texture, and made and coloured with highly refined materials. To obtain the effect it was necessary to reproduce as far as possible the conditions under which the early craftsmen worked, and to create scientifically glass which is impure in colour, irregular in section, and non-homogeneous in texture. The glass is made in cylinders and in "crowns" or circles. The cylinders measure about 14 in. in length by 8 in. in diameter, and vary in thickness from $\frac{1}{8}$ to $\frac{3}{8}$ in. The crowns are about 15 in. in diameter, and vary in thickness from $\frac{1}{8}$ to $\frac{3}{8}$ in., the centre being the thickest. These cylinders and crowns may be either solid colour or flashed. Great variety of colour may be obtained by flashing one colour upon another, such as blue on green, and ruby on blue, green or yellow.

E. J. Prior has introduced an ingenious method of making small oblong and square sheets of coloured glass, which are thick in the centre and taper towards the edges, and which have one surface slightly roughened and one brilliantly polished. Glass is blown into an oblong box-shaped iron mould, about 12 in. in depth and 6 in. across. A hollow rectangular bottle is formed, the base and sides of which are converted into sheets. The outer surface of these sheets is slightly roughened by contact with the iron mould.

(D) *Bottles and mechanically blown Glass.*—The manufacture of bottles has become an industry of vast proportions. The demand constantly increases, and, owing to constant improvements in material in the moulds and in the methods of working, the supply fully keeps pace with the demand. Except for making bottles of special colours, gas-heated tank furnaces are in general use. Melting and working are carried on continuously. The essential qualities of a bottle are strength and power to resist chemical corrosion. The materials are selected with a view to secure these qualities. For the highest quality of bottles, which

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are practically colourless, sand, limestone and sulphate and carbonate of soda are used. The following is a typical analysis of high quality bottle-glass: SiO_2, 69·15%; Na_2O, 13·00%; CaO, 15·00%; Al_2O_3, 2·20%; and Fe_2O_3, 0·65%. For the commoner grades of dark-coloured bottles the glass mixture is cheapened by substituting common salt for part of the sulphate of soda, and by the addition of felspar, granite, granulite, furnace slag and other substances fusible at a high temperature. Bottle moulds are made of cast iron, either in two pieces, hinged together at the base or at one side, or in three pieces, one forming the body and two pieces forming the neck.

A bottle gang or "shop" consists of five persons. The "gatherer" gathers the glass from the tank furnace on the end of the blowing-iron, rolls it on a slab of iron or stone, slightly expands the glass by blowing, and hands the blowing iron and glass to the "blower." The blower places the glass in the mould, closes the mould by pressing a lever with his foot, and either blows down the blowing iron or attaches it to a tube connected with a supply of compressed air. When the air has forced the glass to take the form of the mould, the mould is opened and the blower gives the blowing iron with the bottle attached to it to the "wetter off." The wetter off touches the top of the neck of the bottle with a moistened piece of iron and by tapping the blowing iron detaches the bottle and drops it into a wooden trough. He then grips the body of the bottle with a four-pronged clip, attached to an iron rod, and passes it to the "bottle maker." The bottle maker heats the fractured neck of the bottle, binds a band of molten glass round the end of it and simultaneously shapes the inside and the outside of the neck by using the tool shown in fig. 18. The finished bottle is taken by the "taker in" to the annealing furnace. The bottles are stacked in iron trucks, which, when full, are moved slowly away from a constant source of heat.

FIG. 18.—Tool for moulding the inside and outside of the neck of a bottle.
C, Bottle.
A, Conical piece of iron to form the inside of the neck.
B, B, Shaped pieces of iron, which can be pressed upon the outside of the neck by the spring-handle H.

The processes of manipulation which have been described, although in practice they are very rapidly performed, are destined to be replaced by the automatic working of a machine. Bottle-making machines, based on Ashley's original patent, are already being largely used. They ensure absolute regularity in form and save both time and labour.

A bottle-making machine combines the process of pressing with a plunger with that of blowing by compressed air. The neck of the bottle is first formed by the plunger, and the body is subsequently blown by compressed air admitted through the plunger. A sufficient weight of molten glass to form a bottle is gathered and placed in a funnel-shaped vessel which serves as a measure, and gives access to the mould which shapes the outside of the neck. A plunger is forced upwards into the glass in the neck-mould and forms the neck. The funnel is removed, and the plunger, neck-mould and the mass of molten glass attached to the neck are inverted. A bottle mould rises and envelops the mass of molten glass. Compressed air admitted through the plunger forces the molten glass to take the form of the bottle mould and completes the bottle.

In the case of the machine patented by Michael Owens of Toledo, U.S.A., for making tumblers, lamp-chimneys, and other goods of similar character, the manual operations required are (1) gathering the molten glass at the end of a blowing iron; (2) placing the blowing iron with the glass attached to it in the machine; (3) removing the blowing iron with the blown vessel attached. Each machine (fig. 19) consists of a revolving table carrying five or six moulds. The moulds are opened and closed by cams actuated by compressed air. As soon as a blowing iron is in connexion with an air jet, the sections of the mould close upon the molten glass, and the compressed air forces the glass to take the form of the mould. After removal from the machine, the tumbler is severed from the blowing iron, and its fractured edge is trimmed.

Compressed air or steam is also used for fashioning very large vessels, baths, dishes and reservoirs by the "Sievert" process. Molten glass is spread upon a large iron plate of the required shape and dimensions. The flattened mass of glass is held by a rim, connected to the edge of the plate. The plate with the glass attached to it is inverted, and compressed air or steam is introduced through openings in the plate. The mass of glass, yielding to its own weight and the pressure of air or steam, sinks downwards and adapts itself to any mould or receptacle beneath it.

The processes employed in the manufacture of the glass bulbs for incandescent electric lamps, are similar to the old-

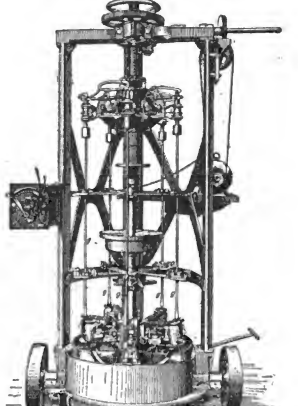

FIG. 19.—Owens's Glass-blowing Machine. *g, g, g*, Blowing-irons.

fashioned processes of bottle making. The mould is in two pieces hinged together; it is heated and the inner surface is rubbed over with finely powdered plumbago. When the glass is being blown in the mould the blowing iron is twisted round and round so that the finished bulb may not be marked by the joint of the mould.

III. MECHANICALLY PRESSED GLASS. (A) *Plate-glass.*—The glass popularly known as "plate-glass" is made by casting and rolling. The following are typical analyses:

	SiO_2.	CaO.	Na_2O.	Al_2O_3.	Fe_2O_3.
French .	71·80	15·70	11·10	1·26	0·14 %
English .	70·64	16·27	11·47	0·70	0·49 %

The raw materials for the production of plate-glass are chosen with great care so as to secure a product as free from colour as possible, since the relatively great thickness of the sheets

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would render even a faint tint conspicuous. The substances employed are the same as those used for the manufacture of sheet-glass, viz. pure sand, a pure form of carbonate of lime, and sulphate of soda, with the addition of a suitable proportion of carbon in the form of coke, charcoal or anthracite coal.

The glass to be used for the production of plate is universally melted in pots or crucibles and not in open tank furnaces. When the glass is completely melted and "fine," *i.e.* free from bubbles, it is allowed to cool down to a certain extent so as to become viscous or pasty. The whole pot, with its contents of viscous glass, is then removed bodily from the furnace by means of huge tongs and is transported to a crane, which grips the pot, raises it, and ultimately tips it over so as to pour the glass upon the slab of the rolling-table. In most modern works the greater part of these operations, as well as the actual rolling of the glass, is carried out by mechanical means, steam power and subsequently electrical power having been successfully applied to this purpose; the handling of the great weights of glass required for the largest sheets of plate-glass which are produced at the present time would, indeed, be impossible without the aid of machinery. The casting-table usually consists of a perfectly smooth cast-iron slab, frequently built up of a number of pieces carefully fitted together, mounted upon a low, massive truck running upon rails, so that it can be readily moved to any desired position in the casting-room. The viscous mass having been thrown on the casting-table, a large and heavy roller passes over it and spreads it out into a sheet. Rollers up to 5 tons in weight are employed and are now generally driven by power. The width of the sheet or plate is regulated by moving guides which are placed in front of the roller and are pushed along by it, while its thickness is regulated by raising or lowering the roller relatively to the surface of the table. Since the surfaces produced by rolling have subsequently to be ground and polished, it is essential that the glass should leave the rolling-table with as smooth a surface as possible, so that great care is required in this part of the process. It is, however, equally important that the glass as a whole should be flat and remains flat during the process of gradual cooling (annealing), otherwise great thicknesses of glass would have to be ground away at the projecting parts of the sheet. The annealing process is therefore carried out in a manner differing essentially from that in use for any other variety of flat glass and nearly resembling that used for optical glass. The rolled sheet is left on the casting-table until it has set sufficiently to be pushed over a flat iron plate without risk of distortion; meanwhile the table has been placed in front of the opening of one of the large annealing kilns and the slab of glass is carefully pushed into the kiln. The annealing kilns are large fire-brick chambers of small height but with sufficient floor area to accommodate four or six large slabs, and the slabs are placed directly upon the floor of the kiln, which is built up of carefully dressed blocks of burnt fire-clay resting upon a bed of sand; in order to avoid any risk of working or buckling in this floor these blocks are set slightly apart and thus have room to expand freely when heated. Before the glass is introduced, the annealing kiln is heated to dull red by means of coal fires in grates which are provided at the ends or sides of the kiln for that purpose. When the floor of the kiln has been covered with slabs of glass the opening is carefully built up and luted with fire-bricks and fire-clay, and the whole is then allowed to cool. In the walls and floor of the kiln special cooling channels or air passages are provided and by gradually opening these to atmospheric circulation the cooling is considerably accelerated while a very even distribution of temperature is obtained; by these means even the largest slabs can now be cooled in three or four days and are nevertheless sufficiently well annealed to be free from any serious internal stress. From the annealing kiln the slabs of glass are transported to the cutting room, where they are cut square, defective slabs being rejected or cut down to smaller sizes. The glass at this stage has a comparatively dull surface and this must now be replaced by that brilliant and perfectly polished surface which is the chief beauty of this variety of glass. The first step in this process is that of grinding the surface down until all projections are removed and a close approximation to a perfect plane is obtained. This operation, like all the subsequent steps in the polishing of the glass, is carried out by powerful machinery. By means of a rotating table either two surfaces of glass, or one surface of glass and one of cast iron, are rubbed together with the interposition of a powerful abrasive such as sand, emery or carborundum. The machinery by which this is done has undergone numerous modifications and improvements, all tending to produce more perfectly plane glass, to reduce the risk of breakage, and to lessen the expenditure of time and power required per sq. yd. of glass to be worked. It is impossible to describe this machinery within the limits of this article, but it is notable that the principal difficulties to be overcome arise from the necessity of providing the glass with a perfectly continuous and unyielding support to which it can be firmly attached but from which it can be detached without undue difficulty.

When the surface of the glass has been ground down to a plane, the surface itself is still "grey," *i.e.* deeply pitted with the marks of the abrasive used in grinding it down; these marks are removed by the process of smoothing, in which the surface is successively ground with abrasives of gradually increasing fineness, leaving ultimately a very smooth and very minutely pitted "grey" surface. This smooth surface is then brilliantly polished by the aid of friction with a rubbing tool covered with a soft substance like leather or felt and fed with a polishing material, such as rouge. A few strokes of such a rubber are sufficient to produce a decidedly "polished" appearance, but prolonged rubbing under considerable pressure and the use of a polishing paste of a proper consistency are required in order to remove the last trace of pitting from the surface. This entire process must, obviously, be applied in turn to each of the two surfaces of the slab of glass. Plate-glass is manufactured in this manner in thicknesses varying from $\frac{3}{16}$ in. to 1 in. or even more, while single sheets are produced measuring more than 27 ft. by 13 ft.

"Rolled Plate" and figured "Rolled Plate."—Glass for this purpose, with perhaps the exception of the best white and tinted varieties, is now universally produced in tank-furnaces, similar in a general way to those used for sheet-glass, except that the furnaces used for "rolled plate" glass of the roughest kinds do not need such minutely careful attention and do not work at so high a temperature. The composition of these glasses is very similar to that of sheet-glass, but for the ordinary kinds of rolled plate much less scrupulous selection need be made in the choice of raw materials, especially of the sand.

The glass is taken from the furnace in large iron ladles, which are carried upon slings running on overhead rails; from the ladle the glass is thrown upon the cast-iron bed of a rolling-table, and is rolled into sheet by an iron roller, the process being similar to that employed in making plate-glass, but on a smaller scale. The sheet thus rolled is roughly trimmed while hot and soft, so as to remove those portions of glass which have been spoilt by immediate contact with the ladle, and the sheet, still soft, is pushed into the open mouth of an annealing tunnel or "lear," down which it is carried by a system of moving grids.

The surface of the glass produced in this way may be modified by altering the surface of the rolling-table; if the table has a smooth surface, the glass will also be more or less smooth, but much dented and buckled on the surface and far from having the smooth face of blown sheet. If the table has a pattern engraved upon it the glass will show the same pattern in relief, the most frequent pattern of the kind being either small parallel ridges or larger ribs crossing to form a lozenge pattern.

The more elaborate patterns found on what is known as "figure rolled plate" are produced in a somewhat different manner; the glass used for this purpose is considerably whiter in colour and much softer than ordinary rolled plate, and instead of being rolled out on a table it is produced by rolling between two moving rollers from which the sheet issues. The pattern is impressed upon the soft sheet by a printing roller which is brought down upon the glass as it leaves the main rolls. This

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glass shows a pattern in high relief and gives a very brilliant effect.

The various varieties of rolled plate-glass are now produced for some purposes with a reinforcement of wire netting which is embedded in the mass of the glass. The wire gives the glass great advantages in the event of fracture from a blow or from fire, but owing to the difference in thermal expansion between wire and glass, there is a strong tendency for such "wired glass" to crack spontaneously.

Patent Plate-glass.—This term is applied to blown sheet-glass, whose surface has been rendered plane and brilliant by a process of grinding and polishing. The name "patent plate" arose from the fact that certain patented devices originated by James Chance of Birmingham first made it possible to polish comparatively thin glass in this way.

(B) *Pressed Glass.*—The technical difference between pressed and moulded glass is that moulded glass-ware has taken its form from a mould under the pressure of a workman's breath, or of compressed air, whereas pressed glass-ware has taken its form from a mould under the pressure of a plunger. Moulded glass receives the form of the mould on its interior as well as on its exterior surface. In pressed glass the exterior surface is modelled by the mould, whilst the interior surface is modelled by the plunger (fig. 20).

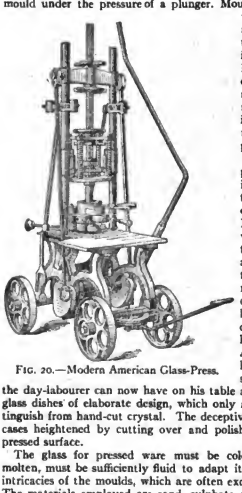

FIG. 20.—Modern American Glass-Press.

The process of pressing glass was introduced to meet the demand for cheap table-ware. Pressed glass, which is necessarily thick and serviceable, has well met this legitimate demand, but it also caters for the less legitimate taste for cheap imitations of hand-cut glass. An American writer has expressed his satisfaction that the day-labourer can now have on his table at a nominal price glass dishes of elaborate design, which only an expert can distinguish from hand-cut crystal. The deceptive effect is in some cases heightened by cutting over and polishing by hand the pressed surface.

The glass for pressed ware must be colourless, and, when molten, must be sufficiently fluid to adapt itself readily to the intricacies of the moulds, which are often exceedingly complex. The materials employed are sand, sulphate of soda, nitrate of soda, calcspar and in some works carbonate of barium. The following is an analysis of a specimen of English pressed glass; SiO_2, 70·68%; Na_2O, 18·38%; CaO, 5·45%; BaO, 4·17%; Al_2O_3, 0·33%; and Fe_2O_3, 0·20%. Tanks and pots are both used for melting the glass. The moulds are made of cast iron. They are usually in two main pieces, a base and an upper part or collar of hinged sections. The plunger is generally worked by a hand lever. The operator knows by touch when the plunger has pressed the glass far enough to exactly fill the mould. Although the moulds are heated, the surface of the glass is always slightly ruffled by contact with the mould. For this reason every piece of pressed glass-ware, as soon as it is liberated from the mould, is exposed to a sharp heat in a small subsidiary furnace in order that the ruffled surface may be removed by melting. These small furnaces are usually heated by an oil spray under the pressure of steam or compressed air.

See Antonio Neri, *Ars vitraria, cum Merritti observationibus* (Amsterdam, 1668) (Neri's work was translated into English by C. Merritt in 1662, and the translation, *The Art of making Glass*, was privately reprinted by Sir T. Phillipps, Bart., in 1826); Johann Kunkel, *Vollstandige Glasmacher-Kunst* (Nuremberg, 1785); Apsley Pellatt, *Curiosities of Glass-making* (London, 1849); A. Sauzay, *Marvels of Glass-making* (from the French) (London, 1869); C. Bontemps, *Guide du verrier* (Paris, 1868); E. Peligot, *Le Verre, son histoire, sa fabrication* (Paris, 1878); W. Stein, "Die Glasfabrikation," in Bolley's *Technologie*, vol. iii. (Brunswick, 1862); H. E. Benrath, *Die Glasfabrikation* (Brunswick, 1875); J. Falck and L. Lobmeyr, *Die Glasindustrie* (Vienna, 1875); D. H. Hovestadt, *Jenaer Glas* (Jena, 1900; Eng. trans. by J. D. and A. Everett, Macmillan, 1907); J. Henrivaux, *Le Verre et le cristal* (Paris, 1887); and *La Verrerie au XXe siècle* (1903); Chance, Harris and Powell, *Principles of Glass-making* (London, 1883); Moritz V. Rohr, *Theorie und Geschichte der photographischen Objektive* (Berlin, 1899); C. E. Guillaume, *Traité pratique de la thermométrie de précision* (Paris, 1889); Louis Coffignal, *Verres et émaux* (Paris, 1900); R. Gerner, *Die Glasfabrikation* (Vienna, 1897); C. Wetzel, *Herstellung grosser Glaskörper* (Vienna, 1900); C. Wetzel, *Bearbeitung von Glaskörpern* (Vienna, 1901); E. Tscheuschner, *Handbuch der Glasfabrikation* (Weimar, 1885); R. Dralle, *Anlage und Betrieb der Glasfabriken* (Leipzig, 1886); G. Tammann, *Kristallisieren und Schmelzen* (Leipzig, 1903); W. Rosenhain, "Some Properties of Glass," *Trans. Optical Society* (London, 1903), "Possible Directions of Progress in Optical Glass," *Proc. Optical Convention* (London, 1905) and *Glass Manufacture* (London, 1908); Introduction to section 1, *Catalogue of the Optical Convention* (London, 1905).)

(H. J. P.; W. RS.)

History of Glass Manufacture.

The great similarity in form, technique and decoration of the earliest known specimens of glass-ware suggests that the craft of glass-making originated from a single centre. It has been generally assumed that Egypt was the birthplace of the glass industry. It is true that many conditions existed in Egypt favourable to the development of the craft. The Nile supplied a waterway for the conveyance of fuel and for the distribution of the finished wares. Materials were available providing the essential ingredients of glass. The Egyptian potteries afforded experience in dealing with vitreous glazes and vitreous colours, and from Egyptian alabaster-quarries veined vessels were wrought, which may well have suggested the decorative arrangement of zigzag lines (see Plate I. figs. 1, 2, 4 *d*) so frequently found on early specimens of glass-ware. In Egypt, however, no traces have at present been found of the industry in a rudimentary condition, and the vases which have been classified as "primitive" bear witness to an elaboration of technique far in advance of the experimental period. The earliest specimens of glass-ware which can be definitely claimed as Egyptian productions, and the glass manufactory discovered by Dr Flinders Petrie at Tell el Amarna, belong to the period of the XVIIIth dynasty. The comparative lateness of this period makes it difficult to account for the wall painting at Beni Hasan, which accurately represents the process of glass-blowing, and which is attributed to the period of the XIth dynasty. Dr Petrie surmounts the difficulty by saying that the process depicted is not glass-blowing, but some metallurgical process in which reeds were used tipped with lumps of clay. It is possible that the picture does not represent Egyptian glass-blowers, but is a traveller's record of the process of glass-blowing seen in some foreign or subject country. The scarcity of specimens of early glass-ware actually found in Egypt, and the advanced technique of those which have been found, lead to the supposition that glass-making was exotic and not a native industry. The tradition, recorded by Pliny (*Nat. Hist.* xxxvi. 65), assigns the discovery of glass to Syria, and the geographical position of that country, as its forests as a source of fuel, and its deposits of sand add probability to the tradition. The story that Phoenician merchants found a glass-like substance under their cooking pots, which had been supported on blocks of natron, need not be discarded as pure fiction. The fire may well have caused the natron, an impure form of carbonate of soda, to combine with the surrounding sand to form silicate of soda, which, although not a permanent glass, is sufficiently glass-like to suggest the

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possibility of creating a permanent transparent material. Moreover, Pliny (xxxvi. 66) actually records the discovery which effected the conversion of deliquescent silicate of soda into permanent glass. The words are "Coeptus addi magnes lapis." There have been many conjectures as to the meaning of the words "magnes lapis." The material has been considered by some to be magnetic iron ore and by others oxide of manganese. Oxides of iron and manganese can only be used in glass manufacture in comparatively small quantities for the purpose of colouring or neutralizing colour in glass, and their introduction would not be a matter of sufficient importance to be specially recorded. In chapter 25 of the same book Pliny describes five varieties of "magnes lapis." One of these he says is found in magnesia, is white in colour, does not attract iron and is like pumice stone. This variety must certainly be magnesian limestone. Magnesian limestone mixed and fused with sand and an alkaline carbonate produces a permanent glass. The scene of the discovery of glass is placed by Pliny on the banks of the little river Belus, under the heights of Mount Carmel, where sand suitable for glass-making exists and wood for fuel is abundant. In this neighbourhood fragments and lumps of glass are still constantly being dug up, and analysis proves that the glass contains a considerable proportion of magnesia. The district was a glass-making centre in Roman times, and it is probable that the Romans inherited and perfected an indigenous industry of remote antiquity. Pliny has so accurately recorded the stages by which a permanent glass was developed that it may be assumed that he had good reason for claiming for Syria the discovery of glass. Between Egypt and Syria there was frequent intercourse both of conquest and commerce. It was customary for the victor after a successful raid to carry off skilled artisans as captives. It is recorded that Tahutmes III. sent Syrian artisans to Egypt. Glass-blowers may have been amongst their captive craftsmen, and may have started the industry in Egypt. The claims of Syria and Egypt are at the present time so equally balanced that it is advisable to regard the question of the birthplace of the glass industry as one that has still to be settled.

The "primitive" vessels which have been found in Egypt are small in size and consist of columnar stibium jars, flattened bottles and amphorae, all decorated with zigzag lines, tiny wide-mouthed vases on feet and minute jugs. The vessels of later date which have been found in considerable quantities, principally in the coast towns and islands of the Mediterranean, are amphorae and alabastra, also decorated with zigzag lines. The amphorae (Plate I. figs. 1 and 2) terminate with a point, or with an unfinished extension from the terminal point, or with a knob. The alabastra have short necks, are slightly wider at the base than at the shoulder and have rounded bases. Dr Petrie has called attention to two technical peculiarities to be found in almost every specimen of early glass-ware. The inner surface is roughened (Plate I. fig. 4 *c*), and has particles of sand adhering to it, as if the vessel had been filled with sand and subjected to heat, and the inside of the neck has the impression of a metal rod (Plate I. fig. 4 *a*), which appears to have been extracted from the neck with difficulty. From this evidence Dr Petrie has assumed that the vessels were not blown, but formed upon a core of sandy paste, modelled upon a copper rod, the rod being the core of the neck (see EGYPT: *Art and Archaeology*). The evidence, however, hardly warrants the abandonment of the simple process of blowing in favour of a process which is so difficult that it may almost be said to be impossible, and of which there is no record or tradition except in connexion with the manufacture of small beads. The technical difficulties to which Dr Petrie has called attention seem to admit of a somewhat less heroic explanation. A modern glass-blower, when making an amphora-shaped vase, finishes the base first, fixes an iron rod to the finished base with a seal of glass, severs the vase from the blowing iron, and finishes the mouth, whilst he holds the vase by the iron attached to its base. The "primitive" glass-worker reversed this process. Having blown the body of the vase, he finished the mouth and neck part, and fixed a small, probably hollow, copper rod inside the finished neck by pressing the neck upon the rod (Plate I. fig. 4 *b*). Having severed the body of the vase from the blowing iron, he heated and closed the fractured base, whilst holding the vase by means of the rod fixed in the neck. Nearly every specimen shows traces of the pressure of a tool on the outside of the neck, as well as signs of the base having been closed by melting. Occasionally a knob or excrescence, formed by the residue of the glass beyond the point at which the base has been pinched together, remains as a silent witness of the process.

If glass-blowing had been a perfectly new invention of Graeco-Egyptian or Roman times, some specimens illustrating the transition from core-moulding to blowing must have been discovered. The absence of traces of the transition strengthens the supposition that the revolution in technique merely consisted in the discovery that it was more convenient to finish the base of a vessel before its mouth, and such a revolution would leave no trace behind. The roughened inner surface and the adhering particles of sand may also be accounted for. The vessels, especially those in which many differently coloured glasses were incorporated, required prolonged annealing. It is probable that when the metal rod was withdrawn the vessel was filled with sand, to prevent collapse, and buried in heated ashes to anneal. The greater the heat of the ashes the more would the sand adhere to and impress the inner surface of the vessels. The decoration of zigzag lines was probably applied directly after the body of the vase had been blown. Threads of coloured molten glass were spirally coiled round the body, and, whilst still viscid, were dragged into zigzags with a metal hook.

Egypt.—The glass industry flourished in Egypt in Graeco-Egyptian and Roman times. All kinds of vessels were blown, both with and without moulds, and both moulding and cutting were used as methods of decoration. The great variety of these vessels is well shown in the illustrated catalogue of Graeco-Egyptian glass in the Cairo museum, edited by C. C. Edgar.

Another species of glass manufacture in which the Egyptians would appear to have been peculiarly skilled is the so-called mosaic glass, formed by the union of rods of various colours in such a manner as to form a pattern; the rod so formed was then reheated and drawn out until reduced to a very small size, 1 sq. in. or less, and divided into tablets by being cut transversely, each of these tablets presenting the pattern traversing its substance and visible on each face. This process was no doubt first practised in Egypt, and is never seen in such perfection as in objects of a decidedly Egyptian character. Very beautiful pieces of ornament of an architectural character are met with, which probably once served as decorations of caskets or other small pieces of furniture or of trinkets; also tragic masks, human faces and birds. Some of the last-named are represented with such truth of colouring and delicacy of detail that even the separate feathers of the wings and tail are well distinguished, although, as in an example in the British Museum, a human-headed hawk, the piece which contains the figure may not exceed $\frac{3}{4}$ in. in its largest dimension. Works of this description probably belong to the period when Egypt passed under Roman domination, as similar objects, though of inferior delicacy, appear to have been made in Rome.

Assyria.—Early Assyrian glass is represented in the British Museum by a vase of transparent greenish glass found in the north-west palace of Nineveh. On one side of this a lion is engraved, and also a line of cuneiform characters, in which is the name of Sargon, king of Assyria, 722 B.C. Fragments of coloured glasses were also found there, but our materials are too scanty to enable us to form any decided opinion as to the degree of perfection to which the art was carried in Assyria. Many of the specimens discovered by Layard at Nineveh have all the appearance of being Roman, and were no doubt derived from the Roman colony, Niniva Claudiopolis, which occupied the same site.

Roman Glass.—In the first centuries of our era the art of glass-making was developed at Rome and other cities under Roman rule in a most remarkable manner, and it reached a point of

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FIG. 1.

FIG. 2.

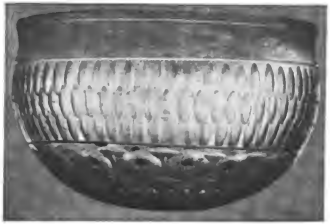

FIG. 6.

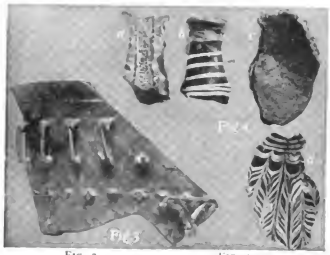

FIG. 3.

FIG. 4.

FIG. 8.

FIG. 5.

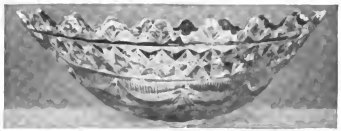

FIG. 10.

FIG. 7.

FIG. 9.

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FIG. 11.—TABLE GLASS.
DESIGNED BY T. G. JACKSON IN 1871.

FIG. 12.—TABLE GLASS.
DESIGNED FOR WM. MORRIS ABOUT 1872 BY PHILIP WEBB.

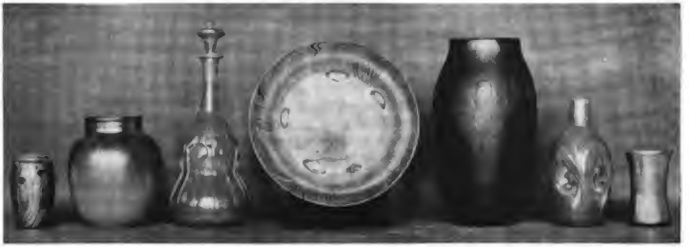

FIG. 13.—TIFFANY GLASS.

FIG. 14.—WHITEFRIARS GLASS, 1906.

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excellence which in some respects has never been excelled or even perhaps equalled. It may appear a somewhat exaggerated assertion that glass was used for more purposes, and in one sense more extensively, by the Romans of the imperial period than by ourselves in the present day; but it is one which can be borne out by evidence. It is true that the use of glass for windows was only gradually extending itself at the time when Roman civilization sank under the torrent of German and Hunnish barbarism, and that its employment for optical instruments was only known in a rudimentary stage; but for domestic purposes, for architectural decoration and for personal ornaments glass was unquestionably much more used than at the present day. It must be remembered that the Romans possessed no fine procelain decorated with lively colours and a beautiful glaze; Samian ware was the most decorative kind of pottery which was then made. Coloured and ornamental glass held among them much the same place for table services, vessels for toilet use and the like, as that held among us by porcelain. Pliny (*Nat. Hist.* xxxvi. 26, 67) tells us that for drinking vessels it was even preferred to gold and silver.

Glass was largely used in pavements, and in thin plates as a coating for walls. It was used in windows, though by no means exclusively, mica, alabaster and shells having been also employed. Glass, in flat pieces, such as might be employed for windows, has been found in the ruins of Roman houses both in England and in Italy, and in the house of the faun at Pompeii a small pane in a bronze frame remains. Most of the pieces have evidently been made by casting, but the discovery of fragments of sheet-glass at Silchester proves that the process of making sheet-glass was known to the Romans. When the window openings were large, as was the case in basilicas and other public buildings, and even in houses, the pieces of glass were, doubtless, fixed in pierced slabs of marble or in frames of wood or bronze. The Roman glass-blowers were masters of all the ordinary methods of manipulation and decoration. Their craftsmanship is proved by the large cinerary urns, by the jugs with wide, deeply ribbed, scientifically fixed handles, and by vessels and vases as elegant in form and light in weight as any that have been since produced at Murano. Their moulds, both for blowing hollow vessels and for pressing ornaments, were as perfect for the purposes for which they were intended as those of the present time. Their decorative cutting (Plate I. figs. 5 and 6), which took the form of simple, incised lines, or bands of shallow oval or hexagonal hollows, was more suited to the material than the deep prismatic cutting of comparatively recent times.

The Romans had at their command, of transparent colours, blue, green, purple or amethystine, amber, brown and rose; of opaque colours, white, black, red, blue, yellow, green and orange. There are many shades of transparent blue and of opaque blue, yellow and green. In any large collection of fragments it would be easy to find eight or ten varieties of opaque blue, ranging from lapis lazuli to turquoise or to lavender and six or seven of opaque green. Of red the varieties are fewer; the finest is a crimson red of very beautiful tint, and there are various gradations from this to a dull brick red. One variety forms the ground of a very good imitation of porphyry; and there is a dull semi-transparent red which, when light is passed through it, appears to be of a dull green hue. With these colours the Roman *vitrarius* worked, either using them singly or blending them in almost every conceivable combination, sometimes, it must be owned, with a rather gaudy and inharmonious effect.

The glasses to which the Venetians gave the name "mille fiori" were formed by arranging side by side sections of glass cane, the canes themselves being built up of differently coloured rods of glass, and binding them together by heat. A vast quantity of small cups and paterae were made by this means in patterns which bear considerable resemblance to the surfaces of madrepores. In these every colour and every shade of colour seem to have been tried in great variety of combination with effects more or less pleasing, but transparent violet or purple appears to have been the most common ground colour. Although most of the vessels of this mille fiori glass were small, some were made as large as 20 in. in diameter. Imitations of natural stones were made by stirring together in a crucible glasses of different colours, or by incorporating fragments of differently coloured glasses into a mass of molten glass by rolling. One variety is that in which transparent brown glass is so mixed with opaque white and blue as to resemble onyx. This was sometimes done with great success, and very perfect imitations of the natural stone were produced. Sometimes purple glass is used in place of brown, probably with the design of imitating the precious murrhine. Imitations of porphyry, of serpentine, and of granite are also met with, but these were used chiefly in pavements, and for the decoration of walls, for which purposes the onyx-glass was likewise employed.

The famous cameo glass was formed by covering a mass of molten glass with one or more coatings of a differently coloured glass. The usual process was to gather, first, a small quantity of opaque white glass; to coat this with a thick layer of translucent blue glass; and, finally, to cover the blue glass with a coating of the white glass. The outer coat was then removed from that portion which was to constitute the ground, leaving the white for the figures, foliage or other ornamentation; these were then sculptured by means of the gem-engraver's tools. Pliny no doubt means to refer to this when he says (*Nat. Hist.* xxxvi. 26. 66), "aliud argenti modo caelatur," contrasting it with the process of cutting glass by the help of a wheel, to which he refers in the words immediately preceding, "aliud torno teritur."

The Portland or Barberini vase in the British Museum is the finest example of this kind of work which has come down to us, and was entire until it was broken into some hundred pieces by a madman. The pieces, however, were joined together by Mr Doubleday with extraordinary skill, and the beauty of design and execution may still be appreciated. The two other most remarkable examples of this cameo glass are an amphora at Naples and the Auldjo vase. The amphora measures 1 ft. ¾ in. in height, 1 ft. 7½ in. in circumference; it is shaped like the earthern amphoras with a foot far too small to support it, and must no doubt have had a stand, probably of gold; the greater part is covered with a most exquisite design of garlands and vines, and two groups of boys gathering and treading grapes and playing on various instruments of music; below these is a line of sheep and goats in varied attitudes. The ground is blue and the figures white. It was found in a house in the Street of Tombs at Pompeii in the year 1839, and is now in the Royal Museum at Naples. It is well engraved in Richardson's *Studies of Ornamental Design*. The Auldjo vase, in the British Museum, is an oenochoe about 9 in. high; the ornament consists mainly of a most beautiful band of foliage, chiefly of the vine, with bunches of grapes; the ground is blue and the ornaments white; it was found at Pompeii in the house of the faun. It also has been engraved by Richardson. The same process was used in producing large tablets, employed, no doubt, for various decorative purposes. In the South Kensington Museum is a fragment of such a tablet or slab; the figure, a portion of which remains, could not have been less than about 14 in. high. The ground of these cameo glasses is most commonly transparent blue, but sometimes opaque blue, purple or dark brown. The superimposed layer, which is sculptured, is generally opaque white. A very few specimens have been met with in which several colours are employed.

At a long interval after these beautiful objects come those vessels which were ornamented either by means of coarse threads trailed over their surfaces and forming rude patterns, or by coloured enamels merely placed on them in lumps; and these, doubtless, were cheap and common wares. But a modification of the first-named process was in use in the 4th and succeeding centuries, showing great ingenuity and manual dexterity,—that, namely, in which the added portions of glass are united to the body of the cup, not throughout, but only at points, and then shaped either by the wheel or by the hand (Plate I. fig. 3). The

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attached portions form in some instances inscriptions, as on a cup found at Strassburg, which bears the name of the emperor Maximian (A.D. 286–310), on another in the Vereinigte Sammlungen at Munich, and on a third in the Trivulzi collection at Milan, where the cup is white, the inscription green and the network blue. Probably, however, the finest example is a situla, 10½ in. high by 8 in. wide at the top and 4 in. at the bottom, preserved in the treasury of St Mark at Venice. This is of glass of a greenish hue; on the upper part is represented, in relief, the chase of a lion by two men on horseback accompanied by dogs; the costume appears to be Byzantine rather than Roman, and the style is very bad. The figures are very much undercut. The lower part has four rows of circles united to the vessel at those points alone where the circles touch each other. All the other examples have the lower portion covered in like manner by a network of circles standing nearly a quarter of an inch from the body of the cup. An example connected with the specimens just described is the cup belonging to Baron Lionel de Rothschild; though externally of an opaque greenish colour, it is by transmitted light of a deep red. On the outside, in very high relief, are figures of Bacchus with vines and panthers, some portions being hollow from within, others fixed on the exterior. The changeability of colour may remind us of the "calices versicolores" which Hadrian sent to Servianus.

So few examples of glass vessels of this period which have been painted in enamel have come down to us that it has been questioned whether that art was then practised; but several specimens have been described which can leave no doubt on the point; decisive examples are afforded by two cups found at Vaspelev, in Denmark, engravings of which are published in the *Annaler for Nordisk Oldkyndeghed* for 1861, p. 305. These are small cups, 3 in. and 2½ in. high, 3¼ in. and 3 in. wide, with feet and straight sides; on the larger are a lion and a bull, on the smaller two birds with grapes, and on each some smaller ornaments. On the latter are the letters B. R. The colours are vitrified and slightly in relief; green, blue and brown may be distinguished. They are found with Roman bronze vessels and other articles.

The art of glass-making no doubt, like all other art, deteriorated during the decline of the Roman empire, but it is probable that it continued to be practised, though with constantly decreasing skill, not only in Rome but in the provinces. Roman technique was to be found in Byzantium and Alexandria, in Syria, in Spain, in Germany, France and Britain.

Early Christian and Byzantine Glass.—The process of embedding gold and silver leaf between two layers of glass originated as early as the 1st century, probably in Alexandria. The process consisted in spreading the leaf on a thin film of blown glass and pressing molten glass on to the leaf so that the molten glass cohered with the film of glass through the pores of the metallic leaf. If before this application of the molten glass the metallic leaf, whilst resting on the thin film of blown glass, was etched with a sharp point, patterns, emblems, inscriptions and pictures could be embedded and rendered permanent by the double coating of glass. The plaques thus formed could be reheated and fashioned into the bases of bowls and drinking vessels. In this way the so-called "fondi d'oro" of the catacombs in Rome were made. They are the broken bases of drinking vessels containing inscriptions, emblems, domestic scenes and portraits etched in gold leaf. Very few have any reference to Christianity, but they served as indestructible marks for indicating the position of interments in the catacombs. The fondi d'oro suggested the manufacture of plaques of gold which could be broken up into tesserae for use in mosaics.

Some of the Roman artificers in glass no doubt migrated to Constantinople, and it is certain that the art was practised there to a very great extent during the middle ages. One of the gates near the port took its name from the adjacent glass houses. St Sofia when erected by Justinian had vaults covered with mosaics and immense windows filled with plates of glass fitted into pierced marble frames; some of the plates, 7 to 8 in. wide and 9 to 10 in. high, not blown but cast, which are in the windows may possibly date from the building of the church. It is also recorded that pierced silver disks were suspended by chains and supported glass lamps "wrought by fire." Glass for mosaics was also largely made and exported. In the 8th century, when peace was made between the caliph Walid and the emperor Justinian II., the former stipulated for a quantity of mosaic for the decoration of the new mosque at Damascus, and in the 10th century the materials for the decoration of the niche of the kibla at Cordova were furnished by Romanus II. In the 11th century Desiderius, abbot of Monte Casino, sent to Constantinople for workers in mosaic.

We have in the work of the monk Theophilus, *Diversarum artium schedula*, and in the probably earlier work of Eraclius, about the 11th century, instructions as to the art of glass-making in general, and also as to the production of coloured and enamelled vessels, which these writers speak of as being practised by the Greeks. The only entire enamelled vessel which we can confidently attribute to Byzantine art is a small vase preserved in the treasury of St Mark's at Venice. This is decorated with circles of rosettes of blue, green and red enamel, each surrounded by lines of gold; within the circles are little figures evidently suggested by antique originals, and precisely like similar figures found on carved ivory boxes of Byzantine origin dating from the 11th or 12th century. Two inscriptions in Cufic characters surround the vase, but they, it would seem, are merely ornamental and destitute of meaning. The presence of these inscriptions may perhaps lead to the inference that the vase was made in Sicily, but by Byzantine workmen. The double-handled blue-glass vase in the British Museum, dating from the 5th century, is probably a chalice, as it closely resembles the chalices represented on early Christian monuments.

Of uncoloured glass brought from Constantinople several examples exist in the treasury of St Mark's at Venice, part of the plunder of the imperial city when taken by the crusaders in 1204. The glass in all is greenish, very thick, with many bubbles, and has been cut with the wheel; in some instances circles and cones, and in one the outlines of the figure of a leopard, have been left standing up, the rest of the surface having been laboriously cut away. The intention would seem to have been to imitate vessels of rock crystal. The so-called "Hedwig" glasses may also have originated in Constantinople. These are small cups deeply and rudely cut with conventional representations of eagles, lions and griffins. Only nine specimens are known. The specimen in the Rijks Museum at Amsterdam has an eagle and two lions. The specimen in the Germanic Museum at Nuremberg has two lions and a griffin.

Saracenic Glass.—The Saracenic invasion of Syria and Egypt did not destroy the industry of glass-making. The craft survived and flourished under the Saracenic régime in Alexandria, Cairo, Tripoli, Tyre, Aleppo and Damascus. In inventories of the 14th century both in England and in France mention may frequently be found of glass vessels of the manufacture of Damascus. A writer in the early part of the 15th century states that "glass-making is an important industry at Haleb (Aleppo)." Edward Dillon (*Glass*, 1902) has very properly laid stress on the importance of the enamelled Saracenic glass of the 13th, 14th and 15th centuries, pointing out that, whereas the Romans and Byzantine Greeks made some crude and ineffectual experiments in enamelling, it was under Saracenic influence that the processes of enamelling and gilding on glass vessels were perfected. An analysis of the glass of a Cairene mosque lamp shows that it is a soda-lime glass and contains as much as 4% of magnesia. This large proportion of magnesia undoubtedly supplied the stability required to withstand the process of enamelling. The enamelled Saracenic glasses take the form of flasks, vases, goblets, beakers and mosque lamps. The enamelled decoration on the lamps is restricted to lettering, scrolls and conventional foliage; on other objects figure-subjects of all descriptions are freely used. C. H. Read has pointed out a curious feature in the construction of the enamelled beakers. The base is double but the inner lining has an opening in the centre. Dillon has suggested that this central recess may have served to support a wick. It is possible, however

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that it served no useful purpose, but that the construction is a survival from the manufacture of vessels with fondi d'oro. The bases containing the embedded gold leaf must have been welded to the vessels to which they belonged, in the same way as the bases are welded to the Saracenic beakers. The enamelling process was probably introduced in the early part of the 13th century; most of the enamelled mosque lamps belong to the 14th century.

Venetian Glass.—Whether refugees from Padua, Aquilcia or other Italian cities carried the art to the lagoons of Venice in the 5th century, or whether it was learnt from the Greeks of Constantinople at a much later date, has been a disputed question. It would appear not improbable that the former was the case, for it must be remembered that articles formed of glass were in the later days of Roman civilization in constant daily use, and that the making of glass was carried on, not as now in large establishments, but by artisans working on a small scale. It seems certain that some knowledge of the art was preserved in France, in Germany and in Spain, and it seems improbable that it should have been lost in that archipelago, where the traditions of ancient civilization must have been better preserved than in almost any other place. In 523 Cassiodorus writes of the "innumerosa navigia" belonging to Venice, and where trade is active there is always a probability that manufactures will flourish. However this may be, the earliest positive evidence of the existence at Venice of a worker in glass would seem to be the mention of Petrus Flavianus, phiolarius, in the ducale of Vitale Falier in the year 1090. In 1224 twenty-nine persons are mentioned as friolari (*i.e.* phiolari), and in the same century "mariegole," or codes of trade regulations, were drawn up (*Monografia della vetraria Veneziana e Muranese*, p. 219). The manufacture had then no doubt attained considerable proportions: in 1268 the glass-workers became an incorporated body; in their processions they exhibited decanters, scent-bottles and the like; in 1279 they made, among other things, weights and measures. In the latter part of this century the glass-houses were almost entirely transferred to Murano. Thenceforward the manufacture continued to grow in importance; glass vessels were made in large quantities, as well as glass for windows. The earliest example which has as yet been described—a cup of blue glass, enamelled and gilt—is, however, not earlier than about 1440. A good many other examples have been preserved which may be assigned to the same century: the earlier of these bear a resemblance in form to the vessels of silver made in the west of Europe; in the later an imitation of classical forms becomes apparent. Enamel and gilding were freely used, in imitation no doubt of the much-admired vessels brought from Damascus. Dillon has pointed out that the process of enamelling had probably been derived from Syria, with which country Venice had considerable commercial intercourse. Many of the ornamental processes which we admire in Venetian glass were already in use in this century, as that of mille fiori, and the beautiful kind of glass known as "vitro di trina" or lace glass. An elaborate account of the processes of making the vitro di trina and the vasi a reticelli (Plate I., fig. 7) is given in Bontempo's *Guide du verrier*, pp. 602-612. Many of the examples of these processes exhibit surprising skill and taste, and are among the most beautiful objects produced at the Venetian furnaces. That peculiar kind of glass usually called schmelz, an imperfect imitation of calcedony, was also made at Venice in the 15th century. Avanturine glass, that in which numerous small particles of copper are diffused through a transparent yellowish or brownish mass, was not invented until about 1600.

The peculiar merits of the Venetian manufacture are the elegance of form and the surprising lightness and thinness of the substance of the vessels produced. The highest perfection with regard both to form and decoration was reached in the 16th century; subsequently the Venetian workmen somewhat abused their skill by giving extravagant forms to vessels, making drinking glasses in the forms of ships, lions, birds, whales and the like.

Besides the making of vessels of all kinds the factories of Murano had for a long period almost an entire monopoly of two other branches of the art—the making of mirrors and of beads. Attempts to make mirrors of glass were made as early as A.D. 1317, but even in the 16th century mirrors of steel were still in use. To make a really good mirror of glass two things are required—a plate free from bubbles and striae, and a method of applying a film of metal with a uniform bright surface free from defects. The principle of applying metallic films to glass seems to have been known to the Romans and even to the Egyptians, and is mentioned by Alexander Neckam in the 12th century, but it would appear that it was not until the 16th century that the process of "silvering" mirrors by the use of an amalgam of tin and mercury had been perfected. During the 16th and 17th centuries Venice exported a prodigious quantity of mirrors, but France and England gradually acquired knowledge and skill in the art, and in 1772 only one glass-house at Murano continued to make mirrors.

The making of beads was probably practised at Venice from a very early period, but the earliest documentary evidence bearing on the subject does not appear to be of earlier date than the 14th century, when prohibitions were directed against those who made of glass such objects as were usually made of crystal or other hard stones. In the 16th century it had become a trade of great importance, and about 1764 twenty-two furnaces were employed in the production of beads. Towards the end of the same century from 600 to 1000 workmen were, it is stated, employed on one branch of the art, that of ornamenting beads by the help of the blow-pipe. A very great variety of patterns was produced; a tariff of the year 1800 contains an enumeration of 562 species and a vast number of sub-species.

The efforts made in France, Germany and England, in the 17th and 18th centuries, to improve the manufacture of glass in those countries had a very injurious effect on the industry of Murano. The invention of colourless Bohemian glass brought in its train the practice of cutting glass, a method of ornamentation for which Venetian glass, from its thinness, was ill adapted. One remarkable man, Giuseppe Briati, exerted himself, with much success, both in working in the old Venetian method and also in imitating the new fashions invented in Bohemia. He was especially successful in making vases and circular dishes of vitro di trina; one of the latter in the Correr collection at Venice, believed to have been made in his glass-house, measures 55 centimetres (nearly 23 in.) in diameter. The vases made by him are as elegant in form as the best of the Cinquecento period, but may perhaps be distinguished by the superior purity and brilliancy of the glass. He also made with great taste and skill large lustres and mirrors with frames of glass ornamented either in intaglio or with foliage of various colours. He obtained a knowledge of the methods of working practised in Bohemia by disguising himself as a porter, and thus worked for three years in a Bohemian glass-house. In 1736 he obtained a patent at Venice to manufacture glass in the Bohemian manner. He died in 1772.

The fall of the republic was accompanied by interruption of trade and decay of manufacture, and in the last years of the 18th and beginning of the 19th century the glass-making of Murano was at a very low ebb. In the year 1838 Signor Bussolin revived several of the ancient processes of glass-working, and this revival was carried on by C. Pietro Biguglia in 1845, and by others, and later by Salviati, to whose successful efforts the modern renaissance of Venetian art glass is principally due.

The fame of Venice in glass-making so completely eclipsed that of other Italian cities that it is difficult to learn much respecting their progress in the art. Hartshorne and Dillon have drawn attention to the important part played by the little Ligurian town, Altare, as a centre from which glass-workers migrated to all parts of Europe. It is said that the glass industry was established at Altare, in the 11th century, by French craftsmen. In the 14th century Muranese glass-workers settled there and developed the industry. It appears that as early as 1205 furnaces had been established at Treviso, Vicenza,

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Padua, Mantua, Ferrara, Ravenna and Bologna. In 1634 there were two glass-houses in Rome and one in Florence; but whether any of these produced ornamented vessels, or only articles of common use and window glass, would not appear to have as yet been ascertained.

Germany—Glass-making in Germany during the Roman period seems to have been carried on extensively in the neighbourhood of Cologne. The Cologne museum contains many specimens of Roman glass, some of which are remarkable for their cut decoration. The craft survived the downfall of the Roman power, and a native industry was developed. This industry must have won some reputation, for in 758 the abbot of Jarrow appealed to the bishop of Mainz to send him a worker in glass. There are few records of glass manufacture in Germany before the beginning of the 16th century. The positions of the factories were determined by the supply of wood for fuel, and subsequently, when the craft of glass-cutting was introduced, by the accessibility of water-power. The vessels produced by the 16th-century glass-workers in Germany, Holland and the Low Countries are closely allied in form and decoration. The glass is coloured (generally green) and the decoration consists of glass threads and glass studs, or prunts ("Nuppen"). The use of threads and prunts is illustrated by the development of the "Roemer," so popular as a drinking-glass, and as a feature in Dutch studies of still life. The "Igel," a squat tumbler covered with prunts, gave rise to the "Krautsrunk," which is like the "Igel," but longer and narrow-waisted. The "Roemer" itself consists of a cup, a short waist studded with prunts and a foot. The foot at first was formed by coiling a thread of glass round the base of the waist; but, subsequently, an open glass cone was joined to the base of the waist, and a glass thread was coiled upon the surface of the cone. The "Passglas," another popular drinking-glass, is cylindrical in form and marked with horizontal rings of glass, placed at regular intervals, to indicate the quantity of liquor to be taken at a draught.

In the edition of 1581 of the *De re metallica* by Georg Agricola, there is a woodcut showing the interior of a German glass factory, and glass vessels both finished and unfinished.

In 1428 a Muranese glass-worker set up a furnace in Vienna, and another furnace was built in the same town by an Italian in 1486. In 1531 the town council of Nuremberg granted a subsidy to attract teachers of Venetian technique. Many specimens exist of German winged and enamelled glasses of Venetian character. The Venetian influence, however, was indirect rather than direct. The native glass-workers adopted the process of enamelling, but applied it to a form of decoration characteristically German. On tall, roomy, cylindrical glasses they painted portraits of the emperor and electors of Germany, or the imperial eagle bearing on its wings the arms of the states composing the empire. The earliest-known example of these enamelled glasses bears the date 1553. They were immensely popular and the fashion for them lasted into the 18th century. Some of the later specimens have views of cities, battle scenes and processions painted in grisaille.

A more important outcome, however, of Italian influence was the production, in emulation of Venetian glass, of a glass made of refined potash, lime and sand, which was more colourless than the material it was intended to imitate. This colourless potash-lime glass has always been known as Bohemian glass. It was well adapted for receiving cut and engraved decoration, and in these processes the German craftsmen proved themselves to be exceptionally skilful. At the end of the 16th century Rudolph II. brought Italian rock-crystal cutters from Milan to take control of the crystal and glass-cutting works he had established at Prague. It was at Prague that Caspar Lehmann and Zachary Belzer learnt the craft of cutting glass. George Schwanhart, a pupil of Caspar Lehmann, started glass-cutting at Ratisbon, and about 1690 Stephen Schmidt and Hermann Schwinger introduced the crafts of cutting and engraving glass in Nuremberg. To the Germans must be credited the discovery, or development, of colourless potash-lime glass, the reintroduction of the crafts of cutting and engraving on glass, the invention by H. Schwanhart of the process of etching on glass by means of hydrofluoric acid, and the rediscovery by J. Kunkel, who was director of the glass-houses at Potsdam in 1679, of the method of making copper-ruby glass.

Low Countries and the United Provinces.—The glass industry of the Low Countries was chiefly influenced by Italy and Spain, whereas German influence and technique predominated in the United Provinces. The history of glass-making in the provinces is almost identical with that of Germany. In the 17th and 18th centuries the processes of scratching, engraving and etching were brought to great perfection.

The earliest record of glass-making in the Low Countries consists in an account of payments made in 1453–1454 on behalf of Philip the Good of Burgundy to "Gossiun de Vieuglise, Maître Vorrier de Lille" for a glass fountain and four glass plateaus. Schuermans has traced Italian glass-workers to Antwerp, Liége, Brussels and Namur. Antwerp appears to have been the headquarters of the Muranese, and Liége the headquarters of the Altarists. Guicciardini in his description of the Netherlands, in 1563, mentions glass as among the chief articles of export to England.

In 1509 the privilege of making "Voires de cristal à la faschon Venise," was granted to Philippe de Gridolphi of Antwerp. In 1623 Anthony Miotti, a Muranese, addressed a petition to Philip IV. of Spain for permission to make glasses, vases and cups of fine crystal, equal to those of Venice, but to be sold at one-third less than Venetian glasses. In 1642 Jean Savonetti "gentilhomme Verrier de Murano" obtained a patent for making glass in Brussels. The Low Country glasses are closely copied from Venetian models, but generally are heavier and less elegant. Owing to the fashion of Dutch and Flemish painters introducing glass vases and drinking-glasses into their paintings of still life, interiors and scenes of conviviality, Holland and Belgium at the present day possess more accurate records of the products of their ancient glass factories than any other countries.

Spain.—During the Roman occupation Pliny states that glass was made "per Hispanias" (*Nat. Hist.* xxxvi. 26. 66). Traces of Roman glass manufactories have been found in Valencia and Murcia, in the valleys which run down to the coast of Catalonia, and near the mouth of the Ebro. Little is known about the condition of glass-making in Spain between the Roman period and the 13th century. In the 13th century the craft of glass-making was practised by the Moors in Almeria, and was probably a survival from Roman times. The system of decorating vases and vessels by means of strands of glass trailed upon the surface in knots, zigzags and trellis work, was adopted by the Moors and is characteristic of Roman craftsmanship. Glass-making was continued at Pinar de la Vidriera and at Al Castril de la Pena into the 17th century. The objects produced show no sign of Venetian influence, but are distinctly Oriental in form. Many of the vessels have four or as many as eight handles, and are decorated with serrated ornamentation, and with the trailed strands of glass already referred to. The glass is generally of a dark-green colour.

Barcelona has a long record as a centre of the glass industry. In 1324 a municipal edict was issued forbidding the erection of glass-furnaces within the city. In 1455 the glass-makers of Barcelona were permitted to form a gild. Jeronimo Paulo, writing in 1491, says that glass vessels of various sorts were sent thence to many places, and even to Rome. Marineus Siculus, writing early in the 16th century, says that the best glass was made at Barcelona; and Gaspar Baneiros, in his *Chronographia*, published in 1562, states that the glass made at Barcelona was almost equal to that of Venice and that large quantities were exported.

The author of the *Atlante español*, writing at the end of the 18th century, says that excellent glass was still made at Barcelona on Venetian models. The Italian influence was strongly felt in Spain, but Spanish writers have given no precise information as to when it was introduced or whence it came. Schuermans has, however, discovered the names of more than twenty Italians who found their way into Spain, in some cases by way of Flanders,

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either from Altare or from Venice. The Spanish glass-makers were very successful in imitating the Venetian style, and many specimens supposed to have originated from Murano are really Spanish. In addition to the works at Barcelona, the works which chiefly affected Venetian methods were those of Cadalso in the province of Toledo, founded in the 16th century, and the works established in 1680 at San Martin de Valdeiglesias in Avila. There were also works at Valdemaqueda and at Villafranca. In 1680 the works in Barcelona, Valdemaqueda and Villafranca are named in a royal schedule giving the prices at which glass was to be sold in Madrid. In 1772 important glass works were established at Recuenco in the province of Cuenca, mainly to supply Madrid. The royal glass manufactory of La Granja de San Ildefonso was founded about 1725; in the first instance for the manufacture of mirror plates, but subsequently for the production of vases and table-ware in the French style. The objects produced are mostly of white clear glass, cut, engraved and gilded. Engraved flowers, views and devices are often combined with decorative cutting. Don Sigismundo Brun is credited with the invention of permanent gilding fixed by heat. Spanish glass is well represented in the Victoria and Albert Museum.

France.—Pliny states that glass was made in Gaul, and there is reason to believe that it was made in many parts of the country and on a considerable scale. There were glass-making districts both in Normandy and in Poitou.

Little information can be gathered concerning the glass industry between the Roman period and the 14th century. It is recorded that in the 7th century the abbot of Wearmouth in England obtained artificers in glass from France; and there is a tradition that in the 11th century glass-workers migrated from Normandy and Brittany and set up works at Altare near Genoa.

In 1302 window glass, probably crown-glass, was made at Beza le Forêt in the department of the Eure. In 1416 these works were in the hands of Robin and Leban Guichard, but passed subsequently to the Le Vaillants.

In 1338 Humbert, the dauphin, granted a part of the forest of Chamboran to a glass-worker named Guionet on the condition that Guionet should supply him with vessels of glass.

In 1466 the abbess of St Croix of Poitiers received a gross of glasses from the glass-works of La Ferrière, for the privilege of gathering fern for the manufacture of potash.

In France, as in other countries, efforts were made to introduce Italian methods of glass-working. Schuermans in his researches discovered that during the 15th and 16th centuries many glass-workers left Altare and settled in France,—the Saroldi migrated to Poitou, the Ferri to Provence, the Massari to Lorraine and the Bormioli to Normandy. In 1551 Henry II. of France established at St Germain en Laye an Italian named Mutio; he was a native of Bologna, but of Altare origin. In 1598 Henry IV. permitted two "gentil hommes verriers" from Mantua to settle at Rouen in order to make "verres de cristal, verres dorée emaul et autres ouvrages qui se font en Venise."

France assimilated the craft of glass-making, and her craftsmen acquired a wide reputation. Lorraine and Normandy appear to have been the most important centres. To Lorraine belong the well-known names Hennezel, de Thietry, du Thisac, de Houx; and to Normandy the names de Bongar, de Cacqueray le Vaillant and de Brossard.

In the 17th century the manufacture of mirror glass became an important branch of the industry. In 1665 a manufactory was established in the Faubourg St Antoine in Paris, and another at Tour-la-Ville near Cherbourg.

Louis Lucas de Nehou, who succeeded de Cacqueray at the works at Tour-la-Ville, moved in 1675 to the works in Paris. Here, in 1688, in conjunction with A. Thevart, he succeeded in perfecting the process of casting plate-glass. Mirror plates previous to the invention had been made from blown "sheet" glass, and were consequently very limited in size. De Nehou's process of rolling molten glass poured on an iron table rendered the manufacture of very large plates possible.

The Manufactoire Royale des Glaces was removed in 1693 to the Château de St Gobain.

In the 18th century the manufacture of *vases de verre* had become so neglected that the Academy of Sciences in 1750 offered a prize for an essay on the means by which the industry might be revived (Labarte, *Histoire des arts industriels*).

The famous Baccarat works, for making crystal glass, were founded in 1818 by d'Artigues.

English Glass.—The records of glass-making in England are exceedingly meagre. There is reason to believe that during the Roman occupation the craft was carried on in several parts of the country. Remains of a Roman glass manufactory of considerable extent were discovered near the Manchester Ship Canal at Warrington. Wherever the Romans settled glass vessels and fragments of glass have been found. There is no evidence to prove that the industry survived the withdrawal of the Roman garrison.

It is probable that the glass drinking-vessels, which have been found in pre-Christian Anglo-Saxon tombs, were introduced from Germany. Some are elaborate in design and bear witness to advanced technique of Roman character. In 675 Benedict Biscop, abbot of Wearmouth, was obliged to obtain glass-workers from France, and in 758 Cuthbert, abbot of Jarrow, appealed to the bishop of Mainz to send him artisans to manufacture "windows and vessels of glass, because the English were ignorant and helpless." Except for the statement in Bede that the French artisans, sent by Benedict Biscop, taught their craft to the English, there is at present no evidence of glass having been made in England between the Roman period and the 13th century. In some deeds relating to the parish of Chiddingfold, in Surrey, of a date not later than 1230, a grant is recorded of twenty acres of land to Lawrence "vitrearius," and in another deed, of about 1280, the "ovenhusveld" is mentioned as a boundary. This field has been identified, and pieces of crucible and fragments of glass have been dug up. There is another deed, dated 1300, which mentions one William "le verir" of Chiddingfold.

About 1350 considerable quantities of colourless flat glass were supplied by John Alemayn of Chiddingfold for glazing the windows in St George's chapel, Windsor, and in the chapel of St Stephen, Westminster. The name Alemayn (Aleman) suggests a foreign origin. In 1380 John Glasewryth, a Staffordshire glass-worker, came to work at Shareswode, Kirkford, and there made brode-glas and vessels for Joan, widow of John Shertere.

There were two kinds of flat glass, known respectively as "brode-glas" and "Normandy" glass. The former was made, as described by Theophilus, from cylinders, which were split, reheated and flattened into square sheets. It was known as Lorraine glass, and subsequently as "German sheet" or sheet-glass. Normandy glass was made from glass circles or disks. When, in after years, the process was perfected, the glass was known as "crown" glass. In 1447 English flat glass is mentioned in the contract for the windows of the Beauchamp chapel at Warwick, but disparagingly, as the contractor binds himself not to use it. In 1480, however, it is referred to in such a way as to suggest that it was superior to "Dutch, Venice or Normandy glass." The industry does not seem to have prospered, for when in 1567 an inquiry was made as to its condition, it was ascertained that only small rough goods were being made.

In the 16th century the fashion for using glass vessels of ornamental character spread from Italy into France and England. Henry VIII. had a large collection of glass drinking-vessels chiefly of Venetian manufacture. The increasing demand for Venetian drinking-glasses suggested the possibility of making similar glass in England, and various attempts were made to introduce Venetian workmen and Venetian methods of manufacture. In 1550 eight Muranese glass-blowers were working in or near the Tower of London. They had left Murano owing to slackness of trade, but had been recalled, and appealed to the Council of Ten in Venice to be allowed to complete their contract in London. Seven of these glass-workers left London in the following year, but one, Josepho Casselari, remained and joined

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Thomas Cavato, a Dutchman. In 1574 Jacob Verzellini, a fugitive Venetian, residing in Antwerp, obtained a patent for making drinking-glasses in London "such as are made in Murano." He established works in Crutched Friars, and to him is probably due the introduction of the use of soda-ash, made from seaweed and seaside plants, in place of the crude potash made from fern and wood ashes. His manufactory was burnt down in 1575, but was rebuilt. He afterwards moved his works to Winchester House, Broad Street. There is a small goblet (Pl. I., fig. 8) in the British Museum which is attributed to Verzellini. It is Venetian in character, of a brownish tint, with two white enamel rings round the body. It is decorated with diamond or steel-point etching, and bears on one side the date 1586, and on the opposite side the words "In God is al mi trust." Verzellini died in 1606 and was buried at Down in Kent. In 1592 the Broad Street works had been taken over by Jerome Bowes. They afterwards passed into the hands of Sir R. Mansel, and in 1618 James Howell, author of *Epistolae Ho-elianae*, was acting as steward. The works continued in operation until 1641. During excavations in Broad Street in 1874 many fragments of glass were found; amongst them were part of a wine-glass, a square scent-bottle and a wine-glass stem containing a spiral thread of white enamel.

A greater and more lasting influence on English glass-making came from France and the Low Countries. In 1567 James Carré of Antwerp stated that he had erected two glass-houses at "Fernefol" (Fernfold Wood in Sussex) for Normandy and Lorraine glass for windows, and had brought over workmen. From this period began the records in England of the great glass-making families of Hennezel, de Thietry, du Thisac and du Houx from Lorraine, and of de Bongar and de Cacqueray from Normandy. About this time glass-works were established at Ewhurst and Alford in Surrey, Loxwood, Kirdford, Wisborough and Petworth in Sussex, and Sevenoaks and Penshurst in Kent. Beginning in Sussex, Surrey and Kent, where wood for fuel was plentiful, the foreign glass-workers and their descendants migrated from place to place, always driven by the fuel-hunger of their furnaces. They gradually made their way into Hampshire, Wiltshire, Gloucestershire, Staffordshire, Northumberland, Scotland and Ireland. They can be traced by cullet heaps and broken-down furnaces, and by their names, often mutilated, recorded in parish registers.

In 1610 a patent was granted to Sir W. Slingsby for burning coal in furnaces, and coal appears to have been used in the Broad Street works. In 1615 all patents for glass-making were revoked and a new patent issued for making glass with coal as fuel, in the names of Mansel, Zouch, Thelwall, Kellaway and Percival. To the last is credited the first introduction of covered crucibles to protect the molten glass from the products of burning coal.

Simultaneously with the issue of this patent the use of wood for melting glass was prohibited, and it was made illegal to import glass from abroad. About 1617 Sir R. Mansel, vice-admiral and treasurer of the navy, acquired the sole rights of making glass in England. These rights he retained for over thirty years.

During the protectorate all patent rights virtually lapsed, and mirrors and drinking-glasses were once more imported from Venice. In 1663 the duke of Buckingham, although unable to obtain a renewal of the monopoly of glass-making, secured the prohibition of the importation of glass for mirrors, coach plates, spectacles, tubes and lenses, and contributed to the revival of the glass industry in all its branches. Evelyn notes in his *Diary* a visit in 1673 to the Italian glass-house at Greenwich, "where glass was blown of finer metal than that of Murano," and a visit in 1677 to the duke of Buckingham's glass-works, where they made huge "vases of mettal as cleare, ponderous and thick as chrystal; also looking-glasses far larger and better than any that came from Venice."

Some light is thrown on the condition of the industry at the end of the 17th century by the Houghton letters on the improvement of trade and commerce, which appeared in 1696. A few of these letters deal with the glass trade, and in one a list is given of the glass-works then in operation. There were 88 glass factories in England which are thus classified:

Bottles	39
Looking-glass plates	2
Crown and plate-glass	5
Window glass	15
Flint and ordinary glass	27
	88

It is probable that the flint-glass of that date was very different from the flint-glass of to-day. The term flint-glass is now understood to mean a glass composed of the silicates of potash and lead. It is the most brilliant and the most colourless of all glasses, and was undoubtedly first perfected in England. Hartshorne has attributed its discovery to a London merchant named Tilson, who in 1663 obtained a patent for making "crystal glass." E. W. Hulme, however, who has carefully investigated the subject, is of opinion that flint-glass in its present form was introduced about 1730. The use of oxide of lead in glass-making was no new thing; it had been used, mainly as a flux, both by Romans and Venetians. The invention, if it may be regarded as one, consisted in eliminating lime from the glass mixture, substituting refined potash for soda, and using a very large proportion of lead oxide. It is probable that flint-glass was not invented, but gradually evolved, that potash-lead glasses were in use during the latter part of the 17th century, but that the mixture was not perfected until the middle of the following century.

The 18th century saw a great development in all branches of glass-making. Collectors of glass are chiefly concerned with the drinking-glasses which were produced in great profusion and adapted for every description of beverage. The most noted are the glasses with stout cylindrical legs (Plate I. fig. 9), containing spiral threads of air, or of white or coloured enamel. To this type of glass belong many of the Jacobite glasses which commemorate the old or the young Pretender.

In 1746 the industry was in a sufficiently prosperous condition to tempt the government to impose an excise duty. The report of the commission of excise, dealing with glass, published in 1835 is curious and interesting reading. So burdensome was the duty and so vexatious were the restrictions that it is a matter for wonder that the industry survived. In this respect England was more fortunate than Ireland. Before 1825, when the excise duty was introduced into Ireland, there were flourishing glass-works in Belfast, Cork, Dublin and Waterford. By 1850 the Irish glass industry had been practically destroyed. Injurious as the excise duty undoubtedly was to the glass trade generally, and especially to the flint-glass industry, it is possible that it may have helped to develop the art of decorative glass-cutting. The duty on flint-glass was imposed on the molten glass in the crucibles and on the unfinished goods. The manufacturer had, therefore, a strong inducement to enhance by every means in his power the selling value of his glass after it had escaped the exciseman's clutches. He therefore employed the best available art and skill in improving the craft of glass-cutting. It is the development of this craft in connexion with the perfecting of flint-glass that makes the 18th century the most important period in the history of English glass-making. Glass-cutting was a craft imported from Germany, but the English material so greatly surpassed Bohemian glass in brilliance that the Bohemian cut-glass was eclipsed. Glass-cutting was carried on at works in Birmingham, Bristol, Belfast, Cork, Dublin, Glasgow, London, Newcastle, Stourbridge, Whittington and Waterford. The most important centres of the craft were London, Bristol, Birmingham and Waterford (see Plate I., fig. 10, for oval cut-glass Waterford bowl). The finest specimens of cut-glass belong to the period between 1780 and 1810. Owing to the sacrifice of form to prismatic brilliance, cut-glass gradually lost its artistic value. Towards the middle of the 19th century it became the fashion to regard all cut-glass as barbarous, and services of even the best period were neglected and dispersed. At the present time scarcely anything is known about the origin of the few specimens of 18th-century English cut-glass

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which have been preserved in public collections. It is strange that so little interest has been taken in a craft in which for some thirty years England surpassed all competitors, creating a wave of fashion which influenced the glass industry throughout the whole of Europe.

In the report of the Excise Commission a list is given of the glass manufactories which paid the excise duty in 1833. There were 103 factories in England, 10 in Scotland and 10 in Ireland. In England the chief centres of the industry were Bristol, Birmingham, London, Manchester, Newcastle, Stourbridge and York. Plate-glass was made by Messrs Cookson of Newcastle, and by the British Plate Glass Company of Ravenhead. Crown and German sheet-glass were made by Messrs Chance & Hartley of Birmingham. The London glass-works were those of Apsley Pellatt of Blackfriars, Christie of Stangate, and William Holmes of Whitefriars. In Scotland there were works in Glasgow, Leith and Portobello. In Ireland there were works in Belfast, Cork, Dublin and Waterford. The famous Waterford works were in the hands of Gatchell & Co.

India.—Pliny states (*Nat. Hist.* xxxvi. 26. 66) that no glass was to be compared to the Indian, and gives as a reason that it was made from broken crystal; and in another passage (xii. 19, 42) he says that the Troglodytes brought to Ocelis (Ghella near Bab-el-Mandeb) objects of glass. We have, however, very little knowledge of Indian glass of any considerable antiquity. A few small vessels have been found in the "topes," as in that at Manikiala in the Punjab, which probably dates from about the Christian era; but they exhibit no remarkable character, and fragments found at Brahmanabad are hardly distinguishable from Roman glass of the imperial period. The chronicle of the Sinhalese kings, the *Mahawansa*, however, asserts that mirrors of glittering glass were carried in procession in 306 B.C., and beads like gems, and windows with ornaments like jewels, are also mentioned at about the same date. If there really was an important manufacture of glass in Ceylon at this early time, that island perhaps furnished the Indian glass of Pliny. In the later part of the 17th century some glass decorated with enamel was made at Delhi. A specimen is in the Indian section of the South Kensington Museum. Glass is made in several parts of India—as Patna and Mysore—by very simple and primitive methods, and the results are correspondingly defective. Black, green, red, blue and yellow glasses are made, which contain a large proportion of alkali and are readily fusible. The greater part is worked into bangles, but some small bottles are blown (Buchanan, *Journey through Mysore*, i. 147, iii. 369).

Persia.—No very remarkable specimens of Persian glass are known in Europe, with the exception of some vessels of blue glass richly decorated with gold. These probably date from the 17th century, for Chardin tells us that the windows of the tomb of Shah Abbas II. (*ob.* 1666), at Kum, were "de cristal peint d'or et d'azur." At the present day bottles and drinking-vessels are made in Persia which in texture and quality differ little from ordinary Venetian glass of the 16th or 17th centuries, while in form they exactly resemble those which may be seen in the engravings in Chardin's *Travels*.

China.—The history of the manufacture of glass in China is obscure, but the common opinion that it was learnt from the Europeans in the 17th century seems to be erroneous. A writer in the *Mémoires concernant les Chinois* (ii. 46) states on the authority of the annals of the Han dynasty that the emperor Wu-ti (140 B.C.) had a manufactory of the kind of glass called "liou-li" (probably a form of opaque glass), that in the beginning of the 3rd century of our era the emperor Tsaou-tsaou received from the West a considerable present of glasses of all colours, and that soon after a glass-maker came into the country who taught the art to the natives.

The Wei dynasty, to which Tsaou-tsaou belonged, reigned in northern China, and at this day a considerable manufacture of glass is carried on at Po-shan-hien in Shantung, which it would seem has existed for a long period. The Rev. A. Williamson (*Journeys in North China*, i. 131) says that the glass is extremely pure, and is made from the rocks in the neighbourhood. The rocks are probably of quartz, *i.e.* rock crystal, a correspondence with Pliny's statement respecting Indian glass which seems deserving of attention.

Whether the making of glass in China was an original discovery of that ingenious people, or was derived via Ceylon from Egypt, cannot perhaps be now ascertained; the manufacture has, however, never greatly extended itself in China. The case has been the converse of that of the Romans; the latter had no fine pottery, and therefore employed glass as the material for vessels of an ornamental kind, for table services and the like. The Chinese, on the contrary, having from an early period had excellent porcelain, have been careless about the manufacture of glass. A Chinese writer, however, mentions the manufacture of a huge vase in A.D. 627, and in 1154 Edrisi (first climate, tenth section) mentions Chinese glass. A glass vase about a foot high is preserved at Nara in Japan, and is alleged to have been placed there in the 8th century. It seems probable that this is of Chinese manufacture. A writer in the *Mémoires concernant les Chinois* (ii. 463 and 477), writing about 1770, says that there was then a glass-house at Peking, where every year a good number of vases were made, some requiring great labour because nothing was blown (rien n'est soufflé), meaning no doubt that the ornamentation was produced not by blowing and moulding, but by cutting. This factory was, however, merely an appendage to the imperial magnificence. The earliest articles of Chinese glass the date of which has been ascertained, which have been noticed, are some bearing the name of the emperor Kienlung (1735–1795), one of which is in the Victoria and Albert Museum.

The manufacture of ornamental glass the leading idea in China seems to be the imitation of natural stones. The coloured glass is usually not of one bright colour throughout, but semi-transparent and marbled; the colours in many instances are singularly fine and harmonious. As in 1770, carving or cutting is the chief method by which ornament is produced, the vessels being blown very solid.

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(A. NE.; H. J. P.)

GLASS, STAINED. All coloured glass is, strictly speaking, "stained" by some metallic oxide added to it in the process of manufacture. But the term "stained glass" is popularly, as well as technically, used in a more limited sense, and is understood to refer to stained glass windows. Still the words "stained glass" do not fully describe what is meant; for the glass in coloured windows is for the most part not only stained but painted. Such painting was, however, until comparatively modern times, used only to give details of drawing and to define *form*. The *colour* in a stained glass window was not painted on the glass but incorporated in it, mixed with it in the making—whence the term "pot-metal" by which self-coloured glass is known, *i.e.* glass coloured in the melting pot.

A medieval window was consequently a patchwork of variously coloured pieces. And the earlier its date the more surely was it a mosaic, not in the form of tesserae, but in the manner known as "opus sectile." Shaped pieces of coloured glass were, that is to say, put together like the parts of a puzzle. The

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nearest approach to an exception to this rule is a fragment at the Victoria and Albert Museum, in which actual tesserae are fused together into a solid slab of many-coloured glass, in effect a window panel, through which the light shines with all the brilliancy of an Early Gothic window. But apart from the fact that the design proves in this case to be even more effective with the light upon it, the use of gold leaf in the tesserae confirms the presumption that this work, which (supposing it to be genuine) would be Byzantine, centuries earlier than any coloured windows that we know of, and entirely different from them in technique, is rather a specimen of fused mosaic that happens to be translucent than part of a window designedly executed in tesserae.

The Eastern (and possibly the earlier) practice was to set chips of coloured glass in a heavy fretwork of stone or to imbed them in plaster. In a medieval window they were held together by strips of lead, in section something like the letter **H**, the upright strokes of which represent the "tapes" extending on either side well over the edges of the glass, and the crossbar the connecting "core" between them. The leading was soldered together at the points of junction, cement or putty was rubbed into the crevices between glass and lead, and the window was attached (by means of copper wires soldered on to the leads) to iron saddle-bars let into the masonry.

Stained glass was primarily the art of the glazier; but the painter, called in to help, asserted himself more and more, and eventually took it almost entirely into his own hands. Between the period when it was glazier's work eked out by painting and when it was painter's work with the aid of the glazier lies the entire development of stained and painted window-making. With the eventual endeavour of the glass painter to do without the glazier, and to get the colour by painting in translucent *enamel* upon colourless glass, we have the beginning of a form of art no longer monumental and comparatively trivial.

This evolution of the painted window from a patchwork of little pieces of coloured glass explains itself when it is remembered that coloured glass was originally not made in the big sheets produced nowadays, but at first in jewels to look as much as possible like rubies, sapphires, emeralds and other precious stones, and afterwards in rounds and sheets of small dimensions. Though some of the earliest windows were in the form of pure glazing ("leaded-lights"), the addition of painting seems to have been customary from the very first. It was a means of rendering detail not to be got in lead. Glazing affords by itself scope for beautiful pattern work; but the old glaziers never carried their art as far as they might have done in the direction of ornament; their aim was always in the direction of picture; the idea was to make windows serve the purpose of coloured story books. That was beyond the art of the glazier. It was easy enough to represent the drapery of a saint by red glass, the ground on which he stood by green, the sky above by blue, his crown by yellow, the scroll in his hand by white, and his flesh by brownish pink; but when it came to showing the folds of red drapery, blades of green grass, details of goldsmith's work, lettering on the scroll, the features of the face—the only possible way of doing it was by painting. The use of paint was confined at first to an opaque brown, used, not as colour, but only as a means of stopping out light, and in that way defining comparatively delicate details within the lead lines. These themselves outlined and defined the main forms of the design. The pigment used by the glass painter was of course vitreous: it consisted of powdered glass and sundry metallic oxides (copper, iron, manganese, &c.), so that, when the pieces of painted glass were made red hot in the kiln, the powdered glass became fused to the surface, and with it the dense colouring matter also. When the pieces of painted glass were afterwards glazed together and seen against the light, the design appeared in the brilliant colour of the glass, its forms drawn in the uniform black into which, at a little distance, leadwork and painting lines became merged.

It needed solid painting to stop out the light entirely: thin paint only obscured it. And, even in early glass, thin paint was used, whether to subdue crude colour or to indicate what little shading a 13th-century draughtsman might desire. In the present state of old glass, the surface often quite disintegrated, it is difficult to determine to what extent thin paint was used for either purpose. There must always have been the temptation to make tint do instead of solid lines; but the more workmanlike practice, and the usual one, was to get difference of tint, as a pen-draughtsman does, by lines of solid opaque colour. In comparatively colourless glass (*grisaille*) the pattern was often made to stand out by cross-hatching the background; and another common practice was to coat the glass with paint all over, and scrape the design out of it. The effect of either proceeding was to lower the tone of the glass without dirtying the colour, as a smear of thin paint would do.

Towards the 14th century, when Gothic design took a more naturalistic direction, the desire to get something like modelling made it necessary to carry painting farther, and they got rid to some extent of the ill effect of shading-colour smeared on the glass by stippling it. This not only softened the tint and allowed of gradation according to the amount of stippling, but let some light through, where the bristles of the stippling-tool took up the pigment. Shading of this kind enforced by touches of strong brushwork, cross-hatching and some scratching out of high lights was the method of glass painting adopted in the 14th century.

Glass was never at the best a pleasant surface to paint on; and glass painting, following the line of least resistance, developed in the later Gothic and early Renaissance periods into something unlike any other form of painting. The outlines continued to be traced upon the glass and fixed in the fire; but, after that, the process of painting consisted mainly in the removal of paint. The entire surface of the glass was coated with an even "matt" of pale brown; this was allowed to dry; and then the high lights were rubbed off, and the modelling was got by scrubbing away the paint with a dry hog-hair brush, more or less, according to the gradations required. Perfect modelling was got by repeating the operation—how often depended upon the dexterity of the painter. A painter's method is partly the outcome of his individuality. One man would float on his colour and manipulate it to some extent in the moist state; another would work entirely upon the dry matt. Great use was made of the pointed stick with which sharp lines of light were easily scraped out; and in the 16th century Swiss glass painters, working upon a relatively small scale, got their modelling entirely with a needle-point, scraping away the paint just as an etcher scratches away the varnish from his etching plate. The practice of the two craftsmen is, indeed, identical, though the one scratches out what are to be black lines and the other lines of light. In the end, then, though a painter would always use touches of the brush to get crisp lines of dark, the manipulation of glass painting consisted more in erasing lights than in painting shadows, more in rubbing out or scraping off paint than in putting it on in brush strokes.

So far there was no thought of getting colour by means of paint. The colour was in the glass itself, permeating the mass ("pot-metal"). There was only one exception to this—ruby glass, the colour of which was so dense that red glass thick enough for its purpose would have been practically obscure; and so they made a colourless pot-metal coated on one side only with red glass. This led to a practice which forms an exception to the rule that in "pot-metal" glass every change of colour, or from colour to white, is got by the use of a separate piece of glass. It was possible in the case of this "flashed" ruby to grind away portions of the surface and thus obtain white on red or red on white. Eventually they made coated glass of blue and other colours, with a view to producing similar effects by abrasion. (The same result is arrived at nowadays by means of etching. The skin of coloured glass, in old days laboriously ground or cut away, is now easily eaten off by fluoric acid.) One other exceptional expedient in colouring had very considerable effect upon the development of glass design from about the beginning of the 14th century. The discovery that a solution of silver applied to glass would under the action of the

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fire stain it yellow enabled the glass painter to get yellow upon colourless glass, green upon grey-blue, and (by staining only the abraded portions) yellow upon blue or ruby. This yellow was neither enamel nor pot-metal colour, but stain—the only staining actually done by the glass painter as distinct from the glass maker. It varied in colour from pale lemon to deep orange, and was singularly pure in quality. As what is called "white" glass became purer and was employed in greater quantities it was lavishly used; so much so that a brilliant effect of silvery white and golden yellow is characteristic of later Gothic windows.

The last stage of glass painting was the employment of enamel not for stopping out light but to get colour. It began to be used in the early part of the 16th century—at first only in the form of a flesh tint; but it was not long before other colours were introduced. This use of colour no longer *in* the glass but *upon* it marks quite a new departure in technique. Enamel colour was finely powdered coloured glass mixed with gum or some such substance into a pigment which could be applied with a brush. When the glass painted with it was brought to a red heat in the oven, the powdered glass melted and was fused to it, just like the opaque brown employed from the very beginning of glass-painting.

This process of enamelling was hardly called for in the interests of art. Even the red flesh-colour (borrowed from the Limoges enamellers upon copper) did not in the least give the quality of flesh, though it enabled the painter to suggest by contrast the whiteness of a man's beard. As for the brighter enamel colours, they had nothing like the depth or richness of "stained" glass. What enamel really did was to make easy much that had been impossible in mosaic, as, for example, to represent upon the very smallest shield of arms any number of "charges" all in the correct tinctures. It encouraged the minute workmanship characteristic of Swiss glass painting; and, though this was not altogether inappropriate to domestic window panes, the painter was tempted by it to depart from the simplicity and breadth of design inseparable from the earlier mosaic practice. In the end he introduced coloured glass only where he could hardly help it, and glazed the great part of his window in rectangular panes of clear glass, upon which he preferred to paint his picture in opaque brown and translucent enamel colours.

Enamel upon glass has not stood the test of time. Its presence is usually to be detected in old windows by specks of light shining through the colour. This is where the enamel has crumbled off. There is a very good reason for that. Enamel must melt at a temperature at which the glass it is painted on keeps its shape. The lower the melting point of the powdered glass the more easily it is fused. The painter is consequently inclined to use enamel of which the contraction and expansion is much greater than that of his glass—with the result that, under the action of the weather, the colour is apt to work itself free and expose the bare white glass beneath. The only enamel which has held its own is that of the Swiss glass-painters of the 16th and 17th centuries. The domestic window panes they painted may not in all cases have been tried by the sudden changes of atmosphere to which church windows are subject; but credit must be given them for exceptionally skilful and conscientious workmanship.

The story of stained glass is bound up with the history of architecture, to which it was subsidiary, and of the church, which was its patron. Its only possible course of development was in the wake of church building. From its very inception it was Gothic and ecclesiastical. And, though it survived the upheaval of the Renaissance and was turned to civil and domestic use, it is to church windows that we must go to see what stained glass really was—or is; for time has been kind to it. The charm of medieval glass lies to a great extent in the material, and especially in the inequality of it. Chemically impure and mechanically imperfect, it was rarely crude in tint or even in texture. It shaded off from light to dark according to its thickness; it was speckled with air bubbles; it was streaked and clouded; and all these imperfections of manufacture went to perfection of colour. And age has improved it: the want of homogeneousness in the material has led to the disintegration of its surface; soft particles in it have been dissolved away by the action of the weather, and the surface, pitted like an oyster-shell, refracts the light in a way which adds greatly to the effect; at the same time there is roothold for the lichen which (like the curtains of black cobwebs) veils and gives mystery to the colour. An appreciable part of the beauty of old glass is the result of age and accident. In that respect no new glass can compare with it. There is, however, no such thing as "the lost secret" of glass-making. It is no secret that age mellows.

Stained and painted glass is commonly apportioned to its "period," Gothic or Renaissance, and further to the particular phase of the style to which it belongs. C. Winston, who was the first to inquire thoroughly into English glass, adopting T. Rickman's classification, divided Gothic windows into Early English (to *c.* 1280), Decorated (to *c.* 1380) and Perpendicular (to *c.* 1530). These dates will do. But the transition from one phase of design to another is never so sudden, nor so easily defined, as any table of dates would lead us to suppose. The old style lingered in one district long after the new fashion was flourishing in another. Besides, the English periods do not quite coincide with those of other countries. France, Germany and the Low Countries count for much in the history of stained glass; and in no two places was the pace of progress quite the same. There was, for example, scarcely any 13th-century Gothic in Germany, where the "geometric" style, equivalent to our Decorated, was preceded by the Romanesque period; in France the Flamboyant took the place of our Perpendicular; and in Italy Gothic never properly took root at all. All these considered, a rather rough and ready division presents the least difficulty to the student of old glass; and it will be found convenient to think of Gothic glass as (1) Early, (2) Middle and (3) Late, and of the subsequent windows as (1) Renaissance and (2) Late Renaissance. The three periods of Gothic correspond approximately to the 13th, 14th and 15th centuries. The limits of the two periods of the Renaissance are not so easily defined. In the first part of the 16th century (in Italy long before that) the Renaissance and Gothic periods overlapped; in the latter part of it, glass painting was already on the decline; and in the 17th and 18th centuries it sank to deeper depths of degradation.

The likeness of early windows to translucent enamel (which is also glass) is obvious. The lines of lead glazing correspond absolutely to the "cloisons" of Byzantine goldsmith's work. Moreover, the extreme minuteness of the leading (not always either mechanically necessary or architecturally desirable) suggests that the starting point of all this gorgeous illumination was the idea of reproducing on a grandiose scale the jewelled effect produced in small by cloisonné enamellers. In other respects the earliest glass shows the influence of Byzantine tradition. It is mainly according to the more or less Byzantine character of its design and draughtsmanship that archaeologists ascribe certain remains of old glass to the 12th or the 11th century. Apart from documentary or direct historic evidence, it is not possible to determine the precise date of any particular fragment. In the "restored" windows at St Denis there are remnants of glass belonging to the year 1108. Elsewhere in France (Reims, Anger, Le Mans, Chartres, &c.) there is to be found very early glass, some of it probably not much later than the end of the 10th century, which is the date confidently ascribed to certain windows at St Remi (Reims) and at Tegernsee. The rarer the specimen the greater may be its technical and antiquarian interest. But, even if we could be quite sure of its date, there is not enough of this very early work, and it does not sufficiently distinguish itself from what followed, to count artistically for much. The glory of early glass belongs to the 13th century.

The design of windows was influenced, of course, by the conditions of the workshop, by the nature of glass, the difficulty of shaping it, the way it could be painted, and the necessity of lead glazing. The place of glass in the scheme of church decoration led to a certain severity in the treatment of it. The growing desire to get more and more light into the churches, and the consequent manufacture of purer and more transparent

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glass, affected the glazier's colour scheme. For all that, the fashion of a window was, *mutatis mutandis*, that of the painting, carving, embroidery, goldsmith's work, enamel and other craftsmanship of the period. The design of an ivory triptych is very much that of a three-light window. There is a little enamelled shrine of German workmanship in the Victoria and Albert Museum which might almost have been designed for glass; and the famous painted ceiling at Hildesheim is planned precisely on the lines of a medallion window of the 13th century. By that time glass had fallen into ways of its own, and there were already various types of design which we now recognize as characteristic of the first great period, in some respects the greatest of all.

Pre-eminently typical of the first period is the "medallion window." Glaziers began by naïvely accepting the iron bars across the light as the basis of their composition, and planned a window as a series of panels, one above the other, between the horizontal crossbars and the upright lines of the border round it. The next step was to mitigate the extreme severity of this composition by the introduction of a circular or other medallion within the square boundary lines. Eventually these were abandoned altogether, the iron bars were shaped according to the pattern, and there was evolved the "medallion window," in which the main divisions of the design are emphasized by the strong bands of iron round them. Medallions were invariably devoted to picturing scenes from Bible history or from the lives of the saints, set forth in the simplest and most straightforward manner, the figures all on one plane, and as far as possible clear-cut against a sapphire-blue or ruby-red ground. Scenery was not so much depicted as suggested. An arch or two did duty for architecture, any scrap of foliated ornament for landscape. Simplicity of silhouette was absolutely essential to the readableness of pictures on the small scale allowed by the medallion. As it is, they are so difficult to decipher, so confused and broken in effect, as to give rise (the radiating shape of "rose windows" aiding) to the misconception that the design of early glass is kaleidoscopic—which it is not. The intervals between subject medallions were filled in England (Canterbury) with scrollwork, in France (Chartres) more often with geometric diaper, in which last sometimes the red and blue merge into an unpleasant purple. Design on this small scale was obviously unsuited to distant windows. Clerestory lights were occupied by figures, sometimes on a gigantic scale, entirely occupying the window, except for the border and perhaps the slightest pretence of a niche. This arrangement lent itself to broad effects of colour. The drawing may be rude; at times the figures are grotesque; but the general impression is one of mysterious grandeur and solemnity.

The depth and intensity of colour in the windows so far described comes chiefly from the quality of the glass, but partly also from the fact that very little white or pale-coloured glass was used. It was not the custom at this period to dilute the colour of a rich window with white. If light was wanted they worked in white, enlivened, it might be, by colour. Strictly speaking, 13th-century glass was never colourless, but of a greenish tint, due to impurities in the sand, potash or other ingredients; it was of a horny consistency, too; but it is convenient to speak of all would-be-clear glass as "white." The greyish windows in which it prevails are technically described as "in grisaille." There are examples (Salisbury, Châlons, Bonlieu, Angers) of "plain glazing" in grisaille, in which the lead lines make very ingenious and beautiful pattern. In the more usual case of *painted* grisaille the lead lines still formed the groundwork of the design, though supplemented by foliated or other detail, boldly outlined in strong brown and emphasized by a background of cross-hatching. French grisaille was frequently all in white (Reims, St Jean-aux-Bois, Sens), English work was usually enlivened by bands and bosses of colour (Salisbury); but the general effect of the window was still grey and silvery, even though there might be distributed about it (the "five sisters," York minster) a fair amount of coloured glass. The use of grisaille is sufficiently accounted for by considerations of economy and the desire to get light; but it was also in some sort a protest (witness the Cistercian interdict of 1134) against undue indulgence in the luxury of colour. At this stage of its development it was confined strictly to patternwork; figure subjects were always in colour. For all that, some of the most restful and entirely satisfying work of the 13th century was in grisaille (Salishury, Chartres, Reims, &c.).

The second or Middle period of Gothic glass marks a stage between the work of the Early Gothic artist who thought out his design as glazing, and that of the later draughtsman who conceived it as something to be painted. It represents to many the period of greatest interest—probably because of its departure from the severity of Early work. It was the period of more naturalistic design; and a touch of nature is more easily appreciated than architectural fitness. Middle Gothic glass, halting as it does between the relatively rude mosaic of early times and the painter-like accomplishment of fully-developed glass painting, has not the salient merits of either. In the matter of tone also it is intermediate between the deep, rich, sober harmonies of Early windows and the lighter, brighter, gayer colouring of later glass. Now for the first time grisaille ornament and coloured figurework were introduced into the same window. And this was done in a very judicious way, in alternate bands of white and deep rich colour, binding together the long lights into which windows were by this time divided (chapter-house, York minster). A similar horizontal tendency of design is noticeable in windows in which the figures are enshrined under canopies, henceforth a feature in glass design. The pinnaclework falls into pronounced bands of brassy yellow between the tiers of figures (nave, York minster) and serves to correct the vertical lines of the masonry. Canopywork grew sometimes to such dimensions as quite to overpower the figure it was supposed to frame; but, then, the sense of scale was never a directing factor in Decorated design. A more interesting form of ornament is to be found in Germany, where it was a pleasing custom (Regensburg) to fill windows with conventional foliage without figurework. There is abundance of Middle Gothic glass in England (York, Wells, Ely, Oxford), but the best of it, such as the great East window at Gloucester cathedral, has features more characteristic of the 15th than of the 14th century.

The keynote of Late Gothic glass is brilliancy. It has a silvery quality. The 15th century was the period of white glass, which approached at last to colourlessness, and was employed in great profusion. Canopywork, more universal than ever, was represented almost entirely in white touched with yellow stain, but not in sufficient quantities to impair its silveriness. Whatever the banality of the idea of imitation stonework in glass, the effect of thus framing coloured pictures in delicate white is admirable: at last we have white and colour in perfect combination. Fifteenth-century figurework contains usually a large proportion of white glass; flesh tint is represented by white; there is white in the drapery; in short, there is always white enough in the figures to connect them with the canopywork and make the whole effect one. The preponderance of white will be better appreciated when it is stated that very often not a fifth or sixth part of the glass is coloured. It is no uncommon thing to find figures draped entirely in white with only a little colour in the background; and figurework all in grisaille upon a ground of white latticework is quite characteristic of Perpendicular glass.

One of the most typical forms of Late English Gothic canopy is where (York minster) its slender pinnacles fill the upper part of the window, and its solid base frames a picture in small of some episode in the history of the personage depicted as large as life above. A much less satisfactory continental practice was to enrich only the lower half of the window with stained glass and to make shift above (Munich) with "roundels" of plain white glass, the German equivalent for diamond latticework.

A sign of later times is the way pictures spread beyond the confines of a single light. This happened by degrees. At first the connexion between the figures in separate window openings was only in idea, as when a central figure of the crucified Christ was flanked by the Virgin and St John in the side lights. Then the arms of the cross would be carried through, or as it were

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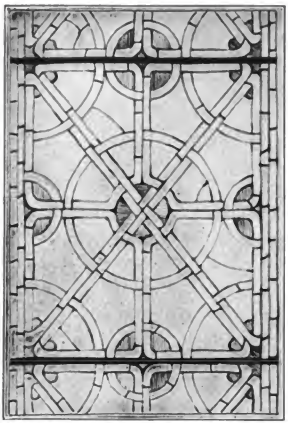
I.



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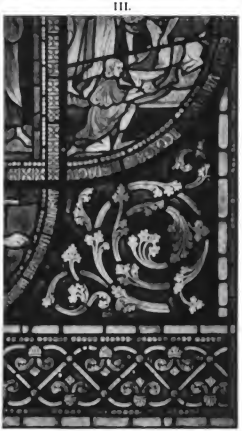

IV.

V.

VI.

I. EARLY GLAZING. From S. Serge, Angers, Grisaille, with colour introduced in the small circles.

II. AN EARLY BORDER. From S. Kunibert, Cologne.

III. PORTION OF AN EARLY MEDALLION WINDOW. From Canterbury, showing the plan of the design and the ornamental details.

IV. AN EARLY FIGURE FROM LYONS. Showing the leading of the eyes, hair, nimbus, and drapery.

V. DECORATED LIGHTS. From S. Urbain, Troyes, showing both the influence of the early period in the figures, and the beginning of the architectural canopy.

VI. TYPICAL DECORATED CANOPY. From Exeter.

Nos. I., II., III., IV., VI. are taken from illustrations in Lewis F. Day, *Windows*, by permission of B. T. Batsford.

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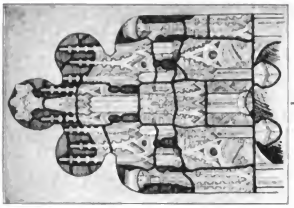

I.

IV.

III.

II.

I. A TYPICAL PERPENDICULAR CANOPY (from Lewis F. Day, *Windows*, by permission of B. T. Batsford).
II. A WINDOW FROM AUCH. Illustrating the transition from Perpendicular to Renaissance.
III. A SIXTEENTH-CENTURY JESSE WINDOW. From Beauvais (source as in Fig. I.).
IV. PORTION OF A RENAISSANCE WINDOW. From Montmorency, showing the perfection of glass painting.

From Lucien Magne, *Oeuvre des Peintres Verriers Français*, by permission of Firmin-Didot et Cie.

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behind, the mullions. The expansion to a picture right across the window was only a question of time. Not that the artist ventured as yet to disregard the architectural setting of his picture—that happened later on—but that he often composed it with such cunning reference to intervening stonework that it did not interfere with it. It has been argued that each separate light of a window ought to be complete in itself. On the other hand it has proved possible to make due acknowledgment of architectural conditions without cramping design in that way. There can be no doubt as to the variety and breadth of treatment gained by accepting the whole window as field for a design. And, when a number of lights go to make a window, it is the window, and no separate part of it, which is the main consideration.

By the end of the Gothic period, glass painters proceeded on an entirely different method from that of the 13th century. The designer of early days began with glazing; he thought in mosaic and leadwork; the lines he first drew were the lines of glazing; painting was only a supplementary process, enabling him to get what lead lines would not give. The Late Gothic draughtsman began with the idea of painting; glazing was to him of secondary importance; he reached a stage (Creation window, Great Malvern) where it is clear that he first sketched out his design, and then bethought him how to glaze it in such wise that the leadwork (which once boldly outlined everything) should not interfere with the picture. The artful way in which he would introduce little bits of colour into a window almost entirely white, makes it certain that he had always at the back of his mind the consideration of the glazing to come. So long as he thought of that, and did not resent it, all was fairly well with glass painting, but there came a point where he found it difficult, if not impossible, to reconcile the extreme delicacy of his painting upon white glass with the comparatively brutal strength of his lead lines. It is here that the conditions of painting and glazing clash at last.

It must not be supposed that Late Gothic windows were never by any chance rich in colour. Local conservatism and personal predilection prevented anything like monotonous progress in a single direction. There is (St Sebald, Nuremberg) Middle Gothic glass as dense in colour as any 13th-century work, and Late Gothic (Troyes cathedral) which, from its colour, one might take at first to be a century earlier than it is. In Italy (Florence) and to some extent in Spain (Seville) it was the custom to make canopywork so rich in colour that it was more like part of the picture than a frame to it. But that was by exception. The tendency was towards lighter windows. Glass itself was less deeply stained when painters depended more upon their power of deepening it by paint. It was the seeking after delicate effects of painting, quite as much as the desire to let light into the church, which determined the tone of later windows. The clearer the glass the more scope it gave for painting.

It is convenient to draw a line between Gothic art and Renaissance. Nothing is easier than to say that windows in which crocketed canopywork occurs are Gothic, and that those with arabesque are Renaissance. But that is an arbitrary distinction, which does not really distinguish. Some of the most beautiful work in glass, such for example as that at Auch, is so plainly intermediate between two styles that it is impossible to describe it as anything but "transitional." And, apart from particular instances, we have only to look at the best Late Gothic work to see that it is informed by the new spirit, and at fine Renaissance glass to observe how it conforms to Gothic traditions of workmanship. The new idea gave a spurt to Gothic art; and it was Gothic impetus which carried Renaissance glass painting to the summit of accomplishment reached in the first half of the 16th century. When that subsided, and the pictorial spirit of the age at last prevailed, the bright days of glass were at an end. If we have to refer to the early Renaissance as the culminating period of glass painting, it is because the technique of an earlier period found in it freer and fuller expression. With the Renaissance, design broke free from the restraints of tradition.

An interesting development of Renaissance design was the framing of pictures in goldcn-yellow arabesque ornament, scarcely architectural enough to be called canopywork, and reminiscent rather of beaten goldsmith's work than of stone carving. This did for the glass picture what a gilt frame does for a painting in oil. Very often framework of any kind was dispensed with. The primitive idea of accepting bars and mullions as boundaries of design, and filling the compartments formed by them with a medley of little subjects, lingered on. The result was delightfully broken colour, but inevitable confusion; for iron and masonry do not effectively separate glass pictures. There was no longer in late glass any pretence of preserving the plane of the window. It was commonly designed to suggest that one saw out of it. Throughout the period of the Renaissance, architectural and landscape backgrounds play an important part in design. An extremely beautiful feature in early 16th-century French glass pictures (Rouen, &c.) is the little peep of distant country delicately painted upon the pale-blue glass which represents the sky. In larger work landscape and architecture were commonly painted upon white (King's College, Cambridge). The landscape effect was always happiest when one or other of these conventions was adopted. Canopywork never went quite out of fashion. For a long while the plan was still to frame coloured pictures in white. Theoretically this is no less effectually to be done by Italian than by Gothic shrinework. Practically the architectural setting assumed in the 16th century more and more the aspect of background to the figures, and, in order that it should take its place in the picture, they painted it so heavily that it no longer told as white. Already in van Orley's magnificent transept windows at St Gudula, Brussels, the great triumphal arch behind the kneeling donors and their patron saints (in late glass donors take more and more the place of holy personages) tells dark against the clear ground. There came a time, towards the end of the century, when, as in the wonderful windows at Gouda, the very quality of white glass is lost in heavily painted shadow.

The pictorial ambition of the glass painter, active from the first, was kept for centuries within the bounds of decoration. Medallion subjects were framed in ornament, standing figures in canopywork, and pictures were conceived with regard to the window and its place in architecture. Severity of treatment in design may have been due more to the limitations of technique than to restraint on the part of the painter. The point is that it led to unsurpassed results. It was by absolute reliance upon the depth and brilliancy of self-coloured glass that all the beautiful effects of early glass were obtained. We need not compare early mosaic with later painted glass; each was in its way admirable; but the early manner is the more peculiar to glass, if not the more proper to it. The ruder and more archaic design gives in fullest measure the glory of glass—for the loss of which no quality of painting ever got in glass quite makes amends. The pictorial effects compatible with glass design are those which go with pure, brilliant and translucent colour. The ideal of a "primitive" Italian painter was more or less to be realized in glass: that of a Dutch realist was not. It is astonishing what glass painters did in the way of light and shade. But the fact remains that heavy painting obscured the glass, that shadows rendered in opaque surface-colour lacked translucency, and that in seeking before all things the effects of shadow and relief, glass painters of the 17th century fell short of the qualities on the one hand of glass and on the other of painting.

The course of glass painting was not so even as this general survey of its progress might seem to imply. It was quickened here, impeded there, by historic events. The art made a splendid start in France; but its development was stayed by the disasters of war, just when in England it was thriving under the Plantagenets. It revived again under Francis I. In Germany it was with the prosperity of the free cities of the Empire that glass painting prospered. In the Netherlands it blossomed out under the favour of Charles V. In the Swiss Confederation its direction was determined by civil and domestic instead of church patronage. In most countries there were in different districts local schools of glass painting, each with some character of its own. To what extent design was affected by national temperament it is not easy to say. The marked divergence of the Flemish from the

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French treatment of glass in the 16th century is not entirely due to a preference on the one part for colour and on the other for light and shade, but is partly owing to the circumstance that, whilst in France design remained in the hands of craftsmen, whose trade was glass painting, in the Netherlands it was entrusted by the emperor to his court painter, who concerned himself as little as possible with a technique of which he knew nothing. If in France we come also upon the names of well-known artists, they seem, like Jean Cousin, to have been closely connected with glass painting: they designed so like glass painters that they might have begun their artistic career in the workshop.

The attribution of fine windows to famous artists should not be too readily accepted; for, though it is a foible of modern times to father whatever is noteworthy upon some great name, the masterpieces of medieval art are due to unknown craftsmen. In Italy, where glass painting was not much practised, and it seems to have been the custom either to import glass painters as they were wanted or to get work done abroad, it may well be that designs were supplied by artists more or less distinguished. Ghiberti and Donatello may have had a hand in the cartoons for the windows of the Duomo at Florence; but it is not to any sculptor that we can give the entire credit of design so absolutely in the spirit of colour decoration. The employment of artists not connected with glass design would go far to explain the great difference of Italian glass from that of other countries. The 14th-century work at Assisi is more correctly described as "Trecento" than as Gothic, and the "Quattrocento" windows at Florence are as different as could be from Perpendicular work. One compares them instinctively with Italian paintings, not with glass elsewhere. And so with the 15th-century Italian glass. The superb 16th-century windows of William of Marseilles at Arezzo, in which painting is carried to the furthest point possible short of sacrificing the pure quality of glass, are more according to contemporary French technique. Both French and Italian influence may be traced in Spanish glass (Avila, Barcelona, Burgos, Granada, Leon, Seville, Toledo). Some of it is said to have been executed in France. If so it must have been done to Spanish order. The coarse effectiveness of the design, the strength of the colour, the general robustness of the art, are characteristically Spanish; and nowhere this side of the Pyrenees do we find detail on a scale so enormous.

We have passed by, in following the progressive course of craftsmanship, some forms of design, peculiar to no one period but very characteristic of glass. The "quarry window," barely referred to, its diamond-shaped or oblong panes painted, richly bordered, relieved by bosses of coloured ornament often heraldic, is of constant occurrence. Entire windows, too, were from first to last given up to heraldry. The "Jesse window" occurs in every style. According to the fashion of the time the "Stem of Jesse" burst out into conventional foliage, vine branches or arbitrary scrollwork. It appealed to the designer by the scope it gave for freedom of design. He found vent, again, for fantastic imagination in the representation of the "Last Judgment," to which the west window was commonly devoted. And there are other schemes in which he delighted; but this is not the place to dwell upon them.

The glass of the 17th century does not count for much. Some of the best in England is the work of the Dutch van Linge family (Wadham and Balliol Colleges, Oxford). What glass painting came to in the 18th century is nowhere better to be seen than in the great west window of the ante-chapel at New College, Oxford. That is all Sir Joshua Reynolds and the best china painter of his day could do between them. The very idea of employing a china painter shows how entirely the art of the glass painter had died out.

It re-awoke in England with the Gothic revival of the 19th century; and the Gothic revival determined the direction modern glass should take. Early Victorian doings are interesting only as marking the steps of recovery (cf. the work of T. Willement in the choir of the Temple church; of Ward and Nixon, lately removed from the south transept of Westminster Abbey; of Wailes). Better things begin with the windows at Westminster inspired by A. C. Pugin, who exercised considerable influence over his contemporaries. John Powell (Hardman & Co.) was an able artist content to walk, even after that master's death, reverently in his footsteps. Charles Winston, whose *Hints on Glass Painting* was the first real contribution towards the understanding of Gothic glass, and who, by the aid of the Powells (of Whitefriars) succeeded in getting something very like the texture and colour of old glass, was more learned in ancient ways of workmanship than appreciative of the art resulting from them. (He is responsible for the Munich glass in Glasgow Cathedral.) So it was that, except for here and there a window entrusted by exception to W. Dyce, E. Poynter, D. G. Rossetti, Ford Madox Brown or E. Burne-Jones, glass, from the beginning of its recovery, fell into the hands of men with a strong bias towards archaeology. The architects foremost in the Gothic revival (W. Butterfield, Sir G. Scott, G. E. Street, &c.) were all inclined that way; and, as they had the placing of commissions for windows, they controlled the policy of glass painters. Designers were constrained to work in the pedantically archaeological manner prescribed by architectural fashion. Unwillingly as it may have been, they made mock-medieval windows, the interest in which died with the popular illusion about a Gothic revival. But they knew their trade; and when an artist like John Clayton (master of a whole school of later glass painters) took a window in hand (St Augustine's, Kilburn; Truro cathedral; King's College Chapel, Cambridge) the result was a work of art from which, tradework as it may in a sense be, we may gather what such men might have done had they been left free to follow their own artistic impulse. It is necessary to refer to this because it is generally supposed that whatever is best in recent glass is due to the romantic movement. The charms of Burne-Jones's design and of William Morris's colour, place the windows done by them among the triumphs of modern decorative art; but Morris was neither foremost in the reaction, nor quite such a master of the material he was working in as he showed himself in less exacting crafts. Other artists to be mentioned in connexion with glass design are: Clement Heaton, Bayne, N. H. J. Westlake and Henry Holiday, not to speak of a younger generation of able men.

Foreign work shows, as compared with English, a less just appreciation of glass, though the foremost draughtsmen of their day were enlisted for its design. In Germany, King Louis of Bavaria employed P. von Cornelius and W. von Kaulbach (Aix-la-Chapelle, Cologne, Glasgow); in France the Bourbons employed J. A. D. Ingres, F. V. E. Delacroix, Vernet and J. H. Flandrin (Dreux); and the execution of their designs was entrusted to the most expert painters to be procured at Munich and Sèvres; but all to little effect. They either used potmetal glass of poor quality, or relied upon enamel—with the result that their colour lacks the qualities of glass. Where it is not heavy with paint it is thin and crude. In Belgium happier results were obtained. In the chapel of the Holy Sacrament at Brussels there is one window by J. B. Capronnier not unworthy of the fine series by B. van Orley which it supplements. At the best, however, foreign artists failed to appreciate the quality of glass; they put better draughtsmanship into their windows than English designers of the mid-Victorian era, and painted them better; but they missed the glory of translucent colour.

Modern facilities of manufacture make possible many things which were hitherto out of the question. Enamel colours are richer; their range is extended; and it may be possible, with the improved kilns and greater chemical knowledge we possess, to make them hold permanently fast. It was years ago demonstrated at Sèvres how a picture may be painted in colours upon a sheet of plate-glass measuring 4 ft. by 2½ ft. We are now no doubt in a position to produce windows painted on much larger sheets. But the results achieved, technically wonderful as they are, hardly warrant the waste of time and labour upon work so costly, so fragile, so lacking in the qualities of a picture on the one hand and of glass on the other.

In America, John la Farge, finding European material not

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dense enough, produced potmetal more heavily charged with colour. This was wilfully streaked, mottled and quasi-accidentally varied; some of it was opalescent; much of it was more like agate or onyx than jewels. Other forms of American enterprise were: the making of glass in lumps, to be chipped into flakes; the ruckling it; the shaping it in a molten state, or the pulling it out of shape. It takes an artist of some reserve to make judicious use of glass like this. La Farge and L. C. Tiffany have turned it to beautiful account, but even they have put it to purposes more pictorial than it can properly fulfil. The design it calls for is a severely abstract form of ornament verging upon the barbaric.

Of late years each country has been learning so much from the others that the newest effort is very much in one direction. It seems to be agreed that the art of the window-maker begins with glazing, that the all-needful thing is beautiful glass, that painting may be reduced to a minimum, and on occasion (thanks to new developments in the making of glass) dispensed with altogether. A tendency has developed itself in the direction not merely of mosaic, but of carrying the glazier's art farther than has been done before and rendering landscapes and even figure subjects in unpainted glass. When, however, it comes to the representation of the human face, the limitations of simple lead-glazing are at once apparent. A possible way out of the difficulty was shown at the Paris Exhibition of 1900 by M. Tournel, who, by fusing together coloured tesserae on to larger pieces of colourless glass, anticipated the discovery of the already mentioned fragment of Byzantine mosaic now in the Victoria and Albert Museum. He may have seen or heard of something of the sort. There would be no advantage in building up whole windows in this way; but for the rendering of the flesh and sundry minute details in a window for the most part heavily leaded, this fusing together of tesserae, and even of little pieces of glass cut carefully to shape, seems to supply the want of something more in keeping with severe mosaic glazing than painted flesh proves to be.

Glass painters are allowed to-day a freer hand than formerly. They are no longer exclusively engaged upon ecclesiastical work; domestic glass is an important industry; and a workman once comparatively exempt from pedantic control is not so easily restrained from self-expression. Moreover, the recognition of the artistic position of craftsmen in general makes it possible for a man to devote himself to glass without sinking to the rank of a mechanic; and artists begin to realize the scope glass offers them. What they lack as yet is experience in their craft, and perhaps due workmanlike respect for traditional ways of workmanship. When the old methods come to be superseded it will be only by new ones evolved out of them. At present the conditions of glass painting remain very much what they were. The supreme beauty of glass is still in the purity, the brilliancy, the translucency of its colour. To make the most of this the designer must be master of his trade. The test of window design

Examples of Important Historical Stained Glass.

There are remains of the earliest known glass: in France—at Le Mans, Chartres, Châlons-sur-Marne, Angers and Poitiers cathedrals, the abbey church of St Denis and at St Remi, Reims: in England—at York minster (fragments): in Germany—at Augsburg and Strassburg cathedrals: in Austria—in the cloisters of Heiligen Kreuz.

The following is a classified list of some of the most characteristic and important windows, omitting for the most part isolated examples, and giving by preference the names of churches where there is a fair amount of glass remaining; the country in which at each period the art throve best is put first.

EARLY GOTHIC

France.

Chartres, Le Mans, Bourges, Reims, Auxerre } cathedrals.
Ste Chapelle, Paris.
Church of St Jean-aux-Bois.

England.

Canterbury, Salisbury, Lincoln } cathedrals.
York minster.

Germany.

Church of St Kunibert, Cologne (Romanesque).
Cologne cathedral.

England.

York minster.
Ely cathedral.
Wells cathedral.
Tewkesbury abbey.

Italy.

Church of St Francis, Assisi.
Church of Or San Michele, Florence.
Church of S. Petronio, Bologna.

MIDDLE GOTHIC

Germany.

Church of St Sebald, Nuremberg.
Strassburg, Regensburg, Augsburg, Erfurt, Freiburg } cathedrals.
Church of Nieder Haslach.

France.

Évreux cathedral.
Church of St Pierre, Chartres.
Cathedral and church of St Urbain, Troyes.
Church of Ste Radegonde, Poitiers.
Cathedral and church of St Ouen, Rouen.

Spain.

Toledo cathedral.

England.

New College, Oxford.
Gloucester cathedral.
York, minster and other churches.
Great Malvern abbey.
Church of St Mary, Shrewsbury.
Fairford church.

LATE GOTHIC

France.

Bourges, Troyes } cathedrals.
Church of Notre Dame, Alençon.

Italy.

The Duomo, Florence.

Germany.

Cologne, Ulm, Munich } cathedrals.
Church of St Lorenz, Nuremberg.

Spain.

Toledo cathedral.

TRANSITION PERIOD

The choir of the cathedral at Auch.

France.

St Vincent, St Patrice, St Godard } Rouen.
Church of St Foy, Conches.
Church of St Gervais, Paris.
Church of St Étienne-du-Mont, Paris.
Church of St Martin, Montmorency.
Church of Écouen.
Church of St Étienne, Beauvais.
Church of St Nizier, Troyes.
Church of Brou, Bourg-en-Bresse.
The Château de Chantilly.

Netherlands.

Groote Kirk, Gouda.
Choir of Brussels cathedral.
Antwerp cathedral.

RENAISSANCE

Netherlands.

Brussels cathedral.
Church of St Jacques, Church of St Martin, Cathedral } Liége.

Italy.

Arezzo, Milan } cathedrals.
Certosa di Pavia.
Church of S. Petronio, Bologna.
Church of Sta Maria Novella, Florence.

Germany.

Freiburg cathedral.

Switzerland.

Lucerne and most of the other principal museums.

Spain.

Granada, Seville } cathedrals.

England.

King's College chapel, Cambridge.
Lichfield cathedral.
St George's church, Hanover Square, London.
St Margaret's church, Westminster.

LATE RENAISSANCE

France.

Church of St Martin-ès-Vignes, Troyes.
Nave and transepts of Auch cathedral.

England.

Wadham, Balliol, New } colleges, Oxford.

Switzerland.

Most museums.

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is, now as ever, that it should have nothing to lose and everything to gain by execution in stained glass.

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GLASSBRENNER, ADOLF (1810–1876), German humorist and satirist, was born at Berlin on the 27th of March 1810. After being for a short time in a merchant's office, he took to journalism, and in 1833 edited *Don Quixote*, a periodical which was suppressed in 1833 owing to its revolutionary tendencies. He next, under the pseudonym *Adolf Brennglas*, published a series of pictures of Berlin life, under the titles *Berlin wie es ist und—trinkt* (30 parts, with illustrations, 1833–1840), and *Buntes Berlin* (14 parts, with illustrations, Berlin, 1837–1858), and thus became the founder of a popular satirical literature associated with modern Berlin. In 1840 he married the actress Adele Peroni (1813–1805), and removed in the following year to Neustrelitz, where his wife had obtained an engagement at the Grand ducal theatre. In 1848 Glassbrenner entered the political arena and became the leader of the democratic party in Mecklenburg-Strelitz. Expelled from that country in 1850, he settled in Hamburg, where he remained until 1858; and then he became editor of the *Montagszeitung* in Berlin, where he died on the 25th of September 1876.

Among Glassbrenner's other humorous and satirical writings may be mentioned: *Leben und Treiben der feinen Welt* (1834); *Bilder und Träume aus Wien* (2 vols., 1836); *Gedichte* (1851, 5th ed. 1870); the comic epics, *Neues Berlin* (1847, 4th ed. 1872), and *Die verkehrte Welt* (1857, 6th ed. 1873); also *Berliner Volksleben* (3 vols., illustrated; Leipzig, 1847–1851). Glassbrenner has published some charming books for children, notably *Lachende Kinder* (14th ed., 1884), and *Sprechende Tiere* (20th ed., Hamburg, 1899).

See R. Schmidt-Cabanis, "Adolf Glassbrenner," in *Unsere Zeit* (1881).

GLASS CLOTH, a textile material, the name of which indicates the use for which it was originally intended. The cloths are in general woven with the plain weave, and the fabric may be all white, striped or checked with red, blue or other coloured threads; the checked cloths are the most common. The real article should be all linen, but a large quantity is made with cotton warp and tow weft, and in some cases they are composed entirely of cotton. The short fibres of the cheaper kind are easily detached from the cloth, and hence they are not so satisfactory for the purpose for which they are intended.

GLASSIUS, SALOMO (1593–1656), theologian and biblical critic, was born at Sondershausen, in the principality of Schwarzburg-Sondershausen, on the 20th of May 1593. In 1612 he entered the university of Jena. In 1615, with the idea of studying law, he moved to Wittenberg. In consequence of an illness, however, he returned to Jena after a year. Here, as a student of theology under Johann Gerhard, he directed his attention especially to Hebrew and the cognate dialects; in 1619 he was made an "adjunctus" of the philosophical faculty, and some time afterwards he received an appointment to the chair of Hebrew. From 1625 to 1638 he was superintendent in Sondershausen; but shortly after the death of Gerhard (1637) he was, in accordance with Gerhard's last wish, appointed to succeed him at Jena. In 1640, however, at the earnest invitation of Duke Ernest the Pious, he removed to Gotha as court preacher and general superintendent in the execution of important reforms which had been initiated in the ecclesiastical and educational establishments of the duchy. The delicate duties attached to this office he discharged with tact and energy; and in the "syncretistic" controversy, by which Protestant Germany was so long vexed, he showed an unusual combination of firmness with liberality, of loyalty to the past with a just regard to the demands of the present and the future. He died on the 27th of July 1656.

His principal work, *Philologia sacra* (1623), marks the transition from the earlier views on questions of biblical criticism to those of the school of Spener. It was more than once reprinted during his lifetime, and appeared in a new and revised form, edited by J. A. Dathe (1731–1791) and G. L. Bauer at Leipzig. Glassius succeeded Gerhard as editor of the Weimar *Bibelwerk*, and wrote the commentary on the poetical books of the Old Testament for that publication. A volume of his *Opuscula* was printed at Leiden in 1700.

See the article in Herzog-Hauck, *Realencyklopädie*.

GLASSWORT, a name given to *Salicornia herbacea* (also known as marsh samphire), a salt-marsh herb with succulent, jointed, leafless stems, in reference to its former use in glass-making, when it was burnt for barilla. *Salsola Kali*, an allied plant with rigid, fleshy, spinous-pointed leaves, which was used for the same purpose, was known as prickly glasswort. Both plants are members of the natural order Chenopodiaceæ.

GLASTONBURY, a market town and municipal borough in the Eastern parliamentary division of Somersetshire, England, on the main road from London to Exeter, 37 m. S.W. of Bath by the Somerset & Dorset railway. Pop. (1901) 4016. The town lies in the midst of orchards and water-meadows, reclaimed from the fens which encircled Glastonbury Tor, a conical height once an island, but now, with the surrounding flats, a peninsula washed on three sides by the river Brue.

The town is famous for its abbey, the ruins of which are fragmentary, and as the work of destruction has in many places descended to the very foundations it is impossible to make out the details of the plan. Of the vast range of buildings for the accommodation of the monks hardly any part remains except the abbot's kitchen, noteworthy for its octagonal interior (the exterior plan being square, with the four corners filled in with fireplaces and chimneys), the porter's lodge and the abbey barn. Considerable portions are standing of the so-called chapel of St Joseph at the west end, which has been identified with the Lady chapel, occupying the site of the earliest church. This chapel, which is the finest part of the ruins, is Transitional work of the 12th century. It measures about 66 ft. from east to west and about 36 from north to south. Below the chapel is a crypt of the 13th century inserted beneath a building which had no previous crypt. Between the chapel and the great church is an Early English building which appears to have served as a Galilee porch. The church itself was a cruciform structure with a choir, nave and transepts, and a tower surmounting the centre of intersection. From east to west the length was 410 ft. and the breadth of the nave was about 80 ft. The nave had ten bays and the choir six. Of the nave three bays of the south side are still standing, and the windows have pointed arches externally and semicircular arches internally. Two of the tower piers and a part of one arch give some indication of the grandeur of the building. The foundations of the Edgar chapel, discovered in 1908, make the whole church the longest of cathedral or monastic churches in the country. The old clock, presented to the abbey by Adam de Sodbury (1322–1335), and noteworthy as an early example of a clock striking the hours automatically with a count-wheel, was once in Wells cathedral, but is now preserved in the Victoria and Albert Museum.

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The Glastonbury thorn, planted, according to the legend, by Joseph of Arimathea, has been the object of considerable comment. It is said to be a distinct variety, flowering twice a year. The actual thorn visited by the pilgrims was destroyed about the Reformation time, but specimens of the same variety are still extant in various parts of the country.

The chief buildings, apart from the abbey, are the church of St John Baptist, Perpendicular in style, with a fine tower and some 15th-century monuments; St Benedict's, dating from 1493–1524; St John's hospital, founded 1246; and the George Inn, built in the time of Henry VII. or VIII. The present stone cross replaced a far finer one of great age, which had fallen into decay. The Antiquarian Museum contains an excellent collection, including remains from a prehistoric village of the marshes, discovered in 1892, and consisting of sixty mounds within a space of five acres. There is a Roman Catholic missionaries' college. In the 16th century the woollen industry was introduced by the duke of Somerset; and silk manufacture was carried on in the 18th century. Tanning and tile-making, and the manufacture of boots and sheep-skin rugs are practised. The town is governed by a mayor, 4 aldermen and 12 councillors. Area, 5000 acres.

The lake-village discovered in 1892 proves that there was a Celtic settlement about 300–200 B.C. on an island in the midst of swamps, and therefore easily defensible. British earthworks and Roman roads and relics prove later occupation. The name of Glastonbury, however, is of much later origin, being a corruption of the Saxon *Glastyngabyrig*. By the Britons the spot seems to have been called Ynys yr Afalon (latinized as Avallonia) or Ynysvitrin (see AVALON), and it became the local habitation of various fragments of Celtic romance. According to the legends which grew up under the care of the monks, the first church of Glastonbury was a little wattled building erected by Joseph of Arimathea as the leader of the twelve apostles sent over to Britain from Gaul by St Philip. About a hundred years later, according to the same authorities, the two missionaries, Phaganus and Deruvianus, who came to king Lucius from Pope Eleutherius, established a fraternity of anchorites on the spot, and after three hundred years more St Patrick introduced among them a regular monastic life. The British monastery founded about 601 was succeeded by a Saxon abbey built by Ine in 708. From the decadent state into which Glastonbury was brought by the Danish invasions it was recovered by Dunstan, who had been educated within its walls and was appointed its abbot about 946. The church and other buildings of his erection remained till the installation, in 1082, of the first Norman abbot, who inaugurated the new epoch by commencing a new church. His successor Herlewin (1101–1120), however, pulled it down to make way for a finer structure. Henry of Blois (1126–1172) added greatly to the extent of the monastery. In 1184 (on 25th May) the whole of the buildings were laid in ruins by fire; but Henry II. of England, in whose hands the monastery then was, entrusted his chamberlain Rudolphus with the work of restoration, and caused it to be carried out with much magnificence. The great church of which the ruins still remain was then erected. In the end of the 12th century, and on into the following, Glastonbury was distracted by a strange dispute, caused by the attempt of Savaric, the ambitious bishop of Bath, to make himself master of the abbey. The conflict was closed by the decision of Innocent III., that the abbacy should be merged in the new see of Bath and Glastonbury, and that Savaric should have a fourth of the property. On Savaric's death his successor gave up the joint bishopric and allowed the monks to elect their own abbot. From this date to the Reformation the monastery, one of the chief Benedictine abbeys in England, continued to flourish, the chief events in its history being connected with the maintenance of its claims to the possession of the bodies or tombs of King Arthur and St Dunstan. From early times through the middle ages it was a place of pilgrimage. As early at least as the beginning of the 11th century the tradition that Arthur was buried at Glastonbury appears to have taken shape; and in the reign of Henry II., according to Giraldus Cambrensis and others, the abbot Henry de Blois, causing search to be made, discovered at the depth of 16 ft. a massive oak trunk with an inscription "Hic jacet sepultus inclitus rex Arthurus in insula Avalonia." After the fire of 1184 the monks asserted that they were in possession of the remains of St Dunstan, which had been abstracted from Canterbury after the Danish sack of 1011 and kept in concealment ever since. The Canterbury monks naturally denied the assertion, and the contest continued for centuries. In 1508 Warham and Goldston having examined the Canterbury shrine reported that it contained all the principal bones of the saint, but the abbot of Glastonbury in reply as stoutly maintained that this was impossible. The day of such disputes was, however, drawing to a close. In 1539 the last and 60th abbot of Glastonbury, Robert Whyting, was lodged in the Tower on account of "divers and sundry treasons." "The 'account' or 'book' of his treasons . . . . seems to be lost, and the nature of the charges . . . . can only be a matter of speculation" (Gairdner, *Cal. Pap.* on Hen. VIII., xiv. ii. *pref.* xxxii). He was removed to Wells, where he was "arraigned and next day put to execution for robbing of Glastonbury church." The execution took place on Glastonbury Tor. His body was quartered and his head fixed on the abbey gate. A darker passage does not occur in the annals of the English Reformation than this murder of an able and high-spirited man, whose worst offence was that he defended as best he could from the hand of the spoiler the property in his charge.

In 1907, the site of the abbey with the remains of the buildings, which had been in private hands since the granting of the estate to Sir Peter Carew by Elizabeth in 1550, was bought by Mr Ernest Jardine for the purpose of transferring it to the Church of England. Bishop Kennion of Bath and Wells entered into an agreement to raise a sum of £31,000, the cost of the purchase; this was completed, and the site and buildings were formally transferred at a dedicatory service in 1909 to the Diocesan Trustees of Bath and Wells, who are to hold and manage the property according to a deed of trust. This deed provided for the appointment of an advisory council, consisting of the archbishop of Canterbury, the bishop of Bath and Wells and four other bishops, each with power to nominate one clerical and one lay member. The council has the duty of deciding the purpose for which the property is to be used "in connexion with and for the benefit of the Church of England." To give time for further collection of funds and deliberation, the property was re-let for five years to the original purchaser.

In the 8th century Glastonbury was already a borough owned by the abbey, which continued to be overlord till the Dissolution. The abbey obtained charters in the 7th century, but the town received its first charter from Henry II., who exempted the men of Glastonbury from the jurisdiction of royal officials and freed them from certain tolls. This was confirmed by Henry III. in 1227, by Edward I. in 1278, by Edward II. in 1313 and by Henry VI. in 1447. The borough was incorporated by Anne in 1706, and the corporation was reformed by the act of 1835. In 1319 Glastonbury received a writ of summons to parliament, but made no return, and has not since been represented. A fair on the 8th of September was granted in 1127; another on the 29th of May was held under a charter of 1282. Fairs known as Torr fair and Michaelmas fair are now held on the second Mondays in September and October and are chiefly important for the sale of horses and cattle. The market day every other Monday is noted for the sale of cheese. Glastonbury owed its medieval importance to its connexion with the abbey. At the Dissolution the introduction of woollen manufacture checked the decay of the town. The cloth trade flourished for a century and was replaced by silk-weaving, stocking-knitting and glove-making, all of which have died out.

See Abbot Gasquet, *Henry VIII. and the English Monasteries* (1906), and *The Last Abbot of Glastonbury* (1895 and 1908); William of Malmesbury, "De antiq. Glastoniensis ecclesiae," in *Rerum Anglicarum script. vet.* tom. i. (1684) (also printed by Hearne and Migne); John of Glastonbury, *Chronica sive de hist. de rebus Glast.*, ed. by Hearne (2 vols., Oxford, 1726); Adam of Domerham, *De rebus gestis Glast.*, ed. by Hearne (2 vols., Oxford, 1727); *Hist. and Antiq. of Glast.* (London, 1807); *Avalonian Guide to the Town of Glastonbury* (8th ed., 1839); Warner, *Hist. of the Abbey and Town* (Bath, 1826); Rev. F. Warre, "Glastonbury Abbey," in *Proc. of Somersetshire*

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Archaeol. and Nat. Hist. Soc., 1849; Rev. F. Warre, "Notice of Ruins of Glastonbury Abbey," *ib.* 1859; Rev. W. A. Jones, "On the Reputed Discovery of King Arthur's Remains at Glastonbury," *ib.* 1859; Rev. J. R. Green, "Dunstan at Glastonbury" and "Giso and Savaric," *ib.* 1863; Rev. Canon Jackson, "Savaric, Bishop of Bath and Glastonbury," *ib.* 1862, 1863; E. A. Freeman, "King Ine," *ib.* 1872 and 1874; Dr W. Beattie, in *Journ. of Brit. Archaeol. Ass.* vol. xii., 1856; Rev. R. Willis, *Architectural History of Glastonbury Abbey* (1866); W. H. P. Greswell, *Chapters on the Early History of Glastonbury Abbey* (1909). Views and plans of the abbey building will be found in Dugdale's *Monasticon* (1655–1673); Stevens's *Monasticon* (1720); Stukeley, *Itinerarium curiosum* (1724); Grose, *Antiquities* (1754); Carter, *Ancient Architecture* (1800); Storer, *Antiq. and Topogr. Cabinet*, ii., iv., v. (1807), &c.; Britton's *Architectural Antiquities*, iv. (1813); *Vetusta monumenta*, iv. (1815); and *New Monasticon*, i. (1817).

GLATIGNY, JOSEPH ALBERT ALEXANDRE (1839–1873), French poet, was born at Lillebonne (Seine Inférieure) on the 21st of May 1839. His father, who was a carpenter and afterwards a gendarme, removed in 1844 to Bernay, where Albert received an elementary education. Soon after leaving school he was apprenticed to a printer at Pont Audemer, where he produced a three-act play at the local theatre. He then joined a travelling company of actors to whom he acted as prompter. Inspired primarily by the study of Théodore de Banville, he published his *Vignes folles* in 1857; his best collection of lyrics, *Les Flèches d'or*, appeared in 1864; and a third volume, *Gilles et pasquins*, in 1872. After Glatigny settled in Paris he improvised at café concerts and wrote several one-act plays. On an expedition to Corsica with a travelling company he was on one occasion arrested and put in irons for a week through being mistaken by the police for a notorious criminal. His marriage with Emma Dennie brought him great happiness, but the hardships of his life weakened his health and he died at Sèvres on the 16th of April 1873.

See Catulle Mendès, *Légende du Parnasse contemporain* (1884), and *Glatigny, drame funambulesque* (1906).

GLATZ (Slav. *Kladsko*), a fortified town of Germany, in the Prussian province of Silesia, in a narrow valley on the left bank of the Neisse, not far from the Austrian frontier, 58 m. S.W. from Breslau by rail. Pop. (1905) 16,051. The town with its narrow streets winds up the fortified hill which is crowned by the old citadel. Across the river, on the Schäferberg, lies a more modern fortress built by the Prussians about 1750. Before the town on both banks of the river there is a fortified camp by which bombardment from the neighbouring heights can be hindered and which affords accommodation for 10,000 men. The inner ceinture of walls was razed in 1891 and their site is now occupied by new streets. There are a Lutheran and two Roman Catholic churches, one of which, the parish church, contains the monuments of seven Silesian dukes. Among the other buildings the principal are the Royal Catholic gymnasium and the military hospital. The industries include machine shops, breweries, and the manufacture of spirits, linen, damask, cloth, hosiery, beads and leather.

Glatz existed as early as the 10th century, and received German settlers about 1250. It was besieged several times during the Thirty Years' War and during the Seven Years' War and came into the possession of Prussia in 1742. In 1821 and 1883 great devastation was caused here by floods. The county of Glatz was long contended for by the kingdoms of Poland and of Bohemia. Eventually it became part of the latter country, and in 1534 was sold to the house of Habsburg, from whom it was taken by Frederick the Great during his attack on Silesia.

See Ludwig, *Die Grafschaft Glatz in Wort und Bild* (Breslau, 1897); Kutzen, *Die Grafschaft Glatz* (Glogau, 1873); and *Geschichtsquellen der Grafschaft Glatz*, edited by F. Volkmer and Hohaus (1883–1891).

GLAUBER, JOHANN RUDOLF (1604–1668), German chemist, was born at Karlstadt, Bavaria, in 1604 and died at Amsterdam in 1668. Little more is known of his life than that he resided successively in Vienna, Salzburg, Frankfurt and Cologne before settling in Holland, where he made his living chiefly by the sale of secret chemical and medicinal preparations. Though his writings abound in universal solvents and other devices of the alchemists, he made some real contributions to chemical knowledge. Thus he clearly described the preparation of hydrochloric acid by the action of oil of vitriol on common salt, the manifold virtues of sodium sulphate—*sal mirabile*, Glauber's salt—formed in the process being one of the chief themes of his *Miraculum mundi*; and he noticed that nitric acid was formed when nitre was substituted for the common salt. Further he prepared a large number of substances, including the chlorides and other salts of lead, tin, iron, zinc, copper, antimony and arsenic, and he even noted some of the phenomena of double decomposition. He was always anxious to turn his knowledge to practical account, whether in preparing medicines, or in furthering industrial arts such as dyeing, or in increasing the fertility of the soil by artificial manures. One of his most notable works was his *Teutschlands Wohlfarth* in which he urged that the natural resources of Germany should be developed for the profit of the country and gave various instances of how this might be done.

His treatises, about 30 in number, were collected and published at Frankfort in 1658–1659, at Amsterdam in 1661, and, in an English translation by Packe, at London in 1689.

GLAUBER'S SALT, decahydrated sodium sulphate, $Na_2SO_4.10H_2O$. It is said by J. Kunkel to have been known as an *arcanum* or secret medicine to the electoral house of Saxony in the middle of the 16th century, but it was first described by J. R. Glauber (*De natura salium*, 1658), who prepared it by the action of oil of vitriol or sulphuric acid on common salt, and, ascribing to it many medicinal virtues, termed it *sal mirabile Glauberi*. As the mineral thenardite or mirabilite, which crystallizes in the rhombic system, it occurs in many parts of the world, as in Spain, the western states of North America and the Russian Caucasus; in the last-named region, about 25 m. E. of Tiflis, there is a thick bed of the pure salt about 5 ft. below the surface, and at Balalpashinsk there are lakes or ponds the waters of which are an almost pure solution. The substance is the active principle of many mineral waters, *e.g.* Frederickshall; it occurs in sea-water and it is a constant constituent of the blood. In combination with calcium sulphate, it constitutes the mineral glauberite or brongniartite, $Na_2SO_4.CaSO_4$, which assumes forms belonging to the monoclinic system and occurs in Spain and Austria. It has a bitter, saline, but not acrid taste. At ordinary temperatures it crystallizes from aqueous solutions in large colourless monoclinic prisms, which effloresce in dry air, and at 35° C. melt in their water of crystallization. At 100° they lose all their water, and on further heating fuse at 843°. Its maximum solubility in water is at 34°; above that temperature it ceases to exist in the solution as a decahydrate, but changes to the anhydrous salt, the solubility of which decreases with rise of temperature. Glauber's salt readily forms supersaturated solutions, in which crystallization takes place suddenly when a crystal of the salt is thrown in; the same effect is obtained by exposure to the air or by touching the solution with a glass rod. In medicine it is employed as an aperient, and is one of the safest and most innocuous known. For children it may be mixed with common salt and the two be used with the food without the child being conscious of any difference. Its simulation of the taste of common salt also renders it suitable for administration to insane patients and others who refuse to take any drug. If, however, its presence is recognized sodium phosphate may be substituted.

GLAUCHAU, a town of Germany, in the kingdom of Saxony, on the right bank of the Mulde, 7 m. N. of Zwickau and 17 W. of Chemnitz by rail. Pop. (1875) 21,743; (1905) 24,556. It has important manufactures of woollen and half-woollen goods, in regard to which it occupies a high position in Germany. There are also dye-works, print-works, and manufactories of paper, linen, thread and machinery. Glauchau possesses a high grade school, elementary schools, a weaving school, an orphanage and an infirmary. Some portions of the extensive old castle date from the 12th century, and the Gottesacker church contains interesting antiquarian relics. Glauchau was founded by a colony of Sorbs and Wends, and belonged to the lords of Schönburg as early as the 12th century.

See R. Hofmann, *Rückblick über die Geschichte der Stadt Glauchau* (1897).

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GLAUCONITE, a mineral, green in colour, and chemically a hydrous silicate of iron and potassium. It especially occurs in the green sands and muds which are gathering at the present time on the sea bottom at many different places. The wide extension of these sands and muds was first made known by the naturalists of the "Challenger," and it is now found that they occur in the Mediterranean as well as in the open ocean, but they have not been found in the Black Sea or in any fresh-water lakes. These deposits are not in a true sense abyssal, but are of terrigenous origin, the mud and sand being derived from the wear of the continents, transported by marine currents. The greater part of the mass consists in all cases of minerals such as quartz, felspar (often labradorite), mica, chlorite, with more or less calcite which is probably always derived from shells or other organic sources. Many accessory minerals such as tourmaline and zircon have been identified also, while augite, hornblende and other volcanic minerals occur in varying proportion as in all the sediments of the open sea. The depth in which they accumulate varies a good deal, viz. from 200 up to 2000 fathoms, but as a rule is less than 1000 fathoms, and it is believed that the most common situations are where the continental shores slope rather steeply into moderate depths of water. Many of the blue muds, which owe their colour to fine particles of sulphide of iron, contain also a small quantity of glauconite; in Globigerina oozes this substance has also been found, and in fact there exists every gradation between the glauconitic deposits and the other types of sands and muds which are found at similar depths.

The colouring matter is believed in every case to be glauconite. Other ingredients, such as lime, alumina and magnesia are usually shown to be present by the analyses, but may perhaps be regarded as non-essential: it is impossible to isolate this substance in a pure state as it occurs only in fine aggregates, mixed with other minerals. The glauconite, though crystalline, never occurs well crystallized but only as dense clusters of very minute particles which react feebly on polarized light. They have one well-marked characteristic inasmuch as they often form rounded lumps. In many cases it is certain that these are casts, which fill up the interior of empty shells of Foraminifera. They may be seen occupying these shells, and when the shell is dissolved away perfect casts of glauconite are set free. Apparently in some manner not understood, the decaying organic matter in the shell of the dead organism initiated or favoured the chemical reactions by which the glauconite was formed. That the mineral originated on the sea bottom among the sand and mud is quite certainly established by these facts; moreover, since it is so soft and friable that it is easily powdered up by pressure with the fingers, it cannot have been transported from any great distance by currents. Small rounded glauconite lumps, which are common on the sands but show no trace of having filled the chambers of Foraminifera, may have arisen by a re-deposit of broken-down casts such as have been described; probably slight movement of the deposits, occasioned by currents, may have broken up the glauconite casts and scattered the soft material through the water. Films or stains of glauconite on shells, sand grains and phosphate nodules are explained by a similar deposit of fragmental glauconite.

In a small number of Tertiary and older rocks glauconite occurs as an essential component. It is found in the Pliocene sands of Holland, the Eocene sands of Paris and the "Molasse" of Switzerland, but is much more abundant in the Lower Cretaceous rocks of N. Europe, especially in the subdivision known as the Greensand. Rounded lumps and casts like those of the green sands of the present day are plentiful in these rocks, and it is obvious that the mode of formation was in all respects the same. The green sand when weathered is brown or rusty coloured, the glauconite being oxidized to limonite. Calcareous sands or impure limestones with glauconite are also by no means rare, an example being the well-known Kentish Rag. In the Chalk-rock and Chalk-marl of some parts of England glauconite is rather frequent, and glauconitic chalk is known also in the north of France. Among the oldest rocks which contain this mineral are the Lower Silurian of the St Petersburg district, but it is very rare in the Palaeozoic formations, possibly because it undergoes crystalline change and is also liable to be oxidized and converted into other ferruginous minerals. It has been suggested that certain deposits of iron ores may owe their origin to deposits of glauconite, as for example those of the Mesabi range, Minnesota, U.S.A. (J. S. F.)

GLAUCOUS (Gr. γλαυκός, bright, gleaming), a word meaning of a sea-green colour, in botany covered with bloom, like a plum or a cabbage-leaf.

GLAUCUS ("bright"), the name of several figures in Greek mythology, the most important of which are the following:

1. Glaucus, surnamed *Pontius*, a sea divinity. Originally a fisherman and diver of Anthedon in Boeotia, having eaten of a certain magical herb sown by Cronus, he leapt into the sea, where he was changed into a god, and endowed with the gift of unerring prophecy. According to others he sprang into the sea for love of the sea-god Melicertes, with whom he was often identified (Athenaeus vii. 296). He was worshipped not only at Anthedon, but on the coasts of Greece, Sicily and Spain, where fishermen and sailors at certain seasons watched for his arrival during the night in order to consult him (Pausanias ix. 22). In art he is depicted as a vigorous old man with long hair and beard, his body terminating in a scaly tail, his breast covered with shells and seaweed. He was said to have been the builder and pilot of the Argo, and to have been changed into a god after the fight between the Argonauts and Tyrrhenians. He assisted the expedition in various ways (Athenaeus, *loc. cit.*; see also Ovid, *Metam.* xiii. 904). Glaucus was the subject of a satyric drama by Aeschylus. He was famous for his amours, especially those with Scylla and Circe.

See the exhaustive monograph by R. Gaedechens, *Glaukos der Meergott* (1860), and article by the same in Roscher's *Lexikon der Mythologie*; and for Glaucus and Scylla, E. Vinet in *Annali dell' Instituto di Correspondenza archeologica*, xv. (1843).

2. Glaucus, usually surnamed *Potnieus*, from Potniae near Thebes, son of Sisyphus by Merope and father of Bellerophon. According to the legend he was torn to pieces by his own mares (Virgil, *Georgics*, iii. 267; Hyginus, *Fab.* 250, 273). On the isthmus of Corinth, and also at Olympia and Nemea, he was worshipped as Taraxippus ("terrifier of horses"), his ghost being said to appear and frighten the horses at the games (Pausanias vi. 20). He is closely akin to Glaucus Pontius, the frantic horses of the one probably representing the stormy waves, the other the sea in its calmer mood. He also was the subject of a lost drama of Aeschylus.

3. Glaucus, the son of Minos and Pasiphaë. When a child, while playing at ball or pursuing a mouse, he fell into a jar of honey and was smothered. His father, after a vain search for him, consulted the oracle, and was referred to the person who should suggest the aptest comparison for one of the cows of Minos which had the power of assuming three different colours. Polyidus of Argos, who had likened it to a mulberry (or bramble), which changes from white to red and then to black, soon afterwards discovered the child; but on his confessing his inability to restore him to life, he was shut up in a vault with the corpse. Here he killed a serpent which was revived by a companion, which laid a certain herb upon it. With the same herb Polyidus brought the dead Glaucus back to life. According to others, he owed his recovery to Aesculapius. The story was the subject of plays by the three great Greek tragedians, and was often represented in mimic dances.

See Hyginus, *Fab.* 136; Apollodorus iii. 3. 10; C. Höck, *Kreta*, iii. 1829; C. Eckermann, *Melampus*, 1840.

4. Glaucus, son of Hippolochus, and grandson of Bellerophon, mythical progenitor of the kings of Ionia. He was a Lycian prince who, along with his cousin Sarpedon, assisted Priam in the Trojan War. When he found himself opposed to Diomedes, with whom he was connected by ties of hospitality, they ceased fighting and exchanged armour. Since the equipment of Glaucus was golden and that of Diomedes brazen, the expression "golden for brazen" (*Iliad*, vi. 236) came to be used proverbially for a bad exchange. Glaucus was afterwards slain by Ajax.

All the above are exhaustively treated by R. Gaedechens in Ersch and Gruber's *Allgemeine Encyclopädie*.

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GLAZING.—The business of the glazier may be confined to the mere fitting and setting of glass (*q.v.*), even the cutting up of the plates into squares being generally an independent art, requiring a degree of tact and judgment not necessarily possessed by the building artificer. The tools generally used by the glazier are the diamond for cutting, laths or straight edges, tee square, measuring rule, glazing knife, hacking knife and hammer, duster, sash tool, two-foot rule and a glazier's cradle for carrying the glass. Glaziers' materials are glass, putty, priming or paint, springs, wash-leather or india-rubber for door panels, size, black. The glass is supplied by the manufacturer and cut to the sizes required for the particular work to be executed. Putty is made of whiting and linseed oil, and is generally bought in iron kegs of ½ or 1 cwt.; the putty should always be kept covered over, and when found to be getting hard in the keg a little oil should be put on it to keep it moist. Priming is a thin coat of paint with a small amount of red lead in it. In the majority of cases after the sashes for the windows are fitted they are sent to the glazier's and primed and glazed, and then returned to the job and hung in their proper positions. When priming sashes it is important that the rebates be thoroughly primed, else the putty will not adhere. All wood that is to be painted requires before being primed to have the knots coated with knotting. When the priming is dry, the glass is cut and fixed into its place; each pane should fit easily with about $\frac{1}{16}$th in. play all round. The glazier runs the putty round the rebates with his hands, and then beds the glass in it, pushing it down tight, and then further secures it by knocking in small nails, called glaziers' sprigs, on the rebate side. He then trims up the edges of the protruding putty and bevels off the putty on the rebate or outside of the sash with a putty knife. The sash is then ready for painting. Large squares and plate glass are usually inserted when the sashes are hung to avoid risks of breakage. For inside work the panes of glass are generally secured with beads (not with putty), and in the best work these beads are fixed with brass screws and caps to allow of easy removal without breaking the beads and damaging the paint, &c. In the case of glass in door panels where there is much vibration and slamming, the glass is bedded in wash-leather or india-rubber and secured with beads as before mentioned.

The most common glass and that generally used is clear sheet in varying thicknesses, ranging in weight from 15 to 30 oz. per sq. ft. This can be had in several qualities of English or foreign manufacture. But there are many other varieties—obscured, fluted, enamelled, coloured and ornamental, rolled and rough plate, British polished plate, patent plate, fluted rolled, quarry rolled, chequered rough, and a variety of figured rolled, and stained glass, and crown-glass with bulls'-eyes in the centre.

Varieties of glass.

Lead light glazing is the glazing of frames with small squares of glass, which are held together by reticulations of lead; these are secured by means of copper wire to iron saddle bars, which are let into mortices in the wood frames or stone jambs. This is formed with strips of lead, soldered at the angles; the glass is placed between the strips and the lead flattened over the edges of glass to secure it. This is much used in public buildings and private residences. In Weldon's method the saddle bars are bedded in the centre of the strips of lead, thus strengthening the frame of lead strips and giving a better appearance.

Wired rolled plate or *wired cast plate*, usually ¼ in. thick, has wire netting embedded in it to prevent the glass from falling in the case of fire; its use is obligatory in London for all lantern and skylights, screens and doors on the staircases of public and warehouse buildings, in accordance with the London Building Act. It is also used for the decks of ships and for port and cabin lights, as it is much stronger than plain glass, and if fractured is held together by the wire.

Patent prismatic rolled glass, or "refrax" (fig. 1), consists of an effectual application of the well-known properties of the prism; it absorbs all the light that strikes the window opening, and diffuses it in the most efficient manner possible in the darkest portions of the apartment. It can be fixed in the ordinary way or placed over the existing glass.

Pavement lights (fig. 2) and stallboard lights are constructed with iron frames in small squares and glazed with thick prismatic glass, and are used to light basements. They are placed on the pavement and under shop fronts in the portion called the stallboard, and are also inserted in iron coal plates.

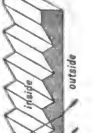

Fig. 1.—Prism Window Glass.

Great skill has of late years been displayed in the ornamentation of glass such as is seen in public saloons, restaurants, &c., as, for instance, in bevelling the edges, silvering, brilliant cutting, embossing, bending, cutting shelving to fancy shapes and polishing, and in glass ventilators.

There are several patent methods of roof glazing, such as are applied to railway stations, studios and printing and other factories requiring light. Some of the first patents of this kind were erected with wood glazing bars; these were unsightly, since they required to be of large sectional area when spanning a distance of 7 or 8 ft., and also required to be constantly painted. This was a source of trouble; the roof was constantly leaking and, moreover, it was not fire-resisting.

Roof glazing.

Subsequent patents one includes the use of steel T-bars, in which the glass is bedded and covered with a capping of copper or zinc secured with bolts and nuts. Another employs steel bars covered with lead; and this is a very good method, as the bars are of small section, require no painting, and are also fire-resisting. There is one reason for preferring wood to steel, namely, that wood does not expand and contract like steel does. After the sun has been on steel bars, especially those in long lengths, they tend to buckle and then when cold contract, thus getting out of shape; there is also the possibility that when expanding they may break the glass. This is more noticeable in the case of iron ventilating frames in this glazing, which after having weathered for a year or two will begin to get out of shape and so give trouble in opening and closing.

Care should be taken not to fit the glass in iron bars tightly, but

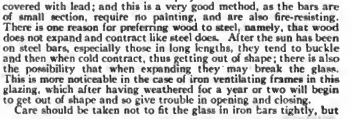

Fig. 2.—Section through Prism Pavement Light, the direction of light rays being indicated by arrows.

a good ⅛th in. play all round should be allowed. A few of the systems of patent roof glazing will be described in the following pages, together with illustrations.

The system of glazing known as the "British Challenge" (fig. 3), with steel bars encased with a sheeting of 4-lb lead, is very simple and durable, needs no painting, and can be fixed at as much as 8 ft. clear bearings, with the bars spaced 2 ft. apart. The ends of the bars rest on the wood or steel purlins or plates, and are either notched and screwed down, or simply fitted with a bracket which is screwed. The bar is of T section with condensation grooves, and the lead wings on top are turned down on to the glass after fitting. This lead-covered steel bar is a great improvement on the plain steel bar as it is entirely unaffected by smoke, acids or exhaust fumes from steam engines; this is important in the case of a railway station, where the fumes would otherwise eat the steel away and so weaken the bars that in time they would snap. Another somewhat similar system is known as "Mellowes' Eclipse Roof Glazing" (fig. 4). It consists of steel T-bars having lead wings on top to turn on to the glass in a similar manner to the last, the top wings being double and the underside of the bar having an additional wing to catch the condensation. The Heywood combination system (fig. 5) is composed of galvanized steel T-bars, sometimes encased in lead and sometimes partly encased. It has a capping and condensation gutters of lead,

Fig. 3.—"British Challenge" Glazing.

Fig. 4.—Mellowes' Glazing.

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and the glass is bedded on asbestos packing to get a better bearing edge, so as to be held more securely. Hope's glazing is very similar, but the bars are either T or cross according to the span. The "Perfection" glazing used by Messrs Helliwell & Co. (fig. 6) is composed of steel shaped T bars with copper capping, secured with bolts and nuts and having asbestos packing on top of the glass under the edges of the capping. Pennycook's glazing is composed of steel shaped T bars encased with lead and lead wings. Rendle's "Invincible" glazing (fig. 7) is composed of steel T bars with specially shaped copper water and condensation channels, all formed in the one piece and resting on top of the T steel; the glass rests on the zinc channel, and a copper capping is fixed over the edges of the glass and secured with bolts and nuts. Deard's glazing is very similar, and is composed of T steel encased with lead; it claims to save all drilling for fixing to iron roofs. There are also other systems composed of wood bars with condensation gutter and capping of copper secured with bolts and nuts, and asbestos packing with slight differences in some minor matters, but these systems are but little used.

FIG. 5.—Heywood's Glazing.

FIG. 6.—Helliwell's "Perfection" Glazing.

FIG. 7.—Rendle's "Invincible" Glazing.

Cloisonné glass is a patent ornamental glass formed by placing two pieces flat against each other enclosing a species of glass mosaic. Designs are worked and shaped in gilt wire and placed on one sheet of glass; the space between the wire is then filled in with coloured beads, and another sheet of glass is placed on top of it to keep them in position, and the edges of the glass are bound with linen, &c., to keep them firmly together.

Glass is now used for decorative purposes, such as wall tiling and ceilings; it is coloured and decorated in almost any shade and presents a very effective appearance. An invention has been patented for building houses entirely of glass; the walls are constructed of blocks or bricks of opaque glass, the several walls being varied in thickness according to the constructional requirements.

Use in building.

It is certainly true that daylight has much to do with the sanitary condition of all buildings, and this being so the proper distribution of daylight to a building is of the greatest possible importance, and must be effected by an ample provision of windows judiciously arranged. The heads of all windows should be kept as near the ceiling as possible, as well to obtain easy ventilation as to ensure good lighting. As far as is practicable a building should be planned so that each room receives the sun's rays for some part of the day. This is rarely an easy matter, especially in towns where the aspect of the building is out of the architect's hands. The best sites for light are found in streets running north and south and east and west, and lighting areas or courts in buildings should always if possible be arranged on these lines. The task of adequately lighting lofty city buildings has been greatly minimized by the introduction of many forms of reflecting and intensifying contrivances, which are used to deflect light into those apartments into which daylight does not directly penetrate, and which would otherwise require the use of artificial light to render them of any use; the most useful of these inventions are the various forms of prism glass already referred to and illustrated in this article.

See L. F. Day, *Stained and Painted Glass*; and W. Eckstein, *Interior Lighting*. (J. Bt.)

GLAZUNOV, ALEXANDER CONSTANTINOVICH (1865–), Russian musical composer, was born in St Petersburg on the 10th of August 1865, his father being a publisher and bookseller. He showed an early talent for music, and studied for a year or so with Rimsky-Korsakov. At the age of sixteen he composed a symphony (afterwards elaborated and published as *op.* 5), but his *opus* 1 was a quartet in D, followed by a pianoforte suite on *S-a-c-h-a*, the diminutive of his name Alexander. In 1884 he was taken up by Liszt, and soon became known as a composer. His first symphony was played that year at Weimar, and he appeared as a conductor at the Paris exhibition in 1889. In 1897 his fourth and fifth symphonies were performed in London under his own conducting. In 1900 he became professor at the St Petersburg conservatoire. His separate works, including orchestral symphonies, dance music and songs, make a long list. Glazunov is a leading representative of the modern Russian school, and a master of orchestration; his tendency as compared with contemporary Russian composers is towards classical form, and he was much influenced by Brahms, though in "programme music" he is represented by such works as his symphonic poems *The Forest*, *Stenka Razin*, *The Kremlin* and his suite *Aus dem Mittelalter*. His ballet music, as in *Raymonda*, achieved much popularity.

GLEBE (Lat. *glacba*, *gleba*, clod or lump of earth, hence soil, land), in ecclesiastical law the land devoted to the maintenance of the incumbent of a church. Burn (*Ecclesiastical Law*, *s.v.* "Glebe Lands") says: "Every church of common right is entitled to house and glebe, and the assigning of them at the first was of such absolute necessity that without them no church could be regularly consecrated. The house and glebe are both comprehended under the word *manse*, of which the rule of the canon law is, *sancitum est ut unicuique ecclesiae unus mansus integer absque ullo servitio tribuatur*." In the technical language of English law the fee-simple of the glebe is said to be in *abeyance*, that is, it exists "only in the remembrance, expectation and intendment of the law." But the freehold is in the parson, although at common law he could alienate the same only with proper consent,—that is, in his case, with the consent of the bishop. The disabling statutes of Elizabeth (Alienation by Bishops, 1559, and Dilapidations, &c., 1571) made void all alienations by ecclesiastical persons, except leases for three terms of twenty-one years or three lives. By an act of 1842 (5 & 6 Vict. c. 27, Ecclesiastical Leases) glebe land and buildings may be let on lease for farming purposes for fourteen years or on an improving lease for twenty years. But the parsonage house and ten acres of glebe situate most conveniently for occupation must not be leased. By the Ecclesiastical Leasing Acts of 1842 (5 & 6 Vict. c. 108) and 1858 glebe lands may be let on building leases for not more than ninety-nine years and on mining leases for not more than sixty years. The Tithe Act 1842, the Glebe Lands Act 1888 and various other acts make provision for the sale, purchase, exchange and gift of glebe lands. In Scots ecclesiastical law, the manse now signifies the minister's dwelling-house, the glebe being the land to which he is entitled in addition to his stipend. All parish ministers appear to be entitled to a glebe, except the ministers in royal burghs proper, who cannot claim a glebe unless there be a landowner's district annexed; and even in that case, when there are two ministers, it is only the first who has a claim.

See Phillimore, *Ecclesiastical Law* (2nd ed.); Cripps, *Law of Church and Clergy*; Leach, *Tithe Acts* (6th ed.); Dart, *Vendors and Purchasers* (7th ed.).

GLEE, a musical term for a part-song of a particular kind. The word, as well as the thing, is essentially confined to England. The technical meaning has been explained in different ways; but there is little doubt of its derivation through the ordinary sense of the word (*i.e.* merriment, entertainment) from the A.S. *gleov*, *gleo*, corresponding to Lat. *gaudium*, *delectamentum*, hence *ludus musicus*; on the other hand, a musical "glee" is by no means necessarily a merry composition. Gleeman (A.S. "gleoman") is translated simply as "musicus" or "cantor," to which the less distinguished titles of "mimus, jocista, scurra," are frequently added in old dictionaries. The accomplishments and social position of the gleeman seem to have been as varied as those of the Provençal "joglar." There are early examples of the word "glee" being used as synonymous with harmony or concerted music. The former explanation, for instance, is given in the *Promptorium parvulorum*, a work of the 15th century. Glee in its present meaning signifies, broadly speaking, a piece of concerted vocal music, generally unaccompanied, and for male voices, though exceptions are found to the last two restrictions. The number of voices ought not to be less than three. As regards musical form, the glee is little distinguished from the catch,—the two terms being often used indiscriminately for the

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same song; but there is a distinct difference between it and the madrigal—one of the earliest forms of concerted music known in England. While the madrigal does not show a distinction of contrasted movements, this feature is absolutely necessary in the glee. In the madrigal the movement of the voices is strictly contrapuntal, while the more modern form allows of freer treatment and more compact harmonies. Differences of tonality are fully explained by the development of the art, for while the madrigal reached its acme in Queen Elizabeth's time, the glee proper was little known before the Commonwealth; and its most famous representatives belong to the 18th century and the first quarter of the 19th. Among the numerous collections of the innumerable pieces of this kind, only one of the earliest and most famous may be mentioned, *Catch that Catch can, a Choice Collection of Catches, Rounds and Canons, for three and four voices*, published by John Hilton in 1652. The name "glee," however, appears for the first time in John Playford's *Musical Companion*, published twenty-one years afterwards, and reprinted again and again, with additions by later composers —Henry Purcell, William Croft and John Blow among the number. The originator of the glee in its modern form was Dr Arne, born in 1710. Among later English musicians famous for their glees, catches and part-songs, the following may be mentioned:—Attwood, Boyce, Bishop, Crotch, Callcott, Shield, Stevens, Horsley, Webb and Knyvett. The convivial character of the glee led, in the 18th century, to the formation of various societies, which offered prizes and medals for the best compositions of the kind and assembled for social and artistic purposes. The most famous amongst these—The Glee Club—was founded in 1787, and at first used to meet at the house of Mr Robert Smith, in St Paul's churchyard. This club was dissolved in 1857. A similar society—The Catch Club—was formed in 1761 and is still in existence.

GLEICHEN, two groups of castles in Germany, thus named from their resemblance to each other (Ger. *gleich* = like, or resembling). The first is a group of three, each situated on a hill in Thuringia between Gotha and Erfurt. One of these called Gleichen, the Wanderslebener Gleiche (1221 ft. above the sea), was besieged unsuccessfully by the emperor Henry IV. in 1088. It was the seat of a line of counts, one of whom, Ernest III., a crusader, is the subject of a romantic legend. Having been captured, he was released from his imprisonment by a Turkish woman, who returned with him to Germany and became his wife, a papal dispensation allowing him to live with two wives at the same time (see Reineck, *Die Sage von der Doppelehe eines Grafen von Gleichen*, 1891). After belonging to the elector of Mainz the castle became the property of Prussia in 1803. The second castle is called Mühlburg (1309 ft. above the sea). This existed as early as 704 and was besieged by Henry IV. in 1087. It came into the hands of Prussia in 1803. The third castle, Wachsenburg (1358 ft.), is still inhabited and contains a collection of weapons and pictures belonging to its owner, the duke of Saxe-Coburg-Gotha, whose family obtained possession of it in 1368. It was built about 935 (see Beyer, *Die drei Gleichen*, Erfurt, 1808). The other group consists of two castles, Neuen-Gleichen and Alten-Gleichen. Both are in ruins and crown two hills about 2 m. S.E. from Göttingen.

The name of Gleichen is taken by the family descended from Prince Victor of Hohenlohe-Langenburg through his marriage with Miss Laura Seymour, daughter of Admiral Sir George Francis Seymour, a branch of the Hohenlohe family having at one time owned part of the county of Gleichen.

GLEIG, GEORGE (1753–1840), Scottish divine, was born at Boghall, Kincardineshire, on the 12th of May 1753, the son of a farmer. At the age of thirteen he entered King's College, Aberdeen, where the first prize in mathematics and physical and moral sciences fell to him. In his twenty-first year he took orders in the Scottish Episcopal Church, and was ordained to the pastoral charge of a congregation at Pittenweem, Fife, whence he removed in 1790 to Stirling. He became a frequent contributor to the *Monthly Review*, the *Gentleman's Magazine*, the *Anti-Jacobin Review* and the *British Critic*. He also wrote several articles for the third edition of the *Encyclopaedia Britannica*, and on the death of the editor, Colin Macfarquhar, in 1793, was engaged to edit the remaining volumes. Among his principal contributions to this work were articles on "Instinct," "Theology" and "Metaphysics." The two supplementary volumes were mainly his own work. He was twice chosen bishop of Dunkeld, but the opposition of Bishop Skinner, afterwards primus, rendered the election on both occasions ineffectual. In 1808 he was consecrated assistant and successor to the bishop of Brechin, in 1810 was preferred to the sole charge, and in 1816 was elected primus of the Episcopal Church of Scotland, in which capacity he greatly aided in the introduction of many useful reforms, in fostering a more catholic and tolerant spirit, and in cementing a firm alliance with the sister church of England. He died at Stirling on the 9th of March 1840.

Besides various sermons, Gleig was the author of *Directions for the Study of Theology*, in a series of letters from a bishop to his son on his admission to holy orders (1827); an edition of *Stackhouse's History of the Bible* (1817); and a life of Robertson the historian, prefixed to an edition of his works. See *Life of Bishop Gleig*, by the Rev. W. Walker (1879). Letters to Henderson of Edinburgh and John Douglas, bishop of Salisbury, are in the British Museum.

His third and only surviving son, GEORGE ROBERT GLEIG (1796–1888), was educated at Glasgow University, whence he passed with a Snell exhibition to Balliol College, Oxford. He abandoned his scholastic studies to enter the army, and served with distinction in the Peninsular War (1813–14), and in the American War, in which he was thrice wounded. Resuming his work at Oxford, he proceeded B.A. in 1818, M.A. in 1821, and, having been ordained in 1820, held successively curacies at Westwell in Kent and Ash (to the latter the rectory of Ivy Church was added in 1822). He was subsequently appointed chaplain of Chelsea hospital (1824), chaplain-general of the forces (1844–1875) and inspector-general of military schools (1846–1857). From 1848 till his death on the 9th of July 1888 he was prebend of Willesden in St Paul's cathedral. During the last sixty years of his life he was a prolific, if not very scientific, writer; he wrote for *Blackwood's Magazine* and *Fraser's Magazine*, and produced a large number of historical works.

Among the latter were (besides histories of the campaigns in which he served), *Life of Sir Thomas Munro* (3 vols., 1830); *History of India* (4 vols., 1830–1835); *The Leipsic Campaign* and *Lives of Military Commanders* (1831); *Story of the Battle of Waterloo* (1847); *Sketch of the Military History of Great Britain* (1845); *Sale's Brigade in Afghanistan* (1847); biographies of Lord Clive (1848), the duke of Wellington (1862), and Warren Hastings (1848; the subject of Macaulay's essay, in which it is described as "three big bad volumes full of undigested correspondence and undiscerning panegyric").

GLEIM, JOHANN WILHELM LUDWIG (1719–1803), German poet, was born on the 2nd of April 1719 at Ermsleben, near Halberstadt. Having studied law at the university of Halle he became secretary to Prince William of Brandenburg-Schwedt at Berlin, where he made the acquaintance of Ewald von Kleist, whose devoted friend he became. When the prince fell at the battle of Prague, Gleim became secretary to Prince Leopold of Dessau; but he soon gave up his position, not being able to bear the roughness of the "Old Dessauer." After residing a few years in Berlin he was appointed, in 1747, secretary of the cathedral chapter at Halberstadt. "Father Gleim" was the title accorded to him throughout all literary Germany on account of his kind-hearted though inconsiderate and undiscriminating patronage alike of the poets and poetasters of the period. He wrote a large number of feeble imitations of Anacreon, Horace and the minnesingers, a dull didactic poem entitled *Halladat oder das rote Buch* (1774), and collections of fables and romances. Of higher merit are his *Preussische Kriegslieder von einem Grenadier* (1758). These, which were inspired by the campaigns of Frederick II., are often distinguished by genuine feeling and vigorous force of expression. They are also noteworthy as being the first of that long series of noble political songs in which later German literature is so rich. With this exception, Gleim's writings are for the most part tamely commonplace in thought and expression. He died at Halberstadt on the 18th of February 1803.

Gleim's *Sämtliche Werke* appeared in 7 vols. in the years 1811–1813; a reprint of the *Lieder eines Grenadiers* was published by

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A. Sauer in 1882. A good selection of Gleim's poetry will be found in F. Muncker, *Anakreontiker und preussisch-patriotische Lyriker* (1894). See W. Körte, *Gleims Leben aus seinen Briefen und Schriften* (1811). His correspondence with Heinse was published in 2 vols. (1894–1896), with Uz (1889), in both cases edited by C. Schüddekopf.

GLEIWITZ, a town of Germany, in the Prussian province of Silesia, on the Klodnitz, and the railway between Oppeln and Cracow, 40 m. S.E. of the former town. Pop. (1875) 14,156; (1905) 61,324. It possesses two Protestant and four Roman Catholic churches, a synagogue, a mining school, a convent, a hospital, two orphanages, and barracks. Gleiwitz is the centre of the mining industry of Upper Silesia. Besides the royal foundry, with which are connected machine manufactories and boiler-works, there are other foundries, meal mills and manufactories of wire, gas pipes, cement and paper.

See B. Nietsche, *Geschichte der Stadt Gleiwitz* (1886); and Seidel, *Die königliche Eisengiesserei zu Gleiwitz* (Berlin, 1896).

GLENALMOND, a glen of Perthshire, Scotland, situated to the S.E. of Loch Tay. It comprises the upper two-thirds of the course of the Almond, or a distance of 20 m. For the greater part it follows a direction east by south, but at Newton Bridge it inclines sharply to the south-east for 3 m., and narrows to such a degree that this portion is known as the Small (or Sma') Glen. At the end of this pass the glen expands and runs eastwards as far as the well-known public school of Trinity College, where it may be considered to terminate. The most interesting spot in the glen is that traditionally known as the grave of Ossian. The district east of Buchanty, near which are the remains of a Roman camp, is said to be the Drumtochty of Ian Maclaren's stories. The mountainous region at the head of the glen is dominated by Ben y Hone or Ben Chonzie (3048 ft. high).

GLENCAIRN, EARLS OF. The 1st earl of Glencairn in the Scottish peerage was ALEXANDER CUNNINGHAM (d. 1488), a son of Sir Robert Cunninghame of Kilmaurs in Ayrshire. Made a lord of the Scottish parliament as Lord Kilmaurs not later than 1469, Cunninghame was created earl of Glencairn in 1488; and a few weeks later he was killed at the battle of Sauchieburn whilst fighting for King James III. against his rebellious son, afterwards James IV. His son and successor, ROBERT (d. *c.* 1490), was deprived of his earldom by James IV., but before 1503 this had been revived in favour of Robert's son, CUTHBERT (d. *c.* 1540), who became 3rd earl of Glencairn, and whose son WILLIAM (*c.* 1490–1547) was the 4th earl. This noble, an early adherent of the Reformation, was during his public life frequently in the pay and service of England, although he fought on the Scottish side at the battle of Solway Moss (1542), where he was taken prisoner. Upon his release early in 1543 he promised to adhere to Henry VIII., who was anxious to bring Scotland under his rule, and in 1544 he entered into other engagements with Henry, undertaking *inter alia* to deliver Mary queen of Scots to the English king. However, he was defeated by James Hamilton, earl of Arran, and the project failed; Glencairn then deserted his fellow-conspirator, Matthew Stewart, earl of Lennox, and came to terms with the queen-mother, Mary of Guise, and her party.

William's son, ALEXANDER, the 5th earl (d. 1574), was a more pronounced reformer than his father, whose English sympathies he shared, and was among the intimate friends of John Knox. In March 1557 he signed the letter asking Knox to return to Scotland; in the following December he subscribed the first "band" of the Scottish reformers; and he anticipated Lord James Stewart, afterwards the regent Murray, in taking up arms against the regent, Mary of Guise, in 1558. Then, joined by Stewart and the lords of the congregation, he fought against the regent, and took part in the attendant negotiations with Elizabeth of England, whom he visited in London in December 1560. When in August 1561 Mary queen of Scots returned to Scotland, Glencairn was made a member of her council; he remained loyal to her after she had been deserted by Murray, but in a few weeks rejoined Murray and the other Protestant lords, returning to Mary's side in 1566. After the queen had married the earl of Bothwell she was again forsaken by Glencairn, who fought against her at Carberry Hill and at Langside. The earl, who was always to the fore in destroying churches, abheys and other "monuments of idolatry," died on the 23rd of November 1574. His short satirical poem against the Grey Friars is printed by Knox in his *History of the Reformation*.

JAMES, the 7th earl (d. *c.* 1622), took part in the seizure of James VI., called the raid of Ruthven in 1582. WILLIAM, the 9th earl (*c.* 1610–1664), a somewhat lukewarm Royalist during the Civil War, was a party to the "engagement" between the king and the Scots in 1647; for this proceeding the Scottish parliament deprived him of his office as lord justice-general, and nominally of his earldom. In March 1653 Charles II. commissioned the earl to command the Royalist forces in Scotland, pending the arrival of General John Middleton, and the insurrection of this year is generally known as Glencairn's rising. After its failure he was betrayed and imprisoned, but although excepted from pardon he was not executed; and when Charles II. was restored he became lord chancellor of Scotland. After a dispute with his former friend, James Sharp, archbishop of St Andrews, he died at Belton in Haddingtonshire on the 30th of May 1664. This earl's son JOHN (d. 1703), who followed his brother Alexander as 11th earl in 1670, was a supporter of the Revolution of 1688. His descendant, JAMES, the 14th earl (1749–1791), is known as the friend and patron of Robert Burns. He performed several useful services for the poet; and when he died on the 30th of January 1791 Burns wrote a *Lament* beginning, "The wind blew hollow frae the hills," and ending with the lines, "But I'll remember thee, Glencairn, and a' that thou hast done for me." The 14th earl was never married, and when his brother and successor, John, died childless in September 1796 the earldom became extinct, although it was claimed by Sir Adam Fergusson, Bart., a descendant of the 10th earl.

GLENCOE, a glen in Scotland, situated in the north of Argyllshire. Beginning at the north-eastern base of Buchaille Etive, it takes a gentle north-westerly trend for 10 m. to its mouth on Loch Leven, a salt-water arm of Loch Linnhe. On both sides it is shut in by wild and precipitous mountains and its bed is swept by the Coe—Ossian's "dark Cona,"—which rises in the hills at its eastern end. About half-way down the glen the stream forms the tiny Loch Triochatan. Towards the gorge the landscape acquires a softer beauty. Here Lord Strathcona, who, in 1804, purchased the heritage of the Macdonalds of Glencoe, built his stately mansion of Mount Royal. The principal mountains on the south side are the various peaks of Buachaille Etive, Stob Dearg (3345 ft.), Bidean nam Bian (3756 ft.) and Meall Mor (2215 ft.), and on the northern side the Pap of Glencoe (2430 ft.), Sgor nam Fiannaidh (3168 ft.) and Meall Dearg (3118 ft.). Points of interest are the Devil's Staircase, a steep, boulder-strewn "cut" (1754 ft. high) across the hills to Fort William; the Study; the cave of Ossian, where tradition says that he was born, and the Iona cross erected in 1883 by a Macdonald in memory of his clansmen who perished in the massacre of 1692. About 1 m. beyond the head of the glen is Kingshouse, a relic of the old coaching days, when it was customary for tourists to drive from Ballachulish via Tyndrum to Loch Lomond. Now the Glencoe excursion is usually made from Oban—by rail to Achnacloich, steamer up Loch Etive, coach up Glen Etive and down Glencoe and steamer at Ballachulish to Ohan. One mile to the west of the Glen lies the village of BALLACHULISH (pop. 1143). It is celebrated for its slate quarries, which have been worked since 1760. The industry provides employment for 600 men and the annual output averages 30,000 tons. The slate is of excellent quality and is used throughout the United Kingdom. Ballachulish is a station on the Callander and Oban extension line to Fort William (Caledonian railway). The pier and ferry are some 2 m. W. of the village.

GLENCORSE, JOHN INGLIS, LORD (1810–1891), Scottish judge, son of a minister, was born at Edinburgh on the 21st of August 1810. From Glasgow University he went to Balliol College, Oxford. He was admitted a member of the Faculty of Advocates, and soon became known as an eloquent and successful pleader. In 1852 he was made solicitor-general for

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Scotland in Lord Derby's first ministry, three months later becoming Lord Advocate. In 1858 he resumed this office in Lord Derby's second administration, being returned to the House of Commons as member for Stamford. He was responsible for the Universities of Scotland Act of 1858, and in the same year he was elevated to the bench as lord justice clerk. In 1867 he was made lord justice general of Scotland and lord president of the court of session, taking the title of Lord Glencorse. Outside his judicial duties he was responsible for much useful public work, particularly in the department of higher education. In 1869 he was elected chancellor of Edinburgh University, having already been rector of the university of Glasgow. He died on the 20th August 1891.

GLENDALOUGH, VALE OF, a mountain glen of Co. Wicklow, Ireland, celebrated and frequently visited both on account of its scenic beauty and, more especially, because of the collection of ecclesiastical remains situated in it. Fortunately for its appearance, it is not approached by any railway, but services of cars are maintained to several points, of which Rathdrum, 8½ m. S.E., is the nearest railway station, on the Dublin & South-Eastern. The glen is traversed by the stream of Glenealo, a tributary of the Avonmore, expanding into small loughs, the Upper and the Lower. The former of these is walled by the abrupt heights of Camaderry (2296 ft.) and Lugduff (2176 ft.), and here the extreme narrowness of the valley adds to its grandeur; while the lower town, where it widens, the romantic character of the scenery is enhanced by the scattered ruins of the former monastic settlement. These ruins have the collective name of the "Seven Churches." The settlement owed its foundation to the hermit St Kevin, who is reputed to have died on the 3rd of June 618; and it rapidly became a seat of learning of wide fame, but suffered much at the hands of the Danes and the Anglo-Normans. In close proximity to an hotel, and to one another, in an enclosure, are a round tower, one of the finest in Ireland, 110 ft. high and 52 in circumference; St Kevin's kitchen or church (closely resembling the house of St Columba at Kells), which measures 25 ft. by 15, with a high-pitched roof and round belfry—supposed to be the earliest example of its type; and the cathedral, 64 by 73 ft., the total length by 51 in width. This possesses a good square-headed doorway, and an east window of ornate character (the chancel being of later date than the nave), and there are also some early tombs, but the whole is in a decayed condition. In the enclosure are also a Lady chapel, chiefly remarkable for its doorway of wrought granite, in a style of architecture resembling Greek; a priest's house (restored), and slight remains of St Chiaran's church. Here is also St Kevin's cross, a granite monolith never completed; and the enclosure is entered by a fine though dilapidated gateway. Other neighbouring remains are Trinity or the Ivy Church, towards Laragh, with beautiful detailed work; St Saviour's monastery, carefully restored under the direction of the Board of Works, with a chancel arch of three orders (re-erected); while on the shores of the upper lough are Reefert Church, the burial-place of the O'Toole family, and Teampull-na-skellig, the church of the rock. St Kevin's bed is a cave approachable with difficulty, above the lough, probably a natural cavity artificially enlarged, to which attaches the legend of St Kevin's hermitage. Along the valley there are a number of monuments and stone crosses of various sizes and styles. The whole collection forms, with the possible exception of Clonmacnoise in King's county, the most striking monument of monasticism in Ireland.

GLENDOWER, OWEN (*c.* 1350–1415), the last to claim the title of an independent prince of Wales, more correctly described as Owain ab Gruffydd, lord of Glyndyvrdwy in Merioneth, was a man of good family, with two great houses, Sycharth and Glyndyvrdwy in the north, besides smaller estates in south Wales. His father was called Gruffydd Vychan, and his mother Helen; on both sides he had pretensions to be descended from the old Welsh princes. Owen was probably born about 1359, studied law at Westminster, was squire to the earl of Arundel, and a witness for Grosvenor in the famous Scrope and Grosvenor lawsuit in 1386. Afterwards he was in the service of Henry of Bolingbroke, the future king, though by an error it has been commonly stated that he was squire to Richard II. Welsh sympathies were, however, on Richard's side, and combined with a personal quarrel to make Owen the leader of a national revolt.

The lords of Glyndyvrdwy had an ancient feud with their English neighbours, the Greys of Ruthin. Reginald Grey neglected to summon Owen, as was his duty, for the Scottish expedition of 1400, and then charged him with treason for failing to appear. Owen thereupon took up arms, and when Henry IV. returned from Scotland in September he found north Wales ablaze. A hurried campaign under the king's personal command was ineffectual. Owen's estates were declared forfeit and vigorous measures threatened by the English government. Still the revolt gathered strength. In the spring of 1401 Owen was raiding in south Wales, and credited with the intention of invading England. A second campaign by the king in the autumn was defeated, like that of the previous year, through bad weather and the Fabian tactics of the Welsh. Owen had already been intriguing with Henry Percy (Hotspur), who during 1401 held command in north Wales, and with Percy's brother-in-law, Sir Edmund Mortimer. During the winter of 1401–1402 his plans were further extended to negotiations with the rebel Irish, the Scots and the French. In the spring he had grown so strong that he attacked Ruthin, and took Grey prisoner. In the summer he defeated the men of Hereford under Edmund Mortimer at Pilleth, near Bryngias, in Radnorshire. Mortimer was taken prisoner and treated with such friendliness as to make the English doubt his loyalty; within a few months he married Owen's daughter. In the autumn the English king was for the third time driven "bootless home and weather-beaten back." The few English strongholds left in Wales were now hard pressed, and Owen boasted that he would meet his enemy in the field. Nevertheless, in May 1403 Henry of Monmouth was allowed to sack Sycharth and Glyndyvrdwy unopposed. Owen had a greater plot in hand. The Percies were to rise in arms, and meeting Owen at Shrewsbury, overwhelm the prince before help could arrive. But Owen's share in the undertaking miscarried through his own defeat near Carmarthen on the 12th of July, and Percy was crushed at Shrewsbury ten days later. Still the Welsh revolt was never so formidable. Owen styled himself openly prince of Wales, established a regular government, and called a parliament at Machynlleth. As a result of a formal alliance the French sent troops to his aid, and in the course of 1404 the great castles of Harlech and Aberystwith fell into his hands.

In the spring of 1405 Owen was at the height of his power; but the tide turned suddenly. Prince Henry defeated the Welsh at Grosmont in March, and twice again in May, when Owen's son Griffith and his chancellor were made prisoners. Scrope's rebellion in the North prevented the English from following up their success. The earl of Northumberland took refuge in Wales, and the tripartite alliance of Owen with Percy and Mortimer (transferred by Shakespeare to an earlier occasion) threatened a renewal of danger. But Northumberland's plots and the active help of the French proved ineffective. The English under Prince Henry gained ground steadily, and the recovery of Aberystwith, after a long siege, in the autumn of 1408 marked the end of serious warfare. In February 1409 Harlech was also recaptured, and Owen's wife, daughter and grandchildren were taken prisoners. Owen himself still held out and even continued to intrigue with the French. In July 1415 Gilbert Talbot had power to treat with Owen and his supporters and admit them to pardon. Owen's name does not occur in the document renewing Talbot's powers in February 1416; according to Adam of Usk he died in 1415. Later English writers allege that he died of starvation in the mountains; but Welsh legend represents him as spending a peaceful old age with his sons-in-law at Ewyas and Monington in Herefordshire, till his death and burial at the latter place. The dream of an independent and united Wales was never nearer realization than under Owen's leadership. The disturbed state of England

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helped him, but he was indeed a remarkable personality, and has not undeservedly become a national hero. Sentiment and tradition have magnified his achievements, and confused his career with tales of portents and magical powers. Owen left many bastard children; his legitimate representative in 1433 was his daughter Alice, wife of Sir John Scudamore of Ewyas.

The facts of Owen's life must be pieced together from scattered references in contemporary chronicles and documents; perhaps the most important are Adam of Usk's *Chronicle* and Ellis's *Original Letters*. On the Welsh side something is given by the bards Iolo Goch and Lewis Glyn Cothi. For modern accounts consult J. H. Wylie's *History of England under Henry IV.* (4 vols., 1884–1898); A. C. Bradley's popular biography; and Professor Tout's article in the *Dictionary of National Biography*. (C. L. K.)

GLENELG, CHARLES GRANT, BARON (1778–1866), eldest son of Charles Grant (*q.v.*), chairman of the directors of the East India Company, was born in India on the 26th of October 1778, and was educated at Magdalene College, Cambridge, of which he became a fellow in 1802. Called to the bar in 1807, he was elected member of parliament for the Inverness burghs in 1807, and having gained some reputation as a speaker in the House of Commons, he was made a lord of the treasury in December 1813, an office which he held until August 1819, when he became secretary to the lord-lieutenant of Ireland and a privy councillor. In 1823 he was appointed vice-president of the board of trade; from September 1827 to June 1828 he was president of the board and treasurer of the navy; then joining the Whigs, he was president of the board of control under Earl Grey and Lord Melbourne from November 1830 to November 1834. At the board of control Grant was primarily responsible for the act of 1833, which altered the constitution of the government of India. In April 1835 he became secretary for war and the colonies, and was created Baron Glenelg. His term of office was a stormy one. His differences with Sir Benjamin d'Urban (*q.v.*), governor of Cape Colony, were serious; but more so were those with King William IV. and others over the administration of Canada. He was still secretary when the Canadian rebellion broke out in 1837; his wavering and feeble policy was fiercely attacked in parliament; he became involved in disputes with the earl of Durham, and the movement for his supercession found supporters even among his colleagues in the cabinet. In February 1839 he resigned, receiving consolation in the shape of a pension of £2000 a year. From 1818 until he was made a peer Grant represented the county of Inverness in parliament, and he has been called "the last of the Canningites." Living mainly abroad during the concluding years of his life, he died unmarried at Cannes on the 23rd of April 1866 when his title became extinct.

Glenelg's brother, SIR ROBERT GRANT (1779–1838), who was third wrangler in 1801, was, like his brother, a fellow of Magdalene College, Cambridge, and a barrister. From 1818 to 1834 he represented various constituencies in parliament, where he was chiefly prominent for his persistent efforts to relieve the disabilities of the Jews.[1] In June 1834 he was appointed governor of Bombay, and he died in India on the 9th of July 1838. Grant wrote a *Sketch of the History of the East India Co.* (1813), and is also known as a writer of hymns.

GLENELG, a municipal town and watering place of Adelaide county, South Australia, on Holdfast Bay, 6½ m. by rail S.S.W. of the city of Adelaide. Pop. (1901) 3940. It is a popular summer resort, connected with Adelaide by two lines of railway. In the vicinity is the "Old Gum Tree" under which South Australia was proclaimed British territory by Governor Hindmarsh in 1836.

GLENGARRIFF, or GLENGARIFF ("Rough Glen"), a celebrated resort of tourists in summer and invalids in winter, in the west riding of county Cork, Ireland, on Glengarriff Harbour, an inlet on the northern side of Bantry Bay, 11 m. by coach road from Bantry on the Cork, Bandon & South Coast railway. Beyond its hotels, Glengarriff is only a small village, but the island-studded harbour, the narrow glen at its head and the surrounding of mountains, afford most attractive views, and its situation on the "Prince of Wales'" route travelled by King Edward VII. in 1848, and on a fine mountain coach road from Macroom, brings it into the knowledge of many travellers to Killarney. Thackeray wrote enthusiastically of the harbour. The glaciated rocks of the glen are clothed with vegetation of peculiar luxuriance, flourishing in the mild climate which has given Glengarriff its high reputation as a health resort for those suffering from pulmonary complaints.

GLEN GREY, a division of the Cape province south of the Stormberg, adjoining on the east the Transkeian Territories. Pop. (1904) 55,107. Chief town Lady Frere, 32 m. N.E. of Queenstown. The district is well watered and fertile, and large quantities of cereals are grown. Over 96% of the inhabitants are of the Zulu-Xosa (Kaffir) race, and a considerable part of the district was settled during the Kaffir wars of Cape Colony by Tembu (Tambookies) who were granted a location by the colonial government in recognition of their loyalty to the British. Act No. 25 of 1894 of the Cape parliament, passed at the instance of Cecil Rhodes, which laid down the basis upon which is effected the change of land tenure by natives from communal to individual holdings, and also dealt with native local self-government and the labour question, applied in the first instance to this division, and is known as the Glen Grey Act (see CAPE COLONY: *History*). The provisions of the act respecting individual land tenure and local self-government were in 1898 applied, with certain modifications, to the Transkeian Territories. The division is named after Sir George Grey, governor of Cape Colony 1854–1860.

GLENS FALLS, a village of Warren county, New York, U.S.A., 55 m. N. of Troy, on the Hudson river. Pop. (1890) 9509; (1900) 12,613, of whom 1762 were foreign-born; (1910 census) 15,243. Glens Falls is served by the Delaware & Hudson and the Hudson Valley (electric) railways. The village contains a state armoury, the Crandall free public library, a Y.M.C.A. building, the Park hospital, an old ladies' home, and St Mary's (Roman Catholic) and Glens Falls (non-sectarian) academies. There are two private parks, open to the public, and a waterworks system is maintained by the village. An iron bridge crosses the river just below the falls, connecting Glens Falls and South Glens Falls (pop. in 1910, 2247). The falls of the Hudson here furnish a fine water-power, which is utilized, in connexion with steam and electricity, in the manufacture of lumber, paper and wood pulp, women's clothing, shirts, collars and cuffs, &c. In 1905 the village's factory products were valued at $4,780,331. About 12 m. above Glens Falls, on the Hudson, a massive stone dam has been erected; here electric power, distributed to a large area, is generated. In the neighbourhood of Glens Falls are valuable quarries of black marble and limestone, and lime, plaster and Portland cement works. Glens Falls was settled about the close of the French and Indian War (1763), and was incorporated as a village in 1839.

GLENTILT, a glen in the extreme north of Perthshire, Scotland. Beginning at the confines of Aberdeenshire, it follows a north-westerly direction excepting for the last 4 m., when it runs due S. to Blair Atholl. It is watered throughout by the Tilt, which enters the Garry after a course of 14 m., and receives on its right the Tarff, which forms some beautiful falls just above the confluence, and on the left the Fender, which has some fine falls also. The attempt of the 6th duke of Atholl (1814–1864) to close the glen to the public was successfully contested by the Scottish Rights of Way Society. The group of mountains—Carn nan Gabhar (3505 ft.), Ben y Gloe (3671) and Carn Liath (3103)—on its left side dominate the lower half of the glen. Marble of good quality is occasionally quarried in the glen, and the rock formation has attracted the attention of geologists from the time of James Hutton.

GLEYRE, MARC CHARLES GABRIEL (1806–1874), French painter, of Swiss origin, was born at Chevilly in the canton of Vaud on the 2nd of May 1806. His father and mother died while he was yet a boy of some eight or nine years of age; and he was brought up by an uncle at Lyons, who sent him to the industrial school of that city. Going up to Paris a lad of

[1] Sir S. Walpole (*History of England*, vol. v.) is wrong in stating that Charles Grant introduced bills to remove Jewish disabilities in 1833 and 1834. They were introduced by his brother Robert.

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seventeen or nineteen, he spent four years in close artistic study—in Hersent's studio, in Suisse's academy, in the galleries of the Louvre. To this period of laborious application succeeded four years of meditative inactivity in Italy, where he became acquainted with Horace Vernet and Léopold Robert; and six years more were consumed in adventurous wanderings in Greece, Egypt, Nubia and Syria. At Cairo he was attacked with ophthalmia, and in the Lebanon he was struck down by fever, and he returned to Lyons in shattered health. On his recovery he proceeded to Paris, and, fixing his modest studio in the rue de Université, began carefully to work out the conceptions which had been slowly shaping themselves in his mind. Mention is made of two decorative panels—" Diana leaving the Bath," and a " Young Nubian"—as almost the first fruits of his genius; but these did not attract public attention till long after, and the painting by which he practically opened his artistic career was the " Apocalyptic Vision of St John," sent to the Salon of 1840. This was followed in 1843 by " Evening," which at the time received a medal of the second class, and afterwards became widely popular under the title of the Lost Illusions. It represents a poet seated on the bank of a river, with drooping head and wearied frame, letting his lyre slip from a careless hand, and gazing sadly at a bright company of maidens whose song is slowly dying from his ear as their boat is borne slowly from his sight.

In spite of the success which attended these first ventures, Gleyre retired from public competition, and spent the rest of his life in quiet devotion to his own artistic ideals, neither seeking the easy applause of the crowd, nor turning his art into a means of aggrandizement and wealth. After 1845, when he exhibited the " Separation of the Apostles," he contributed nothing to the Salon except the " Dance of the Bacchantes " in 1849. Yet he laboured steadily and was abundantly productive. He had an " infinite capacity of taking pains," and when asked by what method he attained to such marvellous perfection of workmanship, he would reply, " En y pensant toujours." A long series of years often intervened between the first conception of a piece and its embodiment, and years not unfrequently between the first and the final stage of the embodiment itself. A landscape was apparently finished; even his fellow artists would consider it done; Gleyre alone was conscious that he had not " found his sky." Happily for French art this high-toned laboriousness became influential on a large number of Gleyre's younger contemporaries; for when Delaroche gave up his studio of instruction he recommended his pupils to apply to Gleyre, who at once agreed to give them lessons twice a week, and characteristically refused to take any fee or reward. By instinct and principle he was a confirmed celibate: " Fortune, talent, health, —he had everything; but he was married," was his lamentation over a friend. Though he lived in almost complete retirement from public life, he took a keen interest in politics, and was a voracious reader of political journals. For a time, indeed, under Louis Philippe, his studio had been the rendezvous of a sort of liberal club. To the last—amid all the disasters that befell his country—he was hopeful of the future, " la raison finira bien par avoir raison." It was while on a visit to the Retrospective Exhibition, opened on behalf of the exiles from Alsace and Lorraine, that he died suddenly on the 5th of May 1874. He left unfinished the " Earthly Paradise," a noble picture, which Taine has described as " a dream of innocence, of happiness and of beauty—Adam and Eve standing in the sublime and joyous landscape of a paradise enclosed in mountains,"—a worthy counterpart to the " Evening." Among the other productions of his genius are the " Deluge," which represents two angels speeding above the desolate earth, from which the destroying waters have just begun to retire, leaving visible behind them the ruin they have wrought; the " Battle of the Lemanus," a piece of elaborate design, crowded but not cumbered with figures, and giving fine expression to the movements of the various bands of combatants and fugitives; the " Prodigal Son," in which the artist has ventured to add to the parable the new element of mother's love, greeting the repentant youth with a welcome that shows that the mother's heart thinks less of the repentance than of the return; " Ruth and Boaz"; " Ulysses and Nausicaa "; " Hercules at the feet of Omphale "; the " Young Athenian," or, as it is popularly called, " Sappho "; " Minerva and the Nymphs "; " Venus πάνδημος "; " Daphnis and Chloë "; and " Love and the Parcae." Nor must it be omitted that he left a considerable number of drawings and water-colours, and that we are indebted to him for a number of portraits, among which is the sad face of Heine, engraved in the *Revue des deux mondes* for April 1852. In Clément's catalogue of his works there are 683 entries, including sketches and studies.

See Fritz Berthoud in *Bibliothèque universelle de Genève* (1874); Albert de Montet, *Dict. biographique des Genevois et des Vaudois* (1877); and *Vie de Charles Gleyre* (1877), written by his friend, Charles Clément, and illustrated by 30 plates from his works.

GLIDDON, GEORGE ROBINS (1809–1857), British Egyptologist, was born in Devonshire in 1809. His father, a merchant, was United States consul at Alexandria, and there Gliddon was taken at an early age. He became United States vice-consul, and took a great interest in Egyptian antiquities. Subsequently he lectured in the United States and succeeded in rousing considerable attention to the subject of Egyptology generally. He died at Panama in 1857. His chief work was *Ancient Egypt* (1850, ed. 1853). He wrote also *Memoir on the Cotton of Egypt* (1841); *Appeal to the Antiquaries of Europe on the Destruction of the Monuments of Egypt* (1841); *Discourses on Egyptian Archaeology* (1841); *Types of Mankind* (1854), in conjunction with J. C. Nott and others; *Indigenous Races of the Earth* (1857), also in conjunction with Nott and others.

GLINKA, FEDOR NIKOLAEVICH (1788–1849), Russian poet and author, was born at Smolensk in 1788, and was specially educated for the army. In 1803 he obtained a commission as an officer, and two years later took part in the Austrian campaign. His tastes for literary pursuits, however, soon induced him to leave the service, whereupon he withdrew to his estates in the government of Smolensk, and subsequently devoted most of his time to study or travelling about Russia. Upon the invasion of the French in 1812, he re-entered the Russian army, and remained in active service until the end of the campaign in 1814. Upon the elevation of Count Milarodovich to the military governorship of St Petersburg, Glinka was appointed colonel under his command. On account of his suspected revolutionary tendencies he was, in 1826, banished to Petrozavodsk, but he nevertheless retained his honorary post of president of the Society of the Friends of Russian literature, and was after a time allowed to return to St Petersburg. Soon afterwards he retired completely from public life, and died on his estates in 1849.

Glinka's martial songs have special reference to the Russian military campaigns of his time. He is known also as the author of the descriptive poem *Kareliya*, &c. (*Carelia, or the Captivity of Marfka Ioannovna*) (1830), and of a metrical paraphrase of the book of Job. His fame as a military author is chiefly due to his *Pisma Russkago Ofitsera* (*Letters of a Russian Officer*) (8 vols., 1815–1816).

GLINKA, MICHAEL IVANOVICH (1803–1857), Russian musical composer, was born at Novospassky, a village in the Smolensk government, on the 2nd of June 1803. His early life he spent at home, but at the age of thirteen we find him at the Blagorodrey Pension, St Petersburg, where he studied music under Carl Maier and John Field, the Irish composer and pianist, who had settled in Russia. We are told that in his seventeenth year he had already begun to compose romances and other minor vocal pieces; but of these nothing now is known. His thorough musical training did not begin till the year 1830, when he went abroad and stayed for three years in Italy, to study the works of old and modern Italian masters. His thorough knowledge of the requirements of the voice may be connected with this course of study. His training as a composer was finished under the contrapuntist Dehn, with whom Glinka stayed for several months at Berlin. In 1833 he returned to Russia, and devoted himself to operatic composition. On the 27th of September (9th of October) 1836, took place the first representation of his opera *Life for the Tsar* (the libretto by Baron

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de Rosen). This was the turning-point in Glinka's life,—for the work was not only a great success, but in a manner became the origin and basis of a Russian school of national music. The story is taken from the invasion of Russia by the Poles early in the 17th century, and the hero is a peasant who sacrifices his life for the tsar. Glinka has wedded this patriotic theme to inspiring music. His melodies, moreover, show distinct affinity to the popular songs of the Russians, so that the term "national" may justly be applied to them. His appointment as imperial chapelmaster and conductor of the opera of St Petersburg was the reward of his dramatic successes. His second opera *Russlan and Lyudmila*, founded on Pushkin's poem, did not appear till 1842; it was an advance upon *Life for the Tsar* in its musical aspect, but made no impression upon the public. In the meantime Glinka wrote an overture and four entr-actes to Kukolnik's drama *Prince Kholmsky*. In 1844 he went to Paris, and his *Jota Arragonesa* (1847), and the symphonic work on Spanish themes, *Une Nuit à Madrid*, reflect the musical results of two years' sojourn in Spain. On his return to St Petersburg he wrote and arranged several pieces for the orchestra, amongst which the so-called *Kamarinskaya* achieved popularity beyond the limits of Russia. He also composed numerous songs and romances. In 1857 he went abroad for the third time; he now wrote his autobiography, orchestrated Weber's *Invitation à la valse*, and began to consider a plan for a musical version of Gogol's *Tarass-Boulba*. Abandoning the idea and becoming absorbed in a passion for ecclesiastical music he went to Berlin to study the ancient church modes. Here he died suddenly on the 3rd of February 1857.

GLINKA, SERGY NIKOLAEVICH (1774–1847), Russian author, the elder brother of Fedor N. Glinka, was born at Smolensk in 1774. In 1796 he entered the Russian army, but after three years' service retired with the rank of major. He afterwards employed himself in the education of youth and in literary pursuits, first in the Ukraine, and subsequently at Moscow, where he died in 1847. His poems are spirited and patriotic; he wrote also several dramatic pieces, and translated Young's *Night Thoughts*.

Among his numerous prose works the most important from an historical point of view are: *Russkoe Chtenie (Russian Reading: Historical Memorials of Russia in the 18th and 19th Centuries)* (2 vols., 1845); *Istoriya Rossii*, &c. (*History of Russia for the use of Youth*) (10 vols., 1817–1819, 2nd ed. 1822, 3rd ed. 1824); *Istoriya Armyan*, &c. (*History of the Migration of the Armenians of Azerbijan from Turkey to Russia*) (1831); and his contributions to the *Russky Vyestnik (Russian Messenger)*, a monthly periodical, edited by him from 1808 to 1820.

GLOBE-FISH, or **SEA-HEDGEHOG**, the names by which some sea-fishes are known, which have the remarkable faculty of inflating their stomachs with air. They belong to the families Diodontidae and Tetrodontidae. Their jaws resemble the sharp beak of a parrot, the bones and teeth being coalesced into one mass with a sharp edge. In the Diodonts there is no mesial division of the jaws, whilst in the Tetrodonts such a division exists, so that they appear to have two teeth above and two

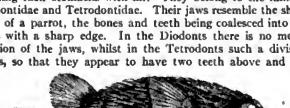

FIG. 1.—*Diodon maculatus.*

below. By means of these jaws they are able to break off branches of corals, and to masticate other hard substances on which they feed. Usually they are of a short, thick, cylindrical shape, with powerful fins (fig. 1). Their body is covered with thick skin, without scales, but provided with variously formed spines, the size and extent of which vary in the different species. When they inflate their capacious stomachs with air, they assume a globular form, and the spines protrude, forming a more or less formidable defensive armour (fig. 2). A fish thus blown out turns over and floats belly upwards, driving before the wind and waves. Many of these fishes are highly poisonous when eaten, and fatal accidents have occurred from this cause. It appears that they acquire poisonous qualities from their food, which frequently consists of decomposing or poisonous animal matter, such as would impart, and often does impart, similar

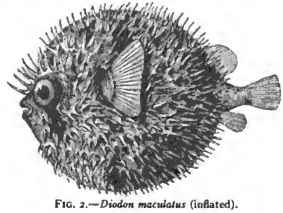

FIG. 2.—*Diodon maculatus* (inflated).

deleterious qualities to other fish. They are most numerous between the tropics and in the seas contiguous to them, but a few species live in large rivers, as, for instance, the *Tetrodon fahaka*, a fish well known to all travellers on the Nile. Nearly 100 different species are known.

GLOBIGERINA, A. d'Orbigny, a genus of Perforate Foraminifera (*q.v.*) of pelagic habit, and formed of a conical spiral aggregate of spheroidal chambers with a crescentic mouth. The shells accumulate at the bottom of moderately deep seas to form "Globigerina ooze" and are preserved thus in the chalk. *Hastigerina* only differs in the "flat" or nautiloid spiral.

GLOCKENSPIEL, or ORCHESTRAL BELLS (Fr. *carillon*; Ger. *Glockenspiel*, *Stahlharmonika*; Ital. *campanelli*; Med. Lat. *tintinnabulum*, *cymbalum*, *bombulum*), an instrument of percussion of definite musical pitch, used in the orchestra, and made in two or three different styles. The oldest form of glockenspiel, seen in illuminated MSS. of the middle ages, consists of a set of bells mounted on a frame and played by one performer by means of steel hammers. The name "bell" is now generally a misnomer, other forms of metal or wood having been found more convenient. The pyramid-shaped glockenspiel, formerly used in the orchestra for simple rhythmical effects, consists of an octave of semitone, hemispherical bells, placed one above the other and fastened to an iron rod which passes through the centre of each, the bells being of graduated sizes and diminishing in diameter as the pitch rises. The lyre-shaped glockenspiel, or steel harmonica (*Stahlharmonika*), is a newer model, which has instead of bells twelve or more bars of steel, graduating in size according to their pitch. These bars are fastened horizontally across two bars of steel set perpendicularly in a steel frame in the shape of a lyre. The bars are struck by little steel hammers attached to whalebone sticks.

Wagner has used the glockenspiel with exquisite judgment in the fire scene of the last act of *Die Walküre* and in the peasants' waltz in the last scene of *Die Meistersinger*. When chords are written for the glockenspiel, as in Mozart's *Magic Flute*, the keyed harmonica[1] is used. It consists of a keyboard having a little hammer attached to each key, which strikes a bar of glass or steel when the key is depressed. The performer, being able to use both hands, can play chords with full harmonies, scale and arpeggio passages in single and double notes. A peal of hemispherical bells was specially constructed for Sir Arthur Sullivan's *Golden Legend*. It consists of four bells constructed of bell-metal about 1 in. thick, the largest measuring 27 in. in diameter, the smallest 23. They are fixed on a stand one above the other, with a clearance of about ⅔ in. between them; the rim of the lowest and largest bell is 15 in. from the foot of the stand. The bells are struck by mallets, which are of two kinds—a pair of hard wood for forte passages, and a pair covered

[1] See "The Keyed Harmonica improved by H. Klein of Pressburg," article in the *Allg. musik. Ztg.*, Bd. i. pp. 675-699 (Leipzig, 1798); also Becker, p. 254, *Bartel*.

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with wash-leather for piano effects. The peal was unique at the time it was made for the *Golden Legend*, but a smaller bell of the same shape, ½ in. thick, with a diameter measuring about 16 in., specially made for the performance of Liszt's *St Elizabeth*, when conducted by the composer in London, evidently suggested the idea for the peal. (K. S.)

GLOGAU, a fortified town of Germany, in the Prussian province of Silesia, 59 m. N.W. from Breslau, on the railway to Frankfort-on-Oder. Pop. (1905) 23,461. It is built partly on an island and partly on the left bank of the Oder; and owing to the fortified enceinte having been pushed farther afield, new quarters have been opened up. Among its most important buildings are the cathedral, in the Gothic, and a castle (now used as a courthouse), in the Renaissance style, two other Roman Catholic and three Protestant churches, a new town-hall, a synagogue, a military hospital, two classical schools (*Gymnasien*) and several libraries. Owing to its situation on a navigable river and at the junction of several lines of railway, Glogau carries on an extensive trade, which is fostered by a variety of local industries, embracing machinery-building, tobacco, beer, oil, sugar and vinegar. It has also extensive lithographic works, and its wool market is celebrated.

In the beginning of the 11th century Glogau, even then a populous and fortified town, was able to withstand a regular siege by the emperor Henry V.; but in 1157 the duke of Silesia, finding he could not hold out against Frederick Barbarossa, set it on fire. In 1252 the town, which had been raised from its ashes by Henry I., the Bearded, became the capital of a principality of Glogau, and in 1482 town and district were united to the Bohemian crown. In the course of the Thirty Years' War Glogau suffered greatly. The inhabitants, who had become Protestants soon after the Reformation, were dragooned into conformity by Wallenstein's soldiery; and the Jesuits received permission to build themselves a church and a college. Captured by the Protestants in 1632, and recovered by the Imperialists in 1633, the town was again captured by the Swedes in 1642, and continued in Protestant hands till the peace of Westphalia in 1648, when the emperor recovered it. In 1741 the Prussians took the place by storm, and during the Seven Years' War it formed an important centre of operations for the Prussian forces. After the battle of Jena (1806) it fell into the hands of the French; and was gallantly held by Laplane, against the Russian and Prussian besiegers, after the battle of Katzbach in August 1813 until the 17th of the following April.

See Minsberg, *Geschichte der Stadt und Festung Glogau's* (2 vols., Glogau, 1853); and H. von Below, *Zur Geschichte des Jahres 1806. Glogau's Belagerung und Vertheidigung* (Berlin, 1893).

GLORIOSA, in botany, a small genus of plants belonging to the natural order Liliaceae, native of tropical Asia and Africa. They are bulbous plants, the slender stems of which support themselves by tendril-like prolongations of the tips of some of the narrow generally lanceolate leaves. The flowers, which are borne in the leaf-axils at the ends of the stem, are very handsome, the six, generally narrow, petals are bent back and stand erect, and are a rich orange yellow or red in colour; the six stamens project more or less horizontally from the place of insertion of the petals. They are generally grown in cultivation as stove-plants.

GLORY (through the O. Fr. *glorie*, modern *gloire*, from Lat. *gloria*, cognate with Gr. κλεός, κλέϝος), a synonym for fame, renown, honour, and thus used of anything which reflects honour and renown on its possessor. In the phrase "glory of God" the word implies both the honour due to the Creator, and His majesty and effulgence. In liturgies of the Christian Church are the *Gloria Patri*, the doxology beginning "Glory be to the Father," the response *Gloria tibi, Domine*, "Glory be to Thee, O Lord," sung or said after the giving out of the Gospel for the day, and the *Gloria in excelsis*, "Glory be to God on high," sung during the Mass and Communion service. A "glory" is the term often used as synonymous with halo, nimbus or aureola (*q.v.*) for the ring of light encircling the head or figure in a pictorial or other representation of sacred persons.

GLOSS, GLOSSARY, &c. The Greek word γλῶσσα (whence our "gloss"), meaning originally a tongue, then a language or dialect, gradually came to denote any obsolete, foreign, provincial, technical or otherwise peculiar word or use of a word (see Arist. *Rhet.* iii. 3. 2). The making of collections and explanations[1] of such γλῶσσαι was at a comparatively early date a well-recognized form of literary activity. Even in the 5th century B.C., among the many writings of Abdera was included a treatise entitled Περὶ Ὁμήρου ἢ ὀρθοεπείης καὶ γλωσσέων. It was not, however, until the Alexandrian period that the γλωσσογράφοι, glossographers (writers of glosses), or glossators, became numerous. Of many of these perhaps even the names have perished; but Athenaeus the grammarian alone (*c.* A.D. 250) alludes to no fewer than thirty-five. Among the earliest was Philetas of Cos (*d. c.* 290 B.C.), the elegiac poet, to whom Aristarchus dedicated the treatise Πρὸς Φιλήταν; he was the compiler of a lexicographical work, arranged probably according to subjects, and entitled Ἄτακτα or Γλῶσσαι (sometimes Ἄτακτοι γλῶσσαι). Next came his disciple Zenodotus of Ephesus (*c.* 280 B.C.), one of the earliest of the Homeric critics and the compiler of Γλῶσσαι Ὁμηρικαί; Zenodotus in turn was succeeded by his greater pupil Aristophanes of Byzantium (*c.* 200 B.C.), whose great compilation Περὶ λέξεων (still partially preserved in that of Pollux), is known to have included Ἀττικαὶ λέξεις, Λακωνικαὶ γλῶσσαι, and the like. From the school of Aristophanes issued more than one glossographer of name,—Diodorus, Artemidorus (Γλῶσσαι, and a collection of λέξεις ὑφαρπτικαί), Nicander of Colophon (Γλῶσσαι, of which some twenty-six fragments still survive), and Aristarchus (*c.* 210 B.C.), the famous critic, whose enormous labours included an arrangement of the Homeric vocabulary (λέξεις) in the order of the books. Contemporary with the last named was Crates of Mallus, who, besides making some new contributions to Greek lexicography and dialectology, was the first to create at Rome a taste for similar investigations in connexion with the Latin idioms. From his school proceeded Zenodotus of Mallus, the compiler of Ἑβρικαὶ λέξεις or γλῶσσαι, a work said to have been designed chiefly to support the views of the school of Pergamum as to the allegorical interpretation of Homer.[2] Of later date were Didymus (Chalcenterus, *c.* 50 B.C.), who made collections of λέξεις τραγῳδουμένας ὡμωμέας, &c.; Apollonius Sophista (*c.* 20 B.C.), whose Homeric *Lexicon* has come down to modern times; and Neoptolemus, known distinctively as ὁ παρὰ τοῖς γράφουσι. In the beginning of the 1st century of the Christian era Apion, a grammarian and rhetorician at Rome during the reigns of Tiberius and Claudius, followed up the labours of Aristarchus and other predecessors with Γλῶσσαι Ὁμηρικαί, and a treatise Περὶ τῆς Ῥωμαϊκῆς διαλέκτου; Heliodorus or Herodorus was another almost contemporary glossographer; Erotian also, during the reign of Nero, prepared a special glossary for the writings of Hippocrates, still preserved. To this period also Pamphilus, the author of the *Λειμών*, from which Diogenian and Julius Vestinus afterwards drew so largely, most probably belonged. In the following century one of the most prominent workers in this department of literature was Aelius Herodianus, whose treatise Περὶ μονήρους λέξεως has been edited in modern times, and whose Ἐπιμερισμοὶ we still possess in an abridgment; also Pollux, Diogenian (Λέξις παντοδαπή), Julius Vestinus (Ἐπιτομὴ τῶν Παμφίλου γλωσσῶν) and especially Phrynichus, who flourished towards the close of the 2nd century, and whose *Eclogae nominum et verborum Atticorum* has frequently been edited. To the 4th century belongs Ammonius of Alexandria (*c.* 380), who wrote Περὶ ὁμοίων καὶ διαφόρων λέξεων, a dictionary of words used in senses different from those in which they had

[1] The history of the literary gloss in its proper sense has given rise to the common English use of the word to mean an interpretation, especially in a disingenuous, sinister or false way; the form "glorze," more particularly associated with explaining away, palliating or talking speciously, is simply an alternative spelling. The word has thus to some extent influenced, or been influenced by, the meaning of the etymologically different "gloss"=lustrous surface (from the same root as "glass"; cf. "glow"), in its extended sense of "outward fair seeming."

[2] See Matthaei, *Glossaria Graeca* (Moscow, 1774/5).

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been employed by older and approved writers. Of somewhat later date is the well-known Hesychius, whose often-edited Λεξικὸν superseded all previous works of the kind; Cyril, the celebrated patriarch of Alexandria, also contributed somewhat to the advancement of glossography by his Συναγωγὴ τῶν πρὸς διάφορον σημασίαν διαφόρως τονουμένων λέξεων; while Orus, Orion, Philoxenus and the two Philemons also belong to this period. The works of Photius, Suidas and Zonaras, as also the *Etymologicum magnum*, to which might be added the *Lexica Sangermania* and the *Lexica Seguerlana*, are referred to in the article DICTIONARY.

To a special category of technical glossaries belongs a large and important class of works relating to the law-compilations of Justinian. Although the emperor forbade under severe penalties all commentaries (*ὑπομνήματα*) on his legislation (*Const. Deo Auctore*, sec. 12; *Const. Tanta*, sec. 21), yet indices (*ἰνδικες*) and references (*παράτιτλα*), as well as translations (*ἑρμηνεῖαι κατὰ πόδα*) and paraphrases (*ἑρμηνεῖαι εἰς πλάτος*), were expressly permitted, and lavishly produced. Among the numerous compilers of alphabetically arranged λέξεις Ῥωμαϊκαί or Λατεινικαί, and γλῶσσαι νομικαί (*glossae nomicae*), Cyril and Philoxenus are particularly noted; but the authors of *παραγραφαί*, or *σημειώσεις*, whether *ἐξωθεν* or *ἔσωθεν κείμεναι*, are too numerous to mention. A collection of these *παραγραφαὶ τῶν παλαιῶν*, combined with *νέαι παραγραφαὶ* on the revised code called *τὰ βασιλικά*, was made about the middle of the 12th century by a disciple of Michael Hagiotheodorita. This work is known as the *Glossa ordinaria τῶν βασιλικῶν*.[1]

In Italy also, during the period of the Byzantine ascendancy, various glossae (glosae) and scholia on the Justinian code were produced [2]; particularly the Turin gloss (reprinted by Savigny), to which, apart from later additions, a date prior to 1000 is usually assigned. After the total extinction of the Byzantine authority in the West the study of law became one of the free arts, and numerous schools for its cultivation were instituted. Among the earliest of these was that of Bologna, where Pepo (1075) and Irnerius (1100–1118) began to give their expositions. They had a numerous following, who, besides delivering exegetical lectures ("ordinariae" on the *Digest* and *Code*, "extraordinariae" on the rest of the *Corpus juris civilis*), also wrote Glossae, first interlinear, afterwards marginal.[3] The series of these glossators was closed by Accursius (*q.v.*) with the compilation known as the *Glossa ordinaria* or *magistralis*, the authority of which soon became very great, so that ultimately it came to be a recognized maxim, "Quod non agnoscit glossa, non agnoscit curia."[4] For some account of the glossators on the canon law, see CANON LAW.

In late classical and medieval Latin, *gloss* was the vulgar and romanic (*e.g.* in the early 8th century Corpus Glossary, and the late 8th century Leiden Glossary), *glossa* the learned form (Varro, *De ling. Lat.* vii. 10; Auson. *Epigr.* 127. 2 (86. 2), written in Greek, Quint. i. 1. 34). The diminutive *glossula* occurs in Diom. 426. 26 and elsewhere. The same meaning has *glossarium* (Gell. xviii. 7. 3 *glosaria = γλωσσάρια*), which also occurs in the modern sense of "glossary" (Papias, "unde *glossarium* dictum quod omnium fere partium glossas contineat"), as do the words *glossa*, *glossae*, *glossulae*, *glossemata* (Steinmeyer, *Alth. Gloss.* iv. 408, 410), expressed in later times by *dictionarium*, *dictionarius*, *vocabularium*, *vocabularius* (see DICTIONARY). *Glossa* and *glossema* (Varro vii. 34. 107; Asinius Gallus, ap. Suet. *De gramm.* 22; Fest. 166[b]. 8, 181[a]. 18; Quint. i. 8. 15, &c.) are synonyms, signifying (*a*) the word which requires explanation; or (*b*) such a word (called *lemma*) together with the interpretation (*interpretamentum*); or (*c*) the interpretation alone (so first in the *Anecd. Helv.*).

Latin, like Greek glossography, had its origin chiefly in the practical wants of students and teachers, of whose names we only know a few. No doubt even in classical times collections of glosses ("glossaries") were compiled, to which allusion seems to be made by Varro (*De ling. Lat.* vii. 1, "tesca, aiunt sancta esse qui glossas scripserunt") and Verrius-Festus (166[b]. 6, "naucum . . . glossematorum . . . scriptores fabae grani quod haereat in fabulo"), but it is not known to what extent Varro, for instance, used them, or retained their original forms. The *scriptores glossematorum* were distinguished from the learned glossographers like Aurelius Opilius (cf. his *Musae*, ap. Suet. *De gramm.* 6; Gell. i. 25. 17; Varro vii. 50, 65, 67, 70, 79, 106), Servius Clodius (Varro vii. 70. 106), Aelius Stilo, L. Ateius Philol., whose *liber glossematorum* Festus mentions (181[a]. 18).

Verrius Flaccus and his epitomists, Festus and Paulus, have preserved many treasures of early glossographers who are now lost to us. He copied Aelius Stilo (Reitzenstein, "Verr. Forsch.," in vol. i. of *Studien zur class. Philol. Abhandl.*, p. 88; Kriegshammer, *Comm. phil. Jen.* vii. 1. 74 sqq.), Aurelius Opilius, Ateius Philol., the treatise *De obscuris Catonis* (Reitzenstein, *ib.* 56. 92). He often made use of Varro (Willers, *De Verrio Flacco*, Halle, 1898), though not of his *ling. lat.* (Kriegshammer, 74 sqq.); and was also acquainted with later glossographers. Perhaps we owe to him the *glossae asbestos* (Goetz, *Corpus*, iv.; *id.*, *Rhein. Mus.* xl. 328). Festus was used by Ps.-Philoxenus (Dammann, "De Festo Ps.-Philoxeni auctore," *Neue Jen. v.* 26 sqq.), as appears from the *glossae ab obscenis* (Goetz, "De Astrabae Pl. fragmentis," *Ind. len.*, 1893, iii. sqq.). The distinct connexions with Nonius need not be ascribed to borrowing, as Thisius and Caper may have been used (P. Schmidt, *De Non. Marc. auct. gramm.* 145; Nettleship, *Lect. and Ess.* 229; Fröhde, *De Non. Marc. et Verrio Flacco*, 2; W. M. Lindsay, "Non. Marc.," *Dict. of Rep. Latin*, 100, &c.).

The *bilingual* (Gr.-Lat., Lat.-Gr.) glossaries also point to an early period, and were used by the grammarians (1) to explain the peculiarities (*idiomata*) of the Latin language by comparison with the Greek, and (2) for instruction in the two languages (Charis. 254. 21 sqq. 7, 292. 16 sqq.; Marchall, *De Q. Remmii P. libris gramm.* 22; Goetz, *Corp. gloss. lat.* ii. 6).

For the purposes of grammatical instruction (Greek for the Romans, Latin for the Hellenistic world), we have systematic works, a translation of Dositheus and the so-called *Hermeneutica*, parts of which may be dated as early as the 3rd century A.D., and lexica (cf. Schoenemann, *De lexicis ant.* 122; Knaack, in *Phil. Rundsch.*, 1884, 372; Traube, in *Byzant. Zitschr.* iii. 605; David, *Comment. Ien.* v. 107 sqq.).

The most important remains of bilingual glossaries are two well-known lexica; one (Latin-Greek), formerly attributed (but wrongly, see Rudorff, in *Abh. Akad. Berl.*, 1865, 220 sq.; Loewe, *Prodr.* 183, 190; Mommsen, *C.I.L.* v. 8120; A. Dammann, *De Festo Pseudophiloxeni auctore*, 12 sqq.; Goetz, *Corp.* ii. 1-212) to Philoxenus (consul A.D. 525), clearly consists of two closely allied glossaries containing glosses to Latin authors, as Horace, Cicero, Juvenal, Virgil, the Juristes, and excerpts from Festus), worked into one by some Greek grammarian, or a person who worked under Greek influence (his alphabet runs A, B, G, D, E, &c.); the other (Greek-Latin) is ascribed to Cyril (Stephanus says it was found at the end of some of his writings), and is considered to be a compilation of not later than the 6th century (Macrobius is used, and the *Cod. Harl.*, which is the source of all the other MSS., belongs to the 7th century; Goetz, *Corp.* ii. 215-583, 587-596, 597-606, *ibid.* p. xx. sqq. Furthermore, the bilingual medico-botanic glossaries had their origin in old lists of plants, as Ps.-Apuleius in the treatise *De herbarum virtutibus*, and Ps.-Dioscorides (cf. M. Wellmann, *Hermes*, xxxiii. 360 sqq., who thinks that the latter work is based on Pamphilus, *q.v.*; Goetz, *Corp.* iii.); the glossary, entitled *Hermeneuma*, printed from the *Cod. Vatic.* reg. Christ. 1260, contains names of diseases.

Just as grammar developed, so we see the original form of the glosses extend. If *massucum edacem* in Placidus indicates the original form, the allied gloss of Festus (*masucium edacem a mandendo scilicet*) shows an etymological addition. Another extension consists in adding special references to the original source, as *e.g.* at the gloss *Ocrem* (Fest. 181[a]. 17), which is taken from Ateius Philol. In this way collections arose like the *priscorum verborum cum exemplis*, a title given by Fest. (218[b]. 10) to a particular work. Further the *glossae veterum* (Charis. 242. 10); the *glossae antiquitatum* (*id.* 229. 30); the *idonei vocum antiquarum enarratores* (Gell. xviii. 6. 8); the *libri rerum verborumque veterum* (*id.* xiii. 24. 25). L.

[1] See Labbé, *Veteres glossae verborum juris quae passim in Basilicis reperiuntur* (1606); Otto, *Thesaurus juris Romani*, iii. (1697); Stephens, *Thesaurus linguae Graecae*, viii. (1825).

[2] See Biener, *Geschichte der Novellen*, 229 sqq.

[3] Irnerius himself is with some probability believed to have been the author of the Brachylogus (*q.v.*).

[4] Thus Fil. Villani (*De origine civitatis Florentiae*, ed. 1847, p. 23), speaking of the Glossator Accursius, says of the Glossae that "tantae auctoritatis gratiaeque fuere, ut omnium consensu publice approbarentur, et reiectis aliis, quibuscumque penitus abolitis, solae juxta textum legum adpositae sunt et ubique terrarum sine controversia pro legibus celebrantur, ita ut nefas sit, non secus quam textui, Glossis Accursii contraire." For similar testimonies see Bayle's *Dictionnaire*, s.v. "Accursius," and Rudorff, *Röm. Rechtsgeschichte*, i. 338 (1857).

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Cincius, according to Festus (330b. 2), wrote *De verbis priscis*; Santra, *De antiquitate verborum* (Festus 277a. 2).

Of Latin glossaries of the first four centuries of the Roman emperors few traces are left, if we except Verrius-Festus. Charis. 229. 30, speaks of *glossae antiquitatum* and 242. 10 of *glossae veterum*, but it is not known whether these glosses are identic, or in what relation they stand to the *glossemata per litteras Latinas ordine composita*, which were incorporated with the works of this grammarian according to the index in Keil, p. 6. Latin glosses occur in Ps.-Philoxenus, and Nonius must have used Latin glossaries; there exists a *glossarium Plautinum* (Ritschl, *Op.* ii. 234 sqq.), and the bilingual glossaries have been used by the later grammarian Martyrius; but of this early period we know by name only Fulgentius and Placidus, who is sometimes called Luctatius Placidus, by confusion with the Statius scholiast, with whom the *glossae Placidi* have no connexion. All that we know of him tends to show that he lived in North Africa (like Fulgentius and Nonius and perhaps Charisius) in the 6th century, from whence his glosses came to Spain, and were used by Isidore and the compiler of the *Liber glossarum* (see below). These glosses we know from (1) Codices Romani (15th and 16th century); (2) the *Liber glossarum*; (3) the Cod. Paris. nov. acquis. 1298 (saec. xi.), a collection of glossaries, in which the Placidus-glosses are kept separate from the others, and still retain traces of their original order (cf. the editions published by A. Mai, *Class. auct.* iii. 427-503, and Deuerling, 1875; Goetz, *Corp.* v.; P. Karl, "De Placidi glossis," *Comm. Ien.* vii. 2. 99, 103 sqq.; Loewe, *Gloss. Nom.* 86; F. Bücheler, in *Thesaur. gloss. emend.*). His collection includes glosses from Plautus and Lucilius.

(Fabius Planciades) Fulgentius (*c.* A.D. 468-533) wrote *Expositio sermonum antiquorum* (ed. Rud. Helm, Lips. 1898; cf. Wessner, *Comment. Ien.* vi. 2. 135 sqq.) in sixty-two paragraphs, each containing a lemma (sometimes two or three) with an explanation giving quotations and names of authors. Next to him come the *glossae Nonianae*, which arose from the contents of the various paragraphs in Nonius Marcellus' work being written in the margin without the words of the text; these epitomized glosses were alphabetized and afterwards copied for other collections (see Goetz, *Corp.* v. 637 sqq., *id.* v. Praef. xxxv.; Onions and Lindsay, *Harvard Stud.* ix. 67 sqq.; Lindsay, *Nonii praef.* xxi.). In a similar way arose the *glossae Eucherii* or *glossae spiritales secundum Eucherium episcopum* found in many MSS. (cf. K. Wotke, *Sits. Ber. Akad. Wien*, cxv. 425 sqq.; = the *Corpus Glossary*, first part), which are an alphabetical extract from the *formulae spiritalis intelligentiae* of St Eucherius, bishop of Lyons, *c.* 434-450.[1]

Other sources were the *Differentiae*, already known to Placidus and much used in the medieval glossaries; and the *Synonyma Ciceronis*; cf. Goetz, "Der Liber glossarum," in *Abhandl. der philol.-hist. Cl. der sächs. Gesellsch. d. Wiss.*, 1893, p. 215; *id.* in *Berl. philol. Wochenschr.*, 1890, p. 195 sqq.; Beck, in *Wochenschr.*, p. 297 sqq., and Sittl, *ibid.* p. 267; *Archiv f. lat. Lex.* vi. 594; W. L. Mahne, (Leid. 1850, 1851); also various collections of *scholia*. By the side of the scholiasts come the grammarians, as Charisius, or an *ars* similar to that ascribed to him; further, treatises *de dubiis generibus*, the *scriptores orthographici* (especially Caper and Beda), and Priscianus, the chief grammarian of the middle ages (cf. Goetz in *Mélanges Boissier*, 224).

During the 6th, 7th and 8th centuries glossography developed in various ways; old glossaries were worked up into new forms, or amalgamated with more recent ones. It ceased, moreover, to be exclusively Latin-Latin, and interpretations in Germanic (Old High German, Anglo-Saxon) and Romanic dialects took the place of or were used side by side with earlier Latin ones. The origin and development of the late classic and medieval glossaries preserved to us can be traced with certainty. While reading the manuscript texts of classical authors, the Bible or early Christian and profane writers, students and teachers, on meeting with any obscure or out-of-the-way words which they considered difficult to remember or to require elucidation, wrote above them, or in the margins, interpretations or explanations in more easy or better-known words. The interpretations written above the line are called "interlinear," those written in the margins of the MSS. "marginal glosses." Again, MSS. of the Bible or portions of the Bible were often provided with literal translations in the vernacular written above the lines of the Latin version (interlinear versions).

Of such glossed MSS. or translated texts, photographs may be seen in the various palaeographical works published in recent years; cf. *The Palaeogr. Society*, 1st ser. vol. ii. pls. 9 (Terentius MS. of 4th or 5th century, interlinear glosses) and 24 (Augustine's epistles, 6th or 7th century, marginal glosses); see further, plates 10, 12, 33, 40, 50-54, 57, 58, 63, 73, 75, 80; vol. iii. plates 10, 24, 31, 39, 44, 54, 80.

From these glossed or annotated MSS. and interlinear versions glossaries were compiled; that is, the obscure and difficult Latin words, together with the interpretations, were excerpted and collected in separate lists, in the order in which they appeared, one after the other, in the MSS., without any alphabetical arrangement, but with the names of the authors or the titles of the books whence they were taken, placed at the head of each separate collection or chapter. In this arrangement each article by itself is called a gloss; when reference is made only to the word explained it is called the *lemma*, while the explanation is termed the *interpretamentum*. In most cases the form of the lemma was retained just as it stood in its source, and explained by a single word (*tesca*: *sancta*, Varro vii. 10; *clucidatus*: *suavis*, *id.* vii. 107; cf. Isid. *Etym.* i. 30. 1, "quid enim illud sit in uno verbo positum declarat [*scil.* glossa] ut conticescere est tacere"), so that we meet with lemmata in the accusative, dative and genitive, likewise explained by words in the same cases; the forms of verbs being treated in the same way. Of this first stage in the making of glossaries, many traces are preserved, for instance, in the late 8th century Leiden Glossary (Voss. 69, ed. J. H. Hessels), where chapter iii. contains words or glosses excerpted from the *Life of St Martin* by Sulpicius Severus; chs. iv., v. and xxxv. glosses from Rufinus; chs. vi. and xl. from Gildas; chs. vii. to xxv. from books of the Bible (Paralipomenon; Proverbs, &c., &c.); chs. xxvi. to xlviii. from Isidore, the *Vita S. Anthonii*, Cassiodorus, St Jerome, Cassianus, Orosius, St Augustine, St Clement, Eucherius, St Gregory, the grammarians Donatus, Phocas, &c. (See also Goetz, *Corp.* v. 546. 23-547. 6, and i. 5-40 from Ovid's *Metam.*; v. 657 from Apuleius, *De deo Socratis*; cf. Landgraf, in *Arch.* ix. 174).

By a second operation the glosses came to be arranged in *alphabetical* order according to the *first* letter of the lemma, but still retained in separate chapters under the names of authors or the titles of books. Of this *second* stage the Leiden Glossary contains traces also: ch. i. (*Verba de Canonibus*) and ii. (*Sermones de Regulis*); see Goetz, *Corp.* v. 529 sqq. (from Terentius), iv. 427 sqq. (Virgil).

The third operation collected all the accessible glosses in alphabetical order, in the first instance according to the first letters of the lemmata. In this arrangement the names of the authors or the titles of the books could no longer be preserved, and consequently the sources whence the glosses were excerpted became uncertain, especially if the grammatical forms of the lemmata had been normalized.

A fourth arrangement collected the glosses according to the first two letters of the lemmata, as in the Corpus Glossary and in the still earlier *Cod. Vat.* 3321 (Goetz, *Corp.* iv. 1 sqq.), where even many attempts were made to arrange them according to the first three letters of the alphabet. A peculiar arrangement is seen in the *Glossae affatim* (Goetz, *Corp.* iv. 471 sqq.), where all words are alphabetized, first according to the initial letter of the word (a, b, c, &c.), and then further according to the first *vowel* in the word (a, e, i, o, u).

No date or period can be assigned to any of the above stages or arrangements. For instance, the first and second are both found in the Leiden Glossary, which dates from the end of the 8th century, whereas the Corpus Glossary, written in the beginning of the same century, represents already the fourth stage.

For the purpose of identification titles have of late years been given to the various nameless collections of glosses, derived partly from their first lemma, partly from other characteristics, as glossae *abstrusae*; glossae *abavus major* and *minor*; g. *affatim*; g. *ab absens*; g. *abactor*; g. *Abba Pater*; g. *a, a*; g. *Vergilianae*; g. *nominum* (Goetz, *Corp.* ii. 563, iv.); g. *Sangallenses* (Warren, *Transact. Amer. Philol. Assoc.* xv., 1885, p. 141 sqq.).

A chief landmark in glossography is represented by the *Origines* (*Etymologiae*) of Isidore (d. 636), an encyclopedia in which he, like Cassiodorus, mixed human and divine subjects together. In many places we can trace his sources, but he also used glossaries. His work became a great mine for later glossographers. In the tenth book he deals with the etymology of many substantives and adjectives arranged alphabetically according to the first letter of the words, perhaps by himself from various sources. His principal source is Servius, then the fathers of the Church (Augustine, Jerome,

[1] The so-called *Malberg glosses*, found in various texts of the Lex Salica, are not glosses in the ordinary sense of the word, but precious remains of the parent of the present literary Dutch, namely, the Low German dialect spoken by the Salian Franks who conquered Gaul from the Romans at the end of the 5th century. It is supposed that the conquerors brought their Frankish law with them, either written down, or by oral tradition; that they translated it into Latin for the sake of the Romans settled in the country, and that the translators, not always knowing a proper Latin equivalent for certain things or actions, retained in their translations the Frankish technical names or phrases which they had attempted to translate into Latin. *E.g.* in chapter ii., by the side of "*porcellus lactans*" (a sucking-pig), we find the Frankish "*chramnechaltio*," lit. a stye-porker. The person who stole such a pig (still kept in an enclosed place, in a stye) was fined three times as much as one who stole a "*porcellus de campo qui sine matre vivere possit*," as the Latin text has it, for which the Malberg technical expression appears to have been *ingymus*, that is, a one year (winter) old animal, *i.e.* a yearling. Nearly all these glosses are preceded by "*mal*" or "*malb*," which is thought to be a contraction for "*malberg*," the Frankish for "forum." The antiquity and importance of these glosses for philology may be realized from the fact that the Latin translation of the Lex Salica probably dates from the latter end of the 5th century. For further information cf. Jac. Grimm's preface to Joh. Merkel's ed. (1850), and H. Kern's notes to J. H. Hessels's ed. (London, 1880) of the Lex Salica.

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Lactantius) and Donatus the grammarian. This tenth book was also copied and used separately, and mixed up with other works (cf. Loewe, *Prodr.* 167. 21). Isidore's *Differentiae* have also had a great reputation.

Next comes the *Liber glossarum*, chiefly compiled from Isidore, but all articles arranged alphabetically; its author lived in Spain *c.* A.D. 690–750; he has been called Ansileubus, but not in any of the MSS., some of which belong to the 8th century; hence this name is suspected to be merely that of some owner of a copy of the book (cf. Loewe, "Der Liber Glossarum," in *Abhandl. der philol.-hist. Class. der kön. sächs. Ges.* xiii., 1893; *id.*, *Corp.* v., praef. xx. 161).

Here come, in regard to time, some Latin glossaries already largely mixed with Germanic, more especially Anglo-Saxon interpretations: (1) the Corpus Glossary (ed. J. H. Hessels), written in Epinal, containing of the 8th century, preserved in the library of Corpus Christi College, Cambridge; (2) the Leiden Glossary (end of 8th century, ed. Hessels; another edition by Plac. Glogger), preserved in the Leiden MS. Voss. Q° 69; (3) the Epinal Glossary, written in the beginning of the 9th century[1] and published in facsimile by the London Phibol. Society from a MS. in the town library at Epinal; (4) the *Glossae Amplonianae, i.e.* three glossaries preserved in the Amplonian library at Erfurt, known as Erfurt[1], Erfurt[2] and Erfurt[3]. The first, published by Goetz (*Corp.* v. 337-401; cf. also Loewe, *Prodr.* 114 sqq.) with the various readings of the kindred Epinal, consists, like the latter, of different collections of glosses (also some from Aldhelm), some arranged alphabetically according to the first letter of the lemma, others according to the first two letters. The title of Erfurt[3] (*incipit II. conscriptio glosarum in unam*) shows that it is also a combination of various glossaries; it is arranged alphabetically according to the first two letters of the lemmata, and contains the *affatim* and *abavus maior* glosses, also a collection from Aldhelm; Erfurt[2] are the *Glossae nominum*, mixed also with Anglo-Saxon interpretations (Goetz, *Corp.* ii. 563). The text of the glossary preserved in the 9th-century MS. *Lat. Monac.* 14429 (Goetz, "Lib. Gloss." 35 sqq.) and the great Abavus Gloss (*id.*, *ibid.* p. 37; *id.*, *Corp.* iv. praef. xxxvii.).

The *Lib. glossarum* has also been the chief source for the important (but not original) glossary of Papias, of A.D. 1053 (cf. Goetz in *Sits. Ber. Akad. Münch.*, 1903, p. 267 sqq., who enumerates eighty-seven MSS. of the 12th to the 15th centuries), of whom we only know that he lived among clerics and dedicated his work to his sons. An edition of it was published at Milan "per Dominicum de Vespolate" on the 12th of December 1476; other editions followed in 1485, 1491, 1496 (at Venice). He also wrote a grammar, chiefly compiled from Priscianus (Hagen, *Anecd. Heiv.* clxxix. sqq.).

The same *Lib. gloss.* is the source (1) for the *Abba Pater* Glossary (cf. Goetz, *ibid.* p. 39), published by G. M. Thomas (*Sits. Ber. Akad. Münch.*, 1868, ii. 369 sqq.); (2) the Greek glossary *Cadmi lucida* (Goetz, *ib.* p. 41); and (3) the Lat.-Arab. glossary in the *Cod. Leid. Scal. Orient.* No. 231 (published by Seybold in *Semit. Studien*, Heft xv.-xvii., Berlin, 1900).

The Paulus-Glossary (cf. Goetz, "Der Liber Glossarum," p. 215) is compiled from the second Salomon-Glossary (*abacti magistratus*), the *Abavus major* and the *Liber glossarum*, with a mixture of Hebraica. Many of his glosses appear again in other compilations, as in the Cod. Vatic. 1469 (cf. Goetz, *Corp.* v. 520 sq.), mixed up with glosses from Beda, Placidus, &c. (cf. a glossary published by Ellis in *Amer. Journ. of Philol.* vi. 4, vii. 3, containing besides Paulus glosses, also excerpts from Isidore; Cambridge *Journ. of Philol.* viii. 71 sqq., xiv. 81 sqq.).

Osbern of Gloucester (*c.* 1123–1200) compiled the glossary entitled *Panormia* (published by Angelo Mai as *Thesaurus novus Latinitatis*, from Cod. Vatic. reg. Christ. 1392; cf. W. Meyer, *Rhein. Mus.* xxix. 1874; Goetz in *Sitzungsber. sächs. Ges. d. Wiss.*, 1894, p. 133 sqq.; *Berichte üb. die Verhandl. der kön. sächs. Gesellsch. der Wiss.*, Leipzig, 1902); giving derivations, etymologies, testimonia collected from Paulus, Priscianus, Plautus, Horace, Virgil, Ovid, Mart. Capella, Macrobius, Ambrosius, Sidonius, Prudentius, Josephus, Jerome, &c., &c. Osbern's material was also used by Hugucio, whose compendium was still more extensively used (cf. Goetz, *l.c.*, p. 121 sqq., who enumerates one hundred and three MSS. of his treatise), and contains many biblical glosses, especially Hebraica, some treatises on Latin numerals, &c. (cf. Hamann, *Weitere Mitteil. aus dem Breviloquus Benthemianus*, Hamburg, 1882; A. Thomas, "Glosses provençales inéd." in *Romania*, xxxiv. p. 177 sqq; P. Toynbee, *ibid.* xxv. p. 537 sqq.).

The great work of Johannes de Janua, entitled *Summa quae vocatur catholicon*, dates from the year 1286, and treats of (1) accent, (2) etymology, (3) syntax, and (4) so-called prosody, *i.e.* a lexicon, which also deals with quantity. It mostly uses Hugucio and Papias; the classical quotations are limited, except from Horace; it quotes the Vulgate by preference, frequently independently from Hugucio; it excerpts Priscianus, Donatus, Isidore, the fathers of the Church, especially Jerome, Gregory, Augustine, Ambrose; it borrows many Hebrew glosses, mostly from Jerome and the other collections then in use; it mentions the *Graecismus* of Eberhardus Bethuniensis, the works of Hrabanus Maurus, the *Doctrinale* of Alexander de Villa Dei, and the *Aurora* of Petrus de Riga. Many quotations from the *Catholicon* in Du Cange are really from Hugucio, and have not been traced to Osbern. There exist many MSS. of this work, and the Mainz edition of 1460 is well known (cf. Goetz in *Berichte üb. die Verhandl. der kön. sächs. Gesellsch. der Wiss.*, Leipzig, 1902).

The Arundel MSS. of the 9th and 10th centuries are numerous, but a diminution becomes visible towards the 11th. We then find grammatical treatises arise, for which also glossaries were used. The chief material was (1) the *Liber glossarum*; (2) the Paulus glosses; (3) the *Abbavus major*; (4) excerpts from Priscian and glosses to Priscian; (5) Hebrew-biblical collections of proper names (chiefly from Jerome). After these comes medieval material, as the *derivationes* which are found in many MSS. (cf. Goetz in *Sitzungsber. sächs. Ges. d. Wiss.*, 1903, p. 136 sqq.; Traube in *Archiv f. lat. Lex. u. Gr.* vi. 264), containing quotations from Plautus, Ovid, Juvenal, Persius, Terence, occasionally from Priscian, Eutyches, and other grammarians, with etymological explanations. These *derivationes* were the basis for the grammatical works of Osbern, Hugucio and Joannes of Janua.

A peculiar feature of the late middle ages are the medico-botanic glossaries based on the earlier ones (see Goetz, *Corp.* iii.). The additions consisted in Arabic words, often explanations, also while Greek, Latin, Hebrew and Arabic, interchange with English, French, Italian and German forms. Of glossaries of this kind we have (1) the *Glossae alphita* (published by S. de Renzi in the 3rd vol. of the *Collect. Salernitana*, Naples, 1854) from two Paris MSS. of the 14th and 15th centuries, but some of the glosses occur already in earlier MSS.); (2) *Sinonoma Bartholomei*, collected by John Mirfeld, towards the end of the 14th century, ed. J. L. G. Mowat (*Anecd. Oxon.* i. 1, 1882, cf. Loewe, *Gloss. Nom.* 116 sqq.); it seems to have used the same or some similar source as No. 1; (3) the compilations of Simon de Janua (*Clavis sanationis*, end of 13th century), and of Matthaeus Silvaticus (*Pandectae medicinae*, 14th century; cf. Th. Sickel, "Discor. Lucanus," in *Roman. Forsch.* x. 3. 371; Steinmeyer, *Althochd. Gloss.* iii.).

Of biblical glossaries we have a large number, mostly mixed with glosses on other, even profane, subjects, as Hebrew and other biblical proper names, and explanations of the text of the Vulgate in general, and the prologues of Hieronymus. So we have the *Glossae veteris ac novi testamenti* (beginning "Prologus graece latine praelocutio sive praefatio") in numerous MSS. of the 9th to 11th centuries, mostly retaining the various books under separate headings (cf. Arevalo, *Isid.* vii. 407 sqq.; Loewe, *Prodr.* 141; Steinmeyer iv. 459; S. Berger, *De compendii exegetici quibusdam medii aevi*, Paris, 1879). Special mention should be made of Guil. Brito, who lived about 1250, and compiled a *Summa* (beginning "difficiles studeo partes quas Biblia gestat Pandere "), contained in many MSS. especially in French libraries. This *Summa* gave rise to the *Mammotrectus* of Joh. Marchesinus, about 1300, of which we have editions printed in 1470, 1476, 1479, &c.

Finally we may mention such compilations as the *Summa Heinrici*; the work of Johannes de Garlandia, which he himself calls *dictionarius* (cf. Scheler in *Jahrb. f. rom. u. engl. Philol.* vi., 1865, p. 142 sqq.); and that of Alexander Neckam (*ib.* vii. p. 60 sqq.), cf. R. Ellis, in *Amer. Journ. of Phil.* x. 2); which are, strictly speaking, not glossographic. The *Breviloquus* drew its chief material from Papias, Huguccio, Brito, &c. (K. Hamann, *Weitere, aus der Breviloquus Benthemianus*, Hamburg, 1879; *id.*, *Weitere Mitteil.*, &c., Hamburg, 1882); so also the *Vocabularium Ex quo*; the various *Gemmae*; *Vocabularia rerum* (cf. Diefenbach, *Glossar. Latino-Germanicum*).

After the revival of learning, J. Scaliger (1540–1609) was the first to impart to glossaries that importance which they deserve (cf. Goetz, in *Sitzungsber. sächs. Ger. d. Wiss.*, 1888, p. 219 sqq.), and in his edition of Festus made great use of Ps.-Philoxenus, which enabled C. Müller, the later editor of Festus, to follow in his steps. Scaliger also planned the publication of a *Corpus glossarum*, and left behind a collection of glosses known as *glossae Isidori* (Goetz, *Corp.* v. p. 589 sqq.; *id.* in *Sitzungsber. sächs. Ges. d. Wiss.*, p. 224 sqq.; Loewe, *Prodr.* 123 sqq.), which occurs also in old glossaries, clearly in reference to the tenth book of the *Etymologiae*.

The study of glosses spread through the publication, in 1573, of the Philoxenian glossaries by H. Stephanus (Estienne), containing, besides the two great glossaries, also the *Hermeneumata Stephani*, which is a recension of the *Ps.-Dositheana* (republished Goetz, *Corp.* iii. 438-474), and the *glossae Stephani*, excerpted from a collection of the *Hermeneumata* (*ib.* iii. 438-474).

In 1600 Bonav. Vulcanius republished the same glossaries, adding (1) the glossae *Isidori*, which now appeared for the first time; (2) the *Onomasticon*; (3) *notae* and *castigationes*, derived from Scaliger (Loewe, *Prodr.* 183).

In 1666 Carolus and Petrus Labbaeus published, with the effective help of Scaliger, another collection of glossaries, republished, in 1679 by Du Cange, after which the 17th and 18th centuries produced no

[1] Anglo-Saxon scholars ascribe an earlier date to the *text* of the MS. on account of certain archaisms in its Anglo-Saxon words.

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further glossaries (Erasm. Nyerup published extracts from the Leiden Glossary, Voss. 69, in 1787, *Symbolae ad Literat. Teut.*), though glosses were constantly used or referred to by Salmasius, Meursius, Heraldus, Barth, Fabricius and Burman at Leiden, where a rich collection of glossaries had been obtained by the acquisition of the Vossius library (cf. Loewe, *Prodr.* 168). In the 19th century came Osann's *Glossarii Latini specimen* (1826); the glossographic publications of Angelo Mai (*Classici auctores*, vols. iii., vi., vii., viii., Rome, 1831–1836, consisting of Osann's *Paramia*, Placidus and various glosses from Vatican MSS.); Fr. Oehler's treatise (1847) on the *Cod. Amplonianus* of Osbern, and his edition of the three Erfurt glossaries, so important for Anglo-Saxon philology; in 1884 G. F. Hildebrand's *Glossarium Latinum* (an extract from *Abolita minor*), preserved in a Cod. Paris. lat. 7690; 1857, Thomas Wright's vol. of Anglo-Saxon glosses, which were republished with others in 1884 by R. Paul Wülcker under the title *Anglo-Saxon and Old English Vocabularies* (London, 2 vols., 1857); L. Diefenbach's supplement to Du Cange, entitled *Glossarium Latino-Germanicum mediae et infimae aetatis*, containing mostly glosses collected from glossaries, vocabularies, &c., enumerated in the preface; Ritschl's treatise (1870) on Placidus, which called forth an edition (1875) of Placidus by Deuerling; G. Loewe's *Prodromus* (1876), and other treatises by him, published after his death by G. Goetz (Leipzig, 1884); 1888, the second volume of Goetz's own great *Corpus glossariorum Latinorum*, of which seven volumes (except the first) had seen the light by 1907, the last two being separately entitled *Thesaurus glossarum emendatarum*, containing many emendations and corrections of earlier glossaries by the Author and other scholars; 1900, Arthur S. Napier, *Old English Glosses* (Oxford), collected chiefly from Aldhelm MSS., but also from Augustine, Avianus, Beda, Boethius, Gregory, Isidore, Juvencus, Phocas, Prudentius, &c.

There are a very great number of glossaries still in MS. scattered in various libraries of Europe, especially in the Vatican, at Monte Cassino, Paris, Munich, Bern, the British Museum, Leiden, Oxford, Cambridge, &c. Much has already been done to make the material contained in these MSS. accessible in print, and much may yet be done with what is still unpublished, though we may find that the differences between the glossaries which often present themselves at first sight are mere differences in form introduced by successive more or less qualified copyists.

Some Celtic (Breton, Cornish, Welsh, Irish) glossaries have been preserved to us, the particulars of which may be learnt from the publications of Whitley Stokes, Sir John Rhys, Kuno Meyer, E. C. Stern, G. I. Ascoli, Heinr. Zimmer, Ernst Windisch, Nigra, and many others; these are published separately as books or in Zeuss's *Grammatica Celtica*, A. Kuhn's *Beitrage zur vergleich. Sprachforschung*, *Zeitschr. für celtische Philologie*, *Archiv für Celtische Lexicographie*, the *Revue celtique*, *Transactions of the London Philological Society*, &c.

The first Hebrew author known to have used glosses was R. Gershom of Metz (1000) in his commentaries on the Talmud. But he and other Hebrew writers after him frequently used the French language (though sometimes also Italian, Slavonic, German) of which an example has been published by Lambert and Brandin, in their *Glossaire hébreu-français du XIIIe siècle: recueil de mots hébreux bibliques avec traduction française* (Paris, 1905). See Isidore Loeb, *Jewish Encyclopedia* (New York and London, 1903), article "Gloss."

AUTHORITIES.—For a great part of what has been said above, the writer is indebted to G. Goetz's article on "Latein. Glossographie" in Pauly's *Realencyklopädie*, by the side of Goetz's *Corpus* and to the great collection of Steinmeyer and Sievers, *Die althochdeutschen Glossen* (in 4 vols., 1879–1898), containing a vast number of (also Anglo-Saxon) glosses culled from Bible MSS. and MSS. of ecclesiastical Christian authors, enumerated and described in the 4th vol. Besides the works of the editors of, or writers on, glosses, already mentioned, we refer here to a few others, whose writings may be consulted: Hugo Blumner; *Catholicon*, ed. Huth (Leipzig, Hertage); DeVit (at end of Forcellini's *Lexicon*); F. Deycks; Du Cange; Funck; J. H. Gallée (*Altsächs. Sprachdenkm.*, 1894); Gröber; K. Gruber (*Hauptquellen des Corpus*, *Epin. u. Erfurt Gloss.*, Erlangen, 1904); Hattemer; W. Heraeus (*Sprache des Petronius und die Glossen*, Leipzig, 1899); Kettner; Kluge; Krumbacher; Lagarde; Landgraf; Marx; W. Meyer-Lubke ("Zu den latein. Glossen" in *Wiener Stud.* xxv. 90 sqq.); Henry Nettleship; Niedermann, *Notes d'épigraph. lat.* (Macon, 1902), *Contribut. à la critique des glosses latines* (Neuchâtel, 1905); Pokrowski; Quicherat; Otto B. Schlutter (many important articles in *Anglia*, *Englische Studien*, *Archiv f. latein. Lexicographie*, &c.); Scholl; Schuchardt; Leo Sommer; Stadler; Stowasser; Strachan; H. Sweet; Usener (*Rhein. Mus.* xxiii. 496, xxiv. 382); A. Way, *Promptorium parvulorum sive clericorum* (3 vols., London, 1843–1865); Weyman, Wilmanns (in *Rhein. Mus.* xxiv. 363); Wölfflin in *Arch. für lat. Lexicogr.*; Zupitza. Cf. further, the various volumes of the following periodicals: *Romania*; *Zeitschr. für deutsches Alterthum*; *Anglia*; *Englische Studien*; *Journal of English and German Philology* (ed. Cook and Karsten); *Archiv for latein. Lexicogr.*, and others treating of philology, lexicography, grammar, &c. (J. H. H.)

GLOSSOP, a market town and municipal borough, in the High Peak parliamentary division of Derbyshire, England, on the extreme northern border of the county; 13 m. E. by S. of Manchester by the Great Central railway. Pop. (1901) 21,526. It is the chief seat of the cotton manufacture in Derbyshire, and it has also woollen and paper mills, dye and print works, and bleaching greens. The town consists of three main divisions, the Old Town (or Glossop proper), Howard Town (or Glossop Dale) and Mill Town. An older parish church was replaced by that of All Saints in 1830; there is also a very fine Roman Catholic church. In the immediate neighbourhood is Glossop Hall, the seat of Lord Howard, lord of the manor, a picturesque old building with extensive terraced gardens. On a hill near the town is Melandra Castle, the site of a Roman fort guarding Longdendale and the way into the hills of the Peak District. In the neighbourhood also a great railway viaduct spans the Dinting valley with sixteen arches. To the north is Longdendale, there are five lakes belonging to the water-supply system of Manchester, formed by damming the Etherow, a stream which descends from the high moors north-east of Glossop. The town is governed by a mayor, 6 aldermen and 18 councillors. Area, 3052 acres.

Glossop was granted by Henry I. to William Peverel, on the attainder of whose son it reverted to the crown. In 1157 it was gifted by Henry II. to the abbey of Basingwerk. Henry VIII. bestowed it on the earl of Shrewsbury. It was made a municipal borough in 1866.

GLOUCESTER, EARLS AND DUKES OF. The English earldom of Gloucester was held by several members of the royal family, including Robert, a natural son of Henry I., and John, afterwards king, and others, until 1218, when Gilbert de Clare was recognized as earl of Gloucester. It remained in the family of Clare (*q.v.*) until 1314, when another Earl Gilbert was killed at Bannockburn; and after this date it was claimed by various relatives of the Clares, among them by the younger Hugh le Despenser (d. 1326) and by Hugh Audley (d. 1347), both of whom had married sisters of Earl Gilbert. In 1397 Thomas le Despenser (1373–1400), a descendant of the Clares, was created earl of Gloucester; but in 1399 he was degraded from his earldom and in January 1400 was beheaded.

The dukedom dates from 1385, when Thomas of Woodstock, a younger son of Edward III., was created duke of Gloucester, but his honours were forfeited when he was found guilty of treason in 1397. The next holder of the title was Humphrey, a son of Henry IV., who was created duke of Gloucester in 1414. He died without sons in 1447, and in 1461 the title was revived in favour of Richard, brother of Edward IV., who became king as Richard III. in 1483.

In 1659 Henry (1630–1660), a brother of Charles II., was formally created duke of Gloucester, a title which he had borne since infancy. This prince, sharing the exile of the Stuarts, had incensed his mother, Queen Henrietta Maria, by his firm adherence to the Protestant religion, and had fought among the Spaniards at Dunkirk in 1658. Having returned to England with Charles II., he died unmarried in London on the 13th of September 1660. The next duke was William (1689–1700), son of the princess Anne, who was, after his mother, the heir to the English throne, and who was declared duke of Gloucester by his uncle, William III., in 1689, but no patent for this creation was ever passed. William died on the 30th of July 1700, and again the title became extinct.

Frederick Louis, the eldest son of George II., was known for some time as duke of Gloucester, but when he was raised to the peerage in 1726 it was as duke of Edinburgh only. In 1764 Frederick's third son, William Henry (1743–1805), was created duke of Gloucester and Edinburgh by his brother, George III. This duke's secret marriage with Maria (d. 1807), an illegitimate daughter of Sir Edward Walpole and widow of James, 2nd Earl Waldegrave, in 1766, greatly incensed his royal relatives and led to his banishment from court. Gloucester died on the 25th of August 1805, leaving an only son, William Frederick (1776–1834), who now became duke of Gloucester and Edinburgh. The duke, who served with the British army in Flanders, married his cousin Mary (1776–1857), a daughter of George III. He died on the 30th of November 1834, leaving no children, and his

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widow, the last survivor of the family of George III., died on the 30th of April 1857.

GLOUCESTER, GILBERT DE CLARE, EARL OF (1243–1295), was a son of Richard de Clare, 7th earl of Gloucester and 8th earl of Clare, and was born at Christchurch, Hampshire, on the 2nd of September 1243. Having married Alice of Angoulême, half-sister of king Henry III., he became earl of Gloucester and Clare on his father's death in July 1262, and almost at once joined the baronial party led by Simon de Montfort, earl of Leicester. With Simon Gloucester was at the battle of Lewes in May 1264, when the king himself surrendered to him, and after this victory he was one of the three persons selected to nominate a council. Soon, however, he quarrelled with Leicester. Leaving London for his lands on the Welsh border he met Prince Edward, afterwards king Edward I., at Ludlow, just after his escape from captivity, and by his skill contributed largely to the prince's victory at Evesham in August 1265. But this alliance was as transitory as the one with Leicester. Gloucester took up the cudgels on behalf of the barons who had surrendered at Kenilworth in November and December 1266, and after putting his demands before the king, secured possession of London. This happened in April 1267, but the earl quickly made his peace with Henry III. and with Prince Edward, and, having evaded an obligation to go on the Crusade, he helped to secure the peaceful accession of Edward I. to the throne in 1272. Gloucester then passed several years in fighting in Wales, or on the Welsh border; in 1289 when the barons were asked for a subsidy he replied on their behalf that they would grant nothing until they saw the king in person (*nisi prius personaliter viderent in Anglia faciem regis*), and in 1291 he was fined and imprisoned on account of his violent quarrel with Humphrey de Bohun, earl of Hereford. Having divorced his wife Alice, he married in 1290 Edward's daughter Joan, or Johanna (d. 1307). Earl Gilbert, who is sometimes called the "Red," died at Monmouth on the 7th of December 1295, leaving in addition to three daughters a son, Gilbert, earl of Gloucester and Clare, who was killed at Bannockburn.

See C. Bémont, *Simon de Montfort, comte de Leicester* (1884), and G. W. Prothero, *Simon de Montfort* (1877).

GLOUCESTER, HUMPHREY, DUKE OF (1391–1447), fourth son of Henry IV. by Mary de Bohun, was born in 1391. He was knighted at his father's coronation on the 11th of October 1399, and created duke of Gloucester by Henry V. at Leicester on the 16th of May 1414. He served in the war next year, and was wounded at Agincourt, where he owed his life to his brother's valour. In April 1416 Humphrey received the emperor Sigismund at Dover and, according to a 16th-century story, did not let him land till he had disclaimed all title to imperial authority in England. In the second invasion of France Humphrey commanded the force which during 1418 reduced the Cotentin and captured Cherbourg. Afterwards he joined the main army before Rouen, and took part in subsequent campaigns till January 1420. He then went home to replace Bedford as regent in England, and held office till Henry's own return in February 1421. He was again regent for his brother from May to September 1422.

Henry V. measured Humphrey's capacity, and by his will named him merely deputy for Bedford in England. Humphrey at once claimed the full position of regent, but the parliament and council allowed him only the title of protector during Bedford's absence, with limited powers. His lack of discretion soon justified this caution. In the autumn of 1422 he married Jacqueline of Bavaria, heiress of Holland, to whose lands Philip of Burgundy had claims. Bedford, in the interest of so important an ally, endeavoured vainly to restrain his brother. Finally in October 1424 Humphrey took up arms in his wife's behalf, but after a short campaign in Hainault went home, and left Jacqueline to be overwhelmed by Burgundy. Returning to England in April 1425 he soon entangled himself in a quarrel with the council and his uncle Henry Beaufort, and stirred up a tumult in London. Open war was averted only by Beaufort's prudence, and Bedford's hurried return. Humphrey had charged his uncle with disloyalty to the late and present kings. With some difficulty Bedford effected a formal reconciliation at Leicester in March 1426, and forced Humphrey to accept Beaufort's disavowal. When Bedford left England next year Humphrey renewed his intrigues. But one complication was removed by the annulling in 1428 of his marriage with Jacqueline. His open adultery with his mistress, Eleanor Cobham, also made him unpopular. To check his indiscretion the council, in November 1429, had the king crowned, and so put an end to Humphrey's protectorate. However, when Henry VI. was soon afterwards taken to be crowned in France, Humphrey was made lieutenant and warden of the kingdom, and thus ruled England for nearly two years. His jealousy of Bedford and Beaufort still continued, and when the former died in 1435 there was no one to whom he would defer. The defection of Burgundy roused English feeling, and Humphrey won popularity as leader of the war party. In 1436 he commanded in a short invasion of Flanders. But he had no real power, and his political importance lay in his persistent opposition to Beaufort and the councillors of his party. In 1439 he renewed his charges against his uncle without effect. His position was further damaged by his connexion with Eleanor Cobham, whom he had now married. In 1441 Eleanor was charged with practising sorcery against the king, and Humphrey had to submit to see her condemned, and her accomplices executed. Nevertheless, he continued his political opposition, and endeavoured to thwart Suffolk, who was now taking Beaufort's place in the council, by opposing the king's marriage to Margaret of Anjou. Under Suffolk's influence Henry VI. grew to distrust his uncle altogether. The crisis came in the parliament of Bury St Edmunds in February 1447. Immediately on his arrival there Humphrey was arrested, and four days later, on the 23rd of February, he died. Rumour attributed his death to foul play. But his health had been long undermined by excesses, and his end was probably only hastened by the shock of his arrest.

Humphrey was buried at St Albans Abbey, in a fine tomb, which still exists. He was ambitious and self-seeking, but unstable and unprincipled, and, lacking the fine qualities of his brothers, excelled neither in war nor in peace. Still he was a cultured and courtly prince, who could win popularity. He is remembered as the good Duke Humphrey, and in his lifetime was a liberal patron of letters. He had been a great collector of books, many of which he presented to the university of Oxford. He contributed also to the building of the Divinity School, and of the room still called Duke Humphrey's library. His books were dispersed at the Reformation and only three volumes of his donation now remain in the Bodleian library. Titus Livius, an Italian in Humphrey's service, wrote a life of Henry V. at his patron's bidding. Other Italian scholars, as Leonardo Aretino, benefited by his patronage. Amongst English men of letters he befriended Reginald Pecock, Whethamstead of St Albans, Capgrave the historian, Lydgate, and Gilbert Kymer, who was his physician and chancellor of Oxford university. A popular error found Humphrey a fictitious tomb in St Paul's Cathedral. The adjoining aisle, called Duke Humphrey's Walk, was frequented by beggars and needy adventurers. Hence the 16th-century proverb "to dine with Duke Humphrey," used of those who loitered there dinnerless.

The most important contemporary sources are Stevenson's *Wars of the English in France*, Whethamstead's *Register*, and Beckington's *Letters* (all in Rolls Ser.), with the various *London Chronicles*, and the works of Waurin and Monstrelet. For his relations with Jacqueline see F. von Löher's *Jacobäa von Bayern und ihre Zeit* (2 vols., Nördlingen, 1869). For other modern authorities consult W. Stubbs's *Constitutional History*; J. H. Ramsay's *Lancaster and York*; *Political History of England*, vol. iv.; R. Pauli, *Pictures of Old England*, pp. 373-401 (1861); and K. H. Vickers, *Humphrey, Duke of Gloucester* (1907). For Humphrey's correspondence with Piero Candido Decembrio see the *English Historical Review*, vols. x., xix., xx.

(C. L. K.)

GLOUCESTER, RICHARD DE CLARE, EARL OF (1222–1262), was a son of Gilbert de Clare, 6th earl of Gloucester and 7th earl of Clare, and was born on the 4th of August 1222, succeeding

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to his father's earldoms on the death of the latter in October 1230. His first wife was Margaret, daughter of Hubert de Burgh, and after her death in 1237 he married Maud, daughter of John de Lacy, earl of Lincoln, and passed his early years in tournaments and pilgrimages, taking for a time a secondary and undecided part in politics. He refused to help Henry III. on the French expedition of 1230, but was afterwards with the king at Paris; then he went on a diplomatic errand to Scotland, and was sent to Germany to work among the princes for the election of his stepfather, Richard, earl of Cornwall, as king of the Romans. About 1258 Gloucester took up his position as a leader of the barons in their resistance to the king, and he was prominent during the proceedings which followed the Mad Parliament at Oxford in 1258. In 1259, however, he quarrelled with Simon de Montfort, earl of Leicester; the dispute, begun in England, was renewed in France and he was again in the confidence and company of the king. This attitude, too, was only temporary, and in 1261 Gloucester and Leicester were again working in concord. The earl died at his residence near Canterbury on the 15th of July 1262. A large landholder like his son and successor, Gilbert, Gloucester was the most powerful English baron of his time; he was avaricious and extravagant, but educated and able. He left several children in addition to Earl Gilbert.

GLOUCESTER, ROBERT, Earl of (d. 1147), was a natural son of Henry I. of England. He was born, before his father's accession, at Caen in Normandy; but the exact date of his birth, and his mother's name are unknown. He received from his father the hand of a wealthy heiress, Mabel of Gloucester, daughter of Robert Fitz Hamon, and with her the lordships of Gloucester and Glamorgan. About 1121 the earldom of Gloucester was created for his benefit. His rank and territorial influence made him the natural leader of the western baronage. Hence, at his father's death, he was sedulously courted by the rival parties of his half-sister the empress Matilda and of Stephen. After some hesitation he declared for the latter, but tendered his homage upon strict conditions, the breach of which should be held to invalidate the contract. Robert afterwards alleged that he had merely feigned submission to Stephen with the object of secretly furthering his half-sister's cause among the English barons. The truth appears to be that he was mortified at finding himself excluded from the inner councils of the king, and so resolved to sell his services elsewhere. Robert left England for Normandy in 1137, renewed his relations with the Angevin party, and in 1138 sent a formal defiance to the king. Returning to England in the following year, he raised the standard of rebellion in his own earldom with such success that the greater part of western England and the south Welsh marches were soon in the possession of the empress. By the battle of Lincoln (Feb. 2, 1141), in which Stephen was taken prisoner, the earl made good Matilda's claim to the whole kingdom. He accompanied her triumphal progress to Winchester and London; but was unable to moderate the arrogance of her behaviour. Consequently she was soon expelled from London and deserted by the bishop Henry of Winchester who, as legate, controlled the policy of the English church. With Matilda the earl besieged the legate at Winchester, but was forced by the royalists to beat a hasty retreat, and in covering Matilda's flight fell into the hands of the pursuers. So great was his importance that his party purchased his freedom by the release of Stephen. The earl renewed the struggle for the crown and continued it until his death (Oct. 31, 1147); but the personal unpopularity of Matilda, and the estrangement of the Church from her cause, made his efforts unavailing. His loyalty to a lost cause must be allowed to weigh in the scale against his earlier double-dealing. But he hardly deserves the extravagant praise which is lavished upon him by William of Malmesbury. The sympathies of the chronicler are too obviously influenced by the earl's munificence towards literary men.

See the *Historia novella* by William of Malmesbury (Rolls edition); the *Historia Anglorum* by Henry of Huntingdon (Rolls edition); J. H. Round's *Geoffrey de Mandeville* (1892); and O. Rössler's *Kaiserin Mathilde* (Berlin, 1897). (H. W. C. D.)

GLOUCESTER, THOMAS OF WOODSTOCK, Duke of (1355–1397), seventh and youngest son of the English king Edward III., was born at Woodstock on the 7th of January 1355. Having married Eleanor (d. 1399), daughter and co-heiress of Humphrey de Bohun, earl of Hereford, Essex and Northampton (d. 1373), Thomas obtained the office of constable of England, a position previously held by the Bohuns, and was made earl of Buckingham by his nephew, Richard II., at the coronation in July 1377. He took part in defending the English coasts against the attacks of the French and Castilians, after which he led an army through northern and central France, and besieged Nantes, which town, however, he failed to take.

Returning to England early in 1381, Buckingham found that his brother, John of Gaunt, duke of Lancaster, had married his wife's sister, Mary Bohun, to his own son, Henry, afterwards King Henry IV. The relations between the brothers, hitherto somewhat strained, were not improved by this proceeding, as Thomas, doubtless, was hoping to retain possession of Mary's estates. Having taken some part in crushing the rising of the peasants in 1381, Buckingham became more friendly with Lancaster; and while marching with the king into Scotland in 1385 was created duke of Gloucester, a mark of favour, however, which did not prevent him from taking up an attitude of hostility to Richard. Lancaster having left the country, Gloucester placed himself at the head of the party which disliked the royal favourers, Michael de la Pole, earl of Suffolk and Robert de Vere, earl of Oxford, whose recent elevation to the dignity of duke of Ireland had aroused profound discontent. The moment was propitious for interference, and supported by those who were indignant at the extravagance and incompetence, real or alleged, of the king, Gloucester was soon in a position of authority. He forced on the dismissal and impeachment of Suffolk; was a member of the commission appointed in 1386 to reform the kingdom and the royal household; and took up arms when Richard began proceedings against the commissioners. Having defeated Vere at Radcot in December 1387 the duke and his associates entered London to find the king powerless in their hands. Gloucester, who had previously threatened his uncle with deposition, was only restrained from taking this extreme step by the influence of his colleagues; but, as the leader of the "lords appellant" in the "Merciless Parliament," which met in February 1388 and was packed with his supporters, he took a savage revenge upon his enemies, while not neglecting to add to his own possessions.

He was not seriously punished when Richard regained his power in May 1389, but he remained in the background, although employed occasionally on public business, and accompanying the king to Ireland in 1394. In 1396, however, uncle and nephew were again at variance. Gloucester disliked the peace with France and Richard's second marriage with Isabella, daughter of King Charles VI.; other causes of difference were not wanting, and it has been asserted that the duke was plotting to seize the king. At all events Richard decided to arrest him. By refusing an invitation to dinner the duke frustrated the first attempt, but on the 11th of July 1397 he was arrested by the king himself at his residence, Pleshey castle in Essex. He was taken at once to Calais, and it is probable that he was murdered by order of the king on the 9th of September following. The facts seem to be as follows. At the beginning of September it was reported that he was dead. The rumour, probably a deliberate one, was false, and about the same time a justice, Sir William Rickhill (d. 1407), was sent to Calais with instructions dated the 17th of August to obtain a confession from Gloucester. On the 8th of September the duke confessed that he had been guilty of treason, and his death immediately followed this avowal. Unwilling to meet his parliament so soon after his uncle's death, Richard's purpose was doubtless to antedate this occurrence, and to foster the impression that the duke had died from natural causes in August. When parliament met in September he was declared guilty of treason and his estates forfeited. Gloucester had one son, Humphrey (c. 1382–1399), who died unmarried, and four daughters, the most notable of whom was Anne (c. 1380–1438), who was

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successively the wife of Thomas, 3rd earl of Stafford, Edmund, 5th earl of Stafford, and William Bourchier, count of Eu. Gloucester is supposed to have written *L'Ordonnance d'Angleterre pour le camp à l'outrance, ou gaige de bataille.*

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GLOUCESTER (abbreviated as pronounced *Glo'ster*), a city, county of a city, municipal and parliamentary borough and port, and the county town of Gloucestershire, England, on the left (east) bank of the river Severn, 114 m. W.N.W. of London. Pop. (1901) 47,955. It is served by the Great Western railway and the west-and-north branch of the Midland railway; while the Berkeley Ship Canal runs S.W. to Sharpness Docks in the Severn estuary (16½ m.). Gloucester is situated on a gentle eminence overlooking the Severn and sheltered by the Cotteswolds on the east, while the Malverns and the hills of the Forest of Dean rise prominently to the west and north-west.

The cathedral, in the north of the city near the river, originates in the foundation of an abbey of St Peter in 681, the foundations of the present church having been laid by Abbot Serlo (1072–1104); and Walter Froucester (d. 1412) its historian, became its first mitred abbot in 1381. Until 1541, Gloucester lay in the see of Worcester, but the separate see was then constituted, with John Wakeman, last abbot of Tewkesbury, for its first bishop. The diocese covers the greater part of Gloucestershire, with small parts of Herefordshire and Wiltshire. The cathedral may be succinctly described as consisting of a Norman nucleus, with additions in every style of Gothic architecture. It is 420 ft. long, and 144 ft. broad, with a beautiful central tower of the 15th century rising to the height of 225 ft. and topped by four graceful pinnacles. The nave is massive Norman with Early English roof; the crypt also, under the choir, aisles and chapels, is Norman, as is the chapter-house. The crypt is one of the four apsidal cathedral crypts in England, the others being at Worcester, Winchester and Canterbury. The south porch is Perpendicular, with fan-tracery roof, as also is the north transept, the south being transitional Decorated. The choir has Perpendicular tracery over Norman work, with an apsidal chapel on each side. The choir-vaulting is particularly rich, and the modern scheme of colouring is judicious. The splendid late Decorated east window is partly filled with ancient glass. Between the apsidal chapels is a cross Lady chapel, and north of the nave are the cloisters, with very early example of fan-tracery, the carols or stalls for the monks' study and writing lying to the south. The finest monument is the canopied shrine of Edward II. who was brought hither from Berkeley. By the visits of pilgrims to this the building and sanctuary were enriched. In a side-chapel, too, is a monument in coloured bog oak of Robert Curthose, a great benefactor to the abbey, the eldest son of the Conqueror, who was interred there; and those of Bishop Warburton and Dr Edward Jenner are also worthy of special mention. A musical festival (the Festival of the Three Choirs) is held annually in this cathedral and those of Worcester and Hereford in turn. Between 1873 and 1890 and in 1897 the cathedral was extensively restored, principally by Sir Gilbert Scott. Attached to the deanery is the Norman prior's chapel. In St Mary's Square outside the Abbey gate, Bishop Hooper suffered martyrdom under Queen Mary in 1555.

Quaint gabled and timbered houses preserve the ancient aspect of the city. At the point of intersection of the four principal streets stood the Tolsey or town hall, replaced by a modern building in 1894. None of the old public buildings, in fact, is left, but the New Inn in Northgate Street is a beautiful timbered house, strong and massive, with external galleries and courtyards, built in 1450 for the pilgrims to Edward II.'s shrine, by Abbot Sebroke, a traditional subterranean passage leading thence to the cathedral. The timber is principally chestnut. There are a large number of churches and dissenting chapels, and it may have been the old proverb, "as sure as God's in Gloucester," which provoked Oliver Cromwell to declare that the city had "more churches than godliness." Of the churches four are of special interest: St Mary de Lode, with a Norman tower and chancel, and a monument of Bishop Hooper, on the site of a Roman temple which became the first Christian church in Britain; St Mary de Crypt, a cruciform structure of the 12th century, with later additions and a beautiful and lofty tower; the church of St Michael, said to have been connected with the ancient abbey of St Peter; and St Nicholas church, originally of Norman erection, and possessing a tower and other portions of later date. In the neighbourhood of St Mary de Crypt are slight remains of Grey-friars and Blackfriars monasteries, and also of the city wall. Early vaulted cellars remain under the Fleece and Saracen's Head inns.

There are three endowed schools: the College school, refounded by Henry VIII. as part of the cathedral establishment; the school of St Mary de Crypt, founded by Dame Joan Cooke in the same reign; and Sir Thomas Rich's Blue Coat hospital for 34 boys (1666). At the Crypt school the famous preacher George Whitefield (1714–1770) was educated, and he preached his first sermon in the church. The first Sunday school was held in Gloucester, being originated by Robert Raikes, in 1780.

The noteworthy modern buildings include the museum and school of art and science, the county gaol (on the site of a Saxon and Norman castle), the Shire Hall and the Whitefield memorial church. A park in the south of the city contains a spa, a chalybeate spring having been discovered in 1814. West of this, across the canal, are the remains (a gateway and some walls) of Llanthony Priory, a cell of the mother abbey in the vale of Ewyas, Monmouthshire, which in the reign of Edward IV. became the secondary establishment.

Gloucester possesses match works, foundries, marble and slate works, saw-mills, chemical works, rope works, flour-mills, manufactories of railway wagons, engines and agricultural implements, and boat and ship-building yards. Gloucester was declared a port in 1882. The Berkeley canal was opened in 1827. The Gloucester canal-harbour and that at Sharpness on the Severn are managed by a board. Principal imports are timber and grain; and exports, coal, salt, iron and bricks. The salmon and lamprey fisheries in the Severn are valuable. The tidal bore in the river attains its extreme height just below the city, and sometimes surmounts the weir in the western branch of the river, affecting the stream up to Tewkesbury lock. The parliamentary borough returns one member. The city is governed by a mayor, 10 aldermen and 30 councillors. Area, 2315 acres.

History.—The traditional existence of a British settlement at Gloucester (Cær Glow, Gleawecastre, Gleucestre) is not confirmed by any direct evidence, but Gloucester was the Roman municipality or *colonia* of *Glevum*, founded by Nerva (A.D. 96–98). Parts of the walls can be traced, and many remains and coins have been found, though inscriptions (as is frequently the case in Britain) are somewhat scarce. Its situation on a navigable river, and the foundation in 681 of the abbey of St Peter by Æthelred favoured the growth of the town; and before the Conquest Gloucester was a borough governed by a portreeve, with a castle which was frequently a royal residence, and a mint. The first overlord, Earl Godwine, was succeeded nearly a century later by Robert, earl of Gloucester. Henry II. granted the first charter in 1155 which gave the burgesses the same liberties as the citizens of London and Winchester, and a second charter of Henry II. gave them freedom of passage on the Severn. The first charter was confirmed in 1104 by Richard I. The privileges of the borough were greatly extended by the charter of John (1200) which gave freedom from toll throughout the kingdom and from pleading outside the borough. Subsequent charters were numerous. Gloucester was incorporated by Richard III. in 1483, the town being made a county in itself. This charter was confirmed in 1489 and 1510, and other charters of incorporation were received by Gloucester from Elizabeth in 1560, James I.

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in 1604, Charles I. in 1626 and Charles II. in 1672. The chartered port of Gloucester dates from 1580. Gloucester returned two members to parliament from 1275 to 1885, since when it has been represented by one member. A seven days' fair from the 24th of June was granted by Edward I. in 1302, and James I. licensed fairs on the 25th of March and the 17th of November, and fairs under these grants are still held on the first Saturday in April and July and the last Saturday in November. The fair now held on the 28th of September was granted to the abbey of St Peter in 1227. A market on Wednesday existed in the reign of John, was confirmed by charter in 1227 and is still held. The iron trade of Gloucester dates from before the Conquest, tanning was carried on before the reign of Richard III., pin-making and bell-founding were introduced in the 16th, and the long-existing coal trade became important in the 18th century. The cloth trade flourished from the 12th to the 16th century. The sea-borne trade in corn and wine existed before the reign of Richard I.

See W. H. Stevenson, *Records of the Corporation of Gloucester* (Gloucester, 1893); *Victoria County History, Gloucestershire*.

GLOUCESTER, a city and port of entry of Essex county, Massachusetts, U.S.A., beautifully situated on Cape Ann. Pop. (1890) 24,651; (1900) 26,121, of whom 8768 were foreign-born, including 4388 English Canadians, 800 French Canadians, 665 Irish, 653 Finns and 594 Portuguese; (1910 census) 24,398. Area, 53·6 sq. m. It is served by the Boston & Maine railway and by a steamboat line to Boston. The surface is sterile, naked and rugged, with bold, rocky ledges, and a most picturesque shore, the beauties of which have made it a favourite summer resort, much frequented by artists. Included within the city borders are several villages, of which the principal one, also known as Gloucester, has a deep and commodious harbour. Among the other villages, all summer resorts, are Annisquam, Bay View and Magnolia (so called from the *Magnolia glauca*, which grows wild there, this being probably its most northerly habitat); near Magnolia are Rafe's Chasm (60 ft. deep and 6-10 ft. wide) and Norman's Woe, the scene of the wreck of the "Hesperus" (which has only tradition as a basis), celebrated in Longfellow's poem. There is some slight general commerce—in 1909 the imports were valued at $130,008; the exports at $7853—but the principal business is fishing, and has been since early colonial days. The pursuit of cod, mackerel, herring and halibut fills up, with a winter coasting trade, the round of the year. In this industry Gloucester is the most important place in the United States; and is, indeed, one of the greatest fishing ports of the world. Most of the adult males are engaged in it. The "catch" was valued in 1805 at $3,212,985 and in 1905 at $3,377,330. The organization of the industry has undergone many transformations, but a notable feature is the general practice—especially since modern methods have necessitated larger vessels and more costly gear, and correspondingly greater capital—of profit-sharing; all the crew entering on that basis and not independently. There are some manufactures, chiefly connected with the fisheries. The total factory product in 1905 was valued at $6,920,084, of which the canning and preserving of fish represented $4,068,571, and glue represented $752,003. An industry of considerable importance is the quarrying of the beautiful, dark Cape Ann granite that underlies the city and all the environs.

Gloucester harbour was probably noted by Champlain (as La Beauport), and a temporary settlement was made by English fishermen sent out by the Dorchester Company of "merchant adventurers" in 1623–1625; some of these settlers returned to England in 1625, and others, with Roger Conant, the governor, removed to what is now Salem.[1] Permanent settlement antedated 1630 at least, and in 1642 the township was incorporated. From Gosnold's voyages onward the extraordinary abundance of cod about Cape Ann was well known, and though the first settlers characteristically enough tried to live by farming, they speedily became perforce a sea-faring folk. The active pursuit of fishing as an industry may be dated as beginning about 1700, for then began voyages beyond Cape Sable. Voyages to the Grand Banks began about 1741. Mackerel was a relatively unimportant catch until about 1821, and since then has been an important but unstable return; halibut fishing has been vigorously pursued since about 1836 and herring since about 1856. At the opening of the War of Independence Gloucester, whose fisheries then employed about 600 men, was second to Marblehead as a fishing-port. The war destroyed the fisheries, which steadily declined, reaching their lowest ebb from 1820 to 1840. Meanwhile foreign commerce had greatly expanded. The cod take had supported in the 18th century an extensive trade with Bilbao, Lisbon and the West Indies, and though changed in nature with the decline of the Bank fisheries after the War of Independence, it continued large through the first quarter of the 19th century. Throughout more than half of the same century also Gloucester carried on a varied and valuable trade with Surinam, hake being the chief article of export and molasses and sugar the principal imports. "India Square" remains, a memento of a bygone day. About 1850 the fisheries revived, especially after 1860, under the influence of better prices, improved methods and the discovery of new grounds, becoming again the chief economic interest; and since that time the village of Gloucester has changed from a picturesque hamlet to a fairly modern, though still quaint and somewhat foreign, settlement. Gasoline boats were introduced in 1900. Ship-building is another industry of the past. The first "schooner" was launched at Gloucester in 1713. From 1830 to 1907, 776 vessels and 5242 lives were lost in the fisheries; but the loss of life has been greatly reduced by the use of better vessels and by improved methods of fishing. Gloucester became a city in 1874.

Gloucester life has been celebrated in many books: among others in Elizabeth Stuart Phelps-Ward's *Singular Life* and *Old Maid's Paradise*, in Rudyard Kipling's *Captains Courageous*, and in James B. Connolly's *Out of Gloucester* (1902), *The Deep Sea's Toll* (1905), and *The Crested Seas* (1907).

See J. J. Babson, *History of the Town of Gloucester* (Gloucester, 1860; with *Notes and Additions*, on genealogy, 1876, 1891); and J. R. Pringle, *History of the Town and City of Gloucester* (Gloucester, 1892).

GLOUCESTER CITY, a city of Camden county, New Jersey, U.S.A., on the Delaware river, opposite Philadelphia. Pop. (1890) 6564; (1900) 6840, of whom 1094 were foreign-born; (1905) 8055; (1910) 9402. The city is served by the West Jersey & Seashore and the Atlantic City railways, and by ferry to Philadelphia, of which it is a residential suburb. Among its manufactures are incandescent gas-burners, rugs, cotton yarns, boats and drills. The municipality owns and operates the water works. It was near the site of Gloucester City that the Dutch in 1623 planted the short-lived colony of Fort Nassau, the first European settlement on the Delaware river, but it was not until after the arrival of English Quakers on the Delaware, in 1677, that a permanent settlement, at first called Axwamus, was established on the site of the present city. This was surveyed and laid out as a town in 1689. During the War of Independence the place was frequently occupied by troops, and a number of skirmishes were fought in its vicinity. The most noted of these was a successful attack upon a detachment of Hessians on the 25th of November 1777 by American troops under the command of General Lafayette. In 1868 Gloucester City was chartered as a city. In Camden county there is a township named GLOUCESTER (pop. in 1905, 2300), incorporated in 1798, and originally including the present township of Clementon and parts of the present townships of Waterford, Union and Winslow.

GLOUCESTERSHIRE, a county of the west midlands of England, bounded N. by Worcestershire, N.E. by Warwickshire, E. by Oxfordshire, S.E. by Berkshire and Wiltshire, S. by Somerset, and W. by Monmouth and Herefordshire. Its area is 1243·3 sq. m. The outline is very irregular, but three physical divisions are well marked—the hills, the vale and the forest. (1) The first (the eastern part of the county) lies among the

[1] According to some authorities (*e.g.* Pringle) a few settlers remained on the site of Gloucester, the permanent settlement thus dating from 1623 to 1625; of this, however, there is no proof, and the contrary opinion is the one generally held.

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uplands of the Cotteswold Hills (*q.v.*), whose westward face is a line of heights of an average elevation of 700 ft., but exceeding 1000 ft. at some points. This line bisects the county from S.W. to N.E. The watershed between the Thames and Severn valleys lies close to it, so that Gloucestershire includes Thames Head itself, in the south-east near Cirencester, and most of the upper feeders of the Thames which join the main stream, from narrow and picturesque valleys on the north. (2) The western Cotteswold line overlooks a rich valley, that of the lower Severn, usually spoken of as "The Vale," or, in two divisions, as the vale of Gloucester and the vale of Berkeley. This great river receives three famous tributaries during its course through Gloucestershire. Near Tewkesbury, on the northern border, the Avon joins it on the left and forms the county boundary for 4 m. This is the river known variously as the Upper, Worcestershire, Warwickshire, Stratford or Shakespeare's Avon, which descends a lovely pastoral valley through the counties named. It is to be distinguished from the Bristol Avon, which rises as an eastward flowing stream of the Cotteswolds, in the south-east of Gloucestershire, sweeps southward and westward through Wiltshire, pierces the hills through a narrow valley which becomes a wooded gorge where the Clifton suspension bridge crosses it below Bristol, and enters the Severn estuary at Avonmouth. For 17 m. from its mouth it forms the boundary between Gloucestershire and Somersetshire, and for 8 m. it is one of the most important commercial waterways in the kingdom, connecting the port of Bristol with the sea. The third great tributary of the Severn is the Wye. From its mouth in the estuary, 8 m. N. of that of the Bristol Avon, it forms the county boundary for 16 m. northward, and above this, over two short reaches of its beautiful winding course, it is again the boundary. (3) Between the Wye and the Severn lies a beautiful and historic tract, the forest of Dean, which, unlike the majority of English forests, maintains its ancient character. Gloucestershire has thus a share in the courses of five of the most famous of English rivers, and covers two of the most interesting physical districts in the country. The minor rivers of the county are never long. The vale is at no point within the county wider than 24 m., and so does not permit the formation of any considerable tributary to the Severn from the Dean Hills on the one hand or the Cotteswolds on the other. The Leadon rises east of Hereford, forms part of the north-western boundary, and joins the Severn near Gloucester, watering the vale of Gloucester, the northern part of the vale. In the southern part, the vale of Berkeley, the Stroudwater traverses a narrow, picturesque and populous valley, and the Little Avon flows past the town of Berkeley, joining the Severn estuary on the left. The Frome runs southward to the Bristol Avon at Bristol. The principal northern feeders of the Thames are the Churn (regarded by some as properly the headwater of the main river) rising in the Seven Springs, in the hills above Cheltenham, and forming the southern county boundary near its junction with the Thames at Cricklade; the Coln, a noteworthy trout-stream, joining above Lechlade, and the Lech (forming part of the eastern county boundary) joining below the same town; while from the east of the county there pass into Oxfordshire the Windrush and the Evenlode, much larger streams, rising among the bare uplands of the northern Cotteswolds.

Geology.—No county in England has a greater variety of geological formations. The pre-Cambrian is represented by the gneissic rocks at the south end of the Malvern Hills and by grits at Huntley. At Damory, Charfield and Woodford is a patch of greenstone, the cause of the upheaval of the Upper Silurian basin of Tortworth, in which are the oldest stratified rocks of the county. Of these the Upper Llandovery is the dominant stratum, exposed near Damory mill, Micklewood chase and Purton passage, wrapping round the base of May and Huntley hills, and reappearing in the vale of Woolhope. The Wenlock limestone is exposed at Falfield mill and Whitfield, and quarried for burning at May hill. The Lower Ludlow shales or mudstones are seen at Berkeley and Purton, where the upper part is probably Aymestry limestone. The series of sandy shales and sandstones which, as Downton sandstones and Ledbury shales, form a transition to the Old Red Sandstone are quarried at Dymock. The "Old Red" itself occurs at Berkeley, Tortworth Green, Thornbury, and several places in the Bristol coal-field, in anticlinal folds forming hills. It forms also the great basin extending from Ross to Monmouth and from Dymock to Mitcheldean, Abenhall, Blakency, &c., within which is the Carboniferous basin of the forest. It is cut through by the Wye from Monmouth to Woolaston. This formation is over 8000 ft. thick in the forest of Dean. The Bristol and Forest Carboniferous basins lie within the synclinal folds of the Old Red Sandstone; and though the seams of coal have not yet been correlated, they must have been once continuous, as further appears from the existence of an intermediate basin, recently pierced, under the Severn. The lower limestone shales are 500 ft. thick in the Bristol area and only 165 in the forest, richly fossiliferous and famous for their bone bed. The great marine series known as the Mountain Limestone, forming the walls of the grand gorges of the Wye and Avon, is over 2000 ft. thick in the latter district, but only 480 in the former, where it yields the brown hematite in pockets largely worked for iron even from Roman times. It is much used too for lime and road metal. Above this comes the Millstone Grit, well seen at Brandon hill, where it is 1000 ft. in thickness, though but 455 in the forest. On this rest the Coal Measures, consisting in the Bristol field of two great series, the lower 2000 ft. thick with 36 seams, the upper 3000 ft. with 22 seams, 9 of which reach 9 ft. in thickness. These two series are separated by over 1700 ft. of hard sandstone (Pennant Grit), containing only 5 coal-seams. In the Forest coal-field the whole series is not 3000 ft. thick, with but 15 seams. At Durdham Down a dolomitic conglomerate, of the age known as Keuper or Upper Trias, rests unconformably on the edges of the Palæozoic rocks, and is evidently a shore deposit, yielding dinosaurian remains. Above the Keuper clays come the Penarth beds, of which classical sections occur at Westbury, Aust, &c. The series consists of grey marls, black paper shales containing much pyrites, and a celebrated bone bed, the Cotham landscape marble, and the White Lias limestone, yielding *Ostrea Liassica* and *Cardium Rhaticum*. The district of Over Severn is mainly of Keuper marls, while the whole vale of Gloucester is occupied by the next formation, the Lias, a warm sea deposit of clays and clayey limestones, characterized by ammonites, belemnites and gigantic saurians. At its base is the insect-bearing limestone bed. The pastures producing Gloucester cheese are on the clays of the Lower Lias. The more calcareous Middle Lias or marlstone forms hillocks flanking the Oolite escarpment of the Cotteswolds, as at Wotton-under-Edge and Churchdown. The Cotteswolds consist of the great limestone series of the Lower Oolite. At the base is a transition series of sands, 30 to 40 ft. thick, well developed at Nailsworth and Frocester. Leckhampton hill is a typical section of the Lower Oolite, where the sands are capped by 40 ft. of a remarkable pea grit. Above this are 147 ft. of freestone, 5 ft. of oolitic marl, 34 ft. of upper freestone and 38 ft. of ragstone. The Painswick stone belongs to lower freestone. Resting on the Inferior Oolite, and dipping with it to S.E., is the "fuller's earth," a rubbly limestone about 100 ft. thick, throwing out many of the springs which form the head waters of the Thames. Then comes the Great or Bath Oolite, at the base of which are the Stonesfield "slate" beds, quarried for roofing, paling, &c., at Sevenhampton and elsewhere. From the Great Oolite Minchinhampton stone is obtained, and at the top is about 40 ft. of flaggy Oolite with beds of clay known as the Forest Marble. Ripple marks are abundant on the flags; in fact all the Oolites seem to have been near shore or in shallow water, much of the limestone consisting of comminuted coral. The highest bed of the Lower Oolite is the Cornbrash, about 40 ft. of rubble, productive in corn, forming a narrow belt from Siddington to Fairford. Near the latter town and Lechlade is a small tract of blue Oxford Clay of the Middle Oolite. The county has no higher Secondary or Tertiary rocks; but the Quaternary series is represented by much northern drift gravel in the vale and Over Severn, by accumulations of Oolitic detritus, including post-Glacial extinct mammalian remains on the flanks of the Cotteswolds, and by submerged forests extending from Sharpness to Gloucester.

Agriculture.—The climate is mild. Between three-quarters and seven-eighths of the total area is under cultivation, and of this some four-sevenths is in permanent pasture. Wheat is the chief grain crop. In the vale the deep rich black and red loamy soil is well adapted for pasturage, and a moist mild climate favours the growth of grasses and root crops. The cattle, save on the frontier of Herefordshire, are mostly shorthorns, of which many are fed for distant markets, and many reared and kept for dairy purposes. The rich grazing tract of the vale of Berkeley produces the famous "double Gloucester" cheeses, and the vale in general has long been celebrated for cheese and butter. The vale of Gloucester is the chief grain-growing district. Turnips, &c., occupy about three-fourths of the green crop acreage, potatoes occupying only about a twelfth. A feature of the county is its apple and pear orchards, chiefly for the manufacture of cider and perry, which are attached to nearly every farm. The Cotteswold district is comparatively barren except in the valleys, but it has been famous since the 15th century for the breed of sheep named after it. Oats and barley are here the chief crops.

Other Industries.—The manufacture of woollen cloth followed upon the early success in sheep-farming among the Cotteswolds. This industry is not confined to the hill country or even to Gloucestershire itself in the west of England. The description of cloth principally manufactured is broadcloth, dressed with teazles to produce a short

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close nap on the face, and made of all shades of colour, but chiefly black, blue and scarlet. The principal centre of the industry lies in and at the foot of the south-western Cotteswolds. Stroud is the centre for a number of manufacturing villages, and south-west of this are Wotton-under-Edge, North Nibley and others. Machinery and tools, paper, furniture, pottery and glass are also produced. Ironstone, clay, limestone and sandstone are worked, and the coal-fields in the forest of Dean are important. Of less extent is the field in the south of the county, N.E. of Bristol. Strontium sulphate is dug from shallow pits in the red marl of Gloucestershire and Somersetshire.

Communications.—Railway communications are provided principally by the Great Western and Midland companies. Of the Great Western lines, the main line serves Bristol from London. It divides at Bristol, one section taking the south-western counties, another South Wales, crossing beneath the Severn by the Severn Tunnel, 4¼ m. in length, a remarkable engineering work. A more direct route, by this tunnel, between London and South Wales, is provided by a line from Wootton Bassett on the main line, running north of Bristol by Badminton and Chipping Sodbury. Other Great Western lines are that from Swindon on the main line, by the Stroud valley to Gloucester, crossing the Severn there, and continuing by the right bank of the river into Wales, with branches north-west into Herefordshire; the Oxford and Worcester trunk line, crossing the north-east of the county, connected with Cheltenham and Gloucester by a branch through the Cotteswolds at Chipping Norton Junction; and the line from Cheltenham by Broadway to Honeybourne. The west-and-north line of the Midland railway follows the vale from Bristol by Gloucester and Cheltenham with a branch into the forest of Dean by Berkeley, crossing the Severn at Sharpness by a great bridge 1387 yds. in length, with 22 arches. The coal-fields of the forest of Dean are served by several branch lines. In the north, Tewkesbury is served by a Midland branch from Ashchurch to Malvern. The Midland and South-western Junction railway runs east and south from Cheltenham by Cirencester, affording communication with the south of England. The East Gloucester line of the Great Western from Oxford terminates at Fairford. The Thames and Severn canal, rising to a summit level in the tunnel through the Cotteswolds at Sapperton, is continued from Wallbridge (Stroud) by the Stroudwater canal, and gives communication between the two great rivers. The Berkeley Ship Canal (1¼ m.) connects the port of Gloucester with its outport of Sharpness on the Severn.

Population and Administration.—The area of the ancient county is 795,709 acres, with a population in 1891 of 599,947 and in 1901 of 634,729. The area of the administrative county is 805,482 acres. The county contains 28 hundreds. The municipal boroughs are—Bristol, a city and county borough (pop. 328,945); Cheltenham (49,439); Gloucester, a city and county borough (47,955); Tewkesbury (5419). The other urban districts are—Wye (1096), Chepstow (3806), Circencester (7536), Coleford (2541), Kingswood, on the eastern outskirts of Bristol (11,961), Nailsworth (3028), Newnham (1184), Stow-on-the-Wold (1386), Stroud (9153), Tetbury (1989), Westbury-on-Severn (1866). The number of small ancient market towns is large, especially in the southern part of the vale, on the outskirts of the forest, and among the foot hills of the wolds. Those in the forest district are mostly connected with the coal trade, such as Lydney (3559), besides Awre and Coleford; and, to the north, besides Newnham, Cinderford and Mitcheldean. South from Stroud there are Minchinhampton (3737) and Nailsworth; near the south-eastern boundary Tetbury and Marshfield; Stonehouse (2183), Dursley (2372), Wotton-under-Edge (2992) and Chipping Sodbury along the western line of the hills; and between them and the Severn, Berkeley and Thornbury (2594). Among the uplands of the Cotteswolds there are no towns, and villages are few, but in the east of the county, in the upper Thames basin, there are, besides Cirencester, Fairford on the Coln and Lechlade, close to the head of the navigation on the Thames itself. Far up in the Lech valley, remote from railway communication, is Northleach, once a great posting station on the Oxford and Cheltenham road. In the north-east are Stow-on-the-Wold, standing high, and Moreton-in-the-Marsh near the headwaters of the Evenlode. In a northern prolongation of the county, almost detached, is Chipping Campden. Winchcomb (1609) lies 6 m. N.E. of Cheltenham. In the north-west, Newent (2485) is the only considerable town. Gloucestershire is in the Oxford circuit, and assizes are held at Gloucester. It has one court of quarter sessions, and is divided into 24 petty sessional divisions. The boroughs of Bristol, Gloucester and Tewkesbury have separate commissions of the peace and courts of quarter sessions. There are 359 civil parishes. Gloucestershire is principally in the diocese of Gloucester, but part is in that of Bristol, and small parts in those of Worcester and Oxford. There are 408 ecclesiastical parishes or districts wholly or in part within the county. There are five parliamentary divisions, namely, Tewkesbury or northern, Cirencester or eastern, Stroud or mid, Thornbury or southern, and Forest of Dean, each returning one member. The county also includes the boroughs of Gloucester and Cheltenham, each returning one member; and the greater part of the borough of Bristol, which returns four members.

History.—The English conquest of the Severn valley began in 577 with the victory of Ceawlin at Deorham, followed by the capture of Cirencester, Gloucester and Bath. The Hwiccas who occupied the district were a West Saxon tribe, but their territory had become a dependency of Mercia in the 7th century, and was not brought under West Saxon dominion until the 9th century. No important settlements were made by the Danes in the district. Gloucestershire probably originated as a shire in the 10th century, and is mentioned by name in the Anglo-Saxon Chronicle in 1016. Towards the close of the 11th century the boundaries were readjusted to include Winchcomb, hitherto a county by itself, and at the same time the forest district between the Wye and the Severn was added to Gloucestershire. The divisions of the county for a long time remained very unsettled, and the thirty-nine hundreds mentioned in the Domesday Survey and the thirty-one hundreds of the Hundred Rolls of 1274 differ very widely in name and extent both from each other and from the twenty-eight hundreds of the present day.

Gloucestershire formed part of Harold's earldom at the time of the Norman invasion, but it offered slight resistance to the Conqueror. In the wars of Stephen's reign the cause of the empress Maud was supported by Robert of Gloucester who had rebuilt the castle at Bristol, and the castles at Gloucester and Cirencester were also garrisoned on her behalf. In the barons' war of the reign of Henry III. Gloucester was garrisoned for Simon de Montfort, but was captured by Prince Edward in 1265, in which year de Montfort was slain at Evesham. Bristol and Gloucester actively supported the Yorkist cause during the Wars of the Roses. In the religious struggles of the 16th century Gloucester showed strong Protestant sympathy, and in the reign of Mary Bishop Hooper was sent to Gloucester to be burnt as a warning to the county, while the same Puritan leanings induced the county to support the Parliamentary cause in the civil war of the 17th century. In 1643 Bristol and Cirencester were captured by the Royalists, but the latter was recovered in the same year and Bristol in 1645. Gloucester was garrisoned for the parliament throughout the struggle.

On the subdivision of the Mercian diocese in 680 the greater part of modern Gloucestershire was included in the diocese of Worcester, and shortly after the Conquest constituted the archdeaconry of Gloucester, which in 1290 comprised the deaneries of Campden, Stow, Cirencester, Fairford, Winchcombe, Stonehouse, Hawkesbury, Bitton, Bristol, Dursley and Gloucester. The district west of the Severn, with the exception of a few parishes in the deaneries of Ross and Staunton, constituted the deanery of the forest within the archdeaconry and diocese of Hereford. In 1535 the deanery of Bitton had been absorbed in that of Hawkesbury. In 1541 the diocese of Gloucester was created, its boundaries being identical with those of the county. On the erection of Bristol to a see in 1542 the deanery of Bristol was transferred from Gloucester to that diocese. In 1836 the sees of Gloucester and Bristol were united; the archdeaconry of Bristol was created out of the deaneries of Bristol, Cirencester, Fairford and Hawkesbury; and the deanery of the forest was transferred to the archdeaconry of Gloucester. In 1882 the archdeaconry of Cirencester was constituted to include the deaneries of Campden, Stow, Northleach north and south, Fairford and Cirencester. In 1897 the diocese of Bristol was recreated, and included the deaneries of Bristol, Stapleton and Bitton.

After the Conquest very extensive lands and privileges in the county were acquired by the church, the abbey of Cirencester alone holding seven hundreds at fee-farm, and the estates of the principal lay-tenants were for the most part outlying parcels of baronies having their "caput" in other counties. The large estates held by William Fitz Osbern, earl of Hereford, escheated to the crown on the rebellion of his son Earl Roger in 1074–1075. The Berkeleys have held lands in Gloucestershire from the time of the Domesday Survey, and the families of Basset, Tracy, Clifton, Dennis and Poyntz have figured prominently in the annals of the county. Gilbert de Clare, earl of Gloucester, and Richard of Cornwall claimed extensive lands and privileges in the shire in the 13th century, and Simon de Montfort owned Minsterworth and Rodley.

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Bristol was made a county in 1425, and in 1483 Richard III. created Gloucester an independent county, adding to it the hundreds of Dudston and King's Barton. The latter were reunited to Gloucestershire in 1673, but the cities of Bristol and Gloucester continued to rank as independent counties, with separate jurisdiction, county rate and assizes. The chief officer of the forest of Dean was the warden, who was generally also constable of St Briavel Castle. The first justice-seat for the forest was held at Gloucester Castle in 1282, the last in 1635. The hundred of the duchy of Lancaster is within the jurisdiction of the duchy of Lancaster for certain purposes.

The physical characteristics of the three natural divisions of Gloucestershire have given rise in each to a special industry, as already indicated. The forest district, until the development of the Sussex mines in the 16th century, was the chief iron-producing area of the kingdom, the mines having been worked in Roman times, while the abundance of timber gave rise to numerous tanneries and to an important ship-building trade. The hill district, besides fostering agricultural pursuits, gradually absorbed the woollen trade from the big towns, which now devoted themselves almost entirely to foreign commerce. Silk-weaving was introduced in the 17th century, and was especially prosperous in the Stroud valley. The abundance of clay and building-stone in the county gave rise to considerable manufactures of brick, tiles and pottery. Numerous minor industries sprang up in the 17th and 18th centuries, such as flax-growing and the manufacture of pins, buttons, lace, stockings, rope and sailcloth.

Gloucestershire was first represented in parliament in 1290, when it returned two members. Bristol and Gloucester acquired representation in 1295, Cirencester in 1572 and Tewkesbury in 1620. Under the Reform Act of 1832 the county returned four members in two divisions; Bristol, Gloucester, Cirencester, Stroud and Tewkesbury returned two members each, and Cheltenham returned one member. The act of 1868 reduced the representation of Cirencester and Tewkesbury to one member each.

Antiquities.—The cathedrals of Gloucester and Bristol, the magnificent abbey church of Tewkesbury, and the church of Cirencester with its great Perpendicular porch, are described under their separate headings. Of the abbey of Hayles near Winchcomb, founded by Richard, earl of Cornwall, in 1246, little more than the foundations are left, but these have been excavated with great care, and interesting fragments have been brought to light. Most of the old market towns have fine parish churches. At Deerhurst near Tewkesbury, and Cleeve near Cheltenham, there are churches of special interest on account of the pre-Norman work they retain. The Perpendicular church at Lechlade is unusually perfect; and that at Fairford was built (*c.* 1500), according to tradition, to contain the remarkable series of stained-glass windows which are said to have been brought from the Netherlands. These are, however, adjudged to be of English workmanship, and are one of the finest series in the country. The great Decorated Calcot Barn is an interesting relic of the monastery of Kingswood near Tetbury. The castle at Berkeley is a splendid example of a feudal stronghold. Thornbury Castle, in the same district, is a fine Tudor ruin, the pretensions of which evoked the jealousy of Cardinal Wolsey against its builder, Edward Stafford, duke of Buckingham, who was beheaded in 1521. Near Cheltenham is the fine 15th-century mansion of Southam de la Bere, of timber and stone. Memorials of the de la Bere family appear in the church at Cleeve. The mansion contains a tiled floor from Hayles Abbey. Near Winchcomb is Sudeley Castle, dating from the 15th century, but the inhabited portion is chiefly Elizabethan. The chapel is the burial place of Queen Catherine Parr. At Great Badminton is the mansion and vast domain of the Beauforts (formerly of the Botelers and others), on the south-eastern boundary of the county.

See *Victoria County History, Gloucestershire*; Sir R. Atkyns, *The Ancient and Present State of Gloucestershire* (London, 1712; 2nd ed., London, 1768); Samuel Rudder, *A New History of Gloucestershire* (Cirencester, 1779); Ralph Bigland, *Historical, Monumental and Genealogical Collections relative to the County of Gloucester* (2 vols., London, 1791); Thomas Rudge, *The History of the County of Gloucester* (2 vols., Gloucester, 1803); T. D. Fosbroke *Abstract of Records and Manuscripts respecting the County of Gloucestershire formed into a History* (2 vols., Gloucester, 1807); *Legends, Tales and Songs in the Dialect of the Peasantry of Gloucestershire* (London, 1876); J. D. Robertson, *Glossary of Dialect and Archaic Words of Gloucester* (London, 1890); W. Bazeley and F. A. Hyett, *Bibliographers' Manual of Gloucestershire* (3 vols., London, 1895–1897); W. H. Hutton, *By Thames and Cotswold* (London, 1903). See also *Transactions of the Bristol and Gloucestershire Archaeological Society.*

GLOVE (O. Eng. *glof*, perhaps connected with Gothic *lofa*, the palm of the hand), a covering for the hand, commonly with a separate sheath for each finger.

The use of gloves is of high antiquity, and apparently was known even to the pre-historic cave dwellers. In Homer Laërtes is described as wearing gloves (χειρίδας ἐπὶ χερσί) while walking in his garden (*Od.* xxiv. 230). Herodotus (vi. 72) tells how Leotychides filled a glove (χειρίς) with the money he received as a bribe, and Xenophon (*Cyrop.* viii. 8. 17) records that the Persians wore fur gloves having separate sheaths for the fingers (χειρίδας βασίας καὶ δακτυλήθρας). Among the Romans also there are occasional references to the use of gloves. According to the younger Pliny (*Ep.* iii. 5. 15) the secretary whom his uncle had with him when ascending Vesuvius wore gloves (*chirotecae*) so that he might not be impeded in his work by the cold, and Varro (*R. R.* i. 55.1) remarks that olives gathered with the bare fingers are better than those gathered with gloves (*digitabula* or *digitalia*). In the northern countries the general use of gloves would be more natural than in the south, and it is not without significance that the most common medieval Latin word for glove (*guantus* or *wantus*, Mod. Fr. *gant*) is of Teutonic origin (O. H. Ger. *want*). Thus in the life of Columbanus by Jonas, abbot of Bobbio (d. *c.* 665), gloves for protecting the hands in doing manual labour are spoken of as *tegumenta manuum quae Galli wantos vocant.* Among the Germans and Scandinavians, in the 8th and 9th centuries, the use of gloves, fingerless at first, would seem to have been all but universal; and in the case of kings, prelates and nobles they often elaborately embroidered and bejewelled. This was more particularly the case with the gloves which formed part of the pontifical vestments(see below). In war and in the chase gloves of leather, or with the backs armoured with articulated iron plates, were early worn; yet in the Bayeux tapestry the warriors on either side fight ungloved. The fact that gloves are not represented by contemporary artists does not prove their non-existence, since this might easily be an omission due to lack of observation or of skill; but, so far as the records go, there is no evidence to prove that gloves were in general use in England until the 13th century. It was in this century that ladies began to wear gloves as ornaments; they were of linen and sometimes reached to the elbow. It was, however, not till the 16th century that they reached their greatest elaboration, when Queen Elizabeth set the fashion for, wearing them richly embroidered and jewelled.

The symbolic sense of the middle ages early gave to the use of gloves a special significance. Their liturgical use by the Church is dealt with below (*Pontifical gloves*); this was imitated from the usage of civil life. Embroidered and jewelled gloves formed part of the *insignia* of the emperors, and also, and that quite early, of the kings of England. Thus Matthew of Paris, in recording the burial of Henry II. in 1189, mentions that he was buried in his coronation robes, with a golden crown on his head and gloves on his hands. Gloves were also found on the hands of King John when his tomb was opened in 1797, and on those of King Edward I. when his tomb was opened in 1774.

See W. B. Redfern, *Royal and Historic Gloves and Shoes*, with numerous examples.

Gages.—Of the symbolical uses of the glove one of the most widespread and important during the middle ages was the practice of tendering a folded glove as a gage for waging one's law. The origin of this custom is probably not far to seek. The promise to fulfil a judgment of a court of law, a promise secured by the delivery of a *wed* or gage, is one of the oldest, if not the very oldest, of all enforceable contracts. This gage was originally

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a chattel of value, which had to be deposited at once by the defendant as security into his adversary's hand; and that the glove became the formal symbol of such deposit is doubtless due to its being the most convenient loose object for the purpose. The custom survived after the contract with the *vadium, wed* or gage had been superseded by the contract with pledges (personal sureties). In the rules of procedure of a baronial court of the 14th century we find: "He shall wage his law with his folded glove (*de son gaunt plyee*) and shall deliver it into the hand of the other, and then take his glove back and find pledges for his law." The delivery of the glove had, in fact, become a mere ceremony, because the defendant had his sureties close at hand.[1]

Associated with this custom was the use of the glove in the wager of battle (*vadium in duello*). The glove here was thrown down by the defendant in open court as security that he would defend his cause in arms; the accuser by picking it up accepted the challenge (see WAGER). This form is still prescribed for the challenge of the king's champion at the coronation of English sovereigns, and was actually followed at that of George IV. (see CHAMPION). The phrase "to throw down the gauntlet" is still in common use of any challenge.

Pledges of Service.—The use of the glove as a pledge of fulfilment is exemplified also by the not infrequent practice of enfeoffing vassals by investing them with the glove; similarly the emperors symbolized by the bestowal of a glove the concession of the right to found a town or to establish markets, mints and the like; the "hands" in the armorial bearings of certain German towns are really gloves, reminiscent of this investiture. Conversely, fiefs were held by the render of presenting gloves to the sovereign. Thus the manor of Little Holland in Essex was held in Queen Elizabeth's time by the service of one knight's fee and the rent of a pair of gloves turned up with hare's skin (Blount's *Tenures*, ed. Beckwith, p. 130). The most notable instance in England, however, is the grand serjeanty of finding for the king a glove for his right hand on coronation day, and supporting his right arm as long as he holds the sceptre. The right to perform this "honourable service" was originally granted by William the Conqueror to Bertram de Verdun, together with the manor of Fernham (Farnham Royal) in Buckinghamshire. The male descendants of Bertram performed this serjeanty at the coronations until the death of Theobald de Verdun in 1316, when the right passed, with the manor of Farnham, to Thomas Lord Furnival by his marriage with the heiress Joan. His son William Lord Furnival performed the ceremony at the coronation of Richard II. He died in 1383, and his daughter and heiress Jean de Furnival having married Sir Thomas Nevill, Lord Furnival in her right, the latter performed the ceremony at the coronation of Henry IV. His heiress Maud married Sir John Talbot (1st earl of Shrewsbury) who, as Lord Furnival, presented the glove embroidered with the arms of Verdun at the coronation of Henry V. When in 1541 Francis earl of Shrewsbury exchanged the manor of Farnham with King Henry VIII. for the site and precincts of the priory of Worksop in Nottinghamshire he stipulated that the right to perform this serjeanty should be reserved to him, and the king accordingly transferred the obligation from Farnham to Worksop. On the 3rd of April 1838 the manor of Worksop was sold to the duke of Newcastle and with it the right to perform the service, which had hitherto always been carried out by a descendant of Bertram de Verdun. At the coronation of King Edward VII. the earl of Shrewsbury disputed the duke of Newcastle's right, on the ground that the serjeanty was attached not to the manor but to the priory lands at Worksop, and that the latter had been subdivided by sale so that no single person was entitled to perform the ceremony and the right had therefore lapsed. His petition for a regrant to himself as lineal heir of Bertram de Verdun, however, was disallowed by the court of claims, and the serjeanty was declared to be attached to the manor of Worksop (G. Woods Wollaston, *Coronation Claims*, London, 1903, p. 133).

Presentations.—From the ceremonial and symbolic use of gloves the transition was easy to the custom which grew up of presenting them to persons of distinction on special occasions. When Queen Elizabeth visited Cambridge in 1578 the vice-chancellor offered her a "paire of gloves, perfumed and garnished with embroiderie and goldsmithe's wourke, price 6os.," and at the visit of James I. there in 1615 the mayor and corporation of the town "delivered His Majesty a fair pair of perfumed gloves with gold laces." It was formerly the custom in England for bishops at their consecrations to make presents of gloves to those who came to their consecration dinners and others, but this gift became such a burden to them that by an order in council in 1678 it was commuted for the payment of a sum of £50 towards the rebuilding of St Paul's. Serjeants at law, on their appointment, were given a pair of gloves containing a sum of money which was termed "regards"; this custom is recorded as early as 1495, when according to the *Black Book* of Lincoln's Inn each of the new serjeants received £6, 13s. 4d. and a pair of gloves costing 4d., and it persisted to a late period. At one time it was the practice for a prisoner who pleaded the king's pardon on his discharge to present the judges with gloves by way of a fee. Glove-silver, according to Jacob's *Law Dictionary*, was a name used of extraordinary rewards formerly given to officers of courts, &c., or of money given by the sheriff of a county in which no offenders were left for execution to the clerk of assize and judge's officers; the explanation of the term is that the glove given as a perquisite or fee was in some cases lined with money to increase its value, and thus came to stand for money ostensibly given in lieu of gloves. It is still the custom in the United Kingdom to present a pair of white gloves to a judge or magistrate who when he takes his seat for criminal business at the appointed time finds no cases for trial. By ancient custom judges are not allowed to wear gloves while actually sitting on the bench, and a witness taking the oath must remove the glove from the hand that holds the book. (See J. W. Norton-Kyshe, *The Law and Customs relating to Gloves*, London, 1901.)

Pontifical gloves (Lat. *chirotheca*) are liturgical ornaments peculiar to the Western Church and proper only to the pope, the cardinals and bishops, though the right to wear them is often granted by the Holy See to abbots, cathedral dignitaries and other prelates, as in the case of the other episcopal insignia. According to the present use the gloves are of silk and of the liturgical colour of the day, the edge of the opening ornamented with a narrow band of embroidery or the like, and the middle of the back with a cross. They may be worn only at the celebration of mass (except masses for the dead). In vesting, the gloves are put on the bishop immediately after the dalmatic, the right hand one by the deacon, the other by the subdeacon. They are worn only until the ablution before the canon of the mass, after which they may not again be put on.

At the consecration of a bishop the consecrating prelate puts the gloves on the new bishop immediately after the mitre, with a prayer that his hands may be kept pure, so that the sacrifice he offers may be as acceptable as the gift of venison which Jacob, his hands wrapped in the skin of kids, brought to Isaac. This symbolism (as in the case of the other vestments) is, however, of late growth. The liturgical use of gloves itself cannot, according to Father Braun, be traced beyond the beginning of the 10th century, and their introduction was due, perhaps to the simple desire to keep the hands clean for the holy mysteries, but more probably merely as part of the increasing pomp with which the Carolingian bishops were surrounding themselves. From the Frankish kingdom the custom spread to Rome, where liturgical gloves are first heard of in the earlier half of the 11th century. The earliest authentic instance of the right to wear them being granted to a non-bishop is a bull of Alexander IV. in 1070, conceding this to the abbot of S. Pietro in Cielo d' Oro.

During the middle ages the occasions on which pontifical gloves (often *wanti*, *guanti*, and sometimes *manicae* in the inventories)

[1] F. W. Maitland and W. P. Baildon, *The Court Baron* (Selden Society, London, 1891), p. 17. Maitland wrongly translates *gaunt plyee* as "twisted glove, adding" why it should be twisted I cannot say." An earlier instance of the delivery of a folded glove as gage is quoted from the 13th-century Anglo-Norman poem known as *The Song of Dermot and the Earl* (ed. G. H. Orpen, Oxford, 1892) in J. H. Round's *Commune of London*, p. 153.

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were worn were not so carefully defined as now, the use varying in different churches. Nor were the liturgical colours prescribed. The most characteristic feature of the medieval pontifical glove was the ornament (*tasellus*, *fibula*, *monile*, *paratura*) set in the middle of the back of the glove. This was usually a small plaque of metal, enamelled or jewelled, generally round, but sometimes square or irregular in shape. Sometimes embroidery was substituted; still more rarely the whole glove was covered, even to the fingers, with elaborate needlework designs.

Liturgical gloves have not been worn by Anglican bishops since the Reformation, though they are occasionally represented as wearing them on their effigies.

See J. Braun, S.J., *Die liturgische Gewandung* (Freiburg im Breisgau, 1907), pp. 359-382, where many beautiful examples are illustrated.

Manufacture of Gloves.—Three countries, according to an old proverb, contribute to the making of a good glove—Spain dressing the leather, France cutting it and England sewing it. But the manufacture of gloves was not introduced into Great Britain till the 10th or 11th century. The incorporation of glovers of Perth was chartered in 1165, and in 1190 a glovemakers' gild was formed in France, with the object of regulating the trade and ensuring good workmanship. The glovers of London in 1349 framed their ordinances and had them approved by the corporation, the city regulations at that time fixing the price of a pair of common sheepskin gloves at 1d. In 1464, when the gild received armorial bearings, they do not seem to have been very strong, but apparently their position improved subsequently and in 1638 they were incorporated as a new company. In 1580 it is recorded that both French and Spanish gloves were on sale in London shops, and in 1661 a company of glovers was incorporated at Worcester, which still remains an important seat of the English glove industry. In America the manufacture of gloves dates from about 1760, when Sir William Johnson brought over several families of glove makers from Perth; these settled in Fulton county, New York, which is now the largest seat of the glove trade in the United States.

Gloves may be divided into two distinct categories, according as these are made of leather or are woven or knitted from fibres such as silk, wool or cotton. The manufacture of the latter kinds is a branch of the hosiery industry. For leather gloves skins of various animals are employed—deer, calves, sheep and lambs, goats and kids, &c.—but kids have had nothing to do with the production of many of the "kid gloves" of commerce. The skins are prepared and dressed by special processes (see LEATHER) before going to the glove-maker to be cut. Owing to the elastic character of the material the cutting is a delicate operation, and long practice is required before a man becomes expert at it. Formerly it was done by shears, the workmen following an outline marked on the leather, but now steel dies are universally employed not only for the bodies of the gloves but also for the thumb-pieces and fourchettes or sides of the fingers. When hand sewing is employed the pieces to be sewn together are placed between a pair of jaws, the holding edges of which are serrated with fine saw-teeth, and the sewer by passing the needle forwards and backwards between each of these teeth secures neat uniform stitching. But sewing machines are now widely employed on the work. The labour of making a glove is much subdivided, different operators sewing different pieces, and others again embroidering the back, forming the button-holes, attaching the buttons, &c. After the gloves are completed, they undergo the process of "laying off," in which they are drawn over metal forms, shaped like a hand and heated internally by steam; in this way they are finally smoothed and shaped before being wrapped in paper and packed in boxes.

Gloves made of thin indiarubber or of white cotton are worn by some surgeons while performing operations, on account of the ease with which they can be thoroughly sterilized.

GLOVER, SIR JOHN HAWLEY (1829–1885), captain in the British navy, entered the service in 1841 and passed his examination as lieutenant in 1849, but did not receive a commission till May 1851. He served on various stations, and was wounded severely in an action with the Burmese at Donabew (4th February 1853). But his reputation was not gained at sea and as a naval officer, but on shore and as an administrative official in the colonies. During his years of service as lieutenant in the navy he had had considerable experience of the coast of Africa, and had taken part in the expedition of Dr W. B. Baikie (1824–1864) up the Niger. On the 21st of April 1863 he was appointed administrator of the government of Lagos, and in that capacity, or as colonial secretary, he remained there till 1872. During this period he had been much employed in repelling the marauding incursions of the Ashantis. When the Ashanti war broke out in 1873, Captain Glover undertook the hazardous and doubtful task of organizing the native tribes, whom hatred of the Ashantis might be expected to make favourable to the British authorities—to the extent at least to which their fears would allow them to act. His services were accepted, and in September of 1873 he landed at Cape Coast, and, after forming a small trustworthy force of Hausa, marched to Accra. His influence sufficed to gather a numerous native force, but neither he nor anybody else could overcome their abject terror of the ferocious Ashantis to the extent of making them fight. In January 1874 Captain Glover was able to render some assistance in the taking of Kumasi, but it was at the head of a Hausa force. His services were acknowledged by the thanks of parliament and by his creation as G.C.M.G. In 1875 he was appointed governor of Newfoundland and held the post till 1881, when he was transferred to the Leeward Islands. He returned to Newfoundland in 1883, and died in London on the 30th September 1885.

Lady Glover's *Life* of her husband appeared in 1897.

GLOVER, RICHARD (1712–1785), English poet, son of Richard Glover, a Hamburg merchant, was born in London in 1712. He was educated at Cheam in Surrey. While there he wrote in his sixteenth year a poem to the memory of Sir Isaac Newton, which was prefixed by Dr Pemberton to his *View of Newton's Philosophy*, published in 1728. In 1737 he published an epic poem in praise of liberty, *Leonidas*, which was thought to have a special reference to the politics of the time; and being warmly commended by the prince of Wales and his court, it soon passed through several editions. In 1739 Glover published a poem entitled *London, or the Progress of Commerce*; and in the same year, with a view to exciting the nation against the Spaniards, he wrote a spirited ballad, *Hosier's Ghost*, very popular in its day. He was also the author of two tragedies, *Boadicea* (1753) and *Medea* (1761), written in close imitation of Greek models. The success of Glover's *Leonidas* led him to take considerable interest in politics, and in 1761 he entered parliament as member for Weymouth. He died on the 25th of November 1785. The *Athenaid*, an epic in thirty books, was published in 1787, and his diary, entitled *Memoirs of a distinguished literary and political Character from 1742 to 1757*, appeared in 1813. Glover was one of the reputed authors of *Junius*; but his claims—which were advocated in an *Inquiry concerning the author of the Letters of Junius* (1815), by R. Duppa—rest on very slight grounds.

GLOVERSVILLE, a city of Fulton county, New York, U.S.A., at the foot-hills of the Adirondacks, about 55 m. N.W. of Albany. Pop. (1890) 13,864; (1900) 18,349, of whom 2542 were foreign-born; (1910 census) 20,642. It is served by the Fonda, Johnstown & Gloversville railway (connecting at Fonda, about 9 m. distant, with the New York Central), and by electric lines connecting with Johnstown, Amsterdam and Schenectady. The city has a public library (26,000 volumes in 1908), the Nathan Littauer memorial hospital, a state armoury and a fine government building. Gloversville is the principal glove-manufacturing centre in the United States. In 1900 Fulton county produced more than 57% and Gloversville 38·8%, of all the leather gloves and mittens made in the United States; in 1905 Gloversville produced 29·9% of the leather gloves and mittens made in the United States, its products being valued at $5,302,196. Gloversville has more than a score of tanneries and leather-finishing factories, and manufactures fur goods. In 1905 the city's total factory product was valued at $9,340,763. The extraordinary localization of the glove-making industry in Gloversville, Johnstown and other parts of Fulton county, is an incident of much interest in the economic history of the United States. The industry seems to have had its origin among a colony of Perthshire families, including many glove-makers, who were settled in this region by Sir William Johnson about 1760. For many years the entire product seems to have been disposed of in the neighbourhood, but about 1800 the goods began to find more distant markets, and by 1825 the industry was firmly established on a prosperous

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basis, the trade being handed down from father to son. An interesting phase of the development is that, in addition to the factory work, a large amount of the industry is in the hands of "home workers" both in the town and country districts. Gloversville, settled originally about 1770, was known for some time as Stump City, its present name being adopted in 1832. It was incorporated as a village in 1851 and was chartered as a city in 1890.

GLOW-WORM, the popular name of the wingless female of the beetle *Lampyris noctiluca*, whose power of emitting light has been familiar for many centuries. The luminous organs of the glow-worm consist of cells similar to those of the fat-body, grouped into paired masses in the ventral region of the hinder abdominal segments. The light given out by the wingless female insect is believed to serve as an attraction to the flying male, whose luminous organs remain in a rudimentary condition. The common glow-worm is a widespread European and Siberian insect, generally distributed in England and ranging in Scotland northwards to the Tay, but unknown in Ireland. Exotic species of *Lampyris* are similarly luminous, and light-giving organs are present in many genera of the family *Lampyridae* from various parts of the world. Frequently—as in the south European *Luciola italica*—both sexes of the beetle are provided with wings, and both male and female emit light. These luminous, winged Lampyrids are generally known as "fire-flies." In correspondence with their power of emitting light, the insects are nocturnal in habit.

Elongate centipedes of the family *Geophilidae*, certain species of which are luminous, are sometimes mistaken for the true glow-worm.

GLOXINIA, a charming decorative plant, botanically a species of *Sinningia* (*S. speciosa*), a member of the natural order Gesneraceae and a native of Brazil. The species has given rise under cultivation to numerous forms showing a wonderful variety of colour, and hybrid forms have also been obtained between these and other species of *Sinningia*. A good strain of seed will produce many superb and charmingly coloured varieties, and if sown early in spring, in a temperature of 65° at night, they may be shifted on into 6-in. pots, and in these may be flowered during the summer. The bulbs are kept at rest through the winter in dry sand, in a temperature of 50°, and to yield a succession should be started at intervals, say at the end of February and the beginning of April. To prolong the blooming season, use weak manure water when the flower-buds show themselves.

GLUCINUM, an alternative name for Beryllium (*q.v.*). When L. N. Vauquelin in 1798 published in the *Annales de chimie* an account of a new earth obtained by him from beryl he refrained from giving the substance a name, but in a note to his paper the editors suggested glucine, from γλυκύς, sweet, in reference to the taste of its salts, whence the name Glucinum or Glucinium (symbol Gl. or sometimes G). The name beryllium was given to the metal by German chemists and was generally used until recently, when the earlier name was adopted.

GLUCK,[1] **CHRISTOPH WILLIBALD** (1714–1787), operatic composer, German by his nationality, French by his place in art, was born at Weidenwang, near Neumarkt, in the upper Palatinate, on the 2nd of July 1714. He belonged to the lower middle class, his father being gamekeeper to Prince Lobkowitz; but the boy's education was not neglected on that account. From his twelfth to his eighteenth year he frequented the Jesuit school of Kommotau in the neighbourhood of Prince Lobkowitz's estate in Bohemia, where he not only received a good general education, but also had lessons in music. At the age of eighteen Gluck went to Prague, where he continued his musical studies under Czernohorsky, and maintained himself by the exercise of his art, sometimes in the very humble capacity of fiddler at village fairs and dances. Through the introductions of Prince Lobkowitz, however, he soon gained access to the best families of the Austrian nobility; and when in 1736 he proceeded to Vienna he was hospitably received at his protector's palace. Here he met Prince Melzi, an ardent lover of music, whom he accompanied to Milan, continuing his education under Giovanni Battista San Martini, a great musical historian and contrapuntist, who was also famous in his own day as a composer of church and chamber music. We soon find Gluck producing operas at the rapid rate necessitated by the omnivorous taste of the Italian public in those days. Nine of these works were produced at various Italian theatres between 1741 and 1745. Although their artistic value was small, they were so favourably received that in 1745 Gluck was invited to London to compose for the Haymarket. The first opera produced there was called *La Caduta dei giganti*; it was followed by a revised version of one of his earlier operas. Gluck also appeared in London as a performer on the musical glasses (see HARMONICA).

The success of his two operas, as well as that of a *pasticcio* (*i.e.* a collection of favourite arias set to a new libretto) entitled *Piramo e Tisbe*, was anything but brilliant, and he accordingly left London. But his stay in England was not without important consequences for his subsequent career. Gluck at this time was rather less than an ordinary producer of Italian opera. Handel's well-known saying that Gluck "knew no more counterpoint than his cook" must be taken in connexion with the less well-known fact that that cook was an excellent bass singer who performed in many of Handel's own operas. But it indicates the musical reason of Gluck's failure, while Gluck himself learnt the dramatic reason through his surprise at finding that arias which in their original setting had been much applauded lost all effect when adapted to new words in the *pasticcio*. Irrelevant as Handel's criticism appears, it was not without bearing on Gluck's difficulties. The use of counterpoint has very little necessary connexion with contrapuntal display; its real and final cause is a certain depth of harmonic expression which Gluck attained only in his most dramatic moments, and for want of which he, even in his finest works, sometimes moved very lamely. And in later years his own mature view of the importance of harmony, which he upheld in long arguments with Grétry, who believed only in melody, shows that he knew that the dramatic expression of music must strike below the surface. At this early period he was simply producing Handelian opera in an amateurish style, suggesting an unsuccessful imitation of Hasse; but the failure of his *pasticcio* is as significant to us as it was to him, since it shows that already the effect of his music depended upon its characteristic treatment of dramatic situations. This characterizing power was as yet not directly evident, and it needed all the influence of the new instrumental resources of the rising sonata-forms before music could pass out of what we may call its architectural and decorative period and enter into dramatic regions at all.

It is highly probable that the chamber music of his master, San Martini, had already indicated to Gluck a new direction which was more or less incompatible with the older art; and there is nothing discreditable either to Gluck or to his contemporaries in the failure of his earlier works. Had the young composer been successful in the ordinary *opera seria*, there is reason to fear that the great dramatic reform, initiated by him, might not have taken place. The critical temper of the London public fortunately averted this calamity. It may also be assumed that the musical atmosphere of the English capital, and especially the great works of Handel, were not without beneficial influence upon the young composer. But of still greater importance in this respect was a short trip to Paris, where Gluck became for the first time acquainted with the classic traditions and the declamatory style of the French opera—a sphere of music in which his own greatest triumphs were to be achieved. Of these great issues little trace, however, is to be found in the works produced by Gluck during the fifteen years after his return from England. In this period Gluck, in a long course of works by no means free from the futile old traditions, gained technical experience and important patronage, though his success was not uniform. His first opera written for Vienna, *La Semiramide riconosciuta*, is again an ordinary *opera seria*, and little more can be said of *Telemacco*, although thirty years later Gluck was able to use most of its overture and an energetic duet in one of his greatest works, *Armide*.

[1] Not, as frequently spelt, Glück.

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Gluck settled permanently at Vienna in 1756, having two years previously been appointed court chapel-master, with a salary of 2000 florins, by the empress Maria Theresa. He had already received the order of knighthood from the pope in consequence of the successful production of two of his works in Rome. During the long interval from 1756 to 1762 Gluck seems to have matured his plans for the reform of the opera; and, barring a ballet named *Don Giovanni*, and some *airs nouveaux* to French words with pianoforte accompaniment, no compositions of any importance have to be recorded. Several later *pièces d'occasion*, such as *Il Trionfo di Clelia* (1763), are still written in the old manner, though already in 1762 *Orfeo ed Euridice* shows that the composer had entered upon a new career. Gluck had for the first time deserted Metastasio for Raniero Calzabigi, who, as Vernon Lee suggests, was in all probability the immediate cause of the formation of Gluck's new ideas, as he was a hot-headed dramatic theorist with a violent dislike for Metastasio, who had hitherto dominated the whole sphere of operatic libretto.

Quite apart from its significance in the history of dramatic music, *Orpheus* is a work which, by its intrinsic beauty, commands the highest admiration. Orpheus's air, *Che faro*, is known to every one; but still finer is the great *scena* in which the poet's song softens even the *ombre sdegnose* of Tartarus. The ascending passion of the entries of the solo (*Deh! placatevi; Mille pene; Men tiranne*), interrupted by the harsh but gradually softening exclamations of the Furies, is of the highest dramatic effect. These melodies, moreover, as well as every declamatory passage assigned to Orpheus, are made subservient to the purposes of dramatic characterization; that is, they could not possibly be assigned to any other person in the drama, any more than Hamlet's monologue could be spoken by Polonius. It is in this power of musically realizing a character—a power all but unknown in the serious opera of his day—that Gluck's genius as a dramatic composer is chiefly shown. After a short relapse into his earlier manner, Gluck followed up his *Orpheus* by a second classical music-drama (1767) named *Alceste*. In his dedication of the score to the grand-duke of Tuscany, he fully expressed his aims, as well as the reasons for his total breach with the old traditions. "I shall try," he wrote, "to reduce music to its real function, that of seconding poetry by intensifying the expression of sentiments and the interest of situations without interrupting the action by needless ornament. I have accordingly taken care not to interrupt the singer in the heat of the dialogue, to wait for a tedious *ritornel*, nor do I allow him to stop on a sonorous vowel, in the middle of a phrase, in order to show the nimbleness of a beautiful voice in a long *cadenza*." Such theories, and the stern consistency with which they were carried out, were little to the taste of the pleasure-loving Viennese; and the success of *Alceste*, as well as that of *Paris and Helena*, which followed two years later, was not such as Gluck had desired and expected. He therefore eagerly accepted the chance of finding a home for his art in the centre of intellectual and more especially dramatic life, Paris. Such a chance was opened to him through the *bailli* Le Blanc du Roullet, attaché of the French embassy at Vienna, and a musical amateur who entered into Gluck's ideas with enthusiasm. A classic opera for the Paris stage was accordingly projected, and the friends fixed upon Racine's *Iphigénie en Aulide*. After some difficulties, overcome chiefly by the intervention of Gluck's former pupil the dauphiness Marie Antoinette, the opera was at last accepted and performed at the Académie de Musique, on the 19th of April 1774.

The great importance of the new work was at once perceived by the musical amateurs of the French capital, and a hot controversy on the merits of *Iphigénie* ensued, in which some of the leading literary men of France took part. Amongst the opponents of Gluck were not only the admirers of Italian vocalization and sweetness, but also the adherents of the earlier French school, who refused to see in the new composer the legitimate successor of Lulli and Rameau. Marmontel, Laharpe and D'Alembert were his opponents, the Abbé Arnaud and others his enthusiastic friends. Rousseau took a peculiar position in the struggle. In his early writings he is a violent partisan of Italian music, but when Gluck himself appeared as the French champion Rousseau acknowledged the great composer's genius; although he did not always understand it, as for example when he suggested that in *Alceste*, "Divinités du Styx," perhaps the most majestic of all Gluck's arias, ought to have been set as a rondo. Nevertheless in a letter to Dr Burney, written shortly before his death, Rousseau gives a close and appreciative analysis of *Alceste*, the first Italian version of which Gluck had submitted to him for suggestions; and when, on the first performance of the piece not being received favourably by the Parisian audience, the composer exclaimed, "*Alceste est tombée*," Rousseau is said to have comforted him with the flattering *bonmot*, "*Oui, mais elle est tombée du ciel.*" The contest received a still more personal character when Piccinni, a celebrated and by no means incapable composer, came to Paris as the champion of the Italian party at the invitation of Madame du Barry, who held a rival court to that of the young princess (see OPERA). A dramatic controversy it suggests a parallel with the Wagnerian and anti-Wagnerian warfare of a later age; but there is no such radical difference between Gluck's and Piccinni's musical methods as the comparison would suggest. Gluck was by far the better musician, but his deficiencies in musical technique were of a kind which contemporaries could perceive as easily as they could perceive Piccinni's. Both composers were remarkable inventors of melody, and both had the gift of making incorrect music sound agreeable. Gluck's indisputable dramatic power might be plausibly dismissed as irrelevant by upholders of music for music's sake, even if Piccinni himself had not chosen, as he did, to assimilate every feature in Gluck's style that he could understand. The rivalry between the two composers was soon developed into a quarrel by the skilful engineering of Gluck's enemies. In 1777 Piccinni was given a libretto by Marmontel on the subject of *Roland*, to Gluck's intense disgust, as he had already begun an opera on that subject himself. This, and the failure of an attempt to show his command of a lighter style by furbishing up some earlier works at the instigation of Marie Antoinette, inspired Gluck to produce his *Armide*, which appeared four months before Piccinni's *Roland* was ready, and raised a storm of controversy, admiration and abuse. Gluck did not anticipate Wagner more clearly in his dramatic reforms than in his caustic temper; and, as in Gluck's own estimation the struggle between *Armide* and *Alceste* is that "*l'un* (*Alceste*) *doit faire pleurer et l'autre faire éprouver une voluptueuse sensation*," it was extremely annoying for him to be told by Laharpe that he had made Armide a sorceress instead of an enchantress, and that her part was "*une criaillerie monotone et fatiguante.*" He replied to Laharpe in a long public letter worthy of Wagner in its venomous sarcasm and its tremendous value as an advertisement for its recipient.

Gluck's next work was *Iphigénie en Tauride*, the success of which finally disposed of Piccinni, who produced a work on the same subject at the same time and who is said to have acknowledged Gluck's superiority. Gluck's next work was *Écho et Narcisse*, the comparative failure of which greatly disappointed him; and during the composition of another opera, *Les Danaïdes*, an attack of apoplexy compelled him to give up work. He left Paris for Vienna, where he lived for several years in dignified leisure, disturbed only by his declining health. He died on the 15th of November 1787. (F. H.; D. F. T.)

The great interest of the dramatic aspect of Gluck's reforms is apt to overshadow his merit as a musician, and yet in some ways to idealize it. One is tempted to regard him as condoning for technical musical deficiencies by sheer dramatic power, whereas unprejudiced study of his work shows that where his dramatic power asserts itself there is no lack of musical technique. Indeed only a great musician could so reform opera as to give it scope for dramatic power at all. Where Gluck differs from the greatest musicians is in his absolute dependence on literature for his inspiration. Where his librettist failed him (as in his last complete work, *Écho et Narcisse*), he could hardly write tolerably good music; and, even in the finest works of his French

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period, the less emotional situations are sometimes set to music which has little interest except as a document in the history of the art. This must not be taken to mean merely that Gluck could not, like Mozart and nearly all the great song-writers, set good music to a bad text. Such inability would prove Gluck's superior literary taste without casting a slur on his musicianship. But it points to a certain weakness as a musician that Gluck could not be inspired except by the more thrilling portions of his libretti. When he was inspired there was no question that he was the first and greatest writer of dramatic music before Mozart. To begin with, he could invent sublime melodies; and his power of producing great musical effects by the simplest means was nothing short of Handelian. Moreover, in his peculiar sphere he deserves the title generally accorded to Haydn of "father of modern orchestration." It is misleading to say that he was the first to use the timbre of instruments with a sense of emotional effect, for Bach and Handel well knew how to give a whole aria or whole chorus peculiar tone by means of a definite scheme of instrumentation. But Gluck did not treat instruments as part of a decorative design, any more than he so treated musical forms. Just as his sense of musical form is that of Philipp Emmanuel Bach and of Mozart, so is his treatment of instrumental tone-colour a thing that changes with every shade of feeling in the dramatic situation, and not in accordance with any purely decorative scheme. To accompany an aria with strings, oboes and flutes, was, for example, a perfectly ordinary procedure; nor was there anything unusual in making the wind instruments play in unison with the strings for the first part of the aria, and writing a passage for one or more of them in the middle section. But it was an unheard-of thing to make this passage consist of long *appoggiaturas* once every two bars in rising sequence on the first oboe, answered by deep *pizzicato* bass notes, while Agamemnon in despair cries: "*J'entends retentir dans mon sein le cri plaintif de la nature.*" Some of Gluck's most forcible effects are of great subtlety, as, for instance, in *Iphigénie en Tauride*, where Orestes tries to reassure himself by saying: "*Le calme rentre dans mon cœur,*" while the intensely agitated accompaniment of the strings belies him. Again, the sense of orchestral climax shown in the oracle scene in *Alceste* was a thing inconceivable in older music, and unsurpassed in artistic and dramatic spirit by any modern composer. Its influence in Mozart's *Idomeneo* is obvious at a first glance.

The capacity for broad melody always implies a true sense of form, whether that be developed by skill or not; and thus Gluck, in rejecting the convenient formalities of older styles of opera, was not, like some reformers, without something better to substitute for them. Moreover he, in consultation with his librettist, achieved great skill in holding together entire scenes, or even entire acts, by dramatically apposite repetitions of short arias and choruses. And thus in large portions of his finest works the music, in spite of frequent full closes, seems to move *pari passu* with the drama in a manner which for naturalness and continuity is surpassed only by the finales of Mozart and the entire operas of Wagner. This is perhaps most noticeable in the second act of *Orfeo*. In its original Italian version both scenes, that in Hades and that in Elysium, are indivisible wholes, and the division into single movements, though technically obvious, is aesthetically only a natural means of articulating the structure. The unity of the scene in Hades extends, in the original version, even to the key-system. This was damaged when Gluck had to transpose the part of Orpheus from an alto to a tenor in the French version. And here we have one of many instances in which the improvements his French experience enabled him to make in his great Italian works were not altogether unmixed. Little harm, however, was done to *Orfeo* which has not been easily remedied by transposing Orpheus's part back again; and in a suitable compromise between the two versions *Orfeo* remains Gluck's most perfect and inspired work. The emotional power of the music is such that the inevitable spoiling of the story by a happy ending has not the aspect of mere conventionality which it had in cases where the music produced no more than the normal effect upon 18th-century audiences. Moreover Gluck's genius was of too high an order for him to be less successful in portraying a sufficiently intense happiness than in portraying grief. He failed only in what may be called the business capacities of artistic technique; and there is less "business" in *Orfeo* than in almost any other music-drama. It was Gluck's first great inspiration, and his theories had not had time to take action in paper warfare. *Alceste* contains his grandest music and is also very free from weak pages; but in its original Italian version the third act did not give Gluck scope for an adequate climax. This difficulty so accentuated itself in the French version that after continual retouchings a part for Hercules was, in Gluck's absence, added by Gossec; and three pages of Gluck's music, dealing with the supreme crisis where Alceste is rescued from Hades (either by Apollo or by Hercules) were no longer required in performance and have been lost. The Italian version is so different from the French that it cannot help us to restore this passage, in which Gluck's music now stops short just at the point where we realize the full height of his power. The comparison between the Italian and French *Alceste* is one of the most interesting that can be made in the study of a musician's development. It would have been far easier for Gluck to write a new opera if he had not been so justly attached to his second Italian masterpiece. So radical are the differences that in retranslating the French libretto into Italian for performance with the French music no one line of Calzabigi's original text can be retained.

In *Iphigénie en Aulide* and *Iphigénie en Tauride*, Gluck shows signs that the controversies aroused by his methods began to interfere with his musical spontaneity. He had not, in *Orfeo*, gone out of his way to avoid rondos, or we should have had no "*Che faro senza Euridice.*" We read with a respectful smile Glück's assurance to the bailli Le Blanc du Roullet that "you would not believe *Armide* to be by the same composer" as *Alceste*. But there is no question that *Armide* is a very great work, full of melody, colour and dramatic point; and that Gluck has availed himself of every suggestion that his libretto afforded for orchestral and emotional effects of an entirely different type from any that he had attempted before. And it is hardly relevant to blame him for his inability to write erotic music. In the first place, the libretto is not erotic, though the subject would no doubt become so if treated by a modern poet. In the second place a conflict of passions (as, for instance, where Armide summons the demons of Hate to exorcise love from her heart, and her courage fails her as soon as they begin) has never, even in *Alceste*, been treated with more dramatic musical force. The work as a whole is unequal, partly because there is a little too much action in it to suit Gluck's methods; but it shows, as does no other opera until Mozart's *Don Giovanni*, a sense of the *development* of characters, as distinguished from the mere presentation of them as already fixed.

In *Iphigénie en Aulide* and *Iphigénie en Tauride*, the very subtlety of the finest features indicates a certain self-consciousness which, when inspiration is lacking, becomes mannerism. Moreover, in both cases the libretti, though skilfully managed, tell a rather more complicated story than those which Gluck had hitherto so successfully treated; and, where inspiration fails, the musical technique becomes curiously amateurish without any corresponding naïveté. Still these works are immortal, and their finest passages are equal to anything in *Alceste* and *Orfeo*. *Écho et Narcisse* we must, like Gluck's contemporaries, regard as a failure. As in *Orfeo*, the pathetic story is ruined by a violent happy ending, but here this artistic disaster takes place before the pathos has had time to assert itself. Gluck had no opportunities in this work for any higher qualities, musical or dramatic, than prettiness; and with him beauty, without visible emotion, was indeed skin-deep. It is a pity that the plan of the great Pelletan-Damcke critical *édition de luxe* of Gluck's French operas forbids the inclusion of his Italian *Paride e Elena*, his third opera to Calzabigi's libretto, which was never given in a French version; for there can be no question that, whatever he owed to France, the

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period of his greatness began with his collaboration with Calzabigi. (D. F. T.)

GLÜCKSBURG, a town of Germany, in the Prussian province of Schleswig-Holstein, romantically situated among pine woods on the Flensburg Fjord off the Baltic, 6 m. N.E. from Flensburg by rail. Pop. (1905) 1551. It has a Protestant church and some small manufactures and is a favourite sea-bathing resort. The castle, which occupies the site of a former Cistercian monastery, was, from 1622 to 1779, the residence of the dukes of Holstein-Sonderburg-Glücksburg, passing then to the king of Denmark and in 1866 to Prussia. King Frederick VII. of Denmark died here on the 15th of November 1863.

GLÜCKSTADT, a town of Germany, in the Prussian province of Schleswig-Holstein, on the right bank of the Elbe, at the confluence of the small river Rhin, and 28 m. N.W. of Altona, on the railway from Itzehoe to Elmshorn. Pop. (1905) 6586. It has a Protestant and a Roman Catholic church, a handsome town-hall (restored in 1873–1874), a gymnasium, a provincial prison and a penitentiary. The inhabitants are chiefly engaged in commerce and fishing; but the frequent losses from inundations have greatly retarded the prosperity of the town. Glückstadt was founded by Christian IV. of Denmark in 1617, and fortified in 1620. It soon became an important trading centre. In 1627–28 it was besieged for fifteen weeks by the imperialists under Tilly, without success. In 1814 it was blockaded by the allies and capitulated, whereupon its fortifications were demolished. In 1830 it was made a free port. It came into the possession of Prussia together with the rest of Schleswig-Holstein in 1866.

See Lucht, *Glückstadt. Beiträge zur Geschichte dieser Stadt* (Kiel, 1854).

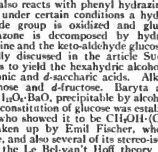
GLUCOSE ((from Gr. γλυκύς, sweet), a carbohydrate of the formula $C_6H_{12}O_6$; it may be regarded as the aldehyde of sorbite. The name is applied in commerce to a complex mixture of carbohydrates obtained by boiling starch with dilute mineral acids; in chemistry, it denotes, with the prefixes *d*, *l* and *d+l* (or *i*), the dextro-rotatory, laevo-rotatory and inactive forms of the definite chemical compound defined above. The *d* modification is of the commonest occurrence, the other forms being only known as synthetic products; for this reason it is usually termed glucose, simply; alternative names are dextrose, grape sugar and diabetic sugar, in allusion to its right-handed optical rotation, its occurrence in large quantity in grapes, and in the urine of diabetic patients respectively. In the vegetable kingdom glucose occurs, always in admixture with fructose, in many fruits, especially grapes, cherries, bananas, &c.; and in combination, generally with phenols and aldehydes belonging to the aromatic series, it forms an extensive class of compounds termed glucosides. It appears to be synthesized in the plant tissues from carbon dioxide and water, formaldehyde being an intermediate product; or it may be a hydrolytic product of a glucoside or of a polysaccharose, such as cane sugar, starch, cellulose, &c. In the plant it is freely converted into more complex sugars, poly-saccharoses and also proteids. In the animal kingdom, also, it is very widely distributed, being sometimes a normal and sometimes a pathological constituent of the fluids and tissues; in particular, it is present in large amount in the urine of those suffering from diabetes, and may be present in nearly all the body fluids. It also occurs in honey, the white appearance of candied honey being due to its separation.

Pure *d*-glucose, which may be obtained synthetically (see SUGAR) or by adding crystallized cane sugar to a mixture of 80% alcohol and $\frac{1}{8}$ volume of fuming hydrochloric acid so long as it dissolves on shaking, crystallizes from water or alcohol at ordinary temperatures in nodular masses, composed of minute six-sided plates, and containing one molecule of water of crystallization. This product melts at 86° C., and becomes anhydrous when heated to 110° C. The anhydrous compound can also be prepared, as hard crusts melting at 146°, by crystallizing concentrated aqueous solutions at 30° to 35°. It is very soluble in water, but only slightly soluble in strong alcohol. Its taste is somewhat sweet, its sweetening power being estimated at from $\frac{1}{2}$ to $\frac{3}{4}$ that of cane sugar. When heated to above 200° it turns brown and produces caramel, a substance possessing a bitter taste, and used, in its aqueous solution or otherwise, under various trade names, for colouring confectionery, spirits, &c. The specific rotation of the plane of polarized light by glucose solutions is characteristic. The specific rotation of a freshly prepared solution is 105°, but this value gradually diminishes to 52·5°, 24 hours sufficing for the transition in the cold, and a few minutes when the solution is boiled. This phenomenon has been called mutarotation by T. M. Lowry. The specific rotation also varies with the concentration; this is due to the dissociation of complex molecules into simpler ones, a view confirmed by cryoscopic measurements.

Glucose may be estimated by means of the polarimeter, *i.e.* by determining the rotation of the plane of polarization of a solution, or, chemically, by taking advantage of its property of reducing alkaline copper solutions. If a glucose solution be added to copper sulphate and much alkali added, a yellowish-red precipitate of cuprous hydrate separates, slowly in the cold, but immediately when the liquid is heated; this precipitate rapidly turns red owing to the formation of cuprous oxide. In 1846 L. C. A. Barreswil found that a strongly alkaline solution of copper sulphate and potassium sodium tartrate (Rochelle salt) remained unchanged on boiling, but yielded an immediate precipitate of cuprous oxide when a solution of glucose was added. He suggested that the method was applicable for quantitatively estimating glucose, but its acceptance only followed after H. von Fehling's investigation. "Fehling's solution" is prepared by dissolving separately 34·639 grammes of copper sulphate, 173 grammes of Rochelle salt, and 71 grammes of caustic soda in water, mixing and making up to 1000 ccs.; 10 ccs. of this solution is completely reduced by 0·05 grammes of hexose. Volumetric methods are used, but the uncertainty of the end of the reaction has led to the suggestion of special indicators, or of determining the amount of cuprous oxide gravimetrically.

Chemistry.—In its chemical properties glucose is a typical oxyaldehyde or aldose. The aldehyde group reacts with hydrocyanic acid to produce two stereo-isomeric cyanhydrins; this isomerism is due to the conversion of an originally non-asymmetric carbon atom into an asymmetric one. The cyanhydrin is hydrolysable to an acid, the lactone of which may be reduced by sodium amalgam to a glucheptose, a non-fermentable sugar containing seven carbon atoms. By repeating the process a non-fermentable gluco-octose and a fermentable glucononose may be prepared. The aldehyde group also reacts with phenyl hydrazine to form two phenylhydrazones; under certain conditions a hydroxyl group adjacent to the aldehyde group is oxidized and glucosazone is produced; this glucosazone is decomposed by hydrochloric acid into phenyl hydrazine and the keto-aldehyde glucosone. These transformations are fully discussed in the article SUGAR. On reduction glucose appears to yield the hexahydric alcohol *d*-sorbite, and on oxidation *d*-gluconic and *d*-saccharic acids. Alkalis partially convert it into *d*-mannose and *d*-fructose. Baryta and lime yield saccharates, *e.g.* $C_6H_{10}O_6.BaO$, precipitable by alcohol.

The constitution of glucose was established by H. Kiliani in 1885–1887, who showed it to be $CH_2OH.(CH.OH)_4.CHO$. The subject was taken up by Emil Fischer, who succeeded in synthesizing glucose, and also several of its stereo-isomers, there being 16 according to the Le Bel-van't Hoff theory (see STEREO-ISOMERISM and SUGAR). This open chain structure is challenged in the views put forward by T. M. Lowry and E. F. Armstrong; in 1899 C. Tanret showed that glucose existed in more than one form, and he isolated *α*, *β* and *γ* varieties with specific rotations of 105°, 52·5° and 22°. It is now agreed that the *β* variety is a mixture of the *α* and *γ*. This discovery explained the mutarotation of glucose. In a fresh solution *α*-glucose only exists, but on standing it is slowly transformed into *γ*-glucose, equilibrium being reached when the *α* and *γ* forms are present in the ratio 0·368:0·632 (Tanret, *Zeit. physikal. Chem.*, 1905, 53, p. 692). It is convenient to refer to these two forms as *α* and *β*. Lowry and Armstrong represent these compounds by the following spatial formulae



which postulate a *γ*-oxidic structure, and 5 asymmetric carbon atoms, *i.e.* one more than in the Fischer formulae. These formulae are supported by many considerations, especially by the selective

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action of enzymes, which follows similar lines with the α- and β-glucosides, *i.e.* the compounds formed by the interaction of glucose with substances generally containing hydroxyl groups (see GLUCOSIDE).

Fermentation of Glucose.—Glucose is readily fermentable. Of the greatest importance is the alcoholic fermentation brought about by yeast cells (*Saccharomyces cerevisiae seu mini*); this follows the equation $C_6H_{12}O_6 = 2C_2H_5O + 2CO_2$. Pasteur considering 94 to 95% of the sugar to be so changed. This character is the base of the plan of adding glucose to wine and beer wort before fermenting, the alcohol content of the liquid after fermentation being increased. Some fusel oil, glycerin and succinic acid appear to be formed simultaneously, but in small amount. Glucose also undergoes fermentation into lactic acid (q.v.) in the presence of the lactic acid bacillus, and into butyric acid if the conditions for the preceding ferment be continued, or by other bacilli. It also yields, by the so-called mucous fermentation, a mucous, gummy mass, mixed with mannitol and lactic acid.

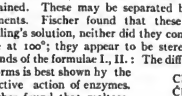
We may here notice the frequent production of glucose by the action of enzymes upon other carbohydrates. Of especial note is the transformation of maltose by maltase into glucose, and of cane sugar by invertase into a mixture of glucose and fructose (invert sugar); other instances are: lactose by lactase into galactose and glucose; trehalose by trehalase into glucose; melibiose by melibiase into galactose and glucose; and of melizitose by melizitase into touranose and glucose, touranose yielding glucose also when acted upon by the enzyme touranase.

Commercial Glucose.—The glucose of commerce, which may be regarded as a mixture of grape sugar, maltose and dextrins, is prepared by hydrolysing starch by boiling with a dilute mineral acid. In Europe, potato starch is generally employed; in America, corn starch. The acid employed may be hydrochloric, which gives the best results, or sulphuric, which is used in Germany; sulphuric acid is more readily separated from the product than hydrochloric, since the addition of powdered chalk precipitates it as calcium sulphate, which may be removed by a filter press. The processes of manufacture have much in common, although varying in detail. The following is an outline of the processes which hydrochloric acid, termed "Starch (" green " starch in America) is made into a " milk " with water, and the milk pumped into boiling dilute acid contained in a closed " converter," generally made of copper or cast iron; steam is led in at the same time, and the pressure is kept up to about 25 lb to the sq. in. When the converter is full the pressure is raised somewhat, and the heating continued until the conversion is complete. The liquid is now run into neutralizing tanks containing sodium carbonate, and, after settling, the supernatant liquid, termed " light liquor," is run through bag filters and then on to bone-char filters, which have been previously used for the " heavy liquor." The colourless or amber-coloured filtrate is concentrated to 27° to 28° B., when it forms the " heavy liquor," just mentioned. This is filtered through fresh bone-char filters, from which it is discharged as a practically colourless liquid. This liquid is concentrated in vacuum pans to a specific gravity of 40° to 44° B., a small quantity of sodium bisulphite solution being added to bleach it, to prevent fermentation, and to inhibit browning. " Syrup glucose " is the commercial name of the product; by continuing the concentration further solid glucose or grape sugar is obtained.

Several brands are recognized: " Mixing glucose " is used by syrup and molasses manufacturers, " jelly glucose " by makers of jellies, " confectioners' glucose " in confectionery, " brewers' glucose " in brewing, &c.

GLUCOSIDE, in chemistry, the generic name of an extensive group of substances characterized by the property of yielding a sugar, more commonly glucose, when hydrolysed by purely chemical means, or decomposed by a ferment or enzyme. The name was originally given to vegetable products of this nature, in which the other part of the molecule was, in the greater number of cases, an aromatic aldehydic or phenolic compound (exceptions are sinigrin and jalapin or scammonin). It has now been extended to include synthetic ethers, such as those obtained by acting on alcoholic glucose solutions with hydrochloric acid, and also the polysaccharoses, *e.g.* cane sugar, which appear to be ethers also. Although glucose is the commonest sugar present in glucosides, many are known which yield rhamnose or iso-dulcite; these may be termed pentosides. Much attention has been given to the non-sugar parts of the molecules; the constitutions of many have been determined, and the compounds synthesized; and in some cases the preparation of the synthetic glucoside effected.

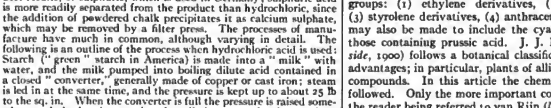
The simplest glucosides are the alkyl esters which E. Fischer (*Ber.*, 28, pp. 1145, 3081) obtained by acting with hydrochloric acid on alcoholic glucose solutions. A better method of preparation is due to E. F. Armstrong and S. L. Courtauld (*Proc. Phys. Soc.*, 1905, July 1), who dissolve solid anhydrous glucose in methyl alcohol containing hydrochloric acid. A mixture of α- and β-glucose result, which are then etherified, and if the solution be neutralized before the β-form isomerizes and the solvent removed, a mixture of the α- and β-methyl ethers is obtained. These may be separated by the action of suitable ferments. Fischer found that these ethers did not reduce Fehling's solution, neither did they combine with phenyl hydrazine at 100°; they appear to be stereo-isomeric γ-oxidic compounds of the formulae I., II.: The difference between the α- and β-forms is best shown by the selective action of enzymes. Fischer found that maltase, an enzyme occurring in yeast cells, hydrolysed α-glucosides but not the β; while emulsin, an enzyme occurring in bitter almonds, hydrolyses the β but not the α. The ethers of non-fermentable sugars are themselves non-fermentable. By acting with these enzymes on the natural glucosides, it is found that the majority are of the β-form; *e.g.* emulsin hydrolyses salicin, helicin, aesculin, coniferin, syringin, &c.



I. α-methyl d-glucoside. II. β-methyl d-glucoside.

Classification of the glucosides is a matter of some difficulty. One based on the chemical constitution of the non-glucose part of the molecules has been proposed by Umney, who framed four groups: (1) ethylene derivatives, (2) benzene derivatives, (3) styrolene derivatives, (4) anthracene derivatives. A group may also be made to include the cyanogenetic glucosides, *i.e.* those containing prussic acid. J. J. L. van Rijn (*Die Glykoside*, 1900) follows a botanical classification, which has several advantages; in particular, plants of allied genera contain similar compounds. In this article the chemical classification will be followed. Only the more important compounds will be noticed, the reader being referred to van Rijn (*loc. cit.*) and to Beilstein's *Handbuch der organischen Chemie* for further details.

1. *Ethylene Derivatives.*—These are generally neutral oils, and are characterized by a burning taste; their principal occurrence is in mustard and *Tropaeolum* seeds. Sinigrin or the potassium salt of myronic acid, $C_{10}H_{18}NS_2KO_{10}{\cdot}H_2O$, occurs in black pepper and in horse-radish root. Hydrolysis with baryta, or decomposition by the ferment myrosin, gives glucose, allyl mustard oil and potassium bisulphate. Sinalbin, $C_{30}H_{44}N_2S_2O_{16}$, occurs in white pepper; it decomposes to the mustard oil HO·C_6H_4·CH_2·NCS, glucose and sinapin, a compound of choline and sinapinic acid. Jalapin or scammonin, $C_{34}H_{56}O_{16}$, occurs in scammony; it hydrolyses to glucose and jalapinolic acid. The formulae of sinigrin, sinalbin, sinapin and jalapinolic acid are:—



2. *Benzene Derivatives.*—These are generally oxy and oxyaldehydic compounds. Arbutin, $C_{12}H_{16}O_7$, which occurs in bearberry along with methyl arbutin, hydrolyses to hydroquinone and glucose. Pharmacologically it acts as a urinary antiseptic and diuretic; the benzoyl derivative, cellotropin, has been used for tuberculosis. Salicin, also termed " saligenin " and " glucose," $C_{13}H_{18}O_7$, occurs in the willow. The enzymes pyralin and emulsin convert it into glucose and saligenin, ortho-oxybenzylalcohol, HO·C_6H_4·CH_2OH. Oxidation gives the aldehyde helicin. Populin, $C_{33}H_{32}O_{15}$, which occurs in the leaves and bark of *Populus tremula*, is benzoyl salicin.

3. *Styrolene Derivatives.*—This group contains a benzene and also an ethylene group, being derived from styrolene $C_6H_5{\cdot}CH{:}CH_2$. Coniferin, $C_{16}H_{22}O_8$, occurs in the cambium of coniferous woods. Emulsin converts it into glucose and coniferyl alcohol, while oxidation gives glycovanillin, which yields with emulsin glucose and vanillin (see EUGENOL and VANILLA). Syringin, which occurs in the bark of *Syringa vulgaris*, is methoxyconiferin. Phloridzin, $C_{21}H_{24}O_{10}$, occurs in the root-bark of various fruit trees; it hydrolyses to glucose and phloretin, which is the phloroglucin ester of para-oxyhydratropic acid. It is related to the pentosides naringin, $C_{21}H_{26}O_{11}$, which hydrolyses to rhamnose and naringenin, the phloroglucin ester of para-oxycinnamic acid, and hesperidin,

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$C_{28}H_{30}O_{16}$(?), which hydrolyses to rhamnose and hesperetin, $C_{16}H_{14}O_6$, the phloroglucin ester of meta-oxy-para-methoxycinnamic acid or isoferulic acid, $C_{10}H_{10}O_4$. We may here include various coumarin and benzo-γ-pyrone derivatives. Aesculin, $C_{15}H_{16}O_9$, occurring in horse-chestnut, and daphnin, occurring in *Daphne alpina*, are isomeric; the former hydrolyses to glucose and aesculetin (4-5-dioxycoumarin), the latter to glucose and daphnetin (3-4-dioxycoumarin). Fraxin, $C_{16}H_{18}O_{10}$, occurring in *Fraxinus excelsior*, and with aesculin in horse-chestnut, hydrolyses to glucose and fraxetin, the monomethyl ester of a trioxycoumarin. Flavone or benzo-γ-pyrone derivatives are very numerous; in many cases they (or the non-sugar part of the molecule) are vegetable dyestuffs. *Quercitrin*, $C_{18}H_{16}O_{11}$, is a yellow dyestuff found in *Quercus tinctoria*; it hydrolyses to rhamnose and quercetin, a dioxy-β-phenyl-trioxybenzo-γ-pyrone. Rhamnetin, a splitting product of the glucosides of *Rhamnus*, is monomethyl quercetin; fisetin, from *Rhus cotinus*, is monooxyquercetin; chrysin is phenyl-dioxybenzo-γ-pyrone. Saponarin, a glucoside found in *Saponaria officinalis*, is a related compound. Strophanthin is the name given to three different compounds, two obtained from *Strophanthus Kombe* and one from *S. hispidus*.

4. *Anthrazene Derivatives.*—These are generally substituted anthraquinones; many have medicinal applications, being used as purgatives, while one, ruberythric acid, yields the valuable dyestuff madder, the base of which is alizarin (q.v.). Chrysophanic acid, a dioxymethylanthraquinone, occurs in rhubarb, which also contains emodin, a trioxymethylanthraquinone; this substance occurs in combination with rhamnose in frangula bark.

The most important cyanogenetic glucoside is amygdalin, which occurs in bitter almonds. The enzyme maltase decomposes it into glucose and mandelic nitrile glucoside; the latter is broken down by emulsin into glucose, benzaldehyde and prussic acid. Emulsin also decomposes amygdalin directly into these compounds without the intermediate formation of mandelic nitrile glucoside. Several other glucosides of this nature have been isolated. The saponins are a group of substances characterized by forming a lather with water; they occur in soap-bark (q.v.). Mention may also be made of indican, the glucoside of the indigo plant; this is hydrolysed by the indigo ferment, indimulsin, to indoxyl and indiglucin.

GLUE (from the O. Fr. *glu*, bird-lime, from the Late Lat. *gluem*, *glus*, glue), a valuable agglutinant, consisting of impure gelatin and widely used as an adhesive medium for wood, leather, paper and similar substances. Glues and gelatins merge into one another by imperceptible degrees. The difference is conditioned by the degree of purity: the more impure form is termed glue and is only used as an adhesive, the purer forms, termed gelatin, have other applications, especially in culinary operations and confectionery. Referring to the article GELATIN for a general account of this substance, it is only necessary to state here that gelatigenous or glue-forming tissues occur in the bones, skins and intestines of all animals, and that by extraction with hot water these agglutinating materials are removed, and the solution on evaporating and cooling yields a jelly-like substance —gelatin or glue.

Glues may be most conveniently classified according to their sources: bone glue, skin glue and fish glue; these may be regarded severally as impure forms of bone gelatin, skin gelatin and isinglass.

Bone Glue.—For the manufacture of glue the bones are supplied fresh or after having been used for making soups; Indian and South American bones are unsuitable, since, by reason of their previous treatment with steam, both their fatty and glue-forming constituents have been already removed (to a great extent). On the average, fresh bones contain about 50% of mineral matter, mainly calcium and magnesium phosphates, about 12% each of moisture and fat, the remainder being other organic matter. The mineral matter reappears in commerce chiefly as artificial manure; the fat is employed in the candle, soap and glycerin industries, while the other organic matter supplies glue.

The separation of the fat, or "de-greasing of the bones" is effected (1) by boiling the bones with water in open vessels; (2) by treatment with steam under pressure; or (3) by means of solvents. The last process is superseding the first two, which give a poor return of fat—a valuable consideration—and also involve the loss of a certain amount of glue. Many solvents have been proposed; the greatest commercial success appears to attend Scottish shale oil and natural petroleum (Russian or American) boiling at about 100° C. The vessels in which the extraction is carried out consist of upright cylindrical boilers, provided with manholes for charging, a false bottom on which the bones rest, and with two steam coils—one for heating only, the other for leading in "live" steam. There is a pipe from the top of the vessel leading to a condensing plant. The vessels are arranged in batteries. In the actual operation the boiler is charged with bones, solvent is run in, and the mixture gradually heated by means of the dry coil; the spirit distils over, carrying with it the water present in the bones; and after a time the extracted fat is run off from discharge cocks in the bottom of the extractor.[1] A fresh charge of solvent is introduced, and the cycle repeated; this is repeated a third and fourth time, after which the bones contain only about 0·2% of fat, and a little of the solvent, which is removed by blowing in live steam under 70 to 80 lb pressure. The de-greased bones are now cleansed from all dirt and flesh by rotation in a horizontal cylindrical drum covered with stout wire gauze. The attrition accompanying this motion suffices to remove the loosely adherent matter, which falls through the meshes of the gauze; this meal contains a certain amount of glue-forming matter, and is generally passed through a finer mesh, the residuum being worked up in the glue-house, and the flour which passes through being sold as a bone-meal, or used as a manure.

The bones, which now contain 5 to 6% of glue-forming nitrogen and about 60% of calcium phosphate, are next treated for glue. The most economical process consists in steaming the bones under pressure (15 lb to start with, afterwards 5 lb) in upright cylindrical boilers fitted with false bottoms. The glue-liquors collect beneath the false bottoms, and when of a strength equal to about 20% dry glue they are run off to the clarifiers. The first runnings contain about 65 to 70% of the total glue; a second steaming extracts another 25 to 30%. For clarifying the solutions, ordinary alum is used, one part being used for 200 parts of dry glue. The alum is added to the hot liquors, and the temperature raised to 100°; it is then allowed to settle, and the surface scum removed by filtering through coarse calico or fine wire filters.

The clear liquors are now concentrated to a strength of about 32% dry glue in winter and 35% in summer. This is invariably effected in vacuum pans—open boiling yields a dark-coloured and inferior product. Many types of vacuum plant are in use; the Yaryan form, invented by H. T. Yaryan, is perhaps the best, and the double-effect system is the most efficient. After concentration the liquors are bleached by blowing in sulphur dioxide, manufactured by burning sulphur; by this means the colour can be lightened to any desired degree. The liquors are now run into galvanized sheet-iron troughs, 2 ft. long, 6 in. wide and 5 in. deep, where they congeal to a firm jelly, which is subsequently removed by cutting round the edges, or by warming with hot water, and turning the cake out. The cake is sliced to sheets of convenient thickness, generally by means of a wire knife, *i.e.* a piece of wire placed in a frame. Mechanical slicers acting on this principle are in use. Instead of allowing the solution to congeal in troughs, it may be "cast" on sheets of glass, the bottoms of which are cooled by running water. After congealing, the tremulous jelly is dried; this is an operation of great nicety: the desiccation must be slow and is generally effected by circulating a rapid current of air about the cakes supported on nets set in frames; it occupies from four to five days, and the cake contains on the average from 10 to 13% of water.

Skin Glue.—In the preparation of skin glue the materials used are the parings and cuttings of hides from tan-yards, the ears of oxen and sheep, the skins of rabbits, hares, cats, dogs and other animals, the parings of tawed leather, parchment and old gloves, and many other miscellaneous scraps of animal matter. Much experience is needed in order to prepare a good

[1] This fat contains a small quantity of solvent, which is removed by heating with steam, when the solvent distils off. Hot water is then run in to melt the fat, which rises to the surface of the water and is floated off. Another boiling with water, and again floating off, frees the fat from dirt and mineral matter, and the product is ready for casking.

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glue from such heterogeneous materials; one blending may be a success and another a failure. The raw material has been divided into three great divisions: (1) sheep pieces and fleshings (ears, &c.); (2) ox-fleshings and trimmings; (3) ox hides and pieces; the best glue is obtained from a mixture of the hide, ear and face clippings of the ox and calf. The raw material or "stock" is first steeped for from two to ten weeks, according to its nature, in wooden vats or pits with lime water, and afterwards carefully dried and stored. The object of the lime steeping is to remove any blood and flesh which may be attached to the skin, and to form a lime soap with the fatty matter present. The "scrows" or glue pieces, which may be kept a long time without undergoing change, are washed with a dilute hydrochloric acid to remove all lime, and then very thoroughly with water; they are now allowed to drain and dry. The skins are then placed in hemp nets and introduced into an open boiler which has a false bottom, and a tap by which liquid may be run off. As the boiling proceeds test quantities of liquid are from time to time examined, and when a sample is found on cooling to form a stiff jelly, which happens when it contains about 32% dry glue, it is ready to draw off. The solution is then run to a clarifier, in which a temperature sufficient to keep it fluid is maintained, and in this way any impurity is permitted to subside. The glue solution is then run into wooden troughs or coolers in which it sets to a firm jelly. The cakes are removed as in the case of bone glue (see above), and, having been placed on nets, are, in the Scottish practice, dried by exposure to open air. This primitive method has many disadvantages: on a hot day the cake may become unshapely, or melt and slip through the net, or dry so rapidly as to crack; a frost may produce fissures, while a fog or mist may precipitate moisture on the surface and occasion a mouldy appearance. The surface of the cake, which is generally dull after drying, is polished by washing with water. The practice of boiling, clarification, cooling and drying, which has been already described in the case of bone glue, has been also applied to the separation of skin glue.

Fish Glue.—Whereas isinglass, a very pure gelatin, is yielded by the sounds of a limited number of fish, it is found that all fish offals yield a glue possessing considerable adhesive properties. The manufacture consists in thoroughly washing the offal with water, and then discharging it into extractors with live steam. After digestion, the liquid is run off, allowed to stand, the upper oily layer removed, and the lower gluey solution clarified with alum. The liquid is then filtered, concentrated in open vats, and bleached with sulphur dioxide.[1] Fish glue is a light-brown viscous liquid which has a distinctly disagreeable odour and an acrid taste; these disadvantages to its use are avoided if it be boiled with a little water and 1% of sodium phosphate, and 0·025% of saccharine added.

Properties of Glue.—A good quality of glue should be free from all specks and grit, have a uniform, light brownish-yellow, transparent appearance, and should break with a glassy fracture. Steeped for some time in cold water it softens and swells up without dissolving, and when again dried it ought to resume its original properties. Under the influence of heat it entirely dissolves in water, forming a thin syrupy fluid with a not disagreeable smell. The adhesiveness of different qualities of glue varies considerably; the best adhesive is formed by steeping the glue, broken in small pieces, in water until they are quite soft, and then placing them with just sufficient water to effect solution in the glue-pot. The hotter the glue, the better the joint; remelted glue is not so strong as the freshly prepared; and newly manufactured glue is inferior to that which has been long in stock. It is therefore seen that many factors enter into the determination of the cohesive power of glue; a well-prepared joint may, under favourable conditions, withstand a pull of about 700 lb per sq. in. The following table, after Kilmarsch, shows the holding power of glued joints with various kinds of woods.

Wood.	lb per sq. in.	
	With grain.	Across grain.
Beech . . .	852	434·5
Maple . . .	784	346
Oak . . .	704	302
Fir . . .	605	132

Special Kinds of Glues, Cements, &c.—By virtue of the fact that the word "glue" is frequently used to denote many adhesives, which may or may not contain gelatin, there will now be given an account of some special preparations. These may be conveniently divided into: (1) liquid glues, mixtures containing gelatin which do not jelly at ordinary temperatures but still possess adhesive properties; (2) water-proof glues, including mixtures containing gelatin, and also the "marine glues," which contain no gelatin; (3) glues or cements for special purposes, *e.g.* for cementing glass, pottery, leather, &c., for cementing dissimilar materials, such as paper or leather to iron.

Liquid Glues.—The demand for liquid glues is mainly due to the disadvantages—the necessity of dissolving and using while hot—of ordinary glue. They are generally prepared by adding to a warm glue solution some reagent which destroys the property of gelatinizing. The reagents in common use are acetic acid; magnesium chloride, used for a glue employed by printers; hydrochloric acid and zinc sulphate; nitric acid and lead sulphate; and phosphoric acid and ammonium carbonate.

Water-proof Glues.—Numerous recipes for water-proof glues have been published; glue, having been swollen by soaking in water, dissolved in four-fifths its weight of linseed oil, furnishes a good water-proof adhesive; linseed oil varnish and litharge, added to a glue solution, is also used; resin added to a hot glue solution in water, and afterwards diluted with turpentine, is another recipe; the best glue is said to be obtained by dissolving one part of glue in one and a half parts of water, and then adding one-fifteen part of potassium bichromate. Alcoholic solutions of various gums, and also tannic acid, confer the same property on glue solutions. The "marine glues" are solutions of india-rubber, shellac or asphaltum, or mixtures of these substances, in benzene or in naphtha. Jeffrey's marine glue is formed by dissolving india-rubber in four parts of benzene and adding two parts of shellac; it is extensively used, being easily applied and drying rapidly and hard. Another water-proof glue which contains no gelatin is obtained by heating linseed oil with five parts of quicklime; when cold it forms a hard mass, which melts on heating like ordinary glue.

Special Glues.—There are innumerable recipes for adhesives specially applicable to certain substances and under certain conditions. For repairing glass, ivory, &c., isinglass or gelatin, which may be replaced by fine glue, yields valuable cements; bookbinders employ an elastic glue obtained from an ordinary glue solution and glycerin, the water being expelled by heating; an efficient cement for mounting photographs is obtained by dissolving glue in ten parts of alcohol and adding one part of glycerin; portable or mouth glue—so named because it melts in the mouth—is prepared by dissolving one part of sugar in a solution of four parts of glue. An india-rubber substitute is obtained by adding sodium tungstate and hydrochloric acid to a strong glue solution; this preparation may be rolled out when heated to 60°.

For further details see Thomas Lambert, *Glue, Gelatine and their Allied Products* (London, 1905); R. L. Fernbach, *Glues and Gelatine* (1907); H. C. Standage, *Agglutinants of all Kinds for all Purposes* (1907).

GLUTARIC ACID, or NORMAL PYROTARTARIC ACID, $HO_2C{\cdot}CH_2{\cdot}CH_2{\cdot}CH_2{\cdot}CO_2H$, an organic acid prepared by the reduction of α-oxyglutaric acid with hydriodic acid, by reducing glutaconic acid, $HO_2C{\cdot}CH_2{\cdot}CH{:}CH{\cdot}CO_2H$, with sodium amalgam, by the decomposition of trimethylene bromide into the cyanide and hydrolysis of this compound, or from acetoacetic ester, which, in the form of its sodium derivative, condenses with β-iodopropionic ester to form acetoglutaric ester, $CH_3{\cdot}CO{\cdot}CH(CO_2C_2H_5){\cdot}CH_2{\cdot}CH_2{\cdot}CO_2C_2H_5$, from which glutaric acid is obtained by hydrolysis. It is also obtained when sebacic, stearic and oleic acids are oxidized with nitric acid. It crystallizes in large monoclinic prisms which melt at 97·5° C., and distils between 302° and 304° C., practically without decomposition. It is soluble in water, alcohol and ether. By long heating the acid is converted into its anhydride, which, however, is obtained more readily by heating the silver salt of the acid with acetyl chloride. By distillation of the ammonium salt glutarimide, $CH_2(CH_2{\cdot}CO)_2NH$, is obtained; it forms small crystals melting at 151° to 152° C. and sublimes unchanged.

On the alkyl glutaric acids, see C. Hell (*Ber.*, 1889, 22, pp. 48, 60), C. A. Bischoff (*Ber.*, 1891, 24, p. 1041), K. Auwers (*Ber.*, 1891, 24, p. 1923) and W. H. Perkin, junr. (*Journ. Chem. Soc.*, 1896, 69, p. 268).

[1] The residue in the extractors is usually dried in steam-heated vessels, and mixed with potassium and magnesium salts; the product is then put on the market as fish-potash guano.

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GLUTEN, a tough, tenacious, ductile, somewhat elastic, nearly tasteless and greyish-yellow albuminous substance, obtained from the flour of wheat by washing in water, in which it is insoluble. Gluten, when dried, loses about two-thirds of its weight, becoming brittle and semi-transparent; when strongly heated it crackles and swells, and burns like feather or horn. It is soluble in strong acetic acid, and in caustic alkalis, which latter may be used for the purification of starch in which it is present. When treated with ·1 to ·2% solution of hydrochloric acid it swells up, and at length forms a liquid resembling a solution of albumin, and laevorotatory as regards polarized light. Moistened with water and exposed to the air gluten putrefies, and evolves carbon dioxide, hydrogen and sulphuretted hydrogen, and in the end is almost entirely resolved into a liquid, which contains leucin and ammonium phosphate and acetate. On analysis gluten shows a composition of about 53% of carbon, 7% of hydrogen, and nitrogen 15 to 18%, besides oxygen, and about 1% of sulphur, and a small quantity of inorganic matter. According to H. Ritthausen it is a mixture of *glutencasein* (Liebig's vegetable fibrin), *glutenfibrin*, *gliadin* (Pflanzenleim), *glutin* or vegetable gelatin, and *mucedin*, which are all closely allied to one another in chemical composition. It is the gliadin which confers upon gluten its capacity of cohering to form elastic masses, and of separating readily from associated starch. In the so-called gluten of the flour of barley, rye and maize, this body is absent (H. Ritthausen and U. Kreusler). The gluten yielded by wheat which has undergone fermentation or has begun to sprout is devoid of toughness and elasticity. These qualities can be restored to it by kneading with salt, lime-water or alum. Gluten is employed in the manufacture of gluten bread and biscuits for the diabetic, and of chocolate, and also in the adulteration of tea and coffee. For making bread it must be used fresh, as otherwise it decomposes, and does not knead well. Granulated gluten is a kind of vermicelli, made in some starch manufactories by mixing fresh gluten with twice its weight of flour, and granulating by means of a cylinder and contained stirrer, each armed with spikes, and revolving in opposite directions. The process is completed by the drying and sifting of the granules.

GLUTTON, or WOLVERINE (*Gulo luscus*), a carnivorous mammal belonging to the *Mustelidae*, or weasel family, and the sole representative of its genus. The legs are short and stout, with large feet, the toes of which terminate in strong, sharp claws considerably curved. The mode of progression is semi-plantigrade. In size and form the glutton is something like the badger, measuring from 2 to 3 ft. in length, exclusive of the thick bushy tail, which is about 8 in. long. The head is broad, the eyes are small and the back arched. The fur consists of an undergrowth of short woolly hair, mixed with long straight hairs, to the abundance and length of which on the sides and tail the creature owes its shaggy appearance. The colour of the fur is blackish-brown, with a broad band of chestnut stretching from the shoulders along each side of the body, the two meeting near the root of the tail. Unlike the majority of arctic animals, the fur of the glutton in winter grows darker. Like other *Mustelidae*, the glutton is provided with anal glands, which secrete a yellowish fluid possessing a highly foetid odour. It is a boreal animal, inhabiting the northern regions of both hemispheres, but most abundant in the circumpolar area of the New World, where it occurs throughout the British provinces and Alaska, being specially numerous in the neighbourhood of the Mackenzie river, and extending southwards as far as New York and the Rocky Mountains. The wolverine is a voracious animal, and also one with an inquisitive disposition. It feeds on grouse, the smaller rodents and foxes, which it digs from their burrows during the breeding-season; but want of activity renders it dependent for most of its food on dead carcases, which it frequently obtains by methods that have made it peculiarly obnoxious to the hunter and trapper. Should the hunter, after succeeding in killing his game, leave the carcase insufficiently protected for more than a single night, the glutton, whose fear of snares is sufficient to prevent him from touching it during the first night, will, if possible, get at and devour what he can on the second, hiding the remainder beneath the snow. It annoys the trapper by following up his lines of marten-traps, often extending to a length of 40 to 50 m., each of which it enters from behind, extracting the bait, pulling up the traps, and devouring or concealing the entrapped martens. So persistent is the glutton in this practice, when once it discovers a line of traps, that its extermination along the trapper's route is a necessary preliminary to the success of his business. This is no easy task, as the glutton is too cunning to be caught by the methods successfully employed on the other members of the weasel family. The trap generally used for this purpose is made to resemble a cache, or hidden store of food, such as the Indians and hunters are in the habit of forming, the discovery and rifling of which is one of the glutton's most congenial occupations—the bait, instead of being paraded as in most traps, being carefully concealed, to lull the knowing beast's suspicions. One of the most prominent characteristics of the wolverine is its propensity to steal and hide things, not merely food which it might afterwards need, or traps which it regards as enemies, but articles which cannot possibly have any interest except that of curiosity. The following instance of this is quoted by Dr E. Coues in his work on the *Fur-bearing Animals of North America*: "A hunter and his family having left their lodge unguarded during

The Glutton, or Wolverine (*Gulo luscus*).

their absence, on their return found it completely gutted—the walls were there, but nothing else. Blankets, guns, kettles, axes, cans, knives and all the other paraphernalia of a trapper's tent had vanished, and the tracks left by the beast showed who had been the thief. The family set to work, and, by carefully following up all his paths, recovered, with some trifling exceptions, the whole of the lost property." The cunning displayed by the glutton in unravelling the snares set for it forms at once the admiration and despair of every trapper, while its great strength and ferocity render it a dangerous antagonist to animals larger than itself, occasionally including man. The rutting-season occurs in March, and the female, secure in her burrow, produces her young—four or five at a birth—in June or July. In defence of these she is exceedingly bold, and the Indians, according to Dr Coues, "have been heard to say that they would sooner encounter a she-bear with her cubs than a carcajou (the Indian name of the glutton) under the same circumstances." On catching sight of its enemy, man, the wolverine before finally determining on flight, is said to sit on its haunches, and, in order to get a clearer view of the danger, shade its eyes with one of its fore-paws. When pressed for food it becomes fearless, and has been known to come on board an ice-bound vessel, and in presence of the crew seize a can of meat. The glutton is valuable for its fur, which, when several skins are sewn together, forms elegant hearth and carriage rugs. (R. L.*)

GLYCAS, MICHAEL, Byzantine historian (according to some a Sicilian, according to others a Corfiote), flourished during the 12th century A.D. His chief work is his *Chronicle* of events

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from the creation of the world to the death of Alexius I. Comnenus (1118). It is extremely brief and written in a popular style, but too much space is devoted to theological and scientific matters. Glycas was also the author of a theological treatise and a number of letters on theological questions. A poem of some 600 "political" verses, written during his imprisonment on a charge of slandering a neighbour and containing an appeal to the emperor Manuel, is still extant. The exact nature of his offence is not known, but the answer to his appeal was that he was deprived of his eyesight by the emperor's orders.

Editions: "Chronicle and Letters," in J. P. Migne, *Patrologia Graeca*, clviii.; poem in E. Legrand, *Bibliothèque grecque vulgaire*, i.: see also F. Hirsch, *Byzantinische Studien* (1876); C. Krumbacher in *Sitzungsberichte bayer. Acad.*, 1894; C. F. Bähr in Ersch and Gruber's *Allgemeine Encyklopädie*.

GLYCERIN, GLYCERINE or GLYCEROL (in pharmacy *Glycerinum*) (from Gr. γλυκύς, sweet), a trihydric alcohol, trihydroxypropane, $C_3H_5(OH)_3$. It is obtainable from most natural fatty bodies by the action of alkalis and similar reagents, whereby the fats are decomposed, water being taken up, and glycerin being formed together with the alkaline salt of some particular acid (varying with the nature of the fat). Owing to their possession of this common property, these natural fatty bodies and various artificial derivatives of glycerin, which behave in the same way when treated with alkalis, are known as glycerides. In the ordinary process of soap-making the glycerin remains dissolved in the aqueous liquors from which the soap is separated.

Glycerin was discovered in 1779 by K. W. Scheele and named *Ölsüss* (*principe doux des huiles*—sweet principle of oils), and more fully investigated subsequently by M. E. Chevreul, who named it glycerin, M. P. E. Berthelot, and many other chemists, from whose researches it results that glycerin is a trihydric alcohol indicated by the formula $C_3H_5(OH)_3$, the natural fats and oils, and the glycerides generally, being substances of the nature of compound esters formed from glycerin by the replacement of the hydrogen of the OH groups by the radicals of certain acids, called for that reason "fatty acids." The relationship of these glycerides to glycerin is shown by the series of bodies formed from glycerin by replacement of hydrogen by "stearyl" ($C_{18}H_{35}O$), the radical of stearic acid ($C_{18}H_{35}O{\cdot}OH$):—

Glycerin.	Monostearin.	Distearin.	Tristearin.
$CH_2{\cdot}OH$	$CH_2{\cdot}O(C_{18}H_{35}O)$	$CH_2{\cdot}O(C_{18}H_{35}O)$	$CH_2{\cdot}O(C_{18}H_{35}O)$
$CH{\cdot}OH$	$CH{\cdot}OH$	$CH{\cdot}O(C_{18}H_{35}O)$	$CH{\cdot}O(C_{18}H_{35}O)$
$CH_2{\cdot}OH$	$CH_2{\cdot}OH$	$CH_2{\cdot}OH$	$CH_2{\cdot}O(C_{18}H_{35}O)$

The process of saponification may be viewed as the gradual progressive transformation of tristearin, or some analogously constituted substance, into distearin, monostearin and glycerin, or as the similar transformation of a substance analogous to distearin or to monostearin into glycerin. If the reaction is brought about in presence of an alkali, the acid set free becomes transformed into the corresponding alkaline salt; but if the decomposition is effected without the presence of an alkali (*i.e.* by means of water alone or by an acid), the acid set free and the glycerin are obtained together in a form which usually admits of their ready separation. It is noticeable that with few exceptions the fatty and oily matters occurring in nature are substances analogous to tristearin, *i.e.* they are trebly replaced glycerins. Amongst these glycerides may be mentioned the following:

Tristearin—$C_3H_5(O{\cdot}C_{18}H_{35}O)_3$. The chief constituent of hard animal fats, such as beef and mutton tallow, &c.; also contained in many vegetable fats in smaller quantity.

Triolein—$C_3H_5(O{\cdot}C_{18}H_{33}O)_3$. Largely present in olive oil and other saponifiable vegetable oils and soft fats; also present in animal fats, especially hog's lard.

Tripalmitin—$C_3H_5(O{\cdot}C_{16}H_{31}O)_3$. The chief constituent of palm oil; also contained in greater or less quantities in human fat, olive oil, and other animal and vegetable fats.

Triricinolein—$C_3H_5(O{\cdot}C_{18}H_{33}O_2)_3$. The main constituent of castor oil.

Other analogous glycerides are apparently contained in greater or smaller quantity in certain other oils. Thus in cows' butter, *tributyrin*, $C_3H_5(O{\cdot}C_4H_7O)_3$, and the analogous glycerides of other readily volatile acids closely resembling butyric acid, are present in small quantity; the production of these acids on saponification and distillation with dilute sulphuric acid is utilized as a test of a purity of butter as sold. *Triacetin*, $C_3H_5(O{\cdot}C_2H_3O)_3$, is apparently contained in cod-liver oil. Some other glycerides isolated from natural sources are analogous in composition to tristearin, but with this difference, that the three radicals which replace hydrogen in glycerin are not all identical; thus kephalin, myelin and lecithin are glycerides in which two hydrogens are replaced by fatty acid radicals, and the third by a complex phosphoric acid derivative.

Glycerin is also a product of certain kinds of fermentation, especially of the alcoholic fermentation of sugar; consequently it is a constituent of many wines and other fermented liquors. According to Louis Pasteur, about $\frac{1}{12}$th of the sugar transformed under ordinary conditions in the fermentation of grape juice and similar saccharine liquids into alcohol and other products becomes converted into glycerin. In certain natural fatty substances, *e.g.* palm oil, it exists in the free state, so that it can be separated by washing with boiling water, which dissolves the glycerin but not the fatty glycerides.

Properties.—Glycerin is a viscid, colourless liquid of sp. gr. 1·265 at 15° C., possessing a somewhat sweet taste; below 0° C. it solidifies to a white crystalline mass, which melts at 17° C. When heated alone it partially volatilizes, but the greater part decomposes; under a pressure of 12 mm. of mercury it boils at 170° C. In an atmosphere of steam it distils without decomposition under ordinary barometric pressure. It dissolves readily in water and alcohol in all proportions, but is insoluble in ether. It possesses considerable solvent powers, whence it is employed for numerous purposes in pharmacy and the arts. Its viscid character, and its non-liability to dry and harden by exposure to air, also fit it for various other uses, such as lubrication, &c., whilst its peculiar physical characters, enabling it to blend with either aqueous or oily matters under certain circumstances, render it a useful ingredient in a large number of products of varied kinds.

Manufacture.—The simplest modes of preparing pure glycerin are based on the saponification of fats, either by alkalis or by superheated steam, and on the circumstance that, although glycerin cannot be distilled by itself under the ordinary pressure without decomposition, it can be readily volatilized in a current of superheated steam. Commercial glycerin is mostly obtained from the "spent lyes" of the soap-maker. In the van Ruymbeke process the spent lyes are allowed to settle, and then treated with "persulphate of iron," the exact composition of which is a trade secret, but it is possibly a mixture of ferric and ferrous sulphates. Ferric hydrate, iron soaps and all insoluble impurities are precipitated. The liquid is filtered-pressed, and any excess of iron in the filtrate is precipitated by the careful addition of caustic soda and then removed. The liquid is then evaporated under a vacuum of 27 to 28 in. of mercury, and, when of specific gravity 1·295 (corresponding to about 80% of glycerin), it is distilled under a vacuum of 28 to 29 in. In the Glatz process the lye is treated with a little milk of lime, the liquid then neutralized with hydrochloric acid, and the liquid filtered. Evaporation and subsequent distillation under a high vacuum gives crude glycerin. The impure glycerin obtained as above is purified by redistillation in steam and evaporation in vacuum pans.

Technical Uses.—Besides its use as a starting-point in the production of "nitroglycerin" (q.v.) and other chemical products, glycerin is largely employed for a number of purposes in the arts, its application thereto being due to its peculiar physical properties. Thus its non-liability to freeze (when not absolutely anhydrous, which it practically never is when freely exposed to the air) and its non-volatility at ordinary temperatures, combined with its power of always keeping fluid and not drying up and hardening, render it valuable as a lubricating agent for clockwork, watches, &c., as a substitute for water in wet gas-meters, and also as an ingredient in cataplasms, plasters, modelling clay, pasty colouring matters, dyeing materials, moist colours for artists, and numerous other analogous substances which are required to be kept in a permanently soft condition. Glycerin acts as a preservative against putrefaction, owing to its antiseptic qualities, which also led to its being employed to preserve untanned leather (especially during transit when exported, the hides being, moreover, kept soft and supple); to make solutions of gelatin, albumen, gum, paste, cements, &c., which will keep without decomposition; to preserve meat and other edibles; to mount anatomical preparations; to preserve vaccine lymph unchanged; and for many similar purposes. Its solvent power is also

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utilized in the production of various colouring fluids, where the colouring matter would not dissolve in water alone; thus aniline violet, the tinctorial constituents of madder, and various allied colouring matters dissolve in glycerin, forming liquids which remain coloured even when diluted with water, the colouring matters being either retained in suspension or dissolved by the glycerin present in the diluted fluid. Glycerin is also employed in the manufacture of formic acid (*q.v.*). Certain kinds of copying inks are greatly improved by the substitution of glycerin, in part or entirely, for the sugar or honey usually added.

In its medicinal use glycerin is an excellent solvent for such substances as iodine, alkaloids, alkalies, &c., and is therefore useful in applying them to diseased surfaces, especially as it aids in their absorption. It does not evaporate or turn rancid, whilst its marked hygroscopic action ensures the moistness and softness of any surface that it covers. Given by the mouth glycerin produces purging if large doses are administered, and has the same action if only a small quantity be introduced into the rectum. For this purpose it is very largely used either as a suppository or in the fluid form (one or two drachms). The result is prompt, safe and painless. Glycerin is useless as a food and is not in any sense a substitute for cod-liver oil. Very large doses in animals cause lethargy, collapse and death.

GLYCOLS, in organic chemistry, the generic name given to the aliphatic dihydric alcohols. These compounds may be obtained by heating the alkylen iodides or bromides (*e.g.* ethylene dibromide) with silver acetate or with potassium acetate and alcohol, the esters so produced being then hydrolysed with caustic alkalis, thus:

$C_2H_4Br_2+2C_2H_3O_2{\cdot}Ag\rightarrow C_2H_4(O{\cdot}C_2H_3O)_2\rightarrow C_2H_4(OH)_2+2K{\cdot}C_2H_3O_2$;

by the direct union of water with the alkylen oxides; by oxidation of the olefines with cold potassium permanganate solution (G. Wagner, *Ber.*, 1888, 21, p. 1231), or by the action of nitrous acid on the diamines.

Glycols may be classified as *primary*, containing two $-CH_2OH$ groups; *primary-secondary*, containing the grouping $-CH(OH){\cdot}CH_2OH$; *secondary*, with the grouping $-CH(OH){\cdot}CH(OH)-$; and *tertiary*, with the grouping $>C(OH){\cdot}(OH)C<$. The secondary glycols are prepared by the action of alcoholic potash on aldehydes, thus:

$3(CH_3)_2CH{\cdot}CHO+KHO=(CH_3)_2CHCO_2K+(CH_3)_2CH{\cdot}CH(OH){\cdot}CH(OH){\cdot}CH(CH_3)_2$.

The tertiary glycols are known as *pinacones* and are formed on the reduction of ketones with sodium amalgam.

The glycols are somewhat thick liquids, of high boiling point, the pinacones only being crystalline solids; they are readily soluble in water and alcohol, but are insoluble in ether. By the action of dehydrating agents they are converted into aldehydes or ketones. In their general behaviour towards oxidizing agents the primary glycols behave very similarly to the ordinary primary alcohols (*q.v.*), but the secondary and tertiary glycols break down, yielding compounds with a smaller carbon content.

Ethylene glycol, $C_2H_4(OH)_2$, was first prepared by A. Wurtz (*Ann. chim.*, 1859 [3], 55, p. 400) from ethylene dibromide and silver acetate. It is a somewhat pleasant smelling liquid, boiling at 197° to 197·5° C. and having a specific gravity of 1·125 (0°). On fusion with solid potash at 250° C. it completely decomposes, giving potassium oxalate and hydrogen,

$C_2H_6O_2+2KHO=K_2C_2O_4+4H_2$.

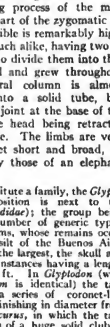
Two propylene glycols, $C_3H_8O_2$, are known, viz. α-propylene glycol, $CH_3{\cdot}CH(OH){\cdot}CH_2OH$, a liquid boiling at 188° to 189° and obtained by heating glycerin with sodium hydroxide and distilling the mixture; and trimethylene glycol, $CH_2OH{\cdot}CH_2{\cdot}CH_2OH$, a liquid boiling at 214° C. and prepared by boiling trimethylene bromide with potash solution (A. Zander, *Ann.*, 1882, 214, p. 178).

GLYCONIC (from Glycon, a Greek lyric poet), a form of verse, best known in Catullus and Horace (usually in the catalectic variety – ⏑ – ⏑ – ⏑ ⏑), with three feet—a spondee and two dactyls; or four—three trochees and a dactyl, or a dactyl and three chorees. Sir R. Jebb pointed out that the last form might be varied by placing the dactyl second or third, and according to its place this verse was called a First, Second or Third Glyconic.

Cf. J. W. White, in *Classical Quarterly* (Oct. 1909).

GLYPH (from Gr. γλύφειν, to carve), in architecture, a vertical channel in a frieze (see TRIGLYPH).

GLYPTODON (Greek for "fluted-tooth "), a name applied by Sir R. Owen to the typical representative of a group of gigantic, armadillo-like, South American, extinct Edentata, characterized by having the carapace composed of a solid piece (formed by the union of a multitude of bony dermal plates) without any movable rings. The facial portion of the skull is very short; a long process of the maxillary bone descends from the anterior part of the zygomatic arch; and the ascending ramus of the mandible is remarkably high. The teeth, $\frac{8}{8}$ in the later species, are much alike, having two deep grooves or flutings on each side, so as to divide them into three distinct lobes (fig.). They are very tall and grow throughout life. The vertebral column is almost entirely welded into a solid tube, but there is a complex joint at the base of the neck, to allow the head being retracted within the carapace. The limbs are very strong, and the feet short and broad, resembling externally those of an elephant or tortoise.



Two views of the tooth of a *Glyptodon*; the upper figure shows the passage of blood-vessels and ing one side, and the not receptacles for bristles. In the early lower the crown.

Glyptodonts constitute a family, the *Glyptodontidae*, whose position is next to the armadillos (*Dasypodidae*); the group being represented by a number of generic types. The Pleistocene forms, whose remains occur abundantly in the silt of the Buenos Aires pampas, are by far the largest, the skull and tail-sheath in some instances having a length of from 12 to 16 ft. In *Glyptodon clavipes* (which *Schistopleurum* is identical) the tail-sheath consists of a series of coronet-like rings, gradually diminishing in diameter from base to tip. *Daedicurus*, in which the tail-sheath is in the form of a huge solid club, is the largest member of the family; in *Panochthus* and *Sclerocalyptus* (*Hoplophorus*) the tail-sheath consists basally of a small number of smooth rings, and terminally of a tube. In some specimens of these genera the horny shields covering the bony scutes of the carapace have been preserved, and since the foramina, which often pierce the latter, stop short of the former, it is evident that these were for the

Pleistocene epoch, when South America became connected with North America, some of the glyptodonts found their way into the latter continent. Among these northern forms some from Texas and Florida have been referred to *Glyptodon*. One large species from Texas has, however, been made the type of a separate genus, under the name of *Glyptotherium texanum*. In some respects it shows affinity with *Panochthus*, although in the simple structure of the tail-sheath it recalls the undermentioned *Propalaeohoplophorus*. All the above are of Pleistocene and perhaps Pliocene age, but in the Santa Cruz beds of Patagonia there occur the two curious genera *Propalaeohoplophorus* and *Peltephilus*, the former of which is a primitive and generalized type of glyptodont, while the latter seems to come nearer to the armadillos. Both are represented by species of comparatively small size. In *Propalaeohoplophorus* the scutes of the carapace, which are less deeply sculptured than in the larger glyptodonts, are arranged in distinct transverse rows, in three of which they partially overlap near the border of the carapace after the fashion of the armadillos. The skull and limb-bones exhibit several features met with in the latter, and the vertebrae of the back are not welded into a continuous tube. There are eight pairs of teeth, the first four of which are simpler than the rest, and may perhaps therefore be regarded as premolars. More remarkable is *Peltephilus*, on account of the fact that the teeth, which are simple, with a chevron-shaped section, form a continuous series from the front of the jaw backwards, the number of pairs being seven. Accordingly, a modification of the character, even of the true Edentata, as given in the earlier article, is rendered necessary. The head bears a pair of horn-like scutes, and the scutes of the carapace and tail, which are loosely opposed or slightly overlapping, form a number of transverse rows.

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GLYPTOTHEK (from Gr. γλυπτός, carved, and θήκη, a place of storage), an architectural term given to a gallery for the exhibition of sculpture, and first employed at Munich, where it was built to exhibit the sculptures from the temple of Aegina.

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GMELIN, the name of several distinguished German scientists, of a Tübingen family. Johann Georg Gmelin (1674–1728), an apothecary in Tübingen, and an accomplished chemist for the times in which he lived, had three sons. The first, Johann Conrad (1702–1759), was an apothecary and surgeon in Tübingen. The second, Johann Georg (1709–1755), was appointed professor of chemistry and natural history in St Petersburg in 1731, and from 1733 to 1743 was engaged in travelling through Siberia. The fruits of his journey were *Flora Sibirica* (4 vols., 1749–1750) and *Reisen durch Sibirien* (4 vols., 1753). He ended his days as professor of medicine at Tübingen, a post to which he was appointed in 1749. The third son, Philipp Friedrich (1721–1768), was extraordinary professor of medicine at Tübingen in 1750, and in 1755 became ordinary professor of botany and chemistry. In the second generation Samuel Gottlieb (1743–1774), the son of Johann Conrad, was appointed professor of natural history at St Petersburg in 1766, and in the following year started on a journey through south Russia and the regions round the Caspian Sea. On his way back he was captured by Usmey Khan, of the Kaitak tribe, and died from the ill-treatment he suffered, on the 27th of July 1774. One of his nephews, Ferdinand Gottlob von Gmelin (1782–1848), became professor of medicine and natural history at Tübingen in 1805, and another, Christian Gottlob (1792–1860), who in 1828 was one of the first to devise a process for the artificial manufacture of ultramarine, was professor of chemistry and pharmacy in the same university. In the youngest branch of the family, Philipp Friedrich had a son, Johann Friedrich (1748–1804), who was appointed professor of medicine in Tübingen in 1772, and in 1775 accepted the chair of medicine and chemistry at Göttingen. In 1788 he published the 13th edition of Linnaeus' *Systema Naturae* with many additions and alterations. His son Leopold (1788–1853), was the best-known member of the family. He studied medicine and chemistry at Göttingen, Tübingen and Vienna, and in 1813 began to lecture on chemistry at Heidelberg, where in 1814 he was appointed extraordinary, and in 1817 ordinary, professor of chemistry and medicine. He was the discoverer of potassium ferricyanide (1822), and wrote the *Handbuch der Chemie* (1st ed. 1817–1819, 4th ed. 1843–1855), an important work in its day, which was translated into English for the Cavendish Society by H. Watts (1815–1884) in 1848–1859. He resigned his chair in 1852, and died on the 13th of April in the following year at Heidelberg.

GMÜND, a town of Germany, in the kingdom of Württemberg,[1] in a charming and fruitful valley on the Rems, here spanned by a beautiful bridge, 31 m. E.N.E. of Stuttgart on the railway to Nördlingen. Pop. (1905) 18,699. It is surrounded by old walls, flanked with towers, and has a considerable number of ancient buildings, among which are the fine church of the Holy Cross; St John's church, which dates from the time of the Hohenstaufen; and, situated on a height near the town, partly hewn out of the rock, the pilgrimage church of the Saviour. Among the modern buildings are the gymnasium, the drawing and trade schools, the Roman Catholic seminary, the town hall and the industrial art museum. Clocks and watches are manufactured here and also other articles of silver, while the town has a considerable trade in corn, hops and fruit. The scenery in the neighbourhood is very beautiful, near the town being the district called Little Switzerland.

Gmünd was surrounded by walls in the beginning of the 12th century by Duke Frederick of Swabia. It received town rights from Frederick Barbarossa, and after the extinction of the Hohenstaufen became a free imperial town. It retained its independence till 1803, when it came into the possession of Württemberg. Gmünd is the birth-place of the painter Hans Baldung (1475–1545) and of the architect Heinrich Arler or Parler (fl. 1350). In the middle ages the population was about 10,000.

See Kaiser, *Gmünd und seine Umgebung* (1888).

[1] There are two places of this name in Austria. (1) Gmünd, a town in Lower Austria, containing a palace belonging to the imperial family. (2) a town in Carinthia, with a beautiful Gothic church and some interesting ruins.

GMUNDEN, a town and summer resort of Austria, in Upper Austria, 40 m. S.S.W. of Linz by rail. Pop. (1900) 7126. It is situated at the efflux of the Traun river from the lake of the same name and is surrounded by high mountains, as the Traunstein (5446 ft.), the Erlakogel (5150 ft.), the Wilde Kogel (6860 ft.) and the Höllen Gebirge. It is much frequented as a health and summer resort, and has a variety of lake, brine, vegetable and pine-cone baths, a hydropathic establishment, inhalation chambers, whey cure, &c. There are a great number of excursions and points of interest round Gmunden, specially worth mentioning being the Traun Fall, 10 m. N. of Gmunden. It is also an important centre of the salt industry in Salzkammergut. Gmunden was a town encircled with walls already in 1186. On the 14th of November 1626, Pappenheim completely defeated here the army of the rebellious peasants.

See F. Krackowizer, *Geschichte der Stadt Gmunden in Oberösterreich* (Gmunden, 1898–1901, 3 vols.).

GNAT (O. Eng. *gnæt*), the common English name for the smaller dipterous flies (see DIPTERA) of the family *Culicidae*, which are now included among "mosquitoes" (see MOSQUITO). The distinctive term has no zoological significance, but in England the "mosquito" has commonly been distinguished from the "gnat" as a variety of larger size and more poisonous bite.

GNATHOPODA, a term in zoological classification, suggested as an alternative name for the group Arthropoda (*q.v.*). The word, which means "jaw-footed," refers to the fact that in the members of the group, some of the lateral appendages or "feet" in the region of the mouth act as jaws.

GNATIA (also EGNATIA or IGNATIA, mod. *Anazzo*, near Fasano), an ancient city of the Peucetii, and their frontier town towards the Sallentini (*i.e.* of Apulia towards Calabria), in Roman times of importance for its trade, lying as it did on the sea, at the point where the Via Traiana joined the coast road,[2] 38 m. S.E. of Barium. The ancient city walls have been almost entirely destroyed in recent times to provide building material,[3] and the place is famous for the discoveries made in its tombs. A considerable collection of antiquities from Gnatia is preserved at Fasano, though the best are in the museum at Bari. Gnatia was the scene of the prodigy at which Horace mocks (*Sat.* i. 5. 97). Near Fasano are two small subterranean chapels with paintings of the 11th century A.D. (E. Bertaux, *L'Art dans l'Italie méridionale*, Paris, 1904, 135). (T. As.)

GNEISENAU, AUGUST WILHELM ANTON, COUNT NEITHARDT VON (1760–1831), Prussian field marshal, was the son of a Saxon officer named Neithardt. Born in 1760 at Schildau, near Torgau, he was brought up in great poverty there, and subsequently at Würzburg and Erfurt. In 1777 he entered Erfurt university; but two years later joined an Austrian regiment there quartered. In 1782 taking the additional name of Gneisenau from some lost estates of his family in Austria, he entered as an officer the service of the margrave of Baireuth-Anspach. With one of that prince's mercenary regiments in English pay he saw active service and gained valuable experience in the War of American Independence, and returning in 1786, applied for Prussian service. Frederick the Great gave him a commission as first lieutenant in the infantry. Made *Stabskapitän* in 1790, Gneisenau served in Poland, 1793–1794, and, subsequently to this, ten years of quiet garrison life in Jauer enabled him to undertake a wide range of military studies. In 1796 he married Caroline von Kottwitz. In 1806 he was one of Hohenlohe's staff-officers, fought at Jena, and a little later commanded a provisional infantry brigade which fought under Lestocq in the Lithuanian campaign. Early in 1807 Major von Gneisenau was sent as commandant to Colberg, which, small and ill-protected as it was, succeeded in holding out until the peace of Tilsit. The commandant received the much-prized order "pour le mérite," and was promoted lieutenant-colonel.

A wider sphere of work was now opened to him. As chief of

[2] There is no authority for calling the latter Via Egnatia.

[3] H. Swinburne, *Travels in the Two Sicilies* (London, 1790), ii. 15, mentions the walls as being 8 yds. thick and 16 courses high.

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engineers, and a member of the reorganizing committee, he played a great part, along with Scharnhorst, in the work of reconstructing the Prussian army. A colonel in 1809, he soon drew upon himself, by his energy, the suspicion of the dominant French, and Stein's fall was soon followed by Gneisenau's retirement. But, after visiting Russia, Sweden and England, he returned to Berlin and resumed his place as a leader of the patriotic party. In open military work and secret machinations his energy and patriotism were equally tested, and with the outbreak of the War of Liberation, Major-General Gneisenau became Blücher's quartermaster-general. Thus began the connexion between these two soldiers which has furnished military history with its best example of the harmonious cooperation between the general and his chief-of-staff. With Blücher, Gneisenau served to the capture of Paris; his military character was the exact complement of Blücher's, and under this happy guidance the young troops of Prussia, often defeated hut never discouraged, fought their way into the heart of France. The plan of the march on Paris, which led directly to the fall of Napoleon, was specifically the work of the chief-of-staff. In reward for his distinguished service he was in 1814, along with York, Kleist and Bülow, made count at the same time as Blücher became prince of Wahlstatt; an annuity was also assigned to him.

In 1815, once more chief of Blücher's staff, Gneisenau played a very conspicuous part in the Waterloo campaign (*q.v.*). Senior generals, such as York and Kleist, had been set aside in order that the chief-of-staff should have the command in case of need, and when on the field of Ligny the old field marshal was disabled, Gneisenau at once assumed the control of the Prussian army. Even in the light of the evidence that many years' research has collected, the precise part taken by Gneisenau in the events which followed is much debated. It is known that Gneisenau had the deepest distrust of the British commander, who, he considered, had left the Prussians in the lurch at Ligny, and that to the hour of victory he had grave doubts as to whether he ought not to fall back on the Rhine. Blücher, however, soon recovered from his injuries, and, with Grolmann, the quartermaster-general, he managed to convince Gneisenau. The relations of the two may be illustrated by Brigadier-General Hardinge's report. Blücher burst into Hardinge's room at Wavre, saying "*Gneisenau has given way*, and we are to march at once to your chief."

On the field of Waterloo, however, Gneisenau was quick to realize the magnitude of the victory, and he carried out the pursuit with a relentless vigour which has few parallels in history. His reward was further promotion and the insignia of the "Black Eagle" which had been taken in Napoleon's coach. In 1816 he was appointed to command the VIIIth Prussian Corps, but soon retired from the service, both because of ill-health and for political reasons. For two years he lived in retirement on his estate, Erdmannsdorf in Silesia, hut in 1818 he was made governor of Berlin in succession to Kalkreuth, and member of the *Staatsrath*. In 1825 he became general field marshal. In 1831 he was appointed to the command of the Army of Observation on the Polish frontier, with Clausewitz as his chief-of-staff. At Posen he was struck down by cholera and died on the 24th of August 1831, soon followed hy his chief-of-staff, who fell a victim to the same disease in November.

As a soldier, Gneisenau was the greatest Prussian general since Frederick; as a man, his noble character and virtuous life secured him the affection and reverence, not only of his superiors and subordinates in the service, hut of the whole Prussian nation. A statue hy Rauch was erected in Berlin in 1855, and in memory of the siege of 1807 the Colberg grenadiers received his name in 1889. One of his sons led a brigade of the VIIIth Army Corps in the war of 1870.

See G. H. Pertz, *Das Leben des Feldmarschalls Grafen Neithardt von Gneisenau*, vols. 1-3 (Berlin, 1864-1869); vols. 4 and 5, G. Delbrück (*ib.* 1879, 1880), with numerous documents and letters; H. Delbrück, *Das Leben des G. F. M. Grafen von Gneisenau* (2 vols., 2nd ed., Berlin, 1894), based on Pertz's work, but containing much new material; Frau von Beguelin, *Denkwürdigkeiten* (Berlin, 1892); Hormayr, *Lebensbilder aus den Befreiungskriegen* (Jena, 1841); Pick, *Aus dem brieflichen Nachlass Gneisenaus*; also the histories of the campaigns of 1807 and 1813-15.

GNEISS, a term long used by the miners of the Harz Mountains to designate the country rock in which the mineral veins occur; it is believed to be a word of Slavonic origin meaning "rotted" or "decomposed." It has gradually passed into acceptance as a generic term signifying a large and varied series of metamorphic rocks, which mostly consist of quartz and felspar (orthoclase and plagioclase) with muscovite and biotite, hornblende or augite, iron oxides, zircon and apatite. There is also a long list of accessory minerals which are present in gneisses with more or less frequency, but not invariably, as garnet, sillimanite, cordierite, graphite and graphitoid, epidote, calcite, orthite, tourmaline and andalusite. The gneisses all possess a more or less marked parallel structure or foliation, which is the main feature hy which many of them are separated from the granites, a group of rocks having nearly the same mineralogical composition and closely allied to many gneisses.

The felspars of the gneisses are predominantly orthoclase (often perthitic), hut microcline is common in the more acid types and oligoclase occurs also very frequently, especially in certain sedimentary gneisses, while more basic varieties of plagioclase are rare. Quartz is very seldom absent and may be blue or milky and opalescent. Muscovite and biotite may both occur in the same rock; in other cases only one of them is present. The commonest and most important types of gneiss are the mica-gneisses. Hornblende is green, rarely hrownish; augite pale green or nearly colourless; enstatite appears in some granulite-gneisses. Epidote, often with enclosures of orthite, is hy no means rare in gneisses from many different parts of the world. Sillimanite and andalusite are not infrequent ingredients of gneiss, and their presence has been accounted for in more than one way. Cordierite-gneisses are a special group of great interest and possessing many peculiarities; they are partly, if not entirely, foliated contact-altered sedimentary rocks. Kyanite and staurolite may also be mentioned as occasionally occurring.

Many varieties of gneiss have received specific names according to the minerals they consist of and the structural peculiarities they exhibit. Muscovite-gneiss, biotite-gneiss and muscovite-biotite-gneiss, more common perhaps than all the others taken together, are grey or pinkish rocks according to the colour of their prevalent felspar, not unlike granites, but on the whole more often fine-grained (though coarse-grained types occur) and possessing a gneissose or foliated structure. The latter consists in the arrangement of the flakes of mica in such a way that their faces are parallel, and hence the rock has the property of splitting more readily in the direction in which the mica plates are disposed. This fissility, though usually marked, is not so great as in the schists or slates, and the split faces are not so smooth as in these latter rocks. The films of mica may be continuous and are usually not flat, hut irregularly curved. In some gneisses the parallel flakes of mica are scattered through the quartz and felspar; in others these minerals form discrete bands, the quartz and felspar being grouped into lenticles separated hy thin films of mica. When large felspars, of rounded or elliptical form, are visible in the gneiss, it is said to have augen structure (Ger. *Augen* = eyes). It should also be remarked that the essential component minerals of the rocks of this family are practically always determinable by naked eye inspection or with the aid of a simple lens. If the rock is too fine grained for this it is generally relegated to the schists. When the bands of folia are very fine and tortuous the structure is called helizitic.

In mica-gneisses sillimanite, kyanite, andalusite and garnet may occur. The significance of these minerals is variously interpreted; they may indicate that the gneiss consists wholly or in part of sedimentary material which has been contact-altered, hut they have also been regarded as having been developed by metamorphic action out of biotite or other primary ingredients of the rock.

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Hornblende-gneisses are usually darker in colour and less fissile than mica-gneisses; they contain more plagioclase, less orthoclase and microcline, and more sphene and epidote. Many of them are rich in hornblende and thus form transitions to amphibolites. Pyroxene-gneisses are less frequent but occur in many parts of both hemispheres. The "charnockite" series are very closely allied to the pyroxene-gneisses. Hypersthene and scapolite both may occur in these rocks and they are sometimes garnetiferous.

In every country where the lowest and oldest rocks have come to the surface and been exposed by the long continued action of denudation in stripping away the overlying formations, gneisses are found in great abundance and of many different kinds. They are in fact the typical rocks of the Archean (Lewisian, Laurentian, &c.) series. In the Alps, Harz, Scotland, Norway and Sweden, Canada, South America, Peninsular India, Himalayas (to mention only a few localities) they occupy wide areas and exhibit a rich diversity of types. From this it has been inferred that they are of great geological age, and in fact this can be definitely proved in many cases, for the oldest known fossiliferous formations may be seen to rest unconformably on these gneisses and are made up of their débris. It was for a long time believed that they represented the primitive crust of the earth, and while this is no longer generally taught there are still geologists who hold that these gneisses are necessarily of pre-Cambrian age. Others, while admitting the general truth of this hypothesis, consider that there are localities in which typical gneisses can be shown to penetrate into rocks that may be as recent as the Tertiary period, or to pass into these rocks so gradually and in such a way as to make it certain that the gneisses are merely altered states of comparatively recent sedimentary or igneous rocks. Much controversy has arisen on these points but this is certain, that gneisses are far the most common among Archean rocks, and where their age is not known the presumption is strong that they are at least pre-Cambrian.

Many gneisses are undoubtedly sedimentary rocks that have been brought to their present state by such agents of metamorphism as heat, movement, crushing and recrystallization. This may be demonstrated partly by their mode of occurrence: they accompany limestones, graphitic schists, quartzites and other rocks of sedimentary type; some of them where least altered may even show remains of bedding or of original pebbly character (conglomerate gneisses). More conclusive, however, is the chemical composition of these rocks which often is such as no igneous masses possess, but resembles that of many impure argillaceous sediments. These sedimentary gneisses (or paragneisses, as they are often called) are often rich in biotite and garnet and may contain kyanite and sillimanite, or less frequently calcite. Some of them, however, are rich in felspar and quartz, with muscovite and biotite; others may even contain hornblende and augite, and all these may bear so close a resemblance to gneisses of igneous origin that by no other characters, chemical or mineralogical, can their original nature be definitely established. In these cases, however, a careful study of the relations of the rock in the field and of the different types which occur together will generally lead to some positive conclusion.

Other gneisses are igneous (orthogneisses). These have very much the same composition as acid igneous rocks such as granite, aplite, hornblende granite, or intermediate rocks such as syenite, diorite and diorite. Many of these orthogneisses are not equally well foliated throughout, but are massive or granitoid in places. They are sometimes subdivided into granite gneiss, diorite gneiss, syenite gneiss and so on. The sedimentary schists into which these rocks have been intruded may show contact alteration by the development of such minerals as cordierite, andalusite and sillimanite. In many of these orthogneisses the foliation is primitive, being an original character of the rock which was produced either by fluxion movements in a highly viscous, semi-solid mass injected at great pressure into the surrounding strata, or by folding stresses acting immediately after consolidation. That the foliation in other orthogneisses is subsequent or superinduced, having been occasioned by pressure and deformation of the solid mass long after it had consolidated and cooled, admits of no doubt, but it is very difficult to establish criteria by which these types may be differentiated. Those gneisses in which the minerals have been crushed and broken by fluxion or injection movements have been called protoclastic, while those which have attained their gneissose state by crushing long after consolidation are distinguished as cataclastic. There are also many examples of gneisses of mixed or synthetic origin. They may be metamorphosed sediments (granulites and schists) into which tongues and thin veins of granitic character have been intruded, following the more or less parallel foliation planes already present in the country rock. These veinlets produce that alternation in mineral composition and banded structure which are essential in gneisses. This intermixture of igneous and sedimentary material may take place on the finest scale and in the most intricate manner. Often there has been resorption of the older rocks, whether sedimentary or igneous, by those which have invaded them, and movement has gone on both during injection and at a later period, so that the whole complex becomes amalgamated and its elements are so completely confused that the geologist can no longer disentangle them.

When we remember that in the earlier stages of the earth's history, to which most gneisses belong, and in the relatively deep parts of the earth's crust, where they usually occur, there has been most igneous injection and greatest frequency of earth movements, it is not difficult to understand the geological distribution of gneissose rocks. All the factors which are required for their production, heat, movement, plutonic intrusions, contact alteration, interstitial moisture at high temperatures, are found at great depths and have acted most frequently and with greatest power on the older rock masses. But locally, where the conditions were favourable, the same processes may have gone on in comparatively recent times. Hence, though most gneisses are Archean, all gneisses are not necessarily so. (J. S. F.)

GNEIST, HEINRICH RUDOLF HERMANN FRIEDRICH VON (1816–1895), German jurist and politician, was born at Berlin on the 13th of August 1816, the son of a judge attached to the "Kammergericht" (court of appeal) in that city. After receiving his school education at the gymnasium at Eisleben in Prussian Saxony, he entered the university of Berlin in 1833 as a student of jurisprudence, and became a pupil of the famous Roman law teacher von Savigny. Proceeding to the degree of *doctor juris* in 1838, young Gneist immediately established himself as a *Privatdocent* in the faculty of law. He had, however, already chosen the judicial branch of the legal profession as a career, and having while yet a student acted as *Auscultator*, was admitted *Assessor* in 1841. He soon found leisure and opportunity to fulfil a much-cherished wish, and spent the next few years on a lengthened tour in Italy, France and England. He utilized his *Wanderjahre* for the purposes of comparative study, and on his return in 1844 was appointed extraordinary professor of Roman law in Berlin university, and thus began a professorial connexion which ended only with his death. The first-fruits of his activity as a teacher were seen in his brilliant work, *Die formellen Verträge des heutigen römischen Obligationen-Rechtes* (Berlin, 1845). *Pari passu* with his academic labours he continued his judicial career, and became in due course successively assistant judge of the superior court and of the supreme tribunal. But to a mind constituted such as his, the want of elasticity in the procedure of the courts was galling. "Brought up," he tells, in the preface to his *Englische Verfassungsgeschichte*, "in the laborious and rigid school of Prussian judges, at a time when the duty of formulating the matter in litigation was entailed upon the judge who personally conducted the pleadings, I became acquainted both with the advantages possessed by the Prussian bureau system as also with its weak points." Feeling the necessity for fundamental reforms in legal procedure, he published, in 1849, his *Trial by Jury*, in which, after pointing out that the origin of that institution was common to both Germany and England, and showing in a masterly way the benefits which had accrued to the latter country through its more extended application, he pleaded for its freer admission in the tribunals of his own country.

The period of "storm and stress" in 1848 afforded Gneist an opportunity for which he had yearned, and he threw himself with ardour into the constitutional struggles of Prussia. Although his candidature for election to the National Assembly of that year was unsuccessful, he felt that "the die was cast," and deciding for a political career, retired in 1850 from his judicial position. Entering the ranks of the National Liberal party, he began both in writing and speeches actively to champion their cause, now busying himself pre-eminently with the study of constitutional law and history. In 1853 appeared his *Adel und Ritterschaft in England*, and in 1857 the *Geschichte und heutige Gestalt der Ämter in England*, a pamphlet primarily written to combat the Prussian abuses of administration, but for which the author also claimed that it had not been without its effect in modifying certain views that had until then ruled in England itself. In 1858 Gneist was appointed ordinary professor of Roman law, and in the same year commenced his parliamentary career by his election for Stettin to the Abgeordnetenhaus (House of Deputies) of the Prussian Landtag, in which assembly he sat thenceforward uninterruptedly until 1893.

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Joining the Left, he at once became one of its leading spokesmen. His chief oratorical triumphs are associated with the early period of his membership of the House; two noteworthy occasions being his violent attack (September 1863) upon the government budget in connexion with the reorganization of the Prussian army, and his defence (1864) of the Polish chiefs of the (then) grand-duchy of Posen, who were accused of high treason. In 1857–1863 was published *Das heutige englische Verfassungs- und Verwaltungsrecht*, a work which, contrasting English and German constitutional law and administration, aimed at exercising political pressure upon the government of the day. In 1868 Gneist became a member of the North German parliament, and acted as a member of the commission for organizing the federal army, and also of that for the settlement of ecclesiastical controversial questions. On the establishment of German unity his mandate was renewed for the Reichstag, and in this he sat, an active and prominent member of the National Liberal party, until 1884. In the Kulturkampf he sided with the government against the attacks of the Clericals, whom he bitterly denounced, and whose implacable enemy he ever showed himself. In 1879, together with his colleague, von Hänel, he violently attacked the motion for the prosecution of certain Socialist members, which as a result of the vigour of his opposition was almost unanimously rejected. He was parliamentary reporter for the committees on all great financial and administrative questions, and his profound acquaintance with constitutional law caused his advice to be frequently sought, not only in his own but also in other countries. In Prussia he largely influenced legislation, the reform of the judicial and penal systems and the new constitution of the Evangelical Church being largely his work. He was also consulted by the Japanese government when a constitution was being introduced into that country. In 1875 he was appointed a member of the supreme administrative court (*Oberverwaltungsgericht*) of Prussia, but only held office for two years. In 1882 was published his *Englische Verfassungsgeschichte* (trans. *History of the English Constitution*, London, 1886), which may perhaps be described as his *magnum opus*. It placed the author at once on the level of such writers on English constitutional history as Hallam and Stubbs, and supplied English literature with a text-book almost unrivalled in point of historical research. In 1888 one of the first acts of the ill-fated emperor Frederick III., who had always, as crown prince, shown great admiration for him, was to ennoble Gneist, and attach him as instructor in constitutional law to his son, the emperor William II., a charge of which he worthily acquitted himself. The last years of his life were full of energy, and, in the possession of all his faculties, he continued his wonted academic labours until a short time before his death, which occurred at Berlin on the 22nd of July 1895.

As a politician, Gneist's career cannot perhaps be said to have been entirely successful. In a country where parliamentary institutions are the living exponents of the popular will he might have risen to a foremost position in the state; as it was, the party to which he allied himself could never hope to become more than what it remained, a parliamentary faction, and the influence it for a time wielded in the counsels of the state waned as soon as the Social-Democratic party grew to be a force to be reckoned with. It is as a writer and a teacher that Gneist is best known to fame. He was a jurist of a special type. To him law was not mere theory, but living force; and this conception of its power animates all his schemes of practical reform. As a teacher he exercised a magnetic influence, not only by reason of the clearness and cogency of his exposition, but also because of the success with which he developed the talents and guided the aspirations of his pupils. He was a man of noble bearing, religious, and imbued with a stern sense of duty. He was proud of being a "Preussischer Junker" (a member of the Prussian squirearchy), and throughout his writings, despite their liberal tendencies, may be perceived the loyalty and affection with which he clung to monarchical institutions. A great admirer and a true friend of England, to which country he was attached by many personal ties, he surpassed all other Germans in his efforts to make her free institutions, in which he found his ideal, the common heritage of the two great nations of the Teutonic race.

Gneist was a prolific writer, especially on the subject he had made peculiarly his own, that of constitutional law and history, and among his works other than those above named, may be mentioned the following: *Budget und Gesetz nach dem constitutionellen Staatsrecht Englands* (Berlin, 1867); *Freie Advocatur* (*ib.*, 1867); *Der Rechtsstaat* (*ib.*, 1872, and 2nd edition, 1879); *Zur Verwaltungsreform in Preussen* (Leipzig, 1880); *Das englische Parlament* (Berlin, 1886); in English translation, *The English Parliament* (London, 1886; 3rd edition, 1889); *Die Militär-Vorlage von 1892 und der preussische Verfassungsconflikt von 1862 bis 1866* (Berlin, 1893); *Die nationale Rechtsidee von den Ständen und das preussische Dreiklassenwahlsystem* (*ib.*, 1895); *Die verfassungsmässige Stellung des preussischen Gesammtministeriums* (*ib.*, 1895). See O. Gierke, *Rudolph von Gneist, Gedächtnisrede* (Berlin, 1895), an In Memoriam address delivered in Berlin.

(P. A.)

GNESEN (Polish, *Gniezno*), a town of Germany, in the Prussian province of Posen, in an undulating and fertile country, on the Wrzesnia, 30 m. E.N.E. of Posen by the railway to Thorn. Pop. (1905) 23,727. Besides the cathedral, a handsome Gothic edifice with twin towers, which contains the remains of St Adalbert, there are eight Roman Catholic churches, a Protestant church, a synagogue, a clerical seminary and a convent of the Franciscan nuns. Among the industries are cloth and linen weaving, brewing and distilling. A great horse and cattle market is held here annually. Gnesen is one of the oldest towns in the former kingdom of Poland. Its name, *Gniezno*, signifies "nest," and points to early Polish traditions. The cathedral is believed to have been founded towards the close of the 9th century, and, having received the bones of St Adalbert, it was visited in 1000 by the emperor Otto III., who made it the seat of an archbishop. Here, until 1320, the kings of Poland were crowned; and the archbishop, since 1416 primate of Poland, acted as protector pending the appointment of a new king. In 1821 the see of Posen was founded and the archbishop removed his residence thither, though its cathedral chapter still remains at Gnesen. After a long period of decay the town revived after 1815, when it came under the rule of Prussia.

See S. Karwowski, *Gniezno* (Posen, 1892).

GNOME, AND GNOMIC POETRY. Sententious maxims, put into verse for the better aid of the memory, were known by the Greeks as gnomes, γνῶμαι, from γνώμη, an opinion. A gnome is defined by the Elizabethan critic Henry Peacham (1567?–1643?) as "a saying pertaining to the manners and common practices of men, which declareth, with an apt brevity, what in this our life ought to be done, or not done." The Gnomic Poets of Greece, who flourished in the 6th century B.C., were those who arranged series of sententious maxims in verse. These were collected in the 4th century, by Lobon of Argos, an orator, but his collection has disappeared. The chief gnomic poets were Theognis, Solon, Phocylides, Simonides of Amorgos, Demodocus, Xenophanes and Euenus. With the exception of Theognis, whose gnomes were fortunately preserved by some schoolmaster about 300 B.C., only fragments of the Gnomic Poets have come down to us. The moral poem attributed to Phocylides, long supposed to be a masterpiece of the school, is now known to have been written by a Jew in Alexandria. Of the gnomic movement typified by the moral works of the poets named above, Prof. Gilbert Murray has remarked that it receives its special expression in the conception of the Seven Wise Men, to whom such proverbs as "Know thyself" and "Nothing too much" were popularly attributed, and whose names differed in different lists. These gnomes or maxims were extended and put into literary shape by the poets. Fragments of Solon, Euenus and Mimnermus have been preserved, in a very confused state, from having been written, for purposes of comparison, on the margins of the MSS. of Theognis, whence they have often slipped into the text of that poet. Theognis enshrines his moral precepts in his elegies, and this was probably the custom of the rest; it is improbable that there ever existed a species of poetry made up entirely of successive gnomes. But the title "gnomic" came to be given to all poetry which dealt in a sententious way with questions

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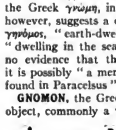
of ethics. It was, unquestionably, the source from which moral philosophy was directly developed, and theorists upon life and infinity, such as Pythagoras and Xenophanes, seem to have begun their career as gnomic poets. By the very nature of things, gnomes, in their literary sense, belong exclusively to the dawn of literature; their naïveté and their simplicity in moralizing betray it. But it has been observed that many of the ethical reflections of the great dramatists, and in particular of Sophocles and Euripides, are gnomic distiches expanded. It would be an error to suppose that the ancient Greek gnomes are all of a solemn character; some are voluptuous and some chivalrous; those of Demodocus of Leros had the reputation of being droll. In modern times, the gnomic spirit has occasionally been displayed by poets of a homely philosophy, such as Francis Quarles (1592–1644) in England and Gui de Pibrac (1529–1584) in France. The once-celebrated *Quatrains* of the latter, published in 1574, enjoyed an immense success throughout Europe; they were composed in deliberate imitation of the Greek gnomic writers of the 6th century B.C. These modern effusions are rarely literature and perhaps never poetry. With the gnomic writings of Pibrac it was long customary to bind up those of Antoine Favre (or Faber) (1557–1624) and of Pierre Mathieu (1563–1621). Gnomes are frequently to be found in the ancient literatures of Arabia, Persia and India, and in the Icelandic staves. The *priamel*, a brief, sententious kind of poem, which was in favour in Germany from the 12th to the 16th century, belonged to the true gnomic class, and was cultivated with particular success by Hans Rosenblut, the lyrical goldsmith of Nuremberg, in the 15th century. (E. G.)

GNOMES (Fr. *gnomes*, Ger. *Gnomen*), in folk-lore, the name now commonly given to the earth and mountain spirits who are supposed to watch over veins of precious metals and other hidden treasures. They are usually pictured as bearded dwarfs clad in brown close-fitting garments with hoods. The word "gnome" as applied to these is of comparatively modern and somewhat uncertain origin. By some it is said to have been coined by Paracelsus (so Hatzfeld and Darmesteter, *Dictionnaire*), who uses *Gnomi* as a synonym of *Pygmaei*, from the Greek γνώμη, intelligence. The *New English Dictionary*, however, suggests a derivation from γνώμα, *i.e.* a Greek type γνώμων, "earth-dweller," on the analogy of θαλασσούριος, "dwelling in the sea," adding, however, that though there is no evidence that the term was not used before Paracelsus, it is possibly "a mere arbitrary invention, like so many others found in Paracelsus" (*N.E.D.* s.v.).

GNOMON, the Greek word for the style of a sundial, or any object, commonly a vertical column, the shadow of which was observed in former times in order to learn the altitude of the sun, especially when on the meridian. The art of constructing a sundial is sometimes termed *gnomonics*. In geometry, a gnomon is a plane figure formed by removing a parallelogram from a corner of a larger parallelogram; in the figure ABCDEFA is a gnomon. Gnomonic projection is a projection of a sphere in which the centre of sight is the centre of the sphere.



GNOSTICISM (Gr. γνῶσις, knowledge), the name generally applied to that spiritual movement existing side by side with genuine Christianity, as it gradually crystallized into the old Catholic Church, which may roughly be defined as a distinct religious syncretism bearing the strong impress of Christian influences.

I. The term "Gnosis" first appears in a technical sense in 1 Tim. vi. 20 (ἡ ψευδώνυμος γνῶσις). It seems to have at first been applied exclusively, or at any rate principally, to a particular tendency within the movement as a whole, *i.e.* to those sections of (the Syrian) Gnostics otherwise generally known as Ophites or Naasseni (see Hippolytus, *Philosophumena*, v. 2: Ναασσηνοὶ . . . οἱ ἑαυτοὺς Γνωστικοὺς ἀποκαλοῦντες; Irenaeus i. 11. 1; Epiphanius, *Haeres.* xxvi. Cf. also the self-assumed name of the Carpocratiani, Iren. i. 25. 6). But in Irenaeus the term has already come to designate the whole movement. This first came into prominence in the opening decades of the 2nd century A.D., but is certainly older; it reached its height in the second third of the same century, and began to wane about the 3rd century, and from the second half of the 3rd century onwards was replaced by the closely-related and more powerful Manichaean movement. Offshoots of it, however, continued on into the 4th and 5th centuries. Epiphanius still had the opportunity of making personal acquaintance with Gnostic sects.

II. Of the actual writings of the Gnostics, which were extraordinarily numerous,[1] very little has survived; they were sacrificed to the destructive zeal of their ecclesiastical opponents. Numerous fragments and extracts from Gnostic writings are to be found in the works of the Fathers who attacked Gnosticism. Most valuable of all are the long extracts in the 5th and 6th books of the *Philosophumena* of Hippolytus. The most accessible and best critical edition of the fragments which have been preserved word for word is to be found in Hilgenfeld's *Ketzergeschichte des Urchristentums*. One of the most important of these fragments is the letter of Ptolemaeus to Flora, preserved in Epiphanius, *Haeres.* xxxiii. 3-7 (see on this point Harnack in the *Sitzungsberichte der Berliner Akademie*, 1902, pp. 507–545). Gnostic fragments are certainly also preserved for us in the *Acts of Thomas*. Here we should especially mention the beautiful and much-discussed *Song of the Pearl*, or *Song of the Soul*, which is generally, though without absolute clear proof, attributed to the Gnostic Bardesanes (till lately it was known only in the Syrian text; edited and translated by Bevan, *Texts and Studies*,[2] vi., 1897; Hofmann, *Zeitschrift für neutestamentliche Wissenschaft*, iv.; for the newly-found Greek text see *Acta apostolorum*, ed. Bonnet, ii. 2, c. 108, p. 219).[3] Generally also much Gnostic matter is contained in the apocryphal histories of the Apostles. To the school of Bardesanes belongs the "Book of the Laws of the Lands," which does not, however, contribute much to our knowledge of Gnosticism. Finally, we should mention in this connexion the text on which are based the pseudo-Clementine *Homilies* and *Recognitiones* (beginning of the 3rd century). It is, of course, already permeated with the Catholic spirit, but has drawn so largely upon sources of a Judaeo-Christian Gnostic character that it comes to a great extent within the category of sources for Gnosticism. Complete original Gnostic works have unfortunately survived to us only from the period of the decadence of Gnosticism. Of these we should mention the comprehensive work called the *Pistis-Sophia*, probably belonging to the second half of the 3rd century.[3] Further, the Coptic-Gnostic texts of the *Codex Brucianus*; both the books of Ieu, and an anonymous third work (edited and translated by C. Schmidt, *Texte und Untersuchungen*, vol. viii., 1892; and a new translation by the same in *Koptische-gnostische Schriften*, i.) which, contrary to the opinion of their editor and translator, the present writer believes to represent, in their existing form, a still later period and a still more advanced stage in the decadence of Gnosticism. For other and older Coptic-Gnostic texts, in one of which is contained the source of Irenaeus's treatises on the Barbelognostics, but which have unfortunately not yet been made completely accessible, see C. Schmidt in *Sitzungsberichte der Berl. Akad.* (1896), p. 839 seq., and "Philotesia," dedicated to Paul Kleinert (1907), p. 315 seq.

On the whole, then, for an exposition of Gnosticism we are thrown back upon the polemical writings of the Fathers in their controversy with heresy. The most ancient of these is Justin, who according to his *Apol.* i. 26 wrote a *Syntagma* against all heresies (*c.* A.D. 150), and also, probably, a special polemic against

[1] See the list of their titles in A. Harnack, *Geschichte der altchristlichen Literatur*, Teil I. v. 171; *ib.* Teil II. *Chronologie der altchristl. Literatur*, i. 533 seq.; also Liechtenhahn, *Die Offenbarung im Gnosticismus* (1901).

[2] For the text see A. Merx, *Bardesanes von Edessa* (1863), and A. Hilgenfeld, *Bardesanes der letzte Gnostiker* (1864).

[3] Ed. Petermann-Schwartze; newly translated by C. Schmidt, *Koptisch-gnostische Schriften*, i. (1905), in the series *Die griechischen christlichen Schriftsteller der ersten drei Jahrhunderte*; see also A. Harnack, *Texte und Untersuchungen*, Bd. vii. Heft 2 (1891), and *Chronologie der altchristlichen Literatur*, ii. 193-195.

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Marcion (fragment in Irenaeus iv. 6. 2). Both these writings are lost. He was followed by Irenaeus, who, especially in the first book of his treatise *Adversus haereses* (Ἔλεγχος καὶ ἀνατροπὴ τῆς ψευδωνύμου γνώσεως βιβλία πέντε, *c.* A.D. 180), gives a detailed account of the Gnostic heresies. He founds his work upon that of his master Justin, but adds from his own knowledge among many other things, notably the detailed account of Valentinianism at the beginning of the book. On Irenaeus, and probably also on Justin, Hippolytus drew for his *Syntagma* (beginning of the 3rd century), a work which is also lost, but can, with great certainty, be reconstructed from three recensions of it: in the *Panarion* of Epiphanius (after 374), in Philaster of Brescia, *Adversus haereses*, and the Pseudo-Tertullian, *Liber adversus omnes haereses*. A second work of Hippolytus (Κατὰ πασῶν αἱρέσεων ἔλεγχος) is preserved in the so-called *Philosophumena* which survives under the name of Origen. Here Hippolytus gave a second exposition supplemented by fresh Gnostic original sources with which he had become acquainted in the meanwhile. These sources quoted in Hippolytus have lately met with very unfavourable criticisms. The opinion has been advanced that Hippolytus has here fallen a victim to the mystification of a forger. The truth of the matter must be that Hippolytus probably made use of a collection of Gnostic texts, put together by a Gnostic, in which were already represented various secondary developments of the genuine Gnostic schools. It is also possible that the compiler has himself attempted here and there to harmonize to a certain extent the various Gnostic doctrines, yet in no case is this collection of sources given by Hippolytus to be passed over; it should rather be considered as important evidence for the beginnings of the decay of Gnosticism. Very noteworthy references to Gnosticism are also to be found scattered up and down the *Stromateis* of Clement of Alexandria. Especially important are the *Excerpta ex Theodoto*, the author of which is certainly Clement, which are verbally extracted from Gnostic writings, and have almost the value of original sources. The writings of Origen also contain a wealth of material. In the first place should be mentioned the treatise *Contra Celsum*, in which the expositions of Gnosticism by both Origen and Celsus are of interest (see especially v. 61 seq. and vi. 25 seq.). Of Tertullian's works should be mentioned: *De praescriptione haereticorum*, especially *Adversus Marcionem*, *Adversus Hermogenem*, and finally *Adversus Valentinianos* (entirely founded on Irenaeus). Here must also be mentioned the dialogue of Adamantius with the Gnostics, *De recta in deum fide* (beginning of 4th century). Among the followers of Hippolytus, Epiphanius in his *Panarion* gives much independent and valuable information from his own knowledge of contemporary Gnosticism. But Theodoret of Cyrus (d. 455) is already entirely dependent on previous works and has nothing new to add. With the 4th century both Gnosticism and the polemical literature directed against it die out.[1]

III. If we wish to grasp the peculiar character of the great Gnostic movement, we must take care not to be led astray by the catchword "Gnosis." It is a mistake to regard the Gnostics as pre-eminently the representatives of intellect among Christians, and Gnosticism as an intellectual tendency chiefly concerned with philosophical speculation, the reconciliation of religion with philosophy and theology. It is true that when Gnosticism was at its height it numbered amongst its followers both theologians and men of science, but that is not its main characteristic. Among the majority of the followers of the movement "Gnosis" was understood not as meaning "knowledge" or "understanding," in our sense of the word, but "revelation." These little Gnostic sects and groups all lived in the conviction that they possessed a secret and mysterious knowledge, in no way accessible to those outside, which was not to be proved or propagated, but believed in by the initiated, and anxiously guarded as a secret. This knowledge of theirs was not based on reflection, on scientific inquiry and proof, but on revelation. It was derived directly from the times of primitive Christianity; from the Saviour himself and his disciples and friends, with whom they claimed to be connected by a secret tradition, or else from later prophets, of whom many sects boasted. It was laid down in wonderful mystic writings, which were in the possession of the various circles (Liechtenhahn, *Die Offenbarung im Gnosticismus*, 1901).

In short, Gnosticism, in all its various sections, its form and its character, falls under the great category of mystic religions, which were so characteristic of the religious life of decadent antiquity. In Gnosticism as in the other mystic religions we find the same contrast of the initiated and the uninitiated, the same loose organization, the same kind of petty sectarianism and mystery-mongering. All alike boast a mystic revelation and a deeply-veiled wisdom. As in many mystical religions, so in Gnosticism, the ultimate object is individual salvation, the assurance of a fortunate destiny for the soul after death. As in the others, so in this the central object of worship is a redeemer-deity who has already trodden the difficult way which the faithful have to follow. And finally, as in all mystical religions, so here too, holy rites and formulas, acts of initiation and consecration, all those things which we call sacraments, play a very prominent part. The Gnostic religion is full of such sacraments. In the accounts of the Fathers we find less about them; yet here Irenaeus' account of the Marcosians is of the highest significance (i. 21 seq.). Much more material is to be found in the original Gnostic writings, especially in the *Pistis-Sophia* and the two books of Ieu, and again in the *Excerpta ex Theodoto*, the *Acts of Thomas*, and here also in the pseudo-Clementine writings. Above all we can see from the original sources of the Mandaean religion, which also represents a branch of Gnosticism, how great a part the sacraments played in the Gnostic sects (Brandt, *Mandäische Religion*, p. 96 seq.). Everywhere we are met with the most varied forms of holy rites —the various baptisms, by water, by fire, by the spirit, the baptism for protection against demons, anointing with oil, sealing and stigmatizing, piercing the ears, leading into the bridal chamber, partaking of holy food and drink. Finally, sacred formulas, names and symbols are of the highest importance among the Gnostic sects. We constantly meet with the idea that the soul, on leaving the body, finds its path to the highest heaven opposed by the deities and demons of the lower realms of heaven, and only when it is in possession of the names of these demons, and can repeat the proper holy formula, or is prepared with the right symbol, or has been anointed with the holy oil, finds its way unhindered to the heavenly home. Hence the Gnostic must above all things learn the names of the demons, and equip himself with the sacred formulas and symbols, in order to be certain of a good destiny after death. The exposition of the system of the Ophites given by Celsus (in Origen vi. 25 seq.), and, in connexion with Celsus, by Origen, is particularly instructive on this point. The two "Coptic Ieu" books unfold an immense system of names and symbols. This system again was simplified, and as the supreme secret was taught in a single name or a single formula, by means of which the happy possessor was able to penetrate through all the spaces of heaven (cf. the name "Caulacau" among the Basilidians; Irenaeus, *Adv. haer.* i. 24. 5, and among other sects). It was taught that even the redeemer-god, when he once descended on to this earth, to rise from it again, availed himself of these names and formulas on his descent and ascent through the world of demons. Traces of ideas of this kind are to be met with almost everywhere. They have been most carefully collected by Anz (*Ursprung des Gnosticismus*, *Texte und Untersuchungen* xv. 4 *passim*) who would see in them the central doctrine of Gnosticism.

IV. All these investigations point clearly to the fact that Gnosticism belongs to the group of mystical religions. We must

[1] See R. A. Lipsius, *Die Quellen der ältesten Ketzergeschichte* (1875); A. Harnack, *Zur Quellenkritik der Geschichte des Gnosticismus* (1873); A. Hilgenfeld, *Ketzergeschichte*, pp. 1-83; Harnack, *Geschichte der altchristlich. Literatur*, i. 171 seq., ii. 533 seq., 712 seq.; J. Kunze, *De historiae Gnostic. fontibus* (1894). On the *Philosophumena* of Hippolytus see G. Salmon, the cross-references in the Philosophumena, *Hermathena*, vol. xi. (1885) p. 5389 seq.; H. Staehelin, *Die gnostischen Quellen Hippolyts*, *Texte und Unters.* Bd. vi. Hft. 3 (1890).

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now proceed to define more exactly the peculiar and distinctive character of the Gnostic system. The basis of the Gnostic religion and world-philosophy lies in a decided Oriental dualism. In sharp contrast are opposed the two worlds of the good and of the evil, the divine world and the material world (ὕλη), the worlds of light and of darkness. In many systems there seems to be no attempt to derive the one world from the other. The true Basilides (*q.v.*), perhaps also Satornil, Marcion and a part of his disciples, Bardesanes and others, were frankly dualists. In the case of other systems, owing to the inexactness of our information, we are unable to decide; the later systems of Mandaeism and Manichaeanism, so closely related to Gnosticism, are also based upon a decided dualism. And even when there is an attempt at reconciliation, it is still quite clear how strong was the original dualism which has to be overcome. Thus the Gnostic systems make great use of the idea of a fall of the Deity himself; by the fall of the Godhead into the world of matter, this matter, previously insensible, is animated into life and activity, and then arise the powers, both partly and wholly hostile, who hold sway over this world. Such figures of fallen divinities, sinking down into the world of matter are those of Sophia (*i.e.* Achamoth) among the Gnostics (Ophites) in the narrower sense of the word, the Simoniani (the figure of Helena), the Barbelognostics, and in the system of the *Pistis-Sophia* or the Primal Man, among the Naasseni and the sect, related to them, as described by Hippolytus.[1] A further weakening of the dualism is indicated when, in the systems of the Valentinian school, the fall of Sophia takes place within the godhead, and Sophia, inflamed with love, plunges into the Bythos, the highest divinity, and when the attempt is thus made genetically to derive the lower world from the sufferings and passions of fallen divinity. Another attempt at reconciliation is set forth in the so-called "system of emanations" in which it is assumed that from the supreme divinity emanated a somewhat lesser world, from this world a second, and so on, until the divine element (of life) became so far weakened and attenuated, that the genesis of a partly, or even wholly, evil world appears both possible and comprehensible. A system of emanations of this kind, in its purest form, is set forth in the expositions coming from the school of Basilides, which are handed down by Irenaeus, while the propositions which are set forth in the *Philosophumena* of Hippolytus as being doctrines of Basilides represent a still closer approach to a monistic philosophy. Occasionally, too, there is an attempt to establish at any rate a threefold division of the world, and to assume between the worlds of light and darkness a middle world connecting the two; this is clearest among the Sethiani mentioned by Hippolytus (and cf. the Gnostics in Irenaeus i. 30. 1). Quite peculiar in this connexion are the accounts in Books xix. and xx. of the Clementine *Homilies*. After a preliminary examination of all possible different attempts at a solution of the problem of evil, the attempt is here made to represent the devil as an instrument of God. Christ and the devil are the two hands of God, Christ the right hand, and the devil the left, the devil having power over this world-epoch and Christ over the next. The devil here assumes very much the characteristics of the punishing and just God of the Old Testament, and the prospect is even held out of his ultimate pardon. All these efforts at reconciliation show how clearly the problem of evil was realized in these Gnostic and half-Gnostic sects, and how deeply they meditated on the subject; it was not altogether without reason that in the ranks of its opponents Gnosticism was judged to have arisen out of the question, *πόθεν τὸ κακόν;*

This dualism had not its origin in Hellenic soil, neither is it related to that dualism which to a certain extent existed also in late Greek religion. For the lower and imperfect world, which in that system too is conceived and assumed, is the nebulous world of the non-existent and the formless, which is the necessary accompaniment of that which exists, as shadow is of light.

In Gnosticism, on the contrary, the world of evil is full of active energy and hostile powers. It is an Oriental (Iranian) dualism which here finds expression, though in one point, it is true, the mark of Greek influence is quite clear. When Gnosticism recognizes in this corporeal and material world the true seat of evil, consistently treating the bodily existence of mankind as essentially evil and the separation of the spiritual from the corporeal being as the object of salvation, this is an outcome of the contrast in Greek dualism between spirit and matter, soul and body. For in Oriental (Persian) dualism it is within this material world that the good and evil powers are at war, and this world beneath the stars is by no means conceived as entirely subject to the influence of evil. Gnosticism has combined the two, the Greek opposition between spirit and matter, and the sharp Zoroastrian dualism, which, where the Greek mind conceived of a higher and a lower world, saw instead two hostile worlds, standing in contrast to each other like light and darkness. And out of the combination of these two dualisms arose the teaching of Gnosticism, with its thoroughgoing pessimism and fundamental asceticism.

Another characteristic feature of the Gnostic conception of the universe is the rôle played in almost all Gnostic systems by the seven world-creating powers. There are indeed certain exceptions; for instance, in the systems of the Valentinian schools is the figure of the one Demiurge who takes the place of the Seven. But how widespread was the idea of seven powers, who created this lower material world and rule over it, has been clearly proved, especially by the systematic examination of the subject by Anz (*Ursprung des Gnosticismus*). These Seven, then, are in most systems half-evil, half-hostile powers; they are frequently characterized as "angels," and are reckoned as the last and lowest emanations of the Godhead; below them —and frequently considered as derived from them—comes the world of the actually devilish powers. On the other hand, among the speculations of the Mandaeans, we find a different and perhaps more primitive conception of the Seven, according to which they, together with their mother Namrus (Rûhâ) and their father (Ur), belong entirely to the world of darkness. They and their family are looked upon as captives of the god of light (Mandâ-d'hayyê, Hibil-Ziwâ), who pardons them, sets them on chariots of light, and appoints them as rulers of the world (cf. chiefly Genza, in *Tractat* 6 and 8; W. Brandt, *Mandäische Schriften*, 125 seq. and 137 seq.; *Mandäische Religion*, 34 seq., &c.). In the Manichaean system it is related how the helper of the Primal Man, the spirit of life, captured the evil *archontes*, and fastened them to the firmament, or according to another account, flayed them, and formed the firmament from their skin (F. C. Baur, *Das manichäische Religionssystem*, v. 65), and this conception is closely related to the other, though in this tradition the number (seven) of the *archontes* is lost. Similarly, the last book of the *Pistis-Sophia* contains the myth of the capture of the rebellious *archontes*, whose leaders here appear as five in number (Schmidt, *Koptisch-gnostische Schriften*, p. 234 seq.).[2] There can scarcely be any doubt as to the origin of these seven (five) powers; they are the seven planetary divinities, the sun, moon and five planets.

In the Mandaean speculations the Seven are introduced with the Babylonian names of the planets. The connexion of the Seven with the planets is also clearly established by the expositions of Celsus and Origen (*Contra Celsum*, vi. 22 seq.) and similarly by the above-quoted passage in the *Pistis-Sophia*, where the *archontes*, who are here mentioned as five, are identified with the five planets (excluding the sun and moon). This collective grouping of the seven (five) planetary divinities is derived from the late Babylonian religion, which can definitely be indicated as the home of these ideas (Zimmern, *Keilinschriften in dem alten Testament*, ii. p. 620 seq.; cf. particularly Diodorus ii. 30). And if in the old sources it is only the first beginnings of this development that can be traced, we must assume that at a later

[1] Cf. the same idea of the fall of mankind in the pagan Gnosticism of "Poimandres"; see Reitzenstein, *Poimandres* (1904); and the position of the Primal Man (*Urmensch*) among the Manichaeans is similar.

[2] These ideas may possibly be traced still further back, and perhaps even underlie St Paul's exposition in Col. ii. 15.

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period the Babylonian religion centred in the adoration of the seven planetary deities. Very instructive in this connexion is the later (Arabian) account of the religion of the Mesopotamian Sabaeans. The religion of the Sabaeans, evidently a later offshoot from the stock of the old Babylonian religion, actually consists in the cult of the seven planets (cf. the great work of Daniel Chwolsohn, *Die Ssabier u. der Ssabismus*). But this reference to Babylonian religion does not solve the problem which is here in question. For in the Babylonian religion the planetary constellations are reckoned as the supreme deities. And here the question arises, how it came about that in the Gnostic systems the Seven appear as subordinate, half-daemonic powers, or even completely as powers of darkness. This can only be explained on the assumption that some religion hostile to, and stronger than the Babylonian, has superimposed itself upon this, and has degraded its principal deities into daemons. Which religion can this have been? We are at first inclined to think of Christianity itself, but it is certainly most improbable that at the time of the rise of Christianity the Babylonian teaching about the seven planet-deities governing the world should have played so great a part throughout all Syria, Asia Minor and Egypt, that the most varying sections of syncretic Christianity should over and over again adopt this doctrine and work it up into their system. It is far more probable that the combination which we meet with in Gnosticism is older than Christianity, and was found already in existence by Christianity and its sects. We must also reject the theory that this degradation of the planetary deities into daemons is due to the influence of Hebrew monotheism, for almost all the Gnostic sects take up a definitely hostile attitude towards the Jewish religion, and almost always the highest divinity among the Seven is actually the creator-God of the Old Testament. There remains, then, only one religion which can be used as an explanation, namely the Persian, which in fact fulfils all the necessary conditions. The Persian religion was at an early period brought into contact with the Babylonian, through the triumphant progress of Persian culture towards the West; at the time of Alexander the Great it was already the prevailing religion in the Babylonian plain (cf. F. Cumont, *Textes et monuments rel. aux mystères de Mithra*, i. 5, 8-10, 14, 223 seq., 233). It was characterized by a main belief, tending towards monotheism, in the Light-deity Ahuramazda and his satellites, who appeared in contrast with him as powers of the nature of angels.

A combination of the Babylonian with the Persian religion could only be effected by the degradation of the Babylonian deities into half-divine, half-daemonic beings, infinitely remote from the supreme God of light and of heaven, or even into powers of darkness. Even the characteristic dualism of Gnosticism has already proved to be in part of Iranian origin; and now it becomes clear how from that mingling of late Greek and Persian dualism the idea could arise that these seven half-daemonic powers are the creators or rulers of this material world, which is separated infinitely from the light-world of the good God. Definite confirmation of this conjecture is afforded us by later sources of the Iranian religion, in which we likewise meet with the characteristic fundamental doctrine of Gnosticism. Thus the *Bundahish* (iii. 25, v. 1) is able to inform us that in the primeval strife of Satan against the light-world, seven hostile powers were captured and set as constellations in the heavens, where they are guarded by good star-powers and prevented from doing harm. Five of the evil powers are the planets, while here the sun and moon are of course not reckoned among the evil powers—for the obvious reason that in the Persian official religion they invariably appear as good divinities (cf. similar ideas in the Arabic treatise on Persian religion *Ulema-i-Islam*, Vullers, *Fragmente über die Religion Zoroasters*, p. 49, and in other later sources for Persian religion, put together in Spiegel, *Eranische Alterthumskunde*, Bd. ii. p. 180). These Persian fancies can hardly be borrowed from the Christian Gnostic systems, their definiteness and much more strongly dualistic character recalling the exposition of the Mandaean (and Manichaean) system, are proofs to the contrary. They are derived from the same period in which the underlying idea of the Gnostic systems also originated, namely, the time at which the ideas of the Persian and Babylonian religions came into contact, the remarkable results of which have thus partly found their way into the official documents of Parsiism.

With this fundamental doctrine of Gnosticism is connected, as Anz has shown in his book which we have so often quoted, a side of their religious practices to which we have already alluded. Gnosticism is to a great extent dominated by the idea that it is above all and in the highest degree important for the Gnostic's soul to be enabled to find its way back through the lower worlds and spheres of heaven ruled by the Seven to the kingdom of light of the supreme deity of heaven. Hence, a principal item in their religious practice consisted in communications about the being, nature and names of the Seven (or of any other hostile daemons barring the way to heaven), the formulas with which they must be addressed, and the symbols which must be shown to them. But names, symbols and formulas are not efficacious by themselves: the Gnostic must lead a life having no part in the lower world ruled by these spirits, and by his knowledge he must raise himself above them to the God of the world of light. Throughout this mystic religious world it was above all the influence of the late Greek religion, derived from Plato, that also continued to operate; it is filled with the echo of the song, the first note of which was sounded by the Platonists, about the heavenly home of the soul and the homeward journey of the wise to the higher world of light.

But the form in which the whole is set forth is Oriental, and it must be carefully noted that the Mithras mysteries, so closely connected with the Persian religion, are acquainted with this doctrine of the ascent of the soul through the planetary spheres (Origen, *Contra Celsum*, vi. 22).

V. We cannot here undertake to set forth and explain in detail all the complex varieties of the Gnostic systems; but it will be useful to take a nearer view of certain principal figures which have had an influence upon at least one series of Gnostic systems, and to examine their origins in the history of religion. In almost all systems an important part is played by the Great Mother (*μήτηρ*) who appears under the most varied forms (cf. GREAT MOTHER OF THE GODS). At an early period, and notably in the older systems of the Ophites (a fairly exact account of which has been preserved for us by Epipbanius and Hippolytus), among the Gnostics in the narrower sense of the word, the Archontici, the Sethites (there are also traces among the Naasseni, cf. the *Philosophumena* of Hippolytus), the *μήτηρ* is the most prominent figure in the light-world, elevated above the *ἑβδομάς*, and the great mother of the faithful. The sect of the Barbelognostics takes its name from the female figure of the Barbelo (perhaps a corruption of Παρθένος; cf. the form Βαρθενών for "virgin" in Epiphanius, *Haer.* xxvi. 1). But Gnostic speculation gives various accounts of the descent or fall of this goddess of heaven. Thus the "Helena" of the Simonians descends to this world in order by means of her beauty to provoke to sensual passion and mutual strife the angels who rule the world, and thus again to deprive them of the powers of light, stolen from heaven, by means of which they rule over the world. She is then held captive by them in extreme degradation. Similar ideas are to be found among the "Gnostics" of Epiphanius. The kindred idea of the light-maiden, who, by exciting the sensual passions of the rulers (*ἄρχοντες*), takes from them those powers of light which still remain to them, has also a central place in the Manichaean scheme of salvation (F. C. Baur, *Das manichäische Religionssystem*, pp. 219, 315, 321). The light-maiden also plays a prominent part in the *Pistis-Sophia* (cf. the index to the translation by C. Schmidt). With this figure of the mother-goddess who descends into the lower world seems to be closely connected the idea of the fallen Sophia, which is so widespread among the Gnostic systems. This Sophia then is certainly no longer the dominating figure of the light-world, she is a lower aeon at the extreme limit of the world of light, who sinks down into matter (Barbelognostics, the anonymous Gnostic of Irenaeus,

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Bardesanes, *Pistis-Sophia*), or turns in presumptuous love towards the supreme God (Βυθός), and thus brings the Fall into the world of the *æons* (Valentinians). This Sophia then appears as the mother of the "seven" gods (see above).

The origin of this figure is not far to seek. It is certainly not derived from the Persian religious system, to the spirit of which it is entirely opposed. Neither would it be correct to identify her entirely with the great goddess Ishtar of the old Babylonian religion. But there can hardly be any doubt that the figure of the great mother-goddess or goddess of heaven, who was worshipped throughout Asia under various forms and names (Astarte, Beltis, Atargatis, Cybele, the Syrian Aphrodite), was the prototype of the *μήτηρ* of the Gnostics (cf. GREAT MOTHER OF THE GODS). The character of the great goddess of heaven is still in many places fairly exactly preserved in the Gnostic speculations. Hence we are able to understand how the Gnostic *μήτηρ*, the Sophia, appears as the mother of the Hebdomas (ἑβδομάς). The great goddess of heaven is the mother of the stars. Particularly instructive in this connexion is the fact that in those very sects, in the systems of which the figure of the *μήτηρ* plays a special part, unbridled prostitution appears as a distinct and essential part of the cult (cf. the accounts of particular branches of the Gnostics, Nicolaitans, Philionites, Borborites, &c. in Epiphanius, *Haer.* xxv., xxvi.). The meaning of this cult is, of course, reinterpreted in the Gnostic sense: by this unbridled prostitution the Gnostic sects desired to prevent the sexual propagation of mankind, the origin of all evil. But the connexion is clear, and hence it also explained the curious Gnostic myth mentioned above, namely that the *μήτηρ* (the light-maiden) by appearing to the archontes (ἄρχοντες), the lower powers of this world, inflames them to sexual lusts, in order to take from them that share of light which they have stolen from the upper world. This is a Gnostic interpretation of the various myths of the great mother-goddess's many loves and love-adventures with other gods and heroes. And when the pagan legend of the Syrian Astarte tells how she lived for ten years in Tyre as a prostitute, this directly recalls the Gnostic myth of how Simon found Helena in a brothel in Tyre (Epiphanius, *Ancoratus*, c. 104). From the same group of myths must be derived the idea of the goddess who descends to the under-world, and is there taken prisoner against her will by the lower powers; the direct prototype of this myth is to be found, *e.g.* in Ishtar's journey to hell. And finally, just as the mother-goddess of south-western Asia stands in particularly intimate connexion with the youthful god of spring (Tammuz, Adonis, Attis), so we ought perhaps to compare here as a parallel the relation of Sophia with the Soter in certain Gnostic systems (see below).

Another characteristic figure of Gnosticism is that of the Primal Man (πρῶτος ἄνθρωπος). In many systems, certainly, it has already been forced quite into the background. But on closer examination we can clearly see that it has a wide influence on Gnosticism. Thus in the system of the Naasseni (see Hippolytus, *Philosophumena*), and in certain related sects there enumerated, the Primal Man has a central and predominant position. Again, in the text on which are based the pseudo-Clementine writings (*Recognitions*, i. 16, 32, 45-47, 52, ii. 47; and *Homilies*, iii. 17 seq. xviii. 14), as in the closely related system of the Ebionites in Epiphanius (*Haer.* xxx. 3-16; cf. liii. 1), we meet with the man who existed before the world, the prophet who goes through the world in various forms, and finally reveals himself in Christ. Among the Barbelognostics (Irenaeus i. 29. 3), the Primal Man (Adamas, *homo perfectus et verus*) and Gnosis appear as a pair of *æons*, occupying a prominent place in the whole series. In the Valentinian systems the pair of æons, Anthropos and Ekklesia, occupy the third or fourth place within the *Ogdoas*, but incidentally we learn that with some representatives of this school the Anthropos took a still more prominent place (first or second; Hilgenfeld, *Ketzergeschichte*, p. 294 seq.). And even in the *Pistis-Sophia* the Primal Man "Ieu" is frequently alluded to as the King of the Luminaries (cf. index to C. Schmidt's translation). We also meet with speculations of this kind about man in the circles of non-Christian Gnosis. Thus in the *Poimandres* of Hermes man is the most prominent figure in the speculation; numerous pagan and half-pagan parallels (the "Gnostics" of Plotinus, Zosimus, Bitys) have been collected by Reitzenstein in his work *Poimandres* (pp. 81-116). Reitzenstein has shown (p. 81 seq.) that very probably the system of the Naasseni described by Hippolytus was originally derived from purely pagan circles, which are probably connected in some way with the mysteries of the Attis cult. The figure in the Mandaean system most closely corresponding to the Primal Man, though this figure also actually occurs in another part of the system (cf. the figure of Adakas Mana; Brandt, *Mandäische Religion*, p. 36 seq.) is that of Mandâ d'hayyê (γνῶσις τῆς ζωῆς; cf. the pair of æons, Adamas and Gnosis, among the Barbelognostics, in Irenaeus i. 29. 3). Finally, in the Manichaean system, as is well known, the Primal Man again assumes the predominant place (Baur, *Manich. Religionssystem*, 49 seq.).

This figure of the Primal Man can particularly be compared with that of the Gnostic Sophia. Wherever this figure has not become quite obscure, it represents that divine power which, whether simply owing to a fall, or as the hero who makes war on, and is partly vanquished by darkness, descends into the darkness of the material world, and with whose descent begins the great drama of the world's development. From this power are derived those portions of light existing and held prisoner in this lower world. And as he has raised himself again out of the material world, or has been set free by higher powers, so shall also the members of the Primal Man, the portions of light still imprisoned in matter, be set free.

The question of the derivation of the myth of the Primal Man is still one of the unsolved problems of religious history. It is worthy of notice that according to the old Persian myth also, the development of the world begins with the slaying of the primal man Gayomart by Angra-Mainyu (Ahriman); further, that the Primal Man ("son of man"=man) also plays a part in Jewish apocalyptic literature (Daniel, Enoch, iv. Ezra), whence this figure passes into the Gospels; and again, that the dogma of Christ's descent into hell is directly connected with this myth. But these parallels do not carry us much further. Even the Persian myth is entirely obscure, and has hitherto defied interpretation. It is certainly true that in some way an essential part in the formation of the myth has been played by the sun-god, who daily descends into darkness, to rise from it again victoriously. But how to explain the combination of the figure of the sun-god with that of the Primal Man is an unsolved riddle. The meaning of this figure in the Gnostic speculations is, however, clear. It answers the question: how did the portions of light to be found in this lower world, among which certainly belong the souls of the Gnostics, enter into it?

A parallel myth to that of the Primal Man are the accounts to be found in most of the Gnostic systems of the creation of the first man. In all these accounts the idea is expressed that so far as his body is concerned man is the work of the angels who created the world. So *e.g.* Satornil relates (Irenaeus i. 24. 1) that a brilliant vision appeared from above to the world-creating angels; they were unable to hold it fast, but formed man after its image. And as the man thus formed was unable to move, but could only crawl like a worm, the supreme Power put into him a spark of life, and man came into existence. Imaginations of the same sort are also to be found, *e.g.* in the genuine fragments of Valentinus (Hilgenfeld, *Ketzergeschichte*, p. 203), the Gnostics of Irenaeus i. 30. 6, the Mandaeans (Brandt, *Religion der Mandäer*, p. 36), and the Manicheans (Baur, *Religionssystem*, p. 118 seq.). The Naasseni (Hippolytus, *Philosophumena*, v. 7) expressly characterize the myth as Chaldean (cf. the passage from Zosimus, in Reitzenstein's *Poimandres*, p. 104). Clearly then the question which the myth of the Primal Man is intended to answer in relation to the whole universe is answered in relation to the nature of man by this account of the coming into being of the first man, which may, moreover, have been influenced by the account in the Old Testament. That question is: how does it happen that in this

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inferior body of man, fallen a prey to corruption, there dwells a higher spark of the divine Being, or in other words, how are we to explain the double nature of man?

VI. Of all the fundamental ideas of Gnosticism of which we have so far treated, it can with some certainty be assumed that they were in existence before the rise of Christianity and the influence of Christian ideas on the development of Gnosticism. The main question with which we have now to deal is that of whether the dominant figure of the Saviour (Σωτήρ) in Gnosticism is of specifically Christian derivation, or whether this can also be explained apart from the assumption of Christian influence. And here it must be premised that, intimately as the conception of salvation is bound up with the Gnostic religion, the idea of salvation accomplished in a definite historical moment to a certain extent remained foreign to it. Indeed, nearly all the Christian Gnostic systems clearly exhibit the great difficulty with which they had to contend in order to reconcile the idea of an historical redeemer, actually occurring in the form of a definite person, with their conceptions of salvation. In Gnosticism salvation always lies at the root of all existence and all history. The fundamental conception varies greatly. At one time the Primal Man, who sank down into matter, has freed himself and risen out of it again, and like him his members will rise out of darkness into the light (*Poimandres*); at another time the Primal Man who was conquered by the powers of darkness has been saved by the powers of light, and thus too all his race will be saved (Manichaeism); at another time the fallen Sophia is purified by her passions and sorrows and has found her *Syzygos*, the *Soter*, and wedded him, and thus all the souls of the Gnostics who still languish in matter will become the brides of the angels of the Soter (Valentinus). In fact salvation, as conceived in Gnosticism, is always a myth, a history of bygone events, an allegory or figure, but not an historical event. And this decision is not affected by the fact that in certain Gnostic sects figured historical personages such as Simon Magus and Menander. The Gnostic ideas of salvation were in the later schools and sects transferred to these persons whom we must consider as rather obscure charlatans and miracle-mongers, just as in other cases they were transferred to the person of Christ. The "Helena" of the Simonian system was certainly not an historical but a mythical figure. This explains the laborious and artificial way in which the person of Jesus is connected in many Gnostic systems with the original Gnostic conception of redemption. In this patchwork the joins are everywhere still clearly to be recognized. Thus, *e.g.* in the Valentinian system, the myth of the fallen Sophia and the Soter, of their ultimate union, their marriage and their 70 sons (Irenaeus i. 4. 5; Hippolytus, *Philos.* vi. 34), has absolutely nothing to do with the Christian conceptions of salvation. The subject is here that of a high goddess of heaven (she has 70 sons) whose friend and lover finds her in the misery of deepest degradation, frees her, and bears her home as his bride. To this myth the idea of salvation through the earthly Christ can only be attached with difficulty. And it was openly maintained that the Soter only existed for the Gnostic, the Saviour Jesus who appeared on earth only for the "Psychicus" (Irenaeus i. 6. 1).

VII. Thus the essential part of most of the conceptions of what we call Gnosticism was already in existence and fully developed before the rise of Christianity. But the fundamental ideas of Gnosticism and of early Christianity had a kind of magnetic attraction for each other. What drew these two forces together was the energy exerted by the universal idea of salvation in both systems. Christian Gnosticism actually introduced only one new figure into the already existing Gnostic theories, namely that of the historical Saviour Jesus Christ. This figure afforded, as it were, a new point of crystallization for the existing Gnostic ideas, which now grouped themselves round this point in all their manifold diversity. Thus there came into the fluctuating mass a strong movement and formative impulse, and the individual systems and sects sprang up like mushrooms from this soil.

It must now be our task to make plain the position of Gnosticism within the Christian religion, and its significance for the development of the latter. Above all the Gnostics represented and developed the distinctly anti-Jewish tendency in Christianity. Paul was the apostle whom they reverenced, and his spiritual influence on them is quite unmistakable. The Gnostic Marcion has been rightly characterized as a direct disciple of Paul. Paul's battle against the law and the narrow national conception of Christianity found a willing following in a movement, the syncretic origin of which directed it towards a universal religion, St Paul's ideas were here developed to their extremest consequences, and in an entirely one-sided fashion such as was far from being in his intention. In nearly all the Gnostic systems the doctrine of the seven world-creating spirits is given an anti-Jewish tendency, the god of the Jews and of the Old Testament appearing as the highest of the seven. The demiurge of the Valentinians always clearly bears the features of the Old Testament creator-God.

The Old Testament was absolutely rejected by most of the Gnostics. Even the so-called Judaeo-Christian Gnostics (Cerinthus), the Ebionite (Essenian) sect of the Pseudo-Clementine writings (the Elkesaites), take up an inconsistent attitude towards Jewish antiquity and the Old Testament. In this repect the opposition to Gnosticism led to a reactionary movement. If the growing Christian Church, in quite a different fashion from Paul, laid stress on the literal authority of the Old Testament, interpreted, it is true, allegorically; if it took up a much more friendly and definite attitude towards the Old Testament, and gave wider scope to the legal conception of religion, this must be in part ascribed to the involuntary reaction upon it of Gnosticism.

The attitude of Gnosticism to the Old Testament and to the creator-god proclaimed in it had its deeper roots, as we have already seen, in the dualism by which it was dominated. With this dualism and the recognition of the worthlessness and absolutely vicious nature of the material world is combined a decided spiritualism. The conception of a resurrection of the body, of a further existence for the body after death, was unattainable by almost all of the Gnostics, with the possible exception of a few Gnostic sects dominated by Judaeo-Christian tendencies. With the dualistic philosophy is further connected an attitude of absolute indifference towards this lower and material world, and the practice of asceticism. Marriage and sexual propagation are considered either as absolute Evil or as altogether worthless, and carnal pleasure is frequently looked upon as forbidden. Then again asceticism sometimes changes into wild libertinism. Here again Gnosticism has exercised an influence on the development of the Church by way of contrast and opposition. If here a return was made to the old material view of the resurrection (the apostolic ἀνάστασις τῆς σαρκός), entirely abandoning the more spiritual conception which had been arrived at as a compromise by Paul, this is probably the result of a reaction from the views of Gnosticism. It was just at this point, too, that Gnosticism started a development which was followed later by the Catholic Church. In spite of the rejection of the ascetic attitude of the Gnostics, as a blasphemy against the Creator, a part of this ascetic principle became at a later date dominant throughout all Christendom. And it is interesting to observe how, *e.g.*, St Augustine, though desperately combating the dualism of the Manichaeans, yet afterwards introduced a number of dualistic ideas into Christianity, which are distinguishable from those of Manichaeism only by a very keen eye, and even then with difficulty.

The Gnostic religion also anticipated other tendencies. As we have seen, it is above all things a religion of sacraments and mysteries. Through its syncretic origin Gnosticism introduced for the first time into Christianity a whole mass of sacramental, mystical ideas, which had hitherto existed in it only in its earliest phases. But in the long run even genuine Christianity has been unable to free itself from the magic of the sacraments; and the Eastern Church especially has taken the same direction as Gnosticism. Gnosticism was also the pioneer of the Christian Church in the strong emphasis laid on the idea of salvation in

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religion. And since the Gnostics were compelled to draw the figure of the Saviour into a world of quite alien myths, their Christology became so complicated in character that it frequently recalls the Christology of the later dogmatic of the Greek Fathers.

Finally, it was Gnosticism which gave the most decided impulse to the consolidation of the Christian Church as a church. Gnosticism itself is a free, naturally-growing religion, the religion of isolated minds, of separate little circles and minute sects. The homogeneity of wide circles, the sense of responsibility engendered by it, and continuity with the past are almost entirely lacking in it. It is based upon revelation, which even at the present time is imparted to the individual, upon the more or less convincing force of the religious imagination and speculations of a few leaders, upon the voluntary and unstable grouping of the schools round the master. Its adherents feel themselves to be the isolated, the few, the free and the enlightened, as opposed to the sluggish and inert masses of mankind degraded into matter, or the initiated as opposed to the uninitiated, the Gnostics as opposed to the "Hylici" (ὑλικοί); at most in the later and more moderate schools a middle place was given to the adherents of the Church as Psychici (ψυχικοί).

This freely-growing Gnostic religiosity aroused in the Church an increasingly strong movement towards unity and a firm and inelastic organization, towards authority and tradition. An organized hierarchy, a definitive canon of the Holy Scriptures, a confession of faith and rule of faith, and unbending doctrinal discipline, these were the means employed. A part was also played in this movement by a free theology which arose within the Church, itself a kind of Gnosticism which aimed at holding fast whatever was good in the Gnostic movement, and obtaining its recognition within the limits of the Church (Clement of Alexandria, Origen). But the mightiest forces, to which in the end this theology too had absolutely to give way, were outward organization and tradition.

It must be considered as an unqualified advantage for the further development of Christianity, as a universal religion, that at its very outset it prevailed against the great movement of Gnosticism. In spite of the fact that in a few of its later representatives Gnosticism assumed a more refined and spiritual aspect, and even produced blossoms of a true and beautiful piety, it is fundamentally and essentially an unstable religious syncretism, a religion in which the determining forces were a fantastic oriental imagination and a sacramentalism which degenerated into the wildest superstitions, a weak dualism fluctuating unsteadily between asceticism and libertinism. Indirectly, however, Gnosticism was certainly one of the most powerful factors in the development of Christianity in the 1st century.

VIII. This sketch may be completed by a short review of the various separate sects and their probable connexion with each other. As a point of departure for the history of the development of Gnosticism may be taken the numerous little sects which were apparently first included under the name of "Gnostics" in the narrower sense. Among these probably belong the Ophites of Celsus (in Origen), the many little sects included by Epiphanius under the name of Nicolaitans and Gnostics (*Haer.* 25. 26); the Archontici (Epiphanius, *Haer.* xl.), Sethites (Cainites) should also here be mentioned, and finally the Carpocratians. Common to all these is the dominant position assumed by the "Seven" (headed by Ialdabaoth); the heavenly world lying above the spheres of the Seven is occupied by comparatively few figures, among which the most important part is played by the μήτηρ, who is sometimes enthroned as the supreme goddess in heaven, but in a few systems has already descended from there into matter, been taken prisoner, &c. Numerous little groups are distinguished from the mass, sometimes by one peculiarity, sometimes by another. On the one hand we have sects with a strongly ascetic tendency, on the other we find some characterized by unbridled libertinism; in some the most abandoned prostitution has come to be the most sacred mystery; in others again appears the worship of serpents, which here appears to be connected in various and often very loose ways with the other ideas of these Gnostics—hence the names of the "Ophites," "Naasseni." To this class also fundamentally belong the Simonians, who have included the probably historical figure of Simon Magus in a system which seems to be closely connected with those we have mentioned, especially if we look upon the "Helena" of this system as a mythical figure. A particular branch of the "Gnostic" sects is represented by those systems in which the figure of Sophia sinking down into matter already appears. To these belong the Barbelognostics (in the description given by Irenaeus the figure of the Spirit takes the place of that of Sophia), and the Gnostics whom Irenaeus (i. 30) describes (cf. Epiphanius, *Haer.* xxvi.). And here may best be included Bardesanes, a famous leader of a Gnostic school of the end of the 2nd century. Most scholars, it is true, following an old tradition, reckon Bardesanes among the Valentinians. But from the little we know of Bardesanes, his system bears no trace of relationship with the complicated Valentinian system, but is rather completely derived from the ordinary Gnosticism, and is distinguished from it apparently only by its more strongly dualistic character. The systems of Valentinus and his disciples must be considered as a further development of what we have just characterized as the popular Gnosticism, and especially of that branch of it to which the figure of Sophia is already known. In them above all the world of the higher æons is further extended and filled with a throng of varied figures. They also exhibit a variation from the characteristic dualism of Gnosticism into monism, in their conception of the fall of Sophia and their derivation of matter from the passions of the fallen Sophia. The figures in the Seven have here entirely disappeared, a remembrance of them being merely preserved in the name of the Δημιουργός (ἑβδομάς). In general, Valentinianism displays a particular resemblance to the dominant ideas of the Church, both in its complicated Christology, its triple division of mankind into πνευματικοί, ψυχικοί and ὑλικοί, and its far-fetched interpretation of texts.[1] A quite different position from those mentioned above is taken by Basilides (*q.v.*). From what little we know of him he was an uncompromising dualist. Both the systems which are handed down under his name by Irenaeus and Hippolytus, that of emanations and the monistic-evolutionary system, represent further developments of his ideas with a tendency away from dualism towards monism. Characteristically, in these Basilidian systems the figure of the "Mother" or of Sophia does not appear. This peculiarity the Basilidian system shares with that of Satornil of Antioch, which has only come down to us in a very fragmentary state, and in other respects recalls in many ways the popular Gnosticism. By itself, on the other hand, stands the system preserved for us by Hippolytus in the *Philosophumena* under the name of the Naasseni, with its central figure of "the Man," which, as we have seen, is very closely related with certain specifically pagan Gnostic speculations which have come down to us (in the *Poimandres*, in Zosimus and Plotinus, *Ennead* ii. 9). With the Naasseni, moreover, are related also the other sects of which Hippolytus alone gives us a notice in his *Philosophumena* (Docetae, Perates, Sethiani, the adherents of Justin, the Gnostic of Monoimos). Finally, apart from all other Gnostics stands Marcion. With him, as far as we are able to conclude from the scanty notices of him, the manifold Gnostic speculations are reduced essentially to the one problem of the good and the just God, the God of the Christians and the God of the Old Testament. Between these two powers Marcion affirms a sharp and, as it appears, originally irreconcilable dualism which with him rests moreover on a speculative basis. Thanks to the noble simplicity and specifically religious character of his ideas, Marcion was able to found not only schools, but a community, a church of his own, which gave trouble to the Church longer than any other Gnostic sect. Among his disciples the speculative and fantastic element of Gnosticism again became more apparent. As we have already intimated, Gnosticism had such a power

[1] For the disciples of Valentinus, especially Marcus, after whom was named a separate sect, the Marcosians, with their Pythagorean theories of numbers and their strong tincture of the mystical, magic, and sacramental, see VALENTINUS AND VALENTINIANS.

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of attraction that it now drew within its limits even Judaeo-Christian sects. Among these we must mention the Judaeo-Christian Gnostic Cerinthus, also the Gnostic Ebionites, of whom Epiphanius (*Haer.*) gives us an account, and whose writings are to be found in a recension in the collected works of the Pseudo-Clementine *Recognitions and Homilies*; to the same class belong the Elkesaites with their mystical scripture, the *Elxai*, extracts of which are given by Hippolytus in the *Philos.* (ix. 13). Later evidence of the decadence of Gnosticism occurs in the *Pistis-Sophia* and the Coptic Gnostic writings discovered and edited by Schmidt. In these confused records of human imagination gone mad, we possess a veritable herbarium of all possible Gnostic ideas, which were once active and now rest peacefully side by side. None the less, the stream of the Gnostic religion is not yet dried up, but continues on its way; and it is beyond a doubt that the later Mandaeanism and the great religious movement of Mani are most closely connected with Gnosticism. These manifestations are all the more characteristic since in them we meet with a Gnosticism which remained essentially more untouched by Christian influences than the Gnostic systems of the 2nd century A.D. Thus these systems throw an important light on the past, and a true perception of the nature and purpose of Gnosticism is not to be obtained without taking them into consideration.

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White-tailed Gnu, or Black Wildebeest (*Connochaetes gnu*).

GNU, the Hottentot name for the large white-tailed South African antelope (*q.v.*), now nearly extinct, know to the Boers as the black wildebeest, and to naturalists as *Connochaetes* (or *Catoblepas*) *gnu*. A second and larger species is the brindled gnu or blue wildebeest (*C. taurinus* or *Catoblepas gorgon*), also known by the Bechuana name *kokon* or *kokoon*; and there are several East African forms more or less closely related to the latter which have received distinct names.

GO, or GO-BANG (Jap. *Go-ban*, board for playing *Go*), a popular table game. It is of great antiquity, having been invented in Japan, according to tradition, by the emperor Yao, 2350 B.C., but it is probably of Chinese origin. According to Falkener the first historical mention of it was made about the year 300 B.C., but there is abundant evidence that it was a popular game long before that period. The original Japanese *Go* is played on a board divided into squares by 19 horizontal and 19 vertical lines, making 361 intersections, upon which the flat round men, 181 white and 181 black, are placed one by one as the game proceeds. The men are placed by the two players on any intersections (*me*) that may seem advantageous, the object being to surround with one's men as many unoccupied intersections as possible, the player enclosing the greater number of vacant points being the winner. Completely surrounded men are captured and removed from the board. This game is played in England upon a board divided into 361 squares, the men being placed upon these instead of upon the intersections.

A much simpler variety of Go, mostly played by foreigners, has for its object to get five men into line. This may have been the earliest form of the game, as the word *go* means five. Except in Japan it is often played on an ordinary draughts-board, and the winner is he who first gets five men into line, either vertically, horizontally or diagonally.

See *Go-Bang*, by A. Howard Cady, in Spalding's Home Library (New York, 1896); *Games Ancient and Oriental*, by Edward Falkener (London, 1892); *Das japan.-chinesische Spiel Go*, by O. Korschelt (Yokohama, 1881); *Das Nationalspiel der Japanesen*, by G. Schurig (Leipzig, 1888).

GOA, the name of the past and present capitals of Portuguese India, and of the surrounding territory more exactly described as Goa settlement, which is situated on the western coast of India, between 15° 44′ and 14° 53′ N., and between 73° 45′ and 74° 26′ E. Pop. (1900) 475,513, area 1301 sq. m.

Goa Settlement.—With Damaun (*q.v.*) and Diu (*q.v.*) Goa settlement forms a single administrative province ruled by a governor-general, and a single ecclesiastical province subject to the archbishop of Goa; for judicial purposes the province includes Macao in China, and Timor in the Malay Archipelago. It is bounded on the N. by the river Terakhul or Araundem, which divides it from the Sawantwari state, E. by the Western Ghats, S. by Kanara district, and W. by the Arabian Sea. It comprises the three districts of Ilhas, Bardez and Salsette, conquered early in the 16th century and therefore known as the Velhas Conquistas (Old Conquests), seven districts acquired later and known as the Novas Conquistas, and the island of Anjidiv or Anjadiva. The settlement, which has a coast-line of 62 m., is a hilly region, especially the Novas Conquistas; its distinguishing features are the Western Ghats, though the highest summits nowhere reach an altitude of 4000 ft., and the island of Goa. Numerous short but navigable rivers water the lowlands skirting the coast. The two largest rivers are the Mandavi and the Juari, which together encircle the island of Goa (Ilhas), being connected on the landward side by a creek. The island (native name Tisvādi, Tissuvaddy, Tissuary) is a triangular territory, the apex of which, called the *cabo* or cape, is a rocky headland separating the harbour of Goa into two anchorages—Agoada or Aguada at the mouth of the Mandavi, on the north, and Mormugão or Marmagão at the mouth of the Juari, on the south. The northern haven is exposed to the full force of the south-west monsoon, and is liable to silt up during the rains. The southern, sheltered by the promontory of Salsette, is always open, but is less used, owing to its greater distance from the city of Goa, which is built on the island. A railway connects Mormagão, south of the Juari estuary, with Castle Rock on the

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Western Ghats. Goa imports textiles and foodstuffs, and exports coco-nuts, areca-nuts, spices, fish, poultry and timber. Its trade is carried on almost entirely with Bombay, Madras, Kathiawar and Portugal. Manganese is mined in large quantities, some iron is obtained, and other products are salt, palm-spirit, betel and bananas.

Cities of Goa.—1. The ancient Hindu city of Goa, of which hardly a fragment survives, was built at the southernmost point of the island, and was famous in early Hindu legend and history for its learning, wealth and beauty. In the Puranas and certain inscriptions its name appears as Gove, Govāpurī, Gomant, &c.; the medieval Arabian geographers knew it as Sindābur or Sandābur, and the Portuguese as Goa Velha. It was ruled by the Kadamba dynasty from the 2nd century A.D. to 1312, and by Mahommedan invaders of the Deccan from 1312 until about 1370, during which period it was visited and described by Ibn Batuta. It was then annexed to the Hindu kingdom of Vijayanagar, of which, according to Ferishta, it still formed part in 1460, when it was conquered by the Bahmani sultan of the Deccan; but two of the best Portuguese chroniclers state that it became independent in 1440, when the second city (Old Goa) was founded.

2. Old Goa is, for the most part, a city of ruins without inhabitants other than ecclesiastics and their dependents. The chief surviving buildings are the cathedral, founded by Albuquerque in 1511 to commemorate his entry into Goa on St Catherine's day 1510, and rebuilt in 1623, and still used for public worship; the convent of St Francis (1517), a converted mosque rebuilt in 1661, with a portal of carved black stone, which is the only relic of Portuguese architecture in India dating from the first quarter of the 16th century; the chapel of St Catherine (1551); the church of Bom Jesus (1594–1603), a superb example of Renaissance architecture as developed by the Jesuits, containing the magnificent shrine and tomb of St Francis Xavier (see XAVIER, FRANCISCODE); and the 17th-century convents of St Monica and St Cajetan. The college of St Paul (see below) is in ruins.

3. Panjim, Pangim or New Goa originally a suburb of Old Goa, is, like the parent city, built on the left bank of the Mandavi estuary, in 15° 30′ N. and 73° 33′ E. Pop. (1901) 9500. It is a modern port with few pretensions to architectural beauty. Ships of the largest size can anchor in the river, but only small vessels can load or discharge at the quay. Panjim became the residence of the viceroy in 1759 and the capital of Portuguese India in 1843. It possesses a lyceum, a school for teachers, a seminary, a technical school and an experimental agricultural station.

Political History.—With the subdivision of the Bahmani kingdom, after 1482, Goa passed into the power of Yusuf Adil Shah, king of Bijapur, who was its ruler when the Portuguese first reached India. At this time Goa was important as the starting-point of pilgrims from India to Mecca, as a mart with no rival except Calicut on the west coast, and especially as the centre of the import trade in horses (Gulf Arabs) from Hormuz, the control of which was a vital matter to the kingdoms warring in the Deccan. It was easily defensible by any power with command of the sea, as the encircling rivers could only be forded at one spot, and had been deliberately stocked with crocodiles. It was attacked on the 10th of February 1510 by the Portuguese under Albuquerque. As a Hindu ascetic had foretold its downfall and the garrison of Ottoman mercenaries was outnumbered, the city surrendered without a struggle, and Albuquerque entered it in triumph, while the Hindu townsfolk strewed filagree flowers of gold and silver before his feet. Three months later Yusuf Adil Shah returned with 60,000 troops, forced the passage of the ford, and blockaded the Portuguese in their ships from May to August, when the cessation of the monsoon enabled them to put to sea. In November Albuquerque returned with a larger force, and after overcoming a desperate resistance, recaptured the city, permitted his soldiers to plunder it for three days, and massacred the entire Mahommedan population.

Goa was the first territorial possession of the Portuguese in Asia. Albuquerque intended it to be a colony and a naval base, as distinct from the fortified factories which had been established in certain Indian seaports. He encouraged his men to marry native women, and to settle in Goa as farmers, retail traders or artisans. These married men soon became a privileged caste, and Goa acquired a large Eurasian population. Albuquerque and his successors left almost untouched the customs and constitutions of the 30 village communities on the island, only abolishing the rite of suttee. A register of these customs (*Foral de usos e costumes*) was published in 1526, and is an historical document of much value; an abstract of it is given in R. S. Whiteway's *Rise of the Portuguese Empire in India* (London, 1898).

Goa became the capital of the whole Portuguese empire in the East. It was granted the same civic privileges as Lisbon. Its senate or municipal chamber maintained direct communications with the king and paid a special representative to attend to its interests at court. In 1563 the governor even proposed to make Goa the seat of a parliament, in which all parts of the Portuguese east were to be represented; this was vetoed by the king.

In 1542 St Francis Xavier mentions the architectural splendour of the city; but it reached the climax of its prosperity between 1575 and 1625. *Goa Dourada*, or Golden Goa, was then the wonder of all travellers, and there was a Portuguese proverb, "He who has seen Goa need not see Lisbon." Merchandise from all parts of the East was displayed in its bazaar, and separate streets were set aside for the sale of different classes of goods—Bahrein pearls and coral, Chinese porcelain and silk, Portuguese velvet and piece-goods, drugs and spices from the Malay Archipelago. In the main street slaves were sold by auction. The houses of the rich were surrounded by gardens and palm groves; they were built of stone and painted red or white. Instead of glass, their balconied windows had thin polished oyster-shells set in lattice-work.

The social life of Goa was brilliant, as befitted the headquarters of the viceregal court, the army and navy, and the church; but the luxury and ostentation of all classes had become a byword before the end of the 16th century. Almost all manual labour was done by slaves; common soldiers assumed high-sounding titles, and it was even customary for the poor noblemen who congregated together in boarding-houses to subscribe for a few silken cloaks, a silken umbrella and a common man-servant, so that each could take his turn to promenade the streets, fashionably attired and with a proper escort. There were huge gambling saloons, licensed by the municipality, where determined players lodged for weeks together; and every form of vice, except drunkenness, was practised by both sexes, although European women were forced to lead a kind of zenana life, and never ventured unveiled into the streets; they even attended at church in their palanquins, so as to avoid observation.

The appearance of the Dutch in Indian waters was followed by the gradual ruin of Goa. In 1603 and 1630 the city was blockaded by Dutch fleets, though never captured, and in 1635 it was ravaged by an epidemic. Its trade was gradually monopolized by the Jesuits. Thevenot in 1666, Baldaeus in 1672, Fryer in 1675 describe its ever-increasing poverty and decay. In 1683 only the timely appearance of a Mogul army saved it from capture by a horde of Mahratta raiders, and in 1739 the whole territory was attacked by the same enemies, and only saved by the unexpected arrival of a new viceroy with a fleet. This peril was always imminent until 1759, when a peace with the Mahrattas was concluded. In the same year the proposal to remove the seat of government to Panjim was carried out; it had been discussed as early as 1684. Between 1695 and 1775 the population dwindled from 20,000 to 1600, and in 1835 Goa was only inhabited by a few priests, monks and nuns.

Ecclesiastical History.—Some Dominican friars came out to Goa in 1510, but no large missionary enterprise was undertaken before the arrival of the Franciscans in 1517. From their headquarters in Goa the Franciscan preachers visited many parts of western India, and even journeyed to Ceylon, Pegu and the Malay Archipelago. For nearly twenty-five years they carried on

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the work of evangelization almost alone, with such success that in 1534 Pope Paul III. made Goa a bishopric, with spiritual jurisdiction over all Portuguese possessions between China and the Cape of Good Hope, though itself suffragan to the archbishopric of Funchal in Madeira. A Franciscan friar, João de Albuquerque, came to Goa as its first bishop in 1538. In 1542 St Francis Xavier came to Goa, and took over the Franciscan college of Santa Fé, for the training of native missionaries; this was renamed the College of St Paul, and became the headquarters of all Jesuit missions in the East, where the Jesuits were commonly styled *Paulistas*. By a Bull dated the 4th of February 1557 Goa was made an archbishopric, with jurisdiction over the sees of Malacca and Cochin, to which were added Macao (1575), Japan (1588), Angamale or Cranganore, which in 1599 combined with Meliapor (Mylapur) (1606), Peking and Nanking (1610), together with the bishopric of Mozambique, which included the entire coast of East Africa. In 1606 the archbishop received the title of Primate of the East, and the king of Portugal was named Patron of the Catholic Missions in the East; his right of patronage was limited by the Concordat of 1857 to Goa, Malacca, Macao and certain parts of British India. The Inquisition was introduced into Goa in 1560: a vivid account of its proceedings is given by C. Dellon, *Relation de l'inquisition de Goa* (1688). Five ecclesiastical councils, which dealt with matters of discipline, were held at Goa—in 1567, 1575, 1585, 1592 and 1606; the archbishop of Goa also presided over the more important synod of Diamper (Udayamperur, about 12 m. S.E. of Cochin), which in 1599 condemned the heretical the tenets and liturgy of the Indian Nestorians, or Christians of St Thomas (*q.v.*). In 1675 Fryer described Goa as "a Rome in India, both for absoluteness and fabrics," and Hamilton states that early in the 18th century the number of ecclesiastics in the settlement had reached the extraordinary total of 30,000. But the Jesuits were expelled in 1759, and by 1800 Goa had lost much even of its ecclesiastical importance. The Inquisition was abolished in 1814 and the religious orders were secularized in 1835.

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GOAL, originally an object set up as the place where a race ends, the winning-post, and so used figuratively of the end to which any effort is directed. It is thus used to translate the Lat. *meta*, the boundary pillar, set one at each end of the circus to mark the turning-point. The word was quite early used in various games for the two posts, with or without a cross-bar, through or over which the ball has to be driven to score a point towards winning the game. The *New English Dictionary* quotes the use in Richard Stanyhurst's *Description of Ireland* (1577); but the word *gôl* in the sense of a boundary appears as early as the beginning of the 14th century in the religious poems of William de Shoreham (*c.* 1315). The origin of the word is obscure. It is usually taken to be derived from a French word *gaule*, meaning a pole or stick, but this meaning does not appear in the English usage, nor does the usual English meaning appear in the French. There is an O. Eng. *gadlan*, to hinder, which may point to a lost *gál*, barrier, but there is no evidence in other Teutonic languages for such a word.

GOALPARA, a town and district of British India, in the Brahmaputra valley division of eastern Bengal and Assam. The town (pop. 6287) overlooks the Brahmaputra. It was the frontier outpost of the Mahommedan power, and has long been a flourishing seat of river trade. The civil station is built on the summit of a small hill commanding a magnificent view of the valley of the Brahmaputra, bounded on the north by the snowy ranges of the Himalayas and on the south by the Garo hills. The native town is built on the western slope of the hill, and the lower portion is subject to inundation from the marshy land which extends in every direction. It has declined in importance since the district headquarters were removed to Dhubri in 1879, and it suffered severely from the earthquake of the 12th of June 1897.

The DISTRICT comprises an area of 3961 sq. m. It is situated along the Brahmaputra, at the corner where the river takes its southerly course from Assam into Bengal. The scenery is striking. Along the banks of the river grow clumps of cane and reed; farther back stretch fields of rice cultivation, broken only by the fruit trees surrounding the villages, and in the background rise the forest-clad hills overtopped by the white peaks of the Himalayas. The soil of the hills is of a red ochreous earth, about 12 m. S.E. of Cochin), which in 1599 consisted of laterite of granite and sandstone interspersed; that of the plains is of alluvial formation. Earthquakes are common and occasionally severe shocks have been experienced. The Brahmaputra annually inundates vast tracts of country. Numerous extensive forests yield valuable timber. Wild animals of all kinds are found. In 1901 the population was 462,083, showing an increase of 2% in the decade. Rice forms the staple crop. Mustard and jute are also largely grown. The manufactures consist of the making of brass and iron utensils and of gold and silver ornaments, weaving of silk cloth, basket-work and pottery. The cultivation of tea has been introduced but does not flourish anywhere in the district. Local trade is in the hands of Marwari merchants, and is carried on at the *bazars*, weekly *hats* or markets and periodical fairs. The chief exports are mustard-seed, jute, cotton, timber, lac, silk cloth, india-rubber and tea; the imports, Bengal rice, European piece goods, salt, hardware, oil and tobacco.

Dhubri (pop. 3737), the administrative headquarters of the district, stands on the Brahmaputra where that river takes its great bend south. It is the termination of the emigration road from North Bengal and of the river steamers that connect with the North Bengal railway. It is also served by the eastern Bengal State railway.

GOAT (a common Teut. word; O. Eng. *gát*, Goth. *gaits*, Mod. Ger. *Geiss*, cognate with Lat. *haedus*, a kid), properly the name of the well-known domesticated European ruminant (*Capra hircus*), which has for all time been regarded as the emblem of everything that is evil, in contradistinction to the sheep, which is the symbol of excellence and purity. Although the more typical goats are markedly distinct from sheep, there is, both as regards wild and domesticated forms, an almost complete gradation from goats to sheep, so that it is exceedingly difficult to define either group. The position of the genus *Capra* (to all the members of which, as well as some allied species, the name "goat" in its wider sense is applicable) in the family *Bovidae* is indicated in the article BOVIDAE, and some of the distinctions between goats and sheep are mentioned in the article SHEEP. Here then it will suffice to mention that goats are characterized by the strong and offensive odour of the males, which are furnished with a beard on the chin; while as a general rule glands are present between the middle toes of the fore feet only.

Goats, in the wild state, are an exclusively old-world group, of which the more typical forms are confined to Europe and south-western and central Asia, although there are two outlying species in northern Africa The wild goat, or pasang, is represented in Europe in the Cyclades and Crete by rather small races.

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more or less mingled with domesticated breeds, the Cretan animal being distinguished as *Capra hircus creticus*; but the large typical race *C. h. aegagrus* is met with in the mountains of Asia Minor and Persia, whence it extends to Sind, where it is represented by a somewhat different race known as *C. h. blythi*. The horns of the old bucks are of great length and beauty, and characterized by their bold scimitar-like backward sweep and sharp front edge, interrupted at irregular intervals by knots or bosses. Domesticated goats have run wild in many islands, such as the Hebrides, Shetland, Canaries, Azores, Ascension and Juan Fernandez. Some of these reverted breeds have developed horns of considerable size, although not showing that regularity of curve distinctive of the wild race. In the Azores the horns are remarkably upright and straight, whence the name of "antelope-goat" which has been given to these animals. The concretions known as *bezoar-stones*, formerly much used in medicine and as antidotes of poison, are obtained from the stomach of the wild goat.

Although there have in all probability been more or less important local crosses with other wild species, there can be no doubt that domesticated goats generally are descended from the wild goat. It is true that many tame goats show spirally twisted horns recalling those of the under-mentioned Asiatic markhor; but in nearly all such instances it will be found that the spiral twists in the opposite direction. Among the domesticated breeds the following are some of the more important.

Firstly, we have the common or European goats, of which there are several more or less well-marked breeds, differing from each other in length of hair, in colour and slightly in the configuration of the horns. The ears are more or less upright, sometimes horizontal, but never actually pendent, as in some Asiatic breeds. The horns are rather flat at the base and not unfrequently corrugated; they rise vertically from the head, curving to the rear, and are more or less laterally inclined. The colour varies from dirty white to dark-brown, but when pure-bred is never black, which indicates eastern blood. Most European countries possess more than one description of the common goat. In the British Isles there are two distinct types, one short and the other long haired. In the former the hair is thick and close, with frequently an under-coat resembling wool. The horns are large in the male, and of moderate size in the female, flat at the base and inclining outwards. The head is short and tapering, the forehead flat and wide, and the nose small; while the legs are strong, thick and well covered with hair. The colour varies from white or grey to black, but is frequently fawn, with a dark line down the spine and another across the shoulders. The other variety has a shaggy coat, generally reddish-black, though sometimes grey or pied and occasionally white. The head is long, heavy and ugly; the nose coarse and prominent, with the horns situated close together, often continuing parallel almost to the extremities, being also large, corrugated and pointed. The legs are long and the sides flat, the animal itself being generally gaunt and thin. This breed is peculiar to Ireland, the Welsh being of a similar type, but more often white. The short-haired goat is the English goat proper. Both British breeds, as well as those from abroad, are frequently ornamented with two tassel-like appendages, hanging near together under the throat. It has been supposed by many that these are traceable to foreign blood; but although there are foreign breeds that possess them, they appear to pertain quite as much to the English native breeds as to those of distant countries, the peculiarity being mentioned in very old works on the goats of the British Islands. The milk-produce in the common goat as well as other kinds varies greatly with individuals. Irish goats often yield a quantity of milk, but the quality is poor. The goats of France are similar to those of Britain, varying in length of hair, colour and character of horns. The Norway breed is frequently white with long hair; it is rather small in size, with small bones, a short rounded body, head small with a prominent forehead, and short, straight, corrugated horns. The facial line is concave. The horns of the males are very large, and curve round after the manner of the wild goat, with a tuft of hair between and in front.

The Maltese goat has the ears long, wide and hanging down below the jaw. The hair is long and cream-coloured. The breed is usually hornless.

The Syrian goat is met with in various parts of the East, in Lower Egypt, on the shores of the Indian Ocean and in Madagascar. The hair and ears are excessively long, the latter so much so that they are sometimes clipped to prevent their being torn by stones or thorny shrubs. The horns are somewhat erect and spiral, with an outward bend.

The Angora goat is often confounded with the Kashmir, but is in reality quite distinct. The principal feature of this breed, of which there are two or three varieties, is the length and quantity of the hair, which has a particularly soft and silky texture, covering the whole body and a great part of the legs with close matted ringlets. The horns of the male differ from those of the female, being directed vertically and in shape spiral, whilst in the female they have a horizontal tendency, somewhat like those of a ram. The coat is composed of two kinds of hair, the one short and coarse and of the character of hair, which lies close to the skin, the other long and curly and of the nature of wool, forming the outer covering. Both are used by the manufacturer, but the exterior portion, which makes up by far the greater bulk, is much the more valuable. The process of shearing takes place in early spring, the average amount of wool yielded

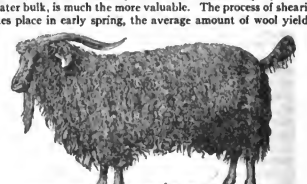

FIG. 1.—Male Angora Goat.

by each animal being about 2½ lb. The best quality comes from castrated males, females producing the next best.

The breed was introduced at the Cape about 1864. The Angora is a bad milker and an indifferent mother, but its flesh is better than that of any other breed, and in its native country is preferred to mutton. The kids are born small, but grow fast, and arrive early at maturity. The Kashmir, or rather Tibet, goat has a delicate head, with semi-pendulous ears, which are both long and wide. The hair varies in length, and is coarse and of different colours according to the individual. The horns are very erect, and sometimes slightly spiral, inclining inwards and to such an extent in some cases as to cross. The coat is composed, as in the Angora, of two materials; but in this breed it is the under-coat that partakes of the nature of wool and is valued as an article of commerce. This under-coat, or *pushm*, which is of a uniform greyish-white tint, whatever the colour of the hair may be, is beautifully soft and silky, and of a fluffy description resembling down. It makes its appearance in the autumn, and continues to grow until the following spring, when, if not removed, it falls off naturally; its collection then commences, occupying from eight to ten days. The animal undergoes during that time a process of combing by which all the wool and a portion of the hair, which of necessity comes with it, is removed. The latter is afterwards carefully separated, when the fleece in a good specimen weighs about half a pound. This is the material of which the far-famed and costly shawls are made, which at one time had such a demand that, it is stated, 16,000 looms were kept in constant work at Kashmir in their manufacture. Those goats having a short, neat head, long, thin, ears, a delicate skin, small bones, and a long heavy coat, are for this purpose deemed the best. There are several varieties

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possessing this valuable quality, but those of Kashmir, Tibet and Mongolia are the most esteemed.

The Nubian goat, which is met with in Nubia, Upper Egypt and Abyssinia, differs greatly in appearance from those previously described. The coat of the female is extremely short, almost like that of a race-horse, and the legs are long. This breed therefore stands considerably higher than the common goat. One of its peculiarities is the convex profile of the face, the forehead being prominent and the nostrils sunk in, the nose itself extremely small, and the lower lip projecting from the upper. The ears are long, broad and thin, and hang down by the side

FIG. 2.—Nubian Goat.

of the head like a lop-eared rabbit. The horns are black, slightly twisted and very short, flat at the base, pointed at the tips, and recumbent on the head. Among goats met with in England a good many show signs of a more or less remote cross with this breed, derived probably from specimens brought from the East on board ships for supplying milk during the voyage.

The Theban goat, of the Sudan, which is hornless, displays the characteristic features of the last in an exaggerated degree, and in the form of the head and skull is very sheep-like.

The Nepal goat appears to be a variety of the Nubian breed, having the same arched facial line, pendulous ears and long legs. The horns, however, are more spiral. The colour of the hair, which is longer than in the Nubian, is black, grey or white, with black blotches.

Lastly the Guinea goat is a dwarf breed originally from the coast whence its name is derived. There are three varieties. Besides the commonest *Capra recurva*, there is a rarer breed, *Capra depressa*, inhabiting the Mauritius and the islands of Bourbon and Madagascar. The other variety is met with along the White Nile, in Lower Egypt, and at various points on the African coast of the Mediterranean.

As regards wild goats other than the representatives of *Capra hircus*, the members of the ibex-group are noticed under IBEX, while another distinctive type receives mention under MARKHOR. The ibex are connected with the wild goat by means of *Capra nubiana*, in which the front edge of the horns is thinner than in either the European *C. ibex* or the Asiatic *C. sibirica*; while the Spanish *C. pyrenaica* shows how the ibex-type of horn may pass into the spirally twisted one distinctive of the markhor, *C. falconeri*. In the article IBEX mention is made of the Caucasus ibex, or tur, *C. caucasica*, as an aberrant member of that group; but beside this animal the Caucasus is the home of another very remarkable goat, or tur, known as *C. pallasi*. In this ruminant, which is of a dark-brown colour, the relatively smooth black horns diverge outwards in a manner resembling those of the bharal among the sheep rather than in goat-fashion; and, in fact, this tur, which has only a very short beard, is so bharal-like that it is commonly called by sportsmen the Caucasian bharal. It is one of the species which render it so difficult to give a precise definition of either sheep or goats.

The short-horned Asiatic goats of the genus *Hemitragus* receive mention in the article TAHR; but it may be added that fossil species of the same genus are known from the Lower Pliocene formations of India, which have also yielded remains of a goat allied to the markhor of the Himalayas. The Rocky Mountain goat (*q.v.*) of America has no claim to be regarded as a member of the goat-group.

For full descriptions of the various wild species, see R. Lydekker, *Wild Oxen, Sheep, and Goats* (London, 1898). (R. L.*)

GOATSUCKER, a bird from very ancient times absurdly believed to have the habit implied by the common name it bears in many European tongues besides English—as testified by the Gr. αἰγοθήλας, the Lat. *caprimulgus*, Ital. *succiacapre*, Span. *chotacabras*, Fr. *tettechèvre*, and Ger. *Ziegenmelker*. The common goatsucker (*Caprimulgus europaeus*, Linn.), is admittedly the type of a very peculiar and distinct family, *Caprimulgidae*, a group remarkable for the flat head, enormously wide mouth, large eyes, and soft, pencilled plumage of its members, which vary in size from a lark to a crow. Its position has been variously assigned by systematists. Though now judiciously removed from the *Passeres*, in which Linnaeus placed all the species known to him, Huxley considered it to form, with two other families—the swifts (*Cypselidae*) and humming-birds (*Trochilidae*)—the division *Cypselomorphae* of his larger group *Aegithognathae*, which is equivalent in the main to the Linnaean *Passeres*. There are two ways of regarding the *Caprimulgidae*—one including the genus *Podargus* and its allies, the other recognizing them as a distinct family, *Podargidae*. As a matter of convenience we shall here comprehend these last in the *Caprimulgidae*, which will then contain two subfamilies, *Caprimulginae* and *Podarginae*; for what, according to older authors, constitutes a third, though represented only by *Steatornis*, the singular oil-bird, or guacharo, certainly seems to require separation as an independent family (see GUACHARO).

Some of the differences between the *Caprimulginae* and *Podarginae* have been pointed out by Sclater (*Proc. Zool. Soc.*, 1866, p. 123), and are very obvious. In the former, the outer toes have *four* phalanges only, thus presenting a very uncommon character among birds, and the middle claws are pectinated; while in the latter the normal number of five phalanges is found,

Common Goatsucker.

and the claws are smooth, and other distinctions more recondite have also been indicated by him (*tom. cit.* p. 582). The *Caprimulginae* may be further divided into those having the gape thickly beset by strong bristles, and those in which there are few such bristles or none—the former containing the genera *Caprimulgus*, *Antrostomus*, *Nyctidromus* and others, and the latter *Podargus*, *Chordiles*, *Lyncornis* and a few more.

The common goatsucker of Europe (*C. europaeus*) arrives late in spring from its winter-retreat in Africa, and its presence is soon made known by its habit of chasing its prey, consisting chiefly of moths and cockchafers, in the evening-twilight. As

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the season advances the song of the cock, from its singularity, attracts attention amid all rural sounds. This song seems to be always uttered when the bird is at rest, though the contrary has been asserted, and is the continuous repetition of a single burring note, as of a thin lath fixed at one end and in a state of vibration at the other, and loud enough to reach in still weather a distance of half-a-mile or more. On the wing, while toying with its mate, or performing its rapid evolutions round the trees where it finds its food, it has the habit of occasionally producing another and equally extraordinary sound, sudden and short, but somewhat resembling that made by swinging a thong in the air, though whether this noise proceeds from its mouth is not ascertained. In general its flight is silent, but at times when disturbed from its repose, its wings may be heard to smite together. The goatsucker, or, to use perhaps its commoner English name, nightjar,[1] passes the day in slumber, crouching on the ground or perching on a tree—in the latter case sitting not across the branch but lengthways, with its head lower than its body. In hot weather, however, its song may sometimes be heard by day and even at noontide, but it is then uttered, as it were, drowsily, and without the vigour that characterizes its crepuscular or nocturnal performance. Towards evening the bird becomes active, and it seems to pursue its prey throughout the night uninterruptedly, or only occasionally pausing for a few seconds to alight on a bare spot—a pathway or road—and then resuming its career. It is one of the few birds that absolutely make no nest, but lays its pair of beautifully-marbled eggs on the ground, generally where the herbage is short, and often actually on the soil. So light is it that the act of brooding, even where there is some vegetable growth, produces no visible depression of the grass, moss or lichens on which the eggs rest, and the finest sand equally fails to exhibit a trace of the parental act. Yet scarcely any bird shows greater local attachment, and the precise site chosen one year is almost certain to be occupied the next. The young, covered when hatched with dark-spotted down, are not easily found, nor are they more easily discovered on becoming fledged, for their plumage almost entirely resembles that of the adults, being a mixture of reddish-brown, grey and black, blended and mottled in a manner that passes description. They soon attain their full size and power of flight, and then take to the same manner of life as their parents. In autumn all leave their summer haunts for the south, but the exact time of their departure has hardly been ascertained. The habits of the nightjar, as thus described, seem to be more or less essentially those of the whole subfamily—the differences observable being apparently less than are found in other groups of birds of similar extent.

A second species of goatsucker (*C. ruficollis*), which is somewhat larger, and has the neck distinctly marked with rufous, is a summer visitant to the south-western parts of Europe, and especially to Spain and Portugal. The occurrence of a single example of this bird at Killingworth, near Newcastle-on-Tyne, in October 1856, has been recorded by Mr Hancock (*Ibis*, 1862, p. 39); but the season of its appearance argues the probability of its being but a casual straggler from its proper home. Many other species of *Caprimulgus* inhabit Africa, Asia and their islands, while one (*C. macrurus*) is found in Australia. Very nearly allied to this genus is *Antrostomus*, an American group containing many species, of which the chuck-will's-widow (*A. carolinensis*) and the whip-poor-will (*A. vociferus*) of the eastern United States (the latter also reaching Canada) are familiar examples. Both these birds take their common name from the cry they utter, and their habits seem to be almost identical with those of the old world goatsuckers. Passing over some other forms which need not here be mentioned, the genus *Nyctidromus*, though consisting of only one species (*N. albicollis*) which inhabits Central and part of South America, requires remark, since it has tarsi of sufficient length to enable it to run swiftly on the ground, while the legs of most birds of the family are so short that they can make but a shuffling progress. *Heleothreptes*, with the unique form of wing possessed by the male, needs mention. Notice must also be taken of two African species, referred by some ornithologists to as many genera (*Macrodipteryx* and *Cosmetornis*), though probably one genus would suffice for both. The males of each of them are characterized by the wonderful development of the ninth primary in either wing, which reaches in fully adult specimens the extraordinary length of 17 in. or more. The former of these birds, the *Caprimulgus macrodipterus* of Adam Afzelius, is considered to belong to the west coast of Africa, and the shaft of the elongated remiges is bare for the greater part of its length, retaining the web, in a spatulate form, only near the tip. The latter, to which the specific name of *vexillarius* was given by John Gould, has been found on the east coast of that continent, and is reported to have occurred in Madagascar and Socotra. In this the remigial streamers do not lose their barbs, and as a few of the next quills are also to some extent elongated, the bird, when flying, is said to look as though it had four wings. Specimens of both are rare in collections, and no traveller seems to have had the opportunity of studying the habits of either so as to suggest a reason for this marvellous sexual development.

The second group of *Caprimulginae*, those which are but poorly provided not at all furnished with rictal bristles, contains about five genera, of which we may particularize *Lyncornis* of the old world and *Chordiles* of the new. The species of the former are remarkable for the tuft of feathers which springs from each side of the head, above and behind the ears, so as to give the bird an appearance like some of the "horned" owls—those of the genus *Scops*, for example; and remarkable as it is to find certain forms of two families, so distinct as are the *Strigidae* and the *Caprimulgidae*, resembling each other in this singular external feature, it is yet more remarkable to note that in some groups of the latter, as in some of the former, a very curious kind of dimorphism takes place. In either case this has been frequently asserted to be sexual, but on that point doubt may fairly be entertained. Certain it is that in some groups of goatsuckers, as in some groups of owls, individuals of the same species are found in plumage of two entirely different hues—rufous and grey. The only explanation as yet offered of this fact is that the difference is sexual, but evidence to that effect is conflicting. It must not, however, be supposed that this common feature, any more than that of the existence of tufted forms in each group, indicates any close relationship between them. The resemblances may be due to the same causes, concerning which future observers may possibly enlighten us, but at present we must regard them as analogies, not homologies. The species of *Lyncornis* inhabit the Malay Archipelago, one, however, occurring also in China. Of *Chordiles* the best-known species is the night-hawk of North America (*C. virginianus* or *C. popetue*), which has a wide range from Canada to Brazil. Others are found in the Antilles and in South America. The general habits of all these birds agree with those of the typical goatsuckers.

We have next to consider the birds forming the genus *Podargus* and those allied to it, whether they be regarded as a distinct family, or as a subfamily of *Caprimulgidae*. As above stated, they have feet constructed as those of birds normally are, and their sternum seems to present the constant though comparatively trivial difference of having its posterior margin elongated into two pairs of processes, while only one pair is found in the true goatsuckers. *Podargus* includes the bird (*P. cuvieri*) known from its cry as morepork to the Tasmanians,[2] and several other species, the number of which is doubtful, from Australia and New Guinea. They have comparatively powerful bills, and it would seem feed to some extent on fruits and berries, though they mainly subsist on insects, chiefly *Cicadae* and *Phasmidae*. They also differ from the true goatsuckers in having the outer toes partially reversible, and they build a flat nest on the horizontal branch of a tree for the reception of their eggs, which are of a spotless white. Apparently allied to *Podargus*, but differing

[1] Other English names of the bird are evejar, fern-owl, churn-owl and wheel-bird—the last from the bird's song resembling the noise made by a spinning-wheel in motion.

[2] In New Zealand, however, this name is given to an owl (*Scelogiaux novae-zelandiae*).

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among other respects in its mode of nidification, is *Aegotheles*, which belongs also to the Australian sub-region; and farther to the northward, extending throughout the Malay Archipelago and into India, comes *Batrachostomus*, wherein we again meet with species having aural tufts somewhat like *Lyncornis*. The *Podargina*e are thought by some to be represented in the new world by the genus *Nyctibius*, of which several species occur from the Antilles and Central America to Brazil. Finally, it may be stated that none of the *Caprimulgidae* seem to occur in Polynesia or in New Zealand, though there is scarcely any other part of the world suited to their habits in which members of the family are not found.

(A. N.)

GOBAT, SAMUEL (1799–1879), bishop of Jerusalem, was born at Crémine, Bern, Switzerland, on the 26th of January 1799. After serving in the mission house at Basel from 1823 to 1826, he went to Paris and London, whence, having acquired some knowledge of Arabic and Ethiopic, he went out to Abyssinia under the auspices of the Church Missionary Society. The unsettled state of the country and his own ill health prevented his making much headway; he returned to Europe in 1835 and from 1839 to 1842 lived in Malta, where he supervised an Arabic translation of the Bible. In 1846 he was consecrated Protestant bishop of Jerusalem, under the agreement between the British and Prussian governments (1841) for the establishment of a joint bishopric for Lutherans and Anglicans in the Holy Land. He carried on a vigorous mission as bishop for over thirty years, his diocesan school and orphanage on Mount Zion being specially noteworthy. He died on the 11th of May 1879.

A record of his life, largely autobiographical, was published at Basel in 1884, and an English translation at London in the same year.

GOBEL, JEAN BAPTISTE JOSEPH (1727–1794), French ecclesiastic and politician, was born at Thann, in Alsace, on the 1st of September 1727. He studied theology in the German College at Rome, and then became successively a member of the chapter of Porrentruy, bishop *in partibus* of Lydda, and finally suffragan of Basel for that part of the diocese situated in French territory. His political life began when he was elected deputy to the states-general of 1789 by the clergy of the *bailliage* of Huningue. The turning-point of his life was his action in taking the oath of the civil constitution of the clergy (Jan. 3rd, 1791); in favour of which he had declared himself since the 5th of May 1790. The civil constitution of the clergy gave the appointment of priests to the electoral assemblies, and since taking the oath Gobel had become so popular that he was elected bishop in several dioceses. He chose Paris, and in spite of the difficulties which he had to encounter before he could enter into possession, was consecrated on the 27th of March 1791 by eight bishops, including Talleyrand. On the 8th of November 1792, Gobel was appointed administrator of Paris. He was careful to flatter the politicians by professing anti-clerical opinions, declaring himself, among other things, opposed to the celibacy of the clergy; and on the 17th Brumaire in the year II. (7th November 1793), he came before the bar of the Convention, and, in a famous scene, resigned his episcopal functions, proclaiming that he did so for love of the people, and through respect for their wishes. The followers of Hébert, who were then pursuing their anti-Christian policy, claimed Gobel as one of themselves; while, on the other hand, Robespierre looked upon him as an atheist, though apostasy cannot strictly speaking be laid to the charge of the ex-bishop, nor did he ever make any actual profession of atheism. Robespierre, however, found him an obstacle to his religious schemes, and involved him in the fate of the Hébertists. Gobel was condemned to death, with Chaumette, Hébert and Anacharsis Cloots, and was guillotined on the 12th of April 1794.

See E. Charavay, *Assemblée électorale de Paris* (Paris, 1890); H. Monin, *La Chanson et l'Église sous la Révolution* (Paris, 1892); A. Aulard, "La Culte de la raison" in the review, *La Révolution Française* (1891). For a bibliography of documents relating to his episcopate see "Episcopat de Gobel" in vol. iii. (1900) of M. Tourneux's *Bibliographie de l'histoire de Paris pendant la Rév. Fr.*

GOBELIN, the name of a family of dyers, who in all probability came originally from Reims, and who in the middle of the 15th century established themselves in the Faubourg Saint Marcel, Paris, on the banks of the Bièvre. The first head of the firm was named Jehan (d. 1476). He discovered a peculiar kind of scarlet dyestuff, and he expended so much money on his establishment that it was named by the common people *la folie Gobelin*. To the dye-works there was added in the 16th century a manufactory of tapestry (*q.v.*). So rapidly did the wealth of the family increase, that in the third or fourth generation some of them forsook their trade and purchased titles of nobility. More than one of their number held offices of state, among others Balthasar, who became successively treasurer general of artillery, treasurer extraordinary of war, councillor secretary of the king, chancellor of the exchequer, councillor of state and president of the chamber of accounts, and who in 1601 received from Henry IV. the lands and lordship of Briecomte-Robert. He died in 1603. The name of the Gobelins as dyers cannot be found later than the end of the 17th century. In 1662 the works in the Faubourg Saint Marcel, with the adjoining grounds, were purchased by Colbert on behalf of Louis XIV., and transformed into a general upholstery manufactory, in which designs both in tapestry and in all kinds of furniture were executed under the superintendence of the royal painter, Le Brun. On account of the pecuniary embarrassments of Louis XIV., the establishment was closed in 1694, but it was reopened in 1697 for the manufacture of tapestry, chiefly for royal use and for presentation. During the Revolution and the reign of Napoleon the manufacture was suspended, but it was revived by the Bourbons, and in 1826 the manufacture of carpets was added to that of tapestry. In 1871 the building was partly burned by the Communists. The manufacture is still carried on under the state.

See Lacordaire, *Notice historique sur les manufactures impériales de tapisserie des Gobelin et de tapis de la Savonnerie, précédée du catalogue des tapisseries qui y sont exposés* (Paris, 1853); Genspach, *Répertoire détaillé des tapisseries exécutées aux Gobelins, 1662–1892* (Paris, 1893); Guiffrey, *Histoire de la tapisserie en France* (Paris, 1878–1885). The two last-named authors were directors of the manufactory.

GOBI (for which alternative Chinese names are SHA-MO, "sand desert," and HAN-HAI, "dry sea"), a term which in its widest significance means the long stretch of desert country that extends from the foot of the Pamirs, in about 77° E., eastward to the Great Khingan Mountains, in 116°–118° E., on the border of Manchuria, and from the foothills of the Altai, the Sayan and the Yablonoi Mountains on the N. to the Nan-tagh or Altyn-tagh and the Nan-shan, the northernmost consistuent ranges of the Kuen-lun Mountains, on the south. By conventional usage a relatively small area on the east side of the Great Khingan, between the upper waters of the Sungari and the upper waters of the Liao-ho, is also reckoned to belong to the Gobi. On the other hand, geographers and Asiatic explorers prefer to regard the W. extremity of the Gobi region (as defined above), namely, the basin of the Tarim in E. Turkestan, as forming a separate and independent desert, to which they have given the name of Takla-makan. The latter restriction governs the present article, which accordingly excludes the Takla-makan, leaving it for separate treatment. The desert of Gobi as a whole is only very imperfectly known, information being confined to the observations which individual travellers have made from their respective itineraries across the desert. Amongst the explorers to whom we owe such knowledge as we possess about the Gobi, the most important have been Marco Polo (1273–1275), Gerbillon (1688–1698), Ijsbrand Ides (1692–1694), Lange (1727–1728 and 1736), Fuss and Bunge (1830–1831), Fritsche (1868–1873), Pavlinov and Matusovski (1870), Ney Elias (1872–1873), N. M. Przhevalsky (1870–1872 and 1876–1877), Zosnovsky (1875), M. V. Pjevtsov (1878), G. N. Potanin (1877 and 1884–1886), Count Széchenyi and L. von Loczy (1879–1880), the brothers Grum-Grzhimailo (1889–1890), P. K. Kozlov (1893–1894 and 1899–1900), V. I. Roborovsky (1894), V. A. Obruchev (1894–1896), Futterer and Holderer (1896), C. E. Bonin (1896 and 1899), Sven Hedin (1897 and 1900–1901), K. Bogdanovich (1898), Ladyghin (1899–1900) and Katsnakov (1899–1900).

Geographically the Gobi (a Mongol word meaning "desert")

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is the deeper part of the gigantic depression which fills the interior of the lower terrace of the vast Mongolian plateau, and measures over 1000 m. from S.W. to N.E. and 450 to 600 m. from N. to S., being widest in the west, along the line joining the Baghrash-kol and the Lop-nor (87°-89° E.). Owing to the immense area covered, and the piecemeal character of the information, no general description can be made applicable to the whole of the Gobi. It will be more convenient, therefore, to describe its principal distinctive sections *serialim*, beginning in the west.

Ghashiun-Gobi and Kuruk-tagh.—The Yulduz valley or valley of the Khaidyk-gol (83°-86° E., 43° N.) is enclosed by two prominent members of the Tian-shan system, namely the Chol-tagh and the Kuruk-tagh, running parallel and close to one another. As they proceed eastward they diverge, successively back on N. and S. respectively so as to leave room for the Baghrash-kol. These two ranges mark the northern and the southern edges respectively of a great swelling, which extends eastward for nearly twenty degrees of longitude. On its northern side the Chol-tagh descends steadily and footfall bright by a string of deep depressions, ranging from Lukchun (425 ft. *below* the level of the sea) to Hami (2800 ft. above sea-level). To the south of the Kuruk-tagh lie the desert of Lop, the desert of Kum-tagh, and the valley of the Buluntai-gol. To this great swelling which stretches up between the two border-ranges of the Chol-tagh and Kuruk-tagh, the Mongols give the name of Ghashiun-Gobi or Salt Desert. It is some 80 to 100 m. across from N. to S., and is traversed by a number of minor parallel ranges, ridges and chains of hills, down to the middle runs a broad stony valley, 25 to 50 m. wide, at an elevation of 3000 to 4500 ft. The Chol-tagh, which reaches an average altitude of 6000 ft., is absolutely sterile, and its northern foot rests upon a narrow belt of barren sand, which leads down to the depressions mentioned above.

The Kuruk-tagh is the greatly disintegrated, denuded and wasted relic of a mountain range which formerly was of incomparably greater magnitude. In the west, between Baghrash-kol and the Tarim, it consists of two, possibly of three, principal ranges, which, although broken in continuity, run generally parallel to one another, and embrace between them numerous minor chains of hills. These minor ranges, together with the principal ranges, divide the region into a series of long, narrow valleys, mostly parallel to one another and to the enclosing mountain chains, which descend like terraced steps, on the one side towards the depression of Lukchun and on the other towards the desert of Lop. In many cases these latitudinal valleys are barred transversely by ridges or spurs, generally elevations *en masse* of the bottom of the valley. Where such elevations exist, there is generally found, on the E. side of the transverse ridge, a cauldron-shaped depression, which some time or other has been the bottom of a former lake, but is now nearly a dry salt-basin. The surface configuration is in fact markedly similar to that which occurs in the piedmont latitudinal valleys of the Kuen-lun. The hydrography of the Ghashiun-Gobi and the Kuruk-tagh is determined by these chequered arrangements of the latitudinal valleys. Most of the principal streams, instead of flowing straight down these valleys, from diagonally and gradually turn west after they have cut their way through one or more of the transverse barrier ranges.[1] To the highest range on the great swelling Grum-Grzhimailo gives the name of Tuguz-ula, its highest summits 9000 ft. above the level of the sea and some 4000 ft. above the crown of the swelling itself. This range he considers to belong to the Chol-tagh system, whereas Sven Hedin would assign it to the Kuruk-tagh. This last, which is pretty certainly identical with the range of Khara-teken-ula (also known as the Kyzyl-sanghir, Sinir, and Singher Mountains), that overlooks the southern shore of the Baghrash-kol, though parted from it by the drift-sand desert of Ak-bel-kum (White Pass Sands), has at first a W.N.W. to E.S.E. strike, but it gradually curves round like a scimitar towards the E.N.E. and at the same time gradually decreases in elevation. In 91° E., while the principal range of the Kuruk-tagh system wheels to the E.N.E., four of its subsidiary ranges terminate, or rather die away somewhat suddenly, on the brink of a long narrow depression (in which Sven Hedin sees a N.E. bay of the former great Central Asian lake of Lop-nor), having over against them the echeloned terminals of similar subordinate ranges of the Pe-shan (Bey-shan) system (see below). The Kuruk-tagh is throughout a relatively low, but almost completely barren range, being entirely destitute of animal life, save for hares, antelopes and wild camels, which frequent its relatively scanty pasturages. Its vegetation, which is confined to these same relatively favoured spots, is of the scantiest and is mainly confined to bushes of saxaul (*Anabasis Ammodendron*), reeds (*kamish*), tamarisks, poplars, *Kalidium* and *Ephedra*.

Desert of Lop.—This section of the Gobi extends south-eastward from the foot of the Kuruk-tagh as far as the present terminal basin of the Tarim, namely Kara-koshun (Przhevalsky's Lop-nor), and is an almost perfectly horizontal expanse, for, while the Baghrash-kol in the N. lies at an altitude of 2940 ft., the Kara-koshun, over 200 m. to the S., is only 300 ft. lower. The characteristic features of this almost dead level or but slightly undulating region are: (i.) broad, unbroken expanses of clay intermingled with sand, the clay (*shor*) being indurated and saliferous and often arranged in terraces; (ii.) hard, level, clay expanses, more or less thickly sprinkled with fine gravel (*tay*), the clay being mostly of a yellow or yellow-grey colour; (iii.) beaches, flattened ridges and tabular masses of consolidated clay (*Jardangs*), arranged in distinctly defined *laminae*, three stories being sometimes superimposed one upon the other, and their vertical faces being abraded, and often undercut, by the wind, while the formations themselves are separated by usually quite narrow wind-furrows, 6 to 20 ft. deep, all sculptured in the direction of the prevailing wind, that is, from N.E. to S.W.; and (iv.) the absence of drift-sand and sand-dunes, except in the south, towards the outlying foothills of the Astin-tagh. Perhaps the most striking characteristic, after the jardangs or clay terraces, is the fact that the whole of this region is not only swept bare of sand by the terrific sand-storms (*buranes*) of the spring months, the particles of sand with which the wind is laden acting like a sand-blast, but the actual substantive materials of the desert itself are abraded, filed, eroded and carried bodily away into the network of lakes in which the Tarim loses itself, or are even blown across the lower, constantly shifting watercourses of that river and deposited on or among the gigantic dunes which choke the eastern end of the desert of Takla-makan. Numerous indications, such as salt-stained depressions of a lacustrine appearance, traces of former lacustrine shore-lines, more or less parallel and concentric, the presence in places of vast quantities of fresh-water mollusc shells (species of *Limnaea* and *Planorbis*), the existence of belts of dead poplars, patches of dead tamarisks and extensive beds of withered reeds, all these always on top of the jardangs, never in the wind-etched furrows, together with a few scrubby poplars and *Elaeagnus*, still struggling hard not to die, the presence of ripple marks of aqueous origin on the leeward sides of the clay terraces, and in other wind-sheltered situations, all testify to the former existence in this region of more or less extensive fresh-water lakes, now of course completely desiccated. During the prevalence of the spring storms the atmosphere that overhangs the immediate surface of the desert is so heavily charged with dust as to be a veritable pall of desolation. Except for the wild camel which frequents the reed oases on the N. edge of the desert, animal life is even less abundant than in the Ghashiun-Gobi, and the same is true as regards the vegetation.

Desert of Kum-tagh.—This section lies E.S.E. of the desert of Lop, on the other side of the Kara-koshun and its more or less temporary continuations, and reaches south-eastwards as far as the vicinity of the town of Sa-chow and the lake of Kara-nor or Kala-chi. Its southern rim is marked by a labyrinth of hills, dotted in groups and irregular clusters, but evidently survivals of two parallel ranges which are now worn down as it were to mere fragments of their former skeletal structure. Between these and the Astin-tagh intervenes a broad latitudinal valley, seamed with watercourses which come down from the foothills of the Astin-tagh and beside which scrubby poplars, plants of the saxaul character maintain a precarious existence, water reaching them in some instances at intervals of years only. This part of the desert has a general slope N.W. towards the relative depression of the Kara-koshun. A noticeable feature of the Kum-tagh is the presence of numerous crescentic belts of drift-sand, especially along the foot of the crumbling desert ranges, where it rises into dunes sometimes as much as 250 ft. in height and climbs like a glacier up the flanks of ranges transverse. The prevailing winds in this region would appear to blow from the W. and N.W. during the summer, winter and autumn, though in spring, when they certainly are more violent, they no doubt come from the N.E., as in the desert of Lop. Anyway, the arrangement of the sand here "agrees perfectly with the law laid down by Potanin, that in the basins of Central Asia the sand is heaped up in greater mass on the south, all along the bordering mountain ranges where the floor of the depressions lies at the highest level."[2] The country to the north of the desert ranges is thus summarily described by Sven Hedin:[3] "The first zone of drift-sand is succeeded by a region which exhibits proofs of wind-modelling on an extraordinarily energetic and well developed scale, the results corresponding to the jardangs and the wind-eroded gullies of the desert of Lop. Both sets of phenomena lie parallel to one another; from this we may infer that the winds which prevail in the two deserts are the same. Next comes, sharply demarcated from the zone just described, a more or less thin kamish steppe growing on level ground; and this in turn is followed by another very narrow belt of sand, immediately south of Achik-kuduk. . . . . Finally in the extreme north we have the characteristic and sharply defined belt of kamish steppe, stretching from E.N.E. to W.S.W., and bounded on N. and S. by high, sharp-cut clay terraces. . . . At the points where we measured them the northern terrace was 113 ft. high and the southern 85½ ft. . . . Both terraces belong to the same level, and would appear to correspond to the shore lines of a big bay of the last surviving remnant of the Central Asian Mediterranean. At the point where I crossed it the depression was 6 to 7 m. wide, and thus resembled a flat valley or immense river-bed."

[1] Cf. G. E. Grum-Grzhimailo, *Opisanije Puteshestviya*, i. 381-417.

[2] Quoted in Sven Hedin, *Scientific Results*, ii. 499.

[3] *Op. cit.* ii. 499-500.

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Desert of Hami and the Pe-shan Mountains.—This section occupies the space between the Tian-shan system on the N. and the Nan-shan Mountains on the S., and is connected on the W. with the desert of Lop. The classic account is that of Przhevalsky, who crossed the desert from Hami (or Khami) to Su-chow (not Sa-chow) in the summer of 1879. In the middle this desert rises into a vast swelling, 80 m. across, which reaches an average elevation of 5000 ft. and a maximum elevation of 5500 ft. On its northern and southern borders it is overtopped by two divisions of high ground (=Pe-shan) belonging to neither of which attains any great relative altitude. Between the northern division and the Karlyk-tagh range or E. Tian-shan intervenes a somewhat undulating barren plain, 3900 ft. in altitude and 40 m. from N. to S., sloping downwards from both N. and S. towards the middle, where lies the oasis of Hami (2800 ft.). Similarly from the southern division of the Bey-san a second plain slopes down for 1000 ft. to the valley of the river Bulunzir or Su-lai-ho, which comes out of China, from the south side of the Great Wall. The valley empties itself into the lake of Kalachi or Kara-nor. From the Bulunzir the same plain continues southwards at a level of 3700 ft. to the foot of the Nan-shan Mountains. The total breadth of the desert from N. to S. is here 160 m. Its general character is that of an undulating plain, dotted over with occasional elevations of clay, which present the appearance of walls, table-topped mounds and broken towers (*yardangi*), the surface of the plain being strewn with gravel and absolutely destitute of vegetation. Generally speaking, the Bey-san ranges consist of isolated hills or groups of hills, of low relative elevation (100 to 300 ft.), scattered without any regard to order over the arch of the swelling. They nowhere present well-defined peaks. Their axis runs from W.S.W. to E.N.E. But whereas Przhevalsky and Sven Hedin consider them to be a continuation of the Kuruk-tagh, though the latter regards them as separated from the Kuruk-tagh by a well-marked basin, the former Central Asia, Mediterranean (Lop-nor), Futterer declares they are a continuation of the Chol-tagh. The swelling or undulating plain between these two ranges of the Bey-san measures about 70 m. across and is traversed by several stretches of high ground having generally an east-west direction.[1] Futterer, who crossed the same desert twenty years after Przhevalsky, agrees generally in his description of it, but supplements the account of the latter explorer with several particulars. He observes that the ranges in this part of the desert are much worn down and wasted, like the Kuruk-tagh farther west and the tablelands of S.E. Mongolia farther east, through the effects of century-long insolation, wind erosion, great and sudden changes of temperature, chemical action and occasional water erosion. Vast areas towards the N. consist of expanses of gently sloping (at a mean slope of 3°) clay, intermingled with gravel. He points out also that the greatest accumulations of sand and other products of aerial denudation do not occur in the deepest parts of the depressions but at the outlets of the valleys and glens, and along the foot of the ranges which flank the depressions on the S. Wherever water has been, desert scrub is found, such as tamarisks, *Dodonaea viscosa*, *Agriophyllum gobicum*, *Calligonum sinnus*, and *Lycium ruthenicum*, but all with their roots elevated on little mounds in the same way as the tamarisks grow in the Takla-makan and desert of Lop.

Farther east, towards Gucheng, the tablelands, or Pen-i-Futterer, are the same as along the Hami-Su-chow route, except that the ranges have lower and broader crests, and the detached hills are more denuded and more disintegrated. Between the ranges occur broad, flat, cauldron-shaped valleys and basins, almost destitute of sand except for a few hares and a few birds, such as the crow and the pheasant, and with scanty vegetation, but no great accumulations of drift-sand. The rocks are severely weathered on the surface, a thick layer of the coarser products of degradation covers the flat floor and climbs a good way up the flanks of the mountain ranges, but all the finer material, sand and clay has been blown away partly S.E. into Ordos, partly into the Chinese provinces of Shen-si and Shan-si, where it is deposited as loess, and partly W., where it chokes all the southern parts of the basin of the Tarim. In these central parts of the Gobi, as indeed in all other parts except the desert of Lop and Ordos, the prevailing winds blow from the S.W. and N.W. These winds are warm in summer, and it is they which in the desert of Hami bring the fierce sandstorms or burans. The wind does blow also from the N.E., but it is then cold and often brings snow, though it speedily clears the air of the everlasting dust haze. In summer great heat is encountered here on the relatively low (3000-4600 ft.), gravelly expanses (*soy*) on the N. and on those of the S. (4000-5000 ft.); but on the higher swelling between, which in the Pe-shan ranges ascends to 7550 ft., there is great cold even in summer, and a wide daily range of temperature. Above the broad and deep accumulations of the products of denudation which have been brought down by the rivers from the Tian-shan ranges (*e.g.* the Karlyk-tagh) on the N. and from the Nan-shan on the S., and have filled up the cauldron-shaped valleys, there rises a broad swelling, built up of granitic rocks, crystalline schists and metamorphosed sedimentary rocks of both Archaic and Palaeozoic age, all greatly folded and tilted up, and shot through with numerous irruptions of volcanic rocks, predominantly porphyritic and dioritic. On this swelling rise four more or less parallel mountain ranges of the Pe-shan system, together with a fifth chain of hills farther S., all having a strike from W.N.W. to E.N.E. The range farthest N. rises to 1000 ft. above the desert and 7550 ft. above sea-level, the next two ranges reach 1300 ft. above the general level of the desert, and the range farthest south 1475 ft. or an absolute altitude of 7200 ft., while the fifth chain of hills does not exceed 650 ft. in relative elevation. All these ranges decrease in altitude from W. to E. In the depressions which border the Pe-shan swelling (N. and S.) occur the Tertiary deposits of the Lower Tertiary sea of the Han-hai; but no traces of those deposits have been found on the swelling itself at altitudes of 5600 to 5700 ft. Hence, Futterer infers, in recent geological times no large sea has occupied the central part of the Gobi. Beyond an occasional visit from a band of nomad Mongols, this region of the Pe-shan swelling is entirely uninhabited.[2] And yet it was from this very region, avers G. E. Grum-Grzhimailo, that the Yue-chi, a nomad race akin to the Tibetans, proceeded when, towards the middle of the 2nd century B.C., they moved westwards and settled near Lake Issyk-kul; and from here proceeded also the Shanshani, or people who some two thousand years ago founded the state of Shanshan or Loû-lan, ruins of the chief town of which Sven Hedin discovered in the desert of Lop in 1901. Here, says the Russian explorer, the Huns gathered strength, as also did the Tukiu (Turks) in the 6th century, and the Uighur tribes and the rulers of the Tangut kingdom. But after Jenghiz Khan in the 12th century drove away the peoples of this region, and no civilization came to take their place, the country went out of cultivation and eventually became the barren desert it now is.[3]

Ala-shan.—This division of the great desert, known also as the Hsi-tau and the Little Gobi, fills the space between the great N. loop of the Hwang-ho or Yellow river on the E., the Edzin-gol on the W., and the Nan-shan Mountains on the S.W., where it is separated from the Chinese province of Kan-suh by the narrow rocky chain of Lung-shan (Ala-shan), to 5300 to 11,600 ft. in altitude. It belongs to the middle basin of the three great depressions into which Potanin divides the Gobi as a whole. "Topographically," says Przhevalsky, "it is a perfect level plain, which in all probability once formed the bed of a huge lake or inland sea." The data upon which he bases this conclusion are the level area of the region as a whole, the hard saline clay and the sand-strewn surface, and lastly the salt lakes which occupy its lowest parts. For the most part there is nothing to be seen but bare sands; in some places they continue so far without a break that the Mongols call them Tyngheri (*i.e.* sky). These vast expanses are absolutely waterless, nor do any oases relieve the unbroken sterility of yellow sand, which in all probability once filled the bed of a huge lake or inland sea.[4] The only human inhabitants of Ala-shan are the Torgod Mongols.

Ordos.—East of the desert of Ala-shan, and only separated from it by the Hwang-ho, is the desert of Ordos or Ho-tau, "a level steppe, partly bordered by low hills. The soil is altogether sandy or a mixture of clay and sand, ill adapted for agriculture. The absolute height of this country is between 3000 and 3500 ft., so that Ordos forms an intermediate step in the descent to China from the Gobi, separated from the latter by the mountain ranges lying on the N. and E. of the Hwang-ho or Yellow river."[5] Towards the south Ordos rises to an altitude of over 5000 ft., and in the W., along the right bank of the Hwang-ho, the Arbus or Arbiso Mountains, which overlook the steppe by some 2000 ft., serve to link the Ala-shan Mountains with the In-shan. The northern part of the great loop of the river is filled with the sands of Kuzupchi, a succession of dunes, 40 to 50 ft. high. Amongst them in scattered patches grow the shrub *Calligonum* and the trees *Calligonum Pugopyrum* and *Populus cornutum*. In some places these sand-dunes approach close to the great river, in others they are parted from it by a belt of sand, intermingled with clay, which terminates in a steep escarpment, 50 ft. and in some localities 100 ft. above the river. This belt is studded with little mounds (7 to 10 ft. high), mostly overgrown with wormwood (*Artemisia campestris*) and the Siberian pea-tree (*Caragana*); and here too grows one of the most characteristic plants of Ordos, the liquorice root (*Glycyrrhiza uralensis*). Eventually

[1] Przhevalsky, *Iz Zayona cheres Hami v Tibet na Vershovya Sholtoy Rékt*, pp. 84-91.

[2] Futterer, *Durch Asien*, i. pp. 206-211.

[3] G. E. Grum-Grzhimailo, *Opisanie Puteshestviya v Sapadniy Kitai*, ii. p. 127.

[4] Its seeds are pounded by the Mongols to flour and mixed with their tea.

[5] Przhevalsky, *Mongolia* (Eng. trans. ed. by Sir H. Yule).

the sand-dunes cross over to the left bank of the Hwang-ho, and are threaded by the beds of dry watercourses, while the level spaces amongst them are studded with little mounds (3 to 6 ft. high), on which grow stunted *Nitraria Schoberi* and *Zygophyllum*. Ordos, which was anciently known as Ho-tan ("the country south of the river") and still farther back in time as Ho-tau, was occupied by the Hiong-nu in the 1st and 2nd centuries A.D., but was almost depopulated during and after the Dungan revolt of 1869. North of the big loop of the Hwang-ho Ordos is separated from the central Gobi by a succession of mountain chains, the Kara-naryn-ula, the Sheitenula, and the In-shan Mountains, which link on to the south end of the Great Khingan Mountains. The In-shan Mountains, which stretch from 108° to 112° E., have a wild Alpine character and are distinguished from other mountains in the S.E. of Mongolia by an abundance of both water and vegetation. In one of their constituent ranges, the bold Munoshi, 70 m. long and nearly as high as Mont Blanc, they attain elevations of 7500 to 8500 ft., and have steep flanks, slashed with rugged gorges and narrow glens. Forests begin on them at 5300 ft. and wild flowers grow in great profusion and variety in summer, though with a striking lack of brilliancy in colouring. In this same border range there is also a much greater abundance and variety of animal life, especially amongst the avifauna.

Eastern Gobi.—Here the surface is extremely diversified, although there are no great differences in vertical elevation. Between Urga (48° N. and 107° E.) and the little lake of Iren-dubasu-nor (111° 50′ E. and 43° 45′ N.) the surface is greatly eroded, and consists of broad flat depressions and basins separated by groups of small detached mountains of relatively low elevation (500 to 600 ft.), through which archaic rocks crop out as crags and isolated rugged masses. The floors of the depressions lie mostly between 2900 and 3200 ft. above sea-level. Farther south, between Iren-dubasu-nor and the Hwang-ho comes a region of broad tablelands alternating with flat plains, the latter ranging at altitudes of 3300 to 3600 ft. and the former at 3500 to 4000 ft. The slopes of the plateaus are more or less steep, and are sometimes protected by "bad lands" on the lowlands. As the border-range of the Khingan is approached the country steadily rises up to 4500 ft. and then to 5350 ft. Here small lakes frequently fill the depressions, though the water in them is generally salt or brackish. The lakes are, as a rule, scarce in south of Urga, streams are frequent, and grass grows more or less abundantly. There is, however, through all the central parts, until the bordering mountains are reached, an utter absence of trees and shrubs. Clay and sand are the predominating constituents, the watercourses, especially in the north, being frequently excavated 6 to 8 ft. deep, and in many places in the flat, dry valleys or depressions farther south beds of brass, 15 to 20 ft. thick, are exposed. West of the main route from Urga to Kalgan the country presents approximately the same general features, except that the mountains are not so irregularly scattered in groups but have more strongly defined strikes, mostly E. to W., W.N.W. to S.S.E., and N.W. to E.N.E. The tablelands too are higher, those of the lowlands ranging from 3300 to 5600 ft., and those of the ranges from 650 to 1650 ft. higher, though in a few cases they reach altitudes of 8000 ft. above sea-level. The elevations do not, however, as a rule form continuous chains, but make up a congeries of short ridges and groups rising from a common base and intersected by a labyrinth of ravines, gullies, glens and basins. But the tablelands, built up of the horizontal red deposits of the Han-hai (Obruchev's *Gobi*), which are characteristic of the southern parts of eastern Mongolia, are absent here or occur only in one locality, near the Shara-muren river, and are then greatly intersected by gullies or dry watercourses.[1] Here there is, however, a great dearth of water, no streams, no lakes, no wells, the precipitation falls but seldom. The prevailing winds blow from the W. and N.W. and the pall of dust overhangs the country as in the Takla-makan and the desert of Lop. Characteristic of the flora are wild garlic, *Kalidium gracile*, wormwood, saxaul, *Nitraria Scoberi*, *Caragana*, *Ephedra*, saltwort and *dirisun* (*Lasiagrostis splendens*).

This great desert country of Gobi is crossed by several trade routes, some of which have been in use for thousands of years. Among the most important are those from Kalgan on the frontier of China to Urga (600 m.), from Su-chow (in Kan-suh) to Hami (420 m.) from Hami to Peking (1300 m.), from Kwei-hwa-cheng (or Kuku-khoto) to Hami and Barkul, and from Peking (in Kan-suh) to Urga.

Climate.—The climate of the Gobi is one of great extremes, combined with rapid changes of temperature, not only at all seasons of the year but even within 24 hours (as much as 58° F.). For instance, at Urga (3770 ft.) the annual mean is 27·5° F., the January mean −15·7°, and the July mean 63·5°, the extremes being 100·5° and −44·5°; while at Sivantse (3005 ft.) the annual mean is 37°, the January mean 2·3°, and the July mean 66·3°, the range being from a recorded maximum of 93° to a recorded minimum of −53°. Even in southern Mongolia the thermometer goes down as low as −27°, and in Ala-shan it rises day after day in July as high as 97°. Although the south-east monsoons reach the S.E. parts of the Gobi, the air generally throughout this region is characterized by extreme dryness, especially during the winter. Hence the icy sandstorms and snowstorms of spring and early summer. The rainfall at Urga for the year amounts to only 9·7 in.

[1] Obruchev. in *Izvestia* of Russ. Geogr. Soc. (1895).

Sands of the Gobi Deserts.—With regard to the origin of the masses of sand out of which the dunes and chains of dunes (*barkhans*) are built up in the several deserts of the Gobi, opinions differ. While some explorers consider them to be the product of marine, or by any rate lacustrine, denudation (the Central Asian Mediterranean), others—and this is not only the more reasonable view, but it is the view which is gaining most ground—consider that they are the products of the aerial denudation of the border ranges (e.g. Nan-shan, Karlyk-tagh, &c.), and more especially of the terribly wasted ranges and chains of hills, which, like the gaunt fragments of montane skeletal remains, lie littered all over the swelling uplands and tablelands of the heart of the Gobi, and then transported by the prevailing winds to the localities in which they are now accumulated, the winds obeying similar transportation laws to the rivers and streams which carry down sediment in moister parts of the world. Potanin points out[2] that, "in spite of a certain amount of regularity observable in the distribution of the sandy deserts over the vast uplands of central Asia. Two agencies are represented in the distribution of the sands, though what they really are is not quite clear; and of these two agencies one prevails in the north-west, the other in the south-east, so that the whole of Central Asia may be divided into two regions, the dividing line between them being drawn from south-east to south-west, from Urga via the eastern end of the Tian-shan to the city of Kashgar. North-west of this line the sandy masses are broken up into detached and disconnected areas, and are almost without exception heaped up around the lakes, and consequently in the lowest parts of the several districts in which they exist. Moreover, we find also that these sandy tracts always occur on the western or south-western shores of the lakes; this is the case with the lakes of Balkash, Ala-kul, Ebi-nor, Ayar-nor (or Telli-nor), Oku-nor, Kuku-nor, Zasan-nor, Ulungur, Usha-nor, Issik-nor and Kara-nor lying E. of Kirghiz-nor. South-east of the line the arrangement of the sand is quite different. In that part of Asia we have three gigantic but disconnected basins. The first, lying farthest east, is enclosed on the one side by the mountains of the Sentei and Khangai Mountains and on the other by the In-shan Mountains. The second or middle division is contained between the Altai of the Gobi and the Ala-shan. The third basin, in the west, lies between the Tian-shan and the border ranges of western Tibet.... The deepest parts of each of these three depressions occur near their northern borders; towards their southern boundaries they are all alike very much higher. . . . However, the sandy deserts are not found in the low-lying tracts but occur on the higher uplands which foot the southern mountain ranges, the In-shan and the Nan-shan. Our maps show an immense expanse of sand south of the Tarim in the western basin; beginning in the neighbourhood of the city of Yarkent (Yarkand), it extends east wards past the town of Khotan, Keriya and Cherchen to Sa-chow. Along this stretch there is only one locality which forms an exception to the rule we have indicated, namely, the region round the lake of Lop-nor. In the middle basin the widest expanse of sand occurs between the Edzin-gol and the range of Ala-shan. On the south it extends nearly as far as a line drawn through the towns of Lian-chow, Kan-chow and Kao-tai at the foot of the Nan-shan; but the south-east it does not approach anything like so far as the latitude (42° N.) of the lake of Ghashiun-nor. Still farther east come the sandy deserts of Ordos, extending southeastward as far as the mountain range which separates Ordos from the (S. Chinese) provinces of Shan-si and Shen-si. The eastern basin drift-sand is encountered between the district of Ude in the north (44° 30′ N.) and the foot of the In-shan in the south." In two regions, if not in three, the sands have overwhelmed large tracts of once cultivated country, and even buried the cities in which men formerly dwelt. These regions are the southern parts of the desert of Takla-makan (where Sven Hedin and M. A. Stein[3] have discovered the ruins under the desert sands), along the N. foot of the Nan-shan, and probably in part (other explorers having helped) in the north of the desert of Lop, where Sven Hedin discovered the ruins of Loū-lan and of other towns or villages. For the present vast accumulation of sand is constantly in movement; though the movement is slow, it has nevertheless been calculated that in the south of the Takla-makan the sand-dunes travel bodily at the rate of roughly something like 160 ft. in the course of a year. The form, shape and arrangement of the individual sand-dunes, and of the barkhans, generally indicate from which direction the predominant winds blow. On the windward side of the dune the slope is long and gentle, while the leeward side is steep and in outline concave like a horse-shoe. The dunes vary in height from 30 up to 300 ft., and in some places mount as it were upon one another's shoulders, and in some localities it is even said that a third tier is sometimes superimposed.

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[2] In *Tangutsko-Tibetskaya Okraina Kitaya i Central'naya Mongoliya*, i, pp. 96, &c.

[3] See *Sand-buried Cities of Khotan* (London, 1902).

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GOBLET, RENÉ (1828–1905), French politician, was born at Aire-sur-la-Lys, in the Pas de Calais, on the 26th of November 1828, and was educated for the law. Under the Second Empire, he helped to found a Liberal journal, *Le Progrès de la Somme*, and in July 1871 was sent by the department of the Somme to the National Assembly, where he took his place on the extreme left. He failed to secure election in 1876, but next year was returned for Amiens. He held a minor government office in 1879, and in 1882 became minister of the interior in the Freycinet cabinet. He was minister of education, fine arts and religion in Henri Brisson's first cabinet in 1885, and again under Freycinet in 1886, when he greatly increased his reputation by an able defence of the government's education proposals. Meanwhile his extreme independence and excessive candour had alienated him from many of his party, and all through his life he was frequently in conflict with his political associates, from Gambetta downwards. On the fall of the Freycinet cabinet in December he formed a cabinet in which he reserved for himself the portfolios of the interior and of religion. The Goblet cabinet was unpopular from the outset, and it was with difficulty that anybody could be found to accept the ministry of foreign affairs, which was finally given to M. Flourens. Then came what is known as the Schnaebele incident, the arrest on the German frontier of a French official named Schnaebele, which caused immense excitement in France. For some days Goblet took no definite decision, but left Flourens, who stood for peace, to fight it out with General Boulanger, then minister of war, who was for the despatch of an ultimatum. Although he finally intervened on the side of Flourens, and peace was preserved, his weakness in face of the Boulangist propaganda became a national danger. Defeated on the budget in May 1887, his government resigned; but he returned to office next year as foreign minister in the radical administration of Charles Floquet. He was defeated at the polls by a Boulangist candidate in 1889, and sat in the senate from 1891 to 1893, when he returned to the popular chamber. In association with MM. E. Lockroy, Ferdinand Sarrien and P. L. Peytral he drew up a republican programme which they put forward in the *Petite République française*. At the elections of 1898 he was defeated, and thenceforward took little part in public affairs. He died in Paris on the 13th of September 1905.

GOBLET, a large type of drinking-vessel, particularly one shaped like a cup, without handles, and mounted on a shank with a foot. The word is derived from the O. Fr. *gobelet*, diminutive of *gobel*, *gobeau*, which Skeat takes to be formed from Low Lat. *cupellus*, cup, diminutive of *cupa*, tub, cask (see DRINKING-VESSELS).

GOBY. The gobies (*Gobius*) are small fishes readily recognized by their ventrals (the fins on the lower surface of the chest) being united into one fin, forming a suctorial disk, by which these fishes are enabled to attach themselves in every possible position to a rock or other firm substances. They are essentially coast-fishes, inhabiting nearly all seas, but disappearing towards the Arctic and Antarctic Oceans. Many enter, or live exclusively in, such fresh waters as are at no great distance from the sea. Nearly 500 different kinds are known. The largest British species, *Gobius capito*, occurring in the rock-pools of Cornwall, measures 10 in. *Gobius alcocki*, from brackish and fresh waters of Lower Bengal, is one of the very smallest of fishes, not measuring over 16 millimetres (= 7 lines). The males are usually more brilliantly coloured than the females, and guard the eggs, which are often placed in a sort of nest made of the shell of some bivalve or of the carapace of a crab, with the convexity turned upwards and

FIG. 1.—*Gobius lentiginosus.*

FIG. 2.—United Ventrals of Goby.

covered with sand, the eggs being stuck to the inner surface of this roof.

Close allies of the gobies are the walking fish or jumping fish (*Periophthalmus*), of which various species are found in great

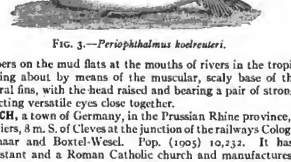

FIG. 3.—*Periophthalmus koelreuteri.*

numbers on the mud flats at the mouths of rivers in the tropics, skipping about by means of the muscular, scaly base of their pectoral fins, with the head raised and bearing a pair of strongly projecting versatile eyes close together.

GOCH, a town of Germany, in the Prussian Rhine province, on the Niers, 8 m. S. of Cleves at the junction of the railways Cologne-Zevenaar and Boxtel-Wesel. Pop. (1905) 10,232. It has a Protestant and a Roman Catholic church and manufactures of brushes, plush goods, cigars and margarine. In the middle ages it was the seat of a large trade in linen. Goch became a town in 1231 and belonged to the dukes of Gelderland and later to the dukes of Cleves.

GOD, the common Teutonic word for a personal object of religious worship. It is thus, like the Gr. *θεός* and Lat. *deus*, applied to all those superhuman beings of the heathen mythologies who exercise power over nature and man and are often identified with some particular sphere of activity; and also to the visible material objects, whether an image of the supernatural being or a tree, pillar, &c. used as a symbol, an idol. The word "god," on the conversion of the Teutonic races to Christianity, was adopted as the name of the one Supreme Being, the Creator of the universe, and of the Persons of the Trinity. The *New English Dictionary* points out that whereas the old Teutonic type of the word is neuter, corresponding to the Latin *numen*, in the Christian applications it becomes masculine, and that even where the earlier neuter form is still kept, as in Gothic and Old Norwegian, the construction is masculine. Popular etymology has connected the word with "good"; this is exemplified by the corruption of "God be with you" into "good-bye." "God" is a word common to all Teutonic languages. In Gothic it is *Guth*; Dutch has the same form as English; Danish and Swedish have *Gud*, German *Gott*. According to the *New English Dictionary*, the original may be found in two Aryan roots, both of the form *ghu*, one of which means "to invoke," the other "to pour" (cf. Gr. *χέω*); the last is used of sacrificial offerings. The word would thus mean the object either of religious invocation or of religious worship by sacrifice. It has been also suggested that the word might mean a "molten image" from the sense of "pour."

See RELIGION; HEBREW RELIGION; THEISM, &c.

GODALMING, a market-town and municipal borough in the Guildford parliamentary division of Surrey, England, 34 m. S.W. of London by the London & South-Western railway. Pop. (1901) 8748. It is beautifully situated on the right bank of the Wey,

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which is navigable thence to the Thames, and on the high road between London and Portsmouth. Steep hills, finely wooded, enclose the valley. The chief public buildings are the church of SS. Peter and Paul, a cruciform building of mixed architecture, but principally Early English and Perpendicular; the town-hall, Victoria hall, and market-house, and a technical institute and school of science and art. Charterhouse School, one of the principal English public schools, originally founded in 1611, was transferred from Charterhouse Square, London, to Godalming in 1872. It stands within grounds 92 acres in extent, half a mile north of Godalming, and consists of spacious buildings in Gothic style, with a chapel, library and hall, besides boarding-houses, masters' houses and sanatoria. (See CHARTERHOUSE.) Godalming has manufactures of paper, leather, parchment and hosiery, and some trade in corn, malt, bark, hoops and timber; and the Bargate stone, of which the parish church is built, is still quarried. The borough is under a mayor, 6 aldermen and 18 councillors. Area, 812 acres.

Godalming (Godelminge) belonged to King Alfred, and was a royal manor at the time of Domesday. The manor belonged to the see of Salisbury in the middle ages, but reverted to the crown in the time of Henry VIII. Godalming was incorporated by Elizabeth in 1574, when the borough originated. The charter was confirmed by James I. in 1620, and a fresh charter was granted by Charles II. in 1666. The borough was never represented in parliament. The bishop of Salisbury in 1300 received the grant of a weekly market to be held on Mondays: the day was altered to Wednesday by Elizabeth's charter. The bishop's grant included a fair at the feast of St Peter and St Paul (29th of June). Another fair at Candlemas (2nd of February) was granted by Elizabeth. The market is still held. The making of cloth, particularly Hampshire kerseys, was the staple industry of Godalming in the middle ages, but it began to decay early in the 17th century and by 1850 was practically extinct. As in other cases, dyeing was subsidiary to the cloth industry. Tanning, introduced in the 15th century, survives. The present manufacture of fleecy hosiery dates from the end of the 18th century.

GODARD, BENJAMIN LOUIS PAUL (1849–1895), French composer, was born in Paris, on the 18th of August 1849. He studied at the Conservatoire, and competed for the Prix de Rome without success in 1866 and 1867. He began by publishing a number of songs, many of which are charming, such as "Je ne veux pas d'autres choses," "Ninon," "Chanson de Florian," also a quantity of piano pieces, some chamber music, including several violin sonatas, a trio for piano and strings, a quartet for strings, a violin concerto and a second work of the same kind entitled "Concerto Romantique." Godard's chance arrived in the year 1878, when with his dramatic cantata, *Le Tasse*, he shared with M. Théodore Dubois the honour of winning the musical competition instituted by the city of Paris. From that time until his death Godard composed a surprisingly large number of works, including four operas, *Pedro de Zalamea*, produced at Antwerp in 1884; *Jocelyn*, given in Paris at the Théâtre du Château d'Eau, in 1888; *Dante*, played at the Opéra Comique two years later; and *La Vivandière*, left unfinished and partly scored by another hand. This last work was heard at the Opéra Comique in 1895, and has been played in England by the Carl Rosa Opera Company. His other works include the "Symphonie légendaire," "Symphonie gothique," "Diane" and various orchestral works. Godard's productivity was enormous, and his compositions are, for this reason only, decidedly unequal. He was at his best in works of smaller dimensions, and has left many exquisite songs. Among his more ambitious works the "Symphonie légendaire" may be singled out as being one of the most distinctive. He had a decided individuality, and his premature death at Cannes on the 10th of January 1895 was a loss to French art.

GODAVARI, a river of central and western India. It flows across the Deccan from the Western to the Eastern Ghats; its total length is 900 m., the estimated area of its drainage basin, 112,200 sq. m. Its traditional source is on the side of a hill behind the village of Trimbak in Nasik district, Bombay, where the water runs into a reservoir from the lips of an image. But according to popular legend it proceeds from the same ultimate source as the Ganges, though underground. Its course is generally south-easterly. After passing through Nasik district, it crosses into the dominions of the nizam of Hyderabad. When it again strikes British territory it is joined by the Pranhita, with its tributaries the Wardha, the Penganga and Wainganga. For some distance it flows between the nizam's dominions and the Upper Godavari district, and receives the Indravati, the Tal and the Sabari. The stream has here a channel varying from 1 to 2 m. in breadth, occasionally broken by alluvial islands. Parallel to the river stretch long ranges of hills. Below the junction of the Sabari the channel begins to contract. The flanking hills gradually close in on both sides, and the result is a magnificent gorge only 200 yds. wide through which the water flows into the plain of the delta, about 60 m. from the sea. The head of the delta is at the village of Dowlaishweram, where the main stream is crossed by the irrigation anicut. The river has seven mouths, the largest being the Gautami Godavari. The Godavari is regarded as peculiarly sacred, and once every twelve years the great bathing festival called *Pushkaram* is held on its banks at Rajahmundry.

The upper waters of the Godavari are scarcely utilized for irrigation, but the entire delta has been turned into a garden of perennial crops by means of the anicut at Dowlaishweram, constructed by Sir Arthur Cotton, from which three main canals are drawn off. The river channel here is ¾ m. wide. The anicut is a substantial mass of stone, bedded in lime cement, about 2½ m. long, 130 ft. broad at the base, and 12 ft. high. The stream is thus pent back so as to supply a volume of 3000 cubic ft. of water per second during its low season, and 12,000 cubic ft. at time of flood. The main canals have a total length of 493 m., irrigating 662,000 acres, and all navigable; and there are 1929 m. of distributary channels. In 1864 water-communication was opened between the deltas of the Godavari and Kistna. Rocky barriers and rapids obstruct navigation in the upper portion of the Godavari. Attempts have been made to construct canals round these barriers with little success, and the undertaking has been abandoned.

GODAVARI, a district of British India, in the north-east of the Madras presidency. It was remodelled in 1907–1908, when part of it was transferred to Kistna district. Its present area is 5634 sq. m. Its territory now lies mainly east of the Godavari river, including the entire delta, with a long narrow strip extending up its valley. The apex of the delta is at Dowlaishweram, where a great dam renders the waters available for irrigation. Between this point and the coast there is a vast extent of rice fields. Farther inland, and enclosing the valley of the great river, are low hills, steep and forest-clad. The north-eastern part, known as the Agency tract, is occupied by spurs of the Eastern Ghats. The coast is low, sandy and swampy, the sea very shallow, so that vessels must lie nearly 5 m. from Cocanada, the chief port. The Sabari is the principal tributary of the Godavari within the district. The Godavari often rises in destructive floods. The population of the present area in 1901 was 1,445,961. In the old district the increase during the last decade was 11%. The chief towns are Cocanada and Rajahmundry. The forests are of great value; coal is known, and graphite is worked. The population is principally occupied in agriculture, the principal crops being rice, oil-seeds, tobacco and sugar. The cigars known in England as Lunkas are partly made from tobacco grown on *lankas* or islands in the river Godavari. Sugar (from the juice of the palmyra palm) and rum are made by European processes at Samalkot. The administrative headquarters are now at Cocanada, the chief seaport; but Rajahmundry, at the head of the delta, is the old capital. A large but decreasing trade is conducted at Cocanada, rice being shipped to Mauritius and Ceylon, and cotton and oil-seeds to Europe. Rice-cleaning mills have been established here and at other places. The district is traversed by the main line of the East Coast railway, with a branch to Cocanada; the iron girder bridge of forty-two spans over the

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Godavari river near Rajahmundry was opened in 1900. There is a government college at Rajahmundry, with a training college attached, and an aided college at Cocanada.

The Godavari district formed part of the Andhra division of Dravida, the north-west portion being subject to the Orissa kings, and the south-western belonging to the Vengi kingdom. For centuries it was the battlefield on which various chiefs fought for independence with varying success till the beginning of the 16th century, when the whole country may be said to have passed under Mahommedan power. At the conclusion of the struggle with the French in the Carnatic, Godavari with the Northern Circars was conquered by the English, and finally ceded by imperial *sanad* in 1765. The district was constituted in 1859, by the redistribution of the territory comprising the former districts of Guntur, Rajahmundry and Masulipatam, into what are now the Kistna and Godavari districts.

See H. Morris, *District Manual* (1878); *District Gazetteer* (1906).

GODEFROY (GOTHOFREDUS), a French noble family, which numbered among its members several distinguished jurists and historians. The family claimed descent from Symon Godefroy, who was born at Mons about 1320 and was lord of Saigneulx near Berry-au-bac, now in the department of Aisne.

DENIS GODEFROY (Dionysius Gothofredus) (1549–1622), jurist, son of Léon Godefroy, lord of Guignecourt, was born in Paris on the 17th of October 1549. He was educated at the Collège de Navarre, and studied law at Louvain, Cologne and Heidelberg, returning to Paris in 1573. He embraced the reformed religion, and in 1579 left Paris, where his abilities and connexions promised a brilliant career, to establish himself at Geneva. He became professor of law there, received the freedom of the city in 1580, and in 1587 became a member of the Council of the Two Hundred. Henry IV. induced him to return to France by making him *grand bailli* of Gex, but no sooner had he installed himself than the town was sacked and his library burnt by the troops of the duke of Savoy. In 1591 he became professor of Roman law at Strassburg, where he remained until April 1600, when in response to an invitation from Frederick IV., elector palatine, he removed to Heidelberg. The difficulties of his position led to his return to Strassburg for a short time, but in November 1604 he definitely settled at Heidelberg. He was made head of the faculty of law in the university, and was from time to time employed on missions to the French court. His repeated refusal of offers of advancement in his own country was due to his Calvinism. He died at Strassburg on the 7th of September 1622, having left Heidelberg before the city was sacked by the imperial troops in 1621. His most important work was the *Corpus juris civilis*, originally published at Geneva in 1583, which went through some twenty editions, the most valuable of them being that printed by the Elzevirs at Amsterdam in 1633 and the Leipzig edition of 1740.

Lists of his other learned works may be found in Senebier's *Hist. litt. de Genève*, vol. ii., and in Nicéron's *Mémoires*, vol. xvii. Some of his correspondence with his learned friends, with his kinsman President de Thou, Isaac Casaubon, Jean Jacques Grynaeus and others, is preserved in the libraries of the British Museum, of Basel and Paris.

His eldest son, THEODORE GODEFROY (1580–1649), was born at Geneva on the 14th of July 1580. He abjured Calvinism, and was called to the bar in Paris. He became historiographer of France in 1613, and was employed from time to time on diplomatic missions. He was employed at the congress of Münster, where he remained after the signing of peace in 1648 as chargé d'affaires until his death on the 5th of October of the next year. His most important work is *Le Cérémonial de France . . .* (1619), a work which became a classic on the subject of royal ceremonial, and was re-edited by his son in an enlarged edition in 1649.

Besides his printed works he made vast collections of historical material which remains in MS. and fills the greater part of the Godefroy collection of over five hundred portfolios in the Library of the Institute in Paris. These were catalogued by Ludovic Lalanne in the *Annuaire Bulletin* (1865–1866 and 1892) of the *Société de l'histoire de France.*

The second son of Denis, JACQUES GODEFROY (1587–1652), jurist, was born at Geneva on the 13th of September 1587. He was sent to France in 1611, and studied law and history at Bourges and Paris. He remained faithful to the Calvinist persuasion, and soon returned to Geneva, where he became active in public affairs. He was secretary of state from 1632 to 1636, and syndic or chief magistrate in 1637, 1641, 1645 and 1649. He died on the 23rd of June 1652. In addition to his civic and political work he lectured on law, and produced, after thirty years of labour, his edition of the *Codex Theodosianus.* This code formed the principal, though not the only, source of the legal systems of the countries formed from the Western Empire. Godefroy's edition was enriched with a multitude of important notes and historical comments, and became a standard authority on the decadent period of the Western Empire. It was only printed thirteen years after his death under the care of his friend Antoine Marville at Lyons (4 vols. 1665), and was reprinted at Leipzig (6 vols.) in 1736–1745. Of his numerous other works the most important was the reconstruction of the twelve tables of early Roman law.

See also the dictionary of Moreri, Nicéron's *Mémoires* (vol. 17) and a notice in the *Bibliothèque universelle de Genève* (Dec. 1837).

DENIS GODEFROY (1615–1681), eldest son of Théodore, succeeded his father as historiographer of France, and re-edited various chronicles which had been published by him. He was entrusted by Colbert with the care and investigation of the records concerning the Low Countries preserved at Lille, where great part of his life was spent. He was also the historian of the reigns of Charles VII. and Charles VIII.

Other members of the family who attained distinction in the same branch of learning were the two sons of Denis Godefroi—Denis (1653–1719), also an historian, and Jean, sieur d'Aumont (1656–1732), who edited the letters of Louis XII., the memoirs of Marguerite de Valois, of Castelnau and Pierre de l'Estoile, and left some useful material for the history of the Low Countries; Jean Baptiste Achille Godefroy, sieur de Maillart (1697–1759), and Denis Joseph Godefroy, sieur de Maillart (1740–1819), son and grandson of Jean Godefroy, who were both officials at Lille, and left valuable historical documents which have remained in MS.

For further details see *Les Savants Godefroy* (Paris, 1873) by the marquis de Godefroy-Ménilglaise, son of Denis Joseph Godefroy.

GODESBERG, a spa of Germany, in the Prussian Rhine province, on the left bank of the Rhine, almost opposite Königswinter, and 4 m. S. of Bonn, on the railway to Coblenz. It is a fashionable summer resort, and contains numerous pretty villas, the residences of merchants from Cologne, Elberfeld, Crefeld and other Rhenish manufacturing centres. It has an Evangelical and three Roman Catholic churches, a synagogue and several educational establishments. Its chalybeate springs annually attract a large number of visitors, and the pump-room, baths and public grounds are arranged on a sumptuous scale. On a conical basalt hill, close by, are the ruins, surmounted by a picturesque round tower, of Godesberg castle. Built by Archbishop Dietrich I. of Cologne in the 13th century, it was destroyed by the Bavarians in 1583.

See Dennert, *Godesberg, eine Perle des Rheins* (Godesberg, 1900).

GODET, FRÉDÉRIC LOUIS (1812–1900), Swiss Protestant theologian, was born at Neuchâtel on the 25th of October 1812. After studying theology at Neuchâtel, Bonn and Berlin, he was in 1850 appointed professor of theology at Neuchâtel. From 1851 to 1866 he also held a pastorate. In 1873 he became one of the founders of the free Evangelical Church of Neuchâtel, and professor in its theological faculty. He died there on the 29th of October 1900. A conservative scholar, Godet was the author of some of the most noteworthy French commentaries published in recent times.

His commentaries are on the Gospel of St John (2 vols., 1863–1865; 3rd ed., 1881–1888; Eng. trans. 1886, &c.); St Luke (2 vols., 1871; 3rd ed., 1888; Eng. trans. 1875, &c.); the Epistle to the Romans (2 vols., 1879–1880; 2nd ed., 1883–1890; Eng. trans., 1880, &c.); Corinthians (2 vols., 1886–1887; Eng. trans. 1886, &c.). His other

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works include *Études bibliques* (2 vols., 1873–1874; 4th ed., 1889; Eng. trans. 1875 f.), and *Introduction au Nouveau Testament* (1893 f.; Eng. trans., 1894, &c.); *Lectures in Defence of the Christian Faith* (Eng. trans. 4th ed., 1900).

GODFREY, SIR EDMUND BERRY (1621–1678), English magistrate and politician, younger son of Thomas Godfrey (1586–1664), a member of an old Kentish family, was born on the 23rd of December 1621. He was educated at Westminster school and at Christ Church, Oxford, and after entering Gray's Inn became a dealer in wood. His business prospered. He was made a justice of the peace for the city of Westminster, and in September 1666 was knighted as a reward for his services as magistrate and citizen during the great plague in London; but in 1669 he was imprisoned for a few days for instituting the arrest of the king's physician, Sir Alexander Fraizer (d. 1681), who owed him money. The tragic events in Godfrey's life began in September 1678 when Titus Oates and two other men appeared before him with written information about the Popish Plot, and swore to the truth of their statements. During the intense excitement which followed the magistrate expressed a fear that his life was in danger, but took no extra precautions for safety. On the 12th of October he did not return home as usual, and on the 17th his body was found on Primrose Hill, Hampstead. Medical and other evidence made it certain that he had been murdered, and the excited populace regarded the deed as the work of the Roman Catholics. Two committees investigated the occurrence without definite result, but in December 1678 a certain Miles Prance, who had been arrested for conspiracy, confessed that he had shared in the murder. According to Prance the deed was instigated by some Roman Catholic priests, three of whom witnessed the murder, and was committed in the courtyard of Somerset House, where Godfrey was strangled by Robert Green, Lawrence Hill and Henry Berry, the body being afterwards taken to Hampstead. The three men were promptly arrested; the evidence of the informer William Bedloe, although contradictory, was similar on a few points to that of Prance, and in February 1679 they were hanged. Soon afterwards, however, some doubt was cast upon this story; a war of words ensued between Prance and others, and it was freely asserted that Godfrey had committed suicide. Later the falsehood of Prance's confession was proved and Prance pleaded guilty to perjury; but the fact remains that Godfrey was murdered. Godfrey was an excellent magistrate, and was very charitable both in public and in private life. Mr John Pollock, in the *Popish Plot* (London, 1903), confirms the view that the three men, Green, Hill and Berry, were wrongfully executed, and thinks the murder was committed by some Jesuits aided by Prance. Godfrey was feared by the Jesuits because he knew, through Oates, that on the 24th of April 1678 a Jesuit congregation had met at the residence of the duke of York to concert plans for the king's murder. He concludes thus: "The success of Godfrey's murder as a political move is indubitable. The duke of York was the pivot of the Roman Catholic scheme in England, and Godfrey's death saved both from utter ruin." On the other hand Mr Alfred Marks in his *Who killed Sir E. B. Godfrey?* (1905) maintains that suicide was the cause of Godfrey's death.

See the article OATES, TITUS, also R. Tuke, *Memoirs of the Life and Death of Sir Edmondbury Godfrey* (London, 1682); and G. Burnet, *History of my Own Time; The Reign of Charles II.*, edited by O. Airy (Oxford, 1900).

GODFREY OF BOUILLON (*c.* 1060–1100), a leader in the First Crusade, was the second son of Eustace II., count of Boulogne, by his marriage with Ida, daughter of Duke Godfrey II. of Lower Lorraine. He was designated by Duke Godfrey as his successor; but the emperor Henry IV. gave him only the mark of Antwerp, in which the lordship of Bouillon was included (1076). He fought for Henry, however, both on the Elster and in the siege of Rome; and he was invested in 1082 with the duchy of Lower Lorraine. Lorraine had been penetrated by Cluniac influences, and Godfrey would seem to have been a man of notable piety. Accordingly, though he had himself served as an imperialist, and though the Germans in general had little sympathy with the Crusaders (*subsannabant . . . quasi delirantes*), Godfrey, nevertheless, when the call came "to follow Christ," almost literally sold all that he had, and followed. Along with his brothers Eustace and Baldwin (the future Baldwin I. of Jerusalem) he led a German contingent, some 40,000 strong, along "Charlemagne's road," through Hungary to Constantinople, starting in August 1096, and arriving at Constantinople, after some difficulties in Hungary, in November. He was the first of the crusading princes to arrive, and on him fell the duty of deciding what the relations of the princes to the eastern emperor Alexius were to be. Eventually, after several disputes and some fighting, he did homage to Alexius in January 1097; and his example was followed by the other princes. From this time until the beginning of 1099 Godfrey appears as one of the minor princes, plodding onwards, and steadily fighting, while men like Bohemund and Raymund, Baldwin and Tancred were determining the course of events.

In 1099 he came once more to the front. The mass of the crusaders became weary of the political factions which divided some of their leaders; and Godfrey, who was more of a pilgrim than a politician, becomes the natural representative of this feeling. He was thus able to force the reluctant Raymund to march southward to Jerusalem; and he took a prominent part in the siege, his division being the first to enter when the city was captured. It was natural therefore that, when Raymund of Provence refused the offered dignity, Godfrey should be elected ruler of Jerusalem (July 22, 1099). He assumed the title not of king, but of "advocate"[1] of the Holy Sepulchre. The new dignity proved still more onerous than honourable; and during his short reign of a year Godfrey had to combat the Arabs of Egypt, and the opposition of Raymund and the patriarch Dagobert. He was successful in repelling the Egyptian attack at the battle of Ascalon (August 1099); but he failed, owing to Raymund's obstinacy and greed, to acquire the town of Ascalon after the battle. Left alone, at the end of the autumn, with an army of some 2000 men, Godfrey was yet able, in the spring of 1100, probably with the aid of new pilgrims, to exact tribute from towns like Acre, Ascalon, Arsuf and Caesarea. But already, at the end of 1099 Dagobert, archbishop of Pisa, had been substituted as patriarch for Arnulf (who had been acting as vicar) by the influence of Bohemund; and Dagobert, whose vassal Godfrey had at once piously acknowledged himself, seems to have forced him to an agreement in April 1100, by which he promised Jerusalem and Jaffa to the patriarch, in case he should acquire in their place Cairo or some other town, or should die without issue. Thus were the foundations of a theocracy laid in Jerusalem; and when Godfrey died (July 1100) he left the question to be decided, whether a theocracy or a monarchy should be the government of the Holy Land.

Because he had been the first ruler in Jerusalem Godfrey was idolized in later saga. He was depicted as the leader of the crusades, the king of Jerusalem, the legislator who laid down the assizes of Jerusalem. He was none of these things. Bohemund was the leader of the crusades; Baldwin was first king; the assizes were the result of a gradual development. In still other ways was the figure of Godfrey idealized by the grateful tradition of later days; but in reality he would seem to have been a quiet, pious, hard-fighting knight, who was chosen to rule in Jerusalem because he had no dangerous qualities, and no obvious defects.

LITERATURE.—The narrative of Albert of Aix may be regarded as presenting the Lotharingian point of view, as the *Gesta* presents the Norman, and Raymund of Agiles the Provençal. The career of Godfrey has been discussed in modern times by R. Röhricht, *Die Deutschen im heiligen Lande*, Band ii., and *Geschichte des ersten Kreuzzuges, passim* (Innsbruck, 1901). (E. BR.)

Romances.—Godfrey was the principal hero of two French *chansons de geste* dealing with the Crusade, the *Chanson d'Antioche* (ed. P. Paris, 2 vols., 1848) and the *Chanson de Jérusalem* (ed. C. Hippeau, 1868), and other poems, containing less historical

[1] An "advocate" was a layman who had been invested with part of an ecclesiastic estate, on condition that he defended the rest, and exercised the blood-ban in lieu of the ecclesiastical owner (see ADVOCATE, sec. *Advocatus ecclesiae*).

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material, were subsequently added. In addition the parentage and early exploits of Godfrey were made the subject of legend. His grandfather was said to be Helias, knight of the Swan, one of the brothers whose adventures are well known, though with some variation, in the familiar fairy tale of "The Seven Swans." Helias, drawn by the swan, one day disembarked at Nijmwegen, and reconquered her territory for the duchess of Bouillon. Marrying her daughter he exacted a promise that his wife should not inquire into his origin. The tale, which is almost identical with the Lohengrin legend, belongs to the class of the Cupid and Psyche narratives. See LOHENGRIN.

See also C. Hippeau, *Le Chevalier au cygne* (Paris, 2 vols., 1874–1877); H. Pigeonneau, *Le Cycle de la croisade et de la famille de Bouillon* (1877); W. Golther, "Lohengrin," in *Roman. Forsch.* (vol. v., 1889); *Hist. litt. de la France*, vol. xxii. pp. 350–402; the English romance of *Helyas, Knyghte of the Swanne* was printed by W. Copland about 1550.

GODFREY OF VITERBO (*c.* 1120–*c.* 1196), chronicler, was probably an Italian by birth, although some authorities assert that he was a Saxon. He evidently passed some of his early life at Viterbo, where also he spent his concluding days, but he was educated at Bamberg, gaining a good knowledge of Latin. About 1140 he became chaplain to the German king, Conrad III.; but the greater part of his life was spent as secretary (*notarius*) in the service of the emperor Frederick I., who appears to have thoroughly trusted him, and who employed him on many diplomatic errands. Incessantly occupied, he visited Sicily, France and Spain, in addition to many of the German cities, in the emperor's interests, and was by his side during several of the Italian campaigns. Both before and after Frederick's death in 1190 he enjoyed the favour of his son, the emperor Henry VI., for whom he wrote his *Speculum regum*, a work of very little value. Godfrey also wrote *Memoria seculorum*, or *Liber memorialis*, a chronicle dedicated to Henry VI., which professes to record the history of the world from the creation until 1185. It is written partly in prose and partly in verse. A revision of this work was drawn up by Godfrey himself as *Pantheon*, or *Universitatis libri qui chronici appellantur*. The author borrowed from Otto of Freising, but the earlier part of his chronicle is full of imaginary occurrences. *Panitheon* was first printed in 1559, and extracts from it are published by L. A. Muratori in the *Rerum Italicarum scriptores*, tome vii. (Milan, 1725). The only part of Godfrey's work which is valuable is the *Gesta Friderici I.*, verses relating events in the emperor's career from 1155 to 1180. Concerned mainly with affairs in Italy, the poem tells of the sieges of Milan, of Frederick's flight to Pavia in 1167, of the treaty with Pope Alexander III. at Venice, and of other stirring episodes with which the author was intimately acquainted, and many of which he had witnessed. Attached to the *Gesta Friderici* is the *Gesta Heinrici VI.*, a shorter poem which is often attributed to Godfrey, although W. Wattenbach and other authorities think it was not written by him. The *Memoria seculorum* was very popular during the middle ages, and has been continued by several writers.

Godfrey's works are found in the *Monumenta Germaniae historica*, Band xxii. (Hanover, 1872). The *Gesta Friderici I. et Heinrici VI.* is published separately with an introduction by G. Waitz (Hanover, 1872). See also H. Ulmann, *Gotfried von Viterbo* (Göttingen, 1863), and W. Wattenbach, *Deutschlands Geschichtsquellen*, Band ii. (Berlin, 1894). (A. W. H.*)

GODHRA, a town of British India, administrative headquarters of the Panch Mahals district of Bombay, and also of the Rewa Kantha political agency; situated 52 m. N.E. of Baroda on the railway from Anand to Ratlam. Pop. (1901) 20,915. It has a trade in timber from the neighbouring forests.

GODIN, JEAN BAPTISTE ANDRÉ (1817–1888), French socialist, was born on the 26th of January 1817 at Esquehéries (Aisne). The son of an artisan, he entered an iron-works at an early age, and at seventeen made a tour of France as journeyman. Returning to Esquehéries in 1837, he started a small factory for the manufacture of castings for heating-stoves. The business increased rapidly, and for the purpose of railway facilities was transferred to Guise in 1846. At the time of Godin's death in 1888 the annual output was over four millions of francs (£160,000), and in 1908 the employees numbered over 2000 and the output was over £280,000. An ardent disciple of Fourier, he advanced a considerable sum of money towards the disastrous Fourierist experiment of V. P. Considérant (*q.v.*) in Texas. He profited, however, by its failure, and in 1859 started the *familistère* or community settlement of Guise on more carefully laid plans. It comprises, in addition to the workshops, three large buildings, four storeys high, capable of housing all the work-people, each family having two or three rooms. Attached to each building is a vast central court, covered with a glass roof, under which the children can play in all weathers. There are also crèches, nurseries, hospital, refreshment rooms and recreation rooms of various kinds, stores for the purchase of groceries, drapery and every necessity, and a large theatre for concerts and dramatic entertainments. In 1880 the whole was turned into a co-operative society, with provision by which it eventually became the property of the workers. In 1871 Godin was elected deputy for Aisne, but retired in 1876 to devote himself to the management of the *familistère*. In 1882 he was created a knight of the legion of honour.

Godin was the author of *Solutions sociales* (1871); *Les Socialistes et les droits du travail* (1874); *Mutualité sociale* (1880); *La République du travail et la réforme parlementaire* (1889). See Bernardot, *Le Familistère de Guise et son fondateur* (Paris, 1887); Fischer, *Die Familistère Godin's* (Berlin, 1890); Lestelle, *Étude sur le familistère de Guise* (Paris, 1904); D. F. P., *Le Familistère illustré, résultats de vingt ans d'association, 1880–1900* (Eng. trans., *Twenty-eight years of co-partnership at Guise*, by A. Williams, 1908).

GODIVA, a Saxon lady, who, according to the legend, rode naked through the streets of Coventry to gain from her husband a remission of the oppressive toll imposed on his tenants. The story is that she was the beautiful wife of Leofric, earl of Mercia and lord of Coventry. The people of that city suffering grievously under the earl's oppressive taxation, Lady Godiva appealed again and again to her husband, who obstinately refused to remit the tolls. At last, weary of her entreaties, he said he would grant her request if she would ride naked through the streets of the town. Lady Godiva took him at his word, and after issuing a proclamation that all persons should keep within doors or shut their windows, she rode through, clothed only in her long hair. One person disobeyed her proclamation, a tailor, ever afterwards known as Peeping Tom. He bored a hole in his shutters that he might see Godiva pass, and is said to have been struck blind. Her husband kept his word and abolished the obnoxious taxes.

The oldest form of the legend makes Godiva pass through Coventry market from one end to the other when the people were assembled, attended only by two soldiers, her long hair flows so that none saw her, "apparentibus cruribus tamen candidissimis." This version is given in *Flores historiarum* by Roger of Wendover, who quoted from an earlier writer. The later story, with its episode of Peeping Tom, has been evolved by later chroniclers. Whether the lady Godiva of this story is the Godiva or Godgifu of history is undecided. That a lady of this name existed in the early part of the 11th century is certain, as evidenced by several ancient documents, such as the Stow charter, the Spalding charter and the Domesday survey, though the spelling of the name varies considerably. It would appear from *Liber Eliensis* (end of 12th century) that she was a widow when Leofric married her in 1040. In or about that year she aided in the founding of a monastery at Stow, Lincolnshire. In 1043 she persuaded her husband to build and endow a Benedictine monastery at Coventry. Her mark, "✠ Ego Godiva Comitissa diu istud desideravi," was found on the charter given by her brother, Thorold of Bucknall—sheriff of Lincolnshire—to the Benedictine monastery of Spalding in 1051; and she is commemorated as benefactress of other monasteries at Leominster, Chester, Wenlock, Worcester and Evesham. She probably died a few years before the Domesday survey (1085–1086), and was buried in one of the porches of the abbey church. Dugdale (1656) says that a window, with representations of Leofric and Godiva, was placed in Trinity Church, Coventry, about the time of Richard II. The Godiva procession, a commemoration of the legendary ride instituted on the 31st of May

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1678 as part of Coventry fair, was celebrated at intervals until 1826. From 1848 to 1887 it was revived, and recently further attempts have been made to popularize the pageant. The wooden effigy of Peeping Tom which, since 1812, has looked out on the world from a house at the north-west corner of Hertford Street, Coventry, represents a man in armour, and was probably an image of St George. It was removed from another part of the town to its present position.

GODKIN, EDWIN LAWRENCE (1831–1902), American publicist, was born in Moyne, county Wicklow, Ireland, on the 2nd of October 1831. His father, James Godkin, was a Presbyterian minister and a journalist, and the son, after graduating in 1851 at Queen's College, Belfast, and studying law in London, was in 1853–1855 war correspondent for the London *Daily News* in Turkey and Russia, being present at the capture of Sevastopol, and late in 1856 went to America and wrote letters to the same journal, giving his impressions of a tour of the southern states of the American Union. He studied law in New York City, was admitted to the bar in 1859, travelled in Europe in 1860–1862, wrote for the London *News* and the New York *Times* in 1862–1865, and in 1865 founded in New York City the *Nation*, a weekly projected by him long before, for which Charles Eliot Norton gained friends in Boston and James Miller McKim (1810–1874) in Philadelphia, and which Godkin edited until the end of the year 1899. In 1881 he sold the *Nation* to the New York *Evening Post*, and became an associate editor of the *Post*, of which he was editor-in-chief in 1883–1899, succeeding Carl Schurz. In the 'eighties he engaged in a controversy with Goldwin Smith over the Irish question. Under his leadership the *Post* broke with the Republican party in the presidential campaign of 1884, when Godkin's opposition to Blaine did much to create the so-called Mugwump party (see MUGWUMP), and his organ became thoroughly independent, as was seen when it attacked the Venezuelan policy of President Cleveland, who had in so many ways approximated the ideal of the *Post* and *Nation*. He consistently advocated currency reform, the gold basis, a tariff for revenue only, and civil service reform, rendering the greatest aid to the last cause. His attacks on Tammany Hall were so frequent and so virulent that in 1894 he was sued for libel because of biographical sketches of certain leaders in that organization—cases which never came up for trial. His opposition to the war with Spain and to imperialism was able and forcible. He retired from his editorial duties on the 30th of December 1899, and sketched his career in the *Evening Post* of that date. Although he recovered from a severe apoplectic stroke early in 1900, his health was shattered, and he died in Greenway, Devonshire, England, on the 21st of May 1902. Godkin shaped the lofty and independent policy of the *Post* and the *Nation*, which had a small but influential and intellectual class of readers. But as editor he had none of the personal magnetism of Greeley, for instance, and his superiority to the influence of popular feeling made Charles Dudley Warner style the *Nation* the "weekly judgment day." He was an economist of the school of Mill, urged the necessity of the abstraction called "economic man," and insisted that socialism put in practice would not improve social and economic conditions in general. In politics he was an enemy of sentimentalism and loose theories in government. He published *A History of Hungary, A.D. 300–1850* (1856), *Government* (1871, in the American Science Series), *Reflections and Comments* (1895), *Problems of Modern Democracy* (1896) and *Unforeseen Tendencies of Democracy* (1898).

See *Life and Letters of E. L. Godkin*, edited by Rollo Ogden (2 vols., New York, 1907).

GODMANCHESTER, a municipal borough in the southern parliamentary division of Huntingdonshire, England, on the right bank of the Ouse, 1 m. S.S.E. of Huntingdon, on a branch of the Great Eastern railway. Pop. (1901) 2017. It has a beautiful Perpendicular church (St Mary's) and an agricultural trade, with flour mills. The town is governed by a mayor, 4 aldermen and 12 councillors. Area, 4907 acres.

A Romano-British village occupied the site of Godmanchester. The town (*Gumencestre, Gomecestre*) belonged to the king before the Conquest and at the time of the Domesday survey. In 1213 King John granted the manor to the men of the town at a fee-farm of £120 yearly, and confirmation charters were granted by several succeeding kings, Richard II. in 1391–1392 adding exemption from toll, pannage, &c. James I. granted an incorporation charter in 1605 under the title of bailiffs, assistants and commonalty, but under the Municipal Reform Act of 1835 the corporation was changed to a mayor, 4 aldermen and 12 councillors. Godmanchester was formerly included for parliamentary purposes in the borough of Huntingdon, which has ceased to be separately represented since 1885. The incorporation charter of 1605 recites that the burgesses are chiefly engaged in agriculture, and grants them a fair, which still continues every year on Tuesday in Easter week.

See *Victoria County History, Huntingdon*; Robert Fox, *The History of Godmanchester* (1831).

GÖDÖLLÖ, a market town of Hungary, in the county of Pest-Pilis-Solt-Kiskun, 23 m. N.E. of Budapest by rail. Pop. (1900) 5875. Gödöllö is the summer residence of the Hungarian royal family, and the royal castle, built in the second half of the 18th century by Prince Anton Grassalkovich, was, with the beautiful domain, presented by the Hungarian nation to King Francis Joseph I. after the coronation in 1867. In its park there are a great number of stags and wild boars. Gödöllö is a favourite summer resort of the inhabitants of Budapest. In its vicinity is the famous place of pilgrimage Mária-Besnyö, with a fine Franciscan monastery, which contains the tombs of the Grassalkovich family.

GODOLPHIN, SIDNEY GODOLPHIN, EARL OF (*c.* 1645–1712), was a cadet of an ancient family of Cornwall. At the Restoration he was introduced into the royal household by Charles II., with whom he had previously become a favourite, and he also at the same period entered the House of Commons as member for Helston. Although he very seldom addressed the House, and, when he did so, only in the briefest manner, he gradually acquired a reputation as the chief to rely on for financial authority. In March 1679 he was appointed a member of the privy council, and in the September following he was promoted, along with Viscount Hyde (afterwards earl of Rochester) and the earl of Sunderland, to the chief management of affairs. Though he voted for the Exclusion Bill in 1680, he was continued in office after the dismissal of Sunderland, and in September 1684 he was created Baron Godolphin of Rialton, and succeeded Rochester as first lord of the treasury. After the accession of James II. he was made chamberlain to the queen, and, along with Rochester and Sunderland, enjoyed the king's special confidence. In 1687 he was named commissioner of the treasury. He was one of the council of five appointed by King James to represent him in London, when he went to join the army after the landing of William, prince of Orange, in England, and, along with Halifax and Nottingham, he was afterwards appointed a commissioner to treat with the prince. On the accession of William, though he only obtained the third seat at the treasury board, he had virtually the chief control of affairs. He retired in March 1690, but was recalled on the November following and appointed first lord. While holding this office he for several years continued, in conjunction with Marlborough, a treacherous intercourse with James II., and is said even to have anticipated Marlborough in disclosing to James intelligence regarding the intended expedition against Brest. Godolphin was not only a Tory by inheritance, but had a romantic admiration for the wife of James II. He also wished to be safe whatever happened, and his treachery in this case was mostly due to caution. After Fenwick's confession in 1696 regarding the attempted assassination of William III., Godolphin, who was compromised, was induced to tender his resignation; but when the Tories came into power in 1700, he was again appointed lord treasurer and retained office for about a year. Though not a favourite with Queen Anne, he was, after her accession, appointed to his old office, on the strong recommendation of Marlborough. He also in 1704 received the honour of knighthood, and in December

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1706 he was created Viscount Rialton and earl of Godolphin. Though a Tory he had an active share in the intrigues which gradually led to the predominance of the Whigs in alliance with Marlborough. The influence of the Marlboroughs with the queen was, however, gradually supplanted by that of Mrs Masham and Harley, earl of Oxford, and with the fortunes of the Marlboroughs those of Godolphin were indissolubly united. The services of both were so appreciated by the nation that they were able for a time to regard the loss of the queen's favour with indifference, and even in 1708 to procure the expulsion of Harley from office; but after the Tory reaction which followed the impeachment of Dr Sacheverel, who ahused Godolphin under the name of Volpone, the queen made use of the opportunity to take the initiatory step towards delivering herself from the irksome thraldom of Marlborough by abruptly dismissing Godolphin from office on the 7th of August 1710. He died on the 15th of September 1712.

Godolphin owed his rise to power and his continuance in it under four sovereigns chiefly to his exceptional mastery of financial matters; for if latterly he was in some degree indebted for his promotion to the support of Marlborough, he received that support mainly hecause Marlborough recognized that for the prosecution of England's foreign wars his financial abilities were an indispensable necessity. He was cool, reserved and cautious, but his prudence was less associated with high sagacity than traceable to the weakness of his personal antipathies and prejudices, and his freedom from political predilections. Perhaps it was his unlikeness to Marlborough in that moral characteristic which so tainted Marlborough's greatness that rendered possible between them a friendship so intimate and undisturbed: he was, it would appear, exceptionally devoid of the passion of avarice; and so little advantage did he take of his opportunities of aggrandizement that, though his style of living was unostentatious,—and in connexion with his favourite pastimes of horse-racing, card-playing and cock-fighting he gained perhaps more than he lost,—all that he left behind him did not, according to the duchess of Marlborough, amount to more than £12,000.

Godolphin married Margaret Blagge, the pious lady whose life was written by Evelyn, on the 16th of May 1675, and married again after her death in 1678. His son and successor, Francis (1678–1766), held various offices at court, and was lord privy seal from 1735 to 1740. He married Henrietta Churchill (d. 1733), daughter of the duke of Marlborough, who in 1722 became in her own right duchess of Marlborough. He died without male issue in January 1766, when the earldom became extinct, and the estates passed to Thomas Osborne, 4th duke of Leeds, the husband of the earl's daughter Mary, whose descendant is the present representative of the Godolphins.

A life of Godolphin was published in 1888 in London by the Hon. H. Elliot.

GODOY, ALVAREZ DE FARIA, RIOS SANCHEZ Y ZARZOSA, MANUEL DE (1767–1851), duke of El Alcudia and prince of the Peace, Spanish royal favourite and minister, was born at Badajoz on the 12th of May 1767. His father, Don José de Godoy, was the head of a very ancient but impoverished family of nobles in Estremadura. His mother, whose maiden name was Maria Antonia Alvarez de Faria, helonged to a Portuguese noble family. Manuel boasts in his memoirs that he had the best masters, but it is certain that he received only the very slight education usually given at that time to the sons of provincial nobles. In 1784 he entered the Guardia de Corps, a body of gentlemen who acted as the immediate body-guard of the king. His well-built and stalwart person, his handsome foolish face, together with a certain geniality of character which he must have possessed, earned him the favour of Maria Luisa of Parma, the princess of Asturias, a coarse, passionate woman who was much neglected by her husband, who on his part cared for nothing but hunting.

When King Charles III. died in 1788, Godoy's fortune was soon made. The princess of Asturias, now queen, understood how to manage her husband Charles IV. Godoy says in his memoirs that the king, who had been carefully kept apart from affairs during his father's life, and who disliked his father's favourite minister Floridablanca, wished to have a creature of his own. This statement is no doubt true as far as it goes. But it requires to be completed by the further detail that the queen put her lover in her husband's way, and that the king was guided by them, when he thought he was ruling for himself through a subservient minister. In some respects King Charles was obstinate, and Godoy is probahly right in saying that he never was an absolute "viceroy," and that he could not always secure the removal of colleagues whom he knew to be his enemies. He could only rule hy obeying. Godoy adopted without scruple this method of pushing his fortunes. When the king was set on a particular course, he followed it; the execution was left to him and the queen. His pliability endeared him to his master, whose lasting affection he earned. In practice he commonly succeeded in inspiring the wishes which he then proceeded to gratify. From the very beginning of the new reign he was promoted in the army with scandalous rapidity, made duke of El Alcudia, and in 1792 minister under the premiership of Aranda, whom he succeeded in displacing by the close of the year.

His official life is fairly divided hy himself into three periods. From 1792 to 1798 he was premier. In the latter year his unpopularity and the intrigues of the French government, which had taken a dislike to him, led to his temporary retirement, without, however, any diminution of the king's personal favour. He asserts that he had no wish to return to office, but letters sent by him to the queen show that he begged for employment. They are written in a very unpleasant mixture of gush and vulgar familiarity. In 1801 he returned to office, and until 1807 he was the executant of the disastrous policy of the court. The third period of his public life is the last year, 1807–1808, when he was desperately striving for his place between the aggressive intervention of Napoleon on the one hand, and the growing hatred of the nation, organized behind, and about, the prince of Asturias, Ferdinand. On the 17th of March 1808 a popular outbreak at Aranjuez drove him into hiding. When driven out by hunger and thirst he was recognized and arrested. By Ferdinand's order he was kept in prison, till Napoleon demanded that he should be sent to Bayonne. Here he rejoined his master and mistress. He remained with them till Charles IV. died at Rome in 1819, having survived his queen. The rest of Godoy's life was spent in poverty and obscurity. After the death of Ferdinand VII., in 1833, he returned to Madrid, and endeavoured to secure the restoration of his property confiscated in 1808. Part of it was the estate of the Soto de Roma, granted hy the cortes to the duke of Wellington. He failed, and during his last years lived on a small pension granted him by Louis Philippe. He died in Paris on the 4th of October 1851.

As a favourite Godoy is remarkable for the length of his hold on the affection of his sovereigns, and for its completeness. Latterly he was supported rather hy the husband than by the wife. He got rid of Aranda hy adopting, in order to please the king, a policy which tended to bring on war with France. When the war proved disastrous, he made the peace of Basel, and was created prince of the Peace for his services. Then he helped to make war with England, and the disasters which followed only made him dearer to the king. Indeed it became a main object with Charles IV. to protect "Manuelito" from popular hatred, and if possible secure him a principality. The queen endured his infidelities to her, which were flagrant. The king arranged a marriage for him with Doña Teresa de Bourbon, daughter of the infante Don Luis by a morganatic marriage, though he was probably already married to Doña Josefa Tudó, and certainly continued to live with her. Godoy, in his memoirs, lays claim to have done much for Spanish agriculture and industry, hut he did little more than issue proclamations and appoint officers. His intentions may have been good, hut the policy of his government was financially ruinous. In his private life he was not only profligate and profuse, but childishly ostentatious. The best that can he said for him is that he was good-natured, and

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did his best to restrain the Inquisition and the purely reactionary parties.

AUTHORITIES.—Godoy's *Memoirs* were published in Spanish, English and French in 1836. A general account of his career will be found in the *Mémoires sur la Révolution d'Espagne*, by the Abbé de Pradt (1816).

GODROON, or GADROON (Fr. *godron*, of unknown etymology), in architecture, a convex decoration (said to be derived from raised work on linen) applied in France to varieties of the bead and reel, in which the bead is often carved with ornament. In England the term is constantly used by auctioneers to describe the raised convex decorations under the bowl of stone or terra-cotta vases. The godroons radiate from the vertical support of the vase and rise half-way up the bowl.

GODWIN, FRANCIS (1562–1633), English divine, son of Thomas Godwin, bishop of Bath and Wells, was born at Hannington, Northamptonshire, in 1562. He was elected student of Christ Church, Oxford, in 1578, took his bachelor's degree in 1580, and that of master in 1583. After holding two Somersetshire livings he was in 1587 appointed subdean of Exeter. In 1590 he accompanied William Camden on an antiquarian tour through Wales. He was created bachelor of divinity in 1593, and doctor in 1595. In 1601 he published his *Catalogue of the Bishops of England since the first planting of the Christian Religion in this Island*, a work which procured him in the same year the bishopric of Llandaff. A second edition appeared in 1615, and in 1616 he published an edition in Latin with a dedication to King James, who in the following year conferred upon him the bishopric of Hereford. The work was republished, with a continuation by William Richardson, in 1743. In 1616 Godwin published *Rerum Anglicarum, Henrico VIII., Edwardo VI. et Maria regnantibus, Annales*, which was afterwards translated and published by his son Morgan under the title *Annales of England* (1630). He is also the author of a somewhat remarkable story, published posthumously in 1638, and entitled *The Man in the Moone, or a Discourse of a Voyage thither, by Domingo Gonsales*, written apparently some time between the years 1590 and 1603. In this production Godwin not only declares himself a believer in the Copernican system, but adopts so far the principles of the law of gravitation as to suppose that the earth's attraction diminishes with the distance. The work, which displays considerable fancy and wit, was translated into French, and was imitated in several important particulars by Cyrano de Bergerac, from whom (if not from Godwin direct) Swift obtained valuable hints in writing of Gulliver's voyage to Laputa. Another work of Godwin's, *Nuncius inanimatus Utopiae*, originally published in 1629 and again in 1657, seems to have been the prototype of John Wilkins's *Mercury, or the Secret and Swift Messenger*, which appeared in 1641. He died, after a lingering illness, in April 1633.

GODWIN, MARY WOLLSTONECRAFT (1759–1797), English miscellaneous writer, was born at Hoxton, on the 27th of April 1759. Her family was of Irish extraction, and Mary's grandfather, who was a respectable manufacturer in Spitalfields, realized the property which his son squandered. Her mother, Elizabeth Dixon, was Irish, and of good family. Her father, Edward John Wollstonecraft, after dissipating the greater part of his patrimony, tried to earn a living by farming, which only plunged him into deeper difficulties, and he led a wandering, shifty life. The family roamed from Hoxton to Edmonton, to Essex, to Beverley in Yorkshire, to Laugharne, Pembrokeshire, and back to London again.

After Mrs Wollstonecraft's death in 1780, soon followed by her husband's second marriage, the three daughters, Mary, Everina and Eliza, sought to earn their own livelihood. The sisters were all clever women—Mary and Eliza far above the average—but their opportunities of culture had been few. Mary, the eldest, went in the first instance to live with her friend Fanny Blood, a girl of her own age, whose father, like Wollstonecraft, was addicted to drink and dissipation. As long as she lived with the Bloods, Mary helped Mrs Blood to earn money by taking in needlework, while Fanny painted in water-colours. Everina went to live with her brother Edward, and Eliza made a hasty and, as it proved, unhappy marriage with a Mr Bishop. A legal separation was afterwards obtained, and the sisters, together with Fanny Blood, took a house, first at Islington, afterwards at Newington Green, and opened a school, which was carried on with indifferent success for nearly two years. During their residence at Newington Green, Mary was introduced to Dr Johnson, who, as Godwin tells us, "treated her with particular kindness and attention."

In 1785 Fanny Blood married Hugh Skeys, a merchant, and went with him to Lisbon, where she died in childbed after sending for Mary to nurse her. "The loss of Fanny," as she said in a letter to Mrs Skeys's brother, George Blood, "was sufficient of itself to have cast a cloud over my brightest days. . . . I have lost all relish for pleasure, and life seems a burden almost too heavy to be endured." Her first novel, *Mary, a Fiction* (1788), was intended to commemorate her friendship with Fanny. After closing the school at Newington Green, Mary became governess in the family of Lord Kingsborough, in Ireland. Her pupils were much attached to her, especially Margaret King, afterwards Lady Mountcashel; and indeed, Lady Kingsborough gave the reason for dismissing her after one year's service that the children loved their governess better than their mother. Mary now resolved to devote herself to literary work, and she was encouraged by Johnson, the publisher in St Paul's churchyard, for whom she acted as literary adviser. She also undertook translations, chiefly from the French. *The Elements of Morality* (1790) from the German of Salzmann, illustrated by Blake, an old-fashioned book for children, and Lavater's *Physiognomy* were among her translations. Her *Original Stories from Real Life* were published in 1791, and, with illustrations by Blake, in 1796. In 1792 appeared *A Vindication of the Rights of Woman*, the work with which her name is always associated.

It is not among the least oddities of this book that it is dedicated to M. Talleyrand Périgord, late bishop of Autun. Mary Wollstonecraft still believed him to be sincere, and working in the same direction as herself. In the dedication she states the "main argument" of the work, "built on this simple principle that, if woman be not prepared by education to become the companion of man, she will stop the progress of knowledge, for truth must be common to all, or it will be inefficacious with respect to its influence or general practice." In carrying out this argument she used great plainness of speech, and it was this that caused all, or nearly all, the outcry. For she did not attack the institution of marriage, nor assail orthodox religion; her book was really a plea for equality of education, passing into one for state education and for the joint education of the sexes. It was a protest against the assumption that woman was only the plaything of man, and she asserted that intellectual companionship was the chief, as it is the lasting, happiness of marriage. She thus directly opposed the teaching of Rousseau, of whom she was in other respects an ardent disciple.

Mrs Wollstonecraft, as she now styled herself, desired to watch the progress of the Revolution in France, and went to Paris in 1792. Godwin, in his memoir of his wife, considers that the change of residence may have been prompted by the discovery that she was becoming attached to Henry Fuseli, but there is little to confirm this surmise; indeed, it was first proposed that she should go to Paris in company with him and his wife, nor was there any subsequent breach in their friendship. She remained in Paris during the Reign of Terror, when communication with England was difficult or almost impossible. Some time in the spring or summer of 1793 Captain Gilbert Imlay, an American, became acquainted with Mary—an acquaintance which ended in a more intimate connexion. There was no legal ceremony of marriage, and it is doubtful whether such a marriage would have been valid at the time; but she passed as Imlay's wife, and Imlay himself terms her in a legal document, "Mary Imlay, my best friend and wife." In August 1793 Imlay was called to Havre on business, and was absent for some months, during which time most of the letters published after her death by Godwin were written. Towards the end of the year she joined Imlay at Havre, and there in the spring of 1794 she gave birth to a girl,

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who received the name of Fanny, in memory of the dear friend of her youth. In this year she published the first volume of a never completed *Historical and Moral View of the French Revolution*. Imlay became involved in a multitude of speculations, and his affection for Mary and their child was already waning. He left Mary for some months at Havre. In June 1795, after joining him in England, Mary left for Norway on business for Imlay. Her letters from Norway, divested of all personal details, were afterwards published. She returned to England late in 1795, and found letters awaiting her from Imlay, intimating his intention to separate from her, and offering to settle an annuity on her and her child. For herself she rejected this offer with scorn: "From you," she wrote, "I will not receive anything more. I am not sufficiently humbled to depend on your beneficence." They met again, and for a short time lived together, until the discovery that he was carrying on an intrigue under her own roof drove her to despair, and she attempted to drown herself by leaping from Putney bridge, but was rescued by watermen. Imlay now completely deserted her, although she continued to bear his name.

In 1796, when Mary Wollstonecraft was living in London, supporting herself and her child by working, as before, for Mr Johnson, she met William Godwin. A friendship sprang up between them,—a friendship, as he himself says, which "melted into love." Godwin states that "ideas which he is now willing to denominate prejudices made him by no means willing to conform to the ceremony of marriage"; but these prejudices were overcome, and they were married at St Pancras church on the 29th of March 1797. And now Mary had a season of real calm in her stormy existence. Godwin, for once only in his life, was stirred by passion, and his admiration for his wife equalled his affection. But their happiness was of short duration. The birth of her daughter Mary, afterwards the wife of Percy Bysshe Shelley, on the 30th of August 1797, proved fatal, and Mrs Godwin died on the 10th of September following. She was buried in the churchyard of Old St Pancras, but her remains were afterwards removed by Sir Percy Shelley to the churchyard of St Peter's, Bournemouth.

Her principal published works are as follows:—*Thoughts on the Education of Daughters*, ... (1787); *The Female Reader* (selections) (1789); *Original Stories from Real Life* (1791); *An Historical and Moral View of the Origin and Progress of the French Revolution, and the effects it has produced in Europe*, vol. i. (no more published) (1796); *Vindication of the Rights of Woman* (1792); *Vindication of the Rights of Man* (1793); *Mary, a Fiction* (1788); *Letters written during a Short Residence in Sweden, Norway and Denmark* (1796); *Posthumous Works* (4 vols., 1798). It is impossible to trace the many articles contributed by her to periodical literature.

A memoir of her life was published by Godwin in 1798. A large portion of C. Kegan Paul's work, *William Godwin, his Friends and Contemporaries*, was devoted to her, and an edition of the *Letters to Imlay* (1879), of which the first edition was published by Godwin, is prefaced by a somewhat fuller memoir. See also E. Dowden, *The French Revolution and English Literature* (1897) pp. 82 et seq.; E. R. Pennell, *Mary Wollstonecraft Godwin* (1885); in the Eminent Women Series; E. R. Clough, *A Study of Mary Wollstonecraft and the Rights of Woman* (1898); an edition of her *Original Stories* (1906), with William Blake's illustrations and an introduction by E. V. Lucas; and the *Love Letters of Mary Wollstonecraft to Gilbert Imlay* (1908), with an introduction by Roger Ingpen.

GODWIN, WILLIAM (1756-1836), English political and miscellaneous writer, son of a Nonconformist minister, was born on the 3rd of March 1756, at Wisbeach in Cambridgeshire. His family came on both sides of middle-class people, and it was probably only as a joke that Godwin, a stern political reformer and philosophical radical, attempted to trace his pedigree to a time before the Norman conquest and the great earl Godwine. Both parents were strict Calvinists. The father died young, and never inspired love or much regret in his son; but in spite of wide differences of opinion, tender affection always subsisted between William Godwin and his mother, until her death at an advanced age.

William Godwin was educated for his father's profession at Hoxton Academy, where he was under Andrew Kippis the biographer and Dr Abraham Rees of the *Cyclopaedia*, and was at first more Calvinistic than his teachers, becoming a Sandemanian, or follower of John Glas (*q.v.*), whom he describes as "a celebrated north-country apostle who, after Calvin had damned ninety-nine in a hundred of mankind, has contrived a scheme for damning ninety-nine in a hundred of the followers of Calvin." He then acted as a minister at Ware, Stowmarket and Beaconsfield. At Stowmarket the teachings of the French philosophers were brought before him by a friend, Joseph Fawcet, who held strong republican opinions. He came to London in 1782, still nominally a minister, to regenerate society with his pen—a real enthusiast, who shrank theoretically from no conclusions from the premises which he laid down. He adopted the principles of the Encyclopaedists, and his own aim was the complete overthrow of all existing institutions, political, social and religious. He believed, however, that calm discussion was the only thing needful to carry every change, and from the beginning to the end of his career he deprecated every approach to violence. He was a philosophic radical in the strictest sense of the term.

His first published work was an anonymous *Life of Lord Chatham* (1783). Under the inappropriate title *Sketches of History* (1784) he published under his own name six sermons on the characters of Aaron, Hazael and Jesus, in which, though writing in the character of an orthodox Calvinist, he enunciates the proposition "God Himself has no right to be a tyrant." Introduced by Andrew Kippis, he began to write in 1785 for the *Annual Register* and other periodicals, producing also three novels now forgotten. The "Sketches of English History" written for the *Annual Register* from 1785 onward still deserve study. He joined a club called the "Revolutionists," and associated much with Lord Stanhope, Horne Tooke and Holcroft. This clerical character was now completely dropped.

In 1793 Godwin published his great work on political science, *The Inquiry concerning Political Justice, and its Influence on General Virtue and Happiness*. Although this work is little known and less read now, it marks a phase in English thought. Godwin could never have been himself a worker on the active stage of life. But he was none the less a power behind the workers, and for its political effect, *Political Justice* takes its place with Milton's *Areopagitica*, with Locke's *Essay on Education* and with Rousseau's *Émile*. By the words "political justice" the author meant "the adoption of any principle of morality and truth into the practice of a community," and the work was therefore an inquiry into the principles of society, of government, that and of morals. From many complete he had been "satisfied that monarchy was a species of government unavoidably corrupt," and from desiring a government of the simplest construction, he gradually came to consider that "government by its very nature counteracts the improvement of original mind." Believing in the perfectibility of the race, that there are no innate principles, and therefore no original propensity to evil, he considered that "our virtues and our vices may be traced to the incidents which make the history of our lives, and if these incidents could be divested of every improper tendency, vice would be extirpated from the world." All control of man by man was more or less intolerable, and the day would come when each man, doing what seems right in his own eyes, would also be doing what is in fact best for the community. Because all will be guided by principles of pure reason. But all was to be done by discussion, and matured change resulting from discussion. Hence, while Godwin thoroughly approved of the philosophic schemes of the precursors of the Revolution, he was as far removed as Burke himself from agreeing with the way in which they were carried out. So logical and uncompromising a thinker as Godwin could not go far in the discussion of abstract questions without exciting the most lively opposition in matters of detailed opinion. An affectionate son, and ever ready to give of his hard-earned income to more than one ne'er-do-well brother, he maintained that natural relationship had no claim on man, nor was gratitude to parents or benefactors any part of justice or virtue. In a day when the penal code was still extremely severe, he argued gravely against all punishments, not only that of death. Property was to belong to him who most wanted it;

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accumulated property was a monstrous injustice. Hence marriage, which is law, is the worst of all laws, and as property the worst of all properties. A man so passionless as Godwin could venture thus to argue without suspicion that he did so only to gratify his wayward desires. Portions of this treatise, and only portions, found ready acceptance in those minds which were prepared to receive them. Perhaps no one received the whole teaching of the book. But it gave cohesion and voice to philosophic radicalism; it was the manifesto of a school without which liberalism of the present day had not been. Godwin himself in after days modified his communistic views, but his strong feeling for individualism, his hatred of all restrictions on liberty, his trust in man, his faith in the power of reason remained; it was a manifesto which enunciated principles modifying action, even when not wholly ruling it.

In May 1794 Godwin published the novel of *Caleb Williams, or Things as they are*, a book of which the political object is overlooked by many readers in the strong interest of the story. The book was dramatized by the younger Colman as *The Iron Chest*. It is one of the few novels of that time which may be said still to live.[1] A theorist who lived mainly in his study, Godwin yet came forward boldly to stand by prisoners arraigned of high treason in that same year—1794. The danger to persons so charged was then great, and he deliberately put himself into the same danger for his friends. But when his own trial was discussed in the privy council, Pitt sensibly held that *Political Justice*, the work on which the charge could best have been founded, was priced at three guineas, and could never do much harm among those who had not three shillings to spare.

From this time Godwin became a notable figure in London society, and there was scarcely an important person in politics, on the Liberal side, in literature, art or science, who does not appear familiarly in the pages of Godwin's singular diary. For forty-eight years, beginning in 1788, and continuing to the very end of his life, Godwin kept a record of every day, of the work he did, the books he read, the friends he saw. Condensed in the highest degree, the diary is yet easy to read when the style is once mastered, and it is a great help to the understanding of his cold, methodical, unimpassioned character. He carried his method into every detail of life, and lived on his earnings with extreme frugality. Until he made a large sum by the publication of *Political Justice*, he lived on an average of £120 a year.

In 1797, the intervening years having been spent in strenuous literary labour, Godwin married Mary Wollstonecraft (see GODWIN, MARY WOLLSTONECRAFT). Since both held the same views regarding the slavery of marriage, and since they only married at all for the sake of possible offspring, the marriage was concealed for some time, and the happiness of the avowed married life was very brief; his wife's death on the 10th of September left Godwin prostrated by affliction, and with a charge for which he was wholly unfit—his infant daughter Mary, and her stepsister, Fanny Imlay, who from that time bore the name of Godwin. His unfitness for the cares of a family, far more than love, led him to contract a second marriage with Mary Jane Clairmont in 1801. She was a widow with two children, one of whom, Clara Mary Jane Clairmont, became the mistress of Lord Byron. The second Mrs Godwin was energetic and painstaking, but a harsh stepmother; and it may be doubted whether the children were not worse off under her care than they would have been under Godwin's neglect.

The second novel which proceeded from Godwin's pen was called *St Leon*, and published in 1799. It is chiefly remarkable for the beautiful portrait of Marguerite, the heroine, drawn from the character of his own wife. His opinions underwent a change in the direction of theism, influenced, he says, by his acquaintance with Coleridge. He also became known to Wordsworth and Lamb. Study of the Elizabethan dramatists led to the production in 1800 of the *Tragedy of Antonio*. Kemble brought it out at Drury Lane, but the failure of this attempt made him refuse *Abbas, King of Persia*, which Godwin offered him in the next year. He was more successful with his *Life of Chaucer*, for which he received £600.

The events of Godwin's life were few. Under the advice of the second Mrs Godwin, and with her active co-operation, he carried on business as a bookseller under the pseudonym of Edward Baldwin, publishing several useful school books and books for children, among them Charles and Mary Lamb's *Tales from Shakespeare*. But the speculation was unsuccessful, and for many years Godwin struggled with constant pecuniary difficulties, for which more than one subscription was raised by the leaders of the Liberal party and by literary men. He became bankrupt in 1822, but during the following years he accomplished one of his best pieces of work, *The History of the Commonwealth*, founded on pamphlets and original documents, which still retains considerable value. In 1833 the government of Earl Grey conferred upon him the office known as yeoman usher of the exchequer, to which were attached apartments in Palace Yard, where he died on the 7th of April 1836.

In his own time, by his writings and by his conversation, Godwin had a great power of influencing men, and especially young men. Though his character would seem, from much which is found in his writings, and from anecdotes told by those who still remember him, to have been unsympathetic, it was not so understood by enthusiastic young people, who hung on his words as those of a prophet. The most remarkable of these was Percy Bysshe Shelley, who in the glowing dawn of his genius turned to Godwin as his teacher and guide. The last of the long series of young men who sat at Godwin's feet was Edward Lytton Bulwer, afterwards Lord Lytton, whose early romances were formed after those of Godwin, and who, in *Eugene Aram*, succeeded to the story as arranged, and the plan to a considerable extent sketched out, by Godwin, whose age and failing health prevented him from completing it. Godwin's character appears in the worst light in connexion with Shelley. His early correspondence with Shelley, which began in 1811, is remarkable for its genuine good sense and kindness; but when Shelley carried out the principles of the author of *Political Justice* in eloping with Mary Godwin, Godwin assumed a hostile attitude that would have been unjustifiable in a man of ordinary views, and was ridiculous in the light of his professions. He was not, moreover, too proud to accept £1000 from his son-in-law, and after the reconciliation following on Shelley's marriage in 1816, he continued to demand money until Shelley's death. His character had no doubt suffered under his long embarrassments and his unhappy marriage.

Godwin's more important works are—*The Inquiry concerning Political Justice, and its Influence on General Virtue and Happiness* (1793); *Things as they are, or the Adventures of Caleb Williams* (1794); *The Inquirer, a series of Essays* (1797); *Memoirs of the Author of the Rights of Woman* (1798); *St Leon, a Tale of the Sixteenth Century* (1799); *Antonio, a Tragedy* (1800); *The Life of Chaucer* (1803); *Fleetwood, a Novel* (1805); *Faulkner, a Tragedy* (1807); *Essay on Sepulchres* (1809); *Lives of Edward and John Philips, the Nephews of Milton* (1815); *Mandeville, a Tale of the Times of Cromwell* (1817); *Of Population*, an answer to Malthus (1820); *History of the Commonwealth* (1824–1828); *Cloudesley, a Novel* (1830); *Thoughts on Man, a series of Essays* (1831); *Lives of the Necromancers* (1834). A volume of essays was also collected from his papers and published in 1873, as left for publication by his daughter Mrs Shelley. Many other short and anonymous works proceeded from his ever busy pen, but many are irrecoverable, and all are forgotten. Godwin's life was published in 1876 in two volumes, under the title *William Godwin, his Friends and Contemporaries*, by C. Kegan Paul. The best estimate of his literary position is that given by Sir Leslie Stephen in his *English Thought in the 18th Century* (ii. 264–281; ed., 1902). See also the article on William Godwin in W. Hazlitt's *The Spirit of the Age* (1825), and "Godwin and Shelley" in Sir L. Stephen's *Hours in a Library* (vol. iii., ed. 1892).

GODWIN-AUSTEN, ROBERT ALFRED CLOYNE (1808–1884), English geologist, the eldest son of Sir Henry E. Austen, was born on the 17th of March 1808. He was educated at Oriel College, Oxford, of which he became a fellow in 1830. He afterwards entered Lincoln's Inn. In 1833 he married the only daughter and heiress of General Sir Henry T. Godwin, K.C.B., and he took the additional name of Godwin by Royal licence

[1] For an analysis of *Caleb Williams* see the chapter on "Theorists of Revolution" in Professor E. Dowden's *The French Revolution and English Literature* (1897).

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in 1854. At Oxford as a pupil of William Buckland he became deeply interested in geology, and soon afterwards becoming acquainted with De la Beche, he was inspired by that great master, and assisted him by making a geological map of the neighbourhood of Newton Abbot, which was embodied in the Geological Survey map. He also published an elaborate memoir "On the Geology of the South-East of Devonshire" (*Trans. Geol. Soc.* ser. 2, vol. viii.). His attention was next directed to the Cretaceous rocks of Surrey, his home-county, his estates being situated at Chilworth and Shalford near Guildford. Later he dealt with the superficial accumulations bordering the English Channel, and with the erratic boulders of Selsea. In 1855 he brought before the Geological Society of London his celebrated paper "On the possible Extension of the Coal-Measures beneath the South-Eastern part of England," in which he pointed out on well-considered theoretical grounds the likelihood of coal-measures being some day reached in that area. In this article he also advocated the freshwater origin of the Old Red Sandstone, and discussed the relations of that formation, and of the Devonian, to the Silurian and Carboniferous. He was elected F.R.S. in 1849, and in 1862 he was awarded the Wollaston medal by the Geological Society of London, on which occasion he was styled by Sir R. I. Murchison "pre-eminently the physical geographer of bygone periods." He died at Shalford House near Guildford on the 25th of November 1884.

His son, Lieut.-Colonel HENRY HARKNESS GODWIN-AUSTEN (b. 1834), entered the army in 1851, and served for many years on the Trigonometrical Survey of India, retiring in 1877. He gave much attention to geology, but is more especially distinguished for his researches on the natural history of India and as the author of *The Land and Freshwater Mollusca of India* (1882–1887).

GODWINE (d. 1053), son of Wulfnoth, earl of the West-Saxons, the leading Englishman in the first half of the 11th century. His birth and origin are utterly uncertain; but he rose to power early in Canute's reign and was an earl in 1018. He received in marriage Gytha, a connexion of the king's, and in 1020 became earl of the West-Saxons. On the death of Canute in 1035 he joined with Queen Emma in supporting the claim of Hardicanute, the son of Canute and Emma, to the crown of his father, in opposition to Leofric and the northern party who supported Harold Harefoot (see HARDICANUTE). While together they held Wessex for Hardicanute, the ætheling Ælfred, son of Emma by her former husband Æthelred II., landed in England in the hope of winning back his father's crown; but falling into the hands of Godwine, he and his followers were cruelly done to death. On the death of Hardicanute in 1042 Godwine was foremost in promoting the election of Edward (the Confessor) to the vacant throne. He was now the first man in the kingdom, though his power was still balanced by that of the other great earls, Leofric of Mercia and Siward of Northumberland. His sons Sweyn and Harold were promoted to earldoms; and his daughter Eadgyth was married to the king (1045). His policy was strongly national in opposition to the marked Normanizing tendencies of the king. Between him and Edward's foreign favourites, particularly Robert of Jumièges, there was deadly feud. The appointment of Robert to the archbishopric of Canterbury in 1051 marks the decline of Godwine's power; and in the same year a series of outrages committed by one of the king's foreign favourites led to a breach between the king and the earl, which culminated in the exile of the latter with all his family (see EDWARD THE CONFESSOR). But next year Godwine returned in triumph; and at a great meeting held outside London he and his family were restored to all their offices and possessions, and the archbishop and many other Normans were banished. In the following year Godwine was smitten with a fit at the king's table, and died three days later on the 15th of April 1053.

Godwine appears to have had seven sons, three of whom—King Harold, Gyrth and Leofwine—were killed at Hastings; two others, Wulfnoth and Ælfgar, are of little importance; another was Earl Tostig (*q.v.*). The eldest son was Sweyn, or **Swegen** (d. 1052), who was outlawed for seducing Eadgifu abbess of Leominster. After fighting for the king of Denmark he returned to England in 1049, when his murder of his cousin Beorn compelled him to leave England for the second time. In 1050, however, he regained his earldom, and in 1051 he shared his father's exile. To atone for the murder of Beorn, Sweyn went on a pilgrimage to Jerusalem, and on the return journey he died on the 29th of September 1052, meeting his death, according to one account, at the hands of the Saracens.

GODWIT, a word of unknown origin, the name commonly applied to a marsh-bird in great repute, when fattened, for the table, and formerly abundant in the fens of Norfolk, the Isle of Ely and Lincolnshire. In Turner's days (1544) it was worth three times as much as a snipe, and at the same period Belon said of it—"C'est vn Oyseau es delices des Françoys." Casaubon, who Latinized its name "*Dei ingenium* (*Ephemerides*, 19th September 1611), was told by the "*ornithotrophaeus*" he visited at Wisbech that in London it fetched twenty pence. Its fame as a delicacy is perpetuated by many later writers, Ben Jonson among them, and Pennant says that in his time (1766) it sold for half-a-crown or five shillings. Under the name godwit two perfectly distinct species of British birds were included, but that which seems to have been especially prized is known to modern ornithologists as the black-tailed godwit, *Limosa aegocephala*, formerly called, from its loud cry, a yarwhelp,[1] shrieker or barker, in the districts it inhabited. The practice of netting this bird in large numbers during the spring and summer, coupled with the gradual reclamation of the fens, to which it resorted, has now rendered it but a visitor in England; and it probably ceased from breeding regularly in England in 1824 or thereabouts, though under favourable conditions it may have occasionally laid its eggs for some thirty years later or more (Stevenson, *Birds of Norfolk*, ii. 250). This godwit is a species of wide range, reaching Iceland, where it is called *Jardraeka* (=earth-raker), in summer, and occurring numerously in India in winter. Its chief breeding-quarters seem to extend from Holland eastwards to the south of Russia. The second British species is that which is known as the bar-tailed godwit, *L. lapponica*, and this seems to have never been more than a bird of double passage in the United Kingdom, arriving in large flocks on the south coast about the 12th of May, and, after staying a few days, proceeding to the north-eastward. It is known to breed in Lapland, but its eggs are of great rarity. Towards autumn the young visit the English coasts, and a few of them remain, together with some of the other species, in favourable situations throughout the winter. One of the local names by which the bar-tailed godwit is known to the Norfolk gunners is scamell, a word which, in the mouth of Caliban (*Tempest*, II. ii.), has been the cause of much perplexity to Shakespearian critics.

The godwits belong to the group *Limicolae*, and are about as big as a tame pigeon, but possess long legs, and a long bill with a slight upward turn. It is believed that in the genus *Limosa* the female is larger than the male. While the winter plumage is of a sober greyish-brown, the breeding-dress is marked by a predominance of bright bay or chestnut, rendering the wearer a very beautiful object. The black-tailed godwit, though varying a good deal in size, is constantly larger than the bar-tailed, and especially longer in the legs. The species may be further distinguished by the former having the proximal third of the tail-quills pure white, and the distal two-thirds black, with a narrow white margin, while the latter has the same feathers barred with black and white alternately for nearly their whole length.

America possesses two species of the genus, the very large marbled godwit or marlin, *L. fedoa*, easily recognized by its size and the buff colour of its axillaries, and the smaller Hudsonian godwit, *L. hudsonica*, which has its axillaries of a deep black. This last, though less numerous than its congener, seems to range over the whole of the continent, breeding in the extreme north, while it has been obtained also in the Strait of Magellan and the Falkland Islands. The first seems not to go farther southward than the Antilles and the Isthmus of Panama.

[1] This name seems to have survived in Whelp Moor, near Brandon, in Suffolk.

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From Asia, or at least its eastern part, two species have been described. One of them, *L. melanuroides*, differs only from *L. aegocephala* in its smaller size, and is believed to breed in Amurland, wintering in the islands of the Pacific, New Zealand and Australia. The other, *L. uropygialis*, is closely allied to and often mistaken for *L. lapponica*, from which it chiefly differs by having the rump barred like the tail. This was found breeding in the extreme north of Siberia by Dr von Middendorff, and ranges to Australia, whence it was, like the last, first described by Gould. (A. N.)

GOEBEN, AUGUST KARL VON (1816–1880), Prussian general of infantry, came of old Hanoverian stock. Born at Stade on the 10th of December 1816, he aspired from his earliest years to the Prussian service rather than that of his own country, and at the age of seventeen obtained a commission in the 24th regiment of Prussian infantry. But there was little scope there for the activities of a young and energetic subaltern, and, leaving the service in 1836, he entered the Carlist army campaigning in Spain. In the five campaigns which he made in the service of Don Carlos he had many and various vicissitudes of fortune. He had not fought for two months when he fell, severely wounded, into the hands of the Spanish Royal troops. After eight months' detention he escaped, but it was not long before he was captured again. This time his imprisonment was long and painful, and on two occasions he was compelled to draw lots for his life with his fellow-captives. When released, he served till 1840 with distinction. In that year he made his way back, a beggar without means or clothing, to Prussia. The Carlist lieutenant-colonel was glad to be re-admitted into the Prussian service as a second lieutenant, but he was still young, and few subalterns could at the age of twenty-four claim five years' meritorious war service. In a few years we find him serving as captain on the Great General Staff, and in 1848 he had the good fortune to be transferred to the staff of the IV. army corps, his immediate superior being Major von Moltke. The two "coming men" became fast friends, and their mutual esteem was never disturbed. In the Baden insurrection Goeben served with distinction on the staff of Prince William, the future emperor. Staff and regimental duty (as usual in the Prussian service) alternated for some years after this, till in 1863 he became major-general commanding the 26th infantry brigade. In 1860, it should be mentioned, he was present with the Spanish troops in Morocco, and took part in the battle of Tetuan.

In the first of Prussia's great wars (1864) he distinguished himself at the head of his brigade at Rackebüll and Sonderburg. In the war of 1866 Lieutenant-General von Goeben commanded the 13th division, of which his old brigade formed part, and, in this higher sphere, once more displayed the qualities of a born leader and skilful tactician. He held almost independent command with conspicuous success in the actions of Dermbach, Laufach, Kissingen, Aschaffenburg, Gerchsheim, Tauber-Bischofsheim and Wurzburg. The mobilization of 1870 placed him at the head of the VIII. (Rhineland) army corps, forming part of the First Army under Steinmetz. It was his resolute and energetic leading that contributed mainly to the victory of Spicheren (6th August), and won the only laurels gained on the Prussian right wing at Gravelotte (18th August). Under Manteuffel the VIII. corps took part in the operations about Amiens and Bapaume, and on the 8th of January 1871 Goeben succeeded that general in the command of the First Army, with which he had served throughout the campaign as a corps commander. A fortnight later he had brought the war in northern France to a brilliant conclusion, by the decisive victory of St Quentin (18th and 19th January 1871). The close of the Franco-German War left Goeben one of the most distinguished men in the victorious army. He was colonel of the 28th infantry, and had the grand cross of the Iron Cross. He commanded the VIII. corps at Coblenz until his death in 1880.

General von Goeben left many writings. His memoirs are to be found in his works *Vier Jahre in Spanien* (Hanover, 1841), *Reise-und Lagerbriefe aus Spanien und vom spanischen Heere in Marokko* (Hanover, 1863) and in the Darmstadt *Allgemeine Militärzeitung*. The former French port (Queuleu) at Metz was renamed Goeben after him, and the 28th infantry bears his name. A statue of Goeben by Schaper was erected at Coblenz in 1884.

See G. Zernin, *Das Leben des Generals August von Goeben* (2 vols., Berlin, 1895–1897); H. Barth, *A. von Goeben* (Berlin, 1906); and, for his share in the war of 1870–71; H. Kunz, *Der Feldzug im N. und N.W. Frankreichs 1870–1871* (Berlin, 1889), and the 14th Monograph of the Great General Staff (1891).

GOEJE, MICHAEL JAN DE (1836–1909), Dutch orientalist, was born in Friesland in 1836. He devoted himself at an early age to the study of oriental languages and became especially proficient in Arabic, under the guidance of Dozy and Juynboll, to whom he was afterwards an intimate friend and colleague. He took his degree of doctor at Leiden in 1860, and then studied for a year in Oxford, where he examined and collated the Bodleian MSS. of Idrisī (part being published in 1866, in collaboration with R. P. Dozy, as *Description de l'Afrique et de l'Espagne*). About the same time he wrote *Mémoires de l'histoire et de la géographie orientales*, and edited *Expugnatio regionum*. In 1883, on the death of Dozy, he became Arabic professor at Leiden, retiring in 1906. He died on the 17th of May 1909. Though perhaps not a teacher of the first order, he wielded a great influence during his long professoriate not only over his pupils, but over theologians and eastern administrators who attended his lectures, and his many editions of Arabic texts have been of the highest value to scholars, the most important being his great text of Ṭabarī. Though entirely averse from politics, he took a keen interest in the municipal affairs of Leiden and made a special study of elementary education. He took the leading part in the International Congress of Orientalists at Algiers in 1905. He was a member of the Institut de France, was awarded the German Order of Merit, and received an honorary doctorate of Cambridge University. At his death he was president of the newly formed International Association of Academies of Science. Among his chief works are *Fragmenta historicorum Arabicorum* (1869–1871); *Diwan of Moslim ibn al-Walid* (1875); *Bibliotheca geographorum Arabicorum* (1870–1894); *Annals of Ṭabari* (1879–1901); edition of Ibn Quṭaiba's biographies (1904); of the travels of Ibn Jubayr (1907, 5th vol. of Gibb Memorial). He was also the chief editor of the *Encyclopaedia of Islam* (vols. i.-iii.), and contributed many articles to periodicals. He wrote for the 9th and the present edition of the *Encyclopaedia Britannica*.

GOES, DAMIÃO DE (1502–1574), Portuguese humanist, was born of a patrician family at Alemquer, in February 1502. Under King John III. he was employed abroad for many years from 1523 on diplomatic and commercial missions, and he travelled over the greater part of Europe. He was intimate with the leading scholars of the time, was acquainted with Luther and other Protestant divines, and in 1532 became the pupil and friend of Erasmus. Goes took his degree at Padua in 1538 after a four years' course. In 1537, at the instance of his friend Cardinal Sadoleto, he undertook to mediate between the Church and the Lutherans, but failed through the attitude of the Protestants. He married in Flanders a rich and noble Dutch lady, D. Joanna de Hargen, and settled at Louvain, then the literary centre of the Low Countries, where he was living in 1542 when the French besieged the town. He was given the command of the defending forces, and saved Louvain, but was taken prisoner and confined for nine months in France, till he obtained his freedom by a heavy ransom. He was rewarded, however, by a grant of arms from Charles V. He finally returned to Portugal in 1545, with a view of becoming tutor to the king's son, but he failed to obtain this post, owing to the denunciations of Father Simon Rodriguez, provincial of the Jesuits, who accused Goes of favouring the Lutheran doctrines and of being a disciple of Erasmus. Nevertheless in 1548 he was appointed chief keeper of the archives and royal chronicler, and at once introduced some much-needed reforms into the administration of his office.

In 1558 he was given a commission to write a history of the reign of King Manoel, a task previously confided to João de Barros, but relinquished by him. It was an onerous undertaking for a conscientious historian, since it was necessary to expose

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the miseries as well as relate the glories of the period, and so to offend some of the most powerful families. Goes had already written a *Chronicle* of Prince John (afterwards. John II.), and when, after more than eight years' labour, he produced the First Part of his *Chronicle* of King Manoel (1566), a chorus of attacks greeted it. the edition was destroyed, and he was compelled to issue a revised version. He brought out the three other parts in 1566–1567, though chapters 23 to 27 of the Third Part were so mutilated by the censorship that the printed text differs largely from the MS. Hitherto Goes, notwithstanding his Liberalism, had escaped the Inquisition, though in 1540 his *Fides, religio, moresque Aethiopum* had been prohibited by the chief inquisitor, Cardinal D. Henrique; but the denunciation of Father Rodriguez in 1545, which had been vainly renewed in 1550, was now brought into action, and in 1571 he was arrested to stand his trial. There seems to be no doubt that the Inquisition made itself on this occasion, as on others, the instrument of private enmity; for eighteen months Goes lay ill in prison, and then he was condemned, though he had lived for thirty years as a faithful Catholic, and the worst that could be proved against him was that in his youth he had spoken against Indulgences, disbelieved in auricular confession, and consorted with heretics. He was sentenced to a term of reclusion, and his property was confiscated to the crown. After he had abjured his errors in private, he was sent at the end of 1572 to do penance at the monastery of Batalha. Later he was allowed to return home to Alemquer, where he died on the 30th of January 1574. He was buried in the church of Nossa Senhora da Varzea.

Damião de Goes was a man of wide culture and genial and courtly manners, a skilled musician and a good linguist. He wrote both Portuguese and Latin with classic strength and simplicity, and his style is free from affectation and rhetorical ornaments. His portrait by Albrecht Dürer shows an open, intelligent face, and the record of his life proves him to have been upright and fearless. His prosperity doubtless excited ill-will, but above all, his ideas, advanced for Portugal, his foreign ways, outspokenness and honesty contributed to the tragedy of his end, at a time when the forces of ignorant reaction held the ascendant. He had, it may be presumed, given some embrage to the court by condemning, in the *Chronicle of King Manoel*, the royal ingratitude to distinguished public servants, though he received a pension and other rewards for that work, and he had certainly offended the nobility by his administration of the archive office and by exposing false genealogical claims in his *Nobiliario*. He paid the penalty for telling the truth, as he knew it, in an age when an historian had to choose between flattery of the great and silence. The *Chronicle of King Manoel* was the first official history of a Portuguese reign to be written in a critical spirit, and Damião de Goes has the honour of having been the first Portuguese royal chronicler to deserve the name of an historian.

His Portuguese works include *Chronica do felicissimo rei Dom Emanuel* (parts i. and ii., Lisbon, 1566, parts iii. and iv., *ib.* 1567). Other editions appeared in Lisbon in 1619 and 1749 and in Coimbra in 1790. *Chronica do principe Dom Joam* (Lisbon, 1558), with subsequent editions in 1567 and 1724 in Lisbon and in 1790 in Coimbra. *Livro de Marco Tullio Ciceron chamado Catam Mayor* (Venice, 1538). This is a translation of Cicero's *De senectute*. His Latin works, published separately, comprise: (1) *Legatio magni imperatoris Presbiteri Joannis, &c.* (Antwerp, 1532); (2) *Legatio Davidis Ethiopiae regis, &c.* (Bologna, 1533); (3) *Commentari rerum gestarum in India* (Louvain, 1539); (4) *Fides, religio, moresque Aethiopum* (Louvain, 1540), incorporating Nos. (2) and (3); (5) *Hispania* (Louvain, 1542); (6) *Aliquot epistolae Sadoleti Bembi et aliorum clarissimorum virorum, &c.* (Louvain, 1544); (7) *Damoni a Goes equitis Lusitani aliquot opuscula* (Louvain, 1544); (8) *Urbis Lovaniensis obsidial* Lisbon, 1546); (9) *De bello Cambaico ultimo* (Louvain, 1549); (10) *Urbani Hierroponensis descriptio* (Evora, 1554); (11) *Epistola ad Hieronymum Cardosum* (Lisbon, 1556). Most of the above went through several editions, and many were afterwards included with new works in such collections as No. (7), and seven sets of *Opuscula* appeared, all incomplete. Nos. (3), (4) and (5) suffered mutilation in subsequent editions, at the hands of the censors, because they offended against religious orthodoxy or family pride.

AUTHORITIES.—(A) Joaquim de Vasconcellos, *Gossiana* (5 vols.), with the following sub-titles: (1) *O Retrato de Albrecht Dürer* (Porto, 1879); (2) *Bibliographia* (Porto, 1879), which describes 67 numbers of books by Goes; (3) *As Variantes das Chronicas Portuguesas* (Porto, 1881); (4) *Damião de Goes: Novos Estudos* (Porto, 1897); (5) *As Cartas Latinas*—in the press (1906). Snr. Vasconcellos only printed a very limited number of copies of these studies for distribution among friends, so that they are rare. (B) Guilherme J. C. Henriques, *Inéditos Goesianos*, vol. i. (Lisbon, 1896), vol. ii. (containing the proceedings at the trial by the Inquisition) (Lisbon, 1898). (C) A. P. Lopes de Mendonça, *Damião de Goes e a Inquisição de Portugal* (Lisbon, 1859). (D) Dr Sousa Pinheiro, *Damião de Goes e D. Antonio Pinheiro* (Coimbra, 1895). (E) Dr Theophilo Braga, *Historia da Universidade de Coimbra* (Lisbon, 1892), i. 374-380. (F) Menendez y Pelayo, *Historia de los Heter. Españoles*, ii. 129-143. (E. Pa.)

GOES, HUGO VAN DER (d. 1482), a painter of considerable celebrity at Ghent, was known to Vasari, as he is known to us, by a single picture in a Florentine monastery. At a period when the family of the Medici had not yet risen from the rank of a great mercantile firm to that of a reigning dynasty, it employed as an agent at the port of Bruges Tommaso Portinari, a lineal descendant, it was said, of Folco, the father of Dante's Beatrix. Tommaso, at that time patron of a chapel in the hospital of Santa Maria Nuova at Florence, ordered an altar-piece of Hugo van der Goes, and commanded him to illustrate the sacred theme of "Quem genuit adoravit." In the centre of a vast triptych, comprising numerous figures of life size, Hugo represented the Virgin kneeling in adoration before the new-born child attended by Shepherds and Angels. On the wings he portrayed Tommaso and his two sons in prayer under the protection of Saint Anthony and St Matthew, and Tommaso's wife and two daughters supported by St Margaret and St Mary Magdalen. The triptych, which has suffered much from decay and restoring, was for over 400 years at Santa Maria Nuova, and is now in the Uffizi Gallery. Imposing because composed of figures of unusual size, the altar-piece is more remarkable for portrait character than for charms of ideal beauty.

There are also small pieces in public galleries which claim to have been executed by Van der Goes. One of these pictures in the National Gallery in London is more nearly allied to the school of Memling than to the triptych of Santa Maria Nuova; another, a small and very beautiful "John the Baptist," at the Pinakothek of Munich, is really by Memling; whilst numerous fragments of an altarpiece in the Belvedere at Vienna, though assigned to Hugo, are by his more gifted countryman of Bruges. Van der Goes, however, was not habitually a painter of easel pieces. He made his reputation at Bruges by producing coloured hangings in distemper. After he settled at Ghent, and became a master of his gild in 1465, he designed cartoons for glass windows. He also made decorations for the wedding of Charles the Bold and Margaret of York in 1468, for the festivals of the Rhetoricians and papal jubilees on repeated occasions, for the solemn entry of Charles the Bold into Ghent in 1470–1471, and for the funeral of Philip the Good in 1474. The labour which he expended on these occasions might well add to his fame without being the less ephemeral. About the year 1475 he retired to the monastery of Rouge Cloitre near Ghent, where he took the cowl. There, though he still clung to his profession, he seems to have taken to drinking, and at one time to have shown decided symptoms of insanity. But his superiors gradually cured him of his intemperance, and he died in the odour of sanctity in 1482.

GOES, a town in the province of Zeeland, Holland, on the island of South Beveland, 11½ m. by rail E. of Middelburg. Pop. (1900) 6100. It is connected by a short canal with the East Scheldt, and has a good harbour (1810) defended by a fort. The principal buildings are the interesting Gothic church (1423) and the picturesque old town hall (restored 1771). There are various educational and charitable institutions. Goes has preserved for centuries its prosperous position as the market-town of the island. The chief industries are boat-building, brewing, bookbinding and cigar-making. The town had its origin in the castle of Oostende, built here by the noble family of Borsselе. It received a charter early in the 15th century from the countess Jacoba of Holland, who frequently stayed at the castle.

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GOETHE, JOHANN WOLFGANG VON (1749–1832), German poet, dramatist and philosopher, was born at Frankfort-on-Main on the 28th of August 1749. He came, on his father's side, of Thuringian stock, his great-grandfather, Hans Christian Goethe, having been a farrier at Artern-on-the-Unstrut, about the middle of the 17th century. Hans Christian's son, Friedrich Georg, was brought up to the trade of a tailor, and in this capacity settled in Frankfort in 1686. A second marriage, however, brought him into possession of the Frankfort inn, "Zum Weidenhof," and he ended his days as a well-to-do innkeeper. His son, Johann Kaspar, the poet's father (1710–1782), studied law at Leipzig, and, after going through the prescribed courses of practical training at Wetzlar, travelled in Italy. He hoped, on his return to Frankfort, to obtain an official position in the government of the free city, but his personal influence with the authorities was not sufficiently strong. In his disappointment he resolved never again to offer his services to his native town, and retired into private life, a course which his ample means facilitated. In 1742 he acquired, as a consolation for the public career he had missed, the title of *kaiserlicher Rat*, and in 1748 married Katharina Elisabeth (1731–1808), daughter of the *Schultheiss* or *Bürgermeister* of Frankfort, Johann Wolfgang Textor. The poet was the eldest son of this union. Of the later children only one, Cornelia, born in 1750, survived the years of childhood; she died as the wife of Goethe's friend, J. G. Schlosser, in 1777. The best elements in Goethe's genius came from his mother's side; of a lively, impulsive disposition, and gifted with remarkable imaginative power, Frau Rat was the ideal mother of a poet; moreover, being hardly eighteen at the time of her son's birth, she was herself able to be the companion of his childhood. From his father, whose stern, somewhat pedantic nature repelled warmer feelings on the part of the children, Goethe inherited that "holy earnestness" and stability of character which brought him unscathed through temptations and passions, and held the balance to his all too powerful imagination.

Unforgettable is the picture which the poet subsequently drew of his childhood spent in the large house with its many nooks and crannies, in the Grosse Hirschgraben at Frankfort. Books, pictures, objects of art, antiquities, reminiscences of Rat Goethe's visit to Italy, above all a marionette theatre, kindled the child's quick intellect and imagination. His training was conducted in its early stages by his father, and was later supplemented by tutors. Meanwhile the varied and picturesque life of Frankfort was in itself an education. In 1759, during the Seven Years' War, the French, as Maria Theresa's allies, occupied the town, and, much to the irritation of Goethe's father, who was a stanch partisan of Frederick the Great, a French lieutenant, Count Thorane, was quartered on the Goethe household. The foreign occupation also led to the establishment of a French troupe of actors, and to their performances the boy, through his grandfather's influence, had free access. Goethe has also recorded his memories of another picturesque event, the coronation of the emperor Joseph II. in the Frankfort Römer or town hall in 1764; but these memories were darkened by being associated in his mind with the tragic dénouement of his first love affair. The object of this passion was a certain Gretchen, who seems to have taken advantage of the boy's interest in her to further the dishonest ends of one of her friends. The discovery of the affair and the investigation that followed cooled Goethe's ardour and caused him to turn his attention seriously to the studies which were to prepare him for the university. Meanwhile the literary instinct had begun to show itself; we hear of a novel in letters—a kind of linguistic exercise, in which the characters carried on the correspondence in different languages—of a prose epic on the subject of Joseph, and various religious poems of which one, *Die Höllenfahrt Christi*, found its way in a revised form into the poet's complete works.

In October 1765, Goethe, then a little over sixteen, left Frankfort for Leipzig, where a wider and, in many respects, less provincial life awaited him. He entered upon his university studies with zeal, but his own education in Frankfort had not been the best preparation for the scholastic methods which still dominated the German universities; of his professors, only Gellert seems to have won his interest, and that interest was soon exhausted. The literary beginnings he had made in Frankfort now seemed to him amateurish and trivial; he felt that he had to turn over a new leaf, and, under the guidance of E. W. Behrisch, a genial, original comrade, he learned the art of writing those light Anacreontic lyrics which harmonized with the tone of polite Leipzig society. Artificial as this poetry is, Goethe was, nevertheless, inspired by a real passion in Leipzig, namely, for Anna Katharina Schönkopf, the daughter of a wine-merchant at whose house he dined. She is the "Annette" after whom the recently discovered collection of lyrics was named, although it must be added that neither these lyrics nor the *Neue Lieder*, published in 1770, express very directly Goethe's feelings for Käthchen Schönkopf. To his Leipzig student-days belong also two small plays in Alexandrines, *Die Laune des Verliebten*, a pastoral comedy in one act, which reflects the lighter side of the poet's love affair, and *Die Mitschuldigen* (published in a revised form, 1769), a more sombre picture, in which comedy is incongruously mingled with tragedy. In Leipzig Goethe also had time for what remained one of the abiding interests of his life, for art; he regarded A. F. Oeser (1717–1799), the director of the academy of painting in the Pleissenburg, who had given him lessons in drawing, as the teacher who in Leipzig had influenced him most. His art studies were also furthered by a short visit to Dresden. His stay in Leipzig came, however, to an abrupt conclusion; the distractions of student life proved too much for his strength; a sudden haemorrhage supervened, and he lay long ill, first in Leipzig, and, after it was possible to remove him, at home in Frankfort. These months of slow recovery were a time of serious introspection for Goethe. He still corresponded with his Leipzig friends, but the tone of his letters changed; life had become graver and more earnest for him. He pored over books on occult philosophy; he busied himself with alchemy and astrology. A friend of his mother's, Susanne Katharina von Klettenberg, who belonged to pietist circles in Frankfort, turned the boy's thoughts to religious mysticism. On his recovery his father resolved that he should complete his legal studies at Strassburg, a city which, although then outside the German empire, was, in respect of language and culture, wholly German. From the first moment Goethe set foot in the narrow streets of the Alsatian capital, in April 1770, the whole current of his thought seemed to change. The Gothic architecture of the Strassburg minster became to him the symbol of a national and German ideal, directly antagonistic to the French tastes and the classical and rationalistic atmosphere that prevailed in Leipzig. The second moment of importance in Goethe's Strassburg period was his meeting with Herder, who spent some weeks in Strassburg undergoing an operation of the eye. In this thinker, who was his senior by five years, Goethe found the master he sought; Herder taught him the significance of Gothic architecture, revealed to him the charm of nature's simplicity, and inspired him with enthusiasm for Shakespeare and the *Volkslied*. Meanwhile Goethe's legal studies were not neglected, and he found time to add to knowledge of other subjects, notably that of medicine. Another factor of importance in Goethe's Strassburg life was his love for Friederike Brion, the daughter of an Alsatian village pastor in Sesenheim. Even more than Herder's precept and example, this passion showed Goethe how trivial and artificial had been the Anacreontic and pastoral poetry with which he had occupied himself in Leipzig; and the lyrics inspired by Friederike, such as *Kleine Blumen, kleine Blätter* and *Wie herrlich leuchtet mir die Natur!* mark the beginning of a new epoch in German lyric poetry. The idyll of Sesenheim, as described in *Dichtung und Wahrheit*, is one of the most beautiful love-stories in the literature of the world. From the first, however, it was clear that Friederike Brion could never become the wife of the Frankfort patrician's son; an unhappy ending to the romance was unavoidable, and, as is to be seen in passionate outpourings like the *Wanderers Sturmlied*, and in the bitter self-accusations of *Clavigo*, it left deep wounds on the poet's sensitive soul.

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To Strassburg we owe Goethe's first important drama, *Götz von Berlichingen*, or, as it was called in its earliest form, *Geschichte Gottfriedens von Berlichingen dramatisiert* (not published until 1831). Revised under the now familiar title, it appeared in 1773, after Goethe's return to Frankfort. In estimating this drama we must bear in mind Goethe's own Strassburg life, and the turbulent spirit of his own age, rather than the historical facts, which the poet found in the autobiography of his hero published in 1731. The latter supplied only the rough materials; the Götz von Berlichingen whom Goethe drew, with his lofty ideals of right and wrong, and his enthusiasm for freedom, is a very different personage from the unscrupulous robber-knight of the 16th century, the rough friend of Franz von Sickingen and of the revolting peasants. Still less historical justification is to be found for the vacillating Weislingen in whom Goethe executed poetic justice on himself as the lover of Friederike, or in the women of the play, the gentle Maria, the heartless Adelheid. But there is genial, creative power in the very subjectivity of these characters, and a vigorous dramatic life, which is irresistible in its appeal. With *Götz von Berlichingen*, Shakespeare's art first triumphed on the German stage, and the literary movement known as *Sturm und Drang* was inaugurated.

Having received his degree in Strassburg, Goethe returned home in August 1771, and began his initiation into the routine of an advocate's profession. In the following year, in order to gain insight into another side of his calling, he spent four months at Wetzlar, where the imperial law-courts were established. But Goethe's professional duties had only a small share in the eventful years which lay between his return from Strassburg and that visit to Weimar at the end of 1775, which turned the whole course of his career, and resulted in his permanent attachment to the Weimar court. Goethe's life in Frankfort was a round of stimulating literary intercourse; in J. H. Merck (1741–1791), an army official in the neighbouring town of Darmstadt, he found a friend and mentor, whose irony and common-sense served as a corrective to his own exuberance of spirits. Wetzlar brought new friends and another passion, that for Charlotte Buff, the daughter of the *Amtmann* there—a love-story which has been immortalized in *Werthers Leiden*—and again the young poet's nature was obsessed by a love which was this time strong enough to bring him to the brink of that suicide with which the novel ends. A visit to the Rhine, where new interests and the attractions of Maximiliane von Laroche, a daughter of Wieland's friend, the novelist Sophie von Laroche, brought partial healing; his intense preoccupation with literary work on his return to Frankfort did the rest. In 1775 Goethe was attracted by still another type of woman, Lili Schönemann, whose mother was the widow of a wealthy Frankfort banker. A formal betrothal took place, and the beauty of the lyrics which Lili inspired leaves no room for doubt that here was a passion no less genuine than that for Friederike or Charlotte. But Goethe—more worldly wise than on former occasions—felt instinctively that the gay, social world in which Lili moved was not really congenial to him. A visit to Switzerland in the summer of 1775 may not have weakened his interest in her, but it at least allowed him to regard her objectively; and, without tragic consequences on either side, the passion was ultimately allowed to yield to the dictates of common-sense. Goethe's departure for Weimar in November made the final break less difficult.

The period from 1771 to 1775 was, in literary respects, the most productive of the poet's life. It had been inaugurated with *Götz von Berlichingen*, and a few months later this tragedy was followed by another, *Clavigo*, hardly less convincing in its character-drawing, and reflecting even more faithfully than the former the experiences Goethe had gone through in Strassburg. Again poetic justice is effected on the unfortunate hero who has chosen his own personal advancement in preference to his duty to the woman he loves; more pointedly than in *Götz* is the moral enforced by Clavigo's worldly friend Carlos, that the ground of Clavigo's tragic end lies not so much in the defiance of a moral law as in the hero's vacillation and want of character. With *Die Leiden des jungen Werthers* (1774), the literary precipitate of the author's own experiences in Wetzlar, Goethe succeeded in attracting, as no German had done before him, the attention of Europe. Once more it was the gospel that the world belongs to the strong, which lay beneath the surface of this romance. This, however, was not the lesson which was drawn from it by Goethe's contemporaries; they shed tears of sympathy over the lovelorn youth whose burden becomes too great for him to bear. While *Götz* inaugurated the manlier side of the *Sturm und Drang* literature, *Werther* was responsible for its sentimental excesses. And to the sentimental rather than to the heroic side belongs also *Stella*, "a drama for lovers," in which the poet again reproduced, if with less fidelity than in *Werther*, certain aspects of his own love troubles. A lighter vein is to be observed in various dramatic satires written at this time, such as *Götter, Helden und Wieland* (1774), *Hanswursts Hochzeit, Fastnachtspiel vom Pater Brey, Satyros*, and in the *Singspiele, Erwin und Elmire* (1775) and *Claudine von Villa Bella* (1776); while in the *Frankfurter Gelehrte Anzeiger* (1772–1773), Goethe drove home the principles of the new movement of *Sturm und Drang* in terse and pointed criticism. The exuberance of the young poet's genius is also to be seen in the many unfinished fragments of this period; at one time we find him occupied with dramas on *Caesar* and *Mahomet*, at another with an epic on *Der ewige Jude*, and again with a tragedy on *Prometheus*, of which a magnificent fragment has passed into his works. Greatest of all the torsos of this period, however, was the dramatization of *Faust*. Thanks to a manuscript copy of the play in its earliest form—discovered as recently as 1887—we are able to distinguish how much of this tragedy was the immediate product of the *Sturm und Drang*, and to understand the intentions with which the young poet began his masterpiece. Goethe's hero changed with the author's riper experience and with his new conceptions of man's place and duties in the world, but the Gretchen tragedy was taken over into the finished poem, practically unaltered, from the earliest *Faust* of the *Sturm und Drang*. With these wonderful scenes, the most intensely tragic in all German literature, Goethe's poetry in this period reaches its climax. Still another important work, however, was conceived, and in large measure written at this time, the drama of *Egmont*, which was not published until 1788. This work may, to some extent, be regarded as supplementary to *Faust*; it presents the lighter, more cheerful and optimistic side of Goethe's philosophy in these years; Graf Egmont, the most winning and fascinating of the poet's heroes, is endowed with that "demonic" power over the sympathies of men and women, which Goethe himself possessed in so high a degree. But *Egmont* depends for its interest almost solely on two characters, Egmont himself and Klärchen, Gretchen's counterpart; regarded as a drama, it demonstrates the futility of that defiance of convention and rules with which the *Sturm und Drang* set out. It remained for Goethe, in the next period of his life, to construct on classic models a new vehicle for German dramatic poetry.

In December 1774 the young "hereditary prince" of Weimar, Charles Augustus, passing through Frankfort on his way to Paris, came into personal touch with Goethe, and invited the poet to visit Weimar when, in the following year, he took up the reins of government. In October 1775 the invitation was repeated, and on the 7th of November of that year Goethe arrived in the little Saxon capital which was to remain his home for the rest of his life. During the first few months in Weimar the poet gave himself up to the pleasures of the moment as unreservedly as his patron; indeed, the Weimar court even looked upon him for a time as a tempter who led the young duke astray. But the latter, although himself a mere stripling, had implicit faith in Goethe, and a firm conviction that his genius could be utilized in other fields besides literature. Goethe was not long in Weimar before he was entrusted with responsible state duties, and events soon justified the duke's confidence. Goethe proved the soul of the Weimar government, and a minister of state of energy and foresight. He interested himself in agriculture, horticulture and mining, which were of paramount importance to the welfare of the duchy, and out of these interests sprang his own love for the natural sciences, which took up so much of his time in later

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years. The inevitable love-interest was also not wanting. As Friederike had fitted into the background of Goethe's Strassburg life, Lotte into that of Wetzlar, and Lili into the gaieties of Frankfort, so now Charlotte von Stein, the wife of a Weimar official, was the personification of the more aristocratic ideals of Weimar society. We possess only the poet's share of his correspondence with Frau von Stein, but it is possible to infer from it that, of all Goethe's loves, this was intellectually the most worthy of him. Frau von Stein was a woman of refined literary taste and culture, seven years older than he and the mother of seven children. There was something more spiritual, something that partook rather of the passionate friendships of the 18th century than of love in Goethe's relations with her. Frau von Stein dominated the poet's life for twelve years, until his journey to Italy in 1786–1788. Of other events of this period the most notable were two winter journeys, the first in 1777, to the Harz Mountains, the second, two years later, to Switzerland—journeys which gave Goethe scope for that introspection and reflection for which his Weimar life left him little time. On the second of these journeys he revisited Friederike in Sesenheim, saw Lili, who had married and settled in Strassburg, and made the personal acquaintance of Lavater in Zürich.

The literary results of these years cannot be compared with those of the preceding period; they are virtually limited to a few wonderful lyrics, such as *Wanderers Nachtlied*, *An den Mond*, *Gesang der Geister über den Wassern*, or ballads, such as *Der Erlkönig*, a charming little drama, *Die Geschwister* (1776), in which the poet's relations to both Lili and Frau von Stein seem to be reflected, a dramatic satire, *Der Triumph der Empfindsamkeit* (1778), and a number of *Singspiele*, *Lila* (1777), *Die Fischerin*, *Scherz, List und Rache*, and *Jery und Bätely* (1780). But greater works were in preparation. A religious epic, *Die Geheimnisse*, and a tragedy *Elpenor*, did not, it is true, advance much further than plans; but in 1777, under the influence of the theatrical experiments at the Weimar court, Goethe conceived and in great measure wrote a novel of the theatre, which was to have borne the title *Wilhelm Meisters theatralische Sendung*; and in 1779 himself took part in a representation before the court at Ettersburg, of his drama *Iphigenie auf Tauris*. This *Iphigenie* was, however, in prose; In the following year Goethe remoulded it in iambics, but it was not until he went to Rome that the drama finally received the form in which we know it.

In September, 1786 Goethe set out from Karlsbad—secretly and stealthily, his plan known only to his servant—on that memorable journey to Italy, to which he had looked forward with such intense longing; he could not cross the Alps quickly enough, so impatient was he to set foot in Italy. He travelled by way of Munich, the Brenner and Lago di Garda to Verona and Venice, and from thence to Rome, where he arrived on the 29th of October 1786. Here he gave himself up unreservedly to the new impressions which crowded on him, and he was soon at home among the German artists in Rome, who welcomed him warmly. In the spring of 1787 he extended his journey as far as Naples and Sicily, returning to Rome in June 1787, where he remained until his final departure for Germany on the 2nd of April 1788. It is difficult to exaggerate the importance of Goethe's Italian journey. He himself regarded it as a kind of climax to his life; never before had he attained such complete understanding of his genius and mission in the world; it afforded him a vantage-ground from which he could renew the past and make plans for the future. In Weimar he had felt that he was no longer in sympathy with the *Sturm und Drang*, but it was Italy which first taught him clearly what might take the place of that movement in German poetry. To the modern reader, who may well be impressed by Goethe's extraordinary receptivity, it may seem strange that his interests in Italy were so limited; for, after all, he saw comparatively little of the art treasures of Italy. He went to Rome in Winckelmann's footsteps; it was the antique he sought, and his interest in the artists of the Renaissance was virtually restricted to their imitation of classic models. This search for the classic ideal is reflected in the works he completed or wrote under the Italian sky. The calm beauty of Greek tragedy is seen in the new iambic version of *Iphigenie auf Tauris* (1787); the classicism of the Renaissance gives the ground-tone to the wonderful drama of *Torquato Tasso* (1790), in which the conflict of poetic genius with the prosaic world is transmuted into imperishable poetry. Classic, too, in this sense, were the plans of a drama on *Iphigenie auf Delphos* and of an epic, *Nausikoa*. Most interesting of all, however, is the reflection of the classic spirit in works already begun in earlier days, such as *Egmont* and *Faust*. The former drama was finished in Italy and appeared in 1788, the latter was brought a step further forward, part of it being published as a *Fragment* in 1790.

Disappointment in more senses than one awaited Goethe on his return to Weimar. He came back from Italy with a new philosophy of life, a philosophy at once classic and pagan, and with very definite ideas of what constituted literary excellence. But Germany had not advanced; in 1788 his countrymen were still under the influence of that *Sturm und Drang* from which the poet had fled. The times seemed to him more out of joint than ever, and he withdrew into himself. Even his relations to the old friends were changed. Frau von Stein had not known of his flight to Italy until she received a letter from Rome; but he looked forward to her welcome on his return. The months of absence, however, the change he had undergone, and doubtless those lighter loves of which the *Römische Elegien* bear evidence, weakened the Weimar memories; if he left Weimar as Frau von Stein's lover he returned only as her friend; and she naturally resented the change. Goethe, meanwhile, satisfied to continue the freer customs to which he had adapted himself in Rome, found a new mistress in Christiane Vulpius (1765–1816), the least interesting of all the women who attracted him. But Christiane gradually filled up a gap in the poet's life; she gave him, quietly, unobtrusively, without making demands on him, the comforts of a home. She was not accepted by court society; it did not matter to her that even Goethe's intimate friends ignored her; and she, who had suited the poet's whim when he desired to shut himself off from all that might dim the recollection of Italy, became with the years an indispensable helpmate to him. On the birth in 1789 of his son, Goethe had some thought of legalizing his relations with Christiane, but this intention was not realized until 1806, when the invasion of Weimar by the French made him fear for both life and property.

The period of Goethe's life which succeeded his return from Italy was restless and unsettled; relieved of his state duties, he returned in 1790 to Venice, only to be disenchanted with the Italy he had loved so intensely a year or two before. A journey with the duke of Weimar to Breslau followed, and in 1792 he accompanied his master on that campaign against France which ended so ingloriously for the German arms at Valmy. In later years Goethe published his account both of this *Campagne in Frankreich* and of the *Belagerung von Mainz*, at which he was also present in 1793. His literary work naturally suffered under these distractions. *Tasso*, and the edition of the *Schriften* in which it was to appear, had still to be completed on his return from Italy; the *Römische Elegien*, perhaps the most Latin of all his works, were published in 1795, and the *Venetianische Epigramme*, the result of the second visit to Italy, in 1796. The French Revolution, in which all Europe was engrossed, was in Goethe's eyes only another proof that the passing of the old régime meant the abrogation of all law and order, and he gave voice to his antagonism to the new democratic principles in the dramas *Der Grosskophta* (1792), *Der Bürgergeneral* (1793), and in the unfinished fragments *Die Aufgeregten* and *Das Mädchen von Oberkirch*. The spirited translation of the epic of *Reinecke Fuchs* (1794) he took up as a relief and an antidote to the social disruption of the time. Two new interests, however, strengthened the ties between Goethe and Weimar,—ties which the Italian journey had threatened to sever: his appointment in 1791 as director of the ducal theatre, a post which he occupied for twenty-two years, and his absorption in scientific studies. In 1790 he published his important *Versuch, die Metamorphose der Pflanzen zu erklären*, which was an even more fundamental achievement for the new science of comparative morphology

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than his discovery some six years earlier of the existence of a formation in the human jaw-bone analogous to the intermaxillary bone in apes; and in 1791 and 1792 appeared two parts of his *Beiträge zur Optik*.

Meanwhile, however, Goethe had again taken up the novel of the theatre which he had begun years before, with a view to finishing it and including it in the edition of his *Neue Schriften* (1792–1800). *Wilhelm Meisters theatralische Sendung* became *Wilhelm Meisters Lehrjahre*; the novel of purely theatrical interests was widened out to embrace the history of a young man's apprenticeship to life. The change of plan explains, although it may not exculpate, the formlessness and loose construction of the work, its extremes of realistic detail and poetic allegory. A hero, who was probably originally intended to demonstrate the failure of the vacillating temperament when brought face to face with the problems of art, proved ill-adapted to demonstrate those precepts for the guidance of life with which the *Lehrjahre* closes; unstable of purpose, Wilhelm Meister is not so much an illustration of the author's life-philosophy as a lay-figure on which he demonstrates his views. *Wilhelm Meister* is a work of extraordinary variety, ranging from the commonplace realism of the troupe of strolling players to the poetic romanticism of Mignon and the harper; its flashes of intuitive criticism and its weighty apothegms add to its value as a *Bildungsroman* in the best sense of that word. Of all Goethe's works, this exerted the most immediate and lasting influence on German literature; it served as a model for the best fiction of the next thirty years.

In completing *Wilhelm Meister*, Goethe found a sympathetic and encouraging critic in Schiller, to whom he owed in great measure his renewed interest in poetry. After years of tentative approaches on Schiller's part, years in which that poet concealed even from himself his desire for a friendly understanding with Goethe, the favourable moment arrived; it was in June 1794, when Schiller was seeking collaborators for his new periodical *Die Horen*; and his invitation addressed to Goethe was the beginning of a friendship which continued unbroken until the younger poet's death. The friendship of Goethe and Schiller, of which their correspondence is a priceless record, had its limitations; it was purely intellectual in character, a certain barrier of personal reserve being maintained to the last. But for the literary life of both poets the gain was incommensurable. As far as actual work was concerned, Goethe went his own way as he had always been accustomed to do; but the mere fact that he devoted himself with increasing interest to literature was due to Schiller's stimulus. It was Schiller, too, who induced him to undertake those studies on the nature of epic and dramatic poetry which resulted in the epic of *Hermann und Dorothea* and the fragment of the *Achilleis*; without the friendship there would have been no *Xenien* and no ballads, and it was his younger friend's encouragement which induced Goethe to betake himself once more to the "misty path" of *Faust*, and bring the first part of that drama to a conclusion.

Goethe's share in the *Xenien* (1795) may be briefly dismissed. This collection of distichs, written in collaboration with Schiller, was prompted by the indifference and animosity of contemporary criticism, and its disregard for what the two poets regarded as the higher interests of German poetry. The *Xenien* succeeded as a retaliation on the critics, but the masterpieces which followed them proved in the long run much more effective weapons against the prevailing mediocrity. Prose works like the *Unterhaltungen deutscher Ausgewanderten* (1795) were unworthy of the poet's genius, and the translation of Benvenuto Cellini's *Life* (1796–1797) was only a translation. But in 1798 appeared *Hermann und Dorothea*, one of Goethe's most perfect poems. It is indeed remarkable—when we consider by how much reflection and theoretic discussion the composition of the poem was preceded and accompanied—that it should make upon the reader so simple and "naïve" an impression; in this respect it is the triumph of an art that conceals art. Goethe has here taken a simple story of village life, mirrored in it the most pregnant ideas of his time, and presented it with a skill which may well be called Homeric; but he has discriminated with the insight of genius between the Homeric method of reproducing the heroic life of primitive Greece and the same method as adapted to the commonplace happenings of 18th-century Germany. In this respect he was undoubtedly guided by a forerunner who has more right than he to the attribute "naïve," by J. H. Voss, the author of *Luise*. Hardly less imposing in their calm, placid perfection are the poems with which, in friendly rivalry, Goethe seconded the more popular ballads of his friend; *Der Zauberlehrling*, *Der Gott und die Bayadere*, *Die Braut von Korinth*, *Alexis und Dora*, *Der neue Pausias* and *Die schöne Müllerin*—a cycle of poems in the style of the *Volkslied* —are among the masterpieces of Goethe's poetry. On the other hand, even the friendship with Schiller did not help him to add to his reputation as a dramatist. *Die natürliche Tochter* (1803), in which he began to embody his ideas of the Revolution on a wide canvas, proved impossible on the stage, and the remaining dramas, which were to have formed a trilogy, were never written. Goethe's classic principles, when applied to the swift, direct art of the theatre, were doomed to failure, and *Die natürliche Tochter*, notwithstanding its good theoretic intention, remains the most lifeless and shadowy of all his dramas. Even less in touch with the living present were the various prologues and *Festspiele*, such as *Paläophron und Neoterpe* (1800), *Was wir bringen* (1802), which in these years he composed for the Weimar theatre.

Goethe's classicism brought him into inevitable antagonism with the new Romantic movement which had been inaugurated in 1798 by the *Athenaeum*, edited by the brothers Schlegel. The sharpness of the conflict was, however, blunted by the fact that, without exception, the young Romantic writers looked up to Goethe as its master; they modelled their fiction on *Wilhelm Meister*; they regarded his lyrics as the high-water mark of German poetry; Goethe, Novalis declared, was the "Statthalter of poetry on earth." With regard to painting and sculpture, however, Goethe felt that a protest was necessary, if the insidious ideas propounded in works like Wackenroder's *Herzensergiessungen* were not to do irreparable harm, by bringing back the confusion of the *Sturm und Drang*; and, as a rejoinder to the Romantic theories, Goethe, in conjunction with his friend Heinrich Meyer (1760–1832), published from 1798 to 1800 an art review, *Die Propyläen*. Again, in *Winckelmann und seine Zeit* (1805) Goethe vigorously defended the classical ideals of which Winckelmann had been the founder. But in the end he proved himself the greatest enemy to the strict classic doctrine by the publication in 1808 of the completed first part of *Faust*, a work which was accepted by contemporaries as a triumph of Romantic art. *Faust* is a patchwork of many colours. With the aid of the vast body of *Faust* literature which has sprung up in recent years, and the many new documents bearing on its history —above all, the so-called *Urfaust*, to which reference has already been made—we are able now to ascribe to their various periods the component parts of the work; it is possible to discriminate between the *Sturm und Drang* hero of the opening scenes and of the Gretchen tragedy—the contemporary of Götz and Clavigo —and the superimposed Faust of calmer moral and intellectual ideals—a Faust who corresponds to Hermann and Wilhelm Meister. In its original form the poem was the dramatization of a specific and individualized story; in the years of Goethe's friendship with Schiller it was extended to embody the higher strivings of 18th-century humanism; ultimately, as we shall see, it became, in the second part, a vast allegory of human life and activity. Thus the elements of which *Faust* is composed were even more difficult to blend than were those of *Wilhelm Meister*; but the very want of uniformity is one source of the perennial fascination of the tragedy, and has made it in a peculiar degree the national poem of the German people, the mirror which reflects the national life and poetry from the outburst of *Sturm und Drang* to the well-weighed and tranquil classicism of Goethe's old age.

The third and final period of Goethe's long life may be said to have begun after Schiller's death. He never again lost touch with literature as he had done in the years which preceded his

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friendship with Schiller; but he stood in no active or immediate connexion with the literary movement of his day. His life moved on comparatively uneventfully. Even the Napoleonic régime of 1806–1813 disturbed but little his equanimity. Goethe, the cosmopolitan *Weltbürger* of the 18th century, had himself no very intense feelings of patriotism, and, having seen Germany flourish as a group of small states under enlightened despotisms, he had little confidence in the dreamers of 1813 who hoped to see the glories of Barbarossa's empire revived. Napoleon, moreover, he regarded not as the scourge of Europe, but as the defender of civilization against the barbarism of the Slavs; and in the famous interview between the two men at Erfurt the poet's admiration was reciprocated by the French conqueror. Thus Goethe had no great sympathy for the war of liberation which kindled young hearts from one end of Germany to the other; and when the national enthusiasm rose to its highest pitch he buried himself in those optical and morphological studies, which, with increasing years, occupied more and more of his time and interest.

The works and events of the last twenty-five years of Goethe's life may be briefly summarized. In 1805, as we have seen, he suffered an irreparable loss in the death of Schiller; in 1806, Christiane became his legal wife, and to the same year belongs the magnificent tribute to his dead friend, the *Epilog zu Schillers Glocke*. Two new friendships about this time kindled in the poet something of the juvenile fire and passion of younger days. Bettina von Arnim came into personal touch with Goethe in 1807, and her *Briefwechsel Goethes mit einem Kinde* (published in 1835) is, in its mingling of truth and fiction, one of the most delightful products of the Romantic mind; but the episode was of less importance for Goethe's life than Bettina would have us believe. On the other hand, his interest in Minna Herzlieb, foster-daughter of the publisher Frommann in Jena, was of a warmer nature, and has left its traces on his sonnets.

In 1808, as we have seen, appeared the first part of *Faust*, and in 1809 it was followed by *Die Wahlverwandtschaften*. The novel, hardly less than the drama, effected a change in the public attitude towards the poet. Since the beginning of the century the conviction had been gaining ground that Goethe's mission was accomplished, that the day of his leadership was over; but here were two works which not merely re-established his ascendancy, but proved that the old poet was in sympathy with the movement of letters, and keenly alive to the change of ideas which the new century had brought in its train. The intimate psychological study of four minds, which forms the subject of the *Wahlverwandtschaften*, was an essay in a new type of fiction, and pointed out the way for developments of the German novel after the stimulus of *Wilhelm Meister* had exhausted itself. Less important than *Die Wahlverwandtschaften* was *Pandora* (1810), the final product of Goethe's classicism, and the most uncompromisingly classical and allegorical of all his works. And in 1810, too, appeared his treatise on *Farbenlehre*. In the following year the first volume of his autobiography was published under the title *Aus meinem Leben, Dichtung und Wahrheit*. The second and third volumes of this work followed in 1812 and 1814; the fourth, bringing the story of his life up to the close of the Frankfort period in 1833, after his death. Goethe felt, even late in life, too intimately bound up with Weimar to discuss in detail his early life there, and he shrank from carrying his biography beyond the year 1775. But a number of other publications—descriptions of travel, such as the *Italienische Reise* (1816–1817), the materials for a continuation of *Dichtung und Wahrheit* collected in *Tag- und Jahreshefte* (1830)—have also to be numbered among the writings which Goethe has left us as documents of his life. Meanwhile no less valuable biographical materials were accumulating in his diaries, his voluminous correspondence and his conversations, as recorded by J. P. Eckermann, the chancellor Müller and F. Soret. Several periodical publications, *Über Kunst und Altertum* (1816–1832), *Zur Naturwissenschaft überhaupt* (1817–1824), *Zur Morphologie* (1817–1824), bear witness to the extraordinary breadth of Goethe's interests in these years. Art, science, literature—little escaped his ken—and that not merely in Germany: English writers, Byron, Scott and Carlyle, Italians like Manzoni, French scientists and poets, could all depend on friendly words of appreciation and encouragement from Weimar.

In *West-östlicher Diwan* (1819), a collection of lyrics—matchless in form and even more concentrated in expression than those of earlier days—which were suggested by a German translation of Hafiz, Goethe had another surprise in store for his contemporaries. And, again, it was an actual passion—that for Marianne von Willemer, whom he met in 1814 and 1815—which rekindled in him the lyric fire. Meanwhile the years were thinning the ranks of Weimar society: Wieland, the last of Goethe's greater literary contemporaries, died in 1813, his wife in 1816, Charlotte von Stein in 1827 and Duke Charles Augustus in 1828. Goethe's retirement from the direction of the theatre in 1817 meant for him a break with the literary life of the day. In 1822 a passion for a young girl, Ulrike von Levetzow, whom he met at Marienbad, inspired the fine *Trilogie der Leidenschaft*, and between 1821 and 1829 appeared the long-expected and long-promised continuation of *Wilhelm Meister*, *Wilhelm Meisters Wanderjahre*. The latter work, however, was a disappointment: perhaps it could not have been otherwise. Goethe had lost the thread of his romance and it was difficult for him to resume it. Problems of the relation of the individual to society and industrial questions were to have formed the theme of the *Wanderjahre*; but since the French Revolution these problems had themselves entered on a new phase and demanded a method of treatment which it was not easy for the old poet to learn. Thus his intentions were only partially carried out, and the volumes were filled out by irrelevant stories, which had been written at widely different periods.

But the crowning achievement of Goethe's literary life was the completion of *Faust*. The poem had accompanied him from early manhood to the end and was the repository for the fullest "confession" of his life; it is the poetic epitome of his experience. The second part is, in form, far removed from the impressive realism of the *Urfaust*. It is a phantasmagory; a drama the actors in which are not creatures of flesh and blood, but the shadows of an unreal world of allegory. The lover of Gretchen had, as far as poetic continuity is concerned, disappeared with the close of the first part. In the second part it is virtually a new Faust who, at the hands of a new Mephistopheles, goes out into a world that is not ours. Yet behind these unconvincing shadows of an imperial court with its financial difficulties, of the classical *Walpurgisnacht*, of the fantastic creation of the Homunculus, the noble Helena episode and the impressive mystery-scene of the close, where the centenarian Faust finally triumphs over the powers of evil, there lies a philosophy of life, a ripe wisdom born of experience, such as no European poet had given to the world since the Renaissance. *Faust* has been well called the "divine comedy" of 18th-century humanism.

The second part of *Faust* forms a worthy close to the life of Germany's greatest man of letters, who died in Weimar on the 22nd of March 1832. He was the last of those universal minds which have been able to compass all domains of human activity and knowledge; for he stood on the brink of an era of rapidly expanding knowledge which has made for ever impossible the universality of interest and sympathy which distinguished him. As a poet, his fame has undergone many vicissitudes since his death, ranging from the indifference of the "Young German" school to the enthusiastic admiration of the closing decades of the 19th century—an enthusiasm to which we owe the Weimar *Goethe-Gesellschaft* (founded in 1885) and a vast literature dealing with the poet's life and work; but the fact of his being Germany's greatest poet and the master of her classical literature has never been seriously put in question. The intrinsic value of his poetic work, regarded apart from his personality, is smaller in proportion to its bulk than is the case with many lesser German poets and with the greatest poets of other literatures. But Goethe was a type of literary man hitherto unrepresented among the leading writers of the world's literature; he was a poet whose supreme greatness lay in his subjectivity. Only a small fraction

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of Goethe's work was written in an impersonal and objective spirit, and sprang from what might be called a conscious artistic impulse; by far the larger—and the better—part is the immediate reflex of his feelings and experiences.

It is as a lyric poet that Goethe's supremacy is least likely to be challenged; he has given his nation, whose highest literary expression has in all ages been essentially lyric, its greatest songs. No other German poet has succeeded in attuning feeling, sentiment and thought so perfectly to the music of words as he; none has expressed so fully that spirituality in which the quintessence of German lyrism lies. Goethe's dramas, on the other hand, have not, in the eyes of his nation, succeeded in holding their own beside Schiller's; but the reason is rather because Goethe, from what might be called a wilful obstinacy, refused to be bound by the conventions of the theatre, than because he was deficient in the cunning of the dramatist. For, as an interpreter of human character in the drama, Goethe is without a rival among modern poets, and there is not one of his plays that does not contain a few scenes or characters which bear indisputable testimony to his mastery. *Faust* is Germany's most national drama, and it remains perhaps for the theatre of the future to prove itself capable of popularizing psychological masterpieces like *Tasso* and *Iphigenie*. It is as a novelist that Goethe has suffered most by the lapse of time. The *Sorrows of Werther* no longer moves us to tears, and even *Wilhelm Meister* and *Die Wahlverwandtschaften* require more understanding for the conditions under which they were written than do *Faust* or *Egmont*. Goethe could fill his prose with rich wisdom, but he was only the perfect artist in verse.

Little attention is nowadays paid to Goethe's work in other fields, work which he himself in some cases prized more highly than his poetry. It is only as an illustration of his many-sidedness and his manifold activity that we now turn to his work as a statesman, as a theatre-director, as a practical political economist. His art-criticism is symptomatic of a phase of European taste which tried in vain to check the growing individualism of Romanticism. His scientific studies and discoveries awaken only an historical interest. We marvel at the obstinacy with which he, with inadequate mathematical knowledge, opposed the Newtonian theory of light and colour; and at his championship of "Neptunism," the theory of aqueous origin, as opposed to "Vulcanism," that of igneous origin of the earth's crust. Of far-reaching importance was, on the other hand, his foreshadowing of the Darwinian theory in his works on the metamorphosis of plants and on animal morphology. Indeed, the deduction to be drawn from Goethe's contributions to botany and anatomy is that he, as no other of his contemporaries, possessed that type of scientific mind which, in the 19th century, has made for progress; he was Darwin's predecessor by virtue of his enunciation of what has now become one of the commonplaces of natural science—organic evolution. Modern, too, was the outlook of the aging poet on the changing social conditions of the age, wonderfully sympathetic his attitude towards modern industry, which steam was just beginning to establish on a new basis, and towards modern democracy. The Europe of his later years was very different from the idyllic and enlightened autocracy of the 18th century, in which he had spent his best years and to which he had devoted his energies; yet Goethe was at home in it.

From the philosophic movement, in which Schiller and the Romanticists were so deeply involved, Goethe stood apart. Comparatively early in life he had found in Spinoza the philosopher who responded to his needs; Spinoza taught him to see in nature the "living garment of God," and more he did not seek or need to know. As a convinced realist he took his standpoint on nature and experience, and could afford to look on objectively at the controversies of the metaphysicians. Kant he by no means ignored, and under Schiller's guidance he learned much from him; but of the younger thinkers, only Schelling, whose mystic nature-philosophy was a development of Spinoza's ideas, touched a sympathetic chord in his nature. As a moralist and a guide to the conduct of life—an aspect of Goethe's work which Carlyle, viewing him through the coloured glasses of Fichtean idealism, emphasized and interpreted not always justly—Goethe was a powerful force on German life in years of political and intellectual depression. It is difficult even still to get beyond the maxims of practical wisdom he scattered so liberally through his writings, the lessons to be learned from *Meister* and *Faust*, or even that calm, optimistic fatalism which never deserted Goethe, and was not completely justified by the tenor of his life. If the philosophy of Spinoza provided the poet with a religion which made individual creeds and dogmas unnecessary and impossible, so Leibnitz's doctrine of predestinism supplied the foundations for his faith in the divine mission of human life.

This many-sided activity is a tribute to the greatness of Goethe's mind and personality; we may regard him merely as the embodiment of his particular age, or as a poet "for all time"; but with one opinion all who have felt the power of Goethe's genius are in agreement—the opinion which was condensed in Napoleon's often cited words, uttered after the meeting at Erfurt: *Voilà un homme!* Of all modern men, Goethe is the most universal type of genius. It is the full, rich humanity of his life and personality—not the art behind which the artist disappears, or the definite pronouncements of the thinker or the teacher—that constitutes his claim to a place in the front rank of men of letters. His life was his greatest work.

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(*b*) *Biography.*—Goethe's autobiography, *Aus meinem Leben: Dichtung und Wahrheit*, in four instalments, parts between 1811 and 1814, a fourth part, bringing the history of his life as far as his departure for Weimar in 1775, in 1833 (English translation by J. Oxenford, 1846); it is supplemented by other biographical writings, as the *Italienische Reise*, 1813–1817; *Reise in die Schweiz im Jahre 1797*; *Aus einer Reise am Rhein, Main und Neckar in den Jahren 1814 und 1815, Tag- und Jahreshefte*, &c., and especially by his diaries and correspondence. The following are the more important biographies: H. Düntzer, *Goethes Leben* (1828; subsequent editions, 1833, 1849, 1856); H. Viehoff, *Goethes Leben* (4 vols., 1847–1854; 5th ed., 1887); J. W. Schäfer, *Goethes Leben* (2 vols., 1851; 3rd ed., 1877); G. H. Lewes, *The Life and Works of Goethe* (2 vols., 1855; 2nd ed., 1864; 3rd ed., 1875; cheap reprint, 1906; the Harriman translation by J. Frese is in its 18th edition, 1900; a shorter biography was published by Lewes in 1873 under the title *The Story of Goethe's Life*); W. Menzies, *W. Goethe, les œuvres expliquées par la vie* (1872–1873); A. Baudissin, *Goethe's Leben* (1878); L. Goelzer, *Goethe, Leben und Schriften* (1874; 2nd ed., 1877); H. Grimm, *Goethe: Vorlesungen* (1876; 8th ed., 1903; English translation, 1880); A. Hayward, *Goethe* (1878); H. H. Boyesen, *Goethe and Schiller, their Lives and Works* (1878); Düntzer, *Goethe-Forschungen* (1880; 2nd ed., 1883; English translation, 1883); A. Baumgartner, *Goethe, sein Leben und seine Werke* (1885); J. Sime, *Life of Goethe* (1888); K. Heinemann, *Goethes Leben und Werke* (1889; 3rd ed., 1903); R. M. Meyer, *Goethe* (1894; 2nd ed., 1901); A. Bielschowsky, *Goethe, sein Leben und seine Werke* (vol. i., 1895; 5th ed., 1904; vol. ii., 1903; English translation by W. A. Cooper, 1905 ff.); G. Witkowsky, *Goethe* (1899); H. G. Atkins, *W. Goethe* (1904); P. Hamann and R. Meyer, *Goethe, Leben und Werke* (1904).

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(*c*) *Criticism.*—H. G. Graef, *Goethe über seine Dichtungen* (1901 ff.); J. W. Braun, *Goethe im Urteile seiner Zeitgenossen* (3 vols., 1883–1885); T. Carlyle, *Essays on Goethe* (1828–1832); X. Marmier, *Etudes sur Goethe* (1852); W. von Biedermann, *Goethe-Forschungen* (1879, 1886); J. Minor and A. Sauer, *Studien zur Goethe-Philologie* (1880); H. Düntzer, *Abhandlungen zu Goethes Leben und Werken* (1881); A. Schöll, *Goethe in Hauptzügen seines Lebens und Wirkens* (1882); V. Hehn, *Gedanken über Goethe* (1887; 4th ed., 1909); W. Scherer, *Aufsätze über Goethe* (1886); J. R. Seeley, *Goethe reviewed after Sixty Years* (1894); E. Dowden, *New Studies in Literature* (1895); E. Rod, *Essais sur Goethe* (1898); A. Luther, *Goethe, sechs Vorträge* (1899); G. Saitschik, *Goethe und Schopenhauer* (1898); W. Bode, *Goethes Lebenskunst* (1900; 2nd ed., 1902); by the same, *Goethes Ästhetik* (1901); T. Vollhehr, *Goethe und die bildende Kunst* (1905); E. Lichtenberger, *Études sur les poésies lyriques de Goethe* (1878); T. Achelis, *Grundzüge der Lyrik Goethes* (1900); B. Litzmann, *Goethes Lyrik* (1903); R. Riemann, *Goethes Romantechnik* (1901); R. Virchow, *Goethe als Naturforscher* (1861); E. Caro, *La Philosophie de Goethe* (1866; 2nd ed., 1870); R. Steiner, *Goethes Weltanschauung* (1897); F. Siebeck, *Goethe als Denker* (1902); F. Baldensperger, *Goethe en France* (1904); S. Waetzoldt, *Goethe und die Romantik* (1888).

More special treatises dealing with individual works are the following: W. Scherer, *Aus Goethes Frühzeit* (1879); R. Weissenfels, *Goethe im Sturm und Drang*, vol. i. (1901); W. Uhlemann, *Quellenstudien zu Goethes Götz von Berlichingen* (1874); J. Baechtold, *Goethes Götz von Berlichingen in dreifacher Gestalt* (1882); J. W. Appell, *Werther und seine Zeit* (1855; 4th ed., 1896); E. Schmidt, *Richardson, Rousseau und Goethe* (1875); H. Herrmann, *Das Jahrmarktsfest zu Plundersweilen* (1900); E. Schmidt, *Goethes Faust in ursprünglicher Gestalt* (1887; 5th ed., 1901); J. Collin, *Goethes Faust in seiner ältesten Gestalt* (1896); H. Hettner, *Goethes Iphigenie in ihrem Verhältnis zur Bildungsgeschichte Dichters* (1861); in *Kleine Schriften*, 1884; K. Bouterwek, *Goethes Iphigenie* (1888); F. T. Bratranek, *Goethes Egmont und Schillers Wallenstein* (1862); C. Schuchardt, *Goethes italienische Reise* (1862); H. Düntzer, *Iphigenie auf Tauris; das drei älteren Bearbeitungen* (1854); F. Kern, *Goethes Tasso* (1890); L. Schubart, *Die philosophischen Grundgedanken in Goethes Wilhelm Meister* (1896); E. Boas, *Schiller und Goethe in Xenienkampf* (1851); E. Schmidt and B. Suphan, *Xenien 1796, nach den Handschriften* (1893); W. von Humboldt, *Ästhetische Versuche: Hermann und Dorothea* (1799); V. Hehn, *Über Goethes Hermann und Dorothea* (1893); A. Fries, *Quellen und Komposition der Achilleis* (1901); K. Alt, *Studien zur Entstehungsgeschichte von Dichtung und Wahrheit* (1898); M. Jung, *Goethes Wanderjahre und die sichtigsten Fragen der 19. Jahrhunderts* (1854); F. Kreyssig, *Vorlesungen über Goethes Faust* (1866); the editions of *Faust* by G. von Loeper (2 vols., 1879), and K. J. Schröer (2 vols., 3rd and 4th ed., 1898–1903); K. Fischer, *Goethes Faust* (3 vols., 1893, 1899, 1903); O. Pniower, *Goethes Faust, Entstehung und Erklärung zu seiner Entstehungsgeschichte* (1899); J. Minor, *Goethes Faust, Entstehungsgeschichte und Erklärung* (2 vols., 1901).

(*d*) *Bibliographical Works, Goethe-Societies, &c.*—L. Unflad, *Die Goethe-Gesellschaft. Ursprung und Entwicklung. Verzeichnis einer Goethe-Bibliothek* (1884), to which G. von Loeper and W. von Biedermann have supplied supplements. F. Strehlke, *Goethes Briefe: Verzeichnis unter Angabe der Quelle* (1852–1884); *British Museum Catalogue of Printed Books: Goethe* (1888); Goedeke, *Grundriss zur Geschichte der deutschen Dichtung* (2nd ed., vol. iv. 1891); and the bibliographies in the *Goethe-Jahrbuch* (since 1880). Also K. Hoyer, *Zur Einführung in die Goethe-Literatur* (1904). On Goethe in England see E. Oswald, *Goethe in England and America* (1899; 2nd ed., 1909); W. Heinemann, *A Bibliographical List of the English Translations and Annotated Editions of Goethe's Faust* (1886). Reference may also be made here to F. Zarncke's *Verzeichnis der Originalausgaben von Goethes Büchern* (1864).

A Goethe-Gesellschaft was founded at Weimar in 1885, and numbers over 2800 members; its publications include the annual *Goethe-Jahrbuch* (since 1880), and a series of *Goethe-Schriften*. A *Goethe-Verein* has existed in Vienna since 1887, and an English society, which has also issued several volumes of publications, since 1886. (J. G. R.)

Goethe's Descendants.—Goethe's only son, AUGUST, born on the 25th of December 1789 at Weimar, married in 1817 Ottilie von Pogwisch (1796–1872), who had come as a child to Weimar with her mother (*née* Countess Henckel von Donnersmarck). The marriage was a very unhappy one, the husband having no qualities that could appeal to a woman who, whatever the censorious might say of her moral character, was distinguished to the last by a lively intellect and a singular charm. August von Goethe, whose sole distinction was his birth and his position as grand-ducal chamberlain, died in Italy, on the 27th of October 1830, leaving three children: WALTHER WOLFGANG, born on April 9, 1818, died on April 15, 1885; WOLFGANG MAXIMILIAN, born on September 18, 1820, died on January 20, 1883; ALMA, born on October 22, 1827, died on September 29, 1844.

Of Walther von Goethe little need be said. In youth he had musical ambitions, studied under Mendelssohn and Weinlig at Leipzig, under Loewe at Stettin, and afterwards at Vienna. He published a few songs of no great merit, and had at his death no more than the reputation among his friends of a kindly and accomplished man.

Wolfgang or, as he was familiarly called, Wolf von Goethe, was by far the more gifted of the two brothers, and his gloomy destiny by so much the more tragic. A sensitive and highly imaginative boy, he was the favourite of his grandfather, who made him his constant companion. This fact, instead of being to the boy's advantage, was to prove his bane. The exalted atmosphere of the great man's ideas was too rarefied for the child's intellectual health, and a brain well fitted to do excellent work in the world was ruined by the effort to live up to an impossible ideal. To maintain himself on the same height as his grandfather, and to make the name of Goethe illustrious in his descendants also, became Wolfgang's ambition; and his incapacity to realize this, very soon borne in upon him, paralyzed

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his efforts and plunged him at last into bitter revolt against his fate and gloomy isolation from a world that seemed to have no use for him but as a curiosity. From the first, too, he was hampered by wretched health; at the age of sixteen he was subjected to one of those terrible attacks of neuralgia which were to torment him to the last; physically and mentally alike he stood in tragic contrast with his grandfather, in whose gigantic personality the vigour of his race seems to have been exhausted.

From 1839 to 1845 Wolfgang studied law at Bonn, Jena, Heidelberg and Berlin, taking his degree of *doctor juris* at Heidelberg in 1845. During this period he had made his first literary efforts. His *Studenten-Briefe* (Jena, 1842), a medley of letters and lyrics, are wholly conventional. This was followed by *Der Mensch und die elementarische Natur* (Stuttgart and Tübingen, 1845), in three parts (*Beiträge*): (1) an historical and philosophical dissertation on the relations of mankind and the "soul of nature," largely influenced by Schelling, (2) a dissertation on the juridical side of the question, *De fragmento Vegoiae*, being the thesis presented for his degree, (3) a lyrical drama, *Erlinde*. In this last, as in his other poetic attempts, Wolfgang showed a considerable measure of inherited or acquired ability, in his wealth of language and his easy mastery of the difficulties of rhythm and rhyme. But this was all. The work was characteristic of his self-centred isolation: ultra-romantic at a time when Romanticism was already an outworn fashion, remote alike from the spirit of the age and from that of Goethe. The cold reception it met with shattered at a blow the dream of Wolfgang's life; henceforth he realized that to the world he was interesting mainly as "Goethe's grandson," that anything he might achieve would be measured by that terrible standard, and he hated the legacy of his name.

The next five years he spent in Italy and at Vienna, tormented by facial neuralgia. Returning to Weimar in 1850, he was made a chamberlain by the grand-duke, and in 1852, his health being now somewhat restored, he entered the Prussian diplomatic service and went as attaché to Rome. The fruit of his long years of illness was a slender volume of lyrics, *Gedichte* (Stuttgart and Tübingen, 1851), good in form, but seldom inspired, and showing occasionally the influence of a morbid sensuality. In 1854 he was appointed secretary of legation; but the aggressive ultramontanism of the Curia became increasingly intolerable to his overwrought nature, and in 1856 he was transferred, at his own request, as secretary of legation to Dresden. This post he resigned in 1859, in which year he was raised to the rank of *Freiherr* (baron). In 1866 he received the title of councillor of legation; but he never again occupied any diplomatic post.

The rest of his life he devoted to historical research, ultimately selecting as his special subject the Italian libraries up to the year 1500. The outcome of all his labours was, however, only the first part of *Studies and Researches in the Times and Life of Cardinal Bessarion*, embracing the period of the council of Florence (privately printed at Jena, 1871), a catalogue of the MSS. in the monastery of Sancta Justina at Padua (Jena, 1873), and a mass of undigested material, which he ultimately bequeathed to the university of Jena.

In 1870 Ottilie von Goethe, who had resided mainly at Vienna, returned to Weimar and took up her residence with her two sons in the Goethehaus. So long as she lived, her small salon in the attic storey of the great house was a centre of attraction for many of the most illustrious personages in Europe. But after her death in 1872 the two brothers lived in almost complete isolation. The few old friends, including the grand-duke Charles Alexander, who continued regularly to visit the house, were entertained with kindly hospitality by Baron Walther; Wolfgang refused to be drawn from his isolation even by the advent of royalty. "Tell the empress," he cried on one occasion, "that I am not a wild beast to be stared at!" In 1870, his increasing illness necessitating the constant presence of an attendant, he went to live at Leipzig, where he died.

Goethe's grandsons have been so repeatedly accused of having displayed a dog-in-the-manger temper in closing the Goethehaus to the public and the Goethe archives to research, that the charge has almost universally come to be regarded as proven. It is true that the house was closed and access to the archives only very sparingly allowed until Baron Walther's death in 1885. But the reason for this was not, as Herr Max Hecker rather absurdly suggests, Wolfgang's jealousy of his grandfather's oppressive fame, but one far more simple and natural. From one cause or another, principally Ottilie von Goethe's extravagance, the family was in very straitened circumstances; and the brothers, being thoroughly unbusinesslike, believed themselves to be poorer than they really were.[1] They closed the Goethehaus and the archives, because to have opened them would have needed an army of attendants.[2] If they deserve any blame it is for the pride, natural to their rank and their generation, which prevented them from charging an entrance fee, an expedient which would not only have made it possible for them to give access to the house and collections, but would have enabled them to save the fabric from falling into the lamentable state of disrepair in which it was found after their death. In any case, the accusation is ungenerous. With an almost exaggerated *Pietät* Goethe's descendants preserved his house untouched, at great inconvenience to themselves, and left it, with all its treasures intact, to the nation. Had they been the selfish misers they are sometimes painted, they could have realized a fortune by selling its contents.

Wolf Goethe (Weimar, 1889) is a sympathetic appreciation by Otto Mejer, formerly president of the Lutheran consistory in Hanover. See also Jenny v. Gerstenbergk, *Ottilie von Goethe und ihre Söhne Walther und Wolf* (Stuttgart, 1901), and the article on Maximilian Wolfgang von Goethe by Max F. Hecker in *Allgem. deutsche Biographie*, Bd. 49, *Nachträge* (Leipzig, 1904). (W. A. P.)

GOETZ, HERMANN (1840–1876), German musical composer, was born at Königsberg in Prussia, on the 17th of December 1840, and began his regular musical studies at the comparatively advanced age of seventeen. He entered the music-school of Professor Stern at Berlin, and studied composition chiefly under Ulrich and Hans von Bülow. In 1863 he was appointed organist at Winterthur in Switzerland, where he lived in obscurity for a number of years, occupying himself with composition during his leisure hours. One of his works was an opera, *The Taming of the Shrew*, the libretto skilfully adapted from Shakespeare's play. After much delay it was produced at Mannheim (in October 1874), and its success was as instantaneous as it has up to the present proved lasting. It rapidly made the round of the great German theatres, and spread its composer's fame over all the land. But Goetz did not live to enjoy this happy result for long. In December 1876 he died at Zürich from overwork. A second opera, *Francesca da Rimini*, on which he was engaged, remained a fragment; but it was finished according to his directions, and was performed for the first time at Mannheim a few months after the composer's death on the 4th of December 1876. Besides his dramatic work, Goetz also wrote various compositions for chamber-music, of which a trio (Op. 1) and a quintet (Op. 16) have been given with great success at the London Monday Popular Concerts. Still more important is the *Symphony in F*. As a composer of comic opera Goetz lacks the sprightliness and artistic *savoir faire* so rarely found amongst Germanic nations. His was essentially a serious nature, and passion and pathos were to him more congenial than humour. The more serious sides of the subject are therefore insisted upon more successfully than Katherine's ravings and Petruchio's eccentricities. There are, however, very graceful passages, *e.g.* the singing lesson Bianca receives from her disguised lover. Goetz's style, although influenced by Wagner and other masters, shows signs of a distinct individuality. The design of his music is essentially of a polyphonic character, and the working out and interweaving of his themes betray the musician of high scholarship. But breadth and beautiful flow of melody also were his,

[1] After Walther's death upwards of £10,000 in bonds, &c., were discovered put away and forgotten in escritoires and odd corners.

[2] This was the reason given by Baron Walther himself to the writer's mother, an old friend of Frau von Goethe, who lived with her family in the Goethehaus for some years after 1871.

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as is seen in the symphony, and perhaps still more in the quintet for pianoforte and strings above referred to. The most important of Goetz's posthumous works are a setting of the 137th Psalm for soprano solo, chorus and orchestra, a "Spring" overture (Op. 15), and a pianoforte sonata for four hands (Op. 17).

GOFFE (or GOUGH), **WILLIAM** (fl. 1642–1660), English parliamentarian, son of Stephen Goffe, puritan rector of Stanmer in Essex, began life as an apprentice to a London salter, a zealous parliamentarian, but on the outbreak of the civil war he joined the army and became captain in Colonel Harley's regiment of the new model in 1645. He was imprisoned in 1642 for his share in the petition to give the control of the militia to the parliament. By his marriage with Frances, daughter of General Edward Whalley, he became connected with Oliver Cromwell's family and one of his most faithful followers. He was a member of the deputation which on the 6th of July 1647 brought up the charge against the eleven members. He was active in bringing the king to trial and signed the death warrant. In 1649 he received the honorary degree of M.A. at Oxford. He distinguished himself at Dunbar, commanding a regiment there and at Worcester. He assisted in the expulsion of Barebone's parliament in 1653, took an active part in the suppression of Penruddock's rising in July 1654, and in October 1655 was appointed major-general for Berkshire, Sussex and Hampshire. Meanwhile he had been elected member for Yarmouth in the parliament of 1654 and for Hampshire in that of 1656. He supported the proposal to bestow a royal title upon Cromwell, who greatly esteemed him, was included in the newly-constituted House of Lords, obtained Lambert's place as major-general of the Foot, and was even thought of as a fit successor to Cromwell. As a member of the committee of nine appointed in June 1658 on public affairs, he was witness to the protector's appointment of Richard Cromwell as his successor. He supported the latter during his brief tenure of power and his fall involved his own loss of influence. In November 1659 he took part in the futile mission sent by the army to Monk in Scotland, and at the Restoration escaped with his father-in-law General Edward Whalley to Massachusetts. Goffe's political aims appear not to have gone much beyond fighting "to pull down Charles and set up Oliver"; and he was no doubt a man of deep religious feeling, who acted throughout according to a strict sense of duty as he conceived it. He was destined to pass the rest of his life in exile, separated from his wife and children, dying, it is supposed, about 1679.

GOFFER, to give a fluted or crimped appearance to anything, particularly to linen or lace frills or trimmings by means of heated irons of a special shape, called goffering-irons or tongs. "Goffering," or the French term *gaufrage*, is also used of the wavey or crimped edging in certain forms of porcelain, and also of the stamped or embossed decorations on the edges of the binding of books. The French word *gaufre*, from which the English form is adapted, means a thin cake marked with a pattern like a honeycomb, a "wafer," which is etymologically the same word. *Waufre* appears in the phrase *un fer à waufres*, an iron for baking cakes on (quotation of 1433 in J. B. Roquefort's *Glossaire de la langue romane*). The word is Teutonic, cf. Dutch *wafel*, Ger. *Waffel*, a form seen in "waffle," the name given to the well-known batter-cakes of America. The "wafer" was so called from its likeness to a honeycomb, *Wabe*, ultimately derived from the root *wab-*, to weave, the cells of the comb appearing to be woven together.

GOG (possibly connected with the Gentilic *Gagaya*, "of the land of Gag," used in Amarna Letters i. 38, as a synonym for "barbarian," or with Ass. *Gagu*, a ruler of the land of *Sahi*, N. of Assyria, or with *Gyges*, Ass. *Gugu*, a king of Lydia), a Hebrew name found in Ezek. xxxviii.–xxxix. and in Rev. xx., and denoting an antitheocratic power that is to manifest itself in the world immediately before the final dispensation. In the later passage, Gog and Magog are spoken of as co-ordinate; in the earlier, Gog is given as the name of the person or people and Magog as that of the land of origin. Magog is perhaps a contracted form of Mat-gog, *mat* being the common Assyrian word for "land." The passages are, however, intimately related and both depend upon Gen. x. 2, though here Magog alone is mentioned. He is the second "son" of Japhet, and the order of the names here and in Ezekiel xxxviii. 2, indicates a locality between Cappadocia and Media, *i.e.* in Armenia. According to Josephus, who is followed by Jerome, the Scythians were primarily intended by this designation; and this plausible opinion has been generally followed. The name Σκύθαι, it is to be observed, however, is often but a vague word for any or all of the numerous and but partially known tribes of the north; and any attempt to assign a more definite locality to Magog can only be very hesitatingly made. According to some, the Maiotes about the Palus Maeotis are meant; according to others, the Massagetae; according to Kiepert, the inhabitants of the northern and eastern parts of Armenia. The imagery employed in Ezekiel's prophetic description was no doubt suggested by the Scythian invasion which about the time of Josiah, 630 B.C., had devastated Asia (Herodotus i. 104-106; Jer. iv. 3-vi. 30). Following on this description, Gog figures largely in Jewish and Mahommedan as well as in Christian eschatology. In the district of Astrakhan a legend is still to be met with, to the effect that Gog and Magog were two great races, which Alexander the Great subdued and banished to the inmost recesses of the Caucasus, where they are meanwhile kept in by the terror of twelve trumpets blown by the winds, but whence they are destined ultimately to make their escape and destroy the world.

The legends that attach themselves to the gigantic effigies (dating from 1708 and replacing those destroyed in the Great Fire) of Gog and Magog in Guildhall, London, are connected only remotely, if at all, with the biblical notices. According to the *Recueyll des histoires de Troye*, Gog and Magog were the survivors of a race of giants descended from the thirty-three wicked daughters of Diocletian; after their brethren had been slain by Brute and his companions, Gog and Magog were brought to London (Troy-novant) and compelled to officiate as porters at the gate of the royal palace. It is known that effigies similar to the present existed in London as early as the time of Henry V.; but when this legend began to attach to them is uncertain. They may be compared with the giant images formerly kept at Antwerp (Antigomes) and Douai (Gayant). According to Geoffrey of Monmouth (*Chronicles*, i. 16), Goëmot or Goëmagot (either corrupted from or corrupted into "Gog and Magog") was a giant who, along with his brother Corineus, tyrannized in the western horn of England until slain by foreign invaders.

GOGO, or GOGHA, a town of British India in Ahmedabad district, Bombay, 193 m. N.W. of Bombay. Pop. (1901) 4798. About ¼ m. east of the town is an excellent anchorage, in some measure sheltered by the island of Piram, which lies still farther east. The natives of this place are reckoned the best sailors in India; and ships touching here may procure water and supplies, or repair damages. The anchorage is a safe refuge during the south-west monsoon, the bottom being a bed of mud and the water always smooth. Gogo has lost its commercial importance and has steadily declined in population and trade since the time of the American Civil War, when it was an important cotton-mart.

GOGOL, NIKOLAI VASILIEVICH (1809–1852), Russian novelist, was born in the province of Poltava, in South Russia, on the 31st of March 1809. Educated at the Niezhin gymnasium, he there started a manuscript periodical, "The Star," and wrote several pieces including a tragedy, *The Brigands*. Having completed his course at Niezhin, he went in 1829 to St Petersburg, where he tried the stage but failed. Next year he obtained a clerkship in the department of appanages, but he soon gave it up. In literature, however, he found his true vocation. In 1829 he published anonymously a poem called *Italy*, and, under the pseudonym of V. Alof, an idyll, *Hans Kuchel Garten*, which he had written while still at Niezhin. The idyll was so ridiculed by a reviewer that its author bought up all the copies he could secure, and burnt them in a room which he hired for the purpose at an inn. Gogol then fell back upon South Russian popular literature, and especially the tales of Cossackdom on which his boyish fancy had been nursed, his father having occupied the

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post of "regimental secretary," one of the honorary officials in the Zaporogian Cossack forces.

In 1830 he published in a periodical the first of the stories which appeared next year under the title of *Evenings in a Farm near Dikanka: by Rudy Panko*. This work, containing a series of attractive pictures of that Little-Russian life which lends itself to romance more readily than does the monotony of "Great-Russian" existence, immediately obtained a great success—its light and colour, its freshness and originality being hailed with enthusiasm by the principal writers of the day in Russia. Whereupon Gogol planned, not only a history of Little-Russia, but also one of the middle ages, to be completed in eight or nine volumes. This plan he did not carry out, though it led to his being appointed to a professorship in the university of St Petersburg, a post in which he met with small success and which he resigned in 1835. Meanwhile he had published his *Arabesques*, a collection of essays and stories; his *Taras Bulba*, the chief of the *Cossack Tales* translated into English by George Tolstoy; and a number of novelettes, which mark his transition from the romantic to the realistic school of fiction, such as the admirable sketch of the tranquil life led in a quiet country house by two kindly specimens of *Old-world Gentlefolks*, or the description of the petty miseries endured by an ill-paid clerk in a government office, the great object of whose life is to secure the "cloak" from which his story takes its name. To the same period belongs his celebrated comedy, the *Revizor*, or government inspector. His aim in writing it was to drag into light "all that was bad in Russia," and to hold it up to contempt. And he succeeded in rendering contemptible and ludicrous the official life of Russia, the corruption universally prevailing throughout the civil service, the alternate arrogance and servility of men in office. The plot of the comedy is very simple. A traveller who arrives with an empty purse at a provincial town is taken for an inspector whose arrival is awaited with fear, and he receives all the attentions and bribes which are meant to propitiate the dreaded investigator of abuses. The play appeared on the stage in the spring of 1836, and achieved a full success, in spite of the opposition attempted by the official classes whose malpractices it exposed. The aim which Gogol had in view when writing the *Revizor* he afterwards fully attained in his great novel, *Mertvuiya Dushi*, or Dead Souls, the first part of which appeared in 1842. The hero of the story is an adventurer who goes about Russia making fictitious purchases of "dead souls," *i.e.* of serfs who have died since the last census, with the view of pledging his imaginary property to the government. But his adventures are merely an excuse for drawing a series of pictures, of an unfavourable kind, of Russian provincial life, and of introducing on the scene a number of types of Russian society. Of the force and truth with which these delineations are executed the universal consent of Russian critics in their favour may be taken as a measure. From the French version of the story a general idea of its merits may be formed, and some knowledge of its plot and its principal characters may be gathered from the English adaptation published in 1854, as an original work, under the title of *Home Life in Russia*. But no one can fully appreciate Gogol's merits as a humorist who is not intimate with the language in which he wrote as well as with the society which he depicted.

In 1836 Gogol for the first time went abroad. Subsequently he spent a considerable amount of time out of Russia, chiefly in Italy, where much of his *Dead Souls* was written. His residence there, especially at Rome, made a deep impression on his mind, which, during his later years, turned towards mysticism. The last works which he published, his *Confession* and *Correspondence with Friends*, offer a painful contrast to the light, bright, vigorous, realistic, humorous writings which had gained and have retained for him his immense popularity in his native land. Asceticism and mystical exaltation had told upon his nervous system, and its feeble condition showed itself in his literary compositions. In 1848 he made a pilgrimage to Jerusalem, and on his return settled down at Moscow, where he died on the 3rd of March 1852.

See *Materials for the Biography of Gogol* (in Russian) (1897), by Shenrok; "Illness and Death of Gogol," by N. Bazhenov, *Russkaya Musl*, January 1902. (W. R. S.-R.)

GOGRA, or GHAGRA, a river of northern India. It is an important tributary of the Ganges, bringing down to the plains more water than the Ganges itself. It rises in Tibet near Lake Manasarowar, not far from the sources of the Brahmaputra and the Sutlej, passes through Nepal where it is known as the Kauriala, and after entering British territory becomes the most important waterway in the United Provinces. It joins the Ganges at Chapra after a course of 600 m. Its tributary, the Rapti, also has considerable commercial importance. The Gogra has the alternative name of Sarju, and in its lower course is also known as that of the Deoha.

GOHIER, LOUIS JÉRÔME (1746–1830), French politician, was born at Semblançay (Indre-et-Loire) on the 27th of February 1746, the son of a notary. He was called to the bar at Rennes, and practised there until he was sent to represent the town in the states-general. In the Legislative Assembly he represented Ille-et-Vilaine. He took a prominent part in the deliberations; he protested against the exaction of a new oath from priests (Nov. 22, 1791), and demanded the sequestration of the emigrants' property (Feb. 7, 1792). He was minister of justice from March 1793 to April 1794, and in June 1799 he succeeded Treilhard in the Directory, where he represented the republican interest. His wife was intimate with Josephine Bonaparte, and when Bonaparte suddenly returned from Egypt in October 1799 he repeatedly protested his friendship for Gohier, who was then president of the Directory, and tried in vain to gain him over. After the *coup d'état* of the 18th Brumaire (Nov. 9, 1799), he refused to abdicate his functions, and sought out Bonaparte at the Tuileries "to save the republic," as he boldly expressed it. He was escorted to the Luxembourg, and on his release he retired to his estate at Eaubonne. In 1802 Napoleon made him consul-general at Amsterdam, and on the union of the Netherlands with France he was offered a similar post in the United States. His health did not permit of his taking up a new appointment, and he died at Eaubonne on the 29th of May 1830.

His *Mémoires d'un vétéran irréprochable de la Révolution* was published in 1824, his report on the papers of the civil list preparatory to the trial of Louis XVI. is printed in *Le Procès de Louis XVI* (Paris, an III) and elsewhere, while others appear in the *Moniteur*.

GÖHRDE, a forest of Germany, in the Prussian province of Hanover, immediately W. of the Elbe, between Wittenberg and Lüneburg. It has an area of about 85 sq. m. and is famous for its oaks, beeches and game preserves. It is memorable for the victory gained here, on the 16th of September 1813, by the allies, under Wallmoden, over the French forces commanded by Pecheur. The hunting-box situated in the forest was built in 1689 and was restored by Ernest Augustus, King of Hanover. It is known to history on account of the constitution of Göhrde, promulgated here in 1719.

GOITO, a village of Lombardy, Italy, in the province of Mantua, from which it is 11 m. N.W., on the road to Brescia. Pop. (village) 737; (commune) 5712. It is situated on the right bank of the Mincio near the bridge. Its position has given it a certain military importance in various campaigns and it has been repeatedly fortified as a bridge-head. The Piedmontese forces won two actions (8th of April and 30th of May 1848) over the Austrians here.

GOITRE (from Lat. *gutlur*, the throat; synonyms, Bronchocele, Derbyshire Neck), a term applied to a swelling in the front of the neck caused by enlargement of the thyroid gland. This structure, which lies between the skin and the anterior surface of the windpipe, and in health is not large enough to give rise to any external prominence (except in the pictures of certain artists), is liable to variations in size, more especially in females, a temporary enlargement of the gland being not uncommon at the catamenial periods, as well as during pregnancy. In goitre the swelling is conspicuous and is not only unsightly but may occasion much discomfort from its pressure upon the windpipe and other important parts of the neck. J. L. Alibert recorded cases of

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goitre where the tumour hung down over the breast, or reached as low as the middle of the thigh.

Goitre usually appears in early life, often from the eighth to the twelfth year; its growth is at first slow, but after several years of comparative quiescence a sudden increase is apt to occur. In the earlier stages the condition of the gland is simply an enlargement of its constituent parts, which retain their normal soft consistence; but in the course of time other changes supervene, and it may become cystic, or acquire hardness from increase of fibrous tissue or from calcareous deposits. Occasionally the enlargement is uniform, but more commonly one of the lobes, generally the right, is the larger. In rare instances the disease is limited to the isthmus which connects the two lobes of the gland. The growth is unattended with pain, and is not inconsistent with good health.

Goitre is a marked example of an endemic disease. There are few parts of the world where it is not found prevailing in certain localities, these being for the most part valleys and elevated plains in mountainous districts (see CRETINISM). The malady is generally ascribed to the use of drinking water impregnated with the salts of lime and magnesia, in which ingredients the water of goitrous districts abounds. But in localities not far removed from those in which goitre prevails, and where the water is of the same chemical composition, the disease may be entirely unknown. The disease may be the result of a combination of causes, among which local telluric or malarial influences concur with those of the drinking water. Goitre is sometimes cured by removal of the individual from the district where it prevails, and it is apt to be acquired by previously healthy persons who settle in goitrous localities; and it is only in such places that the disease exhibits hereditary tendencies.

In the early stages, change of air, especially to the seaside, is desirable, and small doses of iron and of iodine should be given; if this fails small doses of thyroid extract should be tried. If palliative measures prove unsuccessful, operation must be undertaken for the removal of one lateral lobe and the isthmus of the tumour. This may be done under chloroform or after the subcutaneous injection of cocaine. If chloroform is used, it must be given very sparingly, as the breathing is apt to become seriously embarrassed during the operation. After the successful performance of the operation great improvement takes place, the remaining part of the gland slowly decreasing in size. The whole of the gland must not be removed during the operation, lest the strange disease known as Myxoedema should be produced (see METABOLIC DISEASES).

In *exophthalmic goitre* the bronchocele is but one of three phenomena, which together constitute the disease, viz. palpitation of the heart, elargement of the thyroid gland, and protrusion of the eyeballs. This group of symptoms is known by the name of "Graves's disease" or "Von Basedow's disease"—the physicians by whom the malady was originally described. Although occasionally observed in men, this affection occurs chiefly in females, and in comparatively early life. It is generally preceded by impoverishment of blood, and by nervous or hysterical disorders, and it is occasionally seen in cases of organic heart disease. It has been suddenly developed as the effect of fright or of violent emotion. The first symptom is usually the palpitation of the heart, which is aggravated by slight exertion, and may be so severe as not only to shake the whole frame but even to be audible at some distance. A throbbing is felt throughout the body, and many of the larger blood-vessels are, like the heart, seen to pulsate strongly. The enlargement of the thyroid is gradual, and rarely increases to any great size, thus differing from the commoner form of goitre. The enlarged gland is of soft consistence, and communicates a thrill to the touch from its dilated and pulsating blood-vessels. Accompanying the goitre a remarkable change is observed in the eyes, which attract attention by their prominence, and by the startled expression thus given to the countenance. In extreme cases the eyes protrude from their sockets to such a degree that the eyelids cannot be closed, and injury may thus arise to the constantly exposed eyeballs. Apart from such risk, however, the vision is rarely affected. It occasionally happens that in undoubted cases of the disease one or other of the three above-named phenomena is absent, generally either the goitre or the exophthalmos. The palpitation of the heart is the most constant symptom. Sleeplessness, irritability, disorders of digestion, diarrhoea and uterine derangements, are frequent accompaniments. It is a serious disease and, if unchecked, may end fatally. Some cases are improved by general hygienic measures, others by electric treatment, or by the administration of animal extracts or of sera. Some cases, on the other hand, may be considered suitable for operative treatment. (E. O.*)

GOKAK, a town of British India, in the Belgaum district of Bombay, 8 m. from a station on the Southern Mahratta railway. Pop. (1901) 9860. It contains old temples with inscriptions, and is known for a special industry of modelled toys. About 4 m. N.W. are the Gokak Falls, where the Ghatprabha throws itself over a precipice 170 ft. high. Close by, the water has been impounded for a large reservoir, which supplies not only irrigation but also motive power for a cotton-mill employing 2000 hands.

GOKCHA, (GÖK-CHAI; Armenian *Sevanga*; ancient *Haosavagha*), the largest lake of Russian Transcaucasia, in the government of Erivan, in 40° 9′ to 40° 38′ N. and 45° 1′ to 45° 40′ E. Its altitude is 6345 ft., it is of triangular shape, and measures from north-west to south-east 45 m., its greatest width being 25 m., and its maximum depth 67 fathoms. Its area is 540 sq. m. It is surrounded by barren mountains of volcanic origin, 12,000 ft. high. Its outflow is the Zanga, a left bank tributary of the Aras (*Araxes*); it never freezes, and its level undergoes periodical oscillations. It contains four species of *Salmonidae*, and two of *Cyprinidae*, which are only met with in the drainage area of this lake. A lava island in the middle is crowned by an Armenian monastery.

GOLCONDA, a fortress and ruined city of India, in the Nizām's Dominions, 5 m. W. of Hyderabad city. In former times Golconda was the capital of a large and powerful kingdom of the Deccan, ruled by the Kutb Shahi dynasty which was founded in 1512 by a Turkoman adventurer on the downfall of the Bahmani dynasty, but the city was subdued by Aurangzeb in 1687, and annexed to the Delhi empire. The fortress of Golconda, situated on a rocky ridge of granite, is extensive, and contains many enclosures. It is strong and in good repair, but is commanded by the summits of the enormous and massive mausolea of the ancient kings about 600 yds. distant. These buildings, which are now the chief characteristics of the place, form a vast group, situated in an arid, rocky desert. They have suffered considerably from the ravages of time, but more from the hand of man, and nothing but the great solidity of their walls has preserved them from utter ruin. These tombs were erected at a great expense, some of them being said to have cost as much as £150,000. Golconda fort is now used as the Nizām's treasury, and also as the state prison. Golconda has given its name in English literature to the diamonds which were found in other parts of the dominions of the Kutb Shahi dynasty, not near Golconda itself.

GOLD [symbol Au, atomic weight 195·7(H = 1), 197·2(O = 16)], a metallic chemical element, valued from the earliest ages on account of the permanency of its colour and lustre. Gold ornaments of great variety and elaborate workmanship have been discovered on sites belonging to the earliest known civilizations, Minoan, Egyptian, Assyrian, Etruscan (see JEWELRY, PLATE, EGYPT, CRETE, AEGEAN CIVILIZATION, NUMISMATICS), and in ancient literature gold is the universal symbol of the highest purity and value (cf. passages in the Old Testament, *e.g.* Ps. xix. 10 "More to be desired are they than gold, yea, than much fine gold"). With regard to the history of the metallurgy of gold, it may be mentioned that, according to Pliny, mercury was employed in his time both as a means of separating the precious metals and for the purposes of gilding. Vitruvius also gives a detailed account of the means of recovering gold, by amalgamation, from cloth into which it had been woven.

Physical Properties.—Gold has a characteristic yellow colour, which is, however, notably affected by small quantities of other metals; thus the tint is sensibly lowered by small quantities of silver, and heightened by copper. When the gold is finely

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divided, as in "purple of Cassius," or when it is precipitated from solutions, the colour is ruby-red, while in very thin leaves it transmits a greenish light. It is nearly as soft as lead and softer than silver. When pure, it is the most malleable of all metals (see GOLDBEATING). It is also extremely ductile; a single grain may be drawn into a wire 500 ft. in length, and an ounce of gold covering a silver wire is capable of being extended more than 1300 m. The presence of minute quantities of cadmium, lead, bismuth, antimony, arsenic, tin, tellurium and zinc renders gold brittle, $\frac{1}{768}$th part of one of the three metals first named being sufficient to produce that quality. Gold can be readily welded cold; the finely divided metal, in the state in which it is precipitated from solution, may be compressed between dies into disks or medals. The specific gravity of gold obtained by precipitation from solution by ferrous sulphate is from 19·55 to 20·72. The specific gravity of cast gold varies from 18·29 to 19·37, and by compression between dies the specific gravity may be raised from 19·37 to 19·41; by annealing, however, the previous density is to some extent recovered, as it is then found to be 19·40. The melting-point has been variously given, the early values ranging from 1425° C. to 1035° C. Using improved methods, C. T. Heycock and F. H. Neville determined it to be 1061·7° C.; Daniel Berthelot gives 1064° C., while Jaquerod and Perrot give 1066·1-1067·4° C. At still higher temperatures it volatilizes, forming a reddish vapour. Macquer and Lavoisier showed that when gold is strongly heated, fumes arise which gild a piece of silver held in them. Its volatility has also been studied by L. Elsner, and, in the presence of other metals, by Napier and others. The volatility is barely appreciable at 1075°; at 1250° it is four times as much as at 1100°. Copper and zinc increase the volatility far more than lead, while the greatest volatility is induced, according to T. Kirke Rose, by tellurium. It has also been shown that gold volatilizes when a gold-amalgam is distilled. Gold is dissipated by sending a powerful charge of electricity through it when in the form of leaf or thin wire. The electric conductivity is given by A. Matthiessen as 73 at 0° C., pure silver being 100; the value of this coefficient depends greatly on the purity of the metal, the presence of a few thousandths of silver lowering it by 10%. Its conductivity for heat has been variously given as 103 (C. M. Despretz), 98 (F. Crace-Calvert and R. Johnson), and 60 (G. H. Wiedemann and R. Franz), pure silver being 100. Its specific heat is between 0·0298 (Dulong and Petit) and 0·03244 (Regnault). Its coefficient of expansion for each degree between 0° and 100° C. is 0·000014661, or for gold which has been annealed 0·000015136 (Laplace and Lavoisier). The spark spectrum of gold has been mapped by A. Kirchhoff, R. Thalén, Sir William Huggins and H. Krüss; the brightest lines are 6277, 5960, 5935 and 5836 in the orange and yellow, and 5230 and 4792 in the green and blue.

Chemical Properties.—Gold is permanent in both dry and moist air at ordinary or high temperatures. It is insoluble in hydrochloric, nitric and sulphuric acids, but dissolves in *aqua regia*—a mixture of hydrochloric and nitric acids—and when very finely divided in a heated mixture of strong sulphuric acid and a little nitric acid; dilution with water, however, precipitates the metal as a violet or brown powder from this solution. The metal is soluble in solutions of chlorine, bromine, thiosulphates and cyanides; and also in solutions which generate chlorine, such as mixtures of hydrochloric acid with nitric acid, chromic acid, antimonious acid, peroxides and nitrates, and of nitric acid with a chloride. Gold is also attacked when strong sulphuric acid is submitted to electrolysis with a gold positive pole. W. Skey showed that in substances which contain small quantities of gold the precious metal may be removed by the solvent action of iodine or bromine in water. Filter paper soaked with the clear solution is burnt, and the presence of gold is indicated by the purple colour of the ash. In solution minute quantities of gold may be detected by the formation of "purple of Cassius," a bluish-purple precipitate thrown down by a mixture of ferric and stannous chlorides.

The atomic weight of gold was first determined with accuracy by Berzelius, who deduced the value 195·7 (H = 1) from the amount of mercury necessary to precipitate it from the chloride, and 195·2 from the ratio between gold and potassium chloride in potassium aurichloride, $KAuCl_4$. Later determinations were made by Sir T. E. Thorpe and A. P. Laurie, Krüss and J. W. Mallet. Thorpe and Laurie converted potassium auribromide into a mixture of metallic gold and potassium bromide by careful heating. The relation of the gold to the potassium bromide, as well as the amounts of silver and silver bromide which are equivalent to the potassium bromide, were determined. The mean value thus adduced was 196·86. Krüss worked with the same salt, and obtained the value 196·65; while Mallet, by analyses of gold chloride and bromide, and potassium auribromide, obtained the value 196·77.

Occlusion of Gas by Gold.—T. Graham showed that gold is capable of occluding by volume 0·48% of hydrogen, 0·20% of nitrogen, 0·20% of carbon monoxide, and 0·16% of carbon dioxide. Varrentrapp pointed out that "cornets" from the assay of gold may retain gas if they are not strongly heated.

Occurrence and Distribution.—Gold is found in nature chiefly in the metallic state, *i.e.* as "native gold," and less frequently in combination with tellurium, lead and silver. These are the only certain examples of natural combinations of the metal, the minute, though economically valuable, quantity often found in pyrites and other sulphides being probably only present in mechanical suspension. The native metal crystallizes in the cubic system, the octahedron being the commonest form, but other and complex combinations have been observed. Owing to the softness of the metal, large crystals are rarely well defined, the points being commonly rounded. In the irregular crystalline aggregates branching and moss-like forms are most common, and in Transylvania thin plates or sheets with diagonal structures are found. More characteristic, however, than the crystallized are the irregular forms, which, when large, are known as "nuggets" or "pepites," and when in pieces below $\frac{1}{2}$ oz. weight as gold dust, the larger sizes being distinguished as coarse or nuggety gold, and the smaller as gold dust proper. Except in the larger nuggets, which may be more or less angular, or at times even masses of crystals, with or without associated quartz or other rock, gold is generally found bean-shaped or in some other flattened form, the smallest particles being scales of scarcely appreciable thickness, which, from their small bulk as compared with their surface, subside very slowly when suspended in water, and are therefore readily carried away by a rapid current. These form the "float gold" of the miner. The physical properties of native gold are generally similar to that of the melted metal.

Of the minerals containing gold the most important are sylvanite or graphic tellurium (Ag, Au) Te$_2$, with 24 to 26 % ; calaverite, $AuTe_2$, with 42 %; nagyagite or foliate tellurium $(Pb, Au)_{16}$ $Sb_2(S, Te)_{24}$, with 5 to 9 % of gold; petzite, $(Ag, Au)_2Te$, and white tellurium. These are confined to a few localities, the oldest and best known being those of Nagyag and Offenbanya in Transylvania; they have also been found at Red Cloud, Colorado, in Calaveras county, California, and at Perth and Boulder, West Australia. The minerals of the second class, usually spoken of as "auriferous," are comparatively numerous. Prominent among these are galena and iron pyrites, the former being almost invariably gold-bearing. Iron pyrites, however, is of greater practical importance, being in some districts exceedingly rich, and, next to the native metal, is the most prolific source of gold. Magnetic pyrites, copper pyrites, zinc blende and arsenical pyrites are other and less important examples, the last constituting the gold ore formerly worked in Silesia. A native gold amalgam is found as a rarity in California, and bismuth from South America is sometimes rich in gold. Native arsenic and antimony are also very frequently found to contain gold and silver.

The association and distribution of gold may be considered under two different heads, namely, as it occurs in mineral veins—"reef gold," and in alluvial or other superficial deposits which are derived from the waste of the former—"alluvial gold." Four distinct types of reef gold deposits may be distinguished: (1) Gold may occur disseminated through metalliferous veins, generally with sulphides and more particularly with pyrites. These deposits seem to be the primary sources of native gold. (2) More common are the auriferous quartz-reefs—veins or masses of quartz containing gold in flakes visible to the naked eye, or so finely divided as to be invisible. (3) The "banket" formation, which characterises the goldfields of South Africa, consists of a quartzite conglomerate throughout which gold is very finely disseminated. (4) The siliceous sinter at

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Mount Morgan, Queensland, which is obviously associated with hydrothermal action, is also gold-bearing. The genesis of the last three types of deposit is generally assigned to the simultaneous percolation of solutions of gold and silica, the auriferous solution being formed during the disintegration of the gold-bearing metalliferous veins. But there is much uncertainty as to the mechanism of the process; some authors hold that the soluble chloride is first formed, while others postulate the intervention of a soluble aurate.

In the alluvial deposits the associated minerals are chiefly those of great density and hardness, such as platinum, osmiridium and other metals of the platinum group, tinstone, chromic, magnetic and brown iron ores, diamond, ruby and sapphire, zircon, topaz, garnet, &c., which represent the more durable original constituents of the rocks whose distintegration has furnished the detritus.

Statistics of Gold Production.—The supply of gold, and also its relation to the supply of silver, has, among civilized nations, always been of paramount importance in the economic questions concerning money (see MONEY and BIMETALLISM); in this article a summary of the modern gold-producing areas will be given, and for further details reference should be made to the articles on the localities named. The chief sources of the European supply during the middle ages were the mines of Saxony and Austria, while Spain also contributed. The supplies from Mexico and Brazil were important during the 16th and 17th centuries. Russia became prominent in 1823, and for fourteen years contributed the bulk of the supply. The United States (California) after 1848, and Australia after 1851, were responsible for enormous increases in the total production, which has been subsequently enhanced by discoveries in Canada, South Africa, India, China and other countries.

The average annual world's production for certain periods from 1801 to 1880 in ounces is given in Table I. The average

TABLE I.

Period.	Oz.	Period.	Oz.
1801–1810	590,750	1856–1860	6,350,180
1811–1820	380,300	1861–1865	5,951,770
1821–1830	472,400	1866–1870	6,169,660
1831–1840	674,200	1871–1875	5,487,400
1841–1850	1,819,600	1876–1880	5,729,300
1851–1855	6,350,180	—	—

production of the five years 1881–1885 was the smallest since the Australian and Californian mines began to be worked in 1848–1849; the minimum 4,614,588 oz., occurred in 1882. It was not until after 1885 that the annual output of the world began to expand. Of the total production in 1876, 5,016,488 oz., almost the whole was derived from the United States, Australasia and Russia. Since then the proportion furnished by these countries has been greatly lowered by the supplies from South Africa, Canada, India and China. The increase of production has not been uniform, the greater part having occurred most notably since 1895. Among the regions not previously important as gold-producers which now contribute to the annual output, the most remarkable are the goldfields of South Africa (Transvaal and Rhodesia, the former of which were discovered in 1885). India likewise has been added to the list, its active production having begun at about the same time as that of South Africa. The average annual product of India for the period 1886 to 1899 inclusive was £698,708, and its present annual product averages about 550,000 oz., or about £2,200,000, obtained almost wholly from the free-milling quartz veins of the Colar goldfields in Mysore, southern India. In 1900 the output was valued at £1,891,804, in 1905 at £2,450,536, and in 1908 at £2,270,000. Canada, too, assumed an important rank, having contributed in 1900 £5,583,300; but the output has since steadily declined to £1,973,000 in 1908. The great increase during the few years preceding 1899 was due to the development of the goldfields of the North-Western Territory, especially British Columbia. From the district of Yukon (Klondike, &c.) £2,800,000 was obtained in 1899, wholly from alluvial workings, but the progress made since has been slower than was expected by sanguine people. It is, however, probable that the North-Western Territory will continue to yield gold in important quantities for some time to come.

The output of the United States increased from £7,050,000 in 1881 to £16,085,567 in 1900, £17,016,000 in 1905, and to £20,065,000 in 1908. This increase was chiefly due to the exploitation of new goldfields. The fall in the price of silver stimulated the discovery and development of gold deposits, and many states formerly regarded as characteristically silver districts have become important as gold producers. Colorado is a case in point, its output having increased from about £600,000 in 1880 to £6,065,000 in 1900; it was £5,139,800 in 1905. Somewhat more than one-half of the Colorado gold is obtained from the Cripple Creek district. Other states also showed a largely augmented product. On the other hand, the output of California, which was producing over £3,000,000 per annum in 1876, has fallen off, the average annual output from 1876 to 1900 being £3,800,000; in 1905 the yield was £3,839,000. This decrease was largely caused by the practical suspension for many years of the hydraulic mining operations, in preparation for which millions of dollars had been expended in deep tunnels, flumes, &c., and the active continuance of which might have been expected to yield some £2,000,000 of gold annually. This interruption, due to the practical prohibition of the industry by the United States courts, on the ground that it was injuring, through the deposit of tailings, agricultural lands and navigable streams, was lessened, though not entirely removed, by compromises and regulations which permit, under certain restrictions, the renewed exploitation of the ancient river-beds by the hydraulic method. On the other hand, the progressive reduction of mining and metallurgical costs effected by improved transportation and machinery, and the use of high explosives, compressed air, electric-power transmission, &c., resulted in California (as elsewhere) in a notable revival of deep mining. This was especially the case on the "Mother Lode," where highly promising results were obtained. Not only is vein-material formerly regarded as unremunerative now extracted at a profit, but in many instances increased gold-values have been encountered below zones of relative barrenness, and operators have been encouraged to make costly preparations for really deep mining —more than 3000 ft. below the surface. The gold product of California, therefore, may be fairly expected to maintain itself, and, indeed, to show an advance. Alaska appeared in the list of gold-producing countries in 1886, and gradually increased its annual output until 1897, when the country attracted much attention with a production valued at over £500,000; the opening up of new workings has increased this figure immensely, from about £1,400,000 in 1901 to £3,006,500 in 1905. The Alaska gold was derived almost wholly from the large low-grade quartz mines of Douglas Island prior to 1899, but in that year an important district was discovered at Cape Nome, on the north-western coast. The result of a few months' working during that year was more than £500,000 of gold, and a very much larger annual output may reasonably be anticipated in the future; in 1905 it was about £900,000. The gold occurs in alluvial deposits designated as gulch-, bar-, beach-, tundra- and bench-placers. The tundra is a coastal plain, swampy and covered with undergrowth and underlaid by gravel. The most interesting and, thus far, the most productive are the beach deposits, similar to those on the coast of Northern California. These occur in a strip of comparatively fine gravel and sand, 150 yds. wide, extending along the shore. The gold is found in stratified layers, with "ruby" and black sand. The "ruby" sand consists chiefly of fine garnets and magnetites, with a few rose-quartz grains. Further exploration of the interior will probably result in the discovery of additional gold districts.

Mexico, from a gold production of £200,000 in 1891, advanced to about £1,881,800 in 1900 and to about £3,221,000 in 1905. Of this increase, a considerable part was derived from gold-quartz mining, though much was also obtained as a by-product in the working of the ores of other metals. The product of Colombia, Venezuela, the Guianas, Brazil, Uruguay, Argentina, Chile, Bolivia, Peru and Ecuador amounted in 1900 to £2,481,000 and to £2,046,000 in 1905.

In 1876 Australasia produced £7,364,000, of which Victoria contributed £3,984,000. The annual output of Victoria declined

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until the year 1893, when it began to increase rapidly, but not to its former level, the values for 1900 and 1905 being £3,142,000 and £3,138,000. There has been an important increase in Queensland, which advanced from £1,606,000 in 1876 to £2,843,000 in 1900, and subsequently declined to £2,489,000 in 1905. There has been no increase, and, indeed, no large fluctuation until quite recently in the output of New Zealand, which averaged £1,054,000 per annum from 1876 to 1898, but the production of the two years 1900 and 1905 rose to £1,425,450 and £2,070,407 respectively. By far the most important addition to the Australasian product has come from West Australia, which began its production in 1887 — about the time of the inception of mining at Witwatersrand ("the Rand") in South Africa—and by continuous increase, which assumed large proportions towards the close of the 19th century, was £6,426,000 in 1899, £6,170,000 in 1900, and £8,212,000 in 1905. The total Australasian production in 1908 was valued at £14,708,000.

Undoubtedly the greatest of the gold discoveries made in the latter half of the 19th century was that of the Witwatersrand district in the Transvaal. By reason of its unusual geological character and great economic importance this district deserves a more extended description. The gold occurs in conglomerate beds, locally known as "banket." There are several series of parallel beds, interstratified with quartzite and schist, the most important being the "main reef" series. The gold in this conglomerate reef is partly of detrital origin and partly of the genetic character of ordinary vein-gold. The formation is noted for its regularity as regards both the thickness and the gold-tenor of the ore-bearing reefs, in which respect it is unparalleled in the geology of the auriferous formations. The gold carries, on an average, £2 per ton, and is worked by ordinary methods of gold-mining, stamp-milling and cyaniding. In 1899, 5762 stamps were in operation, crushing 7,331,446 tons of ore, and yielding £15,134,000, equivalent to 25·5% of the world's production. Of this, 80% came from within 12 m. of Johannesburg. After September 1899 operations were suspended, almost entirely owing to the Boer War, but on the 2nd of May 1901 they were started again. In 1905 the yield was valued at £20,802,074, and in 1909 at £30,925,788. So certain is the ore-bearing formation that engineers in estimating its auriferous contents feel justified in assuming, as a factor in their calculations, a vertical extension limited only by the lowest depths at which mining is feasible. On such a basis they arrived at more than £600,000,000 as the available gold contained in the Witwatersrand conglomerates. This was a conservative estimate, and was made before the full extent of the reefs was known; in 1904 Lionel Phillips stated that the main reef series had been proved for 61 m., and he estimated the gold remaining to be mined to be worth £2,500,000,000. Deposits similar to the Witwatersrand banket occur in Zululand, and also on the Gold Coast of Africa. In Rhodesia, the country lying north of the Transvaal, where gold occurs in well-defined quartz-veins, there is unquestionable evidence of extensive ancient workings. The economic importance of the region generally has been fully proved. Rhodesia produced £386,148 in 1900 and £722,656 in 1901, in spite of the South African War; the product for 1905 was valued at £1,480,449, and for 1908 at £2,526,000.

The gold production of Russia has been remarkably constant, averaging £4,809,262 per annum; the gold is derived chiefly from placer workings in Siberia.

The gold production of China was estimated for 1899 at £1,328,338 and for 1900 at £860,000; it increased in 1901 to about £1,700,000, to fall to £340,000 in 1905; in 1906 and 1907 it recovered to about £1,000,000.

TABLE II.—*Gold Production of Certain Countries, 1881-1908 (in oz.).*

Year.	Australasia.	Africa.	Canada.	India.	Mexico.	Russia.	United States.	Totals.
1881	1,475,161	..	52,483	..	41,545	1,181,853	1,678,612	4,976,980
1882	1,438,067	..	52,000	..	45,289	1,154,613	1,572,187	4,825,794
1883	1,333,849	..	46,150	..	46,229	1,132,219	1,451,250	4,614,588
1884	1,352,761	..	46,000	..	57,227	1,055,642	1,489,950	4,902,889
1885	1,309,804	..	53,987	..	46,941	1,225,738	1,538,325	5,002,584
1886	1,257,670	..	66,061	..	29,702	922,226	1,693,125	5,044,363
1887	1,290,202	28,754	59,884	15,403	39,861	971,656	1,596,375	5,061,490
1888	1,344,002	240,266	53,150	35,034	47,117	1,030,151	1,604,841	5,175,623
1889	1,540,607	366,023	62,658	37,649	33,861	1,124,051	1,567,000	5,611,245
1890	1,453,172	497,817	55,625	107,273	37,104	1,134,590	1,588,880	5,726,966
1891	1,518,690	729,368	45,022	131,776	48,375	1,168,764	1,604,840	6,287,591
1892	1,638,238	1,210,869	43,905	182,141	54,625	1,190,809	1,897,098	7,102,172
1893	1,711,892	1,478,477	44,850	207,152	63,144	1,139,323	1,739,323	7,777,585
1894	2,020,180	2,024,164	50,411	210,412	217,688	1,167,455	1,910,813	8,813,818
1895	2,170,505	2,277,640	92,440	257,830	290,250	1,397,767	2,254,760	9,814,505
1896	2,185,872	2,260,802	136,274	323,501	314,437	1,041,794	2,568,132	9,950,861
1897	2,547,704	2,832,776	294,587	350,585	352,812	1,124,051	2,774,935	11,420,068
1898	3,137,644	3,876,216	669,445	376,431	411,187	1,231,791	3,118,398	13,877,806
1899	3,837,181	3,532,488	1,031,593	418,869	411,187	1,078,333	3,437,210	14,837,775
1900	3,555,596	419,503	1,348,720	456,444	435,375	974,537	3,829,897	12,315,135
1901	3,719,080	439,704	1,417,216	454,527	497,527	1,105,122	3,805,500	12,698,089
1902	3,946,374	1,887,773	1,003,355	463,824	491,156	1,090,053	3,870,000	14,313,660
1903	4,315,538	3,289,409	911,118	552,873	516,524	1,191,582	3,560,000	15,852,620
1904	4,745,744	4,156,084	793,350	556,097	609,781	1,199,857	3,892,480	16,790,351
1905	4,159,220	5,477,841	700,863	576,899	779,181	1,164,683	3,662,742	18,360,628
1906	3,984,538	6,449,749	581,709	525,527	896,515	1,087,056	4,565,333	19,620,372
1907	3,659,693	7,270,464	399,844	495,965	903,672	1,282,635	4,374,827	19,988,144
1908	3,557,705	7,983,348	462,467	504,309	1,182,445	1,497,076	4,659,360	21,529,300

Alloys.—Gold forms alloys with most metals, and of these many are of great importance in the arts. The alloy with mercury—gold amalgam—is so readily formed that mercury is one of the most powerful agents for extracting the precious metal. With 10% of gold present the amalgam is fluid, and with 12·5% pasty, while with 13% it consists of yellowish-white crystals. Gold readily alloys with silver and copper to form substances in use from remote times for money, jewellery and plate. Other metals which find application in the metallurgy of gold by virtue of their property of extracting the gold as an alloy are lead, which combines very readily when molten, and which can afterwards be separated by cupellation, and copper, which is separated from the gold by solution in acids or by electrolysis; molten lead also extracts gold from the copper-gold alloys. The relative amount of gold in an alloy is expressed in two ways: (1) as "fineness," *i.e.* the amount of gold in 1000 parts of alloy; (2) as "carats," *i.e.* the amount of gold in 24 parts of alloy. Thus, pure gold is 1000 "fine" or 24 carat. In England the following standards are used for plate and jewelry: 375, 500, 625, 750 and 916·6, corresponding to 9, 12, 15, 18 and 22 carats, the alloying metals being silver and copper in varying proportions. In France three alloys of the following standards are used for jewelry, 920, 840 and 750. A greenish alloy used by goldsmiths contains 70% of silver and 30% of gold. "Blue gold" is stated to contain 75% of gold and 25% of iron. The Japanese use for ornament an alloy of gold and silver, the standard of which varies from 350 to 500, the colour of the precious metal being developed by "pickling" in a mixture of plum-juice, vinegar and copper sulphate. They may be said to possess a series of bronzes, in which gold and silver replace tin and zinc, all these alloys being characterized by patina having a wonderful range of tint. The common alloy, Shi-ya-ku-Do, contains 70% of copper and 30% of gold; when exposed to air it becomes coated with a fine black patina, and is much used in Japan for sword ornaments. Gold wire may be drawn of any quality, but it is usual to add 5 to 9 dwts. of copper to the pound. The "solders" used for red gold contain 1 part of copper and 5 of gold; for light gold, 1 part of copper, 1 of silver and 4 of gold.

Gold and Silver.—Electrum is a natural alloy of gold and silver. Matthiessen observed that the density of alloys, the composition of which varies from $AuAg_3$ to Au_4Ag, is greater than that calculated from the densities of the constituent metals. These alloys are harder, more fusible and more sonorous than pure gold. The alloys of the formulae $AuAg$, $AuAg_2$, $AuAg_4$ and $AuAg_{10}$ are perfectly homogeneous, and have been studied by Levol. Molten alloys containing more than 80% of silver deposit on cooling the alloy $AuAg_3$, little gold remaining in the mother liquor.

Gold and Zinc.—When present in small quantities zinc renders gold

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brittle, but it may be added to gold in larger quantities without destroying the ductility of the precious metal; Peligot proved that a triple alloy of gold, copper and zinc, which contains 5·8% of the latter named, is perfectly ductile. The alloy of 11 parts gold and 1 part of zinc is, however, stated to be brittle.

Gold and Tin.—Alchorne showed that gold alloyed with $\frac{1}{20}$th part of tin is sufficiently ductile to be rolled and stamped into coin, provided the metal is not annealed at a high temperature. The alloys of tin and gold are hard and brittle, and the combination of the metals is attended with contraction; thus the alloy SnAu has a density 14·243, instead of 14·821 as indicated by calculation. Matthiessen and Bose obtained large crystals of the alloy Au_2Sn_4, having the colour of tin, which changed to a bronze tint by oxidation.

Gold and Iron.—Hatchett found that the alloy of 11 parts gold and 1 part of iron is easily rolled without annealing. If these proportions the density of the alloy is less than the mean of its constituent metals.

Gold and Palladium.—These metals are stated to alloy in all proportions. According to Chenevix, the alloy composed of equal parts of the two metals is grey, is less ductile than its constituent metals and has the specific gravity 11·08. The alloy of 4 parts of gold and 1 part of palladium is white, hard and ductile. Graham showed that a wire of palladium alloyed with from 24 to 25 parts of gold does not exhibit the remarkable retraction which, in pure palladium, attends its loss of occluded hydrogen.

Gold and Platinum.—Clarke states that the alloy of equal parts of the two metals is ductile, and has almost the colour of gold.

Gold and Rhodium.—Gold alloyed with $\frac{1}{16}$th or $\frac{1}{8}$th of rhodium is, according to Wollaston, very ductile, infusible and of the colour of gold.

Gold and Iridium.—Small quantities of iridium do not destroy the ductility of gold, but this is probably because the metal is only disseminated through the mass, and not alloyed, as it falls to the bottom of the crucible in which the gold is fused.

Gold and Nickel.—Eleven parts of gold and 1 of nickel yield an alloy resembling brass.

Gold and Cobalt.—Eleven parts of gold and 1 of cobalt form a brittle alloy of a dull yellow colour.

Compounds.—Aurous oxide, Au_2O, is obtained by cautiously adding potash to a solution of aurous bromide, or by boiling mixed solutions of auric chloride and mercurous nitrate. It forms a dark-violet precipitate which dries to a greyish-violet powder. When freshly prepared it dissolves in cold water to form an indigo-coloured solution with a reddish fluorescence of colloidal aurous oxide; it is insoluble in hot water. This oxide is slightly basic. Auric oxide, Au_2O_3, is a brown powder, decomposed into its elements when heated to about 250° or on exposure to light. When a concentrated solution of auric chloride is treated with caustic potash, a brown precipitate of auric hydrate, $Au(OH)_3$, is obtained, which, on heating, loses water to form auryl hydrate, $AuO(OH)$, and auric oxide, Au_2O_3. It functions chiefly as an acidic oxide, being less basic than aluminium oxide, and forming no stable oxy-salts. It dissolves in alkalis to form well-defined crystalline salts; potassium aurate, $KAuO_2.3H_2O$, is very soluble in water, and is used in electrogilding. With concentrated ammonia auric oxide forms a black, highly explosive compound of the composition $AuN_2H_3.3H_2O$, named "fulminating gold"; this substance is generally considered to be $Au(NH_2)NH.3H_2O$, but it may be an ammine of the formula $[Au(NH_3)(OH)_2]OH$. Other oxides, *e.g.* Au_3O_4, have been described.

Aurous chloride, $AuCl$, is obtained as a lemon-yellow amorphous powder, insoluble in water, by heating auric chloride to 185°. It begins to decompose into gold and chlorine at 185°, the decomposition being complete at 230°; water decomposes it into gold and auric chloride. Auric chloride, $AuCl_3$, or Au_2Cl_6, is a dark-ruby-red or reddish-brown, crystalline, deliquescent powder obtained by dissolving the metal in *aqua regia*. It is also obtained by carefully evaporating a solution of the metal in chlorine water. The gold chloride of commerce, which is used in photography, is really a hydrochloride, chlorauric or aurichloric acid, $HAuCl_4.3H_2O$, and is obtained in long yellow needles by crystallizing the acid solution. Corresponding to this acid, a series of salts, named chloraurates or aurichlorides, are known. The potassium salt is obtained by crystallizing equivalent quantities of potassium and auric chlorides. Light-yellow monoclinic needles of $2KAuCl_4.H_2O$ are deposited from warm, strongly acid solutions, and transparent rhombic tables of $KAuCl_4.2H_2O$ from neutral solutions. By crystallizing an aqueous solution, red crystals of $AuCl_3.2H_2O$ are obtained. Auric chloride combines with the hydrochlorides of many organic bases—amines, alkaloids, &c.—to form characteristic compounds. Gold dichloride, probably $Au_2Cl_4 = Au.AuCl_4$, aurous chloraurate, is said to be obtained as a dark-red mass by heating finely divided gold to 140°–170° in chlorine. Water decomposes it into gold and auric chloride. The bromides and iodides resemble the chlorides. Aurous bromide, $AuBr$, is a yellowish-green powder obtained by heating the tribromide to 140°; auric bromide, $AuBr_3$, forms reddish-black or scarlet-red leafy crystals, which dissolve in water to form a reddish-brown solution, and combines with bromides to form bromaurates corresponding to the chloraurates. Aurous iodide, AuI, is a light-yellow, sparingly soluble powder obtained, together with free iodine, by adding potassium iodide to auric chloride; auric iodide, AuI_3, is formed as a dark-green powder at the same time, but it readily decomposes to aurous iodide and iodine. Aurous iodide is also obtained as a green solid by acting upon gold with iodine. The iodaurates correspond to the chlor- and bromaurates; the potassium salt, $KAuI_4$, forms highly lustrous, intensely black, four-sided prisms.

Aurous cyanide, $AuCN$, forms yellow, microscopic, hexagonal tables, insoluble in water, and is obtained by the addition of hydrochloric acid to a solution of potassium aurocyanide, $KAu(CN)_2$. This salt is prepared by precipitating a solution of gold in *aqua regia* by ammonia, and then introducing the well-washed precipitate into a boiling solution of potassium cyanide. The solution is filtered and allowed to cool, when colourless rhombic prismoids of the aurocyanide separate. It is also obtained in the action of potassium cyanide on gold in the presence of air, a reaction utilized in the MacArthur-Forrest process of gold extraction (see below). Auric cyanide, $Au(CN)_3$, is not certainly known, but double salts, however, have been frequently described. Potassium auricyanide, $2KAu(CN)_4.3H_2O$, is obtained as large, colourless, efflorescent tablets by crystallizing concentrated solutions of auric chloride and potassium cyanide. The acid, auricyanhydric or auric acid, $2HAu(CN)_4.3H_2O$, is obtained by treating the silver salt (obtained by precipitating the potassium salt with silver nitrate) with hydrochloric acid; it forms tabular crystals, readily soluble in water, alcohol and ether.

Gold forms three sulphides corresponding to the oxides; they readily decompose on heating. Aurous sulphide, Au_2S, is a brownish-black powder formed by passing sulphuretted hydrogen into a solution of potassium aurocyanide and then acidifying. Sodium aurosulphite, $Na_3Au(S.SO_3)_2.4H_2O$, is prepared by fusing gold with sodium sulphide and sulphur, the melt being extracted with water, filtered in an atmosphere of nitrogen, and evaporated in a vacuum over sulphuric acid. It forms colourless, monoclinic prisms, which turn brown on exposure to air. The method of refining gold into solution is mentioned by Stahl in his *Observationes Chymico-Physico-Medicae*; he there remarks that Moses probably destroyed the golden calf by burning it with sulphur and alkali (Ex. xxxii. 20). Auric sulphide, Au_2S_3, is an amorphous powder formed when lithium aurichloride is treated with dry sulphuretted hydrogen at −10°. It is very unstable, decomposing into gold and sulphur at 200°.

Oxy-salts of gold are almost unknown, but the sulphite and thiosulphate form double salts. Thus by adding acid sodium sulphite to, or by passing sulphur dioxide at 50° into, a solution of sodium aurate, the salt, $3Na_2SO_3.Au_2SO_3.4H_2O$ is obtained, which, when precipitated from its aqueous solution by alcohol, forms a purple powder, appearing yellow or green by reflected light. Sodium aurothiosulphate, $3Na_2S_2O_3.Au_2S_2O_3.4H_2O$, forms colourless needles; it is obtained in the direct action of sodium thiosulphate on gold in the presence of an oxidizing agent, or by the addition of a dilute solution of auric chloride to a sodium thiosulphate solution.

Mining and Metallurgy.

The various deposits of gold may be divided into two classes—"veins" and "placers." The vein mining of gold does not greatly differ from that of similar deposits of metals (see MINERAL DEPOSITS). In the placer or alluvial deposits, the precious metal is found usually in a water-worn condition imbedded in earthy matter, and the method of working all such deposits is based on the disintegration of the earthy matter by the action of a stream of water, which washes away the lighter portions and leaves the denser gold. In alluvial deposits the richest ground is usually found in contact with the "bed rock"; and, when the overlying cover of gravel is very thick, as sometimes happens, when the older gravel is covered with a flow of basalt, regular mining by shafts and levels, as in what are known as tunnel-claims, may be required to reach the auriferous ground.

The extraction of gold may be effected by several methods; we may distinguish the following leading types:

1. By simple washing, *i.e.* dressing auriferous sands, gravels, &c.;

2. By amalgamation, *i.e.* forming a gold amalgam, afterwards removing the mercury by distillation;

3. By chlorination, *i.e.* forming the soluble gold chloride and then precipitating the metal;

4. By the cyanide process, *i.e.* dissolving the gold in potassium cyanide solution, and then precipitating the metal;

5. Electrolytically, generally applied to the solutions obtained in processes (3) and (4).

1. *Extraction of Gold by Washing.*—In the early days of gold-washing in California and Australia, when rich alluvial deposits were common at the surface, the most simple appliances sufficed. The most characteristic is the "pan," a circular dish of sheet-iron or "tin," with sloping sides about 13 or 14 in. in diameter. The pan, about two-thirds filled with the "pay dirt" to be washed, is held in the stream or in a hole filled with water. The larger stones having been removed by hand, gyratory motion is given to the pan by a combination of shaking and twisting movements

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so as to keep its contents suspended in the stream of water, which carries away the bulk of the lighter material, leaving the heavy minerals, together with any gold which may have been present. The washing is repeated until enough of the enriched sand is collected, when the gold is finally recovered by careful washing or "panning out" in a smaller pan. In Mexico and South America, instead of the pan, a wooden dish or trough, known as "batea," is used.

The "cradle" is a simple appliance for treating somewhat larger quantities, and consists essentially of a box, mounted on rockers, and provided with a perforated bottom of sheet iron in which the "pay dirt" is placed. Water is poured on the dirt, and the rocking motion imparted to the cradle causes the finer particles to pass through the perforated bottom on to a canvas screen, and thence to the base of the cradle, where the auriferous particles accumulate on transverse bars of wood, called "riffles."

The "tom" is a sort of cradle with an extended sluice placed at an incline of about 1 in 12. The upper end contains a perforated riddle plate which is placed directly over the riffle box, and under certain circumstances mercury may be placed behind the riffles. Copper plates amalgamated with mercury are also used when the gold is very fine, and in some instances amalgamated silver coins have been used for the same purpose. Sometimes the stuff is disintegrated with water in a "puddling machine," which was used, especially in Australia, when the earthy matters are tenacious and water scarce. The machine frequently resembles a brickmaker's wash-mill, and is worked by horse or steam power.

In workings on a larger scale, where the supply of water is abundant, as in California, sluices were generally employed. They are shallow troughs about 12 ft. long, about 16 to 20 in. wide and 8 in. deep. The troughs taper slightly so that they can be joined in series, the total length often reaching several hundred feet. The incline of the sluice varies with the conformation of the ground and the tenacity of the stuff to be washed, from 1 in 10 to 1 in 8. A cross-riffle made of strips of wood 2 in. square laid parallel to the direction of the current, and at other points with boards having transverse notches filled with mercury. These were known originally as Hungarian riffles.

In larger plant the upper ends of the sluices are often cut in rock or lined with stone blocks, the grating stopping the larger stones being known as a "grizzly." In order to save very fine and especially rusty particles of gold, so-called "under-current sluices" are used; these are shallow wooden tanks, 50 yds. and upwards in length in area, which are placed somewhat below the main sluice, and communicate with it above and below, the entry being protected by a grating so that only the finer material is admitted. These are paved with stone blocks or lined with mercury riffles, as the water from the gold-saved velocity of flow, due to the sudden increase of surface, the finer particles of gold may collect. In order to save finely divided gold, amalgamated copper plates are sometimes placed in a nearly level position, at a considerable distance from the head of the sluice, the gold which is retained in it being removed from time to time. Sluices are often made double, and they are usually cleaned up—that is, the deposit rich in gold is removed from them—once a week.

The "pan" is now only used by prospectors, while the "cradle" and "tom" are practically confined to the Chinese; the sluice is considered to be the best contrivance for washing gold gravels.

2. *The Amalgamation Process.*—This method is employed to extract gold from both alluvial and reef deposits: in the first case it is combined with "hydraulic mining," *i.e.* disintegrating auriferous gravels by powerful jets of water, and the sluice system described above; in the second case the vein stuff is prepared by crushing and the amalgamation is carried out in mills.

Hydraulic mining has for the most part been confined to the country of its invention, California, and the western territories of America, where the conditions favourable for its use are more fully developed than elsewhere—notably the presence of thick banks of gravel that cannot be utilized by other methods, and abundance of water, even though considerable work may be required at times to make it available. The general conditions to be observed in such workings may be briefly stated as follows: (1) The whole of the auriferous gravel, down to the "bed rock," must be removed,—that is, no selection of rich or poor parts is possible; (2) this must be accomplished by the aid of water alone, or at times by water supplemented by blasting; (3) the conglomerate must be mechanically disintegrated without interrupting the whole system; (4) the gold must be saved without interrupting the continuous flow of water; and (5) arrangements must be made for disposing of the vast masses of impoverished gravel.

The water is brought from a ditch on the high ground, and through a line of pipes to the distributing box, whence the branch pipes supplying the jets diverge. The stream issues through a nozzle, termed a "monitor" or "giant," which is fitted with a ball and socket joint, so that the direction of the jet may be varied through considerable angles by simply moving a handle. The material of the bank being loosened by blasting and the cutting action of the water, crumbles into holes, and the superincumbent mass, often with large trees and stones, falls into the lower ground. The stream, laden with stones and gravel, passes into the sluices, where the gold is recovered in the manner already described. Under the most advantageous conditions the loss of gold may be estimated at 15 or 20%, the amount recovered representing a value of about two shillings per ton of gravel treated. The loss of mercury is about the same, from 5 to 6 cwt. being in constant use per mile of sluice.

In working auriferous river-beds, dredges have been used with considerable success in certain parts of New Zealand and on the Pacific slope in America. The dredges used in California are almost exclusively of the endless-chain bucket or steam-shovel pattern. Some dredges have a capacity under favourable conditions of over 2000 cub. yds. of gravel daily. The gravel is excavated as in the ordinary form of endless-chain bucket dredge and dumped on to the deck of the dredge. It then passes through screens and grizzlies to retain the coarse gravel, the finer material passing on to sluice boxes provided with riffles, supplied with mercury. There are belt conveyers for discharging the gravel and tailings at the end of the vessel remote from the buckets. The water necessary to the process is pumped from the river; as much as 2000 gallons per minute is used on the larger dredges.

The dressing or mechanical preparation of vein stuff containing gold is generally similar to that of other ores (see ORE-DRESSING), except that the precious metal should be removed from the waste substances as quickly as possible, even although other minerals of value that are subsequently to be recovered may be present. If all quartz, pyrites or other vein stuff must be reduced to a very fine powder as a preliminary to further operations. This may be done in several ways, *e.g.* either (1) by the Mexican crusher or *arrastra*, in which the grinding is effected upon a bed of stone, over which heavy blocks of stone attached to cross arms are dragged by the rotation of the arms about a central spindle, or (2) by the Chilean mill or *trapiche*, also known as the edge-runner, where the grinding stones roll upon the floor, at the same time turning about a central upright,—contrivances which are mainly used for the preparation of silver ores; but by far the largest proportion of the gold quartz of California, Australia and Africa is reduced by (3) the stamp mill, which is similar in principle to that used in Europe for the preparation of tin and other ores.

The stamp mill was first used in California, and its use has since spread over the whole world. In the mills of the Californian type the stamps is a heavy cylindrical iron piece, with a chilled cast-iron shoe, removable so that it can be renewed when necessary, attached to a round iron rod or lifter, the whole weighing from 600 to 900 lb; stamps weighing 1320 lb are in use in the Transvaal. The lift is effected by cams acting on lifting-tappets or tappet-heads carried by cylindrical boxes keyed on to the stems of the lifter about one-fourth of their length from the top. As, however, the cams, unlike those of European stamp mills, are placed to one side of the stamp, the latter is not only lifted but turned partly round on its own axis, owing to by the shoes are worn down uniformly. The height of lift may be between 4 and 18 in., and the number of blows from 30 to over 100 per minute. The stamps are usually arranged in batteries of five; the order of working is usually 1, 4, 2, 5, 3, but other arrangements, *e.g.* 1, 3, 5, 2, 4, and 1, 5, 2, 4, 3, are common. The stuff, previously broken to about 2-in. lumps in a rock-breaker, is fed in through an aperture at the back of the "battery box," a constant supply of water is admitted from above, and mercury in a finely divided state is added at frequent intervals. The discharge of the comminuted material takes place through an aperture, which is covered by a thin steel plate perforated with numerous slits about $\frac{5}{8}$th in. broad and $\frac{1}{4}$ in. long, a certain volume being discharged at every blow and carried forward by the flushing water over an apron or table in front, covered by copper plates filled with mercury. Similar plates are often used to catch any particles of gold that may be thrown back, while the main operation is so conducted that the bulk of the gold may be reduced to the state of amalgam by bringing the two metals into intimate contact under the stamp head, and remain in the battery. The tables in front are laid at an incline of about 8° and are about 13 ft. long; they collect from 10 to 15% of the whole gold; a further quantity is recovered by leading the sands through a gutter about 16 in. broad and 120 ft. long, also lined with amalgamated copper plates, after the pyritic and other heavy minerals have been separated by depositing in catch pits and other similar contrivances.

When the ore does not contain any considerable amount of free gold mercury is not, as a rule, used during the crushing, but the amalgamation is carried out in a separate plant. Contrivances of the most diverse constructions have been employed. The most primitive is the rubbing together of the concentrated crushings with mercury in iron mortars. Barrel amalgamation, *i.e.* mixing the crushings with mercury in rotating barrels, is rarely used, the process being wasteful, since the mercury is specially apt to be "floured" (see below).

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At Schemnitz, Kerpeayes, Kreutberg and other localities in Hungary, quartz vein stuff containing a little gold, partly free and partly associated with pyrites and galena, is, after stamping in mills, similar to those described above, but without rotating stamps, passed through the so-called "Hungarian gold mill" or "quick-mill". This consists of a cast-iron pan having a shallow cylindrical bottom holding mercury, in which a wooden muller, nearly of the same shape as the inside of the pan, and armed below with several projecting blades, is made to revolve by steam or hydraulic power. The stuff from the stamps is conveyed to the middle of the muller, and is distributed over the mercury, when the gold subsides, while the quartz and lighter materials are guided by the blades to the circumference and are discharged, usually into a second similar mill; and subsequently pass over blanket tables, *i.e.* boards covered with canvas or sacking, the gold and heavier particles becoming entangled in the fibres. The action of this mill is really more nearly analogous to that of a centrifugal machine as no grinding action takes place in it. The amalgam is cleaned out periodically—fortnightly or monthly—and after filtering through linen bags to remove the excess of mercury, it is transferred to retorts for distillation (see below).

Many other forms of pan-amalgamating machine have been devised. The Laszlo is an improved Hungarian mill, while the Piccard is of the same type. In the Knox and Boss mills, which are also employed for the amalgamation of silver ores, the grinding is effected between flat horizontal surfaces instead of conical or curved surfaces as in the previously described forms.

One of the greatest difficulties in the treatment of gold by amalgamation, and more particularly in the treatment of pyrites, arises from the so-called "sickening" or "flouring" of the mercury; that is, the particles, losing their bright metallic surfaces, are no longer capable of coalescing with or taking up other metals. Of the numerous remedies proposed the most efficacious is perhaps sodium amalgam. It appears that amalgamation is often impeded by the tarnish found on the surface of the gold when it is associated with sulphur, arsenic, bismuth, antimony or tellurium. Henry Wurtz in America (1864) and Sir William Crookes in England (1865) made independently the discovery that, by the addition of a small quantity of sodium to the mercury, the operation is much facilitated. It is also stated that sodium prevents both the "sickening" and the "flouring" of the mercury which is produced by certain associated minerals. The addition of potassium cyanide has been suggested to assist the amalgamation and to prevent "flouring," but Skey has shown that its use is attended with loss of gold.

Separation of Gold from the Amalgam.—The amalgam is first pressed in wetted canvas or buckskin bags in order to remove excess of mercury. Lumps of the solid amalgam, about 2 in. in diameter, are introduced into an iron vessel provided with an iron tube that leads into a condenser containing water. The distillation is then effected by heating to dull redness. The amalgam usually contains 30 to 40% of gold. Horizontal cylindrical retorts, holding from 200 to 1200 lb of amalgam, are used in the larger Californian mills, pot retorts being used in the smaller mills. The bullion left in the retort is then melted in black-lead crucibles, with the addition of small quantities of suitable fluxes, *e.g.* nitre, sodium carbonate, &c.

The extraction of gold from auriferous minerals by fusion, except as an incident in their treatment for other metals, is very rarely practised. It was at one time practised on the concentrated black iron obtained in the Ural gold washings, which consists chiefly of magnetite, as an iron ore, by smelting it with charcoal for auriferous pig-iron, the latter metal possessing the property of dissolving gold in considerable quantity. By subsequent treatment with sulphuric acid the gold could be recovered. Experiments on this point were made by Anossow in 1835, but they have never been followed in practice.

Gold in galena or other lead ores is invariably recovered in the refining or treatment of the lead, and silver obtained. Pyritic ores containing copper are treated by methods analogous to those of the copper smelter. In Colorado the pyritic ores containing gold and silver in association with copper are smelted in reverberatory furnaces for regulus, which, when desilverized by Ziervogel's method, leaves a residue containing 20 or 30 oz. of gold per ton. This is smelted with rich gold ores, notably those containing tellurium, for white metal or regulus; and by a following process of partial reduction analogous to that of selecting in copper smelting, "bottoms" of impure copper are obtained in which practically all the gold is concentrated. By continuing the treatment of these in the ordinary way of refining, poling and granulating, all the foreign matters other than gold, copper and silver are removed, and, by exposing the granulated metal to a high oxidizing heat for a considerable time the copper may be completely oxidized while the precious metals are unaltered. Subsequent treatment with sulphuric acid renders the copper soluble in water as sulphate, and the final residue consists only gold and silver, which is parted or refined in the ordinary way. This method of separating gold from copper, by converting the latter into oxide and sulphate, is also used at Oker in the Harz.

Extraction by Means of Aqueous Solutions.—Many processes have been suggested in which the gold of auriferous deposits is converted into products soluble in water, from which solutions the gold may be precipitated. Of these processes, two only are of special importance, viz. the chlorination or Plattner process, in which the metal is converted into the chloride, and the cyanide or MacArthur-Forrest process, in which it is converted into potassium aurocyanide.

(3) *Chlorination or Plattner Process.*—In this process moistened gold ores are treated with chlorine gas, the resulting gold chloride dissolved out with water, and the gold precipitated with ferrous sulphate, charcoal, sulphuretted hydrogen or otherwise. The process originated in 1848 with C. F. Plattner, who suggested that the residues from certain mines at Reichenstein, in Silesia, should be treated with chlorine after the arsenical products had been extracted by roasting. It must be noticed, however, that Percy independently made the same discovery, and stated his results at the meeting of the British Association (at Swansea) in 1849, but the Report was not published until 1852. The process was introduced in 1858 by Deetken at Grass Valley, California, where the waste minerals, principally pyrites from tailings, had been worked for a considerable time by amalgamation. The process is rarely applied to ores direct; free-milling ores are generally amalgamated, and the tailings and slimes, after concentration, operated upon. Three stages in the process are to be distinguished: (i.) calcination, to convert all the metals, except gold and silver, into oxides, which are unacted upon by chlorine; (ii.) chlorinating the gold and lixiviating the product; (iii.) precipitating the gold.

The calcination, or roasting, is conducted at a low temperature in some form of reverberatory furnace. Salt is added in the roasting to convert any lime, magnesia or lead which may be present, into the corresponding chlorides. The auric chloride is, however, decomposed at the elevated temperature into finely divided metallic gold, which is then readily attacked by the chlorine gas. The high volatility of gold in the presence of certain metals must also be considered. According to Egleston the loss may be from 40 to 90% of the gold present in cupreous ores according to the temperature and duration of calcination. The roasted mineral, slightly moistened, is introduced into a vat made of stoneware or pitched planks, and furnished with a double bottom. Chlorine, generally prepared by the interaction of pyrolusite, salt and sulphuric acid, is led from a suitable generator beneath the false bottom, and rises through the moistened ore, which rests on a bed of broken quartz; the gold is thus converted into a soluble chloride, which is afterwards removed by washing with water. The lead and roasting vats are employed, the chlorination proceeding more rapidly in the latter case; rotating barrels are sometimes used. There have also been introduced processes in which the chlorine is generated in the chloridizing vat, the reagents used being dilute solutions of bleaching powder and an acid. Munktell's process is of this type. In the Thies process, used in many districts in the United States, the vats are rotating barrels made, in the later forms, of iron lined with lead, and provided with a filter formed of a finely perforated leaden grating running from one end of the barrel to the other, and rigidly held in place by wooden frames. Chlorine is generated within the barrel from sulphuric acid and chloride of lime. After charging, the barrel is rotated, and when the chlorination is complete the contents are emptied on a filter of quartz or some similar material, and the filtrate led to settling tanks.

After settling the solution is run into the precipitating tanks. The precipitants in use are: ferrous sulphate, charcoal and sulphuretted hydrogen, either alone or mixed with sulphur dioxide; the use of copper and iron sulphides has been suggested, but apparently these substances have achieved no success.

In the case of ferrous sulphate, prepared by dissolving iron in dilute sulphuric acid, the reaction follows the equation $AuCl_3+3FeSO_4 = FeCl_3+Fe_2(SO_4)_3+Au$. At the same time any lead, calcium, barium and strontium present are precipitated as sulphates; it is therefore advantageous to remove these metals by the preliminary addition of sulphuric acid, which also serves to keep any basic iron salts in solution. The precipitation is carried out in tanks or vats made with wooden sides and a cement bottom. The solutions are well mixed by stirring with wooden poles, and the gold allowed to settle, the time allowed varying from 12 to 72 hours. The supernatant liquid is led into settling tanks, where a further amount of gold is deposited, and is then filtered through sawdust or sand, the sawdust being afterwards burned and the gold separated from the ashes and the sand treated in the chloridizing vat. The precipitated gold is washed, treated with salt and sulphuric acid to remove iron salts, roughly dried by pressing in cloths or on filter paper, and then melted with salt, borax and nitre in graphite crucibles. Thus prepared it has a fineness of 800-960, the chief impurities usually being iron and lead.

Charcoal is used as the precipitant at Mount Morgan, Australia. Its use was proposed as early as 1818 and 1819 by Hare and Henry; Percy advocated it in 1869, and Davis adopted it on the large scale at a works in Carolina in 1880. The action is not properly understood; it may be due to the reducing gases (hydrogen, hydrocarbons, &c.) which are invariably present in wood charcoal. The process consists essentially in running the solution over layers of charcoal, the charcoal being afterwards burned. It has been found that the reaction proceeds faster when the solution is heated.

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Precipitation with sulphur dioxide and sulphuretted hydrogen proceeds much more rapidly, and has been adopted at many works. Sulphur dioxide, generated by burning sulphur, is forced into the solution under pressure, where it interacts with any free chlorine present to form hydrochloric and sulphuric acids. Sulphuretted hydrogen, obtained by treating iron sulphide or a coarse matte with dilute sulphuric acid, is forced in similarly. The gold is precipitated as the sulphide, together with any arsenic, antimony, copper, silver and lead which may be present. The precipitate is collected in a filter-press, and then roasted in muffle furnaces with nitre, borax and sodium carbonate. The fineness of the gold so obtained is 900 to 950.

4. *Cyanide Process.*—This process depends upon the solubility of gold in a dilute solution of potassium cyanide in the presence of air (or some other oxidizing agent), and the subsequent precipitation of the gold by metallic zinc or by electrolysis. The solubility of gold in cyanide solutions was first shown by R. W. Scheele in 1782; and M. Faraday applied it to the preparation of extremely thin films of the metal. L. Elsner recognized, in 1846, the part played by the atmosphere, and in 1879 Dixon showed that bleaching powder, manganese dioxide, and other oxidizing agents, facilitated the solution. S. B. Christy (*Trans. A.I.M.E.*, 1896, vol. 26) has shown that the solution is hastened by many oxidizing agents, especially sodium and manganese dioxides and potassium ferricyanide. According to G. Bodländer (*Zeit. f. angew. Chem.* 1896, 141) the rate of solution in potassium cyanide depends upon the subdivision of the gold—the finer the subdivision the quicker the solution,—and on the concentration of the solution—the rate increasing until the solution contains 0·05 % of cyanide, and remaining fairly constant with increasing concentration. The action proceeds in two stages; in the first hydrogen peroxide and potassium aurocyanide are formed, and in the second the hydrogen peroxide oxidizes a further quantity of gold and potassium cyanide (see also Bodländer, *loc. cit.*)—thus (1) $2Au+4KCN+O_2+2H_2O=2KAu(CN)_2+4KOH+H_2O_2$; (2) $2Au+4KCN+2H_2O_2=2KAu(CN)_2+4KOH$. The endreaction may be written $4Au+8KCN+2H_2O+O_2=4KAu(CN)_2+4KOH$.

The commercial process was patented in 1890 by MacArthur and Forrest, and is now in use all over the world. It is best adapted for free-milling ores, especially after the bulk of the gold has been removed by amalgamation. It has been especially successful in the Transvaal. In the Witwatersrand banket ore, which contains about 9 dwts. of gold to the metric ton (2000 lb), is stamped and amalgamated, and the slimes and tailings, containing about 3½ dwts. per ton, are cyanided, about 2 dwts. more being thus extracted. The total cost per ton of ore treated is about 6s., of which the cyaniding costs from 2s. to 4s.

The process embraces three operations: (1) Solution of the gold; (2) precipitation of the gold; (3) treatment of the precipitate.

The ores, having been broken and ground, generally in tube mills, until they pass a 150 to 200-mesh sieve, are transferred to the leaching vats, which are constructed of wood, iron or masonry; steel vats, coated inside and out with pitch, of circular section and holding up to 1000 tons, have come into use. The diameter is generally 26 ft., but may be greater; the best depth is considered to be a quarter of the diameter. The vats are fitted with filters made of coco-nut matting and jute cloth supported on wooden frames. The leaching is generally carried out with a strong, medium and a weak liquor, in the order given; sometimes there is a preliminary leaching with a weak liquor. The strengths employed depend also upon the mode of precipitation adopted, stronger solutions (up to 0·25 % KCN) being used when zinc is the precipitant, the electrolytic precipitation of the solution may contain up to 0·1 % KCN. The liquors are run off from the vats to the electrolysing baths or precipitating tanks, and the leached ores are removed by means of doors in the sides of the vats into wagons. In the Transvaal the process occupies 3 to 4 days for fine sands, and up to 14 days for coarse sands; the quantity of cyanide per ton of tailings varies from 0·26 to 0·28 lb, for electrolytic precipitation, and 0·5 lb for zinc precipitation.

The precipitation is effected by zinc in the form of bright turnings, or coated with lead, or by electrolysis. According to Christy, the precipitation with zinc follows equations 1 or 2 according as potassium cyanide is present or not:

(1) $4\ KAu(CN)_2+4Zn+2H_2O=2Zn(CN)_2+K_2Zn(CN)_4+Zn(OK)_2+4H+4Au$;

(2) $2KAu(CN)_2+3Zn+4KCN+2H_2O=2K_2Zn(CN)_4+Zn(OK)_2+4H+2Au$;

one part of zinc precipitating 3·1 parts of gold in the first case, and 2·06 in the second. It may be noticed that the potassium zinc cyanide is useless in gold extraction, and it neither dissolves gold nor can potassium cyanide be regenerated from it.

The precipitating boxes, generally made of wood but sometimes of steel, and set on an incline, are divided by partitions into alternately wide and narrow compartments, so that the liquor travels upwards in its passage through the wide divisions and downwards through the narrow divisions. In the wider compartments are placed sieves having sixteen holes to the square inch and bearing zinc turnings. The gold and other metals are precipitated on the under surfaces of the turnings and fall to the bottom of the compartment as a black slime. The slime is cleaned out fortnightly or monthly, the zinc turnings being cleaned by rubbing and the supernatant liquor allowed to settle in the precipitating boxes or in separate vessels. The slime so obtained consists of finely divided gold and silver (5–50 %), zinc (30–60 %), lead (2–10 %), carbon (2–10 %), together with tin, copper, antimony, arsenic and other impurities of the zinc and ores. After well washing with water, the slimes are roughly dried in bag-filters or filter-presses, and then treated with dilute sulphuric acid, the solution being heated by steam. This dissolves out the zinc. Lime is added to bring down the gold, and the sediment, after washing and drying, is fused in graphite crucibles.

5. *Electrolytic Processes.*—The electrolytic separation of the gold from cyanide solutions was first practised in the Transvaal. The process, as elaborated by Messrs. Siemens and Halske, essentially consists in the electrolysis of weak solutions with iron or steel plate anodes, and lead cathodes, the latter, when coated with gold, being fused and compelled. Its advantages over the zinc process are that the deposited gold is purer and more readily extracted, and that weaker solutions can be employed, thereby effecting an economy in cyanide.

In the process employed at the Worcester Works in the Transvaal, the liquors, containing about 150 grains of gold per ton and from 0·08 to 0·09 % of cyanide, are treated in rectangular vats in which is placed a series of iron and leaden plates at intervals of 1 in. The cathodes, which are sheets of thin lead foil weighing 1½ lb to the sq. yd., are removed monthly, their gold content being from 0·5 to 1·0 %. The foil is folded up, melted in reverberatory furnaces to ingots containing 2 to 4 % of gold. Cupellation brings up the gold to about 900 fine. Many variations of the electrolytic process as above outlined have been suggested. S. Cowper Coles has suggested aluminium cathodes; Andreoli has recommended cathodes of iron and anodes of lead coated with lead peroxide, the gold being removed from the iron cathodes by a brief immersion in molten lead; in the Ferraris-Erici process the gold is amalgamated at a mercury cathode (see also below).

Refining or Parting of Gold.—Gold is almost always silver-bearing, and it may be also noticed that silver generally contains some gold. Consequently the separation of these two metals is one of the most important metallurgical processes. In addition to the separation of the silver the operation extends to the elimination of the last traces of lead, tin, arsenic, &c. which have resisted the preceding cupellation.

The "parting" of gold and silver is of considerable antiquity. Thus Strabo states that in his time a process was employed for refining and purifying gold in large quantities by cementing or burning it with an aluminous earth, which, by destroying the silver, left the gold in a state of purity. Pliny shows that for this purpose the gold was placed on the fire in an earthen vessel with a treble its weight of salt, and that it was afterwards again exposed to the fire with two parts of salt and one of argillaceous rock, which, in the presence of moisture, effected the decomposition of the salt; by this means the silver became converted into chloride.

The methods of parting can be classified into "dry," "wet" and electrolytic methods. In the "dry" methods the silver is converted into sulphide or chloride, the gold remaining unaltered; in the "wet" methods the silver is dissolved by sulphuric acid or boiling sulphuric acid; and in the electrolytic processes advantage is taken of the fact that under certain current densities and other circumstances silver passes from an anode composed of a gold-silver alloy to the cathode more readily than gold. Of the dry methods only F. B. Miller's chlorine process is of any importance, this method, and the wet process of refining by sulphuric acid, together with the electrolytic process, being the only ones now practised.

The conversion of silver into the sulphide may be effected by heating with antimony sulphide, litharge and sulphur, pyrites, or with sulphur alone. The antimony, or *Guss und Fluss*, method was practised up till 1846 at the Dresden mint; it is only applicable to alloys containing more than 50 % of gold. The fusion results in the formation of a gold-antimony alloy, from which the antimony is removed by an oxidizing fusion with nitre. The sulphur and litharge, or *Pfanneneschmied*, process was used to concentrate the gold in the alloy in order to make it amenable to "quartation," or parting with nitric acid. Fusion with sulphur was used for the same purpose as the Pfannenschmied process. It was employed in 1797 at the St Petersburg mint.

The conversion of the silver into the chloride may be effected by means of salt—the "cementation" process—or other chlorides, or by free chlorine—Miller's process. The first process consists essentially in heating the alloy with salt and brickdust; the latter absorbs the chlorine formed, while the gold remains behind as an alloy no longer employed. The second process depends upon the fact that, if chlorine be led into the molten alloy, the base metals and the silver are converted into chlorides. It was proposed in 1858 by Lewis Thompson, but it was only applied commercially after Miller's improvements in 1867, when it was adopted at the Sydney mint. Sir W. C. Roberts-Austen introduced it at the London mint; and it has also been used at Pretoria. It is especially suitable to gold containing little silver and base metals—a character of Australian gold—but it yields to the sulphuric acid and electrolytic methods in point of economy.

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The separation of gold from silver in the wet way may be effected by nitric acid, sulphuric acid or by a mixture of sulphuric acid and *aqua regia*.

Parting by nitric acid is of considerable antiquity, being mentioned by Albertus Magnus (13th cent.), Biringuccio (1540) and Agricola (1556). It is now rarely practised, although in some refineries both the nitric acid and the sulphuric acid processes are combined, the alloy being first treated with nitric acid, or "used to be called" quartation" or "inquartation," from the fact that the alloy best suited for the operation of refining contained 3 parts of silver to 1 of gold. The operation may be conducted in vessels of glass or platinum, and each pound of granulated metal treated with a pound and a quarter of nitric acid of specific gravity 1·32. The method is sometimes employed in the assay of gold.

Refining by sulphuric acid, the process usually adopted for separating gold from silver, was first employed on the large scale by d'Arcet in Paris in 1802, and was introduced into the Mint refinery, London, by Mathison in 1829. It is based upon the facts that concentrated hot sulphuric acid converts silver and copper into soluble sulphates without attacking the gold, the silver sulphate being subsequently reduced to the metallic state by copper plates with the formation of copper sulphate. It is applicable to any alloy, and is the best method for parting gold with the exception of the electrolytic method.

The process embraces four operations: (1) the preparation of an alloy suitable for parting; (2) the treatment with sulphuric acid; (3) the treatment of the residue for gold; (4) the treatment of the solution for silver.

It is necessary to remove as completely as possible any lead, tin, bismuth, antimony, arsenic and tellurium, impurities which impair the properties of gold and silver, by an oxidizing fusion, *e.g.* with nitre. Over 10 % of copper makes the parting difficult; consequently when alloys with percentages of copper is diminished either by the addition of silver free from copper, or else the copper is removed by a chemical process. Other undesirable impurities are the platinum metals, special treatment being necessary when these substances are present. The alloy, after the preliminary refining, is granulated by being poured, while molten, in a thin stream into cold water which is kept well agitated.

The acid treatment is generally carried out in cast iron pots; platinum vessels used to be employed, while porcelain vessels are only used for small operations, *e.g.* for charges of 190 to 225 oz. as at Oker in the Harz. The pots, which are usually cylindrical with a hemispherical bottom, may hold as much as 13,000 to 16,000 oz. of alloy. They are provided with lids, made either of cast iron or of sheet iron with lead, which have openings to serve for the introduction of the alloy and acid, and a vent tube to lead off the vapours evolved during the operation. The bullion with about twice its weight of sulphuric acid of 66° Bé is placed together with copper, lead and silver sulphates. Since the action is sometimes very violent, especially when the bullion is treated in the granulated form (it is steadier when thin plates are operated upon), it is found expedient to add the acid in several portions. The heating is continued for 4 to 12 hours according to the amount of silver present; the end of the reaction is known by the absence of any hissing. Generally the reaction mixture is allowed to cool, and the residue, which settles to the bottom of the pot, consists of gold together with copper, lead and iron sulphates, which are insoluble in strong sulphuric acid; silver sulphate may also separate if present in sufficient quantity and the solution be sufficiently cooled. The solution is removed by ladles or by siphons, and the residue is leached out with boiling water; this removes the sulphates. A certain amount of silver is still present and, according to M. Pettenkofer, it is impossible to remove all the silver by means of sulphuric acid. Several methods are in use for removing the silver. Fusion with an alkaline bisulphate converts the silver into the sulphate, which may be extracted by boiling with sulphuric acid and then with water. Another process consists in treating a mixture of the residue with one-quarter of its weight of calcined sodium sulphate with sulphuric acid, the residue being finally boiled with a large quantity of acid. Or the alloy is dissolved in *aqua regia*, the solution filtered from the insoluble silver chloride, and the gold precipitated by ferrous chloride.

The silver present in the solution obtained in the sulphuric acid boiling is recovered by a variety of processes. The solution may be directly precipitated with copper, the copper passing into solution as copper sulphate, and the silver separating as a mud, termed "cement silver." Or the silver and copper may be separated from the solution by cooling and dilution, and then mixed with iron clippings, the interaction being accompanied with a considerable evolution of heat. Or Gutzkow's method of precipitating the metal with ferrous sulphate may be employed.

The electrolytic parting of gold and silver has been shown to be more economical and free from the objections—such as the poisonous fumes—of the sulphuric acid process. One process depends upon the fact that, with a suitable current density, if a very dilute solution of silver nitrate be electrolysed between an auriferous silver anode and a silver cathode, the silver of the anode is dissolved out and deposited at the cathode, the gold remaining at the anode. The silver is quite free from gold, and the gold after boiling with nitric acid has a fineness of over 999.

Gold is left in the anode slime when copper or silver are refined by the usual processes, but if the gold preponderate in the anode these processes are inapplicable. A cyanide bath, as used in electroplating, would dissolve the gold, but is not suitable for refining, because other metals (silver, copper, &c.) passing with gold into the solution would deposit with it. Bock, however, in 1880 (*Berg- und hüttenmännische Zeitung*, 1880, p. 411) described a process used at the North German Refinery in Hamburg for the refining of gold containing platinum with a small proportion of silver, lead or bismuth, and a subsequent patent specification (1896) and a paper by Wohlwill (*Zeits. f. Elektrochem.*, 1898, pp. 379, 402, 421) have thrown more light upon the process. The electrolyte is gold chloride (2–3 parts of pure gold per 100 of solution) mixed with from 2 to 6 % of the strongest hydrochloric acid to render the gold anodes readily soluble, which they are not in the neutral chloride solution. The bath is used at 65° to 70° C. (150° to 158° F.), and free chlorine be evolved, which is known at once by its pungent smell, the temperature is raised or more acid is added, to promote the solubility of the gold. The bath is used with a current-density of 100 ampères per sq. ft. at 1 volt (or higher), with electrodes about 1·2 in. apart. In this process all the anode metals pass into solution except iridium and other refractory metals of that group, which remain as metals, and silver, which is converted into insoluble chloride; lead and bismuth form chloride and oxychloride respectively, and these dissolve until the bath is saturated with them, and then precipitate with the silver in the tank. But if the gold-strength of the bath be maintained, only gold is deposited at the cathode—in a loose powdery condition from pure solutions, but in a smooth detachable deposit from impure liquors. Under good conditions the gold should contain 99·98 % of the pure metal. The tank is of porcelain or glazed earthenware, the electrodes for impure solutions are ½ in. apart (or more with pure solutions), and are on the multiple system, and the potential difference at the terminals of the tank is 1 volt. A high resistance being employed, the turn-over of gold is rapid—an essential factor of success when the costliness of the metal is taken into account. Platinum and palladium dissolved from the anode accumulate in the solution, and are removed at intervals of, say, a few months by chemical precipitation. It is essential that the bath should not contain more than 5 % of palladium, or some of this metal will deposit with the gold. The slimes are treated chemically for the separation of the metals contained in them.

AUTHORITIES.—Standard works on the metallurgy of gold are the treatises of T. Kirke Rose and of M. Eissler. The cyanide process is especially treated by M. Eissler, *Cyanide Process for the Extraction of Gold*, which pays particular attention to the various treatment methods; Alfred James, *Cyanide Practice*; H. Forbes Julian and Edgar Smart, *Cyaniding Gold and Silver Ores*. Gold milling is treated by Henry Louis, *A Handbook of Gold Milling*; C. G. Warnford Lock, *Gold Milling*; T. A. Rickard, *Stamp Milling of Gold Ores*. Gold dredging is treated by Captain C. C. Longridge in *Gold Dredging*, and hydraulic mining is discussed by the same author in his *Hydraulic Mining*. For operations in special districts see J. M. Maclaren, *Gold* (1906); J. H. Curle, *Gold Mines of the World*; Africa: F. H. Hatch and J. A. Chalmers, *Gold Mines of the Rand*; S. J. Truscott, *Witwatersrand Goldfields Banket and Mining Practice*; Australasia: D. Clark, *Australian Mining and Metallurgy*; Karl Schmeisser, *Goldfields of Australasia*; A. C. Charleton, *Gold Mining and Milling in Western Australia*; India: F. H. Hatch, *The Kolar Gold-Field*.

GOLD AND SILVER THREAD. Under this heading some general account may be given of gold and silver strips, threads and gimp used in connexion with variation of weaving, embroidery and twisting and plaiting or lace work. To this day, in many oriental centres where it seems that early traditions of the knowledge and the use of fabrics wholly or partly woven, ornamented, and embroidered with gold and silver have been maintained, the passion for such brilliant and costly textiles is still strong and prevalent. One of the earliest mentions of the use of gold in a woven fabric occurs in the description of the ephod made for Aaron (Exod. xxxix. 2, 3), "And he made the ephod of gold, blue, and purple, and scarlet, and fine twined linen. And they did beat the gold into thin plates, and cut it into wires (strips), to work it in the blue, and in the purple, and in the scarlet, and in the fine linen, with cunning work." This is suggestive of early Syrian or Arabic in-darning or weaving with gold strips or tinsel. In both the *Iliad* and the *Odyssey* allusion is frequently made to inwoven and embroidered golden textiles. Assyrian sculpture gives an elaborately designed ornament upon the robe of King Assur-nasir-pal (884 B.C.) which was probably an interweaving of gold and coloured threads, and testifies tu the consummate skill of Assyrian or Babylonian workers at that date. From Assyrian and Babylonian weavers the conquering Persians of the time of Darius derived their celebrity as weavers and users of splendid stuffs. Herodotus describes

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the corselet given by Amasis king of Egypt to the Minerva of Lindus and how it was inwoven or embroidered with gold. Darius, we are told, wore a war mantle on which were figured (probably inwoven) two golden hawks as if pecking at each other. Alexander the Great is said to have found Eastern kings and princes arrayed in robes of gold and purple. More than two hundred years later than Alexander the Great was the king of Pergamos (the third bearing the name Attalus) who gave much attention to working in metals and is mentioned by Pliny as having invented weaving with gold, hence the historic Attalic cloths. There are several references in Roman writings to costumes and stuffs woven and embroidered with gold threads and the Graeco-Roman *chryso-phrygium* and the Roman *auri-phrygium* are evidences not only of Roman work with gold threads but also of its indebtedness to Phrygian sources. The famous tunics of Agrippina and those of Heliogabalus are said to have been of tissues made entirely with gold threads, whereas the robes which Marcus Aurelius found in the treasury of Hadrian, as well as the costumes sold at the dispersal of the wardrobe of Commodus, were different in character, being of fine linen and possibly even of silken stuffs inwoven or embroidered with gold threads. The same description is perhaps correct of the reputedly splendid hangings with which King Dagobert decorated the early medieval oratory of St Denis. Reference to these and many such stuffs is made by the respectively contemporary or almost contemporary writers; and a very full and interesting work by Monsieur Francisque Michel (Paris, 1852) is still a standard book for consultation in respect of the history of silk, gold and silver stuffs.

From indications such as these, as well as those of later date, one sees broadly that the art of weaving and embroidering with gold and silver threads passed from one great city to another, travelling as a rule westward. Babylon, Tarsus, Bagdad, Damascus, the islands of Cyprus and Sicily, Constantinople, Venice and southern Spain appear successively in the process of time as famous centres of these much-prized manufactures. During the middle ages European royal personages and high ecclesiastical dignitaries used cloth and tissues of gold and silver for their state and ceremonial robes, as well as for costly hangings and decoration; and various names—ciclatoun, tartarium, naques or nac, baudekin or baldachin (Bagdad) and tissue—were applied to textiles in the making of which gold threads were almost always introduced in combination with others. The thin flimsy paper known as tissue paper is so called because it originally was placed between the folds of gold "tissue" (or weaving) to prevent the contiguous surfaces from fraying each other. Under the articles dealing with carpets, embroidery, lace and tapestry will be found notices of the occasional use in such productions of gold and silver threads. Of early date in the history of European weaving are rich stuffs produced in Southern Spain by Moors, as well as by Saracenic and Byzantine weavers at Palermo and Constantinople in the 12th century, in which metallic threads were freely used. Equally esteemed at about the same period were corresponding stuffs made in Cyprus, whilst for centuries later the merchants in such fabrics eagerly sought for and traded in Cyprus gold and silver threads. Later the actual manufacture of them was not confined to Cyprus, but was also carried on by Italian thread and trimming makers from the 14th century onwards. For the most part the gold threads referred to were of silver gilt. In rare instances of middle-age Moorish or Arabian fabrics the gold threads are made with strips of parchment or paper gilt and still rarer are instances of the use of real gold wire.

In India the preparation of varieties of gold and silver threads is an ancient and important art. The "gold wire" of the manufacturer has been and is as a rule silver wire gilt, the silver wire being, of course, composed of pure silver. The wire is drawn by means of simple draw-plates, with rude and simple appliances, from rounded bars of silver, or gold-plated silver, as the case may be. The wire is flattened into strip, tinsel or ribbon-like form, by passing fourteen or fifteen strands simultaneously, over a fine, smooth, round-topped anvil and beating each as it passes with a heavy hammer having a slightly convex surface. Such strips or tinsel of wire so flattened are woven into Indian *sonirí*, tissue or cloth of gold, the web or warp being composed entirely of golden strips, and *ruperi*, similar tissue of silver. Other gold and silver threads suitable for use in embroidery, pillow and needlepoint lace making, &c., consist of fine strips of flattened wire wound round cores of orange (in the case of silver, white) silk thread so as to completely cover them. Wires flattened or partially flattened are also twisted into exceedingly fine spirals and much used for heavy embroideries. Spangles for embroideries, &c., are made from spirals of comparatively stout wire, by cutting them down ring by ring, laying each C-like ring on an anvil, and by a smart blow with a hammer flattening it out into a thin round disk with a slit extending from the centre to one edge. The demand for many kinds of loom-woven and embroidered gold and silver work in India is immense, and the variety of textiles so ornamented is also very great, chief amongst which are the golden or silvery tinsel fabrics known as kincobs.

Amongst Western communities the demand for gold and silver embroideries and braid lace now exists chiefly in connexion with naval, military and other uniforms, masonic insignia, court costumes, public and private liveries, ecclesiastical robes and draperies, theatrical dresses, &c.

The proportions of gold and silver in the gold thread for the woven braid lace or ribbon trade varies, but in all cases the proportion of gold is exceedingly small. An ordinary gold braid wire is drawn from a bar containing 90 parts of silver and 7 of copper, and plated with 3 of gold. On an average each ounce troy of a bar so plated is drawn into 1500 yds. of wire; and therefore about 16 grains of gold cover 1 m. of wire. (A. S. C.)

GOLDAST AB HAIMINSFELD, MELCHIOR (1576–1635), Swiss writer, an industrious though uncritical collector of documents relating to the medieval history and Constitution of Germany, was born on the 6th of January 1576 (some say 1578), of poor Protestant parents, near Bischofszell, in the Swiss Canton of Thurgau. His university career, first at Ingolstadt (1585–1586), then at Altdorf near Nuremberg (1597–1598), was cut short by his poverty, from which he suffered all his life, and which was the main cause of his wanderings. In 1598 he found a rich protector in the person of Bartholomaeus Schobinger, of St Gall, by whose liberality he was enabled to study at St Gall (where he first became interested in medieval documents, which abound in the conventual library) and elsewhere in Switzerland. Before his patron's death (1604) he became (1603) secretary to Henry, duke of Bouillon, with whom he went to Heidelberg and Frankfort. But in 1604 he entered the service of the Baron von Hohensax, then the possessor of the precious MS. volume of old German poems, returned from Paris to Heidelberg in 1888, and, partially published by Goldast. Soon he was back in Switzerland, and by 1606 in Frankfort, earning his living by preparing and correcting books for the press. In 1611 he was appointed councillor at the court of Saxe-Weimar, and in 1615 he entered the service of the count of Schaumburg at Bückeburg. In 1624 he was forced by the war to retire to Bremen; there in 1625 he deposited his library in that of the town (his books were bought by the town in 1646, but many of his MSS. passed to Queen Christina of Sweden, and hence are now in the Vatican library), he himself returning to Frankfort. In 1627 he became councillor to the emperor and to the archbishop-elector of Trèves, and in 1633 passed to the service of the landgrave of Hesse-Darmstadt. He died at Giessen early in 1635.

His immense industry is shown by the fact that his biographer, Senckenburg, gives a list of 65 works published or written by him, some extending to several substantial volumes. Among the more important are his *Paraeneticorum veterum pars i.* (1604), which contained the old German tales of *Kunig Tyrol von Schotten*, the *Winsbeke* and the *Winsbekin*; *Suevicarum rerum scriptores* (Frankfort, 1605, new edition, 1727); *Rerum Alamannicarum scriptores* (Frankfort, 1606, new edition by Senckenburg, 1730); *Constitutiones imperiales* (Frankfort, 1607–1613, 4 vols.); *Monarchia s. Romani imperii* (Hanover and Frankfort, 1612–1614,

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3 vols.); *Commentarii de regni Bohemiae juribus* (Frankfort, 1627, new edition by Schmink, 1719). He also edited De Thou's *History* (1609–1610) and Willibald Pirckheimer's works (1610). In 1688 a volume of letters addressed to him by his learned friends was published.

Life by Senckenburg, prefixed to his 1730 work. See also R. von Raumer's *Geschichte d. germanischen Philologie* (Munich, 1870).

(W. A. B. C.)

GOLDBEATING.—The art of goldbeating is of great antiquity, being referred to by Homer; and Pliny (*N.H.* 33. 19) states that 1 oz. of gold was extended to 750 leaves, each leaf being four fingers (about 3 in.) square; such a leaf is three times as thick as the ordinary leaf gold of the present time. In all probability the art originated among the Eastern nations, where the working of gold and the use of gold ornaments have been distinguishing characteristics from the most remote periods. On Egyptian mummy cases specimens of original leaf-gilding are met with, where the gold is so thin that it resembles modern gilding (*q.v.*). The minimum thickness to which gold can be beaten is not known with certainty. According to Mersenne (1621) 1 oz. was spread out over 105 sq. ft.; Réaumur (1711) obtained 146½ sq. ft.; other values are 180 sq. ft. and 300 sq. ft. Its malleability is greatly diminished by the presence of other metals, even in very minute quantity. In practice the average degree of tenuity to which the gold is reduced is not nearly so great as the last example quoted above. A "book of gold" containing 25 leaves measuring each 3¼ in., equal to an area of 264 sq. in., generally weighs from 4 to 5 grains.

The gold used by the goldbeater is variously alloyed, according to the colour required. Fine gold is commonly supposed to be incapable of being reduced to thin leaves. This, however, is not the case, although its use for ordinary purposes is undesirable on account of its greater cost. It also adheres on one part of a leaf touching another, thus causing a waste of labour by the leaves being spoiled; but for work exposed to the weather it is much preferable, as it is more durable, and does not tarnish or change colour. The external gilding on many public buildings, *e.g.* the Albert Memorial in Kensington Gardens, London, is done with pure gold. The following is a list of the principal classes of leaf recognized and ordinarily prepared by British beaters, with the proportions of alloy per oz. they contain.

Name of Leaf.	Proportion of Gold.	Proportion of Silver.	Proportion of Copper.
	Grains.	Grains.	Grains.
Red	456–460	..	20–24
Pale red	464	16	16
Extra deep	456	12	12
Deep	444	24	12
Citron	440	30	10
Yellow	408	72	..
Pale yellow	384	96	..
Lemon	360	120	..
Green or pale	312	168	..
White	240	240	..

The process of goldbeating is as follows: The gold, having been alloyed according to the colour desired, is melted in a crucible at a higher temperature than is simply necessary to fuse it, as its malleability is improved by exposure to a greater heat; sudden cooling does not interfere with its malleability, gold differing in this respect from some other metals. It is then cast into an ingot, and flattened, by rolling between a pair of powerful smooth steel rollers, into a ribbon of ⅛ in. wide and to ft. in length to the oz. After being flattened it is annealed and cut into pieces of about 6½ grs. each, or about 75 per oz., and placed between the leaves of a "cutch," which is about ¼ in. thick and 3¼ in. square, containing about 180 leaves of a tough paper. Formerly fine vellum was used for this purpose, and generally still it is interleaved in the proportion of about one of vellum to six of paper. The cutch is beaten on for about 20 minutes with a 17-lb hammer, which rebounds by the elasticity of the skin, and saves the labour of lifting, by which the gold is spread to the size of the cutch; each leaf is then taken out, and cut into four pieces, and put between the skins of a "shoder," 4½ in. square and ¼ in. thick, containing about 720 skins, which have been worn out in the finishing or "mould" process. The shoder requires about two hours' beating upon with a 9-lb hammer. As the gold will spread unequally, the shoder is beaten upon after the larger leaves have reached the edges. The effect of this is that the margins of larger leaves come out of the edges in a state of dust. This allows time for the smaller leaves to reach the full size of the shoder, thus producing a general evenness of size in the leaves. Each leaf is again cut into four pieces, and placed between the leaves of a "mould," composed of about 950 of the finest gold-beaters' skins, 5 in. square and ¼ in. thick, the contents of one shoder filling three moulds. The material has now reached the last and most difficult stage of the process; and on the fineness of the skin and judgment of the workman the perfection and thinness of the leaf of gold depend. During the first hour the hammer is allowed to fall principally upon the centre of the mould. This causes gaping cracks upon the edges of the leaves, the sides of which readily coalesce and unite without leaving any trace of the union after being beaten upon. At the second hour, when the gold is about the 150,000th part of an inch in thickness, it for the first time permits the transmission of the rays of light. Pure gold, or gold but slightly alloyed, transmits green rays; gold highly alloyed with silver transmits pale violet rays. The contract requires in all about four hours' beating with a 7-lb hammer, when the ordinary thinness for the gold leaf of commerce will be reached. A single ounce of gold will at this stage be extended to $75 \times 4 \times 4 = 1200$ leaves, which will trim to squares of about 3¼ in. each. The finished leaf is then taken out of the mould, and the rough edges are trimmed off by slips of the ratan fixed in parallel grooves of an instrument called a waggon, the leaf being laid upon a leathern cushion. The leaves thus prepared are placed into "books" capable of holding 25 leaves each, which have been rubbed over with red ochre to prevent the gold clinging to the paper. Dentist gold is gold leaf carried no farther than the cutch stage, and should be perfectly pure gold.

By the above process also silver is beaten, but not so thin, the inferior value of the metal not rendering it commercially desirable to bestow so much labour upon it. Copper, tin, zinc, palladium, lead, cadmium, platinum and aluminium can be beaten into thin leaves, but not to the same extent as gold or silver.

The fine membrane called goldbeater's skin, used for making up the shoder and mould, is the outer coat of the caecum or blind gut of the ox. It is stripped off in lengths about 25 or 30 in., and freed from fat by dipping in a solution of caustic alkali and scraping with a blunt knife. It is afterwards stretched on a frame; two membranes are glued together, treated with a solution of aromatic substances or camphor in isinglass, and subsequently coated with white of egg. Finally they are cut into squares of 5 or 5¾ in.; and to make up a mould of 950 pieces the gut of about 380 oxen is required, about 2½ skins being got from each animal. A skin will endure about 200 beatings in the mould, after which it is fit for use in the shoder alone.

The dryness of the cutch, shoder and mould is a matter of extreme delicacy. They require to be hot-pressed every time they are used, although they may be used daily, to restore the moisture which they acquire from the atmosphere, except in extremely frosty weather, when they acquire so little moisture that a difficulty arises from their over-dryness, whereby the brilliancy of the gold is diminished, and it spreads very slowly under the hammer. On the contrary, if the cutch or shoder be damp, the gold will become pierced with innumerable microscopic holes; and in the moulds in its more attenuated state it will become reduced to a pulverulent state. This condition is more readily produced in alloyed gold than in fine gold. It is necessary that each skin of the mould should be rubbed over with calcined gypsum each time the mould may be used, in order to prevent the adhesion of the gold to the surface of the skin in beating.

GOLDBERG, a town of Germany, in the Prussian province of Silesia,[1] 14 m. by rail S.W. of Liegnitz, on the Katzbach, an affluent of the Oder. Pop. (1905) 6804. The principal buildings are an old church dating from the beginning of the 13th century, the Schwabe-Priesemuth institution, completed in 1876, for the board and education of orphans, and the classical school or gymnasium (founded in 1524 by Duke Frederick II. of Liegnitz), which in the 17th century enjoyed great prosperity, and numbered Wallenstein among its pupils. The chief manufactures are woollen cloth, flannel, gloves, stockings, leather and beer, and there is a considerable trade in corn and fruit. Goldberg owes its origin and name to a gold mine in the neighbourhood, which, however, has been wholly abandoned since the time of the Hussite wars. The town obtained civic rights in 1211. It suffered heavily from the Tatars in 1241, from the plague in 1334, from the Hussites in 1428, and from the Saxon, Imperial and Swedish forces during the Thirty Years' War. On the 27th of May 1813 a battle took place near it between the French and the

[1] Goldberg is also the name of a small town in the grand-duchy of Mecklenburg-Schwerin.

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Russians; and on the 23rd and the 27th of August of the same year fights between the allies and the French.

See Sturm, *Geschichte der Stadt Goldberg in Schlesien* (1887).

GOLD COAST, that portion of the Guinea Coast (West Africa) which extends from Assini upon the west to the river Volta on the east. It derives its name from the quantities of grains of gold mixed with the sand of the rivers traversing the district. The term Gold Coast is now generally identified with the British Gold Coast colony. This extends from 3° 7′ W. to 1° 14′ E., the length of the coast-line being about 370 m. It is bounded W. by the Ivory Coast colony (French), E. by Togoland (German). On the north the British possessions, including Ashanti (*q.v.*) and the Northern Territories, extend to the 11th degree of north latitude. The frontier separating the colony from Ashanti (fixed by order

in council, 22nd of October 1906) is in general 130 m. from the coast, but in the central portion of the colony the southern limits of Ashanti project wedge-like to the confluence of the rivers Ofin and Prah, which point is but 60 m. from the sea at Cape Coast. The combined area of the Gold Coast, Ashanti and the Northern Territories, is about 80,000 sq. m., with a total population officially estimated in 1908 at 2,700,000; the Gold Coast colony alone has an area of 24,200 sq. m., with a population of over a million, of whom about 2000 are Europeans.

Physical features.—Though the lagoons common to the West African coast are found both at the western and eastern extremities of the colony (Assini in the west and Kwitta in the east) the greater part of the coast-line is of a different character. Cape Three Points (4° 44′ 40″ N. 2° 5′ 45″ W.) juts boldly into the sea, forming the most southerly point of the colony. Thence the coast trends E. by N., and is but slightly indented. The usually low sandy beach is, however, diversified by bold, rocky headlands. The flat belt of country does not extend inland any considerable distance, the spurs of the great plateau which forms the major part of West Africa advancing in the east, in the Akwapim district, near to the coast. Here the hills reach an altitude of over 2000 ft. Out of the level plain rise many isolated peaks, generally of conical formation. Numerous rivers descend from the hills, but bars of sand block their mouths, and the Gold Coast possesses no harbours. Great Atlantic rollers break unceasingly upon the shore. The chief rivers are the Volta (*q.v.*), the Ankobra and the Prah. The Ankobra or Snake river traverses auriferous country, and reaches the sea some 20 m. west of Cape Three Points. It has a course of about 150 m., and is navigable in steam launches for about 80 m. The Prah ("Busum Prah," sacred river) is regarded as a fetish stream by the Fanti and Ashanti. One of its sub-tributaries has its rise near Kumasi. The Prah rises in the N.E. of the colony and flows S.W. Some 60 m. from its mouth it is joined by the Ofin, which comes from the north-west. The united stream flows S. and reaches the sea in 1° 35′ W. As a waterway the river, which has a course of 400 m., is almost useless, owing to the many cataracts in its course. Another river is the Tando, which for some distance in its lower course forms the boundary between the colony and the Ivory Coast.

Geology.—Cretaceous rocks occur at intervals along the coast belt, but are mostly hidden under an extensive development of superficial deposits. Basalt occurs at Axim. Inland is a broad belt of sandstone and marl with an occasional band of auriferous conglomerate, best known and most extensively worked for gold in the Wassaw district. Though the conglomerates bear some resemblance to the "Banket" of South Africa they are most probably of more recent date. The alluvial silts and gravels also carry gold.

Climate.—The climate on the coast is hot, moist and unhealthy, especially for Europeans. The mean temperature in the shade in the coast towns is 78° to 80° F. Fevers and dysentery are the diseases most to be dreaded by the European. The native inhabitants, although they enjoy tolerable health and live to an average age, are subject in the rainy season to numerous chest complaints. There are two wet seasons. From April to August are the greater rains, whilst in October and November occur the "smalls" or second rains. From the end of December to March the dry harmattan wind blows from the Sahara. In consequence of the prevalence of the sea-breeze from the south-west the western portion of the colony, up to the mouth of the Sekum river (a small stream to the west of Accra), is called the windward district, the eastward portion being known as the leeward. The rainfall at Accra, in the leeward district, averages 27 in. in the year, but at places in the windward district is much greater, averaging 79 in. at Axim.

Flora.—The greater part (probably three-fourths) of the colony is covered with primeval forest. Here the vegetation is so luxuriant that for great distances the sky is shut out from view. As a result of the struggle to reach the sunlight the forest growths are almost entirely vertical. The chief trees are silk cottons, especially the bombax and gigantic hard-wood trees, such as the African mahogany, ebony, odum and camwood. The bombax rises for over 100 ft., a straight column-like shaft, 25 to 30 ft. in circumference, and then throws out horizontally a large number of branches. The lowest growth in the forest consists of ferns and herbaceous plants. Of the ferns some are climbers reaching 30 to 40 ft. up the stems of the trees they entwine. Flowering plants are comparatively rare; they include orchids and a beautiful white lily. The "bush" or intermediate growth is made up of smaller trees, the rubber vine and other creepers, some as thick as hawsers, bamboos and sensitive mimosa, and has a height of from 30 to 60 ft. The creepers are found not only in the bush, but on the ground and hanging from the branches of the highest trees. West of the Prah the forest comes down to the edge of the Atlantic. East of that river the coast land is covered with bushes 5 to 12 ft. high, occasional large trees and groves of oil palms. Still farther east, by Accra, are numerous arborescent Euphorbias, and immediately west of the lower Volta forests of oil palms and grassy plains with fan palms. Behind all these eastern regions is a belt of thin forest country before the denser forest is reached. In the north-east are stretches of orchard-like country with wild plum, shea-butter and kola trees, baobabs, dwarf date and fan palms. The cotton and tobacco plants grow wild. At the mouths of the rivers and along the lagoons the mangrove is the characteristic tree. There are numerous coco-nut palms along the coast. The fruit trees and plants also include the orange, pineapple, mango, papaw, banana and avocado or alligator pear.

Fauna.—The fauna includes leopards, panthers, hyenas, Potto lemurs, jackals, antelopes, buffaloes, wild-hogs and many kinds of monkey, including the chimpanzee and the *Colobus vellerosus*, whose skin, with long black silky hair, is much prized in Europe. The elephant has been almost exterminated by ivory hunters. The snakes include pythons, cobras, horned and puff adders and the venomous water snake. Among the lesser denizens of the forest are the squirrel and porcupine. Crocodiles and in fewer numbers manatees and otters frequent the rivers and lagoons and hippopotami are found in the Volta. Lizards of brilliant hue, tortoises and great snails are common. Birds, which are not very numerous, include parrots and hornbills, kingfishers, ospreys, herons, bustards, guinea-fowls, woodpeckers, doves, pigeons, storks, pelicans, swallows, vultures and the spur plover (the last-named rare). Shoals of herrings frequent the coast, and the other fish include mackerel, sole, skate, mullet, bonito, flying fish, fighting fish and shynose. Sharks abound at the mouths of all the rivers, edible turtle are fairly common, as are the sword fish, dolphin and sting ray (with poisonous caudal spine). Oysters are numerous on rocks running into the sea and on the

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exposed roots of mangrove trees. Insect life is multitudinous; beetles, spiders, ants, fireflies, butterflies and flaggers abound. The earth-worm is rare. The mosquitos include the *Culex* or ordinary kind, the *Anopheles*, which carry malarial fever, and the *Stegomyia*, a striped white and black mosquito which carries yellow-fever.

Inhabitants.—The natives are all of the Negro race. The most important tribe is the Fanti (*q.v.*), and the Fanti language is generally understood throughout the colony. The Fanti and Ashanti are believed to have a common origin. It is certain that the Fanti came originally from the north country of the Akim, are essentially agriculturists, who anciently had owned the rule of the king of Benin. The districts in general are named after the tribes inhabiting them. Those in the western part of the colony are mainly of Fanti stock; the Accra and allied tribes inhabit the eastern and are believed to be the aboriginal inhabitants. The Akim (Akem), who occupy the north-east portion of the colony, have engaged in gold-digging from time immemorial. The capital of their country is Kibbi. The Akwapim (Aquapem), southern neighbours of the Akim, are extensively engaged in agriculture and in trade. The Accra, a clever race, are to be found in all the towns of the West African coast as artisans and sailors. They are employed by the interior tribes as middlemen and interpreters. On the right bank of the Volta occupying the low marshy land near the sea are the Adangme. The Krobos live in little villages in the midst of the palm tree woods which grow round about the Kroboberg, an emiuence about 1000 ft. high. Their country lies between that of the Akim and the Adangme. In the west of the colony is the Ashanta country formerly an independent kingdom. The inhabitants were noted for their skill in war. They are one of the finest and most intelligent of the tribes of Accra stock. The Apollonia, a kindred race, occupy the coast region nearest the Ivory Coast.

The Tshi, Tchwi or Chi language,[1] which is that spoken on the Gold Coast, belongs to the great prefix-pronominal group. It com-

Native Languages.

prises many dialects, which may, however, be reduced to two classes or types. Akan dialects are spoken in Assini, Amanahia (Apollonia), Awini, Ahanta, Wasaw, Tshuforo (Juffer or Tufel), and Denkyera in the west, and in Asen, Akim, and Akwapim in the east, as well as in the different parts of Ashanti. Fanti dialects are spoken, not only in Fanti proper, but in Afutu or the country round Cape Coast, in Abora, Agymako, Akomfi, Gomoa and Agona. The difference between the two types is very great; a Fanti, for example, can converse without much difficulty with a native of Akwapim or Ashanti, his language being in fact a deteriorated form of the same original. Akim is considered the finest and purest of all the Akan dialects. The Akwapim, which is based on the Akim but has imbibed Fanti influences, has been made the book-language by the Basel missionaries. They had reduced it to writing before 1850. About a million people in all, it is estimated, speak dialects of the Tshi.

The south-eastern corner of the Gold Coast is occupied by another language known as the Ga or Accra, which comprises the Ga proper and the Adangme and Krobo dialects. Ga proper is spoken by about 40,000 people, including the inhabitants of Ga and Kinka (*i.e.* Accra, in Tshi, Nkran and Labadi), Osu (Christiansborg), Teshi, Tessi, Ningua and numerous inland villages. It has been reduced to writing by the missionaries. The Adangme and Krobo dialects are spoken by about 80,000 people. They differ very considerably from Ga proper, but books printed in Ga can be used by both the Krobo and Adangme natives. Another language known as Guan is used in parts of Akwapim and in Anum beyond the Volta; but not much is known either about it or the Obutu tongue spoken in a few towns in Agona, Gomoa and Akomfi.

Religion and education.

Fetishism (*q.v.*) is the prevailing religion of all the tribes. Belief in a God is universal, as also is a belief in a future state. Christianity and Mahommedanism are both making progress, the natives preferring Christianity to either about 40,000. A Moravian mission was started at Christiansborg about 1736; the Basel mission (Evangelical) was begun in 1828, the missionaries combining manual training and farm labour with purely religious work. The Wesleyans began the mission among the Fanti in 1835, and the Anglican and Roman Catholic Churches are also represented, as well as the Bremen Missionary Society. Elementary education is chiefly in the hands of the Wesleyan, Basel, Bremen and Roman Catholic missions, who have schools at many towns along the coast and in the interior. There are also government and Mahommedan schools. The natives generally are extremely intelligent. They obtain easily the means of subsistence, and are disinclined to unaccustomed labour, such as working in mines. They are keen traders. The native custom of burying the dead under the floors of the houses prevailed until 1874, when it was prohibited by the British authorities.

Towns.—Unlike the other British possessions on the west coast of Africa, the colony has many towns along the shore, this being due to the multiplicity of tradies of rival nations who went thither in quest of gold. Beginning at the west, Newtown, on the Assini or Eyi lagoon, is just within the British frontier. The first place of importance reached is Axim (pop., 1901, 2189), the site of an old Dutch fort built near the mouth of the Axim river, and in the pre-railway days the port of the gold region. Rounding Cape Three Points, whose vicinity is marked by a line of breakers nearly 2½ m. long, Dixcove is reached. Twenty miles farther east is Sekondi (*q.v.*), (pop. about 5000), the starting-point of the railway to the gold-fields and Kumasi. Elmina (*q.v.*), formerly one of the most important posts of European settlement, is reached some distance after passing the mouth of the Prah. Eight miles east of Elmina is Cape Coast (*q.v.*), pop. (1901) 28,948. Passing Sakondi 9 m. farther east, Here, in 1807, a handful of English soldiers made a heroic and successful defence of its fort against the whole Ashanti host. Saltpond, towards the end of the 19th century, diverted to itself the trade formerly done by Anamabo, from which it is distant 5 m. Saltpond is a well-built, flourishing town, and is singular in possessing no ancient fort. Between Anamabo and Saltpond is Kormantine (Cormantyne), noted as the place whence the English first exported slaves from this coast. Hence the general name Coromantyne given to the West Indies to slaves from the Gold Coast. Eighty miles from Cape Coast is Accra (*q.v.*) (pop. 17,892), capital of the colony. (Winnebah is passed 30 m. before Accra is reached. It is an old town noted for the manufacture of canoes.) There is no station of much importance in the 60 m. between Accra and the Volta, on the right bank of which river, near its mouth, is the town of Addah (pop. 13,240). Kwitta (pop. 3018) lies beyond the Volta not far from the German frontier. Of the inland towns Akropong, the residence of the king of Akwapim, is one of the best known. It is 1200 ft. N.E. of Accra, stands on a ridge 1400 ft. above sea-level, and is a healthy place for European residents. At Akropong are the headquarters of the Basel Missionary Society. Akuse is a large town on the banks of the Volta. Tarkwa is the centre of the gold mining industry in the Wassaw district. Its importance dates from the beginning of the 20th century. Accra, Cape Coast and Sekondi possess municipal government.

Agriculture and Trade.—The soil is everywhere very fertile and the needs of the people being few there is little incentive to work. The forests alone supply an inexhaustible source of wealth, notably in the oil palm. Among vegetable products cultivated are cocoa, cotton, Indian corn, yams, cassava, peas, peppers, onions, tomatoes, ground-nuts (*Arachis hypogaea*), Guinea corn (*Sorghum vulgare*) and Guinea grains (*Amomum grana-paradisi*). The most common article of cultivation is, however, the kola nut (*Sterculia acuminata*), the favourite substitute in West Africa for the betel nut. In 1890 efforts were made by the establishment of a government botanical station at Aburi in the Accra district to induce the natives to improve their methods of cultivation and to enlarge the number of their crops. This resulted in the formation of hundreds of cocoa plantations, chiefly in the district immediately north of Accra. Subsequently the cultivation of the plant extended to every district of the colony. The industry had been founded in 1879 by a native of Accra, but it was not until 1901, as the result of the government's fostering care, that the export became of importance. In that year the quantity exported slightly exceeded 2,000,000 lb and fetched £42,000. In 1907 the quantity exported was nearly 21,000,000 lb and in value exceeded £515,000. In 1904 efforts were begun by the government and the British Cotton Growing Association to encourage the cultivation of the growing of cotton for export and by 1907 the cotton industry had become firmly established. Tobacco and coffee are grown at some of the Basel missionary stations.

The chief exports are gold, palm oil and palm kernels, cocoa, rubber, timber (including mahogany) and kola nuts. Of these articles the gold and rubber are shipped chiefly to England, whilst Germany, France and America, take the palm products and groundnuts. The rubber comes chiefly from Ashanti. The imports consist of cotton goods, rum, gin and other spirits, rice, sugar, tobacco, beads, machinery, building materials and European goods generally.

The value of the trade increased from £1,628,309 in 1896 to £4,055,151 in 1906. In the last named year the imports were valued at £2,058,839 and the exports at £1,996,412. While the value of imports had remained nearly stationary since 1902 the value of exports had nearly trebled in that period. In the years 1903–1907 the total trade increased from £3,963,486 to £5,007,690. Great Britain and British colonies take 66% of the exports and supply over 60% of the imports. In both import and export trade Germany is second, followed by France and the United States. Specie is included in these totals, over a quarter of a million being imported in 1903.

Fishing is carried on extensively along the coast, and salted and pickled fish from Addah and Kwitta districts find a ready sale inland. Cloths are woven by the natives from home-grown and imported yarn; the making of canoes, from the silk-cotton trees, is a flourishing industry, and salt from the lagoons near Addah is roughly prepared. There are also native artificers in gold and other metals, the workmanship in some cases being of conspicuous merit. Odum wood is largely used in building and for cabinet work.

Gold Mining.—Gold is found in almost every part of the colony, but only in a few districts in paying quantities. Although since the discovery of the coast gold had been continuously exported to Europe from its ports, it was not until the last twenty years of the 19th century that efforts were made to extract gold according to modern methods. The richness of the Tarkwa main reef was first

[1] This name appears in a great variety of forms—Kwi, Ekwi, Okwi, Oji, Odschi, Otsui, Tyi, Twi, Tschi, Chwee or Chee.

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discovered by a French trader, M. J. Bennat, about 1880. During the period 1880 to 1900 the value of the gold exported varied from a minimum of £32,000 to a maximum (1889) of £103,000. The increased interest shown in the industry led to the construction of a railway (see below) to the chief gold-fields, whereby the difficulties of transport were largely overcome. Consequent upon the taking up of a number of concessions, a concessions ordinance was issued in August 1900. This was followed in 1901 by the grant of 2825 concessions, and a "boom" in the West African market on the London stock exchange. Many concessions were speedily abandoned, and in 1901 the export of gold dropped to its lowest point, 6162 oz., worth £22,186, but in 1902 a large company began crushing ore and the output of gold rose to 26,911 oz., valued at £96,880. In 1903 the export was 292,125 oz., worth £1,164,676. It should be noted that one of the principal gold mines is not in the colony proper, but at Obuasi in Ashanti. Underground labour is performed mainly by Basas and Krumen from Liberia. Of native tribes the Apollonia have proved the best for underground work, as they have mining traditions dating from Portuguese times. A good deal of alluvial gold is obtained by dredging apparatus. The use of dredging apparatus is modern, but the natives have worked the alluvial soil and the sand of the seashore for generations to get the gold they contain.

Communications.—The colony possesses a railway, built and owned by the government, which serves the gold mines, and has its sea terminus at Sekondi. Work was begun in August 1898, but owing to the disturbance caused by the Ashanti rising of 1900 the rails only reached Tarkwa (39 m.) in May 1901. Thence the line is carried to Kumasi, the distance to Obuasi (124 m.) being completed by December 1902, whilst the first train entered the Ashanti capital on the 1st of October 1903. The total length of the line is 168 m. The cost of construction was £1,820,000. The line has a gauge 3 ft. 6 in. There is a branch line, 20 m. long, from Tarkwa N.W. to Prestea on the Ankobra river. Another railway, built 1902–3, 35 m. in length, runs from Accra to Mangoase, in the centre of the chief cocoa plantations. An extension to Kumasi has been surveyed.

Tortuous bush tracks are the usual means of internal communication. These are kept in fair order in the neighbourhood of government stations. There is a well-constructed road 141 m. long from Cape Coast to Kumasi, and roads connecting neighbouring towns are maintained by the government. Systematic attempts to make use of the upper Volta as a means of bringing goods to the interior were first tried in 1900. The rapids about 60 m. from the mouth of the river effectually prevent boats of large size passing up the stream. Where railways or canoes are not available goods are generally carried on the heads of porters, 60 lb being a full load. Telegraphs, introduced in 1882, connect all the important towns in the colony, and a line starting at Cape Coast stretches far inland, via Kumasi to Wa in the Northern Territories. Accra and Sekondi are in telegraphic communication with Europe, the Lagos Coast, Lagos and the Cape of Good Hope. There is regular and frequent steamship communication with Europe by British, Belgian and German lines.

Administration, Revenue, &c.—The country is governed as a crown colony, the governor being assisted by a legislative council composed of officials and nominated unofficial members. Laws, called ordinances, are enacted by the governor with the advice and consent of this council. The law of the colony is the common law and statutes of general application in force in England in 1874, modified by local ordinances passed since that date. The governor is also governor of Ashanti and the Northern Territories, but in those dependencies the legislative council has no authority.

Native laws and customs—which are extremely elaborate and complicated—are not interfered with "except when repugnant to natural justice." Those relating to land tenure and succession may be thus summarized. Individual tenure is not unknown, but most land is held by the tribe or by the family in common, each member having the right to select a part of the common land for his own use. Permanent alienation can only take place with the unanimous consent of the family and is uncommon, but long leases are granted. Succession is through the female, *i.e.* when a man dies his property goes to his sister's children. The government of the tribes is by their own kings and chiefs under the supervision of district commissioners. Slavery has been abolished in the colony. In the Northern Territories the dealing in slaves is unlawful, neither can any person be put in pawn for debt; nor will any court give effect to the relations between master and slave except in so far as those relations may be in accordance with the English laws relating to master and servant.

For administrative purposes the colony is divided into three provinces under provincial commissioners, and each province is subdivided into districts presided over by commissioners, who exercise judicial as well as executive functions. The supreme court consists of a chief justice and three puisne judges. The defence of the colony is entrusted to the Gold Coast regiment of the West African Frontier Force, a force of natives controlled by the Colonial Office but officered from the British army. There is also a corps of volunteers (formed 1892).

The chief source of revenue is the customs and (since 1902) railway receipts, whilst the heaviest items of expenditure are transport (including railways) and mine surveys, medical and sanitary services, and maintenance of the military force. The revenue, which in the period 1894–1898 averaged £244,559 yearly, rose in 1898–1903 to an average of £556,316 a year. For the five years 1903–1907 the average annual revenue was £647,557 and the average annual expenditure £615,696. Save for municipal purposes there is no direct taxation in the colony and no poor-houses exist. There is a public debt of (December 1907) £2,206,964. It should be noted that the expenditure on Ashanti and the Northern Territories is included in the Gold Coast budget.

History.—It is a debated question whether the Gold Coast was discovered by French or by Portuguese sailors. The evidence available is insufficient to prove the assertion, of which there is no contemporary record, that a company of Norman merchants established themselves about 1364 at a place they named La Mina (Elmina), and that they traded with the natives for nearly fifty years, when the enterprise was abandoned. It is well established that a Portuguese expedition under Diogo d'Azambuja, accompanied probably by Christopher Columbus, took possession of (or founded) Elmina in 1481–1482. By the Portuguese it was called variously São Jorge da Mina or Ora del Mina—the mouth of the (gold) mines. That besides alluvial washings they also worked the gold mines was proved by discoveries in the latter part of the 19th century. The Portuguese remained undisturbed in their trade until the Reformation, when the papal bull which had given the country, with many others, to Portugal ceased to have a binding power. English ships in 1553 brought back from Guinea gold to the weight of 150 lb. The fame of the Gold Coast thereafter attracted to it adventurers from almost every European nation. The English were followed by French, Danes, Brandenburgers, Dutch and Swedes. The most aggressive were the Dutch, who from the end of the 16th century sought to oust the Portuguese from the Gold Coast, and in whose favour the Portuguese did finally withdraw in 1642, in return for the withdrawal on the part of the Dutch of their claims to Brazil. The Dutch henceforth made Elmina their headquarters on the coast. Traces of the Portuguese occupation, which lasted 160 years, are still to be found, notably in the language of the natives. Such familiar words as palaver, fetish, caboceer and dash (*i.e.* a gift) have all a Portuguese origin.

An English company built a fort at Kormantine previously to 1651, and some ten years later Cape Coast Castle was built. The settlements made by the English provoked the hostility of the Dutch and led to war between England and Holland, during which Admiral de Ruyter destroyed (1664–1665) all the English forts save Cape Coast castle. The treaty of Breda in 1667 confirmed the Dutch in the possession of their conquests, but the English speedily opened other trading stations. Charles II. in 1672 granted a charter to the Royal African Company, which built forts at Dixcove, Sekondi, Accra, Whydah and other places, besides repairing Cape Coast Castle. At this time the trade both in slaves and gold was very great, and at the beginning of the 18th century the value of the gold exported annually was estimated by Willem Bosman, the chief Dutch factor at Elmina, to be over £200,000. Various European traders were constantly quarrelling among themselves and exercised scarcely any control over the natives. Piracy was rife along the coast, and was not indeed finally stamped out until the middle of the 19th century. The Royal African Company, which lost its monopoly of trade with England in 1700, was succeeded by another, the African Company of Merchants, which was constituted in 1750 by act of parliament and received an annual subsidy from government. The slave trade was then at its height and some 10,000 negroes were exported yearly. Many of the slaves were prisoners of war sold to the merchants by the Ashanti, who had become the chief native power. The abolition of the slave trade (1807) crippled the company, which was dissolved in 1821, when the crown took possession of the forts.

Appearance of the English.

Since the beginning of the 19th century the British had begun to exercise territorial rights in the towns where they held forts, and in 1817 the right of the British to control the natives living in the coast towns was recognized by Ashanti. In 1824 the first step towards the extension of British authority beyond the coast region was taken by Governor Sir Charles M'Carthy, who incited the Fanti to rise against their oppressors, the Ashanti. (The Fanti's country had been conquered by the Ashanti in 1807.)

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Sir Charles and the Fanti army were defeated, the governor losing his life, but in 1826 the English gained a victory over the Ashanti at Dodowah. At this period, however, the home government, disgusted with the Gold Coast by reason of the perpetual disturbances in the protectorate and the trouble it occasioned, determined to abandon the settlements, and sent instructions for the forts to be destroyed and the Europeans brought home. The merchants, backed by Major Rickets, 2nd West India regiments, the administrator, protested, and as a compromise the forts were handed over to a committee of merchants (Sept. 1828), who were given a subsidy of £4000 a year. The merchants secured (1830) as their administrator Mr George Maclean—a gentleman with military experience on the Gold Coast and not engaged in trade. To Maclean is due the consolidation of British interests in the interior. He concluded, 1831, a treaty with the Ashanti advantageous to the Fanti, whilst with very inadequate means he contrived to extend British influence over the whole region of the present colony. In the words of a Fanti trader Maclean understood the people, "he settled things quietly with them and the people also loved him."[1] Complaints that Maclean encouraged slavery reached England, but these were completely disproved, the governor being highly commended on his administration by the House of Commons Committee. It was decided, nevertheless, that the Colonial Office should resume direct control of the forts, which was done in 1843, Maclean continuing to direct native affairs until his death in 1847. The jurisdiction of England on the Gold Coast was defined by the bond of the 6th of March 1844,

Danish and Dutch forts purchased.

an agreement with the native chiefs by which the crown received the right of trying criminals, repressing human sacrifice, &c. The limits of the protectorate inland were not defined. The purchase of the Danish forts in 1850, and of the Dutch forts and territory in 1871, led to the consolidation of the British power along the coast; and the Ashanti war of 1873–74 resulted in the extension of the area of British influence. Since that time the colony has been chiefly engaged in the development of its material resources, a development accompanied by a slow but substantial advance in civilization among the native population. (For further historical information see ASHANTI.)

For a time the Gold Coast formed officially a limb of the "West African Settlements" and was virtually a dependency of Sierra Leone. In 1874 the settlements on the Gold Coast and Lagos were created a separate crown colony, this arrangement lasting until 1886 when Lagos was cut off from the Gold Coast administration.

Northern Territories.

The Northern Territories of the Gold Coast form a British protectorate to the north of Ashanti. They are bounded W. and N.—where 11° N. is the frontier line except at the eastern extremity—by the French colonies of the Ivory Coast and Upper Senegal and Niger, E. by the German colony of Togoland. The southern frontier, separating the protectorate from Ashanti, is the Black Volta to a point a little above its junction with the White Volta. Thence the frontier turns south and afterwards east so as to include the Brumasi district in the protectorate, the frontier gaining the main Volta below Yeji. The Territories include nearly all the country from the meridian of Greenwich to 3° W. and between 8° and 11° N., and cover an area of about 33,000 sq. m.

Lying north of the great belt of primeval forest which extends parallel to the Guinea coast, the greater part of the protectorate consists of open country, well timbered, and much of it presenting a park-like appearance. There are also large stretches of grassy plains, and in the south-east an area of treeless steppe. The flora and fauna resemble those of Ashanti. The country is well watered, the Black Volta forming the west and southern frontier for some distance, while the White Volta traverses its central regions. Both rivers, and also the united stream, contain rapids which impede but do not prevent navigation (see VOLTA). The climate is much healthier than that of the coast districts, and the fever experienced is of a milder type. The rainfall is less than on the coast; the dry season lasts from November (when the harmattan begins to blow) to March. The mean temperature at Gambaga is 80° F., the mean annual rainfall 43 in. The inhabitants were officially estimated in 1907 to number "at least 1,000,000." The Dagomba, Dagarti, Grunshi, Kangarga, Moshi and Zebarima, Negro or Negroid tribes, constitute the bulk of the people, and Fula, Hausa and Yoruba have settled as traders or cattle raisers. A large number of the natives are Moslems, the rest are fetish worshippers. The tribal organization is maintained by the British authorities, who found comparatively little difficulty in putting an end to slave-raiding and gaining the confidence of the chiefs. Trained by British officers, the natives make excellent soldiers.

Agriculture and Trade.—The chief crops are maize, guinea-corn, millet, yams, rice, beans, groundnuts, tobacco and cotton. Cotton is grown in most parts of the protectorate, the soil and climate in many districts being very suitable for its cultivation. Rubber is found in the north-western regions. When the protectorate was assumed by Great Britain the Territories were singularly destitute of fruit trees. The British have introduced the orange, citron, lime, guava, mango and soursop, and among plants the banana, pine-apple and papaw. A large number of vegetables and flowers have also been introduced by the administration.

Stock-raising is carried on extensively, and besides oxen and sheep there are large numbers of horses and donkeys in the Territories. The chief exports are cattle, *dawa-dawa* (a favourite flavouring matter for soup among the Ashanti and other tribes) and shea-butter—the latter used in cooking and as an illuminant. The principal imports are kola-nuts, salt and cotton goods. A large proportion of the European goods imported is German and comes through Togoland. The administration levies a tax on traders' caravans, and in return ensures the safety of the roads. This tax is the chief local source of revenue. The revenue and expenditure of the Territories, as well as statistics of trade, are included in those of the Gold Coast.

Gold exists in quartz formation, chiefly in the valley of the Black Volta, and is found equally on the British and French sides of the frontier.

Towns.—The headquarters of the administration are at Tamale (or Tamari), a town in the centre of the Dagomba country east of the White Volta and 200 m. N.E. of Kumasi. Its inhabitants are keen traders, and it forms a distributing centre for the whole protectorate. Gambaga, an important commercial centre and from 1897 to 1907 the seat of government, is in Mamprusi, the north-east corner of the protectorate and is 85 m. N.N.E. of Tamale. A hundred and forty miles due south of Gambaga is Salaga. This town is situated on the caravan route from the Hausa states to Ashanti, and has a considerable trade in kola-nuts, shea-butter and salt. On the White Volta, midway between Gambaga and Salaga, is the thriving town of Daboya. On the western frontier are Bole (Baule) and Wa. They carry on an extensive trade with Bontuku, the capital of Jaman, and other places in the Ivory Coast colony. In all the towns the population largely consists of aliens—Hausa, Ashanti, Mandingos, &c.

Communications.—Lack of easy communication with the sea hinders the development of the country. The ancient caravan routes have been, however, supplemented by roads built by the British, who have further organized a service of boats on the Volta. Large cargo boats, chiefly laden with salt, ascend that river from Addah to Yeji and Daboya. From Yeji, the port of Salaga, a good road, 150 m. long, has been made to Gambaga. There is also a river service from Yeji to Longoro on the Black Volta, the port of Kintampo, in northern Ashanti. There is a complete telegraphic system connecting the towns of the protectorate with Kumasi and the Gold Coast ports.

History.—It was not until the last quarter of the 19th century that the country immediately north of Ashanti became known to Europeans. The first step forward was made by Monsieur M. J. Bonnat (one of the Kumasi captives, see ASHANTI) who, ascending the Volta, reached Salaga (1875–1876). In 1882 Captain R. La Trobe Lonsdale, an officer in British colonial service, went farther, visiting Yendi in the north and Bontuku in the west. Two years later Captain Brandon Kirby made his way to Kintampo. In 1887–1889 Captain L. G. Binger, a French officer, traversed the country from north to south. Thereafter the whole region was visited by British, French and German political missions. Prominent among the British agents was Mr George E. Ferguson, a native of West Africa, who had previously explored northern Ashanti. Between 1892 and 1897 Ferguson concluded several treaties guarding British interests. In 1897 Lieutenant Henderson and Ferguson occupied Wa, where they were attacked by the *sofas* of Samory (see SENEGAL, § 3).

[1] Blue Book on *Africa* (*Western Coast*) (1865), p. 233.

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Henderson, who had gone to the *sofa* camp to parley, was held prisoner for some time, while Ferguson was killed. Meantime negotiations were opened in Europe to settle the spheres of influence of the respective countries. (The Anglo-French agreement of 1889 had fixed the boundaries of the hinterlands of the French colony of the Ivory Coast and the British colony of the Gold Coast as far as 9° N. only.) A period of considerable tension, arising from the proximity of British and French troops in the disputed territory, was ended by the signature of a convention in Paris (14th of June 1898), in which the western and northern boundaries were defined. The British abandoned their claim to the important town and district of Wagadugu in the north. In the following year (14th of November 1899) an agreement defining the eastern frontier was concluded with Germany. Previously a square block of territory to the north of 8° N. had been regarded as neutral, both by Britain and Germany. This was in virtue of an arrangement made in 1888. By the 1899 convention the neutral zone was parcelled out between the two powers. The delimitation of the frontiers agreed upon took place during 1900–1904.

In 1897 the Northern Territories were constituted a separate district of the Gold Coast hinterland, and were placed in charge of a chief commissioner. Colonel H. P. Northcott (killed in the Boer War, 1899–1902) was the first commissioner and commandant of the troops. He was succeeded by Col. A. H. Morris. In 1901 the Territories were made a distinct administration, under the jurisdiction of the governor of the Gold Coast colony. The government was at first of a semi-military character, but in 1907 a civilian staff was appointed to carry on the administration, and a force of armed constabulary replaced the troops which had been stationed in the protectorate and which were then disbanded. The prosperity of the country under British administration has been marked.

BIBLIOGRAPHY.—A good summary of the condition and history of the colony to the close of the 19th century will be found in vol. 3, "West Africa," of the *Historical Geography of the British Empire* by C. P. Lucas (2nd ed., Oxford, 1900). For current information see the *Gold Coast Civil Service List* (London, yearly), the annual Blue Books published in the colony, and the annual *Report* issued by the Colonial Office, London. For fuller information consult the *Report from the Select Committee on Africa (Western Coast)* (London, 1865), a mine of valuable information; *The Gold Coast, Past and Present*, by G. Macdonald (London, 1898); *History of the Gold Coast and Ashanti*, by C. C. Reindorf, a native pastor (Basel, 1895); *A History of the Gold Coast*, by Carl Christian Reindorf (London, 1893); *Wanderings in West Africa* (London, 1863) and *To the Gold Coast for Gold* (London, 1883), both by Sir Richard Burton. Of the earlier books the most notable are *The Golden Coast or a Description of Guinney together with a relation of such persons as got wonderful estates by their trade thither* (London, 1665), and *A New and Accurate Description of the Coast of Guinea* written (in Dutch) by Willem Bosman, chief factor for the Dutch at Elmina (Eng. trans., 2nd ed., 1721). For a complete survey of the Gold Coast under Dutch control see "Die Niederländisch West-Indische Compagnie an der Gold-Küste" by J. G. Doorman in *Tijds Indische Taal-, Land- en Volkenk*, vol. 40 (1898). For ethnography, religion, law, &c., consult *The Land of Fetish* (London, 1883) and *The Tshi-speaking Peoples of the West Coast of Africa* (London, 1887), both by Col. A. B. Ellis; *Fanti Customary Law* (2nd ed., London, 1904) and *Fanti Law Report* (London, 1904), both by J. M. Sarbah. The *Sketch of the Forestry of West Africa* by Sir Alfred Moloney (London, 1887) contains a comprehensive list of economic plants. See also *Report on Economic Agriculture on the Gold Coast* (Colonial Office Reports, No. 110, 1890), and *Papers relating to the Construction of Railways in . . . the Gold Coast* (London, 1904). The best map is that of Major G. Cuggisberg, over 70 sheets, scale 1 : 125,000 (London, 1907–1909). There is a War Office map on the scale 1 : 1,000,000 in one sheet. See also the works quoted under ASHANTI.

For the Northern Territories see L. G. Binger, *Du Niger au Golfe de Guinée* (Paris, 1892), a standard authority; H. P. Northcott, *Report on the Northern Territories of the Gold Coast* (War Office, London, 1899), a valuable compilation summarizing the then available information. Annual *Reports* on the protectorate are issued by the British Colonial Office. A map on the scale of 1 : 1,000,000 is issued by the War Office. (F. R. C.)

GOLDEN, a city and the county-seat of Jefferson county, Colorado, U.S.A., on Clear Creek (formerly called the Vasquez fork of the South Platte), about 14 m. W. by N. of Denver. Pop. (1900) 2152; (1910) 2477. Golden is a residential suburb of Denver, served by the Colorado & Southern, the Denver & Intermountain (electric), and the Denver & North-Western Electric railways. It is about 5700 ft. above sea-level. About 600 ft. above the city is Castle Rock, with an amusement park, and W. of Golden is Lookout Mountain, a natural park of 3400 acres. About 1 m. S. of the city is a state industrial school for boys, and in Golden is the Colorado State School of Mines (opened 1874), which offers courses in mining engineering and metallurgical engineering. The Independent Pyritic Smelter is at Golden, and among the city's manufactures are pottery, firebrick and tile, made from clays found near by, and flour. There are deposits of coal, copper and gold in the vicinity. Truck-farming and the growing of fruit are important industries in the neighbourhood. The first settlement here was a gold mining camp, established in 1859, and named in honour of Tom Golden, one of the pioneer prospectors. The village was laid out in 1860, and Golden was incorporated as a town in 1865 and was chartered as a city in 1870. Golden was made the capital of Colorado Territory in 1862, and several sessions (or parts of sessions) of the Assembly were held here between 1864 and 1868, when the seat of government was formally established at Denver; the territorial offices of Colorado, however, were at Golden only in 1866–1867.

GOLDEN BULL (Lat. *Bulla Aurea*), the general designation of any charter decorated with a golden seal or *bulla*, either owing to the intrinsic importance of its contents, or to the rank and dignity of the bestower or the recipient. The custom of thus giving distinction to certain documents is said to be of Byzantine origin, though if this be the case it is somewhat strange that the word employed as an equivalent for golden bull in Byzantine Greek should be the hybrid χρυσόβουλλον (cf. Codinus Curopalates, ὁ μέγας λογοθέτης διατάττει τὰ παρὰ τοῦ βασιλέως ἀποστελλόμενα προστάγματα καὶ χρυσόβουλλα πρός τε 'Ρήγας, Σούλτανας, καὶ τοπάρχους; and Anna Comnena, *Alexiad*, lib. iii. διὰ χρυσοβούλιου λόγου; lib. viii., χρυσόβουλον λόγον). In Germany a Golden Bull is mentioned under the reign of Henry I. the Fowler in *Chronica Cassin.* ii. 31, and the oldest German example, if it be genuine, dates from 983. At first the golden seal was formed after the type of a solid coin, but at a later date, while the golden surface presented to the eye was greatly increased, the seal was really composed of two thin metal plates filled in with wax. The number of golden bulls issued by the imperial chancery must have been very large; the city of Frankfort, for example, preserves no fewer than eight.

The name, however, has become practically restricted to a few documents of unusual political importance, the golden bull of the Empire, the golden bull of Brabant, the golden bull of Hungary and the golden bull of Milan—and of these the first is undoubtedly *the* Golden Bull *par excellence*. The main object of the Golden Bull was to provide a set of rules for the election of the German kings, or kings of the Romans, as they are called in this document. Since the informal establishment of the electoral college about a century before (see ELECTORS), various disputes had taken place about the right of certain princes to vote at the elections, these and other difficulties having arisen owing to the absence of any authoritative ruling. The spiritual electors, it is true, had exercised their votes without challenge, but not different was the case of the temporal electors. The families ruling in Saxony and in Bavaria had been divided into two main branches and, as the German states had not yet accepted the principles of primogeniture, it was uncertain which member of the divided family should vote. Thus, both the prince ruling in Saxe-Lauenburg and the prince ruling in Saxe-Wittenberg claimed the vote, and the two branches of the family of Wittelsbach, one settled in Bavaria and the other in the Rhenish palatinate, were similarly at variance, while the duke of Bavaria also claimed the vote at the expense of the king of Bohemia. Moreover, there had been several disputed and double elections to the German crown during the past century. In more than one instance a prince, chosen by a minority of the electors, had claimed to exercise the functions of king, and as often civil war had been the result. Under these circumstances the emperor Charles IV. determined by an

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authoritative pronouncement to make such proceedings impossible in the future, and at the same time to add to his own power and prestige, especially in his capacity as king of Bohemia.

Having arranged various disputes in Germany, and having in April 1355 secured his coronation in Rome, Charles gave instructions for the bull to be drawn up. It is uncertain who is responsible for its actual composition. The honour has been assigned to Bartolo of Sassoferrato, professor of law at Pisa and Perugia, to the imperial secretary, Rudolph of Friedberg, and even to the emperor himself, but there is no valid authority for giving it to any one of the three in preference to the others. In its first form the bull was promulgated at the diet of Nuremberg on the 10th of January 1356, but it was not accepted by the princes until some modifications had been introduced, and in its final form it was issued at the diet of Metz on the 25th of December following.

The text of the Golden Bull consists of a prologue and of thirty-one chapters. Some lines of verse invoking the aid of Almighty God are followed by a rhetorical statement of the evils which arise from discord and division, illustrations being taken from Adam, who was divided from obedience and thus fell, and from Helen of Troy who was divided from her husband. The early chapters are mainly concerned with details of the elaborate ceremonies which are to be observed on the occasion of an election. The number of electors is fixed at seven, the duke of Saxe-Wittenberg, not the duke of Saxe-Lauenburg, receiving the Saxon vote, and the count palatine, not the duke of Bavaria, obtaining the vote of the Wittelsbachs. The electors were arranged in order of precedence thus: the archbishops of Mainz, of Trier and of Cologne, the king of Bohemia, *qui inter electores laicos ex regiae dignitatis fastigio jure et merito obtinet primatum*, the count palatine of the Rhine, the duke of Saxony and the margrave of Brandenburg. The three archbishops were respectively arch-chancellors of the three principal divisions of the Empire, Germany, Arles and Italy, and the four secular electors each held an office in the imperial household, the functions of which they were expected to discharge on great occasions. The king of Bohemia was the arch-cupbearer, the count palatine was the arch-steward (*dapifer*), the duke of Saxony was arch-marshal, and the margrave of Brandenburg was arch-chamberlain. The work of summoning the electors and of presiding over their deliberations fell to the archbishop of Mainz, but if he failed to discharge this duty the electors were to assemble without summons within three months of the death of a king. Elections were to be held at Frankfort; they were to be decided by a majority of votes, and the subsequent coronation at Aix-la-Chapelle was to be performed by the archbishop of Cologne. During a vacancy in the Empire the work of administering the greater part of Germany was entrusted to the count palatine of the Rhine, the duke of Saxony being responsible, however, for the government of Saxony, or rather for the districts *ubi Saxonica jura servantur*.

The chief result of the bull was to add greatly to the power of the electors; for, to quote Bryce (*Holy Roman Empire*), it "confessed and legalized the independence of the electors and the powerlessness of the crown." To these princes were given sovereign rights in their dominions, which were declared indivisible and were to pass according to the rule of primogeniture. Except in extreme cases, there was to be no appeal from the sentences of their tribunals, and they were confirmed in the right of coining money, of taking tolls, and in other privileges, while conspirators against their lives were to suffer the penalties of treason. One clause gave special rights and immunities to the king of Bohemia, who, it must be remembered, at this time was Charles himself, and others enjoined the observance of the public peace. Provision was made for an annual meeting of the electors, to be held at Metz four weeks after Easter, when matters *pro bono et salute communi* were to be discussed. This arrangement, however, was not carried out, although the electors met occasionally. Another clause forbade the cities to receive *Pfahlbürger*, *i.e.* forbade them to take men dwelling outside their walls under their protection. It may be noted that there is no admission whatever that the election of a king needs confirmation from the pope.

The Golden Bull was thus a great victory for the electors, but it weakened the position of the German king and was a distinct humiliation for the other princes and for the cities. The status of those rulers who did not obtain the electoral privilege was lowered by this very fact, and the regulations about the *Pfahlbürger*, together with the prohibition of new leagues and associations, struck a severe blow at the cities. The German kings were elected according to the conditions laid down in the bull until the dissolution of the Empire in 1806. At first the document was known simply as the Lex Carolina; but gradually the name of the Book with the Golden Bull came into use, and the present elliptical title was sufficiently established by 1417 to be officially employed in a charter by King Sigismund. The original autograph was committed to the care of the elector of Mainz, and it was preserved in the archives at Mainz till 1789. Official transcripts were probably furnished to each of the seven electors at the time of the promulgation, and before long many of the other members of the Empire secured copies for themselves. The transcript which belonged to the elector of Trier is preserved in the state archives at Stuttgart, that of the elector of Cologne in the court library at Darmstadt, and that of the king of Bohemia in the imperial archives at Vienna. Berlin, Munich and Dresden also boast the possession of an electoral transcript; and the town of Kitzingen has a contemporary copy in its municipal archives. There appears, however, to be good reason to doubt the genuineness of most of these so-called original transcripts. But perhaps the best known example is that of Frankfort-on-Main, which was procured from the imperial chancery in 1366, and is adorned with a golden seal like the original. Not only was it regularly quoted as the indubitable authority in regard to the election of the emperors in Frankfort itself, but it was from time to time officially consulted by members of the Empire.

The manuscript consists of 43 leaves of parchment of medium quality, each measuring about 10¼ in. in height by 7¼ in breadth. The seal is of the plate and wax type. On the obverse appears a figure of the emperor seated on his throne, with the sceptre in his right hand and the globe in his left; a shield, with the crowned imperial eagle, occupies the space on the one side of the throne, and a corresponding shield, with the crowned Bohemian lion with two tails, occupies the space on the other side; and round the margin runs the legend, *Karolus quartus divina favente clementia, Romanorum imperator semper Augustus et Boemiae rex*. On the reverse is a castle, with the words *Aurea Roma* on the gate, and the circumscription reads, *Roma caput mundi regit orbis frena rotundi*. The original Latin text of the bull was printed at Nuremberg by Friedrich Creussner in 1474, and a second edition by Anthonius Koburger (d. 1532) appeared at the same place in 1477. Since that time it has been frequently reprinted from various manuscripts and collections. M. Goldast gave the Palatine text, compared with those of Bohemia and Frankfort, in his *Collectio constitutionum et legum imperialium* (Frankfort, 1613). Another is to be found in *De comitiis imperii* of O. Panvinius, and a third, of unknown history, is prefixed to the *Codex recessuum imperii* (Mainz, 1559, and again 1613). The Frankfort text appeared in 1742 as *Aurea Bulla secundum exemplar originale Frankfurtense*, edited by W. C. Multz, and the text is also found in J. J. Schmauss, *Corpus juris publici*, edited by R. von Hommel (Leipzig, 1794), and in the *Quellenmässige Urkunden zur Erläuterung der Verfassungsgeschichte Deutschlands im Mittelalter*, edited by W. Altmann and E. Bernheim (Berlin, 1891, and again 1895). German translations, none of which, however, had any official authority, were published at Nuremberg about 1474, at Ulm in 1476, and at Strassburg in 1485. Among the earlier commentators on the document are H. Canisius and J. Limnaeus who wrote *In Auream Bullam* (Strassburg, 1662). The student will find a good account of the older literature on the subject in C. G. Biener's *Commentatio de origine et progressu legum juriumque Germaniae* (1787–1795). See also J. D. von Olenschläger, *Neue Erläuterungen der Güldenen Bulle* (Frankfort and Leipzig, 1766); H. G. von Thulemeyer, *De Bulla Aurea, Argentea, &c.* (Heidelburg, 1692); J. St. Pütter, *Historische Entwickelung der heutigen Staatsverfassung des teutschen Reichs* (Göttingen, 1786–1787), and O. Stobbe, *Geschichte der deutschen Rechtsquellen* (Brunswick, 1860–1864). Among the more modern works may be mentioned: E. Nerger, *Die Goldne Bulle nach ihrem Ursprung* (Göttingen, 1877), O. Hahn, *Ursprung und Bedeutung der Goldnen Bulle* (Breslau, 1903); and M. G. Schmidt, *Die staatsrechtliche Anwendung der Goldnen Bulle* (Halle, 1894). There is a valuable contribution to the subject in the *Quellensammlung zur Geschichte der deutschen Reichsverfassung*, edited by K. Zeumer (Leipzig, 1904), and

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another by O. Harnack in *Das Kurfürsten Kollegium bis zur Mitte des 14ten Jahrhunderts* (Giessen, 1883). There is an English translation of the bull in E. F. Henderson's *Select Historical Documents of the Middle Ages* (London, 1903). (A. W. H.*)

GOLDEN-EYE, a name indiscriminately given in many parts of Britain to two very distinct species of ducks, from the rich yellow colour of their irides. The commonest of them—the *Anas fuligula* of Linnaeus and *Fuligula cristata* of most modern ornithologists—is, however, usually called by English writers the tufted duck, while "golden-eye" is reserved in books for the *A. clangula* and *A. glaucion* of Linnaeus, who did not know that the birds he so named were but examples of the same species, differing only in age or sex; and to this day many fowlers perpetuate a like mistake, deeming the "Morillon," which is the female or young male, distinct from the "Golden-eye" or "Rattle-wings" (as from its noisy flight they oftener call it), which is the adult male. This species belongs to the group known as diving ducks, and is the type of the very well-marked genus *Clangula* of later systematists, which, among other differences, has the posterior end of the sternum prolonged so as to extend considerably over, and, we may not unreasonably suppose, protect the belly—a character possessed in a still greater degree by the merganser (*Merginae*), while the males also exhibit in the extraordinarily developed bony labyrinth of their trachea and its midway enlargement another resemblance to the members of the same subfamily. The golden-eye, *C. glaucion* of modern writers, has its home in the northern parts of both hemispheres, whence in winter it migrates southward; but as it is one of the ducks that constantly resorts to hollow trees for the purpose of breeding it hardly transcends the limit of the Arctic forests on either continent. So well known is this habit to the people of the northern districts of Scandinavia, that they very commonly devise artificial nest-boxes for its accommodation and their own profit. Hollow logs of wood are prepared, the top and bottom closed, and a hole cut in the side. These are affixed to the trunks of living trees in suitable places, at a convenient distance from the ground, and, being readily occupied by the birds in the breeding-season, are regularly robbed, first of the numerous eggs, and finally of the down they contain, by those who have set them up.

The adult male golden-eye is a very beautiful bird, mostly black above, but with the head, which is slightly crested, reflecting rich green lights, a large oval white patch under each eye and elongated white scapulars; the lower parts are wholly white and the feet bright orange, except the webs, which are dusky. In the female and young male, dark brown replaces the black, the cheek-spots are indistinct and the elongated white scapulars wanting. The golden-eye of North America has been by some authors deemed to differ, and has been named *C. americana*, but apparently on insufficient grounds. North America, however, has, in common with Iceland, a very distinct species, *C. islandica*, often called Barrow's duck, which is but a rare straggler to the continent of Europe, and never, so far as known, to Britain. In Iceland and Greenland it is the only habitual representative of the genus, and it occurs from thence to the Rocky Mountains. In breeding-habits it differs from the commoner species, not placing its eggs in tree-holes; but how far this difference is voluntary may be doubted, for in the countries it frequents trees are wanting. It is a larger and stouter bird, and in the male the white cheek-patches take a more crescentic form, while the head is glossed with purple rather than green, and the white scapulars are not elongated. The New World also possesses a third and still more beautiful species of the genus in *C. albeola*, known in books as the buffel-headed duck, and to American fowlers as the "spirit-duck" and "butter-ball"—the former name being applied from its rapidity in diving, and the latter from its exceeding fatness in autumn. This is of small size, but the lustre of the feathers in the male is most brilliant, exhibiting a deep plum-coloured gloss on the head. It breeds in trees, and is supposed to have occurred more than once in Britain. (A. N.)

GOLDEN FLEECE, in Greek mythology, the fleece of the ram on which Phrixus and Helle escaped, for which see ARGONAUTS. For the modern order of the Golden Fleece, see KNIGHTHOOD AND CHIVALRY, section *Orders of Knighthood*.

GOLDEN HORDE, the name of a body of Tatars who in the middle of the 13th century overran a great portion of eastern Europe and founded in Russia the Tatar empire of khanate known as the Empire of the Golden Horde or Western Kipchaks. They invaded Europe about 1237 under the leadership of Bātū Khan, a younger son of Juji, eldest son of Jenghiz Khan, passed over Russia with slaughter and destruction, and penetrated into Silesia, Poland and Hungary, finally defeating Henry II., duke of Silesia, at Liegnitz in the battle known as the Wahlstatt on the 9th of April 1241. So costly was this victory, however, that Bātū, finding he could not reduce Neustadt, retraced his steps and established himself in his magnificent tent (whence the name "golden") on the Volga. The new settlement was known as *Sir Orda* ("Golden Camp," whence "Golden *Horde*"). Very rapidly the powers of Bātū extended over the Russian princes, and so long as the khanate remained in the direct descent from Bātū nothing occurred to check the growth of the empire. The names of Bātū's successors are Sartak (1256), Bereke (Baraka) (1256–1266), Mangū-Timūr (1266–1280), Tūda Mangū (1280–1287), (?) Tūla Bughā (1287–1290), Tōktū (1290–1312), Uzbeg (1312–1340), Tin-Beg (1340), Jānī-Beg (1340–1357). The death of Jānī-Beg, however, threw the empire into confusion. Birdī-Beg (Berdi-Beg) only reigned for two years, after which two rulers, calling themselves sons of Jānī-Beg occupied the throne during one year. From that time (1359) till 1378 no single ruler held the whole empire under control, various members of the other branches of the old house of Jūjī assuming the title. At last in 1378 Tōktāmish, of the Eastern Kipchaks, succeeded in ousting all rivals, and establishing himself as ruler of eastern and western Kipchak. For a short time the glory of the Golden Horde was renewed, until it was finally crushed by Timur in 1395.

See further MONGOLS and RUSSIA; Sir Henry Howorth's *History of the Mongols*; S. Lane-Poole's *Mohammadan Dynasties* (1894), pp. 222-231 for the relations of the various descendants of Jenghiz, see Stockvis, *Manuel d'histoire*, vol. i. chap. ix. table 7.

GOLDEN ROD, in botany, the popular name for *Solidago virgaurea* (natural order Compositae), a native of Britain and widely distributed in the north temperate region. It is an old-fashioned border-plant flowering from July to September, with an erect, sparingly-branched stem and small bright-yellow clustered heads of flowers. It grows well in common soil and is readily propagated by division in the spring or autumn.

GOLDEN ROSE (*rosa aurea*), an ornament made of wrought gold and set with gems, generally sapphires, which is blessed by the pope on the fourth (*Laetare*) Sunday of Lent, and usually afterwards sent as a mark of special favour to some distinguished individual, to a church, or a civil community. Formerly it was a single rose of wrought gold, coloured red, but the form finally adopted is a thorny branch with leaves and flowers, the petals of which are decked with gems, surmounted by one principal rose. The origin of the custom is obscure. From very early times popes have given away a rose on the fourth Sunday of Lent, whence the name Dominica Rosa, sometimes given to this feast. The practice of blessing and sending some such symbol (*e.g. eulogiae*) goes back to the earliest Christian antiquity, but the use of the rose itself does not seem to go farther back than the 11th century. According to some authorities it was used by Leo IX. (1049–1054), but in any case Pope Urban II. sent one to Fulk of Anjou during the preparations for the first crusade. Pope Urban V., who sent a golden rose to Joanna of Naples in 1366, is alleged to have been the first to determine that one should be consecrated annually. Beginning with the 16th century there went regularly with the rose a letter relating the reasons why it was sent, and reciting the merits and virtues of the receiver. When the change was made from the form of the simple rose to the branch is uncertain. The rose sent by Innocent IV. in 1244 to Count Raymond Berengar IV. of Provence was a simple flower without any accessory ornamentation; while the one given by Benedict XI. in 1303 or 1304 to the

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church of St Stephen at Perugia consisted of a branch garnished with five open and two closed roses enriched with a sapphire, the whole having a value of seventy ducats. The value of the gift varied according to the character or rank of the recipient. John XXII. gave away some weighing 12 oz., and worth from £250 to £325. Among the recipients of this honour have been Henry VI. of England, 1446; James III. of Scotland, on whom the rose (made by Jacopo Magnolio) was conferred by Innocent VIII.; James IV. of Scotland; Frederick the Wise, elector of Saxony, who received a rose from Leo X. in 1518; Henry VIII. of England, who received three, the last from Clement VII. in 1524 (each had nine branches, and rested on different forms of feet, one on oxen, the second on acorns, and the third on lions); Queen Mary, who received one in 1555 from Julius III.; the republic of Lucca, so favoured by Pius IV., in 1564; the Lateran Basilica by Pius V. three years later; the sanctuary of Loreto by Gregory XIII. in 1584; Maria Theresa, queen of France, who received it from Clement XI. in 1668; Mary Casimir, queen of Poland, from Innocent XI. in 1684 in recognition of the deliverance of Vienna by her husband, John Sobieski; Benedict XIII. (1726) presented one to the cathedral of Capua, and in 1833 it was sent by Gregory XVI. to the church of St Mark's, Venice. In more recent times it was sent to Napoleon III. of France, the empress Eugénie, and the queens Isabella II., Christina (1886) and Victoria (1906) of Spain. The gift of the golden rose used almost invariably to accompany the coronation of the king of the Romans. If in any particular year no one is considered worthy of the rose, it is laid up in the Vatican.

Some of the most famous Italian goldsmiths have been employed in making the earlier roses; and such intrinsically valuable objects have, in common with other priceless historical examples of the goldsmiths' art, found their way to the melting-pot. It is, therefore, not surprising that the number of existing historic specimens is very small. These include one of the 14th century in the Cluny Museum, Paris, believed to have been sent by Clement V. to the prince-bishop of Basel; another conferred in 1458 on his native city of Siena by Pope Pius II.; and the rose bestowed upon Siena by Alexander VII., a son of that city, which is depicted in a procession in a fresco in the Palazzo Pubblico at Siena. The surviving roses of more recent date include that presented by Benedict XIII. to Capua cathedral; the rose conferred on the empress Caroline by Pius VII., 1819, at Vienna; one of 1833 (Gregory XVI.) at St Mark's, Venice; and Pope Leo XIII.'s rose sent to Queen Christina of Spain, which is at Madrid.

AUTHORITIES.—Angelo Rocca, *Aurea Rosa*, &c. (1719); Busenelli, *De Rosa Aurea. Epistola* (1750); Girbal, *La Rosa de oro* (Madrid, 1820); C. Joret, *La Rose d'or dans l'antiquité et au moyen âge* (Paris, 1892), pp. 432-435; Eugène Muniz in *Revue d'art chrétien* (1901), series v. vol. 12 pp. 1-11; De F. Mely, *Le Trésor de Chartres* (1886); Marquis de Mac Swiney Mashanaglass, *Le Portugal et le Saint Siège: Les Roses d'or envoyées par les Papes aux rois de Portugal au XVIe siècle* (1904); Sir C. Young, *Ornaments and Gift consecrated by the Roman Pontiffs: the Golden Rose, the Cap and Swords presented to Sovereigns of England and Scotland* (1864).

(J. T. S.*; E. A. J.)

GOLDEN RULE, the term applied in all European languages to the rule of conduct laid down in the New Testament (Matthew vii. 12 and Luke vi. 31), "whatsoever ye would that men should do to you, do ye even so to them, for this is the law and the prophets." This principle has often been stated as the fundamental precept of social morality. It is sometimes put negatively or passively, "do not that to another which thou wouldst not have done to thyself" (cf. Hobbes, *Leviathan*, xv. 70, xvii. 85), but it should be observed that in this form it implies merely abstention from evil doing. In either form the precept in ordinary application is part of a hedonistic system of ethics, the criterion of action being strictly utilitarian in character.

See H. Sidgwick, *History of Ethics* (5th ed., 1902), p. 167; James Seth, *Ethical Principles*, p. 97 foll.

GOLDFIELD, a town and the county-seat of Esmeralda county, Nevada, U.S.A., about 170 m. S.E. of Carson City. Pop. (1910, U. S. census) 4838. It is served by the Tonopah & Goldfield, Las Vegas & Tonopah, and Tonopah & Tidewater railways. The town lies in the midst of a desert abounding in high-grade gold ores, and is essentially a mining camp. The discovery of gold at Tonopah, about 18 m. N. of Goldfield, in 1900 was followed by its discovery at Goldfield in 1902 and 1903; in 1904 the Goldfield district produced about 800 tons of ore, which yielded $2,300,000 worth of gold, or 30% of that of the state. This remarkable production caused Goldfield to grow rapidly, and it soon became the largest town in the state. In addition to the mines, there are large reduction works. In 1907 Goldfield became the county-seat. The gold output in 1907 was $8,408,306; in 1908, $4,880,251. Soon after mining on an extensive scale began, the miners organized themselves as a local branch of the Western Federation of Miners, and in this branch were included many labourers in Goldfield other than miners. Between this branch and the mine-owners there arose a series of more or less serious differences, and there were several set strikes —in December 1906 and January 1907, for higher wages; in March and April 1907, because the mine-owners refused to discharge carpenters who were members of the American Federation of Labour, but did not belong to the Western Federation of Miners or to the Industrial Workers of the World affiliated with it, this last organization being, as a result of the strike, forced out of Goldfield; in August and September 1907, because a rule was introduced at some of the mines requiring miners to change their clothing before entering and after leaving the mines,—a rule made necessary, according to the operators, by the wholesale stealing (in miners' parlance, "high-grading") of the very valuable ore (some of it valued at as high as $20 a pound); and in November and December 1907, because some of the mine-owners, avowedly on account of the hard times, adopted a system of paying in cashier's checks. Excepting occasional attacks upon non-union workmen, or upon persons supposed not to be in sympathy with the miners' union, there had been no serious disturbance in Goldfield; but in December 1907, Governor Sparks, at the instance of the mine-owners, appealed to President Roosevelt to send Federal troops to Goldfield, on the ground that the situation there was ominous, that destruction of life and property seemed probable, and that the state had no militia and would be powerless to maintain order. President Roosevelt thereupon (December 4th) ordered General Frederick Funston, commanding the Division of California, at San Francisco, to proceed with 300 Federal troops to Goldfield. The troops arrived in Goldfield on the 6th of December, and immediately afterwards the mine-owners reduced wages and announced that no members of the Western Federation of Miners would thereafter be employed in the mines. President Roosevelt, becoming convinced that conditions had not warranted Governor Sparks's appeal for Federal assistance, but that the immediate withdrawal of the troops might nevertheless lead to serious disorders, consented that they should remain for a short time on condition that the state should immediately organize an adequate militia or police force. Accordingly, a special meeting of the legislature was immediately called, a state police force was organized, and on the 7th of March 1908 the troops were withdrawn. Thereafter work was gradually resumed in the mines, the contest having been won by the mine-owners.

GOLDFINCH (Ger. *Goldfink*[1]), the *Fringilla carduelis* of Linnaeus and the *Carduelis elegans* of later authors, an extremely well-known bird found over the greater parts of Europe and North Africa, and eastwards to Persia and Turkestan. Its gay plumage is matched by its sprightly nature; and together they make it one of the most favourite cage-birds among all classes. As a songster it is indeed surpassed by many other species, but its docility and ready attachment to its master or mistress make up for any defect in its vocal powers. In some parts of England the trade in goldfinches is very considerable. In 1860 Mr Hussey reported (*Zool.*, p. 7144) the average annual captures near Worthing to exceed 11,000 dozens—nearly all being cock-birds; and a witness before a committee of the House of Commons in 1873 stated that, when a boy, he could take forty

[1] The more common German name, however, is *Distelfink* (Thistle-Finch) or *Stieglitz*.

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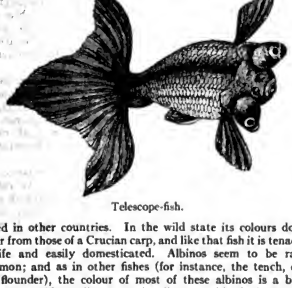
dozens in a morning near Brighton. In these districts and others the number has become much reduced, owing doubtless in part to the fatal practice of catching the birds just before or during the breeding-season; but perhaps the strongest cause of their growing scarcity is the constant breaking-up of waste lands, and the extirpation of weeds (particularly of the order *Compositae*) essential to the improved system of agriculture; for in many parts of Scotland, East Lothian for instance, where goldfinches were once as plentiful as sparrows, they are now only rare stragglers, and yet there they have not been thinned by netting. Though goldfinches may occasionally be observed in the coldest weather, incomparably the largest number leave Britain in autumn, returning in spring, and resorting to gardens and orchards to breed, when the lively song of the cock, and the bright yellow wings of both sexes, quickly attract notice. The nest is a beautifully neat structure, often placed at no great height from the ground, but generally so well hidden by the leafy bough on which it is built as not to be easily found, until, the young being hatched, the constant visits of the parents reveal its site. When the broods leave the nest they move into the more open country, and frequenting pastures, commons, heaths and downs, assemble in large flocks towards the end of summer. Eastward of the range of the present species its place is taken by its congener *C. caniceps*, which is easily recognized by wanting the black hood and white ear-coverts of the British bird. Its home seems to be in Central Asia, but it moves southward in winter, being common at that season in Cashmere, and is not unfrequently brought for sale to Calcutta. The position of the genus *Carduelis* in the family *Fringillidae* is not very clear. Structurally it would seem to have some relation to the siskins (*Chrysomitris*), though the members of the two groups have very different habits, and perhaps its nearest kinship lies with the hawfinches (*Coccothraustes*). See FINCH. (A. N.)

GOLDFISH (*Cyprinus* or *Carassius auratus*), a small fish belonging to the Cyprinid family, a native of China but naturalized in other countries. In the wild state its colours do not differ from those of a Crucian carp, and like that fish it is tenacious of life and easily domesticated. Albinos seem to be rather common; and as in other fishes (for instance, the tench, carp, eel, flounder), the colour of most of these albinos is a bright orange or golden yellow; occasionally even this shade of colour is lost, the fish being more or less pure white or silvery. The Chinese have domesticated these albinos for a long time, and by careful selection have succeeded in propagating all those strange varieties, and even monstrosities, which appear in every domestic animal. In some individuals the dorsal fin is only half its normal length, in others entirely absent; in others the anal fin has a double spine; in others all the fins are of nearly double the usual length. The snout is frequently malformed, giving the head of the fish an appearance similar to that of a bull-dog. The variety most highly prized has an extremely short snout, eyes which almost wholly project beyond the orbit, no dorsal fin, and a very long three- or four-lobed caudal fin (Telescope-fish).



Telescope-fish.

The domestication of the goldfish by the Chinese dates back from the highest antiquity, and they were introduced into Japan at the beginning of the 16th century; but the date of their importation into Europe is still uncertain. The great German ichthyologist, M. E. Bloch, thought he could trace it back in England to the reign of James I., whilst other authors fix the date at 1691. It appears certain that they were brought to France, only much later, as a present to Mme de Pompadour, although the de Goncourts, the historians of the mistresses of Louis XV., have failed to trace any records of this event. The fish has since spread over a considerable part of Europe, and in many places it has reverted to its wild condition. In many parts of south-eastern Asia, in Mauritius, in North and South Africa, in Madagascar, in the Azores, it has become thoroughly acclimatized, and successfully competes with the indigenous fresh-water fishes. It will not thrive in rivers; in large ponds it readily reverts to the coloration of the original wild stock. It flourishes best in small tanks and ponds, in which the water is constantly changing and does not freeze; in such localities, and with a full supply of food, which consists of weeds, crumbs of bread, bran, worms, small crustaceans and insects, it attains to a length of from 6 to 12 in., breeding readily, sometimes at different times of the same year.

GOLDFUSS, GEORG AUGUST (1782–1848), German palaeontologist, born at Thurnau near Bayreuth on the 18th of April 1782, was educated at Erlangen, where he graduated Ph.D. in 1804 and became professor of zoology in 1818. He was subsequently appointed professor of zoology and mineralogy in the university of Bonn. Aided by Count G. Münster he issued the important *Petrefacta Germaniae* (1826–1844), a work which was intended to illustrate the invertebrate fossils of Germany, but it was left incomplete after the sponges, corals, crinoids, echinids and part of the mollusca had been figured. Goldfuss died at Bonn on the 2nd of October 1848.

GOLDIE, SIR GEORGE DASHWOOD TAUBMAN (1846–), English administrator, the founder of Nigeria, was born on the 20th of May 1846 at the Nunnery in the Isle of Man, being the youngest son of Lieut.-Colonel John Taubman Goldie-Taubman, speaker of the House of Keys, by his second wife Caroline, daughter of John E. Hoveden of Hemingford, Cambridgeshire. Sir George resumed his paternal name, Goldie, by royal licence in 1887. He was educated at the Royal Military Academy, Woolwich, and for about two years held a commission in the Royal Engineers. He travelled in all parts of Africa, gaining an extensive knowledge of the continent, and first visited the country of the Niger in 1877. He conceived the idea of adding to the British empire the then little known regions of the lower and middle Niger, and for over twenty years his efforts were devoted to the realization of this conception. The method by which he determined to work was the revival of government by chartered companies within the empire—a method supposed to be buried with the East India Company. The first step was to combine all British commercial interests in the Niger, and this he accomplished in 1879 when the United African Company was formed. In 1881 Goldie sought a charter from the imperial government (the 2nd Gladstone ministry). Objections of various kinds were raised. To meet them the capital of the company (renamed the National African Company) was increased from £125,000 to £1,000,000, and great energy was displayed in founding stations on the Niger. At this time French traders, encouraged by Gambetta, established themselves on the lower river, thus rendering it difficult for the company to obtain territorial rights; but the Frenchmen were bought out in 1884, so that at the Berlin conference on West Africa in 1885 Mr Goldie, present as an expert on matters relating to the river, was able to announce that on the lower Niger the British flag alone flew. Meantime the Niger coast line had been placed under British protection. Through Joseph Thomson, David McIntosh, D. W. Sargent, J. Flint, William Wallace, E. Dangerfield and numerous other agents, over 400 political treaties—drawn up by Goldie—were made with the chiefs of the lower Niger and the Hausa states. The scruples of the British government being overcome, a charter was at length granted

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(July 1886), the National African Company becoming the Royal Niger Company, with Lord Aberdare as governor and Goldie as vice-governor. In 1895, on Lord Aberdare's death, Goldie became governor of the company, whose destinies he had guided throughout.

The building up of Nigeria as a British state had to be carried on in face of further difficulties raised by French travellers with political missions, and also in face of German opposition. From 1884 to 1890, Prince Bismarck was a persistent antagonist, and the strenuous efforts he made to secure for Germany the basin of the lower Niger and Lake Chad were even more dangerous to Goldie's schemes of empire than the ambitions of France. Herr E. R. Flegel, who had travelled in Nigeria during 1882–1884 under the auspices of the British company, was sent out in 1885 by the newly-formed German Colonial Society to secure treaties for Germany, which had established itself at Cameroon. After Flegel's death in 1886 his work was continued by his companion Dr Staudinger, while Herr Hoenigsberg was despatched to stir up trouble in the occupied portions of the Company's territory,—or, as he expressed it, "to burst up the charter." He was finally arrested at Onitsha, and, after trial by the company's supreme court at Asaba, was expelled the country. Prince Bismarck then sent out his nephew, Herr von Puttkamer, as German consul-general to Nigeria, with orders to report on this affair, and when this report was published in a White Book, Bismarck demanded heavy damages from the company. Meanwhile Bismarck maintained constant pressure on the British government to compel the Royal Niger Company to a division of spheres of influence, whereby Great Britain would have lost a third, and the most valuable part, of the company's territory. But he fell from power in March 1890, and in July following Lord Salisbury concluded the famous "Heligoland" agreement with Germany. After this event the aggressive action of Germany in Nigeria entirely ceased, and the door was opened for a final settlement of the Nigeria-Cameroon frontiers. These negotiations, which resulted in an agreement in 1893, were initiated by Goldie as a means of arresting the advance of France into Nigeria from the direction of the Congo. By conceding to Germany a long but narrow strip of territory between Adamawa and Lake Chad, to which she had no treaty claims, a barrier was raised against French expeditions, semi-military and semi-exploratory, which sought to enter Nigeria from the east. Later French efforts at aggression were made from the western or Dahomeyan side, despite an agreement concluded with France in 1890 respecting the northern frontier.

The hostility of certain Fula princes led the company to despatch, in 1897, an expedition against the Mahommedan states of Nupé and Illorin. This expedition was organized and personally directed by Goldie and was completely successful. Internal peace was thus secured, but in the following year the differences with France in regard to the frontier line became acute, and compelled the intervention of the British government. In the negotiations which ensued Goldie was instrumental in preserving for Great Britain the whole of the navigable stretch of the lower Niger. It was, however, evidently impossible for a chartered company to hold its own against the state-supported protectorates of France and Germany, and in consequence, on the 1st of January 1900, the Royal Niger Company transferred its territories to the British government for the sum of £865,000. The ceded territory together with the small Niger Coast Protectorate, already under imperial control, was formed into the two protectorates of northern and southern Nigeria (see further NIGERIA).

In 1903–1904, at the request of the Chartered Company of South Africa, Goldie visited Rhodesia and examined the situation in connexion with the agitation for self-government by the Rhodesians. In 1902–1903 he was one of the royal commissioners who inquired into the military preparations for the war in South Africa (1899–1902) and into the operations up to the occupation of Pretoria, and in 1905–1906 was a member of the royal commission which investigated the methods of disposal of war stores after peace had been made. In 1905 he was elected president of the Royal Geographical Society and held that office for three years. In 1908 he was chosen an alderman of the London County Council. Goldie was created K.C.M.G. in 1887, and a privy councillor in 1898. He became an F.R.S., honorary D.C.L. of Oxford University (1897) and honorary LL.D. of Cambridge (1897). He married in 1870 Matilda Catherine (d. 1898), daughter of John William Elliott of Wakefield.

GOLDING, ARTHUR (*c.* 1536–*c.* 1605), English translator, son of John Golding of Belchamp St Paul and Halsted, Essex, one of the auditors of the exchequer, was born probably in London about 1536. His half-sister, Margaret, married John de Vere, 16th earl of Oxford. In 1549 he was already in the service of Protector Somerset, and the statement that he was educated at Queen's College, Cambridge, lacks corroboration. He seems to have resided for some time in the house of Sir William Cecil, in the Strand, with his nephew, the poet, the 17th earl of Oxford, whose receiver he was, for two of his dedications are dated from Cecil House. His chief work is his translation of Ovid. *The Fyrst Fower Bookes of P. Ovidius Nasos worke, entitled Metamorphosis, translated oute of Latin into Englishe meter* (1565), was supplemented in 1567 by a translation of the fifteen books. Strangely enough the translator of Ovid was a man of strong Puritan sympathies, and he translated many of the works of Calvin. To his version of the *Metamorphoses* he prefixed a long metrical explanation of his reasons for considering it a work of edification. He sets forth the moral which he supposes to underlie certain of the stories, and shows how the pagan machinery may be brought into line with Christian thought. It was from Golding's pages that many of the Elizabethans drew their knowledge of classical mythology, and there is little doubt that Shakespeare was well acquainted with the book. Golding translated also the *Commentaries* of Caesar (1565), Calvin's commentaries on the Psalms (1571), his sermons on the Galatians and Ephesians, on Deuteronomy and the book of Job, Theodore Beza's *Tragedie of Abrahams Sacrifice* (1577) and the *De Beneficiis* of Seneca (1578). He completed a translation begun by Sidney from Philippe de Mornay, *A Worke concerning the Trewenesse of the Christian Religion* (1604). His only original work is a prose *Discourse* on the earthquake of 1580, in which he saw a judgment of God on the wickedness of his time. He inherited three considerable estates in Essex, the greater part of which he sold in 1595. The last trace we have of Golding is contained in an order dated the 25th of July 1605, giving him licence to print certain of his works.

GOLDINGEN (Lettish, *Kuldiga*), a town of Russia, in the government of Courland, 55 m. by rail N.E. of Libau, and on Windau river, in 56° 58′ N. and 21° E. Pop. (1897) 9733. It has woollen mills, needle and match factories, breweries and distilleries, a college for teachers, and ruins of a castle of the Teutonic Knights, built in 1248 and used in the 17th century as the residence of the dukes of Courland.

GOLDMARK, KARL (1832–), Hungarian composer, was born at Keszthely-am-Plattensee, in Hungary, on the 18th of May 1832. His father, a poor cantor in the local Jewish synagogue, was unable to assist to any extent financially in the development of his son's talents. Yet in the household much music was made, and on a cheap violin and home-made flute, constructed by Goldmark himself from reeds cut from the river-bank, the future composer gave rein to his musical ideas. His talent was fostered by the village schoolmaster, by whose aid he was able to enter the music-school of the Oedenburger Verein. Here he remained but a short time, his success at a school concert finally determining his parents to allow him to devote himself entirely to music. In 1844, then, he went to Vienna, where Jansa took up his cause and eventually obtained for him admission to the conservatorium. For two years Goldmark worked under Jansa at the violin, and on the outbreak of the revolution, after studying all the orchestral instruments he obtained an engagement in the orchestra at Raab. There, on the capitulation of Raab, he was to have been shot for a spy, and was only saved at the eleventh hour by the happy arrival of a former colleague. In 1850 Goldmark left Raab for Vienna, where from his friend Mittrich he obtained his first real knowledge of the classics. There, too, he devoted himself to composition. In 1857 Goldmark,

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who was then engaged in the Karl-theater band, gave a concert of his own works with such success that his first quartet attracted very general attention. Then followed the "Sakuntala" and "Penthesilea" overtures, which show how Wagner's influence had supervened upon his previous domination by Mendelssohn, and the delightful "Ländliche Hochzeit" symphony, which carried his fame abroad. Goldmark's reputation was now made, and very largely increased by the production at Vienna in 1875 of his first and best opera, *Die Königin von Saba*. Over this opera he spent seven years. Its popularity is still almost as great as ever. It was followed in November 1886, also at Vienna, by *Merlin*, much of which has been rewritten since then. A third opera, a version of Dickens's *Cricket on the Hearth*, was given by the Royal Carl Rosa Company in London in 1900. Goldmark's chamber music has not made much lasting impression, but the overtures "Im Frühling," "Prometheus Bound," and "Sapho" are fairly well known. A "programme" seems essential to him. In opera he is most certainly at his best, and as an orchestral colourist he ranks among the very highest.

GOLDONI, CARLO (1707–1793), Italian dramatist, the real founder of modern Italian comedy, was born at Venice, on the 25th of February 1707, in a fine house near St Thomas's church. His father Giulio was a native of Modena. The first playthings of the future writer were puppets which he made dance; the first books he read were plays,—among others, the comedies of the Florentine Cicognini. Later he received a still stronger impression from the *Mandragora* of Machiavelli. At eight years old he had tried to sketch a play. His father, meanwhile, had taken his degree in medicine at Rome and fixed himself at Perugia, where he made his son join him; but, having soon quarrelled with his colleagues in medicine, he departed for Chioggia, leaving his son to the care of a philosopher, Professor Caldini of Rimini. The young Goldoni soon grew tired of his life at Rimini, and ran away with a Venetian company of players. He began to study law at Venice, then went to continue the same pursuit at Pavia, but at that time he was studying the Greek and Latin comic poets much more and much better than books about law. "I have read over again," he writes in his own *Memoirs*, "the Greek and Latin poets, and I have told to myself that I should like to imitate them in their style, their plots, their precision; but I would not be satisfied unless I succeeded in giving more interest to my works, happier issues to my plots, better drawn characters and more genuine comedy." For a satire entitled *Il Colosso*, which attacked the honour of several families of Pavia, he was driven from that town, and went first to study with the jurisconsult Morelli at Udine, then to take his degree in law at Modena. After having worked some time as clerk in the chanceries of Chioggia and Feltre, his father being dead, he went to Venice, to exercise there his profession as a lawyer. But the wish to write for the stage was always strong in him, and he tried to do so; he made, however, a mistake in his choice, and began with a tragedy, *Amalasunta*, which was represented at Milan and proved a failure. In 1734 he wrote another tragedy, *Belisario*, which, though not much better, chanced nevertheless to please the public. This first success encouraged him to write other tragedies, some of which were well received; but the author himself saw clearly that he had not yet found his proper sphere, and that a radical dramatic reform was absolutely necessary for the stage. He wished to create a characteristic comedy in Italy, to follow the example of Molière, and to delineate the realities of social life in as natural a manner as possible. His first essay of this kind was *Momolo Cortesan* (Momolo the Courtier), written in the Venetian dialect, and based on his own experience. Other plays followed—some interesting from their subject, others from the characters; the best of that period are—*La Trentadue Disgrazie d' Arlecchino*, *La Notte critica*, *La Boncarotta*, *La Donna di Garbo*. Having, while consul of Genoa at Venice, been cheated by a captain of Ragusa, he founded on this his play *L'Impostore*. At Leghorn he made the acquaintance of the comedian Medebac, and followed him to Venice, with his company, for which he began to write his best plays. Once he promised to write sixteen comedies in a year, and kept his word; among the sixteen are some of his very best, such as *Il Caffè*, *Il Bugiardo*, *La Pamela*. When he left the company of Medebac, he passed over to that maintained by the patrician Vendramin, continuing to write with the greatest facility. In 1761 he was called to Paris, and before leaving Venice he wrote *Una delle ultime sere di Carnevale* (One of the Last Nights of Carnival), an allegorical comedy in which he said good-bye to his country. At the end of the representation of this play, the theatre resounded with applause, and with shouts expressive of good wishes. Goldoni, at this proof of public sympathy, wept as a child. In Paris, during two years, he wrote comedies for the Italian actors; then he taught Italian to the royal princesses; and for the wedding of Louis XVI. and of Marie Antoinette he wrote in French one of his best comedies, *Le Bourru bienfaisant*, which was a great success. When he retired from Paris to Versailles, the king made him a gift of 6000 francs, and fixed on him an annual pension of 1200 francs. It was at Versailles he wrote his *Memoirs*, which occupied him till he reached his eightieth year. The Revolution deprived him all at once of his modest pension, and reduced him to extreme misery; he dragged on his unfortunate existence till 1793, and died on the 6th of February. The day after, on the proposal of André Chénier, the Convention agreed to give the pension back to the poet; and as he had already died, a reduced allowance was granted to his widow.

The best comedies of Goldoni are: *La Donna di Garbo*, *La Bottega di Caffè*, *Pamela nubile*, *Le Barufe chiozzotte*, *I Rusteghi*, *Todero Brontolon*, *Gli Innamorati*, *Il Ventaglio*, *Il Bugiardo*, *La Casa nova*, *Il Burbero benefico*, *La Locandiera*. A collected edition (Venice, 1788) was republished at Florence in 1827. See P. G. Molmenti, *Carlo Goldoni* (Venice, 1875); Rabany, *Carlo Goldoni* (Paris, 1896). The *Memoirs* were translated into English by John Black (Boston, 1877), with preface by W. D. Howells.

GOLDS, a Mongolo-Tatar people, living on the Lower Amur in south-eastern Siberia. Their chief settlements are on the right bank of the Amur and along the Sungari and Usuri rivers. In physique they are typically Mongolic. Like the Chinese they wear a pigtail, and from them, too, have learnt the art of silk embroidery. The Golds live almost entirely on fish, and are excellent boatmen. They keep large herds of swine and dogs, which live, like themselves, on fish. Geese, wild duck, eagles, bears, wolves and foxes are also kept in menageries. There is much reverence paid to the eagles, and hence the Manchus call the Golds "Eaglets." Their religion is Shamanism.

See L. Schrenck, *Die Völker des Amurlandes* (St Petersburg, 1891); Laufer, "The Amoor Tribes," in *American Anthropologist* (New York, 1900); E. G. Ravenstein, *The Russians on the Amur* (1861).

GOLDSBORO, a city and the county-seat of Wayne county, North Carolina, U.S.A., on the Neuse river, about 50 m. S.E. of Raleigh. Pop. (1890) 4017; (1900) 5877 (2520 negroes); (1910) 6107. It is served by the Southern, the Atlantic Coast Line and the Norfolk & Southern railways. The surrounding country produces large quantities of tobacco, cotton and grain, and trucking is an important industry, the city being a distributing point for strawberries and various kinds of vegetables. The city's manufactures include cotton goods, knit goods, cotton-seed oil, agricultural implements, lumber and furniture. Goldsboro is the seat of the Eastern insane asylum (for negroes) and of an Odd Fellows' orphan home. The municipality owns and operates its water-works and electric-lighting plant. Goldsboro was settled in 1838, and was first incorporated in 1841. In the campaign of 1865 Goldsboro was the point of junction of the Union armies under generals Sherman and Schofield, previous to the final advance to Greensboro.

GOLDSCHMIDT, HERMANN (1802–1866), German painter and astronomer, was the son of a Jewish merchant, and was born at Frankfort on the 17th of June 1802. He for ten years assisted his father in his business; but, his love of art having been awakened while journeying in Holland, he in 1832 began the study of painting at Munich under Cornelius and Schnorr, and in 1836 established himself at Paris, where he painted a number of pictures of more than average merit, among which may be mentioned the "Cumaean Sibyl" (1844); an "Offering to

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Venus" (1845); a "View of Rome" (1849); the "Death of Romeo and Juliet" (1857); and several Alpine landscapes. In 1847 he began to devote his attention to astronomy; and from 1852 to 1861 he discovered fourteen asteroids between Mars and Jupiter, on which account he received the grand astronomical prize from the Academy of Sciences. His observations of the protuberances on the sun, made during the total eclipse on the 10th of July 1860, are included in the work of Mädler on the eclipse, published in 1861. Goldschmidt died at Fontainebleau on the 26th of August 1866.

GOLDSMID, the name of a family of Anglo-Jewish bankers sprung from Aaron Goldsmid (d. 1782), a Dutch merchant who settled in England about 1763. Two of his sons, Benjamin Goldsmid (*c.* 1753–1808) and Abraham Goldsmid (*c.* 1756–1810), began business together about 1777 as bill-brokers in London, and soon became great powers in the money market, during the Napoleonic war, through their dealings with the government. Abraham Goldsmid was in 1810 joint contractor with the Barings for a government loan, but owing to a depreciation of the scrip he was forced into bankruptcy and committed suicide. His brother, in a fit of depression, had similarly taken his own life two years before. Both were noted for their public and private generosity, and Benjamin had a part in founding the Royal Naval Asylum. Benjamin left four sons, the youngest being Lionel Prager Goldsmid; Abraham a daughter, Isabel.

Their nephew, Sir Isaac Lyon Goldsmid, Bart. (1778–1859), was born in London, and began in business with a firm of bullion brokers to the Bank of England and the East India Company. He amassed a large fortune, and was made Baron da Palmeira by the Portuguese government in 1846 for services rendered in settling a monetary dispute between Portugal and Brazil, but he is chiefly known for his efforts to obtain the emancipation of the Jews in England and for his part in founding University College, London. The Jewish Disabilities Bill, first introduced in Parliament by Sir Robert Grant in 1830, owed its final passage to Goldsmid's energetic work. He helped to establish the University College hospital in 1834, serving as its treasurer for eighteen years, and also aided in the efforts to obtain reform in the English penal code. Moreover he assisted by his capital and his enterprise to build part of the English southern railways and also the London docks. In 1841 he became the first Jewish baronet, the honour being conferred upon him by Lord Melbourne. He had married his cousin Isabel (see above), and their second son was Sir Francis Henry Goldsmid, Bart. (1808–1878), born in London, and called to the bar at Lincoln's Inn in 1833 (the first Jew to become an English barrister; Q.C. 1858). After the passing of the Jewish Disabilities Bill, in which he had aided his father with a number of pamphlets that attracted great attention, he entered Parliament in 1860 (having succeeded to the baronetcy) as member for Reading, and represented that constituency until his death. He was strenuous on behalf of the Jewish religion, and the founder of the great Jews' Free School. He was a munificent contributor to charities and especially to the endowment of University College. He, like his father, married a cousin, and, dying without issue, was succeeded in the baronetcy by his nephew Sir Julian Goldsmid, Bart. (1838–1896), son of Frederick David Goldsmid (1812–1866), long M.P. for Honiton. Sir Julian was for many years in Parliament, and his wealth, ability and influence made him a personage of considerable importance. He was eventually made a privy councillor. He had eight daughters, but no son, and his entailed property passed to his relation, Mr d'Avigdor, his house in Piccadilly being converted into the Isthmian Club.

Another distinguished member of the same family, Sir Frederic John Goldsmid (1818–1908), son of Lionel Prager Goldsmid (see above), was educated at King's College, London, and entering the Madras army in 1839 served in the China War of 1840–41, with the Turkish troops in eastern Crimea in 1855–56, and was given political employment by the Indian government. He received the thanks of the commander-in-chief and of the war office for services during the Egyptian campaign, and was retired a major-general in 1875. Sir Frederic Goldsmid's name is, however, associated less with military service than with much valuable work in exploration and in surveying, for which he repeatedly received the thanks of government. From 1865 to 1870 he was director-general of the Indo-European telegraph, and carried through the telegraph convention with Persia; and between 1870 and 1872, as commissioner, he settled with Persia the difficult questions of the Perso-Baluch and Perso-Afghan boundaries. In the course of his work he had to travel extensively, and he followed this up by various responsible missions connected with emigration questions. In 1881–1882 he was in Egypt, as controller of the Daira Sanieh, and doing other miscellaneous military work; and in 1883 he went to the Congo, on behalf of the king of the Belgians, as one of the organizers of the new state, but had to return on account of illness. From his early years he had made studies of several Eastern languages, and he ranked among the foremost Orientalists of his day. In 1886 he was president of the geographical section of the British Association meeting held at Birmingham. He had married in 1849, and had two sons and four daughters. In 1871 he was made a K.C.S.I. Besides important contributions to the 9th edition of the *Encyclopaedia Britannica* and many periodicals, he wrote an excellent and authoritative biography of Sir James Outram (2 vols., 1880).

A sister of the last-named married Henry Edward Goldsmid (1812–1855), an eminent Indian civil servant, son of Edward Goldsmid; his reform of the revenue system in Bombay, and introduction of a new system, established after his death, through his reports in 1840–1847, and his devoted labour in land-surveys, were of the highest importance to western India, and established his memory there as a public benefactor.

GOLDSMITH, LEWIS (*c.* 1763–1846), Anglo-French publicist, of Portuguese-Jewish extraction, was born near London about 1763. Having published in 1801 *The Crimes of Cabinets, or a Review of the Plans and Aggressions for Annihilating the Liberties of France, and the Dismemberment of her Territories*, an attack on the military policy of Pitt, he moved, in 1802, from England to Paris. Talleyrand introduced him to Napoleon, who arranged for him to establish in Paris an English tri-weekly, the *Argus*, which was to review English affairs from the French point of view. According to his own account, he was in 1803 entrusted with a mission to obtain from the head of the French royal family, afterwards Louis XVIII., a renunciation of his claims to the throne of France, in return for the throne of Poland. The offer was declined, and Goldsmith says that he then received instructions to kidnap Louis and kill him if he resisted, but, instead of executing these orders, he revealed the plot. He was, nevertheless, employed by Napoleon on various other secret service missions till 1807, when his Republican sympathies began to wane. In 1809 he returned to England, where he was at first imprisoned but soon released; and he became a notary in London. In 1811, being now violently anti-republican, he founded a Sunday newspaper, the *Anti-Gallican Monitor* and *Anti-Corsican Chronicle*, subsequently known as the *British Monitor*, in which he denounced the French Revolution. In 1811 he proposed that a public subscription should be raised to put a price on Napoleon's head, but this suggestion was strongly reprobated by the British government. In the same year he published *Secret History of the Cabinet of Bonaparte* and *Recueil des manifestes, or a Collection of the Decrees of Napoleon Bonaparte*, and in 1812 *Secret History of Bonaparte's Diplomacy*. Goldsmith alleged that in the latter year he was offered £200,000 by Napoleon to discontinue his attacks. In 1815 he published *An Appeal to the Governments of Europe on the Necessity of bringing Napoleon Bonaparte to a Public Trial*. In 1825 he again settled down in Paris, and in 1832 published his *Statistics of France*. His only child, Georgiana, became, in 1837, the second wife of Lord Lyndhurst. He died in Paris on the 6th of January 1846.

GOLDSMITH, OLIVER (1728–1774), English poet, playwright, novelist and man of letters, came of a Protestant and Saxon family which had long been settled in Ireland. He is usually said to have been born at Pallas or Pallasmore, Co. Longford; but recent investigators have contended, with much

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show of probability, that his true birthplace was Smith-Hill House, Elphin, Roscommon, the residence of his mother's father, the Rev. Oliver Jones. His father, Charles Goldsmith, lived at Pallas, supporting with difficulty his wife and children on what he could earn, partly as a curate and partly as a farmer.

While Oliver was still a child his father was presented to the living of Kilkenny West, in the county of West Meath. This was worth about £200 a year. The family accordingly quitted their cottage at Pallas for a spacious house on a frequented road, near the village of Lissoy. Here the boy was taught his letters by a relative and dependent, Elizabeth Delap, and was sent in his seventh year to a village school kept by an old quartermaster on half-pay, who professed to teach nothing but reading, writing and arithmetic, but who had an inexhaustible fund of stories about ghosts, banshees and fairies, about the great Rapparee chiefs, Baldearg O'Donnell and galloping Hogan, and about the exploits of Peterborough and Stanhope, the surprise of Monjuich and the glorious disaster of Brihuega. This man must have been of the Protestant religion; but he was of the aboriginal race, and not only spoke the Irish language, but could pour forth unpremeditated Irish verses. Oliver early became, and through life continued to be, a passionate admirer of the Irish music, and especially of the compositions of Carolan, some of the last notes of whose harp he heard. It ought to be added that Oliver, though by birth one of the Englishry, and though connected by numerous ties with the Established Church, never showed the least sign of that contemptuous antipathy with which, in his days, the ruling minority in Ireland too generally regarded the subject majority. So far indeed was he from sharing in the opinions and feelings of the caste to which he belonged that he conceived an aversion to the Glorious and Immortal Memory, and, even when George III. was on the throne, maintained that nothing but the restoration of the banished dynasty could save the country.

From the humble academy kept by the old soldier Goldsmith was removed in his ninth year. He went to several grammar-schools, and acquired some knowledge of the ancient languages. His life at this time seems to have been far from happy. He had, as appears from the admirable portrait of him by Reynolds at Knole, features harsh even to ugliness. The small-pox had set its mark on him with more than usual severity. His stature was small, and his limbs ill put together. Among boys little tenderness is shown to personal defects; and the ridicule excited by poor Oliver's appearance was heightened by a peculiar simplicity and a disposition to blunder which he retained to the last. He became the common butt of boys and masters, was pointed at as a fright in the play-ground, and flogged as a dunce in the school-room. When he had risen to eminence, those who had once derided him ransacked their memory for the events of his early years, and recited repartees and couplets which had dropped from him, and which, though little noticed at the time, were supposed, a quarter of a century later, to indicate the powers which produced the *Vicar of Wakefield* and the *Deserted Village*.

On the 11th of June 1744, being then in his sixteenth year, Oliver went up to Trinity College, Dublin, as a sizar. The sizars paid nothing for food and tuition, and very little for lodging; but they had to perform some menial services from which they have long been relieved. Goldsmith was quartered, not alone, in a garret of what was then No. 35 in a range of buildings which has long since disappeared. His name, scrawled by himself on one of its window-panes is still preserved in the college library. From such garrets many men of less parts than his have made their way to the woolsack or to the episcopal bench. But Goldsmith, while he suffered all the humiliations, threw away all the advantages of his situation. He neglected the studies of the place, stood low at the examinations, was turned down to the bottom of his class for playing the buffoon in the lecture-room, was severely reprimanded for pumping on a constable, and was caned by a brutal tutor for giving a ball in the attic storey of the college to some gay youths and damsels from the city.

While Oliver was leading at Dublin a life divided between squalid distress and squalid dissipation, his father died, leaving a mere pittance. In February 1749 the youth obtained his bachelor's degree, and left the university. During some time the humble dwelling to which his widowed mother had retired was his home. He was now in his twenty-first year; it was necessary that he should do something; and his education seemed to have fitted him to do nothing but to dress himself in gaudy colours, of which he was as fond as a magpie, to take a hand at cards, to sing Irish airs, to play the flute, to angle in summer and to tell ghost stories by the fire in winter. He tried five or six professions in turn without success. He applied for ordination; but, as he applied in scarlet clothes, he was speedily turned out of the episcopal palace. He then became tutor in an opulent family, but soon quitted his situation in consequence of a dispute about pay. Then he determined to emigrate to America. His relations, with much satisfaction, saw him set out for Cork on a good horse, with £30 in his pocket. But in six weeks he came back on a miserable hack, without a penny, and informed his mother that the ship in which he had taken his passage, having got a fair wind while he was at a party of pleasure, had sailed without him. Then he resolved to study the law. A generous uncle, Mr Contarine, advanced £50. With this sum Goldsmith went to Dublin, was enticed into a gaming-house and lost every shilling. He then thought of medicine. A small purse was made up; and in his twenty-fourth year he was sent to Edinburgh. At Edinburgh he passed eighteen months in nominal attendance on lectures, and picked up some superficial information about chemistry and natural history. Thence he went to Leiden, still pretending to study physic. He left that celebrated university, the third university at which he had resided, in his twenty-seventh year, without a degree, with the merest smattering of medical knowledge, and with no property but his clothes and his flute. His flute, however, proved a useful friend. He rambled on foot through Flanders, France and Switzerland, playing tunes which everywhere set the peasantry dancing, and which often procured for him a supper and a bed. He wandered as far as Italy. His musical performances, indeed, were not to the taste of the Italians; but he contrived to live on the alms which he obtained at the gates of convents. It should, however, be observed that the stories which he told about this part of his life ought to be received with great caution; for strict veracity was never one of his virtues; and a man who is ordinarily inaccurate in narration is likely to be more than ordinarily inaccurate when he talks about his own travels. Goldsmith, indeed, was so regardless of truth as to assert in print that he was present at a most interesting conversation between Voltaire and Fontenelle, and that this conversation took place at Paris. Now it is certain that Voltaire never was within a hundred leagues of Paris during the whole time which Goldsmith passed on the continent.

In February 1756 the wanderer landed at Dover, without a shilling, without a friend and without a calling. He had indeed, if his own unsupported evidence may be trusted, obtained a doctor's degree on the continent; but this dignity proved utterly useless to him. In England his flute was not in request; there were no convents; and he was forced to have recourse to a series of desperate expedients. There is a tradition that he turned strolling player. He pounded drugs and ran about London with phials for charitable chemists. He asserted, upon one occasion, that he had lived "among the beggars in Axe Lane." He was for a time usher of a school, and felt the miseries and humiliations of this situation so keenly that he thought it a promotion to be permitted to earn his bread as a bookseller's hack; but he soon found the new yoke more galling than the old one, and was glad to become an usher again. He obtained a medical appointment in the service of the East India Company; but the appointment was speedily revoked. Why it was revoked we are not told. The subject was one on which he never liked to talk. It is probable that he was incompetent to perform the duties of the place. Then he presented himself at Surgeons' Hall for examination, as "mate to an hospital." Even to so humble a post he was found unequal. Nothing remained but to return to the lowest drudgery of literature. Goldsmith took a room in a tiny square off Ludgate Hill, to which he had to climb

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from Sea-coal Lane by a dizzy ladder of flagstones called Breakneck Steps. Green Arbour Court and the ascent have long disappeared. Here, at thirty, the unlucky adventurer sat down to toil like a galley slave. Already, in 1758, during his first bondage to letters, he had translated Marteilhe's remarkable *Memoirs of a Protestant, Condemned to the Galleys of France for his Religion*. In the years that now succeeded he sent to the press some things which have survived, and many which have perished. He produced articles for reviews, magazines and newspapers; children's books, which, bound in gilt paper and adorned with hideous woodcuts, appeared in the window of Newbery's once far-famed shop at the corner of Saint Paul's churchyard; *An Inquiry into the State of Polite Learning in Europe*, which, though of little or no value, is still reprinted among his works; a volume of essays entitled *The Bee;* a *Life of Beau Nash*; a superficial and incorrect, but very readable, *History of England*, in a series of letters purporting to be addressed by a nobleman to his son; and some very lively and amusing sketches of London Society in another series of letters purporting to be addressed by a Chinese traveller to his friends. All these works were anonymous; but some of them were well known to be Goldsmith's; and he gradually rose in the estimation of the booksellers for whom he drudged. He was, indeed, emphatically a popular writer. For accurate research or grave disquisition he was not well qualified by nature or by education. He knew nothing accurately; his reading had been desultory; nor had he meditated deeply on what he had read. He had seen much of the world; but he had noticed and retained little more of what he had seen than some grotesque incidents and characters which had happened to strike his fancy. But, though his mind was very scantily stored with materials, he used what materials he had in such a way as to produce a wonderful effect. There have been many greater writers; but perhaps no writer was ever more uniformly agreeable. His style was always pure and easy, and, on proper occasions, pointed and energetic. His narratives were always amusing, his descriptions always picturesque, his humour rich and joyous, yet not without an occasional tinge of amiable sadness. About everything that he wrote, serious or sportive, there was a certain natural grace and decorum, hardly to be expected from a man a great part of whose life had been passed among thieves and beggars, street-walkers and merryandrews, in those squalid dens which are the reproach of great capitals.

As his name gradually became known, the circle of his acquaintance widened. He was introduced to Johnson, who was then considered as the first of living English writers; to Reynolds, the first of English painters; and to Burke, who had not yet entered parliament, but had distinguished himself greatly by his writings and by the eloquence of his conversation. With these eminent men Goldsmith became intimate. In 1763 he was one of the nine original members of that celebrated fraternity which has sometimes been called the Literary Club, but which has always disclaimed that epithet, and still glories in the simple name of the Club.

By this date Goldsmith had quitted his miserable dwelling at the top of Breakneck Steps, and, after living for some time at No. 6 Wine Office Court, Fleet Street, had moved into the Temple. But he was still often reduced to pitiable shifts, the most popular of which is connected with the sale of his solitary novel, the *Vicar of Wakefield*. Towards the close of 1763(?) his rent is alleged to have been so long in arrear that his landlady one morning called in the help of a sheriff's officer. The debtor, in great perplexity, despatched a messenger to Johnson; and Johnson, always friendly, though often surly, sent back the messenger with a guinea, and promised to follow speedily. He came, and found that Goldsmith had changed the guinea, and was railing at the landlady over a bottle of Madeira. Johnson put the cork into the bottle, and entreated his friend to consider calmly how money was to be procured. Goldsmith said that he had a novel ready for the press. Johnson glanced at the manuscript, saw that there were good things in it, took it to a bookseller, sold it for £60 and soon returned with the money. The rent was paid; and the sheriff's officer withdrew. (Unfortunately, however, for this time-honoured version of the circumstances, it has of late years been discovered that as early as October 1762 Goldsmith had already sold a third of the *Vicar* to one Benjamin Collins of Salisbury, a printer, by whom it was eventually printed for F. Newbery, and it is difficult to reconcile this fact with Johnson's narrative.)

But before the *Vicar of Wakefield* appeared in 1766, came the great crisis of Goldsmith's literary life. In Christmas week 1764 he published a poem, entitled the *Traveller*. It was the first work to which he had put his name, and it at once raised him to the rank of a legitimate English classic. The opinion of the most skilful critics was that nothing finer had appeared in verse since the fourth book of the *Dunciad*. In one respect the *Traveller* differs from all Goldsmith's other writings. In general his designs were bad, and his execution good. In the *Traveller* the execution, though deserving of much praise, is far inferior to the design. No philosophical poem, ancient or modern, has a plan so noble, and at the same time so simple. An English wanderer, seated on a crag among the Alps, near the point where three great countries meet, looks down on the boundless prospect, reviews his long pilgrimage, recalls the varieties of scenery, of climate, of government, of religion, of national character, which he has observed, and comes to the conclusion, just or unjust, that our happiness depends little on political institutions, and much on the temper and regulation of our own minds.

While the fourth edition of the *Traveller* was on the counters of the booksellers, the *Vicar of Wakefield* appeared, and rapidly obtained a popularity which has lasted down to our own time, and which is likely to last as long as our language. The fable is indeed one of the worst that ever was constructed. It wants, not merely that probability which ought to be found in a tale of common English life, but that consistency which ought to be found even in the wildest fiction about witches, giants and fairies. But the earlier chapters have all the sweetness of pastoral poetry, together with all the vivacity of comedy. Moses and his spectacles, the vicar and his monogamy, the sharper and his cosmogony, the squire proving from Aristotle that relatives are related, Olivia preparing herself for the arduous task of converting a rakish lover by studying the controversy between Robinson Crusoe and Friday, the great ladies with their scandal about Sir Tomkyn's amours and Dr Burdock's verses, and Mr Burchell with his "Fudge," have caused as much harmless mirth as has ever been caused by matter packed into so small a number of pages. The latter part of the tale is unworthy of the beginning. As we approach the catastrophe, the absurdities lie thicker and thicker, and the gleams of pleasantry become rarer and rarer.

The success which had attended Goldsmith as a novelist emboldened him to try his fortune as a dramatist. He wrote the *Good Natur'd Man*, a piece which had a worse fate than it deserved. Garrick refused to produce it at Drury Lane. It was acted at Covent Garden in January 1768, but was coldly received. The author, however, cleared by his benefit nights, and by the sale of the copyright, no less than £500, five times as much as he had made by the *Traveller* and the *Vicar of Wakefield* together. The plot of the *Good Natur'd Man* is, like almost all Goldsmith's plots, very ill constructed. But some passages are exquisitely ludicrous,—much more ludicrous indeed than suited the taste of the town at that time. A canting, mawkish play, entitled *False Delicacy*, had just been produced, and sentimentality was all the mode. During some years more tears were shed at comedies than at tragedies; and a pleasantry which moved the audience to anything more than a grave smile was reprobated as low. It is not strange, therefore, that the very best scene in the *Good Natur'd Man*, that in which Miss Richland finds her lover attended by the bailiff and the bailiff's follower in full court dresses, should have been mercilessly hissed, and should have been omitted after the first night, not to be restored for several years.

In May 1770 appeared the *Deserted Village*. In mere diction and versification this celebrated poem is fully equal, perhaps superior, to the *Traveller*; and it is generally preferred to the

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Traveller by that large class of readers who think, with Bayes in the *Rehearsal*, that the only use of a plot is to bring in fine things. More discerning judges, however, while they admire the beauty of the details, are shocked by one unpardonable fault which pervades the whole. The fault which we mean is not that theory about wealth and luxury which has so often been censured by political economists. The theory is indeed false; but the poem, considered merely as a poem, is not necessarily the worse on that account. The finest poem in the Latin language—indeed, the finest didactic poem in any language—was written in defence of the silliest and meanest of all systems of natural and moral philosophy. A poet may easily be pardoned for reasoning ill; but he cannot be pardoned for describing ill, for observing the world in which he lives so carelessly that his portraits bear no resemblance to the originals, for exhibiting as copies from real life monstrous combinations of things which never were and never could be found together. What would be thought of a painter who should mix August and January in one landscape, who should introduce a frozen river into a harvest scene? Would it be a sufficient defence of such a picture to say that every part was exquisitely coloured, that the green hedges, the apple-trees loaded with fruit, the waggons reeling under the yellow sheaves, and the sun-burned reapers wiping their foreheads were very fine, and that the ice and the boys sliding were also very fine? To such a picture the *Deserted Village* bears a great resemblance. It is made up of incongruous parts. The village in its happy days is a true English village. The village in its decay is an Irish village. The felicity and the misery which Goldsmith has brought close together belong to two different countries and to two different stages in the progress of society. He had assuredly never seen in his native island such a rural paradise, such a seat of plenty, content and tranquillity, as his Auburn. He had assuredly never seen in England all the inhabitants of such a paradise turned out of their homes in one day and forced to emigrate in a body to America. The hamlet he had probably seen in Kent; the ejectment he had probably seen in Munster; but by joining the two, he has produced something which never was and never will be seen in any part of the world.

In 1773 Goldsmith tried his chance at Covent Garden with a second play, *She Stoops to Conquer*. The manager was, not without great difficulty, induced to bring this piece out. The sentimental comedy still reigned, and Goldsmith's comedies were not sentimental. The *Good Natur'd Man* had been too funny to succeed; yet the mirth of the *Good Natur'd Man* was sober when compared with the rich drollery of *She Stoops to Conquer*, which is, in truth, an incomparable farce in five acts. On this occasion, however, genius triumphed. Pit, boxes and galleries were in a constant roar of laughter. If any bigoted admirer of Kelly and Cumberland ventured to hiss or groan, he was speedily silenced by a general cry of "turn him out," or "throw him over." Later generations have confirmed the verdict which was pronounced on that night.

While Goldsmith was writing the *Deserted Village* and *She Stoops to Conquer*, he was employed on works of a very different kind—works from which he derived little reputation but much profit. He compiled for the use of schools a *History of Rome*, by which he made £250; a *History of England*, by which he made £500; a *History of Greece*, for which he received £250; a *Natural History*, for which the booksellers covenanted to pay him 800 guineas. These works he produced without any elaborate research, by merely selecting, abridging and translating into his own clear, pure and flowing language, what he found in books well known to the world, but too bulky or too dry for boys and girls. He committed some strange blunders, for he knew nothing with accuracy. Thus, in his *History of England*, he tells us that Naseby is in Yorkshire; nor did he correct this mistake when the book was reprinted. He was very nearly hoaxed into putting into the *History of Greece* an account of a battle between Alexander the Great and Montezuma. In his *Animated Nature* he relates, with faith and with perfect gravity, all the most absurd lies which he could find in books of travels about gigantic Patagonians, monkeys that preach sermons, nightingales that repeat long conversations. "If he can tell a horse from a cow," said Johnson, "that is the extent of his knowledge of zoology." How little Goldsmith was qualified to write about the physical sciences is sufficiently proved by two anecdotes. He on one occasion denied that the sun is longer in the northern than in the southern signs. It was vain to cite the authority of Maupertuis. "Maupertuis!" he cried, "I understand those matters better than Maupertuis." On another occasion he, in defiance of the evidence of his own senses, maintained obstinately, and even angrily, that he chewed his dinner by moving his upper jaw.

Yet, ignorant as Goldsmith was, few writers have done more to make the first steps in the laborious road to knowledge easy and pleasant. His compilations are widely distinguished from the compilations of ordinary bookmakers. He was a great, perhaps an unequalled, master of the arts of selection and condensation. In these respects his histories of Rome and of England, and still more his own abridgments of these histories, well deserved to be studied. In general nothing is less attractive than an epitome; but the epitomes of Goldsmith, even when most concise, are always amusing; and to read them is considered by intelligent children not as a task but as a pleasure.

Goldsmith might now be considered as a prosperous man. He had the means of living in comfort, and even in what to one who had so often slept in barns and on bulks must have been luxury. His fame was great and was constantly rising. He lived in what was intellectually far the best society of the kingdom, in a society in which no talent or accomplishment was wanting, and in which the art of conversation was cultivated with splendid success. There probably were never four talkers more admirable in four different ways than Johnson, Burke, Beauclerk and Garrick; and Goldsmith was on terms of intimacy with all the four. He aspired to share in their colloquial renown, but never was ambition more unfortunate. It may seem strange that a man who wrote with so much perspicuity, vivacity and grace should have been, whenever he took a part in conversation, an empty, noisy, blundering rattle. But on this point the evidence is overwhelming. So extraordinary was the contrast between Goldsmith's published works and the silly things which he said, that Horace Walpole described him as an inspired idiot. "Noll," said Garrick, "wrote like an angel, and talked like poor Poll." Chamier declared that it was a hard exercise of faith to believe that so foolish a chatterer could have really written the *Traveller*. Even Boswell could say, with contemptuous compassion, that he liked very well to hear honest Goldsmith run on. "Yes, sir," said Johnson, "but he should not like to hear himself." Minds differ as rivers differ. There are transparent and sparkling rivers from which it is delightful to drink as they flow; to such rivers the minds of such men as Burke and Johnson may be compared. But there are rivers of which the water when first drawn is turbid and noisome, but becomes pellucid as crystal and delicious to the taste, if it be suffered to stand till it has deposited a sediment; and such a river is a type of the mind of Goldsmith. His first thoughts on every subject were confused even to absurdity, but they required only a little time to work themselves clear. When he wrote they had that time, and therefore his readers pronounced him a man of genius; but when he talked he talked nonsense and made himself the laughing-stock of his hearers. He was painfully sensible of his inferiority in conversation; he felt every failure keenly; yet he had not sufficient judgment and self-command to hold his tongue. His animal spirits and vanity were always impelling him to try to do the one thing which he could not do. After every attempt he felt that he had exposed himself, and writhed with shame and vexation; yet the next moment he began again.

His associates seem to have regarded him with kindness, which, in spite of their admiration of his writings, was not unmixed with contempt. In truth, there was in his character much to love, but very little to respect. His heart was soft even to weakness;

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he was so generous that he quite forgot to be just; he forgave injuries so readily that he might be said to invite them, and was so liberal to beggars that he had nothing left for his tailor and his hutcher. He was vain, sensual, frivolous, profuse, improvident. One vice of a darker shade was imputed to him, envy. But there is not the least reason to believe that this bad passion, though it sometimes made him wince and utter fretful exclamations, ever impelled him to injure by wicked arts the reputation of any of his rivals. The truth probably is that he was not more envious, but merely less prudent, than his neighbours. His heart was on his lips. All those small jealousies, which are but too common among men of letters, hut which a man of letters who is also a man of the world does his best to conceal, Goldsmith avowed with the simplicity of a child. When he was envious, instead of affecting indifference, instead of damning with faint praise, instead of doing injuries slyly and in the dark, he told everybody that he was envious. "Do not, pray, do not, talk of Johnson in such terms," he said to Boswell; "you harrow up my very soul." George Steevens and Cumberland were men far too cunning to say such a thing. They would have echoed the praises of the man whom they envied, and then have sent to the newspapers anonymous libels upon him. Both what was good and what was had in Goldsmith's character was to his associates a perfect security that he would never commit such villainy. He was neither ill-natured enough, nor long-headed enough, to be guilty of any malicious act which required contrivance and disguise.

Goldsmith has sometimes been represented as a man of genius, cruelly treated by the world, and doomed to struggle with difficulties, which at last broke his heart. But no representation can be more remote from the truth. He did, indeed, go through much sharp misery before he had done anything considerable in literature. But after his name had appeared on the title-page of the *Traveller*, he had none but himself to blame for his distresses. His average income, during the last seven years of his life, certainly exceeded £400 a year, and £400 a year ranked, among the incomes of that day, at least as high as £800 a year would rank at present. A single man living in the Temple, with £400 a year, might then be called opulent. Not one in ten of the young gentlemen of good families who were studying the law there had so much. But all the wealth which Lord Clive had brought from Bengal and Sir Lawrence Dundas from Germany, joined together, would not have sufficed for Goldsmith. He spent twice as much as he had. He wore fine clothes, gave dinners of several courses, paid court to venal beauties. He had also, It should be remembered, to the honour of his heart, though not of his head, a guinea, or five, or ten, according to the state of his purse, ready for any tale of distress, true or false. But it was not in dress or feasting, in promiscuous amours or promiscuous charities, that his chief expense lay. He had been from boyhood a gambler, and at once the most sanguine and the most unskilful of gamblers. For a time he put off the day of inevitable ruin hy temporary expedients. He obtained advances from booksellers hy promising to execute works which he never began. But at length this source of supply failed. He owed more than £2000; and he saw no hope of extrication from his embarrassments. His spirits and health gave way. He was attacked by a nervous fever, which he thought himself competent to treat. It would have been happy for him if his medical skill had been appreciated as justly by himself as by others. Notwithstanding the degree which he pretended to have received on the continent, he could procure no patients. "I do not practise," he once said; "I make it a rule to prescribe only for my friends." "Pray, dear Doctor," said Beauclerk, "alter your rule; and prescribe only for your enemies." Goldsmith, now, in spite of this excellent advice, prescribed for himself. The remedy aggravated the malady. The sick man was induced to call in real physicians; and they at one time imagined that they had cured the disease. Still his weakness and restlessness continued. He could get no sleep. He could take no food. "You are worse," said one of his medical attendants, "than you should be from the degree of fever which you have. Is your mind at ease?" "No; it is not," were the last recorded words of Oliver Goldsmith. He died on the 4th of April 1774, in his forty-sixth year. He was laid in the churchyard of the Temple; but the spot was not marked hy any inscription and is now forgotten. The coffin was followed by Burke and Reynolds. Both these great men were sincere mourners. Burke, when he heard of Goldsmith's death, had burst into a flood of tears. Reynolds had been so much moved hy the news that he had flung aside his hrush and palette for the day.

A short time after Goldsmith's death, a little poem appeared, which will, as long as our language lasts, associate the names of his two illustrious friends with his own. It has already been mentioned that he sometimes felt keenly the sarcasm which his wild blundering talk brought upon him. He was, not long before his last illness, provoked into retaliating. He wisely betook himself to his pen; and at that weapon he proved himself a match for all his assailants together. Within a small compass he drew with a singularly easy and vigorous pencil the characters of nine or ten of his intimate associates. Though this little work did not receive his last touches, it must always be regarded as a masterpiece. It is impossible, however, not to wish that four or five likenesses which have no interest for posterity were wanting to that noble gallery, and that their places were supplied by sketches of Johnson and Gibhon, as happy and vivid as the sketches of Burke and Garrick.

Some of Goldsmith's friends and admirers honoured him with a cenotaph in Westminster Abbey. Nollekens was the sculptor, and Johnson wrote the inscription. It is much to he lamented that Johnson did not leave to posterity a more durable and a more valuable memorial of his friend. A life of Goldsmith would have been an inestimable addition to the Lives of the Poets. No man appreciated Goldsmith's writings more justly than Johnson; no man was better acquainted with Goldsmith's character and habits; and no man was more competent to delineate with truth and spirit the peculiarities of a mind in which great powers were found in company with great weaknesses. But the list of poets to whose works Johnson was requested hy the booksellers to furnish prefaces ended with Lyttelton, who died in 1773. The line seems to have been drawn expressly for the purpose of excluding the person whose portrait would have most fitly closed the series. Goldsmith, however, has been fortunate in his biographers. (M.)

Goldsmith's life has been written by Prior (1837), by Washington Irving (1844–1849), and by John Forster (1848, 2nd ed. 1854). The diligence of Prior deserves great praise; the style of Washington Irving is always pleasing; but the highest place must, in justice, be assigned to the eminently interesting work of Forster. Subsequent biographies are by William Black (1878), and Austin Dobson (1888, American ed. 1899). The above article by Lord Macaulay has been slightly revised for this edition by Mr Austin Dobson, as regards questions of fact for which there has been new evidence.

GOLDSTÜCKER, THEODOR (1821–1872), German Sanskrit scholar, was born of Jewish parents at Königsberg on the 18th of January 1821, and, after attending the gymnasium of that town, entered the university in 1836 as a student of Sanskrit. In 1838 he removed to Bonn, and, after graduating at Königsberg in 1840, proceeded to Paris; in 1842 he edited a German translation of the *Prabodha Chandrodaya*. From 1847 to 1850 he resided at Berlin, where his talents and scholarship were recognized by Alexander von Humboldt, but where his advanced political views caused the authorities to regard him with suspicion. In the latter year he removed to London, where in 1852 he was appointed professor of Sanskrit in University College. He now worked on a new Sanskrit dictionary, of which the first instalment appeared in 1856. In 1861 he published his chief work: *Pāninì: his place in Sanskrit Literature*; and he was one of the founders and chief promoters of the Sanskrit Text Society; he was also an active member of the Philological Society, and of other learned bodies. He died in London on the 6th of March 1872.

As *Literary Remains* some of his writings were published in two volumes (London, 1879), but his papers were left to the India Office with the request that they were not to be published until 1920.

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GOLDWELL, THOMAS (d. 1585), English ecclesiastic, began his career as vicar of Cheriton in 1531, after graduating M.A. at All Souls College, Oxford. He became chaplain to Cardinal Pole and lived with him at Rome, was attainted in 1539, but returned to England on Mary's accession, and in 1555 became bishop of St Asaph, a diocese which he did much to win back to the old faith. On the death of Mary, Goldwell escaped from England and in 1561 became superior of the Theatines at Naples. He was the only English bishop at the council of Trent, and in 1562 was again attainted. In the following year he was appointed vicar-general to Carlo Borromeo, archbishop of Milan. He died in Rome in 1585, the last of the English bishops who had refused to accept the Reformation.

GOLDZIHER, IGNAZ (1850–), Jewish Hungarian orientalist, was born in Stuhlweissenburg on the 22nd of June 1850. He was educated at the universities of Budapest, Berlin, Leipzig and Leiden, and became privat docent at Budapest in 1872. In the next year, under the auspices of the Hungarian government, he began a journey through Syria, Palestine and Egypt, and took the opportunity of attending lectures of Mahommedan scholars in the mosque of el-Azhar in Cairo. He was the first Jewish scholar to become professor in the Budapest University (1894), and represented the Hungarian government and the Academy of Sciences at numerous international congresses. He received the large gold medal at the Stockholm Oriental Congress in 1889. He became a member of several Hungarian and other learned societies, was appointed secretary of the Jewish community in Budapest. He was made Litt. D. of Cambridge (1904) and LL.D. of Aberdeen (1906). His eminence in the sphere of scholarship is due primarily to his careful investigation of pre-Mahommedan and Mahommedan law, tradition, religion and poetry, in connexion with which he published a large number of treatises, review articles and essays contributed to the collections of the Hungarian Academy.

Among his chief works are: *Beiträge zur Literaturgeschichte der Schi'a* (1874); *Beiträge zur Geschichte der Sprachgelehrsamkeit bei den Arabern* (Vienna, 1871–1873); *Der Mythos bei den Hebräern und seine geschichtliche Entwickelung* (Leipzig, 1876; Eng. trans., R. Martineau, London, 1877); *Muhammedanische Studien* (Halle, 1889–1890, 2 vols.); *Abhandlungen zur arabischen Philologie* (Leiden, 1896–1899, 2 vols.); *Buch v. Wesen d. Seele* (ed. 1907).

GOLETTA [LA GOULETTE], a town on the Gulf of Tunis in 36° 50′ N. 10° 19′ E., a little south of the ruins of Carthage, and on the north side of the ship canal which traverses the shallow Lake of Tunis and leads to the city of that name. Built on the narrow strip of sand which separates the lake from the gulf, Goletta is defended by a fort and battery. The town contains a summer palace of the bey, the old seraglio, arsenal and custom-house, and many villas, gardens and pleasure resorts, Goletta being a favourite place for sea-bathing. A short canal, from which the name of the town is derived (Arab. *Halk-el-Wad*, "throat of the canal"), 40 ft. broad and 8½ ft. deep, divides the town and affords communication between the ship canal and a dock or basin, 1082 ft. long and 541 ft. broad. An electric tramway which runs along the north bank of the ship canal connects Goletta with the city of Tunis (*q.v.*). Pop. (1907) about 5000, mostly Jews and Italian fishermen.

Beyond Cape Carthage, 5 m. N. of Goletta, is La Marsa, a summer resort overlooking the sea. The bey has a palace here, and the French resident-general, the British consul, other officials, and many Tunisians have country-houses, surrounded by groves of olive trees.

Before the opening of the ship canal in 1893 Goletta, as the port of Tunis, was a place of considerable importance. The basin at the Goletta end of the canal now serves as a subsidiary harbour to that of Tunis. The most stirring events in the history of the town are connected with the Turkish conquest of the Barbary states. Khair-ed-Din Barbarossa having made himself master of Tunis and its port, Goletta was attacked in 1535 by the emperor Charles V., who seized the pirate's fleet, which was sheltered in the small canal, his arsenal, and 300 brass cannon. The Turks regained possession in 1574. (See TUNISIA: *History.*)

GOLF (in its older forms GOFF, GOUFF or GOWFF, the last of which gives the genuine old pronunciation), a game which probably derives its name from the Ger. *kolbe*, a club—in Dutch, *kolf*—which last is nearly in sound identical and might suggest a Dutch origin,[1] which many pictures and other witnesses further support.

History.—One of the most ancient and most interesting of the pictures in which the game is portrayed is the tailpiece to an illuminated *Book of Hours* made at Bruges at the beginning of the 16th century. The original is in the British Museum. The players, three in number, have but one club apiece. The heads of the clubs are steel or steel covered. They play with a ball each. That which gives this picture a peculiar interest over the many pictures of Dutch schools that portray the game in progress is that most of them show it on the ice, the putting being at a stake. In this *Book of Hours* they are putting at a hole in the turf, as in our modern golf. It is scarcely to be doubted that the game is of Dutch origin, and that it has been in favour since very early days. Further than that our knowledge does not go. The early Dutchmen played golf, they painted golf, but they did not write it.

It is uncertain at what date golf was introduced into Scotland, but in 1457 the popularity of the game had already become so great as seriously to interfere with the more important pursuit of archery. In March of that year the Scottish parliament "decreted and ordained that *wapinshawingis* be halden be the lordis and baronis spirituale and temporale, four times in the zeir; and that the fute-ball and *golf be utterly cryit doun, and nocht usit*; and that the bowe-merkis be maid at ilk paroche kirk a pair of buttis, and *schuttin be usit ilk Sunday*." Fourteen years afterwards, in May 1471, it was judged necessary to pass another act "anent wapenshawings," and in 1491 a final and evidently angry fulmination was issued on the general subject, with pains and penalties annexed. It runs thus— "Futeball and Golfe forbidden. Item, it is statut and ordainit that in na place of the realme there be usit fute-ball, *golfe, or uther sik unprofitabill sportis*," &c. This, be it noted, is an edict of James IV.; and it is not a little curious presently to find the monarch himself setting an example to his commons, by practice of this "unprofitabill sport," as is shown by various entries in the accounts of the lord high treasurer of Scotland (1503–1506).

About a century later, the game again appears on the surface of history, and it is quite as popular as before. In the year 1592 the town council of Edinburgh "ordanis proclamation to be made threw this burgh, that na inhabitants of the samyn be seen at ony pastymes within or without the toun, upoun the Sabboth day, sic as golfe, &c."[2] The following year the edict was re-announced, but with the modification that the prohibition was "in tyme of sermons."

Golf has from old times been known in Scotland as "The *Royal and Ancient* Game of Goff." Though no doubt Scottish monarchs handled the club before him, James IV. is the first who figures formally in the golfing record. James V. was also very partial to the game distinctively known as "royal"; and there is some scrap of evidence to show that his daughter, the unhappy Mary Stuart, was a golfer. It was alleged by her enemies that, as showing her shameless indifference to the fate of her husband, a very few days after his murder, she "was seen playing *golf* and pallmall in the fields beside Seton."[3] That her son, James VI. (afterwards James I. of England), was a golfer, tradition confidently asserts, though the evidence which connects him with the personal practice of the game is slight. Of the interest he took in it we have evidence in his act—already alluded to—"anent *golfe ballis*," prohibiting their importation, except under certain

[1] From an enactment of James VI. (then James I. of England), bearing date 1618, we find that a considerable importation of golf balls at that time took place from Holland, and as thereby "na small quantitie of gold and silver is transported zierly out of his Hienes' kingdome of Scoteland" (see letter of His Majesty from Salisbury, the 5th of August 1618), he issues a royal prohibition, at once as a wise economy of the national moneys, and a protection to native industry in the article. From this it might almost seem that the game was at that date still known and practised in Holland.

[2] *Records of the City of Edinburgh.*

[3] *Inventories of Mary Queen of Scots*, preface, p. lxx. (1863).

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restrictions. Charles I. (as his brother Prince Henry had been [1]) was devotedly attached to the game. Whilst engaged in it on the links of Leith, in 1642, the news reached him of the Irish rebellion of that year. He had not the equanimity to finish his match, but returned precipitately and in much agitation to Holyrood.[2] Afterwards, while prisoner to the Scots army at Newcastle, he found his favourite diversion in "the royal game." "The King was nowhere treated with more honour than at Newcastle, as he himself confessed, both he and his train having liberty to go abroad and play at goff in the Shield Field, without the walls."[3] Of his son, Charles II., as a golfer, nothing whatever is ascertained, but James II. was a known devotee.[4] After the Restoration, James, then duke of York, was sent to Edinburgh in 1681/2 as commissioner of the king to parliament, and an historical monument of his prowess as a golfer remains there to this day in the "Golfer's Land," as it is still called, 77 Canongate. The duke having been challenged by two English noblemen of his suite, to play a match against them, for a very large stake, along with any Scotch ally he might select, chose as his partner one "Johne Patersone," a shoemaker. The duke and the said Johne won easily, and half of the large stake the duke made over to his humble coadjutor, who therewith built himself the house mentioned above. In 1834 William IV. became patron of the St Andrews Golf Club (St Andrews being then, as now, the most famous seat of the game), and approved of its being styled "The *Royal and Ancient* Golf Club of St Andrews." In 1837, as further proof of royal favour, he presented to it a magnificent gold medal, which "should be challenged and played for annually"; and in 1838 the queen dowager, duchess of St Andrews, became patroness of the club, and presented to it a handsome gold medal —"The Royal Adelaide"—with a request that it should be worn by the captain, as president, on all public occasions. In June 1863 the prince of Wales (afterwards Edward VII.) signified his desire to become patron of the club, and in the following September was elected captain by acclamation. His engagements did not admit of his coming in person to undertake the duties of the office, but his brother Prince Leopold (the duke of Albany) having in 1876 done the club the honour to become its captain, twice visited the ancient city in that capacity.

In more recent days, golf has become increasingly popular in a much wider degree. In 1880 the man who travelled about England with a set of golf clubs was an object of some astonishment, almost of alarm, to his fellow-travellers. In those days the commonest of questions in regard to the game was, "You have to be a fine rider, do you not, to play golf?," so confounded was it in the popular mind with the game of polo. At Blackheath a few Scotsmen resident in London had long played golf. In 1864 the Royal North Devon Club was formed at Westward Ho, and this was the first of the seaside links discovered and laid out for golf in England. In 1869 the Royal Liverpool Club established itself in possession of the second English course of this quality at Hoylake, in Cheshire. A golf club was formed in connexion with the London Scottish Volunteers corps, which had its house on the Putney end of Wimbledon Common on Putney Heath; and, after making so much of a start, the progress of the game was slow, though steady, for many years. A few more clubs were formed; the numbers of golfers grew; but it could not be said that the game was yet in any sense popular in England. All at once, for no very obvious reason, the qualities of the ancient Scottish game seemed to strike home, and from that moment its popularity has been wonderfully and increasingly great. The English links that rose into most immediate favour was the fine course of the St George's Golf Club, near Sandwich, on the coast of Kent. To the London golfer it was the first course of the first class that was reasonably accessible, and the fact made something like an epoch in English golf. A very considerable increase, it is true, in the number of English golfers and English golf clubs had taken place before the discovery for golfing purposes of the links at Sandwich. Already there was a chain of links all round the coast, besides numerous inland courses; but since 1890 their increase has been extraordinary, and the number which has been formed in the colonies and abroad is very large also, so that in the *Golfer's Year Book* for 1906 a space of over 300 pages was allotted to the Club Directory alone, each page containing, on a rough average, six clubs. To compute the average membership of these clubs is very difficult. There is not a little overlapping, in the sense that a member of one club will often be a member of several others; but probably the average may be placed at something like 200 members for each club.

The immense amount of golf-playing that this denotes, the large industry in the making of clubs and balls, in the upkeep of links, in the actual work of club-carrying by the caddies, and in the instruction given by the professional class, is obvious. Golf has taken a strong hold on the affections of the people in many parts of Ireland, and the fashion for golf in England has reacted strongly on Scotland itself, the ancient home of the game, where since 1880 golfers have probably increased in the ratio of forty to one. Besides the industry that such a growth of the game denotes in the branches immediately connected with it, as mentioned above, there is to be taken into further account the visiting population that it brings to all lodging-houses and hotels within reach of a tolerable golf links, so that many a fishing village has risen into a moderate watering-place by virtue of no other attractions than those which are offered by its golf course. Therefore to the Briton, golf has developed from something of which he had a vague idea—as of "curling"—to something in the nature of an important business, a business that can make towns and has a considerable effect on the receipts of railway companies.

Moreover, ladies have learned to play golf. Although this is a crude and brief sentence, it does not state the fact too widely nor too forcibly, for though it is true that before 1885 many played on the short links of St Andrews, North Berwick, Westward Ho and elsewhere, still it was virtually unknown that they should play on the longer courses, which till then had been in the undisputed possession of the men. At many places women now have their separate links, at others they play on the same course as the men. But even where links are set apart for women, they are far different from the little courses that used to be assigned to them. They are links only a little less formidable in their bunkers, a little less varied in their features than those of men. The ladies have their annual championship, which they play on the long links of the men, sometimes on one, sometimes on another, but always on courses of the first quality, demanding the finest display of golfing skill.

The claim that England made to a golfing fellowship with Scotland was conceded very strikingly by the admission of three English greens, first those of Hoylake and of Sandwich, and in 1900 Deal, into the exclusive list of the links on which the open championship of the game is decided. Before England had so fully assimilated Scotland's game this great annual contest was waged at St Andrews, Musselburgh and Prestwick in successive years. Now the ancient green of Musselburgh, somewhat worn out with length of hard and gallant service, and moreover, as a nine-holes course inadequately accommodating the numbers who compete in the championships to-day, has been superseded by the course at Muirfield as a championship arena.

While golf had been making itself a force in the southern kingdom, the professional element—men who had learned the game from childhood, had become past-masters, were capable of giving instruction, and also of making clubs and balls and looking after the greens on which golf was played—had at first been taken from the northern side of the Border. But when golf had been started long enough in England for the little boys who were at first employed as "caddies"—in carrying the players' clubs—to grow to sufficient strength to drive the ball as far as their masters, it was inevitable that out of the number who thus began to play in their boyhood some few should develop an exceptional talent for the game. This, in fact, actually happened, and English golfers, both of the amateur

[1] Anonymous author of MS. in the Harleian Library.
[2] See *History of Leith*, by A. Campbell (1827).
[3] *Local Records of Northumberland*, by John Sykes (Newcastle, 1833).
[4] Robertson's *Historical Notices of Leith*.

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and the professional classes, have proved themselves so adept at Scotland's game, that the championships in either the Open or the Amateur competitions have been won more often by English than by Scottish players of late years. Probably in the United Kingdom to-day there are as many English as Scottish professional golf players, and their relative number is increasing.

Golf also "caught on," to use the American expression, in the United States. To the American of 1890 golf was largely an unknown thing. Since then, however, golf has become perhaps a greater factor in the life of the upper and upper-middle classes in the United States than it ever has been in England or Scotland. Golf to the English and the Scots meant only one among several of the sports and pastimes that take the man and the woman of the upper and upper-middle classes into the country and the fresh air. To the American of like status golf came as the one thing to take him out of his towns and give him a reason for exercise in the country. To-day golf has become an interest all over North America, but it is in the Eastern States that it has made most difference in the life of the classes with whom it has become fashionable. Westerners and Southerners found more excuses before the coming of golf for being in the open country air. It is in the Eastern States more especially that it has had so much influence in making the people live and take exercise out of doors. In a truly democratic spirit the American woman golfer plays on a perfect equality with the American man. She does not compete in the men's championships; she has championships of her own; but she plays, without question, on the same links. There is no suggestion of relegating her, as a certain cynical writer in the Badminton volume on golf described it, to a waste corner, a kind of "Jews' Quarter," of the links. And the Americans have taken up golf in the spirit of a sumptuous and opulent people, spending money on magnificent clubhouses beyond the finest dreams of the Englishman or the Scot. The greatest success achieved by any American golfer fell to the lot of Mr Walter Travis of the Garden City club, who in 1904 won the British amateur championship.

So much enthusiasm and so much golf in America have not failed to make their influence felt in the United Kingdom. Naturally and inevitably they have created a strong demand for professional instruction, both by example and by precept, and for professional advice and assistance in the laying-out and upkeep of the many new links that have been created in all parts of the States, sometimes out of the least promising material. By the offer of great prizes for exhibition matches, and of wages that are to the British rate on the scale of the dollar to the shilling, they have attracted many of the best Scottish and English professionals to pay them longer or shorter visits as the case may be, and thus a new opening has been created for the energies of the professional golfing class.

The Game.—The game of golf may be briefly defined as consisting in hitting the ball over a great extent of country, preferably of that sand-hill nature which is found by the sea-side, and finally hitting or "putting" it into a little hole of some 4 in. diameter cut in the turf. The place of the hole is commonly marked by a flag. Eighteen is the recognized number of these holes on a full course, and they are at varying distances apart, from 100 yds. up to anything between a ½ and ½ m. For the various strokes required to achieve the hitting of the ball over the great hills, and finally putting it into the small hole, a number of different "clubs" has been devised to suit the different positions in which the ball may be found and the different directions in which it is wished to propel it. At the start for each hole the ball may be placed on a favourable position (*e.g.* "tee'd" on a small mound of sand) for striking it, but after that it may not be touched, except with the club, until it is hit into the next hole. A "full drive," as the farthest distance that the ball can be hit is called, is about 200 yds. in length, of which some three-fourths will be traversed in the air, and the rest by bounding or running over the ground. It is easily to be understood that when the ball is lying on the turf behind a tall sand-hill, or in a bunker, a differently-shaped club is required for raising it over such an obstacle from that which is needed when it is placed on the tee to start with; and again, that another club is needed to strike the ball out of a cup or out of heavy grass. It is this variety that gives the game its charm. Each player plays with his own ball, with no interference from his opponent, and the object of each is to hit the ball from the starting-point into each successive hole in the fewest strokes. The player who at the end of the round (*i.e.* of the course of eighteen holes) has won the majority of the holes is the winner of the round; or the decision may be reached before the end of the round by one side gaining more holes than there remain to play. For instance, if one player be four holes to the good, and only three holes remain to be played, it is evident that the former must be the winner, for even if the latter win every remaining hole, he still must be one to the bad at the finish.

The British Amateur Championship is decided by a tournament in matches thus played, each defeated player retiring, and his opponent passing on into the next round. In the case of the Open Championship, and in most medal competitions, the scores are differently reckoned—each man's total score (irrespective of his relative merit at each hole) being reckoned at the finish against the total score of the other players in the competition. There is also a species of competition called "bogey" play, in which each man plays against a "bogey" score—a score fixed for each hole in the round before starting—and his position in the competition relatively to the other players is determined by the number of holes that he is to the good or to the bad of the "bogey" score at the end of the round. The player who is most holes to the good, or fewest holes to the bad, wins the competition. It may be mentioned incidentally that golf occupies the almost unique position of being the only sport in which even a single player can enjoy his game, his opponent in this event being "Colonel Bogey"—more often than not a redoubtable adversary.

The links which have been thought worthy, by reason of their geographical positions and their merits, of being the scenes on which the golf championships are fought out, are, as we have already said, three in Scotland—St Andrews, Prestwick and Muirfield—and three in England—Hoylake, Sandwich and Deal. This brief list is very far from being complete as regards links of first-class quality in Great Britain. Besides those named, there are in Scotland—Carnoustie, North Berwick, Cruden Bay, Nairn, Aberdeen, Dornoch, Troon, Machrihanish, South Uist, Islay, Gullane, Luffness and many more. In England there are—Westward Ho, Bembridge, Littlestone, Great Yarmouth, Brancaster, Seaton Carew, Formby, Lytham, Harlech, Burnham, among the seaside ones; while of the inland, some of them of very fine quality, we cannot even attempt a selection, so large is their number and so variously estimated their comparative merits. Ireland has Portrush, Newcastle, Portsalon, Dollymount and many more of the first class; and there are excellent courses in the Isle of Man. In America many fine courses have been constructed. There is not a British colony of any standing that is without its golf course—Australia, India, South Africa, all have their golf championships, which are keenly contested. Canada has had courses at Quebec and Montreal for many years, and the Calcutta Golf Club, curiously enough, is the oldest established (next to the Blackheath Club), the next oldest being the club at Pau in the Basses-Pyrénées.

The Open Championship of golf was started in 1860 by the Prestwick Club giving a belt to be played for annually under the condition that it should become the property of any who could win it thrice in succession. The following is the list of the champions:—

1860.	W. Park, Musselburgh	174—at Prestwick.
1861.	Tom Morris, sen., Prestwick	163—at Prestwick.
1862.	Tom Morris, sen., Prestwick	163—at Prestwick.
1863.	W. Park, Musselburgh	168—at Prestwick.
1864.	Tom Morris, sen., Prestwick	160—at Prestwick.
1865.	A. Strath, St Andrews	162—at Prestwick.
1866.	W. Park, Musselburgh	169—at Prestwick.
1867.	Tom Morris, sen., St Andrews	170—at Prestwick.
1868.	Tom Morris, jun., St Andrews	154—at Prestwick.
1869.	Tom Morris, jun., St Andrews	157—at Prestwick.
1870.	Tom Morris, jun., St Andrews	149—at Prestwick.

Tom Morris, junior, thus won the belt finally, according to the conditions. In 1871 there was no competition; but by 1872 the three clubs of St Andrews, Prestwick and Musselburgh had subscribed for a cup which should be played for over the course of each subscribing club successively, but should never become the property of the winner. In later years the course at Muirfield was substituted for that at Musselburgh, and Hoylake and Sandwich were admitted into the list of championship courses. Up to 1891, inclusive, the play of two rounds, or thirty-six holes, determined the championship, but from 1892 the result has been determined by the play of 72 holes

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After the interregnum of 1871, the following were the champions:—

1872.	Tom Morris, jun., St Andrews	166—at Prestwick.
1873.	Tom Kidd, St Andrews	179—at St Andrews.
1874.	Mungo Park, Musselburgh	159—at Musselburgh.
1875.	Willie Park, Musselburgh	166—at Prestwick.
1876.	Bob Martin, St Andrews	176—at St Andrews.
1877.	Jamie Anderson, St Andrews	160—at Musselburgh.
1878.	Jamie Anderson, St Andrews	157—at Prestwick.
1879.	Jamie Anderson, St Andrews	170—at St Andrews.
1880.	Bob Fergusson, Musselburgh	162—at Musselburgh.
1881.	Bob Fergusson, Musselburgh	170—at Prestwick.
1882.	Bob Fergusson, Musselburgh	171—at St Andrews.
1883.	W. Fernie, Dumfries	159—at Musselburgh.
1884.	Jack Simpson, Carnoustie	160—at Prestwick.
1885.	Bob Martin, St Andrews	171—at St Andrews.
1886.	D. Brown, Musselburgh	157—at Musselburgh.
1887.	Willie Park, jun., Musselburgh	161—at Prestwick.
1888.	Jack Burns, Warwick	171—at St Andrews.
1889.	Willie Park, jun., Musselburgh	155—at Musselburgh.
1890.	Mr John Ball, jun., Hoylake	164—at Prestwick.
1891.	Hugh Kirkaldy, St Andrews	166—at St Andrews.
1892.	Mr H. H. Hilton, Hoylake	305—at Muirfield.
1893.	W. Auchterlonie, St Andrews	322—at Prestwick.
1894.	J. H. Taylor, Winchester	326—at Sandwich.
1895.	J. H. Taylor, Winchester	322—at St Andrews.
1896.	H. Vardon, Scarborough	316—at Muirfield.
1897.	Mr H. H. Hilton, Hoylake	314—at Hoylake.
1898.	H. Vardon, Scarborough	307—at Prestwick.
1899.	H. Vardon, Scarborough	310—at Sandwich.
1900.	J. H. Taylor, Richmond	309—at St Andrews.
1901.	J. Braid, Romford	309—at Muirfield.
1902.	A. Herd, Huddersfield	307—at Hoylake.
1903.	H. Vardon, Ganton	300—at Prestwick.
1904.	J. White, Sunningdale	296—at Sandwich.
1905.	J. Braid, Walton Heath	318—at St Andrews.
1906.	J. Braid, Walton Heath	300—at Muirfield.
1907.	Arnaud Massey, La Boulie	312—at Hoylake.
1908.	J. Braid, Walton Heath	291—at Prestwick.
1909.	J. H. Taylor, Richmond	295—at Deal.
1910.	J. Braid, Walton Heath	298—at St Andrews.

The Amateur Championship is of far more recent institution.

1886.	Mr Horace Hutchinson	at St Andrews.
1887.	Mr Horace Hutchinson	at Hoylake.
1888.	Mr John Ball	at Prestwick.
1889.	Mr J. E. Laidlay	at St Andrews.
1890.	Mr John Ball	at Hoylake.
1891.	Mr J. E. Laidlay	at St Andrews.
1892.	Mr John Ball	at Sandwich.
1893.	Mr P. Anderson	at Prestwick.
1894.	Mr John Ball	at Hoylake.
1895.	Mr L. Balfour-Melville	at St Andrews.
1896.	Mr F. G. Tait	at Sandwich.
1897.	Mr J. T. Allan	at Muirfield.
1898.	Mr John Ball	at Prestwick.
1899.	Mr F. G. Tait	at Hoylake.
1900.	Mr H. H. Hilton	at Sandwich.
1901.	Mr H. H. Hilton	at St Andrews.
1902.	Mr C. Hutchings	at Hoylake.
1903.	Mr R. Maxwell	at Muirfield.
1904.	Mr W. J. Travis	at Sandwich.
1905.	Mr A. G. Barry	at St Andrews.
1906.	Mr J. Robb	at Hoylake.
1907.	Mr John Ball	at St Andrews.
1908.	Mr E. A. Lassen	at Sandwich.
1909.	Mr Robert Maxwell	at Muirfield.
1910.	Mr John Ball	at Hoylake.

The Ladies' Championship was started in 1893.

1893.	Lady M. Scott	at St Annes.
1894.	Lady M. Scott	at Littlestone.
1895.	Lady M. Scott	at Portrush.
1896.	Miss A. B. Pascoe	at Hoylake.
1897.	Miss E. C. Orr	at Gullane.
1898.	Miss L. Thompson	at Yarmouth.
1899.	Miss M. Hezlet	at Newcastle.
1900.	Miss R. K. Adair	at Westward Ho.
1901.	Miss M. A. Graham	at Aberdovy.
1902.	Miss M. Hezlet	at Deal.
1903.	Miss R. K. Adair	at Portrush.
1904.	Miss L. Dod	at Troon.
1905.	Miss B. Thompson	at Cromer.
1906.	Mrs Kennion	at Burnham.
1907.	Miss M. Hezlet	at Newcastle(Co.Down).
1908.	Miss M. Titterton	at St Andrews.
1909.	Miss D. Campbell	at Birkdale.
1910.	Miss Grant Suttie	at Westward Ho.

There have been some slight changes of detail and arrangement as time has gone on, in the rules of the game (the latest edition of the Rules should be consulted). A new class of golfer has arisen, requiring a code of rules framed rather more exactly than the older code. The Scottish golfer, who was "teethed" on a golf club, as Mr Andrew Lang has described it, imbibed all the traditions of the game with his natural sustenance. Very few rules sufficed for him. But when the Englishman, and still more the American (less in touch with the traditions), began to play golf as a new game, then they began to ask for a code of rules that should be lucid and illuminating on every point—an ideal perhaps impossible to realize. It was found, at least, that the code put forward by the Royal and Ancient Club of St Andrews did not realize it adequately. Nevertheless the new golfers were very loyal indeed to the club that had ever of old held, by tacit consent, the position of fount of golfing legislation. The Royal and Ancient Club was appealed to by English golfers to step into the place, analogous to that of the Marylebone Cricket Club in cricket, that they were both willing and anxious to give it. It was a place that the Club at St Andrews did not in the least wish to occupy, but the honour was thrust so insistently upon it, that there was no declining. The latest effort to meet the demands for some more satisfactory legislation on the thousand and one points that continually must arise for decision in course of playing a game of such variety as golf, consists of the appointment of a standing committee, called the "Rules of Golf Committee." Its members all belong to the Royal and Ancient Club; but since this club draws its membership from all parts of the United Kingdom, this restriction is quite consistent with a very general representation of the views of north, south, east and west—from Westward Ho and Sandwich to Dornoch, and all the many first-rate links of Ireland—on the committee. Ireland has, indeed, some of the best links in the kingdom, and yields to neither Scotland nor England in enthusiasm for the game. This committee, after a general revision of the rules into the form in which they now stand, consider every month, either by meeting or by correspondence, the questions that are sent up to it by clubs or by individuals; and the committee's answers to these questions have the force of law until they have come before the next general meeting of the Royal and Ancient Club at St Andrews, which may confirm or may reject them at will. The ladies of Great Britain manage otherwise. They have a Golfing Union which settles questions for them; but since this union itself accepts as binding the answers given by the Rules of Golf Committee, they really arrive at the same conclusions by a slightly different path. Nor does the American Union, governing the play of men and women alike in the States, really act differently. The Americans naturally reserve to themselves freedom to make their own rules, but in practice they conform to the legislation of Scotland, with the exception of a more drastic definition of the status of the amateur player, and certain differences as to the clubs used.

A considerable modification has been effected in the implements of the game. The tendency of the modern wooden clubs is to be short in the head as compared with the clubs of, say, 1880 or 1885. The advantage claimed (probably with justice) for this shape is that it masses the weight behind the point on which the ball is struck. Better material in the wood of the club is a consequence of the increased demand for these articles and the increased competition among their makers. Whereas under the old conditions a few workers at the few greens then in existence were enough to supply the golfing wants, now there is a very large industry in golf club and ball making, which not only employs workers in the local club-makers' shops all the kingdom over, but is an important branch of the commerce of the stores and of the big athletic outfitters, both in Great Britain and in the United States. By far the largest modification in the game since the change to gutta-percha balls from balls of leather-covering stuffed with feathers, is due to the American invention of the india-rubber cased balls. Practically it is as an American invention that it is still regarded, although the British law courts decided, after a lengthy trial (1905), that there had been "prior users" of the principle of the balls' manufacture, and therefore that the patent of Mr Haskell, by whose name the

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first balls of the kind were called, was not good. It is singular to remark that in the first introduction of the gutta-percha balls, superseding the leather and feather compositions, they also were called by the name of their first maker, "Gourlay." The general mode of manufacture of the rubber-cored ball, which is now everywhere in use, is interiorly, a hard core of gutta-percha or some other such substance; round this is wound, by machinery, india-rubber thread or strips at a high tension, and over all is an outer coat of gutta-percha. Some makers have tried to dispense with the kernel of hard substance, or to substitute for it kernels of some fluid or gelatinous substance, but in general the above is a sufficient, though rough, description of the mode of making all these balls. Their superiority over the solid gutta-percha lies in their superior resiliency. The effect is that they go much more lightly off the club. It is not so much in the tee-shots that this superiority is observed, as in the second shots, when the ball is lying badly; balls of the rubber-cored kind, with their greater liveliness, are more easy to raise in the air from a lie of this kind. They also go remarkably well off the iron clubs, and thus make the game easier by placing the player within an iron shot of the hole at a distance at which he would have to use a wooden club if he were playing with a solid gutta-percha ball. They also tend to make the game more easy by the fact that if they are at all mis-hit they go much better than a gutta-percha ball similarly inaccurately struck. As a slight set-off against these qualities, the ball, because of the greater liveliness, is not quite so good for the short game as the solid ball; but on the whole its advantages distinctly overbalance its disadvantages.

When these balls were first put on the market they were sold at two shillings each and even, when the supply was quite unequal to the demand, at a greater deal higher price, rising to as much as a guinea a ball. But the normal price, until about a year after the decision in the British courts of law affirming that there was no patent in the balls, was always two shillings for the best quality of ball. Subsequently there was a reduction down to one shilling for the balls made by many of the manufacturing companies, though in 1910 the rise in the price of rubber sent up the cost. The rubber-cored ball does not go out of shape so quickly as the gutta-percha solid ball and does not show other marks of ill-usage with the club so obviously. It has had the effect of making the game a good deal easier for the second- and third-class players, favouring especially those who were short drivers with the old gutta-percha ball. To the best players it has made the least difference, nevertheless those who were best with the old ball are also best with the new; its effect has merely been to bring the second, third and fourth best closer to each other and to the best.

Incidentally, the question of the expense of the game has been touched on in this notice of the new balls. There is no doubt that the balls themselves tend to a greater economy, not only because of their own superior durability but also because, as a consequence of their greater resiliency, they are not nearly so hard on the clubs, and the clubs themselves being perhaps made of better material than used to be given to their manufacture, the total effect is that a man's necessary annual expenditure on them is very small indeed even though he plays pretty constantly. Four or five rounds are not more than the average of golfers will make an india-rubber cored ball last them, so that the outlay on the weapons is very moderate. On the other hand the expenditure of the clubs on their courses has increased and tends to increase. Demands are more insistent than they used to be for a well kept course, for perfectly mown greens, renewed teeing grounds and so on, and probably the modern golfer is a good deal more luxurious in his clubhouse wants than his father used to be. This means a big staff of servants and workers on the green, and to meet this a rather heavy subscription is required. Such a subscription as five guineas added to a ten or fifteen guinea entrance fee is not uncommon, and even this is very moderate compared with the subscriptions to some of the clubs in the United States, where a hundred dollars a year, or twenty pounds of our money, is not unusual. But on the whole golf is a very economical pastime, as compared with almost any other sport or pastime which engages the attention of Britons, and it is a pastime for all the year round, and for all the life of a man or woman.

Glossary of Technical Terms used in the Game.

Addressing the Ball.—Putting oneself in position to strike the ball.

All Square.—Term used to express that the score stands level, neither side being a hole up.

Baff.—To strike the ground with the club when playing, and so loft the ball unduly.

Baffy.—A short wooden club, with laid-back face, for lofting shots.

Bogey.—The number of strokes which a good average player should take to each hole. This imaginary player is usually known as "Colonel Bogey," and plays a fine game.

Brassy.—A wooden club with a brass sole.

Bulger.—A driver in which the face "bulges" into a convex shape. The head is shorter than in the older-fashioned driver.

Bunker.—A sand-pit.

Bye.—The holes remaining after one side has become more holes up than remain for play.

Caddie.—The person who carries the clubs. Diminutive of "cad"; cf. laddie (from Fr. *cadet*).

Cleek.—The iron-headed club that is capable of the farthest drive of any of the clubs with iron heads.

Cup.—A depression in the ground causing the ball to lie badly.

Dead.—A ball is said to be "dead" when so near the hole that the putting it in in the next stroke is a "dead" certainty. A ball is said to "fall dead" when it pitches with hardly any run.

Divot.—A piece of turf cut out in the act of playing, which, be it noted, should always be replaced before the player moves on.

Dormy.—One side is said to be "dormy" when it is as many holes to the good as remain to be played—so that it cannot be beaten.

Driver.—The longest driving club, used when the ball lies very well and a long shot is needed.

Foozle.—Any very badly missed or bungled stroke.

"Fore!"—A cry of warning to people in front.

Foursome.—A match in which four persons engage, two on each side playing alternately with the same ball.

Green.—(*a*) The links as a whole; (*b*) the "putting-greens" around the holes.

Grip.—(*a*) The part of the club-shaft which is held in the hands while playing; (*b*) the grasp itself—*e.g.* "a firm grip," "a loose grip," are common expressions.

Half-Shot.—A shot played with something less than a full swing.

Halved.—A hole is "halved" when both sides have played it in the same number of strokes. A round is "halved" when each side has won and lost the same number of holes.

Handicap.—The strokes which a player receives either in match play or competition.

Hanging.—Said of a ball that lies on a slope inclining downwards in regard to the direction in which it is wished to drive.

Hazard.—A general term for bunker, whin, long grass, roads and all kinds of bad ground.

Heel.—To hit the ball on the "heel" of the club, *i.e.* the part of the face nearest the shaft, and so send the ball to the right, with the same result as from a slice.

Honour.—The privilege (which its holder is not at liberty to decline) of striking off first from the tee.

Iron.—An iron-headed club intermediate between the cleek and lofting mashie. There are driving irons and lofting irons according to the purposes for which they are intended.

Lie.—(*a*) The angle of the club-head with the shaft (*e.g.* a "flat lie," "an upright lie"); (*b*) the position of the ball on the ground (*e.g.* "a good lie," "a bad lie").

Like, The.—The stroke which makes the player's score equal to his opponent's in course of playing a hole.

Like-as-we-Lie.—Said when both sides have played the same number of strokes.

Line.—The direction in which the hole towards which the player is progressing lies with reference to the present position of his ball.

Mashie.—An iron club with a short head. The *lofting mashie* has the blade much laid back, for playing a short lofting shot. The *driving mashie* has the blade less laid back, and is used for longer, less lofted shots.

Match-Play.—Play in which the score is reckoned by holes won and lost.

Medal-Play.—Play in which the score is reckoned by the total of strokes taken on the round.

Niblick.—A short stiff club with a short, laid back, iron head, used for getting the ball out of a very bad lie.

Odd, The.—A stroke more than the opponent has played.

Press.—To strive to hit harder than you can hit with accuracy.

Pull.—To hit the ball with a pulling movement of the club, so as to make it curve to the left.

Putt.—To play the short strokes near the hole (pronounced as in "but").

Putter.—The club used for playing the short strokes near the hole. Some have a wooden head, some an iron head.

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Rub-of-the-Green.—Any chance deflection that the ball receives as it goes along.

Run Up.—To send the ball low and close to the ground in approaching the hole opposite to lofting it up.

Scratch Player.—Player who receives no odds in handicap competitions.

Slice.—To hit the ball with a cut across it, so that it flies curving to the right.

Stance.—(*a*) The place on which the player has to stand when playing—*e.g.*" a bad stance," " a good stance," are common expressions; (*b*) the position relative to each other of the player's feet.

Stymie.—When one ball opposite to and in line between another and the hole the first is said to " stymie," or " to be a stymie to " the other—from an old Scottish word given by Jamieson to mean " the faintest form of anything." The idea probably was, the " stymie" only left you the " faintest form " of the hole to aim at.

Tee.—The little mound of sand on which the ball is generally placed for the first drive to each hole.

Teeing-Ground.—The place marked as the limit, outside of which it is not permitted to drive the ball off. This marked-out ground is also sometimes called " the tee."

Top.—To hit the ball above the centre, so that it does not rise much from the ground.

Up.—A player is said to be " one up," " two up," &c., when he is so many holes to the good of his opponent.

Wrist-Shot.—A shot less in length than a half-shot, but longer than a putt.

BIBLIOGRAPHY.—The literature of the game has grown to some considerable bulk. For many years it was practically comprised in the fine work by Mr Robert Clark, *Golf: A Royal and Ancient Game*, together with two handbooks on the game by Mr Chambers and by Mr Forgan respectively, and the *Golfiana Miscellanea* of Mr Stewart. A small book by Mr Horace Hutchinson, named *Hints on Golf*, was very shortly followed by a much more important work by Sir Walter Simpson, Bart., called *The Art of Golf*, a title which sufficiently explains itself. The Badminton Library book on *Golf* attempts to collect into one volume the most interesting historical facts known about the game, with *obiter dicta* and advice to learners, and, on similar didactic lines, books have been written by Mr H. C. S. Everard, Mr Garden Smith and W. Park, the professional player. Mr H. J. Whigham, sometime amateur champion golfer of the United States, has given us a book about the game in that country. *The Book of Golf and Golfers*, compiled, with assistance, by Mr Horace Hutchinson, is in the first place a picture-gallery of famous golfers in their respective attitudes of play. Taylor, Vardon and Braid have each contributed a volume of instruction, and Mr G. W. Beldam has published a book with admirable photographs of players in action, called *Great Golfers: their Method at a Glance*. A work intended for the use of green committees is among the volumes of the *Country Life* Library of Sport. Much interesting lore is contained in the *Golfing Annual*, in the *Golfer's Year Book* and in the pages of *Golf*, which has now become *Golf Illustrated*, a weekly paper devoted to the game. Among works that have primarily a local interest, but yet contain much of historical value about the game, may be cited the *Golf Book of East Lothian*, by the Rev. John Kerr, and the *Chronicle of Blackheath Golfers*, by Mr W. E. Hughes. (H. G. H.)

GOLIAD, an unincorporated village and the county-seat of Goliad county, Texas, U.S.A., on the N. bank of the San Antonio river, 85 m. S.E. of San Antonio. Pop. (1900) about 1700. It is served by the Galveston, Harrisburg & San Antonio railway (Southern Pacific System). Situated in the midst of a rich farming and stock-raising country, Goliad has flour mills, cotton gins and cotton-seed oil mills. Here are the interesting ruins of the old Spanish mission of La Bahia, which was removed to this point from the Guadaloupe river in 1747. During the struggle between Mexico and Spain the Mexican leader Bernardo Gutierrez (1778–1814) was besieged here. The name Goliad, probably an anagram of the name of the Mexican patriot Hidalgo (1753–1811), was first used about 1829. On the outbreak of the Texan War of Liberation Goliad was garrisoned by a small force of Mexicans, who surrendered to the Texans in October 1835, and on the 20th of December a preliminary " declaration of independence " was published here, antedating by several months the official Declaration issued at Old Washington, Texas, on the 2nd of March 1836. In 1836, when Santa Anna began his advance against the Texan posts, Goliad was occupied by a force of about 350 Americans under Colonel James W. Fannin (*c.* 1800–1836), who was overtaken on the Coletto Creek while attempting to carry out orders to withdraw from Goliad and to unite with General Houston; he surrendered after a sharp fight (March 19–20) in which he inflicted a heavy loss on the Mexicans, and was marched back with his force to Goliad, where on the morning of the 27th of March they were shot down by Santa Anna's orders. Goliad was nearly destroyed by a tornado on the 19th of May 1903.

GOLIARD, a name applied to those wandering students (*vagantes*) and clerks in England, France and Germany, during the 12th and 13th centuries, who were better known for their rioting, gambling and intemperance than for their scholarship. The derivation of the word is uncertain. It may come from the Lat. *gula*, gluttony (Wright), but was connected by them with a mythical " Bishop Golias," also called " *archipoëta* " and " *primas* "—especially in Germany—in whose name their satirical poems were mostly written. Many scholars have accepted Büdinger's suggestion (*Über einige Reste der Vagantenpoesie in Österreich*, Vienna, 1854) that the title of Golias goes back to the letter of St Bernard to Innocent II., in which he referred to Abelard as Goliath, thus connecting the goliards with the keen-witted student adherents of that great mediæval critic. Giesebrecht and others, however, support the derivation of goliard from *gailliard*, a gay fellow, leaving " Golias " as the imaginary " patron " of their fraternity.

Spiegel has ingeniously disentangled something of a biography of an *archipoëta* who flourished mainly in Burgundy and at Salzburg from 1160 to beyond the middle of the 13th century; but the proof of the reality of this individual is not convincing. It is doubtful, too, if the jocular references to the rules of the " gild " of goliards should be taken too seriously, though their aping of the " orders " of the church, especially their contrasting them with the mendicants, was too bold for church synods. Their satires were almost uniformly directed against the church, attacking even the pope. In 1227 the council of Trèves forbade priests to permit the goliards to take part in chanting the service. In 1229 they played a conspicuous part in the disturbances at the university of Paris, in connexion with the intrigues of the papal legate. During the century which followed they formed a subject for the deliberations of several church councils, notably in 1289 when it was ordered that " no clerks shall be jongleurs, goliards or buffoons," and in 1300 (at Cologne) when they were forbidden to preach or engage in the indulgence traffic. This legislation was only effective when the " privileges of clergy " were withdrawn from the goliards. Those historians who regard the middle ages as completely dominated by ascetic ideals, regard the goliard movement as a protest against the spirit of the time. But it is rather indicative of the wide diversity in temperament among those who crowded to the universities in the 13th century, and who found in the privileges of the clerk some advantage and attraction in the student life. The goliard poems are as truly " mediæval " as the monastic life which they despised; they merely voice another section of humanity. Yet their criticism was most keenly pointed, and marks a distinct step in the criticism of abuses in the church.

Along with these satires went many poems in praise of wine and riotous living. A remarkable collection of them, now at Munich, from the monastery at Benedictbeuren in Bavaria, was published by Schmeller (3rd ed., 1895) under the title *Carmina Burana*. Many of these, which form the main part of song-books of German students to-day, have been delicately translated by John Addington Symonds in a small volume, *Wine, Women and Song* (1884). As Symonds has said, they form a prelude to the Renaissance. The poems of " Bishop Golias " were later attributed to Walter Mapes, and have been published by Thomas Wright in *The Latin Poems commonly attributed to Walter Mapes* (London, 1841).

The word " goliard " itself outlived these turbulent bands which had given it birth, and passed over into French and English literature of the 14th century in the general meaning of jongleur or minstrel, quite apart from any clerical association. It is thus used in *Piers Plowman*, where, however, the *goliard* still rhymes in Latin, and in Chaucer.

See, besides the works quoted above, M. Haeszner, *Goliardendichtung und die Satire im 13ten Jahrhunderi in England* (Leipzig, 1905); Spiegel, *Die Vaganten und ihr " Orden "* (Spires, 1892); Hubatsch, *Die lateinischen Vagantendieder des Mittelalters* (Görlitz, 1870); and the article in *La grande Encyclopédie*. All of these have bibliographical apparatus. (J. T. S.*)

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GOLIATH, the name of the giant by slaying whom David achieved renown (1 Sam. xvii.). The Philistines had come up to make war against Saul and, as the rival camps lay opposite each other, this warrior came forth day by day to challenge to single combat. Only David ventured to respond, and armed with a sling and pebbles he overcame Goliath. The Philistines, seeing their champion killed, lost heart and were easily put to flight. The giant's arms were placed in the sanctuary, and it was his famous sword which David took with him in his flight from Saul (1 Sam. xxi. 1-9). From another passage we learn that Goliath of Gath, "the shaft of whose spear was like a weaver's beam," was slain by a certain Elhanan of Bethlehem in one of David's conflicts with the Philistines (2 Sam. xxi. 18-22)—the parallel 1 Chron. xx. 5, avoids the contradiction by reading the "brother of Goliath." But this old popular story has probably preserved the more original tradition, and if Elhanan is the son of Dodo in the list of David's mighty men (2 Sam. xxiii. 9, 24), the resemblance between the two names may have led to the transference. The narratives of David's early life point to some exploit by means of which he gained the favour of Saul, Jonathan and Israel, but the absence of all reference to his achievement in the subsequent chapters (1 Sam. xxi. 11, xxix. 5) is evidence of the relatively late origin of a tradition which in course of time became one of the best-known incidents in David's life (Ps. cxliv., LXX. title, the apocryphal Ps. cli., Ecclus. xlvii. 4).

See DAVID; SAMUEL (BOOKS) and especially Cheyne, *Aids and Devout Study of Criticism*, pp. 80 sqq., 125 sqq. In the old Egyptian romance of *Sinuhit* (ascribed to about 2000 B.C.), the story of the slaying of the Bedouin hero has several points of resemblance with that of David and Goliath. See L. B. Paton, *Hist. of Syr. and Pal.* p. 299, 491; A. Jeremias, *Das A.T. im Lichte d. alten Orients*, 2nd ed. pp. 299, 491; A. R. S. Kennedy, *Century Bible: Samuel*, p. 122, argues that David's Philistine adversary was originally nameless, in 1 Sam. xvii. he is named only in v. 4.

GOLITSUIN, BORIS ALEKSYEEVICH (1654–1714), Russian statesman, came of a princely family, claiming descent from Prince Gedimin of Lithuania. Earlier members of the family were Mikhail (*d. c.* 1552), a famous soldier, and his great-grandson Vasily Vasilevich (d. 1619), who was sent as ambassador to Poland to offer the Russian crown to Prince Ladislaus. Boris became court chamberlain in 1676. He was the young tsar Peter's chief supporter when, in 1689, Peter resisted the usurpations of his elder sister Sophia, and the head of the loyal council which assembled at the Troitsa monastery during the crisis of the struggle. Golitsuin it was who suggested taking refuge in that strong fortress and over the boyars of the opposite party. In 1690 he was created a boyar and shared with Lev Naryishkin, Peter's uncle, the conduct of home affairs. After the death of the tsaritsa Natalia, Peter's mother, in 1694, his influence increased still further. He accompanied Peter to the White Sea (1694–1695); took part in the Azov campaign (1695); and was one of the triumvirate who ruled Russia during Peter's first foreign tour (1697–1698). The Astrakhan rebellion (1706), which affected all the districts under his government, shook Peter's confidence in him, and seriously impaired his position. In 1707 he was superseded in the Volgan provinces by Andrei Matveyev. A year before his death he entered a monastery. Golitsuin was a typical representative of Russian society of the end of the 17th century in its transition from barbarism to civilization. In many respects he was far in advance of his age. He was highly educated, spoke Latin with graceful fluency, frequented the society of scholars and had his children carefully educated according to the best European models. Yet this eminent, this superior personage was an habitual drunkard, an uncouth savage who intruded upon the hospitality of wealthy foreigners, and was not ashamed to seize upon any dish he took a fancy to, and send it home to his wife. It was his reckless drunkenness which ultimately ruined him in the estimation of Peter the Great, despite his previous inestimable services.

See S. Solovev, *History of Russia* (Rus.), vol. xiv. (Moscow, 1858); R. N. Bain, *The First Romanovs* (London, 1905). (R. N. B.)

GOLITSUIN, DMITRY MIKHAILOVICH (1665–1737), Russian statesman, was sent in 1697 to Italy to learn "military affairs"; in 1704 he was appointed to the command of an auxiliary corps in Poland against Charles XII.; from 1711 to 1718 he was governor of Byelogorod. In 1718 he was appointed president of the newly erected *Kommer Kollegium* and a senator. In May 1723 he was implicated in the disgrace of the vice-chancellor Shafirov and was deprived of all his offices and dignities, which he only recovered through the mediation of the empress Catherine I. After the death of Peter the Great, Golitsuin became the recognized head of the old Conservative party which had never forgiven Peter for putting away Eudoxia and marrying the plebeian Martha Skavronskaya. But the reformers, as represented by Alexander Menshikov and Peter Tolstoi, prevailed; and Golitsuin remained in the background till the fall of Menshikov, 1727. During the last years of Peter II. (1728–1730), Golitsuin was the most prominent statesman in Russia and his high aristocratic theories had full play. On the death of Peter II. he conceived the idea of limiting the autocracy by subordinating it to the authority of the supreme privy council, of which he was president. He drew up a form of constitution which Anne of Courland, the newly elected Russian empress, was forced to sign at Mittau before being permitted to proceed to St Petersburg. Anne lost no time in repudiating this constitution, and never forgave its authors. Golitsuin was left in peace, however, and lived for the most part in retirement, till 1736, when he was arrested on suspicion of being concerned in the conspiracy of his son-in-law Prince Constantine Cantimir. This, however, was a mere pretext, it was for his anti-monarchical sentiments that he was really prosecuted. A court, largely composed of his antagonists, condemned him to death, but the empress reduced the sentence to lifelong imprisonment in Schlüsselburg and confiscation of all his estates. He died in his prison on the 14th of April 1737, after three months of confinement.

See R. N. Bain, *The Pupils of Peter the Great* (London, 1897). (R. N. B.)

GOLITSUIN, VASILY VASILEVICH (1643–1714), Russian statesman, spent his early days at the court of Tsar Alexius where he gradually rose to the rank of boyar. In 1676 he was sent to the Ukraine to keep in order the Crimean Tatars and took part in the Chigirin campaign. Personal experience of the inconveniences and dangers of the prevailing system of preferment, the so-called *myestnichestvo*, or rank priority, which had paralysed the Russian armies for centuries, induced him to propose its abolition, which was accomplished by Tsar Theodore III. (1678). The May revolution of 1682 placed Golitsuin at the head of the *Posolsky Prikaz*, or ministry of foreign affairs, and during the regency of Sophia, sister of Peter the Great, whose lover he became, he was the principal minister of state (1682–1689) and "keeper of the great seal," a title bestowed upon only two Russians before him, Athonasy Orduin-Nashchokin and Artamon Matvyeev. In home affairs his influence was insignificant, but his foreign policy was distinguished by the peace with Poland in 1683, whereby Russia at last recovered Kiev. By the terms of the same treaty, he acceded to the grand league against the Porte, but his two expeditions against the Crimea (1687 and 1689), "the First Crimean War," were unsuccessful and made him extremely unpopular. Only with the utmost difficulty could Sophia get the young tsar Peter to decorate the defeated commander-in-chief as if he had returned a victor. In the civil war between Sophia and Peter (August–September 1689), Golitsuin half-heartedly supported his mistress and shared her ruin. His life was spared owing to the supplications of his cousin Boris, but he was deprived of his boyardom, his estates were confiscated and he was banished successively to Kargopol, Mezen and Kologora, where he died on the 21st of April 1714. Golitsuin was unusually well educated. He understood German and Greek as well as his mother-tongue, and could express himself fluently in Latin. He was a great friend of foreigners, who generally alluded to him as "the great Golitsuin."

His brother MIKHAIL (1674–1730) was a celebrated soldier, who is best known for his governorship of Finland (1714–1721), where his admirable qualities earned the remembrance of the people whom he had conquered. And Mikhail's son Alexander (1718–

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1783) was a diplomat and soldier, who rose to be field-marshal and governor of St Petersburg.

See R. N. Bain, *The First Romanovs* (London, 1905); A. Brückner, *Furst Golizin* (Leipzig, 1887); S. Solovev, *History of Russia* (Rus.), vols. xiii.-xiv. (Moscow, 1858, &c.). (R. N. B.)

GOLIUS or (Gohl), **JACOBUS** (1596–1667), Dutch Orientalist, was born at the Hague in 1596, and studied at the university of Leiden, where in Arabic and other Eastern languages he was the most distinguished pupil of Erpenius. In 1622 he accompanied the Dutch embassy to Morocco, and on his return he was chosen to succeed Erpenius (1624). In the following year he set out on a Syrian and Arabian tour from which he did not return until 1629. The remainder of his life was spent at Leiden where he held the chair of mathematics as well as that of Arabic. He died on the 28th of September 1667.

His most important work is the *Lexicon Arabico-Latinum*, fol., Leiden, 1653, which, based on the *Sihah* of Al-Jauhari, was only superseded by the corresponding work of Freytag. Among his earlier publications may be mentioned editions of various Arabic texts (*Proverbia quaedam Alis, imperatoris Muslemici, et Carmen Tograipoliae doctissimi, necnon dissertatio quaedam Aben Synae*, 1629; and *Ahmedis Arabsiadae vitae et rerum gestarum Timuri, qui vulgo Tamer, lanes dicitur, historia*, 1636). In 1656 he published a new edition, with considerable additions, of the *Grammatica Arabica* of Erpenius. After his death, there was found among his papers a *Dictionarium Persico-Latinum* which was published, with additions, by Edmund Castell in his *Lexicon heptaglotton* (1669). Golius also edited, translated and annotated the astronomical treatise of Alfraganus (*Jahammedis, filii Keiri Ferganensis, qui vulgo Alfraganus dicitur, elementa astronomica Arabice et Latine*, 1669).

GOLLNOW, a town of Germany, in the Prussian province of Pomerania, on the right bank of the Ihna, 14 m. N.N.E. of Stettin, with which it has communication by rail and steamer. Pop. (1905) 8539. It possesses two Evangelical churches, a synagogue and some small manufactures. Gollnow was founded in 1190, and was raised to the rank of a town in 1268. It was for a time a Hanse town, and came into the possession of Prussia in 1720, having belonged to Sweden since 1648.

GOLOSH, or Galosh (from the Fr. *galoche*, Low Lat. *calopedes*, a wooden shoe or clog; an adaptation of the Gr. καλοπόδιον, a diminutive formed of κᾶλον, wood, and πούς, foot), originally a wooden shoe or patten, or merely a wooden sole fastened to the foot by a strap or cord. In the middle ages "galosh" was a general term for a boot or shoe, particularly one with a wooden sole. In modern usage, it is an outer shoe worn in bad weather to protect the inner one, and keep the feet dry. Goloshes are now almost universally made of rubber, and in the United States they are known as "rubbers" simply, the word golosh being rarely if ever used. In the bootmakers' trade, a "golosh" is the piece of leather, of a make stronger than, or different from that of the "uppers," which runs around the bottom part of a boot or shoe, just above the sole.

GOLOVIN, FEDOR ALEKSYEEVICH, Count (d. 1706), Russian statesman, learnt, like so many of his countrymen in later times, the business of a ruler in the Far East. During the regency of Sophia, sister of Peter the Great, he was sent to the Amur to defend the new Muscovite fortress of Albazin against the Chinese. In 1689 he concluded with the Celestial empire the treaty of Nerchinsk, by which the line of the Amur, as far as its tributary the Gorbitsa, was retroceded to China because of the impossibility of seriously defending it. In Peter's grand embassy to the West in 1697 Golovin occupied the second place immediately after Lefort. It was his chief duty to hire foreign sailors and obtain everything necessary for the construction and complete equipment of a fleet. On Lefort's death, in March 1699, he succeeded him as admiral-general. The same year he was created the first Russian count, and was also the first to be decorated with the newly-instituted Russian order of St Andrew. The conduct of foreign affairs was at the same time entrusted to him, and from 1699 to his death he was "the premier minister of the tsar." Golovin's first achievement as foreign minister was to supplement the treaty of Carlowitz, by which peace with Turkey had only been secured for three years, by concluding with the Porte a new treaty at Constantinople (June 13, 1700), by which the term of the peace was extended to thirty years and, besides other concessions, the Azov district and a strip of territory extending thence to Kuban were ceded to Russia. He also controlled, with consummate ability, the operations of the brand-new Russian diplomatists at the various foreign courts. His superiority over all his Muscovite contemporaries was due to the fact that he was already a statesman, in the modern sense, while they were still learning the elements of statesmanship. His death was an irreparable loss to the tsar, who wrote upon the despatch announcing it, the words "Peter filled with grief."

See R. N. Bain, *The First Romanovs* (London, 1905). (R. N. B.)

GOLOVKIN, GAVRIIL IVANOVICH, Count (1660–1734), Russian statesman, was attached (1677), while still a lad, to the court of the tsarevitch Peter, afterwards Peter the Great, with whose mother Natalia he was connected, and vigilantly guarded him during the disquieting period of the regency of Sophia, sister of Peter the Great (1682–1689). He accompanied the young tsar abroad on his first foreign tour, and worked by his side in the dockyards of Saardam. In 1706 he succeeded Golovin in the direction of foreign affairs, and was created the first Russian grand-chancellor on the field of Poltava (1709). Golovkin held this office for twenty-five years. In the reign of Catherine I. he became a member of the supreme privy council which had the chief conduct of affairs during this and the succeeding reigns. The empress also entrusted him with her last will whereby she appointed the young Peter II. her successor and Golovkin one of his guardians. On the death of Peter II. in 1730 he declared openly in favour of Anne, duchess of Courland, in opposition to the aristocratic Dolgorukis and Golitsuins, and his determined attitude on behalf of autocracy was the chief cause of the failure of the proposed constitution, which would have converted Russia into a limited monarchy. Under Anne he was a member of the first cabinet formed in Russia, but had less influence in affairs than Ostermann and Münnich. In 1707 he was created a count of the Holy Roman empire, and in 1710 a count of the Russian empire. He was one of the wealthiest, and at the same time one of the stingiest, magnates of his day. His ignorance of any language but his own made his intercourse with foreign ministers very inconvenient.

See R. N. Bain, *The Pupils of Peter the Great* (London, 1897). (R. N. B.)

GOLOVNIN, VASILY MIKHAILOVICH (1776–1831), Russian vice-admiral, was born on the 20th of April 1776 in the village of Gulynki in the province of Ryazan, and received his education at the Cronstadt naval school. From 1801 to 1806 he served as a volunteer in the English navy. In 1807 he was commissioned by the Russian government to survey the coasts of Kamchatka and of Russian America, including also the Kurile Islands. Golovnin sailed round the Cape of Good Hope, and on the 5th of October 1809, arrived in Kamchatka. In 1811, whilst attempting to survey the coast of the island of Kunashiri, he was seized by the Japanese, and was retained by them as a prisoner, until the 13th of October 1813, when he was liberated, and in the following year he returned to St Petersburg. Soon after this the government planned another expedition, which had for its object the circumnavigation of the globe by a Russian ship, and Golovnin was appointed to the command. He started from St Petersburg on the 7th of September 1817, sailed round Cape Horn, and arrived in Kamchatka in the following May. He returned to Europe by way of the Cape of Good Hope, and landed at St Petersburg on the 17th of September 1819. He died on the 12th of July 1831.

Golovnin published several works, of which the following are the most important:—*Journey to Kamchatka* (2 vols., 1819); *Journey Round the World* (2 vols., 1822); and *Narrative of my Captivity in Japan, 1811–1813* (2 vols., 1816). The last has been translated into French, German and English, the English edition being in three volumes (1824). A complete edition of his works was published at St Petersburg in five volumes in 1864, with maps and charts, and a biography of the author by N. Grech.

GOLTZ, BOGUMIL (1801–1870), German humorist and satirist, was born at Warsaw on the 20th of March 1801. After attending the classical schools of Marienwerder and Königsberg, he learnt farming on an estate near Thorn, and in 1821 entered the university of Breslau as a student of philosophy. But he

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soon abandoned an academical career, and, after returning for a while to country life, retired to the small town of Gollub, where he devoted himself to literary studies. In 1847 he settled at Thorn, "the home of Copernicus," where he died on the 12th of November 1870. Goltz is best known to literary fame by his *Buch der Kindheit* (Frankfort, 1847; 4th ed., Berlin, 1877), in which, after the style of Jean Paul, and Adalbert Stifter, but with a more modern realism, he gives a charming and idyllic description of the impressions of his own childhood. Among his other works must be noted *Ein Jugendleben* (1852); *Der Mensch und die Leute* (1858); *Zur Charakteristik und Naturgeschichte der Frauen* (1859); *Zur Geschichte und Charakteristik des deutschen Genius* (1864), and *Die Weltklugheit und die Lebensweisheit* (1868).

Goltz's works have not been collected, but a selection will be found in Reclam's *Universalbibliothek* (ed. by P. Stein, 1901 and 1906). See O. Roquette, *Siebzig Jahre*, i. (1894).

GOLTZ, COLMAR, FREIHERR VON DER (1843–), Prussian soldier and military writer, was born at Bielkenfeld, East Prussia, on the 12th of August 1843, and entered the Prussian infantry in 1861. In 1864 he entered the Berlin Military Academy, but was temporarily withdrawn in 1866 to serve in the Austrian war, in which he was wounded at Trautenau. In 1867 he joined the topographical section of the general staff, and at the beginning of the Franco-German War of 1870–71 was attached to the staff of Prince Frederick Charles. He took part in the battles of Vionville and Gravelotte and in the siege of Metz. After its fall he served under the Red Prince in the campaign of the Loire, including the battles of Orleans and Le Mans. He was appointed in 1871 professor at the military school at Potsdam, and the same year was promoted captain and placed in the historical section of the general staff. It was then he wrote *Die Operationen der II. Armee bis zur Capitulation von Metz* and *Die Sieben Tage von Le Mans*, both published in 1873. In 1874 he was appointed to the staff of the 6th division, and while so employed wrote *Die Operationen der II. Armee an der Loire* and *Léon Gambetta und seine Armeen*, published in 1875 and 1877 respectively. The latter was translated into French the same year, and both are impartially written. The views expressed in the latter work led to his being sent back to regimental duty for a time, but it was not long before he returned to the military history section. In 1878 von der Goltz was appointed lecturer in military history at the military academy at Berlin, where he remained for five years and attained the rank of major. He published, in 1883, *Rossbach und Jena* (new and revised edition, *Von Rossbach bis Jena und Auerstädt*, 1906), *Das Volk in Waffen* (English translation *The Nation in Arms*), both of which quickly became military classics, and during his residence in Berlin contributed many articles to the military journals. In June 1883 his services were lent to Turkey to reorganize the military establishments of the country. He spent twelve years in this work, the result of which appeared in the Greco-Turkish War of 1897, and he was made a pasha and in 1895 a *mushir* or field-marshal. On his return to Germany in 1896 he became a lieutenant-general and commander of the 5th division, and in 1898, head of the Engineer and Pioneer Corps and inspector-general of fortifications. In 1900 he was made general of infantry and in 1902 commander of the I. army corps. In 1907 he was made inspector-general of the newly created sixth army inspection established at Berlin, and in 1908 was given the rank of colonel-general (*Generaloberst*).

In addition to the works already named and frequent contributions to military periodical literature, he wrote *Kriegführung* (1895, later edition *Krieg- und Heerführung*, 1901; Eng. trans. *The Conduct of War*); *Der thessalische Krieg* (Berlin, 1898); *Ein Ausflug nach Macedonien* (1894); *Anatolische Ausflüge* (1896); a map and description of the environs of Constantinople; *Von Jena bis Pr. Eylau* (1907), a most important historical work, carrying on the story of *Rossbach und Jena* to the peace of Tilsit, &c.

GOLTZIUS, HENDRIK (1558–1617), Dutch painter and engraver, was born in 1558 at Mülebrecht, in the duchy of Jülich. After studying painting on glass for some years under his father, he was taught the use of the burin by Dirk Volkertsz Coornlert, a Dutch engraver of mediocre attainment, whom he soon surpassed, but who retained his services for his own advantage. He was also employed by Philip Galle to engrave a set of prints of the history of Lucretia. At the age of twenty-one he married a widow somewhat advanced in years, whose money enabled him to establish at Haarlem an independent business; but his unpleasant relations with her so affected his health that he found it advisable in 1590 to make a tour through Germany to Italy, where he acquired an intense admiration for the works of Michelangelo, which led him to surpass that master in the grotesqueness and extravagance of his designs. He returned to Haarlem considerably improved in health, and laboured there at his art till his death, on the 1st of January 1617. Goltzius ought not to be judged chiefly by the works he valued most, his eccentric imitations of Michelangelo. His portraits, though mostly miniatures, are master-pieces of their kind, both on account of their exquisite finish, and as fine studies of individual character. Of his larger heads, the life-size portrait of himself is probably the most striking example. His "master-pieces," so called from their being attempts to imitate the style of the old masters, have perhaps been overpraised. In his command of the burin Goltzius is not surpassed even by Dürer; but his technical skill is often unequally aided by higher artistic qualities. Even, however, his eccentricities and extravagances are greatly counterbalanced by the beauty and freedom of his execution. He began painting at the age of forty-two, but none of his works in this branch of art—some of which are in the imperial collection at Vienna—display any special excellences. He also executed a few pieces in chiaroscuro.

His prints amount to more than 300 plates, and are fully described in Bartsch's *Peintre-graveur*, and Weigel's supplement to the same work.

GOLUCHOWSKI, AGENOR, COUNT (1849–), Austrian statesman, was born on the 25th of March 1849. His father, descended from an old and noble Polish family, was governor of Galicia. Entering the diplomatic service, the son was in 1872 appointed attaché to the Austrian embassy at Berlin, where he became secretary of legation, and thence he was transferred to Paris. After rising to the rank of counsellor of legation, he was in 1887 made minister at Bucharest, where he remained till 1893. In these positions he acquired a great reputation as a firm and skilful diplomatist, and on the retirement of Count Kalnoky in May 1895 was chosen to succeed him as Austro-Hungarian minister for foreign affairs. The appointment of a Pole caused some surprise in view of the importance of Austrian relations with Russia (then rather strained) and Germany, but the choice was justified by events. In his speech of that year to the delegations he declared the maintenance of the Triple Alliance, and in particular the closest intimacy with Germany, to be the keystone of Austrian policy; at the same time he dwelt on the traditional friendship between Austria and Great Britain, and expressed his desire for a good understanding with all the powers. In pursuance of this policy he effected an understanding with Russia, by which neither power was to exert any separate influence in the Balkan peninsula, and thus removed a long-standing cause of friction. This understanding was formally ratified during a visit to St Petersburg on which he accompanied the emperor in April 1897. He took the lead in establishing the European concert during the Armenian troubles of 1896, and again resisted isolated action on the part of any of the great powers during the Cretan troubles and the Greco-Turkish War. In November 1897, when the Austro-Hungarian flag was insulted at Mersina, he threatened to bombard the town if instant reparation were not made, and by his firm attitude greatly enhanced Austrian prestige in the East. In his speech to the delegations in 1898 he dwelt on the necessity of expanding Austria's mercantile marine, and of raising the fleet to a strength which, while not vying with the fleets of the great naval powers, would ensure respect for the Austrian flag wherever her interests needed protection. He also hinted at the necessity for European combination to resist American competition. The understanding with Russia in the matter of the Balkan States temporarily endangered friendly relations with Italy,

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who thought her interests threatened, until Goluchowski guaranteed in 1898 the existing order. He further encouraged a good understanding with Italy by personal conferences with the Italian foreign minister, Tittoni, in 1904 and 1905. Count Lamsdorff visited Vienna in December 1902, when arrangements were made for concerted action in imposing on the sultan reforms in the government of Macedonia. Further steps were taken after Goluchowski's interview with the tsar at Mürzsteg in 1903, and two civil agents representing the countries were appointed for two years to ensure the execution of the promised reforms. This period was extended in 1905, when Goluchowski was the chief mover in forcing the Porte, by an international naval demonstration at Mitylene, to accept financial control by the powers in Macedonia. At the conference assembled at Algeciras to settle the Morocco Question, Austria supported the German position, and after the close of the conferences the emperor William II. telegraphed to Goluchowski: "You have proved yourself a brilliant second on the duelling ground and you may feel certain of like services from me in similar circumstances." This pledge was redeemed in 1908, when Germany's support of Austria in the Balkan crisis proved conclusive. By the Hungarians, however, Goluchowski was hated; he was suspected of having inspired the emperor's opposition to the use of Magyar in the Hungarian army, and was made responsible for the slight offered to the Magyar deputation by Francis Joseph in September 1905. So long as he remained in office there was no hope of arriving at a settlement of a matter which threatened the disruption of the Dual monarchy, and on the 11th of October 1906 he was forced to resign.

GOMAL, or GUMAL, the name of a river of Afghanistan, and of a mountain pass on the Dera Ismail Khan border of the North-West Frontier Province of British India. The Gomal river, one of the most important rivers in Afghanistan, rises in the unexplored regions to the south-east of Ghazni. Its chief tributary is the Zhob. Within the limits of British territory the Gomal forms the boundary between the North-West Frontier Province and Baluchistan, and more or less between the Pathan and Baluch races. The Gomal pass is the most important pass on the Indian frontier between the Khyber and the Bolan. It connects Dera Ismail Khan with the Gomal valley in Afghanistan, and has formed for centuries the outlet for the povindah trade. Until the year 1889 this pass was almost unknown to the Anglo-Indian official; but in that year the government of India decided that, in order to maintain the safety of the railway as well as to perfect communication between Quetta and the Punjab, the Zhob valley should, like the Bori valley, be brought under British protection and control, and the Gomal pass should be opened. After the Waziristan expedition of 1894 Wana was occupied by British troops in order to dominate the Gomal and Waziristan; but on the formation of the North-West Frontier Province in 1901 it was decided to replace these troops by the South Waziristan militia, who now secure the safety of the pass.

GOMARUS, FRANZ (1563–1641), Dutch theologian, was born at Bruges on the 30th of January 1563. His parents, having embraced the principles of the Reformation, emigrated to the Palatinate in 1578, in order to enjoy freedom to profess their new faith, and they sent their son to be educated at Strassburg under Johann Sturm (1507–1589). He remained there three years, and then went in 1580 to Neustadt, whither the professors of Heidelberg had been driven by the elector-palatine because they were not Lutherans. Here his teachers in theology were Zacharius Ursinus (1534–1583), Hieronymus Zanchius (1560–1590), and Daniel Tossanus (1541–1602). Crossing to England towards the end of 1582, he attended the lectures of John Rainolds (1549–1607) at Oxford, and those of William Whitaker (1548–1595) at Cambridge. He graduated at Cambridge in 1584, and then went to Heidelberg, where the faculty had been by this time re-established. He was pastor of a Reformed Dutch church in Frankfort from 1587 till 1593, when the congregation was dispersed by persecution. In 1594 he was appointed professor of theology at Leiden, and before going thither received from the university of Heidelberg the degree of doctor. He taught quietly at Leiden till 1603, when Jakobus Arminius came to be one of his colleagues in the theological faculty, and began to teach Pelagian doctrines and to create a new party in the university. Gomarus immediately set himself earnestly to oppose these views in his classes at college, and was supported by Johann B. Bogermann (1570–1637), who afterwards became professor of theology at Franeker. Arminius "sought to make election dependent upon faith, whilst they sought to enforce absolute predestination as the rule of faith, according to which the whole Scriptures are to be interpreted" (J. A. Dorner, *History of Protestant Theology*, i. p. 417). Gomarus then became the leader of the opponents of Arminius, who from that circumstance came to be known as Gomarists. He engaged twice in personal disputation with Arminius in the assembly of the estates of Holland in 1608, and was one of five Gomarists who met five Arminians or Remonstrants in the same assembly of 1609. On the death of Arminius shortly after this time, Konrad Vorstius (1569–1622), who sympathized with his views, was appointed to succeed him, in spite of the keen opposition of Gomarus and his friends; and Gomarus took his defeat so ill that he resigned his post, and went to Middleburg in 1611, where he became preacher at the Reformed church, and taught theology and Hebrew in the newly founded *Illustre Schule*. From this place he was called in 1614 to a chair of theology at Saumur, where he remained four years, and then accepted a call as professor of theology and Hebrew to Groningen, where he stayed till his death on the 11th of January 1641. He took a leading part in the synod of Dort, assembled in 1618 to judge of the doctrines of Arminius. He was a man of ability, enthusiasm and learning, a considerable Oriental scholar, and also a keen controversialist. He took part in revising the Dutch translation of the Old Testament in 1633, and after his death a book by him, called the *Lyra Davidis*, was published, which sought to explain the principles of Hebrew metre, and which created some controversy at the time, having been opposed by Louis Cappel. His works were collected and published in one volume folio, in Amsterdam in 1645. He was succeeded at Groningen in 1643 by his pupil Samuel Maresius (1599–1673).

GOMBERVILLE, MARIN LE ROY, SIEUR DU PARC ET DE (1600–1674), French novelist and miscellaneous writer, was born at Paris in 1600. At fourteen years of age he wrote a volume of verse, at twenty a *Discours sur l'histoire* and at twenty-two a pastoral, *La Caribée*, which is really a novel. The persons in it, though still disguised as shepherds and shepherdesses, represent real persons for whose identification the author himself provides a key. This was followed by a more ambitious attempt, *Polexandre* (5 vols. 1632–1637). The hero wanders through the world in search of the island home of the princess Alcidiane. It contains much history and geography; the travels of Polexandre extending to such unexpected places as Benin, the Canary Islands, Mexico and the Antilles, and incidentally we learn all that was then known of Mexican history. *Cythérée* (4 vols.) appeared in 1630–1642, and in 1651 the *Jeune Alcidiane*, intended to undo any harm the earlier novels may have done, for Gomberville became a Jansenist and spent the last twenty-five years of his life in pious retirement. He was one of the earliest and most energetic members of the Academy. He died in Paris on the 14th of June 1674.

GOMER, the biblical name of a race appearing in the table of nations (Gen. x. 2), as the "eldest son" of Japheth and the "father" of Ashkenaz, Riphath and Togarmah; and in Ezek. xxxviii. 6 as a companion of "the house of Togarmah in the uttermost parts of the north," and an ally of Gog; both Gomer and Togarmah being credited with "hordes,"[1] E.V., *i.e.* "bands" or "armies." The "sons" of Gomer are probably tribes of north-east Asia Minor and Armenia, and Gomer is identified with the Cimmerians. These are referred to in cuneiform inscriptions under the Assyrian name *gimmirâ* (*gimirrai*) as raiding Asia Minor from the north and north-east of the Black

[1] גְּדוּד *Âgaph*, a word peculiar to Ezekiel, Clarendon Press *Heb. Lex.*

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Sea, and overrunning Lydia in the 7th century B.C. (see CIMMERII, SCYTHIA, LYDIA). They do not seem to have made any permanent settlements, unless some such are indicated by the fact that the Armenians called Cappadocia *Gamir*. It is, however, suggested that this name is borrowed from the Old Testament.[1]

The name Gomer (Gomer bath Diblaim) was also borne by the unfaithful wife of Hosea, whom he pardoned and took back (Hosea i. 3). Hosea uses these incidents as symbolic of the sin, punishment and redemption of Israel, but there is no need to regard Gomer as a purely imaginary person. (W. H. BE.)

GOMERA, an island in the Atlantic Ocean, forming part of the Spanish archipelago of the Canary Islands (*q.v.*). Pop. (1900) 15,358; area 144 sq. m. Gomera lies 20 m. W.S.W. of Teneriffe. Its greatest length is about 23 m. The coast is precipitous and the interior mountainous, but Gomera has the most wood and is the best watered of the group. The inhabitants are very poor. Dromedaries are bred on Gomera in large numbers. San Sebastian (3187) is the chief town and a port. It was visited by Columbus on his first voyage of discovery in 1492.

GOMEZ, DIOGO (DIEGO) (fl. 1440–1482), Portuguese seaman, explorer and writer. We first trace him as a *cavalleiro* of the royal household; in 1440 he was appointed receiver of the royal customs—in 1466 judge—at Cintra (*Juiz das causas e feitorias contadas de Cintra*); on the 5th of March 1482 he was confirmed in the last-named office. He wrote, especially for the benefit of Martin Behaim, a Latin chronicle of great value, dealing with the life and discoveries of Prince Henry the Navigator, and divided into three parts: (1) *De prima inventione Guineae*; (2) *De insulis primo inventis in mare (sic) Occidentis*; (3) *De inventione insularum de Açores*. This chronicle contains the only contemporary account of the rediscovery of the Azores by the Portuguese in Prince Henry's service, and is also noteworthy for its clear ascription to the prince of deliberate scientific and commercial purpose in exploration. For, on the one hand, the infante sent out his caravels to search for new lands (*ad quaerendas terras*) from his wish to know the more distant parts of the western ocean, and in the hope of finding islands or *terra firma* beyond the limits laid down by Ptolemy (*ultra descriptionem Tolomei*); on the other hand, his information as to the native trade from Tunis to Timbuktu and the Gambia helped to inspire his persistent exploration of the West African coast—"to seek those lands by way of the sea." Chart and quadrant were used on the prince's vessels, as by Gomez himself on reaching the Cape Verde Islands; Henry, at the time of Diogo's first voyage, was in correspondence with an Oran merchant who kept him informed upon events even in the Gambia *hinterland*; and, before the discovery of the Senegal and Cape Verde in 1445, Gomez' royal patron had already gained reliable information of *some* route to Timbuktu. In the first part of his chronicle Gomez tells how, no long time after the disastrous expedition of the Danish nobleman "Vallarte" (Adalbert) in 1448, he was sent out in command of three vessels along the West African coast, accompanied by one Jacob, an Indian interpreter, to be employed in the event of reaching India. After passing the Rio Grande, beyond Cape Verde, strong currents checked his course; his officers and men feared that they were approaching the extremity of the ocean, and he put back to the Gambia. He ascended this river a considerable distance, to the negro town of "Cantor," whither natives came from "Kukia" and Timbuktu for trade; he gives elaborate descriptions of the negro world he had now penetrated, refers to the Sierra Leone ("Serra Lyoa") Mountains, sketches the course of this range, and says much of Kukia (in the upper Niger basin?), the centre of the West African gold trade, and the resort of merchants and caravans from Tunis, Fez, Cairo and "all the land of the Saracens." Mahommedanism was already dominant at the Cambria estuary, but Gomez seems to have won over at least one important chief, with his court, to Christianity and Portuguese allegiance. Another African voyage, apparently made in 1462, two years after Henry the Navigator's death (though assigned by some to 1460), resulted in a fresh discovery of the Cape Verde Islands, already found by Cadamosto (*q.v.*). To the island of Santiago Gomez, like his Venetian forerunner, claims to have given its present name. His narrative is a leading authority on the last illness and death of Prince Henry, as well as on the life, achievements and purposes of the latter; here alone is recorded what appears to have been the earliest of the navigator's exploring ventures, that which under João de Trasto reached Grand Canary in 1415.

Of Gomez' chronicle there is only one MS., viz. *Cod. Hisp.* 27, in the Hof- und Staats-Bibliothek, Munich; the original Latin text was printed by Schmeller "Über Valentin Fernandez Alemão" in the *Abhandlungen der philosoph.-philolog. Kl. der bayerischen Akademie der Wissenschaften*, vol. iv., part iii. (Munich, 1847); see also Sophus Ruge, "Die Entdeckung der Azoren," pp. 149–180 (esp. 178–179) in the 27th *Jahresbericht des Vereins für Erdkunde* (Dresden, 1901); Jules Mees, *Histoire de la découverte des îles Açores*, pp. 44–45, 125–127 (Ghent, 1901); R. H. Major, *Life of Prince Henry the Navigator*, pp. xviii., xix., 64–65, 287–299, 303–305 (London, 1868); C. R. Beazley, *Prince Henry the Navigator*, 289–298, 304–305; and Introduction to Azurara's *Discovery and Conquest of Guinea*, ii., iv., xiv., xxv.–xxvii., xcii.–xcvi. (London, 1899). (C. R. B.)

GOMEZ DE AVELLANEDA, GERTRUDIS (1814–1873), Spanish dramatist and poet, was born at Puerto Principe (Cuba) on the 23rd of March 1814, and removed to Spain in 1836. Her *Poesías líricas* (1841), issued with a laudatory preface by Gallego, made a most favourable impression and were republished with additional poems in 1850. In 1846 she married a diplomatist named Pedro Sabater, became a widow within a year, and in 1853 married Colonel Domingo Verdugo. Meanwhile she had published *Sab* (1839), *Guatimozin* (1846), and other novels of no great importance. She obtained, however, a series of successes on the stage with *Alfonso Munio* (1844), a tragedy in the new romantic manner; with *Saúl* (1849), a biblical drama indirectly suggested by Alfieri; and with *Baltasar* (1858), a piece which bears some resemblance to Byron's *Sardanapalus*. Her commerce with the world had not diminished her natural piety, and, on the death of her second husband, she found so much consolation in religion that she had thoughts of entering a convent. She died at Madrid on the 2nd of February 1873, full of mournful forebodings as to the future of her adopted country. It is impossible to agree with Villemain that "le génie de don Luis de Léon et de sainte Thérèse a reparu sous le voile funèbre de Gomez de Avellaneda," for she has neither the monk's mastery of poetic form not the nun's sublime simplicity of soul. She has a grandiose tragical vision of life, a vigorous eloquence rooted in pietistic pessimism, a dramatic gift effective in isolated acts or scenes; but she is deficient in constructive power and in intellectual force, and her lyrics, though instinct with melancholy beauty, or the tenderness of resigned devotion, too often lack human passion and sympathy. The edition of her *Obras literarias* (5 vols., 1869–1871), still incomplete, shows a scrupulous care for minute revision uncommon in Spanish writers; but her emendations are seldom happy. But she is interesting as a link between the classic and romantic schools of poetry, and, whatever her artistic shortcomings, she has no rivals of her own sex in Spain during the 19th century.

GOMM, SIR WILLIAM MAYNARD (1784–1875), British soldier, was gazetted to the 9th Foot at the age of ten, in recognition of the services of his father, Lieut.-Colonel William Gomm, who was killed in the attack on Guadaloupe (1794). He joined his regiment as a lieutenant in 1799, and fought in Holland under the duke of York, and subsequently was with Pulteney's Ferrol expedition. In 1803 he became Captain, and shortly afterwards qualified as a staff officer at the High Wycombe military college. On the general staff he was with Cathcart at Copenhagen, with Wellington in the Peninsula, and on Moore's staff at Corunna. He was also on Chatham's staff in the disastrous Walcheren expedition of 1809. In 1810 he rejoined the Peninsular army as Leith's staff officer, and took part in all the battles of 1810, 1811 and 1812, winning his majority after Fuentes d'Onor and his lieutenant-colonelcy at Salamanca. His careful reconnaissances and skilful leading were invaluable to Wellington in the Vittoria campaign, and to the end of the war he was one of the

[1] A. Jeremias, *Das A.T. im Lichte des alten Orients*, pp. 145 f.

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most trusted men of his staff. His reward was a transfer to the Coldstream Guards and the K.C.B. In the Waterloo campaign he served on the staff of the 5th British Division. From the peace until 1839 he was employed on home service, becoming colonel in 1829 and major-general in 1837. From 1839 to 1842 he commanded the troops in Jamaica. He became lieutenant-general in 1846, and was sent out to be commander-in-chief in India, arriving only to find that his appointment had been cancelled in favour of Sir Charles Napier, whom, however, he eventually succeeded (1850–1855). In 1854 he became general and in 1868 field marshal. In 1872 he was appointed constable of the Tower, and he died in 1875. He was twice married, but had no children. His *Letters and Journals* were published by F. C. Carr-Gomm in 1881. Five "Field Marshal Gomm" scholarships were afterwards founded in his memory at Keble College, Oxford.

GOMPERS, SAMUEL (1850–), American labour leader, was born in London on the 27th of January 1850. He was put to work in a shoe-factory when ten years old, but soon became apprenticed to a cigar-maker, removed to New York in 1863, became a prominent member of the International Cigar-makers' Union, was its delegate at the convention of the Federation of Organized Trade and Labor Unions of the United States and Canada, later known as the American Federation of Labor, of which he became first president in 1882. He was successively re-elected up to 1895, when the opposition of the Socialist Labor Party, then attempting to incorporate the Federation into itself, secured his defeat; he was re-elected in the following year. In 1894 he became editor of the Federation's organ, *The American Federationist*.

GOMPERZ, THEODOR (1832–), German philosopher and classical scholar, was born at Brünn on the 29th of March 1832. He studied at Brünn and at Vienna under Herman Bonitz. Graduating at Vienna in 1867 he became *Privatdozent*, and subsequently professor of classical philology (1873). In 1882 he was elected a member of the Academy of Science. He received the degree of Doctor of Philosophy *honoris causa* from the university of Königsberg, and Doctor of Literature from the universities of Dublin and Cambridge, and became correspondent for several learned societies. His principal works are: *Demosthenes der Staatsmann* (1864), *Philodemi de ira liber* (1864), *Traumdeutung und Zauberei* (1866), *Herkulanische Studien* (1865–1866), *Beiträge zur Kritik und Erklärung griech. Schriftsteller* (7 vols., 1875–1900), *Neue Bruchstücke Epikurs* (1876), *Die Bruchstücke der griech. Tragiker und Cobets neueste kritische Manier* (1878), *Herodoteische Studien* (1883), *Ein bisher unbekanntes griech. Schriftsystem* (1884), *Zu Philodems Büchern von der Musik* (1885), *Über den Abschluss des herodoteischen Geschichtswerkes* (1886), *Platonische Aufsätze* (3 vols., 1887–1905), *Zu Herakliits Lehre und den Überresten seines Werkes* (1887), *Zu Aristoteles' Poëtik* (2 parts, 1888–1896), *Über die Charaktere Theophrasts* (1888), *Nachlese zu den Bruchstücken der griech. Tragiker* (1888), *Die Apologie der Heilkunst* (1890), *Philodem und die ästhetischen Schriften der herculanischen Bibliothek* (1891), *Die Schrift vom Staatswesen der Athener* (1891), *Die jüngst entdeckten Überreste einer den Platonischen Phädon enthaltenden Papyrusrolle* (1892), *Aus der Hekale des Kallimachos* (1893), *Essays und Erinnerungen* (1905). He supervised a translation of J. S. Mill's complete works (12 vols., Leipzig, 1869–1880), and wrote a life (Vienna, 1889) of Mill. His *Griechische Denker: Geschichte der antiken Philosophie* (vols. i. and ii., Leipzig, 1893 and 1902) was translated into English by L. Magnus (vol. i., 1901).

GONAGUAS ("borderers"), descendants of a very old cross between the Hottentots and the Kaffirs, on the "ethnical divide" between the two races, apparently before the arrival of the whites in South Africa. They have been always a despised race and regarded as outcasts by the Bantu peoples. They were threatened with extermination during the Kaffir wars, but were protected by the British. At present they live in settled communities under civil magistrates without any tribal organization, and in some districts could be scarcely distinguished from the other natives but for their broken Hottentot-Dutch-English speech.

GONÇALVES DIAS, ANTONIO (1823–1864), Brazilian lyric poet, was born near the town of Caxias, in Maranhão. From the university of Coimbra, in Portugal, he returned in 1845 to his native province, well-equipped with legal lore, but the literary tendency which was strong within him led him to try his fortune as an author at Rio de Janeiro. Here he wrote for the newspaper press, ventured to appear as a dramatist, and in 1846 established his reputation by a volume of poems—*Primeiros Cantos*—which appealed to the national feelings of his Brazilian readers, were remarkable for their autobiographic impress, and by their beauty of expression and rhythm placed their author at the head of the lyric poets of his country. In 1848 he followed up his success by *Segundos Cantos e sextilhas de Frei Antão*, in which, as the title indicates, he puts a number of the pieces in the mouth of a simple old Dominican friar; and in the following year, in fulfilment of the duties of his new post as professor of Brazilian history in the Imperial College of Pedro II. at Rio de Janeiro, he published an edition of Berredo's *Annaes historicos do Maranhão* and added a sketch of the migrations of the Indian tribes. A third volume of poems, which appeared with the title of *Ultimas Cantos* in 1851, was practically the poet's farewell to the service of the muse, for he spent the next eight years engaged under government patronage in studying the state of public instruction in the north and the educational institutions of Europe. On his return to Brazil in 1860 he was appointed a member of an expedition for the exploration of the province of Ceará, was forced in 1862 by the state of his health to try the effects of another visit to Europe, and died in September 1864, the vessel that was carrying him being wrecked off his native shores. While in Germany he published at Leipzig a complete collection of his lyrical poems, which went through several editions, the four first cantos of an epic poem called *Os Tymbiras* (1857) and a *Diccionario da lingua Tupy* (1858).

A complete edition of the works of Dias has made its appearance at Rio de Janeiro. See Wolf, *Brésil littéraire* (Berlin, 1863); Innocencio de Silva, *Diccionario bibliographico portugues*, viii. 157; Sotero dos Reis, *Curso de litteratura portugueza e brasileira*, iv. (Maranhão, 1868); Verissimo, *Estudos de literatura brasileira, segunda serie* (Rio, 1901).

GONCHAROV, IVAN ALEXANDROVICH (1812–1891), Russian novelist, was born 6/18 July 1812, being the son of a rich merchant in the town of Simbirsk. At the age of ten he was placed in one of the gymnasiums at Moscow, from which he passed, though not without some difficulty on account of his ignorance of Greek, into the Moscow University. He read many French works of fiction, and published a translation of one of the novels of Eugène Sue. During his university career he devoted himself to study, taking no interest in the political and Socialistic agitation among his fellow-students. He was first employed as secretary to the governor of Simbirsk, and afterwards in the ministry of finance at St Petersburg. Being absorbed in bureaucratic work, he scarcely paid no attention to the social questions then ardently discussed by such men as Herzen, Aksakov and Bielinski. He began his literary career by publishing translations from Schiller, Goethe and English novelists. His first original work was *Obuiknovennaya Istoria*, "A Common Story" (1847). In 1856 he sailed to Japan as secretary to Admiral Putiatin for the purpose of negotiating a commercial treaty, and on his return to Russia he published a description of the voyage under the title of "The Frigate *Pallada*." His best work is *Oblomov* (1857), which exposed the laziness and apathy of the smaller landed gentry in Russia anterior to the reforms of Alexander II. Russian critics have pronounced this work to be a faithful characterization of Russia and the Russians. Dobrolubov said of it, "Oblomofka [the country-seat of the Oblomovs] is our fatherland: something of Oblomov is to be found in every one of us." Peesarev, another celebrated critic, declared that "Oblomovism," as Goncharov called the sum total of qualities with which he invested the hero of his story, "is an illness fostered by the nature of the Slavonic character and the life of Russian society." In 1858 Goncharov was appointed a censor, and in 1868 he published another novel called *Obreev*. He was not a voluminous writer, and during the latter part of his life produced nothing of any importance. His death occurred on 15/27 September 1891.

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GONCOURT, DE, a name famous in French literary history. EDMOND LOUIS ANTOINE HUOT DE GONCOURT was born at Nancy on the 26th of May 1822, and died at Champrosay on the 16th of July 1896. JULES ALFRED HUOT DE GONCOURT, his brother, was born in Paris on the 17th of December 1830, and died in Paris on the 20th of June 1870.

Writing always in collaboration, until the death of the younger, it was their ambition to be not merely novelists, inventing a new kind of novel, but historians; not merely historians, but the historians of a particular century, and of what was intimate and what is unknown in it; to be also discriminating, indeed innovating, critics of art, but of a certain section of art, the 18th century, in France and Japan; and also to collect pictures and bibelots, always of the French and Japanese 18th century. Their histories (*Portraits intimes du XVIIIe siècle* (1857), *La Femme au XVIIIe siècle* (1862), *La du Barry* (1878), &c.) are made entirely out of documents, autograph letters, scraps of costume, engravings, songs, the unconscious self-revelations of the time; their three volumes on *L'Art du XVIIIe siècle* (1859–1875) deal with Watteau and his followers in the same scrupulous, minutely enlightening way, with all the detail of unpublished documents; and when they came to write novels, it was with a similar attempt to give the inner, undiscovered, minute truths of contemporary existence, the *inédit* of life. The same morbidly sensitive noting of the *inédit*, of whatever came to them from their own sensations of things and people around them, gives its curious quality to the nine volumes of the *Journal*, 1887–1896, which will remain, perhaps, the truest and most poignant chapter of human history that they have written. Their novels, *Sœur Philomène* (1861), *Renée Mauperin* (1864), *Germinie Lacerteux* (1865), *Manette Salomon* (1865), *Madame Gervaisais* (1869), and, by Edmond alone, *La Fille Elisa* (1878), *Les Frères Zemganno* (1879), *La Faustin* (1882), *Chérie* (1884), are, however, the work by which they will live as artists. Learning something from Flaubert, and teaching almost everything to Zola, they invented a new kind of novel, and their novels are the result of a new vision of the world, in which the very element of sight is decomposed, as in a picture of Monet. Seen through the nerves, in this conscious abandonment to the tricks of the eyesight, the world becomes a thing of broken patterns and conflicting colours, and uneasy movement. A novel of the Goncourts is made up of an infinite number of details, set side by side, every detail equally prominent. While a novel of Flaubert, for all its detail, gives above all things an impression of unity, a novel of the Goncourts deliberately dispenses with unity in order to give the sense of the passing of life, the heat and form of its moments as they pass. It is written in little chapters, sometimes no longer than a page, and each chapter is a separate notation of some significant event, some emotion or sensation which seems to throw sudden light on the picture of a soul. To the Goncourts humanity is as pictorial a thing as the world it moves in; they do not search further than "the physical basis of life," and they find everything that can be known of that unknown force written visibly upon the sudden faces of little incidents, little expressive moments. The soul, to them, is a series of moods, which succeed one another, certainly without any of the too arbitrary logic of the novelist who has conceived of character as a solid or consistent thing. Their novels are hardly stories at all, but picture-galleries, hung with pictures of the momentary aspects of the world. French critics have complained that the language of the Goncourts is no longer French, no longer the French of the past; and this is true. It is their distinction—the finest of their inventions—that, in order to render new sensations, a new vision of things, they invented a new language. (A. SY.)

In his will Edmond de Goncourt left his estate for the endowment of an academy, the formation of which was entrusted to MM. Alphonse Daudet and Léon Hennique. The society was to consist of ten members, each of whom was to receive an annuity of 6000 francs, and a yearly prize of 5000 francs was to be awarded to the author of some work of fiction. Eight of the members of the new academy were nominated in the will. They were: Alphonse Daudet, J. K. Huysmans, Léon Hennique, Octave Mirbeau, the two brothers J. H. Rosny, Gustave Geffroy and Paul Marguerite. On the 19th of January 1903, after much litigation, the academy was constituted, with Elémir Bourges, Lucien Descaves and Léon Daudet as members in addition to those mentioned in de Goncourt's will, the place of Alphonse Daudet having been left vacant by his death in 1897.

On the brothers de Goncourt see the *Journal des Goncourt* already cited; also M. A. Belloc (afterwards Lowndes) and M. L. Shedlock, *Edmond and Jules de Goncourt, with Letters and Leaves from their Journals* (1895); Alidor Delzant, *Les Goncourt* (1889) which contains a valuable bibliography; *Lettres de Jules de Goncourt* (1888), with preface by H. Céard; R. Doumic, *Portraits d'écrivains* (1892); Paul Bourget, *Nouveaux Essais de psychologie contemporaine* (1886); Émile Zola, *Les Romanciers naturalistes* (1881), &c.

GONDA, a town and district of British India, in the Fyzabad division of the United Provinces. The town is 28 m. N.W. of Fyzabad, and is an important junction on the Bengal & North-Western railway. The site on which it stands was originally a jungle, in the centre of which was a cattle-fold (*Gontha* or *Gothah*), where the cattle were enclosed at night as a protection against wild beasts, and from this the town derives its name. Pop. (1901) 15,811. The cantonments were abandoned in 1863.

The district of Gonda has an area of 2813 sq. m. It consists of a vast plain with very slight undulations, studded with groves of mango trees. The surface consists of a rich alluvial deposit which is naturally divided into three great belts known as the *tarai* or swampy tract, the *uparhar* or uplands, and the *tarhar* or wet lowlands, all three being marvellously fertile. Several rivers flow through the district, but only two, the Gogra and Rapti, are of any commercial importance, the first being navigable throughout the year, and the latter during the rainy season. The country is dotted with small lakes, the water of which is largely used for irrigation. On the outbreak of the Mutiny in 1857, the raja of Gonda, after honourably escorting the government treasure to Fyzabad, joined the rebels. His estates, along with those of the rani of Tulsipur, were confiscated, and conferred as rewards upon the maharajas of Balrampur and Ajodhya, who had remained loyal. In 1901 the population was 1,403,195, showing a decrease of 4% in one decade. The district is traversed by the main line and three branches of the Bengal & North-Western railway.

GONDAL, a native state of India, in the Kathiawar political agency of Bombay, situated in the centre of the peninsula of Kathiawar. Its area is 1024 sq. m.; pop. (1901) 162,859. The estimated gross revenue is about £100,000, and the tribute £7000. Grain and cotton are the chief products. The chief, whose title is Thakur Sahib, is a Jadeja Rajput, of the same clan as the Rao of Cutch. The Thakur Sahib, Sir Bhagvat Sinhji (b. 1865), was educated at the Rajkot college, and afterwards graduated in arts and medicine at the university of Edinburgh. He published (in English) a *Journal of a Visit to England* and *A Short History of Aryan Medical Science.* In 1892 he received the honorary degree of D.C.L. of Oxford University. He was created K.C.I.E. in 1887 and G.C.I.E. in 1897. The state has long been conspicuous for its progressive administration. It is traversed by a railway connecting it with Bhaunagar, Rajkot and the sea-board. The town of Gondal is 23 m. by rail S. of Rajkot; pop. (1901) 19,502.

GONDAR, properly GUENDAR, a town of Abyssinia, formerly the capital of the Amharic kingdom, situated on a basaltic ridge some 7500 ft. above the sea, about 21 m. N.E. of Lake Tsana, a splendid view of which is obtained from the castle. Two streams, the Angreb on the east side and the Gaha or Kaha on the west, flow from the ridge, and meeting below the town, pass onwards to the lake. In the early years of the 20th century the town was much decayed, numerous ruins of castles, palaces and churches indicating its former importance. It was never a compact city, being divided into districts separated from each other by open spaces. The chief quarters were those of the Abun-Bed or bishop, the Etchege-Bed or chief of the monks, the Debra Berhan or Church of the Light, and the Gemp or castle. There was also a quarter for the Mahommedans. Gondar was a small village when at the beginning of the 16th century it was chosen by the Negus Sysenius (Seged I.) as the capital of his kingdom. His son Fasilidas, or A'lem-Seged (1633–1667), was the builder of the castle which bears his name. Later emperors built other castles and palaces, the latest in date being

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that of the Negus Yesu II. This was erected about 1736, at which time Gondar appears to have been at the height of its prosperity. Thereafter it suffered greatly from the civil wars which raged in Abyssinia, and was more than once sacked. In 1868 it was much injured by the emperor Theodore, who did not spare either the castle or the churches. After the defeat of the Abyssinians at Debra Sin in August 1887 Gondar was looted and fired by the dervishes under Abu Anga. Although they held the town but a short time they inflicted very great damage, destroying many churches, further damaging the castles and carrying off much treasure. The population, estimated by James Bruce in 1770 at 10,000 families, had dwindled in 1903 to about 7000. Since the pacification of the Sudan by the British (1886–1889) there has been some revival of trade between Gondar and the regions of the Blue Nile. Among the inhabitants are numbers of Mahommedans, and there is a settlement of Falashas. Cotton, cloth, gold and silver ornaments, copper wares, fancy articles in bone and ivory, excellent saddles and shoes are among the products of the local industry.

Unlike any other buildings in Abyssinia, the castles and palaces of Gondar resemble, with some modifications, the medieval fortresses of Europe, the style of architecture being the result of the presence in the country of numbers of Portuguese. The Portuguese were expelled by Fasilidas, but his castle was built, by Indian workmen, under the superintendence of Abyssinians who had learned something of architecture from the Portuguese adventurers, helped possibly by Portuguese still in the country. The castle has two storeys, is 90 ft. by 84 ft., has a square tower and circular domed towers at the corners. The most extensive ruins are a group of royal buildings enclosed in a wall. These ruins include the palace of Yesu II., which has several fine chambers. Christian Levantines were employed in its construction and it was decorated in part with Venetian mirrors, &c. In the same enclosure is a small castle attributed to Yesu I. The exterior walls of the castles and palaces named are little damaged and give to Gondar a unique character among African towns. Of the forty-four churches, all in the circular Abyssinian style, which are said to have formerly existed in Gondar or its immediate neighbourhood, Major Powell-Cotton found only one intact in 1900. This church contained some well-executed native paintings of St George and the Dragon, The Last Supper, &c. Among the religious observances of the Christians of Gondar is that of bathing in large crowds in the Gaha on the Feast of the Baptist, and again, though in more orderly fashion, on Christmas day.

See E. Rüppell, *Reise in Abyssinien* (Frankfort-on-the-Main, 1838–1840); T. von Heuglin, *Reise nach Abessinien* (Jena, 1868); G. Lejean, *Voyage en Abyssinie* (Paris, 1872); Achille Raffray, *Afrique orientale; Abyssinie* (Paris, 1876); P. H. G. Powell-Cotton, *Sporting Trip through Abyssinia*, chaps. 27-30 (London, 1902); and *Boll. Soc. Geog. Italiana* for 1900. Views of the castle are given by Heuglin, Raffray and Powell-Cotton.

GONDOKORO, a government station and trading-place on the east bank of the upper Nile, in 4° 54′ N., 31° 43′ E. It is the headquarters of the Northern Province of the (British) Uganda protectorate, is 1070 m. by river S. of Khartum and 350 m. N.N.W. in a direct line of Entebbe on Victoria Nyanza. The station, which is very unhealthy, is at the top of a cliff 25 ft. above the river-level. Besides houses for the civil and military authorities and the lines for the troops, there are a few huts inhabited by Bari, the natives of this part of the Nile. The importance of Gondokoro lies in the fact that it is within a few miles of the limit of navigability of the Nile from Khartum up stream. From this point the journey to Uganda is continued overland.

Gondokoro was first visited by Europeans in 1841–1842, when expeditions sent out by Mehemet Ali, pasha of Egypt, ascended the Nile as far as the foot of the rapids above Gondokoro. It soon became an ivory and slave-trading centre. In 1851 an Austrian Roman Catholic mission was established here, but it was abandoned in 1859. It was at Gondokoro that J. H. Speke and J. A. Grant, descending the Nile after their discovery of its source, met, on the 15th of February 1863, Mr (afterwards Sir) Samuel Baker and his wife who were journeying up the river. In 1871 Baker, then governor-general of the equatorial provinces of Egypt, established a military post at Gondokoro which he named Ismailia, after the then khedive. Baker made this post his headquarters, but Colonel (afterwards General) C. G. Gordon, who succeeded him in 1874, abandoned the station on account of its unhealthy site, removing to Lado. Gondokoro, however, remained a trading-station. It fell into the hands of the Mahdists in 1885. After the destruction of the Mahdist power in 1898 Gondokoro was occupied by British troops and has since formed the northernmost post on the Nile of the Uganda protectorate (see SUDAN; NILE; and UGANDA).

GONDOMAR, DIEGO SARMIENTO DE ACUÑA, COUNT OF (1567–1626), Spanish diplomatist, was the son of Garcia Sarmiento de Sotomayor, corregidor of Granada, and governor of the Canary Islands, by his marriage with Juana de Acuña, an heiress. Diego Sarmiento, their eldest son, was born in the parish of Gondomar, in the bishopric of Tuy, Galicia, Spain, on the 1st of November 1567. He inherited wide estates both in Galicia and in Old Castile. In 1583 he was appointed by Philip II. to the military command of the Portuguese frontier and sea coast of Galicia. He is said to have taken an active part in the repulse of an English coast-raid in 1585, and in the defence of the country during the unsuccessful English attack on Corunna in 1589. In 1593 he was named corregidor of Toro. In 1603 he was sent from court to Vigo to superintend the distribution of the treasure brought from America by two galleons which were driven to take refuge at Vigo, and on his return was named a member of the board of finance. In 1609 he was again employed on the coast of Galicia, this time to repel a naval attack made by the Dutch. Although he held military commands, and administrative posts, his habitual residence was at Valladolid, where he owned the Casa del Sol and was already collecting his fine library. He was known as a courtier, and apparently as a friend of the favourite, the duke of Lerma. In 1612 he was chosen as ambassador in England, but did not leave to take up his appointment till May 1613.

His reputation as a diplomatist is based on his two periods of service in England from 1613 to 1618 and from 1619 to 1622. The excellence of his latinity pleased the literary tastes of James I., whose character he judged with remarkable insight. He flattered the king's love of books and of peace, and he made skilful use of his desire for a matrimonial alliance between the prince of Wales and a Spanish infanta. The ambassador's task was to keep James from aiding the Protestant states against Spain and the house of Austria, and to avert English attacks on Spanish possessions in America. His success made him odious to the anti-Spanish and puritan parties. The active part he took in promoting the execution of Sir Walter Raleigh aroused particular animosity. He was attacked in pamphlets, and the dramatist Thomas Middleton made him a principal person in the strange political play *A Game of Chess*, which was suppressed by order of the council. In 1617 Sarmiento was created count of Gondomar. In 1618 he obtained leave to come home for his health, but was ordered to return by way of Flanders and France with a diplomatic mission. In 1619 he returned to London, and remained till 1622, when he was allowed to retire. On his return he was named a member of the royal council and governor of one of the king's palaces, and was appointed to a complimentary mission to Vienna. Gondomar was in Madrid when the prince of Wales—afterwards Charles I.—made his journey there in search of a wife. He died at the house of the constable of Castile, near Haro in the Rioja, on the 2nd of October 1626.

Gondomar was twice married, first to his niece Beatrix Sarmiento, by whom he had no children, and then to his cousin Constanza de Acuña, by whom he had four sons and three daughters. The hatred he aroused in England, which was shown by constant jeers at the intestinal complaint from which he suffered for years, was the best tribute to the zeal with which he served his own master. Gondomar collected, both before he came to London and during his residence there, a very fine

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library of printed books and manuscripts. Orders for the arrangement, binding and storing of his books in his house at Valladolid take a prominent place in his voluminous correspondence. In 1785 the library was ceded by his descendant and representative the marquis of Malpica to King Charles III., and it is now in the Royal Library at Madrid. A portrait of Gondomar, attributed to Valazquez, was formerly at Stowe. It was mezzotinted by Robert Cooper.

AUTHORITIES.—Gondomar's missions to England are largely dealt with in S. R. Gardiner's *History of England* (London, 1883–1884). In Spanish, Don Pascual de Gayangos wrote a useful biographical introduction to a publication of a few of his letters—*Cinco Cartas político-literarias de Don Diego Sarmiento de Acuña, Conde de Gondomar*, issued at Madrid 1869 by the *Sociedad de Bibliófilos* of the Spanish Academy; and there is a life in English by F. H. Lyon (1910). (D. H.)

GONDOPHARES, or GONDOPHERNES, an Indo-Parthian king who ruled over the Kabul valley and the Punjab. By means of his coins his accession may be dated with practical certainty at A.D. 21, and his reign lasted for some thirty years. He is notable for his association with St Thomas in early Christian tradition. The legend is that India fell to St Thomas, who showed unwillingness to start until Christ appeared in a vision and ordered him to serve King Gondophares and build him a palace. St Thomas accordingly went to India and suffered martyrdom there. This legend is not incompatible with what is known of the chronology of Gondophares' reign.

GONDWANA, the historical name for a large tract of hilly country in India which roughly corresponds with the greater part of the present Central Provinces. It is derived from the aboriginal tribe of Gonds, who still form the largest element in the population and who were at one time the ruling power. From the 12th to as late as the 18th century three or four Gond dynasties reigned over this region with a degree of civilization that seems surprising when compared with the existing condition of the people. They built large walled cities, and accumulated immense treasures of gold and silver and jewels. On the whole, they maintained their independence fairly well against the Mahommedans, being subject only to a nominal submission and occasional payment of tribute. But when the Mahratta invaders appeared, soon after the beginning of the 18th century, the Gond kingdoms offered but a feeble resistance and the aboriginal population fled for safety to the hills. Gondwana was thus included in the dominions of the Bhonsla raja of Nagpur, from whom it finally passed to the British in 1853.

The Gonds, who call themselves Koitur or "highlanders," are the most numerous tribe of Dravidian race in India. Their total number in 1901 was 2,286,913, of whom nearly two millions were enumerated in the Central Provinces, where they form 20% of the population. They have a language of their own, with many dialects, which is intermediate between the two great Dravidian languages, Tamil and Telugu. It is unwritten and has no literature, except a little provided by the missionaries. More than half the Gonds in the Central Provinces have now abandoned their own dialects, and have adopted Aryan forms of speech. This indicates the extent to which they have become Hinduized. The higher class among them, called Raj Gonds, have been definitely admitted into Hinduism as a pure cultivating caste; but the great majority still retain the animistic beliefs, ceremonial observances and impure customs of food which are common to most of the aboriginal tribes of India.

GONFALON (the late French and Italian form, also found in other Romanic languages, of *gonfanon*, which is derived from the O.H. Ger. *gundfano*, *gund*, war, and *fano*, flag, cf. Mod. Ger. *Fahne*, and English "vane"), a banner or standard of the middle ages. It took the form of a small pennon attached below the head of a knight's lance, or when used in religious processions and ceremonies, or as the banner of a city or state or military order, it became a many-streamered rectangular ensign, frequently swinging from a cross-bar attached to a pole. This is the most frequent use of the word. The title of "gonfalonier," the bearer of the gonfalon, was in the middle ages both military and civil. It was borne by the counts of Vexin, as leaders of the men of Saint Denis, and when the Vexin was incorporated in the kingdom of France the title of *Gonfalonier de Sant Denis* passed to the kings of France, who thus became the bearers of the "oriflamme," as the banner of St Denis was called. "Gonfalonier" was the title of civic magistrates of various degrees of authority in many of the city republics of Italy, notably of Florence, Sienna and Lucca. At Florence the functions of the office varied. At first the gonfaloniers were the leaders of the various military divisions of the inhabitants. In 1293 was created the office of gonfalonier of justice, who carried out the orders of the signiory. By the end of the 14th century the gonfalonier was the chief of the signiory. At Lucca he was the chief magistrate of the republic. At Rome two gonfaloniers must be distinguished, that of the church and that of the Roman people; both offices were conferred by the pope. The first was usually granted to sovereigns, who were bound to defend the church and lead her armies. The second bore a standard with the letters S.P.Q.R. on any enterprise undertaken in the name of the church and the people of Rome, and also at ceremonies, processions, &c. This was granted by the pope to distinguished families. Thus the Cesarini held the office till the end of the 17th century. The Pamphili held it from 1686 till 1764.

GONG (Chinese, *gong-gong* or *tam-tam*), a sonorous or musical instrument of Chinese origin and manufacture, made in the form of a broad thin disk with a deep rim. Gongs vary in diameter from about 20 to 40 in., and they are made of bronze containing a maximum of 22 parts of tin to 78 of copper; but in many cases the proportion of tin is considerably less. Such an alloy, when cast and allowed to cool slowly, is excessively brittle, but it can be tempered and annealed in a peculiar manner. If suddenly cooled from a cherry-red heat, the alloy becomes so soft that it can be hammered and worked on the lathe, and afterwards it may be hardened by re-heating and cooling it slowly. In these properties it will be observed, the alloy behaves in a manner exactly opposite to steel, and the Chinese avail themselves of the known peculiarities for preparing the thin sheets of which gongs are made. They cool their castings of bronze in water, and after hammering out the alloy in the soft state, harden the finished gongs by heating them to a cherry-red and allowing them to cool slowly. These properties of the alloy long remained a secret, said to have been first discovered in Europe by Jean Pierre Joseph d'Arcet at the beginning of the 19th century. Rice and Champion are said to have succeeded in producing tam-tams having all the qualities and timbre of the Chinese instruments. The composition of the alloy of bronze used for making gongs is stated to be as follows:[1] Copper, 76·52; Tin, 22·43; Lead, 0·62; Zinc, 0·23; Iron, 0·18. The gong is beaten with a round, hard, leather-covered pad, fitted on a short stick or handle. It emits a peculiarly sonorous sound, its complex vibrations bursting into a wave-like succession of tones, sometimes shrill, sometimes deep. In China and Japan it is used in religious ceremonies, state processions, marriages and other festivals; and it is said that the Chinese can modify its tone variously by particular ways of striking the disk.

The gong has been effectively used in the orchestra to intensify the impression of fear and horror in melodramatic scenes. The tam-tam was first introduced into a western orchestra by Francois Joseph Gossec in the funeral march composed at the death of Mirabeau in 1791. Gaspard Spontini used it in *La Vestale* (1807), in the finale of act II., an impressive scene in which the high pontiff pronounces the anathema on the faithless vestal. It was also used in the funeral music played when the remains of Napoleon the Great were brought back to France in 1840. Meyerbeer made use of the instrument in the scene of the resurrection of the three nuns in *Robert le diable*. Four tam-tams are now used at Bayreuth in *Parsifal* to reinforce the bell instruments, although there is no indication given in the score (see PARSIFAL).

The tam-tam has been treated from its ethnographical side by Franz Heger.[2] (K. S.)

GÓNGORA Y ARGOTE, LUIS DE (1561–1627), Spanish lyric poet, was born at Cordova on the 11th of July 1561. His father, Francisco de Argote, was *corregidor* of that city; the poet early adopted the surname of his mother, Leonora de Góngora, who

[1] See *La grande Encyclopédie*, vol. viii. (Paris), "Bronze," p. 146a.

[2] *Alte Metalltrommeln aus Südost-Asien* (Leipzig, 1902), Bd. i., Text; Bd. ii., Tafeln.

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was descended from an ancient family. At the age of fifteen he entered as a student of civil and canon law at the university of Salamanca; but he obtained no academic distinctions and was content with an ordinary pass degree. He was already known as a poet in 1585 when Cervantes praised him in the *Galatea*; in this same year he took minor orders, and shortly afterwards was nominated to a canonry at Cordova. About 1605–1606 he was ordained priest, and thenceforth resided principally at Valladolid and Madrid, where, as a contemporary remarks, he "noted and stabbed at everything with his satirical pen." His circle of admirers was now greatly enlarged; but the acknowledgment accorded to his singular genius was both slight and tardy. Ultimately indeed, through the influence of the duke of Sandoval, he obtained an appointment as honorary chaplain to Philip III., but even this slight honour he was not permitted long to enjoy. In 1626 a severe illness, which seriously impaired his memory, compelled his retirement to Cordova, where he died on the 24th of May 1627. An edition of his poems was published almost immediately after his death by Juan Lopez de Vicuña; the frequently reprinted edition by Hozes did not appear till 1633. The collection consists of numerous sonnets, odes, ballads, songs for the guitar, and of certain larger poems, such as the *Soledades* and the *Polifemo*. Too many of them exhibit that tortuous elaboration of style (*estilo culto*) with which the name of Góngora is inseparably associated; but though Góngora has been justly censured for affected Latinisms, unnatural transpositions, strained metaphors and frequent obscurity, it must be admitted that he was a man of rare genius,—a fact cordially acknowledged by those of his contemporaries who were most capable of judging. It was only in the hands of those who imitated Góngora's style without inheriting his genius that *culteranismo* became absurd. Besides his lyrical poems Góngora is the author of a play entitled *Las Firmeas de Isabel* and of two incomplete dramas, the *Comedia venatoria* and *El Doctor Carlino*. The only satisfactory edition of his works is that published by R. Foulché-Delbose in the *Bibliotheca Hispanica*.

See Edward Churton, *Góngora* (London, 1862, 2 vols.); M. González y Francés, *Góngora racionero* (Córdoba, 1895); M. González y Francés, *Don Luis de Góngora vindicando su fama ante el propio obispo* (Córdoba, 1899); "Vingt-six Lettres de Góngora" in the *Revue hispanique*, vol. x. pp. 184–225 (Paris, 1903).

GONIOMETER (from Gr. γωνία, angle, and μέτρον, measure), an instrument for measuring the angles of crystals; there are two kinds—the contact goniometer and the reflecting goniometer. Nicolaus Stena in 1669 determined the interfacial angles of quartz crystals by cutting sections perpendicular to the edges, the plane angles of the sections being then the angles between the faces which are perpendicular to the sections. The earliest instrument was the contact goniometer devised by Carangeot in 1783.

The Contact Goniometer (or *Hand-Goniometer*).—This consists of two metal rules pivoted together at the centre of a graduated semicircle (fig. 1). The instrument is placed with its plane perpendicular to an edge between two faces of the crystal to be measured, and the rules are brought into contact with the faces; this is best done by holding the crystal up against the light with the edge in the line of sight. The angle between the rules, as read on the graduated semicircle, then gives the angle between the two faces. The rules are slotted, so that they may be shortened and their tips applied to a crystal partly embedded in its matrix. The instrument represented in fig. 1 is practically the same in all its details as that made for Carangeot, and it is employed at the present day for the approximate measurement of large crystals with dull and rough faces. S. L. Penfield (1900) has devised some cheap and simple forms of contact goniometer, consisting of jointed arms and protractors made of cardboard or celluloid.

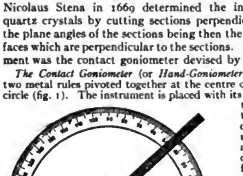

FIG. 1.—Contact Goniometer.

The Reflecting Goniometer.—This is an instrument of far greater precision, and is always used for the accurate measurement of the angles when small crystals with bright faces are available. As a rule, the smaller the crystal the more even are its faces, and when these are smooth and bright they reflect sharply defined images of a bright object. By turning the crystal about an axis parallel to the edge between two faces, the image reflected from a second face may be brought into the same position as that formerly occupied by the image reflected from the first face; the angle through which the crystal has been rotated, as determined by a graduated circle to which the crystal is fixed, is the angle between the normals to the two faces.

Several forms of instruments depending on this principle have been devised, the earliest being the vertical-circle goniometer of W. H. Wollaston, made in 1809. This consists of a circle *m* (fig. 2), graduated to degrees of arc and reading with the vernier *h* to minutes, which turns with the milled head *t* about a horizontal axis. The crystal is attached with wax (a mixture of beeswax and pitch) to the holder *q*, and by means of the pivoted arcs it may be adjusted so that the edge between two faces (a zone-axis) is parallel to, and coincident with, the axis of the instrument. The crystal-holder and adjustment-arcs, together with the milled head *s*, are carried on an axis which passes through the hollow axis of the graduated circle, and may thus be rotated independently of the circle. In use, the goniometer is placed directly opposite to a window, with its axis parallel to the horizontal window-bars, and as far distant as possible. The eye is placed quite close to the crystal, and the image of an upper window-bar (or better still a slit in a dark screen) as seen in the crystal-face is made to coincide with a lower window-bar (or chalk mark on the floor) as seen directly: this is done by turning the milled head *s*, the reading of the graduated circle having previously been observed. Without moving the eye, the milled head *t*, together with the crystal, is then rotated until the image from a second face is brought into the same position; the difference between the first and second readings of the graduated circle will then give the angle between the normals of the two faces.

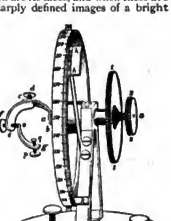

FIG. 2.—Vertical-Circle Goniometer.

Several improvements have been made on Wollaston's goniometer. The adjustment-arcs have been modified; a mirror of black glass fixed to the stand beneath the crystal gives a reflected image of the signal, with which the reflection from the crystal can be more conveniently made to coincide; a telescope provided with cross-wires gives greater precision to the direction of the reflected rays of light; and with the telescope a collimator has sometimes been used.

A still greater improvement was effected by placing the graduated circle in a horizontal position, as in the instruments of E. L. Malus (1810), F. C. von Riese (1829) and J. Babinet (1839). Many forms of the *horizontal-circle goniometer* have been constructed; they are provided with a telescope and collimator, and in construction are essentially the same as a spectrometer, with the addition of arrangements for adjusting and centring the crystal. The instrument shown in fig. 3 is made by R. Fuess of Berlin. It has four concentric axes, which enable the crystal-holder A, together with the adjustment-arcs B and centring-slides D, to be raised or lowered, or to be rotated independently of the circle H; further, either the crystal-holder or the telescope T may be rotated with the circle, while the other

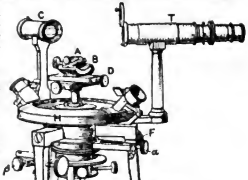

FIG. 3.—Horizontal-Circle Goniometer.

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remains fixed. The crystal is placed on the holder and adjusted so that the edge (zone-axis) between two faces is coincident with the axis of the instrument. Light from an incandescent gas-burner passes through the slit of the collimator C, and the image of the slit (signal) reflected from the crystal face is viewed in the telescope. The clamp a and slow-motion screw F enable the image of the slit brought exactly on the cross-wires of the telescope, and the position of the circle with respect to the vernier is read through the lens. The crystal and the circle are then rotated together until the image from a second face is brought on the cross-wires of the telescope, and the angle through which they have been turned is the angle between the normals to the two faces. While measuring the angles between the faces of crystals the telescope remains fixed by the clamp β, but when this is released the instrument may be used as a spectrometer or refractometer for determining, by the method of minimum deviation, the indices of refraction of an artificially cut prism or of a transparent crystal when the faces are suitably inclined to one another.

With a one-circle goniometer, such as is described above, it is necessary to mount and re-adjust the crystal afresh for the measurement of each zone of faces (*i.e.* each set of faces intersecting in parallel edges); with very small crystals this operation takes a considerable time, and the minute faces are not readily identified again. Further, in certain cases, it is not possible to measure the angles between zones, nor to determine the position of small faces which do not lie in prominent zones on the crystal. These difficulties have been overcome by the use of a two-circle goniometer or theodolite-goniometer, which as a combination of a vertical-circle goniometer and one with a horizontal-circle was first employed by W. H. Miller in 1874. Special forms have been designed by E. S. Fedorov (1889), V. Goldschmidt (1893), S. Czapski (1893) and F. Stoeber (1898), which differ mainly in the arrangement of the optical parts. In these instruments the crystal is set up and adjusted once for all, with the axis of a prominent zone parallel to the axis of either the horizontal or the vertical circle. As a rule, only the angles between the faces of this zone are measured directly; the positions of all the other faces, which need be observed only once, are fixed by the simultaneous readings of the two circles. These readings, corresponding to the polar distance and azimuth, or latitude and longitude, readings of astronomers and telescopes, must be plotted on a projection before the symmetry of the crystal is apparent; and laborious calculations are necessary in order to determine the indices of the faces and the angles between them, and the other constants of the crystal, or to test whether any three faces are accurately in a zone.

These disadvantages are overcome by adding still another graduated circle to the instrument, with its axis perpendicular to the axis of the vertical circle, thus forming a three-circle goniometer. With such an instrument measurements may be made in any zone or between any two faces without re-adjusting the crystal; further the troublesome calculations are avoided, and, indeed, the instrument may be used for solving spherical triangles. Different forms of three-circle goniometers have been designed by G. F. H. Smith (1899 and 1904), E. S. Fedorov (1900) and J. F. C. Klein (1900). Besides being used as a one-, two-, or three-circle goniometer for the measurement of the interfacial angles of crystals, and as a refractometer for determining refractive indices by the prismatic method or by total reflection, Klein's instrument, which is called a polymeter, is fitted with accessory optical apparatus which enables it to be used for examining a crystal in parallel or convergent polarized light and for measuring the optic axial angle.

Goniometers of special construction have been devised for certain purposes; for instance, the inverted horizontal-circle goniometer of H. A. Miers (1903) for measuring crystals during their growth in the mother-liquid. A. E. Tutton (1894) has combined a goniometer with lapidaries' appliances for cutting section-plates and prisms from crystals accurately in any desired direction. The instrument commonly employed for measuring the optic axial angle of large crystals is really a combination of a goniometer with a polariscope. For the optical investigation of minute crystals under the microscope, various forms of stage-goniometer with one, two or three graduated circles have been constructed. An ordinary microscope fitted with cross-wires and a rotating graduated stage serves the purpose of a goniometer for measuring the plane angles of a crystal face or section, being the same in principle as the contact goniometer.

For fuller description of goniometers reference may be made to the text-books of Crystallography and Mineralogy, especially to P. H. Groth, *Physikalische Krystallographie* (4th ed., Leipzig, 1905). See also C. Leiss, *Die optischen Instrumente der Firma R. Fuess, deren Beschreibung, Justierung und Anwendung* (Leipzig, 1899). (L. J. S.)

GONTAUT, MARIE JOSÉPHINE LOUISE, DUCHESSE DE (1773–1857), was born in Paris on the 3rd of August 1773, daughter of Augustin François, comte de Montaut-Navailles, who had been governor of Louis XVI. and his two brothers when children. The count of Provence (afterwards Louis XVIII.) and his wife stood sponsors to Joséphine de Montaut, and she shared the lessons given by Madame de Genlis to the Orleans family, with whom her mother broke off relations after the outbreak of the Revolution. Mother and daughter emigrated to Coblenz in 1792; thence they went to Rotterdam, and finally to England, where Joséphine married the marquis Charles Michel de Gontaut-Saint-Blacard. They returned to France at the Restoration, and resumed their place at court. Madame de Gontaut became lady-in-waiting to Caroline, duchess of Berry, and, on the birth of the princess Louise (Mlle d'Artois, afterwards duchess of Parma), governess to the children of France. Next year the birth of Henry, duke of Bordeaux (afterwards known as the comte de Chambord), added to her charge the heir of the Bourbons. She remained faithful to his cause all her life. Her husband died in 1822, and in 1827 she was created duchesse de Gontaut. She followed the exiled royal family in 1830 to Holyrood Palace, and then to Prague, but in 1834, owing to differences with Pierre Louis, duc de Blacas, who thought her comparatively liberal views dangerous for the prince and princess, she received a hrusque congé from Charles X. Her twin daughters, Joséphine (1796–1844) and Charlotte (1796–1818), married respectively Ferdinand de Chabot, prince de Léon and afterwards duc de Rohan, and François, comte de Bourbon-Busset. She herself wrote in her old age some naïve memoirs, which throw an odd light on the pretensions of the "governess of the children of France." She died in Paris in 1857.

See her *Memoirs* (Eng. ed., 2 vols., 1894), and *Lettres inédites* (1895).

GONVILLE, EDMUND (d. 1351), founder of Gonville Hall, now Gonville and Caius College, at Cambridge, England, is thought to have been the son of William de Gonvile, and the brother of Sir Nicholas Gonvile. In 1320 he was rector of Thelnetham, Suffolk, and steward there for William, earl Warren and the earl of Lancaster. Six years later he was rector of Rushworth, and in 1342 rector of Terrington St John and commissioner for the marshlands of Norfolk. In this year he founded and endowed a collegiate church at Rushworth, suppressed in 1541. The foundation of Gonville Hall at Cambridge was effected by a charter granted by Edward III. in 1348. It was called, officially, the Hall of the Annunciation of the Blessed Virgin, but was usually known as Gunnell or Gonvilde Hall. Its original site was in Free-school Lane, where Corpus Christi College now stands. Gonvile apparently wished it to be devoted to training for theological study, but after his death the foundation was completed by William Bateman, bishop of Norwich and founder of Trinity Hall, on a different site and with considerably altered statutes. (See also CAIUS, JOHN.)

GONZAGA, an Italian princely family named after the town where it probably had its origin. Its known history begins with the 13th century, when Luigi I. (1267–1360), after fierce struggles supplanted his brother-in-law Rinaldo (nicknamed Passerino) Bonacolsi as lord of Mantua in August 1328, with the title of captain-general, and afterwards of vicar-general of the empire, adding the designation of count of Mirandola and Concordia, which fief the Gonzagas held from 1328 to 1354. In July 1335 his son Guido, with the help of Filippino and Feltrino Gonzaga, arrested Reggio from the Scaligeri and held it until 1371. Luigi was succeeded by Guido (d. 1369); the latter's son Luigi II. came next in succession (d. 1382), and then Giovan Francesco I. (d. 1407), who, although at one time allied with the treacherous Gian Galeazzo Visconti, incurred the latter's enmity and all but lost his estates and his life in consequence; eventually he joined the Florentines and Bolognese, enemies of Visconti. He promoted commerce and wisely developed the prosperity of his dominions. His son Giovan Francesco II. (d. 1444) succeeded him under the regency of his uncle Carlo Malatesta and the protection of the Venetians. He became a famous general, and was rewarded for his services to the emperor Sigismund with the title of marquess of Mantua for himself and his descendants (1432), an investiture which legitimatized the usurpations of the house of Gonzaga. His son Luigi III. "il Turco" (d. 1478) likewise became a celebrated soldier, and was also a learned and liberal prince, a patron of literature and the arts. His son Federigo I. (d. 1484) followed in his father's footsteps, and served under various foreign sovereigns, including Bona of Savoy and Lorenzo de' Medici; subsequently he upheld the rights of the house of

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Este against Pope Sixtus IV. and the Venetians, whose ambitious claims were a menace to his own dominions of Ferrara and Mantova. His son Giovan Francesco II. (d. 1519) continued the military traditions of the family, and commanded the allied Italian forces against Charles VIII. at the battle of Fornovo; he afterwards fought in the kingdom of Naples and in Tuscany, until captured by the Venetians in 1509. On his liberation he adopted a more peaceful and conciliatory policy, and with the help of his wife, the famous Isabella d'Este, he promoted the fine arts and letters, collecting pictures, statues and other works of art with intelligent discrimination. He was succeeded by his son Federigo II. (d. 1540), captain-general of the papal forces. After the peace of Cambrai (1529) his ally and protector, the emperor Charles V., raised his title to that of duke of Mantua in 1530; in 1536 the emperor decided the controversy for the succession of Monferrato between Federigo and the house of Savoy in favour of the former. His son Francesco I. succeeded him, and, being a minor, was placed under the regency of his uncle Cardinal Ercole; he was accidentally drowned in 1550, leaving his possessions to his brother Guglielmo. The latter was an extravagant spendthrift, but having subdued a revolt in Monferrato was presented with that territory by the emperor Maximilian II. At his death in 1587 he was succeeded by his son Vincenzo I. (d. 1612), who was more addicted to amusements than to warfare. Then followed in succession his sons Francesco II. (d. 1612), Ferdinando (d. 1626), and Vincenzo II. (d. 1627), all three incapable and dissolute princes. The last named appointed as his successor Charles, the son of Henriette, the heiress of the French family of Nevers-Rethel, who was only able to take possession of the ducal throne after a bloody struggle; his dominions were laid waste by foreign invasions and he himself was reduced to the sorest straits. He died in 1637, leaving his possessions to his grandson Charles (Carlo) II. under the regency of the latter's mother Maria Gonzaga, which lasted until 1647. Charles died in consequence of his own profligacy and was succeeded by his son Ferdinand Charles (Ferdinando Carlo), who was likewise for some years under the regency of his mother Isabella of Austria. Ferdinand Charles, another extravagant and dissolute prince, acquired the county of Guastalla by marriage in 1678, but lost it soon afterwards; he involved his country in useless warfare, with the result that in 1708 Austria annexed the duchy. On the 5th of July of the same year he died in Venice, and with him the Gonzagas of Mantua came to an end.

Of the cadet branches of the house one received the lordship of Bozzolo, another the counties of Novellara and Bagnolo, a third, of which the founder was Ferrante I. (d. 1557), retained the county of Guastalla, raised to a duchy in 1621, and came to an end with the death of Giuseppe Maria on the 16th of August 1746.

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GONZAGA, THOMAZ ANTONIO (1744–1809), Portuguese poet, was a native of Oporto and the son of a Brazilian-born judge. He spent a part of his boyhood at Bahia, where his father was *disembargador* of the appeal court, and returning to Portugal he went to the university of Coimbra and took his law degree at the age of twenty-four. He remained on there for some years and compiled a treatise of natural law on regalist lines, dedicating it to Pombal, but the fall of the marquis led him to leave Coimbra and become a candidate for a magistracy, and in 1782 he obtained the posts of *ouvidor* and *provedor* of the goods of deceased and absent persons at Villa Rica in the province of Minas Geraes in Brazil. In 1786 he was named *disembargador* of the appeal court at Bahia, and three years later, as he was about to marry a young lady of position, D. Maria de Seixas Brandão, the *Marilia* of his verses, he suddenly found himself arrested on the charge of being the principal author of a Republican conspiracy in Minas. Conducted to Rio, he was imprisoned in a fortress and interrogated, but constantly asserted his innocence. However, his friendship with the conspirators compromised him in the eyes of his absolutist judges, who, on the ground that he had known of the plot and not denounced it, sentenced him in April 1792 to perpetual exile in Angola, with the confiscation of his property. Later, this penalty was commuted into one of ten years of exile to Mozambique, with a death sentence if he should return to America. After having spent three years in prison, Gonzaga sailed in May 1792 for Mozambique and shortly after his arrival a violent fever almost ended his life. A wealthy Portuguese gentleman, married to a lady of colour, charitably received him into his house, and when the poet recovered, he married their young daughter who had nursed him through the attack. He lived in exile until his death, practising advocacy at intervals, but his last years were embittered by fits of melancholia, deepening into madness, which were brought on by the remembrance of his misfortunes. His reputation as a poet rests on a little volume of bucolics entitled *Marilia*, which includes all his published verses and is divided into two parts, corresponding with those of his life. The first extends to his imprisonment and breathes only love and pleasure, while the main theme of the second part, written in prison, is his *saudade* for *Marilia* and past happiness. Gonzaga borrowed his forms from the best models, Anacreon and Theocritus, but the matter, except for an occasional imitation of Petrarch, the natural, elegant style and the harmonious metrification, are all his own. The booklet comprises the most celebrated collection of erotic poetry dedicated to a single person in the Portuguese tongue; indeed its popularity is so great as to exceed its intrinsic merit.

Seventy-nine editions had appeared up to 1854, but the Paris edition of 1862 in 2 vols. is in every way the best, although the authenticity of the verses in its 3rd part, which do not relate to *Marilia*, is doubtful. A popular edition of the first two parts was published in 1888 (Lisbon, Corazzi). A French version of *Marilia* by Monglave and Chalas appeared in Paris in 1825, an Italian by Vegezzi Ruscalla at Turin in 1834, a Latin by Dr Castro Lopes at Rio in 1868, and there is a Spanish one by Vedia.

Innocencio da Silva, *Diccionario bibliographico portuguez*, vol. vii. p. 320, also Dr T. Braga, *Filinto Elysio e os Dissidentas da Arcadia* (Oporto, 1901).

(E. Pr.)

GONZÁLEZ-CARVAJAL, TOMAS JOSÉ (1753–1834), Spanish poet and statesman, was born at Seville in 1753. He studied at the university of Seville, and took the degree of LL.D. at Madrid. He obtained an office in the financial department of the government; and in 1795 was made intendant of the colonies which had just been founded in Sierra Morena and Andalusia. During 1809–1811 he held an intendancy in the patriot army. He became, in 1812, director of law in the university of San Isidro; but having offended the government by establishing a chair of international law, he was imprisoned for five years (1815–1820). The revolution of 1820 reinstated him, but the counter-revolution of three years later forced him into exile. After four years he was allowed to return, and he died, in 1834, a member of the supreme council of war. González-Carvajal enjoyed European fame as author of metrical translations of the poetical books of the Bible. To fit himself for this work he commenced the study of Hebrew at the age of fifty-four. He also wrote other works in verse and prose, avowedly taking Luis de Leon as his model.

See biographical notice in *Biblioteca de Rivadeneyra*, vol. lxvii., *Poetas del siglo 18*.

GONZALO DE BERCEO (c. 1180–c. 1246), the earliest Castilian poet whose name is known to us, was born at Berceo, a village in the neighbourhood of Calahorra in the province of Logroño. In 1221 he became a deacon and was attached, as a secular priest, to the Benedictine monastery of San Millan de la Cogolla, in the

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diocese of Calahorra. His name is to he met with in a number of documents between the years 1237 and 1246. He wrote upwards of 13,000 verses, all on devotional subjects. His best work is a life of St Oria; others treat of the life of St Millan, of St Dominic of Silos, of the Sacrifice of the Mass, the Martyrdom of St Laurence, the visible signs preceding the Last Judgment, the Praises of Our Lady, the Miracles of Our Lady and the Lamentations of the Virgin on the Passion of her Son. He writes in the common tongue, the *roman (vulgar)*, and his claim to fame as a poet rests on his use of the *cuaderna via* (single-rhymed quatrains, each verse being of fourteen syllables). Sometimes, however, he takes the more modest title of *juglar* (*jongleur*), when claiming payment for his poems. His literary attainments are not great, and he lacks imagination and animation of style, but he has a certain eloquence, and in speaking of the Virgin and the saints a certain charm, while his verse bears at times the imprint of a passionate devotion, recalling the lyrical style of the great Spanish mystics. There is, however, a very strong popular element in his writings, which explains his long vogue. The great majority of his legends of the Virgin are obviously borrowed from the collection of a Frenchman, Gautier de Coinci; but he has succeeded in making this material entirely his own by reason of a certain conciseness and a realism in detail which make his work far superior to the tedious and colourless narrative of his model.

His *Poesias* are in the *Biblioteca de autores españoles* of Rivadeneyra, vol. lvii. (1864); *La Vida de San Domingo de Silos* has been edited by J. D. FitzGerald (Paris, 1904; see the *Bibliothèque de l'École des Hautes Études*, part 149); see also F. Fernandez y Gonzalez in the *Revista* (vol. i., Madrid, 1860); N. Herguera, "Documentos referentes a Gonzalo de Berceo," in the *Revista de archivos*, (3rd series, Feb.-March, 1904, pp. 178-179). (P. A.)

GOOCH, SIR DANIEL, Bart. (1816–1889), English mechanical engineer, was born at Bedlington, in Northumberland, on the 16th of August 1816. At the age of fifteen, having shown a taste for mechanics, he was put to work at the Tredegar Ironworks, Monmouthshire. In 1834 he went to Warrington, where, at the Vulcan foundry, under Robert Stephenson, he acquired the principles of locomotive design. Subsequently, after passing a year at Dundee, he was engaged by the Stephensons at their Gateshead works, where he seems to have conceived that predilection for the broad gauge for which he was afterwards distinguished, through having to design some engines for a 6-foot gauge in Russia and noticing the advantages it offered in allowing greater space for the machinery, &c., as compared with the standard gauge favoured by Stephenson. In 1837, on I. K. Brunel's recommendation, he was appointed locomotive superintendent to the Great Western railway at a time when the engines possessed by the railway were very poor and inefficient. He soon improved this state of affairs, and gradually provided his employers with locomotives which were unsurpassed for general excellence and economy of working. One of the most famous, the "Lord of the Isles," was awarded a gold medal at the Great Exhibition of 1851, and when, thirty years afterwards, it was withdrawn from active service it had run more than three-quarters of a million miles, all with its original boiler. In 1864 he left the Great Western and interested himself in the problem of laying a telegraph cable across the Atlantic. At this time the "Great Eastern" was in the hands of the bondholders, of whom he himself was one of the most important, and it occurred to him that she might advantageously be utilized in the enterprise. Accordingly, at his instance she was chartered by the Telegraph Construction Company, of which also he was a director, and in 1865 was employed in the attempt to lay a cable, Gooch himself superintending operations. The cable, however, broke in mid-ocean, and the attempt was a failure. Next year it was renewed with more success, for not only was a new cable safely put in place, but the older one was picked up and spliced, so that there were two complete lines between England and America. For this achievement Gooch was created a baronet. Meanwhile the Great Western railway had fallen on evil days, being indeed on the verge of bankruptcy, when in 1866 the directors appealed to him to accept the chairmanship of the board and undertake the rehabilitation of the company. He agreed to the proposal, and was so successful in restoring its prosperity that in 1889, at the last meeting over which he presided, a dividend was declared at the rate of 7½%. Under his administration the system was greatly enlarged and consolidated by the absorption of various smaller lines, such as the Bristol and Exeter and the Cornwall railways, and his appreciation of its strategic value caused him to be a strenuous supporter of the construction of the Severn Tunnel. His death occurred on the 15th of October 1889 at his residence, Clewer Park, near Windsor.

GOOD, JOHN MASON (1764–1827), English writer on medical, religious and classical subjects, was born on the 25th of May 1764 at Epping, Essex. After attending a school at Romsey kept by his father, the Rev. Peter Good, who was a Nonconformist minister, he was, at about the age of fifteen, apprenticed to a surgeon-apothecary at Gosport. In 1783 he went to London to prosecute his medical studies, and in the autumn of 1784 he began to practise as a surgeon at Sudbury in Suffolk. In 1793 he removed to London, where he entered into partnership with a surgeon and apothecary. But the partnership was soon dissolved, and to increase his income he began to devote attention to literary pursuits. Besides contributing both in prose and verse to the *Analytical* and *Critical Reviews* and the *British* and *Monthly Magazines*, and other periodicals, he wrote a large number of works relating chiefly to medical and religious subjects. In 1794 he became a member of the British Pharmaceutical Society, and in that connexion, and especially by the publication of his work, *A History of Medicine* (1795), he did much to effect a greatly needed reform in the profession of the apothecary. In 1820 he took the diploma of M.D. at Marischal College, Aberdeen. He died at Shepperton, Middlesex, on the 2nd of January 1827. Good was not only well versed in classical literature, but was acquainted with the principal European languages, and also with Persian, Arabic and Hebrew. His prose works display wide erudition; but their style is dull and tedious. His poetry never rises above pleasant and well-versified commonplace. His translation of Lucretius, *The Nature of Things* (1805–1807), contains elaborate philological and explanatory notes, together with parallel passages and quotations from European and Asiatic authors.

GOOD FRIDAY (probably "God's Friday"), the English name for the Friday before Easter, kept as the anniversary of the Crucifixion. In the Greek Church it has been or is known as *τάκτα* [*σταυρώσιμον*], *παρασκευή*, *παρασκευὴ μεγάλη* or *ἁγία*, *σωτηρία* or *τὰ σωτήρια*, *ἡμέρα τοῦ σταυροῦ*, while among the Latins the names of most frequent occurrence are Pascha Crucis, Dies Dominicae Passionis, Parasceve, Feria Sexta Paschae, Feria Sexta Major in Hierusalem, Dies Absolutionis. It was called Long Friday by the Anglo-Saxons[1] and Danes, possibly in allusion to the length of the services which marked the day. In Germany it is sometimes designated Stiller Freitag (compare Greek, *ἀβδομὰς ἄπρακτος*; Latin, *hebdomas inofficiosa*, *non laboriosa*), but more commonly Charfreitag. The etymology of this last name has been much disputed, but there seems now to be little doubt that it is derived from the Old High German *chara*, meaning suffering or mourning.

The origin of the custom of a yearly commemoration of the Crucifixion is somewhat obscure. It may be regarded as certain that among Jewish Christians it almost imperceptibly grew out of the old habit of annually celebrating the Passover on the 14th of Nisan, and of observing the "days of unleavened bread" from the 15th to the 21st of that month. In the Gentile churches, on the other hand, it seems to be well established that originally no yearly cycle of festivals was known at all. (See EASTER.)

From its earliest observance, the day was marked by a specially rigorous fast, and also, on the whole, by a tendency to greater simplicity in the services of the church. Prior to the 4th century there is no evidence of non-celebration of the eucharist on Good Friday; but after that date the prohibition of communion

[1] See Johnson's *Collection of Ecclesiastical Laws* (vol. i., anno 957): "Housel ought not to be hallowed on Long Friday, because Christ suffered for us on that day."

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became common. In Spain, indeed, it became customary to close the churches altogether as a sign of mourning; but this practice was condemned by the council of Toledo (633). In the Roman Catholic Church the Good Friday ritual at present observed is marked by many special features, most of which can be traced back to a date at least prior to the close of the 8th century (see the Ordo Romanus in Muratori's *Liturg. Rom. Vet.*). The altar and officiating clergy are draped in black, this being the only day on which that colour is permitted. Instead of the epistle, sundry passages from Hosea, Habakkuk, Exodus and the Psalms are read. The gospel for the day consists of the history of the Passion as recorded by St John. This is often sung in plain-chaunt by three priests, one representing the "narrator," the other two the various characters of the story. The singing of this is followed by bidding prayers for the peace and unity of the church, for the pope, the clergy, all ranks and conditions of men, the sovereign, for catechumens, the sick and afflicted, heretics and schismatics, Jews and heathen. Then follows the "adoration of the cross" (a ceremony derived from the church of Jerusalem and said to date back to near the time of Helena's "invention of the cross"); the hymns *Pange lingua* and *Vexilla regis* are sung, and then follows the "Mass of the Presanctified." The name is derived from the fact that it is celebrated with elements consecrated the day before, the liturgy being omitted on this day. The priest merely places the Sacrament on the altar, censes it, elevates and breaks the host, and communicates, the prayers and responses interspersed being peculiar to the day. This again is followed by vespers, with a special anthem; after which the altar is stripped in silence. In many Roman Catholic countries—in Spain, for example—it is usual for the faithful to spend much time in the churches in meditation on the "seven last words" of the Saviour; no carriages are driven through the streets; the bells and organs are silent; and in every possible way it is sought to deepen the impression of a profound and universal grief. In the Greek Church also the Good Friday fast is excessively strict; as in the Roman Church, the Passion history is read and the cross adored; towards evening a dramatic representation of the entombment takes place, amid open demonstrations of contempt for Judas and the Jews. In Lutheran churches the organ is silent on this day, and altar, font and pulpit are draped in black, as indeed throughout Holy Week. In the Church of England the history of the Passion from the gospel according to John is also read; the collects for the day are based upon the bidding prayers which are found in the Ordo Romanus. The "three hours" service, borrowed from Roman Catholic usage and consisting of prayers, addresses on the "seven last words from the cross" and intervals for meditation and silent prayer, has become very popular in the Anglican Church, and the observance of the day is more marked than formerly among Nonconformist bodies, even in Scotland.

GOODMAN, GODFREY (1583–1656), bishop of Gloucester, was born at Ruthin, Denbighshire, and educated at Westminster and Cambridge. He took orders in 1603, and in 1606 obtained the living of Stapleford Abbots, Essex, which he held together with several other livings. He was canon of Windsor from 1617 and dean of Rochester 1620–1621, and became bishop of Gloucester in 1625. From this time his tendencies towards Roman Catholicism constantly got him into trouble. He preached an unsatisfactory sermon at court in 1626, and in 1628 incurred charges of introducing popery at Windsor. In 1633 he secured the see of Hereford by bribery, but Archbishop Laud persuaded the king to refuse his consent. In 1638 he was said to be converted to Rome, and two years later he was imprisoned for refusing to sign the new canons denouncing popery and affirming the divine right of kings. He afterwards signed and was released on bail, but next year the bishops who had signed were all imprisoned in the Tower, by order of parliament, on the charge of treason. After eighteen weeks' imprisonment Goodman was allowed to return to his diocese. About 1650 he settled in London, where he died a confessed Roman Catholic. His best known book is *The Fall of Man* (London, 1616).

GOODRICH, SAMUEL GRISWOLD (1793–1860), American author, better known under the pseudonym of "Peter Parley," was born, the son of a Congregational minister, at Ridgefield, Connecticut, on the 19th of August 1793. He was largely self-educated, became an assistant in a country store at Danbury, Conn., in 1808, and at Hartford, Conn., in 1811, and from 1816 to 1822 was a bookseller and publisher at Hartford. He visited Europe in 1823–1824, and in 1826 removed to Boston, where he continued in the publishing business, and from 1828 to 1842 he published an illustrated annual, the *Token*, to which he was a frequent contributor both in prose and verse. A selection from these contributions was published in 1841 under the title *Sketches from a Student's Window*. The *Token* also contained some of the earliest work of Nathaniel Hawthorne, N. P. Willis, Henry W. Longfellow and Lydia Maria Child. In 1841 he established *Merry's Museum*, which he continued to edit till 1854. In 1827 he began, under the name of "Peter Parley," his series of books for the young, which embraced geography, biography, history, science and miscellaneous tales. Of these he was the sole author of only a few, but in 1857 he wrote that he was "the author and editor of about 170 volumes," and that about seven millions had been sold. In 1857 he published *Recollections of a Lifetime*, which contains a list both of the works of which he was the author or editor and of the spurious works published under his name. By his writings and publications he amassed a large fortune. He was chosen a member of the Massachusetts House of Representatives in 1836, and of the state Senate in 1837, his competitor in the last election being Alexander H. Everett, and in 1851–1853 he was consul at Paris, where he remained till 1855, taking advantage of his stay to have several of his works translated into French. After his return to America he published, in 1859, *Illustrated History of the Animal Kingdom*. He died, in New York, on the 9th of May 1860.

His brother, CHARLES AUGUSTUS GOODRICH (1790–1862), a Congregational clergyman, published various ephemeral books, and helped to compile some of the "Peter Parley" series.

GOODRICH, or GOODRICKE, **THOMAS** (d. 1554), English ecclesiastic, was a son of Edward Goodrich of East Kirkby, Lincolnshire, and was educated at Corpus Christi College, Cambridge, afterwards becoming a fellow of Jesus College in the same university. He was among the divines consulted about the legality of Henry VIII.'s marriage with Catherine of Aragon, became one of the royal chaplains about 1530, and was consecrated bishop of Ely in 1534. He was favourable to the Reformation, helped in 1537 to draw up the *Institution of a Christian Man* (known as the *Bishops' Book*), and translated the Gospel of St John for the revised New Testament. On the accession of Edward VI. in 1547 the bishop was made a privy councillor, and took a conspicuous part in public affairs during the reign. "A busy secular spirited man," as Burnet calls him, he was equally opposed to the zealots of the "old" and the "new religion." He assisted to compile the First Prayer Book of Edward VI., was one of the commissioners for the trial of Bishop Gardiner, and in January 1551–1552 succeeded Rich as lord high chancellor. This office he continued to hold during the nine days' reign of "Queen Jane" (Lady Jane Grey); but he continued to make his peace with Queen Mary, conformed to the restored religion, and, though deprived of the chancellorship, was allowed to keep his bishopric until his death on the 10th of May 1554.

See the *Dict. Nat. Biog.*, where further authorities are cited.

GOODSIR, JOHN (1814–1867), Scottish anatomist, born at Anstruther, Fife, on the 20th of March 1814, was the son of Dr John Goodsir, and grandson of Dr John Goodsir of Largo. He was educated at the burgh and grammar-schools of his native place and at the university of St Andrews. In 1830 he was apprenticed to a surgeon-dentist in Edinburgh, where he studied anatomy under Robert Knox, and in 1835 he joined his father in practice at Anstruther. Three years later he communicated to the British Association a paper on the pulps and sacs of the human teeth, his researches on the whole process of dentition

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being at this time distinguished by their completeness; and about the same date, on the nomination of Edward Forbes, he was elected to the famous coterie called the "Universal Brotherhood of the Friends of Truth," which comprised artists, scholars, naturalists and others, whose relationship became a potent influence in science. With Forbes he worked at marine zoology, but human anatomy, pathology and morphology formed his chief study. In 1840 he moved to Edinburgh, where in the following year he was appointed conservator of the museum of the College of Surgeons, in succession to William Macgillivray. Much of his reputation rested on his knowledge of the anatomy of tissues. In his lectures in the theatre of the college in 1842–1843 he evidenced the largeness of his observation of cell-life, both physiologically and pathologically, insisting on the importance of the cell as a centre of nutrition, and pointing out that the organism is subdivided into a number of departments. R. Virchow recognized his indebtedness to these discoveries by dedicating his *Cellular Pathologie* to Goodsir, as "one of the earliest and most acute observers of cell-life." In 1843 Goodsir obtained the post of curator in the university of Edinburgh; the following year he was appointed démonstrator of anatomy, and in 1845 curator of the entire museum. A year later he was elected to the chair of anatomy in the university, and devoted all his energies to anatomical research and teaching.

Human myology was his strong point; no one had laboured harder at the dissecting-table; and he strongly emphasized the necessity of practice as a means of research. He believed that anatomy, physiology and pathology could never be properly advanced without daily consideration and treatment of disease. In 1848 he became a fellow of the Royal College of Surgeons, and in the same year he joined the Highland and Agricultural Society, acting as chairman of the veterinary department, and advising on strictly agricultural matters. In 1847 he delivered a series of systematic lectures on the comparative anatomy of the invertebrata; and, about this period, as member of an aesthetic club, he wrote papers on the natural principles of beauty, the aesthetics of the ugly, of smell, the approbation or disapprobation of sounds, &c. Owing to the failing health of Professor Robert Jameson, Goodsir was induced to deliver the course of lectures on natural history during the summer of 1853.

The lectures were long remembered for their brilliancy, but the infinite amount of thought and exertion which they cost broke down the health of the lecturer. Goodsir, nevertheless, persevered in his labours, writing in 1855 on organic electricity, in 1856 on morphological subjects, and afterwards on the structure of organized forms. His speculations in the latter domain gave birth to his theory of a triangle as the mathematical figure upon which nature had built up both the organic and inorganic worlds, and he hoped to complete this triangle theory of formation and law as the greatest of his works. In his lectures on the skull and brain he held the doctrine that symmetry of brain had more to do with the higher faculties than bulk or form. He died at Wardie, near Edinburgh, on the 6th of March 1867, in the same cottage in which his friend Edward Forbes died. His anatomical lectures were remarkable for their solid basis of fact; and no one in Britain took so wide a field for survey or marshalled so many facts for anatomical tabulation and synthesis.

See *Anatomical Memoirs of John Goodsir, F.R.S., edited by W. Turner, with Memoir by H. Lonsdale* (2 vols., Edinburgh, 1868), in which Goodsir's lectures, addresses and writings are epitomized; *Proc. Roy. Soc.* vol. iv. (1868); *Trans. Bot. Soc. Edin.* vol. ix. (1868).

GOODWILL, In the law of property, a term of somewhat vague significance. It has been defined as every advantage which has been acquired in carrying on a business, whether connected with the premises in which the business has been carried on, or with the name of the firm by whom it has been conducted (*Churton* v. *Douglas*, 1859, Johns, 174). Goodwill may be either professional or trade. Professional goodwill usually takes the form of the recommendation by a retiring professional man, doctor, solicitor, &c., to his clients of the successor or purchaser coupled generally with an undertaking not to compete with him. Trade goodwill varies with the nature of the business with which it is connected, but there are two rights which, whatever the nature of the business may be, are invariably associated with it, viz. the right of the purchaser to represent himself as the owner of the business, and the right to restrain competition. For the purposes of the Stamp Act, the goodwill of a business is property, and the proper duty must be paid on the conveyance of such. (See also PARTNERSHIP; PATENTS.)

GOODWIN, JOHN (*c.* 1594–1665), English Nonconformist divine, was born in Norfolk and educated at Queens' College, Cambridge, where he was elected fellow in 1617. He was vicar of St Stephen's, Coleman Street, London, from 1633 to 1645, when he was ejected by parliament for his attacks on Presbyterianism, especially in his Θεομαχία (1644). He thereupon established an independent congregation, and put his literary gifts at Oliver Cromwell's service. In 1648 he justified the proceedings of the army against the parliament ("Pride's Purge") in a pamphlet *Might and Right Well Met*, and in 1649 defended the proceedings against Charles I. (to whom he had offered spiritual advice) in *Βασιλικόν*. At the Restoration this tract, with some that Milton had written to Monk in favour of a republic, was publicly burnt, and Goodwin was ordered into custody, though finally indemnified. He died in 1665. Among his other writings are *Anti-Cavalierisme* (1642), a translation of the *Stratagemata Satanae* of Giacomo Aconcio, the Elizabethan advocate of toleration, tracts against Fifth-Monarchy Men, Cromwell's "Triers" and Baptists, and *Redemption Redeemed, containing a thorough discussion of . . . election, reprobation and the perseverance of the saints* (1651, reprinted 1840). Goodwin's strongly Arminian tendencies brought him into conflict with Robert Baillie, professor of divinity of Glasgow, George Kendall, the Calvinist prebendary of Exeter, and John Owen (*q.v.*), who replied to *Redemption Redeemed* in *The Doctrine of the Saints' Perseverance*, paying a high tribute to his opponent's learning and controversial skill. Goodwin answered all three in the *Triumviri* (1658). John Wesley in later days held him in much esteem and published an abridged edition of his *Imputatio fidei*, a work on justification that had originally appeared in 1642.

Life by T. Jackson (London, 1839).

GOODWIN, NATHANIEL CARL (1857–), American actor, was born in Boston on the 25th of July 1857. While clerk in a large shop he studied for the stage, and made his first appearance in 1873 in Boston in Stuart Robson's company as the newsboy in Joseph Bradford's *Law*. He made an immediate success by his imitations of popular actors. A hit in the burlesque *Black-eyed Susan* led to his taking part in Rice and Goodwin's *Evangeline* company. It was at this time that he married Eliza Weathersby (d. 1887), an English actress with whom he played in B. E. Woolf's *Hobbies*. It was not until 1889, however, that Nat Goodwin's talent as a comedian of the "legitimate" type began to be recognized. From that time he appeared in a number of plays designed to display his drily humorous method, such as Brander Matthews' and George H. Jessop's *A Gold Mine*, Henry Guy Carleton's *A Gilded Fool* and *Ambition*, Clyde Fitch's *Nathan Hale*, H. V. Esmond's *When we were Twenty-one*, &c. Till 1903 he was associated in his performances with his third wife, the actress Maxine Elliott (b. 1873), whom he married in 1898; this marriage was dissolved in 1908.

GOODWIN, THOMAS (1600–1680), English Nonconformist divine, was born at Rollesby, Norfolk, on the 5th of October 1600, and was educated at Christ's College, Cambridge, where in 1616 he graduated B.A. In 1619 he removed to Catharine Hall, where in 1620 he was elected fellow. In 1625 he was licensed a preacher of the university; and three years afterwards he became lecturer of Trinity Church, to the vicarage of which he was presented by the king in 1632. Worried by his bishop, who was a zealous adherent of Laud, he resigned all his preferments and left the university in 1634. He lived for some time in London, where in 1638 he married the daughter of an alderman; but in the following year he withdrew to Holland, and for some time was pastor of a small congregation of English merchants and refugees at Arnheim. Returning to London soon after Laud's impeachment by the Long Parliament, he ministered for some years to the

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Independent congregation meeting at Paved Alley Church, Lime Street, in the parish of St Dunstan's-in-the-East, and rapidly rose to considerable eminence as a preacher; in 1643 he was chosen a member of the Westminster Assembly, and at once identified himself with the Congregational party, generally referred to in contemporary documents as "the dissenting brethren." He frequently preached by appointment before the Commons, and in January 1650 his talents and learning were rewarded by the House with the presidentship of Magdalen College, Oxford, a post which he held until the Restoration. He rose into high favour with the protector, and was one of his intimate advisers, attending him on his death-bed. He was also a commissioner for the inventory of the Westminster Assembly, 1650, and for the approbation of preachers, 1653, and together with John Owen (*q.v.*) drew up an amended Westminster Confession in 1658. From 1660 until his death on the 23rd of February 1680 he lived in London, and devoted himself exclusively to theological study and to the pastoral charge of the Fetter Lane Independent Church.

The works published by Goodwin during his lifetime consist chiefly of sermons printed by order of the House of Commons; but he was also associated with Philip Nye and others in the preparation of the *Apologeticall Narration* (1643). His collected writings, which include expositions of the Epistle to the Ephesians and of the Apocalypse, were published in five folio volumes between 1681 and 1704, and were reprinted in twelve 8vo volumes (Edin., 1861–1866). Characterized by abundant yet one-sided reading, remarkable at once for the depth and for the narrowness of their observation and spiritual experience, often admirably thorough in their workmanship, yet in style intolerably prolix—they fairly exemplify both the merits and the defects of the special school of religious thought to which they belong. Calamy's estimate of Goodwin's qualities may be ignored as both friendly and just. "He was a considerable scholar and an eminent divine, and had a very happy faculty in descanting upon Scripture so as to bring forth surprising remarks, which yet generally tended to illustration." A memoir, derived from his own papers, by his son (Thomas Goodwin, "the younger," 1650?–1716?), Independent minister at London and Pinner, and author of the *History of the Reign of Henry V.*) is prefixed to the fifth volume of his collected works; as a "patriarch and Aklas of Independency" he is also noticed by Anthony Wood in the *Athenae Oxonienses*. An amusing sketch, from Addison's point of view, of the austere and somewhat fanatical president of Magdalen is preserved in No. 494 of the *Spectator*.

GOODWIN, WILLIAM WATSON (1831–), American classical scholar, was born in Concord, Massachusetts, on the 9th of May 1831. He graduated at Harvard in 1851, studied in Germany, was tutor in Greek at Harvard in 1856–1860, and Eliot professor of Greek there from 1860 until his resignation in 1901. He became an overseer of Harvard in 1903. In 1882–1883 he was the first director of the American School for Classical Studies at Athens. Goodwin edited the *Panegyricus* of Isocrates (1864) and Demosthenes *On The Crown* (1901); and assisted in preparing the seventh edition of Liddell and Scott's *Greek-English Lexicon*. He revised an English version by several writers of *Plutarch's Morals* (5 vols., 1871; 6th ed., 1889), and published the Greek text with literal English version of Aeschylus' *Agamemnon* (1906) for the Harvard production of that play in June 1906. As a teacher he did much to raise the tone of classical reading from that of a mechanical exercise to literary study. But his most important work was his *Syntax of the Moods and Tenses of the Greek Verb* (1860), of which the seventh revised edition appeared in 1877 and another (enlarged) in 1890. This was "based in part on Madvig and Krüger," but, besides making accessible to American students the works of these continental grammarians, it presented original matter, including a "radical innovation in the classification of conditional sentences," notably the "distinction between particular and general suppositions." Goodwin's *Greek Grammar* (elementary edition, 1870; enlarged 1879; revised and enlarged 1892) gradually superseded in most American schools the *Grammar* of Hadley and Allen. Both the *Moods and Tenses* and the *Grammar* in later editions are largely dependent on the theories of Gildersleeve for additions and changes. Goodwin also wrote a few elaborate syntactical studies, to be found in *Harvard Studies in Classical Philology*, the twelfth volume of which was dedicated to him upon the completion of fifty years as an alumnus of Harvard and forty-one years as Eliot professor.

GOODWIN SANDS, a dangerous line of shoals at the entrance to the Strait of Dover from the North Sea, about 6 m. from the Kent coast of England, from which they are separated by the anchorage of the Downs. For this they form a shelter. They are partly exposed at low water, but the sands are shifting, and in spite of lights and bell-buoys the Goodwins are frequently the scene of wrecks, while attempts to erect a lighthouse or beacon have failed. Tradition finds in the Goodwins the remnant of an island called Lomea, which belonged to Earl Godwine in the first half of the 11th century, and was afterwards submerged, when the funds devoted to its protection were diverted to build the church steeple at Tenterden (*q.v.*). Four lightships mark the limits of the sands, and also signal by rockets to the lifeboat stations on the coast when any vessel is in distress on the sands. Perhaps the most terrible catastrophe recorded here was the wreck of thirteen ships of war during a great storm in November 1703.

GOODWOOD, a mansion in the parish of Boxgrove, in the Chichester parliamentary division of Sussex, England, 4 m. N.E. of Chichester. It was built from designs of Sir William Chambers with additions by Wyatt, after the purchase of the property by the first duke of Richmond in 1720. The park is in a hilly district, and is enriched with magnificent trees of many varieties, including some huge cedars. In it is a building containing a Roman slab recording the construction of a temple to Minerva and Neptune at Chichester. There is mention of a British tributary prince named Cogidubnus, who perhaps served also as a Roman official. A reference to early Christianity in Britain has been erroneously read into this inscription. On the racecourse a famous annual meeting, dating from 1802, is held in July. The parish church of SS. Mary and Blaize, Boxgrove, is almost entirely a rich specimen of Early English work.

GOODYEAR, CHARLES (1800–1860), American inventor, was born at New Haven, Connecticut, on the 29th of December 1800, the son of Amasa Goodyear, an inventor (especially of farming implements) and a pioneer in the manufacture of hardware in America. The family removed to Naugatuck, Conn., when Charles was a boy; he worked in his father's button factory and studied at home until 1816, when he apprenticed himself to a firm of hardware merchants in Philadelphia. In 1821 he returned to Connecticut and entered into a partnership with his father at Naugatuck, which continued till 1830, when it was terminated by business reverses. Already he was interested in an attempt to discover a method of treatment by which india-rubber could be made into merchandizable articles that would stand extremes of heat and cold. To the solution of this problem the next ten years of his life were devoted. With ceaseless energy and unwavering faith in the successful outcome of his labours, in the face of repeated failures and hampered by poverty, which several times led him to a debtor's prison, he persevered in his endeavours. For a time he seemed to have succeeded with a treatment (or "cure") of the rubber with *aqua fortis*. In 1836 he secured a contract for the manufacture by this process of mail bags for the U.S. government, but the rubber fabric was useless at high temperatures. In 1837 he met and worked with Nathaniel Hayward (1808–1865), who had been an employee of a rubber factory in Roxbury and had made experiments with sulphur mixed with rubber. Goodyear bought from Hayward the right to use this imperfect process. In 1839, by dropping on a hot stove some indiarubber mixed with sulphur, he discovered accidentally the process for the vulcanization of rubber. Two years more passed before he could find any one who had faith enough in his discovery to invest money in it. At last, in 1844, by which time he had perfected his process, his first patent was granted, and in the subsequent years more than sixty patents were granted to him for the application of his original process to various uses. Numerous infringements had to be fought in the courts, the decisive victory coming in 1852 in the case of *Goodyear* v. *Day*, in which his rights were defended by Daniel Webster and opposed by Rufus Choate. In 1852 he went to England, where articles made under his patents had been displayed at the International Exhibition of 1851, but he

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was unable to establish factories there. In France a company for the manufacture of vulcanized rubber by his process failed, and in December 1855 he was arrested and imprisoned for debt in Paris. Owing to the expense of the litigation in which he was engaged and to bad business management, he profited little from his inventions. He died in New York City on the 1st of July 1860. He wrote an account of his discovery entitled *Gum-Elastic and its Varieties* (2 vols., New Haven, 1853–1855).

See also B. K. Peirce, *Trials of an Inventor, Life and Discoveries of Charles Goodyear* (New York, 1866); James Parton, *Famous Americans of Recent Times* (Boston, 1867); and Herbert L. Terry, *India Rubber and its Manufacture* (New York, 1907).

GOOGE, BARNABE (1540–1594), English poet, son of Robert Googe, recorder of Lincoln, was born on the 11th of June 1540 at Alvingham, Lincolnshire. He studied at Christ's College, Cambridge, and at New College, Oxford, but does not seem to have taken a degree at either university. He afterwards removed to Staple's Inn, and was attached to the household of his kinsman, Sir William Cecil. In 1563 he became a gentleman pensioner to Queen Elizabeth. He was absent in Spain when his poems were sent to the printer by a friend, L. Blundeston. Googe then gave his consent, and they appeared in 1563 as *Eglogs, Epytaphes, and Sonettes*. There is extant a curious correspondence on the subject of his marriage with Mary Darrell, whose father refused Googe's suit on the ground that she was bound by a previous contract. The matter was decided by the intervention of Sir William Cecil with Archbishop Parker, and the marriage took place in 1564 or 1565. Googe was provost-marshal of the court of Connaught, and some twenty letters of his in this capacity are preserved in the record office. He died in February 1594. He was an ardent Protestant, and his poetry is coloured by his religious and political views. In the third "Eglog," for instance, he laments the decay of the old nobility and the rise of a new aristocracy of wealth, and he gives an indignant account of the sufferings of his co-religionists under Mary. The other eclogues deal with the sorrows of earthly love, leading up to a dialogue between Corydon and Cornix, in which the heavenly love is extolled. The volume includes epitaphs on Nicholas Grimald, John Bale and on Thomas Phaer, whose translation of Virgil Googe is uncritical enough to prefer to the versions of Surrey and of Gavin Douglas. A much more charming pastoral than any of those contained in this volume, "Phyllida was a fayer maid" (*Tottel's Miscellany*) has been ascribed to Barnabe Googe. He was one of the earliest English pastoral poets, and the first who was inspired by Spanish romance, being considerably indebted to the *Diana Enamorada* of Montemayor.

His other works include a translation from Marcellus Palingenius (said to be an anagram for Pietro Angelo Manzolli) of a satirical Latin poem, *Zodiacus vitae* (Venice, 1531?), in twelve books, under the title of *The Zodyake of Life* (1560); *The Popish Kingdome, or reign of Antichrist* (1570), translated from Thomas Kirchmayer or Naogeorgus; *The Spiritual Husbandrie* from the same author, printed with the last; *Foure Bookes of Husbandrie* (1577), collected by Conradus Heresbachius; and *The Proverbes of . . . Lopez de Mendoza* (1579).

GOOLE, a market town and port in the Osgoldcross parliamentary division of the West Riding of Yorkshire, England, at the confluence of the Don and the Ouse, 24 m. W. by S. from Hull, served by the North Eastern, Lancashire & Yorkshire, Great Central and Asholme joint railways. Pop. of urban district (1901) 16,576. The town owes its existence to the construction of the Knottingley canal in 1826 by the Aire and Calder Navigation Company, after which, in 1829, Goole was made a bonding port. Previously it had been an obscure hamlet. The port was administratively combined with that of Hull in 1885. It is 47 m. from the North Sea (mouth of the Humber), and a wide system of inland navigation opens from it. There are eight docks supplied with timber ponds, quays, warehouses and other accommodation. The depth of water is 21 or 22 ft. at high water, spring tides. Chief exports are coal, stone, woollen goods and machinery; imports, butter, fruit, indigo, logwood, timber and wool. Industries include the manufacture of alum, sugar, rope and agricultural instruments, and iron-founding. Shipbuilding is also carried on, and there is a large dry dock and a patent slip for repairing vessels. Passenger steamship services are worked in connexion with the Lancashire & Yorkshire railway to Amsterdam, Antwerp, Bruges, Copenhagen, Rotterdam and other north European ports. The handsome church of St John the Evangelist, with a lofty tower and spire, dates from 1844.

GOOSE (a common Teut. word, O. Eng. *gōs*, pl. *gēs*, Ger. *Gans*, O. Norse *gás*, from Aryan root, *ghans*, whence Sans. *hańsa*, Lat. *anser* (for *hanser*), Gr. *χήν*, &c.), the general English name for a considerable number of birds, belonging to the family *Anatidae* of modern ornithologists, which are mostly larger than ducks and less than swans. Technically the word goose is reserved for the female, the male being called gander (A.-S. *gandra*).

The most important species of goose, and the type of the genus *Anser*, is undoubtedly that which is the origin of the well-known domestic race (see POULTRY), the *Anser ferus* or *A. cinereus* of most naturalists, commonly called in English the grey or grey lag[1] goose, a bird of exceedingly wide range in the Old World, apparently breeding where suitable localities are to be found in most European countries from Lapland to Spain and Bulgaria. Eastwards it extends to China, but does not seem to be known in Japan. It is the only species indigenous to the British Islands, and in former days bred abundantly in the English Fen-country, where the young were caught in large numbers and kept in a more or less reclaimed condition with the vast flocks of tame-bred geese that at one time formed so valuable a property to the dwellers in and around the Fens. It is impossible to determine when the wild grey lag goose ceased from breeding in England, but it certainly did so towards the end of the 18th century, for Daniell mentions (*Rural Sports*, iii. 242) his having obtained two broods in one season. In Scotland this goose continues to breed sparingly in several parts of the Highlands and in certain of the Hebrides, the nests being generally placed in long heather, and the eggs seldom exceeding five or six in number. It is most likely the birds reared here that are from time to time obtained in England, for at the present day the grey lag goose, though once so numerous, is, and for many years has been, the rarest species of those that habitually resort to the British Islands. The domestication of this species, as Darwin remarks (*Animals and Plants under Domestication*, i. 287), is of very ancient date, and yet scarcely any other animal that has been tamed for so long a period, and bred so largely in captivity, has varied so little. It has increased greatly in size and fecundity, but almost the only change in plumage is that tame geese commonly lose the browner and darker tints of the wild bird, and are more or less marked with white—being often indeed wholly of that colour.[2] The most generally recognized breeds of domestic geese are those to which the distinctive names of Emden and Toulouse are applied; but a singular breed, said to have come from Sevastopol, was introduced into western Europe about the year 1856. In this the upper plumage is elongated, curled and spirally twisted, having their shaft transparent, and so thin that it often splits into fine filaments, which, remaining free for an inch or more, often coalesce again;[3] while the quills are aborted, so that the birds cannot fly.

[1] The meaning and derivation of this word *lag* had long been a puzzle until Skeat suggested (*Ibis*, 1870, p. 301) that it signified late, last, or slow, as in *laggard*, a loiterer, *lagman*, the last man, *lagteeth*, the posterior molar or "wisdom" teeth (as the last to appear), *lag-clock*, a clock that is behind time. Thus the grey lag goose is the grey goose which in England when the name was given was not migratory but *lagged* behind the other wild species at the season when they betook themselves to their northern breeding-pastern. In connexion with this word, however, must be noticed the curious fact mentioned by Rowley (*Orn. Miscell.*, iii. 213), that the flocks of tame geese in Lincolnshire are urged on by their drivers with the cry of "lag'em, lag'em."

[2] Even in the times of the Romans white geese have been held in great estimation, and hence, doubtless, they have been preferred as breeding stock, but the practice of plucking geese alive, continued for so many centuries, has not improbably also helped to perpetuate this variation, for it is well known to many bird-keepers that a white feather is often produced in place of one of the natural colour that has been pulled out.

[3] In some English counties, especially Norfolk and Lincoln, it was no uncommon thing formerly for a man to keep a stock of a thousand geese, each of which might be reckoned to rear on an

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The other British species of typical geese are the bean-goose (*A. segetum*), the pink-footed (*A. brachyrhynchus*) and the white-fronted (*A. albifrons*). On the continent of Europe, but not yet recognized as occurring in Britain, is a small form of the last (*A. erythropus*) which is known to breed in Lapland. All these, for the sake of discrimination, may be divided into *two* groups—(1) those having the "nail" at the tip of the bill white, or of a very pale flesh colour, and (2) those in which this "nail" is black. To the former belong the grey lag goose, as well as *A. albifrons* and *A. erythropus*, and to the latter the other two. *A. albifrons* and *A. erythropus*, which differ little but in size,—the last being not much bigger than a mallard (*Anas boschas*),—may be readily distinguished from the grey lag goose by their bright orange legs and their mouse-coloured upper wing-coverts, to say nothing of their very conspicuous white face and the broad black bars which cross the belly, though the last two characters are occasionally observable to some extent in the grey lag goose, which has the bill and legs flesh-coloured, and the upper wing-coverts of a bluish-grey. Of the second group, with the black "nail," *A. segetum* has the bill long, black at the base and orange in the middle; the feet are also orange, and the upper wing-coverts mouse-coloured, as in *A. albifrons* and *A. erythropus*, while *A. brachyrhynchus* has the bill short, bright pink in the middle, and the feet also pink, the upper wing-coverts being nearly of the same bluish-grey as in the grey lag goose. Eastern Asia possesses in *A. grandis* a third species of this group, which chiefly differs from *A. segetum* in its larger size. In North America there is only one species of typical goose, and that belongs to the white-"nailed" group. It very nearly resembles *A. albifrons*, but is larger, and has been described as distinct under the name of *A. gambeli*. Central Asia and India possess in the bar-headed goose (*A. indicus*) a bird easily distinguished from any of the foregoing by the character implied by its English name; but it is certainly somewhat abnormal, and, indeed, under the name of *Eulabia*, has been separated from the genus *Anser*, which has no other member indigenous to the Indian Region, nor any at all to the Ethiopian, Australian or Neotropical Regions.

America possesses by far the greatest wealth of Anserine forms. Beside others, presently to be mentioned, its northern portions are the home of all the species of snow-geese belonging to the genus *Chen*. The first of these is *C. hyperboreus*, the snow-goose proper, a bird of large size, and when adult of a pure white, except the primaries, which are black. This has long been deemed a visitor to the Old World, and sometimes in considerable numbers, but the later discovery of a smaller form, *C. albatus*, scarcely differing except in size, throws some doubt on the older records, especially since examples which have been obtained in the British Islands undoubtedly belong to this lesser bird, and it would be satisfactory to have the occurrence in the Old World of the true *C. hyperboreus* placed on a surer footing. So nearly allied to the species last named as to have been often confounded with it, is the blue-winged goose, *C. coerulescens*, which is said never to attain a snowy plumage. Then we have a very small species, long ago described as distinct by Samuel Hearne, the Arctic traveller, but until 1861 discredited by ornithologists. Its distinctness has now been fully recognized, and it has received, somewhat unjustly, the name of *C. rossi*. Its face is adorned with numerous papillae, whence it has been removed by Elliot to a separate genus, *Exanthemops*, and for the same reason it has long been known to the European residents in the fur countries as the "horned wavey"—the last word being a rendering of a native name, *Wawa*, which signifies goose. Finally, average seven goslings. The flocks were regularly taken to pasture and water, just as sheep are, and the man who tended them was called the gooseherd, corrupted into gozzerd. The birds were plucked five times in the year, and in autumn the flocks were driven to London or other large markets. They travelled at the rate of about a mile an hour, and would get over nearly 10 m. in the day. For further particulars the reader may be referred to Pennant's *British Zoology*; Montagu's *Ornithological Dictionary*; Latham's *General History of Birds*; and Rowley's *Ornithological Miscellany* (iii. 206-215), where some account also may be found of the goose-fatting at Strassburg.

there appears to belong to this section, though it has been frequently referred to another (*Chloephaga*), and has also been made the type of a distinct genus (*Philacte*), the beautiful emperor goose, *P. canagica*, which is almost peculiar to the Aleutian Islands, though straying to the continent in winter, and may be recognized by the white edging of its remiges.

The southern portions of the New World are inhabited by about half a dozen species of geese not nearly akin to the foregoing, and separated as the genus *Chloephaga*. The most noticeable of them are the rock or kelp goose, *C. antarctica*, and the upland goose, *C. magellanica*. In both of these the sexes are totally unlike in colour, but in others a greater similarity obtains.[1] Formerly erroneously associated with the birds of this group comes one which belongs to the northern hemisphere, and is common to the Old World as well as the New. It contains the geese which have received the common names of bernacles or brents,[2] and the scientific appellations of *Bernicla* and *Branta*—for the use of either of which much may be said by nomenclaturists. All the species of this section are distinguished by their general dark sooty colour, relieved in some by white of greater or less purity, and by way of distinction from the members of the genus *Anser*, which are known as grey geese, are frequently called by fowlers black geese. Of these, the best known both in Europe and North America is the brent-goose—the *Anas bernicla* of Linnaeus, and the *B. torquata* of many modern writers—a truly marine bird, seldom (in Europe at least) quitting salt-water, and coming southwards in vast flocks towards autumn, frequenting bays and estuaries on the British coasts, where it lives chiefly on sea-grass (*Zostera maritima*). It is known to breed in Spitsbergen and in Greenland. A form which is by some ornithologists deemed a good species, and called by them *B. nigricans*, occurs chiefly on the Pacific coast of North America. In it the black of the neck, which in the common brent terminates just above the breast, extends over most of the lower parts. The true bernacle-goose,[3] the *B. leucopsis* of most authors, is but a casual visitor to North America, but is said to breed in Iceland, and occasionally in Norway. Its usual *incunabula*, however, still form one of the puzzles of the ornithologist, and the difficulty is not lessened by the fact that it will breed freely in semi-captivity, while the brent-goose will not. From the latter the bernacle-goose is easily distinguished by its larger size and white cheeks. Hutchins's goose (*B. Hutchinsi*) seems to be its true representative in the New World. In this the face is dark, but a white crescentic or triangular patch extends from the throat on either side upwards behind the eye. Almost exactly similar in coloration to the last, but greatly superior in size, and possessing 18 rectrices, while all the foregoing have but 16, is the common wild goose of America, *B. canadensis*, which, for more than two centuries has been introduced into Europe, where it propagates so freely that it has been included by nearly all the ornithologists of this quarter of the globe as a member of its fauna. An allied form, by some deemed a species, is *B. leucopareia*, which ranges over the western part of North America, and, though having 18 rectrices, is distinguished by a white collar round the lower part of the neck. The most diverse species of this group of geese are the beautiful *B. ruficollis*, a native of north-eastern Asia, which occasionally strays to western Europe, and has been obtained more than once in Britain, and that which is peculiar to the Hawaian archipelago, *B. sandvicensis*.

The largest living goose is that called the Chinese, Guinea or swan-goose, *Cygnopsis cygnoides*, and this is the stock whence the domestic geese of several eastern countries have sprung. It may often be seen in English parks, and it is found to cross readily with the common tame goose, the offspring being fertile,

[1] See Sclater and Salvin, *Proc. Zool. Society* (1876), pp. 361-369.

[2] The etymology of these two words is exceedingly obscure. The ordinary spelling bernicle seems to be wrong, if we may judge from the analogy of the French *Bernache*. In both words the *e* should be sounded as *a*.

[3] The old fable, perhaps still believed by the uneducated in some parts of the world, was that barnacle-geese were produced from the barnacles (*Lepadidae*) that grow on timber exposed to salt-water.

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and Blyth has said that these crosses are very abundant in India. The true home of the species is in eastern Siberia or Mongolia. It is distinguished by its long smooth neck, marked dorsally by a chocolate streak. The reclaimed form is usually distinguished by the knob at the base of the bill, but the evidence of many observers shows that this is not found in the wild race. Of this bird there is a perfectly white breed.

We have next to mention a very curious form, *Cereopsis novae-hollandiae*, which is peculiar to Australia, and is a more terrestrial type of goose than any other now existing. Its short, decurved bill and green cere give it a very peculiar expression, and its almost uniform grey plumage, bearing rounded black spots, is also remarkable. It bears captivity well, breeding in confinement, but is now seldom seen. It appears to have been formerly very abundant in many parts of Australia, from which it has of late been exterminated. Some of its peculiarities seem to have been still more exaggerated in a bird that is wholly extinct, the *Cnemiornis calcitrans* of New Zealand, the remains of which were described in full by Sir R. Owen in 1873 (*Trans. Zool. Society*, ix. 253). Among the first portions of this singular bird that were found were the *tibiae*, presenting an extraordinary development of the *patella*, which, united with the shank-bone, gave rise to the generic name applied. For some time the affinity of the owner of this wonderful structure was in doubt, but all hesitation was dispelled by the discovery of a nearly perfect skeleton, now in the British Museum, which proved the bird to be a goose, of great size, and unable, from the shortness of its wings, to fly. In correlation with this loss of power may also be noted the dwindling of the keel of the sternum. Generally, however, its osteological characters point to an affinity to *Cereopsis*, as was noticed by Dr Hector (*Trans. New Zeal. Institute*, vi. 76-84), who first determined its Anserine character.

Birds of the genera *Chenalopex* (the Egyptian and Orinoco geese), *Plectropterus*, *Sarcidiornis*, *Chlamydochen* and some others, are commonly called geese. It seems uncertain whether they should be grouped with the *Anserinae*. The males of all, like those of the above-mentioned genus *Chloëphaga*, appear to have that curious enlargement at the junction of the bronchial tubes and the trachea which is so characteristic of the ducks and *Anatinae*. (A. N.)

GOOSE (GAME OF), an ancient French game, said to have been derived from the Greeks, very popular at the close of the middle ages. It was played on a piece of card-board upon which was drawn a fantastic scroll, called the *jardin de l'Oie* (goose-garden), divided into 63 spaces marked with certain emblems, such as dice, an inn, a bridge, a labyrinth, &c. The emblem inscribed on 1 and 63, as well as every ninth space between, was a goose. The object was to land one's counter in number 63, the number of spaces moved through being determined by throwing two dice. The counter was advanced or retired according to the space on which it was placed. For instance if it rested on the *inn* it must remain there until each adversary, of which there might be several, had played twice; if it rested on the *death's head* the player must begin over again; if it went beyond 63 it must be retired a certain number of spaces. The game was usually played for a stake, and special fines were exacted for resting on certain spaces. At the end of the 18th century a variation of the game was called the *jeu de la Révolution Française*.

GOOSEBERRY. *Ribes Grossularia*, a well-known fruit-bush of northern and central Europe, placed in the same genus of the natural order to which it gives name (Ribesiaceae) as the closely allied currants. It forms a distinct section *Grossularia*, the members of which differ from the true currents chiefly in their spinous stems, and in their flowers growing on short footstalks, solitary, or two or three together, instead of in racemes.

The wild gooseberry is a small, straggling bush, nearly resembling the cultivated plant,—the branches being thickly set with sharp spines, standing out singly or in diverging tufts of two or three from the bases of the short spurs or lateral leaf shoots, on which the bell-shaped flowers are produced, singly or in pairs, from the groups of rounded, deeply-crenated 3- or 5-lobed leaves. The fruit is smaller than in the garden kinds, but is often of good flavour; it is generally hairy, but in one variety smooth, constituting the *R. Uva-crispa* of writers; the colour is usually green, but plants are occasionally met with having deep purple berries. The gooseberry is indigenous in Europe and western Asia, growing naturally in alpine thickets and rocky woods in the lower country, from France eastward, perhaps as far as the Himalaya. In Britain it is often found in copses and hedgerows and about old ruins, but has been so long a plant of cultivation that it is difficult to decide upon its claim to a place in the native flora of the island. Common as it is now on some of the lower slopes of the Alps of Piedmont and Savoy, it is uncertain whether the Romans were acquainted with the gooseberry, though it may possibly be alluded to in a vague passage of Pliny: the hot summers of Italy, in ancient times as at present, would be unfavourable to its cultivation. Abundant in Germany and France, it does not appear to have been much grown there in the middle ages, though the wild fruit was held in some esteem medicinally for the cooling properties of its acid juice in fevers; while the old English name, *Fea-berry*, still surviving in some provincial dialects, indicates that it was similarly valued in Britain, where it was planted in gardens at a comparatively early period. William Turner describes the gooseberry in his *Herball*, written about the middle of the 16th century, and a few years later it is mentioned in one of Thomas Tusser's quaint rhymes as an ordinary object of garden culture. Improved varieties were probably first raised by the skilful gardeners of Holland, whose name for the fruit, *Kruisbesie*, may have been easily corrupted into the present English vernacular word.[1] Towards the end of the 18th century the gooseberry became a favourite object of cottage-horticulture, especially in Lancashire, where the working cotton-spinners have raised numerous varieties from seed, their efforts having been chiefly directed to increasing the size of the fruit. Of the many hundred sorts enumerated in recent horticultural works, few perhaps equal in flavour some of the older denizens of the fruit-garden, such as the "old rough red" and "hairy amber." The climate of the British Islands seems peculiarly adapted to bring the gooseberry to perfection, and it may be grown successfully even in the most northern parts of Scotland; indeed, the flavour of the fruit is said to improve with increasing latitude. In Norway even, the bush flourishes in gardens on the west coast nearly up to the Arctic circle, and it is found wild as far north as 63°. The dry summers of the French and German plains are less suited to it, though it is grown in some hilly districts with tolerable success. The gooseberry in the south of England will grow well in cool situations, and may be sometimes seen in gardens near London flourishing under the partial shade of apple trees; but in the north it needs full exposure to the sun to bring the fruit to perfection. It will succeed in almost any soil, but prefers a rich loam or black alluvium, and, though naturally a plant of rather dry places, will do well in moist land, if drained.

The varieties are most easily propagated by cuttings planted in the autumn, which root rapidly, and in a few years form good fruit-bearing bushes. Much difference of opinion prevails regarding the mode of pruning this valuable shrub; it is probable that in different situations it may require varying treatment. The fruit being borne on the lateral spurs, and on the shoots of the last year, it is the usual practice to shorten the side branches in the winter, before the buds begin to expand; some reduce the longer leading shoots at the same time, while others prefer to nip off the ends of these in the summer while they are still

[1] The first part of the word has been usually treated as an etymological corruption either of this Dutch word or the allied Ger. *Krausbeere*, or of the earlier forms of the Fr. *groseille*. The *New English Dictionary* takes the obvious derivation from "grose" and "berry" as probable; "the grounds on which plants and fruits have received names associating them with animals are so commonly inexplicable, that the want of appropriateness in the meaning affords no sufficient ground for assuming that the word is an etymologizing corruption." Skeat (*Etym. Dict.*, 1898) connects the French, Dutch and German words, and finds the origin in the M.H.G. *krus*, curling, crisped, applied here to the hairs on the fruit. The French word was latinized as *grossularia* and confused with *groseus*, thick, fat.

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succulent. When large fruit is desired, plenty of manure should be supplied to the roots, and the greater portion of the berries picked off while still small. If standards are desired, the gooseberry may be with advantage grafted or budded on stocks of some other species of *Ribes, R. aureum*, the ornamental golden currant of the flower garden, answering well for the purpose. The giant gooseberries of the Lancashire "fanciers" are obtained by the careful culture of varieties specially raised with this object, the growth being encouraged by abundant manuring, and the removal of all but a very few berries from each plant. Single gooseberries of nearly 2 oz. in weight have been occasionally exhibited; but the produce of such fanciful horticulture is generally insipid. The bushes at times suffer much from the ravages of the caterpillars of the gooseberry or magpie moth, *Abraxas grossulariata*, which often strip the branches of leaves in the early summer, if not destroyed before the mischief is accomplished. The most effectual way of getting rid of this pretty but destructive insect is to look over each bush carefully, and pick off the larvae by hand; when larger they may be shaken off by striking the branches, but by that time the harm is generally done—the eggs are laid on the leaves of the previous season. Equally annoying in some years is the smaller larva of the V-moth, *Halias vanaria*, which often appears in great numbers, and is not so readily removed. The gooseberry is sometimes attacked by the grub of the gooseberry sawfly, *Nematus ribesii*, of which several broods appear in the course of the spring and summer, and are very destructive. The grubs bury themselves in the ground to pass into the pupal state; the first brood of flies, hatched just as the bushes are coming into leaf in the spring, lay their eggs on the lower side of the leaves, where the small greenish larvae soon after emerge. For the destruction of the first brods it has been recommended to syringe the bushes with tar-water; perhaps a very weak solution of carbolic acid might prove more effective. The powdered root of white hellebore is said to destroy both this grub and the caterpillars of the gooseberry moth and V-moth; infusion of foxglove, and tobacco-water, are likewise tried by some growers. If the fallen leaves are carefully removed from the ground in the autumn and burnt, and the surface of the soil turned over with the fork or spade, most eggs and chrysalids will be destroyed.

The gooseberry was introduced into the United States by the early settlers, and in some parts of New England large quantities of the green fruit are produced and sold for culinary use in the towns; but the excessive heat of the American summer is not adapted for the healthy maturation of the berries, especially of the English varieties. Perhaps if some of these, or those raised in the country, could be crossed with one of the indigenous species, kinds might be obtained better fitted for American conditions of culture, although the gooseberry does not readily hybridize. The attacks of the American gooseberry mildew have largely contributed to the failure of the crop in America.

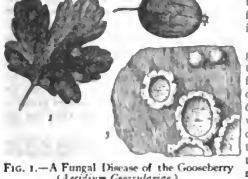

FIG. 1.—A Fungal Disease of the Gooseberry (*Aecidium Grossulariae*.)

1, Leaf showing patches of cluster-cups on surface; 2, Fruit, showing same; 3, Cluster-cups much enlarged.

Occasionally the gooseberry is attacked by the fungus till recently called *Aecidium Grossulariae*, which forms little cups with white torn edges clustered together on reddish spots on the leaves or fruits (fig. 1). It has recently been discovered that the spores contained in these cups will not reproduce the disease on the gooseberry, but infect species of *Carex* (sedges) on which they produce a fungus of a totally different appearance. This stage in the life-history of the parasite gives its name to the whole fungus, so that it is now known as *Puccinia Pringsheimiana*. Both *uredospores* and *teleutospores* are formed on the sedge, and the latter live through the winter and produce the disease on the gooseberry in the succeeding year. In cases where the disease proves troublesome the sedges in the neighbourhood should be destroyed.

A much more prevalent disease is that caused by *Microsphaeria Grossulariae*. This is a mildew growing on the surface of the leaf and sending suckers into the epidermis. The white mycelium gives the leaves of the plant the appearance of having been whitewashed (fig. 2). Numerous white spores are produced in the summer which are able to germinate immediately, and later small blackish fruits (*perithecia*) are produced that pass uninjured through the winter liberating the spores they contain in the spring, which infect the young developing leaves of the bush. In bad cases the plants are greatly injured but frequently little harm is done. Attacked plants should be sprayed with potassium sulphide.

From George Massee's *Text-Book of Plant Diseases*, by permission of Duckworth & Co.

FIG. 2.—Gooseberry Mildew (*Microsphaeria Grossulariae*.)

1, Leaf attacked by the fungus; 2, Fructification or *perithecium*; the end of one of its numerous appendages is shown more highly magnified in 3, 4, 5. spore sacs (*asci*) from the *perithecium*, containing spores.

An allied fungus, *Sphaerotheca mors-uvae*, of much greater virulence, has recently appeared in England, causing the disease known as "American gooseberry mildew" (fig. 3A). In the main the mode of attack is similar to that of the last-mentioned, but not only are the leaves attacked, but the tips of the young shoots and the fruits become covered by the cobweb-like mycelium, the attack frequently resulting in the death of the shoots and the destruction of the fruits. After a

From the *Journal of the Board of Agriculture* (May 1907), by permission of the Dept. of Agriculture and Technical Instruction for Ireland.

FIG. 3A.—American Gooseberry Mildew (*Sphaerotheca mors-uvae*). Plant with leaves and fruit attacked by the fungus.

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time the mycelium becomes rusty brown and produces the winter form of the fungus. Through the winter the shoots are covered thickly with the brown mycelium and in the spring the spores contained in the perithecia germinate and start the infection anew, as in the case of the European mildew. This fungus has recently been the subject of legislation, and when it appears in a district strong repressive measures are called for. In bad cases the attacked bushes should be destroyed, while in milder attacks frequent spraying with potassium sulphide and the pruning off and immediate destruction by fire of all the young shoots showing the mildew should be resorted to.

The gooseberry, when ripe, yields a fine wine by the fermentation of the juice with water and sugar, the resulting sparkling liquor retaining much of the flavour of the fruit. By similarly treating the juice of the green fruit, picked just before it ripens, an effervescing wine is produced, nearly resembling some kinds of champagne, and, when skilfully prepared, far superior to

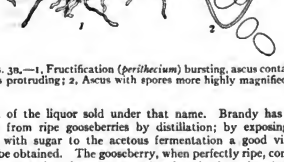

FIG. 38.—1, Fructification (*perithecium*) bursting, ascus containing spores protruding; 2, Ascus with spores more highly magnified.

much of the liquor sold under that name. Brandy has been made from ripe gooseberries by distillation; by exposing the juice with sugar to the acetous fermentation a good vinegar may be obtained. The gooseberry, when perfectly ripe, contains a large quantity of sugar, most abundant in the red and amber varieties; in the former it amounts to from 6 to upwards of 8%. The acidity of the fruit is chiefly due to malic acid.

Several other species of the sub-genus produce edible fruit, though none have as yet been brought under economic culture. Among them may be noticed *R. oxyacanthoides* and *R. Cynosbati*, abundant in Canada and the northern parts of the United States, and *R. gracile*, common along the Alleghany range. The group is a widely distributed one in the north temperate zone,—one species is found in Europe extending to the Caucasus and North Africa (Atlas Mountains), five occur in Asia and nineteen in North America, the range extending southwards to Mexico and Guatemala.

GOOTY, a town and hill fortress in southern India, in the Anantapur district of Madras, 48 m. E. of Bellary. Pop. (1901) 9682. The town is surrounded by a circle of rocky hills, connected by a wall. On the highest of these stands the citadel, 2100 ft. above sea-level and 1000 ft. above the surrounding country. Here was the stronghold of Morari Rao Ghorpade, a famous Mahratta warrior and ally of the English, who was ultimately starved into surrender by Hayder Ali in 1775.

GOPHER (*Testudo polyphemus*), the only living representative on the North American continent of the genus *Testudo* of the family *Testudinidae* or land tortoises; it occurs in the south-eastern parts of the United States, from Florida in the south to the river Savannah in the north. Its carapace, which is oblong and remarkably compressed, measures from 12-18 in. in extreme length, the shields which cover it being grooved, and of a yellow-brown colour. It is characterized by the shape of the front lobe of the plastron, which is bent upwards and extends beyond the carapace. The gopher abounds chiefly in the forests, but occasionally visits the open plains, where it does great damage, especially to the potato crops, on which it feeds. It is a nocturnal animal, remaining concealed by day in its deep burrow, and coming forth at night to feed. The eggs, five in number, almost round and 1¼ in. in diameter, are laid in a separate cavity near the entrance. The flesh of the gopher or mungofa, as it is also called, is considered excellent eating.

The name "gopher" is more commonly applied to certain small rodent mammals, particularly the pocket-gopher.

GÖPPINGEN, a town of Germany, in the kingdom of Württemberg, on the right bank of the Fils, 22 m. E.S.E. of Stuttgart on the railway to Friedrichshafen. Pop. (1905) 20,870. It possesses a castle built, partly with stones from the ruined castle of Hohenstaufen, by Duke Christopher of Württemberg in the 16th century and now used as public offices, two Evangelical churches, a Roman Catholic church, a synagogue, a classical school, and a modern school. The manufactures are considerable and include linen and woollen cloth, leather, glue, paper and toys. There are machine shops and tanneries in the town. Three m. N. of the town are the ruins of the castle of Hohenstaufen. Göppingen originally belonged to the house of Hohenstaufen, and in 1270 came into possession of the counts of Württemberg. It was surrounded by walls in 1129, and was almost entirely rebuilt after a fire in 1782.

See Pfeiffer, *Beschreibung und Geschichte der Stadt Göppingen* (1885).

GORAKHPUR, a city, district and division of the United Provinces of British India. The city is situated on the left bank of the river Rapti. Pop. (1901) 64,148. It is believed to have been founded about 1400 A.D. It is the civil headquarters of the district and was formerly a military cantonment. It consists of a number of adjacent village sites, sometimes separated by cultivated land, and most of the inhabitants are agriculturists.

The DISTRICT OF GORAKHPUR has an area of 4535 sq. m. It lies immediately south of the lower Himalayan slopes, but itself forms a portion of the great alluvial plain. Only a few sandhills break the monotony of its level surface, which is, however, intersected by numerous rivers studded with lakes and marshes. In the north and centre dense forests abound, and the whole country has a verdant appearance. The principal rivers are the Rapti, the Gogra, the Gandak and Little Gandak, the Kuana, the Rohin, the Ami and the Gunghi. Tigers are found in the north, and many other wild animals abound throughout the district. The lakes are well stocked with fish. The district is not subject to very intense heat, from which it is secured by its vicinity to the hills and the moisture of its soil. Dust-storms are rare, and cool breezes from the north, rushing down the gorges of the Himalayas, succeed each short interval of warm weather. The climate is, however, relaxing. The southern and eastern portions are as healthy as most parts of the province, but the *tarai* and forest-tracts are still subject to malaria.

Gautama Buddha, the founder of the religion bearing his name, was born, and died near the boundaries of the district. From the beginning of the 6th century the country was the scene of a continuous struggle between the Bhars and their Aryan antagonists, the Rathors. About 900 the Domhatars or military Brahmans appeared, and expelled the Rathors from the town of Gorakhpur, but they also were soon driven back by other invaders. During the 15th and 16th centuries, after the district had been desolated by incessant war, the descendants of the various conquerors held parts of the territory, and each seems to have lived quite isolated, as no bridges or roads attest any intercourse with each other. Towards the end of the 16th century Mussulmans occupied Gorakhpur town, but they interfered very little with the district, and allowed it to be controlled by the native rajas. In the middle of the 18th century a formidable foe, the Banjaras from the west, so weakened the power of the rajas that they could not resist the fiscal exactions of the Oudh officials, who plundered the country to a great extent. The district formed part of the territory ceded by Oudh to the British under the treaty of 1801. During the Mutiny it was lost for a short time, but under the friendly Gurkhas the rebels were driven out. The population in 1901 was 2,057,074, showing a decrease of 3% in the decade. The district is traversed by the main line and several branches of the Bengal & North-Western railway, and the Gandak, the Gogra and the Rapti are navigable.

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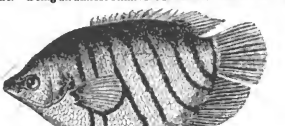
The DIVISION has an area of 9534 sq. m. The population in 1901 was 6,333,012, giving an average density of 664 persons per sq. m., being more than one to every acre, and the highest for any large tract in India.

GORAL, the native name of a small Himalayan rough-haired and cylindrical-horned ruminant classed in the same group as the chamois. Scientifically this animal is known as *Urotragus* (or *Cemas*) *goral*; and the native name is now employed as the designation of all the other members of the same genus. In addition to certain peculiarities in the form of the skull, gorals are chiefly distinguished from serows (*q.v.*) by not possessing a gland below the eye, nor a corresponding depression in the skull. Several species are known, ranging from the Himalaya to Burma, Tibet and North China. Of these, the two Himalayan gorals (*U. goral* and *U. bedfordi*) are usually found in small parties, but less commonly in pairs. They generally frequent grassy hills, or rocky ground clothed with forest; in fine weather feeding only in the mornings and evenings, but when the sky is cloudy grazing throughout the day.

GORAMY, or GOURAMY (*Osphromenus olfax*), reputed to be one of the best-flavoured freshwater fishes in the East Indian archipelago. Its original home is Java, Sumatra, Borneo and several other East Indian islands, but thence it has been transported to and acclimatized in Penang, Malacca, Mauritius and even Cayenne. Being an almost omnivorous fish and tenacious of life,



Goramy.

it seems to recommend itself particularly for acclimatization in other tropical countries; and specimens kept in captivity become as tame as carps. It attains the size of a large turbot. Its shape is flat and short, the body covered with large scales; the dorsal and anal fins are provided with numerous spines, and the ventral fins produced into long filaments. Like *Anabas*, the climbing perch, it possesses a suprabranchial accessory respiratory organ.

GÖRBERSDORF, a village and climatic health resort of Germany, in the Prussian province of Silesia, romantically situated in a deep and well-wooded valley of the Waldenburg range, 1900 ft. above the sea, 60 m. S.W. of Breslau by the railway to Friedland and 3 m. from the Austrian frontier. Pop. 700. It has four large sanatoria for consumptives, the earliest of which was founded in 1854 by Hermann Brehmer (1826–1889).

GORBODUC, a mythical king of Britain. He gave his kingdom away during his lifetime to his two sons, Ferrex and Porrex. The two quarrelled and the younger stabbed the elder. Their mother, loving the latter most, avenged his death by murdering her son, and the people, horrified at her act, revolted and murdered both her and King Gorboduc. This legend was the subject of the earliest regular English tragedy which in 1561 was played before Queen Elizabeth in the Inner Temple hall. It was written by Thomas Sackville, Lord Buckhurst and Thomas Norton in collaboration. Under the title of *Gorboduc* it was published first very corruptly in 1565, and in better form as *The Tragedy of Ferrex and Porrex* in 1570.

GORCHAKOV, or GORTCHAKOFF, a noble Russian family, descended from Michael Vsevolodovich, prince of Chernigov, who, in 1246, was assassinated by the Mongols. PRINCE ANDREY IVANOVICH (1768–1855), general in the Russian army, took a conspicuous part in the final campaigns against Napoleon. ALEXANDER IVANOVICH (1769–1825) served with distinction under his relative Suvarov in the Turkish Wars, and took part as a general officer in the Italian and Swiss operations of 1799, and in the war against Napoleon in Poland in 1806–1807 (battle of Heilsberg). PETR DMITRIEVICH (1790–1868) served under Kamenski and Kutusov in the campaign against Turkey, and afterwards against France in 1813–1814. In 1820 he suppressed an insurrection in the Caucasus, for which service he was raised to the rank of major-general. In 1828–1829 he fought under Wittgenstein against the Turks, won an action at Aidos, and signed the treaty of peace at Adrianople. In 1839 he was made governor of Eastern Siberia, and in 1851 retired into private life. When the Crimean War broke out he offered his services to the emperor Nicholas, by whom he was appointed general of the VI. army corps in the Crimea. He commanded the corps in the battles of Alma and Inkerman. He retired in 1855 and died at Moscow, on the 18th of March 1868.

PRINCE MIKHAIL DMITRIEVICH (1795–1861), brother of the last named, entered the Russian army in 1807 and took part in the campaigns against Persia in 1810, and in 1812–1815 against France. During the Russo-Turkish War of 1828–1829 he was present at the sieges of Silistria and Shumla. After being appointed, in 1830, a general officer, he was present in the campaign in Poland, and was wounded at the battle of Grochow, on the 25th of February 1831. He also distinguished himself at the battle of Ostrolenka and at the taking of Warsaw. For these services he was promoted to the rank of lieutenant-general. In 1846 he was nominated military governor of Warsaw. In 1849 he commanded the Russian artillery in the war against the Hungarians, and in 1852 he visited London as a representative of the Russian army at the funeral of the duke of Wellington. At this time he was chief of the staff of the Russian army and adjutant-general to the tsar. Upon Russia declaring war against Turkey in 1853, he was appointed commander-in-chief of the troops which occupied Moldavia and Wallachia. In 1854 he crossed the Danube and besieged Silistria, but was superseded in April by Prince Paskevich, who, however, resigned on the 8th of June, when Gorchakov resumed the command. In July the siege of Silistria was raised, and the Russian armies recrossed the Danube; in August they withdrew to Russia. In 1855 he was appointed commander-in-chief of the Russian forces in the Crimea in place of Prince Menshikov. Gorchakov's defence of Sevastopol, and final retreat to the northern part of the town, which he continued to defend till peace was signed in Paris, were conducted with skill and energy. In 1856 he was appointed governor-general of Poland in succession to Prince Paskevich. He died at Warsaw on the 30th of May 1861, and was buried, in accordance with his own wish, at Sevastopol.

PRINCE GORCHAKOV, ALEXANDER MIKHAILOVICH (1798–1883), Russian statesman, cousin of Princes Petr and Mikhail Gorchakov, was born on the 16th of July 1798, and was educated at the lyceum of Tsarskoye Selo, where he had as his poet Pushkin as a school-fellow. He became a good classical scholar, and learnt to speak and write in French with facility and elegance. Pushkin in one of his poems described young Gorchakov as "Fortune's favoured son," and predicted his success. On leaving the lyceum Gorchakov entered the foreign office under Count Nesselrode. His first diplomatic work of importance was the negotiation of a marriage between the grand duchess Olga and the crown prince Charles of Württemberg. He remained at Stuttgart for some years as Russian minister and confidential adviser of the crown princess. He foretold the outbreak of the revolutionary spirit in Germany and Austria, and was credited with counselling the abdication of Ferdinand in favour of Francis Joseph. When the German confederation was re-established in 1850 in place of the parliament of Frankfort, Gorchakov was appointed Russian minister to the diet. It was here that he first met Prince Bismarck, with whom he formed a friendship which was afterwards renewed at St Petersburg. The emperor Nicholas found that his ambassador at Vienna, Baron Meyendorff, was not a sympathetic instrument for carrying out his schemes in the East. He therefore transferred Gorchakov to Vienna, where the latter remained through the critical period of the Crimean War.

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Gorchakov perceived that Russian designs against Turkey, supported by Great Britain and France, were impracticable, and he counselled Russia to make no more useless sacrifices, but to accept the bases of a pacification. At the same time, although he attended the Paris conference of 1856, he purposely abstained from affixing his signature to the treaty of peace after that of Count Orlov, Russia's chief representative. For the time, however, he made a virtue of necessity, and Alexander II., recognizing the wisdom and courage which Gorchakov had exhibited, appointed him minister of foreign affairs in place of Count Nesselrode. Not long after his accession to office Gorchakov issued a circular to the foreign powers, in which he announced that Russia proposed, for internal reasons, to keep herself as free as possible from complications abroad, and he added the now historic phrase, "*La Russie ne boude pas; elle se recueille.*" During the Polish insurrection Gorchakov rebuffed the suggestions of Great Britain, Austria and France for assuaging the severities employed in quelling it, and he was especially acrid in his replies to Earl Russell's despatches. In July 1863 Gorchakov was appointed chancellor of the Russian empire expressly in reward for his bold diplomatic attitude towards an indignant Europe. The appointment was hailed with enthusiasm in Russia, and at that juncture Prince Chancellor Gorchakov was unquestionably the most powerful minister in Europe.

An *approchement* now began between the courts of Russia and Prussia; and in 1863 Gorchakov smoothed the way for the occupation of Holstein by the Federal troops. This seemed equally favourable to Austria and Prussia, but it was the latter power which gained all the substantial advantages; and when the conflict arose between Austria and Prussia in 1866, Russia remained neutral and permitted Prussia to reap the fruits and establish her supremacy in Germany. When the Franco-German War of 1870–71 broke out Russia answered for the neutrality of Austria. An attempt was made to form an anti-Prussian coalition, but it failed in consequence of the cordial understanding between the German and Russian chancellors. In return for Russia's service in preventing the aid of Austria from being given to France, Gorchakov looked to Bismarck for diplomatic support in the Eastern Question, and he received an instalment of the expected support when he successfully denounced the Black Sea clauses of the treaty of Paris. This was justly regarded by him as an important service to his country and one of the triumphs of his career, and he hoped to obtain further successes with the assistance of Germany, but the cordial relations between the cabinets of St Petersburg and Berlin did not subsist much longer. In 1875 Bismarck was suspected of a design of again attacking France, and Gorchakov gave him to understand, in a way which was not meant to be offensive, but which roused the German chancellor's indignation, that Russia would oppose any such scheme. The tension thus produced between the two statesmen was increased by the political complications of 1875–1878 in south-eastern Europe, which began with the Herzegovinian insurrection and culminated at the Berlin congress. Gorchakov hoped to utilize the complications in such a way as to recover, without war, the portion of Bessarabia ceded by the treaty of Paris, but he soon lost control of events, and the Slavophil agitation produced the Russo-Turkish campaign of 1877–78. By the preliminary peace of San Stefano the Slavophil aspirations seemed to be realized, but the stipulations of that peace were considerably modified by the congress of Berlin (13th June to 13th July 1878), at which the aged chancellor held nominally the post of first plenipotentiary, but left to the second plenipotentiary, Count Shuvalov, not only the task of defending Russian interests, but also the responsibility and odium for the concessions which Russia had to make to Great Britain and Austria. He had the satisfaction of seeing the lost portion of Bessarabia restored to his country by the Berlin treaty, but at the cost of greater sacrifices than he anticipated. After the congress he continued to hold the post of minister for foreign affairs, but lived chiefly abroad, and resigned formally in 1882, when he was succeeded by M. de Giers. He died at Baden-Baden on the 11th of March 1883. Prince Gorchakov devoted himself entirely to foreign affairs, and took no part in the great internal reforms of Alexander II.'s reign. As a diplomatist he displayed many brilliant qualities—adroitness in negotiation, incisiveness in argument and elegance in style. His statesmanship, though marred occasionally by personal vanity and love of popular applause, was far-seeing and prudent. In the latter part of his career his main object was to raise the prestige of Russia by undoing the results of the Crimean War, and it may fairly be said that he in great measure succeeded. (D. M. W.)

GORDIAN, or GORDIANUS, the name of three Roman emperors. The first, Marcus Antonius Gordianus Sempronianus Romanus Africanus (A.D. 159–238), an extremely wealthy man, was descended from the Gracchi and Trajan, while his wife was the great-granddaughter of Antoninus Pius. While he gained unbounded popularity by his magnificent games and shows, his prudent and retired life did not excite the suspicion of Caracalla, in whose honour he wrote a long epic called *Antoninias*. Alexander Severus called him to the dangerous honours of government in Africa, and during his proconsulship occurred the usurpation of Maximin. The universal discontent roused by the oppressive rule of Maximin culminated in a revolt in Africa in 238, and Gordian reluctantly yielded to the popular clamour and assumed the purple. His son, Marcus Antonius Gordianus (192–238), was associated with him in the dignity. The senate confirmed the choice of the Africans, and most of the provinces gladly sided with the new emperors; but, even while their cause was so successful abroad, they had fallen before the sudden inroad of Cappellianus, legatus of Numidia and a supporter of Maximin. They had reigned only thirty-six days. Both the Gordians had deserved by their amiable character their high reputation; they were men of great accomplishments, fond of literature, and voluminous authors; but they were rather intellectual voluptuaries than able statesmen or powerful rulers. Having embraced the cause of Gordian, the senate was obliged to continue the revolt against Maximin, and appointed Pupienus Maximus and Caelius Balbinus, two of its noblest and most esteemed members, as joint emperors. At their inauguration a sedition arose, and the popular outcry for a Gordian was appeased by the association with them of M. Antonius Gordianus Pius (224–244), grandson of the elder Gordian, then a boy of thirteen. Maximin forthwith invaded Italy, but was murdered by his own troops while besieging Aquileia, and a revolt of the praetorian guards, to which Pupienus and Balbinus fell victims, left Gordian sole emperor. For some time he was under the control of his mother's eunuchs, till Timesitheus,[1] his father-in-law and praefect of the praetorian guard, persuaded him to assert his independence. When the Persians under Shapur (Sapor) I. invaded Mesopotamia, the young emperor opened the temple of Janus for the last time recorded in history, and marched in person to the East. The Persians were driven back over the Euphrates and defeated in the battle of Resaena (243), and only the death of Timesitheus (under suspicious circumstances) prevented an advance into the enemy's territory. Philip the Arabian, who succeeded Timesitheus, stirred up discontent in the army, and Gordian was murdered by the mutinous soldiers in Mesopotamia.

See lives of the Gordians by Capitolinus in the *Scriptores historiae Augustae*; Herodian vii. viii.; Zosimus i. 16, 18; Ammianus Marcellinus xxiii. 5; Eutropius ix. 2; Aurelius Victor, *Caesares*, 27; article SHAPUR (I.); Pauly-Wissowa, *Realencyclopädie*, i. 2619 f. (von Rohden).

GORDIUM, an ancient city of Phrygia situated on the Persian "Royal road" from Pessinus to Ancyra, and not far from the Sangarius. It lies opposite the village Pebi, a little north of the point where the Constantinople-Angora railway crosses the Sangarius. It is not to be confused with Gordiou-kome, refounded as Juliopolis, a Bithynian town on a small tributary of the Sangarius, about 47 m. in an air-line N.W. of Gordium. According to the legend, Gordium was founded by Gordius, a Phrygian peasant who had been called to the throne by his countrymen in obedience to an oracle of Zeus commanding them to select the first person that rode up to the temple of the god in a wagon. The king afterwards dedicated his car to the god, and another

[1] For this name see footnote to SHAPUR.

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oracle declared that whoever succeeded in untying the strangely entwined knot of cornel bark which bound the yoke to the pole should reign over all Asia. Alexander the Great, according to the story, cut the knot by a stroke of his sword. Gordium was captured and destroyed by the Gauls soon after 189 B.C. and disappeared from history. In imperial times only a small village existed on the site. Excavations made in 1900 by two German scholars, G. and A. Koerte, revealed practically no remains later than the middle of the 6th century B.C. (when Phrygia fell under Persian power).

See *Jahrbuch des Instituts*, Ergänzungsheft v. (1904). (J. G. C. A.)

GORDON, the name of a Scottish family, no fewer than 157 main branches of which are traced by the family historians. A laird of Gordon, in Berwickshire, near the English border, is said to have fallen in the battle of the Standard (1138). The families of the two sons ascribed to him by tradition, Richard Gordon of Gordon and Adam Gordon of Huntly, were united by the marriage of their great-grandchildren Alicia and Sir Adam, whose grandson Sir Adam (killed at Halidon Hill, 1333) at first took the English side in the Scottish struggle for independence, and is the first member of the family definitely to emerge into history. He was justiciar of Scotland in 1310, but after Bannockburn he attached himself to Robert Bruce, who granted him in 1318 the lordship of Strathbogie in Aberdeenshire, to which Gordon gave the name of Huntly from a village on the Gordon estate in Berwickshire. He had two sons, Adam and William. The younger son, laird of Stitchel in Roxburghshire, was the ancestor of William de Gordon of Stitchel and Lochinvar, founder of the Galloway branch of the family represented in the Scottish peerage by the dormant viscounty of Kenmure (*q.v.*), created in 1633; most of the Irish and Virginian Gordons are offshoots of this stock. The elder son, Adam, inherited the Gordon-Huntly estates. He had two grandsons, Sir John (d. 1394) and Sir Adam (slain at Homildon Hill, 1403). Sir John had two illegitimate sons, Jock of Scurdargue, the ancestor of the earls of Aberdeen, and Tam of Ruthven. From these two stocks most of the northern Gordon families are derived. Sir Adam's daughter and heiress, Elizabeth, married Sir Alexander Seton, and with her husband was confirmed in 1408 in the possession of the barony of Gordon and Huntly in Berwickshire and of the Gordon lands in Aberdeen. The Seton-Gordons are their descendants. Their son Alexander was created earl of Huntly (see HUNTLY, EARLS AND MARQUESSES OF), probably in 1445; and his heirs became dukes of Gordon, George Gordon (*c.* 1650–1716), 4th marquess of Huntly, being created duke of Gordon in 1684. He had been educated in a French Catholic seminary, and served in the French army in the campaigns of 1673 to 1675. Under James II. he was made keeper of Edinburgh Castle on account of his religion, but he refused to support James's efforts to impose Roman Catholicism on his subjects. He offered little active resistance when the castle was besieged by William III.'s forces. After his submission he was more than once imprisoned on suspicion of Jacobite leanings, and was ordered by George I. to reside on parole in Edinburgh. For some time before his death he was separated from his wife Elizabeth Howard, daughter of the 6th duke of Norfolk. His son Alexander, 2nd duke of Gordon (*c.* 1678–1728), joined the Old Pretender, but gained the royal pardon after the surrender of Gordon Castle in 1716. Of his children by his wife Henrietta Mordaunt, second daughter of Charles Mordaunt, earl of Peterborough, Cosmo George (*c.* 1720–1752) succeeded as 3rd duke; Lord Lewis Gordon (d. 1754) took an active part in the Jacobite rising of 1745; and General Lord Adam Gordon (*c.* 1726–1801) became commander of the forces in Scotland in 1782, and governor of Edinburgh Castle in 1786. Lord George Gordon (*q.v.*) was a younger son of the 3rd duke.

The title, with the earldom of Norwich and the barony of Gordon Huntly, became extinct on the death of George, 5th duke (1770–1836), a distinguished soldier who raised the corps now known as the 2nd battalion of the Gordon Highlanders. The marquessate of Huntly passed to his cousin and heir-male, George, 5th earl of Aboyne. Lady Charlotte Gordon, sister of and co-heiress with the 5th duke, married Charles Lennox, 4th duke of Richmond, whose son took the name of Gordon-Lennox. The dukedom of Gordon was revived in 1876 in favour of the 6th duke of Richmond, who thenceforward was styled duke of Richmond and Gordon. Adam Gordon of Aboyne (d. 1537) took the courtesy title of earl of Sutherland in right of his wife Elizabeth, countess of Sutherland in her own right, sister of the 9th earl. The lawless and turbulent Gordons of Gight were the maternal ancestors of Lord Byron.

Among the many soldiers of fortune bearing the name of Gordon was Colonel John Gordon, one of the murderers of Wallenstein. Patrick Gordon (1635–1699) was born at Auchleuchries in Aberdeenshire, entered the service of Charles X. of Sweden in 1651 and served against the Poles. He changed sides more than once before he found his way to Moscow in 1661 and took service under the tsar Alexis. He became general in 1687; in 1688 he helped to secure Peter the Great's ascendancy; and later he crushed the revolt of the Streltzi. His diary was published in German (3 vols., 1849–1853, Moscow and St Petersburg), and selections from the English original by the Spalding Club (Aberdeen, 1859).

The Gordons fill a considerable place in Scottish legend and ballad. "Captain Car," or "Edom (Adam) of Gordon" describes an incident in the struggle between the Forbeses and Gordons in Aberdeenshire in 1571; "The Duke of Gordon's Daughter" has apparently no foundation in fact, though "Geordie" of the ballad is sometimes said to have been George, 4th earl of Huntly; "The Fire of Frendraught" goes back to a feud (1630) between James Crichton of Frendraught and William Gordon of Rothiemay; the "Gallant Gordons Gay" figure in "Chevy Chase"; William Gordon of Earlston, the Covenanter, appears in "Bothwell Bridge" &c.

See William Gordon (of old Aberdeen), *The History of the Ancient, Noble, and Illustrious House of Gordon* (2 vols., Edinburgh, 1726–1727), of which *A Concise History of the . . . House of Gordon*, by C. A. Gordon (Aberdeen, 1754) is little more than an abridgment; *The Records of Aboyne, 1230–1681*, edited by Charles, 11th marquess of Huntly, &c. (New Spalding Club, Aberdeen, 1894); *The Gordon Book*, ed. J. M. Bulloch (1902); *The House of Gordon*, ed. J. M. Bulloch (Aberdeen, vol. i., 1903); and Mr Bulloch's *The First Duke of Gordon* (1909).

GORDON, ADAM LINDSAY (1833–1870), Australian poet, was born at Fayal, in the Azores, in 1833, the son of a retired Indian officer who taught Hindustani at Cheltenham College. Young Gordon was educated there and at Merton College, Oxford, but a youthful indiscretion led to his being sent in 1853 to South Australia, where he joined the mounted police. He then became a horsebreaker, but on his father's death he inherited a fortune and obtained a seat in the House of Assembly. At this time he had the reputation of being the best non-professional steeplechase rider in the colony. In 1867 he moved to Victoria and set up a livery stable at Ballarat. Two volumes of poems, *Sea Spray and Smoke Drift* and *Ashtaroth*, were published in this year, and two years later he gave up his business and settled at New Brighton, near Melbourne. A second volume of poetry, *Bush Ballads and Galloping Rhymes*, appeared in 1870. It brought him more praise than emolument, and, thoroughly discouraged by his failure to make good his claim to some property in Scotland to which he believed himself entitled, he committed suicide on the 24th of June 1870. His reputation rose after his death, and he became the best known and most widely popular of Australian poets. Much of Gordon's poetry might have been written in England; when, however, it is really local, it is vividly so; his genuine feeling frequently kindles into passion; his versification is always elastic and sonorous, but sometimes too reminiscent of Swinburne. His compositions are almost entirely lyrical, and their merit is usually in proportion to the degree in which they partake of the character of the ballad.

Gordon's poems were collected and published in 1880 with a biographical introduction by Marcus Clarke.

GORDON, ALEXANDER (*c.* 1692–*c.* 1754), Scottish antiquary, is believed to have been born in Aberdeen in 1692. He is the "Sandy Gordon" of Scott's *Antiquary*. Of his parentage and early history nothing is known. He appears to have

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distinguished himself in classics at Aberdeen University, and to have made a living at first by teaching languages and music. When still young he travelled abroad, probably in the capacity of tutor. He returned to Scotland previous to 1726, and devoted himself to antiquarian work. In 1726 appeared the *Itinerarium Septentrionale*, his greatest and best-known work. He was already the friend of Sir John Clerk, of Penicuik, better known as Baron Clerk (a baron of the exchequer); and the baron and Roger Gale (vice-president of the Society of Antiquaries) are the "two gentlemen, the honour of their age and country," whose letters were published, without their consent it appears, as an appendix to the *Itinerarium*. Subsequently Gordon was appointed secretary to the Society for the Encouragement of Learning, with an annual salary of £50. Resigning this post, or, as there seems reason for believing, being dismissed for carelessness in his accounts, he succeeded Dr Stukeley as secretary to the Society of Antiquaries, and also acted for a short time as secretary to the Egyptian Club, an association composed of gentlemen who had visited Egypt. In 1741 he accompanied James Glen (afterwards governor), to South Carolina. Through his influence Gordon, besides receiving a grant of land in South Carolina, became registrar of the province and justice of the peace, and filled several other offices. From his will, dated the 22nd of August 1754, it appears he had a son Alexander and a daughter Frances, to whom he bequeathed most of his property, among which were portraits of himself and of friends painted by his own hand.

See Sir Daniel Wilson, *Alexander Gordon, the Antiquary*; and his Papers in the *Proceedings of the Society of Antiquaries of Scotland*, with Additional Notes and an Appendix of Original Letters by Dr David Laing (*Proc. Soc. of Antiq. of Scot.* x. 363-382).

GORDON, CHARLES GEORGE (1833–1885), British soldier and administrator, fourth son of General H. W. Gordon, Royal Artillery, was born at Woolwich on the 28th of January 1833. He received his early education at Taunton school, and was given a cadetship in the Royal Military Academy, Woolwich, in 1848. He was commissioned as second lieutenant in the corps of Royal Engineers on the 23rd of June 1852. After passing through a course of instruction at the Royal Engineers' establishment, Chatham, he was promoted lieutenant in 1854, and was sent to Pembroke dock to assist in the construction of the fortifications then being erected for the defence of Milford Haven. The Crimean War broke out shortly afterwards, and Gordon was ordered on active service, and landed at Balaklava on the 1st of January 1855. The siege of Sevastopol was in progress, and he had his full share of the arduous work in the trenches. He was attached to one of the British columns which assaulted the Redan on the 18th of June, and was also present at the capture of that work on the 8th of September. He took part in the expedition to Kinburn, and then returned to Sevastopol to superintend a portion of the demolition of the Russian dockyard. After peace with Russia had been concluded, Gordon was attached to an International commission appointed to delimit the new boundary, as fixed by treaty, between Russia and Turkey in Bessarabia; and on the conclusion of this work he was ordered to Asia Minor on similar duty, with reference to the eastern boundary between the two countries. While so employed Gordon took the opportunity to make himself well acquainted with the geography and people of Armenia, and the knowledge of dealing with eastern nations then gained was of great use to him in after life.

He returned to England towards the end of 1858, and was then selected for the appointment of adjutant and field-works instructor at the Royal Engineers' establishment, and took up his new duties at Chatham after promotion to the rank of captain in April 1859. But his stay in England was brief, for in 1860 war was declared against China, and Gordon was ordered out there, arriving at Tientsin in September. He was too late for the attack on the Taku forts, but was present at the occupation of Peking and destruction of the Summer Palace. He remained with the British force of occupation in northern China until April 1862, when the British troops, under the command of General Staveley, proceeded to Shanghai, in order to protect the European settlement at that place from the Taiping rebels. The Taiping revolt, which had some remarkable points of similarity with the Mahdist rebellion in the Sudan, had commenced in 1850 in the province of Kwangsi. The leader, Hung Sin Tsuan, a semi-political, semi-religious enthusiast, assumed the title of Tien Wang, or Heavenly King, and by playing on the feelings of the lower class of people gradually collected a considerable force. The Chinese authorities endeavoured to arrest him, but the imperialist troops were defeated. The area of revolt extended northwards through the provinces of Hunan and Hupeh, and down the valley of the Yangtsze-kiang as far as the great city of Nanking, which was captured by the rebels in 1853. Here the Tien Wang established his court, and while spending his own time in heavenly contemplation and earthly pleasures, sent the assistant Wangs on warlike expeditions through the adjacent provinces. For some years a constant struggle was maintained between the Chinese imperialist troops and the Taipings, with varying success on both sides. The latter gradually advanced eastwards, and approaching the important city of Shanghai, alarmed the European inhabitants, who subscribed to raise a mixed force of Europeans and Manila men for the defence of the town. This force, which was placed under the command of an American, Frederick Townsend Ward (1831–1862), took up a position in the country west of Shanghai to check the advance of the rebels. Fighting continued round Shanghai for about two years, but Ward's force was not altogether successful, and when General Staveley arrived from Tientsin affairs were in a somewhat critical condition. He decided to clear the district of rebels within a radius of 30 m. from Shanghai, and Gordon was attached to his staff as engineer officer. A French force, under the command of Admiral Prôtet, co-operated with Stavcley and Ward, with his little army, also assisted. Kahding, Singpo and other towns were occupied, and the country was fairly cleared of rebels by the end of 1862. Ward was, unfortunately, killed in the assault of Tseki, and his successor, Burgevine, having had a quarrel with the Chinese authorities, Li Hung Chang, the governor of the Kiang-su province, requested General Staveley to appoint a British officer to command the contingent. Staveley selected Gordon, who had been made a brevet-major in December 1862 for his previous services, and the nomination was approved by the British government. The choice was judicious as further events proved. In March 1863 Gordon proceeded to Sungkiang to take command of the force, which had received the name of "The Ever-Victorious Army," an encouraging though somewhat exaggerated title, considering its previous history. Without waiting to reorganize his troops he marched at once to the relief of Chansu, a town 40 m. north-west of Shanghai, which was invested by the rebels. The relief was successfully accomplished, and the operation established Gordon in the confidence of his troops. He then reorganized his force, a matter of no small difficulty, and advanced against Quinsan, which was captured, though with considerable loss. Gordon then marched through the country, seizing town after town from the rebels until at length the great city of Suchow was invested by his army and a body of Chinese imperialist troops. The city was taken on the 29th of November, and after its capture Gordon had a serious dispute with Li Hung Chang, as the latter had beheaded certain of the rebel leaders whose lives the former had promised to spare if they surrendered. This action, though not opposed to Chinese ethics, was so opposed to Gordon's ideas of honour that he withdrew his force from Suchow and remained inactive at Quinsan until February 1864. He then came to the conclusion that the subjugation of the rebels was more important than his dispute with Li, and visited the latter in order to arrange for further operations. By mutual consent no allusion was made to the death of the Wangs. This was a good example of one of Gordon's marked characteristics, that, though a man of strong personal feelings, he was always prepared to subdue them for the public benefit. He declined, however, to take any decoration or reward from the emperor for his services at the capture of Suchow. After

In China.

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the meeting with Li Hung Chang the "Ever-Victorious Army" again advanced and took a number of towns from the rebels, ending with Chanchufu, the principal military position of the Taipings. This fell in May, when Gordon returned to Quinsan and disbanded his force. In June the Tien Wang, seeing his cause was hopeless, committed suicide, and the capture of Nanking by the imperialist troops shortly afterwards brought the Taiping revolt to a conclusion. The suppression of this serious movement was undoubtedly due in great part to the skill and energy of Gordon, who had shown remarkable qualities as a leader of men. The emperor promoted him to the rank of Titu, the highest grade in the Chinese army, and also gave him the Yellow Jacket, the most important decoration in China. He wished to give him a large sum of money, but this Gordon refused. He was promoted lieutenant-colonel for his Chinese services, and made a Companion of the Bath. Henceforth he was often familiarly spoken of as "Chinese" Gordon.

Gordon was appointed on his return to England Commanding Royal Engineer at Gravesend, where he was employed in superintending the erection of forts for the defence of the Thames. He devoted himself with energy to his official duties, and his leisure hours to practical philanthropy. All the acts of kindness which he did for the poor during the six years he was stationed at Gravesend will never be fully known. In October 1871 he was appointed British representative on the international commission which had been constituted after the Crimean War to maintain the navigation of the mouth of the river Danube, with headquarters at Galatz. During 1872 Gordon was sent to inspect the British military cemeteries in the Crimea, and when passing through Constantinople on his return to Galatz he made the acquaintance of Nubar Pasha, prime minister of Egypt, who sounded him as to whether he would take service under the khedive. Nothing further was settled at the time, but the following year he received a definite offer from the khedive, which he accepted with the consent of the British government, and proceeded to Egypt early in 1874. He was then a colonel in the army, though still only a captain in the corps of Royal Engineers.

To understand the object of the appointment which Gordon accepted in Egypt, it is necessary to give a few facts with reference to the Sudan. In 1820–22 Nubia, Sennar and Kordofan had been conquered by Egypt, and the authority of the Egyptians was subsequently extended southward, eastward to the Red Sea and westward over Darfur (conquered by Zobeir Pasha in 1874). One result of the Egyptian occupation of the country was that the slave trade was largely developed, especially in the White Nile and Bahr-el-Ghazal districts. Captains Speke and Grant, who had travelled through Uganda and came down the White Nile in 1863, and Sir Samuel Baker, who went up the same river as far as Albert Nyanza, brought back harrowing tales of the misery caused by the slave-hunters. Public opinion was considerably moved, and in 1869 the khedive Ismail decided to send an expedition up the White Nile, with the double object of limiting the evils of the slave trade and opening up the district to commerce. The command of the expedition was given to Sir Samuel Baker, who reached Khartum in February 1870, but, owing to the obstruction of the river by the sudd or grass barrier, did not reach Gondokoro, the centre of his province, for fourteen months. He met with great difficulties, and when his four years' service came to an end little had been effected beyond establishing a few posts along the Nile and placing some steamers on the river. It was to succeed Baker as governor of the equatorial regions that the khedive asked for Gordon's services, having come to the conclusion that the latter was the most likely person to bring the affair to a satisfactory conclusion. After a short stay in Cairo, Gordon proceeded to Khartum by way of Suakin and Berber, a route which he ever afterwards regarded as the best mode of access to the Sudan. From Khartum he proceeded up the White Nile to Gondokoro, where he arrived in twenty-four days, the sudd, which had proved such an obstacle to Baker, having been removed since the departure of the latter by the Egyptian governor-general. Gordon remained in the equatorial provinces until October 1876, and then returned to Cairo. The two years and a half thus spent in Central Africa was a time of incessant toil. A line of stations was established from the Sobat confluence on the White Nile to the frontier of Uganda—to which country he proposed to open a route from Mombasa—and considerable progress was made in the suppression of the slave trade. The river and Lake Albert were mapped by Gordon and his staff, and he devoted himself with wonted energy to improving the condition of the people. Greater results might have been obtained but for the fact that Khartum and the whole of the Sudan north of the Sobat were in the hands of an Egyptian governor, independent of Gordon, and not too well disposed towards his proposals for diminishing the slave trade. On arriving in Cairo Gordon informed the khedive of his reasons for not wishing to return to the Sudan, but did not definitely resign the appointment of governor of the equatorial provinces. But on reaching London he telegraphed to the British consul-general in Cairo, asking him to let the khedive know that he would not go back to Egypt. Ismail Pasha, feeling, no doubt, that Gordon's resignation would injure his prestige, wrote to him saying that he had promised to return, and that he expected him to keep his word. Upon this Gordon, to whom the keeping of a promise was a sacred duty, decided to return to Cairo, but gave an assurance to some friends that he would not go back to the Sudan unless he was appointed governor-general of the entire country. After some discussion the khedive agreed, and made him governor-general of the Sudan, inclusive of Darfur and the equatorial provinces.

Governor-General.

One of the most important questions which Gordon had to take up on his appointment was the state of the political relations between Egypt and Abyssinia, which had been in an unsatisfactory condition for some years. The dispute centred round the district of Bogos, lying not far inland from Massawa, which both the khedive and King John of Abyssinia claimed as belonging to their respective dominions. War broke out in 1875, when an Egyptian expedition was despatched to Abyssinia, and was completely defeated by King John near Gundet. A second and larger expedition, under Prince Hassan, the son of the khedive, was sent the following year from Massawa. The force was routed by the Abyssinians at Gura, but Prince Hassan and his staff got back to Massawa. Matters then remained quiet until March 1877, when Gordon proceeded to Massawa to endeavour to make peace with King John. He went up to Bogos, and had an interview with Walad Michael, an Abyssinian chief and the hereditary ruler of Bogos, who had joined the Egyptians with a view to raiding on his own account. Gordon, with his usual powers of diplomacy, persuaded Michael to remain quiet, and wrote to the king proposing terms of peace. But he received no reply at that time, as John, feeling pretty secure on the Egyptian frontier after his two successful campaigns against the khedive's troops, had gone southwards to fight with Menelek, king of Shoa. Gordon, seeing that the Abyssinian difficulty could wait for a few months, proceeded to Khartum. Here he took up the slavery question, and proposed to issue regulations making the registration of slaves compulsory, but his proposals were not approved by the Cairo government. In the meantime an insurrection had broken out in Darfur, and Gordon proceeded to that province to relieve the Egyptian garrisons, which were considerably stronger than the force he had available, the insurgents also being far more numerous than his little army. On coming up with the main body of rebels he saw that diplomacy gave a better chance of success than fighting, and, accompanied only by an interpreter, rode into the enemy's camp to discuss the situation. This bold move, which probably no one but Gordon would have attempted, proved quite successful, as part of the insurgents joined him, and the remainder retreated to the south. The relief of the Egyptian garrisons was successfully accomplished, and Gordon visited the provinces of Berber and Dongola, whence he had again to return to the Abyssinian frontier to treat with King John. But no satisfactory settlement was arrived at, and Gordon came back to Khartum in January 1878. There he had scarcely a week's rest when the

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khedive summoned him to Cairo to assist in settling the financial affairs of Egypt. He reached Cairo in March, and was at once appointed by Ismail as president of a commission of inquiry into the finances, on the understanding that the European commissioners of the debt, who were the representatives of the bondholders, and whom Ismail regarded as interested parties, should *not* be members of the commission. Gordon accepted the post on these terms, but the consuls-general of the different powers refused to agree to the constitution of the commission, and it fell to the ground, as the khedive was not strong enough to carry his point. The attempt of the latter to utilize Gordon as a counterpoise to the European financiers having failed, Ismail fell into the hands of his creditors, and was deposed by the sultan in the following year in favour of his son Tewfik. After the conclusion of the financial episode, Gordon proceeded to the province of Harrar, south of Abyssinia, and, finding the administration in a bad condition, dismissed Raouf Pasha, the governor. He then returned to Khartum, and in 1879 went again into Darfur to pursue the slave traders, while his subordinate, Gessi Pasha, fought them with great success in the Bahr-el-Ghazal district and killed Suleiman, their leader and a son of Zobeir. This put an end to the revolt, and Gordon went back to Khartum. Shortly afterwards he went down to Cairo, and when there was requested by the new khedive to pay a visit to King John and make a definite treaty of peace with Abyssinia. Gordon had an interesting interview with the king, but was not able to do much, as the king wanted great concessions from Egypt, and the khedive's instructions were that nothing material was to be conceded. The matter ended by Gordon being made a prisoner and sent back to Massawa. Thence he returned to Cairo and resigned his Sudan appointment. He was considerably exhausted by the three years' incessant work, during which he had ridden no fewer than 8500 m. on camels and mules, and was constantly engaged in the task of trying to reform a vicious system of administration.

In March 1880 Gordon visited the king of the Belgians at Brussels, and King Leopold suggested that he should at some future date take charge of the Congo Free State.

1880-1864. In April the government of the Cape Colony telegraphed to him offering the position of commandant of the Cape local forces, but he declined the appointment. In May the marquess of Ripon, who had been given the post of governor-general of India, asked Gordon to go with him as private secretary. This he agreed to do, but a few days later, feeling that he was not suitable for the position, asked Lord Ripon to release him. The latter refused to do so, and Gordon accompanied him to India, but definitely resigned his post on Lord Ripon's staff shortly afterwards. Hardly had he resigned when he received a telegram from Sir Robert Hart, inspector-general of customs in China, inviting him to go to Peking. He started at once and arrived at Tientsin in July, where he met Li Hung Chang, and learnt that affairs were in a critical condition, and that there was risk of war with Russia. Gordon proceeded to Peking and used all his influence in favour of peace. His arguments, which were given with much plainness of speech, appear to have convinced the Chinese government, and war was avoided. Gordon returned to England, and in April 1881 exchanged with a brother officer, who had been ordered to Mauritius as Commanding Royal Engineer, but who for family reasons was unable to accept the appointment. He remained in Mauritius until the March following, when, on promotion to the rank of major-general, he had to vacate the position of Commanding Royal Engineer. Just at the same time the Cape ministry telegraphed to him to ask if he would go to the Cape to consult with the government as regards settling affairs in Basutoland. The telegram stated that the position of matters was grave, and that it was of the utmost importance that the colony should secure the services of someone of proved ability, firmness and energy. Gordon sailed at once for the Cape, and saw the governor, Sir Hercules Robinson, Mr Thos. Scanlen, the premier, and Mr. J. X. Merriman, a member of the ministry, who, for political reasons, asked him not to go to Basutoland, but to take the appointment of commandant of the colonial forces at King William's Town. After a few months, which were spent in reorganizing the colonial forces, Gordon was requested to go up to Basutoland to try to arrange a settlement with the chief Masupha, one of the most powerful of the Basuto leaders. Greatly to his surprise, at the very time he was with Masupha, Mr. J. W. Sauer, a member of the Cape government, was taking steps to induce Lerethodi, another chief, to advance against Masupha. This not only placed Gordon in a position of danger, but was regarded by him as an act of treachery. He advised Masupha not to deal with the Cape government until the hostile force was withdrawn, and resigned his appointment. He considered that the Basuto difficulty was due to the bad system of administration by the Cape government. That Gordon's views were correct is proved by the fact that a few years later Basutoland was separated from Cape Colony and placed directly under the imperial government. After his return to England from the Cape, being unemployed, Gordon decided to go to Palestine, a country he had long desired to visit. Here he remained for a year, and devoted his time to the study of Biblical history and of the antiquities of Jerusalem. The king of the Belgians then asked him to take charge of the Congo Free State, and he accepted the mission and returned to London to make the necessary preparations. But a few days after his arrival he was requested by the British government to proceed immediately to the Sudan. To understand the reasons for this, it is necessary briefly to recapitulate the course of events in that country since Gordon had left it in 1879.

After his resignation of the post of governor-general, Raouf Pasha, an official of the ordinary type, who, as already mentioned, had been dismissed by Gordon for misgovernment in 1878, was appointed to succeed him.[7] As Raouf was instructed to increase the receipts and diminish the expenditure, the system of government naturally reverted to the old methods, which Gordon had endeavoured to improve. The fact that justice and firmness were succeeded by injustice and weakness tended naturally to the outbreak of revolt, and unfortunately there was a leader ready to head a rebellion—one Mahommed Ahmed, already known for some years as a holy man, who was insulted by an Egyptian official, and retiring with some followers to the island of Abba on the White Nile, proclaimed himself as the mahdi, a successor of the prophet. Raouf endeavoured to take him prisoner but without success, and the revolt spread rapidly. Raouf was recalled, and succeeded by Abdel Kader Pasha, a much stronger governor, who had some success, but whose forces were quite insufficient to cope with the rebels. The Egyptian government was too busily engaged in suppressing Arabi's revolt to be able to send any help to Abdel Kader, and in September 1882, when the British troops entered Cairo, the position in the Sudan was very perilous. Had the British government listened to the representations then made to them, that, having conquered Egypt, it was imperative at once to suppress the revolt in the Sudan, the rebellion could have been crushed, but unfortunately Great Britain would do nothing herself, while the steps she allowed Egypt to take ended in the disaster to Hicks Pasha's expedition. Then, in December 1883, the British government saw that something must be done, and ordered Egypt to abandon the Sudan. But abandonment was a policy most difficult to carry out, as it involved the withdrawal of thousands of Egyptian soldiers, civilian employés and their families. Abdel Kader Pasha was asked to undertake the work, and he agreed on the understanding that he would be supported, and that the policy of abandonment was not to be announced. But the latter condition was refused, and he declined the task. The British government then asked General Gordon to proceed to Khartum to report on the best method of carrying out the evacuation. The mission was highly popular in England. Sir Evelyn Baring (Lord Cromer) was, however, at first opposed to Gordon's appointment. His objections were overcome, and Gordon received his instructions in London on the 18th of January 1884, and started at once for Cairo, accompanied by Lieut.-Colonel J. D. H. Stewart.

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At Cairo he received further instructions from Sir Evelyn Baring, and was appointed by the khedive as governor-general, with executive powers. Travelling by Korosko and Berber, he arrived at Khartum on the 18th of February, and was well received by the inhabitants, who believed that he had come to save the country from the rebels. Gordon at once commenced the task of sending the women and children and the sick and wounded to Egypt, and about two thousand five hundred had been removed before the mahdi's forces closed upon Khartum. At the same time he was impressed with the necessity of making some arrangement for the future government of the country, and asked for the help of Zobeir (*q.v.*), who had great influence in the Sudan, and had been detained in Cairo for some years. This request was made on the very day Gordon reached Khartum, and was in accordance with a similar proposal he had made when at Cairo. But, after delays which involved the loss of much precious time, the British government refused (13th of March) to sanction the appointment, because Zobeir had been a notorious slave-hunter. With this refusal vanished all hope of a peaceful retreat of the Egyptian garrisons. Wavering tribes went over to the mahdi. The advance of the rebels against Khartum was combined with a revolt in the eastern Sudan, and the Egyptian troops in the vicinity of Suakin met with constant defeat. At length a British force was sent to Suakin under the command of General Sir Gerald Graham, and routed the rebels in several hard-fought actions. Gordon telegraphed to Sir Evelyn Baring urging that the road from Suakin to Berber should be opened by a small force. But this request, though strongly supported by Baring and the British military authorities in Cairo, was refused by the government in London. In April General Graham and his forces were withdrawn from Suakin, and Gordon and the Sudan were seemingly abandoned to their fate. The garrison of Berber, seeing that there was no chance of relief, surrendered a month later and Khartum was completely isolated. Had it not been for the presence of Gordon the city would also soon have fallen, but with an energy and skill that were almost miraculous, he so organized the defence that Khartum held out until January 1885. When it is remembered that Gordon was of a different nationality and religion to the garrison and population, that he had only one British officer to assist him, and that the town was badly fortified and insufficiently provided with food, it is just to say that the defence of Khartum is one of the most remarkable episodes in military history. The siege commenced on the 18th of March, but it was not until August that the British government under the pressure of public opinion decided to take steps to relieve Gordon. General Stephenson, who was in command of the British troops in Egypt, wished to send a brigade at once to Dongola, but he was overruled, and it was not until the beginning of November that the British relief force was ready to start from Wadi Halfa under the command of Lord Wolseley. The force reached Korti towards the end of December, and from that place a column was despatched across the Bayuda desert to Metemma on the Nile. After some severe fighting in which the leader of the column, Sir Herbert Stewart, was mortally wounded, the force reached the river on the 20th of January, and the following day four steamers, which had been sent down by Gordon to meet the British advance, and which had been waiting for them for four months, reported to Sir Charles Wilson, who had taken command after Sir Herbert Stewart was wounded.

At Khartum.

Death.

On the 24th Wilson started with two of the steamers for Khartum, but on arriving there on the 28th he found that the place had been captured by the rebels and Gordon killed two days before. A belief has been entertained that Wilson might have started earlier and saved the town, but this is quite groundless. In the first place, Wilson could not have started sooner than he did; and in the second, even if he had been able to do so, it would have made no difference, as the rebels could have taken Khartum any time they pleased after the 5th of January, when the provisions were exhausted. Another popular notion, that the capture of the place was due to treachery on the part of the garrison, is equally without foundation. The attack was made at a point in the fortifications where the rampart and ditch had been destroyed by the rising of the Nile, and when the mahdi's troops entered the soldiers were too weak to make any effectual resistance. Gordon himself expected the town to fall before the end of December, and it is really difficult to understand how he succeeded in holding out until the 26th of January. Writing on the 14th of December he said, "Now, mark this, if the expeditionary force—and I ask for no more than two hundred men—does not come in ten days, the town may fall, and I have done my best for the honour of my country." He had indeed done his best, and far more than could have been regarded as possible. To understand what he went through during the latter months of the siege, it is only necessary to read his own journal, a portion of which, dating from 10th September to 14th December 1884, was fortunately preserved and published.

Gordon was not an author, but he wrote many short memoranda on subjects that interested him, and a considerable number of these have been utilized, especially in the work by his brother, Sir Henry Gordon, entitled *Events in the Life of Charles George Gordon, from its Beginning to its End*. He was a voluminous letter-writer, and much of his correspondence has been published. His character was remarkable, and the influence he had over those with whom he came in contact was very striking. His power to command men of non-European race was probably unique. He had no fear of death, and cared but little for the opinion of others, adhering tenaciously to the course he believed to be right in the face of all opposition. Though not holding to outward forms of religion, he was a truly religious man in the highest sense of the word, and was a constant student of the Bible. To serve God and to do his duty were the great objects of his life, and he died as he had lived, carrying out the work that lay before him to the best of his ability. The last words of his last letter to his sister, written when he knew that death was very near, sum up his character: "I am quite happy, thank God, and, like Lawrence, I have *tried* to do my duty."[1]

[1] With this estimate of Gordon's character may be contrasted those of Lord Cromer (the most severe of Gordon's critics), and of Lord Morley of Blackburn; in their strictures as in their praise they help to explain both the causes of the extraordinary influence wielded by Gordon over all sorts and conditions of men and also his difficulties. Lord Cromer's criticism, it should be remembered, does not deal with Gordon's career as a whole but solely with his last mission to the Sudan; Lord Morley's is a more general judgment.

Lord Cromer (*Modern Egypt*, vol. i., ch. xxvii., p. 565-571) says: "We may admire, and for my own part I do very much admire General Gordon's personal courage, his disinterestedness and his chivalrous feeling in favour of the beleaguered garrisons, but admiration of these qualities is no sufficient plea against a condemnation of his conduct on the ground that it was quixotic. In his last letter to his sister, dated December 14, 1884, he wrote: 'I am quite happy, thank God, and, like Lawrence, I have tried to do my duty' . . . . I am not now dealing with General Gordon's character, which was in many respects noble, or with his military defence of Khartoum, which was heroic, but with the political conduct of his mission, and from this point of view I have no hesitation in saying that General Gordon cannot be considered to have tried to do his duty unless a very strained and mistaken view be taken of what his duty was. . . . As a matter of public morality I cannot think that General Gordon's general reasoning is defensible. . . . I do not think that it can be held that General Gordon made any serious effort to carry out the main ends of British and Egyptian policy in the Sudan. He thought more of his personal opinions than of the interests of the state. . . . In fact, except personal courage, great fertility in military resource, a lively though sometimes ill-directed repugnance to injustice, oppression and meanness of every description, and a considerable power of acquiring influence over those, necessarily limited in number, in whom he was brought into personal contact, General Gordon does not appear to have possessed any of the qualities which would have fitted him to undertake the difficult task he had in hand."

Lord Morley (*Life of Gladstone*, vol. iii., 1st ed., 1903, ch. 9, p. 151) says: "Gordon, as Mr Gladstone said, was a hero of heroes. He was a soldier of infinite personal courage and daring, of striking military energy, initiative and resource; a high, pure and single character, dwelling much in the region of the unseen. But as all who knew him admit, and as his own records testify, notwithstanding an undercurrent of shrewd common sense, he was the creature, almost the sport, of impulse; his impressions and purposes changed with the speed of lightning; anger often mastered him; he went very often by intuitions and inspirations rather than by cool

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GORDON, LORD GEORGE (1751–1793), third and youngest son of Cosmo George, duke of Gordon, was born in London on the 26th of December 1751. After completing his education at Eton, he entered the navy, where he rose to the rank of lieutenant in 1772, but Lord Sandwich, then at the head of the admiralty, would not promise him the command of a ship, and he resigned his commission shortly before the beginning of the American War. In 1774 the pocket borough of Ludgershall was bought for him by General Fraser, whom he was opposing in Inverness-shire, in order to bribe him not to contest the county. He was considered flighty, and was not looked upon as being of much importance. In 1779 he organized, and made himself head of the Protestant associations, formed to secure the repeal of the Catholic Relief Act of 1778. On the 2nd of June 1780 he headed the mob which marched in procession from St George's Fields to the Houses of Parliament in order to present the monster petition against the acts. After the mob reached Westminster a terrific riot ensued, which continued several days, during which the city was virtually at their mercy. At first indeed they dispersed after threatening to make a forcible entry into the House of Commons, but reassembled soon afterwards and destroyed several Roman Catholic chapels, pillaged the private dwellings of many Roman Catholics, set fire to Newgate and broke open all the other prisons, attacked the Bank of England and several other public buildings, and continued the work of violence and conflagration until the interference of the military, by whom no fewer than 450 persons were killed and wounded before the riots were quelled. For his share in instigating the riots Lord Gordon was apprehended on a charge of high treason; but, mainly through the skilful and eloquent defence of Erskine, he was acquitted on the ground that he had no treasonable intentions. His life was henceforth full of crack-brained schemes, political and financial. In 1786 he was excommunicated by the archbishop of Canterbury for refusing to bear witness in an ecclesiastical suit; and in 1787 he was convicted of libelling the queen of France, the French ambassador and the administration of justice in England. He was, however, permitted to withdraw from the court without bail, and made his escape to Holland; but on account of representations from the court of Versailles he was commanded to quit that country, and, returning to England, was apprehended, and in January 1788 was sentenced to five years' imprisonment in Newgate, where he lived at his ease, giving dinners and dances. As he could not obtain securities for his good behaviour on the termination of his term of imprisonment, he was not allowed to leave Newgate, and there he died of delirious fever on the 1st of November 1793. Some time before his apprehension he had become a convert to Judaism, and had undergone the initiatory rite.

A serious defence of most of his eccentricities is undertaken in *The Life of Lord George Gordon, with a Philosophical Review of his Political Conduct*, by Robert Watson, M.D. (London, 1795). The best accounts of Lord George Gordon are to be found in the *Annual Registers* from 1780 to the year of his death.

GORDON, SIR JOHN WATSON (1788–1864), Scottish painter, was the eldest son of Captain Watson, R.N., a cadet of the family of Watson of Overmains, in the county of Berwick. He was born in Edinburgh in 1788, and was educated specially with a view to his joining the Royal Engineers. He entered as a student in the government school of design, under the management of the Board of Manufactures. His natural taste for art quickly developed itself, and his father was persuaded to allow him to adopt it as his profession. Captain Watson was himself a skilful draughtsman, and his brother George Watson, afterwards president of the Scottish Academy, stood high as a portrait painter, second only to Sir Henry Raeburn, who also was a friend of the family. In the year 1808 John sent to the exhibition of the Lyceum in Nicolson Street a subject from the *Lay of the Last Minstrel*, and continued for some years to exhibit fancy subjects; but, although freely and sweetly painted, they were altogether without the force and character which stamped his portrait pictures as the works of a master. After the death of Sir Henry Raeburn in 1823, he succeeded to much of his practice. He assumed in 1826 the name of Gordon. One of the earliest of his famous sitters was Sir Walter Scott, who sat for a first portrait in 1820. Then came J. G. Lockhart in 1821; Professor Wilson, 1822 and 1850, two portraits; Sir Archibald Alison, 1830; Dr Chalmers, 1844; a little later De Quincey, and Sir David Brewster, 1864. Among his most important works may be mentioned the earl of Dalhousie (1833), in the Archers' Hall, Edinburgh; Sir Alexander Hope (1835), in the county buildings, Linlithgow; Lord President Hope, in the Parliament House; and Dr Chalmers. These, unlike his later works, are generally rich in colour. The full length of Dr Brunton (1844), and Dr Lee, the principal of the university (1846), both on the staircase of the college library, mark a modification of his style, which ultimately resolved itself into extreme simplicity, both of colour and treatment.

During the last twenty years of his life he painted many distinguished Englishmen who came to Edinburgh to sit to him. And it is significant that David Cox, the landscape painter, on being presented with his portrait, subscribed for by many friends, chose to go to Edinburgh to have it executed by Watson Gordon, although he neither knew the painter personally nor had ever before visited the country. Among the portraits painted during this period, in what may be termed his third style, are De Quincey, in the National Portrait Gallery, London; General Sir Thomas Macdougall Brisbane, in the Royal Society; the prince of Wales, Lord Macaulay, Sir M. Packington, Lord Murray, Lord Cockburn, Lord Rutherford and Sir John Shaw Lefevre, in the Scottish National Gallery. These latter pictures are mostly clear and grey, sometimes showing little or no positive colour, the flesh itself being very grey, and the handling extremely masterly, though never obtruding its cleverness. He was very successful in rendering acute observant character. A good example of his last style, showing pearly flesh-painting freely handled, yet highly finished, is his head of Sir John Shaw Lefevre.

John Watson Gordon was one of the earlier members of the Royal Scottish Academy, and was elected its president in 1850; he was at the same time appointed limner for Scotland to the queen, and received the honour of knighthood. Since 1841 he had been an associate of the Royal Academy, and in 1851 he was elected a royal academician. He died on the 1st of June 1864.

inference from carefully surveyed fact; with many variations of mood he mixed, as we often see in people less famous, an invincible faith in his own rapid prepossessions while they lasted. Everybody now discerns that to despatch a soldier of this temperament on a piece of business [the mission to the Sudan in 1884] that was not only difficult and dangerous, as Sir E. Baring said, but profoundly obscure, and needing vigilant sanity and self-control, was little better than to call in a wizard with his magic. Mr Gladstone always professed perplexity in understanding why the violent end of the gallant Cavagnari in Afghanistan stirred the world so little in comparison with the fate of Gordon. The answer is that Gordon seized the imagination of England, and seized it on its higher side. His religion was eccentric, but it was religion; the Bible was the rock on which he founded himself, both old dispensation and new; he was known to hate forms, ceremonies and all the 'solemn plausibilities'; his speech was sharp, pithy, rapid and ironic; above all, he knew the ways of war and would not bear the sword for nought."

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GORDON, LEON, originally **JUDAH LOEB BEN ASHER** (1831–1892), Russian-Jewish poet and novelist (Hebrew), was born at Wilna in 1831 and died at St Petersburg in 1892. He took a leading part in the modern revival of the Hebrew language and culture. His satires did much to rouse the Russian Jews to a new sense of the reality of life, and Gordon was the apostle of enlightenment in the Ghettos. His Hebrew style is classical and pure. His poems were collected in four volumes, *Kol Shire Yehudah* (St Petersburg, 1883–1884); his novels in *Kol Kithbe Yehuda* (Odessa, 1889).

For his works see *Jewish Quarterly Review*, xviii. 437 seq.

GORDON, PATRICK (1635–1699), Russian general, was descended from a Scottish family of Aberdeenshire, who possessed the small estate of Auchleuchries, and were connected with the house of Haddo. He was born in 1635, and after completing his education at the parish schools of Cruden and Ellon, entered, in his fifteenth year, the Jesuit college at Braunsberg, Prussia; but, as "his humour could not endure such a still and strict way of living," he soon resolved to return home. He changed his mind, however, before re-embarking, and after journeying on foot in several parts of Germany, ultimately, in 1655, enlisted at Hamburg in the Swedish service. In the course of the next five years he served alternately with the Poles and Swedes as he was taken prisoner by either. In 1661, after further experience as a soldier of fortune, he took service in the Russian army under Alexis I., and in 1665 he was sent on a special mission to England. After his return he distinguished himself in several wars against the Turks and Tatars in southern Russia, and in recognition of his services he in 1678 was made major-general, in 1679 was appointed to the chief command at Kiev, and in 1683 was made lieutenant-general. He visited England in 1686, and in 1687 and 1689 took part as quartermaster-general in expeditions against the Crim Tatars in the Crimea, being made full general for his services, in spite of the denunciations of the Greek Church to which, as a heretic, he was exposed. On the breaking out of the revolution in Moscow in 1689, Gordon with the troops he commanded virtually decided events in favour of the tsar Peter I., and against the tsaritsa Sophia. He was therefore during the remainder of his life in high favour with the tsar, who confided to him the command of his capital during his absence from Russia, employed him in organizing his army according to the European system, and latterly raised him to the rank of general-in-chief. He died on the 29th of November 1699. The tsar, who had visited him frequently during his illness, was with him when he died, and with his own hands closed his eyes.

General Gordon left behind him a diary of his life, written in English. This is preserved in MS. in the archives of the Russian foreign office. A complete German translation, edited by Dr Maurice Posselt (*Tagebuch des Generals Patrick Gordon*) was published, the first volume at Moscow in 1849, the second at St Petersburg in 1851, and the third at St Petersburg in 1853; and *Passages from the Diary of General Patrick Gordon of Auchleuchries* (1635–1699), was printed, under the editorship of Joseph Robertson, for the Spalding Club, Aberdeen, 1859.

GORDON-CUMMING, ROUALEYN GEORGE (1820–1866), Scottish traveller and sportsman, known as the "lion hunter," was born on the 15th of March 1820. He was the second son of Sir William G. Gordon-Cumming, 2nd baronet of Altyre and Gordonstown, Elginshire. From his early years he was distinguished by his passion for sport. He was educated at Eton, and at eighteen joined the East India Co.'s service as a cornet in the Madras Light Cavalry. The climate of India not suiting him, after two years' experience he retired from the service and returned to Scotland. During his stay in the East he had laid the foundation of his collection of hunting trophies and specimens of natural history. In 1843 he joined the Cape Mounted Rifles, but for the sake of absolute freedom sold out at the end of the year and with an ox wagon and a few native followers set out for the interior. He hunted chiefly in Bechuanaland and the Limpopo valley, regions then swarming with big game. In 1848 he returned to England. The story of his remarkable exploits is vividly told in his book, *Five Years of a Hunter's Life in the Far Interior of South Africa* (London, 1850, 3rd ed. 1851). Of this volume, received at first with incredulity by stay-at-home critics, David Livingstone, who furnished Gordon-Cumming with most of his native guides, wrote: "I have no hesitation in saying that Mr Cumming's book conveys a truthful idea of South African hunting" (*Missionary Travels*, chap. vii.). His collection of hunting trophies was exhibited in London in 1851 at the Great Exhibition, and was illustrated by a lecture delivered by Gordon-Cumming. The collection, known as "The South Africa Museum," was afterwards exhibited in various parts of the country. In 1858 Gordon-Cumming went to live at Fort Augustus on the Caledonian Canal, where the exhibition of his trophies attracted many visitors. He died there on the 24th of March 1866.

An abridgment of his book was published in 1856 under the title of *The Lion Hunter of South Africa*, and in this form was frequently reprinted, a new edition appearing in 1904.

GORE, CATHERINE GRACE FRANCES (1799–1861), English novelist and dramatist, the daughter of Charles Moody, a wine-merchant, was born in 1799 at East Retford, Nottinghamshire. In 1823 she was married to Captain Charles Gore; and, in the next year, she published her first work, *Theresa Marchmont, or the Maid of Honour*. Then followed, among others, the *Lettre de Cachet* (1827), *The Reign of Terror* (1827), *Hungarian Tales* (1829), *Manners of the Day* (1830), *Mothers and Daughters* (1831), and *The Fair of May Fair* (1832), *Mrs Armytage* (1836). Every succeeding year saw several volumes from her pen: *The Cabinet Minister* and *The Courtier of the Days of Charles II.*, in 1839; *Preferment* in 1840. In 1841 *Cecil, or the Adventures of a Coxcomb*, attracted considerable attention. *Greville, or a Season in Paris* appeared in the same year; then *Ormington, or Cecil a Peer*, *Fascination*, *The Ambassador's Wife*; and in 1843 *The Banker's Wife*. Mrs Gore continued to write, with unfailing fertility of invention, till her death on the 29th of January 1861. She also wrote some dramas of which the most successful was the *School for Coquettes*, produced at the Haymarket (1831). She was a woman of versatile talent, and set to music Burns's "And ye shall walk in silk attire," one of the most popular songs of her day. Her extraordinary literary industry is proved by the existence of more than seventy distinct works. Her best novels are *Cecil, or the Adventures of a Coxcomb*, and *The Banker's Wife*. *Cecil* gives extremely vivid sketches of London fashionable life, and is full of happy epigrammatic touches. For the knowledge of London clubs displayed in it Mrs Gore was indebted to William Beckford, the author of *Vathek*. *The Banker's Wife* is distinguished by some clever studies of character, especially in the persons of Mr Hamlyn, the cold calculating money-maker, and his warm-hearted country neighbour, Colonel Hamilton.

Mrs Gore's novels had an immense temporary popularity; they were parodied by Thackeray in *Punch*, in his "Lords and Liveries by the author of *Dukes and Déjeuners*"; but, tedious as they are to present-day readers, they presented on the whole faithful pictures of the contemporary life and pursuits of the English upper classes.

GORE, CHARLES (1853–), English divine, was born in 1853, the 3rd son of the Hon. Charles Alexander Gore, brother of the 4th earl of Arran. His mother was a daughter of the 4th earl of Bessborough. He was educated at Harrow and at Balliol College, Oxford, and was elected fellow of Trinity College in 1875. From 1880 to 1883 he was vice-principal of the theological college at Cuddesdon, and, when in 1884 Pusey House was founded at Oxford as a home for Dr Pusey's library and a centre for the propagation of his principles, he was appointed principal, a position which he held until 1893. As principal of Pusey House Mr Gore exercised a wide influence over undergraduates and the younger clergy, and it was largely, if not mainly, under this influence that the "Oxford Movement" underwent a change which to the survivors of the old school of Tractarians seemed to involve a break with its basic principles. "Puseyism" had been in the highest degree conservative, basing itself on authority and tradition, and repudiating any compromise with the modern critical and liberalizing spirit. Mr Gore, starting from the same

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basis of faith and authority, soon found from his practical experience in dealing with the "doubts and difficulties" of the younger generation that this uncompromising attitude was untenable, and set himself the task of reconciling the principle of authority in religion with that of scientific authority by attempting to define the boundaries of their respective spheres of influence. To him the divine authority of the Catholic Church was an axiom, and in 1889 he published two works, the larger of which, *The Church and the Ministry*, is a learned vindication of the principle of Apostolic Succession in the episcopate against the Presbyterians and other Protestant bodies, while the second, *Roman Catholic Claims*, is a defence, couched in a more popular form, of the Anglican Church and Anglican orders against the attacks of the Romanists.

So far his published views had been in complete consonance with those of the older Tractarians. But in 1890 a great stir was created by the publication, under his editorship, of *Lux Mundi*, a series of essays by different writers, being an attempt "to succour a distressed faith by endeavouring to bring the Christian Creed into its right relation to the modern growth of knowledge, scientific, historic, critical; and to modern problems of politics and ethics." Mr Gore himself contributed an essay on "The Holy Spirit and Inspiration." The book, which ran through twelve editions in a little over a year, met with a somewhat mixed reception. Orthodox churchmen, Evangelical and Tractarian alike, were alarmed by views on the incarnate nature of Christ that seemed to them to impugn his Divinity, and by concessions to the Higher Criticism in the matter of the inspiration of Holy Scriptures which appeared to them to convert the "impregnable rock," as Gladstone had called it, into a foundation of sand; sceptics, on the other hand, were not greatly impressed by a system of defence which seemed to draw an artificial line beyond which criticism was not to advance. None the less the book produced a profound effect, and that far beyond the borders of the English Church, and it is largely due to its influence, and to that of the school it represents, that the High Church movement developed thenceforth on "Modernist" rather than Tractarian lines.

In 1891 Mr Gore was chosen to deliver the Bampton lectures before the university, and chose for his subject the Incarnation. In these lectures he developed the doctrine, the enunciation of which in *Lux Mundi* had caused so much heart-searching. This is an attempt to explain how it came that Christ, though incarnate God, could be in error, *e.g.* in his citations from the Old Testament. The orthodox explanation was based on the principle of accommodation (*q.v.*). This, however, ignored the difficulty that if Christ during his sojourn on earth was not subject to human limitations, especially of knowledge, he was not a man as other men, and therefore not subject to their trials and temptations. This difficulty Gore sought to meet through the doctrine of the *κένωσις*. Ever since the Pauline epistles had been received into the canon theologians had, from various points of view, attempted to explain what St Paul meant when he wrote of Christ (2 Phil. ii. 7) that "he emptied himself and took upon him the form of a servant" (*ἑαυτὸν ἐκένωσεν μορφὴν δούλου λαβών*). According to Mr Gore this means that Christ, on his incarnation, became subject to all human limitations, and had, so far as his life on earth was concerned, stripped himself of all the attributes of the Godhead, including the Divine omniscience, the Divine nature being, as it were, hidden under the human.[1]

Lux Mundi and the Bampton lectures led to a situation of some tension which was relieved when in 1893 Dr Gore resigned his principalship and became vicar of Radley, a small parish near Oxford. In 1894 he became canon of Westminster. Here he gained commanding influence as a preacher and in 1898 was appointed one of the court chaplains. In 1902 he succeeded J. J. S. Perowne as bishop of Worcester and in 1905 was installed bishop of Birmingham, a new see the creation of which had been mainly due to his efforts. While adhering rigidly to his views on the divine institution of episcopacy as essential to the Christian Church, Dr Gore from the first cultivated friendly relations with the ministers of other denominations, and advocated co-operation with them in all matters when agreement was possible. In social questions he became one of the leaders of the considerable group of High Churchmen known, somewhat loosely, as Christian Socialists. He worked actively against the sweating system, pleaded for European intervention in Macedonia, and was a keen supporter of the Licensing Bill of 1908. In 1892 he founded the clerical fraternity known as the Community of the Resurrection. Its members are priests, who are bound by the obligation of celibacy, live under a common rule and with a common purse. Their work is pastoral, evangelistic, literary and educational. In 1898 the House of the Resurrection at Mirfield, near Huddersfield, became the centre of the community; in 1903 a college for training candidates for orders was established there, and in the same year a branch house, for missionary work, was set up in Johannesburg in South Africa.

Dr Gore's works include *The Incarnation* (Bampton Lectures, 1891), *The Creed of the Christian* (1895), *The Body of Christ* (1901), *The New Theology and the Old Religion* (1908), and expositions of *The Sermon on the Mount* (1896), *Ephesians* (1898), and *Romans* (1899), while in 1910 he published *Orders and Unity*.

GORE. (1) (O. Eng. *gor*, dung or filth), a word formerly used in the sense of dirt, but now confined to blood that has thickened after being shed. (2) (O. Eng. *gāra*, probably connected with *gare*, an old word for "spear"), something of triangular shape, resembling therefore a spear-head. The word is used for a tapering strip of land, in the "common or open field" system of agriculture, where from the shape of the land the acre or half-acre strips could not be portioned out in straight divisions. Similarly "gore" is used in the United States, especially in Maine and Vermont, for a strip of land left out in surveying when divisions are made and boundaries marked. The triangular sections of material used in forming the covering of a balloon or an umbrella are also called "gores," and in dressmaking the term is used for a triangular piece of material inserted in a dress to adjust the difference in widths. To gore, *i.e.* to stab or pierce with any sharp instrument, but more particularly used of piercing with the horns of a bull, is probably directly connected with *gare*, a spear.

GOREE, an island off the west coast of Africa, forming part of the French colony of Senegal. It lies at the entrance of the large natural harbour formed by the peninsula of Cape Verde. The island, some 900 yds. long by 330 broad, and 3 m. distant from the nearest point of the mainland, is mostly barren rock. The greater part of its surface is occupied by a town, formerly a thriving commercial entrepôt and a strong military post. Until 1906 it was a free port. With the rise of Dakar (*q.v.*), *c.* 1860, on the adjacent coast, Goree lost its trade and its inhabitants, mostly Jolofs, had dwindled in 1905 to about 1500. Its healthy climate, however, makes it useful as a sanatorium. The streets are narrow, and the houses, mainly built of dark-red stone, are flat-roofed. The castle of St Michael, the governor's residence, the hospital and barracks, testify to the former importance of the town. Within the castle is an artesian well, the only water-supply, save that collected in rain tanks, on the island. Goree was first occupied by the Dutch, who took possession of it early in the 17th century and called it Goeree or Goedereede, in memory of the island on their own coast now united with Overflakkee. Its native name is Bir, *i.e.* a belly, in allusion to its shape. It was captured by the English under Commodore (afterwards Admiral Sir Robert) Holmes in 1663, but retaken in the following year by de Ruyter. The Dutch were finally expelled in 1677 by the French under Admiral d'Estrées. Goree subsequently fell again into the hands of the English, but was definitely occupied by France in 1817 (see SENEGAL: *History*).

GORGE, strictly the French word for the throat considered externally. Hence it is applied in falconry to a hawk's crop,

[1] Cf. the Lutheran theologian Ernst Sartorius in his *Lehre von der heiligen Liebe* (1844), *Lehre* ii. pp. 21 et seq.: "the Son of God veils his all-seeing eye and descends into human darkness and as child of man opens his eye as the gradually growing light of the world of humanity, until at the right hand of the Father he allows it to shine forth in all its glory." See Loofs, Art. "Kenosis" in Herzog-Hauck, *Realencyklopädie* (ed. 1901), x. 247.

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and thus, with the sense of something greedy or ravenous, to food given to a hawk and to the contents of a hawk's crop or stomach. It is from this sense that the expression of a person's "gorge rising at" anything in the sense of loathing or disgust is derived. "Gorge," from analogy with "throat," is used with the meaning of a narrow opening as of a ravine or valley between hills; in fortification, of the neck of an outwork or bastion; and in architecture, of the narrow part of a Roman Doric column, between the echinus and the astragal. From "gorge" also comes a diminutive "gorget," a portion of a woman's costume in the middle ages, being a close form of wimple covering the neck and upper part of the breast, and also that part of the body armour covering the neck and collar-bone (see GORGET). The word "gorgeous," of splendid or magnificent appearance, comes from the O. Fr. *gorgias*, with the same meaning, and has very doubtfully been connected with gorge, a ruffle or neck-covering, of a supposed elaborate kind.

GÖRGEI, ARTHUR (1818–), Hungarian soldier, was born at Toporcz, in Upper Hungary, on the 30th of January 1818. He came of a Saxon noble family who were converts to Protestantism. In 1837 he entered the Bodyguard of Hungarian Nobles at Vienna, where he combined military service with a course of study at the university. In 1845, on the death of his father, he retired from the army and devoted himself to the study of chemistry at Prague, after which he retired to the family estates in Hungary. On the outbreak of the revolutionary war of 1848, Görgei offered his sword to the Hungarian government. Entering the Honvéd army with the rank of captain, he was employed in the purchase of arms, and soon became major and commandant of the national guards north of the Theiss. Whilst he was engaged in preventing the Croatian army from crossing the Danube, at the island of Csepel, below Pest, the wealthy Hungarian magnate Count Eugene Zichy fell into his hands, and Görgei caused him to be arraigned before a court-martial on a charge of treason and immediately hanged. After various successes over the Croatian forces, of which the most remarkable was that at Ozora, where 10,000 prisoners fell into his hands, Görgei was appointed commander of the army of the Upper Danube, but, on the advance of Prince Windischgrätz across the Leitha, he resolved to fall back, and in spite of the remonstrances of Kossuth he held to his resolution and retreated upon Waitzen. Here, irritated by what he considered undue interference with his plans, he issued (January 5th, 1849) a proclamation throwing the blame for the recent want of success upon the government, thus virtually revolting against their authority. Görgei retired to the Hungarian Ergebirge and conducted operations on his own initiative. Meanwhile the supreme command had been conferred upon the Pole Dembinski, but the latter fought without success the battle of Kapolna, at which action Görgei's corps arrived too late to take an effective part, and some time after this the command was again conferred upon Görgei. The campaign in the spring of 1849 was brilliantly conducted by him, and in a series of engagements, he defeated Windischgrätz. In April he won the victories of Gödöllö Izaszeg and Nagy Sarló, relieved Komorn, and again won a battle at Acs or Waitzen. Had he followed up his successes by taking the offensive against the Austrian frontier, he might perhaps have dictated terms in the Austrian capital itself. As it was, he contented himself with reducing Ofen, the Hungarian capital, in which he desired to re-establish the diet, and after effecting this capture he remained inactive for some weeks. Meanwhile, at a diet held at Debreczin, Kossuth had formally proposed the dethronement of the Habsburg dynasty and Hungary had been proclaimed a republic. Görgei had refused the field-marshal's bâton offered him by Kossuth and was by no means in sympathy with the new régime. However, he accepted the portfolio of minister of war, while retaining the command of the troops in the field. The Russians had now intervened in the struggle and made common cause with the Austrians; the allies were advancing into Hungary on all sides, and Görgei was defeated by Haynau at Pered (20th–21st of June). Kossuth, perceiving the impossibility of continuing the struggle and being unwilling himself to make terms, resigned his position as dictator, and was succeeded by Görgei, who meanwhile had been fighting hard against the various columns of the enemy. Görgei, convinced that he could not break through the enemy's lines, surrendered, with his army of 20,000 infantry and 2000 cavalry, to the Russian general Rüdiger at Vilagos. Görgei was not court-martialled, as were his generals, but kept in confinement at Klagenfurt, where he lived, chiefly employed in chemical work, until 1867, when he was pardoned and returned to Hungary. The surrender, and particularly the fact that his life was spared while his generals and many of his officers and men were hanged or shot, led, perhaps naturally, to his being accused of treason by public opinion of his countrymen. After his release he played no further part in public life. Even in 1885 an attempt which was made by a large number of his old comrades to rehabilitate him was not favourably received in Hungary. After some years' work as a railway engineer he retired to Visegrád, where he lived thenceforward in retreat. (See also HUNGARY: *History*.)

General Görgei wrote a justification of his operations (*Mein Leben und Wirken in Ungarn 1848-1850*, Leipzig, 1852), an anonymous paper under the title *Was verdanken wir der Revolution?* (1875), and a reply to Kossuth's charges (signed "Joh. Demár") in *Budapesti Szemle*, 1881, 25-26. Amongst those who wrote in his favour were Captain Stephan Görgei (*1848 és 1849 ből*, Budapest, 1885), and Colonel Aschermann (*Ein offenes Wort in der Sache des Honvéd-Generals Arthur Görgei*, Klausenburg, 1867).

See also A. G. Horn, *Görgei, Oberkommandant d. ung. Armee* (Leipzig, 1850); Kinety, *Görgei's Life and Work in Hungary* (London, 1853); Szinyei, in *Magyár Irók* (iii. 1378), Hentaller, *Gorgei as a Statesman* (Hungarian); Elemár, *Görgei in 1848–1849* (Hungarian, Budapest, 1886).

GORGES, SIR FERDINANDO (*c.* 1566–1647), English colonial pioneer in America and the founder of Maine, was born in Somersetshire, England, probably in 1566. From youth both a soldier and a sailor, he was a prisoner in Spain at the age of twenty-one, having been captured by a ship of the Spanish Armada. In 1589 he was in command of a small body of troops fighting for Henry IV. of France, and after distinguishing himself at the siege of Rouen was knighted there in 1591. In 1596 he was commissioned captain and keeper of the castle and fort at Plymouth and captain of St Nicholas Isle; in 1597 he accompanied Essex on the expedition to the Azores; in 1599 assisted him in the attempt to suppress the Tyrone rebellion in Ireland, and in 1600 was implicated in Essex's own attempt at rebellion in London. In 1603, on the accession of James I., he was suspended from his post at Plymouth, but was restored in the same year and continued to serve as "governor of the forts and island of Plymouth" until 1629, when, his garrison having been without pay for three and a half years, his fort a ruin, and all his applications for aid having been ignored, he resigned. About 1605 he began to be greatly interested in the New World; in 1606 he became a member of the Plymouth Company, and he laboured zealously for the founding of the Popham colony at the mouth of the Sagadahoc (now the Kennebec) river in 1607. For several years following the failure of that enterprise in 1608 he continued to fit out ships for fishing, trading and exploring, with colonization as the chief end in view. He was largely instrumental in procuring the new charter of 1620 for the Plymouth Company, and was at all times of its existence perhaps the most influential member of that body. He was the recipient, either solely or jointly, of several grants of territory from it, for one of which he received in 1639 the royal charter of Maine (see MAINE). In 1615 he sought to be appointed governor-general of all New England, but the English Civil War—in which he espoused the royal cause—prevented him from ever actually holding that office. A short time before his death at Long Ashton in 1647 he wrote his *Briefe Narration of the Originall Undertakings of the Advancement of Plantations into the Parts of America*. He was an advocate, especially late in life, of the feudal type of colony.

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See J. P. Baxter (ed.), *Sir Ferdinando Gorges and his Province of Maine* (3 vols., Boston, 1890; in the Prince Society Publications), the first volume of which is a memoir of Gorges, and the other volumes contain a reprint of the *Briefe Narration*, Gorges's letters, and other documentary material.

GORGET (O. Fr. *gorgete*, dim. of *gorge*, throat), the name applied after about 1480 to the collar-piece of a suit of armour. It was generally formed of small overlapping rings of plate, and attached either to the body armour or to the armet. It was worn in the 16th and 17th centuries with the half-armour, with the plain cuirass, and even occasionally without any body armour at all. During these times it gradually became a distinctive badge for officers, and as such it survived in several armies—in the form of a small metal plate affixed to the front of the collar of the uniform coat—until after the Napoleonic wars. In the German army to-day a gorget-plate of this sort is the distinctive mark of military police, while the former officer's gorget is represented in British uniforms by the red patches or tabs worn on the collar by staff officers and by the white patches of the midshipmen in the Royal Navy.

GORGIAS (*c.* 483–375 B.C.), Greek sophist and rhetorician, was a native of Leontini in Sicily. In 427 he was sent by his fellow-citizens at the head of an embassy to ask Athenian protection against the aggression of the Syracusans. He subsequently settled in Athens, and supported himself by the practice of oratory and by teaching rhetoric. He died at Larissa in Thessaly. His chief claim to recognition consists in the fact that he transplanted rhetoric to Greece, and contributed to the diffusion of the Attic dialect as the language of literary prose. He was the author of a lost work *On Nature or the Non-existent* (Περὶ τοῦ μὴ ὄντος ἢ περὶ φύσεως, fragments edited by M. C. Valeton, 1876), the substance of which may be gathered from the writings of Sextus Empiricus, and also from the treatise (ascribed to Theophrastus) *De Melisso, Xenophane, Gorgia*. Gorgias is the central figure in the Platonic dialogue *Gorgias*. The genuineness of two rhetorical exercises (*The Encomium of Helen* and *The Defence of Palamedes*, edited with Antiphon by F. Blass in the Teubner series, 1881), which have come down under his name, is disputed.

For his philosophical opinions see Sophists and Scepticism. See also Gomperz, *Greek Thinkers*, Eng. trans. vol. i. bk. iii. chap. vii.; Jebb's *Attic Orators*, introd. to vol. i. (1893); F. Blass, *Die attische Beredsamkeit*, i. (1887); and article Rhetoric.

GORGON, GORGONS (Gr. Γοργώ, Γοργόνες, the "terrible," or, according to some, the "loud-roaring"), a figure or figures in Greek mythology. Homer speaks of only one Gorgon, whose head is represented in the *Iliad* (v. 741) as fixed in the centre of the aegis of Zeus. In the *Odyssey* (xi. 633) she is a monster of the under-world. Hesiod increases the number of Gorgons to three—Stheno (the mighty), Euryale (the far-springer) and Medusa (the queen), and makes them the daughters of the sea-god Phorcys and of Keto. Their home is on the farthest side of the western ocean; according to later authorities, in Libya (Hesiod, *Theog.* 274; Herodotus ii. 91; Pausanias ii. 21). The Attic tradition, reproduced in Euripides (*Ion* 1002), regarded the Gorgon as a monster, produced by Gaea to aid her sons the giants against the gods and slain by Athena (the passage is a *locus classicus* on the aegis of Athena).

The Gorgons are represented as winged creatures, having the form of young women; their hair consists of snakes; they are round-faced, flat-nosed, with tongues lolling out and large projecting teeth. Sometimes they have wings of gold, brazen claws and the tusks of boars. Medusa was the only one of the three who was mortal; hence Perseus was able to kill her by cutting off her head. From the blood that spurted from her neck sprang Chrysaor and Pegasus, her two sons by Poseidon. The head, which had the power of turning into stone all who looked upon it, was given to Athena, who placed it in her shield; according to another account, Perseus buried it in the market-place of Argos. The hideously grotesque original type of the Gorgoneion, as the Gorgon's head was called, was placed on the walls of cities, and on shields and breastplates to terrify an enemy (cf. the hideous faces on Chinese soldiers' shields), and used generally as an amulet, a protection against the evil eye. Heracles is said to have obtained a lock of Medusa's hair (which possessed the same powers as the head) from Athena and given it to Sterope, the daughter of Cepheus, as a protection for the town of Tegea against attack (Apollodorus ii. 7. 3). According to Roscher, it was supposed, when exposed to view, to bring on a storm, which put the enemy to flight. Frazer (*Golden Bough*, i. 378) gives examples of the superstition that cut hair caused storms. According to the later idea of Medusa as a beautiful maiden, whose hair had been changed into snakes by Athena, the head was represented in works of art with a wonderfully handsome face, wrapped in the calm repose of death. The Rondanini Medusa at Munich is a famous specimen of this conception. Various accounts of the Gorgons were given by later ancient writers. According to Diod. Sic. (iii. 54. 55) they were female warriors living near Lake Tritonis in Libya, whose queen was Medusa; according to Alexander of Myndus, quoted in Athenaeus (v. p. 221), they were terrible wild animals whose mere look turned men to stone. Pliny (*Nat. Hist.* vi. 36 [31]) describes them as savage women, whose persons were covered with hair, which gave rise to the story of their snaky hair and girdle. Modern authorities have explained them as the personification of the waves of the sea or of the barren, unproductive coast of Libya; or as the awful darkness of the storm-cloud, which comes from the west and is scattered by the sun-god Perseus. More recent is the explanation of anthropologists that Medusa, whose virtue is really in her head, is derived from the ritual mask common to primitive cults.

See Jane E. Harrison, *Prolegomena to the Study of Greek Religion* (1903); W. H. Roscher, *Die Gorgonen und Verwandtes* (1879); J. Six, *De Gorgone* (1885), on the types of the Gorgon's head; articles by Roscher and Furtwangler in Roscher's *Lexikon der Mythologie*, by G. Glotz in Daremberg and Saglio's *Dictionnaire des antiquités*, and by R. Gädechens in Ersch and Gruber's *Allgemeine Encyclopädie*; N. G. Polites (Ὁ περὶ τῶν Γοργόνων μῦθος παρὰ τῷ Ἑλληνικῷ λαῷ, 1878) gives an account of the Gorgons, and of the various superstitions connected with them, from the modern Greek point of view, which regards them as malevolent spirits of the sea.

GORGONZOLA, a town of Lombardy, Italy, in the province of Milan, from which it is 11 m. E.N.E. by steam tramway. Pop. (1901) 5134. It is the centre of the district in which is produced the well-known Gorgonzola cheese.

GORI, a town of Russian Transcaucasia, in the government of Tiflis and 49 m. by rail N.W. of the city of Tiflis, on the river Kura; altitude, 2010 ft. Pop. (1897) 10,457. The surrounding country is very picturesque. Gori has a high school for girls, and a school for Russian and Tatar teachers. At one time celebrated for its silk and cotton stuffs, it is now famous for corn, reputed the best in Georgia, and the wine is also esteemed. The climate is excellent, delightfully cool in summer, owing to the refreshing breezes from the mountains, though these are, however, at times disagreeable in winter. Gori was founded (1123) by the Georgian king David II., the Renovater, for the Armenians who fled their country on the Persian invasion. The earliest remains of the fortress are Byzantine; it was thoroughly restored in 1634–1638, but destroyed by Nadir Shah of Persia in the 18th century. There is a church constructed in the 17th century by Capuchin missionaries from Rome. Five miles east of Gori is the remarkable rock-cut town of Uplis-tsykhe, which was a fortress in the time of Alexander the Great of Macedon, and an inhabited city in the reign of the Georgian king Bagrat III. (980–1014).

GORILLA (or Pongo), the largest of the man-like apes, and a native of West Africa from the Congo to Cameroon, whence it extends eastwards across the continent to German East Africa. Many naturalists regard the gorilla as best included in the same genus as the chimpanzee, in which case it should be known as *Anthropopithecus gorilla*, but by others it is regarded as the representative of a genus by itself, when its title will be *Gorilla savagei*, or *G. gorilla*. That there are local forms of gorilla is quite certain: but whether any of these are entitled to rank as distinct species may be a matter of opinion. It was long supposed that the apes encountered on an island off the west coast of Africa by Hanno, the Carthaginian, were gorillas, but in the

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opinion of some of those best qualified to judge, it is probable that the creatures in question were really baboons. The first real account of the gorilla appears to be the one given by an English sailor, Andrew Battel, who spent some time in the wilds of West Africa during and about the year 1590; his account being presented in Purchas's *Pilgrimage*, published in the year 1613. From this it appears that Battel was familiar with both the chimpanzee and the gorilla, the former of which he terms engeco and the latter pongo—names which ought apparently to be adopted for these two species in place of those now in use. Between Battel's time and 1846 nothing appears to have been heard of the gorilla or pongo, but in that year a missionary at the Gabun accidentally discovered a skull of the huge ape; and in 1847 a sketch of that specimen, together with two others, came into the hands of Sir R. Owen, by whom the name *Gorilla savagei* was proposed for the new ape in 1848. Dr Thomas Savage, a missionary at the Gabun, who sent Owen information with regard to the original skull, had, however, himself proposed the name *Troglodytes gorilla* in 1847. The first complete skeleton of a gorilla sent to Europe was received at the museum of the Royal College of Surgeons in 1851, and the first complete skin appears to have reached the British Museum in 1858. Paul B. du Chaillu's account (1861) of his journeys in the Gabun region popularized the knowledge of the existence of the gorilla. Male gorillas largely exceed the females in size, and attain a height of from 5½ ft. to 6½ ft., or perhaps even more. Some of the features distinguishing the gorilla from the mere gorilla-like chimpanzees will be found mentioned in the article PRIMATES. Among them are the small ears, elongated head, the presence of a deep groove alongside the nostrils, the small size of the thumb, and the great length of the arm, which reaches half-way down the shin-bone (tibia) in the erect posture. In old males the eyes are overhung by a beetling penthouse of bone, the hinder half of the middle line of the skull bears a wall-like bony ridge for the attachment of the powerful jaw-muscles, and the tusks, or canines, are of monstrous size, recalling those of a carnivorous animal. The general colour is blackish, with a more or less marked grey or brownish tinge on the hair of the shoulders, and sometimes of chestnut on the head. Mr G. L. Bates (in *Proc. Zool. Soc.*, 1905, vol. i.) states that gorillas only leave the depths of the forest to enter the outlying clearings in the neighbourhood of human settlements when they are attracted by some special fruit or succulent plant; the favourite being the fruit of the "mejom," a tall cane-like plant (perhaps a kind of *Amomum*) which grows abundantly on deserted clearings. At one isolated village the natives, who were unarmed, reported that they not unfrequently saw and heard the gorillas, which broke down the stalks of the plantains in the rear of the habitations to tear out and eat the tender heart. On the old clearings of another village Mr Bates himself, although he did not see a gorilla, saw the fresh tracks of these great apes and the torn stems and discarded fruit rinds of the "mejoms," as well as the broken stalks of the latter, which had been used for beds. On another occasion he came across the bed of an old gorilla which had been used only the night before, as was proved by a negro woman, who on the previous evening had heard the animal breaking and treading down the stalks to form its couch. According to native report, the gorillas sleep on these beds, which are of sufficient thickness to raise them a foot or two above the ground, in a sitting posture, with the head inclined forwards on the breast. In the first case Mr Bates states that the tracks and beds indicated the presence of three or four gorillas, some of which were small. This account does not by any means accord with one given by von Koppenfels, in which it is stated that while the old male gorilla sleeps in a sitting posture at the base of a tree-trunk (no mention being made of a bed), the female and young ones pass the night in a nest in the tree several yards above the ground, made by bending the boughs together and covering them with twigs and moss. Mr Bates's account, as being based on actual inspection of the beds, is probably the more trustworthy. Even when asleep and snoring, gorillas are difficult to approach, since they awake at the slightest rustle, and an attempt to surround the one heard making his bed by the woman resulted in failure. Most gorillas killed by natives are believed by Mr Bates to have been encountered suddenly in the daytime on the ground or in low trees in the outlying clearings. Many natives, even if armed, refuse, however, to molest an adult male gorilla, on account of its ferocity when wounded. Mr Bates, like Mr Winwood Reade, refused to credit du Chaillu's account of his having killed gorillas, and stated that the only instance he knew of one of these animals being slain by a European was an old male (now in Mr Walter Rothschild's museum at Tring) shot by the German trader Paschen in the Yaunde district, of which an illustrated account was published in 1901. Mr E. J. Corns states, however, that two European traders, apparently in the "eighties" of the 19th century, were in the habit of surrounding and capturing these animals on occasion offered.[1] Fully adult gorillas have never been seen alive in captivity—and perhaps never will be, as the creature is ferocious and morose to a degree. So long ago as the year 1855, when the species was known to zoologists only by its skeleton, a gorilla was actually living in England. This animal, a young female, came from the Gabun, and was kept for some months in Wombwell's travelling menagerie, where it was treated as a pet. On its death, the body was sent to Mr Charles Waterton, of Walton Hall, by whom the skin was mounted in a grotesque manner, and the skeleton given to the Leeds museum. Apparently, however, it was not till several years later that the skin was recognized by Mr A. D. Bartlett as that of a gorilla; the animal having probably been regarded by its owner as a chimpanzee. A young male was purchased by the Zoological Society in October 1887, from Mr Cross, the Liverpool dealer in animals. At the time of arrival it was supposed to be about three years old, and stood 2½ ft. high. A second, a male, supposed to be rather older, was acquired in March 1896, having been brought to Liverpool from the French Congo. It is described as having been thoroughly healthy at the date of its arrival, and of an amiable and tractable disposition. Neither survived long. Two others were received in the Zoological Society's menagerie in 1904, and another was housed there for a short time in the following year, while a fifth was received in 1906. Falkenstein's gorilla, exhibited at the Westminster aquarium under the name of pongo, and afterwards at the Berlin aquarium, survived for eighteen months. "Pussi," the gorilla of the Breslau Zoological Gardens, holds a record for longevity, with over seven years of menagerie life. Writing in 1903 Mr W. T. Hornaday stated that but one live gorilla, and that a tiny infant, had ever landed in the United States; and it lived only five days after arrival. (R. L.*)

GORINCHEM, or GORCUM, a fortified town of Holland in the province of south Holland, on the right bank of the Merwede at the confluence of the Linge, 16 m. by rail W. of Dordrecht. It is connected by the Zederik and Merwede canals with Amsterdam, and steamers ply hence in every direction. Pop. (1900) 11,087. Gorinchem possesses several interesting old houses, and overlooking the river are some fortified gateways of the 17th century. The principal buildings are the old church of St Vincent, containing the monuments of the lords of Arkel; the town hall, a prison, custom-house, barracks and a military hospital. The charitable and benevolent institutions are numerous, and there are also a library and several learned associations. Gorinchem possesses a good harbour, and besides working in gold and silver, carries on a considerable trade in grain, hemp, cheese, potatoes, cattle and fish, the salmon fishery being noted. Woerkum, or Woudrichem, a little below the town on the left bank of the Merwede, is famous for its quaint old buildings, which are decorated with mosaics.

GORING, GEORGE GORING, LORD (1608–1657), English Royalist soldier, son of George Goring, earl of Norwich, was born on the 14th of July 1608. He soon became famous at court for his prodigality and dissolute manners. His father-in-law, Richard Boyle, earl of Cork, procured for him a post in the Dutch

[1] In 1905 the Rev. Geo. Grenfell reported that he had that summer shot a gorilla in the Bwela country, east of the Mongala affluent of the Congo.

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army with the rank of colonel. He was permanently lamed by a wound received at Breda in 1637, and returned to England early in 1630, when he was made governor of Portsmouth. He served in the Scottish war, and already had a considerable reputation when he was concerned in the "Army Plot." Officers of the army stationed at York proposed to petition the king and parliament for the maintenance of the royal authority. A second party was in favour of more violent measures, and Goring, in the hope of being appointed lieutenant-general, proposed to march the army on London and overawe the parliament during Strafford's trial. This proposition being rejected by his fellow officers, he betrayed the proceedings to Mountjoy Blount, earl of Newport, who passed on the information indirectly to Pym in April. Colonel Goring was thereupon called on to give evidence before the Commons, who commended him for his services to the Commonwealth. This betrayal of his comrades induced confidence in the minds of the parliamentary leaders, who sent him back to his Portsmouth command. Nevertheless he declared for the king in August. He surrendered Portsmouth to the parliament in September 1642 and went to Holland to recruit for the Royalist army, returning to England in December. Appointed to a cavalry command by the earl of Newcastle, he defeated Fairfax at Seacroft Moor near Leeds in March 1643, but in May he was taken prisoner at Wakefield on the capture of the town by Fairfax. In April 1644 he effected an exchange. At Marston Moor he commanded the Royalist left, and charged with great success, but, allowing his troopers to disperse in search of plunder, was routed by Cromwell at the close of the battle. In November 1644, on his father's elevation to the earldom of Norwich, he became Lord Goring. The parliamentary authorities, however, refused to recognize the creation of the earldom, and continued to speak of the father as Lord Goring and the son as General Goring. In August he had been despatched by Prince Rupert, who recognized his ability, to join Charles in the south, and in spite of his dissolute and insubordinate character he was appointed to supersede Henry, Lord Wilmot, as lieut.-general of the Royalist horse (see GREAT REBELLION). He secured some successes in the west, and in January 1645 advanced through Hampshire and occupied Farnham; but want of money compelled him to retreat to Salisbury and thence to Exeter. The excesses committed by his troops seriously injured the Royalist cause, and his exactions made his name hated throughout the west. He had himself prepared to besiege Taunton in March, yet when in the next month he was desired by Prince Charles, who was at Bristol, to send reinforcements to Sir Richard Grenville for the siege of Taunton, he obeyed the order only with ill-humour. Later in the month he was summoned with his troops to the relief of the king at Oxford. Lord Goring had long been intriguing for an independent command, and he now secured from the king what was practically supreme authority in the west. It was alleged by the earl of Newport that he was willing to transfer his allegiance once more to the parliament. It is not likely that he meditated open treason, but he was culpably negligent and occupied with private ambitions and jealousies. He was still engaged in desultory operations against Taunton when the main campaign of 1645 opened. For the part taken by Goring's army in the operations of the Naseby campaign see GREAT REBELLION. After the decisive defeat of the king, the army of Fairfax marched into the west and defeated Goring in a disastrous fight at Langport on the 10th of July. He made no further serious resistance to the parliamentary general, but wasted his time in frivolous amusements, and in November he obtained leave to quit his disorganized forces and retire to France on the ground of health. His father's services secured him the command of some English regiments in the Spanish service. He died at Madrid in July or August 1657. Clarendon gives him a very unpleasing character, declaring that "Goring . . . would, without hesitation, have broken any trust, or done any act of treachery to have satisfied an ordinary passion or appetite; and in truth wanted nothing but industry (for he had wit, and courage, and understanding and ambition, uncontrolled by any fear of God or man) to have been as eminent and successful in the highest attempt of wickedness as any man in the age he lived in or before. Of all his qualifications dissimulation was his masterpiece; in which he so much excelled, that men were not ordinarily ashamed, or out of countenance, with being deceived but twice by him."

See the life by C. H. Firth in the *Dictionary of National Biography*; Dugdale's *Baronage*, where there are some doubtful stories of his life in Spain; the *Clarendon State Papers*; Clarendon's *History of the Great Rebellion*; and S. R. Gardiner's *History of the Great Civil War*.

GORKI, MAXIM (1868–), the pen-name of the Russian novelist Alexei Maximovich Pyeshkov, who was born at Nizhni-Novgorod on the 26th of March 1868. His father was a dyer, but he lost both his parents in childhood, and in his ninth year was sent to assist in a boot-shop. We find him afterwards in a variety of callings, but devouring books of all sorts greedily, whenever they fell into his hands. He ran away from the boot-shop and went to help a land-surveyor. He was then a cook on board a steamer and afterwards a gardener. In his fifteenth year he tried to enter a school at Kazan, but was obliged to betake himself again to his drudgery. He became a baker, than hawked about *kvas*, and helped the barefooted tramps and labourers at the docks. From these he drew some of his most striking pictures, and learned to give sketches of humble life generally with the fidelity of a Defoe. After a long course of drudgery he had the good fortune to obtain the place of secretary to a barrister at Nizhni-Novgorod. This was the turning-point of his fortunes, as he found a sympathetic master who helped him. He also became acquainted with the novelist Korolenko, who assisted him in his literary efforts. His first story was *Makar Chudra*, which was published in the journal *Kavkaz*. He contributed to many periodicals and finally attracted attention by his tale called *Chelkash*, which appeared in *Russkoe Bogatsvo* ("Russian wealth"). This was followed by a series of tales in which he drew with extraordinary vigour the life of the *bosniaki*, or tramps. He has sometimes described other classes of society, tradesmen and the educated classes, but not with equal success. There are some vigorous pictures, however, of the trading class in his *Foma Gordeyev*. But his favourite type is the rebel, the man in revolt against society, and him he describes from personal knowledge, and enlists our sympathies with him. We get such a type completely in *Konovalov*. Gorki is always preaching that we must have ideals—something better than everyday life, and this view is brought out in his play *At the Lowest Depths*, which had great success at Moscow, but was coldly received at St Petersburg.

For a good criticism of Gorki see *Ideas and Realities in Russian Literature*, by Prince Kropotkin. Many of his works have been translated into English.

GÖRLITZ, a town of Germany, in the Prussian province of Silesia, on the left bank of the Neisse, 62 m. E. from Dresden on the railway to Breslau, and at the junction of lines to Berlin, Zittau and Halle. Pop. (1885) 55,702, (1905) 80,031. The Neisse at this point is crossed by a railway bridge 1650 ft. long and 120 ft. high, with 32 arches. Görlitz is one of the handsomest, and, owing to the extensive forests of 70,000 acres, which are the property of the municipality, one of the wealthiest towns in Germany. It is surrounded by beautiful walks and fine gardens, and although its old walls and towers have now been demolished, many of its ancient buildings remain to form a picturesque contrast with the signs of modern industry. From the hill called Landskrone, about 1500 ft. high, an extensive prospect is obtained of the surrounding country. The principal buildings are the fine Gothic church of St Peter and St Paul, dating from the 15th century, with two stately towers, a famous organ and a very heavy bell; the Frauen Kirche, erected about the end of the 15th century, and possessing a fine portal and choir in pierced work; the Kloster Kirche, restored in 1868, with handsome choir stalls and a carved altar dating from 1383; and the Roman Catholic church, founded in 1853, in the Roman style of architecture, with beautiful glass windows and oil-paintings. The old town hall (Rathaus) contains a very valuable library, having at its entrance a fine flight of steps. There is

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also a new town hall which was erected in 1904–1906. Other buildings are: the old bastion, named Kaisertrutz, now used as a guardhouse and armoury; the gymnasium buildings in the Gothic style erected in 1851; the Ruhmeshalle with the Kaiser Friedrich museum, the house of the estates of the province (Ständehaus), two theatres and the barracks. Near the town is the chapel of the Holy Cross, where there is a model of the Holy Sepulchre at Jerusalem made during the 15th century. In the public park there is a bust of Schiller, a monument to Alexander von Humboldt, and a statue of the mystic Jakob Böhme (1575–1624); a monument has been erected in the town in commemoration of the war of 1870–71, and also one to the emperor William I. and a statue of Prince Frederick Charles. In connexion with the natural history society there is a valuable museum, and the scientific institute possesses a large library and a rich collection of antiquities, coins and articles of *virtu*. Görlitz, next to Breslau, is the largest and most flourishing commercial town of Silesia, and is also regarded as classic ground for the study of German Renaissance architecture. Besides cloth, which forms its staple article of commerce, it has manufactories of various linen and woollen wares, machines, railway wagons, glass, sago, tobacco, leather, chemicals and tiles.

Görlitz existed as a village from a very early period, and at the beginning of the 12th century received civic rights. It was then known as Drebenau, but on being rebuilt after its destruction by fire in 1131 it received the name of Zgorzelice. About the end of the 12th century it was strongly fortified, and for a short time it was the capital of a duchy of Görlitz. It was several times besieged and taken during the Thirty Years' War, and it also suffered considerably in the Seven Years' War. In the battle which took place near it between the Austrians and Prussians on the 7th of September 1757, Hans Karl von Winterfeldt, the general of Frederick the Great, was slain. In 1815 the town, with the greater part of Upper Lusatia, came into the possession of Prussia.

See Neumann, *Geschichte von Görlitz* (1850).

GÖRRES, JOHANN JOSEPH VON (1776–1848), German writer, was born on the 25th of January 1776, at Coblenz. His father was a man of moderate means, who sent his son to a Latin college under the direction of the Roman Catholic clergy. The sympathies of the young Görres were from the first strongly with the French Revolution, and the dissoluteness and irreligion of the French exiles in the Rhineland confirmed him in his hatred of princes. He harangued the revolutionary clubs, and insisted on the unity of interests which should ally all civilized states to one another. He then commenced a republican journal called *Das rote Blatt*, and afterwards *Rübezahl*, in which he strongly condemned the administration of the Rhenish provinces by France.

After the peace of Campo Formio (1797) there was some hope that the Rhenish provinces would be constituted into an independent republic. In 1799 the provinces sent an embassy, of which Görres was a member, to Paris to put their case before the directory. The embassy reached Paris on the 20th of November 1799; two days before this Napoleon had assumed the supreme direction of affairs. After much delay the embassy was received by him; but the only answer they obtained was "that they might rely on perfect justice, and that the French government would never lose sight of their wants." Görres on his return published a tract called *Resultate meiner Sendung nach Paris*, in which he reviewed the history of the French Revolution. During the thirteen years of Napoleon's dominion Görres lived a retired life, devoting himself chiefly to art or science. In 1801 he married Catherine de Lasaulx, and was for some years teacher at a secondary school in Coblenz; in 1806 he moved to Heidelberg, where he lectured at the university. As a leading member of the Heidelberg Romantic group, he edited together with K. Brentano and L. von Arnim the famous *Zeitung für Einsiedler* (subsequently re-named *Trost-Einsamkeit*), and in 1807 he published *Die teutschen Volksbücher*. He returned to Coblenz in 1808, and again found occupation as a teacher in a secondary school, supported by civic funds. He now studied Persian, and in two years published a *Mythengeschichte der asiatischen Welt*, which was followed ten years later by *Das Heldenbuch von Iran*, a translation of part of the *Shahnama*, the epic of Firdousi. In 1813 he actively took up the cause of national independence, and in the following year founded *Der rheinische Merkur*. The intense earnestness of the paper, the bold outspokenness of its hostility to Napoleon, and its fiery eloquence secured for it almost instantly a position and influence unique in the history of German newspapers. Napoleon himself called it *la cinquième puissance*. The ideal it insisted on was a united Germany, with a representative government, but under an emperor after the fashion of other days,—for Görres now abandoned his early advocacy of republicanism. When Napoleon was at Elba, Görres wrote an imaginary proclamation issued by him to the people, the intense irony of which was so well veiled that many Frenchmen mistook it for an original utterance of the emperor. He inveighed bitterly against the second peace of Paris (1815), declaring that Alsace and Lorraine should have been demanded back from France.

Stein was glad enough to use the *Merkur* at the time of the meeting of the congress of Vienna as a vehicle for giving expression to his hopes. But Hardenberg, in May 1815, warned Görres to remember that he was not to arouse hostility against France, but only against Bonaparte. There was also in the *Merkur* an antipathy to Prussia, a continual expression of the desire that an Austrian prince should assume the imperial title, and also a tendency to pronounced liberalism—all of which made it most distasteful to Hardenberg, and to his master King Frederick William III. Görres disregarded warnings sent to him by the censorship and continued the paper in all its fierceness. Accordingly it was suppressed early in 1816, at the instance of the Prussian government; and soon after Görres was dismissed from his post as teacher at Coblenz. From this time his writings were his sole means of support, and he became a most diligent political pamphleteer. In the wild excitement which followed Kotzebue's assassination, the reactionary decrees of Carlsbad were framed, and these were the subject of Görres's celebrated pamphlet *Teutschland und die Revolution* (1820). In this work he reviewed the circumstances which had led to the murder of Kotzebue, and, while expressing all possible horror at the deed itself, he urged that it was impossible and undesirable to repress the free utterance of public opinion by reactionary measures. The success of the work was very marked, despite its ponderous style. It was suppressed by the Prussian government, and orders were issued for the arrest of Görres and the seizure of his papers. He escaped to Strassburg, and thence went to Switzerland. Two more political tracts, *Europa und die Revolution* (1821) and *In Sachen der Rheinprovinzen und in eigener Angelegenheit* (1822), also deserve mention.

In Görres's pamphlet *Die heilige Allianz und die Völker auf dem Kongress zu Verona* he asserted that the princes had met together to crush the liberties of the people, and that the people must look elsewhere for help. The "elsewhere" was to Rome; and from this time Görres became a vehement Ultramontane writer. He was summoned to Munich by King Ludwig of Bavaria as Professor of History in the university, and there his writing enjoyed very great popularity. His *Christliche Mystik* (1836–1842) gave a series of biographies of the saints, together with an exposition of Roman Catholic mysticism. But his most celebrated ultramontane work was a polemical one. Its occasion was the deposition and imprisonment by the Prussian government of the archbishop Clement Wenceslaus, in consequence of the refusal of that prelate to sanction in certain instances the marriages of Protestants and Roman Catholics. Görres in his *Athanasius* (1837) fiercely upheld the power of the church, although the liberals of later date who have claimed Görres as one of their own school deny that he ever insisted on the absolute supremacy of Rome. *Athanasius* went through several editions, and originated a long and bitter controversy. In the *Historisch-politische Blätter*, a Munich journal, Görres and his son Guido (1805–1852) continually upheld the claims of the church. Görres received from the king the order of merit for his services. He died on the 29th of January 1848.

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Görres's *Gesammelte Schriften* (only his political writings) appeared in six volumes (1854–1860), to which three volumes of *Gesammelte Briefe* were subsequently added (1858–1874). Cp. J. Galland, *Joseph von Görres* (1876, 2nd ed. 1877); J. N. Sepp, *Görres und seine Zeitgenossen* (1877), and by the same author, *Görres*, in the series *Geisteshelden* (1896). A *Görres-Gesellschaft* was founded in 1876.

GORSAS, ANTOINE JOSEPH (1752–1793), French publicist and politician, was born at Limoges (Haute-Vienne) on the 24th of March 1752, the son of a shoemaker. He established himself as a private tutor in Paris, and presently set up a school for the army at Versailles, which was attended by commoners as well as nobles. In 1781 he was imprisoned for a short time in the Bicêtre on an accusation of corrupting the morals of his pupils, his real offence being the writing of satirical verse. These circumstances explain the violence of his anti-monarchical sentiment. At the opening of the states-general he began to publish the *Courrier de Versailles à Paris et de Paris à Versailles*, in which appeared on the 4th of October 1780 the account of the banquet of the royal bodyguard. Gorsas is said to have himself read it in public at the Palais Royal, and to have headed one of the columns that marched on Versailles. He then changed the name of his paper to the *Courrier des quatre-vingt-trois départements*, continuing his incendiary propaganda, which had no small share in provoking the popular insurrections of June and August 1792. During the September massacres he wrote in his paper that the prisons were the centre of an anti-national conspiracy and that the people exercised a just vengeance on the guilty. On the 10th of September 1792 he was elected to the Convention for the department of Seine-et-Oise, and on the 10th of January 1793 was elected one of its secretaries. He sat at first with the Mountain, having been long associated with Roland and Brissot, his agreement with the Girondists became gradually more pronounced; during the trial of Louis XVI. he dissociated himself more and more from the principles of the Mountain, and he voted for the king's detention during the war and subsequent banishment. A violent attack on Marat in the *Courrier* led to an armed raid on his printing establishment on the 9th of March 1793. The place was sacked, but Gorsas escaped the popular fury by flight. The facts being reported to the Convention, little sympathy was shown to Gorsas, and a resolution (which was evaded) was passed forbidding representatives to occupy themselves with journalism. On the 2nd of June he was ordered by the Convention to hold himself under arrest with other members of his party. He escaped to Normandy to join Buzot, and after the defeat of the Girondists at Pacy-sur-Eure he found shelter in Brittany. He was imprudent enough to return to Paris in the autumn, where he was arrested on the 6th of October and guillotined the next day.

See the *Moniteur*, No. 268 (1792), Nos. 20, 70 new series 18 (1793); M. Tourneux, *Bibl. de l'hist. de Paris*, 10,291 seq. (1894).

GORST, SIR JOHN ELDON (1835–), English statesman, was born at Preston in 1835, the son of Edward Chaddock Gorst, who took the name of Lowndes on succeeding to the family estate in 1853. He graduated third wrangler from St John's College, Cambridge, in 1857, and was admitted to a fellowship. After beginning to read for the bar in London, his father's illness and death led to his sailing to New Zealand, where he married in 1860 Mary Elizabeth Moore. The Maoris had at that time set up a king of their own in the Waikato district and Gorst, who had made friends with the chief Tamihana (William Thomson), acted as an intermediary between the Maoris and the government. Sir George Grey made him inspector of schools, then resident magistrate, and eventually civil commissioner in Upper Waikato. Tamihana's influence secured his safety in the Maori outbreak of 1863. In 1908 he published a volume of recollections, under the title of *New Zealand Revisited: Recollections of the Days of my Youth*. He then returned to England and was called to the bar at the Inner Temple in 1865, becoming Q.C. in 1875. He stood unsuccessfully for Hastings in the Conservative interest in 1865, and next year entered parliament as member for the borough of Cambridge, but failed to secure re-election at the dissolution of 1868. After the Conservative defeat of that year he was entrusted by Disraeli with the reorganization of the party machinery, and in five years of hard work he paved the way for the Conservative success at the general election of 1874. At a bye-election in 1875 he re-entered parliament as member for Chatham, which he continued to represent until 1892. He joined Sir Henry Drummond-Wolff, Lord Randolph Churchill and Mr Arthur Balfour in the "Fourth Party," and he became solicitor-general in the administration of 1885–1886 and was knighted. On the formation of the second Salisbury administration (1886) he became under-secretary for India and in 1891 financial secretary to the Treasury. At the general election of 1892 he became member for Cambridge University. He was deputy chairman of committees in the House of Commons from 1888 to 1891, and on the formation of the third Salisbury administration in 1895 he became vice-president of the committee of the council on education (until 1902). Sir John Gorst adhered to the principles of Tory democracy which he had advocated in the days of the fourth party, and continued to exhibit an active interest in the housing of the poor, the education and care of their children, and in social questions generally, both in parliament and in the press. But he was always exceedingly "independent" in his political action. He objected to Mr Chamberlain's proposals for tariff reform, and lost his seat at Cambridge at the general election of 1906 to a tariff reformer. He then withdrew from the vice-chancellorship of the Primrose League, of which he had been one of the founders, on the ground that it no longer represented the policy of Lord Beaconsfield. In 1910 he contested Preston as a Liberal, but failed to secure election.

His elder son, SIR J. ELDON GORST (b. 1861), was financial adviser to the Egyptian government from 1898 to 1904, when he became assistant under-secretary of state for foreign affairs. In 1907 he succeeded Lord Cromer as British agent and consul-general in Egypt.

An account of Sir John Gorst's connexion with Lord Randolph Churchill will be found in the *Fourth Party* (1906), by his younger son, Harold E. Gorst.

GORTON, SAMUEL (*c.* 1600–1677), English sectary and founder of the American sect of Gortonites, was born about 1600 at Gorton, Lancashire. He was first apprenticed to a clothier in London, but, fearing persecution for his religious convictions, he sailed for Boston, Massachusetts, in 1636. Constantly involved in religious disputes, he fled in turn to Plymouth, and (in 1637–1638) to Aquidneck (Newport), where he was publicly whipped for insulting the clergy and magistrates. In 1643 he bought land from the Narraganset Indians at Shawomet—now Warwick—where he was joined by a number of his followers; but he quarrelled with the Indians and the authorities at Boston sent soldiers to arrest Gorton and six of his companions. He served a term of imprisonment for heresy at Charlestown, after which he was ejected from the colony. In England in 1646 he published the curious tract "Simplicities Defence against Seven Headed Policy" (reprinted in 1835), giving an account of his grievances against the Massachusetts government. In 1648 he returned to New England with a letter of protection from the earl of Warwick, and joining his former companions at Shawomet, which he named Warwick, in honour of the earl, he remained there till his death at the end of 1677. He is chiefly remembered as the founder of a small sect called the Gortonites, which survived till the end of the 18th century. They had a great contempt for the regular clergy and for all outward forms of religion, holding that the true believers partook of the perfection of God.

Among his quaint writings are: *An Incorruptible Key composed of the CX. Psalms wherewith you may open the rest of the Scriptures* (1647), and *Saltmarsh returned from the Dead*, with its sequel, *An Antidote against the Common Plague of the World* (1657). See L. G. Jones, *Samuel Gorton: a forgotten Founder of our Liberties* (Providence, 1896).

GORTON, an urban district in the Gorton parliamentary division of Lancashire, England, forming an eastern suburb of Manchester. Pop. (1901) 26,564. It is largely a manufacturing district, having cotton mills and iron, engineering and chemical works.

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GORTYNA, or GORTYN, an important ancient city on the southern side of the island of Crete. It stood on the banks of the small river Lethaeus (Mitropolipotamo), about three hours distant from the sea, with which it communicated by means of its two harbours, Metallum and Lebena. It had temples of Apollo Pythius, Artemis and Zeus. Near the town was the famous fountain of Sauros, inclosed by fruit-bearing poplars; and not far from this was another spring, overhung by an evergreen plane tree which in popular belief marked the scene of the amours of Zeus and Europa. Gortyna was, next to Cnossus, the largest and most powerful city of Crete. The two cities combined to subdue the rest of the island; but when they had gained their object they quarrelled with each other, and the history of both towns is from this time little more than a record of their feuds. Neither plays a conspicuous part in the history of Greece. Under the Romans Gortyna became the metropolis of the island. Extensive ruins may still be seen at the modern village of Hagii Deka, and here was discovered the great inscription containing chapters of its ancient laws. Though partly ruinous, the church of St Titus is a very interesting monument of early Christian architecture, dating from about the 4th century.

See also CRETE, and for a full account of the laws see GREEK LAW.

GÖRTZ, GEORG HEINRICH VON, BARON VON SCHLITZ (1668–1719), Holstein statesman, was educated at Jena. He entered the Holstein-Gottorp service, and after the death of the duchess Hedwig Sophia, Charles XII.'s sister, became very influential during the minority of her son Duke Charles Frederick. His earlier policy aimed at strengthening Holstein-Gottorp at the expense of Denmark. With this object, during Charles XII.'s stay at Altranstädt (1706-1707), he tried to divert the king's attention to the Holstein question, and six years later, when the Swedish commander, Magnus Stenbock, crossed the Elbe, Görtz rendered him as much assistance as was compatible with not openly breaking with Denmark, even going so far as to surrender the fortress of Tönning to the Swedes. Görtz next attempted to undermine the grand alliance against Sweden by negotiating with Russia, Prussia and Saxony for the purpose of isolating Denmark, or even of turning the arms of the allies against her, a task by no means impossible in view of the strained relations between Denmark and the tsar. The plan foundered, however, on the refusal of Charles XII. to save the rest of his German domains by ceding Stettin to Prussia. Another simultaneous plan of procuring the Swedish crown for Duke Charles Frederick also came to nought. Görtz first suggested the marriage between the duke of Holstein and the tsarevna Anne of Russia, and negotiations were begun in St Petersburg with that object. On the arrival of Charles XII. from Turkey at Stralsund, Görtz was the first to visit him, and emerged from his presence chief minister or "grand-vizier" as the Swedes preferred to call the bold and crafty satrap, whose absolute devotion to the Swedish king took no account of the intense wretchedness of the Swedish nation. Görtz, himself a man of uncommon audacity, seems to have been fascinated by the heroic element in Charles's nature and was determined, if possible, to save him from his difficulties. He owed his extraordinary influence to the fact that he was the only one of Charles's advisers who believed, or pretended to believe, that Sweden was still far from exhaustion, or at any rate had a sufficient reserve of power to give support to an energetic diplomacy—Charles's own opinion, in fact. Görtz's position, however, was highly peculiar. Ostensibly, he was only the Holstein minister at Charles's court, in reality he was everything in Sweden except a Swedish subject—finance minister, plenipotentiary to foreign powers, factotum, and responsible to the king alone, though he had not a line of instructions. But he was just the man for a hero in extremities, and his whole course of procedure was, of necessity, revolutionary. His chief financial expedient was to debase, or rather ruin, the currency by issuing copper tokens redeemable in better times; but it was no fault of his that Charles XII., during his absence, flung upon the market too enormous an amount of this copper money for Görtz to deal with. By the end of 1718 it seemed as if Görtz's system could not go on much longer, and the hatred of the Swedes towards him was so intense and universal that they blamed him for Charles XII.'s tyranny as well as for his own. Görtz hoped, however, to conclude peace with at least some of Sweden's numerous enemies before the crash came and then, by means of fresh combinations, to restore Sweden to her rank as a great power. It must be admitted that, in pursuance of his "system," Görtz displayed a genius for diplomacy which would have done honour to a Metternich or a Talleyrand. He desired peace with Russia first of all, and at the congress of Åland even obtained relatively favourable terms, only to have them rejected by his obstinately optimistic master. Simultaneously, Görtz was negotiating with Cardinal Alberoni and with the whigs in England; but all his ingenious combinations collapsed like a house of cards on the sudden death of Charles XII. The whole fury of the Swedish nation instantly fell upon Görtz. After a trial before a special commission which was a parody of justice—the accused was not permitted to have any legal assistance or the use of writing materials—he was condemned to decapitation and promptly executed. Perhaps Görtz deserved his fate for "unnecessarily making himself the tool of an unheard-of despotism," but his death was certainly a judicial murder, and some historians even regard him as a political martyr.

See R. N. Bain, *Charles XII.* (London, 1895), and *Scandinavia*, chap. 12 (Cambridge, 1905); B. von Beskow, *Freherre Georg Heinrich von Gortz* (Stockholm, 1868). (R. N. B.)

GÖRZ (Ital. *Gorizia*; Slovene, *Gorica*), the capital of the Austrian crownland of Görz and Gradisca, about 390 m. S.W. of Vienna by rail. Pop (1900) 25,432, two-thirds Italians, the remainder mostly Slovenes and Germans. It is picturesquely situated on the left bank of the Isonzo in a fertile valley, 35 m. N.N.W. of Trieste by rail. It is the seat of an archbishop and possesses an interesting cathedral, built in the 14th century and the richly decorated church of St Ignatius, built in the 17th century by the Jesuits. On an eminence, which dominates the town, is situated the old castle, formerly the seat of the counts of Görz, now partly used as barracks. Owing to the mildness of its climate Görz has become a favourite winter-resort, and has received the name of the Nice of Austria. Its mean annual temperature is 55° F.; while the mean winter temperature is 38·7° F. It is adorned with several pretty gardens with a luxuriant southern vegetation. On a height to the N. of the town is situated the Franciscan convent of Castagnavizza, in whose chapel lie the remains of Charles X. of France(d. 1836), the last Bourbon king, of the duke of Angoulême (d. 1844), his son, and of the duke of Chambord (d. 1883). Seven miles to the north of Görz is the Monte Santo (2275 ft.), a much-frequented place on which stands a pilgrimage church. The industries include cotton and silk weaving, sugar refining, brewing, the manufacture of leather and the making of rosoglio. There is also a considerable trade in wooden work, vegetables, early fruit and wine. Görz is mentioned for the first time at the beginning of the 11th century, and received its charter as a town in 1307. During the middle ages the greater part of its population was German.

GÖRZ AND GRADISCA, a county and crownland of Austria, bounded E. by Carniola, S. by Istria, the Triestine territory and the Adriatic, W. by Italy and N. by Carinthia. It has an area of 1140 sq. m. The coast line, though extending for 25 m., does not present any harbour of importance. It is fringed by alluvial deposits and lagoons, which are for the most part of very modern formation, for as late as the 4th or 5th centuries Aquileia was a great seaport. The harbour of Grado is the only one accessible to the larger kind of coasting craft. On all sides, except towards the south-west where it unites with the Friulian lowland, it is surrounded by mountains, and about four-sixths of its area is occupied by mountains and hills. From the Julian Alps, which traverse the province in the north, the country descends in successive terraces towards the sea, and may roughly be divided into the upper highlands, the lower highlands, the hilly district and the lowlands. The principal peaks in the

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Julian Alps are the Monte Canin (8469 ft.), the Manhart (8784 ft.), the Jalouc (8708 ft.), the Krn (7367 ft.), the Matajur (5386 ft.), and the highest peak in the whole range, the Triglav or Terglou (9304 ft.). The Julian Alps are crossed by the Predil Pass (3811 ft.), through which passes the principal road from Carinthia to the Coastland. The southern part of the province belongs to the Karst region, and here are situated the famous cascades and grottoes of Sankt Kanzian, where the river Reka begins its subterranean course. The principal river of the province is the Isonzo, which rises in the Triglav, and pursues a strange zigzag course for a distance of 78 m. before it reaches the Adriatic. At Görz the Isonzo is still 138 ft. above the sea, and it is navigable only in its lowest section, where it takes the name of the Sdobba. Its principal affluents are the Idria, the Wippach and the Torre with its tributary the Judrio, which forms for a short distance the boundary between Austria and Italy. Of special interest not only in itself but for the frequent allusions to it in classical literature is the Timavus or Timavo, which appears near Duino, and after a very short course flows into the Gulf of Trieste. In ancient times it appears, according to the well-known description of Virgil (*Aen.* i. 244) to have rushed from the mountain by nine separate mouths and with much noise and commotion, but at present it usually issues from only three mouths and flows quiet and still. It is strange enough, however, to see the river coming out full formed from the rock, and capable at its very source of bearing vessels on its bosom. According to a probable hypothesis it is a continuation of the above-mentioned river Reka, which is lost near Sankt Kanzian.

Agriculture, and specially viticulture, is the principal occupation of the population, and the vine is here planted not only in regular vineyards, but is introduced in long lines through the ordinary fields and carried up the hills in terraces locally called *ronchi*. The rearing of the silk-worm, especially in the lowlands, constitutes another great source of revenue, and furnishes the material for the only extensive industry of the country. The manufacture of silk is carried on at Görz, and in and around the village of Haidenschaft. Görz and Gradisca had in 1900 a population of 232,338, which is equivalent to 203 inhabitants per square mile. According to nationality about two-thirds were Slovenes, and the remainder Italians, with only about 2200 Germans. Almost the whole of the population (99·6%) belongs to the Roman Catholic Church. The local diet, of which the archbishop of Görz is a member *ex-officio*, is composed of 22 members, and the crownland sends 5 deputies to the Reichsrat at Vienna. For administrative purposes the province is divided into 4 districts and an autonomous municipality, Görz (pop. 25,432), the capital. Other principal places are Cormons (5824), Monfalcone (5536), Kirchheim (5690), Gradisca (3843) and Aquileia (2319).

Görz first appears distinctly in history about the close of the 10th century, as part of a district bestowed by the emperor Otto III. on John, patriarch of Aquileia. In the 11th century it became the seat of the Eppenstein family, who frequently bore the title of counts of Gorizia; and in the beginning of the 12th century the countship passed from them to the Lurngau family which continued to exist till the year 1500, and acquired possessions in Tirol, Carinthia, Friuli and Styria. On the death of Count Leonhard (12th April 1500) the fief reverted to the house of Habsburg. The countship of Gradisca was united with it in 1754. The province was occupied by the French in 1809, but reverted again to Austria in 1815. It formed a district of the administrative province of Trieste until 1861, when it became a separate crownland under its actual name.

GOSCHEN, GEORGE JOACHIM GOSCHEN, 1st VISCOUNT (1831–1907), British statesman, son of William Henry Göschen, a London merchant of German extraction, was born in London on the 10th of August 1831. He was educated at Rugby under Dr Tait, and at Oriel College, Oxford, where he took a first-class in classics. He entered his father's firm of Frühling & Göschen, of Austin Friars, in 1853, and three years later became a director of the Bank of England. His entry into public life took place in 1863, when he was returned without opposition as member for the city of London in the Liberal interest, and this was followed by his re-election, at the head of the poll, in the general election of 1865. In November of the same year he was appointed vice-president of the Board of Trade and paymaster-general, and in January 1866 he was made chancellor of the duchy of Lancaster, with a seat in the cabinet. When Mr Gladstone became prime minister in December 1868, Mr Goschen joined the cabinet as president of the Poor Law Board, and continued to hold that office until March 1871, when he succeeded Mr Childers as first lord of the admiralty. In 1874 he was elected lord rector of the university of Aberdeen. Being sent to Cairo in 1876 as delegate for the British holders of Egyptian bonds, in order to arrange for the conversion of the debt, he succeeded in effecting an agreement with the Khedive.

In 1878 his views upon the county franchise question prevented him from voting uniformly with his party, and he informed his constituents in the city that he would not stand again at the forthcoming general election. In 1880 he was elected for Ripon, and continued to represent that constituency until the general election of 1885, when he was returned for the Eastern Division of Edinburgh. Being opposed to the extension of the franchise, he was unable to join Mr Gladstone's government in 1880; declining the post of viceroy of India, he accepted that of special ambassador to the Porte, and was successful in settling the Montenegrin and Greek frontier questions in 1880 and 1881. He was made an ecclesiastical commissioner in 1882, and when Sir Henry Brand was raised to the peerage in 1884, the speakership of the House of Commons was offered to him, but declined. During the parliament of 1880–1885 he frequently found himself unable to concur with his party, especially as regards the extension of the franchise and questions of foreign policy; and when Mr Gladstone adopted the policy of Home Rule for Ireland, Mr Goschen followed Lord Hartington (afterwards duke of Devonshire) and became one of the most active of the Liberal Unionists. His vigorous and eloquent opposition to Mr Gladstone's Home Rule Bill of 1886 brought him into greater public prominence than ever, but he failed to retain his seat for Edinburgh at the election in July of that year. On the resignation of Lord Randolph Churchill in December 1886, Mr Goschen, though a Liberal Unionist, accepted Lord Salisbury's invitation to join his ministry, and became chancellor of the exchequer. Being defeated at Liverpool, 26th of January 1887, by seven votes, he was elected for St George's, Hanover Square, on the 9th of February. His chancellorship of the exchequer during the ministry of 1886 to 1892 was rendered memorable by his successful conversion of the National Debt in 1888 (see NATIONAL DEBT). With that financial operation, under which the new 2½% Consols became known as "Goschens," his name will long be connected. Aberdeen University again conferred upon him the honour of the lord rectorship in 1888, and he received a similar honour from the University of Edinburgh in 1890. In the Unionist opposition of 1893 to 1895 Mr Goschen again took a vigorous part, his speeches both in and out of the House of Commons being remarkable for their eloquence and debating power. From 1895 to 1900 Mr Goschen was first lord of the admiralty, and in that office he earned the highest reputation for his businesslike grasp of detail and his statesmanlike outlook on the naval policy of the country. He retired in 1900, and was raised to the peerage by the title of Viscount Goschen of Hawkhurst, Kent. Though retired from active politics he continued to take a great interest in public affairs; and when Mr Chamberlain started his tariff reform movement in 1903, Lord Goschen was one of the weightiest champions of free trade on the Unionist side. He died on the 7th of February 1907, being succeeded in the title by his son George Joachim (b. 1866), who was Conservative M.P. for East Grinstead from 1895 to 1900, and married a daughter of the 1st earl of Cranbrook.

In educational subjects Goschen had always taken the greatest interest, his best known, but by no means his only, contribution to popular culture being his participation in the University

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Extension Movement; and his first efforts in parliament were devoted to advocating the abolition of religious tests and the admission of Dissenters to the universities. His published works indicate how ably he combined the wise study of economics with a practical instinct for business-like progress, without neglecting the more ideal aspects of human life. In addition to his well-known work on *The Theory of the Foreign Exchanges*, he published several financial and political pamphlets and addresses on educational and social subjects, among them being that on *Cultivation of the Imagination*, Liverpool, 1877, and that on *Intellectual Interest*, Aberdeen, 1888. He also wrote *The Life and Times of Georg Joachim Goschen, publisher and printer of Leipzig* (1903). (H. CH.)

GOS-HAWK, *i.e.* goose-hawk, the *Astur palumbarius* of ornithologists, and the largest of the short-winged hawks used in falconry. Its English name, however, has possibly been transferred to this species from one of the long-winged hawks or true falcons, since there is no tradition of the gos-hawk, now so called, having ever been used in Europe to take geese or other large and powerful birds. The genus *Astur* may be readily distinguished from *Falco* by the smooth edges of its beak, its short wings (not reaching beyond about the middle of the tail), and its long legs and toes—though these last are stout and comparatively shorter than in the sparrow-hawks (*Accipiter*). In plumage the gos-hawk has a general resemblance to the peregrine falcon, and it undergoes a corresponding change as it advances from youth to maturity—the young being longitudinally streaked beneath, while the adults are transversely barred. The irides, however, are always yellow, or in old birds orange, while those of the falcons are dark brown. The sexes differ greatly in size. There can be little doubt that the gos-hawk, nowadays very rare in Britain, was once common in England, and even towards the end of the 18th century Thornton obtained a nestling in Scotland, while Irish gos-hawks were of old highly celebrated. Being strictly a woodland-bird, its disappearance may be safely connected with the disappearance of the ancient forests in Great Britain, though its destructiveness to poultry and pigeons has doubtless contributed to its present scarcity. In many parts of the continent of Europe it still abounds. It ranges eastward to China and is much valued in India. In North America it is represented by a very nearly allied species, *A. atricapillus*, chiefly distinguished by the closer barring of the breast. Three or four examples corresponding with this form have been obtained in Britain. A good many other species of *Astur* (some of them passing into *Accipiter*) are found in various parts of the world, but the only one that need here be mentioned is the *A. novae-hollandiae* of Australia, which is remarkable for its dimorphism—one form possessing the normal dark-coloured plumage of the genus and the other being perfectly white, with crimson irides. Some writers hold these two forms to be distinct species and call the dark-coloured one *A. cinereus* or *A. rufi*. (A. N.)

GOSHEN, a division of Egypt settled by the Israelites between Jacob's immigration and the Exodus. Its exact delimitation is a difficult problem. The name may possibly be of Semitic or at least non-Egyptian origin, as in Palestine we meet with a district (Josh. x. 41) and a city (*ib.* xv. 51) of the same name. The Septuagint reads Γόσεν Ἀραβίας in Gen. xlv. 10, and xlvi. 34, elsewhere simply Γόσεμ. In xlvi. 28 "Goshen . . . the land of Goshen" are translated respectively "Heroopolis . . . the land of Rameses." This represents a late Jewish identification. Ptolemy defines "Arabia" as an Egyptian nome on the eastern border of the delta, with capital Phacussa, corresponding to the Egyptian nome Sopt and town Kesem. It is doubtful whether Phacussa be situated at the mounds of Fâḳûs, or at another place, Saft-el-Henneh, which suits Strabo's description of its locality rather better. The extent of Goshen, according to the apocryphal book of Judith (i. 9, 10), included Tanis and Memphis; this is probably an overstatement. It is indeed impossible to say more than that it was a place of good pasture, on the frontier of Palestine, and fruitful in edible vegetables and in fish (Numbers xi. 5). (R. A. S. M.)

GOSHEN, a city and the county-seat of Elkhart county, Indiana, U.S.A., on the Elkhart river, about 95 m. E. by S. of Chicago, at an altitude of about 800 ft. Pop. (1890) 6033; (1900) 7810 (462 foreign-born); (1910) 8514. Goshen is served by the Cleveland, Cincinnati, Chicago & St Louis, and the Lake Shore & Michigan Southern railways, and is connected by electric railway with Warsaw and South Bend. The city has a Carnegie library, and is the seat of Goshen College (under Mennonite control), chartered as Elkhart Institute, at Elkhart, Ind., in 1895, and removed to Goshen and opened under its present name in 1903. The college includes a collegiate department, an academy, a Bible school, a normal school, a summer school and correspondence courses, and schools of business, of music and of oratory, and in 1908–1909 had 331 students, 73 of whom were in the Academy. Goshen is situated in a good farming region and is an important lumber market. There is a good water-power. Among the city's manufactures are wagons and carriages, furniture, wooden-ware, veneering, sash and doors, ladders, lawn swings, rubber goods, flour, foundry products and agricultural machinery. The municipality owns its water works and its electric-lighting system. Goshen was first settled in 1828 and was first chartered as a city in 1868.

GOSLAR, a town of Germany, in the Prussian province of Hanover, romantically situated on the Gose, an affluent of the Oker, at the north foot of the Harz, 24 m. S.E. of Hildesheim and 31 m. S.W. from Brunswick, by rail. Pop. (1905) 17,817. It is surrounded by walls and is of antique appearance. Among the noteworthy buildings are the "Zwinger," a tower with walls 23 ft. thick; the market church, in the Romanesque style, restored since its partial destruction by fire in 1844, and containing the town archives and a library in which are some of Luther's manuscripts; the old town hall (Rathaus), possessing many interesting antiquities; the Kaiserworth (formerly the hall of the tailors' gild and now an inn) with the statues of eight of the German emperors; and the Kaiserhaus, the oldest secular building in Germany, built by the emperor Henry III. before 1050 and often the residence of his successors. This was restored in 1867–1878 at the cost of the Prussian government, and was adorned with frescoes portraying events in German history. Other buildings of interest are:—the small chapel which is all that remains since 1820 of the old and famous cathedral of St Simon and St Jude founded by Henry III. about 1040, containing among other relics of the cathedral an old altar supposed to be that of the idol Krodo which formerly stood on the Burgberg near Neustadt-Harzburg; the church of the former Benedictine monastery of St Mary, or Neuwerk, of the 12th century, in the Romanesque style, with wall-paintings of considerable merit; and the house of the bakers' gild now an hotel, the birthplace of Marshal Saxe. There are four Evangelical churches, a Roman Catholic church, a synagogue, several schools, a natural science museum, containing a collection of Harz minerals, the Fenkner museum of antiquities and a number of small foundations. The town has equestrian statues of the emperor Frederick I. and of the German emperor William I. The population is chiefly occupied in connexion with the sulphur, copper, silver and other mines in the neighbourhood. The town has also been long noted for its beer, and possesses some small manufactures and a considerable trade in fruit.

Goslar is believed to have been founded by Henry the Fowler about 920, and when in the time of Otto the Great the mineral treasures in the neighbourhood were discovered it increased rapidly in prosperity. It was often the meeting-place of German diets, twenty-three of which are said to have been held here, and was frequently the residence of the emperors. About 1350 it joined the Hanseatic League. In the middle of the 14th century the famous *Goslar statutes*, a code of laws, which was adopted by many other towns, was published. The town was unsuccessfully besieged in 1625, during the Thirty Years' War, but was taken by the Swedes in 1632 and nearly destroyed by fire. Further conflagrations in 1728 and 1780 gave a severe blow to its prosperity. It was a free town till 1802, when it

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came into the possession of Prussia. In 1807 it was joined to Westphalia, in 1816 to Hanover and in 1866 it was, along with Hanover, re-united to Prussia.

See T. Erdmann, *Die alte Kaiserstadt Goslar und ihre Umgebung in Geschichte, Sage und Bild* (Goslar, 1892); Crusius, *Geschichte der normals bäuerlichen freien Reichsstadt Goslar* (1842–1843); A. Wolfstieg, *Verfassungsgeschichte von Goslar* (Berlin, 1885); T. Asche, *Die Kaiserpfalz zu Goslar* (1892); Neuburg, *Goslars Bergbau bis 1552* (Hanover, 1892); and the *Urkundenbuch der Stadt Goslar*, edited by C. Bode (Halle, 1893–1900). For the *Goslarische Statuten* see the edition published by Gosche (Berlin, 1840).

GOSLICKI, WAWRZYNIEC (? 1533–1607), Polish bishop, better known under his Latinized name of Laurentius Grimalius Goslicius, was born about 1533. After having studied at Cracow and Padua, he entered the church, and was successively appointed bishop of Kaminietz and of Posen. Goslicki was an active man of business, was held in high estimation by his contemporaries and was frequently engaged in political affairs. It was chiefly through his influence, and through the letter he wrote to the pope against the Jesuits, that they were prevented from establishing their schools at Cracow. He was also a strenuous advocate of religious toleration in Poland. He died on the 31st of October 1607.

His principal work is *De optimo senatore*, &c. (Venice, 1568). There are two English translations published respectively under the titles *A commonwealth of good counsaile*, &c. (1607), and *The Accomplished Senator, done into English by Mr Oldisworth* (1733).

GOSLIN, or **GAUZLINUS** (d. *c.* 886), bishop of Paris and defender of the city against the Northmen (885), was, according to some authorities, the son of Roricon II., count of Maine, according to others the natural son of the emperor Louis I. In 848 he became a monk, and entered a monastery at Reims, later he became abbot of St Denis. Like most of the prelates of his time he took a prominent part in the struggle against the Northmen, by whom he and his brother Louis were taken prisoners (858), and he was released only after paying a heavy ransom (*Prudentii Trecensis episcopi Annales*, ann. 858). From 855 to 867 he held intermittently, and from 867 to 881 regularly, the office of chancellor to Charles the Bald and his successors. In 883 or 884 he was elected bishop of Paris, and foreseeing the dangers to which the city was to be exposed from the attacks of the Northmen, he planned and directed the strengthening of the defences, though he also relied for security on the merits of the relics of St Germain and St Geneviève. When the attack finally came (885), the defence of the city was entrusted to him and to Odo, count of Paris, and Hugh, abbot of St Germain l'Auxerrois. The city was attacked on the 26th of November, and the struggle for the possession of the bridge (now the Pont-au-Change) lasted for two days; but Goslin repaired the destruction of the wooden tower overnight, and the Normans were obliged to give up the attempt to take the city by storm. The siege lasted for about a year longer, while the emperor Charles the Fat was in Italy. Goslin died soon after the preliminaries of the peace had been agreed on, worn out by his exertions, or killed by a pestilence which raged in the city.

See Amaury Duval, *L'Évêque Goslin ou le siège de Paris par les Normands, chronique du IXe siècle* (2 vols., Paris, 1832, 3rd ed. *ib.* 1835).

GOSNOLD, BARTHOLOMEW (d. 1607), English navigator. Nothing is known of his birth, parentage or early life. In 1602, in command of the "Concord," chartered by Sir Walter Raleigh and others, he crossed the Atlantic; coasted from what is now Maine to Martha's Vineyard, landing at and naming Cape Cod and Elizabeth Island (now Cuttyhunk) and giving the name Martha's Vineyard to the island now called No Man's Land; and returned to England with a cargo of furs, sassafras and other commodities obtained in trade with the Indians about Buzzard's Bay. In London he actively promoted the colonization of the regions he had visited and, by arousing the interest of Sir Ferdinando Gorges and other influential persons, contributed toward securing the grants of the charters to the London and Plymouth Companies in 1606. In 1606–1607 he was associated with Christopher Newport in command of the three vessels by which the first Jamestown colonists were carried to Virginia. As a member of the council he took an active share in the affairs of the colony, ably seconding the efforts of John Smith to introduce order, industry and system among the motley array of adventurers and idle "gentlemen" of which the little band was composed. He died from swamp fever on the 22nd of August 1607.

See *The Works of John Smith* (Arber's Edition, London, 1884); and J. M. Brereton, *Brief and True Relation of the North Part of Virginia* (reprinted by B. F. Stevens, London, 1901), an account of Gosnold's voyage of 1602.

GOSPATRIC (fl. 1067), earl of Northumberland, belonged to a family which had connexions with the royal houses both of Wessex and Scotland. Before the Conquest he accompanied Tostig on a pilgrimage to Rome (1061); and at that time was a landholder in Cumberland. About 1067 he bought the earldom of Northumberland from William the Conqueror; but, repenting of his submission, fled with other Englishmen to the court of Scotland (1068). He joined the Danish army of invasion in the next year; but was afterwards able, from his possession of Bamburgh castle, to make terms with the conqueror, who left him undisturbed till 1072. The peace concluded in that year with Scotland left him at William's mercy. He lost his earldom and took refuge in Scotland, where Malcolm seems to have provided for him.

See E. A. Freeman, *Norman Conquest*, vol. i. (Oxford, 1877), and the *English Hist. Review*, vol. xix. (London, 1904).

GOSPEL (O. Eng. *godspel*, *i.e.* good news, a translation of Lat. *bona annuntiatio*, or *evangelium*, Gr. εὐαγγέλιον; cf. Goth. *iu* spill, "to announce good news," Ulfilas' translation of the Greek, from *iu*, that which is good, and *spellon* to announce), primarily the "glad tidings" announced to the world by Jesus Christ. The word thus came to be applied to the whole body of doctrine taught by Christ and his disciples, and so to the Christian revelation generally (see CHRISTIANITY); by analogy the term "gospel" is also used in other connexions as equivalent to "authoritative teaching." In a narrower sense each of the records of the life and teaching of Christ preserved in the writings of the four "evangelists" is described as a Gospel. The many more or less imaginative lives of Christ which are not accepted by the Christian Church as canonical are known as "apocryphal gospels" (see APOCRYPHAL LITERATURE). The present article is concerned solely with general considerations affecting the four canonical Gospels; see for details of each, the articles under MATTHEW, MARK, LUKE and JOHN.

The Four Gospels.—The disciples of Jesus proclaimed the Gospel that He was the Christ. Those to whom this message was first delivered in Jerusalem and Palestine had seen and heard Jesus, or had heard much about Him. They did not require to be told who He was. But more and more as the work of preaching and teaching extended to such as had not this knowledge, it became necessary to include in the Gospel delivered some account of the ministry of Jesus. Moreover, alike those who had followed Him during His life on earth, and all who joined themselves to them, must have felt the need of dwelling on His precepts, so that these must have been often repeated, and also in all probability from an early time grouped together according to their subjects, and so taught. For some time, probably for upwards of thirty years, both the facts of the life of Jesus and His words were only related orally. This would be in accordance with the habits of mind of the early preachers of the Gospel. Moreover, they were so absorbed in the expectation of the speedy return of Christ that they did not feel called to make provision for the instruction of subsequent generations. The Epistles of the New Testament contain no indications of the existence of any written record of the life and teaching of Christ. Tradition indicates A.D. 60–70 as the period when written accounts of the life and teaching of Jesus began to be made (see MARK, GOSPEL OF, and MATTHEW, GOSPEL OF). This may be accepted as highly probable. We cannot but suppose that at a time when the number of the original band of disciples of Jesus who survived must have been becoming noticeably smaller, and all these were advanced in life, the importance of writing down that which had been orally delivered concerning the Gospel-history must have been realized. We also

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gather from Luke's preface (i. 1-4) that the work of writing was undertaken in these circumstances and under the influence of this feeling, and that various records had already in consequence been made.

But do our Gospels, or any of them, in the form in which we actually have them, belong to the number of those earliest records? Or, if not, what are the relations in which they severally stand to them? These are questions which in modern criticism have been greatly debated. With a view to obtaining answers to them, it is necessary to consider the reception of the Gospels in the early Church, and also to examine and compare the Gospels themselves. Some account of the evidence supplied in these two ways must be given in the present article, so far as it is common to all four Gospels, or to three or two of them, and in the articles on the several Gospels so far as it is especial to each.

1. *The Reception of the Gospels in the Early Church.*—The question of the use of the Gospels and of the manner in which they were regarded during the period extending from the latter years of the 1st century to the beginning of the last quarter of the 2nd is a difficult one. There is a lack of explicit references to the Gospels;[1] and many of the quotations which may be taken from them are not exact. At the same time these facts can be more or less satisfactorily accounted for by various circumstances. In the first place, it would be natural that the habits of thought of the period when the Gospel was delivered orally should have continued to exert influence even after the tradition had been committed to writing. Although documents might be known and used, they would not be regarded as the authorities for that which was independently remembered, and would not, therefore, necessarily be mentioned. Consequently, it is not strange that citations of sayings of Christ—and these are the only express citations in writings of the Subapostolic Age—should be made without the source whence they were derived being named, and (with a single exception) without any clear indication that the source was a document. The exception is in the little treatise commonly called the Epistle of Barnabas, probably composed about A.D. 130, where (c. iv. 14) the words "many are called but few chosen" are introduced by the formula "as it is written."

For the identification, therefore, of the source or sources used we have to rely upon the amount of correspondence with our Gospels in the quotations made, and in respect to other parallelisms of statement and of expression, in these early Christian writers. The correspondence is in the main full and true as regards spirit and substance, but it is rarely complete in form. The existence of some differences of language may, however, be too readily taken to disprove derivation. Various forms of the same saying occurring in different documents, or remembered from oral tradition and through catechetical instruction, would sometimes be purposely combined. Or, again, the memory might be confused by this variety, and the verification of quotations, especially of brief ones, was difficult, not only from the comparative scarcity of the copies of books, but also because ancient books were not provided with ready means of reference to particular passages. On the whole there is clearly a presumption that where we have striking expressions which are known to us besides only in one of our Gospel-records, that particular record has been the source of it. And where there are several such coincidences the ground for the supposition that the writing in question has been used may become very strong. There is evidence of this kind, more or less clear in the several cases, that all the four Gospels were known in the first two or three decades of the 2nd century. It is fullest as to our first Gospel and, next to this one, as to our third.

After this time it becomes manifest that, as we should expect, documents were the recognized authorities for the Gospel history; but there is still some uncertainty as to the documents upon which reliance was placed, and the precise estimation in which they were severally held. This is in part at least due to the circumstance that nearly all the writings which have remained of the Christian literature belonging to the period *circa* A.D. 130–180 are addressed to non-Christians, and that for the most part they give only summaries of the teaching of Christ and of the facts of the Gospel, while terms that would not be understood by, and names that would not carry weight with, others than Christians are to a large extent avoided. The most important of the writings now in question are two by Justin Martyr (*circa* A.D. 145–160), viz. his *Apology* and his *Dialogue with Trypho*. In the former of these works he shows plainly his intention of adapting his language and reasoning to Gentile, and in the latter to Jewish, readers. In both his name for the Gospel-records is "Memoirs of the Apostles." After a great deal of controversy there has come to be very wide agreement that he reckoned the first three Gospels among these Memoirs. In the case of the second and third there are indications, though slight ones, that he held the view of their composition and authorship which was common from the last quarter of the century onwards (see MARK, GOSPEL OF, and LUKE, GOSPEL OF), but he has made the largest use of our first Gospel. It is also generally allowed that he was acquainted with the fourth Gospel, though some think that he used it with a certain reserve. Evidence may, however, be adduced which goes far to show that he regarded it, also, as of apostolic authority. There is a good deal of difference of opinion still as to whether Justin reckoned other sources for the Gospel-history besides our Gospels among the Apostolic Memoirs. In this connexion, however, as well as on other grounds, it is a significant fact that within twenty years or so after the death of Justin, which probably occurred *circa* A.D. 160, Tatian, who had been a hearer of Justin, produced a continuous narrative of the Gospel-history which received the name *Diatessaron* ("through four"), in the main a compilation from our four Gospels.[1]

Before the close of the 2nd century the four Gospels had attained a position of unique authority throughout the greater part of the Church, not different from that which they have held since, as is evident from the treatise of Irenaeus *Against Heresies* (c. A.D. 180; see esp. iii. i. 1 f. and x., xi.) and from other evidence only a few years later. The struggle against Gnosticism, which had been going on during the middle part of the century, had compelled the Church both to define her creed and to draw a sharper line of demarcation than heretofore between those writings whose authority she regarded as absolute and all others. The effect of this was no doubt to enhance the sense generally entertained of the value of the four Gospels. At the same time in the formal statements now made it is plainly implied that the belief expressed is no new one. And it is, indeed, difficult to suppose that agreement on this subject between different portions of the Church could have manifested itself at this time in the spontaneous manner that it does, except as the consequence of traditional feelings and convictions, which went back to the early part of the century, and which could hardly have arisen without good foundation, with respect to the special value of these works as embodiments of apostolic testimony, although all that came to be supposed in regard to their actual authorship cannot be considered proved.

2. *The Internal Criticism of the Gospels.*—In the middle of the 19th century an able school of critics, known as the Tübingen school, sought to show from indications in the several Gospels that they were composed well on in the 2nd century in the interests of various strongly marked parties into which the Church was supposed to have been divided by differences in regard to the Judaic and Pauline forms of Christianity. These theories are now discredited. It may on the contrary be confidently asserted with regard to the first three Gospels that the local colouring in them is predominantly Palestinian, and that they

[1] For the only two that can be held to be such in the first half of the 2nd century, and the doubts whether they refer to our present Gospels, see MARK, GOSPEL OF, and MATTHEW, GOSPEL OF.

[1] The character of Tatian's *Diatessaron* has been much disputed in the past, but there can no longer be any reasonable doubt on the subject after recent discoveries and investigations. (An account of these may be seen most conveniently in *The Diatessaron of Tatian*, by S. Hemphill; see under TATIAN.)

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show no signs of acquaintance with the questions and the circumstances of the 2nd century; and that the character even of the Fourth Gospel is not such as to justify its being placed, at furthest, much after the beginning of that century.

We turn to the literary criticism of the Gospels, where solid results have been obtained. The first three Gospels have in consequence of the large amount of similarity between them in contents, arrangement, and even in words and the forms of sentences and paragraphs, been called Synoptic Gospels. It has long been seen that, to account for this similarity, relations of interdependence between them, or of common derivation, must be supposed. And the question as to the true theory of these relations is known as the *Synoptic Problem*. Reference has already been made to the fact that during the greater part of the Apostolic age the Gospel history was taught orally. Now some have held that the form of this oral teaching was to a great extent a fixed one, and that it was the common source of our first three Gospels. This oral theory was for a long time the favourite one in England; it was never widely held in Germany, and in recent years the majority of English students of the Synoptic Problem have come to feel that it does not satisfactorily explain the phenomena. Not only are the resemblances too close, and their character in part not of a kind, to be thus accounted for, but even many of the differences between parallel contexts are rather such as would arise through the revision of a document than through the freedom of oral delivery.

It is now and has for many years been widely held that a document which is most nearly represented by the Gospel of Mark, or which (as some would say) was virtually identical with it, has been used in the composition of our first and third Gospels. This source has supplied the Synoptic Outline, and in the main also the narratives common to all three. Questions connected with the history of this document are treated in the article on MARK, GOSPEL OF.

There is also a considerable amount of matter common to Matthew and Luke, but not found in Mark. It is introduced into the Synoptic Outline very differently in those two Gospels, which clearly suggests that it existed in a separate form, and was independently combined by the first and third evangelists with their other document. This common matter has also a character of its own; it consists mainly of pieces of discourse. The form in which it is given in the two Gospels is in several passages so nearly identical that we must suppose these pieces at least to have been derived immediately or ultimately from the same Greek document. In other cases there is more divergence, but in some of them this is accounted for by the consideration that in Matthew passages from the source now in question have been interwoven with parallels in the other chief common source before mentioned. There are, however, instances in which no such explanation will serve, and it is possible that our first and third evangelists may have used two documents which were not in all respects identical, but which corresponded very closely on the whole. The ultimate source of the subject matter in question, or of the most distinctive and larger part of it, was in all probability an Aramaic one, and in some parts different translations may have been used.

This second source used in the composition of Matthew and Luke has frequently been called "The Logia" in order to signify that it was a collection of the sayings and discourses of Jesus. This name has been suggested by Schleiermacher's interpretation of Papias' fragment on Matthew (see MATTHEW, GOSPEL OF). But some have maintained that the source in question also contained a good many narratives, and in order to avoid any premature assumption as to its contents and character several recent critics have named it "Q." It may, however, fairly be called "the Logian document," as a convenient way of indicating the character of the greater part of the matter which our first and third evangelists have taken from it, and this designation is used in the articles on the Gospels of Luke and Matthew. The reconstruction of this document has been attempted by several critics. The arrangement of its contents can, it seems, best be learned from Luke.

3. One or two remarks may here be added as to the bearing of the results of literary criticism upon the use of the Gospels. Their effect is to lead us, especially when engaged in historical inquiries, to look beyond our Gospels to their sources, instead of treating the testimony of the Gospels severally as independent and ultimate. Nevertheless it will still appear that each Gospel has its distinct value, both historically and in regard to the moral and spiritual instruction afforded. And the fruits of much of that older study of the Gospels, which was largely employed in pointing out the special characteristics of each, will still prove serviceable.

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See also the articles on each Gospel, and the article BIBLE, section *New Testament*.

GOSPORT, a seaport in the Fareham parliamentary division of Hampshire, England, facing Portsmouth across Portsmouth harbour, 81 m. S.W. from London by the London & South-Western railway. Pop. of urban district of Gosport and Alverstoke (1901), 28,884. A ferry and a floating bridge connect it with Portsmouth. It is enclosed within a double line of fortifications, consisting of the old Gosport lines, and, about 3000 yds. to the east, a series of forts connected by strong lines with occasional batteries, forming part of the defence works of Portsmouth harbour. The principal buildings are the town hall and market hall, and the church of Holy Trinity, erected in the time of William III. To the south at Haslar there is a magnificent naval hospital, capable of containing 2000 patients, and adjoining it a gunboat slipway and large barracks. To the north is the Royal Clarence victualling yard, with brewery, cooperage, powder magazines, biscuit-making establishment, and storehouses for various kinds of provisions for the royal navy.

Gosport (Goseporte, Gozeport, Gosberg, Godsport) was originally included in Alverstoke manor, held in 1086 by the bishop and monks of Winchester under whom villeins farmed the land. In 1284 the monks agreed to give up Alverstoke with Gosport to the bishop, whose successors continued to hold them until the lands were taken over by the ecclesiastical commissioners. After the confiscation of the bishop's lands in 1641, however, the manor of Alverstoke with Gosport was granted to George Withers, but reverted to the bishop at the Restoration. In the 16th century Gosport was "a little village of fishermen." It was called a borough in 1461, when there are also traces of burgage tenure. From 1462 one bailiff was elected annually in the borough court, and government by a bailiff continued until 1682, when Gosport was included in Portsmouth borough

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under the charter of Charles II. to that town. This was annulled in 1688, since which time there is no evidence of the election of bailiffs. With this exception no charter of incorporation is known, although by the 16th century the inhabitants held common property in the shape of tolls of the ferry. The importance of Gosport increased during the 16th and 17th centuries owing to its position at the mouth of Portsmouth harbour, and its convenience as a victualling station. For this reason also the town was particularly prosperous during the American and Peninsular Wars. About 1540 fortifications were built there for the defence of the harbour, and in the 17th century it was a garrison town under a lord-lieutenant.

GOSS, SIR JOHN (1800–1880), English composer, was born at Fareham, Hampshire, on the 27th of December 1800. He was elected a chorister of the Chapel Royal in 1811, and in 1816, on the breaking of his voice, became a pupil of Attwood. A few early compositions, some for the theatre, exist, and some glees were published before 1825. He was appointed organist of St Luke's, Chelsea, in 1824, and in 1838 became organist of St Paul's in succession to Attwood; he kept the post until 1872, when he resigned and was knighted. His position in the London musical world of the time was an influential one, and he did much by his teaching and criticism to encourage the study and appreciation of good music. In 1876 he was given the degree of Mus.D. at Cambridge. Though his few orchestral works have very small importance, his church music includes some fine compositions, such as the anthems "O taste and see," "O Saviour of the world" and others. He was the last of the great English school of church composers who devoted themselves almost exclusively to church music; and in the history of the glee his is an honoured name, if only on account of his finest work in that form, the five-part glee, Ossian's "Hymn to the sun." He died at Brixton, London, on the 10th of May 1880.

GOSSAMER, a fine, thread like and filmy substance spun by small spiders, which is seen covering stubble fields and gorse bushes, and floating in the air in clear weather; especially in the autumn. By transference anything light, unsubstantial or flimsy is known as "gossamer." A thin gauzy material used for trimming and millinery, resembling the "chiffon" of to-day, was formerly known as gossamer; and in the early Victorian period it was a term used in the hat trade, for silk hats of very light weight.

The word is obscure in origin it is found in numerous forms in English, and is apparently taken from *gose*, goose and *somere*, summer. The Germans have *Mädchensommer*, maidens' summer, and *Altweibersommer*, old women's summer, as well as *Sommerfäden*, summer-threads, as equivalent to the English gossamer, the connexion apparently being that gossamer is seen most frequently in the warm days of late autumn (St Martin's summer) when geese are also in season. Another suggestion is that the word is a corruption of *gaze à Marie* (gauze of Mary) through the legend that gossamer was originally the threads which fell away from the Virgin's shroud on her assumption.

GOSSE, EDMUND (1849–), English poet and critic, was born in London on the 21st of September 1849, son of the zoologist P. H. Gosse. In 1867 he became an assistant in the department of printed books in the British Museum, where he remained until he became in 1875 translator to the Board of Trade. In 1904 he was appointed librarian to the House of Lords. In 1884–1890 he was Clark Lecturer in English literature at Trinity College, Cambridge. Himself a writer of literary verse of much grace, and master of a prose style admirably expressive of a wide and appreciative culture, he was conspicuous for his valuable work in bringing foreign literature home to English readers. *Northern Studies* (1879), a collection of essays on the literature of Holland and Scandinavia, was the outcome of a prolonged visit to those countries, and was followed by later work in the same direction. He translated Ibsen's *Hedda Gabler* (1891), and, with W. Archer, *The Master-Builder* (1893), and in 1907 he wrote a life of Ibsen for the "Literary Lives" series. He also edited the English translation of the works of Björnson. His services to Scandinavian letters were acknowledged in 1901, when he was made a knight of the Norwegian order of St Olaf of the first class. Mr Gosse's published volumes of verse include *On Viol and Flute* (1873), *King Erik* (1876), *New Poems* (1879), *Firdausi in Exile* (1885), *In Russet and Silver* (1894), *Collected Poems* (1896). *Hypolympia, or the Gods on the Island* (1901), an "ironic phantasy," the scene of which is laid in the 20th century, though the personages are Greek gods, is written in prose, with some blank verse. His *Seventeenth Century Studies* (1883), *Life of William Congreve* (1888), *The Jacobean Poets* (1894), *Life and Letters of Dr John Donne, Dean of St Paul's* (1899), *Jeremy Taylor* (1904, "English Men of Letters"), and *Life of Sir Thomas Browne* (1905) form a very considerable body of critical work on the English 17th-century writers. He also wrote a life of Thomas Gray, whose works he edited (4 vols., 1884); *A History of Eighteenth Century Literature* (1889); a *History of Modern English Literature* (1897), and vols. iii. and iv. of an *Illustrated Record of English Literature* (1903–1904) undertaken in connexion with Dr Richard Garnett. Mr Gosse was always a sympathetic student of the younger school of French and Belgian writers, some of his papers on the subject being collected as *French Profiles* (1905). *Critical Kit-Kats* (1896) contains an admirable criticism of J. M. de Heredia, reminiscences of Lord de Tabley and others. He edited Heinemann's series of "Literature of the World" and the same publisher's "International Library." To the 9th edition of the *Encyclopaedia Britannica* he contributed numerous articles, and his services as chief literary adviser in the preparation of the 10th and 11th editions incidentally testify to the high position held by him in the contemporary world of letters. In 1905 he was entertained in Paris by the leading *littérateurs* as a representative of English literary culture. In 1907 Mr Gosse published anonymously *Father and Son*, an intimate study of his own early family life. He married Ellen, daughter of Dr G. W. Epps, and had a son and two daughters.

GOSSE, PHILIP HENRY (1810–1888), English naturalist, was born at Worcester on the 6th of April 1810, his father, Thomas Gosse (1765–1844) being a miniature painter. In his youth the family settled at Poole, where Gosse's turn for natural history was noticed and encouraged by his aunt, Mrs Bell, the mother of the zoologist, Thomas Bell (1792–1880). He had, however, little opportunity for developing it until, in 1827, he found himself clerk in a whaler's office at Carbonear, in Newfoundland, where he beguiled the tedium of his life by observations, chiefly with the microscope. After a brief and unsuccessful interlude of farming in Canada, during which he wrote an unpublished work on the entomology of Newfoundland, he travelled in the United States, was received and noticed by men of science, was employed as a teacher for some time in Alabama, and returned to England in 1839. His *Canadian Naturalist* (1840), written on the voyage home, was followed in 1843 by his *Introduction to Zoology*. His first widely popular book was *The Ocean* (1844). In 1844 Gosse, who had meanwhile been teaching in London, was sent by the British Museum to collect specimens of natural history in Jamaica. He spent nearly two years on that island, and after his return published his *Birds of Jamaica* (1847) and his *Naturalist's Sojourn in Jamaica* (1851). He also wrote about this time several zoological works for the S.P.C.K., and laboured to such an extent as to impair his health. While recovering at Ilfracombe, he was attracted by the forms of marine life so abundant on that shore, and in 1853 published *A Naturalist's Rambles on the Devonshire Coast*, accompanied by a description of the marine aquarium invented by him, by means of which he succeeded in preserving zoophytes and other marine animals of the humbler grades alive and in good condition away from the sea. This arrangement was more fully set forth and illustrated in his *Aquarium* (1854), succeeded in 1855–1856 by *A Manual of Marine Zoology*, in two volumes, illustrated by nearly 700 wood engravings after the author's drawings. A volume on the marine fauna of Tenby succeeded in 1856. In June of the same year he was elected F.R.S. Gosse, who was a most careful observer, but who

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lacked the philosophical spirit, was now tempted to essay work of a more ambitious order, publishing in 1857 two books, *Life* and *Omphalos*, embodying his speculations on the appearance of life on the earth, which he considered to have been instantaneous, at least as regarded its higher forms. His views met with no favour from scientific men, and he returned to the field of observation, which he was better qualified to cultivate. Taking up his residence at St Marychurch, in South Devon, he produced from 1858 to 1860 his standard work on sea-anemones, the *Actinologia Britannica*. *The Romance of Natural History* and other popular works followed. In 1865 he abandoned authorship, and chiefly devoted himself to the cultivation of orchids. Study of the Rotifera, however, also engaged his attention, and his results were embodied in a monograph by Dr C. T. Hudson (1886). He died at St Marychurch on the 23rd of August 1888.

His life was written by his son, Edmund Gosse.

GOSSEC, FRANÇOIS JOSEPH (1734–1829), French musical composer, son of a small farmer, was born at the village of Vergnies, in Belgian Hainaut, and showing early a taste for music became a choir-boy at Antwerp. He went to Paris in 1751 and was taken up by Rameau. He became conductor of a private band kept by La Popelinière, a wealthy amateur, and gradually determined to do something to revive the study of instrumental music in France. He had his own first symphony performed in 1754, and on conductor to the Prince de Conde's orchestra he produced several operas and other compositions of his own. He imposed his influence upon French music with remarkable success, founded the Concert des Amateurs in 1770, organized the École de Chant in 1784, was conductor of the band of the Garde Nationale at the Revolution, and was appointed (with Méhul and Cherubini) inspector of the Conservatoire de Musique when this institution was created in 1795. He was an original member of the Institute and a chevalier of the legion of honour. Outside France he was but little known, and his own numerous compositions, sacred and secular, were thrown into the shade by those of men of greater genius; but he has a place in history as the inspirer of others, and as having powerfully stimulated the revival of instrumental music. He died at Passy on the 16th of February 1829.

See the *Lives* by P. Hédouin (1852) and E. G. J. Gregoir (1878).

GOSSIP (from the O.E. *godsibb*, *i.e.* God, and *sib*, akin, standing in relation to), originally a god-parent, *i.e.* one who by taking a sponsor's vows at a baptism stands in a spiritual relationship to the child baptized. The common modern meaning is of light personal or social conversation, or, with an invidious sense, of idle tale-bearing. "Gossip" was early used with the sense of a friend or acquaintance, either of the parent of the child baptized or of the other god-parents, and thus came to be used, with little reference to the position of sponsor, for women friends of the mother present at a birth; the transition of meaning to an idle chatterer or talker for talking's sake is easy. The application to the idle talk of such persons does not appear to be an early one.

GOSSNER, JOHANNES EVANGELISTA (1773–1858), German divine and philanthropist, was born at Hausen near Augsburg on the 14th of December 1773, and educated at the university of Dillingen. Here like Martin Boos and others he came under the spell of the Evangelical movement promoted by Johann Michael Sailer, the professor of pastoral theology. After taking priest's orders, Gossner held livings at Dirlewang (1804–1811) and Munich (1811–1817), but his evangelical tendencies brought about his dismissal and in 1826 he formally left the Roman Catholic for the Protestant communion. As minister of the Bethlehem church in Berlin (1829–1846) he was conspicuous not only for practical and effective preaching, but for the founding of schools, asylums and missionary agencies. He died on the 20th of March 1858.

Lives by Bethmann-Hollweg (Berlin, 1858) and H. Dalton (Berlin, 1878).

GOSSON, STEPHEN (1554–1624). English satirist, was baptized at St George's, Canterbury, on the 17th of April 1554. He entered Corpus Christi College, Oxford, 1572, and on leaving the university in 1576 he went to London. In 1598 Francis Meres in his *Palladis Tamia* mentions him with Sidney, Spenser, Abraham Fraunce and others among the "best for pastorall," but no pastorals of his are extant. He is said to have been an actor, and by his own confession he wrote plays, for he speaks of *Catilines Conspiracies* as a "Pig of mine own Sowe." To this play and some others, on account of their moral intention, he extends indulgence in the general condemnation of stage plays contained in his *Schoole of Abuse, containing a pleasant invective against Poets, Pipers, Players, Jesters and such like Caterpillars of the Commonwealth* (1579). The euphuistic style of this pamphlet and its ostentatious display of learning were in the taste of the time, and do not necessarily imply insincerity. Gosson justified his attack by considerations of the disorder which the love of melodrama and of vulgar comedy was introducing into the social life of London. It was not only by extremists like Gosson that these abuses were recognized. Spenser, in his *Teares of the Muses* (1591), laments the same evils, although only in general terms. The tract was dedicated to Sir Philip Sidney, who seems not unnaturally to have resented being connected with a pamphlet which opened with a comprehensive denunciation of poets, for Spenser, writing to Gabriel Harvey (Oct. 16, 1579) of the dedication, says the author "was for hys labor scorned." He dedicated, however, a second tract, *The Ephemerides of Phialo . . . and A Short Apologie of the Schoole of Abuse*, to Sidney on Oct. 28th, 1579. Gosson's abuse of poets seems to have had a large share in inducing Sidney to write his *Apologie for Poetrie*, which probably dates from 1581. After the publication of the *Schoole of Abuse* Gosson retired into the country, where he acted as tutor to the sons of a gentleman (*Plays Confuted*. "To the Reader," 1582). Anthony à Wood places this earlier and assigns the termination of his tutorship indirectly to his animosity against the stage, which apparently wearied his patron of his company. The publication of his polemic provoked many retorts, the most formidable of which was Thomas Lodge's *Defence of Playes* (1580). The players themselves retaliated by reviving Gosson's own plays. Gosson replied to his various opponents in 1582 by his *Playes Confuted in Five Actions*, dedicated to Sir Francis Walsingham. Meanwhile he had taken orders, was made lecturer of the parish church at Stepney (1582), and was presented by the queen to the rectory of Great Wigborough, Essex, which he exchanged in 1600 for St Botolph's, Bishopsgate. He died on the 13th of February 1624. *Pleasant Quippes for Upstart New-fangled Gentlewomen* (1595), a coarse satiric poem, is also ascribed to Gosson.

The *Schoole of Abuse* and *Apologie* were edited (1868) by Prof. E. Arber in his *English Reprints*. Two poems of Gosson's are included.

GOT, FRANÇOIS JULES EDMOND (1822–1901), French actor, was born at Lignerolles on the 1st of October 1822, and entered the Conservatoire in 1841, winning the second prize for comedy that year and the first in 1842. After a year of military service he made his début at the Comédie Française on the 17th of July 1844, as Alexis in *Les Héritiers* and Mascarelles in *Les Précieuses ridicules*. He was immediately admitted *pensionnaire*, and became *sociétaire* in 1850. By special permission of the emperor in 1866 he played at the Odéon in Émile Augier's *Contagion*. His golden jubilee at the Théâtre Français was celebrated in 1894, and he made his final appearance the year after. Got was a fine representative of the grand style of French acting, and was much admired in England as well as in Paris. He wrote the libretto of the opera *François Villon* (1857) and also of *L'Esclave* (1874). In 1881 he was decorated with the cross of the Legion of Honour.

GÖTA, a river of Sweden, draining the great Lake Vener. The name, however, is more familiar in its application to the canal which affords communication between Gothenburg and Stockholm. The river flows out of the southern extremity of the lake almost due south to the Cattegat, which it enters by two arms enclosing the island of Hisingen, the eastern forming the harbour and bearing the heavy sea-traffic of the port of

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Gothenburg. The Göta river is 50 m. in length, and is navigable for large vessels, a series of locks surmounting the famous falls of Trollhättan (*q.v.*). Passing the abrupt wooded Halleberg and Hunneberg (royal shooting preserves) Lake Vener is reached at Venersborg. Several important ports lie on the north, east and south shores (see VENER). From Sjötorp, midway on the eastern shore, the western Göta canal leads S.E. to Karlsborg. Its course necessitates over twenty locks to raise it from the Vener level (144 ft.) to its extreme height of 300 ft., and lower it over the subsequent fall through the small lakes Viken and Botten to Lake Vetter (*q.v.*; 289 ft.), which the route crosses to Motala. The eastern canal continues eastward from this point, and a descent is followed through five locks to Lake Boren, after which the canal, carried still at a considerable elevation, overlooks a rich and beautiful plain. The picturesque Lake Roxen with its ruined castle of Stjernarp is next traversed. At Norsholm a branch canal connects Lake Glan to the north, giving access to the important manufacturing centre of Norrköping. Passing Lake Asplängen, the canal follows a cut through steep rocks, and then resumes an elevated course to the old town of Söderköping, after which the Baltic is reached at Mem. Vessels plying to Stockholm run N.E. among the coastal island-fringe (*skärgård*), and then follow the Södertelge canal into Lake Mälar. The whole distance from Gothenburg to Stockholm is about 360 m., and the voyage takes about 2½ days. The length of artificial work on the Göta canal proper is 54 m., and there are 58 locks. The scenery is not such as will bear adverse weather conditions; that of the western canal is without any interest save in the remarkable engineering work. The idea of a canal dates from 1516, but the construction was organized by Baron von Platten and engineered by Thomas Telford in 1810–1832. The falls of Trollhättan had already been locked successfully in 1800.

GOTARZES, or GOTERZES, king of Parthia (*c.* A.D. 42–51). In an inscription at the foot of the rock of Behistun[1] he is called *Γωτάρζης Γωδόφερρου, i.e.* "son of Gew," and seems to be designated as "satrap of satrap." This inscription therefore probably dates from the reign of Artabanus II. (A.D. 10–40), to whose family Gotarzes must have belonged. From a very barbarous coin of Gotarzes with the inscription *βασιλεως βασιλεων Αρσακης νιος κεκλουμενος Αρταβανου Γωτερζης* (Wroth, *Catalogue of the Coins of Parthia*, p. 165; *Numism. Chron.*, 1900, p. 95; the earlier readings of this inscription are wrong), which must be translated "king of kings Arsakes, named son of Artabanos, Gotarzes," it appears that he was adopted by Artabanus. When the troublesome reign of Artabanus II. ended in A.D. 39 or 40, he was succeeded by Vardanes, probably his son; but against him in 41 rose Gotarzes (the dates are fixed by the coins). He soon made himself detested by his cruelty—among many other murders he even slew his brother Artabanus and his whole family (Tac. *Ann.* xi. 8)—and Vardanes regained the throne in 42; Gotarzes fled to Hyrcania and gathered an army from the Dahan nomads. The war between the two kings was at last ended by a treaty, as both were afraid of the conspiracies of their nobles. Gotarzes returned to Hyrcania. But when Vardanes was assassinated in 45, Gotarzes was acknowledged in the whole empire (Tac. *Ann.* xi. 9 ff.; Joseph. *Antiq.* xx. 3, 4, where Gotarzes is called Kotardes). He now takes on his coins the usual Parthian titles, "king of kings Arsaces the benefactor, the just, the illustrious (*Epiphanes*), the friend of the Greeks (*Philhellen*)," without mentioning his proper name. The discontent excited by his cruelty and luxury induced the hostile party to apply to the emperor Claudius and fetch from Rome an Arsacid prince Meherdates (*i.e.* Mithradates), who lived there as hostage. He crossed the Euphrates in 49, but was beaten and taken prisoner by Gotarzes, who cut off his ears (Tac. *Ann.* xii. 10 ff.). Soon after Gotarzes died, according to Tacitus, of an illness; Josephus says that he was murdered. His last coin is dated from June 51.

[1] Rawlinson, *Journ. Roy. Geog. Soc.* ix. 114; Flandin and Coste, *La Perse ancienne*, i. tab. 19; Dittenberger, *Orientis Graeci inscr.* 431.

An earlier "Arsakes with the name Gotarzes," mentioned on some astronomical tablets from Babylon (Strassmaier in *Zeitschr. für Assyriologie*, vi. 216; Mahler in *Wiener Zeitschr. für Kunde des Morgenlands*, xv. 63 ff.), appears to have reigned for some time in Babylonia about 97 B.C. (ED. M.)

GOTHA, a town of Germany, alternately with Coburg the residence of the dukes of Saxe-Coburg-Gotha, in a pleasant situation on the Leine canal, 6 m. N. of the slope of the Thuringian forest, 17 m. W. from Erfurt, on the railway to Bebra-Cassel. Pop. (1905) 36,906. It consists of an old inner town and encircling suburbs, and is dominated by the castle of Friedenstein, lying on the Schlossberg at an elevation of 1100 ft. With the exception of those in the older portion of the town, the streets are handsome and spacious, and the beautiful gardens and promenades between the suburbs and the castle add greatly to the town's attractiveness. To the south of the castle there is an extensive and finely adorned park. To the north-west of the town the Galberg—on which there is a public pleasure garden—and to the south-west the Seeberg rise to a height of over 1300 ft. and afford extensive views. The castle of Friedenstein, begun by Ernest the Pious, duke of Saxe-Coburg-Gotha, in 1643 and completed in 1654, occupies the site of the old fortress of Grimmenstein. It is a huge square building flanked with two wings, having towers rising to the height of about 140 ft. It contains the ducal cabinet of coins and the ducal library of nearly 200,000 volumes, among which are several rare editions and about 6000 manuscripts. The picture gallery, the cabinet of engravings, the natural history museum, the Chinese museum, and the cabinet of art, which includes a collection of Egyptian, Etruscan, Roman and German antiquities, are now included in the new museum, completed in 1878, which stands on a terrace to the south of the castle. The principal other public buildings are the church of St Margaret with a beautiful portal and a lofty tower, founded in the 12th century, twice burnt down, and rebuilt in its present form in 1652; the church of the Augustinian convent, with an altar-piece by the painter Simon Jacobs; the theatre; the fire insurance bank and the life insurance bank; the ducal palace, in the Italian villa style, with a winter garden and picture gallery; the buildings of the ducal legislature; the hospital; the old town-hall, dating from the 11th century; the old residence of the painter Lucas Cranach, now used as a girls' school; the ducal stable; and the Friedrichsthal palace, now used as public offices. The educational establishments include a gymnasium (founded in 1524, one of the most famous in Germany), two training schools for teachers, conservatoires of music and several scientific institutions. Gotha is remarkable for its insurance societies and for the support it has given to cremation. The crematorium was long regarded as a model for such establishments.

Gotha is one of the most active commercial towns of Thuringia, its manufactures including sausages, for which it has a great reputation, porcelain, tobacco, sugar, machinery, mechanical and surgical instruments, musical instruments, shoes, lamps and toys. There are also a number of nurseries and market gardens. The book trade is represented by about a dozen firms, including that of the great geographical house of Justus Perthes, founded in 1785.

Gotha (in old chronicles called *Gotegewe* and later *Gotaha*) existed as a village in the time of Charlemagne. In 930 its lord Gothard abbot of Hersfeld surrounded it with walls. It was known as a town as early as 1200, about which time it came into the possession of the landgraves of Thuringia. On the extinction of that line Gotha came into the possession of the electors of Saxony, and it fell later to the Ernestine line of dukes. After the battle of Mühlberg in 1547 the castle of Grimmenstein was partly destroyed, but it was again restored in 1554. In 1567 the town was taken from Duke John Frederick by the elector Augustus of Saxony. After the death of John Frederick's sons, it came into the possession of Duke Ernest the Pious, the founder of the line of the dukes of Gotha; and on the extinction of this family it was united in 1825 along with the dukedom to Coburg.

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See *Gotha und seine Umgebung* (Gotha, 1851); Kühne, *Beiträge zur Geschichte der Entwickelung der sozialen Zustände der Stadt und des Herzogtums Gotha* (Gotha, 1862); Humbert, *Les Villes de la Thuringe* (Paris, 1869), and Beck, *Geschichte der Stadt Gotha* (Gotha, 1870).

GOTHAM, WISE MEN OF, the early name given to the people of the village of Gotham, Nottingham, in allusion to their reputed simplicity. But if tradition is to be believed the Gothamites were not so very simple. The story is that King John intended to live in the neighbourhood; but that the villagers, foreseeing ruin as the cost of supporting the court, feigned imbecility when the royal messengers arrived. Wherever the latter went they saw the rustics engaged in some absurd task. John, on this report, determined to have his hunting lodge elsewhere, and the "wise men" boasted, "we ween there are more fools pass through Gotham than remain in it." The "folcs of Gotham" are mentioned as early as the 15th century in the *Towneley Mysteries*; and a collection of their "jests" was published in the 16th century under the title *Merrie Tales of the Mad Men of Gotham, gathered together by A.B., of Phisicke Doctour*. The "A.B." was supposed to represent Andrew Borde or Boorde (1490?–1549), famous among other things for his wit, but be probably had nothing to do with the compilation. As typical of the Gothamite folly is usually quoted the story of the villagers joining hands round a thornbush to shut in a cuckoo so that it would sing all the year. The localizing of fools is common to most countries, and there are many other reputed "imbecile" centres in England besides Gotham. Thus there are the people of Coggeshall, Essex, the "carles of Austwick," Yorkshire, "the gowks of Gordon," Berwickshire, and for many centuries the charge of folly has been made against "silly" Suffolk and Norfolk (*Descriptio Norfolciensium* about 12th century, printed in Wright's *Early Mysteries and other Latin Poems*). In Germany there are the *Schildburgers*, in Holland the people of Kampen. Among the ancient Greeks Boeotia was the home of fools; among the Thracians, Abdera; among the ancient Jews, Nazareth.

See W. A. Clouston, *Book of Noodles* (London, 1888); R. H. Cunningham, *Amusing Prose Chap-books* (1889).

GOTHENBURG (Swed. *Göteborg*), a city and seaport of Sweden, on the river Göta, 5 m. above its mouth in the Cattegat, 285 m. S.W. of Stockholm by rail, and 360 by the Göta canal-route. Pop. (1900) 130,619. It is the chief town of the district (*län*) of Göteborg och Bohus, and the seat of a bishop. It lies on the east or left bank of the river, which is here lined with quays on both sides, those on the west belonging to the large island of Hisingen, contained between arms of the Göta. On this island are situated the considerable suburbs of Lindholmen and Lundby.

The city itself stretches east and south from the river, with extensive and pleasant residential suburbs, over a wooded plain enclosed by low hills. The inner city, including the business quarter, is contained almost entirely between the river and the Rosenlunds canal, continued in the Vallgraf, the moat of the old fortifications; and is crossed by the Storahamn, Östrahamn and Vestrahamn canals. The Storahamn is flanked by the handsome tree-planted quays, Norra and Södra Hamngatan. The first of these, starting from the Stora Bommenshamn, where the sea-going passenger-steamers lie, leads past the museum to the Gustaf-Adolfs-Torg. The museum, in the old East India Company's house, has fine collections in natural history, entomology, botany, anatomy, archaeology and ethnography, a picture and sculpture gallery, and exhibits of coins and industrial art. Gustaf-Adolfs-Torg is the business centre, and contains the town-hall (1670) and exchange (1849). Here are statues by B. E. Fogelberg of Gustavus Adolphus and of Odin, and of Oscar I. by J. P. Molin. Among several churches in this quarter of the city is the cathedral (*Gustavii Domkyrka*), a cruciform church founded in 1633 and rebuilt after fires in 1742 and 1815. Here are also the customs-house and residence of the governor of the *län*. On the north side, closely adjacent, are the Lilla Bommenshamn, where the Göta canal steamers lie, and the two principal railway stations, Statens and Bergslafs Bangård. Above the Rosenlunds canal rises a low, rocky eminence, Lilla Otterhälleberg. The inner city is girdled on the south and east by the Kungspark, which contains Molin's famous group of statuary, the Belt-bucklers (*Bältespännare*), and by the beautiful gardens of the Horticultural Society (*Trädgårdsföreningen*). These grounds are traversed by the broad Nya Allé, a favourite promenade, and beyond them lies the best residential quarter, the first houses facing Vasa Street, Vasa Park and Kungsport Avenue. At the north end of the last are the university and the New theatre. At the west end of Vasa Street is the city library, the most important in the country except the royal library at Stockholm and the university libraries at Upsala and Lund. The suburbs are extensive. To the south-west are Majorna and Masthugget, with numerous factories. Beyond these lie the fine Slottskog Park, planted with oaks, and picturesquely broken by rocky hills commanding views of the busy river and the city. The suburb of Annedal is the workmen's quarter; others are Landala, Garda and Stampen. All are connected with the city by electric tramways. Six railways leave the city from four stations. The principal lines, from the Statens and Bergslafs stations, run N. to Trollhättan, and into Norway (Christiania); N.E. between Lakes Vener and Vetter to Stockholm, Falun and the north; E. to Borås and beyond, and S. by the coast to Helsingborg, &c. From the Vestgöta station a narrow-gauge line runs N.E. to Skara and the southern shores of Vener, and from Sarö station near Slottskog Park a line serves Sarö, a seaside watering-place on an island 20 m. S. of Gothenburg.

The city has numerous important educational establishments. The university (*Högskola*) was a private foundation (1891), but is governed by a board, the members of which are nominated by the state, the town council, Royal Society of Science and Literature, directors of the museum, and the staffs of the various local colleges. There are several boys' schools, a college for girls, a scientific college, a commercial college (1826), a school of navigation, and Chalmers' Polytechnical College, founded by William Chalmers (1748–1811), a native of Gothenburg of English parentage. He bequeathed half his fortune to this institution, and the remainder to the Sahlgrenska hospital. A people's library was founded by members of the family of Dickson, several of whom have taken a prominent part in philanthropical works in the city. The connexion of the family with Gothenburg dates from 1802, when Robert Dickson, a native of Montrose in Scotland, founded the business in which he was joined in 1807 by his brother James.

In respect of industry and commerce as a whole Gothenburg ranks as second to Stockholm in the kingdom; but it is actually the principal centre of export trade and port of register; and as a manufacturing town it is slightly inferior to Malmö. Its principal industrial establishments are mechanical works (both in the city and at Lundby), saw-mills, dealing with the timber which is brought down the Göta, flour-mills, margarine factories, breweries and distilleries, tobacco works, cotton mills, dyeing and bleaching works (at Levanten in the vicinity), furniture factories, paper and leather works, and shipbuilding yards. The vessels registered at the port in 1901 were 247 of 120,488 tons. There are about 3 m. of quays approachable by vessels drawing 20 ft., and slips for the accommodation of large vessels. Gothenburg is the principal port of embarkation of Swedish emigrants for America.

The city is governed by a council including two mayors, and returns nine members to the second chamber of the Riksdag (parliament).

Founded by Gustavus Adolphus in 1619, Gothenburg was from the first designed to be fortified, a town of the same name founded on Hisingen in 1603 having been destroyed by the Danes during the Calmar war. From 1621, when it was first chartered, it steadily increased, though it suffered greatly in the Danish wars of the last half of the 17th and the beginning of the 18th centuries, and from several extensive conflagrations (the last in 1813), which have destroyed important records of its history. The great development of its herring fishery in the latter part

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of the 18th century gave a new impulse to the city's trade, which was kept up by the influence of the "Continental System," under which Gothenburg became a depot for the colonial merchandise of England. After the fall of Napoleon it began to decline, but after its closer connexion with the interior of the country by the Göta canal (opened 1832) and Western railway it rapidly advanced both in population and trade. Since the demolition of its fortifications in 1807, it has been defended only by some small forts. Gothenburg was the birthplace of the poet Bengt Lidner (1757–1793) and two of Sweden's greatest sculptors, Bengt Erland Fogelberg (1786–1854) and Johann Peter Molin (1814–1873). After the French Revolution Gothenburg was for a time the residence of the Bourbon family. The name of this city is associated with the municipal licensing system known as the Gothenburg System (see LIQUOR LAWS).

See W. Berg, *Samlingar till Göteborgs historia* (Gothenburg, 1893); Lagerberg, *Göteborg i äldre och nyare tid* (Gothenburg, 1902); Fröding, *Det forna Göteborg* (Stockholm, 1903).

GOTHIC, the term generally applied to medieval architecture, and more especially to that in which the pointed arch appears. The style was at one time supposed to have originated with the warlike people known as the Goths, some of whom (the East Goths, or Ostrogoths) settled in the eastern portion of Europe, and others (the West Goths, or Visigoths) in the Asturias of Spain; but as no buildings or remains of any description have ever been found, in which there are any traces of an independent construction in either brick or stone, the title is misleading; since, however, it is now so generally accepted it would be difficult to change it. The term when first employed was one of reproach, as Evelyn (1702) when speaking of the faultless building (*i.e.* classic) says, "they were demolished by the Goths or Vandals, who introduced their own licentious style now called modern or Gothic." The employment of the pointed arch in Syria, Egypt and Sicily from the 8th century onwards by the Mahommedans for their mosques and gateways, some four centuries before it made its appearance in Europe, also makes it advisable to adhere to the old term Gothic in preference to Pointed Architecture. (See ARCHITECTURE)

GÖTHITE, or GOETHITE, a mineral composed of an iron hydrate, $Fe_2O_3.H_2O$, crystallizing in the orthorhombic system and isomorphous with diaspore and manganite (*q.v.*). It was first noticed in 1789, and in 1806 was named after the poet Goethe. Crystals are prismatic, acicular or scaly in habit; they have a perfect cleavage parallel to the brachypinacoid (M in the figure). Reniform and stalactitic masses with a radiated fibrous structure also occur. The colour varies from yellowish or reddish to blackish-brown, and by transmitted light it is often blood-red; the streak is brownish-yellow; hardness, 5; specific gravity, 4·3. The best crystals are the brilliant, blackish-brown prisms with terminal pyramidal planes (fig.) from the Restormel iron mines at Lostwithiel, and the Botallack mine at St Just in Cornwall. A variety occurring as thin red scales at Siegen in Westphalia is known as Ruhinglimmer or pyrrhosiderite (from Gr. πυρρός, flame-coloured, and σίδηρος, iron): a scaly-fibrous variety from the same locality is called lepidocrocite (from λεπίς, scale, and κροκίς, fibre). Sammetblende or przibramite is a variety, from Przibram in Bohemia, consisting of delicate acicular or capillary crystals arranged in radiating groups with a velvety surface and yellow colour.

Göthite occurs with other iron oxides, especially limonite and hematite, and when found in sufficient quantity is mined with these as an ore of iron. It often occurs also as an enclosure in other minerals. Acicular crystals, resembling rutile in appearance, sometimes penetrate crystals of pale-coloured amethyst, for instance, at Wolf's Island in Lake Onega in Russia: this form of the mineral has long been known as onegite, and the crystals enclosing it are cut for ornamental purposes under the name of "Cupid's darts" (*flèches d'amour*). The metallic glitter of avanturine or sun-stone (*q.v.*) is due to the enclosed scales of göthite and certain other minerals. (L. J. S.)

GOTHS (*Gotones*, later *Gothi*), a Teutonic people who in the 1st century of the Christian era appear to have inhabited the middle part of the basin of the Vistula. They were probably the easternmost of the Teutonic peoples. According to their own traditions as recorded by Jordanes, they had come originally from the island Scandza, *i.e.* Skåne or Sweden, under the leadership of a king named Berig, and landed first in a region called Gothiscandza. Thence they invaded the territories of the Ulmerugi (the Holmryge of Anglo-Saxon tradition), probably in the neighbourhood of Rügenwalde in eastern Pomerania, and conquered both them and the neighbouring Vandals. Under their sixth king Filimer they migrated into Scythia and settled in a district which they called Oium. The rest of their early history, as it is given by Jordanes following Cassiodorus, is due to an erroneous identification of the Goths with the Getae, and ancient Thracian people. *Early history.*

The credibility of the story of the migration from Sweden has been much discussed by modern authors. The legend was not peculiar to the Goths, similar traditions being current among the Langobardi, the Burgundians, and apparently several other Teutonic nations. It has been observed with truth that so many populous nations can hardly have sprung from the Scandinavian peninsula; on the other hand, the existence of these traditions certainly requires some explanation. Possibly, however, many of the royal families may have contained an element of Scandinavian blood, a hypothesis which would well accord with the social conditions of the migration period, as illustrated, *e.g.*, in *Völsunga Saga* and in *Hervarar Saga ok Heiðreks Konungs*. In the case of the Goths a connexion with Gotland is not unlikely, since it is clear from archaeological evidence that this island had an extensive trade with the coasts about the mouth of the Vistula in early times. If, however, there was any migration at all, one would rather have expected it to have taken place in the reverse direction. For the origin of the Goths can hardly be separated from that of the Vandals, whom according to Procopius they resembled in language and in all other respects. Moreover the Gepidae, another Teutonic people, who are said to have formerly inhabited the delta of the Vistula, also appear to have been closely connected with the Goths. According to Jordanes they participated in the migration from Scandza.

Apart from a doubtful reference by Pliny to a statement of the early traveller Pytheas, the first notices we have of the Goths go back to the first years of the Christian era, at which time they seem to have been subject to the Marcomannic king Maroboduus. They do not enter into Roman history, however, until after the beginning of the 3rd century, at which time they appear to have come in conflict with the emperor Caracalla. During this century their frontier seems to have been advanced considerably farther south, and the whole country as far as the lower Danube was frequently ravaged by them. The emperor Gordianus is called "victor Gothorum" by Capitolinus, though we have no record of the ground for the claim, and further conflicts are recorded with his successors, one of whom, Decius, was slain by the Goths in Moesia. According to Jordanes the kings of the Goths during these campaigns were Ostrogotha and afterwards Cniva, the former of whom is praised also in the Anglo-Saxon poem *Widsith*. The emperor Gallus was forced to pay tribute to the Goths. By this time they had reached the coasts of the Black Sea, and during the next twenty years they frequently ravaged the maritime regions of Asia Minor and Greece. Aurelian is said to have won a victory over them, but the province of Dacia had to be given up. In the time of Constantine the Great Thrace and Moesia were again plundered by the Goths, A.D. 321. Constantine drove them back and concluded peace with their king Ariaric in 336. From the end of the 3rd century we hear of subdivisions of the nation called Greutungi, Teruingi, Austrogothi (Ostrogothi), Visigothi, Taifali, though it is not clear whether these were all distinct.

Though by this time the Goths had extended their territories

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far to the south and east, it must not be assumed that they had evacuated their old lands on the Vistula. Jordanes records several traditions of their conflicts with other Teutonic tribes, in particular a victory won by Ostrogotha over Fastida, king of the Gepidae, and another by Geberic over Visimar, king of the Vandals, about the end of Constantine's reign, in consequence of which the Vandals sought and obtained permission to settle in Pannonia. Geberic was succeeded by the most famous of the Gothic kings, Hermanaric (Eormenric, Iörmunrekr), whose deeds are recorded in the traditions of all Teutonic nations. According to Jordanes he conquered the Heruli, the Aestii, the Venedi, and a number of other tribes who seem to have been settled in the southern part of Russia. From Anglo-Saxon sources it seems probable that his supremacy reached west wards as far as Holstein. He was of a cruel disposition, and is said to have killed his nephews Embrica (Emerca) and Fritla (Fridla) in order to obtain the great treasure which they possessed. Still more famous is the story of Suanihilda (Svanhildr), who according to Northern tradition was his wife and was cruelly put to death on a false charge of unfaithfulness. An attempt to avenge her death was made by her brothers Ammius (Hamðir) and Sarus (Sörli) by whom Hermanaric was severely wounded. To his time belong a number of other heroes whose exploits are recorded in English and Northern tradition, amongst whom we may mention Wudga (Vidigoia), Hama and several others, who in *Widsith* are represented as defending their country against the Huns in the forest of the Vistula. Hermanaric committed suicide in his distress at an invasion of the Huns about A.D. 370, and the portion of the nation called Ostrogothes then came under Hunnish supremacy. The Visigoths obtained permission to cross the Danube and settle in Moesia. A large part of the nation became Christian about this time (see below). The exactions of the Roman governors, however, soon led to a quarrel, which ended in the total defeat and death of Valens at Adrianople in the year 378. (F. G. M. B.)

Later history.

From about 370 the history of the East and West Goths parts asunder, to be joined together again only incidentally and for a season. The great mass of the East Goths stayed north of the Danube, and passed under the overlordship of the Hun. They do not for the present play any important part in the affairs of the Empire. The great mass of the West Goths crossed the Danube into the Roman provinces, and there played a most important part in various characters of alliance and enmity. The great migration was in 376, when they were allowed to pass as peaceful settlers under their chief Frithigern. His rival Athanaric seems to have tried to maintain his party for a while north of the Danube in defiance of the Huns; but he had presently to follow the example of the great mass of the nation. The peaceful designs of Frithigern were meanwhile thwarted by the ill-treatment which the Goths suffered from the Roman officials, which led first to disputes and then to open war. In 378 the Goths won the great battle of Adrianople, and after this Theodosius the Great, the successor of Valens, made terms with them in 381, and the mass of the Gothic warriors entered the Roman service as *foederati*. Many of their chiefs were in high favour; but it seems that the orthodox Theodosius showed more favour to the still remaining heathen party among the Goths than to the larger part of them who had embraced Arian Christianity. Athanaric himself came to Constantinople in 381; he was received with high honours, and had a solemn funeral when he died. His saying is worth recording, as an example of the effect which Roman civilization had on the Teutonic mind. "The emperor," he said, "was a god upon earth, and he who resisted him would have his blood on his own head."

The death of Theodosius in 395 broke up the union between the West Goths and the Empire. Dissensions arose between them and the ministers of Arcadius; the Goths threw off their allegiance, and chose Alaric as their king. This was a restoration alike of national unity and of national independence. The royal title had not been borne by their leaders in the Roman service. Alaric's position is quite different from that of several Goths in the Roman service, who appear as simple rebels. He was of the great West Gothic house of the Balthi, or Bold-men, a house second in nobility only to that of the Amali. His whole career was taken up with marchings to and fro within the lands, first of the Eastern, then of the Western empire. The Goths are under him an independent people under a national king; their independence is in no way interfered with if the Gothic king, in a moment of peace, accepts the office and titles of a Roman general. But under Alaric the Goths make no lasting settlement. In the long tale of intrigue and warfare between the Goths and the two imperial courts which fills up this whole time, cessions of territory are offered to the Goths, provinces are occupied by them, but as yet they do not take root anywhere; no Western land as yet becomes *Gothia*. Alaric's designs of settlement seem in his first stage to have still kept east of the Adriatic, in Illyricum, possibly in Greece. Towards the end of his career his eyes seem fixed on Africa.

Greece was the scene of his great campaign in 395–96, the second Gothic invasion of that country. In this campaign the religious position of the Goths is strongly marked. The Arian appeared as an enemy alike to the pagan majority and the Catholic minority; but he came surrounded by monks, and his chief wrath was directed against the heathen temples (*vide* G. F. Hertzberg, *Geschichte Griechenlands*, iii. 301). His Italian campaigns fall into two great divisions, that of 402–3, when he was driven back by Stilicho, and that of 408–10, after Stilicho's death. In this second war he thrice besieged Rome (408, 409, 410). The second time it suited a momentary policy to set up a puppet emperor of his own, and even to accept a military commission from him. The third time he sacked the city, the first time since Brennus that Rome had been taken by an army of utter foreigners. The intricate political and military details of these campaigns are of less importance in the history of the Gothic nation than the stage which Alaric's reign marks in the history of that nation. It stands between two periods of settlement within the Empire and of service under the Empire. Under Alaric there is no settlement, and service is quite secondary and precarious; after his death in 410 the two begin again in new shapes.

Contemporary with the campaigns of Alaric was a barbarian invasion of Italy, which, according to one view, again brings the East and West Goths together. The great mass of the East Goths, as has been already said, became one of the many nations which were under vassalage to the Huns; but their relation was one merely of vassalage. They remained a distinct people under kings of their own, kings of the house of the Amali and of the kindred of Ermanaric (Jordanes, 48). They had to follow the lead of the Huns in war, but they were also able to carry on wars of their own; and it has been held that among these separate East Gothic enterprises we are to place the invasion of Italy in 405 by Radagaisus (whom R. Pallmann[1] writes Ratiger, and takes him for the chief of the heathen part of the East Goths). One chronicler, Prosper, makes this invasion preceded by another in 400, in which Alaric and Radagaisus appear as partners. The paganism of Radagaisus is certain. The presence of Goths in his army is certain, but it seems dangerous to infer that his invasion was a national Gothic enterprise.

Under Ataulphus, the brother-in-law and successor of Alaric, another era opens, the beginning of enterprises which did in the end lead to the establishment of a settled Gothic monarchy in the West. The position of Ataulphus is well marked by the speech put into his mouth by Orosius. He had at one time dreamed of destroying the Roman power, of turning *Romania* into *Gothia*, and putting Ataulphus in the stead of Augustus; but he had learned that the world could be governed only by the laws of Rome and he had determined to use the Gothic arms for the support of the Roman power. And in the confused and contradictory accounts of his actions (for the story in Jordanes cannot be reconciled with the accounts in Olympiodorus and the chroniclers), we can see something of this principle at work throughout. Gaul and Spain were overrun both by barbarian

[1] *Geschichte der Völkerwanderung* (Gotha, 1863–1864).

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invaders and by rival emperors. The sword of the Goth was to win back the last lands for Rome. And, amid many shiftings of allegiance, Ataulphus seems never to have wholly given up the position of an ally of the Empire. His marriage with Placidia, the daughter of the great Theodosius, was taken as the seal of the union between Goth and Roman, and, had their son Theodosius lived, a dynasty might have arisen uniting both claims. But the career of Ataulphus was cut short at Barcelona in 415, by his murder at the hands of another faction of the Goths. The reign of Sigeric was momentary. Under Wallia in 418 a more settled state of things was established. The Empire received again, as the prize of Gothic victories, the Tarraconensis in Spain, and Novempopulana and the Narbonensis in Gaul. The "second Aquitaine," with the sea-coast from the mouth of the Garonne to the mouth of the Loire, became the West Gothic kingdom of Toulouse. The dominion of the Goths was now strictly Gaulish; their lasting Spanish dominion does not yet begin.

The reign of the first West Gothic Theodoric (419–451) shows a shifting state of relations between the Roman and Gothic powers; but, after defeats and successes both ways, the older relation of alliance against common enemies was again established. At last Goth and Roman had to join together against the common enemy of Europe and Christendom, Attila the Hun. But they met Gothic warriors in his army. By the terms of their subjection to the Huns, the East Goths came to fight for Attila against Christendom at Châlons, just as the Servians came to fight for Bajazet against Christendom at Nicopolis. Theodoric fell in the battle (451). After this momentary meeting, the history of the East and West Goths again separates for a while. The kingdom of Toulouse grew within Gaul at the expense of the Empire, and in Spain at the expense of the Suevi. Under Euric (466–485) the West Gothic power again became largely a Spanish power. The kingdom of Toulouse took in nearly all Gaul south of the Loire and west of the Rhone, with all Spain, except the north-west corner, which was still held by the Suevi. Provence alone remained to the Empire. The West Gothic kings largely adopted Roman manners and culture; but, as they still kept to their original Arian creed, their rule never became thoroughly acceptable to their Catholic subjects. They stood, therefore, at a great disadvantage when a new and aggressive Catholic power appeared in Gaul through the conversion of the Frank Clovis or Chlodwig. Toulouse was, as in days long after, the seat of an heretical power, against which the forces of northern Gaul marched as on a crusade. In 507 the West Gothic king Alaric II. fell before the Frankish arms at Campus Vogladensis, near Poitiers, and his kingdom, as a great power north of the Alps, fell with him. That Spain and a fragment of Gaul still remained to form a West Gothic kingdom was owing to the intervention of the East Goths under the rule of the greatest man in Gothic history.

When the Hunnish power broke in pieces on the death of Attila, the East Goths recovered their full independence. They now entered into relations with the Empire, and were settled on lands in Pannonia. During the greater part of the latter half of the 5th century, the East Goths play in south-eastern Europe nearly the same part which the West Goths played in the century before. They are seen going to and fro, in every conceivable relation of friendship and enmity with the Eastern Roman power, till, just as the West Goths had done before them, they pass from the East to the West. They are still ruled by kings of the house of the Amali, and from that house there now steps forward a great figure, famous alike in history and in romance, in the person of Theodoric, son of Theodemir. Born about 454, his childhood was spent at Constantinople as a hostage, where he was carefully educated. The early part of his life is taken up with various disputes, intrigues and wars within the Eastern empire, in which he has as his rival another Theodoric, son of Triarius, and surnamed Strabo. This older but lesser Theodoric seems to have been the chief, not the king, of that branch of the East Goths which had settled within the Empire at an earlier time. Theodoric the Great, as he is sometimes distinguished, is sometimes the friend, sometimes the enemy, of the Empire. In the former case he is clothed with various Roman titles and offices, as patrician and consul; but in all cases alike he remains the national East Gothic king. It was in both characters together that he set out in 488, by commission from the emperor Zeno, to recover Italy from Odoacer. By 493 Ravenna was taken; Odoacer was killed by Theodoric's own hand; and the East Gothic power was fully established over Italy, Sicily, Dalmatia and the lands to the north of Italy. In this war the history of the East and West Goths begins again to unite, if we may accept the witness of one writer that Theodoric was helped by West Gothic auxiliaries. The two branches of the nation were soon brought much more closely together, when, through the overthrow of the West Gothic kingdom of Toulouse, the power of Theodoric was practically extended over a large part of Gaul and over nearly the whole of Spain. A time of confusion followed the fall of Alaric II., and, as that prince was the son-in-law of Theodoric, the East Gothic king stepped in as the guardian of his grandson Amalaric, and preserved for him all his Spanish and a fragment of his Gaulish dominion. Toulouse passed away to the Frank; but the Goth kept Narbonne and its district, the land of Septimania—the land which, as the last part of Gaul held by the Goths, kept the name of *Gothia* for many ages. While Theodoric lived, the West Gothic kingdom was practically united to his own dominion. He seems also to have claimed a kind of protectorate over the Teutonic powers generally, and indeed to have practically exercised it, except in the case of the Franks.

The East Gothic dominion was now again as great in extent and far more splendid than it could have been in the time of Ermanaric. But it was now of a wholly different character. The dominion of Theodoric was not a barbarian but a civilized power. His twofold position ran through everything. He was at once national king of the Goths, and successor, though without any imperial titles, of the Roman emperors of the West. The two nations, differing in manners, language and religion, lived side by side on the soil of Italy; each was ruled according to its own law, by the prince who was, in his two separate characters, the common sovereign of both. The picture of Theodoric's rule is drawn for us in the state papers drawn up in his name and in the names of his successors by his Roman minister Cassiodorus. The Goths seem to have been thick on the ground in northern Italy; in the south they formed little more than garrisons. In Theodoric's theory the Goth was the armed protector of the peaceful Roman; the Gothic king had the toil of government, while the Roman consul had the honour. All the forms of the Roman administration went on, and the Roman polity and Roman culture had great influence on the Goths themselves. The rule of the prince over two distinct nations in the same land was necessarily despotic; the old Teutonic freedom was necessarily lost. Such a system as that which Theodoric established needed a Theodoric to carry it on. It broke in pieces after his death.

On the death of Theodoric (526) the East and West Goths were again separated. The few instances in which they are found acting together after this time are as scattered and incidental as they were before. Amalaric succeeded to the West Gothic kingdom in Spain and Septimania. Provence was added to the dominion of the new East Gothic king Athalaric, the grandson of Theodoric through his daughter Amalasuntha. The weakness of the East Gothic position in Italy now showed itself. The long wars of Justinian's reign (535–555) recovered Italy for the Empire, and the Gothic name died out on Italian soil. The chance of forming a national state in Italy by the union of Roman and Teutonic elements, such as those which arose in Gaul, in Spain, and in parts of Italy under Lombard rule, was thus lost. The East Gothic kingdom was destroyed before Goths and Italians had at all mingled together. The war of course made the distinction stronger; under the kings who were chosen for the purposes of the war national Gothic feeling had revived. The Goths were now again, if not a wandering people, yet an armed host, no longer the protectors but the

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enemies of the Roman people of Italy. The East Gothic dominion and the East Gothic name wholly passed away. The nation had followed Theodoric. It is only once or twice after his expedition that we hear of Goths, or even of Gothic leaders, in the eastern provinces. From the soil of Italy the nation passed away almost without a trace, while the next Teutonic conquerors stamped their name on the two ends of the land, one of which keeps it to this day.

The West Gothic kingdom lasted much longer, and came much nearer to establishing itself as a national power in the lands which it took in. But the difference of race and faith between the Arian Goths and the Catholic Romans of Gaul and Spain influenced the history of the West Gothic kingdom for a long time. The Arian Goths ruled over Catholic subjects, and were surrounded by Catholic neighbours. The Franks were Catholics from their first conversion; the Suevi became Catholics much earlier than the Goths. The African conquests of Belisarius gave the Goths of Spain, instead of the Arian Vandals, another Catholic neighbour in the form of the restored Roman power. The Catholics everywhere preferred either Roman, Suevian or Frankish rule to that of the heretical Goths; even the unconquerable mountaineers of Cantabria seem for a while to have received a Frankish governor. In some other mountain districts the Roman inhabitants long maintained their independence, and in 534 a large part of the south of Spain, including the great cities of Cadiz, Cordova, Seville and New Carthage, was, with the good will of its Roman inhabitants, reunited to the Empire, which kept some points on the coast as late as 624. That is to say, the same work which the Empire was carrying on in Italy against the East Goths was at the same moment carried on in Spain against the West Goths. But in Italy the whole land was for a while won back, and the Gothic power passed away for ever. In Spain the Gothic power outlived the Roman power, but it outlived it only by itself becoming in some measure Roman. The greatest period of the Gothic power as such was in the reign of Leovigild (568–586). He reunited the Gaulish and Spanish parts of the kingdom which had been parted for a moment; he united the Suevian dominion to his own; he overcame some of the independent districts, and won back part of the recovered Roman province in southern Spain. He further established the power of the crown over the Gothic nobles, who were beginning to grow into territorial lords. The next reign, that of his son Recared (586–601), was marked by a change which took away the great hindrance which had thus far stood in the way of any national union between Goths and Romans. The king and the greater part of the Gothic people embraced the Catholic faith. A vast degree of influence now fell into the hands of the Catholic bishops; the two nations began to unite; the Goths were gradually romanized and the Gothic language began to go out of use. In short, the Romance nation and the Romance speech of Spain began to be formed. The Goths supplied the Teutonic infusion into the Roman mass. The kingdom, however, still remained a Gothic kingdom. "Gothic," not "Roman" or "Spanish," is its formal title; only a single late instance of the use of the formula "regnum Hispaniae" is known. In the first half of the 7th century that name became for the first time geographically applicable by the conquest of the still Roman coast of southern Spain. The Empire was then engaged in the great struggle with the Avars and Persians, and, now that the Gothic kings were Catholic, the great objection to their rule on the part of the Roman inhabitants was taken away. The Gothic nobility still remained a distinct class, and held, along with the Catholic prelacy, the right of choosing the king. Union with the Catholic Church was accompanied by the introduction of the ecclesiastical ceremony of anointing, a change decidedly favourable to elective rule. The growth of those later ideas which tended again to favour the hereditary doctrine had not time to grow up in Spain before the Mahommedan conquest (711). The West Gothic crown therefore remained elective till the end. The modern Spanish nation is the growth of the long struggle with the Mussulmans; but it has a direct connexion with the West Gothic kingdom. We see at once that the Goths hold altogether a different place in Spanish memory from that which they hold in Italian memory. In Italy the Goth was but a momentary invader and ruler; the Teutonic element in Italy comes from other sources. In Spain the Goth supplies an important element in the modern nation. And that element has been neither forgotten nor despised. Part of the unconquered region of northern Spain, the land of Asturia, kept for a while the name of Gothia, as did the Gothic possessions in Gaul and in Crim. The name of the people who played so great a part in all southern Europe, and who actually ruled over so large a part of it has now wholly passed away; but it is in Spain that its historical impress is to be looked for.

Of Gothic literature in the Gothic language we have the Bible of Ulfilas, and some other religious writings and fragments (see *Gothic Language* below). Of Gothic legislation in Latin we have the edict of Theodoric of the year 500, edited by F. Bluhme in the *Monumenta Germaniae historica*; and the books of *Variae* of Cassiodorus may pass as a collection of the state papers of Theodoric and his immediate successors. Among the West Goths written laws had already been put forth by Euric. The second Alaric (484–507) put forth a *Breviarium* of Roman law for his Roman subjects; but the great collection of West Gothic laws dates from the later days of the monarchy, being put forth by King Recceswinth about 654. This code gave occasion to some well-known comments by Montesquieu and Gibbon, and has been discussed by Savigny (*Geschichte des römischen Rechts*, ii. 65) and various other writers. They are printed in the *Monumenta Germaniae, leges*, tome i. (1902). Of special Gothic histories, besides that of Jordanes, already so often quoted, there is the Gothic history of Isidore, archbishop of Seville, a special source of the history of the West Gothic kings down to Svinthala (621–631). But all the Latin and Greek writers contemporary with the days of Gothic predominance make their constant contributions. Not for special facts, but for a general estimate, no writer is more instructive than Salvian of Marseilles in the 5th century, whose work *De Gubernatione Dei* is full of passages contrasting the vices of the Romans with the virtues of the barbarians, especially of the Goths. In all such pictures we must allow a good deal for exaggeration both ways, but there must be a ground-work of truth. The chief virtues which the Catholic presbyter praises in the Arian Goths are their chastity, their piety according to their own creed, their tolerance towards the Catholics under their rule, and their general good treatment of their Roman subjects. He even ventures to hope that such good people may be saved, notwithstanding their heresy. All this must have had some ground-work of truth in the 5th century, but it is not very wonderful if the later West Goths of Spain had a good deal fallen away from the doubtless somewhat ideal picture of Salvian. (E. A. F.)

There is now an extensive literature on the Goths, and among the principal works may be mentioned: T. Hodgkin, *Italy and her Invaders* (Oxford, 1880–1899); L. Aschbach, *Geschichte der Westgoten* (Frankfort, 1827); F. Dahn, *Die Könige der Germanen* (1861–1899); E. von Wietersheim, *Geschichte der Völkerwanderung* (1880–1881); R. Pallmann, *Die Geschichte der Völkerwanderung* (Gotha, 1863–1864); E. Rappaport, *Der Einfälle der Goten in das römische Reich* (Leipzig, 1899), and K. Zeuss, *Die Deutschen und die Nachbarstämme* (Munich, 1837). Other works which may be consulted are: E. Gibbon, *Decline and Fall of the Roman Empire*, edited by J. B. Bury (1896–1900); H. H. Milman, *History of Latin Christianity* (1867); J. B. Bury, *History of the Later Roman Empire* (1889); P. Villari, *Le Invasioni barbariche in Italia* (Milan, 1901); and F. Martroye, *L'Occident à l'époque byzantine: Goths et Vandales* (Paris, 1904). There is a popular history of the Goths by H. Bradley in the "Story of the Nations" series (London, 1888). For the laws see the *Leges* in Band I. of the *Monumenta Germaniae historica, leges* (1902). A. Heffterich, *Entstehung und Geschichte des Westgotenrechts* (Berlin, 1858); F. Bluhme, *Zur Textkritik des Westgothenrechts* (1872); F. Dahn, *Lex Visigothorum. Westgotische Studien* (Würzburg, 1874); C. Rinaudo, *Leggi dei Visigote, studio* (Turin, 1878); and K. Zeumer, "Geschichte der westgotischen Gesetzgebung" in the *Neues Archiv der Gesellschaft für ältere deutsche Geschichtskunde*. See also the article on THEODORIC.

Gothic Language.—Our knowledge of the Gothic language is derived almost entirely from the fragments of a translation

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of the Bible which is believed to have been made by the Arian bishop Wulfila or Ulfilas (d. 383) for the Goths who dwelt on the lower Danube. The MSS. which have come down to us and which date from the period of Ostrogothic rule in Italy (489–555) contain the Second Epistle to the Corinthians complete, together with more or less considerable fragments of the four Gospels and of all the other Pauline Epistles. The only remains of the Old Testament are three short fragments of Ezra and Nehemiah. There is also an incomplete commentary (*skeireins*) on St John's Gospel, a fragment of a calendar, and two charters (from Naples and Arezzo, the latter now lost) which contain some Gothic sentences. All these texts are written in a special character, which is said to have been invented by Wulfila. It is based chiefly on the uncial Greek alphabet, from which indeed most of the letters are obviously derived, and several orthographical peculiarities, *e.g.* the use of *ai* for *e* and *ei* for *i* reflect the Greek pronunciation of the period. Other letters, however, have been taken over from the Runic and Latin alphabets. Apart from the texts mentioned above, the only remains of the Gothic language are the proper names and occasional words which occur in Greek and Latin writings, together with some notes, including the Gothic alphabet, in a Salzburg MS. of the 10th century, and two short inscriptions on a torque and a spear-head, discovered at Buzeo (Walachia) and Kovel (Volhynia) respectively. The language itself, as might be expected from the date of Wulfila's translation, is of a much more archaic type than that of any other Teutonic writings which we possess, except a few of the earliest Northern inscriptions. This may be seen, *e.g.* in the better preservation of final and unaccented syllables and in the retention of the dual and the middle (passive) voice in verbs. It would be quite erroneous, however, to regard the Gothic fragments as representing a type of language common to all Teutonic nations in the 4th century. Indeed the distinctive characteristics of the language are very marked, and there is good reason for believing that it differed considerably from the various northern and western languages, whereas the differences among the latter at this time were probably comparatively slight (see TEUTONIC LANGUAGES). On the other hand, it must not be supposed that the language of the Goths stood quite isolated. Procopius (*Vand.* i. 2) states distinctly that the Gothic language was spoken not only by the Ostrogoths and Visigoths but also by the Vandals and the Gepidae; and in the former case there is sufficient evidence, chiefly from proper names, to prove that his statement is not far from the truth. With regard to the Gepidae we have less information; but since the Goths, according to Jordanes (cap. 17), believed them to have been originally a branch of their own nation, it is highly probable that the two languages were at least closely related. Procopius elsewhere (*Vand.* i. 3; *Goth.* i. 1, iii. 2) speaks of the Rugii, Sciri and Alani as Gothic nations. The fact that the two former were sprung from the north-east of Germany renders it probable that they had Gothic affinities, while the Alani, though non-Teutonic in origin, may have become gothicized in the course of the migration period. Some modern writers have included in the same class the Burgundians, a nation which had apparently come from the basin of the Oder, but the evidence at our disposal on the whole hardly justifies the supposition that their language retained a close affinity with Gothic.

In the 4th and 5th centuries the Gothic language—using the term in its widest sense—must have spread over the greater part of Europe together with the north coast of Africa. It disappeared, however, with surprising rapidity. There is no evidence for its survival in Italy or Africa after the fall of the Ostrogothic and Vandal kingdoms, while in Spain it is doubtful whether the Visigoths retained their language until the Arabic conquest. In central Europe it may have lingered somewhat longer in view of the evidence of the Salzburg MS. mentioned above. Possibly the information there given was derived from southern Hungary or Transylvania where remains of the Gepidae were to be found shortly before the Magyar invasion (889). According to Walafridus Strabo (*de Reb. Eccles.* cap. 7) also Gothic was still used in his time (the 9th century) in some churches in the region of the lower Danube. Thenceforth the language seems to have survived only among the Goths (*Gots Tetraxitae*) of the Crimea, who are mentioned for the last time by Ogier Ghislain de Busbecq, an imperial envoy at Constantinople about the middle of the 16th century. He collected a number of words and phrases in use among them which show clearly that their language, though not unaffected by Iranian influence, was still essentially a form of Gothic.

See H. C. von der Gabelentz and J. Loebe, *Ulfilas* (Altenburg and Leipzig, 1836–1846); E. Bernhardt, *Vulfila oder die gotische Bibel* (Halle, 1875). For other works on the Gothic language see J. Wright, *A Primer of the Gothic Language* (Oxford, 1892), p. 143 f. To the bibliography there given should be added: C. C. Uhlenbeck, *Etymologisches Wörterbuch d. got. Sprache* (Amsterdam and Leipzig, 1901); F. Kluge, "Geschichte d. got. Sprache" in H. Paul's *Grundriss d. germ. Philologie* (2nd ed., vol. i., Strassburg, 1897); W. Streitberg, *Gotisches Elementarbuch* (Heidelberg, 1897); Th. von Grienberger, *Beiträge zur Geschichte d. deutschen Sprache u. Literatur*, xxii. 185 ff.; L. F. A. Wimmer, *Die Runenschrift* (Berlin, 1887), p. 61 ff.; G. Stephens, *Handbook to the Runic Monuments* (London, 1884), p. 203; F. Wrede, *Über die Sprache der Wandalen* (Strassburg, 1886). For further references see K. Zeuss, *Die Deutschen*, p. 432 f. (where earlier references to the Crimean Goths are also given); F. Kluge, *op. cit.*, p. 515 ff.; and O. Bremer, *ib.* vol. iii., p. 822. (H. M. C.)

GOTLAND, an island in the Baltic Sea belonging to Sweden, lying between 57° and 58° N., and having a length from S.S.W. to N.N.E. of 75 m., a breadth not exceeding 30 m., and an area of 1142 sq. m. The nearest point on the mainland is 50 m. from the westernmost point of the island. With the island Färö, off the northern extremity, the Karlsöe, off the west coast, and Götska Sandö, 25 m. N. by E., Gotland forms the administrative district (*län*) of Gotland. The island is a level plateau of Silurian limestone, rising gently eastward, of an average height of 80 to 100 ft., with steep coasts fringed with tapering, free-standing columns of limestone (*raukar*). A few low isolated hills rise inland. The climate is temperate, and the soil, although in parts dry and sterile, is mostly fertile. Former marshy moors have been largely drained and cultivated. There are extensive sand-dunes in the north. As usual in a limestone formation, some of the streams have their courses partly below the surface, and caverns are not infrequent. Less than half the total area is under forest, the extent of which was formerly much greater. Barley, rye, wheat and oats are grown, especially the first, which is exported to the breweries on the mainland. The sugar-beet is also produced and exported, and there are beet-sugar works on the island. Sheep and cattle are kept; there is a government sheep farm at Roma, and the cattle may be noted as belonging principally to an old native breed, yellow and horned. Some lime-burning, cement-making and sea-fishing are carried on. The capital of the island is Visby, on the west coast. There are over 80 m. of railways. Lines run from Visby N.E. to Tingstäde and S. to Hofdhem, with branches from Roma to Klintehamn, a small watering-place on the west coast, and to Slitehamn on the east. Excepting along the coast the island has no scenic attraction, but it is of the highest archaeological interest. Nearly every village has its ruined church, and others occur where no villages remain. The shrunken walled town of Visby was one of the richest commercial centres of the Baltic from the 11th to the 14th century, and its prosperity was shared by the whole island. It retains ten churches besides the cathedral. The massive towers of the village churches are often detached, and doubtless served purposes of defence. The churches of Roma, Hemse, with remarkable mural paintings, Othen and Lärbo may be specially noted. Some contain fine stained glass, as at Dalhem near Visby. The natives of Gotland speak a dialect distinguished from that of any part of the Swedish mainland. Pop. of *län* (1900) 52,781.

Gotland was subject to Sweden before 890, and in 1030 was christianized by St Olaf, king of Norway, when returning from his exile at Kiev. He dedicated the first church in the island to St Peter at Visby. At that time Visby had long been one of the most important trading towns in the Baltic, and the chief distributing centre of the oriental commerce which came to Europe along the rivers of Russia. In the early years of the

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Hanseatic League, or about the middle of the 13th century, it became the chief depôt for the produce of the eastern Baltic countries, including, in a commercial sense, its daughter colony (11th century or earlier) of Novgorod the Great. Although Visby was an independent member of the Hanseatic League, the influence of Lübeck was paramount in the city, and half its governing body were men of German descent. Indeed, Björkander endeavours to prove that the city was a German (Hanseatic) foundation, dating principally from the middle of the 12th century. However that may be, the importance of Visby in the sea trade of the North is conclusively attested by the famous code of maritime law which bears its name. This *Waterrecht dat de Kooplude en de Schippers gemakt hebben to Visby* ("sea-law which the merchants and seamen have made at Visby") was a compilation based upon the Lübeck code, the Oléron code and the Amsterdam code, and was first printed in Low German in 1505, but in all probability had its origin about 1240, or not much later (see SEA LAWS). By the middle of the 14th century the reputation of the wealth of the city was so great that, according to an old ballad, "the Gotlanders weighed out gold with stone weights and played with the choicest jewels. The swine ate out of silver troughs, and the women spun with distaffs of gold." This fabled wealth was too strong a temptation for the energetic Valdemar Atterdag of Denmark. In 1361 he invaded the island, routed the defenders of Visby under the city walls (a monolithic cross marks the burial-place of the islanders who fell) and plundered the city. From this blow it never recovered, its decay being, however, materially helped by the fact that for the greater part of the next 150 years it was the stronghold of successive freebooters or sea-rovers—first, of the Hanseatic privateers called Vitalienbrödre or Viktualienbrüder, who made it their stronghold during the last eight years of the 14th century; then of the Teutonic Knights, whose Grand Master drove out the "Victuals Brothers," and kept the island until it was redeemed by Queen Margaret. There too Erik XIII. (the Pomeranian), after being driven out of Denmark by his own subjects, established himself in 1437, and for a dozen years waged piracy upon Danes and Swedes alike. After him came Olaf and Ivar Thott, two Danish lords, who down to the year 1487 terrorized the seas from their pirates' stronghold of Visby. Lastly, the Danish admiral Sören Norrby, the last supporter of Christian I. of Denmark, when his master's cause was lost, waged a guerrilla war upon the Danish merchant ships and others from the same convenient place. But this led to an expedition by the men of Lübeck, who partly destroyed Visby in 1525. By the peace of Stettin (1570) Gotland was confirmed to the Danish crown, to which it had been given by Queen Margaret. But at the peace of Brömsebro in 1645 it was at length restored to Sweden, to which it has since belonged, except for the three years 1676–1679, when it was forcibly occupied by the Danes, and a few weeks in 1808, when the Russians landed a force.

The extreme wealth of the Gotlanders naturally fostered a spirit of independence, and their relations with Sweden were curious. The island at one period paid an annual tribute of 60 marks of silver to Sweden, but it was clearly recognized that it was paid by the desire of the Gotlanders, and not enforced by Sweden. The pope recognized their independence, and it was by their own free will that they came under the spiritual charge of the bishop of Linköping. Their local government was republican in form, and a popular assembly is indicated in the written *Gotland Law*, which dates not later than the middle of the 13th century. Sweden had no rights of objection to the measures adopted by this body, and there was no Swedish judge or other official in the island. Visby had a system of government and rights independent of, and in some measure opposed to, that of the rest of the island. It seems clear that there were at one time two separate corporations, for the native Gotlanders and the foreign traders respectively, and that these were subsequently fused. The rights and status of native Gotlanders were not enjoyed by foreigners as a whole—even intermarriage was illegal—but Germans, on account of their commercial pre-eminence in the island, were excepted.

See C. H. Bergman, *Gotlands geografi och historia* (Stockholm, 1898) and *Gotländska sköldringar och minnen* (Visby, 1902); A. T. Snöhohm, *Gotlands land och folk* (Visby, 1897 et seq.); W. Moler, *Bidrag till en Gotländsk bibliografi* (Stockholm, 1890); Hans Hildebrand, *Visby och dess Minnesmärken* (Stockholm, 1892 et seq.); A. Björkander, *Till Visby Stads Aeldsta Historia* (1898), where most of the literature dealing with the subject is mentioned; but some of the author's arguments require criticism. For local government and rights see K. Hegel, *Städter und Gilden im Mittelalter* (book iii. ch. iii., Leipzig, 1891).

GOTO ISLANDS [GOTO RETTO, GOTTO], a group of islands belonging to Japan, lying west of Kiushiu, in 33° N., 129° E. The southern of the two principal islands, Fukae-shima, measures 17 m. by 13½; the northern, Nakaori-shima, measures 23 m. by 7½. These islands lie almost in the direct route of steamers plying between Nagasaki and Shanghai, and are distant some 50 m. from Nagasaki. Some dome-shaped hills command the old castle-town of Fukae. The islands are highly cultivated; deer and other game abound, and trout are plentiful in the mountain streams. A majority of the inhabitants are Christians.

GOTTER, FRIEDRICH WILHELM (1746–1797), German poet and dramatist, was born on the 3rd of September 1746, at Gotha. After the completion of his university career at Göttingen, he was appointed second director of the Archive of his native town, and subsequently went to Wetzlar, the seat of the imperial law courts, as secretary to the Saxe-Coburg-Gotha legation. In 1768 he returned to Gotha as tutor to two young noblemen, and here, together with H. C. Boie, he founded the famous *Göttinger Musenalmanach*. In 1770 he was once more in Wetzlar, where he belonged to Goethe's circle of acquaintances. Four years later he took up his permanent abode in Gotha, where he died on the 18th of March 1797. Gotter was the chief representative of French taste in the German literary life of his time. His own poetry is elegant and polished, and in great measure free from the trivialities of the Anacreontic lyric of the earlier generation of imitators of French literature; but he was lacking in the imaginative depth that characterizes the German poetic temperament. His plays, of which *Merope* (1774), an adaptation in admirable blank verse of the tragedies of Maffei and Voltaire, and *Medea* (1775), a *melodrame*, are best known, were mostly based on French originals and had considerable influence in counteracting the formlessness and irregularity of the *Sturm und Drang* drama.

Gotter's collected *Gedichte* appeared in 2 vols. in 1787 and 1788; a third volume (1802) contains his *Literarischer Nachlass*. See B. Litzmann, *Schröder und Gotter* (1887), and R. Schlösser, *F. W. Gotter, sein Leben und seine Werke* (1896).

GOTTFRIED VON STRASSBURG, one of the chief German poets of the middle ages. The dates of his birth and death are alike unknown, but he was the contemporary of Hartmann von Aue, Wolfram von Eschenbach and Walther von der Vogelweide, and his epic *Tristan* was written about the year 1210. In all probability he did not belong to the nobility, as he is entitled *Meister*, never *Herr*, by his contemporaries; his poem—the only work that can with any certainty be attributed to him—bears witness to a learned education. The story of *Tristan* had been evolved from its shadowy Celtic origins by the French *trouvères* of the early 12th century, and had already found its way into Germany before the close of that century, in the crude, unpolished version of Eilhart von Oberge. It was Gottfried, however, who gave it its final form. His version is based not on that of Chrétien de Troyes, but on that of a *trouvère* Thomas, who seems to have been more popular with contemporaries. A comparison of the German epic with the French original is, however, impossible, as Chrétien's *Tristan* is entirely lost, and of Thomas's only a few fragments have come down to us. The story centres in the fatal voyage which Tristan, a vassal to the court of his uncle King Marke of Kurnewal (Cornwall), makes to Ireland to bring back Isolde as the king's bride. On the return voyage Tristan and Isolde drink by mistake a love potion, which binds them irrevocably to each other. The epic resolves itself into a series of love intrigues in which the two lovers ingeniously outwit the trusting king. They are ultimately discovered, and Tristan flees to Normandy where he marries another Isolde—"Isolde with the white hands"—

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without being able to forget the blond Isolde of Ireland. At this point Gottfried's narrative breaks off and to learn the close of the story we have to turn to two minor poets of the time, Ulrich von Türheim and Heinrich von Freiberg—the latter much the superior—who have supplied the conclusion. After further love adventures Tristan is fatally wounded by a poisoned spear in Normandy; the "blond Isolde," as the only person who has power to cure him, is summoned from Cornwall. The ship that brings her is to bear a white sail if she is on board, a black one if not. Tristan's wife, however, deceives him, announcing that the sail is black, and when Isolde arrives, she finds her lover dead. Marke at last learns the truth concerning the love potion, and has the two lovers buried side by side in Kurnewal.

It is difficult to form an estimate of Gottfried's independence of his French source; but it seems clear that he followed closely the narrative of events he found in Thomas. He has, however, introduced into the story an astounding fineness of psychological motive, which, to judge from a general comparison of the Arthurian epic in both lands, is German rather than French; he has spiritualized and deepened the narrative; he has, above all, depicted with a variety and insight, unusual in mediæval literature, the effects of an overpowering passion. Yet, glowing and seductive as Gottfried's love-scenes are, they are never for a moment disfigured by frivolous hints or innuendo; the tragedy is unrolled with an earnestness that admits of no touch of humour, and also, it may be added, with a freedom from moralizing which was easier to attain in the 13th than in later centuries. The mastery of style is no less conspicuous. Gottfried had learned his best lessons from Hartmann von Aue, but he was a more original and daring artificer of rhymes and rhythms than that master; he delighted in the sheer music of words, and indulged in antitheses and allegorical conceits to an extent that proved fatal to his imitators. As far as beauty of expression is concerned, Gottfried's *Tristan* is the masterpiece of the German court epic.

Gottfried's *Tristan* has been frequently edited: by H. F. Massman (Leipzig, 1843); by R. Bechstein (2 vols., 3rd ed., Leipzig, 1890–1891); by W. Golther (2 vols., Stuttgart, 1889); by K. Marold (1906). Translations into modern German have been made by H. Kurz (Stuttgart, 1844); by K. Simrock (Leipzig, 1855); and, best of all, by W. Hertz (Stuttgart, 1877). There is also an abbreviated English translation by Jessie L. Weston (London, 1899). The continuation of Ulrich von Türheim will be found in Massman's edition; that by Heinrich von Freiberg has been separately edited by R. Bechstein (Leipzig, 1877). See also R. Heinzel, "Gottfrieds von Strassburg Tristan und seine Quelle" in the *Zeit. für deut. Alt.* xiv. (1869), pp. 272 ff.; W. Golther, *Die Sage von Tristan und Isolde* (Munich, 1887); F. Piquet, *L'Originalité de Gottfried de Strasbourg dans son poème de Tristan et Isolde* (Lille, 1905). K. Immermann (*q.v.*) has written an epic of *Tristan und Isolde* (1840). R. Wagner (*q.v.*) a musical drama (1865). Cp. R. Bechstein, *Tristan und Isolde in der deutschen Dichtung der Neuzeit* (Leipzig, 1877).

GÖTTINGEN, a town of Germany, in the Prussian province of Hanover, pleasantly situated at the west foot of the Hainberg (1200 ft.), in the broad and fertile valley of the Leine, 67 m. S. from Hanover, on the railway to Cassel. Pop. (1875) 17,055, (1905) 34,030. It is traversed by the Leine canal, which separates the Altstadt from the Neustadt and from Masch, and is surrounded by ramparts, which are planted with lime-trees and form an agreeable promenade. The streets in the older part of the town are for the most part crooked and narrow, but the newer portions are spaciously and regularly built. Apart from the Protestant churches of St John, with twin towers, and of St James, with a high tower (290 ft.), the medieval town hall, built in the 14th century and restored in 1880, and the numerous university buildings, Göttingen possesses few structures of any public importance. There are several thriving industries, including, besides the various branches of the publishing trade, the manufacture of cloth and woollens and of mathematical and other scientific instruments.

The university, the famous Georgia Augusta, founded by George II. in 1734 and opened in 1737, rapidly attained a leading position, and in 1823 its students numbered 1547. Political disturbances, in which both professors and students were implicated, lowered the attendance to 860 in 1834. The expulsion in 1837 of the famous seven professors—*Die Göttinger Sieben*—viz. the Germanist, Wilhelm Eduard Albrecht (1800–1876); the historian, Friedrich Christoph Dahlmann (1785–1860); the orientalist, Georg Heinrich August Ewald (1803–1875); the historian, Georg Gottfried Gervinus (1805–1875); the physicist, Wilhelm Eduard Weber (1804–1891); and the philologists, the brothers Jacob Ludwig Karl Grimm (1785–1863), and Wilhelm Karl Grimm (1786–1859),—for protesting against the revocation by King Ernest Augustus of Hanover of the liberal constitution of 1833, further reduced the prosperity of the university. The events of 1848, on the other hand, told somewhat in its favour; and, since the annexation of Hanover in 1866, it has been carefully fostered by the Prussian government. In 1903 its teaching staff numbered 121 and its students 1529. The main university building lies on the Wilhelmsplatz, and, adjoining, is the famous library of 500,000 vols. and 5300 MSS., the richest collection of modern literature in Germany. There is a good chemical laboratory as well as adequate zoological, ethnographical and mineralogical collections, the most remarkable being Blumenbach's famous collection of skulls in the anatomical institute. There are also a celebrated observatory, long under the direction of Wilhelm Klinkerfues (1827–1863), a botanical garden, an agricultural institute and various hospitals, all connected with the university. Of the scientific societies the most noted is the Royal Society of Sciences (*Königliche Societät der Wissenschaften*) founded by Albrecht von Haller, which is divided into three classes, the physical, the mathematical and the historical-philological. It numbers about 80 members and publishes the well-known *Göttingische gelehrte Anzeigen*. There are monuments in the town to the mathematicians K. F. Gauss and W. E. Weber, and also to the poet G. A. Bürger.

The earliest mention of a village of Goding or Gutingi occurs in documents of about 950 A.D. The place received municipal rights from the German king Otto IV. about 1210, and from 1286 to 1463 it was the seat of the princely house of Brunswick-Göttingen. During the 14th century it held a high place among the towns of the Hanseatic League. In 1531 it joined the Reformation movement, and in the following century it suffered considerably in the Thirty Years' War, being taken by Tilly in 1626, after a siege of 25 days, and recaptured by the Saxons in 1632. After a century of decay, it was anew brought into importance by the establishment of its university; and a marked increase in its industrial and commercial prosperity has again taken place in recent years. Towards the end of the 18th century Göttingen was the centre of a society of young poets of the *Sturm und Drang* period of German literature, known as the *Göttingen Dichterbund* or *Hainbund* (see GERMANY: *Literature*).

See Freudsdorff, *Göttingen in Vergangenheit und Gegenwart* (Göttingen, 1887); the *Urkundenbuch der Stadt Göttingen*, edited by G. Schmidt, A. Hasselblatt and G. Kästner; Unger, *Göttingen und die Georgia Augusta* (1861); and *Göttinger Professoren* (Gotha, 1872); and D. Meyer, *Kulturgeschichtliche Bilder aus Göttingen* (1889).

GÖTTLING, CARL WILHELM (1793–1869), German classical scholar, was born at Jena on the 19th of January 1793. He studied at the universities of Jena and Berlin, took part in the war against France in 1814, and finally settled down in 1822 as professor at the university of his native town, where he continued to reside till his death on the 20th of January 1869. In his early years Göttling devoted himself to German literature, and published two works on the Nibelungen: *Über das Geschichtliche im Nibelungenliede* (1814) and *Nibelungen und Gibelinen* (1817). The greater part of his life, however, was devoted to the study of classical literature, especially the elucidation of Greek authors. The contents of his *Gesammelte Abhandlungen aus dem klassischen Altertum* (1851–1863) and *Opuscula Academica* (published in 1869 after his death) sufficiently indicate the varied nature of his studies. He edited the Τέχνη (grammatical manual) of Theodosius of Alexandria (1822), Aristotle's *Politics* (1824), and *Economics* (1830) and Hesiod (1831; 3rd ed. by J. Flach, 1878). Mention may also be made of his *Allgemeine Lehre vom Accent der griechischen Sprache* (1835), enlarged from a

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smaller work, which was translated into English (1831) as the *Elements of Greek Accentuation*; and of his *Correspondence with Goethe* (published 1880).

See memoirs by C. Nipperdey, his colleague at Jena (1869), G. Lotbholz (Stargard, 1870), K. Fischer (preface to the *Opuscula Academica*), and C. Bursian in *Allgemeine deutsche Biographie*, ix.

GOTTSCHALK [Godescalcus, Gottescalk], (*c.* 808–867?), German theologian, was born near Mainz, and was devoted (*oblatus*) from infancy by his parents,—his father was a Saxon, Count Bern,—to the monastic life. He was trained at the monastery of Fulda, then under the abbot Hrabanus Maurus, and became the friend of Walafrid Strabo and Loup of Ferrières. In June 829, at the synod of Mainz, on the pretext that he had been unduly constrained by his abbot, he sought and obtained his liberty, withdrew first to Corbie, where he met Ratramnus, and then to the monastery of Orbais in the diocese of Soissons. There he studied St Augustine, with the result that he became an enthusiastic believer in the doctrine of absolute predestination, in one point going beyond his master—Gottschalk believing in a predestination to condemnation as well as in a predestination to salvation, while Augustine had contented himself with the doctrine of preterition as complementary to the doctrine of election. Between 835 and 840 Gottschalk was ordained priest, without the knowledge of his bishop, by Rigbold, *chorepiscopus* of Reims. Before 840, deserting his monastery, he went to Italy, preached there his doctrine of double predestination, and entered into relations with Notting, bishop of Verona, and Eberhard, count of Friuli. Driven from Italy through the influence of Hrabanus Maurus, now archbishop of Mainz, who wrote two violent letters to Notting and Eberhard, he travelled through Dalmatia, Pannonia and Norica, but continued preaching and writing. In October 848 he presented to the synod at Mainz a profession of faith and a refutation of the ideas expressed by Hrabanus Maurus in his letter to Notting. He was convicted, however, of heresy, beaten, obliged to swear that he would never again enter the territory of Louis the German, and handed over to Hincmar, archbishop of Reims, who sent him back to his monastery at Orbais. The next year at a provincial council at Quierzy, presided over by Charles the Bald, he attempted to justify his ideas, but was again condemned as a heretic and disturber of the public peace, was degraded from the priesthood, whipped, obliged to burn his declaration of faith, and shut up in the monastery of Hautvilliers. There Hincmar tried again to induce him to retract. Gottschalk however continued to defend his doctrine, writing to his friends and to the most eminent theologians of France and Germany. A great controversy resulted. Prudentius, bishop of Troyes, Wenilo of Sens, Ratramnus of Corbie, Loup of Ferrières and Florus of Lyons wrote in his favour. Hincmar wrote *De praedestinatione* and *De una non trina deitate* against his views, but gained little aid from Johannes Scotus Erigena, whom he had called in as an authority. The question was discussed at the councils of Kiersy (853), of Valence (855) and of Savonnières (859). Finally the pope Nicolas I. took up the case, and summoned Hincmar to the council of Metz (863). Hincmar either could not or would not appear, but declared that Gottschalk might go to defend himself before the pope. Nothing came of this, however, and when Hincmar learned that Gottschalk had fallen ill, he forbade him the sacraments or burial in consecrated ground unless he would recant. This Gottschalk refused to do. He died on the 30th of October between 866 and 870.

Gottschalk was a vigorous and original thinker, but also of a violent temperament, incapable of discipline or moderation in his ideas as in his conduct. He was less an innovator than a reactionary. Of his many works we have only the two professions of faith (cf. Migne, *Patrologia Latina*, cxxi. c. 347 et seq.), and some poems, edited by L. Traube in *Monumenta Germaniae historica: Poëtae Latini aevi Carolini* (t. iii. 707–738). Some fragments of his theological treatises have been preserved in the writings of Hincmar, Erigena, Ratramnus and Loup of Ferrières.

From the 17th century, when the Jansenists exalted Gottschalk, much has been written on him. Mention may be made of two recent studies, F. Picavet, "Les Discussions sur la liberté au temps de Gottschalk, de Raban Maur, d'Hincmar, et de Jean Scot," in *Comptes rendus de l'acad. des sciences morales et politiques* (Paris, 1896); and A. Freystedt, "Studien zu Gottschalks Leben und Lehre," in *Zeitschrift für Kirchengeschichte* (1897), vol. xviii.

GOTTSCHALL, RUDOLF VON (1823–1909), German man of letters, was born at Breslau on the 30th of September 1823, the son of a Prussian artillery officer. He received his early education at the gymnasia in Mainz and Coburg, and subsequently at Rastenburg in East Prussia. In 1841 he entered the university of Königsberg as a student of law, but, in consequence of his pronounced liberal opinions, was expelled. The academic authorities at Breslau and Leipzig were not more tolerant towards the young fire-eater, and it was only in Berlin that he eventually found himself free to prosecute his studies. During this period of unrest he issued *Lieder der Gegenwart* (1842) and *Zeitseufzlichlinge* (1843)—the poetical fruits of his political enthusiasm. He completed his studies in Berlin, took the degree of *doctor juris* in Königsberg, and endeavoured to obtain there the *venia legendi*. His political views again stood in the way, and forsaking the legal career, Gottschall now devoted himself entirely to literature. He met with immediate success, and beginning as dramaturge in Königsberg with *Der Blinde von Alcala* (1846) and *Lord Byron in Italien* (1847) proceeded to Hamburg where he occupied a similar position. In 1852 he married Marie, baroness von Scherr-Thoss, and for the next few years lived in Silesia. In 1862 he took over the editorship of a Posen newspaper, but in 1864 removed to Leipzig. Gottschall was raised, in 1877, by the king of Prussia to the hereditary nobility with the prefix "von," having been previously made a *Geheimer Hofrat* by the grand duke of Weimar. Down to 1887 Gottschall edited the *Brockhaus'sche Blätter für litterarische Unterhaltung* and the monthly periodical *Unsere Zeit*. He died at Leipzig on the 21st of March 1909.

Gottschall's prolific literary productions cover the fields of poetry, novel-writing and literary criticism. Among his volumes of lyric poetry are *Sebastopol* (1856), *Janus* (1873), *Bunte Blüten* (1891). Among his epics, *Carlo Zeno* (1854), *Maja* (1864), dealing with an episode in the Indian Mutiny, and *Merlins Wanderungen* (1887). The comedy *Pitt und Fox* (1854), first produced on the stage in Breslau, was never surpassed by the other lighter pieces of the author, among which may be mentioned *Die Welt des Schwindels* and *Der Spion von Rheinsberg*. The tragedies, *Mazeppa*, *Catharine Howard*, *Amy Robsart* and *Der Götze von Venedig*, were very successful; and the historical novels, *Im Banne des schwarzen Adlers* (1875; 4th ed., 1884), *Die Erbschaft des Blutes* (1881), *Die Tochter Rübezahls* (1889), and *Verkümmerte Existenzen* (1892), enjoyed a high degree of popularity. As a critic and historian of literature Gottschall has also done excellent work. His *Die deutsche Nationalliteratur des 19. Jahrhunderts* (1855; 7th ed., 1901–1902), and *Poetik* (1858; 6th ed., 1903) command the respect of all students of literature.

Gottschall's collected *Dramatische Werke* appeared in 12 vols. in 1880 (2nd ed., 1884); he has also, in recent years, published many volumes of collected essays and criticisms. See his autobiography, *Aus meiner Jugend* (1898).

GOTTSCHED, JOHANN CHRISTOPH (1700–1766), German author and critic, was born on the 2nd of February 1700, at Judithenkirch near Königsberg, the son of a Lutheran clergyman. He studied philosophy and history at the university of his native town, but immediately on taking the degree of *Magister* in 1723, fled to Leipzig in order to evade impressment in the Prussian military service. Here he enjoyed the protection of J. B. Mencke (1674–1732), who, under the name of "Philander von der Linde," was a well-known poet and also president of the *Deutschübende poetische Gesellschaft* in Leipzig. Of this society Gottsched was elected "Senior" in 1726, and in the next year reorganized it under the title of the *Deutsche Gesellschaft*. In 1730 he was appointed extraordinary professor of poetry, and, in 1734, ordinary professor of logic and metaphysics in the university. He died at Leipzig on the 12th of December 1766.

Gottsched's chief work was his *Versuch einer kritischen Dichtkunst für die Deutschen* (1730), the first systematic treatise in German on the art of poetry from the standpoint of Boileau. His *Ausführliche Redekunst* (1728) and his *Grundlegung einer*

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deutschen Sprachkunst (1748) were of importance for the development of German style and the purification of the language. He wrote several plays, of which *Der sterbende Cato* (1732), an adaptation of Addison's tragedy and a French play on the same theme, was long popular on the stage. In his *Deutsche Schaubühne* (6 vols., 1740–1745), which contained mainly translations from the French, he provided the German stage with a classical repertory, and his bibliography of the German drama, *Nöthiger Vorrat zur Geschichte der deutschen dramatischen Dichtkunst* (1757–1765), is still valuable. He was also the editor of several journals devoted to literary criticism. As a critic, Gottsched insisted on German literature being subordinated to the laws of French classicism; he enunciated rules by which the playwright must be bound, and abolished bombast and buffoonery from the serious stage. While such reforms obviously afforded a healthy corrective to the extravagance and want of taste which were rampant in the German literature of the time, Gottsched went too far. In 1740 he came into conflict with the Swiss writers Johann Jakob Bodmer (*q.v.*) and Johann Jakob Breitinger (1701–1776), who, under the influence of Addison and contemporary Italian critics, demanded that the poetic imagination should not be hampered by artificial rules; they pointed to the great English poets, and especially to Milton. Gottsched, although not blind to the beauties of the English writers, clung the more tenaciously to his principle that poetry must be the product of rules, and, in the fierce controversy which for a time raged between Leipzig and Zürich, he was inevitably defeated. His influence speedily declined, and before his death his name became proverbial for pedantic folly.

His wife, Luise Adelgunde Victorie, née Kulmus (1713–1762), in some respects her husband's intellectual superior, was an author of some reputation. She wrote several popular comedies, of which *Das Testament* is the best, and translated the *Spectator* (9 vols., 1739–1743), Pope's *Rape of the Lock* (1744) and other English and French works. After her death her husband edited her *Sämtliche kleinere Gedichte* with a memoir (1763).

See T. W. Danzel, *Gottsched und seine Zeit* (Leipzig, 1848); J. Crüger, *Gottsched, Bodmer, und Breitinger* (with selections from their writings) (Stuttgart, 1884); F. Servaes, *Die Poetik Gottscheds und der Schweizer* (Strassburg, 1887); E. Wolff, *Gottscheds Stellung im deutschen Bildungsleben* (2 vols., Kiel, 1895–1897); and G. Waniek, *Gottsched und die deutsche Literatur seiner Zeit* (Leipzig, 1897). On Frau Gottsched, see P. Schlenther, *Frau Gottsched und die bürgerliche Komödie* (Berlin, 1886).

GÖTZ, JOHANN NIKOLAUS (1721–1781), German poet, was born at Worms on the 9th of July 1721. He studied theology at Halle (1739–1742), where he became intimate with the poets Johann W. L. Gleim and Johann Peter Uz, acted for some years as military chaplain, and afterwards filled various other ecclesiastical offices. He died at Winterburg on the 4th of November 1781. The writings of Götz consist of a number of short lyrics and several translations, of which the best is a rendering of Anacreon. His original compositions are light, lively and sparkling, and are animated rather by French wit than by German depth of sentiment. The best known of his poems is *Die Mädcheninsel*, an elegy which met with the warm approval of Frederick the Great.

Götz's *Vermischte Gedichte* were published with biography by K. W. Ramler (Mannheim, 1785; new ed., 1807), and a collection of his poems, dating from the years 1745–1765, has been edited by C. Schüddekopf in the *Deutsche Literaturdenkmale des 18. und 19. Jahrhunderts* (1893). See also *Briefe von und an J. N. Götz*, edited by C. Schüddekopf (1893).

GOUACHE, a French word adapted from the Ital. *guazzo* (probably in origin connected with "wash"), meaning literally a "ford," but used also for a method of painting in opaque water-colour. The colours are mixed with or painted in a vehicle of gum or honey, and whereas in true water-colours the high lights are obtained by leaving blank the surface of the paper or other material used, or by allowing it to show through a translucent wash in "gouache," these are obtained by white or other light colour. "Gouache" is frequently used in miniature painting.

GOUDA (or TER GOUWE), a town of Holland, in the province of South Holland, on the north side of the Gouwe at its confluence with the Ysel, and a junction station 12¾m. by rail N.E. of Rotterdam. Pop. (1900) 22,303. Tramways connect it with Bodegraven (5¾m. N.) on the old Rhine and with Oudewater (8 m. E.) on the Ysel; and there is a regular steamboat service in various directions, Amsterdam being reached by the canalized Gouwe; Aar, Drecht and Amstel. The town of Gouda is laid out in a fine open manner and, like other Dutch towns, is intersected by numerous canals. On its outskirts pleasant walks and fine trees have replaced the old fortifications. The Groote Markt is the largest market-square in Holland. Among the numerous churches belonging to various denominations, the first place must be given to the Groote Kerk of St John. It was founded in 1485, but rebuilt after a fire in 1552, and is remarkable for its dimensions (345 ft. long and 150 ft. broad), for a large and celebrated organ, and a splendid series of over forty stained-glass windows presented by cities and princes and executed by various well-known artists, including the brothers Dirk (*d. c.* 1577) and Wouter (*d. c.* 1590) Crabeth, between the years 1555 and 1603 (see *Explanation of the Famous and Renowned Glass Works, &c.*, Gouda, 1876, reprinted from an older volume, 1718). Other noteworthy buildings are the Gothic town hall, founded in 1440 and rebuilt in 1600, and the weigh-house, built by Pieter Post of Haarlem (1608–1669) and adorned with a fine relief by Barth. Eggers (*d. c.* 1690). The museum of antiquities (1874) contains an exquisite chalice of the year 1425 and some pictures and portraits by Wouter Crabeth the younger, Corn. Ketel (a native of Gouda, 1548–1616) and Ferdinand Bol (1616–1680). Other buildings are the orphanage, the hospital, a house of correction for women and a music hall.

In the time of the counts the wealth of Gouda was mainly derived from brewing and cloth-weaving; but at a later date the making of clay tobacco pipes became the staple trade, and, although this industry has somewhat declined, the churchwarden pipes of Gouda are still well known and largely manufactured. In winter-time it is considered a feat to skate hither from Rotterdam and elsewhere to buy such a pipe and return with it in one's mouth without its being broken. The mud from the Ysel furnishes the material for large brick-works and potteries; there are also a celebrated manufactory of stearine candles, a yarn factory, an oil refinery and cigar factories. The transit and shipping trade is considerable, and as one of the principal markets of South Holland, the round, white Gouda cheeses are known throughout Europe. Boskoop, 5 m. N. by W. of Gouda on the Gouwe, is famous for its nursery gardens; and the little old-world town of Oudewater as the birthplace of the famous theologian Arminius in 1560. The town hall (1588) of Oudewater contains a picture by Dirk Stoop (d. 1686), commemorating the capture of the town by the Spaniards in 1575 and the subsequent sack and massacre.

GOUDIMEL, CLAUDE, musical composer of the 16th century, was born about 1510. The French and the Belgians claim him as their countryman. In all probability he was born at Besançon, for in his edition of the songs of Arcadelt, as well as in the mass of 1554, he calls himself "natif de Besançon" and "Claudius Godimellus Vescontinus." This discountenances the theory of Ambros that he was born at Vaison near Avignon. As to his early education we know little or nothing, but the excellent Latin in which some of his letters were written proves that, in addition to his musical knowledge, he also acquired a good classical training. It is supposed that he was in Rome in 1540 at the head of a music-school, and that besides many other celebrated musicians, Palestrina was amongst his pupils. About the middle of the century he seems to have left Rome for Paris, where, in conjunction with Jean Duchemin, he published, in 1555, a musical setting of Horace's Odes. Infinitely more important is another collection of vocal pieces, a setting of the celebrated French version of the Psalms by Marot and Beza published in 1565. It is written in four parts, the melody being assigned to the tenor. The invention of the melodies was long ascribed to Goudimel, but they have now definitely been proved

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to have originated in popular tunes found in the collections of this period. Some of these tunes are still used by the French Protestant Church. Others were adopted by the German Lutherans, a German imitation of the French versions of the Psalms in the same metres having been published at an early date. Although the French version of the Psalms was at first used by Catholics as well as Protestants, there is little doubt that Goudimel had embraced the new faith. In Michel Brenet's Biographie (*Annales franc-cuntoises*, Besançon, 1898, P. Jacquin) it is established that in Metz, where he was living in 1565, Goudimel moved in Huguenot circles, and even figured as godfather to the daughter of the president of Senneton. Seven years later he fell a victim to religious fanaticism during the St Bartholomew massacres at Lyons from the 27th to the 28th of August 1572, his death, it is stated, being due to "les ennemis de la gloire de Dieu et quelques méchants envieux de l'honneur qu'il avait acquis." Masses and motets belonging to his Roman period are found in the Vatican library, and in the archives of various churches in Rome; others were published. Thus the work entitled *Missae tres a Claudio Goudimel praestantissimo musico auctore, nunc primum in lucem editae*, contains one mass by the learned editor himself, the other two being by Claudius Sermisy and Jean Maillard respectively. Another collection, *La Fleur des chansons des deux plus excellens musiciens de nostre temps*, consists of part songs by Goudimel and Orlando di Lasso. Burney gives in his history a motet of Goudimel's *Domine quid multiplicati sunt*.

GOUFFIER, the name of a great French family, which owned the estate of Bonnivet in Poitou from the 14th century. GUILLAUME GOUFFIER, chamberlain to Charles VII., was an inveterate enemy of Jacques Cœur, obtaining his condemnation and afterwards receiving his property (1401). He had a great number of children, several of whom played a part in history. ARTUS, seigneur de Boisy (*c.* 1475–1520) was entrusted with the education of the young count of Angoulême (Francis I.), and on the accession of this prince to the throne as Francis I. became grand master of the royal household, playing an important part in the government; to him was given the task of negotiating the treaty of Noyon in 1516; and shortly before his death the king raised the estates of Roanne and Boisy to the rank of a duchy, that of Roannais, in his favour. ADRIEN GOUFFIER (d. 1523) was bishop of Coutances and Albi, and grand almoner of France. GUILLAUME GOUFFIER, seigneur de Bonnivet, became admiral of France (see BONNIVET). CLAUDE GOUFFIER, son of Artus, was created comte de Maulevrier (1542) and marquis de Boisy (1564).

There were many branches of this family, the chief of them being the dukes of Roannais, the counts of Caravas, the lords of Crèvecœur and of Bonnivet, the marquises of Thois, of Brazeux, and of Espagny. The name of Gouffier was adopted in the 18th century by a branch of the house of Choiseul. (M. P.*)

GOUGE, MARTIN (*c.* 1360–1444), surnamed DE CHARPAIGNE, French chancellor, was born at Bourges about 1360. A canon of Bourges, in 1402 he became treasurer to John, duke of Berri, and in 1406 bishop of Chartres. He was arrested by John the Fearless, duke of Burgundy, with the hapless Jean de Montaigu (1349–1409) in 1409, but was soon released and then banished. Attaching himself to the dauphin Louis, duke of Guienne, he became his chancellor, the king's ambassador in Brittany, and a member of the grand council; and on the 13th of May 1415, he was transferred from the see of Chartres to that of Clermont-Ferrand. In May 1418, when the Burgundians re-entered Paris, he only escaped death at their hands by taking refuge in the Bastille. He then left Paris, but only to fall into the hands of his enemy, the duke de la Trémoille, who imprisoned him in the castle of Sully. Rescued by the dauphin Charles, he was appointed chancellor of France on the 3rd of February 1422. He endeavoured to reconcile Burgundy and France, was a party to the selection of Arthur, earl of Richmond, as constable, but had to resign his chancellorship in favour of Regnault of Chartres; first from March 25th to August 6th 1425, and again when La Trémoille had supplanted Richmond. After the fall of La Trémoille in 1433 he returned to court, and exercised a powerful influence over affairs of state almost till his death, which took place at the castle of Beaulieu (Puy-de-Dôme) on the 25th or 26th of November 1444.

See Hiver's account in the *Mémoires de la Société des Antiquaires du Centre*, p. 267 (1869); and the *Nouvelle Biographie générale*, vol. xxi.

GOUGE (adopted from the Fr. *gouge*, derived from the Late Lat. *gubia* or *gulbia*, in Ducange *gulbium*, an implement *ad hortum excolendum*, and also *instrumentum ferreum in usu fabrorum*; according to the *New English Dictionary* the word is probably of Celtic origin, *gylf*, a beak, appearing in Welsh, and *gilh*, a boring tool, in Cornish), a tool of the chisel type with a curved blade, used for scooping a groove or channel in wood, stone, &c. (see TOOL). A similar instrument is used in surgery for operations involving the excision of portions of bone. "Gouge" is also used as the name of a bookbinder's tool, for impressing a curved line on the leather, and for the line so impressed. In mining, a "gouge" is the layer of soft rock or earth sometimes found in each side of a vein of coal or ore, which the miner can scoop out with his pick, and thus attack the vein more easily from the side. The verb "to gouge" is used in the sense of scooping or forcing out.

GOUGH, HUGH GOUGH, VISCOUNT (1779–1869), British field-marshal, a descendant of Francis Gough who was made bishop of Limerick in 1626, was born at Woodstown, Limerick, on the 3rd of November 1779. Having obtained a commission in the army in August 1794, he served with the 78th Highlanders at the Cape of Good Hope, taking part in the capture of Cape Town and of the Dutch fleet in Saldanha Bay in 1796. His next service was in the West Indies, where, with the 87th (Royal Irish Fusiliers), he shared in the attack on Porto Rico, the capture of Surinam, and the brigand war in St Lucia. In 1809 he was called to take part in the Peninsular War, and, joining the army under Wellington, commanded his regiment as major in the operations before Oporto, by which the town was taken from the French. At Talavera he was severely wounded, and had his horse shot under him. For his conduct on this occasion he was afterwards promoted lieutenant-colonel, his commission, on the recommendation of Wellington, being antedated from the day of the duke's despatch. He was thus the first officer who ever received brevet rank for services performed in the field at the head of a regiment. He was next engaged at the battle of Barrosa, at which his regiment captured a French eagle. At the defence of Tarifa the post of danger was assigned to him, and he compelled the enemy to raise the siege. At Vitoria, where Gough again distinguished himself, his regiment captured the baton of Marshal Jourdan. He was again severely wounded at Nivelle, and was soon after created a knight of St Charles by the king of Spain. At the close of the war he returned home and enjoyed a respite of some years from active service. He next took command of a regiment stationed in the south of Ireland, discharging at the same time the duties of a magistrate during a period of agitation. Gough was promoted major-general in 1830. Seven years later he was sent to India to take command of the Mysore division of the army. But not long after his arrival in India the difficulties which led to the first Chinese war made the presence of an energetic general on the scene indispensable, and Gough was appointed commander-in-chief of the British forces in China. This post he held during all the operations of the war; and by his great achievements and numerous victories in the face of immense difficulties, he at length enabled the English plenipotentiary, Sir H. Pottinger, to dictate peace on his own terms. After the conclusion of the treaty of Nanking in August 1842 the British forces were withdrawn; and before the close of the year Gough, who had been made a G.C.B. in the previous year for his services in the capture of the Canton forts, was created a baronet. In August 1843 he was appointed commander-in-chief of the British forces in India, and in December he took the command in person against the Mahrattas, and defeated them at Maharajpur, capturing more than fifty guns. In 1845 occurred the rupture with the Sikhs,

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who crossed the Sutlej in large numbers, and Sir Hugh Gough conducted the operations against them, being well supported by Lord Hardinge, the governor-general, who volunteered to serve under him. Successes in the hard-fought battles of Mudki and Ferozeshah were succeeded by the victory of Sobraon, and shortly afterwards the Sikhs sued for peace at Lahore. The services of Sir Hugh Gough were rewarded by his elevation to the peerage of the United Kingdom as Baron Gough (April 1846). The war broke out again in 1848, and again Lord Gough took the field; but the result of the battle of Chillianwalla being equivocal, he was superseded by the home authorities in favour of Sir Charles Napier; before the news of the supersession arrived Lord Gough had finally crushed the Sikhs in the battle of Gujarat (February 1849). His tactics during the Sikh wars were the subject of an embittered controversy (see SIKH WARS). Lord Gough now returned to England, was raised to a viscountcy, and for the third time received the thanks of both Houses of Parliament. A pension of £2000 per annum was granted to him by parliament, and an equal pension by the East India Company. He did not again see active service. In 1854 he was appointed colonel of the Royal Horse Guards, and two years later he was sent to the Crimea to invest Marshal Pélissier and other officers with the insignia of the Bath. Honours were multiplied upon him during his latter years. He was made a knight of St Patrick, being the first knight of the order who did not hold an Irish peerage, was sworn a privy councillor, was named a G.C.S.I., and in November 1862 was made field-marshal. He was twice married, and left children by both his wives. He died on the 2nd of March 1869.

See R. S. Rait, *Lord Gough* (1903); and Sir W. Lee Warner, *Lord Dalhousie* (1904).

GOUGH, JOHN BARTHOLOMEW (1817–1886), American temperance orator, was born at Sandgate, Kent, England, on the 22nd of August 1817. He was educated by his mother, a schoolmistress, and at the age of twelve was sent to the United States to seek his fortune. He lived for two years with family friends on a farm in western New York, and then entered a book-bindery in New York City to learn the trade. There in 1833 his mother joined him, but after her death in 1835 he fell in with dissolute companions, and became a confirmed drunkard. He lost his position, and for several years supported himself as a ballad singer and story-teller in the cheap theatres and concert-halls of New York and other eastern cities. Even this means of livelihood was being closed to him, when in Worcester, Massachusetts, in 1842 he was induced to sign a temperance pledge. After several lapses and a terrific struggle, he determined to devote his life to lecturing in behalf of temperance reform. Gifted with remarkable powers of pathos and of description, he was successful from the start, and was soon known and sought after throughout the entire country, his appeals, which were directly personal and emotional, being attended with extraordinary responses. He continued his work until the end of his life, made several tours of England, where his American success was repeated, and died at his work, being stricken with apoplexy on the lecture platform at Frankford, Pennsylvania, where he passed away two days later, on the 18th of February 1886. He published an *Autobiography* (1846); *Orations* (1854); *Temperance Addresses* (1870); *Temperance Lectures* (1870); and *Sunlight and Shadow, or Gleanings from My Life Work* (1880).

GOUGH, RICHARD (1735–1809), English antiquary, was born in London on the 21st of October 1735. His father was a wealthy M.P. and director of the East India Company. Gough was a precocious child, and at twelve had translated from the French a history of the Bible, which his mother printed for private circulation. When fifteen he translated Abbé Fleury's work on the Israelites; and at sixteen he published an elaborate work entitled *Atlas Renovatus, or Geography modernized*. In 1752 he entered Corpus Christi College, Cambridge, where he began his work on British topography, published in 1768. Leaving Cambridge in 1756, he began a series of antiquarian excursions in various parts of Great Britain. In 1773 he began an edition in English of Camden's *Britannia*, which appeared in 1789. Meantime he published, in 1786, the first volume of his splendid work, the *Sepulchral Monuments of Great Britain, applied to illustrate the history of families, manners, habits, and arts at the different periods from the Norman Conquest to the Seventeenth Century*. This volume, which contained the first four centuries, was followed in 1796 by a second volume containing the 15th century, and an introduction to the second volume appeared in 1799. Gough was chosen a fellow of the Society of Antiquaries of London in 1767, and from 1771 to 1791 he was its director. He was elected F.R.S. in 1775. He died at Enfield on the 20th of February 1809. His books and manuscripts relating to Anglo-Saxon and northern literature, all his collections in the department of British topography, and a large number of his drawings and engravings of other archaeological remains, were bequeathed to the university of Oxford.

Among the minor works of Gough are *An Account of the Bedford Missal* (in MS.); *A Catalogue of the Coins of Canute, King of Denmark* (1777); *History of Plesby in Essex* (1803); *An Account of the Coins of the Seleucidae, Kings of Syria* (1804); and "History of the Society of Antiquaries of London," prefixed to their *Archaeologia*.

GOUJET, CLAUDE PIERRE (1697–1767), French abbé and littérateur, was born in Paris on the 19th of October 1697. He studied at the College of the Jesuits, and at the Collège Mazarin, but he nevertheless became a strong Jansenist. In 1705 he assumed the ecclesiastical habit, in 1719 entered the order of Oratorians, and soon afterwards was named canon of St Jacques l'Hôpital. On account of his extreme Jansenist opinions he suffered considerable persecution from the Jesuits, and several of his works were suppressed at their instigation. In his latter years his health began to fail, and he lost his eyesight. Poverty compelled him to sell his library, a sacrifice which hastened his death, which took place at Paris on the 1st of February 1767.

He is the author of *Supplément au dictionnaire de Moréri* (1735), and a *Nouveau Supplément* to a subsequent edition of the work; he collaborated in *Bibliothèque française, ou histoire littéraire de la France* (18 vols., Paris, 1740–1759); and in the *Vies des saints* (7 vols., 1730); he also wrote *Mémoires historiques et littéraires sur le collège royal de France* (1758); *Histoire des Inquisitions* (Paris, 1752); and supervised an edition of Richelet's *Dictionnaire*, of which he has also given an abridgment. He helped the abbé Fabre in his continuation of Fleury's *Histoire ecclésiastique*.

See *Mémoires hist. et litt. de l'abbé Goujet* (1767).

GOUJON, JEAN (*c.* 1520–*c.* 1566), French sculptor of the 16th century. Although some evidence has been offered in favour of the date 1520 (*Archives de l'art français*, iii. 350), the time and place of his birth are still uncertain. The first mention of his name occurs in the accounts of the church of St Maclou at Rouen in the year 1540, and in the following year he was employed at the cathedral of the same town, where he added to the tomb of Cardinal d'Amboise a statue of his nephew Georges, afterwards removed, and possibly carved portions of the tomb of Louis de Brezé, executed some time after 1541. On leaving Rouen, Goujon was employed by Pierre Lescot, the celebrated architect of the Louvre, on the restorations of St-Germain l'Auxerrois; the building accounts—some of which for the years 1542–1544 were discovered by M. de Laborde on a piece of parchment binding—specify as his work, not only the carvings of the pulpit (Louvre), but also a Notre Dame de Pitié, now lost. In 1547 appeared Martin's French translation of Vitruvius, the illustrations of which were due, the translator tells us in his "Dedication to the King," to Goujon, "naguères architecte de Monseigneur le Connétable, et maintenant un des vôtres." We learn from this statement not only that Goujon had been taken into the royal service on the accession of Henry II., but also that he had been previously employed under Bullant on the château of Écouen. Between 1547 and 1549 he was employed in the decoration of the Loggia ordered from Lescot for the entry of Henry II. into Paris, which took place on the 16th of June 1549. Lescot's edifice was reconstructed at the end of the 18th century by Bernard Poyet into the Fontaine des Innocents, this being a considerable variation of the original design. At the Louvre, Goujon, under the direction of Lescot, executed the carvings of the south-west angle of the court, the

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reliefs of the Escalier Henri II., and the Tribune des Cariatides, for which he received 737 livres on the 5th of September 1550. Between 1548 and 1554 rose the château d'Anet, in the embellishment of which Goujon was associated with Philibert Delorme in the service of Diana of Poitiers. Unfortunately the building accounts of Anet have disappeared, but Goujon executed a vast number of other works of equal importance, destroyed or lost in the great Revolution. In 1555 his name appears again in the Louvre accounts, and continues to do so every succeeding year up to 1562, when all trace of him is lost. In the course of this year an attempt was made to turn out of the royal employment all those who were suspected of Huguenot tendencies. Goujon has always been claimed as a Reformer; it is consequently possible that he was one of the victims of this attack. We should therefore probably ascribe the work attributed to him in the Hôtel Carnavalet (*in situ*), together with much else executed in various parts of Paris—but now dispersed or destroyed—to a period intervening between the date of his dismissal from the Louvre and his death, which is computed to have taken place between 1564 and 1568, probably at Bologna. The researches of M. Tomaso Sandonnini (see *Gazette des Beaux Arts*, 2e période, vol. xxxi.) have finally disposed of the supposition, long entertained, that Goujon died during the St Bartholomew massacre in 1572.

List of authentic works of Jean Goujon: Two marble columns supporting the organ of the church of St Maclou (Rouen) on right and left of porch on entering; left-hand gate of the church of St Maclou; bas-reliefs for decoration of screen of St Germain l'Auxerrois (now in Louvre); "Victory" over chimney-piece of Salle des Gardes at Écouen; altar at Chantilly; illustrations for Jean Martin's translation of Vitruvius; bas-reliefs and sculptural decoration of Fontaine des Innocents; bas-reliefs adorning entrance of Hôtel Carnavalet, also series of satyrs' heads on keystones of arcade of courtyard; fountain of Diana from Anet (now in Louvre); internal decoration of chapel at Anet; portico of Anet (now in courtyard of École des Beaux Arts); bust of Diane de Poitiers (now at Versailles); Tribune of Caryatides in the Louvre; decoration of "Escalier Henri II.," Louvre; œils de bœuf and decoration of Henri II. façade, Louvre; groups for pediments of façade now placed over entrance to Egyptian and Assyrian collections, Louvre.

See A. A. Pottier, *Œuvres de Goujon* (1844); Reginald Lister, *Jean Goujon* (London, 1903).

GOUJON, JEAN MARIE CLAUDE ALEXANDRE (1766–1795), French publicist and statesman, was born at Bourg on the 13th of April 1766, the son of a postmaster. The boy went early to sea, and saw fighting when he was twelve years old; in 1790 he settled at Meudon, and began to make good his lack of education. As procureur-général-syndic of the department of Seine-et-Oise, in August, 1792, he had to supply the inhabitants with food, and fulfilled his difficult functions with energy and tact. In the Convention, which he entered on the death of Hérault de Séchelles, he took his seat on the benches of the Mountain. He conducted a mission to the armies of the Rhine and the Moselle with creditable moderation, and was a consistent advocate of peace within the republic. Nevertheless, he was a determined opponent of the counter-revolution, which he denounced in the Jacobin Club and from the Mountain after his recall to Paris, following on the revolution of the 9th Thermidor (July 27, 1794). He was one of those who protested against the readmission of Louvet and other survivors of the Girondin party to the Convention in March 1795; and, when the populace invaded the legislature on the 1st Prairial (May 20, 1795) and compelled the deputies to legislate in accordance with their desires, he proposed the immediate establishment of a special commission which should assure the execution of the proposed changes and assume the functions of the various committees. The failure of the insurrection involved the fall of those deputies who had supported the demands of the populace. Before the close of the sitting, Goujon, with Romme, Duroi, Duquesnoy, Bourbotte, Soubrany and others were put under arrest by their colleagues, and on their way to the château of Taureau in Brittany had a narrow escape from a mob at Avranches. They were brought back to Paris for trial before a military commission on the 17th of June, and, though no proof of their complicity in organizing the insurrection could be found—they were, in fact, with the exception of Goujon and Bourbotte, strangers to one another—they were condemned. In accordance with a pre-arranged plan, they attempted suicide on the staircase leading from the court-room with a knife which Goujon had successfully concealed. Romme, Goujon and Duquesnoy succeeded, but the other three merely inflicted wounds which did not prevent their being taken immediately to the guillotine. With their deaths the Mountain ceased to exist as a party.

See J. Claretie, *Les Derniers Montagnards, histoire de l'insurrection de Prairial an III d'après les documents* (1867); *Défense du représentant du peuple Goujon* (Paris, no date), with the letters and a hymn written by Goujon during his imprisonment. For other documents see Maurice Tourneux (Paris, 1890, vol. i., pp. 422-425).

GOULBURN, EDWARD MEYRICK (1818–1897), English churchman, son of Mr Serjeant Goulburn, M.P., recorder of Leicester, and nephew of the Right Hon. Henry Goulburn, chancellor of the exchequer in the ministries of Sir Robert Peel and the duke of Wellington, was born in London on the 11th of February 1818, and was educated at Eton and at Balliol College, Oxford. In 1839 he became fellow and tutor of Merton, and in 1841 and 1843 was ordained deacon and priest respectively. For some years he held the living of Holywell, Oxford, and was chaplain to Samuel Wilberforce, bishop of the diocese. In 1849 he succeeded Tait as headmaster of Rugby, but in 1857 he resigned, and accepted the charge of Quebec Chapel, Marylebone. In 1858 he became a prebendary of St Paul's, and in 1859 vicar of St John's, Paddington. In 1866 he was made dean of Norwich, and in that office exercised a long and marked influence on church life. A strong Conservative and a churchman of traditional orthodoxy, he was a keen antagonist of "higher criticism" and of all forms of rationalism. His *Thoughts on Personal Religion* (1862) and *The Pursuit of Holiness* were well received; and he wrote the *Life* (1892) of his friend Dean Burgon, with whose doctrinal views he was substantially in agreement. He resigned the deanery in 1889, and died at Tunbridge Wells on the 3rd of May 1897.

See *Life* by B. Compton (1899).

GOULBURN, HENRY (1784–1856), English statesman, was born in London on the 19th of March 1784 and was educated at Trinity College, Cambridge. In 1808 he became member of parliament for Horsham; in 1810 he was appointed under-secretary for home affairs and two and a half years later he was made under-secretary for war and the colonies. Still retaining office in the Tory government he became a privy councillor in 1821, and just afterwards was appointed chief secretary to the lord-lieutenant of Ireland, a position which he held until April 1827. Here although frequently denounced as an Orangeman, his period of office was on the whole a successful one, and in 1823 he managed to pass the Irish Tithe Composition Bill. In January 1828 he was made chancellor of the exchequer under the duke of Wellington; like his leader he disliked Roman Catholic emancipation, which he voted against in 1828. In the domain of finance Goulburn's chief achievements were to reduce the rate of interest on part of the national debt, and to allow any one to sell beer upon payment of a small annual fee, a complete change of policy with regard to the drink traffic. Leaving office with Wellington in November 1830, Goulburn was home secretary under Sir Robert Peel for four months in 1835, and when this statesman returned to office in September 1841 he became chancellor of the exchequer for the second time. Although Peel himself did some of the chancellor's work, Goulburn was responsible for a further reduction in the rate of interest on the national debt, and he aided his chief in the struggle which ended in the repeal of the corn laws. With his colleagues he left office in June 1846. After representing Horsham in the House of Commons for over four years Goulburn was successively member for St Germans, for West Looe, and for the city of Armagh. In May 1831 he was elected for Cambridge University, and he retained this seat until his death on the 12th of January 1856

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at Betchworth House, Dorking. Goulburn was one of Peel's firmest supporters and most intimate friends. His eldest son, Henry (1813–1843), was senior classic and second wrangler at Cambridge in 1835.

See S. Walpole, *History of England* (1878–1886).

GOULBURN, a city of Argyle county, New South Wales, Australia, 134 m. S.W. of Sydney by the Great Southern railway. Pop. (1901) 10,618. It lies in a productive agricultural district, at an altitude of 2120 ft., and is a place of great importance, being the chief depot of the inland trade of the southern part of the state. There are Anglican and Roman Catholic cathedrals. Manufactures of boots and shoes, flour and beer, and tanning are important. The municipality was created in 1859; and Goulburn became a city in 1864.

GOULD, AUGUSTUS ADDISON (1805–1866), American conchologist, was born at New Ipswich, New Hampshire, on the 23rd of April 1805, graduated at Harvard College in 1825, and took his degree of doctor of medicine in 1830. Thrown from boyhood on his own exertions, it was only by industry, perseverance and self-denial that he obtained the means to pursue his studies. Establishing himself in Boston, he devoted himself to the practice of medicine, and finally rose to high professional rank and social position. He became president of the Massachusetts Medical Society, and was employed in editing the vital statistics of the state. As a conchologist his reputation is world-wide, and he was one of the pioneers of the science in America. His writings fill many pages of the publications of the Boston Society of Natural History (see vol. xi. p. 197 for a list) and other periodicals. He published with L. Agassiz the *Principles of Zoology* (2nd ed. 1851); he edited the *Terrestrial and Air-breathing Mollusks* (1851–1855) of Amos Binney (1803–1847); he translated Lamarck's *Genera of Shells*. The two most important monuments to his scientific work, however, are *Mollusca and Shells* (vol. xii., 1852) of the United States exploring expedition (1838–1842) under Lieutenant Charles Wilkes (1833), published by the government, and the *Report on the Invertebrata* published by order of the legislature of Massachusetts in 1841. A second edition of the latter work was authorized in 1865, and published in 1870 after the author's death, which took place at Boston on the 15th of September 1866. Gould was a corresponding member of all the prominent American scientific societies, and of many of those of Europe, including the London Royal Society.

GOULD, BENJAMIN APTHORP (1824–1896), American astronomer, a son of Benjamin Apthorp Gould (1787–1859), principal of the Boston Latin school, was born at Boston, Massachusetts, on the 27th of September 1824. Having graduated at Harvard College in 1844, he studied mathematics and astronomy under C. F. Gauss at Göttingen, and returned to America in 1848. From 1852 to 1867 he was in charge of the longitude department of the United States coast survey; he developed and organized the service, was one of the first to determine longitudes by telegraphic means, and employed the Atlantic cable in 1866 to establish longitude-relations between Europe and America. The *Astronomical Journal* was founded by Gould in 1849; and its publication, suspended in 1861, was resumed by him in 1885. From 1855 to 1859 he acted as director of the Dudley observatory at Albany, New York; and published in 1859 a discussion of the places and proper motions of circumpolar stars to be used as standards by the United States coast survey. Appointed in 1862 actuary to the United States sanitary commission, he issued in 1869 an important volume of *Military and Anthropological Statistics*. He fitted up in 1864 a private observatory at Cambridge, Mass.; but undertook in 1868, on behalf of the Argentine republic, to organize a national observatory at Cordoba; began to observe there with four assistants in 1870, and completed in 1874 his *Uranometria Argentina* (published 1879) for which he received in 1883 the gold medal of the Royal Astronomical Society. This was followed by a zone-catalogue of 73,160 stars (1884), and a general catalogue (1885) compiled from meridian observations of 32,448 stars. Gould's measurements of L. M. Rutherfurd's photographs of the Pleiades in 1866 entitle him to rank as a pioneer in the use of the camera as an instrument of precision; and he secured at Cordoba 1400 negatives of southern star-clusters, the reduction of which occupied the closing years of his life. He returned in 1885 to his home at Cambridge, where he died on the 26th of November 1896.

See *Astronomical Journal*, No. 389; *Observatory*, xx. 70 (same notice abridged); *Science* (Dec. 18, 1896, S. C. Chandler); *Astrophysical Journal*, v. 50; *Monthly Notices Roy. Astr. Society*, lvii. 218.

GOULD, SIR FRANCIS CARRUTHERS (1844–), English caricaturist and politician, was born in Barnstaple on the 2nd of December 1844. Although in early youth he showed great love of drawing, he began life in a bank and then joined the London Stock Exchange, where he constantly sketched the members and illustrated important events in the financial world; many of these drawings were reproduced by lithography and published for private circulation. In 1870 he began the regular illustration of the Christmas numbers of *Truth*, and in 1887 he became a contributor to the *Pall Mall Gazette*, transferring his allegiance to the *Westminster Gazette* on its foundation, and subsequently acting as assistant editor. Among his independent publications are *Who killed Cock Robin?* (1897), *Tales told in the Zoo* (1900), two volumes of *Froissart's Modern Chronicles, told and pictured by F. C. Gould* (1902 and 1903), and *Picture Politics*—a periodical reprint of his *Westminster Gazette* cartoons, one of the most noteworthy implements of political warfare in the armoury of the Liberal party. Frequently grafting his ideas on to subjects taken freely from *Uncle Remus, Alice in Wonderland*, and the works of Dickens and Shakespeare, Sir F. C. Gould used these literary vehicles with extraordinary dexterity and point, but with a satire that was not unkind and with a vigour from which bitterness, virulence and cynicism were notably absent. He was knighted in 1906.

GOULD, JAY (1836–1892), American financier, was born in Roxbury, Delaware county, New York, on the 27th of May 1836. He was brought up on his father's farm, studied at Hobart Academy, and though he left school in his sixteenth year, devoted himself assiduously thereafter to private study, chiefly of mathematics and surveying, at the same time keeping books for a blacksmith for his board. For a short time he worked for his father in the hardware business; in 1852–1856 he worked as a surveyor in preparing maps of Ulster, Albany and Delaware counties in New York, of Lake and Geauga counties in Ohio, and of Oakland county in Michigan, and of a projected railway line between Newburgh and Syracuse, N.Y. An ardent anti-renter in his boyhood and youth, he wrote *A History of Delaware County and the Border Wars of New York, containing a Sketch of the Early Settlements in the County, and A History of the Late Anti-Rent Difficulties in Delaware* (Roxbury, 1856). He then engaged in the lumber and tanning business in western New York, and in banking in Stroudsburg, Pennsylvania. In 1863 he married Miss Helen Day Miller, and through her father, Daniel S. Miller, he was appointed manager of the Rensselaer & Saratoga railway, which he bought up when it was in a very bad condition, and skilfully reorganized; in the same way he bought and reorganized the Rutland & Washington railway, from which he ultimately realized a large profit. In 1859 he removed to New York City, where he became a broker in railway stocks, and in 1868 he was elected president of the Erie railway, of which by shrewd strategy he and James Fisk, Jr. (*q.v.*), had gained control in July of that year. The management of the road under his control, and especially the sale of $5,000,000 of fraudulent stock in 1868–1870, led to litigation begun by English bondholders, and Gould was forced out of the company in March 1872 and compelled to restore securities valued at about $7,500,000. It was during his control of the Erie that he and Fisk entered into a league with the Tweed Ring, they admitted Tweed to the directorate of the Erie, and Tweed in turn arranged favourable legislation for them at Albany. With Tweed, Gould was cartooned by Nast in 1869. In October 1871 Gould was the chief bondsman of Tweed when the latter was held in $1,000,000 bail. With Fisk in August 1869 he began to buy gold in a daring

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attempt to " corner " the market, his hope being that, with the advance in price of gold, wheat would advance to such a price that western farmers would sell, and there would be a consequent great movement of breadstuffs from West to East, which would result in increased freight business for the Erie road. His speculations in gold, during which he attempted through President Grant's brother-in-law, A. H. Corbin, to influence the president and his secretary General Horace Porter, culminated in the panic of " Black Friday," on the 24th of September 1869, when the price of gold fell from 162 to 135.

Gould gained control of the Union Pacific, from which in 1883 he withdrew after realizing a large profit. Buying up the stock of the Missouri Pacific he built up, by means of consolidations, reorganizations, and the construction of branch lines, the " Gould System " of railways in the south-western states. In 1880 he was in virtual control of 10,000 miles of railway, about one-ninth of the railway mileage of the United States at that time. Besides, he obtained a controlling interest in the Western Union Telegraph Company, and after 1881 in the elevated railways in New York City, and was intimately connected with many of the largest railway financial operations in the United States for the twenty years following 1868. He died of consumption and of mental strain on the 2nd of December 1892, his fortune at that time being estimated at $72,000,000; all of this he left to his own family.

His eldest son, GEORGE JAY GOULD (b. 1864), was prominent also as an owner and manager of railways, and became president of the Little Rock & Fort Smith railway (1888), the St Louis, Iron Mountain & Southern railway (1893), the International & Great Northern railway (1893), the Missouri Pacific railway (1893), the Texas & Pacific railway (1893), and the Manhattan Railway Company (1892); he was also vice-president and director of the Western Union Telegraph Company. It was under his control that the Wabash system became transcontinental and secured an Atlantic port at Baltimore; and it was he who brought about a friendly alliance between the Gould and the Rockefeller interests.

The eldest daughter, HELEN MILLER GOULD (b. 1868), became widely known as a philanthropist, and particularly for her generous gifts to American army hospitals in the war with Spain in 1898 and for her many contributions to New York University, to which she gave $250,000 for a library in 1895 and $100,000 for a Hall of Fame in 1900.

GOUNOD, CHARLES FRANÇOIS (1818-1893), French composer, was born in Paris on the 17th of June 1818, the son of F. L. Gounod, a talented painter. He entered the Paris Conservatoire in 1836, studied under Reicha, Halévy and Lesueur, and won the " Grand Prix de Rome " in 1839. While residing in the Eternal City he devoted much of his time to the study of sacred music, notably to the works of Palestrina and Bach. In 1843 he went to Vienna, where a " requiem " of his composition was performed. On his return to Paris he tried in vain to find a publisher for some songs he had written in Rome. Having become organist to the chapel of the " Missions Étrangères," he turned his thoughts and mind to religious music. At that time he even contemplated the idea of entering into holy orders. His thoughts were, however, turned to more mundane matters when, through the intervention of Madame Viardot, the celebrated singer, he received a commission to compose an opera on a text by Émile Augier for the Académie Nationale de Musique. *Sapho*, the work in question, was produced in 1851, and if its success was not very great, it at least sufficed to bring the composer 's name to the fore. Some critics appeared to consider this work as evidence of a fresh departure in the style of dramatic music, and Adolphe Adam, the composer, who was also a musical critic, attributed to Gounod the wish to revive the system of musical declamation invented by Gluck. The fact was that *Sapho* differed in some respects from the operatic works of the period, and was to a certain extent in advance of the times. When it was revived at the Paris Opéra in 1884, several additions were made by the composer to the original score, not altogether to its advantage, and *Sapho* once more failed to attract the public. Gounod's second dramatic attempt was again in connexion with a classical subject, and consisted in some choruses written for *Ulysse*, a tragedy by Ponsard, played at the Théâtre Français in 1852, when the orchestra was conducted by Offenbach. The composer's next opera, *La Nonne sanglante*, given at the Paris Opéra in 1854, was a failure.

Goethe's *Faust* had for years exercised a strong fascination over Gounod, and he at last determined to turn it to operatic account. The performance at a Paris theatre of a drama on the same subject delayed the production of his opera for a time. In the meanwhile he wrote in a few months the music for an operatic version of Molière's comedy, *Le Médecin malgré lui*, which was produced at the Théâtre Lyrique in 1858. Berlioz well described this charming little work when he wrote of it, " Everything is pretty, piquant, fluent, in this ' opéra comique ': there is nothing superfluous and nothing wanting." The first performance of *Faust* took place at the Théâtre Lyrique on the 19th of March 1859. Goethe's masterpiece had already been utilized for operatic purposes by various composers, the most celebrated of whom was Spohr. The subject had also inspired Schumann, Berlioz, Liszt, Wagner, to mention only a few, and the enormous success of Gounod's opera did not deter Boito from writing his *Mefistofele*. *Faust* is without doubt the most popular French opera of the second half of the 19th century. Its success has been universal, and nowhere has it achieved greater vogue than in the land of Goethe. For years it remained the recognized type of modern French opera. At the time of its production in Paris it was scarcely appreciated according to its merits. Its style was too novel, and its luscious harmonies did not altogether suit the palates of those dilettanti who still looked upon Rossini as the incarnation of music. Times have indeed changed, and French composers have followed the road opened by Gounod, and have further developed the form of the lyrical drama, adopting the theories of Wagner in a manner suitable to their national temperament. Although in its original version *Faust* contained spoken dialogue, and was divided into set pieces according to custom, yet it differed greatly from the operas of the past. Gounod had not studied the works of German masters such as Mendelssohn and Schumann in vain, and although his own style is eminently Gallic, yet it cannot be denied that much of its charm emanates from a certain poetic sentimentality which seems to have a Teutonic origin. Certainly no music such as his had previously been produced by any French composer. Auber was a gay trifler, scattering his bright effusions with absolute *insouciance*, teeming with melodious ideas, but lacking depth. Berlioz, a musical Titan, wrestled against fate with a superhuman energy, and, Jove-like, subjugated his hearers with his thunderbolts. It was, however, reserved for Gounod to introduce *la note tendre*, to sing the tender passion in accents soft and languorous. The musical language employed in *Faust* was new and fascinating, and it was soon to be adopted by many other French composers, certain of its idioms thereby becoming hackneyed. Gounod's opera was given in London in 1863, when its success, at first doubtful, became enormous, and it was heard concurrently at Covent Garden and Her Majesty's theatres. Since then it has never lost its popularity.

Although the success of *Faust* in Paris was at first not so great as might have been expected, yet it gradually increased and set the seal on Gounod's fame. The fortunate composer now experienced no difficulty in finding an outlet for his works, and the succeeding decade is a specially important one in his career. The opera from his pen which came after *Faust* was *Philémon et Baucis*, a setting of the mythological tale in which the composer followed the traditions of the Opéra Comique, employing spoken dialogue, while not abdicating the individuality of his own style. This work was produced at the Théâtre Lyrique in 1860. It has repeatedly been heard in London. *La Reine de Saba*, a four-act opera, produced at the Grand Opéra on the 28th of February 1862, was altogether a far more ambitious work. For some reason it did not meet

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with success, although the score contains some of Gounod's choicest inspirations, notably the well-known air, "Lend me your aid." *La Reine de Saba* was adapted for the English stage under the name of *Irene*. The non-success of this work proved a great disappointment to Gounod, who, however, set to work again, and this time with better results, *Mireille*, the fruit of his labours, being given for the first time at the Théâtre Lyrique on the 19th of March 1864. Founded upon the *Mireio* of the Provençal poet Mistral, *Mireille* contains much charming and characteristic music. The libretto seems to have militated against its success, and although several revivals have taken place and various modifications and alterations have been made in the score, yet *Mireille* has never enjoyed a very great vogue. Certain portions of this opera have, however, been popularized in the concert-room. *La Colombe*, a little opera in two acts without pretension, deserves mention here. It was originally heard at Baden in 1860, and subsequently at the Opéra Comique. A suavely melodious *entr'acte* from this little work has survived and been repeatedly performed.

Animated with the desire to give a pendant to his *Faust*, Gounod now sought for inspiration from Shakespeare, and turned his attention to *Romeo and Juliet*. Here, indeed, was a subject particularly well calculated to appeal to a composer who had so eminently qualified himself to be considered the musician of the tender passion. The operatic version of the Shakespearean tragedy was produced at the Théâtre Lyrique on the 27th of April 1867. It is generally considered as being the composer's second best opera. Some people have even placed it on the same level as *Faust*, but this verdict has not found general acceptance. Gounod himself is stated to have expressed his opinion of the relative value of the two operas enigmatically by saying, "*Faust* is the oldest, but I was younger; *Roméo* is the youngest, but I was older." The luscious strains wedded to the love scenes, if at times somewhat cloying, are generally in accord with the situations, often irresistibly fascinating, while always absolutely individual. The success of *Roméo* in Paris was great from the outset, and eventually this work was transferred to the Grand Opéra, after having for some time formed part of the répertoire of the Opéra Comique. In London it was not until the part of Romeo was sung by Jean de Reszke that this opera obtained any real bold upon the English public.

After having so successfully sought for inspiration from Molière, Goethe and Shakespeare, Gounod now turned to another famous dramatist, and selected Pierre Corneille's *Polyeucte* as the subject of his next opera. Some years were, however, to elapse before this work was given to the public. The Franco-German War had broken out, and Gounod was compelled to take refuge in London, where he composed the "biblical elegy" *Gallia* for the inauguration of the Royal Albert Hall. During his stay in London Gounod composed a great deal and wrote a number of songs to English words, many of which have attained an enduring popularity, such as "Maid of Athens," "There is a green hill far away," "Oh that we two were maying," "The fountain mingles with the river." His sojourn in London was not altogether pleasant, as he was embroiled in lawsuits with publishers. On Gounod's return to Paris he hurriedly set to music an operatic version of Alfred de Vigny's *Cinq-Mars*, which was given at the Opéra Comique on the 5th of April 1877 (and in London in 1900), without obtaining much success. *Polyeucte*, his much-cherished work, appeared at the Grand Opéra the following year on the 7th of October, and did not meet with a better fate. Neither was Gounod more fortunate with *Le Tribut de Zamora*, his last opera, which, given on the same stage in 1881, speedily vanished, never to reappear. In his later dramatic works he had, unfortunately, made no attempt to keep up with the times, preferring to revert to old-fashioned methods.

The genius of the great composer was, however, destined to assert itself in another field—that of sacred music. His friend Camille Saint-Saëns, in a volume entitled *Portraits et Souvenirs*, writes:

Gounod did not cease all his life to write for the church, to accumulate masses and motetts; but it was at the commencement of his career, in the *Messe de Sainte Cécile*, and at the end, in the oratorios *The Redemption* and *Mors et vita*, that he rose highest.

Saint-Saëns, indeed, has formulated the opinion that the three above-mentioned works will survive all the master's operas. Among the many masses composed by Gounod at the outset of his career, the best is the *Messe de Sainte Cécile*, written in 1855. He also wrote the *Messe du Sacré Cœur* (1876) and the *Messe à la mémoire de Jeanne d'Arc* (1887). This last work offers certain peculiarities, being written for solos, chorus, organ, eight trumpets, three trombones, and harps. In style it has a certain affinity with Palestrina. *The Redemption*, which seems to have acquired a permanent footing in Great Britain, was produced at the Birmingham Festival of 1882. It was styled a sacred trilogy, and was dedicated to Queen Victoria. The score is prefixed by a commentary written by the composer, in which the scope of the oratorio is explained. It cannot be said that Gounod has altogether risen to the magnitude of his task. The music of *The Redemption* bears the unmistakable imprint of the composer's hand, and contains many beautiful thoughts, but the work in its entirety is not exempt from monotony. *Mors et vita*, a sacred trilogy dedicated to Pope Leo XIII., was also produced for the first time in Birmingham at the Festival of 1885. This work is divided into three parts, "Mors," "Judicium," "Vita." The first consists of a Requiem, the second depicts the Judgment, the third Eternal Life. Although quite equal, if not superior to *The Redemption*, *Mors et vita* has not obtained similar success.

Gounod was a great worker, an indefatigable writer, and it would occupy too much space to attempt even an incomplete catalogue of his compositions. Besides the works already mentioned may be named two symphonies which were played during the 'fifties, but have long since fallen into neglect. Symphonic music was not Gounod's forte, and the French master evidently recognized the fact, for he made no further attempts in this style. The incidental music he wrote to the dramas *Les Deux Reines* and *Jeanne d'Arc* must not be forgotten. He also attempted to set Molière's comedy, *Georges Dandin*, to music, keeping to the original prose. This work has never been brought out. Gounod composed a large number of songs, many of which are very beautiful. One of the vocal pieces that have contributed most to his popularity is the celebrated *Meditation on the First Prelude of Bach*, more widely known as the *Ave Maria*. The idea of fitting a melody to the Prelude of Bach was original, and it must be admitted that in this case the experiment was successful.

Gounod died at St Cloud on the 18th of October 1893. His influence on French music was immense, though during the last years of the 19th century it was rather counterbalanced by that of Wagner. Whatever may be the verdict of posterity, it is unlikely that the quality of individuality will be denied to Gounod. To be the composer of *Faust* is alone a sufficient title to lasting fame. (A. He.)

GOURD, a name given to various plants of the order *Cucurbitaceae*, especially those belonging to the genus *Cucurbita*, monoecious trailing herbs of annual duration, with long succulent stems furnished with tendrils, and large, rough, palmately-lobed leaves; the flowers are generally large and of a bright yellow or orange colour, the barren ones with the stamens united; the fertile are followed by the large succulent fruit that gives the gourds their chief economic value. Many varieties of *Cucurbita* are under cultivation in tropical and temperate climates, especially in southern Asia; but it is extremely difficult to refer them to definite specific groups, on account of the facility with which they hybridize; while it is very doubtful whether any of the original forms now exist in the wild state. Charles Naudin, who made a careful and interesting series of observations upon this genus, came to the conclusion that all varieties known in European gardens might be referred to six original species; probably three, or at most four, have furnished the edible kinds in ordinary cultivation. Adopting the specific

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names usually given to the more familiar forms, the most important of the gourds, from an economic point of view, is perhaps *C. maxima*, the *Potiron Jaune* of the French, the red and yellow gourd of British gardeners (fig. 6), the spheroidal fruit of which is remarkable for its enormous size: the colour of the somewhat rough rind varies from white to bright yellow, while in some kinds it remains green; the fleshy interior is of a deep yellow or orange tint. This valuable gourd is grown extensively in southern Asia and Europe. In Turkey and Asia Minor it yields, at some periods of the year, an important article of diet to the people; immense quantities are sold in the markets of Constantinople, where in the winter the heaps of one variety with a white rind are described as resembling mounds of snowballs. The yellow kind attains occasionally a weight of 240 lb. It grows well in Central Europe and the United States, while in the south of England it will produce its gigantic fruit in perfection in hot summers. The yellow flesh of this gourd and its numerous varieties yields a considerable amount of nutriment, and is the more valuable as the fruit can be kept, even in warm climates, for a long time. In France and in the East it is much used in soups and ragouts, while simply boiled it forms a substitute for other table vegetables; the taste has been compared to that of a young carrot. In some countries the larger kinds are employed as cattle food. The seeds yield by expression a large quantity of a bland oil, which is used for the same purposes as that of the poppy and olive. The "mammoth" gourds of English and American gardeners (known in America as squashes) belong to this species. The pumpkin (summer squash of America) is *Cucurbita Pepo*. Some of the varieties of *C. maxima* and *Pepo* contain a considerable quantity of sugar, amounting in the sweetest kinds to 4 or 5%, and in the hot plains of Hungary efforts have been made to make use of them as a commercial source of sugar. The young shoots of both these large gourds may be given to cattle, and admit of being eaten as a green vegetable when boiled. The vegetable marrow is a variety (*ovifera*) of *C. Pepo*. Many smaller gourds are cultivated in India and other hot climates, and some have been introduced into English gardens, rather for the beauty of their fruit and foliage than for their esculent qualities. Among these is *C. Pepo* var. *aurantia*, the orange gourd, bearing a spheroidal fruit, like a large orange in form and colour; in Britain it is generally too bitter to be palatable, though applied to culinary purposes in Turkey and the Levant. *C. Pepo* var. *pyriformis* and var. *verrucosa*, the warted gourds, are likewise occasionally eaten, especially in the immature state; and *C. moschata* (musk melon) is very extensively cultivated throughout India by the natives, the yellow flesh being cooked and eaten.

Photographed from specimens in the British Museum.

Group of Gourds.

1-5. Various forms of bottle gourd, *Lagenaria vulgaris*.

6. Giant gourd, *Cucurbita maxima*.

The bottle-gourds are placed in a separate genus, *Lagenaria*, chiefly differing from *Cucurbita* in the anthers being free instead of adherent. The bottle-gourd properly so-called, *L. vulgaris*, is a climbing plant with downy, heart-shaped leaves and beautiful white flowers: the remarkable fruit (figs. 1-5) first begins to grow in the form of an elongated cylinder, but gradually widens towards the extremity, until, when ripe, it resembles a flask with a narrow neck and large rounded bulb; it sometimes attains a length of 7 ft. When ripe, the pulp is removed from the neck, and the interior cleared by leaving water standing in it; the woody rind that remains is used as a bottle: or the lower part is cut off and cleared out, forming a basin-like vessel applied to the same domestic purposes as the calabash (*Crescentia*) of the West Indies: the smaller varieties, divided lengthwise, form spoons. The ripe fruit is apt to be bitter and cathartic, but while immature it is eaten by the Arabs and Turks. When about the size of a small cucumber, it is stuffed with rice and minced meat, flavoured with pepper, onions, &c., and then boiled, forming a favourite dish with Eastern epicures. The elongated snake-gourds of India and China (*Trichosanthes*) are used in curries and stews.

All the true gourds have a tendency to secrete the cathartic principle *colocynthin*, and in many varieties of *Cucurbita* and the allied genera it is often elaborated to such an extent as to render them unwholesome, or even poisonous. The seeds of several species therefore possess some anthelmintic properties; those of the common pumpkin are frequently administered in America as a vermifuge.

The cultivation of gourds began far beyond the dawn of history, and the esculent species have become so modified by culture that the original plants from which they have descended can no longer be traced. The abundance of varieties in India would seem to indicate that part of Asia as the birthplace of the present edible forms; but some appear to have been cultivated in all the hotter regions of that continent, and in North Africa, from the earliest ages, while the Romans were familiar with at least certain kinds of *Cucurbita*, and with the bottle-gourd. *Cucurbita Pepo*, the source of many of the American forms, is probably a native of that continent.

Most of the annual gourds may be grown successfully in Britain. They are usually raised in hotbeds or under frames, and planted out in rich soil in the early summer as soon as the nights become warm. The more ornamental kinds may be trained over trellis-work, a favourite mode of displaying them in the East; but the situation must be sheltered and sunny. Even *Lagenaria* will sometimes produce fine fruit when so treated in the southern counties.

For an account of these cultivations in England see paper by Mr J. W. Odell, "Gourds and Cucurbits," in *Journ. Royal Hort. Soc.* xxix. 450 (1904).

GOURGAUD, GASPAR, Baron (1783–1852), French soldier, was born at Versailles on the 14th of September 1783; his father was a musician of the royal chapel. At school he showed talent in mathematical studies and accordingly entered the artillery. In 1802 he became junior lieutenant, and thereafter served with credit in the campaigns of 1803–1805, being wounded at Austerlitz. He was present at the siege of Saragossa in 1808, but returned to service in Central Europe and took part in nearly all the battles of the Danubian campaign of 1809. In 1811 he was chosen to inspect and report on the fortifications of Danzig. Thereafter he became one of the ordnance officers attached to the emperor, whom he followed closely through the Russian campaign of 1812; he was one of the first to enter the Kremlin and discovered there a quantity of gunpowder which might have been used for the destruction of Napoleon. For his services in this campaign he received the title of baron, and became first ordnance officer. In the campaign of 1813 in Saxony he further evinced his courage and prowess, especially at Leipzig and Hanau; but it was in the first battle of 1814, near to Brienne, that he rendered the most signal service by killing the leader of a small band of Cossacks who were riding furiously towards Napoleon's tent. Wounded at the battle of Montmirail, he yet recovered in time to share in several of the conflicts which followed, distinguishing himself especially at Laon and Reims. Though enrolled among the royal guards of Louis XVIII. in the summer of 1814, he yet embraced the cause of Napoleon during the Hundred Days (1815), was named general and aide-de-camp by the emperor, and fought at Waterloo.

After the second abdication of the emperor (June 22nd, 1815) Gourgaud retired with him and a few other companions to Rochefort. It was to him that Napoleon entrusted the letter of appeal to the prince regent for an asylum in England. Gourgaud set off in H.M.S. "Slaney," but was not allowed to land

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in England. He determined to share Napoleon's exile and sailed with him on H.M.S. "Northumberland" to St Helena. The ship's secretary, John R. Glover, has left an entertaining account of some of Gourgaud's gasconnades at table. His extreme sensitiveness and vanity soon brought him into collision with Las Cases and Montholon at Longwood. The former he styles in his journal a "Jesuit" and a scribbler who went thither in order to become famous. With Montholon, his senior in rank, the friction became so acute that he challenged him to a duel, for which he suffered a sharp rebuke from Napoleon. Tiring of the life at Longwood and the many slights which he suffered from Napoleon, he desired to depart, but before he could sail he spent two months with Colonel Basil Jackson, whose account of him throws much light on his character, as also on the "policy" adopted by the exiles at Longwood. In England he was gained over by members of the Opposition and thereafter made common cause with O'Meara and other detractors of Sir Hudson Lowe, for whose character he had expressed high esteem to Basil Jackson. He soon published his *Campagne de 1815*, in the preparation of which he had had some help from Napoleon; but Gourgaud's *Journal de Ste-Hélène* was not destined to be published till the year 1899. Entering the arena of letters, he wrote, or collaborated in, two well-known critiques. The first was a censure of Count P. de Ségur's work on the campaign of 1812, with the result that he fought a duel with that officer and wounded him. He also sharply criticized Sir Walter Scott's *Life of Napoleon*. He returned to active service in the army in 1830; and in 1840 proceeded with others to St Helena to bring back the remains of Napoleon to France. He became a deputy to the Legislative Assembly in 1849; he died in 1852.

Gourgaud's works are *La Campagne de 1815* (London and Paris, 1818); *Napoléon et la Grande Armée en Russie; examen critique de l'ouvrage de M. le comte P. de Ségur* (Paris, 1824); *Réfutation de la vie de Napoléon par Sir Walter Scott* (Paris, 1827). He collaborated with Montholon in the work entitled *Mémoires pour servir à l'histoire de France sous Napoléon* (Paris, 1822–1823), and with Belliard and others in the work entitled *Boursienne et ses erreurs* (2 vols., Paris, 1830); but his most important work is the *Journal inédit de Ste-Hélène* (2 vols., Paris, 1899), which is a remarkably naïf and lifelike record of the life at Longwood. See, too, *Notes and Reminiscences of a Staff Officer*, by Basil Jackson (London, 1904), and the bibliography to the article LOWE, SIR HUDSON. (J. HL. R.)

GOURKO, JOSEPH VLADIMIROVICH, COUNT (1828–1901), Russian general, was born, of Lithuanian extraction, on the 15th of November 1828. He was educated in the imperial corps of pages, entered the hussars of the imperial bodyguard as sub-lieutenant in 1846, became captain in 1857, adjutant to the emperor in 1860, colonel in 1861, commander of the 4th Hussar regiment of Mariupol in 1866, and major-general of the emperor's suite in 1867. He subsequently commanded the grenadier regiment, and in 1873 the 1st brigade, and division, of the cavalry of the guard. Although he took part in the Crimean War, being stationed at Belbek, his claim to distinction is due to his services in the Turkish war of 1877. He led the van of the Russian invasion, took Trnovo on the 7th July, crossed the Balkans by the Hain Bogaz pass, debouching near Hainkioi, and, notwithstanding considerable resistance, captured Ufani, Maglish and Kazanlyk; on the 18th of July he attacked Shipka, which was evacuated by the Turks on the following day. Thus within sixteen days of crossing the Danube Gourko had secured three Balkan passes and created a panic at Constantinople. He then made a series of successful reconnaissances of the Tunja valley, cut the railway in two places, occupied Stara Zagora (Turkish, Eski Zagra) and Nova Zagora (Yeni Zagra), checked the advance of Suleiman's army, and returned again over the Balkans. In October he was appointed commander of the allied cavalry, and attacked the Plevna line of communication to Orkhanie with a large mixed force, captured Gorni-Dubnik, Telische and Vratza, and, in the middle of November, Orkhanie itself. Plevna was isolated, and after its fall in December Gourko led the way amidst snow and ice over the Balkans to the fertile valley beyond, totally defeated Suleiman, and occupied Sophia, Philippopolis and Adrianople, the armistice at the end of January 1878 stopping further operations (see RUSSO-TURKISH WARS). Gourko was made a count, and decorated with the 2nd class of St George and other orders. In 1879–1880 he was governor of St Petersburg, and from 1883 to 1894 governor-general of Poland. He died on the 29th of January 1901.

GOURMET, a French term for one who takes a refined and critical, or even merely theoretical pleasure in good cooking and the delights of the table. The word has not the disparaging sense attached to the Fr. *gourmand*, to whom the practical pleasure of good eating is the chief end. The O. Fr. *groumet* or *gromel* meant a servant, or shop-boy, especially one employed in a wine-seller's shop, hence an expert taster of wines, from which the modern usage has developed. The etymology of *gourmet* is obscure; it may be ultimately connected with the English "groom" (*q.v.*). The origin of *gourmand* is unknown. In English, in the form "grummet," the word was early applied to a cabin or ship's boy. Ships of the Cinque Ports were obliged to carry one "grummet"; thus in a charter of 1229 (quoted in the *New English Dictionary*) it is laid down *servitia inde debita Domino Regi, xxi. naves, et in qualibet nave xxi. homines, cum uno garlione qui dicitur gromet.*

GOUROCK, a police burgh and watering-place of Renfrewshire, Scotland, on the southern shore of the Firth of Clyde, 3¼ m. W. by N. of Greenock by the Caledonian railway. Pop. (1901) 5261. It is partly situated on a fine bay affording good anchorage, for which it is largely resorted to by the numerous yacht clubs of the Clyde. The extension of the railway from Greenock (in 1889) to the commodious pier, with a tunnel ¼ m. long, the longest in Scotland, affords great facilities for travel to the ports of the Firth, the sea lochs on the southern Highland coast and the Crinan Canal. The eminence called Barrhill (480 ft. high) divides the town into two parts, the eastern known as Kempoch, the western as Ashton. Near Kempoch point is a monolith of mica-schist, 6 ft. high, called "Granny Kempoch," which the superstitious of other days regarded as possessing influence over the winds, and which was the scene, in 1662, of certain rites that led to the celebrants being burned as witches. Gamble Institute (named after the founder) contains halls, recreation rooms, a public library and baths. It is said that Gourock was the first place on the Clyde where herrings were cured. There is tramway communication with Greenock and Ashton. About 3 m. S.W. there stands on the shore the familiar beacon of the Cloch. Gourock became a burgh of barony in 1694.

GOURVILLE, JEAN HERAULD (1625–1703), French adventurer, was born at La Rochefoucauld. At the age of eighteen he entered the house of La Rochefoucauld as a servant, and in 1646 became secretary to François de la Rochefoucauld, author of the *Maximes*. Resourceful and quick-witted, he rendered services to his master during the Fronde, in his intrigues with the parliament, the court or the princes. In these negotiations he made the acquaintance of Condé, whom he wished to help to escape from the château of Vincennes; of Mazarin, for whom he negotiated the reconciliation with the princes; and of Nicolas Fouquet. After the Fronde he engaged in financial affairs, thanks to Fouquet. In 1658 he farmed the *taille* in Guienne. He bought depreciated *rentes* and had them raised to their nominal value by the treasury; he extorted gifts from the financiers for his protection, being Fouquet's confidant in many operations of which he shared the profits. In three years he accumulated an enormous fortune, still further increased by his unfailing good fortune at cards, playing even with the king. He was involved in the trial of Fouquet, and in April 1663 was condemned to death for peculation and embezzlement of public funds; but escaping, was executed in effigy. He sent a valet one night to take the effigy down from the gallows in the court of the Palais de Justice, and then fled the country. He remained five years abroad, being excepted in 1665 from the amnesty accorded by Louis XIV. to the condemned financiers. Having returned secretly to France, he entered the service of Condé, who, unable to meet his creditors, had need of a clever manager to put his affairs in order. In this way he was able to reappear at court, to assist at the campaigns of the war with Holland, and to offer himself for all the delicate negotiations

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for his master or the king. He received diplomatic missions in Germany, in Holland, and especially in Spain, though it was only in 1694, that he was freed from the condemnation pronounced against him by the chamber of justice. From 1696 he fell ill and withdrew to his estate, where he dictated to his secretary, in four months and a half, his *Mémoires*, an important source for the history of his time. In spite of several errors, introduced purposely, they give a clear idea of the life and morals of a financier of the age of Fouquet, and throw light on certain points of the diplomatic history. They were first published in 1724.

There is a modern edition, with notes, an introduction and appendix, by Lecestre (Paris, 1894–1895, 2 vols.).

GOUT, the name rather vaguely given, in medicine, to a constitutional disorder which manifests itself by inflammation of the joints, with sometimes deposition of urates of soda, and also by morbid changes in various important organs. The term gout, which was first used about the end of the 13th century, is derived through the Fr. *goutte* from the Lat. *gutta*, a drop, in allusion to the old pathological doctrine of the dropping of a morbid material from the blood within the joints. The disease was known and described by the ancient Greek physicians under various terms, which, however, appear to have been applied by them alike to rheumatism and gout. The general term *arthritis* (ἄρθρον, a joint) was employed when many joints were the seat of inflammation; while in those instances where the disease was limited to one part the terms used bore reference to such locality; hence *podagra* (ποδάγρα, from ποῦς, the foot, and ἄγρα, a seizure), *chiragra* (χείρ, the hand), *gonagra* (γόνυ, the knee), &c.

Hippocrates in his *Aphorisms* speaks of gout as occurring most commonly in spring and autumn, and mentions the fact that women are less liable to it than men. He also gives directions as to treatment. Celsus gives a similar account of the disease. Galen regarded gout as an unnatural accumulation of humours in a part, and the chalk-stones as the concretions of these, and he attributed the disease to over-indulgence and luxury. Gout is alluded to in the works of Ovid and Pliny, and Seneca, in his 95th epistle, mentions the prevalence of gout among the Roman ladies of his day as one of the results of their high living and debauchery. Lucian, in his *Tragopodagra*, gives an amusing account of the remedies employed for the cure of gout.

In all times this disease has engaged a large share of the attention of physicians, from its wide prevalence and from the amount of suffering which it entails. Sydenham, the famous English physician of the 17th century, wrote an important treatise on the subject, and his description of the gouty paroxysm, all the more vivid from his having himself been afflicted with the disease for thirty-four years, is still quoted by writers as the most graphic and exhaustive account of the symptomatology of gout. Subsequently Cullen, recognizing gout as capable of manifesting itself in various ways, divided the disease into *regular gout*, which affects the joints only, and *irregular gout*, where the gouty disposition exhibits itself in other forms; and the latter variety he subdivided into *atonic gout*, where the most prominent symptoms are throughout referable to the stomach and alimentary canal; *retrocedent gout*, where the inflammatory attack suddenly disappears from an affected joint and serious disturbance takes place in some internal organ, generally the stomach or heart; and *misplaced gout*, where from the first the disease does not appear externally, but reveals itself by an inflammatory attack of some internal part. Dr Garrod, one of the most eminent authorities on gout, adopted a division somewhat similar to, though simpler than that of Cullen, namely, *regular gout*, which affects the joints alone, and is either acute or chronic, and *irregular gout*, affecting non-articular tissues, or disturbing the functions of various organs.

It is often stated that the attack of gout comes on without any previous warning; but, while this is true in many instances, the reverse is probably as frequently the case, and the premonitory symptoms, especially in those who have previously suffered from the disease, may be sufficiently precise to indicate the impending seizure. Among the more common of these may be mentioned marked disorders of the digestive organs, with a feeble and capricious appetite, flatulence and pain after eating, and uneasiness in the right side in the region of the liver. A remarkable tendency to gnashing of the teeth is sometimes observed. This symptom was first noticed by Dr Graves, who connected it with irritation in the urinary organs, which also is present as one of the premonitory indications of the gouty attack. Various forms of nervous disturbance also present themselves in the form of general discomfort, extreme irritability of temper, and various perverted sensations, such as that of numbness and coldness in the limbs. These symptoms may persist for many days and then undergo amelioration immediately before the impending paroxysm. On the night of the attack the patient retires to rest apparently well, but about two or three o'clock in the morning awakes with a painful feeling in the foot, most commonly in the ball of the great toe, but it may be in the instep or heel, or in the thumb. With the pain there often occurs a distinct shivering followed by feverishness. The pain soon becomes of the most agonizing character: in the words of Sydenham, "now it is a violent stretching and tearing of the ligaments, now it is a gnawing pain, and now a pressure and tightening; so exquisite and lively meanwhile is the part affected that it cannot bear the weight of the bedclothes, nor the jar of a person walking in the room."

When the affected part is examined it is found to be swollen and of a deep red hue. The superjacent skin is tense and glistening, and the surrounding veins are more or less distended. After a few hours there is a remission of the pain, slight perspiration takes place, and the patient may fall asleep. The pain may continue moderate during the day but returns as night advances, and the patient goes through a similar experience of suffering to that of the previous night, followed with a like abatement towards morning. These nocturnal exacerbations occur with greater or less severity during the continuance of the attack, which generally lasts for a week or ten days. As the symptoms decline the swelling and tenderness of the affected joint abate, but the skin over it pits on pressure for a time, and with this there is often associated slight desquamation of the cuticle. During the attacks there is much constitutional disturbance. The patient is restless and extremely irritable, and suffers from cramp in the limbs and from dyspepsia, thirst and constipation. The urine is scanty and high-coloured, with a copious deposit, consisting chiefly of urates. During the continuance of the symptoms the inflammation may leave the one foot and affect the other, or both may suffer at the same time. After the attack is over the patient feels quite well and fancies himself better than he had been for a long time before; hence the once popular notion that a fit of the gout was capable of removing all other ailments. Any such idea, however, is sadly belied in the experience of most sufferers from this disease. It is rare that the first is the only attack of gout, and another is apt to occur within a year, although by care and treatment it may be warded off. The disease, however, undoubtedly tends to take a firmer hold on the constitution and to return. In the earlier recurrences the same joints as were formerly the seat of the gouty inflammation suffer again, but in course of time others become implicated, until in advanced cases scarcely any articulation escapes, and the disease thus becomes chronic. It is to be noticed that when gout assumes this form the frequently recurring attacks are usually attended with less pain than the earlier ones, but their disastrous effects are evidenced alike by the disturbance of various important organs, especially the stomach, liver, kidneys and heart, and by the remarkable changes which take place in the joints from the formation of the so-called chalk-stones or tophi. These deposits, which are highly characteristic of gout, appear at first to take place in the form of a semifluid material, consisting for the most part of urate of soda, which gradually becomes more dense, and ultimately quite hard. When any quantity of this is deposited in the structures of a joint the effect is to produce stiffening, and, as deposits appear to take place to a greater or less amount in connexion with every

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attack, permanent thickening and deformity of the parts is apt to be the consequence. The extent of this depends, of course, on the amount of the deposits, which, however, would seem to be in no necessary relation to the severity of the attack, being in some cases even of chronic gout so slight as to be barely appreciable externally, but on the other hand occasionally causing great enlargement of the joints, and fixing them in a flexed or extended position which renders them entirely useless. Dr Garrod describes the appearance of a hand in an extreme case of this kind, and likens its shape to a bundle of French carrots with their heads forward, the nails corresponding to the stalks. Any of the joints may be thus affected, but most commonly those of the hands and feet. The deposits take place in other structures besides those of joints, such as along the course of tendons, underneath the skin and periosteum, in the sclerotic coat of the eye, and especially on the cartilages of the external ear. When largely deposited in joints an abscess sometimes forms, the skin gives way, and the concretion is exposed. Sir Thomas Watson quotes a case of this kind where the patient when playing at cards was accustomed to chalk the score of the game upon the table with his gouty knuckles.

The recognition of what is termed irregular gout is less easy than that form above described, where the disease gives abundant external evidence of its presence; but that other parts than joints suffer from gouty attacks is beyond question. The diagnosis may often be made in cases where in an attack of ordinary gout the disease suddenly leaves the affected joints and some new series of symptoms arises. It has been often observed when cold has been applied to an inflamed joint that the pain and inflammation in the part ceased, but that some sudden and alarming seizure referable to the stomach, brain, heart or lungs supervened. Such attacks, which correspond to what is termed by Cullen retrocedent gout, often terminate favourably, more especially if the disease again returns to the joints. Further, the gouty nature of some long-continued internal or cutaneous disorder may be rendered apparent by its disappearance on the outbreak of the paroxysm in the joints. Gout, when of long standing, is often found associated with degenerative changes in the heart and large arteries, the liver, and especially the kidneys, which are apt to assume the contracted granular condition characteristic of one of the forms of Bright's disease. A variety of urinary calculus—the uric acid—formed by concretions of this substance in the kidneys is a not unfrequent occurrence in connexion with gout; hence the well-known association of this disease and gravel.

The pathology of gout is discussed in the article on METABOLIC DISEASES. Many points, however, still remain unexplained. As remarked by Trousseau, "the production in excess of uric acid and urates is a pathological phenomenon inherent like all others in the disease; and like all the others it is dominated by a specific cause, which we know only by its effects, and which we term the gouty diathesis." This subject of diathesis (habit, or organic predisposition of individuals), which is regarded as an essential element in the pathology of gout, naturally suggests the question as to whether, besides being inherited, such a peculiarity may also be acquired, and this leads to a consideration of the causes which are recognized as influential in favouring the occurrence of this disease.

It is beyond dispute that gout is in a marked degree hereditary, fully more than half the number of cases being, according to Sir C. Scudamore and Dr Garrod, of this character. But it is no less certain that there are habits and modes of life the observance of which may induce the disease even where no hereditary tendencies can be traced, and the avoidance of which may, on the other hand, go far towards weakening or neutralizing the influence of inherited liability. Gout is said to affect the sedentary more readily than the active. If, however, inadequate exercise be combined with a luxurious manner of living, with habitual over-indulgence in animal food and rich dishes, and especially in alcoholic beverages, then undoubtedly the chief factors in the production of the disease are present.

Much has been written upon the relative influence of various forms of alcoholic drinks in promoting the development of gout. It is generally stated that fermented are more injurious than distilled liquors, and that, in particular, the stronger wines, such as port, sherry and madeira, are much more potent in their gout-producing action than the lighter class of wines, such as hock, moselle, &c., while malt liquors are fully as hurtful as strong wines. It seems quite as probable, however, that over-indulgence in any form of alcohol, when associated with the other conditions already adverted to, will have very much the same effect in developing gout. The comparative absence of gout in countries where spirituous liquors are chiefly used, such as Scotland, is cited as showing their relatively slight effect in encouraging that disease; but it is to be noticed that in such countries there is on the whole a less marked tendency to excess in the other pleasures of the table, which in no degree less than alcohol are chargeable with inducing the gouty habit. Gout is not a common disease among the poor and labouring classes, and when it does occur may often be connected even in them with errors in living. It is not very rare to meet gout in butlers, coachmen, &c., who are apt to live luxuriously while leading comparatively easy lives.

Gout, it must ever be borne in mind, may also affect persons who observe the strictest temperance in living, and whose only excesses are in the direction of over-work, either physical or intellectual. Many of the great names in history in all times have had their existence embittered by this malady, and have died from its effects. The influence of hereditary tendency may often be traced in such instances, and is doubtless called into activity by the depressing consequences of over-work. It may, notwithstanding, be affirmed as generally true that those who lead regular lives, and are moderate in the use of animal food and alcoholic drinks, or still better abstain from the latter altogether, are less likely to be the victims of gout even where an undoubted inherited tendency exists.

Gout is more common in mature age than in the earlier years of life, the greatest number of cases in one decennial period being between the ages of thirty and forty, next between twenty and thirty, and thirdly between forty and fifty. It may occasionally affect very young persons; such cases are generally regarded as hereditary, but, so far as diet is concerned, it has to be remembered that their home life has probably been a predisposing cause. After middle life gout rarely appears for the first time. Women are much less the subjects of gout than men, apparently from their less exposure to the influences (excepting, of course, that of heredity) which tend to develop the disease, and doubtless also from the differing circumstances of their physical constitution. It most frequently appears in females after the cessation of the menses. Persons exposed to the influence of lead poisoning, such as plumbers, painters, &c., are apt to suffer from gout; and it would seem that impregnation of the system with this metal markedly interferes with the uric acid excreting function of the kidneys.

Attacks of gout are readily excited in those predisposed to the disease. Exposure to cold, disorders of digestion, fatigue, and irritation or injuries of particular joints will often precipitate the gouty paroxysm.

With respect to the treatment of gout the greatest variety of opinion has prevailed and practice been pursued, from the numerous quaint nostrums detailed by Lucian to the "expectant" or do-nothing system recommended by Sydenham. But gout, although, as has been shown, a malady of a most severe and intractable character, may nevertheless be successfully dealt with by appropriate medicinal and hygienic measures. The general plan of treatment can be here only briefly indicated. During the acute attack the affected part should be kept at perfect rest, and have applied to it warm opiate fomentations or poultices, or, what answers quite as well, be enveloped in cotton wool covered in with oil silk. The diet of the patient should be light, without animal food or stimulants. The administration of some simple laxative will be of service, as well as the free use of alkaline diuretics, such as the bicarbonate or acetate of potash. The medicinal agent most relied on for the relief of pain is colchicum, which manifestly exercises a powerful

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action on the disease. This drug (*Colchicum autumnale*), which is believed to correspond to the hermodactyl of the ancients, has proved of such efficacy in modifying the attacks that, as observed by Dr Garrod, "we may safely assert that colchicum possesses as specific a control over the gouty inflammation as cinchona barks or their alkaloids over intermittent fever." It is usually administered in the form of the wine in doses of 10 to 30 drops every four or six hours, or in pill as the acetous extract (gr. ½-gr. i.). The effect of colchicum in subduing the pain of gout is generally so prompt and marked that it is unnecessary to have recourse to opiates; but its action requires to be carefully watched by the physician from its well-known nauseating and depressing consequences, which, should they appear, render the suspension of the drug necessary. Otherwise the remedy may be continued in gradually diminishing doses for some days after the disappearance of the gouty inflammation. Should gout give evidence of its presence in an irregular form by attacking internal organs, besides the medicinal treatment above mentioned, the use of frictions and mustard applications to the joints is indicated with the view of exciting its appearance there. When gout has become chronic, colchicum, although of less service than in acute gout, is yet valuable, particularly when the inflammatory attacks recur. More benefit, however, appears to be derived from potassium iodide, guaiacum, the alkalis potash and lithia, and from the administration of aspirin and sodium salicylate. Salicylate of menthol is an effective local application, painted on and covered with a gutta-percha bandage. Lithia was strongly recommended by Dr Garrod from its solvent action upon the urates. It is usually administered in the form of the carbonate (gr. v., freely diluted).

The treatment and regimen to be employed in the intervals of the gouty attacks are of the highest importance. These bear reference for the most part to the habits and mode of life of the patient. Restriction must be laid upon the amount and quality of the food, and equally, or still more, upon the alcoholic stimulants. "The instances," says Sir Thomas Watson, "are not few of men of good sense, and masters of themselves, who, being warned by one visitation of the gout, have thenceforward resolutely abstained from rich living and from wine and strong drinks of all kinds, and who have been rewarded for their prudence and self-denial by complete immunity from any return of the disease, or upon whom, at any rate, its future assaults have been few and feeble." The same eminent authority adds: "I am sure it is worth any *young* man's while, who has had the gout, to become a teetotaller." By those more advanced in life who, from long continued habit, are unable entirely to relinquish the use of stimulants, the strictest possible temperance must be observed. Regular but moderate exercise in the form of walking or riding, in the case of those who lead sedentary lives, is of great advantage, and all over-work, either physical or mental, should be avoided. *Fatigues la bête, et reposes la tête* is the maxim of an experienced French doctor (Dr Debout d'Estrées of Contrexéville). Unfortunately the complete carrying out of such directions, even by those who feel their importance, is too often rendered difficult or impossible by circumstances of occupation and otherwise, and at most only an approximation can be made. Certain mineral waters and baths (such as those of Vichy, Royat, Contrexéville, &c.) are of undoubted value in cases of gout and arthritis. The particular place must in each case be determined by the physician, and special caution must be observed in recommending this plan of treatment in persons whose gout is complicated by organic disease of any kind.

Dr Alexander Haig's "uric acid free diet" has found many adherents. His view as regards the pathology is that in gouty persons the blood is less alkaline than in normal, and therefore less able to hold in solution uric acid or its salts, which are retained in the joints. Assuming gout to be a poisoning by animal food (meat, fish, eggs), and by tea, coffee, cocoa and other vegetable alkaloid-containing substances, he recommends an average daily diet excluding these, and containing 24 oz. of breadstuffs (toast, bread, biscuits and puddings) together with 24 oz. of fruit and vegetables (excluding peas, beans, lentils, mushrooms and asparagus); 8 oz. of the breadstuffs may be replaced by 2½ oz. of milk or 2 oz. of cheese, butter and oil being taken as required, so that it is not strictly a vegetarian diet.

Precisely the opposite view as to diet has recently been put forward by Professor A. Robin of the Hôpital Beaujon, who says serious mistakes are made in ordering patients to abstain from red meats and take light food, fish, eggs, &c. The common object in view is the diminished output of uric acid. This output is chiefly obtained from food rich in nucleins and in collagenous matters, *i.e.* young white meats, eggs, &c. Consequently the gouty subject ought to restrict himself to the consumption of red meat, beef and mutton, and leave out of his dietary all white meat and internal organs. He should take little hydrocarbons and sugars, and be moderate in fats. Vegetarian diet he regards as a mistake, likewise milk diet, as they tend to weaken the patient. To prevent the formation of uric acid Robin prescribes quinic acid combined with formiae or urotropine.

GOUTHIÈRE, PIERRE (1740–1806), French metal worker, was born at Troyes and went to Paris at an early age as the pupil of Martin Cour. During his brilliant career he executed a vast quantity of metal work of the utmost variety, the best of which was unsurpassed by any of his rivals in that great art period. It was long believed that he received many commissions for furniture from the court of Louis XVI., and especially from Marie Antoinette, but recent searches suggest that his work for the queen was confined to bronzes. Gouthière can, however, well bear this loss, nor will his reputation suffer should those critics ultimately be justified who believe that many of the furniture mounts attributed to him were from the hand of Thomire. But if he did not work for the court he unquestionably produced many of the most splendid belongings of the duc d'Aumont, the duchesse de Mazarin and Mme du Barry. Indeed the custom of the beautiful mistress of Louis XV. brought about the financial ruin of the great artist, who accomplished more than any other man for the fame of her château of Louveciennes. When the collection of the duc d'Aumont was sold by auction in Paris in 1782 so many objects mounted by Gouthière were bought for Louis XVI. and Marie Antoinette that it is not difficult to perceive the basis of the belief that they were actually made for the court. The duc's sale catalogue is, however, in existence, with the names of the purchasers and the prices realized. The auction was almost an apotheosis of Gouthière. The precious lacquer cabinets, the chandeliers and candelabra, the tables and cabinets in marquetry, the columns and vases in porphyry, jasper and choice marbles, the porcelains of China and Japan were nearly all mounted in bronze by him. More than fifty of these pieces bore Gouthière's signature. The duc d'Aumont's cabinet represented the high-water mark of the chaser's art, and the great prices which were paid for Gouthière's work at this sale are the most conclusive criterion of the value set upon his achievement in his own day. Thus Marie Antoinette paid 1,020 livres for a red jasper bowl or *brûle-parfum* mounted by him, which was then already famous. Curiously enough it commanded only one-tenth of that price at the Fournier sale in 1831; but in 1865, when the marquis of Hertford bought it at the prince de Beauvais's sale, it fetched 31,900 francs. It is now in the Wallace Collection, which contains the finest and most representative gathering of Gouthière's undoubted work. The mounts of gilt bronze, cast and elaborately chased, show satyrs' heads, from which hang festoons of vine leaves, while within the feet a serpent is coiled to spring. A smaller cup is one of the treasures of the Louvre. There too is a bronze clock, signed by "Gouthière, *cizileur et doreur du Roy à Paris*," dated 1771, with a river god, a water nymph symbolizing the Rhône and its tributary the Durance, and a female figure typifying the city of Avignon. Not all of Gouthière's work is of the highest quality, and much of what he executed was from the designs of others. At his best his delicacy, refinement and finish are exceedingly delightful—in his great moments he ranks with the highest alike as artist and as craftsman. The tone of soft dead gold which is found on some of his mounts he is believed to have invented, but indeed the gilding of all his superlative work possesses a remarkable quality. This charm of tone is admirably seen in the bronzes and candelabra which he executed for the chimneypiece of Marie Antoinette's boudoir at Fontainebleau. He continued to embellish Louveciennes for Madame du Barry until the Revolution, and then the guillotine came for her and absolute ruin for him. When her property was seized

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she owed him 756,000 livres, of which he never received a sol, despite repeated applications to the administrators. "*Réduit à solliciter une place à l'hospice, il mourut dans la misère.*" So it was stated in a lawsuit brought by his sons against du Barry's heirs.

GOUVION SAINT-CYR, LAURENT, MARQUIS DE (1764–1830), French marshal, was born at Toul on the 13th of April 1764. At the age of eighteen he went to Rome with the view of prosecuting the study of painting, but although he continued his artistic studies after his return to Paris in 1784 he never definitely adopted the profession of a painter. In 1792 he was chosen a captain in a volunteer battalion, and served on the staff of General Custine. Promotion rapidly followed, and in the course of two years he had become a general of division. In 1796 he commanded the centre division of Moreau's army in the campaign of the Rhine, and by coolness and sagacity greatly aided him in the celebrated retreat from Bavaria to the Rhine. In 1798 he succeeded Masséna in the command of the army of Italy. In the following year he commanded the left wing of Jourdan's army in Germany; but when Jourdan was succeeded by Masséna, he joined the army of Moreau in Italy, where he distinguished himself in face of the great difficulties that followed the defeat of Novi. When Moreau, in 1800, was appointed to the command of the army of the Rhine, Gouvion St-Cyr was named his principal lieutenant, and on the 9th of May gained a victory over General Kray at Biberach. He was not, however, on good terms with his commander and retired to France after the first operations of the campaign. In 1801 he was sent to Spain to command the army intended for the invasion of Portugal, and was named grand officer of the Legion of Honour. When a treaty of peace was shortly afterwards concluded with Portugal, he succeeded Lucien Bonaparte as ambassador at Madrid. In 1803 he was appointed to the command of an army corps in Italy, in 1805 he served with distinction under Masséna, and in 1806 was engaged in the campaign in southern Italy. He took part in the Prussian and Polish campaigns of 1807, and in 1808, in which year he was made a count, he commanded an army corps in Catalonia; but, not wishing to comply with certain orders he received from Paris (for which see Oman, *Peninsular War*, vol. iii.), he resigned his command and remained in disgrace till 1811. He was still a general of division, having been excluded from the first list of marshals owing to his action in refusing to influence the troops in favour of the establishment of the Empire. On the opening of the Russian campaign he received command of an army corps, and on the 18th of August 1812 obtained a victory over the Russians at Polotsk, in recognition of which he was created a marshal of France. He received a severe wound in one of the actions during the general retreat. St-Cyr distinguished himself at the battle of Dresden (August 26–27, 1813), and in the defence of that place against the Allies after the battle of Leipzig, capitulating only on the 11th of November, when Napoleon had retreated to the Rhine. On the restoration of the Bourbons he was created a peer of France, and in July 1815 was appointed war minister, but resigned his office in the November following. In June 1817 he was appointed minister of marine, and in September following again resumed the duties of war minister, which he continued to discharge till November 1819. During this time he effected many reforms, particularly in respect of measures tending to make the army a national rather than a dynastic force. He exerted himself also to safeguard the rights of the old soldiers of the Empire, organized the general staff and revised the code of military law and the pension regulations. He was made a marquess in 1817. He died at Hyères (Var) on the 17th of March 1830. Gouvion St-Cyr would doubtless have obtained better opportunities of acquiring distinction had he shown himself more blindly devoted to the interests of Napoleon, but Napoleon paid him the high compliment of referring to his "military genius," and entrusted him with independent commands in secondary theatres of war. It is doubtful, however, if he possessed energy commensurate with his skill, and in Napoleon's modern conception of war, as three parts moral to one technical, there was more need for the services of a bold leader of troops whose "doctrine"—to use the modern phrase—predisposed him to self-sacrificing and vigorous action, than for a *savant* in the art of war of the type of St-Cyr. Contemporary opinion, as reflected by Marbot, did justice to his "commanding talents," but remarked the indolence which was the outward sign of the vague complexity of a mind that had passed beyond the simplicity of mediocrity without attaining the simplicity of genius.

He was the author of the following works, all of the highest value: *Journal des opérations de l'armée de Catalogne en 1808 et 1809* (Paris, 1821); *Mémoires sur les campagnes des armées de Rhin et de Rhin-et-Moselle de 1794 à 1797* (Paris, 1829); and *Mémoires pour servir à l'histoire militaire sous le Directoire, le Consulat, et l'Empire* (1831).

See Gay de Vernon's *Vie de Gouvion Saint-Cyr* (1857).

GOVAN, a municipal and police burgh of Lanarkshire, Scotland. It lies on the south bank of the Clyde in actual contact with Glasgow, and in a parish of the same name which includes a large part of the city on both sides of the river. Pop. (1891) 61,589; (1901) 76,532. Govan remained little more than a village till 1860, when the growth of shipbuilding and allied trades gave its development an enormous impetus. Among its public buildings are the municipal chambers, combination fever hospital, Samaritan hospital and reception houses for the poor. Elder Park (40 acres) presented to the burgh in 1885 contains a statue of John Elder (1824–1869), the pioneer shipbuilder, the husband of the donor. A statue of Sir William Pearce (1833–1888), another well-known Govan shipbuilder, once M.P. for the burgh, stands at Govan Cross. The Govan lunacy board opened in 1896 an asylum near Paisley. Govan is supplied with Glasgow gas and water, and its tramways are leased by the Glasgow corporation; but it has an electric light installation of its own, and performs all other municipal functions quite independently of the city, annexation to which it has always strenuously resisted. Prince's Dock lies within its bounds and the shipbuilding yards have turned out many famous ironclads and liners. Besides shipbuilding its other industries are matchmaking, silk-weaving, hair-working, copper-working, tube-making, weaving, and the manufacture of locomotives and electrical apparatus. The town forms the greater part of the Govan division of Lanarkshire, which returns one member to parliament.

GOVERNMENT (O. Fr. *governement*, mod. *gouvernement*, O. Fr. *governer*, mod. *gouverner*, from Lat. *gubernare*, to steer a ship, guide, rule; cf. Gr. κυβερνᾶν), in its widest sense, the ruling power in a political society. In every society of men there is a determinate body (whether consisting of one individual or a few or many individuals) whose commands the rest of the community are bound to obey. This sovereign body is what in more popular phrase is termed the government of the country, and the varieties which may exist in its constitution are known as forms of government. For the opposite theory of a community with "no government," see ANARCHISM.

How did government come into existence? Various answers to this question have at times been given, which may be distinguished broadly into three classes. The first class would comprehend the legendary accounts which nations have given in primitive times of their own forms of government. These are always attributed to the mind of a single lawgiver. The government of Sparta was the invention of Lycurgus. Solon, Moses, Numa and Alfred in like manner shaped the government of their respective nations. There was no curiosity about the institutions of other nations—about the origin of governments in general; and each nation was perfectly ready to accept the traditional νομοθέται of any other.

The second may be called the logical or metaphysical account of the origin of government. It contained no overt reference to any particular form of government, whatever its covert references may have been. It answered the question, how government in general came into existence; and it answered it by a logical analysis of the elements of society. The phenomenon to be accounted for being government and laws, it abstracted government and laws, and contemplated mankind as existing

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without them. The characteristic feature of this kind of speculation is that it reflects how contemporary men would behave if all government were removed, and infers that men must have behaved so before government came into existence. Society without government resolves itself into a number of individuals each following his own aims, and therefore, in the days before government, each man followed his own aims. It is easy to see how this kind of reasoning should lead to very different views of the nature of the supposed original state. With Hobbes, it is a state of war, and government is the result of an agreement among men to keep the peace. With Locke, it is a state of liberty and equality,—it is not a state of war; it is governed by its own law,—the law of nature, which is the same thing as the law of reason. The state of nature is brought to an end by the voluntary agreement of individuals to surrender their natural liberty and submit themselves to one supreme government. In the words of Locke, "Men being by nature all free, equal and independent, no one can be put out of this estate and subjected to the political power of another without his own consent. The only way whereby any one divests himself of his natural liberty, and puts on the *bonds of civil society*, is by agreeing with other men to join and unite into a community" (*On Civil Government*, c. viii.). Locke boldly defends his theory as founded on historical fact, and it is amusing to compare his demonstration of the baselessness of Sir R. Filmer's speculations with the scanty and doubtful examples which he accepts as the foundation of his own. But in general the various forms of the hypothesis eliminate the question of time altogether. The original contract from which government sprang is likewise the subsisting contract on which civil society continues to be based. The historical weakness of the theory was probably always recognized. Its logical inadequacy was conclusively demonstrated by John Austin. But it still clings to speculations on the principles of government.

The "social compact" (see ROUSSEAU) is the most famous of the metaphysical explanations of government. It has had the largest history, the widest influence and the most complete development. To the same class belong the various forms of the theory that governments exist by divine appointment. Of all that has been written about the divine right of kings, a great deal must be set down to the mere flatteries of courtiers and ecclesiastics. But there remains a genuine belief that men are bound to obey their rulers because their rulers have been appointed by God. Like the social compact, the theory of divine appointment avoided the question of historical fact.

The application of the historical method to the phenomena of society has changed the aspect of the question and robbed it of its political interest. The student of the history of society has no formula to express the law by which government is born. All that he can do is to trace governmental forms through various stages of social development. The more complex and the larger the society, the more distinct is the separation between the governing part and the rest, and the more elaborate is the subdivision of functions in the government. The primitive type of ruler is king, judge, priest and general. At the same time, his way of life differs little from that of his followers and subjects. The metaphysical theories were so far right in imputing greater equality of social conditions to more primitive times. Increase of bulk brings with it a more complex social organization. War tends to develop the strength of the governmental organization; peace relaxes it. All societies of men exhibit the germs of government; but there would appear to be races of men so low that they cannot be said to live together in society at all. Modern investigations have illustrated very fully the importance of the family (*q.v.*) in primitive societies, and the belief in a common descent has much to do with the social cohesion of a tribe. The government of a tribe resembles the government of a household; the head of the family is the ruler. But we cannot affirm that political government has its origin in family government, or that there may not have been states of society in which government of some sort existed while the family did not.

I. FORMS OF GOVERNMENT

Three Standard Forms.—Political writers from the time of Aristotle have been singularly unanimous in their classification of the forms of government. There are three ways in which states may be governed. They may be governed by one man, or by a number of men, small in proportion to the whole number of men in the state, or by a number large in proportion to the whole number of men in the state. The government may be a monarchy, an aristocracy or a democracy. The same terms are used by John Austin as were used by Aristotle, and in very nearly the same sense. The determining quality in governments in both writers, and it may safely be said in all intermediate writers, is the numerical relation between the constituent members of the government and the population of the state. There were, of course, enormous differences between the state-systems present to the mind of the Greek philosopher and the English jurist. Aristotle was thinking of the small independent states of Greece, Austin of the great peoples of modern Europe. The unit of government in the one case was a city, in the other a nation. This difference is of itself enough to invalidate all generalization founded on the common terminology. But on one point there is a complete parallel between the politics of Aristotle and the politics of Austin. The Greek cities were to the rest of the world very much what European nations and European colonies are to the rest of the world now. They were the only communities in which the governed visibly took some share in the work of government. Outside the European system, as outside the Greek system, we have only the stereotyped uniformity of despotism, whether savage or civilized. The question of forms of government, therefore, belongs characteristically to the European races. The virtues and defects of monarchy, aristocracy and democracy are the virtues and defects manifested by the historical governments of Europe. The generality of the language used by political writers must not blind us to the fact that they are thinking only of a comparatively small portion of mankind.

Greek Politics.—Aristotle divides governments according to two principles. In all states the governing power seeks either its own advantage or the advantage of the whole state, and the government is bad or good accordingly. In all states the governing power is one man, or a few men or many men. Hence six varieties of government, three of which are bad and three good. Each excellent form has a corresponding depraved form, thus:—

The good government of one (Monarchy) corresponds to the depraved form (Tyranny).
The good government of few (Aristocracy) corresponds to the depraved form (Oligarchy).
The good government of many (Commonwealth) corresponds to the depraved form (Democracy).

The fault of the depraved forms is that the governors act unjustly where their own interests are concerned. The worst of the depraved forms is tyranny, the next oligarchy and the least bad democracy.[1] Each of the three leading types exhibits a number of varieties. Thus in monarchy we have the heroic, the barbaric, the elective dictatorship, the Lacedemonian (hereditary generalship, *στρατηγία*), and absolute monarchy. So democracy and oligarchy exhibit four corresponding varieties. The best type of democracy is that of a community mainly agricultural, whose citizens, therefore, have not leisure for political affairs, and allow the law to rule. The best oligarchy is that in which a considerable number of small proprietors have the power; here, too, the laws prevail. The worst democracy consists of a larger citizen class having leisure for politics; and the worst oligarchy is that of a small number of very rich and influential men. In both the sphere of law is reduced to a minimum. A good government is one in which as much as possible is left to the laws, and as little as possible to the will of the governor.

[1] Aristotle elsewhere speaks of the error of those who think that any one of the depraved forms is better than any other.

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The *Politics* of Aristotle, from which these principles are taken, presents a striking picture of the variety and activity of political life in the free communities of Greece. The king and council of heroic times had disappeared, and self-government in some form or other was the general rule. It is to be noticed, however, that the governments of Greece were essentially unstable. The political philosophers could lay down the law of development by which one form of government gives birth to another. Aristotle devotes a large portion of his work to the consideration of the causes of revolutions. The dread of tyranny was kept alive by the facility with which an over-powerful and unscrupulous citizen could seize the whole machinery of government. Communities oscillated between some form of oligarchy and some form of democracy. The security of each was constantly imperilled by the conspiracies of the opposing factions. Hence, although political life exhibits that exuberant variety of form and expression which characterizes all the intellectual products of Greece, it lacks the quality of persistent progress. Then there was no approximation to a national government, even of the federal type. The varying confederacies and hegemonies are the nearest approach to anything of the kind. What kind of national government would ultimately have arisen if Greece had not been crushed it is needless to conjecture; the true interest of Greek politics lies in the fact that the free citizens were, in the strictest sense of the word, self-governed. Each citizen took his turn at the common business of the state. He spoke his own views in the agora, and from time to time in his own person acted as magistrate or judge. Citizenship in Athens was a liberal education, such as it never can be made under any representative system.

The Government of Rome.—During the whole period of freedom the government of Rome was, in theory at least, municipal self-government. Each citizen had a right to vote laws in his own person in the comitia of the centuries or the tribes. The administrative powers of government were, however, in the hands of a bureaucratic assembly, recruited from the holders of high public office. The senate represented capacity and experience rather than rank and wealth. Without some such instrument the city government of Rome could never have made the conquest of the world. The gradual extension of the citizenship to other Italians changed the character of Roman government. The distant citizens could not come to the voting booths; the device of representation was not discovered; and the comitia fell into the power of the town voters. In the last stage of the Roman republic, the inhabitants of one town wielded the resources of a world-wide empire. We can imagine what would be the effect of leaving to the people of London or Paris the supreme control of the British empire or of France,—irresistible temptation, inevitable corruption. The rabble of the capital learn to live on the rest of the empire.[1] The favour of the effeminate masters of the world is purchased by *panem et circenses*. That capable officers and victorious armies should long be content to serve such masters was impossible. A conspiracy of generals placed itself at the head of affairs, and the most capable of them made himself sole master. Under Caesar, Augustus and Tiberius, the Roman people became habituated to a new form of govern. ment, which is best described by the name of Caesarism. The outward forms of republican government remained, but one man united in his own person all the leading offices, and used them to give a seemingly legal title to what was essentially military despotism. There is no more interesting constitutional study than the chapters in which Tacitus traces the growth of the new system under the subtle and dissimulating intellect of Tiberius. The new Roman empire was as full of fictions as the English constitution of the present day. The master of the world posed as the humble servant of a menial senate. Deprecating the outward symbols of sovereignty, he was satisfied with the modest powers of a consul or a tribunus plebis. The reign of Tiberius, little capable as he was by personal character of captivating the favour of the multitude, did more for imperialism than was done by his more famous predecessors. Henceforward free government all over the world lay crushed beneath the military despotism of Rome. Caesarism remained true to the character imposed upon it by its origin. The Caesar was an elective not an hereditary king. The real foundation of his power was the army, and the army in course of time openly assumed the right of nominating the sovereign. The characteristic weakness of the Roman empire was the uncertainty of the succession. The nomination of a Caesar in the lifetime of the emperor was an ineffective remedy. Rival emperors were elected by different armies; and nothing less than the force of arms could decide the question between them.

Modern Governments.—Feudalism.—The Roman empire bequeathed to modern Europe the theory of universal dominion. The nationalities which grew up after its fall arranged themselves on the basis of territorial sovereignty. Leaving out of account the free municipalities of the middle ages, the problem of government had now to be solved, not for small urban communities, but for large territorial nations. The medieval form of government was feudal. One common type pervaded all the relations of life. The relation of king and lord was like the relation between lord and vassal (see FEUDALISM). The bond between them was the tenure of land. In England there had been, before the Norman Conquest, an approximation to a feudal system. In the earlier English constitution, the most striking features were the power of the witan, and the common property of the nation in a large portion of the soil. The steady development of the power of the king kept pace with the aggregation of the English tribes under one king. The conception that the land belonged primarily to the people gave way to the conception that everything belonged primarily to the king.[2] The Norman Conquest imposed on England the already highly developed feudalism of France, and out of this feudalism the free governments of modern Europe have grown. One or two of the leading steps in this process may be indicated here. The first, and perhaps the most important, was the device of representation. For an account of its origin, and for instances of its use in England before its application to politics, we must be content to refer to Stubbs's *Constitutional History*, vol. ii. The problem of combining a large area of sovereignty with some degree of self-government, which had proved fatal to ancient commonwealths, was henceforward solved. From that time some form of representation has been deemed essential to every constitution professing, however remotely, to be free.

The connexion between representation and the feudal system of estates must be shortly noticed. The feudal theory gave the king a limited right to military service and to certain aids, both of which were utterly inadequate to meet the expenses of the government, especially in time of war. The king therefore had to get contributions from his people, and he consulted them in their respective orders. The three estates were simply the three natural divisions of the people, and Stubbs has pointed out that, in the occasional treaties between a necessitous king and the order of merchants or lawyers, we have examples of inchoate estates or sub-estates of the realm. The right of representation was thus in its origin a right to consent to taxation. The pure theory of feudalism had from the beginning been broken by William the Conqueror causing all free-holders to take an oath of direct allegiance to himself. The institution of parliaments, and the association of the king's smaller tenants *in capite* with other commoners, still further removed the

[1] None of the free states of Greece ever made extensive or permanent conquests; but the tribute sometimes paid by one state to another (as by the Aeginetans to the Athenians) was a manifest source of corruption. Compare the remarks of Hume (*Essays*, part i. 3, *That Politics may be reduced to a Science*), "free governments are the most ruinous and oppressive for their provinces."

[2] Ultimately, in the theory of English law, the king may be said to have become the universal successor of the people. Some of the peculiarities of the prerogative rights seem to be explainable only on this view, *e.g.* the curious distinction between wrecks come to land and wrecks still on water. The common right to wreckage was no doubt the origin of the prerogative right to the former. Every ancient common right has come to be a right of the crown or a right held of the crown by a vassal.

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government from the purely feudal type in which the mesne lord stands between the inferior vassal and the king.

Parliamentary Government.—The English System.—The right of the commons to share the power of the king and lords in legislation, the exclusive right of the commons to impose taxes, the disappearance of the clergy as a separate order, were all important steps in the movement towards popular government. The extinction of the old feudal nobility in the dynastic wars of the 15th century simplified the question by leaving the crown face to face with parliament. The immediate result was no doubt an increase in the power of the crown, which probably never stood higher than it did in the reigns of Henry VIII. and Elizabeth; but even these powerful monarchs were studious in their regard for parliamentary conventionalities. After a long period of speculative controversy and civil war, the settlement of 1688 established limited monarchy as the government of England. Since that time the external form of government has remained unchanged, and, so far as legal description goes, the constitution of William III. might be taken for the same system as that which still exists. The silent changes have, however, been enormous. The most striking of these, and that which has produced the most salient features of the English system, is the growth of cabinet government. Intimately connected with this is the rise of the two great historical parties of English politics. The normal state of government in England is that the cabinet of the day shall represent that which is, for the time, the stronger of the two. Before the Revolution the king's ministers had begun to act as a united body; but even after the Revolution the union was still feeble and fluctuating, and each individual minister was bound to the others only by the tie of common service to the king. Under the Hanoverian sovereigns the ministry became consolidated, the position of the cabinet became definite, and its dependence on parliament, and more particularly on the House of Commons, was established. Ministers were chosen exclusively from one house or the other, and they assumed complete responsibility for every act done in the name of the crown. The simplicity of English politics has divided parliament into the representatives of two parties, and the party in opposition has been steadied by the consciousness that it, too, has constitutional functions of high importance, because at any moment it may be called to provide a ministry. Criticism is sobered by being made responsible. Along with this movement went the withdrawal of the personal action of the sovereign in politics. No king has attempted to veto a bill since the Scottish Militia Bill was vetoed by Queen Anne. No ministry has been dismissed by the sovereign since 1834. Whatever the power of the sovereign may be, it is unquestionably limited to his personal influence over his ministers. And it must be remembered that since the Reform Act of 1832 ministers have become, in practice, responsible ultimately, not to parliament, but to the House of Commons. Apart, therefore, from democratic changes due to a wider suffrage, we find that the House of Commons, as a body, gradually made itself the centre of the government. Since the area of the constitution has been enlarged, it may be doubted whether the orthodox descriptions of the government any longer apply. The earlier constitutional writers, such as Blackstone and J. L. Delolme, regard it as a wonderful compound of the three standard forms,—monarchy, aristocracy and democracy. Each has its place, and each acts as a check upon the others. Hume, discussing the question "Whether the British government inclines more to absolute monarchy or to a republic," decides in favour of the former alternative. "The tide has run long and with some rapidity to the side of popular government, and is just beginning to turn toward monarchy." And he gives it as his own opinion that absolute monarchy would be the easiest death, the true euthanasia of the British constitution. These views of the English government in the 18th century may be contrasted with Bagehot's sketch of the modern government as a working instrument.[1]

[1] See Bagehot's *English Constitution*; or, for a more recent analysis, Sidney Low's *Governance of England*.

Leading Features of Parliamentary Government.—The parliamentary government developed by England out of feudal materials has been deliberately accepted as the type of constitutional government all over the world. Its leading features are popular representation more or less extensive, a bicameral legislature, and a cabinet or consolidated ministry. In connexion with all of these, numberless questions of the highest practical importance have arisen, the bare enumeration of which would surpass the limits of our space. We shall confine ourselves to a few very general considerations.

The Two Chambers.—First, as to the double chamber. This, which is perhaps more accidental than any other portion of the British system, has been the most widely imitated. In most European countries, in the British colonies, in the United States Congress, and in the separate states of the Union,[2] there are two houses of legislature. This result has been brought about partly by natural imitation of the accepted type of free government, partly from a conviction that the second chamber will moderate the democratic tendencies of the first. But the elements of the British original cannot be reproduced to order under different conditions. There have, indeed, been a few attempts to imitate the special character of hereditary nobility attaching to the British House of Lords. In some countries, where the feudal tradition is still strong (*e.g.* Prussia, Austria, Hungary), the hereditary element in the upper chambers has survived as truly representative of actual social and economic relations. But where these social conditions do not obtain (*e.g.* in France after the Revolution) the attempt to establish an hereditary peerage on the British model has always failed. For the peculiar solidarity between the British nobility and the general mass of the people, the outcome of special conditions and tendencies, is a result beyond the power of constitution-makers to attain. The British system too, after its own way, has for a long period worked without any serious collision between the Houses,—the standing and obvious danger of the bicameral system. The actual ministers of the day must possess the confidence of the House of Commons; they need not—in fact they often do not—possess the confidence of the House of Lords. It is only in legislation that the Lower House really shares its powers with the Upper; and (apart from any such change in the constitution as was suggested in 1907 by Sir H. Campbell-Bannerman) the constitution possesses, in the unlimited power of nominating peers, a well-understood last resource should the House of Lords persist in refusing important measures demanded by the representatives of the people. In the United Kingdom it is well understood that the real sovereignty lies with the people (the electorate), and the House of Lords recognizes the principle that it must accept a measure when the popular will has been clearly expressed. In all but measures of first-class importance, however, the House of Lords is a real second chamber, and in these there is little danger of a collision between the Houses. There is the widest possible difference between the British and any other second chamber. In the United States the Senate (constituted on the system of equal representation of states) is the more important of the two Houses, and the only one whose control of the executive can be compared to that exercised by the British House of Commons.

The real strength of popular government in England lies in the ultimate supremacy of the House of Commons. That supremacy had been acquired, perhaps to its full extent, before the extension of the suffrage made the constituencies democratic. Foreign imitators, it may be observed, have been more ready to accept a wide basis of representation than to confer real power on the representative body. In all the monarchical countries of Europe, however unrestricted the right of suffrage may be, the real victory of constitutional government has yet to be won. Where the suffrage means little or nothing, there is little or no reason for guarding it against abuse. The independence of the executive in the United States brings that country, from one

[2] For an account of the double chamber system in the state legislatures see UNITED STATES: *Constitution and Government*, and also S. G. Fisher, *The Evolution of the Constitution* (Philadelphia, 1897).

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point of view, more near to the state system of the continent of Europe than to that of the United Kingdom. The people make a more complete surrender of power to the government (State or Federal) than is done in England.

Cabinet Government.—The peculiar functions of the English cabinet are not easily matched in any foreign system. They are a mystery even to most educated Englishmen. The cabinet (*q.v.*) is much more than a body consisting of chiefs of departments. It is the inner council of the empire, the arbiter of national policy, foreign or domestic, the sovereign in commission. The whole power of the House of Commons is concentrated in its hands. At the same time, it has no place whatever in the legal constitution. Its numbers and its constitution are not fixed even by any rule of practice. It keeps no record of its proceedings. The relations of an individual minister to the cabinet, and of the cabinet to its head and creator, the premier, are things known only to the initiated. With the doubtful exception of France, no other system of government presents us with anything like its equivalent. In the United States, as in the European monarchies, we have a council of ministers surrounding the chief of the state.

Change of Power in the English System.—One of the most difficult problems of government is how to provide for the devolution of political power, and perhaps no other question is so generally and justly applied as the test of a working constitution. If the transmission works smoothly, the constitution, whatever may be its other defects, may at least be pronounced stable. It would be tedious to enumerate all the contrivances which this problem has suggested to political societies. Here, as usual, oriental despotism stands at the bottom of the scale. When sovereign power is imputed to one family, and the law of succession fails to designate exclusively the individual entitled to succeed, assassination becomes almost a necessary measure of precaution. The prince whom chance or intrigue has promoted to the throne of a father or an uncle must make himself safe from his relatives and competitors. Hence the scenes which shock the European conscience when "Amurath an Amurath succeeds." The strong monarchical governments of Europe have been saved from this evil by an indisputable law of succession, which marks out from his infancy the next successor to the throne. The king names his ministers, and the law names the king. In popular or constitutional governments far more elaborate precautions are required. It is one of the real merits of the English constitution that it has solved this problem —in a roundabout way perhaps, after its fashion—but with perfect success. The ostensible seat of power is the throne, and down to a time not long distant the demise of the crown suspended all the other powers of the state. In point of fact, however, the real change of power occurs on a change of ministry. The constitutional practice of the 19th century settled, beyond the reach of controversy, the occasions on which a ministry is bound to retire. It must resign or dissolve when it is defeated[1] in the House of Commons, and if after a dissolution it is beaten again, it must resign without alternative. It may resign if it thinks its majority in the House of Commons not sufficiently large. The dormant functions of the crown now come into existence. It receives back political power from the old ministry in order to transmit it to the new. When the new ministry is to be formed, and how it is to be formed, is also clearly settled by established practice. The outgoing premier names his successor by recommending the king to consult him; and that successor must be the recognized leader of his successful rivals. All this is a matter of custom, not of law; and it is doubtful if any two authorities could agree in describing the custom in language of precision. In theory the monarch may send for any one he pleases, and charge him with the formation of a government; but the ability to form a government restricts this liberty to the recognized head of a party, subject to there being such an individual. It is certain that the intervention of the crown facilitates the transfer of power from one party to another, by giving it the appearance of a mere change of servants. The real disturbance is that caused by the appeal to the electors. A general election is always a struggle between the great political parties for the possession of the powers of government. It may be noted that modern practice goes far to establish the rule that a ministry beaten at the hustings should resign at once without waiting for a formal defeat in the House of Commons.

The English custom makes the ministry dependent on the will of the House of Commons; and, on the other hand, the House of Commons itself is dependent on the will of the ministry. In the last result both depend on the will of the constituencies, as expressed at the general election. There is no fixity in either direction in the tenure of a ministry. It may be challenged at any moment, and it lasts until it is challenged and beaten. And that there should be a ministry and a House of Commons in harmony with each other but out of harmony with the people is rendered all but impossible by the law and the practice as to the duration of parliaments.

Change of Power in the United States.—The United States offers a very different solution of the problem. The American president is at once king and prime minister; and there is no titular superior to act as a conduit-pipe between him and his successor. His crown is rigidly fixed; he can be removed only by the difficult method of impeachment. No hostile vote on matters of legislation can affect his position. But the end of his term is known from the first day of his government; and almost before he begins to reign the political forces of the country are shaping out a new struggle for the succession. Further, a change of government in America means a considerable change in the administrative staff (see CIVIL SERVICE). The commotion caused by a presidential election in the United States is thus infinitely greater and more prolonged than that caused by a general election in England. A change of power in England affects comparatively few personal interests, and absorbs the attention of the country for a comparatively short space of time. In the United States it is long foreseen and elaborately prepared for, and when it comes it involves the personal fortunes of large numbers of citizens. And yet the British constitution is more democratic than the American, in the sense that the popular will can more speedily be brought to bear upon the government.

Change of Power in France.—The established practice of England and America may be compared with the constitutionalism of France. Here the problem presents different conditions. The head of the state is neither a premier of the English, nor a president of the American type. He is served by a prime minister and a cabinet, who, like an English ministry, hold office on the condition of parliamentary confidence; but he holds office himself on the same terms, and is, in fact, a minister like the others. So far as the transmission of power from cabinet to cabinet is concerned, he discharges the functions of an English king. But the transmission of power between himself and his successor is protected by no constitutional devices whatever, and experience would seem to show that no such devices are really necessary. Other European countries professing constitutional government appear to follow the English practice. The Swiss republic is so peculiarly situated that it is hardly fair to compare it with any other. But it is interesting to note that, while the rulers of the states are elected annually, the same persons are generally re-elected.

The Relation between Government and Laws.—It might be supposed that, if any general proposition could be established about government, it would be one establishing some constant relation between the form of a government and the character of the laws which it enforces. The technical language of the English school of jurists is certainly of a kind to encourage such a supposition. The entire body of law in force in a country at any moment is regarded as existing solely by the fiat of the governing power. There is no maxim more entirely in the spirit of this jurisprudence than the following:—"The real legislator is not he by whom the law was first ordained, but he by whose will it continues to be law." The whole of the vast repertory

[1] A government "defeat" may, of course, not really represent a hostile vote in exceptional cases, and in some instances a government has obtained a reversal of the vote and has *not* resigned.

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of rules which make up the law of England—the rules of practice in the courts, the local customs of a county or a manor, the principles formulated by the sagacity of generations of judges, equally with the statutes for the year, are conceived of by the school of Austin as created by the will of the sovereign and the two Houses of Parliament, or so much of them as would now satisfy the definition of sovereignty. It would be out of place to examine here the difficulties which embarrass this definition, but the statement we have made carries on its face a demonstration of its own falsity in fact. There is probably no government in the world of which it could be said that it might change at will the substantive laws of the country and still remain a government. However well it may suit the purposes of analytical jurisprudence to define a law as a command set by sovereign to subject, we must not forget that this is only a definition, and that the assumption it rests upon is, to the student of society, anything but a universal fact. From his point of view the cause of a particular law is not one but many, and of the many the deliberate will of a legislator may not be one. Sir Henry Maine has illustrated this point by the case of the great tax-gathering empires of the east, in which the absolute master of millions of men never dreams of making anything in the nature of a law at all. This view is no doubt as strange to the English statesman as to the English jurist. The most conspicuous work of government in his view is that of parliamentary legislation. For a large portion of the year the attention of the whole people is bent on the operations of a body of men who are constantly engaged in making new laws. It is natural, therefore, to think of law as a factitious thing, made and unmade by the people who happen for the time being to constitute parliament. It is forgotten how small a proportion the laws actually devised by parliament are of the law actually prevailing in the land. No European country has undergone so many changes in the form of government as France. It is surprising how little effect these political revolutions have had on the body of French law. The change from empire to republic is not marked by greater legislative effects than the change from a Conservative to a Liberal ministry in England would be.

These reflections should make us cautious in accepting any general proposition about forms of government and the spirit of their laws. We must remember, also, that the classification of governments according to the numerical proportion between governors and governed supplies but a small basis for generalization. What parallel can be drawn between a small town, in which half the population are slaves, and every freeman has a direct voice in the government, and a great modern state, in which there is not a single slave, while freemen exercise their sovereign powers at long intervals, and through the action of delegates and representatives? Propositions as vague as those of Montesquieu may indeed be asserted with more or less plausibility. But to take any leading head of positive law, and to say that monarchies treat it in one way, aristocracies and democracies in another, is a different matter.

II. Sphere of Government

The action of the state, or sovereign power, or government in a civilized community shapes itself into the threefold functions of legislation, judicature and administration. The two first are perfectly well-defined, and the last includes all the kinds of state action not included in the other two. It is with reference to legislation and administration that the line of permissible state-action requires to be drawn. There is no doubt about the province of the judicature, and that function of government may therefore be dismissed with a very few observations.

The complete separation of the three functions marks a high point of social organization. In simple societies the same officers discharge all the duties which we divide between the legislator, the administrator and the judge. The acts themselves are not consciously recognized as being of different kinds. The evolution of all the parts of a highly complex government from one original is illustrated in a striking way by the history of English institutions. All the conspicuous parts of the modern government, however little they may resemble each other now, can be followed back without a break to their common origin. Parliament, the cabinet, the privy council, the courts of law, all carry us back to the same *nidus* in the council of the feudal king.

Judicature.—The business of judicature, requiring as it does the possession of a high degree of technical skill and knowledge, is generally entrusted by the sovereign body or people to a separate and independent class of functionaries. In England the appellate jurisdiction of the House of Lords still maintains in theory the connexion between the supreme legislative and the supreme judicial functions. In some states of the American Union certain judicial functions of the upper house were for a time maintained after the example of the English constitution as it existed when the states were founded. In England there is also still a considerable amount of judicial work in which the people takes its share. The inferior magistracies, except in populous places, are in the hands of private persons. And by the jury system the ascertainment of fact has been committed in very large measure to persons selected indiscriminately from the mass of the people, subject to a small property qualification. But the higher functions of the judicature are exercised by persons whom the law has jealously fenced off from external interference and control. The independence of the bench distinguishes the English system from every other. It was established in principle as a barrier against monarchical power, and hence has become one of the traditional ensigns of popular government. In many of the American states the spirit of democracy has demanded the subjection of the judiciary to popular control. The judges are elected directly by the people, and hold office for a short term, instead of being appointed, as in England, by the responsible executive, and removable only by a vote of the two Houses. At the same time the constitution of the United States has assigned to the supreme court of the Union a perfectly unique position. The supreme court is the guardian of the constitution (as are the state courts of the constitution of the states; see United States). It has to judge whether a measure passed by the legislative powers is not void by reason of being unconstitutional, and it may therefore have to veto the deliberate resolutions of both Houses of Congress and the president. It is admitted that this singular experiment in government has been completely justified by its success.

Limits of State Interference in Legislation and Administration.—The question of the limits of state action does not arise with reference to the judiciary. The enforcement of the laws is a duty which the sovereign power must of absolute necessity take upon itself. But to what conduct of the citizens the laws shall extend is the most perplexing of all political questions. The correlative question with regard to the executive would be what works of public convenience should the state undertake through its own servants. The whole question of the sphere of government may be stated in these two questions: What should the state do for its citizens? and How far should the state interfere with the action of its citizens? These questions are the direct outcome of modern popular government; they are equally unknown to the small democracies of ancient times and to despotic governments at all times. Accordingly ancient political philosophy, rich as it is in all kinds of suggestions, has very little to say that has any bearing on the sphere of government. The conception that the power of the state can be and ought to be limited belongs to the times of "government by discussion," to use Bagehot's expression,—to the time when the sovereign number is divided by class interests, and when the action of the majority has to be carried out in the face of strong minorities, capable of making themselves heard. Aristotle does indeed dwell on one aspect of the question. He would limit the action of the government in the sense of leaving as little as possible to the personal will of the governors, whether one or many. His maxim is that the law should reign. But that the sphere of law itself should be restricted, otherwise than by general principles of morality, is a consideration wholly foreign to ancient philosophy. The state is conceived as acting like

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a just man, and justice in the state is the same thing as justice in the individual. The Greek institutions which the philosophers are unanimous in commending are precisely those which the most state-ridden nations of modern times would agree in repudiating. The exhaustive discussion of all political measures, which for over two centuries has been a fixed habit of English public life, has of itself established the principle that there are assignable limits to the action of the state. Not that the limits ever have been assigned in terms, but popular sentiment has more or less vaguely fenced off departments of conduct as sacred from the interference of the law. Phrases like "the liberty of the subject," the "sanctity of private property," an Englishman's house is his castle," "the rights of conscience," are the commonplaces of political discussion, and tell the state, "Thus far shalt thou go and no further."

The two contrasting policies are those of *laisses-faire* (let alone) and Protection, or individualism and state-socialism, the one a policy of non-interference with the free play of social forces, the other of their regulation for the benefit of the community. The *laissez-faire* theory was prominently upheld by John Stuart Mill, whose essay on *Liberty*, together with the concluding chapters of his treatise on *Political Economy*, gives a tolerably complete view of the principles of government. There is a general presumption against the interference of government, which is only to be overcome by very strong evidence of necessity. Governmental action is generally less effective than voluntary action. The necessary duties of government are so burdensome, that to increase them destroys its efficiency. Its powers are already so great that individual freedom is constantly in danger. As a general rule, nothing which can be done by the voluntary agency of individuals should be left to the state. Each man is the best judge of his own interests. But, on the other hand, when the thing itself is admitted to be useful or necessary, and it cannot be effected by voluntary agency, or when it is of such a nature that the consumer cannot be considered capable of judging of the quality supplied, then Mill would allow the state to interpose. Thus the education of children, and even of adults, would fairly come within the province of the state. Mill even goes so far as to admit that, where a restriction of the hours of labour, or the establishment of a periodical holiday, is proved to be beneficial to labourers as a class, but cannot be carried out voluntarily on account of the refusal of individuals to co-operate, government may justifiably compel them to co-operate. Still further, Mill would desire to see some control exercised by the government over the operations of those voluntary associations which, consisting of large numbers of shareholders, necessarily leave their affairs in the hands of one or a few persons. In short, Mill's general rule against state action admits of many important exceptions, founded on no principle less vague than that of public expediency. The essay on *Liberty* is mainly concerned with freedom of individual character, and its arguments apply to control exercised, not only by the state, but by society in the form of public opinion. The leading principle is that of Humboldt, "the absolute and essential importance of human development in its richest diversity." Humboldt broadly excluded education, religion and morals from the action, direct and indirect, of the state. Mill, as we have seen, conceives education to be within the province of the state, but he would confine its action to compelling parents to educate their children.

The most thoroughgoing opponent of state action, however, is Herbert Spencer. In his *Social Statics*, published in 1850, he holds it to be the essential duty of government to *protect*—to maintain men's rights to life, to personal liberty and to property; and the theory that the government ought to undertake other offices besides that of protector he regards as an untenable theory. Each man has a right to the fullest exercise of all his faculties, compatible with the same right in others. This is the fundamental law of equal freedom, which it is the duty and the only duty of the state to enforce. If the state goes beyond this duty, it becomes, not a protector, but an aggressor. Thus all state regulations of commerce, all religious establishments, all government relief of the poor, all state systems of education and of sanitary superintendence, even the state of currency and the post-office, stand condemned, not only as ineffective for their respective purposes, but as involving violations of man's natural liberty.

The tendency of modern legislation is more a question of political practice than of political theory. In some cases state interference has been abolished or greatly limited. These cases are mainly two—in matters of opinion (especially religious opinion), and in matters of contract.

The mere enumeration of the individual instances would occupy a formidable amount of space. The reader is referred to such articles as ENGLAND, CHURCH OF; ESTABLISHMENT; MARRIAGE; OATH; ROMAN CATHOLIC CHURCH, &c., and COMPANY; CONTRACT; PARTNERSHIP, &c. In other cases the state has interfered for the protection and assistance of definite classes of persons. For example, the education and protection of children (see CHILDREN, LAW RELATING TO; EDUCATION; TECHNICAL EDUCATION); the regulation of factory labour and dangerous employment (see LABOUR LEGISLATION); improved conditions of health (see ADULTERATION; HOUSING; PUBLIC HEALTH, LAW OF, &c.); coercion for moral purposes (see BET AND BETTING; CRIMINAL LAW; GAMING AND WAGERING; LIQUOR LAWS; LOTTERIES, &c.). Under numerous other headings in this work the evolution of existing forms of government is discussed; see also the bibliographical note to the article CONSTITUTION AND CONSTITUTIONAL LAW.

GOVERNOR (from the Fr. *gouverneur*, from *gouverner*, O. Fr. *goverer*, Lat. *gubernare*, to steer a ship, to direct, guide), in general, one who governs or exercises authority; specifically, an official appointed to govern a district, province, town, &c. In British colonies or dependencies the representative of the crown is termed a governor. Colonial governors are classed as governors-general, governors and lieutenant-governors, according to the status of the colony or group of colonies over which they preside. Their powers vary according to the position which they occupy. In all cases they represent the authority of the crown. In the United States (*q.v.*) the official at the head of every state government is called a governor.

GOW, NIEL (1727–1807), Scottish musician of humble parentage, famous as a violinist and player of reels, but more so for the part he played in preserving the old melodies of Scotland. His compositions, and those of his four sons, Nathaniel, the most famous (1763–1831), William (1765–1794), Andrew (1766–1803), and John (1764–1826), formed the "Gow Collection," comprising various volumes edited by Niel and his sons, a valuable repository of Scottish traditional airs. The most important of Niel's sons was Nathaniel, who is remembered as the author of the well-known "Caller Herrin," taken from the fishwives' cry, a tune to which words were afterwards written by Lady Nairne. Nathaniel's son, NIEL GOW junior (1795–1823), was the author of the famous songs "Flora Macdonald's Lament" and "Cam' ye by Athol."

GOWER, JOHN (d. 1408), English poet, died at an advanced age in 1408, so that he may be presumed to have been born about 1330. He belonged to a good Kentish family, but the suggestion of Sir Harris Nicolas that the poet is to be identified with a John Gower who was at one time possessed of the manor of Kentwell is open to serious objections. There is no evidence that he ever lived as a country gentleman, but he was undoubtedly possessed of some wealth, and we know that he was the owner of the manors of Feltwell in Suffolk and Moulton in Norfolk. In a document of 1382 he is called an "Esquier de Kent," and he was certainly not in holy orders. That he was acquainted with Chaucer we know, first because Chaucer in leaving England for Italy in 1378 appointed Gower and another to represent him in his absence, secondly because Chaucer addressed his *Troilus and Criseide* to Gower and Strode (whom he addresses as "moral Gower" and "philosophical Strode") for criticism and correction, and thirdly because of the lines in the first edition of Gower's *Confessio amantis*, "And gret wel Chaucer whan ye mete," &c. There is no sufficient ground for the suggestion, based partly on the subsequent omission of these lines and partly on the humorous reference of Chaucer to Gower's *Confessio amantis* in the introduction to the *Man of Law's Tale*, that the friendship was broken by a quarrel. From his Latin poem

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Vox clamantis we know that he was deeply and painfully interested in the peasants' rising of 1381; and by the alterations which the author made in successive revisions of this work we can trace a gradually increasing sense of disappointment in the youthful king, whom he at first acquits of all responsibility for the state of the kingdom on account of his tender age. That he became personally known to the king we learn from his own statement in the first edition of the *Confessio amantis*, where he says that he met the king upon the river, was invited to enter the royal barge, and in the conversation which followed received the suggestion which led him to write his principal English poem. At the same time we know, especially from the later revisions of the *Confessio amantis*, that he was a great admirer of the king's brilliant cousin, Henry of Lancaster, afterwards Henry IV., whom he came eventually to regard as a possible saviour of society from the misgovernment of Richard II. We have a record that in 1303 he received a collar from his favourite political hero, and it is to be observed that the effigy upon Gower's tomb is wearing a collar of SS. with the swan badge which was used by Henry.

The first edition of the *Confessio amantis* is dated 1390, and this contains, at least in some copies, a secondary dedication to the then earl of Derby. The later form, in which Henry became the sole object of the dedication, is of the year 1393. Gower's political opinions are still more strongly expressed in the *Cronica tripartita*.

In 1398 he was married to Agnes Groundolf, and from the special licence granted by the bishop of Winchester for the celebration of this marriage in John Gower's private oratory we gather that he was then living in lodgings assigned to him within the priory of St Mary Overy, and perhaps also that he was too infirm to be married in the parish church. It is probable that this was not his first marriage, for there are indications in his early French poem that he had a wife at the time when that was written. His will is dated the 15th of August 1408, and his death took place very soon after this. He had been blind for some years before his death. A magnificent tomb with a recumbent effigy was erected over his grave in the chapel of St John the Baptist within the church of the priory, now St Saviour's, Southwark, and this is still to be seen, though not quite in its original state or place. From the inscription on the tomb, as well as from other indications, it appears that he was a considerable benefactor of the priory and contributed largely to the rebuilding of the church.

The effigy on Gower's tomb rests its head upon a pile of three folio volumes entitled *Speculum meditantis*, *Vox clamantis* and *Confessio amantis*. These are his three principal works. The first of these was long supposed to have perished, but a copy of it was discovered in the year 1895 under the title *Mirour de l'omme*. It is a French poem of about 30,000 lines in twelve-line stanzas, and under the form of an allegory of the human soul describes the seven deadly sins and their opposing virtues, and then the various estates of man and the vices incident to each, concluding with a narrative of the life of the Virgin Mary, and with praise of her as the means of reconciliation between God and man. The work is extremely tedious for the most part, but shows considerable command over the language and a great facility in metrical expression.

Gower's next work was the *Vox clamantis* in Latin elegiac verse, in which the author takes occasion from the peasants' insurrection of 1381 to deal again with the faults of the various classes of society. In the earlier portion the insurrection itself is described in a rather vivid manner, though under the form of an allegory: the remainder contains much the same material as we have already seen in that part of the French poem where the classes of society are described. Gower's Latin verse is very fair, as judged by the medieval standard, but in this book he has borrowed very freely from Ovid, Alexander Neckam, Peter de Riga and others.

Gower's chief claim, however, to reputation as a poet rests upon his English work, the *Confessio amantis*, in which he displays in his native language a real gift as a story-teller. He is himself the lover of his poem, in spite of his advancing years, and he makes his confession to Genius, the priest of Venus, under the usual headings supplied by the seven deadly sins. These with their several branches are successively described, and the nature of them illustrated by tales, which are directed to the illustration both of the general nature of the sin, and of the particular form which it may take in a lover. Finally he receives at once his absolution, and his dismissal from the service of Venus, for which his age renders him unfit. The idea is ingenious, and there is often much quaintness of fancy in the application of moral ideas to the relations of the lover and his mistress. The tales are drawn from very various sources and are often extremely well told. The metre is the short couplet, and it is extremely smooth and regular. The great fault of the *Confessio amantis* is the extent of its digressions, especially in the fifth and seventh books.

Gower also wrote in 1397 a short series of French ballades on the virtue of the married state (*Traitié pour essampler les amantz mariés*), and after the accession of Henry IV. he produced the *Cronica tripartita*, a partisan account in Latin leonine hexameters of the events of the last twelve years of the reign of Richard II. About the same time he addressed an English poem in seven-line stanzas to Henry IV. (*In Praise of Peace*), and dedicated to the king a series of French ballades (*Cinkante Baladez*), which deal with the conventional topics of love, but are often graceful and even poetical in expression. Several occasional Latin pieces also belong to the later years of his life.

On the whole Gower must be admitted to have had considerable literary powers; and though not a man of genius, and by no means to be compared with Chaucer, yet he did good service in helping to establish the standard literary language, which at the end of the 14th century took the place of the Middle English dialects. The *Confessio amantis* was long regarded as a classic of the language, and Gower and Chaucer were often mentioned side by side as the fathers of English poetry.

A complete edition of Gower's works in four volumes, edited by G. C. Macaulay, was published in 1899–1902, the first volume containing the French works, the second and third the English, and the fourth the Latin, with a biography. Before this the *Confessio amantis* had been published in the following editions: Caxton (1483); Berthelette (1532 and 1554); Chalmers, *British Poets* (1810); Reinhold Pauli (1857); H. Morley (1889, incomplete). The two series of French ballades and the *Praise of Peace* were printed for the Roxburghe Club in 1818, and the *Vox clamantis* and *Cronica tripartita* were edited by H. O. Coxe for the Roxburghe Club in 1850. The *Cronica tripartita*, the *Praise of Peace* and some of the minor Latin poems were printed in Wright's *Political Poems* (Rolls series, 14). The *Praise of Peace* appeared in the early folio editions of Chaucer, and has been edited also by Dr Skeat in his *Chaucerian and other Pieces*. Reference may be made to Todd's *Illustrations of the Lives and Writings of Gower and Chaucer*; the article (by Sir H. Nicolas) in the *Retrospective Review* for 1828; *Observations on the Language of Chaucer and Gower*, by F. J. Child; H. Morley's *English Writers*, iv.; Ten Brink's *History of Early English Literature*, ii.; and Courthope's *History of English Poetry*, i. (G. C. M.)

GOWER, a seigniory and district in the county of Glamorgan, lying between the rivers Tawe and Loughor and between Breconshire and the sea, its length from the Breconshire border to Worm's Head being 28 m., and its breadth about 8 m. It corresponds to the ancient commote of Gower (in Welsh *Gwyr*) which in early Welsh times was grouped with two other commotes stretching westwards to the Towy and so formed part of the principality of Ystrad Tywi. Its early association with the country to the west instead of with Glamorgan is perpetuated by its continued inclusion in the diocese of St Davids, its two rural deaneries, West and East Gower, being in the archdeaconry of Carmarthen. What is meant by Gower in modern popular usage, however, is only the peninsular part or "English Gower" (that is the Welsh *Bro-wyr*, as distinct from *Gwyr* proper), roughly corresponding to the hundred of Swansea and lying mainly to the south of a line drawn from Swansea to Loughor.

The numerous limestone caves of the coast are noted for their immense deposits of animal remains, but their traces of man are far scantier, those found in Bacon Hole and in Paviland cave

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being the most important. In the Roman period the river Tawe, or the great morass between it and the Neath, probably formed the boundary between the Silures and the Goidelic population to the west. The latter, reinforced perhaps from Ireland, continued to be the dominant race in Gower till their conquest or partial expulsion in the 4th century by the sons of Cunedda who introduced a Brythonic element into the district. Centuries later Scandinavian rovers raided the coasts, leaving traces of their more or less temporary occupation in such place-names as Burry Holms, Worms Head and Swansea, and probably also in some cliff earthworks. About the year 1100 the conquest of Gower was undertaken by Henry de Newburgh, first earl of Warwick, with the assistance of Maurice de Londres and others. His followers, who were mostly Englishmen from the marches and Somersetshire with perhaps a sprinkling of Flemings, settled for the most part on the southern side of the peninsula, leaving the Welsh inhabitants of the northern half of Gower practically undisturbed. These invaders were probably reinforced a little later by a small detachment of the larger colony of Flemings which settled in south Pembrokeshire. Moated mounds, which in some cases developed into castles, were built for the protection of the various manors into which the district was parcelled out, the castles of Swansea and Loughor being ascribed to the earl of Warwick and that of Oystermouth to Maurice de Londres. These were repeatedly attacked and burnt by the Welsh during the 12th and 13th centuries, notably by Griffith ap Rhys in 1113, by his son the Lord Rhys in 1189, by his grandsons acting in concert with Llewelyn the Great in 1215, and by the last Prince Llewelyn in 1257. With the Norman conquest the feudal system was introduced, and the manors were held *in capite* of the lord by the tenure of castle-guard of the castle of Swansea, the *caput baroniae*.

About 1189 the lordship passed from the Warwick family to the crown and was granted in 1203 by King John to William de Braose, in whose family it remained for over 120 years except for three short intervals when it was held for a second time by King John (1211–1215), by Llewelyn the Great (1216–1223), and the Despensers (*c.* 1323–1326). In 1208 the Welsh and English inhabitants who had frequent cause to complain of their treatment, received each a charter, in similar terms, from King John, who also visited the town of Swansea in 1210 and in 1215 granted its merchants liberal privileges. In 1283 a number of de Braose's tenants—unquestionably Welshmen—left Gower for the royal lordship of Carmarthen, declaring that they would live under the king rather than under a lord marcher. In the following year the king visited de Braose at Oystermouth Castle, which seems to have been made the lord's chief residence, after the destruction of Swansea Castle by Llewelyn. Later on the king's officers of the newly organized county of Carmarthen repeatedly claimed jurisdiction over Gower, thereby endeavouring to reduce its status from that of a lordship marcher with semi-regal jurisdiction, into that of an ordinary constituent of the new county. De Braose resisted the claim and organized the English part of his lordship on the lines of a county palatine, with its own *comitatus* and chancery held in Swansea Castle, the sheriff and chancellor being appointed by himself. The inhabitants, who had no right of appeal to the crown against their lord or the decisions of his court, petitioned the king, who in 1305 appointed a special commission to enquire into their alleged grievances, but in the following year the de Braose of the time, probably in alarm, conceded liberal privileges both to the burgesses of Swansea and to the English and Welsh inhabitants of his "county" of English Gower. He was the last lord seignior to live within the seigniory, which passed from him to his son-in-law John de Mowbray. Other troubles befell the de Braose barons and their successors in title, for their right to the lordship was contested by the Beauchamps, representatives of the earlier earls of Warwick, in prolonged litigation carried on intermittently from 1278 to 1306, the Beauchamps being actually in possession from 1354, when a decision was given in their favour, till its reversal in 1396. It then reverted to the Mowbrays and was held by them until the 4th duke of Norfolk exchanged it in 1489, for lands in England, with William Herbert, earl of Pembroke. The latter's granddaughter brought it to her husband Charles Somerset, who in 1506 was granted her father's subtitle of Baron Herbert of Chepstow, Raglan and Gower, and from him the lordship has descended to the present lord, the duke of Beaufort.

Gower was made subject to the ordinary law of England by its inclusion in 1535 in the county of Glamorgan as then reorganized; its chancery, which from about the beginning of the 14th century had been located at Oystermouth Castle, came to an end, but though the Welsh acts of 1535 and 1542 purported to abolish the rights and privileges of the lords marchers as conquerors, yet some of these, possibly from being regarded as private rights, have survived into modern times. For instance, the seignior maintained a franchise gaol in Swansea Castle till 1858, when it was abolished by act of parliament, the appointment of coroner for Gower is still vested in him, all writs are executed by the lord's officers instead of by the officers of the sheriff for the county, and the lord's rights to the foreshore, treasure trove, felon's goods and wrecks are undiminished.

The characteristically English part of Gower lies to the south and south-west of its central ridge of Cefn y Bryn. It was this part that was declared by Professor Freeman to be "more Teutonic than Kent itself." The seaside fringe lying between this area and the town of Swansea, as well as the extreme north-west of the peninsula, also became anglicized at a comparatively early date, though the place-names and the names of the inhabitants are still mainly Welsh. The present line of demarcation between the two languages is one drawn from Swansea in a W.N.W. direction to Llanrhidian on the north coast. It has remained practically the same for several centuries, and is likely to continue so, as it very nearly coincides with the southern outcrop of the coal measures, the industrial population to the north being Welsh-speaking, the agriculturists to the south being English. In 1901 the Gower rural district (which includes the Welsh-speaking industrial parish of Llanrhidian, with about three-sevenths of the total population) had 64·5% of the population above three years of age that spoke English only, 5·2% that spoke Welsh only, the remainder being bilinguals, as compared with 17% speaking English only, 17·7 speaking Welsh only and the rest bilinguals in the Swansea rural district, and 7% speaking English only, 55·2 speaking Welsh only and the rest bilinguals in the Pontardawe rural district, the last two districts constituting Welsh Gower.

More than one-fourth of the whole area of Gower is unenclosed common land, of which in English Gower fully one-half is apparently capable of cultivation. Besides the demesne manors of the lord seignior, six in number, there are some twelve mesne manors and fees belonging to the Penrice estate, and nearly twenty more belonging to various other owners. The tenure is customary freehold, though in some cases described as copyhold, and in the ecclesiastical manor of Bishopston, descent is by borough English. The holdings are on the whole probably smaller in size than in any other area of corresponding extent in Wales, and agriculture is still in a backward state.

In the Arthurian romances Gower appears in the form of Goire as the island home of the dead, a view which probably sprang up among the Celts of Cornwall, to whom the peninsula would appear as an island. It is also surmised by Sir John Rhŷs that Malory's Brandegore (*i.e.* Brân of Gower) represents the Celtic god of the other world (Rhys, *Arthurian Legend*, 160, 329 et seq.). On Cefn Bryn, almost in the centre of the peninsula, is a cromlech with a large capstone known as Arthnr's Stone. The unusually large number of cairns on this hill, given as eighty by Sir Gardner Wilkinson, suggests that this part of Gower was a favourite burial-place in early British times.

See Rev. J. D. Davies, *A History of West Gower* (4 vols., 1877–1894); Col. W. Ll-Morgan, *An Antiquarian Survey of East Gower* (1899); an article (probably by Professor Freeman) entitled "Anglia Trans-Walliana" in the *Saturday Review* for May 20, 1876; "The Signory of Gower" by G. T. Clark in *Archaeologia Cambrensis* for 1803–1804; *The Surveys of Gower and Kilvey*, ed. by Baker and Grant-Francis (1861–1870). (D. Ll. T.)

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GOWN, properly the term for a loose outer garment formerly worn by either sex but now generally for that worn by women. While "dress" is the usual English word, except in such combinations as "tea-gown," "dressing-gown" and the like, where the original loose flowing nature of the "gown" is referred to, "gown" is the common American word. "Gown" comes from the O. Fr. *goune* or *gonne*. The word appears in various Romanic languages, cf. Ital. *gonna*. The medieval Lat. *gunna* is used of a garment of skin or fur. A Celtic origin has been usually adopted, but the Irish, Gaelic and Manx words are taken from the English. Outside the ordinary use of the word, "gown" is the name for the distinctive robes worn by holders of particular offices or by members of particular professions or of universities, &c. (see ROBES).

GOWRIE, JOHN RUTHVEN, 3RD EARL OF (*c.* 1577–1600), Scottish conspirator, was the second son of William, 4th Lord Ruthven and 1st earl of Gowrie (cr. 1581), by his wife Dorothea, daughter of Henry Stewart, 2nd Lord Methven. The Ruthven family was of ancient Scottish descent, and had owned extensive estates in the time of William the Lion; the Ruthven peerage dated from the year 1488. The 1st earl of Gowrie (? 1541–1584), and his father, Patrick, 3rd Lord Ruthven (*c.* 1520–1566), had both been concerned in the murder of Rizzio in 1566; and both took an active part on the side of the Kirk in the constant intrigues and factions among the Scottish nobility of the period. The former had been the custodian of Mary, queen of Scots, during her imprisonment in Loch Leven, where, according to the queen, he had pestered her with amorous attentions; he had also been the chief actor in the plot known as the "raid of Ruthven" when King James VI. was treacherously seized while a guest at the castle of Ruthven in 1582, and kept under restraint for several months while the earl remained at the head of the government. Though pardoned for this conspiracy he continued to plot against the king in conjunction with the earls of Mar and Angus, and he was executed for high treason on the 2nd of May 1584; his friends complaining that the confession on which he was convicted of treason was obtained by a promise of pardon from the king. His eldest son, William, 2nd earl of Gowrie, only survived till 1588, the family dignities and estates, which had been forfeited, having been restored to him in 1586.

When, therefore, John Ruthven succeeded to the earldom while still a child, he inherited along with his vast estates family traditions of treason and intrigue. There was also a popular belief, though without foundation, that there was Tudor blood in his veins; and Burnet afterwards asserted that Gowrie stood next in succession to the crown of England after King James VI. Like his father and grandfather before him, the young earl attached himself to the party of the reforming preachers, who procured his election in 1593 as provost of Perth, a post that was almost hereditary in the Ruthven family. He received an excellent education at the grammar school of Perth and the university of Edinburgh, where he was in the summer of 1593, about the time when his mother, and his sister the countess of Atholl, aided Bothwell in forcing himself sword in hand into the king's bedchamber in Holyrood Palace. A few months later Gowrie joined with Atholl and Montrose in offering to serve Queen Elizabeth, then almost openly hostile to the Scottish king; and it is probable that he had also relations with the rebellious Bothwell. Gowrie had thus been already deeply engaged in treasonable conspiracy when, in August 1594, he proceeded to Italy with his tutor, William Rhynd, to study at the university of Padua. On his way home in 1599 he remained for some months at Geneva with the reformer Theodore Beza; and at Paris he made acquaintance with the English ambassador, who reported him to Cecil as devoted to Elizabeth's service, and a nobleman "of whom there may be exceeding use made." In Paris he may also at this time have had further communication with the exiled Bothwell; in London he was received with marked favour by Queen Elizabeth and her ministers.

These circumstances owe their importance to the light they throw on the obscurity of the celebrated "Gowrie conspiracy," which resulted in the slaughter of the earl and his brother by attendants of King James at Gowrie House, Perth, a few weeks after Gowrie's return to Scotland in May 1600. This event ranks among the unsolved enigmas of history. The mystery is caused by the improbabilities inherent in any of the alternative hypotheses suggested to account for the unquestionable facts of the occurrence; the discrepancies in the evidence produced at the time; the apparent lack of forethought or plan on the part of the chief actors, whichever hypothesis be adopted, as well as the thoughtless folly of their actual procedure; and the insufficiency of motive, whoever the guilty parties may have been. The solutions of the mystery that have been suggested are three in number: first, that Gowrie and his brother had concocted a plot to murder, or more probably to kidnap King James, and that they lured him to Gowrie House for this purpose; secondly, that James paid a surprise visit to Gowrie House with the intention, which he carried out, of slaughtering the two Ruthvens; and thirdly, that the tragedy was the outcome of an unpremeditated brawl following high words between the king and the earl, or his brother. To understand the relative probabilities of these hypotheses regard must be had to the condition of Scotland in the year 1600 (see SCOTLAND: *History*). Here it can only be recalled that plots to capture the person of the sovereign for the purpose of coercing his actions were of frequent occurrence, more than one of which had been successful, and in several of which the Ruthven family had themselves taken an active part; that the relations between England and Scotland were at this time more than usually strained, and that the young earl of Gowrie was reckoned in London among the adherents of Elizabeth; that the Kirk party, being at variance with James, looked upon Gowrie as an hereditary partisan of their cause, and had recently sent an agent to Paris to recall him to Scotland as their leader; that Gowrie was believed to be James's rival for the succession to the English crown. Moreover, as regards the question of motive it is to be observed, on the one hand, that the Ruthvens believed Gowrie's father to have been treacherously done to death, and his widow insulted by the king's favourite minister; while, on the other, James was indebted in a large sum of money to the earl of Gowrie's estate, and popular gossip credited either Gowrie or his brother, Alexander Ruthven, with being the lover of the queen. Although the evidence on these points, and on every minute circumstance connected with the tragedy itself, has been exhaustively examined by historians of the Gowrie conspiracy, it cannot be asserted that the mystery has been entirely dispelled; but, while it is improbable that complete certainty will ever be arrived at as to whether the guilt lay with James or with the Ruthven brothers, the most modern research in the light of materials inaccessible or overlooked till the 20th century, points pretty clearly to the conclusion that there was a genuine conspiracy by Gowrie and his brother to kidnap the king. If this be the true solution, it follows that King James was innocent of the blood of the Ruthvens; and it raises the presumption that his own account of the occurrence was, in spite of the glaring improbabilities which it involved, substantially true.

The Gowrie conspiracy.

The facts as related by James and other witnesses were, in outline, as follows. On the 5th of August 1600 the king rose early to hunt in the neighbourhood of Falkland Palace, about 14 m. from Perth. Just as he was setting forth in company with the duke of Lennox, the earl of Mar, Sir Thomas Erskine and others, he was accosted by Alexander Ruthven (known as the master of Ruthven), a younger brother of the earl of Gowrie, who had ridden from Perth that morning to inform the king that he had met on the previous day a man in possession of a pitcher full of foreign gold coins, whom he had secretly locked up in a room at Gowrie House. Ruthven urged the king to ride to Perth to examine this man for himself and to take possession of the treasure. After some hesitation James gave credit to the story, suspecting that the possessor of the coins was one of the numerous Catholic agents at that time moving about Scotland in disguise. Without giving a positive reply to

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Alexander Ruthven, James started to hunt; but later in the morning he called Ruthven to him and said he would ride to Perth when the hunting was over. Ruthven then despatched a servant, Henderson, by whom he had been accompanied from Perth in the early morning, to tell Gowrie that the king was coming to Gowrie House. This messenger gave the information to Gowrie about ten o'clock in the morning. Meanwhile Alexander Ruthven was urging the king to lose no time, requesting him to keep the matter secret from his courtiers, and to bring to Gowrie House as small a retinue as possible. James, with a train of some fifteen persons, arrived at Gowrie House about one o'clock, Alexander Ruthven having spurred forward for a mile or so to announce the king's approach. But notwithstanding Henderson's warning some three hours earlier, Gowrie had made no preparations for the king's entertainment, thus giving the impression of having been taken by surprise. After a meagre repast, for which he was kept waiting an hour, James, forbidding his retainers to follow him, went with Alexander Ruthven up the main staircase and passed through two chambers and two doors, both of which Ruthven locked behind them, into a turret-room at the angle of the house, with windows looking on the courtyard and the street. Here James expected to find the mysterious prisoner with the foreign gold. He found instead an armed man, who, as appeared later, was none other than Gowrie's servant, Henderson. Alexander Ruthven immediately put on his hat, and drawing Henderson's dagger, presented it to the king's breast with threats of instant death if James opened a window or called for help. An allusion by Ruthven to the execution of his father, the 1st earl of Gowrie, drew from James a reproof of Ruthven's ingratitude for various benefits conferred on his family. Ruthven then uncovered his head, declaring that James's life should be safe if he remained quiet; then, committing the king to the custody of Henderson, he left the turret—ostensibly to consult Gowrie—and locked the door behind him. While Ruthven was absent the king questioned Henderson, who professed ignorance of any plot and of the purpose for which he had been placed in the turret; he also at James's request opened one of the windows, and was about to open the other when Ruthven returned. Whether or not Alexander had seen his brother is uncertain. But Gowrie had meantime spread the report below that the king had taken horse and had ridden away; and the royal retinue were seeking their horses to follow him. Alexander, on re-entering the turret, attempted to bind James's hands; a struggle ensued, in the course of which the king was seen at the window by some of his followers below in the street, who also heard him cry " treason " and call for help to the earl of Mar. Gowrie affected not to hear these cries, but kept asking what was the matter. Lennox, Mar and most of the other lords and gentlemen ran up the main staircase to the king's help, but were stopped by the locked door, which they spent some time in trying to batter down. John Ramsay (afterwards earl of Holdernesse), noticing a small dark stairway leading directly to the inner chamber adjoining the turret, ran up it and found the king struggling at grips with Ruthven. Drawing his dagger, Ramsay wounded Ruthven, who was then pushed down the stairway by the king. Sir Thomas Erskine, summoned by Ramsay, now followed up the small stairs with Dr Hugh Herries, and these two coming upon the wounded Ruthven despatched him with their swords. Gowrie, entering the courtyard with his stabler Thomas Cranstoun and seeing his brother's body, rushed up the staircase after Erskine and Herries, followed by Cranstoun and others of his retainers; and in the melée Gowrie was killed. Some commotion was caused in the town by the noise of these proceedings; but it quickly subsided, though the king did not deem it safe to return to Falkland for some hours.

The slaughter of the Ruthvens.

The tragedy caused intense excitement throughout Scotland, and the investigation of the circumstances was followed with much interest in England also, where all the details were reported to Elizabeth's ministers. The preachers of the Kirk, whose influence in Scotland was too extensive for the king to neglect, were only with the greatest difficulty persuaded to accept James's account of the occurrence, although he voluntarily submitted himself to cross-examination by one of their number. Their belief, and that of their partisans, influenced no doubt by political hostility to James, was that the king had invented the story of a conspiracy by Gowrie to cover his own design to extirpate the Ruthven family. James gave some colour to this belief, which has not been entirely abandoned, by the relentless severity with which he pursued the two younger, and unquestionably innocent, brothers of the earl. Great efforts were made by the government to prove the complicity of others in the plot. One noted and dissolute conspirator, Sir Robert Logan of Restalrig, was posthumously convicted of having been privy to the Gowrie conspiracy on the evidence of certain letters produced by a notary, George Sprot, who swore they had been written by Logan to Gowrie and others. These letters, which are still in existence, were in fact forged by Sprot in imitation of Logan's handwriting; but the researches of Andrew Lang have shown cause for suspecting that the most important of them was either copied by Sprot from a genuine original by Logan, or that it embodied the substance of such a letter. If this be correct, it would appear that the conveyance of the king to Fast Castle, Logan's impregnable fortress on the coast of Berwickshire, was part of the plot; and it supplies, at all events, an additional piece of evidence to prove the genuineness of the Gowrie conspiracy.

The Sprot forgeries.

Gowrie's two younger brothers, William and Patrick Ruthven, fled to England; and after the accession of James to the English throne William escaped abroad, but Patrick was taken and imprisoned for nineteen years in the Tower of London. Released in 1622, Patrick Ruthven resided first at Cambridge and afterwards in Somersetshire, being granted a small pension by the crown. He married Elizabeth Woodford, widow of the 1st Lord Gerrard, by whom he had two sons and a daughter, Mary; the latter entered the service of Queen Henrietta Maria, and married the famous painter van Dyck, who painted several portraits of her. Patrick died in poverty in a cell in the King's Bench in 1652, being buried as " Lord Ruthven." His son, Patrick, presented a petition to Oliver Cromwell in 1656, in which, after reciting that the parliament of Scotland in 1641 had restored his father to the barony of Ruthven, he prayed that his " extreme poverty " might be relieved by the bounty of the Protector.

See Andrew Lang, *James VI. and the Gowrie Mystery* (London, 1902), and the authorities there cited; Robert Pitcairn, *Criminal Trials in Scotland* (3 vols., Edinburgh, 1833); David Moysie, *Memoirs of the Affairs of Scotland, 1577–1603* (Edinburgh, 1830); Louis A. Barbé, *The Tragedy of Gowrie House* (London, 1887); Andrew Bisset, *Essays on Historical Truth* (London, 1871); David Calderwood, *History of the Kirk of Scotland* (8 vols., Edinburgh, 1842–1849); P. F. Tytler, *History of Scotland* (9 vols., Edinburgh, 1828–1843); John Hill Burton, *History of Scotland* (7 vols., Edinburgh, 1867–1870). W. A. Craigie has edited as *Skotlands Rimur* some Icelandic ballads relating to the Gowrie conspiracy. He has also printed the Danish translation of the official account of the conspiracy, which was published at Copenhagen in 1601. (R. J. M.)

GOWRIE, a belt of fertile alluvial land (*Scotice,* " carse ") of Perthshire, Scotland. Occupying the northern shore of the Firth of Tay, it has a generally north-easterly trend and extends from the eastern boundaries of Perth city to the confines of Dundee. It measures 15 m. in length, its breadth from the river towards the base of the Sidlaw Hills varying from 2 to 4 m. Probably it is a raised beach, submerged until a comparatively recent period. Although it contained much bog land and stagnant water as late as the 18th century, it has since been drained and cultivated, and is now one of the most productive tracts in Perthshire. The district is noteworthy for the number of its castles and mansions, almost wholly residential, among which may be mentioned Kinfauns Castle, Inchyra House, Pitfour Castle, Errol Park, Megginch Castle, dating from 1575; Fingask Castle, Kinnaird Castle, erected in the 15th century and occupied by James VI. in 1617; Rossie Priory, the seat of Lord Kinnaird; and Huntly Castle, built by the 3rd earl of Kinghorne.

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GOYA, a river town and port of Corrientes, Argentine Republic, the commercial centre of the south-western departments of the province and chief town of a department of the same name, on a *riacho* or side channel of the Paraná about 5 m. from the main channel and about 120 m. S. of the city of Corrientes. Pop. (1905, est.) 7000. The town is built on low ground which is subject to inundations in very wet weather, but its streets are broad and the general appearance of its edifices is good. Among its public buildings is a handsome parish church and a national normal school. The productions of the neighbourhood are chiefly pastoral, and its exports include cattle, hides, wool and oranges. Goya had an export of crudely-made cheese long before the modern cheese factories of the Argentine Republic came into existence. The place dates from 1807, and had its origin, it is said, in the trade established there by a ship captain and his wife Gregoria or Goya, who supplied passing vessels with beef.

GOYANNA, or GOIANA, a city of Brazil in the N.E. angle of the state of Pernambuco, about 65 m. N. of the city of Pernambuco. Pop.(1890) 15,436. It is built on a fertile plain between the rivers Tracunhaem and Capibaribe-mirim near their junction to form the Goyanna river, and is 15 m. from the coast. It is surrounded by, and is the commercial centre for, one of the richest agricultural districts of the state, which produces sugar, rum, coffee, tobacco, cotton, cattle, hides and castor oil. The Goyanna river is navigable for small vessels nearly up to the city, but its entrance is partly obstructed and difficult. Goyanna is one of the oldest towns of the state, and was occupied by the Dutch from 1636 to 1654. It has several old-style churches, an orphans' asylum, hospital and some small industries.

GOYA Y LUCIENTES, FRANCISCO (1746–1828), Spanish painter, was born in 1746 at Fuendetodos, a small Aragonese village near Saragossa. At an early age he commenced his artistic career under the direction of José Luzan Martinez, who had studied painting at Naples under Mastroleo. It is clear that the accuracy in drawing Luzan is said to have acquired by diligent study of the best Italian masters did not much influence his erratic pupil. Goya, a true son of his province, was bold, capricious, headstrong and obstinate. He took a prominent part on more than one occasion in those rival religious processions at Saragossa which often ended in unseemly frays; and his friends were led in consequence to despatch him in his nineteenth year to Madrid, where, prior to his departure for Rome, his mode of life appears to have been anything but that of a quiet orderly citizen. Being a good musician, and gifted with a voice, he sallied forth nightly, serenading the caged beauties of the capital, with whom he seems to have been a very general favourite.

Lacking the necessary royal patronage, and probably scandalizing by his mode of life the sedate court officials, he did not receive —perhaps did not seek—the usual honorarium accorded to those students who visited Rome for the purpose of study. Finding in convenient to retire for a time from Madrid, he decided to visit Rome at his own cost; and being without resources he joined a "quadrilla" of bull-fighters, passing from town to town until he reached the shores of the Mediterranean. We next hear of him reaching Rome, broken in health and financially bankrupt. In 1772 he was awarded the second prize in a competition initiated by the academy of Parma, styling himself "pupil to Bayeu, painter to the king of Spain." Compelled to quit Rome somewhat suddenly, he appears again in Madrid in 1775, the husband of Bayeu's daughter, and father of a son. About this time he appears to have visited his parents at Fuendetodos, no doubt noting much which later on he utilized in his genre works. On returning to Madrid he commenced painting canvases for the tapestry factory of Santa Barbara, in which the king took much interest. Between 1776 and 1780 he appears to have supplied thirty examples, receiving about £1200 for them. Soon after the revolution of 1868, an official was appointed to take an inventory of all works of art belonging to the nation, and in one of the cellars of the Madrid palace were discovered forty-three of these works of Goya on rolls forgotten and neglected (see *Los Tapices de Goya; por Cruzado Villaamil*, Madrid, 1870).

His originality and talent were soon recognized by Mengs, the king's painter, and royal favour naturally followed. His career now becomes intimately connected with the court life of his time. He was commissioned by the king to design a series of frescoes for the church of St Anthony of Florida, Madrid, and he also produced works for Saragossa, Valencia and Toledo. Ecclesiastical art was not his forte, and although he cannot be said to have failed in any of his work, his fame was not enhanced by his religious subjects.

In portraiture, without doubt, Goya excelled: his portraits are evidently life-like and unexaggerated, and he disdained flattery. He worked rapidly, and during his long stay at Madrid painted, amongst many others, the portraits of four sovereigns of Spain—Charles III. and IV., Ferdinand VII. and "King Joseph." The duke of Wellington also sat to him; but on his making some remark which raised the artist's choler, Goya seized a plaster cast and hurled it at the head of the duke. There are extant two pencil sketches of Wellington, one in the British Museum, the other in a private collection. One of his best portraits is that of the lovely Andalusian duchess of Alva. He now became the spoiled child of fortune, and acquired, at any rate externally, much of the polish of court manners. He still worked industriously upon his own lines, and, while there is a stiffness almost ungainly in the pose of some of his portraits, the stern individuality is always preserved.

Including the designs for tapestry, Goya's genre works are numerous and varied, both in style and feeling, from his Watteau-like "Al Fresco Breakfast," "Romería de San Isidro," to the "Curate feeding the Devil's Lamp," the "Meson del Gallo" and the painfully realistic massacre of the "Dos de Mayo" (1808). Goya's versatility is proverbial; in his hands the pencil, brush and graver are equally powerful. Some of his crayon sketches of scenes in the bull ring are full of force and character, slight but full of meaning. He was in his thirty-second year when he commenced his etchings from Velasquez, whose influence may, however, be traced in his work at an earlier date. A careful examination of some of the drawings made for these etchings indicates a steadiness of purpose not usually discovered in Goya's craft as draughtsman. He is much more widely known by his etchings than his oils; the latter necessarily must be sought in public and private collections, principally in Spain, while the former are known and prized in every capital of Europe. The etched collections by which Goya is best known include "Los Caprichos," which have a satirical meaning known only to the few; they are bold, weird and full of force. "Los Proverbios" are also supposed to have some hidden intention. "Los Desastres de la Guerra" may fairly claim to depict Spain during the French invasion. In the bull-fight series Goya is evidently at home; he was a skilled master of the barbarous art, and no doubt every sketch is true to nature, and from life.

Goya retired from Madrid, desiring probably during his latter years to escape the trying climate of that capital. He died at Bordeaux on the 16th of April 1828, and a monument has been erected there over his remains. From the deaths of Velasquez and Murillo to the advent of Fortuny, Goya's name is the only important one found in the history of Spanish art.

See also the lives by Paul Lefort (1877), and Yriarte (1867).

GOYÁZ, an inland state of Brazil, bounded by Matto Grosso and Pará on the W., Maranhão, Bahia and Minas Geraes on the E., and Minas Geraes and Matto Grosso on the S. Pop. (1890) 227,572; (1900) 255,284, including many half-civilized Indians and many half-breeds. Area, 288,549 sq. m. The outline of the state is that of a roughly-shaped wedge with the thin edge extending northward between and up to the junction of the rivers Araguaya and Upper Tocantins, and its length is nearly 15° of latitude. The state lies wholly within the great Brazilian plateau region, but its surface is much broken towards the N. by the deeply eroded valleys of the Araguaya and Upper Tocantins rivers and their tributaries. The general slope of the plateau is toward the N., and the drainage of the state is chiefly through the above-named rivers—the principal tributaries of the Araguaya being the Grande and Vermelho, and of the Upper Tocantins, the Manoel Alves Grande, Somno, Paranan

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and Maranhão. A considerable part of southern Goyáz, however, slopes southward and the drainage is through numerous small streams flowing into the Paranahyba, a large tributary of the Paraná. The general elevation of the plateau is estimated to be about 2700 ft., and the highest elevation was reported in 1892 to be the Serra dos Pyreneos (5250 ft.). Crossing the state N.N.E. to S.S.W. there is a well-defined chain of mountains, of which the Pyreneos, Santa Rita and Santa Martha ranges form parts, but their elevation above the plateau is not great. The surface of the plateau is generally open campo and scrub by arboreal growth called *caatingas*, but the streams are generally bordered with forest, especially in the deeper valleys. Towards the N. the forest becomes denser and of the character of the Amazon Valley. The climate of the plateau is usually described as temperate, but it is essentially sub-tropical. The valley regions are tropical, and malarial fevers are common. The cultivation of the soil is limited to local needs, except in the production of tobacco, which is exported to neighbouring states. The open campos afford good pasturage, and live stock is largely exported. Gold-mining has been carried on in a primitive manner for more than two centuries, but the output has never been large and no very rich mines have been discovered. Diamonds have been found, but only to a very limited extent. There is a considerable export of quartz crystal, commercially known as "Brazilian pebbles," used in optical work. Although the northern and southern extremities of Goyáz lie within two great river systems—the Tocantins and Paraná—the upper courses of which are navigable, both of them are obstructed by falls. The only outlet for the state has been by means of mule trains to the railway termini of São Paulo and Minas Geraes, pending the extension of railways from both of those states, one entering Goyáz by way of Catalão, near the southern boundary, and the other at some point further N.

The capital of the state is Goyáz, or Villa-Boa de Goyáz, a mining town on the Rio Vermelho, a tributary of the Araguaya rising on the northern slopes of the Serra de Santa Rita. Pop. (1890) 6807. Gold was discovered here in 1682 by Bartholomeu Bueno, the first European explorer of this region, and the settlement founded by him was called Santa Anna, which is still the name of the parish. The site of the town is a barren, rocky mountain valley, 1900 ft. above sea-level, in which the heat is most oppressive at times and the nights are unpleasantly cold. Goyáz is the see of a bishopric founded in 1826, and possesses a small cathedral and some churches.

GOYEN, JAN JOSEPHSZOON VAN (1596–1656), Dutch painter, was born at Leiden on the 13th of January 1596, learned painting under several masters at Leiden and Haarlem, married in 1618 and settled at the Hague about 1631. He was one of the first to emancipate himself from the traditions of minute imitation embodied in the works of Breughel and Savery. Though he preserved the dun scale of tone peculiar to those painters, he studied atmospheric effects in black and white with considerable skill. He had much influence on Dutch art. He formed Solomon Ruysdael and Pieter Potter, forced attention from Rembrandt, and bequeathed some of his precepts to Pieter de Molyn, Coelenbier, Saftleven, van der Kabel and even Berghem. His life at the Hague for twenty-five years was very prosperous, and he rose in 1640 to be president of his gild. A friend of van Dyck and Bartholomew van der Helst, he sat to both these artists for his likeness. His daughter Margaret married Jan Steen, and he had steady patrons in the stadtholder Frederick Henry, and the chiefs of the municipality of the Hague. He died at the Hague in 1656, possessed of land and houses to the amount of 15,000 florins.

Between 1610 and 1616 van Goyen wandered from one school to the other. He was first apprenticed to Isaak Swanenburgh; he then passed through the workshops of de Man, Klok and de Hoorn. In 1616 he took a decisive step and joined Esaias van der Velde at Haarlem; amongst his earlier pictures, some of 1621 (Berlin Museum) and 1623 (Brunswick Gallery) show the influence of Esaias very perceptibly. The landscape is minute. Details of branching and foliage are given, and the figures are important in relation to the distances. After 1625 these peculiarities gradually disappear. Atmospheric effect in landscapes of cool tints varying from grey green to pearl or brown and yellow dun is the principal object which van Goyen holds in view, and he succeeds admirably in light skies with drifting misty cloud, and downs with cottages and scanty shrubbery or stunted trees. Neglecting all detail of foliage he now works in a thin diluted medium, laying on rubbings as of sepia or Indian ink, and finishing without loss of transparence or lucidity. Throwing his foreground into darkness, he casts alternate light and shade upon the more distant planes, and realizes most pleasing views of large expanse. In buildings and water, with shipping near the banks, he sometimes has the strength if not the colour of Albert Cuyp. The defect of his work is chiefly want of solidity. But even this had its charm for van Goyen's contemporaries, and some time elapsed before Cuyp, who imitated him, restricted his method of transparent tinting to the foliage of foreground trees.

Van Goyen's pictures are comparatively rare in English collections, but his work is seen to advantage abroad, and chiefly at the Louvre, and in Berlin, Gotha, Vienna, Munich and Augsburg. Twenty-eight of his works were exhibited together at Vienna in 1873. Though he visited France once or twice, van Goyen chiefly confined himself to the scenery of Holland and the Rhine. Nine times from 1633 to 1655 he painted views of Dordrecht. Nimeguen was one of his favourite resorts. But he was also fond of Haarlem and Amsterdam, and he did not neglect Arnheim or Utrecht. One of his largest pieces is a view of the Hague, executed in 1651 for the municipality, and now in the town collection of that city. Most of his panels represent reaches of the Rhine, the Waal and the Maese. But he sometimes sketched the downs of Scheveningen, or the sea at the mouth of the Rhine and Scheldt; and he liked to depict the calm inshore, and rarely ventured upon seas stirred by more than a curling breeze or the swell of a coming squall. He often painted winter scenes, with ice and skaters and sledges, in the style familiar to Isaac van Ostade. There are numerous varieties of these subjects in the master's works from 1621 to 1653. One historical picture has been assigned to van Goyen—the "Embarkation of Charles II." in the Bute collection. But this canvas was executed after van Goyen's death. When he tried this form of art he properly mistrusted his own powers. But he produced little in partnership with his contemporaries, and we can only except the "Watering-place" in the gallery of Vienna, where the landscape is enlivened with horses and cattle by Philip Wouvermans. Even Jan Steen, who was his son-in-law, only painted figures for one of his pictures, and it is probable that this piece was completed after van Goyen's death. More than 250 of van Goyen's pictures are known and accessible. Of this number little more than 70 are undated. None exist without the full name or monogram, and yet there is no painter whose hand it is easier to trace without the help of these adjuncts. An etcher, but a poor one, van Goyen has only bequeathed to us two very rare plates.

GOZLAN, LÉON (1806–1866), French novelist and playwriter, was born on the 1st of September 1806, at Marseilles. When he was still a boy, his father, who had made a large fortune as a ship-broker, met with a series of misfortunes, and Léon, before completing his education, had to go to sea in order to earn a living. In 1828 we find him in Paris, determined to run the risks of literary life. His townsman, Joseph Méry, who was then making himself famous by his political satires, introduced him to several newspapers, and Gozlan's brilliant articles in the *Figaro* did much harm to the already tottering government of Charles X. His first novel was *Les Mémoires d'un apothicaire* (1828), and this was followed by numberless others, among which may be mentioned *Washington Levert et Socrate Leblanc* (1838), *Le Notaire de Chantilly* (1836), *Aristide Froissart* (1843) (one of the most curious and celebrated of his productions), *Les Nuits du Père Lachaise* (1846), *Le Tapis vert* (1855), *La Folle du logis* (1857), *Les Emotions de Polydore Marasquin* (1857), &c. His best-known works for the theatre are—

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La Pluie et le beau temps (1861), and *Une Tempête dans un verre d'eau* (1850), two curtain-raisers which have kept the stage; *Le Lion empaillé* (1848), *La Queue du chien d'Alcibiade* (1849), *Louise de Nanteuil* (1854), *Le Gâteau des reines* (1855), *Les Paniers de la comtesse* (1852); and he adapted several of his own novels to the stage. Gozlan also wrote a romantic and picturesque description of the old manors and mansions of his country entitled *Les Châteaux de France* (2 vols., 1844), originally published (1836) as *Les Tourelles*, which has some archaeological value, and a biographical essay on Balzac (*Balzac chez lui*, 1862). He was made a member of the Legion of Honour in 1846, and in 1850 an officer of that order. Gozlan died on the 14th of September 1866, in Paris.

See also P. Audebrand, *Léon Gozlan* (1887).

GOZO (Gozzo), an island of the Maltese group in the Mediterranean Sea, second in size to Malta. It lies N.W. and 3½ m. from the nearest point of Malta, is of oval form, 8½ m. in length and 4½ m. in extreme breadth, and has an area of nearly 25 m. Its chief town, Victoria, formerly called Rabato (pop. in 1901, 5057) stands near the middle of the island on one of a cluster of steep conical hills, 3½ m. from the port of Migiarro Bay, on the south-east shore, below Fort Chambray. The character of the island is similar to that of Malta. The estimated population in 1907 was 21,911.

GOZZI, CARLO, Count (1722–1806), Italian dramatist, was descended from an old Venetian family, and was born at Venice in March 1722. Compelled by the embarrassed condition of his father's affairs to procure the means of self-support, he, at the age of sixteen, joined the army in Dalmatia; but three years afterwards he returned to Venice, where he soon made a reputation for himself as the wittiest member of the Granelleschi society, to which the publication of several satirical pieces had gained him admission. This society, nominally devoted to conviviality and wit, had also serious literary aims, and was especially zealous to preserve the Tuscan literature pure and untainted by foreign influences. The displacement of the old Italian comedy by the dramas of Pietro Chiari (1700–1788) and Goldoni, founded on French models, threatened defeat to all their efforts; and in 1757 Gozzi came to the rescue by publishing a satirical poem, *Tartana degli influssi per l'anno bissetile*, and in 1761 by his comedy, *Fiaba dell' amore delle tre melarancie*, a parody of the manner of the two obnoxious poets, founded on a fairy tale. For its representation he obtained the services of the Sacchi company of players, who, on account of the popularity of the comedies of Chiari and Goldoni—which afforded no scope for the display of their peculiar talents—had been left without employment; and as their satirical powers were thus sharpened by personal enmity, the play met with extraordinary success. Struck by the effect produced on the audience by the introduction of the supernatural or mythical element, which he had merely used as a convenient medium for his satirical purposes, Gozzi now produced a series of dramatic pieces based on fairy tales, which for a period obtained great popularity, but after the breaking up of the Sacchi company were completely disregarded. They have, however, obtained high praise from Goethe, Schlegel, Madame de Staël and Sismondi; and one of them, *Re Turandole*, was translated by Schiller. In his later years Gozzi set himself to the production of tragedies in which the comic element was largely introduced; but as this innovation proved unacceptable to the critics he had recourse to the Spanish drama, from which he obtained models for various pieces, which, however, met with only equivocal success. He died on the 4th of April 1806.

His collected works were published under his own superintendence, at Venice, in 1792, in 10 volumes; and his dramatic works, translated into German by Werthes, were published at Bern in 1795. See Gozzi's work, *Memorie inutili della vita di Carlo Gozzi* (3 vols., Venice, 1797), translated into French by Paul de Musset (1848), and into English by J. A. Symonds (1889); F. Horn, *Über Gozzis dramatische Poesie* (Venice, 1803); Gherardini, *Vita di Gasp. Gozzi* (1821); "Charles Gozzi," by Paul de Musset, in the *Revue des deux mondes* for 15th November 1844; Magrini, *Carlo Gozzi e la fiabe: saggi storici, biografici, e critici* (Cremona, 1876), and the same author's book on Gozzi's life and times (Benevento, 1883).

GOZZI, GASPARO, Count (1713–1786), eldest brother of Carlo Gozzi, was born on the 4th of December 1713. In 1739 he married the poetess Luise Bergalli, and she undertook the management of the theatre of Sant' Angelo, Venice, he supplying the performers with dramas chiefly translated from the French. The speculation proved unfortunate, but meantime he had attained a high reputation for his contributions to the *Gazzetta Veneta*, and he soon came to be known as one of the ablest critics and purest and most elegant stylists in Italy. For a considerable period he was censor of the press in Venice, and in 1774 he was appointed to reorganize the university system at Padua. He died at Padua on the 26th of December 1786.

His principal writings are *Osservatore Veneto periodico* (1761), on the model of the English *Spectator*, and distinguished by its high moral tone and its light and pleasant satire; *Lettere famigliari* (1755), a collection of short racy pieces in prose and verse, on subjects of general interest; *Sermoni*, poems in blank verse after the manner of Horace; *Il Mondo morale* (1760), a personification of human passions with inwoven dialogues in the style of Lucian; and *Giudizio degli antichi poeti sopra la moderna censura di Dante* (1755), a defence of the great poet against the attacks of Bettinelli. He also translated various works from the French and English, including Marmontel's *Tales* and Pope's *Essay on Criticism*. His collected works were published at Venice, 1794–1798, in 12 volumes, and several editions have appeared since.

GOZZOLI, BENOZZO, Italian painter, was born in Florence in 1424, or perhaps 1420, and in the early part of his career assisted Fra Angelico, whom he followed to Rome and worked with at Orvieto. In Rome he executed in Santa Maria in Aracoeli a fresco of "St Anthony and Two Angels." In 1449 he left Angelico, and went to Montefalco, near Foligno in Umbria. In S. Fortunato, near Montefalco, he painted a "Madonna and Child with Saints and Angels," and three other works. One of these, the altar-piece representing "St Thomas receiving the Girdle of the Virgin," is now in the Lateran Museum, and shows the affinity of Gozzoli's early style to Angelico's. He next painted in the monastery of S. Francesco, Montefalco, filling the choir with a triple course of subjects from the life of the saint, with various accessories, including heads of Dante, Petrarch and Giotto. This work was completed in 1452, and is still marked by the style of Angelico, crossed here and there with a more distinctly Giottesque influence. In the same church, in the chapel of St Jerome, is a fresco by Gozzoli of the Virgin and Saints, the Crucifixion and other subjects. He remained at Montefalco (with an interval at Viterbo) probably till 1456, employing Mesastris as assistant. Thence he went to Perugia, and painted in a church a "Virgin and Saints," now in the local academy, and soon afterwards to his native Florence, the headquarters of art. By the end of 1459 he had nearly finished his important labour in the chapel of the Palazzo Riccardi, the "Journey of the Magi to Bethlehem," and, in the tribune of this chapel, a composition of "Angels in a Paradise." His picture in the National Gallery, London, a "Virgin and Child with Saints," 1461, belongs also to the period of his Florentine sojourn. Another small picture in the same gallery, the "Rape of Helen," is of dubious authenticity. In 1464 Gozzoli left Florence for S. Gimignano, where he executed some extensive works; in the church of S. Agostino, a composition of St Sebastian protecting the City from the Plague of this same year, 1464; over the entire choir of the church, a triple course of scenes from the legends of St Augustine, from the time of his entering the school of Tegaste on to his burial, seventeen chief subjects, with some accessories; in the Pieve di S. Gimignano, the "Martyrdom of Sebastian," and other subjects, and some further works in the city and its vicinity. Here his style combined something of Lippo Lippi with its original elements, and he received co-operation from Giusto d'Andrea. He stayed in this city till 1467, and then began, in the Campo Santo of Pisa, from 1469, the vast series of mural paintings with which his name is specially identified. There are twenty-four subjects from the Old Testament, from the "Invention of Wine by Noah" to the "Visit of the Queen of Sheba to Solomon." He contracted to paint three subjects per year for about ten ducats each—a sum which may be regarded as equivalent to

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£100 at the present day. It appears, however, that this contract was not strictly adhered to, for the actual rate of painting was only three pictures in two years. Perhaps the great multitude of figures and accessories was accepted as a set-off against the slower rate of production. By January 1470 he had executed the fresco of "Noah and his Family,"—followed by the "Curse of Ham," the "Building of the Tower of Babel" (which contains portraits of Cosmo de' Medici, the young Lorenzo Politian and others), the "Destruction of Sodom," the "Victory of Abraham," the "Marriages of Rebecca and of Rachel," the "Life of Moses," &c. In the Cappella Ammannati, facing a gate of the Campo Santo, he painted also an "Adoration of the Magi," wherein appears a portrait of himself. All this enormous mass of work, in which Gozzoli was probably assisted by Zanobi Macchiavelli, was performed, in addition to several other pictures during his stay in Pisa (we need only specify the "Glory of St Thomas Aquinas," now in the Louvre), in sixteen years, lasting up to 1485. This is the latest date which can with certainty be assigned to any work from his hand, although he is known to have been alive up to 1498. In 1478 the Pisan authorities had given him, as a token of their regard, a tomb in the Campo Santo. He had likewise a house of his own in Pisa, and houses and land in Florence. In rectitude of life he is said to have been worthy of his first master, Fra Angelico.

The art of Gozzoli does not rival that of his greatest contemporaries either in elevation or in strength, but is pre-eminently attractive by its sense of what is rich, winning, lively and abundant in the aspects of men and things. His landscapes, thronged with birds and quadrupeds, especially dogs, are more varied, circumstantial and alluring than those of any predecessor; his compositions are crowded with figures, more characteristically true when happily and gracefully occupied than when the demands of the subject require tragic or dramatic intensity, or turmoil of action; his colour is bright, vivacious and festive. Gozzoli's genius was, on the whole, more versatile and assimilative than vigorously original; his drawing not free from considerable imperfections, especially in the extremities and articulations, and in the perspective of his gorgeously-schemed buildings. In fresco-painting he used the methods of tempera, and the decay of his works has been severe in proportion. Of his untiring industry the recital of his labours and the number of works produced are the most forcible attestation.

Vasari, Crowe and Cavalcaselle, and the other ordinary authorities, can be consulted as to the career of Gozzoli. A separate *Life* of him, by H. Stokes, was published in 1903 in Newnes's Art library. (W. M. R.)

GRAAFF REINET, a town of South Africa, 185 m. by rail N.W. by N. of Port Elizabeth. Pop. (1904) 10,983, of whom 4055 were whites. The town lies 2463 ft. above the sea and is built on the banks of the Sunday river, which rises a little farther north on the southern slopes of the Sneeuwberg, and here ramifies into several channels. The Dutch church is a handsome stone building with seating accommodation for 1500 people. The college is an educational centre of some importance; it was rebuilt in 1906. Graaff Reinet is a flourishing market for agricultural produce, the district being noted for its mohair industry, its orchards and vineyards.

The town was founded by the Cape Dutch in 1786, being named after the then governor of Cape Colony, C. J. van de Graaff, and his wife. In 1795 the burghers, smarting under the exactions of the Dutch East India Company proclaimed a republic. Similar action was taken by the burghers of Swellendam. Before the authorities at Cape Town could take decisive measures against the rebels, they were themselves compelled to capitulate to the British. The burghers having endeavoured, unsuccessfully, to get aid from a French warship at Algoa Bay surrendered to Colonel (afterwards General Sir) J. O. Vandeleur. In January 1799 Marthinus Prinsloo, the leader of the republicans in 1795, again rebelled, but surrendered in April following. Prinsloo and nineteen others were imprisoned in Cape Town castle. After trial, Prinsloo and another commandant were sentenced to death and others to banishment. The sentences were not carried out and the prisoners were released, March 1803, on the retrocession of the Cape to Holland. In 1801 there had been another revolt in Graaff Reinet, but owing to the conciliatory measures of General F. Dundas (acting governor of the Cape) peace was soon restored. It was this district, where a republican government in South Africa was first proclaimed, which furnished large numbers of the voortrekkers in 1835–1842. It remains a strong Dutch centre.

See J. C. Voight, *Fifty Years of the History of the Republic in South Africa 1795–1845*, vol. i. (London, 1899).

GRABBE, CHRISTIAN DIETRICH (1801–1836), German dramatist, was born at Detmold on the 11th of December 1801. Entering the university of Leipzig in 1823 as a student of law, he continued the reckless habits which he had begun at Detmold, and neglected his studies. Being introduced into literary circles, he conceived the idea of becoming an actor and wrote the drama *Herzog Theodor von Gothland* (1822). This, though showing considerable literary talent, lacks artistic form, and is morally repulsive. Ludwig Tieck, while encouraging the young author, pointed out its faults, and tried to reform Grabbe himself. In 1822 Grabbe removed to Berlin University, and in 1824 passed his advocate's examination. He now settled in his native town as a lawyer and in 1827 was appointed a *Militär-auditeur*. In 1833 he married, but in consequence of his drunken habits was dismissed from his office, and, separating from his wife, visited Düsseldorf, where he was kindly received by Karl Immermann. After a serious quarrel with the latter, he returned to Detmold, where, as a result of his excesses, he died on the 12th of September 1836.

Grabbe had real poetical gifts, and many of his dramas contain fine passages and a wealth of original ideas. They largely reflect his own life and character, and are characterized by cynicism and indelicacy. Their construction also is defective and little suited to the requirements of the stage. The boldly conceived *Don Juan und Faust* (1829) and the historical dramas *Friedrich Barbarossa* (1829), *Heinrich VI.* (1830), and *Napoleon oder die Hundert Tage* (1831), the last of which places the battle of Waterloo upon the stage, are his best works. Among others are the unfinished tragedies *Marius and Sulla* (continued by Erich Korn, Berlin, 1890); and *Hannibal* (1835, supplemented and edited by C. Spielmann, Halle, 1901); and the patriotic *Hermannsschlacht* or the battle between Arminius and Varus (posthumously published with a biographical notice, by E. Duller, 1838).

Grabbe's works have been edited by O. Blumenthal (4 vols., 1875), and by Grisebach (4 vols., 1902). For further notices of his life, see K. Ziegler, *Grabbes Leben und Charakter* (1855); O. Blumenthal, *Beiträge zur Kenntnis Grabbes* (1875); C. A. Piper, *Grabbe* (1898), and A. Ploch, *Grabbes Stellung in der deutschen Literatur* (1905).

GRABE, JOHN ERNEST (1666–1711), Anglican divine, was born on the 10th of July 1666, at Königsberg, where his father, Martin Sylvester Grabe, was professor of theology and history. In his theological studies Grabe succeeded in persuading himself of the schismatical character of the Reformation, and accordingly he presented to the consistory of Samland in Prussia a memorial in which he compared the position of the evangelical Protestant churches with that of the Novatians and other ancient schismatics. He had resolved to join the Church of Rome when a commission of Lutheran divines pointed out flaws in his written argument and called his attention to the English Church as apparently possessing that apostolic succession and manifesting that fidelity to ancient institutions which he desired. He came to England, settled in Oxford, was ordained in 1700, and became chaplain of Christ Church. His inclination was towards the party of the nonjurors. The learned labours to which the remainder of his life was devoted were rewarded with an Oxford degree and a royal pension. He died on the 3rd of November 1711, and in 1726 a monument was erected to him by Edward Harley, earl of Oxford, in Westminster Abbey. He was buried in St Pancras Church, London.

Some account of Grabe's life is given in R. Nelson's *Life of George Bull*, and by George Hickes in a discourse prefixed to the pamphlet against W. Whiston's *Collection of Testimonies against the True*

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Deity of the Son and of the Holy Ghost. His works, which show him to have been learned and laborious but somewhat deficient in critical acumen, include a *Spicilegium SS. Patrum et haereticorum* (1698–1699), which was designed to cover the first three centuries of the Christian church, but was not continued beyond the close of the second. A second edition of this work was published in 1714. He brought out an edition of Justin Martyr's *Apologia prima* (1700), of Irenaeus, *Adversus omnes haereses* (1702), of the Septuagint, and of Bishop Bull's Latin works (1703). His edition of the Septuagint was based on the *Codex Alexandrinus*; it appeared in 4 volumes (1707–1720), and was completed by Francis Lee and by George Wigan.

GRACCHUS, in ancient Rome, the name of a plebeian family of the Sempronian gens. Its most distinguished representatives were the famous tribunes of the people, Tiberius and Gaius Sempronius Gracchus, (4) and (5) below, usually called simply "the Gracchi."

1. Tiberius Sempronius Gracchus, consul in 238 B.C., carried on successful operations against the Ligurian mountaineers, and, at the conclusion of the Carthaginian mercenary war, was in command of the fleet which at the invitation of the insurgents took possession of the island of Sardinia.

2. Tiberius Sempronius Gracchus, probably the son of (1), distinguished himself during the second Punic war. Consul in 215, he defeated the Capuans who had entered into an alliance with Hannibal, and in 214 gained a signal success over Hanno near Beneventum, chiefly owing to the *volones* (slave-volunteers), to whom he had promised freedom in the event of victory. In 213 Gracchus was consul a second time and carried on the war in Lucania; in the following year, while advancing northward to reinforce the consuls in their attack on Capua, he was betrayed into the hands of the Carthaginian Mago by a Lucanian of rank, who had formerly supported the Roman cause and was connected with Gracchus himself by ties of hospitality. Gracchus fell fighting bravely; his body was sent to Hannibal, who accorded him a splendid burial.

3. Tiberius Sempronius Gracchus (*c.* 210–151 B.C.), father of the tribunes, and husband of Cornelia, the daughter of the elder Scipio Africanus, was possibly the son of a Publius Sempronius Gracchus who was tribune in 189. Although a determined political opponent of the two Scipios (Asiaticus and Africanus), as tribune in 187 he interfered on their behalf when they were accused of having accepted bribes from the king of Syria after the war. In 185 he was a member of the commission sent to Macedonia to investigate the complaints made by Eumenes II. of Pergamum against Philip V. of Macedon. In his curule aedileship (182) he celebrated the games on so magnificent a scale that the burdens imposed upon the Italian and extra-Italian communities led to the official interference of the senate. In 181 he went as praetor to Hither Spain, and, after gaining signal successes in the field, applied himself to the pacification of the country. His strict sense of justice and sympathetic attitude won the respect and affection of the inhabitants; the land had rest for a quarter of a century. When consul in 177, he was occupied in putting down a revolt in Sardinia, and brought back so many prisoners that *Sardi venales* (Sardinians for sale) became a proverbial expression for a drug in the market. In 169 Gracchus was censor, and both he and his colleague (C. Claudius Pulcher) showed themselves determined opponents of the capitalists. They deeply offended the equestrian order by forbidding any contractor who had obtained contracts under the previous censors to make fresh offers. Gracchus stringently enforced the limitation of the freedmen to the four city tribes, which completely destroyed their influence in the comitia. In 165 and 161 he went as ambassador to several Asiatic princes, with whom he established friendly relations. Amongst the places visited by him was Rhodes, where he delivered a speech in Greek, which he afterwards published. In 163 he was again consul.

4. Tiberius Sempronius Gracchus (163–133 B.C.), son of (3), was the elder of the two great reformers. He and his brother were brought up by their mother Cornelia, assisted by the rhetorician Diophanes of Mytilene and the Stoic Blossius of Cumae. In 147 he served under his brother-in-law the younger Scipio in Africa during the last Punic war, and was the first to mount the walls in the attack on Carthage. When quaestor in 137, he accompanied the consul C. Hostilius Mancinus to Spain. During the Numantine war the Roman army was saved from annihilation only by the efforts of Tiberius, with whom alone the Numantines consented to treat, out of respect for the memory of his father. The senate refused to ratify the agreement; Mancinus was handed over to the enemy as a sign that it was annulled, and only personal popularity saved Tiberius himself from punishment. In 133 he was tribune, and championed the impoverished farmer class and the lower orders. His proposals (see Agrarian Laws) met with violent opposition, and were not carried until he had, illegally and unconstitutionally, secured the deposition of his fellow-tribune, M. Octavius, who had been persuaded by the optimates to veto them. The senate put every obstacle in the way of the three commissioners appointed to carry out the provisions of the law, and Tiberius, in view of the bitter enmity he had aroused, saw that it was necessary to strengthen his hold on the popular favour. The legacy to the Roman people of the kingdom and treasures of Attalus III. of Pergamum gave him an opportunity. He proposed that the money realized by the sale of the treasures should be divided, for the purchase of implements and stock, amongst those to whom assignments of land had been made under the new law. He is also said to have brought forward measures for shortening the period of military service, for extending the right of appeal from the *judices* to the people, for abolishing the exclusive privilege of the senators to act as jurymen, and even for admitting the Italian allies to citizenship. To strengthen his position further, Tiberius offered himself for re-election as tribune for the following year. The senate declared that it was illegal to hold this office for two consecutive years; but Tiberius treated this objection with contempt. To win the sympathy of the people, he appeared in mourning, and appealed for protection for his wife and children, and whenever he left his house he was accompanied by a bodyguard of 3000 men, chiefly consisting of the city rabble. The meeting of the tribes for the election of tribunes broke up in disorder on two successive days, without any result being attained, although on both occasions the first divisions voted in favour of Tiberius. A rumour reached the senate that he was aiming at supreme power, that he had touched his head with his hand, a sign that he was asking for a crown. An appeal to the consul P. Mucius Scaevola to order him to be put to death at once having failed, P. Scipio Nasica exclaimed that Scaevola was acting treacherously towards the state, and called upon those who agreed with him to take up arms and follow him. During the riot that followed, Tiberius attempted to escape, but stumbled on the slope of the Capitol and was beaten to death with the end of a bench. At night his body, with those of 300 others, was thrown into the Tiber. The aristocracy boldly assumed the responsibility for what had occurred, and set up a commission to inquire into the case of the partisans of Tiberius, many of whom were banished and others put to death. Even the moderate Scaevola subsequently maintained that Nasica was justified in his action; and it was reported that Scipio, when he heard at Numantia of his brother-in-law's death, repeated the line of Homer—"So perish all who do the like again."

See Livy, *Epit.* 58; Appian, *Bell. civ.* i. 9-17; Plutarch, *Tiberius Gracchus*; Vell. Pat. ii. 2, 3.

5. Gaius Sempronius Gracchus (153–121 B.C.), younger brother of (4), was a man of greater abilities, bolder and more passionate, although possessed of considerable powers of self-control, and a vigorous and impressive orator. When twenty years of age he was appointed one of the commissioners to carry out the distribution of land under the provisions of his brother's agrarian law. At the time of Tiberius's death, Gaius was serving under his brother-in-law Scipio in Spain, but probably returned to Rome in the following year (132). In 131 he supported the bill of C. Papirius Carbo, the object of which was to make it legal for a tribune to offer himself as candidate for the office in two consecutive years, and thus to remove

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one of the chief obstacles that had hampered Tiberius. The bill was then rejected, but appears to have subsequently passed in a modified form, as Gaius himself was re-elected without any disturbance. Possibly, however, his re-election was illegal, and he had only succeeded where his brother had failed. For the next few years nothing is heard of Gaius. Public opinion pointed him out as the man to avenge his brother's death and carry out his plans, and the aristocratic party, warned by the example of Tiberius, were anxious to keep him away from Rome. In 126 Gaius accompanied the consul L. Aurelius Orestes as quaestor to Sardinia, then in a state of revolt. Here he made himself so popular that the senate in alarm prolonged the command of Orestes, in order that Gaius might be obliged to remain there in his capacity of quaestor. But he returned to Rome without the permission of the senate, and, when called to account by the censors, defended himself so successfully that he was acquitted of having acted illegally. The disappointed aristocrats then brought him to trial on the charge of being implicated in the revolt of Fregellae, and in other ways unsuccessfully endeavoured to undermine his influence. Gaius then decided to act; against the wishes of his mother he became a candidate for the tribuneship, and, in spite of the determined opposition of the aristocracy, he was elected for the year 123, although only fourth on the list. The legislative proposals[1] brought forward by him had for their object:—the punishment of his brother's enemies; the relief of distress and the attachment to himself of the city populace; the diminution of the power of the senate and the increase of that of the *equites*; the amelioration of the political status of the Italians and provincials.

A law was passed that no Roman citizen should be tried in a matter affecting his life or political status unless the people had previously given its assent. This was specially aimed at Popillius Laenas, who had taken an active part in the prosecution of the adherents of Tiberius. Another law enacted that any magistrate who had been deprived of office by decree of the people should be incapacitated from holding office again. This was directed against M. Octavius, who had been illegally deprived of his tribunate through Tiberius. This unfair and vindictive measure was withdrawn at the earnest request of Cornelia.

He revived his brother's agrarian law, which, although it had not been repealed, had fallen into abeyance. By his *Lex Frumentaria* every citizen resident in Rome was entitled to a certain amount of corn at about half the usual price; as the distribution only applied to those living in the capital, the natural result was that the poorer country citizens flocked into Rome and swelled the number of Gaius's supporters. No citizen was to be obliged to serve in the army before the commencement of his eighteenth year, and his military outfit was to be supplied by the state, instead of being deducted from his pay. Gaius also proposed the establishment of colonies in Italy (at Tarentum and Capua), and sent out to the site of Carthage 6000 colonists to found the new city of Junonia, the inhabitants of which were to possess the rights of Roman citizens; this was the first attempt at over-sea colonization. A new system of roads was constructed which afforded easier access to Rome. Having thus gained over the city proletariat, in order to secure a majority in the comitia by its aid, Gaius did away with the system of voting in the comitia centuriata, whereby the five property classes in each tribe gave their votes one after another, and introduced promiscuous voting in an order fixed by lot.

The judices in the standing commissions for the trial of particular offences (the most important of which was that dealing with the trial of provincial magistrates for extortion, *de repetundis*) were in future to be chosen from the equites (*q.v.*), not as hitherto from the senate. The taxes of the new province of Asia were to be let out by the censors to Roman publicani (who belonged to the equestrian order), who paid down a lump sum for the right of collecting them. It is obvious that this afforded the equites extensive opportunities for money-making and extortion, while the alteration in the appointment of the judices gave them the same practical immunity and perpetuated the old abuses, with the difference that it was no longer senators, but equites, who could look forward with confidence to being leniently dealt with by men belonging to their own order. Gaius also expected that this moneyed aristocracy, which had taken the part of the senate against Tiberius, would now support him against it. It was enacted that the provinces to be assigned to the consuls, should be determined before, instead of after their election; and the consuls themselves had to settle, by lot or other arrangement, which province each of them would take.[2]

These measures raised Gaius to the height of his popularity, and during the year of his first tribuneship he may be considered the absolute ruler of Rome. He was chosen tribune for the second time for the year 122. To this period is probably to be assigned his proposal that the franchise should be given to all the Latin communities and that the status of the Latins should be conferred upon the Italian allies. In 125 M. Fulvius Flaccus had brought forward a similar measure, but he was got out of the way by the senate, who sent him to fight in Gaul. This proposal, more statesmanlike than any of the others, was naturally opposed by the aristocratic party, and lessened Gaius's popularity amongst his own supporters, who viewed with disfavour the prospect of an increase in the number of Roman citizens. The senate put up M. Livius Drusus to outbid him, and his absence from Rome while superintending the organization of the newly-founded colony, Junonia-Carthago, was taken advantage of by his enemies to weaken his influence. On his return he found his popularity diminished. He failed to secure the tribuneship for the third time, and his bitter enemy L. Opimius was elected consul. The latter at once decided to propose the abandonment of the new colony, which was to occupy the site cursed by Scipio, while its foundation had been attended by unmistakable manifestations of the wrath of the gods. On the day when the matter was to be put to the vote, a lictor named Antyllius, who had insulted the supporters of Gaius, was stabbed to death. This gave his opponents the desired opportunity. Gaius was declared a public enemy, and the consuls were invested with dictatorial powers. The Gracchans, who had taken up their position in the temple of Diana on the Aventine, offered little resistance to the attack ordered by Opimius. Gaius managed to escape across the Tiber, where his dead body was found on the following day in the grove of Furrina by the side of that of a slave, who had probably slain his master and then himself. The property of the Gracchans was confiscated, and a temple of Concord erected in the Forum from the proceeds. Beneath the inscription recording the occasion on which the temple had been built some one during the night wrote the words: "The work of Discord makes the temple of Concord."

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GRACE, WILLIAM GILBERT (1848–), English cricketer, was born at Downend, Gloucestershire, on the 18th of July 1848. He found himself in an atmosphere charged with cricket, his father (Henry Mills Grace) and his uncle (Alfred Pocock) being as enthusiastic over the game as his elder brothers, Henry, Alfred and Edward Mills; indeed, in E. M. Grace the family name first became famous. A younger brother, George Frederick, also added to the cricket reputation of the family. "W. G." witnessed his first great match when he was hardly six years old, the occasion being a game between W. Clarke's All-England Eleven and twenty-two of West Gloucestershire. He was endowed by nature with a splendid physique as well as with powers of self-restraint and determination. At the acme of his career he stood full 6 ft. 2 in., being powerfully proportioned, loose yet strong of limb. A non-smoker, and very moderate

[1] These measures cannot be arranged in any definite chronological order, nor can it be decided which belong to his first, which to his second tribuneship. See W. Warde Fowler in *Eng. Hist. Review*, 1905, pp. 209 sqq., 417 sqq.

[2] It is suggested by W. Warde Fowler that Gracchus proposed to add a certain number of *equites* to the senate, thereby increasing it to 900, but the plan was never carried out.

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in all matters, he kept himself in condition all the year round, shooting, hunting or running with the beagles as soon as the cricket season was over. He was also a fine runner, 440 yds. over 20 hurdles being his best distance; and it may be quoted as proof of his stamina that on the 30th of July 1866 he scored 224 not out for England v. Surrey, and two days later won a race in the National and Olympian Association meeting at the Crystal Palace. The title of "champion" was well earned by one who for thirty-six years (1865–1900 inclusive) was actively engaged in first-class cricket. In each of these years he was invited to represent the Gentlemen in their matches against the Players, and, when an Australian eleven visited England, to play for the mother country. As late as 1899 he played in the first of the five international contests; in 1900 he played against the players at the Oval, scoring 58 and 3. At fifty-three he scored nearly 1300 runs in first-class cricket, made 100 runs and over on three different occasions and could claim an average of 42 runs. Moreover, his greatest triumphs were achieved when only the very best cricket grounds received serious attention; when, as some consider, bowling was maintained at a higher standard and when all hits had to be run out. He, with his two brothers, E. M. and G. F., assisted by some fine amateurs, made Gloucestershire in one season a first-class county; and it was he who first enabled the amateurs of England to meet the paid players on equal terms and to beat them. There was hardly a "record" connected with the game which did not stand to his credit. Grace was one of the finest fieldsmen in England, in his earlier days generally taking long-leg and cover-point, in later times generally standing point. He was, at his best, a fine thrower, fast runner and safe "catch." As a bowler he was long in the first flight, originally bowling fast, but in later times adopting a slower and more tricky style, frequently very effective. By profession he was a medical man. In later years he became secretary and manager of the London County Ground. He was married in 1873 to Miss Agnes Day, and one of his sons played for two years in the Cambridge eleven. He was the recipient of two national testimonials: the first, amounting to £1300, being presented to him in the form of a clock and a cheque at Lord's ground by Lord Charles Russell on the 22nd of July 1879; the second, collected by the M.C.C., the county of Gloucestershire, the *Daily Telegraph* and the *Sportsman*, amounted to about £10,000, and was presented to him in 1896. He visited Australia in 1873–1874 (captain), and in 1891–1892 with Lord Sheffield's Eleven (captain); the United States and Canada in 1872, with R. A. Fitzgerald's team.

Dr Grace played his first great match in 1863, when, being only fifteen years of age, he scored 32 against the All-England Eleven and the bowling of Jackson, Tarrant and Tinley; but the scores which first made his name prominent were made in 1864, viz. 170 and 56 not out for the South Wales Club against the Gentlemen of Sussex. It was in 1865 that he first took an active part in first-class cricket, being then 6 ft. in height, and 11 stone in weight, and playing twice for the Gentlemen v. the Players, but his selection was mainly due to his bowling powers, the best exposition of which was his aggregate of 13 wickets for 84 runs for the Gentlemen of the South v. the Players of the South. His highest score was 400 not out, made in July 1876 against twenty-two of Grimsby; but on three occasions he was twice in the innings scoring in nice time against odds, a fate that never befell him in important cricket. In first-class matches his highest score was 344, made for the M.C.C. v. Kent at Canterbury, in August 1876; two days later he made 177 for Gloucestershire v. Notts, and two days after this 318 not out for Gloucestershire v. Yorkshire, the two last-named opposing counties being possessed of exceptionally strong bowling; thus in three consecutive innings Grace scored 839 runs, and was only got out twice. His 344 was the third highest individual score made in a big match in England up to the end of 1901. He also scored 301 for Gloucestershire v. Sussex at Bristol, in August 1896. He made over 200 runs on ten occasions, the most notable perhaps being in 1871, when he performed the feat twice, each time in benefit matches, and each time in the second innings, having been each time got out in the first over of the first innings. He scored over 100 runs on 121 occasions, the hundredth score being 288, made at Bristol for Gloucestershire v. Somersetshire in 1895. He made every figure from 0 to 100, on one occasion "closing" the innings when he had made 93, the only total he had never made between these limits. In 1871 he made ten "centuries," ranging from 268 to 116. In the matches between the Gentlemen and Players he scored "three figures" fifteen times, and at every place where these matches have been played. He made over 100 in each of his "first appearances" at Oxford and Cambridge. Three times he made over 100 in each innings of the same match, viz. at Canterbury, in 1868, for South v. North of the Thames, 130 and 102 not out; at Clifton, in 1887, for Gloucestershire v. Kent, 101 and 103 not out; and at Clifton, in 1888, for Gloucestershire v. Yorkshire, 148 and 153. In 1869, playing at the Oval for the Gentlemen of the South v. the Players of the South, Grace and B. B. Cooper put on 283 runs for the first wicket, Grace scoring 180 and Cooper 101. In 1886 Grace and Scotton put on 170 runs for the first wicket of England v. Australia; this occurred at the Oval in August, and Grace's total score was 170. In consecutive innings against the Players from 1871 to 1873 he scored 217, 77 and 112, 117, 163, 158 and 70. He only twice scored over 100 in a big match in Australia, nor did he ever make 200 at Lord's, his highest being 196 for the M.C.C. v. Cambridge University in 1894. His highest aggregates were 2739 (1871), 2622 (1876), 2346 (1895), 2139 (1873), 2135 (1896) and 2062 (1887). He scored three successive centuries in first-class cricket in 1871, 1872, 1873, 1874 and 1876. Playing against Kent at Gravesend in 1895, he was batting, bowling or fielding during the whole time the game was in progress, his scores being 257 and 73 not out. He scored over 1000 runs and took over 100 wickets in seven different seasons, viz. in 1874, 1665 runs and 129 wickets; in 1875, 1498 runs, 192 wickets; in 1876, 2622 runs, 124 wickets; in 1877, 1474 runs, 179 wickets; in 1878, 1151 runs, 153 wickets; in 1885, 1688 runs, 118 wickets; in 1886, 1846 runs, 122 wickets. He never captured 200 wickets in a season, his highest record being 192 in 1875. Playing against Oxford University in 1886, he took all the wickets in both innings, at a cost of 49 runs. In 1895 he not only made his hundredth century, but actually scored 1000 runs in the month of May alone, his chief scores in that month being 103, 288, 256, 73 and 169, he being then forty-seven years old. He also made during that year scores of 125, 119, 118, 104 and 103 not out, his aggregate for the year being 2346 and his average 51; his innings of 118 was made against the Players (at Lord's), the chief bowlers being Richardson, Mold, Peel and Attewell; he scored level with his partner, E. Stoddart (his junior by fifteen years), the pair making 151 before a wicket fell, Grace making in all 118 out of 241. This may fairly be considered one of his most wonderful years. In 1898 the match between Gentlemen v. Players was, as a special compliment, arranged by the M.C.C. committee to take place on his birthday, and he celebrated the event by scoring 43 and 31 not out, though handicapped by lameness and an injured hand. In twenty-six different seasons he scored over 1000 runs, in three of these years being the only man to do so and five times being one out of two.

During the thirty-six years up to and including 1900 he scored nearly 51,000 runs, with an average of 43; and in bowling he took more than 2800 wickets, at an average cost of about 20 runs per wicket. He made his highest aggregate (2739 runs) and had his highest average (78) in 1871; his average for the decade 1868–1877 was 57 runs. His style as a batsman was more commanding than graceful, but as to its soundness and efficacy there were never two opinions: the severest criticism ever passed upon his powers was to the effect that he did not play slow bowling quite as well as fast.

(W. J. F.)

GRACE (Fr. *grâce*, Lat. *gratia*, from *gratus*, beloved, pleasing; formed from the root *cra-*, Gr. χαρ-, cf. χαίρω, χάρμα, χάρις), a word of many shades of meaning, but always connoting the idea of favour, whether that in which one stands to others or that which one shows to others. The *New English Dictionary* groups the meanings of the word under three main heads: (1) Pleasing quality, gracefulness, (2) favour, goodwill, (3) gratitude, thanks.

It is in the second general sense of "favour bestowed" that the word has its most important connotations. In this sense it means something given by superior authority as a concession made of favour and goodwill, not as an obligation or of right. Thus, a concession may be made by a sovereign or other public authority "by way of grace." Previous to the Revolution of 1688 such concessions on the part of the crown were known in constitutional law as "Graces." "Letters of Grace" (*gratiae, gratiosa rescripta*) is the name given to papal rescripts granting special privileges, indulgences, exemptions and the like. In the language of the universities the word still survives in a shadow of this sense. The word "grace" was originally a dispensation granted by the congregation of the university, or by one of the faculties, from some statutable conditions required for a degree. In the English universities these conditions ceased to be enforced, and the "grace" thus became an essential preliminary to any degree; so that the word has acquired the meaning of (*a*) the licence granted by congregation to take a

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degree, (*b*) other decrees of the governing body (originally dispensations from statutes), all such degrees being called "graces" at Cambridge, (*c*) the permission which a candidate for a degree must obtain from his college or hall.

To this general sense of exceptional favour belong the uses of the word in such phrases as "do me this grace," "to be in some one's good graces" and certain meanings of "the grace of God." The style "by the grace of God," borne by the king of Great Britain and Ireland among other sovereigns, though, as implying the principle of "legitimacy," it has been since the Revolution sometimes qualified on the continent by the addition of "and the will of the people," means in effect no more than the "by Divine Providence," which is the style borne by archbishops. To the same general sense of exceptional favour belong the phrases implying the concession of a right to delay in fulfilling certain obligations, *e.g.* "a fortnight's grace." In law the "days of grace" are the period allowed for the payment of a bill of exchange, after the term for which it has been drawn (in England three days), or for the payment of an insurance premium, &c. In religious language the "Day of Grace" is the period still open to the sinner in which to repent. In the sense of clemency or mercy, too, "grace" is still, though rarely used: "an Act of Grace" is a formal pardon or a free and general pardon granted by act of parliament. Since to grant favours is the prerogative of the great, "Your Grace," "His Grace," &c., became dutiful paraphrases for the simple "you" and "he." Formerly used in the royal address ("the King's Grace," &c.), the style is in England now confined to dukes and archbishops, though the style of "his most gracious majesty" is still used. In Germany the equivalent, *Euer Gnaden*, is the style of princes who are not *Durchlaucht* (*i.e.* Serene Highness), and is often used as a polite address to any superior.

In the language of theology, though in the English Bible the word is used in several of the above senses, "grace" (Gr. χάρις) has special meanings. Above all, it signifies the spontaneous, unmerited activity of the Divine Love in the salvation of sinners, and the Divine influence operating in man for his regeneration and sanctification. Those thus regenerated and sanctified are said to be in a "state of grace." In the New Testament grace is the forgiving mercy of God, as opposed to any human merit (Rom. xi. 6; Eph. ii. 5; Col. i. 6, &c.); it is applied also to certain gifts of God freely bestowed, *e.g.* miracles, tongues, &c. (Rom. xv. 15; 1 Cor. xv. 10; Eph. iii. 8, &c.), to the Christian virtues, gifts of God also, *e.g.* charity, holiness, &c. (2 Cor. viii. 7; 2 Pet. iii. 18). It is also used of the Gospel generally, as opposed to the Law (John i. 17; Rom. vi. 14; 1 Pet. v. 12, &c.); connected with this is the use of the term "year of grace" for a year of the Christian era.

The word "grace" is the central subject of three great theological controversies: (1) that of the nature of human depravity and regeneration (see PELAGIUS), (2) that of the relation between grace and free-will (see CALVIN, JOHN, and ARMINIUS, JACOBUS), (3) that of the "means of grace" between Catholics and Protestants, *i.e.* whether the efficacy of the sacraments as channels of the Divine grace is *ex opere operato* or dependent on the faith of the recipient.

In the third general sense, of thanks for favours bestowed, "grace" survives as the name for the thanksgiving before or after meals. The word was originally used in the plural, and "to do, give, render, yield graces" was said, in the general sense of the French *rendre grâces* or Latin *gratias agere*, of any giving thanks. The close, and finally exclusive, association of the phrase "to say grace" with thanksgiving at meals was possibly due to the formula "Gratias Deo agamus" ("let us give thanks to God") with which the ceremony began in monastic refectories. The custom of saying grace, which obtained in pre-Christian times among the Jews, Greeks and Romans, and was adopted universally by Christian peoples, is probably less widespread in private houses than it used to be. It is, however, still maintained at public dinners and also in schools, colleges and institutions generally. Such graces are generally in Latin and of great antiquity: they are sometimes short, *e.g.* "Laus Deo," "Benedictus benedicat," and sometimes, as at the Oxford and Cambridge colleges, of considerable length. In some countries grace has sunk to a polite formula; in Germany, *e.g.* it is usual before and after meals to bow to one's neighbours and say "Gesegnete Malzeit!" (May your meal be blessed), a phrase often reduced in practice to "Malzeit" simply.

GRACES, THE, (Gr. Χάριτες, Lat. *Gratiae*), in Greek mythology, the personification of grace and charm, both in nature and in moral action. The transition from a single goddess, Charis, to a number or group of Charites, is marked in Homer. In the *Iliad* one Charis is the wife of Hephaestus, another the promised wife of Sleep, while the plural Charites often occurs. The Charites are usually described as three in number—Aglaia (brightness), Euphrosyne (joyfulness), Thalia (bloom)—daughters of Zeus and Hera (or Eurynome, daughter of Oceanus), or of Helios and Aegle; in Sparta, however, only two were known, Cleta (noise) and Phaënna (light), as at Athens Auxo (increase) and Hegemone (queen). They are the friends of the Muses, with whom they live on Mount Olympus, and the companions of Aphrodite, of Peitho, the goddess of persuasion, and of Hermes, the god of eloquence, to each of whom charm is an indispensable adjunct. The need of their assistance to the artist is indicated by the union of Hephaestus and Charis. The most ancient seat of their cult was Orchomenus in Boeotia, where their oldest images, in the form of stones fallen from heaven, were set up in their temple. Their worship was said to have been instituted by Eteocles, whose three daughters fell into a well while dancing in their honour. At Orchomenus nightly dances took place, and the festival Charitesia, accompanied by musical contests, was celebrated; in Paros their worship was celebrated without music or garlands, since it was there that Minos, while sacrificing to the Charites, received the news of the death of his son Androgeus; at Messene they were revered together with the Eumenides; at Athens, their rites, kept secret from the profane, were held at the entrance to the Acropolis. It was by Auxo, Hegemone and Agraulos, the daughter of Cecrops, that young Athenians, on first receiving their spear and shield, took the oath to defend their country. In works of art the Charites were represented in early times as beautiful maidens of slender form, hand in hand or embracing one another and wearing drapery; later, the conception predominated of three naked figures gracefully intertwined. Their attributes were the myrtle, the rose and musical instruments. In Rome the Graces were never the objects of special religious reverence, but were described and represented by poets and artists in accordance with Greek models.

See F. H. Krause, *Musen, Gratien, Horen, und Nymphen* (1871), and the articles by Stoll and Furtwängler in Roscher's *Lexikon der Mythologie*, and by S. Gsell in Daremberg and Saglio's *Dictionnaire des antiquités*, with the bibliography.

GRACIÁN Y MORALES, BALTASAR (1601–1658), Spanish prose writer, was born at Calatayud (Aragon) on the 8th of January 1601. Little is known of his personal history except that on May 14, 1619, he entered the Society of Jesus, and that ultimately he became rector of the Jesuit college at Tarazona, where he died on the 6th of December, 1658. His principal works are *El Héroe* (1630), which describes in apophthegmatic phrases the qualities of the ideal man; the *Arte de ingenio, tratado de la Agudeza* (1642), republished six years afterwards under the title of *Agudeza, y arte de ingenio* (1648), a system of rhetoric in which the principles of *conceptismo* as opposed to *culteranismo* are inculcated; *El Discreto* (1645), a delineation of the typical courtier; *El Oráculo manual y arte de prudencia* (1647), a system of rules for the conduct of life; and *El Criticón* (1651–1653–1657), an ingenious philosophical allegory of human existence. The only publication which bears Gracián's name is *El Comulgatorio* (1655); his more important books were issued under the pseudonym of Lorenzo Gracián (possibly a brother of the writer) or under the anagram of Gracian de Marlones. Gracián was punished for publishing without his superior's permission *El Criticón* (in which Defoe is alleged to have found the germ of *Robinson Crusoe*); but no objection was taken to

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its substance. He has been excessively praised by Schopenhauer, whose appreciation of the author induced him to translate the *Oráculo manual*, and he has been unduly depreciated by Ticknor and others. He is an acute thinker and observer, misled by his systematic misanthropy and by his fantastic literary theories.

See Karl Borinski, *Baltasar Gracián und die Hofliteratur in Deutschland* (Halle, 1894); Benedetto Croce, *I Trattatisti italiani del "concettismo" e Baltasar Gracián* (Napoli, 1899); Narciso José Liñán y Heredia, *Baltasar Gracián* (Madrid, 1902). Schopenhauer and Joseph Jacobs have respectively translated the *Oráculo manual* into German and English.

GRACKLE (Lat. *Graculus* or *Graculus*), a word much used in ornithology, generally in a vague sense, though restricted to members of the families *Sturnidae* belonging to the Old World and *Icteridae* belonging to the New. Of the former those to which it has been most commonly applied are the species known as mynas, mainas, and minors of India and the adjacent countries, and especially the *Gracula religiosa* of Linnaeus, who, according to Jerdon and others, was probably led to confer this epithet upon it by confounding it with the *Sturnus* or *Acridotheres tristis*,[1] which is regarded by the Hindus as sacred to Ram Deo, one of their deities, while the true *Gracula religiosa* does not seem to be anywhere held in veneration. This last is about 10 in.

Gracula religiosa.

in length, clothed in a plumage of glossy black, with purple and green reflections, and a conspicuous patch of white on the quill-feathers of the wings. The bill is orange and the legs yellow, but the bird's most characteristic feature is afforded by the curious wattles of bright yellow, which, beginning behind the eyes, run backwards in form of a lappet on each side, and then return in a narrow stripe to the top of the head. Beneath each eye also is a bare patch of the same colour. This species is common in southern India, and is represented farther to the north, in Ceylon, Burma, and some of the Malay Islands by cognate forms. They are all frugivorous, and, being easily tamed and learning to pronounce words very distinctly, are favourite cage-birds.[2]

In America the name Grackle has been applied to several species of the genera *Scolecophagus* and *Quiscalus*, though these are more commonly called in the United States and Canada "blackbirds," and some of them "boat-tails." They all belong to the family *Icteridae*. The best known of these are the rusty grackle, *S. ferrugineus*, which is found in almost the whole of North America, and *Q. purpureus*, the purple grackle or crow-blackbird, of more limited range, for though abundant in most parts to the east of the Rocky Mountains, it seems not to appear on the Pacific side. There is also Brewer's or the blue-headed grackle, *S. cyanocephalus*, which has a more western range, not occurring to the eastward of Kansas and Minnesota. A fourth species, *Q. major*, inhabits the Atlantic States as far north as North Carolina. All these birds are of exceedingly omnivorous habit, and though destroying large numbers of pernicious insects are in many places held in bad repute from the mischief they do to the corn-crops. (A. N.)

[1] By some writers the birds of the genera *Acridotheres* and *Temenuchus* are considered to be the true mynas, and the species of *Gracula* are called "hill mynas" by way of distinction.

[2] For a valuable monograph on the various species of *Gracula* and its allies see Professor Schlegel's "Bijdrage tot de Kennis von het Geschlacht Beo" (*Nederlandsch Tijdschrift voor de Dierkunde* i. 1-9).

GRADISCA, a town of Austria, in the province of Görz and Gradisca, 10 m. S.W. of Görz by rail. Pop. (1900) 3843, mostly Italians. It is situated on the right bank of the Isonzo and was formerly a strongly fortified place. Its principal industry is silk spinning. Gradisca originally formed part of the margraviate of Friuli, came under the patriarchate of Aquileia in 1028, and in 1420 to Venice. Between 1471 and 1481 Gradisca was fortified by the Venetians, but in 1511 they surrendered it to the emperor Maximilian I. In 1647 Gradisca and its territory, including Aquileia and forty-three smaller places, were erected into a separate countship in favour of Johann Anton von Eggenberg, duke of Krumau. On the extinction of his line in 1717, it reverted to Austria, and was completely incorporated with Görz in 1754. The name was revived by the constitution of 1861, which established the crownland of Görz and Gradisca.

GRADO, a town of northern Spain, in the province of Oviedo; 11 m. W. by N. of the city of Oviedo, on the river Cubia, a left-hand tributary of the Nalon. Pop. (1900) 17,125. Grado is built in the midst of a mountainous, well-wooded and fertile region. It has some trade in timber, live stock, cider and agricultural produce. The nearest railway station is that of the Fabrica de Trubia, a royal cannon-foundry and small-arms factory, 5 m. S.E.

GRADUAL (Med. Lat. *gradualis*, of or belonging to steps or degrees; *gradus*, step), advancing or taking place by degrees or step by step; hence used of a slow progress or a gentle declivity or slope, opposed to steep or precipitous. As a substantive, "gradual" (Med. Lat. *graduale* or *gradale*) is used of a service book or antiphonal of the Roman Catholic Church containing certain antiphons, called "graduals," sung at the service of the Mass after the reading or singing of the Epistle. This antiphon received the name either because it was sung on the steps of the altar or while the deacon was mounting the steps of the ambo for the reading or singing of the Gospel. For the so-called Gradual Psalms, CXX.-CXXXIV., the "songs of degrees," LXX. ᾠδὴ ἀνὰ βαθμῶν, see PSALMS, BOOK OF.

GRADUATE (Med. Lat. *graduare*, to admit to an academical degree, *gradus*), in Great Britain a verb now only used in the academical sense intransitively, *i.e.* "to take or proceed to a university degree," and figuratively of acquiring knowledge of, or proficiency in, anything. The original transitive sense of "to confer or admit to a degree" is, however, still preserved in America, where the word is, moreover, not strictly confined to university degrees, but is used also of those successfully completing a course of study at any educational establishment. As a substantive, a "graduate" (Med. Lat. *graduatus*) is one who has taken a degree in a university. Those who have matriculated at a university, but not yet taken a degree, are known as "undergraduates." The word "student," used of undergraduates *e.g.* in Scottish universities, is never applied generally to those of the English and Irish universities. At Oxford the only "students" are the "senior students" (*i.e.* fellows) and "junior students" (*i.e.* undergraduates on the foundation, or "scholars") of Christ Church. The verb "to graduate" is also used of dividing anything into degrees or parts in accordance with a given scale. For the scientific application see GRADUATION below. It may also mean "to arrange in gradations" or "to adjust or apportion according to a given scale." Thus by "a graduated income-tax" is meant the system by which the percentage paid differs according to the amount of income on a pre-arranged scale.

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GRADUATION (see also GRADUATE), the art of dividing straight scales, circular arcs or whole circumferences into any required number of equal parts. It is the most important and difficult part of the work of the mathematical instrument maker, and is required in the construction of most physical, astronomical, nautical and surveying instruments.

The art was first practised by clockmakers for cutting the teeth of their wheels at regular intervals; but so long as it was confined to them no particular delicacy or accurate nicety in its performance was required. This only arose when astronomy began to be seriously studied, and the exact position of the heavenly bodies to be determined, which created the necessity for strictly accurate means of measuring linear and angular magnitudes. Then it was seen that graduation was an art which required special talents and training, and the best artists gave great attention to the perfecting of astronomical instruments. Of these may be named Abraham Sharp (1651–1742), John Bird (1700–1776), John Smeaton (1724–1792), Jesse Ramsden (1735–1800), John Troughton, Edward Troughton (1753–1835), William Simms (1793–1860) and Andrew Ross.

The first graduated instrument must have been done by the hand and eye alone, whether it was in the form of a straight-edge with equal divisions, or a screw or a divided plate; but, once in the possession of one such divided instrument, it was a comparatively easy matter to employ it as a standard. Hence graduation divides itself into two distinct branches, *original graduation* and *copying*, which latter may be done either by the hand or by a machine called a dividing engine. Graduation may therefore be treated under the three heads of *original graduation*, *copying* and *machine graduation*.

Original Graduation.—In regard to the graduation of straight scales elementary geometry provides the means of dividing a straight line into any number of equal parts by the method of continual bisection; but the practical realization of the geometrical construction is so difficult as to render the method untrustworthy. This method, which employs the common diagonal scale, was used in dividing a quadrant of 3 ft. radius, which belonged to Napier of Merchiston, and which only read to minutes—a result, according to Thomson and Tait (*Nat. Phil.*), "giving no greater accuracy than is now attainable by the pocket sextants of Troughton and Simms, the radius of whose arc is little more than an inch."

The original graduation of a straight line is done either by the method of continual bisection or by stepping. In continual bisection the entire length of the line is first laid down. Then, as nearly as possible, half that distance is taken in the beam-compass and marked off by fair arcs from each end of the line. Should these marks coincide the exact middle point of the line is obtained. If not, as will almost always be the case, the distance between the marks is carefully bisected by hand with the aid of a magnifying glass. The same process is again applied to the halves thus obtained, and so on in succession, dividing the line into parts represented by 2, 4, 8, 16, &c. till the desired divisions are reached. In the method of stepping the smallest division required is first taken, as accurately as possible, by spring dividers, and that distance is then laid off, by successive steps, from one end of the line. In this method, any error at starting will be multiplied at each division by the number of that division. Errors so made are usually adjusted by the dots being put either back or forward a little by means of the dividing punch guided by a magnifying glass. This is an extremely tedious process, as the dots, when so altered several times, are apt to get insufferably large and shapeless.

The division of circular arcs is essentially the same in principle as the graduation of straight lines.

The first example of note is the 8-ft. mural circle which was graduated by George Graham (1673–1751) for Greenwich Observatory in 1725. In this are two concentric arcs of radii 96·0 and 95·8 in. respectively were first described by the beam-compass. On the inner of these the arc of 90° was to be divided into degrees and 12th parts of a degree, while the same on the outer was to be divided into 96 equal parts and those again into 16th parts. The reason for adopting the latter was that, 90 and 16 being both powers of 2, the divisions could be got at by continual bisection alone, which, in Graham's opinion, who first employed it, is the only accurate method, and would thus serve as a check upon the accuracy of the divisions of the outer arc. With the same distance on the beam-compass as was used to describe the inner arc, laid off from 0°, the point 60° was at once determined. With the points 0° and 60° as centres successively, and a distance on the beam-compass very nearly bisecting the arc of 60°, two slight marks were made on the arc; the distance between these marks was divided by the hand aided by a lens, and this gave the point 30°. The chord of 60° laid off from the point 30° gave the point 90°, and the quadrant was now divided into three equal parts. Each of these parts was similarly bisected, and the resulting divisions again trisected, giving 18 parts of 5° each. Each of these quinquesected gave degrees, the 12th parts of which were arrived at by bisecting and trisecting as before. The outer arc was divided by continual bisection alone, and a table was constructed by which the readings of the one arc could be converted into those of the other. After the dots indicating the required divisions were obtained, either straight strokes all directed towards the centre were drawn through them by the dividing knife, or sometimes small arcs were drawn through them by the beam-compass having its fixed point somewhere on the line which was a tangent to the quadrantal arc at the point where a division was to be marked.

The next important example of graduation was done by Bird in 1767. His quadrant, which was also 8-ft. radius, was divided into degrees and 12th parts of a degree. He employed the method of continual bisection aided by chords taken from an exact scale of equal parts, which could read to ·001 of an inch, and which he had previously graduated by continual bisections. With the beam-compass an arc of radius 95·938 in. was first drawn. From this radius the chords of 30°, 15°, 10°, 7° 30′, 4° 40′ and 4° 30′ were computed, and each of them by means of the scale of equal parts laid off on a separate beam-compass to be ready. The radius laid off from 0° gave the point 60°; by the chord of 30° the arc of 60° was bisected; from the point 30° the radius laid off gave the point 90°; the chord of 15° laid off backwards from 90° gave the point 75°; from 75° was laid off forwards the chord of 10° 20′; and from 90° was laid off backwards the chord of 4° 40′; and these were found to coincide in the point 85° 20′. Now $85° 20' \text{ being} = 5' \times 1024 = 5' \times 2^{10}$, the final divisions of 85° 20′ were found by continual bisections. For the remainder of the quadrant beyond 85° 20′, containing 56 divisions of 5′ each, the chord of 64 such divisions was laid off from the point 85° 20′, and the corresponding arc divided by continual bisections as before. There was thus a severe check upon the accuracy of the points already found, viz. 15°, 30°, 60°, 75°, 90°, which, however, were found to coincide with the corresponding points obtained by continual bisection. The short lines through the dots were drawn in the way already mentioned.

The next eminent artists in original graduation are the brothers John and Edward Troughton. The former was the first to devise a means of graduating the quadrantal trinomial bisection without the aid of such a scale of equal parts as was used by Bird. His method was as follows: The radius of the quadrant laid off from 0° gave the point 60°. This arc bisected and the half laid off from 60° gave the point 90°. The arc of 60° bisected and 30° bisected gave 75°; the arc between 75° and 90° bisected gave the point 82° 30′, and the arc between 82° 30′ and 90° bisected gave the point 86° 15′. Further, the arc between 82° 30′ and 86° 15′ trisected, and two-thirds of it taken beyond 82° 30′, gave the point 85°, while the arc between 85° and 86° 15′ also trisected, and one-third part laid off beyond 85°, gave the point 85° 25′. Lastly, the arc between 85° and 85° 25′ being quinquesected, and four-fifths taken beyond 85°, gave 85° 20′, which as before is $= 5' \times 2^{10}$, and so can be finally divided by continual bisection.

The method of original graduation discovered by Edward Troughton is fully described in the *Philosophical Transactions* for 1809, as employed by himself to divide a meridian circle of 4 ft. radius. The circle was first accurately turned both on its face and its inner and outer edges. A roller was next provided, of such diameter that it revolved 16 times on its own axis while made to roll once round the outer edge of the circle. This roller, made movable on pivots, was attached to a frame-work, which could be slid freely, yet tightly, along the circle, the roller meanwhile revolving, by means of frictional contact, on the outer edge. The roller was also, after having been properly adjusted as to size, divided as accurately as possible into 16 equal parts by lines parallel to its axis. While the frame carrying the roller was moved once round along the circle, the points of contact of the roller-divisions with the circle were accurately observed by two microscopes attached to the frame, one of which (which we shall call I) commanded the ring on the circle near its edge, which was to receive the divisions and the other viewed the roller-divisions. The points of contact thus ascertained were marked with faint dots, and the meridian circle thereby divided into 256 very nearly equal parts.

The next part of the operation was to find out and tabulate the errors of these dots, which are called *apparent* errors, in consequence of the error of each dot being ascertained on the supposition that its neighbours are all correct. For this purpose two microscopes (which we shall call A and B) were taken, with cross wires and micrometer adjustments, consisting of a screw and head divided into 100 divisions, 50 of which read in the one and 50 in the opposite direction. These microscopes were fixed so that their cross-wires respectively bisected the dots 0 and 128, which were supposed to be diametrically opposite. The circle was now turned half-way round on its axis, so that dot 128 coincided with the wire of A,

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and, should dot o be found to coincide with B, then the two dots were 180° apart. If not, the cross wire of B was moved till it coincided with dot o, and the number of divisions of the micrometer head noted. Half this number gave clearly the error of dot 128, and it was tabulated + or − according as the arcual distance between o and 128 was found to exceed or fall short of the remaining part of the circumference. The microscope B was now shifted, A remaining opposite dot o as before, till its wire bisected dot 64, and, by giving the circle one quarter of a turn on its axis, the difference of the arcs between dots o and 64 and between 64 and 128 was obtained. The half of this difference gave the tabular error of dot 64, which was tabulated with its proper sign. With the microscope A still in the same position the error of dot 192 was obtained, and in the same way by shifting B to dot 32 the errors of dots 32, 96, 160 and 224 were successively ascertained. In this way the apparent errors of all the 256 dots were tabulated.

From this table of apparent errors a table of *real* errors was drawn up by employing the following formula:—

$$\tfrac{1}{2}(x_a + x_c) + \tfrac{1}{4}z = \text{the real error of dot } b,$$

where x_a is the real error of dot a, x_c the real error of dot c, and z the apparent error of dot b midway between a and c. Having got the real errors of any two dots, the table of apparent errors gives the means of finding the real errors of all the other dots.

The last part of Troughton's process was to employ them to cut the final divisions of the circle, which were to be spaces of 5′ each. Now the mean interval between any two dots is $360'/256 = 5'\times 16\frac{1}{2}$, and hence, in the final division, this interval must be divided into $16\frac{1}{2}$ equal parts. To accomplish this a small instrument, called a subdividing sector, was provided. It was formed of thin brass and had a radius about four times that of the roller, but made adjustable as to length. The sector was placed concentrically on the axis, and rested on the upper surface of the roller. It turned by friction adhesion along with the roller, but was sufficiently loose to allow of its being moved back by hand to any position without affecting the roller. While the roller passes over an angular space equal to the mean interval between two dots, any point of the sector must pass over 16 times that interval, that is to say, over an angle represented by $360°\times 16/256 = 22°\ 30'$. This interval was therefore divided by $16\frac{1}{2}$, and a space equal to 16 of the parts taken. This was laid off on the arc of the sector and divided into 8 equal parts, each equal to 1° 20′; and, to provide for the necessary $\frac{1}{2}$ths of a division, there was laid off at each end of the sector, and beyond the 16 equal parts, two of these parts each subdivided into 8 equal parts. A microscope with cross wires, which we shall call I, was placed on the main frame, so as to command a view of the sector divisions, just as the microscope H viewed the final divisions of the circle. Before the first or zero mark was cut, the zero of the sector was brought under I and then the division cut at the point on the circle indicated by H, which also coincided with the dot o. The frame was then slipped along the circle by the slow screw motion provided for the purpose, till the first sector-division, by the action of the roller, was brought under I. The second mark was then cut on the circle at the point indicated by H. That the marks thus obtained are 5′ apart is evident when we reflect that the distance between them must be $\frac{1}{16}$th of a division on the section which by construction is 1° 20′. This way the first 16 divisions were cut; but before cutting the 17th it was necessary to adjust the micrometer wires of H to the real error of dot 1, as indicated by the table, and bring back the sector, not to zero, but to $\frac{1}{2}$th short of zero. Starting from this position the divisions between dots 1 and 2 were filled in, and then H was adjusted to the real error of dot 2, and the sector brought back to its proper division before commencing the third course. Proceeding in this manner through the whole circle, the microscope H was finally found with its wire at zero, and the sector with its 16th division under its microscope indicating that the circle had been accurately divided.

Copying.—In graduation by copying the pattern must be either an accurately divided straight scale, or an accurately divided circle, commonly called a *dividing plate*.

In copying a straight scale the pattern and scale to be divided, usually called the work, are first fixed side by side, with their upper faces in the same plane. The dividing square, which closely resembles an ordinary joiner's square, is then laid across both, and the point of the dividing knife dropped into the zero division of the pattern. The square is now moved up close to the point of the knife; and, while it is held firmly in this position by the left hand, the first division on the work is made by drawing the knife along the edge of the square with the right hand.

It frequently happens that the divisions required on a scale are either greater or less than those on the pattern. To meet this case, and still use the same pattern, the work must be fixed at a certain angle of inclination with the pattern. This angle is found in the following way. Take the exact ratio of a division on the pattern to the required division on the scale. Call this ratio a. Then, if the required divisions are longer than those of the pattern, the angle is $\cos^{-1}a$, but, if shorter, the angle is $\sec^{-1}a$. In the former case two operations are required before the divisions are cut: first, the square is laid on the pattern, and the corresponding divisions merely notched very faintly on the edge of the work; and, secondly, the square is applied to the work and the final divisions drawn opposite each faint notch. In the second case, that is, when the angle is $\sec^{-1}a$, the dividing square is applied to the work, and the divisions cut when the edge of the square coincides with the end of each division on the pattern.

In copying circles use is made of the dividing plate. This is a circular plate of brass, of 36 in. or more in diameter, carefully graduated near its outer edge. It is turned quite flat, and has a steel pin fixed in its centre, and at right angles to its plane. For guiding the dividing knife an instrument called an index is employed. This is a straight bar of thin steel of length equal to the radius of the plate. A piece of metal, having a V notch with its angle a right angle, is riveted to one end of the bar in such a position that the vertex of the notch is exactly in a line with the edge of the steel bar. In this way, when the index is laid on the plate, with the notch grasping the central pin, the straight edge of the steel bar lies exactly along a radius. The work to be graduated is laid flat on the dividing plate, and fixed by two clamps in a position exactly concentric with it. The index is now laid on, with its edge coinciding with any required division on the dividing plate, and the corresponding division on the work is cut by drawing the dividing knife along the straight edge of the index.

Machine Graduation.—The first dividing engine was probably that of Henry Hindley of York, constructed in 1740, and chiefly used by him for cutting the teeth of clock wheels. This was followed shortly after by an engine devised by the duc de Chaulnes; but the first notable engine was that made by Ramsden, of which an account was published by the Board of Longitude in 1777. He was rewarded by that board with a sum of £300, and a further sum of £315 was given to him on condition that he would divide, at a certain fixed rate, the instruments of other makers. The essential principles of Ramsden's machine have been repeated in almost all succeeding engines for dividing circles.

Ramsden's machine consisted of a large brass plate 45 in. in diameter, carefully turned and movable on a vertical axis. The edge of the plate was ratched with 2160 teeth, into which a tangent screw worked, by means of which the plate could be made to turn through any required angle. Thus six turns of the screw moved the plate through 1°, and $\frac{1}{60}$th of a turn through $\frac{1}{10}$th of a degree. On the axis of the tangent screw was placed a cylinder having a spiral groove cut on its surface. A ratchet-wheel containing 60 teeth was attached to this cylinder, and was so arranged that, when the cylinder moved in one direction, it carried the tangent screw with it, and so turned the plate, but when it moved in the opposite direction, it left the tangent screw, and with it the plate, stationary. Round the spiral groove of the cylinder a catgut band was wound, one end of which was attached to a treadle and the other to a counterpoise weight. When the treadle was depressed the tangent screw turned round, and when the pressure was removed it returned, in obedience to the weight, to its former position without affecting the screw. Provision was also made whereby certain stops could be placed in the way of the screw, which only permitted the requisite amount of turning. The work to be divided was firmly fixed on the plate, and made concentric with it. The divisions were cut, while the screw was stationary, by means of a dividing knife attached to a swing frame, which allowed it to have only a radial motion. In this way the artist could divide very rapidly by alternately depressing the treadle and working the dividing knife.

Ramsden also constructed a linear dividing engine on essentially the same principle. If we imagine the rim of the circular plate with its notches stretched out into a straight line and made movable in a straight slot, the screw, treadle, &c., remaining as before, we get a very good idea of the linear engine.

In 1703 Edward Troughton finished a circular dividing engine, of which the plate was smaller than in Ramsden's, and which differed considerably in simplifying matters of detail. The plate was originally divided by Troughton's own method, already described, and the divisions so obtained were employed

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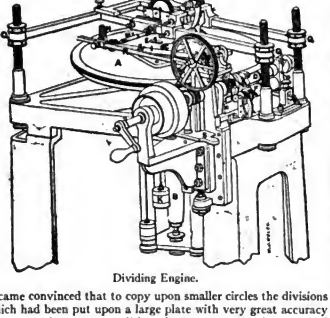
to ratch the edge of the plate for receiving the tangent screw with great accuracy. Andrew Ross (*Trans. Soc. Arts*, 1830–1831) constructed a dividing machine which differs considerably from those of Ramsden and Troughton.

The essential point of difference is that, in Ross's engine, the tangent screw does not turn the engine plate; that is done by an independent apparatus, and the function of the tangent screw is only to stop the plate after it has passed through the required angular interval between two divisions on the work to be graduated. Round the circumference of the plate are fixed 48 projections which just look as if the circumference had been divided into as many deep and somewhat peculiarly shaped notches or teeth. Through each of these teeth a hole is bored parallel to the plane of the plate and also to a tangent to its circumference. Into these holes are screwed steel screws with capstan heads and flat ends. The tangent screw consists only of a single turn of a large square thread which works in the teeth or notches of the plate. This thread is pierced by 90 equally distant holes, all parallel to the axis of the screw, and at the same distance from it. Into each of these holes is inserted a steel screw exactly similar to those in the teeth, but with its end rounded. It is the rounded and flat ends of these sets of screws coming together that stop the engine plate at the desired position, and the exact point can be nicely adjusted by suitably turning the screws.

A description is given of a dividing engine made by William Simms in the *Memoirs of the Astronomical Society*, 1843. Simms



Dividing Engine.

became convinced that to copy upon smaller circles the divisions which had been put upon a large plate with very great accuracy was not only more expeditious but more exact than original graduation. His machine involved essentially the same principle as Troughton's. The accompanying figure is taken by permission.

The plate A is 46 in. in diameter, and is composed of gun-metal cast in one solid piece. It has two sets of 5′ divisions—one very faint on an inlaid ring of silver, and the other stronger on the gun-metal. These were put on by original graduation, mainly on the plan of Edward Troughton. One very great improvement in this engine is that the axis B is tubular, as seen at C. The object of this hollow is to receive the axis of the circle to be divided, so that it can be fixed flat to the plate by the clamps E, without having first to be detached from the axis and other parts to which it has already been carefully fitted. This obviates the necessity for resetting, which can hardly be done without some error. D is the tangent screw, and F the frame carrying it, which turns on carefully polished steel pivots. The screw is pressed against the edge of the plate by a spiral spring acting under the end of the lever G, and by screwing the lever down the screw can be altogether removed from contact with the plate. The edge of the plate is ratched by 4320 teeth which were cut opposite the original division by a circular cutter attached to the screw frame. H is the spiral barrel round which the catgut band is wound, one end of which is attached to the crank L on the end of the axis J and the other to a counterpoise weight not seen. On the other end of J is another crank inclined to L and carrying a band and counterpoise weight seen at K. The object of this weight is to balance the former and give steadiness to the motion. On the axis J is seen a pair of bevelled wheels which move the rod I, which, by another pair of bevelled wheels attached to the box N, gives motion to the axis M, on the end of which is an eccentric for moving the bent lever O, which actuates the bar carrying the cutter. Between the eccentric and the point of the screw P is an undulating plate by which long division can be cut. The cutting apparatus is supported upon the two parallel rails which can be elevated or depressed at pleasure by the nuts Q. Also the cutting apparatus can be moved forward or backward upon these rails to suit circles of different diameters. The box N is movable upon the bar R, and the rod I is adjustable as to length by having a kind of telescope joint. The engine is self-acting, and can be driven either by hand or by a steam-engine or other motive power. It can be thrown in or out of gear at once by a handle seen at S.

Mention may be made of Donkin's linear dividing engine, in which a compensating arrangement is employed whereby great accuracy is obtained notwithstanding the inequalities of the screw used to advance the cutting tool. Dividing engines have also been made by Reichenbach, Repsold and others in Germany, Gambey in Paris and by several other astronomical instrument-makers. A machine constructed by E. R. Watts & Son is described by G. T. McCaw, in the *Monthly Not. R. A. S.*, January 1909.

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GRADUS, or GRADUS AD PARNASSUM (a step to Parnassus), a Latin (or Greek) dictionary, in which the quantities of the vowels of the words are marked. Synonyms, epithets and poetical expressions and extracts are also included under the more important headings, the whole being intended as an aid for students in Greek and Latin verse composition. The first Latin gradus was compiled in 1702 by the Jesuit Paul Aler (1656–1727), a famous schoolmaster. There is a Latin gradus by C. D. Yonge (1850); English-Latin by A. C. Ainger and H. G. Wintle (1890); Greek by J. Brasse (1828) and E. Maltby (1815), bishop of Durham.

GRAETZ, HEINRICH (1817–1891), the foremost Jewish historian of modern times, was born in Posen in 1817 and died at Munich in 1891. He received a desultory education, and was largely self-taught. An important stage in his development was the period of three years that he spent at Oldenburg as assistant and pupil of S. R. Hirsch, whose enlightened orthodoxy was for a time very attractive to Graetz. Later on Graetz proceeded to Breslau, where he matriculated in 1842. Breslau was then becoming the headquarters of Abraham Geiger, the leader of Jewish reform. Graetz was repelled by Geiger's attitude, and though he subsequently took radical views of the Bible and tradition (which made him an opponent of Hirsch), Graetz remained a life-long foe to reform. He contended for freedom of thought; he had no desire to fight for freedom of ritual practice. He momentarily thought of entering the rabbinate, but he was unsuited to that career. For some years he supported himself as a tutor. He had previously won repute by his published essays, but in 1853 the publication of the fourth volume of his history of the Jews made him famous. This fourth volume (the first to be published) dealt with the Talmud. It was a brilliant resuscitation of the past. Graetz's skill in piecing together detached fragments of information, his vast learning and extraordinary critical acumen, were equalled by his vivid power of presenting personalities. No Jewish book of the 19th century produced such a sensation as this, and Graetz won at a bound the position he still occupies as recognized master of Jewish history. His *Geschichte der Juden*, begun in 1853, was completed in 1875; new editions of the several volumes were frequent. The work has been translated into many languages; it appeared in English in five volumes in 1891–1895. The *History* is defective in its lack of objectivity; Graetz's judgments are sometimes biassed, and in particular he lacks sympathy with mysticism. But the history is a work

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of genius. Simultaneously with the publication of vol. iv. Graetz was appointed on the staff of the new Breslau Seminary, of which the first director was Z. Frankel. Graetz passed the remainder of his life in this office; in 1869 he was created professor by the government, and also lectured at the Breslau University. Graetz attained considerable repute as a biblical critic. He was the author of many bold conjectures as to the date of Ruth, Ecclesiastes, Esther and other biblical books. His critical edition of the Psalms (1882–1883) was his chief contribution to biblical exegesis, but after his death Professor Bacher edited Graetz's *Emendationes* to many parts of the Hebrew scriptures.

A full bibliography of Graetz's works is given in the *Jewish Quarterly Review*, iv. 194; a memoir of Graetz is also to be found there. Another full memoir was prefixed to the "index" volume of the *History* in the American re-issue of the English translation in six volumes (Philadelphia, 1898). (I. A.)

GRAEVIUS (properly GRÄVE or GREFFE), **JOHANN GEORG** (1632–1703), German classical scholar and critic, was born at Naumburg, Saxony, on the 20th of January 1632. He was originally intended for the law, but having made the acquaintance of J. F. Gronovius during a casual visit to Deventer, under his influence he abandoned jurisprudence for philology. He completed his studies under D. Heinsius at Leiden, and under the Protestant theologians A. Morus and D. Blondel at Amsterdam. During his residence in Amsterdam, under Blondel's influence he abandoned Lutheranism and joined the Reformed Church; and in 1656 he was called by the elector of Brandenburg to the chair of rhetoric in the university of Duisburg. Two years afterwards, on the recommendation of Gronovius, he was chosen to succeed that scholar at Deventer; in 1662 he was translated to the university of Utrecht, where he occupied first the chair of rhetoric, and from 1667 until his death (January 11th, 1703) that of history and politics. Graevius enjoyed a very high reputation as a teacher, and his lecture-room was crowded by pupils, many of them of distinguished rank, from all parts of the civilized world. He was honoured with special recognition by Louis XIV., and was a particular favourite of William III. of England, who made him historiographer royal.

His two most important works are the *Thesaurus antiquitatum Romanarum* (1694–1699, in 12 volumes), and the *Thesaurus antiquitatum et historiarum Italiae* published after his death, and continued by the elder Burmann (1704–1725). His editions of the classics, although they marked a distinct advance in scholarship, are now for the most part superseded. They include Hesiod (1667), Lucian, *Pseudosophista* (1668), Justin, *Historiae Philippicae* (1669), Suetonius (1672), Catullus, Tibullus et Propertius (1680), and several of the works of Cicero (his best production). He also edited many of the writings of contemporary scholars. The *Oratio funebris* by P. Burmann (1703) contains an exhaustive list of the works of this scholar; see also P. H. Külb in Ersch and Gruber's *Allgemeine Encyklopädie*, and J. E. Sandys, *History of Classical Scholarship*, iii. (1908).

GRAF, ARTURO (1848–), Italian poet, of German extraction, was born at Athens. He was educated at Naples University and became a lecturer on Italian literature in Rome, till in 1882 he was appointed professor at Turin. He was one of the founders of the *Giornale della letteratura italiana*, and his publications include valuable prose criticism; but he is best known as a poet. His various volumes of verse—*Poesie e novelle* (1874), *Dopo il tramonto versi* (1893), &c.—give him a high place among the recent lyrical writers of his country.

GRAF, KARL HEINRICH (1815–1869), German Old Testament scholar and orientalist, was born at Mülhausen in Alsace on the 28th of February 1815. He studied Biblical exegesis and oriental languages at the university of Strassburg under E. Reuss, and, after holding various teaching posts, was made instructor in French and Hebrew at the Landesschule of Meissen, receiving in 1852 the title of professor. He died on the 16th of July 1869. Graf was one of the chief founders of Old Testament criticism. In his principal work, *Die geschichtlichen Bücher des Alten Testaments* (1866), he sought to show that the priestly legislation of Exodus, Leviticus and Numbers is of later origin than the book of Deuteronomy. He still, however, held the accepted view, that the Elohistic narratives formed part of the *Grundschrift* and therefore belonged to the oldest portions of the Pentateuch. The reasons urged against the contention that the priestly legislation and the Elohistic narratives were separated by a space of 500 years were so strong as to induce Graf, in an essay, "Die sogenannte Grundschrift des Pentateuchs," published shortly before his death, to regard the whole *Grundschrift* as post-exilic and as the latest portion of the Pentateuch. The idea had already been expressed by E. Reuss, but since Graf was the first to introduce it into Germany, the theory, as developed by Julius Wellhausen, has been called the Graf-Wellhausen hypothesis.

Graf also wrote, *Der Segen Moses Deut. 33* (1857) and *Der Prophet Jeremia erklärt* (1862). See T. K. Cheyne, *Founders of Old Testament Criticism* (1893); and Otto Pfleiderer's book translated into English by J. F. Smith as *Development of Theology* (1890).

GRÄFE, ALBRECHT VON (1828–1870), German oculist, son of Karl Ferdinand von Gräfe, was born at Berlin on the 22nd of May 1828. At an early age he manifested a preference for the study of mathematics, but this was gradually superseded by an interest in natural science, which led him ultimately to the study of medicine. After prosecuting his studies at Berlin, Vienna, Prague, Paris, London, Dublin and Edinburgh, and devoting special attention to ophthalmology he, in 1850, began practice as an oculist in Berlin, where he founded a private institution for the treatment of the eyes, which became the model of many similar ones in Germany and Switzerland. In 1853 he was appointed teacher of ophthalmology in Berlin university; in 1858 he became extraordinary professor, and in 1866 ordinary professor. Gräfe contributed largely to the progress of the science of ophthalmology, especially by the establishment in 1855 of his *Archiv für Ophthalmologie*, in which he had Ferdinand Arlt (1812–1887) and F. C. Donders (1818–1889) as collaborators Perhaps his two most important discoveries were his method of treating glaucoma and his new operation for cataract. He was also regarded as an authority in diseases of the nerves and brain. He died at Berlin on the 20th of July 1870.

See *Ein Wort der Erinnerung an Albrecht von Gräfe* (Halle, 1870) by his cousin, Alfred Gräfe (1830–1899), also a distinguished ophthalmologist, and the author of *Das Sehen der Schielenden* (Wiesbaden, 1897); and E. Michaelis, *Albrecht von Gräfe. Sein Leben und Wirken* (Berlin, 1877).

GRAFE, HEINRICH (1802–1868), German educationist, was born at Buttstädt in Saxe-Weimar on the 3rd of May 1802. He studied mathematics and theology at Jena, and in 1823 obtained a curacy in the town church of Weimar. He was transferred to Jena as rector of the town school in 1825; in 1840 he was also appointed extraordinary professor of the science of education (Pädagogik) in that university; and in 1842 he became head of the *Burgerschule* (middle class school) in Cassel. After reorganizing the schools of the town, he became director of the new *Realschule* in 1843; and, devoting himself to the interests of educational reform in electoral Hesse, he became in 1849 a member of the school commission, and also entered the house of representatives, where he made himself somewhat formidable as an agitator. In 1852 for having been implicated in the September riots and in the movement against the unpopular minister Hassenpflug, who had dissolved the school commission, he was condemned to three years' imprisonment, a sentence afterwards reduced to one of twelve months. On his release he withdrew to Geneva, where he engaged in educational work till 1855, when he was appointed director of the school of industry at Bremen. He died in that city on the 21st of July 1868.

Besides being the author of many text-books and occasional papers on educational subjects, he wrote *Das Rechtsverhältnis der Volksschule von innen und aussen* (1829); *Die Schulreform* (1834); *Schule und Unterricht* (1839); *Allgemeine Pädagogik* (1845); *Die deutsche Volksschule* (1847). Together with Naumann, he also edited the *Archiv für das praktische Volksschulwesen* (1828–1835).

GRÄFE, KARL FERDINAND VON (1787–1840), German surgeon, was born at Warsaw on the 8th of March 1787. He studied medicine at Halle and Leipzig, and after obtaining licence from the Leipzig university, he was in 1807 appointed private physician to Duke Alexius of Anhalt-Bernburg. In 1811 he became professor of surgery and director of the surgical

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clinic at Berlin, and during the war with Napoleon he was superintendent of the military hospitals. When peace was concluded in 1815, he resumed his professorial duties. He was also appointed physician to the general staff of the army, and he became a director of the Friedrich Wilhelm Institute and of the Medico-Chirurgical Academy. He died suddenly on the 4th of July 1840 at Hanover, whither he had been called to operate on the eyes of the crown prince. Gräfe did much to advance the practice of surgery in Germany, especially in the treatment of wounds. He improved the rhinoplastic process, and its revival was chiefly due to him. His lectures at the university of Berlin attracted students from all parts of Europe.

The following are his principal works: *Normen für die Ablösung grosser Gliedmassen* (Berlin, 1812); *Rhinoplastik* (1818); *Neue Beiträge zur Kunst Theile des Angesichts organisch zu ersetzen* (1821); *Die epidemisch-kontagiöse Augenblennorrhöe Aegyptens in den europäischen Befreiungskriegen* (1824); and *Jahresberichte über das klinisch-chirurgisch-augenärztliche Institut der Universität zu Berlin* (1817–1834). He also edited, with Ph. von Walther, the *Journal für Chirurgie und Augenheilkunde*. See E. Michaelis, *Karl Ferdinand von Gräfe in seiner 30jährigen Wirken für Staat und Wissenschaft* (Berlin, 1840)

GRAFFITO, plural *graffiti*, the Italian word meaning "scribbling" or "scratchings" (*graffiare*, to scribble, Gr. γράφειν), adopted by archaeologists as a general term for the casual writings, rude drawings and markings on ancient buildings, in distinction from the more formal or deliberate writings known as "inscriptions." These "graffiti," either scratched on stone or plaster by a sharp instrument such as a nail, or, more rarely, written in red chalk or black charcoal, are found in great abundance, *e.g.* on the monuments of ancient Egypt. The best-known "graffiti" are those in Pompeii and in the catacombs and elsewhere in Rome. They have been collected by R. Garrucci (*Graffiti di Pompei*, Paris, 1856), and L. Correra ("Graffiti di Roma" in *Bollettino della commissione municipale archaeologica*, Rome, 1893; see also *Corp. Ins. Lat.* iv., Berlin, 1871). The subject matter of these scribblings is much like that of the similar scrawls made to-day by boys, street idlers and the casual "tripper." The schoolboy of Pompeii wrote out lists of nouns and verbs, alphabets and lines from Virgil for memorizing, lovers wrote the names of their beloved, "sportsmen" scribbled the names of horses they had been "tipped," and wrote those of their favourite gladiators. Personal abuse is frequent, and rude caricatures are found, such as that of one Peregrinus with an enormous nose, or of Naso or Nasso with hardly any. Aulus Vettius Firmus writes up his election address and appeals to the *pilicrepi* or ball-players for their votes for him as aedile. Lines of poetry, chiefly suited for lovers in dejection or triumph, are popular, and Ovid and Propertius appear to be favourites. Apparently private owners of property felt the nuisance of the defacement of their walls, and at Rome near the *Porta Portuensis* has been found an inscription begging people not to scribble (*scariphare*) on the walls.

Graffiti are of some importance to the palaeographer and to the philologist as illustrating the forms and corruptions of the various alphabets and languages used by the people, and occasionally guide the archaeologist to the date of the building on which they appear, but they are chiefly valuable for the light they throw on the everyday life of the "man in the street" of the period, and for the intimate details of customs and institutions which no literature or formal inscriptions can give. The graffiti dealing with the gladiatorial shows at Pompeii are in this respect particularly noteworthy; the rude drawings such as that of the *secutor* caught in the net of the *retiarius* and lying entirely at his mercy, give a more vivid picture of what the incidents of these shows were like than any account in words (see Garrucci, *op. cit.*, Pls. x.-xiv.; A. Mau, *Pompeii in Leben und Kunst*, 2nd ed., 1908, ch. xxx.). In 1866 in the Trastevere quarter of Rome, near the church of S. Crisogono, was discovered the guard-house (*excubitorium*) of the seventh cohort of the city police (*vigiles*), the walls being covered by the scribblings of the guards, illustrating in detail the daily routine, the hardships and dangers, and the feelings of the men towards their officers (W. Henzen, "L' Escubitorio della Settima coorte dei Vigili" in *Bull. Inst.* 1867, and *Annali Inst.*, 1874; see also R. Lanciani, *Ancient Rome in the Light of Recent Discoveries*, 230, and *Ruins and Excavations of Ancient Rome*, 1897, 548). The most famous graffito yet discovered is that generally accepted as representing a caricature of Christ upon the cross, found on the walls of the Domus Gelotiana on the Palatine in 1857, and now preserved in the Kircherian Museum of the Collegio Romano. Deeply scratched in the wall is a figure of a man clad in the short *tunica* with one hand upraised in salutation to another figure, with the head of an ass, or possibly a horse, hanging on a cross; beneath is written in rude Greek letters "Anaxamenos worships (his) god." It has been suggested that this represents an adherent of some Gnostic sect worshipping one of the animal-headed deities of Egypt (see Ferd. Becker, *Das Spottcrucifix der römischen Kaiserpaläste*, Breslau, 1866; F. X. Kraus, *Das Spottcrucifix vom Palatin*, Freiburg in Breisgau, 1872; and Visconti and Lanciani, *Guida del Palatino*).

There is an interesting article, with many quotations of graffiti, in the *Edinburgh Review*, October 1859, vol. cx. (C. We.)

GRAFLY, CHARLES (1862–), American sculptor, was born at Philadelphia, Pennsylvania, on the 3rd of December 1862. He was a pupil of the schools of the Pennsylvania Academy of the Fine Arts, Philadelphia, and of Henri M. Chapu and Jean Dampt, and the École des Beaux Arts, Paris. He received an Honorable Mention in the Paris Salon of 1891 for his "Mauvais Présage," now at the Detroit Museum of Fine Arts, a gold medal at the Paris Exposition, in 1900, and medals at Chicago, 1893, Atlanta, 1895, and Philadelphia (the gold Medal of Honor, Pennsylvania Academy of the Fine Arts), 1899. In 1892 he became instructor in sculpture at the Pennsylvania Academy of the Fine Arts, also filling the same chair at the Drexel Institute, Philadelphia. He was elected a full member of the National Academy of Design in 1905. His better-known works include: "General Reynolds," Fairmount Park, Philadelphia; "Fountain of Man" (made for the Pan-American Exposition at Buffalo); "From Generation to Generation"; "Symbol of Life"; "Vulture of War," and many portrait busts.

GRÄFRATH, a town in Rhenish Prussia, on the Itterbach, 14 m. E. of Düsseldorf on the railway Hilden-Vohwinkel. Pop. (1905) 9030. It has a Roman Catholic and two Evangelical churches, and there was an abbey here from 1185 to 1803. The principal industries are iron and steel, while weaving is carried on in the town.

GRAFT (a modified form of the earlier "graff," through the French from the Late Lat. *graphium*, a stylus or pencil), a small branch, shoot or "scion," transferred from one plant or tree to another, the "stock," and inserted in it so that the two unite (see HORTICULTURE). The name was adopted from the resemblance in shape of the "graft" to a pencil. The transfer of living tissue from one portion of an organism to another part of the same or different organism where it adheres and grows is also known as "grafting," and is frequently practised in modern surgery. The word is applied, in carpentry, to an attachment of the ends of timbers, and, as a nautical term, to the "whipping" or "pointing" of a rope's end with fine twine to prevent unravelling. "Graft" is used as a slang term, in England, for a "piece of hard work." In American usage Webster's *Dictionary* (ed. 1904) defines the word as "the act of any one, especially an official or public employé, by which he procures money surreptitiously by virtue of his office or position; also the surreptitious gain thus procured." It is thus a word embracing blackmail and illicit commission. The origin of the English use of the word is probably an obsolete word "graft," a portion of earth thrown up by a spade, from the Teutonic root meaning "to dig," seen in German *graben*, and English "grave."

GRAFTON, DUKES OF. The English dukes of Grafton are descended from HENRY FITZROY (1663–1690), the natural son of Charles II. by Barbara Villiers (countess of Castlemaine and duchess of Cleveland). In 1672 he was married to the daughter and heiress of the earl of Arlington and created earl of Euston; in 1675 he was created duke of Grafton. He was brought

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up as a sailor, and saw military service at the siege of Luxemburg in 1684. At James II.'s coronation he was lord high constable. In the rebellion of the duke of Monmouth he commanded the royal troops in Somersetshire; but later he acted with Churchill (duke of Marlborough), and joined William of Orange against the king. He died of a wound received at the storming of Cork, while leading William's forces, being succeeded as 2nd duke by his son Charles (1682–1757).

AUGUSTUS HENRY FITZROY, 3rd duke of Grafton (1735–1811), one of the leading politicians of his time, was the grandson of the 2nd duke, and was educated at Westminster and Cambridge. He first became known in politics as an opponent of Lord Bute; in 1765 he was secretary of state under the marquis of Rockingham; but he retired next year, and Pitt (becoming earl of Chatham) formed a ministry in which Grafton was first lord of the treasury (1766) but only nominally prime minister. Chatham's illness at the end of 1767 resulted in Grafton becoming the effective leader, but political differences and the attacks of "Junius" led to his resignation in January 1770. He became lord privy seal in Lord North's ministry (1771) but resigned in 1775, being in favour of conciliatory action towards the American colonists. In the Rockingham ministry of 1782 he was again lord privy seal. In later years he was a prominent Unitarian.

Besides his successor, the 4th duke (1760–1844), and numerous other children, he was the father of General Lord Charles Fitzroy (1764–1829), whose sons Sir Charles Fitzroy (1798–1858), governor of New South Wales, and Robert Fitzroy (*q.v.*), the hydrographer, were notable men. The 4th duke's son, who succeeded as 5th duke, was father of the 6th and 7th dukes.

The 3rd duke left in manuscript a *Memoir* of his public career, of which extracts have been printed in Stanhope's *History*, Walpole's *Memories of George III.* (Appendix, vol. iv.), and Campbell's *Lives of the Chancellors*.

GRAFTON, RICHARD (d. 1572), English printer and chronicler, was probably born about 1513. He received the freedom of the Grocers' Company in 1534. Miles Coverdale's version of the Bible had first been printed in 1535. Grafton was early brought into touch with the leaders of religious reform, and in 1537 he undertook, in conjunction with Edward Whitchurch, to produce a modified version of Coverdale's text, generally known as Matthew's Bible (Antwerp, 1537). He went to Paris to reprint Coverdale's revised edition (1538). There Whitchurch and he began to print the folio known as the Great Bible by special licence obtained by Henry VIII. from the French government. Suddenly, however, the work was officially stopped and the presses seized. Grafton fled, but Thomas Cromwell eventually bought the presses and type, and the printing was completed in England. The Great Bible was reprinted several times under his direction, the last occasion being 1553. In 1544 Grafton and Whitchurch secured the exclusive right of printing church service books, and on the accession of Edward VI. he was appointed king's printer, an office which he retained throughout the reign. In this capacity he produced *The Booke of the Common Prayer and Administracion of the Sacramentes, and other Rites and Ceremonies of the Churche: after the Use of the Churche of Englande* (1549 fol.), and *Actes of Parliament* (1552 and 1553). In 1553 he printed Lady Jane Grey's proclamation and signed himself the queen's printer. For this he was imprisoned for a short time, and he seems thereafter to have retired from active business. His historical works include a continuation (1543) of Hardyng's *Chronicle* from the beginning of the reign of Edward IV. down to Grafton's own times. He is said to have taken considerable liberties with the original, and may practically be regarded as responsible for the whole work. He printed in 1548 Edward Hall's *Union of the . . . Families of Lancastre and Yorke*, adding the history of the years from 1532 to 1547. After he retired from the printing business he published *An Abridgement of the Chronicles of England* (1562), *Manuell of the Chronicles of England* (1565), *Chronicle at large and meere Historye of the Affayres of England* (1568). In these books he chiefly adapted the work of his predecessors, but in some cases he gives detailed accounts of contemporary events. His name frequently appears in the records of St Bartholomew's and Christ's hospitals, and in 1553 he was treasurer-general of the hospitals of King Edward's foundation. In 1553–1554 and 1556–1557 he represented the City in Parliament, and in 1562–1563 he sat for Coventry.

An elaborate account of Grafton was written in 1901 by Mr J. A. Kingdon under the auspices of the Grocers' Company, with the title *Richard Grafton, Citizen and Grocer of London, &c.*, in continuation of *Incidents in the Lives of T. Poynte and R. Grafton* (1895). His *Chronicle at large* was reprinted by Sir Henry Ellis in 1809.

GRAFTON, a city of Clarence county, New South Wales, lying on both sides of the Clarence river, at a distance of 45 m. from its mouth, 342 m. N.E. of Sydney by sea. Pop. (1901) 4174. South Grafton, 976. The two sections, North Grafton and South Grafton, form separate municipalities. The river is navigable from the sea to the town for ships of moderate burden, and for small vessels to a point 35 m. beyond it. The entrance to the river has been artificially improved. Grafton is the seat of the Anglican joint-bishopric of Grafton and Armidale, and of a Roman Catholic bishopric created in 1888, both of which have fine cathedrals. Dairy-farming and sugar-growing are important industries, and there are several sugar-mills in the neighbourhood; great numbers of horses, also, are bred for the Indian and colonial markets. Tobacco, cereals and fruits are also grown. Grafton has a large shipping trade with Sydney. There is rail-connexion with Brisbane, &c. The city became a municipality in 1859.

GRAFTON, a township in the S.E. part of Worcester county, Massachusetts, U.S.A. Pop. (1905) 5052; (1910) 5705. It is served by the New York, New Haven & Hartford, and the Boston & Albany railways, and by interurban electric lines. The township contains several villages (including Grafton, North Grafton, Saundersville, Fisherville and Farnumsville); the principal village, Grafton, is about 7 m. S.E. of Worcester. The villages are residential suburbs of Worcester, and attract many summer residents. In the village of Grafton there is a public library. There is ample water power from the Blackstone river and its tributaries, and among the manufactures of Grafton are cotton-goods, boots and shoes, &c. Within what is now Grafton stood the Nipmuck Indian village of Hassanamesit. John Eliot, the "apostle to the Indians," visited it soon after 1651, and organized the third of his bands of "praying Indians" there; in 1671 he established a church for them, the second of the kind in New England, and also a school. In 1654 the Massachusetts General Court granted to the Indians, for their exclusive use, a tract of about 4 sq. m., of which they remained the sole proprietors until 1718, when they sold a small farm to Elisha Johnson, the first permanent white settler in the neighbourhood. In 1728 a group of residents of Marlboro, Sudbury, Concord and Stowe, with the permission of the General Court, bought from the Indians 7500 acres of their lands, and agreed to establish forty English families on the tract within three years, and to maintain a church and school of which the Indians should have free use. The township was incorporated in 1735, and was named in honour of the 2nd duke of Grafton. The last of the pure-blooded Indians died about 1825.

GRAFTON, a city and the county-seat of Taylor county, West Virginia, U.S.A., on Tygart river, about 100 m. by rail S.E. of Wheeling. Pop. (1890) 3150; (1900) 5650, including 226 foreign-born and 162 negroes; (1910) 7563. It is served by four divisions of the Baltimore & Ohio railway, which maintains extensive shops here. The city is about 1000 ft. above sea-level. It has a small national cemetery, and about 4 m. W., at Pruntytown, is the West Virginia Reform School. Grafton is situated near large coal-fields, and is supplied with natural gas. Among its manufactures are machine-shop and foundry products, window glass and pressed glass ware, and grist mill and planing-mill products. The first settlement was made about 1852, and Grafton was incorporated in 1856 and chartered as a city in 1899. In 1903 the population and area of the city were increased by the annexation of the town of Fetterman (pop. in 1900, 796), of Beaumont (unincorporated), and of other territory.

GRAHAM, SIR GERALD (1831–1899), British general, was born on the 27th of June 1831 at Acton, Middlesex. He was

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educated at Dresden and Woolwich Academy, and entered the Royal Engineers in 1850. He served with distinction through the Russian War of 1854 to 1856, was present at the battles of the Alma and Inkerman, was twice wounded in the trenches before Sevastopol, and was awarded the Victoria Cross for gallantry at the attack on the Redan and for devoted heroism on numerous occasions. He also received the Legion of Honour, and was promoted to a brevet majority. In the China War of 1860 he took part in the actions of Sin-ho and Tang-ku, the storming of the Taku Forts, where he was severely wounded, and the entry into Peking (brevet lieutenant-colonelcy and C.B.). Promoted colonel in 1869, he was employed in routine duties until 1877, when he was appointed assistant-director of works for barracks at the war office, a position he held until his promotion to major-general in 1881. In command of the advanced force in Egypt in 1882, he bore the brunt of the fighting, was present at the action of Magfar, commanded at the first battle of Kassassin, took part in the second, and led his brigade at Tell-el-Kebir. For his services in the campaign he received the K.C.B. and thanks of parliament. In 1884 he commanded the expedition to the eastern Sudan, and fought the successful battles of El Teb and Tamai. On his return home he received the thanks of parliament and was made a lieutenant-general for distinguished service in the field. In 1885 he commanded the Suakin expedition, defeated the Arabs at Hashin and Tamai, and advanced the railway from Suakin to Otao, when the expedition was withdrawn (thanks of parliament and G.C.M.G.). In 1896 he was made G.C.B., and in 1899 colonel-commandant Royal Engineers. He died on the 17th of December 1899. He published in 1875 a translation of Goetze's *Operations of the German Engineers in 1870–1871*, and in 1887 *Last Words with Gordon*.

GRAHAM, SIR JAMES ROBERT GEORGE, Bart. (1792–1861), British statesman, son of a baronet, was born at Naworth, Cumberland, on the 1st of June 1792, and was educated at Westminster and Oxford. Shortly after quitting the university, while making the "grand tour" abroad, he became private secretary to the British minister in Sicily. Returning to England in 1818 he was elected to parliament as member for Hull in the Whig interest; but he was unseated at the election of 1820. In 1824 he succeeded to the baronetcy, and in 1826 he re-entered parliament as representative for Carlisle, a seat which he soon exchanged for the county of Cumberland. In the same year he published a pamphlet entitled "Corn and Currency," which brought him into prominence as a man of advanced Liberal opinions; and he became one of the most energetic advocates in parliament of the Reform Bill. On the formation of Earl Grey's administration he received the post of first lord of the admiralty, with a seat in the cabinet. From 1832 to 1837 he sat for the eastern division of the county of Cumberland. Dissensions on the Irish Church question led to his withdrawal from the ministry in 1834, and ultimately to his joining the Conservative party. Rejected by his former constituents in 1837, he was in 1838 elected for Pembroke, and in 1841 for Dorchester. In the latter year he took office under Sir Robert Peel as secretary of state for the home department, a post he retained until 1846. As home secretary he incurred considerable odium in Scotland, by his unconciliating policy on the church question prior to the "disruption" of 1843; and in 1844 the detention and opening of letters at the post-office by his warrant raised a storm of public indignation, which was hardly allayed by the favourable report of a parliamentary committee of investigation. From 1846 to 1852 he was out of office; but in the latter year he joined Lord Aberdeen's cabinet as first lord of the admiralty, in which capacity he acted also for a short time in the Palmerston ministry of 1855. The appointment of a select committee of inquiry into the conduct of the Russian war ultimately led to his withdrawal from official life. He continued as a private member to exercise a considerable influence on parliamentary opinion. He died at Netherby, Cumberland, on the 25th of October 1861.

His *Life*, by C. S. Parker, was published in 1907.

GRAHAM, SYLVESTER (1794–1851), American dietarian, was born in Suffield, Connecticut, in 1794. He studied at Amherst College, and was ordained to the Presbyterian ministry in 1826, but he seems to have preached but little. He became an ardent advocate of temperance reform and of vegetarianism, having persuaded himself that a flesh diet was the cause of abnormal cravings. His last years were spent in retirement and he died at Northampton, Massachusetts, on the 11th of September 1851. His name is now remembered because of his advocacy of unbolted (Graham) flour, and as the originator of "Graham bread." But his reform was much broader than this. He urged, primarily, physiological education, and in his *Science of Human Life* (1836; republished, with biographical memoir, 1858) furnished an exhaustive text-book on the subject. He had carefully planned a complete regimen including many details besides a strict diet. A Temperance (or Graham) Boarding House was opened in New York City about 1832 by Mrs Asenath Nicholson, who published *Nature's Own Book* (2nd ed., 1835) giving Graham's rules for boarders; and in Boston a Graham House was opened in 1837 at 23 Brattle Street.

There were many Grahamites at Brook Farm, and the American Physiological Society published in Boston in 1837 and 1838 a weekly called *The Graham Journal of Health and Longevity, designed to illustrate by facts and sustain by reason and principles the science of human life as taught by Sylvester Graham*, edited by David Campbell. Graham wrote *Essay on Cholera* (1832); *The Esculapian Tablets of the Nineteenth Century* (1834); *Lectures to Young Men on Chastity* (2nd ed., 1837); and *Bread and Bread Making*; and projected a work designed to show that his system was not counter to the Holy Scriptures.

GRAHAM, THOMAS (1805–1869), British chemist, born at Glasgow on the 20th of December 1805, was the son of a merchant of that city. In 1819 he entered the university of Glasgow with the intention of becoming a minister of the Established Church. But under the influence of Thomas Thomson (1773–1852), the professor of chemistry, he developed a taste for experimental science and especially for molecular physics, a subject which formed his main preoccupation throughout his life. After graduating in 1824, he spent two years in the laboratory of Professor T. C. Hope at Edinburgh, and on returning to Glasgow gave lessons in mathematics, and subsequently chemistry, until the year 1829, when he was appointed lecturer in the Mechanics' Institute. In 1830 he succeeded Dr Andrew Ure (1778–1857) as professor of chemistry in the Andersonian Institution, and in 1837, on the death of Dr Edward Turner, he was transferred to the chair of chemistry in University College, London. There he remained till 1855, when he succeeded Sir John Herschel as Master of the Mint, a post he held until his death on the 16th of September 1869. The onerous duties his work at the Mint entailed severely tried his energies, and in quitting a purely scientific career he was subjected to the cares of official life, for which he was not fitted by temperament. The researches, however, which he conducted between 1861 and 1869 were as brilliant as any of those in which he engaged. Graham was elected a fellow of the Royal Society in 1836, and a corresponding member of the Institute of France in 1847, while Oxford made him a D. C. L. in 1855. He took a leading part in the foundation of the London Chemical and the Cavendish societies, and served as first president of both, in 1841 and 1846. Towards the close of his life the presidency of the Royal Society was offered him, but his failing health caused him to decline the honour.

Graham's work is remarkable at once for its originality and for the simplicity of the methods employed in obtaining most important results. He communicated papers to the Philosophical Society of Glasgow before the work of that society was recorded in *Transactions*, but his first published paper, "On the Absorption of Gases by Liquids," appeared in the *Annals of Philosophy* for 1826. The subject with which his name is most prominently associated is the diffusion of gases. In his first paper on this subject (1829) he thus summarizes the knowledge experiment had afforded as to the laws which regulate the movement of gases. "Fruitful as the miscibility of gases has been in interesting speculations, the experimental information we possess

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on the subject amounts to little more than the well-established fact that gases of a different nature when brought into contact do not arrange themselves according to their density, but they spontaneously diffuse through each other so as to remain in an intimate state of mixture for any length of time." For the fissured jar of J. W. Döbereiner he substituted a glass tube closed by a plug of plaster of Paris, and with this simple appliance he developed the law now known by his name "that the diffusion rate of gases is inversely as the square root of their density." (See DIFFUSION.) He further studied the passage of gases by transpiration through fine tubes, and by effusion through a minute hole in a platinum disk, and was enabled to show that gas may enter a vacuum in three different ways: (1) by the molecular movement of diffusion, in virtue of which a gas penetrates through the pores of a disk of compressed graphite; (2) by effusion through an orifice of sensible dimensions in a platinum disk the relative times of the effusion of gases in mass being similar to those of the molecular diffusion, although a gas is usually carried by the former kind of impulse with a velocity many thousand times as great as is demonstrable by the latter; and (3) by the peculiar rate of passage due to transpiration through fine tubes, in which the ratios appear to be in direct relation with no other known property of the same gases—thus hydrogen has exactly double the transpiration rate of nitrogen, the relation of those gases as to density being as 1 : 14. He subsequently examined the passage of gases through septa or partitions of india-rubber, unglazed earthenware and plates of metals such as palladium, and proved that gases pass through these septa neither by diffusion nor effusion nor by transpiration, but in virtue of a selective absorption which the septa appear to exert on the gases in contact with them. By this means ("atmolysis") he was enabled partially to separate oxygen from air.

His early work on the movements of gases led him to examine the spontaneous movements of liquids, and as a result of the experiments he divided bodies into two classes—crystalloids, such as common salt, and colloids, of which gum-arabic is a type—the former having high and the latter low diffusibility. He also proved that the process of liquid diffusion causes partial decomposition of certain chemical compounds, the potassium sulphate, for instance, being separated from the aluminium sulphate in alum by the higher diffusibility of the former salt. He also extended his work on the transpiration of gases to liquids, adopting the method of manipulation devised by J. L. M. Poiseuille. He found that dilution with water does not effect proportionate alteration in the transpiration velocities of different liquids, and a certain determinable degree of dilution retards the transpiration velocity.

With regard to Graham's more purely chemical work, in 1833 he showed that phosphoric anhydride and water form three distinct acids, and he thus established the existence of polybasic acids, in each of which one or more equivalents of hydrogen are replaceable by certain metals (see ACID). In 1835 he published the results of an examination of the properties of water of crystallization as a constituent of salts. Not the least interesting part of this inquiry was the discovery of certain definite salts with alcohol analogous to hydrates, to which the name of alcoholates was given. A brief paper entitled "Speculative Ideas on the Constitution of Matter" (1863) possesses special interest in connexion with work done since his death, because in it he expressed the view that the various kinds of matter now recognized as different elementary substances may possess one and the same ultimate or atomic molecule in different conditions of movement.

Graham's *Elements of Chemistry*, first published in 1833, went through several editions, and appeared also in German, remodelled under J. Otto's direction. His *Chemical and Physical Researches* were collected by Dr James Young and Dr Angus Smith, and printed "for presentation only" at Edinburgh in 1876, Dr Smith contributing to the volume a valuable preface and analysis of its contents. See also T. E. Thorpe, *Essays in Historical Chemistry* (1902)

GRAHAME, JAMES (1765–1811), Scottish poet, was born in Glasgow on the 22nd of April 1765, the son of a successful sawyer. After completing his literary course at Glasgow university, Grahame went in 1784 to Edinburgh, where he qualified as writer to the signet, and subsequently for the Scottish bar, of which he was elected a member in 1795. But his preferences had always been for the Church, and when he was forty-four he took Anglican orders, and became a curate first at Shipton, Gloucestershire, and then at Sedgefield, Durham. His works include a dramatic poem, *Mary Queen of Scots* (1801), *The Sabbath* (1804), *British Georgics* (1804), *The Birds of Scotland* (1806), and *Poems on the Abolition of the Slave Trade* (1810). His principal work, *The Sabbath*, a sacred and descriptive poem in blank verse, is characterized by devotional feeling and by happy delineation of Scottish scenery. In the notes to his poems he expresses enlightened views on popular education, the criminal law and other public questions. He was emphatically a friend of humanity—a philanthropist as well as a poet. He died in Glasgow on the 14th of September 1811.

GRAHAM'S DYKE (or SHEUGH = trench), a local name for the Roman fortified frontier, consisting of rampart, forts and road, which ran across the narrow isthmus of Scotland from the Forth to the Clyde (about 36 m.), and formed from A.D. 140 till about 185 the northern frontier of Roman Britain. The name is locally explained as recording a victorious assault on the defences by one Robert Graham and his men; it has also been connected with the Grampian Hills and the Latin surveying term *groma*. But, as is shown by its earliest recorded spelling, Grymisdyke (Fordun, A.D. 1385), it is the same as the term Grim's Ditch which occurs several times in England in connexion with early ramparts —for example, near Wallingford in south Oxfordshire or between Berkhampstead (Herts) and Bradenham (Bucks). Grim seems to be a Teutonic god or devil, who might be credited with the wish to build earthworks in unreasonably short periods of time. By antiquaries the Graham's Dyke is usually styled the Wall of Pius or the Antonine Vallum, after the emperor Antoninus Pius, in whose reign it was constructed. See further BRITAIN: *Roman*.

(F. J. H.)

GRAHAM'S TOWN, a city of South Africa, the administrative centre for the eastern part of the Cape province, 106 m. by rail N.E. of Port Elizabeth and 43 m. by rail N.N.W. of Port Alfred. Pop. (1904) 13,887, of whom 7283 were whites and 1837 were electors. The town is built in a basin of the grassy hills forming the spurs of the Zuurberg, 1760 ft. above sea-level. It is a pleasant place of residence, has a remarkably healthy climate, and is regarded as the most English-like town in the Cape. The streets are broad, and most of them lined with trees. In the High Street are the law courts, the Anglican cathedral of St George, built from designs by Sir Gilbert Scott, and Commemoration Chapel, the chief place of worship of the Wesleyans, erected by the British emigrants of 1820. The Roman Catholic cathedral of St Patrick, a Gothic building, is to the left of the High Street. The town hall, also in the Gothic style, has a square clock tower built on arches over the pavement. Graham's Town is one of the chief educational centres in the Cape province. Besides the public schools and the Rhodes University College (which in 1904 took over part of the work carried on since 1855 by St Andrew's College), scholastic institutions are maintained by religious bodies. The town possesses two large hospitals, which receive patients from all parts of South Africa, and the government bacteriological institute. It is the centre of trade for an extensive pastoral and agricultural district. Owing to the sour quality of the herbage in the surrounding *sturveld*, stock-breeding and wool-growing have been, however, to some extent replaced by ostrich-farming with which industry Graham's Town is the most important entrepôt. Dairy farming is much practised in the neighbourhood.

In 1812 the site of the town was chosen as the headquarters of the British troops engaged in protecting the frontier of Cape Colony from the inroads of the Kaffirs, and it was named after Colonel John Graham (1778–1821), then commanding the forces. (Graham had commanded the light infantry battalion at the taking of the Cape by the British in the action of the 6th of January 1806. He also took part in campaigns in Italy and Holland during the Napoleonic wars.) In 1819 an attempt was

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made by the Kaffirs to surprise Graham's Town, and 10,000 men attacked it, but they were repulsed by the garrison, which numbered not more than 320 men, infantry and artillery, under Lieut.-Colonel (afterwards General Sir) Thomas Willshire. In 1822 the town was chosen as the headquarters of the 4000 British immigrants who had reached Cape Colony in 1820. It has maintained its position as the most important inland town of the eastern part of the Cape province. In 1864 the Cape parliament met in Graham's Town, the only instance of the legislature sitting elsewhere than in Cape Town. It is governed by a municipality. The rateable value in 1906 was £891,536 and the rate levied 2½d. in the pound.

See T. Sheffield, *The Story of the Settlement* . . . (2nd ed., Graham's Town, 1884); C. T. Campbell, *British South Africa* . . . *with notices of some of the British Settlers of 1820* (London, 1897).

GRAIL, THE HOLY, the famous talisman of Arthurian romance, the object of quest on the part of the knights of the Round Table. It is mainly, if not wholly, known to English readers through the medium of Malory's translation of the French *Quête du Saint Graal*, where it is the cup or chalice of the Last Supper, in which the blood which flowed from the wounds of the crucified Saviour has been miraculously preserved. Students of the original romances are aware that there is in these texts an extraordinary diversity of statement as to the nature and origin of the Grail, and that it is extremely difficult to determine the precise value of these differing versions.[1] Broadly speaking the Grail romances have been divided into two main classes: (1) those dealing with the search for the Grail, the *Quest*, and (2) those relating to its early history. These latter appear to be dependent on the former, for whereas we may have a *Quest* romance without any insistence on the previous history of the Grail, that history is never found without some allusion to the hero who is destined to bring the quest to its successful termination. The *Quest* versions again fall into three distinct classes, differentiated by the personality of the hero who is respectively Gawain, Perceval or Galahad. The most important and interesting group is that connected with Perceval, and he was regarded as the original Grail hero, Gawain being, as it were, his understudy. Recent discoveries, however, point to a different conclusion, and indicate that the *Gawain* stories represent an early tradition, and that we must seek in them rather than in the *Perceval* versions for indications as to the ultimate origin of the Grail.

The character of this talisman or relic varies greatly, as will be seen from the following summary.

1. GAWAIN, included in the continuation to Chrétien's *Perceval* by Wauchier de Denain, and attributed to Bleheris the Welshman, who is probably identical with the Bledhericus of Giraldus Cambrensis, and considerably earlier than Chrétien de Troyes. Here the Grail is a food-providing, self-acting talisman, the precise nature of which is not specified; it is designated as the "rich" Grail, and serves the king and his court *sans serjant et sans seneschal*, the butlers providing the guests with wine. In another version, given at an earlier point of the same continuation, but apparently deriving from a later source, the Grail is borne in procession by a weeping maiden, and is called the "holy" Grail, but no details as to its history or character are given. In a third version, that of *Diu Crône*, a long and confused romance, the origin of which has not been determined, the Grail appears as a reliquary, in which the Host is presented to the king, who once a year partakes alike of it and of the blood which flows from the lance. Another account is given in the prose *Lancelot*, but here Gawain has been deposed from his post as first hero of the court, and, as is to be expected from the treatment meted out to him in this romance, the visit ends in his complete discomfiture. The Grail is here surrounded with the atmosphere of awe and reverence familiar to us through the *Quête*, and is regarded as the chalice of the Last Supper. These are the *Gawain* versions.

2. PERCEVAL.—The most important *Perceval* text is the *Conte del Graal*, or *Perceval le Galois* of Chrétien de Troyes. Here the Grail is wrought of gold richly set with precious stones; it is carried in solemn procession, and the light issuing from it extinguishes that of the candles. What it is is not explained, but inasmuch as it is the vehicle in which is conveyed the Host on which the father of the Fisher king depends for nutriment, it seems not improbable that here, as in *Diu Crône*, it is to be understood as a reliquary. In the *Parzival* of Wolfram von Eschenbach, the ultimate source of which is identical with that of Chrétien, on the contrary, the Grail is represented as a precious stone, brought to earth by angels, and committed to the guardianship of the Grail king and his descendants. It is guarded by a body of chosen knights, or templars, and acts alike as a life and youth preserving talisman—no man may die within eight days of beholding it, and the maiden who bears it retains perennial youth—and an oracle choosing its own servants, and indicating whom the Grail king shall wed. The sole link with the Christian tradition is the statement that its virtue is renewed every Good Friday by the agency of a dove from heaven. The discrepancy between this and the other Grail romances is most startling.

In the short prose romance known as the "Didot" *Perceval* we have, for the first time, the whole history of the relic logically set forth. The *Perceval* forms the third and concluding section of a group of short romances, the two preceding being the *Joseph of Arimathea* and the *Merlin*. In the first we have the precise history of the Grail, how it was the dish of the Last Supper, confided by our Lord to the care of Joseph, whom he miraculously visited in the prison to which he had been committed by the Jews. It was subsequently given by Joseph to his brother-in-law Brons, whose grandson Perceval is destined to be the final winner and guardian of the relic. The *Merlin* forms the connecting thread between this definitely ecclesiastical romance and the chivalric atmosphere of Arthur's court; and finally, in the *Perceval*, the hero, son of Alain and grandson to Brons, is warned by Merlin of the quest which awaits him and which he achieves after various adventures.

In the *Perlesvaus* the Grail is the same, but the working out of the scheme is much more complex; a son of Joseph of Arimathea, Josephe, is introduced, and we find a spiritual knighthood similar to that used so effectively in the *Parzival*.

3. GALAHAD.—The *Quête du Saint Graal*, the only romance of which Galahad is the hero, is dependent on and a completion of the *Lancelot* development of the Arthurian cycle. Lancelot, as lover of Guinevere, could not be permitted to achieve so spiritual an emprise, yet as leading knight of Arthur's court it was impossible to allow him to be surpassed by another. Hence the invention of Galahad, son to Lancelot by the Grail king's daughter; predestined by his lineage to achieve the quest, foredoomed, the quest achieved, to vanish, a sacrifice to his father's fame, which, enhanced by connexion with the Grail-winner, could not risk eclipse by his presence. Here the Grail, the chalice of the Last Supper, is at the same time, as in the *Gawain* stories, self-acting and food-supplying.

The last three romances unite, it will be seen, the quest and the early history. Introductory to the Galahad quest, and dealing only with the early history, is the *Grand Saint Graal*, a work of interminable length, based upon the *Joseph of Arimathea*, which has undergone numerous revisions and amplifications: its precise relation to the *Lancelot*, with which it has now much matter in common, is not easy to determine.

To be classed also under the head of early history are certain interpolations in the MSS. of the *Perceval*, where we find the *Joseph* tradition, but in a somewhat different form, *e.g.* he is said to have caused the Grail to be made for the purpose of receiving the holy blood. With this account is also connected the legend of the *Volto Santo* of Lucca, a crucifix said to have been carved by Nicodemus. In the conclusion to Chrétien's poem, composed by Manessier some fifty years later, the Grail is said to have *followed* Joseph to Britain, how, is not explained.

[1] The etymology of the O. Fr. *graal* or *greal*, of which "grail" is an adaptation, has been much discussed. The Low Lat. original, *gradale* or *grasale*, a flat dish or platter, has generally been taken to represent a diminutive *cratella* of *crater*, bowl, or a lost *cratale*, formed from the same word (see W. W. Skeat, Preface to *Joseph of Arimathie*, Early Eng. Text Soc.).—ED.

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Another continuation by Gerbert, interpolated between those of Wauchier and Manessier, relates how the Grail was brought to Britain by Perceval's mother in the companionship of Joseph.

It will be seen that with the exception of the *Grand Saint Graal*, which has now been practically converted into an introduction to the *Quête*, no two versions agree with each other; indeed, with the exception of the oldest *Gawain*-Grail visit, that due to Bleheris, they do not agree with themselves, but all show, more or less, the influence of different and discordant versions. Why should the vessel of the Last Supper, jealously guarded at Castle Corbenic, visit Arthur's court independently? Why does a sacred relic provide purely material food? What connexion can there be between a precious stone, a *baetylus*, as Dr Hagen has convincingly shown, and Good Friday? These, and such questions as these, suggest themselves at every turn.

Numerous attempts have been made to solve these problems, and to construct a theory of the origin of the Grail story, but so far the difficulty has been to find an hypothesis which would admit of the practically simultaneous existence of apparently contradictory features. At one time considered as an introduction from the East, the theory of the Grail as an Oriental talisman has now been discarded, and the expert opinion of the day may be said to fall into two groups: (1) those who hold the Grail to have been from the first a purely Christian vessel which has accidentally, and in a manner never clearly explained, acquired certain folk-lore characteristics; and (2) those who hold, on the contrary, that the Grail is *aborigine* folk-lore and Celtic, and that the Christian development is a later and accidental rather than an essential feature of the story. The first view is set forth in the work of Professor Birch-Hirschfeld, the second in that of Mr Alfred Nutt, the two constituting the only *travaux d'ensemble* which have yet appeared on the subject. It now seems probable that both are in a measure correct, and that the ultimate solution will be recognized to lie in a blending of two originally independent streams of tradition. The researches of Professor Mannhardt in Germany and of J. G. Frazer in England have amply demonstrated the enduring influence exercised on popular thought and custom by certain primitive forms of vegetation worship, of which the most noteworthy example is the so-called mysteries of Adonis. Here the ordinary processes of nature and progression of the seasons were symbolized under the figure of the death and resuscitation of the god. These rites are found all over the world, and in his monumental work, *The Golden Bough*, Dr Frazer has traced a host of extant beliefs and practices to this source. The earliest form of the Grail story, the *Gawain*-Bleheris version, exhibits a marked affinity with the characteristic features of the Adonis or Tammuz worship; we have a castle on the sea-shore, a dead body on a bier, the identity of which is never revealed, mourned over with solemn rites; a wasted country, whose desolation is mysteriously connected with the dead man, and which is restored to fruitfulness when the quester asks the meaning of the marvels he beholds (the two features of the weeping women and the wasted land being retained in versions where they have no significance); finally the mysterious food-providing, self-acting talisman of a common feast—one and all of these features may be explained as survivals of the Adonis ritual. Professor Martin long since suggested that a key to the problems of the Arthurian cycle was to be found in a nature myth: Professor Rhys regards Arthur as an agricultural hero; Dr Lewis Mott has pointed out the correspondence between the so-called Round Table sites and the ritual of nature worship; but it is only with the discovery of the existence of Bleheris as reputed authority for Arthurian tradition, and the consequent recognition that the Grail story connected with his name is the earliest form of the legend, that we have secured a solid basis for such theories.

With regard to the religious form of the story, recent research has again aided us—we know now that a legend similar in all respects to the Joseph of Arimathea Grail story was widely current at least a century before our earliest Grail texts. The story with Nicodemus as protagonist is told of the *Saint-Sang* relic at Fécamp; and, as stated already, a similar origin is ascribed to the *Volto Santo* at Lucca. In this latter case the legend professes to date from the 8th century, and scholars who have examined the texts in their present form consider that there may be solid ground for this attribution. It is thus demonstrable that the material for our Grail legend, in its present form, existed long anterior to any extant text, and there is no improbability in holding that a confused tradition of pagan mysteries which had assumed the form of a popular folk-tale, became finally Christianized by combination with an equally popular ecclesiastical legend, the point of contact being the vessel of the common ritual feast. Nor can there be much doubt that in this process of combination the Fécamp legend played an important rôle. The best and fullest of the *Perceval* MSS. refer to a book written at Fécamp as source for certain *Perceval* adventures. What this book was we do not know, but in face of the fact that certain special Fécamp relics, silver knives, appear in the Grail procession of the *Parzival*, it seems most probable that it was a *Perceval*-Grail story. The relations between the famous Benedictine abbey and the English court both before and after the Conquest were of an intimate character. Legends of the part played by Joseph of Arimathea in the conversion of Britain are closely connected with Glastonbury, the monks of which foundation showed, in the 12th century, considerable literary activity, and it seems a by no means improbable hypothesis that the present form of the Grail legend may be due to a monk of Glastonbury elaborating ideas borrowed from Fécamp. This much is certain, that between the *Saint-Sang* of Fécamp, the *Volto Santo* of Lucca, and the Grail tradition, there exists a connecting link, the precise nature of which has yet to be determined. The two former were popular objects of pilgrimage; was the third originally intended to serve the same purpose by attracting attention to the reputed burial-place of the apostle of the Grail, Joseph of Arimathea?

BIBLIOGRAPHY.—For the Gawain Grail visits see the Potvin edition of the *Perceval*, which, however, only gives the Bleheris version; the second visit is found in the best and most complete MSS., such as 12,576 and 12,577 (*Fonds français*) of the Paris library. *Diu Crône*, edited by Scholl (Stuttgart, 1852), vol. vi. of *Arthurian Romances* (Nutt), gives a translation of the Bleheris, *Diu Crône* and *Perceval*-*Lancelot* visits.

The *Conte del Graal*, or *Perceval*, is only accessible in the edition of M. Potvin (6 vols., 1866–1871). The Mons MS., from which this has been printed, has proved to be an exceedingly poor and untrustworthy text. *Parzival*, by Wolfram von Eschenbach, has been frequently and well edited: the edition by Bartsch (1875–1877), in *Deutsche Classiker des Mittelalters*, contains full notes and a glossary. Suitable for the more advanced student are those by K. Lachmann (1891), Leitzmann (1902–1903) and E. Martin (1903). There are modern German translations by Simrock (very close to the original) and Hertz (excellent notes). English translation with notes and appendices by J. L. Weston. "Didot" *Perceval*, ed. Hucher; *Le Saint Graal* (1875–1878), vol. i. *Perlesvaus* was printed by Potvin, under the title of *Perceval le Gallois*, in vol. i. of the edition above referred to; a Welsh version from the Hengwert MS. was published with translation by Canon R. Williams (2 vols., 1876–1892). Under the title of *The High History of the Holy Graal* a fine version was published by Dr Sebastian Evans in the Temple Classics (2 vols., 1898). The *Grand Saint Graal* was published by Hucher as given above; this edition includes the *Joseph of Arimathea*. A 15th century metrical English adaptation by one Henry Lovelich, was printed by Dr Furnivall for the Roxburghe Club, 1861–1863; a new edition was undertaken for the Early English Text Society. *Quête du Saint Graal* can best be studied in Malory's somewhat abridged translation, books xiii.-xviii. of the *Morte Arthur*. It has also been printed by Dr Furnivall for the Roxburghe Club, from a MS. in the British Museum. Neither of these texts is, however, very good, and the student who can decipher old Dutch would do well to read it in the metrical translation published by Joeckbloet, *Roman van Lancelot*, as the original here was considerably fuller.

For general treatment of the subject see *Legend of Sir Perceval*, by J. L. Weston, Grimm Library, vol. xvii. (1906); *Studies on the Legend of the Holy Grail*, by A. Nutt (1888), and a more concise treatment of the subject by the same writer in No. 14 of *Popular Studies* (1902); Professor Birch-Hirschfeld's *Die Sage vom Gral* (1877). The late Professor Heinzel's *Die alt-französischen Gral-Romane* contains a mass of valuable matter, but is very confused and ill-arranged. For the Fécamp legend see Leroux de Lincey's *Essai sur l'abbaye de Fescamp* (1840); for the *Volto Santo* and kindred legends, Ernest von Dobschütz, *Christus-Bilder* (Leipzig, 1899). (J. L. W.)

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GRAIN (derived through the French from Lat. *granum*, seed, from an Aryan root meaning "to wear down," which also appears in the common Teutonic word "corn"), a word particularly applied to the seed, in botanical language the "fruit," of cereals, and hence applied, as a collective term to cereal plants generally, to which, in English, the term "corn" is also applied (see GRAIN TRADE). Apart from this, the chief meaning, the word is used of the malt refuse of brewing and distilling, and of many hard rounded small particles, resembling the seeds of plants, such as "grains" of sand, salt, gold, gunpowder, &c. "Grain" is also the name of the smallest unit of weight, both in the United Kingdom and the United States of America. Its origin is supposed to be the weight of a grain of wheat, dried and gathered from the middle of the ear. The troy grain = 1/5760 of a lb, the avoirdupois grain = 1/7000 of a lb. In diamond weighing the grain = ¼ of the carat, = ·7025 of the troy grain. The word "grains" was early used, as also in French, of the small seed-like insects supposed formerly to be the berries of trees, from which a scarlet dye was extracted (see COCHINEAL and KERMES). From the Fr. *en graine*, literally in dye, comes the French verb *engrainer*, Eng. "engrain" or "ingrain," meaning to dye in any fast colour. From the further use of "grain" for the texture of substances, such as wood, meat, &c., "engrained" or "ingrained" means ineradicable, impregnated, dyed through and through. The "grain" of leather is the side of a skin showing the fibre after the hair has been removed. The imitating in paint of the grain of different kinds of woods is known as "graining" (see PAINTER-WORK). "Grain," or more commonly in the plural "grains," construed as a singular, is the name of an instrument with two or more barbed prongs, used for spearing fish. This word is Scandinavian in origin, and is connected with Dan. *green*, Swed. *gren*, branch, and means the fork of a tree, of the body, or the prongs of a fork, &c. It is not connected with "groin," the inguinal parts of the body, which in its earliest forms appears as *grynde*.

GRAINS OF PARADISE, GUINEA GRAINS, or MELEGUETA PEPPER (Ger. *Paradieskörner*, Fr. *graines de Paradis, maniguette*), the seeds of *Amomum Melegueta*, a reed-like plant of the natural order *Zingiberaceae*. It is a native of tropical western Africa, and of Prince's and St Thomas's islands in the Gulf of Guinea, is cultivated in other tropical countries, and may with ease be grown in hothouses in temperate climates. The plant has a branched horizontal rhizome; smooth, nearly sessile, narrowly lanceolate-oblong alternate leaves; large, white, pale pink or purplish flowers; and an ovate-oblong fruit, ensheathed in bracts, which is of a scarlet colour when fresh, and reaches under cultivation a length of 5 in. The seeds are contained in the acid pulp of the fruit, are commonly wedge-shaped and bluntly angular, are about 1¼ lines in diameter and have a glossy dark-brown husk, with a conical light-coloured membranous caruncle at the base and a white kernel. They contain, according to Flückiger and Hanbury, 0·3% of a faintly yellowish neutral essential oil, having an aromatic, not acrid taste, and a specific gravity at 15·5° C. of 0·825, and giving on analysis the formula $C_{18}H_{17}O$, or $C_{16}H_{14}+C_{16}H_{18}O$; also 5·83% of an intensely pungent, viscid, brown resin.

Grains of paradise were formerly officinal in British pharmacopoeias, and in the 13th and succeeding centuries were used as a drug and a spice, the wine known as hippocras being flavoured with them and with ginger and cinnamon. In 1620 they were employed among the ingredients of the twenty-four herring pies which were the ancient fee-favour of the city of Norwich, ordained to be carried to court by the lord of the manor of Carleton (Johnston and Church, *Chem. of Common Life*, p. 355, 1879). Grains of paradise were anciently brought overland from West Africa to the Mediterranean ports of the Barbary states, to be shipped for Italy. They are now exported almost exclusively from the Gold Coast. Grains of paradise are to some extent used illegally to give a fictitious strength to malt liquors, gin and cordials. By 56 Geo. III. c. 58, no brewer or dealer in beer shall have in his possession or use grains of paradise, under a penalty of £200 for each offence; and no druggist shall sell the same to a brewer under a penalty of £500. They are, however, devoid of any injurious physiological action, and are much esteemed as a spice by the natives of Guinea.

See Bentley and Trimen, *Medicinal Plants*, tab. 268; Lanessan, *Hist. des Drogues*, pp. 456-460 (1878).

GRAIN TRADE. The complexity of the conditions of life in the 20th century may be well illustrated from the grain trade of the world. The ordinary bread sold in Great Britain represents, for example, produce of nearly every country in the world outside the tropics.

General considerations.

Wheat has been cultivated from remote antiquity. In a wild state it is practically unknown. It is alleged to have been found growing wild between the Euphrates and the Tigris; but the discovery has never been authenticated, and, unless the plant be sedulously cared for, the species dies out in a surprisingly short space of time. Modern experiments in cross-fertilization in Lancashire by the Garton Brothers have evolved the most extraordinary "sports," showing, it is claimed, that the plant has probably passed through stages of which until the present day there had been no conception. The tales that grains of wheat found in the cerements of Egyptian mummies have been planted and come to maturity are no longer credited, for the vital principle in the wheat berry is extremely evanescent; indeed, it is doubtful whether wheat twenty years old is capable of reproduction. The Garton artificial fertilization experiments have shown endless deviations from the ordinary type, ranging from minute seeds with a closely adhering husk to big berries almost as large as sloes and about as worthless. It is conjectured that the wheat plant, as now known, is a degenerate form of something much finer which flourished thousands of years ago, and that possibly it may be restored to its pristine excellence, yielding an increase twice or thrice as large as it now does, thus postponing to a distant period the famine doom prophesied by Sir W. Crookes in his presidential address to the British Association in 1898. Wheat well repays careful attention; contrast the produce of a carelessly tilled Russian or Indian field and the bountiful yield on a good Lincolnshire farm, the former with its average yield of 8 bushels, the latter with its 50 bushels per acre; or compare the quality, as regards the quantity and flavour of the flour from a fine sample of British wheat, such as is on sale at almost every agricultural show in Great Britain, with the produce of an Egyptian or Syrian field; the difference is so great as to cause one to doubt whether the berries are of the same species.

It may be stated roundly that an average quartern loaf in Great Britain is made from wheat grown in the following countries in the proportions named:—

U.S.A.	U.K.	Russia	Argentina	British India	Canada	Rumania-Bulgaria.	Australia.	Other Countries.
Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.
26	13	9	5	4	3	2	1	1
	Or expressed in percentages as follows:—							
40	20	14	8	6	5	3	2	2

For details connected with grain and its handling see AGRICULTURE, CORN LAWS, GRANARIES, FLOUR, BAKING, WHEAT, &c.

Wheat occupies of all cereals the widest region of any food-stuff. Rice, which shares with millet the distinction of being the principal food-stuff of the greatest number of human beings, is not grown nearly as widely as is wheat, the staple food of the white races. Wheat grows as far south as Patagonia, and as far north as the edge of the Arctic Circle; it flourishes throughout Europe, and across the whole of northern Asia and in Japan; it is cultivated in Persia, and raised largely in India, as far south as the Nizam's dominions. It is grown over nearly the whole of North America. In Canada a very fine wheat crop was raised in the autumn of 1898 as far north as the mission at Fort Providence, on the Mackenzie river, in a latitude above 62°—or less than 200 m. south of the latitude of Dawson City—the period between seed-time and harvest having been ninety-one

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days. In Africa it was an article of commerce in the days of Jacob, whose son Joseph may be said to have run the first and only successful "corner" in wheat. For many centuries Egypt was famous as a wheat raiser; it was a cargo of wheat from Alexandria which St Paul helped to jettison on one of his shipwrecks, as was also, in all probability, that of the "ship of Alexandria whose sign was Castor and Pollux," named in the same narrative. General Gordon is quoted as having stated that the Sudan if properly settled would be capable of feeding the whole of Europe. Along the north coast of Africa are areas which, if properly irrigated, as was done in the days of Carthage, could produce enough wheat to feed half of the Caucasian race. For instance, the vilayet of Tripoli, with an area of 400,000 sq. m., or three times the extent of Great Britain and Ireland, according to the opinion of a British consul, could raise millions of acres of wheat. The cereal flourishes on all the high plateaux of South Africa, from Cape Town to the Zambezi. Land is being extensively put under wheat in the pampas of South America and in the prairies of Siberia.

In the raising of the standard of farming to an English level the volume of the world's crop would be trebled, another fact which Sir William Crookes seems to have overlooked. The experiments of the late Sir J. B. Lawes in Hertfordshire have proved that the natural fruitfulness of the wheat plant can be increased threefold by the application of the proper fertilizer. The results of these experiments will be found in a compendium issued from the Rothamsted Agricultural Experimental Station.

It is by no means, however, the wheat which yields the greatest number of bushels per acre which is the most valuable from a miller's standpoint, for the thinness of the bran and the fineness and strength of the flour are with him important considerations, too often overlooked by the farmer when buying his seed. Nevertheless it is the deficient quantity of the wheat raised in the British Islands, and not the quality of the grain, which has been the cause of so much anxiety to economists and statesmen.

Sir J. Caird, writing in the year 1880, expressed the opinion that arable land in Great Britain would always command a substantial rent of at least 30s. per acre. His figures were based on the assumption that wheat was imported duty free. He calculated that the cost of carriage from abroad of wheat, or the equivalent of the product of an acre of good wheat land in Great Britain, would not be less than 30s. per ton. But freights had come down by 1900 to half the rates predicated by Caird; indeed, during a portion of the interval they ruled very close to zero, as far as steamer freights from America were concerned. In 1900 an all-round freight rate for wheat might be taken at 15s. *per ton* (a ton representing approximately the produce of an acre of good wheat land in England), say from 10s. for Atlantic American and Russian, to 30s. for Pacific American and Australian; about midway between these two extremes we find Indian and Argentine, the greatest bulk coming at about the 15s. rate. Inferior land bearing less than 4½ quarters per acre would not be protected to the same extent, and moreover, seeing that a portion of the British wheat crop has to stand a charge as heavy for land carriage across a county as that borne by foreign wheat across a continent or an ocean, the protection is not nearly so substantial as Caird would make out. The compilation showing the changes in the rates of charges for the railway and other transportation services issued by the Division of Statistics, Department of Agriculture, U.S.A. (Miscellaneous series, Bulletin No. 15, 1898), is a valuable reference book. From its pages are culled the following facts relating to the changes in the rates of freight up to the year 1897.[1] In Table 3 the average rates per ton per mile in cents are shown since 1846. For the Fitchburg Railroad the rate for that year was 4·523 cents per ton per mile, since when a great and almost continuous fall has been taking place, until in 1897, the latest year given, the rate had declined to ·870 of a cent per ton per mile. The railway which shows the greatest fall is the Chesapeake & Ohio, for the charge has fallen from over 7 cents in 1862 and 1863 to ·419 of a cent in 1897, whereas the Erie rates have fallen only from 1·048 in 1852 to ·609 in 1897. Putting the rates of the twelve returning railways together, we find the average freight in the two years 1859–1860 was 3·006 cents per ton per mile, and that in 1896–1897 the average rate had fallen to ·797 of a cent per ton per mile. This difference is very large compared with the smallness of the unit. Coming to the rates on grain, we find (in Table 23) a record for the forty years 1858–1897 of the charge on wheat from Chicago to New York, via all rail from 1858, and via lake and rail since 1868, the authority being the secretary of the Chicago Board of Trade. From 1858 to 1862 the rate varied between 42·37 and 34·80 cents per bushel for the whole trip of roundly 1000 m., the average rate in the quinquennium being 38·43. In the five years immediately prior to the time at which Sir J. Caird expressed the opinion that the cost of carriage from abroad would always protect the British grower, the average all-rail freight from Chicago to New York was 17·76 cents, while the summer rate (partly by water) was 13·17 cents. These rates in 1897, the last year shown on the table, had fallen to 12·50 and 7·42 respectively. The rates have been as follows in quinquennial periods, via all rail:—

Chicago to New York in Cents per Bushel.

1858–1862.	1863–1867.	1868–1872.	1873–1877.	1878–1882.	1883–1887.	1888–1892.	1893–1897.
38·43	31·42	27·91	21·29	16·77	14·67	14·52	12·88

Calculating roundly a cent as equal to a halfpenny, and eight bushels to the quarter, the above would appear in English currency as follows:—

Chicago to New York in Shillings and Pence per Quarter.

1858–1862.	1863–1867.	1868–1872.	1873–1877.	1878–1882.	1883–1887.	1888–1892.	1893–1897.
s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
12 8	10 6	9 3	7 1	5 7	4 10½	4 10	4 3

Another table (No. 38) shows the average rates from Chicago to New York by lakes, canal and river. These in their quinquennial periods are given for the season as follows:—

In Cents per Bushel of 60 lb.

1857–1861.	1876–1880.	1893–1897.
22·15	10·47	4·92

In Shillings and Pence per Quarter of 480 lb.

1857–1861.	1876–1880.	1893–1897.
s. d.	s. d.	s. d.
7 4	3 6	1 7

In Shillings and Pence per Ton of 2240 lb.

1857–1861.	1876–1880.	1893–1897.
s. d.	s. d.	s. d.
34 6	16 6	7 6

This latter mode is the cheapest by which grain can be carried to the eastern seaboard from the American prairies, and it can now be done at a cost of 7s. 6d. per ton. The ocean freight has to be added before the grain can be delivered free on the quay at Liverpool. A rate from New York to Liverpool of 2½d. per bushel, or 7s. 10d. per ton, a low rate, reached in Dec. 1900, is yet sufficiently high, it is claimed, to leave a profit; indeed, there have frequently been times when the rate was as low as 1d. per bushel, or 3s. 1d. per ton; and in periods of great trade depression wheat is carried from New York to Liverpool as ballast, being paid for by the ship-owner. Another route worked more cheaply than formerly is that by river, from the centre of the winter wheat belt, say at St Louis, to New Orleans, and thence by steamer to Liverpool. The river rate has fallen below five

Freight rates.

[1] Valuable information will also be found in Bulletin No. 38 (1905), "Crop Export Movement and Port Facilities on the Atlantic and Gulf Coasts"; in Bulletin No. 49 (1907), "Cost of Hauling Crops from Farms to Shipping Points"; and in Bulletin No. 69 (1908), "European Grain Trade."

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cents per bushel, or 7s. per ton, 2240 lb. In Table No. 71 the cost of transportation is compared year by year with the export price of the two leading cereals in the States as follows:—

Wheat and Corn—Export Prices and Transportation Rates compared.

Year.	Wheat			Corn.		
	Export Price per Bushel.	Rate, Chicago to New York by Lake and Canal, per Bushel	Number of Bushels carried for Price of One Bushel	Export Price per Bushel.	Rate, Chicago to New York by Lake and Canal, per Bushel	Number of Bushels carried for Price of One Bushel.
		Cents.			Cents.	
1867	$0·92	15·95	5·77	$0·72	14·58	4·94
1868	1·36	16·23	8·38	·84·1	13·57	6·20
1869	1·05	17·20	6·10	·72·8	14·98	4·86
1870	1·12	14·85	7·54	·80·5	13·78	5·84
1871	1·18	17·75	6·65	·67·9	16·53	4·11
1872	1·31	21·55	6·08	·61·8	19·62	3·15
1873	1·15	16·89	6·81	·54·2	15·29	3·53
1874	1·29	12·75	10·12	·64·7	11·29	5·73
1875	·97	9·90	9·80	·73·8	8·93	8·26
1876	1·11	8·63	12·86	·60·3	7·93	7·60
1877	1·12	10·76	10·41	·56·0	9·41	5·95
1878	1·33	9·10	14·62	·55·8	8·27	6·73
1879	1·07	11·60	9·22	·47·1	10·43	4·52
1880	1·25	12·27	10·19	·54·3	11·14	4·87
1881	1·11	8·19	13·55	·55·2	7·60	7·26
1882	1·19	7·89	15·08	·60·8	7·23	9·24
1883	1·13	8·37	13·50	·68·4	7·66	8·93
1884	1·07	6·31	16·96	·61·1	5·64	10·83
1885	·86	5·87	14·65	·54·0	5·38	10·04
1886	·87	8·71	9·99	·49·8	7·98	6·24
1887	·89	8·51	10·46	·47·9	7·88	6·08
1888	·85	5·93	14·33	·55·0	5·41	10·17
1889	·90	6·89	13·06	·47·4	6·19	7·66
1890	·83	5·86	14·16	·41·6	5·10	8·20
1891	·93	5·96	15·60	·57·4	5·36	10·71
1892	1·03	5·61	18·36	·55	5·03	10·93
1893	·80	6·31	12·68	·53	5·71	9·28
1894	·67	4·44	15·09	·46	3·99	11·53
1895	·58	4·11	14·11	·53	3·71	14·29
1896	·65	5·38	12·08	·38	4·94	7·60
1897	·75	4·35	17·24	·31	3·79	8·18

The farmers of the United States have now to meet a greatly increased output from Canada—the cost of transport from that country to England being much the same as from the United States. So much improved is the position of the farmer in North America compared with what it was about 1870, that the transport companies in 1901 carried 17½ bushels of his grain to the seaboard in exchange for the value of one bushel, whereas in 1867 he had to give up one bushel in every six in return for the service. As regards the British farmer, it does not appear as if he had improved his position; for he has to send his wheat to greater distances, owing to the collapse of many country millers or their removal to the seaboard, while railway rates have fallen only to a very small extent; again the farmer's wheat is worth only half of what it was formerly; it may be said that the British farmer has to give up one bushel in nine to the railway company for the purpose of transportation, whereas in the 'seventies he gave up one in eighteen only. Enough has been said to prove that the advantage of position claimed for the British farmer by Caird was somewhat illusory. Speaking broadly, the Kansas or Minnesota farmer's wheat does not have to pay for carriage to Liverpool more than 2s. 6d. to 7s. 6d. per ton in excess of the rate paid by a Yorkshire farmer; this, it will be admitted, does not go very far towards enabling the latter to pay rent, tithes and rates and taxes.

The subject of the rates of ocean carriage at different periods requires consideration if a proper understanding of the working of the foreign grain trade is to be obtained. Only a very small proportion of the decline in the price of wheat since 1880 is due to cheapened transport rates; for while the mileage rate has been falling, the length of haulage has been extending, until in 1900 the principal wheat fields of America were 2000 m. farther from the eastern seaboard than was the case in 1870, and consequently, notwithstanding the fall in the mileage rate of 50 to 75%, it still costs the United Kingdom nearly as much to have its quota of foreign wheat fetched from abroad as it did then. The difference in the cost of the operation is shown in the following tabular statement, both the cost in the aggregate on a year's imports and the cost per quarter:—

Quantity of Wheat and Wheaten Flour (as wheat) imported into the United Kingdom from various sources during the calendar year 1900, *together with the average rate of freight.*

1900.

Countries of Origin.	Quantities. Qrs. 480 lb.	Ocean Freight to United Kingdom. Per 480 lb.	Total Cost of Ocean Carriage.
		s. d.	£
Atlantic America	11,171,100	2 3	1,257,100
South Russia	569,000	2 2	62,000
Pacific America	2,389,900	8 1	966,000
Canada	1,877,100	2 8	250,000
Rumania	176,400	2 6	22,000
Argentina and Uruguay	4,322,300	4 10	1,045,000
France	251,900	1 3	16,000
Bulgaria and Rumelia	30,600	2 6	4,000
India	2,200	4 0	400
Austria-Hungary	389,300	1 9	34,000
Chile	600	...	...
North Russia	462,700	1 6	35,000
Germany	438,700	1 6	33,000
Australasia	883,900	6 5	284,000
Minor Countries	225,100	2 6	28,000
Total	23,190,800	Average 3s. 6d.	£4,036,500

Comparing these figures with a similar statement for the year 1872, the most remote year for which similar facts are available, it will be found that the actual total cost per quarter for ocean carriage has not much decreased.

Quantity of Wheat and Wheaten Flour (as wheat) imported into the United Kingdom from various sources during the calendar year 1872, *together with the average rate of freight.*

1872.

Countries of Origin.	Quantities. Qrs.	Ocean Freight to United Kingdom. Per qr.	Total Cost of Carriage.
		s. d.	£
South Russia	3,678,000	8 6	1,563,000
United States	2,030,000	6 6	659,000
Germany	910,000	2 0	91,000
France	660,000	3 0	99,000
Egypt	536,000	4 6	120,000
North Russia	490,000	2 0	49,000
Canada	400,000	7 6	150,000
Chile	330,000	12 0	198,000
Turkey	195,000	7 6	72,000
Spain	130,000	3 6	23,000
Scandinavia	160,000	2 0	16,000
Total, Chief Countries	9,519,000	Average 6s. 5d.	£3,040,000

N.B.—A trifling quantity of Californian and Australian wheat was imported in the period in question, but the Board of Trade records do not distinguish the quantities, therefore they cannot be given. The freight in that year from those countries averaged about 13s. per quarter.

The exact difference between the average freight for the years 1872 and 1900 amounts to about 2s. 11d. per quarter (480 lb), a trifle in comparison with the actual fall in the price of wheat during the same years.

The following data bearing upon the subject, for selected periods, are partly taken from the *Corn Trade Year-Book*:—

Year.	United Kingdom Annual Imports. Wheat and Flour. Qrs.	Ocean Freight to United Kingdom. Per qr.	Aggregate Cost of Carriage.
		s. d.	£
1872	9,469,000	6 5	3,040,000
1882	14,850,000	7 4	5,420,000
1894	16,239,000	3 9	3,041,000
1895	25,197,000	3 0	3,825,000
1896	23,431,000	2 9	3,258,000
1900	23,196,000	3 6	4,036,000

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In passing, it may be pointed out that for a period of four years, from 1871 to 1874, the price of wheat averaged 56s. per quarter (or 7s. per bushel), with the charge for ocean carriage at 6s. 5d. per quarter, whereas in 1901 wheat was sold in England at 28s. (or 3s. 6d. per bushel), and the charge for ocean carriage was 3s. 6d. per quarter; the ocean transport companies carried eight bushels of wheat across the seas in 1901 for the value of one bushel, or exactly at the same ratio as in 1872.

The contrast between the case of railway freight and ocean freight is to be explained by the greater length of the present ocean voyage, which now extends to 10,000 miles in the case of Europe's importation of white wheat from the Pacific Coast of the United States and Australia, in contrast with the short voyage from the Black Sea or across the English Channel or German Ocean. It is largely due to the overlooking of this phase of the question that an American statistician has fallen into the error of stating that about 16s. per quarter of the fall in the price of wheat, which happened between 1880 and 1894, is attributable to the lessened cost of transport.

Thus, whatever the cause of the decline in the price of wheat may be, it cannot be attributed solely to the fall in the rate of rail or ocean freights. Incidental charges are lower than they were in 1870; handling charges, brokers' commissions and insurance premiums have been in many instances reduced, but all these economies when combined only amount to about 2s. per quarter. Now if we add together all these savings in the rate of rail and ocean freights and incidental expenses, we arrive at an aggregate economy of 8s. per quarter, or not one-third of the actual difference between the average price of wheat in 1872 and 1900. To what the remaining difference was due it is difficult to say with certitude; there are some who argue that the tendency of prices to fall is inherent, and that the constant whittling away of intermediaries' profits is sufficient explanation, while bi-metallists have maintained that the phenomenon is clearly to be traced to the action of the German government in demonetizing silver in 1872.

Wheat Prices

The following figures show the fluctuations from year to year of English wheat, chiefly according to a record published by Mr T. Smith, Melford, the period covered being from 1656 to 1905:

Price per Quarter

	s.	d.		s.	d.		s.	d.		s.	d.		s.	d.
1656	38	2	1706	23	1	1756	40	1	1806	79	1	1856	69	2
1657	41	5	1707	25	4	1757	53	4	1807	75	4	1857	56	4
1658	57	9	1708	36	10	1758	44	5	1808	84	4	1858	44	2
1659	58	8	1709	69	9	1759	35	3	1809	97	4	1859	43	9
1660	50	2	1710	69	4	1760	32	7	1810	106	5	1860	53	3
1661	62	2	1711	48	10	1761	36	9	1811	95	5	1861	55	4
1662	65	9	1712	41	2	1762	34	8	1812	126	6	1862	55	5
1663	50	8	1713	45	4	1763	36	1	1813	109	9	1863	44	9
1664	36	0	1714	44	9	1764	41	5	1814	74	4	1864	40	2
1665	43	10	1715	38	2	1765	48	8	1815	65	7	1865	41	10
1666	32	0	1716	42	8	1766	43	1	1816	78	6	1866	49	11
1667	32	0	1717	40	7	1767	57	4	1817	96	11	1867	64	5
1668	35	6	1718	34	6	1768	53	9	1818	86	3	1868	63	9
1669	39	2	1719	31	1	1769	46	3	1819	74	6	1869	48	2
1670	37	0	1720	32	10	1770	43	6	1820	67	10	1870	46	11
1671	37	4	1721	33	4	1771	47	2	1821	56	1	1871	56	8
1672	36	5	1722	32	0	1772	50	8	1822	44	7	1872	57	0
1673	41	5	1723	30	10	1773	51	0	1823	53	4	1873	58	8
1674	61	0	1724	32	10	1774	52	8	1824	63	11	1874	55	9
1675	57	5	1725	43	1	1775	48	4	1825	68	6	1875	45	2
1676	33	9	1726	40	10	1776	38	2	1826	58	8	1876	46	2
1677	37	4	1727	37	4	1777	45	6	1827	58	6	1877	56	9
1678	52	5	1728	48	5	1778	42	0	1828	60	5	1878	46	5
1679	53	4	1729	41	7	1779	33	8	1829	66	3	1879	43	10
1680	40	0	1730	32	5	1780	35	8	1830	64	3	1880	44	4
1681	41	5	1731	29	2	1781	44	6	1831	66	4	1881	45	4
1682	39	1	1732	23	8	1782	47	10	1832	58	8	1882	45	1
1683	35	6	1733	25	2	1783	52	8	1833	52	11	1883	41	7
1684	39	1	1734	34	6	1784	48	10	1834	46	2	1884	35	8
1685	41	5	1735	38	2	1785	51	6	1835	39	4	1885	32	10
1686	30	2	1736	35	10	1786	38	10	1836	48	6	1886	31	0
1687	22	4	1737	33	9	1787	41	2	1837	55	0	1887	32	6
1688	40	10	1738	31	6	1788	45	0	1838	64	7	1888	31	10
1689	26	8	1739	34	2	1789	51	2	1839	70	8	1889	30	9
1690	30	9	1740	45	1	1790	54	2	1840	66	4	1890	31	11
1691	30	2	1741	41	5	1791	48	7	1841	64	4	1891	37	0
1692	41	5	1742	30	2	1792	43	0	1842	57	3	1892	30	3
1693	60	1	1743	22	1	1793	49	3	1843	50	1	1893	26	9
1694	56	10	1744	22	1	1794	52	3	1844	51	3	1894	22	10
1695	47	1	1745	24	5	1795	75	2	1845	50	10	1895	23	1
1696	63	1	1746	34	8	1796	78	7	1846	54	8	1896	26	2
1697	53	4	1747	30	11	1797	53	9	1847	69	9	1897	30	2
1698	60	9	1748	32	10	1798	51	10	1848	52	6	1898	34	0
1699	56	10	1749	32	10	1799	69	0	1849	44	3	1899	25	8
1700	35	6	1750	28	10	1800	113	10	1850	40	3	1900	26	11
1701	33	5	1751	34	2	1801	119	6	1851	38	6	1901	26	9
1702	26	2	1752	37	2	1802	69	10	1852	40	9	1902	28	1
1703	32	0	1753	39	8	1803	58	10	1853	53	3	1903	26	9
1704	41	4	1754	30	9	1804	62	3	1854	72	5	1904	28	4
1705	26	8	1755	30	1	1805	89	0	1855	74	8	1905	29	8
Average per year	42	10		36	0		51	9		65	10		[1]42	7

[1] Average for 46 years only.

GRAM, or Chick-pea, called also Egyptian pea, or Bengal gram (from Port. *grão*, formerly *gram*, Lat. *granum*, Hindi *Chanā*, Bengali *Chhola*, Ital. *cece*, Span. *garbanzo*), the *Cicer arietinum* of Linnaeus, so named from the resemblance of its seed to a ram's head. It is a member of the natural order Leguminosae, largely cultivated as a pulse-food in the south of Europe, Egypt and western Asia as far as India, but is not known undoubtedly wild. The plant is an annual herb with flexuose branches, and alternately arranged pinnately compound leaves, with small, oval, serrated leaflets and small cared stipules. The flowers are borne singly in the leaf-axils on a stalk about half the length of the leaf and jointed and bent in the middle; the corolla is blue-purple. The inflated pod, 1 to 1½ in. long, contains two roundish seeds. It was cultivated by the Greeks in Homer's time under the name *erebinthos*, and is also referred to by Dioscorides as *krios* from the resemblance of the pea to the head of a ram. The Romans called it *cicer*, from which is derived the modern names given to it in the south of Europe. Names, more or less allied to one another, are in vogue among the peoples of the Caucasus, the Caspian Sea, Armenia and Persia, and there is a Sanskrit name and several others analogous or different in modern Indian languages. The plant has been cultivated in Egypt from the beginning of the Christian era, but there is no proof that it was known to the ancient Egyptians. Alphonse de Candolle (*Origin of Cultivated Plants*, p. 325) suggests that the plant originally grew wild in the countries to the south of the Caucasus and to the north of Persia. "The western Aryans (Pelasgians, Helleneș) perhaps introduced the plant into southern Europe, where, however, there is some probability that it was also indigenous. The western Aryans carried it to India." Gram is largely cultivated in the East, where the seeds are eaten raw or cooked in various ways, both in their ripe and unripe condition, and when roasted and ground subserve the same purposes as ordinary flour. In Europe the seeds are used as an ingredient in soups. They contain, in 100 parts without husks, nitrogenous substances 22·7, fat 3·76, starch 63·18, mineral matters 2·6 parts, with water (Forbes Watson, quoted in Parkes's *Hygiene*). The liquid which exudes from the glandular hairs clothing the leaves and stems of the plant, more especially during the cold season when the seeds ripen, contains a notable proportion of oxalic acid. In Mysore the dew containing it is collected by means of cloths spread on the plant over night, and is used in domestic medicine. The steam of water in which the fresh plant is immersed is in the Deccan resorted to by the Portuguese for the treatment of dysmenorrhoea. The seed of *Phaseolus Mungo*, or green gram (Hind. and Beng. *moong*), a form of which plant with black seeds (*P. Max* of Roxburgh) is termed black gram, is an important article of diet among the labouring classes in India. The meal is an excellent substitute for soap, and is stated by Elliot to be an invariable concomitant of the Hindu bath. A variety, var. *radiatus* (*P. Roxburghii*, W. and Arn., or *P. radiatus*, Roxb.) (vern. *urid*, *māshkalāi*), also known as green gram, is perhaps the most esteemed of the leguminous plants of India, where the meal of its seed enters into the composition of the more delicate cakes and dishes. Horse gram, *Dolichos biflorus* (vern. *kulthi*), which supplies in Madras the place of the chick-pea, affords seed which, when boiled, is

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extensively employed as a food for horses and cattle in South India, where also it is eaten in curries.

See W. Elliot, "On the Farinaceous Grains and the various kinds of Pulses used in Southern India," *Edin. New Phil. Journ.* xvi. (1862) 16 sq.; H. Drury, *The Useful Plants of India* (1873); U. C. Dutt, *Materia Medica of the Hindus* (Calcutta, 1877); G. Watt, *Dictionary of the Economic Products of India* (1890).

GRAMMAR (from Lat. *grammatica*, sc. *ars*; Gr. γράμμα, letter, from γράφειν, to write). By the grammar of a language is meant either the relations borne by the words of a sentence and by sentences themselves one to another, or the systematized exposition of these. The exposition may be, and frequently is, incorrect; but it always presupposes the existence of certain customary uses of words when in combination. In what follows, therefore, grammar will be generally employed in its primary sense, as denoting the mode in which words are connected in order to express a complete thought, or, as it is termed in logic, a proposition.

The object of language is to convey thought, and so long as this object is attained the machinery for attaining it is of comparatively slight importance. The way in which we combine our words and sentences matters little, provided that our meaning is clear to others. The expressions "horseflesh" and "flesh of a horse" are equally intelligible to an Englishman and therefore are equally recognized by English grammar. The Chinese manner of denoting a genitive is by placing the defining word before that which it defines, as in *kouc jin*, "man of the kingdom," literally "kingdom man," and the only reason why it would be incorrect in French or Italian is that such a combination would be unintelligible to a Frenchman or an Italian. Hence it is evident that the grammatical correctness or incorrectness of an expression depends upon its intelligibility, that is to say, upon the ordinary use and custom of a particular language. Whatever is so unfamiliar as not to be generally understood is also ungrammatical. In other words, it is contrary to the habit of a language, as determined by common usage and consent. *Scope of grammar.*

In this way we can explain how it happens that the grammar of a cultivated dialect and that of a local dialect in the same country so frequently disagree. Thus, in the dialect of West Somerset, *thee* is the nominative of the second personal pronoun, while in cultivated English the plural accusative *you* (A.-S. *eow*) has come to represent a nominative singular. Both are grammatically correct within the sphere of their respective dialects, but no further. *You* would be as ungrammatical in West Somerset as *thee* is in classical English; and both *you* and *thee*, as nominatives singular, would have been equally ungrammatical in Early English. Grammatical propriety is nothing more than the established usage of a particular body of speakers at a particular time in their history.

It follows from this that the grammar of a people changes, like its pronunciation, from age to age. Anglo-Saxon or Early English grammar is not the grammar of Modern English, any more than Latin grammar is the grammar of modern Italian; and to defend an unusual construction or inflexion on the ground that it once existed in literary Anglo-Saxon is as wrong as to import a peculiarity of some local dialect into the grammar of the cultivated speech. It further follows that different languages will have different grammars, and that the differences will be more or less according to the nearer or remoter relationship of the languages themselves and the modes of thought of those who speak them. Consequently, to force the grammatical framework of one language upon another is to misconceive the whole nature of the latter and seriously to mislead the learner. Chinese grammar, for instance, can never be understood until we discard, not only the terminology of European grammar, but the very conceptions which underlie it, while the polysynthetic idioms of America defy all attempts to discover in them "the parts of speech" and the various grammatical ideas which occupy so large a place in our school-grammars. The endeavour to find the distinctions of Latin grammar in that of English has only resulted in grotesque errors, and a total misapprehension of the usage of the English language.

It is to the Latin grammarians—or, more correctly, to the Greek grammarians, upon whose labours those of the Latin writers were based—that we owe the classification of the subjects with which grammar is commonly supposed to deal. The grammar of Dionysius Thrax, which he wrote for Roman schoolboys in the time of Pompey, has formed the starting-point for the innumerable school-grammars which have since seen the light, and suggested that division of the matter treated of which they have followed. He defines grammar as a practical acquaintance with the language of literary men, and as divided into six parts—accentuation and phonology, explanation of figurative expressions, definition, etymology, general rules of flexion and critical canons. Of these, phonology and accentuation, or prosody, can properly be included in grammar only in so far as the construction of a sentence and the grammatical meaning of a word are determined by accent or letter-change; the accentual difference in English, for example, between *incense* and *incense* belongs to the province of grammar, since it indicates a difference between noun and verb; and the changes of vowel in the Semitic languages, by which various nominal and verbal forms are distinguished from one another, constitute a very important part of their grammatical machinery. But where accent and pronunciation do not serve to express the relations of words in a sentence, they fall into the domain of phonology, not of grammar. The explanation of figurative expressions, again, must be left to the rhetorician, and definition to the lexicographer; the grammarian has no more to do with them than he has with the canons of criticism. *Sub-division of grammar.*

In fact, the old subdivision of grammar, inherited from the grammarians of Rome and Alexandria, must be given up and a new one put in its place. What grammar really deals with are all those contrivances whereby the relations of words and sentences are pointed out. Sometimes it is position, sometimes phonetic symbolization, sometimes composition, sometimes flexion, sometimes the use of auxiliaries, which enables the speaker to combine his words in such a way that they shall be intelligible to another. Grammar may accordingly be divided into the three departments of composition or "word-building," syntax and accidence, by which is meant an exposition of the means adopted by language for expressing the relations of grammar when recourse is not had to composition or simple position.

A systematized exposition of grammar may be intended for the purely practical purpose of teaching the mechanism of a foreign language. In this case all that is necessary is a correct and complete statement of the facts. But a correct and complete statement of the facts is by no means so easy a matter as might appear at first sight. The facts will be distorted by a false theory in regard to them, while they will certainly not be presented in a complete form if the grammarian is ignorant of the true theory they presuppose. The Semitic verb, for example, remains unintelligible so long as the explanation of its forms is sought in the conjugation of the Aryan verb, since it has no tenses in the Aryan sense of the word, but denotes relation and not time. *Modes of treatment.*

A good practical grammar of a language, therefore, should be based on a correct appreciation of the facts which it expounds, and a correct appreciation of the facts is only possible where they are examined and co-ordinated in accordance with the scientific method. A practical grammar ought, wherever it is possible, to be preceded by a scientific grammar.

Comparison is the instrument with which science works, and a scientific grammar, accordingly, is one in which the comparative method has been applied to the relations of speech. If we would understand the origin and real nature of grammatical forms, and of the relations which they represent, we must compare them with similar forms in kindred dialects and languages, as well as with the forms under which they appeared themselves at an earlier period of their history. We shall thus have a comparative grammar and an historical grammar, the latter being devoted to tracing the history of grammatical forms and usages in the

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same language. Of course, an historical grammar is only possible where a succession of written records exists; where a language possesses no older literature we must be content with a comparative grammar only, and look to cognate idioms to throw light upon its grammatical peculiarities. In this case we have frequently to leave whole forms unexplained, or at most conjecturally interpreted, since the machinery by means of which the relations of grammar are symbolized is often changed so completely during the growth of a language as to cause its earlier shape and character to be unrecognizable. Moreover, our area of comparison must be as wide as possible; where we have but two or three languages to compare, we are in danger of building up conclusions on insufficient evidence. The grammatical errors of the classical philologists of the 18th century were in great measure due to the fact that their area of comparison was confined to Latin and Greek.

The historical grammar of a single language or dialect, which traces the grammatical forms and usages of the language as far back as documentary evidence allows, affords material to the comparative grammarian, whose task it is to compare the grammatical forms and usages of an allied group of tongues and thereby reduce them to their earliest forms and senses. The work thus carried out by the comparative grammarian within a particular family of languages is made use of by universal grammar, the object of which is to determine the ideas that underlie all grammar whatsoever, as distinct from those that are peculiar to special families of speech. Universal grammar is sometimes known as "the metaphysics of language," and it has to decide such questions as the nature of gender or of the verb, the true purport of the genitive relation, or the origin of grammar itself. Such questions, it is clear, can only be answered by comparing the results gained by the comparative treatment of the grammars of various groups of language. What historical grammar is to comparative grammar, comparative grammar is to universal grammar.

Universal grammar, as founded on the results of the scientific study of speech, is thus essentially different from that "universal grammar" so much in vogue at the beginning of the 19th century, which consisted of a series of *a priori* assumptions based on the peculiarities of European grammar and illustrated from the same source. But universal grammar, as conceived by modern science, is as yet in its infancy; its materials are still in the process of being collected. The comparative grammar of the Indo-European languages is alone in an advanced state, those of the Semitic idioms, of the Finno-Ugrian tongues and of the Bantu dialects of southern Africa are still in a backward condition; and the other families of speech existing in the world, with the exception of the Malayo-Polynesian and the Sonorian of North America, have not as yet been treated scientifically. Chinese, it is true, possesses an historical grammar, and Van Eys, in his comparative grammar of Basque, endeavoured to solve the problems of that interesting language by a comparison of its various dialects; but in both cases the area of comparison is too small for more than a limited success to be attainable. Instead of attempting the questions of universal grammar, therefore, it will be better to confine our attention to three points—the fundamental differences in the grammatical conceptions of different groups of languages, the main results of a scientific investigation of Indo-European grammar, and the light thrown by comparative philology upon the grammar of our own tongue.

Universal grammar.

The proposition or sentence is the unit and starting-point of speech, and grammar, as we have seen, consists in the relations of its several parts one to another, together with the expression of them. These relations may be regarded from various points of view. In the polysynthetic languages of America the sentence is conceived as a whole, not composed of independent words, but, like the thought which it expresses, one and indivisible. What we should denote by a series of words is consequently denoted by a single long compound—*kuligatchis* in Delaware, for instance, signifying "give me your pretty little paw," and *aglekkigiartor-asuarnipok* in Eskimo, "he goes away hastily and exerts himself to write." Individual words can be, and often are, extracted from the sentence; but in this case they stand, as it were, outside it, being represented by a pronoun within the sentence itself. Thus, in Mexican, we can say not only *ni-xotsi-temoa*, "I look for flowers," but also *ni-k-temoa xotsitl*, where the interpolated guttural is the objective pronoun. As a necessary result of this conception of the sentence the American languages possess no true verb, each act being expressed as a whole by a single word. In Cherokee, for example, while there is no verb signifying "to wash" in the abstract, no less than thirteen words are used to signify every conceivable mode and object of washing. In the incorporating languages, again, of which Basque may be taken as a type, the object cannot be conceived except as contained in the verbal action. Hence every verbal form embodies an objective pronoun, even though the object may be separately expressed. If we pass to an isolating language like Chinese, we find the exact converse of that which meets us in the polysynthetic tongues. Here each proposition or thought is analysed into its several elements, and these are set over against one another as so many independent words. The relations of grammar are consequently denoted by position, the particular position of two or more words determining the relation they bear to each other. The analysis of the sentence has not been carried so far in agglutinative languages like Turkish. In these the relations of grammar are represented by individual words, which, however, are subordinated to the words expressing the main ideas intended to be in relation to one another. The defining words, or indices of grammatical relations, are, in a large number of instances, placed after the words which they define; in some cases, however, as, for example, in the Bantu languages of southern Africa, the relation is conceived from the opposite point of view, the defining words being prefixed. The inflexional languages call in the aid of a new principle. The relations of grammar are denoted symbolically either by a change of vowel or by a change of termination, more rarely by a change at the beginning of a word. Each idea, together with the relation which it bears to the other ideas of a proposition, is thus represented by a single word; that is to say, the ideas which make up the elements of the sentence are not conceived severally and independently, as in Chinese, but as always having a certain connexion with one another. Inflexional languages, however, tend to become analytical hy the logical separation of the flexion from the idea to which it is attached, though the primitive point of view is never altogether discarded, and traces of flexion remain even in English and Persian. In fact, there is no example of a language which has wholly forsaken the conception of the sentence and the relation of its elements with which it started, although each class of languages occasionally trespasses on the grammatical usages of the others. In language, as elsewhere in nature, there are no sharp lines of division, no sudden leaps; species passes insensibly into species, class into class. At the same time the several types of speech—polysynthetic, isolating, agglutinative and inflexional—remain clear and fixed; and even where two languages belong to the same general type, as, for instance, an Indo-European and a Semitic language in the inflexional group, or a Chinese and a Turkish language in the agglutinative group, we find no certain example of grammatical interchange. A mixed grammar, in which the grammatical procedure of two distinct families of speech is intermingled, is almost, if not altogether, unknown.

Differences in grammar of unallied languages.

It is obvious, therefore, that grammar constitutes the surest and most important basis for a classification of languages. Words may be borrowed freely by one dialect from another, or, though originally unrelated, may, by the action of phonetic decay, come to assume the same forms, while the limited number of articulate sounds and conceptions out of which language was first developed, and the similarity of the circumstances by which the first speakers were everywhere surrounded, naturally produce a resemblance between the roots of many unconnected tongues. Where, however, the fundamental conceptions of grammar and

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the machinery by which they are expressed are the same, we may have no hesitation in inferring a common origin.

The main results of scientific inquiry into the origin and primitive meaning of the forms of Indo-European grammar may be summed up as follows. We start with stems or themes, by which are meant words of two or more syllables which terminate in a limited number of sounds. These stems can be classed in groups of two kinds, one in which the groups consist of stems of similar meanings and similar initial syllables, and another in which the final syllables alone coincide. In the first case we have what are termed roots, the simplest elements into which words can be decomposed; in the second case stems proper, which may be described as consisting of suffixes attached to roots. Roots, therefore, are merely the materials out of which speech can be made, the embodiments of isolated conceptions with which the lexicographer alone has to deal, whereas stems present us with words already combined in a sentence and embodying the relations of grammar. If we would rightly understand primitive Indo-European grammar, we must conceive it as having been expressed or implied in the suffixes of the stems, and in the order according to which the stems were arranged in a sentence. In other words, the relations of grammar were denoted partly by juxtaposition or syntax, partly by the suffixes of stems.

Forms of Indo-European grammar.

These suffixes were probably at first unmeaning, or rather clothed with vague significations, which changed according to the place occupied in the sentence by the stem to which they were joined. Gradually this vagueness of signification disappeared, and particular suffixes came to be set apart to represent particular relations of grammar. What had hitherto been expressed by mere position now attached itself to the terminations or suffixes of stems, which accordingly became full-grown words. Some of the suffixes denoted purely grammatical ideas, that is to say, were flexions; others were classificatory, serving to distinguish nouns from verbs, presents from aorists, objects from agents and the like; while others, again, remained unmeaning adjuncts of the root. This origin of the flexions explains the otherwise strange fact that the same suffix may symbolize wholly different grammatical relations. In Latin, for instance, the context and dictionary will alone tell us that *mus-as* is the accusative plural of a noun, and *am-as* the second person singular of a verb, or that *mus-a* is the nominative singular of a feminine substantive, *bon-a* the accusative plural of a neuter adjective. In short, the flexions were originally merely the terminations of stems which were adapted to express the various relations of words to each other in a sentence, as these gradually presented themselves to the consciousness and were extracted from what had been previously implied by position. Necessarily, the same suffix might be used sometimes in a classificatory, sometimes in a flexional sense, and sometimes without any definite sense at all. In the Greek dative-locative πόδ-σ-σι, for example, the suffix -σι is classificatory; in the nominative πόδ-ες it is flexional.

When a particular termination or suffix once acquired a special sense, it would be separated in thought from the stem to which it belonged, and attached in the same sense to other stems and other terminations. Thus in modern English we can attach the suffix *-ize* to almost any word whatsoever, in order to give the latter a transitive meaning, and the Gr. πόδεσσι, quoted above, really contains no less than three suffixes, -ες, -σν and -ι, the last two both denoting the locative, and coalescing, through *e* Fι, into a single syllable -σι. The latter instance shows us how two or more suffixes denoting exactly the same idea may be tacked on one to another, if the original force and signification of the first of them comes to be forgotten. Thus, in O. Eng. *sang-estre* was the feminine of *sang-ere*, "singer," but the meaning of the termination has so entirely died out of the memory that we have to add the Romanic *-ess* to it if we would still distinguish it from the masculine *singer*. A familiar example of the way in which the full sense of the exponent of a grammatical idea fades from the mind and has to be supplied by a new exponent is afforded by the use of expletives in conversational English to denote the superlative. "Very warm" expresses little more than the positive, and to represent the intensity of his feelings the Englishman has recourse to such expressions as "awfully warm" like the Ger. "schrecklich warm."

Such words as "very," "awfully," "schrecklich," illustrate a second mode in which Indo-European grammar has found means of expression. Words may lose their true signification and become the mere exponents of grammatical ideas. Professor Earle divides all words into *presentive* and *symbolic*, the former denoting objects and conceptions, the latter the relations which exist between these. Symbolic words, therefore, are what the Chinese grammarians call "empty words"—words, that is, which have been divested of their proper signification and serve a grammatical purpose only. Many of the classificatory and some of the flexional suffixes of Indo-European speech can be shown to have had this origin. Thus the suffix *tar*, which denotes names of kinship and agency, seems to come from the same root as the Lat. *terminus* and *trans*, our *through*, the Sans. *tar-âmi*, "I pass over," and to have primarily signified "one that goes through" a thing. Thus, too, the Eng. *head* or *hood*, in words like *godhead* and *brotherhood*, is the A.-S. *hâd*, "character" or "rank"; *dom*, in kingdom, the A.-S. *dôm*, "judgment"; and *lock* or *ledge*, in *wedlock* and *knowledge*, the A.-S. *lâc*, "sport" or "gift." In all these cases the "empty words," after first losing every trace of their original significance, have followed the general analogy of the language and assumed the form and functions of the suffixes with which they had been confused.

A third mode of representing the relations of grammar is by the symbolic use of vowels and diphthongs. In Greek, for instance, the distinction between the reduplicated present δίδωμι and the reduplicated perfect δέδωκα is indicated by a distinction of vowel, and in primitive Aryan grammar the vowel *a* seems to have been set apart to denote the subjunctive mood just as *ya* or *i* was set apart to denote the potential. So, too, according to M. Hovelacque, the change of *a* into *i* or *u* in the parent Indo-European symbolized a change of meaning from passive to active. This symbolic use of the vowels, which is the purest application of the principle of flexion, is far less extensively carried out in the Indo-European than in the Semitic languages. The Semitic family of speech is therefore a much more characteristic type of the inflexional languages than is the Indo-European.

The primitive Indo-European noun possessed at least eight cases—nominative, accusative, vocative, instrumental, dative, genitive, ablative and locative. M. Bergaigne has attempted to show that the first three of these, the "strong cases" as they are termed, are really abstracts formed by the suffixes *-as* (*-s*), *-an*, *-m*, *-i*, *-î*, *-â* and *-ya* (*-i*), the plural being nothing more than an abstract singular, as may be readily seen by comparing words like the Gr. ἔτο-ς, and ὄτρε-ς, which mean prcpicely the same. The remaining "weak" cases, formed by the suffixes *-sma*, *-sya*, *-syâ*, *-yâ*, *-i*, *-an*, *-i*, *-bhi*, *-su*, *-i*, *-â* and *-â*, are really adjectives and adverbs. No distinction, for example, can be drawn between "a cup of gold" and "a golden cup," and the instrumental, the dative, the ablative and the locative are, when closely examined, merely adverbs attached to a verb. The terminations of the strong cases do not displace the accent of the stem to which they are suffixed; the suffixes of the weak cases, on the other hand, generally draw the accent upon themselves.

According to Hübschmann, the nominative, accusative and genitive cases are purely grammatical, distinguished from one another through the exigencies of the sentence only, whereas the locative, ablative and instrumental have a logical origin and determine the logical relation which the three other cases bear to each other and the verb. The nature of the dative is left undecided. The locative primarily denotes rest in a place, the ablative motion from a place, and the instrumental the means or concomitance of an action. The dative Hübschmann regards as "the case of the participant object." Like Hübschmann, Holzweissig divides the cases into two classes—the one grammatical and the other logical; and his analysis of their primitive meaning is the same as that of Hübschmann, except as regards

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the dative, the primary sense of which he thinks to have been motion towards a place. This is also the view of Delbrück, who makes it denote tendency towards an object. Delbrück, however, holds that the primary sense of the ablative was that of separation, the instrumental originally indicating concomitance, while there was a double locative, one used like the ablative absolute in Latin, the other being a locative of the object.

The dual was older than the plural, and after the development of the latter survived as a merely useless encumbrance, of which most of the Indo-European languages contrived in time to get rid. There are still many savage idioms in which the conception of plurality has not advanced beyond that of duality. In the Bushman dialects, for instance, the plural, or rather that which is more than one, is expressed by repeating the word; thus *tu* is "mouth," *tutu* "mouths." It may be shown that most of the suffixes of the Indo-European dual are the longer and more primitive forms of those of the plural which have grown out of them by the help of phonetic decay. The plural of the weak cases, on the other hand (the accusative alone excepted), was identical with the singular of abstract nouns; so far as both form and meaning are concerned, no distinction can be drawn between ὄνεϊ and ἵππος. Similarly, *humanity* and *men* signify one and the same thing, and the use of English words like *sheep* or *fish* for both singular and plural shows to what an extent our appreciation of number is determined by the context rather than by the form of the noun. The so-called "broken plurals" of Arabic and Ethiopic are really singular collectives employed to denote the plural.

Gender is the product partly of analogy, partly of phonetic decay. In many languages, such as Eskimo and Choctaw, its place is taken by a division of objects into animate and inanimate, while in other languages they are separated into rational and irrational. There are many indications that the parent Indo-European in an early stage of its existence had no signs of gender at all. The terminations of the names of *father* and *mother*, *pater* and *mater*, for example, are exactly the same, and in Latin and Greek many diphthongal stems, as well as stems in *i* or *u* (like ναῦς and πέκυς, πόλις and λίς), may be indifferently masculine and feminine. Even stems in *o* and *a* (of the second and first declensions), though the first are generally masculine and the second generally feminine, by no means invariably maintain the rule; and feminines like *humus* and ὁδός, or masculines like *advena* and πολίτης, show that there was a time when these stems also indicated no particular gender, but owed their subsequent adaptation, the one to mark the masculine and the other to mark the feminine, to the influence of analogy. The idea of gender was first suggested by the difference between man and woman, male and female, and, as in so many languages at the present day, was represented not by any outward sign but by the meaning of the words themselves. When once arrived at, the conception of gender was extended to other objects besides those to which it properly belonged. The primitive Indo-European did not distinguish between subject and object, but personified objects by ascribing to them the motives and powers of living beings. Accordingly they were referred to by different pronouns, one class denoting the masculine and another class the feminine, and the distinction that existed between these two classes of pronouns was after a time transferred to the nouns. As soon as the preponderant number of stems in *o* in daily use had come to be regarded as masculine on account of their meaning, other stems in o, whatever might be their signification, were made to follow the general analogy and were similarly classed as masculines. In the same way, the suffix *i* or *ya* acquired a feminine sense, and was set apart to represent the feminine gender. Unlike the Semites, the Indo-Europeans were not satisfied with these two genders, masculine and feminine. As soon as object and subject, patient and agent, were clearly distinguished from each other, there arose a need for a third gender, which should be neither masculine nor feminine, but denote things without life. This third gender was fittingly expressed either by the objective case used as a nominative (*e.g. regnum*), or by a stem without any case ending at all (*e.g. virus*).

The adverbial meaning of so many of the cases explains the readiness with which they became crystallized into adverbs and prepositions. An adverb is the attribute of an attribute—"the rose smells sweetly," for example, being resolvable into "the rose has the attribute of scent with the further attribute of sweetness." In our own language *once*, *twice*, *needs*, are all genitives; *seldom* is a dative. The Latin and Greek *humi* and χαμαί are locatives, *facillime* (*facillumed*) and εὐτυχῶς ablatives, πάντη and ἅμα instrumentals, πάροι, ἐξῆς and τηλοῦ genitives. The frequency with which particular cases of particular nouns were used in a specifically attributive sense caused them to become, as it were, petrified, the other cases of the nouns in question passing out of use, and the original force of those that were retained being gradually forgotten. Prepositions are adverbs employed to define nouns instead of verbs and adjectives. Their appearance in the Indo-European languages is comparatively late, and the Homeric poems allow us to trace their growth in Greek. The adverb, originally intended to define the verb, came to be construed with the noun, and the government of the case with which it was construed was accordingly transferred from the verb to the noun. Thus when we read in the *Odyssey* (iv. 43), αὐτοὺς δ' εἰσῆγον θεῖον δόμον, we see that εἰς is still an adverb, and that the accusative is governed by the verb; it is quite otherwise, however, with a line like Ἀτρεϊδὴς δὲ γέροντας ἀολλέας ἦγεν Ἀχαιῶν ἐς κλισίην (*Il.* i. 89) where the adverb has passed into a preposition. The same process of transformation is still going on in English, where we can say indifferently, "What are you looking at?" using "at" as an adverb, and governing the pronoun by the verb, and "At what are you looking?" where "at" has become a preposition. With the growth and increase of prepositions the need of the case-endings diminished, and in some languages the latter disappeared altogether.

Like prepositions, conjunctions also are primarily adverbs used in a demonstrative and relative sense. Hence most of the conjunctions are petrified cases of pronouns. The relation between two sentences was originally expressed by simply setting them side by side, afterwards by employing a demonstrative at the beginning of the second clause to refer to the whole preceding one. The relative pronoun can be shown to have been in the first instance a demonstrative; indeed, we can still use *that* in English in a relative sense. Since the demonstrative at the beginning of the second clause represented the first clause, and was consequently an attribute of the second, it had to stand in some case, and this case became a conjunction. How closely allied the adverb and the conjunction are may be seen from Greek and Latin, where ὡς or *quum* can be used as either the one or the other. Our own *and*, it may be observed, has probably the same root as the Greek locative adverb ἔτι, and originally signified "going further."

Another form of adverb is the infinitive, the adverbial force of which appears clearly in such a phrase as "A wonderful thing to see." Various cases, such as the locative, the dative or the instrumental, are employed in Vedic Sanskrit in the sense of the infinitive, besides the bare stem or neuter formed by the suffixes *man* and *van*. In Greek the neuter stem and the dative case were alone retained for the purpose. The first is found in infinitives like δόμεν and φέρειν (for an earlier φερε-Fεν), the second in the infinitives in -αι. Thus the Gr. δοῦναι answers letter for letter to the Vedic dative *dātáne*, "to give," and the form ψεύδεσθαι is explained by the Vedic *vayodhaí*, for *vayás-dhai*, literally "to do living," *dhai* being the dative of a noun from the root *dhā*, "to place" or "do." When the form ψεύδεσθαι had once come into existence, analogy was ready to create such false imitations as γράφεσθαι or γραφόθεσθαι. The Latin infinitive in *-re* for *-se* has the same origin, *amare*, for instance, being the dative of an old stem *amas*. In *ferri* for *ferei* or *fesei*, from the same root as our English *be*, the original length of the final syllable is preserved. The suffix in *-um* is an accusative, like the corresponding infinitive of classical Sanskrit. This origin of the infinitive explains the Latin construction of the accusative and infinitive. When the Roman said, "Miror te ad me nihil

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scribere," all that he meant at first was, "I wonder at you for writing nothing to me," where the infinitive was merely a dative case used adverbially.

The history of the infinitive makes it clear how little distinction must have been felt at the outset between the noun and the verb. Indeed, the growth of the verb was a slow process. There was a time in the history of Indo-European speech when it had not as yet risen to the consciousness of the speaker, and in the period when the noun did not possess a plural there was as yet also no verb. The attachment of the first and second personal pronouns, or of suffixes resembling them, to certain stems, was the first stage in the development of the latter. Like the Semitic verb, the Indo-European verb seems primarily to have denoted relation only, and to have been attached as an attribute to the subject. The idea of time, however, was soon put into it, and two tenses were created, the one expressing a present or continuous action, the other an aoristic or momentary one. The distinction of sense was symbolized by a distinction of pronunciation, the root-syllable of the aorist being an abbreviated form of that of the present. This abbreviation was due to a change in the position of the accent (which was shifted from the stem-syllable to the termination), and this change again was probably occasioned by the prefixing of the so-called augment to the aorist, which survived into historical times only in Sanskrit, Zend and Greek, and the origin of which is still a mystery. The weight of the first syllable in the aorist further caused the person-endings to be shortened, and so two sets of person-endings, usually termed primary and secondary, sprang into existence. By reduplicating the root-syllable of the present tense a perfect was formed; but originally no distinction was made between present and perfect, and Greek verbs like *δίδωμι* and *ἵημι* are memorials of a time when the difference between "I am come" and "I have come" was not yet felt. Reduplication was further adapted to the expression of intensity and desire (in the so-called intensive and desiderative forms). By the side of the aorist stood the imperfect, which differed from the aorist, so far as outward form was concerned, only in possessing the longer and more original stem of the present. Indeed, as Benfey first saw, the aorist itself was primitively an imperfect, and the distinction between aorist and imperfect is not older than the period when the stem-syllables of certain imperfects were shortened through the influence of the accent, and this differentiation of forms appropriated to denote a difference between the sense of the aorist and the imperfect which was beginning to be felt. After the analogy of the imperfect, a pluperfect was created out of the perfect by prefixing the augment (of which the Greek *ἐμέμνων* is an illustration); though the pluperfect, too, was originally an imperfect formed from the reduplicated present.

Besides time, mood was also expressed by the primitive Indo-European verb, recourse being had to symbolization for the purpose. The imperative was represented by the bare stem, like the vocative, the accent being drawn back to the first syllable, though other modes of denoting it soon came into vogue. Possibility was symbolized by the attachment of the suffix *-ya* to the stem, probability by the attachment of *-a* and *-d*, and in this way the optative and conjunctive moods first arose. The creation of a future by the help of the suffix *-sya* seems to belong to the same period in the history of the verb. This suffix is probably identical with that used to form a large class of adjectives and genitives (like the Greek *ἵππιος* for *ἵππτσιος*); in this case future time will have been regarded as an attribute of the subject, no distinction being drawn, for instance, between "rising sun" and "the sun will rise." It is possible, however, that the auxiliary verb *as*, "to be," enters into the composition of the future; if so, the future will be the product of the second stage in the development of the Indo-European verb when new forms were created by means of composition. The sigmatic or first aorist is in favour of this view, as it certainly belongs to the age of Indo-European unity, and may be a compound of the verbal stem with the auxiliary *as*.

After the separation of the Indo-European languages, composition was largely employed in the formation of new tenses. Thus in Latin we have perfects like *scrip-si* and *ama-vi*, formed by the help of the auxiliaries *as* (*sum*) and *fuo*, while such forms as *amaveram* (*amavi-eram*) or *amarem* (*ama-sem*) bear their origin on their face. So, too, the future in Latin and Old Celtic (*amabo*, Irish *carub*) is based upon the substantive verb *fuo*, "to be," and the English preterite in *-ed* goes back to a suffixed *did*, the reduplicated perfect of *do*. New tenses and moods, however, were created by the aid of suffixes as well as by the aid of composition, or rather were formed from nouns whose stems terminated in the suffixes in question. Thus in Greek we have aorists and perfects in *-κα*, and the characteristics of the two passive aorists, *ye* and *the*, are more probably the suffixes of nominal stems than the roots of the two verbs *ya*, "to go," and *dhā*, "to place," as Bopp supposed. How late some of these new formations were may be seen in Greek, where the Homeric poems are still ignorant of the weak future passive, the optative future, and the aspirated perfect, and where the strong future passive occurs but once and the desiderative but twice. On the other hand, many of the older tenses were disused and lost. In classical Sanskrit, for instance, of the modal aorist forms the precative and benedictive almost alone remain, while the pluperfect, of which Delbrück has found traces in the Veda, has wholly disappeared.

The passive voice did not exist in the parent Indo-European speech. No need for it had arisen, since such a sentence as "I am pleased" could be as well represented by "This pleases me," or "I please myself." It was long before the speaker was able to imagine an action without an object, and when he did so, it was a neuter or substantival rather than a passive verb that he formed. The passive, in fact, grew out of the middle or reflexive, and, except in the two aorists, continued to be represented by the middle in Greek. So, too, in Latin the second person plural is really the middle participle with *estis* understood, and the whole class of deponent or reflexive verbs proves that the characteristic *r* which Latin shares with Celtic could have had at the outset no passive force.

Much light has been thrown on the character and construction of the primitive Indo-European sentence by comparative syntax. In contradistinction to Semitic, where the defining word follows that which is defined, the Indo-European languages place that which is defined after that which defines it; and Bergaigne has made it clear that the original order of the sentence was (1) object, (2) verb, and (3) subject. Greater complication of thought and its expression, the connexion of sentences by the aid of conjunctions, and rhetorical inversion caused that dislocation of the original order of the sentence which reaches its culminating point in the involved periods of Latin literature. Our own language still remains true, however, to the syntax of the parent Indo-European when it sets both adjective and genitive before the nouns which they define. In course of time a distinction came to be made between an attribute used as a mere qualificative and an attribute used predicatively, and this distinction was expressed by placing the predicate in opposition to the subject and accordingly after it. The opposition was of itself sufficient to indicate the logical copula or substantive verb; indeed, the word which afterwards commonly stood for the latter at first signified "existence," and it was only through the wear and tear of time that a phrase like *Deus bonus est*, "God exists as good," came to mean simply "God is good." It is needless to observe that neither of the two articles was known to the parent Indo-European; indeed, the definite article, which is merely a decayed demonstrative pronoun, has not yet been developed in several of the languages of the Indo-European family.

Investigation of English grammar.

We must now glance briefly at the results of a scientific investigation of English grammar and the modifications they necessitate in our conception of it. The idea that the free use of speech is tied down by the rules of the grammarian must first be given up; all that the grammarian can do is to formulate the current uses of his time, which are determined by habit and custom, and are accordingly in a perpetual state of flux. We must next

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get rid of the notion that English grammar should be modelled after that of ancient Rome; until we do so we shall never understand even the elementary principles upon which it is based. We cannot speak of declensions, since English has no genders except in the pronouns of the third person, and no cases except the genitive and a few faint traces of an old dative. Its verbal conjugation is essentially different from that of an inflexional language like Latin, and cannot be compressed into the same categories. In English the syntax has been enlarged at the expense of the accidence; position has taken the place of forms. To speak of an adjective "agreeing" with its substantive is as misleading as to speak of a verb "governing" a case. In fact, the distinction between noun and adjective is inapplicable to English grammar, and should be replaced by a distinction between objective and attributive words. In a phrase like "this is a cannon," *cannon* is objective; in a phrase like "a cannon-ball," it is attributive; and to call it a substantive in the one case and an adjective in the other is only to introduce confusion. With the exception of the nominative, the various forms of the noun are all attributive; there is no difference, for example, between "doing a thing" and "doing badly." Apart from the personal pronouns, the accusative of the classical languages can be represented only by position; but if we were to say that a noun which follows a verb is in the accusative case we should have to define "king" as an accusative in such sentences as "he became king" or "he is king." In conversational English "it is me" is as correct as "c'est moi" in French, or "det er mig" in Danish; the literary "it is I" is due to the influence of classical grammar. The combination of noun or pronoun and preposition results in a compound attribute. As for the verb, Sweet has well said that "the really characteristic feature of the English finite verb is its inability to stand alone without a pronominal prefix." Thus "dream" by itself is a noun; "I dream" is a verb. The place of the pronominal prefix may be taken by a noun, though both poetry and vulgar English frequently insert the pronoun even when the noun precedes. The number of inflected verbal forms is but small, being confined to the third person singular and the special forms of the preterite and past participle, though the latter may with more justice be regarded as belonging to the province of the lexicographer rather than to that of the grammarian. The inflected subjunctive (*be*, *were*, *save* in "God save the King," &c.) is rapidly disappearing. New inflected forms, however, are coming into existence; at all events, we have as good a right to consider *wont*, *shant*, *cant* new inflected forms as the French *aimerai* (*amare habeo*), *aimerais* (*amare habebam*). If the ordinary grammars are correct in treating forms like "I am loving," "I was loving," "I did love," as separate tenses, they are strangely inconsistent in omitting to notice the equally important emphatic form "I do love" or the negative form "I do not love" ("I don't love"), as well as the semi-inflexional "I'll love," "he's loving." It is true that these latter contracted forms are heard only in conversation and not seen in books; but the grammar of a language, it must be remembered, is made by those who speak it and not by the printers.

Our school grammars are the inheritance we have received from Greece and Rome. The necessities of rhetoric obliged the Sophists to investigate the structure of the Greek language, and to them was accordingly due the first analysis of Greek grammar. Protagoras distinguished the three genders and the verbal moods, while Prodicus busied himself with the definition of synonyms. Aristotle, taking the side of Democritus, who had held that the meaning of words is put into them by the speaker, and that there is no necessary connexion between sound and sense, laid down that words "symbolize" objects according to the will of those who use them, and added to the ὄνομα or "noun," and the ῥῆμα or "verb," the σύνδεσμος or "particle." He also introduced the term πτῶσις, "case," to denote any flexion whatsoever. He further divided nouns into simple and compound, invented for the neuter another name than that given by Protagoras, and starting from the termination of the nominative singular, endeavoured to ascertain the rules for indicating a difference of gender. Aristotle was followed by the Stoics, who separated the ἄρθρον or "article" from the particles, determined a fifth part of speech, the παράκτηι or "adverb," confined the term "case" to the flexions of the nouns, distinguishing the four principal cases by names, and divided the verb into its tenses, moods and classes. Meanwhile the Alexandrian critics were studying the language of Homer and the Attic writers, and comparing it with the language of their own day, the result being a minute examination of the facts and rules of grammar. Two schools of grammarians sprang up—the Analogists, headed by Aristarchus, who held that a strict law of analogy existed between idea and word, and refused to admit exceptions to the grammatical rules they laid down, and the Anomalists, who denied general rules of any kind, except in so far as they were consecrated by custom. Foremost among the Anomalists was Crates of Mallos, the leader of the Pergamenian school, to whom we owe the first formal Greek grammar and collection of the grammatical facts obtained by the labours of the Alexandrian critics, as well as an attempt to reform Greek orthography. The immediate cause of this grammar seems to have been a comparison of Latin with Greek, Crates having lectured on the subject while ambassador of Attalus at Rome in 159 B.C. The zeal with which the Romans threw themselves into the study of Greek resulted in the school grammar of Dionysius Thrax, a pupil of Aristarchus, which he published at Rome in the time of Pompey and which is still in existence. Latin grammars were soon modelled upon it, and the attempt to translate the technical terms of the Greek grammarians into Latin was productive of numerous blunders which have been perpetuated to our own day. Thus *tenues* is a mistranslation of the Greek ψιλά, "unaspirated"; *genetivus* of γενική, the case "of the genus"; *accusativus* of αἰτιατική, the case "of the object"; *infinitivus* of ἀπαρέμφατος, "without a secondary meaning" of tense or person. New names were coined to denote forms possessed by Latin and not by Greek; *ablativus*, for instance, was invented by Julius Caesar, who also wrote a treatise *De analogia*. By the 2nd century of the Christian era the dispute between the Anomalists and the Analogists was finally settled, analogy being recognized as the principle that underlies language, though every rule admits of exceptions. Two eminent grammarians of Alexandria, Apollonius Dyscolus and his son Herodian, summed up the labours and controversies of their predecessors, and upon their works were based the Latin grammar composed by Aelius Donatus in the 4th century, and the eighteen books on grammar compiled by Priscian in the age of Justinian. The grammar of Donatus dominated the schools of the middle ages, and, along with the productions of Priscian, formed the type and source of the Latin and Greek school-grammars of modern Europe.

History of formal grammar.

A few words remain to be said, in conclusion, on the bearing of a scientific study of grammar upon the practical task of teaching and learning foreign languages. The grammar of a language is not to be confined within the rules laid down by grammarians, much less is it the creation of grammarians, and consequently the usual mode of making the pupil learn by heart certain fixed rules and paradigms not only gives a false idea of what grammar really is, but also throws obstacles in the way of acquiring it. The unit of speech is the sentence; and it is with the sentence therefore, and not with lists of words and forms, that the pupil should begin. When once a sufficient number of sentences has been, so to speak, assimilated, it will be easy to analyse them into their component parts, to show the relations that these bear to one another, and to indicate the nature and varieties of the latter. In this way the learner will be prevented from regarding grammar as a piece of dead mechanism or a Chinese puzzle, of which the parts must be fitted together in accordance with certain artificial rules, and will realize that it is a living organism which has a history and a reason of its own. The method of nature and science alike is analytic; and if we would learn a foreign language properly we must learn it as we did

Learning the grammar of foreign languages.

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our mother-tongue, by first mastering the expression of a complete thought and then breaking up this expression into its several elements. (A. H. S.)

See PHILOLOGY, and articles on the various languages. Also Steinthal, *Charakteristik der hauptsächlichsten Typen des Sprachbaues* (Berlin, 1860); Schleicher, *Compendium of the Comparative Grammar of the Indo-European Languages*, translated by H. Bendall (London, 1874); Pezzi, *Aryan Philology according to the most recent Researches*, translated by E. S. Roberts (London, 1879); Sayce, *Introduction to the Science of Language* (London, 1879); Lersch, *Die Sprachphilosophie der Alten* (Bonn, 1838–1841); Steinthal, *Geschichte der Sprachwissenschaft bei den Griechen und Römern mit besonderer Rücksicht auf die Logik* (Berlin, 1863, 2nd ed. 1890); Delbrück, *Ablativ localis instrumentalis im Altindischen, Lateinischen, Griechischen, und Deutschen* (Berlin, 1867); Jolly, *Ein Kapitel vergleichender Syntax* (Munich, 1873); Hübschmann, *Zur Casuslehre* (Munich, 1875); Holzweissig, *Wahrheit und Irrthum der localistischen Casustheorie* (Leipzig, 1877); Draeger, *Historische Syntax der lateinischen Sprache* (Leipzig, 1874–1876); Sweet, *Words, Logic, and Grammar* (London, 1876); P. Giles, *Manual of Comp. Philology* (1901); C. Abel, *Ägypt.-indo-eur. Sprachverwandschaft* (1903); Brugmann and Delbrück, *Grundriss d. vergl. Gram. d. indogerm. Spr.* (1886–1900); Fritz Mauthner, *Beiträge zur einer Kritik der Sprache* vol. iii. (1902); T. G. Tucker, *Introd. to a Nat. Hist. of Language* (1908).

GRAMMICHELE, a town of Sicily, in the province of Catania, 55 m. S.W. of it by rail and 31 m. direct. Pop. (1901) 15,075. It was built in 1693, after the destruction by an earthquake of the old town of Occhialà to the north; the latter, on account of the similarity of name, is generally identified with Echetla, a frontier city between Syracusan and Carthaginian territory in the time of Hiero II., which appears to have been originally a Sicel city in which Greek civilization prevailed from the 5th century onwards. To the east of Grammichele a cave shrine of Demeter, with fine votive terra-cottas, has been discovered.

See *Mon. Lincei*, vii. (1897); *Not. degli scavi* (1902), 223.

GRAMMONT (the Flemish name *Gheeraardsbergen* more clearly reveals its etymology *Gerardi-mons*), a town in East Flanders, Belgium, near the meeting point with the provinces of Brabant and Hainaut. It is on the Dender almost due south of Alost, and is chiefly famous because the charter of Grammont given by Baldwin VI., count of Flanders, in A.D. 1068 was the first of its kind. This charter has been styled "the most ancient written monument of civil and criminal laws in Flanders." The modern town is a busy industrial centre. Pop. (1904) 12,835.

GRAMONT, ANTOINE AGÉNOR ALFRED, DUC DE, DUC DE GUICHE, PRINCE DE BIDACHE (1819–1880), French diplomatist and statesman, was born at Paris on the 14th of August 1819, of one of the most illustrious families of the old *noblesse*, a cadet branch of the viscounts of Aure, which took its name from the seigniory of Gramont in Navarre. His grandfather, Antoine Louis Marie, duc de Gramont (1755–1836), had emigrated during the Revolution, and his father, Antoine Héraclius Geneviève Agénor (1789–1855), duc de Gramont and de Guiche, fought under the British flag in the Peninsular War, became a lieutenant-general in the French army in 1823, and in 1830 accompanied Charles X. to Scotland. The younger generation, however, were Bonapartist in sympathy; Gramont's cousin Antoine Louis Raymond, comte de Gramont (1787–1825), though also the son of an *émigré*, served with distinction in Napoleon's armies, while Antoine Agénor, duc de Gramont, owed his career to his early friendship for Louis Napoleon.

Educated at the École Polytechnique, Gramont early gave up the army for diplomacy. It was not, however, till after the *coup d'état* of the 2nd of December 1851, which made Louis Napoleon supreme in France, that he became conspicuous as a diplomat. He was successively minister plenipotentiary at Cassel and Stuttgart (1852), at Turin (1853), ambassador at Rome (1857) and at Vienna (1861). On the 15th of May 1870 he was appointed minister of foreign affairs in the Ollivier cabinet, and was thus largely, though not entirely, responsible for the bungling of the negotiations between France and Prussia arising out of the candidature of Prince Leopold of Hohenzollern for the throne of Spain, which led to the disastrous war of 1870–71. The exact share of Gramont in this responsibility has been the subject of much controversy. The last word may be said to have been uttered by M. Émile Ollivier himself in his *L'Empire libéral* (tome xii., 1900, *passim*). The famous declaration read by Gramont in the Chamber on the 6th of July, the "threat with the hand on the sword-hilt," as Bismarck called it, was the joint work of the whole cabinet; the original draft presented by Gramont was judged to be too "elliptical" in its conclusion and not sufficiently vigorous; the reference to a revival of the empire of Charles V. was suggested by Ollivier; the paragraph asserting that France would not allow a foreign power to disturb to her own detriment the actual equilibrium of Europe was inserted by the emperor. So far, then, as this declaration is concerned, it is clear that Gramont's responsiblity must be shared with his sovereign and his colleagues (Ollivier *op. cit.* xii. 107; see also the two *projets de déclaration* given on p. 570). It is clear, however that he did not share the "passion" of his colleagues for "peace with honour," clear also that he wholly misread the intentions of the European powers in the event of war. That he reckoned upon the active alliance of Austria was due, according to M. Ollivier, to the fact that for nine years he had been a *persona grata* in the aristocratic society of Vienna, where the necessity for revenging the humiliation of 1866 was an article of faith. This confidence made him less disposed than many of his colleagues to make the best of the renunciation of the candidature made, on behalf of his son, by the prince of Hohenzollern-Sigmaringen. It was Gramont who pointed out to the emperor, on the evening of the 12th, the dubious circumstances of the act of renunciation, and on the same night, without informing M. Ollivier, despatched to Benedetti at Ems the fatal telegram demanding the king of Prussia's guarantee that the candidature would not be revived. The supreme responsibility for this act must rest with the emperor, "who imposed it by an exercise of personal power on the only one of his ministers who could have lent himself to such a forgetfulness of the safeguards of a parliamentary régime." As for Gramont, he had "no conception of the exigencies of this régime; he remained an ambassador accustomed to obey the orders of his sovereign; in all good faith he had no idea that this was not correct, and that, himself a parliamentary minister, he had associated himself with an act destructive of the authority of parliament."[1] "On his part," adds M. Ollivier, "it was the result only of obedience, not of warlike premeditation" (*op. cit.* p. 262). The apology may be taken for what it is worth. To France and to the world Gramont was responsible for the policy which put his country definitely into the wrong in the eyes of Europe, and enabled Bismarck to administer to her the "slap in the face" (*soufflet*)—as Gramont called it in the Chamber—by means of the mutilated "Ems telegram," which was the immediate cause of the French declaration of war on the 15th.

After the defeat of Weissenburg (August 4) Gramont resigned office with the rest of the Ollivier ministry (August 9), and after the revolution of September he went to England, returning after the war to Paris, where he died on the 18th of January 1880. His marriage in 1848 with Miss Mackinnon, a Scottish lady, remained without issue. During his retirement he published various apologies for his policy in 1870, notably *La France et la Prusse avant la guerre* (Paris, 1872).

Besides M. Ollivier's work quoted in the text, see L. Thouvenel, *Le Secret de l'empereur, correspondance . . . échangée entre M. Thouvenel, le duc de Gramont, et le général comte de Flahaut 1860–1865* (2nd ed., 2 vols., 1889). A small pamphlet containing his *Souvenirs 1848–1850* was published in 1901 by his brother Antoine Léon Philibert Auguste de Gramont, duc de Lesparre.

GRAMONT, PHILIBERT, COMTE DE (1621–1707), the subject of the famous *Memoirs*, came of a noble Gascon family, said to have been of Basque origin. His grandmother, Diane d'Andouins, comtesse de Gramont, was "la belle Corisande," one of the mistresses of Henry IV. The grandson assumed that

[1] Compare with this Bismarck's remarks to Hohenlohe (Hohenlohe, *Denkwürdigkeiten*, ii. 71): "When Gramont was made minister, Bismarck said to Benedetti that this indicated that the emperor was meditating something evil, otherwise he would not have made so stupid a person minister. Benedetti replied that the emperor knew too little of him, whereupon Bismarck said that the emperor had once described Gramont to him as 'un ancien bellâtre.'"

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his father Antoine II. de Gramont, viceroy of Navarre, was the son of Henry IV., and regretted that he had not claimed the privileges of royal birth. Philibert de Gramont was the son of Antoine II. by his second marriage with Claude de Montmorency, and was born in 1621, probably at the family seat of Bidache. He was destined for the church, and was educated at the *collège* of Pau, in Béarn. He refused the ecclesiastical life, however, and joined the army of Prince Thomas of Savoy, then besieging Trino in Piedmont. He afterwards served under his elder half-brother, Antoine, marshal de Gramont, and the prince of Condé. He was present at Fribourg and Nordlingen, and also served with distinction in Spain and Flanders in 1647 and 1648. He favoured Condé's party at the beginning of the Fronde, but changed sides before he was too severely compromised. In spite of his record in the army he never received any important commission either military or diplomatic, perhaps because of an incurable levity in his outlook. He was, however, made a governor of the Pays d'Aunis and lieutenant of Béarn. During the Commonwealth he visited England, and in 1662 he was exiled from Paris for paying court to Mademoiselle de la Motte Houdancourt, one of the king's mistresses. He went to London, where he found at the court of Charles II. an atmosphere congenial to his talents for intrigue, gallantry and pleasure. He married in London, under pressure from her two brothers, Elizabeth Hamilton, the sister of his future biographer. She was one of the great beauties of the English court, and was, according to her brother's optimistic account, able to fix the count's affections. She was a woman of considerable wit, and held her own at the court of Louis XIV., but her husband pursued his gallant exploits to the close of a long life, being, said Ninon de l'Enclos, the only old man who could affect the follies of youth without being ridiculous. In 1664 he was allowed to return to France. He revisited England in 1670 in connexion with the sale of Dunkirk, and again in 1671 and 1676. In 1688 he was sent by Louis XIV. to congratulate James II. on the birth of an heir. From all these small diplomatic missions he succeeded in obtaining considerable profits, being destitute of scruples whenever money was in question. At the age of seventy-five he had a dangerous illness, during which he became reconciled to the church. His penitence does not seem to have survived his recovery. He was eighty years old when he supplied his brother-in-law, Anthony Hamilton (*q.v.*), with the materials for his *Mémoires*. Hamilton said that they had been dictated to him, but there is no doubt that he was the real author. The account of Gramont's early career was doubtless provided by himself, but Hamilton was probably more familiar with the history of the court of Charles II., which forms the most interesting section of the book. Moreover Gramont, though he had a reputation for wit, was no writer, and there is no reason to suppose that he was capable of producing a work which remains a masterpiece of style and of witty portraiture. When the *Mémoires* were finished it is said that Gramont sold the MS. for 1500 francs, and kept most of the money himself. Fontenelle, then censor of the press, refused to license the book from considerations of respect to the strange old man, whose gambling, cheating and meannesses were so ruthlessly exposed. But Gramont himself appealed to the chancellor and the prohibition was removed. He died on the 10th of January 1707, and the *Mémoires* appeared six years later.

Hamilton was far superior to the comte de Gramont, but he relates the story of his hero without comment, and no condemnation of the prevalent code of morals is allowed to appear, unless in an occasional touch of irony. The portrait is drawn with such skill that the count, in spite of his biographer's candour, imposes by his grand air on the reader much as he appears to have done on his contemporaries. The book is the most entertaining of contemporary memoirs, and in no other book is there a description so vivid, truthful, and graceful of the licentious court of Charles II. There are other and less flattering accounts of the count. His scandalous tongue knew no restraint, and he was a privileged person who was allowed to state even the most unpleasing truths to Louis XIV. Saint-Simon in his memoirs describes the relief that was felt at court when the old man's death was announced.

Mémoires de la vie du comte de Grammont contenant particulièrement l'histoire amoureuse de la cour d'Angleterre sous le règne de Charles I. was printed in Holland with the inscription Cologne, 1713. Other editions followed in 1715 and 1716. *Memoirs of the Life of Count de Grammont . . . translated out of the French by Mr [Abel] Boyer* (1714), was supplemented by a "complext key" in 1719. The *Mémoires* "augmentées de notes et d'éclaircissemens" was edited by Horace Walpole in 1772. In 1793 appeared in London an edition adorned with portraits engraved after originals in the royal collection. An English edition by Sir Walter Scott was published by H. G. Bohn (1846), and this with additions was reprinted in 1889, 1890, 1896, &c. Among other modern editions are an excellent one in the *Bibliothèque Charpentier* edited by M. Gustave Brunet (1859); *Mémoires* . . . (Paris, 1888) with etchings by L. Boisson after C. Delort and an introduction by H. Gausseron; *Memoirs* . . . (1889), edited by Mr H. Vizetelly; and *Memoirs* . . . (1903), edited by Mr Gordon Goodwin.

GRAMOPHONE (an invented word, formed on an inversion of "phonogram"; *φωνή*, sound, *γράμμα*, letter), an instrument for recording and reproducing sounds. It depends on the same general principles as the phonograph (*q.v.*), but it differs in certain details of construction, especially in having the sound-record cut spirally on a flat disk instead of round a cylinder.

GRAMPIANS, THE, a mass of mountains in central Scotland. Owing to the number of ramifications and ridges it is difficult to assign their precise limits, but they may be described as occupying the area between a line drawn from Dumbartonshire to the North Sea at Stonehaven, and the valley of the Spey or even Glenmore (the Caledonian Canal). Their trend is from south-west to north-east, the southern face forming the natural division between the Lowlands and Highlands. They lie in the shires of Argyll, Dumbarton, Stirling, Perth, Forfar, Kincardine, Aberdeen, Banff and Inverness. Among the highest summits are Ben Nevis, Ben Macdhui, and Cairngorms, Ben Lawers, Ben More, Ben Alder, Ben Cruachan and Ben Lomond. The principal rivers flowing from the watershed northward are the Findhorn, Spey, Don, Dee and their tributaries, and southward the South Esk, Tay and Forth with their affluents. On the north the mass is wild and rugged; on the south the slope is often gentle, affording excellent pasture in many places, but both sections contain some of the finest deer-forests in Scotland. They are crossed by the Highland, West Highland and Callander to Oban railways, and present some of the finest scenery in the kingdom. The rocks consist chiefly of granite, gneiss, schists, quartzite, porphyry and diorite. Their fastnesses were originally inhabited by the northern Picts, the Caledonians who, under Galgacus, were defeated by Agricola in A.D. 84 at Mons Graupius—the false reading of which, Grampius, has been perpetuated in the name of the mountains—the site of which has not been ascertained. Some authorities place it at Ardoch; others near the junction of the Tay and Isla, or at Dalginross near Comrie; while some, contending for a position nearer the east coast, refer it to a site in west Forfarshire or to Raedykes near Stonehaven.

GRAMPOUND, a small market town in the mid-parliamentary division of Cornwall, England, 9 m. E.N.E. of Truro, and 2 m. from its station (Grampound Road) on the Great Western railway. It is situated on the river Fal, and has some industry in tanning. It retains an ancient town hall; there is a good market cross; and in the neighbourhood, along the Fal, are several early earthworks.

Grampound (Ponsmure, Graundpont, Grauntpount, Graundpond) and the hundred, manor and vill of Tibeste were formerly so closely associated that in 1400 the former is found styled the vill of Grauntpond called Tibeste. At the time of the Domesday Survey Tibeste was amongst the most valuable of the manors granted to the count of Mortain. The burgensic character of Ponsmure first appears in 1209. Thirty-five years later John of Eltham granted to the burgesses the whole town of Grauntpount. This grant was confirmed in 1378 when its extent and jurisdiction were defined. It was provided that the hundred court of Powdershire should always be held there and two fairs at the feasts of St Peter in Cathedra and St Barnabas, both of which are still held, and a Tuesday market (now held on Friday)

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and that it should be a free borough rendering a yearly rent to the earl of Cornwall. Two members were summoned to parliament by Edward VI. in 1553. The electors consisted of an indefinite number of freemen, about 50 in all, indirectly nominated by the mayor and corporation, which existed by prescription. The venality of the electors became notorious. In 1780 £3000 was paid for a seat: in 1812 each supporter of one of the candidates received £100. The defeat of this candidate in 1818 led to a parliamentary inquiry which disclosed a system of wholesale corruption, and in 1821 the borough was disfranchised. A former woollen trade is extinct.

GRAMPUS (*Orca gladiator*, or *Orca orca*), a cetacean belonging to the *Delphinidae* or dolphin family, characterized by its rounded head without distinct beak, high dorsal fin and large conical teeth. The upper parts are nearly uniform glossy black, and the under parts white, with a strip of the same colour over each eye. The O. Fr. word was *grapois*, *grapeis* or *craspeis*, from Med. Lat. *crassus piscis*, fat fish. This was adapted into English as *grapeys*, *grapeys*, &c., and in the 16th century becomes *graunde pose* as if from *grand poisson*. The final corruption to "grampus" appears in the 18th century and was probably nautical in origin. The animal is also known as the "killer," in allusion to its ferocity in attacking its prey, which consists largely of seals, porpoises and the smaller dolphins. Its fierceness is only equalled by its voracity, which is such that in a specimen measuring 21 ft. in length, the remains of thirteen seals and thirteen porpoises were found, in a more or less digested state, while the animal appeared to have been choked in the endeavour to swallow another seal, the skin of which was found entangled in its teeth. These cetaceans sometimes hunt in packs or schools, and commit great havoc among the belugas or white whales, which occasionally throw themselves ashore to escape their persecutors. The grampus is an inhabitant of northern seas, occurring on the shores of Greenland, and having been caught, although rarely, as far south as the Mediterranean. There are numerous instances of its capture on the British coasts. (See CETACEA.)

GRANADA, LUIS DE (1504–1588), Spanish preacher and ascetic writer, born of poor parents named Sarriá at Granada. He lost his father at an early age and his widowed mother was supported by the charity of the Dominicans. A child of the Alhambra, he entered the service of the alcalde as page, and, his ability being discovered, received his education with the sons of the house. When nineteen he entered the Dominican convent and in 1525 took the vows; and, with the leave of his prior, shared his daily allowance of food with his mother. He was sent to Valladolid to continue his studies and then was appointed procurator at Granada. Seven years after he was elected prior of the convent of Scala Caeli in the mountains of Cordova, which after eight years he succeeded in restoring from its ruinous state, and there he began his work as a zealous reformer. His preaching gifts were developed by the orator Juan de Avila, and he became one of the most famous of Spanish preachers. He was invited to Portugal in 1555 and became provincial of his order, declining the offer of the archbishopric of Braga but accepting the position of confessor and counsellor to Catherine, the queen regent. At the expiration of his tenure of the provincialship, he retired to the Dominican convent at Lisbon, where he lived till his death on the last day of 1588. Aiming, both in his sermons and ascetical writings, at development of the religious view, the danger of the times as he saw it was not so much in the Protestant reformation, which was an outside influence, but in the direction that religion had taken among the masses. He held that in Spain the Catholic faith was not understood by the people, and that their ignorance was the pressing danger. He fell under the suspicion of the Inquisition; his mystical teaching was said to be heretical, and his most famous book, the *Guia de Peccadores*, still a favourite treatise and one that has been translated into nearly every European tongue, was put on the Index of the Spanish Inquisition, together with his book on prayer, in 1559. His great opponent was the restless and ambitious Melchior Cano, who stigmatized the second book as containing grave errors smacking of the heresy of the Alumbrados and manifestly contradicting Catholic faith and teaching. But in 1576 the prohibition was removed and the works of Luis de Granada, so prized by St Francis de Sales, have never lost their value. The friend of St Teresa, St Peter of Alcantara, and of all the noble minds of Spain of his day, no one among the three hundred Spanish mystics excels Luis de Granada in the beauty of a didactic style, variety of illustration and soberness of statement.

The last collected edition of his works is that published in 9 vols. at Antwerp in 1578. A biography by L. Monoz, *La Vida y virtudes de Luis de Granada* (Madrid, 1639); a study of his system by P. Rousselot in *Mystiques espagnoles* (Paris, 1867); Ticknor, *History of Spanish Literature* (vol. iii.), and Fitzmaurice Kelly, *History of Spanish Literature*, pp. 200-202 (London, 1898), may also be consulted.

GRANADA, the capital of the department of Granada, Nicaragua; 32 m. by rail S.E. of Managua, the capital of the republic. Pop. (1900) about 25,000. Granada is built on the north-western shore of Lake Nicaragua, of which it is the principal port. Its houses are of the usual central American type, constructed of adobe, rarely more than one storey high, and surrounded by courtyards with ornamental gateways. The suburbs, scattered over a large area, consist chiefly of cane huts occupied by Indians and half-castes. There are several ancient churches and convents, in one of which the interior of the chancel roof is inlaid with mother-of-pearl. An electric tramway connects the railway station and the adjacent wharves with the market, about 1 m. distant. Ice, cigars, hats, boots and shoes are manufactured, but the characteristic local industry is the production of "Panama chains," ornaments made of thin gold wire. In the neighbourhood there are large cocoa plantations; and the city has a thriving trade in cocoa, coffee, hides, cotton, native tobacco and indigo.

Granada was founded in 1523 by Francisco Fernandez de Córdoba. It became one of the wealthiest of central American cities, although it had always a keen commercial rival in Leon, which now surpasses it in size and importance. In the 17th century it was often raided by buccaneers, notably in 1606, when it was completely sacked. In 1855 it was captured and partly burned by the adventurer William Walker (see CENTRAL AMERICA: *History*).

GRANADA, a maritime province of southern Spain, formed in 1833 of districts belonging to Andalusia, and coinciding with the central parts of the ancient kingdom of Granada. Pop. (1900) 402,460; area, 4028 sq. m. Granada is bounded on the N. by Cordova, Jaen and Albacete, E. by Murcia and Almería, S. by the Mediterranean Sea, and W. by Malaga. It includes the western and loftier portion of the Sierra Nevada (*q.v.*), a vast ridge rising parallel to the sea and attaining its greatest altitudes in the Cerro de Mulhacen (11,421 ft.) and Picacho de la Veleta (11,148), which overlook the city of Granada. Lesser ranges, such as the Sierras of Parapanda, Alhama, Almijara or Harana, adjoin the main ridge. From this central watershed the three principal rivers of the province take their rise, viz.: the Guadiana Menor, which, flowing past Guadix in a northerly direction, falls into the Guadalquivir in the neighbourhood of Ubeda; the Genil which, after traversing the Vega, or Plain of Granada, leaves the province a little to the westward of Loja and joins the Guadalquivir between Cordova and Seville; and the Rio Grande or Guadalfeo, which falls into the Mediterranean at Motril. The coast is little indented and none of its three harbours, Almuñécar, Albuñol and Motril, ranks high in commercial importance. The climate in the lower valleys and the narrow fringe along the coast is warm, but on the higher grounds of the interior is somewhat severe; and the vegetation varies accordingly from the subtropical to the alpine. The soil of the plains is very productive, and that of the Vega of Granada is considered the richest in the whole peninsula; from the days of the Moors it has been systematically irrigated, and it continues to yield in great abundance and in good quality wheat, barley, maize, wine, oil, sugar, flax, cotton, silk and almost every variety of fruit. In the mountains immediately surrounding the city of Granada

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occur many kinds of alabaster, some very fine; there are also quantities of jasper and other precious stones. Mineral waters chiefly chalybeate and sulphurous, are abundant, the most important springs being those of Alhama, which have a temperature of 112° F. There are valuable iron mines, and small quantities of zinc, lead and mercury are obtained. The cane and beet sugar industries, for which there are factories at Loja, at Motril, and in the Vega, developed rapidly after the loss of the Spanish West Indies and the Philippine Islands in 1808, with the consequent decrease in competition. There are also tanneries, foundries and manufactories of woollen, linen, cotton, and rough frieze stuffs, cards, soap, spirits, gunpowder and machinery. Apart from the great highways traversing the province, which are excellent, the roads are few and ill-kept. The railway from Madrid enters the province on the north and bifurcates north-west of Guadix; one branch going eastward to Almería, the other westward to Loja, Malaga and Algeciras. Baza is the terminus of a railway from Lorca. The chief towns include Granada, the capital (pop. 1900, 75,900) with Alhama de Granada (7697), Baza (12,770), Guadix (12,652), Loja (19,143), Montefrío (10,725), and Motril (18,528). These are described in separate articles. Other towns with upwards of 7000 inhabitants are Albuñol (8646), Almuñécar (8022), Cúllar de Baza (8007), Huéscar (7763), Illora (9496) and Puebla de Don Fadrique (7420). The history of the ancient kingdom is inseparable from that of the city of Granada (*q.v.*).

GRANADA, the capital of the province, and formerly of the kingdom of Granada, in southern Spain; on the Madrid-Granada-Algeciras railway. Pop. (1900) 75,900. Granada is magnificently situated, 2195 ft. above the sea, on the north-western slope of the Sierra Nevada, overlooking the fertile lowlands known as the Vega de Granada on the west and overshadowed by the peaks of Veleta (11,148 ft.) and Mulhacen (11,421 ft.) on the south-east. The southern limit of the city is the river Genil, the Roman *Singilis* and Moorish *Shenil*, a swift stream flowing westward from the Sierra Nevada, with a considerable volume of water in summer, when the snows have thawed. Its tributary the Darro, the Roman *Salon* and Moorish *Hadarro*, enters Granada on the east, flows for upwards of a mile from east to west, and then turns sharply southward to join the main river, which is spanned by a bridge just above the point of confluence. The waters of the Darro are much reduced by irrigation works along its lower course, and within the city it has been canalized and partly covered with a roof.

Granada comprises three main divisions, the Antequeruela, the Albaicin (or Albaycin), and Granada properly so-called. The first division, founded by refugees from Antequera in 1410, consists of the districts enclosed by the Darro, besides a small area on its right, or western bank. It is bounded on the east by the gardens and hill of the Alhambra (*q.v.*), the most celebrated of all the monuments left by the Moors. The Albaicin (Moorish *Rabad al Bayazin*, "Falconers' Quarter") lies north-west of the Antequeruela. Its name is sometimes associated with that of Baeza, since, according to one tradition, it was colonized by citizens of Baeza, who fled hither in 1246, after the capture of their town by the Christians. It was long the favourite abode of the Moorish nobles, but is now mainly inhabited by gipsies and artisans. Granada, properly so-called, is north of the Antequeruela, and west of the Albaicin. The origin of its name is obscure; it has been sometimes, though with little probability, derived from *granada*, a pomegranate, in allusion to the abundance of pomegranate trees in the neighbourhood. A pomegranate appears on the city arms. The Moors, however, called Granada *Karnattah* or *Karnattah-al-Yahud*, and possibly the name is composed of the Arabic words *kurn*, "a hill," and *nattah*, "stranger,"—the "city" or "hill of strangers."

Although the city has been to some extent modernized, the architecture of its more ancient quarters has many Moorish characteristics. The streets are, as a rule, ill-lighted, ill-paved and irregular; but there are several fine squares and avenues, such as the Bibarrambla, where tournaments were held by the Moors; the spacious Plaza del Trionfo, adjoining the bull-ring, on the north; the Alameda, planted with plane trees, and the Paseo del Salon. The business centre of the city is the Puerta Real, a square named after a gate now demolished.

Granada is the see of an archbishop. Its cathedral, which commemorates the reconquest of southern Spain from the Moors, is a somewhat heavy classical building, begun in 1529 by Diego de Siloe, and only finished in 1703. It is profusely ornamented with jasper and coloured marbles, and surmounted by a dome. The interior contains many paintings and sculptures by Alonso Cano (1601–1667), the architect of the fine west façade, and other artists. In one of the numerous chapels, known as the Chapel Royal (*Capilla Real*), is the monument of Philip I. of Castile (1478–1506), and his queen Joanna; with the tomb of Ferdinand and Isabella, the first rulers of united Spain (1452–1516). The church of Santa María (1705–1750), which may be regarded as an annexe of the cathedral, occupies the site of the chief mosque of Granada. This was used as a church until 1661. Santa Ana (1541) also replaced a mosque; Nuestra Señora de las Angustias (1664–1671) is noteworthy for its fine towers, and the rich decoration of its high altar. The convent of San Geronimo (or Jeronimo), founded in 1492 by Ferdinand and Isabella, was converted into barracks in 1810; its church contains the tomb of the famous captain Gonsalvo or Gonzalo de Cordova (1453–1515). The Cartuja, or Carthusian monastery north of the city, was built in 1516 on Gonzalo's estate, and in his memory. It contains several fine paintings, and an interesting church of the 17th and 18th centuries.

After the Alhambra, and such adjacent buildings as the Generalife and Torres Bermejas, which are more fitly described in connexion with it, the principal Moorish antiquities of Granada are the 13th-century villa known as the Cuarto Real de San Domingo, admirably preserved, and surrounded by beautiful gardens; the Alcázar de Genil, built in the middle of the 14th century as a palace for the Moorish queens; and the Casa del Cabildo, a university of the same period, converted into a warehouse in the 19th century. Few Spanish cities possess a greater number of educational and charitable establishments. The university was founded by Charles V. in 1531, and transferred to its present buildings in 1769. It is attended by about 600 students. In 1900, the primary schools of Granada numbered 22, in addition to an ecclesiastical seminary, a training-school for teachers, schools of art and jurisprudence, and museums of art and archaeology. There were twelve hospitals and orphanages for both sexes, including a leper hospital in one of the convents. Granada has an active trade in the agricultural produce of the Vega, and manufactures liqueurs, soap, paper and coarse linen and woollen fabrics. Silk-weaving was once extensively carried on, and large quantities of silk were exported to Italy, France, Germany and even America, but this industry died during the 19th century.

History.—The identity of Granada with the Iberian city of *Iliberris* or *Iliberri*, which afterwards became a flourishing Roman colony, has never been fully established; but Roman tombs, coins, inscriptions, &c., have been discovered in the neighbourhood. With the rest of Andalusia, as a result of the great invasion from the north in the 5th century, Granada fell to the lot of the Vandals. Under the caliphs of Cordova, onwards from the 8th century, it rapidly gained in importance, and ultimately became the seat of a provincial government, which, after the fall of the Omayyad dynasty in 1031, or, according to some authorities, 1038, ranked with Seville, Jaen and others as an independent principality. The family of the Zeri, Ziri or Zeiri maintained itself as the ruling dynasty until 1090; it was then displaced by the Almohades, who were in turn overthrown by the Almoravides, in 1154. The dominion of the Almoravides continued unbroken, save for an interval of one year (1160–1161), until 1229. From 1229 to 1238 Granada formed part of the kingdom of Murcia; but in the last-named year it passed into the hands of Abu Abdullah Mahommed Ibn Al Ahmar, prince of Jaen and founder of the dynasty of the Nasrides. Al Ahmar was deprived of Jaen in 1246, but united Granada, Almería and Malaga under his sceptre, and, as the

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fervour of the Christian crusade against the Moors had temporarily abated, he made peace with Castile, and even aided the Christians to vanquish the Moslem princes of Seville. At the same time he offered asylum to refugees from Valencia, Murcia and other territories in which the Moors had been overcome. Al Ahmar and his successors ruled over Granada until 1492, in an unbroken line of twenty-five sovereigns who maintained their independence partly by force, and partly by payment of tribute to their stronger neighbours. Their encouragement of commerce—notably the silk trade with Italy—rendered Granada the wealthiest of Spanish cities; their patronage of art, literature and science attracted many learned Moslems, such as the historian Ibn Khaldun and the geographer Ibn Batuta, to their court, and resulted in a brilliant civilization, of which the Alhambra is the supreme monument.

The kingdom of Granada, which outlasted all the other Moorish states in Spain, fell at last through dynastic rivalries and a harem intrigue. The two noble families of the Zegri and the Beni Serraj (better known in history and legend as the *Abencerrages*) encroached greatly upon the royal prerogatives during the middle years of the 15th century. A crisis arose in 1462, when an endeavour to control the Abencerrages resulted in the dethronement of Abu Nasr Saad, and the accession of his son, Muley Abu'l Hassan, whose name is preserved in that of Mulhacen, the loftiest peak of the Sierra Nevada, and in a score of legends. Muley Hassan weakened his position by resigning Malaga to his brother Ez Zagal, and incurred the enmity of his first wife Aisha by marrying a beautiful Spanish slave, Isabella de Solis, who had adopted the creed of Islam and taken the name of Zorayah, "morning star." Aisha or Ayesha, who thus saw her sons Abu Abdullah Mahommed (Boabdil) and Yusuf in danger of being supplanted, appealed to the Abencerrages, whose leaders, according to tradition, paid for their sympathy with their lives (see ALHAMBRA). In 1482 Boabdil succeeded in deposing his father, who fled to Malaga, but the gradual advance of the Christians under Ferdinand and Isabella forced him to resign the task of defence into the more warlike hands of Muley Hassan and Ez Zagal (1483–1486). In 1491 after the loss of these leaders, the Moors were decisively beaten; Boabdil, who had already been twice captured and liberated by the Spaniards, was compelled to sign away his kingdom; and on the 2nd of January 1492 the Spanish army entered Granada, and the Moorish power in Spain was ended. The campaign had aroused intense interest throughout Christendom; when the news reached London a special thanksgiving service was held in St Paul's Cathedral by order of Henry VII.

GRANADILLA, the name applied to *Passiflora quadrangularis*, Linn., a plant of the natural order *Passifloreae*, a native of tropical America, having smooth, cordate, ovate or acuminate leaves; petioles bearing from 4 to 6 glands; an emetic and narcotic root; scented flowers; and a large, oblong fruit, containing numerous seeds, imbedded in a subacid edible pulp. The granadilla is sometimes grown in British hothouses. The fruits of several other species of *Passiflora* are eaten. *P. laurifolia* is the "water lemon," and *P. maliformis* the "sweet calabash" of the West Indies.

GRANARIES. From ancient times grain has been stored in greater or lesser bulk. The ancient Egyptians made a practice of preserving grain in years of plenty against years of scarcity, and probably Joseph only carried out on a large scale an habitual practice. The climate of Egypt being very dry, grain could be stored in pits for a long time without sensible loss of quality. The silo pit, as it has been termed, has been a favourite way of storing grain from time immemorial in all oriental lands. In Turkey and Persia usurers used to buy up wheat or barley when comparatively cheap, and store it in hidden pits against seasons of dearth. Probably that custom is not yet dead. In Malta a relatively large stock of wheat is always preserved in some hundreds of pits (silos) cut in the rock. A single silo will store from 60 to 80 tons of wheat, which, with proper precautions, will keep in good condition for four years or more. The silos are shaped like a cylinder resting on a truncated cone, and surmounted by the same figure. The mouth of the pit is round and small and covered by a stone slab, and the inside is lined with barley straw and kept very dry. Samples are occasionally taken from the wheat as from the hold of a ship, and at any signs of fermentation the granary is cleared and the wheat turned over, but such is the dryness of these silos that little trouble of this kind is experienced.

Towards the close of the 19th century warehouses specially intended for holding grain began to multiply in Great Britain, but America is the home of great granaries, known there as elevators. There are climatic difficulties in the way of storing grain in Great Britain on a large scale, but these difficulties have been largely overcome. To preserve grain in good condition it must be kept as much as possible from moisture and heat. New grain when brought into a warehouse has a tendency to sweat, and in this condition will easily heat. If the heating is allowed to continue the quality of the grain suffers. An effectual remedy is to turn out the grain in layers, not too thick, on a floor, and to keep turning it over so as to aerate it thoroughly. Grain can thus be conditioned for storage in silos. There is reason to think that grain in a sound and dry condition can be better stored in bins or dry pits than in the open air; from a series of experiments carried out on behalf of the French government it would seem that grain exposed to the air is decomposed at 33 times the rate of grain stored in silo or other bins.

In comparing the grain-storage system of Great Britain with that of North America it must be borne in mind that whereas Great Britain raises a comparatively small amount of grain, which is more or less rapidly consumed, grain-growing is one of the greatest industries of the United States and of Canada. The enormous surplus of wheat and maize produced in America can only be profitably dealt with by such a system of storage as has grown up there since the middle of the 19th century. The American farmer can store his wheat or maize at a moderate rate, and can get an advance on his warrant if he is in need of money. A holder of wheat in Chicago can withdraw a similar grade of wheat from a New York elevator.

Modern granaries are all built on much the same plan. The mechanical equipment for receiving and discharging grain is very similar in all modern warehouses. A granary is usually erected on a quay at which large vessels can lie and discharge. On the land side railway sidings connect the warehouse with the chief lines in its district; accessibility to a canal is an advantage. Ships are usually cleared by bucket elevators which are dipped into the cargo, though in some cases pneumatic elevators are substituted (see CONVEYORS). A travelling band with throw-off carriage will speedily distribute a heavy load of grain. Band conveyors serve equally well for charging or discharging the bins. Bins are invariably provided with hopper bottoms, and any bin can be effectively cleared by the band, which runs underneath, either in a cellar or in a specially constructed tunnel. All granaries should be provided with a sufficient plant of cleaning machinery to take from the grain impurities as would be likely to be detrimental to its storing qualities. Chief among such machines are the warehouse separators which work by sieves and air currents (see FLOUR AND FLOUR MANUFACTURE).

The typical grain warehouse is furnished with a number of chambers for grain storage which are known as silos, and may be built of wood, brick, iron or ferro-concrete. Wood silos are usually square, made of flat strips of wood nailed one on top of the other, and so overlapping each other at the corners that alternately a longitudinal and a transverse batten extends past the corner. The gaps are filled by short pieces of timber securely nailed, and the whole silo wall is thus solid. This type of bin was formerly in great favour, but it has certain drawbacks, such as the possibility of dry rot, while weevils are apt to harbour in the interstices unless lime washing is practised. Bricks and cement are good materials for constructing silos of hexagonal form, but necessitate deep foundations and substantial walls. Iron silos of circular form are used to some extent in Great Britain, but are more common in North and

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South America. In their case the walls are much thinner than with any other material, but the condensation against the inner wall in wet weather is a drawback in damp climates. Cylindrical tank silos have also been made of fire-proof tiles. Ferro-concrete silos have been built on both the Monier and the Hennebique systems. In the earlier type the bin was made of an iron or steel framework filled in with concrete, but more recent structures are composed entirely of steel rods embedded in cement. Granaries built of this material have the great advantage, if properly constructed, of being free from any risk of failure even in case of uneven expansion of the material. With brick silos collapses through pressure of the stored material are not unknown.

Port Arthur, Canada.

One of the largest and most complete grain elevators or warehouses in the world belongs to the Canadian Northern Railway Company, and was erected at Port Arthur, Canada, in 1901–1904. It has a total storage capacity of 7,000,000 bushels, or 875,000 qrs. of 480 lb. The range of buildings and bins forms an oblong, and consists of two storage houses, B and C, placed between two working or receiving houses A and D (fig. 1). The receiving houses are fed by railway sidings. House A, for example, has two sidings, one running through it and repaired since they can be removed and replaced without affecting the main bin walls. It is claimed that these facers constitute the best possible protection against fire. A steel framework, covered with tiles, crowns these circular bins and contains the conveyors and spouts which are used to fill the bins. Five tunnels in the concrete bedding that supports the bins carry the belt conveyors which bring back the grain to the working house for cleaning or shipment. There are altogether in each of the storage houses 80 circular bins, each 21 ft. in diameter, and 20 grouped as to form 63 smaller interspace bins, or 143 bins in all. Each bin will store grain in a column 85 ft. deep, and the whole group has a capacity of 2,500,000 bushels. These bins were all constructed by the Barnett & Record Company of Minneapolis, Minnesota, U.S.A., in accordance with the Johnson & Record patent system of fire-proof tile grain storage construction. In case one of the working houses is attacked by fire the fire-proof storage houses protect not only their own contents but also the other working house, and in the event of its disablement or destruction the remaining one can be easily connected with both the storage houses and handle their contents.

Circular tank silos have not been extensively adopted in Great Britain, but a typical silo tank installation exists at the Walmsley & Smith flour mills which stand beside the Devonshire dock at Barrow-in-Furness. There four circular bins, built of riveted steel

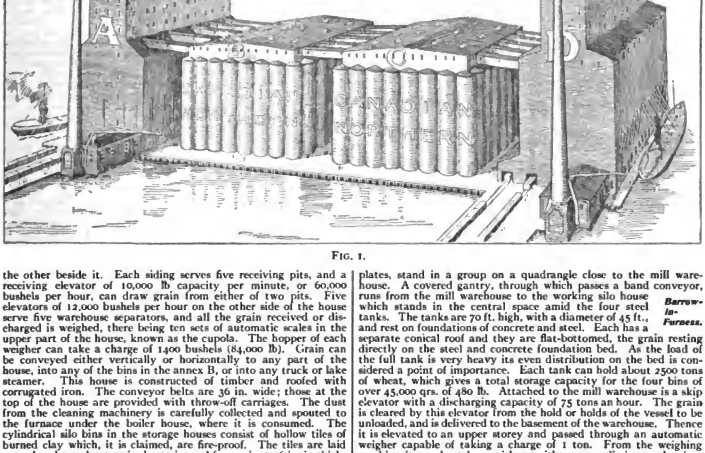

FIG. 1.

the other beside it. Each siding serves five receiving pits, and a receiving elevator of 10,000 lb capacity per minute, or 60,000 bushels per hour, can draw grain from either of two pits. Five elevators of 12,000 bushels per hour on the other side of the house serve five warehouse separators, and all the grain received or discharged is weighed, there being ten sets of automatic scales in the upper part of the house, known as the cupola. The hopper of each weigher can take a charge of 1400 bushels (84,000 lb). Grain can be conveyed either vertically or horizontally to any part of the house, into any of the bins in the annex B, or into any truck or lake steamer. This house is constructed of timber and roofed with corrugated iron. The conveyor belts are 36 in. wide; those at the top of the house are provided with throw-off carriages. The dust from the cleaning machinery is carefully collected and spouted to the furnace under the boiler house, where it is consumed. The cylindrical silo bins in the storage houses consist of hollow tiles of burned clay which, it is claimed, are fire-proof. The tiles are laid on end and are about 12 in. by 12 in. and from 4 in. to 6 in. in thickness according to the size of the bin. Each alternate course consists of grooved blocks of channel tile forming a continuous groove or belt round the bin. This groove receives a steel band acting as a tension member and resisting the lateral pressure of the grain. The steel bands once in position, the groove is completely filled with cement grout by which the steel is encased and protected. Usually the bottoms of the bins are furnished with self-discharging hoppers of weak cinder or gravel concrete finished with cement mortar. For the foundation or supporting floor reinforced concrete is frequently used. The tiles already described are faced with tiles ½ to 1 in. thick, which are laid solid in cement mortar covering the whole exterior of the bin. Any damage to the facing tiles can easily be plates, stand in a group on a quadrangle close to the mill warehouse. A covered gantry, through which passes a band conveyor, runs from the mill warehouse to the working silo house which stands in the central space amid the four steel tanks. The tanks are 70 ft. high, with a diameter of 45 ft., and rest on foundations of concrete and steel. Each has a separate conical roof and they are flat-bottomed, the grain resting directly on the steel and concrete foundation bed. As the load of the full tank is very heavy its even distribution on the bed is considered a point of importance. Each tank can hold about 2500 tons of wheat, which gives a total storage capacity for the four bins of over 45,000 qrs. of 480 lb. Attached to the mill warehouse is a skip elevator with a discharging capacity of 75 tons an hour. The grain is cleared by this elevator from the hold or holds of the vessel to be unloaded, and is delivered to the basement of the warehouse. Thence it is elevated to an upper storey and passed through an automatic weigher capable of taking a charge of 1 ton. From the weighing machine it can be taken, with or without a preliminary cleaning, to any floor of the warehouse, which has a total storing capacity of 8000 tons, or it can be carried by the band conveyor through the gantry to the working house of the silo installation and distributed to any one of the four tank silos. There is also a connexion by a band conveyor running through a covered gantry into the mill, which stands immediately in the rear. It is perfectly easy to turn over the contents of any tank into any other tank. The whole intake and wheat handling plant is moved by two electro-motors of 35 H.P. each, one installed in the warehouse and the other in the silo working house. Steel silo tanks have the advantage of storing a heavy stock of wheat at comparatively small capital outlay. On an average an ordinary silo bin will not hold more than 500 to

Barrow-in-Furness.

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1000 qrs., but each of the bins at Barrow will contain 2500 tons or over 1100 qrs. The steel construction also reduces the risk of fire and consequently lessens the fire premium.

The important granaries at the Liverpool docks date from 1868, but have since been brought up to modern requirements. The storage area of 11½ acres, while the sister warehouses on the Birkenhead side, which stand on the margin of the great float, have an area of 11 acres. The total capacity of these warehouses is about 200,000 qrs.

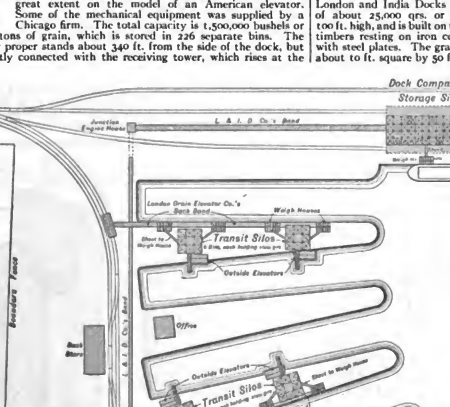
Liverpool.

The grain warehouse of the Manchester docks at Trafford wharf is locally known as the grain elevator, because it was built to a great extent on the model of an American elevator. Some of the mechanical equipment was supplied by a Chicago firm. The total capacity is 1,500,000 bushels or 40,000 tons of grain, which is stored in 226 separate bins. The granary proper stands about 340 ft. from the side of the dock, but is directly connected with the receiving tower, which rises at the per hour; weighing in the tower; conveying grain into the warehouse and distributing it into any of the 226 bins; moving grain from bin to bin either for aerating or delivery, and simultaneously weighing in bulk at the rate of 500 tons per hour; sacking grain, weighing and loading the sacks into 40 railway trucks and 10 carts simultaneously; loading grain from the warehouse into barges or coasting craft at the rate of 150 tons per hour in bulk or of 250 sacks per hour. This warehouse is equipped with a dryer of American construction, which can deal with 50 tons of damp grain at one time, and is connected with the whole bin system so that grain can be readily moved from any bin to the dryer or conversely.

Manchester.

A grain warehouse at the Victoria docks, London, belonging to the London and India Docks Company (fig. 2) has a storing capacity of about 25,000 qrs. or 200,000 bushels. It is over 100 ft. high, and is built on the American plan of interlaced timbers resting on iron columns. The walls are externally cased with steel plates. The grain is stored in 56 silos, most of which are about 10 ft. square by 50 ft. deep. The intake plant has a capacity

London.



General Plan of Storage & Transit Silos, Victoria Docks, London.

Scale, 140 feet = 1 inch.

FIG. 2.

of 100 tons of wheat an hour, and includes six automatic grain scales, each of which can weigh off one sack at a time. The main delivery floor of the warehouse is at a convenient height above the ground level. Portable automatic weighing machines can be placed under any bin. The whole of the plant is driven by electric motors, one being allotted to each machine.

The transit silos of the London Grain Elevator Company, also at the Victoria docks, consist of four complete and independent installations standing on three tongues of land which project into the water (figs. 2 and 3). Each silo house is furnished with eight bins, each of which, 12 ft. square by 80 ft. deep, has a capacity of 1000 qrs. of grain. A kind of well in the middle of each silo house contains the necessary elevators, staircases, &c. The silo bins in each granary are erected on a massive cast iron tank forming a sort of cellar, which rests on a concrete foundation 6 ft. thick. The base of the tank is 30 ft. below the water level. The silos are formed of wooden battens nailed one on top of the other, the pieces interlacing. Rolled steel girders resting on cast iron columns support the silos. To ensure a clean discharge the hopper bottoms were designed so as to avoid joints and thus to be free from rivets or similar protuberances. The exterior of each silo house is covered with corrugated iron, and the same material is used for the roofing. No conveyors serve the silo bins, as the elevators which rise above the tops of the silos can feed any one of them by gravity. There are three delivery elevators to each granary, one with a capacity of 120 tons and the other two of 100 tons each an hour. Each silo house is served by a large elevator with a capacity of 120 tons per hour, which discharges into the elevator well inside the house. The delivery elevators discharge into a receiving bin in which there is a large hopper feeding six automatic weighing machines. Each charge as it is weighed empties itself automatically into sacks, which are then ready for loading. Each pair of warehouses is provided with a conveyor band 308 ft. long, and another for carrying sacks from the weighing sheds to railway trucks or for carrying grain in bulk to barges or trucks. Each silo house has an identical mechanical equipment apart from the delivery band it shares with its fellow warehouse. All operations in connexion with the silo houses are effected under cover. The silos are normally fed by a fleet of twenty-six of Philip's patent self-discharging lighters. These craft are hopper-bottomed and fitted with band conveyors of the ordinary type, running between the double keelson of the lighter and delivering into an elevator erected at the stern of the lighter. By this means little trimming is required after the barge, which holds

water's edge, by a band conveyor protected by a gantry. The main building is 448 ft. long by 80 ft. wide; the whole of the superstructure was constructed of wood with an external casing of brickwork and tiles. The receiving tower is fitted with a bucket elevator capable, within fairly wide limits, of adjustment to the level of the hold to be unloaded. The elevator has the large unloading capacity of 350 tons per hour, assuming it to be working in a full hold. It is supplemented by a pneumatic elevator (Duckham system) which can raise 200 tons per hour and is used chiefly in dealing with parcels of grain or in clearing grain out of holds which the ordinary elevator cannot reach. The power required to work the large elevator as well as the various band conveyors is supplied by two sets of horizontal Corliss compound engines of 500 H.P. jointly, which are fed by two Galloway boilers working at 100 lb pressure. The pneumatic elevator is driven by two sets of triple expansion vertical engines of 600 H.P. fed by three boilers working at a pressure of 160 lb. The grain received in the tower is automatically weighed. From the receiving tower the grain is conveyed into the warehouse where it is at once elevated to the top of a central tower, and is thence distributed to any of the bins by band conveyors in the usual way. The mechanical equipment of this warehouse is very complete, and the following several operations can be simultaneously effected: discharging grain from vessels in the dock at the rate of 350 tons

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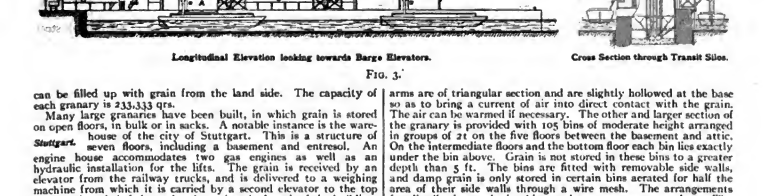
about 200 tons of grain, has been cleared. Ocean steamers of such draft as to preclude their entry into any of the up river docks are cleared at Tilbury by these lighters. It is said that grain loaded at Tilbury into these lighters can be delivered from the transit silos to railway trucks or barges in about six hours. The total storage capacity of the silos amounts to 32,000 qrs. The motive power is furnished by 14 gas engines of a total capacity of 366 H.P.

Two of the largest granaries on the continent of Europe are situated at the mouth of the Danube, at Braila and Galatz, in Rumania, and serve for both the reception and discharge of grain. At the edge of the quay on which these warehouses are built there are rails with a gauge of 11½ ft., upon which run two mechanical loading and unloading appliances. The first consists of a telescopic elevator which raises the grain and delivers it to one of the two band conveyors at the head of the apparatus. Each of these bands feeds automatic weighing machines with an hourly capacity of 75 tons. From these weighers the grain is either discharged through a manhole in the ground to a band conveyor running in a tunnel parallel to the quay wall, or it is raised by a second elevator (part of the same unloading apparatus), set at an inclined angle, which delivers at a sufficient height to load railway trucks on the siding running parallel to the quay. A turning gear is provided so as to reverse, if required, the operation of the whole apparatus, that the portion overhanging the water can be turned to the land side. The unloading capacity is 150 tons of grain per hour. If it be desired to load a ship the telescopic elevator has only to be turned round and dipped into any one of 15 wells, which *Rumania.*



Transit Silos of the London Grain Elevator Co. Ltd., Victoria Docks, London.

Longitudinal Elevation looking towards Barge Elevators. Cross Section through Transit Silos.

FIG. 3.

can be filled up with grain from the land side. The capacity of each granary is 233,333 qrs.

Many large granaries have been built, in which grain is stored on open floors, in bulk or in sacks. A notable instance is the warehouse of the city of Stuttgart. This is a structure of seven floors, including a basement and entresol. An engine house accommodates two gas engines as well as an hydraulic installation for the lifts. The grain is received by an elevator from the railway trucks, and is delivered to a weighing machine from which it is carried by a second elevator to the top storey, where it is fed to a band running the length of the building. A system of pipes runs from floor to floor, and by means of the band conveyor with its movable throw-off carriage grain can be shot to any floor. A second band conveyor is installed in the entresol floor, and serves to convey grain either to the elevator, if it is desired to elevate it to the top floor, or to the loading shed. A second elevator runs through the centre of the building, and is provided with a spout by means of which grain can be delivered into the hopper feeding the cleaning machine, whence the grain passes into a second hopper under which is an automatic weigher; directly under this weigher the grain is sacked. *Stuttgart.*

A good example of a grain warehouse on the combined silo bin and floor storage system is afforded by the granary at Mannheim on the Rhine, which has the storage capacity of 2100 tons. The building is 370 ft. in length, 78 ft. wide and 78 ft. high, and by means of transverse walls it is divided into three sections; of these one contains silos, in another section grain is stored on open floors, while the third, which is situated between the other two, is the grain-cleaning department. This granary stands by the quay side, and a ship elevator of great capacity, which serves the cleaning department, can rapidly clear any ship or barge beneath. The central or screening house section contains machinery specially designed for cleaning barley as well as wheat. The barley plant has a capacity of 5 tons per hour. There are four main elevators in this warehouse, while two more serve the screen house. The usual band conveyors fitted with throw-off carriages are provided, and are supplemented by an elaborate system of pipes which receive grain from the elevators and bands and distribute it at any required point. The plant is operated by electric motors. If desired the floors of the non-silo section can be utilized for storing other goods than grain, and to this end a lift with a capacity of 1 ton runs from the basement to the top storey. The combined *Mannheim.*

capacity of the elevators and conveyors is 100 tons of grain per hour. The mechanical equipment is so complete that four distinct operations are claimed as possible. A ship may be unloaded into silos or into the granary floors, and may simultaneously be loaded either from silos or floors with different kinds of grain. Again, a cargo may be discharged either into silos or upon the floors, and simultaneously the grain may be cleaned. Grain may also be cleared from a vessel, mixed with other grain already received, and then distributed to any desired point. With equal facility grain may be cleaned, blended with other varieties, re-stored in any section of the granary, and transferred from one ship to another.

A granary with special features of interest, erected on the quay at Dortmund, Germany, by a co-operative society, is built of brick on a base of hewn stone, with beams and supports of timber. It is 78 ft. high and consists of seven floors, including basement and attic. Here again there are two sections, the larger being devoted to the storage of grain in low bins, while the smaller section consists of an ordinary silo house. Grain in sacks may be stored in the basement of the larger section which has a capacity of 1675 tons as compared with 825 tons in the silo department. Thus the total storage capacity is 2500 tons. In the silo house the bins, constructed of planks nailed one over the other, are of varying size and are capable of storing grain to a depth of 42 to 47 ft. Some of the bins have been specially adapted for receiving damp grain by being provided internally with transverse wooden arms which form square or lozenge-shaped sections. The object of this arrangement is to break up and aerate the stored grain. The *Dortmund.*

arms are of triangular section and are slightly hollowed at the base so as to bring a current of air into direct contact with the grain. The air can be warmed if necessary. The other and larger section of the granary is provided with 105 bins of moderate height arranged in groups of 21 on the five floors between the basement and attic. On the intermediate floors and the bottom floor each bin lies exactly under the bin above. Grain is not stored in these bins to a greater depth than 5 ft. The bins are fitted with removable side walls, and damp grain is only stored in certain bins aerated for half the area of their side walls through a wire mesh. The arrangements for distributing grain in this warehouse are very complete. The uncleaned grain is taken by the receiving elevator, with a lifting capacity of 20 tons per hour, to a warehouse separator, where it is passed through an automatic weigher and is then either sacked or spouted to the main elevator (capacity 25 tons per hour) and elevated to the attic. From the head of this main elevator the grain can either be fed to a bin in one or other of the main granary floors, or shot to one of the bins in the silo house. In the attic the grain is carried by a spout and belt conveyor to one or other of the turntables, as the appliances may be termed, which serve to distribute through spouts the grain to any one of the floor or silo bins. Alternatively, the grain may be shot into the basement and there fed back into the main elevator by a band conveyor. In this way the grain may be turned over as often as it is deemed necessary. At the bottom of each bin are four apertures connected by spouts, both with the bin below and with the central vertical pipe which passes down through the centre of each group of bins. To regulate the course of the grain from bin to bin or from bin to central pipe, the connecting spouts are fitted with valves of ingenious yet simple construction which deflect the grain in any desired direction, so that the contents of two or more bins may be blended, or grain may be transferred from a bin on one floor to a bin on a lower floor, missing the bin on the floor between. The valves are controlled by chains from the basement.

With reference to the floor bins used at Dortmund, it may be observed that there are granaries built on a similar principle in the United Kingdom. It is probable that bins of moderate height are more suitable for storing grain containing a considerable amount of moisture than deep silos, whether made of wood, ferro-concrete or other material. For one thing floor bins of the Dortmund pattern can be more effectually aerated than deep silos. German wheat has many characteristics in common with British, and, especially

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in north Germany, is not infrequently harvested in a more or less damp condition. In the United Kingdom, Messrs Spencer & Co., of Melksham, have erected several granaries on the floor-bin principle, and have adopted an ingenious system of "telescopic" spouting, by means of which grain may be discharged from one bin to another or at any desired point. This spouting can be applied to bins either with level floors or with hoppered bottoms, if they are arranged one above the other on the different floors, and is so constructed that an opening can be effected at certain points by simply sliding upwards a section of the spout.

National Granaries.—Wheat forms the staple food of a large proportion of the population of the British Isles, and of the total amount consumed about four-fifths is sea-borne. The stocks normally held in the country being limited, serious consequences might result from any interruption of the supply, such as might occur were Great Britain involved in war with a power or powers commanding a strong fleet. To meet this contingency it has been suggested that the State should establish granaries containing a national reserve of wheat for use in emergency, or should adopt measures calculated to induce merchants, millers, &c., to hold larger stocks than at present and to stimulate the production of home-grown wheat.

Stocks of wheat (and of flour expressed in its equivalent weight of wheat) are held by merchants, millers and farmers. Merchants' stocks are kept in granaries at ports of importation and are known as first-hand stocks. Stocks of wheat and flour in the hands of millers and of flour held by bakers are termed second-hand stocks, while farmers' stocks only consist of native wheat. Periodical returns are generally made of first-hand or port stocks, nor should a wide margin of error be possible in the case of farmers' stocks, but second-hand stocks are more difficult to gauge. Since the last decade of the 19th century the storage capacity of British mills has considerably increased. As the number of small mills has diminished the capacity of the bigger ones has increased, and proportionately their warehousing accommodation has been enlarged. At the present time first-hand stocks tend to diminish because a larger proportion of millers' holdings are in mill granaries and silo houses. The immense preponderance of steamers over sailing vessels in the grain trade has also had the effect of greatly diminishing stocks. With his cargo or parcel on a steamer a corn merchant can tell almost to a day when it will be due. In fact foreign wheat owned by British merchants is to a great extent stored in foreign granaries in preference to British warehouses. The merchant's risk is thereby lessened to a certain extent. When his wheat has been brought into a British port, to send it farther afield means extra expense. But wheat in an American or Argentine elevator may be ordered wherever the best price can be obtained for it. Options or "futures," too, have helped to restrict the size of wheat stocks in the United Kingdom. A merchant buys a cargo of wheat on passage for arrival at a definite time, and, lest the market value of grain should have depreciated by the time it arrives, he sells an option against it. In this way he hedges his deal, the option serving as insurance against loss. This is why the British corn trade finds it less risky to limit purchases to bare needs, protecting itself by option deals, than to store large quantities which may depreciate and involve their owners in loss.

Amount of stocks.

Varying estimates have been made of the number of weeks' supply of breadstuffs (wheat and flour) held by millers at various seasons of the year. A table compiled by the secretary of the National Association of British and Irish Millers from returns for 1902 made by 170 milling firms showed 4·7, 4·9, 4·9 and 5 weeks' supply at the end of March, June, September and December respectively. These 170 mills were said to represent 46% of the milling capacity of the United Kingdom, and claimed to have ground 12,000,000 qrs. out of 25,349,000 qrs. milled in 1902. These were obviously large mills; it is probable that the other mills would not have shown anything like such a proportion of stock of either raw or finished material. A fair estimate of the stocks normally held by millers and bakers throughout the United Kingdom would be about four weeks' supply. First-hand stocks vary considerably, but the limits are definite, ranging from 1,000,000 to 3,500,000 qrs., the latter being a high figure. The tendency is for first-hand stocks to decline, but two weeks' supply must be a minimum. Farmers' stocks necessarily vary with the size of the crop and the period of the year; they will range from 9 or 10 weeks on the 1st of September to a half week on the 1st of August. Taking all the stocks together, it is very exceptional for the stock of breadstuffs to fall below 7 weeks' supply. Between the cereal years 1893–1894 and 1903–1904, a period of 570 weeks, the stocks of all kinds fell below 7 weeks' supply in only 9 weeks; of these 9 weeks 7 were between the beginning of June and the end of August 1898. This was immediately after the Leiter collapse. In seven of these eleven years there is no instance of stocks falling below 8 weeks' supply. In 21 out of these 570 weeks and in 39 weeks during the same period stocks dropped below 7½ and 8 weeks' supply respectively. Roughly speaking the stock of wheat available for bread-making varies from a two to four months' supply and is at times well above the latter figure.

The formation of a national reserve of wheat, to be held at the disposal of the state in case of urgent need during war, is beset by many practical difficulties. The father of the scheme was probably *The Miller*, a well-known trade journal. In March and April 1886 two articles appeared in that paper under the heading "Years of Plenty and State Granaries," in which it was urged that to meet the risk of hostile cruisers interrupting the supplies it would be desirable to lay up in granaries on British soil and under government control a stock of wheat sufficient for 12 or alternatively 6 months' consumption. This was to be national property, not to be touched except when the fortune of war sent up the price of wheat to a famine level or caused severe distress. The State holding this large stock—a year's supply of foreign grain would have meant at least 15,000,000 qrs., and have cost about £25,000,000 exclusive of warehousing—was in peace time to sell no wheat except when it became necessary to part with stock as a precautionary measure. In that case the wheat sold was to be replaced by the same amount of new grain. The idea was to provide the country with a supply of wheat until sufficient wheat-growing soil could be broken up to make it practically self-sufficing in respect of wheat. The original suggestion fell quite flat. Two years later Captain Warren, R.N., read a paper on "Great Britain's Corn Supplies in War," before the London Chamber of Commerce, and accepted national granaries as the only practicable safeguard against what appeared to him a great peril. The representatives of the shipping interest opposed the scheme, probably because it appeared to them likely to divert the public from insisting on an all-powerful navy. The corn trade opposed the project on account of its great practical difficulties. But constant contraction of the British wheat acreage kept the question alive, and during the earlier half of the 'nineties it was a favourite theme with agriculturists. Some influential members of parliament pressed the matter on the government, who, acting, no doubt, on the advice of their military and naval experts, refused either a royal commission or a departmental committee. While the then technical advisers of the government were divided on the advisability of establishing national granaries as a defensive measure, the balance of expert opinion was adverse to the scheme. Lord Wolseley, then commander-in-chief, publicly stigmatized the theory that Great Britain might in war be starved into submission as "unmitigated humbug."

National reserve.

In spite of official discouragement the agitation continued, and early in 1897 the council of the Central and Associated Chambers of Agriculture, at the suggestion to a great extent of Mr R. A. Yerburgh, M.P., nominated a committee to examine the question of national wheat stores. This committee held thirteen sittings and examined fifty-four witnesses. Its report, which was published (L. G. Newman & Co., 12 Finsbury Square, London, E.C.) with minutes of the evidence taken, practically recommended that a national reserve of wheat on the lines already sketched should be formed and administered by the State, and that the government should be strongly urged to obtain the

Yerburgh committee.

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appointment of a royal commission, comprising representatives of agriculture, the corn trade, shipping, and the army and navy, to conduct an exhaustive inquiry into the whole subject of the national food-supply in case of war. This recommendation was ultimately carried into effect, but not till nearly five years had elapsed. Of two schemes for national granaries put before the Yerburgh committee, one was formulated by Mr Seth Taylor, a London miller and corn merchant, who reckoned that a store of 10,000,000 qrs. of wheat might be accumulated at an average cost of 40s. per qr.—this was in the Leiter year of high prices—and distributed in six specially constructed granaries to be erected at London, Liverpool, Hull, Bristol, Glasgow and Dublin. The cost of the granaries was put at £7,500,000. Mr Taylor's scheme, all charges included, such as 2½% interest on capital, cost of storage (at 6d. per qr.), and 2s. per qr. for cost of replacing wheat, involved an annual expenditure of £1,250,000. The Yerburgh committee also considered a proposal to stimulate the home supply of wheat by offering a bounty to farmers for every quarter of wheat grown. This proposal has taken different shapes; some have suggested that a bounty should be given on every acre of land covered with wheat, while others would only allow the bounty on wheat raised and kept in good condition up to a certain date, say the beginning of the following harvest. It is obvious that a bounty on the area of land covered by wheat, irrespective of yield, would be a premium on poor farming, and might divert to wheat-growing land unsuitable for that purpose. The suggestion to pay a bounty of say 3s. to 5s. per qr. for all wheat grown and stacked for a certain time stands on a different basis; it is conceivable that a bounty of 5s. might expand the British production of wheat from say 7,000,000 to 9,000,000 qrs., which would mean that a bounty of £2,250,000 per annum, plus costs of administration, had secured an extra home production of 2,000,000 qrs. Whether such a price would be worth paying is another matter; the Yerburgh committee's conclusion was decidedly in the negative. It has also been suggested that the State might subsidize millers to the extent of 2s. 6d. per sack of 280 lb. per annum on condition that each maintained a minimum supply of two months' flour. This may be taken to mean that for keeping a special stock of flour over and above his usual output a miller would be entitled to an annual subsidy of 2s. 6d. per sack. An extra stock of 10,000,000 sacks might be thus kept up at an annual cost of £1,250,000, plus the expenditure of administration, which would probably be heavy. With regard to this suggestion, it is very probable that a few large mills which have plenty of warehouse accommodation and depots all over the country would be ready to keep up a permanent extra stock of 100,000 sacks. Thus a mill of 10,000 sacks' capacity per week, which habitually maintains a total stock of 50,000 sacks, might bring up its stock to 150,000 sacks. Such a mill, being a good customer to railways, could get from them the storage it required for little or nothing. But the bulk of the mills have no such advantages. They have little or no spare warehousing room, and are not accustomed to keep any stock, sending their flour out almost as fast as it is milled. It is doubtful therefore if a bounty of 2s. 6d. per sack would have the desired effect of keeping up a stock of 10,000,000 sacks, sufficient for two to three months' bread consumption.

The controversy reached a climax in the royal commission appointed in 1903, to which was also referred the importation of raw material in war time. Its report appeared in 1905. To the question whether the unquestioned dependence of the United Kingdom on an uninterrupted supply of sea-borne breadstuffs renders it advisable or not to maintain at all times a six months' stock of wheat and flour, it returned no decided answer, or perhaps it would be more correct to say that the commission was hopelessly divided. The main report was distinctly optimistic so far as the liability of the country to harass and distress at the hands of a hostile naval power or combination of powers was concerned. But there were several dissentients, and there was hardly any portion of the report in chief which did not provoke some reservation or another. That a maritime war would cause freights and insurance to rise in a high degree was freely admitted, and it was also admitted that the price of bread must also rise very appreciably. But, provided the navy did not break down, the risk of starvation was dismissed. Therefore all the proposals for providing national granaries or inducing merchants and millers to carry bigger stocks were put aside as unpractical and unnecessary. The commission was, however, inclined to consider more favourably a suggestion for providing free storage for wheat at the expense of the State. The idea was that if the State would subsidize any large granary company to the extent of 6d. or 3d. per qr., grain now warehoused in foreign lands would be attracted to the British Isles. But on the whole the commission held that the main effect of the scheme would be to saddle the government with the rent of all grain stored in public warehouses in the United Kingdom without materially increasing stocks. The proposal to offer bounties to farmers to hold stocks for a longer period and to grow more wheat met with equally little favour.

Royal commission, 1903-1905.

To sum up the advantages of national granaries, assuming any sort of disaster to the navy, the possession of a reserve of even six months' wheat-supply in addition to ordinary stocks would prevent panic prices. On the other hand, the difficulties in the way of forming and administering such a reserve are very great. The world grows no great surplus of wheat, and to form a six months', much more a twelve months', stock would be the work of years. The government in buying up the wheat would have to go carefully if they would avoid sending up prices with a rush. They would have to buy dearly, and when they let go a certain amount of stock they would be bound to sell cheaply. A stock once formed might be held by the State with little or no disturbance of the corn market, although the existence of such an emergency stock would hardly encourage British farmers to grow more wheat. The cost of erecting, equipping and keeping in good order the necessary warehouses would be, probably, much heavier than the most liberal estimate hitherto made by advocates of national granaries. (G. F. Z.)

GRANBY, JOHN MANNERS, MARQUESS OF (1721–1770), British soldier, was the eldest son of the third duke of Rutland. He was born in 1721 and educated at Eton and Trinity College, Cambridge, and was returned as member of parliament for Grantham in 1741. Four years later he received a commission as colonel of a regiment raised by the Rutland interest in and about Leicester to assist in quelling the Highland revolt of 1745. This corps never got beyond Newcastle, but young Granby went to the front as a volunteer on the duke of Cumberland's staff, and saw active service in the last stages of the insurrection. Very soon his regiment was disbanded. He continued in parliament, combining with it military duties, making the campaign of Flanders (1747). Promoted major-general in 1755, three years later he was appointed colonel of the Royal Horse Guards (Blues). Meanwhile he had married the daughter of the duke of Somerset, and in 1754 had begun his parliamentary connexion with Cambridgeshire, for which county he sat until his death. The same year that saw Granby made colonel of the Blues, saw also the despatch of a considerable British contingent to Germany. Minden was Granby's first great battle. At the head of the Blues he was one of the cavalry leaders halted at the critical moment by Sackville, and when in consequence that officer was sent home in disgrace, Lieut.-General Lord Granby succeeded to the command of the British contingent in Ferdinand's army, having 32,000 men under his orders at the beginning of 1760. In the remaining campaigns of the Seven Years' War the English contingent was more conspicuous by its conduct than the Prussians themselves. On the 31st of July 1760 Granby brilliantly stormed Warburg at the head of the British cavalry, capturing 1500 men and ten pieces of artillery. A year later (15th of July 1761) the British defended the heights of Vellinghausen with what Ferdinand himself styled "indescribable bravery." In the last campaign, at Gravenstein und Wilhelmsthal, Homburg and Cassel, Granby's men bore the brunt of the fighting and earned the greatest share of the glory.

Returning to England in 1763 the marquess found himself

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the popular hero of the war. It is said that couriers awaited his arrival at all the home ports to offer him the choice of the Ordnance or the Horse Guards. His appointment to the Ordnance bore the date of the 1st of July 1763, and three years later he became commander-in-chief. In this position he was attacked by "Junius," and a heated discussion arose, as the writer had taken the greatest pains in assailing the most popular member of the Grafton ministry. In 1770 Granby, worn out by political and financial trouble, resigned all his offices, except the colonelcy of the Blues. He died at Scarborough on the 18th of October 1770. He had been made a privy councillor in 1760, lord lieutenant of Derbyshire in 1762, and LL.D. of Cambridge in 1769.

Two portraits of Granby were painted by Sir Joshua Reynolds, one of which is now in the National Gallery. His contemporary popularity is indicated by the number of inns and public-houses which took his name and had his portrait as sign-board.

GRAN CHACO, an extensive region in the heart of South America belonging to the La Plata basin, stretching from 20° to 29° S. lat., and divided between the republics of Argentine, Bolivia and Paraguay, with a small district of south-western Matto Grosso (Brazil). Its area is estimated at from 250,000 to 425,000 sq. m., but the true Chaco region probably does not exceed 300,000 sq. m. The greater part is covered with marshes, lagoons and dense tropical jungle and forest, and is still unexplored. On its southern and western borders there are extensive tracts of open woodland, intermingled with grassy plains, while on the northern side in Bolivia are large areas of open country subject to inundations in the rainy season. In general terms the Gran Chaco may be described as a great plain sloping gently to the S.E., traversed in the same direction by two great rivers, the Pilcomayo and Bermejo, whose sluggish courses are not navigable because of sand-banks, barriers of overturned trees and floating vegetation, and confusing channels. This excludes that part of eastern Bolivia belonging to the Amazon basin, which is sometimes described as part of the Chaco. The greater part of its territory is occupied by nomadic tribes of Indians, some of whom are still unsubdued, while others, like the Matacos, are sometimes to be found on neighbouring sugar estates and estancias as labourers during the busy season. The forest wealth of the Chaco region is incalculable and apparently inexhaustible, consisting of a great variety of palms and valuable cabinet woods, building timber, &c. Its extensive tracts of "quebracho colorado" (*Loxopterygium Lorentzii*) are of very great value because of its use in tanning leather. Both the wood and its extract are largely exported. Civilization is slowly gaining footholds in this region along the southern and eastern borders.

GRAND ALLIANCE, WAR OF THE (alternatively called the War of the League of Augsburg), the third[1] of the great aggressive wars waged by Louis XIV. of France against Spain, the Empire, Great Britain, Holland and other states. The two earlier wars, which are redeemed from oblivion by the fact that in them three great captains, Turenne, Condé and Montecuccoli, played leading parts, are described in the article DUTCH WARS. In the third war the leading figures are: Henri de Montmorency-Boutteville, duke of Luxemburg, the former aide-de-camp of Condé and heir to his daring method of warfare; William of Orange, who had fought against both Condé and Luxemburg in the earlier wars, and was now king of England; Vauban, the founder of the sciences of fortification and siegecraft, and Catinat, the follower of Turenne's cautious and systematic strategy, who was the first commoner to receive high command in the army of Louis XIV. But as soldiers, these men—except Vauban—are overshadowed by the great figures of the preceding generation, and except for a half-dozen outstanding episodes, the war of 1689–97 was an affair of positions and manœuvres.

It was within these years that the art and practice of war began to crystallize into the form called "linear" in its strategic and tactical aspect, and "cabinet-war" in its political and moral aspect. In the Dutch wars, and in the minor wars that preceded the formation of the League of Augsburg, there were still survivals of the loose organization, violence and wasteful barbarity typical of the Thirty Years' War; and even in the War of the Grand Alliance (in its earlier years) occasional brutalities and devastations showed that the old spirit died hard. But outrages that would have been borne in dumb misery in the old days now provoked loud indignation, and when the fierce Louvois disappeared from the scene it became generally understood that barbarity was impolitic, not only as alienating popular sympathies, but also as rendering operations a physical impossibility for want of supplies.

Character of the war.

Thus in 1700, so far from terrorizing the country people into submission, armies systematically conciliated them by paying cash and bringing trade into the country. Formerly, wars had been fought to compel a people to abjure their faith or to change sides in some personal or dynastic quarrel. But since 1648 this had no longer been the case. The Peace of Westphalia established the general relationship of kings, priests and peoples on a basis that was not really shaken until the French Revolution, and in the intervening hundred and forty years the peoples at large, except at the highest and gravest moments (as in Germany in 1680, France in 1709 and Prussia in 1757) held aloof from active participation in politics and war. This was the beginning of the theory that war was an affair of the regular forces only, and that intervention in it by the civil population was a punishable offence. Thus wars became the business of the professional soldiers in the king's own service, and the scarcity and costliness of these soldiers combined with the purely political character of the quarrels that arose to reduce a campaign from an "intense and passionate drama" to a humdrum affair, to which only rarely a few men of genius imparted some degree of vigour, and which in the main was an attempt to gain small ends by a small expenditure of force and with the minimum of risk. As between a prince and his subjects there were still quarrels that stirred the average man—the Dragonnades, for instance, or the English Revolution—but foreign wars were "a stronger form of diplomatic notes," as Clausewitz called them, and were waged with the object of adding a codicil to the treaty of peace that had closed the last incident.

Other causes contributed to stifle the former ardour of war. Campaigns were no longer conducted by armies of ten to thirty thousand men. Large regular armies had come into fashion, and, as Guibert points out, instead of small armies charged with grand operations we find grand armies charged with small operations. The average general, under the prevailing conditions of supply and armament, was not equal to the task of commanding such armies. Any real concentration of the great forces that Louis XIV. had created was therefore out of the question, and the field armies split into six or eight independent fractions, each charged with operations on a particular theatre of war. From such a policy nothing remotely resembling the crushing of a great power could be expected to be gained. The one tangible asset, in view of future peace negotiations, was therefore a fortress, and it was on the preservation or capture of fortresses that operations in all these wars chiefly turned. The idea of the decisive battle for its own sake, as a settlement of the quarrel, was far distant; for, strictly speaking, there was no quarrel, and to use up highly trained and exceedingly expensive soldiers in gaining by brute force an advantage that might equally well be obtained by chicanery was regarded as foolish.

The fortress was, moreover, of immediate as well as contingent value to a state at war. A century of constant warfare had impoverished middle Europe, and armies had to spread over a large area if they desired to "live on the country." This was dangerous in the face of the enemy (cf. the Peninsular War), and it was also uneconomical. The only way to prevent the country people from sending their produce into the fortresses for safety was to announce beforehand that cash would be paid, at a high rate, for whatever the army needed. But even promises

[1] The name "Grand Alliance" is applied to the coalition against Louis XIV. begun by the League of Augsburg. This coalition not only waged the war dealt with in the present article, but (with only slight modifications and with practically unbroken continuity) the war of the SPANISH SUCCESSION (q.v.) that followed.

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rarely brought this about, and to live at all, whether on supplies brought up from the home country and stored in magazines (which had to be guarded) or on local resources, an army had as a rule to maintain or to capture a large fortress. Sieges, therefore, and manœuvres are the features of this form of war, wherein armies progressed not with the giant strides of modern war, but in a succession of short hops from one foothold to the next. This was the procedure of the average commander, and even when a more intense spirit of conflict was evoked by the Luxemburgs and Marlboroughs it was but momentary and spasmodic.

The general character of the war being borne in mind, nine-tenths of its marches and manœuvres can be almost "taken as read"; the remaining tenth, the exceptional and abnormal part of it, alone possesses an interest for modern readers.

In pursuance of a new aggressive policy in Germany Louis XIV. sent his troops, as a diplomatic menace rather than for conquest, into that country in the autumn of 1688. Some of their raiding parties plundered the country as far south as Augshurg, for the political intent of their advance suggested terrorism rather than conciliation as the best method. The league of Augshurg at once took up the challenge, and the addition of new members (Treaty of Vienna, May 1689) converted it into the "Grand Alliance" of Spain, Holland, Sweden, Savoy and certain Italian states, Great Britain, the emperor, the elector of Brandenburg, &c.

"Those who condemned the king for raising up so many enemies, admired him for having so fully prepared to defend himself and even to forestall them," says Voltaire. Louvois had in fact completed the work of organizing the French army on a regular and permanent basis, and had made it not merely the best, but also by far the most numerous in Europe, for Louis disposed in 1688 of no fewer than 375,000 soldiers and 60,000 sailors. The infantry was uniformed and drilled, and the socket bayonet and the flint-lock musket had been introduced. The only relic of the old armament was the pike, which was retained for one-quarter of the foot, though it had been discarded by the Imperialists in the course of the Turkish wars described below. The first artillery regiment was created in 1684, to replace the former semi-civilian organization by a body of artillerymen susceptihle of uniform training and amenable to discipline and orders.

In 1689 Louis had six armies on foot. That in Germany, which had executed the raid of the previous autumn, was not in a position to resist the principal army of the coalition so far from support. Louvois therefore ordered it to lay waste the Palatinate, and the devastation of the country around Heidelberg, Mannheim, Spires, Oppenheim and Worms was pitilessly and methodically carried into effect in January and February. There had been devastations in previous wars, even the high-minded Turenne had used the argument of fire and sword to terrify a population or a prince, while the whole story of the last ten years of the great war had been one of incendiary armies leaving traces of their passage that it took a century to remove. But here the devastation was a purely military measure, executed systematically over a given strategic front for no other purpose than to delay the advance of the enemy's army. It differed from the method of Turenne or Cromwell in that the sufferers were not those people whom it was the purpose of the war to reduce to submission, but others who had no interest in the quarrel. It differed from Wellington's laying waste of Portugal in 1810 in that it was not done for the defence of the Palatinate against a national enemy, but because the Palatinate was where it was. The feudal theory that every subject of a prince at war was an armed vassal, and therefore an enemy of the prince's enemy, had in practice been obsolete for two centuries past; hy 1690 the organization of war, its causes, its methods and its instruments had passed out of touch with the people at large, and it had become thoroughly understood that the army alone was concerned with the army's business. Thus it was that this devastation excited universal reprobation, and that, in the words of a modern French writer, the "idea of Germany came to birth in the flames of the Palatinate."

Devastation of the Palatinate, 1689.

As a military measure this crime was, moreover, quite unprofitable; for it became impossible for Marshal Duras, the French commander, to hold out on the east side of the middle Rhine, and he could think of nothing better to do than to go farther south and to ravage Baden and the Breisgau, which was not even a military necessity. The grand army of the Allies, coming farther north, was practically unopposed. Charles of Lorraine and the elector of Bavaria—lately comrades in the Turkish war (see below)—invested Mainz, the elector of Brandenhurg Bonn. The latter, following the evil precedent of his enemies, shelled the town uselessly instead of making a breach in its walls and overpowering its French garrison, an incident not calculated to advance the nascent idea of German unity. Mainz, valiantly defended by Nicolas du Blé, marquis d'Uxelles, had to surrender on the 8th of September. The governor of Bonn, baron d'Asfeld, not in the least intimidated hy the bombardment, held out till the army that had taken Mainz reinforced the elector of Brandenburg, and then, rejecting the hard terms of surtender offered him by the latter, he fell in resisting a last assault on the 12th of October. Only 850 men out of his 6000 were left to surrender on the 16th, and the duke of Lorraine, less truculent than the elector, escorted them safely to Thionville. Boufflers, with another of Louis's armies, operated from Luxemhurg (captured hy the French in 1684 and since held) and Trarbach towards the Rhine, hut in spite of a minor victory at Kochheim on the 21st of August, he was unable to relieve either Mainz or Bonn.

In the Low Countries the French marshal d'Humières, being in superior force, had obtained *special permission* to offer battle to the Allies. Leaving the garrison of Lille and Tournay to amuse the Spaniards, he hurried from Maubeuge to oppose the Dutch, who from Namur had advanced slowly on Philippeville. The infantry was uniformed and drilled, and the socket bayonet and the flint-lock musket had been introduced. The only relic of the old armament was the pike, which was retained for one-quarter of the foot, though it had been discarded by the Imperialists in the course of the Turkish wars described below. The first artillery regiment was created in 1684, to replace the former semi-civilian organization by a body of artillerymen susceptihle of uniform training and amenable to discipline and orders.

In 1689 Louis had six armies on foot. That in Germany, which had executed the raid of the previous autumn, was not in a position to resist the principal army of the coalition so far from support. Louvois therefore ordered it to lay waste the Palatinate, and the devastation of the country around Heidelberg, Mannheim, Spires, Oppenheim and Worms was pitilessly and methodically carried into effect in January and February. There had been devastations in previous wars, even the high-minded Turenne had used the argument of fire and sword to terrify a population or a prince, while the whole story of the last ten years of the great war had been one of incendiary armies leaving traces of their passage that it took a century to remove. But here the devastation was a purely military measure, executed systematically over a given strategic front for no other purpose than to delay the advance of the enemy's army. It differed from the method of Turenne or Cromwell in that the sufferers were not those people whom it was the purpose of the war to reduce to submission, but others who had no interest in the quarrel. It differed from Wellington's laying waste of Portugal in 1810 in that it was not done for the defence of the Palatinate against a national enemy, but because the Palatinate was where it was. The feudal theory that every subject of a prince at war was an armed vassal, and therefore an enemy of the prince's enemy, had in practice been obsolete for two centuries past; hy 1690 the organization of war, its causes, its methods and its instruments had passed out of touch with the people at large, and it had become thoroughly understood that the army alone was concerned with the army's business. Thus it was that this devastation excited universal reprobation, and that, in the words

Simultaneously with these operations, the Jacobite cause was being fought to an issue in Ireland. War began early in 1689 with desultory engagements between the Orangemen of the north and the Irish regular army, most of which the earl of Tyrconnel had induced to declare for King James, and the Northern struggle after a time condensed itself into the defence of Derry and Enniskillen. The siege of the former place, begun by James himself and carried on by the French general Rosen, lasted 105 days. In marked contrast to the sieges of the continent, this was resisted by the townsmen themselves, under the leadership of the clergyman George Walker. But the relieving force (consisting of two frigates, a supply ship and a force under Major-general Percy Kirke) was dilatory, and it was not until the defenders were in the last extremity that Kirke actually broke through the blockade (July 31st). Enniskillen was less closely invested, and its inhabitants, organized by Colonel Wolseley and other officers sent by Kirke, actually kept the open field and defeated the Jacobites at Newtown Butler (July 31st). A few days later the Jacobite army withdrew from the north. But it was long before an adequate army could be sent over from England to deal with it. Marshal Schomberg (q.v.), one of the most distinguished soldiers of the time, who had been expelled from the French service as a Huguenot, was indeed sent over in August, but the army he brought, some 10,000 strong, was composed of raw recruits, and when it was assembled in camp at Dundalk to be trained for its work, it was quickly ruined by an epidemic of fever. But James failed to take advantage of his opportunity to renew the war in the north, and the relics of Schomberg's army wintered in security, covered by the Enniskillen troops. In the spring of 1690, however, more troops, this time experienced regiments from Holland, Denmark and Brandenburg, were sent, and in June, Schomberg in Ireland and Major-general Scravemore in Chester having thoroughly organized and equipped the field army, King William assumed the command

The war in Ireland, 1689-1691.

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himself. Five days after his arrival he began his advance from Loughbrickland near Newry, and on the 1st of July he engaged James's main army on the river Boyne, close to Drogheda. Schomberg was killed and William himself wounded, but the Irish army was routed.

No stand was made by the defeated party either in the Dublin or in the Waterford district. Lauzun, the commander of the French auxiliary corps in James's army, and Tyrconnel both discountenanced any attempt to defend Limerick, where the Jacobite forces had reassembled; but Patrick Sarsfield (earl of Lucan), as the spokesman of the younger and more ardent of the Irish officers, pleaded for its retention. He was left, therefore, to hold Limerick, while Tyrconnel and Lauzun moved northward into Galway. Here, as in the north, the quarrel enlisted the active sympathies of the people against the invader, and Sarsfield not only surprised and destroyed the artillery train of William's army, but repulsed every assault made on the walls that Lauzun had said "could be battered down by rotten apples." William gave up the siege on the 30th of August. The failure was, however, compensated in a measure by the arrival in Ireland of an expedition under Lord Marlborough, which captured Cork and Kinsale, and next year (1691) the Jacobite cause was finally crushed by William's general Ginckell (afterwards earl of Athlone) in the battle of Aughrim in Galway (July 12th), in which St Ruth, the French commander, was killed and the Jacobite army dissipated. Ginckell, following up his victory, besieged Limerick afresh. Tyrconnel died of apoplexy while organizing the defence, and this time the town was invested by sea as well as by land. After six weeks' resistance the defenders offered to capitulate, and with the signing of the treaty of Limerick on the 1st of October the Irish war came to an end. Sarsfield and the most energetic of King James's supporters retired to France and were there formed into the famous "Irish Brigade." Sarsfield was killed at the battle of Neerwinden two years later.

The campaign of 1690 on the continent of Europe is marked by two battles, one of which, Luxemburg's victory of Fleurus, belongs to the category of the world's great battles. It is described under FLEURUS, and the present article only deals summarily with the conditions in which it was fought. Of these, though they in fact led to an encounter that could, in itself, fairly be called decisive, were in closer accord with the general spirit of the war than was the decision that arose out of them.

Luxemburg had a powerful enemy in Louvois, and he had consequently been allotted only an insignificant part in the first campaign. But after the disasters of 1689 Louis re-arranged the commands on the north-east frontier so as to allow Humières, Luxemburg and Boufflers to combine for united action. "I will take care that Louvois plays fair," Louis said to the duke when he gave him his letters of service. Though apparently Luxemburg was not authorized to order such a combination himself, as senior officer he would automatically take command if it came about. The whole force available was probably close on 100,000, but not half of these were present at the decisive battle, though Luxemburg certainly practised the utmost "economy of force" as this was understood in those days (see also NEERWINDEN). On the remaining theatres of war, the dauphin, assisted by the duc de Lorge, held the middle Rhine, and Catinat the Alps, while other forces were in Roussillon, &c., as before. Catinat's operations are briefly described below. Those of the others need no description, for though the Allies formed a plan for a grand concentric advance on Paris, the preliminaries to this advance were so numerous and so closely interdependent that on the most favourable estimate the winter would necessarily find the Allied armies many leagues short of Paris. In fact, the Rhine offensive collapsed when Charles of Lorraine died (17th April), and the reconquest of his lost duchy ceased to be a direct object of the war.

Fleurus, 1690.

Luxemburg began operations by drawing in from the Sambre country, where he had hitherto been stationed, to the Scheldt and "eating up" the country between Oudenarde and Ghent in the face of a Spanish army concentrated at the latter place (15th May–12th June). He then left Humières with a containing force in the Scheldt region and hurried back to the Sambre to interpose between the Allied army under Waldeck and the fortress of Dinant which Waldeck was credited with the intention of besieging. His march from Tournay to Gerpinnes was counted a model of skill—the *locus classicus* for the maxim that ruled till the advent of Napoleon—"march always in the order in which you encamp, or purpose to encamp, or fight." For four days the army marched across country in close order, covered in all directions by reconnoitring cavalry and advanced, flank and rear guards. Under these conditions eleven miles a day was practically forced marching, and on arriving at Jeumont-sur-Sambre the army was given three days' rest. Then followed a few leisurely marches in the direction of Charleroi, during which a detachment of Boufflers's army came in, and the cavalry explored the country to the north. On news of the enemy's army being at Trazegnies, Luxemburg hurried across a ford of the Sambre above Charleroi, but this proved to be a detachment only, and soon information came in that Waldeck was encamped near Fleurus. Thereupon Luxemburg, without consulting his subordinate generals, took his army to Velaine. He knew that the enemy was marking time till the troops of Liége and the Brandenburgers from the Rhine were near enough to co-operate in the Dinant enterprise, and he was determined to fight a battle at once. From Velaine, therefore, on the morning of the 1st of July, the army moved forward to Fleurus and there won one of the most brilliant victories in the history of the Royal army. But Luxemburg was not allowed to pursue his advantage. He was ordered to hold his army in readiness to besiege either Namur, Mons, Charleroi or Ath, according as later orders dictated; and to send back the borrowed regiments to Boufflers, who was being pressed back by the Brandenburg and Liége troops. Thus Waldeck reformed his army in peace at Brussels, where William III. of England soon afterwards assumed command of the Allied forces in the Netherlands, and Luxemburg and the other marshals stood fast for the rest of the campaign, being forbidden to advance until Catinat—in Italy—should have won a battle.

Staffarda.

In this quarter the armed neutrality of the duke of Savoy had long disquieted the French court. His personal connexions with the imperial family and his resentment against Louvois, who had on some occasion treated him with his usual patronizing arrogance, inclined him to join the Allies, while on the other hand he could hope for extensions of his scanty territory only by siding with Louis. In view of this doubtful condition of affairs the French army under Catinat had for some time been maintained on the Alpine frontier, and in the summer of 1690 Louis XIV. sent an ultimatum to Victor Amadeus to compel him to take one side or the other actively and openly. The result was that Victor Emmanuel threw in his lot with the Allies and obtained help from the Spaniards and Austrians in the Milanese. Catinat thereupon advanced into Piedmont, and won, principally by virtue of his own watchfulness and the high efficiency of his troops, the important victory of Staffarda (August 18th, 1690). This did not, however, enable him to overrun Piedmont, and as the duke was soon reinforced, he had to be content with the methodical conquest of a few frontier districts. On the side of Spain, a small French army under the duc de Noailles passed into Catalonia and there lived at the enemy's expense for the duration of the campaign.

In these theatres of war, and on the Rhine, where the disunion of the German princes prevented vigorous action, the following year, 1691, was uneventful. But in the Netherlands there were a siege, a war of manœuvres and a cavalry combat, each in its way somewhat remarkable. The siege was that of Mons, which was, like many sieges in the former wars, conducted with much pomp by Louis XIV. himself, with Boufflers and Vauban under him. On the surrender of the place, which was hastened by red-hot shot (April 8th), Louis returned to Versailles and divided his army between Boufflers and Luxemburg, the former of whom departed to the Meuse. There he attempted by bombardment to enforce the surrender of Liége, but had to desist when the elector of Brandenburg threatened Dinant. The principal armies on either side faced one another under the command respectively of William III. and of Luxemburg. The Allies were first concentrated to the south of Namur, and Luxemburg hurried thither, but neither party found any tempting opportunity for battle, and when the cavalry had consumed all the forage available in the district, the two armies edged away gradually towards Flanders. The war of manœuvre continued, with a

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slight balance of advantage on Luxemburg's side, until September, when William returned to England, leaving Waldeck in command of the Allied army, with orders to distribute it in winter quarters amongst the garrison towns. This gave the momentary opportunity for which Luxemburg had been watching, and at Leuze (20th Sept.) he fell upon the cavalry of Waldeck's rearguard and drove it back in disorder with heavy losses until the pursuit was checked by the Allied infantry.

In 1692[1] the Rhine campaign was no more decisive than before, although Lorge made a successful raid into Württemberg in September and foraged his cavalry in German territory till the approach of winter. The Spanish campaign was unimportant, but on the Alpine side the Allies under the duke of Savoy drove back Catinat into Dauphiné, which they ravaged with fire and sword. But the French peasantry were quicker to take arms than the Germans, and, inspired by the local gentry—amongst whom figured the heroine, Philis de la Tour du Pin (1645–1708), daughter of the marquis de la Charce—they beset every road with such success that the small regular army of the invaders was powerless. Brought practically to a standstill, the Allies soon consumed the provisions that could be gathered in, and then, fearing lest the snow should close the passes behind them, they retreated.

In the Low Countries the campaign as before began with a great siege. Louis and Vauban invested Namur on the 26th of May. The place was defended by the prince de Barbançon (who had been governor of Luxemburg when that place was besieged in 1684) and Coehoorn (*q.v.*), Vauban's rival in the science of fortification. Luxemburg, with a small army, manœuvred to cover the siege against William III.'s army at Louvain. The place fell on the 5th of June,[2] after a very few days of Vauban's "regular" attack, but the citadel held out until the 23rd. Then, as before, Louis returned to Versailles, giving injunctions to Luxemburg to "preserve the strong places and the country, while opposing the enemy's enterprises and subsisting the army at his expense." This negative policy, contrary to expectation, led to a hard-fought battle. William, employing a common device, announced his intention of retaking Namur, but set his army in motion for Flanders and the sea-coast fortresses held by the French. Luxemburg, warned in time, hurried towards the Scheldt, and the two armies were soon face to face again, Luxemburg about Steenkirk. William in front of Hal. William then formed the plan of surprising Luxemburg's right wing before it could be supported by the rest of his army, relying chiefly on false information that a detected spy at his headquarters was forced to send, to mislead the duke. But Luxemburg had the material protection of a widespread net of outposts as well as a secret service, and although ill in bed when William's advance was reported, he shook off his apathy, mounted his horse and, enabled by his outpost reports to divine his opponent's plan, he met it (3rd August) by a swift concentration of his army, against which the Allies, whose advance and deployment had been mismanaged, were powerless (see STEENKIRK). In this almost accidental battle both sides suffered enormous losses, and neither attempted to bring about, or even to risk, a second resultless trial of strength. Boufflers's army returned to the Sambre and Luxemburg and William established themselves for the rest of the season at Lessines and Ninove respectively, 13 m. apart. After both armies had broken up into their winter quarters, Louis ordered Boufflers to attempt the capture of Charleroi. But a bombardment failed to intimidate the garrison, and when the Allies began to re-assemble, the attempt was given up (19th–21st Oct.). This failure was, however, compensated by the siege and capture of Furnes (28th Dec. 1692–7th Jan. 1693).

Siege of Namur, 1692.

Steenkirk.

In 1693, the culminating point of the war was reached. It began, as mentioned above, with a winter enterprise that at least indicated the aggressive spirit of the French generals. The king promoted his admiral, Tourville, and Catinat, the *roturier*, to the marshalship, and founded the military order of St Louis on the 10th of April. The grand army in the Netherlands this year numbered 120,000, to oppose whom William III. had only some 40,000 at hand. But at the very beginning of operations Louis, after reviewing this large force at Gembloux, broke it up, in order to send 30,000 under the dauphin to Germany, where Lorge had captured Heidelberg and seemed able, if reinforced, to overrun south Germany. But the imperial general Prince Louis of Baden took up a position near Heilbronn so strong that the dauphin and Lorge did not venture to attack him. Thus King Louis sacrificed a reality to a dream, and for the third time lost the opportunity, for which he always longed, of commanding in chief in a great battle. He himself, to judge by his letter to Monsieur on the 8th of June, regarded his action as a sacrifice of personal dreams to tangible realities. And, before the event falsified predictions, there was much to be said for the course he took, which accorded better with the prevailing system of war than a Fleurus or a Neerwinden. In this system of war the rival armies, as armies, were almost in a state of equilibrium, and more was to be expected from an army dealing with something dissimilar to itself—a fortress or a patch of land or a convoy—than from its collision with another army of equal force.

Thus Luxemburg obtained his last and greatest opportunity. He was still superior in numbers, but William at Louvain had the advantage of position. The former, authorized by his master this year "*non seulement d'empêcher les ennemis de rien entreprendre, mais d'emporter quelques avantages sur eux*," threatened Liége, drew William over to its defence and then advanced to attack him. The Allies, however, retired to another position, between the Great and Little Geete rivers, and there, in a strongly entrenched position around Neerwinden, they were attacked by Luxemburg on the 29th of July. The long and doubtful battle, one of the greatest victories ever won by the French army, is briefly described under NEERWINDEN. It ended in a brilliant victory for the assailant, but Luxemburg's exhausted army did not pursue; William was as unshaken and determined as ever; and the campaign closed, not with a treaty of peace, but with a few manœuvres which, by inducing William to believe in an attack on Ath, enabled Luxemburg to besiege and capture Charlerol (October).

Neerwinden.

Neerwinden was not the only French victory of the year. Catinat, advancing from Fenestrelle and Susa to the relief of Pinerolo (Pignerol), which the duke of Savoy was besieging, took up a position in formal order of battle north of the village of Marsaglia. Here on the 4th of October the duke of Savoy attacked him with his whole army, front to front. But the greatly superior regimental efficiency of the French, and Catinat's minute attention to details[3] in arraying them, gave the new marshal a victory that was a not unworthy pendant to Neerwinden. The Piedmontese and their allies lost, it is said, 10,000 killed, wounded and prisoners, as against Catinat's 1800. But here, too, the results were trifling, and this year of victory is remembered chiefly as the year in which "people perished of want to the accompaniment of *Te Deums*."

Marsaglia.

In 1694 (late in the season owing to the prevailing distress and famine) Louis opened a fresh campaign in the Netherlands. The armies were larger and more ineffective than ever, and William offered no further opportunities to his formidable opponent. In September, after inducing William to desist from his intention of besieging Dunkirk by appearing on his flank with a mass of cavalry,[4] which had ridden from the Meuse, 100 m., in 4 days, Luxemburg gave up his command. He died on the 4th of January following, and with him the tradition of the Condé school of warfare disappeared from Europe. In Catalonia the marshal de Noailles won a victory (27th May) over the Spaniards at the ford of the Ter

[1] Louvois died in July 1691.

[2] A few days before this the great naval reverse of La Hogue put an end to the projects of invading England hitherto entertained at Versailles.

[3] Marsaglia is, if not the first, at any rate, one of the first, instances of a bayonet charge by a long deployed line of infantry.

[4] Hussars figured here for the first time in western Europe. A regiment of them had been raised in 1692 from deserters from the Austrian service.

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(Torroella, 5 m. above the mouth of the river), and in consequence captured a number of walled towns.

Later campaigns of the war.

In 1695 William found Marshal Villeroi a far less formidable opponent than Luxemburg had been, and easily succeeded in keeping him in Flanders while a corps of the Allies invested Namur. Coehoorn directed the siege-works, and Boufflers the defence. Gradually, as in 1692, the defenders were dislodged from the town, the citadel outworks and the citadel itself, the last being assaulted with success by the "British grenadiers," as the song commemorates, on the 30th of August. Boufflers was rewarded for his sixty-seven days' defence by the grade of marshal.

By 1696 necessity had compelled Louis to renounce his vague and indefinite offensive policy, and he now frankly restricted his efforts to the maintenance of what he had won in the preceding campaigns. In this new policy he met with much success. Boufflers, Lorge, Noailles and even the incompetent Villeroi held the field in their various spheres of operations without allowing the Allies to inflict any material injury, and also (by having recourse again to the policy of living by plunder) preserving French soil from the burden of their own maintenance. In this, as before, they were powerfully assisted by the disunion and divided counsels of their heterogeneous enemies. In Piedmont, Catinat crowned his work by making peace and alliance with the duke of Savoy, and the two late enemies having joined forces captured one of the fortresses of the Milanese. The last campaign was in 1697. Catinat and Vauban besieged Ath. This siege was perhaps the most regular and methodical of the great engineer's career. It lasted 23 days and cost the assailants only 50 men. King William did not stir from his entrenched position at Brussels, nor did Villeroi dare to attack him there. Lastly, in August 1697 Vendôme, Noailles' successor, captured Barcelona. The peace of Ryswijk, signed on the 30th of October, closed this war by practically restoring the *status quo ante*; but neither the ambitions of Louis nor the Grand Alliance that opposed them ceased to have force, and three years later the struggle began anew (see SPANISH SUCCESSION, WAR OF THE).

Austro-Turkish wars, 1682-1699.

Concurrently with these campaigns, the emperor had been engaged in a much more serious war on his eastern marches against the old enemy, the Turks. This war arose in 1682 out of internal disturbances in Hungary. The campaign of the following year is memorable for all time as the last great wave of Turkish invasion. Mahommed IV. advanced from Belgrade in May, with 200,000 men, drove back the small imperial army of Prince Charles of Lorraine, and early in July invested Vienna itself. The two months' defence of Vienna by Count Rüdiger Starhemberg (1635-1701) and the brilliant victory of the relieving army led by John Sobieski, king of Poland, and Prince Charles on the 12th of September 1683, were events which, besides their strictly military importance, possess the romantic interest of an old knightly crusade against the heathen.

But the course of the war, after the tide of invasion had ebbed, differed little from the wars of contemporary western Europe. Turkey figured rather as a factor in the balance of power than as the "infidel," and although the battles and sieges in Hungary were characterized by the bitter personal hostility of Christian to Turk which had no counterpart in the West, the war as a whole was as methodical and tedious as any Rhine or Low Countries campaign. In 1684 Charles of Lorraine gained a victory at Waitzen on the 27th of June and another at Eperies on the 18th of September, and unsuccessfully besieged Budapest.

In 1685 the Germans were uniformly successful, though a victory at Gran (August 16th) and the overthrowing of Neuhäusel (August 19th) were the only outstanding incidents. In 1686 Charles, assisted by the elector Max Emanuel of Bavaria, besieged and stormed Budapest (Sept. 2nd). In 1687 they followed up their success by a great victory at Mohacz (Aug. 12th). In 1688 the Austrians advanced still further, took Belgrade, threatened Widin and entered Bosnia. The margrave Louis of Baden, who afterward became one of the most celebrated of the methodical generals of the day, won a victory at Derbent on the 5th of September 1688, and next year, in spite of the outbreak of a general European war, he managed to win another battle at Nisch (Sept. 24th), to capture Widin (Oct. 14th) and to advance to the Balkans, but in 1690, more troops having to be withdrawn for the European war, the imperialist generals lost Nisch, Widin and Belgrade one after the other. There was, however, no repetition of the scenes of 1683, for in 1691 Louis won the battle of Szlankamen (Aug. 19th). After two more desultory if successful campaigns he was called to serve in western Europe, and for three years more the war dragged on without result, until in 1697 the young Prince Eugene was appointed to command the imperialists and won a great and decisive victory at Zenta on the Theiss (Sept. 11th). This induced a last general advance of the Germans eastward, which was definitively successful and brought about the peace of Carlowitz (January 1699). (C. F. A.)

NAVAL OPERATIONS

The naval side of the war waged by the powers of western Europe from 1689 to 1697, to reduce the predominance of King Louis XIV., was not marked by any very conspicuous exhibition of energy or capacity, but it was singularly decisive in its results. At the beginning of the struggle the French fleet kept the sea in face of the united fleets of Great Britain and Holland. It displayed even in 1690 a marked superiority over them. Before the struggle ended it had been fairly driven into port, and though its failure was to a great extent due to the exhaustion of the French finances, yet the inability of the French admirals to make a proper use of their fleets, and the incapacity of the king's ministers to direct the efforts of his naval officers to the most effective aims, were largely responsible for the result.

When the war began in 1689, the British Admiralty was still suffering from the disorders of the reign of King Charles II., which had been only in part corrected during the short reign of James II. The first squadrons were sent out late and in insufficient strength. The Dutch, crushed by the obligation to maintain a great army, found an increasing difficulty in preparing their fleet for action early. Louis XIV., a despotic monarch, with as yet unexhausted resources, had it within his power to strike first. The opportunity offered him was a very tempting one. Ireland was still loyal to King James II., and would therefore have afforded an admirable basis of operations to a French fleet. No serious attempt was made to profit by the advantage thus presented. In March 1689 King James was landed and reinforcements were prepared for him at Brest. A British squadron under the command of Arthur Herbert (afterwards Lord Torrington), sent to intercept them, reached the French port too late, and on returning to the coast of Ireland sighted the convoy off the Old Head of Kinsale on the 10th of May. The French admiral Chateaurenault held on to Bantry Bay, and an indecisive encounter took place on the 11th of May. The troops and stores for King James were successfully landed. Then both admirals, the British and the French, returned home, and neither in that nor in the following year was any serious effort made by the French to gain command of the sea between Ireland and England. On the contrary, a great French fleet entered the Channel, and gained a success over the combined British and Dutch fleets on the 10th of July 1690 (see BEACHY HEAD, BATTLE OF), which was not followed up by vigorous action. In the meantime King William III. passed over to Ireland and won the battle of the Boyne. During the following year, while the cause of King James was being finally ruined in Ireland, the main French fleet was cruising in the Bay of Biscay, principally for the purpose of avoiding battle. During the whole of 1689, 1690 and 1691, British squadrons were active on the Irish coast. One raised the siege of Londonderry in July 1689, and another convoyed the first British forces sent over under the duke of Schomberg. Immediately after Beachy Head in 1690, a part of the Channel fleet carried out an expedition under the earl (afterwards duke) of Marlborough, which took Cork and reduced a large part of the south of the island. In 1691 the French did little more than help to carry away the wreckage of their allies and their own detachments. In 1692 a vigorous but tardy attempt was made to employ their fleet to cover an invasion of England (see LA HOGUE, BATTLE OF). It ended in defeat, and the allies remained masters of the Channel. The defeat of La Hogue did not do so much harm to the naval power of King Louis as has sometimes been supposed. In the next year, 1693, he was able to strike a severe blow at the Allies. The important Mediterranean trade of Great Britain and Holland, called for convenience the Smyrna convoy, having been delayed during the previous year, anxious measures were taken to see it safe on its road in 1693. But the arrangements of the allied governments and admirals were not good. They made no effort to blockade Brest, nor did they take effective steps to discover whether or not the French fleet had left the port. The convoy was seen beyond the Scilly Isles by the main fleet. But as the French admiral Tourville had left Brest for the Straits of Gibraltar with a powerful force and had been joined by a squadron from Toulon, the whole convoy was scattered or taken by him, in the latter days of June, near Lagos. But though this success was a very fair equivalent for the defeat at La

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Hogue, it was the last serious effort made by the navy of Louis XIV. in this war. Want of money compelled him to lay his fleet up. The allies were now free to make full use of their own, to harass the French coast, to intercept French commerce, and to co-operate with the armies acting against France. Some of the operations undertaken by them were more remarkable for the violence of the effort than for the magnitude of the results. The numerous bombardments of French Channel ports, and the attempts to destroy St Malo, the great nursery of the active French privateers, by infernal machines, did little harm. A British attack on Brest in June 1694 was beaten off with heavy loss. The scheme had been betrayed by Jacobite correspondents. Yet the inability of the French king to avert these enterprises showed the weakness of his navy and the limitations of his power. The protection of British and Dutch commerce was never complete, for the French privateers were active to the end. But French commerce was wholly ruined.

It was the misfortune of the allies that their co-operation with armies was largely with the forces of a power so languid and so bankrupt as Spain. Yet the series of operations directed by Russel in the Mediterranean throughout 1694 and 1695 demonstrated the superiority of the allied fleet, and checked the advance of the French in Catalonia. Contemporary with the campaigns in Europe was a long series of cruises against the French in the West Indies, undertaken by the British navy, with more or less help from the Dutch and a little feeble assistance from the Spaniards. They began with the cruise of Captain Lawrence Wright in 1690–1691, and ended with that of Admiral Nevil in 1696–1697. It cannot be said that they attained to any very honourable achievement, or even did much to weaken the French hold on their possessions in the West Indies and North America. Some, and notably the attack made on Quebec by Sir William Phips in 1690, with a force raised in the British colonies, ended in defeat. None of them was so triumphant as the plunder of Carthagena in South America by the Frenchman Pointis, in 1697, at the head of a semi-piratical force. Too often there was absolute misconduct. In the buccaneering and piratical atmosphere of the West Indies, the naval officers of the day, who were still infected with the corruption of the reign of Charles II., and who calculated on distance from home to secure them immunity, sank nearly to the level of pirates and buccaneers. The indifference of the age to the laws of health, and its ignorance of them, caused the ravages of disease to be frightful. In the case of Admiral Nevil's squadron, the admiral himself and all his captains except one, died during the cruise, and the ships were unmanned. Yet it was their own vices which caused these expeditions to fail, and not the strength of the French defence. When the war ended, the navy of King Louis XIV. had disappeared from the sea.

See Burchett, *Memoirs of Transactions at Sea during the War with France, 1688–1697* (London, 1703); Lediard, *Naval History* (London, 1735), particularly valuable for the quotations in his notes. For the West Indian voyages, Tronde, *Batailles navales de la France* (Paris, 1867); De Yonghe, *Geschiedenis van het Nederlandsche Zeewezen* (Haarlem, 1860). (D. H.)

GRAND CANARY (Gran Canaria), an island in the Atlantic Ocean, forming part of the Spanish archipelago of the Canary Islands (*q.v.*). Pop. (1900) 127,471; area 523 sq. m. Grand Canary, the most fertile island of the group, is nearly circular in shape, with a diameter of 24 m. and a circumference of 75 m. The interior is a mass of mountain with ravines radiating to the shore. Its highest peak, Los Pexos, is 6400 ft. Large tracts are covered with native pine (*P. canariensis*). There are several mineral springs on the island. Las Palmas (pop. 44,517), the capital, is described in a separate article. Telde (8078), the second place in the island, stands on a plain, surrounded by palm trees. At Atalaya, a short distance from Las Palmas, the making of earthenware vessels employs some hundreds of people, who inhabit holes made in the tufa.

GRAND CANYON, a profound gorge in the north-west corner of Arizona, in the south-western part of the United States of America, carved in the plateau region by the Colorado river. Of it Captain Dutton says: "Those who have long and carefully studied the Grand Canyon of the Colorado do not hesitate for a moment to pronounce it by far the most sublime of all earthly spectacles"; and this is also the verdict of many who have only viewed it in one or two of its parts.

The Colorado river is made by the junction of two large streams, the Green and Grand, fed by the rains and snows of the Rocky Mountains. It has a length of about 2000 m. and a drainage area of 255,000 sq. m., emptying into the head of the Gulf of California. In its course the Colorado passes through a mountain section; then a plateau section; and finally a desert lowland section which extends to its mouth. It is in the plateau section that the Grand Canyon is situated. Here the surface of the country lies from 5000 to 9000 ft. above sea-level, being a table-land region of buttes and mesas diversified by lava intrusions, flows and cinder cones. The region consists in the main of stratified rocks bodily uplifted in a nearly horizontal position, though profoundly faulted here and there, and with some moderate folding. For a thousand miles the river has cut a series of canyons, bearing different names, which reach their culmination in the Marble Canyon, 66 m. long, and the contiguous Grand Canyon which extends for a distance of 217 m. farther down stream, making a total length of continuous canyon from 2000 to 6000 ft. in depth, for a distance of 283 m., the longest and deepest canyon in the world. This huge gash in the earth is the work of the Colorado river, with accompanying weathering, through long ages; and the river is still engaged in deepening it as it rushes along the canyon bottom.

The higher parts of the enclosing plateau have sufficient rainfall for forests, whose growth is also made possible in part by the cool climate and consequently retarded evaporation; but the less elevated portions have an arid climate, while the climate in the canyon bottom is that of the true desert. Thus the canyon is really in a desert region, as is shown by the fact that only two living streams enter the river for a distance of 500 m. from the Green river to the lower end of the Grand Canyon; and only one, the Kanab Creek, enters the Grand Canyon itself. This, moreover, is dry during most of the year. In spite of this lack of tributaries, a large volume of water flows through the canyon at all seasons of the year, some coming from the scattered tributaries, some from springs, but most from the rains and snows of the distant mountains about the headwaters. Owing to enclosure between steeply rising canyon walls, evaporation is retarded, thus increasing the possibility of the long journey of the water from the mountains to the sea across a vast stretch of arid land.

The river in the canyon varies from a few feet to an unknown depth, and at times of flood has a greatly increased volume. The river varies in width from 50 ft. in some of the narrow Granite Gorges, where it bathes both rock walls, to 500 or 600 ft. in more open places. In the 283 m. of the Marble and Grand Canyons, the river falls 2330 ft., and at one point has a fall of 210 ft. in 10 m. The current velocity varies from 3 to 20 or more miles per hour, being increased in places by low falls and rapids; but there are no high falls below the junction of the Green and Grand.

Besides the canyons of the main river, there are a multitude of lateral canyons occupied by streams at intervals of heavy rain. As Powell says, the region "is a composite of thousands, and tens of thousands of gorges." There are "thousands of gorges like that below Niagara Falls, and there are a thousand Yosemites." The largest of all, the Grand Canyon, has an average depth of 4000 ft. and a width of 4½ to 12 m. For a long distance, where crossing the Kaibab plateau, the depth is 6000 ft. For much of the distance there is an inner narrower gorge sunk in the bottom of a broad outer canyon. The narrow gorge is in some places no more than 3500 ft. wide at the top. To illustrate the depth of the Grand Canyon, Powell writes: "Pluck up Mount Washington (6203 ft. high) by the roots to the level of the sea, and drop it head first into the Grand Canyon, and the dam will not force its waters over the wall."

While there are notable differences in the Grand Canyon from point to point, the main elements are much alike throughout

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its length and are due to the succession of rock strata revealed in the canyon walls. At the base, for some 800 ft., there is a complex of crystalline rocks of early geological age, consisting of gneiss, schist, slate and other rocks, greatly plicated and traversed by dikes and granite intrusions. This is an ancient mountain mass, which has been greatly denuded. On it rest a series of durable quartzite beds inclined to the horizontal, forming about 800 ft. more of the lower canyon wall. On this come first 500 ft. of greenish sandstones and then 700 ft. of bedded sandstone and limestone strata, some massive and some thin, which on weathering form a series of alcoves. These beds, like those above, are in nearly horizontal position. Above this comes 1600 ft. of limestone—often a beautiful marble, as in the Marble Canyon, but in the Grand Canyon stained a brilliant red by iron oxide washed from overlying beds. Above this "red wall" are 800 ft. of grey and bright red sandstone beds looking "like vast ribbons of landscape." At the top of the canyon is 1000 ft. of limestone with gypsum and chert, noted for the pinnacles and towers which denudation has developed. It is these different rock beds, with their various colours, and the differences in the effect of weathering upon them, that give the great variety and grandeur to the canyon scenery. There are towers and turrets, pinnacles and alcoves, cliffs, ledges, crags and moderate talus slopes, each with its characteristic colour and form according to the set of strata in which it lies. The main river has cleft the plateau in a huge gash; innumerable side gorges have cut it to right and left; and weathering has etched out the cliffs and crags and helped to paint it in the gaudy colour bands that stretch before the eye. There is grandeur here and weirdness in abundance, but beauty is lacking. Powell puts the case graphically when he writes: "A wall of homogeneous granite like that in the Yosemite is but a naked wall, whether it be 1000 or 5000 ft. high. Hundreds and thousands of feet mean nothing to the eye when they stand in a meaningless front. A mountain covered by pure snow 10,000 ft. high has but little more effect on the imagination than a mountain of snow 1000 ft. high—it is but more of the same thing; but a façade of seven systems of rock has its sublimity multiplied sevenfold."

To the ordinary person most of the Grand Canyon is at present inaccessible, for, as Powell states, "a year scarcely suffices to see it all"; and "it is a region more difficult to traverse than the Alps or the Himalayas." But a part of the canyon is now easily accessible to tourists. A trail leads from the Atchison, Topeka & Santa Fé railway at Flagstaff, Arizona; and a branch line of the railway extends from Williams, Arizona, to a hotel on the very brink of the canyon. The plateau, which in places bears an open forest, mainly of pine, varies in elevation, but is for the most part a series of fairly level terrace tops with steep faces, with mesas and buttes here and there, and, especially near the huge extinct volcano of San Francisco mountain, with much evidence of former volcanic activity, including numerous cinder cones. The traveller comes abruptly to the edge of the canyon, at whose bottom, over a mile below, is seen the silvery thread of water where the muddy torrent rushes along on its never-ceasing task of sawing its way into the depths of the earth. Opposite rise the highly coloured and terraced slopes of the other canyon wall, whose crest is fully 12 m. distant.

Down by the river are the folded rocks of an ancient mountain system, formed before vertebrate life appeared on the earth, then worn to an almost level condition through untold ages of slow denudation. Slowly, then, the mountains sank beneath the level of the sea, and in the Carboniferous Period—about the time of the formation of the coal-beds—sediments began to bury the ancient mountains. This lasted through other untold ages until the Tertiary Period—through much of the Palaeozoic and all of the Mesozoic time—and a total of from 12,000 to 16,000 ft. of sediments were deposited. Since then erosion has been dominant, and the river has eaten its way down to, and into, the deeply buried mountains, opening the strata for us to read, like the pages of a book. In some parts of the plateau region as much as 30,000 ft. of rock have been stripped away, and over an area of 200,000 sq. m. an average of over 6000 ft. has been removed.

The Grand Canyon was probably discovered by G. L. de Cardenas in 1540, but for 329 years the inaccessibility of the region prevented its exploration. Various people visited parts of it or made reports regarding it; and the Ives Expedition of 1858 contains a report upon the canyon written by Prof. J. S. Newberry. But it was not until 1869 that the first real exploration of the Grand Canyon was made. In that year Major J. W. Powell, with five associates (three left the party in the Grand Canyon), made the complete journey by boat from the junction of the Green and Grand rivers to the lower end of the Grand Canyon. This hazardous journey ranks as one of the most daring and remarkable explorations ever undertaken in North America; and Powell's descriptions of the expedition are among the most fascinating accounts of travel relating to the continent. Powell made another expedition in 1871, but did not go the whole length of the canyon. The government survey conducted by Lieut. George M. Wheeler also explored parts of the canyon, and C. E. Dutton carried on extensive studies of the canyon and the contiguous plateau region. In 1890 Robert B. Stanton, with six associates, went through the canyon in boats, making a survey to determine the feasibility of building a railway along its base. Two other parties, one in 1896 (Nat. Galloway and William Richmond) the other in 1897 (George F. Flavell and companion), have made the journey through the canyon. So far as there is record these are the only four parties that have ever made the complete journey through the Grand Canyon. It has sometimes been said that James White made the passage of the canyon before Powell did; but this story rests upon no real basis.

For accounts of the Grand Canyon of the Colorado see J. W. Powell, *Explorations of the Colorado River of the West and its Tributaries* (Washington, 1875); J. W. Powell, *Canyons of the Colorado* (Meadville, Pa., 1895); F. S. Dellenbaugh, *The Romance of the Colorado River* (New York, 1902); Capt. C. E. Dutton, *Tertiary History of the Grand Canyon District, with Atlas* (Washington, 1882), being Monograph No. 2, U.S. Geological Survey. See also the excellent topographic map of the Grand Canyon prepared by F. E. Matthes and published by the U.S. Geological Survey. (R. S. T.)

GRAND-DUKE (Fr. *grand-duc*, Ital. *granduca*, Ger. *Grossherzog*), a title borne by princes ranking between king and duke. The dignity was first bestowed in 1567 by Pope Pius V. on Duke Cosimo I. of Florence, his son Francis obtaining the emperor's confirmation in 1576; and the predicate "Royal Highness" was added in 1699. In 1806 Napoleon created his brother-in-law Joachim Murat, grand-duke of Berg, and in the same year the title was assumed by the landgrave of Hesse-Darmstadt, the elector of Baden, and the new ruler of the secularized bishopric of Würzburg (formerly Ferdinand III., grand-duke of Tuscany) on joining the Confederation of the Rhine. At the present time, according to the decision of the Congress of Vienna, the title is borne by the sovereigns of Luxemburg, Saxe-Weimar (grand-duke of Saxony), Mecklenburg-Schwerin, Mecklenburg-Strelitz, and Oldenburg (since 1829), as well as by those of Hesse-Darmstadt and Baden. The emperor of Austria includes among his titles those of grand-duke of Cracow and Tuscany, and the king of Prussia those of grand-duke of the Lower Rhine and Posen. The title is also retained by the dispossessed Habsburg-Lorraine dynasty of Tuscany.

Grand-duke is also the conventional English equivalent of the Russian *velikiy knyaz*, more properly "grand-prince" (Ger. Grossfürst), at one time the title of the rulers of Russia, who, as the eldest born of the house of Rurik, exercised overlordship over the *udyelniye knyazi* or local princes. On the partition of the inheritance of Rurik, the eldest of each branch assumed the title of grand-prince. Under the domination of the Golden Horde the right to bestow the title *velikiy knyaz* was reserved by the Tatar Khan, who gave it to the prince of Moskow. In Lithuania this title also symbolized a similar overlordship, and it passed to the kings of Poland on the union of Lithuania with the Polish republic. The style of the emperor of Russia now

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includes the titles of grand-duke (*velikiy knyaz*) of Smolensk, Lithuania, Volhynia, Podolia and Finland. Until 1886 this title grand-duke or grand-duchess, with the style "Imperial Highness," was borne by all descendants of the imperial house. It is now confined to the sons and daughters, brothers and sisters, and male grandchildren of the emperor. The other members of the imperial house bear the title of prince (*knyaz*) and princess (*knyaginya*, if married, *knyazhna*, if unmarried) with the style of "Highness." The emperor of Austria, as king of Hungary, also bears this title as "grand-duke" of Transylvania, which was erected into a "grand-principedom" (Grossfürstentum) in 1765 by Maria Theresa.

GRANDEE (Span. *Grande*), a title of honour borne by the highest class of the Spanish nobility. It would appear to have been originally assumed by the most important nobles to distinguish them from the mass of the *ricos hombres*, or great barons of the realm. It was thus, as Selden points out, not a general term denoting a class, but "an additional dignity not only to all dukes, but to some marquesses and condes also" (*Titles of Honor*, ed. 1672, p. 478). It formerly implied certain privileges; notably that of sitting covered in the royal presence. Until the time of Ferdinand and Isabella, when the power of the territorial nobles was broken, the grandees had also certain more important rights, *e.g.* freedom from taxation, immunity from arrest save at the king's express command, and even—in certain cases—the right to renounce their allegiance and make war on the king. Their number and privileges were further restricted by Charles I. (the emperor Charles V.), who reserved to the crown the right to bestow the title. The grandees of Spain were further divided into three classes: (1) those who spoke to the king and received his reply with their heads covered; (2) those who addressed him uncovered, but put on their hats to hear his answer; (3) those who awaited the permission of the king before covering themselves. All grandees were addressed by the king as "my cousin" (*mi primo*), whereas ordinary nobles were only qualified as "my kinsman" (*mi pariente*). The title of "grandee," abolished under King Joseph Bonaparte, was revived in 1834, when by the *Estatudo real* grandees were given precedence in the Chamber of Peers. The designation is now, however, purely titular, and implies neither privilege nor power.

GRAND FORKS, a city in the Boundary district of British Columbia; situated at the junction of the north and south forks of the Kettle river, 2 m. N. of the international boundary. Pop. (1908) about 2500. It is in a good agricultural district, but owes its importance largely to the erection here of the extensive smelting plant of the Granby Consolidated Company, which smelts the ores obtained from the various parts of the Boundary country, but chiefly those from the Knob Hill and Old Ironsides mines. The Canadian Pacific railway, as well as the Great Northern railway, runs to Grand Forks, which thus has excellent railway communication with the south and east.

GRAND FORKS, a city and the county-seat of Grand Forks county, North Dakota, U.S.A., at the junction of the Red river (of the North) and Red Lake river (whence its name), about 80 m. N. of Fargo. Pop. (1900) 7652, of whom 2781 were foreign-born; (1905) 10,127; (1910) 27,888. It is served by the Northern Pacific and the Great Northern railways, and has a considerable river traffic, the Red river (when dredged) having a channel 60 ft. wide and 4 ft. deep at low water below Grand Forks. At University, a small suburb, is the University of North Dakota (co-educational; opened 1884). Affiliated with it is Wesley College (Methodist Episcopal), now at Grand Forks (with a campus adjoining that of the University), but formerly the Red River Valley University at Wahpeton, North Dakota. In 1907–1908 the University had 57 instructors and 861 students; its library had 25,000 bound volumes and 5000 pamphlets. At Grand Forks, also, are St Bernard's Ursuline Academy (Roman Catholic) and Grand Forks College (Lutheran). Among the city's principal buildings are the public library, the Federal building and a Y.M.C.A. building. As the centre of the great wheat valley of the Red river, it has a busy trade in wheat, flour and agricultural machinery and implements, as well as large jobbing interests. There are railway car-shops here, and among the manufactures are crackers, brooms, bricks and tiles and cement. The municipality owns its water-works and an electric lighting plant for street lighting. In 1801 John Cameron (d. 1804) erected a temporary trading post for the North-West Fur Company on the site of the present city; it afterwards became a trading post of the Hudson's Bay Company. The first permanent settlement was made in 1871, and Grand Forks was reached by the Northern Pacific and chartered as a city in 1881.

GRAND HAVEN, a city, port of entry, and the county-seat of Ottawa county, Michigan, U.S.A., on Lake Michigan, at the mouth of Grand river, 30 m. W. by N. of Grand Rapids and 78 m. E. of Milwaukee. Pop. (1900) 4743, of whom 1277 were foreign-born; (1904) 5239; (1910) 5856. It is served by the Grand Trunk and the Père Marquette railways, and by steamboat lines to Chicago, Milwaukee and other lake ports, and is connected with Grand Rapids and Muskegon by an electric line. The city manufactures pianos, refrigerators, printing presses and leather; is a centre for the shipment of fruit and celery; and has valuable fisheries near—fresh, salt and smoked fish, especially whitefish, are shipped in considerable quantities. Grand Haven is the port of entry for the Customs District of Michigan, and has a small export and import trade. The municipality owns and operates its water-works and electric-lighting plant. A trading post was established here about 1821 by an agent of the American Fur Company, but the permanent settlement of the city did not begin until 1834. Grand Haven was laid out as a town in 1836, and was chartered as a city in 1867.

GRANDIER, URBAN (1590–1634), priest of the church of Sainte Croix at Loudun in the department of Vienne, France, was accused of witchcraft in 1632 by some hysterical novices of the Carmelite Convent, where the trial, protracted for two years, was held. Grandier was found guilty and burnt alive at Loudun on the 18th of August 1634.

GRAND ISLAND, a city and the county-seat of Hall county, Nebraska, U.S.A., on the Platte river, about 154 m. W. by S. of Omaha. Pop. (1900) 7554 (1330 foreign-born); (1910) 10,326. It is served by the Union Pacific, the Chicago, Burlington & Quincy, and the St Joseph & Grand Island railways, being the western terminus of the last-named line and a southern terminus of a branch of the Union Pacific. The city is situated on a slope skirting the broad, level bottom-lands of the Platte river, in the midst of a fertile farming region. Grand Island College (Baptist; co-educational) was established in 1892 and the Grand Island Business and Normal College in 1890; and the city is the seat of a state Sailors' and Soldiers' Home, established in 1888. Grand Island has a large wholesale trade in groceries, fruits, &c.; is an important horse-market, and has large stock-yards. There are shops of the Union Pacific in the city, and among its manufactures are beet-sugar—Grand Island is in one of the principal beet-sugar-growing districts of the state—brooms, wire fences, confectionery and canned corn. The most important industry of the county is the raising and feeding of sheep and neat cattle. A "Grand Island" was founded in 1857, and was named from a large island (nearly 50 m. long) in the Platte opposite its site; but the present city was laid out by the Union Pacific in 1866. It was chartered as a city in 1873.

GRANDMONTINES, a religious order founded by St Stephen of Thiers in Auvergne towards the end of the 11th century. St Stephen was so impressed by the lives of the hermits whom he saw in Calabria that he desired to introduce the same manner of life into his native country. He was ordained, and in 1073 obtained the pope's permission to establish an order. He betook himself to Auvergne, and in the desert of Muret, near Limoges, he made himself a hut of branches of trees and lived there for some time in complete solitude. A few disciples gathered round him, and a community was formed. The rule was not reduced to writing until after Stephen's death, 1124. The life was eremitical and very severe in regard to silence, diet and bodily austerities; it was modelled after the rule of the Camaldolese, but various regulations were adopted from the Augustinian canons. The superior was called the "Corrector."

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About 1150 the hermits, being compelled to leave Muret, settled in the neighbouring desert of Grandmont, whence the order derived its name. Louis VII. founded a house at Vincennes near Paris, and the order had a great vogue in France, as many as sixty houses being established by 1170, but it seems never to have found favour out of France; it had, however, a couple of cells in England up to the middle of the 15th century. The system of lay brothers was introduced on a large scale, and the management of the temporals was in great measure left in their hands; the arrangement did not work well, and the quarrels between the lay brothers and the choir monks were a constant source of weakness. Later centuries witnessed mitigations and reforms in the life, and at last the order came to an end just before the French Revolution. There were two or three convents of Grandmontine nuns. The order played no great part in history.

See Helyot, *Hist. des ordres religieux* (1714), vii. cc. 54, 55; Max Heimbucher, *Orden und Kongregationen* (1896), i. § 31; and the art. in Wetzer and Welte, *Kirchenlexicon* (ed. 2), and in Herzog, *Realencyklopadie* (ed. 3). (E. C. B.)

GRAND RAPIDS, a city and the county-seat of Kent county, Michigan, U.S.A., at the head of navigation on the Grand river, about 30 m. from Lake Michigan and 145 m. W.N.W. of Detroit. Pop. (1890) 60,278; (1900) 87,565, of whom 23,896 were foreign-born and 604 were negroes; (1910 census) 112,571. Of the foreign-born population in 1900, 11,137 were Hollanders; 3318 English-Canadians; 3253 Germans; 1137 Irish; 1060 from German Poland; and 1026 from England. Grand Rapids is served by the Michigan Central, the Lake Shore & Michigan Southern, the Grand Trunk, the Père Marquette and the Grand Rapids & Indiana railways, and by electric interurban railways. The valley here is about 2 m. wide, with a range of hills on either side, and about midway between these hills the river flows over a limestone bed, falling about 18 ft. in 1 m. Factories and mills line both banks, but the business blocks are nearly all along the foot of the E. range of hills; the finest residences command picturesque views from the hills farther back, the residences on the W. side being less pretentious and standing on bottom-lands. The principal business thoroughfares are Canal, Monroe and Division streets. Among the important buildings are the United States Government building (Grand Rapids is the seat of the southern division of the Federal judicial district of western Michigan), the County Court house, the city hall, the public library (presented by Martin A. Ryerson of Chicago), the Manufacturer's building, the *Evening Press* building, the Michigan Trust building and several handsome churches. The principal charitable institutions are the municipal Tuberculosis Sanatorium; the city hospital; the Union Benevolent Association, which maintains a home and hospital for the indigent, together with a training school for nurses; Saint John's orphan asylum (under the superintendence of the Dominican Sisters); Saint Mary's hospital (in charge of the Sisters of Mercy); Butterworth hospital (with a training school for nurses); the Woman's Home and Hospital, maintained largely by the Woman's Christian Temperance Union; the Aldrich Memorial Deaconess' Home; the D. A. Blodgett Memorial Children's Home, and the Michigan Masonic Home. About 1 m. N. of the city, overlooking the river, is the Michigan Soldiers' Home, with accommodation for 500. On the E. limits of the city is Reed's Lake, a popular resort during the summer season. The city is the see of Roman Catholic and Protestant Episcopal bishops. In 1907–1908, through the efforts of a committee of the Board of Trade, interest was aroused in the improvement of the city, appropriations were made for a "city plan," and flood walls were completed for the protection of the lower parts of the city from inundation. The large quantities of fruit, cereals and vegetables from the surrounding country, and ample facilities for transportation by rail and by the river, which is navigable from below the rapids to its mouth, make the commerce and trade of Grand Rapids very important. The manufacturing interests are greatly promoted by the fine water-power, and as a furniture centre the city has a world-wide reputation—the value of the furniture manufactured within its limits in 1904 amounted to $9,409,007, about 5·5% of the value of all furniture manufactured in the United States. Grand Rapids manufactures carpet sweepers—a large proportion of the whole world's product,—flour and grist mill products, foundry and machine-shop products, planing-mill products, school seats, wood-working tools, fly paper, calcined plaster, barrels, kegs, carriages, wagons, agricultural implements and bricks and tile. The total factory product in 1904 was valued at $31,032,589, an increase of 30·6% in four years.

On the site of Grand Rapids there was for a long time a large Ottawa Indian village, and for the conversion of the Indians a Baptist mission was established in 1824. Two years later a trading post joined the mission, in 1833 a saw mill was built, and for the next few years the growth was rapid. The settlement was organized as a town in 1834, was incorporated as a village in 1838, and was chartered as a city in 1850, the city charter being revised in 1857, 1871, 1877 and 1905.

GRAND RAPIDS, a city and the county-seat of Wood county, Wisconsin, U.S.A., on both sides of the Wisconsin river, about 137 m. N.W. of Milwaukee. Pop. (1900) 4493, of whom 1073 were foreign-born; (1905) 6157; (1910) 6521. It is served by the Minneapolis, St Paul & Sault Ste Marie, the Green Bay & Western, the Chicago & North-Western, and the Chicago, Milwaukee & St Paul railways. It is a railway and distributing centre, and has manufactories of lumber, sash, doors and blinds, hubs and spokes, woodenware, paper, wood-pulp, furniture and flour. The public buildings include a post office, court house, city hall, city hospital and the T. B. Scott Free Public Library (1892). The city owns and operates its water-works; the electric-lighting and telephone companies are co-operative. Grand Rapids was first chartered as a city in 1869. That part of Grand Rapids on the west bank of the Wisconsin river was formerly the city of Centralia (pop. in 1890, 1435); it was annexed in 1900.

GRANDSON (Ger. *Grandsee*), a town in the Swiss canton of Vaud, near the south-western end of the Lake of Neuchâtel, and by rail 20 m. S.W. of Neuchâtel and 3 m. N. of Yverdon. Its population in 1900 was 1771, mainly French-speaking and Protestant. Its ancient castle was long the home of a noted race of barons, while in the very old church (once belonging to a Benedictine monastery) there are a number of Roman columns, &c., from Avenches and Yverdon. It has now a tobacco factory. Its lords were vassals of the house of Savoy, till in 1475 the castle was taken by the Swiss at the beginning of their war with Charles the Bold, duke of Burgundy, whose ally was the duchess of Savoy. It was retaken by Charles in February 1476, and the garrison put to death. The Swiss hastened to revenge this deed, and in a famous battle (2nd March 1476) defeated Charles with great loss, capturing much booty. The scene of the battle was between Concise and Corcelles, north-east of the town, and is marked by several columns, perhaps ancient menhirs. Grandson was thenceforward till 1798 ruled in common by Berne and Fribourg, and then was given to the canton du Léman, which in 1803 became that of Vaud.

See F. Chabloz, *La Bataille de Grandson* (Lausanne, 1897).

GRANET, FRANÇOIS MARIUS (1777–1849), French painter, was born at Aix in Provence, on the 17th of December 1777; his father was a small builder. The boy's strong desires led his parents to place him—after some preliminary teaching from a passing Italian artist—in a free school of art directed by M. Constantin, a landscape painter of some reputation. In 1703 Granet followed the volunteers of Aix to the siege of Toulon, at the close of which he obtained employment as a decorator in the arsenal. Whilst a lad he had, at Aix, made the acquaintance of the young comte de Forbin, and upon his invitation Granet, in the year 1797, went to Paris. De Forbin was one of the pupils of David, and Granet entered the same studio. Later he got possession of a cell in the convent of Capuchins, which, having served for a manufactory of assignats during the Revolution, was afterwards inhabited almost exclusively by artists. In the changing lights and shadows of the corridors of the Capuchins, Granet found the materials for that one picture to the painting of which, with varying success, he devoted his life.

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In 1802 he left Paris for Rome, where he remained until 1819, when he returned to Paris, bringing with him besides various other works one of fourteen repetitions of his celebrated Chœur des Capucins, executed in 1811. The figures of the monks celebrating mass are taken in this subject as a substantive part of the architectural effect, and this is the case with all Granet's works, even with those in which the figure subject would seem to assert its importance, and its historical or romantic interest. "Stella painting a Madonna on his Prison Wall," 1810 (Leuchtenberg collection); "Sodoma à l'hôpital," 1815 (Louvre); "Basilique basse de St François d'Assise," 1823 (Louvre); "Rachat de prisonniers," 1831 (Louvre); "Mort de Poussin," 1834 (Villa Demidoff, Florence), are among his principal works; all are marked by the same peculiarities, everything is sacrificed to tone. In 1819 Louis Philippe decorated Granet, and afterwards named him Chevalier de l'Ordre St Michel, and Conservateur des tableaux de Versailles (1826). He became member of the institute in 1830; but in spite of these honours, and the ties which bound him to M. de Forbin, then director of the Louvre, Granet constantly returned to Rome. After 1848 he retired to Aix, immediately lost his wife, and died himself on the 21st of November 1849. He bequeathed to his native town the greater part of his fortune and all his collections, now exhibited in the Musée, together with a very fine portrait of the donor painted by Ingres in 1811.

GRANGE (through the A.-Fr. *graunge*, from the Med. Lat. *granea*, a place for storing grain, *granum*), properly a granary or barn. In the middle ages a "grange" was a detached portion of a manor with farm-houses and barns belonging to a lord or to a religious house; in it the crops could be conveniently stored for the purpose of collecting rent or tithe. Thus, such barns are often known as "tithe-barns." In many cases a chapel was included among the buildings or stood apart as a separate edifice. The word is still used as a name for a superior kind of farm-house, or for a country-house which has farm-buildings and agricultural land attached to it.

Architecturally considered, the "grange" was usually a long building with high wooden roof, sometimes divided by posts or columns into a sort of nave and aisles, and with walls strongly buttressed. Sometimes these granges were of very great extent; one at St Leonards, Hampshire, was originally 225 ft. long by 75 ft. wide, and a still larger one (303 ft. long) existed at Chertsey. Ancient granges, or tithe-barns, still exist at Glastonbury, Bradford-on-Avon, St Mary's Abbey, York, and at Coxwold. A fine example at Peterborough was pulled down at the end of the 19th century. In France there are many examples in stone of the 12th, 13th and 14th centuries; some divided into a central and two side aisles by arcades in stone. Externally granges are noticeable on account of their great roofs and the slight elevation of the eaves, from 8 to 10 ft. only in height. In the 15th century they were sometimes protected by moats and towers. At Ardennes in Normandy, where the grange was 154 ft. long; Vaucler c near Laon, Picardy, 246 ft. long and in two storeys; at Perrières, St Vigor, near Bayeux, and Ouilly near Falaise, all in Normandy; and at St Martin-au-Bois (Oise) are a series of fine examples. Attached to the abbey of Longchamps, near Paris, is one of the best-preserved granges in France, with walls in stone and internally divided into three aisles in oak timber of extremely fine construction.

In the social economic movement in the United States of America, which began in 1867 and was known as the "Farmers' Movement," "grange" was adopted as the name for a local chapter of the Order of the Patrons of Husbandry, and the movement is thus often known as the "Grangers' Movement" (see FARMERS' MOVEMENT). There are a National Grange at Washington, supervising the local divisions, and state granges in most states.

GRANGEMOUTH, a police burgh and seaport of Stirlingshire, Scotland. Pop. (1901) 8386. It is situated on the south shore of the estuary of the Forth, at the mouth of the Carron and also of Grange Burn, a right-hand tributary of the Carron, 3 m. N.E. of Falkirk by the North British and Caledonian railways. It is the terminus of the Forth and Clyde Canal, from the opening of which (1780) its history may be dated. The principal buildings are the town hall (in the Greek style), public hall, public institute and free library, and there is a public park presented by the marquess of Zetland. Since 1810, when it became a head port, it has gradually attained the position of the chief port of the Forth west of Leith. The first dock (opened in 1846), the second (1859) and the third (1882) cover an area of 28 acres, with timber ponds of 44 acres and a total quayage of 2500 yards. New docks, 93 acres in extent, with an entrance from the firth, were opened in 1905 at a cost of more than £1,000,000. The works rendered it necessary to divert the influx of the Grange Burn from the Carron to the Forth. Timber, pig-iron and iron ore are the leading imports, and coal, produce and iron the chief exports. The industries include shipbuilding, rope and sail making and iron founding. There is regular steamer communication with London, Christiania, Hamburg, Rotterdam and Amsterdam. Experiments in steam navigation were carried out in 1802 with the "Charlotte Dundas" on the Forth and Clyde Canal at Grangemouth. Kersa House adjoining the town on the S.W. is a seat of the marquess of Zetland.

GRANGER, JAMES (1723–1776), English clergyman and print-collector, was born in Dorset in 1723. He went to Oxford, and then entered holy orders, becoming vicar of Shiplake; but apart from his hobby of portrait-collecting, which resulted in the principal work associated with his name, and the publication of some sermons, his life was uneventful. Yet a new word was added to the language—"to grangerize"—on account of him. In 1769 he published in two quarto volumes a *Biographical History of England* "consisting of characters dispersed in different classes, and adapted to a methodical catalogue of engraved British heads"; this was "intended as an essay towards reducing our biography to a system, and a help to the knowledge of portraits." The work was supplemented in later editions by Granger, and still further editions were brought out by the Rev. Mark Noble, with additions from Granger's materials. Blank leaves were left for the filling in of engraved portraits for extra illustration of the text, and it became a favourite pursuit to discover such illustrations and insert them in a *Granger*, so that "grangerizing" became a term for such an extra-illustration of any work, especially with cuts taken from other books. The immediate result of the appearance of Granger's own work was the rise in value of books containing portraits, which were cut out and inserted in collector's copies.

GRANITE (adapted from the Ital. *granito*, grained; Lat. *granum*, grain), the group designation for a family of igneous rocks whose essential characteristics are that they are of acid composition (containing high percentages of silica), consist principally of quartz and felspar, with some mica, hornblende or augite, and are of holocrystalline or "granitoid" structure. In popular usage the term is given to almost any crystalline rock which resembles granite in appearance or properties. Thus syenites, diorites, gabbros, diabases, porphyries, gneiss, and even limestones and dolomites, are bought and sold daily as "granites." True granites are common rocks, especially among the older strata of the earth's crust. They have great variety in colour and general appearance, some being white or grey, while others are pink, greenish or yellow: this depends mainly on the state of preservation of their felspars, which are their most abundant minerals, and partly also on the relative proportion in which they contain biotite and other dark coloured silicates. Many granites have large rounded or angular crystals of felspar (Shap granite, many Cornish granites), well seen on polished faces. Others show an elementary foliation or banding (*e.g.* Aberdeen granite). Rounded or oval dark patches frequently appear in the granitic matrix of many Cornish rocks of this group.

In the field granite usually occurs in great masses, covering wide areas. These are generally elliptical or nearly circular and may be 20 m. in diameter or more. In the same district separate areas or "bosses" of granite may be found, all having much in common in their mineralogical and structural features, and such groups have probably all proceeded from the same

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focus or deep-seated source. Towards their margins these granite outcrops often show modifications by which they pass into diorite or syenite, &c.; they may also be finer grained (like porphyries) or rich in tourmaline, or intersected by many veins of pegmatite. From the main granite dikes or veins often run out into the surrounding rocks, thus proving that the granite is intrusive and has forced its way upwards by splitting apart the strata among which it lies. Further evidence of this is afforded by the alteration which the granite has produced through a zone which varies from a few yards to a mile or more in breadth around it. In the vicinity of intrusive granites slates become converted into hornfelses containing biotite, chiastolite or andalusite, sillimanite and a variety of other minerals; limestones recrystallize as marbles, and all rocks, according to their composition, are more or less profoundly modified in such a way as to prove that they have been raised to a high temperature by proximity to the molten intrusive mass. Where exposed in cliffs and other natural sections many granites have a rudely columnar appearance. Others weather into large cuboidal blocks which may produce structures resembling cyclopean masonry. The tors of the west of England are of this nature. These differences depend on the disposition of the joint cracks which traverse the rock and are opened up by the action of frost and weathering.

The majority of granites are so coarse in grain that their principal component minerals may be identified in the hand specimens by the unaided eye. The felspar is pearly, white or pink, with smooth cleaved surfaces; the quartz is usually transparent, glassy with rough irregular fractures; the micas appear as shining black or white flakes. Very coarse granites are called pegmatite or giant granite, while very fine granites are known as microgranites (though the latter term has also been applied to certain porphyries). Many granites show pearly scales of white mica; others contain dark green or black hornblende in small prisms. Reddish grains of sphene or of garnet are occasionally visible. In the tourmaline granites prisms of black schorl occur either singly or in stellate groups. The parallel banded structures of many granites, which may be original or due to crushing, connect these rocks with the granite gneisses or orthogneisses.

Under the microscope the felspar is mainly orthoclase with perthite or microcline, while a small amount of plagioclase (ranging from oligoclase to albite) is practically never absent. These minerals are often clouded by a deposit of fine mica and kaolin, due to weathering. The quartz is transparent, irregular in form, destitute of cleavage, and is filled with very small cavities which contain a fluid, a mobile bubble and sometimes a minute crystal. The micas, brown and white, are often in parallel growth. The hornblende of granites is usually pale green in section, the augite and enstatite nearly colourless. Tourmaline may be brown, yellow or blue, and often the same crystal shows zones of different colours. Apatite, zircon and iron oxides, in small crystals, are always present. Among the less common accessories may be mentioned pinkish garnets; andalusite in small pleochroic crystals; colourless grains of topaz; six-sided compound crystals of cordierite, which weather to dark green pinite; blue-black hornblende (riebeckite), beryl, tinstone, orthite and pyrites.

The sequence of crystallization in the granites is of a normal type, and may be ascertained by observing the perfection with which the different minerals have crystallized and the order in which they enclose one another. Zircon, apatite and iron oxides are the first; their crystals are small, very perfect and nearly free from enclosures; they are followed by hornblende and biotite; if muscovite is present it succeeds the brown mica. Of the felspars the plagioclase separates first and forms well-shaped crystals of which the central parts may be more basic than the outer zones. Last come orthoclase, quartz, microcline and micropegmatite, which fill up the irregular spaces left between the earlier minerals. Exceptions to this sequence are unusual; sometimes the first of the felspars have preceded the hornblende or biotite which may envelop them in ophitic manner. An earlier generation of felspar, and occasionally also of quartz, may be represented by large and perfect crystals of these minerals giving the rock a porphyritic character.

Many granites have suffered modification by the action of vapours emitted during cooling. Hydrofluoric and boric emanations exert a profound influence on granitic rocks; their felspar is resolved into aggregates of kaolin, muscovite and quartz, tourmaline appears, largely replacing the brown mica; topaz also is not uncommon. In this way the rotten granite or china stone, used in pottery, originates; and over considerable areas kaolin replaces the felspar and forms valuable sources of china clay. Veins of quartz, tourmaline and chlorite may traverse the granite, containing tinstone often in workable quantities. These veins are the principal sources of tin in Cornwall, but the same changes may appear in the body of the granite without being restricted to veins, and tinstone occurs also as an original constituent of some granite pegmatites.

Granites may also be modified by crushing. Their crystals tend to lose their original forms and to break into mosaics of interlocking grains. The latter structure is very well seen in the quartz, which is a brittle mineral under stress. White mica develops in the felspars. The larger crystals are converted into lenticular or elliptical "augen," which may be shattered throughout or may have a peripheral seam of small detached granules surrounding a still undisintegrated core. Streaks of "granulitic" or pulverized material wind irregularly through the rock, giving it a roughly foliated character.

The interesting structural variation of granite in which there are spheroidal masses surrounded by a granitic matrix is known as "orbicular granite." The spheroids range from a fraction of an inch to a foot in diameter, and may have a felspar crystal at the centre. Around this there may be several zones, alternately lighter and darker in colour, consisting of the essential minerals of the rock in different proportions. Radiate arrangement is sometimes visible in the crystals of the whole or part of the spheroid. Spheroidal granites of this sort are found in Sweden, Finland, Ireland, &c. In other cases the spheroids are simply dark rounded lumps of biotite, in fine scales. These are probably due to the adhesion of the biotite crystals to one another as they separated from the rock magma at an early stage in its crystallization. The Rapakiwi granites of Finland have many round or ovoidal felspar crystals scattered through a granitic matrix. These larger felspars have no crystalline outlines and consist of orthoclase or microcline surrounded by borders of white oligoclase. Often they enclose dark crystals of biotite and hornblende, arranged zonally. Many of these granites contain tourmaline, fluorite and monazite. In most granite masses, especially near their contacts with the surrounding rocks, it is common to find enclosures of altered sedimentary or igneous materials which are more or less dissolved and permeated by the granitic magma.

The chemical composition of a few granites from different parts of the world is given below:—

	SiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	MgO.	CaO.	Na_2O.	K_2O.
I.	74·69	16·21	..	1·16	0·48	0·28	1·18	3·64
II.	71·33	11·18	3·96	1·45	0·88	2·10	3·51	3·49
III.	72·93	13·87	1·94	0·79	0·51	1·74	3·68	3·74
IV.	76·12	12·18	1·21	0·72	1·12	1·54	2·55	3·21
V.	73·90	13·65	0·28	0·42	0·14	0·23	2·53	7·09
VI.	68·87	16·62	0·43	2·72	1·60	0·71	1·80	6·48

I. Carn Brea, Cornwall (Phillips); II. Mazaruni, Brit. Guiana (Harrison); III. Rodö, near Almö, Vesternorrland, Sweden (Holmquist); IV. Abruzzen, a group of hills in the Riesengebirge (Milch); V. Pikes Peak, Colorado (Matthews); VI. Wilson's Creek, near Omeo, Victoria (Howitt).

Only the most important components are shown in the table, but all granites contain also small amounts of zirconia, titanium oxide, phosphoric acid, sulphur, oxides of barium, strontium, manganese and water. These are in all cases less than 1%, and usually much less than this, except the water, which may be 2 or 3% in weathered rocks. From the chemical composition it may be computed that granites contain, on an average, 35 to 55% of quartz, 20 to 30% of orthoclase, 20 to 30% of plagioclase felspar (including the albite of microperthite) and 5 to 10% of ferromagnesian

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silicates and minor accessories such as apatite, zircon, sphene and iron oxides. The aplites, pegmatites, graphic granites and muscovite granites are usually richest in silica, while with increase of biotite and hornblende, augite and enstatite the analyses show the presence of more magnesia, iron and lime.

In the weathering of granite the quartz suffers little change; the felspar passes into dull cloudy, soft aggregates of kaolin, muscovite and secondary quartz, while chlorite, quartz and calcite replace the biotite, hornblende and augite. The rock often assumes a rusty brown colour from the liberation of the oxides of iron, and the decomposed mass is friable and can easily be dug with a spade; where the granite has been cut by joint planes not too close together weathering proceeds from their surfaces and large rounded blocks may be left embedded in rotted materials. The amount of water in the rock increases and part of the alkalis is carried away in solution; they form valuable sources of mineral food to plants. The chemical changes are shown by the following analyses:

	H_2O.	SiO_2.	TiO_2.	Al_2O_3.	FeO.	Fe_2O_3.	CaO.	MgO.	Na_2O.	K_2O.	P_2O_5.
I.	1·22	69·33	n.d.	14·33	3·60	..	3·21	2·44	2·70	2·67	0·10
II.	3·27	66·82	n.d.	15·62	1·69	1·88	3·13	2·76	2·58	2·44	n.d.
III.	4·70	65·69	0·31	15·23	..	4·39	2·63	2·64	2·12	2·00	0·06

Analyses of I., fresh grey granite; II. brown moderately firm granite; III. residual sand, produced by the weathering of the same mass (anal. G. P. Merrill).

The differences are surprisingly small and are principally an increase in the water and a diminution in the amount of alkalis and lime together with the oxidation of the ferrous oxide. (J. S. F.)

GRAN SASSO D'ITALIA (" Great Rock of Italy "), a mountain of the Abruzzi, Italy, the culminating point of the Apennines, 9560 ft. in height. In formation it resembles the limestone Alps of Tirol and there are on its elevated plateaus a number of *doline* or funnel-shaped depressions into which the melted snow and the rain sink. The summit is covered with snow for the greater part of the year. Seen from the Adriatic, Monte Corno, as it is sometimes called, from its resemblance to a horn, affords a magnificent spectacle; the Alpine region beneath its summit is still the home of the wild boar, and here and there are dense woods of beech and pine. The group has numerous other lofty peaks, of which the chief are the Pizzo di Intermesole (8680 ft.), the Corno Piccolo (8650 ft.), the Pizzo Cefalone (8307 ft.) and the Monte della Portella (7835 ft.). The most convenient starting-point for the ascent is Assergi, 10 m. N.E. of Aquila, at the S. foot of the Gran Sasso. The Italian Alpine Club has erected a hut S.W. of the principal summit, and has published a special guidebook (E. Abbate, *Guida al Gran Sasso d' Italia*, Rome, 1888). The view from the summit extends to the Tyrrhenian Sea on the west and the mountains of Dalmatia on the east in clear weather. The ascent was first made in 1704 by Orazio Delfico from the Teramo side. In Assergi is the interesting church of Sta. Maria Assunta, dating from 1150, with later alterations (see Gavini, in *L'Arte*, 1901, 316, 301).

GRANT, SIR ALEXANDER, 8th Bart. (1826–1884), British scholar and educationalist, was born in New York on the 13th of September 1826. After a childhood spent in the West Indies, he was educated at Harrow and Oxford. He entered Oxford as scholar of Balliol, and subsequently held a fellowship at Oriel from 1849 to 1860. He made a special study of the Aristotelian philosophy, and in 1857 published an edition of the *Ethics* (4th ed. 1885) which became a standard text-book at Oxford. In 1855 he was one of the examiners for the Indian Civil Service, and in 1856 a public examiner in classics at Oxford. In the latter year he succeeded to the baronetcy. In 1859 he went to Madras with Sir Charles Trevelyan, and was appointed inspector of schools; the next year he removed to Bombay, to fill the post of Professor of History and Political Economy in the Elphinstone College. Of this he became Principal in 1862; and, a year later, vice-chancellor of Bombay University, a post he held from 1863 to 1865 and again from 1865 to 1868. In 1865 he took upon himself also the duties of Director of Public Instruction for Bombay Presidency. In 1868 he was appointed a member of the Legislative Council. In the same year, upon the death of Sir David Brewster, he was appointed Principal of Edinburgh University, which had conferred an honorary LL.D. degree upon him in 1865. From that time till his death (which occurred in Edinburgh on the 30th of November 1884) his energies were entirely devoted to the well-being of the University. The institution of the medical school in the University was almost solely due to his initiative; and the Tercentenary Festival, celebrated in 1884, was the result of his wisely directed enthusiasm. In that year he published *The Story of the University of Edinburgh during its First Three Hundred Years*. He was created Hon. D.C.L. of Oxford in 1880, and an honorary fellow of Oriel College in 1882.

GRANT, ANNE (1755–1838), Scottish writer, generally known as Mrs Grant of Laggan, was born in Glasgow, on the 21st of February 1755. Her childhood was spent in America, her father, Duncan MacVicar, being an army officer on service there. In 1768 the family returned to Scotland, and in 1779 Anne married James Grant, an army chaplain, who was also minister of the parish of Laggan, near Fort Augustus, Inverness, where her father was barrack-master. On her husband's death in 1801 she was left with a large family and a small income. In 1802 she published by subscription a volume of *Original Poems, with some Translations from the Gaelic*, which was favourably received. In 1806 her *Letters from the Mountains*, with their spirited description of Highland scenery and legends, awakened much interest. Her other works are *Memoirs of an American Lady, with Sketches of Manners and Scenery in America as they existed previous to the Revolution* (1808), containing reminiscences of her childhood; *Essays on the Superstitions of the Highlanders of Scotland* (1811); and *Eighteen Hundred and Thirteen, a Poem* (1814). In 1810 she went to live in Edinburgh. For the last twelve years of her life she received a pension from government. She died on the 7th of November 1838.

See *Memoir and Correspondence of Mrs Grant of Laggan, edited by her son J. P. Grant* (3 vols., 1844).

GRANT, CHARLES (1746–1823), British politician, was born at Aldourie, Inverness-shire, on the 16th of April 1746, the day on which his father, Alexander Grant, was killed whilst fighting for the Jacobites at Culloden. When a young man Charles went to India, where he became secretary, and later a member of the board of trade. He returned to Scotland in 1790, and in 1802 was elected to parliament as member for the county of Inverness. In the House of Commons his chief interests were in Indian affairs, and he was especially vigorous in his hostility to the policy of the Marquess Wellesley. In 1805 he was chosen chairman of the directors of the East India Company and he retired from parliament in 1818. A friend of William Wilberforce, Grant was a prominent member of the evangelical party in the Church of England; he was a generous supporter of the church's missionary undertakings. He was largely responsible for the establishment of the East India college, which was afterwards erected at Haileybury. He died in London on the 31st of October 1823. His eldest son, Charles, was created a peer in 1835 as Baron Glenelg.

See Henry Morris, *Life of Charles Grant* (1904).

GRANT, SIR FRANCIS (1803–1878), English portrait-painter, fourth son of Francis Grant of Kilgraston, Perthshire, was born at Edinburgh in 1803. He was educated for the bar, but at the age of twenty-four he began at Edinburgh systematically to study the practice of art. On completing a course of instruction he removed to London, and as early as 1843 exhibited at the Royal Academy. At the beginning of his career he utilized his sporting experiences by painting groups of huntsmen, horses and hounds, such as the " Meet of H.M. Staghounds " and the " Melton Hunt "; but his position in society gradually made him a fashionable portrait-painter. In drapery he had the taste of a connoisseur, and rendered the minutest details of costume with felicitous accuracy. In female portraiture he achieved considerable success, although rather in depicting the high-born graces and external characteristics than the true personality. Among his portraits of this class may be mentioned Lady

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Glenlyon, the marchioness of Waterford, Lady Rodney and Mrs Beauclerk. In his portraits of generals and sportsmen he proved himself more equal to his subjects than in those of statesmen and men of letters. He painted many of the principal celebrities of the time, including Scott, Macaulay, Lockhart, Disraeli, Hardinge, Gough, Derby, Palmerston and Russell, his brother Sir J. Hope Grant and his friend Sir Edwin Landseer. From the first his career was rapidly prosperous. In 1842 he was elected an associate of the Royal Academy, and in 1851 an Academician; and in 1866 he was chosen to succeed Sir C. Eastlake in the post of president, for which his chief recommendations were his social distinction, tact, urbanity and friendly and liberal consideration of his brother artists. Shortly after his election as president he was knighted, and in 1870 the degree of D.C.L. was conferred upon him by the university of Oxford. He died on the 5th of October 1878.

GRANT, GEORGE MONRO (1835–1902), principal of Queen's University, Kingston, Ontario, was born in Nova Scotia in 1835. He was educated at Glasgow university, where he had a brilliant academic career; and having entered the ministry of the Presbyterian Church, he returned to Canada and obtained a pastoral charge in Halifax, Nova Scotia, which he held from 1863 to 1877. He quickly gained a high reputation as a preacher and as an eloquent speaker on political subjects. When Canada was confederated in 1867 Nova Scotia was the province most strongly opposed to federal union. Grant threw the whole weight of his great influence in favour of confederation, and his oratory played an important part in securing the success of the movement. When the consolidation of the Dominion by means of railway construction was under discussion in 1872, Grant travelled from the Atlantic to the Pacific with the engineers who surveyed the route of the Canadian Pacific railway, and his book *Ocean to Ocean* (1873) was one of the first things that opened the eyes of Canadians to the value of the immense heritage they enjoyed. He never lost an opportunity, whether in the pulpit or on the platform, of pressing on his hearers that the greatest future for Canada lay in unity with the rest of the British Empire; and his broad statesman-like judgment made him an authority which politicians of all parties were glad to consult. In 1877 Grant was appointed principal of Queen's University, Kingston, Ontario, which through his exertions and influence expanded from a small denominational college into a large and influential educational centre; and he attracted to it an exceptionally able body of professors whose influence in speculation and research was widely felt during the quarter of a century that he remained at its head. In 1888 he visited Australia, New Zealand and South Africa, the effect of this experience being to strengthen still further the Imperialism which was the guiding principle of his political opinions. On the outbreak of the South African War in 1899 Grant was at first disposed to be hostile to the policy of Lord Salisbury and Mr Chamberlain; but his eyes were soon opened to the real nature of President Kruger's government, and he enthusiastically welcomed and supported the national feeling which sent men from the outlying portions of the Empire to assist in upholding British supremacy in South Africa. Grant did not live to see the conclusion of peace, his death occurring at Kingston on the 10th of May 1902. At the time of his death *The Times* observed that "it is acknowledged on all hands that in him the Dominion has lost one of the ablest men that it has yet produced." He was the author of a number of works, of which the most notable besides *Ocean to Ocean* are, *Advantages of Imperial Federation* (1889), *Our National Objects and Aims* (1890), *Religions of the World in Relation to Christianity* (1894) and volumes of sermons and lectures. Grant married in 1872 Jessie, daughter of William Lawson of Halifax.

GRANT, JAMES (1822–1887), British novelist, was born in Edinburgh on the 1st of August 1822. His father, John Grant, was a captain in the 92nd Gordon Highlanders and had served through the Peninsular War. For several years James Grant was in Newfoundland with his father, but in 1839 he returned to England, and entered the 62nd Foot as an ensign. In 1843 he resigned his commission and devoted himself to writing, first magazine articles, but soon a profusion of novels, full of vivacity and incident, and dealing mainly with military scenes and characters. His best stories, perhaps, were *The Romance of War* (his first, 1845), *Bothwell* (1851), *Frank Hilton; or, The Queen's Own* (1855), *The Phantom Regiment* and *Harry Ogilvie* (1856), *Lucy Arden* (1858), *The White Cockade* (1867), *Only an Ensign* (1871), *Shall I Win Her?* (1874), *Playing with Fire* (1887). Grant also wrote *British Battles on Land and Sea* (1873–1875) and valuable books on Scottish history. Permanent value attaches to his great work, in three volumes, on *Old and New Edinburgh* (1880). He was the founder and energetic promoter of the National Association for the Vindication of Scottish Rights. In 1875 he became a Roman Catholic. He died on the 5th of May 1887.

GRANT, JAMES AUGUSTUS (1827–1892), Scottish explorer of eastern equatorial Africa, was born at Nairn, where his father was the parish minister, on the 11th of April 1827. He was educated at the grammar school and Marischal College, Aberdeen, and in 1846 joined the Indian army. He saw active service in the Sikh War (1848–49), served throughout the mutiny of 1857, and was wounded in the operations for the relief of Lucknow. He returned to England in 1858, and in 1860 joined J. H. Speke (*q.v.*) in the memorable expedition which solved the problem of the Nile sources. The expedition left Zanzibar in October 1860 and reached Gondokoro, where the travellers were again in touch with civilization, in February 1863. Speke was the leader, but Grant carried out several investigations independently and made valuable botanical collections. He acted throughout in absolute loyalty to his comrade. In 1864 he published, as supplementary to Speke's account of their journey, *A Walk across Africa*, in which he dealt particularly with "the ordinary life and pursuits, the habits and feelings of the natives" and the economic value of the countries traversed. In 1864 he was awarded the patron's medal of the Royal Geographical Society, and in 1866 given the Companionship of the Bath in recognition of his services in the expedition. He served in the intelligence department of the Abyssinian expedition of 1868; for this he was made C.S.I. and received the Abyssinian medal. At the close of the war he retired from the army with the rank of lieutenant-colonel. He had married in 1865, and he now settled down at Nairn, where he died on the 11th of February 1892. He made contributions to the journals of various learned societies, the most notable being the "Botany of the Speke and Grant Expedition" in vol. xxix. of the *Transactions of the Linnaean Society*.

GRANT, SIR JAMES HOPE (1808–1875), English general, fifth and youngest son of Francis Grant of Kilgraston, Perthshire, and brother of Sir Francis Grant, P.R.A., was born on the 22nd of July 1808. He entered the army in 1826 as cornet in the 9th Lancers, and became lieutenant in 1828 and captain in 1835. In 1842 he was brigade-major to Lord Saltoun in the Chinese War, and specially distinguished himself at the capture of Chin-Kiang, after which he received the rank of major and the C.B. In the first Sikh War of 1845–46 he took part in the battle of Sobraon; and in the Punjab campaign of 1848–49 he commanded the 9th Lancers, and won high reputation in the battles of Chillianwalla and Guzerat (Gujarat). He was promoted brevet lieutenant-colonel and shortly afterwards to the same substantive rank. In 1854 he became brevet-colonel, and in 1856 brigadier of cavalry. He took a leading part in the suppression of the Indian mutiny of 1857, holding for some time the command of the cavalry division, and afterwards of a movable column of horse and foot. After rendering valuable service in the operations before Delhi and in the final assault on the city, he directed the victorious march of the cavalry and horse artillery despatched in the direction of Cawnpore to open up communication with the commander-in-chief Sir Colin Campbell, whom he met near the Alambagh, and who raised him to the rank of brigadier-general, and placed the whole force under his command during what remained of the perilous march to Lucknow for the relief of the residency. After the retirement towards Cawnpore he greatly aided in effecting there the total rout of the rebel troops, by making a detour which threatened their rear; and following in pursuit with a flying column, he defeated them with the loss of

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nearly all their guns at Serai Ghat. He also took part in the operations connected with the recapture of Lucknow, shortly after which he was promoted to the rank of major-general, and appointed to the command of the force employed for the final pacification of India, a position in which his unwearied energy, and his vigilance and caution united to high personal daring, rendered very valuable service. Before the work of pacification was quite completed he was created K.C.B. In 1859 he was appointed, with the local rank of lieutenant-general, to the command of the British land forces in the united French and British expedition against China. The object of the campaign was accomplished within three months of the landing of the forces at Pei-tang (1st of August 1860). The Taku Forts had been carried by assault, the Chinese defeated three times in the open and Peking occupied. For his conduct in this, which has been called the "most successful and the best carried out of England's little wars," he received the thanks of parliament and was gazetted G.C.B. In 1861 he was made lieutenant-general and appointed commander-in-chief of the army of Madras; on his return to England in 1865 he was made quartermaster-general at headquarters; and in 1870 he was transferred to the command of the camp at Aldershot, where he took a leading part in the reform of the educational and training systems of the forces, which followed the Franco-German War. The introduction of annual army manœuvres was largely due to Sir Hope Grant. In 1872 he was gazetted general. He died in London on the 7th of March 1875.

Incidents in the Sepoy War of 1857–58, compiled from the Private Journal of General Sir Hope Grant, K.C.B., together with some explanatory chapters by Capt. H. Knollys, Royal Artillery, was published in 1873, and *Incidents in the China War of 1860* appeared posthumously under the same editorship in 1875.

GRANT, SIR PATRICK (1804–1895), British field marshal, was the second son of Major John Grant, 97th Foot, of Auchterblair, Inverness-shire, where he was born on the 11th of September 1804. He entered the Bengal native infantry as ensign in 1820, and became captain in 1832. He served in Oudh from 1834 to 1838, and raised the Hariana Light Infantry. Employed in the adjutant-general's department of the Bengal army from 1838 until 1854, he became adjutant-general in 1846. He served under Sir Hugh Gough at the battle of Maharajpur in 1843, winning a brevet majority, was adjutant-general of the army at the battles of Moodkee in 1845 (twice severely wounded), and of Ferozshah and Sobraon in 1846, receiving the C.B. and the brevet rank of lieutenant-colonel. He took part in the battles of Chillianwalla and Gujarat in 1849, gaining further promotion, and was appointed aide-de-camp to the queen. He served also in Kohat in 1851 under Sir Charles Napier. Promoted major-general in 1854, he was commander-in-chief of the Madras army from 1856 to 1861. He was made K.C.B. in 1857, and on General Anson's death was summoned to Calcutta to take supreme command of the army in India. From Calcutta he directed the operations against the mutineers, sending forces under Havelock and Outram for the relief of Cawnpore and Lucknow, until the arrival of Sir Colin Campbell from England as commander-in-chief, when he returned to Madras. On leaving India in 1861 he was decorated with the G.C.B. He was promoted lieutenant-general in 1862, was governor of Malta from 1867 to 1872, was made G.C.M.G. in 1868, promoted general in 1870, field marshal in 1883 and colonel of the Royal Horse Guards and gold-stick-in-waiting to the queen in 1885. He married as his second wife, in 1844, Frances Maria, daughter of Sir Hugh (afterwards Lord) Gough. He was governor of the Royal Hospital, Chelsea, from 1874 until his death there on the 28th of March 1895.

GRANT, ROBERT (1814–1892), British astronomer, was born at Grantown, Scotland, on the 17th of June 1814. At the age of thirteen the promise of a brilliant career was clouded by a prolonged illness of such a serious character as to incapacitate him from all school-work for six years. At twenty, however, his health greatly improved, and he set himself resolutely, without assistance, to repair his earlier disadvantages by the diligent study of Greek, Latin, Italian and mathematics. Astronomy also occupied his attention, and it was stimulated by the return of Halley's comet in 1835, as well as by his success in observing the annular eclipse of the sun of the 15th of May 1836. After a short course at King's College, Aberdeen, he obtained in 1841 employment in his brother's counting-house in London. During this period the idea occurred to him of writing a history of physical astronomy. Before definitely beginning the work he had to search, amongst other records, those of the French Academy, and for that purpose took up his residence in Paris in 1845, supporting himself by giving lessons in English. He returned to London in 1847. *The History of Physical Astronomy from the Earliest Ages to the Middle of the Nineteenth Century* was first published in parts in *The Library of Useful Knowledge*, but after the issue of the ninth part this mode of publication was discontinued, and the work appeared as a whole in 1852. The main object of the work is, in the author's words, "to exhibit a view of the labours of successive inquirers in establishing a knowledge of the mechanical principles which regulate the movements of the celestial bodies, and in explaining the various phenomena relative to their physical constitution which observation with the telescope has disclosed." The lucidity and completeness with which a great variety of abstruse subjects were treated, the extent of research and the maturity of judgment it displayed, were the more remarkable, when it is remembered that this was the first published work of one who enjoyed no special opportunities, either for acquiring materials, or for discussing with others engaged in similar pursuits the subjects it treats of. The book at once took a leading place in astronomical literature, and earned for its author in 1856 the award of the Royal Astronomical Society's gold medal. In 1859 he succeeded John Pringle Nichol as professor of astronomy in the University of Glasgow. From time to time he contributed astronomical papers to the *Monthly Notices*, *Astronomische Nachrichten*, *Comptes rendus* and other scientific serials; but his principal work at Glasgow consisted in determining the places of a large number of stars with the Ertel transit-circle of the Observatory. The results of these labours, extending over twenty-one years, are contained in the *Glasgow Catalogue of 6415 Stars*, published in 1883. This was followed in 1892 by the *Second Glasgow Catalogue of 2156 Stars*, published a few weeks after his death, which took place on the 24th of October 1892.

See *Month. Noiices Roy. Astr. Society*, liii., 210 (E. Dunkin); *Nature*, Nov. 10, 1892; *The Times*, Nov. 2, 1892; *Roy. Society's Catalogue of Scient. Papers*. (A. A. R.*)

GRANT, ULYSSES SIMPSON (1822–1885), American soldier, and eighteenth president of the United States, was born at Point Pleasant, Ohio, on the 27th of April 1822. He was a descendant of Matthew Grant, a Scotchman, who settled in Dorchester, Massachusetts, in 1630. His earlier years were spent in helping his father, Jesse R. Grant, upon his farm in Ohio. In 1839 he was appointed to a place in the military academy at West Point, and it was then that his name assumed the form by which it is generally known. He was christened Hiram, after an ancestor, with Ulysses for a middle name. As he was usually called by his middle name, the congressman who recommended him for West Point supposed it to be his first name, and added thereto the name of his mother's family, Simpson. Grant was the best horseman of his class, and took a respectable place in mathematics, but at his graduation in 1843 he only ranked twenty-first in a class of thirty-nine. In September 1845 he went with his regiment to join the forces of General Taylor in Mexico; there he took part in the battles of Palo Alto, Resaca de la Palma and Monterey, and, after his transfer to General Scott's army, which he joined in March 1847, served at Vera Cruz, Cerro Gordo, Churubusco, Molino del Rey and at the storming of Chapultepec. He was breveted first lieutenant for gallantry at Molino del Rey and captain for gallantry at Chapultepec. In August 1848, after the close of the war, he married Julia T. Dent (1826–1902), and was for a while stationed in California and Oregon, but in 1854 he resigned his commission. His reputation in the service had suffered from allegations of intemperate drinking, which, whether well founded or not,

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certainly impaired his usefulness as a soldier. For the next six years he lived in St Louis, Missouri, earning a scanty subsistence by farming and dealings in real estate. In 1860 he removed to Galena, Illinois, and became a clerk in a leather store kept by his father. At that time his earning capacity seems not to have exceeded $800 a year, and he was regarded by his friends as a broken and disappointed man. He was living at Galena at the outbreak of hostilities between the North and South.

[For the history of the Civil War, and of Grant's battles and campaigns, the reader is referred to the article AMERICAN CIVIL WAR. To the " call to arms " of 1861 Grant promptly responded. After some delay he was commissioned colonel of the 21st Illinois regiment and soon afterwards brigadier-general. He was shortly assigned to a territorial command on the Mississippi, and first won distinction by his energy in seizing, on his own responsibility, the important point of Paducah, Kentucky, situated at the confluence of the two great waterways of the Tennessee and the Ohio (6th Sept. 1861). On the 7th of November he fought his first battle as a commander, that of Belmont (Missouri), which, if it failed to achieve any material result, certainly showed him to be a capable and skilful leader. Early in 1862 he was entrusted by General H. W. Halleck with the command of a large force to clear the lower reaches of the Cumberland and the Tennessee, and, whatever criticism may be passed on the general strategy of the campaign, Grant himself, by his able and energetic work, thoroughly deserved the credit of his brilliant success of Fort Donelson, where 15,000 Confederates were forced to capitulate. Grant and his division commanders were promoted to the rank of major-general U.S.V. soon afterwards, but Grant's own fortunes suffered a temporary eclipse owing to a disagreement with Halleck. When, after being virtually under arrest, he rejoined his army, it was concentrated about Savannah on the Tennessee, preparing for a campaign towards Corinth, Miss. On the 6th of April 1862 a furious assault on Grant's camps brought on the battle of Shiloh (*q.v.*). After two days' desperate fighting the Confederates withdrew before the combined attack of the Army of the Tennessee under Grant and the Army of the Ohio under Buell. But the Army of the Tennessee had been on the verge of annihilation on the evening of the first day, and Grant's leadership throughout was by no means equal to the emergency, though he displayed his usual personal bravery and resolution. In the grand advance of Halleck's armies which followed Shiloh, Grant was relieved of all important duties by his assignment as second in command of the whole force, and was thought by the army at large to be in disgrace. But Halleck soon went to Washington as general-in-chief, and Grant took command of his old army and of Rosecrans' Army of the Mississippi. Two victories (Iuka and Corinth) were won in the autumn of 1862, but the credit of both fell to Rosecrans, who commanded in the field, and the nadir of Grant's military fortunes was reached when the first advance on Vicksburg (*q.v.*), planned on an unsound basis, and complicated by a series of political intrigues (which had also caused the adoption of the original scheme), collapsed after the minor reverses of Holly Springs and Chickasaw Bayou (December 1862).

Grant's Civil War career.

It is fair to assume that Grant would have followed other unsuccessful generals into retirement, had he not shown that, whatever his mistakes or failures, and whether he was or was not sober and temperate in his habits, he possessed the iron determination and energy which in the eyes of Lincoln and Stanton,[1] and of the whole Northern people, was the first requisite of their generals. He remained then with his army near Vicksburg, trying one plan after another without result, until at last after months of almost hopeless work his perseverance was crowned with success—a success directly consequent upon a strange and bizarre campaign of ten weeks, in which his daring and vigour were more conspicuous than ever before. On the 4th of July 1863 the great fortress surrendered with 29,491 men, this being one of the most important victories won by the Union arms in the whole war. Grant was at once made a major-general in the regular army. A few months later the great reverse of Chickamauga created an alarm in the North commensurate with the elation that had been felt at the double victory of Vicksburg and Gettysburg, and Grant was at once ordered to Chattanooga, to decide the fate of the Army of the Cumberland in a second battle. Four armies were placed under his command, and three of these concentrated at Chattanooga. On the 25th of November 1863 a great three-days' battle ended with the crushing defeat of the Confederates, who from this day had no foothold in the centre and west.

After this, in preparation for a grand combined effort of all the Union forces, Grant was placed in supreme command, and the rank of lieutenant-general revived for him (March 1864). Grant's headquarters henceforth accompanied the Army of the Potomac, and the lieutenant-general directed the campaign in Virginia. This, with Grant's driving energy infused into the best army that the Union possessed, resolved itself into a series, almost uninterrupted, of terrible battles. Tactically the Confederates were almost always victorious, strategically, Grant, disposing of greatly superior forces, pressed back Lee and the Army of Northern Virginia to the lines of Richmond and Petersburg, while above all, in pursuance of his explicit policy of " attrition," the Federal leader used his men with a merciless energy that has few, if any, parallels in modern history. At Cold Harbor six thousand men fell in one useless assault lasting an hour, and after two months the Union armies lay before Richmond and Petersburg indeed, but had lost no fewer than 72,000 men. But Grant was unshaken in his determination. " I purpose to fight it out on this line, if it takes all summer," was his message from the battlefield of Spottsylvania to the chief of staff at Washington. Through many weary months he never relaxed his hold on Lee's army, and, in spite of repeated partial reverses, that would have been defeats for his predecessors, he gradually wore down his gallant adversary. The terrible cost of these operations did not check him: only on one occasion of grave peril were any troops sent from his lines to serve elsewhere, and he drew to himself the bulk of the men whom the Union government was recruiting by thousands for the final effort. Meanwhile all the other campaigns had been closely supervised by Grant, preoccupied though he was with the operations against his own adversary. At a critical moment he actually left the Virginian armies to their own commanders, and started to take personal command in a threatened quarter, and throughout he was in close touch with Sherman and Thomas, who conducted the campaigns on the south-east and the centre. That he succeeded in the efficient exercise of the chief command of armies of a total strength of over one million men, operating many hundreds of miles apart from each other, while at the same time he watched and manœuvred against a great captain and a veteran army in one field of the war, must be the greatest proof of Grant's powers as a general. In the end complete success rewarded the sacrifices and efforts of the Federals on every theatre of war: in Virginia, where Grant was in personal control, the merciless policy of attrition wore down Lee's army until a mere remnant was left for the final surrender.

Grant had thus brought the great struggle to an end, and was universally regarded as the saviour of the Union. A careful study of the history of the war thoroughly bears out the popular view. There were soldiers more accomplished, as was McClellan, more brilliant, as was Rosecrans, and more exact, as was Buell, but it would be difficult to prove that these generals, or indeed any others in the service, could have accomplished the task which Grant brought to complete success. Nor must it be supposed that Grant learned little from three years' campaigning

[1] President Lincoln was Grant's most unwavering supporter. Many amusing stories are told of his replies to various deputations which waited upon him to ask for Grant's removal. On one occasion he asked the critics to ascertain the brand of whisky favoured by Grant, so that he could send kegs of it to the other generals. The question of Grant's abstemiousness was and is of little importance. The cause at stake over-rode every prejudice and the people of the United States, since the war, have been in general content to leave the question alone, as was evidenced by the outcry raised in 1908, when President Taft reopened it in a speech at Grant's tomb.

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in high command. There is less in common than is often supposed between the buoyant energy that led Grant to Shiloh and the grim plodding determination that led him to Vicksburg and to Appomattox. Shiloh revealed to Grant the intensity of the struggle, and after that battle, appreciating to the full the material and moral factors with which he had to deal, he gradually trained his military character on those lines which alone could conduce to ultimate success. Singleness of purpose, and relentless vigour in the execution of the purpose, were the qualities necessary to the conduct of the vast enterprise of subduing the Confederacy. Grant possessed or acquired both to such a degree that he proved fully equal to the emergency. If in technical finesse he was surpassed by many of his predecessors and his subordinates, he had the most important qualities of a great captain, courage that rose higher with each obstacle, and the clear judgment to distinguish the essential from the minor issues in war.—(C. F. A.)]

After the assassination of President Lincoln a disposition was shown by his successor, Andrew Johnson, to deal severely with the Confederate leaders, and it was understood that indictments for treason were to be brought against General Lee and others. Grant, however, insisted that the United States government was bound by the terms accorded to Lee and his army at Appomattox. He went so far as to threaten to resign his commission if the president disregarded his protest. This energetic action on Grant's part saved the United States from a foul stain upon its escutcheon. In July 1866 the grade of general was created, for the first time since the organization of the government, and Grant was promoted to that position. In the following year he became involved in the deadly quarrel between President Johnson and Congress. To tie the president's hands Congress had passed the Tenure of Office Act, forbidding the president to remove any cabinet officer without the consent of the Senate; but in August 1867 President Johnson suspended Secretary Stanton and appointed Grant secretary of war *ad interim* until the pleasure of the Senate should be ascertained. Grant accepted the appointment under protest, and held it until the following January, when the Senate refused to confirm the president's action, and Secretary Stanton resumed his office. President Johnson was much disgusted at the readiness with which Grant turned over the office to Stanton, and a bitter controversy ensued between Johnson and Grant. Hitherto Grant had taken little part in politics. The only vote which he had ever cast for a presidential candidate was in 1856 for James Buchanan; and leading Democrats, so late as the beginning of 1868, hoped to make him their candidate in the election of that year; but the effect of the controversy with President Johnson was to bring Grant forward as the candidate of the Republican party. At the convention in Chicago on the 20th of May 1868 he was unanimously nominated on the first ballot. The Democratic party nominated the one available Democrat who had the smallest chance of beating him—Horatio Seymour, lately governor of New York, an excellent statesman, but at that time hopeless as a candidate because of his attitude during the war. The result of the contest was at no time in doubt; Grant received 214 electoral votes and Seymour 80.

Presidency, 1868.

The most important domestic event of Grant's first term as president was the adoption of the fifteenth amendment to the Constitution on the 30th of March 1870, providing that suffrage throughout the United States should not be restricted on account of race, colour or previous condition of servitude. The most important event in foreign policy was the treaty with Great Britain of the 8th of May 1871, commonly known as the Treaty of Washington, whereby several controversies between the United States and Great Britain, including the bitter questions as to damage inflicted upon the United States by the "Alabama" and other Confederate cruisers built and equipped in England, were referred to arbitration. In 1869 the government of Santo Domingo (or the Dominican Republic) expressed a wish for annexation by the United States, and such a step was favoured by Grant, but a treaty negotiated with this end in view failed to obtain the requisite two-thirds vote in the Senate. In May 1872 something was done towards alleviating the odious Reconstruction laws for dragooning the South, which had been passed by Congress in spite of the vetoes of President Johnson. The Amnesty Bill restored civil rights to all persons in the South, save from 300 to 500 who had held high positions under the Confederacy. As early as 1870 President Grant recommended measures of civil service reform, and succeeded in obtaining an act authorizing him to appoint a Civil Service commission. A commission was created, but owing to the hostility of the politicians in Congress it accomplished little. During the fifty years since Crawford's Tenure of Office Act was passed in 1820, the country had been growing more and more familiar with the spectacle of corruption in high places. The evil rose to alarming proportions during Grant's presidency, partly because of the immense extension of the civil service, partly because of the growing tendency to alliance between spoilsmen and the persons benefited by protective tariffs, and partly because the public attention was still so much absorbed in Southern affairs that little energy was left for curbing rascality in the North. The scandals, indeed, were rife in Washington, and affected persons in close relations with the president. Grant was ill-fitted for coping with the difficulties of such a situation. Along with high intellectual powers in certain directions, he had a simplicity of nature charming in itself, but often calculated to render him the easy prey of sharpers. He found it almost impossible to believe that anything could be wrong in persons to whom he had given his friendship, and on several occasions such friends proved themselves unworthy of him. The feeling was widely prevalent in the spring of 1872 that the interests of pure government in the United States demanded that President Grant should not be elected to a second term. This feeling led a number of high-minded gentlemen to form themselves into an organization under the name of Liberal Republicans. They held a convention at Cincinnati in May with the intention of nominating for the presidency Charles Francis Adams, who had ably represented the United States at the court of St James's during the Civil War. The convention, was, however, captured by politicians who converted the whole affair into a farce by nominating Horace Greeley, editor of the *New York Tribune*, who represented almost anything rather than the object for which the convention had been called together. The Democrats had despaired of electing a candidate of their own, and hoped to achieve success by adopting the Cincinnati nominee, should he prove to be an eligible person. The event showed that while their defeat in 1868 had taught them despondency, it had not taught them wisdom; it was still in their power to make a gallant fight by nominating a person for whom Republican reformers could vote. But with almost incredible fatuity, they adopted Greeley as their candidate. As a natural result Grant was re-elected by an overwhelming majority.

Second presidency.

The most important event of his second term was his veto of the Inflation Bill in 1874 followed by the passage of the Resumption Act in the following year. The country was still labouring under the curse of an inconvertible paper currency originating with the Legal Tender Act of 1862. There was a considerable party in favour of debasing the currency indefinitely by inflation, and a bill with that object was passed by Congress in April 1874. It was promptly vetoed by President Grant, and two months later he wrote a very sensible letter to Senator J. P. Jones of Nevada advocating a speedy return to specie payments. The passage of the Resumption Act in January 1875 was largely due to his consistent advocacy, and for these measures he deserves as high credit as for his victories in the field. In spite of these great services, popular dissatisfaction with the Republican party rapidly increased during the years 1874–1876. The causes were twofold: firstly, there was great dissatisfaction with the troubles in the Southern states, owing to the harsh Reconstruction laws and the robberies committed by the carpet-bag governments which those laws kept in power; secondly, the scandals at

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Washington, comprising wholesale frauds on the public revenue, awakened lively disgust. In some cases the culprits were so near to President Grant that many persons found it difficult to avoid the suspicion that he was himself implicated, and never perhaps was his bold upon popular favour so slight as in the summer and autumn of 1876.

After the close of his presidency in the spring of 1877 Grant started on a journey round the world, accompanied by his wife and one son. He was received with distinguished honours in England and on the continent of Europe, whence he made his way to India, China and Japan. After his return to America in September 1880 he went back to his old home in Galena, Illinois. A faction among the managers of the Republican party attempted to secure his nomination for a third term as president, and in the convention at Chicago in June 1880 he received a vote exceeding 300 during 36 consecutive ballots. Nevertheless, his opponents made such effective use of the popular prejudice against third terms that the scheme was defeated, and Garfield was named in his stead. In August 1881 General Grant bought a house in the city of New York. His income was insufficient for the proper support of his family, and accordingly he had become partner in a banking house in which one of his sons was interested along with other persons. The name of the firm was Grant and Ward. The ex-president invested in it all his available property, but paid no attention to the management of the business. His facility in giving his confidence to unworthy people was now to be visited with dire calamity. In 1884 the firm became bankrupt, and it was discovered that two of the partners had been perpetrating systematic and gigantic frauds. This severe blow left General Grant penniless, just at the time when he was beginning to suffer acutely from the disease which finally caused his death. Down to this time he had never made any pretensions to literary skill or talent, but on being approached by the *Century Magazine* with a request for some articles he undertook the work in order to keep the wolf from the door. It proved a congenial task, and led to the writing of his *Personal Memoirs*, a frank, modest and charming book, which ranks among the best standard military biographies. The sales earned for the general and his family something like half a million dollars. The circumstances in which it was written made it an act of heroism comparable with any that Grant ever showed as a soldier. During most of the time he was suffering tortures from cancer in the throat, and it was only four days before his death that he finished the manuscript. In the spring of 1885 Congress passed a bill creating him a general on the retired list; and in the summer he was removed to a cottage at Mount M'Gregor, near Saratoga, where he passed the last five weeks of his life, and where he died on the 23rd of July 1885. His body was placed in a temporary tomb in Riverside Drive, in New York City, overlooking the Hudson river.[1]

Later life.

Grant showed many admirable and lovable traits. There was a charming side to his trustful simplicity, which was at times almost like that of a sailor set ashore. He abounded in kindliness and generosity, and if there was anything especially difficult for him to endure, it was the sight of human suffering, as was shown on the night at Shiloh, where he lay out of doors in the icy rain rather than stay in a comfortable room where the surgeons were at work. His good sense was strong, as well as his sense of justice, and these qualities stood him in good service as president, especially in his triumphant fight against the greenback monster. Altogether, in spite of some shortcomings, Grant was a massive, noble and lovable personality, well fit to be remembered as one of the heroes of a great nation. (J. Fi.)

[1] The permanent tomb is of white granite and white marble and is 150 ft. high with a circular cupola topping a square building 90 ft. on the side and 72 ft. high; the sarcophagus, in the centre of the building, is of red Wisconsin porphyry. The cornerstone was laid by President Harrison in 1892, and the tomb was dedicated on the 27th of April 1897 with a splendid parade and addresses by President McKinley and General Horace Porter, president of the Grant Monument Association, which from 90,000 contributions raised the funds for the tomb.

General Grant's son, FREDERICK DENT GRANT (b. 1850), graduated at the U.S. Military Academy in 1871, was aide-de-camp to General Philip Sheridan in 1873–1881, and resigned from the army in 1881, after having attained the rank of lieutenant-colonel. He was U.S. minister to Austria in 1889–1893, and police commissioner of New York city in 1894–1898. He served as a brigadier-general of volunteers in the Spanish-American War of 1898, and then in the Philippines, becoming brigadier-general in the regular army in February 1901 and major-general in February 1906.

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GRANT (from A.-Fr. *graunter*, O. Fr. *greanter* for *creanter*, popular Lat. *creantare*, for *credentare*, to entrust, Lat. *credere*, to believe, trust), originally permission, acknowledgment, hence the gift of privileges, rights, &c., specifically in law, the transfer of property by an instrument in writing, termed a deed of grant. According to the old rule of common law, the immediate freehold in corporeal hereditaments lay in livery (see FEOFFMENT), whereas incorporeal hereditaments, such as a reversion, remainder, advowson, &c., lay in grant, that is, passed by the delivery of the deed of conveyance or grant without further ceremony. The distinction between property lying in livery and in grant is now abolished, the Real Property Act 1845 providing that all corporeal tenements and hereditaments shall be transferable as well by grant as by livery (see CONVEYANCING). A grant of personal property is properly termed an assignment or bill of sale.

GRANTH, the holy scriptures of the Sikhs, containing the spiritual and moral teaching of Sikhism (*q.v.*). The book is called the *Adi Granth Sahib* by the Sikhs as a title of respect, because it is believed by them to be an embodiment of the gurus. The title is generally applied to the volume compiled by the fifth guru Arjan, which contains the compositions of Guru Nanak, the founder of the Sikh religion; of his successors, Guru Angad, Amar Das, Ram Das and Arjan; hymns of the Hindu bhagats or saints, Jaidev, Namdev, Trilochan, Sain, Ramanand, Kabir, Rai Das, Pipa, Bhikhan, Beni, Parmanand Das, Sur Das, Sadhna and Dhanna Jat; verses of the Mahommedan saint called Farid; and panegyrics of the gurus by bards who either attended them or admired their characters. The compositions of the ninth guru, Teg Bahadur, were subsequently added to the *Adi Granth* by Guru Govind Singh. One recension of the sacred volume preserved at Mangat in the Gujrat district contains a hymn composed by Mira Bai, queen of Chitor. The *Adi Granth* contains passages of great picturesqueness and beauty. The original copy is said to be in Kartarpur in the Jullundur district, but the chief copy in use is now in the Har Mandar or Golden Temple at Amritsar, where it is daily read aloud by the attendant Granthis or scripture readers.

There is also a second *Granth* which was compiled by the Sikhs in 1734, and popularly known as the *Granth of the tenth Guru*, but it has not the same authority as the *Adi Granth*. It contains Guru Govind Singh's *Japji*, the *Akal Ustil* or Praise of the Creator, thirty-three *sawaias* (quatrains containing some of the main tenets of the guru and strong reprobation of idolatry and hypocrisy), and the *Vachitar Natak* or wonderful drama, in which the guru gives an account of his parentage, divine mission and the battles in which he was engaged. Then come three abridged translations by different hands of the *Devi Mahatamya*,

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an episode in the *Markandeya Puran*, in praise of Durga, the goddess of war. Then follow the *Gyan Parbodh* or awakening of knowledge, accounts of twenty-four incarnations of the deity, selected because of their warlike character; the *Hazare de Shabd*; the *Shastar Nam Mala*, which is a list of offensive and defensive weapons used in the guru's time, with special reference to the attributes of the Creator; the *Tria Charitar* or tales illustrating the qualities, but principally the deceit of women; the *Kabit*, compositions of a miscellaneous character; the *Zafarnama* containing the tenth guru's epistle to the emperor Aurangzeb, and several metrical tales in the Persian language. This *Granth* is only partially the composition of the tenth guru. The greater portion of it was written by bards in his employ.

Form of the Granth.

The two volumes are written in several different languages and dialects. The *Adi Granth* is largely in old Punjabi and Hindi, but Prākrit, Persian, Mahratti and Gujrati are also represented. The *Granth of the Tenth Guru* is written in the old and very difficult Hindi affected by literary men in the Patna district in the 16th century. In neither of these sacred volumes is there any separation of words. As there is no separation of words in Sanskrit, the *gyanis* or interpreters of the guru's hymns prefer to follow the ancient practice of junction of words. This makes the reading of the Sikh scriptures very difficult, and is one of the causes of the decline of the Sikh religion.

The hymns in the *Adi Granth* are arranged not according to the gurus or bhagats who compose them, but according to *rags* or musical measures. There are thirty-one such measures in the *Adi Granth*, and the hymns are arranged according to the measures to which they are composed. The gurus who composed hymns, namely the first, second, third, fourth, fifth and ninth gurus, all used the name Nanak as their nom-de-plume. Their compositions are distinguished by mahallas or wards. Thus the compositions of Guru Nanak are styled mahalla one, the compositions of Guru Angad are styled mahalla two, and so on. After the hymns of the gurus are found the hymns of the bhagats under their several musical measures. The Sikhs generally dislike any arrangement of the *Adi Granth* by which the compositions of each guru or bhagat should be separately shown.

The Sikh doctrines.

All the doctrines of the Sikhs are found set forth in the two *Granths* and in compositions called *Rahit Namas* and *Tanakhwah Namas*, which are believed to have been the utterances of the tenth guru. The cardinal principle of the sacred books is the unity of God, and starting from this premiss the rejection of idolatry and superstition. Thus Guru Govind Singh writes:

"Some worshipping stones, put them on their heads;
Some suspend lingams from their necks;
Some see the God in the South; some bow their heads to the West.
Some fools worship idols, others busy themselves with worshipping the dead.
The whole world entangled in false ceremonies hath not found God's secret."

Next to the unity of God comes the equality of all men in His sight, and so the abolition of caste distinctions. Guru Nanak says:

"Caste hath no power in the next world; there is a new order of beings,
Those whose accounts are honoured are the good."

The concremation of widows, though practised in later times by Hinduized Sikhs, is forbidden in the *Granth*. Guru Arjan writes:

"She who considereth her beloved as her God,
Is the blessed *sati* who shall be acceptable in God's Court."

It is a common belief that the Sikhs are allowed to drink wine and other intoxicants. This is not the case. Guru Nanak wrote:

"By drinking wine man committeth many sins."

Guru Arjan wrote:

"The fool who drinketh evil wine is involved in sin."

And in the Rahit Nama of Bhai Desa Singh there is the following:

"Let a Sikh take no intoxicant; it maketh the body lazy; it diverteth men from their temporal and spiritual duties, and inciteth them to evil deeds."

It is also generally believed that the Sikhs are bound to abstain from the flesh of kine. This, too, is a mistake, arising from the Sikh adoption of Hindu usages. The two *Granths* of the Sikhs and all their canonical works are absolutely silent on the subject. The Sikhs are not bound to abstain from any flesh, except that which is obviously unfit for human food, or what is killed in the Mahommedan fashion by jagging an animal's throat with a knife. This flesh-eating practice is one of the main sources of their physical strength. Smoking is strictly prohibited by the Sikh religion. Guru Teg Bahadur preached to his host as follows:

"Save the people from the vile drug, and employ thyself in the service of Sikhs and holy men. When the people abandon the degrading smoke and cultivate their lands, their wealth and prosperity shall increase, and they shall want for nothing . . . but when they smoke the vile vegetable, they shall grow poor and lose their wealth."

Guru Govind Singh also said:

"Wine is bad, bhang destroyeth one generation, but tobacco destroyeth all generations."

In addition to these prohibitions Sikhism inculcates most of the positive virtues of Christianity, and specially loyalty to rulers, a quality which has made the Sikhs valuable servants of the British crown.

The *Granth* was translated by Dr Trumpp, a German missionary, on behalf of the Punjab government in 1877, but his rendering is in many respects incorrect, owing to insufficient knowledge of the Punjabi dialects. *The Sikh Religion*, &c., in 6 vols. (London, 1909) is an authoritative version prepared by M. Macauliffe, in concert with the modern leaders of the Sikh sect. (M. M.)

GRANTHAM, THOMAS ROBINSON, 1st BARON (*c.* 1695–1770), English diplomatist and politician, was a younger son of Sir William Robinson, Bart. (1655–1736) of Newby, Yorkshire, who was member of parliament for York from 1697 to 1722. Having been a scholar and minor fellow of Trinity College, Cambridge, Thomas Robinson gained his earliest diplomatic experience in Paris and then went to Vienna, where he was English ambassador from 1730 to 1748. During 1741 he sought to make peace between the empress Maria Theresa and Frederick the Great, but in vain, and in 1748 he represented his country at the congress of Aix-la-Chapelle. Returning to England he sat in parliament for Christchurch from 1749 to 1761. In 1754 Robinson was appointed a secretary of state and leader of the House of Commons by the prime minister, the duke of Newcastle, and it was on this occasion that Pitt made the famous remark to Fox, "the duke might as well have sent us his jackboot to lead us." In November 1755 he resigned, and in April 1761 he was created Baron Grantham. He was master of the wardrobe from 1749 to 1754 and again from 1755 to 1760, and was joint postmaster-general in 1765 and 1766. He died in London on the 30th of September 1770.

Grantham's elder son, THOMAS ROBINSON (1738–1786), who became the 2nd baron, was born at Vienna on the 30th of November 1738. Educated at Westminster School and at Christ's College, Cambridge, he entered parliament as member for Christchurch in 1761, and succeeded to the peerage in 1770. In 1771 he was sent as ambassador to Madrid and retained this post until war broke out between England and Spain in 1779. From 1780 to 1782 Grantham was first commissioner of the board of trade and foreign plantations, and from July 1782 to April 1783 secretary for the foreign department under Lord Shelburne. He died on the 20th of July 1786, leaving two sons, Thomas Philip, who became the 3rd baron, and Frederick John afterwards 1st earl of Ripon.

THOMAS PHILIP ROBINSON, 3rd Baron Grantham (1781–1859), in 1803 took the name of Weddell instead of that of Robinson. In May 1833 he became Earl de Grey of Wrest on the death of his maternal aunt, Amabell Hume-Campbell, Countess de Grey (1751–1833), and he now took the name of de Grey. He was first lord of the admiralty under Sir Robert Peel in 1834–1835

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and from 1841 to 1844 lord-lieutenant of Ireland. On his death without male issue his nephew, George Frederick Samuel Robinson, afterwards marquess of Ripon (*q.v.*), succeeded as Earl de Grey.

GRANTHAM, a municipal and parliamentary borough of Lincolnshire, England; situated in a pleasant undulating country on the river Witham. Pop. (1901) 17,503. It is an important junction of the Great Northern railway, 105 m. N. by W. from London, with branch lines to Nottingham, Lincoln and Boston; while there is communication with Nottingham and the Trent by the Grantham canal. The parish church of St Wulfram is a splendid building, exhibiting all the Gothic styles, but mainly Early English and Decorated. The massive and ornate western tower and spire, about 280 ft. in height, are of early Decorated workmanship. There is a double Decorated crypt beneath the lady chapel. The north and south porches are fine examples of a later period of the same style. The delicately carved font is noteworthy. Two libraries, respectively of the 16th and 17th centuries, are preserved in the church. At the King Edward VI. grammar school Sir Isaac Newton received part of his education. A bronze statue commemorates him. The late Perpendicular building is picturesque, and the school was greatly enlarged in 1904. The Angel Hotel is a hostelry of the 15th century, with a gateway of earlier date. A conduit dating from 1597 stands in the wide market-place. Modern public buildings are a gild hall, exchange hall, and several churches and chapels. The Queen Victoria Memorial home for nurses was erected in 1902–1903. The chief industries are malting and the manufacture of agricultural implements. Grantham returns one member to parliament. The borough falls within the S. Kesteven or Stamford division of the county. Grantham was created a suffragan bishopric in the diocese of Lincoln in 1905. The municipal borough is under a mayor, 4 aldermen and 12 councillors. Area, 1726 acres.

Although there is no authentic evidence of Roman occupation, Grantham (Graham, Granham in Domesday Book) from its situation on the Ermine Street, is supposed to have been a Roman station. It was possibly a borough in the Saxon period, and by the time of the Domesday Survey it was a royal borough with 111 burgesses. Charters of liberties existing now only in the confirmation charter of 1377 were granted by various kings. From the first the town was governed by a bailiff appointed by the lord of the manor, but by the end of the 14th century the office of alderman had come into existence. Finally government under a mayor and alderman was granted by Edward IV. in 1463, and Grantham became a corporate town. Among later charters, that of James II., given in 1685, changed the title to that of government by a mayor and 6 aldermen, but this was afterwards reversed and the old order resumed. Grantham was first represented in parliament in 1467, and returned two members; but by the Redistribution Act of 1885 the number was reduced to one. Richard III. in 1483 granted a Wednesday market and two fairs yearly, namely on the feast of St Nicholas the Bishop, and the two following days, and on Passion Sunday and the day following. At the present day the market is held on Saturday, and fairs are held on the Monday, Tuesday and Wednesday following the fifth Sunday in Lent; a cherry fair on the 11th of July and two stock fairs on the 26th of October and the 17th of December.

GRANTLEY, FLETCHER NORTON, 1ST BARON (1716–1780), English politician, was the eldest son of Thomas Norton of Grantley, Yorkshire, where he was born on the 23rd of June 1716. He became a barrister in 1730, and, after a period of inactivity, obtained a large and profitable practice, becoming a K.C. in 1754, and afterwards attorney-general for the county palatine of Lancaster. In 1756 he was elected member of parliament for Appleby; he represented Wigan from 1761 to 1768, and was appointed solicitor-general for England and knighted in 1762. He took part in the proceedings against John Wilkes, and, having become attorney-general in 1763, prosecuted the 5th Lord Byron for the murder of William Chaworth, losing his office when the marquess of Rockingham came into power in July 1765. In 1769, being now member of parliament for Guildford, Norton became a privy councillor and chief justice in eyre of the forests south of the Trent, and in 1770 was chosen Speaker of the House of Commons. In 1777, when presenting the bill for the increase of the civil list to the king, he told George III. that parliament has "not only granted to your majesty a large present supply, but also a very great additional revenue; great beyond example; great beyond your majesty's highest expense." This speech aroused general attention and caused some irritation; but the Speaker was supported by Fox and by the city of London, and received the thanks of the House of Commons. George, however, did not forget these plain words, and after the general election of 1780, the prime minister, Lord North, and his followers declined to support the re-election of the retiring Speaker, alleging that his health was not equal to the duties of the office, and he was defeated when the voting took place. In 1782 he was made a peer as Baron Grantley of Markenfield. He died in London on the 1st of January 1789. He was succeeded as Baron Grantley by his eldest son William (1742–1822). Wraxall describes Norton as "a bold, able and eloquent, but not a popular pleader," and as Speaker he was aggressive and indiscreet. Derided by satirists as "Sir Bullface Doublefee," and described by Horace Walpole as one who "rose from obscure infamy to that infamous fame which will long stick to him," his character was also assailed by Junius, and the general impression is that he was a bot-tempered, avaricious and unprincipled man.

See H. Walpole, *Memoirs of the Reign of George III.*, edited by G. F. R. Barker (1894); Sir N. W. Wraxall, *Historical and Posthumous Memoirs*, edited by H. B. Wheatley (1884); and J. A. Manning, *Lives of the Speakers* (1850).

GRANTOWN, the capital of Speyside, Elginshire, Scotland. Pop. (1901) 1568. It lies on the left bank of the Spey, 23¾ m. S. of Forres by the Highland railway, with a station on the Great North of Scotland's Speyside line connecting Craigellachie with Boat of Garten. It was founded in 1776 by Sir James Grant of Grant, and became the chief seat of that ancient family, who had lived on their adjoining estate of Freuchie (Gaelic, *fraochach*, "heathery") since the beginning of the 15th century, and hence were usually described as the lairds of Freuchie. The public buildings include the town hall, court house and orphan hospital; and the industries are mainly connected with the cattle trade and the distilling of whisky. The town, built of grey granite, presents a handsome appearance, and being delightfully situated in the midst of the most beautiful pine and birch woods in Scotland, with pure air and a bracing climate, is an attractive resort. Castle Grant, immediately to the north, is the principal mansion of the earl of Seafield, the head of the Clan Grant. In a cave, still called "Lord Huntly's Cave," in a rocky glen in the vicinity, George, marquess of Huntly, lay hid during Montrose's campaign in 1644–45.

GRANULITE (Lat. *granulum*, a little grain), a name used by petrographers to designate two distinct classes of rocks. According to the terminology of the French school it signifies a granite in which both kinds of mica (muscovite and biotite) occur, and corresponds to the German *Granit*, or to the English "muscovite biotite granite." This application has not been accepted generally. To the German petrologists "granulite" means a more or less banded fine-grained metamorphic rock, consisting mainly of quartz and felspar in very small irregular crystals, and containing usually also a fair number of minute rounded pale-red garnets. Among English and American geologists the term is generally employed in this sense. The granulites are very closely allied to the gneisses, as they consist of nearly the same minerals, but they are finer grained, have usually less perfect foliation, are more frequently garneti ferous, and have some special features of microscopic structure. In the rocks of this group the minerals, as seen in a microscopic slide, occur as small rounded grains forming a mosaic closely fitted together. The individual crystals have never perfect form, and indeed rarely any traces of it. In some granulites they interlock, with irregular borders; in others they have been drawn out and

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flattened into tapering lenticles by crushing. In most cases they are somewhat rounded with smaller grains between the larger. This is especially true of the quartz and felspar which are the predominant minerals; mica always appears as flat scales (irregular or rounded but not hexagonal). Both muscovite and biotite may be present and vary considerably in abundance; very commonly they have their flat sides parallel and give the rock a rudimentary schistosity, and they may be aggregated into bands—in which case the granulites are indistinguishable from certain varieties of gneiss. The garnets are very generally larger than the above-mentioned ingredients, and easily visible with the eye as pink spots on the broken surfaces of the rock. They usually are filled with enclosed grains of the other minerals.

The felspar of the granulites is mostly orthoclase or cryptoperthite; microcline, oligoclase and albite are also common. Basic felspars occur only rarely. Among accessory minerals, in addition to apatite, zircon, and iron oxides, the following may be mentioned: hornblende (not common), riebeckite (rare), epidote and zoisite, calcite, sphene, andalusite, sillimanite, kyanite, hercynite (a green spinel), rutile, orthite and tourmaline. Though occasionally we may find larger grains of felspar, quartz or epidote, it is more characteristic of these rocks that all the minerals are in small, nearly uniform, imperfectly shaped individuals.

On account of the minuteness with which it has been described and the important controversies on points of theoretical geology which have arisen regarding it, the granulite district of Saxony (around Rosswein, Penig, &c.) may be considered the typical region for rocks of this group. It should be remembered that though granulites are probably the commonest rocks of this country, they are mingled with granites, gneisses, gabbros, amphibolites, mica schists and many other petrographical types. All of these rocks show more or less metamorphism either of a thermal character or due to pressure and crushing. The granites pass into gneiss and granulite; the gabbros into flaser gabbro and amphibolite; the slates often contain andalusite or chiastolite, and show transitions to mica schists. At one time these rocks were regarded as Archean gneisses of a special type. Johannes Georg Lehmann propounded the hypothesis that their present state was due principally to crushing acting on them in a solid condition, grinding them down and breaking up their minerals, while the pressure to which they were subjected welded them together into coherent rock. It is now believed, however, that they are comparatively recent and include sedimentary rocks, partly of Palaeozoic age, and intrusive masses which may be nearly massive or may have gneissose, flaser or granulitic structures. These have been developed largely by the injection of semi-consolidated highly viscous intrusions, and the varieties of texture are original or were produced very shortly after the crystallization of the rocks. Meanwhile, however, Lehmann's advocacy of post-consolidation crushing as a factor in the development of granulites has been so successful that the terms granulitization and granulitic structures are widely employed to indicate the results of dynaniometamorphism acting on rocks at a period long after their solidification.

The Saxon granulites are apparently for the most part igneous and correspond in composition to granites and porphyries. There are, however, many granulites which undoubtedly were originally sediments (arkoses, grits and sandstones). A large part of the highlands of Scotland consists of paragranulites of this kind, which have received the group name of "Moine gneisses."

Along with the typical acid granulites above described, in Saxony, India, Scotland and other countries there occur dark-coloured basic granulites ("trap granulites"). These are fine-grained rocks, not usually banded, nearly black in colour with small red spots of garnet. Their essential minerals are pyroxene, plagioclase and garnet: chemically they resemble the gabbros. Green augite and hypersthene form a considerable part of these rocks, they may contain also biotite, hornblende and quartz. Around the garnets there is often a radial grouping of small grains of pyroxene and hornblende in a clear matrix of felspar: these "centric" structures are frequent in granulites. The rocks of this group accompany gabbro and serpentine, but the exact conditions under which they are formed and the significance of their structures is not very clearly understood. (J. S. F.)

GRANVELLA, ANTOINE PERRENOT, CARDINAL DE (1517–1586), one of the ablest and most influential of the princes of the church during the great political and ecclesiastical movements which immediately followed the appearance of Protestantism in Europe, was born on the 20th of August 1517 at Besançon, where his father, Nicolas Perrenot de Granvella (1484–1550), who afterwards became chancellor of the empire under Charles V., was practising as a lawyer. Later Nicolas held an influential position in the Netherlands, and from 1530 until his death he was one of the emperor's most trusted advisers in Germany. On the completion of his studies in law at Padua and in divinity at Louvain, Antoine held a canonry at Besançon, but he was promoted to the bishopric of Arras when barely twenty-three (1540). In his episcopal capacity he attended several diets of the empire, as well as the opening meetings of the council of Trent; and the influence of his father, now chancellor, led to his being entrusted with many difficult and delicate pieces of public business, in the execution of which he developed a rare talent for diplomacy, and at the same time acquired an intimate acquaintance with most of the currents of European politics. One of his specially noteworthy performances was the settlement of the terms of peace after the defeat of the league of Schmalkalden at Mühlberg in 1547, a settlement in which, to say the least, some particularly sharp practice was exhibited. In 1550 he succeeded his father in the office of secretary of state; in this capacity he attended Charles in the war with Maurice, elector of Saxony, accompanied him in the flight from Innsbruck, and afterwards drew up the treaty of Passau (August 1552). In the following year he conducted the negotiations for the marriage of Mary of England and Philip II. of Spain, to whom, in 1555, on the abdication of the emperor, he transferred his services, and by whom he was employed in the Netherlands. In April 1559 Granvella was one of the Spanish commissioners who arranged the peace of Cateau Cambrésis, and on Philip's withdrawal from the Netherlands in August of the same year he was appointed prime minister to the regent, Margaret of Parma. The policy of repression which in this capacity he pursued during the next five years secured for him many tangible rewards, in 1560 he was elevated to the archiepiscopal see of Malines, and in 1561 he received the cardinal's hat; but the growing hostility of a people whose religious convictions he had set himself to trample under foot ultimately made it impossible for him to continue in the Low Countries; and by the advice of his royal master he, in March 1564, retired to Franche Comté. Nominally this withdrawal was only of a temporary character, but it proved to be final. The following six years were spent in comparative quiet, broken, however, by a visit to Rome in 1565; but in 1570 Granvella, at the call of Philip, resumed public life by accepting another mission to Rome. Here he helped to arrange the alliance between the Papacy, Venice and Spain against the Turks, an alliance which was responsible for the victory of Lepanto. In the same year he became viceroy of Naples, a post of some difficulty and danger, which for five years he occupied with ability and success. He was summoned to Madrid in 1575 by Philip II. to be president of the council for Italian affairs. Among the more delicate negotiations of his later years were those of 1580, which had for their object the ultimate union of the crowns of Spain and Portugal, and those of 1584, which resulted in a check to France by the marriage of the Spanish infanta Catherine to Charles Emmanuel, duke of Savoy. In the same year he was made archbishop of Besançon, but meanwhile he had been stricken with a lingering disease; he was never enthroned, but died at Madrid on the 21st of September 1586. His body was removed to Besançon, where his father had been buried. Granvella was a man of great learning, which was equalled by his industry, and these qualities made him almost indispensable both to Charles V. and to Philip II.

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Numerous letters and memoirs of Granvella are preserved in the archives of Besançon. These were to some extent made use of by Prosper Levêque in his *Mémoires pour servir* (1753), as well as by the Abbé Boisot in the *Trésor de Granvelle*. A commission for publishing the whole of the letters and memoirs was appointed by Guizot in 1834, and the result has been the issue of nine volumes of the *Papiers d'Etat du cardinal de Granvelle*, edited by C. Weiss (Paris, 1841–1852). They form a part of the *Collection de documents inédits sur l'histoire de France*, and were supplemented by the *Correspondance du cardinal Granvelle, 1565–1536*, edited by M. E. Poullet and G. J. C. Piot (12 vols., Brussels, 1878–1896). See also the anonymous *Histoire du cardinal de Granvelle*, attributed to Courchetet D'Esnans (Paris, 1761); J. L. Motley, *Rise of the Dutch Republic*; M. Philippson, *Ein Ministerium unter Philipp II.* (Berlin, 1895); and the *Cambridge Modern History* (vol. iii. 1904).

GRANVILLE, GRANVILLE GEORGE LEVESON-GOWER, 2ND EARL (1815–1891), English statesman, eldest son of the 1st Earl Granville (1773–1846), by his marriage with Lady Harriet, daughter of the duke of Devonshire, was born in London on the 11th of May 1815. His father, Granville Leveson-Gower, was a younger son of Granville, 2nd Lord Gower and 1st marquess of Stafford (1720–1803), by his third wife; an elder son by the second wife (a daughter of the 1st duke of Bridgwater) became the 2nd marquess of Stafford, and his marriage with the daughter and heiress of the 17th earl of Sutherland (countess of Sutherland in her own right) led to the merging of the Gower and Stafford titles in that of the dukes of Sutherland (created 1833), who represent the elder branch of the family. As Lord Granville Leveson-Gower, the 1st Earl Granville (created viscount in 1815 and earl in 1833) entered the diplomatic service and was ambassador at St Petersburg (1804–1807) and at Paris (1824–1841). He was a Liberal in politics and an intimate friend of Canning. The title of Earl Granville had been previously held in the Carteret family.

After being at Eton and Christ Church, Oxford, young Lord Leveson went to Paris for a short time under his father, and in 1836 was returned to parliament in the Whig interest for Morpeth. For a short time he was under-secretary for foreign affairs in Lord Melbourne's ministry. In 1840 he married Lady Acton (Marie Louise Pelline de Dalberg, widow of Sir Richard Acton; see ACTON and DALBERG). From 1841 till his father's death in 1846, when he succeeded to the title, he sat for Lichfield. In the House of Lords he signalized himself as a Free Trader, and Lord John Russell made him master of the buckhounds (1846). He proved a useful member of the party, and his influence and amiable character were valuable in all matters needing diplomacy and good breeding. He became vice-president of the Board of Trade in 1848, and took a prominent part in promoting the great exhibition of 1851. In the latter year, having already been admitted to the cabinet, he succeeded Palmerston at the foreign office until Lord John Russell's defeat in 1852; and when Lord Aberdeen formed his government at the end of the year, he became first president of the council, and then chancellor of the duchy of Lancaster (1854). Under Lord Palmerston (1855) he was president of the council. His interest in education (a subject associated with this office) led to his election (1856) as chancellor of the London University, a post he held for thirty-five years; and he was a prominent champion of the movement for the admission of women, and also of the teaching of modern languages. From 1855 Lord Granville led the Liberals in the Upper House, both in office, and, after Palmerston's resignation in 1858, in opposition. He went in 1856 as head of the British mission to the tsar's coronation in Moscow. In June 1850 the queen, embarrassed by the rival ambitions of Palmerston and Russell, sent for him to form a ministry, but he was unable to do so, and Palmerston again became prime minister, with Lord John as foreign secretary and Granville as president of the council. In 1860 his wife died, and to this heavy loss was shortly added that of his great friends Lord and Lady Canning and of his mother (1862); but he devoted himself to his political work, and retained his office when, on Palmerston's death in 1865, Lord Russell (now a peer) became prime minister and took over the leadership in the House of Lords. He was made Lord Warden of the Cinque Ports, and in the same year married again, his second wife being Miss Castalia Campbell. From 1866 to 1868 he was in opposition, but in December 1868 he became colonial secretary in Gladstone's first ministry. His tact was invaluable to the government in carrying the Irish Church and Land Bills through the House of Lords. On the 27th of June 1870, on Lord Clarendon's death, he was transferred to the foreign office. Lord Granville's name is mainly associated with his career as foreign secretary (1870–1874 and 1880–1885); but the Liberal foreign policy of that period was not distinguished by enterprise or "backbone." Lord Granville personally was patient and polite, but his courteous and pacific methods were somewhat inadequate in dealing with the new situation then arising in Europe and outside it; and foreign governments had little scruple in creating embarrassments for Great Britain, and relying on the disinclination of the Liberal leaders to take strong measures. The Franco-German War of 1870 broke out within a few days of Lord Granville's quoting in the House of Lords (11th of July) the curiously unprophetic opinion of the permanent under-secretary (Mr Hammond) that "he had never known so great a lull in foreign affairs." Russia took advantage of the situation to denounce the Black Sea clauses of the treaty of Paris, and Lord Granville's protest was ineffectual. In 1871 an intermediate zone between Asiatic Russia and Afghanistan was agreed on between him and Shuválov; but in 1873 Russia took possession of Khiva, within the neutral zone, and Lord Granville had to accept the aggression. When the Conservatives came into power in 1874, his part for the next six years was to criticize Disraeli's "spirited" foreign policy, and to defend his own more pliant methods. He returned to the foreign office in 1880, only to find an anti-British spirit developing in German policy which the temporizing methods of the Liberal leaders were generally powerless to deal with. Lord Granville failed to realize in time the importance of the Angra Pequeña question in 1883–1884, and he was forced, somewhat ignominiously, to yield to Bismarck over it. Whether in Egypt, Afghanistan or equatorial and south-west Africa, British foreign policy was dominated by suavity rather than by the strength which commands respect. Finally, when Gladstone took up Home Rule for Ireland, Lord Granville, whose mind was similarly receptive to new ideas, adhered to his chief (1886), and gracefully gave way to Lord Rosebery when the latter was preferred to the foreign office; the Liberals had now realized that they had lost ground in the country by Lord Granville's occupancy of the post. He went to the Colonial Office for six months, and in July 1886 retired from public life. He died in London on the 31st of March 1891, being succeeded in the title by his son, born in 1872. Lord Granville was a man of much charm and many friendships, and an admirable after-dinner speaker. He spoke French like a Parisian, and was essentially a diplomatist; but he has no place in history as a constructive statesman.

The life of Lord Granville (1905), by Lord Fitzmaurice, is full of interesting material for the history of the period, but being written by a Liberal, himself an under-secretary for foreign affairs, it explains rather than criticizes Lord Granville's work in that department.

(H. CH.)

GRANVILLE, JOHN CARTERET, EARL (1690–1763), English statesman, commonly known by his earlier title as Lord Carteret, born on the 22nd of April 1690, was the son of George, 1st Lord Carteret, by his marriage with Grace Granville, daughter of Sir John Granville, 1st earl of Bath, and great grandson of the Elizabethan admiral, Sir Richard Grenville, famous for his death in the "Revenge." The family of Carteret was settled in the Channel Islands, and was of Norman descent. John Carteret was educated at Westminster, and at Christ Church, Oxford. Swift says that "with a singularity scarce to be justified he carried away more Greek, Latin and philosophy than properly became a person of his rank." Throughout life Carteret not only showed a keen love of the classics, but a taste for, and a knowledge of, modern languages and literatures. He was almost the only Englishman of his time who knew German. Harte, the author of the *Life of Gustavus Adolphus*, acknowledged the aid which Carteret had given him. On the

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17th of October 1710 he married at Longleat Lady Frances Worsley, grand-daughter of the first Viscount Weymouth. He took his seat in the Lords on the 25th of May 1711. Though his family, on both sides, had been devoted to the house of Stuart, Carteret was a steady adherent of the Hanoverian dynasty. He was a friend of the Whig leaders Stanhope and Sunderland, took a share in defeating the Jacobite conspiracy of Bolingbroke on the death of Queen Anne, and supported the passing of the Septennial Act. Carteret's interests were however in foreign, and not in domestic policy. His serious work in public life began with his appointment, early in 1719, as ambassador to Sweden. During this and the following year he was employed in saving Sweden from the attacks of Peter the Great, and in arranging the pacification of the north. His efforts were finally successful. During this period of diplomatic work he acquired an exceptional knowledge of the affairs of Europe, and in particular of Germany, and displayed great tact and temper in dealing with the Swedish senate, with Queen Ulrica, with the king of Denmark and Frederick William I. of Prussia. But he was not qualified to hold his own in the intrigues of court and parliament in London. Named secretary of state for the southern department on his return home, he soon became helplessly in conflict with the intrigues of Townshend and Sir Robert Walpole. To Walpole, who looked upon every able colleague, or subordinate, as an enemy to be removed, Carteret was exceptionally odious. His capacity to speak German with the king would alone have made Sir Robert detest him. When, therefore, the violent agitation in Ireland against Wood's halfpence (see SWIFT, JONATHAN) made it necessary to replace the duke of Grafton as lord lieutenant, Carteret was sent to Dublin. He landed in Dublin on the 23rd of October 1724, and remained there till 1730. In the first months of his tenure of office he had to deal with the furious opposition to Wood's halfpence, and to counteract the effect of Swift's *Drapier's Letters*. The lord lieutenant had a strong personal liking for Swift, who was also a friend of Lady Carteret's family. It is highly doubtful whether Carteret could have reconciled his duty to the crown with his private friendships, if government had persisted in endeavouring to force the detested coinage on the Irish people. Wood's patent was however withdrawn, and Ireland settled down. Carteret was a profuse and popular lord lieutenant who pleased both the "English interest" and the native Irish. He was at all times addicted to lavish hospitality, and according to the testimony of contemporaries was too fond of burgundy. When he returned to London in 1730, Walpole was firmly established as master of the House of Commons, and as the trusted minister of King George II. He had the full confidence of Queen Caroline, whom he prejudiced against Carteret. Till the fall of Walpole in 1742, Carteret could take no share in public affairs except as a leader of opposition of the Lords. His brilliant parts were somewhat obscured by his rather erratic conduct, and a certain contempt, partly aristocratic and partly intellectual, for commonplace men and ways. He endeavoured to please Queen Caroline, who loved literature, and he has the credit, on good grounds, of having paid the expenses of the first handsome edition of *Don Quixote* to please her. But he reluctantly, and most unwisely, allowed himself to be entangled in the scandalous family quarrel between Frederick, prince of Wales, and his parents. Queen Caroline was provoked into classing him and Bolingbroke, as "the two most worthless men of parts in the country." Carteret took the popular side in the outcry against Walpole for not making war on Spain. When the War of the Austrian Succession approached, his sympathies were entirely with Maria Theresa—mainly on the ground that the fall of the house of Austria would dangerously increase the power of France, even if she gained no accession of territory. These views made him welcome to George II., who gladly accepted him as secretary of state in 1742. In 1743 he accompanied the king of Germany, and was present at the battle of Dettingen on the 27th of June. He held the secretaryship till November 1744. He succeeded in promoting an agreement between Maria Theresa and Frederick. He understood the relations of the European states, and the interests of Great Britain among them. But the defects which had rendered him unable to baffle the intrigues of Walpole made him equally unable to contend with the Pelhams. His support of the king's policy was denounced as subservience to Hanover. Pitt called him "an execrable, a sole minister who had renounced the British nation." A few years later Pitt adopted an identical policy, and professed that whatever he knew he had learnt from Carteret. On the 18th of October 1744 Carteret became Earl Granville on the death of his mother. His first wife died in June 1743 at Aschaffenburg, and in April 1744 he married Lady Sophia Fermor, daughter of Lord Pomfret—a fashionable beauty and "reigning toast" of London society, who was younger than his daughters. "The nuptials of our great Quixote and the fair Sophia," and Granville's ostentatious performance of the part of lover, were ridiculed by Horace Walpole. The countess Granville died on the 7th of October 1745, leaving one daughter Sophia, who married Lord Shelburne, 1st marquis of Lansdowne. This marriage may have done something to increase Granville's reputation for eccentricity. In February 1746 he allowed himself to be entrapped by the intrigues of the Pelhams into accepting the secretaryship, but resigned in forty-eight hours. In June 1751 he became president of the council, and was still liked and trusted by the king, but his share in government did not go beyond giving advice, and endeavouring to forward ministerial arrangements. In 1756 he was asked by Newcastle to become prime minister as the alternative to Pitt, but Granville, who perfectly understood why the offer was made, declined and supported Pitt. When in October 1761 Pitt, who had information of the signing of the "Family Compact" wished to declare war on Spain, and declared his intention to resign unless his advice was accepted, Granville replied that "the opinion of the majority (of the Cabinet) must decide." He spoke in complimentary terms of Pitt, but resisted his claim to be considered as a "sole minister" or, in the modern phrase, "a prime minister." Whether he used the words attributed to him in the Annual Register for 1761 is more than doubtful, but the minutes of council show that they express his meaning. Granville remained in office as president till his death. His last act was to listen while on his death-bed to the reading of the preliminaries of the treaty of Paris. He was so weak that the under-secretary, Robert Wood, author of an essay on *The Original Genius of Homer*, would have postponed the business, but Granville said that it "could not prolong his life to neglect his duty," and quoted the speech of Sarpedon from *Iliad* xii. 322-328, repeating the last word (*λαμεν*) "with a calm and determined resignation." He died in his house in Arlington Street, London, on the 22nd of January 1763. The title of Granville descended to his son Robert, who died without issue in 1776, when the earldom of this creation became extinct.

A somewhat partisan life of Granville was published in 1887, by Archibald Ballantyne, under the title of *Lord Carteret, a Political Biography*.

GRANVILLE, a town of Cumberland county, New South Wales, 13 m. by rail W. of Sydney. Pop. (1901) 5094. It is an important railway junction and manufacturing town, producing agricultural implements, tweed, pipes, tiles and bricks; there are also tanneries, flour-mills, and kerosene and meat export works. It became a municipality in 1885.

GRANVILLE, a fortified sea-port and bathing-resort of north-western France, in the department of Manche, at the mouth of the Bosq, 85 m. S. by W. of Cherbourg by rail. Pop. (1906) 10,530. Granville consists of two quarters, the upper town built on a promontory jutting into the sea and surrounded by ramparts, and the lower town and harbour lying below it. The barracks and the church of Notre-Dame, a low building of granite, partly Romanesque, partly late Gothic in style, are in the upper town. The port consists of a tidal harbour, two floating basins and a dry dock. Its fleets take an active part in deep sea fishing, including the cod-fishing off Newfoundland, and oyster-fishing is carried on. It has regular communication

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with Guernsey and Jersey, and with the islands of St Pierre and Miquelon. The principal exports are eggs, vegetables and fish; coal, timber and chemical manures are imported. The industries include ship-building, fish-salting, the manufacture of cod-liver oil, the preserving of vegetables, dyeing, metal-founding, rope-making and the manufacture of chemical manures. Among the public institutions are a tribunal and a chamber of commerce. In the commune are included the Iles Chausey about 7½ m. N.W. of Granville (see CHANNEL ISLANDS). Granville, before an insignificant village, was fortified by the English in 1437, taken by the French in 1441, bombarded and burned by the English in 1695, and unsuccessfully besieged by the Vendean troops in 1793. It was again bombarded by the English in 1803.

GRANVILLE, a village in Licking county, Ohio, U.S.A., in the township of Granville, about 6 m. W. of Newark and 27 m. E. by N. of Columbus. Pop. of the village (1910) 1304; of the township (1910) 2442. Granville is served by the Toledo & Ohio Central and the Ohio Electric railways, the latter reaching Newark (where it connects with the Pittsburg, Cincinnati, Chicago & St Louis and the Baltimore & Ohio railways), Columbus, Dayton, Zanesville and Springfield. Granville is the seat of Denison University, founded in 1831 by the Ohio Baptist Education Society and opened as a manual labour school, called the Granville Literary and Theological Institution. It was renamed Granville College in 1845, and took its present name in 1854 in honour of William S. Denison of Adamsville, Ohio, who had given $10,000 to the college. The university comprised in 1907–1908 five departments: Granville College (229 students), the collegiate department for men; Shepardson College (246 students, including 82 in the preparatory department), the collegiate department for women, founded as the Young Ladies' Institute of Granville in 1859, given to the Baptist denomination in 1887 by Dr Daniel Shepardson, its principal and owner, and closely affiliated for scholastic purposes, since 1900, with the university, though legally it is still a distinct institution; Doane Academy (137 students), the preparatory department for boys, established in 1832, named Granville Academy in 1887, and renamed in 1895 in honour of William H. Doane of Cincinnati, who gave to it its building; a conservatory of music (137 students); and a school of art (38 students).

In 1805 the Licking Land Company, organized in the preceding year in Granville, Massachusetts, bought 20,040 acres of land in Ohio, including the site of Granville; the town was laid out, and in the last months of that year settlers from Granville, Mass., began to arrive. By January 1806 the colony numbered 234 persons; the township was incorporated in 1806 and the village was incorporated in 1831. There are several remarkable Indian mounds near Granville, notably one shaped like an alligator.

See Henry Bushnell, *History of Granville, Ohio* (Columbus, O., 1889).

GRAPE, the fruit of the vine (*q.v.*). The word is adopted from the O. Fr. *grape*, mod. *grappe*, bunch or cluster of flowers or fruit, *grappes de raisin*, bunch of grapes. The French word meant properly a hook; cf. M.H.G. *krapfe*, Eng. "grapnel," and "cramp." The development of meaning seems to be vine-hook, cluster of grapes cut with a hook, and thence in English a single grape of a cluster. The projectile called "grape" or "grape-shot," formerly used with smooth-bore ordnance, took its name from its general resemblance to a bunch of grapes. It consisted of a number of spherical bullets (heavier than those of the contemporary musket) arranged in layers separated by thin iron plates, a bolt passing through the centre of the plates binding the whole together. On being discharged the projectile delivered the bullets in a shower somewhat after the fashion of case-shot.

GRAPHICAL METHODS, devices for representing by geometrical figures the numerical data which result from the quantitative investigation of phenomena. The simplest application is met with in the representation of tabular data such as occur in statistics. Such tables are usually of single entry, *i.e.* to a certain value of one variable there corresponds one, and only one, value of the other variable. To construct the graph, as it is called, of such a table, Cartesian co-ordinates are usually employed. Two lines or axes at right angles to each other are chosen, intersecting at a point called the origin; the horizontal axis is the axis of abscissae, the vertical one the axis of ordinates. Along one, say the axis of abscissae, distances are taken from the origin corresponding to the values of one of the variables; at these points perpendiculars are erected, and along these ordinates distances are taken corresponding to the related values of the other variable. The curve drawn through these points is the graph. A general inspection of the graph shows in bold relief the essential characters of the table. For example, if the world's production of corn over a number of years be plotted, a poor yield is represented by a depression, a rich one by a peak, a uniform one over several years by a horizontal line and so on. Moreover, such graphs permit a convenient comparison of two or more different phenomena, and the curves render apparent at first sight similarities or differences which can be made out from the tables only after close examination. In making graphs for comparison, the scales chosen must give a similar range of variation, otherwise the correspondence may not be discerned. For example, the scales adopted for the average consumption of tea and sugar must be ounces for the former and pounds for the latter. Cartesian graphs are almost always yielded by automatic recording instruments, such as the barograph, meteorograph, seismometer, &c. The method of polar co-ordinates is more rarely used, being only specially applicable when one of the variables is a direction or recorded as an angle. A simple case is the representation of photometric data, *i.e.* the value of the intensity of the light emitted in different directions from a luminous source (see LIGHTING).

The geometrical solution of arithmetical and algebraical problems is usually termed graphical analysis; the application to problems in mechanics is treated in MECHANICS, § 5, *Graphic Statics*, and DIAGRAM. A special phase is presented in VECTOR ANALYSIS.

GRAPHITE, a mineral species consisting of the element carbon crystallized in the rhombohedral system. Chemically, it is thus indentical with the cubic mineral diamond, but between the two there are very wide differences in physical characters. Graphite is black and opaque, whilst diamond is colourless and transparent; it is one of the softest (H = 1) of minerals, and diamond the hardest of all; it is a good conductor of electricity, whilst diamond is a bad conductor. The specific gravity is 2·2, that of diamond is 3·5. Further, unlike diamond, it never occurs as distinctly developed crystals, but only as imperfect six-sided plates and scales. There is a perfect cleavage parallel to the surface of the scales, and the cleavage flakes are flexible but not elastic. The material is greasy to the touch, and soils everything with which it comes into contact. The lustre is bright and metallic. In its external characters graphite is thus strikingly similar to molybdenite (*q.v.*).

The name graphite, given by A. G. Werner in 1789, is from the Greek γράφειν, "to write," because the mineral is used for making pencils. Earlier names, still in common use, are plumbago and black-lead, but since the mineral contains no lead these names are singularly inappropriate. Plumbago (Lat. *plumbum*, lead) was originally used for an artificial product obtained from lead ore, and afterwards for the ore (galena) itself; it was confused both with graphite and with molybdenite. The true chemical nature of graphite was determined by K. W. Scheele in 1779.

Graphite occurs mainly in the older crystalline rocks—gneiss, granulite, schist and crystalline limestone—and also sometimes in granite: it is found as isolated scales embedded in these rocks, or as large irregular masses or filling veins. It has also been observed as a product of contact-metamorphism in carbonaceous clay-slates near their contact with granite, and where igneous rocks have been intruded into beds of coal; in these cases the mineral has clearly been derived from organic matter. The graphite found in granite and in veins in gneiss, as well as that contained in meteoric irons, cannot have had such an origin. As an artificial product, graphite is well known as dark lustrous scales in grey pig-iron, and in the "kish" of iron furnaces: it is also produced artificially on a large scale, together with

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carborundum, in the electric furnace (see below). The graphite veins in the older crystalline rocks are probably akin to metalliferous veins and the material derived from deep-seated sources; the decomposition of metallic carbides by water and the reduction of hydrocarbon vapours have been suggested as possible modes of origin. Such veins often attain a thickness of several feet, and sometimes possess a columnar structure perpendicular to the enclosing walls; they are met with in the crystalline limestones and other Laurentian rocks of New York and Canada, in the gneisses of the Austrian Alps and the granulites of Ceylon. Other localities which have yielded the mineral in large amount are the Alibert mine in Irkutsk, Siberia and the Borrowdale mine in Cumberland. The Santa Maria mines of Sonora, Mexico, probably the richest deposits in the world, supply the American lead pencil manufacturers. The graphite of New York, Pennsylvania and Alabama is "flake" and unsuitable for this purpose.

Graphite is used for the manufacture of pencils, dry lubricants, grate polish, paints, crucibles and for foundry facings. The material as mined usually does not contain more than 20 to 50% of graphite: the ore has therefore to be crushed and the graphite floated off in water from the heavier impurities. Even the purest forms contain a small percentage of volatile matter and ash. The Cumberland graphite, which is especially suitable for pencils, contains about 12 % of impurities. (L. J. S.)

Artificial Manufacture.—The alteration of carbon at high temperatures into a material resembling graphite has long been known. In 1803 Girard and Street patented a furnace and a process by which this transformation could be effected. Carbon powder compressed into a rod was slowly passed through a tube in which it was subjected to the action of one or more electric arcs. E. G. Acheson, in 1896, patented an application of his carborundum process to graphite manufacture, and in 1899 the International Acheson Graphite Co. was formed, employing electric current from the Niagara Falls. Two procedures are adopted: (1) graphitization of moulded carbons; (2) graphitization of anthracite *en masse*. The former includes electrodes, lamp carbons, &c. Coke, or some other form of amorphous carbon, is mixed with a little tar, and the required article moulded in a press or by a die. The articles are stacked transversely in a furnace, each being packed in granular coke and covered with carborundum. At first the current is 3000 amperes at 220 volts, increasing to 9000 amperes at 20 volts after 20 hours. In graphitizing *en masse* large lumps of anthracite are treated in the electric furnace. A soft, unctuous form results on treating carbon with ash or silica in special furnaces, and this gives the so-called "deflocculated" variety when treated with gallo-tannic acid. These two modifications are valuable lubricants. The massive graphite is very easily machined and is widely used for electrodes, dynamo brushes, lead pencils and the like.

See "Graphite and its Uses," *Bull. Imperial Institute*, (1906) p. 353, (1907) p. 70; F. Cirkel, *Graphite* (Ottawa, 1907). (W. G. M.)

GRAPTOLITES, an assemblage of extinct zoophytes whose skeletal remains are found in the Palaeozoic rocks, occasionally in great abundance. They are usually preserved as branching or unbranching carbonized bodies, tree-like, leaf-like or rod-like in shape, their edges regularly toothed or denticulated. Most frequently they occur lying on the bedding planes of black shales; less commonly they are met with in many other kinds of sediment, and when in limestone they may retain much of their original relief and admit of a detailed microscopic study.

Each Graptolite represents the common horny or chitinous investment or supporting structure of a colony of zooids, each tooth-like projection marking the position of the sheath or *theca* of an individual zooid. Some of the branching forms have a distinct outward resemblance to the polyparies of *Sertularia* and *Plumularia* among the recent Hydroida (*Calyptoblastea*); in none of the unbranching forms, however, is the similarity by any means close.

The Graptolite polyparies vary considerably in size: the majority range from 1 in. to about 6 in. in length; few examples have been met with having a length of more than 30 in.

Very different views have been held as to the systematic place and rank of the Graptolites. Linnaeus included them in his group of false fossils (*Graptolithus* = written stone). At one time they were referred by some to the Polyzoa (Bryozoa), and later, by almost general consent, to the Hydroida (Calyptoblastea) among the Hydrozoa (Hydromedusae). Of late years an opinion is gaining ground that they may be regarded as constituting collectively an independent phylum of their own (*Graptolithina*).

There are two main groups, or sub-phyla: the *Graptoloidea* or Graptolites proper, and the *Dendroidea* or tree-like Graptolites; the former is typified by the unbranched genus *Monograptus* and the latter by the many-branched genus *Dendrograptus*.

A *Monograptus* makes its first appearance as a minute dagger-like body (the *sicula*), which represents the flattened covering of the primary or embryonic zooid of the colony. This sicula, which had originally the shape of a hollow cone, is formed of two portions or regions—an upper and smaller (*apical* or embryonic) portion, marked by delicate longitudinal lines, and having a fine tubular thread (the *nema*) proceeding from its apex; and a lower (thecal or *apertural*) portion, marked by transverse lines of growth and widening in the direction of the mouth, the lip or apertural margin of which forms the broad end of the sicula. This margin is normally furnished with a perpendicular spine (*virgella*) and occasionally with two shorter lateral spines or lobes.

A bud is given off from the sicula at a variable distance along its length. From this bud is developed the first zooid and first serial theca of the colony. This theca grows in the direction of the apex of the sicula, to which it adheres by its dorsal wall. Thus while the mouth of the sicula is directed downwards, that of the first serial theca is pointed upwards, making a theoretical angle of about 180° with the direction of that of the sicula.

From this first theca originates a second, opening in the same direction, and from the second a third, and so on, in a continuous linear series until the polypary is complete. Each zooid buds from the one immediately preceding it in the series, and intercommunication is effected by all the budding orifices (including that in the wall of the sicula) remaining permanently open. The sicula itself ceases to grow soon after the earliest theca have been developed; it remains permanently attached to the dorsal wall of the polypary, of which it forms the proximal end, its apex rarely reaching beyond the third or fourth theca.

A fine cylindrical rod or fibre (the so-called solid axis or *virgula*) becomes developed in a median groove in the dorsal wall of the polypary, and is sometimes continued distally as a naked rod. It was formerly supposed that a virgula was present in all the Graptoloidea; hence the term *Rhabdophora* sometimes employed for the Graptoloidea in general, and *rhabdosome* for the individual polypary; but while the virgula is present in many (Axonophora) it is absent as such in others (Axonolipa).

The GRAPTOLOIDEA are arranged in eight families, each named after a characteristic genus: (1) Dichograptidae; (2) Leptograptidae; (3) Dicranograptidae; (4) Diplograptidae; (5) Glossograptidae (sub-family, Lasiograptidae); (6) Retiolitidae; (7) Dimorphograptidae; (8) Monograptidae.

In all these families the polypary originates as in *Monograptus* from a nema-bearing sicula, which invariably opens downwards and gives off only a single bud, such branching as may take place occurring at subsequent stages in the growth of the polypary. In some species young examples have been met with in which the nema ends above in a small membranous disk, which has been interpreted as an organ of attachment to the underside of floating bodies, probably sea weeds, from which the young polypary hung suspended.

Broadly speaking, these families make their first appearance in time in the order given above, and show a progressive morphological evolution along certain special lines. There is a tendency for the branches to become reduced in number, and for the serial thecae to become directed more and more upwards towards the line of the nema. In the oldest family—Dichograptidae—in which the branching polypary is bilaterally symmetrical and the thecae uniserial (*monoprionidian*)—there is a gradation from earlier groups with many branches to later groups with only two; and from species in which all the branches and their thecae are directed downwards, through species in which the branches become bent back more and more outwards and upwards, until in some the terminal thecae open almost vertically. In the genus *Phyllograptus* the branches have become reduced

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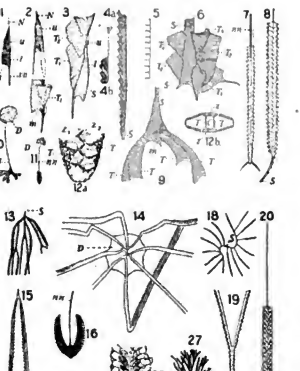

1. *Diplograptus*, young sicula.
2. *Monograptus dubius*, sicula and first serial theca (partly restored).
3. Young form (all above after Wiman).
4a. Older form.
4b. Showing virgula (after Holm).
5. *Rastrites distans*.
6. Base of *Diplograptus* (after Wiman).
7. *D. calcaratus*.
8. *Dimorphograptus*.
9. Base of *Didymograptus minutus* (after Holm).
10. Young *Dictyograptus*, with primary disk.
11. Ibid. *Diplograptus* (after Ruedemann).
12 *a-b*. Base and transverse section, *Retiolites Geinitzianus* (after Holm).
13. *Bryograptus Kjerulfi*.
14. *Dichograptus octobrachiatus*, with central disk.
15. *Didymograptus Murchisoni*.
16. *D. sibiricus*.
17 *a-b*. *Phyllograptus* and transverse section.
18. *Nemagraptus gracilis*.
19. *Dicranograptus ramosus*.
20. *Climacograptus Scharenbergi*.
21. *Glossograptus Hincksii*.
22. *Lasiograptus costatus* (after Elles and Wood).
23. *Dictyonema* (*-graptus*) *flabelliforme* (*-is*).
24. *Dictyonema* (*-dendron*) *pelsatum* with base of attachment.
25. *D. cervicorne*, branches (after Holm).
26. *D. rarum* (section after Wiman).
27. *Dendrograptus Hallianus*.
28. Synrhabdosome of *Dictyograptus* (after Ruedemann).
S, Sicula.
u, Upper or apical portion.
l, Lower or apertural.
m, Mouth.
N, Nema.
nn, Nemacaulus or virgular tube.
V, Virgula.
vv, Virgella.
ss, Septal strands.
T, Theca.
C, Common canal (in Retiolites).
G, Gonangium.
g, Gonotheca.
b, Budding theca.

to four and these coalesce by their dorsal walls along the line of the nema, and the sicula becomes embedded in the base of the polypary. In the family of the Diplograptidae the branches are reduced to two; these also coalesce similarly by their dorsal walls, and the polypary thus becomes biserial (*diprionidian*), and the line of the nema is taken by a long axial tube-like structure, the *nemacaulus* or virgular tube. Finally, in the latest family, the Monograptidae, the branches are theoretically reduced to one, the polypary is uniserial throughout, and all the thecae are directed outwards and upwards.

The thecae in the earliest family—Dichograptidae—are so similar in form to the sicula itself that the polypary has been compared to a colony of siculae; there is the greatest variation in shape in those of the latest family—Monograptidae—in some species of which the terminal portion of each theca becomes isolated (*Rastrites*) and in some coiled into a rounded lobe. The thecae in several of the families are occasionally provided with spines or lateral processes: the spines are especially conspicuous at the base in some biserial forms: in the Lasiograptidae the lateral processes originate a marginal meshwork surrounding the polypary.

Histologically, the perisarc or *lent* in the Graptoloidea appears to be composed of three layers, a middle layer of variable structure, and an overlying and an underlying layer of remarkable tenuity. The central layer is usually thick and marked by lines of growth; but in *Glossograptus* and *Lasiograptus* it is thinned down to a fine membrane stretched upon a skeleton framework of lists and fibres, and in *Retiolites* this membrane is reduced to a delicate network. The groups typified by these three genera are sometimes referred to, collectively, as the *Retioloidea*, and the structure as *retioloid*.

It is the general practice of palaeontologists to regard each graptolite polypary (*rhabdosome*) developed from a single sicula as an individual of the highest order. Certain American forms, however, which are preserved as stellate groups, have been interpreted as complex umbrella-shaped colonial stocks, individuals of a still higher order (*synrhabdosomes*), composed of a number of biserial polyparies (each having a sicula at its outer extremity) attached by their nemacauli to a common centre of origin, which is provided with two disks, a swimming bladder and a ring of capsules.

In the DENDROIDEA, as a rule, the polypary is non-symmetrical in shape and tree-like or shrub-like in habit, with numerous branches irregularly disposed, and with a distinct stem-like or short basal portion ending below in root-like fibres or in a membranous disk or sheet of attachment. An exception, however, is constituted by the comprehensive genus *Dictyonema*, which embraces species composed of a large number of divergent and sub-parallel branches, united by transverse dissepiments into a symmetrical cone-like or funnel-shaped polypary, and includes some forms (*Dictyograptus*) which originate from a nema-bearing sicula and have been claimed as belonging to the Graptoloidea.

Of the early development of the polypary in the Dendroidea little is known, but the more mature stages have been fully worked out. In *Dictyonema* the branches show thecae of two kinds: (1) the ordinary tubular thecae answering to those of the Graptoloidea and occupied by the nourishing zooids; and (2) the so-called *bithecae*, birdnest-like cups (regarded by their discoverers as gonothecae) opening alternately right and left of the ordinary thecae. Internally, there existed a third set of thecae, held to have been inhabited by the budding individuals. In the genus *Dendrograptus* the gonothecae open within the walls of the ordinary thecae, and the branches present an outward resemblance to those of the uniserial Graptoloidea. But in striking contrast to what obtains among the Graptoloidea in general, the budding orifices in the Dendroidea become closed, and all the various cells shut off from each other.

The classification of the Dendroidea is as yet unsatisfactory: the families most conspicuous are those typified by the genera *Dendrograptus*, *Dictyonema*, *Inocaulis* and *Thamnograptus*.

As regards the *modes of reproduction among the Graptolites* little is known. In the Dendroidea, as already pointed out, the bithecae were possibly gonothecae, but they have been interpreted by some as nematophores. In the Graptoloidea certain lateral and vesicular appendages of the polypary in the Lasiograptidae have been looked upon as connected with the reproductive system; and in the umbrella-shaped *synrhabdosomes* already referred to, the common centre is surrounded by a ring of what have been regarded as ovarian capsules. The theory of the gonangial nature of the vesicular bodies in the Graptoloidea is, however, disputed by some authorities, and it has been suggested that the zooid of the sicula itself is not the

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product of the normal or sexual mode of propagation in the group, but owes its origin to a peculiar type of budding or non-sexual reproduction, in which, as temporary resting or protecting structures, the vesicular bodies may have had a share.

As respects the *mode of life of the Graptolites* there can be little doubt that the Dendroidea were, with some exceptions, sessile or benthonic animals, their polyparies, like those of the recent Calyptoblastea, growing upwards, their bases remaining attached to the sea floor or to foreign bodies, usually fixed. The Graptoloidea have also been regarded by some as benthonic organisms. A more prevalent view, however, is that the majority were pseudo-planktonic or drifting colonies, hanging from the underside of floating seaweeds; their polyparies being each suspended by the nema in the earliest stages of growth, and, in later stages, some by the nemacaulus, while others became adherent above by means of a central disk or by parts of their dorsal walls. Some of these ancient seaweeds may have remained permanently rooted in the littoral regions, while others may have become broken off and drifted, like the recent Sargassum, at the mercy of the winds and currents, carrying the attached Graptolites into all latitudes. The more complex umbrella-shaped colonies of colonies (synrhabdosomes) described as provided with a common swimming bladder (pneumatophore?) may have attained a holo-planktonic or free-swimming mode of existence.

The *range of the Graptolites in time* extends from the Cambrian to the Carboniferous. The Dendroidea alone, however, have this extended range, the Graptoloidea becoming extinct at the close of Silurian time. Both groups make their first appearance together near the end of the Cambrian; but while in the succeeding Ordovician and Silurian the Dendroidea are comparatively rare, the Graptoloidea become the most characteristic and, locally, the most abundant fossils of these systems.

The species of the Graptoloidea have individually a remarkably short range in geological time; but the geographical distribution of the group as a whole, and that of many of its species, is almost world-wide. This combination of circumstances has given the Graptoloidea a paramount stratigraphical importance as palaeontological indices of the detailed sequence and correlation of the Lower Palaeozoic rocks in general. Many *Graptolite zones*, showing a constant uniformity of succession, paralleled in this respect only by the longer known Ammonite zones of the Jurassic, have been distinguished in Britain and northern Europe, each marked by a characteristic species. Many British species and associations of genera and species, occurring on corresponding horizons to those on which they are found in Britain, have been met with in the graptolite-bearing Lower Palaeozoic formations of other parts of Europe, in America, Australia, New Zealand and elsewhere.

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GRASLITZ (Czech, *Kraslice*), a town of Bohemia, on the Zwodau, 145 m. N.W. of Prague by rail. Pop. (1900) 11,803, exclusively German. Graslitz is one of the most important industrial towns of Bohemia, its specialities being the manufacture of musical instruments, carried on both as a factory and a domestic industry, and lace-making. Next in importance are cotton-spinning and weaving, machine embroidery, brewing, and the mother-of-pearl industry.

GRASMERE, a village and lake of Westmorland, in the heart of the English Lake District. The village (pop. of urban district in 1901, 781) lies near the head of the lake, on the small river Rothay and the Keswick-Ambleside road, 12½ m. from Keswick and 4 from Ambleside. The scenery is very beautiful; the valley about the lakes of Grasmere and Rydal Water is in great part wooded, while on its eastern flank there rises boldly the range of hills which includes Rydal Fell, Fairfield and Seat Sandal, and, farther north, Helvellyn. On the west side are Loughrigg Fell and Silver How. The village has become a favourite centre for tourists, but preserves its picturesque and sequestered appearance. In a house still standing William Wordsworth lived from 1799 to 1808, and it was subsequently occupied by Thomas de Quincey and by Hartley Coleridge. Wordsworth's tomb, and also that of Coleridge, are in the churchyard of the ancient church of St Oswald, which contains a memorial to Wordsworth with an inscription by John Keble. A festival called the Rushbearing takes place on the Saturday within the octave of St Oswald's day (August 5th), when a holiday is observed and the church decorated with rushes, heather and flowers. The festival is of early origin, and has been derived by some from the Roman *Floralia*, but appears also to have been made the occasion for carpeting the floors of churches, unpaved in early times, with rushes. Moreover, in a procession which forms part of the festivities at Grasmere, certain Biblical stories are symbolized, and in this a connexion with the ancient miracle plays may be found (see H. D. Rawnsley, *A Rambler's Note-Book at the English Lakes*, Glasgow, 1902). Grasmere is also noted for an athletic meeting in August.

The lake of Grasmere is just under 1 m. in length, and has an extreme breadth of 766 yds. A ridge divides the basin from north to south, and rises so high as to form an island about the middle. The greatest depth of the lake (75 ft.) lies to the east of this ridge.

GRASS AND GRASSLAND, in agriculture. The natural vegetable covering of the soil in most countries is "grass" (for derivation see GRASSES) of various kinds. Even where dense forest or other growth exists, if a little daylight penetrates to the ground grass of some sort or another will grow. On ordinary farms, or wherever farming of any kind is carried out, the proportion of the land not actually cultivated will either be in grass or will revert naturally to grass in time if left alone, after having been cultivated.

Pasture land has always been an important part of the farm, but since the "era of cheap corn" set in its importance has been increased, and much more attention has been given to the study of the different species of grass, their characteristics, the improvement of a pasture generally, and the "laying down" of arable land into grass where tillage farming has not paid. Most farmers desire a proportion of grass-land on their farms—from a third to a half of the area—and even on wholly arable farms there are usually certain courses in the rotation of crops devoted to grass (or clover). Thus the Norfolk 4-course rotation is corn, roots, corn, clover; the Berwick 5-course is corn, roots, corn, grass, grass; the Ulster 8-course, corn, flax, roots, corn, flax, grass, grass, grass; and so on, to the point where the grass remains down for 5 years, or is left indefinitely.

Permanent grass may be grazed by live-stock and classed as pasture pure and simple, or it may be cut for hay. In the latter case it is usually classed as "meadow" land, and often forms an alluvial tract alongside a stream, but as grass is often grazed and hayed in alternate years, the distinction is not a hard and fast one.

There are two classes of pasturage, temporary and permanent. The latter again consists of two kinds, the permanent grass natural to land that has never been cultivated, and the pasture that has been laid down artificially on land previously arable and allowed to remain and improve itself in the course of time. The existence of ridge and furrow on many old pastures in Great Britain shows that they were cultivated at one time, though perhaps more than a century ago. Often a newly laid down pasture will decline markedly in thickness and quality about the fifth and sixth year, and then begin to thicken and improve year by year afterwards. This is usually attributed

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to the fact that the unsuitable varieties die out, and the "naturally" suitable varieties only come in gradually. This trouble can be largely prevented, however, by a judicious selection of seed, and by subsequently manuring with phosphatic manures, with farmyard or other bulky "topdressings," or by feeding sheep with cake and corn over the field.

All the grasses proper belong to the natural order *Gramineae* (see GRASSES), to which order also belong all the "corn" plants cultivated throughout the world, also many others, such as bamboo, sugar-cane, millet, rice, &c. &c., which yield food for mankind. Of the grasses which constitute pastures and hayfields over a hundred species are classified by botanists in Great Britain, with many varieties in addition, but the majority of these, though often forming a part of natural pastures, are worthless or inferior for farming purposes. The grasses of good quality which should form a "sole" in an old pasture and provide the bulk of the forage on a newly laid down piece of grass are only about a dozen in number (see below), and of these there are only some six species of the very first importance and indispensable in a "prescription" of grass seeds intended for laying away land in temporary or permanent pasture. Dr W. Fream caused a botanical examination to be made of several of the most celebrated pastures of England, and, contrary to expectation, found that their chief constituents were ordinary perennial ryegrass and white clover. Many other grasses and legumes were present, but these two formed an overwhelming proportion of the plants.

In ordinary usage the term grass, pasturage, hay, &c., includes many varieties of clover and other members of the natural order *Leguminosae* as well as other "herbs of the field," which, though not strictly "grasses," are always found in a grass field, and are included in mixtures of seeds for pasture and meadows. The following is a list of the most desirable or valuable agricultural grasses and clovers, which are either actually sown or, in the case of old pastures, encouraged to grow by draining, liming, manuring, and so on:—

Grasses.

Alopecurus pratensis	Meadow foxtail.
Anthoxanthum odoratum	Sweet vernal grass.
Avena elatior	Tall oat-grass.
Avena flavescens	Golden oat-grass.
Cynosurus cristatus	Crested dogstail.
Dactylis glomerata	Cocksfoot.
Festuca duriuscula	Hard fescue.
Festuca elatior	Tall fescue.
Festuca ovina	Sheep's fescue.
Festuca pratensis	Meadow fescue.
Lolium italicum	Italian ryegrass.
Phleum pratense	Timothy or catstail.
Poa nemoralis	Wood meadow-grass.
Poa pratensis	Smooth meadow-grass.
Poa trivialis	Rough meadow-grass.

Clovers, &c.

Medicago lupulina	Trefoil or "Nonsuch."
Medicago sativa	Lucerne (Alfalfa).
Trifolium hybridum	Alsike clover.
" pratense	Broad red clover.
" pratense perenne	Perennial clover.
" incarnatum	Crimson clover or "Trifolium."
" procumbens	Yellow Hop-trefoil.
" repens	White or Dutch clover.
Achillea Millefolium	Yarrow or Milfoil.
Anthyllis vulneraria	Kidney-vetch.
Lotus major	Greater Birdsfoot Trefoil.
Lotus corniculatus	Lesser " "
Carum petroselinum	Field parsley.
Plantago lanceolata	Plantain.
Cichorium intybus	Chicory.
Poterium officinale	Burnet.

The predominance of any particular species is largely determined by climatic circumstances, the nature of the soil and the treatment it receives. In limestone regions sheep's fescue has been found to predominate; on wet clay soil the dog's bent (*Agrostis canina*) is common; continuous manuring with nitrogenous manures kills out the leguminous plants and stimulates such grasses as cocksfoot; manuring with phosphates stimulates the clovers and other legumes; and so on. Manuring with basic slag at the rate of from 5 to 10 cwt. per acre has been found to give excellent results on poor clays and peaty soils. Basic slag is a by-product of the Bessemer steel process, and is rich in a soluble form of phosphate of lime (tetra-phosphate) which specially stimulates the growth of clovers and other legumes, and has renovated many inferior pastures.

In the Rothamsted experiments continuous manuring with "mineral manures" (no nitrogen) on an old meadow has reduced the grasses from 71 to 64% of the whole, while at the same time it has increased the *Leguminosae* from 7% to 24%. On the other hand, continuous use of nitrogenous manure in addition to "minerals" has raised the grasses to 94% of the total and reduced the legumes to less than 1%.

As to the best kinds of grasses, &c., to sow in making a pasture out of arable land, experiments at Cambridge, England, have demonstrated that of the many varieties offered by seedsmen only a very few are of any permanent value. A complex mixture of tested seeds was sown, and after five years an examination of the pasture showed that only a few varieties survived and made the "sole" for either grazing or forage. These varieties in the order of their importance were:—

Cocksfoot	26
Perennial rye grass	16
Meadow fescue	13
Hard fescue	9
Crested dogstail	8
Timothy	6
White clover	4
Meadow foxtail	2

The figures represent approximate percentages.

Before laying down grass it is well to examine the species already growing round the hedges and adjacent fields. An inspection of this sort will show that the Cambridge experiments are very conclusive, and that the above species are the only ones to be depended on. Occasionally some other variety will be prominent, but if so there will be a special local reason for this.

On the other hand, many farmers when sowing down to grass like to have a good bulk of forage for the first year or two, and therefore include several of the clovers, lucerne, Italian ryegrass, evergreen ryegrass, &c., knowing that these will die out in the course of years and leave the ground to the more permanent species.

There are also several mixtures of "seeds" (the technical name given on the farm to grass-seeds) which have been adopted with success in laying down permanent pasture in some localities.

	Young.	De Laune.	Leicester.	Elliot.	Cambridge average.	General purpose mixture.
Cocksfoot	..	8	4	8	8	4
Perennial ryegrass	..	..	2	..	6	10
Meadow fescue	..	6	2	..	5	..
Hard fescue	..	1	1	2	3	..
Crested dogstail	3	2	..	1	3	..
Timothy	..	3	1	..	2	2
Meadow foxtail	..	10	..	..	1	1
Tall fescue	..	3	1	3½	..	2
Tall oat grass	..	..	1	3	..	..
Italian ryegrass	..	..	2	..	..	5
Smooth meadow grass	..	..	..	1	..	..
Rough meadow grass	..	1	..	1	..	..
Golden oat grass	..	..	½	1	..	..
Sheep's fescue	..	1	..	..	..	..
Broad red clover	..	1	..	..	..	2
Perennial red clover	..	1	..	1½	..	2
Alsike	..	1	1½	1	..	2
Lucerne (Alfalfa)	..	..	..	..	..	8
White clover	4	1	1	2	2	2
Kidney vetch	6	..	..	2½	..	..
Sheep's parsley	..	..	..	1	..	..
Yarrow	1	1	½	1	..	..
Burnet	8	..	..	8	..	..
Chicory	4	..	..	2½	..	..
Plantain	4	..	..	..	..	..
Total lb per acre	30	40	17	40	30	40

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Arthur Young more than 100 years ago made out one to suit chalky hillsides; Mr Faunce de Laune (Sussex) in our days was the first to study grasses and advocated leaving out ryegrass of all kinds; Lord Leicester adopted a cheap mixture suitable for poor land with success; Mr Elliot (Kelso) has introduced many deep-rooted "herbs" in his mixture with good results. Typical examples of such mixtures are given on preceding page.

Temporary pastures are commonly resorted to for rotation purposes, and in these the bulky fast-growing and short-lived grasses and clovers are given the preference. Three examples of temporary mixtures are given below.

	One year.	Two years.	Three or four years.
Italian ryegrass	14	10	6
Cocksfoot	2	4	6
Timothy		2	3
Broad red clover	8	5	3
Alsike	3	2	2
Trefoil	3	2	2
Perennial ryegrass		5	10
Meadow fescue		2	2
Perennial red clover		2	2
White clover		1	2
Meadow foxtail		1	2
Total lb per acre	30	36	40

Where only a one-year hay is required, broad red clover is often grown, either alone or mixed with a little Italian ryegrass, while other forage crops, like trefoil and trifolium, are often grown alone.

In Great Britain a heavy clay soil is usually preferred for pasture, both because it takes most kindly to grass and because the expense of cultivating it makes it unprofitable as arable land when the price of corn is low. On light soil the plant frequently suffers from drought in summer, the want of moisture preventing it from obtaining proper root-hold. On such soil the use of a heavy roller is advantageous, and indeed on any soil excepting heavy clay frequent rolling is beneficial to the grass, as it promotes the capillary action of the soil-particles and the consequent ascension of ground-water.

In addition, the grass on the surface helps to keep the moisture from being wasted by the sun's heat.

The graminaceous crops of western Europe generally are similar to those enumerated. Elsewhere in Europe are found certain grasses, such as Hungarian brome, which are suitable for introduction into the British Isles. The grasses of the American prairies also include many plants not met with in Great Britain. Some half-dozen species are common to both countries: Kentucky "blue-grass" is the British *Poa pratensis*; couch grass (*Triticum repens*) grows plentifully without its underground runners; bent (*Agrostis vulgaris*) forms the famous "red-top," and so on. But the American buffalo-grass, the Canadian buffalo-grass, the "bunch" grasses, "squirrel-tail" and many others which have no equivalents in the British Islands, form a large part of the prairie pasturage. There is not a single species of true clover found on the prairies, though cultivated varieties can be introduced. (P. McC.)

GRASSE, FRANÇOIS JOSEPH PAUL, MARQUIS DE GRASSE-TILLY, COMTE DE (1722–1788), French sailor, was born at Bar, in the present department of the Alpes Maritimes. In 1734 he took service on the galleys of the order of Malta, and in 1740 entered the service of France, being promoted to chief of squadron in 1779. He took part in the naval operations of the American War of Independence, and distinguished himself in the battles of Dominica and Saint Lucia (1780), and of Tobago (1781). He was less fortunate at St Kitts, where he was defeated by Admiral Hood. Shortly afterwards, in April 1782, he was defeated and taken prisoner by Admiral Rodney. Some months later he returned to France, published a *Mémoire justificatif*, and was acquitted by a court-martial (1784). He died at Paris in January 1788.

His son Alexandre de Grasse, published a *Notice bibliographique sur l'amiral comte de Grasse d'après les documents inédits* in 1840. See G. Lacour-Gayet, *La Marine militaire de la France sous le règne de Louis XV* (Paris, 1902).

GRASSE, a town in the French department of the Alpes Maritimes (till 1860 in that of the Var), 12½ m. by rail N. of Cannes. Pop. (1906) town, 13,958; commune, 20,305. It is built in a picturesque situation, in the form of an amphitheatre and at a height of 1066 ft. above the sea, on the southern slope of a hill, facing the Mediterranean. In the older (eastern) part of the town the streets are narrow, steep and winding, but the new portion (western) is laid out in accordance with modern French ideas. It possesses a remarkably mild and salubrious climate, and is well supplied with water. That used for the purpose of the factories comes from the fine spring of Foux. But the drinking water used in the higher portions of the town flows, by means of a conduit, from the Foulon stream, one of the sources of the Loup. Grasse was from 1244 (when the see was transferred hither from Antibes) to 1790 an episcopal see, but was then included in the diocese of Fréjus till 1860, when politically as well as ecclesiastically, the region was annexed to the newly-formed department of the Alpes Maritimes. It still possesses a 12th-century cathedral, now a simple parish church; while an ancient tower, of uncertain date, rises close by near the town hall, which was formerly the bishop's palace (13th century). There is a good town library, containing the muniments of the abbey of Lérins, on the island of St Honorat opposite Cannes. In the chapel of the old hospital are three pictures by Rubens. The painter J. H. Fragonard (1732–1806) was a native of Grasse, and some of his best works were formerly to be seen here (now in America). Grasse is particularly celebrated for its perfumery. Oranges and roses are cultivated abundantly in the neighbourhood. It is stated that the preparation of attar of roses (which costs nearly £100 per 2 lb) requires alone nearly 7,000,000 roses a year. The finest quality of olive oil is also manufactured at Grasse. (W. A. B. C.)

GRASSES,[1] a group of plants possessing certain characters in common and constituting a family (Gramineae) of the class Monocotyledons. It is one of the largest and most widespread and, from an economic point of view, the most important family of flowering plants. No plant is correctly termed a grass which is not a member of this family, but the word is in common language also used, generally in combination, for many plants of widely different affinities which possess some resemblance (often slight) in foliage to true grasses; *e.g.* knot-grass (*Polygonum aviculare*), cotton-grass (*Eriophorum*), rib-grass (*Plantago*), scorpion-grass (*Myosotis*), blue-eyed grass (*Sisyrinchium*), sea-grass (*Zostera*). The grass-tree of Australia (*Xanthorrhoea*) is a remarkable plant, allied to the rushes in the form of its flower, but with a tall, unbranched, soft-woody, palm-like trunk bearing a crown of long, narrow, grass-like leaves and stalked heads of small, densely-crowded flowers. In agriculture the word has an extended signification to include the various fodder-plants, chiefly leguminous, often called "artificial grasses." Indeed, formerly *grass* (also spelt *gwrs*, *gres*, *gyrs* in the old herbals) meant any green herbaceous plant of small size.

Yet the first attempts at a classification of plants recognized and separated a group of *Gramina*, and this, though bounded by nothing more definite than habit and general appearance, contained the Gramineae of modern botanists. The older group, however, even with such systematists as Ray (1703), Scheuchzer (1719), and Micheli (1729), embraced in addition the Cyperaceae

[1] The word "grass" (O. Eng. *gærs*, *græs*) is common to Teutonic languages, cf. Dutch Ger. Goth. *gras*, Dan. *græs*; the root is the O. Teut. *gra-*, *gro-*, to increase, whence "grow," and "green," the typical colour of growing vegetation. The Indo-European root is seen in Lat. *gramen*. The O. Eng. *grasian*, formed from *græs*, gives "to graze," of cattle feeding on growing herbage, also "grazier," one who grazes or feeds cattle for the market; "to graze," to abrade, to touch lightly in passing, may be a development of this from the idea of close cropping; if it is to be distinguished a possible connexion may be found with "glace" (Fr. *glacer*, glide, slip, Lat. *glacies*, ice), to glance off, the change in form being influenced by "grate," to scrape, scratch (Fr. *gratter*, Ger. *kratzen*).

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(Sedge family), Juncaceae (Rush family), and some other monocotyledons with inconspicuous flowers. Singularly enough, the sexual system of Linnaeus (1735) served to mark off more distinctly the true grasses from these allies, since very nearly all of the former then known fell under his Triandria Digynia, whilst the latter found themselves under his other classes and orders.

I. Structure.—The general type of true grasses is familiar in the cultivated cereals of temperate climates—wheat, barley, rye, oats, and in the smaller plants which make up pastures and meadows and form a principal factor of the turf of natural downs. Less familiar are the grains of warmer climates—rice, maize, millet and sorgho, or the sugar-cane. Still farther removed are the bamboos of the tropics, the columnar stems of which reach to the height of forest trees. All are, however, formed on a common plan.

Root.—Most cereals and many other grasses are annual, and possess a tuft of very numerous slender root-fibres, much branched and of great length. The majority of the members of the family are of longer duration, and have the roots also fibrous, but fewer, thicker and less branched. In such cases they are very generally given off from just above each node (often in a circle) of the lower part of the stem or rhizome, perforating the leaf-sheaths. In some bamboos they are very numerous from the lower nodes of the erect culms, and pass downwards to the soil, whilst those from the upper nodes shrivel up and form circles of spiny fibres.

Stem.—The underground stem or rootstock (rhizome) of perennial grasses is usually well developed, and often forms very

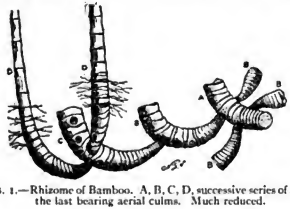

Fig. 1.—Rhizome of Bamboo. A, B, C, D, successive series of axes, the last bearing aerial culms. Much reduced.

long creeping or subterranean rhizomes, with elongated internodes and sheathing scales; the widely-creeping, slender rhizomes in Marram-grass (*Psamma*), *Agropyrum junceum*, *Elymus arenarius*, and other sand-loving plants render them useful as sand-binders. It is also frequently short, with the nodes crowded. The turf-formation, which is characteristic of open situations in cool temperate climates, results from an extensive production of short stolons, the branches and the fibrous roots developed from their nodes forming the dense "sod." The very large rhizome of the bamboos (fig. 1) is also a striking example of "definite" growth; it is much branched, the short, thick, curved branches being given off below the apex of the older ones and at right angles to them, the whole forming a series of connected arched axes, truncate at their ends, which were formerly continued into leafy culms. The rhizome is always solid, and has the usual internal structure of the monocotyledonous stem. In the cases of branching just cited the branches break directly through the sheath of the leaf in connexion with which they arise. In other cases the branches grow upwards through the sheaths which they ultimately split from above, and emerging as aerial shoots give a tufted habit to the plant. Good examples are the oat, cock's-foot (*Dactylis*) and other British grasses. This mode of growth is the cause of the "tillering" of cereals, or the production of a large number of erect growing branches from the lower nodes of the young stem. Isolated tufts or tussocks are also characteristic of steppe—and savanna—vegetation and open places generally in the warmer parts of the earth.

The aerial leaf-bearing branches (culms) are a characteristic feature of grasses. They are generally numerous, erect, cylindrical (rarely flattened) and conspicuously jointed with evident nodes. The nodes are solid, a strong plate of tissue passing across the stem, but the internodes are commonly hollow, although examples of completely solid stems are not uncommon (*e.g.* maize, many Andropogons, sugar-cane). The swollen nodes are a characteristic feature. In wheat, barley and most of the British native grasses they are a development, not of the culm, but of the base of the leaf-sheath. The function of the nodes is to raise again culms which have become bent down; they are composed of highly turgescent tissue, the cells of which elongate on the side next the earth when the culm is placed in a horizontal or oblique position, and thus raise the culm again to an erect position. The internodes continue to grow in length, especially the upper ones, for some time; the increase takes place in a zone at the extreme base, just above the node. The exterior of the culms is more or less concealed by the leaf-sheaths; it is usually smooth and often highly polished, the epidermal cells containing an amount of silica sufficient to leave after burning a distinct skeleton of their structure. Tabasheer is a white substance mainly composed of silica, found in the joints of several bamboos. A few of the lower internodes may become enlarged and subglobular, forming nutriment-stores, and grasses so characterized are termed "bulbous" (*Arrhenatherum*, *Poa bulbosa*, &c.). In internal structure grass-culms, save in being hollow, conform to that usual in monocotyledons; the vascular bundles run parallel in the internodes, but a horizontal interlacement occurs at the nodes. In grasses of temperate climates branching is rare at the upper nodes of the culm, but it is characteristic of the bamboos and many tropical grasses. The branches are strictly distichous. In many bamboos they are long and spreading or drooping and copiously ramified, in others they are reduced to hooked spines. One genus (*Dinochloa*, a native of the Malay archipelago) is scandent, and climbs over trees 100 ft. or more in height, *Olyra latifolia*, a widely-spread tropical species, is also a climber on a humbler scale.

Grass-culms grow with great rapidity, as is most strikingly seen in bamboos, where a height of over 100 ft. is attained in from two to three months, and many species grow two, three or even more feet in twenty-four hours. Silicic hardening does not begin till the full height is nearly attained. The largest bamboo recorded is 170 ft., and the diameter is usually reckoned at about 4 in. to each 50 ft.

Leaves.— These present special characters usually sufficient for ordinal determination. They are solitary at each node and arranged in two rows, the lower often crowded, forming a basal tuft. They consist of two distinct portions, the sheath and the blade. The sheath is often of great length, and generally completely surrounds the culm, forming a firm protection for the internode, the younger basal portion of which, including the zone of growth, remains tender for some time. As a rule it is split down its whole length, thus differing from that of Cyperaceae which is almost invariably (*Eriospora* is an exception) a complete tube; in some grasses, however (species of *Poa*, *Bromus* and others), the edges are united. The sheaths are much dilated in *Alopecurus vaginatus* and in a species of *Potamochloa*, in the latter, an East Indian aquatic grass, serving as floats. At the summit of the sheath, above the origin of the blade, is the *ligule*, a usually membranous process of small size (occasionally reaching 1 in. in length) erect and pressed around the culm. It is rarely quite absent, but may be represented by a tuft of hairs (very conspicuous in *Pariana*). It serves to prevent rain-water, which has run down the blade, from entering the sheath. *Melica uniflora* has in addition to the ligule, a green erect tongue-like process, from the line of junction of the edges of the sheath.

The blade is frequently wanting or small and imperfect in the basal leaves, but in the rest is long and set on to the sheath at an angle. The usual form is familiar—sessile, more or less ribbon-shaped, tapering to a point, and entire at the edge. The chief modifications are the articulation of the deciduous

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blade on to the sheath, which occurs in all the Bambuseae (except *Planotia*) and in *Spartina stricta*; and the interposition of a petiole between the sheath and the blade, as in bamboos, *Leptaspis*, *Pharus*, *Pariana*, *Lophatherum* and others. In the latter case the leaf usually becomes oval, ovate or even cordate or sagittate, but these forms are found in sessile leaves also (*Olyra*, *Panicum*). The venation is strictly parallel, the midrib usually strong, and the other ribs more slender. In *Anomochloa* there are several nearly equal ribs and in some broad-leaved grasses (*Bambuseae*, *Pharus*, *Leptaspis*) the venation becomes tesselated by transverse connecting veins. The tissue is often raised above the veins, forming longitudinal ridges, generally on the upper face; the stomata are in lines in the intervening furrows. The thick prominent veins in *Agropyrum* occupy the whole upper surface of the leaf. Epidermal appendages are rare, the most frequent being marginal, saw-like, cartilaginous teeth, usually minute, but occasionally (*Danthonia scabra*, *Panicum serratum*) so large as to give the margin a serrate appearance. The leaves are occasionally woolly, as in *Alopecurus lanatus* and one or two *Panicums*. The blade is often twisted, frequently so much so that the upper and under faces become reversed. In dry-country grasses the blades are often folded on the midrib, or rolled up. The rolling is effected by bands of large wedge-shaped cells—motor-cells—between the nerves, the loss of turgescence by which, as the air dries, causes the blade to curl towards the face on which they occur. The rolling up acts as a protection from too great loss of water, the exposed surface being specially protected to this end by a strong cuticle, the majority or all of the stomata occurring on the protected surface. The stiffness of the blade, which becomes very marked in dry-country grasses, is due to the development of girders of thick-walled mechanical tissue which follow the course of all or the principal veins (fig. 2).

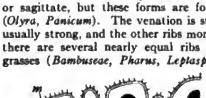

FIG. 2.—Magnified transverse section of one-half of a leaf-blade of *Festuca rubra*. The dark portions represent supporting and conducting tissue; the upper face bears furrows, at the bottom of each of which are seen the motor cells *m*.

Inflorescence.—This possesses an exceptional importance in grasses, since, their floral envelopes being much reduced and the sexual organs of very great uniformity, the characters employed for classification are mainly derived from the arrangement of the flowers and their investing bracts. Various interpretations have been given to these glumaceous organs and different terms employed for them by various writers. It may, however, be

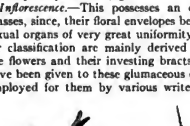

FIG. 3.—One-flowered spikelet of *Agrostis*. *b*, Barren glumes; *f*, flowering glumes.

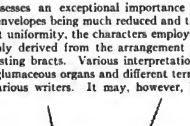

FIG. 4.—Two-flowered spikelet of *Aira*. (Both enlarged.)

considered as settled that the whole of the bodies known as glumes and paleae, and distichously arranged externally to the flower, form no part of the floral envelopes, but are of the nature of bracts. These are arranged so as to form *spikelets* (locustae), and each spikelet may contain one, as in *Agrostis* (fig. 3) two, as in *Aira* (fig. 4) three, or a great number of flowers, as in *Briza* (fig. 5) *Triticum* (fig. 6); in some species of *Eragrostis* there are nearly 60. The flowers are, as a rule, placed laterally on the axis(*rachilla*)of the spikelet, but in one-flowered spikelets they appear to be terminal, and are probably really so in *Anthoxanthum* (fig. 7) and in two anomalous genera, *Anomochloa* and *Streptochaeta*.

In immediate relation with the flower itself, and often entirely concealing it, is the *palea* or *pale* (" upper pale " of most systematic agrostologists). This organ (fig. 13, 1) is peculiar to grasses

FIG. 5.—Spikelet of *Briza*. (Both enlarged.)

FIG. 6.—Spikelet of *Triticum*.

among Glumiflorae (the series to which belong the two families Gramineae and Cyperaceae), and is almost always present, certain *Oryzeae* and *Phalarideae* being the only exceptions. It is of thin membranous consistence, usually obtuse, often bifid, and possesses no central rib or nerve, but has two lateral ones, one on either side; the margins are frequently folded in at the ribs, which thus become placed at the sharp angles. This structure was formerly regarded as pointing to the fusion of two organs, and the pale was considered by Robert Brown to represent two portions soldered together of a trimerous perianth-whorl, the third portion being the " lower pale." The pale is now generally considered to represent the single bracteole, characteristic of Monocotyledons, the binerved structure being the result of the pressure of the axis of the spikelet during the development of the pale, as in *Iris* and others.

FIG. 7.—Spikelet of *Anthoxanthum* (enlarged) without the two lower barren glumes, showing the two upper awned barren glumes (*g*) and the flower.

The flower with its pale is sessile, and is placed in the axil of another bract in such a way that the pale is exactly opposed to it, though at a slightly higher level. It is this second bract or flowering glume which has been generally called by systematists the " lower pale," and with the " upper pale " was formerly considered to form an outer floral envelope (" calyx," Jussieu; " perianthium," Brown). The two bracts are, however, on different axes, one secondary to the other, and cannot therefore be parts of one whorl of organs. They are usually quite unlike one another, but in some genera (*e.g.* most *Festuceae*) are very similar in shape and appearance.

The flowering glume has generally a more or less boat-shaped form, is of firm consistence, and possesses a well-marked central midrib and frequently several lateral ones. The midrib in a large proportion of genera extends into an appendage termed the *awn* (fig. 4), and the lateral veins more rarely extend beyond the glume as sharp points (*e.g. Pappophorum*). The form of the flowering glume is very various, this organ being plastic and extensively modified in different genera. It frequently extends downwards a little on the rachilla, forming with the latter a swollen callus, which is separated from the free portion by a furrow. In *Leptaspis* it is formed into a closed cavity by the union of its edges, and encloses the flower, the styles projecting through the pervious summit. Valuable characters for distinguishing genera are obtained from the awn. This presents itself variously developed from a mere subulate point to an organ several inches in length, and when complete (as in *Andropogoneae*, *Areneae* and *Stipeae*) consists of two well-marked portions, a lower twisted part and a terminal straight portion,

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usually set in at an angle with the former, sometimes trifid and occasionally beautifully feathery (fig. 8). The lower part is most often suppressed, and in the large group of the *Paniceæ* awns of any sort are very rarely seen. The awn may be either terminal or may come off from the back of the flowering glume, and Duval Jouve's observations have shown that it represents the blade of the leaf of which the portion of the flowering glume below its origin is the sheath; the twisted part (so often suppressed) corresponds with the petiole, and the portion of the glume extending beyond the origin of the awn (very long in some species, *e.g.* of *Danthonia*) with the ligule of the developed foliage-leaf. When terminal the awn has three fibro-vascular bundles, when dorsal only one; it is covered with stomate-bearing epidermis.

The flower with its palea is thus sessile in the axil of a floriferous glume, and in a few grasses (*Leersia* (fig. 9), *Coleanthus*, *Nardus*) the spikelet consists of nothing more, but usually (even in uniflorous spikelets) other glumes are present. Of these the two placed distichously opposite each other at the base of the spikelet never bear any flower in their axils, and are called the *empty* or *barren glumes* (figs. 3, 8). They are the "glumes" of most writers, and together form what was called the "gluma" by R. Brown. They rarely differ much from one another, but one may be smaller or quite absent (*Panicum*, *Setaria* (fig. 10), *Paspalum*, *Latium*), or both be altogether suppressed, as above noticed. They are commonly firm and strong, often enclose the spikelet, and are rarely provided with long points or imperfect awns. Generally speaking they do not share in the special modifications of the flowering glumes, and rarely themselves undergo modification, chiefly in hardening of portions (*Sclerachne*, *Manisuris*, *Anthephora*, *Peltophorum*), so as to afford greater protection to the flowers or fruit. But it is usual to find, besides the basal glumes, a few other empty ones, and these are in two- or more-flowered spikelets (see *Triticum*, fig. 6) at the top of the rhachilla (numerous in *Lophatherum*), or in uniflorous ones (fig. 10) below and interposed between the floral glume and the basal pair.

FIG. 8.—Spikelet of *Stipa pennata*. The pair of barren glumes (*b*) are separated from the flowering glume, which bears a long awn, twisted below the knee and feathery above. About ½ nat. size.

FIG. 9.—Spikelet of *Leersia*, with an abortive branch (*h*) beneath it. *b*, Barren glume; *p*, flowering glume; *f*, palea.

FIG. 10.—Spikelet of *Setaria*, with an abortive branch (*h*) beneath it. *l*, Barren glume; *b*, flowering glume; *p*, palea.

The axis of the spikelet is frequently jointed and breaks up into articulations above each flower. Tufts or borders of hairs are frequently present (*Calamagrostis*, *Phragmites*, *Andropogon*), and are often so long as to surround and conceal the flowers (fig. 11). The axis is often continued beyond the last flower or glume as a bristle or stalk.

Involucres or organs outside the spikelets also occur, and are formed in various ways. Thus in *Setaria* (fig. 10), *Pennisetum*, &c., the one or more circles of simple or feathery hairs represent abortive branches of the inflorescence; in *Cenchrus* (fig. 12) these become consolidated, and the inner ones flattened so as to form a very hard globular spiny case to the spikelets. The cup-shaped involucre of *Cornucopia* is a dilatation of the axis into a hollow receptacle with a raised border. In *Cynosurus* (Dog's tail) the pectinate involucre which conceals the spikelet is a barren or abortive spikelet. Bracts of a more general character subtending branches of the inflorescence are singularly rare in Gramineæ, in marked contrast with Cyperaceæ, where they are so conspicuous. They however occur in a whole section of *Andropogon*, in *Anomochloa*, and at the base of the spike in *Sesleria*. The remarkable ovoid involucre of *Coix*, which becomes of stony hardness, white and polished (then known as "Job's tears," *q.v.*), is also a modified bract or leaf-sheath. It is closed except at the apex, and contains the female spikelet, the stalks of the male inflorescence emerging through the small apical orifice.

FIG. 11.—Spikelet of Reed (*Phragmites communis*) opened out. *a*, *b*. Barren glumes. *c*, *c*. Fertile glumes, each enclosing one flower with its pale *d*. Note the zigzag axis (*rhachilla*) bearing long silky hairs.

Any number of spikelets may compose the inflorescence, and their arrangement is very various. In the spicate forms, with sessile spikelets on the main axis, the latter is often dilated and flattened (*Paspalum*), or is more or less thickened and hollowed out (*Stenotaphrum*, *Rottboellia*, *Tripsacum*), when the spikelets are sunk and buried within the cavities. Every variety of racemose and paniculate inflorescence obtains, and the number of spikelets composing those of the large kinds is often immense. Rarely the inflorescence consists of very few flowers; thus *Lygeum Spartum*, the most anomalous of European grasses, has but two or three large uniflorous spikelets, which are fused together at the base, and have no basal glumes, but are enveloped in a large, hooded, spathe-like bract.

FIG. 12.—Spikelet of *Cenchrus echinatus* enclosed in a bristly involucre.

Flower.—This is characterized by remarkable uniformity. The perianth is represented by very rudimentary, small, fleshy scales arising below the ovary, called *lodicules*; they are elongated or truncate, sometimes fringed with hairs, and are in contact with the ovary. Their usual number is two, and they are placed collaterally at the anterior side of the flower (fig. 13,) that is, within the flowering glume. They are generally considered to represent the inner whorl of the ordinary monocotyledonous

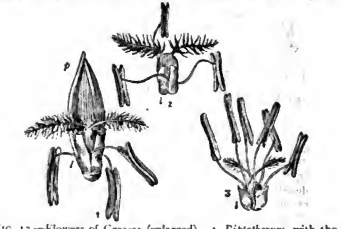

FIG. 13.—Flowers of Grasses (enlarged). 1, *Piptatherum*, with the palea *p*; 2, *Poa*; 3, *Oryza*; *l*, Lodicule.

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(liliaceous) perianth, the outer whorl of these being suppressed as well as the posterior member of the inner whorl. This latter is present almost constantly in *Stipeae* and *Bambuseae*, which have three lodicules, and in the latter group they are occasionally more numerous. In *Anomochloa* they are represented by hairs. In *Streptochaeta* there are six lodicules, alternately arranged in two whorls. Sometimes, as in *Anthoxanthum*, they are absent. In *Melica* there is one large anterior lodicule resulting presumably from the union of the two which are present in allied genera. Professor E. Hackel, however, regards this as an undivided second pale, which in the majority of the grasses is split in halves, and the posterior lodicule, when present, as a third pale. On this view the grass-flower has no perianth. The function of the lodicules is the separation of the pale and glume to allow the protrusion of stamens and stigmas; they effect this by swelling and thus exerting pressure on the base of these two structures. Where, as in *Anthoxanthum*, there are no lodicules, pale and glume do not become laterally separated, and the stamens and stigmas protrude only at the apex of the floret (fig. 7). Grass-flowers are usually hermaphrodite, but there are very many exceptions. Thus it is common to find one or more imperfect (usually male) flowers in the same spikelet with bisexual ones, and their relative position is important in classification. *Holcus* and *Arrhenatherum* are examples in English grasses; and as a rule in species of temperate regions separation of the sexes is not carried further. In warmer countries monoecious and dioecious grasses are more frequent. In such cases the male and female spikelets and inflorescence may be very dissimilar, as in maize, Job's tears, *Euchlaena*, *Spinifex*, &c.; and in some dioecious species this dissimilarity has led to the two sexes being referred to different genera (*e.g.* *Anthephora axilliflora* is the female of *Buchloe dactyloides*, and *Neurachne paradoxa* of a species of *Spinifex*). In other grasses, however, with the sexes in different plants (*e.g.* *Brisopyrum*, *Distichlis*, *Eragrostis capitata*, *Gynerium*), no such dimorphism obtains. *Amphicarpum* is remarkable in having cleistogamic flowers borne on long radical subterranean peduncles which are fertile, whilst the conspicuous upper panicules are not, though apparently perfect, never produce fruit. Something similar occurs in *Leersia oryzoides*, where the fertile spikelets are concealed within the leaf-sheaths.

Androecium.—In the vast majority there are three stamens alternating with the lodicules, and therefore one anterior, *i.e.* opposite the flowering glume, the other two being posterior and in contact with the palea (fig. 13, 1 and 2). They are hypogynous, and have long and very delicate filaments, and large, linear or oblong two-celled anthers, dorsifixed and ultimately very versatile, deeply indented at each end, and commonly exserted and pendulous. Suppression of the anterior stamen sometimes occurs (*e.g.* *Anthoxanthum*, fig. 7), or the two posterior ones may be absent (*Uniola*, *Cinna*, *Phippsia*, *Festuca bromoides*). There is in some genera (*Oryza*, most *Bambuseae*) another row of three stamens, making six in all (fig. 13, 3); and *Anomochloa* and *Tetrarrhena* possess four. The stamens become numerous (ten to forty) in the male flowers of a few monoecious genera (*Pariana*, *Lasiola*). In *Ochlandra* they vary from seven to thirty, and in *Gigantochloa* they are monadelphous.

Gynoecium.—The pistil consists of a single carpel, opposite the pale in the median plane of the spikelet. The ovary is small, rounded to elliptical, and one-celled, and contains a single slightly bent ovule sessile on the ventral suture (that is, springing from the back of the ovary); the micropyle points downwards. It bears usually two lateral styles which are quite distinct or connate at the base, sometimes for a greater length (fig. 14, 1), each ends in a densely hairy or feathery stigma (fig. 14). Occasionally there is but a single style, as in *Nardus* (fig. 14, 7), which corresponds to the midrib of the carpel. The very long and apparently simple stigma of maize arises from the union of two. Many of the bamboos have a third, anterior, style.

Comparing the flower of Gramineae with the general monocotyledonous plan as represented by Liliaceae and other families (fig. 15), it will be seen to differ in the absence of the outer row and the posterior member of the inner row of the perianth-leaves, of the whole inner row of stamens, and of the two lateral carpels,

FIG. 14.—Pistils of Grasses (much enlarged). 1, *Alopecurus*; 2, *Bromus*; 3, *Arrhenatherum*; 4, *Glyceria*; 5, *Melica*; 6, *Milium*; 7, *Nardus*.

whilst the remaining members of the perianth are in a rudimentary condition. But each or any of the usually missing organs are to be found normally in different genera, or as occasional developments.

Pollination.—Grasses are generally wind-pollinated, though self-fertilization sometimes occurs. A few species, as we have seen, are monoecious or dioecious, while many are polygamous (having unisexual as well as bisexual flowers

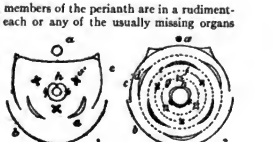

FIG. 15.—Diagrams of the ordinary Grass-flower.

1, Actual condition; 2, Theoretical, with the suppressed organs supplied.
a. Axis.
b. Flowering glume.
c. Palea.
d. Outer row of perianth leaves.
e. Inner row.
f. Outer row of stamens.
g. Inner row.
h. Pistil.

as in many members of the tribes *Andropogoneae*, fig. 18, and *Paniceae*), and in these the male flower of a spikelet always blooms later than the hermaphrodite, so that its pollen can only effect cross-fertilization upon other spikelets in the same or another plant. Of those with only bisexual flowers, many are strongly protogynous (the stigmas protruding before the anthers are ripe), such as *Alopecurus* and *Anthoxanthum* (fig. 7), but generally the anthers protrude first and discharge the greater part of their pollen before the stigmas appear. The filaments elongate rapidly at flowering-time, and the lightly versatile anthers empty an abundance of finely granular smooth pollen through a longitudinal slit. Some flowers, such as rye, have lost the power of effective self-fertilization, but in most cases both forms, self- and cross-fertilization, seem to be possible. Thus the species of wheat are usually self-fertilized, but cross-fertilization is possible since the glumes are open above, the stigmas project laterally, and the anthers empty only about one-third of their pollen in their own flower and the rest into the air. In some cultivated races of barley, cross-fertilization is precluded, as the flowers never open. Reference has already been made to cleistogamic species which occur in several genera.

Fruit and Seed.—The ovary ripens into a usually small ovoid or rounded fruit, which is entirely occupied by the single large seed, from which it is not to be distinguished, the thin pericarp being completely united to its surface. To this peculiar fruit the term *caryopsis* has been applied (more familiarly "grain"); it is commonly furrowed longitudinally down one side (usually the inner, but in *Coix* and its allies, the outer), and an additional covering is not unfrequently provided by the adherence of the persistent palea, or even also of the flowering

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glume (" chaff " of cereals). From this type are a few deviations; thus in *Sporobolus*, &c. (fig. 16), the pericarp is not united with the seed but is quite distinct, dehisces, and allows the loose seed to escape. Sometimes the pericarp is membranous, sometimes hard, forming a nut, as in some genera of *Bambuseae*, while in other *Bambuseae* it becomes thick and fleshy, forming a berry often as large as an apple. In *Melocanna* the berry forms an edible fruit 3 or 4 in. long, with a pointed beak of 2 in. more; it is indehiscent, and the small seed germinates whilst the fruit is still attached to the tree, putting out a tuft of roots and a shoot, and not falling till the latter is 6 in. long. The position of the embryo is plainly visible on the front side at the base of the grain. On the other, posterior, side of the grain is a more or less evident, sometimes punctiform, sometimes elongated or linear mark, the hilum, the place where the ovule was fastened to the wall of the ovary. The form of the hilum is constant throughout a genus, and sometimes also in whole tribes.

FIG. 16.—Fruit of *Sporobolus*, showing the dehiscent pericarp and seed.

The testa is thin and membranous but occasionally coloured, and the embryo small, the great bulk of the seed being occupied by the hard farinaceous endosperm (albumen) on which the nutritive value of the grain depends. The outermost layer of endosperm, the aleuron-layer, consists of regular cells filled with small proteid granules; the rest is made up of large polygonal cells containing numerous starch-grains in a matrix of proteid which may be continuous (horny endosperm) or granular (mealy endosperm). The embryo presents many points of interest. Its position is remarkable, closely applied to the surface of the endosperm at the base of its outer side. This character is absolute for the whole order, and effectually separates Gramineae from Cyperaceae. The part in contact with the endosperm is plate-like, and is known as the *scutellum*; the surface in contact with the endosperm forms an absorptive epithelium. In some grasses there is a small scale-like appendage opposite the scutellum, the *epiblast*. There is some difference of opinion as to which structure or structures represent the cotyledon. Three must be considered: (1) the scutellum, connected by vascular tissue with the vascular cylinder of the main axis of the embryo which it more or less envelops; it never leaves the seed, serving merely to prepare and absorb the food-stuff in the endosperm; (2) the cellular outgrowth of the axis, the epiblast, small and inconspicuous as in wheat, or larger as in *Stipa*; (3) the pileole or germ-sheath, arising on the same side of the axis and above the scutellum, enveloping the plumule in the seed and appearing above ground as a generally colourless sheath from the apex of which the plumule ultimately breaks (fig. 17, 4, *b*). The development of these structures (which was investigated by van Tieghem),

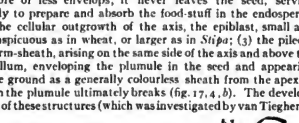

FIG. 17.—A Grain of Wheat. 1, back, and 2, front view; 3, vertical section, showing (*b*) the endosperm, and (*a*) embryo; 4, beginning of germination, showing (*b*) the pileole and (*c*) the radicle and secondary rootlets surrounded by their coleorrhizae.

especially in relation to the origin of the vascular bundles which supply them, favours the view that the scutellum and pileole are highly differentiated parts of a single cotyledon, and this view is in accord with a comparative study of the seedling of grasses and of other monocotyledons. The epiblast has been regarded as representing a second cotyledon, but this is a very doubtful interpretation.

Germination.—In germination the coleorhiza lengthens, ruptures the pericarp, and fixes the grain to the ground by developing numerous hairs. The radicle then breaks through the coleorhiza, as do also the secondary rootlets where, as in the case of many cereals, these have been formed in the embryo (fig. 17, 4). The germ-sheath grows vertically upwards, its stiff apex pushing through the soil, while the plumule is hidden in its hollow interior. Finally the plumule escapes, its leaves successively breaking through at the tip of the germ-sheath. The scutellum meanwhile feeds the developing embryo from the endosperm. The growth of the primary root is limited; sooner or later adventitious roots develop from the axis above the radicle which they ultimately exceed in growth.

Means of Distribution.—Various methods of scattering the grain have been adopted, in which parts of the spikelet or inflorescence are concerned. Short spikes may fall from the culm as a whole; or the axis of a spike or raceme is jointed so that one spikelet falls with each joint as in many *Andropogoneae* and *Hordeae*. In many-flowered spikelets the rachilla is often jointed and breaks into as many pieces as there are fruits, each piece bearing a glume and pale. One-flowered spikelets may fall as a whole (as in the tribes *Paniceae* and *Andropogoneae*), or the axis is jointed above the barren glumes so that only the flowering glume and pale fall with the fruit. These arrangements are, with few exceptions, lacking in cultivated cereals though present in their wild forms, so far as these are known. Such arrangements are disadvantageous for the complete gathering of the fruit, and therefore varieties in which they are not present would be preferred for cultivation. The persistent bracts (glume and pale) afford an additional protection to the fruit; they protect the embryo, which is near the surface, from too rapid wetting and, when once soaked, from drying up again. They also decrease the specific gravity, so that the grain is more readily carried by the wind, especially when, as in *Briza*, the glume has a large surface compared with the size of the grain, or when, as in *Holcus*, empty glumes also take part; in Canary grass (*Phalaris*) the large empty glumes bear a membranous wing on the keel. In the sugar-cane (*Saccharum*) and several allied genera the separating joints of the axis bear long hairs below the spikelets; in others, as in *Arundo* (a reed-grass), the flowering glumes are enveloped in long hairs. The awn which is frequently borne on the flowering glume is also a very efficient means of distribution, catching into fur of animals or plumage of birds, or as often in *Stipa* (fig. 8) forming a long feather for wind-carriage. In *Tragus* the glumes bear numerous short hooked bristles. The fleshy berries of some *Bambuseae* favour distribution by animals.

The awn is also of use in burying the fruit in the soil. Thus in *Stipa*, species of *Arena*, *Heteropogon* and others the base of the glume forms a sharp point which will easily penetrate the ground; above the point are short stiff upwardly pointing hairs which oppose its withdrawal. The long awn, which is bent and closely twisted below the bend, acts as a driving organ; it is very hygroscopic, the coils untwisting when damp and twisting up when dry. The repeated twisting and untwisting, especially when the upper part of the awn has become fixed in the earth or caught in surrounding vegetation, drives the point deeper and deeper into the ground. Such grasses often cause harm to sheep by catching in the wool and boring through the skin.

A peculiar method of distribution occurs in some alpine and arctic grasses, which grow under conditions where ripening of the fruit is often uncertain. The entire spikelet, or single flowers, are transformed into small-leaved shoots which fall from the axes and readily root in the ground. Some species, such as *Poa stricta*, are known only in this viviparous condition; others, like our British species *Festuca ovina* and *Poa alpina*, become viviparous under the special climatic conditions.

II. CLASSIFICATION.—Gramineae are sharply defined from all other plants, and there are no genera as to which it is possible to feel a doubt whether they should be referred to it or not. The only family closely allied is Cyperaceae, and the points of difference between the two may be here brought together. The

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best distinctions are found in the position of the embryo in relation to the endosperm—lateral in grasses, basal in Cyperaceae—and in the possession by Gramineae of the 2-nerved palea below each flower. Less absolute characters, but generally trustworthy and more easily observed, are the feathery stigmas, the always distichous arrangement of the glumes, the usual absence of more general bracts in the inflorescence, the split leaf-sheaths, and the hollow, cylindrical, jointed culms—some or all of which are wanting in all Cyperaceae. The same characters will distinguish grasses from the other glumiferous orders, Restiaceae, and Eriocaulonaceae, which are besides further removed by their capsular fruit and pendulous ovules. To other monocotyledonous families the resemblances are merely of adaptive or vegetative characters. Some Commelinaceae and Marantaceae approach grasses in foliage; the leaves of *Allium*, &c., possess a ligule; the habit of some palms reminds one of the bamboos; and Juncaceae and a few Liliaceae possess an inconspicuous scarious perianth. There are about 300 genera containing about 3500 well-defined species.

The great uniformity among the very numerous species of this vast family renders its *classification* very difficult. The difficulty has been increased by the confusion resulting from the multiplication of genera founded on slight characters, and from the description (in consequence of their wide distribution) of identical plants under several different genera.

No characters for main divisions can be obtained from the flower proper or fruit (with the exception of the character of the hilum), and it has therefore been found necessary to trust to characters derived from the usually less important inflorescence and bracts.

Robert Brown suggested two primary divisions—Paniceae and Poaceae, according to the position of the most perfect flower in the spikelet; this is the upper (apparently) terminal one in the first, whilst in the second it occupies the lower position, the more imperfect ones (if any) being above it. Munro supplemented this by another character easier of verification, and of even greater constancy, in the articulation of the pedicel in the Paniceae immediately below the glumes; whilst in Poaceae this does not occur, but the axis of the spikelet frequently articulates *above* the pair of empty basal glumes. Neither of these great divisions will well accommodate certain genera allied to *Phalaris*, for which Brown proposed tentatively a third group (since named *Phalarideae*); this, or at least the greater part of it, is placed by Bentham under the Poaceae.

The following arrangement has been proposed by Professor Eduard Hackel in his recent monograph on the order.

A. Spikelets one-flowered, rarely two-flowered as in *Zea*, falling from the pedicel entire or with certain joints of the rachis at maturity. Rachilla not produced beyond the flowers.

a. Hilum a point; spikelets not laterally compressed.

α Fertile glume and pale hyaline; empty glumes thick, membranous to cortaceous or cartilaginous, the lowest the largest. Rachis generally jointed and breaking up when mature.

1. Spikelets unisexual, male and female in separate inflorescences or on different parts of the same inflorescence. 1. *Maydeae*.

2. Spikelets bisexual, or male and bisexual, each male standing close to a bisexual. 2. *Andropogoneae*.

β Fertile glume and pale cartilaginous, cortaceous or papery; empty glumes more delicate, usually herbaceous, the lowest usually smallest. Spikelets falling singly from the unjointed rachis of the spike or the ultimate branches of the panicle. 3. *Paniceae*.

b. Hilum a line; spikelets laterally compressed. 4. *Oryzeae*.

B. Spikelets one- to indefinite-flowered; in the one-flowered the rachilla frequently produced beyond the flower; rachilla generally jointed above the empty glumes, which remain after the fruiting glumes have fallen. When more than one-flowered, distinct internodes are developed between the flowers.

a. Culm herbaceous, annual; leaf-blade sessile, and not jointed to the sheath.

α Spikelets upon distinct pedicels and arranged in panicles or racemes.

I. Spikelets one-flowered.

i. Empty glumes 4. 5. *Phalarideae*.

ii. Empty glumes 2, 6. *Agrostideae*.

II. Spikelets more than one-flowered.

i. Fertile glumes generally shorter than the empty glumes, usually with a bent awn on the back. 7. *Aveneae*.

ii. Fertile glumes generally longer than the empty, unawned or with a straight, terminal awn. 9. *Festuceae*.

β Spikelets crowded in two close rows, forming a one-sided spike or raceme with a continuous (not jointed) rachis. 8. *Chlorideae*.

γ Spikelets in two opposite rows forming an equal-sided spike. 10. *Hordeae*.

b. Culm woody, at any rate at the base, leaf-blade jointed to the sheath, often with a short, slender petiole. 11. *Bambuseae*.

Tribe 1. *Maydeae* (7 genera in the warmer parts of the earth). *Zea Mays* (maize, *q.v.*, or Indian corn) (*q.v.*). *Tripsacum*, 2 or 3 species in subtropical America north of the equator; *Tr. dactyloides* (gama grass) extends northwards to Illinois and Connecticut; it is used for fodder and as an ornamental plant. *Coix Lacryma- Jobi* (Job's tears) *q.v.*

Tribe 2. *Andropogoneae* (25 genera, mainly tropical). The spikelets are arranged in spike-like racemes, generally in pairs consisting of a sessile and stalked spikelet at each joint of the rachis (fig. 18). Many are savanna grasses, in various parts of the tropics, for instance the large genus *Andropogon*, *Elionurus* and others. *Saccharum officinarum* (sugar-cane) (*q.v.*). *Sorghum*, an important tropical cereal known as black millet or *durra* (*q.v.*). *Miscanthus* and *Erianthus*, nearly allied to *Saccharum*, are tall reed-like grasses, with large silky flower-panicles, which are grown for ornament. *Imperata*, another ally, is a widespread tropical genus; one species *I. arundinacea* is the principal grass of the alang-alang fields in the Malay Archipelago; it is used for thatch. *Vossia*, an aquatic grass, often floating, is found in western India and tropical Africa. In the swampy lands of the upper Nile it forms, along with a species of *Saccharum*, huge floating grass barriers. *Elionurus*, a widespread savanna grass in tropical and subtropical America, and also in the tropics of the old world, is rejected by cattle probably on account of its aromatic character, the spikelets having a strong balsam-like smell. Other aromatic members are *Andropogon Schoenanthus* (lemon-grass), yields lemon-grass oil; a variety is used by the negroes in western Africa for haemorrhage. Other species of the same genus are used as stimulants and cosmetics in various parts of the tropics. The species of *Heteropogon*, a cosmopolitan genus in the warmer parts of the world, have strongly awned spikelets. *Themeda Forskalii*, which occurs from the Mediterranean region to South Africa and Tasmania, is the kangaroo grass of Australia, where, as in South Africa, it often covers wide tracts.

FIG. 18.—A pair of spikelets of *Andropogon*.

Tribe 3. *Paniceae* (about 25 genera, tropical to subtropical; few temperate), a second flower, generally male, rarely hermaphrodite, is often present below the fertile flower. *Paspalum*, is a large tropical genus, most abundant in America, especially on the pampas and campos; many species are good forage plants, and the grain is sometimes used for food. *Amphicarpum*, native in the southeastern United States, has fertile cleistogamous spikelets on filiform runners at the base of the culm, those on the terminal panicle are sterile. *Panicum*, a very polymorphic genus, and one of the largest in the order, is widely spread in all warm countries; together with species of *Paspalum* they form good forage grasses in the South American savannas and campos. *Panicum Crus-galli* is a polymorphic cosmopolitan grass, which is often grown for fodder; in one form (*P. frumentaceum*) it is cultivated in India for its grain. *P. plicatum*, with broad folded leaves, is an ornamental greenhouse grass. *P. miliaceum* is millet (*q.v.*), and *P. altissimum*, Guinea grass. In the closely allied genus *Digitaria*, which is sometimes regarded as a section of *Panicum*, the lowest barren glume is reduced to a point; *D. sanguinalis* is a very widespread grass, in Bohemia it is cultivated as a food-grain; it is also the crab-grass of the southern United States, where it is used for fodder.

In *Setaria* and allied genera the spikelet is subtended by an involucre of bristles or spines which represent sterile branches of the inflorescence. *Setaria italica*, Hungarian grass, is extensively grown as a food-grain both in China and Japan, parts of India and western Asia, as well as in Europe, where its culture dates from prehistoric times; it is found in considerable quantity in the lake dwellings of the Stone age.

In *Cenchrus* the bristles unite to form a tough spiny capsule

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fig. 12); *C. tribuloides* (bur-grass) and other species are troublesome weeds in North and South America, as the involucre clings to the wool of sheep and is removed with great difficulty. *Pennisetum typhoideum* is widely cultivated as a grain in tropical Africa. *Spinifex*, a dioecious grass, is widespread on the coasts of Australia and eastern Asia, forming an important sand-binder. The female heads are spinose with long pungent bracts, fall entire when ripe and are carried away by wind or sea, becoming finally anchored in the sand and falling to pieces.

Tribe 4. *Oryzeae* (16 genera, mainly tropical and subtropical). The spikelets are sometimes unisexual, and there are often six stamens. *Leersia* is a genus of swamp grasses, one of which *L. oryzoides* occurs in the north temperate zone of both old and new worlds, and is a rare grass in Surrey, Sussex and Hampshire. *Zizania aquatica* (Tuscarora or Indian rice) is a reed-like grass growing over large areas on banks of streams and lakes in North America and north-east Asia. The Indians collect the grain for food. *Oryza sativa* (rice) (*q.v.*). *Lygeum Spartum*, with a creeping stem and stiff rush-like leaves, is common on rocky soil on the high plains bordering the western Mediterranean, and is one of the sources of esparto.

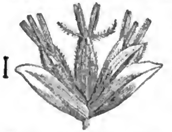

Fig. 19.—*Phalarideae*. Spikelet of *Hierochloe*.

Tribe 5. *Phalarideae* (6 genera, three of which are South African and Australasian; the others are more widely distributed, and represented in our flora). *Phalaris arundinacea*, is a reed-grass found on the banks of British rivers and lakes; a variety with striped leaves known as ribbon-grass is grown for ornament. *P. canariensis* (Canary grass, a native of southern Europe and the Mediterranean area) is grown for bird-food and sometimes as a cereal. *Anthoxanthum odoratum*, the sweet vernal grass of our flora, owes its scent to the presence of coumarin, which is also present in the closely allied genus *Hierochloe* (fig. 19), which occurs throughout the temperate and frigid zones.

Tribe 6. *Agrostideae* (about 35 genera, occurring in all parts of the world; eleven are British). *Aristida* and *Stipa* are large and widely distributed genera, occurring especially on open plains and steppes; the conspicuously awned persistent flowering glume forms an efficient means of dispersing the grain. *Stipa pennata* is a characteristic species of the Russian steppes. *St. spartea* (porcupine grass) and other species are plentiful on the North American prairies. *St. tenacissima* is the Spanish esparto grass (*q.v.*), known in North Africa as halfa or alfa. *Phleum* has a cylindrical spike-like inflorescence; *P. pratense* (timothy) is a valuable fodder grass, as also is *Alopecurus pratensis* (foxtail). *Sporobolus*, a large genus in the warmer parts of both hemispheres, but chiefly America, derives its name from the fact that the seed is ultimately expelled from the fruit. *Agrostis* is a large world-wide genus, but especially developed in the north temperate zone, where it includes important meadow-grasses. *Calamagrostis* and *Deyeuxia* are tall, often reed-like grasses, occurring throughout the temperate and arctic zones and upon high mountains in the tropics. *Ammophila arundinacea* (or *Psamma arenaria*) (Marram grass) with its long creeping stems forms a useful sand-binder on the coasts of Europe, North Africa and the Atlantic states of America.

Tribe 7. *Aveneae* (about 24 genera, seven of which are British). *Holcus lanatus* (Yorkshire fog, soft grass) is a common meadow and wayside grass with woolly or downy leaves. *Aira* is a genus of delicate annuals with slender hair-like branches of the panicle. *Deschampsia* and *Trisetum* occur in temperate and cold regions or on high mountains in the tropics; *T. pratense* (*Avena flavescens*) with a loose panicle and yellow shining spikelets is a valuable fodder-grass. *Avena fatua* is the wild oat and *A. sativa* the cultivated oat (*q.v.*). *Arrhenatherum avenaceum*, a perennial field grass, native in Britain and central and southern Europe, is cultivated in North America.

Tribe 8. *Chlorideae* (about 30 genera, chiefly in warm countries). The only British representative is *Cynodon Dactylon* (dog's tooth, Bermuda grass) found on sandy shores in the south-west of England; it is a cosmopolitan, covering the ground in sandy soils, and forming an important forage grass in many dry climates (Bermuda grass of the southern United States, and known as durba, dub and other names in India). Species of *Chloris* are grown as ornamental grasses. *Bouteloua* with numerous species (mesquite grass, grama grass) on the plains of the south-western United States, afford good grazing. *Eleusine indica* is a common tropical weed; the nearly allied species *E. Coracana* is a cultivated grain in the warmer parts of Asia and throughout Africa. *Buchloe dactyloides* is the buffalo grass of the North American prairies, a valuable fodder.

Tribe 9. *Festuceae* (about 83 genera, including tropical, temperate, arctic and alpine forms) many are important meadow-grasses; 15 are British. *Gynerium argenteum* (pampas grass) is a native of southern Brazil and Argentina. *Arundo* and *Phragmites* are tall reed-grasses (see Reed). Several species of *Triodia* cover large areas of the interior of Australia, and from their stiff, sharply pointed leaves are very troublesome. *Eragrostis*, one of the larger genera of the order, is widely distributed in the warmer parts of the earth; many species are grown for ornament and *E. abyssinica* is an important food-plant in Abyssinia. *Koeleria cristata* is a fodder-grass. *Briza media* (quaking grass) is a useful meadow-grass. *Dactylis glomerata* (cock's-foot), a perennial grass with a dense panicle, common in pastures and waste places is a useful meadow-grass. It has become naturalized in North America, where it is known as orchard grass, as it will grow in shade. *Cynosurus cristatus* (dog's tail) is a common pasture-grass. *Poa*, a large genus widely distributed in temperate and cold countries, includes many meadow and alpine grasses; eight species are British; *P. annua* (fig. 20) is the very common weed in paths and waste places; *P. pratensis* and *P. trivialis* are also common grasses of meadows, banks and pastures, the former is the "June grass" or "Kentucky blue grass" of North America; *P. alpina* is a mountain grass of the northern hemisphere and found also in the Arctic region. The largest species of the genus is *Poa flabellata* which forms great tufts 6-7 ft. high with leaves arranged like a fan; it is a native of the Falkland and certain antarctic islands where it is known as tussock grass. *Glyceria fluitans*, manna-grass, so-called from the sweet grain, is one of the best fodder grasses for swampy meadows; the grain is an article of food in central Europe. *Festuca* (fescue) is also a large and widely distributed genus, but found especially in the temperate and cold zones; it includes valuable pasture grasses, such as *F. ovina* (sheep's fescue), *F. rubra*; nine species are British. The closely allied genus *Bromus* (brome grass) is also widely distributed but most abundant in the north temperate zone; *B. erectus* is a useful forage grass on dry chalky soil.

Fig. 20.—*Poa annua*. Plant in Flower; about ¼ nat. size. 1, one spikelet.

Tribe 10. *Hordeae* (about 19 genera, widely distributed; six are British). *Nardus stricta* (mat-weed), found on heaths and dry pastures, is a small perennial with slender rigid stem and leaves, it is a useless grass, crowding out better sorts. *Lolium perenne*, ray- (or by corruption rye-) grass, is common in waste places and a valuable pasture-grass; *L. italicum* is the Italian ray-grass; *L. temulentum* (darnel) contains a narcotic principle in the grain. *Secale cereale*, rye (*q.v.*), is cultivated mainly in northern Europe. *Agropyrum repens* (couch grass) has a long creeping underground stem, and is a troublesome weed in cultivated land; the widely creeping stem of *A. junceum*, found on sandy sea-shores, renders it a useful sand-binder. *Triticum sativum* is wheat (*q.v.*) (fig. 21), and *Hordeum sativum*, barley (*q.v.*). *H. murinum*, wild barley, is a common grass in waste places. *Elymus arenarius* (lyme grass) occurs on sandy sea-shores in the north temperate zone and is a useful sand-binder.

Tribe 11. *Bambuseae*. Contains 23 genera, mainly tropical. See Bamboo.

Fig. 21.—Spike of Wheat (*Triticum sativum*). About ⅓ nat. size.

III. Distribution.—Grasses are the most universally diffused of all flowering plants. There is no district in which they do not occur, and in nearly all they are a leading feature of the flora. In number of species Gramineae comes considerably after Compositae and

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Leguminosae, the two most numerous orders of phanerogams, but in number of individual plants it probably far exceeds either; whilst from the wide extension of many of its species, the proportion of Gramineae to other orders in the various floras of the world is much higher than its number of species would lead one to expect. In tropical regions, where Leguminosae is the leading order, grasses closely follow as the second, whilst in the warm and temperate regions of the northern hemisphere, in which Compositae takes the lead, Gramineae again occupies the second position.

While the greatest number of species is found in the tropical zone, the number of individuals is greater in the temperate zones, where they form extended areas of turf. Turf- or meadow-formation depends upon uniform rainfall. Grasses also characterize steppes and savannas, where they form scattered tufts. The bamboos are a feature of tropical forest vegetation, especially in the monsoon region. As the colder latitudes are entered the grasses become relatively more numerous, and are the leading family in Arctic and Antarctic regions. The only countries where the order plays a distinctly subordinate part are some extra-tropical regions of the southern hemisphere, Australia, the Cape, Chili, &c. The proportion of graminaceous species to the whole phanerogamic flora in different countries is found to vary from nearly $\frac{1}{4}$th in the Arctic regions to about $\frac{1}{25}$th at the Cape; in the British Isles it is about $\frac{1}{13}$th.

The principal climatic cause influencing the number of graminaceous species appears to be amount of moisture. A remarkable feature of the distribution of grasses is its uniformity; there are no great centres for the order, as in Compositae, where a marked preponderance of endemic species exists; and the genera, except some of the smallest or monotypic ones, have usually a wide distribution.

The distribution of the tropical tribe *Bambuseae* is interesting. The species are about equally divided between the Indo-Malayan region and tropical America, only one species being common to both. The tribe is very poorly represented in tropical Africa; one species *Oxytenanthera abyssinica* has a wide range, and three monotypic genera are endemic in western tropical Africa. None is recorded for Australia, though species may perhaps occur on the northern coast. One species of *Arundinaria* reaches northwards as far as Virginia, and the elevation attained in the Andes by some species of *Chusquea* is very remarkable,—one, *C. aristata*, being abundant from 15,000 ft. up to nearly the level of perpetual snow.

Many grasses are almost cosmopolitan, such as the common reed, *Phragmites communis*; and many range throughout the warm regions of the globe, *e.g. Cynodon Dactylon*, *Eleusine indica*, *Imperata arundinacea*, *Sporobolus indicus*, &c., and such weeds of cultivation as species of *Setaria*, *Echinochloa*. Several species of the north temperate zone, such as *Poa nemoralis*, *P. pratensis*, *Festuca ovina*, *F. rubra* and others, are absent in the tropics but reappear in the antarctic regions; others (*e.g. Phleum alpinum*) appear in isolated positions on high mountains in the intervening tropics. No tribe is confined to one hemisphere and no large genus to any one floral region; facts which indicate that the separation of the tribes goes back to very ancient times. The revision of the Australian species by Bentham well exhibits the wide range of the genera of the order in a flora generally so peculiar and restricted as that of Australia. Thus of the 90 indigenous genera (many monotypic or very small) only 14 are endemic, 1 extends to South Africa, 3 are common to Australia and New Zealand, 18 extend also into Asia, whilst no fewer than 54 are found in both the Old and New Worlds, 26 being chiefly tropical and 28 chiefly extra-tropical.

Of specially remarkable species *Lygeum* is found on the sea-sand of the eastern half of the Mediterranean basin, and the minute *Coleanthus* occurs in three or four isolated spots in Europe (Norway, Bohemia, Austria, Normandy), in North-east Asia (Amur) and on the Pacific coast of North America (Oregon, Washington). Many remarkable endemic genera occur in tropical America, including *Anomochloa* of Brazil, and most of the large aquatic species with separated sexes are found in this region. The only genus of flowering plants peculiar to the arctic regions is the beautiful and rare grass *Pleuropogon Sabinii*, of Melville Island.

Fossil Grasses.—While numerous remains of grass-like leaves are a proof that grasses were widespread and abundantly developed in past geological ages, especially in the Tertiary period, the fossil remains are in most cases too fragmentary and badly preserved for the determination of genera, and conclusions based thereon in explanation of existing geographical distribution are most unsatisfactory. There is, however, justification for referring some specimens to *Arundo*, *Phragmites*, and to the *Bambuseae*.

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GRASSHOPPER (Fr. *sauterelle*, Ital. *grillo*, Ger. *Grashüpfer*, *Heuschrecke*, Swed. *Gräshoppa*), names applied to orthopterous insects belonging to the families *Locustidae* and *Acrididae*. They are especially remarkable for their saltatory powers, due to the great development of the hind legs, which are much longer than the others and have stout and powerful thighs, and also for their stridulation, which is not always an attribute of the male only. The distinctions between the two families may be briefly stated as follows:—The *Locustidae* have very long thread-like antennae, four-jointed tarsi, a long ovipositor, the auditory organs on the tibiae of the first leg and the stridulatory organ in the wings; the *Acrididae* have short stout antennae, three-jointed tarsi, a short ovipositor, the auditory organs on the first abdominal segment, and the stridulatory organ between the posterior leg and the wing. The term "grasshopper" is almost synonymous with LOCUST (*q.v.*). Under both "grasshopper" and "locust" are included members of both families above noticed, but the majority belong to the *Acrididae* in both cases. In Britain the term is chiefly applicable to the large green grasshopper (*Locusta* or *Phasgonura viridissima*) common in most parts of the south of England, and to smaller and much better-known species of the genera *Stenobothrus*, *Gomphocerus* and *Tettix*, the latter remarkable for the great extension of the pronotum, which often reaches beyond the extremity of the body. All are vegetable feeders, and, as in all orthopterous insects, have an incomplete metamorphosis, so that their destructive powers are continuous from the moment of emergence from the egg till death. The migratory locust (*Pachytylus cinerascens*) may be considered only an exaggerated grasshopper, and the Rocky Mountain locust (*Caloptenus spretus*) is still more entitled to the name. In Britain the species are not of sufficient size, nor of sufficient numerical importance, to do any great damage. The colours of many of them assimilate greatly to those of their habitats; the green of the *Locusta viridissima* is wonderfully similar to that of the herbage amongst which it lives, and those species that frequent more arid spots are protected in the same manner. Yet many species have brilliantly coloured under-wings (though scarcely so in English forms), and during flight are almost as conspicuous as butterflies. Those that belong to the *Acrididae* mostly lay their eggs in more or less cylindrical masses, surrounded by a glutinous secretion, in the ground. Some of the *Locustidae* also lay their eggs in the ground, but others deposit them in fissures in trees and low plants, in which the female is aided by a long flattened ovipositor, or process at the extremity of the abdomen, whereas in the *Acrididae* there is only an

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apparatus of valves. The stridulation or "song" in the latter is produced by friction of the hind legs against portions of the wings or wing-covers. To a practised ear it is perhaps possible to distinguish the "song" of even closely allied species, and some are said to produce a sound differing by day and night.

GRASS OF PARNASSUS, in botany, a small herbaceous plant known as *Parnassia palustris* (natural order *Saxifragaceae*), found on wet moors and bogs in Britain but less common in the south. The white regular flower is rendered very attractive

Grass of Parnassus (*Parnassia palustris*). 1, one of the gland-bearing scales enlarged.

by a circlet of scales, opposite the petals, each of which bears a fringe of delicate filaments ending in a yellow knob. These glisten in the sunshine and look like a drop of honey. Honey is secreted by the base of each of the scales.

GRATE (from Lat. *crates*, a hurdle), the iron or steel receptacle for a domestic fire. When coal replaced logs and irons were found to be unsuitable for burning the comparatively small lumps, and for this reason and on account of the more concentrated heat of coal it became necessary to confine the area of the fire. Thus a basket or cage came into use, which, as knowledge of the scientific principles of heating increased, was succeeded by the small grate of iron and fire-brick set close into the wall which has since been in ordinary use in England. In the early part of the 19th century polished steel grates were extensively used, but the labour and difficulty of keeping them bright were considerable, and they were gradually replaced by grates with a polished black surface which could be quickly renewed by an application of black-lead. The most frequent form of the 18th-century grate was rather high from the hearth, with a small hob on each side. The brothers Adam designed many exceedingly elegant grates in the shape of movable baskets ornamented with the paterae and acanthus leaves, the swags and festoons characteristic of their manner. The modern dog-grate is a somewhat similar basket supported upon dogs or andirons, fixed or movable. In the closing years of the 19th century a "well-grate" was invented, in which the fire burns upon the hearth, combustion being aided by an air-chamber below.

GRATIAN (FLAVIUS GRATIANUS AUGUSTUS), Roman emperor 375–383, son of Valentinian I. by Severa, was born at Sirmium in Pannonia, on the 18th of April (or 23rd of May) 359. On the 24th of August 367 he received from his father the title of Augustus. On the death of Valentinian (17th of November 375) the troops in Pannonia proclaimed his infant son (by a second wife Justina) emperor under the title of Valentinian II. (*q.v.*). Gratian acquiesced in their choice; reserving for himself the administration of the Gallic provinces, he handed over Italy, Illyria and Africa to Valentinian and his mother, who fixed their residence at Milan. The division, however, was merely nominal, and the real authority remained in the hands of Gratian. The eastern portion of the empire was under the rule of his uncle Valens. In May 378 Gratian completely defeated the Lentienses, the southernmost branch of the Alamanni, at Argentaria, near the site of the modern Colmar. When Valens met his death fighting against the Goths near Adrianople on the 9th of August in the same year, the government of the eastern empire devolved upon Gratian, but feeling himself unable to resist unaided the incursions of the barbarians, he ceded it to Theodosius (January 379). With Theodosius he cleared the Balkans of barbarians. For some years Gratian governed the empire with energy and success, but gradually he sank into indolence, occupied himself chiefly with the pleasures of the chase, and became a tool in the hands of the Frankish general Merobaudes and bishop Ambrose. By taking into his personal service a body of Alani, and appearing in public in the dress of a Scythian warrior, he aroused the contempt and resentment of his Roman troops. A Roman named Maximus took advantage of this feeling to raise the standard of revolt in Britain and invaded Gaul with a large army, upon which Gratian, who was then in Paris, being deserted by his troops, fled to Lyons, where, through the treachery of the governor, he was delivered over to one of the rebel generals and assassinated on the 25th of August 383.

The reign of Gratian forms an important epoch in ecclesiastical history, since during that period orthodox Christianity for the first time became dominant throughout the empire. In dealing with pagans and heretics Gratian, who during his later years was greatly influenced by Ambrose, bishop of Milan, exhibited severity and injustice at variance with his usual character. He prohibited heathen worship at Rome; refused to wear the insignia of the pontifex maximus as unbefitting a Christian; removed the altar of Victory from the senate-house at Rome, in spite of the remonstrance of the pagan members of the senate, and confiscated its revenues; forbade legacies of real property to the Vestals; and abolished other privileges belonging to them and to the pontiffs. For his treatment of heretics see the church histories of the period.

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GRATIANUS, FRANCISCUS, compiler of the *Concordia discordantium canonum* or *Decretum Gratiani*, and founder of the science of canon law, was born about the end of the 11th century at Chiusi in Tuscany or, according to another account, at Carraria near Orvieto. In early life he appears to have been received into the Camaldulian monastery of Classe near Ravenna, whence he afterwards removed to that of San Felice in Bologna, where he spent many years in the preparation of the *Concordia*. The

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precise date of this work cannot be ascertained, but it contains references to the decisions of the Lateran council of 1139, and there is fair authority for believing that it was completed while Pope Alexander III. was still simply professor of theology at Bologna,—in other words, prior to 1150. The labours of Gratian are said to have been rewarded with the bishopric of Chiusi, but if so he appears never to have been consecrated; at least his name is not in any authentic list of those who have occupied that see. The year of his death is unknown.

For some account of the *Decretum Gratiani* and its history see CANON LAW. The best edition is that of Friedberg (*Corpus juris canonici*, Leipzig, 1879). Compare Schultze, *Zur Geschichte der Litteratur über das Decret Gratians* (1870), *Die Glosse zum Decret Gratians* (1872), and *Geschichte der Quellen und Litteratur des kanonischen Rechts* (3 vols., Stuttgart, 1875).

GRATRY, AUGUSTE JOSEPH ALPHONSE (1805–1872), French author and theologian, was born at Lille on the 10th of March 1805. He was educated at the École Polytechnique, Paris, and, after a period of mental struggle which he has described in *Souvenirs de ma jeunesse*, he was ordained priest in 1832. After a stay at Strassburg as professor of the Petit Séminaire, he was appointed director of the Collège Stanislas in Paris in 1842 and, in 1847, chaplain of the École Normale Supérieure. He became vicar-general of Orleans in 1861, professor of ethics at the Sorbonne in 1862, and, on the death of Barante, a member of the French Academy in 1867, where he occupied the seat formerly held by Voltaire. Together with M. Pététot, *curé* of Saint Roch, he reconstituted the Oratory of the Immaculate Conception, a society of priests mainly devoted to education. Gratry was one of the principal opponents of the definition of the dogma of papal infallibility, but in this respect he submitted to the authority of the Vatican Council. He died at Montreux in Switzerland on the 6th of February 1872.

His chief works are: *De la connaissance de Dieu*, opposing Positivism (1855); *La Logique* (1856); *Les Sources, conseils pour la conduite de l'esprit* (1861–1862); *La Philosophie du credo* (1861); *Commentaire sur l'évangile de Saint Matthieu* (1863); *Jésus-Christ, lettres à M. Renan* (1864); *Les Sophistes et la critique* (in controversy with E. Vacherot) (1864); *La Morale et la loi de l'histoire*, setting forth his social views (1868); *Mgr. l'évêque d'Orléans et Mgr. l'archevêque de Malines* (1869), containing a clear exposition of the historical arguments against the doctrine of papal infallibility. There is a selection of Gratry's writings and appreciation of his style by the Abbé Pichot, in *Pages choisies des Grands Ecrivains* series, published by Armand-Colin (1897). See also the critical study by the oratorian A. Chauvin, *L'Abbé Gratry* (1901); *Le Père Gratry* (1900), and *Les Derniers Jours du Père Gratry et son testament spirituel*, (1872), by Cardinal Adolphe Perraud, Gratry's friend and disciple.

GRATTAN, HENRY (1746–1820), Irish statesman, son of James Grattan, for many years recorder of Dublin, was born in Dublin on the 3rd of July 1746. He early gave evidence of exceptional gifts both of intellect and character. At Trinity College, Dublin, where he had a distinguished career, he began a lifelong devotion to classical literature and especially to the great orators of antiquity. He was called to the Irish bar in 1772, but never seriously practised the law. Like Flood, with whom he was on terms of friendship, he cultivated his natural genius for eloquence by study of good models, including Bolingbroke and Junius. A visit to the English House of Lords excited boundless admiration for Lord Chatham, of whose style of oratory Grattan contributed an interesting description to *Barataniana* (see FLOOD, HENRY). The influence of Flood did much to give direction to Grattan's political aims; and it was through no design on Grattan's part that when Lord Charlemont brought him into the Irish parliament in 1775, in the very session in which Flood damaged his popularity by accepting office, Grattan quickly superseded his friend in the leadership of the national party. Grattan was well qualified for it. His oratorical powers were unsurpassed among his contemporaries. He conspicuously lacked, indeed, the grace of gesture which he so much admired in Chatham; he had not the sustained dignity of Pitt; his powers of close reasoning were inferior to those of Fox and Flood. But his speeches were packed with epigram, and expressed with rare felicity of phrase; his terse and telling sentences were richer in profound aphorisms and maxims of political philosophy than those of any other statesman save Burke; he possessed the orator's incomparable gift of conveying his own enthusiasm to his audience and convincing them of the loftiness of his aims.

The principal object of the national party was to set the Irish parliament free from constitutional bondage to the English privy council. By virtue of Poyning's Act, a celebrated statute of Henry VII., all proposed Irish legislation had to be submitted to the English privy council for its approval under the great seal of England before being passed by the Irish parliament. A bill so approved might be accepted or rejected, but not amended. More recent English acts had further emphasized the complete dependence of the Irish parliament, and the appellate jurisdiction of the Irish House of Lords had also been annulled. Moreover, the English Houses claimed and exercised the power to legislate directly for Ireland without even the nominal concurrence of the parliament in Dublin. This was the constitution which Molyneux and Swift had denounced, which Flood had attacked, and which Grattan was to destroy. The menacing attitude of the Volunteer Convention at Dungannon greatly influenced the decision of the government in 1782 to resist the agitation no longer. It was through ranks of volunteers drawn up outside the parliament house in Dublin that Grattan passed on the 16th of April 1782, amidst unparalleled popular enthusiasm, to move a declaration of the independence of the Irish parliament. "I found Ireland on her knees," Grattan exclaimed, "I watched over her with a paternal solicitude; I have traced her progress from injuries to arms, and from arms to liberty. Spirit of Swift, spirit of Molyneux, your genius has prevailed! Ireland is now a nation!" After a month of negotiation the claims of Ireland were conceded. The gratitude of his countrymen to Grattan found expression in a parliamentary grant of £100,000, which had to be reduced by one half before he would consent to accept it.

One of the first acts of "Grattan's parliament" was to prove its loyalty to England by passing a vote for the support of 20,000 sailors for the navy. Grattan himself never failed in loyalty to the crown and the English connexion. He was, however, anxious for moderate parliamentary reform, and, unlike Flood, he favoured Catholic emancipation. It was, indeed, evident that without reform the Irish House of Commons would not be able to make much use of its newly won independence. Though now free from constitutional control it was no less subject than before to the influence of corruption, which the English government had wielded through the Irish borough owners, known as the "undertakers," or more directly through the great executive officers. "Grattan's parliament" had no control over the Irish executive. The lord lieutenant and his chief secretary continued to be appointed by the English ministers; their tenure of office depended on the vicissitudes of English, not Irish, party politics; the royal prerogative was exercised in Ireland on the advice of English ministers. The House of Commons was in no sense representative of the Irish people. The great majority of the people were excluded as Roman Catholics from the franchise; two-thirds of the members of the House of Commons were returned by small boroughs at the absolute disposal of single patrons, whose support was bought by a lavish distribution of peerages and pensions. It was to give stability and true independence to the new constitution that Grattan pressed for reform. Having quarrelled with Flood over "simple repeal" Grattan also differed from him on the question of maintaining the Volunteer Convention. He opposed the policy of protective duties, but supported Pitt's famous commercial propositions in 1785 for establishing free trade between Great Britain and Ireland, which, however, had to be abandoned owing to the hostility of the English mercantile classes. In general Grattan supported the government for a time after 1782, and in particular spoke and voted for the stringent coercive legislation rendered necessary by the Whiteboy outrages in 1785; but as the years passed without Pitt's personal favour towards parliamentary reform bearing fruit in legislation, he gravitated towards the opposition, agitated for commutation of tithes in Ireland, and supported the Whigs

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on the regency question in 1788. In 1792 he succeeded in carrying an Act conferring the franchise on the Roman Catholics; in 1794 in conjunction with William Ponsonby he introduced a reform bill which was even less democratic than Flood's bill of 1783. He was as anxious as Flood had been to retain the legislative power in the hands of men of property, for "he had through the whole of his life a strong conviction that while Ireland could best be governed by Irish hands, democracy in Ireland would inevitably turn to plunder and anarchy."[1] At the same time he desired to admit the Roman Catholic gentry of property to membership of the House of Commons, a proposal that was the logical corollary of the Relief Act of 1792. The defeat of Grattan's mild proposals helped to promote more extreme opinions, which, under French revolutionary influence, were now becoming heard in Ireland.

The Catholic question had rapidly become of the first importance, and when a powerful section of the Whigs joined Pitt's ministry in 1794, and it became known that the lord-lieutenancy was to go to Lord Fitzwilliam, who shared Grattan's views, expectations were raised that the question was about to be settled in a manner satisfactory to the Irish Catholics. Such seems to have been Pitt's intention, though there has been much controversy as to how far Lord Fitzwilliam (*q.v.*) had been authorized to pledge the government. After taking Grattan into his confidence, it was arranged that the latter should bring in a Roman Catholic emancipation bill, and that it should then receive government support. But finally it appeared that the viceroy had either misunderstood or exceeded his instructions; and on the 19th of February 1795 Fitzwilliam was recalled. In the outburst of indignation, followed by increasing disaffection in Ireland, which this event produced, Grattan acted with conspicuous moderation and loyalty, which won for him warm acknowledgments from a member of the English cabinet.[2] That cabinet, however, doubtless influenced by the wishes of the king, was now determined firmly to resist the Catholic demands, with the result that the country rapidly drifted towards rebellion. Grattan warned the government in a series of masterly speeches of the lawless condition to which Ireland had been driven. But he could now count on no more than some forty followers in the House of Commons, and his words were unheeded. He retired from parliament in May 1797, and departed from his customary moderation by attacking the government in an inflammatory "Letter to the citizens of Dublin."

At this time religious animosity had almost died out in Ireland, and men of different faiths were ready to combine for common political objects. Thus the Presbyterians of the north, who were mainly republican in sentiment, combined with a section of the Roman Catholics to form the organization of the United Irishmen, to promote revolutionary ideas imported from France; and a party prepared to welcome a French invasion soon came into existence. Thus stimulated, the increasing disaffection culminated in the rebellion of 1798, which was sternly and cruelly repressed. No sooner was this effected than the project of a legislative union between the British and Irish parliaments, which had been from time to time discussed since the beginning of the 18th century, was taken up in earnest by Pitt's government. Grattan from the first denounced the scheme with implacable hostility. "There was, however, much to be said in its favour. The constitution of Grattan's parliament offered no security, as the differences over the regency question had made evident that in matters of imperial interest the policy of the Irish parliament and that of Great Britain would be in agreement; and at a moment when England was engaged in a life and death struggle with France it was impossible for the ministry to ignore the danger, which had so recently been emphasized by the fact that the independent constitution of 1782 had offered no safeguard against armed revolt. The rebellion put an end to the growing reconciliation between Roman Catholics and Protestants; religious passions were now violently inflamed, and the Orangemen and Catholics divided the island into two hostile factions. It is a curious circumstance, in view of the subsequent history of Irish politics, that it was from the Protestant Established Church, and particularly from the Orangemen, that the bitterest opposition to the union proceeded; and that the proposal found support chiefly among the Roman Catholic clergy and especially the bishops, while in no part of Ireland was it received with more favour than in the city of Cork. This attitude of the Catholics was caused by Pitt's encouragement of the expectation that Catholic emancipation, the commutation of tithes, and the endowment of the Catholic priesthood, would accompany or quickly follow the passing of the measure.

When in 1799 the government brought forward their bill it was defeated in the Irish House of Commons. Grattan was still in retirement. His popularity had temporarily declined, and the fact that his proposals for parliamentary reform and Catholic emancipation had become the watchwords of the rebellious United Irishmen had brought upon him the bitter hostility of the governing classes. He was dismissed from the privy council; his portrait was removed from the hall of Trinity College; the Merchant Guild of Dublin struck his name off their rolls. But the threatened destruction of the constitution of 1782 quickly restored its author to his former place in the affections of the Irish people. The parliamentary recess had been effectually employed by the government in securing by lavish corruption a majority in favour of their policy. On the 15th of January 1800 the Irish parliament met for its last session; on the same day Grattan secured by purchase a seat for Wicklow; and at a late hour, while the debate was proceeding, he appeared to take his seat. "There was a moment's pause, an electric thrill passed through the House, and a long wild cheer burst from the galleries."[3] Enfeebled by illness, Grattan's strength gave way when he rose to speak, and he obtained leave to address the House sitting. Nevertheless his speech was a superb effort of oratory; for more than two hours he kept his audience spellbound by a flood of epigram, of sustained reasoning, of eloquent appeal. After prolonged debates Grattan, on the 26th of May, spoke finally against the committal of the bill, ending with an impassioned peroration in which he declared, "I will remain anchored here with fidelity to the fortunes of my country, faithful to her freedom, faithful to her fall."[4] These were the last words spoken by Grattan in the Irish parliament.

The bill establishing the union was carried through its final stages by substantial majorities. The people remained listless, giving no indications of any eager dislike of the government policy. "There were absolutely none of the signs which are invariably found when a nation struggles passionately against what it deems an impending tyranny, or rallies around some institution which it really loves."[5] One of Grattan's main grounds of opposition to the union had been his dread of seeing the political leadership in Ireland pass out of the hands of the landed gentry; and he prophesied that the time would come when Ireland would send to the united parliament "a hundred of the greatest rascals in the kingdom."[6] Like Flood before him, Grattan had no leaning towards democracy; and he anticipated that by the removal of the centre of political interest from Ireland the evil of absenteeism would be intensified.

For the next five years Grattan took no active part in public affairs; it was not till 1805 that he became a member of the parliament of the United Kingdom. He modestly took his seat on one of the back benches, till Fox brought him forward to a seat near his own, exclaiming, "This is no place for the Irish Demosthenes!" His first speech was on the Catholic question, and though some doubt had been felt lest Grattan, like Flood, should belie at Westminster the reputation made in Dublin, all agreed with the description of his speech by the *Annual Register* as "one of the most brilliant and eloquent ever pronounced within the walls of parliament." When Fox and Grenville came into power in 1806 Grattan was offered, but refused to

[1] W. E. H. Lecky, *Leaders of Public Opinion in Ireland*, i. 127 (enlarged edition, 2 vols., 1903).
[2] *Ibid.* i. 204.
[3] *Ibid.* i. 241.
[4] *Grattan's Speeches*, iv. 23.
[5] W. E. H. Lecky, *History of England in the Eighteenth Century*, viii. 491. Cf. *Cornwallis Correspondence*, iii. 250.
[6] W. E. H. Lecky, *Leaders of Public Opinion in Ireland*, i. 270.

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accept, an office in the government. In the following year he showed the strength of his judgment and character by supporting, in spite of consequent unpopularity in Ireland, a measure for increasing the powers of the executive to deal with Irish disorder, Roman Catholic emancipation, which he continued to advocate with unflagging energy though now advanced in age, became complicated after 1808 by the question whether a veto on the appointment of Roman Catholic bishops should rest with the crown. Grattan supported the veto, but a more extreme Catholic party was now arising in Ireland under the leadership of Daniel O'Connell, and Grattan's influence gradually declined. He seldom spoke in parliament after 1810, the most notable exception being in 1815, when he separated himself from the Whigs and supported the final struggle against Napoleon. His last speech of all, in 1819, contained a passage referring to the union he had so passionately resisted, which exhibits the statesmanship and at the same time the equable quality of Grattan's character. His sentiments with regard to the policy of the union remained, he said, unchanged; but "the marriage having taken place it is now the duty, as it ought to be the inclination, of every individual to render it as fruitful, as profitable and as advantageous as possible." In the following summer, after crossing from Ireland to London when out of health to help forward the Catholic question once more, he became seriously ill. On his death-bed he spoke generously of Castlereagh, and with warm eulogy of his former rival, Flood. He died on the 6th of June 1820, and was buried in Westminster Abbey close to the tombs of Pitt and Fox. His statue is in the outer lobby of the Houses of Parliament at Westminster. Grattan had married in 1782 Henrietta Fitzgerald, a lady descended from the ancient family of Desmond, by whom he had two sons and two daughters.

The most searching scrutiny of his private life only increases the respect due to the memory of Grattan as a statesman and the greatest of Irish orators. His patriotism was untainted by self-seeking; he was courageous in risking his popularity for what his sound judgment showed him to be the right course. As Sydney Smith said with truth of Grattan soon after his death: "No government ever dismayed him. The world could not bribe him. He thought only of Ireland; lived for no other object; dedicated to her his beautiful fancy, his elegant wit, his manly courage, and all the splendour of his astonishing eloquence."[1]

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[1] Sydney Smith's *Works*, ii. 166-167.

GRATTIUS [FALISCUS], Roman poet, of the age of Augustus, author of a poem on hunting (*Cynegetica*), of which 541 hexameters remain. He was possibly a native of Falerii. The only reference to him in any ancient writer is incidental (Ovid, *Ex Ponto*, iv. 16. 33). He describes various kinds of game, methods of hunting, the best breeds of horses and dogs.

There are editions by R. Stern (1832); E. Bährens in *Poëtae Latini Minores* (i., 1879) and G. G. Curcio in *Poeti Latini Minori* (i., 1902), with bibliography; see also H. Schenkl, *Zur Kritik des G.* (1898). There is a translation by Christopher Wase (1654).

GRAUDENZ (Polish *Grudziadz*), a town in the kingdom of Prussia, province of West Prussia, on the right bank of the Vistula, 18 m. S.S.W. of Marienwerder and 37 m. by rail N.N.E. of Thorn. Pop. (1885) 17,336, (1905) 35,088. It has two Protestant and three Roman Catholic churches, and a synagogue. It is a place of considerable manufacturing activity. The town possesses a museum and a monument to Guillaume René Courbière (1733–1811), the defender of the town in 1807. It has fine promenades along the bank of the Vistula. Graudenz is an important place in the German system of fortifications, and has a garrison of considerable size.

Graudenz was founded about 1250, and received civic rights in 1291. At the peace of Thorn in 1466 it came under the lordship of Poland. From 1665 to 1759 it was held by Sweden, and in 1772 it came into the possession of Prussia. The fortress of Graudenz, which since 1873 has been used as a barracks and a military depot and prison, is situated on a steep eminence about 1½ m. north of the town and outside its limits. It was completed by Frederick the Great in 1776, and was rendered famous through its defence by Courbière against the French in 1807.

GRAUN, CARL HEINRICH (1701–1759), German musical composer, the youngest of three brothers, all more or less musical, was born on the 7th of May 1701 at Wahrenbrück in Saxony. His father held a small government post and he gave his children a careful education. Graun's beautiful soprano voice secured him an appointment in the choir at Dresden. At an early age he composed a number of sacred cantatas and other pieces for the church service. He completed his studies under Johann Christoph Schmidt (1664–1728), and profited much by the Italian operas which were performed at Dresden under the composer Lotti. After his voice had changed to a tenor, he made his début at the opera of Brunswick, in a work by Schürmann, an inferior composer of the day; but not being satisfied with the arias assigned him he re-wrote them, so much to the satisfaction of the court that he was commissioned to write an opera for the next season. This work, *Polydorus* (1726), and five other operas written for Brunswick, spread his fame all over Germany. Other works, mostly of a sacred character, including two settings of the *Passion*, also belong to the Brunswick period. Frederick the Great, at that time crown prince of Prussia, heard the singer in Brunswick in 1735, and immediately engaged him for his private chapel at Rheinsberg. There Graun remained for five years, and wrote a number of cantatas, mostly to words written by Frederick himself in French, and translated into Italian by Bolterelli. On his accession to the throne in 1740, Frederick sent Graun to Italy to engage singers for a new opera to be established at Berlin. Graun remained a year on his travels, earning universal applause as a singer in the chief cities of Italy. After his return to Berlin he was appointed conductor of the royal orchestra (*Kapellmeister*) with a salary of 2000 thalers (£300). In this capacity he wrote twenty-eight operas, all to Italian words, of which the last, *Merope* (1756), is perhaps the most perfect. It is probable that Graun was subjected to considerable humiliation from the arbitrary caprices of his royal master, who was never tired of praising the operas of Hasse and abusing those of his *Kapellmeister*. In his oratorio *The Death of Jesus* Graun shows his skill as a contrapuntist, and his originality of melodious invention. In the Italian operas he imitates the florid style of his time, but even in these the recitatives occasionally show considerable dramatic power. Graun died on the 8th of August 1759, at Berlin, in the same house in which, thirty-two years later, Meyerbeer was born.

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GRAVAMEN (from Lat. *gravare*, to weigh down; *gravis*, heavy), a complaint or grievance, the ground of a legal action, and particularly the more serious part of a charge against an accused person. In English the term is used chiefly in ecclesiastical cases, being the technical designation of a memorial presented from the Lower to the Upper House of Convocation, setting forth grievances to be redressed, or calling attention to breaches in church discipline.

GRAVE. (1) (From a common Teutonic verb, meaning "to dig"; in O. Eng. *grafan*; cf. Dutch *graven*, Ger. *graben*), a place dug out of the earth in which a dead body is laid for burial, and hence any place of burial, not necessarily an excavation (see FUNERAL RITES and BURIAL). The verb "to grave," meaning properly to dig, is particularly used of the making of incisions in a hard surface (see ENGRAVING). (2) A title, now obsolete, of a local administrative official for a township in certain parts of Yorkshire and Lincolnshire; it also sometimes appears in the form "grieve," which in Scotland and Northumberland is used for sheriff (q.v.), and also for a bailiff or under-steward. The origin of the word is obscure, but it is probably connected with the German *graf*, count, and thus appears as the second part of many Teutonic titles, such as landgrave, burgrave and margrave. "Grieve," on the other hand, seems to be the northern representative of O.E. *gerefa*, reeve; cf. "sheriff" and "count." (3) (From the Lat. *gravis*, heavy), weighty, serious, particularly with the idea of dangerous, as applied to diseases and the like, of character or temperament as opposed to gay. It is also applied to sound, low or deep, and is thus opposed to "acute." In music the term is adopted from the French and Italian, and applied to a movement which is solemn or slow. (4) To clean a ship's bottom in a specially constructed dock, called a "graving dock." The origin of the word is obscure; according to the *New English Dictionary* there is no foundation for the connexion with "greaves" or "graves," the refuse of tallow, in candle or soap-making, supposed to be used in "graving" a ship. It may be connected with an O. Fr. *grave*, mod. *grève*, shore.

GRAVEL, or PEBBLE BEDS, the name given to deposits of rounded, subangular, water-worn stones, mingled with finer material such as sand and clay. The word "gravel" is adapted from the O. Fr. *gravele*, mod. *gravelle*, dim. of *grave*, coarse sand, sea-shore, Mod. Fr. *grève*. The deposits are produced by the attrition of rock fragments by moving water, the waves and tides of the sea and the flow of rivers. Extensive beds of gravel are forming at the present time on many parts of the British coasts where suitable rocks are exposed to the attack of the atmosphere and of the sea waves during storms. The flint gravels of the coast of the Channel, Norfolk, &c., are excellent examples. When the sea is rough the lesser stones are washed up and down the beach by each wave, and in this way are rounded, worn down and finally reduced to sand. These gravels are constantly in movement, being urged forward by the shore currents especially during storms. Large banks of gravel may be swept away in a single night, and in this way the coast is laid bare to the erosive action of the sea. Moreover, the movement of the gravel itself wears down the subjacent rocks. Hence in many places barriers have been erected to prevent the drift of the pebbles and preserve the land, while often it has been found necessary to protect the shores by masonry or cement work. Where the pebbles are swept along to a projecting cape they may be carried onwards and form a long spit or submarine bank, which is constantly reduced in size by the currents and tides which flow across it (*e.g.* Spurn Head at the mouth of the Humber). The Chesil Bank is the best instance in Britain of a great accumulation of pebbles constantly urged forward by storms in a definite direction. In the shallower parts of the North Sea considerable areas are covered with coarse sand and pebbles. In deeper water, however, as in the Atlantic, beyond the 100 fathom line pebbles are very rare, and those which are found are mostly erratics carried southward by floating icebergs, or volcanic rocks ejected by submarine volcanoes.

In many parts of Britain, Scandinavia and North America there are marine gravels, in every essential resembling those of the sea-shore, at levels considerably above high tide. These gravels often lie in flat-topped terraces which may be traced for great distances along the coast. They are indications that the sea at one time stood higher than it does at present, and are known to geologists as "raised beaches." In Scotland such beaches are known 25, 50 and 100 ft. above the present shores. In exposed situations they have old shore cliffs behind them; although their deposits are mainly gravelly there is much fine sand and silt in the raised beaches of sheltered estuaries and near river mouths.

River gravels occur most commonly in the middle and upper parts of streams where the currents in times of flood are strong enough to transport fairly large stones. In deltas and the lower portions of large rivers gravel deposits are comparatively rare and indicate periods when the volume of the stream was temporarily greatly increased. In the higher torrents also, gravels are rare because transport is so effective that no considerable accumulations can form. In most countries where the drainage is of a mature type, river gravels occur in the lower parts of the courses of the rivers as banks or terraces which lie some distance above the stream level. Individual terraces usually do not persist for a long space but are represented by a series of benches at about the same altitude. These were once continuous, and have been separated by the stream cutting away the intervening portions as it deepened and broadened its channel. Terraces of this kind often occur in successive series at different heights, and the highest are the oldest because they were laid down at a time when the stream flowed at their level and mark the various stages by which the valley has been eroded. While marine terraces are nearly always horizontal, stream terraces slope downwards along the course of the river.

The extensive deposits of river gravels in many parts of England, France, Switzerland, North America, &c., would indicate that at some former time the rivers flowed in greater volume than at the present day. This is believed to be connected with the glacial epoch and the augmentation of the streams during those periods when the ice was melting away. Many changes in drainage have taken place since then; consequently wide sheets of glacial and fluvio-glacial gravel lie spread out where at present there is no stream. Often they are commingled with sand, and where there were temporary post-glacial lakes deposits of silt, brick clay and mud have been formed. These may be compared to the similar deposits now forming in Greenland, Spitzbergen and other countries which are at present in a glacial condition.

As a rule gravels consist mainly of the harder kinds of stone because these alone can resist attrition. Thus the gravels formed from chalk consist almost entirely of flint, which is so hard that the chalk is ground to powder and washed away, while the flint remains little affected. Other hard rocks such as chert, quartzite, felsite, granite, sandstone and volcanic rocks very frequently are largely represented in gravels, while coal, limestone and shale are far less common. The size of the pebbles varies from a fraction of an inch to several feet; it depends partly on the fissility of the original rocks and partly on the strength of the currents of water; coarse gravels indicate the action of powerful eroding agents. In the Tertiary systems gravels occur on many horizons, *e.g.* the Woolwich and Reading beds, Oldhaven beds and Bagshot beds of the Eocene of the London basin. They do not essentially differ from recent gravel deposits. But in course of time the action of percolating water assisted by pressure tends to convert gravels into firm masses of conglomerate by depositing carbonate of lime, silica and other substances in their interstices. Gravels are not usually so fossiliferous as finer deposits of the same age, partly because their porous texture enables organic remains to be dissolved away by water, and partly because shells and other fossils are comparatively fragile and would be broken up during the accumulation of the pebbles. The rock fragments in conglomerates, however, sometimes contain fossils which have not been found elsewhere. (J. S. F.)

GRAVELINES (Flem. *Gravelinghe*), a fortified seaport town of northern France, in the department of Nord and arrondissement

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of Dunkirk, 15 m. S.W. of Dunkirk on the railway to Calais. Pop. (1906) town, 1858; commune, 6284. Gravelines is situated on the Aa, 1¼ m. from its mouth in the North Sea. It is surrounded by a double circuit of ramparts and by a tidal moat. The river is canalized and opens out beneath the fortifications into a floating basin. The situation of the port is one of the best in France on the North Sea, though its trade has suffered owing to the nearness of Calais and Dunkirk and the silting up of the channel to the sea. It is a centre for the cod and herring fisheries. Imports consist chiefly of timber from Northern Europe and coal from England, to which eggs and fruit are exported. Gravelines has paper-manufactories, sugar-works, fish-curing works, salt-refineries, chicory-roasting factories, a cannery for preserved peas and other vegetables and an important timber-yard. The harbour is accessible to vessels drawing 18 ft. at high tides. The greater part of the population of the commune of Gravelines dwells in the maritime quarter of Petit-Fort-Philippe at the mouth of the Aa, and in the village of Les Huttes (to the east of the town), which is inhabited by the fisher-folk.

The canalization of the Aa by a count of Flanders about the middle of the 12th century led to the foundation of Gravelines (*grave-linghe*, meaning "count's canal."). In 1558 it was the scene of the signal victory of the Spaniards under the count of Egmont over the French. It finally passed from the Spaniards to the French by the treaty of the Pyrenees in 1659.

GRAVELOTTE, a village of Lorraine between Metz and the French frontier, famous as the scene of the battle of the 18th of August 1870 between the Germans under King William of Prussia and the French under Marshal Bazaine (see METZ and FRANCO-GERMAN WAR). The battlefield extends from the woods which border the Moselle above Metz to Roncourt, near the river Orne. Other villages which played an important part in the battle of Gravelotte were Saint Privat, Amanweiler or Amanvillers and Sainte-Marie-aux-Chênes, all lying to the N. of Gravelotte.

GRAVES, ALFRED PERCEVAL (1846–), Irish writer, was born in Dublin, the son of the bishop of Limerick. He was educated at Windermere College, and took high honours at Dublin University. In 1869 he entered the Civil Service as clerk in the Home Office, where he remained until he became in 1874 an inspector of schools. He was a constant contributor of prose and verse to the *Spectator*, *The Athenaeum*, *John Bull*, and *Punch*, and took a leading part in the revival of Irish letters. He was for several years president of the Irish Literary Society, and is the author of the famous ballad of "Father O'Flynn" and many other songs and ballads. In collaboration with Sir C. V. Stanford he published *Songs of Old Ireland* (1882), *Irish Songs and Ballads* (1893), the airs of which are taken from the Petrie MSS.; the airs of his *Irish Folk-Songs* (1897) were arranged by Charles Wood, with whom he also collaborated in *Songs of Erin* (1901).

His brother, Charles L. Graves (b. 1856), educated at Marlborough and at Christ Church, Oxford, also became well known as a journalist, author of two volumes of parodies, *The Hawarden Horace* (1894) and *More Hawarden Horace* (1896), and of skits in prose and verse. An admirable musical critic, his *Life and Letters of Sir George Grove* (1903) is a model biography.

GRAVESEND, a municipal and parliamentary borough, river-port and market town of Kent, England, on the right bank of the Thames opposite Tilbury Fort, 22 m. E. by S. of London by the South-Eastern & Chatham railway. Pop. (1901) 27,106. It extends about 2 m. along the river bank, occupying a slight acclivity which reaches its summit at Windmill Hill, whence extensive views are obtained of the river, with its windings and shipping. The older and lower part of the town is irregularly built, with narrow and inconvenient streets, but the upper and newer portion contains several handsome streets and terraces. Among several piers are the town pier, erected in 1832, and the terrace pier, built in 1845, at a time when local river-traffic by steamboat was specially prosperous. Gravesend is a favourite resort of the inhabitants of London, both for excursions and as a summer residence; it is also a favourite yachting centre. The principal buildings are the town-hall, the parish church of Gravesend, erected on the site of an ancient building destroyed by fire in 1727; Milton parish church, a Decorated and Perpendicular building erected in the time of Edward II.; and the county courts. Milton Mount College is a large institution for the daughters of Congregational ministers. East of the town are the earthworks designed to assist Tilbury Fort in obstructing the passage up river of an enemy's force. They were originally constructed on Vauhan's system in the reign of Charles II. Rosherville Gardens, a popular resort, are in the western suburb of Rosherville, a residential quarter named after James Rosher, an owner of lime works. They were founded in 1843 by George Jones. Gravesend, which is within the Port of London, has some import trade in coal and timber, and fishing, especially of shrimps, is carried on extensively. The principal other industries are boat-building, ironfounding, brewing and soap-boiling. Fruit and vegetables are largely grown in the neighbourhood for the London market. Since 1867 Gravesend has returned a member to parliament, the borough including Northfleet to the west. The town is governed by a mayor, 6 aldermen and 18 councillors. Area, 1250 acres.

In the Domesday Survey "Gravesham" is entered among the bishop of Bayeux's lands, and a "hythe" or landing-place is mentioned. In 1401 Henry IV. granted the men of Gravesend the sole right of conveying in their own vessels all persons travelling between London and Gravesend, and this right was confirmed by Edward IV. in 1462. In 1562 the town was granted a charter of incorporation by Elizabeth, which vested the government in 2 portreeves and 12 jurats, but by a later charter of 1568 one portreeve was substituted for the two. Charles I. incorporated the town anew under the title of the mayor, jurats and inhabitants of Gravesend, and a further charter of liberties was granted by James II. in 1687. A Thursday market and fair on the 13th of October were granted to the men of Gravesend by Edward III. in 1367; Elizabeth's charters gave them a Wednesday market and fairs on the 24th of June and the 13th of October, with a court of pie-powder; by the charter of Charles I. Thursday and Saturday were made the market days, and these were changed again to Wednesday and Saturday by a charter of 1604, which also granted a fair on the 23rd of April; the fairs on these dates have died out, but the Saturday market is still held.

From the beginning of the 17th century Gravesend was the chief station for East Indiamen; most of the ships outward bound from London stopped here to victual. A customs house was built in 1782. Queen Elizabeth established Gravesend as the point where the corporation of London should welcome in state eminent foreign visitors arriving by water. State processions by water from Gravesend to London had previously taken place, as in 1522, when Henry VIII. escorted the emperor Charles V. A similar practice was maintained until modern times; as when, on the 7th of March 1803, the princess Alexandra was received here by the prince of Wales (King Edward VII.) three days before their marriage. Gravesend parish church contains memorials to "Princess" Pocahontas, who died when preparing to return home from a visit to England in 1617, and was buried in the old church. A memorial pulpit from the state of Indiana, U.S.A., made of Virginian wood, was presented in 1904, and a fund was raised for a stained-glass window by ladies of the state of Virginia.

GRAVINA, GIOVANNI VINCENZO (1664–1718), Italian littérateur and jurisconsult, was born at Roggiano, a small town near Cosenza, in Calabria, on the 20th of January 1664. He was descended from a distinguished family, and under the direction of his maternal uncle, Gregorio Caloprese, who possessed some reputation as a poet and philosopher, received a learned education, after which he studied at Naples civil and canon law. In 1689 he came to Rome, where in 1695 he united with several others of literary tastes in forming the Academy of Arcadians. A schism occurred in the academy in 1711, and Gravina and his followers founded in opposition to it the Academy of Quirina. From Innocent XII. Gravina received the offer of various

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ecclesiastical honours, but declined them from a disinclination to enter the clerical profession. In 1699 he was appointed to the chair of civil law in the college of La Sapienza, and in 1703 he was transferred to the chair of canon law. He died at Rome on the 6th of January 1718. He was the adoptive father of Metastasio.

Gravina is the author of a number of works of great erudition, the principal being his *Origines juris civilis*, completed in 3 vols. (1713) and his *De Romano imperio* (1712). A French translation of the former appeared in 1775, of which a second edition was published in 1822. His collected works were published at Leipzig in 1737, and at Naples, with notes by Mascovius, in 1756.

GRAVINA, a town and episcopal see of Apulia, Italy, in the province of Bari, from which it is 63 m. S.W. by rail (29 m. direct), 1148 ft. above sea-level. Pop. (1901) 18,197. The town is probably of medieval origin, though some conjecture that it occupies the site of the ancient Blera, a post station on the Via Appia. The cathedral is a basilica of the 15th century. The town is surrounded with walls and towers, and a castle of the emperor Frederick II. rises above the town, which later belonged to the Orsini, dukes of Gravina; just outside it are dwellings and a church (S. Michele) all hewn in the rock, and now abandoned.

Prehistoric remains in the district (remains of ancient settlements, *tumuli*, &c.) are described by V. di Cicco in *Notizie degli scavi* (1901), p. 217.

GRAVITATION (from Lat. *gravis*, heavy), in physical science, that mutual action between masses of matter by virtue of which every such mass tends toward every other with a force varying directly as the product of the masses and inversely as the square of their distances apart. Although the law was first clearly and rigorously formulated by Sir Isaac Newton, the fact of the action indicated by it was more or less clearly seen by others. Even Ptolemy had a vague conception of a force tending toward the centre of the earth which not only kept bodies upon its surface, but in some way upheld the order of the universe. John Kepler inferred that the planets move in their orbits under some influence or force exerted by the sun; but the laws of motion were not then sufficiently developed, nor were Kepler's ideas of force sufficiently clear, to admit of a precise statement of the nature of the force. C. Huygens and R. Hooke, contemporaries of Newton, saw that Kepler's third law implied a force tending toward the sun which, acting on the several planets, varied inversely as the square of the distance. But two requirements necessary to generalize the theory were still wanting. One was to show that the law of the inverse square not only represented Kepler's third law, but his first two laws also. The other was to show that the gravitation of the earth, following one and the same law with that of the sun, extended to the moon. Newton's researches showed that the attraction of the earth on the moon was the same as that for bodies at the earth's surface, only reduced in the inverse square of the moon's distance from the earth's centre. He also showed that the total gravitation of the earth, assumed as spherical, on external bodies, would be the same as if the earth's mass were concentrated in the centre. This led at once to the statement of the law in its most general form.

The law of gravitation is unique among the laws of nature, not only in its wide generality, taking the whole universe in its scope, but in the fact that, so far as yet known, it is absolutely unmodified by any condition or cause whatever. All other forms of action between masses of matter, vary with circumstances. The mutual action of electrified bodies, for example, is affected by their relative or absolute motion. But no conditions to which matter has ever been subjected, or under which it has ever been observed, have been found to influence its gravitation in the slightest degree. We might conceive the rapid motions of the heavenly bodies to result in some change either in the direction or amount of their gravitation towards each other at each moment; but such is not the case, even in the most rapidly moving bodies of the solar system. The question has also been raised whether the action of gravitation is absolutely instantaneous. If not, the action would not be exactly in the line adjoining the two bodies at the instant, but would be affected by the motion of the line joining them during the time required by the force to pass from one body to the other. The result of this would be seen in the motions of the planets around the sun; but the most refined observations show no such effect. It is also conceivable that bodies might gravitate differently at different temperatures. But the most careful researches have failed to show any apparent modification produced in this way except what might be attributed to the surrounding conditions. The most recent and exhaustive experiment was that of J. H. Poynting and P. Phillips (*Proc. Roy. Soc.*, 76A, p. 445). The result was that the change, if any, was less than $\frac{1}{10}$ of the force for one degree change of temperature, a result too minute to be established by any measures.

Another cause which might be supposed to modify the action of gravitation between two bodies would be the interposition of masses of matter between them, a cause which materially modifies the action of electrified bodies. The question whether this cause modifies gravitation admits of an easy test from observation. If it did, then a portion of the earth's mass or of that of any other planet turned away from the sun would not be subjected to the same action of the sun as if directly exposed to that action. Great masses, as those of the great planets, would not be attracted with a force proportional to the mass because of the hindrance or other effect of the interposed portions. But not the slightest modification due to this cause is shown. The general conclusion from everything we see is that a mass of matter in Australia attracts a mass in London precisely as it would if the earth were not interposed between the two masses.

We must therefore regard the law in question as the broadest and most fundamental one which nature makes known to us.

It is not yet experimentally proved that variation as the inverse square is absolutely true at all distances. Astronomical observations extend over too brief a period of time to show any attraction between different stars except those in each other's neighbourhood. But this proves nothing because, in the case of distances so great, centuries or even thousands of years of accurate observation will be required to show any action. On the other hand the enigmatical motion of the perihelion of Mercury has not yet found any plausible explanation except on the hypothesis that the gravitation of the sun diminishes at a rate slightly greater than that of the inverse square—the most simple modification being to suppose that instead of the exponent of the distance being exactly -2, it is $-2{\cdot}000\,000\,161\,2$.

The argument is extremely simple in form. It is certain that, in the general average, year after year, the force with which Mercury is drawn toward the sun does vary from the exact inverse square of its distance from the sun. The most plausible explanation of this is that one or more masses of matter move around the sun, whose action, whether they are inside or outside the orbit of Mercury, would produce the required modification in the force. From an investigation of all the observations upon Mercury and the other three interior planets, Simon Newcomb found it almost out of the question that any such mass of matter could exist without changing either the figure of the sun itself or the motion of the planes of the orbits of either Mercury or Venus. The qualification "almost" is necessary because so complex a system of actions comes into play, and accurate observations have extended through so short a period, that the proof cannot be regarded as absolute. But the fact that careful and repeated search for a mass of matter sufficient to produce the desired effect has been in vain, affords additional evidence of its non-existence. The most obvious test of the reality of the required modifications would be afforded by two other bodies, the motions of whose pericentres should be similarly affected. These are Mars and the moon. Newcomb found an excess of motions in the perihelion of Mars amounting to about $5''$ per century. But the combination of observations and theory on which this is based is not sufficient fully to establish so slight a motion. In the case of the motion of the moon around the earth, assuming the gravitation of the latter to be subject to the modification in question, the annual motion of the moon's

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perigee should be greater by 1·5" than the theoretical motion. E. W. Brown is the first investigator to determine the theoretical motions with this degree of precision; and he finds that there is no such divergence between the actual and the computed motion. There is therefore as yet no ground for regarding any deviation from the law of inverse square as more than a possibility. (S. N.)

GRAVITATION CONSTANT AND MEAN DENSITY OF THE EARTH

The law of gravitation states that two masses M_1 and M_2, distant d from each other, are pulled together each with a force $G.M_1M_2/d^2$, where G is a constant for all kinds of matter—the *gravitation constant*. The acceleration of M_2 towards M_1 or the force exerted on it by M_1 per unit of its mass is therefore GM_1/d^2. Astronomical observations of the accelerations of different planets towards the sun, or of different satellites towards the same primary, give us the most accurate confirmation of the distance part of the law. By comparing accelerations towards different bodies we obtain the ratios of the masses of those different bodies and, in so far as the ratios are consistent, we obtain confirmation of the mass part. But we only obtain the ratios of the masses to the mass of some one member of the system, say the earth. We do not find the mass in terms of grammes or pounds. In fact, astronomy gives us the product GM, but neither G nor M. For example, the acceleration of the earth towards the sun is about 0·6 cm/sec.^{2} at a distance from it about 15×10^{12} cm. The acceleration of the moon towards the earth is about 0·27 cm/sec.^{2} at a distance from it about 4×10^{10} cm. If S is the mass of the sun and E the mass of the earth we have $0{\cdot}6=GS/(15\times10^{12})^2$ and $0{\cdot}27=GE/(4\times10^{10})^2$ giving us GS and GE, and the ratio S/E = 300,000 roughly; but we do not obtain either S or E in grammes, and we do not find G.

The aim of the experiments to be described here may be regarded either as the determination of the mass of the earth in grammes, most conveniently expressed by its mass÷its volume, that is by its " mean density " Δ, or the determination of the " gravitation constant " G. Corresponding to these two aspects of the problem there are two modes of attack. Suppose that a body of mass m is suspended at the earth's surface where it is pulled with a force w vertically downwards by the earth—its weight. At the same time let it be pulled with a force p by a measurable mass M which may be a mountain, or some measurable part of the earth's surface layers, or an artificially prepared mass brought near m, and let the pull of M be the same as if it were concentrated at a distance d. The earth pull may be regarded as the same as if the earth were all concentrated at its centre, distant R.

Then
$$w=G.\tfrac{4}{3}\pi R^3\Delta m/R^2=G.\tfrac{4}{3}\pi R\Delta m, \quad . \quad . \quad . \quad . \quad (1)$$
and
$$p=GMm/d^2 \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (2)$$
By division
$$\Delta=\frac{3M}{4\pi Rd^2}\cdot\frac{w}{p}.$$

If then we can arrange to observe w/p we obtain Δ, the mean density of the earth.

But the same observations give us G also. For, putting $m=w/g$ in (2), we get
$$G=\frac{d^2}{M}\cdot\frac{p}{w}\cdot g.$$

In the second mode of attack the pull p between two artificially prepared measured masses M_1, M_2 is determined when they are a distance d apart, and since $p=G.M_1M_2/d^2$ we get at once $G=pd^2/M_1M_2$. But we can also deduce Δ. For putting $w=mg$ in (1) we get
$$\Delta=\tfrac{1}{2}\frac{g}{G}\cdot\frac{1}{\pi R}.$$

Experiments of the first class in which the pull of a known mass is compared with the pull of the earth may be termed experiments on the mean density of the earth, while experiments of the second class in which the pull between two known masses is directly measured may be termed experiments on the gravitation constant.

We shall, however, adopt a slightly different classification for the purpose of describing methods of experiment, viz:—

1. Comparison of the earth pull on a body with the pull of a natural mass as in the Schiehallion experiment.
2. Determination of the attraction between two artificial masses as in Cavendish's experiment.
3. Comparison of the earth pull on a body with the pull of an artificial mass as in experiments with the common balance.

It is interesting to note that the possibility of gravitation experiments of this kind was first considered by Newton, and in both of the forms (1) and (2). In the *System of the World* (3rd ed., 1737, p. 40) he calculates that the deviation by a hemispherical mountain, of the earth's density and with radius 3 m., on a plumb-line at its side will be less than 2 minutes. He also calculates (though with an error in his arithmetic) the acceleration towards each other of two spheres each a foot in diameter and of the earth's density, and comes to the conclusion that in either case the effect is too small for measurement. In the *Principia*, bk. iii., prop. x., he makes a celebrated estimate that the earth's mean density is five or six times that of water. Adopting this estimate, the deviation by an actual mountain or the attraction of two terrestrial spheres would be of the orders calculated, and regarded by Newton as immeasurably small.

Whatever method is adopted the force to be measured is very minute. This may be realized if we here anticipate the results of the experiments, which show that in round numbers $\Delta=5{\cdot}5$ and $G=1/15{,}000{,}000$ when the masses are in grammes and the distances in centimetres.

Newton's mountain, which would probably have density about $\Delta/2$ would deviate the plumb-line not much more than half a minute. Two spheres 30 cm. in diameter (about 1 ft.) and of density 11 (about that of lead) just not touching would pull each other with a force rather less than 2 dynes, and their acceleration would be such that they would move into contact if starting 1 cm. apart in rather over 400 seconds.

From these examples it will be realized that in gravitation experiments extraordinary precautions must be adopted to eliminate disturbing forces which may easily rise to be comparable with the forces to be measured. We shall not attempt to give an account of these precautions, but only seek to set forth the general principles of the different experiments which have been made.

I. *Comparison of the Earth Pull with that of a Natural Mass.*

Bouguer's Experiments.—The earliest experiments were made by Pierre Bouguer about 1740, and they are recorded in his *Figure de la terre* (1749). They were of two kinds. In the first he determined the length of the seconds pendulum, and thence g at different levels. Thus at Quito, which may be regarded as on a table-land 1466 toises (a toise is about 6·4 ft.) above sea-level, the seconds pendulum was less by 1/1331 than on the Isle of Inca at sea-level. But if there were no matter above the sea-level, the inverse square law would make the pendulum less by 1/1118 at the higher level. The value of g then at the higher level was greater than could be accounted for by the attraction of an earth ending at sea-level by the difference 1/1118−1/1331 = 1/6083, and this was put down to the attraction of the plateau 1466 toises high; or the attraction of the whole earth was 6083 times the attraction of the plateau. Using the rule, now known as " Young's rule," for the attraction of the plateau, Bouguer found that the density of the earth was 4·7 times that of the plateau, a result certainly much too large.

In the second kind of experiment he attempted to measure the horizontal pull of Chimborazo, a mountain about 20,000 ft. high, by the deflection of a plumb-line at a station on its south side. Fig. 1 shows the principle of the method. Suppose that two stations are fixed, one on the side of the mountain due south of the summit, and the other on the same latitude but some distance westward, away from the influence of the mountain. Suppose that at the second station a star is observed to pass the meridian, for simplicity we will say directly overhead, then a

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plumb-line will hang down exactly parallel to the observing telescope. If the mountain were away it would also hang parallel to the telescope at the first station when directed to the same star. But the mountain pulls the plumb-line towards it and the star appears to the north of the zenith and evidently

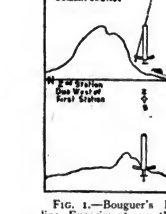

FIG. 1.—Bouguer's Plumb-line Experiment on the attraction of Chimborazo.

mountain pull/earth pull = tangent of angle of displacement of zenith.

Bouguer observed the meridian altitude of several stars at the two stations. There was still some deflection at the second station, a deflection which he estimated as 1/14 that at the first station, and he found on allowing for this that his observations gave a deflection of 8 seconds at the first station. From the form and size of the mountain he found that if its density were that of the earth the deflection should be 10·3 seconds, or the earth was nearly 13 times as dense as the mountain, a result several times too large. But the work was carried on under enormous difficulties owing to the severity of the weather, and no exactness could be expected. The importance of the experiment lay in its proof that the method was possible.

Maskelyne's Experiment.—In 1774 Nevil Maskelyne (*Phil. Trans.*, 1775, p. 495) made an experiment on the deflection of the plumb-line by Schiehallion, a mountain in Perthshire, which has a short ridge nearly east and west, and sides sloping steeply on the north and south. He selected two stations on the same meridian, one on the north, the other on the south slope, and by means of a zenith sector, a telescope provided with a plumb-bob, he determined at each station the meridian zenith distances of a number of stars. From a survey of the district made in the years 1774–1776 the geographical difference of latitude between the two stations was found to be 42·04 seconds, and this would have been the difference in the meridian zenith difference of the same star at the two stations had the mountain been away. But at the north station the plumb-bob was pulled south and the zenith was deflected northwards, while at the south station the effect was reversed. Hence the angle between the zeniths, or the angle between the zenith distances of the same star at the two stations was greater than the geographical 42·04 seconds. The mean of the observations gave a difference of 54·2 seconds, or the double deflection of the plumb-line was 54·2–42·04, say 11·26 seconds.

The computation of the attraction of the mountain on the supposition that its density was that of the earth was made by Charles Hutton from the results of the survey (*Phil. Trans.*, 1778, p. 689), a computation carried out by ingenious and important methods. He found that the deflection should have been greater in the ratio 17804 : 9033 say 0 : 5, whence the density of the earth comes out at 9/5 that of the mountain. Hutton took the density of the mountain at 2·5, giving the mean density of the earth 4·5. A revision of the density of the mountain from a careful survey of the rocks composing it was made by John Playfair many years later (*Phil. Trans.*, 1811, p. 347), and the density of the earth was given as lying between 4·5588 and 4·867.

Other experiments have been made on the attraction of mountains by Francesco Carlini (*Milano Effem. Ast.*, 1824, p. 28) on Mt. Blanc in 1821, using the pendulum method after the manner of Bouguer, by Colonel Sir Henry James and Captain A. R. Clarke (*Phil. Trans.*, 1856, p. 501), using the plumb-line deflection at Arthur's Seat, by T. C. Mendenhall (*Amer. Jour. of Sci.* xxi. p. 90), using the pendulum method on Fujiyama in Japan, and by E. D. Preston (*U.S. Coast and Geod. Survey Rep.*, 1893, p. 513) in Hawaii, using both methods.

Airy's Experiment.—In 1854 Sir G. B. Airy (*Phil. Trans.* 1856, p. 297) carried out at Harton pit near South Shields an experiment which he had attempted many years before in conjunction with W. Whewell and R. Sheepshanks at Dolcoath. This consisted in comparing gravity at the top and at the bottom of a mine by the swings of the same pendulum, and thence finding the ratio of the pull of the intervening strata to the pull of the whole earth. The principle of the method may be understood by assuming that the earth consists of concentric spherical shells each homogeneous, the last of thickness h equal to the depth of the mine. Let the radius of the earth to the bottom of the mine be R, and the mean density up to that point be Δ. This will not differ appreciably from the mean density of the whole. Let the density of the strata of depth h be δ. Denoting the values of gravity above and below by g_a and g_b we have

$$g_b = G\tfrac{4}{3}\pi\frac{R^3\Delta}{R^2} = G.\tfrac{4}{3}\pi R\Delta,$$

and

$$g_a = G\tfrac{4}{3}\pi\frac{R^3\Delta}{(R+h)^2} + G.4\pi h\delta$$

(since the attraction of a shell h thick on a point just outside it is $G.4\pi(R+h)^2h\delta/(R+h)^2 = G.4\pi h\delta$).

Therefore

$$g_a = G.\tfrac{4}{3}\pi R\Delta\left(1 - \frac{2h}{R} + \frac{3h}{R}\frac{\delta}{\Delta}\right) \text{ nearly,}$$

whence

$$\frac{g_a}{g_b} = 1 - \frac{2h}{R} + \frac{3h}{R}\frac{\delta}{\Delta},$$

and

$$\frac{\Delta}{\delta} = \frac{3h}{R}\Big/\left(-1 + \frac{2h}{R} + \frac{g_a}{g_b}\right)$$

Stations were chosen in the same vertical, one near the pit bank, another 1250 ft. below in a disused working, and a "comparison" clock was fixed at each station. A third clock was placed at the upper station connected by an electric circuit to the lower station. It gave an electric signal every 15 seconds by which the rates of the two comparison clocks could be accurately compared. The two "invariable" seconds pendulums were swung, one in front of the upper and the other in front of the lower comparison clock after the manner of Kater, and these invariables were interchanged at intervals. From continuous observations extending over three weeks and after applying various corrections Airy obtained $g_a/g_b = 1{\cdot}00005185$. Making corrections for the irregularity of the neighbouring strata he found $\Delta/\delta = 2{\cdot}6266$. W. H. Miller made a careful determination of δ from specimens of the strata, finding it 2·5. The final result taking into account the ellipticity and rotation of the earth is $\Delta = 6{\cdot}565$.

Von Sterneck's Experiments.—(*Mitth. des K.U.K. Mil. Geog. Inst. zu Wien*, ii., 1882, p. 77; 1883, p. 59; vi., 1886, p. 97). R. von Sterneck repeated the mine experiment in 1882–1883 at the Adalbert shaft at Pribram in Bohemia and in 1885 at the Abraham shaft near Freiberg. He used two invariable half-seconds pendulums, one swung at the surface, the other below at the same time. The two were at intervals interchanged. Von Sterneck introduced a most important improvement by comparing the swings of the two invariables with the same clock which by an electric circuit gave a signal at each station each second. This eliminated clock rates. His method, of which it is not necessary to give the details here, began a new era in the determinations of local variations of gravity. The values which von Sterneck obtained for Δ were not consistent, but increased with the depth of the second station. This was probably due to local irregularities in the strata which could not be directly detected.

All the experiments to determine Δ by the attraction of natural masses are open to the serious objection that we cannot determine the distribution of density in the neighbourhood with any approach to accuracy. The experiments with artificial masses next to be described give much more consistent results, and the experiments with natural masses are now only of use

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in showing the existence of irregularities in the earth's superficial strata when they give results deviating largely from the accepted value.

II. *Determination of the Attraction between two Artificial Masses.*

Cavendish's Experiment (*Phil. Trans.*, 1798, p. 469).—This celebrated experiment was planned by the Rev. John Michell. He completed an apparatus for it but did not live to begin work with it. After Michell's death the apparatus came into the possession of Henry Cavendish, who largely reconstructed it, but still adhered to Michell's plan, and in 1797–1798 he carried out the experiment. The essential feature of it consisted in the determination of the attraction of a lead sphere 12 in. in diameter on another lead sphere 2 in. in diameter, the distance between the centres being about 9 in., by means of a torsion balance. Fig. 2 shows how the experiment was carried out. A torsion rod *hh* 6 ft. long, tied from its ends to a vertical piece *mg*, was

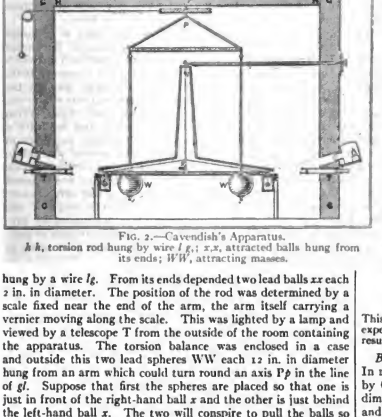

FIG. 2.—Cavendish's Apparatus.
h h, torsion rod hung by wire *l g*; *x x*, attracted balls hung from its ends; *W W*, attracting masses.

hung by a wire *lg*. From its ends depended two lead balls *xx* each 2 in. in diameter. The position of the rod was determined by a scale fixed near the end of the arm, the arm itself carrying a vernier moving along the scale. This was lighted by a lamp and viewed by a telescope T from the outside of the room containing the apparatus. The torsion balance was enclosed in a case and outside this two lead spheres WW each 12 in. in diameter hung from an arm which could turn round an axis P*p* in the line of *gl*. Suppose that first the spheres are placed so that one is just in front of the right-hand ball *x* and the other is just behind the left-hand ball *x*. The two will conspire to pull the balls so that the right end of the rod moves forward. Now let the big spheres be moved round so that one is in front of the left ball and the other behind the right ball. The pulls are reversed and the right end moves backward. The angle between its two positions is (if we neglect cross attractions of right sphere on left ball and left sphere on right ball) four times as great as the deflection of the rod due to approach of one sphere to one ball.

The principle of the experiment may be set forth thus. Let $2a$ be the length of the torsion rod, m the mass of a ball, M the mass of a large sphere, d the distance between the centres, supposed the same on each side. Let θ be the angle through which the rod moves round when the spheres WW are moved from the first to the second of the positions described above. Let μ be the couple required to twist the rod through 1 radian. Then $\mu\theta = 4GMma/d^2$. But μ can be found from the time of vibration of the torsion system when we know its moment of inertia I, and this can be determined. If T is the period $\mu = 4\pi^2 I/T^2$, whence $G = \pi^2 d^2 I\theta/T^2 Mma$, or putting the result in terms of the mean density of the earth Δ it is easy to show that, if L, the length of the seconds pendulum, is put for g/π^2, and C for $2\pi R$, the earth's circumference, then

$$\Delta = \frac{3}{2}\frac{L}{C}\frac{Mma}{d^2 I}\frac{T^2}{\theta}$$

The original account by Cavendish is still well worth studying on account of the excellence of his methods. His work was undoubtedly very accurate for a pioneer experiment and has only really been improved upon within the last generation. Making various corrections of which it is not necessary to give a description, the result obtained (after correcting a mistake first pointed out by F. Baily) is $\Delta = 5{\cdot}448$. In seeking the origin of the disturbed motion of the torsion rod Cavendish made a very important observation. He found that when the masses were left in one position for a time the attracted balls crept now in one direction, now in another, as if the attraction were varying. Ultimately he found that this was due to convection currents in the case containing the torsion rod, currents produced by temperature inequalities. When a large sphere was heated the ball near it tended to approach and when it was cooled the ball tended to recede. Convection currents constitute the chief disturbance and the chief source of error in all attempts to measure small forces in air at ordinary pressure.

Reich's Experiments (*Versuche über die mittlere Dichtigkeit der Erde mittelst der Drehwage*, Freiberg, 1838; "Neue Versuche mit der Drehwage," *Leipzig Abh. Math. Phys.* i., 1852, p. 383).—In 1838 F. Reich published an account of a repetition of the Cavendish experiment carried out on the same general lines, though with somewhat smaller apparatus. The chief differences consisted in the methods of measuring the times of vibration and the deflection, and the changes were hardly improvements. His result after revision was $\Delta = 5{\cdot}49$. In 1852 he published an account of further work giving as result $\Delta = 5{\cdot}58$. It is noteworthy that in his second paper he gives an account of experiments suggested by J. D. Forbes in which the deflection was not observed directly, but was deduced from observations of the time of vibration when the attracting masses were in different positions.

Let T_1 be the time of vibration when the masses are in one of the usual attracting positions. Let d be the distance between the centres of attracting mass and attracted ball, and δ the distance through which the ball is pulled. If a is the half length of the torsion rod and θ the deflection, $\delta = a\theta$. Now let the attracting masses be put one at each end of the torsion rod with their centres in the line through the centres of the balls and d from them, and let T_2 be the time of vibration. Then it is easy to show that

$$\delta/d = a\theta/d = (T_1 - T_2)/(T_1 + T_2).$$

This gives a value of θ which may be used in the formula. The experiments by this method were not consistent, and the mean result was $\Delta = 6{\cdot}25$.

Baily's Experiment (*Memoirs of the Royal Astron. Soc.* xiv.).—In 1841–1842 Francis Baily made a long series of determinations by Cavendish's method and with apparatus nearly of the same dimensions. The attracting masses were 12-in. lead spheres and as attracted balls he used various masses, lead, zinc, glass, ivory, platinum, hollow brass, and finally the torsion rod alone without balls. The suspension was also varied, sometimes consisting of a single wire, sometimes being bifilar. There were systematic errors running through Baily's work, which it is impossible now wholly to explain. These made the resulting value of Δ show a variation with the nature of the attracted masses and a variation with the temperature. His final result $\Delta = 5{\cdot}6747$ is not of value compared with later results.

Cornu and Baille's Experiment (*Comptes rendus*, lxxvi., 1873, p. 954; lxxvi., 1878, pp. 571, 609, 1001; xcvi., 1883, p. 1493).—In 1870 MM. A. Cornu and J. Baille commenced an experiment by the Cavendish method which was never definitely completed, though valuable studies of the behaviour of the torsion apparatus were made. They purposely departed from the dimensions previously used. The torsion balls were of copper about 100 gm. each, the rod was 50 cm. long, and the suspending wire was 4 metres long. On each side of each ball was a hollow iron sphere. Two of these were filled with mercury weighing 12 kgm., the two spheres of mercury constituting the attracting masses. When the position of a mass was to be changed the mercury was pumped from the sphere on one side to that on the other side of a ball. To avoid counting time a

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method of electric registration on a chronograph was adopted. A provisional result was $\Delta = 5{\cdot}56$.

Boys's Experiment (*Phil. Trans.*, A., 1895, pt. i., p. 1).—Professor C. V. Boys having found that it is possible to draw quartz fibres of practically any degree of fineness, of great strength and true in their elasticity, determined to repeat the Cavendish experiment, using his newly invented fibres for the suspension of the torsion rod. He began by an inquiry as to the best dimensions for the apparatus. He saw that if the period of vibration is kept constant, that is, if the moment of inertia I is kept proportional to the torsion couple per radian μ, then the deflection remains the same however the linear dimensions are altered so long as they are all altered in the same proportion. Hence we are driven to conclude that the dimensions should be reduced until further reduction would make the linear quantities too small to be measured with exactness, for reduction in the apparatus enables variations in temperature and the consequent air disturbances to be reduced, and the experiment in other ways becomes more manageable. Professor Boys took as the exactness to be sought for 1 in 10,000. further saw that reduction in length of the torsion rod with given balls is an advantage. For if the rod be halved the moment of inertia is one-fourth, and if the suspending fibre is made finer so that the torsion couple per radian is also one-fourth the time remains the same. But the moment of the attracting force is halved only, so that the deflection against one-fourth torsion is doubled. In Cavendish's arrangement there would be an early limit to the advantage in reduction of rod in that the mass opposite one ball would begin seriously to attract the other ball. But Boys avoided this difficulty by suspending the balls from the ends of the torsion rod at different levels and by placing the attracting masses at these different levels. Fig. 3 represents diagrammatically a vertical section of the arrangement used on a scale of about 1/10. The torsion rod was a small rectangular mirror about 2·4 cm. wide hung by a quartz fibre about 43 cm. long. From the sides of this mirror the balls were hung by quartz fibres at levels differing by 15 cm. The balls were of gold either about 5 mm. in diameter and weighing about 1·3 gm. or about 6·5 mm. in diameter and weighing 2·65 gm. The attracting masses were lead spheres, about 10 cm. in diameter and weighing about 7·4 kgm. each. These were suspended from the top of the case which could be rotated round the central tube, and they were arranged so that the radius to the centre from the axis of the torsion system made 65° with the torsion rod, the position in which the moment of the attraction was a maximum. The torsion rod mirror reflected a distant scale by which the deflection could be read. The time of vibration was recorded on a chronograph. The result of the experiment, probably the best yet made, was $\Delta = 5{\cdot}527$; $G = 6{\cdot}658 \times 10^{-8}$.

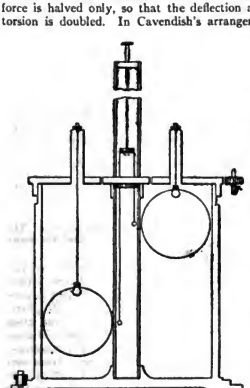

Fig. 3.—Diagram of a Section of Professor Boys's Apparatus.

Braun's Experiment (*Denkschr. Akad. Wiss. Wien, math.-naturw. Cl.* 64, p. 187, 1896).—In 1896 Dr K. Braun, S.J., gave an account of a very careful and excellent repetition of the Cavendish experiment with apparatus much smaller than was used in the older experiments, yet much larger than that used by Boys. A notable feature of the work consisted in the suspension of the torsion apparatus in a receiver exhausted to about 4 mm. of mercury, a pressure at which convection currents almost disappear while "radiometer" forces have hardly begun. For other ingenious arrangements the original paper or a short abstract in *Nature*, lvi., 1897, p. 127, may be consulted. The attracted balls weighed 54 gm. each and were 25 cm. apart. The attracting masses were spheres of mercury each weighing 9 kgm. and brought into position outside the receiver. Braun used both the deflection method and the time of vibration method suggested to Reich by Forbes. The methods gave almost identical results and his final values are to three decimal places the same as those obtained by Boys.

G. K. Burgess's Experiment (*Thèses présentées à la faculté des sciences de Paris pour obtenir le titre de docteur de l'université de Paris*, 1901).—This was a Cavendish experiment in which the torsion system was buoyed up by a float in a mercury bath. The attracted masses could thus be made large, and yet the suspending wire could be kept fine. The torsion beam was 12 cm. long, and the attracted balls were lead spheres each 2 kgm. From the centre of the beam depended a vertical steel rod with a varnished copper hollow float at its end, entirely immersed in mercury. The surface of the mercury was covered with dilute sulphuric acid to remove irregularities due to varying surface tension acting on the steel rod. The size of the float was adjusted so that the torsion fibre of quartz 35 cm. long had only to carry a weight of 5 to 10 gm. The time of vibration was over one hour. The torsion couple per radian was determined by preliminary experiments. The attracting masses were each 10 kgm. turning in a circle 18 cm. in diameter. The results gave $\Delta = 5{\cdot}55$ and $G = 6{\cdot}64 \times 10^{-8}$.

Eötvös's Experiment (*Ann. der Physik und Chemie*, 1896, 59, p. 354).—In the course of investigations on local variations of gravity by means of the torsion balance, R. Eötvos devised a method for determining (a somewhat like the vibration method used by Reich and Braun. Two pillars were built up of lead blocks 30 cm. square in cross section, 60 cm. high and 30 cm. apart. A torsion rod somewhat less than 30 cm. long with small weights at the ends was enclosed in a double-walled brass case of as little depth as possible, a device which secured great steadiness through freedom from convection currents. The suspension was a platinum wire about 150 cm. long. The torsion rod was first set in the line joining the centres of the pillars and its time of vibration was taken. Then it was set with its length perpendicular to the line joining the centres and the time again taken. From these times Eötvos was able to deduce $G = 6{\cdot}65 \times 10^{-8}$ whence $\Delta = 5{\cdot}53$. This is only a provisional value. The experiment was only as it were a by-product in the course of exceedingly ingenious work on the local variation in gravity for which the original paper should be consulted.

Wilsing's Experiment (*Publ. des astrophysikalischen Observ. zu Potsdam*, 1887, No. 22, vol. vi. pt. ii.; pt. iii. p. 133).—We may perhaps class with the Cavendish type an experiment made by J. Wilsing, in which a vertical "double pendulum" was used in place of a horizontal torsion system. Two weights each 540 gm. were fixed at the ends of a rod 1 metre long. A knife edge was fixed on the rod just above its centre of gravity, and this was supported so that the rod could vibrate about a vertical position. Two attracting masses, cast-iron cylinders each 325 kgm., were placed, say, one in front of the top weight on the pendulum and the other behind the bottom weight, and the position of the rod was observed in the usual mirror and scale way. Then the front attracting mass was dropped to the level of the lower weight and the back mass was raised to that of the upper weight, and the consequent deflection of the rod was

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observed. By taking the time of vibration of the pendulum first as used in the deflection experiment and then when a small weight was removed from the upper end a known distance from the knife edge, the restoring couple per radian deflection could be found. The final result gave $\Delta = 5{\cdot}579$.

J. Joly's suggested Experiment (*Nature* xli., 1890, p. 256).—Joly has suggested that G might be determined by hanging a simple pendulum in a vacuum, and vibrating outside the case two massive pendulums each with the same time of swing as the simple pendulum. The simple pendulum would be set swinging by the varying attraction and from its amplitude after a known number of swings of the outside pendulums G could be found.

III. *Comparison of the Earth Pull on a body with the Pull of an Artificial Mass by Means of the Common Balance.*

The principle of the method is as follows:—Suppose a sphere of mass m and weight w to be hung by a wire from one arm of a balance. Let the mass of the earth be E and its radius be R. Then $w = GEm/R^2$. Now introduce beneath m a sphere of mass M and let d be the distance of its centre from that of m. Its pull increases the apparent weight of m say by δw. Then $\delta w = GMm/d^2$. Dividing we obtain $\delta w/w = MR^2/Ed^2$, whence $E = MR^2w/d^2\delta w$; and since $g = GE/R^2$, G can be found when E is known.

Von Jolly's Experiment (*Abhand. der k. bayer. Akad. der Wiss.* 2 Cl. xiii. Bd. 1 Abt. p. 157, and xiv. Bd. 2 Abt. p. 3).—In the first of these papers Ph. von Jolly described an experiment in which he sought to determine the decrease in weight with increase of height from the earth's surface, an experiment suggested by Bacon (*Nov. Org. Bk.* 2, § 36), in the form of comparison of rates of two clocks at different levels, one driven by a spring, the other by weights. The experiment in the form carried out by von Jolly was attempted by H. Power, R. Hooke, and others in the early days of the Royal Society (Mackenzie, *The Laws of Gravitation*). Von Jolly fixed a balance at the top of his laboratory and from each pan depended a wire supporting another pan 5 metres below. Two 1-kgm. weights were first balanced in the upper pans and then one was moved from an upper to the lower pan on the same side. A gain of 1·5 mgm. was observed after correction for greater weight of air displaced at the lower level. The inverse square law would give a slightly greater gain and the deficiency was ascribed to the configuration of the land near the laboratory. In the second paper a second experiment was described in which a balance was fixed at the top of a tower and provided as before with one pair of pans just below the arms and a second pair hung from these by wires 21 metres below. Four glass globes were prepared equal in weight and volume. Two of these were filled each with 5 kgm. of mercury and then all were sealed up. The two heavy globes were then placed in the upper pans and the two light ones in the lower. The two on one side were now interchanged and a gain in weight of about 31·7 mgm. was observed. Air corrections were eliminated by the use of the globes of equal volume. Then a lead sphere about 1 metre radius was built up of blocks under one of the lower pans and the experiment was repeated. Through the attraction of the lead sphere on the mass of mercury when below the gain was greater by 0·589 mgm. This result gave $\Delta = 5{\cdot}692$.

Experiment of Richarz and Krigar-Menzel (*Anhang zu den Abhand. der k. preuss. Akad. der Wiss. zu Berlin*, 1898).—In 1884 A. König and F. Richarz proposed a similar experiment which was ultimately carried out by Richarz and O. Krigar-Menzel. In this experiment a balance was supported somewhat more than 2 metres above the floor and with scale pans above and below as in von Jolly's experiment. Weights each 1 kgm. were placed, say, in the top right pan and the bottom left pan. Then they were shifted to the bottom right and the top left, the result being, after corrections for change in density of air displaced through pressure and temperature changes, a gain in weight of 1·2453 mgm. on the right due to change in level of 2.2628 metres. Then a rectangular column of lead 210 cm. square cross section and 200 cm. high was built up under the balance between the pairs of pans. The column was perforated with two vertical tunnels for the passage of the wires supporting the lower pans. On repeating the weighings there was now a decrease on the right when a kgm. was moved on that side from top to bottom while another was moved on the left from bottom to top. This decrease was 0·1211 mgm. showing a total change due to the lead mass of 1·2453 + 0·1211 = 1·3664 mgm. and this is obviously four times the attraction of the lead mass on one kgm. The changes in the positions of the weights were made automatically. The results gave $\Delta = 5{\cdot}05$ and $G = 6{\cdot}685 \times 10^{-8}$.

Poynting's Experiment (*Phil. Trans.*, vol. 182, A, 1891, p. 565).—In 1878 J. H. Poynting published an account of a preliminary experiment which he had made to show that the common balance was available for gravitational work. The experiment was on the same lines as that of von Jolly but on a much smaller scale. In 1891 he gave an account of the full experiment carried out with a larger balance and with much greater care. The balance had a 4-ft. beam. The scale pans were removed, and from the two arms were hung lead spheres each weighing about 20 kgm. at a level about 120 cm. below the beam. The balance was supported in a case above a horizontal turn-table with axis vertically below the central knife edge, and on this turn-table was a lead sphere weighing 150 kgm.—the attracting mass. The centre of this sphere was 30 cm. below the level of the centres of the hanging weights. The turn-table could be rotated between stops so that the attracting mass was first immediately below the hanging weight on one side, and then immediately under that on the other side. On the same turn-table but at double the distance from the centre was a second sphere of half the weight introduced merely to balance the larger sphere and keep the centre of gravity at the centre of the turn-table. Before the introduction of this sphere errors were introduced through the tilting of the floor of the balance room when the turn-table was rotated. Corrections of course had to be made for the attraction of this second sphere. The removal of the large mass from left to right made an increase in weight on that side of about 1 mgm. determined by riders in a special way described in the paper. To eliminate the attraction on the beam and the rods supporting the hanging weights another experiment was made in which these weights were moved up the rods through 30 cm. and on now moving the attracting sphere from left to right the gain on the right was only about ⅓ mgm. The difference, ⅔ mgm., was due entirely to change in distance of the attracted masses. After all corrections the results gave $\Delta = 5{\cdot}493$ and $G = 6{\cdot}698 \times 10^{-8}$.

Final Remarks.—The earlier methods in which natural masses were used have disadvantages, as already pointed out, which render them now quite valueless. Of later methods the Cavendish appears to possess advantages over the common balance method in that it is more easy to ward off temperature variations, and so avoid convection currents, and probably more easy to determine the actual value of the attracting force. For the present the values determined by Boys and Braun may be accepted as having the greatest weight and we therefore take

Mean density of the earth $\Delta = 5{\cdot}527$

Constant of gravitation $G = 6{\cdot}658 \times 10^{-8}$.

Probably $\Delta = 5{\cdot}53$ and $G = 6{\cdot}66 \times 10^{-8}$ are correct to 1 in 500.

AUTHORITIES.—J. H. Poynting, *The Mean Density of the Earth* (1894), gives an account of all work up to the date of publication with a bibliography; A. Stanley Mackenzie, *The Laws of Gravitation* (1899), gives annotated extracts from various papers, some historical notes and a bibliography. *A Bibliography of Geodesy, Appendix 8, Report for 1902 of the U.S. Coast and Geodetic Survey* includes a very complete bibliography of gravitational work. (J.H.P.)

GRAVY, a word usually confined to the natural juices which come from meat during cooking. In early uses (in the *New English Dictionary* the quotations date from the end of the 14th to the beginning of the 16th centuries) it meant a sauce of broth flavoured with spices and almonds. The more modern usage seems to date from the end of the 16th century. The word is obscure in origin. It has been connected with "graves" or "greaves," the refuse of tallow in the manufacture of soap or candles. The more probable derivation is from the French. In Old French the word is almost certainly *grané*, and is derived

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from *grain*, "something used in cooking." The word was early read and spelled with a *u* or *v* instead of *n*, and the corruption was adopted in English.

GRAY, ASA (1810–1888), American botanist, was born at Paris, Oneida county, N.Y., on the 18th of November 1810. He was the son of a farmer, and received no formal education except at the Fairfield (N.Y.) academy and the Fairfield medical school. From Dr James Hadley, the professor of chemistry and *materia medica* he obtained his first instruction in science (1825–1826). In the spring of 1827 he first began to collect and identify plants. His formal education, such as it was, ended in February 1831, when he took the degree of M.D. His first contribution to descriptive botany appeared in 1835, and thereafter an uninterrupted series of contributions to systematic botany flowed from his pen for fifty-three years. In 1836 his first botanical text-book appeared under the title *Elements of Botany*, followed in 1839 by his *Botanical Text-Book for Colleges, Schools, and Private Students* which developed into his *Structural Botany*. He published later *First Lessons in Botany and Vegetable Physiology* (1857); *How Plants Grow* (1858); *Field, Forest, and Garden Botany* (1869); *How Plants Behave* (1872). These books served the purpose of developing popular interest in botanical studies. His most important work, however, was his *Manual of the Botany of the Northern United States*, the first edition of which appeared in 1847. This manual has passed through a large number of editions, is clear, accurate and compact to an extraordinary degree, and within its geographical limits is an indispensable book for the student of American botany.

Throughout his life Gray was a diligent writer of reviews of books on natural history subjects. Often these reviews were elaborate essays, for which the books served merely as texts; often they were clear and just summaries of extensive works; sometimes they were sharply critical, though never ill-natured or unfair; always they were interesting, lively and of literary as well as scientific excellence. The greater part of Gray's strictly scientific labour was devoted to a *Flora* of North America, the plan of which originated with his early teacher and associate, John Torrey of New York. The second volume of Torrey and Gray's *Flora* was completed in 1843; but for forty years thereafter Gray gave up a large part of his time to the preparation of his *Synoptical Flora* (1878). He lived at the period when the flora of North America was being discovered, described and systematized; and his enthusiastic labours in this fresh field placed him at the head of American botanists and on a level with the most famous botanists of the world. In 1846 he published a paper on the distribution of plants under the title *Statistics of the Flora of the Northern United States*; and this paper was followed in 1850 by a memoir on the botany of Japan and its relations to that of North America, a paper of which Sir J. D. Hooker said that "in point of originality and far-reaching results [it] was its author's *opus magnum*." It was Gray's study of plant distribution which led to his intimate correspondence with Charles Darwin during the years in which Darwin was elaborating the doctrines that later became known as Darwinism. From 1855 to 1875 Gray was both a keen critic and a sympathetic exponent of the Darwinian principles. His religious views were those of the Evangelical bodies in the Protestant Church; so that, when Darwinism was attacked as equivalent to atheism, he was in position to answer effectively the unfounded allegation that it was fatal to the doctrine of design. He taught that "the most puzzling things of all to the old-school teleologists are the *principia* of the Darwinian." He openly avowed his conviction that the present species are not special creations, but rather derived from previously existing species; and he made his avowal with frank courage, when this truth was scarcely recognized by any naturalists, and when to the clerical mind evolution meant atheism.

In 1842 Gray accepted the Fisher professorship of natural history in Harvard University. On his accession to this chair the university had no herbarium, no botanical library, few plants of any value, and but a small garden, which for lack of money had never been well stocked or well arranged. He soon brought together, chiefly by widespread exchanges, a valuable herbarium and library, and arranged the garden; and thereafter the development of these botanical resources was part of his regular labours. The herbarium soon became the largest and most valuable in America, and on account of the numerous type specimens it contains it is likely to remain a collection of national importance. Nothing of what Gray did for the botanical department of the university has been lost; on the contrary, his labours were so well directed that everything he originated and developed has been enlarged, improved and placed on stable foundations. He himself made large contributions to the establishment by giving it all his own specimens, many books and no little money, and by his will he gave it the royalties on his books. During his long connexion with the university he brought up two generations of botanists and he always took a strong personal interest in the researches and the personal prospects of the young men who had studied under him. His scientific life was mainly spent in the herbarium and garden in Cambridge; but his labours there were relieved by numerous journeys to different parts of the United States and to Europe, all of which contributed to his work on the Synoptical Flora. He lived to a good age—long enough, indeed, to receive from learned societies at home and abroad abundant evidence of their profound respect for his attainments and services. He died at Cambridge, Mass., on the 30th of January 1888.

His *Letters* (1893) were edited by his wife; and his *Scientific Papers* (1888) by C. S. Sargent. (C. W. E.)

GRAY, DAVID (1838–1861), Scottish poet, the son of a handloom weaver, was born at Merkland, near Glasgow, on the 29th of January 1838. His parents resolved to educate him for the church, and through their self-denial and his own exertions as a pupil teacher and private tutor he was able to complete a course of four sessions at the university of Glasgow. He began to write poetry for *The Glasgow Citizen* and began his idyll on the Luggie, the little stream that ran through Merkland. His most intimate companion at this time was Robert Buchanan, the poet; and in May 1860 the two agreed to proceed to London, with the idea of finding literary employment. Shortly after his arrival in London Gray introduced himself to Monckton Milnes, afterwards Lord Houghton, with whom he had previously corresponded. Lord Houghton tried to persuade him to return to Scotland, but Gray insisted on staying in London. He was unsuccessful in his efforts to place Gray's poem, "The Luggie," in *The Cornhill Magazine*, but gave him some light literary work. He also showed him great kindness when a cold which had seized him assumed the serious form of consumption, and sent him to Torquay; but as the disease made rapid progress, an irresistible longing seized Gray to return to Merkland, where he arrived in January 1861, and died on the 3rd of December following, having the day before had the gratification of seeing a printed specimen copy of his poem "The Luggie," published eventually by the exertions of Sydney Dobell. He was buried in the Auld Aisle Churchyard, Kirkintilloch, where in 1865 a monument was erected by "friends far and near" to his memory.

"The Luggie," the principal poem of Gray, is a kind of reverie in which the scenes and events of his childhood and his early aspirations are mingled with the music of the stream which he celebrates. The series of sonnets, "In the Shadows," was composed during the latter part of his illness. Most of his poems necessarily bear traces of immaturity, and lines may frequently be found in them which are mere echoes from Thomson, Wordsworth or Tennyson, but they possess, nevertheless, distinct individuality, and show a real appreciation of natural beauty.

The Luggie and other Poems, with an introduction by R. Monckton Milnes, and a brief memoir by James Hedderwick, was published in 1862; and a new and enlarged edition of Gray's *Poetical Works*, edited by Henry Glassford Bell, appeared in 1874. See also *David Gray and other Essays*, by Robert Buchanan (1868), and the same writer's poem on David Gray, in *Idyls and Legends of Inverburn*.

GRAY, ELISHA (1835–1901), American electrician, was born in Barnesville, Belmont county, Ohio, on the 2nd of August 1835. He worked as a carpenter and in a machine shop, reading

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in physical science at the same time, and for five years studied at Oberlin College, where he taught for a time. He then investigated the subject of telegraphy, and in 1867 patented a telegraphic switch and annunciator. Experimenting in the transmittal of electro-tones and of musical tones by wire, he utilized in 1874 animal tissues in his receivers, and filed, on the 14th of February 1876, a caveat for the invention of a telephone, only a few hours after the filing of an application for a patent by Alexander Graham Bell. (See TELEPHONE.) The caveat was disregarded; letters patent No. 174,465 were granted to Bell, whose priority of invention was upheld in 1888 by the United States Supreme Court (see *Molecular Telephone Co.* v. *American Bell Telephone Co.*, 126 U.S. 1). Gray's experiments won for him high praise and the decoration of the Legion of Honour at the Paris Exposition of 1878. He was for a time a manufacturer of electrical apparatus, particularly of his own inventions; and was chief electrical expert of the Western Electric Company of Chicago. At the Columbian Exposition of 1893 Gray was chairman of the International Congress of Electricians. He died at Newtonville, Massachusetts, on the 21st of January 1901. Among his later inventions were appliances for multiplex telegraphy and the telautograph, a machine for the electric transmission of handwriting. He experimented in the submarine use of electric bells for signalling.

Gray wrote, besides scientific addresses and many monographs, *Telegraphy and Telephony* (1878) and *Electricity and Magnetism* (1900).

GRAY, HENRY PETERS (1819–1877), American portrait and genre painter, was born in New York on the 23rd of June 1819. He was a pupil of Daniel Huntington there, and subsequently studied in Rome and Florence. Elected a member of the National Academy of Design in 1842, he succeeded Huntington as president in 1870, holding the position until 1871. The later years of his life were devoted to portrait work. He was strongly influenced by the old Italian masters, painting in mellow colour with a classical tendency. One of his notable canvases was an allegorical composition called "The Birth of our Flag" (1875). He died in New York City on the 12th of November 1877.

GRAY, HORACE (1828–1902), American jurist, was born in Boston, Massachusetts, on the 24th of March 1828. He graduated at Harvard in 1845; was admitted to the bar in 1851, and in 1854–1861 was reporter to the Supreme Court of Massachusetts. He practised law, first in partnership with Ebenezer Rockwood Hoar, and later with Wilder Dwight (1823–1862) and Charles F. Blake; was appointed associate justice of the state Supreme Court on the 23rd of August 1864, becoming chief-justice on the 5th of September 1873; and was associate justice of the Supreme Court of the United States from December 1881 to August 1902, resigning only a few weeks before his death at Nahant, Mass., on the 15th of September 1902. Gray had a fine sense of the dignity of the bench, and a taste for historical study. His judgments were unmistakably clear and contained the essence of earlier opinions. A great case lawyer, he was a much greater judge, the variety of his knowledge and his contributions to admiralty and prize law and to testamentary law being particularly striking; in constitutional law he was a "loose" rather than a "strict" constructionist.

See Francis C. Lowell, "Horace Gray," in *Proceedings of the American Academy*, vol. 39, pp. 627-637 (Boston, 1904).

GRAY, JOHN DE (d. 1214), bishop of Norwich, entered Prince John's service, and at his accession (1199) was rapidly promoted in the church till he became bishop of Norwich in September 1200. King John's attempt to force him into the primacy in 1205 started the king's long and fatal quarrel with Pope Innocent III. De Gray was a hard-working royal official, in finance, in justice, in action, using his position to enrich himself and his family. In 1209 he went to Ireland to govern it as justiciar. He adopted a forward policy, attempting to extend the English frontier northward and westward, and fought a number of campaigns on the Shannon and in Fermanagh. But in 1212 he suffered a great defeat. He assimilated the coinage of Ireland to that of England, and tried to effect a similar reform in Irish law. De Gray was a good financier, and could always raise money: this probably explains the favour he enjoyed from King John. In 1213 he is found with 500 knights at the great muster at Barham Downs, when Philip Augustus was threatening to invade England. After John's reconciliation with Innocent he was one of those exempted from the general pardon, and was forced to go in person to Rome to obtain it. At Rome he so completely gained over Innocent that the pope sent him back with papal letters recommending his election to the bishopric of Durham (1213); but he died at St Jean d'Audely in Poitou on his homeward journey (October 1214).

GRAY, JOHN EDWARD (1800–1875), English naturalist, born at Walsall, Staffordshire, in 1800, was the eldest of the three sons of S. F. Gray, of that town, druggist and writer on botany, and author of the *Supplement to the Pharmacopoeia*, &c., his grandfather being S. F. Gray, who translated the *Philosophia Botanica* of Linnaeus for the *Introduction to Botany* of James Lee (1715–1795). Gray studied at St Bartholomew's and other hospitals for the medical profession, but at an early age was attracted to the pursuit of botany. He assisted his father by collecting notes on botany and comparative anatomy and zoology in Sir Joseph Banks's library at the British Museum, aided by Dr W. E. Leach, assistant keeper, and the systematic synopsis of the *Natural Arrangement of British Plants*, 2 vols., 1821, was prepared by him, his father writing the preface and introduction only. In consequence of his application for membership of the Linnaean Society being rejected in 1822, he turned to the study of zoology, writing on zoophytes, shells, *Mollusca* and *Papilionidae*, still aided by Dr Leach at the British Museum. In December 1824 he obtained the post of assistant in that institution; and from that date to December 1830, when J. G. Children retired from the keepership, he had so zealously applied himself to the study, classification and improvement of the national collection of zoology that he was selected as the fittest person to be entrusted with its charge. Immediately on his appointment as keeper, he took in hand the revision of the systematic arrangement of the collections; scientific catalogues followed in rapid succession; the department was raised in importance; its poverty as well as its wealth became known, and whilst increased grants, donations and exchanges made good many deficiencies, great numbers of students, foreign as well as English, availed themselves of its resources to enlarge the knowledge of zoology in all its branches. In spite of numerous obstacles, he worked up the department, within a few years of his appointment as keeper, to such a state of excellence as to make it the rival of the cabinets of Leiden, Paris and Berlin; and later on it was raised under his management to the dignity of the largest and most complete zoological collection in the world. Although seized with paralysis in 1870, he continued to discharge the functions of keeper of zoology, and to contribute papers to the *Annals of Natural History*, his favourite journal, and to the transactions of a few of the learned societies; but at Christmas 1874, having completed half a century of official work, he resigned office, and died in London on the 7th of March 1875.

Gray was an exceedingly voluminous writer, and his interests were not confined to natural history only, for he took an active part in questions of public importance of his day, such as slave emancipation, prison discipline, abolition of imprisonment for debt, sanitary and municipal organizations, the decimal system, public education, extension of the opening of museums, &c. He began to publish in 1820, and continued till the year of his death.

The titles of the books, memoirs and miscellaneous papers written by him, accompanied by a few notes, fill a privately printed list of 56 octavo pages with 1162 entries.

GRAY, PATRICK GRAY, 6TH BARON (d. 1612), was descended from Sir Andrew Gray (*c.* 1390–1469) of Broxmouth and Foulis, who was created a Scottish peer as Lord Gray, probably in 1445. Andrew was a leading figure in Scottish politics during the reigns of James I. and his two successors, and visited England as a

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hostage,' a diplomatist and a pilgrim. The 2nd Lord Gray was his grandson Andrew (d. 1514), and the 4th lord was the latter's grandson Patrick (d. 1582), a participant in Scottish politics during the stormy time of Mary, queen of Scots. Patrick's son, Patrick, the 5th lord (d. 1609), married Barbara, daughter of William, 2nd Lord Ruthven, and their son Patrick, known as the "Master of Gray," is the subject of this article. Educated at Glasgow University and brought up as a Protestant, young Patrick was married early in life to Elizabeth Lyon, daughter of Lord Glamis, whom he repudiated almost directly; and afterwards went to France, where he joined the friends of Mary, queen of Scots, became a Roman Catholic, and assisted the French policy of the Guises in Scotland. He returned and took up his residence again in Scotland in 1583, and immediately began a career of treachery and intrigue, gaining James's favour by disclosing to him his mother's secrets, and acting in agreement with James Stewart, earl of Arran, in order to keep Mary a prisoner in England. In 1584 he was sent as ambassador to England, to effect a treaty between James and Elizabeth and to exclude Mary. His ambition incited him at the same time to promote a plot to secure the downfall of Arran. This was supported by Elizabeth, and was finally accomplished by letting loose the lords banished from Scotland for their participation in the rebellion called the Raid of Ruthven, who, joining Gray, took possession of the king's person at Stirling in 1585, the league with England being ratified by the parliament in December. Gray now became the intermediary between the English government and James on the great question of Mary's execution, and in 1587 he was despatched on an embassy to Elizabeth, ostensibly to save Mary's life. Gray had, however, previously advised her secret assassination and had endeavoured to overcome all James's scruples; and though he does not appear to have carried treachery so far as to advise her death on this occasion, no representations made by him could have had any force or weight. The execution of Mary caused his own downfall and loss of political power in Scotland; and after his return he was imprisoned on charges of plots against Protestantism, of endeavouring to prevent the king's marriage, and of having been bribed to consent to Mary's death. He pleaded guilty of sedition and of having obstructed the king's marriage, and was declared a traitor; but his life was spared by James and he was banished from the country, but permitted to return in 1589, when he was restored to his office of master of the wardrobe to which he had been appointed in 1585. His further career was marked by lawlessness and misconduct. In 1592, together with the 5th Lord Bothwell, he made an unsuccessful attempt to seize the king at Falkland, and the same year earned considerable discredit by bringing groundless accusations against the Presbyterian minister, Robert Bruce; while after the king's accession to the English throne he was frequently summoned before the authorities on account of his conduct. Notwithstanding, he never lost James's favour. In 1609 he succeeded his father as 6th Baron Gray, and died in 1612.

Gray was an intimate friend of Sir Philip Sidney, but, if one of the ablest, handsomest and most fascinating, he was beyond doubt one of the most unscrupulous men of his day. He married as his second wife in 1585 Mary Stewart, daughter of Robert, earl of Orkney, and had by her, besides six daughters, a son, Andrew (d. 1663), who succeeded him as 7th Baron Gray. Andrew, who served for a long time in the French army, was a supporter, although not a very prominent one, of Charles I. and afterwards of Charles II. He was succeeded as 8th Lord Gray by Patrick (d. 1711), a son of his daughter Anne, and Patrick's successor was his kinsman and son-in-law John (d. 1724). On the extinction of John's direct line in 1878 the title of Lord Gray passed to George Stuart, earl of Moray. In 1606 Gray had been ranked sixth among the Scottish baronies.

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GRAY, ROBERT (1809–1872), first bishop of Cape Town and metropolitan of South Africa, was born at Bishop Wearmouth, Durham, and was the son of Robert Gray, bishop of Bristol. He was educated at Eton and Oxford, and took orders in 1833. After holding the livings of Whitworth, Durham, 1834–1845, and Stockton-on-Tees 1845–1847, he was consecrated bishop of Cape Town in 1847; the bishopric having been endowed through the liberality of Miss (afterwards Baroness) Burdett-Coutts. Until 1853 he was a suffragan of Canterbury, but in that year he formally resigned his see and was reappointed by letters patent metropolitan of South Africa in view of the contemplated establishment of the suffragan dioceses of Graham's Town and Natal. In that capacity his coercive jurisdiction was twice called in question, and in each case the judicial committee of the privy council decided against him. The best-known case is that of Bishop Colenso, whom Gray deposed and excommunicated in 1861. The spiritual validity of the sentence was upheld by the convocation of Canterbury and the Pan-Anglican synod of 1867, but legally Colenso remained bishop of Natal. The privy council decisions declared, in effect, that the Anglican body in South Africa was on the footing of a voluntary religious society. Gray, accepting this position, obtained its recognition by the mother church as the Church of the Province of South Africa, in full communion with the Church of England. The first provincial synod was held in 1870. During his episcopate Bishop Gray effected a much-needed organization of the South African church, to which he added five new bishoprics, all carved out of the original diocese of Cape Town. It was also chiefly owing to his suggestions that the universities' mission to Central Africa was founded.

GRAY, SIR THOMAS (d. *c.* 1369), English chronicler, was a son of Sir Thomas Gray, who was taken prisoner by the Scots at Bannockburn and who died about 1344. The younger Thomas was present at the battle of Neville's Cross in 1346; in 1355, whilst acting as warden of Norham Castle, he was made a prisoner, and during his captivity in Edinburgh Castle he devoted his time to studying the English chroniclers, Gildas, Bede, Ranulf Higdon and others. Released in 1357 he was appointed warden of the east marches towards Scotland in 1367, and he died about 1369. Gray's work, the *Scalacronica* (so called, perhaps, from the scaling-ladder in the crest of the Grays), is a chronicle of English history from the earliest times to about the year 1362. It is, however, only valuable for the reigns of Edward I. and Edward II. and part of that of Edward III., being especially so for the account of the wars between England and Scotland, in which the author's father and the author himself took part. Writing in Norman-French, Gray tells of Wallace and Bruce, of the fights at Bannockburn, Byland and Dupplin, and makes some mention of the troubles in England during the reign of Edward II. He also narrates the course of the war in France between 1355 and 1361; possibly he was present during some of these campaigns.

The *Scalacronica* was summarized by John Leland in the 16th century; the part dealing with the period from 1066 to the end, together with the prologue, was edited for the Maitland Club by J. Stevenson (1836); and the part from 1272 to 1362 was translated into English by Sir Herbert Maxwell (Glasgow, 1907). In the extant manuscript, which is in Corpus Christi College, Cambridge, there is a gap extending from about 1340 to 1355, and Gray's account of this period is only known from Leland's summary.

GRAY, THOMAS (1716–1771), English poet, the fifth and sole surviving child of Philip and Dorothy Gray, was born in London on the 26th of December 1716. His mother's maiden name was Antrobus, and in partnership with her sister Mary she kept a millinery shop in Cornhill. This and the house connected with it were the property of Philip Gray, a money-scrivener, who married Dorothy in 1706 and lived with her in the house, the sisters renting the shop from him and supporting themselves by its profits. Philip Gray had impaired the fortune which he inherited from his father, a wealthy London merchant; yet he was sufficiently well-to-do, and at the close of his life was building a house upon some property of his own at Wanstead. But he was selfish and brutal, and in 1735 his wife took some abortive

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steps to obtain a separation from him. At this date she had given birth to twelve children, of whom Thomas was the only survivor. He owed his life as well as his education to this "careful, tender mother," as he calls her. The child was suffocating when she opened one of his veins with her own hand. He went at her expense to Eton in 1727, and was confided to the care of her brother, William Antrobus, one of the assistant-masters, during some part at least of his school-life.

At Eton Gray's closest friends were Horace Walpole, Richard West (son of the lord chancellor of Ireland and grandson of the famous Bishop Burnet), and Thomas Ashton, afterwards fellow of Eton. This little coterie was dubbed "the Quadruple Alliance"; its members were studious and literary, and took little part in the amusements of their fellows. In 1734 Gray matriculated at Peterhouse, Cambridge, of which his uncle, Robert Antrobus, had been a fellow. At Cambridge he had once more the companionship of Walpole and Ashton who were at King's, but West went to Christchurch, Oxford. Gray made at this time the firmest and most constant friendship of his life with Thomas Wharton (not the poet Warton) of Pembroke College. He was maintained by his mother, and his straitened means were eked out by certain small exhibitions from his college. His conspicuous abilities and known devotion to study perhaps atoned in the eyes of the authorities for his indifference to the regular routine of study; for mathematics in particular he had an aversion which was the one exception to his almost limitless curiosity in other directions. During his first Cambridge period he learnt Italian "like any dragon," and made translations from Guarini, Dante and Tasso, some of which have been preserved. In September 1738 he is in the agony of leaving college, nor can we trace his movements with any certainty for a while, though it may be conjectured that he spent much time with Horace Walpole, and made in his company some fashionable acquaintances in London. On the 29th of March 1739, he started with Walpole for a long continental tour, for the expenses of which it is probable that his father, for once, came in some measure to his assistance. In Paris, Gray visited the great with his friend, studied the picture-galleries, went to tragedies, comedies, operas and cultivated there that taste for the French classical dramatists, especially Racine, whom he afterwards tried to imitate in the fragmentary "Agrippina." It is characteristic of him that he travels through France with Caesar constantly in his hands, ever noting and transcribing. In the same way, in crossing the Alps and in Piedmont, he has "Livy in the chaise with him and Silius Italicus too." In Italy he made a long sojourn, principally at Florence, where Walpole's life-long correspondent, Horace Mann, was British envoy, and received and treated the travellers most hospitably. But Rome and Naples are also described in Gray's letters, sometimes vividly, always amusingly, and in his notes are almost catalogued. Herculaneum, an object of intense interest to the young poet and antiquary, had been discovered the year before. At length in April 1741 Gray and Walpole set out northwards for Reggio. Here they quarrelled. Gray, "never a boy," was a student, and at times retiring; Walpole, in his way a student too, was at this time a very social being, somewhat too frivolous, and, what was worse, too patronizing. He good-humouredly said at a later date, "Gray loves to find fault," and this fault-finding was expressed, no doubt with exaggeration, in a letter to Ashton, who violated Gray's confidence. The rupture followed, and with two friends, John Chute of the Vyne, Hampshire, and the young Francis Whithed, Gray went to Venice to see the doge wed the Adriatic on Ascension Day. Thence he returned home attended only by a *laquais de voyage*, visiting once more the Grande Chartreuse where he left in the album of the brotherhood those beautiful alcaics, *O Tu severa Religio loci*, which reveal his characteristic melancholy (enhanced by solitude and estrangement) and that sense of the glory as distinct from the horror of mountain scenery to which perhaps he was the first of Englishmen to give adequate expression. On the 18th of September 1741 we find him in London, astonishing the street boys with his deep ruffles, large bag-wig and long sword, and "mortified" under the hands of the English barber. On the 6th of November his father died; Philip Gray had, it is evident, been less savage and niggardly at last to those who were dependent upon him, and his death left his wife and son some measure of assured peace and comfort.

London was Gray's headquarters for more than a year, with occasional visits to Stoke Poges, to which his mother and Mary Antrobus had retired from business to live with their sister, Mrs Rogers. At Stoke he heard of the death of West, to whom he had sent the "Ode on Spring," which was returned to him unopened. It was an unexpected blow, shocking in all its circumstances, especially if we believe the story that his friend's frail life was brought to a close by the discovery that the mother whom he tenderly loved had been an unfaithful wife, and, as some say, poisoned her husband. About this tragedy Gray preserved a mournful silence, broken only by the pathetic sonnet, and some Latin lines, in which he laments his loss. The year 1742, was, for him, fruitful in poetic effort, of which, however, much was incomplete. The "Agrippina," the *De principiis Cogitandi*, the splenetic "Hymn to Ignorance" in which he contemplates his return to the university, remain fragments; but besides the two poems already mentioned, the "Ode on a Distant Prospect of Eton College" and the "Hymn to Adversity," perhaps the most faultless of his poems, were written before the close of the summer. After hesitating between Trinity Hall and Peterhouse, he returned to the latter, probably as a fellow-commoner. He had hitherto neglected to read for a degree; he proceeded to that of LL.B. in 1744. In 1745 a reconciliation with Walpole, long desired probably on both sides, was effected through the kind offices of Chute's sister. In 1746 he spent his time between Cambridge, Stoke and London; was much with Walpole; graphically describes the trial of the Scottish rebel lords, and studied Greek with avidity; but "the muse," which by this time perhaps had stimulated him to begin the "Elegy," "has gone, and left him in much worse company." In town he finds his friends Chute and Whithed returned to England, and "flaunts about" in public places with them. The year 1747 produced only the ode on Walpole's cat, and we gather that he is mainly engaged in reading with a very critical eye, and interesting himself more in the troubles of Pembroke College, in which he almost seems to live, than in the affairs of Peterhouse. In this year also he made the acquaintance of Mason, his future biographer. In 1748 he first came before the public, but anonymously, in Dodsley's *Miscellany*, in which appeared the Eton ode, the ode on spring, and that on the cat. In the same year he sent to Wharton the beginning of the didactic poem, "The Alliance of Education and Government," which remains a fragment. His aunt, Mary Antrobus, died in 1749.

There is little to break the monotony of his days till 1750, when from Stoke he sent Walpole "a thing to which he had at last put an end." The "thing" was the "Elegy." It was shown about in manuscript by his admiring friend; it was impudently pirated, and Gray had it printed by Dodsley in self-defence. Even thus it had "a pinch or two in its cradle," of which it long bore the marks. The publication led to the one incident in Gray's life which has a touch of romance. At Stoke-house had come to live the widowed Lady Cobham, who learnt that the author of the "Elegy" was her neighbour. At her instance, Lady Schaub, her visitor, and Miss Speed, her protégée, paid him a call; the poet was out, and his quiet mother and aunts were somewhat flustered at the apparition of these women of fashion, whose acquaintance Gray had already made in town. Hence the humorous "Long Story." A platonic affection sprang up between Gray and Miss Speed; rumour, upon the death of Lady Cobham, said that they were to be married, but the lady escaped this mild destiny to become the Baroness de la Peyrière, afterwards Countess Viry, and a dangerous political *intriguante*.

In 1753 all Gray's completed poems, except the sonnet on the death of West, were published by Dodsley in a handsome volume illustrated by Richard Bentley, the son of the celebrated master of Trinity. To these designs we owe the verses to the artist

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which were posthumously published from a MS. torn at the end. In the same year Gray's mother died and was buried in the churchyard at Stoke Poges, the scene of the "Elegy," in the same grave with Mary Antrobus. A visit to his friend Dr Wharton at Durham later in the year revives his earlier impressions of that bolder scenery which is henceforth to be in the main the framework of his muse. Already in 1752 he had almost completed "The Progress of Poesy," in which, and in "The Bard," the imagery is largely furnished forth by mountain and torrent. The latter poem long held fire; Gray was stimulated to finish it by hearing the blind Welsh harper Parry at Cambridge. Both odes were the first-fruits of the press which Walpole had set up at Strawberry Hill, and were printed together there in 1757. They are genuinely Pindaric, that is, with corresponding strophes, antistrophes and epodes. As the Greek motto prefixed to them implies, they were vocal to the intelligent only; and these at first were few. But the odes, if they did not attain the popularity of the "Elegy," marked an epoch in the history of English poetry, and the influence of "The Bard" may be traced even in that great but very fruitful imposture, the pseudo-Ossian of Macpherson. Gray yields to the impulse of the Romantic movement; he has long been an admirer of ballad poetry; before he wrote "The Bard" he had begun to study Scandinavian literature, and the two "Norse Odes," written in 1761, were in style and metrical form strangely anticipative of Coleridge and Scott. Meanwhile his Cambridge life had been vexed by the freaks of the fellow-commoners of Peterhouse, a peculiarly riotous set. He had suffered great inconvenience for a time by the burning of his property in Cornhill, and so nervous was he on the subject of fire that he had provided himself with a rope-ladder by which he might descend from his college window. Under this window a hunting-party of these rude lads raised in the early morning the cry of fire; the poet's night-capped head appeared and was at once withdrawn. This, or little more than this, was the simple fact out of which arose the legend still current at Cambridge. The servile authorities of Peterhouse treated Gray's complaints with scant respect, and he migrated to Pembroke College. "I left my lodgings," he said, "because the rooms were noisy, and the people of the house dirty."

In 1758 died Mrs Rogers, and Gray describes himself as employed at Stoke in "dividing nothing" between himself and the surviving aunt, Mrs Oliffe, whom he calls "the spawn of Cerberus and the Dragon of Wantley." In 1759 he availed himself of the MS. treasures of the British Museum, then for the first time open to the public, made a very long sojourn in town, and in 1761 witnessed the coronation of George III., of which to his friend Brown of Pembroke he wrote a very vivacious account. In his last years he revealed a craving for a life less sedentary than heretofore. He visited various picturesque districts of Great Britain, exploring great houses and ruined abbeys; he was the pioneer of the modern tourist, noting and describing in the spirit now of the poet, now of the art-critic, now of the antiquary. In 1762 he travelled in Yorkshire and Derbyshire; in 1764 in the Lowlands of Scotland, and thence went to Southampton and its neighbourhood. In 1765 he revisits Scotland; he is the guest of Lord Strathmore at Glamis; and revels in "those monstrous creatures of God," the Highland mountains. His most notable achievement in this direction was his journey among the English lakes, of which he wrote an interesting account to Wharton; and even in 1770, the year before his death, he visited with his young friend Norton Nicholls "five of the most beautiful counties of the kingdom," and descended the Wye for 40 m. In all these quests he displays a physical energy which surprises and even perplexes us. His true academic status was worthily secured in 1768, when the duke of Grafton offered him the professorship of modern history which in 1763 he had vainly endeavoured to obtain from Bute. He wrote in 1769 the "Installation Ode" upon the appointment of Grafton as chancellor of the university. It was almost the only instance in which he successfully executed a task, not, in the strictest sense, self-imposed; the great founders of the university are tactfully memorized and pass before us in a kind of heraldic splendour. He bore with indifference the taunts to which, from Junius and others, he was exposed for this tribute to his patron. He was contemplating a journey to Switzerland to visit his youthful friend de Bonstetten when, in the summer of 1771, he was conscious of a great decline in his physical powers. He was seized with a sudden illness when dining in his college hall, and died of gout in the stomach on the 30th of July 1771. His last moments were attended by his cousin Mary Antrobus, post mistress through his influence at Cambridge and daughter of his Eton tutor; and he was laid beside his beloved mother in the churchyard of Stoke Poges.

Owing to his shyness and reserve he had few intimate friends, but to these his loss was irreparable; for to them he revealed himself either in boyish levity and banter, or wise and sympathetic counsel and tender and yet manly consolation; to them he imparted his quiet but keen observation of passing events or the stores of his extensive reading in literature ancient, medieval or modern; and with Proteus-like variety he writes at one time as a speculative philosopher, at another as a critic in art or music, at another as a meteorologist and nature-lover. His friendship with the young, after his migration to Pembroke College, is a noteworthy trait in his character. With Lord Strathmore and the Lyons and with William Palgrave he conversed as an elder brother, and Norton Nicholls of Trinity Hall lost in him a second father, who had taught him to think and feel. The brilliant young foreigner, de Bonstetten, looked back after a long and chequered career with remembrance still vivid to the days in which the poet so soon to die taught him to read Shakespeare and Milton in the monastic gloom of Cambridge. With the elderly "Levites" of the place he was less in sympathy; they dreaded his sarcastic vein; they were conscious that he laughed at them, and in the polemics of the university he was somewhat of a free lance, fighting for his own hand. Lampoons of his were privately circulated with effect, and that he could be the fiercest of satirists the "Cambridge Courtship" on the candidature of Lord Sandwich for the office of high steward, and the verses on Lord Holland's mimic ruins at Westgate, sufficiently prove. The faculty which he displayed in humour and satire was denied to his more serious muse; there all was the fruit of long delay; of that higher inspiration he had a thin but very precious vein, and the sublimity which he undoubtedly attained was reached by an effort of which captious and even sympathetic criticism can discover the traces. In his own time he was regarded as an innovator, for like Collins he revived the poetic diction of the past, and the adverse judgments of Johnson and others upon his work are in fact a defence of the current literary traditions. Few men have published so little to so much effect; few have attained to fame with so little ambition. His favourite maxim was "to be employed is to be happy," but he was always employed in the first instance for the satisfaction of his own soul, and to this end and no other he made himself one of the best Greek scholars at Cambridge in the interval between Bentley and Porson. His genius was receptive rather than creative, and it is to be regretted that he lacked energy to achieve that history of English poetry which he once projected, and for which he possessed far more knowledge and insight than the poet Thomas Warton, to whom he resigned the task. He had a fine taste in music, painting and architecture; and his correspondence includes a wide survey of such European literature as was accessible to him, with criticisms, sometimes indeed a little limited and insular, yet of a singularly fresh and modern cast. In person he was below the middle height, but well-made, and his face, in which the primness of his features was redeemed by his flashing eyes, was the index of his character. There was a touch of affectation in his demeanour, and he was sometimes reticent and secretive even to his best friends. He was a refined Epicurean in his habits, and a deist rather than a Christian in his religious beliefs; but his friend, Mrs Bonfoy, had "taught him to pray" and he was keenly alive to the dangers of a flippant scepticism. In a beautiful alcaic stanza he pronounces the man supremely happy who in the depths of the heart is conscious

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of the "fount of tears," and his characteristic melancholy, except in the few hours when it was indeed black, was not a pitiable state; rather, it was one secret of the charm both of the man and of the poet.

A very complete bibliography of Gray will be found in Dr. Bradshaw's edition of the poems in the Aldine series. Dodsley published ten of the poems, exclusive of the "Long Story," in 1768. Mason's *Life of Gray* (1778) included the poems and some hitherto unpublished fragments, with a selection from his letters, much garbled. Mathias in 1814 reprinted Mason's edition and added much from Gray's MS. commentaries together with some more of his translations. The most exhaustive edition of Gray's writings was achieved by the Rev. John Mitford, who first did justice to the correspondence with Wharton and Norton Nicholls (5 vols., Pickering, 1836–1843; correspondence of Gray and Mason, Bentley, 1853); see also the edition of the works by Edmund Gosse (4 vols. 1884); the Life by the same in Eng. Men of Letters (2nd ed., 1889); some further relics are given in *Gray and His Friends* by D. C. Tovey (Cambridge, 1890); and a new edition of the letters copiously annotated by D. C. Tovey is in the Standard Library (1900–1907). Nicholl's *Illustrations*, vol. vi. p. 805, quoted by Professor Kittredge in the *Nation*, Sept. 12th, 1900, gives the true story of Gray's migration to Pembroke College. Matthew Arnold's essay on Gray in Ward's *English Poets* is one of the minor classics of literary criticism.

(D. C. To.)

GRAY (or GREY), **WALTER DE** (d. 1255), English prelate and statesman, was a nephew of John de Gray, bishop of Norwich, and was educated at Oxford. He owed his early and rapid preferment in church and state to the favour of King John, becoming the king's chancellor in 1205, and being chosen bishop of Lichfield in 1210. He was, however, not allowed to keep this bishopric, but he became bishop of Worcester in 1214, resigning his office as chancellor in the same year. Gray was with John when the king signed Magna Carta in June 1215; soon after this event he left England on the king's business, and it was during his absence that he was forced into the archbishopric of York, owing his election to the good offices of John and of Pope Innocent III. He took a leading part in public affairs during the minority of Henry III., and was regarded with much favour by this king, who employed him on important errands to foreign potentates, and left him as guardian of England when he went to France in 1242. Afterwards the archbishop seems to have been less favourably disposed towards Henry, and for a time he absented himself from public business; however, in 1255, he visited London to attend a meeting of parliament, and died at Fulham on the 1st of May 1255. Gray was always anxious to assert his archiepiscopal authority over Scotland, and to maintain it against the archbishop of Canterbury, but in neither case was he very successful. He built the south transept of the minster at York and bought for his see the village, afterwards called Bishopthorpe, which is still the residence of the archbishop of York. He was also generous to the church at Ripon. Gray was regarded by his contemporaries as an avaricious, but patriotic man.

GRAY, a town of eastern France, capital of an arrondissement in the department of Haute-Saône, situated on the declivity of a hill on the left bank of the Saône, 36 m. S.W. of Vesoul by the Eastern railway. Pop. (1906) 5742. The streets of the town are narrow and steep, but it possesses broad and beautiful quays and has a busy port. Three bridges, one dating from the 18th century, unite it to suburbs on the right bank of the river, on which is the railway-station from which lines branch off to Auxonne, Dijon, Besançon and Culmont-Chalindrey. The principal buildings are the Gothic church, restored in the style of the Renaissance but with a modern portal, and the hôtel de ville, built by the Spaniards in 1568. The latter building has a handsome façade decorated with columns of red granite. Gray is the seat of a subprefect and has tribunals of first instance and of commerce, a chamber of commerce, a communal college and a small museum. It has large flour-mills; among the other industries is the manufacture of machinery and iron goods. There is also a considerable transit traffic in goods from the south of France and the colonies, and trade in iron, corn, provisions, vegetables, wine, wood, &c., much of which is carried by river. Gray was founded in the 7th century. Its fortifications were destroyed by Louis XIV. During the Franco-German War General von Werder concentrated his army corps in the town and held it for a month, making it the *point d'appui* of movements towards Dijon and Langres, as well as towards Besançon.

Gray gave its name to the distinguished English family of de Gray, Gray or Grey, Anschitel de Gray being mentioned as an Oxfordshire tenant in Domesday.

GRAYLING (*Thymallus*), fishes belonging to the family *Salmonidae*. The best known are the "poisson bleu" of the Canadian voyageurs, and the European species, *Thymallus vulgaris* (the *Asch* or *Asche* of Germany, *ombre* of France, and *temola* of Upper Italy). This latter species is esteemed on account of its agreeable colours (especially of the dorsal fin), its well-flavoured flesh, and the sport it affords to anglers. The grayling differ from the genus *Salmo* in the smaller mouth with comparatively feeble dentition, in the larger scales, and especially in the much greater development of the dorsal fin, which contains 20 to 24 rays. These beautiful fishes, of which five or six species are known, inhabit the fresh waters of Europe, Siberia and the northern parts of North America. The European species, *T. vulgaris* or *vexillifer*, attains, though rarely, a length of 2 ft. The colours during life are remarkably changeable and iridescent; small dark spots are sometimes present on the body; the very high dorsal fin is beautifully marked with purplish bands and ocelli. In England and Scotland the grayling appears to have had originally a rather irregular distribution, but it has now been introduced into a great number of rivers; it is not found in Ireland. It is more generally distributed in Scandinavia and Russia, and the mountain streams of central Europe southwards to the Alpine water of Upper Italy. Specimens attaining to a weight of 4 lb are very scarce.

GRAYS THURROCK, or GRAYS, an urban district in the south-eastern parliamentary division of Essex, England, on the Thames, 20 m. E. by S. from London by the London, Tilbury & Southend railway. Pop. (1901) 13,834. The church of St Peter and St Paul, wholly rebuilt, retains some Norman work. The town takes its name from a family of Gray who held the manor for three centuries from 1140. There are an endowed and two training ship schools. Roman remains have been found in the vicinity; and the geological formations exhibiting the process of silting up of a former river channel are exposed in the quarries, and contain large mammalian remains. The town has trade in bricks, lime and cement.

GRAZ [GRATZ], the capital of the Austrian duchy and crown-land of Styria, 140 m. S.W. of Vienna by rail. Pop. (1900) 138,370. It is picturesquely situated on both banks of the Mur, just where this river enters a broad and fertile valley, and the beauty of its position has given rise to the punning French description, *La Ville des grâces sur la rivière de l'amour*. The main town lies on the left bank of the river at the foot of the Schlossberg (1545 ft.) which dominates the town. The beautiful valley traversed by the Mur, known as the Grazer Feld and bounded by the Wildonerberge, extends to the south; to the S.W. rise the Bacher Gebirge and the Koralpen; to the N. the Schöckel (4745 ft.), and to the N.W. the Alps of Upper Styria. On the Schlossberg, which can be ascended by a cable tramway, beautiful parks have been laid out, and on its top is the bell-tower, 60 ft. high, and the quaint clock-tower, 52 ft. high, which bears a gigantic clock-dial. At the foot of the Schlossberg is the Stadt-Park.

Among the numerous churches of the city the most important is the cathedral of St Aegidius, a Gothic building erected by the emperor Frederick III. in 1450–1462 on the site of a previous church mentioned as early as 1157. It has been several times modified and redecorated, more particularly in 1718. The present copper spire dates from 1663. The interior is richly adorned with stained-glass windows of modern date, costly shrines, paintings and tombs. In the immediate neighbourhood of the cathedral is the mausoleum church erected by the emperor Ferdinand II. Worthy of mention also are the parish church, a Late Gothic building, finished in 1520, and restored in 1875, which possesses an altar piece by Tintoretto; the Augustinian church, appropriated to the service of the university since 1827;

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the small Leech Kirche, an interesting building in Early Gothic style, dating from the 13th century, and the Herz Jesu-Kirche, a building in Early Gothic style, finished in 1891, with a tower 360 ft. high. Of the secular buildings the most important is the Landhaus, where the local diet holds its sittings, erected in the 16th century in the Renaissance style. It possesses an interesting portal and a beautiful arcaded court, and amongst the curiosities preserved here is the Styrian hat. In its neighbourhood is the Zeughaus or arsenal, built in 1644, which contains a very rich collection of weapons of the 15th-17th centuries, and which is maintained exactly in the same condition as it was 250 years ago. The town hall, built in 1807, and rebuilt in 1892 in the German Renaissance style, and the imperial castle, dating from the 11th century, now used as government offices, are also worth notice.

At the head of the educational institutions is the university founded in 1586 by the Austrian archduke Charles Francis, and restored in 1817 after an interruption of 45 years. It is now housed in a magnificent building, finished in 1895, and is endowed with numerous scientific laboratories and a rich library. It had in 1901 a teaching staff of 161 professors and lecturers, and 1652 students, including many Italians from the Küstenland and Dalmatia. The Joanneum Museum, founded in 1811 by the archduke John Baptist, has become very rich in many departments, and an additional huge building in the rococo style was erected in 1895 for its accommodation. The technical college, founded in 1814 by the archduke John Baptist, had in 1901 about 400 pupils.

An active trade, fostered by abundant railway communications, is combined with manufactures of iron and steel wares, paper, chemicals, vinegar, physical and optical instruments, besides artistic printing and lithography. The extensive workshops of the Southern railway are at Graz, and since the opening of the railway to the rich coal-fields of Köflach the number of industrial establishments has greatly increased.

Amongst the numerous interesting places in the neighbourhood are: the Hilmteich, with the Hilmwarte, about 100 ft. high; and the Rosenberg (1570 ft.), whence the ascent of the Platte (2136 ft.) with extensive view is made. At the foot of the Rosenberg is Maria Grün, with a large sanatorium. All these places are situated to the N. of Graz. On the left bank of the Mur is the pilgrimage church of Maria Trost, built in 1714; on the right bank is the castle of Eggenberg, built in the 17th century. To the S.W. is the Buchkogel (2150 ft.), with a magnificent view, and a little farther south is the watering-place of Tobelbad.

History.—Graz may possibly have been a Roman site, but the first mention of it under its present name is in a document of A.D. 881, after which it became the residence of the rulers of the surrounding district, known later as Styria. Its privileges were confirmed by King Rudolph I. in 1281. Surrounded with walls and fosses in 1435, it was able in 1481 to defend itself against the Hungarians under Matthias Corvinus, and in 1529 and 1532 the Turks attacked it with as little success. As early as 1530 the Lutheran doctrine was preached in Graz by Seifried and Jacob von Eggenberg, and in 1540 Eggenberg founded the Paradies or Lutheran school, in which Kepler afterwards taught. But the archduke Charles burned 20,000 Protestant books in the square of the present lunatic asylum, and succeeded by his oppressive measures in bringing the city again under the authority of Rome. From the earlier part of the 15th century Graz was the residence of one branch of the family of Habsburg, a branch which succeeded to the imperial throne in 1619 in the person of Ferdinand II. New fortifications were constructed in the end of the 16th century by Franz von Poppendorf, and in 1644 the town afforded an asylum to the family of Ferdinand III. The French were in possession of the place in 1707 and again in 1805; and in 1809 Marshal Macdonald having, in accordance with the terms of the peace of Vienna, entered the citadel which he had vainly besieged, blew it all up with the exception of the bell-tower and the citizens' or clock tower. It benefited greatly during the 19th century from the care of the archduke John and received extended civic privileges in 1860.

See Ilwof and Peters, *Graz, Geschichte und Topographie der Stadt* (Graz, 1875); G. Fels, *Graz und seine Umgebung* (Graz, 1898); L. Mayer, *Die Stadt der Grazien* (Graz, 1897), and Holrichter, *Rückblicke in die Vergangenheit von Graz* (Graz, 1885).

GRAZZINI, ANTONIO FRANCESCO (1503–1583), Italian author, was born at Florence on the 22nd of March 1503, of good family both by his father's and mother's side. Of his youth and education all record appears to be lost, but he probably began early to practise as an apothecary. In 1540 he was one of the founders of the Academy of the Humid (degli Umidi) afterwards called "della Fiorentina," and later took a prominent part in the establishment of the more famous Accademia della Crusca. In both societies he was known as *Il Lasca* or *Leuciscus*, and this pseudonym is still frequently substituted for his proper name. His temper was what the French happily call a difficult one, and his life was consequently enlivened or disturbed by various literary quarrels. His Humid brethren went so far as to expel him for a time from the society—the chief ground of offence being apparently his ruthless criticism of the "Araneans," a party of the academicians who maintained that the Florentine or Tuscan tongue was derived from the Hebrew, the Chaldee, or some other branch of the Semitic. He was readmitted in 1566, when his friend Salviati was "consul" of the academy. His death took place on the 18th of February 1583. Il Lasca ranks as one of the great masters of Tuscan prose. His style is copious and flexible; abundantly idiomatic, but without any affectation of being so, it carries with it the force and freshness of popular speech, while it lacks not at the same time a flavour of academic culture. His principal works are *Le Cene* (1756), a collection of stories in the manner of Boccaccio, and a number of prose comedies, *La Gelosia* (1568), *La Spiritata* (1561), *I Parentadi*, *La Arenga*, *La Sibilla*, *La Pinzochera*, *L'Arzigogolo*. The stories, though of no special merit as far as the plots are concerned, are told with verve and interest. A number of miscellaneous poems, a few letters and *Four Orations to the Cross* complete the list of Grazzini's extant works.

He also edited the works of Berni, and collected *Tutti i trionfi, larri, mascherate, e canti carnascialeschi, andati per Firenze dal tempo del magnifico Lorenzo de' Medici fino all' anno 1559*. In 1868 Adamo Rossi published in his *Ricerche per le biblioteche di Perugia* three "novelle" by Grazzini, from a MS. of the 16th century in the "Comunale" of Perugia: and in 1870 a small collection of those poems which have been left unpublished by previous editors appeared at Poggibonsi, *Alcune Poesie inedite*. See Pietro Fanfani's "Vita del Lasca," prefixed to his edition of the *Opere di A. Grazzini* (Florence, 1857).

GREAT AWAKENING, the name given to a remarkable religious revival centring in New England in 1740–1743, but covering all the American colonies in 1740–1750. The word "awakening" in this sense was frequently (and possibly first) used by Jonathan Edwards at the time of the Northampton revival of 1734–1735, which spread through the Connecticut Valley and prepared the way for the work in Rhode Island, Massachusetts and Connecticut (1740–1741) of George Whitefield, who had previously been preaching in the South, especially at Savannah, Georgia. He, his immediate follower, Gilbert Tennent (1703–1764), other clergymen, such as James Davenport, and many untrained laymen who took up the work, agreed in the emotional and dramatic character of their preaching, in rousing their hearers to a high pitch of excitement, often amounting to frenzy, in the undue stress they put upon "bodily effects" (the physical manifestations of an abnormal psychic state) as proofs of conversion, and in their unrestrained attacks upon the many clergymen who did not join them and whom they called "dead men," unconverted, unregenerate and careless of the spiritual condition of their parishes. Jonathan Edwards, Benjamin Colman (1673–1747), and Joseph Bellamy, recognized the viciousness of so extreme a position. Edwards personally reprimanded Whitefield for presuming to say of any one that he was unconverted, and in his *Thoughts Concerning the Present Revival of Religion* devoted much space to "showing what things are to be corrected, or avoided, in promoting this work." Edwards' famous sermon at Enfield in 1741 so affected his audience that they cried and groaned aloud, and he found

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it necessary to bid them be still that he might go on; but Davenport and many itinerants provoked and invited shouting and even writhing, and other physical manifestations. At its May session in 1742 the General Court of Massachusetts forbade itinerant preaching save with full consent from the resident pastor; in May 1743 the annual ministerial convention, by a small plurality, declared against "several errors in doctrine and disorders in practice which have of late obtained in various parts of the land," against lay preachers and disorderly revival meetings; in the same year Charles Chauncy, who disapproved of the revival, published *Seasonable Thoughts on the State of Religion in New England*; and in 1744–1745 Whitefield, upon his second tour in New England, found that the faculties of Harvard and Yale had officially "testified" and "declared" against him and that most pulpits were closed to him. Some separatist churches were formed as a result of the Awakening; these either died out or became Baptist congregations. To the reaction against the gross methods of the revival has been ascribed the religious apathy of New England during the last years of the 18th century; but the martial and political excitement, beginning with King George's War (*i.e.* the American part of the War of the Austrian Succession) and running through the American War of Independence and the founding of the American government, must be reckoned at the least as contributing causes.

See Joseph Tracy, *The Great Awakening* (Boston, 1842); Samuel P. Hayes, "An Historical Study of the Edwardean Revivals," in *The American Journal of Psychology*, vol. 13 (Worcester, Mass., 1902); and Frederick M. Davenport, *Primitive Traits in Religious Revivals* (New York, 1905), especially chapter viii. pp. 94–131.

(R. We.)

GREAT BARRIER REEF, a vast coral reef extending for 1200 m. along the north-east coast of Australia (*q.v.*). The channel within it is protected from heavy seas by the reef, and is a valuable route of communication for coasting steamers. The reef itself is also traversed by a number of navigable passages.

GREAT BARRINGTON, a township of Berkshire county, Massachusetts, U.S.A., on the Housatonic river, in the Berkshire hills, about 25 m. S.W. of Pittsfield. Pop. (1890) 4612; (1900) 5854. of whom 1187 were foreign-born; (1910 census) 5926. Its area is about 45 sq. m. The township is traversed by a branch of the New York, New Haven & Hartford railroad, and the Berkshire Street railway (controlled by the N.Y., N.H. & H.) has its southern terminus here. Within the township are three villages—Great Barrington (the most important), Housatonic and Van Deusenville; the first two are about 5 m. apart. The village of Great Barrington, among the hills, is well known as a summer resort. The Congregational church with its magnificent organ (3054 pipes) is worthy of mention. There is a public library in the village of Great Barrington and another in the village of Housatonic. Monument Mt. (1710 ft.), partly in Stockbridge, commands a fine view of the Berkshires and the Housatonic Valley. The Sedgwick School (for boys) was removed from Hartford, Connecticut, to Great Barrington in 1869. There are various manufactures, including cotton-goods (in the village of Housatonic), and electric meters, paper, knit goods and counterpanes (in the village of Great Barrington); and marble and blue stone are quarried here; but the township is primarily given over to farming. The fair of the Housatonic Agricultural Society is held here annually during September; and the district court of South Berkshire sits here. The township was incorporated in 1761, having been, since 1743, the "North Parish of Sheffield"; the township of Sheffield, earlier known as the "Lower Housatonic Plantation" was incorporated in 1733. Great Barrington was named in honour of John Shute (1678–1734), Viscount Barrington of Ardglass (the adjective "Great" being added to distinguish it from another township of the same name). In 1761–1787 it was the shire-town. Great Barrington was a centre of the disaffection during Shays's rebellion, and on the 12th of September 1786 a riot here prevented the sitting of court. Samuel Hopkins, one of the most eminent of American theologians, was pastor here in 1743–1769; General Joseph Dwight (1703–1765), a merchant, lawyer and brigadier-general of Massachusetts militia, who took part in the Louisburg expedition in 1745 and later in the French and Indian War, lived here from 1758 until his death; and William Cullen Bryant lived here as a lawyer and town clerk in 1816–1825.

See C. J. Taylor, *History of Great Barrington* (Great Barrington, 1882).

GREAT BASIN, an area in the western Cordilleran region of the United States of America, about 200,000 sq. m. in extent, characterized by wholly interior drainage, a peculiar mountain system and extreme aridity. Its form is approximately that of an isosceles triangle, with the sharp angle extending into Lower California, W. of the Colorado river; the northern edge being formed by the divide of the drainage basin of the Columbia river, the eastern by that of the Colorado, the western by the central part of the Sierra Nevada crest, and by other high mountains. The N. boundary and much of the E. is not conspicuously uplifted, being plateau, rather than mountain. The W. half of Utah, the S.W. corner of Wyoming, the S.E. corner of Idaho, a large area in S.E. Oregon, much of S. California, a strip along the E. border of the last-named state, and almost the whole of Nevada are embraced within the limits of the Great Basin.

The Great Basin is not, as its name implies, a topographic cup. Its surface is of varied character, with many independent closed basins draining into lakes or "playas," none of which, however, has outlet to the sea. The mountain chains, which from their peculiar geologic character are known as of the "Basin Range type" (not exactly conterminous in distribution with the Basin), are echelloned in short ranges running from N. to S. Many of them are fault block mountains, the crust having been broken and the blocks tilted so that there is a steep face on one side and a gentle slope on the other. This is the Basin Range type of mountain. These mountains are among the most recent in the continent, and some of them, at least, are still growing. In numerous instances clear evidence of recent movements along the fault planes has been discovered; and frequent earthquakes testify with equal force to the present uplift of the mountain blocks. The valleys between the tilted mountain blocks are smooth and often trough-like, and are often the sites of shallow salt lakes or playas. By the rain wash and wind action detritus from the mountains is carried to these valley floors, raising their level, and often burying low mountain spurs, so as to cause neighbouring valleys to coalesce. The plateau "lowlands" in the centre of the Basin are approximately 5000 ft. in altitude. Southward the altitude falls, Death valley and Coahuila valley being in part below the level of the sea. The whole Basin is marked by three features of elevation—the Utah basin, the Nevada basin and, between them, the Nevada plateau.

Over the lowlands of the Basin, taken generally, there is an average precipitation of perhaps 6–7 in., while in the Oregon region it is twice as great, and in the southern parts even less. The mountains receive somewhat more. The annual evaporation from water surfaces is from 60 to 150 in. (60 to 80 on the Great Salt Lake). The reason for the arid climate differs in different sections. In the north it is due to the fact that the winds from the Pacific lose most of their moisture, especially in winter, on the western slopes of the Sierra Nevada; in the south it is due to the fact that the region lies in a zone of calms, and light, variable winds. Precipitation is largely confined to local showers, often of such violence as to warrant the name "cloud bursts," commonly applied to the heavy down-pours of this desert region. It is these heavy rains, of brief duration, when great volumes of water rapidly run off from the barren slopes, that cause the deep channels, or arroyas, which cross the desert. Permanent streams are rare. Many mountains are quite without perennial streams, and some lack even springs. Few of the mountain creeks succeed in reaching the arid plains, and those that do quickly disappear by evaporation or by seepage into the gravels. In the N.W. there are many permanent lakes without outlet fed by the mountain streams; others, snow fed, occur among the Sierra Nevada; and some in the larger mountain masses of the middle region. Almost all are saline. The largest

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of all, Great Salt Lake, is maintained by the waters of the Wasatch and associated plateaus. No lakes occur south of Owens in the W. and Sevier in the E. (39°); evaporation below these limits is supreme. Most of the small closed basins, however, contain "playas," or alkali mud flats, that are overflowed when the tributary streams are supplied with storm water.

Save where irrigation has reclaimed small areas, the whole region is a vast desert, though locally only some of the interior plains are known as "deserts." Such are the Great Salt Lake and Carson deserts in the north, the Mohave and Colorado and Amargosa (Death Valley) deserts of the south-west. Straggling forests, mainly of conifers, characterize the high plateaus of central Utah. The lowlands and the lower mountains, especially southward, are generally treeless. Cottonwoods line the streams, salt-loving vegetation margins the bare playas, low bushes and scattered bunch-grass grow over the lowlands, especially in the north. Gray desert plants, notably cactuses and other thorny plants, partly replace in the south the bushes of the north. Except on the scattered oases, where irrigation from springs and mountain streams has reclaimed small patches, the desert is barren and forbidding in the extreme. There are broad plains covered with salt and alkali, and others supporting only scattered bunch grass, sage bush, cactus and other arid land plants. There are stony wastes, or alluvial fans, where mountain streams emerge upon the plains, in time of flood, bringing detritus in their torrential courses from the mountain canyons and depositing it along the mountain base. The barrenness extends into the mountains themselves, where there are bare rock cliffs, stony slopes and a general absence of vegetation. With increasing altitude vegetation becomes more varied and abundant, until the tree limit is reached; then follows a forest belt, which in the highest mountains is limited above by cold as it is below by aridity.

The successive explorations of B. L. E. Bonneville, J. C. Frémont and Howard Stansbury (1806–1863) furnished a general knowledge of the hydrographic features and geological lacustrine history of the Great Basin, and this knowledge was rounded out by the field work of the U.S. Geological Survey from 1870 to 1883, under the direction of Grove Karl Gilbert. The mountains are composed in great part of Paleozoic strata, often modified by vulcanism and greatly denuded and sculptured by wind and water erosion. The climate in late geologic time was very different from that which prevails to-day. In the Pleistocene period many large lakes were formed within the Great Basin; especially, by the fusion of small catchment basins, two great confluent bodies of water—Lake Lahontan (in the Nevada basin) and Lake Bonneville (in the Utah basin). The latter, the remnants of which are represented to-day by Great Salt, Sevier and Utah Lakes, had a drainage basin of some 54,000 sq. m.

See G. K. Gilbert in Wheeler Survey, *U.S. Geographical Survey West of the Hundredth Meridian*, vol. iii.; Clarence King and others in the *Report of the Fortieth Parallel Survey* (U.S. Geol. Exploration of the Fortieth Parallel); G. K. Gilbert's *Lake Bonneville* (U.S. Geological Survey, *Monographs*, No. 1, 1890), also I. C. Russell's *Lake Lahontan* (Same, No. 11, 1885), with references to other publications of the Survey. For reference to later geological literature, and discussion of the Basin Ranges, see J. E. Spurr, *Bull. Geol. Soc. Amer.* vol. 12, 1901, p. 217; and G. D. Louderback, same, vol. 15, 1904, p. 280; also general bibliographies issued by the U.S. Geol. Survey (e.g. *Bull.* 301, 372 and 409).

GREAT BEAR LAKE, an extensive sheet of fresh water in the north-west of Canada, between 65° and 67° N., and 117° and 123° W. It is of very irregular shape, has an estimated area of 11,200 sq. m., a depth of 270 ft., and is upwards of 200 ft. above the sea. It is 175 m. in length, and from 25 to 45 in breadth, though the greatest distance between its northern and southern arms is about 180 m. The Great Bear river discharges its waters into the Mackenzie river. It is full of fish, and the neighbouring country, though barren and uncultivated, contains quantities of game.

GREAT CIRCLE. The circle in which a sphere is cut by a plane is called a "great circle," when the cutting plane passes through the centre of sphere. Treating the earth as a sphere, the meridians of longitude are all great circles. Of the parallels of latitude, the equator only is a great circle. The shortest line joining any two points is an arc of a great circle. For "great circle sailing" see NAVIGATION.

GREAT FALLS, a city and the county-seat of Cascade county, Montana, U.S.A., 99 m. (by rail) N.E. of Helena, on the S. bank of the Missouri river, opposite the mouth of the Sun river, at an altitude of about 3300 ft. It is 10 m. above the Great Falls of the Missouri, from which it derives its name. Pop. (1890) 3979; (1900) 14,930, of whom 4692 were foreign-born; (1910 census) 13,948. It has an area of about 8 sq. m. It is served by the Great Northern and the Billings & Northern (Chicago, Burlington & Quincy system) railways. The city has a splendid park system of seven parks (about 530 acres) with 15 m. of boulevards.[1] Among the principal buildings are a city hall, court house, high school, commercial college, Carnegie library, the Columbus Hospital and Training School for Nurses (under the supervision of the Sisters of Charity), and the Montana Deaconess hospital. There is a Federal land office in the city. Great Falls lies in the midst of a region exceptionally rich in minerals—copper, gold, silver, lead, iron, gypsum, limestone, sapphires and bituminous coal being mined in the neighbourhood. Much grain is grown in the vicinity, and the city is an important shipping point for wool, live-stock and cereals. Near Great Falls the Missouri river, within 7½ m., contracts from a width of about 900 to 300 yds. and falls more than 500 ft., the principal falls being the Black Eagle Falls (50 ft.), from which power is derived for the city's street railway and lighting plant, the beautiful Rainbow Falls (48 ft.) and Great Falls (92 ft.). Giant Spring Fall, about 20 ft. high, is a cascade formed by a spring on the bank of the river near Rainbow Falls. The river furnishes very valuable water-power, partly utilized by large manufacturing establishments, including flour mills, plaster mills, breweries, iron works, mining machinery shops, and smelting and reduction works. The Boston & Montana copper smelter is one of the largest in the world; it has a chimney stack 506 ft. high, and in 1908 employed 1200 men in the smelter and 2500 in its mining department. Great Falls ranked second (to Anaconda) among the cities of the state in the value of the factory product of 1905, which was $13,291,079, showing an increase of 42·4% since 1900. The city owns and operates its water-supply system. Great Falls was settled in 1884, and was chartered as a city in 1888.

GREAT HARWOOD, an urban district in the Darwen parliamentary division of Lancashire, England, 4¾ m. N.E. of Blackburn, on the Lancashire and Yorkshire railway. Pop. (1901) 12,015. It is of modern growth, a township of cotton operatives, with large collieries in the vicinity. An agricultural society is also maintained.

GREATHEAD, JAMES HENRY (1844–1896), British engineer, was born at Grahamstown, Cape Colony, on the 6th of August 1844. He migrated to England in 1859, and in 1864 was a pupil of P. W. Barlow, from whom he became acquainted with the shield system of tunnelling with which his name is especially associated. Barlow, indeed, had a strong belief in the shield, and was the author of a scheme for facilitating the traffic of London by the construction of underground railways running in cast-iron tubes constructed by its aid. To show what the method could do, it was resolved to make a subway under the Thames near the Tower, but the troubles encountered by Sir M. I. Brunel in the Thames Tunnel, where also a shield was employed, made engineers hesitate to undertake the subway, even though it was of very much smaller dimensions (6 ft. 7 in.

[1] Great Falls was a pioneer among the cities of the state in the development of a park system. When the city was first settled its site was a "barren tract of sand, thinly covered with buffalograss and patches of sage brush." The first settler, Paris Gibson, of Minneapolis, began the planting of trees, which, though not indigenous, grew well. The city's sidewalks are bordered by strips of lawn, in which there is a row of trees, and the city maintains a large nursery where trees are grown for this purpose. A general state law (1901) placing the parking of cities on a sound financial basis is due very largely to the impulse furnished by Great Falls. See an article, "Great Falls, the Pioneer Park City of Montana," by C. H. Forbes-Lindsay, in the *Craftsman* for November 1908.

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internal diameter) than the tunnel. At this juncture Greathead came forward and offered to take up the contract; and he successfully carried it through in 1869 without finding any necessity to resort to the use of compressed air, which Barlow in 1867 had suggested might be employed in water-bearing strata. After this he began to practise on his own account, and mainly divided his time between railway construction and taking out patents for improvements in his shield, and for other inventions such as the "Ejector" fire-hydrant. Early in the 'eighties he began to work in conjunction with a company whose aim was to introduce into London from America the Hallidie system of cable traction, and in 1884 an act of Parliament was obtained authorizing what is now the City & South London Railway—a tube-railway to be worked by cables. This was begun in 1886, and the tunnels were driven by means of the Greathead shield, compressed air being used at those points where water-bearing gravel was encountered. During the progress of the works electrical traction became so far developed as to be superior to cables; the idea of using the latter was therefore abandoned, and when the railway was opened in 1890 it was as an electrical one. Greathead was engaged in two other important underground lines in London—the Waterloo & City and the Central London. He lived to see the tunnels of the former completed under the Thames, but the latter was scarcely begun at the time of his death, which happened at Streatham, in the south of London, on the 21st of October 1896.

GREAT LAKES OF NORTH AMERICA, THE. The connected string of five fresh-water inland seas, Lakes Superior, Michigan, Huron, Erie and Ontario, lying in the interior of North America, between the Dominion of Canada on the north and the United States of America on the south, and forming the head-waters of the St Lawrence river system, are collectively and generally known as "The Great Lakes." From the head of lake Superior these lakes are navigable to Buffalo, at the foot of lake Erie, a distance of 1023 m., for vessels having a draught of 20 ft.; from Buffalo to Kingston, 191 m. farther, the draught is limited, by the depth in the Welland canal, to 14 ft.; lake Superior, the largest and most westerly of the lakes, empties, through the river St Mary, 55 m. long, into lake Huron. From Point Iroquois, which may be considered the foot of the lake, to Sault Ste Marie, St Mary's Falls, St Mary's Rapids or the Soo, as it is variously called, a distance of 14 m., there is a single channel, which has been dredged by the United States government, at points which required deepening, to give a minimum width of 800 ft. and a depth of 23 ft. at mean stage water. Below the Sault, the river, on its course to lake Huron, expands into several lakes, and is divided by islands into numerous contracted passages. There are two navigated channels; the older one, following the international boundary-line by way of lake George, has a width of 150 to 300 ft., and a depth of 17 ft.; it is buoyed but not lighted, and is not capable of navigation by modern large freighters; the other, some 12 m. shorter, an artificial channel dredged by the United States government in their own territory, has a minimum width of 300 ft. and depth of 20 ft. It is elaborately lighted throughout its length. A third channel, west of all the islands, was designed for steamers bound down, the older channel being reserved for upbound boats.

Between lake Superior and lake Huron there is a fall of 20 ft. of which the Sault, in a distance of ½ m., absorbs from 18 to 19½ ft., the height varying as the lakes change in level. The enormous growth of inter-lake freight traffic has justified the construction of three separate locks, each overcoming the rapids by a single lift—two side by side on the United States and one on the Canadian side of the river. These locks, the largest in the world, are all open to Canadian and United States vessels alike, and are operated free from all taxes or tolls on shipping. The Canadian ship canal, opened to traffic on the 9th of September 1895, was constructed through St Mary Island, on the north side of the rapids, by the Canadian government, at a cost of $3,681,227, to facilitate traffic and to secure to Canadian vessels an entrance to lake Superior without entering United States territory. The canal is 5067 ft. long between the extremities of the entrance piers, has one lock 900 ft. long and 60 ft. wide, with a depth on the sills at the lowest known water-level of 20½ ft. The approaches to the canal are dredged to 18 ft. deep, and are well buoyed and lighted. On the United States side of the river the length of the canal is 1⅞ m., the channel outside the locks having a width varying from 108 to 600 ft. and depth of 25 ft. The locks of 1855 were closed in 1886, to give place to the Poe lock. The Weitzel lock, opened to navigation on the 1st of September 1881, was built south of the old locks, the approach being through the old canal. Its chamber is 515 ft. long between lock gates, and 80 ft. wide, narrowing to 60 ft. at the gates. The length of the masonry walls is 717 ft., height 30½ ft., with 17 ft. over mitre sills at mean stage of water. The Poe lock, built because the Weitzel lock, large and fully equipped as it is, was insufficient for the rapidly growing traffic, was opened on the 3rd of August 1896. Its length between gates is 800 ft.; width 100 ft.; length of masonry walls 1100 ft.; height 43½ to 45 ft., with 22 ft. on the mitre sill at mean stage.

The expenditure by the United States government on the canal, with its several locks, and on improving the channel through the river, aggregated fourteen million dollars up to the end of 1906.[1] Plans were prepared in 1907 for a third United States lock with a separate canal approach.

The canals are closed every winter, the average date of opening up to 1893 being the 1st of May, and of closing the 1st of December. The pressure of business since that time, aided possibly by some slight climatic modification, has extended the season, so that the average date of opening is now ten days earlier and of closing twelve days later. The earliest opening was in 1902 on the 1st of April, and the latest closing in 1904 on the 20th of December.

The table below gives the average yearly commerce for periods of five years, and serves to show the rapid increase in freight growth.

Around the canals have grown up two thriving towns, one on the Michigan, the other on the Ontario side of the river, with manufactories driven by water-power derived from the Sault.

Statement of the commerce through the several Sault Ste Marie canals, averaged for every five years.[2]

Years.	Passages.	Registered Tonnage.	Passengers.	Coal. Net Tons.	Flour. Barrels.	Wheat. Bushels.	Other Grains. Bushels.	General Merchandise. Net Tons.	Salt. Barrels.	Iron Ore. Net Tons.	Lumber. M. ft. B.M.	Total Freight. Net Tons.
1855–1859[3]	387	192,207	6,206	4,672	19,555	None.	34,612	2,249	1,248	27,206	320	55,797
1880–1884	4,457	2,267,166	34,607	463,431	681,726	5,435,601	936,346	81,966	107,225	867,999	79,144	2,184,731
1885–1889	7,908	4,901,105	29,434	1,398,441	1,838,325	18,438,085	1,213,815	74,447	175,725	2,497,403	197,605	5,441,297
1890–1894	11,965	9,912,589	24,609	2,678,805	5,764,766	34,875,971	1,738,706	87,540	231,178	4,939,909	510,482	10,627,349
1895–1899	18,352	18,451,447	40,289	3,270,842	8,319,699	57,227,269	23,349,134	164,426	282,156	10,728,075	832,968	19,354,974
1900–1904	19,374	26,199,795	54,093	5,457,019	7,021,839	56,269,265	26,760,533	646,277	407,263	20,020,487	999,944	31,245,505
1906 alone	22,155	41,098,324	63,033	8,739,630	6,495,350	84,271,358	54,343,155	1,134,851	468,162	35,357,042	900,631	51,751,080

The outlet of lake Michigan, the only lake of the series lying wholly in United States territory, is at the Strait of Mackinac, near the point where the river St Mary reaches lake Huron. With lake Michigan are connected the Chicago Sanitary and Ship canal, the Illinois and Michigan, and the Illinois and Mississippi canals, for which see ILLINOIS. With lake Huron is always

[1] Statistical report of lake commerce passing through canals. Col. Chas. E. L. B. Davis, U.S.A., engineer in charge, 1907.

[2] Statistical report of lake commerce passing through canals, published annually by the U.S. engineer officer in charge.

[3] The first five years of operation.

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included Georgian Bay as well as the channel north of Manitoulin Island. As it is principally navigated as a connecting waterway between lakes Superior and Michigan and lake Erie it has no notable harbours on it. It empties into lake Erie through the river St Clair, lake St Clair and the river Detroit. On these connecting waters are several important manufacturing and shipping towns, and through this chain passes nearly all the traffic of the lakes, both that to and from lake Michigan ports, and also that of lake Superior. The tonnage of a single short season of navigation exceeds in the aggregate 60,000,000 tons. Extensive dredging and embankment works have been carried on by the United States government in lake St Clair and the river Detroit, and a 20-ft. channel now exists, which is being constantly improved. Lake St Clair is nearly circular, 25 m. in diameter, with the north-east quadrant filled by the delta of the river St Clair. It has a very flat bottom with a general depth of only 21 ft., shoaling very gradually, usually to reed beds that line the low swampy shores. To enter the lake from river St Clair two channels have been provided, with retaining walls of cribwork, one for upward, the other for downward bound vessels. Much dredging has also been necessary at the outlet of the lake into river Detroit. A critical point in that river is at Limekiln crossing, a cut dredged through limestone rock above the Canadian town of Amherstburg. The normal depth here before improvement was 12½-15 ft.; by a project of 1902 a channel 600 ft. wide and 21 ft. deep was planned; there are separate channels for up- and down-bound vessels. To prevent vessels from crowding together in the cut, the Canadian government maintains a patrol service here, while the United States government maintains a similar patrol in the St Mary channel.

The Grand Trunk railway opened in 1891 a single track tunnel under the river St Clair, from Sarnia to Port Huron. It is 6026 ft. long, a cylinder 20 ft. in diameter, lined with cast iron in flanged sections. A second tunnel was undertaken between Detroit and Windsor, under the river Detroit.

From Buffalo, at the foot of lake Erie, the river Niagara runs northwards 36 m. into lake Ontario. To overcome the difference of 327 ft. in level between lakes Erie and Ontario, the Welland canal, accommodating vessels of 255 ft. in length, with a draught of 14 ft., was built, and is maintained by Canada. The Murray canal extends from Presqu'ile Bay, on the north shore of lake Ontario, a distance of 6¼ m., to the headquarters of the Bay of Quinte. Trent canal is a term applied to a series of water stretches in the interior of Ontario which are ultimately designed to connect lake Huron and lake Ontario. At Peterboro a hydraulic balance-lock with a lift of 65 ft., 140 ft. in length and 33 ft. clear in width, allowing a draught of 8 ft., has been constructed. The ordinary locks are 134 by 33 ft. with a draught of 6 ft. When the whole route of 200 m. is completed, there will not be more than 15 m. of actual canal, the remaining portion of the waterway being through lakes and rivers. For the Erie canal, between that lake and the Hudson river, see Erie and New York.

The population of the states and provinces bordering on the Great Lakes is estimated to be over 35,000,000. In Pennsylvania and Ohio, south of lake Erie, there are large coal-fields. Surrounding lake Michigan and west of lake Superior are vast grain-growing plains, and the prairies of the Canadian north-west are rapidly increasing the area and quantity of wheat grown; while both north and south of lake Superior are the most extensive iron mines in the world, from which 35 million tons of ore were shipped in 1906. The natural highway for the shipment of all these products is the Great Lakes, and over them coal is distributed westwards and grain and iron ore are concentrated eastwards. The great quantity of coarse freights, that could only be profitably carried long distances by water, has revolutionized the type of vessel used for its transportation, making large steamers imperative, consolidating interests and cheapening methods. It is usual for the vessels in the grain trade and in the iron-ore trade to make their up trips empty; but in consequence of the admirable facilities provided at terminal points, they make very fast time, and carry freight very cheaply. The cost of freight per ton-mile fell from 23/100 cent in 1887 to 8/100 cent in 1898; since then the rate has slightly risen, but keeps well below 1/10 cent per ton-mile.

The traffic on the lakes may be divided into three classes, passenger, package freight and bulk freight. Of passenger boats the largest are 380 ft. long by 44 ft. beam, having a speed of over 20 m. an hour, making the round trip between Buffalo and Chicago 1800 m., or Buffalo and Duluth 2000 m., every week. They carry no freight. The Canadian Pacific railway runs a line of fine Tyne-built passenger and freight steamers between Owen Sound and Fort William, and these two lines equal in accommodation transatlantic passenger steamers. On lake Michigan many fine passenger boats run out of Chicago, and on lake Ontario there are several large and fast Canadian steamers on routes radiating from Toronto. The package freight business, that is, the transportation of goods in enclosed parcels, is principally local; all the through business of this description is controlled by lines run by the great trunk railways, and is done in boats limited in beam to 50 ft. to admit them through bridges over the rivers at Chicago and Buffalo. By far the greatest number of vessels on the lakes are bulk freighters, and the conditions of the service have developed a special type of vessel. Originally sailing vessels were largely used, but these have practically disappeared, giving place to steamers, which have grown steadily in size with every increase in available draught. In 1894 there was no vessel on the lakes with a capacity of over 5000 tons; in 1906 there were 254 vessels of a greater capacity, 12 of them carrying over 12,000 tons each. For a few years following 1890 many large barges were built, carrying up to 8000 tons each, intended to be towed by a steamer. It was found, however, that the time lost by one boat of the pair having to wait for the other made the plan unprofitable and no more were built. Following 1888 some 40 whale-back steamers and barges, having oval cross-sections without frames or decks, were built, but experience failed to demonstrate any advantage in the type, and their construction has ceased. The modern bulk freighter is a vessel 600 ft. long, 58 ft. beam, capable of carrying 14,000 tons on 20 ft. draught, built with a midship section practically rectangular, the coefficient frequently as high as ·98, with about two-thirds of the entire length absolutely straight, giving a block coefficient up to ·87. The triple-expansion machinery and boilers, designed to drive the boat at a speed of 12 m. an hour, are in the extreme stern, and the pilot house and quarters in the extreme bow, leaving all the cargo space together. Hatches are spaced at multiples of 12 ft. throughout the length and are made as wide as possible athwartships to facilitate loading and unloading. The vessels are built on girder frames and fitted with double bottoms for strength and water ballast. This type of vessel can be loaded in a few minutes, and unloaded by self-filling grab buckets up to ten tons capacity, worked hydraulically, in six or eight hours. The bulk freight generally follows certain well-defined routes; iron ore is shipped east from ports on both sides of lake Superior and on the west side of lake Michigan to rail shipping points on the south shore of lake Erie. Wheat and other grains from Duluth find their way to Buffalo, as do wheat, corn (maize) and other grains from Chicago. Wheat from the Canadian north-west is distributed from Fort William and Port Arthur to railway terminals on Georgian Bay, to Buffalo, and to Port Colborne for trans-shipment to canal barges for Montreal, and coal is distributed from lake Erie to all western points. The large shipping trade is assisted by both governments by a system of aids to navigation that mark every channel and danger. There are also life-saving stations at all dangerous points.

The Great Lakes never freeze over completely, but the harbours and often the connecting rivers are closed by ice. The navigable season at the Sault is about 7½ months; in lake Erie it is somewhat longer. The season of navigation has been slightly lengthened since 1905, by using powerful tugs as ice-breakers in the spring and autumn, the Canadian government undertaking the service at Canadian terminal ports, chiefly at Fort William and Port Arthur, the most northerly ports, where the season

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is naturally shortest, and the Lake Carriers' Association, a federation of the freighting steamship owners, acting in the river St Mary. Car ferries run through the winter across lake Michigan and the Strait of Mackinac, across the rivers St Clair and Detroit, and across the middle of lakes Erie and Ontario. The largest of these steamers is 350 ft. long by 56 ft. wide, draught 14 ft., horse power 3500, speed 13 knots. She carries on four tracks 30 freight cars, with 1350 tons of freight. Certain passenger steamers run on lake Michigan, from Chicago north, all the winter.

The level of the lakes varies gradually, and is affected by the general character of the season, and not by individual rainfalls. The variations of level of the several lakes do not necessarily synchronize. There is an annual fluctuation of about 1 ft. in the upper lakes, and in some seasons over 2 ft. in the lower lakes; the lowest point being at the end of winter and the highest in midsummer. In lake Michigan the level has ranged from a maximum in the years 1859, 1876 and 1886, to a minimum nearly 5 ft. lower in 1896. In lake Ontario there is a range of 5½ ft. between the maximum of May 1870 and the minimum of November 1895. In consequence of the shallowness of lake Erie, its level is seriously disturbed by a persistent storm; a westerly gale lowers the water at its upper end exceptionally as much as 7 ft., seriously interfering with the navigation of the river Detroit, while an easterly gale produces a similar effect at Buffalo. (For physiographical details see articles on the several lakes, and UNITED STATES.)

There is geological evidence to show that the whole basin of the lakes has in recent geological times gradually changed in level, rising to the north and subsiding southwards; and it is claimed that the movement is still in gradual progress, the rate assigned being ·42 ft. per 100 m. per century. The maintenance of the level of the Great Lakes is a matter of great importance to the large freight boats, which always load to the limit of depth at critical points in the dredged channels or in the harbours. Fears have been entertained that the water power canals at Sault Ste Marie, the drainage canal at Chicago and the dredged channel in the river Detroit will permanently lower the levels respectively of lake Superior and of the Michigan-Huron-Erie group. An international deep-waterway commission exists for the consideration of this question, and army engineers appointed by the United States government have worked on the problem.[1] Wing dams in the rivers St Mary and Niagara, to retard the discharges, have been proposed as remedial measures. The Great Lakes are practically tideless, though some observers claim to find true tidal pulsations, said to amount to 3½ in. at spring tide at Chicago. Secondary undulations of a few minutes in period, ranging from 1 to 4 in., are well marked.

The Great Lakes are well stocked with fish of commercial value. These are largely gathered from the fishermen by steam tenders, and taken fresh or in frozen condition to railway distributing points. In lakes Superior and Huron salmon-trout (*Salvelinus namaycush*, Walb) are commercially most important. They ordinarily range from 10 to 50 lb in weight, and are often larger. In Georgian Bay the catches of whitefish (*Coregonus clupeiformis*, Mitchill) are enormous. In lake Erie whitefish, lesser whitefish, erroneously called lake-herring (*C. artedi*, Le Sueur), and sturgeon (*Acipenser rubicundus*, Le Sueur) are the most common. There is good angling at numerous points on the lakes and their feeders. The river Nipigon, on the north shore of lake Superior, is famous as a stream abounding in speckled trout (*Salvelinus fontinalis*, Mitchill) of unusual size. Black bass (*Micropterus*) are found from Georgian Bay to Montreal, and the maskinonge (*Esox nobilior*, Le Sueur), plentiful in the same waters, is a very game fish that often attains a weight of 70 lb.

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[1] Report of the Chief of Engineers, U.S. Army, in *Report of War Department, U.S.* 1898, p. 3776.

GREAT MOTHER OF THE GODS, the ancient Oriental-Greek-Roman deity commonly known as Cybele (*q.v.*) in Greek and Latin literature from the time of Pindar. She was also known under many other names, some of which were derived from famous places of worship: as Dindymene from Mt. Dindymon, Mater Idaea from Mt. Ida, Sipylene from Mt. Sipylus, Agdistis from Mt. Agdistis or Agdus, Mater Phrygia from the greatest stronghold of her cult; while others were reflections of her character as a great nature goddess: *e.g.* Mountain Mother, Great Mother of the Gods, Mother of all Gods and all Men. As the great Mother deity whose worship extended throughout Asia Minor she was known as Mā or Ammas. Cybele is her favourite name in ancient and modern literature, while Great Mother of the Gods, or Great Idaean Mother of the Gods (*Mater Deum Magna, Mater Deum Magna Idaea*), the most frequently recurring epigraphical title, was her ordinary official designation.

The legends agree in locating the rise of the worship of the Great Mother in Asia Minor, in the region of loosely defined geographical limits which comprised the Phrygian empire of prehistoric times, and was more extensive than the Roman province of Phrygia (Diod. Sic. iii. 58; Paus. vii. 17; Arnob. v. 5; Firm. Mat. *De error.*, 3; Ovid, *Fasti*, iv. 223 ff.; Sallust. Phil. *De diis et mundo*, 4; Jul. *Or.* v. 165 ff.). Her best-known early seats of worship were Mt. Ida, Mt. Sipylus, Cyzicus, Sardis and Pessinus, the last-named city, in Galatia near the borders of Roman Phrygia, finally becoming the strongest centre of the cult. She was known to the Romans and Greeks as essentially Phrygian, and all Phrygia was spoken of as sacred to her (Schol. Apollon. Rhod. *Argonautica*, i. 1126). It is probable, however, that the Phrygian race, which invaded Asia Minor from the north in the 9th century B.C., found a great nature goddess already universally worshipped there, and blended her with a deity of their own. The Asiatic-Phrygian worship thus evolved was further modified by contact with the Syrians and Phoenicians, so that it acquired strong Semitic characteristics. The Great Mother known to the Greeks and Romans was thus merely the Phrygian form of the nature deity of all Asia Minor.

From Asia Minor the cult of the Great Mother spread first to Greek territory. It found its way into Thrace at an early date, was known in Boeotia by Pindar in the 6th century, and entered Attica near the beginning of the 4th century (Grant Showerman, *The Great Mother of the Gods, Bulletin of the University of Wisconsin*, No. 43, Madison, 1901). At Peiraeus, where it probably arrived by way of the Aegean islands, it existed privately in a fully developed state, that is, accompanied by the worship of Attis, at the beginning of the 4th century, and publicly two centuries later (D. Comparetti, *Annales*, 1862, pp. 23 ff.). The Greeks from the first saw in the Great Mother a resemblance to their own Rhea, and finally identified the two completely, though the Asiatic peculiarities of the cult were never universally popular with them (Showerman, p. 204). In her less Asiatic aspect, *i.e.* without Attis, she was sometimes identified with Gaia and Demeter. It was in this phase that she was worshipped in the Metroön at Athens. In reality, the Mother Goddess appears under three aspects: Rhea, the Homeric and Hesiodic goddess of Cretan origin; the Phrygian Mother, with Attis; and the Greek Great Mother, a modified form of the Phrygian Mother, to be explained as the original goddess of the Phrygians of Europe, communicated to the Greek stock before the Phrygian invasion of Asia Minor and consequent mingling with Asiatic stocks (cf. Showerman, p. 252).

In 204 B.C., in obedience to the Sibylline prophecy which said that whenever an enemy from abroad should make war on Italy he could be expelled and conquered if the Idaean Mother were brought to Rome from Pessinus, the cult of the Great Mother, together with her sacred symbol, a small meteoric stone reputed to have fallen from the heavens, was transferred to Rome and established in a temple on the Palatine (Livy xxix. 10-14). Her identification by the Romans with Maia, Ops, Rhea, Tellus

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and Ceres contributed to the establishment of her worship on a firm footing. By the end of the Republic it had attained prominence, and under the Empire it became one of the three most important cults in the Roman world, the other two being those of Mithras and Isis. Epigraphic and numismatic evidence prove it to have penetrated from Rome as a centre to the remotest provinces (Showerman, pp. 291-293). During the brief revival of paganism under Eugenius in A.D. 394, occurred the last appearance of the cult in history. Besides the temple on the Palatine, there existed minor shrines of the Great Mother near the present church of St Peter, on the Sacra Via on the north slope of the Palatine, near the junction of the Almo and the Tiber, south of the city (*ibid.* 311-314).

In all her aspects, Roman, Greek and Oriental, the Great Mother was characterized by essentially the same qualities. Most prominent among them was her universal motherhood. She was the great parent of gods and men, as well as of the lower orders of creation. "The winds, the sea, the earth and the snowy seat of Olympus are hers, and when from her mountains she ascends into the great heavens, the son of Cronus himself gives way before her" (Apollon. Rhod. *Argonautica*, i. 1098). She was known as the All-begetter, the All-nourisher, the Mother of all the Blest. She was the great, fruitful, kindly earth itself. Especial emphasis was placed upon her maternity over wild nature. She was called the Mountain Mother; her sanctuaries were almost invariably upon mountains, and frequently in caves; the name Cybele itself being by some derived from the latter; lions were her faithful companions. Her universal power over the natural world finds beautiful expression in Apollonius Rhodius, *Argonautica*, i. 1140 ff. She was also a chaste and beautiful deity. Her especial affinity with wild nature was manifested by the orgiastic character of her worship. Her attendants, the Corybantes, were wild, half demonic beings. Her priests, the Galli, were eunuchs attired in female garb, with long hair fragrant with ointment. Together with priestesses, they celebrated her rites with flutes, horns, castanets, cymbals and tambourines, madly yelling and dancing until their frenzied excitement found its culmination in self-scourging, self-laceration or exhaustion. Self-emasculation sometimes accompanied this delirium of worship on the part of candidates for the priesthood (Showerman, pp. 234-239). The *Attis* of Catullus (lxiii.) is a brilliant treatment of such an episode.

Though her cult sometimes existed by itself, in its fully developed state the worship of the Great Mother was accompanied by that of Attis (*q.v.*). The cult of Attis never existed independently. Like Adonis and Aphrodite, Baal and Astarte, &c., the two formed a duality representing the relations of Mother Nature to the fruits of the earth. There is no positive evidence to prove the existence of the cult publicly in this phase in Greece before the 2nd century B.C., nor in Rome before the Empire, though it may have existed in private (Showerman, "Was Attis at Rome under the Republic?" in *Transactions of the American Philological Association*, vol. 31, 1900, pp. 46-59; Cumont, *s.v.* "Attis," De Ruggiero's *Dizionario epigrafico* and Pauly-Wissowa's *Realencyclopädie*, Supplement; Hepding, *Attis, seine Mythen und seine Kult*, Giessen, 1903, p. 142).

The philosophers of the late Roman Empire interpreted the Attis legend as symbolizing the relations of Mother Earth to her children the fruits. Porphyrius says that Attis signified the flowers of spring time, and was cut off in youth because the flower falls before the fruit (Augustine, *De civ. Dei*, vii. 25). Maternus (*De error.* 3) interprets the love of the Great Mother for Attis as the love of the earth for her fruits; his emasculation as the cutting of the fruits; his death as their preservation; and his resurrection as the sowing of the seed again.

At Rome the immediate direction of the cult of the Great Mother devolved upon the high priest, *Archigallus*, called Attis, a high priestess, *Sacerdos Maxima*, and its support was derived, at least in part, from a popular contribution, the *stips*. Besides other priests, priestesses and minor officials, such as musicians, curator, &c., there were certain colleges connected with the administration of the cult, called *cannophori* (reed-bearers) and *dendrophori* (branch-bearers). The Quindecimvirs exercised a general supervision over this cult, as over all other authorized cults, and it was, at least originally, under the special patronage of a club or sodality (Showerman, pp. 269-276). Roman citizens were at first forbidden to take part in its ceremonies, and the ban was not removed until the time of the Empire.

The main public event in the worship of the Great Mother was the annual festival, which took place originally on the 4th of April, and was followed on the 5th by the Megalesia, games instituted in her honour on the introduction of the cult. Under the Empire, from Claudius on, the Megalesia lasted six days, April 4-10, and the original one day of the religious festival became an annual cycle of festivals extending from the 15th to the 27th of March, in the following order. (1) The 15th of March, *Canna intrat*—the sacrifice of a six-year-old bull in behalf of the mountain fields, the high priest, a priestess and the *cannophori* officiating, the last named carrying reeds in procession in commemoration of the exposure of the infant Attis on the reedy banks of the stream Gallus in Phrygia. (This may have been originally a phallic procession. Cf. Showerman, *American Journal of Philol.* xxvii. 1; *Classical Journal* i. 4.) (2) The 22nd of March, *Arbor intrat*—the bearing in procession of the sacred pine, emblem of Attis' self-mutilation, death and immortality, to the temple on the Palatine, the symbol of the Mother's cave, by the *dendrophori*, a gild of workmen who made the Mother, among other deities, a patron. (3) The 24th of March, *Dies sanguinis*—a day of mourning, fasting and abstinence, especially sexual, commemorating the sorrow of the Mother for Attis, her abstinence from food and her chastity. The frenzied dance and self-laceration of the priests in commemoration of Attis' deed, and the submission to the act of consecration by candidates for the priesthood, was a special feature of the day. The *taurobolium* (*q.v.*) was often performed on this day, on which probably took place the initiation of mystics. (4) The 25th of March, *Hilaria*—one of the great festal days of Rome, celebrated by all the people. All mourning was put off, and good cheer reigned in token of the return of the sun and spring, which was symbolized by the renewal of Attis' life. (5) The 26th of March, *Requietio*—a day of rest and quiet. (6) The 27th of March, *Lavatio*—the crowning ceremony of the cycle. The silver statue of the goddess, with the sacred meteoric stone, the *Acus*, set in its head, was borne in gorgeous procession and bathed in the Almo, the remainder of the day being given up to rejoicing and entertainment, especially dramatic representation of the legend of the deities of the day. Other ceremonies, not necessarily connected with the annual festival, were the *taurobolium* (*q.v.*), the sacrifice of a bull, and the *criobolium* (*q.v.*), the sacrifice of a ram, the latter being the analogue of the former, instituted for the purpose of giving Attis special recognition. The baptism of blood, which was the feature of these ceremonies, was regarded as purifying and regenerating (Showerman, *Great Mother*, pp. 277-284).

The Great Mother figures in the art of all periods both in Asia and Europe, but is especially prominent in the art of the Empire. No work of the first class, however, was inspired by her. She appears on coins, in painting and in all forms of sculpture, usually with mural crown and veil, well draped, seated on a throne, and accompanied by two lions. Other attributes which often appear are the patera, tympanum, cymbals, sceptre, garlands and fruits. Attis and his attributes, the pine, Phrygian cap, pedum, syrinx and torch, also appear. The Cybele of Formia, now at Copenhagen, is one of the most famous representations of the goddess. The Niobe of Mt. Sipylus is really the Mother. In literature she is the subject of frequent mention, but no work of importance, with the exception of Catullus lxiii., is due to her inspiration. Her importance in the history of religion is very great. Together with Isis and Mithras, she was a great enemy, and yet a great aid to Christianity. The gorgeous rites of her worship, its mystic doctrine of communion with the divine through enthusiasm, its promise of regeneration through baptism of blood in the taurobolium, were features which attracted the masses of the people and made it a strong

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rival of Christianity; and its resemblance to the new religion, however superficial, made it, in spite of the scandalous practices which grew up around it, a stepping-stone to Christianity when the tide set in against paganism.

AUTHORITIES.—Grant Showerman, "The Great Mother of the Gods," *Bulletin of the University of Wisconsin*, No. 43; *Philology and Literature Series*, vol. i. No. 3 (Madison, 1901); Hugo Hepding, *Attis, seine Mythen und seine Kult* (Giessen, 1903); Rapp, *Roscher's Ausführliches Lexicon der griechischen und römischen Mythologie s.v.* "Kybele"; Drexler, *ibid. s.v.* "Meter." See ROMAN RELIGION; GREEK RELIGION, ATTIS, CORYBANTES; for the great "Hittite" portrayal of the Nature Goddess at Pteria, see PTERIA. (G. SN.)

GREAT REBELLION (1642–52), a generic name for the civil wars in England and Scotland, which began with the raising of King Charles I.'s standard at Nottingham on the 22nd of August 1642, and ended with the surrender of Dunottar Castle to the Parliament's troops in May 1652. It is usual to classify these wars into the First Civil War of 1642–46, and the Second Civil War of 1648–52. During most of this time another civil war was raging in Ireland. Its incidents had little or no connexion with those of the Great Rebellion, but its results influenced the struggle in England to a considerable extent.

1. *First Civil War (1642–46).*—It is impossible rightly to understand the events of this most national of all English wars without some knowledge of the motive forces on both sides. On the side of the king were enlisted the deep-seated loyalty which was the result of two centuries of effective royal protection, the pure cavalier spirit foreshadowing the courtier era of Charles II., but still strongly tinged with the old feudal indiscipline, the militarism of an expert soldier nobility, well represented by Prince Rupert, and lastly a widespread distrust of extreme Puritanism, which appeared unreasonable to Lord Falkland and other philosophic statesmen and intolerable to every other class of Royalists. The foot of the Royal armies was animated in the main by the first and last of these motives; in the eyes of the sturdy rustics who followed their squires to the war the enemy were rebels and fanatics. To the cavalry, which was composed largely of the higher social orders, the rebels were, in addition, bourgeois, while the soldiers of fortune from the German wars felt all the regular's contempt for citizen militia. Thus in the first episodes of the First Civil War moral superiority tended to be on the side of the king. On the other side, the causes of the quarrel were primarily and apparently political, ultimately and really religious, and thus the elements of resistance in the Parliament and the nation were at first confused, and, later, strong and direct. Democracy, moderate republicanism and the simple desire for constitutional guarantees could hardly make head of themselves against the various forces of royalism, for the most moderate men of either party were sufficiently in sympathy to admit compromise. But the backbone of resistance was the Puritan element, and this waging war at first with the rest on the political issue soon (as the Royalists anticipated) brought the religious issue to the front. The Presbyterian system, even more rigid than that of Laud and the bishops—whom no man on either side supported save Charles himself—was destined to be supplanted by the Independents and their ideal of free conscience, but for a generation before the war broke out it had disciplined and trained the middle classes of the nation (who furnished the bulk of the rebel infantry, and later of the cavalry also) to centre their whole will-power on the attainment of their ideals. The ideals changed during the struggle, but not the capacity for striving for them, and the men capable of the effort finally came to the front and imposed their ideals on the rest by the force of their trained wills.

Material force was throughout on the side of the Parliamentary party. They controlled the navy, the nucleus of an army which was in process of being organized for the Irish war, and nearly all the financial resources of the country. They had the sympathies of most of the large towns, where the trained bands, drilled once a month, provided cadres for new regiments. Further, by recognizing the inevitable, they gained a start in war preparations which they never lost. The earls of Warwick, Essex and Manchester and other nobles and gentry of their party possessed great wealth and territorial influence. Charles, on the other hand, although he could, by means of the "press" and the lords-lieutenant, raise men without authority from Parliament, could not raise taxes to support them, and was dependent on the financial support of his chief adherents, such as the earls of Newcastle and Derby. Both parties raised men when and where they could, each claiming that the law was on its side—for England was already a law-abiding nation—and acting in virtue of legal instruments. These were, on the side of the Parliament, its own recent "Militia Ordinance"; on that of the king, the old-fashioned "Commissions of Array." In Cornwall the Royalist leader, Sir Ralph Hopton, indicted the enemy before the grand jury of the county as disturbers of the peace, and had the *posse comitatus* called out to expel them. The local forces in fact were everywhere employed by whichever side could, by producing valid written authority, induce them to assemble.

2. *The Royalist and Parliamentarian Armies.*—This thread of local feeling and respect for the laws runs through the earlier operations of both sides almost irrespective of the main principles at stake. Many a promising scheme failed because of the reluctance of the militiamen to serve beyond the limits of their own county, and, as the offensive lay with the king, his cause naturally suffered far more therefrom than that of the enemy. But the real spirit of the struggle was very different. Anything which tended to prolong the struggle, or seemed like want of energy and avoidance of a decision, was bitterly resented by the men of both sides, who had their hearts in the quarrel and had not as yet learned by the severe lesson of Edgehill that raw armies cannot bring wars to a speedy issue. In France and Germany the prolongation of a war meant continued employment for the soldiers, but in England "we never encamped or entrenched . . . or lay fenced with rivers or defiles. Here were no leaguers in the field, as at the story of Nuremberg,[1] neither had our soldiers any tents or what they call heavy baggage. 'Twas the general maxim of the war—Where is the enemy? Let us go and fight them. Or . . . if the enemy was coming . . . Why, what should be done! Draw out into the fields and fight them." This passage from the *Memoirs of a Cavalier*, ascribed to Defoe, though not contemporary evidence, is an admirable summary of the character of the Civil War. Even when in the end a regular professional army is evolved—exactly as in the case of Napoleon's army—the original decision-compelling spirit permeated the whole organization. From the first the professional soldiers of fortune, be their advice good or bad, are looked upon with suspicion, and nearly all those Englishmen who loved war for its own sake were too closely concerned for the welfare of their country to attempt the methods of the Thirty Years' War in England. The formal organization of both armies was based on the Swedish model, which had become the pattern of Europe after the victories of Gustavus Adolphus, and gave better scope for the *moral* of the individual than the old-fashioned Spanish and Dutch formations in which the man in the ranks was a highly-finished automaton.

3. *Campaign of 1642.*—When the king raised his standard at Nottingham on the 22nd of August 1642, war was already in progress on a small scale in many districts, each side endeavouring to secure, or to deny to the enemy, fortified country-houses, territory, and above all arms and money. Peace negotiations went on in the midst of these minor events until there came from the Parliament an ultimatum so aggressive as to fix the warlike purpose of the still vacillating court at Nottingham, and, in the country at large, to convert many thousands of waverers to active Royalism. Ere long Charles—who had hitherto had less than 1500 men—was at the head of an army which, though very deficient in arms and equipment, was not greatly inferior in numbers or enthusiasm to that of the Parliament. The latter (20,000 strong exclusive of detachments) was organized during July, August and September about London, and moved thence to Northampton under the command of Robert, earl of Essex.

At this moment the military situation was as follows. Lord Hertford in south Wales, Sir Ralph Hopton in Cornwall, and the

[1] Gustavus Adolphus before the battle of the Alte Veste (see THIRTY YEARS' WAR).

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young earl of Derby in Lancashire, and small parties in almost every county of the west and the midlands, were in arms for the king. North of the Tees, the earl of Newcastle, a great territorial magnate, was raising troops and supplies for the king, while Queen Henrietta Maria was busy in Holland arranging for the importation of war material and money. In Yorkshire opinion was divided, the royal cause being strongest in York and the North Riding, that of the Parliamentary party in the clothing towns of the West Riding and also in the important seaport of Hull. The Yorkshire gentry made an attempt to neutralize the county, but a local struggle soon began, and Newcastle thereupon prepared to invade Yorkshire. The whole of the south and east as well as parts of the midlands and the west and the important towns of Bristol and Gloucester were on the side of the Parliament. A small Royalist force was compelled to evacuate Oxford on the 10th of September.

On the 13th of September the main campaign opened. The king—in order to find recruits amongst his sympathizers and arms in the armouries of the Derbyshire and Staffordshire trained bands, and also to be in touch with his disciplined regiments in Ireland by way of Chester—moved westward to Shrewsbury, Essex following suit by marching from Northampton to Worcester. Near the last-named town a sharp cavalry engagement (Powick Bridge) took place on the 23rd between the advanced cavalry of Essex's army and a force under Prince Rupert which was engaged in protecting the retirement of the Oxford detachment. The result of the fight was the instantaneous overthrow of the rebel cavalry, and this gave the Royalist troopers a confidence in themselves and in their brilliant leader which was not destined to be shaken until they met Cromwell's Ironsides. Rupert soon withdrew to Shrewsbury, where he found many Royalist officers eager to attack Essex's new position at Worcester. But the road to London now lay open and it was decided to take it. The intention was not to avoid a battle, for the Royalist generals desired to fight Essex before he grew too strong, and the temper of both sides made it impossible to postpone the decision; in Clarendon's words, "it was considered more counsellable to march towards London, it being morally sure that the earl of Essex would put himself in their way," and accordingly the army left Shrewsbury on the 12th of October, gaining two days' start of the enemy, and moved south-east via Bridgnorth, Birmingham and Kenilworth. This had the desired effect. Parliament, alarmed for its own safety, sent repeated orders to Essex to find the king and bring him to battle. Alarm gave place to determination when it was discovered that Charles was enlisting papists and seeking foreign aid. The militia of the home counties was called out, a second army under the earl of Warwick was formed round the nucleus of the London trained bands, and Essex, straining every nerve to regain touch with the enemy, reached Kineton, where he was only 7 m. from the king's headquarters at Edgecote, on the 22nd.

4. *Battle of Edgehill.*—Rupert promptly reported the enemy's presence, and his confidence dominated the irresolution of the king and the caution of Lord Lindsey, the nominal commander-in-chief. Both sides had marched widely dispersed in order to live, and the rapidity with which, having the clearer purpose, the Royalists drew together helped considerably to neutralize Essex's superior numbers. During the morning of the 23rd the Royalists formed in battle order on the brow of Edgehill facing towards Kineton. Essex, experienced soldier as he was, had distrusted his own raw army too much to force a decision earlier in the month, when the king was weak; he now found Charles in a strong position with an equal force to his own 14,000, and some of his regiments were still some miles distant. But he advanced beyond Kineton, and the enemy promptly left their strong position and came down to the foot of the hill, for, situated as they were, they had either to fight wherever they could induce the enemy to engage, or to starve in the midst of hostile garrisons. Rupert was on the right of the king's army with the greater part of the horse, Lord Lindsey and Sir Jacob Astley in the centre with the foot, Lord Wilmot (with whom rode the earl of Forth, the principal military adviser of the king) with a smaller body of cavalry on the left. In rear of the centre were the king and a small reserve. Essex's order was similar. Rupert charged as soon as his wing was deployed, and before the infantry of either side was ready. Taking ground to his right front and then wheeling inwards at full speed he instantly rode down the Parliamentary horse opposed to him. Some infantry regiments of Essex's left centre shared the same fate as their cavalry. On the other wing Forth and Wilmot likewise swept away all that they could see of the enemy's cavalry, and the undisciplined Royalists of both wings pursued the fugitives in wild disorder up to Kineton, where they were severely handled by John Hampden's infantry brigade (which was escorting the artillery and baggage of Essex's army). Rupert brought back only a few rallied squadrons to the battlefield, and in the meantime affairs there had gone badly for the king. The right and centre of the Parliamentary foot (the left having been brought to a halt by Rupert's charge) advanced with great resolution, and being at least as ardent as, and much better armed than, Lindsey's men, engaged them fiercely and slowly gained ground. Only the best regiments on either side, however, maintained their order, and the decision of the infantry battle was achieved mainly by a few Parliamentary squadrons. One regiment of Essex's right wing only had been the target of Wilmot's charge, the other two had been at the moment invisible, and, as every Royalist troop on the ground, even the king's guards, had joined in the mad ride to Kineton, these, Essex's life-guard, and some troops that had rallied from the effect of Rupert's charge—amongst them Captain Oliver Cromwell's—were the only cavalry still present. All these joined with decisive effect in the attack on the left of the royal infantry. The king's line was steadily rolled up from left to right, the Parliamentary troopers captured his guns and regiment after regiment broke up. Charles himself stood calmly in the thick of the fight, but he had not the skill to direct it. The royal standard was taken and retaken, Lindsey and Sir Edmund Verney, the standard-bearer, being killed. By the time that Rupert returned both sides were incapable of further effort and disillusioned as to the prospect of ending the war at a blow.

On the 24th Essex retired, leaving Charles to claim the victory and to reap its results. Banbury and Oxford were reoccupied by the Royalists, and by the 28th Charles was marching down the Thames valley on London. Negotiations were reopened, and a peace party rapidly formed itself in London and Westminster. Yet field fortifications sprang up around London, and when Rupert stormed and sacked Brentford on the 12th of November the trained bands moved out at once and took up a position at Turnham Green, barring the king's advance. Hampden, with something of the fire and energy of his cousin Cromwell, urged Essex to turn both flanks of the Royal army via Acton and Kingston, but experienced professional soldiers urged him not to trust the London men to hold their ground while the rest manœuvred. Hampden's advice was undoubtedly premature. A Sedan or Worcester was not within the power of the Parliamentarians of 1642, for, in Napoleon's words, "one only manœuvres around a fixed point," and the city levies at that time were certainly not, *vis-à-vis* Rupert's cavalry, a fixed point. As a matter of fact, after a slight cannonade at Turnham Green on the 13th, Essex's two-to-one numerical superiority of itself compelled the king to retire to Reading. Turnham Green has justly been called the Valmy of the English Civil War. Like Valmy, without being a battle, it was a victory, and the tide of invasion came thus far, ebbed, and never returned

5. *The Winter of 1642–43.*—In the winter, while Essex lay inactive at Windsor, Charles by degrees consolidated his position in the region of Oxford. The city was fortified as a reduit for the whole area, and Reading, Wallingford, Abingdon, Brill, Banbury and Marlborough constituted a complete defensive ring which was developed by the creation of smaller posts from time to time. In the north and west, winter campaigns were actively carried on. "It is summer in Yorkshire, summer in Devon, and cold winter at Windsor," said one of Essex's critics. At the beginning of December Newcastle crossed the Tees,

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defeated Hotham, the Parliamentary commander in the North Riding, then joining hands with the hard-pressed Royalists at York, established himself between that city and Pontefract. Lord Fairfax and his son Sir Thomas, who commanded for the Parliament in Yorkshire, had to retire to the district between Hull and Selby, and Newcastle was free to turn his attention to the Puritan "clothing towns" of the West Riding—Leeds, Halifax and Bradford. The townsmen, however, showed a determined front, the younger Fairfax with a picked body of cavalry rode through Newcastle's lines into the West Riding to help them, and about the end of January 1643 the earl gave up the attempt to reduce the towns. He continued his march southward, however, and gained ground for the king as far as Newark, so as to be in touch with the Royalists of Nottinghamshire, Derbyshire and Leicestershire (who, especially about Newark and Ashby-de-la-Zouch, were strong enough to neutralize the local forces of the Parliament), and to prepare the way for the further advance of the army of the north when the queen's convoy should arrive from over-seas.

In the west Sir Ralph Hopton and his friends, having obtained a true bill from the grand jury against the Parliamentary disturbers of the peace, placed themselves at the head of the county militia and drove the rebels from Cornwall, after which they raised a small force for general service and invaded Devonshire (November 1642). Subsequently a Parliamentary army under the earl of Stamford was withdrawn from south Wales to engage Hopton, who had to retire into Cornwall. There, however, the Royalist general was free to employ the militia again, and thus reinforced he won a victory over a part of Stamford's forces at Bradock Down near Liskeard (January 19, 1643) and resumed the offensive. About the same time Hertford, no longer opposed by Stamford, brought over the South Wales Royalists to Oxford, and the fortified area around that place was widened by the capture of Cirencester on the 2nd of February. Gloucester and Bristol were now the only important garrisons of the Roundheads in the west. In the midlands, in spite of a Parliamentary victory won by Sir William Brereton at Nantwich on the 28th of January, the Royalists of Shropshire, Staffordshire and Leicestershire soon extended their influence through Ashby-de-la-Zouch into Nottinghamshire and joined hands with their friends at Newark. Further, around Chester a new Royalist army was being formed under Lord Byron, and all the efforts of Brereton and of Sir John Gell, the leading supporter of the Parliament in Derbyshire, were required to hold their own, even before Newcastle's army was added to the list of their enemies. Lord Brooke, who commanded for the Parliament in Warwickshire and Staffordshire and was looked on by many as Essex's eventual successor, was killed in besieging Lichfield cathedral on the 2nd of March, and, though the cathedral soon capitulated, Gell and Brereton were severely handled in the indecisive battle of Hopton Heath near Stafford on the 19th of March, and Prince Rupert, after an abortive raid on Bristol (March 7), marched rapidly northward, storming Birmingham en route, and recaptured Lichfield cathedral. He was, however, soon recalled to Oxford to take part in the main campaign. The position of affairs for the Parliament was perhaps at its worst in January. The Royalist successes of November and December, the ever-present dread of foreign intervention, and the burden of new taxation which the Parliament now found itself compelled to impose, disheartened its supporters. Disorders broke out in London, and, while the more determined of the rebels began thus early to think of calling in the military assistance of the Scots, the majority were for peace on any conditions. But soon the position improved somewhat; Stamford in the west and Brereton and Gell in the midlands, though hard pressed, were at any rate in arms and undefeated, Newcastle had failed to conquer the West Riding, and Sir William Waller, who had cleared Hampshire and Wiltshire of "malignants," entered Gloucestershire early in March, destroyed a small Royalist force at Highnam (March 24), and secured Bristol and Gloucester for the Parliament. Finally, some of Charles's own intrigues opportunely coming to light, the waverers, seeing the impossibility of plain dealing with the court, rallied again to the party of resistance, and the series of negotiations called by the name of the Treaty of Oxford closed in April with no more result than those which had preceded Edgehill and Turnham Green. About this time too, following and improving upon the example of Newcastle in the north, Parliament ordered the formation of the celebrated "associations" or groups of counties banded together by mutual consent for defence. The most powerful and best organized of these was that of the eastern counties (headquarters Cambridge), where the danger of attack from the north was near enough to induce great energy in the preparations for meeting it, and at the same time too distant effectively to interfere with these preparations. Above all, the Eastern Association was from the first guided and inspired by Colonel Cromwell.

6. *The Plan of Campaign, 1643.*—The king's plan of operations for the next campaign, which was perhaps inspired from abroad, was more elaborate than the simple "point" of 1642. The king's army, based on the fortified area around Oxford, was counted sufficient to use up Essex's forces. On either hand, therefore, in Yorkshire and in the west, the Royalist armies were to fight their way inwards towards London, after which all three armies, converging on that place in due season, were to cut off its supplies and its sea-borne revenue and to starve the rebellion into surrender. The condition of this threefold advance was of course that the enemy should not be able to defeat the armies in detail, *i.e.* that he should be fixed and held in the Thames valley; this secured, there was no purely military objection against operating in separate armies from the circumference towards the centre. It was on the rock of local feeling that the king's plan came to grief. Even after the arrival of the queen and her convoy, Newcastle had to allow her to proceed with a small force, and to remain behind with the main body, because of Lancashire and the West Riding, and above all because the port of Hull, in the hands of the Fairfaxes, constituted a menace that the Royalists of the East Riding refused to ignore. Hopton's advance too, undertaken without the Cornish levies, was checked in the action of Sourton Down (Dartmoor) on the 25th of April, and on the same day Waller captured Hereford. Essex had already left Windsor to undertake the siege of Reading, the most important point in the circle of fortresses round Oxford, which after a vain attempt at relief surrendered to him on the 26th of April. Thus the opening operations were unfavourable, not indeed so far as to require the scheme to be abandoned, but at least delaying the development until the campaigning season was far advanced.

7. *Victories of Hopton.*—But affairs improved in May. The queen's long-expected convoy arrived at Woodstock on the 13th. The earl of Stamford's army, which had again entered Cornwall, was attacked in its selected position at Stratton and practically annihilated by Hopton (May 16). This brilliant victory was due above all to Sir Bevil Grenville and the lithe Cornishmen, who, though but 2400 against 5400 and destitute of artillery, stormed "Stamford Hill," killed 300 of the enemy, and captured 1700 more with all their guns, colours and baggage. Devon was at once overrun by the victors. Essex's army, for want of material resources, had had to be content with the capture of Reading, and a Royalist force under Hertford and Prince Maurice (Rupert's brother) moved out as far as Salisbury to hold out a hand to their friends in Devonshire, while Waller, the only Parliamentary commander left in the field in the west, had to abandon his conquests in the Severn valley to oppose the further progress of his intimate friend and present enemy, Hopton. Early in June Hertford and Hopton united at Chard and rapidly moved, with some cavalry skirmishing, towards Bath, where Waller's army lay. Avoiding the barrier of the Mendips, they moved round via Frome to the Avon. But Waller, thus cut off from London and threatened with investment, acted with great skill, and some days of manœuvres and skirmishing followed, after which Hertford and Hopton found themselves on the north side of Bath facing Waller's entrenched position on the top of Lansdown Hill. This position the Royalists

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stormed on the 5th of July. The battle of Lansdown was a second Stratton for the Cornishmen, but this time the enemy was of different quality and far differently led, and they had to mourn the loss of Sir Bevil Grenville and the greater part of their whole force. At dusk both sides stood on the flat summit of the hill, still firing into one another with such energy as was not yet expended, and in the night Waller drew off his men into Bath. "We were glad they were gone," wrote a Royalist officer, "for if they had not, I know who had within the hour." Next day Hopton was severely injured by the explosion of a wagon containing the reserve ammunition, and the Royalists, finding their victory profitless, moved eastward to Devizes, closely followed by the enemy. On the 10th of July Sir William Waller took post on Roundway Down, overlooking Devizes, and captured a Royalist ammunition column from Oxford. On the 11th he came down and invested Hopton's foot in Devizes itself, while the Royalist cavalry, Hertford and Maurice with them, rode away towards Salisbury. But although the siege was pressed with such vigour that an assault was fixed for the evening of the 13th, the Cornishmen, Hopton directing the defence from his bed, held out stubbornly, and on the afternoon of July 13th Prince Maurice's horsemen appeared on Roundway Down, having ridden to Oxford, picked up reinforcements there, and returned at full speed to save their comrades. Waller's army tried its best, but some of its elements were of doubtful quality and the ground was all in Maurice's favour. The battle did not last long. The combined attack of the Oxford force from Roundway and of Hopton's men from the town practically annihilated Waller's army. Very soon afterwards Rupert came up with fresh Royalist forces, and the combined armies moved westward. Bristol, the second port of the kingdom, was their objective, and in four days from the opening of the siege it was in their hands (July 26), Waller with the beaten remnant of his army at Bath being powerless to intervene. The effect of this blow was felt even in Dorsetshire. Within three weeks of the surrender Prince Maurice with a body of fast-moving cavalry overran that county almost unopposed.

8. *Adwalton Moor.*—Newcastle meanwhile had resumed operations against the clothing towns, this time with success. The Fairfaxes had been fighting in the West Riding since January with such troops from the Hull region as they had been able to bring across Newcastle's lines. They and the townsmen together were too weak for Newcastle's increasing forces, and an attempt was made to relieve them by bringing up the Parliament's forces in Nottinghamshire, Derbyshire, Lincolnshire and the Eastern Association. But local interests prevailed again, in spite of Cromwell's presence, and after assembling at Nottingham, the midland rebels quietly dispersed to their several counties (June 2). The Fairfaxes were left to their fate, and about the same time Hull itself narrowly escaped capture by the queen's forces through the treachery of Sir John Hotham, the governor, and his son, the commander of the Lincolnshire Parliamentarians. The latter had been placed under arrest at the instance of Cromwell and of Colonel Hutchinson, the governor of Nottingham Castle; he escaped to Hull, but both father and son were seized by the citizens and afterwards executed. More serious than an isolated act of treachery was the far-reaching Royalist plot that had been detected in Parliament itself, for complicity in which Lord Conway, Edmund Waller the poet, and several members of both Houses were arrested. The safety of Hull was of no avail for the West Riding towns, and the Fairfaxes underwent a decisive defeat at Adwalton (Atherton) Moor near Bradford on the 30th of June. After this, by way of Lincolnshire, they escaped to Hull and reorganized the defence of that place. The West Riding perforce submitted.

The queen herself with a second convoy and a small army under Henry (Lord) Jermyn soon moved via Newark, Ashby-de-la-Zouch, Lichfield and other Royalist garrisons to Oxford, where she joined her husband on the 14th of July. But Newcastle (now a marquis) was not yet ready for his part in the programme. The Yorkshire troops would not march on London while the enemy was master of Hull, and by this time there was a solid barrier between the royal army of the north and the capital. Roundway Down and Adwalton Moor were not after all destined to be fatal, though peace riots in London, dissensions in the Houses, and quarrels amongst the generals were their immediate consequences. A new factor had arisen in the war—the Eastern Association.

9. *Cromwell and the Eastern Association.*—This had already intervened to help in the siege of Reading and had sent troops to the abortive gathering at Nottingham, besides clearing its own ground of "malignants." From the first Cromwell was the dominant influence. Fresh from Edgehill, he had told Hampden, "You must get men of a spirit that is likely to go as far as gentlemen will go," not "old decayed serving-men, tapsters and such kind of fellows to encounter gentlemen that have honour and courage and resolution in them," and in January 1643 he had gone to his own county to "raise such men as had the fear of God before them and made some conscience of what they did." These men, once found, were willing, for the cause, to submit to a rigorous training and an iron discipline such as other troops, fighting for honour only or for profit only, could not be brought to endure.[1] The result was soon apparent. As early as the 13th of May, Cromwell's regiment of horse—recruited from the horse-loving yeomen of the eastern counties—demonstrated its superiority in the field in a skirmish near Grantham, and in the irregular fighting in Lincolnshire during June and July (which was on the whole unfavourable to the Parliament), as previously in pacifying the Eastern Association itself, these Puritan troopers distinguished themselves by long and rapid marches that may bear comparison with almost any in the history of the mounted arm. When Cromwell's second opportunity came at Gainsborough on the 28th of July, the "Lincolneer" horse who were under his orders were fired by the example of Cromwell's own regiment, and Cromwell, directing the whole with skill, and above all with energy, utterly routed the Royalist horse and killed their general, Charles Cavendish.

In the meantime the army of Essex had been inactive. After the fall of Reading a serious epidemic of sickness had reduced it to impotence. On the 18th of June the Parliamentary cavalry was routed and John Hampden mortally wounded at Chalgrove Field near Chiselhampton, and when at last Essex, having obtained the desired reinforcements, moved against Oxford from the Aylesbury side, he found his men demoralized by inaction, and before the menace of Rupert's cavalry, to which he had nothing to oppose, he withdrew to Bedfordshire (July). He made no attempt to intercept the march of the queen's convoys, he had permitted the Oxford army, which he should have held fast, to intervene effectually in the midlands, the west, and the south-west, and Waller might well complain that Essex, who still held Reading and the Chilterns, had given him neither active nor passive support in the critical days preceding Roundway Down. Still only a few voices were raised to demand his removal, and he was shortly to have an opportunity of proving his skill and devotion in a great campaign and a great battle. The centre and the right of the three Royalist armies had for a moment (Roundway to Bristol) united to crush Waller, but their concentration was short-lived. Plymouth was to Hopton's men what Hull was to Newcastle's—they would not march on London until the menace to their homes was removed. Further, there were dissensions among the generals which Charles was too weak to crush, and consequently the original plan reappears—the main Royalist army to operate in the centre, Hopton's (now Maurice's) on the right, Newcastle on the left towards London. While waiting for the fall of Hull and Plymouth, Charles naturally decided to make the best use of his time by reducing Gloucester, the one great fortress of the Parliament in the west.

10. *Siege and Relief of Gloucester.*—This decision quickly brought on a crisis. While the earl of Manchester (with Cromwell as his lieutenant-general) was appointed to head the forces of the Eastern Association against Newcastle, and Waller was

[1] "Making not money but that which they took to be the public felicity to be their end they were the more engaged to be valiant" (Baxter).

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given a new army wherewith again to engage Hopton and Maurice, the task of saving Gloucester from the king's army fell to Essex, who was heavily reinforced and drew his army together for action in the last days of August. Resort was had to the press-gang to fill the ranks, recruiting for Waller's new army was stopped, and London sent six regiments of trained bands to the front, closing the shops so that every man should be free to take his part in what was thought to be the supreme trial of strength.

On the 26th, all being ready, Essex started. Through Aylesbury and round the north side of Oxford to Stow-on-the-Wold the army moved resolutely, not deterred by want of food and rest, or by the attacks of Rupert's and Wilmot's horse on its flank. On the 5th of September, just as Gloucester was at the end of its resources, the siege was suddenly raised and the Royalists drew off to Painswick, for Essex had reached Cheltenham and the danger was over. Then, the field armies being again face to face and free to move, there followed a series of skilful manœuvres in the Severn and Avon valleys, at the end of which the Parliamentary army gained a long start on its homeward road via Cricklade, Hungerford and Reading. But the Royalist cavalry under Rupert, followed rapidly by Charles and the main body from Evesham, strained every nerve to head off Essex at Newbury, and after a sharp skirmish on Aldbourne Chase on the 18th of September succeeded in doing so. On the 19th the whole Royal army was drawn up, facing west, with its right on Newbury and its left on Enborne Heath. Essex's men knew that evening that they would have to break through by force—there was no suggestion of surrender.

11. *First Battle of Newbury, September 20, 1643.*—The ground was densely intersected by hedges except in front of the Royalists' left centre (Newbury Wash) and left (Enborne Heath), and, practically, Essex's army was never formed in line of battle, for each unit was thrown into the fight as it came up its own road or lane. On the left wing, in spite of the Royalist counter-strokes, the attack had the best of it, capturing field after field, and thus gradually gaining ground to the front. Here Lord Falkland was killed. On the Reading road itself Essex did not succeed in deploying on to the open ground on Newbury Wash, but victoriously repelled the royal horse when it charged up to the lanes and hedges held by his foot. On the extreme right of the Parliamentary army, which stood in the open ground of Enborne Heath, took place a famous incident. Here two of the London regiments, fresh to war as they were, were exposed to a trial as severe as that which broke down the veteran Spanish infantry at Rocroi in this same year. Rupert and the Royalist horse again and again charged up to the squares of pikes, and between each charge his guns tried to disorder the Londoners, but it was not until the advance of the royal infantry that the trained bands retired, slowly and in magnificent order, to the edge of the heath. The result of it all was that Essex's army had fought its hardest and failed to break the opposing line. But the Royalists had suffered so heavily, and above all the valour displayed by the rebels had so profoundly impressed them, that they were glad to give up the disputed road and withdraw into Newbury. Essex thereupon pursued his march, Reading was reached on the 22nd after a small rearguard skirmish at Aldermaston, and so ended one of the most dramatic episodes of English history.

12. *Hull and Winceby.*—Meanwhile the siege of Hull had commenced. The Eastern Association forces under Manchester promptly moved up into Lincolnshire, the foot besieging Lynn (which surrendered on the 16th of September) while the horse rode into the northern part of the county to give a hand to the Fairfaxes. Fortunately the sea communications of Hull were open. On the 18th of September part of the cavalry in Hull was ferried over to Barton, and the rest under Sir Thomas Fairfax went by sea to Saltfleet a few days later, the whole joining Cromwell near Spilsby. In return the old Lord Fairfax, who remained in Hull, received infantry reinforcements and a quantity of ammunition and stores from the Eastern Association. On the 11th of October Cromwell and Fairfax together won a brilliant cavalry action at Winceby, driving the Royalist horse in confusion before them to Newark, and on the same day Newcastle's army around Hull, which had suffered terribly from the hardships of continuous siege work, was attacked by the garrison and so severely handled that next day the siege was given up. Later, Manchester retook Lincoln and Gainsborough, and thus Lincolnshire, which had been almost entirely in Newcastle's hands before he was compelled to undertake the siege of Hull, was added in fact as well as in name to the Eastern Association.

Elsewhere, in the reaction after the crisis of Newbury, the war languished. The city regiments went home, leaving Essex too weak to hold Reading, which the Royalists reoccupied on the 3rd of October. At this the Londoners offered to serve again, and actually took part in a minor campaign around Newport Pagnell, which town Rupert attempted to fortify as a menace to the Eastern Association and its communications with London. Essex was successful in preventing this, but his London regiments again went home, and Sir William Waller's new army in Hampshire failed lamentably in an attempt on Basing House (November 7), the London trained bands deserting *en bloc*. Shortly afterwards Arundel surrendered to a force under Sir Ralph, now Lord Hopton (December 9).

13. *The "Irish Cessation" and the Solemn League and Covenant.*—Politically, these months were the turning-point of the war. In Ireland, the king's lieutenant, by order of his master, made a truce with the Irish rebels (Sept. 15). Charles's chief object was to set free his army to fight in England, but it was believed universally that Irish regiments—in plain words, papists in arms—would shortly follow. Under these circumstances his act united against him nearly every class in Protestant England, above all brought into the English quarrel the armed strength of Presbyterian Scotland. Yet Charles, still trusting to intrigue and diplomacy to keep Scotland in check, deliberately rejected the advice of Montrose, his greatest and most faithful lieutenant, who wished to give the Scots employment for their army at home. Only ten days after the "Irish cessation," the Parliament at Westminster swore to the Solemn League and Covenant, and the die was cast. It is true that even a semblance of Presbyterian theocracy put the "Independents" on their guard and definitely raised the question of freedom of conscience, and that secret negotiations were opened between the Independents and Charles on that basis, but they soon discovered that the king was merely using them as instruments to bring about the betrayal of Aylesbury and other small rebel posts. All parties found it convenient to interpret the Covenant liberally for the present, and at the beginning of 1644 the Parliamentary party showed so united a front that even Pym's death (December 8, 1643) hardly affected its resolution to continue the struggle.

The troops from Ireland, thus obtained at the cost of an enormous political blunder, proved to be untrustworthy after all. Those serving in Hopton's army were "mutinous and shrewdly infected with the rebellious humour of England." When Waller's Londoners surprised [1] and routed a Royalist detachment at Alton (December 13, 1643), half the prisoners took the Covenant. Hopton had to retire, and on the 6th of January 1644 Waller recaptured Arundel. Byron's Cheshire army was in no better case. Newcastle's retreat from Hull and the loss of Gainsborough had completely changed the situation in the midlands, Brereton was joined by the younger Fairfax from Lincolnshire, and the Royalists were severely defeated for a second time at Nantwich (January 25). As at Alton, the majority of the prisoners (amongst them Colonel George Monk) took the Covenant and entered the Parliamentary army. In Lancashire, as in Cheshire, Staffordshire, Nottinghamshire and Lincolnshire, the cause of the Parliament was in the ascendant. Resistance revived in the West Riding towns, Lord Fairfax was again in the field in the

[1] For the third time within the year the London trained bands turned out in force. It was characteristic of the early years of the war that imminent danger alone called forth the devotion of the citizen soldier. If he was employed in ordinary times (*e.g.* at Basing House) he would neither fight nor march with spirit.

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East Riding, and even Newark was closely besieged by Sir John Meldrum. More important news came in from the north. The advanced guard of the Scottish army had passed the Tweed on the 19th of January, and the marquis of Newcastle with the remnant of his army would soon be attacked in front and rear at once.

14. *Newark and Cheriton* (*March 1644*).—As in 1643, Rupert was soon on his way to the north to retrieve the fortunes of his side. Moving by the Welsh border, and gathering up garrisons and recruits snowball-wise as he marched, he went first to Cheshire to give a hand to Byron, and then, with the utmost speed, he made for Newark. On the 20th of March 1644 he bivouacked at Bingham, and on the 21st he not only relieved Newark but routed the besiegers' cavalry. On the 22nd Meldrum's position was so hopeless that he capitulated on terms. But, brilliant soldier as he was, the prince was unable to do more than raid a few Parliamentary posts around Lincoln, after which he had to return his borrowed forces to their various garrisons and go back to Wales—laden indeed with captured pikes and muskets—to raise a permanent field army. But Rupert could not be in all places at once. Newcastle was clamorous for aid. In Lancashire, only the countess of Derby, in Lathom House, held out for the king, and her husband pressed Rupert to go to her relief. Once, too, the prince was ordered back to Oxford to furnish a travelling escort for the queen, who shortly after this gave birth to her youngest child and returned to France. The order was countermanded within a few hours, it is true, but Charles had good reason for avoiding detachments from his own army. On the 29th of March, Hopton had undergone a severe defeat at Cheriton near New Alresford. In the preliminary manœuvres and in the opening stages of the battle the advantage lay with the Royalists, and the earl of Forth, who was present, was satisfied with what had been achieved and tried to break off the action. But Royalist indiscipline ruined everything. A young cavalry colonel charged in defiance of orders, a fresh engagement opened, and at the last moment Waller snatched a victory out of defeat. Worse than this was the news from Yorkshire and Scotland. Charles had at last assented to Montrose's plan and promised him the title of marquis, but the first attempt to raise the Royalist standard in Scotland gave no omen of its later triumphs. In Yorkshire Sir Thomas Fairfax, advancing from Lancashire through the West Riding, joined his father. Selby was stormed on the 11th of April, and thereupon Newcastle, who had been manœuvring against the Scots in Durham, hastily drew back, sent his cavalry away, and shut himself up with his foot in York. Two days later the Scottish general, Alexander Leslie, Lord Leven, joined the Fairfaxes and prepared to invest that city.

15. *Plans of Campaign for 1644.*—The original plan of the Parliamentary "Committee of Both Kingdoms," which directed the military and civil policy of the allies after the fashion of a modern cabinet, was to combine Essex's and Manchester's armies in an attack upon the king's army, Aylesbury being appointed as the place of concentration. Waller's troops were to continue to drive back Hopton and to reconquer the west, Fairfax and the Scots to invest Newcastle's army, while in the midlands Brereton and the Lincolnshire rebels could be counted upon to neutralize, the one Byron, the others the Newark Royalists. But Waller, once more deserted by his trained bands, was unable to profit by his victory of Cheriton, and retired to Farnham. Manchester, too, was delayed because the Eastern Association was still suffering from the effects of Rupert's Newark exploit—Lincoln, abandoned by the rebels on that occasion, was not reoccupied till the 6th of May. Moreover, Essex found himself compelled to defend his conduct and motives to the Committee of Both Kingdoms, and as usual was straitened for men and money. But though there were grave elements of weakness on the other side, the Royalists considered their own position to be hopeless. Prince Maurice was engaged in the fruitless siege of Lyme Regis, Gloucester was again a centre of activity and counterbalanced Newark, and the situation in the north was practically desperate. Rupert himself came to Oxford (April 25) to urge that his new army should be kept free to march to aid Newcastle, who was now threatened—owing to the abandonment of the enemy's original plan—by Manchester as well as Fairfax and Leven. There was no further talk of the concentric advance of three armies on London. The fiery prince and the methodical earl of Brentford (Forth) were at one at least in recommending that the Oxford area with its own garrison and a mobile force in addition should be the pivot of the field armies' operations. Rupert, needing above all adequate time for the development of the northern offensive, was not in favour of abandoning any of the barriers to Essex's advance. Brentford, on the other hand, thought it advisable to contract the lines of defence, and Charles, as usual undecided, agreed to Rupert's scheme and executed Brentford's. Reading, therefore, was dismantled early in May, and Abingdon given up shortly afterwards.

16. *Cropredy Bridge.*—It was now possible for the enemy to approach Oxford, and Abingdon was no sooner evacuated than (May 26) Waller's and Essex's armies united there—still, unfortunately for their cause, under separate commanders. From Abingdon Essex moved direct on Oxford, Waller towards Wantage, where he could give a hand to Massey, the energetic governor of Gloucester. Affairs seemed so bad in the west (Maurice with a whole army was still vainly besieging the single line of low breastworks that constituted the fortress of Lyme) that the king despatched Hopton to take charge of Bristol. Nor were things much better at Oxford; the barriers of time and space and the supply area had been deliberately given up to the enemy, and Charles was practically forced to undertake extensive field operations with no hope of success save in consequence of the enemy's mistakes. The enemy, as it happened, did not disappoint him. The king, probably advised by Brentford, conducted a skilful war of manœuvre in the area defined by Stourbridge, Gloucester, Abingdon and Northampton, at the end of which Essex, leaving Waller to the secondary work, as he conceived it, of keeping the king away from Oxford and reducing that fortress, marched off into the west with most of the general service troops to repeat at Lyme Regis his Gloucester exploit of 1643. At one moment, indeed, Charles (then in Bewdley) rose to the idea of marching north to join Rupert and Newcastle, but he soon made up his mind to return to Oxford. From Bewdley, therefore, he moved to Buckingham—the distant threat on London producing another evanescent citizen army drawn from six counties under Major-General Browne—and Waller followed him closely. When the king turned upon Browne's motley host, Waller appeared in time to avert disaster, and the two armies worked away to the upper Cherwell. Brentford and Waller were excellent strategists of the 17th century type, and neither would fight a pitched battle without every chance in his favour. Eventually on the 29th of June the Royalists were successful in a series of minor fights about Cropredy Bridge, and the result was, in accordance with continental custom, admitted to be an important victory, though Waller's main army drew off unharmed. In the meantime, Essex had relieved Lyme (June 15) and occupied Weymouth, and was preparing to go farther. The two rebel armies were now indeed separate. Waller had been left to do as best he could, and a worse fate was soon to overtake the cautious earl.

17. *Campaign of Marston Moor.*—During these manœuvres the northern campaign had been fought to an issue. Rupert's courage and energy were more likely to command success in the English Civil War than all the conscientious caution of an Essex or a Brentford. On the 16th of May he left Shrewsbury to fight his way through hostile country to Lancashire, where he hoped to re-establish the Derby influence and raise new forces. Stockport was plundered on the 25th, the besiegers of Lathom House utterly defeated at Bolton on the 28th. Soon afterwards he received a large reinforcement under General Goring, which included 5000 of Newcastle's cavalry. The capture of the almost defenceless town of Liverpool—undertaken as usual to allay local fears—did not delay Rupert more than three or four days, and he then turned towards the Yorkshire border with

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greatly augmented forces. On the 14th of June he received a despatch from the king, the gist of which was that there was a time-limit imposed on the northern enterprise. If York were lost or did not need his help, Rupert was to make all haste southward via Worcester. "If York be relieved and you beat the rebels' armies of both kingdoms, then, but otherways not, I may possibly make a shift upon the defensive to spin out time until you come to assist me."

Charles did manage to "spin out time." But it was of capital importance that Rupert had to do his work upon York and the allied army in the shortest possible time, and that, according to the despatch, there were only two ways of saving the royal cause, "having relieved York by beating the Scots," or marching with all speed to Worcester. Rupert's duty, interpreted through the medium of his temperament, was clear enough. Newcastle still held out, his men having been encouraged by a small success on the 17th of June, and Rupert reached Knaresborough on the 30th. At once Leven, Fairfax and Manchester broke up the siege of York and moved out to meet him. But the prince, moving still at high speed, rode round their right flank via Boroughbridge and Thornton Bridge and entered York on the north side. Newcastle tried to dissuade Rupert from fighting, but his record as a general was scarcely convincing as to the value of his advice. Rupert curtly replied that he had orders to fight, and the Royalists moved out towards Marston Moor (q.v.) on the morning of July 2, 1644. The Parliamentary commanders, fearing a fresh manœuvre, had already begun to retire towards Tadcaster, but as soon as it became evident that a battle was impending they turned back. The battle of Marston Moor began about four in the afternoon. It was the first real trial of strength between the best elements on either side, and it ended before night with the complete victory of the Parliamentary armies. The Royalist cause in the north collapsed once for all, Newcastle fled to the continent, and only Rupert, resolute as ever, extricated 6000 cavalry from the *débâcle* and rode away whence he had come, still the dominant figure of the war.

18. *Independency.*—The victory gave the Parliament entire control of the north, but it did not lead to the definitive solution of the political problem, and in fact, on the question of Charles's place in a new Constitution, the victorious generals quarrelled even before York had surrendered. Within three weeks of the battle the great army was broken up. The Yorkshire troops proceeded to conquer the isolated Royalist posts in their county, the Scots marched off to besiege Newcastle-on-Tyne and to hold in check a nascent Royalist army in Westmorland. Rupert in Lancashire they neglected entirely. Manchester and Cromwell, already estranged, marched away into the Eastern Association. There, for want of an enemy to fight, their army was forced to be idle, and Cromwell and the ever-growing Independent element quickly came to suspect their commander of lukewarmness in the cause. Waller's army, too, was spiritless and immobile. On the 2nd of July, despairing of the existing military system, he made to the Committee of Both Kingdoms the first suggestion of the New Model,—"My lords," he wrote, "till you have an army merely your own, that you may command, it is. . . impossible to do anything of importance." Browne's trained band army was perhaps the most ill-behaved of all—once the soldiers attempted to murder their own general. Parliament in alarm set about the formation of a new general service force (July 12), but meantime both Waller's and Browne's armies (at Abingdon and Reading respectively) ignominiously collapsed by mutiny and desertion. It was evident that the people at large, with their respect for the law and their anxiety for their own homes, were tired of the war. Only those men—such as Cromwell—who has set their hearts on fighting out the quarrel of conscience, kept steadfastly to their purpose. Cromwell himself had already decided that the king himself must be deprived of his authority, and his supporters were equally convinced. But they were relatively few. Even the Eastern Association trained bands had joined in the disaffection in Waller's army, and that unfortunate general's suggestion of a professional army, with all its dangers, indicated the only means of enforcing a peace such as Cromwell and his friends desired. There was this important difference, however, between Waller's ides and Cromwell's achievement—that the professional soldiers of the New Model were disciplined, led, and in all things inspired by "godly" officers. Godliness, devotion to the cause, and efficiency were indeed the only criteria Cromwell applied in choosing officers. Long before this he had warned the Scottish major-general Lawrence Crawford that the precise colour of a man's religious opinions mattered nothing compared with his devotion to them, and had told the committee of Suffolk, "I had rather have a plain russet-coated captain that knows what he fights for and loves what he knows than that which you call a 'gentleman' and is nothing else. I honour a gentleman that is so indeed . . . but seeing it was necessary the work must go on, better plain men than none." If "men of honour and birth" possessed the essentials of godliness, devotion, and capacity, Cromwell preferred them, and as a fact only seven out of thirty-seven of the superior officers of the original New Model were not of gentle birth.

19. *Lostwithiel.*—But all this was as yet in the future. Essex's military promenade in the west of England was the subject of immediate interest. At first successful, this general penetrated to Plymouth, whence, securely based as he thought, he could overrun Devon. Unfortunately for him he was persuaded to overrun Cornwall as well. At once the Cornishmen rose, as they had risen under Hopton, and the king was soon on the march from the Oxford region, disregarding the armed mobs under Waller and Browne. Their state reflected the general languishing of the war spirit on both sides, not on one only, as Charles discovered when he learned that Lord Wilmot, the lieutenant-general of his horse, was in correspondence with Essex. Wilmot was of course placed under arrest, and was replaced by the dissolute General Goring. But it was unpleasantly evident that even gay cavaliers of the type of Wilmot had lost the ideals for which they fought, and had come to believe that the realm would never be at peace while Charles was king. Henceforward it will be found that the Royalist foot, now a thoroughly professional force, is superior in quality to the once superb cavalry, and that not merely because its opportunities for plunder, &c., are more limited. Materially, however, the immediate victory was undeniably with the Royalists. After a brief period of manœuvre, the Parliamentary army, now far from Plymouth found itself surrounded and starving at Lostwithiel, on the Fowey river, without hope of assistance. The horse cut its way out through the investing circle of posts, Essex himself escaped by sea, but Major-General Skippon, his second in command, had to surrender with the whole of the foot on the 2nd of September. The officers and men were allowed to go free to Portsmouth, but their arms, guns and munitions were the spoil of the victors. There was now no trustworthy field force in arms for the Parliament south of the Humber, for even the Eastern Association army was distracted by its religious differences, which had now at last come definitely to the front and absorbed the political dispute in a wider issue. Cromwell already proposed to abolish the peerage, the members of which were inclined to make a hollow peace, and had ceased to pay the least respect to his general, Manchester, whose scheme for the solution of the quarrel was an impossible combination of Charles and Presbyterianism. Manchester for his part sank into a state of mere obstinacy, refusing to move against Rupert, even to besiege Newark, and actually threatened to hang Colonel Lilburne for capturing a Royalist castle without orders.

20. *Operations of Essex's, Waller's and Manchester's Armies.*—After the success of Lostwithiel there was little to detain Charles's main army in the extreme west, and meanwhile Banbury, a most important point in the Oxford circle, and Basing House (near Basingstoke) were in danger of capture. Waller, who had organized a small force of reliable troops, had already sent cavalry into Dorsetshire with the ides of assisting Essex, and he now came himself with reinforcements to prevent, so far as lay in his power, the king's return to the Thames valley. Charles was accompanied of course only by his permanent forces and

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by parts of Prince Maurice's and Hopton's armies—the Cornish levies had as usual scattered as soon as the war receded from their borders. Manchester slowly advanced to Reading, Essex gradually reorganized his broken army at Portsmouth, while Waller, far out to the west at Shaftesbury, endeavored to gain the necessary time and space for a general concentration in Wiltshire, where Charles would be far from Oxford and Basing and, in addition, outnumbered by two to one. But the work of rearming Essex's troops proceeded slowly for want of money, and Manchester peevishly refused to be hurried either by his more vigorous subordinates or by the Committee of Both Kingdoms, saying that the army of the Eastern Association was for the guard of its own employers and not for general service. He pleaded the renewed activity of the Newark Royalists as his excuse, forgetting that Newark would have been in his hands ere this had he chosen to move thither instead of lying idle for two months. As to the higher command, things had come to such a pass that, when the three armies at last united, a council of war, consisting of three army commanders, several senior officers, and two civilian delegates from the Committee, was constituted. When the vote of the majority had determined what was to be done, Essex, as lord general of the Parliament's first army, was to issue the necessary orders for the whole. Under such conditions it was not likely that Waller's hopes of a great battle at Shaftesbury would be realized. On the 8th of October he fell back, the royal army following him step by step and finally reaching Whitchurch on the 20th of October. Manchester arrived at Basingstoke on the 17th, Waller on the 19th, and Essex on the 21st. Charles had found that he could not relieve Basing (a mile or two from Basingstoke) without risking a battle with the enemy between himself and Oxford;[1] he therefore took the Newbury road and relieved Donnington Castle near Newbury on the 22nd. Three days later Banbury too was relieved by a force which could now be spared from the Oxford garrison. But for once the council of war on the other side was for fighting a battle, and the Parliamentary armies, their spirits revived by the prospect of action and by the news of the fall of Newcastle and the defeat of a sally from Newark, marched briskly. On the 26th they appeared north of Newbury on the Oxford road. Like Essex in 1643, Charles found himself headed off from the shelter of friendly fortresses, but beyond this fact there is little similarity between the two battles of Newbury, for the Royalists in the first case merely drew a barrier across Essex's path. On the present occasion the eager Parliamentarians made no attempt to force the king to attack them; they were well content to attack him in his chosen position themselves, especially as he was better off for supplies and quarters than they.

21. *Second Newbury.*—The second battle of Newbury is remarkable as being the first great manœuvre-battle (as distinct from "pitched" battle) of the Civil War. A preliminary reconnaissance by the Parliamentary leaders (Essex was not present, owing to illness) established the fact that the king's infantry held a strong line of defence behind the Lambourn brook from Shaw (inclusive) to Donnington (exclusive), Shaw House and adjacent buildings being held as an advanced post. In rear of the centre, in open ground just north of Newbury, lay the bulk of the royal cavalry. In the left rear of the main line, and separated from it by more than a thousand yards, lay Prince Maurice's corps at Speen, advanced troops on the high ground west of that village, but Donnington Castle, under its energetic governor Sir John Boys, formed a strong post covering this gap with artillery fire. The Parliamentary leaders had no intention of flinging their men away in a frontal attack on the line of the Lambourn, and a flank attack from the east side could hardly succeed owing to the obstacle presented by the confluence of the Lambourn and the Kennet, hence they decided on a wide turning movement via Chieveley, Winterbourne and Wickham Heath, against Prince Maurice's position—a decision which, daring and energetic as it was, led only to a modified success, for reasons which will appear. The flank march, out of range of the castle, was conducted with punctuality and precision. The troops composing it were drawn from all three armies and led by the best fighting generals, Waller, Cromwell, and Essex's subordinates Balfour and Skippon. Manchester at Clay Hill was to stand fast until the turning movement had developed, and to make a vigorous holding attack on Shaw House as soon as Waller's guns were heard at Speen. But there was no commander-in-chief to co-ordinate the movements of the two widely separated corps, and consequently no co-operation. Waller's attack was not unexpected, and Prince Maurice had made ready to meet him. Yet the first rush of the rebels carried the entrenchments of Speen Hill, and Speen itself, though stoutly defended, fell into their hands within an hour, Essex's infantry recapturing here some of the guns they had had to surrender at Lostwithiel. But meantime Manchester, in spite of the entreaties of his staff, had not stirred from Clay Hill. He had made one false attack already early in the morning, and been severely handled, and he was aware of his own deficiencies as a general. A year before this he would have asked for and acted upon the advice of a capable soldier, such as Cromwell or Crawford, but now his mind was warped by a desire for peace on any terms, and he sought only to avoid defeat pending a happy solution of the quarrel. Those who sought to gain peace through victory were meanwhile driving Maurice back from hedge to hedge towards the open ground at Newbury, but every attempt to emerge from the lanes and fields was repulsed by the royal cavalry, and indeed by every available man and horse, for Charles's officers had gauged Manchester's intentions, and almost stripped the front of its defenders to stop Waller's advance. Nightfall put an end to the struggle around Newbury, and then—too late—Manchester ordered the attack on Shaw House. It failed completely in spite of the gallantry of his men, and darkness being then complete it was not renewed. In its general course the battle closely resembled that of Freiburg (*q.v.*), fought the same year on the Rhine. But, if Waller's part in the battle corresponded in a measure to Turenne's, Manchester was unequal to playing the part of Condé, and consequently the results, in the case of the French won by three days' hard fighting, and even then comparatively small, were in the case of the English practically nil. During the night the royal army quietly marched away through the gap between Waller's and Manchester's troops. The heavy artillery and stores were left in Donnington Castle, Charles himself with a small escort rode off to the north-west to meet Rupert, and the main body gained Wallingford unmolested. An attempt at pursuit was made by Waller and Cromwell with all the cavalry they could lay hands on, but it was unsupported, for the council of war had decided to content itself with besieging Donnington Castle. A little later, after a brief and half-hearted attempt to move towards Oxford, it referred to the Committee for further instructions. Within the month Charles, having joined Rupert at Oxford and made him general of the Royalist forces *vice* Brentford, reappeared in the neighbourhood of Newbury. Donnington Castle was again relieved (November 9) under the eyes of the Parliamentary army, which was in such a miserable condition that even Cromwell was against fighting, and some manœuvres followed, in the course of which Charles relieved Basing House and the Parliamentary armies fell back, not in the best order, to Reading. The season for field warfare was now far spent, and the royal army retired to enjoy good quarters and plentiful supplies around Oxford.

22. *The Self-denying Ordinance.*—On the other side, the dissensions between the generals had become flagrant and public, and it was no longer possible for the Houses of Parliament to ignore the fact that the army must be radically reformed. Cromwell and Waller from their places in parliament attacked Manchester's conduct, and their attack ultimately became, so far as Cromwell was concerned, an attack on the Lords, most of whom held the same views as Manchester, and on the Scots, who attempted to bring Cromwell to trial as an "incendiary." At the crisis of their bitter controversy Cromwell suddenly

[1] Charles's policy was still, as before Marston Moor, to "spin out time" until Rupert came back from the north.

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proposed to stifle all animosities by the resignation of all officers who were members of either House, a proposal which affected himself not less than Essex and Manchester. The first "self-denying ordinance" was moved on the 9th of December, and provided that "no member of either house shall have or execute any office or command . . .," &c. This was not accepted by the Lords, and in the end a second "self-denying ordinance" was agreed to (April 3, 1645), whereby all the persons concerned were to resign, but without prejudice to their reappointment. Simultaneously with this, the formation of the New Model was at last definitely taken into consideration. The last exploit of Sir William Waller, who was not re-employed after the passing of the ordinance, was the relief of Taunton, then besieged by General Goring's army. Cromwell served as his lieutenant-general on this occasion, and we have Waller's own testimony that he was in all things a wise, capable and respectful subordinate. Under a leader of the stamp of Waller, Cromwell was well satisfied to obey, knowing the cause to be in good hands.

23. *Decline of the Royalist Cause.*—A raid of Goring's horse from the west into Surrey and an unsuccessful attack on General Browne at Abingdon were the chief enterprises undertaken on the side of the Royalists during the early winter. It was no longer "summer in Devon, summer in Yorkshire" as in January 1643. An ever-growing section of Royalists, amongst whom Rupert himself was soon to be numbered, were for peace; many scores of loyalist gentlemen, impoverished by the loss of three years' rents of their estates and hopeless of ultimate victory, were making their way to Westminster to give in their submission to the Parliament and to pay their fines. In such circumstances the old decision-seeking strategy was impossible. The new plan, suggested probably by Rupert, had already been tried with strategical success in the summer campaign of 1644. As we have seen, it consisted essentially in using Oxford as the centre of a circle and striking out radially at any favourable target—"manœuvring about a fixed point," as Napoleon called it. It was significant of the decline of the Royalist cause that the "fixed point" had been in 1643 the king's field army, based indeed on its great entrenched camp, Banbury-Cirencester-Reading-Oxford, but free to move and to hold the enemy wherever met, while now it was the entrenched camp itself, weakened by the loss or abandonment of its outer posts, and without the power of binding the enemy if they chose to ignore its existence, that conditioned the scope and duration of the single remaining field army's enterprises.

24. *The New Model Ordinance.*—For the present, however, Charles's cause was crumbling more from internal weakness than from the blows of the enemy. Fresh negotiations for peace which opened on the 29th of January at Uxbridge (by the name of which place they are known to history) occupied the attention of the Scots and their Presbyterian friends, the rise of Independency and of Cromwell was a further distraction, and over the new army and the Self-denying Ordinance the Lords and Commons were seriously at variance. But in February a fresh mutiny in Waller's command struck alarm into the hearts of the disputants. The "treaty" of Uxbridge came to the same end as the treaty of Oxford in 1643, and a settlement as to army reform was achieved on the 15th of February. Though it was only on the 25th of March that the second and modified form of the ordinance was agreed to by both Houses, Sir Thomas Fairfax and Philip Skippon (who were not members of parliament) had been approved as lord general and major-general (of the infantry) respectively of the new army as early as the 21st of January. The post of lieutenant-general and cavalry commander was for the moment left vacant, but there was little doubt as to who would eventually occupy it.

25. *Victories of Montrose.*—In Scotland, meanwhile, Montrose was winning victories which amazed the people of the two kingdoms. Montrose's royalism differed from that of Englishmen of the 17th century less than from that of their forefathers under Henry VIII. and Elizabeth. To him the king was the protector of his people against Presbyterian theocracy, scarcely less offensive to him than the Inquisition itself, and the feudal oppression of the great nobles. Little as this ideal corresponded to the Charles of reality, it inspired in Montrose not merely romantic heroism but a force of leadership which was sufficient to carry to victory the nobles and gentry, the wild Highlanders and the experienced professional soldiers who at various times and places constituted his little armies. His first unsuccessful enterprise has been mentioned above. It seemed, in the early stages of his second attempt (August 1644), as if failure were again inevitable, for the gentry of the northern Lowlands were overawed by the prevailing party and resented the leadership of a lesser noble, even though he were the king's lieutenant over all Scotland. Disappointed of support where he most expected it, Montrose then turned to the Highlands. At Blair Athol he gathered his first army of Royalist clansmen, and good fortune gave him also a nucleus of trained troops. A force of disciplined experienced soldiers (chiefly Irish Macdonalds and commanded by Alastair of that name) had been sent over from Ireland earlier in the year, and, after ravaging the glens of their hereditary enemies the Campbells, had attempted without success, now here, now there, to gather the other clans in the king's name. Their hand was against every man's, and when he finally arrived in Badenoch, Alastair Macdonald was glad to protect himself by submitting to the authority of the king's lieutenant.

There were three hostile armies to be dealt with, besides—ultimately—the main covenanting army far away in England. The duke of Argyll, the head of the Campbells, had an army of his own clan and of Lowland Covenanter levies, Lord Elcho with another Lowland army lay near Perth, and Lord Balfour of Burleigh was collecting a third (also composed of Lowlanders) at Aberdeen. Montrose turned upon Elcho first, and found him at Tippermuir near Perth on the 1st of September 1644. The Royalists were about 3000 strong and entirely foot, only Montrose himself and two others being mounted, while Elcho had about 7000 of all arms. But Elcho's townsmen found that pike and musket were clumsy weapons in inexperienced hands, and, like Mackay's regulars at Killiecrankie fifty years later, they wholly failed to stop the rush of the Highland swordsmen. Many hundreds were killed in the pursuit, and Montrose slept in Perth that night, having thus accounted for one of his enemies. Balfour of Burleigh was to be his next victim, and he started for Aberdeen on the 4th. As he marched, his Highlanders slipped away to place their booty in security. But the Macdonald regulars remained with him, and as he passed along the coast some of the gentry came in, though the great western clan of the Gordons was at present too far divided in sentiment to take his part. Lord Lewis Gordon and some Gordon horse were even in Balfour's army. On the other hand, the earl of Airlie brought in forty-four horsemen, and Montrose was thus able to constitute two wings of cavalry on the day of battle. The Covenanters were about 2500 strong and drawn up on a slope above the How Burn[1] just outside Aberdeen (September 13, 1644). Montrose, after clearing away the enemy's skirmishers, drew up his army in front of the opposing line, the foot in the centre, the forty-four mounted men, with musketeers to support them, on either flank. The hostile left-wing cavalry charged piecemeal, and some bodies of troops did not engage at all. On the other wing, however, Montrose was for a moment hard pressed by a force of the enemy that attempted to work round to his rear. But he brought over the small band of mounted men that constituted his right wing cavalry, and also some musketeers from the centre, and destroyed the assailants, and when the ill-led left wing of the Covenanters charged again, during the absence of the cavalry, they were mown down by the close-range volleys of Macdonald's musketeers. Shortly afterwards the centre of Balfour's army yielded to pressure and fled in disorder. Aberdeen was sacked by order of Montrose, whose drummer had been murdered while delivering a message under a flag of truce to the magistrates.

26. *Inverlochy.*—Only Argyll now remained to be dealt with. The Campbells were fighting men from birth, like Montrose's own men, and had few townsmen serving with them. Still there were enough of the latter and of the impedimenta of regular

[1] The ground has been entirely built over for many years.

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warfare with him to prevent Argyll from overtaking his agile enemy, and ultimately after a "hide-and-seek" in the districts of Rothiemurchus, Blair Athol, Banchory and Strathbogie, Montrose stood to fight at Fyvie Castle, repulsed Argyll's attack on that place and slipped away again to Rothiemurchus. There he was joined by Camerons and Macdonalds from all quarters for a grand raid on the Campbell country; he himself wished to march into the Lowlands, well knowing that he could not achieve the decision in the Grampians, but he had to bow, not for the first time nor the last, to local importunity. The raid was duly executed, and the Campbells' boast, "It's a far cry to Loch Awe," availed them little. In December and January the Campbell lands were thoroughly and mercilessly devastated, and Montrose then retired slowly to Loch Ness, where the bulk of his army as usual dispersed to store away its plunder. Argyll, with such Highland and Lowland forces as he could collect after the disaster, followed Montrose towards Lochaber, while the Seaforths and other northern clans marched to Loch Ness. Caught between them, Montrose attacked the nearest. The Royalists crossed the hills into Glen Roy, worked thence along the northern face of Ben Nevis, and descended like an avalanche upon Argyll's forces at Inverlochy (February 2, 1645). As usual, the Lowland regiments gave way at once—Montrose had managed in all this to keep with him a few cavalry—and it was then the turn of the Campbells. Argyll escaped in a boat, but his clan, as a fighting force, was practically annihilated, and Montrose, having won four victories in these six winter months, rested his men and exultingly promised Charles that he would come to his assistance with a brave army before the end of the summer.

27. *Organization of the New Model Army.*—To return to the New Model. Its first necessity was regular pay; its first duty to serve wherever it might be sent. Of the three armies that had fought at Newbury only one, Essex's, was in a true sense a general service force, and only one, Manchester's, was paid with any regularity. Waller's army was no better paid than Essex's and no more free from local ties than Manchester's. It was therefore broken up early in April, and only 600 of its infantry passed into the New Model. Essex's men, on the other hand, wanted but regular pay and strict officers to make them excellent soldiers, and their own major-general, Skippon, managed by tact and his personal popularity to persuade the bulk of the men to rejoin. Manchester's army, in which Cromwell had been the guiding influence from first to last, was naturally the backbone of the New Model. Early in April Essex, Manchester, and Waller resigned their commissions, and such of their forces as were not embodied in the new army were sent to do local duties, for minor armies were still maintained, General Poyntz's in the north midlands, General Massey's in the Severn valley, a large force in the Eastern Association, General Browne's in Buckinghamshire, &c., besides the Scots in the north.

The New Model originally consisted of 14,400 foot and 7700 horse and dragoons. Of the infantry only 6000 came from the combined armies, the rest being new recruits furnished by the press.[1] Thus there was considerable trouble during the first months of Fairfax's command, and discipline had to be enforced with unusual sternness. As for the enemy, Oxford was openly contemptuous of "the rebels' new brutish general" and his men, who seemed hardly likely to succeed where Essex and Waller had failed. But the effect of the Parliament's having "an army all its own" was soon to be apparent.

28. *First Operations of 1645.*—On the Royalist side the campaign of 1645 opened in the west, whither the young prince of Wales (Charles II.) was sent with Hyde (later earl of Clarendon), Hopton and others as his advisers. General (Lord) Goring, however, now in command of the Royalist field forces in this quarter, was truculent, insubordinate and dissolute, though on the rare occasions when he did his duty he displayed a certain degree of skill and leadership, and the influence of the prince's counsellors was but small. As usual, operations began with the sieges necessary to conciliate local feeling. Plymouth and Lyme were blocked up, and Taunton again invested. The reinforcement thrown into the last place by Waller and Cromwell was dismissed by Blake (then a colonel in command of the fortress and afterwards the great admiral of the Commonwealth), and after many adventures rejoined Waller and Cromwell. The latter generals, who had not yet laid down their commissions, then engaged Goring for some weeks, but neither side having infantry or artillery, and both finding subsistence difficult in February and March and in country that had been fought over for two years past, no results were to be expected. Taunton still remained unrelieved, and Goring's horse still rode all over Dorsetshire when the New Model at last took the field.

29. *Rupert's Northern March.*—In the midlands and Lancashire the Royalist horse, as ill-behaved even as Goring's men, were directly responsible for the ignominious failure with which the king's main army began its year's work. Prince Maurice was joined at Ludlow by Rupert and part of his Oxford army early in March, and the brothers drove off Brereton from the siege of Beeston Castle and relieved the pressure on Lord Byron in Cheshire. So great was the danger of Rupert's again invading Lancashire and Yorkshire that all available forces in the nortb, English and Scots, were ordered to march against him. But at this moment the prince was called back to clear his line of retreat on Oxford. The Herefordshire and Worcestershire peasantry, weary of military exactions, were in arms, and though they would not join the Parliament, and for the most part dispersed after stating their grievances, the main enterprise was wrecked. This was but one of many ill-armed crowds—"Clubmen" as they were called—that assembled to enforce peace on both parties. A few regular soldiers were sufficient to disperse them in all cases, but their attempt to establish a third party in England was morally as significant as it was materially futile. The Royalists were now fighting with the courage of despair, those who still fought against Charles did so with the full determination to ensure the triumph of their cause, and with the conviction that the only possible way was the annihilation of the enemy's armed forces, but the majority were so weary of the war that the earl of Manchester's Presbyterian royalism—which had contributed so materially to the prolongation of the struggle—would probably have been accepted by four-fifths of all England as the basis of a peace. It was, in fact, in the face of almost universal opposition that Fairfax and Cromwell and their friends at Westminster guided the cause of their weaker comrades to complete victory.

30. *Cromwell's Raid.*—Having without difficulty rid himself of the Clubmen, Rupert was eager to resume his march into the north. It is unlikely that he wished to join Montrose, though Charles himself favoured that plan, but he certainly intended to fight the Scottish army, more especially as after Inverlochy it had been called upon to detach a large force to deal with Montrose. But this time there was no Royalist army in the north to provide infantry and guns for a pitched battle, and Rupert had perforce to wait near Hereford till the main body, and in particular the artillery train, could come from Oxford and join him. It was on the march of the artillery train to Hereford that the first operations of the New Model centred. The infantry was not yet ready to move, in spite of all Fairfax's and Skippon's efforts, and it became necessary to send the cavalry by itself to prevent Rupert from gaining a start. Cromwell, then under Waller's command, had come to Windsor to resign his commission as required by the Self-denying Ordinance. Instead, he was placed at the head of a brigade of his own old soldiers, with orders to stop the march of the artillery train. On the 23rd of April he started from Watlington north-westward. At dawn on the 24th he routed a detachment of Royalist horse at Islip. On the same day, though he had no guns and only a few firearms in the whole force, he terrified the governor of Bletchingdon House into surrender. Riding thence to Witney, Cromwell won another cavalry fight at Bampton-in-the-Bush on the 27th, and attacked Faringdon House, though without success, on the

[1] The Puritans had by now disappeared almost entirely from the ranks of the infantry. *Per contra* the officers and sergeants and the troopers of the horse were the sternest Puritans of all, the survivors of three years of a disheartening war.

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29th. Thence he marched at leisure to Newbury. He had done his work thoroughly. He had demoralized the Royalist cavalry, and, above all, had carried off every horse on the country-side. To all Rupert's entreaties Charles could only reply that the guns could not be moved till the 7th of May, and he even summoned Goring's cavalry from the west to make good his losses.

31. *Civilian Strategy.*—Cromwell's success thus forced the king to concentrate his various armies in the neighbourhood of Oxford, and the New Model had, so Fairfax and Cromwell hoped, found its target. But the Committee of Both Kingdoms on the one side, and Charles, Rupert and Goring on the other, held different views. On the 1st of May Fairfax, having been ordered to relieve Taunton, set out from Windsor for the long march to that place; meeting Cromwell at Newbury on the 2nd, he directed the lieutenant-general to watch the movements of the king's army, and himself marched on to Blandford, which he reached on the 7th of May. Thus Fairfax and the main army of the Parliament were marching away in the west while Cromwell's detachment was left, as Waller had been left the previous year, to hold the king as best he could. On the very evening that Cromwell's raid ended, the leading troops of Goring's command destroyed part of Cromwell's own regiment near Faringdon, and on the 3rd Rupert and Maurice appeared with a force of all arms at Burford. Yet the Committee of Both Kingdoms, though aware on the 29th of Goring's move, only made up its mind to stop Fairfax on the 3rd, and did not send off orders till the 5th. These orders were to the effect that a detachment was to be sent to the relief of Taunton, and that the main army was to return. Fairfax gladly obeyed, even though a siege of Oxford and not the enemy's field army was the objective assigned him. But long before he came up to the Thames valley the situation was again changed. Rupert, now in possession of the guns and their teams, urged upon his uncle the resumption of the northern enterprise, calculating that with Fairfax in Somersetshire, Oxford was safe. Charles accordingly marched out of Oxford on the 7th towards Stow-on-the-Wold, on the very day, as it chanced, that Fairfax began his return march from Blandford. But Goring and most of the other generals were for a march into the west, in the hope of dealing with Fairfax as they had dealt with Essex in 1644. The armies therefore parted as Essex and Waller had parted at the same place in 1644, Rupert and the king to march northward, Goring to return to his independent command in the west. Rupert, not unnaturally wishing to keep his influence with the king and his authority as general of the king's army unimpaired by Goring's notorious indiscipline, made no attempt to prevent the separation, which in the event proved wholly unprofitable. The flying column from Blandford relieved Taunton long before Goring's return to the west, and Colonel Weldon and Colonel Graves, its commanders, set him at defiance even in the open country. As for Fairfax, he was out of Goring's reach preparing for the siege of Oxford.

32. *Charles in the Midlands.*—On the other side also the generals were working by data that had ceased to have any value. Fairfax's siege of Oxford, ordered by the Committee on the 10th of May, and persisted in after it was known that the king was on the move, was the second great blunder of the year and was hardly redeemed, as a military measure, by the visionary scheme of assembling the Scots, the Yorkshiremen, and the midland forces to oppose the king. It is hard to understand how, having created a new model army "all its own" for general service, the Parliament at once tied it down to a local enterprise, and trusted an improvised army of local troops to fight the enemy's main army. In reality the Committee seems to have been misled by false information to the effect that Goring and the governor of Oxford were about to declare for the Parliament, but had they not despatched Fairfax to the relief of Taunton in the first instance the necessity for such intrigues would not have arisen. However, Fairfax obeyed orders, invested Oxford, and, so far as he was able without a proper siege train, besieged it for two weeks, while Charles and Rupert ranged the midlands unopposed. At the end of that time came news so alarming that the Committee hastily abdicated their control over military operations and gave Fairfax a free hand. "Black Tom" gladly and instantly abandoned the siege and marched northward to give battle to the king.

Meanwhile Charles and Rupert were moving northward. On the 11th of May they reached Droitwich, whence after two days' rest they marched against Brereton. The latter hurriedly raised the sieges he had on hand, and called upon Yorkshire and the Scottish army there for aid. But only the old Lord Fairfax and the Yorkshiremen responded. Leven had just heard of new victories won by Montrose, and could do no more than draw his army and his guns over the Pennine chain into Westmorland in the hope of being in time to bar the king's march on Scotland via Carlisle.

33. *Dundee.*—After the destruction of the Campbells at Inverlochy, Montrose had cleared away the rest of his enemies without difficulty. He now gained a respectable force of cavalry by the adhesion of Lord Gordon and many of his clan, and this reinforcement was the more necessary as detachments from Leven's army under Baillie and Hurry—disciplined infantry and cavalry—were on the march to meet him. The Royalists marched by Elgin and through the Gordon country to Aberdeen, and thence across the Esk to Coupar-Angus, where Baillie and Hurry were encountered. A war of manœuvre followed, in which they thwarted every effort of the Royalists to break through into the Lowlands, but in the end retired into Fife. Montrose thereupon marched into the hills with the intention of reaching the upper Forth and thence the Lowlands, for he did not disguise from himself the fact that there, and not in the Highlands, would the quarrel be decided, and was sanguine—over-sanguine, as the event proved—as to the support he would obtain from those who hated the kirk and its system. But he had called to his aid the semi-barbarous Highlanders, and however much the Lowlands resented a Presbyterian inquisition, they hated and feared the Highland clans beyond all else. He was equally disappointed in his own army. For a war of positions the Highlanders had neither aptitude nor inclination, and at Dunkeld the greater part of them went home. If the small remnant was to be kept to its duty, plunder must be found, and the best objective was the town of Dundee. With a small force of 750 foot and horse Montrose brilliantly surprised that place on the 4th of April, but Baillie and Hurry were not far distant, and before Montrose's men had time to plunder the prize they were collected to face the enemy. His retreat from Dundee was considered a model operation by foreign students of the art of war (then almost as numerous as now), and what surprised them most was that Montrose could rally his men after a sack had begun. The retreat itself was remarkable enough. Baillie moved parallel to Montrose on his left flank towards Arbroath, constantly heading him off from the hills and attempting to pin him against the sea. Montrose, however, halted in the dark so as to let Baillie get ahead of him and then turned sharply back, crossed Baillie's track, and made for the hills. Baillie soon realized what had happened and turned back also, but an hour too late. By the 6th the Royalists were again safe in the broken country of the Esk valley. But Montrose cherished no illusions as to joining the king at once; all he could do, he now wrote, was to neutralize as many of the enemy's forces as possible.

34. *Auldearn.*—For a time he wandered in the Highlands seeking recruits. But soon he learned that Baillie and Hurry had divided their forces, the former remaining about Perth and Stirling to observe him, the latter going north to suppress the Gordons. Strategy and policy combined to make Hurry the objective of the next expedition. But the soldier of fortune who commanded the Covenanters at Aberdeen was no mean antagonist. Marching at once with a large army (formed on the nucleus of his own trained troops and for the rest composed of clansmen and volunteers) Hurry advanced to Elgin, took contact with Montrose there, and, gradually and skilfully retiring, drew him into the hostile country round Inverness. Montrose fell into the trap, and Hurry took his measures to surprise him at Auldearn so successfully that (May 9) Montrose, even though the

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indiscipline of some of Hurry's young soldiers during the night march gave him the alarm, had barely time to form up before the enemy was upon him. But the best strategy is of no avail when the battle it produces goes against the strategist, and Montrose's tactical skill was never more conspicuous than at Auldearn. Alastair Macdonald with most of the Royalist infantry and the Royal standard was posted to the right (north) of the village to draw upon himself the weight of Hurry's attack; only enough men were posted in the village itself to show that it was occupied, and on the south side, out of sight, was Montrose himself with a body of foot and all the Gordon horse. It was the prototype, on a small scale, of Austerlitz. Macdonald resisted sturdily while Montrose edged away from the scene of action, and at the right moment and not before, though Macdonald had been driven back on the village and was fighting for life amongst the gardens and enclosures, Montrose let loose Lord Gordon's cavalry. These, abandoning for once the pistol tactics of their time, charged home with the sword. The enemy's right wing cavalry was scattered in an instant, the nearest infantry was promptly ridden down, and soon Hurry's army had ceased to exist.

35. *Campaign of Naseby.*—If the news of Auldearn brought Leven to the region of Carlisle, it had little effect on his English allies. Fairfax was not yet released from the siege of Oxford, in spite of the protests of the Scottish representatives in London. Massey, the active and successful governor of Gloucester, was placed in command of a field force on the 25th of May, but he was to lead it against, not the king, but Goring. At that moment the military situation once more changed abruptly. Charles, instead of continuing his march on to Lancashire, turned due eastward towards Derbyshire. The alarm at Westminster when this new development was reported was such that Cromwell, in spite of the Self-Denying Ordinance, was sent to raise an army for the defence of the Eastern Association. Yet the Royalists had no intentions in that direction. Conflicting reports as to the condition of Oxford reached the royal headquarters in the last week of May, and the eastward march was made chiefly to "spin out time" until it could be known whether it would be necessary to return to Oxford, or whether it was still possible to fight Leven in Yorkshire—his move into Westmorland was not yet known—and invade Scotland by the easy east coast route.

Goring's return to the west had already been countermanded and he had been directed to march to Harborough, while the South Wales Royalists were also called in towards Leicester. Later orders (May 26) directed him to Newbury, whence he was to feel the strength of the enemy's positions around Oxford. It is hardly necessary to say that Goring found good military reasons for continuing his independent operations, and marched off towards Taunton regardless of the order. He redressed the balance there for the moment by overawing Massey's weak force, and his purse profited considerably by fresh opportunities for extortion, but he and his men were not at Naseby. Meanwhile the king, at the geographical centre of England, found an important and wealthy town at his mercy. Rupert, always for action, took the opportunity, and Leicester was stormed and thoroughly pillaged on the night of the 30th-31st of May. There was the usual panic at Westminster, but, unfortunately for Charles, it resulted in Fairfax being directed to abandon the siege of Oxford and given *carte blanche* to bring the Royal army to battle wherever it was met. On his side the king had, after the capture of Leicester, accepted the advice of those who feared for the safety of Oxford—Rupert, though commander-in-chief, was unable to insist on the northern enterprise—and had marched to Daventry, where he halted to throw supplies into Oxford. Thus Fairfax in his turn was free to move, thanks to the insubordination of Goring, who would neither relieve Oxford nor join the king for an attack on the New Model. The Parliamentary general moved from Oxford towards Northampton so as to cover the Eastern Association. On the 12th of June the two armies were only a few miles apart, Fairfax at Kislingbury, Charles at Daventry, and, though the Royalists turned northward again on the 13th to resume the Yorkshire project under the very eyes of the enemy, Fairfax followed close. On the night of the 13th Charles slept at Lubenham, Fairfax at Guilsborough. Cromwell, just appointed lieutenant-general of the New Model, had ridden into camp on the morning of the 13th with fresh cavalry from the eastern counties, Colonel Rossiter came up with more from Lincolnshire on the morning of the battle, and it was with an incontestable superiority of numbers and an overwhelming moral advantage that Fairfax fought at Naseby (*q.v.*) on the 14th of June. The result of the battle, this time a decisive battle, was the annihilation of the Royal army. Part of the cavalry escaped, a small fraction of it in tolerable order, but the guns and the baggage train were taken, and, above all, the splendid Royal infantry were killed or taken prisoners to a man.

36. *Effects of Naseby.*—After Naseby, though the war dragged on for another year, the king never succeeded in raising an army as good as, or even more numerous than, that which Fairfax's army had so heavily outnumbered on the 14th of June. That the fruits of the victory could not be gathered in a few weeks was due to a variety of hindrances rather than to direct opposition—to the absence of rapid means of communication, the paucity of the forces engaged on both sides relatively to the total numbers under arms, and from time to time to the political exigencies of the growing quarrel between Presbyterians and Independents. As to the latter, within a few days of Naseby, the Scots rejoiced that the "back of the malignants was broken," and demanded reinforcements as a precaution against "the insolence of others," *i.e.* Cromwell and the Independents—"to whom alone the Lord has given the victory of that day." Leven had by now returned to Yorkshire, and a fortnight after Naseby, after a long and honourable defence by Sir Thomas Glemham, Carlisle fell to David Leslie's besieging corps. Leicester was reoccupied by Fairfax on the 18th, and on the 20th Leven's army, moving slowly southward, reached Mansfield. This move was undertaken largely for political reasons, *i.e.* to restore the Presbyterian balance as against the victorious New Model. Fairfax's army was intended by its founders to be a specifically English army, and Cromwell for one would have employed it against the Scots almost as readily as against malignants. But for the moment the advance of the northern army was of the highest military importance, for Fairfax was thereby set free from the necessity of undertaking sieges. Moreover, the publication of the king's papers taken at Naseby gave Fairfax's troops a measure of official and popular support which a month before they could not have been said to possess, for it was now obvious that they represented the armed force of England against the Irish, Danes, French, Lorrainers, &c., whom Charles had for three years been endeavouring to let loose on English soil. Even the Presbyterians abandoned for the time any attempt to negotiate with the king, and advocated a vigorous prosecution of the war.

37. *Fairfax's Western Campaign.*—This, in the hands of Fairfax and Cromwell, was likely to be effective. While the king and Rupert, with the remnant of their cavalry, hurried into South Wales to join Sir Charles Gerard's troops and to raise fresh infantry, Fairfax decided that Goring's was the most important Royalist army in the field, and turned to the west, reaching Lechlade on the 26th, less than a fortnight after the battle of Naseby. One last attempt was made to dictate the plan of campaign from Westminster, but the Committee refused to pass on the directions of the Houses, and he remained free to deal with Goring as he desired. Time pressed; Charles in Monmouthshire and Rupert at Bristol were well placed for a junction with Goring, which would have given them a united army 15,000 strong. Taunton, in spite of Massey's efforts to keep the field, was again besieged, and in Wilts and Dorset numerous bands of Clubmen were on foot which the king's officers were doing their best to turn into troops for their master. But the process of collecting a fresh royal army was slow, and Goring and his subordinate, Sir Richard Grenville, were alienating the king's most devoted adherents by their rapacity, cruelty and debauchery. Moreover, Goring had no desire to lose the independent command he had extorted at Stow-on-the-Wold in May.

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Still, it was clear that he must be disposed of as quickly as possible, and Fairfax requested the Houses to take other measures against the king (June 26). This they did by paying up the arrears due to Leven's army and bringing it to the Severn valley. On the 8th of July Leven reached Alcester, bringing with him a Parliamentarian force from Derbyshire under Sir John Gell. The design was to besiege Hereford.

38. *Langport.*—By that time Fairfax and Goring were at close quarters. The Royalist general's line of defence faced west along the Yeo and the Parrett between Yeovil and Bridgwater, and thus barred the direct route to Taunton. Fairfax, however, marched from Lechlade via Marlborough and Blandford—hindered only by Clubmen—to the friendly posts of Dorchester and Lyme, and with these as his centre of operations he was able to turn the headwaters of Goring's river-line via Beaminster and Crewkerne. The Royalists at once abandoned the south and west side of the rivers—the siege of Taunton had already been given up—and passed over to the north and east bank. Bridgwater was the right of this second line as it had been the left of the first; the new left was at Ilchester. Goring could thus remain in touch with Charles in south Wales through Bristol, and the siege of Taunton having been given up there was no longer any incentive for remaining on the wrong side of the water-line. But his army was thoroughly demoralized by its own licence and indiscipline, and the swift, handy and resolute regiments of the New Model made short work of its strong positions. On the 7th of July, demonstrating against the points of passage between Ilchester and Langport, Fairfax secretly occupied Yeovil. The post at that place, which had been the right of Goring's first position, had, perhaps rightly, been withdrawn to Ilchester when the second position was taken up, and Fairfax repaired the bridge without interruption. Goring showed himself unequal to the new situation. He might, if sober, make a good plan when the enemy was not present to disturb him, and he certainly led cavalry charges with boldness and skill. But of strategy in front of the enemy he was incapable. On the news from Yeovil he abandoned the line of the Yeo as far as Langport without striking a blow, and Fairfax, having nothing to gain by continuing his détour through Yeovil, came back and quietly crossed at Long Sutton, west of Ilchester (July 9). Goring had by now formed a new plan. A strong rearguard was posted at Langport and on high ground east and north-east of it to hold Fairfax, and he himself with the cavalry rode off early on the 8th to try and surprise Taunton. This place was no longer protected by Massey's little army, which Fairfax had called up to assist his own. But Fairfax, who was not yet across Long Sutton bridge, heard of Goring's raid in good time, and sent Massey after him with a body of horse. Massey surprised a large party of the Royalists at Ilminster on the 9th, wounded Goring himself, and pursued the fugitives up to the south-eastern edge of Langport. On the 10th Fairfax's advanced guard, led by Major Bethel of Cromwell's own regiment, brilliantly stormed the position of Goring's rearguard east of Langport, and the cavalry of the New Model, led by Cromwell himself, swept in pursuit right up to the gates of Bridgwater, where Goring's army, dismayed and on the point of collapse, was more or less rallied. Thence Goring himself retired to Barnstaple. His army, under the regimental officers, defended itself in Bridgwater resolutely till the 23rd of July, when it capitulated. The fall of Bridgwater gave Fairfax complete control of Somerset and Dorset from Lyme to the Bristol channel. Even in the unlikely event of Goring's raising a fresh army, he would now have to break through towards Bristol by open force, and a battle between Goring and Fairfax could only have one result. Thus Charles had perforce to give up his intention of joining Goring—his recruiting operations in south Wales had not been so successful as he hoped, owing to the apathy of the people and the vigour of the local Parliamentary leaders—and to resume the northern enterprise begun in the spring.

39. *Schemes of Lord Digby.*—This time Rupert would not be with him. The prince, now despairing of success and hoping only for a peace on the best terms procurable, listlessly returned to his governorship of Bristol and prepared to meet Fairfax's impending attack. The influence of Rupert was supplanted by that of Lord Digby. As sanguine as Charles and far more energetic, he was for the rest of the campaign the guiding spirit of the Royalists, but being a civilian he proved incapable of judging the military factors in the situation from a military standpoint, and not only did he offend the officers by constituting himself a sort of confidential military secretary to the king, but he was distrusted by all sections of Royalists for his reckless optimism. The resumption of the northern enterprise, opposed by Rupert and directly inspired by Digby, led to nothing. Charles marched by Bridgnorth, Lichfield and Ashbourne to Doncaster, where on the 18th of August he was met by great numbers of Yorkshire gentlemen with promises of fresh recruits. For a moment the outlook was bright, for the Derbyshire men with Gell were far away at Worcester with Leven, the Yorkshire Parliamentarians engaged in besieging Scarborough Castle, Pontefract and other posts. But two days later he heard that David Leslie with the cavalry of Leven's army was coming up behind him, and that, the Yorkshire sieges being now ended, Major-General Poyntz's force lay in his front. It was now impossible to wait for the new levies, and reluctantly the king turned back to Oxford, raiding Huntingdonshire and other parts of the hated Eastern Association *en route*.

40. *Montrose's Last Victories.*—David Leslie did not pursue him. Montrose, though the king did not yet know it, had won two more battles, and was practically master of all Scotland. After Auldearn he had turned to meet Baillie's army in Strathspey, and by superior mobility and skill forced that commander to keep at a respectful distance. He then turned upon a new army which Lindsay, titular earl of Crawford, was forming in Forfarshire, but that commander betook himself to a safe distance, and Montrose withdrew into the Highlands to find recruits (June). The victors of Auldearn had mostly dispersed on the usual errand, and he was now deserted by most of the Gordons, who were recalled by the chief of their clan, the marquess of Huntly, in spite of the indignant remonstrances of Huntly's heir, Lord Gordon, who was Montrose's warmest admirer. Baillie now approached again, but he was weakened by having to find trained troops to stiffen Lindsay's levies, and a strong force of the Gordons had now been persuaded to rejoin Montrose. The two armies met in battle near Alford on the Don; little can be said of the engagement save that Montrose had to fight cautiously and tentatively as at Aberdeen, not in the decision-forcing spirit of Auldearn, and that in the end Baillie's cavalry gave way and his infantry was cut down as it stood. Lord Gordon was amongst the Royalist dead (July 2). The plunder was put away in the glens before any attempt was made to go forward, and thus the Covenanters had leisure to form a numerous, if not very coherent, army on the nucleus of Lindsay's troops. Baillie, much against his will, was continued in the command, with a council of war (chiefly of nobles whom Montrose had already defeated, such as Argyll, Elcho and Balfour) to direct his every movement. Montrose, when rejoined by the Highlanders, moved to meet him, and in the last week of July and the early part of August there were manœuvres and minor engagements round Perth. About the 7th of August Montrose suddenly slipped away into the Lowlands, heading for Glasgow. Thereupon another Covenanting army began to assemble in Clydesdale. But it was clear that Montrose could beat mere levies, and Baillie, though without authority and despairing of success, hurried after him. Montrose then, having drawn Baillie's Fifeshire militia far enough from home to ensure their being discontented, turned upon them on the 14th of August near Kilsyth. Baillie protested against fighting, but his aristocratic masters of the council of war decided to cut off Montrose from the hills by turning his left wing. The Royalist general seized the opportunity, and his advance caught them in the very act of making a flank march (August 15). The head of the Covenanters' column was met and stopped by the furious attack of the Gordon infantry, and Alastair Macdonald led the men of his own name and the Macleans against its flank. A breach was made in the centre of Baillie's army at the first rush, and then

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Montrose sent in the Gordon and Ogilvy horse. The leading half of the column was surrounded, broken up and annihilated. The rear half, seeing the fate of its comrades, took to flight, but in vain, for the Highlanders pursued *à outrance*. Only about one hundred Covenanting infantry out of six thousand escaped. Montrose was now indeed the king's lieutenant in all Scotland.

41. *Fall of Bristol.*—But Charles was in no case to resume his northern march. Fairfax and the New Model, after reducing Bridgwater, had turned back to clear away the Dorsetshire Clubmen and to besiege Sherborne Castle. On the completion of this task, it had been decided to besiege Bristol, and on the 23rd of August—while the king's army was still in Huntingdon, and Goring was trying to raise a new army to replace the one he had lost at Langport and Bridgwater—the city was invested. In these urgent circumstances Charles left Oxford for the west only a day or two after he had come in from the Eastern Association raid. Calculating that Rupert could hold out longest, he first moved to the relief of Worcester, around which place Leven's Scots, no longer having Leslie's cavalry with them to find supplies, were more occupied with plundering their immediate neighbourhood for food than with the siege works. Worcester was relieved on the 1st of September by the king. David Leslie with all his cavalry was already on the march to meet Montrose, and Leven had no alternative but to draw off his infantry without fighting. Charles entered Worcester on the 8th, but he found that he could no longer expect recruits from South Wales. Worse was to come. A few hours later, on the night of the 9th–10th, Fairfax's army stormed Bristol. Rupert had long realized the hopelessness of further fighting—the very summons to surrender sent in by Fairfax placed the fate of Bristol on the political issue, —the lines of defence around the place were too extensive for his small force, and on the 11th he surrendered on terms. He was escorted to Oxford with his men, conversing as he rode with the officers of the escort about peace and the future of his adopted country. Charles, almost stunned by the suddenness of the catastrophe, dismissed his nephew from all his offices and ordered him to leave England, and for almost the last time called upon Goring to rejoin the main army—if a tiny force of raw infantry and disheartened cavalry can be so called—in the neighbourhood of Raglan. But before Goring could be brought to withdraw his objections Charles had again turned northward towards Montrose. A weary march through the Welsh hills brought the Royal army on the 22nd of September to the neighbourhood of Chester. Charles himself with one body entered the city, which was partially invested by the Parliamentarian colonel Michael Jones, and the rest under Sir Marmaduke Langdale was sent to take Jones's lines in reverse. But at the opportune moment Poyntz's forces, which had followed the king's movements since he left Doncaster in the middle of August, appeared in rear of Langdale, and defeated him in the battle of Rowton Heath (September 24), while at the same time a sortie of the king's troops from Chester was repulsed by Jones. Thereupon the Royal army withdrew to Denbigh, and Chester, the only important seaport remaining to connect Charles with Ireland, was again besieged.

42. *Philiphaugh.*—Nor was Montrose's position, even after Kilsyth, encouraging, in spite of the persistent rumours of fighting in Westmorland that reached Charles and Digby. Glasgow and Edinburgh were indeed occupied, and a parliament summoned in the king's name. But Montrose had now to choose between Highlanders and Lowlanders. The former, strictly kept away from all that was worth plundering, rapidly vanished, even Alastair Macdonald going with the rest. Without the Macdonalds and the Gordons, Montrose's military and political resettlement of Scotland could only be shadowy, and when he demanded support from the sturdy middle classes of the Lowlands, it was not forgotten that he had led Highlanders to the sack of Lowland towns. Thus his new supporters could only come from amongst the discontented and undisciplined Border lords and gentry, and long before these moved to join him the romantic conquest of Scotland was over. On the 6th of September David Leslie had recrossed the frontier with his cavalry and some infantry he had picked up on the way through northern England. Early on the morning of the 13th he surprised Montrose at Philiphaugh near Selkirk. The king's lieutenant had only 650 men against 4000, and the battle did not last long. Montrose escaped with a few of his principal adherents, but his little army was annihilated. Of the veteran Macdonald infantry, 500 strong that morning, 250 were killed in the battle and the remainder put to death after accepting quarter. The Irish, even when they bore a Scottish name, were, by Scotsmen even more than Englishmen, regarded as beasts to be knocked on the head. After Naseby the Irishwomen found in the king's camp were branded by order of Fairfax; after Philiphaugh more than 300 women, wives or followers of Macdonald's men, were butchered. Montrose's Highlanders at their worst were no more cruel than the sober soldiers of the kirk.

43. *Digby's Northern Expedition.*—Charles received the news of Philiphaugh on the 28th of September, and gave orders that the west should be abandoned, the prince of Wales should be sent to France, and Goring should bring up what forces he could to the Oxford region. On the 4th of October Charles himself reached Newark (whither he had marched from Denbigh after revictualling Chester and suffering the defeat of Rowton Heath). The intention to go to Montrose was of course given up, at any rate for the present, and he was merely waiting for Goring and the Royalist militia of the west—each in its own way a broken reed to lean upon. A hollow reconciliation was patched up between Charles and Rupert, and the court remained at Newark for over a month. Before it set out to return to Oxford another Royalist force had been destroyed. On the 14th of October, receiving information that Montrose had raised a new army, the king permitted Langdale's northern troops to make a fresh attempt to reach Scotland. At Langdale's request Digby was appointed to command in this enterprise, and, civilian though he was, and disastrous though his influence had been to the discipline of the army, he led it boldly and skilfully. His immediate opponent was Poyntz, who had followed the king step by step from Doncaster to Chester and back to Welbeck, and he succeeded on the 15th in surprising Poyntz's entire force of foot at Sherburn. Poyntz's cavalry were soon after this reported approaching from the south, and Digby hoped to trap them also. At first all went well and body after body of the rebels was routed. But by a singular mischance the Royalist main body mistook the Parliamentary squadrons in flight through Sherburn for friends, and believing all was lost took to flight also. Thus Digby's cavalry fled as fast as Poyntz's and in the same direction, and the latter, coming to their senses first, drove the Royalist horse in wild confusion as far as Skipton. Lord Digby was still sanguine, and from Skipton he actually penetrated as far as Dumfries. But whether Montrose's new army was or was not in the Lowlands, it was certain that Leven and Leslie were on the Border, and the mad adventure soon came to an end. Digby, with the mere handful of men remaining to him, was driven back into Cumberland, and on the 24th of October, his army having entirely disappeared, he took ship with his officers for the Isle of Man. Poyntz had not followed him beyond Skipton, and was now watching the king from Nottingham, while Rossiter with the Lincoln troops was posted at Grantham. The king's chances of escaping from Newark were becoming smaller day by day, and they were not improved by a violent dispute between him and Rupert, Maurice, Lord Gerard and Sir Richard Willis, at the end of which these officers and many others rode away to ask the Parliament for leave to go over-seas. The pretext for the quarrel mattered little, the distinction between the views of Charles and Digby on the one hand and Rupert and his friends on the other was fundamental—to the latter peace had become a political as well as a military necessity. Meanwhile south Wales, with the single exception of Raglan Castle, had been overrun by the Parliamentarians. Everywhere the Royalist posts were falling. The New Model, no longer fearing Goring, had divided, Fairfax reducing the garrisons of Dorset and Devon, Cromwell those of Hampshire. Amongst the latter was the famous Basing House, which was stormed at dawn on the

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14th of October and burnt to the ground. Cromwell, his work finished, returned to headquarters, and the army wintered in the neighbourhood of Crediton.

44. *End of the First War.*—The military events of 1646 call for no comment. The only field army remaining to the king was Goring's, and though Hopton, who sorrowfully accepted the command after Goring's departure, tried at the last moment to revive the memories and the local patriotism of 1643, it was of no use to fight against the New Model with the armed rabble that Goring turned over to him. Dartmouth surrendered on January 18, Hopton was defeated at Torrington on February 16, and surrendered the remnant of his worthless army on March 14. Exeter fell on April 13. Elsewhere, Hereford was taken on December 17, 1645, and the last battle of the war was fought and lost at Stow-on-the-Wold by Lord Astley on March 21, 1646. Newark and Oxford fell respectively on May 6 and June 24. On August 31 Montrose escaped from the Highlands. On the 19th of the same month Raglan Castle surrendered, and the last Royalist post of all, Harlech Castle, maintained the useless struggle until March 13, 1647. Charles himself, after leaving Newark in November 1645, had spent the winter in and around Oxford, whence, after an adventurous journey, he came to the camp of the Scottish army at Southwell on May 5, 1646.

45. *Second Civil War (1648–52).*—The close of the First Civil War left England and Scotland in the hands potentially of any one of the four parties or any combination of two or more that should prove strong enough to dominate the rest. Armed political Royalism was indeed at an end, but Charles, though practically a prisoner, considered himself and was, almost to the last, considered by the rest as necessary to ensure the success of whichever amongst the other three parties could come to terms with him. Thus he passed successively into the hands of the Scots, the Parliament and the New Model, trying to reverse the verdict of arms by coquetting with each in turn. The Presbyterians and the Scots, after Cornet Joyce of Fairfax's horse seized upon the person of the king for the army (June 3, 1647), began at once to prepare for a fresh civil war, this time against Independency, as embodied in the New Model—henceforward called the Army—and after making use of its sword, its opponents attempted to disband it, to send it on foreign service, to cut off its arrears of pay, with the result that it was exasperated beyond control, and, remembering not merely its grievances but also the principle for which it had fought, soon became the most powerful political party in the realm. From 1646 to 1648 the breach between army and parliament widened day by day until finally the Presbyterian party, combined with the Scots and the remaining Royalists, felt itself strong enough to begin a second civil war.

46. *The English War.*—In February 1648 Colonel Poyer, the Parliamentary governor of Pembroke Castle, refused to hand over his command to one of Fairfax's officers, and he was soon joined by some hundreds of officers and men, who mutinied, ostensibly for arrears of pay, but really with political objects. At the end of March, encouraged by minor successes, Poyer openly declared for the king. Disbanded soldiers continued to join him in April, all South Wales revolted, and eventually he was joined by Major-General Laugharne, his district commander, and Colonel Powel. In April also news came that the Scots were arming and that Berwick and Carlisle had been seized by the English Royalists. Cromwell was at once sent off at the head of a strong detachment to deal with Laugharne and Poyer. But before he arrived Laugharne had been severely defeated by Colonel Horton at St Fagans (May 8). The English Presbyterians found it difficult to reconcile their principles with their allies when it appeared that the prisoners taken at St Fagans bore "We long to see our King" on their hats; very soon in fact the English war became almost purely a Royalist revolt, and the war in the north an attempt to enforce a mixture of Royalism and Presbyterianism on Englishmen by means of a Scottish army. The former were disturbers of the peace and no more. Nearly all the Royalists who had fought in the First Civil War had given their parole not to bear arms against the Parliament, and many honourable Royalists, foremost amongst them the old Lord Astley, who had fought the last battle for the king in 1646, refused to break their word by taking any part in the second war. Those who did so, and by implication those who abetted them in doing so, were likely to be treated with the utmost rigour if captured, for the army was in a less placable mood in 1648 than in 1645, and had already determined to "call Charles Stuart, that man of blood, to an account for the blood he had shed." On the 21st of May Kent rose in revolt in the king's name. A few days later a most serious blow to the Independents was struck by the defection of the navy, from command of which they had removed Vice-Admiral Batten, as being a Presbyterian. Though a former lord high admiral, the earl of Warwick, also a Presbyterian, was brought back to the service, it was not long before the navy made a purely Royalist declaration and placed itself under the command of the prince of Wales. But Fairfax had a clearer view and a clearer purpose than the distracted Parliament. He moved quickly into Kent, and on the evening of June 1 stormed Maidstone by open force, after which the local levies dispersed to their homes, and the more determined Royalists, after a futile attempt to induce the City of London to declare for them, fled into Essex. In Cornwall, Northamptonshire, North Wales and Lincolnshire the revolt collapsed as easily. Only in South Wales, Essex and the north of England was there serious fighting. In the first of these districts Cromwell rapidly reduced all the fortresses except Pembroke, where Laugharne, Poyer and Powel held out with the desperate courage of deserters. In the north, Pontefract was surprised by the Royalists, and shortly afterwards Scarborough Castle declared for the king. Fairfax, after his success at Maidstone and the pacification of Kent, turned northward to reduce Essex, where, under their ardent, experienced and popular leader Sir Charles Lucas, the Royalists were in arms in great numbers. He soon drove the enemy into Colchester, but the first attack on the town was repulsed and he had to settle down to a long and wearisome siege *en règle*. A Surrey rising, remembered only for the death of the young and gallant Lord Francis Villiers in a skirmish at Kingston (July 7), collapsed almost as soon as it had gathered force, and its leaders, the duke of Buckingham and the earl of Holland, escaped, after another attempt to induce London to declare for them, to St Albans and St Neots, where Holland was taken prisoner. Buckingham escaped over-seas.

47. *Lambert in the North.*—By the 10th of July therefore the military situation was well defined. Cromwell held Pembroke, Fairfax Colchester, Lambert Pontefract under siege; elsewhere all serious local risings had collapsed, and the Scottish army had crossed the Border. It is on the adventures of the latter that the interest of the war centres. It was by no means the veteran army of Leven, which had long been disbanded. For the most part it consisted of raw levies, and as the kirk had refused to sanction the enterprise of the Scottish parliament, David Leslie and thousands of experienced officers and men declined to serve. The duke of Hamilton proved to be a poor substitute for Leslie; his army, too, was so ill provided that as soon as England was invaded it began to plunder the countryside for the bare means of sustenance. Major-General Lambert, a brilliant young general of twenty-nine, was more than equal to the situation. He had already left the sieges of Pontefract and Scarborough to Colonel Rossiter, and hurried into Cumberland to deal with the English Royalists under Sir Marmaduke Langdale. With his cavalry he got into touch with the enemy about Carlisle and slowly fell back, fighting small rearguard actions to annoy the enemy and gain time, to Bowes and Barnard Castle. Langdale did not follow him into the mountains, but occupied himself in gathering recruits and supplies of material and food for the Scots. Lambert, reinforced from the midlands, reappeared early in June and drove him back to Carlisle with his work half finished. About the same time the local horse of Durham and Northumberland were put into the field by Sir A. Hesilrige, governor of Newcastle, and under the command of Colonel Robert Lilburne won a considerable success (June 30) at the river Coquet. This reverse, coupled with the existence of Langdale's

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force on the Cumberland side, practically compelled Hamilton to choose the west coast route for his advance, and his army began slowly to move down the long *couloir* between the mountains and the sea. The campaign which followed is one of the most brilliant in English history.

48. *Campaign of Preston.*—On the 8th of July the Scots, with Langdale as advanced guard, were about Carlisle, and reinforcements from Ulster were expected daily. Lambert's horse were at Penrith, Hexham and Newcastle, too weak to fight and having only skilful leading and rapidity of movement to enable them to gain time. Far away to the south Cromwell was still tied down before Pembroke, Fairfax before Colchester. Elsewhere the rebellion, which had been put down by rapidity of action rather than sheer weight of numbers, smouldered, and Prince Charles and the fleet cruised along the Essex coast. Cromwell and Lambert, however, understood each other perfectly, while the Scottish commanders quarrelled with Langdale and each other. Appleby Castle surrendered to the Scots on the 31st of July, whereat Lambert, who was still hanging on to the flank of the Scottish advance, fell back from Barnard Castle to Richmond so as to close Wensleydale against any attempt of the invaders to march on Pontefract. All the restless energy of Langdale's horse was unable to dislodge him from the passes or to find out what was behind that impenetrable cavalry screen. The crisis was now at hand. Cromwell had received the surrender of Pembroke on the 11th, and had marched off, with his men unpaid, ragged and shoeless, at full speed through the midlands. Rains and storms delayed his march, but he knew that Hamilton in the broken ground of Westmorland was still worse off. Shoes from Northampton and stockings from Coventry met him at Nottingham, and, gathering up the local levies as he went, he made for Doncaster, where he arrived on the 8th of August, having gained six days in advance of the time he had allowed himself for the march. He then called up artillery from Hull, exchanged his local levies for the regulars who were besieging Pontefract, and set off to meet Lambert. On the 12th he was at Wetherby, Lambert with horse and foot at Otley, Langdale at Skipton and Gargrave, Hamilton at Lancaster, and Sir George Monro with the Scots from Ulster and the Carlisle Royalists (organized as a separate command owing to friction between Monro and the generals of the main army) at Hornby. On the 13th, while Cromwell was marching to join Lambert at Otley, the Scottish leaders were still disputing as to whether they should make for Pontefract or continue through Lancashire so as to join Lord Byron and the Cheshire Royalists.

49. *Preston Fight.*—On the 14th Cromwell and Lambert were at Skipton, on the 15th at Gisburn, and on the 16th they marched down the valley of the Ribble towards Preston with full knowledge of the enemy's dispositions and full determination to attack him. They had with them horse and foot not only of the army, but also of the militia of Yorkshire, Durham, Northumberland and Lancashire, and withal were heavily outnumbered, having only 8600 men against perhaps 20,000 of Hamilton's command. But the latter were scattered for convenience of supply along the road from Lancaster, through Preston, towards Wigan, Langdale's corps having thus become the left flank guard instead of the advanced guard. Langdale called in his advanced parties, perhaps with a view to resuming the duties of advanced guard, on the night of the 13th, and collected them near Longridge. It is not clear whether he reported Cromwell's advance, but, if he did, Hamilton ignored the report, for on the 17th Monro was half a day's march to the north, Langdale east of Preston, and the main army strung out on the Wigan road, Major-General Baillie with a body of foot, the rear of the column, being still in Preston. Hamilton, yielding to the importunity of his lieutenant-general, the earl of Callendar, sent Baillie across the Ribble to follow the main body just as Langdale, with 3000 foot and 500 horse only, met the first shock of Cromwell's attack on Preston Moor. Hamilton, like Charles at Edgehill, passively shared in, without directing, the battle, and, though Langdale's men fought magnificently, they were after four hours' struggle driven to the Ribble. Baillie attempted to cover the Ribble and Darwen bridges on the Wigan road, but Cromwell had forced his way across both before nightfall. Pursuit was at once undertaken, and not relaxed until Hamilton had been driven through Wigan and Winwick to Uttoxeter and Ashbourne. There, pressed furiously in rear by Cromwell's horse and held up in front by the militia of the midlands, the remnant of the Scottish army laid down its arms on the 25th of August. Various attempts were made to raise the Royalist standard in Wales and elsewhere, but Preston was the death-blow. On the 28th of August, starving and hopeless of relief, the Colchester Royalists surrendered to Lord Fairfax. The victors in the Second Civil War were not merciful to those who had brought war into the land again. On the evening of the surrender of Colchester, Sir Charles Lucas and Sir George Lisle were shot. Laugharne, Poyer and Powel were sentenced to death, but Poyer alone was executed on the 25th of April 1649, being the victim selected by lot. Of five prominent Royalist peers who had fallen into the hands of the Parliament, three, the duke of Hamilton, the earl of Holland, and Lord Capel, one of the Colchester prisoners and a man of high character, were beheaded at Westminster on the 9th of March. Above all, after long hesitations, even after renewal of negotiations, the army and the Independents "purged" the House of their ill-wishers, and created a court for the trial and sentence of the king. The more resolute of the judges nerved the rest to sign the death-warrant, and Charles was beheaded at Whitehall on the 30th of January.

50. *Cromwell in Ireland.*—The campaign of Preston was undertaken under the direction of the Scottish parliament, not the kirk, and it needed the execution of the king to bring about a union of all Scottish parties against the English Independents. Even so, Charles II. in exile had to submit to long negotiations and hard conditions before he was allowed to put himself at the head of the Scottish armies. The marquis of Huntly was executed for taking up arms for the king on the 22nd of March 1649. Montrose, under Charles's directions, made a last attempt to rally the Scottish Royalists early in 1650. But Charles merely used Montrose as a threat to obtain better conditions for himself from the Covenanters, and when the nobles of all the Royalists was defeated (Carbisdale, April 27), delivered up to his pursuers (May 4), and executed (May 21, 1650), he was not ashamed to give way to the demands of the Covenanters, and to place himself at the head of Montrose's executioners. His father, whatever his faults, had at least chosen to die for an ideal, the Church of England. Charles II. now proposed to regain the throne by allowing Scotland to impose Presbyterianism on England, and dismissed all the faithful Cavaliers who had followed him to exile. Meanwhile, Ireland, in which a fresh war, with openly anti-English and anti-Protestant objects, had broken out in 1648, was thoroughly reduced to order by Cromwell, who beat down all resistance by his skill, and even more by his ruthless severity, in a brief campaign of nine months (battle of Rathmines near Dublin, won by Colonel Michael Jones, August 2, 1649; storming of Drogheda, September 11, and of Wexford, October 11, by Cromwell; capture of Kilkenny, March 28, 1650, and of Clonmel, May 10). Cromwell returned to England at the end of May 1650, and on June 26 Fairfax, who had been anxious and uneasy since the execution of the king, resigned the command-in-chief of the army to his lieutenant-general. The pretext, rather than the reason, of Fairfax's resignation was his unwillingness to lead an English army to reduce Scotland.

51. *The Invasion of Scotland.*—This important step had been resolved upon as soon as it was clear that Charles II. would come to terms with the Covenanters. From this point the Second Civil War becomes a war of England against Scotland. Here at least the Independents carried the whole of England with them. No Englishman cared to accept a settlement at the hands of a victorious foreign army, and on the 28th of June, five days after Charles II. had sworn to the Covenant, the new lord-general was on his way to the Border to take command of the English army. About the same time a new militia act was passed that was destined to give full and decisive effect to the

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national spirit of England in the great final campaign of the war. Meanwhile the motto *frappez fort, frappez vite* was carried out at once by the regular forces. On the 19th of July 1650 Cromwell made the final arrangements at Berwick-on-Tweed. Major-General Harrison, a gallant soldier and an extreme Independent, was to command the regular and auxiliary forces left in England, and to secure the Commonwealth against Royalists and Presbyterians. Cromwell took with him Fleetwood as lieutenant-general and Lambert as major-general, and his forces numbered about 10,000 foot and 5000 horse. His opponent David Leslie (his comrade of Marston Moor) had a much larger force, but its degree of training was inferior, it was more than tainted by the political dissensions of the people at large, and it was, in great part at any rate, raised by forced enlistment. On the 22nd of July Cromwell crossed the Tweed. He marched on Edinburgh by the sea coast, through Dunbar, Haddington and Musselburgh, living almost entirely on supplies landed by the fleet which accompanied him—for the country itself was incapable of supporting even a small army—and on the 29th he found Leslie's army drawn up and entrenched in a position extending from Leith to Edinburgh.

52. *Operations around Edinburgh.*—The same day a sharp but indecisive fight took place on the lower slopes of Arthur's Seat, after which Cromwell, having felt the strength of Leslie's line, drew back to Musselburgh. Leslie's horse followed him up sharply, and another action was fought, after which the Scots assaulted Musselburgh without success. Militarily Leslie had the best of it in these affairs, but it was precisely this moment that the kirk party chose to institute a searching three days' examination of the political and religious sentiments of his army. The result was that the army was "purged" of 80 officers and 3000 soldiers as it lay within musket shot of the enemy. Cromwell was more concerned, however, with the supply question than with the distracted army of the Scots. On the 6th of August he had to fall back as far as Dunbar to enable the fleet to land supplies in safety, the port of Musselburgh being unsafe in the violent and stormy weather which prevailed. He soon returned to Musselburgh and prepared to force Leslie to battle. In preparation for an extended manœuvre three days' rations were served out. Tents were also issued, perhaps for the first time in the civil wars, for it was a regular professional army, which had to be cared for, made comfortable and economized, that was now carrying on the work of the volunteers of the first war. Even after Cromwell started on his manœuvre, the Scottish army was still in the midst of its political troubles, and, certain though he was that nothing but victory in the field would give an assured peace, he was obliged to intervene in the confused negotiations of the various Scottish parties. At last, however, Charles II. made a show of agreeing to the demands of his strange supporters, and Leslie was free to move. Cromwell had now entered the hill country, with a view to occupying Queensferry and thus blocking up Edinburgh. Leslie had the shorter road and barred the way at Corstorphine Hill (August 21). Cromwell, though now far from his base, manœuvred again to his right, Leslie meeting him once more at Gogar (August 27). The Scottish lines at that point were strong enough to dismay even Cromwell, and the manœuvre on Queensferry was at last given up. It had cost the English army severe losses in sick, and much suffering in the autumn nights on the bleak hillsides.

53. *Dunbar.*—On the 28th Cromwell fell back on Musselburgh, and on the 31st, after embarking his non-effective men, to Dunbar. Leslie followed him up, and wished to fight a battle at Dunbar on Sunday, the 1st of September. But again the kirk intervened, this time to forbid Leslie to break the Sabbath, and the unfortunate Scottish commander could only establish himself on Doon Hill (see DUNBAR) and send a force to Cockburnspath to bar the Berwick road. He had now 23,000 men to Cromwell's 11,000, and proposed, *faute de mieux*, to starve Cromwell into surrender. But the English army was composed of "ragged soldiers with bright muskets," and had a great captain of undisputed authority at their head. Leslie's, on the other hand, had lost such discipline as it had ever possessed, and was now, under outside influences, thoroughly disintegrated. Cromwell wrote home, indeed, that he was "upon an engagement very difficult," but, desperate as his position seemed, he felt the pulse of his opponent and steadily refused to take his army away by sea. He had not to wait long. It was now the turn of Leslie's men on the hillside to endure patiently privation and exposure, and after one night's bivouac, Leslie, too readily inferring that the enemy was about to escape by sea, came down to fight. The battle of Dunbar (*q.v.*) opened in the early morning of the 3rd of September. It was the most brilliant of all Oliver's victories. Before the sun was high in the heavens the Scottish army had ceased to exist.

54. *Royalism in Scotland.*—After Dunbar it was easy for the victorious army to overrun southern Scotland, more especially as the dissensions of the enemy were embittered by the defeat of which they had been the prime cause. The kirk indeed put Dunbar to the account of its own remissness in not purging their army more thoroughly, but, as Cromwell wrote on the 4th of September, the kirk had "done its do." "I believe their king will set up on his own score," he continued, and indeed, now that the army of the kirk was destroyed and they themselves were secure behind the Forth and based on the friendly Highlands, Charles and the Cavaliers were in a position not only to defy Cromwell, but also to force the Scottish national spirit of resistance to the invader into a purely Royalist channel. Cromwell had only received a few drafts and reinforcements from England, and for the present he could but block up Edinburgh Castle (which surrendered on Christmas eve), and try to bring up adequate forces and material for the siege of Stirling—an attempt which was frustrated by the badness of the roads and the violence of the weather. The rest of the early winter of 1650 was thus occupied in semi-military, semi-political operations between detachments of the English army and certain armed forces of the kirk party which still maintained a precarious existence in the western Lowlands, and in police work against the moss-troopers of the Border counties. Early in February 1651, still in the midst of terrible weather, Cromwell made another resolute but futile attempt to reach Stirling. This time he himself fell sick, and his losses had to be made good by drafts of recruits from England, many of whom came most unwillingly to serve in the cold wet bivouacs that the newspapers had graphically reported.[1]

55. *The English Militia.*—About this time there occurred in England two events which had a most important bearing on the campaign. The first was the detection of a widespread Royalist-Presbyterian conspiracy—how widespread no one knew, for those of its promoters who were captured and executed certainly formed but a small fraction of the whole number. Harrison was ordered to Lancashire in April to watch the north Welsh, Isle of Man and Border Royalists, and military precautions were taken in various parts of England. The second was the revival of the militia. Since 1644 there had been no general employment of local forces, the quarrel having fallen into the hands of the regular armies by force of circumstances. The New Model, though a national army, resembled Wellington's Peninsular army more than the soldiers of the French Revolution and the American Civil War. It was now engaged in prosecuting a war of aggression against the hereditary foe over the Border—strictly the task of a professional army with a national basis. The militia was indeed raw and untrained. Some of the Essex men "fell flat on their faces on the sound of a cannon." In the north of England Harrison complained to Cromwell of the "badness" of his men, and the lord general sympathized, having "had much such stuff" sent him to make good the losses in trained men. Even he for a moment lost touch with the spirit of the people. His recruits were unwilling drafts for foreign service, but in England the new levies were trusted to defend

[1] The tents were evidently issued for regular marches, not for cross-country manœuvres against the enemy. These manœuvres, as we have seen, often took several days. The *bon général ordinaire* of the 17th and 18th centuries framed his manœuvres on a smaller scale so as not to expose his expensive and highly trained soldiers to discomfort and the consequent temptation to desert.

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their homes, and the militia was soon triumphantly to justify its existence on the day of Worcester.

56. *Inverkeithing.*—While David Leslie organized and drilled the king's new army beyond the Forth, Cromwell was, slowly and with frequent relapses, recovering from his illness. The English army marched to Glasgow in April, then returned to Edinburgh. The motives of the march and that of the return are alike obscure, but it may be conjectured that, the forces in England under Harrison having now assembled in Lancashire, the Edinburgh-Newcastle-York road had to be covered by the main army. Be this as it may, Cromwell's health again broke down and his life was despaired of. Only late in June were operations actively resumed between Stirling and Linlithgow. At first Cromwell sought without success to bring Leslie to battle, but he stormed Callendar House near Falkirk on July 13, and on the 16th of July he began the execution of a brilliant and successful manœuvre. A force from Queensferry, covered by the English fleet, was thrown across the Firth of Forth to Northferry. Lambert followed with reinforcements, and defeated a detachment of Leslie's army at Inverkeithing on the 20th. Leslie drew back at once, but managed to find a fresh strong position in front of Stirling, whence he defied Cromwell again. At this juncture Cromwell prepared to pass his whole army across the firth. His contemplated manœuvre of course gave up to the enemy all the roads into England, and before undertaking it the lord general held a consultation with Harrison, as the result of which that officer took over the direct defence of the whole Border. But his mind was made up even before this, for on the day he met Harrison at Linlithgow three-quarters of his whole army had already crossed into Fife. Burntisland, surrendered to Lambert on the 29th, gave Cromwell a good harbour upon which to base his subsequent movements. On the 30th of July the English marched upon Perth, and the investment of this place, the key to Leslie's supply area, forced the crisis at once. Whether Leslie would have preferred to manœuvre Cromwell from his vantage-ground or not is immaterial; the young king and the now predominant Royalist element at headquarters seized the long-awaited opportunity at once, and on the 31st, leaving Cromwell to his own devices, the Royal army marched southward to raise the Royal standard in England.

57. *The Third Scottish Invasion of England.*—Then began the last and most thrilling campaign of the Great Rebellion. Charles II. expected complete success. In Scotland, *vis-à-vis* the extreme Covenanters, he was a king on conditions, and he was glad enough to find himself in England with some thirty solidly organized regiments under Royalist officers and with no regular army in front of him. He hoped, too, to rally not merely the old faithful Royalists, but also the overwhelming numerical strength of the English Presbyterians to his standard. His army was kept well in hand, no excesses were allowed, and in a week the Royalists covered 150 m.—in marked contrast to the duke of Hamilton's ill-fated expedition of 1648. On the 8th of August the troops were given a well-earned rest between Penrith and Kendal.

But the Royalists were mistaken in supposing that the enemy was taken aback by their new move. Everything had been foreseen both by Cromwell and by the Council of State in Westminster. The latter had called out the greater part of the militia on the 7th. Lieutenant-General Fleetwood began to draw together the midland contingents at Banbury, the London trained bands turned out for field service no fewer than 14,000 strong. Every suspected Royalist was closely watched, and the magazines of arms in the country-houses of the gentry were for the most part removed into the strong places. On his part Cromwell had quietly made his preparations. Perth passed into his hands on the 2nd of August, and he brought back his army to Leith by the 5th. Thence he despatched Lambert with a cavalry corps to harass the invaders. Harrison was already at Newcastle picking the best of the county mounted troops to add to his own regulars. On the 9th Charles was at Kendal, Lambert hovering in his rear, and Harrison marching swiftly to bar his way at the Mersey. Fairfax emerged for a moment from his retirement to organize the Yorkshire levies, and the best of these as well as of the Lancashire, Cheshire and Staffordshire militias were directed upon Warrington, which point Harrison reached on the 15th, a few hours in front of Charles's advanced guard. Lambert too, slipping round the left flank of the enemy, joined Harrison, and the English fell back (16th), slowly and without letting themselves be drawn into a fight, along the London road.

58. *Campaign of Worcester.*—Cromwell meanwhile, leaving Monk with the least efficient regiments to carry on the war in Scotland, had reached the Tyne in seven days, and thence, marching 20 m. a day in extreme heat—with the country people carrying their arms and equipment—the regulars entered Ferrybridge on the 19th, at which date Lambert, Harrison and the north-western militia were about Congleton.[1] It seemed probable that a great battle would take place between Lichfield and Coventry about the 25th or 26th of August, and that Cromwell, Harrison, Lambert and Fleetwood would all take part in it. But the scene and the date of the *denouement* were changed by the enemy's movements. Shortly after leaving Warrington the young king had resolved to abandon the direct march on London and to make for the Severn valley, where his father had found the most constant and the most numerous adherents in the first war, and which had been the centre of gravity of the English Royalist movement of 1648. Sir Edward Massey, formerly the Parliamentary governor of Gloucester, was now with Charles, and it was hoped that he would induce his fellow-Presbyterians to take arms. The military quality of the Welsh border Royalists was well proved, that of the Gloucestershire Presbyterians not less so, and, based on Gloucester and Worcester as his father had been based on Oxford, Charles II. hoped, not unnaturally, to deal with an Independent minority more effectually than Charles I. had done with a Parliamentary majority of the people of England. But even the pure Royalism which now ruled in the invading army could not alter the fact that it was a Scottish army, and it was not an Independent faction but all England that took arms against it. Charles arrived at Worcester on the 22nd of August, and spent five days in resting the troops, preparing for further operations, and gathering and arming the few recruits who came in. It is unnecessary to argue that the delay was fatal; it was a necessity of the case foreseen and accepted when the march to Worcester had been decided upon, and had the other course, that of marching on London via Lichfield, been taken the battle would have been fought three days earlier with the same result. As affairs turned out Cromwell merely shifted the area of his concentration two marches to the south-west, to Evesham. Early on the 28th Lambert surprised the passage of the Severn at Upton, 6 m. below Worcester, and in the action which followed Massey was severely wounded. Fleetwood followed Lambert. The enemy was now only 16,000 strong and disheartened by the apathy with which they had been received in districts formerly all their own. Cromwell, for the first and last time in his military career, had a two-to-one numerical superiority.

59. *The "Crowning Mercy."*—He took his measures deliberately. Lilburne from Lancashire and Major Mercer with the Worcestershire horse were to secure Bewdley Bridge on the enemy's line of retreat. Lambert and Fleetwood were to force their way across the Teme (a little river on which Rupert had won his first victory in 1642) and attack St John's, the western suburb of Worcester. Cromwell himself and the main army were to attack the town itself. On the 3rd of September, the anniversary of Dunbar, the programme was carried out exactly. Fleetwood forced the passage of the Teme, and the bridging train (which had been carefully organized for the purpose) bridged both the Teme and the Severn. Then Cromwell on the left bank and Fleetwood on the right swept in a semicircle 4 m. long up to Worcester. Every hedgerow was contested by the stubborn Royalists, but Fleetwood's men would not be denied, and Cromwell's extreme right on the eastern side of the town repelled, after three hours' hard fighting, the last desperate attempt of the Royalists to break

[1] The lord general had during his march thrown out successively two flying columns under Colonel Lilburne to deal with the Lancashire Royalists under the earl of Derby. Lilburne entirely routed the enemy at Wigan on the 25th of August.

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out. It was indeed, as a German critic[1] has pointed out, the prototype of Sedan. Everywhere the defences were stormed as darkness came on, regulars and militia fighting with equal gallantry, and the few thousands of the Royalists who escaped during the night were easily captured by Lilburne and Mercer, or by the militia which watched every road in Yorkshire and Lancashire. Even the country people brought in scores of prisoners, for officers and men alike, stunned by the suddenness of the disaster, offered no resistance. Charles escaped after many adventures, but he was one of the few men in his army who regained a place of safety. The Parliamentary militia were sent home within a week. Cromwell, who had ridiculed "such stuff" six months ago, knew them better now. "Your new raised forces," he wrote to the House, "did perform singular good service, for which they deserve a very high estimation and acknowledgment." Worcester resembled Sedan in much more than outward form. Both were fought by "nations in arms," by citizen soldiers who had their hearts in the struggle, and could be trusted not only to fight their hardest but to march their best. Only with such troops would a general dare to place a deep river between the two halves of his army or to send away detachments beforehand to reap the fruits of victory, in certain anticipation of winning the victory with the remainder. The sense of duty, which the raw militia possessed in so high a degree, ensured the arrival and the action of every column at the appointed time and place. The result was, in Napier, one of those rare victories in which a pursuit is superfluous—a "crowning mercy," as Cromwell called it. There is little of note in the closing operations. Monk had completed his task by May 1652; and Scotland, which had twice attempted to impose its will on England, found itself reduced to the position of an English province under martial law. The details of its subjection are uninteresting after the tremendous climax of Worcester.

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GREAT SALT LAKE, a shallow body of highly concentrated brine in the N.W. part of Utah, U.S.A., lying between 118·8° and 113·2° W. long. and between 40·7° and 41·8° lat. Great Salt Lake is 4218 ft. above sea-level. It has no outlet, and is fed chiefly by the Jordan, the Weber and the Bear rivers, all draining the mountainous country to the E. and S.E. The irregular outline of the lake has been compared to the roughly drawn hand, palm at the S., thumb (exaggerated in breadth) pointing N.E., and the fingers (crowded together and drawn too small) reaching N.

No bathymetric survey of the lake has been made, but the maximum depth is 60 ft. and the mean depth less than 20 ft., possibly as little as 13 ft. The lake in 1906 was approximately 75 m. long, from N.W. to S.E., and 30 m. (maximum width) 50 m. and an area of 1750 sq. m. This area is not constant, as the water is very shallow at the margins, and the relation between supply from precipitation, &c., and loss by evaporation is variable, there being an annual difference in the height of the water of 15·18 in. between June (highest) and November (lowest), and besides a difference running through longer cycles: in 1850 the water was lower and the lake smaller than by any previous observations (the area and general outline were nearly the same again in 1906); then the water rose until 1873; and between 1886 and 1902 the fall in level was 11·6 ft. The range of rise and fall from 1845 to 1886 was 13 ft., this being the rise in 1865–1886. With the fall of water there is an increase in the specific gravity, which in 1850 was 1·17, and in September 1901 was 1·179; in 1850 the proportion of solids by weight was 22·282%, in September 1901 it was 25·221; at the earlier of these dates the solids in a litre of water weighed 260·69 grams, at the latter date 302·122 grams. The exact cause of this cyclic variation is unknown: the low level of 1906 is usually regarded as the result of extensive irrigation and ploughing in the surrounding country, which have robbed the lake, in part, of its normal supply of water. It is also to be noted that the rise and fall of the lake level have been coincident, respectively, with continued wet and dry cycles. That the lake will soon dry up entirely seems unlikely, as there is a central trough, 25 to 30 m. wide, about 45 ft deep, running N.W. and S.E. The area and

[1] Fritz Hoenig, *Cromwell*.

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shore-line of the lake are evidently affected by a slight surface tilt, for during the same generation that has seen the recent fall of the lake level the shore-line is in many cases 2 m. from the old, and fences may be seen a mile or more out in the lake. The lake bed is for the most part clear sand along the margin, and in deeper water is largely coated with crusts of salt, soda and gypsum.

The lake is a novel and popular bathing resort, the specific gravity of the water being so great that one cannot sink or entirely submerge oneself. There are well-equipped bathing pavilions at Garfield and Saltair on the S. shore of the lake about 20 m. from Salt Lake City. The bathing is invigorating; it must be followed by a freshwater bath because of the incrustation of the body from the briny water. The large amount of salt in the water makes both fauna and flora of the lake scanty; there are a few algae, the larvae of an *Ephydra* and of a *Tipula* fly, specimens of what seems to be *Corixa decolor*, and in great quantities, so as to tint the surface of the water, the brine shrimp, *Artemia salina* (or *gracilis* or *fertilis*), notable biologically for the rarity of males, for the high degree of parthenogenesis and for apparent interchangeableness with the *Branchipus*.

The lake is of interest for its generally mountainous surroundings, save to the N.W., where it skirts the Great Salt Lake Desert, for the mountainous peninsula, the Promontory, lying between thumb and fingers of the hand, shaped like and resembling in geological structure the two islands S. of it, Fremont and Antelope,[1] and the Oquirrh range S. of the lake. The physiography of the surrounding country shows clearly that the basin occupied by Great Salt Lake is one of many left by the drying up of a large Pleistocene lake, which has been called lake Bonneville. Well-defined wave-cut cliffs and terraces show two distinct shore-lines of this early lake, one the "Bonneville Shore-line," about 1000 ft. above Great Salt Lake, and the other, the "Provo Shore-line," about 625 ft. higher than the present lake. These shore-lines and the presence of two alluvial deposits, the lower and the larger of yellow clay 90 ft. deep, and, separated from it by a plane of erosion, the other, a deposit of white marl, 10-20 ft. deep, clearly prove the main facts as to lake Bonneville: a dry basin was first occupied by the shallow waters of a small lake; then, during a long period of excessive moisture (or cold), the waters rose and spread over an area nearly as large as lake Huron with a maximum depth of 1000 ft.; a period of great dryness followed, in which the lake disappeared; then came a second, shorter, but more intense period of moisture, and in this time the lake rose, covered a larger area than before, including W. Utah and a little of S. Idaho and of E. Nevada, about 19,750 sq. m., had a very much broken shore-line of 2550 m. and a maximum depth of 1050 ft. and a mean depth of 800 ft., overflowed the basin at the N., and by a tributary stream through Red Rock Pass at the N. end of the Cache valley poured its waters into the Columbia river system. The great lake was then gradually reduced by evaporation, leaving only shallow bodies of salt water, of which Great Salt Lake is the largest. The cause of the climatic variations which brought about this complex history of the Salt Lake region is not known; but it is worthy of note that the periods of highest water levels were coincident with a great expansion of local valley glaciers, some of which terminated in the waters of lake Bonneville.

Industrially Great Salt Lake is of a certain importance. In early days it was the source of the salt supply of the surrounding country; and the manufacture of salt is now an important industry. The brine is pumped into conduits, carried to large ponds and there evaporated by the sun; during late years the salt has been refined here, being purified of the sulphates and magnesium compounds which formerly rendered it efflorescent and of a low commercial grade. Mirabilite, or Glauber's salt, is commercially valuable, occurring in such quantities in parts of the lake that one may wade knee-deep in it; it separates from the brine at a temperature between 30° and 20° F. The lake is crossed E. and W. by the Southern Pacific railway's so-called "Lucin Cut-off," which runs from Ogden to Lucin on a trestle with more than 20 m. of "fill"; the former route around the N. end of the lake was 43 m. long.

Great Salt Lake was first described in 1689 by Baron La Hontan, who had merely heard of it from the Indians. "Jim" Bridger, a famous mountaineer and scout, saw the lake in 1824, apparently before any other white man. Captain Bonneville described the lake and named it after himself, but the name was transferred to the great Pleistocene lake. John C. Frémont gave the first description of any accuracy in his *Report* of 1845. But comparatively little was known of it before the Mormon settlement in 1847. In 1850 Captain Howard Stansbury completed a survey, whose results were published in 1852. The most extensive and important studies of the region, however, are those by Grove Karl Gilbert of the United States Geological Survey, who in 1879–1890 studied especially the earlier and greater lake.

See J. E. Talmage, *The Great Salt Lake, Present and Past* (Salt Lake City, 1900); and Grove Karl Gilbert, *Lake Bonneville*, monograph 1 of United States Geological Survey (Washington, 1890), containing (pp. 12-19) references to the earlier literature.

GREAT SLAVE LAKE (Athapuscow), a lake of Mackenzie district, Canada. It is situated between 60° 50′ and 62° 55′ N. and 108° 40′ and 117° W., at an altitude of 301 ft. above the sea. It is 325 m. long, from 15 to 50 m. wide, and includes an area of 9770 sq. m. The water is very clear and deep. Its coast line is irregular and deeply indented by large bays, and its north-eastern shores are rugged and mountainous. The western shores are well wooded, chiefly with spruce, but the northern and eastern are dreary and barren. It is navigable from about the 1st of July to the end of October. The Yellow-knife, Hoar-frost, Lockhart (discharging the waters of Aylmer, Clinton-Colden and Artillery Lakes), Tchzudezeth, Du Rocher, Hay (400 m. in length), and Slave rivers empty into Great Slave Lake. The bulk of its water empties by the Mackenzie river into the Arctic Ocean, but a small portion finds its way by the Ark-i-linik river into Hudson's Bay. It was discovered in 1771 by Samuel Hearne.

GREAT SOUTHERN OCEAN, the name given to the belt of water which extends almost continuously round the globe between the parallel of 40° S. and the Antarctic Circle (66½° S.). The fact that the southern extremity of South America is the only land extending into this belt gives it special physical importance in relation to tides and currents, and its position with reference to the Antarctic Ocean and continent makes it convenient to regard it as a separate ocean from which the Atlantic, Pacific and Indian Oceans may be said to radiate. (See Ocean.)

GREAVES, JOHN (1602–1652), English mathematician and antiquary, was the eldest son of John Greaves, rector of Colemore, near Alresford in Hampshire. He was educated at Balliol College, Oxford, and in 1630 was chosen professor of geometry in Gresham College, London. After travelling in Europe, he visited the East in 1637, where he collected a considerable number of Arabic, Persian and Greek manuscripts, and made a more accurate survey of the pyramids of Egypt than any traveller who had preceded him. On his return to Europe he visited a second time several parts of Italy, and during his stay at Rome instituted inquiries into the ancient weights and measures. In 1643 he was appointed to the Savilian professorship of astronomy at Oxford, but he was deprived of his Gresham professorship for having neglected its duties. In 1645 he essayed a reformation of the calendar, but his plan was not adopted. In 1648 he lost both his fellowship and his Savilian chair on account of his adherence to the royalist party. But his private fortune more than sufficed for all his wants till his death on the 8th of October 1652.

Besides his papers in the *Philosophical Transactions*, the principal works of Greaves are *Pyramidographia, or a Description of the Pyramids in Egypt* (1646); *A Discourse on the Roman Foot and*

[1] Besides these islands there are a few small islands farther N., and W. of Antelope, Stansbury Island, which, like Antelope and Fremont Islands, is connected with the mainland by a bar sometimes uncovered and rarely in more than a foot of water.

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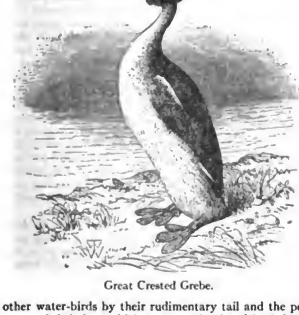
Denarius (1649); and *Elementa linguae Persicae* (1649). His miscellaneous works were published in 1737 by Dr Thomas Birch, with a biographical notice of the author. See also Smith's *Vita quorundam erudit. virorum* and Ward's *Gresham Professors*.

GREBE (Fr. *grèbe*), the generally accepted name for all the birds of the family *Podicipedidae*,[1] belonging to the group *Pygopodes* of Illiger, members of which inhabit almost all parts of the world. Some systematic writers have distributed them into several so-called genera, but, with one exception, these seem to be insufficiently defined, and here it will be enough to allow but two—Latham's *Podiceps* and the *Centropelma* of Sclater and Salvin. Grebes are at once distinguishable from



Great Crested Grebe.

all other water-birds by their rudimentary tail and the peculiar structure of their feet, which are not only placed far behind, but have the tarsi flattened and elongated toes furnished with broad lobes of skin and flat blunt nails.

In Europe are five well-marked species of *Podiceps*, the commonest and smallest of which is the very well-known dab-chick of English ponds, *P. fluviatilis* or *minor*, the little grebe of ornithologists, found throughout the British Islands, and with a wide range in the old world. Next in size are two species known as the eared and horned grebes, the former of which, *P. nigricollis*, is a visitor from the south, only occasionally showing itself in Britain and very rarely breeding, while the latter, *P. auritus*, has a more northern range, breeding plentifully in Iceland, and is a not uncommon winter-visitant. Then there is the larger red-necked grebe, *P. griseigena*, also a northern bird, and a native of the subarctic parts of both Europe and America, while lastly the great crested grebe, *P. cristatus* or gaunt—known as the loon on the meres and broads of East Anglia and some other parts of England, is also widely spread over the old world. North America is credited with seven species of grebes, of which two (*P. griseigena* and *P. auritus*) are admitted to be specifically inseparable from those already named, and two (*P. occidentalis* and *P. californicus*) appear to be but local forms; the remaining two (*P. dominicus* and *P. ludovicianus*) may, however, be accounted good species, and the last differs so much from other grebes that many systematists make it the type of a distinct genus, *Podilymbus*. South America seems to possess four or five more species, one of which, the *P. micropterus* of Gould (*Proc. Zool. Society*, 1858, p. 220), has been deservedly separated from the genus *Podiceps* under the name *Centropelma* by Sclater and Salvin (*Exot. Ornithology*, p. 189, pl. xcv.), owing to the form of its bill, and the small size of its wings, which renders it absolutely flightless. Lake Titicaca in Bolivia is, so far as is known at present, its only habitat. Grebes in general, though averse from taking wing, have much greater power of flight than would seem possible on examination of their alar organs, and are capable of prolonged aerial journeys. Their plumage is short and close. Above it is commonly of some shade of brown, but beneath it is usually white, and so glossy as to be in much request for muffs and the trimming of ladies' dresses. Some species are remarkable for the crests or tippets, generally of a golden-chestnut colour, they assume in the breeding season. *P. auritus* is particularly remarkable in this respect, and when in its full nuptial attire presents an extraordinary aspect, the head (being surrounded, as it were, by a *nimbus* or aureole, such as that with which painters adorn saintly characters), reflecting the rays of light, glitters with a glory that passes description. All the species seem to have similar habits of nidification. Water-weeds are pulled from the bottom of the pool, and piled on a convenient foundation, often a seminatant growth of bog-bean (*Menyanthes*), till they form a large mass, in the centre of which a shallow cup is formed, and the eggs, with a chalky white shell almost equally pointed at each end, are laid—the parent covering them, whenever she has time to do so, before leaving the nest. Young grebes are beautiful objects, clothed with black, white and brown down, disposed in streaks and their bill often brilliantly tinted. When taken from the nest and placed on dry ground, it is curious to observe the way in which they progress—using the wings almost as fore-feet, and suggesting the notion that they must be quadrupeds instead of birds. (A. N.)

GRECO, EL, the name commonly given to Dominico Theotocopuli (d. 1614), Cretan painter, architect and sculptor. He was born in Crete, between 1545 and 1550, and announces his Cretan origin by his signature in Greek letters on his most important pictures, especially on the "St Maurice" in the Escorial. He appears to have studied art first of all in Venice, and on arriving in Rome in 1570 is described as having been a pupil of Titian, in a letter written by the miniaturist, Giulio Clovio, addressed to Cardinal Alessandro Farnesi, dated the 15th of November 1570.

Although a student under Titian, he was at no time an exponent of his master's spirit, and his early historical pictures were attributed to many other artists, but never to Titian. Of his early works, two pictures of "The Healing of the Blind Man" at Dresden and Palma, and the four of "Christ driving the money-changers out of the Temple" in the Yarborough collection, the Cork collection, the National Gallery, and the Beruete collection at Madrid, are the chief. His first authentic portrait is that of his fellow-countryman, Giulio Clovio. It was painted between 1570 and 1578, is signed in Greek characters, and preserved at Naples, and the last portrait he painted under the influence of the Italian school appears to be that of a cardinal now in the National Gallery, of which four replicas painted in Spain are known. He appears to have come to Spain in 1577, but, on being questioned two years later in connexion with a judicial suit, as to when he arrived in the country, and for what purpose he came, declined to give any information. He was probably attracted by the prospect of participating in the decoration of the Escorial, and he appears to have settled down in Toledo, where his first works were the paintings for the high altar of Santo Domingo, and his famous picture of "The Disrobing of Christ" in the sacristy of the cathedral. It was in connexion with this last-named work that he proved refractory, and the records of a law-suit respecting the price to be paid to him give us the earliest information of the artist's sojourn in Spain. In 1590, he painted the "History of St Maurice" for Philip II., and in 1578, his masterpiece, entitled "The Burial of the Count Orgaz." This magnificent picture, one of the finest in Spain, is at last being appreciated, and can only be put a little below the masterpieces of Velazquez. It is a strangely

[1] Often, but erroneously, written *Podicipidae*. The word *Podiceps* being a contracted form of *Podicipes* (cf. Gloger, *Journal für Ornithologie*, 1854, p. 430, note), a combination of *podex*, *podicis* and *pes*, *pedis*, its further compounds must be in accordance with its derivation.

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individual work, representing Spanish character even more truthfully than did any Spanish artist, and it gathers up all the fugitive moods, the grace and charm, the devices and defects of a single race, and gives them complete stability in their wavering expressions.

Between 1595 and 1600, El Greco executed two groups of paintings in the church of San José at Toledo, and in the hospital of La Caridad, at Illescas. Besides these, he is known to have painted thirty-two portraits, several manuscripts, and many paintings for altar-pieces in Toledo and the neighbourhood. As an architect he was responsible for more than one of the churches of Toledo, and as a sculptor for carvings both in wood and in marble, and he can only be properly understood in all his varied excellences after a visit to the city where most of his work was executed.

He died on the 7th of April 1614, and the date of his death is one of the very few certain facts which we have respecting him. The record informs us that he made no will, that he received the sacraments, and was buried in the church of Santo Domingo. The popular legend of his having gone mad towards the latter part of his career has no foundation in fact, but his painting became more and more eccentric as his life went on, and his natural perversity and love of strange, cold colouring, increased towards the end of his life. As has been well said, "Light with him was only used for emotional appeal, and was focussed or scattered at will." He was haughtily certain of the value of his own art, and was determined to paint in cold, ashen colouring, with livid, startling effect, the gaunt and extraordinary figures that he beheld with his eccentric genius. His pictures have wonderful visionary quality, admirable invention, and are full of passionate fervency. They may be considered extravagant, but are never commonplace, and are exceedingly attractive in their intense emotion, marvellous sincerity, and strange, chilly colour.

El Greco's work is typically modern, and from it the portrait-painter, J. S. Sargent, claims to have learnt more than from that of any other artist. It immortalizes the character of the people amongst whom he dwelt, and he may be considered as the initiator of truth and realism in art, a precursor and inspirer of Velazquez.

In his own time he was exceedingly popular, and held in great repute. Sonnets were written in his honour, and he is himself said to have written several treatises, but these have not come down to our time. For more than a generation his work was hardly known, but it is now gaining rapidly in importance, and its true position is more and more recognized. Some examples of the artist's own handwriting have been discovered in Toledo, and Señor Don Manuel Cossia of Madrid has spent many years collecting information for a work dealing with the artist.

(G. C. W.)

GRECO-TURKISH WAR, 1897. This war between Greece and Turkey (see GREECE: *Modern History*) involved two practically distinct campaigns, in Thessaly and in Epirus. Upon the Thessalian frontier the Turks, early in March, had concentrated six divisions (about 58,000 men), 1500 sabres and 156 guns, under Edhem Pasha. A seventh division was rendered available a little later. The Greeks numbered about 45,000 infantry, 800 cavalry and 96 guns, under the crown prince. On both sides there was a considerable dispersion of forces along the frontier. The Turkish navy, an important factor in the war of 1877–78, had become paralytic ten years later, and the Greek squadron held complete command of the sea. Expeditionary forces directed against the Turkish line of communications might have influenced the course of the campaign; but for such work the Greeks were quite unprepared, and beyond bombarding one or two insignificant ports on the coast-line, and aiding the transport of troops from Athens to Volo, the navy practically accomplished nothing. On the 9th and 10th April Greek irregulars crossed the frontier, either with a view to provoke hostilities or in the hope of fomenting a rising in Macedonia. On the 16th and 17th some fighting occurred, in which Greek regulars took part; and on the 18th Edhem Pasha, whose headquarters had for some time been established at Elassona, ordered a general advance. The Turkish plan was to turn the Greek left and to bring on a decisive action, but this was not carried out. In the centre the Turks occupied the Meluna Pass on the 19th, and the way was practically open to Larissa. The Turkish right wing, however, moving on Damani and the Reveni Pass, encountered resistance, and the left wing was temporarily checked by the Greeks among the mountains near Nezeros. At Mati, covering the road to Tyrnavo, the Greeks entrenched themselves. Here sharp fighting occurred on the 21st and 22nd, during which the Greeks sought to turn the right flank of the superior Turkish central column. On the 23rd fighting was renewed, and the advance guard of the Turkish left column, which had been reinforced, and had pressed back the Greeks, reached Deliler. The Turkish forces had now drawn together, and the Greeks were threatened on both flanks. In the evening a general retreat was ordered, and the loose discipline of the Greek army was at once manifested. Rumours of disaster spread among the ranks, and wild panic supervened. There was nothing to prevent an orderly retirement upon Larissa, which had been fortified and provisioned, and which offered a good defensive position. The general *débâcle* could not, however, be arrested, and in great disorder the mass of the Greek army fled southwards to Pharsala. There was no pursuit, and the Turkish commander-in-chief did not reach Larissa till the 27th. Thus ended the first phase of the war, in which the Greeks showed tenacity in defence, which proved fruitless by reason of initially bad strategic dispositions entailing far too great dispersion, and also because there was no plan of action beyond a general desire to avoid risking a defeat which might prevent the expected risings in Macedonia and elsewhere. The handling of the Turkish army showed little skill or enterprise; but on both sides political considerations tended to prevent the application of sound military principles.

Larissa being abandoned by the Greeks, Velestino, the junction of the Thessalian railways, where there was a strong position covering Volo, seemed to be the natural rallying point for the Greek army. Here the support of the fleet would have been secured, and a Turkish advance across the Othrys range upon Athens could not have taken place until the flanking position had been captured. Whether by direction or by natural impulse, however, the mass of the Greek troops made for Pharsala, where some order was re-established, and preparations were made to resist attack. The importance of Velestino was recognized by sending a brigade thither by railway from Pharsala, and the inferior Greek army was thus split into two portions, separated by nearly 40 m. On 27th April a Turkish reconnaissance on Velestino was repulsed, and further fighting occurred on the 29th and 30th, in which the Greeks under Colonel Smolenski held their own. Meanwhile the Turks made preparations to attack Pharsala, and on 5th May the Greeks were driven from their positions in front of the town by three divisions. Further fighting followed on the 6th, and in the evening the Greek army retired in fair order upon Domokos. It was intended to turn the Greek left with the first division under Haïri Pasha, but the flanking force did not arrive in time to bring about a decisive result. The abandonment of Pharsala involved that of Velestino, where the Turks had obtained no advantage, and on the evening of the 5th Colonel Smolenski began a retirement upon Halmyros. Again delaying, Edhem Pasha did not attack Domokos till the 17th, giving the Greeks time to entrench their positions. The attack was delivered in three columns, of which the right was checked and the centre failed to take the Greek trenches and suffered much loss. The left column, however, menaced the line of retreat, and the Greek army abandoned the whole position during the night. No effective stand was made at the Furka Pass, which was evacuated on the following night. Colonel Smolenski, who arrived on the 18th from Halmyros, was directed to hold the pass of Thermopylae. The Greek forces being much demoralized, the intervention of the tsar was invoked by telegraph; and the latter sent a personal appeal to the Sultan, who directed a suspension of hostilities. On the 20th an armistice was arranged.

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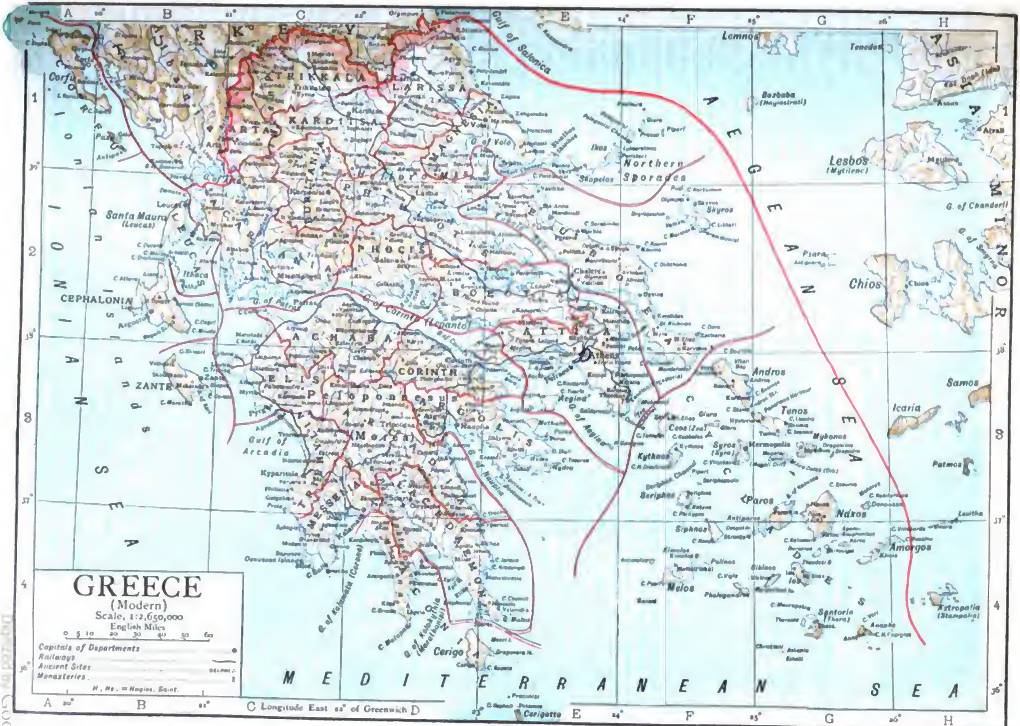
GREECE
(Modern)
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English Miles
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Railways
Ancient Sites
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H., Ha. = Hagios, Saint.
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AEGEAN SEA
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IONIAN SEA
Ionian Islands
TURKEY
ASIA MINOR
Gulf of Salonica
Lemnos
Tenedos
Lesbos
(Mytilene)
Chios
Samos
Icaria
Patmos
Amorgos
Naxos
Paros
Antiparos
Siphnos
Seriphos
Melos
Kythnos
Syros
(Syra)
Hermopolis
Tenos
Mykonos
Andros
Ceos (Zea)
Santorin
(Thera)
Astropalia
(Stampalia)
Skyros
Psara
Northern
Sporades
Skopelos
Ikos
G. of Chanderli
G. of Smyrna
Corfu
Paxo
Antipaxo
Santa Maura
(Leucas)
Ithaca
CEPHALONIA
ZANTE
Cerigo
Cerigotto
TRIKKALA
LARISSA
KARDITSA
ARTA
MAGNESIA
PHTHIOTIS
PHOCIS
BOEOTIA
EUBOEA
ATTICA
ACHAEA
ELIS
CORINTH
ARGOLIS
ARCADIA
MESSENIA
LACONIA
Peloponnesus
(Morea)
Athens
Aegina
G. of Aegina
Chalcis
G. of Volo
Volo
G. of Arta
G. of Patras
G. of Corinth (Lepanto)
Corinth
Tripolitsa
Nauplia
Gulf of
Arcadia
Kyparissia
G. of Kalamata (Corone)
G. of Kolokythia
(Marathonisi)
Lamia
Patras

In Epirus at the outbreak of war about 15,000 Greeks, including a cavalry regiment and five batteries, the whole under Colonel Manos, occupied a line of defence from Arta to Peta. The Turks, about 28,000 strong, with forty-eight guns, under Achmet Hifsi Pasha, were distributed mainly at Iannina, Pentepagadia, and in front of Arta. On 18th April the Turks commenced a three days' bombardment of Arta; but successive attempts to take the bridge were repulsed, and during the night of the 21st they retired on Philippiada, 26 m. distant, which was attacked and occupied by Colonel Manos on the 23rd. The Greeks then advanced to Pentepagadia, meeting with little resistance. Their difficulties now began. After some skirmishing on the 27th, the position held by their advanced force near Homopulos was attacked on the 28th. The attack was renewed on the 29th, and no Greek reinforcements were forthcoming when needed. The Euzones made a good defence, but were driven back by superior force, and a retreat was ordered, which quickly degenerated into panic-stricken flight to and across the Arta. Reinforcements, including 2500 Epirote volunteers, were sent to Arta from Athens, and on 12th May another incursion into Turkish territory began, the apparent object being to occupy a portion of the country in view of the breakdown in Thessaly and the probability that hostilities would shortly end. The advance was made in three columns, while the Epirote volunteers were landed near the mouth of the Luro river with the idea of cutting off the Turkish garrison of Prevesa. The centre column, consisting of a brigade, three squadrons and two batteries, which were intended to take up and hold a defensive position, attacked the Turks near Strevina on the 14th. The Greeks fought well, and being reinforced by a battalion from the left column, resumed the offensive on the following day, and fairly held their own. On the night of the 15th a retreat was ordered and well carried out. The volunteers landed at the mouth of the Luro, were attacked and routed with heavy loss.

The campaign in Epirus thus failed as completely as that in Thessaly. Under the terms of the treaty of peace, signed on 20th September, and arranged by the European powers, Turkey obtained an indemnity of £T4,000,000, and a rectification of the Thessalian frontier, carrying with it some strategic advantage. History records few more unjustifiable wars than that which Greece gratuitously provoked. The Greek troops on several occasions showed tenacity and endurance, but discipline and cohesion were manifestly wanting. Many of the officers were incapable; the campaign was gravely mismanaged; and politics, which led to the war, impeded its operations. On the other hand, the fruits of the German tuition, which began in 1880, and received a powerful stimulus by the appointment of General von der Goltz in 1883, were shown in the Turkish army. The mobilization was on the whole smoothly carried out, and the newly completed railways greatly facilitated the concentration on the frontier. The young school of officers trained by General von der Goltz displayed ability, and the artillery at Pharsala and Domokos was well handled. The superior leading was, however, not conspicuously successful; and while the rank and file again showed excellent military qualities, political conditions and the Oriental predilection for half-measures and for denying full responsibility and full powers to commanders in the field enfeebled the conduct of the campaign. On account of the total want of careful and systematic peace training on both sides, a war which presented several interesting strategic problems provided warnings in place of military lessons. (G. S. C.)

GREECE,[1] an ancient geographical area, and a modern kingdom more or less corresponding thereto, situated at the south-eastern extremity of Europe and forming the most southerly portion of the Balkan Peninsula. The modern kingdom is bounded on the N. by European Turkey and on the E., S. and W. by the Aegean, Mediterranean and Ionian seas. The name *Graecia*, which was more or less vaguely given to the ancient country by the Romans, seems not to have been employed by any native writer before Aristotle; it was apparently derived by the Romans from the Illyrians, who applied the name of an Epirote tribe (Γραικοί, Graeci) to all their southern neighbours. The names Hellas, Hellenes (Ἑλλας, Ἕλληνες), by which the ancient Greeks called their country and their race, and which are still employed by the modern Greeks, originally designated a small district in Phthiotis in Thessaly and its inhabitants, who gradually spread over the lands south of the Cambunian mountains. The name Hellenes was not universally applied to the Greek race until the post-Homeric epoch (Thucyd. i. 3).

[1] See also GREEK ART, GREEK LANGUAGE, GREEK LAW, GREEK LITERATURE, GREEK RELIGION.

1. GEOGRAPHY AND STATISTICS

The ancient Greeks had a somewhat vague conception of the northern limits of Hellas. Thessaly was generally included and Epirus excluded; some writers included some of the southern cantons of Epirus, while others excluded not only all that country but Aetolia and Acarnania. Generally speaking, the confines of Hellas in the age of its greatest distinction were represented by a line drawn from the northern shore of the Ambracian Gulf on the W. to the mouth of the Peneus on the E. Macedonia and Thrace were regarded as outside the pale of Hellenic civilization till 386 B.C., when after his conquest of Thessaly and Phocis, Philip of Macedon obtained a seat in the Amphictyonic Council. In another sense, however, the name Hellas expressed an ethnological rather than a geographical unity; it denoted every country inhabited by Hellenes. It thus embraced all the Greek settlements on the coasts and islands of the Mediterranean, on the shores of the Hellespont, the Bosporus and the Black Sea. Nevertheless, the Greek peninsula within the limits described above, together with the adjacent islands, was always regarded as Hellas *par excellence*. The continental area of Hellas proper was no greater than that of the modern Greek kingdom, which comprises but a small portion of the territories actually occupied by the Greek race. The Greeks have always been a maritime people, and the real centre of the national life is now, as in antiquity, the Aegean Sea or Archipelago. Thickly studded with islands and bordered by deeply indented coasts with sheltered creeks and harbours, the Aegean in the earliest days of navigation invited the enterprise of the mariner; its shores, both European and Asiatic, became covered with Greek settlements and its islands, together with Crete and Cyprus, became Greek. True to their maritime instincts, the Greeks rarely advanced inland to any distance from the sea; the coasts of Macedonia, Thrace and Asia Minor are still mainly Greek, but, except for some isolated colonies, the *hinterland* in each case lies outside the limits of the race. Continental Greece is divided by its mountain ranges into a number of natural cantons; the existence of physical barriers tended in the earliest times to the growth of isolated political communities, and in the epoch of its ancient independence the country was occupied by seventeen separate states, none of them larger than an ordinary English county. These states, which are noticed separately, were: Thessaly, in northern Greece; Acarnania, Aetolia, Locris, Doris, Phocis, Megaris, Boeotia and Attica in central Greece; and Corinthia, Sicyonia, Achaea, Elis, Messenia, Laconia, Argolis and Arcadia in the Peloponnesus.

Extent of ancient Greece.

Modern Greece, which (including the adjacent islands) extends from 35° 50′ to 39° 54′ N. and from 19° 20′ to 26° 15′ E., comprises all the area formerly occupied by these states. Under the arrangement concluded at Constantinople on the 21st of July 1832 between Great Britain, France, Russia and Turkey, the northern boundary of Greece was drawn from the Gulf of Arta (Sinus Ambracius) to the Gulf of Volo (S. Pagasaeus), the line keeping to the crest of the Othrys range. Thessaly and part of Acarnania were thus left to Turkey. The island of Euboea, the Cyclades and the northern Sporades were added to the new kingdom. In 1864 the Ionian Islands (*q.v.*) were ceded by Great Britain to Greece. In 1880 the Conference of Berlin proposed a new frontier, which transferred to Greece not only Thessaly but a considerable portion of southern Epirus, extending to the river Kalamas. This, however, was rejected by Turkey, and the existing boundary was traced in 1881. Starting from the Aegean coast at a point

Extent of modern Greece.

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near Platamona, between Mount Olympus and the mouth of the Salambria (Peneus), the line passes over the heights of Kritiri and Zygos (Pindus) and descends the course of the river Arta to its mouth. After the war of 1897 Greece restored to Turkey some strategical points on the frontier possessing no geographical importance. The greatest length of Greece is about 250 m., the greatest breadth 180 m. The country is generally divided, into five parts, which are indicated by its natural features:—(i.) Northern Greece, which extends northwards from Mount Othrys and the gulfs of Zeitun (Lamia) and Arta to the Cambunian Mountains, and comprises Thessaly and a small portion of Epirus; (ii.) Central Greece, extending from the southern limits of Northern Greece to the gulfs of Corinth and Aegina; (iii.) the peninsula of the Peloponnesus or Morea, attached to the mainland by the Isthmus of Corinth; (iv.) the Ionian Islands on the west coasts of Epirus and Greece; (v.) The islands of the Aegean Sea, including Euboea, the Cyclades and the northern Sporades.

Physical features.

In the complexity of its contour and the variety of its natural features Greece surpasses every country in Europe, as Europe surpasses every continent in the world. The broken character of its coast-line is illustrated by a few statistics. In Thessaly no part of the country is more than 50 m. from the sea. Although the area of Greece is considerably smaller than that of Portugal, its coast-line is greater than that of Spain and Portugal together. The mainland is penetrated by numerous gulfs and inlets, and the adjoining seas are studded with islands. Another characteristic is the number and complexity of the mountain chains, which traverse every part of the country and which, together with their ramifications, cover four-fifths of its surface. The mountain-chains interlace, the interstices forming small enclosed basins, such as the plain of Boeotia and the plateau of Arcadia; the only plain of any extent is that of Thessaly. The mountains project into the sea, forming peninsulas, and sometimes reappearing in rows or groups of islands; they descend abruptly to the coast or are separated from it by small alluvial plains. The portions of the country suitable for human colonization were thus isolated one from the other, but as a rule possessed easy access to the sea. The earliest settlements were generally situated on or around some rocky eminence, which dominated the surrounding plain and was suitable for fortification as a citadel or acropolis; owing to the danger of piratical attacks they were usually at some little distance from the sea, but in the vicinity of a natural harbour. These physical features of the country played an important part in moulding the character of its inhabitants. Protected against foreign invasion by the mountain barriers and to a great extent cut off from mutual intercourse except by sea, the ancient Greek communities developed a marked individuality and a strong sentiment of local patriotism; their inhabitants were both mountaineers and mariners; they possessed the love of country, the vigour and the courage which are always found in highlanders, together with the spirit of adventure, the versatility and the passion for freedom characteristic of a seafaring people. The great variety of natural products as well as the facility of maritime communication tended to the early growth of commercial enterprise, while the peculiar beauty of the scenery, though little dwelt upon in ancient literature, undoubtedly quickened the poetic and artistic instincts of the race. The effects of physical environment are no less noticeable among the modern Greeks. The rural populations of Attica and Boeotia, though descended from Albanian colonists in the middle ages, display the same contrast in character which marked the inhabitants of those regions in ancient times.

Mountains.

In its general aspect the country presents a series of striking and interesting contrasts. Fertile tracts covered with vineyards, olive groves, corn-fields or forests display themselves in close proximity with rugged heights and rocky precipices; the landscape is never monotonous; its outlines are graceful, and its colouring, owing to the clearness of the air, is at once brilliant and delicate, while the sea, in most instances, adds a picturesque feature, enhancing the charm and variety of the scenery.

The ruling feature in the mountain system of northern Greece is the great chain of Pindus, which, extending southwards from the lofty Shar Dagh (Skardos) near Uskub, forms the backbone of the Balkan peninsula. Reaching the frontier of Greece a little S. of lat. 40°, the Pindus range is intersected by the Cambunian Mountains running E. and W.; the eastern branch, which forms the northern boundary of Thessaly, extends to the Gulf of Salonica and culminates in Mount Olympus (9754 ft.) a little to the N. of the Greek frontier; then bending to the S.E. it follows the coast-line, forming a rampart between the Thessalian plain and the sea; the barrier is severed at one point only where the river Salambria (anc. *Peneus*) finds an exit through the narrow defile of Tempe. South of Tempe the mountain ridge, known as the Mavro Vouno, connects the pyramidal Kissovo (anc. *Ossa*, 6400 ft.) with Plessidi (anc. *Pelion*, 5310 ft.); it is prolonged in the Magnesian peninsula, which separates the Gulf of Volo from the Aegean, and is continued by the mountains of Euboea (highest summits, Dirphys, 5725 ft., and Ocha, 4830 ft.) and by the islands of Andros and Tenos. West of Pindus, the Cambunian Mountains are continued by several ridges which traverse Epirus from north to south, enclosing the plain and lake of Iannina; the most westerly of these, projecting into the Adriatic, forms the Acrocerannian promontory terminating in Cape Glossa. The principal pass through the Cambunian Mountains is that of Meluna, through which runs the carriage-road connecting the town of Elassona in Macedonia with Larissa, the capital of Thessaly; another pass leads at Reveni and elsewhere. The central chain of Pindus at the point where it is intersected by the Cambunian Mountains forms the mass of Zygos (anc. *Lacmon*, 7113 ft.) through which a horse-path connects the town of Metzovo with Kalabaka in Thessaly; on the declivity immediately N. of Kalabaka are a series of rocky pinnacles on which a number of monasteries are perched. Trending to the S., the Pindus chain terminates in the conical Mount Velouchi (anc. *Tymphrestus*, 7609 ft.) in the heart of the mountainous region of northern Greece. From this centre-point a number of mountains radiate in all directions. To the E. runs the chain of Helloro (anc. *Othrys*; highest summit, Hagios Elias, 5558 ft.) separating the plain of Thessaly from the valley of the Sperchéios and traversed by the Thermopylae pass (278o ft.); to the S.E. is Mount Katávorha (anc. *Oeta*, 7080 ft.) extending to the southern shore of the Gulf of Lamia at Thermopylae; to the S.E., S. and S.W. are the mountains of Aetolia and Acarnania. The Aetolian group, which may be regarded as the northern continuation of the Pindus range, includes Korna (8240 ft.), the highest mountain in Greece, and Vardusi (anc. *Korax*, 8190 ft.). The mountains of Acarnania with Τύμπλε κορυφή (5215 ft.) rise to the W. of the valley of the Aspropotamo (anc. *Achelous*). The Cambunian Mountains are prolonged to the S.E. by the double-crested Liakoura (anc. *Parnassus*; 8064 ft.) in Phocis; by Palaeo Vouno (anc. *Helicon*, 5738 ft.) and Elateas (anc. *Cithaeron*, 4626 ft.) respectively W. and S. of the Boeotian plain; and by the mountains of Attica, Aegina (anc. *Panes*, 4626 ft.), Mendeli (anc. *Pentelicus* or *Briessos*, 3639 ft.), Trelhovouno (anc. *Hymettus*, 3369 ft.), and Keratia (2136 ft.)—terminating in the promontory of Sunium, but reappearing in the islands of Ceos, Cythnos, Seriphos and Siphnos. South of Cithaeron are Patera in Megaris (3583 ft.) and Makri Plagi (anc. *Geraneia*, 4495 ft.) overlooking the Isthmus of Corinth.

The mountains of the Morea, grouped around the elevated central plateau of Arcadia, form an independent system with ramifications extending through the Argolid peninsula on the E. and the three southern promontories of Laconia, Taygetus (anc. *Taygetum Acrium*, &c. the eastern end of the northern chain, separating Arcadia from the Gulf of Corinth, is Ziria (anc. *Cyllene*, 7789 ft.); it forms a counterpart to Parnassus on the opposite side of the gulf. A little to the W. is Chelmos (anc. *Aroania*, 7146 ft.); farther S. Mount Olonos (anc. *Erymanthus*, 7297 ft.) and Voidia (anc. *Panachaicon*, 6322 ft.) overlooking the Gulf of Patras. The highest summit in the Argolid peninsula is Hagios Elias (anc. *Arachnaeon*, 3930 ft.). The series of heights forming the eastern rampart of Arcadia, including Artemision (5814 ft.) and Ktenia (5246 ft.) is continued to the S. by the Malevo range (anc. *Parnon*, highest summit 6365 ft.) which extends into the peninsula of Malea and reappears in the island of Cerigo. Separated from Parnon by the Eurotas valley to the W., the chain of Taygetus (mod. *Pentedaktylon*; highest summit Hagios Elias, 7874 ft., the culminating point of the Morea) forms a barrier between the plains of Laconia and Messenia; it is traversed by the Langada pass leading from Sparta to Kalamata. The range is prolonged to the S. through the district of Maina and terminates in Cape Matapan (anc. *Taenarum*). The mountains of western Arcadia are less lofty and of a less marked type; they include Hagios Petros (4777 ft.) and Palaeócastro (anc. *Pholoe*, 2257 ft.). N. of the Alpheus valley, Lycaeum (anc. *Lycaeus*), the haunt of Pan, and Nomia (4554 ft.) W. of the plain of Megalopolis. Farther south, the mountains of western Messenia form a detached group (Varvara, 4003 ft.; Mathia, 3140 ft.) extending to Cape Gallo (anc. *Acritas*) and the Gerenian district of Maina. In central Arcadia are Apanokrapa (anc. *Maenalus*, also sacred to Pan) and Roudia (5072 ft.); the Taygetus chain forms the southern continuation of these mountains.

Rivers.

There are noteworthy fortified heights of ancient Greece were the Acrocorinthus, the citadel of Corinth (1885 ft.); Ithome (2631 ft.) at Messene; Larissa (950 ft.) at Argos; the Acropolis of Mycenae (910 ft.); Tiryns (60 ft.) near Nauplia, which also possessed its own citadel, the Palamidhi or Acro-nauplia (705 ft.); the Acropolis of Athens (300 ft. above the main level of the city and 512 ft. above the sea), and the Cadmea of Thebes (715 ft.).

Greece has few rivers; most of these are small, rapid and turbid, as might be expected from the mountainous configuration of the country. They are either perennial rivers or torrents, the whole bed of the latter being dry in summer, and only filled with water after the autumn rains. The chief rivers (none of which is navigable) are the Salambria (*Peneus*) in Thessaly, the Mavropotamo (*Cephissus*) in Phocis, the Hellada (*Sperchéios*) in Phthiotis, the Aspropotamo (*Achelous*) in Aetolia, and the Ruphia (*Alpheus*) and Vasiliko (*Eurotas*) in the Morea. Of the famous rivers of Athens, the one, the Ilissus, is only a chain of pools all summer, and the other, the Cephisus, though never absolutely dry, does not reach the sea,

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being drawn off in numerous artificial channels to irrigate the neighbouring olive groves. A frequent peculiarity of the Greek rivers is their sudden disappearance in subterranean chasms and reappearance on the surface again, such as gave rise to the fabled course of the Alpheus under the sea, and its emergence in the fountain of Arethusa in Syracuse. Some of these chasms—"Katavothras"—are merely sieves with herbage and gravel in the bottom, but others are large caverns through which the course of the river may sometimes be followed. Floods are frequent, especially in autumn, and natural fountains abound and gush out even from the tops of the hills. Aganippe rises high up among the peaks of Helicon, and Peirene flows from the summit of Acrocorinthus. The only noteworthy cascade, however, is that of the Styx in Arcadia, which has a fall of 500 ft. During part of the year it is lost in snow, and it is at all times almost inaccessible. Lakes are numerous, but few are of considerable size, and many merely marshes in summer. The largest are Karla (*Boebeïs*) in Thessaly, Trichonis in Aetolia, Copais in Boeotia, Pheneus and Stymphalus in Arcadia.

Plains. The valleys are generally narrow, and the plains small in extent, deep basins walled in among the hills or more free at the mouths of the rivers. The principal plains are those of Thessaly, Boeotia, Messenia, Argos, Elis and Marathon. The bottom of these plains consists of an alluvial soil, the most fertile in Greece. In some of the mountainous regions, especially in the Morea, are extensive table-lands. The plain of Mantinea is 2000 ft. high, and the upland district of Sciritis, between Sparta and Tegea, is in some parts 3000 ft.

Coast. Strabo said that the guiding thing in the geography of Greece was the sea, which presses in upon it at all parts with a thousand arms. From the Gulf of Arta on the one side to the Gulf of Volo on the other the coast is indented with a succession of natural bays and gulfs. The most important are the Gulfs of Aegina (*Saronicus*) and Lepanto (*Corinthiacus*), which separate the Morea from the northern mainland of Greece,—the first an inlet of the Aegean, the second of the Ionian Sea,—and are now connected by a canal cut through the high land of the narrow Isthmus of Corinth (3½ m. wide). The outer portion of the Gulf of Lepanto is called the Gulf of Patras, and the inner part the Bay of Corinth; a narrow inlet on the north side of the same gulf, called the Bay of Salona or Itea, penetrates northwards into Phocis so far that it is within 24 geographical miles of the Gulf of Zeitun on the north-east coast. The width of the entrance to the gulf of Lepanto is subject to singular changes, which are ascribed to the formation of alluvial deposits by certain marine currents, and their removal again by others. At the time of the Peloponnesian war this channel was 1200 yds. broad; in the time of Strabo it was only 850; and in our own day it has again increased to 2200. On the coast of the Morea there are several large gulfs, that of Arcadia (*Cyparissius*) on the west, Kalamata (*Messeniacus*) and Kolokythia (*Laconicus*) on the south and Nauplia (*Argolicus*) on the east. Between Euboea and the mainland lie the channels of Trikeri, Talanti (*Euboicum Mare*) and Egripo; the latter two are connected by the strait of Egripo (*Euripus*). This strait, which is spanned by a swing-bridge, is about 180 ft. wide, and is remarkable for the unexplained eccentricity of its tide, which has puzzled ancients and moderns alike. The current runs at the average speed of 5m. an hour, but continues only for a short time in one direction, changing its course, it is said, ten or twelve times in a day; it is sometimes very violent.

Volcanic action. There are no volcanoes on the mainland of Greece, but everywhere traces of volcanic action and frequently visitations of earthquakes, for it lies near a centre of volcanic agency, the island of Santorin, which has been within recent years in a state of eruption. There is an extinct crater at Mount Laphystium (*Granitsa*) in Boeotia. The mountain of Methane, on the coast of Argolis, was produced by a volcanic eruption in 282 B.C. Earthquakes laid Thebes in ruins in 1853, destroyed every house in Corinth in 1858, filled up the Castalian spring in 1870, devastated Zante in 1893 and the district of Atalanta in 1894. There are hot springs at Thermopylae and other places, which are used for sanitary purposes. Various parts of the coast exhibit indications of upheaval within historical times. On the coast of Elis four rocky islets are now joined to the land, which were separate from it in the days of ancient Greece. There are traces of earlier sea-beaches at Corinth, and on the coast of the Morea, and at the mouth of the Hellada. The land has gained so much that the pass of Thermopylae which was extremely narrow in the time of Leonidas and his three hundred, is now wide enough for the motions of a whole army. (J. D. B.)

Geology. Structurally, Greece may be divided into two regions, an eastern and a western. The former includes Thessaly, Boeotia, the island of Euboea, the isthmus of Corinth, and the peninsula of Argolis, and, throughout, the strike of the beds is nearly from west to east. The western region includes the Pindus and all the parallel ranges, and the whole of the Peloponnesus excepting Argolis. Here the folds which affect the Mesozoic and early Tertiary strata run approximately from N.N.W. to S.S.E.

Up to the close of the 19th century the greater part of Greece was believed to be formed of Cretaceous rocks, but later researches have shown that the supposed Cretaceous beds include a variety of geological horizons. The geological sequence begins with crystalline schists and limestones, followed by Palaeozoic, Triassic and Liassic rocks. The oldest beds which hitherto have yielded fossils belong to the Carboniferous System (*Fusulina* limestone of Euboea). Following upon these older beds are the great limestone masses which cover most of the eastern region, and which are now known to include Jurassic, Tithonian, Lower and Upper Cretaceous and Eocene beds. In the Pindus and the Peloponnesus these beds are overlaid by a series of shales and platy limestones (Olonos Limestone of the Peloponnesus), which were formerly supposed to be of Tertiary age. It has now been shown, however, that the upper series of limestones has been brought upon the top of the lower by a great overthrust. Triassic fossils have been found in the Olonos Limestone and it is almost certain that other Mesozoic horizons are represented.

The earth movements which produced the mountain chains of western Greece have folded the Eocene beds and must therefore be of post-Eocene date. The Neogene beds, on the other hand, are not affected by the folds, although by faulting without folding they have in some places been raised to a height of nearly 6000 ft. They lie, however, chiefly along the coast and in the valleys, and consist of marls, conglomerates and sands, sometimes with seams of lignite. The Pikermi deposits, of late Miocene age, are famous for their rich mammalian fauna.

Although the folding which formed the mountain chains appears to have ceased, Greece is still continually shaken by earthquakes, and these earthquakes are closely connected with the great lines of fracture to which the country owes its outline. Around the narrow gulf which separates the Peloponnesus from the mainland, earthquakes are particularly frequent, and another region which is often shaken is the south-western corner of Greece, the peninsula of Messene.[1] (P. La.)

Flora. The vegetation of Greece in general resembles that of southern Italy while presenting many types common to that of Asia Minor. Owing to the geographical configuration of the peninsula and its mountainous surface the characteristic flora of the Mediterranean regions is often found in juxtaposition with that of central Europe. In respect to its vegetation the country may be regarded as divided into four zones. In the first, extending from the sea-level to the height of 1500 ft., oranges, olives, dates, almonds, pomegranates, figs and vines flourish, and cotton and tobacco are grown. In the neighbourhood of streams are found the laurel, myrtle, oleander and lentisk, together with the plane and white poplar; the cypress is often a picturesque feature in the landscape, and there is a variety of aromatic plants. The second zone, from 1500 to 3500 ft., is the region of the oak, chestnut and other British trees. In the third, from 3500 to 5500 ft., the beech is the characteristic forest tree; the *Abies cephalonica* and *Pinus pinea* now take the place of the *Pinus halepensis*, which grows everywhere in the lower regions. Above 5500 ft. is the Alpine region, marked by small plants, lichens and mosses. During the short period of spring anemones and other wild flowers enrich the hillsides with magnificent colouring; in June all verdure disappears except in the watered districts and elevated plateaus. The asphodel grows abundantly in the dry rocky soil; aloes, planted in rows, form impenetrable hedges. Medicinal plants are numerous, such as the *Inula Helenium*, the *Mandragora Officinarum*, the *Colchicum napolitanum* and the *Helleborus orientalis*, which still grows abundantly near Aspraspitia, the ancient Anticyra, at the foot of Parnassus.

Fauna. The fauna is similar to that of the other Mediterranean peninsulas, and includes some species found in Asia Minor but not elsewhere in Europe. The lion existed in northern Greece in the time of Aristotle and at an earlier period in the Morea. The bear is still found in the Pindus range. Wolves are common in all the mountainous regions and jackals are numerous in the Morea. Foxes are abundant in all parts of the country; the polecat is found in the woods of Attica and the Morea; the lynx is now rare. The wild boar is common in the mountains of northern Greece, but is almost extinct in the Peloponnesus. The badger, the marten and the weasel are found on the mainland and in the islands. The red deer, the fallow deer and the roe exist in northern Greece, but are becoming scarce. The otter is rare. Hares and rabbits are abundant in many parts of the country, especially in the Cyclades; the two species never occupy the same district, and in the Cyclades some islands (Naxos, Melos, Tenos, &c.) form the exclusive domain of the hares, others (Seriphos, Kimolos, Mykonos, &c.) of the rabbits. In Andros alone a demarcation has been arrived at, the hares retaining the northern and the rabbits the southern portion of the island.

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[1] For the Geology of Greece see: M. Neumayr, &c., *Denks. k. Akad. Wiss. Wien, math.-nat. Cl.* vol. xl. (1880); A. Philippson, *Der Peloponnes* (Berlin, 1892) and "Beiträge zur Kenntnis der griechischen Inselwelt," *Peterm. Mitt.*, Ergänz.-heft No. 134 (1901); R. Lepsius, *Geologie von Attika* (Berlin, 1893); L. Cayeux, "Phénomènes de charriage dans la Méditerranée orientale," *C. R. Acad. Sci. Paris*, vol. cxxxvi. (1903) pp. 474-476; J. Deprat, "Note préliminaire sur la géologie de l'île d'Eubée," *Bull. Soc. Géol. France*, ser. 4, vol. iii. (1903) pp. 229-243, p. vii. and "Note sur la géologie du massif du Pélion et sur l'influence exercée par les massifs archéens sur la tectonique de l'Égéide," *ib.* vol. iv. (1904), pp. 299-338.

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The chamois is found in the higher mountains, such as Pindus, Parnassus and Tymphrestus. The Cretan *agrimi*, or wild goat (*Capra nubiana, C. aegagrus*), found in Antimelos and said to exist in Taygetus, the jackal, the stellion, and the chameleon are among the Asiatic species not found westward of Greece. There is a great variety of birds; of 358 species catalogued two-thirds are migratory. Among the birds of prey, which are very numerous, are the golden and imperial eagle, the yellow vulture, the *Gypaetus barbatus*, and several species of falcons. The celebrated owl of Athena (*Athene noctua*) is becoming rare at Athens, but still haunts the Acropolis and the royal garden; it is a small species, found everywhere in Greece. The wild goose and duck, the bustard, partridge, woodcock, snipe, wood-pigeon and turtle-dove are numerous. Immense flocks of quails visit the southern coast of the Morea, where they are captured in great numbers and exported alive. The stork, which was common in the Turkish epoch, has now become scarce. There is a great variety of reptiles, of which sixty-one species have been catalogued. The sauriana are all harmless; among them the stellion (*Stellio vulgaris*), commonly called κροκόδειλος in Mykonos and Crete, is believed by Heldreich to have furnished a name to the crocodile of the Nile (Herod. ii. 69). There are five species of tortoise and nine of Amphibia. Of the latter, which are numerous, there are only two dangerous species, the *Vipera ammodytes* and the *Vipera aspis*; the first-named is common. Among the marine fauna are the dolphins, familiar in the legends and sculpture of antiquity; in the clear water of the Aegean they often afford a beautiful spectacle as they play round ships; porpoises and whales are sometimes seen. Sea-fish, of which 246 species have been ascertained, are very abundant.

Climate.

The climate of Greece, like that of the other countries of the Balkan peninsula, is liable to greater extremes of heat and cold than prevail in Spain and Italy; the difference is due to the general contour of the peninsula, which assimilates its climatic conditions to those of the European mainland. Another distinctive feature is the great variety of local contrasts; the rapid transitions are the natural effect of diversity in the geographical configuration of the country. Within a few hours it is possible to pass from winter to spring and from spring to summer. The spring is short; the sun is already powerful in March, but the increasing warmth is often checked by cold northerly winds; in many places the corn harvest is cut in May, when southerly winds prevail and the temperature rises rapidly. The great heat of summer is tempered throughout the whole region of the archipelago by the Etesian winds, which blow regularly from the N.E. for forty to fifty days in July and August. This current of cool dry air from the north is due to the vacuum resulting from intense heat in the region of the Sahara. The healthy Etesian winds are generally replaced towards the end of summer by the southerly Libas or sirocco, the effect of which, when blowing strongly, resembles the blast from a furnace and is most injurious to health. The sirocco affects, though in a less degree, the other countries of the Balkan peninsula and even Rumania. The mean summer temperature is about 79° Fahr. The autumn is the most unhealthy season of the year owing to the great increase of humidity, especially in October and November. At the end of October snow reappears on the higher mountains, remaining on the summits till June. The winter is mild, and even in the north there are, as a rule, many warm clear days; but the recurrence of biting northerly winds and cold blasts from the mountains, as well as the rapid transitions from heat to cold and the difference in the temperature of sunshine and shade, render the climate somewhat treacherous and unsuitable for invalids. Snow seldom falls in the maritime and lowland districts and frost is rare. The mean winter temperature is from 48° to 55° Fahr. The rainfall varies greatly according to localities; it is greatest in the Ionian Islands (53·34 ins. at Corfu), in Arcadia and in the other mountainous districts, and least on the Aegean littoral and in the Cyclades; in Attica, the driest region in Greece, it is 16·1 ins. The wettest months are November, December and January; the driest July and August, when, except for a few thunder-storms, there is practically no rainfall. The rain generally accompanies southerly or south-westerly winds. In all the maritime districts the sea breeze greatly modifies the temperature; it begins about 9 A.M., attains its maximum force soon after noon, and ceases about an hour after sunset. Greece is renowned for the clearness of its climate; fogs and mists are almost unknown. In most years, however, only four or five days are recorded in which the sky is perfectly cloudless. The natural healthiness of the climate is counteracted in the towns, especially in Athens, by deficient sanitation and by stifling clouds of dust, which propagate infection and are peculiarly hurtful in cases of ophthalmia and pulmonary disease. Malarial fever is endemic in the marshy districts, especially in the autumn.

Area and population.

The area of the country was 18,341 sq. m. before the acquisition of the Ionian Islands in 1864, 19,381 sq. m. prior to the annexation of Thessaly and part of Epirus in 1881, and 24,552 sq. m. at the census in 1896. If we deduct 152 sq. m., the extent of territory ceded to Turkey after the war of 1897, the area of Greece in 1908 would be 24,400 sq. m. Other authorities give 25,164 and 25,130 sq. m. as the area prior to the rectification of the frontier in 1898.[1] The population in 1896 was 2,433,806, or 99·1 to the sq. m., the population of the territories annexed in 1881 being approximately 350,000; and 2,631,952 in 1907, or 107·8 to the sq. m. (according to the official estimate of the area), showing an increase of 198,146 or 0·81% per annum, as compared with 1·61% during the period between 1896 and 1889; the diminished increase is mainly due to emigration. The population by sex in 1907 is given as 1,324,942 males and 1,307,010 females (or 50·3% males to 49·6 females). The preponderance of males, which was 52% to 48% females in 1896, has also been reduced by emigration; it is most marked in the northern departments, especially in Larissa. Only in the departments of Arcadia, Eurytania, Corinth, Cephalonia, Lacedaemon, Laconia, Phocis, Argolis and in the Cyclades, is the female population in excess of the male.

Neither the census of 1896 nor that of 1889 gave any classification by professions, religion or language. The following figures, which are only approximate, were derived from unofficial sources in 1901:—agricultural and pastoral employments 444,000; industries 64,200; traders and their employés 118,000; labourers and servants 31,300; various professions 15,700; officials 12,000; clergy about 6000; lawyers 4000; physicians 2500. In 1879, 1,635,698 of the population were returned as Orthodox Christians, 14,677 as Catholics and Protestants, 2652 as Jews, and 740 as of other religions. The annexation of Thessaly and part of Epirus is stated to have added 24,165 Mahommedan subjects to the Hellenic kingdom. A considerable portion of these, however, emigrated immediately after the annexation, and, although a certain number subsequently returned, the total Mahommedan population in Greece was estimated to be under 5000 in 1908. A number of the Christian inhabitants of these regions, estimated at about 50,000, retained Turkish nationality with the object of escaping military service. The Albanian population, estimated at 200,000 by Finlay in 1851, still probably exceeds 120,000. It is gradually being absorbed in the Hellenic population. In 1870, 37,598 persons (an obviously untrustworthy figure) were returned as speaking Albanian only. In 1879 the number is given as 58,858. The Vlach population, which has been increased by the annexation of Thessaly, numbers about 60,000. The number of foreign residents is unknown. The Italians are the most numerous, numbering about 11,000. Some 1500 persons, mostly Maltese, possess British nationality.

By a law of 27 November 1899, Greece, which had hitherto been divided into sixteen departments (νόμοι) was redivided into twenty-six departments, as follows:—

Departments.	*Pop.*	*Departments.*	*Pop.*
1 Attica. . .	341,247	14 Corinth . . .	71,229
2 Boeotia . .	65,816	15 Arcadia . . .	162,324
3 Phthiotis. .	112,328	16 Achaea . . .	150,918
4 Phocis . . .	62,246	17 Elis	103,810
5 Aetolia and Acarnania . .	141,405	18 Cephalonia . .	90,523
6 Eurytania . .	47,192	19 Messenia . . .	127,991
7 Arta	41,280	20 Laconia . . .	61,522
8 Trikkala . .	90,548	21 Lacedaemon . .	87,106
9 Karditsa . .	92,941	22 Corfu	99,571
10 Larissa . .	95,066	23 Cephalonia . .	71,235
11 Magnesia. . .	102,742	24 Leucas (with Ithaca)	41,186
12 Euboea . . .	116,903	25 Zante	42,502
13 Argolis . . .	61,894	26 Cyclades . . .	130,378

The population is densest in the Ionian Islands, exceeding 307 per sq. m. The departments of Acarnania, Phocis and Euboea are the most thinly inhabited (about 58, 61 and 66 per sq. m. respectively).

Very little information is obtainable with regard to the movement of the population; no register of births, deaths and marriages is kept in Greece. The only official statistics are found in the periodical returns of the mortality in the twelve principal towns, according to which the yearly average of deaths in these towns for the five years 1903–1907 was approximately 10,253, or 23·8 per 1000; of these more than a quarter are ascribed to pulmonary consumption, due in the main to defective sanitation. Both the birth-rate and death-rate are low, being 27·6 and 20·7 per 1000 respectively. Infant mortality is slight, and in point of longevity Greece compares favourably with most other European countries. The number of illegitimate births is 12·25 per 1000; these are almost exclusively in the towns.

Of the total population 28·5% are stated to live in towns. The population of the principal towns is:—

	1896.	1907.
Athens . . .	111,486	167,479
Peiraeus . . .	43,848	73,579
Patras . . .	37,985	37,724

[1] No state survey of Greece was available in 1908, though a survey had been undertaken by the ministry of war.

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	1896.	1907.
Trikkala	21,149	17,809
Hermopolis (Syra)	18,760	18,132
Corfu	18,581	28,254[1]
Volo	16,788	23,863
Larissa	15,373	18,001
Zante	14,906	13,580
Kalamata	14,298	15,397
Pyrgos	12,708	13,690
Tripolis	10,465	10,789
Chalcis	8,661	10,958
Laurium	7,926	10,007

No trustworthy information is obtainable with regard to immigration and emigration, of which no statistics have ever been kept. Emigration, which was formerly in the main to Egypt and Rumania, is now almost exclusively to the United States of America. The principal exodus is from Arcadia, Laconia and Maina; the emigrants from these districts, estimated at about 14,000 annually, are for the most part young men approaching the age of military service. According to American statistics 12,431 Greeks arrived in the United States from Greece during the period 1899–1898 and 130,154 in 1899–1907; a considerable number, however, have returned to Greece, and those remaining in the United States at the end of 1907 were estimated at between 136,000 and 138,000; this number was considerably reduced in 1908 by remigration. Since 1896 the tendency to emigration has received a notable and somewhat alarming impulse. There is an increasing immigration into the towns from the rural districts, which are gradually becoming depopulated. Both movements are due in part to the preference of the Greeks for a town life and in part to distaste for military service, but in the main to the poverty of the peasant population, whose condition and interests have been neglected by the government.

Greece is inhabited by three races—the Greeks, the Albanians and the Vlachs. The Greeks who are by far the most numerous, have to a large extent absorbed the other races; the process of assimilation has been especially rapid since the foundation of the Greek kingdom. Like most European nations, the modern Greeks are a mixed race. The question of their origin has been the subject of much learned controversy; their presumed descent from the Greeks of the classical epoch has proved a national asset of great value; during the period of their struggle for independence it won them the devoted zeal of the Philhellenes, it inspired the enthusiasm of Byron, Victor Hugo, and a host of minor poets, and it has furnished a pleasing illusion to generations of scholarly tourists who delight to discover in the present inhabitants of the country the mental and physical characteristics with which they have been familiarized by the literature and art of antiquity. This amiable tendency is encouraged by the modern Greeks, who possess an implicit faith in their illustrious ancestry. The discussion of the question entered a very acrimonious stage with the appearance in 1830 of Fallmerayer's *History of the Morea during the Middle Ages*. Fallmerayer maintained that after the great Slavonic immigration at the close of the 8th century the original population of northern Greece and the Morea, which had already been much reduced during the Roman period, was practically supplanted by the Slavonic element and that the Greeks of modern times are in fact Byzantinized Slavs. This theory was subjected to exhaustive criticism by Ross, Hopf, Finlay and other scholars, and although many of Fallmerayer's conclusions remain unshaken, the view is now generally held that the base of the population both in the mainland and the Morea is Hellenic, not Slavonic. During the 5th and 6th centuries Greece had been subjected to Slavonic incursions which resulted in no permanent settlements. After the great plague of 746–747, however, large tracts of depopulated country were colonized by Slavonic immigrants; the towns remained in the hands of the Greeks, many of whom emigrated to Constantinople. In the Morea the Slavs established themselves principally in Arcadia and the region of Taygetus, extending their settlements into Achaia, Elis, Laconia and the promontory of Taenaron; on the mainland they occupied portions of Acarnania, Aetolia, Doris and Phocis. Slavonic place-names occurring in all these districts confirm the evidence of history with regard to this immigration. The Slavs, who were not a maritime race, did not colonize the Aegean Islands, but a few Slavonic place-names in Crete seem to indicate that some of the invaders reached that island. The Slavonic settlements in the Morea proved more permanent than those in northern Greece, which were attacked by the armies of the Byzantine emperors. But even in the Morea the Greeks, or "Romans" as they called themselves (Ῥωμαῖοι), who had been left undisturbed on the eastern side of the peninsula, eventually absorbed the alien element, which disappeared after the 15th century. In addition to the place-names the only remaining traces of the Slav immigration are the Slavonic type of features, which occasionally recurs, especially among the Arcadian peasants, and a few customs and traditions. Even when allowance is made for the remarkable power of assimilation which the Greeks possessed in virtue of their superior civilization, it is difficult to resist the conclusion that the Hellenic element must always have been the most numerous in order to effect so complete an absorption. This element has apparently undergone no essential change since the epoch of Roman domination. The destructive invasions of the Goths in A.D. 267 and 395 introduced no new ethnic feature; the various races which during the middle ages obtained partial or complete mastery in Greece—the Franks, the Venetians, the Turks—contributed no appreciable ingredient to the mass of the population. The modern Greeks may therefore be regarded as in the main the descendants of the population which inhabited Greece in the earlier centuries of Byzantine rule. Owing to the operation of various causes, historical, social and economic, that population was composed of many heterogeneous elements and represented in a very limited degree the race which repulsed the Persians and built the Parthenon. The internecine conflicts of the Greek communities, wars with foreign powers and the deadly struggles of factions in the various cities, had to a large extent obliterated the old race of free citizens by the beginning of the Roman period. The extermination of the Plataeans by the Spartans and of the Melians by the Athenians during the Peloponnesian war, the proscription of Athenian citizens after the war, the massacre of the Corcyraean oligarchs by the democratic party, the slaughter of the Thebans by Alexander and of the Corinthians by Mummius, are among the more familiar instances of the catastrophes which overtook the civic element in the Greek cities; the void can only have been filled from the ranks of the metics or resident aliens and of the descendants of the far more numerous slave population. Of the latter a portion was of Hellenic origin; when a city was taken the males of military age were frequently put to the sword, but the women and children were sold as slaves; in Laconia and Thessaly there was a serf population of indigenous descent. In the classical period four-fifths of the population of Attica were slaves and of the remainder half were metics. In the Roman period the number of slaves enormously increased, the supply being maintained from the regions on the borders of the empire; the same influences which in Italy extinguished the small landed proprietors and created the *latifundia* prevailed also in Greece. The purely Hellenic population, now greatly diminished, congregated in the towns; the large estates which replaced the small freeholds were cultivated by slaves and managed or farmed by slaves or freedmen, and wide tracts of country were wholly depopulated. How greatly the free citizen element had diminished by the close of the 1st century A.D. may be judged from the estimate of Plutarch that all Greece could not furnish more than 3000 hoplites. The composite population which replaced the ancient Hellenic stock became completely Hellenized. According to craniologists the modern Greeks are brachycephalous while the ancient race is stated to have been dolichocephalous, but it seems doubtful whether any such generalization with regard to the ancients can be conclusively established. The Aegean islanders are more brachycephalous than the inhabitants of the mainland, though apparently of purer Greek descent. No general conception of the facial type of the ancient race can be derived from the highly-idealized statues of deities, heroes and athletes; so far as can be judged from portrait statues it was very varied. Among the modern Greeks the same variety of features prevails; the face is usually oval, the nose generally

Ethnology.

[1] Including suburbs.

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long and somewhat aquiline, the teeth regular, and the eyes remarkably bright and full of animation. The country-folk are, as a rule, tall and well-made, though slightly built and rather meagre; their form is graceful and supple in movement. The urban population, as elsewhere, is physically very inferior. The women often display a refined and delicate beauty which disappears at an early age. The best physical types of the race are found in Arcadia, in the Aegean Islands and in Crete.

The Albanian population extends over all Attica and Megaris (except the towns of Athens, Peiraeus and Megara), the greater part of Boeotia, the eastern districts of Locris, the southern half of Euboea and the northern side of Andros, the whole of the islands of Salamis, Hydra, Spetsae and Poros, and part of Aegina, the whole of Corinthia and Argolis, the northern districts of Arcadia and the eastern portion of Achaea. There are also small Albanian groups in Laconia and Messenia (see ALBANIA). The Albanians, who call themselves *Shkyipetar*, and are called by the Greeks *Arvanitae* (Ἀρβανῖται), belong to the Tosk or southern branch of the race; their immigration took place in the latter half of the 14th century. Their first settlements in the Morea were made in 1347-1355. The Albanian colonization was first checked by the Turks; in 1454 an Albanian insurrection in the Morea against Byzantine rule was crushed by the Turkish general Tura Khan, whose aid had been invoked by the Palaeologi. With a few exceptions, the Albanians in Greece remain their Christian faith after the Turkish conquest. The failure of the insurrection of 1770 was followed by a settlement of Moslem Albanians, who had been employed by the Turks to suppress the revolt. The Christian Albanians have long lived on good terms with the Greeks while retaining their own customs and language and rarely intermarrying with their neighbours. They played a brilliant part during the War of Independence, and furnished the Greeks with many of their most distinguished leaders. The process of their Hellenization, which scarcely began till after the establishment of the kingdom, has been somewhat slow; most of the men can now speak Greek, but Albanian is still the language of the household. The Albanians, who are mainly occupied with agriculture, are less quick-witted, less versatile, and less addicted to politics than the Greeks, who regard them as intellectually their inferiors. A vigorous and manly race, they furnish the best soldiers in the Greek army, and also make excellent sailors.

The Vlachs, who call themselves *Aromâni*, *i. e.* Romans, form another important foreign element in the population of Greece. They are found principally in Pindus (the Agrapha district), the mountainous parts of Thessaly, Othrys, Oeta, the mountains of Boeotia, Aetolia and Acarnania; they have a few settlements in Euboea. They are for the most part either nomad shepherds and herdsmen or carriers (*kiradjii*). They apparently descend from the Latinized provincials of the Roman epoch who took refuge in the higher mountains from the incursions of the barbarians and Slavs (see VLACHS and MACEDONIA). In the 13th century the Vlach principality of "Great Walachia" (Μεγάλη Βλαχία) included Thessaly and southern Macedonia as far as Castoria; its capital was at Hypati near Lamia. Acarnania and Aetolia were known as "Lesser Walachia." The urban element among the Vlachs has been almost completely Hellenized; it has always displayed great aptitude for commerce, and Athens owes many of its handsomest buildings to the benefactions of wealthy Vlach merchants. The nomad population in the mountains has retained its distinctive nationality and customs together with its Latin language, though most of the men can speak Greek. Like the Albanians, the pastoral Vlachs seldom intermarry with the Greeks; they occasionally take Greek wives, but never give their daughters to Greeks; many of them are illiterate, and their children rarely attend the schools. Owing to their deficient intellectual culture they are regarded with disdain by the Greeks, who employ the term βλάχος to denote not only a shepherd but an ignorant rustic.

A considerable Italian element was introduced into the Ionian Islands during the middle ages owing to their prolonged subjection to Latin princes and subsequently (till 1797) to the Venetian republic. The Italians intermarried with the Greeks; Italian became the language of the upper classes, and Roman Catholicism was declared the state religion. The peasantry, however, retained the Greek language and remained faithful to the Eastern Church; during the past century the Italian element was completely absorbed by the Greek population.

The Turkish population in Greece, which numbered about 70,000 before the war of liberation, disappeared in the course of the struggle or emigrated at its conclusion. The Turks in Thessaly are mainly descended either from colonists established in the country by the Byzantine emperors or from immigrants from Asia Minor, who arrived at the end of the 14th century; they derive their name Konariots from Iconium (Konia). Many of the beys or land-owning class are the lineal representatives of the Seljuk nobles who obtained fiefs under the feudal system introduced here and in Macedonia by the Sultan Bayezid I.

Notwithstanding their composite origin, their wide geographical distribution and their cosmopolitan instincts, the modern Greeks are a remarkably homogeneous people, differing markedly in character from neighbouring races, united by a common enthusiasm in the pursuit of their national aims, and profoundly convinced of their superiority to other nations. Their distinctive character, combined with their traditional tendency to regard non-Hellenic peoples as barbarous, has, indeed, to some extent counteracted the results of their great energy and zeal in the assimilation of other races; the advantageous position which they attained at an early period under Turkish rule owing to their superior civilization, their versatility, their wealth, and their monopoly of the ecclesiastical power would probably have enabled them to Hellenize permanently the greater part of the Balkan peninsula had their attitude towards other Christian races been more sympathetic. Always the most civilized race in the East, they have successively influenced their Macedonian, Roman and Turkish conquerors, and their remarkable intellectual endowments bid fair to secure them a brilliant position in the future. The intense patriotic zeal of the Greeks may be compared with that of the Hungarians; it is liable to degenerate into arrogance and intolerance; it sometimes blinds their judgment and involves them in ill-considered enterprises, but it nevertheless offers the best guarantee for the ultimate attainment of their national aims. All Greeks, in whatever country they may reside, work together for the realization of the Great Idea (ἡ Μεγάλη Ἰδέα)—the supremacy of Hellenism in the East—and to this object they freely devote their time, their wealth and their talents; the large fortunes which they amass abroad are often bequeathed for the foundation of various institutions in Greece or Turkey, for the increase of the national fleet and army, or for the spread of Hellenic influence in the Levant. This patriotic sentiment is unfortunately much exploited by self-seeking demagogues and publicists, who rival each other in exaggerating the national pretensions and in pandering to the national vanity. In no other country is the passion for politics so intense; "keen political discussions are constantly going on at the cafés; the newspapers, which are extraordinarily numerous and generally of little value, are literally devoured, and every measure of the government is violently criticized and ascribed to interested motives." The influence of the journals is enormous; even the waiters in the cafés and domestic servants have their favourite newspaper, and discourse fluently on the political problems of the day. Much of the national energy is wasted by this continued political fever; it is diverted from practical aims, and may be said to evaporate in words. The practice of independent criticism tends to indiscipline in the organized public services; it has been remarked that every Greek soldier is a general and every sailor an admiral. During the war of 1897 a young naval lieutenant telegraphed to the minister of war condemning the measures taken by his admiral, and his action was applauded by several journals. There is also little discipline in the ranks of political parties, which are held together, not by any definite principle, but by the personal influence of the leaders; defections are frequent, and as a rule each deputy in the Chamber makes

National character.

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his terms with his chief. On the other hand, the independent character of the Greeks is favourably illustrated by the circumstance that Greece is the only country in the Balkan peninsula in which the government cannot count on securing a majority by official pressure at the elections. Few scruples are observed in political warfare, but attacks on private life are rare. The love of free discussion is inherent in the strongly-rooted democratic instinct of the Greeks. They are in spirit the most democratic of European peoples; no trace of Latin feudalism survives, and aristocratic pretensions are ridiculed. In social life there is no artificial distinction of classes; all titles of nobility are forbidden; a few families descended from the chiefs in the War of Independence enjoy a certain pre-eminence, but wealth and, still more, political or literary notoriety constitute the principal claim to social consideration. The Greeks display great intellectual vivacity; they are clever, inquisitive, quick-witted and ingenious, but not profound; sustained mental industry and careful accuracy are distasteful to them, and their aversion to manual labour is still more marked. Even the agricultural class is but moderately industrious; abundant opportunities for relaxation are provided by the numerous church festivals. The desire for instruction is intense even in the lowest ranks of the community; rhetorical and literary accomplishments possess a greater attraction for the majority than the fields of modern science. The number of persons who seek to qualify for the learned professions is excessive; they form a superfluous element in the community, an educated proletariat, attaching themselves to the various political parties in the hope of obtaining state employment and spending an idle existence in the cafés and the streets when their party is out of power. In disposition the Greeks are lively, cheerful, plausible, tactful, sympathetic; very affable with strangers, hospitable, kind to their servants and dependants, remarkably temperate and frugal in their habits, amiable and united in family life. Drunkenness is almost unknown, thrift is universally practised; the standard of sexual morality is high, especially in the rural districts, where illegitimacy is extremely rare. The faults of the Greeks must in a large degree be attributed to their prolonged subjection to alien races; their cleverness often degenerates into cunning, their ready invention into mendacity, their thrift into avarice, their fertility of resource into trickery and fraud. Dishonesty is not a national vice, but many who would scorn to steal will not hesitate to compass illicit gains by duplicity and misrepresentation; deceit, indeed, is often practised gratuitously for the mere intellectual satisfaction which it affords. In the astuteness of their monetary dealings the Greeks proverbially surpass the Jews, but fall short of the Armenians; their remarkable aptitude for business is sometimes marred by a certain short-sightedness which pursues immediate profits at the cost of ulterior advantages. Their vanity and egoism, which are admitted by even the most favourable observers, render them jealous, exacting, and peculiarly susceptible to flattery. In common with other southern European peoples the Greeks are extremely excitable; their passionate disposition is prone to take offence at slight provocation, and trivial quarrels not infrequently result in homicide. They are religious, but by no means fanatical, except in regard to politico-religious questions affecting their national aims. In general the Greeks may be described as a clever, ambitious and versatile people, capable of great effort and sacrifice, but deficient in some of the more solid qualities which make for national greatness.

The customs and habits of the Greek peasantry, in which the observances of the classical age may often be traced, together with their legends and traditions, have furnished an interesting subject of investigation to many writers (see *Bibliography* below). In the towns the more cosmopolitan population has largely adopted the "European" mode of life, and the upper classes show a marked preference for French manners and usages. In both town and country, however, the influence of oriental ideas is still apparent, due in part to the long period of Turkish domination, in part to the contact of the Greeks with Asiatic races at all epochs of their history. In the rural districts, especially, the women lead a somewhat secluded life and occupy a subject position; they wait at table, and only partake of the meal when the men of the family have been served. In most parts of continental Greece the women work in the fields, but in the Aegean Islands and Crete they rarely leave the house. Like the Turks, the Greeks have a great partiality for coffee, which can always be procured even in the remotest hamlets; the Turkish practice of carrying a string of beads or rosary (*comboloio*), which provides an occupation for the hands, is very common. Many of the observances in connexion with births, christenings, weddings and funerals are very interesting and in some cases are evidently derived from remote antiquity. Nuptial ceremonies are elaborate and protracted; in some of the islands of the archipelago they continue for three weeks. In the preliminary negotiations for a marriage the question of the bride's dowry plays a very important part; a girl without a dowry often remains unmarried, notwithstanding the considerable excess of the male over the female population. Immediately after the christening of a female child her parents begin to lay up her portion, and young men often refrain from marrying until their sisters have been settled in life. The dead are carried to the tomb in an open coffin; in the country districts professional mourners are engaged to chant dirges; the body is washed with wine and crowned with a wreath of flowers. A valedictory oration is pronounced at the grave. Many superstitions still prevail among the peasantry; the belief in the vampire and the evil eye is almost universal. At Athens and in the larger towns many handsome dwelling-houses may be seen, but the upper classes have no predilection for rural life, and their country houses are usually mere farmsteads, which they rarely visit. In the more fertile districts two-storeyed houses of the modern type are common, but in the mountainous regions the habitations of the country-folk are extremely primitive; the small stone-built hut, almost destitute of furniture, shelters not only the family but its cattle and domestic animals. In Attica the peasants' houses are usually built of cob. In Maina the villagers live in fortified towers of three or more storeys; the animals occupy the ground floor, the family the topmost storey; the intermediate space serves as a granary or hay-loft. The walls are loop-holed for purposes of defence in view of the traditional vendetta and feuds, which in some instances have been handed down from remote generations and are maintained by occasional sharp-shooting from these primitive fortresses. In general cleanliness and sanitation are much neglected; the traveller in the country districts is doomed to sleepless nights unless he has provided himself with bedding and a hammock. Even Athens, though enriched by many munificent benefactions, is still without a drainage system or an adequate water supply; the sewers of many houses open into the streets, in which rubbish is allowed to accumulate. The effects of insanitary conditions are, however, counteracted in some degree by the excellent climate. The Aegean islanders contrast favourably with the continentals in point of personal cleanliness and the neatness of their dwellings; their houses are generally covered with the flat roof, familiar in Asia, on which the family sleep in summer. The habits and customs of the islanders afford an interesting study. Propitiatory rites are still practised by the mariners and fishermen, and thank-offerings for preservation at sea are hung up in the churches. Among the popular amusements of the Greeks dancing holds a prominent place; the dance is of various kinds; the most usual is the somewhat inanimate round dance (*συρτὸ* or *τράτα*), in which a number of persons, usually of the same sex, take part holding hands; it seems indentical with the Slavonic *kolo* ("circle"). The more lively Albanian fling is generally danced by three or four persons, one of whom executes a series of leaps and pirouettes. The national music is primitive and monotonous. All classes are passionately addicted to card-playing, which is forbidden by law in places of public resort. The picturesque national costume, which is derived from the Albanian Tosks, has unfortunately been abandoned by the upper classes and the urban population since the abdication of King Otho, who always wore it; it is maintained as the uniform of the *evzones* (highland

Customs.

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regiments). It consists of a red cap with dark blue tassel, a white shirt with wide sleeves, a vest and jacket, sometimes of velvet, handsomely adorned with gold or black braid, a belt in which various weapons are carried, a white kilt or *fustanella* of many folds, white hose tied with garters, and red leather shoes with pointed ends, from which a tassel depends. Over all is worn the shaggy white *capote*. The islanders wear a dark blue costume with a crimson waistband, loose trousers descending to the knee, stockings and pumps or long boots. The women's costume is very varied; the loose red fez is sometimes worn and a short velvet jacket with rich gold embroidery. The more elderly women are generally attired in black. In the Megara district and elsewhere peasant girls wear on festive occasions a headdress composed of strings of coins which formerly represented the dowry.

Greece is a constitutional monarchy; hereditary in the male line, or, in case of its extinction, in the female. The sovereign, by decision of the conference of London (August 1863), is styled "king of the Hellenes"; the title "king of Greece" was borne by King Otho. The heir apparent is styled ὁ διάδοχος, "the successor"; the title "duke of Sparta," which has been accorded to the crown prince, is not generally employed in Greece. The king and the heir apparent must belong to the Orthodox Greek Church; a special exception has been made for King George, who is a Lutheran. The king attains his majority on completing his eighteenth year; before ascending the throne he must take the oath to the constitution in presence of the principal ecclesiastical and lay dignitaries of the kingdom, and must convoke the Chamber within two months after his accession. The civil list amounts to 1,125,000 dr., in addition to which it was provided that King George should receive £4000 annually as a personal allowance from each of the three protecting powers, Great Britain, France and Russia. The heir apparent receives from the state an annuity of 200,000 dr. The king has a palace at Athens and other residences at Corfu, Tatoi (on the slopes of Mt Parnes) and Larissa. The present constitution dates from the 29th of October 1864. The legislative power is shared by the king with a single chamber (βουλή) elected by manhood suffrage for a period of four years. The election is by ballot; candidates must have completed their thirtieth year and electors their twenty-first. The deputies (βουλευταί), according to the constitution, receive only their travelling expenses, but they vote themselves a payment of 1800 dr. each for the session and a further allowance in case of an extraordinary session. The Chamber sits for a term of not less than three or more than six months. No law can be passed except by an absolute majority of the house, and one-half of the members must be present to form a quorum; these arrangements have greatly facilitated the practice of obstruction, and often enable individual deputies to impose terms on the government for their attendance. In 1898 the number of deputies was 234. Some years previously a law diminishing the national representation and enlarging the constituencies was passed by Trikoupis with the object of checking the local influence of electors upon deputies, but the measure was subsequently repealed. The number of deputies, however, who had hitherto been elected in the proportion of one to twelve thousand of the population, was reduced in 1905, when the proportion of one to sixteen thousand was substituted; the Chamber of 1906, elected under the new system, consisted of 177 deputies. In 1906 the electoral districts were diminished in number and enlarged so as to coincide with the twenty-six administrative departments (νόμοι); the reduction of these departments to their former number of sixteen, which is in contemplation, will bring about some further diminution in parliamentary representation. It is hoped that recent legislation will tend to check the pernicious practice of bartering personal favours, known as συναλλαγή, which still prevails to the great detriment of public morality, paralysing all branches of the administration and wasting the resources of the state. Political parties are formed not for the furtherance of any principle or cause, but with the object of obtaining the spoils of office, and the various groups, possessing no party watchword or programme, frankly designate themselves by the names of their leaders. Even the strongest government is compelled to bargain with its supporters in regard to the distribution of patronage and other favours. The consequent instability of successive ministries has retarded useful legislation and seriously checked the national progress. In 1906 a law was passed disqualifying junior officers of the army and navy for membership of the Chamber; great numbers of these had hitherto been candidates at every election. This much-needed measure had previously been passed by Trikoupis, but had been repealed by his rival Delyannes. The executive is vested in the king, who is personally irresponsible, and governs through ministers chosen by himself and responsible to the Chamber, of which they are *ex-officio* members. He appoints all public officials, sanctions and proclaims laws, convokes, prorogues and dissolves the Chamber, grants pardon or amnesty, coins money and confers decorations. There are seven ministries which respectively control the departments of foreign affairs, the interior, justice, finance, education and worship, the army and the navy.

Government.

Local administration.

The 26 departments or νομοί, into which the country is divided for administrative purposes, are each under a prefect or nomarch (νόμαρχος); they are subdivided into 69 districts or eparchies, and into 445 communes or demes (δῆμοι) under mayors or demarchs (δήμαρχοι). The prefects and sub-prefects are nominated by the government; the mayors are elected by the communes for a period of four years. The prefects are assisted by a departmental council, elected by the population, which manages local business and assesses rates; there are also communal councils under the presidency of the mayors. There are altogether some 12,000 state-paid officials in the country, most of them inadequately remunerated and liable to removal or transferral upon a change of government. A host of office-seekers has thus been created, and large numbers of educated persons spend many years in idleness or in political agitation. A law passed in 1905 secures tenure of office to civil servants of fifteen years' standing, and some restrictions have been placed on the dismissal and transferral of schoolmasters.

Justice.

Under the Turks the Greeks retained, together with their ecclesiastical institutions, a certain measure of local self-government and judicial independence. The Byzantine code, based on the Roman, as embodied in the Ἑξάβιβλος of Armenopoulos (1345), was sanctioned by royal decree in 1835 with some modifications as the civil law of Greece. Further modifications and new enactments were subsequently introduced, derived from the old French and Bavarian systems. The penal code is Bavarian, the commercial French. Liberty of person and domicile is inviolate; no arrest can be made, no house entered, and no letter opened without a judicial warrant. Trial by jury is established for criminal, political and press offences. A new civil code, based on Saxon and Italian law, has been drawn up by a commission of jurists, but it has not yet been considered by the Chamber. A separate civil code, partly French, partly Italian, is in force in the Ionian Islands. The law is administered by 1 court of cassation (styled the "Areopagus"), 5 courts of appeal, 26 courts of first instance, 233 justices of the peace and 19 correctional tribunals.

The judges, who are appointed by the Crown, are liable to removal by the minister of justice, whose exercise of this right is often invoked by political partisans. The administration of justice suffers in consequence, more especially in the country districts, where the judges must reckon with the influential politicians and their adherents. The pardon or release of a convicted criminal is not infrequently due to pressure on the part of some powerful patron. The lamentable effects of this system have long been recognized, and in 1906 a law was introduced securing tenure of office for two or four years to judges of the courts of first instance and of the inferior tribunals. In the circumstances crime is less rife than might be expected; the temperate habits of the Greeks have conduced to this result. A serious feature is the great prevalence of homicide, due in

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part to the passionate character of the people, but still more to the almost universal practice of carrying weapons. The traditions of the vendetta are almost extinct in the Ionian Islands, but still linger in Maina, where family feuds are transmitted from generation to generation. The brigand of the old-fashioned type (ληστής, κλέφτης) has almost disappeared, except in the remoter country districts, and piracy, once so prevalent in the Aegean, has been practically suppressed, but numbers of outlaws or absconding criminals (φυγόδικοι) still haunt the mountains, and the efforts of the police to bring them to justice are far from successful. Their ranks were considerably increased after the war of 1897, when many deserters from the army and adventurers who came to Greece as volunteers betook themselves to a predatory life. On the other hand, there is no habitually criminal class in Greece, such as exists in the large centres of civilization, and professional mendicancy is still rare.

Police duties, for which officers and, in some cases, soldiers of the regular army were formerly employed, are since 1906 carried out by a reorganized gendarmerie force of 194 officers and 6344 non-commissioned officers and men, distributed in the twenty-six departments and commanded by an inspector-general resident at Athens, who is aided by a consultative commission. There are male and female prisons at all the departmental centres; the number of prisoners in 1906 was 5705. Except in the Ionian Islands, the general condition of the prisons is deplorable; discipline and sanitation are very deficient, and conflicts among the prisoners are sometimes reported in which knives and even revolvers are employed. A good prison has been built near Athens by Andreas Syngros, and a reformatory for juvenile offenders (εφηβείον) has been founded by George Averoff, another national benefactor. Capital sentences are usually commuted to penal servitude for life; executions, for which the guillotine is employed, are for the most part carried out on the island of Bourzi near Nauplia; they are often postponed for months or even for years. There is no enactment resembling the Habeas Corpus Act, and accused persons may be detained indefinitely before trial. The Greeks, like the other nations liberated from Turkish rule, are somewhat litigious, and numbers of lawyers find occupation even in the smaller country towns.

Education.

The Greeks, an intelligent people, have always shown a remarkable zeal for learning, and popular education has made great strides. So eager is the desire for instruction that schools are often founded in the rural districts on the initiative of the villagers, and the sons of peasants, artisans and small shopkeepers come in numbers to Athens, where they support themselves by domestic service or other humble occupations in order to study at the university during their spare hours. Almost immediately after the accession of King Otho steps were taken to establish elementary schools in all the communes, and education was made obligatory. The law is not very rigorously applied in the remoter districts, but its enforcement is scarcely necessary. In 1808 there were 2014 "demotic" or primary schools, with 3465 teachers, attended by 129,210 boys (5·38% of the population) and 29,119 girls (1·19% of the population). By a law passed in 1905 the primary schools, which had reached the number of 3359 in that year, were reduced to 2604. The expenditure on primary schools is nominally sustained by the communes, but in reality by the government in the form of advances to the communes, which are not repaid; it was reduced in 1905 from upwards of 7,000,000 dr. to under 6,000,000 dr. In 1905 there were 306 "Hellenic" or secondary schools, with 819 teachers and 21,575 pupils (boys only) maintained by the state at a cost of 1,720,096 dr.; and 39 higher schools, or gymnasia, with 261 masters and 6485 pupils, partly maintained by the state (expenditure 615,600 dr.) and partly by benefactions and other means. Besides these public schools there are several private educational institutions, of which there are eight at Athens with 650 pupils. The Polytechnic Institute of Athens affords technical instruction in the departments of art and science to 221 students. Scientific agricultural instruction has been much neglected; there is an agricultural school at Aidinion in Thessaly with 40 pupils; there are eight agricultural stations (σταθμοί) in various parts of the country. There are two theological seminaries—the Rizari School at Athens (120 pupils) and a preparatory school at Arta; three other seminaries have been suppressed. The Commercial and Industrial Academy at Athens (about 225 pupils), a private institution, has proved highly useful to the country; there are four commercial schools, each in one of the country towns. A large school for females at Athens, the Arsakion, is attended by 1500 girls. There are several military and naval schools, including the military college of the Euelpides at Athens and the school of naval cadets (τῶν δοκίμων). The university of Athens in 1905 numbered 57 professors and 2598 students, of whom 557 were from abroad. Of the six faculties, theology numbered 79 students, law 1467, medicine 567, arts 206, physics and mathematics 192, and pharmacy 87. The university receives a subvention from the state, which in 1905 amounted to 363,000 dr.; it possesses a library of over 150,000 volumes and geological, zoological and botanical museums. A small tax on university education was imposed in 1903; the total cost to the student for the four years' course at the university is about £25. Higher education is practically gratuitous in Greece, and there is a somewhat ominous increase in the number of educated persons who disdain agricultural pursuits and manual labour. The intellectual culture acquired is too often of a superficial character owing to the tendency to sacrifice scientific thoroughness and accuracy, to neglect the more useful branches of knowledge, and to aim at a showy dialectic and literary proficiency. (For the native and foreign archaeological institutions see ATHENS.)

Religion

The Greek branch of the Orthodox Eastern Church is practically independent, like those of Servia, Montenegro and Rumania, though nominally subject to the patriarchate of Constantinople. The jurisdiction of the patriarch was in fact repudiated in 1833, when the king was declared the supreme head of the church, and the severance was completed in 1850. Ecclesiastical affairs are under the control of the Ministry of Education. Church government is vested in the Holy Synod, a council of five ecclesiastics under the presidency of the metropolitan of Athens; its sittings are attended by a royal commissioner. The church can invoke the aid of the civil authorities for the punishment of heresy and the suppression of unorthodox literature, pictures, &c. There were formerly 21 archbishoprics and 29 bishoprics in Greece, but a law passed in 1899 suppressed the archbishoprics (except the metropolitan see of Athens) on the death of the existing prelates, and fixed the total number of sees at 32. The prelates derive their incomes partly from the state and partly from the church lands. There are about 5500 priests, who belong for the most part to the poorest classes. The parochial clergy have no fixed stipends, and often resort to agriculture or small trading in order to supplement the scanty fees earned by their ministrations. Owing to their lack of education their personal influence over their parishioners is seldom considerable. In addition to the parochial clergy there are 19 preachers (ἱεροκήρυκες) salaried by the state. There are 170 monasteries and 4 nunneries in Greece, with about 1600 monks and 250 nuns. In regard to their constitution the monasteries are either "idiorrhythmic" or "coenobian" (see ATHOS); the monks (καλόγεροι) are in some cases assisted by lay brothers (κοσμικοί). More than 300 of the smaller monasteries were suppressed in 1829 and their revenues secularized. Among the more important and interesting monasteries are those of Megaspelaeon and Lavra (where the standard of insurrection, unfurled in 1821, is preserved) near Kalavryta, St Luke of Stiris near Arachova, Daphne and Penteli near Athens, and the Meteora group in northern Thessaly. The bishops, who must be unmarried, are as a rule selected from the monastic order and are nominated by the king; the parish priests are allowed to marry, but the remarriage of widowers is forbidden. The bulk of the population, about 2,000,000, belongs to the Orthodox Church; other Christian confessions number about 15,000, the great majority being Roman Catholics. The Roman Catholics (principally in Naxos and the Cyclades) have three

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archbishoprics (Athens, Naxos and Corfu), five bishoprics and about 60 churches. The Jews, who are regarded with much hostility, have almost disappeared from the Greek mainland; they now number about 5000, and are found principally at Corfu. The Mahommedans are confined to Thessaly except a few at Chalcis. National sentiment is a more powerful factor than personal religious conviction in the attachment of the Greeks to the Orthodox Church; a Greek without the pale of the church is more or less an alien. The Catholic Greeks of Syros sided with the Turks at the time of the revolution; the Mahommedans of Crete, though of pure Greek descent, have always been hostile to their Christian fellow-countrymen and are commonly called Turks. On the other hand, that portion of the Macedonian population which acknowledges the patriarch of Constantinople is regarded as Greek, while that which adheres to the Bulgarian exarchate, though differing in no point of doctrine, has been declared schismatic. The constitution of 1864 guarantees toleration to all creeds in Greece and imposes no civil disabilities on account of religion.

Greece is essentially an agricultural country; its prosperity depends on its agricultural products, and more than half the population is occupied in the cultivation of the soil and kindred pursuits. The land in the plains and valleys is exceedingly rich, and, wherever there is a sufficiency of water, produces magnificent crops. Cereals nevertheless furnish the principal figure in the list of imports, the annual value being about 30,000,000 fr. The country, especially since the acquisition of the fertile province of Thessaly, might under a well-developed agricultural system provide a food-supply for all its inhabitants and an abundant surplus for exportation. Thessaly alone, indeed, could furnish cereals for the whole of Greece. Unfortunately, however, agriculture is still in a primitive state, and the condition of the rural population has received very inadequate attention from successive governments. The wooden plough of the Hesiodic type is still in use, especially in Thessaly; modern implements, however, are being gradually introduced. The employment of manure and the rotation of crops are almost unknown; the fields are generally allowed to lie fallow in alternate years. As a rule, countries dependent on agriculture are liable to sudden fluctuations in prosperity, but in Greece the diversity of products is so great that a failure in one class of crops is usually compensated by exceptional abundance in another. Among the causes which have hitherto retarded agricultural progress are the ignorance and conservatism of the peasantry, antiquated methods of cultivation, want of capital, absentee proprietorship, sparsity of population, bad roads, the prevalence of usury, the uncertainty of boundaries and the land tax, which, in the absence of a survey, is levied on ploughing oxen; to these may be added the insecurity hitherto prevailing in many of the country districts and the growing distaste for rural life which has accompanied the spread of education. Large estates are managed under the metayer system; the cultivator paying the proprietor from one-third to half of the gross produce; the landlords, who prefer to live in the larger towns, see little of their tenants, and rarely interest themselves in their welfare. A great proportion of the best arable land in Thessaly is owned by persons who reside permanently out of the country. The great estates in this province extend over some 1,500,000 acres, of which about 500,000 are cultivated. In the Peloponnesus peasant proprietorship is almost universal; elsewhere it is gradually supplanting the metayer system; the small properties vary from 2 or 3 to 50 acres. The extensive state lands, about one-third of the area of Greece, were formerly the property of Mahommedan religious communities (*vakoufs*); they are for the most part farmed out annually by auction. They have been much encroached upon by neighbouring owners; a considerable portion has also been sold to the peasants. The rich plain of Thessaly suffers from alternate droughts and inundations, and from the ravages of field mice; with improved cultivation, drainage and irrigation it might be rendered enormously productive. A commission has been occupied for some years in preparing a scheme of hydraulic works. Usury is, perhaps, a greater scourge to the rural population than any visitation of nature; the institution of agricultural banks, lending money at a fair rate of interest on the security of their land, would do much to rescue the peasants from the clutches of local Shylocks. There is a difficulty, however, in establishing any system of land credit owing to the lack of a survey. Since 1897 a law passed in 1882 limiting the rate of interest to 8% (to 9% in the case of commercial debts) has to some extent been enforced by the tribunals. In the Ionian Islands the rate of 10% still prevails.

Agriculture.

The following figures give approximately the acreage in 1906 and the average annual yield of agricultural produce, no official statistics being available:—

	Acres.
Fields sown or lying fallow	3,000,000
Vineyards	337,500
Currant plantations	175,000
Olives (10,000,000 trees)	250,000
Fruit trees (fig, mulberry, &c.)	125,000
Meadows and pastures	7,500,000
Forests	2,000,000
Waste lands	2,875,000
	16,262,500

The average annual yield is as follows:—

Wheat	350,000,000	kilograms
Maize	100,000,000	,,
Rye	20,000,000	,,
Barley	70,000,000	,,
Oats	75,000,000	,,
Beans, lentils, &c.	25,000,000	,,
Currants	350,000,000	Venetian lb
Sultanina	4,000,000	,,
Wine	3,000,000	hectolitres
Olive oil	300,000	,,
Olives (preserved)	100,000,000	kilograms
Figs (exported only)	12,000,000	,,
Seed cotton	6,500,000	,,
Tobacco	8,000,000	,,
Vegetables and fresh fruits	20,000,000	,,
Cocoons	1,000,000	,,
Hesperidiums (exported only)	4,000,000	,,
Carobs (exported only)	5,000,000	,,
Resin	5,000,000	,,
Beet	12,000,000	,,

Rice is grown in the marshy plains of Elis, Boeotia, Marathon and Missolonghi; beet in Thessaly. The cultivation of vegetables is increasing; beans, peas and lentils are the most common. Potatoes are grown in the upland districts, but are not a general article of diet. Of late years market-gardening has been taken up as a new industry in the neighbourhood of Athens. There is a great variety of fruits. Orange plantations are found everywhere; in 1860 they occupied about 90,000 acres; in 1887, 433,701 acres. The trees are sometimes of immense age and form a picturesque feature in the landscape. In latter years the groves in many parts of the western Morea and Zante have been cut down to make room for currant plantations; the destruction has been deplorable in its consequences, for, as the tree requires twenty years to come into full bearing, replanting is seldom resorted to. Preserved olives, eaten with bread, are a common article of food. Excellent olive oil is produced in Attica and elsewhere. The value of the oil and fruit exported varies from five to ten million francs. Figs are also abundant, especially in Messenia and in the Cyclades. Mulberry trees are planted for the purposes of sericulture; they have been cut down in great numbers in the currant-growing districts. Other fruit trees are the orange, citron, lemon, pomegranate and almond. Peaches, apricots, pears, cherries, &c., abound, but are seldom scientifically cultivated; the fruit is generally gathered while unripe. Cotton in 1906 occupied about 12,300 acres, chiefly in the neighbourhood of Livadia. Tobacco plantations in 1893 covered 16,320 acres, yielding about 3,500,000 kilograms; the yield in 1906 was 9,000,000 kilograms. About 40% of the produce is exported, principally to Egypt and Turkey. More important are the vineyards, which occupied in 1887 an area of 306,421 acres. The best wine is made at Patras, on the royal estate at Decelea, and on other estates in Attica; a peculiar flavour is imparted to the wine of the country by the addition of resin. The wine of Santorin, the modern representative of the famous "malmsey," is mainly exported to Russia. The foreign demand for Greek wines is rapidly increasing; 3,770,257 gallons were exported in 1890, 4,974,196 gallons in 1894. There is also a growing demand for Greek cognac. The export of wine in 1906 was 20,850,941 okes, value 5,848,544 fr.; of cognac, 364,720 okes, value 1,091,160 fr.

The currant, by far the most important of Greek exports, is cultivated in a limited area extending along the southern shore of the Gulf of Corinth and the seaboard of the Western Peloponnesus,

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in Zante, Cephalonia and Leucas, and in certain districts of Acarnania and Aetolia; attempts to cultivate it elsewhere have generally proved unsuccessful. The history of the currant industry has been a record of extraordinary vicissitudes. Previously to 1877 the currant was exported solely for eating purposes, the amounts for the years 1872 to 1877 being 70,766 tons, 71,222 tons, 76,210 tons, 72,916 tons, 86,947 tons, and 82,181 tons respectively. In 1877, however, the French vineyards began to suffer seriously from the phylloxera, and French wine producers were obliged to have recourse to dried currants, which make an excellent wine for blending purposes. The importation of currants into France at once rose from 881 tons in 1877 to 20,999 tons in 1880, and to 70,401 tons in 1889, or about 20,000 tons more than were imported into England in that year. Meanwhile the total amount of currants produced in Greece had nearly doubled in these thirteen years. The country was seized with a mania for currant planting; every other industry was neglected, and olive, orange and lemon groves were cut down to make room for the more lucrative growth. The currant growers, in order to increase their production as rapidly as possible, had recourse to loans at a high rate of interest, and the great profits which they made were devoted to further planting, while the loans remained unpaid, and rose rapidly. By 1891 the French vineyards had to a great extent recovered from the disease, and wine producers in France began to clamour against the competition of foreign wines and wine-producing raisins and currants. The import duty on these was therupon raised from 3 francs per 15 francs per 100 kilos, and was further increased in 1894 to 25 francs. The currant trade with France was thus extinguished; of a crop averaging 160,000 tons, only some 110,000 now found a market. Although a fresh opening for exportation was found in Russia, the value of the fruit dropped from £15 to £5 per ton, a price scarcely covering the cost of cultivation. In July 1895 the government introduced a measure, since known as the Retention (παρακράτησις) Law, by which it was enacted that every shipper should deliver into depots provided by the government a weight of currants equivalent to 15% of the amount which he intended to export. A later law fixed the quantity to be retained by the state at 10%, which might be increased to 20%, should a representative committee, meeting every summer at Athens, so advise the government. The currants thus taken over by the government cannot be exported unless they are reduced to pulp, syrup or otherwise rendered unsuitable for eating purposes; they may be sold locally for wine-making or distilling, due precautions being taken that they are not used in any other way. The price of exported currants is thus maintained at an artificial figure. The Retention Law, which after 1895 was voted annually, was passed for a period of ten years in 1899. This pernicious measure, which is in defiance of all economic laws, perpetuates a superfluous production, retards the development of other branches of agriculture and burdens the government with vast accumulations of an unmarketable commodity. It might excusably be adopted as a temporary expedient to meet a pressing crisis, but as a permanent system it can only prove detrimental to the country and the currant growers themselves.

Currants.

In 1899 a "Bank of Viticulture" was established at Patras for the purpose of assisting the growers, to whom it was bound to make advances at a low rate of interest; it obtained stock in the bank and the sale of the retained fruit, from which its capital was derived. The bank soon found itself burdened with an enormous unsaleable stock, while its loans for the most part remained unpaid; meantime over-production, the cause of the trouble, continued to increase and prices further diminished. In 1903 a syndicate of English and other foreign capitalists made proposals for a monopoly of the export, guaranteeing fixed prices to the growers. The scheme, which conflicted with Anglo-Greek commercial conventions, was rejected by the Theotokis ministry; serious disturbances followed in the currant-growing districts, and M. Theotokis resigned. His successor, M. Rallis, in order to appease the cultivators, arranged that the Current Bank should offer them fixed minimum prices for the various grades, and guaranteed it a loan of 6,000,000 dr. The resources of the bank, however, gave out before the end of the season, and prices pursued their downward course. Another experiment was then tried; the export duty (15%) was made payable in kind, the retention quota being thus practically raised from 10 to 15%. The only result of this measure was a diminution of the export; in the spring of 1905 prices fell very low and the growers began to despair. A syndicate of banks and capitalists then came forward, which introduced the system now in operation. A privileged company was formed which obtained a charter from the government for twenty years, during which period the retention and export duties are maintained at the fixed rates of 20 and 15% respectively. The company aims at keeping up the prices of the marketable qualities by employing profitably for industrial purposes the unexported surplus and retaining inferior qualities; it pays to the state 4,000,000 dr. annually under the head of export duty; offers all growers at the beginning of each agricultural year a fixed price of 115 dr. per 1000 Venetian lb irrespective of quality, and pays a price varying from 115 dr. to 145 dr. according to quality at the end of the year for the unexported surplus. In return for these advantages to the growers the company is entitled to receive 7 dr. on every 1000 lb of currants produced and to dispose of the whole retained amount. A special company has been formed for the conversion of the superfluous product into spirit, wine, &c. The system may perhaps prove commercially remunerative, but it penalizes the producers of the better growths in order to provide a livelihood for the growers of inferior and unmarketable kinds and protracts an abnormal situation. The following table gives the annual currant crop from 1877 to 1905:—

Year.	Total crop (tons).	Exported to Gt. Britain.	Exported to France.
1877	82,181	..	881
1878	100,004	..	9,086
1879	92,311	..	19,087
1880	92,337	..	20,999
1881	121,994	..	30,315
1882	109,403	51,933	26,282
1883	114,986	52,092	24,815
1884	129,268	59,629	39,198
1885	113,287	55,765	37,730
1886	127,570	48,892	45,000
1887	127,160	55,549	37,438
1888	158,728	63,714	40,735
1889	142,308	52,251	69,555
1890	146,749	67,502	37,816
1891	161,545	70,762	39,712
1892	116,944	60,418	21,727
1893	119,886	73,000	6,800
1894	135,500	64,500	15,000
1895	167,695	60,500	26,500
1896	153,514	65,000	6,500
1897	115,730	63,000	2,000
1898	153,514	69,500	6,000
1899	144,071	65,600	3,800
1900	47,236	36,000	300
1901	139,820	58,000	1,216
1902	152,580	58,400	4,782
1903	179,499	54,800	4,470
1904	146,890	58,850	820
1905	162,957	61,700	1,042

The "peronospora," a species of white blight, first caused considerable damage in the Greek vineyards in 1892, recurring in 1897 and 1900.

More than half the cultivable area of Greece is devoted to pasturage. Cattle-rearing, as a rule, is a distinct occupation from agricultural farming; the herds are sent to pasture on the mountains in the summer, and return to the plains at the beginning of winter. The larger cattle are comparatively rare, being kept almost exclusively for agricultural labour; the smaller are very abundant. Beef is scarcely eaten in Greece, the milk of cows is rarely drunk and butter is almost unknown. Cheese, a staple article of diet, is made from the milk of sheep and goats. The number of larger cattle has declined in recent years; that of the smaller has increased. The native breed of oxen is small; buffaloes are seldom seen except in north-western Thessaly; a few camels are used in the neighbourhood of Parnassus. The Thessalian breed of horses, small but sturdy and enduring, can hardly be taken to represent the celebrated chargers of antiquity. Mules are much employed in the mountainous districts; the best type of these animals is found in the islands. The flocks of long-horned sheep and goats add a picturesque feature to Greek rural scenery. The goats are more numerous in proportion to the population than in any other European country (137 per 100 inhabitants). The shepherds' dogs rival those of Bulgaria in ferocity. According to an unofficial estimate published in 1905 the numbers of the various domestic animals in 1899 were as follows: Oxen and buffaloes, 408,744; horses, 157,068; mules, 88,869; donkeys, 141,174; camels, 51; sheep, 4,568,151; goats, 3,339,439; pigs, 79,716. During the four years 1899–1902 the annual average value of imported cattle was 4,218,015 dr., of exported cattle 209,321 dr.

Stock-farming.

The forest area (about 2,500,000 acres or one-fifth of the surface of the mainland) is for the most part state property. The value of the forests has been estimated at 200,000,000 fr.; the most productive are in the district extending from the Pindus range to the Gulf of Corinth. The principal trees are the oak (about 30 varieties), the various coniferae, the chestnut, maple, elm, beech, alder, cornel and arbutus. In Greece, as in other lands formerly subject to Turkish rule, the forests are not only neglected, but often deliberately destroyed; this great source of national wealth is thus continually diminishing. Every year immense forest fires may be seen raging in the mountains, and many of the most picturesque districts in the country are converted into desolate wilderness. These conflagrations are mainly the work of shepherds eager to provide increased pasturage for their flocks; they are sometimes, however, due to the carelessness of smokers, and occasionally, it is said, to spontaneous ignition in hot weather. Great damage is also done by the goats, which browse on the young saplings; the pine trees are much injured by the practice of scoring their bark for resin. With the disappearance of the trees the soil of the mountain slopes, deprived of its natural protection, is soon washed away

Forests.

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by the rain; the rapid descent of the water causes inundations in the plains, while the uplands become sterile and lose their vegetation. The climate has been affected by the change: rain falls less frequently but with greater violence, and the process of denudation is accelerated. The government has from time to time made efforts for the protection of the forests, but with little success till recently. A staff of inspectors and forest guards was first organized in 1877. The administration of the forests has since 1893 been entrusted to a department of the Ministry of Finance, which controls a staff of 4 inspectors (*δασαρχίται*), 31 superintendents (*δασαρχοί*), 52 head foresters (*δασοφύλακες*) and 298 foresters (*δασοφύλακες*). The foresters are aided during the summer months, when fires are most frequent, by about 500 soldiers and gendarmes. About a third of these functionaries have received instruction in the school of forestry at Vythine in the Morea, open since 1898. Owing to the measures now taken, which include excommunication by the parish priests of incendiaries and their accomplices, the conflagrations have considerably diminished. The total annual value of the products of the Greek forests averages 15,000,000 drachmae. The revenue accuring to the government in 1905 was 1,418,158 dr., as compared with 583,991 dr. in 1883. The increase is mainly due to improved administration. The supply of timber for house-construction, shipbuilding, furniture-making, railway sleepers, &c., is insufficient, and is supplemented by importation (annual value about 12,000,000 francs); transport is rendered difficult by the lack of roads and navigable streams. The principal secondary products are valonea (annual exportation about 1,250,000 fr.) and resin, which is locally employed as a preservative ingredient in the fabrication of wine. The administration of the forests is still defective, and measures for the augmentation and better instruction of the staff of foresters have been designed by the government. In 1900 a society for the reafforesting of the country districts and environs of the large towns was founded at Athens under the patronage of the crown princess.

Mines.

The chief minerals are silver, lead, zinc, copper manganese, magnesia, iron, sulphur and coal. Emery, salt, millstone and gypsum, which are found in considerable quantities, are worked by the government. The important mines at Laurium, a source of great wealth to ancient Athens, were reopened in 1864 by a Franco-Italian company, but were declared to be state property in 1871; they are now worked by a Greek and a French company. The output of marketable ore in 1899 amounted to 486,760 tons, besides 289,292 tons of dressed lead ore. In 1905 the output was as follows: Raw and roasted manganese iron ore, 113,636 tons; hematite iron ore, 94,734 tons; calamine or zinc ore, 22,612 tons; arsenic and argentiferous lead, 1875 tons; zinc blende and galena, 443 tons; total, 233,300 tons, together with 164,857 tons of dressed lead, producing 13,822 tons of silver pig lead containing 1657 to 1910 grams of silver per ton. It has been found profitable to resmelt the scoriae of the ancient workings. The total value of the exports from the Laurium mines, which in 1875 amounted to only £150,513, had in 1899 increased to £527,200, but fell in 1905 to £499,882. The revenue accruing to the government from all mines

	Tons.	Francs.
Chrome	8,000	337,952
Emery	6,972	742,486
Gypsum	185	7,995
Iron ore	465,622	3,387,467
Ferromanganese	89,687	1,182,652
Lead (argentiferous pig) ore	13,729	6,811,792
Lignite	11,757	143,814
Magnesite	43,498	864,982
Manganese ore	8,171	122,565
Mill stones	12,628	34,660
Salt	25,201	1,638,065
Sulphur	1,126	121,000
Zinc ore	22,562	2,852,355

and quarries, including those worked by the state, was estimated in the budget for 1906 at 1,332,000 dr. The emery of Naxos, which is a state monopoly, is excellent in quality and very abundant. Mines of iron ore have latterly been opened at Larimna in Locris. Magnesite mines are worked by an Anglo-Greek company in Euboea. There are sulphur and manganese mines in the island of Melos, and the volcanic island of Santorin produces pozzolana, a kind of cement, which is exported in considerable quantities. The great abundance of marble in Greece has latterly attracted the attention of foreign capitalists. New quarries have been opened since 1897 by an English company on the north slope of Mount Pentelicus, and are now connected by rail with Athens and the Peiraeus. The marble on this side of the mountain is harder than that on the south, which alone was worked by the ancients. The output in 1905 was 1573 tons. Mount Pentelicus furnished material for most of the celebrated buildings of ancient Athens; the marble, which is white, blue-veined, and somewhat transparent, assumes a rich yellow hue after long exposure to the air. The famous Parian quarries are still worked; white marble is also found at Scyros, Tenos and Naxos; grey at Stoura and Karystos; variegated at Valaxa and Karystos; green on Taygetus and in Thessaly; black at Tenos; and red (porphyry) in Maina.

The official statistics of the output and value of minerals produced in 1905 were as in the preceding table.

The number of persons employed in mining operations in 1905 was 9934.

Commerce and industry.

Owing to the natural aptitude of the Greeks for commerce and their predilection for a seafaring life a great portion of the trade of the Levant has fallen into their hands. Important Greek mercantile colonies exist in all the larger ports of the Mediterranean and the Black Sea, and many of them possess great wealth. In some of the islands of the archipelago almost every householder is the owner or joint owner of a ship. The Greek mercantile marine, which in 1888 consisted of 1352 vessels (70 steamers) with a total tonnage of 219,415 tons, numbered in 1906, according to official returns, 1364 vessels (275 steamers) with a total tonnage of 427,201 tons. This figure is apparently too low, as the shipowners are prone to understate the tonnage in order to diminish the payment of dues. Almost the whole corn trade of Turkey is in Greek hands. A large number of the sailing ships, especially the smaller vessels engaged in the coasting trade, belong to the islanders. A considerable portion of the shipping on the Danube and Pruth is owned by the inhabitants of Ithaca and Cephalonia; a certain number of their *sloops* (*σκάφα*) have latterly been acquired by Rumanian Jews, but the Greek flag is still predominant. There are seven principal Greek steamship companies owning 40 liners with a total tonnage of 21,972 tons. In 1847 there was but one lighthouse in Greek waters; in 1906 there were 70 lighthouses and 68 port lanterns. Hermoupolis (Syra) is the chief seat of the carrying trade, but as a commercial port it yields to Peiraeus, which is the principal centre of distribution for imports. Other important ports are Patras, Volo, Corfu, Kalamata and Laurium.

The following table gives the total value (in francs) of special Greek commerce for the given years:—

	1887.	1892.	1897.	1902.
Imports	131,849,325	119,306,007	116,363,348	137,229,364
Exports	102,652,487	82,261,464	81,708,626	79,663,473

The marked fluctuations in the returns are mainly attributable to variations in the price and quantity of imported cereals and in the sale of currants. The great crops of imports, caused by the large importation of food-stuffs and manufactured articles, is due to the neglect of agriculture and the undeveloped condition of local industries.

The imports and exports for 1905 were distributed as follows:—

	Imports from.	Exports to.
	Frs.	Frs.
Russia	27,725,218	819,025
Great Britain	27,516,928	24,436,707
Austria-Hungary	19,444,415	7,876,806
Turkey	15,538,370	4,516,403
Germany	13,866,687	7,514,474
France	10,101,070	7,078,321
Italy	6,190,253	4,266,210
Bulgaria	5,135,718	133,106
Rumania	3,814,641	1,152,207
America	2,656,501	6,440,648
Belgium	2,276,393	2,068,138
Netherlands	1,921,762	7,180,301
Egypt	634,035	5,928,555
Switzerland	348,281	
Other countries	4,555,781	4,288,365
Total	141,756,053	83,691,166

An enumeration of the chief articles of importation and exportation, together with their value, will be found in tabular form overleaf.

Greece does not possess any manufacturing industries on a large scale; the absence of a native coal supply is an obstacle to their development. In 1889 there were 145 establishments employing steam of 5568 indicated horse-power; in 1892 the total horse-power employed was estimated at 10,000. In addition to the smelting-works at Laurium, at which some 5000 hands are employed by Greek and French companies and local proprietors, there are flour mills, cloth, cotton and silk spinning mills, ship-building and engineering works oil-presses, tanneries, powder and dynamite mills, soap mills (abou-

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Principal Articles of Importation.

Articles.	1904. Total value in francs.	1904. Imported from the United Kingdom.	1905. Total value in francs.	1905. Imported from the United Kingdom.
Cereals	27,735,808	none	32,511,784	none
Textiles	17,999,344	10,762,464	13,460,620	5,497,172
Raw minerals	13,341,191	7,630,633	..	..
Forest products	10,146,599	9,769	12,254,190	61,309
Wrought metals	7,757,444	2,162,250	..	..
Coals and pit-coal	6,522,086	6,087,068	5,073,841	4,308,357
Yarn and tissues	4,739,819	2,504,667	8,021,523	6,838,079
Fish	4,092,615	2,394,224	1,014,164	186,072
Raw hides	4,558,101	478,965	3,999,657	215,745
Various animals	4,271,151	none	3,373,523	1,268
Horses	3,011,450	none	2,070,250	none
Paper, books, &c.	3,327,144	157,017	3,319,700	76,454
Coffee	2,957,691	293,610	3,066,904	107,296
Sugar	2,606,696	none	2,887,854	70
Rice	1,977,894	63,882	1,901,486	236,027
Colours	1,750,858	341,839	2,146,509	281,433

Chief Articles of Exportation.

Articles.	1904. Total value in francs.	1904. Exported to the United Kingdom.	1905. Total value in francs.	1905. Exported to the United Kingdom.
Currants	28,841,678	14,569,137	34,299,780	17,008,929
Minerals and raw metals	19,134,185	5,161,898	15,125,072	5,438,698
Wines	10,084,960	429,143	5,832,139	881,696
Tobacco	7,285,385	39,512	6,157,092	147,565
Olive oil	4,163,262	212,081	2,150,285	64,310
Figs	3,583,428	62,304	3,309,432	338,196
Minerals and metals (worked)	2,754,245	7,750	2,607,580	900
Olives	2,703,362	9,813	1,138,116	18,800
Valonea	1,558,678	200,849	1,917,014	146,927
Cognac	1,027,224	12,099	1,091,160	2,283

40), and some manufactures of paper, glass, matches, turpentine, white lead, hats, gloves, candles, &c. About 100 factories are established in the neighbourhood of Athens and Peiraeus. The wine industry (10 factories) is of considerable importance, and the manufacture of cognac has latterly made great progress; there are 10 large and numerous small cognac distilleries. Ship-building is carried on actively at all the ports on the mainland and islands; about 200 ships, mostly of low tonnage, are launched annually.

Public Works.—The important drainage-works at Lake Copais were taken over by an English company in 1890. The lake covered an area of 58,080 acres, the greater part of which is now rendered fit for cultivation. The drainage works consist of a canal, 28 kilometres in length, and a tunnel of 600 metres descending through the mountain to a lower lake, which is connected by a second tunnel with the sea. The reclaimed land is highly fertile. The area under crops amounted in 1906 to 27,414 acres, of which 20,744 were let to tenants and the remainder farmed by the company. The uncultivated portion affords excellent grazing. The canal through the Isthmus of Corinth was opened to navigation in November 1893. The total cost of the works, which were begun by a company in 1882, was 70,000,000 francs. The narrowness of the canal, which is only 24·60 metres broad at the surface, and the strength of the current which passes through it, seriously detract from its utility. The high charges imposed on foreign vessels have proved almost prohibitive. There are reduced rates for ships sailing in Greek waters. Up to the 31st of July 1906, 37,214 vessels, with a tonnage of 4,971,922, had passed through the canal. The receipts up to that date were 3,207,835 drachmae (mainly from Greek ships) and 415,976 francs (mainly from foreign ships). In 1905, 2930 vessels (2735 Greek) passed through, the receipts being 281,935 drachmae and 34,142 francs. The total liabilities of the company in 1906 were about 40,000,000 fr. The canal would be more frequented by foreign shipping if the harbours at its entrances were improved, and its sides, which are of masonry, lined with beams; efforts are being made to raise funds for these purposes. The widening of the Euripus Channel at Chalcis to the extent of 21·56 metres was accomplished in 1894. The operations involved the destruction of the picturesque Venetian tower which guarded the strait. A canal was completed in 1903 rendering navigable the shallow channel between Leucas (Santa Maura) and the mainland (breadth 15 metres, depth 5 metres). Large careening docks were undertaken in 1909 at Peiraeus at an estimated cost of 4,750,000 drachmae.

Communications.—Internal communication by roads is improving, though much remains to be done, especially as regards the quality of the roads. A considerable impetus was given to road-making under the Trikoupis administration. In 1878 there were only 555 m. of roads; in 1898 there were 2398 m.; in 1906, 3275 m. Electric trams have been introduced at Patras. Railways were open to traffic in 1906 for a length of 598 m.; in 1906 for a length of 867 m. The circuit of the Morea railways (462 m.) was completed in 1902; from Eleusis to Megara on the Isthmus canal, a cogwheel railway, finished in 1894, ascends to Kalavryta. A very important undertaking is the completion of a line from Peiraeus to the Frontier, the contract for which was signed in 1900 between the Greek government and the Eastern Railway Extension Syndicate (subsequently converted into the *Société des Chemins de Fer hellèniques*). A line connecting Peiraeus with Larissa was begun in 1890, but in 1894 the English company which had undertaken the contract went into liquidation. Under the contract of 1900 the line was drawn through Demerli, in the south of Thessaly, to Larissa, a distance of 217 m., and continued through the vale of Tempe to the Turkish frontier (about 246 m. in all). Branch lines have been constructed to Lamia and Chalcis. The establishment of a connexion with the continental railway system, by a junction with the line from Belgrade to Salonica, would be of immense advantage to Greece, and the Peiraeus would become an important place of embarkation for Egypt, India and the Far East.

Posts and telegraphs.

In 1905 the number of post offices was 640. Of these 320 were also telegraph and 89 telephone stations, with 664 clerks; the remaining post offices possess no special staff, but are served by persons who also pursue other occupations. The number of postmen and other employees was 889. During the year there passed through the post 8,897,899 ordinary letters for the interior, 2,980,958 for foreign destinations, 2,788,427 from abroad; 540,411 registered letters or parcels for the interior, 309,907 for foreign countries, and 300,150 from abroad; 880,673 post-cards for the interior, 504,785 from abroad, and 187,975 sent abroad; 100,686 samples; 7,068,125 printed papers for the interior, 3,278,495 to or from foreign countries. Telegraph lines in 1905 extended over 4222 m. with 6836 m. of wires; 841,913 inland telegrams, 221,188 service telegrams and 129,036 telegrams to foreign destinations were despatched, and 198,519 received from abroad. The receipts amounted to 4,589,601 drachmae (postal service 2,744,212, telegraph and telephone services 1,845,389 drachmae) and expenditure to 3,954,742 drachmae.

Army.

The Greek army has recently been in a state of transition. Its condition has never been satisfactory, partly owing to the absence of systematic effort in the work of organization, partly owing to the pernicious influence of politics. In 1897 it amounted to 4,589,601 drachmae (postal service 2,744,212, telegraph and telephone services 1,845,389 drachmae) and expenditure to 3,954,742 drachmae.

The Greek army has recently been in a state of transition. Its condition has never been satisfactory, partly owing to the absence of systematic effort in the work of organization, partly owing to the pernicious influence of politics. In 1897 it was not in a condition of readiness. The experience of the war of 1897 proved the need of far-reaching administrative changes and disciplinary reforms. A scheme of complete reorganization was subsequently elaborated under the auspices of the crown prince Constantine, the commander-in-chief, and received the assent of the Chamber in June 1904. During the war of 1897 about 65,000 infantry, 1000 cavalry, and 24 batteries were put into the field, and after great efforts another 15,000 men were mobilized. Under the new scheme it is proposed to maintain on a peace footing 1887 officers, 25,140 non-commissioned officers and men, and 4059 horses and mules; in time of war the active army will consist of at least 120,000 men and the territorial army of at least 60,000 men. The heavy expenditure entailed by the project has been an obstacle to its immediate realization. In order to meet this expenditure a special fund has been instituted in addition to the ordinary military budget, and certain revenues have been assigned to it amounting to about 5,500,000 drachmae annually. In 1906, however, it was decided to suspend partially for five years the operation of the law of 1904 and to devote

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the resources thus economized together with other funds to the immediate purchase of new armaments and equipment. Under this temporary arrangement the peace strength of the army in 1908 consisted of 1939 officers and civilians, 19,416 non-commissioned officers and men and 2661 horses and mules; it is calculated that the reserves will furnish about 77,000 men and the territorial army about 37,000 men in time of war.

Military service is obligatory, and liability to serve begins from the twenty-first year. The term of service comprises two years in the active army, ten years in the active army reserve (for cavalry eight years), eight years in the territorial army (for cavalry ten years) and ten years for all branches in the territorial army reserve. As a rule, however, the period of service in the active army has hitherto been considerably shortened; with a view to economy, the men, under the law of 1904, receive furlough after eighteen months with the colours. Exemptions from military service, which were previously very numerous, are also restricted considerably by the law of 1904, which will secure a yearly contingent of about 13,000 men in time of peace. The conscripts in excess of the yearly contingent are withdrawn by lot; they are required to receive six months' training in the ranks as supernumeraries before passing into the reserve, in which they form a special category of "liability" men. Under the temporary system of 1906 the contingent is reduced to about 10,000 men by postponing the abrogation of several exemptions, and the period of service is fixed at fourteen months for all the conscripts alike. The field army as constituted by the law of 1904 consists of 3 divisions, each division comprising 2 brigades of infantry, each of 2 regiments of 3 battalions and other units. There are thus 36 battalions of infantry (of which 12 are cadres); also 6 battalions of *evzones* (highlanders), 18 squadrons of cavalry (6 cadres), 33 batteries of artillery (6 cadres), 3 battalions of engineers and telegraphists, 3 companies of ambulance, 3 of train, &c. The artillery is composed of 24 field batteries, 3 heavy and 6 mountain batteries; it is mainly provided with Krupp 7·5 cm. guns dating from 1870 or earlier. After a series of trials in 1907 it was decided to order 36 field batteries of 7·5 cm. quick-firing guns and 6 mountain batteries, in all 168 guns, with 1500 projectiles for each battery from the Creuzot factory. The infantry, which was hitherto armed with the obsolete Gras rifle (·433 in.), was furnished in 1907 with the Mannlicher-Schönauer (model 1903) of which 100,000 had been delivered in May 1908. Hitherto the gendarmerie, which replaced the police, have formed a corps drawn from the army, which in 1908 consisted of 194 officers and 6344 non-commissioned officers and men, but a law passed in 1907 provided for these forces being thenceforth recruited separately by voluntary enlistment in annual contingents of 700 men. The participation of the officers in politics, which has proved very injurious to discipline, has been checked by a law forbidding officers below the rank of colonel to stand for the Chamber. In the elections of 1905 115 officers were candidates. The three divisional headquarters are at Larissa, Athens and Missolonghi; the six headquarters of brigades are at Trikkala, Larissa, Athens, Chalcis, Missolonghi and Nauplia. In 1907 annual manœuvres were instituted.

The Greek fleet consisted in 1907 of 3 armoured barbette ships of 4885 tons (built in France in 1890, reconstructed 1899), carrying each three 10·8-in. guns, five 6-in., thirteen quick-firing and smaller guns, and three torpedo tubes; 1 cruiser of 1770 tons (built in 1879), with two 6·7-in. and six light quick-firing guns; 1 armoured central battery ship of 1774 tons (built 1867, reconstructed 1897) with two 8·4 in. and nine small quick-firing guns; 2 coast-defence gunboats with one 10·6-in. gun each; 4 corvettes; 1 torpedo depôt ship; 8 destroyers, each with six guns (ordered in 1905); 3 transport steamers; 7 small gunboats; 3 mining boats; 5 torpedo boats; 1 royal yacht; 2 school ships and various minor vessels. The personnel of the navy was composed in 1907 of 437 officers, 26 cadets, 1118 petty officers, 2372 seamen and stokers, 60 boys and 99 civilians, together with 386 artisans employed at the arsenal. The navy is manned chiefly by conscription; the period of service is two years, with four years in the reserve. The headquarters of the fleet and arsenal are in the island of Salamis, where there is a dockyard with naval stores, a floating dock and a torpedo school. Most of the vessels of the Greek fleet were in 1907 obsolete; in 1904 a commission under the presidency of Prince George proposed the rearmament of the existing ironclads and the purchase of three new ironclads and other vessels. A different scheme of reorganization, providing almost exclusively for submarines and scout vessels, was suggested to the government by the French admiral Fournier in 1908, but was opposed by the Greek naval officers. With a view to the augmentation and better equipment of the fleet a special fund was instituted in 1900 to which certain revenues have been assigned; it has been increased by various donations and bequests and by the proceeds of a state lottery. The fleet is not exercised methodically either in navigation or gunnery practice; a long voyage, however, was undertaken by the ironclad vessels in 1904. The Greeks, especially the islanders of the Aegean, make better sailors than soldiers; the personnel of the navy, if trained by foreign officers, might be brought to a high state of efficiency.

Navy.

Finance.

The financial history of Greece has been unsatisfactory from the outset. Excessive military and naval expenditure (mainly due to repeated and hasty mobilizations), a lax and improvident system of administration, the corruption of political parties and the instability of the government, which has rendered impossible the continuous application of any scheme of fiscal reform—all alike have contributed to the economic ruin of the country. For a long series of years preceding the declaration of national insolvency in 1893 successive budgets presented a deficit, which in years of political excitement and military activity assumed enormous proportions: the shortcomings of the budget were supplied by the proceeds of foreign loans, or by means of advances obtained in the country at a high rate of interest. The two loans which had been contracted during the war of independence were exclusively by means of a conversion in 1889. Of the existing foreign loans the earliest is that of 60,000,000 frs., guaranteed by the three protecting powers in 1832; owing to the payment of interest and amortization by the powers, the capital amounted in 1871 to 30,392,853 fr.; on this Greece pays an annual sum of 900,000 fr., of which 300,000 have been granted by the powers as a yearly subvention to King George. The only other existing foreign obligation of early date is the debt to the heirs of King Otho (4,500,000 fr.) contracted in 1868. A large amount of internal debt was incurred between 1848 and 1880, but a considerable proportion of this was redeemed with the proceeds of the foreign loans negotiated after this period. At the end of 1880 the entire national debt, external and internal, stood at 252,652,381 dr. In 1881 the era of great foreign loans began. In that year a 5% loan of 120,000,000 fr. was raised to defray the expenses of the mobilization of 1880. This was followed in 1884 by a 5% loan of 170,000,000 fr., of which 100,000,000 was actually issued. The service of these loans was guaranteed by various State revenues. A "patriotic loan" of 30,000,000 dr. without interest, issued during the war excitement of 1885, proved a failure, only 2,723,860 dr. being subscribed. In 1888 a 4% loan of 135,000,000 fr. was contracted, secured on the receipts of the five State monopolies, the management of which was entrusted to a privileged company. In the following year (1889) two 4% loans of 30,000,000 fr. and 125,000,000 fr. respectively were issued without guarantee or sinking fund; Greek credit has now apparently attained an established position in the foreign money market, but a decline of public confidence soon became evident. In 1890, of a 5% loan of 80,000,000 fr. effective, authorized for the construction of the Peiraeus-Larissa railway, only 40,050,000 fr. was taken up abroad and 12,900,000 fr. at home; large portions of the proceeds were devoted to other purposes. In 1892 the government was compelled to make large additions to the internal floating debt, and to borrow 16,500,000 fr. from the National Bank on onerous terms. In 1893 an effort to obtain a foreign loan for the reduction of the forced currency proved unsuccessful. (For the events leading up to the declaration of national bankruptcy in that year see under *Recent History*.) A funding convention was concluded in the summer, under which the creditors accepted scrip instead of cash payments of interest. A few months later this arrangement was reversed by the Chamber, and on the 13th December a law was passed assigning provisionally to all the foreign loans alike 30% of the stipulated interest; the reduced coupons were made payable in paper instead of gold, the sinking funds were suspended, and the sums encashed by the monopoly company were confiscated. The causes of the financial catastrophe may be briefly summarized as follows: (1) The military preparations of 1885–1886, with the attendant disorganization of the country; the extraordinary expenditure of these years amounted to 130,987,772 dr. (2) Excessive borrowing abroad, involving a charge

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for the service of foreign loans altogether disproportionate to the revenue. (3) Remissness in the collection of taxation: the total loss through arrears in a period of ten years (1882–1891) was 36,549,202 dr., being in the main attributable to non-payment of direct taxes. (4) The adverse balance of trade, largely due to the neglected condition of agriculture; in the five years previous the crisis (1888–1892) the exports were stated to amount to £19,578,973, while the imports reached £24,890,146; foreign live stock and cereals being imported to the amount of £6,193,579. The proximate cause of the crisis was the rise in the exchange owing to the excessive amount of paper money in circulation. Forced currency was first introduced in 1868, when 15,000,000 dr. in paper money was issued; it was abolished in the following year, but reintroduced in 1877 with a paper issue of 44,000,000 dr. It was abolished a second time in 1884, but again put into circulation in 1885, when paper to the amount of 45,000,000 dr. were authorized. In 1893 the total authorized forced currency was 146,000,000 dr., of which 88,000,000 (including 14,000,000 dr. in small notes) was on account of the government. The gold and silver coinage had practically disappeared from circulation. The rate of exchange, as a rule, varies directly with the amount of paper money in circulation, but, owing to speculation, it is liable to violent fluctuations whenever there is an exceptional demand for gold in the market. In 1893 the gold franc stood at the ratio of 1·60 to the paper drachma; the service of the foreign loans required upwards of 31,000,000 dr. in gold, and any attempt to realize this sum in the market would have involved an outlay equivalent to at least half the budget. With the failure of the projected loan for the withdrawal of the forced currency repudiation became inevitable. The law of the 13th of December was not recognized by the national creditors: prolonged negotiations followed, but no arrangement was arrived at till 1897, when the intervention of the powers after the war with Turkey furnished the opportunity for a definite settlement. It was stipulated that Turkey should receive an indemnity of £T4,000,000 contingent on the evacuation of Thessaly; in order to secure the payment of this sum by Greece without prejudice to the interests of her creditors, and to enable the country to recover from the economic consequences of the war, Great Britain, France and Russia undertook to guarantee a 2½% loan of 170,000,000 fr., of which 150,000,000 fr. has been issued. By the preliminary treaty of peace of the 4th of September 1897 an International Financial Commission, composed of six representatives of the powers, was charged with the payment of the indemnity to Turkey, and with "absolute control" over the collection and employment of the revenues sufficient for the service of the foreign debt. A law defining the powers of the Commission was passed by the Chamber, 26th of February 1898 (o.s.). The revenues assigned to its supervision were the five government monopolies, the tobacco and stamp duties, and the import duties of Piræus (estimated in value estimated at 39,600,000 dr.); the collection was entrusted to a Greek society, which is under the absolute control of the Commission. The returns of Peiraeus customs (estimated at 10,700,000 dr.) are regarded as an extra guarantee, and are handed over to the Greek government; when the produce of other revenues exceeds 28,900,000 dr. the "plus value" or surplus is divided in the proportion of 50·8 % to the Greek government and 49·2 % to the creditors. The plus values amounted to 3,301,481 dr. in 1898, 3,533,755 dr. in 1899 and 4,342,713 dr. in 1900. Simultaneously with the establishment of the control the interest for the Monopoly Loan was fixed at 43% for the Funding Loan at 40%, and for the other loans at 32 % of the original interest. With the revenues at its disposal the International Commission has been able not only to make certain augmentations in the service of the foreign debt; since 1900 it has begun to take measures for the reduction of the forced currency, of which 2,000,000 dr. will be annually bought up and destroyed till the amount in circulation is reduced to 100,000,000 dr. On the 1st of January 1901 the authorized paper issue was 164,000,000 dr., of which 92,000,000 (including 18,000,000 in fractional currency) was on account of the government; the amount in actual circulation was 148,619,618 dr. On the 31st of July 1906 the paper issue had been reduced to 142,775,000 dr., and the amount in circulation was 124,668,057 dr. The financial commission retains its powers until the extinction of all the foreign loans contracted since 1881. Though its activity is mainly limited to the administration of the assigned revenues, it has exercised a beneficial influence over the whole domain of Greek finance; the effect may be observed in the greatly enhanced value of Greek securities since its institution, averaging 25·76% in 1906. No change can be made in its composition or working without the consent of the six powers, and none of the officials employed in the collection of the revenues subject to its control can be dismissed or transferred without its consent. It thus constitutes an element of stability and order which cannot fail to react on the general administration. It is unable, however, to control the expenditure or to assert any direct influence over the government, with which the responsibility still rests for an improved system of collection, a more efficient staff of functionaries and the repression of smuggling. The country has shown a remarkable vitality in recovering from the disasters of 1897, and should it in future obtain a respite from paroxysms of military and political excitement, its financial regeneration will be assured.

The following table gives the actual expenditure and receipts for the period 1889–1906 inclusive:

Year.	Actual Receipts.	Actual Expenditure.	Surplus or Deficit.
	Drachmae.	Drachmae.	Drachmae.
1889	83,731,591	110,772,327	−27,040,736
1890	79,931,795	125,932,579	−46,000,784
1891	99,321,872	122,856,385	−23,514,513
1892	95,465,569	107,283,498	−11,817,929
1893[1]	96,723,418	92,133,565	+ 4,589,853
1894	102,885,643	85,135,752	+17,749,891
1895	93,657,065	91,641,967	+ 3,015,098
1896	96,931,726	90,890,607	+ 6,041,119
1897[2]	92,485,825	137,043,929	−44,558,104
1898[3]	104,949,718	110,341,431	− 5,391,713
1899	111,318,273	104,586,504	+ 6,731,769
1900	112,206,829	112,049,279	+ 157,550
1901	115,731,159	113,646,301	+ 2,087,858
1902	123,949,931	121,885,707	+ 2,064,224
1903	120,194,362	117,436,549	+ 2,757,813
1904	121,186,246	120,200,247	+ 985,999
1905	126,472,580	118,699,761	+ 7,772,819
1906	125,753,358	124,461,577	+ 1,291,781

The steady increase of receipts since 1898 attests the growing prosperity of the country, but expenditure has been allowed to outstrip revenue, and, notwithstanding the official figures which represent a series of surpluses, the accumulated deficit in 1905 amounted to about 14,000,000 dr. in addition to treasury bonds for 8,000,000 dr. A remarkable feature has been the rapid fall in the exchange since 1903; the gold franc, which stood at 1·63 dr. in 1902, had fallen to 1·98 in October 1906. The decline, a favourable symptom if resulting from normal economic factors, is apparently due to a combination of exceptional circumstances, and consequently may not be maintained; it has imposed a considerable strain on the financial and commercial situation. The purchasing power of the drachma remains almost stationary and the price of imported commodities continues high; import dues, which since 1904 are payable in drachmae at the fixed rate of 1·15 to the franc, have been practically increased by more than 30%. In April 1902 a 5% loan of 43,750,000 francs for the completion of the railway from Peiraeus to the Turkish frontier, and another loan of 11,750,000 drachmae for the construction of a line from Pyrgos to Metigala, linking up the Morea railway system, were sanctioned by the Chamber. The first-named, the "Greek Railways Loan," was taken up at 80 by the syndicate contracting for the works and was placed on the market in 1902. The service of both loans is provided by the International Commission from the surplus funds of the assigned revenues. On the 1st of January 1906 the external debt amounted to 125,939,500 francs and the internal (including the paper circulation) to 171,629,436 drachmae.

The budget estimates for 1906 were as follows: Civil list, 1,325,000 dr.; pensions, payment of deputies, &c., 7,706,676 dr.; public debt, 34,253,471 dr.; foreign affairs, 3,563,994 dr.; justice, 6,240,271 dr.; interior, 13,890,927 dr.; religion and education, 7,143,924 dr.; army, 20,618,563 dr.; navy, 7,583,369 dr.; finance, 2,362,143 dr.; collection of revenue, 10,650,487 dr.; various expenditure, 9,122,752 dr.; total, 124,461,577 dr.

The two privileged banks in Greece are the National Bank, founded in 1841; capital 20,000,000 drachmae in 20,000 shares of 1000 dr. each, fully paid up; reserve fund 14,500,000 dr.; notes in circulation (September 1906) 126,721,887 dr., of which 76,360,905 dr. on account of the government; and the Ionian Bank, incorporated in 1839; capital paid up £315,500 in 63,102 shares of £5 each; notes in circulation, 10,200,000 drachmae, of which 3,500,000 (in fractional notes of 1 and 2 dr.) on account of the government. The notes issued by these two banks constitute the forced paper currency circulating throughout the kingdom. In the case of the Ionian Bank the privilege of issuing notes, originally limited to the Ionian Islands, will expire in 1920. The National Bank is a private institution under supervision of the government, which is represented by a royal commissioner on the board of administration; the central establishment is at Athens with forty-two branches throughout the country. The headquarters of the Ionian Bank, which is a British institution, are in London; the bank has a central office at Athens and five branches in Greece. The privileged Epiro-Thessalian Bank ceased to exist from the 4th of January 1900, when it was amalgamated with the National Bank. There are several other banking companies, as well as private banks, at Athens. The most important is the Bank of Athens (capital 40,000,000 dr.), founded in 1893; it possesses five branches in Greece and six abroad.

Greece entered the Latin Monetary Union in 1868. The monetary unit is the new drachma, equivalent to the franc, and divided into

[1] Reduction of interest on foreign debt by 70 %.
[2] War with Turkey.
[3] International Financial Commission instituted.

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100 lepta or centimes. There are nickel coins of 20, 10 and 5 lepta, copper coins of 10 and 5 lepta. Gold and silver coins were minted in Paris between 1868 and 1884, but have since practically disappeared from the country. The paper currency consists of notes for 1000 dr., 500 dr., 100 dr., 25 dr., 10 dr. and 5 dr., and of fractional notes for 2 dr. and 1 dr.

Currency, weights and measures.

The decimal system of weights and measures was adopted in 1876, but some of the old Turkish standards are still in general use. The dram = ⅄ oz. avoirdupois approximately; the oke = 400 drams or 2·8 lb; the kilo = 2 okes or 0·1 of an imperial hundredweight; the cantar or quintal = 44 okes or 123·2 lb. Liquids are measured by weight. The punta = 1¼ in.; the rupia, 3⅓ in.; the pik, 26 in.; the stadion = 1 kilometre or 1093½ yds. The stremma (square measure) is nearly one-third of an acre.

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2. HISTORY

a. Ancient; to 146 B.C.

1. *Introductory.*—It is necessary to indicate at the outset the scope and object of the present article. The reader must not expect to find in it a compendious summary of the chief events in the history of ancient Greece. It is not intended to supply an "Outlines of Greek History." It may be questioned whether such a sketch of the history, within the limits of space which are necessarily imposed in a work of reference, would be of utility to any class of readers. At any rate, the plan of the present work, in which the subject of Greek history is treated of in a large number of separate articles, allows of the narrative of events being given in a more satisfactory form under the more general of the headings (*e.g.* ATHENS, SPARTA, PELOPONNESIAN WAR). The character of the history itself suggests a further reason why a general article upon Greek history should not be confined to, or even attempt, a narrative of events. A sketch of Greek history is not possible in the sense in which a sketch of Roman history, or even of English history, is possible. Greek history is not the history of a single state. When Aristotle composed his work upon the constitutions of the Greek states, he found it necessary to extend his survey to no less than 158 states. Greek history is thus concerned with more than 150 separate and independent political communities. Nor is it even the history of a single country. The area occupied by the Greek race extended from the Pyrenees to the Caucasus, and from southern Russia to northern Africa. It is inevitable, therefore, that the impression conveyed by a sketch of Greek history should be a misleading one. A mere narrative can hardly fail to give a false perspective. Experience shows that such a sketch is apt to resolve itself into the history of a few great movements and of a few leading states. What is still worse, it is apt to confine itself, at any rate for the greater part of the period dealt with, to the history of Greece in the narrower sense, *i.e.* of the Greek peninsula. For the identification of Greece with Greece proper there may be some degree of excuse when we come to the 5th and 4th centuries. In the period that lies behind the year 500 B.C. Greece proper forms but a small part of the Greek world. In the 7th and 6th centuries it is outside Greece itself that we must look for the most active life of the Greek people and the most brilliant manifestations of the Greek spirit. The present article, therefore, will be concerned with the causes and conditions of events, rather than with the events themselves; it will attempt analysis rather than narrative. Its object will be to indicate problems and to criticize views; to suggest lessons and parallels, and to estimate the importance of the Hellenic factor in the development of civilization.

2. *The Minoan and Mycenaean Ages.*—When does Greek history begin? Whatever may be the answer that is given to this question, it will be widely different from any that could have been proposed a generation ago. Then the question was, How late does Greek history begin? To-day the question is, How early does it begin? The suggestion made by Grote that the first Olympiad (776 B.C.) should be taken as the starting-point of the history of Greece, in the proper sense of the term "history," seemed likely, not so many years ago, to win general acceptance. At the present moment the tendency would seem to be to go back as far as the 3rd or 4th millennium B.C. in order to reach a starting-point. It is to the results of archaeological research during the last thirty years that we must attribute so startling a change in the attitude of historical science towards this problem. In the days when Grote published the first volumes of his *History of Greece* archaeology was in its infancy. Its results, so far as they affected the earlier periods of Greek history, were scanty; its methods were unscientific. The methods have been gradually perfected by numerous workers in the field; but the results, which have so profoundly modified our conceptions of the early history of the Aegean area, are principally due to the discoveries of two men, Heinrich Schliemann and A. J. Evans. A full account of these discoveries will be found elsewhere (see AEGEAN CIVILIZATION and CRETE). It will be sufficient to mention here that Schliemann's labours began with the excavations on the site of Troy in the years 1870–1873; that he passed on to the excavations at Mycenae in 1876 and to those at Tiryns in 1884. It was the discoveries of these years that revealed to us the Mycenaean age, and carried back the history to the middle of the 2nd millennium. The discoveries of Dr A. J. Evans in the island of Crete belong to a later period. The work of excavation was begun in 1900, and was carried on in subsequent years. It has revealed to us the Minoan age, and enabled us to trace back the development and origins of the civilization for a further period of 1000 or 1500 years. The dates assigned by archaeologists to the different periods of Mycenaean and Minoan art must be regarded as merely approximate. Even the relation of the two civilizations is still, to some extent, a matter of conjecture. The general chronological scheme,

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GREECE
(Ancient)
Scale, 1:2,650,000
English Miles
Fortified Heights
Longitude East 25° of Greenwich
MACEDONIA, Continuation north on Same Scale
MARE THRACICUM
MARE AEGAEUM
MARE MYRTOUM
MARE IONIUM
EPIRUS
THESSALY
AETOLIA
PHOCIS
BOEOTIA
ATTICA
ACHAEA
ELIS
ARCADIA
MESSENIA
LACONIA
ARGOLIS
MACEDONIA
CHALCIDICE
Sinus Thermaicus
Corcyra
Leucadia
Ithaca
Cephallenia
Zacynthus
Lesbos
Chios
Andros
Tenos
Icaria
Paros
Naxos
Amorgos
Melos
Thera
Lemnos
Scyros
Cythera
Aegina
Athenae
Thebae
Corinthus
Argos
Sparta
Patrae
Olympia
Delphi
Thermopylae
Tempe
Pylae
Thermae
Thessalonica
Pella
Dodona
Pyrrhus
Cyprassus
Mycenae
Tiryns
Epidaurus
Cyrene
Cyrenaica
Sinus Saronicus
Sinus Corinthiacus
Sinus Messeniacus
Sinus Laconicus
Sinus Argolicus
Sinus Singiticus
Sinus Toronaicus
Sinus Strymonicus
Sinus Pagasaeus
Sinus Maliacus
Sinus Ambracicus
Sinus Corcyraeus
Sinus Crissaeus
Sinus Cretaicus
Sinus Cyrenaicus
Sinus Syrticus
Sinus Hermaeus
Sinus Cyzicenus
Sinus Adriaticus
Sinus Ionicus
Sinus Tarentinus
Sinus Messeniacus
Sinus Laconicus
Sinus Argolicus
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Sinus Cyrenaicus
Sinus Syrticus
Sinus Hermaeus
Sinus Cyzicenus
Sinus Adriaticus
Sinus Ionicus
Sinus Tarentinus
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however, in the sense of the relative order of the various periods and the approximate intervals between them, is too firmly established, both by internal evidence, such as the development of the styles of pottery, and of the art in general, and by external evidence, such as the points of contact with Egyptian art and history, to admit of its being any longer seriously called in question.

If, then, by "Greek history" is to be understood the history of the lands occupied in later times by the Greek race (*i.e.* the Greek peninsula and the Aegean basin), the beginnings of the history must be carried back some 2000 years before Grote's proposed starting-point. If, however, "Greek history" is taken to mean the history of the Greek people, the determination of the starting-point is far from easy. For the question to which archaeology does not as yet supply any certain answer is the question of race. Were the creators of the Minoan and Mycenaean civilization Greeks or were they not? In some degree the Minoan evidence has modified the answer suggested by the Mycenaean. Although wide differences of opinion as to the origin of the Mycenaean civilization existed among scholars when the results of Schliemann's labours were first given to the world, a general agreement had gradually been arrived at in favour of the view which would identify Mycenaean with Achaean or Homeric. In presence of the Cretan evidence it is no longer possible to maintain this view with the same confidence. The two chief difficulties in the way of attributing either the Minoan or the Mycenaean civilization to an Hellenic people are connected respectively with the script and the religion. The excavations at Cnossus have yielded thousands of tablets written in the linear script. There is evidence that this script was in use among the Mycenaeans as well. If Greek was the language spoken at Cnossus and Mycenae, how is it that all attempts to decipher the script have hitherto failed? The Cretan excavations, again, have taught us a great deal as to the religion of the Minoan age; they have, at the same time, thrown a new light upon the evidence supplied by Mycenaean sites. It is no longer possible to ignore the contrast between the cults of the Minoan and Mycenaean ages, and the religious conceptions which they imply, and the cults and religious conceptions prevalent in the historical period. On the other hand, it may safely be asserted that the argument derived from the Mycenaean art, in which we seem to trace a freedom of treatment which is akin to the spirit of the later Greek art, and is in complete contrast to the spirit of Oriental art, has received striking confirmation from the remains of Minoan art. The decipherment of the script would at once solve the problem. We should at least know whether the dominant race in Crete in the Minoan age spoke an Hellenic or a non-Hellenic dialect. And what could be inferred with regard to Crete in the Minoan age could almost certainly be inferred with regard to the mainland in the Mycenaean age. In the meanwhile, possibly until the tablets are read, at any rate until further evidence is forthcoming, any answer that can be given to the question must necessarily be tentative and provisional. (See AEGEAN CIVILIZATION.)

It has already been implied that this period of the history of Greece may be subdivided into a Minoan and a Mycenaean age. Whether these terms are appropriate is a question of comparatively little importance. They at least serve to remind us of the part played by the discoveries at Mycenae and Cnossus in the reconstruction of the history. The term "Mycenaean," it is true, has other associations than those of locality. It may seem to imply that the civilization disclosed in the excavations at Mycenae is Achaean in character, and that it is to be connected with the Pelopid dynasty to which Agamemnon belonged. In its scientific use, the term must be cleared of all such associations. Further, as opposed to "Minoan" it must be understood in a more definite sense than that in which it has often been employed. It has come to be generally recognized that two different periods are to be distinguished in Schliemann's discoveries at Mycenae itself. There is an earlier period, to which belong the objects found in the shaft-graves, and there is a later period, to which belong the beehive tombs and the remains of the palaces. It is the latter period which is "Mycenaean" in the strict sense; *i.e.* it is "Mycenaean" as opposed to "Minoan." To this period belong also the palace at Tiryns, the beehive-tombs discovered elsewhere on the mainland of Greece, and one of the cities on the site of Troy (Schliemann's sixth). The pottery of this period is as characteristic of it, both in its forms (*e.g.* the "stirrup" or "false-necked" form of vase) and in its peculiar glaze, as is the architecture of the palaces and the beehive-tombs. Although the chief remains have been found on the mainland of Greece itself, the art of this period is found to have extended as far north as Troy and as far east as Cyprus. On the other hand, hardly any traces of it have been discovered on the west coast of Asia Minor, south of the Troad. The Mycenaean age, in this sense, may be regarded as extending from 1600 to 1200 B.C. The Minoan age is of far wider extent. Its latest period includes both the earlier and the later periods of the remains found at Mycenae. This is the period called by Dr Evans "Late Minoan." To this period belong the Great Palace at Cnossus and the linear system of writing. The "Middle Minoan" period, to which the earlier palace belongs, is characterized by the pictographic system of writing and by polychrome pottery of a peculiarly beautiful kind. Dr Evans proposes to carry back this period as far as 2500 B.C. Even behind it there are traces of a still earlier civilization. Thus the Minoan age, even if limited to the middle and later periods, will cover at least a thousand years. Perhaps the most surprising result of the excavations in Crete is the discovery that Minoan art is on a higher level than Mycenaean art. To the scholars of a generation ago it seemed a thing incredible that the art of the shaft-graves, and the architecture of the beehive-tombs and the palaces, could belong to the age before the Dorian invasion. The most recent discoveries seem to indicate that the art of Mycenae is a decadent art; they certainly prove that an art, hardly inferior in its way to the art of the classical period, and a civilization which implies the command of great material resources, were flourishing in the Aegean perhaps a thousand years before the siege of Troy.

Oriental influence.

To the question, "What is the origin of this civilization? Is it of foreign derivation or of native growth?" it is not possible to give a direct answer. It is clear, on the one hand that it was developed, by a gradual process of differentiation, from a culture which was common to the whole Aegean basin and extended as far to the west as Sicily. It is equally clear, on the other hand, that foreign influences contributed largely to the process of development. Egyptian influences, in particular, can be traced throughout the "Minoan" and "Mycenaean" periods. The developed art, however, both in Crete and on the mainland, displays characterisics which are the very opposite of those which are commonly associated with the term "oriental." Egyptian work, even of the best period, is stiff and conventional; in the best Cretan work, and, in a less degree, in Mycenaean work, we find an originality and a freedom of treatment which remind one of the spirit of the Greek artists. The civilization is, in many respects, of an advanced type. The Cretan architects could design on a grand scale, and could carry out their designs with no small degree of mechanical skill. At Cnossus we find a system of drainage in use, which is far in advance of anything known in the modern world before the 19th century. If the art of the Minoan age falls short of the art of the Periclean age, it is hardly inferior to that of the age of Peisistratus. It is a civilization, too, which has long been familiar with the art of writing. But it is one that belongs entirely to the Bronze Age. Iron is not found until the very end of the Mycenaean period, and then only in small quantities. Nor is this the only point of contrast between the culture of the earliest age and that of the historical period in Greece. The chief seats of the early culture are to be found either in the island of Crete, or, on the mainland, at Tiryns and Mycenae. In the later history Crete plays no part, and Tiryns and Mycenae are obscure. With the great names of a later age, Argos, Sparta and Athens, no great discoveries are connected. In northern Greece, Orchomenos rather than Thebes is the centre of influence. Further points of contrast readily

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suggest themselves. The so-called Phoenician alphabet, in use amongst the later Greeks, is unknown in the earliest age. Its systems of writing, both the earlier and the later one, are syllabic in character, and analogous to those in vogue in Asia Minor and Cyprus. In the art of war, the chariot is of more importance than the foot-soldier, and the latter, unlike the Greek hoplite, is lightly clad, and trusts to a shield large enough to cover the whole body, rather than to the metal helmet, breast-plate and greaves of later times (see ARMS AND ARMOUR: *Greek*). The political system appears to have been a despotic monarchy, and the realm of the monarch to have extended to far wider limits than those of the "city-states" of historical Greece. It is, perhaps, in the religious practices of the age, and in the ideas implied in them, that the contrast is most apparent. Neither in Crete nor on the mainland is there any trace of the worship of the "Olympian" deities. The cults in vogue remind us rather of Asia than of Greece. The worship of pillars and of trees carries us back to Canaan, while the double-headed axe, so prominent in the ritual of Cnossus, survives in later times as the symbol of the national deity of the Carians. The beehive-tombs, found on many sites on the mainland besides Mycenae, are evidence both of a method of sepulture and of ideas of the future state, which are alien to the practice and the thought of the Greeks of history. It is only in one region—in the island of Cyprus—that the culture of the Mycenaean age is found surviving into the historical period. As late as the beginning of the 5th century B.C. Cyprus is still ruled by kings, the alphabet has not yet displaced a syllabary, the characteristic forms of Mycenaean vases still linger on, and the chief deity of the island is the goddess with attendant doves whose images are among the common objects of Mycenaean finds.

3. *The Homeric Age.*—Alike in Crete and on the mainland the civilization disclosed by excavation comes abruptly to an end. In Crete we can trace it back from *c.* 1200 B.C. to the Neolithic period. From the Stone Age to the end of the Minoan Age the development is continuous and uninterrupted.[1] But between the culture of the Early Age and the culture of the Dorians, who occupied the island in historical times, no connexion whatever can be established. Between the two there is a great gulf fixed. It would be difficult to imagine a greater contrast than that presented by the rude life of the Dorian communities in Crete when it is compared with the political power, the material resources and the extensive commerce of the earlier period. The same gap between the archaeological age and the historical exists on the mainland also. It is true that the solution of continuity is here less complete. Mycenaean art continues, here and there, in a debased form down to the 9th century, a date to which we can trace back the beginnings of the later Greek art. On one or two lines (*e.g.* architecture) it is even possible to establish some sort of connexion between them. But Greek art as a whole cannot be evolved from Mycenaean art. We cannot bridge over the interval that separates the latter art, even in its decline, from the former. It is sufficient to compare the "dipylon" ware (with which the process of development begins, which culminates in the pottery of the Great Age) with the Mycenaean vases, to satisfy oneself that the gulf exists. What then is the relation of the Heroic or Homeric Age (*i.e.* the age whose life is portrayed for us in the poems of Homer) to the Earliest Age? It too presents many contrasts to the later periods. On the other hand, it presents contrasts to the Minoan Age, which, in their way, are not less striking. Is it then to be identified with the Mycenaean Age? Schliemann, the discoverer of the Mycenaean culture, unhesitatingly identified Mycenaean with Homeric. He even identified the shaft-graves of Mycenae with the tombs of Agamemnon and Clytemnestra. Later inquirers, while refusing to discover so literal a correspondence between things Homeric and things Mycenaean, have not hesitated to accept a general correspondence between the Homeric Age and the Mycenaean. Where it is a case of comparing literary evidence with archaeological, an exact coincidence is not of course to be demanded. The most that can be asked is that a general correspondence should be established. It may be conceded that the case for such a correspondence appears prima facie a strong one. There is much in Homer that seems to find confirmation or explanation in Schliemann's finds. Mycenae is Agamemnon's city; the plan of the Homeric house agrees fairly well with the palaces at Tiryns and Mycenae; the forms and the technique of Mycenaean art serve to illustrate passages in the poems; such are only a few of the arguments that have been urged. It is the great merit of Professor Ridgeway's work (*The Early Age of Greece*) that it has demonstrated, once and for all, that Mycenaean is not Homeric pure and simple. He insists upon differences as great as the resemblances. Iron is in common use in Homer; it is practically unknown to the Mycenaeans. In place of the round shield and the metal armour of the Homeric soldier, we find at Mycenae that the warrior is lightly clad in linen, and that he fights behind an oblong shield, which covers the whole body; nor are the chariots the same in form. The Homeric dead are cremated; the Mycenaean are buried. The gods of Homer are the deities of Olympus, of whose cult no traces are to be found in the Mycenaean Age. The novelty of Professor Ridgeway's theory is that for the accepted equation, Homeric = Achaean = Mycenaean, he proposes to substitute the equations, Homeric = Achaean = post-Mycenaean, and Mycenaean = pre-Achaean = Pelasgian. The Mycenaean civilization he attributes to the Pelasgians, whom he regards as the indigenous population of Greece, the ancestors of the later Greeks, and themselves Greek both in speech and blood. The Homeric heroes are Achaeans, a fair-haired Celtic race, whose home was in the Danube valley, where they had learned the use of iron. In Greece they are newcomers, a conquering class comparable to the Norman invaders of England or Ireland, and like them they have acquired the language of their subjects in the course of a few generations. The Homeric civilization is thus Achaean, *i.e.* it is Pelasgian (Mycenaean) civilization, appropriated by a ruder race; but the Homeric culture is far inferior to the Mycenaean. Here, at any rate, the Norman analogy breaks down. Norman art in England is far in advance of Saxon. Even in Normandy (as in Sicily), where the Norman appropriated rather than introduced, he not only assimilated but developed. In Greece the process must have been reversed.

The theory thus outlined is probably stronger on its destructive side than on its constructive. To treat the Achaeans as an immigrant race is to run counter to the tradition of the Greeks themselves, by whom the Achaeans were regarded as indigenous (cf. Herod. viii. 73). Nor is the Pelasgian part of the theory easy to reconcile with the Homeric evidence. If the Achaeans were a conquering class ruling over a Pelasgian population, we should expect to find this difference of race a prominent feature in Homeric society. We should, at least, expect to find a Pelasgian background to the Homeric picture. As a matter of fact, we find nothing of the sort. There is no consciousness in the Homeric poems of a distinction of race between the governing and the subject classes. There are, indeed, Pelasgians in Homer, but the references either to the people or the name are extraordinarily few. They appear as a people, presumably in Asia Minor, in alliance with the Trojans; they appear also, in a single passage, as one of the tribes inhabiting Crete. The name survives in "Pelasgicon Argos," which is probably to be identified with the valley of the Spercheius,[2] and as an epithet of Zeus of Dodona. The population, however, of Pelasgicon Argos and of Dodona is no longer Pelasgian. Thus, in the age of Homer, the Pelasgians belong, so far as Greece proper is concerned, to a past that is already remote. It is inadmissible to appeal to Herodotus against Homer. For the conditions of the Homeric age Homer is the sole authoritative witness. If, however, Professor Ridgeway has failed to prove that "Mycenaean" equals "Pelasgian," he has certainly proved that much that is Homeric is post-Mycenaean. It is possible

[1] It would be more accurate to say to the year 1500 B.C. At Cnossus the palace is sacked soon after this date, and the art, both in Crete and in the whole Aegean area, becomes lifeless and decadent.

[2] See T. W. Allen in the *Classical Review*, vol. xx. (1906), No. 4 (May).

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that different strata are to be distinguished in the Homeric poems. There are passages which seem to assume the conditions of the Mycenaean age; there are others which presuppose the conditions of a later age. It may be that the latter passages reflect the circumstances of the poet's own times, while the former ones reproduce those of an earlier period. If so, the substitution of iron for bronze must have been effected in the interval between the earlier and the later periods.

The Homeric state.

It has already been pointed out that the question whether the makers of the Minoan and Mycenaean civilizations were Greeks must still be regarded as an open one. No such question can be raised as to the Homeric Age. The Achaeans may or may not have been Greek in blood. What is certain is that the Achaean Age forms an integral part of Greek history. Alike on the linguistic, the religious and the political sides, Homer is the starting-point of subsequent developments. In the Greek dialects the great distinction is that between the Doric and the rest. Of the non-Doric dialects the two main groups are the Aeolic and Ionic, both of which have been developed, by a gradual process of differentiation, from the language of the Homeric poems. With regard to religion it is sufficient to refer to the judgment of Herodotus, that it was Homer and Hesiod who were the authors of the Greek theogony (ii. 53 οὗτοί εἰσι οἱ ποιήσαντες θεογονίην Ἕλλησι). It is a commonplace that Homer was the Bible of the Greeks. On the political side, Greek constitutional development would be unintelligible without Homer. When Greek history, in the proper sense, begins, oligarchy is almost universal. Everywhere, however, an antecedent stage of monarchy has to be presupposed. In the Homeric system monarchy is the sole form of government; but it is monarchy already well on the way to being transformed into oligarchy. In the person of the king are united the functions of priest, of judge and of leader in war. He belongs to a family which claims divine descent and his office is hereditary. He is, however, no despotic monarch. He is compelled by custom to consult the council (*boulê*) of the elders, or chiefs. He must ask their opinion, and, if he fails to obtain their consent, he has no power to enforce his will. Even when he has obtained the consent of the council, the proposal still awaits the approval of the assembly (*agora*), of the people.

Homeric society.

Thus in the Homeric state we find the germs not only of the oligarchy and democracy of later Greece, but also of all the various forms of constitution known to the Western world. And a monarchy such as is depicted in the Homeric poems is clearly ripe for transmutation into oligarchy. The chiefs are addressed as kings (βασιλῆες), and claim, equally with the monarch, descent from the gods. In Homer, again, we can trace the later organization into tribe (φυλή), clan (γένος), and phratry, which is characteristic of Greek society in the historical period, and meets us in analogous forms in other Aryan societies. The γένος corresponds to the Roman *gens*, the φυλή to the Roman tribe, and the phratry to the *curia*. The importance of the *phratry* in Homeric society is illustrated by the well-known passage (*Iliad* ix. 63) in which the outcast is described as "one who belongs to no phratry" (ἀφρήτωρ). It is a society that is, of course, based upon slavery, but it is slavery in its least repulsive aspect. The treatment which Eumaeus and Eurycleia receive at the hands of the poet of the *Odyssey* is highly creditable to the humanity of the age. A society which regarded the slave as a mere chattel would have been impatient of the interest shown in a swineherd and a nurse. It is a society, too, that exhibits many of the distinguishing traits of later Greek life. Feasting and quarrels, it is true, are of more moment to the heroes than to the contemporaries of Pericles or Plato; but "music" and "gymnastic" (though the terms must be understood in a more restricted sense) are as distinctive of the age of Homer as of that of Pindar. In one respect there is retrogression in the historical period. Woman in Homeric society enjoys a greater freedom, and receives greater respect, than in the Athens of Sophocles and Pericles.

4. *The Growth of the Greek States.*—The Greek world at the beginning of the 6th century B.C. presents a picture in many respects different from that of the Homeric Age. The Greek race is no longer confined to the Greek peninsula. It occupies the islands of the Aegean, the western seaboard of Asia Minor, the coasts of Macedonia and Thrace, of southern Italy and Sicily. Scattered settlements are found as far apart as the mouth of the Rhone, the north of Africa, the Crimea and the eastern end of the Black Sea. The Greeks are called by a national name, *Hellenes*, the symbol of a fully-developed national self-consciousness. They are divided into three great branches, the Dorian, the Ionian and the Aeolian, names almost, or entirely, unknown to Homer. The heroic monarchy has nearly everywhere disappeared. In Greece proper, south of Thermopylae, it survives, but in a peculiar form, in the Spartan state alone. What is the significance and the explanation of contrasts so profound?

Dorian invasion.

It is probable that the explanation is to be found, directly or indirectly, in a single cause, the Dorian invasion. In Homer the Dorians are mentioned in one passage only (*Odyssey* xix. 177). They there appear as one of the races which inhabit Crete. In the historical period the whole Peloponnese, with the exception of Arcadia, Elis and Achaea, is Dorian. In northern Greece the Dorians occupy the little state of Doris, and in the Aegean they form the population of Crete, Rhodes and some smaller islands. Thus the chief centres of Minoan and Mycenaean culture have passed into Dorian hands, and the chief seats of Achaean power are included in Dorian states. Greek tradition explained the overthrow of the Achaean system by an invasion of the Peloponnese by the Dorians, a northern tribe, which had found a temporary home in Doris. The story ran that, after an unsuccessful attempt to force an entrance by the Isthmus of Corinth, they had crossed from Naupactus, at the mouth of the Corinthian Gulf, landed on the opposite shore, and made their way into the heart of the Peloponnese, where a single victory gave them possession of the Achaean states. Their conquests were divided among the invaders into three shares, for which lots were cast, and thus the three states of Argos, Sparta and Messenia were created. There is much in this tradition that is impossible or improbable. It is impossible, *e.g.* for the tiny state of Doris, with its three or four "small, sad villages" (πόλεις μικραὶ καὶ λυπρόχωροι, Strabo, p. 427), to have furnished a force of invaders sufficient to conquer and re-people the greater part of the Peloponnese. It is improbable that the conquest should have been either as sudden, or as complete, as the legend represents. On the contrary, there are indications that the conquest was gradual, and that the displacement of the older population was incomplete. The improbability of the details affords, however, no ground for questioning the reality of the invasion.[1] The tradition can be traced back at Sparta to the 7th century B.C. (Tyrtaeus, quoted by Strabo, p. 362), and there is abundant evidence, other than that of legend, to corroborate it. There is the Dorian name, to begin with. If, as Beloch supposes, it originated on the coast of Asia Minor, where it served to distinguish the settlers in Rhodes and the neighbouring islands from the Ionians and Aeolians to the north of them, how came the great and famous states of the Peloponnese to adopt a name in use among the petty colonies planted by their kinsmen across the sea? Or, if Dorian is simply Old Peloponnesian, how are we to account for the Doric dialect or the Dorian pride of race?

It is true that there are great differences between the literary Doric, the dialect of Corinth and Argos, and the dialects of Laconia and Crete, and that there are affinities between the dialect of Laconia and the non-Dorian dialects of Arcadia and Elis. It is equally true, however, and of far more consequence, that all the Doric dialects are distinguished from all other Greek dialects by certain common characteristics. Perhaps the strongest sentiment in the Dorian nature is the pride of race. Indeed, it looks as if the Dorians claimed to be the sole genuine Hellenes. How can we account for an indigenous population, first imagining itself to be immigrant, and then developing a

[1] It has been impugned by J. Beloch, *Griechische Geschichte*, i. 149 ff.

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contempt for the rest of the race, equally indigenous with itself, on account of a fictitious difference in origin? Finally, there is the archaeological evidence. The older civilization comes to an abrupt end, and it does so, on the mainland at least, at the very period to which tradition assigns the Dorian migration. Its development is greatest, and its overthrow most complete, precisely in the regions occupied by the Dorians and the other tribes, whose migrations were traditionally connected with theirs. It is hardly too much to say that the archaeologist would have been compelled to postulate an inroad into central and southern Greece of tribes from the north, at a lower level of culture, in the course of the 12th and 11th centuries B.C., if the historian had not been able to direct him to the traditions of the great migrations (*μεταναστάσεις*), of which the Dorian invasion was the chief. With the Dorian migration Greek tradition connected the expansion of the Greek race eastwards across the Aegean. In the historical period the Greek settlements on the western coast of Asia Minor fall into three clearly defined groups. To the north is the Aeolic group, consisting of the island of Lesbos and twelve towns, mostly insignificant, on the opposite mainland. To the south is the Dorian *hexapolis*, consisting of Cnidus and Halicarnassus on the mainland, and the islands of Rhodes and Cos. In the centre comes the Ionian *dodecapolis*, a group consisting of ten towns on the mainland, together with the islands of Samos and Chios. Of these three groups, the Ionian is incomparably the most important. The Ionians also occupy Euboea and the Cyclades. Although it would appear that Cyprus (and possibly Pamphylia) had been occupied by settlers from Greece in the Mycenaean age, Greek tradition is probably correct in putting the colonization of Asia Minor and the islands of the Aegean after the Dorian migration. Both the Homeric and the archaeological evidence seem to point to the same conclusion. Between Rhodes on the south and the Troad on the north scarcely any Mycenaean remains have been found. Homer is ignorant of any Greeks east of Euboea. If the poems are earlier than the Dorian Invasion, his silence is conclusive. If the poems are some centuries later than the Invasion, they at least prove that, within a few generations of that event, it was the belief of the Greeks of Asia Minor that their ancestors had crossed the seas after the close of the Heroic Age. It is probable, too, that the names Ionian and Aeolian, the former of which is found once in Homer, and the latter not at all, originated among the colonists in Asia Minor, and served to designate, in the first instance, the members of the Ionic and Aeolic *dodecapolis*. As Curtius[1] pointed out, the only Ionia known to history is in Asia Minor. It does not follow that Ionia is the original home of the Ionian race, as Curtius argued. It almost certainly follows, however, that it is the original home of the Ionian name.

It is less easy to account for the name *Hellenes*. The Greeks were profoundly conscious of their common nationality, and of the gulf that separated them from the rest of mankind. They themselves recognized a common race and language, and a common type of religion and culture, as the chief factors in this sentiment of nationality (see Herod. viii. 144 τὸ Ἑλληνικὸν ἐὸν *ὅμαιμόν τε καὶ ὁμόγλωσσον καὶ θεῶν ἱδρύματά τε κοινὰ καὶ θυσίαι ἤθεά τε ὁμότροπα*). "Hellenes" was the name of their common race, and "Hellas" of their common country. In Homer there is no distinct consciousness of a common nationality, and consequently no antithesis of Greek and Barbarian (see Thuc. i. 3). Nor is there a true collective name. There are indeed Hellenes (though the name occurs in one passage only, *Iliad* ii. 684), and there is a Hellas; but his Hellas, whatever its precise signification may be, is, at any rate, not equivalent either to Greece proper or to the land of the Greeks, and his Hellenes are the inhabitants of a small district to the south of Thessaly. It is possible that the diffusion of the Hellenic name was due to the Dorian invaders. Its use can be traced back to the first half of the 7th century. Not less obscure are the causes of the fall of monarchy. It cannot have been the immediate effect of the Dorian conquest, for the states founded by the Dorians were at first monarchically governed. It may, however, have been an indirect effect of it. We have already seen that the power of the Homeric king is more limited than that of the rulers of Cnossus, Tirynsor Mycenae. In other words, monarchy is already in decay at the epoch of the Invasion. The Invasion, in its effects on wealth, commerce and civilization, is almost comparable to the irruption of the barbarians into the Roman empire. The monarch of the Minoan and Mycenaean age has extensive revenues at his command; the monarch of the early Dorian states is little better than a petty chief. Thus the interval, once a wide one, that separates him from the nobles tends to disappear. The decay of monarchy was gradual; much more gradual than is generally recognized. There were parts of the Greek world in which it still survived in the 6th century, *e.g.* Sparta, Cyrene, Cyprus, and possibly Argos and Tarentum. Both Herodotus and Thucydides apply the title "king" (*βασιλεύς*) to the rulers of Thessaly in the 5th century. The date at which monarchy gave place to a republican form of government must have differed, and differed widely, in different cases. The traditions relating to the foundation of Cyrene assume the existence of monarchy in Thera and in Crete in the middle of the 7th century (Herodotus iv. 150 and 154), and the reign of Amphicrates at Samos (Herod. iii. 59) can hardly be placed more than a generation earlier. In view of our general ignorance of the history of the 7th and 8th centuries, it is hazardous to pronounce these instances exceptional. On the other hand, the change from monarchy to oligarchy was completed at Athens before the end of the 8th century, and at a still earlier date in some of the other states. The process, again, by which the change was effected was, in all probability, less uniform than is generally assumed. There are extremely few cases in which we have any trustworthy evidence, and the instances about which we are informed refuse to be reduced to any common type. In Greece proper our information is fullest in the case of Athens and Argos. In the former case, the king is gradually stripped of his powers by a process of devolution. An hereditary king, ruling for life, is replaced by three annual and elective magistrates, between whom are divided the executive, military and religious functions of the monarch (see ARCHON). At Argos the fall of the monarchy is preceded by an aggrandisement of the royal prerogatives. There is nothing in common between these two cases, and there is no reason to suppose that the process elsewhere was analogous to that at Athens. Everywhere, however, oligarchy is the form of government which succeeds to monarchy. Political power is monopolized by a class of nobles, whose claim to govern is based upon birth and the possession of land, the most valuable form of property in an early society. Sometimes power is confined to a single clan (*e.g.* the Bacchiadae at Corinth); more commonly, as at Athens, all houses that are noble are equally privileged. In every case there is found, as the adviser of the executive, a Boulê, or council, representative of the privileged class. Without such a council a Greek oligarchy is inconceivable. The relations of the executive to the council doubtless varied. At Athens it is clear that the real authority was exercised by the archons;[2] in many states the magistrates were probably subordinate to the council (cf. the relation of the consuls to the senate at Rome). And it is clear that the way in which the oligarchies used their power varied also. The cases in which the power was abused are naturally the ones of which we hear; for an abuse of power gave rise to discontent and was the ultimate cause of revolution. We hear little or nothing of the cases in which power was exercised wisely. Happy is the constitution which has no annals! We know, however, that oligarchy held its ground for generations, or even for centuries, in a large proportion of the Greek states; and a government which, like the oligarchies of Elis, Thebes or Aegina, could maintain itself for three or four centuries cannot have been merely oppressive.

Government.

[1] *History of Greece* (Eng. trans., i. 32 ff.); cf. the same writer's *Ionier vor der ionischen Wanderung*.

[2] If the account of early Athenian constitutional history given in the *Athenaion Politeia* were accepted, it would follow that the archons were inferior in authority to the Eupatrid Boulê, the Areopagus.

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The period of the transition from monarchy to oligarchy is the period in which commerce begins to develop, and trade-routes to be organized. Greece had been the centre of an active trade in the Minoan and Mycenaean epochs. The products of Crete and of the Peloponnese had found their way to Egypt and Asia Minor. The overthrow of the older civilization put an end to commerce. The seas became insecure and intercourse with the East was interrupted. Our earliest glimpses of the Aegean after the period of the migrations disclose the raids of the pirate and the activity of the Phoenician trader. It is not till the 8th century has dawned that trade begins to revive, and the Phoenician has to retire before his Greek competitor. For some time to come, however, no clear distinction is drawn between the trader and the pirate. The pioneers of Greek trade in the West are the pirates of Cumae (Thucyd. vi. 4). The expansion of Greek commerce, unlike that of the commerce of the modern world, was not connected with any great scientific discoveries. There is nothing in the history of ancient navigation that is analogous to the invention of the mariner's compass or of the steam-engine. In spite of this, the development of Greek commerce in the 7th and 6th centuries was rapid. It must have been assisted by the great discovery of the early part of the former century, the invention of coined money. To the Lydians, rather than the Greeks, belongs the credit of the discovery; but it was the genius of the latter race that divined the importance of the invention and spread its use. The coinage of the Ionian towns goes back to the reign of Gyges (*c.* 675 B.C.). And it is in Ionia that commercial development is earliest and greatest. In the most distant regions the Ionian is first in the field. Egypt and the Black Sea are both opened up to Greek trade by Miletus, the Adriatic and the Western Mediterranean by Phocaea and Samos. It is significant that of the twelve states engaged in the Egyptian trade in the 6th century all, with the exception of Aegina, are from the eastern side of the Aegean (Herod. ii. 178). On the western side the chief centres of trade during these centuries were the islands of Euboea and Aegina and the town of Corinth. The Aeginetan are the earliest coins of Greece proper (*c.* 650 B.C.); and the two rival scales of weights and measures, in use amongst the Greeks of every age, are the Aeginetan and the Euboic. Commerce naturally gave rise to commercial leagues, and commercial relations tended to bring about political alliances. Foreign policy even at this early epoch seems to have been largely determined by considerations of commerce. Two leagues, the members of which were connected by political as well as commercial ties, can be recognized. At the head of each stood one of the two rival powers in the island of Euboea, Chalcis and Eretria. Their primary object was doubtless protection from the pirate and the foreigner. Competing routes were organized at an early date under their influence, and their trading connexions can be traced from the heart of Asia Minor to the north of Italy. Miletus, Sybaris and Etruria were members of the Eretrian league; Samos, Corinth, Rhegium and Zancle (commanding the Straits of Messina), and Cumae, on the Bay of Naples, of the Chalcidian. The wool of the Phrygian uplands, woven in the looms of Miletus, reached the Etruscan markets by way of Sybaris; through Cumae, Rome and the rest of Latium obtained the elements of Greek culture. Greek trade, however, was confined to the Mediterranean area. The Phoenician and the Carthaginian navigators penetrated to Britain; they discovered the passage round the Cape two thousand years before Vasco da Gama's time. The Greek sailor dared not adventure himself outside the Black Sea, the Adriatic and the Mediterranean. Greek trade, too, was essentially maritime. Ports visited by Greek vessels were often the starting points of trade-routes into the interior; the traffic along those routes was left in the hands of the natives (see *e.g.* Herod. iv. 24). One service, the importance of which can hardly be overestimated, was rendered to civilization by the Greek traders—the invention of geography. The science of geography is the invention of the Greeks. The first maps were made by them (in the 6th century); and it was the discoveries and surveys of their sailors that made map-making possible.

Trade.

Closely connected with the history of Greek trade is the history of Greek colonization. The period of colonization, in its narrower sense, extends from the middle of the 8th to the middle of the 6th century. Greek colonization is, however, merely a continuation of the process which at an earlier epoch had led to the settlement, first of Cyprus, and then of the islands and coasts of the Aegean. From the earlier settlements the colonization of the historical period is distinguished by three characteristics. The later colony acknowledges a definite *metropolis* ("mother-city"); it is planted by a definite *oecist* (οἰκιστής); it has a definite date assigned to its foundation.[1] It would be a mistake to regard Greek colonization as commercial in origin, in the sense that the colonies were in all cases established as trading-posts. This was the case with the Phoenician and Carthaginian settlements, most of which remained mere factories; and some of the Greek colonies (*e.g.* many of those planted by Miletus on the shores of the Black Sea) bore this character. The typical Greek colony, however, was neither in origin nor in development a mere trading-post. It was, or it became, a *polis*, a city-state, in which was reproduced the life of the parent state. Nor was Greek colonization, like the emigration from Europe to America and Australia in the 19th century, simply the result of over-population. The causes were as various as those which can be traced in the history of modern colonization. Those which were established for the purposes of trade may be compared to the factories of the Portuguese and Dutch in Africa and the Far East. Others were the result of political discontent, in some form or shape; these may be compared to the Puritan settlements in New England. Others again were due to ambition or the mere love of adventure (see Herod. v. 42 ff., the career of Dorieus). But however various the causes, two conditions must always be presupposed—an expansion of commerce and a growth of population. Within the narrow limits of the city-state there was a constant tendency for population to become redundant, until, as in the later centuries of Greek life, its growth was artificially restricted. Alike from the Roman colonies, and from those founded by the European nations in the course of the last few centuries, the Greek colonies are distinguished by a fundamental contrast. It is significant that the contrast is a political one. The Roman colony was in a position of entire subordination to the Roman state, of which it formed a part. The modern colony was, in varying degrees, in political subjection to the home government. The Greek colony was completely independent; and it was independent from the first. The ties that united a colony to its metropolis were those of sentiment and interest; the political tie did not exist. There were, it is true, exceptions. The colonies established by imperial Athens closely resembled the colonies of imperial Rome. The cleruchy (*q.v.*) formed part of the Athenian state; the cleruchs kept their status as citizens of Athens and acted as a military garrison. And if the political tie, in the proper sense, was wanting, it was inevitable that political relations should spring out of commercial or sentimental ones. Thus we find Corinth interfering twice to save her colony Syracuse from destruction, and Megara bringing about the revolt of Byzantium, her colony, from Athens. Sometimes it is not easy to distinguish political relations from a political tie (*e.g.* the relations of Corinth, both in the Persian and Peloponnesian Wars, to Ambracia and the neighbouring group of colonies). When we compare the development of the Greek and the modern colonies we shall find that the development of the former was even more rapid than that of the latter. In at least three respects the Greek settler was at an advantage as compared with the colonist of modern times. The differences of race, of colour and of climate, with which the chief problems of modern colonization are connected, played no part in the history of the Greek settlements. The races amongst whom the Greeks planted

Colonization.

[1] The dates before the middle of the 7th century are in most cases artificial, *e.g.* those given by Thucydides (book vi.) for the earlier Sicilian settlements. See J. P. Mahaffy, *Journal of Hellenic Studies*, ii. 164 ff.

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themselves were in some cases on a similar level of culture. Where the natives were still backward or barbarous, they came of a stock either closely related to the Greek, or at least separated from it by no great physical differences. We need only contrast the Carian, the Sicel, the Thracian or even the Scythian, with the native Australian, the Hottentot, the Red Indian or the Maori, to apprehend the advantage of the Greek. Amalgamation with the native races was easy, and it involved neither physical nor intellectual degeneracy as its consequence. Of the races with which the Greeks came in contact the Thracian was far from the highest in the scale of culture; yet three of the greatest names in the Great Age of Athens are those of men who had Thracian blood in their veins, viz. Themistocles, Cimon and the historian Thucydides. In the absence of any distinction of colour, no insuperable barrier existed between the Greek and the hellenized native. The *demos* of the colonial cities was largely recruited from the native population,[1] nor was there anything in the Greek world analogous to the "mean whites" or the "black belt." Of hardly less importance were the climatic conditions. In this respect the Mediterranean area is unique. There is no other region of the world of equal extent in which these conditions are at once so uniform and so favourable. Nowhere had the Greek settler to encounter a climate which was either unsuited to his labour or subversive of his vigour. That in spite of these advantages so little, comparatively speaking, was effected in the work of Hellenization before the epoch of Alexander and the Diadochi, was the effect of a single counteracting cause. The Greek colonist, like the Greek trader, clung to the shore. He penetrated no farther inland than the sea-breeze. Hence it was only in islands, such as Sicily or Cyprus, that the process of Hellenization was complete. Elsewhere the Greek settlements formed a mere fringe along the coast.

The tyrants.

To the 7th century there belongs another movement of high importance in its bearing upon the economic, religious and literary development of Greece, as well as upon its constitutional history. This movement is the rise of the *tyrannis*. In the political writers of a later age the word possesses a clear-cut connotation. From other forms of monarchy it is distinguished by a twofold differentiation. The *tyrannus* is an unconstitutional ruler, and his authority is exercised over unwilling subjects. In the 7th and 6th centuries the line was not drawn so distinctly between the tyrant and the legitimate monarch. Even Herodotus uses the words "tyrant" and "king" interchangeably (*e.g.* the princes of Cyprus are called "kings" in v. 110 and "tyrants" in v. 109), so that it is sometimes difficult to decide whether a legitimate monarch or a tyrant is meant (*e.g.* Aristophilides of Tarentum, iii. 136, or Telys of Sybaris, v. 44). But the distinction between the tyrant and the king of the Heroic Age is a valid one. It is not true that his rule was always exercised over unwilling subjects; it is true that his position was always unconstitutional. The Homeric king is a legitimate monarch; his authority is invested with the sanctions of religion and immemorial custom. The tyrant is an illegitimate ruler; his authority is not recognized, either by customary usage or by express enactment. But the word "tyrant" was originally a neutral term; it did not necessarily imply a misuse of power. The origin of the *tyrannis* is obscure. The word *tyrannus* has been thought, with some reason, to be a Lydian one. Probably both the name and the thing originated in the Greek colonies of Asia Minor, though the earliest tyrants of whom we hear in Asia Minor (at Ephesus and Miletus) are a generation later than the earliest in Greece itself, where, both at Sicyon and at Corinth, tyranny appears to date back to the second quarter of the 7th century. It is not unusual to regard tyranny as a universal stage in the constitutional development of the Greek states, and as a stage that occurs everywhere at one and the same period. In reality, tyranny is confined to certain regions, and it is a phenomenon that is peculiar to no one age or century. In Greece proper, before the 4th century B.C., it is confined to a small group of states round the Corinthian and Saronic Gulfs. The greater part of the Peloponnese was exempt from it, and there is no good evidence for its existence north of the Isthmus, except at Megara and Athens. It plays no part in the history of the Greek cities in Chalcidice and Thrace. It appears to have been rare in the Cyclades. The regions in which it finds a congenial soil are two, Asia Minor and Sicily. Thus it is incorrect to say that most Greek states passed through this stage. It is still wider of the mark to assume that they passed through it at the same time. There is no "Age of the Tyrants." Tyranny began in the Peloponnese a hundred years before it appears in Sicily, and it has disappeared in the Peloponnese almost before it begins in Sicily. In the latter the great age of tyranny comes at the beginning of the 5th century; in the former it is at the end of the 7th and the beginning of the 6th. At Athens the history of tyranny begins after it has ended both at Sicyon and Corinth. There is, indeed, a period in which tyranny is non-existent in the Greek states; roughly speaking, the last sixty years of the 5th century. But with this exception, there is no period in which the tyrant is not to be found. The greatest of all the tyrannies, that of Dionysius at Syracuse, belongs to the 4th century. Nor must it be assumed that tyranny always comes at the same stage in the history of a constitution; that it is always a stage between oligarchy and democracy. At Corinth it is followed, not by democracy but by oligarchy, and it is an oligarchy that lasts, with a brief interruption, for two hundred and fifty years. At Athens it is not immediately preceded by oligarchy. Between the Eupatrid oligarchy and the rule of Peisistratus there comes the timocracy of Solon. These exceptions do not stand alone. The cause of tyranny is, in one sense, uniform. In the earlier centuries, at any rate, tyranny is always the expression of discontent; the tyrant is always the champion of a cause. But it would be a mistake to suppose that the discontent is necessarily political, or that the cause which he champions is always a constitutional one. At Sicyon it is a racial one; Cleisthenes is the champion of the older population against their Dorian oppressors (see Herod. v. 67, 68). At Athens the discontent is economic rather than political; Peisistratus is the champion of the Diacrii, the inhabitants of the poorest region of Attica. The party-strifes of which we hear in the early history of Miletus, which doubtless gave the tyrant his opportunity, are concerned with the claims of rival industrial classes. In Sicily the tyrant is the ally of the rich and the foe of the *demos*, and the cause which he champions, both in the 5th century and the 4th, is a national one, that of the Greek against the Carthaginian. We may suspect that in Greece itself the tyrannies of the 7th century are the expression of an anti-Dorian reaction. It can hardly be an accident that the states in which the *tyrannis* is found at this epoch, Corinth, Megara, Sicyon, Epidaurus, are all of them states in which a Dorian upper class ruled over a subject population. In Asia Minor the *tyrannis* assumes a peculiar character after the Persian conquest. The tyrant rules as the deputy of the Persian satrap. Thus in the East the tyrant is the enemy of the national cause; in the West, in Sicily, he is its champion.

Tyranny is not a phenomenon peculiar to Greek history. It is possible to find analogies to it in Roman history, in the power of Caesar, or of the Caesars; in the despotisms of medieval Italy; or even in the Napoleonic empire. Between the tyrant and the Italian despot there is indeed a real analogy; but between the Roman principate and the Greek *tyrannis* there are two essential differences. In the first place, the principate was expressed in constitutional forms, or veiled under constitutional fictions; the tyrant stood altogether outside the constitution. And, secondly, at Rome both Julius and Augustus owed their position to the power of the sword. The power of the sword, it is true, plays a large part in the history of the later tyrants (*e.g.* Dionysius of Syracuse); the earlier ones, however, had no mercenary armies at their command. We can hardly compare the bodyguard of Peisistratus to the legions of the first or the second Caesar.

[1] At Syracuse the *demos* makes common cause with the Sicel serf-population against the nobles (Herod. vii. 155).

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The view taken of the *tyrannis* in Greek literature is almost uniformly unfavourable. In this respect there is no difference between Plato and Aristotle, or between Herodotus and the later historians.[1] His policy is represented as purely selfish, and his rule as oppressive. Herodotus is influenced partly by the traditions current among the oligarchs, who had been the chief sufferers, and partly by the odious associations which had gathered round tyranny in Asia Minor. The philosophers write under their impressions of the later *tyrannis*, and their account is largely an a priori one. It is seldom that we find any attempt, either in the philosophers or the historians, to do justice to the real services rendered by the tyrants.[2] Their first service was a constitutional one. They helped to break down the power of the old aristocratic houses, and thus to create the social and political conditions indispensable to democracy. The *tyrannis* involved the sacrifice of liberty in the cause of equality. When tyranny falls, it is never succeeded by the aristocracies which it had overthrown. It is frequently succeeded by an oligarchy, but it is an oligarchy in which the claim to exclusive power is based, not upon mere birth, but upon wealth, or the possession of land. It would be unfair to treat this service as one that was rendered unconsciously and unwillingly. Where the tyrant asserted the claims of an oppressed class, he consciously aimed at the destruction of privilege and the effacement of class distinctions. Hence it is unjust to treat his power as resting upon mere force. A government which can last eighty or a hundred years, as was the case with the tyrannies at Corinth and Sicyon, must have a moral force behind it. It must rest upon the consent of its subjects. The second service which the tyrants rendered to Greece was a political one. Their policy tended to break down the barriers which isolated each petty state from its neighbours. In their history we can trace a system of wide-spread alliances, which are often cemented by matrimonial connexions. The Cypselid tyrants of Corinth appear to have been allied with the royal families of Egypt, Lydia and Phrygia, as well as with the tyrants of Miletus and Epidaurus, and with some of the great Athenian families. In Sicily we find a league of the northern tyrants opposed to a league of the southern; and in each case there is a corresponding matrimonial alliance. Anaxilaus of Rhegium is the son-in-law and ally of Terillus of Himera; Gelo of Syracuse stands in the same relation to Theron of Agrigentum. Royal marriages have played a great part in the politics of Europe. In the comparison of Greek and modern history it has been too often forgotten how great a difference it makes, and how great a disadvantage it involves, to a republic that it has neither sons nor daughters to give in marriage. In commerce and colonization the tyrants were only continuing the work of the oligarchies to which they succeeded. Greek trade owed its expansion to the intelligent efforts of the oligarchs who ruled at Miletus and Corinth, in Samos, Aegina and Euboea; but in particular cases, such as Miletus, Corinth, Sicyon and Athens, there was a further development, and a still more rapid growth, under the tyrants. In the same way, the foundation of the colonies was in most cases due to the policy of the oligarchical governments. They can claim credit for the colonies of Chalcis and Eretria, of Megara, Phocaea and Samos, as well as for the great Achaean settlements in southern Italy. The Cypselids at Corinth, and Thrasybulus at Miletus, are instances of tyrants who colonized on a great scale.

Religion under the "tyrants."

In their religious policy the tyrants went far to democratize Greek religion. The functions of monarchy had been largely religious; but, while the king was necessarily a priest, he was not the only priest in the community. There were special priesthoods, hereditary in particular families, even in the monarchical period; and upon the fall of the monarchy, while the priestly functions of the kings passed to republican magistrates, the priesthoods which were in the exclusive possession of the great families tended to become the important ones. Thus, before the rise of tyranny, Greek religion is aristocratic. The cults recognized by the state are the *sacra* of noble clans. The religious prerogatives of the nobles helped to confirm their political ones, and, as long as religion retained its aristocratic character, it was impossible for democracy to take root. The policy of the tyrants aimed at fostering popular cults which had no associations with the old families, and at establishing new festivals. The cult of the wine-god, Dionysus, was thus fostered at Sicyon by Cleisthenes, and at Corinth by the Cypselids; while at Athens a new festival of this deity, which so completely overshadowed the older festival that it became known as the Great Dionysia, probably owed its institution to Peisistratus. Another festival, the Panathenaea, which had been instituted only a few years before his rise to power, became under his rule, and thanks to his policy, the chief national festival of the Athenian state. Everywhere, again, we find the tyrants the patrons of literature. Pindar and Bacchylides, Aeschylus and Simonides found a welcome at the court of Hiero. Polycrates was the patron of Anacreon, Periander of Arion. To Peisistratus has been attributed, possibly not without reason, the first critical edition of the text of Homer, a work as important in the literary history of Greece as was the issue of the Authorized Version of the Bible in English history. It we would judge fairly of tyranny, and of what it contributed to the development of Greece, we must remember how many states there were in whose history the period of greatest power coincides with the rule of a tyrant. This is unquestionably true of Corinth and Sicyon, as well as of Syracuse in the 5th, and again in the 4th century; it is probably true of Samos and Miletus. In the case of Athens it is only the splendour of the Great Age that blinds us to the greatness of the results achieved by the policy of the Peisistratids.

With the overthrow of this dynasty tyranny disappears from Greece proper for more than a century. During the century and a half which had elapsed since its first appearance the whole aspect of Greek life, and of the Greek world, had changed. The development was as yet incomplete, but the lines on which it was to proceed had been clearly marked out. Political power was no longer the monopoly of a class. The struggle between the "few" and the "many" had begun; in one state at least (Athens) the victory of the "many" was assured. The first chapter in the history of democracy was already written. In the art of war the two innovations which were ultimately to establish the military supremacy of Greece, hoplite tactics and the trireme, had already been introduced. Greek literature was no longer synonymous with epic poetry. Some of its most distinctive forms had not yet been evolved; indeed, it is only quite at the end of the period that prose-writing begins; but both lyric and elegiac poetry had been brought to perfection. In art, statuary was still comparatively stiff and crude; but in other branches, in architecture, in vase-painting and in coin-types, the aesthetic genius of the race had asserted its pre-eminence. Philosophy, the supreme gift of Greece to the modern world, had become a living power. Some of her most original thinkers belong to the 6th century. Criticism had been applied to everything in turn: to the gods, to conduct, and to the conception of the universe. Before the Great Age begins, the claims of intellectual as well as of political freedom had been vindicated. It was not, however, in Greece proper that progress had been greatest. In the next century the centre of gravity of Greek civilization shifts to the western side of the Aegean; in the 6th century it must be looked for at Miletus, rather than at Athens. In order to estimate how far the development of Greece had advanced, or to appreciate the distinctive features of Greek life at this period, we must study Ionia, rather than Attica or the Peloponnese. Almost all that is greatest and most characteristic is to be found on the eastern side of the Aegean. The great names in the history of science and philosophy before the beginning of the 5th century—Thales, Pythagoras, Xenophanes, Heraclitus, Parmenides, Anaximander, Hecataeus; names which are representative of mathematics, astronomy, geography and metaphysics, are all, without exception, Ionian. In poetry, too, the most famous names, if not so exclusively Ionian, are connected either with the Asiatic coast or with

The arts.

[1] An exception should perhaps be made in the case of Thucydides.
[2] The Peisistratidae come off better, however.

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the Cyclades. Against Archilochus and Anacreon, Sappho and Alcaeus, Greece has nothing better to set, after the age of Hesiod, than Tyrtaeus and Theognis. Reference has already been made to the greatness of the Ionians as navigators, as colonizers and as traders. In wealth and in population, Miletus, at the epoch of the Persian conquest, must have been far ahead of any city of European Greece. Sybaris, in Magna Graecia, can have been its only rival outside Ionia. There were two respects, however, in which the comparison was in favour of the mother-country. In warfare, the superiority of the Spartan infantry was unquestioned; in politics, the Greek states showed a greater power of combination than the Ionian.

Finally, Ionia was the scene of the first conflicts with the Persian. Here were decided the first stages of a struggle which was to determine the place of Greece in the history of the world. The rise of Persia under Cyrus was, as Herodotus saw, the turning-point of Greek history. Hitherto the Greek had proved himself indispensable to the oriental monarchies with which he had been brought into contact. In Egypt the power of the Saite kings rested upon the support of their Greek mercenaries. Amasis (569–525 B.C.), who is raised to the throne as the leader of a reaction against the influence of the foreign garrison, ends by showing greater favour to the Greek soldiery and the Greek traders than all that were before him. With Lydia the relations were originally hostile; the conquest of the Greek fringe is the constant aim of Lydian policy. Greek influences, however, seem to have quickly permeated Lydia, and to have penetrated to the court. Alyattes (610–560 B.C.) marries an Ionian wife, and the succession is disputed between the son of this marriage and Croesus, whose mother was a Carian. Croesus (560–546 B.C.) secures the throne, only to become the lavish patron of Greek sanctuaries and the ally of a Greek state. The history of Hellenism had begun. It was the rise of Cyrus that closed the East to Greek enterprise and Greek influences. In Persia we find the antithesis of all that is characteristic of Greece—autocracy as opposed to liberty; a military society organized on an aristocratic basis, to an industrial society, animated by a democratic spirit; an army, whose strength lay in its cavalry, to an army, in which the foot-soldier alone counted; a morality, which assigned the chief place to veracity, to a morality which subordinated it to other virtues; a religion, which ranks among the great religions of the world, to a religion, which appeared to the most spiritual minds among the Greeks themselves both immoral and absurd. Between two such races there could be neither sympathy nor mutual understanding. In the Great Age the Greek had learned to despise the Persian, and the Persian to fear the Greek. In the 6th century it was the Persian who despised, and the Greek who feared. The history of the conflicts between the Ionian Greeks and the Persian empire affords a striking example of the combination of intellectual strength and political weakness in the character of a people. The causes of the failure of the Ionians to offer a successful resistance to Persia, both at the time of the conquest by Harpagus (546–545 B.C.) and in the Ionic revolt (499–494 B.C.), are not far to seek. The centrifugal forces always tended to prove the stronger in the Greek system, and nowhere were they stronger than in Ionia. The tie of their tribal union proved weaker, every time it was put to the test, than the political and commercial interests of the individual states. A league of jealous commercial rivals is certain not to stand the strain of a protracted struggle against great odds. Against the advancing power of Lydia a common resistance had not so much as been attempted. Miletus, the greatest of the Ionian towns, had received aid from Chios alone. Against Persia a common resistance was attempted. The Panionium, the centre of a religious amphictyony, became for the moment the centre of a political league. At the time of the Persian conquest Miletus held aloof. She secured favourable terms for herself, and left the rest of Ionia to its fate. In the later conflict, on the contrary, Miletus is the leader in the revolt. The issue was determined, not as Herodotus represents it, by the inherent indolence of the Ionian nature, but by the selfish policy of the leading states. In the sea-fight at Lade (494 B.C.) the decisive battle of the war, the Milesians and Chians fought with desperate courage. The day was lost thanks to the treachery of the Samian and Lesbian contingents.

External relations.

Persian wars.

The causes of the successful resistance of the Greeks to the invasions of their country, first by Datis and Artaphernes (490 B.C.), in the reign of Darius, and then by Xerxes in person (480–479 B.C.), are more complex. Their success was partly due to a moral cause. And this was realized by the Greeks themselves. They felt (see Herod. vii. 104) that the subjects of a despot are no match for the citizens of a free state, who yield obedience to a law which is self-imposed. But the cause was not solely a moral one. Nor was the result due to the numbers and efficiency of the Athenian fleet, in the degree that the Athenians claimed (see Herod. vii. 139). The truth is that the conditions, both political and military, were far more favourable to the Greek defence in Europe than they had been in Asia. At this crisis the centripetal forces proved stronger than the centrifugal. The moral ascendancy of Sparta was the determining factor. In Sparta the Greeks had a leader whom all were ready to obey (Herod. viii. 2). But for her influence the forces of disintegration would have made themselves felt as quickly as in Ionia. Sparta was confronted with immense difficulties in conducting the defence against Xerxes. The two chief naval powers, Athens and Aegina, had to be reconciled after a long and exasperating warfare (see AEGINA). After Thermopylae, the whole of northern Greece, with the exception of Athens and a few minor states, was lost to the Greek cause. The supposed interests of the Peloponnesians, who formed the greater part of the national forces, conflicted with the supposed interests of the Athenians. A more impartial view than was possible to the generation for which Herodotus wrote suggests that Sparta performed her task with intelligence and patriotism. The claims of Athens and Sparta were about equally balanced. And in spite of her great superiority in numbers,[1] the military conditions were far from favourable to Persia. A land so mountainous as Greece is was unsuited to the operations of cavalry, the most efficient arm of the service in the Persian Army, as in most oriental ones. Ignorance of local conditions, combined with the dangerous nature of the Greek coast, exposed their ships to the risk of destruction; while the composite character of the fleet, and the jealousies of its various contingents, tended to neutralize the advantage of numbers. In courage and discipline, the flower of the Persian infantry was probably little inferior to the Greek; in equipment, they were no match for the Greek panoply. Lastly, Xerxes laboured under a disadvantage, which may be illustrated by the experience of the British army in the South African War—distance from his base.

5. *The Great Age (480–338 B.C.).*—The effects of the repulse of Persia were momentous in their influence upon Greece. The effects upon Elizabethan England of the defeat of the Spanish armada would afford quite an inadequate parallel. It gave the Greeks a heightened sense, both of their own national unity and of their superiority to the barbarian, while at the same time it helped to create the material conditions requisite alike for the artistic and political development of the 5th century. Other cities besides Athens were adorned with the proceeds of the spoils won from Persia, and Greek trade benefited both from the reunion of Ionia with Greece, and from the suppression of piracy in the Aegean and the Hellespont. Do these developments justify us in giving to the period, which begins with the repulse of Xerxes, and ends with the victory of Philip, the title of "the Great Age"? If the title is justified in the case of the 5th century, should the 4th century be excluded from the period? At first sight, the difference between the 4th century and the 5th may seem greater than that which exists between the 5th and the 6th. On the political side, the 5th century is an age of growth, the 4th an age of decay; on the literary side, the

[1] The numbers given by Herodotus (upwards of 5,000,000) are enormously exaggerated. We must divide by ten or fifteen to arrive at a probable estimate of the forces that actually crossed the Hellespont.

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former is an age of poetry, the latter an age of prose. In spite of these contrasts, there is a real unity in the period which begins with the repulse of Xerxes and ends with the death of Alexander, as compared with any preceding one. It is an age of maturity in politics, in literature, and in art; and this is true of no earlier age. Nor can we say that the 5th century is, in all these aspects of Greek life, immature as compared with the 4th, or, on the other hand, that the 4th is decadent as compared with the 5th. On the political side, maturity is, in one sense, reached in the earlier century. There is nothing in the later century so great as the Athenian empire. In another sense, maturity is not reached till the 4th century. It is only in the later century that the tendency of the Greek constitutions to conform to a common type, democracy, is (at least approximately) realized, and it is only in this century that the principles upon which democracy is based are carried to their logical conclusion. In literature, if we confine our attention to poetry, we must pronounce the 5th century the age of completed development; but in prose the case is different. The style even of Thucydides is immature, as compared with that of Isocrates and Plato. In philosophy, however high may be the estimate that is formed of the genius of the earlier thinkers, it cannot be disputed that in Plato and Aristotle we find a more mature stage of thought. In art, architecture may perhaps be said to reach its zenith in the 5th, sculpture in the 4th century. In its political aspect, the history of the Great Age resolves itself into the history of two movements, the imperial and the democratic. Hitherto Greece had meant, politically, an aggregate of independent states, very numerous, and, as a rule, very small. The principle of autonomy was to the Greek the most sacred of all political principles; the passion for autonomy the most potent of political factors. In the latter half of the 6th century Sparta had succeeded in combining the majority of the Peloponnesian states into a loose federal union; so loose, however, that it appears to have been dormant in the intervals of peace. In the crisis of the Persian invasion the Peloponnesian League was extended so as to include all the states which had espoused the national cause. It looked on the morrow of Plataea and Mycale (the two victories, won simultaneously, in 470 B.C., by Spartan commanders, by which the danger from Persia was finally averted) as if a permanent basis for union might be found in the hegemony of Sparta. The sense of a common peril and a common triumph brought with it the need of a common union; it was Athens, however, instead of Sparta, by whom the first conscious effort was made to transcend the isolation of the Greek political system and to bring the units into combination. The league thus founded (the Delian League, established in 477 B.C.) was under the presidency of Athens, but it included hardly any other state besides those that had conducted the defence of Greece. It was formed, almost entirely, of the states which had been liberated from Persian rule by the great victories of the war. The Delian League, even in the form in which it was first established, as a confederation of autonomous allies, marks an advance in political conceptions upon the Peloponnesian League. Provision is made for an annual revenue, for periodical meetings of the council, and for a permanent executive. It is a real federation, though an imperfect one. There were defects in its constitution which rendered it inevitable that it should be transformed into an empire. Athens was from the first "the predominant partner." The fleet was mainly Athenian, the commanders entirely so; the assessment of the tribute was in Athenian hands; there was no federal court appointed to determine questions at issue between Athens and the other members; and, worst omission of all, the right of secession was left undecided. By the middle of the century the Delian League has become the Athenian empire. Henceforward the imperial idea, in one form or another, dominates Greek politics. Athens failed to extend her authority over the whole of Greece. Her empire was overthrown; but the triumph of autonomy proved the triumph of imperialism. The Spartan empire succeeds to the Athenian, and, when it is finally shattered at Leuctra (371 B.C.), the hegemony of Thebes, which is established on its ruins, is an empire in all but name. The decay of Theban power paves the way for the rise of Macedon.

Systems of government.

Thus throughout this period we can trace two forces contending for mastery in the Greek political system. Two causes divide the allegiance of the Greek world, the cause of empire and the cause of autonomy. The formation of the confederacy of Delos did not involve the dissolution of the alliance between Athens and Sparta. For seventeen years more Athens retained her place in the league, "which had been established against the Mede" under the presidency of Sparta in 480 B.C. (Thuc. i. 102). The ascendancy of Cimon and the Philolaconian party at Athens was favourable to a good understanding between the two states, and at Sparta in normal times the balance inclined in favour of the party whose policy is best described by the motto "quieta non movere."

The Peloponnesian Wars.

In the end, however, the opposition of the two contending forces proved too strong for Spartan neutrality. The fall of Cimon (461 B.C.) was followed by the so-called "First Peloponnesian War," a conflict between Athens and her maritime rivals, Corinth and Aegina, into which Sparta was ultimately drawn. Thucydides regards the hostilities of these years (460–454 B.C.), which were resumed for a few months in 446 B.C., on the expiration of the Five Years' Truce, as preliminary to those of the great Peloponnesian War (431–404 B.C.). The real question at issue was in both cases the same. The tie that united the opponents of Athens was found in a common hostility to the imperial idea. It is a complete misapprehension to regard the Peloponnesian War as a mere duel between two rival claimants for empire. The ultimatum presented by Sparta on the eve of the war demanded the restoration of autonomy to the subjects of Athens. There is no reason for doubting her sincerity in presenting it in this form. It would, however, be an equal misapprehension to regard the war as merely a struggle between the cause of empire and the cause of autonomy. Corresponding to this fundamental contrast there are other contrasts, constitutional, racial and military. The military interest of the war is largely due to the fact that Athens was a sea power and Sparta a land one. As the war went on, the constitutional aspect tended to become more marked. At first there were democracies on the side of Sparta, and oligarchies on the side of Athens. In the last stage of the war, when Lysander's influence was supreme, we see the forces of oligarchy everywhere united and organized for the destruction of democracy. In its origin the war was certainly not due to the rivalry of Dorian and Ionian. This racial, or tribal, contrast counted for more in the politics of Sicily than of Greece; and, though the two great branches of the Greek race were represented respectively by the leaders of the two sides, the allies on neither side belonged exclusively to the one branch or the other. Still, it remains true that the Dorian states were, as a rule, on the Spartan side, and the Ionian states, as a rule, on the Athenian—a division of sentiment which must have helped to widen the breach, and to intensify the animosities.

The Athenian empire.

As a political experiment the Athenian empire possesses a unique interest. It represents the first attempt to fuse the principles of imperialism and democracy. It is at once the first empire in history possessed and administered by a sovereign people, and the first which sought to establish a common system of democratic institutions amongst its subjects.[1] It was an experiment that failed, partly owing to the inherent strength of the oligarchic cause, partly owing to the exclusive character of ancient citizenship. The Athenians themselves recognized that their empire depended for its existence upon the solidarity of democratic interests (see Thuc. iii. 47; Pseudo-Xenophon, *de Rep. Ath.* i. 14, iii. 10). An understanding existed between the democratic leaders in the subject-states and the democratic party at Athens.

[1] It has been denied by some writers (e.g. by A. H. J. Greenidge) that Athens interfered with the constitutions of the subject-states. For the view put forward in the text, the following passages may be quoted: Aristotle, *Politics* 1307 b 20; Isocrates, *Panegyricus*, 105, 106, *Panathenaicus*, 54 and 68; Xenophon, *Hellenica*, iii. 4. 7; Ps.-Xen. *Athen. Constit.* i. 14, iii. 10.

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Charges were easily trumped up against obnoxious oligarchs, and conviction as easily obtained in the Athenian courts of law. Such a system forced the oligarchs into an attitude of opposition. How much this opposition counted for was realized when the Sicilian disaster (413 B.C.) gave the subjects their chance to revolt. The organization of the oligarchical party throughout the empire, which was effected by Lysander in the last stage of the war, contributed to the overthrow of Athenian ascendancy hardly less than the subsidies of Persia. Had Athens aimed at establishing a community of interest between herself and her subjects, based upon a common citizenship, her empire might have endured. It would have been a policy akin to that which secured the permanence of the Roman empire. And it was a policy which found advocates when the day for it was past (see Aristophanes, *Lysistrata*, 574 ff.; cf. the grant of citizenship to the Samians after Aegospotami, *C.I.A.* iv. 2, 1b). But the policy pursued by Athens in the plenitude of her power was the reverse of the policy pursued by Rome in her treatment of the franchise. It is hardly an exaggeration to say that the fate of the empire was sealed by the law of Pericles (451 B.C.), by which the franchise was restricted to those who could establish Athenian descent on both sides. It was not merely that the process of amalgamation through intermarriage was abruptly checked; what was more serious was that a hard and fast line was drawn, once and for all, between the small body of privileged rulers and the great mass of unprivileged subjects. Maine (*Early Institutions*, lecture 13) has classed the Athenian empire with those of the familiar Oriental type, which attempt nothing beyond the raising of taxes and the levying of troops. The Athenian empire cannot, indeed, be classed with the Roman, or with the British rule in India; it does not, therefore, deserve to be classed with the empires of Cyrus or of Jenghiz Khan. Though the basis of its organization, like that of the Persian empire under Darius, was financial, it attempted, and secured, objects beyond the mere payment of tribute and the supply of ships. If Athens did not introduce a common religion, or a common system of education, or a common citizenship, she did introduce a common type of political institutions, and a common jurisdiction.[1] She went some way, too, in the direction of establishing a common system of coins, and of weights and measures. A common language was there already. In a word, the Athenian empire marks a definite stage of political evolution.

The mature democracy.

The other great political movement of the age was the progress of democracy. Before the Persian invasion democracy was a rare phenomenon in Greek politics. Where it was found it existed in an undeveloped form, and its tenure of power was precarious. By the beginning of the Peloponnesian War it had become the prevalent form of government. The great majority of Greek states had adopted democratic constitutions. Both in the Athenian sphere of influence and in the colonial world outside that sphere, democracy was all but the only form of constitution known. It was only in Greece proper that oligarchy held its own. In the Peloponnese it could count a majority of the states; in northern Greece at least a half of them. The spread of democratic institutions was arrested by the victory of Sparta in the East, and the rise of Dionysius in the West. There was a moment at the end of the 5th century when it looked as if democracy was a lost cause. Even Athens was for a brief period under the rule of the Thirty (404–403 B.C.). In the regions which had formed the empire of Athens the decarchies set up by Lysander were soon overthrown, and democracies restored in most cases, but oligarchy continued to be the prevalent form in Greece proper until Leuctra (371 B.C.), and in Sicily tyranny had a still longer tenure of power. By the end of the Great Age oligarchy has almost disappeared from the Greek world, except in the sphere of Persian influence. The Spartan monarchy still survives; a few Peloponnesian states still maintain the rule of the few; here and there in Greece itself we meet with a revival of the *tyrannis*; but, with these exceptions, democracy is everywhere the only type of constitution. And democracy has developed as well as spread. At the end of the 5th century the constitution of Cleisthenes, which was a democracy in the view of his contemporaries, had come to be regarded as an aristocracy (Aristot. *Ath. Pol.* 29. 3). We can trace a similar change of sentiment in Sicily. As compared with the extreme form of constitution adopted at Syracuse after the defeat of the Athenian expedition, the democracies established two generations earlier, on the fall of the *tyrannis*, appeared oligarchical. The changes by which the character of the Greek democracies was revolutionized were four in number: the substitution of sortition for election, the abolition of a property qualification, the payment of officials and the rise of a class of professional politicians. In the democracy of Cleisthenes no payment was given for service, whether as a magistrate, a juror or a member of the Boulê. The higher magistracies were filled by election, and they were held almost exclusively by the members of the great Athenian families. For the highest office of all, the archonship, none but *Pentacosiomedimni* (the first of the four Solonian classes) were eligible. The introduction of pay and the removal of the property qualification formed part of the reforms of Pericles. Sortition had been instituted for election a generation earlier (487 B.C.).[2] What is perhaps the most important of all these changes, the rise of the demagogues, belongs to the era of the Peloponnesian War. From the time of Cleisthenes to the outbreak of the war every statesman of note at Athens, with the exception of Themistocles (and, perhaps, of Ephialtes), is of aristocratic birth. Down to the fall of Cimon the course of Athenian politics is to a great extent determined by the alliances and antipathies of the great clans. With the Peloponnesian War a new epoch begins. The chief office, the *strategia*, is still, as a rule, held by men of rank. But leadership in the Ecclesia has passed to men of a different class. The demagogues were not necessarily poor men. Cleon was a wealthy man; Eucrates, Lysicles and Hyperbolus were, at any rate, tradesmen rather than artisans. The first "labour member" proper is Cleophon (411–404 B.C.), a lyre-maker. They belonged, however, not to the land-owning, but to the industrial classes; they were distinguished from the older race of party-leaders by a vulgar accent, and by a violence of gesture in public speaking, and they found their supporters among the population of the city and its port, the Peiraeus, rather than among the farmers of the country districts. In the 4th century the demagogues, though under another name, that of orators, have acquired entire control of the Ecclesia. It is an age of professionalism, and the professional soldier has his counterpart in the professional politician. Down to the death of Pericles the party-leader had always held office as Strategus. His rival, Thucydides, son of Melesias, forms a solitary exception to this statement. In the 4th century the divorce between the general and the statesman is complete. The generals are professional soldiers, who aspire to no political influence in the state, and the statesmen devote themselves exclusively to politics, a career for which they have prepared themselves by a professional training in oratory or administrative work. The ruin of agriculture during the war had reduced the old families to insignificance. Birth counts for less than nothing as a political asset in the age of Demosthenes.

The city-state.

But great as are the contrasts which have been pointed out between the earlier and the later democracy, those that distinguish the ancient conception of democracy from the modern are of a still more essential nature. The differences that distinguish the democracies of ancient Greece from those of the modern world have their origin, to a great extent, in the difference between a city-state and a nation-state. Many of the most famous Greek states

[1] The evidence seems to indicate that all the more important criminal cases throughout the empire were tried in the Athenian courts. In civil cases Athens secured to the citizens of the subject-states the right of suing Athenian citizens, as well as citizens of other subject-states.

[2] After this date, and partly in consequence of the change, the archonship, to which sortition was applied, loses its importance. The *strategi* (generals) become the chief executive officials. As election was never replaced by the lot in their case, the change had less practical meaning than might appear at first sight. (See ARCHON; STRATEGUS.)

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had an area of a few square miles; the largest of them was no larger than an English county. Political theory put the limit of the citizen-body at 10,000. Though this number was exceeded in a few cases, it is doubtful if any state, except Athens, ever counted more than 20,000 citizens. In the nation-states of modern times, democratic government is possible only under the form of a representative system; in the city-state representative government was unnecessary, and therefore unknown. In the ancient type of democracy a popular chamber has no existence. The Ecclesia is not a chamber in any sense of the term; it is an assembly of the whole people, which every citizen is entitled to attend, and in which every one is equally entitled to vote and speak. The question raised in modern political science, as to whether sovereignty resides in the electors or their representatives, has thus neither place nor meaning in ancient theory. In the same way, one of the most familiar results of modern analysis, the distinction between the executive and the legislative, finds no recognition in the Greek writers. In a direct system of government there can be no executive in the proper sense. Executive functions are discharged by the ecclesia, to whose decision the details of administration may be referred. The position of the strategi, the chief officials in the Athenian democracy of the 5th century, was in no sense comparable to that of a modern cabinet. Hence the individual citizen in an ancient democracy was concerned in, and responsible for, the actual work of government to a degree that is inconceivable in a modern state. Thus participation in the administrative and judicial business of the state is made by Aristotle the differentia of the citizen (*τοῖς κοινῇ κριτοῦ καὶ ἀρχῆς*, Aristot. *Politics*, p. 1275 a 20). A large proportion of the citizens of Athens, in addition to frequent service in the courts of law, must in the course of their lives have held a magistracy, great or small, or have acted for a year or two as members of the Boulē.[1] It must be remembered that there was nothing corresponding to a permanent civil service in the ancient state. Much of the work of a government office would have been transacted by the Athenian Boulē. It must be remembered, too, that political and administrative questions of great importance came before the popular courts of law. Hence it follows that the ordinary citizen of an ancient democracy, in the course of his service in the Boulē or the law-courts, acquired an interest in political questions, and a grasp of administrative work, which none but a select few can hope to acquire under the conditions of the modern system. Where there existed neither a popular chamber nor a distinct executive, there was no opportunity for the growth of a party-system. There were, of course, political parties at Athens and elsewhere—oligarchs and democrats, conservatives and radicals, a peace-party and a war-party, according to the burning question of the day. There was, however, nothing equivalent to a general election, to a cabinet (or to that collective responsibility which is of the essence of a cabinet), or to the government and the opposition. Party organization, therefore, and a party system, in the proper sense, were never developed. Whatever may have been the evils incident to the ancient form of democracy, the "boss," the caucus and the spoils-system were not among them.

Besides these differences, which, directly or indirectly, result from the difference of scale, there are others, hardly less profound, which are not connected with the size of the city-state. Perhaps the most striking contrast between the democracies of ancient and of modern times is to be found in their attitude towards privilege. Ancient democracy implies privilege; modern democracy implies its destruction. In the more fully developed democracies of the modern world (*e.g.* in the United States, or in Australia), the privilege of class is unknown; in some of them (*e.g.* New Zealand, Australia, Norway) even the privilege of sex has been abolished. Ancient democracy was bound up with privilege as much as oligarchy was. The transition from the latter to the former was effected by enlarging the area of privilege and by altering its basis. In an oligarchical state citizenship might be confined to 10 % of the free population; under a democracy 50% might enjoy it. In the former case the qualification might be wealth or land; in the latter case it might be, as it was at Athens, birth, *i.e.* descent, on both sides, from a citizen family. But, in both cases alike, the distinction between a privileged and an unprivileged body of free-born residents is fundamental. To the unprivileged class belonged, not only foreigners temporarily resident (*ξένοι*) and aliens permanently domiciled (*μέτοικοι*), but also those native-born inhabitants of the state who were of foreign extraction, on one side or the other.[2] The privileges attaching to citizenship included, in addition to eligibility for office and a vote in the assembly, such private rights as that of owning land or a house, or of contracting a marriage with one of citizen status. The citizen, too, was alone the recipient of all the various forms of pay (*e.g.* for attendance in the assembly, for service in the Boulē or the law-courts, or for the celebration of the great festivals) which are so conspicuous a feature in the developed democracy of the 4th century. The *metoeci* could not even plead in a court of law in person, but only through a patron (*προστάτης*). It is intelligible that privileges so great should be jealously guarded. In the democracies of the modern world naturalization is easy; in those of ancient Greece admission to the franchise was rarely accorded. In modern times, again, we are accustomed to connect democracy with the emancipation of women. It is true that only a few democratic constitutions grant them the suffrage; but though, as a rule, they are denied public rights, the growth of popular government has been almost everywhere accompanied by an extension of their private rights, and by the removal of the restrictions imposed by law, custom or public opinion upon their freedom of action. In ancient Greece the democracies were as illiberal in their policy as the oligarchies. Women of the respectable class were condemned to comparative seclusion. They enjoyed far less freedom in 4th-century Athens than in the Homeric Age. It is not in any of the democracies, but in conservative Sparta, that they possess privilege and exercise influence.

Position of women.

The most fundamental of all the contrasts between democracy in its ancient and in its modern form remains to be stated. The ancient state was inseparable from slavery. In this respect there was no difference between democracy and the other forms of government. No inconsistency was felt, therefore, between this institution and the democratic principle. Modern political theory has been profoundly affected by the conception of the dignity of labour; ancient political theory tended to regard labour as a disqualification for the exercise of political rights. Where slavery exists, the taint of it will inevitably cling to all labour that can be performed by the slave. In ancient Athens (which may be taken as typical of the Greek democracies) unskilled labour was almost entirely slave-labour, and skilled labour was largely so. The arts and crafts were, to some extent, exercised by citizens, but to a less extent in the 4th than in the 6th century. They were, however, chiefly left to aliens or slaves. The citizen-body of Athens in the age of Demosthenes has been stigmatized as consisting in great measure of salaried paupers. There is, doubtless, an exaggeration in this. It is, however, true, both that the system of state-pay went a long way towards supplying the simple wants of a southern population, and that a large proportion of the citizens had time to spare for the service of the state. Had the life of the lower class of citizens been absorbed in a round of mechanical labours, as fully as is the life of our industrial classes, the working of an ancient democracy would have been impossible. In justice to the ancient democracies it must be conceded that, while popular government carried with it neither the enfranchisement of the alien nor the emancipation of the slave, the rights secured to both classes were more considerable in the democratic states than elsewhere. The lot of the slave, as well as that of the alien, was a peculiarly favourable one at Athens. The pseudo-Xenophon in the 5th century (*De rep. Ath.* 1. 10-12) and Plato

Slavery.

[1] For an estimate of the numbers annually engaged in the service of Athens, see Aristot. *Ath. Pol.* 24. 3.

[2] Foreign is not used here as equivalent to non-Hellenic. It means "belonging to another state, whether Greek or barbarian."

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in the 4th (*Republic*, p. 563 B), prove that the spirit of liberty, with which Athenian life was permeated, was not without its influence upon the position of these classes. When we read that critics complained of the opulence of slaves, and of the liberties they took, and when we are told that the slave could not be distinguished from the poorer class of citizens either by his dress or his look, we begin to realize the difference between the slavery of ancient Athens and the system as it was worked on the Roman *latifundia* or the plantations of the New World.

It had been anticipated that the fall of Athens would mean the triumph of the principle of autonomy. If Athens had surrendered within a year or so of the Sicilian catastrophe, this anticipation would probably have been fulfilled. It was the last phase of the struggle (412–404 B.C.) that rendered a Spartan empire inevitable. The oligarchical governments established by Lysander recognized that their tenure of power was dependent upon Spartan support, while Lysander himself, to whose genius, as a political organizer not less than as a commander, the triumph of Sparta was due, was unwilling to see his work undone. The Athenian empire had never included the greater part of Greece proper; since the Thirty Years' Peace its possessions on the mainland, outside the boundaries of Attica, were limited to Naupactus and Plataea. Sparta, on the other hand, attempted the control of the entire Greek world east of the Adriatic. Athens had been compelled to acknowledge a dual system; Sparta sought to establish uniformity. The attempt failed from the first. Within a year of the surrender of Athens, Thebes and Corinth had drifted into an attitude of opposition, while Argos remained hostile. It was not long before the policy of Lysander succeeded in uniting against Sparta the very forces upon which she had relied when she entered on the Peloponnesian War. The Corinthian War (394–387 B.C.) was brought about by the alliance of all the second-class powers—Thebes, Athens, Corinth, Argos—against the one first-class power, Sparta. Though Sparta emerged successful from the war, it was with the loss of her maritime empire, and at the cost of recognizing the principle of autonomy as the basis of the Greek political system. It was already evident, thus early in the century, that the centrifugal forces were to prove stronger than the centripetal. Two further causes may be indicated which help to explain the failure of the Spartan empire. In the first place Spartan sea-power was an artificial creation. History seems to show that it is idle for a state to aspire to naval supremacy unless it possesses a great commercial marine. Athens had possessed such a marine; her naval supremacy was due not to the mere size of her fleet, but to the numbers and skill of her seafaring population. Sparta had no commerce. She could build fleets more easily than she could man them. A single defeat (at Cnidus, 391 B.C.) sufficed for the ruin of her sea-power. The second cause is to be found in the financial weakness of the Spartan state. The Spartan treasury had been temporarily enriched by the spoils of the Peloponnesian War, but neither during that war, nor afterwards, did Sparta succeed in developing any scientific financial system. Athens was the only state which either possessed a large annual revenue or accumulated a considerable reserve. Under the conditions of Greek warfare, fleets were more expensive than armies. Not only was money needed for the building and maintenance of the ships, but the sailor must be paid, while the soldier served for nothing. Hence the power with the longest purse could both build the largest fleet and attract the most skilful seamen.

The Spartan empire.

The battle of Leuctra transferred the hegemony from Sparta to Thebes, but the attempt to unite Greece under the leadership of Thebes was from the first doomed to failure. The conditions were less favourable to Thebes than they had been to Athens or Sparta. Thebes was even more exclusively a land-power than Sparta. She had no revenue comparable to that of Athens in the preceding century. Unlike Athens and Sparta, she had not the advantage of being identified with a political cause. As the enemy of Athens in the 5th century, she was on the side of oligarchy; as the rival of Sparta in the 4th, she was on the side of democracy; but in her bid for primacy she could not appeal, as Athens and Sparta could, to a great political tradition, nor had she behind her, as they had, the moral force of a great political principle. Her position, too, in Boeotia itself was insecure. The rise of Athens was in great measure the result of the *synoecism* (συνοικισμός) of Attica. All inhabitants of Attica were Athenians. But "Boeotian" and "Theban" were not synonymous terms. The Boeotian league was an imperfect form of union, as compared with the Athenian state, and the claim of Thebes to the presidency of the league was, at best, sullenly acquiesced in by the other towns. The destruction of some of the most famous of the Boeotian cities, however necessary it may have been in order to unite the country, was a measure which at once impaired the resources of Thebes and outraged Greek sentiment. It has been often held that the failure of Theban policy was due to the death of Epaminondas (at the battle of Mantinea, 362 B.C.). For this view there is no justification. His policy had proved a failure before his death. Where it harmonized with the spirit of the age, the spirit of dissidence, it succeeded; where it attempted to run counter to it, it failed. It succeeded in destroying the supremacy of Sparta in the Peloponnese; it failed to unite the Peloponnese on a new basis. It failed still more signally to unite Greece north of the Isthmus. It left Greece weaker and more divided than it found it (see the concluding words of Xenophon's *Hellenics*). It would be difficult to overestimate the importance of his policy as a destructive force; as a constructive force it effected nothing.[1] The Peloponnesian system which Epaminondas overthrew had lasted two hundred years. Under Spartan leadership the Peloponnese had enjoyed almost complete immunity from invasion and comparative immunity from *stasis* (faction). The claim that Isocrates makes for Sparta is probably well-founded (*Archidamus*, 64-69; during the period of Spartan ascendency the Peloponnesians were εὐδαιμονέστατοι τῶν Ἑλλήνων). Peloponnesian sentiment had been one of the chief factors in Greek politics; to it, indeed, in no small degree was due the victory over Persia. The Theban victory at Leuctra destroyed the unity, and with it the peace and the prosperity, of the Peloponnese. It inaugurated a period of misery, the natural result of *stasis* and invasion, to which no parallel can be found in the earlier history (see Isocrates, *Archidamus*, 65, 66; the Peloponnesians were ὠμαλισμένοι ταῖς συμφοραῖς). It destroyed, too, the Peloponnesian sentiment of hostility to the invader. The bulk of the army that defeated Mardonius at Plataea came from the Peloponnese; at Chaeronea no Peloponnesian state was represented.

Theban hegemony.

The question remains, Why did the city-state fail to save Greece from conquest by Macedon? Was this result due to the inherent weakness either of the city-state itself, or of one particular form of it, democracy? It is clear, in any case, that the triumph of Macedon was the effect of causes which had long been at work. If neither Philip nor Alexander had appeared on the scene, Greece might have maintained her independence for another generation or two; but, when invasion came, it would have found her weaker and more distracted, and the conquerors might easily have been less imbued with the Greek spirit, and less sympathetic towards Greek ideals, than the great Macedonian and his son. These causes are to be found in the tendencies of the age, political, economic and moral. Of the two movements which characterized the Great Age in its political aspect, the imperial and the democratic, the one failed and the other succeeded. The failure and the success were equally fatal to the chances of Greece in the conflict with Macedon. By the middle of the 4th century Greek politics had come to be dominated by the theory of the balance of power. This theory, enunciated in its coarsest form by Demosthenes (*Pro Megalopolit.* 4 συμφέρει τῇ πόλει καὶ Λακεδαιμονίοις ἀσθενεῖς εἶναι καὶ Ὀμβαίους; cf. *in Aristocrat.* 102, 103), had shaped the foreign policy of Athens since the end of the Peloponnesian War. As long as Sparta was the stronger, Athens inclined to a Theban alliance; after Leuctra she tended in the direction of a Spartan one. At the epoch of Philip's

The rise of Macedon.

[1] It failed even to create a united Arcadia or a strong Messenia.

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accession the forces were everywhere nicely balanced. The Peloponnese was fairly equally divided between the Theban and the Spartan interests, and central Greece was similarly divided between the Theban and the Athenian. Farther north we get an Athenian party opposed to an Olynthian in Chalcidice, and a republican party, dependent upon the support of Thebes, opposed to that of the tyrants in Thessaly. It is easy to see that the political conditions of Greece, both in the north and in the south, invited interference from without. And the triumph of democracy in its extreme form was ruinous to the military efficiency of Greece. On the one side there was a monarchical state, in which all powers, civil as well as military, were concentrated in the hands of a single ruler; on the other, a constitutional system, in which a complete separation had been effected between the responsibility of the statesman and that of the commander.[1]

It could not be doubtful with which side victory would rest. Meanwhile, the economic conditions were steadily growing worse. The cause which Aristotle assigns for the decay of the Spartan state—a declining population (see *Politics*, p. 1270 a ἀπώλετο ἡ πόλις τῶν Λακεδαιμονίων διὰ τὴν ὀλιγανθρωπίαν)—might be extended to the Greek world generally. The loss of population was partly the result of war and *stasis*—Isocrates speaks of the number of political exiles from the various states as enormous[2]—but it was also due to a declining birth-rate, and to the exposure of infants. Aristotle, while condemning exposure, sanctions the procuring of abortion (*Politics*, 1335 b). It is probable that both ante-natal and post-natal infanticide were rife everywhere, except among the more backward communities. A people which has condemned itself to racial suicide can have little chance when pitted against a nation in which healthier instincts prevail. The materials for forming a trustworthy estimate of the population of Greece at any given epoch are not available; there is enough evidence, however, to prove that the military population of the leading Greek states at the era of the battle of Chaeronea (338 B.C.) fell far short of what it had been at the beginning of the Peloponnesian War. The decline in population had been accompanied by a decline in wealth, both public and private; and while revenues had shrunk, expenditure had grown. It was a century of warfare; and warfare had become enormously more expensive, partly through the increased employment of mercenaries, partly through the enhanced cost of material. The power of the purse had made itself felt even in the 5th century; Persian gold had helped to decide the issue of the great war. In the politics of the 4th century the power of the purse becomes the determining factor. The public finance of the ancient world was singularly simple in character, and the expedients for raising a revenue were comparatively few. The distinction between direct and indirect taxation was recognized in practice, but states as a rule were reluctant to submit to the former system. The revenue of Athens in the 5th century was mainly derived from the tribute paid by her subjects; it was only in time of war that a direct tax was levied upon the citizen-body.[3] In the age of Demosthenes the revenue derived from the Athenian Confederacy was insignificant. The whole burden of the expenses of a war fell upon the 1200 richest citizens, who were subject to direct taxation in the dual form of the *Trierarchy* and the *Eisphora* (property-tax). The revenue thus raised was wholly insufficient for an effort on a great scale; yet the revenues of Athens at this period must have exceeded those of any other state.

It is to moral causes, however, rather than to political or economic ones, that the failure of Greece in the conflict with Macedon is attributed by the most famous Greek statesmen of that age. Demosthenes is never weary of insisting upon the decay of patriotism among the citizens and upon the decay of probity among their leaders. Venality had always been the besetting sin of Greek statesmen. Pericles' boast as to his own incorruptibility (Thuc. ii. 60) is significant as to the reputation of his contemporaries. In the age of Demosthenes the level of public life in this respect had sunk at least as low as that which prevails in many states of the modern world (see Demosth. *On the Crown*, 61 παρὰ τοῖς Ἕλλησιν, οὐ τοῦτ' ἀλλ' ἅπασιν ὁμοίως φορὰ προδοτῶν καὶ διαφθόρων συνέβη; cf. §§ 295, 296). Corruption was certainly not confined to the Macedonian party. The best that can be said in defence of the patriots, as well as of their opponents, is that they honestly believed that the policy which they were bribed to advocate was the best for their country's interests. The evidence for the general decay of patriotism among the mass of the citizens is less conclusive. The battle of Megalopolis (331 B.C.), in which the Spartan soldiery "went down in a blaze of glory," proves that the spirit of the Lacedemonian state remained unchanged. But at Athens it seemed to contemporary observers—to Isocrates equally with Demosthenes—that the spirit of the great days was extinct (see Isocr. *On the Peace*, 47, 48). It cannot, of course, be denied that public opinion was obstinately opposed to the diversion of the Theoric Fund to the purposes of the war with Philip. It was not till the year before Chaeronea that Demosthenes succeeded in persuading the assembly to devote the entire surplus to the expenses of the war.[4] Nor can it be denied that mercenaries were far more largely employed in the 4th century than in the 5th. In justice, however, to the Athenians of the Demosthenic era, it should be remembered that the burden of direct taxation was rarely imposed, and was reluctantly endured, in the previous century. It must also be remembered that, even in the 4th century, the Athenian citizen was ready to take the field, provided that it was not a question of a distant expedition or of prolonged service.[5] For distant expeditions, or for prolonged service, a citizen-militia is unsuited. The substitution of a professional force for an unprofessional one is to be explained, partly by the change in the character of Greek warfare, and partly by the operation of the laws of supply and demand. There had been a time when warfare meant a brief campaign in the summer months against a neighbouring state. It had come to mean prolonged operations against a distant enemy.[6] Athens was at war, *e.g.* with Philip, for eleven years continuously (357–346 B.C.). If winter campaigns in Thrace were unpopular at this epoch, they had been hardly less unpopular in the epoch of the Peloponnesian War. In the days of her greatness, too, Athens had freely employed mercenaries, but it was in the navy rather than the army. In the age of Pericles the supply of mercenary rowers was abundant, the supply of mercenary troops inconsiderable. In the age of Demosthenes incessant warfare and ceaseless revolution had filled Greece with crowds of homeless adventurers. The supply helped to create the demand. The mercenary was as cheap as the citizen-soldier, and much more effective. On the whole, then, it may be inferred that it is a mistake to regard the prevalence of the mercenary system as the expression of a declining patriotism. It would be nearer the mark to treat the transition from the voluntary to the professional system as cause rather than effect: as one among the causes which contributed to the decay of public spirit in the Greek world.

6. *From Alexander to the Roman Conquest* (336–146 B.C.).—In the history of Greece proper during this period the interest is mainly constitutional. It may be called the age of federation. Federation, indeed, was no novelty in Greece. Federal unions had existed in Thessaly, in Boeotia and elsewhere, and the Boeotian league can be traced back at least to the 6th century. Two newly-founded federations, the Chalcidian and the Arcadian, play no inconsiderable part in the politics of the 4th century. But it is not till the 3rd century that federation attains to its full development in Greece, and becomes the normal type of polity. The two great

Federal government.

[1] See Demosthenes, *On the Crown*, 235. Philip was αὐτοκράτωρ, διοικήσεως, ἡγεμών, κύριος πάντων.

[2] See *Archidamus*, 68; *Philippus*, 136, ὥστε ῥᾴδιον εἶναι συστῆσαι στρατόπεδον μείζον καὶ κρείττον ἐκ τῶν πλανωμένων ἢ ἐκ τῶν πολιτευομένων.

[3] The *Liturgies* (*e.g.* the trierarchy) had much the same effect as a direct tax levied upon the wealthiest citizens.

[4] His extreme caution in approaching the question at an earlier date is to be noticed. See, *e.g.*, *Olynthiacs*, i. 19, 20.

[5] *e.g.* the two expeditions sent to Euboea, the cavalry force that took part in the battle of Mantinea, and the army that fought at Chaeronea. The troops in all these cases were citizens.

[6] For the altered character of warfare see Demosthenes, *Philippics*, iii. 48, 49.

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leagues of this period are the Aetolian and the Achaean. Both had existed in the 4th century, but the latter, which had been dissolved shortly before the beginning of the 3rd century, becomes important only after its restoration in 280 B.C., about which date the former, too, first begins to attract notice. The interest of federalism lies in the fact that it marks an advance beyond the conception of the city-state. It is an attempt to solve the problem which the Athenian empire failed to solve, the reconciliation of the claims of local autonomy with those of national union. The federal leagues of the 3rd century possess a further interest for the modern world, in that there can be traced in their constitutions a nearer approach to a representative system than is found elsewhere in Greek experience. A genuine representative system, it is true, was never developed in any Greek polity. What we find in the leagues is a sort of compromise between the principle of a primary assembly and the principle of a representative chamber. In both leagues the nominal sovereign was a primary assembly, in which every individual citizen had the right to vote. In both of them, however, the real power lay with a council (*βουλή*) composed of members representative of each of the component states.[1]

Alexander's empire.

The real interest of this period, however, is to be looked for elsewhere than in Greece itself. Alexander's career is one of the turning-points in history. He is one of the few to whom it has been given to modify the whole future of the human race. He originated two forces which have profoundly affected the development of civilization. He created Hellenism, and he created for the western world the monarchical ideal. Greece had produced personal rulers of ability, or even of genius; but to the greatest of these, to Peisistratus, to Dionysius, even to Jason of Pherae, there clung the fatal taint of illegitimacy. As yet no ruler had succeeded in making the person of the monarch respectable. Alexander made it sacred. From him is derived, for the West, that "divinity that doth hedge a king." And in creating Hellenism he created, for the first time, a common type of civilization, with a common language, literature and art, as well as a common form of political organization. In Asia Minor he was content to reinforce the existing Hellenic elements (cf. the case of Side, Arrian, *Anabasis*, i. 26. 4). In the rest of the East his instrument of hellenization was the *polis*. He is said to have founded no less than seventy cities, destined to become centres of Greek influence; and the great majority of these were in lands in which city-life was almost unknown. In this respect his example was emulated by his successors. The eastern provinces were soon lost, though Greek influences lingered on even in Bactria and across the Indus. It was only the regions lying to the west of the Euphrates that were effectively hellenized, and the permanence of this result was largely due to the policy of Rome. But after all deductions have been made, the great fact remains that for many centuries after Alexander's death Greek was the language of literature and religion, of commerce and of administration throughout the Nearer East. Alexander had created a universal empire as well as a universal culture. His empire perished at his death, but its central idea survived—that of the municipal freedom of the Greek *polis* within the framework of an imperial system. Hellenistic civilization may appear degenerate when compared with Hellenic; when compared with the civilizations which it superseded in non-Hellenic lands, it marks an unquestionable advance. (For the history of Greek civilization in the East, see HELLENISM.) Greece left her mark upon the civilization of the West as well as upon that of the East, but the process by which her influence was diffused was essentially different. In the East Hellenism came in the train of the conqueror, and Rome was content to build upon the foundations laid by Alexander. In the West Greek influences were diffused by the Roman conquest of Greece. It was through the ascendancy which Greek literature, philosophy and art acquired over the Roman mind that Greek culture penetrated to the nations of western Europe. The civilization of the East remained Greek. The civilization of the West became and remained Latin, but it was a Latin civilization that was saturated with Greek influences. The ultimate division, both of the empire and the church, into two halves, finds its explanation in this original difference of culture.

[1] It is known that the councillors were appointed by the states in the Aetolian league; it is only surmised in the case of the Achaean.

ANCIENT AUTHORITIES.—(I.) For the earliest periods of Greek history, the so-called Minoan and Mycenaean, the evidence is purely archaeological. It is sufficient here to refer to the article AEGEAN CIVILIZATION. For the next period, the Heroic or Homeric Age, the evidence is derived from the poems of Homer. In any estimate of the value of these poems as historical evidence, much will depend upon the view taken of the authorship, age and unity of the poems. For a full discussion of these questions see HOMER. It cannot be questioned that the poems are evidence for the existence of a period in the history of the Greek race, which differed from later periods in political and social, military and economic conditions. But here agreement ends. If, as is generally held by German critics, the poems are not earlier than the 9th century, if they contain large interpolations of considerably later date and if they are Ionian in origin, the authority of the poems becomes comparatively slight. The existence of different strata in the poems will imply the existence of inconsistencies and contradictions in the evidence; nor will the evidence be that of a contemporary. It will also follow that the picture of the heroic age contained in the poems is an idealized one. The more extreme critics, *e.g.* Beloch, deny that the poems are evidence even for the existence of a pre-Dorian epoch. If, on the other hand, the poems are assigned to the 11th or 12th century, to a Peloponnesian writer, and to a period anterior to the Dorian Invasion and the colonization of Asia Minor (this is the view of the late Dr D. B. Munro), the evidence becomes that of a contemporary, and the authority of the poems for the distribution of races and tribes in the Heroic Age, as well as for the social and political conditions of the poet's time, would be conclusive. Homer recognizes no Dorians in Greece, except in Crete (see *Odyssey*, xix. 177), and no Greek colonies in Asia Minor. Only two explanations are possible. Either there is deliberate archaism in the poems, or else they are earlier in date than the Dorian Invasion and the colonization of Asia Minor.

Herodotus.

II. For the period that extends from the end of the Heroic Age to the end of the Peloponnesian War[2] the two principal authorities are Herodotus and Thucydides. Not only have the other historical works which treated of this period perished (those at least whose date is earlier than the Christian era), but their authority was secondary and their material chiefly derived from these two writers. In one respect then this period of Greek history stands alone. Indeed, it might be said, with hardly an exaggeration, that there is nothing like it elsewhere in history. Almost our sole authorities are two writers of unique genius, and they are writers whose works have come down to us intact. For the period which ends with the repulse of the Persian invasion our authority is Herodotus. For the period which extends from 478 to 411 we are dependent upon Thucydides'. In each case, however, a distinction must be drawn. The Persian Wars form the proper subject of Herodotus's work; the Peloponnesian War is the subject of Thucydides. The interval between the two wars is merely sketched by Thucydides; while of the period anterior to the conflicts of the Greek with the Persians, Herodotus does not attempt either a complete or a continuous narrative. His references to it are episodical and accidental. Hence our knowledge of the Persian Wars and of the Peloponnesian War is widely different in character from our knowledge of the rest of this period. In the history of these wars the *lacunae* are few; in the rest of the history they are alike frequent and serious. In the history, therefore, of the Persian and Peloponnesian Wars little is to be learnt from the secondary sources. Elsewhere, especially in the interval between the two wars, they become relatively important.

In estimating the authority of Herodotus (*q.v.*) we must be

[2] Strictly speaking, to 411 B.C. For the last seven years of the war our principal authority is Xenophon, *Hellenica*, i., ii.

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careful to distinguish between the invasion of Xerxes and all that is earlier. Herodotus's work was published soon after 430 B.C., *i.e.* about half a century after the invasion. Much of his information was gathered in the course of the preceding twenty years. Although his evidence is not that of an eye-witness, he had had opportunities of meeting those who had themselves played a part in the war, on one side or the other (*e.g.* Thersander of Orchomenos, ix. 16). In any case, we are dealing with a tradition which is little more than a generation old, and the events to which the tradition relates, the incidents of the struggle against Xerxes, were of a nature to impress themselves indelibly upon the minds of contemporaries. Where, on the other hand, he is treating of the period anterior to the invasion of Xerxes, he is dependent upon a tradition which is never less than two generations old, and is sometimes centuries old. His informants were, at best, the sons or grandsons of the actors in the wars (*e.g.* Archias the Spartan, iii. 55). Moreover, the invasion of Xerxes, entailing, as it did, the destruction of cities and sanctuaries, especially of Athens and its temples, marks a dividing line in Greek history. It was not merely that evidence perished and records were destroyed. What in reference to tradition is even more important, a new consciousness of power was awakened, new interests were aroused, and new questions and problems came to the front. The former things had passed away; all things were become new. A generation that is occupied with making history on a great scale is not likely to busy itself with the history of the past. Consequently, the earlier traditions became faint and obscured, and the history difficult to reconstruct. As we trace back the conflict between Greece and Persia to its beginnings and antecedents, we are conscious that the tradition becomes less trustworthy as we pass back from one stage to another. The tradition of the expedition of Datis and Artaphernes is less credible in its details than that of the expedition of Xerxes, but it is at once fuller and more credible than the tradition of the Ionian revolt. When we get back to the Scythian expedition, we can discover but few grains of historical truth.

Much recent criticism of Herodotus has been directed against his veracity as a traveller. With this we are not here concerned. The criticism of him as an historian begins with Thucydides. Among the references of the latter writer to his predecessor are the following passages: i. 21; i. 22 *ad fin.*; i. 20 *ad fin.* (cf. Herod. ix. 53, and vi. 57 *ad fin.*); iii. 62 § 4 (cf. Herod. ix. 87); ii. 2 §§ 1 and 3 (cf. Herod. viii. 133); ii. 8 § 3 (cf. Herod. vi. 98). Perhaps the two clearest examples of this criticism are to be found in Thucydides' correction of Herodotus's account of the Cylonian conspiracy (Thuc. i. 126, cf. Herod. v. 71) and in his appreciation of the character of Themistocles—a veiled protest against the slanderous tales accepted by Herodotus (i. 138). In Plutarch's tract "On the Malignity of Herodotus" there is much that is suggestive, although his general standpoint, viz. that Herodotus was in duty bound to suppress all that was discreditable to the valour or patriotism of the Greeks, is not that of the modern critic. It must be conceded to Plutarch that he makes good his charge of bias in Herodotus's attitude towards certain of the Greek states. The question, however, may fairly be asked, how far this bias is personal to the author, or how far it is due to the character of the sources from which his information was derived. He cannot, indeed, altogether be acquitted of personal bias. His work is, to some extent, intended as an *apologia* for the Athenian empire. In answer to the charge that Athens was guilty of robbing other Greek states of their freedom, Herodotus seeks to show, firstly, that it was to Athens that the Greek world, as a whole, owed its freedom from Persia, and secondly, that the subjects of Athens, the Ionian Greeks, were unworthy to be free. This leads him to be unjust both to the services of Sparta and to the qualities of the Ionian race. For his estimate of the debt due to Athens see vii. 139. For bias against the Ionians see especially iv. 142 (cf. Thuc. vi. 77); cf. also i. 143 and 146, vi. 12-14 (Ladé), vi. 112 *ad fin.* A striking example of his prejudice in favour of Athens is furnished by vi. 91. At a moment when Greece rang with the crime of Athens in expelling the Aeginetans from their island, he ventures to trace in their expulsion the vengeance of heaven for an act of sacrilege nearly sixty years earlier (see AEGINA). As a rule, however, the bias apparent in his narrative is due to the sources from which it is derived. Writing at Athens, in the first years of the Peloponnesian War, he can hardly help seeing the past through an Athenian medium. It was inevitable that much of what he heard should come to him from Athenian informants, and should be coloured by Athenian prejudices. We may thus explain the leniency which he shows towards Argos and Thessaly, the old allies of Athens, in marked contrast to his treatment of Thebes, Corinth and Aegina, her deadliest foes. For Argos cf. vii. 152; Thessaly, vii. 172-174; Thebes, vii. 132, vii. 233, ix. 87; Corinth (especially the Corinthian general Adeimantus, whose son Aristeus was the most active enemy of Athens at the outbreak of the Peloponnesian War), vii. 5, vii. 21, viii. 29 and 61, vii. 94; Aegina, ix. 78-80 and 85. In his intimacy with members of the great Alcmaeonid house we probably have the explanation of his depreciation of the services of Themistocles, as well as of his defence of the family from the charges brought against it in connexion with Cylon and with the incident of the shield shown on Pentelicus at the time of Marathon (v. 71, vi. 121-124). His failure to do justice to the Cypselid tyrants of Corinth (v. 92), and to the Spartan king Cleomenes, is to be accounted for by the nature of his sources—in the former case, the tradition of the Corinthian oligarchy; in the latter, accounts, partly derived from the family of the exiled king Demaratus and partly representative of the view of the ephorate. Much of the earlier history is cast in a religious mould, *e.g.* the story of the Mermnad kings of Lydia in book i., or of the fortunes of the colony of Cyrene (iv. 145-167). In such cases we cannot fail to recognize the influence of the Delphic priesthood. Grote has pointed out that the moralizing tendency observable in Herodotus is partly to be explained by the fact that much of his information was gathered from priests and at temples, and that it was given in explanation of votive offerings, or of the fulfilment of oracles. Hence the determination of the sources of his narrative has become one of the principal tasks of Herodotean criticism. In addition to the current tradition of Athens, the family tradition of the Alcmaeonidae, and the stories to be heard at Delphi and other sanctuaries, there may be indicated the Spartan tradition, in the form in which it existed in the middle of the 5th century; that of his native Halicarnassus, to which is due the prominence of its queen Artemisia; the traditions of the Ionian cities, especially of Samos and Miletus (important both for the history of the Mermnadae and for the Ionian Revolt); and those current in Sicily and Magna Graecia, which were learned during his residence at Thurii (Sybaris and Croton, v. 44, 45; Syracuse and Gela, vii. 153-167). Among his more special sources we can point to the descendants of Demaratus, who still held, at the beginning of the 4th century, the principality in the Troad which had been granted to their ancestor by Darius (Xen. *Hell.* iii. 1. 6), and to the family of the Persian general Artabazus, in which the satrapy of Dascylium (Phrygia) was hereditary in the 5th century.[1] His use of written material is more difficult to determine. It is generally agreed that the list of Persian satrapies, with their respective assessments of tribute (iii. 89-97), the description of the royal road from Sardis to Susa (v. 52-54), and of the march of Xerxes, together with the list of the contingents that took part in the expedition (vii. 26-131), are all derived from documentary and authoritative sources. From previous writers (*e.g.* Dionysius of Miletus, Hecataeus, Charon of Lampsacus and Xanthus the Lydian) it is probable that he has borrowed little, though the fragments are too scanty to permit of adequate comparison. His references to monuments, dedicatory offerings, inscriptions and oracles are frequent.

The chief defects of Herodotus are his failure too grasp the principles of historical criticism, to understand the nature of military operations, and to appreciate the importance of

[1] Possibly some of his information about Persian affairs may have been derived, at first or second hand, from Zopyrus, son of Megabyzus, whose flight to Athens is mentioned in iii. 160.

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chronology. In place of historical criticism we find a crude rationalism (*e.g.* ii. 45, vii. 129, viii. 8). Having no conception of the distinction between occasion and cause, he is content to find the explanation of great historical movements in trivial incidents or personal motives. An example of this is furnished by his account of the Ionian revolt, in which he fails to discover the real causes either of the movement or of its result. Indeed, it is clear that he regarded criticism as no part of his task as an historian. In vii. 152 he states the principles which have guided him—ἐγὼ δὲ ὀφείλω λέγειν τὰ λεγόμενα, πείθεσθαί γε μὲν οὐ παντάπασι ὀφείλω, καὶ μοι τοῦτο τὸ ἔπος ἐχέτω ἐς πάντα λόγον. In obedience to this principle he again and again gives two or more versions of a story. We are thus frequently enabled to arrive at the truth by a comparison of the discrepant traditions. It would have been fortunate if all ancient writers who lacked the critical genius of Thucydides had been content to adopt the practice of Herodotus. His accounts of battles are always unsatisfactory. The great battles, Marathon, Thermopylae, Salamis and Plataea, present a series of problems. This result is partly due to the character of the traditions which he follows—traditions which were to some extent inconsistent or contradictory, and were derived from different sources; it is, however, in great measure due to his inability to think out a strategical combination or a tactical movement. It is not too much to say that the battle of Plataea, as described by Herodotus, is wholly unintelligible. Most serious of all his deficiencies is his careless chronology. Even in the case of the 5th century, the data which he affords are inadequate or ambiguous. The interval between the Scythian expedition and the Ionian revolt is described by so vague an expression as μετὰ δὲ οὐ πολλὸν χρόνον ἄνεσις κακῶν ἦν (v. 28). In the history of the revolt itself, though he gives us the interval between its outbreak and the fall of Miletus (ἕκτῳ ἔτεϊ, vi. 18), he does not give us the interval between this and the battle of Ladē, nor does he indicate with sufficient precision the years to which the successive phases of the movement belong. Throughout the work professed synchronisms too often prove to be mere literary devices for facilitating a transition from one subject to another (cf. *e.g.* v. 81 with 89, 90; or vi. 51 with 87 and 94). In the 6th century, as Grote pointed out, a whole generation, or more, disappears in his historical perspective (cf. i. 30, vi. 125, v. 94, iii. 47, 48, v. 113 contrasted with v. 104 and iv. 162). The attempts to reconstruct the chronology of this century upon the basis of the data afforded by Herodotus (*e.g.* by Beloch, *Rheinisches Museum*, xlv., 1890, pp. 465-473) have completely failed.

In spite of all such defects Herodotus is an author, not only of unrivalled literary charm, but of the utmost value to the historian. If much remains uncertain or obscure, even in the history of the Persian Wars, it is chiefly to motives or policy, to topography or strategy, to dates or numbers, that uncertainty attaches. It is to these that a sober criticism will confine itself.

Thucydides is at once the father of contemporary history and the father of historical criticism. From a comparison of i. 1, i. 22 and v. 26, we may gather both the principles to which he adhered in the composition of his work and the conditions under which it was composed. It is seldom that the circumstances of an historical writer have been so favourable for the accomplishment of his task. Thucydides was a contemporary of the Twenty-Seven Years' War in the fullest sense of the term. He had reached manhood at its outbreak, and he survived its close by at least half-a-dozen years. And he was more than a mere contemporary. As a man of high birth, a member of the Periclean circle, and the holder of the chief political office in the Athenian state, the *strategia*, he was not only familiar with the business of administration and the conduct of military operations, but he possessed in addition a personal knowledge of those who played the principal part in the political life of the age. His exile in the year 424 afforded him opportunities of visiting the scenes of distant operations (*e.g.* Sicily) and of coming in contact with the actors on the other side. He himself tells us that he spared no pains to obtain the best information available in each case. He also tells us that he began collecting materials for his work from the very beginning of the war. Indeed, it is probable that much of books i.–v. 24 was written soon after the Peace of Nicias (421), just as it is possible that the history of the Sicilian Expedition (books vi. and vii.) was originally intended to form a separate work. To the view, however, which has obtained wide support in recent years, that books i.–v. 22 and books vi. and vii. were separately published, the rest of book v. and book viii. being little more than a rough draught, composed after the author had adopted the theory of a single war of twenty-seven years' duration, of which the Sicilian Expedition and the operations of the years 431–421 formed integral parts, there seem to the present writer to be insuperable objections. The work, as a whole, appears to have been composed in the first years of the 4th century, after his return from exile in 404, when the material already in existence must have been revised and largely recast. There are exceedingly few passages, such as iv. 48. 5, which appear to have been overlooked in the process of revision. It can hardly be questioned that the impression left upon the reader's mind is that the point of view of the author, in all the books alike, is that of one writing after the fall of Athens.

Thucydides.

The task of historical criticism in the case of the Peloponnesian War is widely different from its task in the case of the Persian Wars. It has to deal, not with facts as they appear in the traditions of an imaginative race, but with facts as they appeared to a scientific observer. Facts, indeed, are seldom in dispute. The question is rather whether facts of importance are omitted, whether the explanation of causes is correct, or whether the judgment of men and measures is just. Such inaccuracies as have been brought home to Thucydides on the strength, *e.g.* of epigraphic evidence, are, as a rule, trivial. His most serious errors relate to topographical details, in cases where he was dependent on the information of others. Sphacteria (see PYLOS) (see G. B. Grundy, *Journal of Hellenic Studies*, xvi., 1896, p. 1) is a case in point. Nor have the difficulties connected with the siege of Plataea been cleared up either by Grundy or by others (see Grundy, *Topography of the Battle of Plataea*, &c., 1894). Where, on the contrary, he is writing at first hand his descriptions of sites are surprisingly correct. The most serious charge as yet brought against his authority as to matters of fact relates to his account of the Revolution of the Four Hundred, which appears, at first sight, to be inconsistent with the documentary evidence supplied by Aristotle's *Constitution of Athens* (q.v.). It may be questioned, however, whether the documents have been correctly interpreted by Aristotle. On the whole, it is probable that the general course of events was such as Thucydides describes (see E. Meyer, *Forschungen*, ii. 406-436), though he failed to appreciate the position of Theramenes and the Moderate party, and was clearly misinformed on some important points of detail. With regard to the omission of facts, it is unquestionable that much is omitted that would not be omitted by a modern writer. Such omissions are generally due to the author's conception of his task. Thus the internal history of Athens is passed over as forming no part of the history of the war. It is only where the course of the war is directly affected by the course of political events (*e.g.* by the Revolution of the Four Hundred) that the internal history is referred to. However much it may be regretted that the relations of political parties are not more fully described, especially in book v., it cannot be denied that from his standpoint there is logical justification even for the omission of the ostracism of Hyperbolus. There are omissions, however, which are not so easily explained. Perhaps the most notable instance is that of the raising of the tribute in 425 B.C. (see DELIAN LEAGUE).

Nowhere is the contrast between the historical methods of Herodotus and Thucydides more apparent than in the treatment of the causes of events. The distinction between the occasion and the cause is constantly present to the mind of Thucydides, and it is his tendency to make too little rather than too much of the personal factor. Sometimes, however, it may be doubted whether his explanation of the causes of an event is adequate or correct. In tracing the causes of the Peloponnesian War itself,

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modern writers are disposed to allow more weight to the commercial rivalry of Corinth; while in the case of the Sicilian expedition, they would actually reverse his judgment (ii. 65 ὁ ἐς Σικελίαν πλοῦς ὃς οὐ τοσοῦτον γνώμης ἁμάρτημα ἦν πρὸς οὓς ἐστρατεύσαν). To us it seems that the very idea of the expedition implied a gigantic miscalculation of the resources of Athens and of the difficulty of the task. His judgments of men and of measures have been criticized by writers of different schools and from different points of view. Grote criticized his verdict upon Cleon, while he accepted his estimate of the policy of Pericles. More recent writers, on the other hand, have accepted his view of Cleon, while they have selected for attack his appreciation alike of the policy and the strategy of Pericles. He has been charged, too, with failure to do justice to the statesmanship of Alcibiades.[1] There are cases, undoubtedly, in which the balance of recent opinion will be adverse to the view of Thucydides. There are many more in which the result of criticism has been to establish his view. That he should occasionally have been mistaken in his judgment and his views is certainly no detraction from his claim to greatness.

On the whole, it may be said that while the criticism of Herodotus, since Grote wrote, has tended seriously to modify our view of the Persian Wars, as well as of the earlier history, the criticism of Thucydides, in spite of its imposing bulk, has affected but slightly our view of the course of the Peloponnesian War. The labours of recent workers in this field have borne most fruit where they have been directed to subjects neglected by Thucydides, such as the history of political parties, or the organization of the empire (G. Gilbert's *Innere Geschichte Athens im Zeitalter der pel. Kriages* is a good example of such work).

In regard to Thucydides' treatment of the period between the Persian and Peloponnesian Wars (the so-called *Pentecontaëteris*) it should be remembered that he does not profess to give, even in outline, the history of this period as a whole. The period is regarded simply as a prelude to the Peloponnesian War. There is no attempt to sketch the history of the Greek world or of Greece proper during this period. There is, indeed, no attempt to give a complete sketch of Athenian history. His object is to trace the growth of the Athenian Empire, and the causes that made the war inevitable. Much is therefore omitted not only in the history of the other Greek states, especially the Peloponnesian, but even in the history of Athens. Nor does Thucydides attempt an exact chronology. He gives us a few dates (*e.g.* surrender of Ithome, in the tenth year, i. 103; of Thasos, in the third year, i. 101; duration of the Egyptian expedition six years, i. 110; interval between Tanagra and Oenophyta 61 days, i. 108; revolt of Samos, in the sixth year after the Thirty Years' Truce, i. 115), but from these data alone it would be impossible to reconstruct the chronology of the period. In spite of all that can be gleaned from our other authorities, our knowledge of this, the true period of Athenian greatness, must remain slight and imperfect as compared with our knowledge of the next thirty years.

Of the secondary authorities for this period the two principal ones are Diodorus (xi. 38 to xii. 37) and Plutarch. Diodorus is of value chiefly in relation to Sicilian affairs, to which he devotes about a third of this section of his work and for which he is almost our sole authority. His source for Sicilian history is the Sicilian writer Timaeus (*q.v.*), an author of the 3rd century B.C. For the history of Greece Proper during the Pentecontaetia Diodorus contributes comparatively little of importance. Isolated notices of particular events (*e.g.* the *Synoecism* of Elis, 471 B.C., or the foundation of Amphipolis, 437 B.C.), which appear to be derived from a chronological writer, may generally be trusted. The greater part of his narrative is, however, derived from Ephorus, who appears to have had before him little authentic information for this period of Greek history other than that afforded by Thucydides' work. Four of Plutatch's *Lives* are concerned with this period, viz. *Themistocles*, *Aristides*, *Cimon* and *Pericles*. From the *Aristides* little can be gained. Plutarch, in this biography, appears to be mainly dependent upon Idomeneus of Lampsacus, an excessively untrustworthy writer of the 3rd century B.C., who is probably to be credited with the invention of the oligarchical conspiracy at the time of the battle of Plataea (ch. 13), and of the decree of Aristides, rendering all four classes of citizens eligible for the archonship (ch. 22). The *Cimon*, on the other hand, contains much that is valuable; such as, *e.g.* the account of the battle of the Eurymedon (chs. 12 and 13). To the *Pericles* we owe several quotations from the Old Comedy. Two other of the *Lives*, *Lycurgus* and *Solon*, are amongst our most important sources for the early history of Sparta and Athens respectively. Of the two (besides *Pericles*) which relate to the Peloponnesian War, *Alcibiades* adds little to what can be gained from Thucydides and Xenophon; the *Nicias*, on the other hand, supplements Thucydides' narrative of the Sicilian expedition with many valuable details, which, it may safely be assumed, are derived from the contemporary historian, Philistus of Syracuse. Amongst the most valuable material afforded by Plutarch are the quotations, which occur in almost all the *Lives*, from the collection of Athenian decrees (ψηφισμάτων συναγωγή) formed by the Macedonian writer Craterus, in the 3rd century B.C. Two other works may be mentioned in connexion with the history of Athens. For the history of the Athenian Constitution down to the end of the 5th century B.C. Aristotle's *Constitution of Athens* (*q.v.*) is our chief authority. The other *Constitution of Athens*, erroneously attributed to Xenophon, a tract of singular interest both on literary and historical grounds, throws a good deal of light on the internal condition of Athens, and on the system of government, both of the state and of the empire, in the age of the Peloponnesian War, during the earlier years of which it was composed.

Diodorus.

Plutarch.

The constitutions.

To the literary sources for the history of Greece, especially of Athens, in the 5th century B.C. must be added the epigraphic. Few inscriptions have been discovered which date back beyond the Persian Wars. For the latter half of the 5th century they are both numerous and important. Of especial value are the series of Quota-lists, from which can be calculated the amount of tribute paid by the subject-allies of Athens from the year 454 B.C. onwards. The great majority of the inscriptions of this period are of Athenian origin. Their value is enhanced by the fact that they relate, as a rule, to questions of organization, finance and administration, as to which little information is to be gained from the literary sources.

Inscriptions.

For the period between the Persian and Peloponnesian Wars Busolt, *Griechische Geschichte*, iii. 1, is indispensable. Hill's *Sources of Greek History, B.C. 478–431* (Oxford, 1897) is excellent. It gives the most important inscriptions in a convenient form.

III. *The 4th Century to the Death of Alexander.*—Of the historians who flourished in the 4th century the sole writer whose works have come down to us is Xenophon. It is a singular accident of fortune that neither of the two authors, who at once were most representative of their age and did most to determine the views of Greek history current in subsequent generations, Ephorus (*q.v.*) and Theopompus (*q.v.*), should be extant. It was from them, rather than from Herodotus, Thucydides or Xenophon that the Roman world obtained its knowledge of the history of Greece in the past, and its conception of its significance. Both were pupils of Isocrates, and both, therefore, bred up in an atmosphere of rhetoric. Hence their popularity and their influence. The scientific spirit of Thucydides was alien to the temper of the 4th century, and hardly more congenial to the age of Cicero or Tacitus. To the rhetorical spirit, which is common to both, each added defects peculiar to himself. Theopompus is a strong partisan, a sworn foe to Athens and to Democracy. Ephorus, though a military historian, is ignorant of the art of war. He is also incredibly careless and uncritical. It is enough to point to his description of the battle of the Eurymedon (Diodorus xi. 60-62), in which, misled by an epigram, which he supposed to relate to this engagement (it really refers to the Athenian victory off Salamis in Cyprus, 449 B.C.). he

Xenophon.

[1] For a defence of Thucydides' judgment on all three statesmen, see E. Meyer, *Forschungen*, ii. 296-379.

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makes the coast of Cyprus the scene of Cimon's naval victory, and finds no difficulty in putting it on the same day as the victory on shore on the banks of the Eurymedon, in Pamphylia. Only a few fragments remain of either writer, but Theopompus (*q.v.*) was largely used by Plutarch in several of the *Lives*, while Ephorus continues to be the main source of Diodorus' history, as far as the outbreak of the Sacred War (Fragments of Ephorus in Müller's *Fragmenta historicorum Graecorum*, vol. i.; of Theopompus in *Hellenica Oxyrhynchia, cum Theopompi et Cratippi fragmentis*, ed. B. P. Grenfell and A. S. Hunt, 1909).

It may be at least claimed for Xenophon (*q.v.*) that he is free from all taint of the rhetorical spirit. It may also be claimed for him that, as a witness, he is both honest and well-informed. But, if there is no justification for the charge of deliberate falsification, it cannot be denied that he had strong political prejudices, and that his narrative has suffered from them. His historical writings are the *Anabasis*, an account of the expedition of the Ten Thousand, the *Hellenica* and the *Agesilaus*, a eulogy of the Spartan king. Of these the *Hellenica* is far the most important for the student of history. It consists of two distinct parts (though there is no ground for the theory that the two parts were separately written and published), books i. and ii., and books iii. to vii. The first two books are intended as a continuation of Thucydides' work. They begin, quite abruptly, in the middle of the Attic year 411/10, and they carry the history down to the fall of the Thirty, in 403. Books iii. to vii., the *Hellenica* proper, cover the period from 401 to 362, and give the histories of the Spartan and Theban hegemonies down to the death of Epaminondas. There is thus a gap of two years between the point at which the first part ends and that at which the second part begins. The two parts differ widely, both in their aim and in the arrangement of the material. In the first part Xenophon attempts, though not with complete success, to follow the chronological method of Thucydides, and to make each successive spring, when military and naval operations were resumed after the winter's interruption, the starting-point of a fresh section. The resemblance between the two writers ends, however, with the outward form of the narrative. All that is characteristic of Thucydides is absent in Xenophon. The latter writer shows neither skill in portraiture, nor insight into motives. He is deficient in the sense of proportion and of the distinction between occasion and cause. Perhaps his worst fault is a lack of imagination. To make a story intelligible it is necessary sometimes to put oneself in the reader's place, and to appreciate his ignorance of circumstances and events which would be perfectly familiar to the actors in the scene or to contemporaries. It was not given to Xenophon, as it was to Thucydides, to discriminate between the circumstances that are essential and those that are not essential to the comprehension of the story. In spite, therefore, of its wealth of detail, his narrative is frequently obscure. It is quite clear that in the trial of the generals, *e.g.*, something is omitted. It may be supplied as Diodorus has supplied it (xiii. 101), or it may be supplied otherwise. It is probable that, when under cross-examination before the council, the generals, or some of them, disclosed the commission given to Theramenes and Thrasybulus. The important point is that Xenophon himself has omitted to supply it. As it stands his narrative is unintelligible. In the first two books, though there are omissions (*e.g.* the loss of Nisaea, 409 B.C.), they are not so serious as in the last five, nor is the bias so evident. It is true that if the account of the rule of the Thirty given in Aristotle's *Constitution of Athens* be accepted, Xenophon must have deliberately misrepresented the course of events to the prejudice of Theramenes. But it is at least doubtful whether Aristotle's version can be sustained against Xenophon's, though it may be admitted, not only that there are mistakes as to details in the latter writer's narrative, but that less than justice is done to the policy and motives of the "Buskin." The *Hellenica* was written, it should be remembered, at Corinth, after 362. More than forty years had thus elapsed since the events recorded in the first two books, and after so long an interval accuracy of detail, even where the detail is of importance, is not always to be expected.[1] In the second part the chronological method is abandoned. A subject once begun is followed out to its natural ending, so that sections of the narrative which are consecutive in order are frequently parallel in point of date. A good example of this will be found in book iv. In chapters 2 to 7 the history of the Corinthian war is carried down to the end of 390, so far as the operations on land are concerned, while chapter 8 contains an account of the naval operations from 394 to 388. In this second part of the *Hellenica* the author's disqualifications for his task are more apparent than in the first two books. The more he is acquitted of bias in his selection of events and in his omissions, the more clearly does he stand convicted of lacking all sense of the proportion of things. Down to Leuctra (371 B.C.) Sparta is the centre of interest, and it is of the Spartan state alone that a complete or continuous history is given. After Leuctra, if the point of view is no longer exclusively Spartan, the narrative of events is hardly less incomplete. Throughout the second part of the *Hellenica* omissions abound which it is difficult either to explain or justify. The formation of the Second Athenian Confederacy of 377 B.C., the foundation of Megalopolis and the restoration of the Messenian state are all left unrecorded. Yet the writer who passes them over without mention thinks it worth while to devote more than one-sixth of an entire book to a chronicle of the unimportant feats of the citizens of the petty state of Phlius. Nor is any attempt made to appraise the policy of the great Theban leaders, Pelopidas and Epaminondas. The former, indeed, is mentioned only in a single passage, relating to the embassy to Susa in 368; the latter does not appear on the scene till a year later, and receives mention but twice before the battle of Mantinea. An author who omits from his narrative some of the most important events of his period, and elaborates the portraiture of an Agesilaus while not attempting the bare outline of an Epaminondas, may be honest; he may even write without a consciousness of bias; he certainly cannot rank among the great writers of history.[2]

For the history of the 4th century Diodorus assumes a higher degree of importance than belongs to him in the earlier periods. This is partly to be explained by the deficiencies of Xenophon's *Hellenica*, partly by the fact that for the interval between the death of Epaminondas and the accession of Alexander we have in Diodorus alone a continuous narrative of events. Books xiv. and xv. of his history include the period covered by the *Hellenica*. More than half of book xiv. is devoted to the history of Sicily and the reign of Dionysius, the tyrant of Syracuse. For this period of Sicilian history he is, practically, our sole authority. In the rest of the book, as well as in book xv., there is much of value, especially in the notices of Macedonian history. Thanks to Diodorus we are enabled to supply many of the omissions of the *Hellenica*. Diodorus is, *e.g.*, our sole literary authority for the Athenian naval confederation of 377. Book xvi. must rank, with the *Hellenica* and Arrian's *Anabasis*, as one of the three principal authorities for this century, so far, at least, as works of an historical character are concerned. It is our authority for the Social and the Sacred Wars, as well as for the reign of Philip. It is a curious irony of fate that, for what is perhaps the most momentous epoch in the history of Greece, we should have to turn to a writer of such inferior capacity. For this period his material is better and his importance greater: his intelligence is as limited as ever. Who but Diodorus would be capable of narrating the siege and capture of Methone twice over, once under the year 354, and again under the year 352 (xvi. 31 and 34; cf. xii. 35 and 42; Archidamus (*q.v.*) dies in 434, commands Peloponnesian army in 431); or of giving three different numbers of years (eleven, ten and nine) in three different passages (chs. 14, 23 and 59) for the length of the

Diodorus.

[1] On the discrepancies between Xenophon's account of the Thirty, and Aristotle's, see G. Busolt, *Hermes* (1898), pp. 71-86.

[2] The fragment of the New Historian (*Oxyrhynchus Papyri*, vol. v.) affords exceedingly important material for the criticism of Xenophon's narrative. (See THEOPOMPUS.)

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Sacred War; or of asserting the conclusion of peace between Athens and Philip in 340, after the failure of his attack on Perinthus and Byzantium? Amongst the subjects which are omitted is the Peace of Philocrates. For the earlier chapters, which bring the narrative down to the outbreak of the Sacred War, Ephorus, as in the previous book, is Diodorus' main source. His source for the rest of the book, *i.e.* for the greater part of Philip's reign, cannot be determined. It is generally agreed that it is not the *Philippica* of Theopompus.

Historians of Alexander's reign.

For the reign of Alexander our earliest extant authority is Diodorus, who belongs to the age of Augustus. Of the others, Q. Curtius Rufus, who wrote in Latin, lived in the reign of the emperor Claudius, Arrian and Plutarch in the 2nd century A.D. Yet Alexander's reign is one of the best known periods of ancient history. The Peloponnesian War and the twenty years of Roman history which begin with 63 B.C. are the only two periods which we can be said to know more fully or for which we have more trustworthy evidence. For there is no period of ancient history which was recorded by a larger number of contemporary writers, or for which better or more abundant materials were available. Of the writers actually contemporary with Alexander there were five of importance—Ptolemy, Aristobulus, Callisthenes, Onesicritus and Nearchus; and all of them occupied positions which afforded exceptional opportunities of ascertaining the facts. Four of them were officers in Alexander's service. Ptolemy, the future king of Egypt, was one of the *somatophylaces* (we may, perhaps, regard them as corresponding to Napoleon's marshals); Aristobulus was also an officer of high rank (see Arrian, *Anab.* vi. 29. 10); Nearchus was admiral of the fleet which surveyed the Indus and the Persian Gulf, and Onesicritus was one of his subordinates. The fifth, Callisthenes, a pupil of Aristotle, accompanied Alexander on his march down to his death in 327 and was admitted to the circle of his intimate friends. A sixth historian, Cleitarchus, was possibly also a contemporary; at any rate he is not more than a generation later. These writers had at their command a mass of official documents, such as the *βασίλειοι ἐφημερίδες*—the *Gazette* and *Court Circular* combined—edited and published after Alexander's death by his secretary, Eumenes of Cardia; the *σταθμοί*, or records of the marches of the armies, which were carefully measured at the time; and the official reports on the conquered provinces. That these documents were made use of by the historians is proved by the references to them which are to be found in Arrian, Plutarch and Strabo; *e.g.* Arrian, *Anab.* vii. 25 and 26, and Plutarch, *Alexander* 76 (quotation from the *βασίλειοι ἐφημερίδες*); Strabo xv. 723 (reference to the *σταθμοί*), ii. 69 (reports drawn up on the various provinces). We have, in addition, in Plutarch numerous quotations from Alexander's correspondence with his mother, Olympias, and with his officers. The contemporary historians may be roughly divided into two groups. On the one hand there are Ptolemy and Aristobulus, who, except in a single instance, are free from all suspicion of deliberate invention. On the other hand, there are Callisthenes, Onesicritus and Cleitarchus, whose tendency is rhetorical. Nearchus appears to have allowed full scope to his imagination in dealing with the wonders of India, but to have been otherwise veracious. Of the extant writers Arrian (*q.v.*) is incomparably the most valuable. His merits are twofold. As the commander of Roman legions and the author of a work on tactics, he combined a practical with a theoretical knowledge of the military art, while the writers whom he follows in the *Anabasis* are the two most worthy of credit, Ptolemy and Aristobulus. We may well hesitate to call in question the authority of writers who exhibit an agreement which it would be difficult to parallel elsewhere in the case of two independent historians. It may be inferred from Arrian's references to them that there were only eleven cases in all in which he found discrepancies between them. The most serious drawback which can be alleged against them is an inevitable bias in Alexander's favour. It would be only natural that they should pass over in silence the worst blots on their great commander's fame. Next in value to the *Anabasis* comes Plutarch's *Life of Alexander*, the merits of which, however, are not to be gauged by the influence which it has exercised upon literature. The *Life* is a valuable supplement to the *Anabasis*, partly because Plutarch, as he is writing biography rather than history (for his conception of the difference between the two see the famous preface, *Life of Alexander*, ch. i.), is concerned to record all that will throw light upon Alexander's character (*e.g.* his epigrammatic sayings and quotations from his letters); partly because he tells us much about his early life, before he became king, while Arrian tells us nothing. It is unfortunate that Plutarch writes in an uncritical spirit; it is hardly less unfortunate that he should have formed no clear conception and drawn no consistent picture of Alexander's character. Book xvii. of Diodorus and the *Historiae Alexandri* of Curtius Rufus are thoroughly rhetorical in spirit. It is probable that in both cases the ultimate source is the work of Clitarchus.

The orators.

It is towards the end of the 5th century that a fresh source of information becomes available in the speeches of the orators, the earliest of whom is Antiphon (d. 411 B.C.). Lysias is of great importance for the history of the Thirty (see the speeches against Eratosthenes and Agoratus), and a good deal may be gathered from Andocides with regard to the last years of the 5th and the opening years of the next century. At the other end of this period Lycurgus, Hyperides and Dinarchus throw light upon the time of Philip and Alexander. The three, however, who are of most importance to the historian are Isocrates, Aeschines and Demosthenes. Isocrates (*q.v.*), whose long life (436–338) more than spans the interval between the outbreak of the Peloponnesian War and the triumph of Macedon at Chaeronea, is one of the most characteristic figures in the Greek world of his day. To comprehend that world the study of Isocrates is indispensable; for in an age dominated by rhetoric he is the prince of rhetoricians. It is difficult for a modern reader to do him justice, so alien is his spirit and the spirit of his age from ours. It must be allowed that he is frequently monotonous and prolix; at the same time it must not be forgotten that, as the most famous representative of rhetoric, he was read from one end of the Greek world to the other. He was the friend of Evagoras and Archidamus, of Dionysius and Philip; he was the master of Aeschines and Lycurgus amongst orators and of Ephorus and Theopompus amongst historians. No other contemporary writer has left so indelible a stamp upon the style and the sentiment of his generation. It is a commonplace that Isocrates is the apostle of Panhellenism. It is not so generally recognized that he is the prophet of Hellenism. A passage in the *Panegyricus* (§ 50 *ὥστε τὸ τῶν Ἑλλήνων ὄνομα μήκετι τοῦ γένους ἀλλὰ τῆς διανοίας δοκεῖν εἶναι καὶ μᾶλλον Ἕλληνας καλεῖσθαι τοὺς τῆς παιδεύσεως τῆς ἡμετέρας ἢ τοὺς τῆς κοινῆς φύσεως μετέχοντας*) is the key to the history of the next three centuries. Doubtless he had no conception of the extent to which the East was to be hellenized. He was, however, the first to recognize that it would be hellenized by the diffusion of Greek culture rather than of Greek blood. His Panhellenism was the outcome of his recognition of the new forces and tendencies which were at work in the midst of a new generation. When Greek culture was becoming more and more international, the exaggeration of the principle of autonomy in the Greek political system was becoming more and more absurd. He had sufficient insight to be aware that the price paid for this autonomy was the domination of Persia; a domination which meant the servitude of the Greek states across the Aegean and the demoralization of Greek political life at home. His Panhellenism led him to a more liberal view of the distinction between what was Greek and what was not than was possible to the intenser patriotism of a Demosthenes. In his later orations he has the courage not only to pronounce that the day of Athens as a first-rate power is past, but to see in Philip the needful leader in the crusade against Persia. The earliest and greatest of his political orations is the *Panegyricus*, published in 380 B.C., midway between the peace of Antalcidas and Leuctra. It is his *apologia* for Panhellenism. To the period of the Social War belong the *De pace* (355 B.C.) and the *Areopagiticus* (354 B.C.),

Isocrates.

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both of great value as evidence for the internal conditions of Athens at the beginning of the struggle with Macedon. The *Plataicus* (373 B.C.) and the *Archidamus* (366 B.C.) throw light upon the politics of Boeotia and the Peloponnese respectively. The *Panathenaicus* (339 B.C.), the child of his old age, contains little that may not be found in the earlier orations. The *Philippus* (346 B.C.) is of peculiar interest, as giving the views of the Macedonian party.

Not the least remarkable feature in recent historical criticism is the reaction against the view which was at one time almost universally accepted of the character, statesmanship and authority of the orator Demosthenes (*q.v.*).

Demosthenes.

During the last quarter of a century his character and statesmanship have been attacked, and his authority impugned, by a series of writers of whom Holm and Beloch are the best known. With the estimate of his character and statesmanship we are not here concerned. With regard to his value as an authority for the history of the period, it is to his speeches, and to those of his contemporaries, Aeschines, Hypereides, Dinarchus and Lycurgus, that we owe our intimate knowledge, both of the working of the constitutional and legal systems, and of the life of the people, at this period of Athenian history. From this point of view his value can hardly be overestimated. As a witness, however, to matters of fact, his authority can no longer be rated as highly as it once was, *e.g.* by Schaefer and by Grote. The orator's attitude towards events, both in the past and in the present, is inevitably a different one from the historian's. The object of a Thucydides is to ascertain a fact, or to exhibit it in its true relations. The object of a Demosthenes is to make a point, or to win his case. In their dealings with the past the orators exhibit a levity which is almost inconceivable to a modern reader. Andocides, in a passage of his speech *On the Mysteries* (§ 107), speaks of Marathon as the crowning victory of Xerxes' campaign; in his speech *On the Peace* (§ 3) he confuses Miltiades with Cimon, and the Five Years' Peace with the Thirty Years' Truce. Though the latter passage is a mass of absurdities and confusions, it was so generally admired that it was incorporated by Aeschines in his speech *On the Embassy* (§§ 172-176). If such was their attitude towards the past; if, in order to make a point, they do not hesitate to pervert history, is it likely that they would conform to a higher standard of veracity in their statements as to the present—as to their contemporaries, their rivals or their own actions? When we compare different speeches of Demosthenes, separated by an interval of years, we cannot fail to observe a marked difference in his statements. The farther he is from the events, the bolder are his mis-statements. It is only necessary to compare the speech *On the Crown* with that *On the Embassy*, and this latter speech with the *Philippics* and *Olynthiacs*, to find illustrations. It has come to be recognized that no statement as to a matter of fact is to be accepted, unless it receives independent corroboration, or unless it is admitted by both sides. The speeches of Demosthenes may be conveniently divided into four classes according to their dates. To the pre-Philippic period belong the speeches *On the Symmories* (354 B.C.), *On Megalopolis* (352 B.C.), *Against Aristocrates* (351 B.C.), and, perhaps, the speech *On Rhodes* (? 351 B.C.). These speeches betray no consciousness of the danger threatened by Philip's ambition. The policy recommended is one based upon the principle of the balance of power. To the succeeding period, which ends with the peace of Philocrates (346 B.C.), belong the *First Philippic* and the three *Olynthiacs*. To the period between the peace of Philocrates and Chaeronea belong the speech *On the Peace* (346 B.C.), the *Second Philippic* (344 B.C.), the speeches *On the Embassy* (344 B.C.) and *On the Chersonese* (341 B.C.), and the *Third Philippic*. The masterpiece of his genius, the speech *On the Crown*, was delivered in 330 B.C., in the reign of Alexander. Of the three extant speeches of Aeschines (*q.v.*) that *On the Embassy* is of great value, as enabling us to correct the mis-statements of Demosthenes. For the period from the death of Alexander to the fall of Corinth (323-146 B.C.) our literary authorities are singularly defective. For the Diadochi Diodorus (books xviii.-xx.) is our chief source. These books form the most valuable part of Diodorus' work. They are mainly based upon the work of Hieronymus of Cardia, a writer who combined exceptional opportunities for ascertaining the truth (he was in the service first of Eumenes, and then of Antigonus) with an exceptional sense of its importance. Hieronymus ended his history at the death of Pyrrhus (272 B.C.), but, unfortunately, book xx. of Diodorus' work carries us no farther than 303 B.C., and of the later books we have but scanty fragments. The narrative of Diodorus may be supplemented by the fragments of Arrian's *History of the events after Alexander's death* (which reach, however, only to 321 B.C.), and by Plutarch's *Lives* of *Eumenes* and of *Demetrius*. For the rest of the 3rd century and the first half of the 2nd we have his *Lives* of *Pyrrhus*, of *Aratus*, of *Philopoemen*, and of *Agis and Cleomenes*. For the period from 220 B.C. onwards Polybius (*q.v.*) is our chief authority (see ROME: *Ancient History*, section "Authorities"). In a period in which the literary sources are so scanty great weight attaches to the epigraphic and numismatic evidence.

BIBLIOGRAPHY.—The literature which deals with the history of Greece, in its various periods, departments and aspects, is of so vast a bulk that all that can be attempted here is to indicate the most important and most accessible works.

General Histories of Greece.—Down to the middle of the 19th century the only histories of Greece deserving of mention were the products of English scholarship. The two earliest of these were published about the same date, towards the end of the 18th century, nearly three-quarters of a century before any history of Greece other than a mere compendium, appeared on the Continent. John Gillies' *History of Greece* was published in 1786, Mitford's in 1784. Both works were composed with a political bias and a political object. Gillies was a Whig. In the dedication (to George III.) he expresses the hope that "the History of Greece exposes the dangerous turbulence of Democracy, and arraigns the despotism of Tyrants, while it evinces the inestimable benefits, resulting to Liberty itself, from the steady operation of well-regulated monarchy." Mitford was a Tory, who thought to demonstrate the evils of democracy from the example of the Athenian state. His *History*, in spite of its bias, was a work of real value. More than fifty years elapsed between Mitford's work and Thirlwall's. Connop Thirlwall, fellow of Trinity College, Cambridge, afterwards bishop of St Davids, brought to sound judgment to the aid of ripe scholarship. His *History of Greece*, published in 1835-1838 (8 vols.), is entirely free from the controversial tone of Mitford's volumes. Ten years later (1846) George Grote published the first volumes of his history, which was not completed (in 12 vols.) till 1856. Grote, like Mitford, was a politician—an ardent Radical, with republican sympathies. It was in order to refute the slanders of the Tory partisan that he was impelled to write a history of Greece, which should do justice to the greatest democracy of the ancient world, the Athenian state. Thus, in the case of three of these four writers, the interest in their subject was mainly political. Incomparably the greatest of these works is Grote's. Grote had his faults and his limitations. His prejudices are strong, and his scholarship is weak; he had never visited Greece, and he knew little or nothing of Greek art; and, at the time he wrote, the importance of coins and inscriptions was imperfectly apprehended. In spite of every defect, however, his work is the greatest history of Greece that has yet been written. It is not too much to say that nobody knows Greek history till he has mastered Grote. No history of Greece has since appeared in England on a scale at all comparable to that of Grote's work. The most important of the more recent ones is that by J. B. Bury (1 vol., 1900), formerly fellow of Trinity College, Dublin, afterwards Regius Professor of Modern History at Cambridge. Mitford and Bury end with the death of Alexander; Gillies and Grote carry on the narrative a generation farther; and Thirlwall's work extends to the absorption of Greece in the Roman Empire (146 B.C.).

While in France the *Histoire des Grecs* (ending at 146 B.C.) of Victor Duruy (new edition, 2 vols., 1883), Minister of Public Instruction under Napoleon III., is the only one that need be mentioned, in Germany there has been a succession of histories of Greece since the middle of the 19th century. Kortüm's *Geschichte Griechenlands* (3 vols., 1854), a work of little merit, was followed by Max Duncker's *Geschichte der Griechen* (vols. 1 and 2 published in 1856; vols. 3 and 4 by Neue Folge, which bring the narrative down to the death of Pericles, in 1884; the two former volumes form vols. 5, 6 and 7 of his *Geschichte des Alterthums*), and by the *Griechische Geschichte* of Ernst Curtius (3 vols., 1857-1867). An English translation of Duncker, by S. F. Alleyne, appeared in 1883 (2 vols., Bentley), and of Curtius, by A. W. Ward (5 vols., Bentley, 1868-1873). Among more recent works may be mentioned the *Griechische Geschichte* of Adolf Holm (4 vols., Berlin, 1886-1894; English translation by F. Clarke, 4 vols., Macmillan, 1894-1898), and histories with the same title by Julius Beloch (3 vols., Strassburg, 1893-1904) and Georg Busolt (2nd ed., 3 vols., Gotha, 1893-1904). Holm carries on the narrative to 30 B.C., Beloch to 217 B.C., Busolt to Chaeronea

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(338 B.C.).[1] Busolt's work is entirely different in character from any other history of Greece. The writer's object is to refer in the notes (which constitute five-sixths of the book) to the views of every writer in any language upon every controverted question. It is absolutely indispensable, as a work of reference, for any serious study of Greek history. The ablest work since Grote's is Eduard Meyer's *Geschichte des Alterums*, of which 5 vols. (Stuttgart and Berlin, 1884–1902) have appeared, carrying the narrative down to the death of Epaminondas (362 B.C.). Vols. 2–5 are principally concerned with Greek history. It must be remembered that, partly owing to the literary finds and the archaeological discoveries of the last thirty years, and partly owing to the advance made in the study of epigraphy and numismatics, all the histories published before those of Busolt, Beloch, Meyer and Henry are dated.

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b. Post-Classical: 146 B.C.–A.D. 1800

I. THE PERIOD OF ROMAN RULE.—(i.) *Greece under the Republic* (146–27 B.C.). After the collapse of the Achaean League (*q.v.*) the Senate appointed a commission to reorganize Greece as a Roman dependency. Corinth, the chief centre of resistance, was destroyed and its inhabitants sold into slavery. In addition to this act of exemplary punishment, which may perhaps have been inspired in part by the desire to crush a commercial competitor, steps were taken to obviate future insurrections. The national and cantonal federations were dissolved, commercial intercourse between cities was restricted, and the government transferred from the democracies to the propertied classes, whose interests were bound up with Roman supremacy. In other respects few changes were made in existing institutions. Some favoured states like Athens and Sparta retained their full sovereign rights as *civitates liberae*, the other cities continued to enjoy local self-government. The ownership of the land was not greatly disturbed by confiscations, and though a tribute upon it was levied, this impost may not have been universal. General powers of supervision were entrusted to the governor of Macedonia, who could reserve cases of high treason for his decision, and in case of need send troops into the country. But although Greece was in the *provincia* of the Macedonian proconsul, in the sense of belonging to his sphere of command, its status was in fact more favourable than that of other provincial dependencies.

This settlement was acquiesced in by the Greek people, who had come to realize the hopelessness of further resistance. The internal disorder which was arising from the numerous disputes about property rights consequent upon the political revolutions was checked by the good offices of the historian Polybius, whom the Senate deputed to mediate between the litigants. The pacification of the country eventually became so complete that the Romans withdrew the former restrictions upon intercourse and allowed some of the leagues to revive. But its quiet was seriously disturbed during the first Mithradatic War (88–84 B.C.), when numerous Greek states sided with Mithradates (*q.v.*). The success which the invader experienced in detaching the Greeks from Rome is partly to be explained by the skilful way in which his agents incited the imperialistic ambitions of prominent cities like Athens, partly perhaps by his promises of support to the democratic parties. The result of the war was disastrous to Greece. Apart from the confiscations and exactions by which the Roman general L. Cornelius Sulla punished the disloyal communities, the extensive and protracted campaigns left Central Greece in a ruinous condition. During the last decades of the Roman republic European Greece was scarcely affected by contemporary wars nor yet exploited by Roman magistrates in the same systematic manner as most other provinces. Yet oppression by officials who traversed Greece from time to time and demanded lavish entertainments and presentations in the guise of *viaticum* or *aurum coronarium* was not unknown. Still greater was the suffering produced by the rapacity of Roman traders and capitalists: it is recorded that Sicyon was reduced to sell its most cherished art treasures in order to satisfy its creditors. A more indirect but none the less far-reaching drawback to Greek prosperity was the diversion of trade which followed upon the establishment of direct communication between Italy and the Levant. The most lucrative source of wealth which remained to the European Greeks was pasturage in large domains, an industry which almost exclusively profited the richer citizens and so tended to widen the breach between capitalists and the poorer classes, and still further to pauperize the latter. The coast districts and islands also suffered considerably from swarms of pirates who, in the absence of any strong fleet in Greek waters, were able to obtain a firm footing in Crete and freely plundered the chief trading places and sanctuaries; the most notable of such visitations was experienced in 69 B.C. by the island of Delos. This evil came to an end with the general suppression of piracy in the Mediterranean by Pompey (67 B.C.), but the depopulation which it had caused in some regions is attested by the fact that the victorious admiral settled some of his captives on the desolated coast strip of Achaea.

In the conflict between Julius Caesar and Pompey the Greeks provided the latter with a large part of his excellent fleet. In 48 B.C. the decisive campaign of the war was fought on Greek soil, and the resources of the land were severely taxed by the requisitions of both armies. As a result of Caesar's victory at Pharsalus, the whole country fell into his power; the treatment which it received was on the whole lenient, though individual cities were punished severely. After the murder of Caesar the Greeks supported the cause of Brutus (42 B.C.), but were too weak to render any considerable service. In 30 B.C. the Peloponnese for a short time was made over to Sextus Pompeius. During the subsequent period Greece remained in the hands of M. Antonius (Mark Antony), who imposed further exactions in order to defray the cost of his wars. The extensive levies which

[1] Vol. iii. goes down to the end of the Peloponnesian War.

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he made in 31 B.C. for his campaign against Octavian, and the contributions which his gigantic army required, exhausted the country's resources so completely that a general famine was prevented only by Octavian's prompt action after the battle of Actium in distributing supplies of grain and evacuating the land with all haste. The depopulation which resulted from the civil wars was partly remedied by the settlement of Italian colonists at Corinth and Patrae by Julius Caesar and Octavian; on the other hand, the foundation of Nicopolis (*q.v.*) by the latter merely had the effect of transferring the people from the country to the city.

(ii.) *The Early Roman Empire* (27 B.C.–A.D. 323).—Under the emperor Augustus Thessaly was incorporated with Macedonia; the rest of Greece was converted into the province of Achaea, under the control of a senatorial proconsul resident at Corinth. Many states, including Athens and Sparta, retained their rights as free and nominally independent cities. The provincials were encouraged to send delegates to a communal synod (κοινὸν τῶν Ἀχαίων) which met at Argos to consider the general interests of the country and to uphold national Hellenic sentiment; the Delphic amphictyony was revived and extended so as to represent in a similar fashion northern and central Greece.

Economic conditions did not greatly improve under the empire. Although new industries sprang up to meet the needs of Roman luxury, and Greek marble, textiles and table delicacies were in great demand, the only cities which regained a really flourishing trade were the Italian communities of Corinth and Patrae. Commerce languished in general, and the soil was mainly abandoned to pasturage. Though certain districts retained a measure of prosperity, *e.g.* Thessaly, Phocis, Elis, Argos and Laconia, huge tracts stood depopulated and many notable cities had sunk into ruins; Aetolia, Acarnania and Epirus never recovered from the effects of former wars and from the withdrawal of their surviving inhabitants into Nicopolis. Such wealth as remained was amassed in the hands of a few great landowners and capitalists; the middle class continued to dwindle, and large numbers of the people were reduced to earning a precarious subsistence, supplemented by frequent doles and largesses.

Social conditions.

The social aspect of Greek life henceforward becomes its most attractive feature. After a long period of storm and stress, the European Hellenes had relapsed into a quiet and resigned frame of mind which stands in sharp contrast on the one hand with the energy and ability, and on the other with the vulgar intriguing of their Asiatic kinsmen. Seeing no future before them, the inhabitants were content to dwell in contemplation amid the glories of the past. National pride was fostered by the undisguised respect with which the leading Romans of the age treated Hellenic culture. And although this sentiment could degenerate into antiquarian pedantry and vanity, such as finds its climax in the diatribes of Apollonius of Tyana against the "barbarians," it prevented the nation from sinking into some of the worst vices of the age. A healthy social tone repressed extravagant luxury and the ostentatious display of wealth, and good taste long checked the spread of gladiatorial contests beyond the Italian community of Corinth. The most widespread abuse of that period, the adulation and adoration of emperors, was indeed introduced into European Greece and formed an essential feature of the proceedings at the Delphic amphictyony, but it never absorbed the energies of the people in the same way as it did in Asia. In order to perpetuate their old culture, the Greeks continued to set great store by classical education, and in Athens they possessed an academic centre which gradually became the chief university of the Roman empire. The highest representatives of this type of old-world refinement are to be found in Dio Chrysostom and especially in Plutarch of Chaeroneia (*q.v.*).

The relations between European Greece and Rome were practically confined to the sphere of scholarship. The Hellenes had so far lost their warlike qualities that they supplied scarcely any recruits to the army. They retained too much local patriotism to crowd into the official careers of senators or imperial servants. Although in the 1st century A.D. the astute Greek man of affairs and the *Graeculus esuriens* of Juvenal abounded in Rome, both these classes were mainly derived from the less pure-blooded population beyond the Aegean.

The influx of Greek rhetoricians and professors into Italy during the 2nd and 3rd centuries was balanced by the large number of travellers who came to Greece to frequent its sanatoria, and especially to admire its works of art; the abundance in which these latter were preserved is strikingly attested in the extant record of Pausanias (about A.D. 170).

The experience of the Greeks under their earliest governors seems to have been unfortunate, for in A.D. 15 they petitioned Tiberius to transfer the administration to an imperial legate. This new arrangement was sanctioned, but only lasted till A.D. 44, when Claudius restored the province to the senate. The proconsuls of the later 1st and 2nd centuries were sometimes ill qualified for their posts, but cases of oppression are seldom recorded against them. The years 66 and 67 were marked by a visit of the emperor Nero, who made a prolonged tour through Greece in order to display his artistic accomplishments at the various national festivals. In return for the flattering reception accorded to him he bestowed freedom and exemption from tribute upon the country. But this favour was almost neutralized by the wholesale depredations which he committed among the chief collections of art. A scheme for cutting through the Corinthian isthmus and so reviving the Greek carrying trade was inaugurated in his presence, but soon abandoned.

Roman administration.

As Nero's grant of self-government brought about a recrudescence of misplaced ambition and party strife, Vespasian revoked the gift and turned Achaea again into a province, at the same time burdening it with increased taxes. In the 2nd century a succession of genuinely phil-Hellenic emperors made serious attempts to revive the nation's prosperity. Important material benefits were conferred by Hadrian, who made a lengthy visit to Greece. Besides erecting useful public works in many cities, he relieved Achaea of its arrears of tribute and exempted it from various imposts. In order to check extravagance on the part of the free cities, he greatly extended the practice of placing them under the supervision of imperial functionaries known as *correctores*. Hadrian fostered national sentiment by establishing a new pan-Hellenic congress at Athens, while he gave recognition to the increasing ascendancy of Hellenic culture at Rome by his institution of the Athenaeum.

In the 3rd century the only political event of importance was the act of Caracalla which threw open the Roman citizenship to large numbers of provincials. Its chief effect in Greece was to diminish the preponderance of the wealthy classes, who formerly had used their riches to purchase the franchise and so to secure exemption from taxation. The chief feature of this period is the renewal of the danger from foreign invasions. Already in 175 a tribe named Costoboci had penetrated into central Greece, but was there broken up by the local militia. In 253 a threatened attack was averted by the stubborn resistance of Thessalonica. In 267–268 the province was overrun by Gothic bands, which captured Athens and some other towns, but were finally repulsed by the Attic levies and exterminated with the help of a Roman fleet.

(iii.) *The Late Roman Empire.*—After the reorganization of the empire by Diocletian, Achaea occupied a prominent position in the "diocese" of Macedonia. Under Constantine I. it was included in the "prefecture" of Illyricum. It was subdivided into the "eparchies" of Hellas, Peloponnesus, Nicopolis and the islands, with headquarters at Thebes, Corinth, Nicopolis and Samos. Thessaly was incorporated with Macedonia. A complex hierarchy of imperial officials was now introduced and the system of taxation elaborated so as to yield a steady revenue to the central power. The levying of the land-tax was imposed upon the δεκάπρωτοι or "ten leading men," who, like the Latin *decuriones*, were entrusted henceforth with the administration in most cities. The tendency to reduce all constitutions to the Roman municipal pattern became prevalent under the rulers of this period, and the greater number of them was stereotyped

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by the general regulations of the Codex Theodosianus (438). Although the elevation of Constantinople to the rank of capital was prejudicial to Greece, which felt the competition of the new centre of culture and learning and had to part with numerous works of art destined to embellish its privileged neighbour, the general level of prosperity in the 4th century was rising. Commercial stagnation was checked by a renewed expansion of trade consequent upon the diversion of the trade routes to the east from Egypt to the Euxine and Aegean Seas. Agriculture remained in a depressed condition, and many small proprietors were reduced to serfdom; but the fiscal interests of the government called for the good treatment of this class, whose growth at the expense of the slaves was an important step in the gradual equalization of the entire population under the central despotism which restored solidarity to the Greek nation.

This prosperity received a sharp set-back by a series of unusually severe earthquakes in 375 and by the irruption of a host of Visigoths under Alaric (395–396), whom the imperial officers allowed to overrun the whole land unmolested and the local levies were unable to check. Though ultimately hunted down in Arcadia and induced to leave the province, Alaric had time to execute systematic devastations which crippled Greece for several decades. The arrears of taxation which accumulated in consequence were remitted by Theodosius II. in 428.

The emperors of the 4th century made several attempts to stamp out by edict the old pagan religion, which, with its accompaniment of festivals, oracles and mysteries, still maintained an outward appearance of vigour, and, along with the philosophy in which the intellectual classes found comfort, retained the affection of the Greeks. Except for the decree of Theodosius I. by which the Olympian games were interdicted (394), these measures had no great effect, and indeed were not rigorously enforced. Paganism survived in Greece till about 600, but the interchange of ideas and practices which the long-continued contact with Christianity had effected considerably modified its character. Hence the Christian religion, though slow in making its way, eventually gained a sure footing among a nation which accepted it spontaneously. The hold of the Church upon the Greeks was strengthened by the judicious manner in which the clergy, unsupported by official patronage and often out of sympathy with the Arian emperors, identified itself with the interests of the people. Though in the days when the orthodox Church found favour at court corruption spread among its higher branches, the clergy as a whole rendered conspicuous service in opposing the arbitrary interferences of the central government and in upholding the use of the Hellenic tongue, together with some rudiments of Hellenic culture.

The separation of the eastern and western provinces of the empire ultimately had an important effect in restoring the language and customs of Greece to their predominant position in the Levant. This result, however, was long retarded by the romanizing policy of Constantine and his successors. The emperors of the 5th and 6th centuries had no regard for Greek culture, and Justinian I. actively counteracted Hellenism by propagating Roman law in Greece, by impairing the powers of the self-governing cities, and by closing the philosophical schools at Athens (529). In course of time the inhabitants had so far forgotten their ancient culture that they abandoned the name of Hellenes for that of Romans (*Rhomaioi*). For a long time Greece continued to be an obscure and neglected province, with no interests beyond its church and its commercial operations, and its culture declined rapidly. Its history for some centuries dwindles into a record of barbarian invasions which, in addition to occasional plagues and earthquakes, seem to have been the only events found worthy of record by the contemporary chroniclers.

In the 5th century Greece was only subjected to brief raids by Vandal pirates (466–474) and Ostrogoths (482). In Justinian's reign irruptions by Huns and Avars took place, but led to no far-reaching results. The emperor had endeavoured to strengthen the country's defences by repairing the fortifications of cities and frontier posts (530), but his policy of supplanting the local guards by imperial troops and so rendering the natives incapable of self-defence was ill-advised; fortunately it was never carried out with energy, and so the Greek militias were occasionally able to render good service against invaders

Towards the end of the century mention is made for the first time of an incursion by Slavonic tribes (581). These invaders are to be regarded as merely the forerunners of a steady movement of immigration by which a considerable part of Greece passed for a time into foreign hands. It is doubtful how far the newcomers won their territory by force of arms; in view of the desolation of many rural tracts, which had long been in progress as a result of economic changes, it seems probable that numerous settlements were made on unoccupied land and did not challenge serious opposition. At any rate the effect upon the Greek population was merely to accelerate its emigration from the interior to the coastland and the cities. The foreigners, consisting mainly of Slovenes and Wends, occupied the mountainous inland, where they mostly led a pastoral life; the natives retained some strips of plain and dwelt secure in their walled towns, among which the newly-built fortresses of Monemvasia, Corone and Calamata soon rose to prosperity. The Slavonic element, to judge by the geographical names in that tongue which survive in Greece, is specially marked in N.W. Greece and Peloponnesus; central Greece appears to have been protected against them by the fortress-square of Chalcis, Thebes, Corinth and Athens. For a long time the two nations dwelt side by side without either displacing the other. The Slavs were too rude and poor, and too much distracted with cantonal feuds, to make any further headway; the Greeks, unused to arms and engrossed in commerce, were content to adopt a passive attitude. The central government took no steps to dislodge the invaders, until in 783 the empress Irene sent an expedition which reduced most of the tribes to pay tribute. In 810 a desperate attempt by the Slavs to capture Patrae was foiled; henceforth their power steadily decreased and their submission to the emperor was made complete by 850. A powerful factor in their subjugation was the Greek clergy, who by the 10th century had christianized and largely hellenized all the foreigners save a remnant in the peninsula of Maina.

Slavonic immigrations.

II. THE BYZANTINE PERIOD.—In the 7th century the Greek language made its way into the imperial army and civil service, but European Greece continued to have little voice in the administration. The land was divided into four "themes" under a yearly appointed civil and military governor. Imperial troops were stationed at the chief strategic points, while the natives contributed ships for naval defence. During the dispute about images the Greeks were the backbone of the image-worshipping party, and the iconoclastic edicts of Leo III. led to a revolt in 727 which, however, was easily crushed by the imperial fleet; a similar movement in 823, when the Greeks sent 350 ships to aid a pretender, met with the same fate. The firm government of the Isaurian dynasty seems to have benefited Greece, whose commerce and industry again became flourishing. In spite of occasional set-backs due to the depredations of pirates, notably the Arab corsairs who visited the Aegean from the 7th century onwards, the Greeks remained the chief carriers in the Levant until the rise of the Italian republics, supplying all Europe with its silk fabrics.

In the 10th century Greece experienced a renewal of raids from the Balkan tribes. The Bulgarians made incursions after 929 and sometimes penetrated to the Isthmus; but they mostly failed to capture the cities, and in 995 their strength was broken by a crushing defeat on the Spercheius at the hands of the Byzantine army. Yet their devastations greatly thinned the population of northern Greece, and after 1084 Thessaly was occupied without resistance by nomad tribes of Vlachs. In 1084 also Greece was subjected to the first attack from the new nations of the west, when the Sicilian Normans gained a footing in the Ionian islands. The same people made a notable raid upon the seaboard of Greece in 1145–1146, and sacked the cities of Thebes and Corinth. The Venetians also appear as rivals of

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the Greeks, and after 1122 their encroachments in the Aegean Sea never ceased.

In spite of these attacks, the country on the whole maintained its prosperity. The travellers Idrisi of Palermo (1153) and Benjamin of Tudela (1161) testify to the briskness of commerce, which induced many foreign merchants to take up their residence in Greece. But this prosperity revived an aristocracy of wealth which used its riches and power for purely selfish ends, and under the increasing laxity of imperial control the *archontes* or municipal rulers often combined with the clergy in oppressing the poorer classes. Least of all were these nobles prepared to become the champions of Greece against foreign invaders at a time when they alone could have organized an effectual resistance.

III. *The Latin Occupation and Turkish Conquest.*—The capture of Constantinople and dissolution of the Byzantine empire by the Latins (1204) brought in its train an invasion of Greece by Frankish barons eager for new territory. The natives, who had long forgotten the use of arms and dreaded no worse oppression from their new masters, submitted almost without resistance, and only the N.W. corner of Greece, where Michael Angelus, a Byzantine prince, founded the "despotat" of Epirus, was saved from foreign occupation. The rest of the country was divided up between a number of Frankish barons, chief among whom were the dukes of Achaea (or Peloponnese) and "grand signors" of Thebes and Athens, the Venetians, who held naval stations at different points and the island of Crete, and various Italian adventurers who mainly settled in the Cyclades. The conquerors transplanted their own language, customs and religion to their new possessions, and endeavoured to institute the feudal system of land-tenure. Yet recognizing the superiority of Greek civil institutions they allowed the natives to retain their law and internal administration and confirmed proprietors in possession of their land on payment of a rent; the Greek church was subordinated to the Roman archbishops, but upheld its former control over the people. The commerce and industry of the Greek cities was hardly affected by the change of government.

Greek history during the Latin occupation loses its unity and has to be followed in several threads. In the north the "despots" of Epirus extended their rule to Thessaly and Macedonia, but eventually were repulsed by the Asiatic Greeks of Nicaea, and after a decisive defeat at Pelagonia (1259) reduced to a small dominion round Iannina. Thessaly continued to change masters rapidly. Till 1308 it was governed by a branch line of the Epirote dynasty. When this family died out it fell to the Grand Catalan Company; in 1350 it was conquered along with Epirus by Stephen Dushan, king of Servia. About 1307 it was annexed by the Ottoman Turks, who after 1431 also gradually wrested Epirus from its latest possessors, the Beneventine family of Tocco (1390–1460).

The leading power in central Greece was the Burgundian house de la Roche, which established a mild and judicious government in Boeotia and Attica and in 1261 was raised to ducal rank by the French king Louis IX. A conflict with the Grand Catalan Company resulted in a disastrous defeat of the Franks on the Boeotian Cephissus (1311) and the occupation of central Greece by the Spanish mercenaries, who seized for themselves the barons' fiefs and installed princes from the Sicilian house of Aragon as "dukes of Athens and Neopatras" (Thessaly). After seventy-five years of oppressive rule and constant wars with their neighbours the Catalans were expelled by the Peloponnesian baron Nerio Acciaiuoli. The new dynasty, whose peaceful government revived its subjects' industry, became tributary to the Turks about 1415, but was deposed by Sultan Mahommed II., who annexed central Greece in 1456.

The conquest of the Peloponnese was effected by two French knights, William Champlitte and Geoffrey Villehardouin, the latter of whom founded a dynasty of "princes of all Achaea." The rulers of this line were men of ability, who controlled their barons and spiritual vassals with a firm hand and established good order throughout their province. The Franks of the Morea maintained as high a standard of culture as their compatriots at home, while the natives grew rich enough from their industry to pay considerable taxes without discontent. The climax of the Villehardouins' power was attained under Prince William, who subdued the last independent cities of the coast and the mountaineers of Maina (1246–1248). In 1259, however, the same ruler was involved in the war between the rulers of Epirus and Nicaea, and being captured at the battle of Pelagonia, could only ransom himself by the cession of Laconia to the restored Byzantine empire. This new dependency after 1349 was treated with great care by the Byzantine monarchs, who sought to repress the violence of the local aristocracies by sending their kinsmen to govern under the title of "despots." On the other hand, with the extinction of the Villehardouin dynasty the Frankish province fell more and more into anarchy; at the same time the numbers of the foreigners were constantly dwindling through war, and as they disdained to recruit them by intermarriage, the preponderance of the native element in the Morea eventually became complete. Thus by 1400 the Byzantines were enabled to recover control over almost the whole peninsula and apportion it among several "despots." But the mutual quarrels of these princes soon proved fatal to their rule. Already in the 14th century they had employed Albanians and the Turkish pirates who harried their coasts as auxiliaries in their wars. The Albanians largely remained as settlers, and the connexion with the Turks could no longer be shaken off. In spite of attempts to fortify the Isthmus (1415) an Ottoman army penetrated into Morea and deported many inhabitants in 1423. An invasion of central Greece by the despot Constantine was punished by renewed raids in 1446 and 1450. In 1457 the despot Thomas withheld the tribute which he had recently stipulated to pay, but was reduced to obedience by an expedition under Mahommed II. (1458). A renewed revolt in 1459 was punished by an invasion attended with executions and deportations on a large scale, and by the annexation of the Morea to Turkey (1460).

IV. *The Turkish Dominion till 1800.*—Under the Ottoman government Greece was split up into six *sanjaks* or military divisions: (1) Morea, (2) Epirus, (3) Thessaly, (4) Euboea, Boeotia and Attica, (5) Aetolia and Acarnania, (6) the rest of central Greece, with capitals at Nauplia, Jannina, Trikkala, Negropont (Chalkis), Karlili and Lepanto; further divisions were subsequently composed of Crete and the islands. In each *sanjak* a number of fiefs was apportioned to Turkish settlers, who were bound in return to furnish some mounted men for the sultan's army, the total force thus held in readiness being over 7000. The local government was left in the hands of the *archontes* or primates in each community, who also undertook the farming of the taxes and the policing of their districts. Law was usually administered by the Greek clergy. The natives were not burdened with large imposts, but the levying of the land-tithes was effected in an inconvenient fashion, and the capitation-tax, to which all Christians were subjected was felt as a humiliation. A further grievance lay in the requisitions of forced labour which the pashas were entitled to call for; but the most galling exaction was the tribute of children for the recruiting of the Janissaries (*q.v.*), which was often levied with great ruthlessness. The habitual weakness of the central government also left the Greeks exposed to frequent oppression by the Turkish residents and by their own magistrates and clergy. But the new rulers met with singularly little opposition. The dangerous elements of the population had been cleared away by Mahommed's executions; the rest were content to absorb their energies in agriculture and commerce, which in spite of preferential duties and capitulations to foreign powers largely fell again into the hands of Greeks. Another important instrument by which the people were kept down was their own clergy, whom the Turkish rulers treated with marked favour and so induced to acquiesce in their dominion.

In the following centuries Greece was often the theatre of war in which the Greeks played but a passive part. Several wars with Venice (1463–70, 1408–1504) put the Turks in possession of the last Italian strongholds on the mainland. But the

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issue was mainly fought out on sea; the conflicts which had never ceased in the Aegean since the coming of the Italians now grew fiercer than ever; Greek ships and sailors were frequently requisitioned for the Turkish fleets, and the damage done to the Greek seaboard by the belligerents and by fleets of adventurers and corsairs brought about the depopulation of many islands and coast-strips. The conquest of the Aegean by the Ottomans was completed by 1570; but Venice retained Crete till 1669 and never lost Corfu until its cession to France in 1797.

In 1684 the Venetians took advantage of the preoccupation of Turkey on the Danube to attack the Morea. A small mercenary army under Francesco Morosini captured the strong places with remarkable ease, and by 1687 had conquered almost the whole peninsula. In 1687 the invaders also captured Athens and Lepanto; but the former town had soon to be abandoned, and with their failure to capture Negropont (1688) the Venetians were brought to a standstill. By the peace of Karlowitz (1699) the Morea became a possession of Venice. The new rulers, in spite of the commercial restrictions which they imposed in favour of their own traders, checked the impoverishment and decrease of population (from 300,000 to 86,000) which the war had caused. By their attempts to cooperate with the native magistrates and the mildness of their administration they improved the spirit of their subjects. But they failed to make their government popular, and when in 1715 the Ottomans with a large and well-disciplined army set themselves to recover the Morea, the Venetians were left without support from the Greeks. The peninsula was rapidly recaptured and by the peace of Passarowitz (1718) again became a Turkish dependency. The gaps left about this time in the Greek population were largely made up by an immigration from Albania.

The condition of the Greeks in the 18th century showed a great improvement which gave rise to yet greater hopes. Already in the 17th century the personal services of the subjects had been commuted into money contributions, and since 1676 the tribute of children fell into abeyance. The increasing use of Greek officials in the Turkish civil service, coupled with the privileges accorded to the Greek clergy throughout the Balkan countries, tended to recall the consciousness of former days of predominance in the Levant. Lastly, the education of the Greeks, which had always remained on a comparatively high level, was rapidly improved by the foundation of new schools and academies.

The long neglect which Greece had experienced at the hands of the European Powers was broken in 1764, when Russian agents appeared in the country with promises of a speedy deliverance from the Turks. A small expedition under Feodor and Alexis Orloff actually landed in the Morea in 1769, but failed to rouse national sentiment. Although the Russian fleet gained a notable victory off Chesme near Chios, a heavy defeat near Tripoliza ruined the prospects of the army. The Albanian troops in the Turkish army subsequently ravaged the country far and wide, until in 1779 they were exterminated by a force of Turkish regulars. In 1774 a concession, embodied in the treaty of Kuchuk Kainarji, by which Greek traders were allowed to sail under the protection of the Russian flag, marked an important step in the rehabilitation of the country as an independent power. Greek commerce henceforth spread swiftly over the Mediterranean, and increased intercourse developed a new sense of Hellenic unity. Among the pioneers who fostered this movement should be mentioned Constantine Rhigas, the "modern Tyrtaeus," and Adamantios Coraës (*q.v.*), the reformer of the Greek tongue. The revived memories of ancient Hellas and the impression created by the French revolution combined to give the final impulse which made the Greeks strike for freedom. By 1800 the population of Greece had increased to 1,000,000, and although 200,000 of these were Albanians, the common aversion to the Moslem united the two races. The military resources of the country alone remained deficient, for the *armatoli* or local militias, which had never been quite disbanded since Byzantine times, were at last suppressed by Ali Pasha of Iannina and found but a poor substitute in the klephts who henceforth spring into prominence. But at the first sign of weakness in the Turkish dominion the Greek nation was ready to rise, and the actual outbreak of revolt had become merely a question of time.

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See also ROMAN EMPIRE, LATER; ATHENS. (M. O. B. C.)

c. Modern History: 1800–1908.

At the beginning of the 19th century Greece was still under Turkish domination, but the dawn of freedom was already breaking, and a variety of forces were at work which prepared the way for the acquisition of national independence. The decadence of the Ottoman empire, which began with the retreat of the Turks from Vienna in 1683, was indicated in the 18th century by the weakening of the central power, the spread of anarchy in the provinces, the ravages of the janissaries, and the establishment of practically independent sovereignties or fiefs, such as those of Mehemet of Bushat at Skodra and of Ali Pasha of Tepelen at Iannina; the 19th century witnessed the first uprisings of the Christian populations and the detachment of the outlying portions of European Turkey. Up to the end of the 18th century none of the subject races had risen in spontaneous revolt against the Turks, though in some instances they rendered aid to the sultan's enemies; the spirit of the conquered nations had been broken by ages of oppression. In some of the remoter and more mountainous districts, however, the authority of the Turks had never been completely established; in Montenegro a small fragment of the Serb race maintained its independence; among the Greeks, the Mainotes in the extreme south of the Morea and the Sphakiote mountaineers in Crete had never been completely subdued. Resistance to Ottoman rule was maintained sporadically in the mountainous districts by the Greek *klephts* or brigands, the counterpart of the Slavonic *haiduks*, and by the pirates of the Aegean; the *armatoles* or bodies of Christian warriors, recognized by the Turks as a local police, often differed little in their proceedings from the brigands whom they were appointed to pursue.

The decadence of Turkey.

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Of the series of insurrections which took place in the 19th century, the first in order of time was the Servian, which broke out in 1804; the second was the Greek, which began in 1821. In both these movements the influence of Russia played a considerable part. In the case of the Servians Russian aid was mainly diplomatic, in that of the Greeks it eventually took a more material form. Since the days of Peter the Great, the eyes of Russia had been fixed on Constantinople, the great metropolis of the Orthodox faith. The policy of inciting the Greek Christians to revolt against their oppressors, which was first adopted in the reign of the empress Anna, was put into practical operation by the empress Catharine II., whose favourite, Orlov, appeared in the Aegean with a fleet in 1769 and landed in the Morea, where he organized a revolt. The attempt proved a failure; Orlov re-embarked, leaving the Greeks at the mercy of the Turks, and terrible massacres took place at Tripolitza, Lemnos and elsewhere. By the treaty of Kutchuk-Kainarji (July 21, 1774) Russia obtained a vaguely-defined protectorate over the Orthodox Greek subjects of Turkey, and in 1781 she arrived at an arrangement with Austria, known as the "Greek project," for a partition of Turkish territory and the restoration of the Byzantine empire under Constantine, the son of Catharine II. The outbreak of the French Revolution distracted the attention of the two empires, but Russia never ceased to intrigue among the Christian subjects of Turkey. A revolt of the inhabitants of Suli in 1790 took place with her connivance, and in the two first decades of the 19th century her agents were active and ubiquitous

Russian influence.

The influence of the French Revolution, which pervaded all Europe, extended to the shores of the Aegean. The Greeks, who had hitherto been drawn together mainly by a common religion, were now animated by the sentiment of nationality and by an ardent desire for political freedom. The national awakening, as in the case of the other subject Christian nations, was preceded by a literary revival. Literary and patriotic societies, the Philhellenes, the Philomousi, came into existence; Greek schools were founded everywhere; the philological labours of Coraës, which created the modern written language, furnished the nation with a mode of literary expression; the songs of Rhigas of Velestino fired the enthusiasm of the people. In 1815 was founded the celebrated *Philikè Hetaereia*, or friendly society, a revolutionary organization with centres at Moscow, Bucharest, Triest, and in all the cities of the Levant; it collected subscriptions, issued manifestos, distributed arms and made preparations for the coming insurrection. The revolt of Ali Pasha of Iannina against the authority of the sultan in 1820 formed the prelude to the Greek uprising; this despot, who had massacred the Greeks by hundreds, now declared himself their friend, and became a member of the Hetaerea. In March 1821 Alexander Ypsilanti, a former aide-de-camp of the tsar Alexander I., and president of the Hetaerea, entered Moldavia from Russian territory at the head of a small force; in the same month Archbishop Germanos of Patras unfurled the standard of revolt at Kalavryta in the Morea.

Greek revolutionary activity.

For the history of the prolonged struggle which followed see GREEK WAR OF INDEPENDENCE. The warfare was practically brought to a close by the annihilation of the Egyptian fleet at Navarino by the fleets of Great Britain, France and Russia on the 20th of October 1827. Nine months previously, Count John Capo d'Istria (*q.v.*), formerly minister of foreign affairs of the tsar Alexander, had been elected president of the Greek republic for seven years beginning on January 18, 1828. By the protocol of London (March 22, 1829) the Greek mainland south of a line drawn from the Gulf of Arta to the Gulf of Volo, the Morea and the Cyclades were declared a principality tributary to the sultan under a Christian prince. The limits drawn by the protocol of London were confirmed by the treaty of Adrianople (September 14, 1829), by which Greece was constituted an independent monarchy. The governments of Russia, France and England were far from sharing the enthusiasm which the gallant resistance of the Greeks had excited among the peoples of Europe, and which inspired the devotion of Byron, Cochrane, Sir Richard Church, Fabvier and other distinguished Philhellenes; jealousies prevailed among the three protecting powers, and the newly-liberated nation was treated in a niggardly spirit; its narrow limits were reduced by a new protocol (February 3, 1830), which drew the boundary line at the Aspropotamo, the Spercheios and the Gulf of Lamia. Capo d'Istria, whose Russian proclivities and arbitrary government gave great offence to the Greeks, was assassinated by two members of the Mavromichalis family (October 9, 1831), and a state of anarchy followed. Before his death the throne of Greece had been offered to Prince Leopold of Saxe-Coburg-Gotha, afterwards king of the Belgians, who declined it, basing his refusal on the inadequacy of the limits assigned to the new kingdom and especially the exclusion of Crete.

Independence of Greece.

By the convention of London (May 7, 1832) Greece was declared an independent kingdom under the protection of Great Britain, France and Russia with Prince Otto, son of King Louis I. of Bavaria, as king. The frontier line, now traced from the Gulf of Arta to the Gulf of Lamia, was fixed by the arrangement of Constantinople (July 21, 1832). King Otto, who had been brought up in a despotic court, ruled absolutely for the first eleven years of his reign; he surrounded himself with Bavarian advisers and Bavarian troops, and his rule was never popular. The Greek chiefs and politicians, who found themselves excluded from all influence and advancement, were divided into three factions which attached themselves respectively to the three protecting powers. On the 15th of September 1843 a military revolt broke out which compelled the king to dismiss the Bavarians and to accept a constitution. A responsible ministry, a senate nominated by the king, and a chamber elected by universal suffrage were now instituted. Mavrocordatos, the leader of the English party, became the first prime minister, but his government was overthrown at the ensuing elections, and a coalition of the French and Russian parties under Kolettes and Metaxas succeeded to power. The warfare of factions was aggravated by the rivalry between the British and French ministers, Sir Edmond Lyons and M. Piscatory; King Otto supported the French party, and trouble arose with the British government, which in 1847 despatched warships to enforce the payment of interest on the loan contracted after the War of Independence. A British fleet subsequently blockaded the Peiraeus in order to obtain satisfaction for the claims of Pacifico, a Portuguese Jew under British protection, whose house had been plundered during a riot. On the outbreak of hostilities between Russia and Turkey in 1853 the Greeks displayed sympathy with Russia; armed bands were sent into Thessaly, and an insurrection was fomented in Epirus in the hope of securing an accession of territory. In order to prevent further hostile action on the part of Greece, British and French fleets made a demonstration against the Peiraeus, which was occupied by a French force during the Crimean War. The disappointment of the national hopes increased the unpopularity of King Otto, who had never acquiesced in constitutional rule. In 1862 a military revolt broke out, and a national assembly pronounced his deposition. The vacant throne was offered by the assembly to Duke Nicholas of Leuchtenberg, a cousin of the tsar, but the mass of the people desired a constitutional monarchy of the British type; a plebiscite was taken, and Prince Alfred of England was elected by an almost unanimous vote. The three protecting powers, however, had bound themselves to the exclusion of any member of their ruling houses. In the following year Prince William George of Schleswig-Holstein-Sonderburg-Glücksburg, whom the British government had designated as a suitable candidate, was elected by the National Assembly with the title "George I., king of the Hellenes." Under the treaty of London (July 13, 1863) the change of dynasty was sanctioned by the three protecting powers, Great Britain undertaking to cede to Greece the seven Ionian Islands, which since 1815 had formed a commonwealth under British protection.

King Otto.

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On the 29th of October 1863 the new sovereign arrived in Athens, and in the following June the British authorities handed over the Ionian Islands to a Greek commissioner. King George thus began his reign under the most favourable auspices, the patriotic sentiments of the Greeks being flattered by the acquisition of new territory. He was, however, soon confronted with constitutional difficulties; party spirit ran riot at Athens, the ministries which he appointed proved short-lived, his counsellor, Count Sponneck, became the object of violent attacks, and at the end of 1864 he was compelled to accept an ultra-democratic constitution, drawn up by the National Assembly. This, the sixth constitution voted since the establishment of the kingdom, is that which is still in force. In the following year Count Sponneck left Greece, and the attention of the nation was concentrated on the affairs of Crete. The revolution which broke out in that island received moral and material support from the Greek government, with the tacit approval of Russia; military preparations were pressed forward at Athens, and cruisers were purchased, but the king, aware of the inability of Greece to attain her ends by warlike means, discouraged a provocative attitude towards Turkey, and eventually dismissed the bellicose cabinet of Koumoundouros. The removal of a powerful minister commanding a large parliamentary majority constituted an important precedent in the exercise of the royal prerogative; the king adopted a similar course with regard to Delyannes in 1892 and 1897. The relations with the porte, however, continued to grow worse, and Hobart Pasha, with a Turkish fleet, made a demonstration off Syra. The Cretan insurrection was finally crushed in the spring of 1869, and a conference of the powers, which assembled that year at Paris, imposed a settlement of the Turkish dispute on Greece, but took no steps on behalf of the Cretans. In 1870 the murder of several Englishmen by brigands in the neighbourhood of Athens produced an unfavourable impression in Europe; in the following year the confiscation of the Laurion mines, which had been ceded to a Franco-Italian company, provoked energetic action on the part of France and Italy. In 1875, after an acute constitutional crisis, Charilaos Trikoupes, who but ten months previously had been imprisoned for denouncing the corruption in a newspaper article, was summoned to form a cabinet. This remarkable man, the only great statesman whom modern Greece has produced, exercised an extraordinary influence over his countrymen for the next twenty years; had he been able to maintain himself uninterruptedly in power during that period, Greece might have escaped a long succession of misfortunes. His principal opponent, Theodore Delyannes, succeeded in rallying a strong body of adherents, and political parties, hitherto divided into numerous factions, centred around these two prominent figures.

Accession of George I.

In 1877 the outbreak of the Russo-Turkish War produced a fever of excitement in Greece; it was felt that the quarrels of the party leaders compromised the interests of the country, and the populace of Athens insisted on the formation of a coalition cabinet. The "great" or "oecumenical" ministry, as it was called, now came into existence under the presidency of the veteran Kanares; in reality, however, it was controlled by Trikoupes, who, recognizing the unpreparedness of the country, resolved on a pacific policy. The capture of Plevna by the Russians brought about the fall of the "oecumenical" ministry, and Koumoundouros and Delyannes, who succeeded to power, ordered the invasion of Thessaly. Their warlike energies, however, were soon checked by the signing of the San Stefano Treaty, in which the claims of Greece to an extension of frontier were altogether ignored. At the Berlin congress two Greek delegates obtained a hearing on the proposal of Lord Salisbury. The congress decided that the rectification of the frontier should be left to Turkey and Greece, the mediation of the powers being proposed in case of non-agreement; it was suggested, however, that the rectified frontier should extend from the valley of the Peneus on the east to the mouth of the Kalamas, opposite the southern extremity of Corfu, on the west. In 1879 a Greco-Turkish commission for the delimitation met first at Prevesa, and subsequently at Constantinople, but its conferences were without result, the Turkish commissioners declining the boundary suggested at Berlin. Greece then invoked the arbitration of the powers, and the settlement of the question was undertaken by a conference of ambassadors at Berlin (1880). The line approved by the conference was practically that suggested by the congress; Turkey, however, refused to accept it, and the Greek army was once more mobilized. In was evident, however, that nothing could be gained by an appeal to arms, the powers not being prepared to apply coercion to Turkey. By a convention signed at Constantinople in July 1881, the demarcation was entrusted to a commission representing the six powers and the two interested parties. The line drawn ran westwards from a point between the mouth of the Peneus and Platamona to the summits of Mounts Kritiri and Zygos, thence following the course of the river Arta to its mouth. An area of 13,395 square kilometres, with a population of 300,000 souls, was thus added to the kingdom, while Turkey was left in possession of Iannina, Metzovo and most of Epirus. The ceded territory was occupied by Greek troops before the close of the year.

New frontier, 1881.

In 1882 Trikoupes came into power at the head of a strong party, over which he exercised an influence and authority hitherto unknown in Greek political life. With the exception of three brief intervals (May 1885 to May 1886, October 1890 to February 1892, and a few months in 1893), he continued in office for the next twelve years. The reforms which he introduced during this period were generally of an unpopular character, and were loudly denounced by his democratic rivals; most of them were cancelled during the intervals when his opponent Delyannes occupied the premiership. The same want of continuity proved fatal to the somewhat ambitious financial programme which he now inaugurated. While pursuing a cautious foreign policy, and keeping in control the rash impetuosity of his fellow-countrymen, he shared to the full the national desire for expansion, but he looked to the development of the material resources of the country as a necessary preliminary to the realization of the dreams of Hellenism. With this view he endeavoured to attract foreign capital to the country, and the confidence which he inspired in financial circles abroad enabled him to contract a number of loans and to better the financial situation by a series of conversions. Under a stable, wise, and economical administration this far-reaching programme might perhaps have been carried out with success, but the vicissitudes of party politics and the periodical outbursts of national sentiment rendered its realization impossible. In April 1885 Trikoupes fell from power, and a few months later the indignation excited in Greece by the revolution of Philippopolis placed Delyannes once more at the head of a warlike movement. The army and fleet were again mobilized with a view to exacting territorial compensation for the aggrandizement of Bulgaria, and several conflicts with the Turkish troops took place on the frontier. The powers, after repeatedly inviting the Delyannes cabinet to disarm, established a blockade of Peiraeus and other Greek ports (8th May 1886), France alone declining to co-operate in this measure. Delyannes resigned (11th May) and Trikoupes, who succeeded to power, issued a decree of disarmament (25th May). Hostilities, however, continued on the frontier, and the blockade was not raised till 7th June. Trikoupes had now to face the serious financial situation brought about by the military activity of his predecessor. He imposed heavy taxation, which the people, for the time at least, bore without murmuring, and he continued to inspire such confidence abroad that Greek securities maintained their price in the foreign market. It was ominous, however, that a loan which he issued in 1890 was only partially covered. Meanwhile the Cretan difficulty had become once more a source of trouble to Greece. In 1889 Trikoupes was grossly deceived by the Turkish government, which, after inducing him to dissuade the Cretans from opposing the occupation of certain fortified posts, issued a firman annulling many important provisions in the constitution of the island. The indignation

Trikoupes and Delyannes.

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in Greece was intense, and popular discontent was increased by the success of the Bulgarians in obtaining the *exequatur* of the sultan for a number of bishops in Macedonia. In the autumn of 1900 Trikoupes was beaten at the elections, and Delyannes, who had promised the people a radical reform of the taxation, succeeded to power. He proved unequal, however, to cope with the financial difficulty, which now became urgent; and the king, perceiving that a crisis was imminent, dismissed him and recalled Trikoupes. The hope of averting national bankruptcy depended on the possibility of raising a loan by which the rapid depreciation of the paper currency might be arrested, but foreign financiers demanded guarantees which seemed likely to prove hurtful to Greek susceptibilities; an agitation was raised at Athens, and Trikoupes suddenly resigned (May 1893). His conduct at this juncture appears to have been due to some misunderstandings which had arisen between him and the king. The Sotiropoulos-Khalles ministry which followed effected a temporary settlement with the national creditors, but Trikoupes, returning to power in the autumn, at once annulled the arrangement. He now proceeded to a series of arbitrary measures which provoked the severest criticism throughout Europe and exposed Greece to the determined hostility of Germany. A law was hastily passed which deprived the creditors of 70% of their interest, and the proceeds of the revenues conceded to the monopoly bondholders were seized (December 1893). Long negotiations followed, resulting in an arrangement which was subsequently reversed by the German bondholders. In January 1895 Trikoupes resigned office, in consequence of a disagreement with the crown prince on a question of military discipline. His popularity had vanished, his health was shattered, and he determined to abandon his political career. His death at Cannes (11th April 1896), on the eve of a great national convulsion, deprived Greece of his masterly guidance and sober judgment at a critical moment in her history.

Nationalist agitation, 1896.

His funeral took place at Athens on 23rd April, while the city was still decorated with flags and garlands after the celebration of the Olympic games. The revival of the ancient festival, which drew together multitudes of Greeks from abroad, led to a lively awakening of the national sentiment, hitherto depressed by the economic misfortunes of the kingdom, and a secret patriotic society, known as the *Ethnikè Hetaereia*, began to develop prodigious activity, enrolling members from every rank of life and establishing branches in all parts of the Hellenic world. The society had been founded in 1894, by a handful of young officers who considered that the military organization of the country was neglected by the government; its principal aim was the preparation of an insurrectionary movement in Macedonia, which, owing to the activity of the Bulgarians and the reconciliation of Prince Ferdinand with Russia, seemed likely to be withdrawn for ever from the domain of Greek irredentism. The outbreak of another insurrection in Crete supplied the means of creating a diversion for Turkey while the movement in Macedonia was being matured; arms and volunteers were shipped to the island, but the society was as yet unable to force the hand of the government, and Delyannes, who had succeeded Trikoupes in 1895, loyally aided the powers in the restoration of order by advising the Cretans to accept the constitution of 1896. The appearance of strong insurgent bands in Macedonia in the summer of that year testified to the activity of the society and provoked the remonstrances of the powers, while the spread of its propaganda in the army led to the issue of a royal rescript announcing grand military manœuvres, the formation of a standing camp, and the rearmament of the troops with a new weapon (6th December). The objects of the society were effectually furthered by the evident determination of the porte to evade the application of the stipulated reforms in Crete; the Cretan Christians lost patience, and indignation was widespread in Greece. Emissaries of the society were despatched to the island, and affairs were brought to a climax by an outbreak at Canea on 4th February 1897. The Turkish troops fired on the Christians, thousands of whom took refuge on the warships of the powers, and a portion of the town was consumed by fire.

Cretan crisis, 1897.

Delyannes now announced that the government had abandoned the policy of abstention. On the 6th two warships were despatched to Canea, and on the 10th a torpedo flotilla, commanded by Prince George, left Peiraeus amid tumultuous demonstrations. The ostensible object of these measures was the protection of Greek subjects in Crete, and Delyannes was still anxious to avoid a definite rupture with Turkey, but the Ethnikè Hetaereia had found means to influence several members of the ministry and to alarm the king. Prince George, who had received orders to prevent the landing of Turkish reinforcements on the island, soon withdrew from Cretan waters owing to the decisive attitude adopted by the commanders of the international squadron. A note was now addressed by the government to the powers, declaring that Greece could no longer remain a passive spectator of events in Crete, and on the 13th of February a force of 1500 men, under Colonel Vassos, embarked at Peiraeus. On the same day a Greek warship fired on a Turkish steam yacht which was conveying troops from Candia to Sitia. Landing near Canea on the night of the 14th, Colonel Vassos issued a proclamation announcing the occupation of Crete in the name of King George. He had received orders to expel the Turkish garrisons from the fortresses, but his advance on Canea was arrested by the international occupation of that town, and after a few engagements with the Turkish troops and irregulars he withdrew into the interior of the island. Proposals for the coercion of Greece were now put forward by Germany, but Great Britain declined to take action until an understanding had been arrived at with regard to the future government of Crete. Eventually (2nd March) collective notes were addressed to the Greek and Turkish governments announcing the decision of the powers that (1) Crete could in no case in present circumstances be annexed to Greece; (2) in view of the delays caused by Turkey in the application of the reforms, Crete should be endowed with an effective autonomous administration, calculated to ensure it a separate government, under the suzerainty of the sultan. Greece was at the same time summoned to remove its army and fleet within the space of six days, and Turkey was warned that its troops must for the present be concentrated in the fortified towns and ultimately withdrawn from the island. The action of the powers produced the utmost exasperation at Athens; the populace demanded war with Turkey and the annexation of Crete, and the government drew up a reply to the powers in which, while expressing the conviction that autonomy would prove a failure, it indicated its readiness to withdraw some of the ships, but declined to recall the army. A suggestion that the troops might receive a European mandate for the preservation of order in the island proved unacceptable to the powers, owing to the aggressive action of Colonel Vassos after his arrival. Meanwhile troops, volunteers and munitions of war were hurriedly despatched to the Turkish frontier in anticipation of an international blockade of the Greek ports, but the powers contented themselves with a pacific blockade of Crete, and military preparations went on unimpeded.

War with Turkey.

While the powers dallied, the danger of war increased; on 29th March the crown prince assumed command of the Greek troops in Thessaly, and a few days later hostilities were precipitated by the irregular forces of the Ethnikè Hetaereia, which attacked several Turkish outposts near Grevena. According to a report of its proceedings, subsequently published by the society, this invasion received the previous sanction of the prime minister. On 17th April Turkey declared war. The disastrous campaign which followed was of short duration, and it was evident from the outset that the Greeks had greatly underrated the military strength of their opponents (see GRECO-TURKISH WAR). After the evacuation of Larissa on the 24th, great discontent prevailed at Athens; Delyannes was invited by the king to resign, but refusing to do so was dismissed (29th April). His successor, Rhalles, after recalling the army from Crete (9th May) invoked the mediation

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of the powers, and an armistice was concluded on the 19th of that month. Thus ended an unfortunate enterprise, which was undertaken in the hope that discord among the powers would lead to a European war and the dismemberment of Turkey. Greek interference in Crete had at least the result of compelling Europe to withdraw the island for ever from Turkish rule. The conditions of peace put forward by Turkey included a war indemnity of £10,000,000 and the retention of Thessaly; the latter demand, however, was resolutely opposed by Great Britain, and the indemnity was subsequently reduced to £4,000,000. The terms agreed to by the powers were rejected by Rhalles; the chamber, however, refused him a vote of confidence and King George summoned Zaimes to power (October 3). The definitive treaty of peace, which was signed at Constantinople on the 6th of December, contained a provision for a slight modification of the frontier, designed to afford Turkey certain strategical advantages; the delimitation was carried out by a commission composed of military delegates of the powers and representatives of the interested parties. The evacuation of Thessaly by the Turkish troops was completed in June 1898. An immediate result of the war was the institution of an international financial commission at Athens, charged with the control of certain revenues assigned to the service of the national debt. The state of the country after the conclusion of hostilities was deplorable; the towns of northern Greece and the islands were crowded with destitute refugees from Thessaly; violent recriminations prevailed at Athens, and the position of the dynasty seemed endangered. A reaction, however, set in, in consequence of an attempt to assassinate King George (28th February 1898), whose great services to the nation in obtaining favourable terms from the powers began to receive general recognition. In the following summer the king made a tour through the country, and was everywhere received with enthusiasm. In the autumn the powers, on the initiative of Russia, decided to entrust Prince George of Greece with the government of Crete; on 26th November an intimation that the prince had been appointed high commissioner in the island was formally conveyed to the court of Athens, and on 21st December he landed in Crete amid enthusiastic demonstrations (see CRETE).

In April 1899 Zaimes gave way to Theotokes, the chief of the Trikoupist party, who introduced various improvements in the administration of justice and other reforms including a measure transferring the administration of the army from the minister of war to the crown prince. In May 1901 a meeting took place at Abbazia, under the auspices of the Austro-Hungarian government, between King George and King Charles of Rumania with a view to the conclusion of a Graeco-Rumanian understanding directed against the growth of Slavonic, and especially Bulgarian, influence in Macedonia. The compact, however, was destined to be short-lived owing to the prosecution of a Rumanian propaganda among the semi-Hellenized Vlachs of Macedonia. In November riots took place at Athens, the patriotic indignation of the university students and the populace being excited by the issue of a translation of the Gospels into modern Greek at the suggestion of the queen. The publication was attributed to Panslavist intrigues against Greek supremacy over the Orthodox populations of the East, and the archbishop of Athens was compelled to resign. Theotokes, whose life was attempted, retired from power, and Zaimes formed a cabinet. In 1902 the progress of the Bulgarian movement in Macedonia once more caused great irritation in Greece. Zaimes, having been defeated at the elections in December, resigned, and was succeeded by Delyannes, whose popularity had not been permanently impaired by the misfortunes of the war. Delyannes now undertook to carry out extensive economic reforms, and introduced a measure restoring the control of the army to the ministry of war. He failed, however, to carry out his programme, and, being deserted by a section of his followers, resigned in June 1903, when Theotokes again became prime minister. The new cabinet resigned within a month owing to the outbreak of disturbances in the currant-growing districts, and Rhalles took office for the second time (July 8). The Bulgarian insurrection in Macedonia during the autumn caused great excitement in Athens, and Rhalles adopted a policy of friendship with Turkey (see MACEDONIA). The co-operation of the Greek party in Macedonia with the Turkish authorities exposed it to the vengeance of the insurgents, and in the following year a number of Greek bands were sent into that country. The campaign of retaliation was continued in subsequent years.

Macedonian troubles.

Murder of Delyannes.

In December Rhalles, who had lost the support of the Delyannist party, was replaced by Theotokes, who promulgated a scheme of army reorganization, introduced various economies and imposed fresh taxation. In December the government was defeated on a vote of confidence and Delyannes once more became prime minister, obtaining a considerable majority in the elections which followed (March 1905), but on the 13th of June he was assassinated. He was succeeded by Rhalles, who effected a settlement of the currant question and cultivated friendly relations with Turkey in regard to Macedonia.

In the autumn anti-Greek demonstrations in Rumania led to a rupture of relations with that country. In December the ministry resigned owing to an adverse vote of the chamber, and Theotokes formed a cabinet. The new government, as a preliminary to military and naval reorganization, introduced a law directed against the candidature of military officers for parliament. Owing to obstruction practised by the military members of the chamber a dissolution took place, and at the subsequent elections (April 1906) Theotokes secured a large majority. In the autumn various excesses committed against the Greeks in Bulgaria in reprisal for the depredations of the Greek bands in Macedonia caused great indignation in Greece, but diplomatic relations between the two countries were not suspended. On the 26th of September Prince George, who had resigned the high commissionership of Crete, returned to Athens; the designation of his successors was accorded by the protecting powers to King George as a satisfaction to Greek national sentiment (see CRETE). The great increase in the activity of the Greek bands in Macedonia during the following spring and summer led to the delivery of a Turkish note at Athens (July 1907), which was supported by representations of the powers.

In October 1908 the proclamation by the Cretan assembly of union with Greece threatened fresh complications, the cautious attitude of the Greek government leading to an agitation in the army, which came to a head in 1909. On the 18th of July a popular demonstration against his Cretan policy led to the resignation of Theotokes, whose successor, Rhalles, announced a programme of military and economical reform. The army, however, took matters into its own hands, and on the 23rd of August Rhalles was replaced by Mavromichales, the nominee of the "Military League." For the next six months constitutional government was practically superseded by that of the League, and for a while the crown itself seemed to be in danger. The influence of the League, however, rapidly declined; army and navy quarrelled; and a fresh *coup d'état* at the beginning of 1910 failed of its effect, owing to the firmness of the king. On the 7th of February Mavromichales resigned, and his successor, Dragoumis, accepting the Cretan leader Venezelo's suggestion of a national assembly, succeeded in persuading the League to dissolve (March 29) on receiving the king's assurance that such an assembly would be convened. On the 31st, accordingly, King George formally proclaimed the convocation of a national assembly to deal with the questions at issue.

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GREEK ART. It is proposed in the present article to give a brief account of the history of Greek art and of the principles embodied in that history. In any broad view of history, the products of the various arts practised by a people constitute an objective and most important record of the spirit of that people. But all nations have not excelled in the same way: some have found their best expression in architecture, some in music, some in poetry. The Greeks most fully embodied their ideas in two ways, first in their splendid literature, both prose and verse, and secondly, in their plastic and pictorial art, in which matter they have remained to our days among the greatest instructors of mankind. The three arts of architecture, sculpture and painting were brought by them into a focus; and by their aid they produced a visible splendour of public life such as has perhaps been nowhere else attained.

The volume of the remains of Greek civilization is so vast, and the learning with which these have been discussed is so ample, that it is hopeless to attempt to give in a work like the present any complete account of either. Rather we shall be frankly eclectic, choosing for consideration such results of Greek art as are most noteworthy and most characteristic. In some cases it will be possible to give a reference to a more detailed treatment of particular monuments in these volumes under the heading of the places to which they belong. Architectural detail is relegated to ARCHITECTURE and allied architectural articles. Coins (see NUMISMATICS) and gems (see GEMS) are treated apart, as are vases (CERAMICS), and in the bibliography which closes this article an effort is made to direct those who wish for further information in any particular branch of our subject.

1. *The Rediscovery of Greek Art.*—The visible works of Greek architect, sculptor and painter, accumulated in the cities of Greece and Asia Minor until the Roman conquest. And in spite of the ravages of conquering Roman generals, and the more systematic despoilings of the emperors, we know that when Pausanias visited Greece, in the age of the Antonines, it was from coast to coast a museum of works of art of all ages. But the tide soon turned. Works of originality were no longer produced, and a succession of disasters gradually obliterated those of previous ages. In the course of the Teutonic and Slavonic invasions from the north, or in consequence of earthquakes, very frequent in Greece, the splendid cities and temples fell into ruins; and with the taking of Constantinople by the Franks in 1204 the last great collection of works of Greek sculpture disappeared. But while paintings decayed, and works in metal were melted down, many marble buildings and statues survived, at least in a mutilated condition, while terra-cotta is almost proof against decay.

With the Renaissance attention was directed to the extant remains of Greek and Roman art; as early as the 15th century collections of ancient sculpture, coins and gems began to be formed in Italy; and in the 16th the enthusiasm spread to Germany and France. The earl of Arundel, in the reign of James I., was the first Englishman to collect antiques from Italy and Asia Minor: his marbles are now in the Ashmolean Museum at Oxford. Systematic travel in Greece for the discovery of buildings and works of art was begun by Spon and Wheler (1675–1676); and the discovery of Pompeii in 1748 opened a new chapter in the history of ancient art.

But though kings delighted to form galleries of ancient statues, and the great Italian artists of the Renaissance drew from them inspiration for their paintings and bronzes, the first really critical appreciation of Greek art belongs to Winckelmann (*Geschichte der Kunst des Alterthums*, 1764). The monuments accessible to Winckelmann were but a very small proportion of those we now possess, and in fact mostly works of inferior merit: but he was the first to introduce the historical method into the treatment of ancient art, and to show how it embodied the ideas of the great peoples of the ancient world. He was succeeded by Lessing, and the waves of thought and feeling set in motion by these two affected the cultivated class in all nations, —they inspired in particular Goethe in Germany and Lord Byron in England.

The second stage in the recovery of Greek art begins with the permission accorded by the Porte to Lord Elgin in 1800 to remove to England the sculptural decoration of the Parthenon and other buildings of Athens. These splendid works, after various vicissitudes, became the property of the English nation, and are now the chief treasures of the British Museum. The sight of them was a revelation to critics and artists, accustomed only to the base copies which fill the Italian galleries, and a new epoch in the appreciation of Greek art began. English and German savants, among whom Cockerell and Stackelberg were conspicuous, recovered the glories of the temples of Aegina and Bassae. Leake and Ross, and later Curtius, journeyed through the length and breadth of Greece, identifying ancient sites and studying the monuments which were above ground. Ross reconstructed the temple of Athena Nikē on the Acropolis of Athens from fragments rescued from a Turkish bastion.

Meantime more methodical exploration brought to light the remains of remarkable civilizations in Asia, not only in the valley of the Euphrates, but in Lycia, whence Sir Charles Fellows brought to London the remains of noteworthy tombs, among which the so-called Harpy Monument and Nereid Monument take the first place. Still more important were the accessions derived from the excavations of Sir Charles Newton, who in the years 1852–1859 resided as consul in Asia Minor, and explored the sites of the mausoleum at Halicarnassus and the shrine of Demeter at Cnidus. Pullan at Priene, and Wood at Ephesus also made fruitful excavations.

The next landmark is set by the German excavations at Olympia (1876 and foll.), which not only were conducted with a scientific completeness before unknown, and at great cost, but also established the principle that in future all the results of excavations in Greece must remain in the country, the right of first publication only remaining with the explorers. The discovery of the Hermes of Praxiteles, almost the only certain original of a great Greek sculptor which we possess, has furnished a new and invaluable fulcrum for the study of ancient art. In emulation of the achievements of the Germans at Olympia, the Greek archaeological society methodically excavated the Athenian acropolis, and were rewarded by finding numerous statues and fragments of pediments belonging to the age of Peisistratus, an age when the promise of art was in full bud. More recently French explorers have made a very thorough examination of the site of Delphi, and have succeeded in recovering almost complete two small treasuries, those of the people of Athens and of Cnidus or Siphnos, the latter of 6th-century Ionian work, and adorned with extremely important sculpture.

No other site of the same importance as Athens, Olympia and Delphi remains for excavation in Greece proper. But in all parts of the country, at Tegea, Corinth, Sparta and on a number of other ancient sites, striking and important monuments have come to light. And at the same time monuments already known in Italy and Sicily, such as the temples of Paestum, Selinus and Agrigentum have been re-examined with fuller knowledge and better system. Only Asia Minor, under the influence of Turkish rule, has remained a country where systematic exploration is difficult. Something, however, has been accomplished at Ephesus, Priene, Assos and Miletus, and great works of sculpture such as the reliefs of the great altar at Pergamum, now at Berlin, and the splendid sarcophagi from Sidon, now at Constantinople, show what might be expected from methodic investigation of the wealthy Greek cities of Asia.

From further excavations at Herculaneum we may expect a rich harvest of works of art of the highest class, such as have already been found in the excavations on that site in the past; and the building operations at Rome are constantly bringing

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to light fine statues brought from Greece in the time of the Empire, which are now placed in the collections of the Capitol and the Baths of Diocletian.

The work of explorers on Greek sites requires as its complement and corrective much labour in the great museums of Europe. As museum work apart from exploration tends to dilettantism and pedantry, so exploration by itself does not produce reasoned knowledge. When a new building, a great original statue, a series of vases is discovered, these have to be fitted in to the existing frame of our knowledge; and it is by such fitting in that the edifice of knowledge is enlarged. In all the museums and universities of Europe the fresh examination of new monuments, the study of style and subject, and attempts to work out points in the history of ancient art, are incessantly going on. Such archaeological work is an important element in the gradual education of the world, and is fruitful, quite apart from the particular results attained, because it encourages a method of thought. Archaeology, dealing with things which can be seen and handled, yet being a species of historic study, lies on the borderland between the province of natural science and that of historic science, and furnishes a bridge whereby the methods of investigation proper to physical and biological study may pass into the human field.

These investigations and studies are recorded, partly in books, but more particularly in papers in learned journals (see bibliography), such as the *Mitteilungen* of the German Institute, and the English *Journal of Hellenic Studies*.

An example or two may serve to give the reader a clearer notion of the recent progress in the knowledge of Greek art.

To begin with architecture. Each of the palmary sites of which we have spoken has rendered up examples of early Greek temples. At Olympia there is the Heraeum, earliest of known temples of Greece proper, which clearly shows the process whereby stone gradually superseded wood as a constructive material. At Delphi the explorers have been so fortunate as to be able to put together the treasuries of the Cnidians (or Siphnians) and of the Athenians. The former (see fig. 17) is a gem of early Ionic art, with two Caryatid figures in front in the place of columns, and adorned with the most delicate tracery and fine reliefs. On the Athenian acropolis very considerable remains have been found of temples which were destroyed by the Persians when they temporarily occupied the site in 480 B.C. And recently the ever-renewed study of the Erechtheum has resulted in a restoration of its original form more valuable and trustworthy than any previously made.

In the field of sculpture recent discoveries have been too many and too important to be mentioned at any length. One instance may serve to mark the rapidity of our advance. When the remains of the Mausoleum were brought to London from the excavations begun by Sir Charles Newton in 1856 we knew from Pliny that four great sculptors, Scopas, Bryaxis, Leochares and Timotheus, had worked on the sculpture; but we knew of these artists little more than the names. At present we possess many fragments of two pediments at Tegea executed under the direction of Scopas, we have a basis with reliefs signed by Bryaxis, we have identified a group in the Vatican museum as a copy of the Ganymede of Leochares, and we have pedimental remains from Epidaurus which we know from inscriptional evidence to be either the works of Timotheus or made from his models. Any one can judge how enormously our power of criticizing the Mausoleum sculptures, and of comparing them with contemporary monuments, has increased.

In regard to ancient painting we can of course expect no such fresh illumination. Many important wall-paintings of the Roman age have been found at Rome and Pompeii: but we have no certain or even probable work of any great Greek painter. We have to content ourselves with studying the colouring of reliefs, such as those of the sarcophagi at Constantinople, and the drawings on vases, in order to get some notion of the composition and drawing of painted scenes in the great age of Greece. As to the portraits of the Roman age painted on wood which have come in considerable quantities from Egypt, they stand at a far lower level than even the paintings of Pompeii. The number of our vase-paintings, however, increases steadily, and whole classes, such as the early vases of Ionia, are being marked off from the crowd, and so becoming available for use in illustrating the history of Hellenic civilization.

The study of Greek art is thus one which is eminently progressive. It has over the study of Greek literature the immense advantage that its materials increase far more rapidly. And it is becoming more and more evident that a sound and methodic study of Greek art is quite as indispensable as a foundation for an artistic and archaeological education as the study of Greek poets and orators is as a basis of literary education. The extreme simplicity and thorough rationality of Greek art make it an unrivalled field for the training and exercise of the faculties which go to the making of the art-critic and art historian.

2. *The General Principles of Greek Art.*—Before proceeding to sketch the history of the rise and decline of Greek art, it is desirable briefly to set forth the principles which underlie it (see also P. Gardner's *Grammar of Greek Art*).

As the literature of Greece is composed in a particular language, the grammar and the syntax of which have to be studied before the works in poetry and prose can be read, so Greek works of art are composed in what may be called an artistic language. To the accidence of a grammar may be compared the mere technique of sculpture and painting: to the syntax of a grammar correspond the principles of composition and grouping of individual figures into a relief or picture. By means of the rules of this grammar the Greek artist threw into form the ideas which belonged to him as a personal or a racial possession.

We may mention first some of the more external conditions of Greek art; next, some of those which the Greek spirit posited for itself.

No nation is in its works wholly free from the domination of climate and geographical position; least of all a people so keenly alive to the influence of the outer world as the Greeks. They lived in a land where the soil was dry and rocky, far less hospitable to vegetation than that of western Europe, while on all sides the horizon of the land was bounded by hard and jagged lines of mountain. The sky was extremely clear and bright, sunshine for a great part of the year almost perpetual, and storms, which are more than passing gales, rare. It was in accordance with these natural features that temples and other buildings should be simple in form and bounded by clear lines. Such forms as the cube, the oblong, the cylinder, the triangle, the pyramid are found in their constructions. Just as in Switzerland the gables of the chalets match the pine-clad slopes and lofty summits of the mountains, so in Greece, amid barer hills of less elevation, the Greek temple looks thoroughly in place. But its construction is related not only to the surface of the land, but also to the character of the race. M. Émile Boutmy, in his interesting *Philosophie de l'architecture en Grèce*, has shown how the temple is a triumph of the senses and the intellect, not primarily emotional, but showing in every part definite purpose and design. It also exhibits in a remarkable degree the love of balance, of symmetry, of a mathematical proportion of parts and correctness of curvature which belong to the Greek artist.

The purposes of a Greek temple may be readily judged from its plan. Primarily it was the abode of the deity, whose statue dwelt in it as men dwell in their own houses. Hence the cella or *naos* is the central feature of the building. Here was placed the image to which worship was brought, while the treasures belonging to the god were disposed partly in the cella itself, partly in a kind of treasury which often existed, as in the Parthenon, behind the cella. There was in large temples a porch of approach, the *pronaos*, and another behind, the *opisthodomos*. Temples were not meant for, nor accommodated to, regular services or a throng of worshippers. Processions and festivals took place in the open air, in the streets and fields, and men entered the abodes of the gods at most in groups and families, commonly alone. Thus when a place had been found for the statue, which stood for the presence of the god, for the small altar of incense, for the implements of cult and the gifts of

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votaries, little space remained free, and great spaces or subsidiary chapels such as are usual in Christian cathedrals did not exist (see TEMPLE).

Here our concern is not with the purposes or arrangements of a temple, but with its appearance and construction, regarded as a work of art, and as an embodiment of Greek ideas. A few simple and striking principles may be formulated, which are characteristic of all Greek buildings:—

(i.) Each member of the building has one function, and only one, and this function controls even the decoration of that member. The pillar of a temple is made to support the architrave and is for that purpose only. The flutings of the pillar, being perpendicular, emphasize this fact. The line of support which runs up through the pillar is continued in the triglyph, which also shows perpendicular grooves. On the other hand, the wall of a temple is primarily meant to divide or space off; thus it may well at the top be decorated by a horizontal band of relief, which belongs to it as a border belongs to a curtain. The base of a column, if moulded, is moulded in such a way as to suggest support of a great weight; the capital of a column is so carved as to form a transition between the column and the cornice which it supports.

(ii.) Greek architects took the utmost pains with the proportions, the symmetry as they called it, of the parts of their buildings. This was a thing in which the keen and methodical eyes of the Greeks delighted, to a degree which a modern finds it hard to understand. Simple and natural relations, 1:2, 1:3, 2:3 and the like, prevailed between various members of a construction. All curves were planned with great care, to please the eye with their flow; and the alternations and correspondences of features is visible at a glance. For example, the temple must have two pediments and two porches, and on its sides and fronts triglyph and metope must alternate with unvarying regularity.

(iii.) Rigidity in the simple lines of a temple is avoided by the device that scarcely any outline is actually straight. All are carefully planned and adapted to the eye of the spectator. In the Parthenon the line of the floor is curved, the profiles of the columns are curved, the corner columns slope inward from their bases, the columns are not even equidistant. This elaborate adaptation, called entasis, was expounded by F. C. Penrose in his work on Athenian architecture, and has since been observed in several of the great temples of Greece.

(iv.) Elaborate decoration is reserved for those parts of the temple which have, or at least appear to have, no strain laid upon them. It is true that in the archaic age experiments were made in carving reliefs on the lower drums of columns (as at Ephesus) and on the line of the architrave (as at Assus). But such examples were not followed. Nearly always the spaces reserved for mythological reliefs or groups are the tops of walls, the spaces between the triglyphs, and particularly the pediments surmounting the two fronts, which might be left hollow without danger to the stability of the edifice. Detached figures in the round are in fact found only in the pediments, or standing upon the tops of the pediments. And metopes are sculptured in higher relief than friezes.

"When we examine in detail even the simplest architectural decoration, we discover a combination of care, sense of proportion, and reason. The flutings of an Ionic column are not in section mere arcs of a circle, but made up of a combination of curves which produce a beautiful optical effect; the lines of decoration, as may be best seen in the case of the Erechtheum, are cut with a marvellous delicacy. Instead of trying to invent new schemes, the mason contents himself with improving the regular patterns until they approach perfection, and he takes everything into consideration. Mouldings on the outside of a temple, in the full light of the sun, are differently planned from those in the diffused light of the interior. Mouldings executed in soft stone are less fine than those in marble. The mason thinks before he works, and while he works, and thinks in entire correspondence with his surroundings." [1]

Greek architecture, however, is treated elsewhere (see ARCHITECTURE); we will therefore proceed to speak briefly of the principles exemplified in sculpture. Existing works of Greek sculpture fall easily into two classes. The first class comprises what may be called works of substantive art, statues or groups made for their own sake and to be judged by themselves. Such are cult-statues of gods and goddesses from temple and shrine, honorary portraits of rulers or of athletes, dedicated groups and the like. The second class comprises decorative sculptures, such as were made, usually in relief, for the decoration of temples and tombs and other buildings, and were intended to be subordinate to architectural effect.

Speaking broadly, it may be said that the works of substantive sculpture in our museums are in the great majority of cases copies of doubtful exactness and very various merit. The Hermes of Praxiteles is almost the only marble statue which can be assigned positively to one of the great sculptors; we have to work back towards the productions of the peers of Praxiteles through works of poor execution, often so much restored in modern times as to be scarcely recognizable. Decorative works, on the other hand, are very commonly originals, and their date can often be accurately fixed, as they belong to known buildings. They are thus infinitely more trustworthy and more easy to deal with than the copies of statues of which the museums of Europe, and more especially those of Italy, are full. They are also more commonly unrestored. But yet there are certain disadvantages attaching to them. Decorative works, even when carried out under the supervision of a great sculptor, were but seldom executed by him. Usually they were the productions of his pupils or assistants. Thus they are not on the same level of art as substantive sculpture. And they vary in merit to an extraordinary extent, according to the capacity of the man who happened to have them in hand, and who was probably but little controlled. Every one knows how noble are the pedimental sculptures of the Parthenon. But we know no reason why they should be so vastly superior to the frieze from Phigalia; nor why the heads from the temple at Tegea should be so fine, while those from the contemporary temple at Epidaurus should be comparatively insignificant. From the records of payments made to the sculptors who worked on the Erechtheum at Athens it appears that they were ordinary masons, some of them not even citizens, and paid at the rate of 60 drachms (about 60 francs) for each figure, whether of man or horse, which they produced. Such piece-work would not, in our days, produce a very satisfactory result.

Works of substantive sculpture may be divided into two classes, the statues of human beings and those of the gods. The line between the two is not, however, very easy to draw, or very definite. For in representing men the Greek sculptor had an irresistible inclination to idealize, to represent what was generic and typical rather than what was individual, and the essential rather than the accidental. And in representing deities he so fully anthropomorphized them that they became men and women, only raised above the level of everyday life and endowed with a superhuman stateliness. Moreover, there was a class of heroes represented largely in art who covered the transition from men to gods. For example, if one regards Heracles as a deity and Achilles as a man of the heroic age and of heroic mould, the line between the two will be found to be very narrow.

Nevertheless one may for convenience speak first of human and afterwards of divine figures. It was the custom from the 6th century onwards to honour those who had done any great achievement by setting up their statues in conspicuous positions. One of the earliest examples is that of the tyrannicides, Harmodius and Aristogiton, a group, a copy of which has come down to us (Plate I. fig. 50 [2]). Again, people who had not won any distinction were in the habit of dedicating to the deities portraits of themselves or of a priest or priestess, thus bringing themselves, as it were, constantly under the notice of a divine patron. The rows of statues before the temples at Miletus, Athens and

[1] *Grammar of Greek Art.*

[2] It may here be pointed out that it was found impossible, with any regard for the appearance of the pages, to arrange the Plates for this article so as to preserve a chronological order in the individual figures; they are not arranged consecutively as regards the history or the period, and are only grouped for convenience in paging.—Ed.

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Photo, Brogi.
FIG. 50.—HARMODIUS AND ARISTOGITON. (NAT. MUS., NAPLES.)

Photo, Brogi.
FIG. 51.—FARNESE BULL. (NAPLES.)

Photo, Anderson.
FIG. 52.—LAOCOON GROUP. (VATICAN.)

Photo, Anderson.
FIG. 53.—GANYMEDE OF LEOCHARES. (VATICAN.)

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Photo, Anderson.

FIG. 54.—FLAYING OF MARSYAS. (VILLA ALBANI, ROME.)

Photo, Anderson.

FIG. 55.—APOLLO OF THE BELVIDERE. (VATICAN.)

FIG. 56.—HEAD OF YOUNG ALEXANDER. (BRIT. MUS.)

Photo, Seebah.

FIG. 57.—HERMES OF ALCAMENES. (CONSTANTINOPLE.)

FIG. 58.—THESEUS AND AMAZON (ERETRIA).

Photo, Mansell.

FIG. 59.—DRUM OF COLUMN FROM EPHESUS. (BRIT. MUS.)

Photo, Baldwin Coolidge.

FIG. 60.—YOUNG HERMES. (MUS. OF FINE ARTS, BOSTON.)

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elsewhere came thus into being. But from the point of view of art, by far the most important class of portraits consisted of athletes who had won victories at some of the great games of Greece, at Olympia, Delphi or elsewhere. Early in the 6th century the custom arose of setting up portraits of athletic victors in the great sacred places. We have records of numberless such statues executed by all the greatest sculptors. When Pausanias visited Greece he found them everywhere far too numerous for complete mention.

It is the custom of studying and copying the forms of the finest of the young athletes, combined with the Greek habit of complete nudity during the sports, which lies at the basis of Greek excellence in sculpture. Every sculptor had unlimited opportunities for observing young vigorous bodies in every pose and in every variety of strain. The natural sense of beauty which was an endowment of the Greek race impelled him to copy and preserve what was excellent, and to omit what was ungainly or poor. Thus there existed, and in fact there was constantly accumulating, a vast series of types of male beauty, and the public taste was cultivated to an extreme delicacy. And of course this taste, though it took its start from athletic customs, and was mainly nurtured by them, spread to all branches of portraiture, so that elderly men, women, and at last even children, were represented in art with a mixture of ideality and fidelity to nature such as has not been reached by the sculpture of any other people.

The statues of the gods began either with stiff and ungainly figures roughly cut out of the trunk of a tree, or with the monstrous and symbolical representations of Oriental art. In the Greece of late times there were still standing rude pillars, with the tops sometimes cut into a rough likeness to the human form. And in early decoration of vases and vessels one may find Greek deities represented with wings, carrying in their hands lions or griffins, bearing on their heads lofty crowns. But as Greek art progressed it grew out of this crude symbolism. In the language of Brunn, the Greek artists borrowed from Oriental or Mycenaean sources the letters used in their works, but with these letters they spelled out the ideas of their own nation. What the artists of Babylon and Egypt express in the character of the gods by added attribute or symbol, swiftness by wings, control of storms by the thunderbolt, traits of character by animal heads, the artists of Greece work more and more fully into the sculptural type; modifying the human subject by the constant addition of something which is above the ordinary level of humanity, until we reach the Zeus of Pheidias or the Demeter of Cnidus. When the decay of the high ethical art of Greece sets in, the gods become more and more warped to the merely human level. They lose their dignity, but they never lose their charm.

The decorative sculpture of Greece consists not of single figures, but of groups; and in the arrangement of these groups the strict Greek laws of symmetry, of rhythm, and of balance, come in. We will take the three most usual forms, the pediment, the metope and the frieze, all of which belong properly to the temple, but are characteristic of all decoration, whether of tomb, trophy or other monument.

The form of the pediment is triangular; the height of the triangle in proportion to its length being about 1 : 8. The conditions of space are here strict and dominant; to comply with them requires some ingenuity. To a modern sculptor the problem thus presented is almost insoluble; but it was allowable in ancient art to represent figures in a single composition as of various sizes, in correspondence not to actual physical measurement but to importance. As the more important figures naturally occupy the midmost place in a pediment, their greater size comes in conveniently. And by placing some of the persons of the group in a standing, some in a seated, some in a reclining position, it can be so contrived that their heads are equidistant from the upper line of the pediment.

The statues in a Greek pediment, which are after quite an early period usually executed in the round, fall into three, five or seven groups, according to the size of the whole. As examples to illustrate this exposition we take the two pediments of the temple at Olympia, the most complete which have come down to us, which are represented in figs. 33 and 34. The east pediment represents the preparation for the chariot race between Pelops and Oenomaus. The central group consists of five figures, Zeus standing between the two pairs of competitors and their wives. In the corners recline the two river-gods Alpheus and Cladeus, who mark the locality; and the two sides are filled up with the closely corresponding groups of the chariots of Oenomaus and Pelops with their grooms and attendants. Every figure to the left of Zeus balances a corresponding figure on his right, and all the lines of the composition slope towards a point above the apex of the pediment.

In the opposite or western pediment is represented the battle between Lapiths and Centaurs which broke out at the marriage of Peirithous in Thessaly. Here we have no less than nine groups. In the midst is Apollo. On each side of him is a group of three, a centaur trying to carry off a woman and a Lapith striking at him. Beyond these on each side is a struggling pair, next once more a trio of two combatants and a woman, and finally in each corner two reclining female figures, the outermost apparently nymphs to mark locality. A careful examination of these compositions will show the reader more clearly than detailed description how clearly in this kind of group Greek artists adhered to the rules of rhythm and of balance.

The metopes were the long series of square spaces which ran along the outer walls of temples between the upright triglyphs and the cornice. Originally they may have been left open and served as windows; but the custom came in as early as the 7th century, first of filling them in with painted boards or slabs of stone, and next of adorning them with sculpture. The metopes of the Treasury of Sicyon at Delphi (Plate IV. fig. 66) are as early as the first half of the 6th century. This recurrence of a long series of square fields for occupation well suited the genius and the habits of the sculptor. As subjects he took the successive exploits of some hero such as Heracles or Theseus, or the contemporary groups of a battle. His number of figures was limited to two or three, and these figures had to be worked into a group or scheme, the main features of which were determined by artistic tradition, but which could be varied in a hundred ways so as to produce a pleasing and in some degree novel result.

With metopes, as regards shape, we may compare the reliefs of Greek tombs, which also usually occupy a space roughly square, and which also comprise but a few figures arranged in a scheme generally traditional. A figure standing giving his hand to one seated, two men standing hand in hand, or a single figure in some vigorous pose is sufficient to satisfy the simple but severe taste of the Greeks.

In regard to friezes, which are long reliefs containing figures ranged between parallel lines, there is more variety of custom. In temples the height of the relief from the background varies according to the light in which it was to stand, whether direct or diffused. Almost all Greek friezes, however, are of great simplicity in arrangement and perspective. Locality is at most hinted at by a few stones or trees, never actually portrayed. There is seldom more than one line of figures, in combat or procession, their heads all equidistant from the top line of the frieze. They are often broken up into groups; and when this is the case, figure will often balance figure on either side of a central point almost as rigidly as in a pediment. An example of this will be found in the section of the Mausoleum frieze shown in fig. 70, Plate IV. Some of the friezes executed by Greek artists for semi-Greek peoples, such as those adorning the tomb at Trysa in Lycia, have two planes, the figures in the background being at a higher level.

The rules of balance and symmetry in composition which are followed in Greek decorative art are still more to be discerned in the paintings of vases, which must serve, in the absence of more dignified compositions, to enlighten us as to the methods of Greek painters. Great painters would not, of course, be bound by architectonic rule in the same degree as the mere workmen who painted vases. Nevertheless we must never forget that

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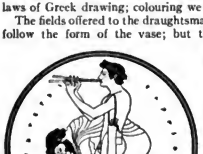
Greek painting of the earlier ages was of extreme simplicity. It did not represent localities, save by some slight hint; it had next to no perspective; the colours used were but very few even down to the days of Apelles. Most of the great pictures of which we hear consisted of but one or two figures; and when several figures were introduced they were kept apart and separately treated, though, of course, not without relation to one another. Idealism and ethical purpose must have predominated in painting as in sculpture and in the drama and in the writing of history.

We will take from vases a few simple groups to illustrate the laws of Greek drawing; colouring we cannot illustrate.

The fields offered to the draughtsman on Greek vases naturally follow the form of the vase; but they may be set down as approximately round, square or oblong. To each of these spaces the artist carefully adapts his designs. In fig. 1 we have a characteristic adaptation to circular form by the vase painter Epictetus.



(*Brit. Mus. Catalogue of Vases*, iii. Pl. vi. 2).

FIG. 1.—Kylix by Epictetus.

In the early period of painting all the space not occupied by the figures is filled with patterns or accessories, or even animals which have no connexion with the subject (fig. 9). In later and more developed art, as in this example, the outlines of the figures are so arranged as to fill the space.

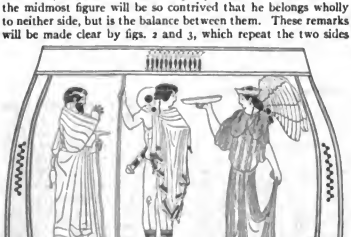
When the space is square we have much the same problem as is presented by the metope spaces of a temple. In the case of both square and oblong fields the laws of balance are carefully observed. Thus if there is an even number of figures in the scheme, two of them will form a sort of centre-piece, those on either side balancing one another. If the number of figures is uneven, either there will be a group of three in the midst, or the midmost figure will be so contrived that he belongs wholly to neither side, but is the balance between them. These remarks will be made clear by figs. 2 and 3, which repeat the two sides of an amphora, one of which bears a design of three figures, the other of four.

The Greek artist not only adhered to the architectonic laws of balance and symmetry, but he thought in schemes. Certain group arrangements had a recognized signification. There are schemes for warriors fighting on equal terms, and schemes which represent the defeat of one of these by the other; the vanquished has commonly fallen on his knees, but still defends himself. There is a scheme for the leading away of a captive woman; the captor leads her by the hand looking back at her, while a friend walks behind to ward off pursuit. Such schemes are constantly varied in detail, and often very skilfully varied; but the Greek artist uses schemes as a sort of shorthand, to show as clearly as possible what he meant. They serve the same purpose as the mask in the acting of a play, the first glance at which will tell the spectators what they have to look for.

No doubt the great painters of Greece were not so much under the dominion of these schemes as the very inferior painters of vases. They used the schemes for their own purposes instead of being used by them. But as great poets do not revolt against the restrictions of the sonnet or of rhyme, so great artists in Greece probably found recognized conventions more helpful than hurtful.

Students of Greek sculpture and vases must be warned not to suppose that Greek reliefs and drawings can be taken as direct illustrations of Homer or the dramatists. Book illustration in the modern sense did not exist in Greece. The poet and the painter pursued courses which were parallel, but never in actual contact. Each moved by the traditions of his own craft. The poet took the accepted tale and enshrined it in a setting of feeling and imagination. The painter took the traditional schemes which were current, and altered or enlarged them, adding new figures and new motives, but not attempting to set aside the general scheme. But varieties suitable to poetry were not likely to be suitable in painting. Thus it is but seldom that a vase-painter seems to have had in his mind, as he drew, passages of the Homeric poems, though these might well be familiar to him. And almost never does a vase-painting of the 5th century show any sign of the influence of the dramatists, who were bringing before the Athenian public on the stage many of the tales and incidents popular with the vase-painter. Only on vases of lower Italy of the 4th century and later we can occasionally discern something of Aeschylean and Euripidean influence in the treatment of a myth; and even in a few cases we may discern that the vase-painter has taken suggestions direct from the actors in the theatre.

3. *Historic Sketch.*—We propose next to trace in brief outline the history of Greek art from its rise to its decay. We begin with the rise of a national art, after the destruction of the Minoan and Mycenaean civilizations of early Greece by the irruption of tribes from the north, that is to say, about 800 B.C., and we stop with the Roman age of Greece, after which Greek art works in the service of the conquerors (see ROMAN ART). The period 800–50 B.C. we divide into four sections: (1) the period down to the Persian Wars, 800–480 B.C.; (2) the period



From *Wiener Vorlegeblätter*, 1890, Pl. viii., by permission of the Director of the *K. K. Österr. Archäol. Institut*.

FIG. 2. Vase Drawings. FIG. 3.

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of the early schools of art, 480–400 B.C.; (3) the period of the later great schools, 400–300 B.C.; (4) the period of Hellenistic art, 300–50 B.C. In dealing with these successive periods we confine our sketch to the three greater branches of representative art, architecture, sculpture and painting, which in Greece are closely connected. The lesser arts, of pottery, gem-engraving, coin-stamping and the like, are treated of under the heads of CERAMICS, GEM, NUMISMATICS, &c., while the more technical treatment of architectural construction are dealt with under ARCHITECTURE and allied architectural articles. Further, for brief accounts of the chief artists the reader is referred to biographical articles, under such heads as PHEIDIAS, PRAXITELES, APELLES. We treat here only of the main course of art in its historic evolution.

Period I. 800–480 B.C.—The fact is now generally allowed that the Mycenaean, or as it is now termed Aegean, civilization was for the most part destroyed by an invasion from the north. This invasion appears to have been gradual; its racial character is much in dispute. Archaeological evidence abundantly proves that it was the conquest of a more by a less rich and civilized race. In the graves of the period (900–600 B.C.) we find none of the wealthy spoil which has made celebrated the tombs of Mycenae and Vaphio(*q.v.*). The character of the pottery and the bronze-work which is found in these later graves reminds us of the art of the necropolis of Hallstatt in Austria, and other sites belonging to what is called the bronze age of North Europe. Its predominant characteristic is the use of geometrical forms, the lozenge, the triangle, the maeander, the circle with tangents, in place of the elaborate spirals and plant-forms which mark Mycenaean ware. For this reason the period from the 9th to the 7th century in Greece passes by the name of "the Geometric Age." It is commonly held that in the remains of the Geometric Age we may trace the influence of the Dorians, who, coming in as a hardy but uncultivated race, probably of purer Aryan blood than the previous inhabitants of Greece, not only brought to an end the wealth and the luxury which marked the Mycenaean age, but also replaced an art which was in character essentially southern by one which belonged rather to the north and the west. The great difficulty inherent in this view, a difficulty which has yet to be met, lies in the fact that some of the most abundant and characteristic remains of the geometric age which we possess come, not from Peloponnesus, but from Athens and Boeotia, which were never conquered by the Dorians.

Northern invasion.

The geometric ware is for the most part adorned with painted patterns only. Fig. 4 is a characteristic example, a small two-handled vase from Rhodes in the Ashmolean Museum, the adornment of which consists in zigzags, circles with tangents, and lines of water birds, perhaps swans. Sometimes, however, especially in the case of large vases from the cemetery at Athens, which adjoins the Dipylon gate, scenes from Greek life are depicted, from daily life, not from legend or divine myth. Especially scenes from the lying-in-state and the burial of the dead are prevalent. An excerpt from a Dipylon vase (fig. 5) shows a dead man on his couch surrounded by mourners, male and female. Both sexes are apparently represented naked, and are distinguished very simply; some of them hold branches to sprinkle the corpse or to keep away flies. It will be seen how primitive and conventional is the drawing of this age, presenting a wonderful contrast to the free drawing and modelling of the Mycenaean age. In the same graves with the pottery are sometimes found plaques of gold or bronze, and towards the end of the geometric age these somtimes bear scenes from mythology, treated with the greatest simplicity.

Geometric ware.

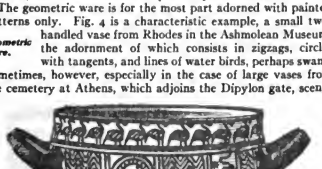

FIG. 4.—Geometric Vase from Rhodes. (Ashmolean Museum.)

Mon. d. Inst. ix. 30.

FIG. 5.—Corpse with Mourners.

For example, in the museum of Berlin are the contents of a tomb found at Corinth, consisting mainly of gold work of geometric decoration. But in the same tomb were also found gold plates or plaques of repoussé work bearing subjects from Greek

Arch. Zeit. 1884, 8.

FIG. 6.—Gold Plaques: Corinth.

legend. Two of these are shown in fig. 6. On one Theseus is slaying the Minotaur, while Ariadne stands by and encourages the hero. The tale could not have been told in a simpler or more straightforward way. On the other we have an armed warrior with his charioteer in a chariot drawn by two horses. The treatment of the human body is here more advanced than on the vases of the Dipylon. On the site of Olympia, where Mycenaean remains are not found, but the earliest monuments show the geometric style, a quantity of dedications in bronze have been found, the decoration of which belongs to this style. Fig. 7 shows the handle of a tripod from Olympia, which is adorned with geometric patterns and surmounted by the figure of a horse.

Olympia iv. 33.

FIG. 7.—Handle of Tripod.

It was about the 6th century that the genius of the Greeks, almost suddenly, as it seems to us, emancipated itself from the thraldom of tradition, and passed beyond the limits with which the nations of the east and west had hitherto been content, in a free and bold effort towards the ideal. Thus the 6th century marks

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the stage in art in which it may be said to have become definitely Hellenic. The Greeks still borrowed many of their decorative forms, either from the prehistoric remains in their own country or, through Phoenician agency, from the old-world empires of Egypt and Babylon, but they used those forms freely to express their own meaning. And gradually, in the course of the century, we see both in the painting of vases and in sculpture a national spirit and a national style forming under the influence of Greek religion and mythology, Greek athletic training, Greek worship of beauty. We must here lay emphasis on the fact, which is sometimes overlooked in an age which is greatly given to the Darwinian search after origins, that it is one thing to trace back to its original sources the nascent art of Greece, and quite another thing to follow and to understand its gradual embodiment of Hellenic ideas and civilization. The immense success with which the veil has in late years been lifted from the prehistoric age of Greece, and the clearness with which we can discern the various strands woven into the web of Greek art, have tended to fix our attention rather on what Greece possessed in common with all other peoples at the same early stage of civilization than on what Greece added for herself to this common stock. In many respects the art of Greece is incomparable—one of the great inspirations which have redeemed the world from mediocrity and vulgarity. And it is the searching out and appreciation of this unique and ideal beauty in all its phases, in idea and composition and execution, which is the true task of Greek archaeological science.

In very recent years it has been possible, for the first time, to trace the influence of Ionian painting, as represented by vases, on the rise of art. The discoveries at Naucratis and Daphnae in Egypt, due to the keenness and pertinacity of W. M. Flinders Petrie, threw new light on this matter. It became evident that when those cities were first inhabited by Ionian Greeks, in the 7th century, they used pottery of several distinct but allied styles, the most notable feature of which was the use of the lotus in decoration, the presence of continuous friezes of animals and of monsters, and the filling up of the background with rosettes, lozenges and other forms. Fig. 8 shows a vase found in Rhodes which illustrates this Ionian decoration. The sphinx, the deer and the swan are prominent on it, the last-named serving as a link between the geometric ware and the more brilliant and varied ware of the Ionian cities. The assignment of the many species of early Ionic ware to various Greek localities, Miletus, Samos, Phocaea and other cities, is a work of great difficulty, which now closely occupies the attention of archaeologists. For the results of their studies the reader is referred to two recent German works, Böhlau's *Aus ionischen und italischen Nekropolen*, and Endt's *Beiträge zur ionischen Vasenmalerei*. The feature which is most interesting in this pottery from our present point of view is the way in which representations of Greek myth and legend gradually make their way, and relegate the mere decoration of the vases to borders and neck. One of the earliest examples of representation of a really Greek subject is the contest of Menelaus and Euphorbus on a plate found in Rhodes. On the vases of Melos, of the 7th century, which are, however, not Ionian, but rather Dorian in character, we have a certain number of mythological scenes, battles of Homeric heroes and the like. One of these is shown in fig. 9. It represents Apollo in a chariot drawn by winged horses, playing on the lyre, and accompanied by a pair of Muses, meeting his sister Artemis. It is notable that Apollo is bearded, and that Artemis holds her stag by the horns, much in the manner of the deities on Babylonian cylinders; in the other hand she carries an arrow; above is a line of water birds.

Ionian vases.

Mus. Napolen. 57.

FIG. 8.—Jug from Rhodes.

Some sites in Asia Minor and the islands adjoining, such cities as Samos, Camirus in Rhodes, and the Ionian colonies on the

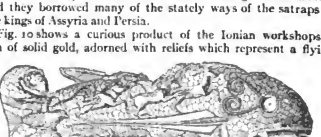
Conze, Mel. Tongefässe, 4.

FIG. 9.—Vase Painting: Melos.

Black Sea, have furnished us with a mass of ware of the Ionian class, but it seldom bears interesting subjects; it is essentially decorative. For Ionian ware which has closer relation to Greek mythology and history we must turn elsewhere. The cemeteries of the great Etruscan cities, Caere in particular, have preserved for us a large number of vases, which are now generally recognized as Ionian in design and drawing, though they may in some cases be only Italian imitations of Ionian imported ware. Thus has been filled up what was a blank page in the history of early Greek art. The Ionian painting is unrestrained in character, characterized by a licence not foreign to the nature of the race, and wants the self-control and moderation which belong to Doric art, and to Attic art after the first.

Some of the most interesting examples of early Ionic painting are found on the sarcophagi of Clazomenae. In that city in archaic times an exceptional custom prevailed of burying the dead in great coffins of terra-cotta adorned with painted scenes from chariot-racing, war and the chase. The British Museum possesses some remarkable specimens, which are published in A. S. Murray's *Terra-Cotta Sarcophagi of the British Museum*. On one of them he sees depicted a battle between Cimmerian invaders and Greeks, the former accompanied to the field by their great war-dogs. In some of the representations of hunting on these sarcophagi the hunters ride in chariots, a way of hunting quite foreign to the Greeks, but familiar to us from Assyrian wall-sculptures. We know that the life of the Ionians before the Persian conquest was refined and not untinged with luxury, and they borrowed many of the stately ways of the satraps of the kings of Assyria and Persia.

Fig. 10 shows a curious product of the Ionian workshops, a fish of solid gold, adorned with reliefs which represent a flying



Furtwängler, Goldfund v. Vettersfelde.

FIG. 10.—Fish of Gold.

eagle, lions pulling down their prey, and a monstrous sea-god among his fishes. This relic is the more valuable on account of the spot where it was found—Vettersfelde in Brandenburg. It

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Photo, Giraudon.

FIG. 61.—WINGED VICTORY OF SAMOTHRACE. (LOUVRE.)

FIG. 63.—HEAD OF WARRIOR, RESTORED, FROM TEGEA.

Photo, Giraudon

FIG. 62.—WINGED VICTORY OF SAMOTHRACE. (LOUVRE.)

Photo, Anderson.

FIG. 64.—MARSYAS OF MYRON. (LATERAN MUS.)

Photo, Mansell.

FIG. 65.—EAST PEDIMENT OF THE PARTHENON; LEFT AND RIGHT ENDS. (BRIT. MUS.)

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FIG. 66.—METOPE OF THE TREASURY OF SICYON AT DELPHI.
(From *Fouilles de Delphes*, by permission of A. Fontemoing.)

FIG. 67.—GREEK PAINTING OF WOMAN'S HEAD.
(From *Comptes Rendus* of St. Petersburg, 1865. Pl. I.)

Photo, F. Bruckmann.
FIG. 68.—DISCOBOLUS OF MYRON, RESTORED BY PROF. FURTWÄNGLER.

Photo, Giraudon.
FIG. 69.—FIGHTER OF AGASIAS. (LOUVRE.)

Photo, Mansell.
FIG. 70.—PORTION OF FRIEZE OF MAUSOLEUM. (BRIT. MUS.)

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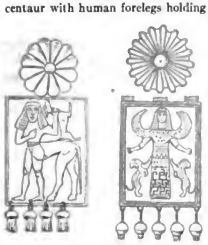
furnishes a proof that the influence and perhaps the commerce of the Greek colonies on the Black Sea spread far to the north through the countries of the Scythians and other barbarians. The fish dates from the 6th century B.C.

We may compare some of the gold ornaments from Camirus in Rhodes, which show an Ionian tendency, perhaps combined with Phoenician elements. On one of them (fig. 11) we see a centaur with human forelegs holding up a fawn, on the other the oriental goddess whom the Greeks identified with their Artemis, winged, and flanked by lions. This form was given to Artemis on the Corinthian chest of Cypselus, a work of art preserved at Olympia, and carefully described for us by Pausanias.



Brit. Mus.

FIG. 11.—Gold Ornaments from Camirus.

From Ionia the style of vase-painting which has been called by various names, but may best be termed the "orientalizing," spread to Greece proper. Its main home here was in Corinth; and small Corinthian unguent-vases bearing figures of swans, lions, monsters and human beings, the intervals between which are filled by rosettes, are found wherever Corinthian trade penetrated, notably in the cemeteries of Sicily. For the larger Corinthian vases, which bore more elaborate scenes from mythology, we must again turn to the graves of the cities of Etruria. Here, besides the Ionian ware, of which mention has already been made, we find pottery of three Greek cities clearly defined, that of Corinth, that of Chalcis in Euboea, and that of Athens. Corinthian and Chalcidian ware is most readily distinguished by means of the alphabets used in the inscriptions which have distinctive forms easily to be identified. Whether in the style of the paintings coming from the various cities any distinct differences may be traced is a far more difficult question, into which we cannot now enter. The subjects are mostly from heroic legend, and are treated with great simplicity and directness. There is a manly vigour about them which distinguishes them at a glance from the laxer works of Ionian style. Fig. 12 shows a group from a Chalcidian vase, which represents the conflict

Mon. d. Inst. I. 51.

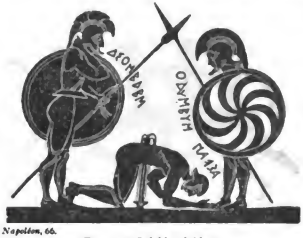
FIG. 12.—Fight over the Body of Achilles.

over the dead body of Achilles. The corpse of the hero lies in the midst, the arrow in his heel. The Trojan Glaucus tries to draw away the body by means of a rope tied round the ankle, but in doing so is transfixed by the spear of Ajax, who charges under the protection of the goddess Athena. Paris on the Trojan side shoots an arrow at Ajax.

In fig. 13, from a Corinthian vase, Ajax falls on his sword in the presence of his colleagues, Odysseus and Diomedes. The short stature of Odysseus is a well-known Homeric feature. These vases are black-figured; the heroes are painted in silhouette on the red ground of the vases. Their names are appended in archaic Greek letters.

The early history of vase-painting at Athens is complicated. It was only by degrees that the geometric style gave way to, or developed into, what is known as the black-figured style. It would seem that until the age of Peisistratus Athens was not notable in the world of art, and nothing could be ruder than some of the vases of Athens in the 7th century,

Athens.



Mus. Napoleon, 66.

FIG. 13.—Suicide of Ajax.

for example that here figured, on one side of which are represented the winged Harpies (fig. 14) and on the other Perseus accompanied by Athena flying from the pursuit of the Gorgons. This vase retains in its decoration some features of geometric style; but the lotus and rosette, the lion and sphinx which appear on it, belong to the wave of Ionian influence. Although it involves a departure from strict chronological order, it will be well here to follow the course of development in pottery at Athens until the end of our period. Neighbouring cities, and especially Corinth, seem to have exercised a strong influence at Athens about the

Arch. Zeit. 1881, 9.

FIG. 14.—Harpies: Attic Vase.

7th century. We have even a class of vases called by archaeologists Corintho-Attic. But in the course of the 6th century there is formed at Athens a distinct and marked black-figured style. The most remarkable example of this ware is the so-called François vase at Munich, by Clitias and Ergotimus, which contains, in most careful and precise rendering, a number of scenes from Greek myth. One of these vases is dated, since it bears the name and the figure of Callias in his chariot (*Mon. dell' Inst.* iii. 45), and this Callias won a victory at Olympia in 564 B.C. Fig. 15 shows the reverse of a somewhat later black-figured vase of the Panathenaic class, given at Athens as a prize to the winner of a foot-race at the Panathenaea, with the foot-race (*stadion*) represented on it. A large number of Athenian vases of the 6th century have reached us, which bear the signatures of the potters who made, or the artists who painted them; lists of these will be found in the useful work of Klein, *Griechische Vasen mit Meistersignaturen*. The recent excavations on the

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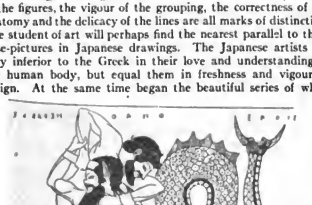
Acropolis have proved the erroneousness of the view, strongly maintained by Brunn, that the mass of the black-figured vases were of a late and imitative fabric. We now know that, with a few exceptions, vases of this class are not later than the early part of the 5th century. The same excavations have also proved that red-figured vase-painting, that is, vase-painting in which the background was blocked out with black, and the figures left in the natural colour of the vase originated at Athens in the last quarter of the 6th century. We cannot here give a

Mon. d. Inst. x. 48 m.

FIG. 15.—Foot-race: Panathenaic Vase.

detailed account of the beautiful series of Athenian vases of this fabric. Many of the finest of them are in the British Museum. As an example, fig. 16 presents a group by the painter Pamphaeus, representing Heracles wrestling with the river-monster Achelous, which belongs to the age of the Persian Wars. The clear precision of the figures, the vigour of the grouping, the correctness of the anatomy and the delicacy of the lines are all marks of distinction. The student of art will perhaps find the nearest parallel to these vase-pictures in Japanese drawings. The Japanese artists are very inferior to the Greek in their love and understanding of the human body, but equal them in freshness and vigour of design. At the same time began the beautiful series of white



Wiener Vorlegeblätter, D. 6.

FIG. 16.—Heracles and Achelous.

vases made at Athens for the purpose of burial with the dead, and found in great quantities in the cemeteries of Athens, of Eretria, of Gela in Sicily, and of some other cities. They are well represented in the British Museum and that of Oxford.

We now return to the early years of the 6th century, and proceed to trace, by the aid of recent discoveries, the rise of architecture and sculpture. The Greek temple in its character and form gives the clue to the whole character of Greek art. It is the abode of the deity, who is represented by his sacred image; and the flat surfaces of the temple offer a great field to the sculptor for the depicting of sacred legend. The process of discovery has emphasized the line which divides Ionian from Dorian architecture and art. We will speak first of the temples and the sculpture of Ionia. The Ionians were a people far more susceptible than were the Dorians to oriental influences. The dress, the art, the luxury of western Asia attracted them with irresistible force. We may suspect, as Brunn has suggested, that Ionian artists worked in the great Assyrian and Persian palaces, and that the reliefs which adorn the walls of those palaces were in part their handiwork. Some of the great temples of Ionia have been excavated in recent years, notably those of Apollo at Miletus, of Hera at Samos, and of Artemis at Ephesus. Very little, however, of the architecture of the 6th-century temples of those sites has been recovered. Quite recently, however, the French excavators at Delphi have successfully restored the treasury of the people of Cnidus, which is quite a gem of Ionic style, the entablature being supported in front not by pillars but by two maidens or Corae, and a frieze running all round the building above. But though this building is of

Delphi.

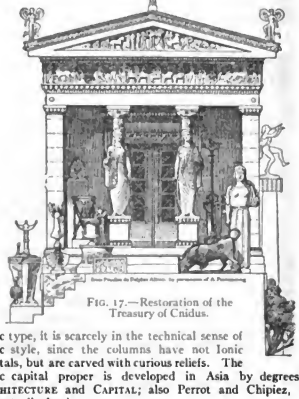


FIG. 17.—Restoration of the Treasury of Cnidus.

Ionic type, it is scarcely in the technical sense of Ionic style, since the columns have not Ionic capitals, but are carved with curious reliefs. The Ionic capital proper is developed in Asia by degrees (see ARCHITECTURE and CAPITAL; also Perrot and Chipiez, *Hist. de l'art*, vii. ch. 4).

The Doric temple is not wholly of European origin. One of the earliest examples is the old temple of Assus in Troas. Yet it was developed mainly in Hellas and the west. The most ancient example is the Heraeum at Olympia, next to which come the fragmentary temples of Corinth and of Selinus in Sicily. With the early Doric temple we are familiar from examples which have survived in fair preservation to our own days at Agrigentum in Sicily, Paestum in Italy, and other sites.

Of the decorative sculpture which adorned these early temples we have more extensive remains than we have of actual construction. It will be best to speak of them under their districts. On the coast of Asia Minor, the most extensive series of archaic decorative sculptures which has come down to us is that which adorned the temple of Assus (fig. 18). These were placed in a unique position on the temple, a long frieze running along the entablature, with representations of wild animals, of centaurs, of Hercules seizing Achelous, and of men feasting, scene succeeding scene without much order or method. The only figures from Miletus which can be considered as belonging to the original temple destroyed by Darius, are the dedicated seated statues, some of which, brought away by Sir Charles Newton, are now preserved at the British Museum. At Ephesus Mr Wood has been more successful, and has recovered considerable fragments

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of the temple of Artemis, to which, as Herodotus tells us, Croesus presented many columns. The lower part of one of these columns, bearing figures in relief of early Ionian style, has been put together at the British Museum; and remains of inscriptions recording the presentation by Croesus are still to be traced. Reliefs from a cornice of somewhat later date are also to be found at the British Museum. Among the Aegean islands,

From Perrot and Chipiez, vii. pl. 35, by permission of Chapman and Hall, Ltd., and Hachette & Co.

FIG. 18.—Restoration of the Temple at Assus.

Delos has furnished us with the most important remains of early art. French excavators have there found a very early statue of a woman dedicated by one Nicandra to Artemis, a figure which may be instructively compared with another from Samus, dedicated to Hera by Cheramues. The Delian statue is in shape like a flat beam; the Samian, which is headless, is like a round tree. The arms of the Delian figure are rigid to the sides; the Samian lady has one arm clasped to her breast. A great improvement on these helpless and inexpressive figures is marked by another figure found at Delos, and connected, though perhaps incorrectly, with a basis recording the execution of a statue by Archermus and Micciades, two sculptors who stood, in the middle of the 6th century, at the head of a sculptural school at Chios. The representation (fig. 19) is of a running or flying figure, having six wings, like the seraphim in the vision of

FIG. 19.—Nikē of Delos, restored.

Isaiah, and clad in long drapery. It may be a statue of Nike or Victory, who it said to have been represented in winged form by Archermus. The figure, with its neatness and precision of work, its expressive face and strong outlines, certainly marks great progress in the art of sculpture. When we examine the early sculpture of Athens, we find reason to think that the Chian school had great influence in that city in the days of Peisistratus.

At Athens, in the age 650–480, we may trace two quite distinct periods of architecture and sculpture. In the earlier of the two periods, a rough limestone was used alike for the walls and the sculptural decoration of temples; in the later period it was superseded by marble, whether native or imported. Every visitor to the museum of the Athenian acropolis stands astonished at the recently recovered groups which decorated the pediments of Athenian temple-

Athenian sculpture.

Athen. Mitteil. x. 237.

FIG. 20.—Athenian Pediment: Heracles and Hydra.

before the age of Peisistratus—groups of large size, rudely cut in soft stone, of primitive workmanship, and painted with bright red, blue and green, in a fashion which makes no attempt to follow nature, but only to produce a vivid result. The two largest in scale of these groups seem to have belonged to the pediments of the early 6th-century temple of Athena. On other smaller pediments, perhaps belonging to shrines of Heracles and Dionysus, we have conflicts of Heracles with Triton or with other monstrous foes. It is notable how fond the Athenian artists of this early time are of exaggerated muscles and of monstrous forms, which combine the limbs of men and of animals; the measure and moderation which mark developed Greek art are as completely absent as are skill in execution or power of grouping. Fig. 20 shows a small pediment in which appears in relief

Athen. Mitteil. xxii. 3.

FIG. 21.—Pediment: Athena and Giant.

the slaying of the Lernaean hydra by Heracles. The hero strikes at the many-headed water-snake, somewhat inappropriately, with his club. Iolaus, his usual companion, holds the reins of the chariot which awaits Heracles after his victory. On the extreme left a huge crab comes to the aid of the hydra.

There can be little doubt that Athens owed its great start in art to the influence of the court of Peisistratus, at which artists of all kinds were welcome. We can trace a gradual transformation in sculpture, in which the influence of the Chian and other progressive schools of sculpture is visible, not only in the substitution of island marble for native stone, but in increased grace and truth to nature, in the toning down of glaring colour, and the appearance of taste in composition. A transition

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between the older and the newer is furnished by the well-known statue of the calf-bearer, an Athenian preparing to sacrifice a calf to the deities, which is made of marble of Hymettus, and in robust clumsiness of forms is not far removed from the lime-stone pediments. The sacrificer has been commonly spoken of as Hermes or Theseus, but he seems rather to be an ordinary human votary.

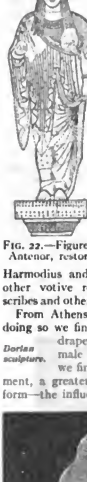

FIG. 22.—Figure by Antenor, restored.

In the time of Peisistratus or his sons a peristyle of columns was added to the old temple of Athena; and this necessitated the preparation of fresh pediments. These were of marble. In one of them was represented the battle between gods and giants; in the midst Athena herself striking at a prostrate foe (fig. 21). In these figures no eye can fail to trace remarkable progress. On about the same level of art are the charming statues dedicated to Athena, which were set up in the latter half of the 6th century in the Acropolis, whose graceful though conventional forms and delicate colouring make them one of the great attractions of the Acropolis Museum. We show a figure (fig. 22) which, if it be rightly connected with the basis on which it stands, is the work of the sculptor Antenor, who was also author of a celebrated group representing the tyrant-slayers, Harmodius and Aristogiton. To the same age belong many other votive reliefs of the Acropolis, representing horsemen, scribes and other votaries of Athena.

From Athens we pass to the seats of Dorian art. And in doing so we find a complete change of character. In place of draped goddesses and female figures, we find nude male forms. In place of Ionian softness and elegance, we find hard, rigid outlines, strong muscular development, a greater love of and faithfulness to the actual human form—the influence of the palaestra rather than of the harem.

Dorian sculpture.

FIG. 23.—Bust from Crete.

To the known series of archaic male figures, recent years have added many examples. We may especially mention a series of figures from the temple of Apollo Ptoos in Boeotia, probably representing the god himself. Still more noteworthy are two colossal nude figures of Apollo, remarkable both for force and for rudeness, found at Delphi, the inscriptions of which prove them to be the work of an Argive sculptor. (Plate V. fig. 76.) From Crete we have acquired the upper part of a draped figure (fig. 23), whether male or female is not certain, which should be an example of the early Daedalid school, whence the art of Peloponnesus was derived; but we can scarcely venture to treat it as a characteristic product of that school; rather the likeness to the dedication of Nicandra is striking.

Another remarkable piece of Athenian sculpture, of the time of the Persian Wars, is the group of the tyrannicides Harmodius and Aristogiton, set up by the people of Athens, and made by the sculptors Critius and Nesiotes. These figures were hard and rigid in outline, but showing some progress in the treatment of the nude. Copies are preserved in the museum of Naples (Plate I. fig. 50). It should be observed that one of the heads does not belong.

Next in importance to Athens, as a find-spot for works of early Greek art, ranks Olympia. Olympia, however, did not suffer like Athens from sudden violence, and the explorations there have brought to light a continuous series of remains, beginning with the bronze tripods of the geometric age already mentioned and ending at the barbarian invasions of the 4th century A.D. Notable among the 6th-century stone-sculpture of Olympia are the pediment of the treasury of the people of Megara, in which is represented a battle of gods and giants, and a huge rude head of Hera (fig. 24), which seems to be part of the image worshipped in the Heraeum. Its flatness and want of style are noteworthy. Among the temples of Greece proper the Heraeum of Olympia stands almost alone for antiquity and interest, its chief rival, besides the temples of Athens, being the other temple of Hera at Argos. It appears to have been originally constructed of wood, for which stone was by slow degrees, part by part, substituted. In the time of Pausanias one of the pillars was still of oak, and at the present day the varying diameter of the columns and other structural irregularities bear witness to the process of constant renewal which must have taken place. The early small bronzes of Olympia form an important series, figures of deities standing or striding, warriors in their armour, athletes with exaggerated muscles, and women draped in the Ionian fashion, which did not become unpopular in Greece until after the Persian Wars. Excavations at Sparta have revealed interesting monuments belonging to the worship of ancestors, which seems in the conservative Dorian states of Greece to have been more strongly developed than elsewhere. On some of these stones, which doubtless belonged to the family cults of Sparta, we see the ancestor seated holding a wine-cup, accompanied by his faithful horse or dog; on some we see the ancestor and ancestress seated side by side (fig. 25), ready to receive the gifts of their descendants, who appear in the corner of the relief on a much smaller scale. The male figure holds a wine-cup, in allusion to the libations of wine made at the tomb. The female figure holds her veil and the pomegranate, the recognized food of the dead. A huge serpent stands erect behind the pair. The style of these sculptures is as striking as the subjects; we see lean, rigid

Olympia, Sparta, Sellasia.

FIG. 24.—Head of Hera: Olympia.

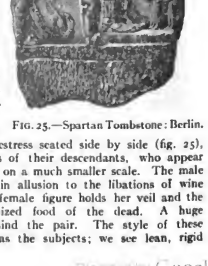

FIG. 25.—Spartan Tombstone: Berlin.

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From a Cast.

FIG. 71.—APHRODITE OF CNIDUS. (VATICAN.)

Photo, Anderson.

FIG. 72.—BRONZE BOXER OF TERME. (ROME.)

FIG. 73.—BRONZE OF CERIGOTTO. (ATHENS.) Found in the sea near Cythera.

FIG. 74.—AGIAS AT DELPHI. (From *Fouilles de Delphes*, by permission of A. Fontemoing.)

FIG. 75.—CORA (KORÉ) OF ERECHTHEUM. (ATHENS.)

FIG. 76.—APOLLO AT DELPHI. (From *Fouilles de Delphes*, by permission of A. Fontemoing.)

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Photo, Giraudon.

FIG. 77.—APHRODITE OF MELOS. (LOUVRE.)

Photo, Alinari.

FIG. 78.—NIOBE AND HER YOUNGEST DAUGHTER. (FLORENCE.)

Photo, Anderson.

FIG. 79.—APOXYOMENUS. (VATICAN.)

Photo, Brogi.

FIG. 80.—DORYPHORUS OF POLYCLITUS. (NAT. MUS., NAPLES.)

Photo, Alinari

FIG. 81.—ANTIOCH SEATED ON A ROCK. (VATICAN.)

Photo, English Photographic Co.

FIG. 82.—HERMES OF PRAXITELES. (OLYMPIA.)

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forms with severe outline carved in a very low relief, the surface of which is not rounded but flat. The name of Selinus in Sicily, an early Megarian colony, has long been associated with some of the most curious of early sculptures, the metopes of ancient temples, representing the exploits of Heracles and of Perseus. Even more archaic metopes have in recent years been brought to light, one representing a seated sphinx, one the journey of Europa over the sea on the back of the amorous bull (fig. 26), a pair of dolphins swimming beside her. In simplicity and in rudeness of work these reliefs remind us of the limestone pediments of Athens (fig. 20), but yet they are of another and a severer style; the Ionian laxity is wanting.

Delphi.

The recent French excavations at Delphi add a new and important chapter to the history of 6th-century art. Of three treasure-houses, those of Sicyon, Cnidus and Athens, the sculptural adornments have been in great part recovered. These sculptures form a series almost covering the century 570–470 B.C., and include representations of some myths of which we have hitherto had no example. We may say here a few words as to the sculpture which has been discovered, leaving to the article DELPHI an account of the topography and the buildings of the sacred site. Of the archaic temple of Apollo, built as Herodotus tells us by the Alcmaeonidae of Athens, the only sculptural remains which have come down to us are some fragments of the pedimental figures. Of the treasuries which contained the offerings of the pious at Delphi, the most archaic of which there are remains is that belonging to the people of Sicyon. To it appertain a set of exceedingly primitive metopes. One represents Idas and Dioscuri driving off cattle (Plate IV. fig. 66); another, the ship Argo; another, Europa on the bull, others merely animals, a ram or a boar. The treasury of the people of Cnidus (or perhaps Siphnos) is in style some half a century later (see fig. 17). To it belongs a long frieze representing a variety of curious subjects: a battle, perhaps between Greeks and Trojans, with gods and goddesses looking on; a gigantomachy in which the figures of Poseidon, Athena, Hera, Apollo, Artemis and Cybele can be made out, with their opponents, who are armed like Greek hoplites; Athena and Heracles in a chariot; the carrying off of the daughters of Leucippus by Castor and Pollux; Aeolus holding the winds in sacks. The Treasury of the Athenians, erected at the time of the Persian Wars, was adorned with metopes of singularly clear-cut and beautiful style, but very fragmentary, representing the deeds of Heracles and Theseus.

FIG. 26.—Metope: Europa on Bull: Palermo.

We have yet to speak of the most interesting and important of all Greek archaic sculptures, the pediments of the temple at Aegina (*q.v.*). These groups of nude athletes fighting over the corpses of their comrades are preserved at Munich, and are familiar to artists and students. But the very fruitful excavations of Professor Furtwängler have put them in quite a new light. Furtwängler (*Aegina: Heiligtum der Aphaia*) has entirely rearranged these pediments, in a way which removes the extreme simplicity and rigour of the composition, and introduces far greater variety of attitudes and motive. We repeat here these new arrangements (figs. 27 and 28), the reasons for which must be sought in Furtwängler's great publication. The individual figures are not much altered, as the restorations of Thorwaldsen, even when incorrect, have now a prescriptive right of which it is not easy to deprive them. Besides the pediments of Aegina must be set the remains of the pediments of the temple of Apollo at Eretria in Euboea, the chief group of which (Plate II. fig. 58), Theseus carrying off an Amazon, is one of the most finely executed works of early Greek art.

Aegina.

Period II. 480–400 B.C.—The most marvellous phenomenon in the whole history of art is the rapid progress made by Greece in painting and sculpture during the 5th century B.C. As in literature the 5th century takes us from the rude peasant plays of Thespis to the drama of Sophocles and Euripides; as in philosophy it takes us from Pythagoras to Socrates; so in sculpture it covers the space from the primitive works made for the Peisistratidae to some of the most perfect productions of the chisel.

In architecture the 5th century is ennobled by the Theseum, the Parthenon and the Erechtheum, the temples of Zeus at Olympia, of Apollo at Phigalia, and many other central shrines, as well as by the Hall of the Mystae at Eleusis and the Propylaea of the Acropolis. Some of the most important of the Greek temples of Italy and Sicily, such as those of Segesta and Selinus, date from the same age. It is, however, only of their sculptural decorations, carried out by the greatest masters in Greece, that we need here treat in any detail.

Architecture.

It is the rule in the history of art that innovations and technical progress are shown earlier in the case of painting than in that of sculpture, a fact easily explained by the greater ease and rapidity of the brush compared with the chisel. That this was the order of development in Greek art cannot be doubted. But our means for judging of the painting of the 5th century are very slight. The noble paintings of such masters as Polygnotus, Micon and Panaenus, which once adorned the walls of the great porticoes of Athens and Delphi, have disappeared. There remain only the designs drawn rather than painted on the beautiful vases of the age, which in some degree help us to realize, not the colouring or the charm of contemporary

Painting.

FIG. 27.—Restoration of West Pediment, Aegina.

FIG. 28.—Restoration of East Pediment, Aegina.

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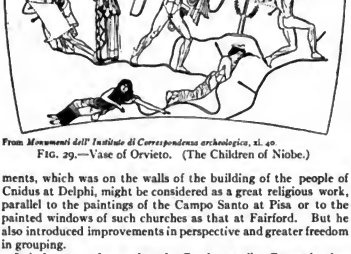
paintings, but the principle of their composition and the accuracy of their drawing.

Polygnotus of Thasos was regarded by his compatriots as a great ethical painter. His colouring and composition were alike very simple, his figures quiet and statuesque, his drawing careful and precise. He won his fame largely by incorporating in his works the best current ideas as to mythology, religion and morals. In particular his painting of Hades with its rewards and punish-

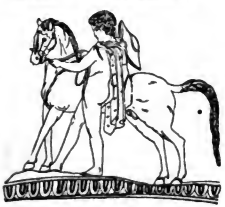


From *Monumenti dell' Instituto di Correspondenza archeologica*, xi. 40.

FIG. 29.—Vase of Orvieto. (The Children of Niobe.)

ments, which was on the walls of the building of the people of Cnidus at Delphi, might be considered as a great religious work, parallel to the paintings of the Campo Santo at Pisa or to the painted windows of such churches as that at Fairford. But he also introduced improvements in perspective and greater freedom in grouping.

It is fortunate for us that the Greek traveller Pausanias has left us very careful and detailed descriptions of some of the most important of the frescoes of Polygnotus, notably of the Taking of Troy and the Visit to Hades, which were at Delphi. A comparison of these descriptions with vase paintings of the middle of the 5th century has enabled us to discern with great probability the principles of Polygnotan drawing and perspective. Professor Robert has even ventured to restore the paintings on the evidence of vases. We here represent one of the scenes depicted on a vase found at Orvieto (fig. 29), which is certainly Polygnotan in character. It represents the slaying of the children of Niobe by Apollo and Artemis. Here we may observe a remarkable perspective. The different heights of the rocky background are represented by lines traversing the picture on which the figures stand; but the more distant figures are no smaller than the nearer. The forests of Mount Sipylus are represented by a single conventional tree. The figures are beautifully drawn, and full of charm; but there is a want of energy in the action.



Arch. Zeit. 1878, pl. 12.

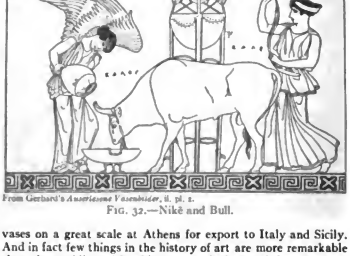
FIG. 30.—Vase Drawing

There can be little doubt that the school of Polygnotus exercised great influence on contemporary sculpture. Panaenus, brother of Pheidias, worked with Polygnotus, and many of the groupings found in the sculptures of the Parthenon remind us of those usual with the Thasian master. At this simple and early stage of art there was no essential difference between fresco-painting and coloured relief, light and shade and aerial perspective being unknown. We reproduce two vase-paintings, one (fig. 30) a group of man and horse which closely resembles figures in the Panathenaic frieze of the Parthenon (fig. 31); the other (fig. 32) representing Victory pouring water for a sacrificial ox to drink, which reminds us of the balustrade of the shrine of Wingless Victory at Athens.

Most writers on Greek painting have supposed that after the middle of the 5th century the technique of painting rapidly improved. This may well have been the case; but we have little means of testing the question. Such improvements would soon raise such a barrier between fresco-painting and vase-painting,—which by its very nature must be simple and architectonic,—that vases can no longer be used with confidence as evidence for contemporary painting. The stories told us by Pliny of the lives of Greek painters are mostly of a trivial and untrustworthy character. Some of them are mentioned in this *Encyclopaedia* under the names of individual artists. We can only discern a few general facts. Of Agatharchus of Athens we learn that he painted, under compulsion, the interior of the house of Alcibiades. And we are told that he painted a scene for the tragedies of Aeschylus or Sophocles. This has led some writers to suppose that he attempted illusive landscape; but this is contrary to the possibilities of the time; and it is fairly certain that what he really did was to paint the wooden front of the stage building in imitation of architecture; in fact he painted a permanent architectural background, and not one suited to any particular play. Of other painters who flourished at the end of the century, such as Zeuxis and Aristides, it will be best to speak under the next period.

FIG. 31.—Part of Frieze of the Parthenon.

It is now generally held, in consequence of evidence furnished by tombs, that the 5th century saw the end of the making of



From Gerhard's *Auserlesene Vasenbilder*, ii. pl. 1.

FIG. 32.—Nikè and Bull.

vases on a great scale at Athens for export to Italy and Sicily. And in fact few things in the history of art are more remarkable than the rapidity with which vase-painting at Athens reached its highest point and passed it on the downward road. At the beginning of the century black-figured ware was scarcely out of fashion, and the masters of the severe red-figured style, Pamphaeus, Epictetus and their contemporaries, were in vogue.

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The schools of Euphronius, Hiero and Duris belong to the age of the Persian wars. With the middle of the century the works of these makers are succeeded by unsigned vases of most beautiful design, some of them showing the influence of Polygnotus. In the later years of the century, when the empire of Athens was approaching its fall, drawing becomes laxer and more careless, and in the treatment of drapery we frequently note the over-elaboration of folds, the want of simplicity, which begin to mark contemporary sculpture. These changes of style can only be satisfactorily followed in the vase rooms of the British Museum, or other treasuries of Greek art (see also A. B. Walters, *History of Ancient Pottery*; and the article CERAMICS).

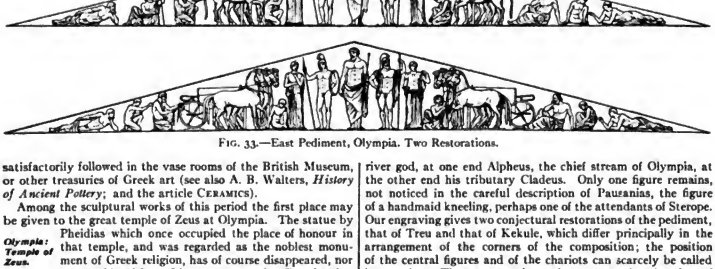

FIG. 33.—East Pediment, Olympia. Two Restorations.

Among the sculptural works of this period the first place may be given to the great temple of Zeus at Olympia. The statue by Pheidias which once occupied the place of honour in that temple, and was regarded as the noblest monument of Greek religion, has of course disappeared, nor are we able with confidence to restore it. But the plan of the temple, its pavement, some of its architectural ornaments, remain. The marbles which occupied the pediments and the metopes of the temple have been in large part recovered, having been probably thrown down by earthquakes and gradually buried in the alluvial soil. The utmost ingenuity and science of the archaeologists of Germany have been employed in the recovery of the composition of these groups; and although doubt remains as to the places of some figures, and their precise attitudes, yet we may fairly say that we know more about the sculpture of

Olympia: Temple of Zeus.

stood Zeus the supreme arbiter. On one side of him stood Oenomaüs with his wife Sterope, on the other Pelops and Hippodameia, the daughter of Oenomaüs, whose position at once indicates that she is on the side of the newcomer, whatever her parents may feel. Next on either side are the four-horse chariots of the two competitors, that of Oenomaüs in the charge of his perfidious groom Myrtilus, who contrived that it should break down in the running, that of Pelops tended by his grooms. At either end, where the pediment narrows to a point, reclines a river god, at one end Alpheus, the chief stream of Olympia, at the other end his tributary Cladeus. Only one figure remains, not noticed in the careful description of Pausanias, the figure of a handmaid kneeling, perhaps one of the attendants of Sterope. Our engraving gives two conjectural restorations of the pediment, that of Treu and that of Kekule, which differ principally in the arrangement of the corners of the composition; the position of the central figures and of the chariots can scarcely be called in question. The moment chosen is one, not of action, but of expectancy, perhaps of preparation for sacrifice. The arrangement is undeniably stiff and formal, and in the figures we note none of the trained perfection of style which belongs to the sculptures of the Parthenon, an almost contemporary temple. Faults abound, alike in the rendering of drapery and in the representation of the human forms, and the sculptor has evidently trusted to the painter who was afterwards to colour his work, to remedy some of his clumsiness, or to make clear the ambiguous. Nevertheless there is in the whole a dignity, a sobriety, and a simplicity, which reconcile us to the knowledge that this pediment was certainly regarded in antiquity as a noble work, fit to adorn even the palace of Zeus. In the other, the western pediment (fig. 34), the subject is the riot of the Centaurs when they attended the wedding of Peirithous in Thessaly, and, attempting to carry off the bride and her comrades, were slain by Peirithous and Theseus. In the midst of the pediment, invisible like Zeus in the eastern pediment, stands Apollo, while on either side of him Theseus and Peirithous attack the Centaurs with weapons hastily snatched. Our illustration gives two possible arrangements. The monsters are in various attitudes

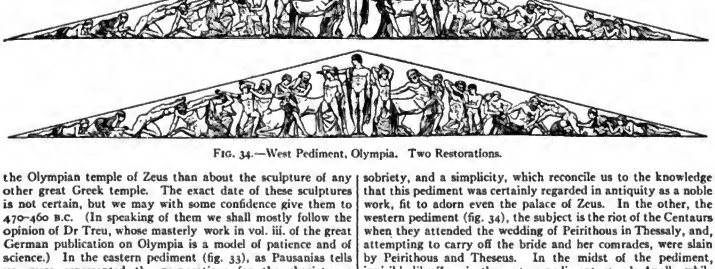

FIG. 34.—West Pediment, Olympia. Two Restorations.

the Olympian temple of Zeus than about the sculpture of any other great Greek temple. The exact date of these sculptures is not certain, but we may with some confidence give them to 470–460 B.C. (In speaking of them we shall mostly follow the opinion of Dr Treu, whose masterly work in vol. iii. of the great German publication on Olympia is a model of patience and of science.) In the eastern pediment (fig. 33), as Pausanias tells us, were represented the preparations for the chariot-race between Oenomaüs and Pelops, the result of which was to determine whether Pelops should find death or a bride and a kingdom. In the midst, invisible to the contending heroes,

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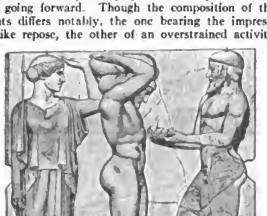
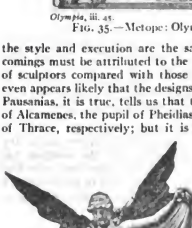
of attempted violence, of combat and defeat; with each grapples one of the Lapith heroes in the endeavour to rob them of their prey. In the corners of the pediment recline female figures, perhaps attendant slaves, though the farthest pair may best be identified as local Thessalian nymphs, looking on with the calmness of divine superiority, yet not wholly unconcerned in what is going forward. Though the composition of the two pediments differs notably, the one bearing the impress of a parade-like repose, the other of an overstrained activity, yet,



Olympia, iii. 45.
FIG. 35.—Metope: Olympia; restored.

the style and execution are the same in both, and the shortcomings must be attributed to the inferior skill of a local school of sculptors compared with those of Athens or of Aegina. It even appears likely that the designs also belong to a local school. Pausanias, it is true, tells us that the pediments were the work of Alcamenes, the pupil of Pheidias, and of Paeonius, a sculptor of Thrace, respectively; but it is almost certain that he was misled by the local guides, who would naturally be anxious to connect the sculptures of their great temple with well-known names.



Olympia, iii. 48.
FIG. 36.—Nikê of Paeonius; restored.

The metopes of the temple are in the same style of art as the pediments, but the defects of awkwardness and want of mastery are less conspicuous, because the narrow limits of the metope exclude any elaborate grouping. The subjects are provided by the twelve labours of Heracles; the figures introduced in each metope are but two or at most three; and the action is simplified as much as possible. The example shown (fig. 35) represents Heracles holding up the sky on a cushion, with the friendly aid of a Hesperid nymph, while Atlas, whom he has relieved of his usual burden, approaches bringing the apples which it was the task of Heracles to procure.

Another of the fruits of the excavations of Olympia is the floating Victory by Paeonius, unfortunately faceless (fig. 36), which was set up in all probability in memory of the victory of the Athenians and their Messenian allies at Sphacteria in 425 B.C. The inscription states that it was dedicated by the Messenians and people of Naupactus from the spoils of their enemies, but the name of the enemy is not mentioned in the inscription. The statue of Paeonius, which comes floating down through the air with drapery borne backward, is of a bold and innovating type, and we may trace its influence in many works of the next age.

Among the discoveries at Delphi none is so striking and valuable to us as the life-size statue in bronze of a charioteer holding in his hand the reins. This is maintained by M. Homolle to be part of a chariot-group set up by Polyzalus, brother of Gelo and Hiero of Syracuse, in honour of a victory won in the chariot-race at the Pythian games at Delphi (fig. 37). The charioteer is evidently a high-born youth, and is clad in the long chiton which was necessary to protect a driver of a chariot from the rush of air. The date would be about 480–470 B.C. Bronze groups representing victorious chariots with their drivers were among the noblest and most costly dedications of antiquity; the present figure is our only satisfactory representative of them. In style the figure is very notable, tall and slight beyond all contemporary examples. The contrast between the conventional decorousness of face and drapery and the lifelike accuracy of hands and

Delphic charioteer.

Mémoires, Piot, 1897, 10.
FIG. 37.—Bronze Charioteer: Delphi.

feet is very striking, and indicates the clashing of various tendencies in art at the time when the great style was formed in Greece.

The three great masters of the 5th century, Myron, Pheidias and Polyclitus are all in some degree known to us from their works. Of Myron we have copies of two works, the Marsyas (Plate III. fig. 64) and the Discobolus. The Marsyas (a copy in the Lateran Museum) represents the Satyr so named in the grasp of conflicting emotions, eager to pick up the flutes which Athena has thrown down, but at the same time dreading her displeasure if he does so. The Discobolus has usually been judged from the examples in the Vatican and the British Museum, in which the anatomy is modernized and the head wrongly put on. We have now photographs of the very superior replica in the Lancelotti gallery at Rome, the pose of which is much nearer to the original. Our illustration represents a restoration made at Munich, by combining the Lancelotti head with the Vatican body (Plate IV. fig. 68).

Of the works of Pheidias we have unfortunately no certain copy, if we except the small replicas at Athens of his Athena Parthenos. The larger of these (fig. 38) was found in 1880: it is very clumsy, and the wretched device by which a pillar is introduced to support the Victory in the hand of Athena can scarcely be supposed to have belonged to the great original. Tempting theories have been published by Furtwängler (*Masterpieces of Greek Sculpture*) and other archaeologists, which identify copies of the Athena Lemnia of Pheidias, his Pantarces,

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his Aphrodite Urania and other statues; but doubt hangs over all these attributions.

A more pertinent and more promising question is, how far we may take the decorative sculpture of the Parthenon, since Lord Elgin's time the pride of the British Museum, as the actual work of Pheidias, or as done from his designs. Here again we have no conclusive evidence; but it appears from the testimony of inscriptions that the pediments at all events were not executed until after Pheidias's death.

Of course the pediments and frieze of the Parthenon (*q.v.*), whose work soever they may be, stand at the head of all Greek decorative sculpture. Whether we regard the grace of the composition, the exquisite finish of the statues in the round, or the delightful atmosphere of poetry and religion which surrounds these sculptures, they rank among the masterpieces of the world. The Greeks esteemed them far below the statue which the temple was made to shelter; but to us, who have lost the great figure in ivory and gold, the carvings of the casket which once contained it are a perpetual source of instruction and delight. The whole is reproduced by photography in A. S. Murray's *Sculptures of the Parthenon*.

FIG. 38.—Statuette of Athena Parthenos.

An abundant literature has sprung up in regard to these sculptures in recent years. It will suffice here to mention the discussions in Furtwängler's *Masterpieces*, and the very ingenious attempts of Sauer to determine by a careful examination of the bases and backgrounds of the pediments as they now stand how the figures must have been arranged in them. The two ends of the eastern pediment (Plate III. fig. 65) are the only fairly well-preserved part of the pediments.

Among the pupils of Pheidias who may naturally be supposed to have worked on the sculptures of the Parthenon, the most notable were Alcamenes and Agoracritus. Some fragments remain of the great statue of Nemesis at Rhamnus by Agoracritus. And an interesting light has been thrown on Alcamenes by the discovery at Pergamum of a professed copy of his Hermes set up at the entrance to the Acropolis at Athens (Plate II. fig. 57). The style of this work, however, is conventional and archaistic, and we can scarcely regard it as typical of the master.

Another noted contemporary who was celebrated mainly for his portraits was Cresilas, a Cretan. Several copies of his portrait of Pericles exist, and testify to the lofty and idealizing style of portraiture in this great age.

We possess also admirable sculpture belonging to the other important temples of the Acropolis, the Erechtheum and the temple of Nike. The temple of Nike is the earlier, being possibly a memorial of the Spartan defeat at Sphacteria. The Erechtheum belongs to the end of our period, and embodies the delicacy and finish of the conservative school of sculpture at Athens just as the Parthenon illustrates the ideas of the more progressive school. The reconstruction of the Erechtheum has been a task which has long occupied the attention of archaeologists (see the paper by Mr Stevens in the *American Journal of Archaeology*, 1906). Our illustration (Plate V. fig. 75) shows one of the Corae or maidens who support the entablature of the south porch of the Erechtheum in her proper setting. This use of the female figure in place of a pillar is based on old Ionian precedent (see fig. 17) and is not altogether happy; but the idea is carried out with remarkable skill, the perfect repose and solid strength of the maiden being emphasized.

Beside Pheidias of Athens must be placed the greatest of early Argive sculptors, Polyclitus. His two typical athletes, the Doryphorus or spear-bearer (Plate VI. fig. 80) and the Diadumenus, have long been identified, and though the copies are not first-rate, they enable us to recover the principles of the master's art.

Among the bases discovered at Olympia, whence the statues had been removed, are three or four which bear the name of Polyclitus, and the definite evidence furnished by these bases as to the position of the feet of the statues which they once bore has enabled archaeologists, especially Professor Furtwängler, to identify copies of those statues among known works. Also newly discovered copies of Polyclitan works have made their appearance. At Delos there has been found a copy of the Diadumenus, which is of much finer work than the statue in the British Museum from Vaison. The Museum of Fine Arts at Boston, U.S.A., has secured a very beautiful statue of a young Hermes, who but for the wings on the temples might pass as a boy athlete of Polyclitan style (Plate II. fig. 60). In fact, instead of relying as regards the manner of Polyclitus on Roman copies of the Doryphorus and Diadumenus, we have quite a gallery of athletes, boys and men, who all claim relationship, nearer or more remote, to the school of the great Argive master. It might have been hoped that the excavations, made under the leadership of Professor Waldstein at the Argive Heraeum, would have enlightened us as to the style of Polyclitus. Just as the sculptures of the Parthenon are the best monument of Pheidias, so it might seem likely that the sculptural decoration of the great temple which contained the Hera of Polyclitus would show us at large how his school worked in marble. Unfortunately the fragments of sculpture from the Heraeum are few. The most remarkable is a female head, which may perhaps come from a pediment (fig. 39). But archaeologists are not in agreement whether it is in style Polyclitan or whether it rather resembles in style Attic works. Other heads and some highly-finished fragments of bodies come apparently from the metopes of the same temple. (See also article ARGOS.)

Polyclitus.

FIG. 39.—Female Head: Heraeum.

Another work of Polyclitus was his Amazon, made it is said in competition with his great contemporaries, Pheidias, Cresilas and Phradmon, all of whose Amazons were preserved in the great temple of Artemis at Ephesus. In our museums are many statues of Amazons representing 5th century originals. These have usually been largely restored, and it is no easy matter to discover their original type. Professor Michaelis has recovered

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successfully three types (fig. 40). The attribution of these is a matter of controversy. The first has been given to the chisel of Polyclitus; the second seems to represent the Wounded Amazon of Cresilas; the third has by some archaeologists been given to Pheidias. It does not represent a wounded amazon, but one alert, about to leap upon her horse with the help of a spear as a leaping pole.

We can devote little more than a passing mention to the sculpture of other temples and shrines of the later 5th century, *Lycia.* which nevertheless deserve careful study. The frieze from the temple of Apollo at Phigalia, representing Centaur and Amazon battles, is familiar to visitors of the British Museum, where, however, its proximity to the remains of the

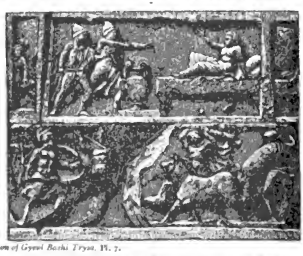
FIG. 40.—Types of Amazons (Michaelis.)

Parthenon lays stress upon the faults of grouping and execution which this frieze presents. It seems to have been executed by local Arcadian artists. More pleasing is the sculpture of the Ionic tomb called the Nereid monument, brought by Sir Charles Fellows from Lycia. Here we have not only a series of bands of relief which ran round the tomb, but also detached female figures, whence the name which it bears is derived. A recent view sees in these women with their fluttering drapery not nymphs of the sea, but personifications of sea-breezes.

The series of known Lycian tombs has been in recent years enriched through the acquisition by the museum of Vienna of the sculptured friezes which adorned a heroon near Geul Bashi. In the midst of the enclosure was a tomb, and the walls of the enclosure itself were adorned within and without with a great series of reliefs, mostly of mythologic purport. Many subjects which but rarely occur in early Greek art, the siege of Troy, the adventure of the Seven against Thebes, the carrying off of the daughters of Leucippus, Ulysses shooting down the Suitors, are here represented in detail. Professor Benndorf, who has published these sculptures in an admirable volume, is disposed to see in them the influence of the Thasian painter Polygnotus. Any one can see their kinship to painting, and their subjects recur in some of the great frescoes painted by Polygnotus, Micon and others for the Athenians. Like other Lycian sculptures, they contain non-Hellenic elements; in fact Lycia forms a link of the chain which extends from the wall-paintings of Assyria to works like the columns of Trajan and of Antoninus, but is not embodied in the more purely idealistic works of the highest Greek art. The date of the Vienna tomb is not much later than the middle of the 5th century. A small part of the frieze of this monument is shown in fig. 41. It will be seen that in this fragment there are two scenes, one directly above the other. In the upper line Ulysses, accompanied by his son Telemachus, is in the act of shooting the suitors, who are reclining at table in the midst of a feast; a cup-bearer, possibly Melanthius, is escaping by a door behind Ulysses. In the lower line is the central group of a frieze which represents the hunting of the Calydonian boar, which is represented, as is usual in the best time of Greek art, as an ordinary animal and no monster.

Archaeologists have recently begun to pay more attention to an interesting branch of Greek art which had until recently been neglected, that of sculptured portraits. The *Portraits.* known portraits of the 5th century now include Pericles, Herodotus, Thucydides, Anacreon, Sophocles, Euripides, Socrates and others. As might be expected in a time when style in sculpture was so strongly pronounced, these portraits, when not later unfaithful copies, are notably ideal. They represent the great men whom they portray not in the spirit of realism. Details are neglected, expression is not elaborated; the sculptor tries to represent what is permanent in his subject rather than what is temporary. Hence these portraits do not seem to belong to a particular time of life; they only represent a man in the perfection of physical force and mental energy. And the race or type is clearly shown through individual traits. In some cases it is still disputed whether statues of this age represent deities or mortals, so notable are the repose and dignity which even human figures acquire under the hands of 5th-century masters. The Pericles after Cresilas in the British Museum, and the athlete-portraits of Polyclitus, are good examples.

Period III. 400–300 B.C.—The high ideal level attained by Greek art at the end of the 5th century is maintained in the 4th. There cannot be any question of decay in it save at Athens, where undoubtedly the loss of religion and the decrease of national prosperity acted prejudicially. But in Peloponnesus the time was one of expansion; several new and important cities, such as Messene, Megalopolis and Mantinea, arose under the protection of Epaminondas. And in Asia the Greek cities were still prosperous and artistic, as were the cities of Italy and Sicily which kept their independence. On the whole we find during this age some diminution of the freshness and simplicity of art;



Heroon of Gyoul Bashi Trysa, N. 7.

FIG. 41.—Odysseus and Suitors; Hunting of Boar.

it works less in the service of the gods and more in that of private patrons; it becomes less ethical and more sentimental and emotional. On the other hand, there can be no doubt that technique both in painting and sculpture advanced with rapid strides; artists had a greater mastery of their materials, and ventured on a wider range of subject.

In the 4th century no new temples of importance rose at Athens; the Acropolis had taken its final form; but at Messene, Tegea, Epidaurus and elsewhere, very admirable buildings arose. The remains of the temple at Tegea are of wonderful beauty and finish; as are those of the theatre and the so-called *Tholus* of Epidaurus. In Asia Minor vast temples of the Ionic order arose, especially at Miletus and Ephesus. The colossal pillars of Miletus astonish the visitors to the Louvre; while the sculptured columns of Ephesus in the British Museum (Plate II. fig. 59) show a high level of artistic skill. The Mausoleum erected about 350 B.C. at Halicarnassus in memory of Mausolus, king of Caria, and adorned with sculpture by the most noted

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artists of the day, was reckoned one of the wonders of the world. It has been in part restored in the British Museum. Mr Oldfield's conjectural restoration, published in *Archaeologia* for 1805, though it has many rivals, surpasses them all in the lightness of the effect, and in close correspondence to the description by Pliny. We show a small part of the sculptural decoration, representing a battle between Greeks and Amazons (Plate IV. fig. 70), wherein the energy of the action and the careful balance of figure against figure are remarkable. We possess also the fine portraits of Mausolus himself and his wife Artemisia, which stood in or on the building, as well as part of a gigantic chariot with four horses which surmounted it.

Another architectural work of the 4th century, in its way a gem, is the structure set up at Athens by Lysicrates, in memory of a choragic victory. This still survives, though the reliefs with which it is adorned have suffered severely from the weather.

The 4th century is the brilliant period of ancient painting. It opens with the painters of the Asiatic School, Zeuxis and Parrhasius and Protogenes, with their contemporaries Nicias and Apollodorus of Athens, Timanthes of Sicyon or Cythnus, and

Nat. Mus., Naples.

FIG. 42.—Greek Drawing of Women playing at Knucklebones.

Euphranor of Corinth. It witnesses the rise of a great school at Sicyon, under Eupompus and Pamphilus, which was noted for its scientific character and the fineness of its drawing, and which culminated in Apelles, the painter of Alexander the Great, and probably the greatest master of the art in antiquity. To each of these painters a separate article is given, fixing their place in the history of the art. Of their paintings unfortunately we can form but a very inadequate notion. Vase-paintings, which in the 5th century give us some notion at least of contemporary drawing, are less careful in the 4th century. Now and then we find on them figures admirably designed, or successfully foreshortened; but these are rare occurrences. The art of the vase decorator has ceased to follow the methods and improvements of contemporary fresco painters, and is pursued as a mere branch of commerce.

But very few actual paintings of the age survive, and even these fragmentary remains have with time lost the freshness of their colouring; nor are they in any case the work of a noteworthy hand. We reproduce two examples. The first is from a stone of the vault of a Crimean grave (Plate IV. fig. 67). The date of the grave is fixed to the 4th century by ornaments found in it, among which was a gold coin of Alexander the Great. The representation is probably of Demeter or her priestess, her hair bound with poppies and other flowers. The original is of large size. The other illustration (fig. 42) represents the remains of a drawing on marble, representing a group of women playing knucklebones. It was found at Herculaneum. Though signed by one Alexander of Athens, who was probably a worker of the Roman age, Professor Robert is right in maintaining that Alexander only copied a design of the age of Zeuxis and Parrhasius. In fact the drawing and grouping is so closely like that of reliefs of about 400 B.C. that the drawing is of great historic value, though there be no colouring. Several other drawings of the same class have been found at Herculaneum, and on the walls of the Transtiberine Villa at Rome (now in the Terme Museum).

Until about the year 1880, our knowledge of the great Greek sculptors of the 4th century was derived mostly from the statements of ancient writers and from Roman copies, or what were supposed to be copies, of their works. We are now in a far more satisfactory position. We now possess an original work of Praxiteles, and sculptures executed under the immediate direction of, if not from the hand of, other great sculptors of that age—Scopas, Timotheus and others. Among all the discoveries made at Olympia, none has become so familiar to the artistic world as that of the Hermes of Praxiteles. It is the first time that we have become possessed of a first-rate Greek original by one of the greatest of sculptors. Hitherto almost all the statues in our museums have been either late copies of Greek works of art, or else the mere decorative sculpture of temples and tombs, which was by the ancients themselves but little regarded. But we can venture without misgiving to submit the new Hermes to the strictest examination, sure that in every line and touch we have the work of a great artist. This is more than we can say of any of the literary remains of antiquity—poem, play or oration. Hermes is represented by the sculptor (fig. 43 and Plate VI. fig. 82) in the act of carrying the young child Dionysus to the nymphs who were charged with his rearing. On the journey he pauses and amuses himself by holding out to the child-god a bunch of grapes, and watching his eagerness to grasp them. To the modern eye the child is not a success; only the latest art of Greece is at home in dealing with children. But the Hermes, strong without excessive muscular development, and graceful without leanness, is a model of physical formation, and his face expresses the perfection of health, natural endowment and sweet nature. The statue can scarcely be called a work of religious art in the modern or Christian sense of the word religious, but from the Greek point of view it is religious, as embodying the result of the harmonious development of all human faculties and life in accordance with nature.

Praxiteles.

Olympia, iii. 53.

FIG. 43.—Hermes of Praxiteles; restored.

The Hermes not only adds to our knowledge of Praxiteles, but also confirms the received views in regard to him. Already many works in galleries of sculpture had been identified as copies of statues of his school. Noteworthy among these are, the group at Munich representing Peace nursing the infant Wealth, from an original by Cephisodotus, father of Praxiteles; copies of the Cnidian Aphrodite of Praxiteles, especially one in the Vatican which is here illustrated (Plate V. fig. 71); copies of the Apollo slaying a lizard (Sauroctonus), of a Satyr (in the Capitol Museum), and others. These works, which are noted

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for their softness and charm, make us understand the saying of ancient critics that Praxiteles and Scopas were noted for the pathos of their works, as Pheidias and Polyclitus for the ethical quality of those they produced. But the pathos of Praxiteles is of a soft and dreamy character; there is no action, or next to none; and the emotions which he rouses are sentimental rather than passionate. Scopas, as we shall see, was of another mood. The discovery of the Hermes has naturally set archaeologists searching in the museums of Europe for other works which may from their likeness to it in various respects be set down as Praxitelean in character. In the case of many of the great sculptors of Greece—Strongylion, Silanion, Calamis and others—it is of little use to search for copies of their works, since we have little really trustworthy evidence on which to base our inquiries. But in the case of Praxiteles we really stand on a safe level. Naturally it is impossible in these pages to give any sketch of the results, some almost certain, some very doubtful, of the researches of archaeologists in quest of Praxitelean works. But we may mention a few works which have been claimed by good judges as coming from the master himself. Professor Brunn claimed as work of Praxiteles a torso of a satyr in the Louvre, in scheme identical with the well-known satyr of the Capitol. Professor Furtwängler puts in the same category a delicately beautiful head of Aphrodite at Petworth. And his translator, Mrs Strong, regards the Aberdeen head of a young man in the British Museum as the actual work of Praxiteles. Certainly this last head does not suffer when placed beside the Olympian head of Hermes. At Mantinea has been found a basis whereon stood a group of Latona and her two children, Apollo and Artemis, made by Praxiteles. This base bears reliefs representing the musical contest of Apollo and Marsyas, with the Muses as spectators, reliefs very pleasing in style, and quite in the manner of Attic artists of the 4th century. But of course we must not ascribe them to the hand of Praxiteles himself; great sculptors did not themselves execute the reliefs which adorned temples and other monuments, but reserved them for their pupils. Yet the graceful figures of the Muses of Mantinea suggest how much was due to Praxiteles in determining the tone and character of Athenian art in relief in the 4th century. Exactly the same style which marks them belongs also to a mass of sepulchral monuments at Athens, and such works as the Sidonian sarcophagus of the Mourning Women, to be presently mentioned.

Excavation on the site of the temple of Athena Alea at Tegea has resulted in the recovery of works of the school of Scopas. Pausanias tells us that Scopas was the architect of the temple, and so important in the case of a Greek temple is the sculptural decoration, that we can scarcely doubt that the sculpture also of the temple at Tegea was under the supervision of Scopas, especially as he was more noted as a sculptor than as an architect. In the pediments of the temple were represented two scenes from mythology, the hunting of the Calydonian boar and the combat between Achilles and Telephus. To one or other of these scenes belong several heads of local marble discovered on the spot, which are very striking from their extraordinary life and animation. Unfortunately they are so much injured that they can scarcely be made intelligible except by the help of restoration; we therefore engrave one of them, the helmeted head, as restored by a German sculptor (Plate III. fig. 63). The strong bony frame of this head, and its depth from front to back, are not less noteworthy than the parted lips and deeply set and strongly shaded eye; the latter features impart to the head a vividness of expression such as we have found in no previous work of Greek art, but which sets the key to the developments of art which take place in the Hellenistic age. A draped torso of Atalanta from the same pediment has been fitted to one of these heads. Hitherto Scopas was known to us, setting aside literary records, only as one of the sculptors who had worked at the Mausoleum. Ancient critics and travellers, however, bear ample testimony to his fame, and the wide range of his activity, which extended to northern Greece, Peloponnese and Asia Minor. His Maenads and his Tritons and other beings of the sea were much copied in antiquity. But perhaps he reached his highest level in statues such as that of Apollo as leader of the Muses, clad in long drapery.

Scopas.

The interesting precinct of Aesculapius at Epidaurus has furnished us with specimens of the style of an Athenian contemporary of Scopas, who worked with him on the Mausoleum. An inscription which records the sums spent on the temple of the Physician-god, informs us that the models for the sculptures of the pediments, and one set of acroteria or roof adornments, were the work of Timotheus. Of the pedimental figures and the acroteria considerable fragments have been recovered, and we may with confidence assume that at all events the models for these were by Timotheus. It is strange that the unsatisfactory arrangement whereby a noted sculptor makes models and some local workman the figures enlarged from those models, should have been tolerated by so artistic a people as the Greeks. The subjects of the pediments appear to have been the common ones of battles between Greek and Amazon and between Lapith and Centaur. We possess fragments of some of the Amazon figures, one of which, striking downwards at the enemy, is here shown (fig. 44). Their attitudes are vigorous and alert; but the work shows no delicacy of detail. Figures of Nereids riding on horses, which were found on the same site, may very probably be roof ornaments (acroteria) of the temple. We have also several figures of Victory, which probably were acroteria on some smaller temple, perhaps that of Artemis. A base found at Athens, sculptured with figures of horsemen in relief, bears the name of Bryaxis, and was probably made by a pupil of his. Probable conjecture assigns to Leochares the originals copied in the Ganymede of the Vatican, borne aloft by an eagle (Plate I. fig. 53) and the noble statue of Alexander the Great at Munich (see LEOCHARES). Thus we may fairly say that we are now acquainted with the work of all the great sculptors who worked on the Mausoleum—Scopas, Bryaxis, Leochares and Timotheus; and are in a far more advantageous position than were the archaeologists of 1880 for determining the artistic problems connected with that noblest of ancient tombs.

Timotheus, Bryaxis, Leochares.

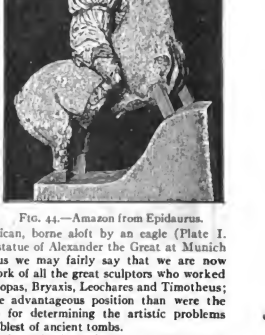

FIG. 44.—Amazon from Epidaurus.

Contemporary with the Athenian school of Praxiteles and Scopas was the great school of Argos and Sicyon, of which Lysippus was the most distinguished member. Lysippus continued the academic traditions of Polyclitus, but he was far bolder in his choice of subjects and more innovating in style. Gods, heroes and mortals alike found in him a sculptor who knew how to combine fine ideality with a vigorous actuality. He was at the height of his fame during Alexander's life, and the grandiose ambition of the great Macedonian found him ample employment, especially in the frequent representation of himself and his marshals.

We have none of the actual works of Lysippus; but our best evidence for his style will be found in the statue of Agias an athlete (Plate V. fig. 74) found at Delphi, and shown by an inscription to be a marble copy of a bronze original by Lysippus. The Apoxyomenus of the Vatican (man scraping himself with a strigil) (Plate VI. fig. 70) has hitherto been regarded as a copy from Lysippus; but of this there is no evidence, and the style of that statue belongs rather to the 3rd century than the 4th.

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The Agias, on the other hand, is in style contemporary with the works of 4th-century sculptors.

Of the elaborate groups of combatants with which Lysippus enriched such centres as Olympia and Delphi, or of the huge bronze statues which he erected in temples and shrines, we can form no adequate notion. Perhaps among the extant heads of Alexander the one which is most likely to preserve the style of Lysippus is the head from Alexandria in the British Museum (Plate II. fig. 56), though this was executed at a later time.

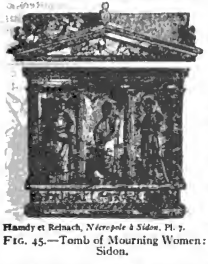
Many noted extant statues may be attributed with probability to the latter part of the 4th or the earlier part of the 3rd century. We will mention a few only. The celebrated group at Florence representing Niobe and her children falling before the arrows of Apollo and Artemis is certainly a work of the pathetic school, and may be by a pupil of Praxiteles. Niobe, in an agony of grief, which is in the marble tempered and idealized, tries to protect her youngest daughter from destruction (Plate VI. fig. 78). Whether the group can have originally been fitted into the gable of a temple is a matter of dispute.

Two great works preserved in the Louvre are so noted that it is but necessary to mention them, the Aphrodite of Melos (Plate VI. fig. 77), in which archaeologists are now disposed to see the influence of Scopas, and the Victory of Samothrace (Plate III. figs. 61 and 62), an original set up by Demetrius Poliorcetes after a naval victory won at Salamis in Cyprus in 306 B.C. over the fleet of Ptolemy, king of Egypt.

Nor can we pass over without notice two works so celebrated as the Apollo of the Belvidere in the Vatican (Plate II. fig. 55), and the Artemis of Versailles. The Apollo is now by most archaeologists regarded as probably a copy of a work of Leochares, to whose Ganymede it bears a superficial resemblance. The Artemis is regarded as possibly due to some artist of the same age. But it is by no means clear that we have the right to remove either of these figures from among the statues of the Hellenistic age. The old theory of Preller, which saw in them copies from a trophy set up to commemorate the repulse of the Gauls at Delphi in 278 B.C., has not lost its plausibility.

This may be the most appropriate place for mentioning the remarkable find made at Sidon in 1886 of a number of sarcophagi, which once doubtless contained the remains of kings of Sidon. They are now in the museum of Constantinople, and are admirably published by Hamdy Bey and T. Reinach (*Une Nécropole royale à Sidon*, 1892–1896). The sarcophagi in date cover a considerable period. The earlier are made on Egyptian models, the covers shaped roughly in the form of a human body or mummy. The later, however, are Greek in form, and are clearly the work of skilled Greek sculptors, who seem to have been employed by the grandees of Phoenicia in the adornment of their last resting-places. Four of these sarcophagi in particular claim attention, and in fact present us with examples of Greek art of the 5th and 4th centuries in several of its aspects. To the 5th century belong the tomb of the Satrap, the reliefs of which bring before us the activities and glories of some unknown king, and the Lycian sarcophagus, so called from its form, which resembles that of tombs found in Lycia, and which is also adorned with reliefs which have reference to the past deeds of the hero buried in the tomb, though these deeds are represented, not in the Oriental manner directly, but in the Greek manner, clad in mythological forms. To the 4th century belong two other sarcophagi. One of these is called the Tomb of Mourning Women. On all sides of it alike are ranged a series of beautiful female figures, separated by Ionic pillars, each in a somewhat different attitude, though all attitudes denoting grief (fig. 45). The pediments at the ends of the cover are also closely connected with the mourning for the loss of a friend and protector, which is the theme of the whole decoration of the sarcophagus. We see depicted in them the telling of the news of the death, with the results in the mournful attitude of the two seated figures. The mourning women must be taken, not as the representation of any persons in particular, but generally as the expression of the feeling of a city. Such figures are familiar to us in the art of the second Attic school; we could easily find parallels to the sarcophagus among the 4th-century sepulchral reliefs of Athens. We can scarcely be mistaken in attributing the workmanship of this beautiful sarcophagus to some sculptor trained in the school of Praxiteles. And it is a conjecture full of probability that it once contained the body of Strato, king of Sidon, who ruled about 380 B.C., and who was *proxenos* or public friend of the Athenians.

Sarcophagi of Sidon.



Hamdy et Reinach, *Nécropole à Sidon*, Pl. 7.

FIG. 45.—Tomb of Mourning Women: Sidon.

More celebrated is the astonishing tomb called that of Alexander, though there can be no doubt that, although it commemorates the victories and exploits of Alexander, it was made not to hold his remains, but those of some ruler of Sidon who was high in his favour. Among all the monuments of antiquity which have come down to us, none is more admirable than this, and none more characteristic of the Greek genius. We give, in two lines, the composition which adorned one of the sides of this sarcophagus. It represents a victory of Alexander, probably that of the Granicus (fig. 46). On the left we see the Macedonian king charging the Persian horse, on the right his general Parmenio, and in the midst a younger officer, perhaps Cleitus. Mingled with the chiefs are foot-soldiers, Greek and Macedonian, with whom the Persians are mingled in unequal fray. What most strikes the modern eye is the remarkable freshness and force of the action and the attitudes. Those, however, who have seen the originals have been specially impressed with the colouring, whereof, of course, our engraving gives no hint, but which is applied to the whole surface of the relief with equal skill and delicacy. There are other features in the relief on which a Greek eye would have dwelt with special pleasure—the exceedingly careful symmetry of the whole, the balancing of figure against figure, the skill with which the result of the battle is hinted rather than depicted. The composition is one in which the most careful planning and the most precise calculation are mingled with freedom of hand and expressiveness in detail. The faces in particular show more expression than would be tolerated in art of the previous century. We are unable as yet to assign an author or even a school to the sculptor of this sarcophagus; he comes to us as a new and striking phenomenon in the history of ancient art. The reliefs which adorn the other sides of the sarcophagus are almost equally interesting. On one side we see Alexander again, in the company of a Persian noble, hunting a lion. The short sides also show us scenes of fighting and hunting. In fact it can scarcely be doubted that if we had but a clue to the interpretation of the reliefs, they would be found to embody historic events of the end of the 4th century. There are but a few other works of art, such as the Bayeux tapestry and the Column of Trajan, which bring contemporary history so vividly before our eyes. The battles with the Persians represented in some of the sculpture of the Parthenon and the temple of Nike at Athens are treated conventionally and with no attempt at realism; but here the ideal and the actual are blended into a work of consummate art, which is at the same time, to those who can read the language of Greek art, a historic record. The portraits of Alexander the Great which appear on this sarcophagus are almost contemporary, and the most authentic likenesses of him which we possess. The great Macedonian exercised so strong an influence on contemporary art that a multitude of heads of the age, both of gods and men, and even the portraits of his successors, show traces of his type.

We have yet to mention what are among the most charming and the most characteristic products of the Greek chisel, the

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beautiful tombs, adorned with seated or standing portraits or with reliefs, which were erected in great numbers on all the main roads of Greece. A great number of these from the Dipylon cemetery are preserved in the Central Museum at Athens, and

Hamdy et Reinach. *Nécropole à Sidon*, Pl. 30.

FIG. 46.—Battle of The Granicus: Sarcophagus from Sidon.

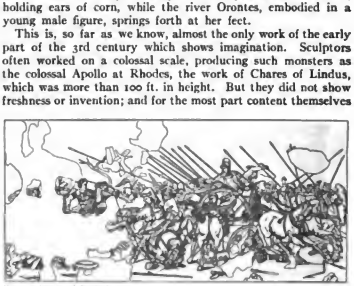
impress all visitors by the gentle sentiment and the charm of grouping which they display (Gardner, *Sculptured Tombs of Hellas*).

Period IV. 300–50 B.C.—There can be no question but that the period which followed the death of Alexander, commonly called the age of Hellenism, was one of great activity and expansion in architecture. The number of cities founded by himself and his immediate successors in Asia and Egypt was enormous. The remains of these cities have in a few cases (Ephesus, Pergamum, Assus, Priene, Alexandria) been partially excavated. But the adaptation of Greek architecture to the needs of the semi-Greek peoples included in the dominions of the kings of Egypt, Syria and Pergamum is too vast a subject for us to enter upon here (see ARCHITECTURE).

Painting during this age ceased to be religious. It was no longer for temples and public stoae that artists worked, but for private persons; especially they made frescoes for the decoration of the walls of houses, and panel pictures for galleries set up by rich patrons. The names of very few painters of the Hellenistic age have come down to us. There can be no doubt that the character of the art declined, and there were no longer produced great works to be the pride of cities, or to form an embodiment for all future time of the qualities of a deity or the circumstances of scenes mythical or historic. But at the same time the mural paintings of Pompeii and other works of the Roman age, which are usually more or less nearly derived from Hellenistic models, prove that in technical matters painting continued to progress. Colouring became more varied, groups more elaborate, perspective was worked out with greater accuracy, and imagination shook itself free from many of the conventions of early art. Pompeian painting, however, must be treated of under Roman, not under Greek art. We figure a single example, to show the elaboration of painting at Alexandria and elsewhere, the wonderful Pompeian mosaic (fig. 47), which represents the victory of Alexander at Issus. This work being in stone has preserved its colouring; and it stands at a far higher level of art than ordinary Pompeian paintings, which are the work of mere house-decorators. This on the contrary is certainly copied from the work of a great master. It is instructive to compare it with the sarcophagus illustrated in Fig. 46, which it excels in perspective and in the freedom of individual figures, though the composition is much less careful and precise. Alexander charges from the left (his portrait being the least successful part of the picture), and bears down a young Persian; Darius in his chariot flees towards the right; in the foreground a young knight is trying to manage a restive horse. It will be observed how very simple is the indication of locality: a few stones and a broken tree stand for rocks and woods.

Among the original sculptural creations of the early Hellenistic age, a prominent place is claimed by the statue of Fortune, typifying the city of Antioch (Plate VI. fig. 81), a work of Eutychides, a pupil of Lysippus. Of this we possess a small copy, which is sufficient to show how worthy of admiration was the original. We have a beautiful embodiment of the personality of the city, seated on a rock, holding ears of corn, while the river Orontes, embodied in a young male figure, springs forth at her feet.

This is, so far as we know, almost the only work of the early part of the 3rd century which shows imagination. Sculptors often worked on a colossal scale, producing such monsters as the colossal Apollo at Rhodes, the work of Chares of Lindus, which was more than 100 ft. in height. But they did not show freshness or invention; and for the most part content themselves



From a photograph by G. Brogi.

FIG. 47.—Mosaic of the Battle of Issus (Naples).

with varying the types produced in the great schools of the 4th century. The wealthy kings of Syria, Egypt and Asia Minor formed art galleries, and were lavish in their payments; but it has often been proved in the history of art that originality cannot be produced by mere expenditure.

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A great artist, whose date has been disputed, but who is now assigned to the Hellenistic age, Damophon of Messene, is known to us from his actual works. He set up in the shrine of the *Mistress* (Despoena) at Lycosura in Arcadia a great group of figures consisting of Despoena, Demeter, Artemis and the Titan Anytus. Three colossal heads found on the spot probably belong to the three last-mentioned deities. We illustrate the head of Anytus, with wild disordered hair and turbulent expression (fig. 48). Dr Dörpfeld has argued, on architectural grounds, that shrine and images alike must be given to a later time than the 4th century; and this judgment is now confirmed by inscriptional and other evidence.

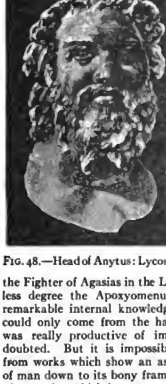

FIG. 48.—Head of Anytus: Lycosura.

In one important direction sculpture certainly made progress. Hitherto Greek sculptors had contented themselves with studying the human body whether in rest or motion, from outside. The dissection of the human body, with a consequent increase in knowledge of anatomy, became usual at Alexandria in the medical school which flourished under the Ptolemies. This improved anatomical knowledge soon reacted upon the art of sculpture. Works such as the Fighter of Agasias in the Louvre (Plate IV. fig. 69), and in a less degree the Apoxyomenus (Plate VI. fig. 70), display a remarkable internal knowledge of the human frame, such as could only come from the habit of dissection. Whether this was really productive of improvement in sculpture may be doubted. But it is impossible to withhold one's admiration from works which show an astonishing knowledge of the body of man down to its bony framework, and a power and mastery of execution which have never since been surpassed.

With accuracy in the portrayal of men's bodies goes of necessity a more naturalistic tendency in portraiture. As we have seen, the art of portraiture was at a high ideal level in the Pheidian age; and even in the age of Alexander the Great, notable men were rendered rather according to the idea than the fact. To a base and mechanical naturalism Greek art never at any time descended. But from 300 B.C. onwards we have a marvellous series of portraits which may be termed rather characteristic than ideal, which are very minute in their execution, and delight in laying emphasis on the havoc wrought by time and life on the faces of noteworthy men. Such are the portraits of Demosthenes, of Antisthenes, of Zeno and others, which exist in our galleries. And it was no long step from these actual portraits to the invention of characteristic types to represent the great men of a past generation, such as Homer and Lycurgus, or to form generic images to represent weatherbeaten fishermen or toothless old women.

Our knowledge of the art of the later Hellenistic age has received a great accession since 1875 through the systematic labours directed by the German Archaeological Institute, which have resulted in recovering the remains of Pergamum, the fortress-city which was the capital of the dynasty of the Philetaeri. Among the ancient buildings of Pergamum none was more ambitious in scale and striking in execution than the great altar used for sacrifices to Zeus, a monument supposed to be referred to in the phrase of the Apocalypse "where Satan's throne is." This altar, like many great sacrificial altars of later Greece, was a vast erection to which one mounted by many steps, and its outside was adorned with a frieze which represented on a gigantic scale, in the style of the 2nd century B.C., the battle between the gods and the giants. This enormous frieze (see PERGAMUM) is now one of the treasures of the Royal Museums of Berlin, and it cannot fail to impress visitors by the size of the figures, the energy of the action, and the strong vein of sentiment which pervades the whole, giving it a certain air of modernity, though the subject is strange to the Christian world. In early Greek art the giants where they oppose the gods are represented as men armed in full panoply, "in shining armour, holding long spears in their hands," to use the phrase in which Hesiod describes them. But in the Pergamene frieze the giants are strange compounds, having the heads and bodies of wild and fierce barbarians, sometimes also human legs, but sometimes in the place of legs two long serpents, the heads of which take with the giants themselves a share in the battle. Sometimes also they are winged. The gods appear in the forms which had been gradually made for them in the course of Greek history, but they are usually accompanied by the animals sacred to them in cultus, between which and the serpent-feet of the giants a weird combat goes on. We can conjecture the source whence the Pergamene artist derived the shaggy hair, the fierce expression, the huge muscles of his giants (fig. 49); probably these features came originally from the Galatians, who at the time had settled in Asia Minor, and were spreading the terror of their name and the report of their savage devastations through all Asia Minor. The victory over the giants clearly stands for the victory of Greek civilization over Gallic barbarism; and this meaning is made more emphatic because the gods are obviously inferior in physical force to their opponents, indeed, a large proportion of the divine combatants are goddesses. Yet everywhere the giants are overthrown, writhing in pain on the ground, or transfixed by the weapons of their opponents; everywhere the gods are victorious, yet in the victory retain much of their divine calm. The piecing together of the frieze at Berlin has been a labour of many years; it is now complete, and there is a special museum devoted to it. Some of the groups have become familiar to students from photographs, especially the group which represents Zeus slaying his enemies with thunderbolts, and the group wherein Athena seizes by the hair an overthrown opponent, who is winged, while Victory runs to crown her, and beneath is seen Gaia, the earth-goddess who is the mother of the giants, rising out of the ground, and mourning over her vanquished and tortured children. Another and smaller frieze which also decorated the altar-place gives us scenes from the history of Telephus, who opposed the landing of the army of Agamemnon in Asia Minor and was overthrown by Achilles. This frieze, which is quite fragmentary, is put together by Dr Schneider in the *Jahrbuch* of the German Archaeological Institute for 1900.

FIG. 49.—Giant from Great Altar: Pergamum.

Altar of Pergamum.

Since the Renaissance Rome has continually produced a crop of works of Greek art of all periods, partly originals brought from Greece by conquering generals, partly copies, such as the group at Rome formerly known as Paetus and Arria, and the overthrown giants and barbarians which came from the elaborate trophy set up by Attalus at Athens, of which copies exist in many museums. A noted work of kindred school is the group of Laocoon and his sons (Plate I. fig. 52), signed by Rhodian sculptors of the 1st century B.C., which has been perhaps more discussed than any work of the Greek chisel, and served as a peg

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for the aesthetic theories of Lessing and Goethe. In our days the histrionic and strained character of the group is regarded as greatly diminishing its interest, in spite of the astounding skill and knowledge of the human body shown by the artists. To the same school belong the late representations of Marsyas being flayed by the victorious Apollo (Plate II. fig. 54), a somewhat repulsive subject, chosen by the artists of this age as a means for displaying their accurate knowledge of anatomy.

Rome.

On what a scale some of the artists of Asia Minor would work is shown us by the enormous group, by Apollonius and Tauriscus of Tralles, which is called the Farnese Bull (Plate I. fig. 51), and which represents how Dirce was tied to a wild bull by her stepsons Zethus and Amphion.

The extensive excavations and alterations which have taken place at Rome in recent years have been very fruitful; the results may be found partly in the palace of the Conservatori on the Capitol, partly in the new museum of the Terme. Among recently found statues none excel in interest some bronzes of large size dating from the Hellenistic age. In the figure of a seated boxer (Plate V. fig. 72), in scale somewhat exceeding life, attitude and gesture are expressive. Evidently the boxer has fought already, and is awaiting a further conflict. His face is cut and swollen; on his hands are the terrible caestus, here made of leather, and not loaded with iron, like the caestus described by Virgil. The figure is of astounding force; but though the face is brutal and the expression savage, in the sweep of the limbs there is nobility, even ideal beauty. To the last the Greek artist could not set aside his admiration for physical perfection. Another bronze figure of more than life-size is that of a king of the Hellenistic age standing leaning on a spear. He is absolutely nude, like the athletes of Polyclitus. Another large bronze presents us with a Hellenistic type of Dionysus.

Besides the bronzes found in Rome we may set those recently found in the sea on the coast of Cythera, the contents of a ship sailing from Greece to Rome, and lost on the way. The date of these bronze statues has been disputed. In any case, even if executed in the Roman age, they go back to originals of the 5th and 4th centuries. The most noteworthy among them is a beautiful athlete (Plate V. fig. 73) standing with hand upraised, which reflects the style of the Attic school of the 4th century.

After 146 B.C. when Corinth was destroyed and Greece became a Roman province, Greek art, though by no means extinct, worked mainly in the employ of the Roman conquerors (see ROMAN ART).

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GREEK FIRE, the name applied to inflammable and destructive compositions used in warfare during the middle ages and particularly by the Byzantine Greeks at the sieges of Constantinople. The employment of liquid fire is represented on Assyrian bas-reliefs. At the siege of Plataea (429 B.C.) the Spartans attempted to burn the town by piling up against the walls wood saturated with pitch and sulphur and setting it on fire (Thuc. ii. 77), and at the siege of Delium (424 B.C.) a cauldron containing pitch, sulphur and burning charcoal, was placed against the walls and urged into flame by the aid of a bellows, the blast from which was conveyed through a hollow tree-trunk (Thuc. iv. 100). Aeneas Tacticus in the following century mentions a mixture of sulphur, pitch, charcoal, incense and tow, which was packed in wooden vessels and thrown lighted upon the decks of the enemy's ships. Later, as in receipts given by Vegetius (*c.* A.D. 350), naphtha or petroleum is added, and some nine centuries afterwards the same substances are found forming part of mixtures described in the later receipts (which probably date from the beginning of the 13th century) of the collection known as the *Liber ignium* of Marcus Graecus. In subsequent receipts saltpetre and turpentine make their appearance, and the modern "carcass composition," containing sulphur, tallow, rosin, turpentine, saltpetre and crude antimony, is a representative of the same class of mixtures, which became known to the Crusaders as Greek fire but were more usually called wildfire. Greek fire, properly so-called, was, however, of a somewhat different character. It is said that in the reign of Constantine Pogonatus (648–685) an architect named Callinicus, who had fled from Heliopolis in Syria to Constantinople, prepared a wet fire which was thrown out from siphons (τὸ διὰ τῶν σιφώνων ἐκφερόμενον πῦρ ὑγρόν), and that by its aid the ships of the Saracens were set on fire at Cyzicus and their defeat assured. The art of compounding this mixture, which is also referred to as πῦρ θαλάσσιον, or sea fire, was jealously guarded at Constantinople, and the possession of the secret on several occasions proved of great advantage to the city. The nature of the compound is somewhat obscure. It has been supposed that the novelty introduced by Callinicus was saltpetre, but this view involves the difficulty that that substance was apparently not known till the 13th century, even if it were capable of accounting for the properties attributed to the wet fire. Lieut.-Colonel H. W. L. Hime, after a close examination of the available evidence, concludes that what distinguished Greek fire from the other incendiaries of the period was the presence of quicklime, which was well known to give rise to a large development of heat when brought into contact with water. The mixture, then, was composed of such materials as sulphur and naphtha with

[1] The date is given when the work cannot be considered new.

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quicklime, and took fire spontaneously when wetted—whence the name of wet fire or sea fire; and portions of it were "projected and at the same time ignited by applying the hose of a water engine to the breech" of the siphon, which was a wooden tube, cased with bronze.

See Lieut.-Col. H. W. L. Hime, *Gunpowder and Ammunition, their Origin and Progress* (London, 1904).

GREEK INDEPENDENCE, WAR OF, the name given to the great rising of the Greek subjects of the sultan against the Ottoman domination, which began in 1821 and ended in 1833 with the establishment of the independent kingdom of Greece. The circumstances that led to the insurrection and the general diplomatic situation by which its fortunes were from time to time affected are described elsewhere (see GREECE: *History*; TURKEY: *History*). The present article is confined to a description of the general character and main events of the war itself. If we exclude the abortive invasion of the Danubian principalities by Prince Alexander Ypsilanti (March 1821), which collapsed ignominiously as soon as it was disavowed by the tsar, the theatre of the war was confined to continental Greece, the Morea, and the adjacent narrow seas. Its history may, broadly speaking, be divided into three periods: the first (1821–1824), during which the Greeks, aided by numerous volunteers from Europe, were successfully pitted against the sultan's forces alone; the second, from 1824, when the disciplined troops of Mehemet Ali, pasha of Egypt, turned the tide against the insurgents; the third, from the intervention of the European powers in the autumn of 1827 to the end.

When, on the 2nd of April 1821, Archbishop Germanos, head of the *Hetaeria* in the Morea, raised the standard of the cross at Kalavryta as the signal for a general rising of the Christian population, the circumstances were highly favourable. In the Morea itself, in spite of plentiful warning, the Turks were wholly unprepared; while the bulk of the Ottoman army, under the *serashier* Khurshid Pasha, was engaged in the long task of reducing the intrepid Ali, pasha of Iannina (see ALI, pasha of Iannina).

Another factor, and that the determining one, soon came to the aid of the Greeks. In warfare carried on in such a country as Greece, sea-girt and with a coast deeply indented, inland without roads and intersected with rugged mountains, victory—as Wellington was quick to observe—must rest with the side that has command of the sea. This was assured to the insurgents at the outset by the revolt of the maritime communities of the Greek archipelago. The Greeks of the islands had been accustomed from time immemorial to seafaring; their ships—some as large as frigates—were well armed, to guard against the Barbary pirates and rovers of their own kin; lastly, they had furnished the bulk of the sailors to the Ottoman navy which, now that this recruiting ground was closed, had to be manned hastily with impressed crews of dock-labourers and peasants, many of whom had never seen the sea. The Turkish fleet, "adrift in the Archipelago"—as the British seamen put it—though greatly superior in tonnage and weight of metal, could never be a match for the Greek brigs, manned as these were by trained, if not disciplined, crews.

The war was begun by the Greeks without definite plan and without any generally recognized leadership. The force with which Germanos marched from Kalavryta against Patras was composed of peasants armed with scythes, clubs and slings, among whom the "primates" exercised a somewhat honorary authority. The town itself was destroyed and those of its Mussulman inhabitants who could not escape into the citadel were massacred; but the citadel remained in the hands of the Turks till 1828. Meanwhile, in the south, leaders of another stamp had appeared: Petros, bey of the Maina (*q.v.*) chief of the Mavromichales, who at the head of his clan attacked Kalamata and put the Mussulman inhabitants to the sword; and Kolokotrones, a notable brigand once in the service of the Ionian government, who—fortified by a vision of the Virgin—captured Karytaena and slaughtered its infidel population. Encouraged by these successes the revolt spread rapidly; within three weeks there was not a Mussulman left in the open country, and the remnants of the once dominant class were closely besieged in the fortified towns by hosts of wild peasants and brigands. The flames of revolt now spread across the Isthmus of Corinth; early in April the Christians of Dervenokhoria rose, and the whole of Boeotia and Attica quickly followed suit; at the beginning of May the Mussulman inhabitants of Athens were blockaded in the Acropolis. In the Morea, meanwhile, a few Mussulman fortresses still held out: Coron, Modon, Navarino, Patras, Nauplia, Monemvasia, Tripolitsa. One by one they fell, and everywhere were repeated the same scenes of butchery. The horrors culminated in the capture of Tripolitsa, the capital of the vilayet. In September this was taken by storm; Kolokotrones rode in triumph to the citadel over streets carpeted with the dead; and the crowning triumph of the Cross was celebrated by a cold-blooded massacre of 2000 prisoners of all ages and both sexes. This completed the success of the insurrection in the Morea, where only Patras, Nauplia, and one or two lesser fortresses remained to the Turks.

Outbreak of the insurrection.

Meanwhile, north of the Isthmus, the fortunes of war had been less one-sided. In the west Khurshid's lieutenant, Omar Vrioni (a Mussulman Greek of the race of the Palaeologi), had inflicted a series of defeats on the insurgents, recaptured Levadia, and on the 30th of June relieved the Acropolis; but the rout of the troops which Mahommed Pasha was bringing to his aid by the Greeks in the defile of Mount Oeta, and the news of the fall of Tripolitsa, forced him to retreat, and the campaign of 1821 ended with the retirement of the Turks into Thessaly.

The month of April had witnessed the revolt of the principal Greek islands, Spetsae on the 7th, Psara on the 23rd, Hydra on the 28th and Samos on the 30th. Their fleets were divided into squadrons, of which one, under Tombazes, was deputed to watch for the entrance of the Ottomans into the archipelago, while the other under Andreas Miaoulis (*q.v.*) sailed to blockade Patras and watch the coasts of Epirus. At sea, as on land, the Greeks opened the campaign with hideous atrocities, almost their first exploit being the capture of a vessel carrying to Mecca the sheik-ul-Islam and his family, whom they murdered with every aggravation of outrage.

General character of the war.

These inauspicious beginnings, indeed, set the whole tone of the war, which was frankly one of mutual extermination. On both sides the combatants were barbarians, without discipline or competent organization. At sea the Greeks rapidly developed into mere pirates, and even Miaoulis, for all his high character and courage, was often unable to prevent his captains from sailing home at critical moments, when pay or booty failed. On land the presence of a few educated Phanariots, such as Demetrios Ypsilanti or Alexander Mavrocordato, was powerless to inspire the rude hordes with any sense of order or of humanity in warfare; while every lull in the fighting, due to a temporary check to the Turks, was the signal for internecine conflicts due to the rivalry of leaders who, with rare exceptions, thought more of their personal power and profit than of the cause of Greece.

Turkish reprisals.

This cause, indeed, was helped more by the impolitic reprisals of the Turks than by the heroism of the insurgents. All Europe stood aghast at the news of the execution of the Patriarch Gregorios of Constantinople (April 22, 1821) and the wholesale massacres that followed, culminating as these did in the extermination of the prosperous community of Scio (Chios) in March 1822. The cause of Greece was now that of Christendom, of the Catholic and Protestant West, as of the Orthodox East. European Liberalism, too, gagged and fettered under Metternich's "system," recognized in the Greeks the champions of its own cause; while even conservative statesmen, schooled in the memories of ancient Hellas, saw in the struggle a fight of civilization against barbarism. This latter belief, which was, moreover, flattering to their vanity, the Greek leaders were astute enough to foster; the propaganda of Adamantios Coraës (*q.v.*) had done its

Europe and the rising Philhellenism.

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work; and wily brigands, like Odysseus of Ithaka, assuming the style and trappings of antiquity, posed as the champions of classic culture against the barbarian. All Europe, then, hailed with joy the exploit of Constantine Kanaris, who on the night of June 18–19 succeeded in steering a fire-ship among the Turkish squadron off Scio, and burned the flag-ship of the capudan-pasha with 3000 souls on board.

Meanwhile Sultan Mahmud, now wide awake to the danger, had been preparing for a systematic effort to suppress the rising. The threatened breach with Russia had been avoided by Metternich's influence on the tsar Alexander; the death of Ali of Iannina had set free the army of Khurshid Pasha, who now, as *seraskier* of Rumelia, was charged with the task of reducing the Morea. In the spring of 1822 two Turkish armies advanced southwards: one, under Omar Vrioni, along the coast of Western Hellas, the other, under Ali, pasha of Drama (Dramali), through Boeotia and Attica. Omar was held in check by the mud ramparts of Missolonghi; but Dramali, after exacting fearful vengeance for the massacre of the Turkish garrison of the Acropolis at Athens, crossed the Isthmus and with the over-confidence of a conquering barbarian advanced to the relief of the hard-pressed garrison of Nauplia. He crossed the perilous defile of Dervenaki unopposed; and at the news of his approach most of the members of the Greek government assembled at Argos fled in panic terror. Demetrios Ypsilanti, however, with a few hundred men joined the Mainote Karayanni in the castle of Larissa, which crowns the acropolis of ancient Argos. This held Dramali in check, and gave Kolokotrones time to collect an army. The Turks, in the absence of the fleet which was to have brought them supplies, were forced to retreat (August 6); the Greeks, inspired with new courage, awaited them in the pass of Dervenaki, where the undisciplined Ottoman host, thrown into confusion by an avalanche of boulders hurled upon them, was annihilated. In Western Greece the campaign had an outcome scarcely less disastrous for the Turks. The death of Ali of Iannina had been followed by the suppression of the insurgent Suliotes and the advance of Omar Vrioni southwards to Missolonghi; but the town held out gallantly, a Turkish surprise attack, on the 6th of January 1823, was beaten off, and Omar Vrioni had to abandon the siege and retire northwards to Makrynoros.

Expedition of Dramali, 1822.

The victorious outcome of the year's fighting had a disastrous effect upon the Greeks. Their victories had been due mainly to the guerilla tactics of the leaders of the type of Kolokotrones; Mavrocordato, whose character and antecedents had marked him out as the natural head of the new Greek state, in spite of his successful defence of Missolonghi, had been discredited by failures elsewhere; and the Greeks thus learned to despise their civilized advisers and to underrate the importance of discipline. The temporary removal of the common peril, moreover, let loose all the sectional and personal jealousies, which even in face of the enemy had been with difficulty restrained, and the year 1823 witnessed the first civil war between the Greek parties. These internecine feuds might easily have proved fatal to the cause of Greece. In the Archipelago Hydriotes and Spetsiotes were at daggers drawn; the men of Psara were at open war with those of Samos; all semblance of discipline and cohesion had vanished from the Greek fleet. Had Khosrev, the new Ottoman admiral, been a man of enterprise, he might have regained the command of the sea and, with it, that of the whole situation. But the fate of his predecessor had filled him with a lively terror of Kanaris and his fire-ships; he contented himself with a cruise round the coasts of Greece, and was happy to return to safety under the guns of the Dardanelles without having accomplished anything beyond throwing supplies and troops into Coron, Modon and Patras. On land, meanwhile, the events of the year before practically repeated themselves. In the west an army of Mussulman and Catholic Albanians, under Mustai Pasha, advanced southwards. On the night of the 21st of August occurred the celebrated exploit of Marko Botzaris and his Suliotes: a successful surprise attack on the camp of the Ottoman vanguard, in which the Suliote leader fell. The jealousy of the Aetolian militia for the Suliotes, however, prevented the victory being decisive; and Mustai advanced to the siege of Anatoliko, a little town in the lagoons near Missolonghi. Here he was detained until, on the 11th of December, he was forced to raise the siege and retire northwards. His colleague, Yussuf Pasha, in East Hellas fared no better; here, too, the Turks gained some initial successes, but in the end the harassing tactics of Kolokotrones and his guerilla bands forced them back into the plain of the Kephissos. At the end of the year the Greeks were once more free to renew their internecine feuds.

Civil war among the Greeks.

Campaign of 1823.

Just when these feuds were at their height, in the autumn of 1823, the most famous of the Philhellenes who sacrificed themselves for the cause of Greece, Lord Byron, arrived in Greece.

The year 1824 was destined to be a fateful one for the Greek cause. The large loans raised in Europe, the first instalment of which Byron had himself brought over, while providing the Greeks with the sinews of war, provided the struggle for power was added a struggle for a share of this booty, and a second civil war broke out, Kolokotrones leading the attack on the forces of the government. Early in 1825 the government was victorious; Kolokotrones was in prison; and Odysseus, the hero of so many exploits and so many crimes, who had ended by turning traitor and selling his services to the Turks, had been captured, imprisoned in the Acropolis, and finally assassinated by his former lieutenant Gouras (July 16, 1824). But a new and more terrible danger now threatened Greece. Sultan Mahmud, despairing of suppressing the insurrection by his own power, had reluctantly summoned to his aid Mehemet Ali, pasha of Egypt, whose well-equipped fleet and disciplined army were now thrown into the scale against the Greeks. Already, in June 1823, the pasha's son-in-law Hussein Bey had landed in Crete, and by April of the following year had reduced the insurgent islanders to submission. Crete now became the base of operations against the Greeks. On the 10th of June Hussein appeared before Kasos, a nest of pirates of evil reputation, which he captured and destroyed. The same day the Egyptian fleet, under Ibrahim Pasha, sailed from Alexandria. Khosrev, too, emboldened by this new sense of support, ventured to sea, surprised and destroyed Psara (July 2), and planned an attack on Samos, which was defeated by Miaoulis and his fire-ships (August 16, 17). On the 1st of September, however, Khosrev succeeded in effecting a junction with Ibrahim off Budrun, and two indecisive engagements followed with the united Greek fleet on the 5th and 10th. The object of Ibrahim was to reach Suda Bay with his transports, which the Greeks should at all costs have prevented. A first attempt was defeated by Miaoulis on the 16th of November, and Ibrahim was compelled to retire and anchor off Rhodes; but the Greek admiral was unable to keep his fleet together, the season was far advanced, his captains were clamouring for arrears of pay, and the Greek fleet sailed for Nauplia, leaving the sea unguarded. On the 5th of December Ibrahim again set sail, and reached Suda without striking a blow. Here he completed his preparations, and, on the 24th of February 1825, landed at Modon in the Morea with a force of 4000 regular infantry and 500 cavalry. The rest followed, without the Greeks making any effort to intercept them.

Second civil war, 1824.

Intervention of Mehemet Ali.

Ibrahim in the Morea.

The conditions of the war were now completely changed. The Greeks, who had been squandering the money provided by the loans in every sort of senseless extravagance, affected to despise the Egyptian invaders, but they were soon undeceived. On the 21st of March Ibrahim had laid siege to Navarino, and after some delay a Greek force under Skourti, a Hydriote sea-captain, was sent to its relief. The Greeks had in all some 7000 men, Suliotes, Albanians, *armatoli* from Rumelia, and some irregular Bulgarian and Vlach cavalry. On the 19th of April they were met by

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Ibrahim at Krommydi with 2000 regular infantry, 400 cavalry and four guns. The Greek entrenchments were stormed at the point of the bayonet by Ibrahim's fellahin at the first onset; the defenders broke and fled, leaving 600 dead on the field. The news of this disaster, and of the fall of Pylos and Navarino that followed, struck terror into the Greek government; and in answer to popular clamour Kolokotrones was taken from prison and placed at the head of the army. But the guerilla tactics of the wily klepht were powerless against Ibrahim, who marched northward, and, avoiding Nauplia for the present, seized Tripolitsa, and made this the base from which his columns marched to devastate the country far and wide.

Meanwhile from the north the Ottomans were making another supreme effort. The command of the army that was to operate in west Hellas had been given to Reshid "Kutahia," pasha of Iannina, an able general and a man of determined character. On the 6th of April, after bribing the Albanian clansmen to neutrality, he passed the defile of Makrynoros, which the Greeks had left undefended, and on the 7th of May opened the second siege of Missolonghi. For twelve months the population held out, repulsing the attacks of the enemy, refusing every offer of honourable capitulation. This resistance was rendered possible by the Greek command of the sea, Miaoulis from time to time entering the lagoons with supplies; it came to an end when this command was lost. In September 1825 Ibrahim, at the order of the sultan, had joined Reshid before the town; piecemeal the outlying forts and defences now fell, until the garrison, reduced by starvation and disease, determined to hazard all on a final sortie. This took place on the night of the 22nd of April 1826; but a mistaken order threw the ranks of the Greeks into disorder, and the Turks entered the town pell-mell with the retreating crowd. Only a remnant of the defenders succeeded in gaining the forests of Mount Zygos, where most of them perished.

Reshid "Kutahia" besieges Missolonghi.

The fall of Missolonghi, followed as this was by the submission of many of the more notable chiefs, left Reshid free to turn his attention to East Hellas, where Gouras had been ruling as a practically independent chief and in the spirit of a brigand. The peasants of the open country welcomed the Turks as deliverers, and Reshid's conciliatory policy facilitated his march to Athens, which fell at the first assault on the 25th of August, siege being at once laid to the Acropolis, where Gouras and his troops had taken refuge. Round this the war now centred; for all recognized that its fall would involve that of the whole of Greece. In these straits the Greek government entrusted the supreme command of the troops to Karaiskakis, an old retainer of Ali of Iannina, a master of the art of guerilla war, and, above all, a man of dauntless courage and devoted patriotism. A first attempt to relieve the Acropolis, with the assistance of some disciplined troops under the French Colonel Fabvier, was defeated at Chaidari by the Turks. The garrison of the Acropolis was hard pressed, and the death of Gouras (October 13th) would have ended all, had not his heroic wife taken over the command and inspired the defenders with new courage. For months the siege dragged on, while Karaiskakis fought with varying success in the mountains, a final victory at Distomo (February 1827) over Omar Vrioni securing the restoration to the Greek cause of all continental Greece, except the towns actually held by the Turks.

Karaiskakis.

It was at this juncture that the Greek government, reinforced by a fresh loan from Europe, handed over the chief command at sea to Lord Cochrane (earl of Dundonald, *q.v.*), and that of the land forces to General (afterwards Sir Richard) Church, both Miaoulis and Karaiskakis consenting without demur to serve under them. Cochrane and Church at once concentrated their energies on the task of relieving the Acropolis. Already, on the 5th of February, General Gordon had landed and entrenched himself on the hill of Munychia, near the ancient Piraeus, and the efforts of the Turks to dislodge him had failed, mainly owing to the fire of the steamer "Karteria" commanded by Captain Hastings. When Church and Cochrane arrived, a general assault on the Ottoman camp was decided on. This was preceded, on the 25th of April, by an attack, headed by Cochrane, on the Turkish troops established near the monastery of St Spiridion, the result of which was to establish communications between the Greeks at Munychia and Phalerum and isolate Reshid's vanguard on the promontory of the Piraeus. The monastery held out for two days longer, when the Albanian garrison surrendered on terms, but were massacred by the Greeks as they were marching away under escort. For this miserable crime Church has, by some historians, been held responsible by default; it is clear, however, from his own account that no blame rests upon him (see his MS. *Narrative*, vol. i. chap. ii. p. 34). The assault on the Turkish main camp was fixed for the 6th of May; but, unfortunately, a chance skirmish brought on an engagement the day before, in the course of which Karaiskakis was killed, an irreparable loss in view of his prestige with the wild *armatoli*. The assault on the following day was a disastrous failure. The Greeks, advancing prematurely over broken ground and in no sort of order, were fallen upon in flank by Reshid's horsemen, and fled in panic terror. The English officers, who in vain tried to rally them, themselves only just escaped by scrambling into their boats and putting off to the war-vessels, whose guns checked the pursuit and enabled a remnant of the fugitives to escape. Church held Munychia till the 27th, when he sent instructions for the garrison of the Acropolis to surrender. On the 5th of June the remnant of the defenders marched out with the honours of war, and continental Greece was once more in the power of the Turks. Had Reshid at once advanced over the Isthmus, the Morea also must have been subdued; but he was jealous of Ibrahim, and preferred to return to Iannina to consolidate his conquests.

Cochrane and Church.

Greek defeat at Athens.

The fate of Greece was now in the hands of the Powers, who after years of diplomatic wrangling had at last realized that intervention was necessary if Greece was to be saved for European civilization. The worst enemy of the Greeks was their own incurable spirit of faction; in the very crisis of their fate, during the siege of Missolonghi, rival presidents and rival assemblies struggled for supremacy, and a third civil war had only been prevented by the arrival of Cochrane and Church. Under their influence a new National Assembly met at Troezene in March 1827 and elected as president Count Capo d' Istria (*q.v.*), formerly Russian minister for foreign affairs; at the same time a new constitution was promulgated which, when the very life of the insurrection seemed on the point of flickering out, set forth the full ideal of Pan-Hellenic dreams. Anarchy followed; war of Rumeliotes against Moreotes, of chief against chief; rival factions bombarded each other from the two forts at Nauplia over the stricken town, and in derision of the impotent government. Finally, after months of inaction, Ibrahim began once more his systematic devastation of the country. To put a stop to this the Powers decided to intervene by means of a joint demonstration of their fleets, in order to enforce an armistice and compel Ibrahim to evacuate the Morea (Treaty of London, July 6, 1827). The refusal of Ibrahim to obey, without special instruction from the sultan, led to the entrance of the allied British, French and Russian fleet into the harbour of Navarino and the battle of the 20th of October 1827 (see NAVARINO). This, and the two campaigns of the Russo-Turkish war of 1828–29, decided the issue.

Renewed anarchy.

AUTHORITIES.—There is no trustworthy history of the war, based on all the material now available, and all the existing works must be read with caution, especially those by eye-witnesses, who were too often prejudiced or the dupes of the Greek factions. The best-known works are: G. Finlay, *Hist. of the Greek Revolution* (2 vols., London, 1861); Gordon, *Hist. of the Greek Revolution* (London, 1833); C. W. P. Mendelssohn-Bartholdy, *Geschichte Griechenlands, &c. (Staatengeschichte der neuesten Zeit)* (2 vols., Leipzig, 1870–1874); F. C. H. L. Pouqueville, *Histoire de la régénération de la Grèce, &c.* (4 vols., Paris, 1824),—the author was French resident at the court of Ali of Iannina and afterwards consul at Patras; Count A. Prokesch-Osten, *Geschichte des Abfalls der Griechen vom türkischen Reich, &c.* (6 vols., Vienna, 1867), the last four volumes consisting of *pièces justificatives* of much value. See also W. Alison Phillips, *The War of Greek Independence* (London and New York,

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1897), a sketch compiled mainly from the above-mentioned works; Spiridonos Tricoupi, *Ἱστορία τῆς Ἑλληνικῆς ἐπαναστάσεως* (Athens, 1853); J. Philemon, *Δοκίμιον ἱστορικὸν περὶ τῆς Ἑλληνικῆς ἐπαναστάσεως* (Athens, 1859), in four parts: (1) History of the Hetaeria Philike, (2) The heralding of the war and the rising under Ypsilanti, (3 and 4). The insurrection in Greece to 1822, with many documents. Of great value also are the 29 volumes of Correspondence and Papers of Sir Richard Church, now in the British Museum (Add. MSS. 36,543-36,571). Among these is a Narrative by Church of the war in Greece during his tenure of the command (vols. xxi.-xxiii., Nos. 36,563-36,565), which contains the material for correcting many errors repeated in most works on the war, notably the strictures of Finlay and others on Church's conduct before Athens. For further information see the bibliography appended to W. Alison Phillips's chapter on "Greece and the Balkan Peninsula" in the *Cambridge Modern History*, x. 803. (W. A. P.)

GREEK LANGUAGE. Greek is one of the eight main branches into which the Indo-European languages (*q.v.*) are divided. The area in which it is spoken has been curiously constant throughout its recorded history. These limits are, roughly speaking, the shores of the Aegean, on both the European and the Asiatic side, and the intermediate islands (one of the most archaic of Greek dialects being found on the eastern side in the island of Cyprus), and the Greek peninsula generally from its southern promontories as far as the mountains which shut in Thessaly on the north. Beyond Mt. Olympus and the Cambunian mountains lay Macedonia, in which a closely kindred dialect was spoken, so closely related, indeed, that O. Hoffmann has argued (*Die Makedonen*, Göttingen, 1906) that Macedonian is not only Greek, but a part of the great Aeolic dialect which included Thessalian to the south and Lesbian to the east. In the north-west, Greek included many rude dialects little known even to the ancient Greeks themselves, and it extended northwards beyond Aetolia and Ambracia to southern Epirus and Thesprotia. In the Homeric age the great shrine of Pelasgian Zeus was at Dodona, but, by the time of Thucydides, Aetolia and all north of it had come to be looked upon as the most backward of Greek lands, where men lived a savage life, speaking an almost unintelligible language, and eating raw flesh (*ὠμοφάγοι καὶ χαλεπῶς γλῶσσαν ἱέντες*, Thuc. iii. 94, of the Aetolian Eurytanes). The Greeks themselves had no memory of how they came to occupy this land. Their earliest legends connected the origin of their race with Thessaly and Mt. Pindus, but Athenians and Arcadians also boasted themselves of autochthonous race, inhabiting a country wherein no man had preceded their ancestors. The Greek language, at any rate as it has come down to us, is remarkably perfect, in vowel sounds being the most primitive of any of the Indo-European languages, while its verb system has no rival in completeness except in the earliest Sanskrit of the Vedic literature. Its noun system, on the other hand, is much less complete, its cases being more broken down than those of the Aryan, Armenian, Slavonic and Italic families.

The most remarkable characteristic of Greek is one conditioned by the geographical aspect of the land. Across countries so broken up with mountains as Greece. Not only do mountain ranges as elsewhere on the European continent run east and west, but other ranges cross them from north to south, thus dividing the portions of Greece at some distance from the sea into hollows without outlet, every valley being separated for a considerable part of the year from contact with every other, and inter-communication at all seasons being rendered difficult. Thus till external coercion from Macedon came into play it was never possible to establish a great central government controlling the Greek mainland. In geographical situation of the islands in the Aegean equally led to the isolation of one little territory from another. To these geographical considerations may be added the inveterate desire of the Greeks to make the *πόλις*, the city-state, all things at all times an independent unit, a desire which, originating in the geographical conditions, even accentuated the isolating effect of the natural features of the country. Thus at one time in the little island of Amorgos there were no less than three separate and independent political units. The inevitable result of geographical and political division was the maintenance of a great number of local characteristics in language, differentiating in this respect also each political community from its nearest neighbours. It was only natural that the inhabitants of a country so little adapted to maintain a numerous population should have early sent off swarms to other lands. The earliest stage of colonization lies in the borderland between myth and history. The Greeks themselves knew that a population had preceded them in the islands of the Cyclades which they identified with the Carians of Asia Minor (Herodotus i. 171; Thucydides i. 4. 8). The same population indeed appears to have preceded them on the mainland of Greece, for there are similar place-names in Caria and in Greece which have an etymology in Greek. Thus the endings of words like Parnassus and Halicarnassus seem identical, and the common ending of place-names in *-ανθα*, *Κόρινθος*, *Πραξιάνθεια*, &c., seems to be the same in origin with the common ending of Asiatic names in *-nda*, Alinda, Karyanda, &c. Probably the earliest portion of Asia Minor to be colonized by the Greeks was the north-west, to which came settlers from Thessaly, when the early inhabitants were driven out by the Thesprotians, who later controlled Thessaly. The name Aeolis, which after times gave to the N.W. of Asia Minor, was the old name for Thessaly (Thuc. vii. 57). These Thesprotians were of the same stock as the Dorians, to whose invasion of the Peloponnese the later migration, which carried the Ionians to Asia and the Cypriot Greeks to Cyprus, in all probability was due. From the north-west Peloponnese probably the Dorians took Crete, where alone their existence is recorded by Homer (*Odyssey*, xix. 175 ff.; Diodorus Siculus v. 80. 2); cp. Fick, *Vorgriechische Ortsnamen* (1906).

Among the Greeks of the pre-Dorian period Herodotus distinguishes various stocks. Though the name is not Homeric, both Herodotus and Thucydides recognize an Aeolian stock which must have spread over Thessaly and far to the west till it was suppressed and absorbed by the Dorian stock which came in from the north-west. The name of Aeolis still attached in Thucydides' time to the mountains of Calydon between the mountains and the N. side of the entrance to the Corinthian gulf (iii. 102). In Boeotia the same stock survived (Thuc. vii. 57. 5), overlaid by an influx of Dorians, and it came down to the isthmus; for the Corinthians, though speaking in historical times a Doric dialect, were originally Aeolians (Herod. v. 68). In the Peloponnese Herodotus recognizes (viii. 73) three original stocks, the Arcadians, the Ionians of Cynuria and the Achaeans. In Arcadia there is little doubt that the pre-Dorian population maintained itself and its language, just as in the mountains of Wales, the Scottish Highlands and Connemara the Celtic language has maintained itself against the Saxon invaders. By Herodotus' time the Cynurians had been doricized, while the Ionians, along the south side of the Corinthian gulf, were expelled by the Achaeans (Herod. vii. 94, viii. 73), apparently themselves driven from their own homes by the Dorian invasion (Strabo viii. p. 333 *fin.*). However this may be, the Achaeans of historical times spoke a dialect akin to that of northern Elis and of the Greeks on the north side of the Corinthian gulf. How close the relation may have been between the language of the Achaeans of the Peloponnese in the Homeric age and their contemporaries in Thessaly we have no means of ascertaining definitely, the documentary evidence for the history of the dialects being all very much later than Homeric times. Even in the Homeric catalogue Agamemnon has to lend the Arcadians ships to take them to Troy (*Iliad*, ii. 612). But a population speaking the same or a very similar dialect was probably seated on the eastern coast, and migrated at the beginning of the Doric invasion to Cyprus. The latter population wrote not in the Greek alphabet but in a peculiar syllabary and held little communication with the rest of the Greek world, it succeeded in preserving in Cyprus a very archaic dialect very closely akin to that of Arcadia, and also containing a considerable number of words found in the Homeric vocabulary but lost or modified in later Greek elsewhere.

On this historical foundation alone is it possible to understand clearly the relation of the dialects in historical times. The prehistoric movements of the Greek tribes can to some extent be realized in their dialects, as recorded in their inscriptions, though all existing inscriptions belong to a much later period. Thus from the ancient Aeolis of northern Greece sprang the historical dialects of Thessaly and Boeotia with the neighbouring coast of Asia Minor. At an early period the Dorians had invaded and to some extent affected the character of the southern Thessalian and to a much greater extent that of the Boeotian dialect. The dialects of Locris, Phocis and Aetolia were a somewhat uncouth and uniliterary form of Doric. According to accepted tradition, Elis had been colonized by Oxylus the Aetolian, and the dialect of the more northerly part of Elis, as already pointed out, is, along with the Achaean of the south side of the Corinthian gulf, closely akin to those dialects north of the Isthmus. The most southerly part of Elis—Triphylia—has a dialect akin to Arcadian. Apart from Arcadian the other dialects of the Peloponnese in historical times are all Doric, though in small details they differ among themselves. Though we are unable to check the statements of the historians as to the area occupied by Ionic in prehistoric times, it is clear from the legends of the close connexion between Athens and Troezen that the same dialect had been spoken on both sides of the Saronic gulf, and may well have extended, as Herodotus says (viii. 73), along the eastern coast of the Peloponnese and the south side of the Corinthian gulf. According to legend, the Ionians expelled from the Peloponnese collected at Athens before they started on their migrations to the coast of Asia Minor. Be that as it may, legend and language alike connected the Athenians with the Ionians, though by the 5th century B.C. the Athenians no longer cared to be known by the name (Hdt. i. 143). Lemnos, Imbros and Scyros, which had long belonged to Athens, were Athenian also in language. The great island of Euboea and all the islands of the central Aegean between Greece and Asia were Ionic. Chios, the most

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northerly Ionic island on the Asiatic coast, seems to have been originally Aeolic, and its Ionic retained some Aeolic characteristics. The most southerly of the mainland towns which were originally Aeolic was Smyrna, but this at an early date became Ionic (Hdt. i. 149). The last important Ionic town to the south was Miletus, but at an early period Ionic widened its area towards the south also and took in Halicarnassus from the Dorians. According to Herodotus, there were four kinds of Ionic (χαρακτῆρες γλώσσης τέσσαρες, i. 142). Herodotus tells us the areas in which these dialects were spoken, but nothing of the differences between them. They were (1) Samian; (2) Chios and Erythrae, (3) the towns in Lydia, (4) the towns in Caria. The language of the inscriptions unfortunately is a κοινή, a conventional literary language which receives no differences of importance. Only recently has the characteristic so well known in Herodotus ει appearing in certain words where other dialects have ῃ (δοκεῖ for δοκῇ, κοῦ for ποῦ, &c.) been found in any inscription. It is, however, clear that this was a popular characteristic not considered to be sufficiently dignified for official documents. We may conjecture that the native languages spoken on the Lydian and Carian coasts had affected the character of the language spoken by the Greek immigrants, more especially as the settlers from Athens married Carian women, while the settlers from the other towns were a mixture of Greek tribes, many of them not Ionic at all (Hdt. i. 146).

The more southerly islands of the Aegean and the most southerly peninsula of Asia Minor were Doric. In the Homeric age Dorians were only one of many peoples in Crete, but in historical times, though the dialects of the eastern and the western part of the island differ from one another and from the middle whence our most valuable documents come, all are Doric. By Melos and Thera Dorians carried their language to Cos, Calymnus, Cnidus and Rhodes.

These settlements, Aeolic, Ionic and Doric, grew and prospered, and like flourishing hives themselves sent out fresh swarms to other lands. Most prosperous and energetic of all was Miletus, which established its trading posts in the Black Sea to the north and in the delta of the Nile (Naucratis) to the south. The Ionians too sent off their colonies, carrying their dialects with them, Paros to Thasos, Euboea to the peninsulas of Chalcidice; the Dorians of Megara guarded the entrance to the Black Sea at Chalcedon and Byzantium. While Achaean influence, next to the more southern Ionic islands, Corinth carried her dialect with her colonies to the coast of Acarnania, Leucas and Corcyra. But the greatest of all Corinthian colonies was much farther to the west—at Syracuse in Sicily. Unfortunately the continuous occupation of the same or adjacent sites has led to the loss of almost all that is early from Corinth and from Syracuse. Corcyra has bequeathed to us some interesting grave inscriptions from the 6th century B.C. Southern Italy and Sicily were early colonized by Greeks. According to tradition Cumae was founded not long after the 8th century B.C., even if not the earliest nearer the founding of Syracuse in 735 B.C., we have apparently no record earlier than the first half of the 5th century B.C., though it is still the earliest of Chalcidian inscriptions. Tarentum was a Laconian foundation, but the longest and most important document from a Laconian colony in Italy comes from Heraclea about the end of the 4th century B.C.—the report of a commission upon and the lease of temple lands with description and conditions almost of modern precision. To Achaea belonged the Italian towns of Croton, Sybaris, Metapontum and Sybaris. The ancestry of the Greek towns of Sicily has been explained by Thucydides (vi. 2-5). Selinus, a colony of Megara, bewrays its origin in its dialect. Gela and Agrigentum no less clearly show their descent from Rhodes. According to tradition the great city of Cyrene in Africa was founded from Thera, itself an offshoot from Sparta.

Chief Characteristics of the Greek Dialects

1. *Arcadian and Cyprian.*—As Cyprian was written in a syllabary which could not represent a consonant by itself, did not distinguish between voiced, unvoiced and aspirated consonants, did not represent at all a nasal before another consonant, and did not distinguish between long and short vowels, the interpretation of the symbols is of the nature of a conundrum and the answer is not always certain. Thus the same combination of two symbols would have to stand for τόνε, τόδε, δόνε, δοθῆ, τόνθε, τῶθε, τό, δῆ. No inscription of more than a few words in length is found in either dialect earlier than the 5th century B.C. In both dialects the number of important inscriptions is steadily increasing. Both dialects change final ο to υ, ἀπό passing into ἀπύ. Arcadian changes the verb ending -αι into -αι. Arcadian uses ὁ or ϝ for an original ϝο-sound, which appears in Attic Greek as βʹ: βάλλω, Ἄπολλον, βλαύλοι, "throw." In inflexion both agree in changing -ōο of masculine -ā stems into ων (Arcadian carries this form also into the feminine -ā stems), and in using locatives in -αι and -οι for the dative, such locatives being governed by the prepositions ἀνύ and ἐ (before a consonant ἐς) in Arcadian. Verbs in -αω, -εω and -οω are declined not as -ω, but as -μι verbs. The final ι of the ending of the 3rd plural present changes the preceding τ to σ: φέροντι, cp. Laconian (Doric) φέροντι, Attic φέρουσι, Lesbian φέρωισ. Instead of the Attic τίς, the interrogative pronoun appears as εἴτε, the initial σ in Arcadian being written with a special symbol ϡ. The pronunciation is not certain. The original sound was φϝ, as in Latin *quis*, whence Attic τίς and Thessalian πίς. In Arcadian καϝ the Aeolic particle ϝε and the Ionic ωϝ seem to be combined.

2. *Aeolic.*—Though Boeotian is overlaid with a Doric element, it nevertheless agrees with Thessalian and Lesbian in some characteristics. Unlike Greek generally, they represent the original φϝο of the word for *four* by π before ε, where Attic and other dialects have τ: πέτταρες, Attic τέτταρες. The corresponding voiced and aspirated sounds are similarly treated: Βελφοσανε the adjective in Thessalian to Δελφοί, and φήρ for θήρ. They all tend to change ε to υ: δνυμα, "name"; ος for ω in Thessalian; Ἄπυλλον, "Apollo"; and υ in Boeotian for αι: Fυκία (οἰκία), "house." They also make the dative plural of the third declension in -σσι, and the participle active in -ντες and -ντι like a present participle in -ων. Instead of the Athenian method of giving the father's name in the genitive when a citizen is described, these dialects (especially Thessalian) tend to make an adjective: thus instead of the Attic Δημοσθένης Δημοσθένους, Aeolic would rather have Δ. Δημοσθένειος. Thessalian stands midway between Lesbian and Boeotian, agreeing with Lesbian in the use of double consonants, where Attic has a single consonant, with or without lengthening of the previous syllable: ἔμμι, ἐσσί and the original *ἔστι; στάλλα, Attic στᾶλη; ξίννος for an earlier ξίνϝος, Attic ξῖνος, Ionic ξεῖνος, Doric ξῦνος. Where Attic has -ᾶσι from an earlier -ανσι or -αντι, Lesbian has -αισι: ταῖς ἄρχαισ accusative in Lesbian τάνς ἄρχανς. Lesbian has no oxytone words according to the grammarians, the accent being carried back to the penult or ante-penultimate syllable. It has also no "rough breathing," but this characteristic it shared with the Ionic of Asia Minor, and in the course of time with other dialects. The characteristic particle of the dialects is κε, while the Doric has it also, the Arcadian use, and the Attic and Ionic ἄν. Thessalian and Lesbian agree in making their long vowels close, η belonging ει (a close ε, not a diphthong), πατείρ, "father." The ν sound did not become ϋ as in Attic and Ionic, and before when the Ionic and Attic ν was dropped it was spelt ϙ, or when in contact with dentals ϣν, as in ὄϣυμα=ὄνυμα, "name," τυύχα=τύχη, "chance"; the pronunciation, therefore, must have been like the English sound in *news, tune*. Boeotian developed earlier than other dialects the change of ᾱ to η, a process which in the Attic modern Greek: αι became έ, αυ passing into αύ: compare πατείρ and Fυκία above: ει became ι in ἔχι, "has." Thessalian shows some examples of the Homeric genitive in -οιο: πολίοιο, &c.; the ordinary genitive of ο- stems is in -ω.

There are some points of connexion between this group and Arcadian-Cyprian: in both Thessalian and Cyprian the characteristic πτόλις (Attic, &c., πόλις) and δακτρον- for δάφνη are found, and both groups form the "contracting verbs" not in -ω but in -μι. In the second group as in the first there is little that precedes the 5th century B.C. Future additions to our materials may be expected to lessen the gap between the two groups and Homer.

3. *Ionic-Attic.*—One of the earliest of Greek inscriptions—of the 7th century B.C., at least—is the famous one written in 5 or 6 lines from right to left upon a wine goblet (οἰνοχόη) given as a prize: *hὸς τὸν ὀρχηστὸν νῖκτορ | ἀτελόταται ταῖζει τόττο δεκᾶς μιν.* The last words are uncertain. Till lately early inscriptions in Ionic were few, but recently an early inscription has been found at Ephesus and a later copy of a long early inscription at Miletus.

The most noticeable characteristic of Attic and Ionic is the change of ᾱ into η which is universal in Ionic but does not appear in Attic after another vowel or ρ. The Attic declension has ᾱ after ε, ι or ρ in earlier μάτηρ, τιμή, but Attic had σοφία, σοφῶμαι χώρα, not σοφίη, σοφέομαι and χώρη as in Ionic. The apparent exception κόρη is explained by the fact that in this word a digamma ϝ has been lost after ρ, in Doric κόρϝα. That the change took place after the Ionians came into Asia is shown by the word Μῆδος, which in Cyprian is Μᾶδοι; the Medes were certainly not known to the Greeks till long after the conquest of Ionia. While Aeolic and the greater part of Doric kept ϝ, this symbol and the sound it represented by it had disappeared from both Ionic and Attic before writing records begin—in other words, were certainly not in use after 800 B.C. The symbol was known and occurs in a few isolated instances. Both dialects agreed in changing ᾱ into ῑ, so that α u sound has to be represented by ω. The short ε tended towards ι, so that the contraction in εϝ+ε gave ου. In the same way short ε tended towards ι, so that the contraction of ε+ε gave ει, which was not a diphthong but a close ē-sound. In Attic Greek these contractions were represented by Ο and Ε respectively till the official adoption of the Ionic alphabet at Athens in 403 B.C. So also were the lengthened syllables which represent in their length the loss of an earlier consonant, as ἔμεινα and ἔσεινα, Aeolic ἔμεννα, ἔσεννα, which stand for a prehistoric *ἔμενσα and *ἔσενσα, containing the -σ- of the first aorist, and τίθει, ἔασιν, ἔχουτι representing an earlier τίθεντι, ἐάντι (3 pl. present) or *ἔχοντσι (dative pl. of present participle). Both dialects also agreed in changing ῥ before ι into σ (like Aeolic), as in ἔχουσι above, and in the 3rd person singular of -μι verbs, τίθησι, δίδωσι, &c., and in noun stems, as πείσις for an earlier πειθι-. Neither dialect used the particle κε or κα, but both have ἄν instead. One of the effects of the change of ᾱ into η was that the combination ᾱν changed in both dialects to ην, which in all Attic records and in the later Ionic has become ων by a metathesis in the quantity of the vowels: πάσ, earlier πάντς, "temple," is in Homeric Greek τοῖς, in later Ionic and Attic τοῦς. In the dative (locative) plural of the -ā stems, Ionic has generally -ῃσι on the analogy of the singular; Attic had first the old locative form in -ᾱσι, -ᾶσι, which survived

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in forms which became adverbs like Ἀθήνησι and θύρασι; but after 420 B.C. these were replaced by -αι, θύραι, &c. The Ionic of Asia Minor showed many changes earlier than that of the Cyclades and Euboea. It lost the aspirate very early: hence in the Ionic alphabet ΙΙ is ε, not h; it changed αι and ευ into αο and οο, and very early replaced το a large extent the -ω by the -ο verbs. This confusion can be seen in progress in the Attic literature of the 5th and 4th centuries B.C., διώκομαι gradually giving way to διωκτὸς, while the literature generally uses forms like ἐδίκη for ἐδίκη (impft.). In Attic alone the aspirated h survived: in the Ionic of Euboea and the Cyclades ceased by the end of the 5th century. The Ionic of Asia Minor has -ιο as the genitive of ι-stems; the other forms of Ionic have -ιος.

4. *Doric.*—As already mentioned, the dialects of the North-West differ in several respects from Doric elsewhere. As general characteristics of Doric may be noted the contractions of α+ε into η, and of α+ο or ω into ᾱ, while the results in Attic and Ionic of these contractions are ᾱ and ω respectively: Δώκη from τιμάω, Attic δίκαι; τιμᾶται cf. pres. from τιμάω, Attic τιμᾶται; τιμᾶ gen. pl. of τιμή "honour," Attic τιμῶν. In inflection the most noticeable points are the pronominal adverbs in locative form: τουτεῖ, ταρεῖ (this from a stem limited to a few Doric dialects and the Bucolic Poets), τεῖδε, δεῦα, the nom. pl. of the article τοί, ταί, not οἱ, αἱ, and so τοῖσα in Selinus and Rhodes; the 1st pl. of the verb in -μες, not in -μεν, cp. the Latin -mus; the aorist and future in -ξ-, where other dialects have -σ-, or contraction from presents in -ζω; διώξω, διώκω, Doric διώξεω, &c.; the future passive with active endings, ἐκκλησθήσουσι (Rhodes), found as yet only in the Doric islands and in the Doric prose of Archimedes; the particles αἰ "if" and κα with a similar value to the Aeolic κε and the Attic-Ionic ἂν. Doric had an accentuation somewhat different both from Aeolic and from Ionic-Attic, but the details of the system are very imperfectly known.

In older works Doric is often divided into a *dialectus severior* and a *dialectus mitis*. But the difference is one of time rather than of place, the peculiarities of Doric being gradually softened down till it was ultimately merged in the *lingua franca*, the κοινή, which in time engulfed all the local dialects except the descendant of Spartan, Tzakonian. Here it is possible to mention its varieties only in the briefest form. (a) The southern dialects are well illustrated in the inscriptions of Laconia recently much increased in number by the excavations of the British School at Athens. Apart from some brief dedications, the earliest inscription of importance is the list of names placed on a bronze caldron set up about 479 B.C. to commemorate the tribes which had repulsed the Persians. The column, originally at Delphi, is now at Constantinople. The most striking features of the dialect are the retention of ϝ at the beginning of words, as in the dedication from the 6th century B.C. found at *Annual of British School*, xiv. 134). The dialect changed -σ- between vowels into -h-, μῶϝα for μῶσα "muse." Later it changed θ into a sound like the English *th*, which was represented by σ. Before σ-sounds ε here and in some other Doric dialects changed το ι: θεός, σός for θεός "god." The result of contraction and lengthening ᾱ was not ει and ου as in Attic and Ionic, but η and ω: ἦμι infinitive =εἶναι from **esmen*; gen. sing. of σ-stems in ω: θεῶ, acc. pl. in -ως: θεώς; ἀγ was represented by δδ, not ζ, as in Attic-Ionic; μέσσδδα = μέσζα. The dialect has many singularities, especially in connexion with the state education and organization of the boys and young men. The Heraclean tables from a Laconian colony in S. Italy have curious forms in -αισι for the dat. pl. of the participle πραισδόαισι=Attic πράττουσι. Of the dialect of Cos known chiefly from a long inscription about mysteries from Andania being only about 100 B.C. From Argolis there are a considerable number of early inscriptions, and in a later form of the dialect the cures recorded at the temple of Asklepios at Epidaurus present many points of interest. There is also an inscription of the 6th century B.C. from the temple of Aphaia in Aegina. ϝ survives in the old inscriptions: ἑϝρμῆνι (=ἑρμῆνι); ϝι, whether original or arising by sound change from -πϳ, persists till the 2nd century B.C.: διαγινώσκοντα = ἢ διαγινώσκοντα, τὸν νόμον = τὸν νόμον. The dialect of the Tzakhus in Arcadia nearly resemble Laconian more closely than does that of the rest of the Argolic area. Corinth and her colonies in the earliest inscriptions preserve ϝ and ϡ (= Latin Q) before ο and υ sounds, and write ξ and ψ by χσ and φσ, the symbols which have come to be used in this position in Attic. In the Corcyrean and Sicilian forms of the dialect, λ before a dental appears as ν: Φιντίας = Φιλτίας; and in Sicilian the perfect-active was treated as a present: δόδωκα for δέδωκα, &c. From Megara has come lately an obscure inscription from the beginning of the 5th century: its colony Selinus has inscriptions from the middle of the same century; the inscriptions from Byzantium and its other Pontic colonies date only from Hellenistic times. In Crete, which shows a considerable variety of subdialects, the most important document is the great inscription from Gortyn containing twelve tables of family law, which was discovered in 1884. The local alphabet has no separate symbols for χ and φ, and these sounds are therefore written with κ and π. As in Argive the combination -ντ- was kept both medially and finally except before words beginning with a consonant; -ἰτ- was represented by ζ later by -ττ-, as in Thessalian and Boeotian: ὀπάττω, Attic ὀπάσω; and finally by -σθ-: λ combined with a preceding vowel into an αυ-diphthong: αὐκί, Attic ἀλλά, cp. the English pronunciation of *talk*, &c. In Gortyn and some other towns -σδ- was assimilated to -θθ-, where θ must have been a spirant like the English *th* in *thin*; ζ of Attic Greek is represented initially by δ, medially by δδ, but in some towns by ϝ and ττ: δδός (=ζυγός), διαδδέκτερ (=διαζύξαι). Final consonants are generally assimilated to the beginning of the next word. In inflection there are many local peculiarities. In Melos and Thera some very old inscriptions have been found written in an alphabet without symbols for φ, χ, ψ, ξ, which are therefore written as πh, κh or ϡ, πσ, κσ. The contractions of ο+ε and of ο+ο are preserved in the Ionic of Euboea. The old rock inscriptions of Thera are among the most archaic yet discovered. The most characteristic feature of Rhodian Doric is the infinitive in -μεν: δόμεν, &c. (=Attic δοῦναι), which passed also to Gela and Agrigentum. Inscriptions from Cos are numerous, but too late to represent the earliest form of the dialect.

(*b*) The dialects of N.W. Doric, Locrian, Phocian, Aetolian, with which go Elean and Achaean, present a more uncouth appearance than the other Doric dialects except perhaps Cretan. Only from Locris and Phocis come early old inscriptions; later a κοινή was developed, in which the documents of the Aetolian league are written, and of which the most distinctive mark is the dative plural of consonant stems in -σσι: ἀρχέοντσι (=Attic ἄρχουσι), ἀγόνσσι (=Attic ἀγῶσι), &c. Phocian and the Locrian of Opus have also forms like Aeolic in -εσσι. In place of the dative in -φι, locatives in -σι are used in Locrian and Phocian. Generally north of the Corinthian gulf the middle present participle ends in -μενος; similar forms are found also in Elean. Locrian changed ε before ρ into α: ταῦρα for ταῦρε; cf. English *Kerr* and *Carr*, *sergeant* and *Sargeaunt*. σσ appears for σθ, and ρ and ϝ are still much in use in the 5th century B.C. Many thousands of inscriptions were found in the French excavations at Delphi, but nothing earlier than the 5th century B.C. In the older inscriptions the Aeolic influence—datives in -εσσι, δοῦμα for δωμα—is better marked than later. In the Laws of the Labyad phratry (about 400 B.C.) the genitive is in ου, but a fragment in -ω is also found, Γοίκω, which seems to be an old ablative fossilized as an adverb. The nom. pl. δεκατρόπορ is used for the acc.; similar forms are found in Elean and Achaean.

The more important of the older materials for Achaean come from the Achaean colonies of S. Italy, and being scanty give us only an imperfect view of the dialect, but it is clearly in all its main features Doric. Much more remarkable is the Elean dialect known chiefly from inscriptions found at Olympia, some of which are as early as the beginning of the 6th century. The dialect was regularly treated first by a Doric and then by the Attic κοινή, but under the Caesars the archaic dialect was restored. Many of its characteristics it shares with the dialects north of the Corinthian gulf, but it changes original τσ to ὁ: μεσμν, &c.; ὁ was apparently a spirant, as in modern Greek (=th in English *the*, *thine*), and it disappears in the case of the earliest inscriptions. Final -τ became -ρ; this is found also in Laconian; -ἰτ- became -σσ-, but was not simplified as in Attic to -σ-: δοσα = Attic ὅσα.

As we have seen, Ionians, Aetolians and Dorians tended to level local peculiarities and make a generally intelligible dialect in which treaties and other important records were framed. The language of literature is always of necessity to some extent a κοινή: with some Greek writers the use of a mixed literary language was systematic. The local dialect of Boeotia was not easily intelligible in other districts, and a writer like Pindar, whose patrons were mostly not Boeotians, had perforce to write in a dialect that they could understand. Hence there arose a conventional Doric, which Aeolic elements, where forms a strong contrast to that of Corinna, who kept more or less closely to the Boeotian dialect. For different literary purposes Greek had different κοιναί. A poet who would write an epic must adopt a language modelled on that of Homer and Hesiod; Alcaeus and Sappho were the models for the love lyric, which was therefore Aeolic; Stesichorus was the founder of the triumphal ode, which, as he was a Dorian of Sicily, must henceforth be in Doric, though Pindar was an Aeolian, and its other chief representatives, Simonides and Bacchylides, were Ionians from the island of Ceos. The chorale of tragedy was always conventional Doric, and in the iambics also are Doric words like ἁρμός, λᾶας, &c. Elegy and epigram were founded on epic; the satirical iambics of Hipponax and his late disciple Herodas are Ionic. The first Greek prose was developed in Ionic, and in an excellent example has been preserved to us in Herodotus. Thucydides was not an Ionian, but he could not shake himself free of the tradition: he therefore writes πράσσω, τάσσω, &c., with -σσ-, which was Ionic, but is never found in Attic inscriptions nor in the writers who imitate the language of common life—Aristophanes (when not parodying tragedy, or other forms of literature or dialect), Plato and the Orators (with the partial exception of Antiphon, who ordinarily has -ττ-, but in the one speech actually intended for the law-courts -σσ-). Similarly Hippocrates and his medical school in Cos wrote in Ionic, not, however, in the Ionic of Herodotus, but in a language more akin to the Ionic κοινή of the inscriptions; and this dialect continued to be used in medicine later, much as doctors now use Latin for their prescriptions. The first literary document written in Attic prose is the treatise on the *Constitution of Athens*, which is generally printed amongst the minor works of Xenophon, but really belongs to about 425 B.C. From the fragment of Aristophanes'

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Banqueters and from the first speech of Lysias "Against Theomnestos" it is clear that the Attic dialect had changed rapidly in the 6th and 5th centuries B.C., and that much of the phraseology of Solon's laws was no longer intelligible by 400 B.C. Among the most difficult of the literary dialects to trace is the earliest—the Homeric dialect. The Homeric question cannot be discussed here, and on that question it may be said *quot homines tot sententiae*. To the present writer, however, it seems probable that the poems were composed in Chios as tradition asserted; the language contains many Aeolisms, and the heroes sung are, except for the Athenians (very briefly referred to), and possibly Telamonian Ajax, not of the Ionic stock. Chios was itself an Ionicized Aeolic colony (Diodorus v. 81. 7). The hypothesis of a great poet writing on the basis of earlier Aeolic lays (κλέα ἀνδρῶν) in Chios seems to explain the main peculiarities of the Homeric language, which, however, was modified to some extent in later times first under Ionic and afterwards under Athenian influence.

Of Dorian literature we know little. The works of Archimedes written in the Syracusan dialect were much altered in language by the late copyists. The most striking development of the late classical age in Doric lands is that of pastoral poetry, which, like Spenser, is "writ in no language," but, on a basis of Syracusan and possibly Coan Doric, has in its structure many elements borrowed from the Aeolic love lyric and from epic.

From the latter part of the 5th century B.C. Athens became ever more important as a literary centre, and Attic prose became the model for the later κοινή, which grew up as a consequence of the decay of the local dialects. For this decay there were several reasons. If the Athenian empire had survived the Peloponnesian War, Attic influence would no doubt soon have permeated the whole of that empire. This consummation was postponed. Attic became the court language of Macedon, and, when Alexander's conquests led to the foundation of great new towns, like Alexandria, filled with inhabitants from all parts of the Greek world, this dialect furnished a basis for common intercourse. Naturally the resultant dialect was not pure Attic. There were in it considerable traces of Ionic. In Attica itself the dialect was less uniform than elsewhere even in the 5th century B.C., because Athens was a centre of empire, literature and commerce. Like every other language which is not under the dominion of the schoolmaster, it borrowed the names of foreign objects which it imported from foreign lands, not only from those of Greek-speaking peoples, but also from Egypt, Persia, Lydia, Phoenicia, Thrace and elsewhere. The Ionians were great seafarers, and from them Athens borrowed words for seacraft and even for the tides: ἄμπωτις "ebb," ῥαχία "high tide," an Ionic word ῥηχίη spelt in Attic fashion. From the Dorians it borrowed words connected with war and sport: λοχαγός, κυναγός, &c. A soldier of fortune like Xenophon, who spent most of his life away from Athens, introduced not only strange words but strange grammatical constructions also into his literary compositions. With Aristotle, not a born Athenian but long resident in Athens, the κοινή may be said to have begun. Some characteristics of Attic foreigners found it hard to acquire—its subtle use of particles and its accent. Hence in Hellenistic Greek particles are comparatively rare. According to Cicero, Theophrastus, who came from as near Attica as Eretria in Euboea, was easily detected by a market-woman as no Athenian after he had lived thirty years in Athens. Thoucritus, an Athenian, who was taken prisoner in the Peloponnesian War and lived for many years in Epirus as a slave, was unable to recover the Athenian accent on his return, and his family lay under the suspicion that they were an alien's children, as his son tells us in Demosthenes' speech "Against Eubulides." In the κοινή there were several divisions, though the line between them is faint and irregular. There was a κοινή of literary men like Polybius and of carefully prepared state documents, as at Magnesia or Pergamum; and a different κοινή of the vulgar which is represented to us in its Egyptian form in the Pentateuch, in a later and at least partially Palestinian form in the Gospels. Still more corrupt is the language which we find in the ill-written and ill-spelt private letters found amongst the Egyptian papyri. Not out of the old dialects but out of this κοινή arose modern Greek, with a variety of dialects no less bewildering than that of ancient Greek. In one place more rapidly, in another more slowly, the characteristics of modern Greek begin to appear. As we have seen, in Boeotia the vowels and diphthongs began to pass into the characteristic sounds of modern Greek four centuries before Christ. Dorian dialects illustrate early the passing of the old aspirate θ, the sound of which was like the final *t* in English *bit*, into a sound like the English *th* in *thin*, *pith*, which it still retains in modern Greek. The change of γ between vowels into a *y* sound was charged by the comic poets against Hyperbolus the demagogue about 415 B.C. Only when the Attic sound changes stood isolated amongst the Greek dialects did they give way in the κοινή to Ionic. Thus the forms with -σσ- instead of -ττ- won the day, while modern Greek shows that sometimes the -ρρ- which Attic shared with some Doric dialects and Arcadian was retained, and that sometimes the Ionic -ρσ-, which was also Lesbian and partly Doric, took its place. In other cases, where Ionic and Attic did not agree, forms came in which were different from either: the genitives of masculine *ā* stems were now formed as in Doric with ᾱ, but the analogy of the other cases may have been the effective force. The form ναός "temple," instead of Ionic νηός, Attic νεώς, can only be Doric.[1] In the first five centuries of the Christian era came in the modern Greek characteristics of Itacism and vowel contraction, of the pronunciation of μπ and ντ as *mb* and *nd* and many other sound changes, the loss of the dative and the confusion of the 1st with the 3rd declension, the dropping of the -μι conjugation, the loss of the optative and the assimilation of the imperfect and second aorist endings to those of the first aorist.[2] There were meantime spasmodic attempts at the revival of the old language. Lucian wrote Attic dialogue with a facility almost equal to Plato; the old dialect was revived in the inscriptions of Sparta; Balbilla, a lady-in-waiting on Hadrian's empress, wrote epigrams in Aeolic, and there were other attempts of the same kind. But they were only *tours de force*, κῆποι Ἀδώνιδος, whose flowers had no root in the spoken language and therefore could not survive. Even in the hands of a cultivated man like Plutarch the κοινή of the 1st century A.D. looks entirely different from Attic Greek. Apart from non-Attic constructions, which are not very numerous, the difference consists largely in the new vocabulary of the philosophical schools since Aristotle, whose jargon had become part of the language of educated men in Plutarch's time, and made a difference in the language not unlike that which has been brought about in English by the development of the natural sciences. It is hardly necessary to say that these changes, whether of the κοινή or of modern Greek, did not of necessity impair the powers of the language as an organ of expression; if elaborate inflection were a necessity for the highest literary merit, then we must prefer Cædmon to Milton and Cynewulf to Shakespeare.

The Chief Characteristics of Greek.

As is obvious from the foregoing account of the Greek dialects, it is not possible to speak of the early history of Greek as handed down to us as that of a single uniform tongue. From the earliest times it shows much variety of dialect accentuated by the geographical characteristics of the country, but arising, at least in part, from the fact that the Greeks came into the country in separate waves divided from one another by centuries. For the history of the language it is necessary to take as a beginning the form of the Indo-European language from which Greek descended, so far as it can be reconstructed from a comparison of the individual I.E. languages (see INDO-EUROPEAN LANGUAGES). The sounds of this language, so far as at present ascertained, were the following:—

(*a*) 11 vowels: *a*, *ā*, *e*, *ē*, *i*, *ī*, *o*, *ō*, *u*, *ū*, *ə* (a short indistinct vowel).
(*b*) 14 diphthongs: *ai*, *au*, *ei*, *eu*, *oi*, *ou*, *āi*, *āu*, *ēi*, *ēu*, *ōi*, *ōu*, *əi*, *əu*.
(*c*) 20 stop consonants.

Labials: *p*, *b*, *ph*, *bh* (*ph* and *bh* being *p* and *b* followed by an audible breath, not *f* and *v*).

Dentals: *t*, *d*, *th*, *dh* (*th* and *dh not* spirants like the two English sounds in *thin* and *then*, but aspirated *t* and *d*).

Palatals: *k̂*, *ĝ*, *k̂h*, *ĝh* (*kh* and *gh* aspirates as explained above).

Velars: *q*, *g*, *qh*, *gh* (velars differ from palatals by being produced against the soft palate instead of the roof of the mouth).

Labio-velars: *qᵘ*, *gᵘ*, *qᵘh*, *gᵘh* (these differ from the velars by being combined with a slight labial *w*-sound).

(*d*) Spirants—
Labial: *w*.
Dental: *s*, *z*, post-dental *ṣ*, *ẓ*, interdental possibly þ, ð.
Palatal: χ (Scotch *ch*), *y*.
Velar: *x* (a deeply guttural χ, heard now in Swiss dialects), ʒ.

Closely akin to *w* and *y* and often confused with them were the semi-vowels *u̯* and *i̯*.

(*e*) Liquids: *l*, *r*.

(*f*) Nasals: *m* (labial), *n* (dental), *ñ* (palatal), *ṅ* (velar), the last three in combination with similar consonants.

(*a*) As far as the vowels are concerned, Greek retains the original state of things more accurately than any other language. The sounds of short *e* and short *o* in Attic and Ionic were close, so that *e*+*e* contracted to a long close *e* represented by ει, *o*+*o* to a long close *o* represented by ου. In these dialects *u*, both long and short, was modified to *ü*, and they changed the long *ā* to *ē*, though Attic has ā after ε, ι and ρ. In Greek *ə* appeared regularly as α, but under the influence of analogy often as ε and ο.

(*b*) The short diphthongs as a whole remained unchanged before a following consonant. Before a following vowel the diphthong was divided between the two syllables, the ι or υ forming a consonant at the beginning of the second syllable, which ultimately disappeared. Thus from a root *dheu-* "run" comes a verb θέω for θε-ϝω, from an earlier *θευ-ω. The corresponding adjective is θοός "swift," for θο-ϝο-ς, from an earlier *θευ-ο-ς. The only dialect which kept the whole diphthong in one syllable was Aeolic. The long diphthongs, except at the ends of words, were shortened in Attic. Some of these appear merely as long vowels, having lost their second element in the proethnic period. Apparent long diphthongs like those in λῃτουργία, σῴζω arise by contraction of two syllables.

(*c*) The consonants suffered more extensive change. The voiced aspirates became unvoiced, so that *bh*, *dh*, *ĝh*, *gh*, *gᵘh* are confused with original *ph*, *th*, *k̂h*, *qh*, *qᵘh*: I.E. **bherō* (Skt. *bharāmi*) is Gr. φέρω; I.E. **dhūmos* (Skt. *dhūmas*), Gr. θυμός; I.E. **ĝhimo-* (Skt.

[1] Thumb, *Die griechische Sprache im Zeitalter des Hellenismus* (1901), pp. 242-243.
[2] Thumb, *op. cit.* p. 249.

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hima-), Gr. (ἐσ)-χιμα-ε; I.E. ***stigh-** (Skt. *stigh-*), Gr. στίχε; I.E. ***gthen-** (Skt. *han-*), Gr. θείνω (probably), φόνος. The palatal and velar series cannot be distinguished in Greek; for the differences between them resort must be had to languages of the *satem*-group, such as Sanskrit, Zend or Slavonic, where the palatals appear as sibilants (see INDO-EUROPEAN LANGUAGES). The labio-velar series present a great variety of forms in the different Greek dialects, and in the same dialect before different sounds. Thus in Attic before *o* vowels, nasals and liquids, the series appears as *π, β, φ*; before *e* and *i* vowels as *τ, δ(δ), θ*; in combination with *u*, which led to loss of the *ŭ* by dissimilation, *κ, γ, χ*. Thus ἕπομαι corresponds to the Latin *sequo-r*, apart from the ending; βύκ to Latin *bos* (borrowed from Sabine), English *cow*; φόνος "slaughter," βένος Irish *genim*, "I wound." Parallel to these forms with *p* are forms in the Italic languages except Latin and Faliscan, and in the Cymric group of the Celtic languages. The dental forms *τ, δ, θ* stand by themselves. Thus τό (from the same root as τίς, τοῦ, τόθεν, etc.) is parallel to the Latin *qui*, the Oscan *pis*, old Irish *cia*, Welsh *pwy*, "who?" "what?"; Attic τέτταρες, Ionic τέσσερες "four" is parallel to Latin *quattuor*, Oscan πετορα, old Irish *cethir*, old Welsh *petguar*; τέκνα is from the same root as *τοκή*. For the voiced sound, *β* is much more usual than *δ* before *e* and *i* sounds; thus βίος "life," from the same root as Skt. *jīvas*, Latin *vīrus*; βόσ "bowstring," Skt. *jyā*, &c. In Arcado-Cyprian and Aeolic, *π* and *β* often precede *e* and *i* sounds. Thus parallel to Attic τέτταρες Lesbian πίσυρες, Homer τέσσαρες, Boeotian πίτταρες; Thessalian βίλλομαι, Boeotian βείλομαι alongside of Attic βούλομαι, Lesbian βώλλομαι, Doric βώλομαι and also βήλομαι. In Arcadian and Cyprian the form corresponding to τίς was σις, in Thessalian κις, where the labialization was lost to the article πις, τις.

A great variety of changes in the stopped consonants arose in combination with other sounds, especially *ŭ* (a semivowel of the nature of English *y*), *ψ* (*w*) and *s*; *-τŭ-, -θŭ-* became first *-σσ-* and later *-σ-* in Attic Greek, *-ττ-* in Ionic and in the Lesbian penultimate (the origin of *-ττ-* is uncertain): Attic ὀ-τάσσω, earlier ὀ-τάνσω, Boeotian ὀ-τάττω, from the same stem as the Latin *quot*, *quotiens*; Homeric μέσσος, Attic μέσος from **μεθ-τος*, Latin *medius*; *-τŭ-, -χŭ-* became *-σσ-*, Attic *-τ-*: πάσσω "I sprinkle," πάστρα from **πάκ-τρα*, cp. Latin *pix*, *picis*, ἐλάσσων, Attic ἐλάττων comparative to ἐλαχύς. *δ* and *γ* became *ζ*: Ζεύς (Skt. *Dyāus*) ἅλτις from ἅλτις, stem ἁλτιδ- "hope," μαστίζω from μάστις, stem μαστιγ- "lash."

(*d*) The sound *ψ* was represented in the Greek alphabet by *ϝ*, the "digamma," but in Attic and Ionic the sound was lost very early. In Aeolic, particularly Boeotian and Lesbian, it was persistent, and so also in many Doric dialects, especially at the beginning of words. When the Ionic alphabet was adopted by districts which had retained *ϝ*, it was represented by *β*: βοιδέω, βοιδή for ϝοιδέω, ϝοιδή. In Attic it disappeared, leaving no trace; in Ionic it lengthened the preceding syllable; thus in Homer ὑακόεσσα is scanned with a long because the root of the verb contained *ϝ*: ὕα-ε-, Attic has ὕσσα, but Ionic ὗσαι for ὕϝ-σαι. Its combination with *s* became *-σσ-*, Attic and Boeotian *-ττ-*, in τέσσερες, τέττορες, πέττορες for I.E. *qtetŭ-*.

But the most effective of all elements in changing the appearance of Greek words was the sound *s*. Before vowels at the beginning, or between vowels in the middle of words, it passed into the so-called "rough breathing." Thus ἑπτά is the same word as the Latin *septem*, English *seven*; ἁλ-ς has the same stem as the Latin *sal*, English *sal-t*; ἑ͂ω for *σέθω* is the same as the Latin *uro* (**seuō*). Combined with *ŭ* or *ψ* before and into *h*: ὗς, Latin *sȳs*, *sȳmen*, "hand"; ἥδυς, Doric ἅδυς, Latin *suāvis*, English *sweet*; ἐϝ, οἷος for **ϝοσϝιος*, **ϝός*, Lesbian ϝεός "temple," through **ϝαϝός* from **ϝαϝός* connected with ϝαῦλα "dwell." Before nasals and liquids it was assimilated: ἐν-σι-ντι, ἐν-τι-ντι, ἐν-σι-ντι, ἐνσί, ἐντί, Attic ἐσμέν, English *snow*; λέγω, Latin *laxus*, English *slack*; ῥέω from **sreγ-ō* of the same origin as English *stream* (where *t* is a later insertion), imperfect ἔῤῥεον for **esreγom*; cp. also φιλομμειδής, ἀγάμμοτος, ἄλλυγρος.

After nasals *s* is assimilated except finally; when assimilated, in all dialects except Aeolic the previous syllable is lengthened if not already long: Attic ἔνσιμι, ἔμμενε for the first aorist **enemsa*, **emensa*; but τάνς, τάς, &c., of the accusative pl. either remained or became ν in Aeolic τανς, τας in Doric and Attic τάς, τᾶς, in Doric τόνς, τός; cp. τοθεῖς for **τοθένς*, βᾶς for **βάνς*. εἰς "one" for **sem-s*, then by analogy of the neuter **sem*. Assimilation of *σ* to preceding *ρ* and λ is a matter of dialect: Ionic θαρσέω, but Attic θαῤῥέω, and so also the Doric of Thera; ἄλσος, but ἄλλομαι, ἤστεκα. With nasals *ŭ* affected the previous syllable: τεττάνων (**τεττμων*), where *ŭ* is the nasal of the stem τέκτων, itself forming a syllable (see the article N for these so-called sonant nasals). Before *ŭ* original *ne* becomes *n*; hence ἄνθη, though ἄν-θος, from the same root as English *tome*. Original *ŭ* does not survive in Greek, but is represented by the aspirate at the beginning of words, ἅγνδι = Skt. *yajñas*; medially after consonants it disappears, affecting the preceding consonant or syllable where a consonant precedes; between vowels it disappears. A sound of the same kind is indicated in Cyprian and some other dialects as a glide or transition sound between two vowels.

(*e*) The most remarkable feature in the treatment of the nasals is that when *n* or *m* forms a syllable by itself its consonant character disappears altogether and it is represented by the vowel *a* only: τανύς, Latin *tentus*, *a-* negative particle, Latin *in*, English *un*; ἀ-πλόος has the same prefix as the Latin *sem-plex* (*sm*). The liquids in similar cases show λα or αλ and ρα or αρ: τί-τλα-μεν, νί-σπλα; ἄβραοσ, θρασύς, θάρσος.

The ends of words were modified in appearance by the loss of all stop-consonants and the change of final *m* to *n*, δόωξε, Latin *dixit*; ζυγόν, Latin *iugum*.

Accent.—The vowel system of Greek has been so well preserved because it has shown till late times very little in the way of stress accent. As in early Sanskrit the accent was predominantly a pitch accent (see ACCENT).

Noun System.—The I.E. noun had three numbers, but the dual was limited to pairs, the two hands, the two horses in the chariot, and was so little in use that the original form of the oblique cases cannot be restored with certainty. Ionic has no dual. The I.E. noun had the following cases: Nominative, Accusative, Genitive, Ablative, Instrumental, Locative and Dative. The vocative was not properly a case, because it usually stands outside the syntactical construction of the sentence; when a distinctive form appears, it is the bare stem, and there is no form (separate from the nominative) for the plural. Greek has confused genitive and ablative (the distinction between them seems to have been derived from the pronouns), except for the solitary ϝόλεω=ὁλωόν in an inscription of Delphi. The instrumental, locative and dative are mixed in one case, partly for phonetic, partly for syntactical reasons. In Arcadian, Elean, Thessalian, and later widely in N. Greek, the locative *-οι* is used for the dative. The masculine ā-stems make the nom. in most dialects in *-ᾱς*. The genitive is in *-ᾱο* (with ᾱ borrowed from the *o*-stems), which remains in Homer and Boeotian, appears in Arcado-Cyprian as *-αν*, *-ᾱν*, in the metathesized quantity *-ην* in Ionic. The Attic form in *-ου* is borrowed directly from the *o*-stems. In the plural the *-ᾱ* and *-ō* stems follow the article in making their nominatives in *-αι* and *-οι* instead of the original *-ᾱς* and *-ōς*. The neuter plural was in origin a collective singular, and for this reason takes a singular verb; the plural of ζυγόν "yoke" was originally **ζυγᾱ*, and declined like any other *-ᾱ* stem. But through the influence of the masculine and feminine forms the neuter took the same oblique cases, and like its own singular takes the same ending as the nominative. In the plural of *-ᾱ* and *-ō* stems, the locative in *-σοι*, *-ωσι* was long kept apart from the instrumental-dative form in *-αις*, *-οις*.

The Verb System.—The verb system of Greek is more complete than that of any of the other I.E. languages. Its only rival, the early Vedic verb system, is already in decay when history begins, and when the classical period of Sanskrit arrives the moods have broken down, and the aorist, perfect, and imperfect tenses are syntactically confused. Throughout Greek the primary classes of the moods are maintained, but in the period of the *κοινή* the optative occurs less and less and finally disappears. The original I.E. had two voices, an active and a middle, and to these Greek has added a third, the passive, distinguished from the middle in many verbal and nominal forms for the future and aorist, made with a syllable *-θη-, τιμηθήσομαι, ἐτιμήθην*, though in this instance, τιμήσομαι, the future middle, is often used with a passive sense. Other forms which Greek has added to the original system are the periphrastic future, a past of the perfect stem with aorist endings. It merely expressed the perfect action in past time, and, except as derived from the context, did not possess the notion of relative time (past at a time already past), which attaches to the Latin forms with the same name. The future optative was also a new formation, betraying its origin in the fact that it is almost entirely limited to *Oratio Obliqua*. The aorist imperatives were also new; the history of some of them, as the second sing. act. εἶδον, is not yet clear. The perfect system is affected by the distinction between *-ō* and *-mi* verbs; the former or thematic verbs have a so-called "thematic vowel" between the root and the personal suffix, while the *-mi* verbs attach the suffixes directly to the root. The distinction is really one between monosyllabic and disyllabic roots. The history of the personal endings is not altogether clear; the *-θ* verbs have in the present forms for the 2nd and 3rd person in *-εις* and *-ει*, which are not yet elucidated. In the middle, Greek does not entirely agree with Sanskrit in its personal endings, and the original forms cannot always be restored with certainty. The endings of the primary tenses differed from those of the secondary, but there has been a certain amount of confusion between them.

The syntax of the verb is founded on the original I.E. distinction of the verb forms, not by time, but by kind of action, as of action, progressive action (present and imperfect), consummated action (aorist), state arising from action, emphatic or repeated action (perfect). For the details of this see INDO-EUROPEAN LANGUAGES.

BIBLIOGRAPHY.—(1) A grammar of Greek, which will deal fully with the whole material of the language, is at present a *desideratum*, and is hardly possible so long as new dialect material is being constantly added and while comparatively so little has been done on the syntax of the dialects. The greatest collection of material is to be found in the new edition of Kühner's *Griechische Grammatik*, *Laut- und Formenlehre*, by Blass (2 vols., 1890–1892); *Syntax*, by Gerth (2 vols., 1896, 1900). Blass's part is useful only for material, the explanations being entirely antiquated. The only full historical account of the language (sounds, forms and syntax) at present in existence is K. Brugmann's *Griechische Grammatik* (3rd ed., 1900).

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Gustav Meyer's *Griechische Grammatik* (nothing on accent or syntax), which did excellent pioneer work when it first appeared in 1880, was hardly brought up to date in its 3rd edition (1896), but is still useful for the dialect and bibliographical material collected. See also H. Hirt, *Handbuch der griech. Laut- und Formenlehre* (1902). Of smaller grammars in English perhaps the most complete is that of J. Thompson (London, 1902). The grammar of Homer was handled by D. B. Monro (2nd ed., Oxford, 1891). The syntax has been treated in many special works, amongst which may be mentioned W. W. Goodwin, *Syntax of the Greek Moods and Tenses* (new ed., 1889); B. L. Gildersleeve and C. W. E. Miller, *Syntax of Classical Greek from Homer to Demosthenes*, pt. i. (New York, 1901— and following); J. M. Stahl, *Kritisch-historische Syntax des griechischen Verbums* (1907); F. E. Thompson, *Attic Greek Syntax* (1907). (ii.) The relations between Greek and the other I.E. languages are very well brought out in P. Kretschmer's *Einleitung in die Geschichte der griechischen Sprache* (Göttingen, 1896). For comparative grammar see K. Brugmann and B. Delbrück, *Grundriss der vergleichenden Grammatik der indogermanischen Sprachen* (2nd ed., begun 1897; is still incomplete) and Brugmann's *Kurze vergleichende Grammatik* (1902–1903); A. Meillet, *Introduction à l'étude comparative des langues indo-européennes* (2nd ed., 1908). Greek compared with Latin and English: P. Giles, *A Short Manual of Comparative Philology for Classical Students* (2nd ed., 1901, with an appendix containing a brief account and specimens of the dialects); Riemann and Goelzer, *Grammaire comparative du Grec et du Latin* (1901), a parallel grammar in 2 vols., specially valuable for syntax. (iii.) For the dialects two works have recently appeared, both covering the same space the whole field: A. Thumb, *Handbuch der griechischen Dialekte* (with bibliographies for each dialect, 1909); C. D. Buck, *Introduction to the Study of the Greek Dialects, Grammar, Selected Inscriptions, Glossary* (Boston, 1910). Works on a larger scale are Meister's, continued by R. Meister, by O. Hoffmann and by H. W. Smyth. For the *κοινή* may be specially mentioned A. Thumb, *Die griech. Sprache in Zeitalter des Hellenismus* (1901); E. Mayser, *Grammatik der griechischen Papyri aus der Ptolemäerzeit: Laut- und Wortlehre* (1906); H. St J. Thackeray, *A Grammar of the Old Testament in Greek*, vol. i. (1909); Blass, *Grammar of New Testament Greek*, trans. by Thackeray (1898); J. H. Moulton, *A Grammar of New Testament Greek. I. Prolegomena* (3rd ed., 1906). (iv.) For the development from the *κοινή* to modern Greek: J. N. Jannaris, *An Historical Greek Grammar, chiefly of the Attic Dialect, as written and spoken from Classical Antiquity down to the Present Time* (1901); G. N. Hatzidakis, *Einleitung in die neugriechische Grammatik* (1892); A. Thumb, *Handbuch der neugriechischen Volkssprache* (1910). (v.) The inscriptions are collected in *Inscriptiones Graecae* in the course of publication by the Berlin Academy, those important for dialect in the *Sammlung der griech. Dialektinschriften*, edited by Collitz and Bechtel. The earlier parts of this collection are to some extent superseded by later volumes of the *Inscr. Graecae*, containing better readings and new inscriptions. A good selection (too brief) is Solmsen's *Inscriptiones Graecae ad illustrandas dialectos selectae* (3rd ed., 1910). A serviceable lexicon for dialect words is van Herwerden's *Lexicon Graecum suppletorium et dialectícum* (2nd ed., much enlarged, 2 vols. 1910). (vi.) The historical basis for the distribution of the Greek dialects is discussed at length in the histories of E. Meyer (*Geschichte des Altertums*, ii.) and G. Busolt (*Griechische Geschichte*, i.); by Professor Ridgeway, *Early Age of Greece*, i. (1901), and F. Kretschmer in *Glotta*, i. 9 ff. See also A. Fick, *Die vorgriechischen Ortsnamen* (1905). (vii.) Bibliographies containing the new publications on Greek, with some account of their contents, appear from time to time in *Indogermanische Forschungen*; *Anzeiger* (Strassburg, Trübner), annually in *Glotta* (Göttingen, Vandenhoeck und Ruprecht), and *The Year's Work in Classical Studies* (London, Murray). (P. Gl.)

GREEK LAW. Ancient Greek law is a branch of comparative jurisprudence the importance of which has been long ignored.

Greek law and comparative jurisprudence.

Jurists have commonly left its study to scholars, who have generally refrained from comparing the institutions of the Greeks with those of other nations. Greek law has, however, been partially compared with Roman law, and has been incidentally illustrated with the aid of the primitive institutions of the Germanic nations. It may now be studied in its earlier stages in the laws of Gortyn; its influence may be traced in legal documents preserved in Egyptian papyri; and it may be recognized as a consistent whole in its ultimate relations to Roman law in the eastern provinces of the Roman empire.

The existence of certain panhellenic principles of law is implied by the custom of settling a difference between two Greek states, or between members of a single state, by resorting to external arbitration. The general unity of Greek law is mainly to be seen in the laws of inheritance and adoption, in laws of commerce and contract, and in the publicity uniformly given to legal agreements.

No systematic collection of Greek laws has come down to us. Our knowledge of some of the earliest notions of the subject is derived from the Homeric poems. For the details of Attic law we have to depend on *ex parte* statements in the speeches of the Attic orators, and we are sometimes enabled to check those statements by the trustworthy, but often imperfect, aid of inscriptions. Incidental illustrations of the laws of Athens may be found in the *Laws* of Plato, who deals with the theory of the subject without exercising any influence on actual practice. The *Laws* of Plato are criticized in the *Politics* of Aristotle, who, besides discussing laws in their relation to constitutions, reviews the work of certain early Greek lawgivers. The treatise on the *Constitution of Athens* includes an account of the jurisdiction of the various public officials and of the machinery of the law courts, and thus enables us to dispense with the second-hand testimony of grammarians and scholiasts who derived their information from that treatise (see CONSTITUTION OF ATHENS). The works of Theophrastus *On the Laws*, which included a recapitulation of the laws of various barbaric as well as Grecian states, are now represented by only a few fragments (Nos. 97-106, ed. Wimmer).

Original authorities.

Our earliest evidence is to be sought in the Homeric poems. In the primitive society of the heroic age (as noticed by Plato) written laws were necessarily unknown; for, "in that early period, they had no letters; they lived by habit and by the customs of their ancestors" (*Laws*, 680 A). We find a survival from a still more primitive time in the savage Cyclops, who is "unfamiliar with dooms of law, or rules of right" (*οὔτε δίκας ἐὺ εἰδότα οὔτε θέμιστας*, *Od.* ix. 215 and 112 f.).

Law in Homer.

Dikē (*δίκη*), assigned by Curtius (*Etym.* 134) to the same root as *deiknymi*, primarily means a "way pointed out," a "course prescribed by usage," hence "way" or "fashion," "manner" or "precedent." In the Homeric poems it sometimes signifies a "doom" of law, a legal "right," a "lawsuit"; while it is rarely synonymous with "justice," as in *Od.* xiv. 84, where "the gods honour justice," *τίουσι δίκην*.

Dikē.

Various senses of "right" are expressed in the same poems by *themis* (*θέμις*), a term assigned (*ib.* 254) to the same root as *tithēmi*. The primary sense *themis* is that which "has been laid down"; hence a particular decision or "doom." The plural *themistes* implies a body of such precedents, "rules of right," which the king receives from Zeus with his sceptre (*Il.* ix. 99). *Themis* and *dikē* have sometimes been compared with the Roman *fas* and *jus* respectively, the former being regarded as of divine, the latter of human origin; and this is more satisfactory than the latest view (that of Hirzel), which makes "counsel" the primary meaning of *themis*.

Themis.

Themistes (*θεμῐστες*), an ordinance (from the same root as *themis*), is not found in "Homer," except in the last line of the original form of the *Odyssey* (xxiii. 296), where it probably refers to the "ordinance" of wedlock. The common term for law, *nómos*, is first found in Hesiod, but not in a specially legal sense (*e.g. Op.* 276).

Themistes. Nomos.

A trial for homicide is one of the scenes represented on the shield of Achilles (*Il.* xviii. 497-508). The folk are here to be seen thronging the market-place, where a strife has arisen between two men as to the price of a man that has been slain. The slayer vows that he has paid all (*εἶπεν τἀπ' ἀποδοῦναι*), the kinsman of the slain protests that he has received nothing (*ἀναίνετο μηδὲν ἑλέσθαι*); both are eager to join issue before an umpire, and both are favoured by their friends among the folk, who are kept back by the heralds. The cause is tried by the elders, who are seated on polished stones in a sacred circle, and in the midst there lie two talents of gold, "to give to him who, among them all, sets forth the cause most rightly" (*τῷ δόμεν ὃς μετὰ τοῖσι δίκην ἰθύντατα εἴποι*).

The trial scene.

The discussions of the above passage have chiefly turned on two points: (1) the legal questions at issue; and (2) the destination of the "two talents." (1) In the ordinary view (*a*), it is solely a question whether the fine or blood-money, corresponding to the *Wergeld* (see WERGELD, TEUTONIC PEOPLES, BRITAIN: *Anglo-Saxon*) of the old Germanic law (Grimm, *Rechtsalterthümer*, 661 f.), has been paid or not. (This is accepted by Thomissen, Lipsius, Sidgwick and Ridgeway.) In the other view (*b*), it is held that the slayer "claimed to pay" the fine, and the kinsman of the slain "refused to accept any compensation" (so Passow and Leaf, approved by Pollock). (2) The "two talents" (shown by Ridgeway to be a small sum, equal in

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value to two oxen) are awarded either (*a*) to the litigant who "pleads his cause most justly before them" (so Thonissen, Shilleto and Lipsius, in accordance with the Attic use of phrases like δίκην αἰτεῖν), or (*b*) to the judge "who, among all the elders, gives the most righteous judgment" (so Maine, approved by Sidgwick, Pollock, Leaf and Ridgeway).

On this controversy, cf. Maine's *Ancient Law*, chap. x. pp. 385 f., 405 f., ed. Pollock; Thonissen, *Droit pénal* (1875), 27; P. M. Laurence (on Shilleto's view) in *Journal of Philology*, viii. (1879), 125 f.; Ridgeway, *ib.* x. (1882), 30 f., and *Journal of Hellenic Studies*, viii. (1887), 133 f.; and Leaf, *ib.* viii. 122 f., and in his Commentary on *Iliad*, ii. (1902), 610-614; also J. H. Lipsius in *Leipziger Studien*, xii. (1890), 225-231, criticized by H. Sidgwick in *Classical Review*, viii. (1894), 1-4.

We are told elsewhere in Homer that sometimes a man accepted blood-money from the slayer of his brother or his son, and that the slayer remained in the land after paying this penalty (*Il.* ix. 633). As a rule the slayer found it safest to flee (*Od.* xxiii. 118 f.), but even so, he might be pursued by the friends of the slain (*Od.* xv. 272-278). If he remained, the land was not (as in later ages) deemed to be polluted by his presence. In Homer, Orestes does not slay Clytaemestra, and he needs no "purification" for slaying Aegisthus.

Greek law given to Lycurgus at Sparta.

The laws of Sparta are ascribed to the legislation of Lycurgus, whose traditional date is 884 B.C. Written laws are said to have been expressly forbidden by Lycurgus (Plutarch, *Lycurgus*, 13); hence the "laws of Sparta" are simply a body of traditional observances. We learn that all trials for homicide came before the Council of Elders and lasted for several days, and that all civil causes were tried by the ephors (ϕ.τ.). We are also told that originally the land was equally divided among the citizens of Sparta, and that this equality was enforced by law (Polybius vi. 45-46). Early in the 4th century the ephor Epitadeus, owing to a disagreement with his son, enacted that every Spartan should be allowed to transfer his estate and his allotment to any other person (Plutarch, *Agis*, 5), while Aristotle, in a much-debated passage of the *Politics* (ii. 9. 14-15), criticizes the Spartan constitution for allowing the accumulation of property in a few hands, an evil aggravated by the large number of "heiresses"; "a man (he adds) may bestow his heiress on any one he pleases; and, if he dies intestate, this privilege descends to his heir."

Era of written laws.

Law was first reduced to writing in the 7th century B.C. A written code is a necessary condition of just judgment, and such a code was the first concession which the people in the Greek cities extorted from the ruling aristocracies. The change was generally effected with the aid of a single legislator entrusted with complete authority to draw up a code.

Zaleucus at Locri Epizephyrii.

Charondas at Catana, etc.

Androdamas of Rhegium.

Philolaus of Corinth.

The first communities to reach this stage of progress were the Greek colonies in the West. The Epizephyrian Locrians, near the extreme south of Italy, received the earliest written code from Zaleucus (663 B.C.), whose strict and severe legislation put an end to a period of strife and confusion, though we know little of his laws, except that they attached definite penalties to each offence, and that they strictly protected the rights of property. Two centuries later, his code was adopted even by the Athenian colony of Thurii in south Italy (443 B.C.). Charondas, the "disciple" of Zaleucus, became the lawgiver, not only of his native town of Catana on the east coast of Sicily, but also of other Chalcidian colonies in Sicily and Italy. The laws of Charondas were marked by a singular precision, but there was nothing (says Aristotle) that he could claim as his own except the special procedure against false witnesses (*Politics*, ii. 12. 11). In the case of judges who neglected to serve in the law courts, he inflicted a large fine on the rich and a small fine on the poor (*ib.* vi. (iv.) 13. 2). Androdamas of Rhegium gave laws on homicide and on heiresses to the Chalcidians of Thrace, while Philolaus of Corinth provided the Thebans with "laws of adoption" with a view to preventing any change in the number of the allotments of land (*ib.* ii. 12. 8-14).

The laws of Gortyn.

Local legislation in Crete is represented by the laws of the important city of Gortyn, which lies to the south of Ida in a plain watered by the Lethaeus. Part of that stream forms a sluice for a water-mill, and at or near this mill some fragmentary inscriptions were found by French archaeologists in 1857 and 1879. The great inscription, to which most of our knowledge of the laws is due, was not discovered until 1884. It had been preserved on a wall 27 ft. long and 5 ft. high, the larger part of which was buried in the ground, while its farthest extremity passed obliquely athwart the bed of the mill-stream. It was necessary to divert the water before the last four columns could be transcribed by the Italian scholar, Federico Halbherr, whose work was completed in the same year by the excavation and transcription of the first eight columns by the German scholar, E. Fabricius. In the following year Halbherr discovered more than eighty small fragments on the neighbouring site of a former temple of the Pythian Apollo.

These fragments, which are far earlier than the great inscription above-mentioned, have been assigned to about 650 B.C. They precede the introduction of coined money into Crete, the penalties being reckoned, not in coins, but in cattle-heads. They deal with the powers of the magistrates and the observances of religion, but are mainly concerned with private matters of barter and sale, dowry and adoption, inheritance and succession, fines for trespass and regulations of blood-money. As in the code of Zaleucus, we have a fixed scale of penalties, including the fine of a single tripod, and ranging from one to a hundred caldrons.

The great inscription is perhaps two centuries later (*c.* 450 B.C.). It contains, as a number of amendments or additions to an earlier code, and it deals exclusively with private law, in which the family and family property occupy the largest part. The procedure is entirely oral; oaths and other oral testimony are alone admitted; there are no documentary proofs, and no record of the verdict except in the memory of the judge or of his "remembrancer." All the causes are tried before a single judge, who varies according to the nature of the suit. Where the law specially enjoins it, he is bound to give judgment (διαδικάσαι) in accordance with the law and the "witnesses or bailsmen," but, in other cases, he is permitted to "put oath and decide (κρίναι) in view of" the contentions of the parties," as distinguished from "the declarations of the witnesses." Offences against the person are treated as matters of private compensation according to a carefully graduated tariff. In certain cases the defendant may clear himself by an "oath of purgation" with the support of "conjurors" (ὁμώμοται), the *Eideshelfer* of old Germanic law (Grimm 859 f.), who have no necessary knowledge of the facts. There is no interference with the exposure of infants, except in the interest of the father (if the child is freeborn) or of the lord (in case of serfs). The law of debt is primitive, though less severe than that of the early Romans. In contrast with these primitive elements we have others which are distinctly progressive. The estates of husband, wife and sons are regarded as absolutely distinct. Wills are unknown, even in their most restricted form. Elaborate provisions are made to secure with all speed the marriage of an "heiress"; she is bound to marry the eldest of her paternal uncles or to surrender part of her estate, and it is only if there are no paternal uncles that she is permitted to marry one (and that the eldest) of their sons. Adoption is made by the simple procedure of mounting a block of stone in the market-place and making a public announcement at a time when the citizens are assembled. The adopted son does not inherit any larger share than that of a daughter. Any one who desires to repudiate his adopted son makes a public announcement as before, and the person repudiated receives, by way of nominal compensation, the gift of a small number of staters. In these later "laws of Gortyn" we have reached the time when payments are made, not in "caldrons," but in coins. In the inscription itself the laws are simply described as "these writings."

The text of the great inscription was first published by E. Fabricius in *Ath. Mitth.* ix. (1884), 1-25; there is a cast of the whole in the Cambridge Museum of Classical Archaeology. Cf. Comparetti's *Leggi di Gortyna* (1893); Bücheler and Zitteltmann in *Rhein. Mus.* xl. (1885); Dareste, Haussoullier and Th. Reinach, *Inscr. juridiques grecques*, iii. (1894), 352-393 (with the literature there quoted). Eng. trans. by Roby in *Law Quarterly Review* (1886), 135-152; see also E. S. Roberts, *Gk. Epigraphy*, i. 39 f., 52 f., 325-332; J. W. Headlam in *Journal of Hellenic Studies*, xiii. (1892-1893), 48-69; P. Gardner and F. B. Jevons, *Greek Antiquities* (1895), 560-574; W. Wyse in Whibley's *Companion to Greek Studies* (1905), 378-383; and Hermann Lipsius, *Zum Recht von Gortyns* (Leipzig, 1909).

Athens.

A Roman writer ascribes to the Athenians the very invention of lawsuits (Aelian, *Var. Hist.* iii. 38), and the Athenians themselves regarded their tribunals of homicide as institutions of immemorial antiquity (Isocr. *Paneg.* 40).

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On the abolition of the single decennial archon [1] in 683 B.C., his duties were distributed over several officials holding office for one year only. The judicial duties thenceforth discharged by the chief archon (*the* archon), in the case of citizens, were discharged by the polemarch in the case of foreign settlers or metics (*μέτοικοι*); while the king-archon, who succeeded to the religious functions of the ancient kings, decided cases connected with religious observances (see ARCHON). He also presided over the primitive council of the state, which was identical with the council of the Areopagus. It was possibly with a view to the recognition of the rights of the lower classes that, about the middle of the 7th century B.C., the three archons were raised to the number of nine by the institution of the joint board of the six *thesmothetae*, who superintended the judicial system in general, kept a record of all legal decisions, and drew attention to any defects in the laws. It is probable that in their title we have the earliest example in Attic Greek of the use of *thesmos* in the sense of "law."

The three senior archons.

The thesmothetae.

The constitution was at this time thoroughly oligarchical. With a view, however, to providing a remedy for the conflict between the several orders of the state, the first code of Athenian law was drawn up and published by Draco (strictly Dracon), who is definitely described as a *thesmothetês* (621). His laws were known as *thesmoi*. The distinctive part of his legislation was the law of homicide, which was held in such high esteem that it was left unaltered in the legislation of Solon and in the democratic restoration of 411 B.C. It is partly preserved in an inscription of 409, which has been restored with the aid of quotations from the orators (*C.I.A.* i. 61; *Inscr. juridiques*, ii. 1. 1–24; and Hicks, *Gk. Hist. Inscr.* No. 50). It drew a careful distinction between different kinds of homicide. Of the rest of Draco's legislation we only know that Aristotle (*Politics*, ii. 12, 13) was struck by the severity of the penalties, and that the creditor was permitted to seize the person of the debtor as security for his debt.

Draco.

The conflict of the orders was not allayed until both parties agreed in choosing Solon as mediator and as archon (594 B.C.). Solon cancelled all mortgages and debts secured on the person of the debtor, set free all who had become slaves for debt, and forbade such slavery for the future (see SOLON). Thenceforth every citizen had also "the right of appeal to the law-courts," and the privilege of claiming legal satisfaction on behalf of any one who was wronged. Cases of constitutional law (*inter alia*) came before large law-courts numbering hundreds of jurors, and the power of voting in these law-courts made the people masters of the constitution (Aristotle's *Constitution of Athens*, c. 9). Solon's legislation also had an important effect on the law of property. In primitive times, on a man's death, his money or lands remained in the family, and, even in the absence of direct descendants, the owner could not dispose of his property by will. Permission to execute a will was first given to Athenian citizens by the laws of Solon. But "the Athenian Will was only an inchoate Testament" (Maine's *Ancient Law*, c. vi.); for this permission was expressly limited to those citizens who had no direct male descendants (Dem. *Lept.* 102; Plutarch, *Solon*, 21; cf. Wyse on Isaeus, p. 325).

Solon.

The law of intestate succession is imperfectly preserved in [Dem.] 43, § 51 (cf. Wyse, *ib.* p. 562 f.). In the absence of direct male descendants, a daughter who survived her father was known as an *ἐπίκληρος*, not an "heiress," but a "person who went with the estate"; and, in the absence of a will, the right or duty of marrying the daughter followed (with certain obvious exceptions) the same rules as the right of succession to the estate (cf. Wyse, *ib.* p. 348 f.).

Among the reforms of Cleisthenes (508) was the law of ostracism (*q.v.*). The privileges of the Areopagus were curtailed (while its right to try certain cases of homicide was left untouched) by the reforms of Ephialtes (462), and of Pericles, who also restored the thirty "local justices" (453), limited the franchise to those of citizen-blood by both parents (451), and was the first to assign to jurors a fee for their services in the law-courts, which was raised to three obols by Cleon (425).

Cleisthenes, Ephialtes.

Pericles, Cleon.

In contrast to legislative reforms brought about by lawgivers entrusted with special authority, such as Draco, Solon and Cleisthenes, there was the regular and normal course of public legislation. The legislative power was not exercised directly by the popular assembly (see ECCLESIA), but the preliminary consent of that body was necessary for the appointment of a legislative commission.

Ordinary course of legislation.

In the 5th century (*e.g.* in 450 and 446 B.C.) certain commissioners called *συγγραφεῖς* were appointed to draw up laws which, after approval by the council, were submitted to the assembly. The same term was still in use in March 411 (Thuc. viii. 61). But in October, on the overthrow of the Four Hundred, the commissioners are for the first time called *nomothetae* (*ib.* 97).

Syngraphels. Nomothetae.

The procedure in ordinary legislation was as follows. At the first meeting of the assembly in the year, the people was asked whether it would permit motions to be made for altering or supplementing the existing laws. A debate ensued, and, if such permission were granted, any citizen who wished to make a motion to the above effect was required to publish his proposals in the market-place, and to hand them to the secretary of the council (Boulê) to be read aloud at more than one meeting of the assembly. At the third regular meeting the council selected the legislative commissioners, who were drawn by lot from the whole number of those then qualified to act as jurors. The number, and the duration of the commission, were determined in each case by the people. The proceedings before the commission were conducted exactly in the manner of a lawsuit. Those who desired to see old laws repealed, altered or replaced by new laws came forward as *accusers* of those laws; those of the contrary opinion, as *defenders*; and the defence was formally entrusted to public advocates specially appointed for the purpose (*συνήγοροι*). The number of the commissioners varied with the number or importance of the laws in question; there is evidence for the number 1001 (Dem. xxiv. 27). If a law approved by the commission was deemed to be unconstitutional, the proposer was liable to be prosecuted (by a *γραφὴ παρανόμων*), just as in the case of the proposer of an unconstitutional decree in the public assembly. Formal proceedings might also be instituted against laws on the sole ground of their inexpediency (see note on Aristotle's *Constitution of Athens*, p. 219, ed. Sandys). A prosecutor who (like Aeschines in his indictment of Ctesiphon) failed to obtain one-fifth of the votes was fined 1000 *drachmae* (£40), and lost the right to adopt this procedure in future. When a year had elapsed, the proposer of a law or a decree was free from personal responsibility. This was the case with Leptines, but the law itself could still be attacked, and, in this event, five advocates were appointed to defend it (*ἐνδίκως*), cf. Dem. *Lept.* 144, 146.

Limits of space make it impossible to include in the present article any survey of the purport of the extant remains of the laws of Athens. Such a survey would begin with the laws of the family, including laws of marriage, adoption and inheritance, followed by the law of property and contracts, and the laws for the protection of life, the protection of the person, and the protection of the constitution. The texts have been collected and classified in Télfy's *Corpus juris Attici* (1867), a work which can be supplemented or corrected with the aid of Aristotle's *Constitution of Athens*; while some of the recent expositions of the subject are mentioned in the bibliography at the end of this article. We now proceed to notice the law of homicide, but solely in connexion with jurisdiction.

The laws of Athens.

The general term for a tribunal is *δικαστήριον* (from *δικάζω*), Anglicized "dicastery." Of all the tribunals of Athens those for the trial of homicide were at once the most primitive and the least liable to suffer change through lapse of time. In the old Germanic law all trials whatsoever were held in the open air (Grimm 793 f.). At Athens this custom was characteristic of all the five primitive courts of homicide, the object being to prevent the prosecutor and the judges from coming under the same roof as one who was charged with the shedding of blood (Antiphon, *De caede Herodis*, 11). The place where the trial was held depended on the nature of the charge.

Jurisdiction: the five primitive tribunals for the trial of homicide.

[1] For further information as to the evolution of the Athenian constitution see ARCHON, AREOPAGUS, BOULÊ, ECCLESIA, STRATEGUS, and articles on all the chief legislators.

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1. The rock of the Acropolis, outside the earliest of the city-walls, was the proper place for the trial of persons charged with premeditated homicide, or with wounding with intent to kill. The penalty for the former crime was death; for the latter exile; and, in either case, the property was confiscated. If the votes were equal, the person accused was acquitted. The proceedings lasted for three days, and each side might make two speeches. After the first speech the person accused of premeditated homicide was mercifully permitted to go into exile, in which case his property was confiscated, and in the ordinary course he remained in exile for the rest of his life.

On the Areopagus.

2. Charges of unpremeditated homicide, or of instigating another to inflict bodily harm on a third person, or of killing a slave of a resident alien or a foreigner, were tried at the Palladium, the ancient shrine of Pallas, east of the city-walls. The punishment for unpremeditated homicide was exile (without confiscation) until such time as the criminal had propitiated the relatives of the person slain, or (failing that) for some definite time. The punishment for instigating a crime was the same as for actually committing it.

At the Palladion.

3. Trials at the Delphinion, the shrine of Apollo Delphinius, in the same quarter, were reserved for special cases of either accidental or justifiable homicide.

At the Delphinion.

4. If a man already in exile for unpremeditated homicide were accused of premeditated homicide, or of wounding with intent to kill, provision was made for this rare contingency by permitting him to approach the shore of Attica and conduct his defence on board a boat, while his judges heard the cause on shore, at a "place of pits" called Phreatto, near the harbour of Zea. If the accused were found guilty, he incurred the proper penalty; if acquitted, he remained in exile.

At Phreatto.

5. The court in the precincts of the Prytaneum, to the north of the Acropolis, was only of ceremonial importance. It "solemnly heard and condemned undiscovered murderers, and animals or inanimate objects that had caused the loss of life."[1] The writ ran "against the doer of the deed," and any instrument of death that was found guilty was thrown across the frontier. The trial was held by the four "tribe-kings" (φυλοβασιλεῖς), an archaic survival from before the time of Cleisthenes. On these five courts see Aristotle's *Constitution of Athens*, c. 57, and Dem. *Aristocr.* 65-79.)

At the Prytaneum.

In all the courts of homicide the president was the archon-basileus, or king-archon, who on these occasions laid aside his crown. Originally all these courts were under the jurisdiction of an ancient body of judges called the ephetae (ἐφέται), whose institution was ascribed to Draco. The transfer of the first of the above courts to the council of the Areopagus is attributed to Solon. In practice the jurisdiction of the ephetae (for also AREOPAGUS) was probably confined to the courts at the Palladion and Delphinion; but even there the rights of this primitive body became obsolete, for trials "at the Palladion" sometimes came before an ordinary tribunal of 500 or 700 jurors (Isocr. *c. Callim.* 52, 54; [Dem.] *c. Neaeram*, 10).

Ephetae.

Except in the case of the primitive courts of homicide, the right of jurisdiction was entrusted to the several archons until the date of Solon (594). When the direct jurisdiction of the archons was impaired by Solon's institution of the "right of appeal to the law-courts," the dignity of those officials was recognized by their having the privilege of presiding over the new tribunals (ἡγεμονία δικαστηρίου). A similar position was assigned to the other executive officers, such as the strategi (generals), the board of police called the "Eleven," and the financial officers, all of whom presided over cases connected with their respective departments. In their new position as presidents of the several courts, the archons received plaints, obtained from both parties the evidence which they proposed to present, formally presided at the trial, and gave instructions for the execution of the sentence. The choice of the presiding magistrate in each case was determined by the normal duties of his office. Thus the chief archon, the official guardian of orphans and widows, presided in all cases, public or private, connected with the family property of citizens (Aristotle, *u.s.* c. 56). The king-archon had charge of all offences against religion, *e.g.* indictments for impiety, disputes within the family as to the right to hold a particular priesthood, and all actions for homicide (c. 57). The third archon, the polemarch, discharged in relation to resident aliens all such legal duties as were discharged by the chief archon in relation to citizens (c. 58). The trial of military offences was under the presidency of the strategi, who were assisted by the other military officers in preparing the case for the court. The six junior archons, the *thesmothetae*, acted as a board which was responsible for all cases not specially assigned to any other officials (details in c. 59).

The presidents of the tribunals.

The chief archon.

The king-archon.

The polemarch.

The strategi.

The thesmothetae.

The Forty, who were appointed by lot, four for each of the ten tribes, acted as sole judges in petty cases where the damages claimed did not exceed ten *drachmae*. Claims beyond that amount they handed over to the arbitrators. The four representatives of any given tribe received notice of such claims brought against members of that tribe. It seems probable that they dealt with all private suits not otherwise assigned, but, unlike the archons, they did not prepare any case for the court but referred it, in the first instance, to a public arbitrator appointed by lot (c. 53).[2]

The Forty.

The public arbitrators (διαιτηταί) were a body including all Athenian citizens in the sixtieth year of their age. The arbitrator, on receiving the case from the four representatives of the Forty, first endeavoured to bring the parties to an agreement. If this failed, he heard the evidence and gave a decision. If the decision were accepted, the case was at an end, but, if either of the two parties insisted on appealing to a law-court, the arbitrator placed in two caskets (one for each party) copies of all the depositions, oaths and challenges, and of all the laws quoted in the case, sealed them up, and, after attaching a copy of his own decision, handed them over to the four representatives of the Forty, who brought the case into court and presided over the trial. Documents which had not been brought before the arbitrator could not be produced in court. The court consisted of 201 jurors where the sum in question was not more than 1000 *drachmae* (£40); in other cases the number of jurors was 401 (c. 53).

The public arbitrators.

A small board of five appointed by lot, one for each pair of tribes, and known as the "introducers" (εἰσαγωγεῖς), brought up certain of the cases that had to be decided within a month (ἔμμηνοι δίκαι), such as actions for restitution of dowry, repayment of capital for setting up a business, and cases connected with banking.

Eisagogeis.

The largest and most important of the legal tribunals, the "dicastery" (*par excellence*), was known as the *heliaea*. The name, which is of uncertain origin,[3] denotes not only the place where the court was held but also the members of the court,—the *heliastae* of Aristophanes, the *dicastae*, or δικῶται δικασταί, of the Attic orators. During the palmy days of the Athenian democracy, in the interval between the Persian and the Peloponnesian wars, the total number liable to serve as jurors is said to have been 6000 (Aristotle, *u.s.* c. 24. 3), and this number was never exceeded (Aristoph. *Vesp.* 661 f.). Any Athenian citizen in full possession of his rights, and over thirty years of age, was entitled to be placed on the list (Aristotle, *u.s.* c. 63. 3). At the beginning of the year the whole body of jurors assembled on the hill of Ardettos looking down on the Panathenaic Stadium, and there took a solemn oath to the effect that they would judge according to the laws and decrees of the Athenian people and of the council of the Five Hundred (Boulē), and that, in cases where there were no laws, they would decide to the best of their judgment; that they would hear both sides impartially, and vote on the case actually before the court.

Heliaea.

It has been suggested that, as the normal number of a court was 500, the maximum number of 6000 jurors was probably divided into ten sections of 500 each, with 1000 reserves. There is evidence in the 4th century for courts of 200, 400, 500, 700 and

[1] In the case of "animals," we may compare the Mosaic law of Exod. xxxi. 28 and the old Germanic law (Grimm 664); and in that of "inanimate objects," the English law of deodands (Blackstone I. 300), repealed in 1846. See also Frazer on Pausanias, I. 28. 10.

[2] Cf. R. J. Bonner, in *Classical Philology* (Chicago, 1907), 407-418, who urges that only cases belonging to the Forty were subject to public arbitration.

[3] Connected either with ἁθροίζεσθαι, "to assemble," or ἥλιον, or Ἥλιε (cf. Curt Wachsmuth, *Stadt Athen*, ii. (1) 353-364). The first is possibly right (cf. Rogers on Aristoph. *Σφῆκες*, xvii. f.); the second implies that this large court was held in the open air (Lipsius, *Att. Recht*, 172).

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(in important political trials) various multipes of 500, namely, 1000, 1500, 2000 or 2500. To some of these numbers one juror is added; it was probably added to all, to obviate the risk of the votes being exactly equal.

The evidence as to the organization of the jurors in the early part of the 4th century is imperfect. Passages in Aristophanes (*Ecclesiazusae*, 682–688; *Plutus*, 1166 f.) imply that in 392–388 B.C. the total number was divided into ten sections distinguished by the first ten letters of the Greek alphabet, A to K. Every juror, on his first appointment, received a ticket of boxwood (or of bronze) bearing his name with that of his father and his deme, and with one of the above letters in the upper left-hand corner. Of the bronze tickets many have been found (see notes on Aristotle's *Constitution of Athens*, c. 63, and fig. 1 in frontispiece, ed. Sandys). These tickets formed part of the machinery for allotting the jurors to the several courts. To guard against the possibility of bribery or other undue influence, the allotment did not take place until immediately before the hearing of the case. Each court contained an equal number of jurors from each of the ten tribes, and thus represented the whole body of the state. The juror, on entering the court assigned him, received a counter (see fig. 3 in frontispiece, *n.s.*), on presenting which at the end of the day he received his fee. The machinery for carrying out the above arrangements is minutely described at the end of Aristotle's *Constitution of Athens* (for details, cf. Gilbert, 397–399, Eng. trans., or Wyse in Whibley's *Companion to Greek Studies*, 387 f.).

The law-courts gradually superseded most of the ancient judicial functions of the council and the assembly, but the council continued to hold a strict scrutiny (δοκιμασία) of candidates for office or for other privileges, while the council itself, as well as all other officials, had to give account (εὔθυνα) on ceasing to hold office. The council also retained the right to deal with extraordinary crimes against the state. It was open to any citizen to bring such crimes to the knowledge of the council in writing. The technical term for this information, denunciation or impeachment was *eisangelia* (εἰσαγγελία). The council could inflict a fine of 500 *drachmae* (£20), or, in important cases, refer the matter either to a law-court, as in the trial of Antiphon (Thuc. viii. 68), or to the ecclesia, as in that of Alcibiades (415 B.C.), and the strategi in command at Arginusae (406; Xen. *Hell.* i. 7. 19). The term εἰσαγγελία was also applied to denunciations brought against persons who wronged the orphan or the widow, or against a public arbitrator who had neglected his duty (Dem. *Meidias*, 86 f.).

Jurisdiction of the council and assembly.

Eisangelia.

A "presentation" of criminal information (πρόβολή) might be laid before the assembly with a view to obtaining its preliminary sanction for bringing the case before a judicial tribunal. Such was the mode of procedure adopted against persons who had brought malicious, groundless or vexatious accusations, or who had violated the sanctity of certain public festivals. The leading example of the former is the trial of the accusers who prompted the people to put to death the generals who had won the Battle of Arginusae (Xen. *Hell.* i. 7. 34); and, of the latter, the proceedings of Demosthenes against Meidias.

Probolê.

Legal actions (δίκαι) were classified as private (ἴδιαι) or public (δημόσιαι). The latter were also described as γραφαί or "prosecutions," but some γραφαί were called "private," when the state was regarded as only indirectly injured by a wrong done to an individual citizen (Dem. xxi. 47). A private suit could only be brought by the man directly interested, or, in the case of a slave, a ward or an alien, by the master, guardian or patron respectively; and, if the suit were successful, the sum claimed generally went to the plaintiff. Public actions may be divided into ordinary criminal cases, and offences against the state. As a rule they could be instituted by any person who possessed the franchise, and the penalty was paid to the state. If the prosecutor failed to obtain one-fifth of the votes, he had to pay a fine of 1000 *drachmae* (£40), and lost the right of ever bringing a similar action.

Classes of legal actions.

Lawsuits, whether public or private, were also distinguished as δίκαι κατά τινος or πρός τινα, according as the defeated party could or could not be personally punished. Actions (ἀγῶνες) were also distinguished as ἀγῶνες τιμητοί ("to be assessed"), in which the amount of damages had to be determined by the court, because it had not been fixed by law, and ἀτίμητοι ("not to be assessed"), in which the damages had *not* to be determined by the court, because they had already been fixed by law or by special agreement.

Among special kinds of action were ἀπαγωγή, ἐφήγησις and ἔνδειξις. These could only be employed when the offence was patent and could not be denied. In the first, the person accused was summarily arrested by the prosecutor and haled into the presence of the proper official. In the second, the accuser took the officer with him to arrest the culprit (Dem. xxii. 26). In the third, he lodged an information with the official, and left the latter to effect the capture. Φάσις, a general term for many kinds of legal "information," was a form of procedure specially directed against those who injured the fiscal interests of the state, and against guardians who neglected the pecuniary interests of their wards. Ἀπογραφή was an action for confiscating property in private hands, which was claimed as belonging to the state, the term being derived from the claimants' written inventory of the property in question.

Ordinary legal procedure.

The ordinary procedure in all lawsuits, public or private, began with a personal summons (πρόσκλησις) of the defendant by the plaintiff accompanied by two witnesses (κλητῆρες). If the defendant failed to appear in court, these witnesses gave proof of the summons, and judgment went by default.

The action was begun by presenting a written statement of the case to the magistrate who presided over trials of the class in question. If the statement were accepted, court-fees were paid by both parties in a private action, and by the prosecutor alone in a public action. The magistrate fixed a day for the preliminary investigation (ἀνάκρισις), and, whenever several causes were instituted at the same time, he drew lots to determine the order in which they should be taken. Hence the plaintiff was said "to have a suit assigned him by lot" (λαγχάνειν δίκην), a phrase practically equivalent to "obtaining leave to bring an action." At the ἀνάκρισις the plaintiff and defendant both swore to the truth of their statements. If the defendant raised no formal protest, the trial proceeded in regular course (εἰσαγωγή), but he might contend that the suit was inadmissible, and, to prove his point, might bring witnesses to confront those on the side of the plaintiff (διαμαρτυρία), or he might rely on argument without witnesses by means of a written statement traversing that of the plaintiff (παραγραφή). The person who submitted the special plea in bar of action naturally spoke first, and, if he gained the verdict, the main suit could not come on, or, at any rate, not in the way proposed or before the same court. A cross-action (ἀντιγραφή) might be brought by the defendant, but the verdict did not necessarily affect that of the original suit.

In the preliminary examination copies of the laws or other documents bearing on the case were produced. If any such document were in the hands of a third person, he could be compelled to produce it by an action for that purpose (εἰς ἐμφανῶν κατάστασιν). The depositions were ordinarily made before the presiding officer and were taken down in his presence. If a witness were compelled to be absent, a certified copy of his deposition might be sent (ἐκμαρτυρία). The depositions of slaves were not accepted, unless made under torture, and for receiving such evidence the consent of both parties was required. Either party could challenge the other to submit his slaves to the test (πρόκλησις εἰς βάσανον), and, in the event of the challenge being refused, could comment on the fact when the case came before the court. Either party could also challenge the other to take an oath (πρόκλησις εἰς ὅρκον), and, if the oath were declined, could similarly comment on the fact.

Documents.

Challenges.

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Mercantile cases had to be decided within the interval of a month; others might be postponed for due cause. If, on the day of trial, one of the parties was absent, his representative had to show cause under oath (ὑπωμοσία); if the other party objected, he did so under oath (ἀνθυπωμοσία). If the plea for delay were refused by the court, and it were the defendant who failed to appear, judgment went by default; in the absence of the plaintiff, the case was given in favour of the defendant. *The trial.*

The official who had conducted the preliminary inquiry also presided at the trial. The proceedings began with a solemn sacrifice. The plea of the plaintiff and the formal reply of the defendant were then read by the clerk. The court was next addressed first by the plaintiff, next by the defendant; in some cases there were two speeches on each side. Every litigant was legally required to conduct his own case. The speeches were often composed by professional experts for delivery by the parties to the suit, who were required to speak in person, though one or more unprofessional supporters (συνήγοροι) might subsequently speak in support of the case. The length of the speeches was in many cases limited by law to a fixed time recorded by means of a water-clock (clepsydra). Documents were not regarded as part of the speech, and, while these were being read, the clock was stopped (Goethe found a similar custom in force in Venice in October 1786). The witnesses were never cross-examined, but one of the litigants might formally interrogate the other. The case for the defence was sometimes finally supported by pathetic appeals on the part of relatives and friends.

When the speeches were over, the votes were taken. In the 5th century mussel-shells (χοιρίναι) were used for the purpose. Each of the jurors received a shell, which he placed in one of the two urns, in that to the front if he voted for acquittal; in that to the back if he voted for condemnation. If a second vote had to be taken to determine the amount of the penalty, wax tablets were used, on which the juror drew a long line, if he gave the heavy penalty demanded by the plaintiff; a short one, if he decided in favour of the lighter penalty proposed by the defendant.

In the 4th century the mussel-shells were replaced by disks of bronze. Each disk (inscribed with the words ΨΗΦΟΣ ΔΗΜΟΣΙΑ) was about 1 in. in diameter, with a short tube running through the centre. This tube was either perforated or closed (see figs. 6 and 7 in frontispiece to Aristotle's *Constitution of Athens*, ed. Sandys). One of each kind was given to every juror, who was required to use the perforated or the closed disk, according as he voted for the plaintiff or for the defendant. On the platform there were two urns, one of bronze and one of wood. The juror placed in the hollow of his hand the disk that he proposed to use, and closed his fingers on the extremity of the tube, so that no one could see whether it were a perforated disk or not, and then deposited it in the bronze urn, and (with the same precaution to ensure secrecy) dropped the unused disk into the wooden urn. The votes were sorted by persons appointed by lot, and counted by the president of the court, and the result announced by the herald. For any second vote the same procedure was adopted (Aristotle, *u.s.*, c. 68 of Kenyon's Berlin text).

Pecuniary penalties were inflicted both in public and in private suits; personal penalties, in public suits only. Personal penalties included sentences of death or exile, or different degrees of disfranchisement (ἀτιμία) with or without confiscation. Imprisonment *before* trial was common, and persons mulcted in penalties might be imprisoned until the penalties were paid, but imprisonment was never inflicted as the *sole* penalty after conviction. Foreigners alone could be sold into slavery. Sentences of death were carried out under the supervision of the board of police called the "Eleven." In ancient times a person condemned was hurled into a deep pit (the barathrum) in a north-western suburb of Athens. In later times he was compelled to drink the fatal draught of hemlock. Common malefactors were beaten to death with clubs. Fines were collected and confiscated property sold by special officials, called πράκτορες and πωληταί respectively. In private suits the sentence was executed by the state if the latter had a share in any fine imposed, or if imprisonment were part of the penalty. Otherwise, the execution of the sentence was left to the plaintiff, who had the right of distraint, or, if this failed, could bring an action of ejectment (δίκη ἐξούλης). *Penalties.*

From the verdict of the heliaea there was no appeal. But, if judgment had been given by default, the person condemned might bring an action to prove that he was not responsible for such default, τὴν ἔρημον (*sc.* δίκην) ἀντλαγχάνειν. The corresponding term for challenging the award of an arbitrator was τὴν μὴ οὖσαν ἀντλαγχάνειν. He might also bring an action for false evidence (δίκη ψευδομαρτυρίων) against his opponent's witnesses, and, on their conviction, have the sentence annulled. This "denunciation" of false evidence was technically called ἐπισκήψις and ἐπισκήπτεσθαι.

The large number of the jurors made bribery difficult, but, as was first proved by Anytus (in 409), not impossible. It also diminished the feeling of personal responsibility, while it increased the influence of political motives. In addressing such a court, the litigants were not above appealing to the personal interests of the general public. We have a striking example of this in the terms in which Lysias makes one of his clients close a speech in prosecution of certain retail corn-dealers who have incurred the penalty of death by buying more than 75 bushels of wheat at one time: "If you *condemn* these persons, you will be doing what is right, and will pay *less* for the purchase of your corn; if you *acquit* them, you will pay *more*" (xxii. § 22). *Character of the Athenian tribunals.*

Speakers were also tempted to take advantage of the popular ignorance by misinterpreting the enactments of the law, and the jurors could look for no aid from the officials who formally presided over the courts. The latter were not necessarily experts, for they owed their own original appointment to the caprice of the lot. Almost the only officials specially elected as experts were the strategi, and these presided only in their own courts. Again, there was every temptation for the informer to propose the confiscation of the property of a wealthy citizen, who would naturally prefer paying blackmail to running the risk of having his case tried before a large tribunal which was under every temptation to decide in the interests of the treasury. In conclusion we may quote the opinions on the judicial system of Athens which have been expressed by two eminent classical scholars and English lawyers.

A translator of Aristophanes, Mr B. B. Rogers records his opinion "that it would be difficult to devise a judicial system less adapted for the due administration of justice" (Preface to *Wasps*, xxxv. f.), while a translator of Demosthenes, Mr C. R. Kennedy, observes that the Athenian jurors "were persons of no legal education or learning; taken at haphazard from the whole body of citizens, and mostly belonging to the lowest and poorest class. On the other hand, the Athenians were naturally the quickest and cleverest people in the world. Their wits were sharpened by the habit . . . of taking an active part in important debates, and hearing the most splendid orators. There was so much litigation at their courts that they were constantly either engaged as jurors, or present as spectators in courts of law" (*Private Orations*, p. 361).

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(J. E. S.*)

GREEK LITERATURE.—The literature of the Greek language is broadly divisible into three main sections: (1) Ancient, (2) Byzantine, (3) Modern. These are dealt with below in that order.

I. The Ancient Greek Literature

The ancient literature falls into three periods: (A) *The Early Literature*, to about 475 B.C.; epic, elegiac, iambic and lyric poetry; the beginnings of literary prose. (B) *The Attic Literature* 475–300 B.C.; tragic and comic drama; historical, oratorical and philosophical prose. (C) *The Literature of the Decadence*, 300 B.C. to A.D. 529; which may again be divided into the Alexandrian period, 300–146 B.C., and the Graeco-Roman period, 146 B.C. to A.D. 529.

For details regarding particular works or the lives of their authors reference should be made to the separate articles devoted to the principal Greek writers. The object of the following pages is to sketch the literary development as a whole, to show how its successive periods were related to each other, and to mark the dominant characteristics of each.

(A) *The Early Literature.*—A process of natural growth may be traced through all the best work of the Greek genius. The Greeks were not literary imitators of foreign models; the forms of poetry and prose in which they attained to such unequalled excellence were first developed by themselves. Their literature had its roots in their political and social life; it is the spontaneous expression of that life in youth, maturity and decay; and the order in which its several fruits are produced is not the result of accident or caprice. Further, the old Greek literature has a striking completeness, due to the fact that each great branch of the Hellenic race bore a characteristic part in its development. Ionians, Aeolians, Dorians, in turn contributed their share. Each dialect corresponded to a certain aspect of Hellenic life and character. Each found its appropriate work.

The dialects.

The Ionians on the coast of Asia Minor—a lively and genial people, delighting in adventure, and keenly sensitive to everything bright and joyous—created artistic epic poetry out of the lays in which Aeolic minstrels sang of the old Achaean wars. And among the Ionians arose elegiac poetry, the first variation on the epic type. These found a fitting instrument in the harmonious Ionic dialect, the flexible utterance of a quick and versatile intelligence. The Aeolians of Lesbos next created the lyric of personal passion, in which the traits of their race—its chivalrous pride, its bold but sensuous fancy—found a fitting voice in the fiery strength and tenderness of Aeolic speech. The Dorians of the Peloponnesus, Sicily and Magna Graecia then perfected the choral lyric for festivals and religious worship; and here again an earnest faith, a strong pride in Dorian usage and renown had an apt interpreter in the massive and sonorous Doric. Finally, the Attic branch of the Ionian stock produced the drama, blending elements of all the other kinds, and developed an artistic literary prose in history, oratory and philosophy. It is in the Attic literature that the Greek mind receives its most complete interpretation.

A natural affinity was felt to exist between each dialect and that species of composition for which it had been specially used. Hence the dialect of the Ionian epic poets would be adopted with more or less thoroughness even by epic or elegiac poets who were not Ionians. Thus the Aeolian Hesiod uses it in epos, the Dorian Theognis in elegy, though not without alloy. Similarly, the Dorian Theocritus wrote love-songs in Aeolic. All the faculties and tones of the language were thus gradually brought out by the co-operation of the dialects. Old Greek literature has an essential unity—the unity of a living organism; and this unity comprehends a number of distinct types, each of which is complete in its own kind.

Extant Greek literature begins with the Homeric poems. These are works of art which imply a long period of antecedent poetical cultivation. Of the pre-Homeric poetry we have no remains, and very little knowledge. Such glimpses as we get of it connect it with two different stages in the religion of the prehistoric Hellenes. The first of these stages is that in which the agencies or forms of external nature were personified indeed, yet with the consciousness that the personal names were only symbols. Some very ancient Greek songs of which mention is made may have belonged to this stage—as the songs of Linus, Ialemus and Hylas. Linus, the fair youth killed by dogs, seems to be the spring passing away before Sirius. Such songs have been aptly called "songs of the seasons." The second stage is that in which the Hellenes have now definitively personified the powers which they worship. Apollo, Demeter, Dionysus, Cybele, have now become to them beings with clearly conceived attributes. To this second stage belong the hymns connected with the names of the legendary bards, such as Orpheus, Musaeus, Eumolpus, who are themselves associated with the worship of the Pierian Muses and the Attic ritual of Demeter. The seats of this early sacred poetry are not only "Thracian"—*i.e.* on the borders of northern Greece—but also "Phrygian" and "Cretan." It belongs, that is, presumably to an age when the ancestors of the Hellenes had left the Indo-European home in central Asia, but had not yet taken full possession of the lands which were afterwards Hellenic. Some of their tribes were still in Asia; others were settling in the islands of the Aegean; others were passing through the lands on its northern seaboard. If there was a period when the Greeks possessed no poetry but hymns forming part of a religious ritual, it may be conjectured that it was not of long duration. Already in the *Iliad* a secular character belongs to the marriage hymn and to the dirge for the dead, which in ancient India were chanted by the priest. The bent of the Greeks was to claim poetry and music as public joys; they would not long have suffered them to remain sacerdotal mysteries. And among the earliest themes on which the lay artist in poetry was employed were probably war-ballads, sung by minstrels in the houses of the chiefs whose ancestors they celebrated.

Pre-Homeric poetry.

Songs of the seasons.

Hymns.

Such war-ballads were the materials from which the earliest epic poetry of Greece was constructed. By an "epic" poem the Greeks meant a narrative of heroic action in hexameter verse. The term ἔπη meant at first simply "verses"; it acquired its special meaning only when μέλη, lyric songs set to music, came to be distinguished from ἔπη, verses not set to music, but merely recited. Epic poetry is the only kind of extant Greek poetry which is older than about 700 B.C. The early epos of Greece is represented by the *Iliad* and the *Odyssey*, Hesiod and the Homeric hymns; also by some fragments of the "Cyclic" poets.

Epos.

After the Dorian conquest of the Peloponnesus, the Aeolian emigrants who settled in the north-west of Asia Minor brought with them the warlike legends of their chiefs, the Achaean princes of old. These legends lived in the ballads of the Aeolic minstrels, and from them passed southward into Ionia, where the Ionian poets gradually shaped them into higher artistic forms. Among the seven places which claimed to be the birthplace of Homer, that which has the best title is Smyrna. Homer himself is called "son of Meles"—the stream which flowed through old Smyrna, on the border between Aeolia and Ionia. The tradition is significant in regard to the origin and character of the *Iliad*, for in the *Iliad* we have Achaean ballads worked up by Ionian art. A preponderance

The "Iliad" and the "Odyssey."

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of evidence is in favour of the view that the *Odyssey* also, at least in its earliest form, was composed on the Ionian coast of Asia Minor. According to the Spartan account, Lycurgus was the first to bring to Greece a complete copy of the Homeric poems, which he had obtained from the Creophylidae, a clan or gild of poets in Samos. A better authenticated tradition connects Athens with early attempts to preserve the chief poetical treasure of the nation. Peisistratus is said to have charged some learned men with the task of collecting all "the poems of Homer"; but it is difficult to decide how much was comprehended under this last phrase, or whether the province of the commission went beyond the mere task of collecting. Nor can it be determined what exactly it was that Solon and Hipparchus respectively did for the Homeric poems. Solon, it has been thought, enacted that the poems should be recited from an authorized text (ἐξ ὑποβολῆς); Hipparchus, that they should be recited in a regular order (ἐξ ὑπολήψεως). At any rate, we know that in the 6th century B.C. a recitation of the poems of Homer was one of the established competitions at the Panathenaea, held once in four years. The reciter was called a *rhapsodist*—properly one who weaves a long, smoothly-flowing chant, then an epic poet who chants his own or another's poem. The rhapsodist did not, like the early minstrel, use the accompaniment of the harp; he gave the verses in a flowing recitative, bearing in his hand a branch of laurel, the symbol of Apollo's inspiration. In the 5th century B.C. we find that various Greek cities had their own editions (αἱ πολιτικαί, κατὰ πόλεις or ἐκ τῶνδε ἐκδόσεις) of the poems, for recitation at their festivals. Among these were the editions of Massilia, of Chios and of Argolis. There were also editions bearing the name of the individual editor (αἱ κατ' ἄνδρα)—the best known being that which Aristotle prepared for Alexander. The recension of the poems by Aristarchus (156 B.C.) became the standard one, and is probably that on which the existing text is based. The oldest Homeric MS. extant, Venetus A of the *Iliad*, is of the 10th century; the first printed edition of Homer was that edited by the Byzantine Demetrius Chalcondyles (Florence, 1488).

The Homeric question.

The ancient Greeks were almost unanimous in believing the *Iliad* and the *Odyssey* to be the work of one man, Homer, to whom they also ascribed some extant hymns, and probably much more besides. Aristotle and Aristarchus seem to have put Homer's date about 1044 B.C., Herodotus about 850 B.C. It is not till about 170 B.C. that the grammarians Hellanicus and Xenon put forward the view that Homer was the author of the *Iliad*, but not of the *Odyssey*. Those who followed them in assigning different authors to the two poems were called the Separators (*Chorizontes*). Aristarchus combated "the paradox of Xenon," and it does not seem to have had much acceptance in antiquity. Giovanni Battista Vico, a Neapolitan (1668–1744), seems to have been the first modern to suggest the composite authorship and oral tradition of the Homeric poems; but this was a pure conjecture in support of his theory that the names of ancient lawgivers and poets are often mere symbols. F. A. Wolf, in the *Prolegomena* to his edition (1795), was the founder of a scientific scepticism. The *Iliad*, he said (for he recognized the comparative unity and consistency of the *Odyssey*), was pieced together from many small unwritten poems by various hands, and was first committed to writing in the time of Peisistratus. This view was in harmony with the tone of German criticism at the time; it was welcomed as a new testimony to the superiority of popular poetry, springing from fresh natural sources, to elaborate works of art; and it at once found enthusiastic adherents. For the course of Homeric controversy since Wolf the reader is referred to the article HOMER.

Cyclic poems.

The Ionian school of epos produced a number of poems founded on the legends of the Trojan war, and intended as introductions or continuations to the *Iliad* and the *Odyssey*. The grammarian Proclus (A.D. 140) has preserved the names and subjects of some of these; but the fragments are very scanty. The *Nostoi* or *Homeward Voyages*, by Agias (or Hagias) of Troezen, filled up the gap of ten years between the *Iliad* and the *Odyssey*; the *Lay of Telegonus*, by Eugammon of Cyrene, continued the story of the *Odyssey* to the death of Odysseus by the hand of Telegonus, the son whom Circe bore to him. Similarly the *Cyprian Lays* by Stasinus of Cyprus, ascribed by others to Hegesias (or Hegesinus) of Salamis or Halicarnassus, was introductory to the *Iliad*; the *Aethiopis* and the *Sack of Troy*, by Arctinus of Miletus, and the *Little Iliad*, by Lesches of Mytilene, were supplementary to it. These and many other names of lost epics—some taken also from the Theban myths (*Thebaïs*, *Epigoni*, *Oedipodea*)—serve to show how prolific was that epic school of which only two great examples remain. The name of *epic cycle* was properly applied to a prose compilation of abstracts from these epics, pieced together in the order of the events. The compilers were called "cyclic" writers; and the term has now been transferred to the epic poets whom they used.[1]

Hesiodic epos.

The epic poetry of Ionia celebrated the great deeds of heroes in the old wars. But in Greece proper there arose another school of epos, which busied itself with religious lore and ethical precepts, especially in relation to the rural life of Boeotia. This school is represented by the name of Hesiod. The legend spoke of him as vanquishing Homer in a poetical contest of Chalcis in Euboea; and it expresses the fact that, to the old Greek mind, these two names stood for two contrasted epic types. Nothing is certainly known of his date, except that it must have been subsequent to the maturity of Ionian epos. He is conjecturally placed about 850–800 B.C.; but some would refer him to the early part of the 7th century B.C. His home was at Ascra, a village in a valley under Helicon, whither his father had migrated from Cyme in Aeolis on the coast of Asia Minor. In Hesiod's *Works and Days* we have the earliest example of a didactic poem. The seasons and the labours of the Boeotian farmer's year are followed by a list of the days which are lucky or unlucky for work. The *Theogony*, or "Origin of the Gods," describes first how the visible order of nature arose out of chaos; next, how the gods were born. Though it never possessed the character of a sacred book, it remained a standard authority on the genealogies of the gods. So far as a corrupt and confused text warrants a judgment, the poet was piecing together—not always intelligently—the fragments of a very old cosmogonic system, using for this purpose both the hymns preserved in the temples and the myths which lived in folklore. The epic lay in 480 lines called the *Shield of Heracles*—partly imitated from the 18th book of the *Iliad*—is the work of an author or authors later than Hesiod. In the Hesiodic poetry, as represented by the *Works and Days* and the *Theogony*, we see the influence of the temple at Delphi. Hesiod recognizes the existence of δαίμονες—spirits of the departed who haunt the earth as the invisible guardians of justice; and he connects the office of the poet with that of the prophet. The poet is one whom the gods have authorized to impress doctrine and practical duties on men. A religious purpose was essentially characteristic of the Hesiodic school. Its poets treated the old legends as relics of a sacred history, and not merely, in the Ionian manner, as subjects of idealizing art. Such titles as the *Maxims of Cheiron* and the *Lay of Melampus*, the seer—lost poems of the Hesiodic school—illustrate its ethical and its mystic tendencies.

The Homeric hymns.

The *Homeric Hymns* are a collection of pieces, some of them very short, in hexameter verse. Their traditional title is—*Hymns* or *Preludes of Homer and the Homeridae*. The second of the alternative designations is the true one. The pieces are not "hymns" used in formal worship, but "preludes" or prefatory addresses (προοίμια) with which the rhapsodists ushered in their recitations of epic poetry. The "prelude" might be addressed to the presiding god of the festival, or to any local deity whom the reciter wished to honour. The pieces (of which there are 33) range in date perhaps from 750 to 500 B.C. (though some authorities assign dates as late as the 3rd and 4th centuries A.D.; see ed. by Sikes and Allen, *e.g.* p. 228), and it is probable that the collection was

[1] For authorities and criticisms see T. W. Allen in *Classical Quarterly* (Jan. and April 1908).

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formed in Attica, for the use of rhapsodists. The style is that of the Ionian or Homeric epos; but there are also several traces of the Hesiodic or Boeotian school. The principal "hymns" are (1) to Apollo (generally treated as two or more hymns combined in one); (2) to Hermes; (3) to Aphrodite; and (4) to Demeter. The hymn to Apollo, quoted by Thucydides (iii. 104) as Homer's, is of peculiar interest on account of the lines describing the Ionian festival at Delos. Two celebrated pieces of a sportive kind passed under Homer's name. The *Margites*—a comic poem on one "who knew many things but knew them all badly"—is regarded by Aristotle as the earliest germ of comedy, and was possibly as old as 700 B.C. Only a few lines remain. The *Batracho(myo)machia*, or *Battle of the Frogs and Mice* probably belongs to the decline of Greek literature, perhaps to the 2nd century B.C.[1] About 300 verses of it are extant.

Transition from epos to elegy.

In the *Iliad* and the *Odyssey* the personal opinions or sympathies of the poet may sometimes be conjectured, but they are not declared or even hinted. Hesiod, indeed, sometimes gives us a glimpse of his own troubles or views. Yet Hesiod is, on the whole, essentially a prophet. The message which he delivers is not from himself; the truths which he imparts have not been discovered by his own search. He is the mouthpiece of the Delphian Apollo. Personal opinion and feeling may tinge his utterance, but they do not determine its general complexion. The egotism is a single thread; it is not the basis of the texture. Epic poetry was in Greece the foundation of all other poetry; for many centuries no other kind was generally cultivated, no other could speak to the whole people. Politically, the age was monarchical or aristocratic; intellectually, it was too simple for the analysis of thought or emotion. Kings and princes loved to hear of the great deeds of their ancestors; common men loved to hear of them too, for they had no other interest. The mind of Greece found no subject of contemplation so attractive as the warlike past of the race, or so useful as that lore which experience and tradition had bequeathed. But in the course of the 8th century B.C. the rule of hereditary princes began to disappear. Monarchy gave place to oligarchy, and this—often after the intermediate phase of a tyrannis—to democracy. Such a change was necessarily favourable to the growth of reflection. The private citizen is no longer a mere cipher, the Homeric *τις*, a unit in the dim multitude of the king-ruled folk; he gains more power of independent action, his mental horizon is widened, his life becomes fuller and more interesting. He begins to feel the need of expressing the thoughts and feelings that are stirred in him. But as yet a prose literature does not exist; the new thoughts, like the old heroic stories, must still be told in verse. The forms of verse created by this need were the Elegiac and the Iambic.

Elegy.

The elegiac metre is, in form, a simple variation on the epic metre, obtained by docking the second of two hexameters so as to make it a verse of five feet or measures. But the poetical capabilities of the elegiac couplet are of a wholly different kind from those of heroic verse. *Ἔλεγοι* seems to be the Greek form of a name given by the Carians and Lydians to a lament for the dead. This was accompanied by the soft music of the Lydian flute, which continued to be associated with Greek elegy. The non-Hellenic origin of elegy is indicated by this very fact. The flute was to the Greeks an Asiatic instrument—string instruments were those which they made their own—and it would hardly have been wedded by them to a species of poetry which had arisen among themselves. The early elegiac poetry of Greece was by no means confined to mourning for the dead. War, love, politics, proverbial philosophy, were in turn its themes; it dealt, in fact, with the chief interest of the poet and his friends, whatever that might be at the time. It is the direct expression of the poet's own thoughts, addressed to a sympathizing society. This is its first characteristic. The second is that, even when most pathetic or most spirited, it still preserves, on the whole, the tone of conversation or of narrative. Greek elegy stops short of lyric passion. English elegy, whether funereal as in Dryden and Pope, or reflective as in Gray, is usually true to the same normal type. Roman elegy is not equally true to it, but sometimes tends to trench on the lyric province. For Roman elegy is mainly amatory or sentimental; and its masters imitated, as a rule, not the early Greek elegists, not Tyrtaeus or Theognis, but the later Alexandrian elegists, such as Callimachus or Philetas. Catullus introduced the metre to Latin literature, and used it with more fidelity than his followers to its genuine Greek inspiration.

Iambic verse.

Elegy, as we have seen, was the first slight deviation from epos. But almost at the same time another species arose which had nothing in common with epos, either in form or in spirit. This was the iambic. The word *ἴαμβοι*, *iambus* (*ἰάπτειν*, to dart or shoot) was used in reference to the licensed raillery at the festivals of Demeter; it was the maiden Iambe, the myth said, who drew the first smile from the mourning goddess. The iambic metre was at first used for satire; and it was in this strain that it was chiefly employed by its earliest master of note, Archilochus of Paros (670 B.C.). But it was adapted to the expression generally of any pointed thought. Thus it was suitable to fables. Elegiac and iambic poetry both belong to the borderland between epic and lyric. While, however, elegy stands nearer to epos, iambic stands nearer to the lyric. Iambic poetry can express the personal feeling of the poet with greater intensity than elegy does; on the other hand, it has not the lyric flexibility, self-abandonment or glow. As we see in the case of Solon, iambic verse could serve for the expression of that deeper thought, that more inward self-communing, for which the elegiac form would have been inappropriate.

But these two forms of poetry, both Ionian, the elegiac and the iambic, belong essentially to the same stage of the literature. They stand between the Ionian epos and the lyric poetry of the Aeolians and Dorians. The earliest of the Greek elegists, Callinus and Tyrtaeus, use elegy to rouse a warlike spirit in sinking hearts. Archilochus too wrote warlike elegy, but used it also in other strains, as in lament for the dead. The elegy of Mimnermus of Smyrna or Colophon is the plaintive farewell of an ease-loving Ionian to the days of Ionian freedom. In Solon elegy takes a higher range; it becomes political and ethical.[2] Theognis represents the maturer union of politics with a proverbial philosophy. Another gnomic poet was Phocylides of Miletus; an admonitory poem extant under his name is probably the work of an Alexandrine Jewish Christian. Xenophanes gives a philosophic strain to elegy. With Simonides of Ceos it reverts, in an exquisite form, to its earliest destination, and becomes the vehicle of epitaph on those who fell in the Persian Wars. Iambic verse was used by Simonides (or Semonides) of Amorgus, as by Archilochus, for satire—but satire directed against classes rather than persons. Solon's iambics so far preserve the old associations of the metre that they represent the polemical or controversial side of his political poetry. Hipponax of Ephesus was another iambic satirist—using the *σκάζων* ("limping") or choliambic verse, produced by substituting a spondee for an iambus in the last place. But it was not until the rise of the Attic drama that the full capabilities of iambic verse were seen.

Lyric poetry.

The lyric poetry of early Greece may be regarded as the final form of that effort at self-expression which in the elegiac and iambic is still incomplete. The lyric expression is deeper and more impassioned. Its intimate union with music and with the rhythmical movement of the dance gives to it more of an ideal character. At the same time the continuity of the music permits pauses to the voice—pauses necessary as reliefs after a climax. Before lyric poetry could be effective, it was necessary that some progress should have been made in the art of music. The instrument used by the Greeks to accompany the voice was the four-stringed lyre, and the first great epoch in Greek music was when Terpander of Lesbos (660 B.C.), by adding three strings, gave the lyre the

[1] Others attribute it, as well as the *Margites*, to Pigres of Halicarnassus, the supposed brother of the Carian queen Artemisia, who fought on the side of Xerxes at the battle of Salamis.

[2] The extant fragments of Solon have been augmented by lengthy quotations in the *Constitution of Athens*.

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compass of the octave. Further improvements are ascribed to Olympus and Thaletas. By 500 B.C. Greek music had probably acquired all the powers of expression which the lyric poet could demand. The period of Greek lyric poetry may be roughly defined as from 670 to 440 B.C. Two different parts in its development were taken by the Aeolians and the Dorians.

Aeolian school.

The lyric poetry of the Aeolians—especially of Lesbos—was essentially the utterance of personal feeling, and was usually intended for a single voice, not for a chorus. Lesbos, in the 7th century B.C., had attained some naval and commercial importance. But the strife of oligarchy and democracy was active; the Lesbian nobles were often driven by revolution to exchange their luxurious home-life for the hardships of exile. It is such a life of contrasts and excitements, working on a sensuous and fiery temperament, that is reflected in the fragments of Alcaeus. In these glimpses of war and love, of anxiety for the storm-tossed state and of careless festivity, there is much of the cavalier spirit; if Archilochus is in certain aspects a Greek Byron, Alcaeus might be compared to Lovelace. The other great representative of the Aeolian lyric is Sappho, the only woman of Greek race who is known to have possessed poetical genius of the first order. Intensity and melody are the characteristics of the fragments that remain to us.[1] Probably no poet ever surpassed Sappho as an interpreter of passion in exquisitely subtle harmonies of form and sound. Anacreon of Teos, in Ionia, may be classed with the Aeolian lyrists in so far as the matter and form of his work resembled theirs, though the dialect in which he wrote was mainly the Ionian. A few fragments remain from his hymns to the gods, from love-poems and festive songs. The collection of sixty short pieces which passes current under his name date only from the 10th century. The short poems which it comprises are of various age and authorship, probably ranging in date from *c.* 200 B.C. to A.D. 400 or 500. They have not the pure style, the flexible grace, or the sweetness of the classical fragments; but the verses, though somewhat mechanical, are often pretty.

Dorian school.

The Dorian lyric poetry, in contrast with the Aeolian, had more of a public than of a personal character, and was for the most part choral. Hymns or choruses for the public worship of the gods, and odes to be sung at festivals on occasions of public interest, were its characteristic forms. Its central inspiration was the pride of the Dorians in the Dorian past, in their traditions of worship, government and social usage. The history of the Dorian lyric poetry does not present us with vivid expressions of personal character, like those of Alcaeus and Sappho, but rather with a series of artists whose names are associated with improvements of form. Thus Alcman (the Doric form of Alcmaeon; 660 B.C.) is said to have introduced the balanced movement of strophe and antistrophe. Stesichorus, of Himera in Sicily, added the epode, sung by the chorus while stationary after these movements; Arion of Methymna in Lesbos gave a finished form to the choral hymn ("dithyramb") in honour of Dionysus, and organized the "cyclic" or circular chorus which sang it at the altar. Ibycus of Rhegium (*c.* 540) wrote choral lyrics after Stesichorus and glowing love-songs in the Aeolic style.

Simonides and Pindar.

The culmination of the lyric poetry is marked by two great names, Simonides and Pindar. Simonides (556–468) was an Ionian of the island of Ceos, but his lyrics belonged by form to the choral Dorian school. Many of his subjects were taken from the events of the Persian wars: his epitaphs on those who fell at Thermopylae and Salamis were celebrated. In him the lyric art of the Dorians is interpreted by Ionian genius, and Athens—where part of his life was passed—is the point at which they meet. Simonides is the first Greek lyrist whose significance is not merely Aeolian or Dorian but Panhellenic. The same character belongs even more completely to his younger contemporary. Pindar (518–*c.* 443) was born in Boeotia of a Dorian stock; thus, as Ionian and Dorian elements meet in Simonides, so Dorian and Aeolian elements meet in Pindar. Simonides was perhaps the most tender and most exquisite of the lyric poets. Pindar was the boldest, the most fervid and the most sublime. His extant fragments[1] represent almost every branch of the lyric art. But he is known to us mainly by forty-four *Epinicia*, or odes of victory, for the Olympian, Pythian, Nemean and Isthmian festivals. The general characteristic of the treatment is that the particular victory is made the occasion of introducing heroic legends connected with the family or city of the victor, and of inculcating the moral lessons which they teach. No Greek lyric poetry can be completely appreciated apart from the music, now lost, to which it was set. Pindar's odes were, further, essentially occasional poems; they abound in allusions of which the effect is partly or wholly lost on us; and the glories which they celebrate belong to a life which we can but imperfectly realize. Of all the great Greek poets, Pindar is perhaps the one to whom it is hardest for us to do justice; yet we can at least recognize his splendour of imagination, his strong rapidity and his soaring flight.

Bacchylides of Ceos (*c.* 504–430), the youngest of the three great lyric poets and nephew of Simonides, was known only by scant fragments until a few disconnected poems on an Egyptian papyrus in 1896. They consist of thirteen (or fourteen) epinicia, two of which celebrate the same victories as two odes of Pindar. The papyrus also contains six odes for the festivals of gods or heroes. The poems contain valuable information on the court life of the time and legendary history. Bacchylides, the little "Cean nightingale," is inferior to his great rival Pindar, "the Swan of Dirce," in originality and splendour of language, but he writes simply and elegantly, while his excellent γνῶμαι attracted readers of a philosophical turn of mind, amongst them the emperor Julian.

Similarly, the scanty fragments of Timotheus of Miletus (d. 357), musical composer and poet, and inventor of the eleven-stringed lyre, were increased by the discovery in 1902 of some 250 lines of his "nome" the *Persae*, written after the manner of Terpander. The beginning is lost; the middle describes the battle of Salamis; the end is of a personal nature. The papyrus is the oldest Greek MS. and belongs to the age of Alexander the Great. The language is frequently very obscure, and the whole is a specimen of lyric poetry in its decline.

(B) *The Attic Literature.*—The Ionians of Asia Minor, the Aeolians and the Dorians had now performed their special parts in the development of Greek literature. Epic poetry had interpreted the heroic legends of warlike deeds done by Zeus-nourished kings and chiefs. Then, as the individual life became more and more elegiac and iambic poetry had become the social expression of that life in all its varied interests and feelings. Lastly, lyric poetry had arisen to satisfy a twofold need—to be the more intense utterance of personal emotion, or to give choral voice, at stirring moments, to the faith or fame, the triumph or the sorrow, of a city or a race. A new form of poetry was now to be created, with elements borrowed from all the rest. And this was to be achieved by the people of Attica, in whose character and language the distinctive traits of an Ionian descent were tempered with some of the best qualities of the Dorian stock.

Origin of drama.

The drama (*q.v.*) arose from the festivals of Dionysus, the god of wine, which were held at intervals from the beginning of winter to the beginning of spring. A troop of rustic worshippers would gather around the altar of the god, and sing a hymn in his honour, telling of his victories or sufferings in his progress over the earth. "Tragedy" meant "the goat-song," a goat (τράγος) being sacrificed to Dionysus before the hymn was sung. "Comedy," "the village-song," is the same hymn regarded as an occasion for

Tragedy.

[1] Since the above was written, four considerable fragments generally assigned to Sappho have been discovered: a prayer to the Nereids for the safe return of her brother Charaxus; the leave-taking of a favourite pupil; a greeting to Atthis, one of her friends, in Lydia; the fourth, much mutilated, addressed to another pupil, Gongyla. They are of great beauty and throw considerable light on the personality of Sappho and the language and metre of her poems.

[1] Recently increased by specimens of the *Partheneia* (choral songs for maidens) and paeans.

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rustic jest. Then the leader of the chorus would assume the part of a messenger from Dionysus, or even that of the god himself, and recite an adventure to the worshippers, who made choral response. The next step was to arrange a dialogue between the leader(*κορυφαῖος*, *coryphaeus*) and one chosen member of the chorus, hence called "the answerer" (*ὑποκριτής*, *hypocrités*, afterwards the ordinary word for "actor"). This last improvement is ascribed to the Attic Thespis (about 536 B.C.). The elements of drama were now ready. The choral hymn to Dionysus (the "dithyramb") had received an artistic form from the Dorians; dialogue, though only between the leader of the chorus and a single actor, had been introduced in Attica. Phrynichus, an Athenian, celebrated in this manner some events of the Persian Wars; but in his "drama" there was still only one actor. Choerilus of Athens and Pratinas of Phlius, who belonged to the same period, developed the satyric drama; Pratinas also wrote tragedies, dithyrambs, and *hyporchemata* (lively choral odes chiefly in honour of Apollo).

Aeschylus (born 525 B.C.) became the real founder of tragedy by introducing a second actor, and thus rendering the dialogue independent of the chorus. At the same time the choral song—hitherto the principal part of the performance—became subordinate to the dialogue; and drama was mature. Aeschylus is also said to have made various improvements of detail in costume and the like; and it was early in his career that the theatre of Dionysus under the acropolis was commenced—the first permanent home of Greek drama, in place of the temporary wooden platforms which had hitherto been used. The system of the "trilogy" and the "tetralogy" is further ascribed to Aeschylus,—the "trilogy" being properly a series of three tragedies connected in subject, such as the *Agamemnon*, *Choëphori*, *Eumenides*, which together form the *Oresteia*, or Story of Orestes. The "tetralogy" is such a triad with a "satyric drama" added—that is, a drama in which "satyrs," the grotesque woodland beings who attended on Dionysus, formed the chorus, as in the earlier dithyramb from which drama sprang. The *Cyclops* of Euripides is the only extant specimen of a satyric drama. In the seven tragedies which alone remain of the seventy which Aeschylus is said to have composed, the forms of kings and heroes have a grandeur which is truly Homeric; there is a spirit of Panhellenic patriotism such as the Persian Wars in which he fought might well quicken in a soldier-poet; and, pervading all, there is a strain of speculative thought which seeks to reconcile the apparent conflicts between the gods of heaven and of the underworld by the doctrine that both alike, constrained by necessity, are working out the law of righteousness. Sophocles, who was born thirty years after Aeschylus (495 B.C.), is the most perfect artist of the ancient drama. No one before or after him gave to Greek tragedy so high a degree of ideal beauty, or appreciated so finely the possibilities and the limitations of its sphere. He excels especially in drawing character; his *Antigone*, his *Ajax*, his *Oedipus*—indeed, all the chief persons of his dramas—are typical studies in the great primary emotions of human nature. He gave a freer scope to tragic dialogue by adding a third actor; and in one of his later plays, the *Oedipus at Colonus*, a fourth actor is required. From the time when he won the tragic prize against Aeschylus in 468 to his death in 405 B.C. he was the favourite dramatist of Athens; and for us he is not only a great dramatist, but also the most spiritual representative of the age of Pericles. The distinctive interest of Euripides is of another kind. He was only fifteen years younger than Sophocles; but when he entered on his poetical career, the old inspirations of tragedy were already failing. Euripides marks a period of transition in the tragic art, and is, in fact, the mediator between the classical and the romantic drama. The myths and traditions with which the elder dramatists had dealt no longer commanded an unquestioning faith. Euripides himself was imbued with the new intellectual scepticism of the day; and the speculative views which were conflicting in his own mind are reflected in his plays. He had much picturesque and pathetic power; he was a master of expression; and he shows ingenuity in devising fresh resources for tragedy—especially in his management of the choral songs. Aeschylus is Panhellenic, Sophocles is Athenian, Euripides is cosmopolitan. He stands nearer to the modern world than either of his predecessors; and though with him Attic tragedy loses its highest beauty, it acquires new elements of familiar human interest.

Aeschylus.

Sophocles.

Euripides.

In Attica, as in England, a period of rather less than fifty years sufficed for the complete development of the tragic art. The two distinctive characteristics of Athenian drama are its originality and its abundance. The Greeks of Attica were not the only inventors of drama, but they were the first people who made drama a complete work of art. And the great tragic poets of Attica were remarkably prolific. Aeschylus was the reputed author of 70 tragedies, Sophocles of 113, Euripides of 92; and there were others whose productiveness was equally great.

Comedy represented the lighter side, as tragedy the graver side, of the Dionysiac worship; it was the joy of spring following the gloom of winter. The process of growth was nearly the same as in tragedy; but the Dorians, not the Ionians of Attica, were the first who added dialogue to the comic chorus. Susarion, a Dorian of Megara, exhibited, about 580 B.C., pieces of the kind known as "Megarian farces." Epicharmus of Cos (who settled at Syracuse) gave literary form to the Doric farce, and treated in burlesque style the stories of gods and heroes, and subjects taken from everyday life. His Syracusan contemporary Sophron (*c.* 450) was a famous writer of mimes, chiefly scenes from low-class life. The most artistic form of comedy seems, however, to have been developed in Attica. The greatest names before Aristophanes are those of Cratinus and Eupolis; but from about 470 B.C. there seems to have been a continuous succession of comic dramatists, amongst them Plato Comicus, the author of 28 comedies, political satires and parodies after the style of the Middle Comedy. Aristophanes came forward as a comic poet in 427 B.C., and retained his popularity for about forty years. He presents a perhaps unique union of bold fancy, exquisite humour, critical acumen and lyrical power. His eleven extant comedies may be divided into three groups, according as the licence of political satire becomes more and more restricted. In the *Acharnians*, *Knights*, *Clouds*, *Wasps* and *Peace* (425–421) the poet uses unrestrained freedom. In the *Birds*, *Lysistrata*, *Thesmophoriazusae* and *Frogs* (414–405) a greater reserve may be perceived. Lastly, in the *Ecclesiazusae* and the *Plutus* (392–388) personal satire is almost wholly avoided. The same general tendency continued. The so-called "Middle Comedy" (390–320) represents the transition from the Old Comedy, or political satire, to satire of a literary or social nature; its chief writers were Antiphanes of Athens and Alexis of Thurii. The "New Comedy" (320–250) resembled the modern "comedy of manners."

Comedy.

Aristophanes.

Its chief representative was Menander (342–291), the author of 105 comedies. Fragments have been discovered of seven of these, of sufficient length to give an idea of their dramatic action. His plays were produced on the stage as late as the time of Plutarch, and his *γνῶμαι*, distinguished by worldly wisdom, were issued in the form of anthologies, which enjoyed great popularity. Other prominent writers of this class were Diphilus, Philemon, Posidippus and Apollodorus of Carystus. About 330 B.C. Rhinthon of Tarentum revived the old Doric farce in his *Hilarotragoediae* or travesties of tragic stories. These successive periods cannot be sharply or precisely marked off. The change which gradually passed over the comic drama was simply the reflection of the change which passed over the political and social life of Athens. The Old Comedy, as we see it in the earlier plays of Aristophanes, was probably the most powerful engine of public criticism that has ever existed in any community. Unsparing personality was its essence. The comic poet used this recognized right on an occasion at once festive and sacred, in a society where every man of any note was known by name and sight to the rest. The same thousands who heard a policy or a character denounced or lauded in the theatre might be required to pass sentence on it in the popular assembly or in the courts of law.

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The development of Greek poetry had been completed before a prose literature had begun to exist. The earliest name in extant Greek prose literature is that of Herodotus; and, when he wrote, the Attic drama had already passed its prime. There had been, indeed, writers of prose before Herodotus; but there had not been, in the proper sense of the term, a prose literature. The causes of this comparatively late origin of Greek literary prose are independent of the question as to the time at which the art of writing began to be generally used for literary purposes. Epic poetry exercised for a very long period a sovereign spell over the Greek mind. In it was deposited all that the race possessed of history, theology, philosophy, oratory. Even after an age of reflection had begun, elegiac poetry, the first offshoot of epic, was, with iambic verse, the vehicle of much which among other races would have been committed to prose. The basis of Greek culture was essentially poetical. A political cause worked in the same direction. In the Eastern monarchies the king was the centre of all, and the royal records afforded the elements of history from a remote date. The Greek nation was broken up into small states, each busied with its own affairs and its own men. It was the collision between the Greek and the barbarian world which first provided a national subject for a Greek historian. The work of Herodotus, in its relation to Greek prose, is so far analogous to the *Iliad* in its relation to Greek poetry, that it is the earliest work of art, and that it bears a Panhellenic stamp.

Literary prose.

The sense and the degree in which Herodotus was original may be inferred from what is known of earlier prose-writers.

Early prose writers.

For about a century before Herodotus there had been a series of writers in philosophy, mythology, geography and history. The earliest, or among the earliest, of the philosophical writers were Pherecydes of Syros (550 B.C.) and the Ionian Anaximenes and Anaximander. It is doubtful whether Cadmus of Miletus, supposed to have been the first prose writer, was an historical personage. The Ionian writers, especially called λογογράφοι, "narrators in prose" (as distinguished from ἑποποιοί, makers of verse), were those who compiled the myths, especially in genealogies, or who described foreign countries, their physical features, usages and traditions. Hecataeus of Miletus (500 B.C.) is the best-known representative of the *logographi* in both these branches. Hellanicus of Mytilene (450 B.C.), among whose works was a history of Attica, appears to have made a nearer approach to the character of a systematic historian. Other logographi were Charon of Lampsacus; Pherecydes of Leros, who wrote on the myths of early Attica; Hippys of Rhegium, the oldest writer on Italy and Sicily; and Acusilaus of Argos in Boeotia, author of genealogies (see LOGOGRAPHI, and GREECE: *Ancient History*, "Authorities").

Herodotus.

Herodotus was born in 484 B.C.; and his history was probably not completed before the beginning of the Peloponnesian War (431 B.C.). His subject is the struggle between Greece and Asia, which he deduces from the legendary rape of the Argive Io by Phoenicians, and traces down to the final victory of the Greeks over the invading host of Xerxes. His literary kinship with the historical or geographical writers who had preceded him is seen mainly in two things. First, though he draws a line between the mythological and the historical age, he still holds that myths, as such, are worthy to be reported, and that in certain cases it is part of his duty to report them. Secondly, he follows the example of such writers as Hecataeus in describing the natural and social features of countries. He seeks to combine the part of the geographer or intelligent traveller with his proper part as historian. But when we turn from these minor traits to the larger aspects of his work, Herodotus stands forth as an artist whose conception and whose method were his own. His history has an epic unity. Various as are the subordinate parts, the action narrated is one, great and complete; and the unity is due to this, that Herodotus refers all events of human history to the principle of divine Nemesis. If Sophocles had told the story of Oedipus in the *Oedipus Tyrannus* alone, and had not added to it the *Oedipus at Colonus*, it would have been comparable to the story of Xerxes as told by Herodotus. Great as an artist, great too in the largeness of his historical conception, Herodotus fails chiefly by lack of insight into political cause and effect, and by a general silence in regard to the history of political institutions. Both his strength and his weakness are seen most clearly when he is contrasted with that other historian who was strictly his contemporary and who yet seems divided from him by centuries.

Thucydides.

Thucydides was only thirteen years younger than Herodotus; but the intellectual space between the men is so great that they seem to belong to different ages. Herodotus is the first artist in historical writing; Thucydides is the first thinker. Herodotus interweaves two threads of causation—human agency, represented by the good or bad qualities of men, and divine agency, represented by the vigilance of the gods on behalf of justice. Thucydides concentrates his attention on the human agency (without, however, denying the other), and strives to trace its exact course. The subject of Thucydides is the Peloponnesian War. In resolving to write its history, he was moved, he says, by these considerations. It was probably the greatest movement which had ever affected Hellas collectively. It was possible for him as a contemporary to record it with approximate accuracy. And this record was likely to have a general value, over and above its particular interest as a record, seeing that the political future was likely to resemble the political past. This is what Thucydides means when he calls his work "a possession for ever." The speeches which he ascribes to the persons of the history are, as regards form, his own essays in rhetoric of the school to which Antiphon belongs. As regards matter, they are always so far dramatic that the thoughts and sentiments are such as he conceived possible for the supposed speaker. Thucydides abstains, as a rule, from moral comment; but he tells his story as no one could have told it who did not profoundly feel its tragic force; and his general claim to the merit of impartiality is not invalidated by the possible exceptions—difficult to estimate—in the cases of Cleon and Hyperbolus.

Xenophon.

Strong as is the contrast between Herodotus and Thucydides, their works have yet a character which distinguish both alike from the historical work of Xenophon in the *Anabasis* and the *Hellenica*. Herodotus gives us a vivid drama with the unity of an epic. Thucydides takes a great chapter of contemporary history and traces the causes which are at work throughout it, so as to give the whole a scientific unity. Xenophon has not the grasp either of the dramatist or of the philosopher. His work does not possess the higher unity either of art or of science. The true distinction of Xenophon consists in his thorough combination of the practical with the literary character. He was an accomplished soldier, who had done and seen much. He was also a good writer, who could make a story both clear and lively. But the several parts of the story are not grouped around any central idea, such as a divine Nemesis is for Herodotus, or such as Thucydides finds in the nature of political man. The seven books of the *Hellenica* form a supplement to the history of Thucydides, beginning in 411 and going down to 362 B.C. The chief blot on the *Hellenica* is the author's partiality to Sparta, and in particular to Agesilaus. Some of the greatest achievements of Epaminondas and Pelopidas are passed over in silence. On the whole, Xenophon is perhaps seen at his best in his narrative of the *Retreat of the Ten Thousand*—a subject which exactly suits him. The *Cyropaedeia* is a romance of little historical worth, but with many good passages. *The Recollections of Socrates*, on the other hand, derive their principal value from being uniformly matter-of-fact. In his minor pieces on various subjects Xenophon appears as the earliest essayist. It may be noted that one of the essays erroneously ascribed to him—that *On the Athenian Polity*—is probably the oldest specimen in existence of literary Attic prose.

His contemporaries Ctesias of Cnidus and Philistus of Syracuse wrote histories of Persia and Sicily. In the second half of the 4th century a number of histories were compiled by literary men of little practical knowledge, who had been trained in the

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rhetorical schools. Such were Ephorus of Cyme and Theopompus of Chios, both pupils of Isocrates; and the writers of *Atthides* (chronicles of Attic history), the chief of whom were Androtion and Philochorus. Timaeus of Tauromenium was the author of a great work on Sicily, and introduced the system of reckoning by Olympiads.

The steps by which an Attic prose style was developed, and the principal forms which it assumed, can be traced most clearly in the Attic orators. Every Athenian citizen who aspired to take part in the affairs of the city, or even to be qualified for self-defence before a law-court, required to have some degree of skill in public speaking; and an Athenian audience looked upon public debate, whether political or forensic, as a competitive trial of proficiency in a fine art. Hence the speaker, no less than the writer, was necessarily a student of finished expression; and oratory had a more direct influence on the general structure of literary prose than has ever perhaps been the case elsewhere. A systematic rhetoric took its rise in Sicily, where Corax of Syracuse (466 B.C.) devised his *Art of Words* to assist those who were pleading before the law-courts; and it was brought to Athens by his disciple Tisias. The teaching of the Sophists, again, directed attention, though in a superficial and imperfect way, to the elements of grammar and logic; and Gorgias of Leontini—whose declamation, however turgid, must have been striking—gave an impulse at Athens to the taste for elaborate rhetorical brilliancy.

Oratory.

Antiphon represents the earliest, and what has been called the grand, style of Attic prose; its chief characteristics are a grave, dignified movement, a frequent emphasis on verbal contrasts, and a certain austere elevation. The interest of Andocides is mainly historical; but he has graphic power. Lysias, the representative of the "plain style," breaks through the rigid mannerism of the elder school, and uses the language of daily life with an ease and grace which, though the result of study, do not betray their art. He is, in his own way, the canon of an Attic style; and his speeches, written for others, exhibit also a high degree of dramatic skill. Isocrates, whose manner may be regarded as intermediate between that of Antiphon and that of Lysias, wrote for readers rather than for hearers. The type of literary prose which he founded is distinguished by ample periods, by studied smoothness and by the temperate use of rhetorical ornament. From the middle of the 4th century B.C. the Isocratic style of prose became general in Greek literature. From the school of Rhodes, in which it became more florid, it passed to Cicero, and through him it has helped to shape the literary prose of the modern world. The speeches of Isaeus in will-cases are interesting,—apart from their bearing on Attic life,—because in them we see, as Dionysius says, "the seeds and the beginnings" of that technical mastery in rhetorical argument which Demosthenes carries to perfection. Isaeus has also, in a degree, some of the qualities of Lysias. Demosthenes excels all other masters of Greek prose not only in power but in variety; his political speeches, his orations in public or private causes, show his consummate and versatile command over all the resources of the language. In him the development of Attic prose is completed, and the best elements in each of its earlier phases are united. The modern world can more easily appreciate Demosthenes as a great natural orator than as an elaborate artist. But, in order to apprehend his place in the history of Attic prose, we must remember that the ancients felt him to be both; and that he was even reproached by detractors with excessive study of effect. Aeschines is the most theatrical of the Greek orators; he is vehement, and often brilliant, but seldom persuasive. Hypereides was, after Demosthenes, probably the most effective; he had much of the grace of Lysias, but also a wit, a fire and a pathos which were his own. Portions of six of his speeches, found in Egypt between 1847 and 1890, are extant. The one oration of Lycurgus which remains to us is earnest and stately, reminding us both of Antiphon and of Isocrates. Dinarchus was merely a bad imitator of Demosthenes. There seems more reason to regret that Demades is not represented by larger fragments. The decline of Attic oratory may be dated from Demetrius of Phalerum (318 B.C.), the pupil of Aristotle, and the first to introduce the custom of making speeches on imaginary subjects as practised in the rhetorical schools. Cicero names him as the first who impaired the vigour of the earlier eloquence, "preferring his own sweetness to the weight and dignity of his predecessors." He forms a connecting link between Athens and Alexandria, where he found refuge after his downfall and promoted the foundation of the famous library.

The Attic orators.

Demosthenes.

In later times oratory chiefly flourished in the coast and island settlements of Asia Minor, especially Rhodes. Here a new, florid style of oration arose, called the "Asiatic," which owed its origin to Hegesias of Magnesia (*c.* 250 B.C.).

The place of Plato in the history of Greek literature is as unique as his place in the history of Greek thought. The literary genius shown in the dialogues is many-sided: it includes dramatic power, remarkable skill in parody, a subtle faculty of satire, and, generally, a command over the finer tones of language. In passages of continuous exposition, where the argument rises into the higher regions of discussion, Plato's prose takes a more decidedly poetical colouring—never florid or sentimental, however, but lofty and austere. In Plato's later works—such, for instance, as the *Laws*, *Timaeus*, *Critias*—we can perceive that his style did not remain unaffected by the smooth literary prose which contemporary writers had developed. Aristotle's influence on the form of Attic prose literature would probably have been considerable if his *Rhetoric* had been published while Attic oratory had still a vigorous life before it. But in this, as in other departments of mental effort, it was Aristotle's lot to set in order what the Greek intellect had done in that creative period which had now come to an end. His own chief contribution to the original achievements of the race was the most fitting one that could have been made by him in whose lifetime they were closed. He bequeathed an instrument by which analysis could be carried further, he founded a science of reasoning, and left those who followed him to apply it in all those provinces of knowledge which he had mapped out.[1] Theophrastus, his pupil and his successor in the Lyceum, opens the new age of research and scientific classification with his extant works on botany, but is better known to modern readers by his lively *Characters*, the prototypes of such sketches in English literature as those of Hall, Overbury and Earle.

Philosophical prose—Plato and Aristotle.

(C) *The Literature of the Decadence.*—The period of decadence in Greek literature begins with the extinction of free political life in the Greek cities. So long as the Greek commonwealths were independent and vigorous, Greek life rested on the identity of the man with the citizen. The city state was the highest unit of social organization; the whole training and character of the man were viewed relatively to his membership of the city. The market-place, the assembly, the theatre were places of frequent meeting, where the sense of citizenship was quickened, where common standards of opinion or feeling were formed. Poetry, music, sculpture, literature, art, in all their forms, were matters of public interest. Every citizen had some degree of acquaintance with them, and was in some measure capable of judging them. The poet and the musician, the historian and the sculptor, did not live a life of studious seclusion or engrossing professional work. They were, as a rule, in full sympathy with the practical interests of their time. Their art, whatever its form might be, was the concentrated and ennobled expression of their political existence. Aeschylus breathed into tragedy the inspiration of one who had himself fought the great fight of national liberation. Sophocles was the colleague of Pericles in a high military command. Thucydides describes the operations of the Peloponnesian War with the practical knowledge of one who had been in charge of a fleet. Ictinus and Pheidias gave shape in stone, not to mere visions of the studio, but to the more glorious, because more

Character of the creative age.

[1] His *Constitution of Athens* (q.v.), of which a papyrus MS. was found in Egypt and published in 1891, forms part of a larger work on the constitution of 158 Greek and foreign cities.

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real and vivid, perceptions which had been quickened in them by a living communion with the Athenian spirit, by a daily contemplation of Athenian greatness, in the theatre where tragic poets idealized the legends of the past, in the ecclesia where every citizen had his vote on the policy of the state, or in that free and gracious society, full of beauty, yet exempt from vexatious constraint, which belonged to the age of Pericles. The tribunal which judged these works of literature or art was such as was best fitted to preserve the favourable conditions under which they arose. Criticism was not in the hands of a literary clique or of a social caste. The influence of jealousy or malevolence, and the more fatal influence of affectation, had little power to affect the verdict. The verdict was pronounced by the whole body of the citizens. The success or failure of a tragedy was decided, not by the minor circumstance that it gained the first or second prize, but by the collective opinion of the citizens assembled in the theatre of Dionysus. A work of architecture or sculpture was approved or condemned, not by the sentence of a few whom the multitude blindly followed, but by the general judgment of some twenty thousand persons, each of whom was in some degree qualified by education and by habit to form an independent estimate. The artist worked for all his fellow-citizens, and knew that he would be judged by all. The soul of his work was the fresh and living inspiration of nature; it was the ennobled expression of his own life; and the public opinion before which it came was free, intelligent and sincere.

The transition to Hellenism.

Philip of Macedon did not take away the municipal independence of the Greek cities, but he dealt a death-blow to the old political life. The Athenian poet, historian, artist might still do good work, but he could never again have that which used to be the very mainspring of all such activity—the daily experience and consciousness of participation in the affairs of an independent state. He could no longer breathe the invigorating air of constitutional freedom, or of the social intercourse to which that freedom lent dignity as well as grace. Then came Alexander's conquests; Greek civilization was diffused over Asia and the East by means of Greek colonies in which Asiatic and Greek elements were mingled. The life of such settlements, under the monarchies into which Alexander's empire broke up, could not be animated by the spirit of the Greek commonwealths in the old days of political freedom. But the externals of Greek life were there—the temples, the statues, the theatres, the porticos. Ceremonies and festivals were conducted in the Greek manner. In private life Greek usages prevailed. Greek was the language most used, and books were in demand. The mixture of races would always in some measure distinguish even the outward life of such a community from that of a pure Greek state; and the facility with which Greek civilization was adopted would vary in different places. Syria, for example, was rapidly and completely Hellenized. Judaea resisted the process to the last. In Egypt a Greek aristocracy of office, birth and intellect existed side by side with a distinct native life. But, viewed in its broadest aspect, this new civilization may be called Hellenism. Hellenism (*q.v.*) means the adoption of Hellenic ways; and it is properly applied to a civilization, generally Hellenic in external things, pervading people not necessarily or exclusively Hellenic by race. What the Hellenic literature was to Hellas, that the Hellenistic literature was to Hellenism. The literature of Hellenism has the Hellenic form without the Hellenic soul. The literature of Hellas was creative; the literature of Hellenism is derivative.

The Alexandrian period.

Alexandria was the centre of Greek intellectual activity from Alexander to Augustus. Its "Museum," or college, and its library, both founded by the first Ptolemy (Soter), gave it such attractions for learned men as no other city could rival. The labours of research or arrangement are those which characterize the Alexandrian period. Even in its poetry spontaneous motive was replaced by erudite skill, as in the hymns, epigrams and elegies of Callimachus, in the enigmatic verses of Lycophron, in the highly finished epic of Apollonius Rhodius, and in the versified lore, astronomical or medical, of Aratus and Nicander. The mimes of Herodas (or Herondas) of Cos (*c.* 300 B.C.), written in the Ionic dialect and choliambic verse, represent scenes from everyday life. The papyrus (published in 1891) contains seven complete poems and fragments of an eighth. They are remarkably witty and full of shrewd observations, but at times coarse. The pastoral poetry of the age—Dorian by origin—was the most pleasing; for this, if it is to please at all, must have its spring in the contemplation of nature. Theocritus is not exempt from the artificialism of the Hellenizing literature; but his true sense of natural beauty entitles him to a place in the first rank of pastoral poets. Bion of Ionia and Moschus of Syracuse also charm by the music and often by the pathos of their bucolic verse. Excavations on the site of the temple of Asclepius at Epidaurus have brought to light two hexameter poems and a paean (in Ionic metre) on Apollo and Asclepius by a local poet named Isyllus, who flourished about 280. Tragedy was represented by the poets known as the Alexandrian *Pleiad*. But it is not for its poetry of any kind that this period of Greek literature is memorable. Its true work was in erudition and science. Aristarchus (156 B.C.), the greatest in a long line of Alexandrian critics, set the example of a more thorough method in revising and interpreting the ancient texts, and may in this sense be said to have become the founder of scientific scholarship. The critical studies of Alexandria, carried on by the followers of Aristarchus, gradually formed the basis for a science of grammar. The earliest Greek grammar is that of Dionysius Thrax (born *c.* 166), a pupil of Aristarchus. Translation was another province of work which employed the learned of Alexandria—where the Septuagint version of the Old Testament was begun, probably about 300–250 B.C. Chronology was treated scientifically by Eratosthenes, and was combined with history by Manetho in his chronicles of Egypt, and by Berossus in his chronicles of Chaldaea. Euclid was at Alexandria in the reign of Ptolemy Soter. Herophilus and Erasistratus were distinguished physicians and anatomists, and the authors of several medical works. The general results of the Alexandrian period might perhaps be stated thus. Alexandria produced a few eminent men of science, some learned poets (in a few cases, of great literary merit) and many able scholars. The preservation of the best Greek literature was due chiefly to the unremitting care of the Alexandrian critics, whose appreciation of it partly compensated for the decay of the old Greek perceptions in literature and art, and who did their utmost to hand it down in a form as free as possible from the errors of copyists. On the whole, the patronage of letters by the Ptolemies had probably as large a measure of success as was possible under the existing conditions; and it was afforded at a time when there was special danger that a true literary tradition might die out of the world.

Erudition and science.

Summary.

Poetry.

The Graeco-Roman period in the literature of Hellenism may be dated from the Roman subjugation of Greece. "Greece made a captive of the rough conqueror," but it did not follow from this intellectual conquest that Athens became once more the intellectual centre of the world. Under the empire, indeed, the university of Athens long enjoyed a pre-eminent reputation. But Rome gradually became the point to which the greatest workers in every kind were drawn. Greek literature had already made a home there before the close of the 2nd century B.C. Sulla brought a Greek library from Athens to Rome. Such men as Cicero and Atticus were indefatigable collectors and readers of Greek books. The power of speaking and writing the Greek language became an indispensable accomplishment for highly educated Romans. The library planned by Julius Caesar and founded by Augustus had two principal departments, one for Latin, the other for Greek works. Tiberius, Vespasian, Domitian and Trajan contributed to enlarge the collection. Rome became more and more the rival of Alexandria, not only as possessing great libraries, but also as a seat of learning at which Greek men of letters found appreciation and encouragement. Greek poetry, especially in its higher forms, rhetoric and literary criticism, history and philosophy, were all cultivated by Greek writers at Rome.

The Graeco-Roman period.

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The first part of the Graeco-Roman period may be defined as extending from 146 B.C. to the close of the Roman republic.

First part: 146-30 B.C.

At its commencement stands the name of one who had more real affinity than any of his contemporaries with the great writers of old Athens, and who, at the same time, saw most clearly how the empire of the world was passing to Rome. The subject of Polybius (*c.* 205–120) was the history of Roman conquest from 264 to 146 B.C. His style, plain and straightforward, is free from the florid rhetoric of the time. But the distinction of Polybius is that he is the last Greek writer who in some measure retains the spirit of the old citizen-life. He chose his subject, not because it gave scope to learning or literary skill, but with a motive akin to that which prompted the history of Thucydides—namely, because, as a Greek citizen, he felt intensely the political importance of those wars which had given Rome the mastery of the world. The chief historical work which the following century produced—the *Universal History* of Diodorus Siculus (fl. *c.* 50 B.C.)—resembled that of Polybius in recognizing Rome as the political centre of the earth, as the point on which all earlier series of events converged. In all else Diodorus represents the new age in which the Greek historian had no longer the practical knowledge and insight of a traveller, a soldier or a statesman, but only the diligence, and usually the dulness, of a laborious compiler.

The Greek literature of the Roman empire, from Augustus to Justinian, was enormously prolific. The area over which the Greek language was diffused—either as a medium of intercourse or as an established branch of the higher education—was co-extensive with the empire itself. An immense store of materials had now been accumulated, on which critics, commentators, compilers, imitators, were employed with incessant industry. In very many of its forms, the work of composition or adaptation had been reduced to a mechanical knack. If there is any one characteristic which broadly distinguishes the Greek literature of these five centuries, it is the absence of originality either in form or in matter. Lucian is, in his way, a rare exception; and his great popularity—he is the only Greek writer of this period, except Plutarch, who has been widely popular—illustrates the flatness of the arid level above which he stands out. The sustained abundance of literary production under the empire was partly due to the fact that there was no open political career. Never, probably, was literature so important as a resource for educated men; and the habit of reciting before friendly or obsequious audiences swelled the number of writers whose taste had been cultivated to a point just short of perceiving that they ought not to write.

Second part: 30 B.C.–A.D. 529.

In the manifold prose work of this period, four principal departments may be distinguished. (1) *History*, with *Biography*, and *Geography*. History is represented by Dionysius of Halicarnassus—also memorable for his criticisms on the orators and his effort to revive a true standard of Attic prose—by Cassius Dio, Josephus, Arrian, Appian, Herodian, Eusebius and Zosimus. In biography, the foremost names are Plutarch, Diogenes Laërtius and Philostratus; in geography, Hipparchus of Nicaea, Strabo, Ptolemy and Pausanias. (2) *Erudition* and *Science*. The learned labours of the Alexandrian schools were continued in all their various fields. Under this head may be mentioned such works as the lexicons of Julius Pollux, Harpocration and Hesychius, Hephaestion's treatise on metre, and Herodian's system of accentuation; the commentaries of Galen on Plato and on Hippocrates; the learned miscellanies of Athenaeus, Aelian and Stobaeus; and the *Stratagems* of Polyaenus. (3) *Rhetoric* and *Belles-Lettres*. The most popular writers on the theory of rhetoric were Hermagoras, Hermogenes, Aphthonius and Cassius Longinus—the last the reputed author of the essay *On Sublimity*. Among the most renowned teachers of rhetoric—now distinctively called "Sophists," or rhetoricians—were Dio Chrysostom, Aelius Aristides, Themistius, Himerius, Libanius and Herodes Atticus. Akin to the rhetorical exercises were various forms of ornamental or imaginative prose—dialogues, letters, essays or novels. Lucian, in his dialogues, exhibits more of the classical style and of the classical spirit than any writer of the later age; he has also a remarkable affinity with the tone of modern satire, as in Swift or Voltaire. His Attic prose, though necessarily artificial, was at least the best that had been written for four centuries. The emperor Julian was the author both of orations and of satirical pieces. The chief of the Greek novelists (the forerunner of whom was Aristides of Miletus, *c.* 100 B.C., in his *Milesian Tales*) are Xenophon of Ephesus and Longus, representing a purely Greek type of romance, and Heliodorus—with his imitators Achilles Tatius and Chariton—representing a school influenced by Oriental fiction. There were also many Christian romances in Greek, usually of a religious tendency. Alciphron's fictitious *Letters*—founded largely on the New Comedy of Athens—represent the same kind of industry which produced the letters of Phalaris, Aristaenetus and similar collections. (4) *Philosophy* is represented chiefly by Epictetus and Marcus Aurelius, in both of whom the Stoic element is the prevailing one; by the Neoplatonists, such as Plotinus, Porphyry, Iamblichus; and by Proclus, of that eclectic school which arose at Athens in the 5th century A.D.

Depart-ments of prose literature.

The Greek poetry of this period presents no work of high merit. Babrius versified the Aesopic *Fables*; Oppian (or two poets of this name) wrote didactic poems on fishing and hunting; Nonnus and Quintus Smyrnaeus made elaborate essays in epic verse; and the Orphic lore inspired some poems and hymns of a mystic character. The so-called *Sibylline Oracles*, in hexameter verse, range in date from about 170 B.C. to A.D. 700, and are partly the expression of the Jewish longings for the restoration of Israel, partly predictions of the triumph of Christianity. By far the most pleasing compositions in verse which have come to us from this age are some of the short poems in the Greek Anthology, which includes some pieces as early as the beginning of the 5th century B.C. and some as late as the 6th century of the Christian era.

Verse.

The Anthology.

The 4th century may be said to mark the beginning of the last act in the decay of literary Hellenism. From that point the decline was rapid and nearly continuous. The attitude of the church towards it was no longer that which had been held by Clement of Alexandria, by Justin Martyr or by Origen. There was now a Christian Greek literature, and a Christian Greek eloquence of extraordinary power. The laity became more and more estranged from the Greek literature—however intrinsically pure and noble—of the pagan past. At the same time the Greek language—which had maintained its purity in Italian seats—was becoming corrupted in the new Greek Rome of the East. In A.D. 529 Justinian put forth an edict by which the schools of heathen philosophy were formally closed. The act had at least a symbolical meaning. It is necessary to guard against the supposition that such assumed landmarks in political or literary history always mark a definite transition from one order of things to another. But it is practically convenient, or necessary, to use such landmarks.

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II. Byzantine Literature

By "Byzantine literature" is generally meant the literature, written in Greek, of the so-called Byzantine period. There is no justification whatever for the inclusion of Latin works of the time of the East Roman empire. The close of the Byzantine period is clearly marked by the year 1453, at which date, with the fall of the Eastern empire, the peculiar culture and literary life of the Byzantines came to an end. It is only as regards the beginning of the Byzantine period that any doubts exist. There are no sufficient grounds for dating it from Justinian, as was formerly often done. In surveying the whole development of the political, ecclesiastical and literary life and of the general culture of the Roman empire, and particularly of its eastern portion, we arrive, on the contrary, at the conclusion that the actual date of the beginning of this new era—*i.e.* the Christian-Byzantine, in contradistinction to the Pagan-Greek and Pagan-Roman—falls within the reign of Constantine the Great. By the foundation of the new capital city of Constantinople (which lay amid Greek surroundings) and by the establishment of the Christian faith as the state religion, Constantine finally broke with the Roman-Pagan tradition, and laid the foundation of the Christian-Byzantine period of development. Moreover, in the department of language, so closely allied with that of literature, the 4th century marks a new epoch. About this time occurred the final disappearance of a characteristic of the ancient Greek language, important alike in poetry and in rhythmic prose, the difference of "quantity." Its place was henceforth taken by the accent, which became a determining principle in poetry, as well as for the rhythmic conclusion of the prose sentence. Thus the transition from the old musical language to a modern conversational idiom was complete.

Definition.

The reign of Constantine the Great undoubtedly marks the beginning of a new period in the most important spheres of national life, but it is equally certain that in most of them ancient tradition long continued to exercise an influence. Sudden breaches of continuity are less common in the general culture and literary life of the world than in its political or ecclesiastical development. This is true of the transition from pagan antiquity to the Christian middle ages. Many centuries passed before the final victory of the new religious ideas and the new spirit in public and private intellectual and moral life. The last noteworthy remnants of paganism disappeared as late as the 6th and 7th centuries. The last great educational establishment which rested upon pagan foundations—the university of Athens—was not abolished till A.D. 529. The Hellenizing of the seat of empire and of the state, which was essential to the independent development of Byzantine literature, proceeds yet more slowly. The first purely *Greek* emperor was Tiberius II. (578–582); but the complete Hellenizing of the character of the state had not been accomplished until the 7th century. We shall, therefore, regard the period from the 4th to the 7th century as that of the transition between ancient times and the middle ages. This period coincides with the rise of a new power in the world's history—Islam. But though, in this transitional period, the old and the new elements are both to a large extent present and are often inextricably interwoven, yet it is certain that the new elements are, both as regards their essential force and their influence upon the succeeding period, of infinitely greater moment than the decrepit and mostly artificial survivals of the antique.

Transitional period.

In order to estimate rightly the character of Byzantine literature and its distinctive peculiarities, in contradistinction to ancient Greek, it is imperative to examine the great difference between the civilizations that produced them. The Byzantine did not possess the homogeneous, organically constructed system of the ancient civilization, but was the outcome of an amalgamation of which Hellenism formed the basis. For, although the Latin character of the empire was at first completely retained, even after its final division in 395, yet the dominant position of Greek in the Eastern empire gradually led to the Hellenizing of the state. The last great act of the Latin tradition was the codification, in the Latin language, of the law by Justinian (527–565). But it is significant that the *Novels* of Justinian were composed partly in Greek, as were all the laws of the succeeding period. Of the emperors in the centuries following Justinian, many of course were foreigners, Isaurians, Armenians and others; but in language and education they were all Greeks. In the last five centuries of the empire, under the Comneni and the Palaeologi, court and state are purely Greek.

Mixed character of Byzantine culture.

In spite of the dominant position of Greek in the Eastern empire, a linguistic and national uniformity such as formed the foundation of the old Latin *Imperium Romanum* never existed there. In the West, with the expansion of Rome's political supremacy, the Latin language and Latin culture were everywhere introduced—first into the non-Latin provinces of Italy, later into Spain, Gaul and North Africa, and at last even into certain parts of the Eastern empire. This Latinizing was so thorough that it weathered all storms, and, in the countries affected by it, was the parent of new and vigorous nationalities, the French, the Spaniards, the Portuguese and the Rumanians. Only in Africa did "Latinism" fail to take root permanently. From the 6th century that province relapsed into the hands of the native barbarians and of the immigrant Arabs, and both the Latin and the Greek influences (which had grown in strength during the period of the Eastern empire) were, together with Christianity, swept away without leaving a trace behind. It might have been expected that the Hellenizing of the political system of the Eastern empire would have likewise entailed the Hellenizing of the non-Greek portions of the empire. Such, however, was not the case; for all the conditions precedent to such a development were wanting. The non-Greek portions of the Eastern empire were not, from the outset, gradually incorporated into the state from a Greek centre, as were the provinces in the West from a Latin centre. They had been acquired in the old period of the homogeneous Latin *Imperium*. In the centuries immediately following the division of the empire, the idea of Hellenizing the Eastern provinces could not take root, owing to the fact that Latin was retained, at least in principle, as the state language. During the later centuries, in the non-Greek parts, centrifugal tendencies and the destructive inroads of barbarians began on all sides; and the government was too much occupied with the all but impossible task of preserving the political unity of the empire to entertain seriously the wider aim of an assimilation of language and culture. Moreover, the Greeks did not possess that enormous political energy and force which enabled the Romans to assimilate foreign races; and, finally, they were confronted by sturdy Oriental, mostly Semitic, peoples, who were by no means so easy to subjugate as

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were the racially related inhabitants of Gaul and Spain. Their impotence against the peoples of the East will be still less hardly judged if we remember the fact already mentioned, that even the Romans were within a short period driven back and overwhelmed by the North African Semites who for centuries had been subjected to an apparently thorough process of Latinization.

The influence of Greek culture then, was very slight; how little indeed it penetrated into the oriental mind is shown by the fact that, after the violent Arab invasion in the south-east corner of the Mediterranean, the Copts and Syrians were able to retain their language and their national characteristics, while Greek culture almost completely disappeared. The one great instance of assimilation of foreign nationalities by the Greeks is the Hellenizing of the Slavs, who from the 6th century had migrated into central Greece and the Peloponnese. All other non-Greek tribes of any importance which came, whether for longer or for shorter periods, within the sphere of the Eastern empire and its civilization—such as the Copts, Syrians, Armenians, Georgians, Rumanians, Serbs, Bulgarians, Albanians —one and all retained their nationality and language. The complete Latinizing of the West has, accordingly, no counterpart in a similar Hellenizing of the East. This is clearly shown during the Byzantine period in the progress of Christianity. Everywhere in the West, even among the non-Romanized Anglo-Saxons, Irish and Germans, Latin maintained its position in the church services and in the other branches of the ecclesiastical system; down to the Reformation the church remained a complete organic unity. In the East, at the earliest period of its conversion to Christianity, several foreign tongues competed with Greek, *i.e.* Syrian, Coptic, Armenian, Georgian, Gothic, Old-Bulgarian and others. The sacred books were translated into these languages and the church services were held in them and not in Greek. One noticeable effect of this linguistic division in the church was the formation of various sects and national churches (cf. the Coptic Nestorians, the Syrian Monophysites, the Armenian and, in more recent times, the Slavonic national churches). The Church of the West was characterized by uniformity in language and in constitution. In the Eastern Church parallel to the multiplicity of languages developed also a corresponding variety of doctrine and constitution.

Roman influence.

Though the character of Byzantine culture is mainly Greek, and Byzantine literature is attached by countless threads to ancient Greek literature, yet the Roman element forms a very essential part of it. The whole political character of the Byzantine empire is, despite its Greek form and colouring, genuinely Roman. Legislation and administration, the military and naval traditions, are old Roman work, and as such, apart from immaterial alterations, they continued to exist and operate, even when the state in head and limbs had become Greek. It is strange, indeed, how strong was the political conception of the Roman state (*Staatsgedanke*), and with what tenacity it held its own, even under the most adverse conditions, down to the latter days of the empire. The Greeks even adopted the name "Romans," which gradually became so closely identified with them as to supersede the name "Hellenes"; and thus a political was gradually converted into an ethnographical and linguistic designation. *Rhomaioi* was the most common popular term for Greeks during the Turkish period, and remains so still. The old glorious name "Hellene" was used under the empire and even during the middle ages in a contemptuous sense—"Heathen"—and has only in quite modern times, on the formation of the kingdom of "Hellas," been artificially revived. The vast organization of the Roman political system could not but exercise in various ways a profound influence upon Byzantine civilization; and it often seemed as if Roman political principles had educated and nerved the unpolitical Greek people to great political enterprise. The Roman influence has left distinct traces in the Greek language, Greek of the Byzantine and modern period is rich in Latin terms for conceptions connected with the departments of justice, administration and the imperial court. In literature such "barbarisms" were avoided as far as possible, and were replaced by Greek periphrases.

Christianity.

But by far the most momentous and radical change wrought on the old Hellenism was effected by Christianity; and yet the transition was, in fact, by no means so abrupt as one might be led to believe by comparing the Pagan-Hellenic culture of Plato's day with the Christian-Byzantine of the time of Justinian. For the path had been most effectually prepared for the new religion by the crumbling away of the ancient belief in the gods, by the humane doctrine of the Stoics, and, finally, by the mystic intellectual tendencies of Neoplatonism. Moreover, in many respects Christianity met paganism halfway by adapting itself to popular usages and ideas and by adopting important parts of the pagan literature. The whole educational system especially, even in Christian times, was in a very remarkable manner based almost entirely on the methods and material inherited from paganism. Next to the influences of Rome and of Christianity, that of the East was of importance in developing the Byzantine civilization, and in lending Byzantine literature its distinctive character.

The Orient.

Much that was oriental in the Eastern empire dates back to ancient times, notably to the period of Alexander the Great and his successors. Since the Greeks had at that period Hellenized the East to the widest extent, and had already founded everywhere flourishing cities, they themselves fell under the manifold influences of the soil they occupied. In Egypt, Palestine and Syria, in Asia Minor as far inland as Mesopotamia, Greek and oriental characteristics were often blended. In respect of the wealth and the long duration of its Greek intellectual life, Egypt stands supreme. It covers a period of nearly a thousand years from the foundation of Alexandria down to the conquest of Egypt by the Arabs (A.D. 643). The real significance of Egyptian Hellenism during this long period can be properly estimated only if a practical attempt be made to eliminate from the history of Greek literature and science in pagan and in Christian times all that owed its origin to the land of the Nile. The soil of Egypt proved itself especially productive of Greek literature under the Cross (Origen, Athanasius, Arius, Synesius), in the same way as the soil of North Africa was productive of Latin literature (Tertullian, Cyprian, Lactantius, Augustine). Monastic life, which is one of the chief characteristic elements of Christian-Byzantine civilization, had its birth in Egypt.

Syria and Palestine came under the influence of Greek civilization at a later date than Egypt. In these, Greek literature and culture attained their highest development between the 3rd and the 8th centuries of the Christian era. Antioch rose to great influence, owing at first to its pagan school of rhetoric and later to its Christian school of exegesis. Gaza was renowned for its school of rhetoric; Berytus for its academy of law. It is no mere accident that sacred poetry, aesthetically the most valuable class of Byzantine literature, was born in Syria and Palestine.

In Asia Minor, the cities of Tarsus, Caesarea, Nicaea, Smyrna, Ephesus, Nicopolis, &c., were all influential centres of Greek culture and literature. For instance, the three great fathers of Cappadocia, Basil, Gregory of Nyssa, and Gregory of Nazianzus all belonged to Asia Minor.

If all the greater Greek authors of the first eight centuries of the Christian era, *i.e.* the period of the complete development of Byzantine culture, be classified according to the countries of their birth, the significant fact becomes evident that nine-tenths come from the African and Asiatic districts, which were for the most part opened up only after Alexander the Great, and only one-tenth from European Greece. In other words, the old original European Greece was, under the emperors, completely outstripped in intellectual productive force by the newly founded African and Asiatic Greece. This huge tide of conquest which surged from Greece over African and Syrian territories occupied largely by foreign races and ancient civilizations, could not fail to be fraught with serious consequences for the Greeks themselves. The experience of the

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Romans in their conquest of Greece (*Graecia capta ferum victorem cepit*) repeated itself in the conquest of the East by Greece, though to a minor extent and in a different way. The whole literature of Egypt, Syria and Asia Minor cannot, despite its international and cosmopolitan character, disavow the influence of the Oriental soil on which it was nourished. Yet the growth of too strong a local colouring in its literature was repressed, partly by the checks imposed by ancient Greek tradition, partly by the spirit of Christianity which reconciled all national distinctions. Even more clearly and unmistakably is Oriental influence shown in the province of Byzantine art, as Joseph Strzygowski has conclusively proved.

The greater portion of Greek literature from the close of ancient times down to the threshold of modern history was written in a language identical in its principal features with the common literary language, the so-called *Koinè*, which had its origin in the Alexandrian age. This is the literary form of Greek as a universal language, though a form that scintillates with many facets, from an almost Attic diction down to one that approaches the language of everyday life such as we have, for instance, in the New Testament. From what has been already said, it follows that this stable literary language cannot always have remained a language of ordinary life. For, like every living tongue, the vernacular Greek continually changed in pronunciation and form, as well as in vocabulary and grammar, and thus the living language surely and gradually separated itself from the rigid written language. This gulf was, moreover, considerably widened owing to the fact that there took place in the written language a retrograde movement, the so-called "Atticism." Introduced by Dionysius of Halicarnassus in the 1st century before Christ, this linguistic-literary fashion attained its greatest height in the 2nd century A.D., but still continued to flourish in succeeding centuries, and, indirectly, throughout the whole Byzantine period. It is true that it often seemed as though the living language would be gradually introduced into literature; for several writers, such as the chronicler Malalas in the 6th century, Leontius of Neapolis (the author of *Lives of Saints*) in the 7th century, the chronicler Theophanes at the beginning of the 9th century, and the emperor Constantine Porphyrogenitus in the 10th century, made in their writings numerous concessions to the living language. This progressive tendency might well have led, in the 11th and 12th centuries, to the founding in the Greek vernacular of a new literary language similar to the promising national languages and literature which, at that period, in the Romance countries, developed out of the despised popular idiom. In the case of the Byzantines, unfortunately, such a radical change never took place. All attempts in the direction of a popular reform of the literary language, which were occasionally made in the period from the 6th to the 10th centuries, were in turn extinguished by the resuscitation of classical studies, a movement which, begun in the 9th century by Photius and continued in the 11th by Psellus, attained its full development under the Comneni and the Palaeologi. This classical renaissance turned back the literary language into the old ossified forms, as had previously happened in the case of the Atticism of the early centuries of the empire. In the West, humanism (so closely connected with the Byzantine renaissance under the Comneni and the Palaeologi) also artificially reintroduced the "Ciceronian" Latin, but was unable seriously to endanger the development of the national languages, which had already attained to full vitality. In Byzantium, the humanistic movement came prematurely, and crushed the new language before it had fairly established itself. Thus the language of the Byzantine writers of the 11th–15th centuries is almost Old Greek in colour; artificially learnt by grammar, lexicon and assiduous reading, it followed Attic models more and more slavishly; to such an extent that, in determining the date of works, the paradoxical principle holds good that the more ancient the language, the more recent the author.

Language.

Owing to this artificial return to ancient Greek, the contrast that had long existed with the vernacular was now for the first time fully revealed. The gulf between the two forms of language could no longer be bridged; and this fact found its expression in literature also. While the vulgarizing authors of the 6th–10th centuries, like the Latin-writing Franks (such as Gregory of Tours), still attempted a compromise between the language of the schools and that of conversation, we meet after the 12th century with authors who freely and naturally employed the vernacular in their literary works. They accordingly form the Greek counterpart of the oldest writers in Italian, French and other Romance languages. That they could not succeed like their Roman colleagues, and always remained the pariahs of Greek literature, is due to the all-powerful philological-antiquarian tendency which existed under the Comneni and the Palaeologi. Yet once more did the vernacular attempt to assert its literary rights, *i.e.* in Crete and some other islands in the 16th and 17th centuries. But this attempt also was foiled by the classical reaction of the 19th century. Hence it comes about that Greek literature even in the 20th century employs grammatical forms which were obsolete long before the 10th century. Thus the Greeks, as regards their literary language, came into a *cul de sac* similar to that in which certain rigidly conservative Oriental nations find themselves, *e.g.* the Arabs and Chinese, who, not possessing a literary language suited to modern requirements, have to content themselves with the dead Old-Arabic or the ossified Mandarin language. The divorce of the written and spoken languages is the most prominent and also the most fatal heritage that the modern Greeks have received from their Byzantine forefathers.

The whole Byzantine intellectual life, like that of the Western medieval period, is dominated by theological interests. Theology accordingly, in literature too, occupies the chief place, in regard to both quantity and quality. Next to it comes the writing of history, which the Byzantines cultivated with great conscientiousness until after the fall of the empire. All other kinds of prose writing, *e.g.* in geography, philosophy, rhetoric and the technical sciences, were comparatively neglected, and such works are of value for the most part only in so far as they preserve old interpreted old material. In poetry, again, theology takes the lead. The poetry of the Church produced works of high aesthetic merit and enduring value. In secular poetry, the writing of epigrams especially was cultivated with assiduity and often with ability. In popular literature poetry predominates, and many productions worthy of notice, new both in matter and in form, are here met with.

General character of Byzantine literature.

The great classical period of Greek theological literature is that of the 4th century. Various factors contributed to this result—some of them positive, particularly the establishment of Christianity as the official religion and the protection accorded to it by the state, others negative, *i.e.* the heretical movements, especially Arianism, which at this period arose in the east of the empire and threatened the unity of the doctrine and organization of the church. It was chiefly against these that the subtle Athanasius of Alexandria directed his attacks. The learned Eusebius founded a new department of literature, church history. In Egypt, Antonius (St Anthony) founded the Greek monastic system; Synesius of Cyrene, like his greater contemporary Augustine in the West, represents both in his life and in his writings the difficult transition from Plato to Christ. At the centre, in the forefront of the great intellectual movement of this century, stand the three great Cappadocians, Basil the Great, the subtle dogmatist, his brother Gregory of Nyssa, the philosophically trained defender of the Christian faith, and Gregory of Nazianzus, the distinguished orator and poet. Closely allied to them was St Chrysostom, the courageous champion of ecclesiastical liberty and of moral purity. To modern readers the greater part of this literature appears strange and foreign; but, in order to be appreciated rightly, it must be regarded as the outcome of the period in which it was produced, a period stirred to its depths by religious emotions. For the times in which they lived and for their readers, the Greek fathers reached the highest attainable; though, of course, they produced nothing of such general human

Theology.

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interest, nothing so deep and true, as the *Confessions* of St Augustine, with which the poetical autobiography of Gregory of Nazianzus cannot for a moment be compared.

The glorious bloom of the 4th century was followed by a perceptible decay in theological intellectual activity. Independent production was in succeeding centuries almost solely prompted by divergent dogmatical views and heresies, for the refutation of which orthodox authors were impelled to take up the pen. In the 5th and 6th centuries a more copious literature was called into existence by the Monophysites, who maintained that there was but *one* nature in Christ; in the 7th century by the Monothelites, who acknowledged but *one* will in Christ; in the 8th century by the Iconoclasts and by the new teaching of Mahomet. One very eminent theologian, whose importance it has been reserved for modern times to estimate aright—Leontius of Byzantium (6th century)—was the first to introduce Aristotelian definitions into theology, and may thus be called the first scholastic. In his works he attacked the heretics of his age, particularly the Monophysites, who were also assailed by his contemporary Anastasius of Antioch. The chief adversaries of the Monothelites were Sophronius, patriarch of Jerusalem (whose main importance, however, is due to his work in other fields, in hagiography and homiletics), Maximus the Confessor, and Anastasius Sinaïtes, who also composed an interpretation of the *Hexaëmeron* in twelve books. Among writers in the departments of critical interpretation and asceticism in this period must be enumerated Procopius of Gaza, who devoted himself principally to the exegesis of the Old Testament; Johannes Climax (6th century), named after his much-read ascetic work *Klimax* (Jacob's ladder); and Johannes Moschus (d. 619), whose chief work *Leimon* ("spiritual pasture") describes monastic life in the form of statements and narratives of their experiences by monks themselves. The last great heresy, which shook the Greek Church to its very foundations, the Iconoclast movement, summoned to the fray the last great Greek theologian, John of Damascus (Johannes Damascenus). Yet his chief merit lies not so much in his polemical speeches against the Iconoclasts, and in his much admired but over-refined poetry, as in his great dogmatic work, *The Fountain of Knowledge*, which contains the first comprehensive exposition of Christian dogma. It has remained the standard work on Greek theology down to the present day. Just as the internal development of the Greek Church in all essentials reached its limit with the Iconoclasts, so also its productive intellectual activity ceased with John of Damascus. Such theological works as were subsequently produced, consisted mostly in the interpretation and revision of old materials. An extremely copious, but unfruitful, literature was produced by the disputes about the reunion of the Greek and Roman Churches. Of a more independent character is the literature which in the 14th century centred round the dissensions of the Hesychasts.

Among theologians after John of Damascus must be mentioned: the emperor Leo VI., the Wise (886–911), who wrote numerous homilies and church hymns, and Theodorus of Studium (759–826), who in his numerous writings affords us instructive glimpses of monastic life. Pre-eminent stands the figure of the patriarch Photius. Yet his importance consists less in his writings, which often, to a remarkable extent, lack independence of thought and judgment, than in his activity as a prince of the church. For he it was who carried the differences which had already repeatedly arisen between Rome and Constantinople to a point at which reconciliation was impossible, and was mainly instrumental in preparing the way for the separation of the Greek and Latin Churches accomplished in 1054 under the patriarch Michael Cerularius. In the 11th century the polyhistor Michael Psellus also wrote polemics against the Euchites, among whom the Syrian Gnosis was reviving. All literature, including theology, experienced a considerable revival under the Comneni. In the reign of Alexius I. Comnenus (1081–1118), Euthymius Zigabenus wrote his great dogmatic work, the *Dogmatic Panoply*, which, like *The Fountain of Knowledge* of John of Damascus in earlier times, was partly positive, furnishing an armoury of theology, partly negative and directed against the sects. In addition to attacking the dead and buried doctrines of the Monothelites, Iconoclasts, &c., to fight which was at this time a mere tilting at windmills, Zigabenus also carried on a polemic against the heretics of his own day, the Armenians, Bogomils and Saracens. Zigabenus's *Panoply* was continued and enlarged a century later by the historian Nicetas Acominatus, who published it under the title *Treasure of Orthodoxy*. To the writings against ancient heresies were next added a flood of tracts, of all shapes and sizes, "against the Latins," *i.e.* against the Roman Church, and among their authors must also be enumerated an emperor, the gifted Theodore II. Lascaris (1254–1258). The chief champion of the union with the Roman Church was the learned Johannes Beccus (patriarch of Constantinople 1275–1282). Of his opponents by far the most eminent was Gregory of Cyprus, who succeeded him on the patriarchal throne. The fluctuations in the fortunes of the two ecclesiastical parties are reflected in the occupation of the patriarchal throne. The battles round the question of the union, which were waged with southern passion, were for a while checked by the dissensions aroused by the mystic tendency of the Hesychasts. The impetus to this great literary movement was given by the monk Barlaam, a native of Calabria, who came forward in Constantinople as an opponent of the Latins and was in 1339 entrusted by Andronicus III. with a mission to Pope Benedict XII. at Avignon. He condemned the doctrine of the Hesychasts, and attacked them both orally and in writing. Among those who shared his views are conspicuous the historian Nicephorus Gregoras and Gregorius Acindynus, the latter of whom closely followed Thomas Aquinas in his writings. In fact the struggle against the Hesychasts was essentially a struggle between sober western scholasticism and dreamy Graeco-Oriental mysticism. On the side of the Hesychasts fought Gregorius Palamas, who tried to give a dogmatic foundation to the mysticism of the Hesychasts, Cabasilas, and the emperor John VI. Cantacuzenus who, after his deposition, sought, in the peaceful retreat of a monastery, consolation in theological studies, and in his literary works refuted the Jews and the Mahommedans. For the greatest Byzantine "apologia" against Islamism we are indebted to an emperor, Manuel II. Palaeologus (1391–1425), who by learned discussions tried to make up for the deficiency in martial prowess shown by the Byzantines in their struggle with the Turks. On the whole, theological literature was in the last century of the empire almost completely occupied with the struggles for and against the union with Rome. The reason lay in the political conditions. The emperors saw more and more clearly that without the aid of the West they would no longer be able to stand their ground against the Turks, the vanguard of the armies of the Crescent; while the majority of Byzantine theologians feared that the assistance of the West would force the Greeks to unite with Rome, and thereby to forfeit their ecclesiastical independence. Considering the supremacy of the theological party in Byzantium, it was but natural that religious considerations should gain the day over political; and this was the view almost universally held by the Byzantines in the later centuries of the empire; in the words of the chronicler Ducas: "it is better to fall into the hands of the Turks than into those of the Franks." The chief opponent of the union was Marcus Eugenicus, metropolitan of Ephesus, who, at the Council of Florence in 1439, denounced the union with Rome accomplished by John VIII. Palaeologus. Conspicuous there among the partisans of the union, by reason of his erudition and general literary merit, was Bessarion, afterwards cardinal, whose chief activity already falls under the head of Graeco-Italian humanism.

Hagiography, *i.e.* the literature of the acts of the martyrs and the lives of the saints, forms an independent group and one comparatively unaffected by dogmatic struggles. The main interest centres here round the objects described, the personalities of the martyrs and saints themselves. The authors, on the other hand—the *Acts of the Martyrs* are mostly anonymous—keep more in the background than in other branches of literature. The man whose name is

Hagiography.

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mainly identified with Greek hagiography. Symeon Metaphrastes, is important not as an original author, but only as an editor. Symeon revised in the 10th century, according to the rhetorical and linguistic principles of his day, numerous old *Acts of the Martyrs*, and incorporated them in a collection consisting of several volumes, which was circulated in innumerable copies, and thus to a great extent superseded the older original texts. These *Acts of the Martyrs*, in point of time, are anterior to our period; but of the *Lives of Saints* the greater portion belong to Byzantine literature. They began with biographies of monks distinguished for their saintly living, such as were used by Palladius about 420 in his *Historia Lausiaca*. The most famous work of this description is that by Athanasius of Alexandria, viz. the biography of St Anthony, the founder of monachism. In the 6th century Cyril of Scythopolis wrote several lives of saints, distinguished by a simple and straightforward style. More expert than any one else in reproducing the naïve popular style was Leontius of Neapolis in Cyprus who, in the 7th century, wrote, among other works, a life of St John the Merciful, archbishop of Alexandria, which is very remarkable as illustrating the social and intellectual conditions of the time. From the popular *Lives of Saints*, which for the reading public of the middle ages formed the chief substitute for modern "belles lettres," it is easy to trace the transition to the religious novel. The most famous work of this class is the history of BARLAAM AND JOSAPHAT (*q.v.*).

Religious poetry.

The religious poetry of the Greeks primarily suffered from the influence of the ancient Greek form, which was fatal to original development. The oldest work of this class is the hymn, composed in anapaestic monometers and dimeters, which was handed down in the manuscripts with the *Paedagogus* of Clement of Alexandria (d. about 215), but was probably not his work. The next piece of this class is the famous "Maidens' Song" in the *Banquet* of St Methodius (d. about 311), in which many striking violations of the old rules of quantity are already apparent. More faithful to the tradition of the schools was Gregory of Nazianzus. But, owing to the fact that he generally employed antiquated versification and very erudite language, his poems failed to reach the people or to find a place in the services of the church. Just as little could the artificial paraphrase of the Psalms composed by the younger Apollinaris, or the subtle poems of Synesius, become popular. It became more and more patent that, with the archaic metre which was out of keeping with the character of the living language, no genuine poetry suited to the age could possibly be produced. Fortunately, an entirely new form of poetical art was discovered, which conferred upon the Greek people the blessings of an intelligible religious poetry—the rhythmic poem. This no longer depended on difference of quantity in the syllables, which had disappeared from the living language, but on the accent. Yet the transition was not effected by the substitution of accent for the old long syllables; the ancient verse form was entirely abandoned, and in its stead new and variously constructed lines and strophes were formed. In the history of the rhythmic sacred poetry three periods are clearly marked—the preparatory period; that of the hymns; and that of the *Canones*. About the first period we know, unfortunately, comparatively little. It appears that in it church music was in the main confined to the insertion of short songs between the Psalms or other portions of Holy Writ and the acclamations of the congregation. The oldest rhythmic songs date from Gregory of Nazianzus—his "Maidens' Song" and his "Evening Hymn." Church poetry reached its highest expression in the second period, in the grand development of the hymns, *i.e.* lengthy songs comprising from twenty to thirty similarly constructed strophes, each connected with the next in acrostic fashion. Hymnology, again, attained its highest perfection in the first half of the 6th century with Romanos, who in the great number and excellence of his hymns dominated this species of poetry, as Homer did the Greek epic. From this period dates, moreover, the most famous song of the Greek Church, the so-called *Acathistus*, an anonymous hymn of praise to the Virgin Mary, which has sometimes, but erroneously, been attributed to the patriarch Sergius.

Canones.

A Church poetry entered upon a new stage, characterized by an increase in artistic finish and a falling off in poetical vigour, with the composition of the *Canones*, songs artfully built up out of eight or nine lyrics, all differently constructed. Andreas, archbishop of Crete (*c.* 650–720), is regarded as the inventor of this new class of song. His chief work, "the great Canon," comprises no less than 250 strophes. The most celebrated writers of *Canones* are John of Damascus and Cosmas of Jerusalem, both of whom flourished in the first half of the 8th century. The "vulgar" simplicity of Romanos was regarded by them as an obsolete method; they again resorted to the classical style of Gregory of Nazianzus, and John of Damascus even took a special delight in the most elaborate tricks of expression. In spite of this, or perhaps on that very account, both he and Cosmas were much admired in later times, were much read, and—as was very necessary—much commentated. Later, sacred poetry was more particularly cultivated in the monastery of the Studium at Constantinople by the abbot Theodorus and others. Again, in the 9th century, Joseph, "the hymn-writer," excelled as a writer of songs, and, finally, John Mauropus (11th century), bishop of Euchaita, John Zonaras (12th century), and Nicephorus Blemmydes (13th century), were also distinguished as authors of sacred poems, *i.e. Canones*. The Basilian Abbey of Grotta Ferrata near Rome, founded in 1004, and still existing, was also a nursery of religious poetry. As regards the rhythmic church poetry, it may now be regarded as certain that its origin was in the East. Old Hebrew and Syrian models mainly stimulated it, and Romanos (*q.v.*) was especially influenced by the metrical homilies of the great Syrian father Ephraem (d. about 373).

Profane literature: historical accounts.

In profane literature the writing of history takes the first place, as regards both form and substance. The Greeks have always been deeply interested in history, and they have never omitted, amid all the vicissitudes of their existence, to hand down a record to posterity. Thus, they have produced a literature extending from the Ionian logographers and Herodotus down to the times of Sultan Mahommed II. In the Byzantine period all historical accounts fall under one of two groups, entirely different, both in regard to matter, (1) historical works, the authors of which described, as did most historians of ancient times, a period of history in which they themselves had lived and moved, or one which only immediately preceded their own times; and (2) chronicles, shortly recapitulating the history of the world. This latter class has no exact counterpart in ancient literature. The most clearly marked stage in the development of a Christian-Byzantine universal history was the chronicle (unfortunately lost) written by the Hellenized Jew, Justus of Tiberias, at the beginning of the 2nd century of the Christian era; this work began with the story of Moses.

Byzantine histories of contemporary events do not differ substantially from ancient historical works, except in their Christian colouring. Yet even this is often very faint and blurred owing to close adherence to ancient methods. Apart from this, neither a new style nor a new critical method nor any radically new views appreciably altered the main character of Byzantine historiography. In their style most Byzantine compilers of contemporary history followed the beaten track of older historians, *e.g.* Herodotus, Thucydides, and, in some details, also Polybius. But, in spite of their often excessive tendency to imitation, they displayed considerable power in the delineation of character and were not wanting in independent judgment. As regards the selection of their matter, they adhered to the old custom of beginning their narrative where their predecessors left off.

The outstripping of the Latin West by the Greek East, which after the close of the 4th century was a self-evident fact, is reflected in historiography also. After Constantine the Great, the history of the empire, although its Latin character was maintained until the 6th century, was mostly written by Greeks;

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e.g. Eunapius (*c.* 400), Olympiodorus (*c.* 450), Priscus (*c.* 450), Malchus (*c.* 490), and Zosimus, the last pagan historian (*c.* 500), all of whom, with the exception of Zosimus, are unfortunately preserved to us only in fragments. Historiography received a great impulse in the 6th century. The powerful Procopius and Agathias (*q.v.*), tinged with poetical rhetoric, described the stirring and eventful times of Justinian, while Theophanes of Byzantium, Menander Protector, Johannes of Epiphaneia and Theophylactus of Simocatta described the second half of the 6th century. Towards the close of the 6th century also flourished the last independent ecclesiastical historian, Evagrius, who wrote the history of the church from 431 to 593. There now followed, however, a lamentable falling off in production. From the 7th to the 10th century the historical side is represented by a few chronicles, and it was not until the 10th century that, owing to the revival of ancient classical studies, the art of writing history showed some signs of life. Several historical works are associated with the name of the emperor Constantine VII. Porphyrogenitus. To his learned circle belonged also Joseph Genesius, who at the emperor's instance compiled the history of the period from 813 to 886. A little work, interesting from the point of view of historical and ethnographical science, is the account of the taking of Thessalonica by the Cretan Corsairs (A.D. 904), which a priest, Johannes Cameniata, an eyewitness of the event, has bequeathed to posterity. There is also contained in the excellent work of Leo Diaconus (on the period from 959 to 975) a graphic account of the bloody wars of the Byzantines with the Arabs in Crete and with the Bulgarians. A continuation was undertaken by the philosopher Michael Psellus in a work covering the period from 976 to 1077. A valuable supplement to the latter (describing the period from 1034 to 1079) was supplied by the jurist Michael Attaliata. The history of the Eastern empire during the Crusades was written in four considerable works, by Nicephorus Bryennius, his learned consort Anna Comnena, the "honest Aetolian," Johannes Cinnamus, and finally by Nicetas Acominatus in an exhaustive work which is authoritative for the history of the 4th Crusade. The melancholy conditions and the ever increasing decay of the empire under the Palaeologi (13th–15th centuries) are described in the same dry style, though with a still closer following of classical models. The events which took place between the taking of Constantinople by the Latins and the restoration of Byzantine rule (1203–1261) are recounted by Georgius Acropolita, who emphasizes his own share in them. The succeeding period was written by the versatile Georgius Pachymeres, the erudite and high-principled Nicephorus Gregoras, and the emperor John VI. Cantacuzenus. Lastly, the death-struggle between the East Roman empire and the mighty rising power of the Ottomans was narrated by three historians, all differing in culture and in style, Laonicus Chalcocondyles, Ducas and Georgius Phrantzes. With them may be classed a fourth (though he lived outside the Byzantine period), Critobulus, a high-born Greek of Imbros, who wrote, in the style of the age of Pericles, the history of the times of the sultan Mahommed II. (down to 1467).

Chronicles.

The essential importance of the Byzantine chronicles (mostly in the fact that they in part replace older lost works, and thus fill up many gaps in our historical survey (*e.g.* for the period from about 600 to 800 of which very few records remain). They lay no claim to literary merit, but are often serviceable for the history of language. Many such chronicles were furnished with illustrations. The remains of one such illustrated chronicle on papyrus, dating from the beginning of the 5th century, has been preserved for us by the soil of Egypt.[1] The authors of the chronicles were mostly monks, who wished to compile handbooks of universal history for their brethren and for pious laymen; and this explains the strong clerical and popular tendency of these works. And it is due to these two qualities that the chronicles obtained a circulation abroad, both in the West and also among the peoples Christianized from Byzantium, *e.g.* the Slavs, and in all of them sowed the seeds of an indigenous historical literature. Thus the chronicles, despite the jejuneness of their style and their uncritical treatment of material were for the general culture of the middle ages of far greater importance than the erudite contemporary histories designed only for the highly educated circles in Byzantium. The oldest Byzantine chronicle of universal history preserved to us is that of Malalas (6th century), which is also the purest type of this class of literature. In the 7th century was completed the famous *Easter* or *Paschal Chronicle* (*Chronicon Paschale*). About the end of the 8th or the beginning of the 9th century Georgius Syncellus compiled a concise chronicle, which began with the Creation and was continued down to the year 284. At the request of the author, when on his death-bed, the continuation of this work was undertaken by Theophanes Confessor, who brought down the account from A.D. 284 to his own times (A.D. 813). This exceedingly valuable work of Theophanes was again continued (from 813–961) by several anonymous chroniclers. A contemporary of Theophanes, the patriarch Nicephorus, wrote, in addition to a *Short History* of the period from 602 to 769, a chronological sketch from Adam down to the year of his own death in 829. Of great influence on the age that followed was Georgius Monachus, only second in importance as chronicler of the early Byzantine period, who compiled a chronicle of the world's history (from Adam until the year 843, the end of the Iconoclast movement), far more theological and monkish in character than the work of Theophanes. Among later chroniclers Johannes Scylitza stands out conspicuously. His work (covering the period from 811 to 1057), as regards the range of its subject-matter, is something between a universal and a contemporary history. Georgius Cedrenus (*c.* 1100) embodied the whole of Scylitza's work, almost unaltered, in his *Universal Chronicle*. In the 12th century the general increase in literary production was evident also in the department of chronicles of the world. From this period dates, for instance, the most distinguished and learned work of this class, the great universal chronicle of John Zonaras. In the same century Michael Glycas compiled his chronicle of the world's history, a work written in the old popular style and designed for the widest circles of readers. Lastly, in the 12th century, Constantine Manasses wrote a universal chronicle in the so-called "political" verse. With this verse-chronicle must be classed the imperial chronicle of Ephraem, written in Byzantine trimeters at the beginning of the 14th century.

Geography.

Geography and topography, subjects so closely connected with history, were as much neglected by the Byzantines as by their political forerunners, the Romans. Of purely practical importance are a few handbooks of navigation, itineraries, guides for pilgrims, and catalogues of provinces and cities, metropolitan sees and bishoprics. The geographical work of Stephanus of Byzantium, which dates from Justinian's time, has been lost. To the same period belongs the only large geographical work which has been preserved to us, the *Christian Topography* of Cosmas Indicopleustes. For the topography of Constantinople a work entitled *Ancient History* (*Patria*) *of Constantinople*, which may be compared to the mediæval *Arabilia urbis Romae*, and in late manuscripts has been wrongly attributed to a certain Codinus, is of great importance.

Philosophy.

Ancient Greek philosophy under the empire sent forth two new shoots—Neopythagoreanism and Neoplatonism. It was the latter with which moribund paganism essayed to stem the advancing tide of Christianity. The last great exponent of this philosophy was Proclus in Athens (d. 485). The dissolution, by order of Justinian, of the school of philosophy at Athens in 529 was a fatal blow to this nebulous system, which had long since outlived the conditions that made it a living force. In the succeeding period philosophical activity was of two main kinds; on the one hand, the old philosophy, *e.g.* that of Aristotle, was employed to systematize Christian

[1] See Ad. Bauer and J. Strzygowski, "Eine alexandrinische Weltchronik" (1905) (*Denkschrift der kaiserlich. Akademie der Wissenschaften*, li.).

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doctrine, while, on the other, the old works were furnished with copious commentaries and paraphrases. Leontius of Byzantium had already introduced Aristotelian definitions into Christology; but the real founder of medieval ecclesiastical philosophy was John of Damascus. Owing, however, to his having early attained to canonical authority, the independent progress of ecclesiastical philosophy was arrested; and to this it is due that in this respect the later Byzantine period is far poorer than is the West. Byzantium cannot boast a scholastic like Thomas Aquinas. In the 11th century philosophical studies experienced a satisfactory revival, mainly owing to Michael Psellus, who brought Plato as well as Aristotle again into fashion.

Rhetoric.

Ancient rhetoric was cultivated in the Byzantine period with greater ardour than scientific philosophy, being regarded as an indispensable aid to instruction. It would be difficult to imagine anything more tedious than the numerous theoretical writings on the subject and the examples of their practical application: mechanical school essays, which here count as "literature," and innumerable letters, the contents of which are wholly insignificant. The evil effects of this were felt beyond the proper sphere of rhetoric. The anxious attention paid to the laws of rhetoric and the unrestricted use of its withered flowers were detrimental to a great part of the rest of Byzantine literature, and greatly hampered the development of any individuality and simplicity of style. None the less, among the rhetorical productions of the time are to be found a few interesting pieces, such as the *Philopatris*, in the style of Lucian, which gives us a remarkable picture of the times of Nicephorus Phocas (10th century). In two other smaller works a journey to the dwellings of the dead is described, after the pattern of Lucian's *Nekyomanteia*, viz. in *Timarion* (12th century) and in Mazaris' *Journey to the Underworld* (*c.* 1414). A very charming representative of Byzantine rhetoric is Michael Acominatus, who, in addition to theological works, wrote numerous occasional speeches, letters and poems.

The sciences.

In the field of scientific production, which can be accounted literature in the modern acceptation of the term only in a limited sense, Byzantium was dominated to an extravagant and even grotesque extent by the rules of what in modern times is termed "classical scholarship." The numerous works which belong to this category, such as grammars, dictionaries, commentaries on ancient authors, extracts from ancient literature, and metrical and musical treatises, are of little general interest, although of great value for special branches of philological study, *e.g.* for tracing the influences through which the ancient works handed down to us have passed, as well as for their interpretation and emendation; for information about ancient authors now lost; for the history of education; and for the underlying principles of intellectual life in Byzantium. The most important monument of Byzantine philology is, perhaps, the *Library* of the patriarch Photius. The period from about 650 to 850 is marked by a general decay of culture. Photius, who in the year 850 was about thirty years of age, now set himself with admirable energy to the task of making ancient literature, now for the most part dead and forgotten, known once more to his contemporaries, thus contributing to its preservation. He gave an account of all that he read, and in this way composed 280 essays, which were collected in what is commonly known as the *Library* or *Myriobiblon*. The character of the individual sketches is somewhat mechanical and formal; a more or less complete account of the contents is followed by critical discussion, which is nearly always confined to the linguistic form. With this work may be compared in importance the great *Lexikon* of Suidas, which appeared about a century later, a sort of encyclopaedia, of which the main feature was its articles on the history of literature. A truly sympathetic figure is Eustathius, the famous archbishop of Thessalonica (12th century). His voluminous commentaries on Homer, however, rivet the attention less than his enthusiastic devotion to science, his energetic action on behalf of the preservation of the literary works of antiquity, and last, not least, his frank and heroic character, which had nothing in it of the Byzantine. If, on the other hand, acquaintance with a caricature of Byzantine philology be desired, it is afforded by Johannes Tzetzes, a contemporary of Eustathius, a Greek in neither name nor spirit, narrow-minded, angular, superficial, and withal immeasurably conceited and ridiculously coarse in his polemics. The transition to Western humanism was effected by the philologists of the period of the Palaeologi, such as Maximus Planudes, whose translations of numerous works renewed the long-broken ties between Byzantium and the West; Manuel Moschopulus, whose grammatical works and commentaries were, down to the 16th century, used as school text-books; Demetrius Triclinius, distinguished as a textual critic; the versatile Theodorus Metochites, and others.

Jurisprudence.

Originally, as is well known, Latin was the exclusive language of Roman law. But with Justinian, who codified the laws in his *Corpus juris*, the Hellenizing of the legal language also began. The *Institutes* and the *Digest* were translated into Greek, and the *Novels* also were issued in a Greek form. Under the Macedonian dynasty there began, after a long stagnation, the resuscitation of the code of Justinian. The emperor Basilius I. (867–886) had extracts made from the existing law, and made preparations for the codifying of all laws. But the whole work was not completed till the time of Leo VI. the Wise (886–912), and Constantine VII. Porphyrogenitus (912–950), when it took the form of a grand compilation from the *Digests*, the *Codex*, and the *Novels*, and is commonly known as the *Basilica* (Τὰ βασιλικά). In the East it completely superseded the old Latin *Corpus juris* of Justinian. More that was new was produced, during the Byzantine period, in canon law than in secular legislation. The purely ecclesiastical rules of law, the *Canones*, were blended with those of civil law, and thus arose the so-called *Nomocanon*, the most important edition of which is that of Theodorus Bestes in 1090. The alphabetical handbook of canon law written by Matthaeus Blastares about the year 1335 also exercised a great influence.

Mathematics and astronomy.

In the province of mathematics and astronomy the remarkable fact must be recorded that the revival among the Greeks of these long-forgotten studies was primarily due to Perso-Arabian influence. The *Great Syntaxis* of Ptolemy operated in the oriental guise of the *Almagest*. The most important direct source of this intellectual loan was not Arabia, however, but Persia. Towards the close of the 13th century the Greeks became acquainted with Persian astronomy. At the beginning of the 14th century Georgius Chrysococca and Isaac Argyrus wrote astronomical treatises based on Persian works. Then the Byzantines themselves, notably Theodorus Metochites and Nicephorus Gregoras, at last had recourse to the original Greek sources.

Military science.

The Byzantines did much independent work in the field of military science. The most valuable work of the period on this subject is one on tactics, which has come down to posterity associated with the name of Leo VI., the Wise.

Profane poetry.

Of profane poetry—in complete contrast to sacred poetry—the general characteristic was its close imitation of the antique in point of form. All works belonging to this category reproduce the ancient style and are framed after ancient models. The metre is, for the most part, either the Byzantine regular twelve-syllable trimeter, or the "political" verse; more rarely the heroic and Anacreontic measures.

Epic.

Epic popular poetry, in the ancient sense, begins only with the vernacular Greek literature (see below); but among the literary works of the period there are several which can be compared with the epics of the Alexandrine age. Nonnus (*c.* 400) wrote, while yet a pagan, a fantastic epic on the triumphal progress of the god Dionysus to India, and, as a Christian, a voluminous commentary on the gospel of St John. In the 7th century, Georgius Pisides sang in several lengthy iambic poems the martial deeds of the emperor Heraclius, while the deacon Theodosius (10th century) immortalized in extravagant language the victories of the brave Nicephorus Phocas.

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From the 11th century onwards, religious, grammatical, astrological, medical, historical and allegorical poems, framed partly in duodecasyllables and partly in "political" verse, made their appearance in large quantities. Didactic religious poems were composed, for example, by Philippus (ὁ Μονόγραστος, Solitarius, *c.* 1100), grammatico-philological poems by Johannes Tzetzes, astrological by Johannes Camaterus (12th century), others on natural science by Manuel Philes (14th century) and a great moral, allegorical, didactic epic by Georgius Lapithes (14th century).

Didactic poems.

To these may be added some voluminous poems, which in style and matter must be regarded as imitations of the ancient Greek romances. They all date from the 12th century, a fact evidently connected with the general revival of culture which characterizes the period of the Comneni. Two of these romances are written in the duodecasyllable metre, viz. the story of Rodanthe and Dosicles by Theodorus Prodromus, and an imitation of this work, the story of Drusilla and Charicles by Nicetas Eugenianus; one in "political" verse, the love story of Aristander and Callithea by Constantine Manasses, which has only been preserved in fragments, and lastly one in prose, the story of Hysmine and Hysminias, by Eustathius (or Eumathius) Macrembolita, which is the most insipid of all.

Romances.

The objective point of view which dominated the whole Byzantine period was fatal to the development of a profane lyrical poetry. At most a few poems by Johannes Geometres and Christophorus of Mytilene and others, in which personal experiences are recorded with some show of taste, may be placed in this category. The dominant form for all subjective poetry was the epigram, which was employed in all its variations from playful trifles to long elegiac and narrative poems. Georgius Pisides (7th century) treated the most diverse themes. In the 9th century Theodorus of Studium had lighted upon the happy idea of immortalizing monastic life in a series of epigrams. The same century produced the only poetess of the Byzantine period, Casia, from whom we have several epigrammatic productions and church hymns, all characterized by originality. Epigrammatic poetry reached its highest development in the 10th and 11th centuries, in the productions of Johannes Geometres, Christophorus of Mytilene and John Mauropus. Less happy are Theodorus Prodromus (12th century) and Manuel Philes (14th century). From the beginning of the 10th century also dates the most valuable collection of ancient and of Byzantine epigrammatic poems, the *Anthologia Palatina* (see ANTHOLOGY).

Lyrics.

The epigram.

Dramatic poetry, in the strict sense of the term, was as completely lacking among the Byzantine Greeks as was the condition precedent to its existence, namely, public performance. Apart from some moralizing allegorical dialogues (by Theodorus Prodromus, Manuel Philes and others), we possess only a single work of the Byzantine period that, at least in external form, resembles a drama: the *Sufferings of Christ* (Χριστὸς Πάσχων). This work, written probably in the 12th century, or at all events not earlier, is a cento, *i.e.* is in great measure composed of verses culled from ancient writers, *e.g.* Aeschylus, Euripides and Lycophron; but it was certainly not written with a view to the dramatic production.

Drama.

The vernacular literature stands alone, both in form and in contents. We have here remarkable originality of conception and probably also entirely new and genuinely medieval matter. While in the artificial literature prose is pre-eminent, in the vernacular literature, poetry, both in quantity and quality, takes the first place, as was also the case among the Latin nations, where the vulgar tongue first invaded the field of poetry and only later that of prose. Though a few preliminary attempts were made (proverbs, acclamations addressed by the people to the emperor, &c.), the Greek vernacular was employed for larger works only from the 12th century onwards; at first in poems, of which the major portion were cast in "political" verse, but some in the trochaic eight-syllabled line. Towards the close of the 15th century rhyme came into use. The subjects treated in this vernacular poetry are exceedingly diverse. In the capital city a mixture of the learned and the popular language was first used in poems of admonition, praise and supplication. In this oldest class of "vulgar" works must be reckoned the *Spaneas*, an admonitory poem in imitation of the letter of Pseudo-Isocrates addressed to Demonicus; a supplicatory poem composed in prison by the chronicler Michael Glycas, and several begging poems of Theodorus Prodromus (Ptochoprodromos). In the succeeding period erotic poems are met with, such as the Rhodian love songs preserved in a MS. in the British Museum (ed. W. Wagner, Leipzig, 1870), fairy-tale like romances such as the *Story of Ptocholeon*, oracles, prayers, extracts from Holy Writ, lives of saints, &c. Great epic poems, in which antique subjects are treated, such as the legends of Troy and of Alexander, form a separate group. To these may be added romances in verse after the manner of the works written in the artificial classical language, *e.g. Callimachus and Chrysorrhoë*, *Belthandrus and Chrysantza*, *Lybistrus and Rhodamne*, also romances in verse after the Western pattern, such as *Phlorius* and *Platziaphlora* (the old French story of *Flore et Blanchefleur*). Curious are also sundry legends connected with animals and plants, such as an adaptation of the famous medieval animal fables of the *Physiologus*, a history of quadrupeds, and a book of birds, both written with a satirical intention, and, lastly, a rendering of the story of Reynard the Fox. Of quite peculiar originality also are several legendary and historical poems, in which famous heroes and historical events are celebrated. There are, for instance, poems on the fall of Constantinople, the taking of Athens and Trebizond, the devastating campaign of Timur, the plague in Rhodes in 1498, &c. In respect of importance and antiquity the great heroic epic of Digenis Akritas stands pre-eminent.

Vernacular Greek literature.

Among prose works written in the vulgar tongue, or at least in a compromise with it, may be mentioned the Greek rendering of two works from an Indian source, the *Book of the Seven Wise Masters* (as *Syntipas the Philosopher* by Michael Andreopulus), and the *Hitopadera* or *Mirror of Princes* (through the Arabic *Kalilah and Dimnah* by Simeon Sethus as Στεφανίτης καὶ Ἰχνηλάτης), a fish book, a fruit book (both skits on the Byzantine court and official circles). To these must be added the Greek laws of Jerusalem and of Cyprus of the 12th and 13th centuries, chronicles, &c. In spite of many individual successes, the literature written in the vulgar tongue succumbed, in the race for existence, to its elder sister, the literature written in classical and polished Greek. This was mainly due to the continuous employment of the ancient language in the state, the schools and the church.

"Vulgar" prose works.

The importance of Byzantine culture and literature in the history of the world is beyond dispute. The Christians of the East Roman empire guarded for more than a thousand years the intellectual heritage of antiquity against the violent onslaught of the barbarians. They also called into life a peculiar medieval culture and literature. They communicated the treasures of the old pagan as well as of their own Christian literature to neighbouring nations; first of all to the Syrians, then to the Copts, Armenians, Georgians; later, to the Arabians, the Bulgarians, the Serbs and the Russians. Through their teaching they created a new East European culture, embodied above all in the Russian empire, which, on its religious side, is included in the Orthodox Eastern Church, and from the point of view of nationality touches the two extremes of Greek and Slav. Finally the learned men of the dying Byzantine empire, fleeing from the barbarism of the Turks, transplanted the treasures of old Hellenic wisdom to the West, and thereby fertilized the Western peoples with rich germs of culture.

General significance of Byzantine literature.

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4. Historical literature: A collective edition of the Byzantine historians and chroniclers was begun under Louis XIV., and continued later (1648-1819), called the *Paris Corpus*. This whole collection was on B. G. Nicbuhr's advice republished with some additions (Bonn, 1828-1878), under the title *Corpus scriptorum historiae Byzantinae*. The most important authors have also appeared in the *Bibliotheca Teubneriana*. A few Byzantine and oriental historical works are also contained in the collection edited by J. B. Bury (1898 seq.).

5. Vernacular Greek literature: The most important collective editions are: W. Wagner, *Medieval Greek Texts* (1870), *Carmina Graeca Medii Aevi* (1874), *Trois Poèmes grecs du moyen âge* (1881); E. Legrand, *Collection de monuments pour servir à l'étude de la langue néo-hellenique* (in 26 parts, 1869-1875), *Bibliothèque grecque vulgaire* (in 8 vols., 1880-1896). (K. KR.)

III. MODERN GREEK LITERATURE (1453-1908)

After the capture of Constantinople, the destruction of Greek national life and the almost total effacement of Greek civilization naturally involved a more or less complete cessation of Greek literary production in the regions subjected to the rule of a barbarous conqueror. Learned Greeks found a refuge away from their native land; they spoke the languages of foreign people, and when they wrote books they often used those languages, but in most cases they also wrote in Greek. The fall of Constantinople must not therefore be taken as indicating a break in the continuity of Greek literary history. Nor had that event so decisive an influence as has been supposed on the revival of learning in western Europe. The crusades had already brought the Greeks and Westerns together, and the rule of the Franks at Constantinople and in the Levant had rendered the contact closer. Greeks and Latins had keenly discussed the dogmas which divided the Eastern and Western Churches; some Greeks had adopted the Latin faith or had endeavoured to reconcile the two communions, some had attained preferment in the Roman Church. Many had become connected by marriage or other ties with the Italian nobles who ruled in the Aegean or the Heptanesos, and circumstances led them to settle in Italy. Of the writers who thus found their way to the West before the taking of Constantinople the most prominent were Leon or Leontios Pilatos, Georgius Gemistus, or Pletho, Manuel and John Chrysoloras, Theodore Gazes, George of Trebizond and Cardinal Bessarion.

The Ottoman conquest had reduced the Christian races in the plains to a condition of serfdom, but the spirit of liberty continued to breathe in the mountains, where groups of desperate men, the Klephts and the Haiduks, maintained the struggle against alien tyranny. The adventurous and romantic life of these champions of freedom, spent amid the noblest solitudes of nature and often tinged with the deepest tragedy, naturally produced a poetry of its own, fresh, spontaneous and entirely indigenous. The Klephtic ballads, all anonymous and composed in the language of the people, are unquestionably the best and most genuine Greek poetry of this epoch. They breathe the aroma of the forests and mountains; like the early rhapsodies of antiquity, which peopled nature with a thousand forms, they lend a voice to the trees, the rocks, the rivers and to the mountains themselves, which sing the prowess of the Klepht, bewail his death and comfort his disconsolate wife or mother. Olympia boasts to Ossa that the footstep of the Turk has never desecrated its valleys; the standard of freedom floats over its springs; there is a Klepht beneath every tree of its forests; an eagle sits on its summit with the head of a warrior in its talons. The dying Klepht bids his companions make him a large and lofty tomb that he may stand therein and load his musket: "Make a window in the side that the swallows may tell me that spring has come, that the nightingales may sing me the approach of flowery May." The wounded Vervos is addressed by his horse: "Rise, my master, let us go and find our comrades." "My bay horse, I cannot rise; I am dying: dig me a tomb with thy silver-shod hoof; take me in thy teeth and lay me therein. Bear my arms to my companions and this handkerchief to my beloved, that she may see it and lament me." Another type of the popular poetry is presented by the folk-songs of the Aegean islanders and the maritime population of the Asiatic coast. In many of the former the influence of the Frankish conquest is apparent. Traces of the ancient mythology are often to be found in the popular songs. Death is commonly personified by Charon, who struggles with his victim; Charon is sometimes worsted, but as a rule he triumphs in the conflict.

The Klephtic poetry.

In Crete, which for nearly two centuries after the fall of Constantinople remained under Venetian rule, a school of Greek poetry arose strongly impressed with Italian influences. The language employed is the dialect of the Candiotes, with its large admixture of Venetian words. The first product of this somewhat hybrid literature was *Erotocritos*, an epic poem in five cantos, which relates the love story of Areta, daughter of Hercules, king of Athens, and Erotocritos, the son of his minister. The poem presents an interesting picture of Greece under the feudal Frankish princes, though professing to describe an episode of the classical epoch; notwithstanding some tedious passages, it possesses considerable merit and contains some charming scenes. The metre is the rhymed alexandrine. Of the author, Vicence Cornaro, who lived in the middle or end of the 16th century, little is known; he probably belonged to the ducal family of that name, from which Tasso was descended. The second poem is the *Erophile* of George Chortakis, a Cretan, also written in the Candiote dialect. It is a tragic drama, the scene of which is laid in Egypt. The dialogue is poor, but there are some fine choral interludes, which perhaps are by a different hand. Chortakis, who was brought up at Retimo, lived at the end of the 16th and beginning of the 17th centuries. The third Cretan poem worthy of notice is the *Shepherdess*, a charming and graceful idyll written by Nicolas Drimyticos, a native of Apokorona, early in the 17th century. Other Cretan poets were J. Gregoropoulos and G. Melissinos (1500), who wrote epigrams, and Maroulos (1493), who endeavoured to write Pindaric odes.

Cretan poets.

Among the Greeks who were prominent in spreading a knowledge of Greek in Europe after the fall of Constantinople were John Argyropulos, Demetrius Chalcondyles, Constantine and John Lascaris and Marcus Musurus, a Cretan. These men wrote in the accepted literary language; in general, however, they were rather employed about literature than engaged in producing it. They taught Greek; several of them wrote Greek grammars; they transcribed and edited Greek classical writers, and they collected manuscripts. Their stores enriched the newly founded libraries of St Mark at Venice, of the Escorial, of the Vatican and of the National Library in Paris. But none of them accomplished much in literature strictly so called. The question which most deeply interested them was that of the rival merits of the Platonic and Aristotelian philosophies, over which a controversy of extraordinary bitterness broke out towards the close of the 15th century. The dispute was in reality theological rather than philosophical; the cause of Plato was championed by the advocates of a union between the Eastern and Western Churches, that of Aristotle was upheld by the opposing party, and all the fury of the old Byzantine dogmatic controversies was revived. The patriarch, George Kurtesios or Gennadius, whom Mahommed II. had appointed after the capture of

Literary activity after the fall of Constantinople.

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Constantinople, wrote a treatise in favour of Aristotle and ex-communicated Gemistus Pletho, the principal writer among the Platonists. On the other hand, George of Trebizond, who attacked Pletho with unmeasured virulence, was compelled to resign his post of secretary to Pope Nicholas V. and was imprisoned by Pope Paul I. Scholarship was not wholly extinct in Greece or among the Greeks for a considerable time after the Turkish conquest. Arsenius, who succeeded Musurus as bishop of Monemvasia (1510), wrote commentaries on Aristophanes and Euripides; his father, Apostoles, made a collection of Greek proverbs. Aemilius Portos, a Cretan, and Leo Allatios (1600–1650) of Chios edited a number of works of the classical and later periods with commentaries and translations; Allatios also wrote Greek verses showing skill and cleverness. Constantine Rhodokanakes, physician to Charles II. of England, wrote verses on the return of that monarch to England. About the time of the fall of Constantinople we meet with some versifiers who wrote poems in the spoken dialect on historical subjects; among these were Papaspondylos Zotikos (1444), Georgilas Limenitis (1450–1500) and Jacobos Trivoles (beginning of the 16th century); their poems have little merit, but are interesting as specimens of the popular language of the day and as illustrating the manners and ideas of contemporary Greeks.

Among the prose writers of the 16th century were a number of chroniclers. At the end of the 15th, Kritobulos of Imbros, who had been private secretary of Muhommed II., wrote the history of his master, Emmanuel Melaxos a history of the patriarchate, and Phranzes a history of the Palaeologi. Theodosius Zygomalas (1580) wrote a history of Constantinople from 1301 to 1578. In the 17th century Demetrius Cantemir, a Moldavian by birth, wrote a history of the Ottoman empire, and G. Kontares tales of ancient Athens. Others composed chronicles of Cyprus and Crete, narratives of travels and biographies of saints. Most of these works are written in the literary language, the study of which was kept alive by the patriarchate and the schools which it maintained at Constantinople and elsewhere. Various theological and philosophical works, grammars and dictionaries were written during this period, but elegant literature practically disappears.[1]

Historical works.

A literary revival followed in the 18th century, the precursor of the national uprising which resulted in the independence of Greece. The efforts of the great Phanariote families at Constantinople, the educational zeal of the higher Greek clergy and the munificence of wealthy Greeks in the provinces, chiefly merchants who had acquired fortunes by commerce, combined to promote the spread of education among a people always eager for instruction. The Turks, indifferent to educational matters, failed to discern the significance of the movement. Schools were established in every important Greek town, and school-books and translations from Western languages issued from the presses of Venice, Triest, Vienna and other cities where the Greeks possessed colonies. Young men completed their studies in the Western universities and returned to the East as the missionaries of modern civilization. For the greater part of the 18th century the literature was mainly theological. Notable theological writers of this epoch were Elias Miniates, an elegant preacher, whose sermons are written in the popular language, and Meletios of Iannina, metropolitan of Athens, whose principal works were an ecclesiastical history, written in ancient Greek, and a descriptive geography of Greece in the modern language, composed, like the work of Pausanias, after a series of tours. The works of two distinguished prelates, both natives of Corfu and both ardent partisans of Russia, Nikephoros Theotokes (1731?–1800) and Eugenios Bulgares (1715–1806), mark the beginning of the national and literary renaissance. They wrote much in defence of Greek orthodoxy against Latin heresy. Theotokes, famous as a preacher, wrote, besides theological and controversial works, treatises on mathematics, geography and physics. Bulgares was a most prolific author; he wrote numerous translations and works on theology, archaeology, philosophy, mathematics, physics and astronomy; he translated the *Aeneid* and *Georgics* of Virgil into Homeric verse at the request of Catherine II. His writings exercised a considerable influence over his contemporaries.

The literary revival.

The poets of the earlier period of the Greek revival were Constantinos Rhigas (*q.v.*), the Alcman of the revolutionary movement, whose songs fired the spirit of his fellow-countrymen; Christopoulos (1772–1847), a Phanariote, who wrote some charming Anacreontics, and Jacobos Rizos Neroulos (1778–1850), also a Phanariote, author of tragedies, comedies and lyrics, and of a work in French on modern Greek literature. They are followed in the epoch of Greek independence by the brothers Panagiotes and Alexander Soutzos (1800–1868 and 1803–1863) and Alexander Rhizos Rhangabès (Rhankaves, 1810–1892), all three Phanariotes. Both Soutzos had a rich command of musical language, were highly ideal in their conceptions, strongly patriotic and possessed an ardent love of liberty. Both imitated to some extent Byron, Lamartine and Béranger; they tried various forms of poetry, but the genius of Panagiotes was essentially lyrical, that of Alexander satirical. The other great poet of the Greek revival, Alexander Rizos Rhangabé, was a writer with a fine poetic feeling, exquisite diction and singular beauty and purity of thought and sentiment. Besides numerous odes, hymns, ballads, narrative poems, tragedies and comedies, he wrote several prose works, including a history of ancient Greece, a history of modern Greek literature, several novels and works on ancient art and archaeology. Among the numerous dramatic works of this time may be mentioned the Μαρία Δοξαταρῆ of Demetrios Bernardakes, a Cretan, the scene of which is laid in the Morea at the time of the crusades.

Poets of the Greek revival.

In prose composition, as in poetry, the national revival was marked by an abundant output. Among the historians the greatest is Spiridon Trikoupis, whose *History of the Revolution* is a monumental work. It is distinguished by beauty of style, clearness of exposition and an impartiality which is all the more remarkable as the author played a leading part in the events which he narrates. Almost all the chiefs of the revolutionary movement left their memoirs, even Kolokotrones, who was illiterate, dictated his recollections. John Philemon, of Constantinople, wrote a history of the revolution in six volumes. He was an ardent partisan of Russia, and as such was opposed to Trikoupis, who was attached to the English party. K. Paparrhegopoulos's *History of the Greek Nation* is especially valuable in regard to the later periods; in regard to the earlier he largely follows Gibbon and Grote. With him may be mentioned Moustoxides of Corfu, who wrote on Greek history and literature; Sakellarios, who dealt with the topography and history of Cyprus; N. Dragoumes, whose historical memoirs treat of the period which followed the revolution; K. Assopios, who wrote on Greek literature and history. In theology Oeconomos fills the place occupied by Miniates in the 17th century as a great preacher. Kontogones is well known by his *History of Patristic Literature of the First Three Centuries* and his *Ecclesiastical History*, and Philotheos Bryennios, bishop of Serres, by his elaborate edition of *Clemens Romanus*. Kastorches wrote well on Latin literature. Great literary activity in the domains of law, political economy, mathematics, the physical sciences and archaeology displayed itself in the generation after the establishment of the Greek kingdom.

Prose writers of the revival.

But the writer who at the time of the national revival not only exercised the greatest influence over his contemporaries but even to a large extent shaped the future course of Greek literature was Adamantios Coraës (Korais) of Chios. This remarkable man, who devoted his life to philological studies, was at the same time an ardent patriot, and in the prolegomena to his numerous editions of the classical

Coraës.

[1] The patriarch Cyrillos Lucares (1572–1638), who had studied for a time in England and whose sympathies with Protestantism made him many enemies, established a Greek printing-press at Constantinople, from which he had the temerity to issue a work condemning the faith of Mahomet; he was denounced to the Turks by the Jesuits, and his printing-press was suppressed.

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writers, written in Greek or French, he strove to awake the interest of his countrymen in the past glories of their race or administered to them sage counsels, at the same time addressing ardent appeals to civilized Europe on their behalf. The great importance of Coraës, however, lies in the fact that he was practically the founder of the modern literary language.

The modern literary language.

In contemporary Greek literature two distinct forms of the modern language present themselves—the vernacular (ἡ καθομιλουμένη) and the purified (ἡ καθαρεύουσα). The former is the oral language, spoken by the whole Greek world, with local dialectic variations; the latter is based on the Greek of the Hellenistic writers, modified, but not essentially altered, in successive ages by the popular speech. At the time of the War of Independence the enthusiasm of the Greeks and the Philhellenes was fired by the memory of an illustrious past, and at its close a classical reaction followed: the ancient nomenclature was introduced in every department of the new state, towns and districts received their former names, and children were christened after Greek heroes and philosophers instead of the Christian saints. In the literary revival which attended the national movement, two schools of writers made their appearance—the purists, who, rejecting the spoken idiom as degenerate and corrupt, aimed at the restoration of the classical language, and the vulgarists, who regarded the vernacular or "Romaic" as the genuine and legitimate representative of the ancient tongue. A controversy which had existed in former times was thus revived, with the result that a state of confusion still prevails in the national literature. The classical scholar who is as yet unacquainted with modern Greek will find, in the pages of an ordinary periodical or newspaper, specimens of the conventional literary language which he can read with ease side by side with poems or even prose in the vernacular which he will be altogether unable to interpret.

Reforms of Coraës.

The vernacular or oral language is never taught, but is universally spoken. It has been evolved from the ancient language by a natural and regular process, similar to that which has produced the Romance languages from the Latin, or the Russian, Bulgarian and Servian from the old Slavonic. It has developed on parallel lines with the modern European languages, and in obedience to the same laws; like them, it might have grown into a literary language had any great writers arisen in the middle ages to do for it what Dante and his successors of the *trecento* did for Italian. But the effort to adapt it to the requirements of modern literature could hardly prove successful. In the first place, the national sentiment of the Greeks prompts them to imitate the classical writers, and so far as possible to appropriate their diction. The beauty and dignity of the ancient tongue possesses such an attraction for cultivated writers that they are led insensibly to adopt its forms and borrow from its wealth of phrase and idiom. In the next place, a certain literary tradition and usage has already been formed which cannot easily be broken down. For more than half a century the generally accepted written language, half modern half ancient, has been in use in the schools, the university, the parliament, the state departments and the pulpit, and its influence upon the speech of the more educated classes is already noticeable. It largely owes its present form—though a fixed standard is still lacking—to the influence and teaching of Coraës. As in the time of the decadence a κοινὴ διάλεκτος stood midway between the classical language and the popular speech, so at the beginning of the 19th century there existed a common literary dialect, largely influenced by the vernacular, but retaining the characteristics of the old Hellenistic, from which it was derived by an unbroken literary tradition. This written language Coraës took as the basis of his reforms, purging it of foreign elements, preserving its classical remnants and enlarging its vocabulary with words borrowed from the ancient lexicon or, in case of need, invented in accordance with a fixed principle. He thus adopted a middle course, discountenancing alike the pedantry of the purists and the over-confident optimism of the vulgarists, who found in the uncouth popular speech all the material for a *langue savante*. The language which he thus endeavoured to shape and reconstruct is, of course, conventional and artificial. In course of time it will probably tend to approach the vernacular, while the latter will gradually be modified by the spread of education. The spoken and written languages, however, will always be separated by a wide interval.

Poetical writers in the vernacular.

Many of the best poets of modern Greece have written in the vernacular, which is best adapted for the natural and spontaneous expression of the feelings. Dionysios Solomos (1798–1857), the greatest of them all, employed the dialect of the Ionian Islands. Of his lyrics, which are full of poetic fire and inspiration, the most celebrated is his "Ode to Liberty." Other poets, of what may be described as the Ionic school, such as Andreas Kalvos (1796–1869), Julius Typaldos (1814–1883), John Zampelios (1787–1856), and Gerasimos Markoras (b. 1826), followed his example in using the Heptanesian dialect. On the other hand, Georgios Tertsetes (1806–1874), Aristotle Valaorites (1824–1879) and Gerasimos Mavrogiannes, though natives of the Ionian Islands, adopted in their lyrics the language of the Klephtic ballads—in other words, the vernacular of the Pindus range and the mountainous district of Epirus. This dialect had at least the advantage of being generally current throughout the mainland, while it derived distinction from the heroic exploits of the champions of Greek liberty. The poems of Valaorites, which are characterized by vivid imagination and grace of style, have made a deep impression on the nation. Other poets who largely employed the Epirotic dialect and drew their inspiration from the Klephtic songs were John Vilaras (1771–1823), George Zalokostas (1805–1857) in his lyric pieces, and Theodore Aphentoules, a Cretan (d. 1893). With the poems of this group may be classed those of Demetrius Bikelas (b. 1835). The popular language has been generally adopted by the younger generation of poets, among whom may be mentioned Aristomenes Probelegios (b. 1850), George Bizyenos (1853–1896), George Drosines, Kostes Palamas (b. 1859), John Polémes, Argyres Ephthaliotes, and Jacob Polylas (d. 1896).

Poetical writers in the conventional language.

Contemporary with the first-mentioned or Ionic group, there existed at Constantinople a school of poets who wrote in the accepted literary language, and whose writings serve as models for the later group which gathered at Athens after the emancipation of Greece. The literary traditions founded by Alexander Rizos Rhangabès (1810–1892) and the brothers Alexander and Panagiotis Soutzos (1803–1863 and 1800–1868), who belonged to Phanariot families, were maintained in Athens by Spiridion Basiliades (1843–1874) Angelos Vlachos (b. 1838), John Karasoutzas (1824–1873), Demetrios Paparrhegopoulos (1843–1873), and Achilles Paraschos (b. 1838). The last, a poet of fine feeling, has also employed the popular language. In general the practice of versification in the conventional literary language has declined, though sedulously encouraged by the university of Athens, and fostered by annual poetic competitions with prizes provided by patriotic citizens. Greek lyric poetry during the first half of the century was mainly inspired by the patriotic sentiment aroused by the struggle for independence, but in the present generation it often shows a tendency towards the philosophic and contemplative mood under the influence of Western models.

Dramatists, translators and satirists.

There has been an abundant production of dramatic literature in recent years. In succession to Alexander Rhangabès, John Zampelios and the two Soutzos, who belong to the past generation, Kleon Rhangabès, Angelos Vlachos, Demetrios Koromelas, Basiliades and Bernadakes are the most prominent among modern dramatic writers. Numerous translations of foreign masterpieces have appeared, among which the metrical versions of *Romeo and Juliet*, *Othello*, *King Lear*, *Hamlet*, *Macbeth* and *The Merchant of Venice*, by Demetrios Bikelas, deserve mention as examples of artistic excellence. Goethe's *Faust* has been rendered into verse by Probelegios, and *Hamlet*, *Antony and Cleopatra*, *Coriolanus and Julius Caesar*, into prose by Damiroles.

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Among recent satirists, George Soures (b. 1853) occupies a unique position. He reviews social and political events in the 'Ρωμηός, a witty little newspaper written entirely in verse, which is read with delight by all classes of the population.

Recent prose writers.

Almost all the prose writers have employed the literary language. In historical research the Greeks continue to display much activity and erudition, but no great work comparable to Spiridion Trikoupis's *History of the Revolution* has appeared in the present generation. A history of the Greek nation from the earliest times to the present day, by Spiridion Lampros, and a general history of the 19th century by Karolides, have recently been published. The valuable Μνημεῖα of Sathas, the μελέαι Βυζαντινῆς ἱστορίας of Spiridion Zampelios and Mavrogiannes's *History of the Ionian Islands* deserve special mention, as well as the essays of Bikelas, which treat of the Byzantine and modern epochs of Greek history. Some of the last-named were translated into English by the late marquis of Bute. Among the writers on jurisprudence are Peter Paparrhegopoulos, Kalligas, Basileios Oekonomedes and Nikolaos Saripolos. Brailas-Armenes and John Skaltzounes, the latter an opponent of Darwin, have written philosophical works. The *Ecclesiastical History* of Diomedes Kyriakos and the *Theological Treatises* of Archbishop Latas should be noted. The best-known writers of philological works are Constantine Kontos, a strong advocate of literary purism, George Hatzidakes, Theodore Papademetrakopoulos and John Psichari; in archaeology, Stephen Koumanoudes, Panagiotes Kavvadias and Christos Tsountas have won a recognized position among scholars. John Svoronos is a high authority on numismatics. The works of John Hatzidakes on mathematics, Anast. Christomanos on chemistry, and Demetrios Aeginetes on astronomy are well known.

Fiction.

The earlier works of fiction, written in the period succeeding the emancipation of Greece, were much affected by foreign influence. Modern Greece has not produced any great novelist. The Κρητικὸν ἔπος of Spiridion Zampelios, the scene of which is laid in Crete, and the *Thanos Blechas* of Kalligas are interesting, the former for accuracy of historical detail, the latter as a picture of peasant life in the mountains of Greece. Original novel writing has not been much cultivated, but translations of foreign romances abound. In later times the short story has come into vogue through the example of D. Bikelas, whose tales have acquired great popularity; one of them, *Loukis Laras*, has been translated into many languages. The example of Bikelas has been followed by Drosines Karkavitzas, Ephthaliotis, Xenopoulos and many others.

Prose writers in the vernacular.

The most distinguished of the writers who adhere to the vernacular in prose is John Psichari, professor of the École des Hautes Études in Paris. He is the recognized leader of the vulgarists. Among the best known of his works are Τὸ ταξεῖδί μου, a narrative of a journey in Greek lands, Τόνειρο τοῦ Γιανίρη, 'Η Ζοΐλεα, and ὁ Μάγος. The tales of Karkavitzas and Ephthaliotis are also in the vernacular. Among the younger of M. Psichari's followers is M. Palli, who has recently published a translation of the *Iliad*. Owing to the limited resources of the popular language, the writers of this school are sometimes compelled to employ strange and little-known words borrowed from the various dialects. The vernacular has never been adopted by writers on scientific subjects, owing to its inherent unsuitability and the incongruity arising from the introduction of technical terms derived from the ancient language. Notwithstanding the zeal of its adherents, it seems unlikely to maintain its place in literature outside the domain of poetry; nor can any other result be expected, unless its advocates succeed in reforming the system of public instruction in Greece.

Periodicals and Journals.

Many periodicals are published at Athens, among which may be mentioned the *Athena*, edited by Constantine Kontos, the *Ethnikè Agogè*, a continuation of the old *Hestia*, the *Harmonia* and the Διάνλασις τῶν παίδων, an educational review. The Parnassos, the Archaeological Society and other learned bodies issue annual or quarterly reports. The Greek journals are both numerous and widely read. They contain much clever writing, which is often marred by inaccuracy and a deficient sense of responsibility. Their tendency to exaggerated patriotic sentiment sometimes borders on the ludicrous. For many years the *Nea Hemèra* of Trieste exerted a considerable influence over the Greek world, owing to the able political reviews of its editor, Anastasios Byzantios (d. 1898), a publicist of remarkable insight and judgment.

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(J. D. B.)

GREEK RELIGION. The recent development of anthropological science and of the comparative study of religions has enabled us at last to assign to ancient Greek religion its proper place in the classification of creeds and to appreciate its importance for the history of civilization. In spite of all the diversities of local cults we may find a general definition of the theological system of the Hellenic communities, and with sufficient accuracy may describe it as an anthropomorphic polytheism, preserving many traces of a pre-anthropomorphic period, unchecked by any exacting dogma or tradition of revelation, and therefore pliantly adapting itself to all the changing circumstance of the social and political history of the race, and easily able to assimilate alien ideas and forms. Such a religion, continuing in whole or in part throughout a period of at least 2000 years, was more capable of progress than others, possibly higher, that have crystallized at an early period into a fixed dogmatic type; and as, owing to its essential character, it could not be convulsed by any inner revolution that might obliterate the deposits of its earlier life, it was likely to preserve the imprints of the successive ages of culture, and to reveal more clearly than any other testimony the evolution of the race from savagery to civilization. Hence it is that Greek religion appears to teem with incongruities, the highest forms of religious life being often confronted with the most primitive. And for this reason the student of savage

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anthropology and the student of the higher religions of the world are equally rewarded by its study.

Modern ethnology has arrived at the conviction that the Hellenic nation, like others that have played great parts in history, was the product of a blend of populations, the conquering tribes of Aryan descent coming from the north and settling among and upon certain pre-Hellenic Mediterranean stocks. The conclusion that is naturally drawn from this is that Hellenic religion is also the product of a blend of early Aryan or Indo-Germanic beliefs with the cult-ideas and practices of the Mediterranean area that were from of old indigenous in the lands which the later invaders conquered. But to disentangle these two component parts of the whole, which might seem to be the first problem for the history of the development of this religion, is by no means an easy task; we may advance further towards its solution, when the mysterious pre-Hellenic Mediterranean language or group of languages, of which traces remain in Hellenic place-names, and which may be lying uninterpreted on the brick-tablets of the palace of Cnossus, has found its interpreter. For the first question is naturally one of language. But the comparative study of the Indo-European speech-group, great as its philological triumphs have been, has been meagre in its contributions to our positive knowledge of the original belief of the primitive stock. It is not possible to reconstruct a common Indo-European religion. The greater part of the separate Aryan cult-systems may have developed after the diffusion and may have been the result of contact in prehistoric days with non-Aryan peoples. And many old religious etymological equations, such as *Οὐρανός* = Sanskrit Varuna, *Ἑρμῆς* = Sarameyâs, Athena = Ahana, were uncritically made and have been abandoned. The chief fact that philology has revealed concerning the religious vocabulary of the Aryan peoples is that many of them are found to have designated a high god by a word derived from a root meaning "bright," and which appears in Zeus, Jupiter, Sanskrit *Dyaus*. This is important enough, but we should not exaggerate its importance, nor draw the unwarranted inference that therefore the primitive Indo-Europeans worshipped one supreme God, the Sky-Father. Besides the word "Zeus," the only other names of the Hellenic pantheon that can be explained wholly or partly as words of Aryan formation are Poseidon, Demeter, Hestia, Dionysus (whose name and cult were derived from the Aryan stock of the Thraco-Phrygians) and probably Pan. But other names, such as Athena, Ares, Apollo, Artemis, Hera, Hermes, have no discovered affinities with other Aryan speech-groups; and yet there is nothing suspiciously non-Aryan in the formation of these words, and they may all have belonged to the earliest Hellenic-Aryan vocabulary. In regard to others, such as Rhea, Hephaestus and Aphrodite, it is somewhat more probable that they belonged to an older pre-Hellenic stock that survived in Crete and other islands, and here and there on the mainland; while we know that Zeus derived certain unintelligible titles in Cretan cult from the indigenous Eteo-cretan speech.

A minute consideration of a large mass of evidence justifies the conclusion that the main tribes of the Aryan Hellenes, pushing down from the north, already possessed certain deities in common such as Zeus, Poseidon and Apollo with whom they associated certain goddesses, and that they maintained the cult of Hestia or "Holy Hearth." Further, a comparison of the developed religions of the respective Aryan peoples suggests that they tended to give predominance to the male divinity, although we have equally good reason to assert that the cult of goddesses, and especially of the earth-goddess, is a genuinely "Aryan" product. But when the tribes of this family poured into the Greek peninsula, it is probable that they would find in certain centres of a very ancient civilization, such as Argolis and Crete, the dominant cult of a female divinity.[1] The recent excavations on the site of the Hera temple at Argos prove that a powerful goddess was worshipped here many centuries before it is probable that the Hellenic invader appeared. He may have even found the name Hera there, or may have brought it with him and applied it to the indigenous divinity. Again, we are certain that the great mother-goddess of Crete, discovered by Dr Arthur Evans, is the ancestress of Rhea and of the Greek "Mother of the gods"; and it is a reasonable conjecture that she accounts for many of the traits of Artemis and perhaps for Athena. But the evidence by no means warrants us in assuming as an axiom that wherever we find a dominant goddess-cult, as that of Demeter at Eleusis, we are confronted with a non-Hellenic religious phenomenon. The very name "Demeter" and the study of other Aryan religions prove the prominence of the worship of the earth-goddess in our own family of the nations. Finally, we must reckon with the possibility that the other great nations which fringed the Mediterranean, Hittite, Semitic and Egyptian peoples, left their impress on early Greek religion, although former scholars may have made rash use of this hypothesis.[2]

Recognizing then the great perplexity of these problems concerning the ethnic origins of Hellenic religion, we may at least reduce the tangle of facts to some order by distinguishing its lower from its higher forms, and thus provide the material for some theory of evolution. We may collect and sift the phenomena that remain over from a pre-anthropomorphic period, the imprints of a savage past, the beliefs and practices that belong to the animistic or even the pre-animistic period, fetishism, the worship of animals, human sacrifice. We shall at once be struck with the contrast between such civilized cults as those of Zeus, Athena, Apollo, high personal divinities to whom the attributes of a progressive morality could be attached, and practices that long survived in backward communities, such as the Arcadian worship of the thunder and the winds, the cult of Zeus *Κραναός* "the thunder" at Mantinea and Zeus *Καππότας* in Laconia, who is none other than the mysterious meteoric stone that falls from heaven. These are examples of a religious view in which certain natural phenomena or objects are regarded as mysteriously divine or sacred in their own right and a personal divinity has not yet emerged or been separated from them. A noteworthy product of primitive animistic feeling is the universally prevalent cult of Hestia, who is originally "Holy Hearth" pure and simple, and who even under the developed polytheism, in which she played no small part, was never established as a separate anthropomorphic personage.

Animism.

The animistic belief that certain material objects can be charged with a divine potency or spirit gives rise to fetishism, a term which properly denotes the worshipful or superstitious use of objects made by art and invested with a mysterious power, so as to be used like amulets for the purposes of protective magic or for higher purposes of communion with the divinity. From the earliest discoverable period down to the present day fetishism has been a powerful factor in the religion of the Graeco-Roman world. The importance of the sacred stone and pillar in the "Mycenaean" or "Minoan" period which preceded Homer has been impressively shown by Dr Arthur Evans, and the same fetishistic worship continued throughout the historic ages of classic paganism, the rude aniconic emblem of pillar or tree-trunk surviving often by the side of the iconic masterpiece. It is a reasonable conjecture that the earliest anthropomorphic images of divinities, which were beginning to make their appearance by the time of Homer, were themselves evolved by slow transformation from the upright sacred column. And the altar itself may have arisen as another form of this; the simple heap of stones, such

Fetishism.

[1] This has often been explained as a result of *Mutterrecht*, or reckoning descent through the female; for reasons against this hypothesis see L. R. Farnell in *Archiv für vergleichende Religionswissenschaft* (1904); cf. A. J. Evans, "Mycenaean Tree and Pillar Cult," in *Journ. of Hellenic Studies* (1901).

[2] V. Bérard has recently revived the discredited theory of a prevalent Phoenician influence in his ingenious but uncritical work, *L'Origine des cultes arcadiens*. M. P. Foucart believes in very early borrowing from Egypt, as explaining much in the religion of Demeter and Dionysus; see *Les Grands Mystères d'Eleusis* and *Le Culte de Dionysos en Attique*.

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as those erected to Hermes by the way-side and called 'Ερμαῖοι λόφοι, may have served both as a place of worship and as an *agalma* that could attract and absorb a divine potency into itself. Hence the fetishistic power of the altar was fully recognized in Greek ritual, and hence also in the cult of Apollo Agyieus the god and the altar are called by the same name.

It has been supposed that the ancestors of the historic Greeks, before they were habituated to conceive of their divinities as in human form, may have been accustomed to invest them with animal attributes and traits. We must not indeed suppose it to be a general law of religious evolution that "theriomorphism" must always precede anthropomorphism and that the latter transcends and obliterates the former. The two systems can exist side by side, and savages of low religious development can conceive of their deities as assuming at one time human, at another bestial, shape. Now the developed Greek religion was devotedly anthropomorphic, and herein lay its strength and its weakness; nevertheless, the advanced Hellene could imagine his Dionysus entering temporarily into the body of the sacrificial bull or goat, and the men of Pʼhigalia in Arcadia were attached to their horse-headed Demeter, and the primitive Laconians possibly to a ram-headed Apollo. Theriolatry in itself, *i.e.* the worship of certain animals as of divine power in their own right, apart from any association with higher divinities, can scarcely be traced among the Greek communities at any period. They are not found to have paid reverence to any species, though individual animals could acquire temporarily a divine character through communion with the altar or with the god. The wolf might at one time have been regarded as the incarnation of Apollo, the wolf-god, and here and there we find faint traces of a wolf-sacrifice and of offerings laid out for wolves. But the occasional propitiation of wild beasts may fall short of actual worship. The Athenian who slew a wolf might give it a sumptuous funeral, probably to avoid a blood-feud with the wolf's relatives, yet the Athenian state offered rewards for a wolf's head. Nor did any Greek individual or state worship flies as a class, although a small oblation might be thrown to the flies before the great sacrifice to Apollo on the Leucadian rock, to please them and to persuade them not to worry the worshippers at the great solemnity, where the reek of roast flesh would be likely to attract them.

Theriolatry suggests totemism; and though we now know that the former can arise and exist quite independently of the latter, recent anthropologists have interpreted the apparent sanctity or prestige of certain animals in parts of Greek mythology and religion as the deposit of an earlier totemistic system. But this interpretation, originated and maintained with great acumen by Andrew Lang and W. Robertson Smith, appears now somewhat hazardous; and as a scientific hypothesis there are many flaws in it. The more observant study of existing totem-tribes has weakened our impression of the importance of totemism as a primitive religious phenomenon. It is in reality more important as a social than as a religious factor. If indeed we choose to regard totemism as a mere system of nomenclature, by which a tribe names itself after some animal or plant, then we might quote a few examples of Hellenic tribes totemistic in this sense. But totemism is a fact of importance only when it affects the tribal marriage laws or the tribal religion. And the tribal marriage laws of ancient Greece, so far as they are known, betray no clear mark of totemistic arrangements; nor does the totemism of contemporary savages appear to affect their religion in any such way as to suggest a natural explanation for any of the peculiar phenomena of early Hellenic polytheism. Here and there we have traces of a snake-tribe in Greece, the Ὄφιεῖς in Aetolia, the Ὀφιογενεῖς in Cyprus and Parium, but we are not told that these worshipped the snake, though the latter clan were on terms of intimacy with it. Where the snake was actually worshipped in Hellenic cult—the cases are few and doubtful—it may have been regarded as the incarnation of the ancestor or as the *avatar* of the under-world divinity.

Totemism.

Finally, among the primitive or savage phenomena the practice of human sacrifice looms large. Encouraged at one time by the Delphic oracle, it was becoming rare and repellent to the conscience by the 6th century B.C.; but it was not wholly extinct in the Greek world even by the time of Porphyry. The facts are very complex and need critical handling, and a satisfying scientific explanation of them all is still to be sought.

Human sacrifice.

We can now observe the higher aspects of the advanced polytheism. And at the outset we must distinguish between mythology and religion strictly understood, between the stories about the divinities and the private or public religious service. No doubt the former are often a reflection of the latter, in many cases being suggested by the ritual which they may have been invented to interpret, and often envisaging important cult-ideas. Such for example are the myths about the purification and trial of Orestes, Theseus, Ixion, the story of Demeter's sorrow, of the sufferings and triumph of Dionysus, and those about the abolition of human sacrifice. Yet Greek mythology as a whole was irresponsible, without reserve, and unchecked by dogma or sacerdotal prohibition; and frequently it sank below the level of the current religion, which was almost free from the impurities which shock the modern reader of Hellenic myths. Nor again did any one feel himself called upon to believe any particular myth; in fact, faith, understood in the sense in which the term is used in Christian theology, as the will to believe certain dogmatic statements about the nature and action of divinity, is a concept which was neither named nor recognized in Hellenic ethics or religious doctrine; only, if a man proclaimed his disbelief in the existence of the gods and refused to join in the ritual of the community, he would become "suspect," and might at times be persecuted by his fellows. Greek religion was not so much an affair of doctrine as of ritual, religious formulae of which the cult-titles of the divinities were an important component, and prayer; and the most illuminative sources of our knowledge of it are the ritual-inscriptions and other state-documents, the private dedications, the monuments of religious art and certain passages in the literature, philology and archaeology being equally necessary to the equipment of the student.

We are tempted to turn to Homer as the earliest authority. And though Homer is not primitive and does not present even an approximately complete account of Greek religion, we can gather from his poems a picture of an advanced polytheism which in form and structure at least is that which was presented to the world of Aeschylus. We discern a pantheon already to some extent systematized, a certain hierarchy and family of divinities in which the supremacy of Zeus is established as incontestable. And the anthropomorphic impulse, the strongest trend in the Greek religious imagination, which filled the later world with fictitious personages, generating transparent shams such as an Ampidromus for the ritual of the Ampidromia, Amphiction for the Amphictiones, a hero Κέραμος for the gild of potters, is already at its height in the Homeric poems. The deities are already clear-cut, individual personalities of distinct ethos, plastically shaped figures such as the later sculpture and painting could work upon, not vaguely conceived *numina* like the forms of the old Roman religion. Nor can we call them for the most part nature-deities like the personages of the Vedic system, thinly disguised "personifications" of natural phenomena. Athena is not the blue sky nor Apollo the sun; they are simply Athena and Apollo, divine personages with certain powers and character, as real for their people as Christ and the Virgin for Christendom. By the side of these, though generally in a subordinate position, we find that Homer recognized certain divinities that we may properly call nature-powers, such as Helios, Gaia and the river-deities, forms descending probably from a remote animistic period, but maintaining themselves within the popular religion till the end of Paganism. Again, though Homer may talk and think at times with levity and *banalité* about his deities, his deeper utterances impute an advanced morality to the supreme

Religion in Homer.

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God. His Zeus is on the whole a power of righteousness, dealing with men by a righteous law of nemesis, never being himself the author of evil—an idea revealed in the opening passage of the *Odyssey*—but protecting the good and punishing the wicked. Vengeance, indeed, was one of the attributes of divinity both for Homer and the average Greek of the later period, as it is in Judaic and Christian theology, though Plato and Euripides protested strongly against such a view. But the Homeric Zeus is equally a god of pity and mercy, and the man who neglects the prayers of the sorrowful and afflicted, who violates the sanctity of the suppliant and guest, or oppresses the poor or the wanderer, may look for divine punishment. Though not regarded as the physical author of the universe or the Creator, he is in a moral sense the father of gods and men. And though the sense of sin and the need of piacular sacrifice are expressed in the Homeric poems, the relations between gods and men that they reveal are on the whole genial and social; the deity sits unseen at the good man's festal sacrifice, and there is a simple apprehension of the idea of divine communion. There is also indeed a glimmering of the dark background of the nether world, and the chthonian powers that might send up the Erinys to fulfil the curse of the wronged. Yet on the whole the religious atmosphere is generally cheerful and bright; freer than that of the later ages from the taint of magic and superstition; nor is Homer troubled much about the life after death; he scarcely recognizes the cult of the dead,[1] and is not oppressed by fear of the ghost-world.

If we look now broadly over the salient facts of the Greek public and private worship of the historic period we find much in it that agrees with Homeric theology. His "Olympian" system retains a certain life almost to the end of Paganism, and it is a serious mistake to suppose that it had lost its hold upon the people of the 5th and 4th century B.C. We find it, indeed, enriched in the post-Homeric period with new figures of prestige and power; Dionysus, of whom Homer had only faintly heard, becomes a high god with a worship full of promise for the future. Demeter and Kore, the mother and the girl, whom Homer knew well enough but could not use for his epic purposes, attract the ardent affections and hopes of the people; and Asclepius, whom the old poet did not recognize as a god, wins a conspicuous place in the later shrines. But much that has been said of the Homeric may be said of the later classical theology. The deities remain anthropomorphic, and appear as clearly defined individuals. A certain hierarchy is recognized; Zeus is supreme, even in the city of Athena, but each of the higher divinities played many parts, and local enthusiasm could frustrate the departmental system of divine functions; certain members of the pantheon had a preference for the life of the fields, but as the *polis* emerged from the village communities, Demeter, Hermes, Artemis and others, the gods and goddesses of the husbandmen and shepherds, become powers of the council-chamber and the market-place. The moral ideas that we find in the Homeric religion are amply attested by cult-records of the later period. The deities are regarded on the whole as beneficent, though revengeful if wronged or neglected; the cult-titles used in prayer, which more than any other witnesses reveal the thought and wish of the worshipper, are nearly always euphemistic, the doubtful title of Demeter Erinys being possibly an exception. The important cults of Zeus Ἱκέσιος and Προστάτιος, the suppliant's protecting deity, embody the ideas of pity and mercy that mark advanced religion; and many momentous steps in the development of morality and law were either suggested or assisted by the state-religion. For example, the sanctity of the oath, the main source of the secular virtue of truthfulness, was originally a religious sanction, and though the Greek may have been prone to perjury, yet the Hellenic like the Hebraic religious ethics regarded it as a heinous sin. The sanctity of family duties, the sacredness of the life of the kinsman, were ideas fostered by early Hellenic religion before they generated principles of secular ethics. In the post-Homeric period, the development of the doctrine of purity, which was associated with the Apolline religion, combining with a growing dread of the ghost-world, stimulated and influenced in many important ways the evolution of the Greek law concerning homicide.[2] And the beginnings of international law and morality were rooted in religious sanctions and taboo. In fact, Greek state-life was indebted in manifold ways to Greek religion, and the study of the Greek oracles would alone supply sufficient testimony of this. In many cases the very origin of the state was religious, the earliest *polis* sometimes having arisen under the shadow of the temple.

The post-Homeric period.

Yet as Greek religion was always in the service of the state, and the priest a state-official, society was the reverse of theocratic. Secular advance, moral progress and the march of science, could never long be thwarted by religious tradition; on the contrary, speculative thought and artistic creation were considered as attributes of divinity. We may say that the religion of Hellas penetrated the whole life of the people, but rather as a servant than as a master.

Distinct and apart from these public worships and those of the clan and family were the mystic cults of Eleusis, Andania and Samothrace, and the private services of the mystic brotherhoods. The latter were scattered broadcast over Hellas, and the influence of the former was strengthened and their significance intensified by the wave of mysticism that spread at first from the north from the beginning of the 7th century onwards, and derived its strength from the power of Dionysus and the Orphic brotherhoods. New ideals and hopes began to stir in the religious consciousness, and we find a strong salvationist tendency, the promise of salvation relying on mystic communion with the deity. Also a new and vital principle is at work; Orphism is the only force in Greek religion of a clear apostolic purpose, for it broke the barriers of the old tribal and civic cults, and preached its message to land and free, Hellene and barbarian.

The later history of Greek paganism is mainly concerned with its gradual penetration by Oriental ideas and worships, and the results of this *θεοκρασία* are discerned in an ever increasing mysticism and a tendency towards monotheism. Obliterated as the old Hellenic religion appeared to be by Christianity, it nevertheless retained a certain life, though transformed, under the new creed to which it lent much of its hieratic organization and religious terminology. The indebtedness of Christianity to Hellenism is one of the most interesting problems of comparative religion; and for an adequate estimate a minute knowledge of the ritual and the mystic cults of Hellas is one of the essential conditions.

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[1] This became very powerful from the 7th century onward, and there are reasons for supposing that it existed in the pre-Homeric, or Mycenaean, period; *vide* Rohde's *Psyche* (new edition), Tsountas and Manatt, *The Mycenaean Age*.

[2] See L. R. Farnell, *Evolution of Religion* (Hibbert Lectures, 1905), pp. 139–152.

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GREELEY, HORACE (1811–1872), American statesman and man of letters, was born at Amherst, New Hampshire, on the 3rd of February 1811. His parents were of Scottish-Irish descent, but the ancestors of both had been in New England for several generations. He was the third of seven children. His father, Zaccheus Greeley, owned a farm of 50 acres of stony, sterile land, from which a bare support was wrung. Horace was a feeble and precocious lad, taking little interest in the ordinary sports of childhood, learning to read before he was able to talk plainly, and the prodigy of the neighbourhood for accurate spelling. Before Horace was ten years old (1820), his father became bankrupt, his home was sold by the sheriff, and Zaccheus Greeley himself fled the state to escape arrest for debt. The family soon removed to West Haven, Vermont, where, all working together, they made a scanty living as day labourers. Horace from childhood desired to be a printer, and, when barely eleven years old, tried to be taken as an apprentice in an office at Whitehall, New York, but was rejected on account of his youth. After three years more with the family as a day labourer at West Haven, he succeeded, with his father's consent, in being apprenticed in the office of *The Northern Spectator*, at East Poultney, Vermont. Here he soon became a good workman, developed a passion for politics and especially for political statistics, came to be depended upon for more or less of the editing of the paper, and was a figure in the village debating society. He received only $40 a year, but he sent most of his money to his father. In June 1830 *The Northern Spectator* was suspended. Meantime his father had removed to a small tract of wild land in the dense forests of Western Pennsylvania, 30 m. from Erie. The released apprentice now visited his parents, and worked for a little time with them on the farm, meanwhile seeking employment in various printing offices, and, when he got it, giving nearly all his earnings to his father. At last, with no further prospect of work nearer home, he started for New York. He travelled on foot and by canal-boat, entering New York in August 1831, with all his clothes in a bundle carried over his back with a stick, and with but $10 in his pocket. More than half of this sum was exhausted while he made vain efforts to find employment. Many refused to employ him, in the belief that he was a runaway apprentice, and his poor, ill-fitting apparel and rustic look were everywhere greatly against him. At last he found work on a 32mo New Testament, set in agate, double columns, with a middle column of notes in pearl. It was so difficult and so poorly paid that other printers had all abandoned it. He barely succeeded in making enough to pay his board bill, but he finished the task, and thus found subsequent employment easier to get.

In January 1833 Greeley formed a partnership with Francis V. Story, a fellow-workman. Their combined capital amounted to about $150. Procuring their type on credit, they opened a small office, and undertook the printing of the *Morning Post*, the first cheap paper published in New York. Its projector, Dr Horatio D. Shepard, meant to sell it for one cent, but under the arguments of Greeley he was persuaded to fix the price at two cents. The paper failed in less than three weeks, the printers losing only $50 or $60 by the experiment. They still had a *Bank Note Reporter* to print, and soon got the printing of a tri-weekly paper, the *Constitutionalist*, the organ of some lottery dealers. Within six months Story was drowned, but his brother-in-law, Jonas Winchester, took his place in the firm. Greeley was now asked by James Gordon Bennett to go into partnership with him in starting *The Herald*. He declined the venture, but recommended the partner whom Bennett subsequently took. On the 2nd of March 1834, Greeley and Winchester issued the first number of *The New Yorker*, a weekly literary and news paper, the firm then supposing itself to be worth about $3000. Of the first number they sold about 100 copies; of the second, nearly 200. There was an average increase for the next month of about 100 copies per week. The second volume began with a circulation of about 4550 copies, and with a loss on the first year's publication of $3000. The second year ended with 7000 subscribers and a further loss of $2000. By the end of the third year *The New Yorker* had reached a circulation of 9500 copies, and had sustained a total loss of $7000. It was published seven years (until the 20th of September 1841), and was never profitable, but it was widely popular, and it gave Greeley, who was its sole editor, much prominence. On the 5th of July 1836 Greeley married Miss Mary Y. Cheney, a Connecticut school teacher, whom he had met in a Grahamite (vegetarian) boarding-house in New York.

During the publication of *The New Yorker* he added to the scanty income which the job printing brought him by supplying editorials to the short-lived *Daily Whig* and various other publications. In 1838 he had gained such standing as a writer that he was selected by Thurlow Weed, William H. Seward, and other leaders of the Whig Party, for the editorship of a campaign paper entitled *The Jeffersonian*, published at Albany. He continued *The New Yorker*, and travelled between Albany and New York each week to edit the two papers. The *Jeffersonian* was a quiet and instructive rather than a vehement campaign sheet, and the Whigs believed that it had a great effect upon the elections of the next year. When, on the 2nd of May 1840, some time after the nomination by the Whig party of William Henry Harrison for the Presidency, Greeley began the publication of a new weekly campaign paper, *The Log Cabin*, it sprang at once into a great circulation; 40,000 copies of the first number were sold, and it finally rose to 80,000. It was considered a brilliant political success, but it was not profitable, and in September 1841 was merged in the *Weekly Tribune*. On the 3rd of April 1841, Greeley announced that on the following Saturday (April 10th) he would begin the publication of a daily newspaper of the same general principles, to be called *The Tribune*. He was now entirely without money. From a personal friend, James Coggeshall, he borrowed $1000, on which capital and the editor's reputation *The Tribune* was founded. It began with 500 subscribers. The first week's expenses were $525 and the receipts $92. By the end of the fourth week it had run up a circulation of 6000, and by the seventh reached 11,000, which was then the full capacity of its press. It was alert, cheerful and aggressive, was greatly helped by the attacks of rival papers, and promised success almost from the start.

From this time Greeley was popularly identified with *The Tribune*, and its share in the public discussion of the time is his history. It soon became moderately prosperous, and his assured income should have placed him beyond pecuniary worry. His income was long above $15,000 per year, frequently as much as $25,000 or more. But he lacked business thrift, inherited a disposition to endorse for his friends, and was often unable to distinguish between deserving applicants for aid and adventurers. He was thus frequently straitened, and, as his necessities pressed, he sold successive interests in his newspaper. At the outset he owned the whole of it. When it was already firmly established (in July 1841), he took in Thomas McElrath as an equal partner, upon the contribution of $2000 to the common fund. By the 1st of January 1840 he had reduced his interest to 31½ shares out of 100; by July 2nd, 1860, to 15 shares; in 1868 he owned only 9; and in 1872, only 6. In 1867 the stock sold for $6500 per share, and his last sale was for $9600. He bought wild lands, took stock in mining companies, desiccated egg companies, patent looms, photo-lithographic companies, gave away profusely, lent to plausible rascals, and was the ready prey of every new inventor who chanced to find him with money or with property that he could readily convert into money.

In September 1841 Greeley merged his weekly papers, *The Log Cabin* and *The New Yorker*, into *The Weekly Tribune*, which soon attained as wide circulation as its predecessors, and was much more profitable. It rose in a time of great political excitement to a total circulation of a quarter of a million, and sometimes had for successive years 140,000 to 150,000. For several years it was rarely much below 100,000. Its subscribers were found throughout all quarters of the northern half of the Union from Maine to Oregon, large packages going to remote districts beyond the Mississippi or Missouri, whose only connexion with the outside world was through a weekly or semi-weekly mail. The readers of this weekly paper acquired a personal affection for

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its editor, and he was thus for many years the American writer most widely known and most popular among the rural classes. The circulation of *The Daily Tribune* was never proportionately great—its advocacy of a protective tariff, prohibitory liquor legislation and other peculiarities, repelling a large support which it might otherwise have commanded in New York. It rose within a short time after its establishment to a circulation of 20,000, reached 50,000 and 60,000 during the Civil War, and thereafter ranged at from 30,000 to 45,000. After May 1845 a semi-weekly edition was also printed, which ultimately reached a steady circulation of from 15,000 to 25,000.

From the outset it was a cardinal principle with Greeley to hear all sides, and to extend a special hospitality to new ideas. In March 1842 *The Tribune* began to give one column daily to a discussion of the doctrines of Charles Fourier, contributed by Albert Brisbane. Gradually Greeley came to advocate some of these doctrines editorially. In 1846 he had a sharp discussion upon them with a former subordinate, Henry J. Raymond, then employed upon a rival journal. It continued through twelve articles on each side, and was subsequently published in book form. Greeley became personally interested in one of the Fourierite associations, the North American Phalanx, at Red Bank, N. J. (1843–1855), while the influence of his discussions doubtless led to or gave encouragement to other socialistic experiments, such as that at Brook Farm. When this was abandoned, its leader George Ripley, with one or two other members, sought employment from Greeley upon *The Tribune*. Greeley dissented from many of Fourier's propositions, and in later years was careful to explain that the principle of association for the common good of working men and the elevation of labour was the chief feature which attracted him. Co-operation among working men he continued to urge throughout his life. In 1850 the Fox Sisters, on his wife's invitation, spent several weeks in his house. His attitude towards their "rappings" and "spiritual manifestations" was one of observation and inquiry; and in his *Recollections* he wrote concerning these manifestations: "That some of them are the result of juggle, collusion or trick I am confident; that others are *not*, I decidedly believe."

From boyhood he had believed in a protective tariff, and throughout his active life he was its most trenchant advocate and propagandist. Besides constantly urging it in the columns of *The Tribune*, he appeared early in 1843 in a public debate on "The Grounds of Protection," with Samuel J. Tilden and Parke Godwin as his opponents. A series of popular essays on the subject were published over his own signature in *The Tribune* in 1869, and subsequently republished in book form, with a title-page describing protection to home industry as a system of national co-operation for the elevation of labour. He opposed woman suffrage on the ground that the majority of women did not want it and never would, and declared that until woman should "emancipate herself from the thraldom to etiquette," he "could not see how the 'woman's rights theory' is ever to be anything more than a logically defensible abstraction." He aided practical efforts, however, for extending the sphere of woman's employments. He opposed the theatres, and for a time refused to publish their advertisements. He held the most rigid views on the sanctity of marriage and against easy divorce, and vehemently defended them in controversies with Robert Dale Owen and others. He practised and pertinaciously advocated total abstinence from spirituous liquors, but did not regard prohibitory laws as always wise. He denounced the repudiation of state debts or the failure to pay interest on them. He was zealous for Irish repeal, once held a place in the "Directory of the Friends of Ireland," and contributed liberally to its support. He used the occasion of Charles Dickens's first visit to America to urge international copyright, and was one of the few editors to avoid alike the flunkeyism with which Dickens was first received, and the ferocity with which he was assailed after the publication of his *American Notes*. On the occasion of Dickens's second visit to America, Greeley presided at the great banquet given him by the press of the country. He made the first elaborate reports of popular scientific lectures by Louis Agassiz and other authorities. He gave ample hearing to the advocates of phonography and of phonographic spelling. He was one of the most conspicuous advocates of the Pacific railroads, and of many other internal improvements.

But it is as an anti-slavery leader, and as perhaps the chief agency in educating the mass of the Northern people to that opposition through legal forms to the extension of slavery which culminated in the election of Abraham Lincoln and the Civil War, that Greeley's main work was done. Incidents in it were his vehement opposition to the Mexican War as a scheme for more slavery territory, the assault made upon him in Washington by Congressman Albert Rust of Arkansas in 1856, an indictment in Virginia in the same year for circulating incendiary documents, perpetual denunciation of him in Southern newspapers and speeches, and the hostility of the Abolitionists, who regarded his course as too conservative. His anti-slavery work culminated in his appeal to President Lincoln, entitled "The Prayer of Twenty Millions," in which he urged "that all attempts to put down the rebellion and at the same time uphold its inciting cause" were preposterous and futile, and that "every hour of deference to slavery" was "an hour of added and deepened peril to the Union." President Lincoln in his reply said: "My paramount object is to save the Union, and not either to save or destroy slavery.... What I do about slavery and the coloured race, I do because I believe it helps to save this Union; and what I forbear, I forbear because I do not believe it would help to save the Union ... I have here stated my purpose according to my views of official duty; and I intend no modification of my oft-expressed personal wish that all men everywhere could be free." Precisely one month after the date of this reply the Emancipation Proclamation was issued.

Greeley's political activity, first as a Whig, and then as one of the founders of the Republican party, was incessant; but he held few offices. In 1848–1849 he served a three months' term in Congress, filling a vacancy. He introduced the first bill for giving small tracts of government land free to actual settlers, and published an exposure of abuses in the allowance of mileage to members, which corrected the evil, but brought him much personal obloquy. In the National Republican Convention in 1860, not being sent by the Republicans of his own state on account of his opposition to William Seward as a candidate, he was made a delegate for Oregon. His active hostility to Seward did much to prevent the success of that statesman, and to bring about instead the nomination of Abraham Lincoln. This was attributed by his opponents to personal motives, and a letter from Greeley to Seward, the publication of which he challenged, was produced, to show that in his struggling days he had been wounded at Seward's failure to offer him office. In 1861 he was a candidate for United States senator, his principal opponent being William M. Evarts. When it was clear that Evarts could not be elected, his supporters threw their votes for a third candidate, Ira Harris, who was thus chosen over Greeley by a small majority. At the outbreak of the war he favoured allowing the Southern states to secede, provided a majority of their people at a fair election should so decide, declaring "that he hoped never to live in a Republic whereof one section was pinned to the other by bayonets." When the war began he urged the most vigorous prosecution of it. The "On to Richmond" appeal, which appeared day after day in *The Tribune*, was incorrectly attributed to him, and it did not wholly meet his approval; but after the defeat in the first battle of Bull Run he was widely blamed for it. In 1864 he urged negotiations for peace with representatives of the Southern Confederacy in Canada, and was sent by President Lincoln to confer with them. They were found to have no sufficient authority. In 1864 he was one of the Lincoln Presidential electors for New York. At the close of the war, contrary to the general feeling of his party, he urged universal amnesty and impartial suffrage as the basis of reconstruction. In 1867 his friends again wished to elect him to the Senate of the United

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States, and the indications were all in his favour. But he refused to be elected under any misapprehension of his attitude, and with what his friends thought unnecessary candour re-stated his obnoxious views on universal amnesty at length, just before the time for the election, with the certainty that this would prevent his success. Some months later he signed the bail bond of Jefferson Davis, and this provoked a torrent of public indignation. He had written a popular history of the late war, the first volume having an immense sale and bringing him unusually large profits. The second was just issued, and the subscribers, in their anger, refused by thousands to receive it. An unsuccessful attempt was also made to expel him from the Union League Club of New York.

In 1867 he was a delegate-at-large to the convention for the revision of the state constitution, and in 1869 and 1870 he was the Republican candidate for controller of the state and member of Congress respectively, but in each case was defeated.

He was dissatisfied with General Grant's administration, and became its sharp critic. The discontent which he did much to develop ended in the organization of the Liberal Republican party, which held its National Convention at Cincinnati in 1872, and nominated Greeley for the presidency. For a time the tide of feeling ran strongly in his favour. It was first checked by the action of his life-long opponents, the Democrats, who also nominated him at their National Convention. He expected their support, on account of his attitude toward the South and hostility to Grant, but he thought it a mistake to give him their formal nomination. The event proved his wisdom. Many Republicans who had sympathized with his criticisms of the administration, and with the declaration of principles adopted at the first convention, were repelled by the coalition. This feeling grew stronger until the election. His old party associates regarded him as a renegade, the Democrats gave him a half-hearted support. The tone of the canvass was one of unusual bitterness, amounting sometimes to actual ferocity. In August, on representations of the alarming state of the contest, he took the field in person, and made a series of campaign speeches, beginning in New England and extending throughout Pennsylvania, Ohio and Indiana, which aroused great enthusiasm, and were regarded at the time by both friends and opponents as the most brilliant continuous exhibition of varied intellectual power ever made by a candidate in a presidential canvass. General Grant received in the election 3,597,070 votes, Greeley 2,834,079. The only states Greeley carried were Georgia, Kentucky, Maryland, Missouri, Tennessee and Texas.

He had resigned his editorship of *The Tribune* immediately after the nomination; he now resumed it cheerfully; but it was soon apparent that his powers had been overstrained. For years he had suffered greatly from sleeplessness. During the intense excitement of the campaign the difficulty was increased. Returning from his campaign tour, he went immediately to the bedside of his dying wife, and for some weeks had practically no sleep at all. This resulted in an inflammation of the upper membrane of the brain, delirium and death. He expired on the 29th of November 1872. His funeral was a simple but impressive public pageant. The body lay in state in the City Hall, where it was surrounded by crowds of many thousands. The ceremonies were attended by the President and Vice-President of the United States, the Chief-Justice of the Supreme Court, and a large number of eminent public men of both parties, who followed the hearse in a solemn procession, preceded by the mayor and other civic authorities, down Broadway. He had been the target of constant attack during his life, and his personal foibles, careless dress and mental eccentricities were the theme of endless ridicule. But his death revealed the high regard in which he was generally held as a leader of opinion and faithful public servant. "Our later Franklin" Whittier called him, and it is in some such light his countrymen remember him.

In 1851 Greeley visited Europe for the first time, serving as a juryman at the Crystal Palace Exhibition, appearing before a committee of the House of Commons on newspaper taxes, and urging the repeal of the stamp duty on advertisements. In 1855 he made a second trip to Europe. In Paris he was arrested on the suit of a sculptor, whose statue had been injured in the New York World's Fair (of which he had been a director), and spent two days in Clichy, of which he gave an amusing account. In 1859 he visited California by the overland route, and had numerous public receptions. In 1871 he visited Texas, and his trip through the southern country, where he had once been so hated, was an ovation. About 1852 he purchased a farm at Chappaqua, New York, where he afterwards habitually spent his Saturdays, and experimented in agriculture. He was in constant demand as a lecturer from 1843, when he made his first appearance on the platform, always drew large audiences, and, in spite of his bad management in money matters, received considerable sums, sometimes $6000 or $7000 for a single winter's lecturing. He was also much sought for as a contributor, over his own signature, to the weekly newspapers, and was sometimes largely paid for these articles. In religious faith he was from boyhood a Universalist, and for many years was a conspicuous member of the leading Universalist church in New York.

His published works are: *Hints Toward Reforms* (1850); *Glances at Europe* (1851); *History of the Struggle for Slavery Extension* (1856); *Overland Journey to San Francisco* (1860); *The American Conflict* (2 vols., 1864–1866); *Recollections of a Busy Life* (1868; new edition, with appendix containing an account of his later years, his argument with Robert Dale Owen on Marriage and Divorce, and Miscellanies, 1873); *Essays on Political Economy* (1870); and *What I know of Farming* (1871). He also assisted his brother-in-law, John F. Cleveland, in editing *A Political Text-book* (1860), and supervised for many years the annual issues of *The White Almanac* and *The Tribune Almanac*, comprising extensive political statistics.

The best Lives of Greeley are those by James Parton (New York, 1855; new ed., Boston, 1872) and W. A. Linn (N.Y. 1903). Lives have also been written by L. U. Reavis (New York, 1872), and L. D. Ingersoll (Chicago, 1873); and there is a *Memorial of Horace Greeley* (New York, 1873). (W. R.)

GREELEY, a city and the county-seat of Weld county, Colorado, U.S.A., about 50 m. N. by E. of Denver. Pop. (1890) 2395; (1900) 3023 (286 foreign-born); (1910) 8179. It is served by the Union Pacific and the Colorado & Southern railways. In 1908 a franchise was granted to the Denver & Greeley Electric railway. The city is the seat of the State Normal School of Colorado (1889). There are rich coal-fields near the city. The county is naturally arid and unproductive, and its agricultural importance is due to an elaborate system of irrigation. In 1899 Weld county had under irrigation 226,613 acres, representing an increase of 102·2% since 1889, and a much larger irrigated area than in any other county of the state. Irrigation ditches are supplied with water chiefly from the Cache la Poudre, Big Thompson and South Platte rivers, near the foothills. The principal crops are potatoes, sugar beets, onions, cabbages and peas; in 1899 Weld county raised 2,821,285 bushels of potatoes on 23,195 acres (53% of the potato acreage for the entire state). The manufacture of beet sugar is a growing industry, a large factory having been established at Greeley in 1902. Beets are also grown as food for live stock, especially sheep. Peas, tomatoes, cabbages and onions are canned here. Greeley was founded in 1870 by Nathan Cook Meeker (1817–1879), agricultural editor of the New York *Tribune*. With the support of Horace Greeley (in whose honour the town was named), he began in 1869 to advocate in *The Tribune* the founding of an agricultural colony in Colorado. Subsequently President Hayes appointed him Indian agent at White River, Colorado, and he was killed at what is now Meeker, Colorado, in an uprising of the Ute Indians. Under Meeker's scheme, which attracted mainly people from New England and New York state, most of whom were able to contribute at least a little capital, the Union Colony of Colorado was organized and chartered, and bought originally 11,000 acres of land, each member being entitled to buy from it one residence lot, one business lot, and a tract of farm land.

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The funds thus acquired were, to a large extent, expended in making public improvements. A clause inserted in all deeds forbade the sale of intoxicating liquors on the land concerned, under pain of the reversion of such property to the colony. The initiation fees ($5) were used for the expenses of locating the colony, and the membership certificate fees ($150) were expended in the construction of irrigating ditches, as was the money received from the sale of town lots, except about $13,000 invested in a school building (now the Meeker Building). Greeley was organized as a town in 1871, and was chartered as a city of the second class in 1886. The "Union Colony of Colorado" still exists as an incorporated body and holds reversionary rights in streets, alleys and public grounds, and in all places "where intoxicating liquors are manufactured, sold or given away, as a beverage."

See Richard T. Ely, "A Study of a 'Decreed' Town," *Harper's Magazine*, vol. 106 (1902–1903), p. 390 sqq.

GREEN, ALEXANDER HENRY (1832–1896), English geologist, son of the Rev. Thomas Sheldon Green, master of the Ashby Grammar School, was born at Maidstone on the 10th of October 1832. He was educated partly at his father's school, Ashby-de-la-Zouch, and afterwards at Gonville and Caius College, Cambridge, where he graduated as sixth wrangler in 1855 and was elected a fellow of his college. In 1861 he joined the Geological Survey of Great Britain, and surveyed large areas of the midland counties, Derbyshire and Yorkshire. He wrote (wholly or in part) memoirs on the Geology of Banbury (1864), of Stockport (1866), of North Derbyshire (1869, 2nd ed. 1887), and of the Yorkshire Coal-field (1878). In 1874 he retired from the Geological Survey, having been appointed professor of geology in the Yorkshire College at Leeds; in 1885 he became also professor of mathematics, while for many years he held the lectureship on geology at the school of military engineering at Chatham. He was elected F.R.S. in 1886, and two years later was chosen professor of geology in the university of Oxford. His manual of *Physical Geology* (1876, 3rd ed. 1882) is an excellent book. He died at Boar's Hill, Oxford, on the 19th of August 1896.

A portrait of him, with brief memoir, was published in *Proc. Yorksh. Geol. and Polytechnic Soc.* xiii. 232.

GREEN, DUFF (1791–1875), American politician and journalist, was born in Woodford county, Kentucky, on the 15th of August 1791. He was a school teacher in his native state, served during the War of 1812 in the Kentucky militia, and then settled in Missouri, where he worked as a schoolmaster and practised law. He was a member of the Missouri Constitutional Convention of 1820, and was elected to the state House of Representatives in 1820 and to the state Senate in 1822, serving one term in each house. Becoming interested in journalism, he purchased and for two years edited the St Louis *Enquirer*. In 1825 he bought and afterwards edited in Washington, D.C., *The United States Telegraph*, which soon became the principal organ of the Jackson men in opposition to the Adams administration. Upon Andrew Jackson's election to the presidency, the *Telegraph* became the principal mouthpiece of the administration, and received printing patronage estimated in value at $50,000 a year, while Green became one of the coterie of unofficial advisers of Jackson known as the "Kitchen Cabinet." In the quarrel between Jackson and John C. Calhoun, Green supported the latter, and through the columns of the *Telegraph* violently attacked the administration. In consequence, his paper was deprived of the government printing in the spring of 1831. Green, however, continued to edit it in the Calhoun interest until 1835, and gave vigorous support to that leader's nullification views. From 1835 to 1838 he edited *The Reformation*, a radically partisan publication, devoted to free trade and the extreme states' rights theory. In 1841–1843 he was in Europe on behalf of the Tyler administration, and he is said to have been instrumental in causing the appointment of Lord Ashburton to negotiate in Washington concerning the boundary dispute between Maine and Canada. In January 1843 Green established in New York City a short-lived journal, *The Republic*, to combat the spoils system and to advocate free trade. In September 1844 Calhoun, then secretary of state, sent Green to Texas ostensibly as consul at Galveston, but actually, it appears, to report to the administration, then considering the question of the annexation of Texas, concerning the political situation in Texas and Mexico. After the close of the war with Mexico Green was sent to that country in 1849 by President Taylor to negotiate concerning the moneys which, by the treaty of Guadalupe Hidalgo, the United States had agreed to pay; and he saved his country a considerable sum by arranging for payment in exchange instead of in specie. Subsequently Green was engaged in railway building in Georgia and Alabama. On the 10th of June 1875 he died in Dalton, Georgia, a city which in 1848 he had helped to found.

GREEN, JOHN RICHARD (1837–1883), English historian, was born at Oxford on 12th December 1837, and educated at Magdalen College School and at Jesus College, where he obtained an open scholarship. On leaving Oxford he took orders and became the incumbent of St Philip's, Stepney. His preaching was eloquent and able; he worked diligently among his poor parishioners and won their affection by his ready sympathy. Meanwhile he studied history in a scholarly fashion, and wrote much for the *Saturday Review*. Partly because his health was weak and partly because he ceased to agree with the teaching of the Church of England, he abandoned clerical life and devoted himself to history; in 1868 he took the post of librarian at Lambeth, but his health was already breaking down and he was attacked by consumption. His *Short History of the English People* (1874) at once attained extraordinary popularity, and was afterwards expanded in a work of four volumes (1877–1880). Green is pre-eminently a picturesque historian; he had a vivid imagination and a keen eye for colour. His chief aim was to depict the progressive life of the English people rather than to write a political history of the English state. In accomplishing this aim he worked up the results of wide reading into a series of brilliant pictures. While generally accurate in his statement of facts, and showing a firm grasp of the main tendency of a period, he often builds more on his authorities than is warranted by their words, and is apt to overlook points which would have forced him to modify his representations and lower the tone of his colours. From his animated pages thousands have learned to take pleasure in the history of their own people, but could scarcely learn to appreciate the complexity inherent in all historical movement. His style is extremely bright, but it lacks sobriety and presents some affectations. His later histories, *The Making of England* (1882) and *The Conquest of England* (1883), are more soberly written than his earlier books, and are valuable contributions to historical knowledge. Green died at Mentone on the 7th of March 1883. He was a singularly attractive man, of wide intellectual sympathies and an enthusiastic temperament; his good-humour was unfailing and he was a brilliant talker; and his work was done with admirable courage in spite of ill-health. It is said that Mrs Humphry Ward's *Robert Elsmere* is largely a portrait of him. In 1877 Green married Miss Alice Stopford; and Mrs Green, besides writing a memoir of her husband, prefixed to the 1888 edition of his *Short History*, has herself done valuable work as an historian, particularly in her *Henry II.* in the "English Statesmen" series (1888), her *Town Life in the 15th Century* (1894), and *The Making of Ireland and its Undoing* (1908).

See the *Letters of J. R. Green* (1901), edited by Leslie Stephen. (W. Hu.)

GREEN, MATTHEW (1696–1737), English poet, was born of Nonconformist parents. He had a post in the custom house, and the few anecdotes that have been preserved of him show him to have been as witty as his poems would lead one to expect. He died unmarried at his lodging in Nag's Head Court, Gracechurch Street, in 1737. His *Grotto*, a poem on Queen Caroline's grotto at Richmond, was printed in 1732; and his chief poem, *The Spleen*, in 1737 with a preface by his friend Richard Glover. These and some other short poems were printed in Dodsley's collection (1748), and subsequently in various editions of the British poets. They were edited in 1796 with a preface by Dr Aikin and in 1883 by R. E. A. Willmott with the poems of Gray and others. *The Spleen* is an epistle to Mr Cuthbert Jackson,

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advocating cheerfulness, exercise and a quiet content as remedies. It is full of witty sayings. Thomas Gray said of it: "There is a profusion of wit everywhere; reading would have formed his judgment, and harmonized his verse, for even his wood-notes often break out into strains of real poetry and music."

GREEN, THOMAS HILL (1836–1882), English philosopher, the most typical English representative of the school of thought called *Neo-Kantian*, or *Neo-Hegelian*, was born on the 7th of April 1836 at Birkin, a village in the West Riding of Yorkshire, of which his father was rector. On the paternal side he was descended from Oliver Cromwell, whose honest, sturdy independence of character he seemed to have inherited. His education was conducted entirely at home until, at the age of fourteen, he entered Rugby, where he remained five years. In 1855 he became an undergraduate member of Balliol College, Oxford, of which society he was, in 1860, elected fellow. His life, henceforth, was devoted to teaching (mainly philosophical) in the university—first as college tutor, afterwards, from 1878 until his death (at Oxford on the 26th of March 1882) as Whyte's Professor of Moral Philosophy. The lectures he delivered as professor form the substance of his two most important works, viz. the *Prolegomena to Ethics* and the *Lectures on the Principles of Political Obligation*, which contain the whole of his positive constructive teaching. These works were not published until after his death, but Green's views were previously known indirectly through the *Introduction* to the standard edition of Hume's works by Green and T. H. Grose (d. 1906), fellow of Queen's College, in which the doctrine of the "English" or "empirical" philosophy was exhaustively examined.

Hume's empiricism, combined with a belief in biological evolution (derived from Herbert Spencer), was the chief feature in English thought during the third quarter of the 19th century. Green represents primarily the reaction against doctrines which, when carried out to their logical conclusion, not only "rendered all philosophy futile," but were fatal to practical life. By reducing the human mind to a series of unrelated atomic sensations, this teaching destroyed the possibility of knowledge, and further, by representing man as a "being who is simply the result of natural forces," it made conduct, or any theory of conduct, unmeaning; for life in any human, intelligible sense implies a personal self which (1) *knows* what to do, (2) has *power* to do it. Green was thus driven, not theoretically, but as a practical necessity, to raise again the whole question of man in relation to nature. When (he held) we have discovered what man in himself is, and what his relation to his environment, we shall then know his function—what he is fitted to do. In the light of this knowledge we shall be able to formulate the moral code, which, in turn, will serve as a criterion of actual civic and social institutions. These form, naturally and necessarily, the objective expression of moral ideas, and it is in some civic or social whole that the moral ideal must finally take concrete shape.

To ask "What is man?" is to ask "What is experience?" for experience means that of which I am conscious. The facts of consciousness are the only facts which, to begin with, we are justified in asserting to exist. On the other hand, they are valid evidence for whatever is necessary to their own explanation, *i.e.* for whatever is logically involved in them. Now the most striking characteristic of man, that in fact which marks him specially, as contrasted with other animals, is *self*-consciousness. The simplest mental act into which we can analyse the operations of the human mind—the act of sense-perception—is never merely a *change*, physical or psychical, but is the *consciousness* of a change. Human experience consists, not of processes in an animal organism, but of these processes recognized as such. That which we perceive is from the outset an apprehended fact—that is to say, it cannot be analysed into isolated elements (so-called sensations) which, as such, are not constituents of consciousness at all, but exists from the first as a synthesis of relations in a consciousness which keeps distinct the "self" and the various elements of the "object," though holding all together in the unity of the act of perception. In other words, the whole mental structure we call knowledge consists, in its simplest equally with its most complex constituents, of the "work of the mind." Locke and Hume held that the work of the mind was *eo ipso* unreal because it was "made by" man and not "given to" man. It thus represented a subjective creation, not an objective fact. But this consequence follows only upon the assumption that the work of the mind is arbitrary, an assumption shown to be unjustified by the results of exact science, with the distinction, universally recognized, which such science draws between truth and falsehood, between the real and "mere ideas." This (obviously valid) distinction logically involves the consequence that the object, or content, of knowledge, viz. reality, is an intelligible ideal reality, a system of thought relations, a spiritual cosmos. How is the existence of this ideal whole to be accounted for? Only by the existence of some "principle which renders all relations possible and is itself determined by none of them"; an eternal self-consciousness which knows in whole what we know in part. To God the world *is*, to man the world *becomes*. Human experience is God gradually made manifest.

Carrying on the same analytical method into the special department of moral philosophy, Green held that ethics applies to the peculiar conditions of social life that investigation into man's nature which metaphysics began. The faculty employed in this further investigation is no "separate moral faculty," but that same reason which is the source of all our knowledge—ethical and other. Self-reflection gradually reveals to us human capacity, human function, with, consequently, human responsibility. It brings out into clear consciousness certain potentialities in the realization of which man's true good must consist. As the result of this analysis, combined with an investigation into the surroundings man lives in, a "content"—a moral code—becomes gradually evolved. Personal good is perceived to be realizable only by making actual the conceptions thus arrived at. So long as these remain potential or ideal, they form the motive of action; motive consisting always in the idea of some "end" or "good" which man presents to himself as an end in the attainment of which he would be satisfied, that is, in the realization of which he would find his true self. The determination to realize the self in some definite way constitutes an "act of will," which, as thus constituted, is neither arbitrary nor externally determined. For the motive which may be said to be its cause lies *in* the man himself, and the identification of the self with such a motive is a *self*-determination, which is at once both rational and free. The "freedom of man" is constituted, not by a supposed ability to do anything he may choose, but in the power to identify himself with that true good which reason reveals to him as *his* true good. This good consists in the realization of personal character; hence the final good, *i.e.* the moral ideal, as a whole, can be realized only in some society of persons who, while remaining ends to themselves in the sense that their individuality is not lost but rendered more perfect, find this prefection attainable only when the separate individualities are integrated as part of a social whole. Society is as necessary to form persons as persons are to constitute society. Social union is the indispensable condition of the development of the special capacities of the individual members. Human self-perfection cannot be gained in isolation; it is attainable only in inter-relation with fellow-citizens in the social community.

The law of our being, so revealed, involves in its turn civic or political duties. Moral goodness cannot be limited to, still less constituted by, the cultivation of self-regarding virtues, but consists in the attempt to realize in practice that moral ideal which self-analysis has revealed to us as *our* ideal. From this fact arises the ground of political obligation, for the institutions of political or civic life are the concrete embodiment of moral ideas in terms of our day and generation. But, as society exists only for the proper development of persons, we have a criterion by which to test these institutions, viz. do they, or do they not, contribute to the development of moral character in the individual citizens? It is obvious that the final moral ideal is not realized in any body of civic institutions actually existing, but the same analysis which demonstrates this deficiency points out the direction which a true development will take. Hence arises the

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conception of rights and duties which *should be* maintained by law, as opposed to those actually maintained; with the further consequence that it may become occasionally a moral duty to rebel against the state in the interest of the state itself, that is, in order better to subserve that end or function which constitutes the *raison d'être* of the state. The state does not consist in any definite concrete organization formed once for all. It represents a "general will" which is a desire for a common good. Its basis is not a coercive authority imposed upon the citizens from without, but consists in the spiritual recognition, on the part of the citizens, of that which constitutes their true nature. "Will, not force, is the basis of the state."

Green's teaching was, directly and indirectly, the most potent philosophical influence in England during the last quarter of the 19th century, while his enthusiasm for a common citizenship, and his personal example in practical municipal life, inspired much of the effort made, in the years succeeding his death, to bring the universities more into touch with the people, and to break down the rigour of class distinctions.

Of his philosophical doctrine proper, the most striking characteristic is Integration, as opposed to Disintegration, both in thought and in reality. "That which is" is a *whole*, not an *aggregate*; an organic complex of parts, not a mechanical mass; a "whole" too not material but spiritual, "a world of thought-relations." On the critical side this teaching is now admittedly valid against the older empiricism, and the cogency of the reasoning by which his constructive theory is supported is generally recognized. Nevertheless, Green's statement of his conclusions presents important difficulties. Even apart from the impossibility of conceiving a whole of relations which are relations and nothing else (this objection is perhaps largely verbal), no explanation is given of the fact (obvious in experience) that the spiritual entities of which the Universe is composed *appear* material. Certain elements present themselves in feeling which seem stubbornly to resist any attempt to explain them in terms of thought. While, again, legitimately insisting upon personality as a fundamental constituent in any true theory of reality, the relation between human individualities and the divine Person is left vague and obscure; nor is it easy to see how the existence of several individualities—human or divine—in *one* cosmos is theoretically possible. It is at the solution of these two questions that philosophy in the immediate future may be expected to work.

Green's most important treatise—the *Prolegomena to Ethics*—practically complete in manuscript at his death—was published in the year following, under the editorship of A. C. Bradley (1883; 1890). Shortly afterwards R. L. Nettleship's standard edition of his *Works* (exclusive of the *Prolegomena*) appeared in three volumes: vol. i. containing reprints of Green's criticism of Hume, Spencer, Lewes; vol. ii. Lectures on Kant, on Logic, on the Principles of Political Obligation; vol. iii. Miscellanies, preceded by a full *Memoir* by the Editor. The *Principles of Political Obligation* was afterwards published in separate form. A criticism of *Neo-Hegelianism* will be found in Andrew Seth (Pringle Pattison), *Hegelianism and Personality*. See also articles in *Mind* (January and April 1882) by A. J. Balfour and Henry Sidgwick, in the *Academy* (xxviii. 242 and xxv. 297) by S. Alexander, and in the *Philosophical Review* (vi., 1897) by S. S. Laurie; W. H. Fairbrother, *Philosophy of T. H. Green* (London and New York, 1896); D. G. Ritchie, *The Principles of State Interference* (London, 1891); H. Sidgwick, *Lectures on the Philosophy of Kant* (London, 1905); J. H. Muirhead, *The Service of the State: Four Lectures on the Political Teaching of T. H. Green* (1908); A. W. Benn, *English Rationalism in the XIXth Century* (1906), vol. ii., pp. 401 foll. (W. H. F.,* X.)

GREEN, VALENTINE (1739–1813), British engraver, was born at Halesowen. He was placed by his father in a solicitor's office at Evesham, where he remained for two years; but ultimately he decided, on his own responsibility, to abandon the legal profession and became a pupil of a line engraver at Worcester. In 1765 he migrated to London and began work as a mezzotint engraver, having taught himself the technicalities of this art, and quickly rose to a position in absolutely the front rank of British engravers. He became a member of the Incorporated Society of Artists in 1767, an associate-engraver of the Royal Academy in 1775, and for some forty years he followed his profession with the greatest success. The exclusive right of engraving and publishing plates from the pictures in the Düsseldorf gallery was granted him by the duke of Bavaria in 1780, but, after he had issued more than twenty of these plates, the siege of that city by the French put an end to this undertaking and caused him serious financial loss. From this cause, and through the failure of certain other speculations, he was reduced to poverty; and in consequence he took the post of keeper of the British Institution in 1805, and continued in this office for the remainder of his life. During his career as an engraver he produced some four hundred plates after portraits by Reynolds, Romney, and other British artists, after the compositions of Benjamin West, and after pictures by Van Dyck, Rubens, Murillo, and other old masters. It is claimed for him that he was one of the first engravers to show how admirably mezzotint could be applied to the translation of pictorial compositions as well as portraits, but at the present time it is to his portraits that most attention is given by collectors. His engravings are distinguished by exceptional richness and subtlety of tone, and by very judicious management of relations of light and shade; and they have, almost without exception, notable freshness and grace of handling.

See *Valentine Green*, by Alfred Whitman (London, 1902).

GREEN, WILLIAM HENRY (1825–1900), American Hebrew scholar, was born in Groveville, near Bordentown, New Jersey, on the 27th of January 1825. He was descended in the sixth generation from Jonathan Dickinson, first president of the College of New Jersey (now Princeton University), and his ancestors had been closely connected with the Presbyterian church. He graduated in 1840 from Lafayette College, where he was tutor in mathematics (1840–1842) and adjunct professor (1843–1844). In 1846 he graduated from Princeton Theological Seminary, and was instructor in Hebrew there in 1846–1849. He was ordained in 1848 and was pastor of the Central Presbyterian church of Philadelphia in 1849–1851. From August 1851 until his death, in Princeton, New Jersey, on the 10th of February 1900, he was professor of Biblical and Oriental Literature in Princeton Theological Seminary. From 1859 the title of his chair was Oriental and Old Testament Literature. In 1868 he refused the presidency of Princeton College; as senior professor he was long acting head of the Theological Seminary. He was a great Hebrew teacher: his *Grammar of the Hebrew Language* (1861, revised 1888) was a distinct improvement in method on Gesenius, Roediger, Ewald and Nordheimer. All his knowledge of Semitic languages he used in a "conservative Higher Criticism," which is maintained in the following works: *The Pentateuch Vindicated from the Aspersions of Bishop Colenso* (1863), *Moses and the Prophets* (1883), *The Hebrew Feasts in their Relation to Recent Critical Hypotheses Concerning the Pentateuch* (1885), *The Unity of the Book of Genesis* (1895), *The Higher Criticism of the Pentateuch* (1895), and *A General Introduction to the Old Testament*, vol. i. *Canon* (1898), vol. ii. *Text* (1899). He was the scholarly leader of the orthodox wing of the Presbyterian church in America, and was moderator of the General Assembly of 1891. Green was chairman of the Old Testament committee of the Anglo-American Bible revision committee.

See the articles by John D. Davis in *The Biblical World*, new series, vol. xv., pp. 406–413 (Chicago, 1900), and *The Presbyterian and Reformed Review*, vol. xi. pp. 377–396 (Philadelphia, 1900).

GREENAWAY, KATE (1846–1901), English artist and book illustrator, was the daughter of John Greenaway, a well-known draughtsman and engraver on wood, and was born in London on the 17th of March 1846. After a course of study at South Kensington, at "Heatherley's" life classes, and at the Slade School, Kate Greenaway began, in 1868, to exhibit water-colour drawings at the Dudley Gallery, London. Her more remarkable early work, however, consisted of Christmas cards, which, by reason of their quaint beauty of design and charm of draughtsmanship, enjoyed an extraordinary vogue. Her subjects were, in the main, young girls, children, flowers, and landscape; and the air of artless simplicity, freshness, humour, and purity of these little works so appealed to public and artists alike that the enthusiastic welcome habitually accorded to them is to be attributed to something more than love of novelty. In the line she had struck out Kate Greenaway was encouraged by H. Stacy Marks, R.A., and she refused to listen to those friends who urged her to return to a more conventional manner. Thenceforward her illustrations for children (such as for *Little Folks*, 1873, *et seq.*) attracted much attention. In 1877 her drawings at the Dudley Gallery were sold for £54, and her Royal Academy picture for eighteen guineas; and in the same year she began to draw for the

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Illustrated London News. In the year 1879 she produced *Under the Window*, of which 150,000 copies are said to have been sold, and of which French and German editions were also issued. Then followed *The Birthday Book*, *Mother Goose*, *Little Ann*, and other books for children which were appreciated not less by adults, and were to be found on sale in the bookshops of every capital in Europe and in the cities of America. The extraordinary success achieved by the young girl may be estimated by the amounts paid to her as her share of the profits: for *Under the Window* she received £1130; for *The Birthday Book*, £1250; for *Mother Goose*, £900; and for *Little Ann*, £567. These four books alone produced a clear return of £8000. "Toy-books" though they were, these little works created a revolution in illustration, and so were of real importance; they were loudly applauded by John Ruskin (*Art of England* and *Fors Clavigera*), by Ernest Chesneau and Arsène Alexandre in France, by Dr Muther in Germany, and by leading art-critics throughout the world. In 1890 Kate Greenaway was elected a member of the Royal Institute of Painters in Water Colours, and in 1891, 1894 and 1898 she exhibited water-colour drawings, including illustrations for her books, at the gallery of the Fine Art Society (by which a representative selection was exhibited in 1902), where they surprised the world by the infinite delicacy, tenderness, and grace which they displayed. A leading feature in Miss Greenaway's work was her revival of the delightfully quaint costume of the beginning of the 19th century; this lent humour to her fancy, and so captivated the public taste that it has been said, with poetic exaggeration, that "Kate Greenaway dressed the children of two continents." Her drawings of children have been compared with Stothard's for grace and with Reynolds's for naturalness, and those of flowers with the work of van Huysum and Botticelli. From 1883 to 1897, with a break only in 1896, she issued a series of *Kate Greenaway's Almanacs*. Although she illustrated *The Pied Piper of Hamelin* and other works, the artist preferred to provide her own text; the numerous verses which were found among her papers after her death prove that she might have added to her reputation with her pen. She had great charm of character, but was extremely shy of public notice, and not less modest in private life. She died at Hampstead on the 6th of November 1901.

See the *Life*, by M. H. Spielmann and G. S. Layard (1905).

(M. H. S.)

GREENBACKS, a form of paper currency in the United States, so named from the green colour used on the backs of the notes. They are treasury notes, and were first issued by the government in 1862, "as a question of hard necessity," to provide for the expenses of the Civil War. The government, following the example of the banks, had suspended specie payment. The new notes were therefore for the time being an inconvertible paper currency, and, since they were made legal tender, were really a form of fiat money. The first act, providing for the issue of notes to the amount of $150,000,000, was that of the 25th February 1862; the acts of 11th July 1862 and 3rd March 1863 each authorized further issues of $150,000,000. The notes soon depreciated in value, and at the lowest were worth only 35 cents on the dollar. The act of 12th April 1866 authorized the retirement of $10,000,000 of notes within six months and of $4,000,000 per month thereafter; this was discontinued by act of 4th February 1868. On 1st January 1879 specie payment was resumed, and the nominal amount of notes then stood at $346,681,000, which is still outstanding.

The so-called *Greenback party* (also called the *Independent*, and the *National* party) first appeared in a presidential campaign in 1876, when its candidate, Peter Cooper, received 81,740 votes. It advocated increasing the volume of greenbacks, forbidding bank issues, and the paying in greenbacks of the principal of all government bonds not expressly payable in coin. In 1878 the party, by various fusions, cast over 1,000,000 votes and elected 14 Congressmen; and in 1880 there was fusion with labour reformers and it cast 308,578 votes for its presidential candidate, J. B. Weaver, and elected 8 Congressmen. In 1884 their candidate Benjamin F. Butler (also the candidate of the Anti-Monopoly party) received 175,370 votes. Subsequently the party went out of existence.

GREEN BAY, a city and the county-seat of Brown county, Wisconsin, U.S.A., at the S. extremity of Green Bay, at the mouth of the Fox river, 114 m. N. of Milwaukee. Pop. (1890) 9069; (1900) 18,684, of whom 4022 were foreign-born and 33 were negroes; (1910 census) 25,236. The city is served by the Chicago & North-Western, the Chicago, Milwaukee & St Paul, the Kewaunee, Green Bay & Western, and the Green Bay & Western railways, by an inter-urban electric railway connecting with other Fox River Valley cities, and by lake and river steamboat lines. Green Bay lies on high level ground on both sides of the river, which is here crossed by several bridges. The city has the Kellogg Public Library, the Brown County Court House, two high schools, a business college, several academies, two hospitals, an orphan asylum and the State Odd Fellows' Home. It is the seat of a Roman Catholic cathedral, the bishopric being the earliest established in the North-west. The so-called "Tank Cottage," now in Washington Park, is said to be the oldest house in Wisconsin; it was built on the W. bank of the river near its mouth by Joseph Roy, a French-Canadian *voyageur*, in 1766, was subsequently somewhat modified, and in 1908 was bought and removed to its present site by the Green Bay Historical Society. Midway between Green Bay and De Pere (5 m. S.W. of Green Bay) is the state reformatory, opened in 1899–1901. Green Bay's fine harbour accommodates a considerable lake commerce, and the city is the most important railway and wholesale distributing centre in N.E. Wisconsin. Its manufactures include lumber and lumber products, furniture, wagons, woodenware, farm implements and machinery, flour, beer, canned goods, brick and tile and dairy products; and it has lumber yards, grain elevators, fish warehouses and railway repair shops. The total value of the factory product in 1905 was $4,873,027, an increase of 70·9% since 1900. The first recorded visit of a European to the vicinity of what is now Green Bay is that of Jean Nicolet, who was sent west by Champlain in 1634, and found, probably at the Red Banks, some 10 m. below the present city, a village of Winnebago Indians, who he thought at first were Chinese. Between 1654 and 1658 Radisson and Groseilliers and other *coureurs des bois* were at Green Bay. Claude Jean Allouez, the Jesuit missionary, established a mission on the W. shore of the bay, about 20 m. from the present city. Later he removed his mission to the Red Banks, and in the winter of 1671–1672 established it permanently 5 m. above the present city, at Rapides des Pères, on the E. shore of the Fox river. In 1673 Joliet and Marquette visited the spot. In 1683–1685 Le Sueur and Nicholas Perrot traded with the Indians here. In 1718–1720 Fort St Francis was erected at the mouth of the river on the W. bank, and after being several times deserted was permanently re-established in 1732. About 1745 Augustin de Langlade established a trading post at La Baye and later brought his family there from Mackinac. This was the first permanent settlement at Green Bay and in Wisconsin. The British garrison which occupied the fort from 1761 to 1763, during which time the fort received the name of Fort Edward Augustus, was removed at the time of Pontiac's rising, and the fort was never re-garrisoned by the English, except for a short time during the War of 1812. The inhabitants of La Baye were, however, acknowledged subjects of Great Britain, the jurisdiction of the United States being practically a dead letter until the American fort (Fort Howard) was garrisoned in 1816. As early as 1810 fur traders, employed by John Jacob Astor, were stationed here; about 1820 Astor erected a warehouse and other buildings; and for many years Green Bay consisted of two distinct settlements, Astor and Navarino, which were finally united in 1839 as Green Bay. The city was chartered in 1854. In 1893 Fort Howard was consolidated with it. The Green Bay *Intelligencer*, the first newspaper in Wisconsin, began publication here in 1833.

See Neville and Martin, *Historic Green Bay* (Green Bay, 1893); and Martin and Beaumont, *Old Green Bay* (Green Bay, 1900).

GREENCASTLE, a city and the county-seat of Putnam county, Indiana, U.S.A., about 38 m. W. by S. of Indianapolis and on the Big Walnut river. Pop. (1900) 3661; (1910) 3700. It is served by the Cleveland, Cincinnati, Chicago & St. Louis,

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the Chicago, Indianapolis & Louisville, the Vandalia, and the Terre Haute, Indianapolis & Eastern (electric) railways. It has manufactures of some importance, including lumber, pumps, kitchen-cabinets, drag-saws, lightning-rods and tin-plate, is in the midst of a blue grass region, and is a shipping point for beef cattle. The city has a Carnegie library and is the seat of the de Pauw University (co-educational), a Methodist Episcopal institution, founded as Indiana Asbury University in 1837, and renamed in 1884 in honour of Washington Charles de Pauw (1822–1887), a successful capitalist, banker and glass manufacturer. The total gifts of Mr de Pauw and his family to the institution amount to about $600,000. Among the presidents of the university have been Bishop Matthew Simpson, Bishop Thomas Bowman (b. 1817), and Bishop Edwin Holt Hughes (b. 1866), all of the Methodist Episcopal church. The university comprises the Asbury College of Liberal Arts, a School of Music, a School of Art and an Academy, and had in 1909–1910 43 instructors, a library of 37,000 volumes, and 1017 students. Greencastle was first settled about 1820, and was chartered as a city in 1861.

GREENE, GEORGE WASHINGTON (1811–1883), American historian, was born at East Greenwich, Rhode Island, on the 8th of April 1811, the grandson of Major-General Nathanael Greene. He entered Brown University in 1824, left in his junior year on account of ill-health, was in Europe during the next twenty years, except in 1833–1834, when he was principal of Kent Academy at East Greenwich, and was the United States consul at Rome from 1837 to 1845. He was instructor in modern languages in Brown University from 1848 to 1852; and in 1871–1875 was non-resident lecturer in American history in Cornell University. He died at East Greenwich, Rhode Island, on the 2nd of February 1883. His published works include French and Italian text-books; *Historical Studies* (1850); *Biographical Studies* (1860); *Historical View of the American Revolution* (1865); *Life of Nathanael Greene* (3 vols., 1867–1871); *The German Element in the War of American Independence* (1876); and a *Short History of Rhode Island* (1877).

GREENE, MAURICE (1695–1755) English musical composer, was born in London. He was the son of a clergyman in the city, and soon became a chorister of St Paul's cathedral, where he studied under Charles King, and subsequently under Richard Brind, organist of the cathedral from 1707 to 1718, whom, on his death in the last-named year, he succeeded. Nine years later he became organist and composer to the chapel royal, on the death of Dr Croft. In 1730 he was elected to the chair of music in the university of Cambridge, and had the degree of doctor of music conferred on him. Dr Greene was a voluminous composer of church music, and his collection of *Forty Select Anthems* became a standard work of its kind. He wrote a "Te Deum," several oratorios, a masque, *The Judgment of Hercules*, and a pastoral opera, *Phoebe* (1748); also glees and catches: and a collection of *Catches and Canons for Three and Four Voices* is amongst his compositions. In addition he composed many occasional pieces for the king's birthday, having been appointed master of the king's band in 1735. But it is as a composer of church music that Greene is chiefly remembered. It is here that his contrapuntal skill and his sound musical scholarship are chiefly shown. With Handel, Greene was originally on intimate terms, but his equal friendship for Buononcini, Handel's rival, estranged the German master's feelings from him, and all personal intercourse between them ceased. Greene, in conjunction with the violinist Michael Christian Festing (1727–1752) and others, originated the Society of Musicians, for the support of poor artists and their families. He died on the 1st of December 1755.

GREENE, NATHANAEL (1742–1786), American general, son of a Quaker farmer and smith, was born at Potowomut, in the township of Warwick, Rhode Island, on the 7th of August (not, as has been stated, 6th of June) 1742. Though his father's sect discouraged "literary accomplishments," he acquired a large amount of general information, and made a special study of mathematics, history and law. At Coventry, R.I., whither he removed in 1770 to take charge of a forge built by his father and his uncles, he was the first to urge the establishment of a public school; and in the same year he was chosen a member of the legislature of Rhode Island, to which he was re-elected in 1771, 1772 and 1775. He sympathized strongly with the Whig, or Patriot, element among the colonists, and in 1774 joined the local militia. At this time he began to study the art of war. In December 1774 he was on a committee appointed by the assembly to revise the militia laws. His zeal in attending to military duty led to his expulsion from the Society of Friends.

In 1775, in command of the contingent raised by Rhode Island, he joined the American forces at Cambridge, and on the 22nd of June was appointed a brigadier by Congress. To him Washington assigned the command of the city of Boston after it was evacuated by Howe in March 1776. Greene's letters of October 1775 and January 1776 to Samuel Ward, then a delegate from Rhode Island to the Continental Congress, favoured a declaration of independence. On the 9th of August 1776 he was promoted to be one of the four new major-generals and was put in command of the Continental troops on Long Island; he chose the place for fortifications (practically the same as that picked by General Charles Lee) and built the redoubts and entrenchments of Fort Greene on Brooklyn Heights. Severe illness prevented his taking part in the battle of Long Island. He was prominent among those who advised a retreat from New York and the burning of the city, so that the British might not use it. Greene was placed in command of Fort Lee, and on the 25th of October succeeded General Israel Putnam in command of Fort Washington. He received orders from Washington to defend Fort Washington to the last extremity, and on the 11th of October Congress had passed a resolution to the same effect; but later Washington wrote to him to use his own discretion. Greene ordered Colonel Magaw, whowas in immediate command, to defend the place until he should hear from him again, and reinforced it to meet General Howe's attack. Nevertheless, the blame for the losses of Forts Washington and Lee was put upon Greene, but apparently without his losing the confidence of Washington, who indeed himself assumed the responsibility. At Trenton Greene commanded one of the two American columns, his own, accompanied by Washington, arriving first; and after the victory here he urged Washington to push on immediately to Princeton, but was over-ruled by a council of war. At the Brandywine Greene commanded the reserve. At Germantown Greene's command, having a greater distance to march than the right wing under Sullivan, failed to arrive in good time—a failure which Greene himself thought (without cause) would cost him Washington's regard; on this, with the affair of Fort Washington, Bancroft based his unfavourable estimate of Greene's ability. But on their arrival, Greene and his troops distinguished themselves greatly.

At the urgent request of Washington, on the 2nd of March 1778, at Valley Forge, he accepted the office of quartermaster-general (succeeding Thomas Mifflin), and of his conduct in this difficult work, which Washington heartily approved, a modern critic, Colonel H. B. Carrington, has said that it was "as good as was possible under the circumstances of that fluctuating uncertain force." He had become quartermaster-general on the understanding, however, that he should retain the right to command troops in the field; thus we find him at the head of the right wing at Monmouth on the 28th of June. In August Greene and Lafayette commanded the land forces sent to Rhode Island to co-operate with the French admiral d'Estaing, in an expedition which proved abortive. In June 1780 Greene commanded in a skirmish at Springfield, New Jersey. In August he resigned the office of quartermaster-general, after a long and bitter struggle with Congress over the interference in army administration by the Treasury Board and by commissions appointed by Congress. Before his resignation became effective it fell to his lot to preside over the court which, on the 29th of September, condemned Major John André to death.

On the 14th of October he succeeded Gates as commander-in-chief of the Southern army, and took command at Charlotte, N.C.,

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on the 2nd of December. The army was weak and badly equipped and was opposed by a superior force under Cornwallis. Greene decided to divide his own troops, thus forcing the division of the British as well, and creating the possibility of a strategic interplay of forces. This strategy led to General Daniel Morgan's victory of Cowpens (just over the South Carolina line) on the 17th of January 1781, and to the battle at Guilford Court House, N.C. (March 15), in which after having weakened the British troops by continual movements, and drawn in reinforcements for his own army, Greene was defeated indeed, but only at such cost to the victor that Tarleton called it "the pledge of ultimate defeat." Three days after this battle Cornwallis withdrew toward Wilmington. Greene's generalship and judgment were again conspicuously illustrated in the next few weeks, in which he allowed Cornwallis to march north to Virginia and himself turned swiftly to the reconquest of the inner country of South Carolina. This, in spite of a reverse sustained at Lord Rawdon's hands at Hobkirk's Hill (2 m. N. of Camden) on the 25th of April, he achieved by the end of June, the British retiring to the coast. Greene then gave his forces a six weeks' rest on the High Hills of the Santee, and on the 8th of September, with 2600 men, engaged the British under Lieut.-Colonel James Stuart (who had succeeded Lord Rawdon) at Eutaw Springs; the battle, although tactically drawn, so weakened the British that they withdrew to Charleston, where Greene penned them during the remaining months of the war. Greene's Southern campaign showed remarkable strategic features that remind one of those of Turenne, the commander whom he had taken as his model in his studies before the war. He excelled in dividing, eluding and tiring his opponent by long marches, and in actual conflict forcing him to pay for a temporary advantage a price that he could not afford. He was greatly assisted by able subordinates, including the Polish engineer, Tadeusz Kosciusko, the brilliant cavalry captains, Henry ("Light-Horse Harry") Lee and William Washington, and the partisan leaders, Thomas Sumter and Francis Marion.

South Carolina and Georgia voted Greene liberal grants of lands and money. The South Carolina estate, Boone's Barony, S. of Edisto in Bamberg County, he sold to meet bills for the rations of his Southern army. On the Georgia estate, Mulberry Grove, 14 m. above Savannah, on the river, he settled in 1785, after twice refusing (1781 and 1784) the post of secretary of war, and there he died of sunstroke on the 19th of June 1786. Greene was a singularly able, and—like other prominent generals on the American side—a self-trained soldier, and was second only to Washington among the officers of the American army in military ability. Like Washington he had the great gift of using small means to the utmost advantage. His attitude towards the Tories was humane and even kindly, and he generously defended Gates, who had repeatedly intrigued against him, when Gates's conduct of the campaign in the South was criticized. There is a monument to Greene in Savannah (1829). His statue, with that of Roger Williams, represents the state of Rhode Island in the National Hall of Statuary in the Capitol at Washington; in the same city there is a bronze equestrian statue of him by H. K. Brown.

See the *Life of Nathanael Greene* (3 vols., 1867–1871), by his grandson, George W. Greene, and the biography (New York, 1893), by Brig.-Gen. F. V. Greene, in the "Great Commanders Series."

GREENE, ROBERT (*c.* 1560–1592), English dramatist and miscellaneous writer, was born at Norwich about 1560. The identity of his father has been disputed, but there is every reason to believe that he belonged to the tradesmen's class and had small means. It is doubtful whether Robert Greene attended Norwich grammar school; but, as an eastern counties man (to one of whose plays, *Friar Bacon*, the Norfolk and Suffolk borderland owes a lasting poetic commemoration) he naturally found his way to Cambridge, where he entered St John's College as a sizar in 1575 and took his B.A. thence in 1579, proceeding M.A. in 1583 from Clare Hall. His life at the university was, according to his own account, spent "among wags as lewd as himself, with whom he consumed the flower of his youth." In 1588 he was incorporated at Oxford, so that on some of his title-pages he styles himself "utriusque Academiae in Artibus Magister"; and Nashe humorously refers to him as "utriusque Academiae Robertus Greene." Between the years 1578 and 1583 he had travelled abroad, according to his own account very extensively, visiting France, Germany, Poland and Denmark, besides learning at first-hand to "hate the pride of Italie" and to know the taste of that poet's fruit, "Spanish mirabolones." The grounds upon which it has been suggested that he took holy orders are quite insufficient; according to the title-page of a pamphlet published by him in 1585 he was then a "student in phisicke." Already, however, after taking his M.A. degree, he had according to his own account begun his London life, and his earliest extant literary production was in hand as early as 1580. He now became "an author of playes and a penner of love-pamphlets, so that I soone grew famous in that qualitie, that who for that traide growne so ordinary about London as Robin Greene?" "Glad was that printer," says Nashe, "that might bee so blest to pay him deare for the very dregs of his wit." By his own account he rapidly sank into the worst debaucheries of the town, though Nashe declares that he never knew him guilty of notorious crime. He was not without passing impulses towards a more righteous and sober life, and was derided in consequence by his associates as a "Puritane and Presizian." It is possible that he, as well as his bitter enemy, Gabriel Harvey, exaggerated the looseness of his conduct. His marriage, which took place in 1585 or 1586, failed to steady him; if Francesco, in Greene's pamphlet *Never too late to mend* (1590), is intended for the author himself, it had been a runaway match; but the fiction and the autobiographical sketch in the *Repentance* agree in their account of the unfaithfulness which followed on the part of the husband. He lived with his wife, whose name seems to have been Dorothy ("Doll"; and cf. Dorothea in *James IV.*), for a while; "but forasmuch as she would perswade me from my wilful wickednes, after I had a child by her, I cast her off, having spent up the marriage-money which I obtained by her. Then left I her at six or seven, who went into Lincolnshire, and I to London," where his reputation as a playwright and writer of pamphlets of "love and vaine fantasyes" continued to increase, and where his life was a feverish alternation of labour and debauchery. In his last years he took it upon himself to make war on the cutpurses and "conny-catchers" with whom he came into contact in the slums, and whose doings he fearlessly exposed in his writings. He tells us how at last he was friendless "except it were in a fewe alehouses," where he was respected on account of the score he had run up. When the end came he was a dependant on the charity of the poor and the pitying love of the unfortunate. Henri Murger has drawn no picture more sickening and more pitiful than the story of Greene's death, as told by his Puritan adversary, Gabriel Harvey—a veracious though a far from unprejudiced narrator. Greene had taken up the cudgels provided by the Harvey brothers on their intervention in the Marprelate controversy, and made an attack (immediately suppressed) upon Gabriel's father and family in the prose-tract *A Quip for an Upstart Courtier, or a Quaint Dispute between Velvet Breeches and Cloth Breeches* (1592). After a banquet where the chief guest had been Thomas Nashe—an old associate and perhaps a college friend of Greene's, any great intimacy with whom, however, he seems to have been anxious to disclaim—Greene had fallen sick "of a surfeit of pickle herringe and Rennish wine." At the house of a poor shoemaker near Dowgate, deserted by all except his compassionate hostess (Mrs Isam) and two women—one of them the sister of a notorious thief named "Cutting Ball," and the mother of his illegitimate son, Fortunatus Greene—he died on the 3rd of September 1592. Shortly before his death he wrote under a bond for £10 which he had given to the good shoemaker, the following words addressed to his long-forsaken wife: "Doll, I charge thee, by the loue of our youth and by my soules rest, that thou wilte see this man paide; for if hee and his wife had not succoured me, I had died in the streetes.—Robert Greene."

Four Letters and Certain Sonnets, Harvey's attack on Greene.

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appeared almost immediately after his death, as to the circumstances of which his relentless adversary had taken care to inform himself personally. Nashe took up the defence of his dead friend and ridiculed Harvey in *Strange News* (1593); and the dispute continued for some years. But, before this, the dramatist Henry Chettle published a pamphlet from the hand of the unhappy man, entitled *Greene's Groat's-worth of Wit bought with a Million of Repentance* (1592), containing the story of Roberto, who may be regarded, for practical purposes, as representing Greene himself. This ill-starred production may almost be said to have done more to excite the resentment of posterity against Greene's name than all the errors for which he professed his repentance. For in it he exhorted to repentance three of his *quondam* acquaintance. Of these three Marlowe was one—to whom and to whose creation of "that Atheist Tamberlaine" he had repeatedly alluded. The second was Peele, the third probably Nashe. But the passage addressed to Peele contained a transparent allusion to a fourth dramatist, who was an actor likewise, as "an vpstart crow beautified with our feathers, that with his *Tygres heart wrapt in a player's hyde* supposes hee is as well able to bombast out a blanke-verse as the best of you; and being an absolute Iohannes-fac-totum, is in his owne conceyt the only shake-scene in a countrey." The phrase italicized parodies a passage occurring in *The True Tragedie of Richard, Duke of York*, &c., and retained in Part III. of *Henry VI*. If Greene (as many eminent critics have thought) had a hand in *The True Tragedie*, he must here have intended a charge of plagiarism against Shakespeare. But while it seems more probable that (as the late R. Simpson suggested) the upstart crow beautified with the feathers of the three dramatists is a sneering description of the actor who declaimed their verse, the *animus* of the whole attack (as explained by Dr Ingleby) is revealed in its concluding phrases. This "shake-scene," *i.e.* this *actor* had ventured to intrude upon the domain of the regular staff of playwrights—their monopoly was in danger!

Two other prose pamphlets of an autobiographical nature were issued posthumously. Of these, *The Repentance of Robert Greene, Master of Arts* (1592), must originally have been written by him on his death-bed, under the influence, as he says, of Father Parsons's *Booke of Resolution* (*The Christian Directorie, appertayning to Resolution*, 1582, republished in an enlarged form, which became very popular, in 1585); but it bears traces of having been improved from the original; while *Greene's Vision* was certainly not, as the title-page avers, written during his last illness.

Altogether not less than thirty-five prose-tracts are ascribed to Greene's prolific pen. Nearly all of them are interspersed with verses; in their themes they range from the "misticall" wonders of the heavens to the familiar but "pernitious sleights" of the sharpers of London. But the most widely attractive of his prose publications were his "love-pamphlets," which brought upon him the outcry of Puritan censors. The earliest of his novels, as they may be called, *Mamillia*, was licensed in 1583. This interesting story may be said to have accompanied Greene through life; for even part ii., of which, though probably completed several years earlier, the earliest extant edition bears the date 1593, had a sequel, *The Anatomie of Love's Flatteries*, which contains a review of suitors recalling Portia's in *The Merchant of Venice*. *The Myrrour of Modestie* (the story of Susanna) (1584); *The Historie of Arbasto, King of Denmarke* (1584); *Morando, the Tritameron of Love* (a rather tedious imitation of the *Decameron* (1584); *Planetomachia* (1585) (a contention in story-telling between Venus and Saturn); *Penelope's Web* (1587) (another string of stories); *Alcida, Greene's Metamorphosis* (1588), and others, followed. In these popular productions he appears very distinctly as a follower of John Lyly; indeed, the first part of *Mamillia* was entered in the Stationers' Registers in the year of the appearance of *Euphues*, and two of Greene's novels are by their titles announced as a kind of sequel to the parent romance: *Euphues his Censure to Philautus* (1587), *Menaphon*. *Camilla's Alarum to Slumbering Euphues* (1589), named in some later editions *Greene's Arcadia*. This pastoral romance, written in direct emulation of Sidney's, with a heroine called Samila, contains St Sephestia's charming lullaby, with its refrain "Father's sorowe, father's joy." But, though Greene's style copies the balanced oscillation, and his diction the ornateness (including the proverbial philosophy) of Lyly, he contrives to interest by the matter as well as to attract attention by the manner of his narratives. Of his highly moral intentions he leaves the reader in no doubt, since they are exposed on the title-pages. The full title of the *Myrrour of Modestie* for instance continues: "wherein appeareth as in a perfect glasse how the Lord delivereth the innocent from all imminent perils, and plagueth the blood-thirsty hypocrites with deserved punishments," &c. On his *Pandosto, The Triumph of Time* (1588) Shakespeare founded *A Winter's Tale*; in fact, the novel contains the entire plot of the comedy, except the device of the living statue; though some of the subordinate characters in the play, including Autolycus, were added by Shakespeare, together with the pastoral fragrance of one of its episodes.

In Greene's *Never too Late* (1590), announced as a "Powder of Experience: sent to all youthfull gentlemen" for their benefit, the hero, Francesco, is in all probability intended for Greene himself, the sequel or second part is, however, pure fiction. This episodical narrative has a vivacity and truthfulness of manner which savour of an 18th century novel rather than of an Elizabethan tale concerning the days of "Palmerin, King of Great Britain." Philador, the prodigal of *The Mourning Garment* (1590), is obviously also in some respects a portrait of the writer. The experiences of the Roberto of *Greene's Groat's-worth of Wit* (1592) are even more palpably the experiences of the author himself, though they are possibly overdrawn—for a born rhetorician exaggerates everything, even his own sins. Besides these and the posthumous pamphlets on his repentance, Greene left realistic pictures of the very disreputable society to which he finally descended, in his pamphlets on "conny-catching": *A Notable Discovery of Coosnage* (1591), *The Blacke Bookes Messenger*. *Laying open the Life and Death of Ned Browne, one of the most Notable Cutpurses, Crossbiters, and Conny-catchers that ever lived in England* (1592). Much in Greene's manner, both in his romances and in his pictures of low life, anticipated what proved the slow course of the actual development of the English novel, and it is probable that his *Repentance*, and that which best suited the bright fancy, ingenuity and wit of which his genius was compounded, was pamphlet-spinning and story-telling rather than dramatic composition. It should be added that, euphuist as Greene was, few of his contemporaries in their lyrics warbled wood-notes which like his resemble Shakespeare's in their native freshness.

Curiously enough, as Mr Churton Collins has pointed out, Greene, except in the two pamphlets written just before his death, never refers to his having written plays; and before 1592 his contemporaries are equally silent as to his labours as a playwright. Only four plays remain to us of which he was indisputably the sole author. The earliest of these seems to have been the *Comicall History of Alphonsus, King of Arragon*, of which Henslowe's *Diary* contains no trace. But it can hardly have been first acted long after the production of Marlowe's *Tamburlaine*, which had, in all probability, been brought on the stage in 1587. For this play, "comical" only in the negative sense of having a happy ending, was manifestly written in emulation as well as in direct imitation of Marlowe's tragedy. While Greene cannot have thought himself capable of surpassing Marlowe as a tragic poet, he very probably wished to outdo him in "business," and to equal him in the rant which was sure to bring down at least part of the house. *Alphonsus* is a *history* proper—a dramatized chronicle or narrative of warlike events. Its fame could never equal that of Marlowe's tragedy; but its composition showed that Greene could seek to rival the most popular drama of the day, without falling very far short of his model.

In the *Honourable History of Friar Bacon and Friar Bungay* (not known to have been acted before February, 1592, but probably written in 1589) Greene once more attempted to emulate

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Marlowe; and he succeeded in producing a masterpiece of his own. Marlowe's *Doctor Faustus*, which doubtless suggested the composition of Greene's comedy, reveals the mighty tragic genius of its author; but Greene resolved on an altogether distinct treatment of a cognate theme. Interweaving with the popular tale of Friar Bacon and his wondrous doings a charming idyl (so far as we know, of his own invention), the story of Prince Edward's love for the Fair Maid of Fressingfield, he produced a comedy brimful of amusing action and genial fun. *Friar Bacon* remains a dramatic picture of English Elizabethan life with which *The Merry Wives* alone can vie; and not even the ultra-classicism in the similes of its diction can destroy the naturalness which constitutes its perennial charm. *The History of Orlando Furioso, one of the Twelve Peeres of France* has on unsatisfactory evidence been dated as before 1586, and is known to have been acted on the 21st of February 1592. It is a free dramatic adaptation of Ariosto, Harington's translation of whom appeared in 1591, and who in one passage is textually quoted; and it contains a large variety of characters and a superabundance of action. Fairly lucid in arrangement and fluent in style, the treatment of the madness of Orlando lacks tragic power. Very few dramatists from Sophocles to Shakespeare have succeeded in subordinating the grotesque effect of madness to the tragic; and Greene is not to be included in the list.

In *The Scottish Historie of James IV.* (acted 1592, licensed for publication 1594) Greene seems to have reached the climax of his dramatic powers. The "historical" character of this play is pure pretence. The story is taken from one of Giraldi Cinthio's tales. Its theme is the illicit passion of King James for the chaste lady Ida, to obtain whose hand he endeavours, at the suggestion of a villain called Ateukin, to make away with his own wife. She escapes in doublet and hose, attended by her faithful dwarf; but, on her father's making war upon her husband to avenge her wrongs, she brings about a reconciliation between them. Not only is this well-constructed story effectively worked out, but the characters are vigorously drawn, and in Ateukin there is a touch of Iago. The fooling by Slipper, the clown of the piece, is unexceptionable; and, lest even so the play should hang heavy on the audience, its action is carried off by a "pleasant comedie"—*i.e.* a prelude and some dances between the acts—"presented by Oboram, King of Fayeries," who is, however, a very different person from the Oberon of *A Midsummer Night's Dream*.

George-a-Greene the Pinner of Wakefield (acted 1593, printed 1599), a delightful picture of English life fully worthy of the author of *Friar Bungay*, has been attributed to him; but the external evidence is very slight, and the internal unconvincing. Of the comedy of *Fair Em*, which resembles *Friar Bacon* in more than one point, Greene cannot have been the author; the question as to the priority between the two plays is not so easily solved. The conjecture as to his supposed share in the plays on which the second and third parts of *Henry VI.* are founded has been already referred to. He was certainly joint author with Thomas Lodge of the curious drama called *A Looking Glasse for London and England* (acted in 1592 and printed in 1594)—a dramatic apologue conveying to the living generation of Englishmen the warning of Nineveh's corruption and prophesied doom. The lesson was frequently repeated in the streets of London by the "Ninevitical motions" of the puppets; but there are both fire and wealth of language in Greene and Lodge's oratory. The comic element is not absent, being supplied in abundance by Adam, the clown of the piece, who belongs to the family of Slipper, and of Friar Bacon's servant, Miles.

Greene's dramatic genius has nothing in it of the intensity of Marlowe's tragic muse; nor perhaps does he ever equal Peele at his best. On the other hand, his dramatic poetry is occasionally animated with the breezy freshness which no artifice can simulate. He had considerable constructive skill, but he has created no character of commanding power—unless Ateukin be excepted; but his personages are living men and women, and marked out from one another with a vigorous but far from rude hand. His comic humour is undeniable, and he had the gift of light and graceful dialogue. His diction is overloaded with classical ornament, but his versification is easy and fluent, and its cadence is at times singularly sweet. He creates his best effects by the simplest means; and he is indisputably one of the most attractive of early English dramatic authors.

Greene's dramatic works and poems were edited by Alexander Dyce in 1831 with a life of the author. This edition was reissued in one volume in 1858. His complete works were edited for the Huth Library by A. B. Grosart. This issue (1881–1886) contains a translation of Nicholas Storojhenko's monograph on Greene (Moscow, 1878). Greene's plays and poems were edited with introductions and notes by J. Churton Collins in 2 vols. (Oxford, 1905); the general introduction to this edition has superseded previous accounts of Greene and his dramatic and lyrical writings. An account of his pamphlets is to be found in J. J. Jusserand's *English Novel in the Time of Shakespeare* (Eng. trans., 1890). See also W. Bernhardi, *Robert Greenes Leben und Schriften* (1874); F. M. Bodenstedt, in *Shakespeare's Zeitgenossen und ihre Werke* (1858); and an introduction by A. W. Ward to *Friar Bacon and Friar Bungay* (Oxford, 1880, 4th ed., 1901). (A. W. W.)

GREENFIELD, a township and the county-seat of Franklin county, in N.E. Massachusetts, U.S.A., including an area of 20 sq. m. of meadow and hill country, watered by the Green and Deerfield rivers and various small tributaries. Pop. (1890) 5252, (1900) 7927, of whom 1431 were foreign-born; (1910 census) 10,427. The principal village, of the same name as the township, is situated on the N. bank of the Deerfield river, and on the Boston & Maine railway and the Connecticut Valley street railway (electric). Among Greenfield's manufactures are cutlery, machinery, and taps and dies. Greenfield, originally part of Deerfield, was settled about 1682, was established as a "district" in 1753, and on the 23rd of August 1775 was, by a general Act, separated from Deerfield and incorporated as a separate township, although it had assumed full township rights in 1774 by sending delegates to the Provincial Congress. In 1793 part of it was taken to form the township of Gill; in 1838 part of it was annexed to Bernardston; and in 1896 it annexed a part of Deerfield. It was much disaffected at the time of Shays's Rebellion.

See F. M. Thompson, *History of Greenfield* (2 vols., Greenfield, 1904).

GREENFINCH (Ger. *Grünfink*), or GREEN LINNET, as it is very often called, a common European bird, the *Fringilla chloris* of Linnaeus, ranked by many systematists with one section of hawfinches, *Coccothraustes*, but apparently more nearly allied to the other section *Hesperiphona*, and perhaps justifiably deemed the type of a distinct genus, to which the name *Chloris* or *Ligurinus* has been applied. The cock, in his plumage of yellowish-green and yellow is one of the most finely coloured of common English birds, but he is rather heavily built, and his song is hardly commended. The hen is much less brightly tinted. Throughout Britain, as a rule, this species is one of the most plentiful birds, and is found at all seasons of the year. It pervades almost the whole of Europe, and in Asia reaches the river Ob. It visits Palestine, but is unknown in Egypt. It is, however, abundant in Mauritania, whence specimens are so brightly coloured that they have been deemed to form a distinct species, the *Ligurinus aurantiiventris* of Dr Cabanis, but that view is now generally abandoned. In the north-east of Asia and its adjacent islands occur two allied species—the *Fringilla sinica* of Linnaeus and the *F. kawarahiba* of Temminck. (A. N.)

GREENHEART, one of the most valuable of timbers, the produce of *Nectandra Rodiaei*, natural order Lauraceae, a large tree, native of tropical South America and the West Indies. The Indian name of the tree is *sipiri* or *bibiru*, and from its bark and fruits is obtained the febrifuge principle bibirine. Greenheart wood is of a dark-green colour, sap wood and heart wood being so much alike that they can with difficulty be distinguished from each other. The heart wood is one of the most durable of all timbers, and its value is greatly enhanced by the fact that it is proof against the ravages of many marine borers which rapidly destroy piles and other submarine structures of most other kinds of wood available for such purposes. In the Kelvingrove Museum, Glasgow, there are two pieces of planking from a wreck submerged during eighteen years on the west coast of Scotland.

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The one specimen—greenheart—is merely slightly pitted on the surface, the body of the wood being perfectly sound and untouched, while the other—teak—is almost entirely eaten away. Greenheart, tested either by transverse or by tensile strain, is one of the strongest of all woods, and it is also exceedingly dense, its specific gravity being about 1150. It is included in the second line of Lloyd's Register for shipbuilding purposes, and it is extensively used for keelsons, beams, engine-bearers and planking, &c., as well as in the general engineering arts, but its excessive weight unfits it for many purposes for which its other properties would render it eminently suitable.

GREENLAND (Danish, &c., *Grönland*), a large continental island, the greater portion of which lies within the Arctic Circle, while the whole is arctic in character. It is not connected with any portion of Europe or America except by suboceanic ridges; but in the extreme north it is separated only by a narrow strait from Ellesmere Land in the archipelago of the American continent. It is bounded on the east by the North Atlantic, the Norwegian and Greenland Seas—Jan Mayen, Iceland, the Faeroe Islands and the Shetlands being the only lands between it and Norway. Denmark Strait is the sea between it and Iceland, and the northern Norwegian Sea or Greenland Sea separates it from Spitsbergen. On the west Davis Strait and Baffin Bay separate it from Baffin Land. The so-called bay narrows northward into the strait successively known as Smith Sound, Kane Basin, Kennedy Channel and Robeson Channel. A submarine ridge, about 300 fathoms deep at its deepest, unites Greenland with Iceland (across Denmark Strait), the Faeroes and Scotland. A similar submarine ridge unites it with the Cumberland Peninsula of Baffin Land, across Davis Strait. Two large islands (with others smaller) lie probably off the north coast, being apparently divided from it by very narrow channels which are not yet explored. If they be reckoned as integral parts of Greenland, then the north coast, fronting the polar sea, culminates about 83° 40′ N. Cape Farewell, the most southerly point (also on a small island), is in 59° 45′ N. The extreme length of Greenland may therefore be set down at about 1650 m., while its extreme breadth, which occurs about 77° 30′ N., is approximately 800 m. The area is estimated at 827,375 sq. m. Greenland is a Danish colony, inasmuch as the west coast and also the southern east coast belong to the Danish crown. The scattered settlements of Europeans on the southern parts of the coasts are Danish, and the trade is a monopoly of the Danish government.

The southern and south-western coasts have been known, as will be mentioned later, since the 10th century, when Norse settlers appeared there, and the names of many famous arctic explorers have been associated with the exploration of Greenland. The communication between the Norse settlements in Greenland and the motherland Norway was broken off at the end of the 14th and the beginning of the 15th century, and the Norsemen's knowledge about their distant colony was gradually more or less forgotten. The south and west coast of Greenland was then re-discovered by John Davis in July 1585, though previous explorers, as Cortereal, Frobisher and others, had seen it, and at the end of the 16th and the beginning of the 17th century the work of Davis (1586–1588), Hudson (1610) and Baffin (1616) in the western seas afforded some knowledge of the west coast. This was added to by later explorers and by whalers and sealers. Among explorers who in the 19th century were specially connected with the north-west coast may be mentioned E. A. Inglefield (1852) who sailed into Smith's Sound,[1] Elisha Kent Kane (1853–1855)[2] who worked northward through Smith Sound into Kane Basin, and Charles Francis Hall (1871) who explored the strait (Kennedy Channel and Robeson Channel) to the north of this.[3]

The northern east coast was sighted by Hudson (1607) in about 73° 30′ N. (C. Hold with Hope), and during the 17th century and later this northern coast was probably visited by many Dutch whalers. The first who gave more accurate information was the Scottish whaler, Captain William Scoresby, jun. (1822), who, with his father, explored the coast between 69° and 75° N., and gave the first fairly trustworthy map of it.[4] Captains Edward Sabine and Clavering (1823) visited the coast between 72° 5′ and 75° 12′ N. and met the only Eskimo ever seen in this part of Greenland. The second German polar expedition in 1870, under Carl Christian Koldewey[5] (1837–1908), reached 77° N. (Cape Bismarck); and the duke of Orleans, in 1905, ascertained that this point was on an island (the Dove Bay of the German expedition being in reality a strait) and penetrated farther north, to about 78° 16′. From this point the north-east coast remained unexplored, though a sight was reported in 1670 by a whaler named Lambert, and again in 1775 as far north as 79° by Daines Barrington, until a Danish expedition under Mylius Erichsen in 1906–1908 explored it, discovering North-East Foreland, the easternmost point (see POLAR REGIONS and map). The southern part of the east coast was first explored by the Dane Wilhelm August Graah (1829–1830) between Cape Farewell and 65° 16′ N.[6] In 1883–1885 the Danes G. Holm and T. V. Garde carefully explored and mapped the coast from Cape Farewell to Angmagssalik, in 66° N.; F. Nansen and his companions also travelled along a part of this coast in 1888.[7] A. E. Nordenskiöld, in the "Sophia," landed near Angmagssalik, in 65° 36′ N., in 1883.[8] Captain C. Ryder, in 1891–1892, explored and mapped the large Scoresby Sound, or, more correctly, Scoresby Fjord.[10] Lieutenant G. Amdrup, in 1899, explored the coast from Angmagssalik north to 67° 22′ N.[11] A part of this coast, about 67° N., had also been seen by Nansen in 1882.[12] In 1899 Professor A. G. Nathorst explored the land between Franz Josef Fjord and Scoresby Fjord, where the large King Oscar Fjord, connecting Davy's Sound with Franz Joseph Fjord, was discovered.[13] In 1900 Lieutenant Amdrup explored the still unknown east coast from 69° 10′ N. south to 67° N.[14]

From the work of explorers in the north-west it had been possible to infer the approximate latitude of the northward termination of Greenland long before it was definitely known. Towards the close of the 19th century several explorers gave attention to this question. Lieutenant (afterwards Admiral) L. A. Beaumont (1876), of the Nares Expedition, explored the coast north-east of Robeson Channel to 82° 20′ N.[15] In 1882 Lieut. J. B. Lockwood and Sergeant (afterwards Captain) D. L. Brainard, of the U.S. expedition to Lady Franklin Bay,[16] explored the north-west coast beyond Beaumont's farthest to a promontory in 83° 24′ N. and 40° 46′ E. and they saw to the north-east Cape Washington, in about 83° 38′ N. and 39° 30′ E., the most northerly point of land till then observed. In July 1892 R. E. Peary and E. Astrup, crossing by land from Inglefield Gulf, Smith Sound, discovered Independence Bay on the north-east coast in 81° 37′ N. and 34° 5′ W.[17] In May 1895 it

[1] Inglefield, *Summer Search for Franklin* (London, 1853).
[2] *Second Grinnell Expedition* (2 vols., Philadelphia, 1856).
[3] Davis, *Polaris (Hall's) North Polar Expedition* (Washington, 1876). See also Bessels, *Die amerikanische Nordpol-Expedition* (Leipzig, 1879).
[4] *Journal of a Voyage to the Northern Whale Fishery* (1823).
[5] *Die zweite deutsche Nordpolarfahrt* (1873–1875).
[6] *Reise til Östkysten af Grönland* (1832; trans. by G. Gordon Macdougall, 1837).
[7] *Meddelelser om Grönland*, parts ix. and x. (Copenhagen, 1888).
[8] *The First Crossing of Greenland*, vol. i. (London, 1890). H. Mohn and F. Nansen; "Wissenschaftliche Ergebnisse von Dr F. Nansen Durchquerung von Grönland" (1888), Ergänzungsheft No. 105 zu *Petermanns Mitteilungen* (Gotha, 1892).
[9] A. F. Nordenskiöld, *Den andra Dicksonska Expeditionen til Grönland* (Stockholm, 1885).
[10] *Meddelelser om Grönland*, pts. xvii.-xix (Copenhagen, 1895–1896).
[11] *Geografisk Tidskrift*, xv. 53-71 (Copenhagen, 1899).
[12] *Ibid.* vii. 76-79 (Copenhagen, 1884).
[13] *The Geographical Journal*, xiv. 534 (1899); xvii. 48 (1901).;
Två Somrar i Norra Ishafvet (Stockholm, 1901).
[14] *Meddelelser om Grönland*, parts xxvi.-xxvii.
[15] Nares, *Voyage to the Polar Sea* (2 vols. London, 1877). See also Blue Book, journals, &c., (Nares) Expedition, 1875–1876 (London, 1877).
[16] A. W. Greely, *Report on the Proceedings of the United States Expedition to Lady Franklin Bay, Grinnell Land*, vols. i. and ii. (Washington, 1885); *Three Years of Arctic Service* (2 vols. London, 1886).
[17] R. E. Peary, *Northward over the "Great Ice"* (2 vols. New York, 1898); E. Astrup, *Blandt Nordpolens's Naboer* (Christiania, 1895).

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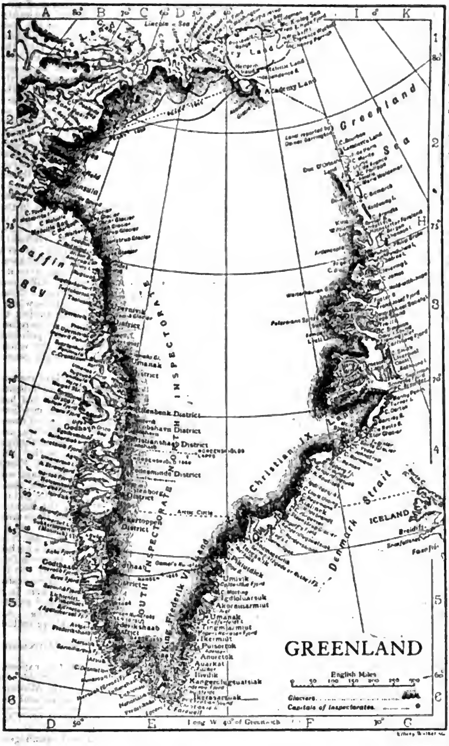
was revisited by Peary, who supposed this bay to be a sound communicating with Victoria Inlet on the north-west coast. To the north Heilprin Land and Melville Land were seen stretching northwards, but the probability seemed to be that the coast soon trended north-west. In 1901 Peary rounded the north point, and penetrated as far north as 83° 50′ N. The scanty exploration of the great ice-cap, or inland ice, which may be asserted to cover the whole of the interior of Greenland, has been prosecuted chiefly from the west coast. In 1751 Lars Dalager, a Danish trader, took some steps in this direction from Frederikshaab. In 1870 Nordenskiöld and Berggren walked 35 m. inland from the head of Aulatsivik Fjord (near Disco Bay) to an elevation of 2200 ft. The Danish captain Jens Arnold Dietrich Jensen reached, in 1878, the Jensen Nunataks (5400 ft. above the sea), about 45 m. from the western margin, in 62° 50′ N.[1] Nordenskiöld penetrated in 1883 about 70 m. inland in 68° 20′ N., and two Lapps of his expedition went still farther on skis, to a point nearly under 45° W. at an elevation of 6600 ft. Peary and Maigaard reached in 1886 about 100 m. inland, a height of 7500 ft. in 69° 30′ N. Nansen with five companions in 1888 made the first complete crossing of the inland ice, working from the east coast to the west, about 64° 25′ N., and reached a height of 8922 ft. Peary and Astrup, as already indicated, crossed in 1892 the northern part of the inland ice between 78° and 82° N., reaching a height of about 8000 ft., and determined the northern termination of the ice-covering. Peary made very nearly the same journey again in 1895. Captain T. V. Garde explored in 1893 the interior of the inland ice between 61° and 62° N. near its southern termination, and he reached a height of 7080 ft. about 60 m. from the margin.[2]



Coasts.—The coasts of Greenland are for the most part deeply indented with fjords, being intensely glaciated. The coast-line of Melville Bay (the northern part of the west coast) is to some degree an exception, though the fjords may here be somewhat filled with glaciers, and, for another example, it may be noted that Peary observed a marked contrast on the north coast. Eastward as far as Cape Morris Jesup there are precipitous headlands and islands, as elsewhere, with deep water close inshore. East of the same cape there is an abrupt change; the coast is unbroken, the mountains recede inland, and there is shoal-water for a considerable distance from the coast. Numerous islands lie off the coasts where they are indented; but these are in no case large, excepting those off the north coast, and that of Disco off the west, which is crossed by the parallel of 70° N. This island, which is separated by Waigat Strait from the Nugsuak peninsula, is lofty, and has an area of 3005 sq. m. Steenstrup in 1898 discovered in it the warmest spring known in Greenland, having a temperature of 66° F.

The unusual glaciation of the east coast is evidently owing to the north polar current carrying the ice masses from the north polar basin south-westward along the land, and giving it an entirely arctic climate down to Cape Farewell. In some parts the interior ice-covering extends down to the outer coast, while in other parts its margin is situated more inland, and the ice-bare coast-land is deeply intersected by fjords extending far into the interior, where they are blocked by enormous glaciers or "ice-currents" from the interior ice-covering which discharge masses of icebergs into them. The east coast of Greenland is in this respect highly interesting. All coasts in the world which are much intersected by deep fjords have, with very few exceptions, a western exposure, *e.g.* Norway, Scotland, British Columbia and Alaska, Patagonia and Chile, and even Spitsbergen and Novaya Zemlya, whose west coasts are far more indented than their east ones. Greenland forms the most prominent exception, its eastern coast being quite as much indented as its western. The reason is to be found in its geographical position, a cold ice-covered polar current running south along the land, while not far outside there is an open warmer sea, a circumstance which, while producing a cold climate, must also give rise to much precipitation, the land being thus exposed to the alternate erosion of a rough atmosphere and large glaciers. On the east coast of Baffin Land and Labrador there are similar conditions. The result is that the east coast of Greenland has the largest system of typical fjords known on the earth's surface. Scoresby Fjord has a length of about 180 m. from the outer coast to the point where it is blocked by the glaciers, and with its numerous branches covers an enormous area. Franz Josef Fjord, with its branch King Oscar Fjord, communicating with Davy's Sound, forms a system of fjords on a similar scale. These fjords are very deep; the greatest depth

[1] *Meddelelser om Grönland*, part i. (Copenhagen, 1879).
[2] *Ibid.* part xvi. (Copenhagen, 1896).

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found by Ryder in Scoresby Sound was 300 fathoms, but there are certainly still greater depths; like the Norwegian fjords they have, however, probably all of them, a threshold or sill, with shallow water, near their mouths. A few soundings made outside this coast seem to indicate that the fjords continue as deep submarine valleys far out into the sea. On the west coast there are also many great fjords. One of the best known from earlier days is the great Godthaab Fjord (or Baals Revier) north of 64° N. Along the east coast there are many high mountains, exceeding 6000 and 7000 ft. in height. One of the highest peaks hitherto measured is at Tiningnertok, on the Lindenow Fjord, in 60° 35′ N., which is 7340 ft. high. At the bottom of Mogens Heinesen Fjord, 62° 30′ N., the peaks are 6300 ft., and in the region of Umanak, 63° N., they even exceed 6600 ft. At Umivik, where Nansen began his journey across the inland ice, the highest peak projecting through the ice-covering is Gamel's Numatak, 5440 ft., in 64° N., and in the region of Angmagssalik, which is very mountainous, the mountains rise to 6500 ft., the most prominent peak being Ingolf's Fjeld, in 66° 26′ N., about 6000 ft., which is seen from far out at sea, and forms an excellent landmark. The highest point, probably the Blaserk (i.e. the Sark or blue shirt) of the old Norsemen, their first landmark on their way from Iceland to the Oster Bygd, the present Julianehaab district, on the south-west coast of Greenland. A little farther north the coast is much lower, rising only to heights of 2000 ft., and just north of 67° 10′ N. only to 500 ft. or less.[1] The highest mountains near the inner branches of Scoresby Fjord are about 7000 ft. The Petermann Spitze, near the shore of Franz Josef Fjord, measured by Payer and Ryder, to be 11,000 ft., has hitherto been considered to be the highest mountain in Greenland, but according to Nathorst it "is probably only two-thirds as high as Payer supposed," perhaps between 8000 and 9000 ft.

Along the west coast of Greenland the mountains are generally not quite so high, but even here peaks of 5000 and 6000 ft. are not uncommon. As a whole the coasts are unusually mountainous, and Greenland forms in this respect an interesting exception, as there is no other known land of such a size so filled along its coasts on all sides with high mountains and deep fjords and valleys.

The Inland Ice.—The whole interior of Greenland is completely covered by the so-called inland ice, an enormous glacier forming a regular shield-shaped expanse of snow and glacier ice, and burying all valleys and mountains far below its surface. Its area is about 715,400 sq. m., and it is by far the greatest glacier of the northern hemisphere. Only occasionally there emerge lofty rocks, isolated but not completely covered by the ice-cap; such rocks are known as *nunatakit* in Eskimo words. The inland ice rises in the centre to about a level of 9000, and in places perhaps 10,000 ft. or more, and descends gradually by extremely gentle slopes towards the coasts or the bottom of the fjords on all sides, discharging a great part of its yearly drainage or surplus of precipitation in the form of icebergs in the fjords, the so-called ice-fjords, which are numerous both on the west and on the east coast. These icebergs float away, and are gradually melted in the sea, the temperature of which is thus lowered by cold stored up in the interior of Greenland. The main current of these icebergs are met with in the Atlantic south of Newfoundland. The surface of the inland ice forms in a transverse section from the west to the east coast an extremely regular curve, almost approaching an arc of a wide circle, which along Nansen's route has its highest ridge somewhat nearer the east than the west coast. The east side also seems to be the case farther south. The curve shows, however, slight irregularities in the shape of undulations. The angle of the slope decreases gradually from the margin of the inland ice, where it may be 1° or more, to the central interior, where it is 0°. Large interior the surface of the inland ice is composed of dry snow which never melts, and is constantly packed and worked smooth by the winds. It extends as a completely even plain of snow, with long, almost imperceptible, undulating waves, at a height of 8000 to 10,000 ft., obliterating the features of the underlying land, the mountains and valleys of which are completely interred. Over the deepest valleys of the land in the interior this ice-cap must be at least 6000 or 7000 ft. thicker than over the highest mountains in the interior, the snow of the surface gradually changes its structure. At first it becomes more coarse-grained, like the *Firn Schnee* of the Alps, and is moist by melting during the summer. Nearer the coast, where the melting on the surface is more considerable, the wet snow freezes hard during the winter and is more or less transformed into ice, on the surface of which rivers and lakes are formed, the water of which, however, soon finds its way through crevasses and holes in the ice down to its under surface, and reaches the sea as a sub-glacial river. Near its margin the surface of the inland ice is broken up by numerous large crevasses, formed by the outward motion of the glacier covering the underlying land. The steep ice-walls at the margin of the inland ice show, especially where the motion of the ice is slow, a distinct striation, which indicates the strata of annual precipitation with the intervening thin seams of dust (Nordenskiöld's kryokonite). This is partly dust blown on to the surface of the ice from the ice-bare coast-land and partly the dust of the atmosphere brought down by the falling snow and accumulated on the surface of the glacier's covering by the melting during the summer. In the rapidly moving glaciers of the ice-fjords this striation is not distinctly visible, being evidently obliterated by the strong motion of the ice masses.

The ice-cap of Greenland must to some extent be considered as a viscous mass, which, by the vertical pressure in its interior, is pressed outwards and slowly flows towards the coasts, just as a mass of pitch placed on a table and left to itself will in the course of time flow outwards towards all sides. The movement of the outward-creeping inland ice will naturally be more independent of the configurations of the underlying land in the interior, where its thickness is so enormous, than near the margin where it is thinner. Here the ice converges into the valleys and moves with increasing velocity in the form of glaciers into the sea, where they break off as ice-bergs. The drainage of the interior of Greenland is thus partly given off in the solid form of icebergs, partly by the melting of the snow and ice on the surface of the ice-cap, especially near its western margin, and partly by some slight evaporation. The melting of the ice on its under side by the interior heat of the earth. After Professor Amund Helland had, in July 1875, discovered the amazingly great velocity, up to 64½ ft. in twenty-four hours, with which the glaciers of Greenland move into the sea, the margin of the inland ice and its glaciers was studied by several expeditions. K. J. V. Steenstrup during several years, Captain Hammer in 1879–1880, Captain Ryder in 1886–1887, Dr Drygalski in 1892–1893,[2] and several American expeditions during later years, all examined the question closely. The highest known velocities of glaciers were measured by Ryder in the Upernivik glacier (in 73° N.), where, between the 13th and 14th of August of 1886, he found a velocity of 125 ft. in twenty-four hours, and the average velocity during several days of 101 ft. (Danish).[3] It was, however, ascertained that there is a great difference between the velocities of the glaciers in winter and in summer. For instance, Ryder found that the Upernivik glacier had an average velocity of only 33 ft. in April 1887. There seem to be periodical oscillations in the extension of the glaciers and the inland ice similar to those that have been observed on the glaciers of the Alps and elsewhere. But these interesting phenomena have not hitherto been subject to systematic observation, and our knowledge of them is therefore very uncertain. Numerous glacial phenomena, such as roches moutonnées, striated rocks, moraines, erratic blocks, &c., prove that the whole of Greenland, even the small islands and skerries outside the coast, has once been covered by the inland ice.

Numerous raised beaches or terraces, containing shells of marine molluscs, &c., occur along the whole coast of Greenland, and indicate that the whole of this large land has been raised, or the sea has sunk, in post-glacial times, after the inland ice covered its now ice-free coasts.[4] In the north-eastern part of Smith Sound these traces of the gradual upheaval of the land, or sinking of the sea, are very marked; but they are also very distinct in the south, although not found so high above sea-level, which seems to show that the upheaval has been greater in the north. In Uvkusigsat Fjord (72° 20′ N.) the highest terrace is 480 ft. above the sea.[4] On Manitsok (65° 30′ N.) the highest raised beach was 360 ft. above the sea.[5] In the Isortok Fjord (67° 11′ N.) the highest raised beach is 380 ft. above sea-level.[6] In the Amerdlik Fjord (64° 14′ N.) the highest marine terrace is about 340 ft. above sea-level, and at Ilivertalik (63° 14′ N.), north of Fiskernaes, the highest terrace is about 325 ft. above the sea. At Kakarsuak, near the Björnesund (62° 50′ N.), a terrace is found at 615 ft. above the sea, but it is doubtful whether this is of marine origin.[7] In the Julianehaab district, between 60° and 61° N., the highest marine terraces are found at about 160 ft. above the sea.[8] The highest marine terrace observed in Scoresby Fjord, on the east coast, was 240 ft. above sea-level.[9] There is a common belief that during quite recent times the west and south-west coast, within the Danish possessions, has been sinking. Although there are many indications which may make this probable, none of them can be said to be quite decisive.[10]

Geology.—So far as made out, the structure of explored Greenland is as follows:

1. *Laurentian gneiss* forms the greatest mass of the exposed rocks of the country bare of ice. They are found on both sides of Smith Sound, rising to heights of 2000 ft., and underlie the Miocene and Cretaceous rocks of Disco Island, Noursoak Peninsula and the

[1] See C. Kruuse in *Geografisk Tidsskrift*, xv. 64 (Copenhagen, 1899). See also F. Nansen, "Die Ostküste Grönlands," Ergänzungsheft No. 105 zu *Petermanns Mitteilungen* (Gotha, 1892), p. 55 and pl. iv., sketch No. 11.

[2] E. v. Drygalski, *Grönland-Expedition der Gesellschaft für Erdkunde zu Berlin, 1892–1893* (2 vols., Berlin, 1897).

[3] *Meddelelser om Grönland*, part viii. pp. 203-270 (Copenhagen, 1889).

[4] *Ibid.*, part iv. p. 230 (Copenhagen, 1883); see also part xiv. pp. 317 et seq., 323.

[5] *Ibid.* part xiv. p. 323 (Copenhagen, 1898).

[6] *Ibid.* part ii. pp. 181-188 (Copenhagen, 1881).

[7] *Ibid.* part i. pp. 99-101 (Copenhagen, 1879).

[8] *Ibid.* part ii. p. 39 (Copenhagen, 1881); part xvi. pp. 150-154 (1896).

[9] *Ibid.*, part xix. p. 175 (1896).

[10] *Ibid.* part i. p. 34; part ii. p. 40; part xiv. pp. 343-347; part iv. p. 237; part viii. p. 26.

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Oolites of Pendulum Island in East Greenland. Ancient schists occur on the east coast south of Angmagssalik, and basalts and schists are found in Scoresby Fjord. It is possible that some of these rocks are also of Huronian age, but it is doubtful whether the rocks so designated by the geologists of the "Alert" and "Discovery" expedition are really the rocks so known in Canada, or are a continuous portion of the fundamental or oldest gneiss of the north-west of Scotland and the western isles.

2. *Silurian.*—Upper Silurian, having a strong relation to the Wenlock group of Britain, but with an American facies, and Lower Silurian, with a succession much the same as in British North America, are found on the shores of Smith Sound, and Nathorst has discovered them in King Oscar Fjord, but not as yet so far south as the Danish possessions.

3. *Devonian* rocks are believed to occur in Igaliko and Tunnudiorbik Fjords, in S.W. Greenland, but as they are unfossiliferous sandstone, rapidly disintegrating, this cannot be known. It is, however, likely that this formation occurs in Greenland, for in Dana Bay, Captain Feilden found a specimen of *Spirifera* and *Productus mesolobus* or *costatus*, though it is possible that these fossils represent the "Ursa stage" (Heer) of the Lower Carboniferous. A few Devonian forms have also been recorded from the Parry Archipelago, and Nathorst has shown the existence of Old Red Sandstone facies of Devonian in Traill Island, Geographical Society Island, Ymer Island and Gauss Peninsula.

4. *Carboniferous.*—In erratic blocks of sandstone, found on the Disco Archipelago by Whitaker, Nares detected a *Sigillaria* and a species of either *Pecopteris* or *Gleichenia*, perhaps of this age; and probably much of the extreme northern coast of Ellesmere Land, and therefore, in all likelihood, the opposite Greenland shore, contains a clearly developed Carboniferous limestone fauna, identical with that so widely distributed over the North American continent, and referable also to British and Spitsbergen species. Of the Coal Measures above these, if they occur, we know nothing at present. Capt. Feilden's notes suggestive that, though the explorers have not met with this formation on the northern shores of Greenland, yet it was observed that a continuation of the direction of the known strike of the limestones of Feilden peninsula, carried over the polar area, passes through the neighbourhood of Spitsbergen, where the formation occurs, and contains certain species identical with those of the Grinnell Land rocks of this horizon. The facies of the fossils is, according to Mr Etheridge, North American and Canadian, though many of the species are British. The corals are few in number, but the *Mollusoida* (*Lingula*) are more numerous in species and individuals. No Secondary rocks have been discovered in the extreme northern parts of West Greenland, but they are present on the east and west coasts in more southerly latitudes than Smith Sound.

5. *Jurassic.*—These do not occur on the west coast, but on the east coast the German expedition discovered marls and sandstones on Kuhn Island, resembling those of the Russian Jurassic, characterised by the presence of *Belemnites Panderianus*, *B. volgensis*, *B. absolutus*, and a *Cyprina* near to *C. tyssolae*. On the south coast of the same island are coarse-grained, brownish micaceous and light-coloured calcareous sandstone and marls, containing fossils, which render it probable that they are of the same age as the coal-bearing Jurassic rocks of Brora (Scotland) and the Middle Dogger of Yorkshire. There is also coal on Kuhn Island.

The Danish expeditions of 1899–1900 have added considerably to our knowledge of the Jurassic rocks of East Greenland. Rhaetic-Lias plants have been described by Dr Hartz from Cape Stewart and Vardeklöft. Dr Madsen has recognized fossils that correspond with those from the Inferior oolite, Cornbrash and Callovian of England. Upper Kimmeridge and Portlandian beds are also met with.

6. *Cretaceous.*—Beds of this age, consisting of sandstones and coal, are found on the northern coast of Disco Island and the southern side of the Noursoak Peninsula, the beds in the former locality, "the Komse strata" of Nordenskiöld, being the oldest. They reach 1000 ft. in thickness, occupying undulating hollows in the underlying gneiss, and dip towards the Noursoak Peninsula at 20°, when the overlying Atanakerdluk strata come in. Both these series contain numerous plant remains, evergreen oaks, magnolias, aralias, &c., and seams of lignite (coal), which is burnt; but in neither occur the marine beds of the United States. Still, the presence of dicotyledonous leaves, such as *Magnolia alternans*, in the Atanakerdluk strata, proves their close alliance with the Dakota series of the United States. The underlying Komse beds are not present in the American series. They are characterized by fine cycads (*Zamites arcticus* and *Glossozamites Hoheneggeri*), which also occur in the Urgonian strata of Wernsdorff.

7. *Miocene.*—This formation, one of the most widely spread in polar lands, though the most local in Greenland, is also the best known feature in its geology. It is limited to Disco Island, and perhaps to a small part of the Noursoak Peninsula, and the neighbouring country, and consists of numerous thin beds of sandstone, shale and coal—the sideritic shale containing immense quantities of leaves, stems, fruit, &c., as well as some insects, and the coal pieces of retinite. The study of these plant and insect remains shows that forests containing a vegetation very similar to that of California and the southern United States, in some instances even the species of trees being all but identical, flourished in 70° N. during geological periods comparatively recent. These beds, as well as the Cretaceous series, from which they are as yet only imperfectly distinguished, are associated with sheets of basalt, which penetrate them in great dikes, and in some places, owing to the wearing away of the softer sedimentary rocks, stand out in long walls running across the beds. These Miocene strata have not been found farther north on the Greenland shore than the region mentioned; but in Lady Franklin Bay, on the Grinnell Land side of Smith Sound, they again appear, so that the chances are they will be found on the opposite coast, though doubtless the great disintegration Greenland has undergone and is undergoing has destroyed many of the softer rocks of fossiliferous rocks. On the east coast, more particularly in Hochstetter Foreland, the Miocene beds again appear, and we may add that there are traces of them even on the west coast, between Sonntag Bay and Foulke Fjord, at the entrance to Smith Sound. It thus appears that since early Tertiary times there has been a great change in the climate of Greenland.

Nathorst has suggested that the whole of Greenland is a "horst," in the subordinate folds of which, as well as in the deeper "graben," the younger rocks are preserved, often with a covering of Tertiary or later lava flows.[1]—J. A. H.]

Minerals.—Native iron was found by Nordenskiöld at Ovifak, on Disco Island, in 1870, and brought to Sweden (1871) as meteorites. The largest mass or nodule weighed 20 tons. Similar iron has later been found by K. J. V. Steenstrup in several places on the west coast enclosed as smaller or larger nodules in the basalt. This iron has very often beautiful Widmannstatten figures like those of iron meteorites, but it is undoubtedly of telluric origin.[2] In 1895 Peary found native iron at Cape York; since John Ross's voyage in 1818 it has been known to exist there, and from it the Eskimo got iron for their weapons. In 1897 Peary brought the largest nodule to New York; it was estimated to weigh nearly 100 tons. This iron is considered by several of the first authorities on the subject to be of meteoric origin,[3] but no evidence hitherto given seems to prove decisively that it cannot be telluric. That the nodules found were lying on gneissic rock, with no basaltic rocks in the neighbourhood, does not prove that the iron was not originally in the basalt, for the nodules may have been transported by the glaciers, like other erratic blocks, and will stand erosion much longer than the basalt, which may long ago have disappeared. This iron seems, however, in several respects to be unlike the celebrated large nodules of iron found by Nordenskiöld at Ovifak, but appears to resemble much more closely the softer kind of iron nodules found by Steenstrup in the basalt;[4] it stands exposure to the air equally well, and has similar Widmannstätten figures very sharp, as is to be expected in such a large mass. It contains, however, more nickel and also phosphorus. A few other minerals may be noticed, and some have been worked to a small extent—graphite is abundant, particularly near Upernivik; cryolite is found almost exclusively at Ivigtut; copper has been observed at several places, but only in nodules and laminae of limited extent; and coal of poor quality is found in the districts about Disco Bay and Umanak Fjord. Steatite or soapstone has long been used by the natives for the manufacture of lamps and vessels.

Climate.—The climate is very uncertain, the weather changing suddenly from bright sunshine (when mosquitos often swarm) to dense fog or heavy falls of snow and icy winds. At Julianehaab in the extreme south-west the winter is not much colder than that of Norway and Sweden in the same locality; but its mean temperature for the whole year probably approximates to that on the Norwegian coast 600 m. farther north. The climate of the interior has been found to be of a continental character, with large ranges of temperature, and with an almost permanent anti-cyclonic region over the interior of the inland ice, from which the prevailing winds radiate towards the coasts. On the 64th parallel the mean annual temperature at an elevation of 6560 ft. is supposed to be +13° F., or reduced to sea-level 5° F. The mean annual temperature in the interior farther north is supposed to be −10° F. reduced to sea-level. The mean temperature of the warmest month, July, in the interior should be, reduced to sea-level, on the 64th parallel 32° F., and that of the coldest month, January, about −22° F., while in North Greenland it is probably −40° reduced to sea-level. Here we may probably find the lowest temperatures of the northern hemisphere. The interior of Greenland contains both summer and winter a pole of cold, situated in the opposite longitude to that of Siberia, with which it is well able to compete in extreme severity. On Nansen's expedition temperatures of about −49° F. were experienced during

[1] See A. G. Nathorst, "Bidrag till nordöstra Grönlands geologi," with map *Geologiska Foreningens i Stockholm Förhandlingar*, No. 257, Bd. 23, Heft 4, 1901; O. Heer, *Flora fossilis Arctica* (7 vols., 1868–1883), and especially *Meddelelser om Grönland* for numerous papers on the geology and palaeontology.

[2] *Medd. om Grönl.*, part iv. pp. 115–131 (Copenhagen, 1883).

[3] See Peary, *Northward over the "Great Ice,"* ii. 604 et seq. (New York, 1898).

[4] See *loc. cit.* pp. 127–128.

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the nights in the beginning of September, and the minimum during the winter may probably sink to −90° F. in the interior of the inland ice. These low temperatures are evidently caused by the radiation of heat from the snow-surface in the rarefied air in the interior. The daily range of temperature is therefore very considerable, sometimes amounting to 40°. Such a range is elsewhere found only in deserts, but the surface of the inland ice may be considered to be an elevated desert of snow.[1] The climate of the east coast is on the whole considerably more arctic than that of the west coast in corresponding latitudes; the land is much more completely snow-covered, and the snow-line goes considerably lower. The probability also is that there is more precipitation, and that the mean temperature are lower.[2] The well-known strangely warm and violent winds of Greenland occur both on the west and the east coast; they are more local than was formerly believed, and are formed by cyclonic winds passing either over mountains or down the outer slope of the inland ice.[3] Mirage and similar phenomena and the aurora are common.

Fauna and Flora.—It was long a common belief that the fauna and flora of Greenland were essentially European, a circumstance which would make it probable that Greenland has been separated by sea from America during a comparatively late time than from Europe. The correctness of this hypothesis may, however, be doubted. The land mammals of Greenland are decidedly more American than European; the musk-ox, the banded lemming (*Cuniculus torquatus*), the white bear, all of which there seems to have been a new invasion recently round the northern part of the country to the east coast, the Eskimo and the dog—probably also the reindeer—have all come from America, while the other land mammals, the polar bear, the reindeer, the Arctic hare, the stoat (*Mustela erminea*), are perfectly circumpolar forms. The species of seals and whales are, if anything, more American than European, and so to some extent are the fishes. The bladder-nose seal (*Cystophora cristata*), for instance, may be said to be a Greenland-American species, while a Scandinavian species, such as the grey seal (*Halichoerus grypus*), appears to be very rare both in Greenland and America. Of the sixty-one species of birds breeding in Greenland, eight are European-Asiatic, four are American, and the rest are circumpolar or North Atlantic or North Pacific in their distribution.[4] About 310 species of vascular plants are found, of which about forty species are American, forty-four European-Asiatic, fifteen endemic, and the rest common both to America and Europe or Asia. We thus see that the American and the European-Asiatic elements of the flora are nearly equivalent; and if the flora of Arctic North America were better known, the number of plants common to America might be still more enlarged.[5]

In the south, a few goats, sheep, and pigs have been introduced. The whaling industry was formerly prolific off the west coast but decayed when the right whale nearly disappeared. The white whale fishery of the Eskimo, however, continued, and sealing is important; walruses are also caught and sometimes narwhals. There are also important fisheries for cod, caplin, halibut, red fish (*Sebastes*) and *nepisak* (*Cyclopterus lumpus*); a shark (*Somniosus microcephalus*) is taken for the oil from its liver; and sea-trout are found in the streams and rivers of the south. On land reindeer were formerly hunted, to their practical extinction in the south, but in the districts of Godthaab, Sukkertoppen and Holstensborg there are still many reindeer. The eider-duck, guillemot and other sea-birds are in some parts valuable for food in winter, and so is the ptarmigan. Eggs of sea-birds are collected and eider-down. Valuable fur is obtained from the white and blue fox, the skin of the eider-duck and the polar bear.

At Tasiusak (73° 22′ N.), the most northern civilized settlement in the world, gardening has been attempted without success, but several plants do well in forcing frames. At Umanak (70° 40′ N.) is the most northern garden in the world. Broccoli and radishes grow well, turnips (but not every year), lettuce and chervil succeed sometimes, but parsley cannot be reared. At Jacobshavn (69° 12′ N.), only some 15 m. from the inland ice, gardening succeeds very well; broccoli and lettuce grow willingly; the spinach produces large leaves; chervil, pepper-grass, leeks, parsley and turnips grow very well; the radishes are sown and gathered twice during the summer (June to August). In the south, in the Julianehaab district, even flowering plants, such as aster, nemophilia and mignonette, are cultivated, and broccoli, spinach, sorrel, chervil, parsley, rhubarb, turnips, lettuce, radishes grow well. Potatoes give fair results when they are taken good care of, carrots grow to a thickness of 1½ in., while cabbage does poorly. Strawberries and cucumbers have been ripened in a forcing frame. In the "Kongespeil" (King's mirror) of the 13th century it is stated that the old Norsemen tried in vain to raise barley.

The wild vegetation in the height of summer is, in favourable situations, profuse in individual plants, though scanty in species. The plants are of the usual arctic type, and identical with or allied to those found in Lapland or on the summits of the highest British hills. Forest there is none in all the country. In the north, where the lichen-covered or ice-shaven rocks do not protrude, the ground is covered with a carpet of mosses, creeping dwarf willows, crowberries and similar plants, while the flowers most common are the andromeda, the yellow poppy, pedicularis, pyrola, the saxifrages, the flowering mosses; but in South Greenland there is something in the shape of bush, the dwarf birches even rising a few feet in very sheltered places, the willows may grow higher than a man, and the vegetation is less arctic and more abundant.

Government and Trade.—The trade of Greenland is a monopoly of the Danish crown, dating from 1774, and is administered in Copenhagen by a government board (*Kongeaige Grönlandske Handel*) and in the country by various government officials. In order to meet the double purposes of government and trade the west coast, up to nearly 74° N., is divided into two inspectorates, the southern extending to 67° 40′ N., the northern comprising the rest of the country; the respective seats of government being at Godthaab and Godhavn. These inspectorates are ruled by two superior officials or governors responsible to the director of the board in Copenhagen. Each of the inspectorates is divided into districts, each district having, in addition to the chief settlement or *coloni*, several outlying posts and Eskimo hunting stations, each presided over by an *udligger*, who is responsible to the *colonibestyrer*, or superintendent of the district. These trading settlements, which dot the coast for a distance of 1000 m., are usually sited in a bight in a fiord. Eskimo hunting and fishing stations blubber is the chief article received, and is forwarded in casks to the *coloni*, where it is boiled into oil, and prepared for being despatched to Copenhagen by means of the government ships which arrive and leave between May and November. For the rest of the year navigation is stopped, though the winter months form the busy seal-killing season. The principle upon which the government acts is to give the natives low prices for their produce, but to sell them European articles of necessity at prime cost, and other stores, such as bread, at prices which will scarcely pay for the purchase and freight, while no merchandise is charged, on an average, more than 20% over the cost price in Denmark. In addition the Greenlanders are allowed to order goods from private dealers on paying freight for them at the rate of 2½d. per 10 lb. or 1s. 6d. per cub. ft. The prices to be paid for European and native articles are fixed every year, the prices current in Danish and Eskimo being printed and distributed by the government. Out of the payment five-sixths are given to the sellers, and one-sixth devoted to the Greenlanders' public fund, spent in "public works," in charity, and on other unforeseen contingencies. The object of the monopoly is solely for the good of the Greenlanders—to prevent spirits being sold to them, and the vice, disease and misery which usually attend the collision between natives and civilization of the trader's type being introduced into the primitive arctic community. The inspectors, in addition to being trade superintendents, are magistrates, but serious crime is very rare. Though the officials are all-powerful, local councils or *parsissaet* were organized in 1857 in every district. To these parish parliaments delegates are sent from every station. These *parsissoks*, elected at the rate of about one representative to 120 voters, wear a cap with a badge (a bear rampant), and aid the European members of the council in distributing the surplus profit apportioned to each district, and generally in advising on to the welfare of that part of Greenland under their partial

[1] H. Mohn, "The Climate of the Interior of Greenland," *The Scott. Geogr. Magazine*, vol. ix. (Edinburgh, 1893), pp. 142–148; and H. Mohn and F. Nansen, "Wissenschaftliche Ergebnisse," &c. Ergänzungsheft No. 105 zu *Petermanns Mitteilungen* (1892), p. 51.

[2] On the climate of the east coast of Greenland see V. Willaume-Jantzen, *Meddelelser om Grönland*, part ix. (1889), pp. 285-310, part xvii. (1895), pp. 171-180.

[3] See A. Paulsen, *Meteorolog. Zeitschrift* (1889), p. 241; F. Nansen, *The First Crossing of Greenland* (London, 1890), vol. ii. pp. 496-497; H. Mohn and F. Nansen, "Wissenschaftliche Ergebnisse," &c. Ergänzungsheft No. 105 zu *Petermanns Mitteilungen* (1892), p. 51.

[4] H. Winge, "Grönlands Fugle," *Meddelelser om Grönland*, part xxi. pp. 62-63 (Copenhagen, 1899).

[5] See J. Lange, "Conspectus florae Groenlandicae," *Meddelelser om Grönland*, part iii. (Copenhagen, 1880 and 1887); E. Warming, "Om Grönlands Vegetation," *Meddelelser om Grönland*, part xii. (Copenhagen, 1888); and in *Botanische Jahrbücher*, vol. x. (1888–1889). See also A. Blytt, *Englers Jahrbücher*, ii. (1882), pp. 1-50; A. G. Nathorst, *Öfversigt af K. Vetenskap. Akad. Forhandl.* (Stockholm, 1884); "Kritische Bemerkungen über die Geschichte der Vegetation Grönlands," *Botanische Jahrbücher*, vol. xiv. (1891).

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control. The municipal council has the disposal of 30% of the annual profits made on produce purchased within the confines of each district. It holds two sessions every year, and the discussions are entirely in the Eskimo language. In addition to their functions as guardians of the poor, the parish members have to investigate crimes and punish misdemeanours, settle litigations and divide inheritances. They can impose fines for small offences not worth sending before the inspector, and, in cases of high misdemeanour, have the power of inflicting corporal punishment.

A Danish *coloni* in Greenland might seem to many not to be a cheerful place at best; though in the long summer days they would certainly find some of those on the southern fjords comparatively pleasant. The fact is, however, that most people who ever lived some time in Greenland always long to go back. There are generally in a *coloni* three or four Danish houses, built of wood and pitched over, in addition to storehouses and a blubber-boiling establishment. The Danish residents may include, besides a *coloni-bestyrer* and his assistant, a *missionair* or clergyman, at a few places also a doctor, and perhaps a carpenter and a schoolmaster. In addition there are generally from twenty to several hundred Eskimo, who live in huts built of stone and turf, each entered by a short tunnel. Lately their houses in the *colonis* have also to some extent been built of imported wood. Following the west coast northward, the trading centres are these: in the south inspectorate, Julianehaab, near which are remains of the early Norse settlements of Eric the Red and his companions (the *Öster-Bygd*); Frederikshaab, in which district are the cryolite mines of Ivigtut; Godthaab, the principal settlement of all, in the neighbourhood of which are also early Norse remains (the *Vester-Bygd*); Sukkertoppen, a most picturesque locality; and Holstenborg. In the north inspectorate the centres are: Egedesminde, on an islet at the mouth of Disco Bay; Christianshaab, one of the pleasantest settlements in the north, and Jacobshavn, on the inner shores of the same bay; Godhavn (or Lievely) on the south coast of Disco Island, formerly an important seat of the whaling industry; Ritenbenk, Umanak, and, most northerly of all, Upernivik. On the east coast there is but one *coloni*, Angmagssalik, in 65° 30′ N., only established in 1894. For ecclesiastical purposes Danish Greenland is reckoned in the province of the bishop of Zeeland. The Danish mission in Greenland has a yearly grant of £2000 from the trading revenue of the colony, besides a contribution of £880 from the state. The Moravian mission, which had worked in Greenland for a century and a half, retired from the country in 1900. The trade of Greenland has on the whole much decreased in modern times, and trading and missions cost the Danish state a comparatively large sum (about £11,000 every year), although this is partly covered by the income from the royalty of the cryolite mines at Ivigtut. There is, however, a yearly deficiency of more than £6000. The decline in the value of the trade, which was formerly very profitable, has to a great extent been brought about by the fall in the price of seal-oil. It might be expected that there should be a decrease in the Greenland seal fisheries, caused by the European and American sealers catching larger quantities every year, especially along the coasts of Newfoundland and Labrador, and so actually diminishing the number of the animals in the Greenland seas. The statistics of South Greenland, however, do not seem to demonstrate any such decrease. The average number of seals killed annually is about 33,000.[1] The annual value of imports, consisting of manufactured goods, foodstuffs, &c., may be taken somewhat to exceed £40,000. The chief articles of export (together with those that have lapsed) have been already indicated; but they may be summarized as including seal-oil, seal, fox, bird and bear skins, fish products and eiderdown, with some quantity of worked skins. Walrus tusks and walrus hides, which in the days of the old Norse settlements were the chief articles of export, are now of little importance.

Population.—The area of the entire Danish colony is estimated at 45,000 sq. m., and its population in 1901 was 11,803. The Europeans number about 300. The Eskimo population of Danish Greenland (west coast) seems to have decreased since the middle of the 18th century. Hans Egede estimated the population then at 30,000, but this is probably a large overestimate. The decrease may chiefly have been due to infectious diseases, especially a very severe epidemic of smallpox. During the last half of the 19th century there was on the whole a slight increase of the native population. The population fluctuates a good deal, owing, to some extent, to an immigration of natives from the east to the west coast. The population of the east coast seems on the whole to be decreasing in number, several hundreds chiefly living at Angmagssalik. In the north part of the east coast, in the region of Scoresby Fjord and Franz Josef Fjord, numerous ruins of Eskimo settlements are found, and in 1823 Clavering met Eskimo there, but now they have either completely died out or have wandered south. A little tribe of Eskimo living in the region of Cape York near Smith Sound—the so-called "Arctic Highlanders" or Smith Sound Eskimo—number about 240.

History.—In the beginning of the 10th century the Norwegian Gunnbjörn, son of Ulf Kráka, is reported to have found some islands to the west of Iceland, and he may have seen, without landing upon it, the southern part of the east coast of Greenland. In 982 the Norwegian Eric the Red sailed from Iceland to find the land which Gunnbjörn had seen, and he spent three years on its south-western coasts exploring the country. On his return to Iceland in 985 he called the land Greenland in order to make people more willing to go there, and reported so favourably on its possibilities that he had no difficulty in obtaining followers. In 986 he started again from Iceland with 25 ships, but only 14 of them reached Greenland, where a colony was founded on the south-west coast, in the present Julianehaab district. Eric built his house at Brattalid, near the inner end of the fjord Tunugdliarfik, just north of the present Julianehaab. Other settlers followed and in a few years two colonies had been formed, one called Österbygd in the present district of Julianehaab comprising later about 190 farms, and another called Vesterbygd farther north on the west coast in the present district of Godthaab, comprising later about 90 farms. Numerous ruins in the various fjords of these two districts indicate now where these colonies were. Wooden coffins, with skeletons wrapped in coarse hairy cloth, and both pagan and Christian tombstones with runic inscriptions have been found. On a voyage from Norway to Greenland Leif Ericsson (son of Eric the Red) discovered America in the year 1000, and a few years later Torfinn Karlsefne sailed with three ships and about 150 men, from Greenland to Nova Scotia to form a colony, but returned three years later (see VINLAND).

When the Norsemen came to Greenland they found various remains indicating, as the old sagas say, that there had been people of a similar kind as those they met with in Vinland, in America, whom they called *Skraeling* (the meaning of the word is uncertain, it means possibly weak people); but the sagas do not report that they actually met the natives then. But somewhat later they have probably met with the Eskimo farther north on the west coast in the neighbourhood of Disco Bay, where the Norsemen went to catch seals, walrus, &c. The Norse colonists penetrated on these fishing expeditions at least to 73° N., where a small runic stone from the 14th century has been found. On a voyage in 1267 they penetrated even still farther north into the Melville Bay.

[1] Owing to representations of the Swedish government in 1874 as to the killing of seals at breeding time on the east coast of Greenland, and the consequent loss of young seals left to die of starvation, the Seal Fisheries Act 1875 was passed in England to provide for the establishment of a close time for seal fishery in the seas in question. This act empowered the crown, by order in council, to put its provisions in force, when any foreign state, whose ships or subjects were engaged in the seal fishery in the area mentioned in the schedule thereto, had made, or was about to make, similar provisions with respect to its ships and subjects. An order in council under the act, declaring the season to begin on the 3rd of April in each year, was issued February 8, 1876. Rescinded February 15, 1876, it was re-enacted on November 28, 1876, and is still operative.

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Christianity was introduced by Leif Ericsson at the instance of Olaf Trygvasson, king of Norway, in 1000 and following years. In the beginning of the 12th century Greenland got its own bishop, who resided at Garolar, near the present Eskimo station Igoliko, on an isthmus between two fjords, Igaliksfjord (the old Einarsfjord) and Tunugdliarfik (the old Eriksfjord), inside the present colony Julianehaab. The Norse colonies had twelve churches, one monastery and one nunnery in the Österbygd, and four churches in the Vesterbygd. Greenland, like Iceland, had a republican organization up to the years 1247 to 1261, when the Greenlanders were induced to swear allegiance to the king of Norway. Greenland belonged to the Norwegian crown till 1814, when, at the dissolution of the union between Denmark and Norway, neither it nor Iceland and the Faeroes were mentioned, and they, therefore, were kept by the Danish king and thus came to Denmark. The settlements were called respectively *Öster Bygd* (or eastern settlement) and *Vester* (western) *Bygd*, both being now known to be on the south and west coast (in the districts of Julianehaab and Godthaab respectively), though for long the view was persistently held that the first was on the east coast, and numerous expeditions have been sent in search of these "lost colonies" and their imaginary survivors. These settlements at the height of their prosperity are estimated to have had 10,000 inhabitants, which, however, is an over-estimate, the number having probably been nearer one-half or one-third of that number. The last bishop appointed to Greenland died in 1540, but long before that date those appointed had never reached their sees; the last bishop who resided in Greenland died there in 1377. After the middle of the 14th century very little is heard of the settlements, and their communication with the motherland, Norway, evidently gradually ceased. This may have been due in great part to the fact that the shipping and trade of Greenland became a monopoly of the king of Norway, who kept only one ship sailing at long intervals (of years) to Greenland; at the same time the shipping and trade of Norway came more and more in the hands of the Hanseatic League, which took no interest in Greenland. The last ship that is known to have visited the Norse colony in Greenland returned to Norway in 1410. With no support from home the settlements seem to have decayed rapidly. It has been supposed that they were destroyed by attacks of the Eskimo, who about this period seem to have become more numerous and to have extended southwards along the coast from the north. This seems a less feasible explanation; it is more probable that the Norse settlers intermarried with the Eskimo and were gradually absorbed. About the end of the 15th or the beginning of the 16th century it would appear that all Norse colonization had practically disappeared. When in 1585 John Davis visited it there was no sign of any people save the Eskimo, among whose traditions are a few directly relating to the old Norsemen, and several traces of Norse influence.[1] For more than two hundred years Greenland seems to have been neglected, almost forgotten. It was visited by whalers, chiefly Dutch, but nothing in the form of permanent European settlements was established until the year 1721, when the first missionary, the Norwegian clergyman Hans Egede, landed, and established a settlement near Godthaab. Amid many hardships and discouragements he persevered; and at the present day the native race is civilized and Christianized. Many of the colonists of the 18th century were convicts and other offenders; and in 1750 the trade became a monopoly in the hands of a private company. In 1733–1734 there was a dreadful epidemic of smallpox, which destroyed a great number of the people. In 1774 the trade ceased to be profitable as a private monopoly, and to prevent it being abandoned the government took it over. Julianehaab was founded in the following year. In 1807–1814, owing to the war, communication was cut off with Norway and Denmark; but subsequently the colony prospered in a languid fashion

Authorities.—As to the discovery of Greenland by the Norsemen and its early history see Konrad Maurer's excellent paper, "Geschichte der Entdeckung Ostgrönlands" in the report of *Die zweite deutsche Nordpolarfahrt 1869–1870* (Leipzig, 1874), vol. i.; G. Storm, *Studies on the "Vineland" Voyages* (Copenhagen, 1889); *Extraits des Mémoires de la Société Royale des Antiquaires du Nord* (1888); K. J. V. Steenstrup, "Om Osterbygden," *Meddelelser om Grönland*, part ix. (1882), pp. 1-351; Finnur Jönsson, "Grönlands gamle Topografi efter Kilderne" in *Meddelelser om Grönland*, part xx. (1899), pp. 265-329; Joseph Fischer, *The Discoveries of the Norsemen in America*, translated from German by B. H. Soulsby (London, 1903). As to the general literature on Greenland, a number of the more important modern works have been noticed in footnotes. The often-quoted *Meddelelser om Grönland* is of especial value; it is published in parts (Copenhagen) since 1879, and is chiefly written in Danish, but each part has a summary in French. In part xiii. there is a most valuable list of literature about Greenland up to 1880. See also *Geographical Journal*, passim.

Amongst other important books on Greenland may be mentioned: Hans Egede, *Description of Greenland* (London, 1745); Crantz, *History of Greenland* (2 vols., London, 1820); *Grönlands historiske Mindesmerker* (3 vols., Copenhagen, 1838–1845); H. Rink, *Danish Greenland* (London, 1877); H. Rink, *Tales of the Eskimo* (London, 1875); (see also same, "Eskimo Tribes" in *Meddelelser om Grönland*, part xi.); Johnstrup, *Giesecke's Mineralogiske Reise i Grönland* (Copenhagen, 1878). (F. N.)

[1] Cf. F. Nansen, *Eskimo Life* (London, 1893).

GREENLAW (a "grassy hill"), a town of Berwickshire, Scotland. Pop. (1901) 611. It is situated on the Blackadder, 6½ m. S.E. of Edinburgh by the North British railway company's branch line from Reston Junction to St Boswells. The town was built towards the end of the 17th century, to take the place of an older one, which stood about a mile to the S.E. It was the county town from 1696 to 1853, when for several years it shared this dignity with Duns, which, however, is now the sole capital. The chief manufactures are woollens and agricultural implements. About 3 m. to the S. the ruin of Hume Castle, founded in the 13th century, occupies a commanding site. Captured by the English in 1547, in spite of Lady Home's gallant defence, it was retaken two years afterwards, only to fall again in 1569. After its surrender to Cromwell in 1650 it gradually decayed. Towards the close of the 18th century the 3rd earl of Marchmont had the walls rebuilt out of the old stones, and the castle, though a mere shell of the original structure, is now a picturesque ruin.

GREENLEAF, SIMON (1783–1853), American jurist, was born at Newburyport, Massachusetts, on the 5th of December 1783. When a child he was taken by his father to Maine, where he studied law, and in 1805 began to practise at Standish. He soon removed to Gray, where he practised for twelve years, and in 1818 removed to Portland. He was reporter of the supreme court of Maine from 1820 to 1832, and published nine volumes of *Reports of Cases in the Supreme Court of Maine* (1822–1835). In 1833 he became Royall professor, and in 1846 succeeded Judge Joseph Story as Dane professor of law in Harvard University; in 1848 he retired from his active duties, and became professor emeritus. After being for many years president of the Massachusetts Bible Society, he died at Cambridge, Mass., on the 6th of October 1853. Greenleaf's principal work is a *Treatise on the Law of Evidence* (3 vols., 1842–1853). He also published *A Full Collection of Cases Overruled, Denied, Doubted, or Limited in their Application, taken from American and English Reports* (1821), and *Examination of the Testimony of the Four Evangelists by the Rules of Evidence administered in the Courts of Justice, with an account of the Trial of Jesus* (1846; London, 1847). He revised for the American courts William Cruise's *Digest of Laws respecting Real Property* (3 vols., 1849–1850).

GREEN MONKEY, a west African representative of the typical group of the guenon monkeys technically known as *Cercopithecus callitrichus*, taking its name from the olive-greenish hue of the fur of the back, which forms a marked contrast to the white whiskers and belly.

GREENOCK, a municipal and police burgh and seaport of Renfrewshire, Scotland, on the southern shore of the Firth of Clyde, 23 m. W. by N. of Glasgow by the Caledonian and the Glasgow & South-Western railways, 21 m. by the river and firth. Pop. (1901) 68,142. The town has a water frontage of nearly 4 m. and rises gradually to the hills behind the town in which are situated, about 3 m. distant, Loch Thom and Loch Gryfe, from both of which is derived the water supply for domestic use, and for driving several mills and factories. The streets are

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laid out on the comparatively level tract behind the firth, the older thoroughfares and buildings lying in the centre. The west end contains numerous handsome villas and a fine esplanade, 1¼m. long, running from Prince's Pier to Fort Matilda, which is supplied with submarine mines for the defence of the river. The capacious bay, formerly known as the Bay of St Lawrence from a religious house long since demolished, is protected by a sandbank that ends here, and is hence known as the Tail of the Bank. The fairway between this bank, which begins to the west of Dumbarton, and the southern shore constitutes the safest anchorage in the upper firth. There is a continuous line of electric tramways, connecting with Port Glasgow on the east and Gourock on the west, a total distance of 7½ m. The annual rainfall amounts to 64 in. and Greenock thus has the reputation of being the wettest town in Scotland.

Many of the public buildings are fine structures. The municipal buildings, an ornate example of Italian Renaissance, with a tower 244 ft. high, were opened in 1887. The custom house on the old steamboat quay, in classic style with a Doric portico, dates from 1818. The county buildings (1867) have a tower and spire 112 ft. high. The Watt Institution, founded in 1837 by a son of the famous engineer, James Watt, contains the public library (established in 1783), the Watt scientific library (presented in 1816 by Watt himself), and the marble statue of James Watt by Sir Francis Chantrey. Adjoining it are the museum and lecture hall, the gift of James McLean, opened in 1876. Other buildings are the sheriff court house, and the Spence Library, founded by the widow of William Spence the mathematician. In addition to numerous board schools there are the Greenock academy for secondary education, the technical college (1900), the school of art, and a school of navigation and engineering. The charitable institutions include the infirmary; the cholera hospital; the eye infirmary; the fever reception house; Sir Gabriel Wood's mariners' asylum, an Elizabethan building erected in 1851 for the accommodation of aged merchant seamen; and the Smithson poorhouse and lunatic asylum, built beyond the southern boundary in 1879. Near Albert Harbour stands the old west now the north parish church (a Gothic edifice dating from 1591) containing some stained-glass windows by William Morris; in its kirkyard Burns's "Highland Mary" was buried (1786). The west parish church in Nicholson Street (1839) is in the Italian Renaissance style and has a campanile. The middle parish church (1759) in Cathcart Square is in the Classic style with a fine spire. Besides burial grounds near the infirmary and attached to a few of the older churches, a beautiful cemetery, 90 acres in extent, has been laid out in the south-western district. The parks and open spaces include Wellington Park, Well Park in the heart of the town (these were the gift of Sir Michael Shaw-Stewart), Whin Hill, Lyle Road—a broad drive winding over the heights towards Gourock, constructed as a "relief work" in the severe winter of 1879–1880.

Greenock is under the jurisdiction of a town council with provost and bailies. It is a parliamentary burgh, represented by one member. The corporation owns the supplies of water (the equipment of works and reservoirs is remarkably complete), gas, electric light and power, and the tramways (leased to a company). The staple industries are shipbuilding (established in 1760) and sugar refining (1765). Greenock-built vessels have always been esteemed, and many Cunard, P. & O. and Allan liners have been constructed in the yards. The town has been one of the chief centres of the sugar industry. Other important industries include the making of boilers, steam-engines, locomotives, anchors, chain-cables, sailcloth, ropes, paper, woollen and worsted goods, besides general engineering, an aluminium factory, a flax-spinning mill, distilleries and an oil-refinery. The seal and whale fisheries, once vigorously prosecuted, are extinct, but the fishing-fleets for the home waters and the Newfoundland grounds are considerable. Till 1772 the town leased the first harbour (finished in 1710) from Sir John Shaw, the superior, but acquired it in that and the following year, and a graving dock was opened in 1786. Since then additions and improvements have been periodically in progress, and there are now several tidal harbours—among them Victoria harbour, Albert harbour, the west harbour, the east harbour, the northern tidal harbour, the western tidal harbour, the great harbour and James Watt dock (completed in 1886 at a cost of £630,000 with an area of 2000 ft. by 400 ft. with a depth at low water of 32 ft.), Garvel graving dock and other dry docks. The quayage exceeds 100 acres in area and the quay walls are over 3 m. in length. Both the Caledonian and the Glasgow & South-Western railways (in Prince's Pier the latter company possesses a landing-stage nearly 1400 ft. long) have access to the quays. From first to last the outlay on the harbour has exceeded £1,500,000.

In the earlier part of the 17th century Greenock was a fishing village, consisting of one row of thatched cottages. A century later there were only six slated houses in the place. In 1635 it was erected by Charles I. into a burgh of barony under a charter granted to John Shaw, the government being administered by a baron-bailie, or magistrate, appointed by the superior. Its commercial prosperity received an enormous impetus from the Treaty of Union (1707), under which trade with America and the West Indies rapidly developed. The American War of Independence suspended progress for a brief interval, but revival set in in 1783, and within the following seven years shipping trebled in amount. Meanwhile Sir John Shaw—to whom and to whose descendants, the Shaw-Stewarts, the town has always been indebted—by charter (dated 1741 and 1751) had empowered the householders to elect a council of nine members, which proved to be the most liberal constitution of any Scots burgh prior to the Reform Act of 1832, when Greenock was raised to the status of a parliamentary burgh with the right to return one member to parliament. Greenock was the birthplace of James Watt, William Spence (1777–1815) and Dr John Caird (1820–1898), principal of Glasgow University, who died in the town and was buried in Greenock cemetery. John Galt, the novelist, was educated in Greenock, where he also served some time in the custom house as a clerk. Rob Roy is said to have raided the town in 1715.

GREENOCKITE, a rare mineral composed of cadmium sulphide, CdS, occurring as small, brilliant, honey-yellow crystals or as a canary-yellow powder. Crystals are hexagonal with hemimorphic development, being differently terminated at the two ends. The faces of the hexagonal prism and of the numerous hexagonal pyramids are deeply striated horizontally. The crystals are translucent to transparent, and have an adamantine to resinous lustre; hardness 3-3½; specific gravity 4·9. Crystals have been found only in Scotland, at one or two places in the neighbourhood of Glasgow, where they occur singly on prehnite in the amygdaloidal cavities of basaltic igneous rocks—a rather unusual mode of occurrence for a metallic sulphide. The first, and largest crystal (about ½ in. across) was found, about the year 1810, in the dolerite quarry at Bowling in Dumbartonshire, but this was thought to be blende. A larger number of crystals, but of smaller size, were found in 1840 during the cutting of the Bishopton tunnel on the Glasgow & Greenock railway; they were detected by Lord Greenock, afterwards the 2nd earl of Cathcart, after whom the mineral was named. A third locality is the Boyleston quarry near Barrhead. At all other localities—Przibram in Bohemia, Laurion in Greece, Joplin in Missouri, &c.—the mineral is represented only as a powder dusted over the surface of zinc minerals, especially blende and calamine, which contain a small amount of cadmium replacing zinc.

Isomorphous with greenockite is the hexagonal zinc sulphide (ZnS) known as wurtzite. Both minerals have been prepared artificially, and are not uncommon as furnace products. Previous to the recent discovery in Sardinia of cadmium oxide as small octahedral crystals, greenockite was the only known mineral containing cadmium as an essential constituent. (L. J. S.).

GREENORE, a seaport and watering-place of county Louth, Ireland, beautifully situated at the north of Carlingford Lough on its western shore. It was brought to importance by the action of the London & North-Western railway company of England, which owns the pier and railways joining the Great Northern system at Dundalk (12¼ m.) and Newry (14 m.). A regular

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service of passenger steamers controlled by the company runs to Holyhead, Wales, 80 m. S.E. A steam ferry crosses the Lough to Greencastle, for Kilkeel, and the southern watering-places of county Down. The company also owns the hotel, and laid out the golf links. In the vicinity a good example of raised beach, some 10 ft. above present sea-level, is to be seen.

GREENOUGH, GEORGE BELLAS (1778–1855), English geologist, was born in London on the 18th of January 1778. He was educated at Eton, and afterwards (1795) entered Pembroke College, Oxford, but never graduated. In 1798 he proceeded to Göttingen to prosecute legal studies, but having attended the lectures of Blumenbach he was attracted to the study of natural history, and, coming into the possession of a fortune, he abandoned law and devoted his attention to science. He studied mineralogy at Freiburg under Werner, travelled in various parts of Europe and the British Isles, and worked at chemistry at the Royal Institution. A visit to Ireland aroused deep interest in political questions, and he was in 1807 elected member of parliament for the borough of Gatton, continuing to hold his seat until 1812. Meanwhile his interest in geology increased, he was elected F.R.S. in 1807, and he was the chief founder with others of the Geological Society of London in 1807. He was the first chairman of that Society, and in 1811, when it was more regularly constituted, he was the first president: and in this capacity he served on two subsequent occasions, and did much to promote the advancement of geology. In 1819 he published *A Critical Examination of the First Principles of Geology*, a work which was useful mainly in refuting erroneous theories. In the same year was published his famous *Geological Map of England and Wales*, in six sheets; of which a second edition was issued in 1839. This map was to a large extent based on the original map of William Smith; but much new information was embodied. In 1843 he commenced to prepare a geological map of India, which was published in 1854. He died at Naples on the 2nd of April 1855.

GREENOUGH, HORATIO (1805–1852), American sculptor, son of a merchant, was born at Boston, on the 6th of September 1805. At the age of sixteen he entered Harvard, but he devoted his principal attention to art, and in the autumn of 1825 he went to Rome, where he studied under Thorwaldsen. After a short visit in 1826 to Boston, where he executed busts of John Quincy Adams and other people of distinction, he returned to Italy and took up his residence at Florence. Here one of his first commissions was from James Fenimore Cooper for a group of Chanting Cherubs; and he was chosen by the American government to execute the colossal statue of Washington for the national capital. It was unveiled in 1843, and was really a fine piece of work for its day; but in modern times it has been sharply criticized as unworthy and incongruous. Shortly afterwards he received a second government commission for a colossal group, the "Rescue," intended to represent the conflict between the Anglo-Saxon and Indian races. In 1851 he returned to Washington to superintend its erection, and in the autumn of 1852 he was attacked by brain fever, of which he died in Somerville near Boston on the 18th of December. Among other works of Greenough may be mentioned a bust of Lafayette, the Medora and the Venus Victrix in the gallery of the Boston Athenaeum. Greenough was a man of wide culture, and wrote well both in prose and verse.

See H. T. Tuckerman, *Memoir of Horatio Greenough* (New York, 1853).

GREENOUGH, JAMES BRADSTREET (1833–1901), American classical scholar, was born in Portland, Maine, on the 4th of May 1833. He graduated at Harvard in 1856, studied one year at the Harvard Law School, was admitted to the Michigan bar, and practised in Marshall, Michigan, until 1865, when he was appointed tutor in Latin at Harvard. In 1873 he became assistant professor, and in 1883 professor of Latin, a post which he resigned hardly six weeks before his death at Cambridge, Massachusetts, on the 11th of October 1901. Following the lead of Goodwin's *Moods and Tenses* (1860), he set himself to study Latin historical syntax, and in 1870 published *Analysis of the Latin Subjunctive*, a brief treatise, privately printed, of much originality and value, and in many ways coinciding with Berthold Delbrück's *Gebrauch des Conjunctivs und Optativs in Sanskrit und Griechischen* (1871), which, however, quite overshadowed the *Analysis*. In 1872 appeared *A Latin Grammar for Schools and Colleges, founded on Comparative Grammar*, by Joseph A. Allen and James B. Greenough, a work of great critical carefulness. His theory of *cum*-constructions is that adopted and developed by William Gardner Hale. In 1872–1880 Greenough offered the first courses in Sanskrit and comparative philology given at Harvard. His fine abilities for advanced scholarship were used outside the classroom in editing the Allen and Greenough Latin Series of text-books, although he occasionally contributed to *Harvard Studies in Classical Philology* (founded in 1889 and endowed at his instance by his own class) papers on Latin syntax, prosody and etymology—a subject on which he planned a long work—on Roman archaeology and on Greek religion at the time of the New Comedy. He assisted largely in the founding of Radcliffe College. An able English scholar and an excellent etymologist, he collaborated with Professor George L. Kittredge on *Words and their Ways in English Speech* (1901), one of the best books on the subject in the language. He wrote clever light verse, including *The Blackbirds*, a comedietta, first published in *The Atlantic Monthly* (vol. xxxix. 1877); *The Rose and the Ring* (1880), a pantomime adapted from Thackeray; *The Queen of Hearts* (1885), a dramatic fantasia; and *Old King Cole* (1889), an operetta.

See the sketch by George L. Kittredge in *Harvard Studies in Classical Philology*, vol. xiv. (1903), pp. 1–17 also printed in *Harvard Graduates' Magazine*, vol. x., Dec. 1901, pp. 196–201).

GREEN RIBBON CLUB, one of the earliest of the loosely combined associations which met from time to time in London taverns or coffee-houses for political purposes in the 17th century. It had its meeting-place at the King's Head tavern at Chancery Lane End, and was therefore known as the "King's Head Club." It seems to have been founded about the year 1675 as a resort for members of the political party hostile to the court, and as these associates were in the habit of wearing in their hats a bow, or "bob," of green ribbon, as a distinguishing badge useful for the purpose of mutual recognition in street brawls, the name of the club became changed, about 1670, to the Green Ribbon Club. The frequenters of the club were the extreme faction of the country party, the men who supported Titus Oates, and who were concerned in the Rye House Plot and Monmouth's rebellion. Roger North tells us that "they admitted all strangers that were confidingly introduced, for it was a main end of their institutions to make proselytes, especially of the raw estated youth newly come to town." According to Dryden (*Absalom and Achitophel*) drinking was the chief attraction, and the members talked and organized sedition over their cups. Thomas Dangerfield supplied the court with a list of forty-eight members of the Green Ribbon Club in 1679; and although Dangerfield's numerous perjuries make his unsupported evidence worthless, it receives confirmation as regards several names from a list given to James II. by Nathan Wade in 1685 (*Harleian MSS.* 6845), while a number of more eminent personages are mentioned in *The Cabal*, a satire published in 1680, as also frequenting the club. From these sources it would appear that the duke of Monmouth himself, and statesmen like Halifax, Shaftesbury, Buckingham, Macclesfield, Cavendish, Bedford, Grey of Warke, Herbert of Cherbury, were among those who fraternized at the King's Head Tavern with third-rate writers such as Scroop, Mulgrave and Shadwell, with remnants of the Cromwellian régime like Falconbridge, Henry Ireton and Claypole, with such profligates as Lord Howard of Escrik and Sir Henry Blount, and with scoundrels of the type of Dangerfield and Oates. An allusion to Dangerfield, notorious among his other crimes and treacheries for a seditious paper found in a meal-tub, is found in connexion with the club in *The Loyal Subjects' Litany*, one of the innumerable satires of the period, in which occur the lines:

"From the dark-lanthorn Plot, and the Green Ribbon Club
From brewing sedition in a sanctified Tub,
Libera nos, Domine."

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The club was the headquarters of the Whig opposition to the court, and its members were active promoters of conspiracy and sedition. The president was either Lord Shaftesbury or Sir Robert Peyton, M.P. for Middlesex, who afterwards turned informer. The Green Ribbon Club served both as a debating society and an intelligence department for the Whig faction. Questions under discussion in parliament were here threshed out by the members over their tobacco and ale; the latest news from Westminster or the city was retailed in the tavern, "for some or others were continually coming and going," says Roger North, "to import or export news and stories." Slander of the court or the Tories was invented in the club and sedulously spread over the town, and measures were there concerted for pushing on the Exclusion Bill, or for promoting the pretensions of the duke of Monmouth. The popular credulity as to Catholic outrages in the days of the Popish Plot was stimulated by the scandalmongers of the club, whose members went about in silk armour, supposed to be bullet proof, "in which any man dressed up was as safe as a house," says North, "for it was impossible to strike him for laughing"; while in their pockets, "for street and crowd-work," they carried the weapon of offence invented by Stephen College and known as the "Protestant Flail."

The genius of Shaftesbury found in the Green Ribbon Club the means of constructing the first systematized political organization in England. North relates that "every post conveyed the news and tales legitimated there, as also the malign constructions of all the good actions of the government, especially to places where elections were depending, to shape men's characters into fit qualifications to be chosen or rejected." In the general election of January and February 1679 the Whig interest throughout the country was managed and controlled by a committee sitting at the club in Chancery Lane. The club's organizing activity was also notably effective in the agitation of the Petitioners in 1679. This celebrated movement was engineered from the Green Ribbon Club with all the skill and energy of a modern caucus. The petitions were prepared in London and sent down to every part of the country, where paid canvassers took them from house to house collecting signatures with an air of authority that made refusal difficult. The great "pope-burning" processions in 1680 and 1681, on the anniversary of Queen Elizabeth's accession, were also organized by the club. They ended by the lighting of a huge bon-fire in front of the club windows; and as they proved an effective means of inflaming the religious passions of the populace, it was at the Green Ribbon Club that the *mobile vulgus* first received the nickname of "the mob." The activity of the club was, however, short-lived. The failure to carry the Exclusion Bill, one of the favourite projects of the faction, was a blow to its influence, which declined rapidly after the flight of Shaftesbury, the confiscation of the city of London's charter, and the discovery of the Rye House Plot, in which many of its members were implicated. In 1685 John Ayloffe, who was found to have been "a clubber at the King's Head Tavern and a green-ribon man," was executed in front of the premises on the spot where the "pope-burning" bon-fires had been kindled; and although the tavern was still in existence in the time of Queen Anne, the Green Ribbon Club which made it famous did not survive the accession of James II. The precise situation of the King's Head Tavern, described by North as "over against the Inner Temple Gate," was at the corner of Fleet Street and Chancery Lane, on the east side of the latter thoroughfare.

See Sir George **Sitwell**, *The First Whig* (Scarborough, 1894), containing an illustration of the Green Ribbon Club and a pope-burning procession; Roger North, *Examen* (London, 1740); Anchitell Grey, *Debates of the House of Commons, 1667–1684*, vol. viii. (10 vols., London, 1769); Sir John Bramston, *Autobiography* (Camden Soc., London, 1845). (R. J. M.)

GREENSAND, in geology, the name that has been applied to no fewer than three distinct members of the Cretaceous System, viz. the Upper Greensand (see GAULT), the Lower Greensand and the so-called Cambridge Greensand, a local phase of the base of the Chalk (*q.v.*). The term was introduced by the early English geologists for certain sandy rocks which frequently exhibited a greenish colour on account of the presence of minute grains of the green mineral glauconite. Until the fossils of these rocks came to be carefully studied there was much confusion between what is now known as the Upper Greensand (Selbornian) and the Lower Greensand. Here we shall confine our attention to the latter.

The Lower Greensand was first examined in detail by W. H. Fitton (*Q.J.G.S.* iii., 1847), who, in 1845, had proposed the name "Vectine" for the formation. The name was revived under the form "Vectian" in 1885 by A. J. Jukes-Browne, because, although sands and sandstones prevail, the green colour has often changed by oxidation of the iron to various shades of red and brown, and other lithological types, clays and limestones represent this horizon in certain areas. The Lower Greensand is typically developed in the Wealden district, in the Isle of Wight, in Dorsetshire about Swanage, and it appears again beneath the northern outcrop of the Chalk in Berkshire, Oxfordshire and Bedfordshire, and thence it is traceable through Norfolk and Lincolnshire into east Yorkshire. It rests conformably upon the Wealden formation in the south of England, but it is clearly separable from the beds beneath by the occurrence of marine fossils, and by the fact that there is a marked overlap of the Lower Greensand on the Weald in Wiltshire, and derived pebbles are found in the basal beds. The whole series is 800 ft. thick at Atherfield in the Isle of Wight, but it thins rapidly westward. It is usually clearly marked off from the overlying Gault.

In the Wealden area the Lower Greensand has been subdivided as follows, although the several members are not everywhere recognizable:—

	Isle of Wight.
Folkestone Beds (70-100 ft.)	Carstone and Sand rock series.
Sandgate Beds (75-100 ft.)	Ferruginous Sands (Shanklin sands).
Hythe Beds (80-300 ft.)	Ferruginous Sands (Walpen sands).
Atherfield Clay (20-90 ft.).	Atherfield Clay.

The Atherfield Clay is usually a sandy clay, fossiliferous. The basal portion, 5-6 ft., is known as the "Ferna bed" from the abundance of *Perna Mulleti*; other fossils are *Hoplites Deshayesii*, *Exogyra sinuata*, *Ancyloceras Mathesonianum*. The Hythe beds are interstratified thin limestones and sandstones; the former are bluish-grey in colour, compact and hard, with a certain amount of quartz and glauconite. The limestone is known locally as "rag"; the Kentish Rag has been largely employed as a building stone and roadstone; it frequently contains layers of chert (known as Sevenoaks stone near that town). The sandy portions are very variable; the stone is often clayey and calcareous and rarely hard enough to make a good building stone; locally it is called "hassock" (or Calkstone). The two stones are well exposed in the Iguanodon Quarry near Maidstone (so called from the discovery of the bones of that reptile). Southwest of Dorking sandstone and grit become more prevalent, and it is known there as "Bargate stone," much used around Godalming. Pulborough stone is another local sandstone of the Hythe beds. Fuller's earth occurs in parts of this formation in Surrey. The Sandgate beds, mainly dark, argillaceous sand and clay, are well developed in east Kent, and about Midhurst, Pulborough and Petworth. At Nutfield the celebrated fuller's earth deposits occur on this horizon; it is also found near Maidstone, at Bletchingley and Red Hill. The Folkestone beds are light-coloured, rather coarse sands, enclosing layers of siliceous limestone (Folkestone stone) and chert; a phosphatic bed is found near the top. These beds are well seen in the cliffs at Folkestone and near Reigate. At Ightham there is a fine, hard, white sandstone along with a green, quartzitic variety (Ightham stone). In Sussex the limestone and chert are usually lacking, but a ferruginous grit, "carstone," occurs in lenticular masses and layers, which is used for road metal at Pulborough, Fittleworth, &c.

The Lower Greensand usually forms picturesque, healthy country, as about Leith Hill, Hindhead, Midhurst, Petworth, at Woburn, or at Shanklin and Sandown in the Isle of Wight. Outside the southern area the Lower Greensand is represented by the Faringdon sponge-bearing beds in Berkshire, the Sandy and

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Potton beds in Bedfordshire, the Shotover iron sands of Oxfordshire, the sands and fuller's earth of Woburn, the Leighton Buzzard sands, the brick clays of Snettisham, and perhaps the Sandringham sands of Norfolk, and the carstone of that county and Lincolnshire. The upper ironstone, limestone and clay of the Lincolnshire Tealby beds appear to belong to this horizon along with the upper part of the Speeton beds of Yorkshire. The sands of the Lower Greensand are largely employed for the manufacture of glass, for which purpose they are dug at Aylesford, Godstone, near Reigate, Hartshill, near Aylesbury and other places; the ferruginous sand is worked as an iron ore at Seend.

This formation is continuous across the channel into France, where it is well developed in Boulonnais. According to the continental classification the Atherfield Clay is equivalent to the Urgonian or Barremian; the Sandgate and Hythe beds belong to the Aptian (*q.v.*); while the upper part of the Folkestone beds would fall within the lower Albian (*q.v.*).

See the *Memoirs of the Geological Survey*, "Geology of the Weald" (1875), "Geology of the Isle of Wight" (2nd ed., 1889), "Geology of the Isle of Purbeck" (1898); and the *Record of Excursions*, Geologists' Association (London, 1891). (J. A. H.)

GREENSBORO, a city and the county-seat of Guilford county, North Carolina, U.S.A., about 80 m. N.W. of Raleigh. Pop. (1890) 3317, (1900) 10,035, of whom 4086 were negroes; (1910 census), 15,895. Greensboro is served by several lines of the Southern railway. It is situated in the Piedmont region of the state and has an excellent climate. The city is the seat of the State Normal and Industrial College (1892) for girls; of the Greensboro Female College (Methodist Episcopal, South; chartered in 1838 and opened in 1846), of which the Rev. Charles F. Deems was president in 1850–1854, and which, owing to the burning of its buildings, was suspended from 1863 to 1874; and of two institutions for negroes—a State Agricultural and Mechanical College, and Bennett College (Methodist Episcopal, co-educational, 1873). Another school for negroes, Immanuel Lutheran College (Evangelical Lutheran, co-educational), was opened at Concord, N.C., in 1903, was removed to Greensboro in 1905, and in 1907 was established at Lutherville, E. of Greensboro. About 6 m. W. of Greensboro is Guilford College (co-educational; Friends), founded as "New Garden Boarding School" in 1837 and re-chartered under its present name in 1888. Greensboro has a Carnegie library, St Leo hospital and a large auditorium. It is the shipping-point for an agricultural, lumbering and trucking region, among whose products Indian corn, tobacco and cotton are especially important; is an important insurance centre; has a large wholesale trade; and has various manufactures, including cotton goods[1] (especially blue denim), tobacco and cigars, lumber, furniture, sash, doors and blinds, machinery, foundry products and terra-cotta. The value of the factory products increased from $925,411 in 1900 to $1,828,837 in 1905, or 97·6%. The municipality owns and operates the water-works. Greensboro was named in honour of General Nathanael Greene, who on the 15th of March 1781 fought with Cornwallis the battle of Guilford Court House, about 6 m. N.W. of the city, where there is now a Battle-Ground Park of 100 acres (including Lake Wilfong); this park contains a Revolutionary museum, and twenty-nine monuments, including a Colonial Column, an arch (1906) in memory of Brig.-General Francis Nash (1720–1777), of North Carolina, who died in October 1777 of wounds received at Germantown, and Davidson Arch (1905), in honour of William Lee Davidson (1746–1781), a brigadier-general of North Carolina troops, who was killed at Catawba and in whose honour Davidson College, at Davidson, N.C., was named. Greensboro was founded and became the county-seat in 1808, was organized as a town in 1829, and was first chartered as a city in 1870.

[1] One of the first cotton mills in the South and probably the first in this state was established at Greensboro in 1832. It closed about 20 years afterwards, and in 1889 new mills were built. Three very large mills were built in the decade after 1895, and three mill villages, Proximity, Revolution and White Oak, named from these three mills, lie immediately N. of the city; in 1908 their population was estimated at 8000. The owners of these mills maintain schools for the children of operatives and carry on "welfare work" in these villages.

GREENSBURG, a borough and the county-seat of Westmoreland county, Pennsylvania, U.S.A., 31 m. E.S.E. of Pittsburg. Pop. (1890) 4202; (1900) 6508 (484 foreign-born); (1910) 5420. It is served by two lines of the Pennsylvania railway. It is an important coal centre, and manufactures engines, iron and brass goods, flour, lumber and bricks. In addition to its public school system, it has several private schools, including St Mary's Academy and St Joseph's Academy, both Roman Catholic. About 3 m. N.E. of what is now Greensburg stood the village of Hanna's Town, settled about 1770 and almost completely destroyed by the Indians on the 13th of July 1782; here what is said to have been the first court held west of the Alleghanies opened on the 6th of April 1773, and the county courts continued to be held here until 1787. Greensburg was settled in 1784–1785, immediately after the opening of the state road, not far from the trail followed by General John Forbes on his march to Fort Duquesne in 1758; it was made the county-seat in 1787, and was incorporated in 1799. In 1905 the boroughs of Ludwick (pop. in 1900, 901), East Greensburg (1050), and South-east Greensburg (620) were merged with Greensburg.

See John N. Boucher's *History of Westmoreland County, Pa.* (3 vols., New York, 1906).

GREENSHANK, one of the largest of the birds commonly known as sandpipers, the *Totanus glottis* of most ornithological writers. Some exercise of the imagination is however needed to see in the dingy olive-coloured legs of this species a justification of the English name by which it goes, and the application of that name, which seems to be due to Pennant, was probably by way of distinguishing it from two allied but perfectly distinct species of *Totanus* (*T. calidris* and *T. fuscus*) having red legs and usually called redshanks. The greenshank is a native of the northern parts of the Old World, but in winter it wanders far to the south, and occurs regularly at the Cape of Good Hope, in India and thence throughout the Indo-Malay Archipelago to Australia. It has also been recorded from North America, but its appearance there must be considered accidental. Almost as bulky as a woodcock, it is of a much more slender build, and its long legs and neck give it a graceful appearance, which is enhanced by the activity of its actions. Disturbed from the moor or marsh, where it has its nest, it rises swiftly into the air, conspicuous by its white back and rump, and uttering shrill cries flies round the intruder. It will perch on the topmost bough of a tree, if a tree be near, to watch his proceedings, and the cock exhibits all the astounding gesticulations in which the males of so many other *Limicolae* indulge during the breeding-season—with certain variations, however, that are peculiarly its own. It breeds in no small numbers in the Hebrides, and parts of the Scottish Highlands from Argyllshire to Sutherland, as well as in the more elevated or more northern districts of Norway, Sweden and Finland, and probably also thence to Kamchatka. In North America it is represented by two species, *Totanus semipalmatus* and *T. melanoleucus*, there called willets, telltales or tattlers, which in general habits resemble the greenshank of the Old World. (A. N.)

GREENVILLE, a city and the county-seat of Washington county, Mississippi, U.S.A., on the E. bank of the Mississippi river, about 75 m. N. of Vicksburg. Pop. (1890) 6658; (1900) 7642 (4987 negroes); (1910) 6610. Greenville is served by the Southern and the Yazoo & Mississippi Valley railways, and by various passenger and freight steamboat lines on the Mississippi river. It is situated in the centre of the Yazoo Delta, a rich cotton-producing region, and its industries are almost exclusively connected with that staple. There are large warehouses, compresses and gins, extensive cotton-seed oil works and sawmills. Old Greenville, about 1 m. S. of the present site, was the county seat of Jefferson county until 1825 (when Fayette succeeded it), and later became the county-seat of Washington county. Much of the old town caved into the river, and during the Civil War it was burned by the Federal forces soon after the capture of Memphis. The present site was then adopted. The town of Greenville was incorporated in 1870; in 1886 it was chartered as a city.

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GREENVILLE, a city and the county-seat of Darke county, Ohio, U.S.A., on Greenville Creek, 36 m. N.W. of Dayton. Pop. (1900) 5501; (1910) 6237. It is served by the Pittsburg, Cincinnati, Chicago & St Louis and the Cincinnati Northern railways, and by interurban electric railways. It is situated about 1050 ft. above sea-level and is the trade centre of a large and fertile agricultural district, producing cereals and tobacco. It manufactures lumber, foundry products, canned goods and creamery products and has grain elevators and tobacco warehouses. In the city is a Carnegie library, and 3 m. distant there is a county Children's Home and Infirmary. The municipality owns and operates its water-works. Greenville occupies the site of an Indian village and of Fort Greenville (built by General Anthony Wayne in 1793 and burned in 1796). Here, on the 3rd of August 1795, General Wayne, the year after his victory over the Indians at Falien Timbers, concluded with them the treaty of Greenville, the Indians agreeing to a cessation of hostilities and ceding to the United States a considerable portion of Ohio and a number of small tracts in Indiana, Illinois and Michigan (including the sites of Sandusky, Toledo, Defiance, Fort Wayne, Detroit, Mackinac, Peoria and Chicago), and the United States agreeing to pay to the Indians $20,000 worth of goods immediately and an annuity of goods, valued at $9500, for ever. The tribes concerned were the Wyandots, the Delawares, the Shawnees, the Ottawas, the Chippewas, the Pottawatomies, the Miamis, the Weeas, the Kickapoos, the Piankeshaws, the Kaskaskins and the Eel-river tribe. Tecumseh lived at Greenville from 1805 to 1809, and a second Indian treaty was negotiated there in July 1814 by General W. H. Harrison and Lewis Cass, by which the Wyandots, the Delawares, the Shawnees, the (Ohio) Senecas and the Miamis agreed to aid the United States in the war with Great Britain. The first permanent white settlement of Greenville was established in 1808 and the town was laid out in the same year. It was made the county-seat of the newly erected county in 1809, was incorporated as a town in 1838 and chartered as a city in 1887.

GREENVILLE, a city and the county-seat of Greenville county, South Carolina, U.S.A., on the Reedy river, about 140 m. N.W. of Columbia, in the N.W. part of the state. Pop. (1890) 8607; (1900) 11,860, of whom 5414 were negroes; (1910, census) 15,741. It is served by the Southern, the Greenville & Knoxville and the Charleston & Western Carolina railways. It lies 976 ft. above sea-level, near the foot of the Blue Ridge Mountains, its climate and scenery attracting summer visitors. It is in an extensive cotton-growing and cotton-manufacturing district. Greenville's chief interest is in cotton, but it has various other manufactures, including carriages, wagons, iron and fertilizers. The total value of the factory products of the city in 1905 was $1,676,774, an increase of 73·5% since 1900. The city is the seat of Furman University, Chicora College for girls (1893; Presbyterian), and Greenville Female College (1854; Baptist), which in 1907–1908 had 379 students, and which, besides the usual departments, has a conservatory of music, a school of art, a school of expression and physical culture and a kindergarten normal training school. Furman University (Baptist; opened in 1852) grew out of the "Furman Academy and Theological Institution," opened at Edgefield, S.C., in 1827, and named in honour of Richard Furman (1755–1825), a well-known Baptist clergyman of South Carolina, whose son, James C. Furman (1809–1891), was long president of the University. In 1907–1908 the university had a faculty of 15 and 250 students, of whom 101 were in the Furman Fitting School. Greenville was laid out in 1797, was originally known as Pleasantburg and was first chartered as a city in 1868.

GREENVILLE, a city and the county-seat of Hunt county, Texas, U.S.A., near the headwaters of the Sabine river, 48 m. N.E. of Dallas. Pop. (1900) 6860, of whom 114 were foreign-born and 1751 were negroes; (1910) 8850. It is served by the Missouri, Kansas & Texas, the St Louis South-Western and the Texas Midland railways. It is an important cotton market, has gins and compresses, a large cotton seed oil refinery, and other manufactories, and is a trade centre for a rich agricultural district. The city owns and operates its electric-lighting plant. It is the seat of Burleson College (Baptist), founded in 1893, and 1 m. from the city limits, in the village of Peniel (pop. 1908, about 500), a community of "Holiness" people, are the Texas Holiness University (1898), a Holiness orphan asylum and a Holiness press. Greenville was settled in 1844, and was chartered as a city in 1875. In 1907 the Texas legislature granted to the city a new charter establishing a commission government similar to that of Galveston.

GREENWICH, a township of Fairfield county, Connecticut, U.S.A., on Long Island Sound, in the extreme S.W. part of the state, about 28 m. N.E. of New York City. It contains a borough of the same name and the villages of Cos Cob, Riverside and Sound Beach, all served by the New York, New Haven & Hartford Railway; the township has steamboat and electric railway connexions with New York City. Pop. of the township (1900) 12,172, of whom 3271 were foreign-born; (1910) 16,463; of the borough (1910) 3886. Greenwich is a summer resort, principally for New Yorkers. Among the residents have been Edwin Thomas Booth, John Henry Twachtman, the landscape painter, and Henry Osborne Havemeyer (1847–1907), founder of the American Sugar Company. There are several fine churches in the township; of one in Sound Beach the Rev. William H. H. Murray (1840–1904), called "Adirondack Murray," from his *Camp Life in the Adirondack Mountains* (1868), was once pastor. In the borough are a public library, Greenwich Academy (1827; co-educational), the Brunswick School for boys (1903), with which Betts Academy of Stamford was united in 1908, and a hospital. The principal manufactures are belting, woollens, tinners' hardware, iron and gasolene motors. Oysters are shipped from Greenwich. The first settlers came from the New Haven Colony in 1640; but the Dutch, on account of the exploration of Long Island Sound by Adrian Blok in 1614, laid claim to Greenwich, and as New Haven did nothing to assist the settlers, they consented to union with New Netherland in 1642. Greenwich then became a Dutch manor. By a treaty of 1650, which fixed the boundary between New Netherland and the New Haven Colony, the Dutch relinquished their claim to Greenwich, but the inhabitants of the town refused to submit to the New Haven Colony until October 1656. Six years later Greenwich was one of the first towns of the New Haven Colony to submit to Connecticut. The township suffered severely during the War of Independence on account of the frequent quartering of American troops within its borders, the depredations of bands of lawless men after the occupation of New York by the British in 1778 and its invasion by the British in 1779 (February 25) and 1781 (December 5). There was also a strong loyalist sentiment. On the old post-road in Greenwich is the inn, built about 1720, at which Israel Putnam was surprised in February 1779 by a force under General Tryon; according to tradition he escaped by riding down a flight of steep stone steps. The inn was purchased in 1901 by the Daughters of the American Revolution, who restored it and made it a Putnam Memorial. The township government of Greenwich was instituted in the colonial period. The borough of Greenwich was incorporated in 1858.

See D. M. Mead, *History of the Town of Greenwich* (New York, 1857).

GREENWICH, a south-eastern metropolitan borough of London, England, bounded N. by the river Thames, E. by Woolwich, S. by Lewisham and W. by Deptford. Pop. (1901) 95,770. Area, 3851·7 acres. It has a river-frontage of 4½ m., the Thames making two deep bends, enclosing the Isle of Dogs on the north and a similar peninsula on the Greenwich side. Greenwich is connected with Poplar on the north shore by the Greenwich tunnel (1902), for foot-passengers, to the Isle of Dogs (Cubitt Town), and by the Blackwall Tunnel (1897) for street traffic, crossing to a point between the East and West India Docks (see POPLAR). The main thoroughfares from W. to E. are Woolwich and Shooter's Hill Roads, the second representing the old high road through Kent, the Roman Watling Street. Greenwich is first noticed in the reign of Ethelred, when it was a station of the Danish fleet (1011–1014).

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The most noteworthy buildings are the hospital and the observatory. Greenwich Hospital, as it is still called, became in 1873 a Royal Naval College. Upon it or its site centre nearly all the historical associations of the place. The noble buildings, contrasting strangely with the wharves adjacent and opposite to it, make a striking picture, standing on the low river-bank with a background formed by the wooded elevation of Greenwich Park. They occupy the site of an ancient royal palace called Greenwich House, which was a favourite royal residence as early as 1300, but was granted by Henry V. to Thomas Beaufort, duke of Exeter, from whom it passed to Humphrey, duke of Gloucester, who largely improved the property and named it *Placentia*. It did not revert to the crown till his death in 1447. It was the birthplace of Henry VIII., Queen Mary and Queen Elizabeth, and here Edward VI. died. The building was enlarged by Edward IV., by Henry VIII., who made it one of his chief residences, by James I. and by Charles I., who erected the "Queen's House" for Henrietta Maria. The tenure of land from the crown "as of the manor of East Greenwich" became at this time a recognized formula, and occurs in a succession of American colonial charters from those of Virginia in 1606, 1609 and 1612 to that of New Jersey in 1674. Along with other royal palaces Greenwich was at the Revolution appropriated by the Protector, but it reverted to the crown on the restoration of Charles II., by whom it was pulled down, and the west wing of the present hospital was erected as part of an extensive design which was not further carried out. In its unfinished state it was assigned by the patent of William and Mary to certain of the great officers of state, as commissioners for its conversion into a hospital for seamen; and it was opened as such in 1705. The building consists of four blocks. Behind a terrace 860 ft. in length, stretching along the river side, are the buildings erected in the time of Charles II. from Inigo Jones's designs, and in that of Queen Anne from designs by Sir Christopher Wren; and behind these buildings are on the west those of King William and on the east those of Queen Mary, both from Wren's designs. In the King William range is the painted hall. Here in 1806 the remains of Nelson lay in state before their burial in St Paul's Cathedral. Its walls and ceiling were painted by Sir James Thornhill with various emblematic devices, and it is hung with portraits of the most distinguished admirals and paintings of the chief naval battles of England. In the Queen Anne range is the Royal Naval Museum, containing models, relics of Nelson and of Franklin, and other objects. In the centre of the principal quadrangle of the hospital there is a statue of George II. by Rysbrack, sculptured out of a single block of marble taken from the French by Admiral Sir George Rooke. In the upper quadrangle is a bust of Nelson by Chantrey, and there are various other memorials and relics. The oldest part of the building was in some measure rebuilt in 1811, and the present chapel was erected to replace one destroyed by fire in 1779. The endowments of the hospital were increased at various periods from bequests and forfeited estates. Formerly 2700 retired seamen were boarded within it, and 5000 or 6000 others, called outpensioners, received stipends at various rates out of its funds; but in 1865 an act was passed empowering the Admiralty to grant liberal pensions in lieu of food and lodging to such of the inmates as were willing to quit the hospital, and in 1869 another act was passed making their leaving on these conditions compulsory. It was then devoted to the accommodation of the students of the Royal Naval College, the Infirmary being granted to the Seamen's Hospital Society. Behind the College is the Royal Hospital School, where 1000 boys, sons of petty officers and seamen, are boarded.

To the south of the hospital is Greenwich Park (185 acres), lying high, and commanding extensive views over London, the Thames and the plain of Essex. It was enclosed by Humphrey, duke of Gloucester, and laid out by Charles II., and contains a fine avenue of Spanish chestnuts planted in his time. In it is situated the Royal Observatory, built in 1675 for the advancement of navigation and nautical astronomy. From it the exact time is conveyed each day at one o'clock by electric signal to the chief towns throughout the country; British and the majority of foreign geographers reckon longitude from its meridian. A standard clock and measures are seen at the entrance. A new building was completed in 1899, the magnetic pavilion lying some 400 yds. to the east, so placed to avoid the disturbance of instruments which would be occasioned by the iron used in the principal building. South of the park lies the open common of Blackheath, mainly within the borough of Lewisham, and in the east the borough includes the greater part of Woolwich Common.

At Greenwich an annual banquet of cabinet ministers, known as the whitebait dinner, formerly took place. This ceremony arose out of a dinner held annually at Dagenham, on the Essex shore of the Thames, by the commissioners for engineering works carried out there in 1705–1720—a remarkable achievement for this period—to save the lowlands from flooding. To one of these dinners Pitt was invited, and was subsequently accompanied by some of his colleagues. Early in the 19th century the venue of the dinner, which had now become a ministerial function, was transferred to Greenwich, and though at first not always held here, was later celebrated regularly at the "Ship," an hotel of ancient foundation, closed in 1908. The banquet continued till 1868, was revived in 1874–1880, and was held for the last time in 1894.

The parish church of Greenwich, in Church Street, is dedicated to St Alphege, archbishop, who was martyred here by the Danes in 1012. In the church Wolfe, who died at Quebec (1759), and Tallis, the musician, are buried. A modern stained-glass window commemorates Wolfe.

The parliamentary borough of Greenwich returns one member. Two burgesses were returned in 1577, but it was not again represented till the same privilege was conferred on it in 1832. The borough council consists of a mayor, five aldermen and thirty councillors.

GREENWOOD, FREDERICK (1830–1909), English journalist and man of letters, was born in April 1830. He was one of three brothers—the others being James and Charles—who all gained reputation as journalists. Frederick started life in a printing house, but at an early age began to write in periodicals. In 1853 he contributed a sketch of Napoleon III. to a volume called *The Napoleon Dynasty* (2nd ed., 1855). He also wrote several novels: *The Loves of an Apothecary* (1854), *The Path of Roses* (1859) and (with his brother James) *Under a Cloud* (1860). To the second number of the *Cornhill Magazine* he contributed "An Essay without End," and this led to an introduction to Thackeray. In 1862, when Thackeray resigned the editorship of the *Cornhill*, Greenwood became joint editor with G. H. Lewes. In 1864 he was appointed sole editor, a post which he held until 1868. While at the *Cornhill* he wrote an article in which he suggested, to some extent, how Thackeray might have intended to conclude his unfinished work *Denis Duval*, and in its pages appeared *Margaret Denzil's History*. Greenwood's most ambitious work of fiction, published in volume form in 1864. At that time Greenwood had conceived the idea of an evening newspaper, which, while containing "all the news proper to an evening journal," should, for the most part, be made up "of original articles upon the many things which engage the thoughts, or employ the energies, or amuse the leisure of mankind." Public affairs, literature and art, "and all the influences which strengthen or dissipate society" were to be discussed by men whose independence and authority were equally unquestionable. Canning's *Anti-Jacobin* and the *Saturday Review* of 1864 were the joint models Greenwood had before him. The idea was taken up by Mr George Smith, and the *Pall Mall Gazette* (so named after Thackeray's imaginary paper in *Pendennis*) was launched in February 1865, with Greenwood as editor. Within a few years he had come to exercise a great influence on public affairs. His views somewhat rapidly ripened from what was described as philosophic Liberalism into Conservatism. No minister in Great Britain, Mr Gladstone declared, ever had a more able, a more zealous, a more effective supporter for his policy than Lord Beaconsfield

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had in Greenwood. It was on the suggestion of Greenwood that Beaconsfield purchased in 1875 the Suez Canal shares of the Khedive Ismail; the British government being ignorant, until informed by Greenwood, that the shares were for sale and likely to be bought by France. It was characteristic of Greenwood that he declined to publish the news of the purchase of the shares in the *Pall Mall* before the official announcement was made.

Early in 1880 the *Pall Mall* changed owners, and the new proprietor required it to support Liberal policy. Greenwood at once resigned his editorship, but in May a new paper, the *St James's Gazette*, was started for him by Mr Henry Hucks Gibbs (afterwards Lord Aldenham), and Greenwood proceeded to carry on in it the tradition which he had established in the *Pall Mall*. At the *St James's* Greenwood remained for over eight years, continuing to exercise a marked influence upon political affairs, notably as a pungent critic of the Gladstone administration (1880–1885) and an independent supporter of Lord Salisbury. His connexion with the paper ceased in August 1888, owing to disagreements with the new proprietor, Mr E. Steinkopff, who had bought the *St James's* at Greenwood's own suggestion. In January 1891 Greenwood brought out a weekly review which he named the *Anti-Jacobin*. It failed, however, to gain public support, the last number appearing in January 1892. In 1893 he published *The Lover's Lexicon* and in 1894 *Imagination in Dreams*. He continued to express his views on political and social questions in contributions to newspapers and magazines, writing frequently in the *Westminster Gazette*, the *Pall Mall*, *Blackwood*, the *Cornhill*, &c. Towards the end of his life his political views reverted in some respects to the Liberalism of his early days.

In the words of George Meredith "Greenwood was not only a great journalist, he had a statesman's head. The national interests were always urgent at his heart." He was remarkable for securing for his papers the services of the ablest writers of the day, and for the gift of recognizing merit in new writers, such, for instance, as Richard Jeffries and J. M. Barrie. His instinct for capacity in others was as sure as was his journalistic judgment. In 1905, on the occasion of his 75th birthday, a dinner was given in his honour by leading statesmen, journalists, and men of letters (with John Morley—who had succeeded him as editor of the *Pall Mall*—in the chair). In May 1907 he contributed to *Blackwood* an article on "The New Journalism," in which he drew a sharp contrast between the old and the new conditions under which the work of a newspaper writer is conducted. He died at Wydenham on the 1st of December 1909.

See *Honouring Frederick Greenwood*, being a report of the speeches at the dinner on the 8th of April 1905 (London, privately printed, 1905); "Birth and Infancy of the *Pall Mall Gazette*," an article contributed by Greenwood to the *Pall Mall* of the 14th of April 1897; "The Blowing of the Trumpet" in the introduction to the *St James's* (May 31, 1880); obituary notices in the *Athenaeum* (Dec. 25, 1909) and *The Times* (Dec. 17, 1909).

GREENWOOD, JOHN (d. 1593), English Puritan and Separatist (the date and place of his birth are unknown), entered as a sizar at Corpus Christi College, Cambridge, on the 18th of March 1577–1578, and commenced B.A. 1581. Whether he was directly influenced by the teaching of Robert Browne (*q.v.*), a graduate of the same college, is uncertain; in any case he held strong Puritan opinions, which ultimately led him to Separatism of the most rigid type. In 1581 he was chaplain to Lord Rich, at Rochford, Essex. At some unspecified time he had been made deacon by John Aylmer, bishop of London, and priest by Thomas Cooper, bishop of Lincoln; but ere long he renounced this ordination as "wholly unlawful." Details of the next few years are lacking; but by 1586 he was the recognized leader of the London Separatists, of whom a considerable number had been imprisoned at various times since 1567. Greenwood was arrested early in October 1586, and the following May was committed to the Fleet prison for an indefinite time, in default of bail for conformity. During his imprisonment he wrote some controversial tracts in conjunction with his fellow-prisoner Henry Barrowe (*q.v.*). He is understood to have been at liberty in the autumn of 1588; but this may have been merely "the liberty of the prison." However, he was certainly at large in September 1592, when he was elected "teacher" of the Separatist church. Meanwhile he had written (1590) "An Answer to George Gifford's pretended Defence of Read Prayers." On the 5th of December he was again arrested; and the following March was tried, together with Barrowe, and condemned to death on a charge of "devising and circulating seditious books." After two respites, one at the foot of the gallows, he was hanged on the 6th of April 1593.

AUTHORITIES.—H. M. Dexter, *Congregationalism during the last three hundred years*; *The England and Holland of the Pilgrims*; F. J. Powicke, *Henry Barrowe and the Exiled Church of Amsterdam*; B. Brook, *Lives of the Puritans*; C. H. Cooper, *Athenae Cantabrigienses*, vol. ii.

GREG, WILLIAM RATHBONE (1809–1881), English essayist, the son of a merchant, was born at Manchester in 1809. He was educated at the university of Edinburgh and for a time managed a mill of his father's at Bury, and in 1832 began business on his own account. He entered with ardour into the struggle for free trade, and obtained in 1842 the prize offered by the Anti-Corn Law League for the best essay on "Agriculture and the Corn Laws." He was too much occupied with political, economical and theological speculations to give undivided attention to his business, which he gave up in 1850 to devote himself to writing. His *Creed of Christendom* was published in 1851, and in 1852 he published no less than twelve articles to four leading quarterlies. Disraeli praised him; Sir George Cornewall Lewis bestowed a Commissionership of Customs upon him in 1856; and in 1864 he was made Comptroller of the Stationery Office. Besides contributions to periodicals he produced several volumes of essays on political and social philosophy. The general spirit of these is indicated by the titles of two of the best known, *The Enigmas of Life* (1872) and *Rocks Ahead* (1874). They represent a reaction from the high hopes of the author's youth, when wise legislation was assumed to be a remedy for every public ill. Greg was a man of deep moral earnestness of character and was interested in many philanthropic works. He died at Wimbledon on the 15th of November 1881. His brother, ROBERT HYDE GREG (1705–1875), was an economist and antiquary of some distinction. Another brother, SAMUEL GREG (1804–1876), became well known in Lancashire by his philanthropic efforts on behalf of the working-people. PERCY GREG (1836–1889), son of William Rathbone Greg, also wrote, like his father, on politics, but his views were violently reactionary. His *History of the United States to the Reconstruction of the Union* (1887) is a polemic rather than a history.

GREGARINES (mod. Lat. *Gregarina*, from *gregarius*, collecting in a flock or herd, *grex*) a large and abundant order of Sporozoa Ectospora, in which a very high degree of morphological specialization and cytological differentiation of the cell-body is frequently found. On the other hand, the life-cycle is, in general, fairly simple. Other principal characters which distinguish Gregarines from allied Sporozoan parasites are as follows:—The fully-grown adult (trophozoite) is always "free" in some internal cavity, *i.e.* it is extracellular; in nearly all cases prior to sporulation two Gregarines (associates) become attached to one another, forming a couple (syzygy), and are surrounded by a common cyst; inside the cyst the body of each associate becomes segmented up into a number of sexual elements (gametes, primary sporoblasts), which then conjugate in pairs; the resulting copula (zygote, definitive sporoblast) becomes usually a spore by the secretion of spore-membranes (sporocyst), its protoplasm (sporoplasm) dividing up to form the germs (sporozoites).

F. Redi (1684) is said to have been the first to observe a Gregarine parasite, but his claim to this honour is by no means certain. Much later (1787) Cavolini described and figured an indubitable Gregarine (probably the form now known as *Aggregata conformis*) from a Crustacean (*Pachygrapsus*), which, however, he regarded as a tapeworm. Leon Dufour, who in his researches on insect anatomy came across several species of these parasites, also considered them as allied to the worms and proposed the generic name of *Gregarina*.

Historical.

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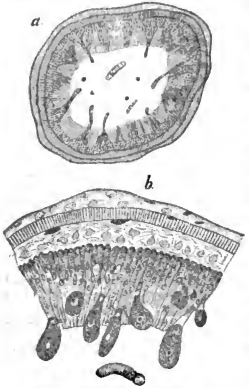
The unicellular nature of Gregarines was first realized by A. von Kölliker, who from 1845–1848 added considerably to our knowledge of the frequent occurrence and wide distribution of these organisms. Further progress was due to F. Stein who demonstrated about this time the relation of the "pseudonavicellae" (spores) to the reproduction of the parasites.



From Wasielewski's *Sporozoenkunde*, after Pfeiffer.

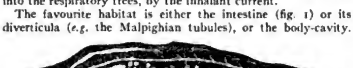
FIG. 1.—*a*, Transverse Section of Intestine of Mealworm, infected with *Gregarina* (*Clepsydrina*) *polymorpha*;[1] *b*, Part of a highly magnified.

Apart from the continually increasing number of known species, matters remained at about this stage for many years. It is, in fact, only since the closing years of the 19th century that the complete life-history has been fully worked out; this has now been done in many cases, thanks to the researches of M. Siedlecki, L. Cuénot, L. Léger, O. Duboscq, A. Laveran, M. Caullery, F. Mesnil and others, to whom also we owe most of our knowledge regarding the relations of the parasites to the cells of their host during their early development.

Gregarines are essentially parasites of Invertebrates; they are not known to occur in any true Vertebrate although met with in Ascidians. By far the greatest number of hosts is furnished by the Arthropods. Many members of the various groups of worms (especially the Annelids) also harbour the parasites, and certain very interesting forms are found in Echinoderms; in the other classes, they either occur only sporadically or else are absent. Infection is invariably of the accidental (casual) type, by way of the alimentary canal, the spores being usually swallowed by the host when feeding; a novel variation of this method has been described by Woodcock (31) in the case of a Gregarine parasitic in *Cucumaria*, where the spores are sucked up through the cloaca into the respiratory trees, by the inhalant current.

Occurrence; mode of infection.

The favourite habitat is either the intestine (fig. 1) or its diverticula (*e.g.* the Malpighian tubules), or the body-cavity.



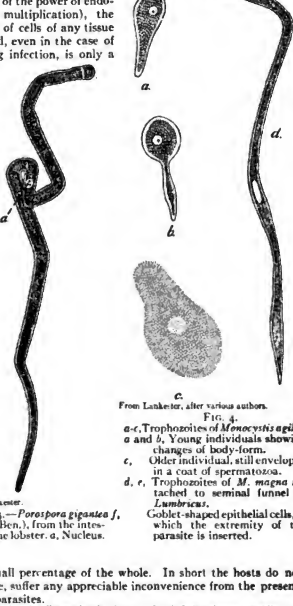
From Wasielewski, after Léger

FIG. 2.—Cysts of a Coelomic Gregarine, in the body-cavity of a larva of *Tipula*.

In the latter case, after infection has occurred, the liberated germs at once traverse the intestinal epithelium. They may come to rest in the connective tissue of the sub-mucosa (remaining, however, extracellular), grow considerably in that situation, and ultimately fall into the body-cavity (*e.g. Diplocystis*); or they may pass straightway into the body-cavity and there come into relation with some organ or tissue (*e.g. Monocystis* of the earthworm, which is for a time intracellular in the spermatoblasts (fig. 4, *c*). In the case of intestinal Gregarines, the behaviour of the young trophozoite with respect to the epithelial cells of its host varies greatly. The parasite may remain only attached to the host-cell, never becoming actually intracellular (*e.g. Pterocephalus*); more usually it penetrates partially into it, the extracellular portion of the Gregarine, however, giving rise subsequently to most of the adult (*e.g. Gregarina*); or lastly, in a few forms, the early development is entirely intracellular (*e.g. Lankesteria, Stenophora*).

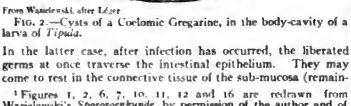
Habitat and effects on host.

The effects on the host are confined to the parasitized cells. These generally undergo at first marked hypertrophy and alteration in character; this condition is succeeded by one of atrophy, when the substance of the cell becomes in one way or another practically absorbed by the growing parasite (cf. also Coccidia). Since, however, the Gregarines never overrun their hosts in the way that many other Sporozoa do (because of their lack, in general, of the power of endogenous multiplication), the number of cells of any tissue attacked, even in the case of a strong infection, is only a very small percentage of the whole. In short the hosts do not, as a rule, suffer any appreciable inconvenience from the presence of the parasites.



From Lankester, after various authors.

FIG. 4.
a-c, Trophozoites of *Monocystis agilis*. *a* and *b*, Young individuals showing changes of body-form.
c, Older individual, still enveloped in a coat of spermatozoa.
d, *e*, Trophozoites of *M. magna* attached to seminal funnel of *Lumbricus*.



From Lankester.

FIG. 3.—*Porospora gigantea f*, (E. van Ben.), from the intestine of the lobster. *a*, Nucleus.
Goblet-shaped epithelial cells, in which the extremity of the parasite is inserted.

[1] Figures 1, 2, 6, 7, 10, 11, 12 and 16 are redrawn from Wasielewski's *Sporozoenkunde*, by permission of the author and of the publisher, Gustav Fischer, Jena.

The body of a Gregarine is always of a definite shape, usually oval

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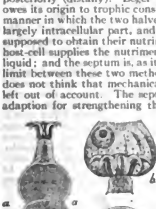
or elongated; in one or two instances (*e.g. Diplodina*) it is spherical, and, on the other hand, in *Porospora* (fig. 3) it is greatly drawn out and vermiform. In many adult Gregarines, the body is divided into two distinct but unequal regions or halves, the anterior part being known as the *protomerite*, the hinder, generally the larger, as the *deutomerite*. This feature is closely associated with another important morphological character, one which is observable, however, only during the earlier stages of growth and development, namely, the presence of a definite organ, the *epimerite*, which serves for the attachment of the parasite to the host-cell (fig. 6).

Morphology.

After Siedlecki, from Lankester's *Treatise on Zoology*.

FIG. 5.—Part of a section through the apparatus of fixation of a *Pterocephalus*, showing root-like processes extending from the Gregarine between the epithelial cells. *g*, Head of Gregarine; *r*, Root-like processes; *ep*, Epithelial cells.

In those Gregarines (most intestinal forms) which become attached to an epithelial cell, the attachment occurs by means of a minute projection or beak (rostrum) at the anterior end of the sporozoite, which pushes its way into the cell, followed by the first part of the growing germ. This portion of the body increases in size much quicker at first than the rest (the extracellular part), more or less fills up the host-cell, and forms the well-developed epimerite or secondary attaching organella. The extracellular part of the Gregarine next grows rapidly, and a transverse septum is formed at a short distance away from (outside) the point where the body penetrates into the cell (fig. 6); this marks off the large deutomerite posteriorly (distally). Léger thinks that this partition most likely owes its origin to trophic considerations, *i.e.* to the slightly different manner in which the two halves of the young parasite (the proximal, largely intracellular part, and the distal, extracellular one) may be supposed to obtain their nutriment. In the case of the one half, the host-cell supplies the nutriment, in that of the other, the intestinal liquid; and the septum is, as it were, the expression of the conflicting limit between these two methods. Nevertheless, the present writer does not think that mechanical considerations should be altogether left out of account. The septum may also be, in many cases, a special adaption for strengthening the body of the fixed parasite against lateral thrusts or strains, due to the impact of foreign bodies (food, &c.) in the intestine.



From Wasielewski, after Léger.

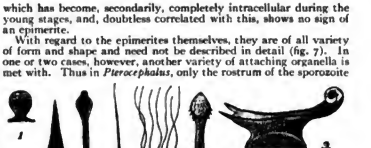
FIG. 6.—*Corycella armata*, Léger. *a*, Cephalont; *b*, Epimerite in host-cell; c_1, Sporont.

At the point where the body becomes actually intracellular, it is constricted, and this constriction marks off the epimerite (internally) from the middle portion (between this point and the septum), which is the protomerite. Further growth is restricted, practically, to the extracellular regions, and the epimerite often comes to appear ultimately as a small appendage at the anterior end of the protomerite. A Gregarine at this stage is known as a cephalont. Later on, the parasite breaks loose from the host-cell and becomes free in the lumen, the separation taking place at the constriction between the protomerite and the epimerite; the latter is left behind in the remains of the host-cell, the former becomes the anterior part of the free trophozoite.

In other Gregarines, however, those, namely, which pass inwards, ultimately becoming "coelomic," as well as those which become entirely intracellular, no epimerite is ever developed, and, further, the body remains single or unseptate. These forms, which include, for instance, *Monocystis* (fig. 4), *Lankesteria*, *Diplocystis*, are distinguished, as *Acephalina* or *Aseptata* (*Haplocyta*, *Monocystida*), according to which character is referred to, from the others, termed *Cephalina* or *Septata* (*Polycystidae*).

The two sets of terms are not, however, completely identical or interchangeable, for there are a few forms which possess an epimerite, but which lack the division into protomerite and deutomerite, and are hence known as *Pseudomonocystida*; this condition may be primitive (*Dolocystis*) or (possibly) secondary, the partition having in course of time disappeared. Again, *Stenophora* is a septate form which has become, secondarily, completely intracellular during the young stages, and, doubtless correlated with this, shows no sign of an epimerite.

With regard to the epimerites themselves, they are of all variety of form and shape and need not be described in detail (fig. 7). In one or two cases, however, another variety of attaching organella is met with. Thus in *Pterocephalus*, only the rostrum of the sporozoite



From Wasielewski, after Léger.

FIG. 7.—Forms of Epimerites.

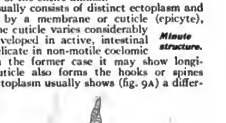
1, Gregarina longa.
2, Sycia inopinata.
3, Pileocephalus heeri.
4, Stylorhynchus longicollis.
5, Belosides firmus.
6, Cometoides crinitus.
7, Geneiorhynchus monnieri.
8, Echinomera hispida.
9, Pterocephalus nobilis.

penetrates into the host-cell, and no epimerite is formed. Instead, a number of fine root-like processes are developed from near the anterior end, which pass in between the host-cells (fig. 5) and thus anchor the parasite firmly. Similarly, in the curious *Schizogregarinae*, the anterior end of the (unseptate) body forms a number of stiff, irregular processes, which perform the same function (fig. 8). It is to be noted that these processes are non-motile, and not in any way comparable to pseudopodia, to which they were formerly likened.

A very interesting and remarkable morphological peculiarity has been recently described by Léger (**18**) in the case of a new Gregarine, *Taeniocystis*. In this form the body is elongated and metamerically segmented, recalling that of a segmented worm, the adult trophozoites possessing numerous partitions or segments (each corresponding to the septum between the proto- and deuto-merite in an ordinary Polycystid), which divide up the cytoplasm into roughly equal compartments. Léger thinks only the deutomerite becomes thus segmented, the protomerite remaining small and undivided. The nucleus remains single, so that there is no question as to the unicellular or individual nature of the entire animal.

Minute structure.

The general cytoplasm usually consists of distinct ectoplasm and endoplasm, and is limited by a membrane or cuticle (epicyte), secreted by the former. The cuticle varies considerably in thickness, being well developed in active, intestinal forms, but very thin and delicate in non-motile coelomic forms (*e.g. Diplodina*). In the former case it may show longitudinal striations. The cuticle also forms the hooks or spines of many epimerites. The ectoplasm usually shows (fig. 9A) a differentiation into two layers, an outer, firmer layer, clear and hyaline, the sarcocyte, and an inner layer, the myocyte, which is formed of a network of muscle-fibrillae (mainly longitudinal and transverse, fig. 9B). The sarcocyte alone constitutes the septum, traversing the endoplasm, in septate Gregarines. The myonemes are undoubtedly the agents responsible for the so-called "gregariniod" movements (of flexion and contraction) to be observed in many forms. The peculiar gliding movements were formerly thought to be produced by the extrusion of a gelatinous thread or mucus-tube, but Crawley (**8**) has recently ascribed them to a complicated succession of wave-like contractions of the myocyte layer. This view is supported by the fact that certain coelomic forms, like *Diplodina* and others, which either lack muscle-fibrils or else show no ectoplasmic differentiation at all, are non-motile. The endoplasm, or nutritive plasm, consists of a semi-fluid matrix in which are embedded vast numbers of grains and spherules of various kinds and of all sizes, representing an accumulation of food-material which is being stored up prior to reproduction. The largest and most abundant grains are of a substance termed para-glycogen, a carbohydrate; in addition, flattened



After Léger and Hagenmüller, from Lankester's *Treatise on Zoology*.

FIG. 8.—Three Individuals (G) of *Ophrycystis schneideri*, attached to wall of Malpighian tubule of *Blaps* sp. *p*, Syncytial protoplasm of the tubule; *c*, Cilia lining the lumen.

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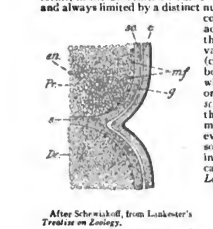
lenticular platelets, of an albuminoid character, and highly-refringent granules often occur.

The nucleus is always lodged in the endoplasm, and, in the septate forms, in the deutomeritic half of the body. It is normally spherical and always limited by a distinct nuclear membrane, which itself often contains chromatin. The most characteristic feature of the nucleus is the deeply-staining, more or less vacuolated spherical karyosome (consisting of chromatin intimately bound up with a plastinoid basis) which is invariably present. In one or two instances (*e.g. Diplocystis schneideri*) the nucleus has more than one karyosome. All the chromatin of the nucleus is not, however, confined to the karyosome, some being in the form of grains in the nuclear sap; and in some cases at any rate (*e.g. Diplodina, Lankesteria*) there is a well-marked nuclear reticulum which is impregnated with granules and dots of chromatin.



After Schewiakoff, from Lankester's *Treatise on Zoology*.

FIG. 9A.—Longitudinal section of a Gregarine in the region of the septum between protomerite and deutomerite.
Pr, Protomerite.
De, Deutomerite.
s, Septum.
en, Endoplasm.
sc, Sarcocyte.
c, Cuticle.
m, f, Myocyte fibrils (cut across).
g, Gelatinous layer.

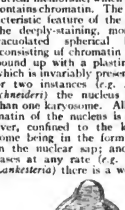
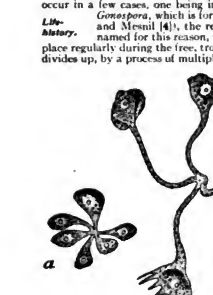


FIG. 9B.—*Gregarina munieri*, showing the network of myocyte fibrillae.

A sexual multiplication (schizogony) is only known certainly to occur in a few cases, one being in a Monocystid form, a species of *Gonospora*, which is for a long time intracellular (Caullery and Mesnil [4]), the rest among the *Schizogregarinae*, so named for this reason, in which schizogonous fission takes place regularly during the free, trophic condition. Usually, the body divides up, by a process of multiple fission (fig. 10), into a few (up to eight) daughter-individuals; but in a new genus (*Eleutheroschizon*), Brasil (3) finds that a great number of little merozoites are formed, and a large amount of vacuolated cytoplasm is left over unused.

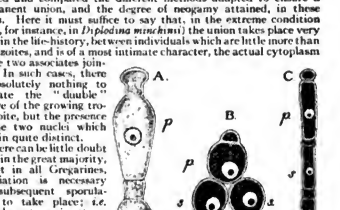
Life-history.



From Wasielewski, after A. Schneider.

FIG. 10.—Schizogony in *Ophryocystis francisci*. *a*, Rosette of small individuals, produced from a schizont which has just divided; *b*, A later stage, the daughter-individuals about to separate and assuming the characters of the adult.

In the vast majority of Gregarines, however, the life-cycle is limited to gametogony and sporogony. A very general, if not indeed universal, prelude to gametogony is the characteristic and important feature of the order, known as association, the biological significance of which has only lately been fully brought out (see H. M. Woodcock [31]). In normal association, two individuals which are to be regarded as of opposite sex, come into close contact with each other and remain thus attached. The manner in which the parasites join varies in different forms; the association may be end-to-end (terminal), either by like or by unlike poles, or it may be side-to-side (lateral) (fig. 12). The couple (syzygy) thus formed may proceed forthwith to encystment and sporoblast-formation (*Lankesteria, Monocystis*), or may continue in the trophic phase for some time longer (*Gregarina*). In one or two instances (*Zygocystis*), association occurs as soon as the trophozoites become adult. This leads on to the interesting phenomenon of precocious association (neogamy), found in non-motile, coelomic Gregarines (*e.g. Cystobia, Diplodina* and *Diplocystis*), in which the parasitism is most advanced. Woodcock (*loc. cit.*) has described and compared the different methods adopted to ensure a permanent union, and the degree of neogamy attained, in these forms. Here it must suffice to say that, in the extreme condition (seen, for instance, in *Diplodina minchini*) the union takes place very early in the life-history, between individuals which are little more than sporozoites, and is of a most intimate character, the actual cytoplasm of the two associates joining. In such cases, there is absolutely nothing to indicate the "double" nature of the growing trophozoite, but the presence of the two nuclei which remain quite distinct.



From Wasielewski, after Léger.

FIG. 11.—*Eimeriaysitis spp. a, b*, Associations of two and three Gregarines; *c*, function may be delayed (chain of five parasites; *p*, Primite; *s*, or, as it were, temporarily Satellites.

There can be little doubt that, in the great majority, if not in all Gregarines, association is necessary for subsequent sporulation to take place; *i.e.* that the cytotactic attraction imparts a developmental stimulus to both partners, which is requisite for the formation of primary sporoblasts (gametes). This association is usually permanent; but in one or two cases (perhaps *Gonospora sp.*) temporary association may suffice. While association has fundamentally a reproductive (sexual) significance, in some cases, this suspended, the cytotactic attraction serving meanwhile a subsidiary purpose in trophic life. Thus, probably, are to be explained the curious multiple associations and long chains of Gregarines (fig. 11) sometimes met with (*e.g. Eimeriacystis, Clepsydrina*).

Encystment is nearly always double, *i.e.* of an associated couple. Solitary encystment has been described, but whether successful independent sporulation results, is uncertain; if it does, the encystment in such cases is, in all probability, only after prior (temporary) association. In the case of free parasites, a well-developed cyst is secreted by the syzygy, which rotates and gradually becomes spherical. A thick, at first gelatinous, outer cyst-membrane (*ectocyst*) is laid down, and then a thin, but firm internal one (endocyst). The cyst once formed, further development is quite independent of the host, and, in fact, often proceeds outside it. In certain coelomic Gregarines, on the other hand, which remain in very close relation with the host's tissues, little or nothing of an encystment-process on the part of the parasites is recognizable, the cyst-wall being formed by an enclosing layer of the host (*Diplodina*).

From Wasielewski, after Léger.

FIG. 12.—Associations of *Gonospora sparsa*.

The nuclear changes and multiplication which precede sporoblast-formation vary greatly in different Gregarines and can only be outlined here. In the formation of both sets of sexual elements (gametes) there is always a comprehensive nuclear purification or maturation. This elimination of a part of the nuclear material (to be distinguished as trophic or somatic, from the functional or germinal portion, which forms the sexual nuclei) may occur at widely-different periods. In some cases (*Lankesteria, Monocystis*), a large part of the original (sporont-) nucleus of each associate is at once got rid of, and the resulting (segmentation-) nucleus, which is highly-specialized, represents the sexual part. In other cases, again, the entire sporont-nucleus proceeds to division, and the distinction between somatic and germinal portions does not become manifest until after nuclear multiplication has continued for some little time, when certain of the daughter-nuclei become altered in character, and ultimately degenerate, the remainder giving rise to the sporoblast-nuclei (*Diplodina, Stylorhynchus*). Even after the actual sporoblasts (sex-cells) themselves are constituted, their nuclei may yet undergo a final maturation (*e.g. Clepsydrina ovalis*); and in *Monocystis*, indeed, Brasil (2) finds that what is apparently a similar process is delayed until after conjugation and formation of the zygote (definitive sporoblast).

Nuclear multiplication is usually indirect, the mitosis being, as a

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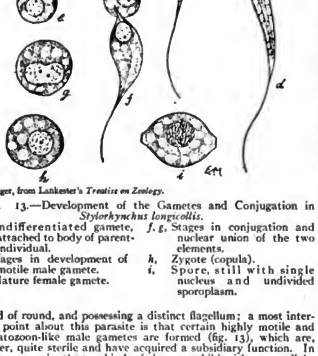
rule, more elaborate in the earlier than in the later divisions. The attraction-spheres are generally large and conspicuous, sometimes consisting of a well-developed centrosphere, with or without centrosomic granules, at other times of very large centrosomes with a few astral rays. In those cases where the karyosome is retained, and the sporont-nucleus divides up as a whole, however, the earliest nuclear divisions are direct; the daughter-nuclei being formed either by a process of simple constriction (*e.g. Diplodina*), or by a kind of multiple fission or fragmentation (*Gregarina* and *Selenidium spp.*). Nevertheless, the later divisions, at any rate in *Diplodina*, are indirect.

By the time nuclear multiplication is well advanced or completed, the bodies of the two parent-Gregarines (associates) have usually become very irregular in shape, and produced into numerous lobes and processes. While in some forms (*e.g. Monocystis*, *Urospora*, *Stylorhynchus*) the two individuals remain fairly separate and independent of each other, in others (*Lankesteria*) they become intertwined and interlocked, often to a remarkable extent (*Diplodina*). The sexual nuclei next pass to the surface of the processes and segments, where they take up a position of uniform distribution. Around each, a small area of cytoplasm becomes segregated, the whole often projecting as a little bud or hillock from the general surface. These uninuclear protuberances are at length cut off as the sporoblasts or gametes. Frequently a large amount of the general protoplasm of each parent-individual is left over unused, constituting two cystal residua, which may subsequently fuse; in *Diplodina*, however, practically the whole cytoplasm is used up in the formation of the gametes.

The sporoblasts themselves show all gradations from a condition of marked differentiation into male and female (anisogamy), to one of complete equality (isogamy). Anisogamy is most highly developed in *Pterocephalus*. Here, the male elements (microgametes) are minute, elongated and spindle-like in shape, with a minute rostrum anteriorly and a long flagellum posteriorly, and very active; the female elements (megagametes) are much larger, oblong to ovoid, and quite passive. In *Stylorhynchus* the difference between the conjugating gametes is not quite so pronounced (fig. 13), the male elements being of about the same bulk as the females, but pyriform



After Léger, from Lankester's *Treatise on Zoology*.

FIG. 13.—Development of the Gametes and Conjugation in *Stylorhynchus longicollis*.

a, Undifferentiated gamete, attached to body of parent-individual.
b-d, Stages in development of motile male gamete.
e, Mature female gamete.
f, g, Stages in conjugation and nuclear union of the two elements.
h, Zygote (copula).
i, Spore, still with single nucleus and undivided sporoplasm.

instead of round, and possessing a distinct flagellum; a most interesting point about this parasite is that certain highly motile and spermatozoon-like male gametes are formed (fig. 13), which are, however, quite sterile and have acquired a subsidiary function. In other cases, again, the two kinds of element exhibit either very slight differences (*Monocystis*) or none (*Urospora*, *Gonospora*), in size and appearance, the chief distinction being in the nuclei, those of the male elements being smaller and chromatically denser than those of the females.

Lastly, in *Lankesteria*, *Gregarina*, *Clepsydrina*, *Diplocystis* and *Diplodina* complete isogamy is found, there being no apparent difference whatever between the conjugating elements. Nevertheless, these forms are also to be regarded as instances of binary sexuality and not merely of exogamy; for it is practically certain that this condition of isogamy is derived from one of typical anisogamy, through a stage such as is seen in *Gonospora*, &c. And, similarly, just as in all instances where the formation of differentiated gametes has been observed, the origin of the two conjugates is from different associates (parent-sporonts), and all the elements arising from the same parent are of the same sex, so it is doubtless the case here.

The actual union is brought about or facilitated by the well-known phenomenon termed the *danse des sporoblastes*, which is due to various

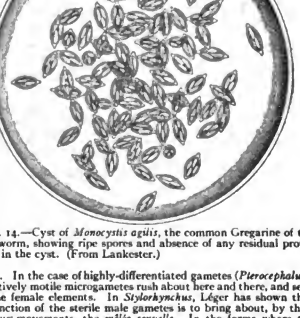


FIG. 14.—Cyst of *Monocystis agilis*, the common Gregarine of the Earthworm, showing ripe spores and absence of any residual protoplasm in the cyst. (From Lankester.)

causes. In the case of highly-differentiated gametes (*Pterocephalus*), the actively motile microgametes rush about here and there, and seek out the female elements. In *Stylorhynchus*, Léger has shown that the function of the sterile male gametes is to bring about, by their vigorous movements, the *mêlée sexuelle*. In the forms where the gametes are isogamous or only slightly differentiated and (probably) not of themselves motile, other factors aid in producing the necessary commingling. Thus in *Gregarina sp.* from the mealworm, the unused somata or cystal residua become amœboid and send out processes which drive the peripherally-situated gametes round in the cyst; in some cases where the residual soma becomes liquefied (*Urospora*) the movements of the host are considered to be sufficient; and lastly, in *Diplodina*, owing to the extent to which the intertwining process is carried, if each gamete is not actually contiguous to a suitable fellow-conjugant, a very slight movement or mutual attraction will bring two such, when liberated, into contact.

An unusual modification of the process of sporoblast-formation and conjugation, which occurs in *Opalrocystis*, must be mentioned. Here encystment of two associates takes place as usual; the sporont-nucleus of each, however, only divides twice, and one of the daughter-nuclei resulting from each division degenerates. Hence only one sporoblast-nucleus, representing a quarter of the original nuclear-material, persists in each half. Around this some of the cytoplasm condenses, the rest forming a residuum. The sporoblast or gamete thus formed is completely isogamous and normally conjugates with the like one from the other associate, when a single zygote results which becomes a spore containing eight sporozoites, in the ordinary manner. Sometimes, however, the septum between the two halves of the cyst does not break down, in which case parthenogenesis occurs, each sporoblast developing by itself into a small spore.

The two conjugating elements unite completely, cytoplasm with cytoplasm and nucleus with nucleus, to form the definitive sporoblast or zygote. The protoplasm assumes a definite outline, generally that of an ovoid or barrel, and secretes a delicate membrane, the ectospore. This subsequently becomes thickened, and often produced into rims, spines or processes, giving rise to the characteristic appearance of the Gregarine spore. Internal to the ectocyst, another, thinner membrane, the endocyst, is also laid down. These two membranes form the spore-wall (sporocyst). Meanwhile the contents of the spore have been undergoing division. By successive divisions, usually mitotic, the zygote-nucleus gives rise to eight daughter-nuclei, each of which becomes the nucleus of a sporozoite. Next, the sporoplasm becomes split longitudinally, around each nucleus, and thus eight sickle-shaped (falciform) sporozoites are formed. There is usually a

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certain amount of unused sporoplasm left over in the centre of the spore, constituting the sporal residuum. It is important to note that in all known Gregarines, with one exception, the number of sporozoites in the spore is eight; the exception is *Selenidium*, in many ways far from typical, where the number is half, viz. four.

Hitherto a variation from the general mode of spore-formation has been considered to occur in certain Crustacean Gregarines, the *Aggregatidae* and the *Porosporidae*. The spores of these forms have been regarded as gymnospores (naked), lacking the enveloping membranes (sporocyst) of the ordinary spores, and the sporozoites, consequently, as developed freely in the cyst. In the case of the first-named parasites, however, what was taken for sporogony has been proved to be really schizogony, and on other grounds these forms are, in the present writer's opinion, preferably associated with the Coccidia (*q.v.*). With regard to the *Porosporidae*, also, it is quite likely that the gymnosporous cysts considered to belong to the Gregarine *Porospora* (as known in the trophic condition) have really no connexion with it, but represent the schizogonous generation of some other form, similar to *Aggregata*; in which case the true spores of *Porospora* have yet to be identified.

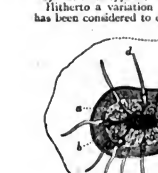


FIG. 15.—Ripe Cyst of *Gregarina blattarum*, partially emptied. (From Lankester.) *a*, Channels leading to the sporoducts; *b*, Mass of spores still left in the cyst; *c*, Endocyst; *d*, The everted sporoducts; *e*, Gelatinous ectocyst.

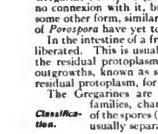
In the intestine of a fresh host the cysts rupture and the spores are liberated. This is usually largely brought about by the swelling of the residual protoplasm. Sometimes (*e.g. Gregarina*) long tubular outgrowths, known as sporoducts (fig. 15), are developed from the residual protoplasm, for the passage of the spores to the exterior.

Classification.

The Gregarines are extremely numerous, and include several families, characterized, for the most part, by the form of the spores (fig. 16). The specialized *Schizogregarinae* are usually separated off from the rest as a distinct sub-order.

SUB-ORDER I.—*Schizogregarinae.*

Forms in which schizogonic reproduction is of general occurrence during the extra-cellular, trophic phase. Three genera, *Ophryocystis*, *Schizocystis* and *Eleutheroschizon*, different peculiarities of which have been referred to above. Mostly parasitic in the intestine



From Wasielewski, after Léger.

FIG. 16.—Spores of various Gregarines.

a, *Eiermocystis*, *Sphaerocystis*, &c. *f*, *Stylorhynchidae* (type of).
b, *Echinomera*, *Pterocephalus*, &c. *g*, *Menosporidae*.
c, *Gregarina*, &c. *h*, *Gonospora terebellae*.
d, *Beloidea*. *i*, *Ceratospora*.
e, *Ancyrophora*. *k*, *Urospora synaptae*.

or Malpighian tubules of insects. (In this type of parasite, as exemplified by *Ophryocystis*, the body was formerly wrongly considered as amoeboid, and hence this genus was placed in a special order, the *Amoebosporidia*.)

SUB-ORDER II.—*Eugregarinae.*

Schizogony very exceptional, only occurring during the intracellular phase, if at all. Gregarines fall naturally into two tribes, described as cephalont and septate, or as acephalont and aseptate (haplocytic), respectively. In strictness, however, as already mentioned, these two sets of terms do not agree absolutely, and whichever set is adopted, the other must be taken into account in estimating the proper position of certain parasites. Here the cephalont or acephalont condition is regarded as the more primary and fundamental.

Tribe A.—*Cephalina* (practically equivalent to *Septata*).

Save exceptionally, the body possesses an epimerite, at any rate during the early stages of growth, and is typically septate. Mostly intestinal parasites of Arthropods.

The chief families, with representative genera, are as follows: *Porosporidae*, with *Porospora gigantea*, at present thought to be gymnosporous; *Gregarinidae* (*Clepsydrinidae*), with *Gregarina*, *Clepsydrina*, *Eirmocystis*, *Hyalospora*, *Cnemidospora*, *Stenophora*; *Dufymorphidae*, with *Dufymorphya*; *Dactylophoridae*, with *Dactylophorus*, *Pterocephalus*, *Echinomera*, *Rhopalonia*; *Actinocephalidae* with *Actinocephalus*, *Pyxinia*, *Coleorhynchus*, *Stephanophora*, *Legeria*, *Stictospora*, *Pileocephalus*, *Scaphophora*; *Acanthosporidae* with *Acanthospora*, *Echinocystis*, *Comatocystis*; *Menosporidae* with *Menospora*; *Hoplorhynchus*; *Stylorhynchidae*, with *Stylorhynchus*, *Lophocephalus*; *Dolocystidae* with *Dolocystis*; and *Taeniocystidae*, with *Taeniocystis*. The curious genus *Selenidium* is somewhat apart.

Tribe B.—*Acephalina* (practically equivalent to *Aseptata*, *Haplocyta*).

The body never possesses an epimerite and is non-septate. Chiefly colonic parasites of "worms," Holothurians and insects.

The *Aseptata* have not been so completely arranged in families as the *Septata*. Léger has distinguished two well-marked ones, but the remaining genera still want classifying more in detail. Fam. *Gonosporidae*, with *Gonospora*, *Diplodina*; and *Urosporidae*, with *Urospora*, *Cystobia*, *Lithocystis*, *Ceratospora*; the genera *Monocystis*, *Diplocystis Lankesteria* and *Zygocystis* probably constitute another; *Pierospora* and, again, *Syncystis* are distinct; lastly, certain forms, *e.g. Zygosoma*, *Anchora* (*Anchorina*), are incompletely known.

There remains for mention the remarkable parasite, recently described by J. Nusbaum (**24**) under the appropriate name of *Schaudinnella henleae*, which inhabits the intestine of *Henlea leptodera*. Briefly enumerated, the principal features in the life-cycle are as follows. The young trophozoites (gamonts) are attached to the intestinal cells, but practically entirely extracellular. Association is very primitive in character and indiscriminate; it takes place indifferently between individuals which will give rise to gametes of the same or opposite sex. Often it is temporary; at other times it is multiple, several adults becoming more or less enclosed in a gelatinous investment. Nevertheless, in no case does true encystment occur, the sex-cells being developed practically free. The female gametes are large and egg-like; the males, minute and flagellate, with no flagellum and apparently non-motile. While many of the zygotes ("amphionts") resulting from copulation pass out to the exterior, to infect a new host, others, possessing a more delicate investing-membrane, penetrate in between the intestinal cells, apparently by a further infection, and undergo numerous sporozoites are formed in each zygote. It will be seen that *Schaudinnella* is a practically unique form. While, on the one hand, it recalls the Gregarines in many ways, on the other hand it differs widely from them in several characteristic features, being primitive in some respects, but highly specialized in others, so that it cannot be properly included in the order. *Schaudinnella* rather represents a primitive Ectosporan parasite, which has proceeded upon a line of its own, intermediate between the Gregarines and Coccidia.

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GRÉGOIRE, HENRI (1750–1831), French revolutionist and constitutional bishop of Blois, was born at Vého near Lunéville, on the 4th of December 1750, the son of a peasant. Educated at the Jesuit college at Nancy, he became curé of Emberménil and a teacher at the Jesuit school at Pont-à-Mousson. In 1783 he was crowned by the academy of Nancy for his *Éloge de la poésie*, and in 1788 by that of Metz for an *Essai sur la régénération physique et morale des Juifs*. He was elected in 1789 by the clergy of the *bailliage* of Nancy to the states-general, where he soon became conspicuous in the group of clerical and lay deputies of Jansenist or Gallican sympathies who supported the Revolution. He was among the first of the clergy to join the third estate, and contributed largely to the union of the three orders; he presided at the permanent sitting of sixty-two hours while the Bastille was being attacked by the people, and made a vehement speech against the enemies of the nation. He subsequently took a leading share in the abolition of the privileges of the nobles and the Church. Under the new civil constitution of the clergy, to which he was the first priest to take the oath (December 27, 1790), he was elected bishop by two departments. He selected that of Loire-et-Cher, taking the old title of bishop of Blois, and for ten years (1791–1801) ruled his diocese with exemplary zeal. An ardent republican, it was he who in the first session of the National Convention (September 21, 1792) proposed the motion for the abolition of the kingship, in a speech in which occurred the memorable phrase that "kings are in the moral order what monsters are in the natural." On the 15th of November he delivered a speech in which he demanded that the king should be brought to trial, and immediately afterwards was elected president of the Convention, over which he presided in his episcopal dress. During the trial of Louis XVI., being absent with other three colleagues on a mission for the union of Savoy to France, he along with them wrote a letter urging the condemnation of the king, but omitting the words *à mort*; and he endeavoured to save the life of the king by proposing in the Convention that the penalty of death should be suspended.

When on the 7th of November 1793 Gobel, bishop of Paris, was intimidated into resigning his episcopal office at the bar of the Convention, Grégoire, who was temporarily absent from the sitting, hearing what had happened, hurried to the hall, and in the face of a howling mob of deputies refused to abjure either his religion or his office. He was prepared to face the death which he expected; but his courage, a rare quality at that time, won the day, and the hubbub subsided in cries of "Let Grégoire have his way!" Throughout the Terror, in spite of attacks in the Convention, in the press, and on placards posted at the street corners, he appeared in the streets in his episcopal dress and daily read mass in his house. After Robespierre's fall he was the first to advocate the reopening of the churches (speech of December 21, 1794). He also exerted himself to get measures put in execution for restraining the vandalistic fury against the monuments of art, extended his protection to artists and men of letters, and devoted much of his attention to the reorganization of the public libraries, the establishment of botanic gardens, and the improvement of technical education. He had taken during the Constituent Assembly a great interest in Negro emancipation, and it was on his motion that men of colour in the French colonies were admitted to the same rights as whites. On the establishment of the new constitution, Grégoire was elected to the Council of 500, and after the 18th Brumaire he became a member of the Corps Législatif, then of the Senate (1801). He took the lead in the national church councils of 1797 and 1801; but he was strenuously opposed to Napoleon's policy of reconciliation with the Holy See, and after the signature of the concordat he resigned his bishopric (October 8, 1801). He was one of the minority of five in the Senate who voted against the proclamation of the empire, and he opposed the creation of the new nobility and the divorce of Napoleon from Josephine; but notwithstanding this he was subsequently created a count of the empire and officer of the Legion of Honour. During the later years of Napoleon's reign he travelled in England and Germany, but in 1814 he had returned to France and was one of the chief instigators of the action that was taken against the empire.

To the clerical and ultra-royalist faction which was supreme in the Lower Chamber and in the circles of the court after the second Restoration, Grégoire, as a revolutionist and a schismatic bishop, was an object of double loathing. He was expelled from the Institute and forced into retirement. But even in this period of headlong reaction his influence was felt and feared. In 1814 he had published a work, *De la constitution française de l'an 1814*, in which he commented on the Charter from a Liberal point of view, and this reached its fourth edition in 1819. In this latter year he was elected to the Lower Chamber by the department of Isère. By the powers of the Quadruple Alliance this event was regarded as of the most sinister omen, and the question was even raised of a fresh armed intervention in France under the terms of the secret treaty of Aix-la-Chapelle. To prevent such a catastrophe Louis XVIII. decided on a modification of the franchise; the Dessolle ministry resigned; and the first act of Decazes, the new premier, was to carry a vote in the chamber annulling the election of Grégoire. From this time onward the ex-bishop lived in retirement, occupying himself in literary pursuits and in correspondence with most of the eminent savants of Europe; but as he had been deprived of his pension as a senator he was compelled to sell his library to obtain means of support. He died on the 20th of May 1831.

To the last Grégoire remained a devout Catholic, exactly fulfilling all his obligations as a Christian and a priest; but he refused to budge an inch from his revolutionary principles. During his last illness he confessed to his parish *curé*, a priest of Jansenist sympathies, and expressed his desire for the last sacraments of the Church. These the archbishop of Paris would only concede on condition that he would retract his oath to the civil constitution of the clergy, which he peremptorily refused to do. Thereupon, in defiance of the archbishop, the abbé Baradère gave him the *viaticum*, while the rite of extreme unction was administered by the abbé Guillon, an opponent of the civil constitution, without consulting the archbishop or the parish curé. The attitude of the archbishop roused great excitement in Paris, and the government had to take precautions to avoid a repetition of the riots which in the preceding February had led to the sacking of the church of St Germain l'Auxerrois and the archiepiscopal palace. On the day after his death Grégoire's funeral was celebrated at the church of the Abbaye-aux-Bois; the clergy of the church had absented themselves in obedience to the archbishop's orders, but mass was sung by the abbé Grieu assisted by two clergy, the catafalque being decorated with the episcopal insignia. After the hearse set out from the church the horses were unyoked, and it was dragged by students to the cemetery of Montparnasse, the cortège being followed by a sympathetic crowd of some 20,000 people.

Whatever his merits as a writer or as a philanthropist, Grégoire's name lives in history mainly by reason of his wholehearted effort to prove that Catholic Christianity is not irreconcilable with modern conceptions of political liberty. In this effort he was defeated, mainly because the Revolution, for lack of experience in the right use of liberty, changed into a military despotism which allied itself with the spiritual despotism of Rome; partly because, when the Revolution was overthrown,

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the parties of reaction sought salvation in the " union of altar and throne." Possibly Grégoire's Gallicanism was fundamentally irreconcilable with the Catholic idea of authority. At least it made their traditional religion possible for those many French Catholics who clung passionately to the benefits the Revolution had brought them; and had it prevailed, it might have spared France and the world that fatal gulf between Liberalism and Catholicism which Pius IX.'s Syllabus of 1864 sought to make impassable.

Besides several political pamphlets, Grégoire was the author of *Histoire des sectes religieuses, depuis le commencement du siècle dernier jusqu'à l'époque actuelle* (2 vols., 1810); *Essai historique sur les libertés de l'église gallicane* (1818); *De l'influence du Christianisme sur la condition des femmes* (1821); *Histoire des confesseurs des empereurs, des rois, et d'autres princes* (1824); *Histoire du mariage des prêtres en France* (1826). *Grégoriana, ou résumé général de la conduite, des actions, et des écrits de M. le comte Henri Grégoire*, preceded by a biographical notice by Cousin d'Avalon, was published in 1821; and the *Mémoires . . . de Grégoire*, with a biographical notice by H. Carnot, appeared in 1837 (2 vols.). See also A. Debidour, *L'Abbé Grégoire* (1881); A. Gazier, *Études sur l'histoire religieuse de la Révolution Française* (1883); L. Maggiolo, *La Vie et les œuvres de l'abbé Grégoire* (Nancy, 1884), and numerous articles in *La Révolution Française*; E. Meaume, *Étude hist. et bibg. sur les Lorrains révolutionnaires* (Nancy, 1882); and A. Gazier, *Études sur l'histoire religieuse de la Révolution Française* (1887).

GREGORAS, NICEPHORUS (*c.* 1295–1360), Byzantine historian, man of learning and religious controversialist, was born at Heraclea in Pontus. At an early age he settled at Constantinople, where his reputation for learning brought him under the notice of Andronicus II., by whom he was appointed Chartophylax (keeper of the archives). In 1326 Gregoras proposed (in a still extant treatise) certain reforms in the calendar, which the emperor refused to carry out for fear of disturbances; nearly two hundred years later they were introduced by Gregory XIII. on almost the same lines. When Andronicus was dethroned (1328) by his grandson Andronicus III., Gregoras shared his downfall and retired into private life. Attacked by Barlaam, the famous monk of Calabria, he was with difficulty persuaded to come forward and meet him in a war of words, in which Barlaam was worsted. This greatly enhanced his reputation and brought him a large number of pupils. Gregoras remained loyal to the elder Andronicus to the last, but after his death he succeeded in gaining the favour of his grandson, by whom he was appointed to conduct the unsuccessful negotiations (for a union of the Greek and Latin churches) with the ambassadors of Pope John XXII. (1333). Gregoras subsequently took an important part in the Hesychast controversy, in which he violently opposed Gregorius Palamas, the chief supporter of the sect. After the doctrines of Palamas had been recognized at the synod of 1351, Gregoras, who refused to acquiesce, was practically imprisoned in a monastery for two years. Nothing is known of the end of his life. His chief work is his *Roman History*, in 37 books, of the years 1204 to 1359. It thus partly supplements and partly continues the work of George Pachymeres. Gregoras shows considerable industry, but his style is pompous and affected. Far too much space is devoted to religious matters and dogmatic quarrels. This work and that of John Cantacuzene supplement and correct each other, and should be read together. The other writings of Gregoras, which (with a few exceptions) still remain unpublished, attest his great versatility. Amongst them may be mentioned a history of the dispute with Palamas; biographies of his uncle and early instructor John, metropolitan of Heraclea, and of the martyr Cosratus of Antioch; funeral orations for Theodore Metochita, and the two emperors Andronicus; commentaries on the wanderings of Odysseus and on Synesius's treatise on dreams; tracts on orthography and on words of doubtful meaning; a philosophical dialogue called *Florentius or Concerning Wisdom*; astronomical treatises on the date of Easter and the preparation of the astrolabe; and an extensive correspondence.

Editions: in Bonn *Corpus scriptorum hist. Byz.*, by L. Schopen and I. Bekker, with life and list of works by J. Boivin (1829–1855); J. P. Migne, *Patrologia graeca*, cxlviii., cxlix.; see also C. Krumbacher, *Geschichte der byzantinischen Litteratur* (1897).

GREGOROVIUS, FERDINAND (1821–1891), German historian, was born at Neidenburg on the 19th of January 1821, and studied at the university of Königsberg. After spending some years in teaching he took up his residence in Italy in 1852, remaining in that country for over twenty years. He was made a citizen of Rome, and he died at Munich on the 1st of May 1891. Gregorovius's interest in and acquaintance with Italy and Italian history is mainly responsible for his great book, *Geschichte der Stadt Rom im Mittelalter* (Stuttgart, 1859–1872, and other editions), a work of much erudition and interest, which has been translated into English by A. Hamilton (13 vols., 1894–1900), and also into Italian at the expense of the Romans (Venice, 1874–1876). It deals with the history of Rome from about A.D. 400 to the death of Pope Clement VII. in 1534, and in the words of its author it describes " how, from the time of Charles the Great to that of Charles V., the historic system of the papacy remained inseparable from that of the Empire." The other works of Gregorovius include: *Geschichte des Kaisers Hadrian und seiner Zeit* (Königsberg, 1851), English translation by M. E. Robinson (1898); *Corsica* (Stuttgart, 1854), English translation by R. Martineau (1855); *Lucrezia Borgia* (Stuttgart, 1874), English translation by J. L. Garner (1904); *Die Grabdenkmäler der Päpste* (Leipzig, 1881), English translation by R. W. Seton-Watson (1903); *Wanderjahre in Italien* (5 vols., Leipzig, 1888–1892); *Geschichte der Stadt Athen im Mittelalter* (1889); *Kleine Schriften zur Geschichte der Kultur* (Leipzig, 1887–1892); and *Urban VIII. im Widerspruch zu Spanien und dem Kaiser* (Stuttgart, 1879). This last work was translated into Italian by the author himself (Rome, 1879). Gregorovius was also something of a poet; he wrote a drama, *Der Tod des Tiberius* (1851), and some *Gedichte* (Leipzig, 1891).

His *Römische Tagebücher* were edited by F. Althaus (Stuttgart, 1892), and were translated into English as the *Roman Journals of F. Gregorovius*, by A. Hamilton (1907).

GREGORY, ST (*c.* 213–*c.* 270), surnamed in later ecclesiastical tradition Thaumaturgus (the miracle-worker), was born of noble and wealthy pagan parents at Neocaesarea in Pontus, about A.D. 213. His original name was Theodorus. He took up the study of civil law, and, with his brother Athenodorus, was on his way to Berytus to complete his training when at Caesarea he met Origen, and became his pupil and then his convert (A.D. 233). In returning to Cappadocia some five years after his conversion, it had been his original intention to live a retired ascetic life (Eus. *H.E.* vi. 30), but, urged by Origen, and at last almost compelled by Phaedimus of Amasia, his metropolitan, neither of whom was willing to see so much learning, piety and masculine energy practically lost to the church, he, after many attempts to evade the dignity, was consecrated bishop of his native town (about 240). His episcopate, which lasted some thirty years, was characterized by great missionary zeal, and by so much success that, according to the (doubtless somewhat rhetorical) statement of Gregory of Nyssa, whereas at the outset of his labours there were only seventeen Christians in the city, there were at his death only seventeen persons in all who had not embraced Christianity. This result he achieved in spite of the Decian persecution (250–251), during which he had felt it to be his duty to absent himself from his diocese, and notwithstanding the demoralizing effects of an irruption of barbarians (Goths and Boranians) who laid waste the diocese in A.D. 253–254. Gregory, although he has not always escaped the charge of Sabellianism, now holds an undisputed place among the fathers of the church; and although the turn of his mind was practical rather than speculative, he is known to have taken an energetic part in most of the doctrinal controversies of his time. He was active at the first synod of Antioch (A.D. 264–265), which investigated and condemned the heresies of Paul of Samosata; and the rapid spread in Pontus of a Trinitarianism approaching the Nicene type is attributed in large measure to the weight of his influence. Gregory is believed to have died in the reign of Aurelian, about the year 270, though perhaps an earlier date is more probable. His festival (semiduplex) is observed by the Roman Catholic Church on the 17th of November.

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For the facts of his biography we have an outline of his early years in his eulogy on Origen, and incidental notices in the writings of Eusebius, of Basil of Caesarea and Jerome. Gregory of Nyssa's untrustworthy panegyric represents him as having wrought miracles of a very startling description; but nothing related by him comes near the astounding narratives given in the *Martyrologies*, or even in the *Breviarium Romanum*, in connexion with his name.

The principal works of Gregory Thaumaturgus are the *Panegyricus in Origenem* (Εἰς Ὠριγένην πανηγυρικὸς λόγος), which he wrote when on the point of leaving the school of that great master (it contains a valuable minute description of Origen's mode of instruction), a *Metaphrasis in Ecclesiasten*, characterized by Jerome as "short but useful"; and an *Epistola canonica*, which treats of the discipline to be undergone by those Christians who under pressure of persecution had relapsed into paganism, but desired to be restored to the privileges of the Church. It gives a good picture of the conditions of the time, and shows Gregory to be a true shepherd (cf. art. PENANCE). The *Ἔκθεσις πίστεως* (*Expositio fidei*), a short creed usually attributed to Gregory, and traditionally alleged to have been received by him immediately in vision from the apostle John himself, is probably authentic. A sort of Platonic dialogue of doubtful authenticity "on the impassivity and the passivity of God" in Syriac is in the British Museum.

Editions: Gerhard Voss (Mainz, 1604), Fronto Ducäus (Paris, 1622), Migne, *Patr. Graec.* x. 963.

Translations: S. D. F. Salmond in *Ante-Nicene Fathers*, vi.; *Lives*, by Pallavicini (Rome, 1644); J. L. Boye (Jena, 1709); H. R. Reynolds (*Dict. Chr. Biog.* ii.); G. Krüger, *Early Chr. Lit.* 226; Herzog-Hauck, *Realencykl.* vii. (where full bibliographies are given).

GREGORY, ST, OF NAZIANZUS (329–389), surnamed Theologus, one of the four great fathers of the Eastern Church, was born about the year A.D. 329, at or near Nazianzus, Cappadocia. His father, also named Gregory, had lately become bishop of the diocese; his mother, Nonna, exercised a powerful influence over the religious convictions of both father and son. Gregory visited successively the two Caesareas, Alexandria and Athens, as a student of grammar, mathematics, rhetoric and philosophy; at Athens he had for fellow-students Basil (*q.v.*), who afterwards became bishop of Caesarea, and Julian, afterwards emperor. Shortly after his return to his father's house at Nazianzus (about the year 360) Gregory received baptism. He resolved to give himself to the service of religion; but for some time, and indeed more or less throughout his whole life, was in a state of hesitation as to the form which that service ought to take. Strongly inclined by nature and education to a contemplative life spent among books and in the society of congenial friends, he was continually urged by outward circumstances, as well as by an inward call, to active pastoral labour. The spirit of refined intellectual monasticism, which clung to him through life and never ceased to struggle for its ascendancy, was about this time strongly encouraged by his intercourse with Basil, who induced him to share the exalted pleasures of his retirement in Pontus. To this period belongs the preparation of the Φιλοκαλία, a sort of chrestomathy compiled by the two friends from the writings of Origen. But the events which were stirring the political and ecclesiastical life of Cappadocia, and indeed of the whole Roman world, made a career of learned leisure difficult if not impossible to a man of Gregory's position and temperament. The emperor Constantius, having by intrigue and intimidation succeeded in thrusting a semi-Arian formula upon the Western bishops assembled at Ariminum in Italy, had next attempted to follow the same course with the Eastern episcopate. The aged bishop of Nazianzus having yielded to the imperial threats, a great storm arose among the monks of the diocese, which was only quelled by the influence of the younger Gregory, who shortly afterwards (about 361) was ordained to the priesthood. After a vain attempt to evade his new duties and responsibilities by flight, he appears to have continued to act as a presbyter in his father's diocese without interruption for some considerable time; and it is probable that his two *Invectives* against Julian are to be assigned to this period. Subsequently (about 372), under a pressure which he somewhat resented, he allowed himself to be nominated by Basil as bishop of Sasima, a miserable little village some 32 m. from Tyana; but he seems hardly, if at all, to have assumed the duties of this diocese, for after another interval of "flight" we find him once more (about 372–373) at Nazianzus, assisting his aged father, on whose death (374) he retired to Seleucia in Isauria for a period of some years. Meanwhile a more important field for his activities was opening up. Towards 378–379 the small and depressed remnant of the orthodox party in Constantinople sent him an urgent summons to undertake the task of resuscitating their cause, so long persecuted and borne down by the Arians of the capital. With the accession of Theodosius to the imperial throne, the prospect of success to the Nicene doctrine had dawned, if only it could find some courageous and devoted champion. The fame of Gregory as a learned and eloquent disciple of Origen, and still more of Athanasius, pointed him out as such a defender; nor could he resist the appeal made to him, although he took the step reluctantly. Once arrived in Constantinople, he laboured so zealously and well that the orthodox party speedily gathered strength; and the small apartment in which they had been accustomed to meet was soon exchanged for a vast and celebrated church which received the significant name of Anastasia, the Church of the Resurrection. Among the hearers of Gregory were to be found, not only churchmen like Jerome and Evagrius, but also heretics and pagans; and it says much for the sound wisdom and practical tact of the preacher that he set himself less to build up and defend a doctrinal position than to urge his flock to the cultivation of the loving Christian spirit which cherishes higher aims than mere heresy hunting or endless disputation. Doctrinal, nevertheless, he was, as is abundantly shown by the famous five discourses on the Trinity, which earned for him the distinctive appellation of *θεολόγος*. These orations are the finest exposition of the Catholic doctrine of the Trinity as conceived by the orthodox teachers of the East, and they were directed especially against the Eunomians and Macedonians. "There is perhaps no single book in Greek patristic literature to which the student who desires to gain an exact and comprehensive view of Greek theology can be more confidently referred." With the arrival of Theodosius in 380 came the visible triumph of the orthodox cause; the metropolitan see was then conferred upon Gregory, and after the assembling of the second ecumenical council in 381 he received consecration from Meletius. In consequence, however, of a spirit of discord and envy which had manifested itself in connexion with this promotion, he soon afterwards resigned his dignity and withdrew into comparative retirement. The rest of his days were spent partly at Nazianzus in ecclesiastical affairs, and partly on his neighbouring patrimonial estate at Arianzus, where he followed his favourite literary pursuits, especially poetical composition, until his death, which occurred in 389 or 390. His festival is celebrated in the Eastern Church on the 25th and 30th of January, in the Western on the 9th of May (duplex).

His extant works consist of poems, epistles and orations. The poems, which include epigrams, elegies and an autobiographical sketch, have been frequently printed, the *editio princeps* being the Aldine (1504). Other editions are those of Tollius (1696) and Muratori (1709); a volume of *Carmina selecta* also has been edited by Dronke (1840). The tragedy entitled *Χριστὸς πάσχων* usually included is certainly not genuine. Gregory's poetry did not absorb his best energies; it was adopted in his later years as a recreation rather than as a serious pursuit; thus it is occasionally delicate, graphic, beautiful, but it is not sustained. Of the hymns none have passed into ecclesiastical use. The letters are entitled to a higher place in literature. They are always easy and natural; and there is nothing forced in the manner in which their acute, witty and profound sayings are introduced. Those to Basil introduce us to the story of a most romantic friendship, those to Nicobulus have theological value for their bearing on the Apollinarian controversy. As an orator he was so facile, vigorous and persuasive, that men forgot his small stature and emaciated countenance. Forty-five orations are extant. Gregory was less an independent theologian than an interpreter. He was influenced by Athanasius in his Christology, by Origen in his anthropology, for, though teaching original sin and deriving human mortality from the Fall, he insists on the ability of the human will to choose the good and to co-operate in the work of salvation with the will of God. Though possessed neither of Basil's gift of government nor of Gregory of Nyssa's power of speculative thought, he worthily takes a place in that triumvirate of Cappadocians whom the Catholic Church gratefully recognizes as having been, during the critical struggles in the latter half of the 4th century, the best defenders of its faith. The *Opera omnia* were

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first published by Hervagius (Basel, 1550); the subsequent editions have been those of Billius (Paris, 1669, 1611; aucta ex interpretatione Morelli, 1630), of the Benedictines (begun in 1778, but interrupted by the French Revolution and not completed until 1840, Caillau being the final editor) and of Migne. The *Theological Orations* (edited by A. J. Mason) were published separately at Cambridge in 1899.

Scattered notices of the life of Gregory Nazianzen are to be found in the writings of Socrates, Sozomen, Theodoret and Rufinus, as well as in his own letters and poems. The data derived from these sources do not always harmonize with the account of Suidas. The earlier modern authorities, such as Tillemont (*Mem. Eccl.* t. ix.) and Leclerc (*Bib. Univ.* t. xviii.), were used by Gibbon. See also C. Ullmann, *Gregorius von Nazianz, der Theologe* (1825; Eng. trans. by G. F. Coxe, M.A., 1857); A. Bénoit, *St Grégoire de Nazianze; sa vie, ses œuvres, et son époque* (1877); Montaut, *Revue critique de quelques questions historiques se rapportant à St Grégoire de Nazianze* (1879); F. W. Farrar, *Lives of the Fathers*, i. 491–582, and F. Loofs in Hauck-Herzog's *Realencyk. für prot. Theologie*, vii. 138.

GREGORY, ST, OF NYSSA (*c.* 331–*c.* 396), one of the four great fathers of the Eastern Church, designated by one of the later ecumenical councils as "a father of fathers," was a younger brother of Basil (the Great), bishop of Caesarea, and was born (probably) at Neocaesarea about A.D. 331. For his education he was chiefly indebted to his elder brother. At a comparatively early age he entered the church, and held for some time the office of anagnost or reader; subsequently he manifested a desire to devote himself to the secular life as a rhetorician, an impulse which was checked by the earnest remonstrances of Gregory of Nazianzus. Finally, in 371 or 372 he was ordained by his brother Basil to the bishopric of Nyssa, a small town in Cappadocia. Here he is usually said (but on inadequate data) to have adopted the opinion then gaining ground in favour of the celibacy of the clergy, and to have separated from his wife Theosebia, who became a deaconess in the church. His strict orthodoxy on the subject of the Trinity and the Incarnation, together with his vigorous eloquence, combined to make him peculiarly obnoxious to the Arian faction, which was at that time in the ascendant through the protection of the emperor Valens; and in 375, the synod of Ancyra, convened by Demetrius the Arian governor of Pontus, condemned him for alleged irregularities in his election and in the administration of the finances of his diocese. In 376 he was deprived of his see, and Valens sent him into exile, whence he did not return till the publication of the edict of Gratian in 378. Shortly afterwards he took part in the proceedings of the synod which met at Antioch in Caria, principally in connexion with the Meletian schism. At the great ecumenical council held at Constantinople in 381, he was a conspicuous champion of the orthodox faith; according to Nicephorus, indeed, the additions made to the Nicene creed were entirely due to his suggestion, but this statement is of doubtful authority. That his eloquence was highly appreciated is shown by the facts that he pronounced the discourse at the consecration of Gregory of Nazianzus, and that he was chosen to deliver the funeral oration on the death of Meletius the first president of the council. In the following year, moreover (382), he was commissioned by the council to inspect and set in order the churches of Arabia, in connexion with which mission he also visited Jerusalem. The impressions he gathered from this journey may, in part at least, be gathered from his famous letter *De cunctibus Hierosolyma*, in which an opinion strongly unfavourable to pilgrimages is expressed. In 383 he was probably again in Constantinople; where in 385 he pronounced the funeral orations of the princess Pulcheria and afterwards of the empress Placilla. Once more we read of him in 394 as having been present in that metropolis at the synod held under the presidency of Nectarius to settle a controversy which had arisen among the bishops of Arabia; in the same year he assisted at the consecration of the new church of the apostles at Chalcedon, on which occasion there is reason to believe that his discourse commonly but wrongly known as that Εἰς τὴν ἑαυτοῦ χειροτονίαν was delivered. The exact date of his death is unknown; some authorities refer it to 376, others to 400. His festival is observed by the Greek Church on the 10th of January; in the Western martyrologies he is commemorated on the 9th of March.

Gregory of Nyssa was not so firm and able an administrator as his brother Basil, nor so magnificent an orator as Gregory of Nazianzus, but he excelled them both, alike as a speculative and constructive theologian, and in the wide extent of his acquirements. His teaching, though strictly trinitarian, shows considerable freedom and originality of thought; in many points his mental and spiritual affinities with Origen show themselves with advantage, as in his doctrine of ἀποκατάστασις or final restoration. There are marked pantheistic tendencies, *e.g.* the inclusion of sin as a necessary part of the cosmical process, which make him akin to the pantheistic monophysites and to some modern thinkers.

His style has been frequently praised by competent authorities for sweetness, richness and elegance. His numerous works may be classified under five heads: (1) Treatises in doctrinal and polemical theology. Of these the most important is that *Against Eunomius* in twelve books. Its doctrinal thesis (which is supported with great philosophic acumen and rhetorical power) is the divinity and consubstantiality of the Word; incidentally the character of Basil, which Eunomius had aspersed, is vindicated, and the heretic himself is held up to scorn and contempt. This is the work which, most probably in a shorter draft, was read by its author when at Constantinople before Gregory Nazianzen and Jerome in 381 (Jerome, *De vir. ill.* 128). To the same class belong the treatise *To Eustathius*, against the tritheists; *On Faith*, against the Arians; *On Common Notions*, in explanation of the terms in current employment with regard to the Trinity; *Ten Syllogisms*, against the Manichaeans; *To Theophilus*, against the Apollinarians; an *Antirrhetic* against the same; *Against Fate*, a disputation with a heathen philosopher; *De anima et resurrectione*, a dialogue with his dying sister Macrina; and the *Oratio catechetica magna*, an argument for the incarnation as the best possible form of redemption, intended to convince educated pagans and Jews. (2) Practical treatises. To this category belong the tracts *On Virginity* and *On Pilgrimages*; as also the *Canonical Epistle* upon the rules of penance. (3) Expository and homiletical works, including the *Hexaëmeron*, and several series of discourses *On the Workmanship of Man*, *On the Inscriptions of the Psalms*, *On the Sixth Psalm*, *On the Brethren Baptized*, *Ecclesiastes*, *On Canticles*, *On the Lord's Prayer* and *On the Eight Beatitudes*. (4) Biographical, consisting chiefly of funeral orations. (5) Letters.

The only complete editions of the whole works are those by Frontin le Duc (Fronto Ducaeus, Paris, 1615; with additions, 1618 and 1638) and by Migne. G. H. Forbes began an excellent critical edition, but only two parts of the first volume appeared (Burntisland, 1855 and 1861) containing the *Explicatio apologetica in hexaëmeron* and the *De opificio hominis*. Of the new edition projected by F. Oehler only the first volume, containing the *Opera dogmatica*, has appeared (1865). There have been numerous editions of several single treatises, as for example of the *Oratio catechetica* (J. G. Krabinger, Munich, 1838; J. H. Crawley, Cambridge, 1903), *De creatione* and *De anima et resurrectione*.

See F. W. Farrar, *Lives of the Fathers*, ii. 56–83, the monograph by J. Rupp (*Gregors, des Bischofs von Nyssa, Leben und Meinungen*, Leipzig, 1834), and compare P. Heyns (*Disputatio historico-theologica de Greg. Nyss.*, 1835), C. W. Moller (*Gregorii Nyss. doctrinam de hominis natura et illustravit et cum Origeniana comparavit*, 1854) and J. N. Stigler, *Die Psychologie des h. Gregors von Nyssa* (Regensburg, 1857), and many smaller monographs cited in Hauck-Herzog's *Realencyk. für prot. Theol.* vii. 149.

GREGORY, ST, OF TOURS (538–594), historian of the Franks, was born in the chief city of the Arverni (the modern Clermont-Ferrand) on the 30th of November 538. His real name was Georgius Florentius, Georgius being his grandfather's name and Florentius his father's. He was called Gregory after his maternal great-grandfather, the bishop of Langres. Gregory belonged to an illustrious senatorial family, many of whose members held high office in the church and bear honoured names in the history of Christianity. He was descended, it is said, from Vettius Epagathus, who was martyred at Lyons in 177 with St Pothinus; his paternal uncle, Gallus, was bishop of Clermont; his maternal grandmother, Nicetius (St Nizier), occupied the see of Lyons; and he was a kinsman of Euphronius, bishop of Tours.

Gregory lost his father early, and his mother Armentaria settled in the kingdom of Burgundy on an estate belonging to her near Cavaillon, where her son often visited her. Gregory was brought up at Clermont-Ferrand by his uncle Gallus and by his successor, Avitus, and there he received his education. Among protane authors he read the first six books of the *Aeneid* and Sallust's history of the Catiline conspiracy, but his education was mainly religious. The principles of religion he learnt from

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the Bible, Sulpicius Severus and some lives of saints, but to patristic literature and the subtleties of theology he remained a stranger. In 563, at the age of twenty-five, he was ordained deacon. Falling seriously ill, he went to Tours to seek a cure at the tomb of St Martin. At Tours he lived with Euphronius, and so great was the young man's popularity that, on the death of Euphronius in 573, the people unanimously designated him bishop.

At that time Tours belonged to Austrasia, and King Sigebert hastened to confirm Gregory's election. After the assassination of Sigebert (575), the province was ruled by Chilperic for nine years, during which period Gregory displayed the greatest energy in protecting his town and church from the Frankish king. He had to contend with Count Leudast, the governor of Tours; despite all the king's threats, he refused to give up Chilperic's son Meroving, who had sought refuge from his father's wrath at the sanctuary of St Martin; and he defended Bishop Pretextatus against Chilperic, by whom he had been condemned for celebrating the marriage of Merovech and Queen Brunhilda. In 580 Gregory was himself accused before a council at Berny of using abusive language against Queen Fredegond, but he cleared himself of the charge by an oath and was acquitted. On the death of Chilperic, Tours remained for two years (584–585) in the hands of Guntram, but when Guntram adopted his nephew Childebert, Sigebert's son, it again became Austrasian. This change was welcome to Gregory, who often visited the court. In 586 he was at Coblenz, and on his return to Yvois (the modern Carignan) visited the stylite Wulfilaic; in 588 we hear of him at Metz and also at Chalon-sur-Saône, whither he was sent to obtain from King Guntram the ratification of the pact of Andelot; in 593 he was at Orleans, where Childebert had just succeeded his uncle Guntram. In the intervals of these journeys he governed Tours with great firmness, repressing disorders and reducing the monks and nuns to obedience. He died on the 17th of November 594.

Gregory left many writings, of which he himself gives an enumeration at the end of his *Historia Francorum*: "Decem libros Historiarum, septem Miraculorum, unum de Vita Patrum scripsi; in Psalterii tractatu librum unum commentatus sum; de Cursibus etiam ecclesiasticis unum librum condidi." The ten books of history are discussed below. The seven books of miracles are divided into the *De gloria martyrum*, the *De virtutibus sancti Juliani*, four books of *Miracula sancti Martini*, and the *De gloria confessorum*, the last dealing mainly with confessors who had dwelt in the cities of Tours and Clermont. The *Vitae patrum* consists of twenty biographies of bishops, abbots and hermits belonging to Gaul. The commentary on the Psalms is lost, the preface and the titles of the chapters alone being extant. The treatise *De cursibus ecclesiasticis*, discovered in 1853, is a liturgical manual for determining the hour of divers nocturnal offices by the position of the stars. Gregory also left a life of St Andrew, translated from the Greek, and a history of the Seven Sleepers of Ephesus, translated from Syriac.

His most important work, however, is the *Historia Francorum*, which is divided into three parts. The first four books, which were composed at one time, cover the period from the creation of the world to the death of Sigebert in 575. The first book, which is a mere compilation from the chronicles of St Jerome and Orosius, is of no value. The second book, from 397 to 511, deals with the invasions of the Franks, and is based on the histories of Sulpicius Alexander and Renatus Profuturus Frigeridus, now lost; on the catalogues of the bishops of Clermont and Tours; on some lives of saints, *e.g.* Remigius and Maxentius, now lost; on the annals of Arles and Angers, now lost; and on legends, either collected by Gregory himself from oral tradition, or cantilenes or epics written in the Latin and Germanic languages. In the third and fourth books the earlier part is based on materials collected from men older than himself; of the later events he was himself an eye-witness. The fifth and sixth books, up to the death of Chilperic (584), deal with matters within his own experience. The first six books are often separate in the MSS., and it was these alone that were used by the chronicler Fredegarius in his abridgment of Gregory's history. To the first six books Gregory subsequently added chapters on the bishops Salonius and Sagittarius, and on his quarrels with Felix of Nantes. The authenticity of these chapters has been undeservedly attacked by Catholic writers. Books vii. to x., from 584 to 591, were written in the form of a diary; of each important event, as it occurred, he inserted an account in his book. The last six books are of great historical value.

Gregory had an intimate knowledge of contemporary events. He was frequently at court, and he found Tours an excellent place for collecting information. The shrine of St Martin attracted the sick from all quarters, and the basilica of the saint was a favourite sanctuary for political refugees. Moreover, Tours was on the high road between the north and south of France, and was a convenient stage for travellers, the ambassadors going to and from Spain frequently halting there. Gregory plied every one with questions, and in this way gathered a great mass of detailed information. He was, besides, at great pains to be an impartial writer, but was not always successful. His devotion to Austrasia made him very bitter against, and perhaps unjust to, the sovereigns of Neustria, Chilperic and Fredegond. As an orthodox Christian, he had no good word for the Arians. He excuses the crimes of kings who protected the church, such as Clovis, Clotaire I. and Guntram, but had no mercy for those who violated ecclesiastical privileges. This attitude, no doubt, explains his hatred for Chilperic. But if Gregory's historical judgments are suspect, he at least concealed nothing and invented nothing; and we can correct his judgments by his own narrative. His history is a curious compound of artlessness and shrewdness. He was ignorant of the rules of grammar, confused genders and cases, and wrote in the vernacular Latin of his time, apart from certain passages which are especially elaborated and filled with poetical and elegant expressions. But in spite of his shortcomings he is an exceedingly attractive writer, and his mastery of the art of narrative has earned for him the name of the Herodotus of the barbarians.

T. Ruinart brought out a complete edition of Gregory's works at Paris in 1699. The best modern complete edition is that of W. Arndt and B. Krusch in *Mon. Germ. hist. script. rer. Merov.* (vol. i., 1885). Of the many editions of the *Historia Francorum* may be mentioned those of Guadet and Taranne in the *Soc. de l'hist. de France* (4 vols., with French translation, 1836–1838), of Omont (the first six books; a reproduction of the Corvey MS.) and of G. Collon (the last four books; a reproduction of the Brussels MS. No. 9, 403). Gregory's hagiographic works were published by H. Bordier in the *Soc. de l'hist. de France* (4 vols., with French translation, 1857–1864). Cf. J. W. Löbell, *Gregor von Tours und seine Zeit* (2nd ed., Leipzig, 1868); G. Monod, "Études critiques sur les sources de l'histoire mérovingienne" in the *Bibl. de l'École des Hautes Études* (1872); G. Kurth, "Grégoire de Tours et les études classiques au VIe siècle" in the *Revue des questions historiques* (xxiv. 586 seq., 1878); Max Bonnet, *Le Latin de Grégoire de Tours* (Paris, 1890). For details, see Ulysse Chevalier, *Biobibliographie* (2nd ed.). (C. Pf.)

GREGORY THE ILLUMINATOR, the reputed founder of the Armenian Church. His legend is briefly as follows. His father Anak, head of the Parthian clan of Suren, was bribed about the time of his birth (*c.* 257) by the Sassanid king of Persia to assassinate the Armenian king, Chosroes, who was of the old Arsacid dynasty, and father of Tiridates or Trdat, first Christian king of Armenia. Anak was slain by his victim's soldiers; Gregory was rescued by his Christian nurse, carried to Caesarea in Cappadocia, and brought up a Christian. Grown to manhood he took service under Tiridates, now king of Armenia, in order by his own fidelity to atone for his father's treachery. Presently at a feast of Anahite Gregory refused to assist his sovereign in offering pagan sacrifice, and his parentage being now revealed, was thrown into a deep pit at Artashat, where he languished for fourteen years, during which persecution raged in Armenia.

The scene of the legend now shifts to Rome, where Diocletian falls in love with a lovely nun named Ripsimé; she, rather than gratify his passion, flees with her abbess Gaiana and several priests to Armenia. Diocletian asks her back of Tiridates, who meanwhile has fallen in love with her himself. He too is flouted, and in his rage tortures and slays her and her companions. The traditional date of this massacre is the 5th of October,

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A.D. 301. Providence, incensed at such cruelty, turns Tiridates into a wild boar, and afflicts his subjects with madness; but his sister, Chosrowidukht, has a revelation to bring Gregory back out of his pit. The king consents, the saint is acclaimed, the bodies of the thirty-seven martyrs solemnly interred, and the king, after fasting five, and listening to Gregory's homilies for sixty days, is healed. This all took place at Valarshapat, where Gregory, anxious to fix a site on which to build shrines for the relics of Ripsimé and Gaiana, saw the Son of God come down in a sheen of light, the stars of heaven attending, and smite the earth with a golden hammer till the nether world resounded to his blows. Three chapels were built on the spot, and Gregory raised his cross there and elsewhere for the people to worship, just as St Nino was doing about the same time in Georgia. There followed a campaign against the idols whose temples and books were destroyed. The time had now come for Gregory, who was still a layman and father of two sons, to receive ordination; so he went to Caesarea, where Leontius ordained and consecrated him catholicos or vicar-general of Armenia. This was sometime about 200, when Leontius may have acceded, though we first hear of him as bishop in 314.

Gregory's ordination at Caesarea is historical. The vision at Valarshapat was invented later by the Armenians when they broke with the Greeks, in order to give to their church the semblance, if not of apostolic, at least of divine origin.

According to Agathangelus, Tiridates went to Rome with Gregory, Aristaces, son of Gregory, and Albianos, head of the other priestly family, to make a pact with Constantine, newly converted to the faith, and receive a pallium from Silvester. The better sources make Sardica the scene of meeting and name Eusebius (of Nicomedia) as the prelate who attended Constantine. There is no reason to doubt that some such visit was made about the year 315, when the death of Maximin Daza left Constantine supreme. Eusebius testifies (*H.E.* ix. 8) that the Armenians were ardent Christians, and ancient friends and allies of the Roman empire when Maximin attacked them about the year 308. The conversion of Tiridates was probably a matter of policy. His kingdom was honeycombed with Christianity, and he wished to draw closer to the West, where he foresaw the victory of the new faith, in order to fortify his realm against the Sassanids of Persia. Following the same policy he sent Aristaces in 325 to the council of Nice. Gregory is related to have added a clause to the creed which Aristaces brought back; he became a hermit on Mount Sebuh about the year 332, and died there.

Is the Ripsimé episode mere legend? The story of the conversion of Georgia by St Nino in the same age is so full of local colour, and coheres so closely with the story of Ripsimé and Gaiana, that it seems over-sceptical to explain the latter away as a mere doublet of the legend of Prisca and Valeria. The historians Faustus of Byzant and Lazar of Pharp in the 5th century already attest the reverence with which their memory was invested. We know from many sources the prominence assigned to women prophets in the Phrygian church. Nino's story reads like that of such a female missionary, and something similar must underlie the story of her Armenian companions.

The history of Gregory by Agathangelus is a compilation of about 450, which was rendered into Greek 550. Professor Marr has lately published an Arabic text from a MS. in Sinai which seems to contain an older tradition. A letter of Bishop George of Arabia to Jeshu, a priest of the town Anab, dated 714 (edited by Dashian, Vienna, 1891), contains an independent tradition of Gregory, and styles him a Roman by birth.

In spite of legendary accretions we can still discern the true outlines and significance of his life. He did not really illumine or convert great Armenia, for the people were in the main already converted by Syrian missionaries to the Adoptionist or Ebionite type of faith which was dominant in the far East, and was afterwards known as Nestorianism. Marcionites and Montanists had also worked in the field. Gregory persuaded Tiridates to destroy the last relics of the old paganism, and carried out in the religious sphere his sovereign's policy of detaching Great Armenia from the Sassanid realm and allying it with the Greco-Roman empire and civilization. He set himself to Hellenize or Catholicize Armenian Christianity, and in furtherance of this aim set up a hierarchy officially dependent on the Cappadocian. He in effect turned his country into a province of the Greek see of Cappadocia. This hierarchical tie was soon snapped, but the Hellenizing influence continued to work, and bore its most abundant fruit in the 5th century. His career was thus analogous to that of St Patrick in Ireland.

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(F. C. C.)

GREGORY (*Gregorius*), the name of sixteen popes and one anti-pope.

SAINT GREGORY, surnamed the Great (*c.* 540–604), the first pope of that name, and the last of the four doctors of the Latin Church, was born in Rome about the year 540. His father was Gordianus "the regionary," a wealthy man of senatorial rank, owner of large estates in Sicily and of a palace on the Caelian Hill in Rome; his mother was Silvia, who is commemorated as a saint on the 3rd of November. Of Gregory's early period we know few details, and almost all the dates are conjectural. He received the best education to be had at the time, and was noted for his proficiency in the arts of grammar, rhetoric and dialectic. Entering on a public career he held, about 573, the high office of prefect of the city of Rome; but about 574, feeling irresistibly attracted to the "religious" life, he resigned his post, founded six monasteries in Sicily and one in Rome, and in the last—the famous monastery of St Andrew—became himself a monk. This grateful seclusion, however, he was not permitted long to enjoy. About 578 he was ordained "seventh deacon" (or possibly archdeacon) of the Roman Church, and in the following spring Pope Pelagius II. appointed him "apocrisiarius," or resident ambassador, at the imperial court in Constantinople. Here he represented the interests of his church till about 586, when he returned to Rome and was made abbot of St Andrew's monastery. His rule, though popular, was characterized by great severity, as may be inferred from the story of the monk Justus, who was denied Christian burial because he had secreted a small sum of money. About this time Gregory completed and published his well-known exposition of the book of Job, commenced in Constantinople: he also delivered lectures on the Heptateuch, the books of Kings, the Prophets, the book of Proverbs and the Song of Songs. To this period, moreover, Bede's incident of the English slave-boys (if indeed it be accepted as historical) ought to be assigned. Passing one day through the Forum, Gregory saw some handsome slaves offered for sale, and inquired their nation. "Angles," was the reply. "Good," said the abbot, "they have the faces of angels, and should be coheirs with the angels in heaven. From what province do they come?" "From Deira." "Deira. Yea, verily, they shall be saved from God's ire (*de ira*) and called to the mercy of Christ. How is the king of that country named?" "Ælla." "Then must Alleluia be sung in Ælla's land." Gregory determined personally to undertake the conversion of Britain, and with the pope's consent actually set out upon the mission, but on the third day of his journey he was overtaken by messengers recalling him to Rome. In the year 590 Pelagius II. died of the plague that was raging in the city; whereupon the clergy and people unanimously chose Gregory as his successor. The abbot did his best to avoid the dignity, petitioned the emperor Maurice not

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to ratify his election, and even meditated going into hiding; but, "while he was preparing for flight and concealment, he was seized and carried off and dragged to the basilica of St Peter," and there consecrated bishop, on the 3rd of September 590.

The fourteen years of Gregory's pontificate were marked by extraordinary vigour and activity. "He never rested," writes a biographer, "he was always engaged in providing for the interests of his people, or in writing some composition worthy of the church, or in searching out the secrets of heaven by the grace of contemplation." His mode of life was simple and ascetic in the extreme. Having banished all lay attendants from his palace, he surrounded himself with clerics and monks, with whom he lived as though he were still in a monastery. To the spiritual needs of his people he ministered with pastoral zeal, frequently appointing "stations" and delivering sermons; nor was he less solicitous in providing for their physical necessities. Deaconries (offices of alms) and guest-houses were liberally endowed, and free distributions of food were made to the poor in the convents and basilicas. The funds for these and similar purposes were supplied from the Patrimony of St Peter—the papal estates in Italy, the adjacent islands, Gaul, Dalmatia and Africa. These extensive domains were usually administered by specially appointed agents,—rectors and defensors,—who resided on the spot; but the general superintendence devolved upon the pope. In this sphere Gregory manifested rare capacity. He was one of the best of the papal landlords. During his pontificate the estates increased in value, while at the same time the real grievances of the tenants were redressed and their general position was materially improved. Gregory's principal fault as a man of business was that he was inclined to be too lavish of his revenues. It is said that he even impoverished the treasury of the Roman Church by his unlimited charities.

Within the strict bounds of his patriarchate, *i.e.* the churches of the suburbicarian provinces and the islands, it was Gregory's policy to watch with particular care over the election and discipline of the bishops. With wise toleration he was willing to recognize local deviations from Roman usage (*e.g.* in the ritual of baptism and confirmation), yet he was resolute to withstand any unauthorized usurpation of rights and privileges. The following rules he took pains to enforce: that clerics in holy orders should not cohabit with their wives or permit any women, except those allowed by the canons, to live in their houses; that clerics accused on ecclesiastical or lesser criminal charges should be tried only in the ecclesiastical courts; that clerics in holy orders who had lapsed should "utterly forfeit their orders and never again approach the ministry of the altar"; that the revenues of each church should be divided by its bishop into four equal parts, to be assigned to the bishop, the clergy, the poor and the repair of the fabric of the church.

In his relations with the churches which lay outside the strict limits of his patriarchate, in northern Italy, Spain, Gaul, Africa and Illyricum and also in the East, Gregory consistently used his influence to increase the prestige and authority of the Roman See. In his view Rome, as the see of the Prince of the Apostles, was by divine right "the head of all the churches." The decrees of councils would have no binding force "without the authority and consent of the apostolic see": appeals might be made to Rome against the decisions even of the patriarch of Constantinople: all bishops, including the patriarchs, if guilty of heresy or uncanonical proceedings, were subject to correction by the pope. "If any fault is discovered in a bishop," Gregory wrote, "I know of no one who is not subject to the apostolic see." It is true that Gregory respected the rights of metropolitans and disapproved of unnecessary interference within the sphere of their jurisdiction canonically exercised; also that in his relations with certain churches (*e.g.* those in Africa) he found it expedient to abstain from any obtrusive assertion of Roman claims. But of his general principle there can be no doubt. His sincere belief in the apostolic authority of the see of St Peter, his outspoken assertion of it, the consistency and firmness with which in practice he maintained it (*e.g.* in his controversies with the bishops of Ravenna concerning the use of the pallium, with Maximus the "usurping" bishop of Salona, and with the patriarchs of Constantinople in respect of the title "ecumenical bishops"), contributed greatly to build up the system of papal absolutism. Moreover this consolidation of spiritual authority coincided with a remarkable development of the temporal power of the papacy. In Italy Gregory occupied an almost regal position. Taking advantage of the opportunity which circumstances offered, he boldly stepped into the place which the emperors had left vacant and the Lombard kings had not the strength to seize. For the first time in history the pope appeared as a political power, a temporal prince. He appointed governors to cities, issued orders to generals, provided munitions of war, sent his ambassadors to negotiate with the Lombard king and actually dared to conclude a private peace. In this direction Gregory went farther than any of his predecessors: he laid the foundation of a political influence which endured for centuries. "Of the medieval papacy," says Milman, "the real father is Gregory the Great."

The first monk to become pope, Gregory was naturally a strong supporter of monasticism. He laid himself out to diffuse the system, and also to carry out a reform of its abuses by enforcing a strict observance of the Rule of St Benedict (of whom it may be noted, he was the earliest biographer). Two slight innovations were introduced: the minimum age of an abbess was fixed at sixty, and the period of novitiate was prolonged from one year to two. Gregory sought to protect the monks from episcopal oppression by issuing *privilegia*, or charters in restraint of abuses, in accordance with which the jurisdiction of the bishops over the monasteries was confined to spiritual matters, all illegal aggressions being strictly prohibited. The documents are interesting as marking the beginning of a revolution which eventually emancipated the monks altogether from the control of their diocesans and brought them under the direct authority of the Holy See. Moreover Gregory strictly forbade monks to minister in parish churches, ordaining that any monk who was promoted to such ecclesiastical cure should lose all rights in his monastery and should no longer reside there. "The duties of each office separately are so weighty that no one can rightly discharge them. It is therefore very improper that one man should be considered fit to discharge the duties of both, and that by this means the ecclesiastical order should interfere with the monastic life, and the rule of the monastic life in turn interfere with the interests of the churches."

Once more, Gregory is remembered as a great organizer of missionary enterprise for the conversion of heathens and heretics. Mose important was the two-fold mission to Britain—of St Augustine in 596, of Mellitus, Paulinus and others in 601; but Gregory also made strenuous efforts to uproot paganism in Gaul, Italy, Sicily, Sardinia and Corsica, Arianism in Spain, Donatism in Africa, Manichaeism in Sicily, the heresy of the Three Chapters in Istria and northern Italy. In respect of the methods of conversion which he advocated he was not less intolerant than his contemporaries. Towards the Jews, however, he acted with exceptional lenity, protecting them from persecution and securing them the enjoyment of their legal privileges. The so-called "simoniacal heresy," particularly prevalent in Gaul, Illyricum and the East, he repeatedly attacked; and against the Gallican abuse of promoting laymen to bishoprics he protested with vigour.

The extent and character of Gregory's works in connexion with the liturgy and the music of the church is a subject of dispute. If we are to credit a 9th century biographer, Gregory abbreviated and otherwise simplified the Sacramentary of Gelasius, producing a revised edition with which his own name has become associated, and which represents the groundwork of the modern Roman Missal. But though it is certain that he introduced three changes in the liturgy itself (viz. the addition of some words in the prayer *Hanc igitur*, the recitation of the Pater Noster at the end of the Canon immediately before the fraction of the bread, and the chanting of the Allelulia after the Gradual at other times besides the season of Easter) and two

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others in the ceremonial connected therewith (forbidding deacons to perform any musical portion of the service except the chanting of the gospel, and subdeacons to wear chasubles), neither the external nor the internal evidence appears to warrant belief that the Gregorian Sacramentary is his work. Ecclesiastical tradition further ascribes to Gregory the compilation of an Antiphonary, the revision and rearrangement of the system of church music, and the foundation of the Roman *schola cantorum*. It is highly doubtful, however, whether he had anything to do either with the Antiphonary or with the invention or revival of the *cantus planus*; it is certain that he was not the founder of the Roman singing-school, though he may have interested himself in its endowment and extension.

Finally, as Fourth Doctor of the Latin Church, Gregory claims the attention of theologians. He is the link between two epochs. The last of the great Latin Fathers and the first representative of medieval Catholicism he brings the dogmatic theology of Tertullian, Ambrose and Augustine into relation with the Scholastic speculation of later ages. "He connects the Graeco-Roman with the Romano-Germanic type of Christianity." His teaching, indeed, is neither philosophical, systematic nor truly original. Its importance lies mainly in its simple, popular summarization of the doctrine of Augustine (whose works Gregory had studied with infinite care, but not always with insight), and in its detailed exposition of various religious conceptions which were current in the West but had not hitherto been defined with precision (*e.g.* the views on angelology and demonology, on purgatory, the Eucharistic Sacrifice, and the efficacy of relics). In his exposition of such ideas Gregory made a distinct advance upon the older theology and influenced profoundly the dogmatic development of the future. He imparted a life and impulse to prevailing tendencies, helping on the construction of the system hereafter to be completed in Scholasticism. He gave to theology a tone and emphasis which could not be disregarded. From his time to that of Anselm no teacher of equal eminence arose in the Church.

Gregory died on the 12th of March 604, and was buried the same day in the portico of the basilica of St Peter, in front of the sacristy. Translations took place in the 9th, 15th and 17th centuries, and the remains now rest beneath the altar in the chapel of Clement VIII. In respect of his character, while most historians agree that he was a really great man, some deny that he was also a great saint. The worst blot on his fair fame is his adulatory congratulation of the murderous usurper Phocas; though his correspondence with the Frankish queen Brunhilda, and the series of letters to and concerning the renegade monk Venantius also present problems which his admirers find difficult of solution. But while it may be admitted that Gregory was inclined to be unduly subservient to the great, so that at times he was willing to shut his eyes to the vices and even the crimes of persons of rank; yet it cannot fairly be denied that his character as a whole was singularly noble and unselfish. His life was entirely dominated by the religious motive. His sole desire was to promote the glory of God and of his church. At all times he strove honestly to live up to the light that was in him. "His goal," says Lau, "was always that which he acknowledged as the best." Physically, Gregory was of medium height and good figure. His head was large and bald, surrounded with a fringe of dark hair. His face was well-proportioned, with brown eyes, aquiline nose, thick and red lips, high-coloured cheeks, and prominent chin sparsely covered with a tawny beard. His hands, with tapering fingers, were remarkable for their beauty.

Gregory's Works.—The following are now universally admitted to be genuine:—*Epistolarum libri xiv.*, *Moralium libri xxxv.*, *Regulae pastoralis liber*, *Dialogorum libri iv.*, *Homiliarum in Ezechielem prophetam libri ii.*, *Homiliarum in Evangelia libri ii.* These are all printed in Migne's *Patrologia Latina*. The *Epistolae*, however, have been published separately by P. Ewald and L. M. Hartmann in the *Monumenta Germaniae historica* (Berlin, 1887–1899), and this splendid edition has superseded all others. The question of the chronological reconstruction of the *Register* is dealt with by Ewald in his celebrated article in the *Neues Archiv der Gesellschaft für ältere deutsche Geschichtskunde*, iii. pp. 433-625; and briefly by T. Hodgkin, *Italy and her Invaders*, v. 333-343. For information about these writings of Gregory, consult especially G. J. T. Lau, *Gregor I. der Grosse*, pt. ii. chap. i.; *Die Schriften Gregors* and F. Homes Dudden, *Gregory the Great* (see Index II. B.). In addition to the above-mentioned works there are printed under Gregory's name in Migne's *Patrologia Latina*, vol. lxxix., the following:—*Super Cantica Canticorum expositio*, *In librum primum Regum variarum expositionum libri vi.*, *In septem psalmos poenitentiales expositio* and *Concordia quorundam testimoniorum s. scripturae*. But (with the possible exception of the first) none of these treatises are of Gregorian authorship. See the discussions in Migne, Lau and Dudden.

AUTHORITIES.—(*a*) The principal ancient authorities for the life and works of Gregory are given in their chronological order. They are: Gregory of Tours, *Historia Francorum*, x. 1; *Liber pontificalis*, "Vita Gregorii Magni"; Isidore of Seville, *Historia Gothorum*, 49, and Ildefonsus of Toledo, *De vir. illustr.* i.; an anonymous *Vita Gregorii* (of English authorship) belonging to the monastery of St Gall, discovered by Ewald and published by F. A. Gasquet, *A Life of Pope S. Gregory the Great* (1904); Bede, *Historia ecclesiastica*, ii. c. 1; Paul the Deacon, *Vita Gregorii Magni* (770–780); John the Deacon, *Vita Gregorii* (872–882). (*b*) Recent Literature: J. Barmby, *Gregory the Great* (1892); T. Bonsmann, *Gregor I. der Grosse, ein Lebensbild* (1890); F. Homes Dudden, *Gregory the Great: his place in History and Thought* (2 vols., 1905); G. J. T. Lau, *Gregor I. der Grosse nach seinem Leben und seiner Lehre geschildert* (1845); C. Wolfsgruber, *Gregor der Grosse* (1897). See also F. Gregorovius, *Rome in the Middle Ages* (Eng. trans.) ii. 16-103; T. Hodgkin, *Italy and her Invaders*, v. cc. 7-10; H. K. Mann, *The Lives of the Popes*, i. 1-250; F. W. Kellett, *Pope Gregory the Great and his Relations with Gaul*; L. Pingaud, *La Politique de Saint Grégoire le Grand*; W. Watsaum, *Die wichtigsten Richtungen und Ziele der Tätigkeit des Papstes Gregors des Grossen*; W. Hünaus, *Die Bedeutung Gregors des Grossen als liturgischer Schriftsteller*; E. G. P. Wyatt, *St Gregory and the Gregorian Music*; and the bibliographies of Gregory in Chevalier, *Répertoire des sources historiques du moyen âge*, and A. Potthast, *Bibliotheca historica medii aevi*.

(F. H. D.)

GREGORY II., pope from 715 to 731, succeeded Constantine I., whom he accompanied from Constantinople in 710. Gregory did all in his power to promote the spread of Christianity in Germany, and gave special encouragement to the mission of St Boniface, whom he consecrated bishop in 722. He was a staunch adherent of the East Roman empire, which still exercised sovereignty over Rome, Ravenna and some other parts of Italy, and he impeded as far as possible the progress of the Lombards. About 726, however, he became involved in a conflict with the emperor Leo the Isaurian on account of the excessive taxation of the Italians, and, later, on the question of image worship, which had been proscribed by the government of Constantinople. Leo endeavoured to rid himself of the pope by violence, but Gregory, supported by the people of Rome and also by the Lombards, succeeded in eluding the emperor's attacks, and died peacefully on the 11th of February 731.

GREGORY III., pope from 731 to 741. He condemned the iconoclasts at a council convened at Rome in November 731, and, like his predecessor Gregory II., stimulated the missionary labours of St Boniface, on whom he conferred the pallium. Towards the Lombards he took up an imprudent attitude, in support of which he in vain invoked the aid of the Frankish prince Charles Martel.

GREGORY IV., pope from 827 to 844, was chosen to succeed Valentinus in December 827, on which occasion he recognized the supremacy of the Frankish emperor in the most unequivocal manner. His name is chiefly associated with the quarrels between Lothair and Louis the Pious, in which he espoused the cause of the former, for whom, in the Campus Mendacii (*Lügenfeld*, field of lies), as it is usually called (833), he secured by his treachery a temporary advantage. The institution of the feast of All Saints is usually attributed to this pope. He died on the 25th of January 844, and was succeeded by Sergius II.

GREGORY V. (Bruno), pope from 996 to 999, a great-grandson of the emperor Otto the Great, succeeded John XV. when only twenty-four years of age, and until the council of Pavia (997) had a rival in the person of the anti-pope John XVI., whom the people of Rome, in revolt against the will of the youthful emperor Otto III., had chosen after having expelled Gregory. The most memorable acts of his pontificate were those arising out of the continuacy of the French king, Robert, who was ultimately brought to submission by the rigorous infliction of a sentence

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of excommunication. Gregory died suddenly, and not without suspicion of foul play, on the 18th of February 999. His successor was Silvester II.

GREGORY VI., pope from 1045 to 1046. As Johannes Gratianus he had earned a high reputation for learning and probity, and in 1045 he bought the Roman pontificate from his godson Benedict IX. At a council held by the emperor Henry III. at Sutri in 1046, he was accused of simony and deposed. He was banished into Germany, where he died in 1047. He was accompanied into exile by his young protégé Hildebrand (afterwards pope as Gregory VII.), and was succeeded by Clement II. (L. D.*)

GREGORY VII., pope from 1073 to 1085. Hildebrand (the future pope) would seem to have been born in Tuscany—perhaps Raovacum—early in the third decade of the 11th century. The son of a plain citizen, Bunicus or Bonizo, he came to Rome at an early age for his education; an uncle of his being abbot of the convent of St Mary on the Aventine. His instructors appear to have included the archpriest Johannes Gratianus, who, by disbursing a considerable sum to Benedict IX., smoothed his way to the papal throne and actually ascended it as Gregory VI. But when the emperor Henry III., on his expedition to Rome (1046), terminated the scandalous *impasse* in which three popes laid claim to the chair of Peter by deposing all three, Gregory VI. was banished to Germany, and Hildebrand found himself obliged to accompany him. As he himself afterwards admitted, it was with extreme reluctance that he crossed the Alps. But his residence in Germany was of great educative value, and full of significance for his later official activity. In Cologne he was enabled to pursue his studies; he came into touch with the circles of Lorraine where interest in the elevation of the Church and her life was highest, and gained acquaintance with the political and ecclesiastical circumstances of that country which was destined to figure so largely in his career. Whether, on the death of Gregory VI. in the beginning of 1048, Hildebrand proceeded to Cluny is doubtful. His brief residence there, if it actually occurred, is to be regarded as no more than a visit; for he was never a monk of Cluny. His contemporaries indeed describe him as a monk; but his entry into the convent must be assigned to the period preceding or following his German travels and presumably took place in Rome. He returned to that city with Bishop Bruno of Toul, who was nominated pope under the title of Leo IX. (1048–1054). Under him Hildebrand found his first employment in the ecclesiastical service, becoming a subdeacon and steward in the Roman Church. He acted, moreover, as a legate in France, where he was occupied *inter alia* with the question of Berengarius of Tours, whose views on the Lord's Supper had excited opposition. On the death of Leo IX. he was commissioned by the Romans as their envoy to the German court, to conduct the negotiations with regard to his successor. The emperor pronounced in favour of Bishop Gebhard of Eichstädt, who, in the course of his short reign as Victor II. (1055–1057), again employed Hildebrand as his legate to France. When Stephen IX. (Frederick of Lorraine) was raised to the papacy, without previous consultation with the German court, Hildebrand and Bishop Anselm of Lucca were despatched to Germany to secure a belated recognition, and he succeeded in gaining the consent of the empress Agnes. Stephen, however, died before his return, and, by the hasty elevation of Bishop Johannes of Velletri, the Roman aristocracy made a last attempt to recover their lost influence on the appointment to the papal throne—a proceeding which was charged with peril to the Church as it implied a renewal of the disastrous patrician régime. That the crisis was surmounted was essentially the work of Hildebrand. To Benedict X., the aristocratic nominee, he opposed a rival pope in the person of Bishop Gerhard of Florence, with whom the victory rested. The reign of Nicholas II. (1059–1061) was distinguished by events which exercised a potent influence on the policy of the Curia during the next two decades—the *rapprochement* with the Normans in the south of Italy, and the alliance with the democratic and, subsequently, anti-German movement of the Patarenes in the north. It was also under his pontificate (1059) that the law was enacted which transferred the papal election to the College of Cardinals, thus withdrawing it from the nobility and populace of Rome and thrusting the German influence on one side. It would be too much to maintain that these measures were due to Hildebrand alone, but it is obvious that he was already a dominant personality on the Curia, through he still held no more exalted office than that of archdeacon, which was indeed only conferred on him in 1059. Again, when Nicholas II. died and a new schism broke out, the discomfiture of Honorius II. (Bishop Cadalus of Parma) and the success of his rival (Anselm of Lucca) must be ascribed principally, if not entirely, to Hildebrand's opposition to the former. Under the sway of Alexander II. (1061–1073) this man loomed larger and larger in the eye of his contemporaries as the soul of the Curial policy. It must be confessed the general political conditions, especially in Germany, were at that period exceptionally favourable to the Curia, but to utilize them with the sagacity actually shown was nevertheless no slight achievement, and the position of Alexander at the end of his pontificate was a brilliant justification of the Hildebrandine statecraft.

On the death of Alexander II. (April 21, 1073), Hildebrand became pope and took the style of Gregory VII. The mode of his election was bitterly assailed by his opponents. True, many of the charges preferred are obviously the emanations of scandal and personal dislike, liable to suspicion from the very fact that they were not raised to impugn his promotion till several years had elapsed (*c.* 1076); still it is plain from his own account of the circumstances of his elevation that it was conducted in extremely irregular fashion, and that the forms prescribed by the law of 1059 were not observed. But the sequel justified his election—of which the worst that can be said is that there was no general suffrage. And this sequel again owed none of its success to chance, but was the fruit of his own exertions. In his character were united wide experience and great energy tested in difficult situations. It is proof of the popular faith in his qualifications that, although the circumstances of his election invited assault in 1073, no sort of attempt was then made to set up a rival pontiff. When, however, the opposition which took head against him had gone so far as to produce a pretender to the chair, his long and undisputed possession tended to prove the original legality of his papacy; and the appeal to irregularities at its beginning not only lost all cogency but assumed the appearance of a mere biased attack. On the 22nd of May he received sacerdotal ordination, and on the 30th of June episcopal consecration; the empress Agnes and the duchess Beatrice of Tuscany being present at the ceremony, in addition to Bishop Gregory of Vercelli, the chancellor of the German king, to whom Gregory would thus seem to have communicated the result of the election.

The focus of the ecclesiastico-political projects of Gregory VII. is to be found in his relationship with Germany. Since the death of Henry III. the strength of the monarchy in that country had been seriously impaired, and his son Henry IV. had to contend with great internal difficulties. This state of affairs was of material assistance to the pope. His advantage was still further accentuated by the fact that in 1073 Henry was but twenty-three years of age and by temperament inclined to precipitate action. Many sharp lessons were needful before he learned to bridle his impetuosity, and he lacked the support and advice of a disinterested and experienced statesman. Such being the conditions, a conflict between Gregory VII. and Henry IV. could have only one issue—the victory of the former.

In the two following years Henry was compelled by the Saxon rebellion to come to amicable terms with the pope at any cost. Consequently in May 1074 he did penance at Nuremberg in presence of the legates to expiate his continued intimacy with the members of his council banned by Gregory, took an oath of obedience, and promised his support in the work of reforming the Church. This attitude, however, which at first won him the confidence of the pope, he abandoned so soon as he gained the upper hand of the Saxons: this he achieved by his victory at Hohenburg on the Unstrut (June 9, 1075). He now attempted to reassert his rights of suzerain in upper Italy without delay.

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He sent Count Eberhard to Lombardy to combat the Patarenes; nominated the cleric Tedaldo to the archbishopric of Milan, thus settling a prolonged and contentious question; and finally endeavoured to establish relations with the Norman duke, Robert Guiscard. Gregory VII. answered with a rough letter, dated December 8, in which—among other charges—he reproached the German king with breach of his word and with his further countenance of the excommunicated councillors; while at the same time he sent by word of mouth a brusque message intimating that the enormous crimes which would be laid to his account rendered him liable, not only to the ban of the church, but to the deprivation of his crown. Gregory ventured on these audacious measures at a time when he himself was confronted by a reckless opponent in the person of Cencius, who on Christmas-night did not scruple to surprise him in church and carry him off as a prisoner, though on the following day he was obliged to surrender his captive. The reprimands of the pope, couched as they were in such an unprecedented form, infuriated Henry and his court, and their answer was the hastily convened national council in Worms, which met on the 24th of January 1076. In the higher ranks of the German clergy Gregory had many enemies, and a Roman cardinal, Hugo Candidus, once on intimate terms with him but now at variance, had made a hurried expedition to Germany for the occasion and appeared at Worms with the rest. All the gross scandals with regard to the pontiff that this prelate could utter were greedily received by the assembly, which committed itself to the ill-considered and disastrous resolution that Gregory had forfeited his papal dignity. In a document full of accusations the bishops renounced their allegiance. In another King Henry pronounced him deposed, and the Romans were required to choose a new occupant for the vacant chair of St Peter. With the utmost haste two bishops were despatched to Italy in company with Count Eberhard under commission of the council, and they succeeded in procuring a similar act of deposition from the Lombard bishops in the synod of Piacenza. The communication of these decisions to the pope was undertaken by the priest Roland of Parma, and he was fortunate enough to gain an opportunity for speech in the synod, which had barely assembled in the Lateran church, and there to deliver his message announcing the dethronement of the pontiff. For the moment the members were petrified with horror, but soon such a storm of indignation was aroused that it was only due to the moderation of Gregory himself that the envoy was not cut down on the spot. On the following day the pope pronounced the sentence of excommunication against the German king with all formal solemnity, divested him of his royal dignity and absolved his subjects from the oaths they had sworn to him. This sentence purported to eject the king from the church and to strip him of his crown. Whether it would produce this effect, or whether it would remain an idle threat, depended not on the author of the verdict, but on the subjects of Henry—before all, on the German princes. We know from contemporary evidence that the excommunication of the king made a profound impression both in Germany and Italy. Thirty years before, Henry III. had deposed three popes, and thereby rendered a great and acknowledged service to the church. When Henry IV. attempted to copy this summary procedure he came to grief, for he lacked the support of the people. In Germany there was a speedy and general revulsion of sentiment in favour of Gregory, and the particularism of the princes utilized the auspicious moment for prosecuting their anti-regal policy under the cloak of respect for the papal decision. When at Whitsuntide the king proposed to discuss the measures to be taken against Gregory in a council of his nobles at Mainz, only a few made their appearance; the Saxons snatched at the golden opportunity for renewing their insurrection and the anti-royalist party grew in strength from month to month. The situation now became extremely critical for Henry. As a result of the agitation, which was zealously fostered by the papal legate Bishop Altmann of Passau, the princes met in October at Tribur to elect a new German king, and Henry, who was stationed at Oppenheim on the left bank of the Rhine, was only saved from the loss of his sceptre by the failure of the assembled princes to agree on the question of his successor. Their dissension, however, merely induced them to postpone the verdict. Henry, they declared, must make reparation to the pope and pledge himself to obedience; and they settled that, if, on the anniversary of his excommunication, he still lay under the ban, the throne should be considered vacant. At the same time they determined to invite Gregory to Augsburg, there to decide the conflict. These arrangements showed Henry the course to be pursued. It was imperative, under any circumstances and at any price, to secure his absolution from Gregory before the period named, otherwise he could scarcely foil his opponents in their intention to pursue their attack against himself and justify their measures by an appeal to his excommunication. At first he attempted to attain his ends by an embassy, but when Gregory rejected his overtures he took the celebrated step of going to Italy in person. The pope had already left Rome, and had intimated to the German princes that he would expect their escort for his journey on January 8 in Mantua. But this escort had not appeared when he received the news of the king's arrival. Henry, who travelled through Burgundy, had been greeted with wild enthusiasm by the Lombards, but resisted the temptation to employ force against Gregory. He chose instead the unexpected and unusual, but, as events proved, the safest course, and determined to compel the pope to grant him absolution by doing penance before him at Canossa, where he had taken refuge. This occurrence was quickly embellished and inwoven by legend, and great uncertainty still prevails with regard to several important points. The reconciliation was only effected after prolonged negotiations and definite pledges on the part of the king, and it was with reluctance that Gregory at length gave way, for, if he conferred his absolution, the diet of princes in Augsburg, in which he might reasonably hope to act as arbitrator, would either be rendered purposeless, or, if it met at all, would wear an entirely different character. It was impossible, however, to deny the penitent re-entrance into the church, and the politician had in this case to be subordinated to the priest. Still the removal of the ban did not imply a genuine reconciliation, and no basis was gained for a settlement of the great questions at issue—notably that of investiture. A new conflict was indeed inevitable from the very fact that Henry IV. naturally considered the sentence of deposition repealed with that of excommunication; while Gregory on the other hand, intent on reserving his freedom of action, gave no hint on the subject at Canossa.

That the excommunication of Henry IV. was simply a pretext—not a motive—for the opposition of the rebellious German nobles is manifest. For not only did they persist in their policy after his absolution, but they took the more decided step of setting up a rival king in the person of Duke Rudolph of Swabia (Forchheim, March 1077). At the election the papal legates present observed the appearance of neutrality, and Gregory himself sought to maintain this attitude during the following years. His task was the easier in that the two parties were of fairly equal strength, each endeavouring to gain the upper hand by the accession of the pope to their side. But his hopes and labours, with the object of receiving an appeal to act as arbitrator in the dynastic strife, were fruitless, and the result of his non-committal policy was that he forfeited in large measure the confidence of both parties. Finally he decided for Rudolph of Swabia in consequence of his victory at Flarchheim (January 27, 1080). Under pressure from the Saxons, and misinformed as to the significance of this battle, Gregory abandoned his waiting policy and again pronounced the excommunication and deposition of King Henry (March 7, 1080), unloosing at the same time all oaths sworn to him in the past or the future. But the papal censure now proved a very different thing from the papal censure four years previously. In wide circles it was felt to be an injustice, and men began to put the question—so dangerous to the prestige of the pope—whether an excommunication pronounced on frivolous grounds was entitled to respect. To make matters worse, Rudolph of Swabia died on the 16th of October of the

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same year. True, a new claimant—Hermann of Luxemburg—was put forward in August 1081, but his personality was ill adapted for a leader of the Gregorian party in Germany, and the power of Henry IV. was in the ascendant. The king, who had now been schooled by experience, took up the struggle thus forced upon him with great vigour. He refused to acknowledge the ban on the ground of illegality. A council had been summoned at Brixen, and on the 25th of June 1080 it pronounced Gregory deposed and nominated the archbishop Guibert of Ravenna as his successor—a policy of anti-king, anti-pope. In 1081 Henry opened the conflict against Gregory in Italy. The latter had now fallen on evil days, and he lived to see thirteen cardinals desert him, Rome surrendered by the Romans to the German king, Guibert of Ravenna enthroned as Clement III. (March 24, 1084), and Henry crowned emperor by his rival, while he himself was constrained to flee from Rome.

The relations of Gregory to the remaining European states were powerfully influenced by his German policy; for Germany, by engrossing the bulk of his powers, not infrequently compelled him to show to other rulers that moderation and forbearance which he withheld from the German king. The attitude of the Normans brought him a rude awakening. The great concessions made to them under Nicholas II. were not only powerless to stem their advance into central Italy but failed to secure even the expected protection for the papacy. When Gregory was hard pressed by Henry IV., Robert Guiscard left him to his fate, and only interfered when he himself was menaced with the German arms. Then, on the capture of Rome, he abandoned the city to the tender mercies of his warriors, and by the popular indignation evoked by his act brought about the banishment of Gregory.

In the case of several countries, Gregory attempted to establish a claim of suzerainty on the part of the see of St Peter, and to secure the recognition of its self-asserted rights of possession. On the ground of "immemorial usage" Corsica and Sardinia were assumed to belong to the Roman Church. Spain and Hungary were also claimed as her property, and an attempt was made to induce the king of Denmark to hold his realm as a fief from the pope. Philip I. of France, by his simony and the violence of his proceedings against the church, provoked a threat of summary measures; and excommunication, deposition and the interdict, appeared to be imminent in 1074. Gregory, however, refrained from translating his menaces into actions, although the attitude of the king showed no change, for he wished to avoid a dispersion of his strength in the conflict soon to break out in Germany. In England, again, William the Conqueror derived no less benefit from this state of affairs. He felt himself so safe that he interfered autocratically with the management of the church, forbade the bishops to visit Rome, filled bishoprics and abbeys, and evinced little anxiety when the pope expatiated to him on the different principles which he entertained as to the relationship of church and state, or when he prohibited him from commerce or commanded him to acknowledge himself a vassal of the apostolic chair. Gregory had no power to compel the English king to an alteration in his ecclesiastical policy, so chose to ignore what he could not approve, and even considered it advisable to assure him of his particular affection.

Gregory, in fact, established relations—if no more—with every land in Christendom; though these relations did not invariably realize the ecclesiastico-political hopes connected with them. His correspondence extended to Poland, Russia and Bohemia. He wrote in friendly terms to the Saracen king of Mauretania in north Africa, and attempted, though without success, to bring the Armenians into closer contact with Rome. The East, especially, claimed his interest. The ecclesiastical rupture between the bishops of Rome and Byzantium was a severe blow to him, and he laboured hard to restore the former amicable relationship. At that period it was impossible to suspect that the schism implied a definite separation, for prolonged schisms had existed in past centuries, but had always been surmounted in the end. Both sides, moreover, had an interest in repairing the breach between the churches. Thus, immediately on his accession to the pontificate, Gregory sought to come into touch with the emperor Michael VII. and succeeded. When the news of the Saracenic outrages on the Christians in the East filtered to Rome, and the political embarrassments of the Byzantine emperor increased, he conceived the project of a great military expedition and exhorted the faithful to participation in the task of recovering the sepulchre of the Lord (1074). Thus the idea of a crusade to the Holy Land already floated before Gregory's vision, and his intention was to place himself at the head. But the hour for such a gigantic enterprise was not yet come, and the impending struggle with Henry IV. turned his energies into another channel.

In his treatment of ecclesiastical policy and ecclesiastical reform, Gregory did not stand alone, but on the contrary found powerful support. Since the middle of the 11th century the tendency—mainly represented by Cluny—towards a stricter morality and a more earnest attitude to life, especially on the part of the clergy, had converted the papacy; and, from Leo IX. onward, the popes had taken the lead in the movement. Even before his election, Gregory had gained the confidence of these circles, and, when he assumed the guidance of the church, they laboured for him with extreme devotion. From his letters we see how he fostered his connexion with them and stimulated their zeal, how he strove to awake the consciousness that his cause was the cause of God and that to further it was to render service to God. By this means he created a personal party, unconditionally attached to himself, and he had his confidants in every country. In Italy Bishop Anselm of Lucca, to take an example, belonged to their number. Again, the duchess Beatrice of Tuscany and her daughter the Margravine Matilda, who put her great wealth at his disposal, were of inestimable service. The empress Agnes also adhered to his cause. In upper Italy the Patarenes had worked for him in many ways, and all who stood for their objects stood for the pope. In Germany at the beginning of his reign the higher ranks of the clergy stood aloof from him and were confirmed in their attitude by some of his regulations. But Bishop Altmann of Passau, who has already been mentioned, and Archbishop Gebhard of Salzburg, were among his most zealous followers. That the convent of Hirschau in Swabia was held by Gregory was a fact of much significance, for its monks spread over the land as itinerant agitators and accomplished much for him in southern Germany. In England Archbishop Lanfranc of Canterbury probably stood closest to him; in France his champion was Bishop Hugo of Dié, who afterwards ascended the archiepiscopal chair of Lyons.

The whole life-work of Gregory VII. was based on his conviction that the church has been founded by God and entrusted with the task of embracing all mankind in a single society in which His will is the only law; that, in her capacity as a divine institution, she outtops all human structures; and that the pope, *qua* head of the church, is the vice-regent of God on earth, so that disobedience to him implies disobedience to God—or, in other words, a defection from Christianity. Elaborating an idea discoverable in St Augustine, he looked on the worldly state—a purely human creation—as an unhallowed edifice whose character is sufficiently manifest from the fact that it abolishes the equality of man, and that it is built up by violence and injustice. He developed these views in a famous series of letters to Bishop Hermann of Metz. But it is clear from the outset that we are only dealing with reflections of strictly theoretical importance; for any attempt to interpret them in terms of action would have bound the church to annihilate not merely a single definite state, but all states. Thus Gregory, as a politician desirous of achieving some result, was driven in practice to adopt a different standpoint. He acknowledged the existence of the state as a dispensation of Providence, described the coexistence of church and state as a divine ordinance, and emphasized the necessity of union between the *sacerdotium* and the *imperium*. But at no period would he have dreamed of putting the two powers on an equality; the superiority of church to state was to him a fact which admitted

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of no discussion and which he had never doubted. Again, this very superiority of the church implied in his eyes a superiority of the papacy, and he did not shrink from drawing the extreme conclusions from these premises. In other words, he claimed the right of excommunicating and deposing incapable monarchs, and of confirming the choice of their successors. This habit of thought needs to be appreciated in order to understand his efforts to bring individual states into feudal subjection to the chair of St Peter. It was no mere question of formality, but the first step to the realization of his ideal theocracy comprising each and every state.

Since this papal conception of the state involved the exclusion of independence and autonomy, the history of the relationship between church and state is the history of one continued struggle. In the time of Gregory it was the question of appointment to spiritual offices—the so-called *investiture*—which brought the theoretical controversy to a head. The preparatory steps had already been taken by Leo IX., and the subsequent popes had advanced still further on the path he indicated; but it was reserved for Gregory and his enactments to provoke the outbreak of the great conflict which dominated the following decades. By the first law (1075) the right of investiture for churches was in general terms denied to the laity. In 1078 neglect of this prohibition was made punishable by excommunication, and, by a further decree of the same year, every investiture conferred by a layman was declared invalid and its acceptance pronounced liable to penalty. It was, moreover, enacted that every layman should restore, under pain of excommunication, all lands of the church, held by him as fiefs from princes or clerics; and that, henceforward, the assent of the pope, the archbishop, &c., was requisite for any investiture of ecclesiastical property. Finally in 1080 the forms regulating the canonical appointment to a bishopric were promulgated. In case of a vacancy the election was to be conducted by the people and clergy under the auspices of a bishop nominated by the pope or metropolitan; after which the consent of the pope or archbishop was to be procured; if any violation of these injunctions occurred, the election should be null and void and the right of choice pass to the pope or metropolitan. In so legislating, Gregory had two objects: in the first place, to withdraw the appointment to episcopal offices from the influence of the king; in the second, to replace that influence by his own. The intention was not to increase the power of the metropolitan: he simply desired that the nomination of bishops by the pope should be substituted for the prevalent nomination of bishops by the king. But in this course of action Gregory had a still more ambitious goal before his eyes. If he could once succeed in abolishing the lay investiture the king would, *ipso facto*, be deprived of his control over the great possessions assigned to the church by himself and his predecessors, and he could have no security that the duties and services attached to those possessions would continue to be discharged for the benefit of the Empire. The bishops in fact were to retain their position as princes of the Empire, with all the lands and rights of supremacy pertaining to them in that capacity; but the bond between them and the Empire was to be dissolved: they were to owe allegiance not to the king, but to the pope—a non-German sovereign who, in consequence of the Italian policy of the German monarchy, found himself in perpetual opposition to Germany. Thus, by his ecclesiastical legislation, Gregory attempted to shake the very foundations on which the constitution of the German empire rested, while completely ignoring the historical development of that constitution (see INVESTITURE).

That energy which Gregory threw into the expansion of the papal authority, and which brought him into collision with the secular powers, was manifested no less in the internal government of the church. He wished to see all important matters of dispute referred to Rome; appeals were to be addressed to himself, and he arrogated the right of legislation. The fact that his laws were usually promulgated by Roman synods which he convened during Lent does not imply that these possessed an independent position; on the contrary, they were entirely dominated by his influence, and were no more than the instruments of his will. The centralization of ecclesiastical government in Rome naturally involved a curtailment of the powers of the bishops and metropolitans. Since these in part refused to submit voluntarily and attempted to assert their traditional independence, the pontificate of Gregory is crowded with struggles against the higher ranks of the prelacy. Among the methods he employed to break their power of resistance, the despatch of legates proved peculiarly effective. The regulation, again, that the metropolitans should apply at Rome in person for the pallium—pronounced essential to their qualifications for office—served to school them in humility.

This battle for the foundation of papal omnipotence within the church is connected with his championship of compulsory celibacy among the clergy and his attack on simony. Gregory VII. did not introduce the celibacy of the priesthood into the church, for even in antiquity it was enjoined by numerous laws. He was not even the first pope to renew the injunction in the 11th century, for legislation on the question begins as early as in the reign of Leo IX. But he took up the struggle with greater energy and persistence than his predecessors. In 1074 he published an encyclical, requiring all to renounce their obedience to those bishops who showed indulgence to their clergy in the matter of celibacy. In the following year he commanded the laity to accept no official ministrations from married priests and to rise against all such. He further deprived these clerics of their revenues. Wherever these enactments were proclaimed they encountered tenacious opposition, and violent scenes were not infrequent, as the custom of marriage was widely diffused throughout the contemporary priesthood. Other decrees were issued by Gregory in subsequent years, but were now couched in milder terms, since it was no part of his interest to increase the numbers of the German faction. As to the objectionable nature of simony—the transference or acquisition of a spiritual office for monetary considerations—no doubt could exist in the mind of an earnest Christian, and no theoretical justification was ever attempted. The practice, however, had attained great dimensions both among the clergy and the laity, and the sharp campaign, which had been waged since the days of Leo IX., had done little to limit its scope. The reason was that in many cases it had assumed an extremely subtle form, and detection was difficult when the simony took the character of a tax or an honorarium. The fact, again, that lay investiture was described as simony, inevitably brought with it an element of confusion, and, in the case of a charge of simoniacal practices, enormously accentuates the difficulty of determining the actual state of affairs. The war against simony in its original form was undoubtedly necessary, but it led to highly complicated and problematic issues. Was the priest or bishop, whose ordination was due to simony, actually in the possession of the sacerdotal or episcopal power or not? If the answer was in the affirmative, it would seem possible to buy the Holy Ghost; if in the negative, then obviously all the official acts of the respective priest or bishop—which, according to the doctrine of the church, presupposed the possession of a spiritual quality—were invalid. And, since the number of simoniacal bishops was at that period extremely large, incalculable consequences resulted. The difficulty of the problem accounts for the diversity of solutions propounded. The perplexity of the situation was aggravated by the fact that, if the stricter view was adopted, it followed that the sacrament of ordination must be pronounced invalid, even in the cases where it had been unconsciously sought at the hands of a simoniac, for the dispenser was in point of fact no bishop, although he exercised the episcopal functions and his transgressions were unknown, and consequently it was impossible for him to ordain others. In the time of Gregory the conflict was still swaying to and fro, and he himself in 1078 declared consecration by a simoniac null and void.

The pontificate of Gregory VII. came to a melancholy close, for he died an exile in Salerno; the Romans and a number of his most trusted coadjutors had renounced him, and the faithful band in Germany had shrunk to scant proportions. Too much

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the politician, too rough in his methods, too exclusively the representative of the Roman see and its interests, he had gained more enemies than friends. He was of course a master of statecraft; he had pursued political ends with consummate skill, causing them to masquerade as requirements of religion; but he forgot that incitement to civil war, the preaching of rebellion, and the release of subjects from their oaths, were methods which must infallibly lead to moral anarchy, and tend, with justice, to stifle the confidence once felt in him. The more he accustomed his contemporaries to the belief that any and every measure—so long as it opened up some prospect of success—was good in his sight, no matter how dangerous the fruits it might mature, the fainter grew their perception of the fact that he was not only a statesman but primarily the head of the Christian Church. That the frail bonds of piety and religious veneration for the chair of St Peter had given way in the struggle for power was obvious to all, when he himself lost that power and the star of his opponent was in the ascendant. He had given the rein to his splendid gifts as a ruler, and in his capacity of pope he omitted to provide an equivalent counterpoise. We are told that he was once an impressive preacher, and he could write to his faithful contessees in terms which prove that he was not wanting in religious feeling; but in the whirlpool of secular politics this phase of his character was never sufficiently developed to allow the vice-gerent of Christ to be heard instead of the hierarch in his official acts.

But to estimate the pontificate of Gregory by the disasters of its closing years would be to misconceive its significance for the history of the papacy entirely. On the contrary, his reign forms an important chapter in the history of the popedom as an institution; it contains the germs of far-reaching modifications of the church, and it gave new impulses to both theory and practice, the value of which may indeed be differently estimated, but of which the effects are indubitable. It was he who conceived and formulated the ideal of the papacy as a structure embracing all peoples and lands. He took the first step towards the codification of ecclesiastical law and the definite ratification of the claims of the apostolic chair as corner-stones in the church's foundation. He educated the clergy and the lay world in obedience to Rome; and, finally, it was due to his efforts that the duty of the priest with regard to sexual abstinence was never afterwards a matter of doubt in the Catholic Christianity of the West.

On the 25th of May 1085 he died, unbroken by the misfortunes of his last years, and unshaken in his self-certainty. *Dilexi justitiam et odivi iniquitatem: propterea morior in exilio*—are said to have been his last words. In 1584 Gregory XIII. received him into the *Martyrologium Romanum*; in 1606 he was canonized by Paul V. The words dedicated to him in the *Breviarium Romanum*, for May 25, contain such an apotheosis of his pontificate that in the 18th and 19th centuries they were prohibited by the governments of several countries with Roman Catholic populations.

BIBLIOGRAPHY.—A comprehensive survey of the sources and literature for the history of Gregory VII. is given by C. Mirbt, s.v. "Gregor VII.," in Herzog-Hauck, *Realencyklopädie*, 3rd ed., vol. vii. pp. 96 sqq. The main source for the reign of Gregory consists of his letters and decrees, the greater part of which are collected in the *Registrum* (ed. P. Jaffé, *Bibliotheca rerum Germanicarum*, ii., Berlin, 1865). The letters preserved in addition to this official collection are also reprinted by Jaffé under the title of *Epistolae collectae*. The *Dictatus Papae*—a list of twenty-seven short sentences on the rights of the pope,—which is given in the *Registrum*, is not the work of Gregory VII., but should probably be ascribed to Cardinal Deusdedit. Further: A. Potthast, *Bibliotheca historica medii aevi*, i. (2nd ed., Berlin, 1896), pp. 541 sq., ii. 1351; P. Jaffé, *Regesta pontificum* (2nd ed., 1865), tome i. pp. 594-649, Nr. 4771-5313, tome ii. p. 751. The most important letters and decrees of Gregory VII. are reprinted by C. Mirbt, *Quellen zur Geschichte des Papsttums* (2nd ed., Tübingen, 1901), Nr. 183 sqq., pp. 100 sqq. The oldest life of Gregory is that by Paul von Bermried, reprinted, *e.g.* by Watterich, *Vitae pontificum*, i. 474-546. Among the historians the following are of especial importance: Berthold, Bernold, Lambert von Hersfeld, Bruno, Marianus Scotus, Leo of Ostia, Peter of Marte Cassino, Sigebert of Gembloux, Hugo of Flavigny, Arnulph and Landulf of Milan, Donizo—their works being reprinted in the section "Scriptores" in the *Monumenta Germaniae historica*, vols. v., vi., vii., viii., xii. The struggles which broke out under Gregory VII. and were partially continued in the subsequent decades gave rise to a pamphlet literature which is of extreme importance for their internal history. The extant materials vary greatly in extent, and display much diversity from the literary-historical point of view. Most of them are printed in the *Monumenta Germaniae*, under the title, *Libelli de lite imperatorum et pontificum saeculis XI. et XII. conscripti*, tome i. (Hanover, 1891), tome ii. (1892), tome iii. (1897). The scientific investigation of the Gregorian age has received enormous benefit from the critical editions of the sources in the *Monumenta Germaniae*, so that the old literature is for the most part antiquated. This is true even of the great monograph on this pope—A. F. Gfrörer, *Papst Gregorius VII. und sein Zeitalter* (7 vols., Schaffhausen, 1859–1861), which must be used with extreme caution. The present state of criticism is represented by the following works: G. Meyer von Knonau, *Jahrbücher des deutschen Reichs unter Heinrich IV. und Heinrich V.*, vol. i. (Leipzig, 1890), ii. (1894), iii. (1900), iv. (1903); W. Martens, *Gregor VII., sein Leben und Werken* (2 vols., Leipzig, 1904); C. Mirbt, *Die Publizistik im Zeitalter Gregors VII.* (Leipzig, 1894); A. Hauck, *Kirchengeschichte Deutschlands* (3 vols., Leipzig, 1894). The special literature on individual events during the Gregorian pontificate is so extensive that no list can be given here. On Gregory's elevation to the chair, cf. C. Mirbt, *Die Wahl Gregors VII.* (Marburg, 1892). See also A. H. Mathew, D.D., *Life and Times of Hildebrand, Pope Gregory VII.* (1910). (C. M.)

GREGORY VIII. (*Mauritius Burdinus*), antipope from 1118 to 1121, was a native of southern France, who had crossed the Pyrenees while young and had later been made archbishop of Braga. Suspended by Paschal II. in 1114 on account of a dispute with the Spanish primate and papal legate, the archbishop of Toledo, he went to Rome and regained favour to such an extent that he was employed by the pope on important legations. He opposed the extreme Hildebrandine policy, and, on the refusal of Gelasius II. to concede the emperor's claim to investiture, he was proclaimed pope at Rome by Henry V. on the 8th of March 1118. He was not universally recognized, however, and never fully enjoyed the papal office. He was excommunicated by Gelasius II. in April 1118, and by Calixtus II. at the synod of Reims (October 1119). He was driven from Rome by the latter in June 1121, and, having been surrendered by the citizens of Sutri, he was forced to accompany in ridiculous guise the triumphal procession of Calixtus through Rome. He was exiled to the convent of La Cava, where he died.

The life of Gregory VIII. by Baluzius in *Baluzii miscellanea*, vol. i, ed. by J. D. Mansi (Lucca, 1761), is an excellent vindication of an antipope. The chief sources are in *Monumenta Germaniae historica, Scriptores*, vols. 5 and 20, and in J. M. Watterich, *Pontif. Roman. vitae*, vol. 2. See C. Mirbt, *Die Publizistik im Zeitalter Gregors VII.* (Leipzig, 1894); J. Langen, *Geschichte der römischen Kirche von Gregor VII. bis Innocenz III.* (Bonn, 1893); Jaffé, *Regesta pontif. Roman.*, 2nd ed., (1885–1888); K. J. von Hefele, *Conciliengeschichte*, Bd. 5, 2nd ed.; F. Gregorovius, *Rome in the Middle Ages*, vol. 4, trans. by Miss G. W. Hamilton (London, 1900–1902); P. B. Gams, *Kirchengeschichte von Spanien*, vol. 3 (Regensburg, 1876).

GREGORY VIII. (*Alberto de Mora*), pope from the 21st of October to the 17th of December 1187, a native of Benevento and Praemonstratensian monk, successively abbot of St Martin at Laon, cardinal-deacon of San' Adriano al foro, cardinal-priest of San Lorenzo in Lucina, and chancellor of the Roman Church, was elected to succeed Urban III. Of amiable disposition, he hastened to make peace with Henry VI. and promised not to oppose the latter's claim to Sicily. He addressed general letters both to the bishops, reminding them of their duties to the Roman Church, especially of their required visits *ad limina*, and to the whole Christian people, urging a new crusade to recover Jerusalem. He died at Pisa while engaged in making peace between the Pisans and Genoese in order to secure the help of both cities in the crusade. His successor was Clement III.

His letters are in J. P. Migne, *Patrol. Lat.* vol. 202. Consult also J. M. Watterich, *Pontif. Roman. vitae*, vol. 2 (Leipzig, 1862), and Jaffé-Wattenbach, *Regesta pontif. Roman.* (1885–1888). See J. Langen, *Geschichte der römischen Kirche von Gregor VII. bis Innocenz III.* (Bonn, 1893); P. Nadig, *Gregors VIII. 57tägiges Pontifikat* (Basel, 1890); P. Scheffer-Boichorst, *Friedrichs I. letzter Streit mit der Kurie* (Berlin, 1866); F. Gregorovius, *Rome in the Middle Ages*, vol. 4, trans. by Mrs G. W. Hamilton (London, 1896).

GREGORY IX. (*Ugolino Conti de Segni*), pope from the 19th of March 1227, to the 22nd of August 1241, was a nobleman of Anagni and probably a nephew of Innocent III. He studied

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at Paris and Bologna, and, having been successively archpriest of St Peter's, papal chaplain, cardinal-deacon of Sant' Eustachio, cardinal-bishop of Ostia, the first protector of the Franciscan order, and papal legate in Germany under Innocent III., and Honorius III., he succeeded the latter in the papacy. He had long been on friendly terms with the emperor Frederick II., but now excommunicated him (29th of September 1227) for continued neglect of his vows and refusal to undertake the crusade. When Frederick finally set out the following June without making submission to the pope, Gregory raised an insurrection against him in Germany, and forced him in 1230 to beg for absolution. The Romans, however, soon began a very bitter war against the temporal power and exiled the pope (1st of June 1231). Hardly had this contest been brought to an end favourable to the papacy (May 1235) when Gregory came into fresh conflict with Frederick II. He again excommunicated the emperor and released his subjects from their allegiance (24th of March 1239). Frederick, on his side, invaded the Papal States and prevented the assembling of a general council convoked for Easter 1241. The work of Gregory, however, was by no means limited to his relations with emperor and Romans. He systematized the Inquisition and entrusted it to the Dominicans; his rules against heretics remained in force until the time of Sixtus V. He supported Henry III. against the English barons, and protested against the Pragmatic Sanction of Louis IX. of France. He sent monks to Constantinople to negotiate with the Greeks for church unity, but without result. He canonized Saints Elizabeth of Thuringia, Dominic, Anthony of Padua and Francis of Assisi. He permitted free study of the Aristotelian writings, and issued (1234), through his chaplain, Raymond of Pennaforte, an important new compilation of decretals which he prescribed in the bull *Rex pacificus* should be the standard text-book in canon law at the universities of Bologna and Paris. Gregory was famed for his learning and eloquence, his blameless life, and his great strength of character. He died on the 22nd of August 1241, while Frederick II. was advancing against him, and was succeeded by Celestine IV.

For the life of Gregory IX., consult his Letters in *Monumenta Germaniae historica, Epistolae saeculi XIII. e regestis pontif. Romanorum selectae* (Berlin, 1883); "Les Registres de Grégoire IX," ed. L. Auvray in *Bibliothèque des écoles françaises d'Athènes et de Rome* (Paris, 1890–1905); A. Potthast, *Regesta pontif. Roman.* (Berlin, 1875) and "Registri dei Cardinali Ugolino d' Ostia et Ottaviano degli Ubaldini," ed. G. Levi in *Fonti per la storia d' Italia* (1890). See J. Felten, *Papst Gregor IX.* (Freiburg i. B., 1886); J. Marx, *Die Vita Gregorii IX. quellenkritisch untersucht* (1889); F. Balan, *Storia di Gregorio IX e delsuo tempo* (3 vols., Modena, 1872–1873); F. Gregorovius, *Rome in the Middle Ages*, vol. 5, trans. by Mrs G. W. Hamilton (London, 1900–1902); H. H. Milman, *Latin Christianity*, vol. 5 (London, 1899); R. Honig, *Rapporti tra Federico II e Gregorio IX rispetto alla spedizione in Palestina* (1896); P. T. Masetti, *I Pontefici Onoria III, Gregorio IX ed Innocenzo IV a fronte dell' Imperatore Federico II nel secolo XIII* (1884); T. Frantz, *Der grosse Kampf zwischen Kaiserium u. Papstium zur Zeit des Hohenstaufen Friedrich II.* (Berlin, 1903); W. Norden, *Das Papstium u. Byzanz* (Berlin, 1903). An exhaustive bibliography and an excellent article on Gregory by Carl Mirbt are to be found in Hauck's *Realencyklopädie*, 3rd edition.

GREGORY X. (*Tebaldo Visconti*), pope from the 1st of September 1271, to the 10th of January 1276, was born at Piacenza in 1208, studied for the church, and became archdeacon of Liége. The eighteen cardinals who met to elect a successor to Clement IV. were divided into French and Italian factions, which wrangled over the election for nearly three years in the midst of great popular excitement, until finally, stirred by the eloquence of St Bonaventura, the Franciscan monk, they entrusted the choice to six electors, who hit on Visconti, at that time accompanying Edward of England on the crusade. He returned to Rome and was ordained priest on 19th of March 1272, and consecrated on the 27th. He at once summoned the fourteenth general council of the Catholic Church, which met at Lyons in 1274, with an attendance of some 1600 prelates, for the purpose of considering the eastern schism, the condition of the Holy Land, and the abuses in the church. The Greeks were persuaded, thanks to St Bonaventura, to consent to a union with Rome for the time being, and Rudolph of Habsburg renounced at the council all imperial rights in the States of the Church. The most celebrated among the many reform decrees issued by Gregory was the constitution determining for the first time the form of conclave at papal elections, which in large measure has remained ever since the law of the church. Gregory was on his way to Rome to crown Rudolph and send him out on a great crusade in company with the kings of England, France, Aragon and Sicily, when he died at Arezzo on the 10th of January 1276. He was a nobleman, fond of peace and actuated by the consciousness of a great mission. He has been honoured as a saint by the inhabitants of Arezzo and Piacenza. His successor in the papacy was Innocent V.

The registers of Gregory X. have been published by J. Guiraud in the *Bibliothèque des écoles françaises d'Athènes et de Rome* (Paris, 1892–1898). See K. J. von Hefele, *Conciliengeschichte*, vol. 5, 2nd edition (1873–1890); H. Finke, *Konzilienstudien z. Gesch. des 13ten Jahrhunderts* (Münster, 1891); P. Piacenza, *Compendio della storia del b. Gregorio X, papa* (Piacenza, 1876); F. Gregorovius, *Rome in the Middle Ages*, vol. 5, trans. by Mrs G. W. Hamilton (London, 1900–1902); H. Otto, *Die Beziehungen Rudolfs von Habsburgs zu Papst Gregor X.* (Innsbruck, 1895); A. Zisterer, *Gregor X. u. Rudolf von Habsburg in ihren gegenseitigen Beziehungen* (Freiburg i. B., 1891); F. Wallner, *Die Politik der Kurie unter Gregor X.* (Berlin, 1894); A. Potthast, *Regesta pontif. Roman.*, vol. 2 (Berlin, 1875); W. Norden, *Das Papstium und Byzanz* (Berlin, 1903); J. Loserth, "Akten über die Wahl Gregors X." in *Neues Archiv*, xxi. (1895); A. von Hirsch-Gereuth, "Die Kreuzzugspolitik Gregors X." in *Studien z. Gesch. d. Kreuzzugsider nach den Kreuzzügen* (Munich, 1896). There is an excellent article by Carl Mirbt in Hauck's *Realencyklopädie*, 3rd edition.

GREGORY XI. (*Pierre Roger de Beaufort*), pope from the 30th of December 1370 to the 27th of March 1378, born in Limousin in 1330, created cardinal-deacon of Sta Maria Nuova by his uncle, Clement VI., was the successor of Urban V. His efforts to establish peace between France and England and to aid the Eastern Christians against the Turks were fruitless, but he prevented the Visconti of Milan from making further encroachments on the States of the Church. He introduced many reforms in the various monastic orders and took vigorous measures against the heresies of the time. His energy was stimulated by the stirring words of Catherine of Siena, to whom in particular the transference of the papal see back to Italy (17th of January 1377) was almost entirely due. Whilst at Rome he issued several bulls to the archbishop of Canterbury, the king of England, and the university of Oxford, commanding an investigation of Wycliffe's doctrines. Gregory was meditating a return to Avignon when he died. He was the last of the French popes who for some seventy years had made Avignon their see, a man learned and full of zeal for the church, but irresolute and guilty of nepotism. The great schism, which was to endure fifty years, broke out soon after the election of his successor, Urban VI.

See H. J. Tomaseth, "Die Register u. Secretäre Urbans V. u. Gregors XI." in *Mitteilungen des Instituts für österreichische Geschichtsforschung* (1898); Baluzius, *Vitae pap. Avenion.* vol. 1 (Paris, 1693); L. Pastor, *History of the Popes*, vol. 1, trans. by F. I. Antrobus (London, 1899); F. Gregorovius, *Rome in the Middle Ages*, vol. 6, trans. by Mrs G. W. Hamilton (London, 1900–1902); J. P. Kirsch, *Die Rückkehr der Päpste Urban V. u. Gregor XI. von Avignon nach Rom* (Paderborn, 1898); J. B. Christophe, *Histoire de la papauté pendant le XIVe siècle*, vol. 2 (Paris, 1853). There is a good article by J. N. Brischar in the *Kirchenlexikon*, 2nd edition.

GREGORY XII. (*Angelo Coriaro*, or *Correr*), pope from the 30th of November 1406, to the 4th of July 1415, was born of a noble family at Venice about 1326. Successively bishop of Castello, Latin patriarch of Constantinople, cardinal-priest of San Marco, and papal secretary, he was elected to succeed Innocent VII., after an interregnum of twenty-four days, under the express condition that, should the antipope Benedict XIII. at Avignon renounce all claim to the papacy, he also would renounce his, so that the long schism might be terminated. As pope, he concluded a treaty with his rival at Marseilles, by which a general council was to be held at Savona in September, 1408, but King Ladislaus of Naples, who opposed the plan from policy, seized Rome and brought the negotiations to nought. Gregory had promised not to create any more cardinals, and when he did so, in 1408, his former cardinals deserted him and, together with the Avignon cardinals, convoked the council of

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Pisa, which, despite its irregularity, proclaimed in June 1409 the deposition of both popes and the election of Alexander V. Gregory, still supported by Naples, Hungary, Bavaria, and by Rupert, king of the Romans, found protection with Ladislaus, and in a synod at Cividale del Friuli banned Benedict and Alexander as schismatical, perjured and scandalous. John XXIII., having succeeded to the claims of Alexander in 1410, concluded a treaty with Ladislaus, by which Gregory was banished from Naples on the 31st of October 1411. The pope then took refuge with Carlo Malatesta, lord of Rimini, through whom he presented his resignation to the council of Constance on the 4th of July 1415. A weak and easily-influenced old man, his resignation was the noblest act of his pontificate. The rest of his life was spent in peaceful obscurity as cardinal-bishop of Porto and legate of the mark of Ancona. He died at Recanati on the 18th of October 1417. Some writers reckon Alexander V. and John XXIII. as popes rather than as antipopes, and accordingly count Gregory's pontificate from 1406 to 1409. Roman Catholic authorities, however, incline to the other reckoning.

See L. Pastor, *History of the Popes*, vol. i., trans. by F. I. Antrobus (London, 1899); M. Creighton, *History of the Papacy*, vol. i (London, 1899); N. Valois, *La France et le grand schisme d'occident* (Paris, 1896–1902); Louis Gayet, *Le Grand Schisme d'occident* (Paris, 1898); J. von Haller, *Papsttum u. Kirchenreform* (Berlin, 1903); J. Loserth, *Geschichte des spätteren Mittelalters* (1903); *Theoderici de Nyem de schismate libri tres*, ed. by G. Erler (Leipzig, 1890). There is an excellent article by J. N. Brischar in the *Kirchenlexikon* 2nd ed., vol. 5. (C. H. HA.)

GREGORY XIII. (*U'go Buoncompagno*), pope from 1572 to 1585, was born on the 7th of January 1502, in Bologna, where he received his education, and subsequently taught, until called to Rome (1539) by Paul III., who employed him in various offices. He bore a prominent part in the council of Trent, 1562–1563. In 1564 he was made cardinal by Pius IV., and, in the following year, sent to Spain as legate. On the 13th of May 1572 he was chosen pope to succeed Pius V. His previous life had been rather worldly, and not wholly free from spot; but as pope he gave no occasion of offence. He submitted to the influence of the rigorists, and carried forward the war upon heresy, though not with the savage vehemence of his predecessor. However, he received the news of the massacre of St Bartholomew (23rd of August 1572) with joy, and publicly celebrated the event, having been led to believe, according to his apologists, that France had been miraculously delivered, and that the Huguenots had suffered justly as traitors. Having failed to rouse Spain and Venice against the Turks, Gregory attempted to form a general coalition against the Protestants. He subsidized Philip II. in his wars in the Netherlands; aided the Catholic League in France; incited attacks upon Elizabeth by way of Ireland. With the aid of the Jesuits, whose privileges he multiplied, he conducted a vigorous propaganda. He established or endowed above a score of colleges, among them the Collegium Romanum (founded by Ignatius Loyola in 1550), and the Collegium Germanicum, in Rome. Among his noteworthy achievements are the reform of the calendar on the 24th of February 1582 (see CALENDAR); the improved edition of the *Corpus juris canonici*, 1582; the splendid Gregorian Chapel in St Peter's; the fountains of the Piazza Navona; the Quirinal Palace; and many other public works. To meet the expenses entailed by his liberality and extravagance, Gregory resorted to confiscation, on the pretext of defective titles or long-standing arrearages. The result was disastrous to the public peace: nobles armed in their defence; old feuds revived; the country became infested with bandits; not even in Rome could order be maintained. Amid these disturbances Gregory died, on the 10th of April 1585, leaving to his successor, Sixtus V., the task of pacifying the state.

See the contemporary lives by Cicarella, continuator of Platina, *De vitis pontiff. Rom.*; Ciaconius, *Vitae et res gestae summorum pontiff. Rom.* (Rome, 1601–1602); and Ciappi, *Comp. dell' attioni e santa vita di Gregorio XIII* (Rome, 1591). See also Bompiano, *Hist. pontificatus Gregorii XIII.* (Rome, 1665); Ranke, *Popes* (Eng. trans., Austin), i. 428 seq.; v. Reumont, *Gesch. der Stadt Rom*, iii. 2, 566 seq.; and for numerous references upon Gregory's relation to the massacre of St Bartholomew, *Cambridge Mod. Hist.* iii. 771 seq.

GREGORY XIV. (*Nicolò Sfondrate*), pope 1590–1591, was born in Cremona, on the 11th of February 1535, studied in Perugia, and Padua, became bishop of his native place in 1560, and took part in the council of Trent, 1562–1563. Gregory XIII. made him a cardinal, 1583, but ill-health forbade his active participation in affairs. His election to the papacy, to succeed Urban VII., on the 5th of December 1590, was due to Spanish influence. Gregory was upright and devout, but utterly ignorant of politics. During his short pontificate the States of the Church suffered dire calamities, famine, epidemic and a fresh outbreak of brigandage. Gregory was completely subservient to Philip II.; he aided the league, excommunicated Henry of Navarre, and threatened his adherents with the ban; but the effect of his intervention was only to rally the moderate Catholics to the support of Henry, and to hasten his conversion. Gregory died on the 15th of October 1591, and was succeeded by Innocent IX.

See Ciaconius, *Vitae et res gestae summorum pontiff. Rom.* (Rome, 1601–1602); Cicarella, continuator of Platina, *De vitis pontiff. Rom* (both contemporary); Brosch, *Gesch. des Kirchenstaates* (1880), i. 300 Ranke, *Popes* (Eng. trans., Austin), ii. 228 seq.

GREGORY XV. (*Alessandro Ludovisi*) was born on the 9th of January 1554, in Bologna, where he also studied and taught. He was made archbishop of his native place and cardinal by Paul V., whom he succeeded as pope on the 9th of February 1621. Despite his age and feebleness, Gregory displayed remarkable energy. He aided the emperor in the Thirty Years' War, and the king of Poland against the Turks. He endorsed the claims of Maximilian of Bavaria to the electoral dignity, and was rewarded with the gift of the Heidelberg library, which was carried off to Rome. Gregory founded the Congregation of the Propaganda, encouraged missions, fixed the order to be observed in conclaves, and canonized Ignatius Loyola, Francis Xavier, Philip Neri and Theresa de Jesus. He died on the 8th of July 1623, and was succeeded by Urban VIII.

See the contemporary life by Vitorelli, continuator of Ciaconius, *Vitae et res gestae summorum pontiff. Rom.*; Ranke's excellent account, *Popes* (Eng. trans., Austin), ii. 468 seq.; v. Reumont, *Gesch. der Stadt Rom*, iii. 2, 609 seq.; Brosch, *Gesch. des Kirchenstaates* (1880), i. 370 seq.; and the extended bibliography in Herzog-Hauck, *Realencyklopädie*, *s.v.* "Gregor XV." (T. F. C.)

GREGORY XVI. (*Bartolommeo Alberto Cappellari*), pope from 1831 to 1846, was born at Belluno on the 18th of September 1765, and at an early age entered the order of the Camaldoli, among whom he rapidly gained distinction for his theological and linguistic acquirements. His first appearance before a wider public was in 1799, when he published against the Italian Jansenists a controversial work entitled *Il Trionfo della Santa Sede*, which, besides passing through several editions in Italy, has been translated into several European languages. In 1800 he became a member of the Academy of the Catholic Religion, founded by Pius VII., to which he contributed a number of memoirs on theological and philosophical questions and in 1805 was made abbot of San Gregorio on the Caelian Hill. When Pius VII. was carried off from Rome in 1809, Cappellari withdrew to Murano, near Venice, and in 1814, with some other members of his order, he removed to Padua; but soon after the restoration of the pope he was recalled to Rome, where he received successive appointments as vicar-general of the Camaldoli, councillor of the Inquisition, prefect of the Propaganda, and examiner of bishops. In March 1825 he was created cardinal by Leo XII., and shortly afterwards was entrusted with an important mission to adjust a concordat regarding the interests of the Catholics of Belgium and the Protestants of Holland. On the 2nd of February 1831 he was, after sixty-four days' conclave, unexpectedly chosen to succeed Pius VIII. in the papal chair. The revolution of 1830 had just inflicted a severe blow on the ecclesiastical party in France, and almost the first act of the new government there was to seize Ancona, thus throwing all Italy, and particularly the Papal States, into an excited condition which seemed to demand strongly repressive measures. In the course of the struggle which ensued it was more than once necessary to call in the Austrian bayonets. The reactionaries in power put off their promised reforms so persistently as to anger even

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Metternich; nor did the replacement of Bernetti by Lambruschini in 1836 mend matters; for the new cardinal secretary of state objected even to railways and illuminating gas, and was liberal chiefly in his employment of spies and of prisons. The embarrassed financial condition in which Gregory left the States of the Church makes it doubtful how far his lavish expenditure in architectural and engineering works, and his magnificent patronage of learning in the hands of Mai, Mezzofanti, Gaetano, Moroni and others, were for the real benefit of his subjects. The years of his pontificate were marked by the steady development and diffusion of those ultramontane ideas which were ultimately formulated, under the presidency of his successor Pius IX., by the council of the Vatican. He died on the 1st of June 1846.

See A. M. Bernasconi, *Acta Gregorii Papae XVI. scilicet constitutiones, bullae, litterae apostolicae, epistolae*, vols. i-4 (Rome, 1901 ff.); Cardinal Wiseman, *Recollections of the Last Four Popes* (London, 1858); Herzog-Hauck, *Realencyklopädie*, vol. vii. (Leipzig, 1899), 127 ff. (gives literature); Frederik Nielsen, *History of the Papacy in the 19th Century*, ii. (London, 1906). (W. W. R.*)

GREGORY,[1] the name of a Scottish family, many members of which attained high eminence in various departments of science, fourteen having held professorships in mathematics or medicine. Of the most distinguished of their number a notice is given below.

I. DAVID GREGORY (1627–1720), eldest son of the Rev. John Gregory of Drumoak, Aberdeenshire, who married Janet Anderson in 1621. He was for some time connected with a mercantile house in Holland, but on succeeding to the family estate of Kinardie returned to Scotland, and occupied most of his time in scientific pursuits, freely giving his poorer neighbours the benefit of his medical skill. He is said to have been the first possessor of a barometer in the north of Scotland; and on account of his success by means of it in predicting changes in the weather, he was accused of witchcraft before the presbytery of Aberdeen, but he succeeded in convincing that body of his innocence.

II. JAMES GREGORY (1638–1675), Scottish mathematician, younger brother of the preceding, was educated at the grammar school of Aberdeen and at Marischal College of that city. At an early period he manifested a strong inclination and capacity for mathematics and kindred sciences; and in 1663 he published his famous treatise *Optica promota*, in which he made known his great invention, the Gregorian reflecting telescope. About 1665 he went to the university of Padua, where he studied for some years, and in 1667 published *Vera circuli et hyperbolae quadratura*, in which he discussed infinite convergent series for the areas of the circle and hyperbola. In the following year he published also at Padua *Geometriae pars universalis*, in which he gave a series of rules for the rectification of curves and the mensuration of their solids of revolution. On his return to England in this year he was elected a fellow of the Royal Society; in 1669 he became professor of mathematics in the university of St Andrews; and in 1674 he was transferred to the chair of mathematics in Edinburgh. In October 1675, while showing the satellites of the planet Jupiter to some of his students through one of his telescopes, he was suddenly struck with blindness, and he died a few days afterwards.

He was also the author of *Exercitationes geometricae* (1668), and, it is alleged, of a satirical tract entitled *The Great and New Art of Weighing Vanity*, intended to ridicule certain fallacies of a contemporary writer on hydraulics, and published at Glasgow in 1672, professedly by "Patrick Mathers, archbeadle of the university of St Andrews."

III. DAVID GREGORY (1661–1708), son of David Gregory (1627–1720), was born in Aberdeen and educated partly in his native city and partly in Edinburgh, where he became professor of mathematics in 1683. From 1691 till his death he was Savilian professor of astronomy at Oxford. His principal works are *Exercitatio geometrica de dimensione figurarum* (1684), *Catoptricae et dioptricae sphaericae elementa* (1695), and *Astronomiae physicae et geometricae elementa* (1702)—the last a work highly esteemed by Sir Isaac Newton, of whose system it is an illustration and a defence. A *Treatise on Practical Geometry* which he left in manuscript was translated from the Latin and published in 1745. He was succeeded in the chair of mathematics in Edinburgh by his brother James; another brother, Charles, was in 1707 appointed professor of mathematics in the university of St Andrews; and his eldest son, David (1696–1767), became professor of modern history at Oxford, and canon and subsequently dean of Christ Church.

IV. JOHN GREGORY (1724–1773), Scottish physician, grandson of James Gregory (1638–1675) and youngest son of Dr James Gregory (d. 1731), professor of medicine in King's College, Aberdeen, was born at Aberdeen on the 3rd of June 1724. He received his early education at the grammar school of Aberdeen and at King's College in that city, and in 1741 he attended the medical classes at Edinburgh university. In 1745 he went to Leiden to complete his medical studies, and during his stay there he received without solicitation the degree of doctor of medicine from King's College, Aberdeen. On his return from Holland he was elected professor of philosophy at King's College, but in 1749 he resigned his professorship on account of its duties interfering too much with his private practice. In 1754 he proceeded to London, where he made the acquaintance of many persons of distinction, and the same year was chosen fellow of the Royal Society. On the death in November 1755 of his brother Dr James Gregory, who had succeeded his father as professor of medicine in King's College, Aberdeen, he was appointed to that office. In 1764 he removed to Edinburgh in the hope of obtaining a more extended field of practice as a physician, and in 1766 he was appointed professor of the practice of medicine in the university of Edinburgh, to whose eminence as a medical school he largely contributed. He died of gout on the 10th of February 1773.

He is the author of *A Comparative View of the State and Faculties of Man with those of the Animal World* (1765); *Observations on the Duties, Offices and Qualifications of a Physician* (1772); *Elements of the Practice of Physic* (1772); and *A Father's Legacy to his Daughters* (1774). His *Whole Works*, with a life by Mr Tytler (afterwards Lord Woodhouselee), were published at Edinburgh in 1788.

V. JAMES GREGORY (1753–1821), Scottish physician, eldest son of the preceding, was born at Aberdeen in January 1753. He accompanied his father to Edinburgh in 1764, and after going through the usual course of literary studies at that university, he was for a short time a student at Christchurch, Oxford. It was there probably that he acquired that taste for classical learning which afterwards distinguished him. He studied medicine at Edinburgh, and, after graduating doctor of medicine in 1774, spent the greater part of the next two years in Holland, France and Italy. Shortly after his return to Scotland he was appointed in 1776 to the chair his father had formerly held, and in the following year he also entered on the duties of teacher of clinical medicine in the Royal Infirmary. On the illness of Dr William Cullen in 1790 he was appointed joint-professor of the practice of medicine, and he became the head of the Edinburgh Medical School on the death of Dr Cullen in the same year. He died on the 2nd of April 1821. As a medical practitioner Gregory was for the last ten years of his life at the head of the profession in Scotland. He was at one time president of the Edinburgh College of Physicians, but his indiscretion in publishing certain private proceedings of the college led to his suspension on the 13th of May 1809 from all rights and privileges which pertained to the fellowship.

Besides his *Conspectus medicinae theoreticae*, published in 1788 as a text-book for his lectures on the institutes, Dr Gregory was the author of "A Theory of the Moods of Verbs," published in the *Edin. Phil. Trans.* (1787), and of *Literary and Philosophical Essays*, published in two volumes in 1792.

VI. WILLIAM GREGORY (1803–1858), son of James Gregory (1753–1821), was born on the 25th of December 1803. In 1837 he became professor of chemistry at the Andersonian Institution, Glasgow, in 1839 at King's College, Aberdeen, and in 1844 at Edinburgh University. He died on the 24th of April 1858. Gregory was one of the first in England to advocate the theories of Justus von Liebig, and translated several of his works. He is also the author of *Outlines of Chemistry* (1845), and an *Elementary Treatise on Chemistry* (1853).

[1] See A. G. Stewart, *The Academic Gregories.*

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VII. DUNCAN FARQUHARSON GREGORY (1813–1844), brother of the preceding, was born on the 13th of April 1813. After studying at the university of Edinburgh he in 1833 entered Trinity College, Cambridge, where he was for a time assistant professor of chemistry, but he devoted his attention chiefly to mathematics. He died on the 23rd of February 1844.

The *Cambridge Mathematical Journal* was originated, and for some time edited, by him; and he also published a *Collection of Examples of Processes in the Differennal and Integral Calculus* (1841). A *Treatise on the Application of Analysis to Solid Geometry*, which he left unfinished, was completed by W. Walton, and published posthumously in 1846. His *Mathematical Writings*, edited by W. Walton, with a biographical memoir by Robert Leslie Ellis, appeared in 1865.

GREGORY, EDWARD JOHN (1850–1909), British painter, born at Southampton, began work at the age of fifteen in the engineer's drawing office of the Peninsular and Oriental Company. Afterwards he studied at South Kensington, and about 1871 entered on a successful career as an illustrator and as an admirable painter in oil and water colour. He was elected associate of the Royal Academy in 1883, academician in 1898, and president of the Royal Institute of Painters in Water Colours in 1898. His work is distinguished by remarkable technical qualities, by exceptional firmness and decision of draughtsmanship and by unusual certainty of handling. "Marooned," a water colour, is in the National Gallery of British Art. Many of his pictures were shown at Burlington House at the winter exhibition of 1909–1910 after his death in June 1909.

GREGORY, OLINTHUS GILBERT (1774–1841), English mathematician, was born on the 29th of January 1774 at Yaxley in Huntingdonshire. Having been educated by Richard Weston, a Leicester botanist, he published in 1793 a treatise, *Lessons Astronomical and Philosophical*. Having settled at Cambridge in 1796, Gregory first acted as sub-editor on the *Cambridge Intelligencer*, and then opened a bookseller's shop. In 1802 he obtained an appointment as mathematical master at Woolwich through the influence of Charles Hutton, to whose notice he had been brought by a manuscript on the "Use of the Sliding Rule"; and when Hutton resigned in 1807 Gregory succeeded him in the professorship. Failing health obliged him to retire in 1838, and he died at Woolwich on the 2nd of February 1841.

Gregory wrote *Hints for the Use of Teachers of Elementary Mathematics* (1840, new edition 1853), and *Mathematics for Practical Men* (1825), which was revised and enlarged by Henry Law in 1848, and again by J. R. Young in 1862. His *Letters on the Evidences of Christianity* (1815) have been several times reprinted, and an abridgment was published by the Religious Tract Society in 1853. He will probably be longest remembered for his *Biography of Robert Hall*, which first appeared in the collected edition of Hall's works, was published separately in 1833, and has since passed through several editions. The minor importance of his *Memoir of John Mason Good* (1828) is due to the narrower fame of the subject. Gregory was one of the founders of the Royal Astronomical Society. In 1802 he was appointed editor of the *Gentlemen's Diary*, and in 1818 editor of the *Ladies' Diary* and superintendent of the almanacs of the Stationers' Company.

GREIFENBERG, a town of Germany, in the Prussian province of Pomerania, on the Rega, 45 m. N.E. of Stettin on the railway to Kolberg. Pop. (1905) 7208. It has two Evangelical churches (among them that of St Mary, dating from 13th century), two ancient gateways, a powder tower and a gymnasium. The manufacture of machines, stoves and bricks are the principal industries. Greifenberg possessed municipal rights as early as 1262, and in the 14th and 15th centuries had a considerable shipping trade, but it lost much of its prosperity during the Thirty Years' War.

See Riemann, *Geschichte der Stadt Greifenberg* (1862).

GREIFENHAGEN, a town of Germany, in the Prussian province of Pomerania, on the Reglitz, 12 m. S.S.W. of Stettin by rail. Pop. (1905) 6473. Its prosperity depends chiefly on agriculture and it has a considerable trade in cattle. There are also felt manufactures and saw mills. Greifenhagen was built in 1230, and was raised to the rank of a town and fortified about 1250. In the Thirty Years' War it was taken both by the imperialists and the Swedes, and in 1675 it was captured by the Brandenburgers, into whose possession it came finally in 1679.

GREIFSWALD, a town of Germany, in the Prussian province of Pomerania, on the navigable Ryk, 3 m. from its mouth on the Baltic at the little port of Wyk, and 20 m. S.E. from Stralsund by rail. Pop. (1875) 18,022, (1905) 23,750. It has wide and regular streets, flanked by numerous gabled houses, and is surrounded by pleasant promenades on the site of its old ramparts. The three Gothic Protestant churches, the Marienkirche, the Nikolaikirche and the Jakobikirche, and the town-hall (Rathaus) are the principal edifices, and these with their lofty spires are very picturesque. There is a statue of the emperor Frederick III. and a war memorial in the town. The industries mainly consist in shipbuilding, fish-curing, and the manufacture of machinery (particularly for agriculture), and the commerce in the export of corn, wood and fish. There is a theatre, an orphanage and a municipal library. Greifswald is, however, best known to fame by reason of its university. This, founded in 1456, is well endowed and is largely frequented by students of medicine. Connected with it are a library of 150,000 volumes and 800 MSS., a chemical laboratory, a zoological museum, a gynaecological institute, an ophthalmological school, a botanical garden and at Eldena (a seaside resort on the Baltic) an agricultural school. In front of the university, which had 775 students and about 100 teachers in 1904, stands a monument commemorating its four hundredth anniversary.

Greifswald was founded about 1240 by traders from the Netherlands. In 1250 it received a town constitution and Lübeck rights from Duke Wratislaw of Pomerania. In 1270 it joined the Hanse towns, Stralsund, Rostock, Wismar and Lübeck, and took part in the wars which they carried on against the kings of Denmark and Norway. During the Thirty Years' War it was formed into a fortress by the imperialists, but they vacated it in 1631 to the Swedes, in whose possession it remained after the peace of Westphalia. In 1678 it was captured by the elector of Brandenburg, but was restored to the Swedes in the following year; in 1713 it was desolated by the Russians; in 1715 it came into the possession of Denmark; and in 1721 it was again restored to Sweden, under whose protection it remained till 1815, when, along with the whole of Swedish Pomerania, it came into the possession of Prussia.

See J. G. L. Kosegarten, *Geschichte der Universität Greifswald* (1856); C. Gesterding, *Beitrag zur Geschichte der Stadt Greifswald* (3 vols., 1827–1829); and I. Ziegler, *Geschichte der Stadt Greifswald* (Greifswald, 1897).

GREISEN (in French, *hyalomicte*), a modification of granite, consisting essentially of quartz and white mica, and distinguished from granite by the absence of felspar and biotite. In the hand specimen the rock has a silvery glittering appearance from the abundance of lamellar crystals of muscovite, but many greisens have much of the appearance of granite, except that they are paler in colour. The commonest accessory minerals are tourmaline, topaz, apatite, fluorspar and iron oxides; a little felspar more or less altered may also be present and a brown mica which is biotite or lithionite. The tourmaline in section is brown, green, blue or colourless, and often the same crystal shows many different tints. The white mica forms mostly large plates with imperfect crystalline outlines. The quartz is rich in fluid enclosures. Apatite and topaz are both colourless and of irregular form. Felspar if present may be orthoclase and oligoclase.

Greisen occurs typically in belts or veins intersecting granite. At the centre of each vein there is usually a fissure which may be open or filled with quartz. The greisen bands are from 1 in. up to 2 ft. or more in thickness. At their outer edges they pass gradually into the granite, for they contain felspar crystals more or less completely altered into aggregates of white mica and quartz. The transition between the two rocks is perfectly gradual, a fact which shows that the greisen has been produced by alteration of the granite. Vapours or fluids rising through the fissure have been the agents which effected the transmutation. They must have contained fluorine, boron and probably also lithium, for topaz, mica and tourmaline, the new minerals of the granite, contain these elements. The change is a post-volcanic

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or pneumatolytic one induced by the vapours set free by the granite magma when it cools. Probably the rock was at a relatively high temperature at the time. A similar type of alteration, the development of white mica, quartz and tourmaline, is found sometimes in sedimentary rocks around granite masses. Greisen is closely connected with schorl rock both in its mineralogical composition and in its mode of origin. The latter is a pneumatolytic product consisting of quartz and tourmaline; it often contains white mica and thus passes by all stages into greisen. Both of these rocks carry frequently small percentages of tin oxide (cassiterite) and may be worked as ores of tin. They are common in Cornwall, Saxony, Tasmania and other districts which are centres of tin-mining. Many other greisens occur in which no tin is found. The analyses show the composition

	SiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	CaO.	MgO.	K_2O.	Na_2O.	Fl.	B_2O_3.
Granite .	70·17	15·07	·88	1·79	1·13	1·11	5·73	2·69	·15	tr.
Greisen	69·42	15·65	1·25	3·30	·63	1·02	4·06	·27	3·36	·59

of Cornish granite and greisen. They make it clear that there has been an introduction of fluorine and boron and a diminution in the alkalies during the transformation of the granitic rock into the greisen. (J. S. F.)

GREIZ, a town of Germany, capital of the principality of Reuss-Greiz (Reuss the Elder), in a pleasant valley on the right bank of the White Elster, near the borders of Saxony, and 66 m. by rail S. from Leipzig. Pop. (1875) 12,057; (1905) 23,114. It consists of two parts, the old town on the right bank and the new town on the left bank of the river; it is rapidly growing and is regularly laid out. The principal buildings are the palace of the prince of Reuss-Greiz, surrounded by a fine park, the old château on a rocky hill overlooking the town, the summer palace with a fine garden, the old town church dating from 1225 and possessing a beautiful tower, the town hall, the governmental buildings and statues of the emperor William I. and of Bismarck. There are classical and modern schools and a school of textile industry. The industries are considerable, and include dyeing, tanning and the manufacture of woollen, cotton, shawls, coverlets and paper. Greiz (formerly *Greuez*) is apparently a town of Slav origin. From the 12th century it was governed by *advocati* (*Vögte*), but in 1236 it came into the possession of Gera, and in 1550 of the younger line of the house of Plauen. It was wholly destroyed by fire in 1494, and almost totally in 1802.

See Wilke, *Greiz und seine Umgebung* (1875), and *Jahresberichte des Vereins für Greizer Geschichte* (1894, seq.)

GRENADA, the southernmost of the Windward Islands, British West Indies. It lies between 11° 58′ and 12° 15′ N. and between 61° 35′ and 61° 50′ W., being 140 m. S.W. of Barbados and 85 m. N. by W. of Trinidad. In shape oval, it is 21 m. long, 12 m. broad at its maximum and has an area of 133 sq. m. It owes much of its beauty to a well-wooded range of mountains traversing the island from N. to S. and throwing off from the centre spurs which form picturesque and fertile valleys. These mountains attain their highest elevation in Mount Catharine (2750 ft.). In the S.E. and N.W. there are stretches of low or undulating ground, devoted to fruit growing and cattle raising. The island is of volcanic origin; the only signs of upheaval are raised limestone beaches in the extreme N. Red and grey sandstones, hornblende and argillaceous schist are found in the mountains, porphyry and basaltic rocks also occur; sulphur and fuller's earth are worked. In the centre, at the height of 1740 ft. above the sea, is the chief natural curiosity of Grenada, the Grand Etang, a circular lake, 13 acres in extent, occupying the site of an ancient crater. Near it is a large sanatorium, much frequented as a health resort. In the north-east is a larger lake, Lake Antoine, also occupying a crater, but it lies almost at the sea level. The island is watered by several short rivers, mainly on the east and south; there are numerous fresh water springs, as well as hot chalybeate and sulphurous springs. The south-eastern coast is much indented with bays. The climate is good, the temperature equable and epidemic diseases are rare. In the low country the average yearly temperature is 82° F., but it is cooler in the heights. The rainfall is very heavy, amounting in some parts to as much as 200 in., a year. The rainy season lasts from May to December, but refreshing showers frequently occur during other parts of the year. The average annual rainfall at St Georges is 79·07 in., and at Grand Etang 164 in. The excellent climate and good sea-bathing have made Grenada the health resort of the neighbouring islands, especially of Trinidad. Good roads and byeways intersect it in every direction. The soil is extraordinarily fertile, the chief products being cocoa and spices, especially nutmegs. The exports, sent chiefly to Great Britain, are cocoa, spices, wool, cotton, coffee, live stock, hides, turtles, turtle shell, kola nuts, vanilla and timber. Barbados is dependent on Grenada for the majority of its firewood. Sugar is still grown, and rum and molasses are made, but the consumption of these is confined to the island.

Elementary education is chiefly in the hands of the various denominations, whose schools are assisted by government grants-in-aid. There are, however, a few secular schools conducted by the government, and government-aided secondary schools for girls and a grammar school for boys. The schools are controlled by a board of education, the members of which are nominated by the government, and small fees are charged in all schools. The governor of the Windward Islands resides in Grenada and is administrator of it. The Legislative Council consists of 14 members; 7 including the governor are *ex-officio* members and the rest are nominated by the Crown. English is universally spoken, but the negroes use a French *patois*, which, however, is gradually dying out. Only 2% of the inhabitants are white, the rest being negroes and mulattoes with a few East Indians. The capital, St George, in the south-west, is built upon a lava peninsula jutting into the sea and forming one side of its land-locked harbour. It is surrounded by an amphitheatre of hills, up the sides of which climb the red-brick houses of the town. At the extremity of the peninsula is Fort St George, with a saluting battery. The ridge connecting Fort St George with Hospital Hill is tunnelled to give access to the two parts of the town lying on either side. The population in 1901 was 5198. There are four other towns—on the west coast Gouyave, or Charlotte Town, and 4 m. N. of it Victoria; on the north coast Sauteurs; and Grenville at the head of a wide bay on the east. They are all in frequent communication with the capital by steamer. The population of the entire colony in 1901 was 63,438.

History.—Grenada was discovered in 1498 by Columbus, who named it Conception. Neither the Spanish nor the British, to whom it was granted in 1627, settled on the island. The governor of Martinique, du Parquet, purchased it in 1650, and the French were well received by the Caribs, whom they afterwards extirpated with the greatest cruelty. In 1665 Grenada passed into the hands of the French West India Company, and was administered by it until its dissolution in 1674, when the island passed to the French Crown. Cocoa, coffee and cotton were introduced in 1714. During the wars between Great Britain and France, Grenada capitulated to the British forces in 1762, and was formally ceded next year by the Treaty of Paris. The French, under Count d'Estaing, re-captured the island in 1779, but it was restored to Great Britain by the Treaty of Versailles in 1783. A rebellion against the British rule, instigated and assisted by the French, occurred in 1795, but was quelled by Sir Ralph Abercromby in the following year. The emancipation of the slaves took place in 1837, and by 1877 it was found necessary to introduce East Indian labour. Grenada, with cocoa as its staple, has not experienced similar depression to that which overtook the sugar-growing islands of the West Indies.

See *Grenada Handbook* (London, 1905).

GRENADE (from the French word for a pomegranate, from a resemblance in shape to that fruit), a small spherical explosive vessel thrown by hand. Hand-grenades were used in war in the 16th century, but the word "grenade" was also from the

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first used to imply an explosive shell fired from a gun; this survives to the present day in the German *Granate*. These weapons were employed after about 1660, by special troops called "grenadiers" (*q.v.*), and in the wars of the 17th and 18th centuries they are continually met with. They became obsolete in the 19th century, but were given a new lease of life in the 20th, owing to their employment in the siege of Port Arthur in 1904, where hand-grenades of a modern type, and containing powerful modern explosives, proved very effective (see AMMUNITION, *Shell*). Hand-grenades filled with chemicals and made of glass are used as a method of fire-extinction, and similar vessels containing a liquid with a very strong smell are used to discover defects in a drain or sewer.

GRENADIER, originally a soldier whose special duty it was to throw hand-grenades. The latter were in use for a considerable time before any special organization was given to the troops who were to use them. In 1667 four men per company in the French *Régiment du Roi* were trained with grenades (siege of Lille), and in 1668–1670 grenadier companies were formed in this regiment and in about thirty others of the French line. Evelyn, in his *Diary*, tells us that on the 29th of June 1678 he saw at Hounslow "a new sort of soldiers called granadiers, who were dexterous in flinging hand-granades." As in the case of the fusiliers, the French practice was therefore quickly copied in England. Eventually each English battalion had a grenadier company (see for illustrations *Archaeological Journal*, xxiii. 222, and xlvii. 321–324). Besides their grenades and the firelock, grenadiers carried axes which, with the grenades, were employed in the assault of fortresses, as we are told in the celebrated song, "The British Grenadiers."

The grenadier companies were formed always of the most powerful men in the regiment and, when the grenade ceased to be used, they maintained their existence as the "crack" companies of their battalions, taking the right of the line on parade and wearing the distinctive grenadier headdress. This system was almost universal, and the typical infantry regiment of the 18th and early 19th century had a grenadier and a light company besides its "line" companies. In the British and other armies these *élite* companies were frequently taken from their regiments and combined in grenadier and light infantry battalions for special service, and Napoleon carried this practice still further in the French army by organizing brigades and divisions of grenadiers (and correspondingly of *voltigeurs*). Indeed the companies thus detached from the line practically never returned to it, and this was attended with serious evils, for the battalion at the outbreak of war lost perhaps a quarter of its best men, the average men only remaining with the line. This special organization of grenadiers and light companies lasted in the British army until about 1858. In the Prussian service the grenadiers became permanent and independent battalions about 1740, and the gradual adoption of the four-company battalion by Prussia and other nations tended still further to place the grenadiers by themselves and apart from the line. Thus at the present day in Germany, Russia and other countries, the title of "grenadiers" is borne by line regiments, indistinguishable, except for details of uniform and often the *esprit de corps* inherited from the old *élite* companies, from the rest. In the British service the only grenadiers remaining are the Grenadier Guards, originally the 1st regiment of Foot Guards, which was formed in 1660 on the nucleus of a regiment of English royalists which followed the fortunes of Charles II. in exile. In Russia a whole army corps (headquarters Moscow), inclusive of its artillery units, bears the title.

The special headdress of the grenadier was a pointed cap, with peak and flaps, of embroidered cloth, or a loose fur cap of similar shape; both these were light field service caps. The fur cap has in the course of time developed into the tall "bearskin" worn by British guards and various corps of other armies; the embroidered field cap survives, transformed, however, into a heavy brass headdress, in the uniform of the 1st Prussian Foot Guards, the 1st Prussian Guard Grenadiers and the Russian Paul (Pavlovsky) Grenadier Guards.

GRENADINES, a chain of islets in the Windward Islands, West Indies. They stretch for 60 m. between St Vincent and Grenada, following a N.E. to S.W. direction, and consist of some 600 islets and rocks. Some are a few square miles in extent, others are merely rocky cones projecting from the deep. For purposes of administration they are divided between St Vincent and Grenada. Bequia, the chief island in the St Vincent group, is long and narrow, with an area 6 sq. m. Owing to a lack of water it is only slightly cultivated, but game is plentiful. Admiralty Bay, on the W. side, is a safe and commodious harbour. Carriacou, belonging to Grenada, is the largest of the group, being 7 m. long, 2 m. wide and 13 sq. m. in extent. A ridge of hills, rising to an altitude of 700 ft., traverses the centre from N.E. to S.W.; here admirable building stone is found. There are two good harbours on the west coast, Hillsborough Bay on which stands Hillsborough, the chief town, and Tyrell Bay, farther south. The island is thickly populated, the negro peasantry occupying small lots and working on the *metayer* system. Excellent oysters are found along the coast, and cotton and cattle are the chief exports. Pop. of the group, mostly on Carriacou (1901) 6407.

GRENOBLE, the ancient capital of the Dauphiné in S.E. France, and now the chief town of the Isère department, 75 m. by rail from Lyons, 38½ m. from Chambéry and 85½ m. from Gap. Pop. (1906), town, 58,641; commune, 73,022. It is one of the most beautifully situated, and also one of the most strongly fortified, cities in Europe. Built at a height of 702 ft. on both banks of the river Isère just above its junction with the Drac, the town occupies a considerable plain at the south-western end of the fertile Graisivaudan valley. To the north rise the mountains of the Grande Chartreuse, to the east the range of Belledonne, and to the south those of Taillefer and the Moucherotte, the higher summits of these ranges being partly covered with snow. From the Jardin de Ville and the quays of the banks of the Isère the summit of Mont Blanc itself is visible. The greater part of the town rises on the left bank of the Isère, which is bordered by broad quays. The older portion has the tortuous and narrow streets usual in towns that have been confined within fortifications, but in modern times these hindrances have been demolished. The newer portion of the town has wide thoroughfares and buildings of the modern French type, solid but not picturesque. The original town (of but small extent) was built on the right bank of the Isère at the southern foot of the Mont Rachais, now covered by a succession of fortresses that rise picturesquely on the slope of that hill to a very considerable height (885 ft. above the town).

Grenoble is the seat of a bishopric which was founded in the 4th century, and now comprises the department of the Isère—formerly a suffragan of Vienne it now forms part of the ecclesiastical province of Lyons. The most remarkable building in the town is the Palais de Justice, erected (late 15th century to 16th century) on the site of the old palace of the Parlement of the Dauphiné. Opposite is the most noteworthy church of the city, that of St André (13th century), formerly the chapel of the dauphins of the Viennois: in it is the 17th century monument of Bayard (1476–1524), the *chevalier sans peur et sans reproche*, which was removed hither in 1822; but it is uncertain whose bones are therein. The cathedral church of Notre Dame is a heavy building, dating in part from the 11th century. The church of St Laurent, on the right bank of the Isère, is the oldest in the city (11th century) and has a remarkable crypt, dating from Merovingian times. The town hall is a mainly modern building, constructed on the site of the palace of the dauphins, while the prefecture is entirely modern. The town library contains a considerable collection of paintings, mainly of the modern French school, but is more remarkable for its very rich collection of MSS. (7000) and printed books (250,000 vols.) which in great part belonged till 1793 to the monastery of the Grande Chartreuse. The natural history museum houses rich collections of various kinds, which contain (*inter alia*) numerous geological specimens from the neighbouring districts of the Dauphiné and Savoy. The university, revived in modern times

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after a long abeyance, occupies a modern building, as does also the hospital, though founded as far back as the 13th century. There are numerous societies in the town, including the Académie Delphinale (founded in 1772), and many charitable institutions.

The staple industry of Grenoble is the manufacture of kid gloves, most of the so-called *gants Jouvin* being made here—they are named after the reviver of the art, X. Jouvin (1800–1844). There are about 80 glove factories, which employ 18,500 persons (of whom 15,000 are women), the annual output being about 800,000 dozen pairs of gloves. Among other articles produced at Grenoble are artificial cements, liqueurs, straw hats and carved furniture.

Grenoble occupies the site of Cularo, a village of the Allobroges, which only became of importance when fortified by Diocletian and Maximian at the end of the 3rd century. Its present name is a corruption of Gratianopolis, a title assumed probably in honour of Gratian (4th century), who raised it to the rank of a *civitas*. After passing under the power of the Burgundians (*c.* 440) and the Franks (532) it became part of the kingdom of Provence (879–1032). On the break-up of that kingdom a long struggle for supremacy ensued between the bishops of the city and the counts of Albon, the latter finally winning the day in the 12th century, and taking the title of Dauphins of the Viennois in the 13th century. In 1349 Grenoble was ceded with the rest of the Dauphiné to France, but retained various municipal privileges which had been granted by the dauphins to the town, originally by a charter of 1242. In 1562 it was sacked by the Protestants under the baron des Adrets, but in 1572 the firmness of its governor, Bertrand de Gordes, saved it from a repetition of the Massacre of St Bartholomew. In 1590 Lesdiguières (1543–1626) took the town in the name of Henry IV., then still a Protestant, and during his long governorship (which lasted to his death) did much for it by the construction of fortifications, quays, &c. In 1788 the attempt of the king to weaken the power of the parlement of Grenoble (which, though strictly a judicial authority, had preserved traditions of independence, since the suspension of the states-general of the Dauphiné in 1628) roused the people to arms, and the "day of the tiles" (7th of June 1788) is memorable for the defeat of the royal forces. In 1700, on the formation of the department of the Isère, Grenoble became its capital. Grenoble was the first important town to open its gates to Napoleon on his return from Elba (7th of March 1815), but a few months later (July) it was obliged to surrender to the Austrian army. Owing to its situation Grenoble was formerly much subject to floods, particularly in the case of the wild Drac. One of the worst took place in 1219, while that of 1778 was known as the *déluge de la Saint Crépin*. Among the celebrities who have been born at Grenoble are Vaucanson (1709–1782), Mably (1709–1785), Condillac (1715–1780), Beyle, best known as Stendhal, his *nom de guerre* (1783–1842), Barnave (1761–1793) and Casimir Perier (1777–1832).

See A. Prudhomme, *Histoire de Grenoble* (1888); X. Roux, *La Corporation des gantiers de Grenoble* (1887); H. Duhamel, *Grenoble considéré comme centre d'excursions* (1902); J. Marion, *Cartulaires de l'église cathédrale de Grenoble* (Paris, 1869). (W. A. B. C.)

GRENVILLE, SIR BEVIL (1596–1643), Royalist soldier in the English Civil War (see GREAT REBELLION), was educated at Exeter College, Oxford. As member of Parliament, first for Cornwall, then for Launceston, Grenville supported Sir John Eliot and the opposition, and his intimacy with Eliot was lifelong. In 1630, however, he appears as a royalist going to the Scottish War in the train of Charles I. The reasons of this change of front are unknown, but Grenville's honour was above suspicion, and he must have entirely convinced himself that he was doing right. At any rate he was a very valuable recruit to the royalist cause, being "the most generally loved man in Cornwall." At the outbreak of the Civil War he and others of the gentry not only proclaimed the king's Commission of Array at Launceston assizes, but also persuaded the grand jury of the county to declare their opponents guilty of riot and unlawful assembly, whereupon the *Posse comitatus* was called out to expel them. Under the command of Sir Ralph Hopton, Sir Bevil took a distinguished part in the action of Bradock Down, and at Stratton (16 May 1643), where the parliamentary earl of Stamford was completely routed by the Cornishmen, led one of the storming parties which captured Chudleigh's lines (*Clarendon*, vii. 89). A month later, the endeavour of Hopton to unite with Maurice and Hertford from Oxford brought on the battle of Lansdown, near Bath. Here Grenville was killed at the head of the Cornish infantry as it reached the top of the hill. His death was a blow from which the king's cause in the West never recovered, for he alone knew how to handle the Cornishmen. Hopton they revered and respected, but Grenville they loved as peculiarly their own commander, and after his death there is little more heard of the reckless valour which had won Stratton and Lansdown. Grenville is the type of all that was best in English royalism. He was neither rapacious, drunken nor dissolute, but his loyalty was unselfish, his life pure and his skill no less than his bravery unquestionable. A monument to him has been erected on the field of Lansdown.

See Lloyd, *Memoirs of Excellent Personages* (1668); S. R. Gardiner, *History of the English Civil War* (vol. i. *passim*).

GRENVILLE, GEORGE (1712–1770), English statesman, second son of Richard Grenville and Hester Temple, afterwards Countess Temple, was born on the 14th of October 1712. He was educated at Eton and at Christ Church, Oxford, and was called to the bar in 1735. He entered parliament in 1741 as member for Buckingham, and continued to represent that borough till his death. In parliament he was a member of the "Boy Patriot" party which opposed Sir Robert Walpole. In December 1744 he became a lord of the admiralty in the Pelham administration. He allied himself with his brother Richard and with William Pitt in forcing their feeble chief to give them promotion by rebelling against his authority and obstructing business. In June 1747 he became a lord of the treasury, and in 1754 treasurer of the navy and privy councillor. As treasurer of the navy in 1758 he introduced and carried a bill which established a less unfair system of paying the wages of the seamen than had existed before. He remained in office in 1761, when his brother Lord Temple and his brother-in-law Pitt resigned upon the question of the war with Spain, and in the administration of Lord Bute he was entrusted with the leadership of the House of Commons. In May 1762 he was appointed secretary of state, and in October first lord of the admiralty; and in April 1763 he became first lord of the treasury and chancellor of the exchequer. The most prominent measures of his administration were the prosecution of Wilkes and the passing of the American Stamp Act, which led to the first symptoms of alienation between America and the mother country. During the latter period of his term of office he was on a very unsatisfactory footing with the young king George III., who gradually came to feel a kind of horror of the interminable persistency of his conversation, and whom he endeavoured to make use of as the mere puppet of the ministry. The king made various attempts to induce Pitt to come to his rescue by forming a ministry, but without success, and at last had recourse to the marquis of Rockingham, on whose agreeing to accept office Grenville was dismissed July 1765. He never again held office, and died on the 13th of November 1770.

The nickname of "gentle shepherd" was given him because he bored the House by asking over and over again, during the debate on the Cider Bill of 1763, that somebody should tell him "where" to lay the new tax if it was not to be put on cider. Pitt whistled the air of the popular tune "Gentle Shepherd, tell me where," and the House laughed. Though few excelled him in a knowledge of the forms of the House or in mastery of administrative details, his tact in dealing with men and with affairs was so defective that there is perhaps no one who has been at the head of an English administration to whom a lower place can be assigned as a statesman.

In 1749 he married Elizabeth, daughter of Sir William Wyndham, by whom he had a large family. His son, the second Earl Temple, was created marquess, and his grandson duke, of Buckingham. Another son was William, afterwards Lord

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Grenville. Another, Thomas Grenville (1755–1846), who was, with one interval, a member of parliament from 1780 to 1818, and for a few months during 1806 and 1807 president of the board of control and first lord of the admiralty, is perhaps more famous as a book-collector than as a statesman; he bequeathed his large and valuable library to the British Museum.

The Grenville Papers, being the Correspondence of Richard Grenville, Earl Temple, K.G., and the Right Hon. George Grenville, their Friends and Contemporaries, were published at London in 1852, and afford the chief authority for his life. But see also H. Walpole's *Memoirs of the Reign of George II.* (London, 1845); Lord Stanhope's *History of England* (London, 1858); Lecky's *History of England* (1885); and E. D. Adams, *The Influence of Grenville on Pitt's Foreign Policy* (Washington, 1904).

GRENVILLE (or GREYNVILE), **SIR RICHARD** (*c.* 1541–1591), British naval commander, was born of an old Cornish family about 1541. His grandfather, Sir Richard, had been marshal of Calais in the time of Henry VIII., and his father commanded and was lost in the "Mary Rose" in 1545. At an early age Grenville is supposed to have served in Hungary under the emperor Maximilian against the Turks. In the years 1571 and 1584 he sat in parliament for Cornwall, and in 1583 and 1584 he was commissioner for the works at Dover harbour. He appears to have been a man of much pride and ambition. Of his bravery there can be no doubt. In 1585 he commanded the fleet of seven vessels by which the colonists sent out by his cousin, Sir Walter Raleigh, were carried to Roanoke Island in the present North Carolina. Grenville himself soon returned with the fleet to England, capturing a Spanish vessel on his way, but in 1586 he carried provisions to Roanoke, and finding the colony deserted, left a few men to maintain possession. He then held an important post in charge of the defences of the western counties of England. When a squadron was despatched in 1591, under Lord Thomas Howard, to intercept the homeward-bound treasure-fleet of Spain, Grenville was appointed as second in command on board the "Revenge," a ship of 500 tons which had been commanded by Drake against the Armada in 1588. At the end of August Howard with 16 ships lay at anchor to the north of Flores in the Azores. On the last day of the month he received news from a pinnace, sent by the earl of Cumberland, who was then off the Portugal coast, that a Spanish fleet of 53 vessels was then bearing up to the Azores to meet the treasure-ships. Not being in a position to fight a fleet more than three times the size of his own, Howard gave orders to weigh anchor and stand out to sea. But, either from some misunderstanding of the order, or from some idea of Grenville's that the Spanish vessels rapidly approaching were the ships for which they had been waiting, the "Revenge" was delayed and cut off from her consorts by the Spaniards. Grenville resolved to try to break through the middle of the Spanish line. His ship was becalmed under the lee of a huge galleon, and after a hand-to-hand fight lasting through fifteen hours against fifteen Spanish ships and a force of five thousand men, the "Revenge" with her hundred and fifty men was captured. Grenville himself was carried on board the Spanish flag-ship "San Pablo," and died a few days later. The incident is commemorated in Tennyson's ballad of "The Revenge."

The spelling of Sir Richard's name has led to much controversy. Four different families, each of which claim to be descended from him, spell it Granville, Grenville, Grenfell and Greenfield. The spelling usually accepted is Grenville, but his own signature, in a bold clear handwriting, among the Tanner MSS. in the Bodleian library at Oxford, is Greynvile.

GRENVILLE (or GRANVILLE), **SIR RICHARD** (1600–1658), English royalist, was the third son of Sir Bernard Grenville (1559–1636), and a grandson of the famous seaman, Sir Richard Grenville. Having served in France, Germany and the Netherlands, Grenville gained the favour of the duke of Buckingham, took part in the expeditions to Cadiz, to the island of Rhé and to La Rochelle, was knighted, and in 1628 was chosen member of parliament for Fowey. Having married Mary Fitz (1596–1671), widow of Sir Charles Howard (d. 1622) and a lady of fortune, Grenville was made a baronet in 1630; his violent temper, however, made the marriage an unhappy one, and he was ruined and imprisoned as the result of two lawsuits, one with his wife, and the other with her kinsman, the earl of Suffolk. In 1633 he escaped from prison and went to Germany, returning to England six years later to join the army which Charles I. was collecting to march against the Scots. Early in 1641, just after the outbreak of the Irish rebellion, Sir Richard led some troops to Ireland, where he won some fame and became governor of Trim; then returning to England in 1643 he was arrested at Liverpool by an officer of the parliament, but was soon released and sent to join the parliamentary army. Having, however, secured men and money, he hurried to Charles I. at Oxford and was despatched to take part in the siege of Plymouth, quickly becoming the leader of the forces engaged in this enterprise. Compelled to raise the siege he retired into Cornwall, where he helped to resist the advancing Parliamentarians; but he quickly showed signs of insubordination, and, whilst sharing in the siege of Taunton, he was wounded and obliged to resign his command. About this time loud complaints were brought against Grenville. He had behaved, it was said, in a very arbitrary fashion; he had hanged some men and imprisoned others; he had extorted money and had used the contributions towards the cost of the war for his own ends. Many of these charges were undoubtedly true, but upon his recovery the councillors of the prince of Wales gave him a position under Lord Goring, whom, however, he refused to obey. Equally recalcitrant was his attitude towards Goring's successor, Sir Ralph Hopton, and in January 1646 he was arrested. But he was soon released; he went to France and Italy, and after visiting England in disguise passed some time in Holland. He was excepted by parliament from pardon in 1648, and after the king's execution he was with Charles II. in France and elsewhere until some unfounded accusation which he brought against Edward Hyde, afterwards earl of Clarendon, led to his removal from court. He died in 1658, and was buried at Ghent. In 1644, when Grenville deserted the parliamentary party, a proclamation was put out against him; in this there were attached to his name several offensive epithets, among them being *skellum*, a word probably derived from the German *Schelm*, a scoundrel. Hence he is often called "skellum Grenville."

Grenville wrote an account of affairs in the west of England, which was printed in T. Carte's *Original Letters* (1739). To this partisan account Clarendon drew up an answer, the bulk of which he afterwards incorporated in his *History*. In 1654 Grenville wrote his *Single defence against all aspersions of all malignant persons*. This is printed in the *Works* of George Granville, Lord Lansdowne (London, 1736), where Lansdowne's *Vindication* of his kinsman, Sir Richard, against Clarendon's charges is also found. See also Clarendon, *History of the Rebellion*, edited by W. D. Macray (Oxford, 1888); and R. Granville, *The King's General in the West* (1908).

GRENVILLE, WILLIAM WYNDHAM GRENVILLE, BARON (1759–1834), English statesman, youngest son of George Grenville, was born on the 25th of October 1759. He was educated at Eton and Christ Church, Oxford, gaining the chancellor's prize for Latin verse in 1779. In February 1782 Grenville was returned to parliament as member for the borough of Buckingham, and in the following September he became secretary to the lord lieutenant of Ireland, who at this time was his brother, Earl Temple, afterwards marquess of Buckingham. He left office in June 1783, but in the following December he became paymaster-general of the forces under his cousin, William Pitt, and in 1786 vice-president of the committee of trade. In 1787 he was sent on an important mission to the Hague and Versailles with reference to the affairs of Holland. In January 1789 he was chosen speaker of the House of Commons, but he vacated the chair in the same year on being appointed secretary of state for the home department; about the same time he resigned his other offices, but he became president of the board of control, and in November 1790 was created a peer as Baron Grenville. In the House of Lords he was very active in directing the business of the government, and in 1791 he was transferred to the foreign office, retaining his post at the board of control until 1793. He was doubtless regarded by Pitt as the man best fitted to carry out his policy with reference to France, but in the succeeding years he and his chief were frequently at variance on important

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questions of foreign policy. In spite of his multifarious duties at the foreign office Grenville continued to take a lively interest in domestic matters, which he showed by introducing various bills into the House of Lords. In February 1801 he resigned office with Pitt because George III. would not consent to the introduction of any measure of Roman Catholic relief, and in opposition he gradually separated himself from his former leader. When Pitt returned to power in 1804 Grenville refused to join the ministry unless his political ally, Fox, was also admitted thereto; this was impossible and he remained out of office until February 1806, when just after Pitt's death he became the nominal head of a coalition government. This ministry was very unfortunate in its conduct of foreign affairs, but it deserves to be remembered with honour on account of the act passed in 1807 for the abolition of the slave trade. Its influence, however, was weakened by the death of Fox, and in consequence of a minute drawn up by Grenville and some of his colleagues the king demanded from his ministers an assurance that in future they would not urge upon him any measures for the relief of Roman Catholics. They refused to give this assurance and in March 1807 they resigned. Grenville's attitude in this matter was somewhat aggressive; his colleagues were not unanimous in supporting him, and Sheridan, one of them, said "he had known many men knock their heads against a wall, but he had never before heard of any man who collected the bricks and built the very wall with an intention to knock out his own brains against it."

Lord Grenville never held office again, although he was requested to do so on several occasions. He continued, however, to take part in public life, being one of the chief supporters of Roman Catholic emancipation, and during the remaining years of his active political career, which ended in 1823, he generally voted with the Whigs, although in 1815 he separated himself from his colleague, Charles Grey, and supported the warlike policy of Lord Liverpool. In 1819, when the marquess of Lansdowne brought forward his motion for an inquiry into the causes of the distress and discontent in the manufacturing districts, Grenville delivered an alarmist speech advocating repressive measures. His concluding years were spent at Dropmore, Buckinghamshire, where he died on the 12th of January 1834. His wife, whom he married in 1792, was Anne (1772–1864), daughter of Thomas Pitt, 1st Baron Camelford, but he had no issue and his title became extinct. In 1809 he was elected chancellor of Oxford university.

Though Grenville's talents were not of the highest order his straightforwardness and industry, together with his knowledge of politics and the moderation of his opinions, secured for him considerable political influence. He may be enrolled among the band of English statesmen who have distinguished themselves in literature. He edited Lord Chatham's letters to his nephew, Thomas Pitt, afterwards Lord Camelford (London, 1804, and other editions); he wrote a small volume, *Nugae Metricae* (1824), being translations into Latin from English, Greek and Italian, and an *Essay on the Supposed Advantages of a Sinking Fund* (1828).

The Dropmore MSS. contain much of Grenville's correspondence, and on this the Historical Manuscripts Commission has published a report.

GRESHAM, SIR THOMAS (1519–1579), London merchant, the founder of the Royal Exchange and of Gresham College, London, was descended from an old Norfolk family; he was the only son of Sir Richard Gresham, a leading London merchant, who for some time held the office of lord mayor, and for his services as agent of Henry VIII. in negotiating loans with foreign merchants received the honour of knighthood. Though his father intended him to follow his own profession, he nevertheless sent him for some time to Caius College, Cambridge, but there is no information as to the duration of his residence. It is uncertain also whether it was before or after this that he was apprenticed to his uncle Sir John Gresham, who was also a merchant, but we have his own testimony that he served an apprenticeship of eight years. In 1543, at the age of twenty-four, he was admitted a member of the Mercers' Company, and in the same year he went to the Low Countries, where, either on his own account or on that of his father or uncle, he both carried on business as a merchant and acted in various matters as an agent for Henry VIII. In 1544 he married the widow of William Read, a London merchant, but he still continued to reside principally in the Low Countries, having his headquarters at Antwerp. When in 1551 the mismanagement of Sir William Dansell, "king's merchant" in the Low Countries, had brought the English government into great financial embarrassment, Gresham was called in to give his advice, and chosen to carry out his own proposals. Their leading feature was the adoption of various methods—highly ingenious, but quite arbitrary and unfair—for raising the value of the pound sterling on the "bourse" of Antwerp, and it was so successful that in a few years nearly all King Edward's debts were discharged. The advice of Gresham was likewise sought by the government in all their money difficulties, and he was also frequently employed in various diplomatic missions. He had no stated salary, but in reward of his services received from Edward various grants of lands, the annual value of which at that time was ultimately about £400 a year. On the accession of Mary he was for a short time in disfavour, and was displaced in his post by Alderman William Dauntsey. But Dauntsey's financial operations were not very successful and Gresham was soon reinstated; and as he professed his zealous desire to serve the queen, and manifested great adroitness both in negotiating loans and in smuggling money, arms and foreign goods, not only were his services retained throughout her reign, but besides his salary of twenty shillings *per diem* he received grants of church lands to the yearly value of £200. Under Queen Elizabeth, besides continuing in his post as financial agent of the crown, he acted temporarily as ambassador at the court of the duchess of Parma, being knighted in 1559 previous to his departure. By the outbreak of the war in the Low Countries he was compelled to leave Antwerp on the 19th of March 1567; but, though he spent the remainder of his life in London, he continued his business as merchant and financial agent of the government in much the same way as formerly. Elizabeth also found him useful in a great variety of other ways, among which was that of acting as jailer, to Lady Mary Grey, who, as a punishment for marrying Thomas Keys the sergeant porter, remained a prisoner in his house from June 1569 to the end of 1572. In 1565 Gresham made a proposal to the court of aldermen of London to build at his own expense a bourse or exchange, on condition that they purchased for this purpose a piece of suitable ground. In this proposal he seems to have had an eye to his own interest as well as to the general good of the merchants, for by a yearly rental of £700 obtained for the shops in the upper part of the building he received a sufficient return for his trouble and expense. Gresham died suddenly, apparently of apoplexy, on the 21st of November 1579. His only son predeceased him, and his illegitimate daughter Anne he married to Sir Nathaniel Bacon, brother of the great Lord Bacon. With the exception of a number of small sums bequeathed to the support of various charities, the bulk of his property, consisting of estates in various parts of England of the annual value of more than £2300, was bequeathed to his widow and her heirs with the stipulation that after her decease his residence in Bishopsgate Street, as well as the rents arising from the Royal Exchange, should be vested in the hands of the corporation of London and the Mercers' Company, for the purpose of instituting a college in which seven professors should read lectures—one each day of the week—on astronomy, geometry, physic, law, divinity, rhetoric and music. The lectures were begun in 1597, and were delivered in the original building until 1768, when, on the ground that the trustees were losers by the gift, it was made over to the crown for a yearly rent of £500, and converted into an excise office. From that time a room in the Royal Exchange was used for the lectures until in 1843 the present building was erected at a cost of £70000.

A notice of Gresham is contained in Fuller's *Worthies* and Ward's *Gresham Professors*; but the fullest account of him, as well as of the history of the Exchange and Gresham College is that by J. M. Burgon in his *Life and Times of Sir Thomas Gresham* (2 vols., 1839). See also a *Brief Memoir of Sir Thomas Gresham* (1833); and *The Life of Sir Thomas Gresham, Founder of the Royal Exchange* (1845).

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GRESHAM, WALTER QUINTON (1832–1895), American statesman and jurist, was born near Lanesville, Harrison county, Indiana, on the 17th of March 1832. He spent two years in an academy at Corydon, Indiana, and one year at the Indiana State University at Bloomington, then studied law, and in 1854 was admitted to the bar. He was active as a campaign speaker for the Republican ticket in 1856, and in 1860 was elected to the State House of Representatives as a Republican in a strong Democratic district. In the House, as chairman of the committee on military affairs, he did much to prepare the Indiana troops for service in the Federal army; in 1861 he became colonel of the 53rd Indiana Volunteer Infantry, and subsequently took part in Grant's Tennessee campaign of 1862, and in the operations against Corinth and Vicksburg, where he commanded a brigade. In August 1863 he was appointed brigadier-general of volunteers, and was placed in command of the Federal forces at Natchez. In 1864 he commanded a division of the 17th Army Corps in Sherman's Atlanta campaign, and before Atlanta, on the 20th of July, he received a wound which forced him to retire from active service, and left him lame for life. In 1865 he was brevetted major-general of volunteers. After the war he practised law at New Albany, Indiana, and in 1869 was appointed by President Grant United States District Judge for Indiana. In April 1883 he succeeded Timothy O. Howe (1816–1883) as postmaster-general in President Arthur's cabinet, taking an active part in the suppression of the Louisiana Lottery, and in September 1884 succeeded Charles J. Folger as secretary of the treasury. In the following month he resigned to accept an appointment as United States Judge for the Seventh Judicial Circuit. Gresham was a candidate for the Republican presidential nomination in 1884 and 1888, in the latter year leading for some time in the balloting. Gradually, however, he grew out of sympathy with the Republican leaders and policy, and in 1892 advocated the election of the Democratic candidate, Grover Cleveland, for the presidency. From the 7th of March 1893 until his death at Washington on the 28th of May 1895, he was secretary of state in President Cleveland's cabinet.

GRESHAM'S LAW, in economics, the name suggested in 1857 by H. D. Macleod for the principle of currency which may be briefly summarized—"bad money drives out good." Macleod gave it this name, which has been universally adopted, under the impression that the principle was first explained by Sir Thomas Gresham in 1558. In reality it had been well set forth by earlier economic writers, notably Oresme and Copernicus. Macleod states the law in these terms: the worst form of currency in circulation regulates the value of the whole currency and drives all other forms of currency out of circulation. Gresham's law applies where there is under-weight or debased coin in circulation with full-weight coin of the same metal; where there are two metals in circulation, and one is undervalued as compared with the other, and where inconvertible paper money is put into circulation side by side with a metallic currency. See further BIMETALLISM; MONEY.

GRESSET, JEAN BAPTISTE LOUIS (1709–1777), French poet and dramatist, was born at Amiens on the 20th of August 1709. His poem *Vert Vert* is his main title to fame. He spent, however, the last twenty-five years of his life in regretting the frivolity which enabled him to produce this most charming of poems. He was brought up by the Jesuits of Amiens. He was accepted as a novice at the age of sixteen, and sent to pursue his studies at the Collège Louis le Grand in Paris. After completing his course he was appointed, being then under twenty years of age, to a post as assistant master in a college at Rouen. He published *Vert Vert* at Rouen in 1734. It is a story, in itself exceedingly humorous, showing how a parrot, the delight of a convent, whose talk was all of prayers and pious ejaculations, was conveyed to another convent as a visitor to please the nuns. On the way he falls among bad companions, forgets his convent language, and shocks the sisters on arrival by profane swearing. He is sent back in disgrace, punished by solitude and plain bread, presently repents, reforms and is killed by kindness. The story, however, is nothing. The treatment of the subject, the atmosphere which surrounds it, the delicacy in which the little prattling ways of the nuns, their jealousies, their tiny trifles, are presented, takes the reader entirely by surprise. The poem stands absolutely unrivalled, even among French *contes en vers*.

Gresset found himself famous. He left Rouen, went up to Paris, where he found refuge in the same garret which had sheltered him when a boy at the Collège Louis le Grand, and there wrote his second poem, *La Chartreuse*. It was followed by the *Carême impromptu*, the *Lutrin vivant* and *Les Ombres*. Then trouble came upon him; complaints were made to the fathers of the alleged licentiousness of his verses, the real cause of complaint being the ridicule which *Vert Vert* seemed to throw upon the whole race of nuns and the anti-clerical tendency of the other poems. An example, it was urged, must be made; Gresset was expelled the order. Men of robust mind would have been glad to get rid of such a yoke. Gresset, who had never been taught to stand alone, went forth weeping. He went to Paris in 1740 and there produced *Édouard III*, a tragedy (1740) and *Sidnei* (1745), a comedy. These were followed by *Le Méchant* which still keeps the stage, and is qualified by Brunetière as the best verse comedy of the French 18th century theatre, not excepting even the *Métromanie* of Alexis Piron. Gresset was admitted to the Academy in 1748. And then, still young, he retired to Amiens, where his relapse from the discipline of the church became the subject of the deepest remorse. He died at Amiens on the 16th of June 1777.

The best edition of his poems is A. A. Rénouard's (1811). See Jules Wogue, *J. B. L. Gresset* (1894).

GRETNA GREEN, or GRAITNEY GREEN, a village in the south-east of Dumfriesshire, Scotland, about 8 m. E. of Annan, 9 m. N.N.W. of Carlisle, and ¼ m. from the river Sark, here the dividing-line between England and Scotland, with a station on the Glasgow & South-Western railway. The Caledonian and North British railways have a station at Gretna on the English side of the Border. As the nearest village on the Scottish side, Gretna Green was notorious as the resort of eloping couples, who had failed to obtain the consent of parents or guardians to their union. Up till 1754, when Lord Hardwicke's act abolishing clandestine marriages came into force, the ceremony had commonly been performed in the Flert prison in London. After that date runaway couples were compelled to seek the hospitality of a country where it sufficed for them to declare their wish to marry in the presence of witnesses. At Gretna Green the ceremony was usually performed by the blacksmith, but the toll-keeper, ferryman or in fact any person might officiate, and the toll-house, the inn, or, after 1826, Gretna Hall was the scene of many such weddings, the fees varying from half a guinea to a sum as large as impudence could extort or extravagance bestow. As many as two hundred couples were married at the toll-house in a year. The romantic traffic was practically, though not necessarily, put an end to in 1856, when the law required one of the contracting parties to reside in Scotland three weeks previous to the event.

GRÉTRY, ANDRÉ ERNEST MODESTE (1741–1813), French composer, was born at Liége on the 8th of February 1741, his father being a poor musician. He was a choir boy at the church of St Denis. In 1753 he became a pupil of Leclerc and later of Renekin and Moreau. But of greater importance was the practical tuition he received by attending the performance of an Italian opera company. Here he heard the operas of Galuppi, Pergolesi and other masters; and the desire of completing his own studies in Italy was the immediate result. To find the necessary means he composed in 1759 a mass which he dedicated to the canons of the Liége cathedral, and it was at the cost of Canon Hurley that he went to Italy in the March of 1759. In Rome he went to the Collège de Liége. Here Grétry resided for five years, studiously employed in completing his musical education under Casali. His proficiency in harmony and counterpoint was, however, according to his own confession, at all times very moderate. His first great success was achieved by *La Vendemmiatrice*, an Italian intermezzo or operetta, composed for the Aliberti theatre in Rome and received with universal

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applause. It is said that the study of the score of one of Monsigny's operas, lent to him by a secretary of the French embassy in Rome, decided Grétry to devote himself to French comic opera. On New Year's day 1767 he accordingly left Rome, and after a short stay at Geneva (where he made the acquaintance of Voltaire, and produced another operetta) went to Paris. There for two years he had to contend with the difficulties incident to poverty and obscurity. He was, however, not without friends, and by the intercession of Count Creutz, the Swedish ambassador, Grétry obtained a libretto from Marmontel, which he set to music in less than six weeks, and which, on its performance in August 1768, met with unparalleled success. The name of the opera was *Le Huron*. Two others, *Lucile* and *Le Tableau parlant*, soon followed, and thenceforth Grétry's position as the leading composer of comic opera was safely established. Altogether he composed some fifty operas. His masterpieces are *Zémire et Azor* and *Richard Cœur de Lion*,—the first produced in 1771, the second in 1784. The latter in an indirect way became connected with a great historic event. In it occurs the celebrated romance, *O Richard, ô mon roi, l'univers l'abandonne*, which was sung at the banquet—"fatal as that of Thyestes," remarks Carlyle—given by the bodyguard to the officers of the Versailles garrison on October 3, 1789. The *Marseillaise* not long afterwards became the reply of the people to the expression of loyalty borrowed from Grétry's opera. The composer himself was not uninfluenced by the great events he witnessed, and the titles of some of his operas, such as *La Rosière républicaine* and *La Fête de la raison*, sufficiently indicate the epoch to which they belong; but they are mere *pièces de circonstance*, and the republican enthusiasm displayed is not genuine. Little more successful was Grétry in his dealings with classical subjects. His genuine power lay in the delineation of character and in the expression of tender and typically French sentiment. The structure of his concerted pieces on the other hand is frequently flimsy, and his instrumentation so feeble that the orchestral parts of some of his works had to be rewritten by other composers, in order to make them acceptable to modern audiences. During the revolution Grétry lost much of his property, but the successive governments of France vied in favouring the composer, regardless of political differences. From the old court he received distinctions and rewards of all kinds; the republic made him an inspector of the conservatoire; Napoleon granted him the cross of the legion of honour and a pension. Grétry died on the 24th of September 1813, at the Hermitage in Montmorency, formerly the house of Rousseau. Fifteen years after his death Grétry's heart was transferred to his birthplace, permission having been obtained after a tedious lawsuit. In 1842 a colossal bronze statue of the composer was set up at Liége.

See Michael Brenet, *Vie de Grétry* (Paris, 1884); Joach. le Breton, *Notice historique sur la vie et les ouvrages de Grétry* (Paris, 1814); A. Grétry (his nephew), *Grétry en famille* (Paris, 1814); Felix van Hulst, *Grétry* (Liége, 1842); L. D. S. *Notice biographique sur Grétry* (Bruxelles, 1869).

GREUZE, JEAN BAPTISTE (1725–1805), French painter, was born at Tournus, in Burgundy, on the 21st of August 1725, and is generally said to have formed his own talent; this is, however, true only in the most limited sense, for at an early age his inclinations, though thwarted by his father, were encouraged by a Lyonnese artist named Grandon, or Grondom, who enjoyed during his lifetime considerable reputation as a portrait-painter. Grandon not only persuaded the father of Greuze to give way to his son's wishes, and permit the lad to accompany him as his pupil to Lyons, but, when at a later date he himself left Lyons for Paris—where his son-in-law Grétry the celebrated composer enjoyed the height of favour—Grandon carried young Greuze with him. Settled in Paris, Greuze worked from the living model in the school of the Royal Academy, but did not attract the attention of his teachers; and when he produced his first picture, "Le Père de famille expliquant la Bible à ses enfants," considerable doubt was felt and shown as to his share in its production. By other and more remarkable works of the same class Greuze soon established his claims beyond contest, and won for himself the notice and support of the well-known connoisseur La Live de Jully, the brother-in-law of Madame d'Epinay. In 1755 Greuze exhibited his "Aveugle trompé," upon which, presented by Pigalle the sculptor, he was immediately *agréé* by the Academy. Towards the close of the same year he left France for Italy, in company with the Abbé Louis Gougenot, who had deserted from the magistrature—although he had obtained the post of "conseillier au Châtelet"—in order to take the "petit collet." Gougenot had some acquaintance with the arts, and was highly valued by the Academicians, who, during his journey with Greuze, elected him an honorary member of their body on account of his studies in mythology and allegory; his acquirements in these respects are said to have been largely utilized by them, but to Greuze they were of doubtful advantage, and he lost rather than gained by this visit to Italy in Gougenot's company. He had undertaken it probably in order to silence those who taxed him with ignorance of "great models of style," but the Italian subjects which formed the entirety of his contributions to the Salon of 1757 showed that he had been put on a false track, and he speedily returned to the source of his first inspiration. In 1759, 1761 ("L'Accordée de village"—Louvre), and 1763 Greuze exhibited with ever-increasing success; in 1765 he reached the zenith of his powers and reputation. In that year he was represented with no less than thirteen works, amongst which may be cited "La Jeune Fille qui pleure son oiseau mort," "La Bonne Mère," "Le Mauvais fils puni" (Louvre) and "La Malédiction paternelle" (Louvre). The Academy took occasion to press Greuze for his diploma picture, the execution of which had been long delayed, and forbade him to exhibit on their walls until he had complied with their regulations. "J'ai vu la lettre," says Diderot, "qui est un modèle d'honnêteté et d'estime; j'ai vu la réponse de Greuze, qui est un modèle de vanité et d'impertinence: il fallait appuyer cela d'un chef-d'œuvre, et c'est ce que Greuze n'a pas fait." Greuze wished to be received as a historical painter, and produced a work which he intended to vindicate his right to despise his qualifications as a *peintre de genre*. This unfortunate canvas—"Sevère et Caracalla" (Louvre)—was exhibited in 1769 side by side with Greuze's portrait of Jeaurat (Louvre) and his admirable "Petite Fille au chien noir." The Academicians received their new member with all due honours, but at the close of the ceremonies the Director addressed Greuze in these words—"Monsieur, l'Académie vous a reçu, mais c'est comme peintre de genre; elle a eu égard à vos anciennes productions, qui sont excellentes, et elle a fermé les yeux sur celle-ci, qui n'est digne ni d'elle ni de vous." Greuze, greatly incensed, quarrelled with his *confrères*, and ceased to exhibit until, in 1804, the Revolution had thrown open the doors of the Academy to all the world. In the following year, on the 4th of March 1805, he died in the Louvre in great poverty. He had been in receipt of considerable wealth, which he had dissipated by extravagance and bad management, so that during his closing years he was forced even to solicit commissions which his enfeebled powers no longer enabled him to carry out with success. The brilliant reputation which Greuze acquired seems to have been due, not to his acquirements as a painter—for his practice is evidently that current in his own day—but to the character of the subjects which he treated. That return to nature which inspired Rousseau's attacks upon an artificial civilization demanded expression in art. Diderot, in *Le Fils naturel et le père de famille*, tried to turn the vein of domestic drama to account on the stage; that which he tried and failed to do Greuze, in painting, achieved with extraordinary success, although his works, like the plays of Diderot, were affected by that very artificiality against which they protested. The touch of melodramatic exaggeration, however, which runs through them finds an apology in the firm and brilliant play of line, in the freshness and vigour of the flesh tints, in the enticing softness of expression (often obtained by almost an abuse of *méplats*), by the alluring air of health and youth, by the sensuous attractions, in short, with which Greuze invests his lessons of bourgeois morality. As Diderot said of "La Bonne Mère," "ça prêche la population;" and a certain piquancy of contrast is the result which never

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fails to obtain admirers. "La Jeune Fille à l'agneau" fetched, indeed, at the Pourtalès sale in 1865, no less than 1,000,200 francs. One of Greuze's pupils, Madame Le Doux, imitated with success the manner of her master; his daughter and granddaughter, Madame de Valory, also inherited some traditions of his talent. Madame de Valory published in 1813 a comédie-vaudeville, *Greuze, ou l'accordée de village*, to which she prefixed a notice of her grandfather's life and works, and the *Salons* of Diderot also contain, besides many other particulars, the story at full length of Greuze's quarrel with the Academy. Four of the most distinguished engravers of that date, Massard père, Flipart, Gaillard and Levasseur, were specially entrusted by Greuze with the reproduction of his subjects, but there are also excellent prints by other engravers, notably by Cars and Le Bas.

See also Normand, *J. B. Greuze* (1892). (E. F. S. D.)

GREVILLE, CHARLES CAVENDISH FULKE (1794–1865), English diarist, a great-grandson by his father of the 5th earl of Warwick, and son of Lady Charlotte Bentinck, daughter of the duke of Portland, formerly a leader of the Whig party, and first minister of the crown, was born on the 2nd of April 1794. Much of his childhood was spent at his grandfather's house at Bulstrode. He was one of the pages of George III., and was educated at Eton and Christ Church, Oxford; but he left the university early, having been appointed private secretary to Earl Bathurst before he was twenty. The interest of the duke of Portland had secured for him the secretaryship of the island of Jamaica, which was a sinecure office, the duties being performed by a deputy, and the reversion of the clerkship of the council. Greville entered upon the discharge of the duties of clerk of the council in ordinary in 1821, and continued to perform them for nearly forty years. He therefore served under three successive sovereigns,—George IV., William IV. and Victoria,—and although no political or confidential functions are attached to that office, it is one which brings a man into habitual intercourse with the chiefs of all the parties in the state. Well-born, well-bred, handsome and accomplished, Greville led the easy life of a man of fashion, taking an occasional part in the transactions of his day and much consulted in the affairs of private life. Until 1855 when he sold his stud he was an active member of the turf, and he trained successively with Lord George Bentinck, and with the duke of Portland. But the celebrity which now attaches to his name is entirely due to the posthumous publication of a portion of a Journal or Diary which it was his practice to keep during the greater part of his life. These papers were given by him to his friend Mr Henry Reeve a short time before his death (which took place on the 18th of January 1865), with an injunction that they should be published, as far as was feasible, at not too remote a period after the writer's death. The journals of the reigns of George IV. and William IV. (extending from 1820 to 1837) were accordingly so published in obedience to his directions about ten years after that event. Few publications have been received with greater interest by the public; five large editions were sold in little more than a year, and the demand in America was as great as in England. These journals were regarded as a faithful record of the impressions made on the mind of a competent observer, at the time, by the events he witnessed and the persons with whom he associated. Greville did not stoop to collect or record private scandal. His object appears to have been to leave behind him some of the materials of history, by which the men and actions of his own time would be judged. He records not so much public events as the private causes which led to them; and perhaps no English memoir-writer has left behind him a more valuable contribution to the history of the 19th century. Greville published anonymously, in 1845, a volume on the *Past and Present Policy of England to Ireland*, in which he advocated the payment of the Roman Catholic clergy; and he was also the author of several pamphlets on the events of his day.

His brother, HENRY GREVILLE (1801–1872), attaché to the British embassy in Paris from 1834 to 1844, also kept a diary, of which part was published by Viscountess Enfield, *Leaves from the Diary of Henry Greville* (London, 1883–1884).

See the preface and notes to the *Greville Memoirs* by Henry Reeve. The memoirs appeared in three sets—one from 1817 to 1837 (London, 1875, 3 vols.), and two for the period from 1837 to 1860, three volumes in 1885 and two in 1887. When the first series appeared in 1875 some passages caused extreme offence. The copies issued were as far as possible recalled and passages suppressed.

GRÉVIN, JACQUES (*c.* 1539–1570), French dramatist, was born at Clermont about 1539. He studied medicine at the university of Paris. He became a disciple of Ronsard, and was one of the band of dramatists who sought to introduce the classical drama in France. As Sainte-Beuve points out, the comedies of Grévin show considerable affinity with the farces and *sotties* that preceded them. His first play, *La Mauberline*, was lost, and formed the basis of a new comedy, *La Trésorière*, first performed at the college of Beauvais in 1558, though it had been originally composed at the desire of Henry II. to celebrate the marriage of Claude, duchess of Lorraine. In 1560 followed the tragedy of *Jules César*, imitated from the Latin of Muret, and a comedy, *Les Ébahis*, the most important but also the most indecent of his works. Grévin was also the author of some medical works and of miscellaneous poems, which were praised by Ronsard until the friends were separated by religious differences. Grévin became in 1561 physician and counsellor to Margaret of Savoy, and died at her court in Turin in 1570.

The *Théâtre* of Jacques Grévin was printed in 1562, and in the *Ancien Théâtre français*, vol. iv. (1855–1856). See L. Pinvert, *Jacques Grévin* (1899).

GRÉVY, FRANÇOIS PAUL JULES (1813–1891), President of the French Republic, was born at Mont-sous-Vaudrey in the Jura, on the 15th of August 1813. He became an advocate in 1837, and, having steadily maintained republican principles under the Orleans monarchy, was elected by his native department to the Constituent Assembly of 1848. Foreseeing that Louis Bonaparte would be elected president by the people, he proposed to vest the chief authority in a president of the Council elected and removable by the Assembly, or in other words, to suppress the Presidency of the Republic. After the *coup d'état* this proposition gained Grévy a reputation for sagacity, and upon his return to public life in 1868 he took a prominent place in the republican party. After the fall of the Empire he was chosen president of the Assembly on the 16th of February 1871, and occupied this position till the 2nd of April 1876, when he resigned on account of the opposition of the Right, which blamed him for having called one of its members to order in the session of the previous day. On the 8th of March 1876 he was elected president of the Chamber of Deputies, a post which he filled with such efficiency that upon the resignation of Marshal MacMahon he seemed to step naturally into the Presidency of the Republic (30th January 1879), and was elected without opposition by the republican parties (see FRANCE: *History*). Quiet, shrewd, attentive to the public interest and his own, but without any particular distinction, he would have left an unblemished reputation if he had not unfortunately accepted a second term (18th December 1885). Shortly afterwards the traffic of his son-in-law (Daniel Wilson) in the decorations of the Legion of Honour came to light. Grévy was not accused of personal participation in these scandals, but he was somewhat obstinate in refusing to realize that he was responsible indirectly for the use which his relative had made of the Élysée, and it had to be unpleasantly impressed upon him that his resignation was inevitable (2nd December 1887). He died at Mont-sous-Vaudrey on the 9th of September 1891. He owed both his success and his failure to the completeness with which he represented the particular type of the thrifty, generally sensible and patriotic, but narrow-minded and frequently egoistic *bourgeois*.

See his *Discours politiques et judiciaires, rapports et messages . . . accompagnés de notices historiques et précédés d'une introduction par L. Delabrousse* (2 vols., 1888).

GREW, NEHEMIAH (1641–1712), English vegetable anatomist and physiologist, was the only son of Obadiah Grew (1607–1688), Nonconformist divine and vicar of St Michael's, Coventry, and was born in Warwickshire in 1641. He graduated at Cambridge in 1661, and ten years later took the degree of M.D. at Leiden,

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his thesis being *Disputatio medico-physica . . . de liquore nervoso.* He began observations on the anatomy of plants in 1664, and in 1670 his essay, *The Anatomy of Vegetables begun*, was communicated to the Royal Society by Bishop Wilkins, on whose recommendation he was in the following year elected a fellow. In 1672, when the essay was published, he settled in London, and soon acquired an extensive practice as a physician. In 1673 he published his *Idea of a Physiological History*, which consisted of papers he had communicated to the Royal Society in the preceding year, and in 1677 he succeeded Henry Oldenburg as secretary of the society. He edited the *Philosophical Transactions* in 1678–1679, and in 1681 he published "by request" a descriptive catalogue of the rarities preserved at Gresham College, with which were printed some papers he had read to the Royal Society on the *Comparative Anatomy of Stomacks and Guts*. In 1682 appeared his great work on the *Anatomy of Plants*, which also was largely a collection of previous publications. It was divided into four books, *Anatomy of Vegetables begun*, *Anatomy of Roots*, *Anatomy of Trunks* and *Anatomy of Leaves, Flowers, Fruits and Seeds*, and was illustrated with eighty-two plates, while appended to it were seven papers mostly of a chemical character. Among his other publications were *Sea-water made Fresh* (1684), the *Nature and Use of the Salt contained in Epsom and such other Waters* (1697), which was a rendering of his *Tractatus de salis . . . usu* (1695), and *Cosmologia sacra* (1701). He died suddenly on the 25th of March 1712. Linnaeus named a genus of trees *Grewia* (nat. ord. Tiliaceae) in his honour.

GREY, CHARLES GREY, 2ND EARL (1764–1845), English statesman, was the eldest surviving son of General Sir Charles Grey, afterwards 1st Earl Grey. He was born at his father's residence, Fallodon, near Alnwick, on the 13th of March 1764. General Grey (1729–1807), who was a younger son of the house of Grey of Howick, one of the most considerable territorial families in Northumberland, had already begun a career of active service which, like the political career of his son, covered nearly half a century. Before the latter was born, General Grey had served on the staff of Prince Ferdinand of Brunswick in the Seven Years' War and had been wounded at Minden. While the son was making verses at Eton, the father was serving against the revolted colonists in Pennsylvania and New Jersey, and while the young member for Northumberland was denouncing Pitt's war against the Convention, the veteran soldier was destroying the remnant of the French colonial empire by the capture of Martinique and Guadeloupe. When Napoleon threatened an invasion, General Grey took the command of the southern district, and at the peace of Amiens he was rewarded with a peerage, as Baron Grey of Alnwick, being created in 1806 Earl Grey and Viscount Howick. His elder brother, Sir Henry Grey of Howick, the head of the family, had supported the government in parliament. But the political career of young Grey, who was heir-presumptive to the family estates, took a different complexion.

Young Grey expected to reoccupy the seat which had been his uncle's; and his early years were spent in preparation for a parliamentary career. He was sent to Eton, and proceeded thence to Cambridge. William Pitt, a youth five years older, was then in residence as a master of arts, studiously paying court to the Whigs of the university; and at the general election of 1780 he came forward as a candidate for the academical seat. His name stood last on the poll, but he was brought in elsewhere, and his first speech proved him a man of the first mark. The unparalleled successes which followed portended grave changes. Pitt's elevation to the premiership, his brilliant and hard-fought battle in the house, and his complete rout of the Whig party at the general election of 1784, when he came in for Cambridge at the head of the poll, threatened the great territorial interest with nothing less than extinction. It was to this interest that Grey belonged; and hence, when at length returned for Northumberland in 1786, he at once came forward as a vigorous assailant of the government of Pitt. He was hailed by the opposition, and associated with Fox, Burke and Sheridan as a manager in the Hastings impeachment. During the nineteen years which remained of the career of Fox, he followed the great Whig statesman with absolute fidelity, and succeeded him as leader of the party. The shortcomings of Fox's statesmanship were inherited by Grey. Both were equally devoid of political originality, shunned the severer labours of the politician, and instinctively feared any deviation from the traditions of their party. Such men cannot save a party in its decadence, and the history of Fox and Grey has been aptly termed the history of the decline and fall of Whiggism.

The stunning blow of 1784 was the first incident in this history. Its full significance was not at once perceived. An opposition, however weak in the beginning, generally has a tendency to revive, and Grey's early successes in the house helped to revive the Foxites. The European situation became favourable to this revival. The struggle in France for popular rights, culminating in the great Revolution, was watched by Fox with interested sympathy. He affected to regard the domination of Pitt as the domination of the crown, and as leading logically to absolutism, and saw in that popular sympathy for the French Revolution which naturally arose in England an instrument which might be employed to overthrow this domination.

But Pitt gathered the fruits of the windfall. The spread of "Jacobinism," or "French principles," became the pretext on which the stronger half of the opposition went over to the government. Burke led the movement in the Commons, the duke of Portland and Lord Fitzwilliam in the Lords, and with this second incident in the Whig decline began the difficulties of Grey's career. The domination of the premier had already stirred the keenest resentment in the younger and more ambitious members of the Whig party. Freed from the restraint of the steadier politicians under Burke and Portland, the residuum under Fox fell into a series of grave mistakes. Of this residuum Grey became the moving spirit, for though Fox did not check their activity, he disclaimed the responsibility of their policy. Fox had refused to condemn "French principles," and denounced the war with France; but he would take no part in exciting agitation in England. It was otherwise with the restless spirits among whom Grey was found. Enraged by the attitude of Pitt, which was grounded on the support of the constituencies as they then stood, the residuum plotted an ill-timed agitation for parliamentary reform.

The demand for parliamentary reform was as yet in a rudimentary stage. Forty years later it had become the demand of an unenfranchised nation, disabused by a sudden spread of political and economical knowledge. It was as yet but the occasional instrument of the scheming politician. Chatham had employed the cry in this sense. The Middlesex agitators had done the same; even the premier of the time, after his accession to power, had sought to strengthen his hands in the same way. But Pitt's hands were now strengthened abundantly; whereas the opposition had nothing to lose and much to gain by such a measure. The cry for reform thus became their natural expedient. Powerless to carry reform in the House, they sought to overawe parliament by external agitation, and formed the Society of the Friends of the People, destined to unite the forces of all the "patriotic" societies which already existed in the country, and to pour their violence irresistibly on a terrified parliament. Grey and his friends were enrolled in his portentous association, and presented in parliament its menacing petitions. Such petitions, which were in fact violent impeachments of parliament itself, proceeding from voluntary associations having no corporate existence, had been hitherto unknown in the English parliament. They had been well known in the French assembly. They had heralded and furthered the victory of the Jacobins, the dissolution of the constitution, the calling of the Convention and the fall of the monarchy.

The Society of the Friends of the People was originally an after-dinner folly, extemporized at the house of a man who afterwards gained an earldom by denouncing it as seditious. Fox discountenanced it, though he did not directly condemn it; but Grey was overborne by the fierce Jacobinism of Lauderdale, and avowed himself the parliamentary mouthpiece of this dangerous

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agitation. But Pitt, strong in his position, cut the ground from under Grey's feet by suppressing the agitation with a strong hand. The suspension of the Habeas Corpus Act, the Gagging Acts and the state prosecutions form a painful historical episode. But the discredit belongs as much to Grey and Lauderdale as to Pitt. Grey always spoke regretfully of his share in the movement. "One word from Fox," he said, "would have kept me out of all the mess of the Friends of the People. But he never spoke it."

It was Grey who moved the impeachment of Pitt, and he next promoted the equally foolish "Secession." Since the parliament did not properly represent the nation, and refused to reform itself or to impeach the minister, nothing remained but to disown it; and the opposition announced their intention of "seceding," or systematically absenting themselves from their places in parliament. This futile movement was originated by Grey, Lauderdale and the duke of Bedford. It obtained a somewhat wider support. It suited the languor of some dispirited politicians like Fox, and the avarice of some lawyers in large practice like Erskine; but sensible politicians at once condemned it. It directly ignored parliamentary government, and amounted to nothing but a pettish threat of revolution. "Secession," said Lord Lansdowne, with characteristic shrewdness, "either means rebellion, or it is nonsense." Pitt easily dashed this feeble weapon from the hands of his opponents. He roused jealousy in the absent by praising the parts and the patriotism of the rest, and thus gradually brought them back. Grey himself reappeared to protest against the union with Ireland.

When Pitt died in 1806 nothing could prevent the reunited opposition from coming into power, and thus the Broad-bottom ministry was formed under Fox. On his death Grenville became premier, and Grey, now Lord Howick, foreign secretary, and leader of the House of Commons. Disunion, always the bane of English Liberalism, lurked in the coalition, and the Foxites and Grenvillites were only ostensibly at one. Grey opposed the war policy of Grenville; and this policy was not more successful than it had been in the hands of Pitt. And the change from the leadership of Fox to that of Grenville was only too perceptible. Both in court and country Grenville affected the role of Pitt, and assumed a stiff and peremptory attitude which ill became him. An ill-advised dissolution weakened their majority; they lost ground by the "delicate investigation" into the conduct of the princess of Wales; Lord Henry Petty's budget was too specious to command confidence; and the king, fully aware of their weak situation, resolved to get rid of them. When they proposed to concede a portion of the Catholic claims, George refused and demanded of them an undertaking never to propose such a measure again. This was refused, and the Grenville-Grey cabinet retired in March 1807. In the same year Grey's father died, and Grey went to the Upper House. Opposition united Grey and Grenville for a time, but the parties finally split on the old war question. When Napoleon returned from Elba in 1815, and once more seized the government of France, the same question arose which had arisen in 1792, Was England to go to war for the restoration of the Bourbons? Grenville followed the traditions of Pitt, and supported the ministry in at once renewing hostilities. Grey followed those of Fox, and maintained the right of France to choose her own governors, and the impossibility of checking the reaction in the emperor's favour. The victory of Waterloo put an end to the dispute, but the disruption became permanent. The termination of the war, and the cessation of all action in common, reduced the power of the opposition to nothing. Grenville retired from public life, and his adherents reinforced the ministry. Little remained for the Whigs to do. But the persecution of the queen afforded an opportunity of showing that the ministry were not omnipotent; and the part taken on that occasion by Grey won him at once the increased respect of the nation and the undying aversion of George IV. It sealed the exclusion of himself and his few friends from office during the king's life; and when in 1827 Grey came forth to denounce the ministry of Canning, he declared that he stood alone in the political world. His words were soon justified, for when Lord Goderich resigned, the remnant which had hitherto supported Grey, hastened to support the ministry of the duke of Wellington.

We now reach the principal episode in Grey's career. In 1827 he seemed to stand forth the solitary and powerless relic of an extinct party. In 1832 we find that party restored to its old numbers and activity, supreme in parliament, popular in the nation, and Lord Grey at its head. The duke of Wellington's foolish declaration against parliamentary reform, made in a season of great popular excitement, suddenly deprived him of the confidence of the country, and a coalition of the Whigs and Canningites became inevitable. The Whigs had in 1827 supported the Canningites; the latter now supported the Whigs, of whom Grey remained the traditional head. George IV. was dead, and no obstacle existed to Grey's elevation. Grey was sent for by William IV. in November 1830, and formed a coalition cabinet, pledged to carry on the work in which the duke of Wellington had faltered. But Grey himself was the mere instrument of the times. An old-fashioned Whig, he had little personal sympathy with the popular cause, though he had sometimes indicated a certain measure of reform as necessary. When he took office, he guessed neither the extent to which the Reform Act would go, nor the means by which it would be carried. That he procured for the country a measure of constitutional reform for which he had agitated in his youth was little more than a coincidence. In his youth he had put himself at the head of a frantic agitation against parliament, because he there found himself powerless. In his old age the case was reversed. Suddenly raised to a position of authority in the country, he boldly stood between parliament, as then constituted, and the formidable agitation which now threatened it and by a forced reform saved it from revolution. In his youth he had assailed Pitt's administration because Pitt's administration threatened with extinction the political monopoly of that landed interest to which he belonged. In his old age, on the contrary, unable to check the progress of the wave, he swam with it, and headed the movement which compelled that landed interest to surrender its monopoly.

The second reading of the first Reform Bill was carried in the Commons by a majority of one. This was equivalent to a defeat, and further failures precipitated a dissolution. The confidence which the bold action of the ministry had won was soon plainly proved, for the second reading was carried in the new parliament by a majority of 136. When the bill had at length passed the Commons after months of debate, it was Grey's task to introduce it to the Lords. It was rejected by a majority of 41. The safety of the country now depended on the prudence and courage of the ministry. The resignation of Grey and his colleagues was dreaded even by the opposition, and they remained in office with the intention of introducing a third Reform Bill in the next session. The last months of 1831 were the beginning of a political crisis such as England had not seen since 1688. The two extreme parties, the Ultra-Radicals and the Ultra-Tories, were ready for civil war. Between them stood the ministry and the majority of intelligent peace-loving Englishmen; and their course of action was soon decided. The bill must be passed, and there were but two ways of passing it. One was to declare the consent of the House of Lords unnecessary to the measure, the other to create, if necessary, new peers in sufficient number to outvote the opposition. These two expedients did not in reality differ. To swamp the house in the way proposed would have been to destroy it. The question whether the ministry should demand the king's consent to such a creation, if necessary, was debated in the cabinet in September. Brougham proposed it, and gradually a majority of the cabinet were won over. Grey had at first refused to employ even the threat of so unconstitutional a device as a means to the proposed end. But his continued refusal would have broken up the ministry, and the breaking up of the ministry must now have been the signal for revolution. The second reading in the Commons was passed in December by a majority of 162, and on New-Year's day 1832 the majority of the cabinet resolved on demanding power to carry it in the Lords by a creation of peers. Grey carried the resolution to the king.

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Some time still remained before the bill could be committed and read a third time. It was not until the 9th of April that Grey moved the second reading in the Lords. A sufficient number of the opposition temporized; and the second reading was allowed to pass by a majority of nine. Their intention was to mutilate the bill in committee. The Ultra-Tories, headed by the duke of Wellington, had entered a protest against the second reading, but they were now politically powerless. The struggle had become a struggle on the one hand for the whole bill, to be carried by a creation of peers, and on the other for some mutilated measure. Grey's instinct divined that the crisis was approaching. Either the king must consent to swamp the House, or the ministry must cease to stand in the breach between the peers and the country. The king, a weak and inexperienced politician, had in the meantime been wrought upon by the temporizing leaders in the Lords. He was induced to believe that if the Commons should reject the mutilated bill when it was returned to them, and the ministry should consequently retire, the mutilated bill might be reintroduced and passed by a Tory ministry. He was deaf to all representations of the state of public opinion; and to the surprise of the ministry, and the terror and indignation of every man of sense in the country, he rejected their proposal and accepted their resignation, May 9, 1832. The duke of Wellington undertook the hopeless task of constructing a ministry which should pass a restricted or sham Reform Bill. The only man who could have made the success of such a ministry even probable was Peel, and Peel's conscience and good sense forbade the attempt. He refused, and after a week of the profoundest agitation throughout the country, the king, beaten and mortified, was forced to send for Grey and Brougham. On being told that his consent to the creation of peers was the only condition on which they could undertake the government, he angrily and reluctantly yielded. The chancellor, with cool forethought, demanded this consent in writing. Grey thought such a demand harsh and unnecessary. "I wonder," he said to Brougham, when the interview was over, "you could have had the heart to press it." But Brougham was inexorable, and the king signed the following paper: "The king grants permission to Earl Grey, and to his chancellor, Lord Brougham, to create such a number of peers as will be sufficient to ensure the passing of the Reform Bill, first calling up peers' eldest sons.—WILLIAM R., Windsor, May 17, 1832."

Grey had now won the game. There was no danger that he would have to resort to the expedient which he was authorized to employ. The introduction of sixty new peers would have destroyed the opposition, but it would have been equivalent to the abolition of the House. The king's consent made known, a sufficient number of peers were sure to withdraw to enable the bill to pass, and thus the dignity of both king and peerage would be saved. The duke of Wellington headed this movement on the part of the opposition; and the third reading of the bill was carried in the Lords by a majority of 84.

It is well known that in after years both Grey and Brougham disclaimed any intention of executing their threat. If this were so, they must have merely pretended to brave a danger which they secretly feared to face, and intended to avoid; and the credit of rescuing the country would belong to the duke of Wellington and the peers who seceded with him. To argue such cowardice in them from statements made when the crisis was long past, and when they were naturally willing to palliate the rough policy which they were forced to adopt, would be to set up a needless and unjustifiable paradox. Nothing else in the career of either Grey or Brougham leads us to suppose them capable of the moral baseness of yielding up the helm of state, in an hour of darkness and peril, to reckless and unskilled hands. Such would have been the result if they had lacked the determination to carry out their programme to the end. The influence of every statesman in the country would then have been extinguished, and the United Kingdom would have been absolutely in the hands of O'Connell and Orator Hunt.

Grey took but little part in directing the legislation of the reformed parliament. Never anxious for power, he had executed the arduous task of 1831–1832 rather as a matter of duty than of inclination, and wished for an opportunity of retiring. Such an opportunity very shortly presented itself. The Irish policy of the ministry had not conciliated the Irish people, and O'Connell denounced them with the greatest bitterness. On the renewal of the customary Coercion Bill, the ministry was divided on the question whether to continue to the lord-lieutenant the power of suppressing public meetings. Littleton, the Irish secretary, was for abolishing it; and with the view of conciliating O'Connell, he informed him that the ministry intended to abandon it. But the result proved him to have been mistaken, and O'Connell, with some reason supposing himself to have been duped, called on Littleton to resign his secretaryship. It had also transpired in the discussion that Lord Althorp, the leader of the House of Commons, was privately opposed to retaining those clauses which it was his duty to push through the house. Lord Althorp therefore resigned, and Grey, who had lately passed his seventieth year, took the opportunity of resigning also. It was his opinion, it appeared, which had overborne the cabinet in favour of the public meeting clauses; and his voluntary withdrawal enabled Lord Althorp to return to his post and to proceed with the bill in its milder form. Grey was succeeded by Lord Melbourne; but no other change was made in the cabinet. Grey took no further part in politics. During most of his remaining years he continued to live in retirement at Howick, where he died on the 17th of July 1845, in his eighty-second year. By his wife Mary Elizabeth, only daughter of the first Lord Ponsonby, whom he married on the 18th of November 1794, he became the father of ten sons and five daughters. Grey's eldest son Henry (q.v.) became the 3rd earl, and among his other sons were General Charles Grey (1804–1870) and Admiral Frederick Grey (1805–1878).

In public life, Grey could always be upon occasion bold, strenuous and self-sacrificing; but he was little disposed for the active work of the politician. He was not one of those who took the statesman's duty "as a pleasure he was to enjoy." A certain stiffness and reserve ever seemed in the popular eye to hedge him in; nor was his oratory of the kind which stirs enthusiasm and delight. A tall, stately figure, fine voice and calm aristocratic bearing reminded the listener of Pitt rather than of Fox, and his speeches were constructed on the Attic rather than the Asiatic model. Though simple and straightforward, they never lacked either point or dignity; and they were admirably adapted to the audience to which they were addressed. The scrupulous uprightness of Grey's political and private character completed the ascendancy which he gained; and no politician could be named who, without being a statesman of the highest class, has left a name more enviably placed in English history. (E. J. P.)

GREY, SIR EDWARD, 3rd Bart. (1862–), English statesman, was educated at Winchester and at Balliol College, Oxford, and succeeded his grandfather, the 2nd baronet, at the age of twenty. He entered the House of Commons as Liberal member for Berwick-on-Tweed in 1885, but he was best known as a country gentleman with a taste for sport and as amateur champion tennis-player. His interest in politics was rather languid, but he was a disciple of Lord Rosebery, and in the 1892–1895 Liberal ministry he was under-secretary for foreign affairs. In this position he earned a reputation as a politician of thorough straightforwardness and grit, and as one who would maintain British interests independently of party; and he shared with Mr Asquith the reputation of being the ablest of the Imperialists who followed Lord Rosebery. Though outside foreign affairs he played but a small part in the period of Liberal opposition between 1895 and 1905, he retained public confidence as one who was indispensable to a Liberal administration. When Sir Henry Campbell-Bannerman's cabinet was formed in December 1905 he became foreign minister, and he retained this office when in April 1908 Mr Asquith became prime minister.

GREY, SIR GEORGE (1812–1898), British colonial governor and statesman, only son of Lieutenant-Colonel Grey of the 30th Foot, was born in Lisbon on the 14th of April 1812, eight days after the death of his father at the storming of Badajoz.

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He passed through Sandhurst with credit, and received his commission in 1829. His lieutenancy was dated 1831, and his captaincy 1839, in which year he sold out and left the army. In the early 'thirties he was quartered in Ireland, where the wretchedness of the poorer classes left a deep impression on his mind. In 1836 the Royal Geographical Society accepted his offer to explore the north-west region of West Australia, and accordingly he landed at Hanover Bay at the end of 1837. The surrounding country he found broken and difficult, and his hardships were aggravated by the tropical heat and his ignorance of the continent. In a skirmish with the natives, in which he was speared near the hip, he showed great courage, and put the assailants to flight, shooting the chief, who had wounded him. After a brave endeavour to continue his journey his wound forced him to retreat to the coast, whence he sailed to Mauritius to recruit. Next year he again essayed exploration, this time on the coast to the north and south of Shark's Bay. He had three whale-boats and an ample supply of provisions, but by a series of disasters his stores were spoilt by storms, his boats wrecked in the surf, and the party had to tramp on foot from Gantheaume Bay to Perth, where Grey, in the end, walked in alone, so changed by suffering that friends did not know him. In 1839 he was appointed governor-resident at Albany, and during his stay there married Harriett, daughter of Admiral Spencer, and also prepared for publication an account, in two volumes, of his expeditions. In 1840 he returned to England, to be immediately appointed by Lord John Russell to succeed Colonel Gawler as governor of South Australia. Reaching the colony in May 1841, he found it in the depths of a depression caused by mismanagement and insane land speculation. By rigorously reducing public expenditure, and forcing the settlers to quit the town and betake themselves to tilling their lands, and with the opportune help of valuable copper discoveries, Grey was able to aid the infant colony to emerge from the slough. So striking were his energy and determination that when, in 1845, the little settlements in New Zealand were found to be involved in a native war, and on the verge of ruin, he was sent to save them. The Maori chiefs in open rebellion were defeated, and made their submission. Another powerful leader suspected of fomenting discontent was arrested, and friendly chieftains were subsidized and honoured. Bands of the natives were employed in making government roads, and were paid good wages. The governor gained the veneration of the Maori tribes, in whose welfare he took a close personal interest, and of whose legends and myths he made a valuable and scholarly collection, published in New Zealand in 1855 and reprinted thirty years afterwards. With peace prosperity came to New Zealand, and the colonial office desired to give the growing settlements full self-government. Grey, arguing that this would renew war with the Maori, returned the constitution to Downing Street. But though the colonial office sustained him, he became involved in harassing disputes with the colonists, who organized an active agitation for autonomy. In the end a second constitution, partly framed by Grey himself, was granted them, and Grey, after eight years of despotic but successful rule, was transferred to Cape Colony. He had been knighted for his services, and had undoubtedly shown strength, dexterity and humanity in dealing with the whites and natives. In South Africa his success continued. He thwarted a formidable Kaffir rebellion in the Eastern Provinces, and pushed on the work of settlement by bringing out men from the German Legion and providing them with homes. He gained the respect of the British, the confidence of the Boers, the admiration and the trust of the natives. The Dutch of the Free State and the Basuto chose him as arbitrator of their quarrels. When the news of the Indian Mutiny reached Cape Town he strained every nerve to help Lord Canning, despatching men, horses, stores and £60,000 in specie to Bombay. He persuaded a detachment, then on its way round the Cape as a reinforcement for Lord Elgin in China, to divert its voyage to Calcutta. Finally, in 1859, Grey almost reached what would have been the culminating point of his career by federating South Africa. Persuaded by him, the Orange Free State passed resolutions in favour of this great step, and their action was welcomed by Cape Town. But the colonial office disapproved of the change, and when Grey attempted to persevere with it Sir Edward Bulwer Lytton recalled him. A change of ministry during his voyage to England displaced Sir Edward Bulwer Lytton. But though the duke of Newcastle reinstated Grey, it was with instructions to let federation drop. In 1861 the colonial office sent him, for the fourth time in succession, to take up a post of exceptional difficulty by again entrusting him with the governorship of New Zealand, where an inglorious native war in Taranaki had just been succeeded by an armed truce. Grey did his best to make terms with the rebels and to re-establish friendship with the Maori king and the land league of tribes formed to stop further sales of land to the whites. But the Maori had got guns and powder, and were suspicious and truculent. In vain Grey, supported by Bishop Selwyn and by Fox and the peace party among the settlers, strove to avert war. It came in 1863, and spread from province to province. Ten thousand regulars and as many colonial riflemen were employed to put it down. The imperial troops were badly handled, and Grey, losing patience, became involved in bitter disputes with their commanders. As an example to the former he himself attacked and captured Weraroa, the strongest of the Maori stockades, with a handful of militia, a feat which delighted the colonists, but made him as much unliked at the war office as he now was at Downing Street. Moreover, Grey had no longer real control over the militia. New Zealand had become a self-governing colony, and though he vindicated the colonists generally when libellous imputations of cruelty and land-grabbing were freely made against them in London, he crossed swords with his ministers when the latter confiscated three million acres of tribal land belonging to the insurgent Maori. Yet through all these troubles progress was made; many successes were gained in 1866, chiefly by the colonial militia, and a condition of something like tranquillity had been reached in 1867, when he received a curt intimation from the duke of Buckingham that he was about to be superseded. The colonists, who believed he was sacrificed for upholding their interests and good name, bade farewell to him in 1868 in an outburst of gratitude and sympathy; but his career as a colonial governor was at an end. Returning to England, he tried to enter public life, delivered many able speeches advocating what later came to be termed Imperialism, and stood for Newark. Discouraged, however, by the official Liberals, he withdrew and turned again to New Zealand. In 1872 he was given a pension of £1000 a year, and settled down on the island of Kawau, not far from Auckland, which he bought, and where he passed his leisure in planting, gardening and collecting books. In 1875, on the invitation of the Auckland settlers, he became superintendent of their province, and entered the New Zealand House of Representatives to resist the abolition of the provincial councils of the colony, a change then being urged on by Sir Julius Vogel in alliance with the Centralist Party. In this he failed, but his eloquence and courage drew round him a strong Radical following, and gave him the premiership in 1877. Manhood suffrage, triennial parliaments, a land-tax, the purchase of large estates and the popular election of the governor, were leading points of his policy. All these reforms, except the last, he lived to see carried; none of them were passed by him. A commercial depression in 1879 shook his popularity, and on the fall of his ministry in 1879 he was deposed, and for the next fifteen years remained a solitary and pathetic figure in the New Zealand parliament, respectfully treated, courteously listened to, but never again invited to lead. In 1891 he came before Australia as one of the New Zealand delegates to the federal convention at Sydney, and characteristically made his mark by standing out almost alone for "one man one vote" as the federal franchise. This point he carried, and the Australians thronged to hear him, so that his visits to Victoria and South Australia were personal triumphs. When, too, in 1894, he quitted New Zealand for London, some reparation was at last made him by the imperial government; he was called to the privy council, and graciously received by Queen Victoria on his visit to Windsor. Thereafter

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he lived in London, and died on the 20th of September 1898. He was given a public funeral at St Paul's. Grey was all his life a collector of books and manuscripts. After leaving Cape Colony, he gave his library to Cape Town in 1862; his subsequent collection, which numbered 12,000 volumes, he presented to the citizens of Auckland in 1887. In gratitude the people of Cape Town erected a statue of him opposite their library building.

Lives of Sir George Grey have been written by W. L. and L. Rees (1892), Professor G. C. Henderson (1907) and J. Collier (1909).
(W. P. R.)

GREY, HENRY GREY, 3RD EARL (1802–1894), English statesman, was born on the 28th of December 1802, the son of the 2nd Earl Grey, prime minister at the time of the Reform Bill of 1832. He entered parliament in 1826, under the title of Viscount Howick, as member for Winchilsea, which constituency he left in 1831 for Northumberland. On the accession of the Whigs to power in 1830 he was made under-secretary for the colonies, and laid the foundation of his intimate acquaintance with colonial questions. He belonged at the time to the more advanced party of colonial reformers, sharing the views of Edward Gibbon Wakefield on questions of land and emigration, and resigned in 1834 from dissatisfaction that slave emancipation was made gradual instead of immediate. In 1835 he entered Lord Melbourne's cabinet as secretary at war, and effected some valuable administrative reforms, especially by suppressing malpractices detrimental to the troops in India. After the partial reconstruction of the ministry in 1839 he again resigned, disapproving of the more advanced views of some of his colleagues. These repeated resignations gave him a reputation for crotchetiness, which he did not decrease by his disposition to embarrass his old colleagues by his action on free trade questions in the session of 1841. During the exile of the Liberals from power he went still farther on the path of free trade, and anticipated Lord John Russell's declaration against the corn laws. When, on Sir Robert Peel's resignation in December 1845, Lord John Russell was called upon to form a ministry, Howick, who had become Earl Grey by the death of his father in the preceding July, refused to enter the new cabinet if Lord Palmerston were foreign secretary (see J. R. Thursfield in vol. i. and Hon. F. H. Baring in vol. xxiii. of the *English Historical Review*). He was greatly censured for perverseness, and particularly when in the following July he accepted Lord Palmerston as a colleague without remonstrance. His conduct, nevertheless, afforded Lord John Russell an escape from an embarrassing situation. Becoming colonial secretary in 1846, he found himself everywhere confronted with arduous problems, which in the main he encountered with success. His administration formed an epoch. He was the first minister to proclaim that the colonies were to be governed for their own benefit and not for the mother-country's; the first systematically to accord them self-government so far as then seemed possible; the first to introduce free trade into their relations with Great Britain and Ireland. The concession by which colonies were allowed to tax imports from the mother-country *ad libitum* was not his; he protested against it, but was overruled. In the West Indies he suppressed, if he could not overcome, discontent; in Ceylon he put down rebellion; in New Zealand he suspended the constitution he had himself accorded, and yielded everything into the masterful hands of Sir George Grey. The least successful part of his administration was his treatment of the convict question at the Cape of Good Hope, which seemed an exception to his rule that the colonies were to be governed for their own benefit and in accordance with their own wishes, and subjected him to a humiliating defeat. After his retirement he wrote a history and defence of his colonial policy in the form of letters to Lord John Russell, a dry but instructive book (*Colonial Policy of Lord John Russell's Administration*, 1853). He resigned with his colleagues in 1852. No room was found for him in the Coalition Cabinet of 1853, and although during the Crimean struggle public opinion pointed to him as the fittest man as minister for war, he never again held office. During the remainder of his long life he exercised a vigilant criticism on public affairs. In 1858 he wrote a work (republished in 1864) on parliamentary reform; in 1888 he wrote another on the state of Ireland; and in 1892 one on the United States tariff. In his latter years he was a frequent contributor of weighty letters to *The Times* on land, tithes, currency and other public questions. His principal parliamentary appearances were when he moved for a committee on Irish affairs in 1866, and when in 1878 he passionately opposed the policy of the Beaconsfield cabinet in India. He nevertheless supported Lord Beaconsfield at the dissolution, regarding Mr Gladstone's accession to power with much greater alarm. He was a determined opponent of Mr Gladstone's Home Rule policy. He died on the 9th of October 1894. None ever doubted his capacity or his conscientiousness, but he was generally deemed impracticable and disagreeable. Prince Albert, however, who expressed himself as ready to subscribe to all Grey's principles, and applauded him for having principles, told Stockmar that, although dogmatic, he was amenable to argument; and Sir Henry Taylor credits him with "more freedom from littlenesses of feeling than I have met before in any public man." His chief defect was perceived and expressed by his original tutor and subsequent adversary in colonial affairs, Edward Gibbon Wakefield, who wrote, "With more than a common talent for understanding principles, he has no originality of thought, which compels him to take all his ideas from somebody; and no power of working out theory in practice, which compels him to be always in somebody's hands as respects decision and action."

The earl had no sons, and he was followed as 4th earl by his nephew Albert Henry George (b. 1851), who in 1904 became governor-general of Canada.

GREY, LADY JANE (1537–1554), a lady remarkable no less for her accomplishments than for her misfortunes, was the great-granddaughter of Henry VII. of England. Her descent from that king was traced through a line of females. His second daughter Mary, after being left a widow by Louis XII. of France, married Charles Brandon, duke of Suffolk, who was a favourite with her brother King Henry VIII. Of this marriage came two daughters, the elder of whom, Lady Frances Brandon, was married to Henry Grey, marquess of Dorset; and their issue, again, consisted of daughters only. Lady Jane, the subject of this article, was the eldest of three whom the marquess had by Lady Frances. Thus it will appear that even if the crown of England had ever fallen into the female line of descent from Henry VII., she could not have put in a rightful claim unless the issue of his elder daughter, Margaret, had become extinct. But Margaret had married James IV. of Scotland; and, though her descendant, James VI., was ultimately called to the English throne, Henry VIII. had placed her family after that of his second sister in the succession; so that, failing the lawful issue of Henry himself, Lady Jane would, according to this arrangement, have succeeded. It was to these circumstances that she owed her exceptional position in history, and became the victim of an ambition which was not her own.

She was born at her father's seat named Bradgate in Leicestershire about the year 1537. Her parents, though severe disciplinarians, bestowed more than ordinary care upon her education, and she herself was so teachable and delighted so much in study that she became the marvel of the age for her acquirements. She not only excelled in needlework and in music, both vocal and instrumental, but while still very young she had thoroughly mastered Latin, Greek, French and Italian. She was able to speak and write both Greek and Latin with an accuracy that satisfied even such critics as Ascham and her tutor Dr Aylmer, afterwards bishop of London. She also acquired some knowledge of at least three Oriental tongues, Hebrew, Chaldee and Arabic. In Ascham's *Schoolmaster* is given a touching account of the devotion with which she pursued her studies and the harshness she experienced from her parents. The love of learning was her solace; in reading Demosthenes and Plato she found a refuge from domestic unhappiness. When about ten years old she was placed for a time in the household of Thomas, Lord Seymour, who, having obtained her wardship, induced her parents to let her stay with him, even after the death of his wife, Queen

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Catherine Parr, by promising to marry her to his nephew, King Edward VI. Lord Seymour, however, was attainted of high treason and beheaded in 1549, and his brother, the duke of Somerset, made some overtures to the marquess of Dorset to marry her to his son the earl of Hertford. These projects, however, came to nothing. The duke of Somerset in his turn fell a victim to the ambition of Dudley, duke of Northumberland, and was beheaded three years after his brother. Meanwhile, the dukedom of Suffolk having become extinct by the deaths of Charles Brandon and his two sons, the title was conferred upon the marquess of Dorset, Lady Jane's father. Northumberland, who was now all-powerful, fearing a great reverse of fortune in case of the king's death, as his health began visibly to decline, endeavoured to strengthen himself by marriages between his family and those of other powerful noblemen, especially of the new-made duke of Suffolk. His three eldest sons being already married, the fourth, who was named Lord Guilford Dudley, was accordingly wedded to Lady Jane Grey about the end of May 1553. The match received the full approval of the king, who furnished the wedding apparel of the parties by royal warrant. But Edward's state of health warned Northumberland that he must lose no time in putting the rest of his project into execution. He persuaded the king that if the crown should descend to his sister Mary the work of the Reformation would be undone and the liberties of the kingdom would be in danger. Besides, both Mary and her sister Elizabeth had been declared illegitimate by separate acts of parliament, and the objections to Mary queen of Scots did not require to be pointed out. Edward was easily persuaded to break through his father's will and make a new settlement of the crown by deed. The document was witnessed by the signatures of all the council and of all but one of the judges; but those of the latter body were obtained only with difficulty by threats and intimidation.

Edward VI. died on the 6th July 1553, and it was announced to Lady Jane that she was queen. She was then but sixteen years of age. The news came upon her as a most unwelcome surprise, and for some time she resisted all persuasions to accept the fatal dignity; but at length she yielded to the entreaties of her father, her father-in-law and her husband. The better to mature their plans the cabal had kept the king's death secret for some days, but they proclaimed Queen Jane in the city on the 10th. The people received the announcement with manifest coldness, and a vintner's boy was even so bold as to raise a cry for Queen Mary, for which he next day had his ears nailed to the pillory and afterwards cut off. Mary, however, had received early intimation of her brother's death, and, retiring from Hunsdon into Norfolk, gathered round her the nobility and commons of those parts. Northumberland was despatched thither with an army to oppose her; but after reaching Newmarket he complained that the council had not sent him forces in sufficient numbers and his followers began to desert. News also came that the earl of Oxford had declared for Queen Mary; and as most of the council themselves were only seeking an opportunity to wash their hands of rebellion, they procured a meeting at Baynard's Castle, revoked their former acts as done under coercion, and caused the lord mayor to proclaim Queen Mary, which he did amid the shouts of the citizens. The duke of Suffolk was obliged to tell his daughter that she must lay aside her royal dignity and become a private person once more. She replied that she relinquished most willingly a crown that she had only accepted out of obedience to him and her mother, and her nine days' reign was over.

The leading actors in the conspiracy were now called to answer for their deeds. Northumberland was brought up to London a prisoner, tried and sent to the block, along with some of his partisans. The duke of Suffolk and Lady Jane were also committed to the Tower; but the former, by the influence of his duchess, procured a pardon. Lady Jane and her husband Lord Guilford Dudley were also tried, and received sentence of death for treason. This, however, was not immediately carried out; on the contrary, the queen seems to have wished to spare their lives and mitigated the rigour of their confinement. Unfortunately, owing to the general dislike of the queen's marriage with Philip of Spain, Sir Thomas Wyat soon after raised a rebellion in which the duke of Suffolk and his brothers took part, and on its suppression the queen was persuaded that it was unsafe to spare the lives of Lady Jane and her husband any longer. On hearing that they were to die, Lady Jane declined a parting interview with her husband lest it should increase their pain, and prepared to meet her fate with Christian fortitude. She and her husband were executed on the same day, on the 12th of February 1554, her husband on Tower Hill, and herself within the Tower an hour afterwards, amidst universal sympathy and compassion.

See Ascham's *Schoolmaster*; Burnet's *History of the Reformation*; Howard's *Lady Jane Grey*; Nicolas's *Literary Remains of Lady Jane Grey*; Tytler's *England under Edward VI. and Mary*; *The Chronicles of Queen Jane*, ed. J. G. Nichols; *The Accession of Queen Mary* (Guaran's narrative), ed. R. Garnett (1892); Foxe's *Acts and Monuments*.

GREY DE WILTON and GREY DE RUTHYN. The first Baron Grey de Wilton was Reginald de Grey, who was summoned to parliament as a baron in 1295 and who died in 1308. Reginald's son John, the 2nd baron (1268–1323), was one of the lords ordainers in 1310 and was a prominent figure in English politics during the reign of Edward II. The later barons Grey de Wilton were descended from John's eldest son Henry (d. 1342), while a younger son Roger (d. 1353) was the ancestor of the barons Grey de Ruthyn.

WILLIAM, 13TH LORD GREY DE WILTON (d. 1562), who succeeded to the title on the death of his brother Richard, about 1520, won great fame as a soldier by his conduct in France during the concluding years of Henry VIII.'s reign, and was one of the leaders of the victorious English army at the battle of Pinkie in 1547. He was then employed on the Scottish marches and in Scotland, and in 1549 he rendered good service in suppressing the rebellion in Oxfordshire and in the west of England; in 1551 he was imprisoned as a friend of the fallen protector, the duke of Somerset, and he was concerned in the attempt made by John Dudley, duke of Northumberland, to place Lady Jane Grey on the English throne in 1553. However, he was pardoned by Queen Mary and was entrusted with the defence of Guines. Although indifferently supported he defended the town with great gallantry, but in January 1558 he was forced to surrender and for some time he remained a prisoner in France. Under Elizabeth, Grey was again employed on the Scottish border, and he was responsible for the pertinacious but unavailing attempt to capture Leith in May 1560. He died at Cheshunt in Hertfordshire on the 14th/25th of December 1562.

He was described by William Cecil as "a noble, valiant, painful and careful gentleman," and his son and successor, Arthur, wrote *A Commentary of the Services and Charges of William, Lord Grey of Wilton, K.G.* This has been edited by Sir P. de M. Grey Egerton for the Camden Society (1847).

Grey's elder son ARTHUR, 14TH LORD GREY DE WILTON (1536–1593), was during early life with his father in France and in Scotland; he fought at the battle of St Quentin and helped to defend Guines and to assault Leith. In July 1580 he was appointed lord deputy of Ireland, and after an initial defeat in Wicklow was successful in reducing many of the rebels to a temporary submission. Perhaps the most noteworthy event during his tenure of this office was the massacre of 600 Italians and Spaniards at Smerwick in November 1580, an action for which he was responsible. Having incurred a heavy burden of debt Grey frequently implored the queen to recall him, and in August 1582 he was allowed to return to England (see E. Spenser, *View of the State of Ireland*, edited by H. Morley, 1890, and R. Bagwell, *Ireland under the Tudors*, vol. iii., 1890). While in Ireland Grey was served as secretary by Edmund Spenser, and in book v. of the *Faerie Queene* the poet represents his patron as a knight of very noble qualities named Artegall. As one of the commissioners who tried Mary queen of Scots, Grey defended the action of Elizabeth's secretary, William Davison, with regard to this matter, and he took part in the preparations for the defence of England against the Spaniards in 1588. His

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account of the defence of Guines was used by Holinshed in his *Chronicles*.

When he died on the 14th of October 1593 he was succeeded as 15th baron by his son THOMAS (d. 1614), who while serving in Ireland incurred the enmity of Robert Devereux, earl of Essex, and of Henry Wriothesley, earl of Southampton; and after fighting against Spain in the Netherlands he was a member of the court which sentenced these two noblemen to death in 1601. On the accession of James I. he was arrested for his share in the "Bye" plot, an attempt made by William Watson and others to seize the king. He was tried and sentenced to death, but the sentence was not carried out and he remained in prison until his death on the 9th of July 1614. He displayed both ability and courage at his trial, remarking after sentence had been passed, "the house of Wilton hath spent many lives in their prince's service and Grey cannot beg his." Like his father Grey was a strong Puritan. He left no children and his barony became extinct.

In 1784 Sir Thomas Egerton, Bart., a descendant in the female line of the 14th baron, was created Baron Grey de Wilton. He died without sons in September 1814, when his barony became extinct; but the titles of Viscount Grey de Wilton and earl of Wilton, which had been conferred upon him in 1801, passed to Thomas Grosvenor (1799–1882), the second son of his daughter Eleanor (d. 1846), and her husband Robert Grosvenor, 1st marquess of Westminster. Thomas took the name of Egerton and his descendants still hold the titles.

ROGER GREY, 1ST BARON GREY DE RUTHYN, who was summoned to parliament as a baron in 1324, saw much service as a soldier before his death on the 6th of March 1353. The second baron was his son Reginald, whose son REGINALD (*c.* 1362–1440) succeeded to the title on his father's death in July 1388. In 1410 after a long dispute the younger Reginald won the right to bear the arms of the Hastings family. He enjoyed the favour both of Richard II. and Henry IV., and his chief military exploits were against the Welsh, who took him prisoner in 1402 and only released him upon payment of a heavy ransom. Grey was a member of the council which governed England during the absence of Henry V. in France in 1415; he fought in the French wars in 1420 and 1421 and died on the 30th of September 1440. His eldest son, Sir John Grey, K.G. (d. 1439), who predeceased his father, fought at Agincourt and was deputy of Ireland in 1427. He was the father of EDMUND GREY (d. 1489), who succeeded his grandfather as Lord Grey de Ruthyn in 1440 and was created earl of Kent in 1465.

One of Reginald Grey's younger sons, Edward (1415–1457), succeeded his maternal grandfather as Baron Ferrers of Groby in 1445. He was the ancestor of the earls of Stamford and also of the Greys, marquesses of Dorset and dukes of Suffolk.

The barony of Grey de Ruthyn was merged in the earldom of Kent until the death of Henry, the 8th earl, in November 1639. It then devolved upon Kent's nephew Charles Longueville (1612–1643), through whose daughter Susan (d. 1676) it came to the family of Yelverton, who were earls of Sussex from 1717 to 1799. The next holder was Henry Edward Gould (1780–1810), a grandson of Henry Yelverton, earl of Sussex; and through Gould's daughter Barbara, marchioness of Hastings (d. 1858), it passed to the last marquess of Hastings, on whose death in 1868 the barony fell into abeyance, this being terminated in 1885 in favour of Hastings's sister Bertha (d. 1887), the wife of Augustus Wykeham Clifton. Their son, Rawdon George Grey Clifton (b. 1858), succeeded his mother as 24th holder of the barony.

GREYMOUTH, a seaport of New Zealand, the principal port on the west coast of South Island, in Grey county. Pop. (1906) 4569. It stands on the small estuary of the Grey or Mawhera river, has a good harbour, and railway communication with Hokitika, Reefton, &c., while the construction of a line to connect with Christchurch and Nelson was begun in 1887. The district is both auriferous and coal-bearing. Gold-dredging is a rich industry, and the coal-mines have attendant industries in coke, bricks and fire-clay. The timber trade is also well developed. The neighbouring scenery is picturesque, especially among the hills surrounding Lake Brunner (15 m. S.E.).

GREYTOWN (SAN JUAN DEL NORTE), the principal seaport on the Caribbean coast of Nicaragua, in the extreme south-eastern corner of the republic, and at the mouth of the northern channel of the San Juan river delta. Pop. (1905) about 2500. The town occupies the seaward side of a narrow peninsula, formed by the windings of the river. Most of its houses are raised on piles 2 or 3 ft. above the ground. The neighbourhood is unhealthy and unsuited for agriculture, so that almost all food-stuffs must be imported, and the cost of living is high. Greytown has suffered severely from the accumulation of sand in its once fine harbour. Between 1832 and 1848 Point Arenas, the seaward end of the peninsula, was enlarged by a sandbank more than 1 m. long; between 1850 and 1875 the depth of water over the bar decreased from about 25 ft. to 5 ft., and the entrance channel, which had been nearly ½m. wide, was almost closed. Subsequent attempts to improve the harbour by dredging and building jetties have only had partial success; but Greytown remains the headquarters of Nicaraguan commerce with Europe and eastern America. The village called America, 1 m. N., was built as the eastern terminus of a proposed interoceanic canal.

The harbour of San Juan, discovered by Columbus, was brought into further notice by Captain Diego Machuca, who in 1529 sailed down the river from Lake Nicaragua. The date of the first Spanish settlement on the spot is not known, but in the 17th century there were fortifications at the mouth of the river. In 1796 San Juan was made a port of entry by royal charter, and new defences were erected in 1821. In virtue of the protectorate claimed by Great Britain over the Mosquito Coast (*q.v.*), the Mosquito Indians, aided by a British force, seized the town in 1848 and occupied it until 1860, when Great Britain ceded its protectorate to Nicaragua by the treaty of Managua. This treaty secured religious liberty and trial by jury for all civil and criminal charges in Greytown; its seventh article declared the port free, but was never enforced.

GREYWACKE, or GRAUWACKE (a German word signifying a grey earthy rock), the designation, formerly more generally used by English geologists than at the present day, for impure, highly composite, gritty rocks belonging to the Palaeozoic systems. They correspond to the sandstones, grits and fine conglomerates of the later periods. Greywackes are mostly grey, brown, yellow or black, dull-coloured, sandy rocks which may occur in thick or thin beds along with slates, limestones, &c., and are abundant in Wales, the south of Scotland and the Lake district of England. They contain a very great variety of minerals, of which the principal are quartz, orthoclase and plagioclase, calcite, iron oxides and graphitic carbonaceous matters, together with (in the coarser kinds) fragments of such rocks as felsite, chert, slate, gneiss, various schists, quartzite. Among other minerals found in them are biotite and chlorite, tourmaline, epidote, apatite, garnet, hornblende and augite, sphene, pyrites. The cementing material may be siliceous or argillaceous, and is sometimes calcareous. As a rule greywackes are not fossiliferous, but organic remains may be common in the finer beds associated with them. Their component particles are usually not much rounded by attrition, and the rocks have often been considerably indurated by pressure and mineral changes, such as the introduction of interstitial silica. In some districts the greywackes are cleaved, but they show phenomena of this kind much less perfectly than the slates. Although the group is so diverse that it is difficult to characterize mineralogically, it has a well-established place in petrographical classifications, because these peculiar composite arenaceous deposits are very frequent among Silurian and Cambrian rocks, and rarely occur in Secondary or Tertiary systems. Their essential features are their gritty character and their complex composition. By increasing metamorphism greywackes frequently pass into mica-schists, chloritic schists and sedimentary gneisses. (J. S. F.)

GRIBEAUVAL, JEAN BAPTISTE DE (1715–1789), French artillery general, was the son of a magistrate of Amiens and was born there on the 15th of September 1715. He entered the French royal artillery in 1732 as a volunteer, and became an officer in 1735. For nearly twenty years regimental duty and scientific work occupied him, and in 1752 he became captain of a company of miners. A few years later he was employed in a military mission in Prussia. In 1757, being then a lieutenant-

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colonel, he was lent to the Austrian army on the outbreak of the Seven Years' War, and served as a general officer of artillery. The siege of Glatz and the defence of Schweidnitz were his principal exploits. The empress Maria Theresa rewarded him for his work with the rank of lieutenant field-marshal and the cross of the Maria Theresa order. On his return to France he was made *maréchal de camp*, in 1764 inspector of artillery, and in 1765 lieutenant-general and commander of the order of St Louis. For some years after this he was in disfavour at court, and he became first inspector of artillery only in 1776, in which year also he received the grand cross of the St Louis order. He was now able to carry out the reforms in the artillery arm which are his chief title to fame. See ARTILLERY; and for full details Gribeauval's own *Table des constructions des principaux attirails de l' artillerie . . . de M. de Gribeauval*, and the *règlement* for the French artillery issued in 1776. He died in 1789.

See Puységur in *Journal de Paris*, supplement of the 8th of July 1789; Chevalier de Passac, *Précis sur M. de Gribeauval* (Paris, 1816); Veyrines, *Gribeauval* (Paris, 1889), and Hennébert, *Gribeauval, lieutenant-général des armées du roy* (Paris, 1896).

GRIBOYEDOV, ALEXANDER SERGUEEVICH (1795–1829), Russian dramatic author, was born in 1795 at Moscow, where he studied at the university from 1810 to 1812. He then obtained a commission in a hussar regiment, but resigned it in 1816. Next year he entered the civil service, and in 1818 was appointed secretary of the Russian legation in Persia, whence he was transferred to Georgia. He had commenced writing early, and had produced on the stage at St Petersburg in 1816 a comedy in verse, translated from the French, called *The Young Spouses*, which was followed by other pieces of the same kind. But neither these nor the essays and verses which he wrote would have been long remembered but for the immense success gained by his comedy in verse, *Goré ot uma*, or "Misfortune from Intelligence" (Eng. trans. by N. Benardaky, 1857). A satire upon Russian society, or, as a high official styled it, "A pasquinade on Moscow," its plot is slight, its merits consisting in its accurate representation of certain social and official types—such as Famousoff, the lover of old abuses, the hater of reforms; his secretary, Molchanin, servile fawner upon all in office; the aristocratic young liberal and Anglomaniac, Repetiloff; contrasted with whom is the hero of the piece, Tchatsky, the ironical satirist, just returned from the west of Europe, who exposes and ridicules the weaknesses of the rest, his words echoing that outcry of the young generation of 1820 which reached its climax in the military insurrection of 1825, and was then sternly silenced by Nicholas. Griboyedov spent the summer of 1823 in Russia, completed his play and took it to St Petersburg. There it was rejected by the censorship. Many copies were made and privately circulated, but Griboyedov never saw it published. The first edition was printed in 1833, four years after his death. Only once did he see it on the stage, when it was acted by the officers of the garrison at Erivan. Soured by disappointment he returned to Georgia, made himself useful by his linguistic knowledge to his relative Count Paskievitch-Erivansky during a campaign against Persia, and was sent to St Petersburg with the treaty of 1828. Brilliantly received there, he thought of devoting himself to literature, and commenced a romantic drama, *A Georgian Night*. But he was suddenly sent to Persia as minister-plenipotentiary. Soon after his arrival at Teheran a tumult arose, caused by the anger of the populace against some Georgian and Armenian captives—Russian subjects—who had taken refuge in the Russian embassy. It was stormed, Griboyedov was killed (February 11, 1829), and his body was for three days so ill-treated by the mob that it was at last recognized only by an old scar on the hand, due to a wound received in a duel. It was taken to Tiflis, and buried in the monastery of St David. There a monument was erected to his memory by his widow, to whom he had been but a few months married.

GRIEG, EDVARD HAGERUP (1843–1907), Norwegian musical composer, was born on the 15th of June 1843 in Bergen, where his father, Alexander Grieg (*sic*), was English consul. The Grieg family were of Scottish origin, but the composer's grandfather, a supporter of the Pretender, left his home at Aberdeen after Charles Edward's defeat at Culloden, and went to Bergen, where he carried on business. The composer's mother, Gesine Hagerup, belonged to a pure Norwegian peasant family; and it is from the mother rather than from the father that Edvard Grieg derived his musical talent. She had been educated as a pianist and began to give her son lessons on the pianoforte when he was six years of age. His first composition, "Variations on a German melody," was written at the age of nine. A summer holiday in Norway with his father in 1858 seems to have exercised a powerful influence on the child's musical imagination, which was easily kindled at the sight of mountain and fjord. In the autumn of the same year, at the recommendation of Ole Bull, young Grieg entered the Leipzig Conservatorium, where he passed, like all his contemporaries, under the influence of the Mendelssohn and Schumann school of romantics. But the curriculum of academic study was too narrow for him. He dreamed half his time away and overworked during the other half. In 1862 he completed his Leipzig studies, and appeared as pianist and composer before his fellow-citizens of Bergen. In 1863 he studied in Copenhagen for a short time with Gade and Emil Hartmann, both composers representing a sentimental strain of Scandinavian temperament, from which Grieg emancipated himself in favour of the harder inspiration of Richard Nordraak. "The scales fell from my eyes," says Grieg of his acquaintance with Nordraak. "For the first time I learned through him to know the northern folk tunes and my own nature. We made a pact to combat the effeminate Gade-Mendelssohn mixture of Scandinavism, and boldly entered upon the new path along which the northern school at present pursues its course." Grieg now made a kind of crusade in favour of national music. In the winter of 1864–1865 he founded the Copenhagen concert-society Euterpe, which was intended to produce the works of young Norwegian composers. During the winters of 1865–1866 and 1869–1870 Grieg was in Rome. In the autumn of 1866 he settled in Christiania, where from 1867 till 1880 he conducted a musical union. From 1880 to 1882 he directed the concerts of the Harmonic Society in Bergen. In 1872 the Royal Musical Academy of Sweden made Grieg a member; in 1874 the Norwegian Storthing granted him an annual stipend of 1600 kronen. He had already been decorated with the Olaf order in 1873. In 1888 he played his pianoforte concerto and conducted his "two melodies for strings" at a Philharmonic concert in London, and visited England again in 1891, 1894 and 1896, receiving the degree of Mus.D. from the university of Cambridge in 1894. He died at Bergen on the 4th of September 1907.

As a composer Grieg's distinguishing quality is lyrical. Whether his orchestral works or his songs or his best pianoforte works are submitted to examination, it is almost always the note of song that tells. Sometimes, as in the music to Ibsen's *Peer Gynt*, or in the suite for stringed orchestra, *Aus Holbergs Zeit*, this characteristic is combined with a strong power for raising pictures in the listener's mind, and the romantic "programme" tendency in Grieg's music becomes clearer the farther writers like Richard Strauss carry this movement. Grieg's songs may be said to be generally the more spontaneous the more closely they conform to the simple model of the *Volkslied;* yet the much sung "Ich liebe dich" is a song of a different kind, which has hardly ever been surpassed for the perfection with which it depicts a strong momentary emotion, and it is difficult to ascribe greater merits to songs of Grieg even so characteristic as "Solvejg's Lied" and "Ein Schwan." The pianoforte concerto is brilliant and spontaneous; it has been performed by most pianists of the first rank, but its essential qualities and the pure nationality of its themes have been brought out to their perfection by one player only—the Norwegian pianist Knudsen. The first and second of Grieg's violin sonatas are agreeable, so free and artless is the flow of their melody. In his numerous piano pieces and in those of his songs which are devoid of a definitely national inspiration the impression made is less permanent. Bülow called Grieg the "Chopin of the North." The phrase is an exaggeration rather than an expression of the truth, for

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the range of the appeal in Chopin is far wider, nor has the national movement inaugurated by Grieg shown promise of great development. He is rather to be regarded as the pioneer of a musical mission which has been perfectly carried out by himself alone.

See La Mara, *Edvard Grieg* (Leipzig, 1898).

GRIESBACH, JOHANN JAKOB (1745–1812), German biblical critic, was born at Butzbach, a small town of Hesse-Darmstadt, where his father, Konrad Kaspar (1705–1777), was pastor, on the 4th of January 1745. He was educated at Frankfort-on-the-Main, and at the universities of Tübingen, Leipzig and Halle, where he became one of J. S. Semler's most ardent disciples. It was Semler who induced him to turn his attention to the textual criticism of the New Testament. At the close of his undergraduate career he undertook a literary tour through Germany, Holland, France and England. On his return to Halle, he acted for some time as *Privatdozent*, but in 1773 was appointed to a professorial chair; in 1775 he was translated to Jena, where the rest of his life was spent (though he received calls to other universities). He died on the 24th of March 1812. Griesbach's fame rests upon his work in New Testament criticism, in which he inaugurated a new epoch.

His critical edition of the New Testament first appeared at Halle, in three volumes, in 1774–1775. The first volume contained the first three Gospels, synoptically arranged; the second, the Epistles and the book of Revelation. All the historical books were reprinted in one volume in 1777, the synoptical arrangement of the Gospels having been abandoned as inconvenient. Of the second edition, considerably enlarged and improved, the first volume appeared in 1796 and the second in 1806 (Halle and London). Of a third edition, edited by David Schulz, only the first volume, containing the four Gospels, appeared (1827).

For the construction of his critical text Griesbach took as his basis the Elzevir edition. Where he differed from it he placed the Elzevir reading on the inner margin, and such other readings he thought worthy of special consideration (these last, however, being printed in smaller type). To all the readings on this margin he attached special marks indicating the precise degree of probability in his opinion attaching to each. In weighing these probabilities he proceeded upon a particular theory which in its leading features he had derived from J. A. Bengel and J. S. Semler, dividing all the MSS. into three main groups—the Alexandrian, the Western and the Byzantine (see BIBLE: *New Testament*, "Textual Criticism"). A reading supported by only one recension he considered as having only one witness in its favour; those readings which were supported by all the three recensions, or even by two of them, especially if these two were the Alexandrian and the Western, he unhesitatingly accepted as genuine. Only when each of the three recensions gives a different reading does he proceed to discuss the question on other grounds. See his *Symbolae criticae ad supplendas et corrigendas variarum N.T. lectionum collectiones* (Halle, 1785, 1793), and his *Commentarius criticus in textum Graecum*, which extends to the end of Mark, and discusses the more important various readings with great care and thoroughness (Jena, 1794 ff.). Among the other works of Griesbach (which are comparatively unimportant) may be mentioned his university thesis *De codicibus quatuor evangelistarum Origenianis* (Halle, 1771) and a work upon systematic theology (*Anleitung zur Kenntniss der populären Dogmatik*, Jena, 1779). His *Opuscula*, consisting chiefly of university "Programs" and addresses, were edited by Gabler (2 vols., Jena, 1824).

See the article in Herzog-Hauck, *Realencyklopädie*, and the *Allgemeine deutsche Biographie*.

GRIESBACH, a watering-place in the grand duchy of Baden, in the valley of the Rench, 1550 ft. above the sea, 6 m. W. from Freudenstadt in Württemberg. It is celebrated for its saline chalybeate waters (twelve springs), which are specific in cases of anaemia, feminine disorders and diseases of the nervous system, and were used in the 16th century. The annual number of visitors is nearly 2000. Pop. (1900) 800. From 1665 to 1805 Griesbach was part of the bishopric of Strassburg.

See Haberer, *Die Renchbäder Peterstbal und Griesbach* (Würzburg, 1866).

GRIFFE (French for "claw"), an architectural term for the spur, an ornament carved at the angle of the square base of columns.

GRIFFENFELDT, PEDER, COUNT (*Peder Schumacher*) (1635–1699), Danish statesman, was born at Copenhagen on the 24th of August 1635, of a wealthy trading family connected with the leading civic, clerical and learned circles in the Danish capital. His tutor, Jens Vorde, who prepared him in his eleventh year for the university, praises his extraordinary gifts, his mastery of the classical languages and his almost disquieting diligence. The brilliant way in which he sustained his preliminary examination won him the friendship of the examiner, Bishop Jasper Brokman, at whose palace he first met Frederick III. The king was struck with the lad's bright grey eyes and pleasant humorous face; and Brokman, proud of his pupil, made him translate a chapter from a Hebrew Bible first into Latin and then into Danish, for the entertainment of the scholarly monarch. In 1654 young Schumacher went abroad for eight years, to complete his education. From Germany he proceeded to the Netherlands, staying at Leiden, Utrecht and Amsterdam, and passing in 1657 to Queen's College, Oxford, where he lived three years. The epoch-making events which occurred in England, while he was at Oxford profoundly interested him, and coinciding with the Revolution in Denmark, which threw open a career to the middle classes, convinced him that his proper sphere was politics. In the autumn of 1660 Schumacher visited Paris, shortly after Mazarin's death, when the young Louis XIV. first seized the reins of power. Schumacher seems to have been profoundly impressed by the administrative superiority of a strong centralised monarchy in the hands of an energetic monarch who knew his own mind; and, in politics, as in manners, France ever afterwards was his model. The last year of his travels was spent in Spain, where he obtained a thorough knowledge of the Castilian language and literature. His travels, however, if they enriched his mind, relaxed his character, and he brought home easy morals as well as exquisite manners.

On his return to Copenhagen, in 1662, Schumacher found the monarchy established on the ruins of the aristocracy, and eager to buy the services of every man of the middle classes who had superior talents to offer. Determined to make his way in this "new Promised Land," the young adventurer contrived to secure the protection of Kristoffer Gabel, the king's confidant, and in 1663 was appointed the royal librarian. A romantic friendship with the king's bastard, Count Ulric Frederick Gyldenlöve, consolidated his position. In 1665 Schumacher obtained his first political post as the king's secretary, and the same year composed the memorable *Kongelov* (see DENMARK, *History*). He was now a personage at court, where he won all hearts by his amiability and gaiety; and in political matters also his influence was beginning to be felt.

On the death of Frederick III. (February 9th, 1670) Schumacher was the most trusted of all the royal counsellors. He alone was aware of the existence of the new throne of walrus ivory embellished with three silver life-size lions, and of the new regalia, both of which treasures he had, by the king's command, concealed in a vault beneath the royal castle. Frederick III. had also confided to him a sealed packet containing the *Kongelov*, which was to be delivered to his successor alone. Schumacher had been recommended to his son by Frederick III. on his death-bed. "Make him a great man, but do it slowly!" said Frederick, who thoroughly understood the characters of his son and of his minister. Christian V. was, moreover, deeply impressed by the confidence which his father had ever shown to Schumacher. When, on the 9th of February 1670, Schumacher delivered the *Kongelov* to Christian V., the king bade all those about him withdraw, and after being closeted a good hour with Schumacher, appointed him his "Obergeheimesekreter." His promotion was now almost disquietingly rapid. In May 1670 he received the titles of excellency and privy councillor; in July of the same year he was ennobled under the name of Griffenfeldt, deriving his title from the gold griffin with outspread wings which surmounted his escutcheon; in November 1673 he was created a count, a knight of the Elephant and, finally, imperial chancellor. In the course of the next few months he gathered into his hands every branch of the government: he had reached the apogee of his short-lived greatness.

But if his offices were manifold, so also were his talents. Seldom has any man united so many and such various gifts in his own person and carried them so easily—a playful wit, a vivid imagination, oratorical and literary eloquence and, above all, a profound knowledge of human nature both male and female,

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of every class and rank, from the king to the meanest citizen. He had captivated the accomplished Frederick III. by his literary graces and ingenious speculations; he won the obtuse and ignorant Christian V. by saving him trouble, by acting and thinking for him, and at the same time making him believe that he was thinking and acting for himself. Moreover, his commanding qualities were coupled with an organizing talent which made itself felt in every department of the state, and with a marvellous adaptability which made him an ideal diplomatist.

On the 25th of May 1671 the dignities of count and baron were introduced into Denmark "to give lustre to the court"; a few months later the order of the Danebrog was instituted as a fresh means of winning adherents by marks of favour. Griffenfeldt was the originator of these new institutions. To him monarchy was the ideal form of government. But he had also a political object. The aristocracy of birth, despite its reverses, still remained the élite of society; and Griffenfeldt, the son of a burgess as well as the protagonist of monarchy, was its most determined enemy. The new baronies and countships, owing their existence entirely to the crown, introduced a strong solvent into aristocratic circles. Griffenfeldt saw that, in future, the first at court would be the first everywhere. Much was also done to promote trade and industry, notably by the revival of the *Kammer Kollegium*, or board of trade, and the abolition of some of the most harmful monopolies. Both the higher and the provincial administrations were thoroughly reformed with the view of making them more centralized and efficient; and the positions and duties of the various magistrates, who now also received fixed salaries, were for the first time exactly defined. But what Griffenfeldt could create, Griffenfeldt could dispense with, and it was not long before he began to encroach upon the jurisdiction of the new departments of state by private conferences with their chiefs. Nevertheless it is indisputable that, under the single direction of this master-mind, the Danish state was now able, for a time, to utilize all its resources as it had never done before.

In the last three years of his administration, Griffenfeldt gave himself entirely to the conduct of the foreign policy of Denmark. It is difficult to form a clear idea of this, first, because his influence was perpetually traversed by opposite tendencies; in the second place, because the force of circumstances compelled him, again and again, to shift his standpoint; and finally because personal considerations largely intermingled with his foreign policy, and made it more elusive and ambiguous than it need have been. Briefly, Griffenfeldt aimed at restoring Denmark to the rank of a great power. He proposed to accomplish this by carefully nursing her resources, and in the meantime securing and enriching her by alliances, which would bring in large subsidies while imposing a minimum of obligations. Such a conditional and tentative policy, on the part of a second-rate power, in a period of universal tension and turmoil, was most difficult; but Griffenfeldt did not regard it as impossible. The first postulate of such a policy was peace, especially peace with Denmark's most dangerous neighbour, Sweden. The second postulate was a sound financial basis, which he expected the wealth of France to supply in the shape of subsidies to be spent on armaments. Above all things Denmark was to beware of making enemies of France and Sweden at the same time. An alliance, on fairly equal terms, between the three powers, would, in these circumstances, be the consummation of Griffenfeldt's "system"; an alliance with France to the exclusion of Sweden would be the next best policy; but an alliance between France and Sweden, without the admission of Denmark, was to be avoided at all hazards. Had Griffenfeldt's policy succeeded, Denmark might have recovered her ancient possessions to the south and east comparatively cheaply. But again and again he was overruled. Despite his open protests and subterraneous counter-mining, war was actually declared against Sweden in 1675, and his subsequent policy seemed so obscure and hazardous to those who did not possess the clue to the perhaps purposely tangled skein, that the numerous enemies whom his arrogance and superciliousness had raised up against him, resolved to destroy him.

On the 11th of March 1676, while on his way to the royal apartments, Griffenfeldt was arrested in the king's name and conducted to the citadel, a prisoner of state. A minute scrutiny of his papers, lasting nearly six weeks, revealed nothing treasonable; but it provided the enemies of the fallen statesman with a deadly weapon against him in the shape of an entry in his private diary, in which he had imprudently noted that on one occasion Christian V. in a conversation with a foreign ambassador had "spoken like a child." On the 3rd of May Griffenfeldt was tried not by the usual tribunal, in such cases the *Højesteret*, or supreme court, but by an extraordinary tribunal of 10 dignitaries, none of whom was particularly well disposed towards the accused. Griffenfeldt, who was charged with simony, bribery, oath-breaking, malversation and *lèse-majesté*, conducted his own defence under every imaginable difficulty. For forty-six days before his trial he had been closely confined in a dungeon without lights, books or writing materials. Every legal assistance was illegally denied him. Nevertheless he proved more than a match for the forensic ability arrayed against him, and his first plea in defence is in a high degree dignified and manly. Finally, he was condemned to degradation and decapitation; though one of the ten judges not only refused to sign the sentence, but remonstrated in private with the king against its injustice. And indeed its injustice was flagrant. The primary offence of the ex-chancellor was the taking of bribes, which no twisting of the law could convert into a capital offence, while the charge of treason had not been substantiated. Griffenfeldt was pardoned on the scaffold, at the very moment when the axe was about to descend. On hearing that the sentence was commuted to life-long imprisonment, he declared that the pardon was harder than the punishment, and vainly petitioned for leave to serve his king for the rest of his life as a common soldier. For the next two and twenty years Denmark's greatest statesman lingered out his life in a lonely state-prison, first in the fortress of Copenhagen, and finally at Munkholm on Trondhjem fiord. He died at Trondhjem on the 12th of March 1699. Griffenfeldt married Kitty Nansen, the granddaughter of the great Burgomaster Hans Nansen, who brought him half a million rix-dollars. She died in 1672, after bearing him a daughter.

See *Danmark's Riges Historie*, vol. v. (Copenhagen, 1897–1905); Jörgenson, *Peter Schumacher-Griffenfeldt* (Copenhagen, 1893–1894); O. Vaupell, *Rigshansler Grev Griffenfeldt* (Copenhagen, 1880–1882); Bain, *Scandinavia*, cap. x. (Cambridge, 1905).

(R. N. B.)

GRIFFIN [O'GRIOBTA, O'GREEVA], **GERALD** (1803–1840), Irish novelist and dramatic writer, was born at Limerick of good family, on the 12th of December 1803. His parents emigrated in 1820 to America, but he was left with an elder brother, who was a medical practitioner at Adare. As early as his eighteenth year he undertook for a short time the editorship of a newspaper in Limerick. Having written a tragedy, *Aguire*, which was highly praised by his friends, he set out in 1823 for London with the purpose of "revolutionizing the dramatic taste of the time by writing for the stage." In spite of the recommendations of John Banim, he had a hard struggle with poverty. It was only by degrees that his literary work obtained any favour. *The Noyades*, an opera entirely in recitative, was produced at the English Opera House in 1826; and the success of *Holland Tide Tales* (1827) led to *Tales of the Munster Festivals* (3 vols., 1827), which were still more popular. In 1829 appeared his fine novel, *The Collegians*, afterwards successfully adapted for the stage by Dion Boucicault under the title of *The Colleen Bawn*. He followed up this success with *The Invasion* (1832), *Tales of my Neighbourhood* (1835), *The Duke of Monmouth* (1836), and *Talis Qualis, or Tales of the Jury-room* (1842). He also wrote a number of lyrics touched with his native melancholy. But he became doubtful as to the moral influence of his writings, and ultimately he came to the conclusion that his true sphere of duty was to be found within the Church. He was admitted into a society of the Christian Brothers at Dublin, in September 1838, under the name of Brother Joseph, and in the following summer

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he removed to Cork, where he died of typhus fever on the 12th of June 1840. Before adopting the monastic habit he burned all his manuscripts; but *Gisippus*, a tragedy which he had composed before he was twenty, accidentally escaped destruction, and in 1842 was put on the Drury Lane stage by Macready with great success.

The collected works of Gerald Griffin were published in 1842–1843 in eight volumes, with a *Life* by his brother William Griffin, M.D.; an edition of his *Poetical and Dramatic Works* (Dublin, 1895) by C. G. Duffy; and a selection of his lyrics, with a notice by George Sigerson, is included in the *Treasury of Irish Poetry*, edited by Stopford A. Brooke and T. W. Rolleston (London, 1900).

GRIFFIN, a city and the county-seat of Spalding county, Georgia, U.S.A., 43 m. S. of Atlanta, and about 970 ft. above the sea. Pop. (1890) 4503; (1900) 6857 (3258 negroes); (1910) 7478. It is served by the Southern and the Central of Georgia railways, and is the southern terminus of the Griffin & Chattanooga Division of the latter. The city is situated in a rich agricultural region, and just outside the corporate limits is an agricultural experiment station, established by the state but maintained by the Federal government. Griffin has a large trade in cotton and fruit. The principal industry is the manufacture of cotton and cotton-seed oil. Buggies, wagons, chairs and harness are among the other manufactures. The municipality owns and operates the water and electric-lighting systems. Griffin was founded in 1840 and was chartered as a city in 1846.

GRIFFIN, GRIFFON or GRYPHON (from Fr. *griffon*, Lat. *gryphus*, Gr. γρύψ), in the natural history of the ancients, the name of an imaginary rapacious creature of the eagle species, represented with four legs, wings and a beak,—the fore part resembling an eagle and the hinder a lion. In addition, some writers describe the tail as a serpent. This animal, which was supposed to watch over gold mines and hidden treasures, and to be the enemy of the horse, was consecrated to the Sun; and the ancient painters represented the chariot of the Sun as drawn by griffins. According to Spanheim, those of Jupiter and Nemesis were similarly provided. The griffin of Scripture is probably the osprey, and the name is now given to a species of vulture. The griffin was said to inhabit Asiatic Scythia, where gold and precious stones were abundant; and when strangers approached to gather these the creatures leapt upon them and tore them in pieces, thus chastising human avarice and greed. The one-eyed Arimaspi waged constant war with them, according to Herodotus (iii. 16). Sir John de Mandeville, in his *Travels*, described a griffin as eight times larger than a lion.

The griffin is frequently seen as a charge in heraldry (see HERALDRY, fig. 163); and in architectural decoration is usually represented as a four-footed beast with wings and the head of a leopard or tiger with horns, or with the head and beak of an eagle; in the latter case, but very rarely, with two legs. To what extent it owes its origin to Persian sculpture is not known, the capitals at Persepolis have sometimes leopard or lion heads with horns, and four-footed beasts with the beaks of eagles are represented in bas-reliefs. In the temple of Apollo Branchidae near Miletus in Asia Minor, the winged griffin of the capitals has leopards' heads with horns. In the capitals of the so-called lesser propylaea at Eleusis conventional eagles with two feet support the angles of the abacus. The greater number of those in Rome have eagles' beaks, as in the frieze of the temple of Antoninus and Faustina, and their tails devolop into conventional foliage. A similar device was found in the Forum of Trajan. The best decorative employment of the griffin is found in the vertical supports of tables, of which there are two or three examples in Pompeii and others in the Vatican and the museums in Rome. In some of these cases the head is that of a lion at one end of the support and an eagle at the other end, and there is only one strongly developed paw; the wings circling round at the top form conspicuous features on the sides of these supports, the surfaces below being filled with conventional Greek foliage.

GRIFFITH, SIR RICHARD JOHN (1784–1878), Irish geologist, was born in Dublin on the 20th of September 1784. He obtained in 1799 a commission in the Royal Irish Artillery, but a year later, when the corps was incorporated with that of England, he retired, and devoted his attention to civil engineering and mining. He studied chemistry, mineralogy and mining for two years in London under William Nicholson (editor of the *Journal of Nat. Phil.*), and afterwards examined the mining districts in various parts of England, Wales and Scotland. While in Cornwall he discovered ores of nickel and cobalt in material that had been rejected as worthless. He completed his studies under Robert Jameson and others at Edinburgh, was elected a Fellow of the Royal Society of Edinburgh in 1807, a member of the newly established Geological Society of London in 1808, and in the same year he returned to Ireland. In 1809 he was appointed by the commissioners to inquire into the nature and extent of the bogs in Ireland, and the means of improving them. In 1812 he was elected professor of geology and mining engineer to the Royal Dublin Society. During subsequent years he made many surveys and issued many reports on mineral districts in Ireland, and these formed the foundation of his first geological map of the country (1815). In 1822 Griffith became engineer of public works in Cork, Kerry and Limerick, and was occupied until 1830 in repairing old roads and in laying out many miles of new roads. Meanwhile in 1825 he was appointed to carry out the perambulation or boundary survey of Ireland, the object of which was to ascertain and mark the boundaries of every county, barony, parish and townland in preparation for the ordnance survey. This work was finished in 1844. He was also called upon to assist in preparing a bill for the general valuation of Ireland; the act was passed in 1826, and he was appointed commissioner of valuation, in which capacity he continued to act until 1868. On "Griffith's valuation" the various local and public assessments were made. His extensive investigations furnished him with ample material for improving his geological map, and the second edition was published in 1835. A third edition on a larger scale (1 in. to 4 m.) was issued under the Board of Ordnance in 1839, and it was further revised in 1855. For this great work and his other services to science he was awarded the Wollaston medal by the Geological Society in 1854. In 1850 he was made chairman of the Irish Board of Works, and in 1858 he was created a baronet. He died in Dublin on the 22nd of September 1878.

Among his many geological works the following may be mentioned: *Outline of the Geology of Ireland* (1838); *Notice respecting the Fossils of the Mountain Limestone of Ireland, as compared with those of Great Britain, and also with the Devonian System* (1842); *A Synopsis of the Characters of the Carboniferous Limestone Fossils of Ireland* (1844) (with F. McCoy); *A Synopsis of the Silurian Fossils of Ireland* (1846) (with F. McCoy). See memoirs in *Quart. Journ. Geol. Soc.* xxxv. 39; and *Geol. Mag.*, 1878, p. 524, with bibliography.

GRILLE, a French term for an enclosure in either iron or bronze; there is no equivalent in English, "grating" applying more to a horizontal frame of bars over a sunk area, and "grate" to the iron bars of an open fireplace. The finest examples of the grille are those known as the *rejas*, which in Spanish churches form the enclosures of the chapels, such as the *reja* in the Capilla Real at Granada in wrought iron partly gilt (1522). Similar grilles are employed to protect the ground-floor windows of mansions not only in Spain but in Italy and Germany. In England the most beautiful example is that in front of Queen Eleanor's tomb in Westminster Abbey, in wrought iron. The finest grilles in Italy are the enclosures of the tombs of the Della Scalas at Verona (end of 13th century), in Germany the grille of the cenotaph of Maximilian at Innsbruck (early 16th century) and in France those which enclose the Place Stanislaus, the Place de la Carrière and the churches of Nancy, which were wrought by Jean Lamour in the middle of the 18th century. Generally, however, throughout Germany the wrought iron grilles are fine examples of forging, and they are employed for the enclosures of the numerous fountains, in the tympana of gateways, and for the protection of windows. At Danzig in the Marienkirche are some fine examples in brass.

GRILLPARZER, FRANZ (1791–1872), the greatest dramatic poet of Austria, was born in Vienna, on the 15th of January 1791. His father, severe, pedantic, a staunch upholder of the liberal traditions of the reign of Joseph II., was an advocate

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of some standing; his mother, a nervous, finely-strung woman, belonged to the well-known musical family of Sonnleithner. After a desultory education, Grillparzer entered in 1807 the university of Vienna as a student of jurisprudence; but two years later his father died, leaving the family in straitened circumstances, and Franz, the eldest son, was obliged to turn to private tutoring. In 1813 he received an appointment in the court library, but as this was unpaid, he accepted after some months a clerkship that offered more solid prospects, in the Lower Austrian revenue administration. Through the influence of Graf Stadion, the minister of finance, he was in 1818 appointed poet to the Hofburgtheater, and promoted to the *Hofkammer* (exchequer); in 1832 he became director of the archives of that department, and in 1856 retired from the civil service with the title of *Hofrat*. Grillparzer had little capacity for an official career and regarded his office merely as a means of independence.

In 1817 the first representation of his tragedy *Die Ahnfrau* made him famous, but before this he had written a long tragedy in iambics, *Blanca von Castilien* (1807–1809), which was obviously modelled on Schiller's *Don Carlos*; and even more promising were the dramatic fragments *Spartacus* and *Alfred der Grosse* (1809). *Die Ahnfrau* is a gruesome "fate-tragedy" in the trochaic measure of the Spanish drama, already made popular by Adolf Müllner in his *Schuld*; but Grillparzer's work is a play of real poetic beauties, and reveals an instinct for dramatic as opposed to merely theatrical effect, which distinguishes it from other "fate-dramas" of the day. Unfortunately its success led to the poet's being classed for the best part of his life with playwrights like Müllner and Houwald. *Die Ahnfrau* was followed by *Sappho* (1818), a drama of a very different type; in the classic spirit of Goethe's *Tasso*, Grillparzer unrolled the tragedy of poetic genius, the renunciation of earthly happiness imposed upon the poet by his higher mission. In 1821 appeared *Das goldene Vliess*, a trilogy which had been interrupted in 1819 by the death of the poet's mother—in a fit of depression she had taken her own life—and a subsequent visit to Italy. Opening with a powerful dramatic prelude in one act, *Der Gastfreund*, Grillparzer depicts in *Die Argonauten* Jason's adventures in his quest for the Fleece; while *Medea*, a tragedy of noble classic proportions, contains the culminating events of the story which had been so often dramatized before. The theme is similar to that of *Sappho*, but the scale on which it is represented is larger; it is again the tragedy of the heart's desire, the conflict of the simple happy life with that sinister power—be it genius, or ambition—which upsets the equilibrium of life. The end is bitter disillusionment, the only consolation renunciation. Medea, her revenge stilled, her children dead, bears the fatal Fleece back to Delphi, while Jason is left to realize the nothingness of human striving and earthly happiness.

For his historical tragedy *König Ottokars Glück und Ende* (1823, but owing to difficulties with the censor, not performed until 1825), Grillparzer chose one of the most picturesque events in Austrian domestic history, the conflict of Ottokar of Bohemia with Rudolph von Habsburg. With an almost modern realism he reproduced the motley world of the old chronicler, at the same time not losing sight of the needs of the theatre; the fall of Ottokar is but another text from which the poet preached the futility of endeavour and the vanity of worldly greatness. A second historical tragedy, *Ein treuer Diener seines Herrn* (1826, performed 1828), attempts to embody a more heroic gospel; but the subject—the superhuman self-effacement of Bankbanus before Duke Otto of Meran—proved too uncompromising an illustration of Kant's categorical imperative of duty to be palatable in the theatre. With these historical tragedies began the darkest ten years in the poet's life. They brought him into conflict with the Austrian censor—a conflict which grated on Grillparzer's sensitive soul, and was aggravated by his own position as a servant of the state; in 1826 he paid a visit to Goethe in Weimar, and was able to compare the enlightened conditions which prevailed in the little Saxon duchy with the intellectual thraldom of Vienna. To these troubles were added more serious personal worries. In the winter of 1820–1821 he had met for the first time Katharina Fröhlich (1801–1870), and the acquaintance rapidly ripened into love on both sides; but whether owing to a presentiment of mutual incompatibility, or merely owing to Grillparzer's conviction that life had no happiness in store for him, he shrank from marriage. Whatever the cause may have been, the poet was plunged into an abyss of misery and despair to which his diary bears heart-rending witness; his sufferings found poetic expression in the fine cycle of poems bearing the significant title *Tristia ex Ponto* (1835).

Yet to these years we owe the completion of two of Grillparzer's greatest dramas, *Des Meeres und der Liebe Wellen* (1831) and *Der Traum, ein Leben* (1834). In the former tragedy, a dramatization of the story of Hero and Leander, he returned to the Hellenic world of *Sappho*, and produced what is perhaps the finest of all German love-tragedies. His mastery of dramatic technique is here combined with a ripeness of poetic expression and with an insight into motive which suggests the modern psychological drama of Hebbel and Ibsen; the old Greek love-story of Musaeus is, moreover, endowed with something of that ineffable poetic grace which the poet had borrowed from the great Spanish poets, Lope de Vega and Calderon. *Der Traum, ein Leben*, Grillparzer's technical masterpiece, is in form perhaps even more Spanish; it is also more of what Goethe called a "confession." The aspirations of Rustan, an ambitious young peasant, are shadowed forth in the hero's dream, which takes up nearly three acts of the play; ultimately Rustan awakens from his nightmare to realize the truth of Grillparzer's own pessimistic doctrine that all earthly ambitions and aspirations are vanity; the only true happiness is contentment with one's lot, "des Innern stiller Frieden und die schuldbefreite Brust." *Der Traum, ein Leben* was the first of Grillparzer's dramas which did not end tragically, and in 1838 he produced his only comedy, *Weh' dem, der lügt*. But *Weh' dem, der lügt*, in spite of its humour of situation, its sparkling dialogue and the originality of its idea—namely, that the hero gains his end by invariably telling the truth, where his enemies as invariably expect him to be lying—was too strange to meet with approval in its day. Its failure was a blow to the poet, who turned his back for ever on the German theatre. In 1836 Grillparzer paid a visit to Paris and London, in 1843 to Athens and Constantinople. Then came the Revolution which struck off the intellectual fetters under which Grillparzer and his contemporaries had groaned in Austria, but the liberation came too late for him. Honours were heaped upon him; he was made a member of the Academy of Sciences; Heinrich Laube, as director of the Burgtheater, reinstated his plays on the repertory; he was in 1861 elected to the Austrian *Herrenhaus*; his eightieth birthday was a national festival, and when he died in Vienna, on the 21st of January 1872, the mourning of the Austrian people was universal. With the exception of a beautiful fragment, *Esther* (1861), Grillparzer published no more dramatic poetry after the fiasco of *Weh' dem, der lügt*, but at his death three completed tragedies were found among his papers. Of these, *Die Jüdin von Toledo*, an admirable adaptation from the Spanish, has won a permanent place in the German classical repertory; *Ein Bruderzwist im Hause Habsburg* is a powerful historical tragedy and *Libussa* is perhaps the ripest, as it is certainly the deepest, of all Grillparzer's dramas; the latter two plays prove how much was lost by the poet's divorce from the theatre.

Although Grillparzer was essentially a dramatist, his lyric poetry is in the intensity of its personal note hardly inferior to Lenau's; and the bitterness of his later years found vent in biting and stinging epigrams that spared few of his greater contemporaries. As a prose writer, he has left one powerful short story, *Der arme Spielmann* (1848), and a volume of critical studies on the Spanish drama, which shows how completely he had succeeded in identifying himself with the Spanish point of view.

Grillparzer's brooding, unbalanced temperament, his lack of will-power, his pessimistic renunciation and the bitterness which his self-imposed martyrdom produced in him, made him peculiarly adapted to express the mood of Austria in the epoch of intellectual

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thraldom that lay between the Napoleonic wars and the Revolution of 1848; his poetry reflects exactly the spirit of his people under the Metternich régime, and there is a deep truth behind the description of *Der Traum, ein Leben* as the Austrian *Faust*. His fame was in accordance with the general tenor of his life; even in Austria a true understanding for his genius was late in coming, and not until the centenary of 1891 did the German-speaking world realize that it possessed in him a dramatic poet of the first rank; in other words, that Grillparzer was no mere "Epigone" of the classic period, but a poet who, by a rare assimilation of the strength of the Greeks, the imaginative depth of German classicism and the delicacy and grace of the Spaniards, had opened up new paths for the higher dramatic poetry of Europe.

Grillparzer's *Sämtliche Werke* are edited by A. Sauer, in 20 vols., 5th edition (Stuttgart, 1892–1894); also, since the expiry of the copyright in 1901, innumerable cheap reprints. *Briefe und Tagebücher*, edited by C. Glossy and A. Sauer (2 vols., Stuttgart, 1903). *Jahrbuch der Grillparzer-Gesellschaft*, edited by K. Glossy (the publication of the Grillparzer Society) (Vienna, 1891 ff.). See also H. Laube, *Franz Grillparzers Lebensgeschichte* (Stuttgart, 1884); J. Volkelt, *Franz Grillparzer als Dichter des Tragischen* (Nördlingen, 1888); E. Reich, *Franz Grillparzer's Dramen* (Dresden, 1894); A. Ehrhard, *Franz Grillparzer* (Paris, 1900) (German translation by M. Necker, Munich, 1902); H. Sittenberger, *Grillparzer, sein Leben und Wirken* (Berlin, 1904); Gustav Pollak, *F. Grillparzer and the Austrian Drama* (New York, 1907). Of Grillparzer's works, translations have appeared in English of *Sappho* (1820, by J. Bramsen; 1846, by E. B. Lee; 1855, by L. C. Cumming; 1876, by E. Frothingham); and of *Medea* (1879, by F. W. Thurstan and J. A. Wittmann). Byron's warm admiration of *Sappho* (*Letters and Journals*, v. 171) is well known, while Carlyle's criticism, in his essay on *German Playwrights* (1829), is interesting as expressing the generally accepted estimate of Grillparzer in the first half of the 19th century. See the bibliography in O. Francke's *Geschichte der deutschen Dichtung*, 2nd ed., vol. viii. (1905). (J. G. R.)

GRIMALD (or GRIMOALD), **NICHOLAS** (1519–1562), English poet, was born in Huntingdonshire, the son probably of Giovanni Baptista Grimaldi, who had been a clerk in the service of Empson and Dudley in the reign of Henry VII. He was educated at Christ's College, Cambridge, where he took his B.A. degree in 1540. He then removed to Oxford, becoming a probationer-fellow of Merton College in 1541. In 1547 he was lecturing on rhetoric at Christ Church, and shortly afterwards became chaplain to Bishop Ridley, who, when he was in prison, desired Grimald to translate Laurentius Valla's book against the alleged *Donation of Constantine*, and the *De gestis Basilicensis Concilii* of Aeneas Sylvius (Pius II.). His connexion with Ridley brought him under suspicion, and he was imprisoned in the Marshalsea. It is said that he escaped the penalties of heresy by recanting his errors, and was despised accordingly by his Protestant contemporaries. Grimald contributed to the original edition (June 1557) of *Songes and Sonettes* (commonly known as *Tottel's Miscellany*), forty poems, only ten of which are retained in the second edition published in the next month. He translated (1553) Cicero's *De officiis* as *Marcus Tullius Ciceroes three bokes of duties* (and ed., 1556); a Latin paraphrase of Virgil's *Georgics* (printed 1591) is attributed to him, but most of the works assigned to him by Bale are lost. Two Latin tragedies are extant; *Archiprophetа sive Johannes Baptista*, printed at Cologne in 1548, probably performed at Oxford the year before, and *Christus redivivus* (Cologne, 1543), edited by Prof. J. M. Hart (for the Modern Language Association of America, 1886, separately issued 1890). It cannot be determined whether Grimald was familiar with Buchanan's *Baptistes* (1543), or with J. Schoeppe's *Johannes decollatus vel Ectrachelistes* (1546). Grimald provides a purely romantic motive for the catastrophe in the passionate attachment of Herodias to Herod, and constantly resorts to lyrical methods. As a poet Grimald is memorable as the earliest follower of Surrey in the production of blank verse. He writes sometimes simply enough, as in the lines on his own childhood addressed to his mother, but in general his style is more artificial, and his metaphors more studied than is the case with the other contributors to the *Miscellany*. His classical reading shows itself in the comparative terseness and smartness of his verses. His epitaph was written by Barnabe Googe in May 1562.

See C. H. Herford, *Studies in the Literary Relations of England and Germany* (pp. 113–119, 1886). *A Catalogue of printed books . . . by writers bearing the name of Grimaldi* (ed. A. B. Grimaldi), printed 1883; and Arber's reprint of *Tottel's Miscellany*.

GRIMALDI, GIOVANNI FRANCESCO (1606–1680), Italian architect and painter, named Il Bolognese from the place of his birth, was a relative of the Caracci family, under whom it is presumed he studied first. He was afterwards a pupil of Albani. He went to Rome, and was appointed architect to Pope Paul V., and was also patronized by succeeding popes. Towards 1648 he was invited to France by Cardinal Mazarin, and for about two years was employed in buildings for that minister and for Louis XIV., and in fresco-painting in the Louvre. His colour was strong, somewhat excessive in the use of green; his touch light. He painted history, portraits and landscapes—the last with predilection, especially in his advanced years—and executed engravings and etchings from his own landscapes and from those of Titian and the Caracci. Returning to Rome, he was made president of the Academy of St Luke; and in that city he died on the 28th of November 1680, in high repute not only for his artistic skill but for his upright and charitable deeds. His son Alessandro assisted him both in painting and in engraving. Paintings by Grimaldi are preserved in the Quirinal and Vatican palaces, and in the church of S. Martino a'Monti; there is also a series of his landscapes in the Colonna Gallery.

GRIMALDI, JOSEPH (1779–1837), the most celebrated of English clowns, was born in London on the 18th of December 1779, the son of an Italian actor. When less than two years old he was brought upon the stage at Drury Lane; at the age of three he began to appear at Sadler's Wells; and he did not finally retire until 1828. As the clown of pantomime he was considered without an equal, his greatest success being in *Mother Goose*, at Covent Garden (1806 and often revived). Grimaldi died on the 31st of May 1837.

His *Memoirs* in two volumes (1838) were edited by Charles Dickens.

GRIMKÉ, SARAH MOORE (1792–1873) and **ANGELINA EMILY** (1805–1879), American reformers, born in Charleston, South Carolina—Sarah on the 6th of November 1792, and Angelina on the 20th of February 1805—were daughters of John Fachereau Grimké (1752–1819), an artillery officer in the Continental army, a jurist of some distinction, a man of wealth and culture and a slave-holder.

Their older brother, THOMAS SMITH GRIMKÉ (1786–1834), was born in Charleston; graduated at Yale in 1807; was a successful lawyer, and in 1826–1830 was a member of the state Senate, in which he, almost alone of the prominent lawyers of the state, opposed nullification; he strongly advocated spelling-reform, temperance and absolute non-resistance, and published *Addresses on Science, Education and Literature* (1831). His early intellectual influence on Sarah was strong.

In her thirteenth year Sarah was godmother to her sister Angelina. Sarah in 1821 revisited Philadelphia, whither she had accompanied her father on his last illness, and there, having been already dissatisfied with the Episcopal Church and with the Presbyterian, she became a Quaker; so, too, did Angelina, who joined her in 1829. Both sisters (Angelina first) soon grew into a belief in immediate abolition, strongly censured by many Quakers, who were even more shocked by a sympathetic letter dated "8th Month, 30th, 1835" written by Angelina to W. L. Garrison, followed in 1836 by her *Appeal to the Christian Women of the South*, and at the end of that year, by an *Epistle to the Clergy of the Southern States*, written by Sarah, who now thoroughly agreed with her younger sister. In the same year, at the invitation of Elizur Wright (1804–1885), corresponding secretary of the American Anti-Slavery Society, Angelina, accompanied by Sarah, began giving talks on slavery, first in private and then in public, so that in 1837, when they set to work in Massachusetts, they had to secure the use of large halls. Their speaking from public platforms resulted in a letter issued by some members of the General Association of Congregational Ministers of Massachusetts, calling on the clergy to close their

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churches to women exhorters; Garrison denounced the attack on the Grimké sisters and Whittier ridiculed it in his poem "The Pastoral Letter." Angelina pointedly answered *Miss Beecher on the Slave Question* (1837) in letters in the *Liberator*. Sarah, who had never forgotten that her studies had been curtailed because she was a girl, contributed to the Boston *Spectator* papers on "The Province of Woman" and published *Letters on the Condition of Women and the Equality of the Sexes* (1838)—the real beginning of the "woman's rights" movement in America, and at the time a cause of anxiety to Whittier and others, who urged upon the sisters the prior importance of the anti-slavery cause. In 1838 Angelina married Theodore Dwight Weld (1803–1895), a reformer and abolition orator and pamphleteer, who had taken part in the famous Lane Seminary debates in 1834, had left the Seminary for the lecture platform when the anti-slavery society was broken up by the Lane trustees, but had lost his voice in 1836 and had become editor of the publications of the American Anti-Slavery Society.[1] They lived, with Sarah, at Fort Lee, New Jersey, in 1838–1840, then on a farm at Belleville, New Jersey, and then conducted a school for black and white alike at Eagleswood, near Perth Amboy, New Jersey, from 1854 to 1864. Removing to Hyde Park, Massachusetts, the three were employed in Dr Lewis's school. There Sarah died on the 23rd of December 1873, and Angelina on the 26th of October 1879. Both sisters indulged in various "fads"—Graham's diet, bloomer-wearing, absolute non-resistance. Angelina did no public speaking after her marriage, save at Pennsylvania Hall (Philadelphia), destroyed by a mob immediately after her address there; but besides her domestic and school duties she was full of tender charity. Sarah at the age of 62 was still eager to study law or medicine, or to do something to aid her sex; at 75 she translated and abridged Lamartine's life of Joan of Arc.

See Catherine H. Birney, *The Grimké Sisters* (Boston, 1885).

GRIMM, FRIEDRICH MELCHIOR, BARON VON (1723–1807), French author, the son of a German pastor, was born at Ratisbon on the 26th of December 1723. He studied at the University of Leipzig, where he came under the influence of Gottsched and of J. A. Ernesti, to whom he was largely indebted for his critical appreciation of classical literature. When nineteen he produced a tragedy, *Banise*, which met with some success. After two years of study he returned to Ratisbon, where he was attached to the household of Count Schönberg. In 1748 he accompanied August Heinrich, Count Friesen, to Paris as secretary, and he is said by Rousseau to have acted for some time as reader to Frederick, the young hereditary prince of Saxe-Gotha. His acquaintance with Rousseau, through a mutual sympathy in regard to musical matters, soon ripened into intimate friendship, and led to a close association with the encyclopaedists. He rapidly obtained a thorough knowledge of the French language, and acquired so perfectly the tone and sentiments of the society in which he moved that all marks of his foreign origin and training seemed effaced. A witty pamphlet entitled *Le Petit Prophète de Boehmischbroda* (1753), written by him in defence of Italian as against French opera, established his literary reputation. It is possible that the origin of the pamphlet is partly to be accounted for by his vehement passion[2] for Mlle Fel, the *prima donna* of the Italian company. In 1753 Grimm, following the example of the abbé Raynal, began a literary correspondence with various German sovereigns. Raynal's letters, *Nouvelles littéraires*, ceased early in 1755. With the aid of friends, especially of Diderot and Mme d'Épinay, during his temporary absences from France, Grimm himself carried on the correspondence, which consisted of two letters a month, until 1773, and eventually counted among his subscribers Catherine II. of Russia, Stanislas Poniatowski, king of Poland, and many princes of the smaller German States.

[1] Weld was the author of several anti-slavery books which had considerable influence at the time. Among them are *The Bible against Slavery* (1837), *American Slavery as It Is* (1839), a collection of extracts from Southern papers, and *Slavery and the Internal Slave Trade in the U.S.* (1841).

[2] Rousseau's account of this affair (*Confessions*, 2nd part, 8th book) must be received with caution.

It was probably in 1754 that Grimm was introduced by Rousseau to Madame d'Épinay, with whom he soon formed a *liaison* which led to an irreconcilable rupture between him and Rousseau. Rousseau was induced by his resentment to give in his *Confessions* a wholly mendacious portrait of Grimm's character. In 1755, after the death of Count Friesen, who was a nephew of Marshal Saxe and an officer in the French army, Grimm became *secrétaire des commandements* to the duke of Orleans, and in this capacity he accompanied Marshal d'Estrées on the campaign of Westphalia in 1756–57. He was named envoy of the town of Frankfort at the court of France in 1759, but was deprived of his office for criticizing the comte de Broglie in a despatch intercepted by Louis XV. He was made a baron of the Holy Roman Empire in 1775. His introduction to Catherine II. of Russia took place at St Petersburg in 1773, when he was in the suite of Wilhelmine of Hesse-Darmstadt on the occasion of her marriage to the czarevitch Paul. He became minister of Saxe-Gotha at the court of France in 1776, but in 1777 he again left Paris on a visit to St Petersburg, where he remained for nearly a year in daily intercourse with Catherine. He acted as Paris agent for the empress in the purchase of works of art, and executed many confidential commissions for her. In 1783 and the following years he lost his two most intimate friends, Mme d'Épinay and Diderot. In 1792 he emigrated, and in the next year settled in Gotha, where his poverty was relieved by Catherine, who in 1796 appointed him minister of Russia at Hamburg. On the death of the empress Catherine he took refuge with Mme d'Épinay's granddaughter, Émilie de Belsunce, comtesse de Bueil. Grimm had always interested himself in her, and had procured her dowry from the empress Catherine. She now received him with the utmost kindness. He died at Gotha on the 19th of December 1807.

The correspondence of Grimm was strictly confidential, and was not divulged during his lifetime. It embraces nearly the whole period from 1750 to 1790, but the later volumes, 1773 to 1790, were chiefly the work of his secretary, Jakob Heinrich Meister. At first he contented himself with enumerating the chief current views in literature and art and indicating very slightly the contents of the principal new books, but gradually his criticisms became more extended and trenchant, and he touched on nearly every subject—political, literary, artistic, social and religious—which interested the Parisian society of the time. His notices of contemporaries are somewhat severe, and he exhibits the foibles and selfishness of the society in which he moved; but he was unbiassed in his literary judgments, and time has only served to confirm his criticisms. In style and manner of expression he is thoroughly French. He is generally somewhat cold in his appreciation, but his literary taste is delicate and subtle; and it was the opinion of Sainte-Beuve that the quality of his thought in his best moments will compare not unfavourably even with that of Voltaire. His religious and philosophical opinions were entirely negative.

Grimm's *Correspondance littéraire, philosophique et critique . . ., depuis 1753 jusqu'en 1769*, was edited, with many excisions, by J. B. A. Suard and published at Paris in 1812, in 6 vols. 8vo; *deuxième partie, de 1772 à 1782*, in 1812 in 5 vols. 8vo; and *troisième partie, pendant une partie des années 1775 et 1776, et pendant les années 1782 à 1790 inclusivement*, in 1813 in 5 vols. 8vo. A supplementary volume appeared in 1814; the whole correspondence was collected and published by M. Jules Taschereau, with the assistance of A. Chaudé, in a *Nouvelle Edition, revue et mise dans un meilleur ordre, avec des notes et des éclaircissements, et où se trouvent rétablies pour la première fois les phrases supprimées par la censure impériale* (Paris, 1829, 15 vols. 8vo); and the *Correspondance inédite, et recueil de dictées, pensées, morceaux, et fragments retranchés par la censure impériale en 1812 et 1813* was published in 1829. The standard edition is that of M. Tourneux (16 vols., 1877–1882). Grimm's *Mémoire historique sur l'origine et les suites de mon attachement pour l'impératrice Catherine II jusqu' au décès de sa majesté impériale*, and Catherine's correspondence with Grimm (1774–1796) were published by J. Grot in 1880, in the *Collection* of the Russian Imperial Historical Society. She treats him very familiarly, and calls him Héraclite, Georges Dandin, &c. At the time of the Revolution she begged him to destroy her letters, but he refused, and after his death they were returned to St Petersburg. Grimm's side of the correspondence, however, is only partially preserved. He signs himself

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"Pleureur." Some of Grimm's letters, besides the official correspondence, are included in the edition of M. Tourneux; others are contained in the *Erinnerungen einer Urgrossmutter* of K. von Bechtolsheim, edited (Berlin, 1902) by Count C. Oberndorff. See also Mme d'Épinay's *Mémoires*; Rousseau's *Confessions*; the notices contained in the editions quoted; E. Scherer, *Melchior Grimm* (1887); Sainte-Beuve, *Causeries du lundi*, vol. vii. For further works bearing on the subject, see K. A. Georges, *Friedrich Melchior Grimm* (Hanover and Leipzig, 1904).

GRIMM, JACOB LUDWIG CARL (1785–1863), German philologist and mythologist, was born on the 4th of January 1785 at Hanau, in Hesse-Cassel. His father, who was a lawyer, died while he was a child, and the mother was left with very small means; but her sister, who was lady of the chamber to the landgravine of Hesse, helped to support and educate her numerous family. Jacob, with his younger brother Wilhelm (born on the 24th of February 1786), was sent in 1798 to the public school at Cassel. In 1802 he proceeded to the university of Marburg, where he studied law, a profession for which he had been destined by his father. His brother joined him at Marburg a year later, having just recovered from a long and severe illness, and likewise began the study of law. Up to this time Jacob Grimm had been actuated only by a general thirst for knowledge and his energies had not found any aim beyond the practical one of making himself a position in life. The first definite impulse came from the lectures of Savigny, the celebrated investigator of Roman law, who, as Grimm himself says (in the preface to the *Deutsche Grammatik*), first taught him to realize what it meant to study any science. Savigny's lectures also awakened in him that love for historical and antiquarian investigation which forms the basis of all his work. Then followed personal acquaintance, and it was in Savigny's well-provided library that Grimm first turned over the leaves of Bodmer's edition of the Old German minnesingers and other early texts, and felt an eager desire to penetrate further into the obscurities and half-revealed mysteries of their language. In the beginning of 1805 he received an invitation from Savigny, who had removed to Paris, to help him in his literary work. Grimm passed a very happy time in Paris, strengthening his taste for the literatures of the middle ages by his studies in the Paris libraries. Towards the close of the year he returned to Cassel, where his mother and Wilhelm had settled, the latter having finished his studies. The next year he obtained a situation in the war office with the very small salary of 100 thalers. One of his grievances was that he had to exchange his stylish Paris suit for a stiff uniform and pigtail. But he had full leisure for the prosecution of his studies. In 1808, soon after the death of his mother, he was appointed superintendent of the private library of Jerome Buonaparte, king of Westphalia, into which Hesse-Cassel had been incorporated by Napoleon. Jerome appointed him an auditor to the state council, while he retained his other post. His salary was increased in a short interval from 2000 to 4000 francs, and his official duties were hardly more than nominal. After the expulsion of Jerome and the reinstalment of an elector, Grimm was appointed in 1813 secretary of legation, to accompany the Hessian minister to the headquarters of the allied army. In 1814 he was sent to Paris to demand restitution of the books carried off by the French, and in 1814–1815 he attended the congress of Vienna as secretary of legation. On his return he was again sent to Paris on the same errand as before. Meanwhile Wilhelm had received an appointment in the Cassel library, and in 1816 Jacob was made second librarian under Völkel. On the death of Völkel in 1828 the brothers expected to be advanced to the first and second librarianships respectively, and were much dissatisfied when the first place was given to Rommel, keeper of the archives. So they removed next year to Göttingen, where Jacob received the appointment of professor and librarian, Wilhelm that of under-librarian. Jacob Grimm lectured on legal antiquities, historical grammar, literary history, and diplomatics, explained Old German poems, and commented on the *Germania* of Tacitus. At this period he is described as small and lively in figure, with a harsh voice, speaking a broad Hessian dialect. His powerful memory enabled him to dispense with the manuscript which most German professors rely on, and he spoke extempore, referring only occasionally to a few names and dates written on a slip of paper. He himself regretted that he had begun the work of teaching so late in life; and as a lecturer he was not successful: he had no idea of digesting his facts and suiting them to the comprehension of his hearers; and even the brilliant, terse and eloquent passages which abound in his writings lost much of their effect when jerked out in the midst of a long array of dry facts. In 1837, being one of the seven professors who signed a protest against the king of Hanover's abrogation of the constitution established some years before, he was dismissed from his professorship, and banished from the kingdom of Hanover. He returned to Cassel together with his brother, who had also signed the protest, and remained there till, in 1840, they accepted an invitation from the king of Prussia to remove to Berlin, where they both received professorships, and were elected members of the Academy of Sciences. Not being under any obligation to lecture, Jacob seldom did so, but together with his brother worked at the great dictionary. During their stay at Cassel Jacob regularly attended the meetings of the academy, where he read papers on the most varied subjects. The best known of these are those on Lachmann, Schiller, and his brother Wilhelm (who died in 1859), on old age, and on the origin of language. He also described his impressions of Italian and Scandinavian travel, interspersing his more general observations with linguistic details, as is the case in all his works.

Grimm died in 1863, working up to the last. He was never ill, and worked on all day, without haste and without pause. He was not at all impatient of interruption, but seemed rather to be refreshed by it, returning to his work without effort. He wrote for the press with great rapidity, and hardly ever made corrections. He never revised what he had written, remarking with a certain wonder of his brother, "Wilhelm reads his manuscripts over again before sending them to press!" His temperament was uniformly cheerful, and he was easily amused. Outside his own special work he had a marked taste for botany. The spirit which animated his work is best described by himself at the end of his autobiography. "Nearly all my labours have been devoted, either directly or indirectly, to the investigation of our earlier language, poetry and laws. These studies may have appeared to many, and may still appear, useless; to me they have always seemed a noble and earnest task, definitely and inseparably connected with our common fatherland, and calculated to foster the love of it. My principle has always been in these investigations to under-value nothing, but to utilize the small for the illustration of the great, the popular tradition for the elucidation of the written monuments."

The purely scientific side of Grimm's character developed slowly. He seems to have felt the want of definite principles of etymology without being able to discover them, and indeed even in the first edition of his grammar (1819) he seems to be often groping in the dark. As early as 1815 we find A. W. Schlegel reviewing the *Altdeutsche Wälder* (a periodical published by the two brothers) very severely, condemning the lawless etymological combinations it contained, and insisting on the necessity of strict philological method and a fundamental investigation of the laws of language, especially in the correspondence of sounds. This criticism is said to have had a considerable influence on the direction of Grimm's studies.

The first work he published, *Über den altdeutschen Meistergesang* (1811), was of a purely literary character. Yet even in this essay Grimm showed that *Minnesang* and *Meistersang* were really one form of poetry, of which they merely represented different stages of development, and also announced his important discovery of the invariable division of the *Lied* into three strophic parts.

His text-editions were mostly prepared in common with his brother. In 1812 they published the two ancient fragments of the *Hildebrandslied* and the *Weissenbrunner Gebet*. Jacob having discovered what till then had never been suspected—the alliteration in these poems. However, Jacob had little taste for text-editing, and, as he himself confessed, the evolving of a

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critical text gave him little pleasure. He therefore left this department to others, especially Lachmann, who soon turned his brilliant critical genius, trained in the severe school of classical philology, to Old and Middle High German poetry and metre. Both brothers were attracted from the beginning by all national poetry, whether in the form of epics, ballads or popular tales. They published in 1816–1818 an analysis and critical sifting of the oldest epic traditions of the Germanic races under the title of *Deutsche Sagen*. At the same time they collected all the popular tales they could find, partly from the mouths of the people, partly from manuscripts and books, and published in 1812–1815 the first edition of those *Kinder-und Hausmärchen* which have carried the name of the brothers Grimm into every household of the civilized world, and founded the science of folk-lore. The closely allied subject of the satirical beast epic of the middle ages also had a great charm for Jacob Grimm, and he published an edition of the *Reinhart Fuchs* in 1834. His first contribution to mythology was the first volume of an edition of the Eddaic songs, undertaken conjointly with his brother, published in 1815, which, however, was not followed by any more. The first edition of his *Deutsche Mythologie* appeared in 1835. This great work covers the whole range of the subject, tracing the mythology and superstitions of the old Teutons back to the very dawn of direct evidence, and following their decay and loss down to the popular traditions, tales and expressions in which they still linger.

Although by the introduction of the Code Napoléon into Westphalia Grimm's legal studies were made practically barren, he never lost his interest in the scientific study of law and national institutions, as the truest exponents of the life and character of a people. By the publication (in 1828) of his *Rechtsalterthümer* he laid the foundations of that historical study of the old Teutonic laws and constitutions which was continued with brilliant success by Georg L. Maurer and others. In this work Grimm showed the importance of a linguistic study of the old laws, and the light that can be thrown on many a dark passage in them by a comparison of the corresponding words and expressions in the other old cognate dialects. He also knew how—and this is perhaps the most original and valuable part of his work—to trace the spirit of the laws in countless allusions and sayings which occur in the old poems and sagas, or even survive in modern colloquialisms.

Of all his more general works the boldest and most far-reaching is his *Geschichte der deutschen Sprache*, where at the same time the linguistic element is most distinctly brought forward. The subject of the work is, indeed, nothing less than the history which lies hidden in the words of the German language—the oldest national history of the Teutonic tribes determined by means of language. For this purpose he laboriously collects the scattered words and allusions to be found in classical writers, and endeavours to determine the relations in which the German language stood to those of the Getae, Thracians, Scythians, and many other nations whose languages are known only by doubtfully identified, often extremely corrupted remains preserved by Greek and Latin authors. Grimm's results have been greatly modified by the wider range of comparison and improved methods of investigation which now characterize linguistic science, and many of the questions raised by him will probably for ever remain obscure; but his book will always be one of the most fruitful and suggestive that have ever been written.

Grimm's famous *Deutsche Grammatik* was the outcome of his purely philological work. The labours of past generations—from the humanists onwards—had collected an enormous mass of materials in the shape of text-editions, dictionaries and grammars, although most of it was uncritical and often untrustworthy. Something had even been done in the way of comparison and the determination of general laws, and the conception of a comparative Teutonic grammar had been clearly grasped by the illustrious Englishman George Hickes, at the beginning of the 18th century, and partly carried out by him in his *Thesaurus*. Ten Kate in Holland had afterwards made valuable contributions to the history and comparison of the Teutonic languages. Even Grimm himself did not at first intend to include all the languages in his grammar; but he soon found that Old High German postulated Gothic, that the later stages of German could not be understood without the help of the Low German dialects, including English, and that the rich literature of Scandinavia could as little be ignored. The first edition of the first part of the *Grammar*, which appeared in 1819, and is now extremely rare, treated of the inflections of all these languages, together with a general introduction, in which he vindicated the importance of an historical study of the German language against the a priori, quasi-philosophical methods then in vogue.

In 1822 this volume appeared in a second edition—really a new work, for, as Grimm himself says in the preface, it cost him little reflection to mow down the first crop to the ground. The wide distance between the two stages of Grimm's development in these two editions is significantly shown by the fact that while the first edition gives only the inflections, in the second volume phonology takes up no fewer than 600 pages, more than half of the whole volume. Grimm had, at last, awakened to the full conviction that all sound philology must be based on rigorous adhesion to the laws of sound-change, and he never afterwards swerved from this principle, which gave to all his investigations, even in their boldest flights, that iron-bound consistency, and that force of conviction which distinguish science from dilettanteism; up to Grimm's time philology was nothing but a more or less laborious and conscientious dilettanteism, with occasional flashes of scientific inspiration; he made it into a science. His advance must be attributed mainly to the influence of his contemporary R. Rask. Rask was born two years later than Grimm, but his remarkable precocity gave him somewhat the start. Even in Grimm's first editions his Icelandic paradigms are based entirely on Rask's grammar, and in his second edition he relied almost entirely on Rask for Old English. His debt to Rask can only be estimated at its true value by comparing his treatment of Old English in the two editions; the difference is very great. Thus in the first edition he declines *dæg, dæges*, plural *dægas*, not having observed the law of vowel-change pointed out by Rask. There can be little doubt that the appearance of Rask's Old English grammar was a main inducement for him to recast his work from the beginning. To Rask also belongs the merit of having first distinctly formulated the laws of sound-correspondence in the different languages, especially in the vowels, those more fleeting elements of speech which had hitherto been ignored by etymologists.

This leads to a question which has been the subject of much controversy,—Who discovered what is known as *Grimm's law?* This law of the correspondence of consonants in the older Indogermanic, Low and High German languages respectively was first fully stated by Grimm in the second edition of the first part of his grammar. The correspondence of single consonants had been more or less clearly recognized by several of his predecessors; but the one who came nearest to the discovery of the complete law was the Swede J. Ihre, who established a considerable number of "literarum permutationes," such as *b* for *f*, with the examples *bära = ferre, befwer = fiber*. Rask, in his essay on the origin of the Icelandic language, gives the same comparisons, with a few additions and corrections, and even the very same examples in most cases. As Grimm in the preface to his first edition expressly mentions this essay of Rask, there is every probability that it gave the first impulse to his own investigations. But there is a wide difference between the isolated permutations of his predecessors and the comprehensive generalizations under which he himself ranged them. The extension of the law to High German is also entirely his own. The only fact that can be adduced in support of the assertion that Grimm wished to deprive Rask of his claims to priority is that he does not expressly mention Rask's results in his second edition. But this is part of the plan of his work, viz. to refrain from all controversy or reference to the works of others. In his first edition he expressly calls attention to Rask's essay, and praises it most ungrudgingly. Rask himself refers as little to Ihre, merely alluding in a general way to Ihre's permutations, although his own debt to Ihre is infinitely greater than that of Grimm to

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Rask or any one else. It is true that a certain bitterness of feeling afterwards sprang up between Grimm and Rask, but this was the fault of the latter, who, impatient of contradiction and irritable in controversy, refused to acknowledge the value of Grimm's views when they involved modification of his own. The importance of Grimm's generalization in the history of philology cannot be overestimated, and even the nystic completeness and symmetry of its formulation, although it has proved a hindrance to the correct explanation of the causes of the changes, was well calculated to strike the popular mind, and give it a vivid idea of the paramount importance of law, and the necessity of disregarding mere superficial resemblance. The most lawless etymologist bows down to the authority of Grimm's law, even if he honours it almost as much in the breach as in the observance.

The grammar was continued in three volumes, treating principally of derivation, composition and syntax, which last was left unfinished. Grimm then began a third edition, of which only one part, comprising the vowels, appeared in 1840, his time being afterwards taken up mainly by the dictionary. The grammar stands alone in the annals of science for comprehensiveness, method and fullness of detail. Every law, every letter, every syllable of inflection in the different languages is illustrated by an almost exhaustive mass of material. It has served as a model for all succeeding investigators. Diez's grammar of the Romance languages is founded entirely on its methods, which have also exerted a profound influence on the wider study of the Indo-Germanic languages in general.

In the great German dictionary Grimm undertook a task for which he was hardly suited. His exclusively historical tendencies made it impossible for him to do justice to the individuality of a living language; and the disconnected statement of the facts of language in an ordinary alphabetical dictionary fatally mars its scientific character. It was also undertaken on so large a scale as to make it impossible for him and his brother to complete it themselves. The dictionary, as far as it was worked out by Grimm himself, may be described as a collection of disconnected antiquarian essays of high value.

Grimm's scientific character is notable for its combination of breadth and unity. He was as far removed from the narrowness of the specialist who has no ideas, no sympathies beyond some one author, period or corner of science, as from the shallow dabbler who feverishly attempts to master the details of half-a-dozen discordant pursuits. Even within his own special studies there is the same wise concentration; no Mezzofanti-like parrot display of useless polyglottism. The very foundations of his nature were harmonious; his patriotism and love of historical investigation received their fullest satisfaction in the study of the language, traditions, mythology, laws and literature of his own countrymen and their nearest kindred. But from this centre his investigations were pursued in every direction as far as his unerring instinct of healthy limitation would allow. He was equally fortunate in the harmony that subsisted between his intellectual and moral nature. He made cheerfully the heavy sacrifices that science demands from its disciples, without feeling any of that envy and bitterness which often torment weaker natures; and although he lived apart from his fellow men, he was full of human sympathies, and no man has ever exercised a profounder influence on the destinies of mankind. His was the very ideal of the noblest type of German character.

The following is a complete list of his separately published works, those which he published in common with his brother being marked with a star. For a list of his essays in periodicals, &c., see vol. v. of his *Kleinere Schriften*, from which the present list is taken. His life is best studied in his own "Selbstbiographie," in vol. i. of the *Kleinere Schriften*. There is also a brief memoir by K. Goedeke in *Göttinger Professoren* (Gotha (Perthes), 1872): *Über den altdeutschen Meistergesang* (Göttingen, 1811); **Kinder- und Hausmarchen* (Berlin, 1812–1815) (many editions); **Das Lied von Hildebrand und das Weissenbrunner Gebet* (Cassel, 1812); *Altdeutsche Wälder* (Cassel, Frankfort, 1813–1816, 3 vols.); **Der arme Heinrich von Hartmann von der Aue* (Berlin, 1815); *Irmenstrasse und Irmensäule* (Vienna, 1815); **Die Lieder der alten Edda* (Berlin, 1815), *Silva de romances viejos* (Vienna, 1815); **Deutsche Sagen* (Berlin, 1816–1818, 2nd ed., Berlin, 1865–1866); *Deutsche Grammatik* (Göttingen, 1819, 2nd ed., Göttingen, 1822–1840) (reprinted 1870 by W. Scherer, Berlin); *Wuk Stephanovitsch's kleine serbische Grammatik, verdeutscht mit einer Vorrede* (Leipzig and Berlin, 1824); *Zur Recension der deutschen Grammatik* (Cassel, 1826); **Irische Elfenmärchen, aus dem Englischen* (Leipzig, 1826); *Deutsche Rechtsalterthümer* (Göttingen, 1828, 2nd ed., 1854); *Hymnorum veteris ecclesiae XXVI. interpretatio theodisca* (Göttingen, 1830); *Reinhart Fuchs* (Berlin, 1834); *Deutsche Mythologie* (Göttingen, 1835, 3rd ed., 1854, 2 vols.); *Taciti Germania edidit* (Göttingen, 1835); *Über meine Entlassung* (Basel, 1838); (together with Schmeller) *Lateinische Gedichte des X. und XI. Jahrhunderts* (Göttingen, 1838); *Sendschreiben an Karl Lachmann über Reinhart Fuchs* (Berlin, 1840); *Weistümer*, Th. i. (Göttingen, 1840) (continued, partly by others, in 5 parts, 1840–1869); *Andreas und Elene* (Cassel, 1840); *Frau Aventure* (Berlin, 1842); *Geschichte der deutschen Sprache* (Leipzig, 1848, 3rd ed., 1868, 2 vols.); *Das Wort des Besitzes* (Berlin, 1850); **Deutsches Wörterbuch*, Bd. i. (Leipzig, 1854); *Rede auf Wilhelm Grimm und Rede über das Alter* (Berlin, 1868, 3rd ed., 1865); *Kleinere Schriften* (Berlin, 1864–1870, 5 vols.). (H. Sw.)

GRIMM, WILHELM CARL (1786–1859). For the chief events in the life of Wilhelm Grimm see article on Jacob Grimm above. As Jacob himself said in his celebrated address to the Berlin Academy on the death of his brother, the whole of their lives were passed together. In their schooldays they had one bed and one table in common, as students they had two beds and two tables in the same room, and they always lived under one roof, and had their books and property in common. Nor did Wilhelm's marriage in any way disturb their harmony. As Cleasby said ("Life of Cleasby," prefixed to his *Icelandic Dictionary*, p. lxix.), "they both live in the same house, and in such harmony and community that one might almost imagine the children were common property." Wilhelm's character was a complete contrast to that of his brother. As a boy he was strong and healthy, but as he grew up he was attacked by a long and severe illness, which left him weak all his life. His was a less comprehensive and energetic mind than that of his brother, and he had less of the spirit of investigation, preferring to confine himself to some limited and definitely bounded field of work; he utilized everything that bore directly on his own studies, and ignored the rest. These studies were almost always of a literary nature. It is characteristic of his more aesthetic nature that he took great delight in music, for which his brother had but a moderate liking, and had a remarkable gift of story-telling. Cleasby, in the account of his visit to the brothers, quoted above, tells that "Wilhelm read a sort of farce written in the Frankfort dialect, depicting the 'malheurs' of a rich Frankfort tradesman on a holiday jaunt on Sunday. It was very droll, and he read it admirably." Cleasby describes him as "an uncommonly animated, jovial fellow." He was, accordingly, much sought in society, which he frequented much more than his brother.

His first work was a spirited translation of the Danish *Kämpeviser, Altdänische Heldenlieder*, published in 1811–1813, which made his name at first more widely known than that of his brother. The most important of his text editions are—*Rolandslied* (Göttingen, 1838); *Konrad von Wurzburg's Goldene Schmiede* (Berlin, 1840); *Grave Rudolf* (Göttingen, 1844, 2nd ed.); *Athis und Prophilias* (Berlin, 1846); *Altdeutsche Gespräche* (Berlin, 1851); *Freidank* (Göttingen, 1860, 2nd ed.). Of his other works the most important is *Deutsche Heldensage* (Berlin, 1868, 2nd ed.). His *Deutsche Runen* (Göttingen, 1821) has now only an historical interest. (H. Sw.)

GRIMMA, a town in the kingdom of Saxony, on the left bank of the Mulde, 19 m. S.E. of Leipzig on the railway Döbeln-Dresden. Pop. (1905) 11,182. It has a Roman Catholic and three Evangelical churches, and among other principal buildings are the Schloss built in the 12th century, and long a residence of the margraves of Meissen and the electors of Saxony; the town-hall, dating from 1442, and the famous school Fürstenschule (*Illustre Moldanum*), erected by the elector Maurice on the site of the former Augustinian monastery in 1550, having provision for 104 free scholars and a library numbering 10,000 volumes. There are also a modern school, a teachers' seminary, a commercial school and a school of brewing. Among the industries of the town are ironfounding, machine building and dyeworks, while paper and gloves are manufactured there. Gardening and agriculture generally are also important branches of industry. In the immediate neighbourhood are the ruins of the Cistercian

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nunnery from which Catherine von Bora fled in 1523, and the village of Döben, with an old castle. Grimma is of Sorbian origin, and is first mentioned in 1203. It passed then into possession of Saxony and has remained since part of that country.

See Lorenz, *Die Stadt Grimma, historisch beschrieben* (Leipzig, 1871); Rössler, *Geschichte der königlich sächsischen Fürsten- und Landesschule Grimma* (Leipzig, 1891); L. Schmidt, *Urkundenbuch der Stadt Grimma* (Leipzig, 1895); and Fraustadt, *Grimmenser Stammbuch* (Grimma, 1900).

GRIMMELSHAUSEN, HANS JAKOB CHRISTOFFEL VON (*c.* 1625–1676), German author, was born at Gelnhausen in or about 1625. At the age of ten he was kidnapped by Hessian soldiery, and in their midst tasted the adventures of military life in the Thirty Years' War. At its close, Grimmelshausen entered the service of Franz Egon von Fürstenberg, bishop of Strassburg and in 1665 was made *Schultheiss* (magistrate) at Renchen in Baden. On obtaining this appointment, he devoted himself to literary pursuits, and in 1669 published *Der abenteuerliche Simplicissimus, Teutsch, d.h. die Beschreibung des Lebens eines seltsamen Vaganten, genannt Melchior Sternfels von Fuchsheim*, the greatest German novel of the 17th century. For this work he took as his model the picaresque romances of Spain, already to some extent known in Germany. *Simplicissimus* is in great measure its author's autobiography; he begins with the childhood of his hero, and describes the latter's adventures amid the stirring scenes of the Thirty Years' War. The realistic detail with which these pictures are presented makes the book one of the most valuable documents of its time. In the later parts Grimmelshausen, however, over-indulges in allegory, and finally loses himself in a Robinson Crusoe story. Among his other works the most important are the so-called *Simplicianische Schriften: Die Erzbetrügerin und Landstörtzerin Courasche* (*c.* 1669); *Der seltsame Springinsfeld* (1670) and *Das wunderbarliche Vogelnest* (1672). His satires, such as *Der teutsche Michel* (1673) and "gallus," two novels, like *Dietwald und Amelinde* (1670) are of inferior interest. He died at Renchen on the 17th of August 1676, where a monument was erected to him in 1879.

Editions of *Simplicissimus* and the *Simplicianische Schriften* have been published by A. von Keller (1854), H. Kurz (1863–1864), J. Tittmann (1877) and F. Bobertag (1882). A reprint of the first edition of the novel was edited by R. Kögel for the series of *Neudrucke des 16. und 17. Jahrhunderts* (1880). See the introductions to these editions; also F. Antoine, *Étude sur le Simplicissimus de Grimmelshausen* (1882) and E. Schmidt in his *Charakteristiken*, vol. i. (1886).

GRIMOARD, PHILIPPE HENRI, COMTE DE (1753–1815), French soldier and military writer, entered the royal army at the age of sixteen, and in 1775 published his *Essai théorique et pratique sur les batailles*. Shortly afterwards Louis XVI. placed him in his own military cabinet and employed him especially in connexion with schemes of army reform. By the year of the Revolution he had become one of Louis's most valued counsellors, in political as well as military matters, and was marked out, though only a colonel, as the next Minister of War. In 1791 Grimoard was entrusted with the preparation of the scheme of defence for France, which proved two years later of great assistance to the Committee of Public Safety. The events of 1792 put an end to his military career, and the remainder of his life was spent in writing military books.

The following works by him, besides his first essay, have retained some importance: *Éclaircissemens sur les dernières campagnes de Turenne* (Paris, 1780), *Lettres et mémoires de Turenne* (Paris, 1780), *Troupes légères et leur emploi* (Paris, 1782), *Conquêtes de Gustave-Adolphe* (Stockholm and Neufchatel, 1782–1791); *Mémoires de Gustave Adolphe* (Paris, 1790), Correspondence of Marshal Richelieu (Paris, 1789), St Germain (1789), and Bernis (1790), *Vie et règne de Frédéric le Grand* (London, 1788), *Lettres et mémoires du maréchal de Saxe* (Paris, 1794), *L'Expédition de Minorque en 1756* (Paris, 1798), *Recherches sur la force de l'armée française depuis Henri IV jusqu'en 1805* (Paris, 1806), *Mémoires du maréchal de Tessé* (Paris, 1806), *Lettres de Bolingbroke* (Paris, 1808), *Traité sur le service d'état-major* (Paris, 1809), and (with Servan) *Tableau historique de la guerre de la Révolution 1792–1794* (Paris, 1808).

GRIMSBY, or GREAT GRIMSBY, a municipal, county and parliamentary borough of Lincolnshire, England; an important seaport near the mouth of the Humber on the south shore. Pop. (1901) 63,138. It is 155 m. N. by E. from London by the Great Northern railway, and is also served by the Great Central railway. The church of St James, situated in the older part of the town, is a cruciform Early English building, retaining, in spite of injudicious restoration, many beautiful details. The chief buildings are that containing the town hall and the grammar school (a foundation of 1547), the exchange, a theatre, and the customs house and dock offices. A sailors' and fishermen's Harbour of Refuge, free library, constitutional club and technical school are maintained. The duke of York public gardens were opened in 1894. Adjacent to Grimsby on the east is the coastal watering-place of Cleethorpes.

The dock railway station lies a mile from the town station. In 1849 the Great Central (then the Manchester, Sheffield and Lincolnshire) railway initiated a scheme of reclamation and dock-construction. This was completed in 1854, and subsequent extensions were made. There are two large fish-docks, and, for general traffic, the Royal dock, communicating with the Humber through a tidal basin, the small Union dock, and the extensive Alexandra dock, together with graving docks, timber yards, a patent slip, &c. These docks have an area of about 104 acres, but were found insufficient for the growing traffic of the port, and in 1906 the construction of a large new dock, of about 40 acres' area and 30 to 35 ft. depth, was undertaken by the Great Central Company at Immingham, 5 m. above Grimsby on the Humber. The principal imports are butter, woollens, timber, cereals, eggs, glass, cottons, preserved meat, wool, sugar and bacon. The exports consist chiefly of woollen yarn, woollens, cotton goods, cotton yarn, machinery, &c. and coal. It is as a fishing port, however, that Grimsby is chiefly famous. Two of the docks are for the accommodation of the fishing fleet, which, consisting principally of steam trawlers, numbers upwards of 500 vessels. Regular passenger steamers run from Grimsby to Dutch and south Swedish ports, and to Esbjerg (Denmark), chiefly those of the Wilson line and the Great Central railway. The chief industries of Grimsby are shipbuilding, brewing, tanning, manufactures of ship tackle, ropes, ice for preserving fish, turnery, flour, linseed cake, artificial manure; and there are saw mills, bone and corn mills, and creosote works. The municipal borough is under a mayor, 12 aldermen and 36 councillors. Area, 2852 acres.

Grimsby (*Grimesbi*) is supposed to have been the landing-place of the Danes on their first invasion of Britain towards the close of the 8th century. It was a borough by prescription as early as 1201, in which year King John granted the burgesses a charter of liberties according to the custom of the burgesses of Northampton. Henry III. in 1227 granted to "the mayor and good men" of Grimsby, that they should hold the town for a yearly rent of £111, and confirmed the same in 1271. These charters were confirmed by later sovereigns. A governing charter, under the title of mayor and burgesses, was given by James II. in 1688, and under this the appointment of officers and other of the corporation, arrangements are to a great extent regulated. In 1201 King John granted the burgesses an annual fair for fifteen days, beginning on the 25th of May. Two annual fairs are now held, namely on the first Monday in April and the second Monday in October. No early grant of a market can be found, but in 1792 the market-day was Wednesday. In 1888 it had ceased to exist. Grimsby returned two members to the parliament of 1298, but in 1833 the number was reduced to one.

In the time of Edward III. Grimsby was an important seaport, but the haven became obstructed by sand and mud deposited by the Humber, and so the access of large vessels was prevented. At the beginning of the 19th century a subscription was raised by the proprietors of land in the neighbourhood for improving the harbour, and an act was obtained by which they were incorporated under the title "The Grimsby Haven Co." The fishing trade had become so important by 1800 that it was necessary to construct a new dock.

GRIMSTON, SIR HARBOTTLE (1603–1685), English politician, second son of Sir Harbottle Grimston, Bart. (d. 1648), was born

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at Bradfield Hall, near Manningtree, on the 27th of January 1603. Educated at Emmanuel College, Cambridge, he became a barrister of Lincoln's Inn, then recorder of Harwich and recorder of Colchester. As member for Colchester, Grimston sat in the Short Parliament of 1640, and he represented the same borough during the Long Parliament, speedily becoming a leading member of the popular party. He attacked Archbishop Laud with great vigour; was a member of the important committees of the parliament, including the one appointed in consequence of the attempted seizure of the five members; and became deputy-lieutenant of Essex after the passing of the militia ordinance in January 1642. He disliked taking up arms against the king, but remained nominally an adherent of the parliamentary party during the Civil War. In the words of Clarendon, he "continued rather than concurred with them." Grimston does not appear to have taken the Solemn League and Covenant, but after the conclusion of the first period of the war he again became more active. He was president of the committee which investigated the escape of the king from Hampton Court in 1647, and was one of those who negotiated with Charles at Newport in 1648, when, according to Burnet, he fell upon his knees and urged the king to come to terms. From this time Grimston's sympathies appear to have been with the Royalists. Turned out of the House of Commons when the assembly was "purged" by colonel Pride, he was imprisoned; but was released after promising to do nothing detrimental to the parliament or the army, and spent the next few years in retirement. Before this time, his elder brother having already died, he had succeeded his father as 2nd baronet. In 1656 Sir Harbottle was returned to Cromwell's second parliament as member for Essex; but he was not allowed to take his seat; and with 97 others who were similarly treated he issued a remonstrance to the public. He was among the secluded members who re-entered the Long Parliament in February 1660, was then a member of the council of state, and was chosen Speaker of the House of Commons in the Convention Parliament of 1660. As Speaker he visited Charles II. at Breda, and addressed him in very flattering terms on his return to London; but he refused to accede to the king's demand that he should dismiss Burnet from his position as chaplain to the Master of the Rolls, and in parliament he strongly denounced any relaxation of the laws against papists. Grimston did not retain the office of Speaker after the dissolution of the Convention Parliament, but he was a member of the commission which tried the regicides, and in November 1660 he was appointed Master of the Rolls. Report says he paid Clarendon £8000 for the office, while Burnet declares he obtained it "without any application of his own." He died on the 2nd of January 1685. His friend and chaplain, Burnet, speaks very highly of his piety and impartiality, while not omitting the undoubted fact that he was "much sharpened against popery." He translated the law reports of his father-in-law, the judge, Sir George Croke (1560–1642), which were written in Norman-French, and five editions of this work have appeared. Seven of his parliamentary speeches were published, and he also wrote *Strena Christiana* (London, 1644, and other editions). Grimston's first wife, Croke's daughter Mary, bore him six sons and two daughters; and by his second wife, Anne, daughter and heiress of Sir Nathaniel Bacon, K.B., a grandson of Sir Nicholas Bacon, he had one daughter.

Of his sons one only, Samuel (1643–1700), survived his father, and when he died in October 1700 the baronetcy became extinct. Sir Harbottle's eldest daughter, Mary, married Sir Capel Luckyn, Bart., and their grandson, William Luckyn, succeeded to the estates of his great-uncle, Sir Samuel Grimston, and took the name of Grimston in 1700. This William Luckyn Grimston (1683–1756) was created Baron Dunboyne and Viscount Grimston in the peerage of Ireland in 1719. He was succeeded as 2nd viscount by his son James (1711–1773), whose son James Bucknall (1747–1808) was made an English peer as baron Verulam of Gorhambury in 1790. Then in 1815 his son James Walter (1775–1845), 2nd baron Verulam, was created earl of Verulam, and the present peer is his direct descendant. Sir Harbottle Grimston bought Sir Nicholas Bacon's estate at Gorhambury, which is still the residence of his descendants.

See G. Burnet, *History of My Own Time*, edited by O. Airy (Oxford, 1900).

GRIMTHORPE, EDMUND BECKETT, 1ST BARON (1816–1905), son of Sir Edmund Beckett Denison, was born on the 12th of May 1816. He was educated at Doncaster and Eton, whence he proceeded to Trinity College, Cambridge, and graduated thirtieth wrangler in 1838. He was called to the bar at Lincoln's Inn in 1841. Upon succeeding to the baronetcy in 1874 he dropped the name of Denison, which his father had assumed in 1816. From 1877 to 1900 he was chancellor and vicar-general of York, and he was raised to the peerage in 1886. He was made a Q.C. in 1854, and was for many years a leader of the Parliamentary Bar. He devoted himself to the study of astronomy, horology and architecture, more especially Gothic ecclesiastical architecture. As early as 1850 he had become a recognized authority on clocks, watches and bells, and in particular on the construction of turret clocks, for he had designed Dent's Great Exhibition clock, and his *Rudimentary Treatise* had gone through many editions. In 1851 he was called upon, in conjunction with the astronomer royal (Mr, afterwards Sir, G. B. Airy) and Mr Dent, to design a suitable clock for the new Houses of Parliament. The present tower clock, popularly known as "Big Ben," was constructed after Lord Grimthorpe's designs. In a number of burning questions during his time Lord Grimthorpe took a prominent part. It is, however, in connexion with the restoration of St Albans Abbey that he is most widely known. The St Albans Abbey Reparation Committee, which had been in existence since 1871, and for which Sir Gilbert Scott had carried out some admirable repairs, obtained a faculty from the Diocesan Court in 1877 to repair and restore the church and fit it for cathedral and parochial services. Very soon, however, the committee found itself unable to raise the necessary funds, and it was at this juncture that a new faculty was granted to Lord Grimthorpe (then Sir Edmund Beckett) to "restore, repair and refit" the abbey at his own expense. Lord Grimthorpe made it an express stipulation that the work should be done according to his own designs and under his own supervision. His public spirit in undertaking the task was undeniable, but his treatment of the roof, the new west front, and the windows inserted in the terminations of the transepts, excited a storm of adverse criticism, and was the subject of vigorous protests from the professional world of architecture. He died on the 29th of April 1905, being succeeded as 2nd baron by his nephew, E. W. Beckett (b. 1856), who had sat in parliament as conservative member for the Whitby division of Yorkshire from 1885.

GRINDAL, EDMUND (*c.* 1519–1583), successively bishop of London, archbishop of York and archbishop of Canterbury, born about 1519, was son of William Grindal, a farmer of Hensingham, in the parish of St Bees, Cumberland. He was educated at Magdalene and Christ's Colleges and then at Pembroke Hall, Cambridge, where he graduated B.A. and was elected fellow in 1538. He proceeded M.A. in 1541, was ordained deacon in 1544 and was proctor and Lady Margaret preacher in 1548–1549. Probably through the influence of Ridley, who had been master of Pembroke Hall, Grindal was selected as one of the Protestant disputants during the visitation of 1549. He had a considerable talent for this work and was often employed on similar occasions. When Ridley became bishop of London, he made Grindal one of his chaplains and gave him the precentorship of St Paul's. He was soon promoted to be one of Edward VI.'s chaplains and prebendary of Westminster, and in October 1552 was one of the six divines to whom the Forty-two articles were submitted for examination before being sanctioned by the Privy Council. According to Knox, Grindal distinguished himself from most of the court preachers in 1553 by denouncing the worldliness of the courtiers and foretelling the evils to follow on the king's death.

That event frustrated Grindal's proposed elevation to the episcopal bench and he did not consider himself bound to await the evils which he had foretold. He abandoned his preferments

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on Mary's accession and made his way to Strassburg. Thence, like so many of the Marian exiles, he proceeded to Frankfurt, where he endeavoured to compose the disputes between the "Coxians" (see COX, RICHARD), who regarded the 1552 Prayer Book as the perfection of reform, and the Knoxians, who wanted further simplification. He returned to England in January 1559, was appointed one of the committee to revise the liturgy, and one of the Protestant representatives at the Westminster conference. In July he was also elected Master of Pembroke Hall in succession to the recusant Dr Thomas Young (1514–1580) and Bishop of London in succession to Bonner.

Grindal himself was, however, inclined to be recalcitrant from different motives. He had qualms about vestments and other traces of "popery" as well as about the Erastianism of Elizabeth's ecclesiastical government. His Protestantism was robust enough; he did not mind recommending that a priest "might be put to some torment" (*Hatfield MSS.* i. 260); and in October 1562 he wrote to Cecil begging to know "if that second Julian, the king of Navarre, is killed; as he intended to preach at St Paul's Cross, and might take occasion to mention God's judgements on him" (*Domestic Col.*, 1547–1580, p. 209). But he was loth to execute judgments upon English Puritans, and modern high churchmen complain of his infirmity of purpose, his opportunism and his failure to give Parker adequate assistance in rebuilding the shattered fabric of the English Church. Grindal lacked that firm faith in the supreme importance of uniformity and autocracy which enabled Whitgift to persecute with a clear conscience nonconformists whose theology was indistinguishable from his own. Perhaps he was as wise as his critics; at any rate the rigour which he repudiated hardly brought peace or strength to the Church when practised by his successors, and London, which was always a difficult see, involved Bishop Sandys in similar troubles when Grindal had gone to York. As it was, although Parker said that Grindal "was not resolute and severe enough for the government of London," his attempts to enforce the use of the surplice evoked angry protests, especially in 1565, when considerable numbers of the nonconformists were suspended; and Grindal of his own motion denounced Cartwright to the Council in 1570. Other anxieties were brought upon him by the burning of his cathedral in 1561, for although Grindal himself is said to have contributed £1200 towards its rebuilding, the laity of his diocese were niggardly with their subscriptions and even his clergy were not liberal.

In 1570 Grindal was translated to the archbishopric of York, where Puritans were few and coercion would be required mainly for Roman Catholics. His first letter from Cawood to Cecil told that he had not been well received, that the gentry were not "well-affected to godly religion and among the common people many superstitious practices remained." It is admitted by his Anglican critics that he did the work of enforcing uniformity against the Roman Catholics with good-will and considerable tact. He must have given general satisfaction, for even before Parker's death two persons so different as Burghley and Dean Nowell independently recommended Grindal's appointment as his successor, and Spenser speaks warmly of him in the *Shepherd's Calendar* as the "gentle shepherd Algrind." Burghley wished to conciliate the moderate Puritans and advised Grindal to mitigate the severity which had characterized Parker's treatment of the nonconformists. Grindal indeed attempted a reform of the ecclesiastical courts, but his metropolitical activity was cut short by a conflict with the arbitrary temper of the queen. Elizabeth required Grindal to suppress the "prophesyings" or meetings for discussion which had come into vogue among the Puritan clergy, and she even wanted him to discourage preaching; she would have no doctrine that was not inspired by her authority. Grindal remonstrated, claiming some voice for the Church, and in June 1577 was suspended from his jurisdictional, though not his spiritual, functions for disobedience. He stood firm, and in January 1578 Secretary Wilson informed Burghley that the queen wished to have the archbishop deprived. She was dissuaded from this extreme course, but Grindal's sequestration was continued in spite of a petition from Convocation in 1581 for his reinstatement. Elizabeth then suggested that he should resign; this he declined to do, and after making an apology to the queen he was reinstated towards the end of 1582. But his infirmities were increasing, and while making preparations for his resignation, he died on the 6th of July 1583 and was buried in Croydon parish church. He left considerable benefactions to Pembroke Hall, Cambridge, Queen's College, Oxford, and Christ's College, Cambridge; he also endowed a free school at St Bees, and left money for the poor of St Bees, Canterbury, Lambeth and Croydon.

Strype's *Life of Grindal* is the principal authority; see also *Dict. Nat. Biogr.* and, besides the authorities there cited, Gough's General Index to Parker Soc. Publ.; Acts of the Privy Council; Cal. of Hatfield MSS.; Dixon's *Hist. of the Church of England*; Frere's volume in Stephens' and Hunt's series; *Cambridge Mod. Hist.* vol. iii.; Cox's *Elizabethan Clergy*; Birt's *Elizabethan Religious Settlement*; and Pierce's *Introduction to the Marprelate Tracts* (1909).
(A. F. P.)

GRINDELWALD, a valley in the Bernese Oberland, and one of the chief resorts of tourists in Switzerland. It is shut in on the south by the precipices of the Wetterhorn, Mettenberg and Eiger, between which two famous glaciers flow down. On the north it is sheltered by the Faulhorn range, while on the east the Great Scheidegg Pass leads over to Meiringen; and on the south-west the Little Scheidegg or Wengern Alp (railway 11¾ m. across) divides it from Lauterbrunnen. The main village is connected with Interlaken by a rack railway (13 m.). The valley is very green, and possesses excellent pastures, as well as fruit trees, though little corn is grown. It is watered by the Black Lütschine, a tributary of the Aar. The height of the parish church above the sea-level is 3468 ft. The population in 1900 was 3346, practically all Protestant and German-speaking, and living in 558 houses. The glacier guides are among the best in the Alps. The valley was originally inhabited by the serfs of various great lords in summer for the sake of pasturage. A chapel in a cave was superseded about 1146 by a wooden church, replaced about 1180 by a stone church, which was pulled down in 1703 to erect the present building. Gradually the Austin canons of Interlaken bought out all the other owners in the valley, but when that house was suppressed in 1528 by the town of Bern the inhabitants gained their freedom. The houses near the hotel Adler bear the name of Gydisdorf, but there is no village of Grindelwald properly speaking, though that name is usually given to the assemblage of hotels and shops between Gydisdorf and the railway station. Grindelwald is now very much frequented by visitors in winter.

See W. A. B. Coolidge, *Walks and Excursions in the Valley of Grindelwald* (also in French and German) (Grindelwald, 1900); Emmanuel Friedli, *Bärndütsch als Spiegel bernischen Volkstums*, vol. ii. (Grindelwald, Bern, 1908); E. F. von Mülinen, *Beiträge zur Heimatkunde des Kantons Bern, deutschen Teils*, vol. i. (Bern, 1879), pp. 24-26; G. Strasser, *Der Gletschermann* (Grindelwald, 1888–1890). Scattered notices may be found in the edition (London, 1899) of the "General Introduction" (entitled "Hints and Notes for Travellers in the Alps") to John Ball's *Alpine Guide*. (W. A. B. C.)

GRINGOIRE (or GRINGORE), **PIERRE** (*c.* 1480–1539), French poet and dramatist, was born about the year 1480, probably at Caen. In his first work, *Le Chasteau de labour* (1499), a didactic poem in praise of diligence, he narrates the troubles following on marriage. A young couple are visited by Care, Need, Discomfort, &c.; and other personages common to medieval allegories take part in the action. In November 1501 Gringoire was in Paris directing the production of a mystery play in honour of the archduke Philip of Austria, and in subsequent years he received many similar commissions. The fraternity of the *Enfans sans Souci* advanced him to the dignity of *Mère Sotte* and afterwards to the highest honour of the gild, that of *Prince des Sots*. For twenty years Gringoire seems to have been at the head of this illustrious confrérie. As *Prince des Sots* he exercised an extraordinary influence. At no time was the stage, rude and coarse as it was, more popular as a true exponent of the popular mind. Gringoire's success lay in the fact that he followed, but did not attempt to lead; on his stage the people saw exhibited their passions, their judgments of the moment, their jealousies, their hatreds and their ambitions. Brotherhoods

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of the kind existed all over France. In Paris there were the *Enfans sans Souci*, the *Basochiens*, the *Confrérie de la Passion* and the *Souverain Empire de Galilée*; at Dijon there were the *Mère Folle* and her family; in Flanders the *Société des Arbalétriers* played comedies; at Rouen the *Cornards* or *Conards* yielded to none in vigour and fearlessness of satire. On Shrove Tuesday 1512 Gringoire, who was the accredited defender of the policy of Louis XII., and had already written many political poems, represented the *Jeu du Prince des Sots et Mère Sotte*. It was at the moment when the French dispute with Julius II. was at its height. *Mère Sotte* was disguised as the Church, and disputed the question of the temporal power with the prince. The political meaning was even more thinly veiled in the second part of the entertainment, a morality named *L'Homme obstiné*, the principal personage representing the pope. The performance concluded with a farce. Gringoire adopted for his device on the frontispiece of this trilogy, *Tout par Raison, Raison par Tout, Par tout Raison*. He has been called the *Aristophane des Halles*. In one respect at least he resembles Aristophanes. He is serious in his merriment; there is purpose behind his extravagances. The Church was further attacked in a poem printed about 1510, *La Chasse du cerf des cerfs* (*serf des serfs*, i.e. *servus servorum*), under which title that of the pope is thinly veiled. About 1514 he wrote his mystery of the *Vie de Monseigneur Saint-Louis par personnages* in nine books for the *confrérie* of the masons and carpenters. He became in 1518 herald at the court of Lorraine, with the title of Vaudemont, and married Catherine Roger, a lady of gentle birth. During the last twenty years of a long life he became orthodox, and dedicated a *Blason des hérétiques* to the duke of Lorraine. There is no record of the payment of his salary as a herald after Christmas 1538, so that he died probably in 1539.

His works were edited by C. d'Héricault and A. de Montaiglon for the *Bibliothèque elzévirienne* in 1858. This edition was incomplete, and was supplemented by a second volume in 1877 by Montaiglon and M. James de Rothschild. These volumes include the works already mentioned, except *Le Chasteau de labour*, and in addition, *Les Folles Entreprises* (1505), a collection of didactic and satirical poems, chiefly ballades and rondeaux, one section of which is devoted to the exposition of the tyranny of the nobles, and another to the vices of the clergy; *L'Entreprise de Venise* (*c.* 1509), a poem in seven-lined stanzas, giving a list of the Venetian fortresses which belonged, according to Gringoire, to other powers; *L'Espoir de paix* (1st ed. not dated; another, 1510), a verse treatise on the deeds of "certain popes of Rome," dedicated to Louis XII.; and *La Coquelusche* (1510), a verse description of an epidemic, apparently influenza. For details of his other satires, *Le Blason des fausses Amours*, *Comment a de trop tard marié*, *Les Fantasies du monde qui règne*; of his religious verse, *Chants royaux* (on the Passion, 1527), *Heures de Notre Dame* (1525); and a collection of tales in prose and verse, taken from the *Gesta Romanorum*, entitled *Les Fantaisies de Mère Sotte* (1516), see G. Brunet, *Manuel du libraire* (s.v. Gringore). Most of Gringoire's works conclude with an acrostic giving the name of the author. The *Chasteau de labour* was translated into English by Alexander Barclay and printed by Wynkyn de Worde in 1506. Barclay's translation was edited (1905) with his original for the Roxburghe Club by Mr A. W. Pollard, who provided an account of Gringoire, and a bibliography of the book. See also, for the *Jeu du Prince des Sots*, Petit de Julleville, *La Comédie et les mœurs en France au moyen âge*, pp. 151-168 (Paris, 1886); for *Saint Louis*, the same author's *Les Mystères*, i. 331 et seq., ii. 583-597 (1880), with further bibliographical references; and E. Picot, *Gringore et les comédiens italiens* (1877). The real Gringoire cannot be said to have many points of resemblance with the poet described in Victor Hugo's *Notre-Dame de Paris*, nor is there more foundation in fact for the one-act prose comedy of Théodore de Banville.

GRINNELL, a city in Poweshiek county, Iowa, U.S.A., 55 m. E. by N. of Des Moines. Pop. (1900) 3860, of whom 274 were foreign-born; (1905) 4634; (1910) 5036. Grinnell is served by the Chicago, Rock Island & Pacific, and the Iowa Central railways. It is the seat of Iowa College (co-educational), founded in 1847 by the Iowa Band (Congregationalists and graduates of New England colleges and Andover Theological Seminary, who had devoted themselves to home missionary educational work in Iowa, and who came to Iowa in 1843), and by a few earlier pioneers from New England. The college opened in 1848 at Davenport, and in 1850 removed to Grinnell, where there was a school called Grinnell University, which it absorbed. Closely affiliated with the college are the Grinnell Academy and the Grinnell School of Music. In 1907–1908 the College had 463 students, the Academy had 129 students, and the School of Music had 141 students. Among the manufactures are carriages and gloves. The city was named in honour of one of its founders, Josiah Bushnell Grinnell (1821–1891), a Congregational clergyman, friend of and sympathizer with John Brown, and from 1863 to 1867 a member of the National House of Representatives. Grinnell was settled in 1854, was incorporated as a town in 1865, and in 1882 was chartered as a city of the second class. In 1882 it suffered severely from a cyclone.

GRIQUALAND EAST and **GRIQUALAND WEST**, territorial divisions of the Cape Province of the Union of South Africa. Griqualand East, which lies south of Basutoland and west of Natal, is so named from the settlement there in 1862 of Griquas under Adam Kok. It forms part of the Transkeian Territories of the Cape, and is described under KAFFRARIA. Griqualand West, formerly Griqualand simply, also named after its Griqua inhabitants, is part of the great tableland of South Africa. It is bounded S. by the Orange river, W. and N. by Bechuanaland, E. by the Transvaal and Orange Free State Province, and has an area of 15,197 sq. m. It has a general elevation of 3000 to 4000 ft. above the sea, low ranges of rocky hills, the Kaap, Asbestos, Vansittart and Langeberg mountains, traversing its western portion in a general N.E.-S.W. direction. The only perennial rivers are in the eastern district, through which the Vaal flows from a point a little above Fourteen Streams to its junction with the Orange (160 m.). In this part of its course the Vaal receives the Harts river from the north and the Riet from the east. The Riet, 4 m. within the Griqualand frontier, is joined by the Modder. The banks of the rivers are shaded by willows; elsewhere the only tree is the mimosa. The greater part of the country is barren, merging N.W. into absolute desert. The soil is, however, wherever irrigated, extremely fertile. The day climate is hot and dry, but the nights are frequently cold. Rain rarely falls, though thunderstorms of great severity occasionally sweep over the land, and sandstorms are prevalent in the summer. A portion of the country is adapted for sheep-farming and the growing of crops, horse-breeding is carried on at Kimberley, and asbestos is worked in the south-western districts, but the wealth of Griqualand West lies in its diamonds, which are found along the banks of the Vaal and in the district between that river and the Riet. From the first discovery of diamonds in 1867 up to the end of 1905 the total yield of diamonds was estimated at 13½ tons, worth £95,000,000.

The chief town is Kimberley (*q.v.*), the centre of the diamond mining industry. It is situated on the railway from Cape Town to the Zambezi, which crosses the country near its eastern border. Three miles south of Kimberley is Beaconsfield (*q.v.*). On the banks of the Vaal are Barkly West (*q.v.*), Windsorton (pop. 800) and Warrenton (pop. 1500); at all these places are river diggings, diamonds being found along the river from Fourteen Streams to the Harts confluence. Warrenton is 44 m. N. by rail from Kimberley. Douglas (pop. 300), on the south bank of the Vaal, 12 m. above its confluence with the Orange, is the centre of an agricultural district, a canal 9½ m. long serving to irrigate a considerable area. Thirty-five miles N.W. of Douglas is Griquatown (pop. 401), the headquarters of the first Griqua settlers. Campbell (pop. 250) is 30 m. E. of Griquatown, and Postmasburg 42 m. N. by W. A census taken in 1877 showed the population of Griqualand West to be 45,277, of whom 12,347 were whites. At the census of 1891 the population was 83,215, of whom 29,602 were whites, and in 1904 the population was 108,498, of whom 32,570 were whites.

History.—Before the settlement in it of Griqua clans the district was thinly inhabited by Bushmen and Hottentots. At the end of the 18th century a horde known as Bastaards, descendants of Dutch farmers and Hottentot women, led a nomadic life on the plains south of the Orange river. In 1803 a missionary named Anderson induced a number of the Bastaards with their chief Barend Barends to settle north of the river, and a mission station was formed at a place where there was a strong

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flowing fountain, which has now disappeared, which gave the name of Klaarwater to what is now known as Griquatown or Griquastad. Klaarwater became a retreat for other Bastaards, Hottentot refugees, Kaffirs and Bechuanas. From Little Namaqualand came a few half-breeds and others under the leadership of Adam Kok, son of Cornelius Kok and grandson of Adam Kok (c. 1710–1795), a man of mixed white and Hottentot blood who is regarded as the founder of the modern Griquas. The settlement prospered, and in 1813, at the instance of the Rev. John Campbell, who had been sent by the London Missionary Society to inspect the country, the tribesmen abandoned the name of Bastaards in favour of that of Griquas,[1] some of them professing descent from a Hottentot tribe, originally settled near Saldanha Bay, called by the early Dutch settlers at the Cape Chariguriqua or Grigriqua. Under the guidance of missionaries the Griquas made some progress in civilization, and many professed Christianity. Adam Kok and Barends having moved eastward in 1820, those who remained behind elected as their head man a teacher in the mission school named Andries Waterboer, who successfully administered the settlement, and by defeating the Makololo raiders greatly increased the prestige of the tribe. Meanwhile Adam Kok and his companions had occupied part of the country between the Modder and Orange rivers. In 1825 Kok settled at the mission station of Philippolis (founded two years previously), and in a short time had exterminated the Bushmen inhabiting that region. He died about 1835, and after a period of civil strife was succeeded by his younger son, Adam Kok III. This chief in November 1843 signed a treaty placing himself under British protection. Many Dutch farmers were settled on the land he claimed. In 1845 he received British military aid in a contest with the white settlers, and in 1848 helped the British under Sir Harry Smith against the Boers (see ORANGE FREE STATE: *History*). Eventually finding himself straitened by the Boers of the newly established Orange Free State, he removed in 1861–1863 with his people, some 3000 in number, to the region (then depopulated by Kaffir wars) now known as Griqualand East. His sovereign rights to all territory north of the Orange he sold to the Free State for £4000. He founded Kokstad (*q. v.*) and died in 1876. Waterboer, the principal Griqua chief, had entered into treaty relations with the British government as early as 1834, and he received a subsidy of £150 a year. He proved a stanch ally of the British, and kept the peace on the Cape frontier to the day of his death in 1852. He was succeeded by his son Nicholas Waterboer, under whom the condition of the Griquas declined—a decline induced by the indolence of the people and intensified by the drying up of the water supplies, cattle plague and brandy drinking. During this period white settlers acquired farms in the country, and the loss of their independence by the Griquas became inevitable. The discovery of diamonds along the banks of the Vaal in 1867 entirely altered the fortunes of the country, and by the end of 1869 the rush to the alluvial diggings had begun. At the diggers' camps the Griquas exercised no authority, but over part of the district the South African Republic and the Orange Free State claimed sovereignty. At Klip Drift (now Barkly West) the diggers formed a regular government and elected Theodore Parker as their president. Most of the diggers being British subjects, the high commissioner of South Africa interfered, and a Cape official was appointed magistrate at Klip Drift, President Parker resigning office in February 1871. At this time the "dry diggings," of which Kimberley is the centre, had been discovered,[2] and over the miners there the Orange Free State asserted jurisdiction. The land was, however, claimed by Nicholas Waterboer, who, on the advice of his agent, David Arnot, petitioned the British to take over his country. This Great Britain consented to do, and on the 27th of October 1871 proclamations were issued by the high commissioner receiving Waterboer and his Griquas as British subjects and defining the limits of his territory. In addition to the Kimberley district this territory included that part of the diamondiferous area which had been claimed by the Transvaal, but which had been declared, as the result of the arbitration of R. W. Keate, lieutenant-governor of Natal, part of Waterboer's land. On the 4th of November a small party of Cape Mounted Police took possession of the dry diggings and hoisted the British flag. Shortly afterwards the representative of the Orange Free State withdrew. The Free State was greatly incensed by the action of the British government, but the dispute as to the sovereignty was settled in 1876 by the payment of £90,000 by the British to the Free State as compensation for any injury inflicted on the state.

The diggers, who under the nominal rule of the Transvaal and Free State had enjoyed practical independence, found the new government did little for their benefit, and a period of disorder ensued, which was not put an end to by the appointment in January 1873 of Mr (afterwards Sir) Richard Southey[3] as sole administrator, in place of the three commissioners who had previously exercised authority. In the July following the territory was made a crown colony and Southey's title changed to that of lieutenant-governor. The government remained unpopular, the diggers complaining of its unrepresentative character, the heavy taxation exacted, and the inadequate protection of property. They formed a society for mutual protection, and the discontent was so great that an armed force was sent (early in 1875) from the Cape to overawe the agitators. At the same time measures were taken to render the government more popular. The settlement of the dispute with the Free State paved the way for the annexation of Griqualand to the Cape Colony on the 15th of October 1880.

See KIMBERLEY, CAPE COLONY, TRANSVAAL and ORANGE FREE STATE. For the early history of the country and an account of life at the diggings, 1871–1875, consult G. M'Call Theal's *Compendium of the History and Geography of South Africa* (London, 1878), chapters xi. and xii.; Gardner F. Williams, *The Diamond Mines of South Africa* (New York and London, 1902); and the works bearing on the subject quoted in that book. See also Theal's *History of South Africa . . . 1834–1854* (London, 1893); J. Campbell, *Travels in South Africa* (London, 1815), *Travels . . . A Second Journey . . .* (2 vols., London, 1822); the Blue Books C. 508 of 1872 (the last-named containing the Keate award, &c.); the Griqualand West report in *Papers relating to Her Majesty's Colonial Possessions*, part ii. (1875), and the *Life of Sir Richard Southey, K.C.M.G.*, by A. Wilmot (London, 1904). For the Griqua people consult G. W. Stow, *The Native Races of South Africa*, chapters xvii.–xx. (London, 1905).

GRISAILLE, a French term, derived from *gris*, grey, for painting in monochrome in various shades of grey, particularly used in decoration to represent objects in relief. The frescoes of the roof of the Sistine chapel have portions of the design in *grisaille*. At Hampton Court the lower part of the decoration of the great staircase by Verrio is in *grisaille*. The term is also applied to monochrome painting in enamels, and also to stained glass; a fine example of *grisaille* glass is in the window known as the Five Sisters, at the end of the north transept in York cathedral.

GRISELDA, a heroine of romance. She is said to have been the wife of Walter, marquis of Saluces or Saluzzo, in the 11th century, and her misfortunes were considered to belong to history when they were handled by Boccaccio and Petrarch, although the probability is that Boccaccio borrowed his narrative from a Provençal *fabliau*. He included it in the recitations of the tenth day (*Decamerone*), and must have written it about 1350. Petrarch related it in a Latin letter in 1373, and his translation formed the basis of much of the later literature. The letter was printed by Ulrich Zel about 1470, and often subsequently. It was translated into French as *La Patience de*

[1] The Griquas, as a distinct tribe, numbered at the Cape census of 1904 but 6289. They have largely intermarried with Kaffir and Bechuana tribes.

[2] The order of discovery of the chief mines was:—Dutoitspan, Sept. 1870; Bultfontein, Nov. 1870; De Beers, May 1871; Colesberg Kop (Kimberley), July 1871.

[3] Sir Richard Southey (1809–1901) was the son of one of the emigrants from the west of England to Cape Colony (1820). He organized and commanded a corps of Guides in the Kaffir war of 1834–35, and was with Sir Harry Smith at Boomplaats (1848). From 1864 to 1872 he was colonial secretary at the Cape. He gave up his appointment in Griqualand West in 1875, and lived thereafter in retirement. In 1891 he was created a K.C.M.G.

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Griselidis and printed at Brêhan-Loudéac in 1484, and its popularity is shown by the number of early editions quoted by Brunet (*Manuel du libraire, s.v.* Petrarca). The story was dramatized in 1395, and a *Mystère de Griselidis, marquise de Saluses par personnaiges* was printed by Jehan Bonfons (no date). Chaucer followed Petrarch's version in the *Canterbury Tales*. Ralph Radcliffe, who flourished under Henry VIII., is said to have written a play on the subject, and the story was dramatized by Thomas Dekker, Henry Chettle and W. Haughton in 1603.

An example of the many ballads of Griselda is given in T. Deloney's *Garland of Good Will* (1685), and the 17th-century chap-book, *The History of Patient Grisel* (1619), was edited by H. B. Wheatley (1885) for the Villon Society with a bibliographical and literary introduction.

GRISI, GIULIA (1811–1869), Italian opera-singer, daughter of one of Napoleon's Italian officers, was born in Milan. She came of a family of musical gifts, her maternal aunt Josephina Grassini (1773–1850) being a favourite opera-singer both on the continent and in London; her mother had also been a singer, and her elder sister Giudetta and her cousin Carlotta were both exceedingly talented. Giulia was trained to a musical career, and made her stage début in 1828. Rossini and Bellini both took an interest in her, and at Milan she was the first Adalgisa in Bellini's *Norma*, in which Pasta took the title-part. Grisi appeared in Paris in 1832, as Semiramide in Rossini's opera, and had a great success; and in 1834 she appeared in London. Her voice was a brilliant dramatic soprano, and her established position as a prima donna continued for thirty years. She was a particularly fine actress, and in London opera her association with such singers as Lablache, Rubini, Tamburini and Mario was long remembered as the palmy days of Italian opera. In 1854 she toured with Mario in America. She had married Count de Melcy in 1836, but this ended in a divorce; and in 1856 she married Mario (*q.v.*). She died in Berlin on the 29th of November 1869.

GRISON (*Galictis vittata*), a carnivorous mammal, of the family *Mustelidae*, common in Central and South America and Mexico. It is about the size of a marten, and has the upper surface of a bluish-grey tint, and the under surface is dark brown. The grison lives on small mammals and birds, and in settled districts is destructive to poultry. Allamand's grison (*G. allamandi*), with the same range, is somewhat larger. Another member of the genus is the tayra or taira (*G. barbara*), about as large as an otter, with a range from Mexico to Argentina. This species hunts in companies (see CARNIVORA).

GRISONS (Ger. *Graubünden*), the most easterly of the Swiss cantons and also the largest in extent, though relatively the most sparsely populated. Its total area is 2753·2 sq. m., of which 1634·4 sq. m. are classed as "productive" (forests covering 503·1 sq. m. and vineyards 1·3 sq. m.), but it has also 138·6 sq. m. of glaciers, ranking in this respect next after the Valais and before Bern. The whole canton is mountainous, the principal glacier groups being those of the Tödi, N. (11,887 ft.), of Medels, S.W. (Piz Medel, 10,509 ft.), of the Rheinwald or the Adula Alps, S.W. (Rheinwaldhorn, 11,140 ft.), with the chief source of the Rhine, of the Bernina, S.E. (Piz Bernina, 13,304 ft.), the most extensive, of the Albula, E. (Piz Kesch, 11,228 ft.), and of the Silvretta, N.E. (Piz Linard, 11,201 ft.). The principal valleys are those of the upper Rhine and of the upper Inn (or Engadine, *q.v.*). The three main sources of the Rhine are in the canton. The valley of the Vorder Rhine is called the Bündner Oberland, that of the Mittel Rhine the Val Medels, and that of the Hinter Rhine (the principal), in different parts of its course, the Rheinwald, the Schams valley and the Domleschg valley, while the upper valley of the Julia is named the Oberhalbstein. The chief affluents of the Rhine in the canton are the Glenner (flowing through the Lugnetz valley), the Avers Rhine, the Albula (swollen by the Julia and the Landwasser), the Plessur (Schanfigg valley) and the Landquart (coming from the Prättigau). The Rhine and the Inn flow respectively into the North and the Black Seas. Of other streams that of Val Mesocco joins the Ticino and so the Po, while the Maira or Mera (Val Bregaglia) and the Poschiavino join the Adda, and the Rambach (Münster valley) the Adige, all four thus ultimately reaching the Adriatic Sea. The inner valleys are the highest in Central Europe, and among the loftiest villages are Juf, 6998 ft. (the highest permanently inhabited village in the Alps), at the head of the Avers glen, and St Moritz, 6037 ft., in the Upper Engadine. The lower courses of the various streams are rent by remarkable gorges, such as the Via Mala, the Rofna, the Schyn, and those in the Avers, Medels and Lugnetz glens, as well as that of the Züge in the Landwasser glen. Below Coire, near Malans, good wine is produced, while in the Val Mesocco, &c., maize and chestnuts flourish. But the forests and the mountain pasturages are the chief source of wealth. The lower pastures maintain a fine breed of cows, while the upper are let out in summer to Bergamasque shepherds. There are many mineral springs, such as those of St Moritz, Schuls, Alvaneu, Fideris, Le Prese and San Bernardino. The climate and vegetation, save on the southern slope of the Alps, are alpine and severe. But yearly vast numbers of strangers visit different spots in the canton, especially Davos (*q.v.*), Arosa and the Engadine. As yet there are comparatively few railways. There is one from Maienfeld (continued north to Constance and north-west to Zürich) to Coire (11 m.), which sends off a branch line from Landquart, E., past Klosters to Davos (31 m.). From Coire the line bears west to Reichenau (6 m.), whence one branch runs S.S.E. beneath the Albula Pass to St Moritz (50 m.), and another S.W. up the Hinter Rhine valley to Ilanz (20½ m.). There are, however, a number of fine carriage roads across the passes leading to or towards Italy. Besides those leading to the Engadine may be noted the roads from Ilanz past Disentis over the Oberalp Pass (6719 ft.) to Andermatt, from Disentis over the Lukmanier Pass (6289 ft.) to Biasca, on the St Gotthard railway, from Reichenau past Thusis and Splügen over the San Bernardino Pass (6769 ft.) to Bellinzona on the same railway line, and from Splügen over the Splügen Pass (6946 ft.) to Chiavenna. The Septimer Pass (7582 ft.) from the Julier route to the Maloja route has now only a mule path, but was probably known in Roman times (as was possibly the Splügen), and was much frequented in the middle ages.

The population of the canton in 1900 was 104,520. Of this number 55,155 (mainly near Coire and Davos, in the Prättigau and in the Schanfigg valley) were Protestants, while 49,142 (mainly in the Bündner Oberland, the Vall Mesocco and the Oberhalbstein) were Romanists, while there were also 114 Jews (81 of whom lived in Davos). In point of language 48,762 (mainly near Coire and Davos, in the Prättigau and in the Schanfigg valley) were German-speaking, while 17,539 (mostly in the Val Mesocco, the Val Bregaglia and the valley of Poschiavo, but including a number of Italian labourers engaged on the construction of the Albula railway) were Italian-speaking. But the characteristic tongue of the Grisons is a survival of an ancient Romance language (the *lingua rustica* of the Roman Empire), which has lagged behind its sisters. It has a scanty printed literature, but is still widely spoken, so that, of the 38,651 persons in the Swiss Confederation who speak it, no fewer than 36,472 are in the Grisons. It is distinguished into two dialects: the Romonsch (sometimes wrongly called Romansch), which prevails in the Bündner Oberland and in the Hinter Rhine valley (Schams and Domleschg), and the Ladin (closely related to the tongue spoken in parts of the South Tyrol), that survives in the Engadine and in the neighbouring valleys of Bergün, Oberhalbstein and Münster. (See F. Rausch's *Geschichte der Literatur des rhaeto-romanischen Volkes*, Frankfort, 1870, and Mr Coolidge's bibliography of this language, given on pp. 22-23 of Lorria and Martel's *Le Massif de la Bernina*, Zürich, 1804.) Yet in the midst of this Romance-speaking population are islets (mostly, if not entirely, due to immigration in the 13th century from the German-speaking Upper Valais) of German-speaking inhabitants, so in the Vals and Safien glens, and at Obersaxen (all in the Bündner Oberland), in the Rheinwald (the highest part of the Hinter Rhine valley), and in the Avers glen (middle reach of the Hinter Rhine valley), as well as in and around Davos itself.

There is not much industrial activity in the Grisons. A

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considerable portion of the population is engaged in attending to the wants of the foreign visitors, but there is a considerable trade with Italy, particularly in the wines of the Valtellina, while many young men seek their fortunes abroad (returning home after having accumulated a small stock of money) as confectioners, pastry-cooks and coffee-house keepers. A certain number of lead and silver mines were formerly worked, but are now abandoned. The capital of the canton is Coire (*q.v.*).

The canton is divided into 14 administrative districts, and includes 224 communes. It sends 2 members (elected by a popular vote) to the Federal *Ständerath*, and 5 members (also elected by a popular vote) to the Federal *Nationalrath*. The existing cantonal constitution was accepted by the people in 1892, and came into force on 1st January 1894. The legislature (*Grossrath*—no numbers fixed by the constitution) is elected for 2 years by a popular vote, as are the 5 members of the executive (*Kleinrath*) for 3 years. The "obligatory referendum" obtains in the case of all laws and important matters of expenditure, while 3000 citizens can demand ("facultative referendum") a popular vote as to resolutions and ordinances made by the legislature. Three thousand citizens also have the right of "initiative" as to legislative projects, but 5000 signatures are required for a proposed revision of the cantoral constitution. In the revenue and expenditure of the canton the taxes are never counted. This causes an apparent deficit which is carried to the capital account, and is met by the land tax (art. 19 of the constitution), so that there is never a real deficit, as the amount of the land tax varies annually according to the amount that *must* be provided. In the pre-1799 constitution of the three Raetian Leagues the system of the "referendum" was in working as early as the 16th century, not merely as between the three Leagues themselves, but as between the bailiwicks (*Hochgerichte*), the sovereign units within each League, and sometimes (as in the Upper Engadine) between the villages composing each bailiwick.

The greater part (excluding the three valleys where the inhabitants speak Italian) of the modern canton of the Grisons formed the southern part of the province of Raetia (probably the aboriginal inhabitants, the Raeti, were Celts rather than, as was formerly believed, Etruscans), set up by the Romans after their conquest of the region in 15 B.C. The Romanized inhabitants were to a certain extent (The Romonsch or Ladin tongue is a survival of the Roman dominion) Teutonized under the Ostrogoths (A.D. 493–537) and under the Franks (from 537 onwards). Governors called *Praesides* are mentioned in the 7th and 8th centuries, while members of the same family occupied the episcopal see of Coire (founded 4th-5th centuries). About 806 Charles the Great made this region into a county, but in 831 the bishop procured for his dominions exemption ("immunity") from the jurisdiction of the counts, while before 847 his see was transferred from the Italian province of Milan to the German province of Mainz (Mayence) and was thus cut off from Italy to be joined to Germany. In 916 the region was united with the duchy of Alamannia, but the bishop still retained practical independence, and his wide-spread dominions placed him even above the abbots of Disentis and Pfäfers, who likewise enjoyed "immunity." In the 10th century the bishop obtained fresh privileges from the emperors (besides the Val Bregaglia in 960), and so became the chief of the many feudal nobles who struggled for power in the region. He became a prince of the empire in 1170 and later allied himself with the rising power (in the region) of the Habsburgers. This led in 1367 to the foundation of the League of God's House or the *Gotteshausbund* (composed of the city and chapter of Coire, and of the bishop's subjects, especially in the Engadine, Val Bregaglia, Domleschg and Oberhalbstein) in order to stem his rising power, the bishop entering it in 1302. In 1395 the abbot of Disentis, the men of the Lugnetz valley, and the great feudal lords of Räzuns and Sax (in 1399 the counts of Werdenberg came in) formed another League, called the *Ober Bund* (as comprising the highlands in the Vorder Rhine valley) and also wrongly the "Grey League" (as the word interpreted "grey" is simply a misreading of *graven* or counts, though the false view has given rise to the name of Grisons or Graubünden for the whole canton), their alliance being strengthened in 1424 when, too, the free men of the Rheinwald and Schams came in, and in 1480 the Val Mesocco also. Finally, in 1436, the third Raetian League was founded, that of the *Zehngerichtenbund* or League of the Ten Jurisdictions, by the former subjects of the count of Toggenburg, whose dynasty then became extinct; they include the inhabitants of the Prättigau, Davos, Maienfeld, the Schanfigg valley, Churwalden, and the lordship of Belfort (*i.e.* the region round Alvaneu), and formed ten bailiwicks, whence the name of the League. In 1450 the *Zehngerichtenbund* concluded an alliance with the *Gotteshausbund* and in 1471 with the *Ober Bund*; but of the so-called perpetual alliance at Vazerol, near Tiefenkastels, there exists no authentic evidence in the oldest chronicles, though diets were held there. By a succession of purchases (1477–1496) nearly all the possessions of the extinct dynasty of the counts of Toggenburg in the Prättigau had come to the junior or Tyrolese line of the Habsburgers. On its extinction (1496) in turn they passed to the elder line, the head of which, Maximilian, was already emperor-elect and desired to maintain the rights of his family there and in the Lower Engadine. Hence in 1497 the *Ober Bund* and in 1498 the *Gotteshausbund* became allies of the Swiss Confederation. War broke out in 1499, but was ended by the great Swiss victory (22nd May 1499) at the battle of the Calven gorge (above Mals) which, added to another Swiss victory at Dornach (near Basel), compelled the emperor to recognize the *practical* independence of the Swiss and their allies of the Empire. The religious Reformation brought disunion into the three Leagues, as the *Ober Bund* clung in the main to the old faith, and for this reason their connexion with the Swiss Confederation was much weakened. In 1526, by the Articles of Ilanz, the last remaining traces of the temporal jurisdiction of the bishop of Coire was abolished. In 1486 Poschiavo had at last been secured from Milan, and Maienfeld with Malans was bought in 1509, while in 1549 the Val Mesocco (included in the *Ober Bund* since 1480) purchased its freedom of its lords, the Trivulzió family of Milan. In 1512 the three Leagues conquered from Milan the rich and fertile Valtellina, with Bormio and Chiavenna, and held these districts as subject lands till in 1797 they were annexed to the Cisalpine Republic. The struggle for lucrative offices in these lands further sharpened the long rivalry between the families of Planta (Engadine) and Salis (Val Bregaglia), while in the 17th century this rivalry was complicated by political enmities, as the Plantas favoured the Spanish side and the Salis that of France during the long struggle (1620–1630) for the Valtellina (see JENATSCH and VALTELLINA). Troubles arose (1622) also in the Prättigau through the attempts of the Habsburgers to force the inhabitants to give up Protestantism. Finally, after the emperor had *formally* recognized, by the treaty of Westphalia (1648), the independence of the Swiss Confederation, the rights of the Habsburgers in the Prättigau and the Lower Engadine were bought up (1649 and 1652). But the Austrian *enclaves* of Tarasp (Lower Engadine) and of Räzuns (near Reichenau) were only annexed to the Grisons in 1809 and 1815 respectively, in each case France holding the lordship for a short time after its cession by Austria. In 1748 (finally in 1762) the three Leagues secured the upper portion of the valley of Münster. In 1799 the French invaded the canton, which became the scene of a fierce conflict (1799–1800) between them and the united Russian and Austrian army, in the course of which the French burnt (May 1799) the ancient convent of Disentis with all its literary treasures. In April 1799 the provisional government agreed to the incorporation of the three Leagues in the Helvetic Republic, though it was not till June 1801 that the canton of Raetia became formally part of the Helvetic Republic. In 1803, by Napoleon's Act of Mediation, it entered, under the name of Canton of the Grisons or Graubünden, the reconstituted Swiss Confederation, of which it then first became a full member.

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GRISWOLD, RUFUS WILMOT (1815–1857), American editor and compiler, was born in Benson, Vermont, on the 15th of February 1815. He travelled extensively, worked in newspaper offices, was a Baptist clergyman for a time, and finally became a journalist in New York City, where he was successively a member of the staffs of *The Evangelist*, *The Christian Journal*, *The New World* (1839–1840) and *The New Yorker* (1840). From 1841 to 1843 he edited *Graham's Magazine* (Philadelphia), and added to its list of contributors many leading American writers. From 1850 to 1852 he edited the *International Magazine* (New York), which in 1852 was merged into *Harper's Magazine*. He died in New York City on the 27th of August 1857. He is best known as the compiler and editor of various anthologies (with brief biographies and critiques), such as *Poets and Poetry of America* (1842), his most popular and valuable book; *Prose Writers of America* (1846); *Female Poets of America* (1848); and *Sacred Poets of England and America* (1849). Of his own writings his *Republican Court: or American Society in the Days of Washington* (1854) is the only one of permanent value. He edited the first American edition of Milton's prose works (1845), and, as literary executor, edited, with James R. Lowell and N. P. Willis, the works (1850) of Edgar Allan Poe. Griswold's great contemporary reputation as a critic has not stood the test of time; but he rendered a valuable service in making Americans better acquainted with the poetry and prose of their own countrymen.

See *Passages from the Correspondence and Other Papers of Rufus W. Griswold* (Cambridge, Mass., 1898), edited by his son William McCrillis Griswold (1853–1899).

GRIVET, a monkey, *Cercopithecus sabaeus*, of the guenon group, nearly allied to the green monkey. It is common throughout equatorial Africa. The chin, whiskers and a broad band across the forehead, as well as the under-parts, are white, and the head and back olive-green. These monkeys are very commonly seen in menageries.

GROAT (adapted from the Dutch *groot*, great, thick; cf. Ger. *Groschen*; the Med. Lat. *grossus* gives Ital. *grosso*, Fr. *gros*, as names for the coin), a name applied as early as the 13th century on the continent of Europe to any large or thick coin. The groat was almost universally a silver coin, but its value varied considerably, as well at different times as in different countries. The English groat was first coined in 1351, of a value somewhat higher than a penny. The continuous debasement of both the penny and the groat left the latter finally worth four pennies. The issue of the groat was discontinued after 1662, but a coin worth fourpence was again struck in 1836. Although frequently referred to as a groat, it had no other official designation than a "fourpenny piece." Its issue was again discontinued in 1856. The groat was imitated in Scotland by a coin struck by David II. in 1358. In Ireland it was first struck by Edward IV. in 1460.

GROCER, literally one who sells by the gross, a wholesale dealer; the word is derived through the O. Fr. form, *grossier*, from the Med. Lat. *grossarius*, defined by du Cange, *Glossarium*, s.v. *Grossarex*, as *solidae mercis propola*. The name, as a general one for dealers by wholesale, "engrossers" as opposed to "regrators," the retail dealers, is found with the commodity attached; thus in the *Munimenta Gildhallae* ("Rolls" series) ii. 1.304 (quoted in the *New English Dictionary*) is found an allusion to *grossours de vin*, cf. *groser of fysshe*, *Surtees Misc.* (1888) 63, for the customs of Malton (quoted *ib.*). The specific application of the word to one who deals either by wholesale or retail in tea, coffee, cocoa, dried fruits, spices, sugar and all kinds of articles of use or consumption in a household is connected with the history of the Grocers' Company of London, one of the twelve "great" livery companies. In 1345 the pepperers and the spicers amalgamated and were known as the Fraternity of St Anthony. The name "grocers" first appears in 1373 in the records of the company. In 1386 the association was granted a right of search over all "spicers" in London, and in 1394 they obtained the right to inspect or "garble" spices and other "subtil wares." Their first charter was obtained in 1428; letters patent in 1447 granted an extension of the right of search over the whole county, but removed the "liberties" of the city of London. They sold all kinds of drugs, medicines, ointments, plasters, and medicated and other waters. For the separation of the apothecaries from the grocers in 1617 see APOTHECARY. (See further LIVERY COMPANIES.)

See *The Grocery Trade*, by J. Aubrey Rees (1910).

GROCYN, WILLIAM (1446?–1519), English scholar, was born at Colerne, Wiltshire, about 1446. Intended by his parents for the church, he was sent to Winchester College, and in 1465 was elected to a scholarship at New College, Oxford. In 1467 he became a fellow, and had among his pupils William Warham, afterwards archbishop of Canterbury. In 1479 he accepted the rectory of Newton Longville, in Buckinghamshire, but continued to reside at Oxford. As reader in divinity in Magdalen College in 1481, he held a disputation with John Taylor, professor of divinity, in presence of King Richard III., and the king acknowledged his skill as a debater by the present of a buck and five marks. In 1485 he became prebendary of Lincoln cathedral. About 1488 Grocyn left England for Italy, and before his return in 1491 he had visited Florence, Rome and Padua, and studied Greek and Latin under Demetrius Chalchondyles and Politian. As lecturer in Exeter College he found an opportunity of indoctrinating his countrymen in the new Greek learning.

Erasmus says in one of his letters that Grocyn taught Greek at Oxford before his visit to Italy. The Warden of New College, Thomas Chaundler, invited Cornelius Vitelli, then on a visit to Oxford, to act as praelector. This was about 1475, and as Vitelli was certainly familiar with Greek literature, Grocyn may have learnt Greek from him. He seems to have lived in Oxford until 1490, but when his friend Colet became dean of St Paul's in 1504 he was settled in London. He was chosen by his friend to deliver lectures in St Paul's; and in this connexion he gave a singular proof of his honesty. He had at first denounced all who impugned the authenticity of the *Hierarchia ecclesiastica* ascribed to Dionysius the Areopagite, but, being led to modify his views by further investigation, he openly declared that he had been completely mistaken. He also counted Linacre, William Lily, William Latimer and More among his friends, and Erasmus writing in 1514 says that he was supported by Grocyn in London, and calls him "the friend and preceptor of us all." He held several preferments, but his generosity to his friends involved him in continual difficulties, and though in 1506 he was appointed on Archbishop Warham's recommendation master or warden of All Hallows College at Maidstone in Kent, he was still obliged to borrow from his friends, and even to pledge his plate as a security. He died in 1519, and was buried in the collegiate church at Maidstone. Linacre acted as his executor, and expended the money he received in gifts

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to the poor and the purchase of books for poor scholars. With the exception of a few lines of Latin verse on a lady who snowballed him, and a letter to Aldus Manutius at the head of Linacre's translation of Proclus's *Sphaera* (Venice, 1499), Grocyn has left no literary proof of his scholarship or abilities. His proposal to execute a translation of Aristotle in company with Linacre and Latimer was never carried out. Wood assigns some Latin works to Grocyn, but on insufficient authority. By Erasmus he has been described as " vir severissimae castissimae vitae, ecclesiasticarum constitutionum observantissimus pene usque ad superstitionem, scholasticae theologiae ad unguem doctus ac natura etiam acerrimi judicii, demum in omni disciplinarum genere exacte versatus " (*Declarationes ad censuras facultatis theologiae Parisianae*, 1522).

An account of Grocyn by Professor Burrows appeared in the Oxford Historical Society's *Collectanea* (1890).

GRODNO, one of the Lithuanian governments of western Russia, lying between 51° 40' and 52° N. and between 22° 12' and 26° E., and bounded N. by the government of Vilna, E. by Minsk, S. by Volhynia, and W. by the Polish governments of Lomza and Siedlce. Area, 14,026 sq. m. Except for some hills (not exceeding 925 ft.) in the N., it is a uniform plain, and is drained chiefly by the Bug, Niemen, Narev and Bobr, all navigable. There are also several canals, the most important being the Augustowo and Oginsky. Granites and gneisses crop out along the Bug, Cretaceous, and especially Tertiary, deposits elsewhere. The soil is mostly sandy, and in the district of Grodno and along the rivers is often drift-sand. Forests, principally of *Coniferae*, cover more than one-fourth of the area. Amongst them are some of vast extent, *e.g.* those of Grodno (410 sq. m.) and Byelovitsa (Bialowice) (376 sq. m.), embracing wide areas of marshy ground. In the last mentioned forest the wild ox survives, having been jealously preserved since 1803. Peat bogs, sometimes as much as 4 to 7 ft. thick, cover extensive districts. The climate is wet and cold; the annual mean temperature being 44·5° F., the January mean 22·5° and the July mean 64·5°. The rainfall amounts to 21½ in.; hail is frequent. Agriculture is the predominant industry. The peasants own 42½ % of the land, that is, about 4,000,000 acres, and of these over 2½ million acres are arable. The crops principally grown are potatoes, rye, oats, wheat, flax, hemp and some tobacco. Horses, cattle and sheep are bred in fairly large numbers. There is, however, a certain amount of manufacturing industry, especially in woollens, distilling and tobacco. In woollens this government ranks second (after Moscow) in the empire, the centre of the industry being Byelostok. Other factories produce silk, shoddy and leather. The government is crossed by the main lines of railway from Warsaw to St Petersburg and from Warsaw to Moscow. The population numbered 1,008,521 in 1870 and 1,616,630 in 1897; of these last 789,801 were women and 255,046 were urban. In 1906 it was estimated at 1,826,600. White Russians predominate (54 %), then follow Jews (17·4 %), Poles (10 %), Lithuanians and Germans. The government is divided into nine districts, the chief towns, with their populations in 1897, being Grodno (*q.v.*), Brest-Litovsk (pop. 42,812 in 1901), Byelsk (7461), Byelostok or Bialystok (65,781 in 1901), Kobrin (10,365), Pruzhany (7634), Slonim (15,803), Sokolsk (7505) and Volkovysk (10,584). In 1795 Grodno, which had been Polish for ages, was annexed by Russia.

GRODNO, a town of Russia, capital of the government of the same name in 53° 40' N. and 23° 50' E., on the right bank of the Niemen, 160 m. by rail N.E. of Warsaw and 98 m. S.W. of Vilna on the main line to St Petersburg. Pop. (1901) 41,736, nearly two-thirds Jews. It is an episcopal see of the Orthodox Greek church and the headquarters of the II. Army Corps. It has two old castles, now converted to other uses, and two churches (16th and 17th centuries). Tobacco factories and distilleries are important; machinery, soap, candles, vehicles and firearms are also made. Built in the 12th century, Grodno was almost entirely destroyed by the Mongols (1241) and Teutonic knights (1284 and 1301). Stephen Bathory, king of Poland, made it his capital, and died there in 1586. The Polish Estates frequently met at Grodno after 1673, and there in 1793 they signed the second partition of Poland. It was at Grodno that Stanislaus Poniatowski resigned the Polish crown in 1795.

GROEN VAN PRINSTERER, GUILLAUME (1801–1876), Dutch politician and historian, was born at Voorburg, near the Hague, on the 21st of August 1801. He studied at Leiden university, and graduated in 1823 both as doctor of literature and LL.D. From 1829 to 1833 he acted as secretary to King William I. of Holland, afterwards took a prominent part in Dutch home politics, and gradually became the leader of the so-called anti-revolutionary party, both in the Second Chamber, of which he was for many years a member, and outside. In Groen the doctrines of Guizot and Stahl found an eloquent exponent. They permeate his controversial and political writings and historical studies, of which his *Handboek of Dutch History* (in Dutch) and *Maurice et Barnevelt* (in French, 1875, a criticism of Motley's *Life of Van Olden-Barnevelt*) are the principal. Groen was violently opposed to Thorbecke, whose principles he denounced as ungodly and revolutionary. Although he lived to see these principles triumph, he never ceased to oppose them until his death, which occurred at the Hague on the 19th of May 1876. He is best known as the editor of the *Archives et correspondance de la maison d'Orange* (12 vols., 1835–1845), a great work of patient erudition, which procured for him the title of the " Dutch Gachard." J. L. Motley acknowledges his indebtedness to Groen's *Archives* in the preface to his *Rise of the Dutch Republic*, at a time when the American historian had not yet made the acquaintance of King William's archivist, and also bore emphatic testimony to Groen's worth as a writer of history in the correspondence published after his death. At the first reception, in 1858, of Motley at the royal palace at the Hague, the king presented him with a copy of Groen's *Archives* as a token of appreciation and admiration of the work done by the " worthy vindicator of William I., prince of Orange." This copy, bearing the king's autograph inscription, afterwards came into the possession of Sir William Vernon Harcourt, Motley's son-in-law.

GROIN. (1) An obsolete word for the grunting of swine, from Lat. *grunnire*, and so applied to the snout of a pig; it is probably the origin of the word, more commonly spelled " groyne," for a small timber framework or wall of masonry used on sea coasts as a breakwater to prevent the encroachment of sand and shingle. (2) (Of uncertain origin; from an older form *grynde* or *grinde*; the derivation from " grain," an obsolete word meaning " fork," cannot, according to the *New English Dictionary*, be accepted), in anatomy the folds or grooves formed between the lower part of the abdomen and the thighs, covering the inguinal glands, and so applied in architecture to the angle or " arris " formed by the intersection of two vaults crossing one another, occasionally called by workmen " groin point." If the vaults are both of the same radius and height, their intersections lie in a vertical plane, in other cases they form winding curves for which it is difficult to provide centering. In early medieval vaulting this was sometimes arranged by a slight alteration in the geometrical curve of the vault, but the problem was not satisfactorily solved until the introduction of the rib which henceforth ruled the vaulting surface of the web or cell (see VAULT). The name " Welsh groin " or " underpitch " is generally given to the vaulting surface or web where the main longitudinal vault is higher than the cross or transverse vaults; as the transverse rib (of much greater radius than that of the wall rib), projected diagonally in front of the latter, the filling-in or web has to be carried back from the transverse to the wall rib. The term " groin centering " is used where, in groining without ribs, the whole surface is supported by centering during the erection of the vaulting. In ribbed work the stone ribs only are supported by timber ribs during the progress of the work, any light stuff being used while filling in the spandrils. (See VAULT.)

GROLMANN, KARL WILHELM GEORG VON (1777–1843), Prussian soldier, was born in Berlin on the 30th of July 1777. He entered an infantry regiment when scarcely thirteen, became an ensign in 1795, second lieutenant 1797, first lieutenant 1804 and staff-captain in 1805. As a subaltern he had become one of

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Scharnhorst's intimates, and he was distinguished for his energetic and fearless character before the war of 1866, in which he served throughout, from Jena to the peace of Tilsit, as a staff officer, and won the rank of major for distinguished service in action. After the peace, and the downfall of Prussia, he was one of the most active of Scharnhorst's assistants in the work of reorganization (1809), joined the *Tugendbund* and endeavoured to take part in Schill's abortive expedition, after which he entered the Austrian service as a major on the general staff. Thereafter he journeyed to Cadiz to assist the Spaniards against Napoleon, and he led a corps of volunteers in the defence of that port against Marshal Victor in 1810. He was present at the battle of Albuera, at Saguntum, and at Valencia, becoming a prisoner of war at the surrender of the last-named place. Soon, however, he escaped to Switzerland, whence early in 1813 he returned to Prussia as a major on the general staff. He served successively under Colonel von Dolfs and General von Kleist, and as commissioner at the headquarters of the Russian general Barclay de Tolly. He took part with Kleist in the victory of Kulm, and recovered from a severe wound received at that action in time to be present at the battle of Leipzig. He played a conspicuous part in the campaign of 1814 in France, after which he was made a major-general. In this rank he was appointed quartermaster-general to Field Marshal Prince Blücher, and, after his chief and Gneisenau, Grolmann had the greatest share in directing the Prussian operations of 1815. In the decision, on the 18th of June 1815, to press forward to Wellington's assistance (see WATERLOO CAMPAIGN), Grolmann actively concurred, and as the troops approached the battle-field, he is said to have overcome the momentary hesitation of the commander-in-chief and the chief of staff by himself giving the order to advance. After the peace of 1815, Grolmann occupied important positions in the ministry of war and the general staff. His last public services were rendered in Poland as commander-in-chief, and practically as civil administrator of the province of Posen. He was promoted general of infantry in 1837 and died on the 1st of June 1843, at Posen. His two sons became generals in the Prussian army. The Prussian 18th infantry regiment bears his name.

General von Grolmann supervised and provided much of the material for von Damitz's *Gesch. des Feldzugs 1815* (Berlin, 1837–1838), and *Gesch. des Feldzugs 1814 in Frankreich* (Berlin, 1842–1843).

See v. Conrady, *Leben und Wirken des Generals Karl von Grolmann* (Berlin, 1894–1896).

GROMATICI (from *groma* or *gruma*, a surveyor's pole), or *Agrimensores*, the name for land-surveyors amongst the Romans. The art of surveying was probably at first in the hands of the augurs, by whom it was exercised in all cases where the demarcation of a *templum* (any consecrated space) was necessary. Thus, the boundaries of Rome itself, of colonies and camps, were all marked out in accordance with the rules of augural procedure. The first professional surveyor mentioned is L. Decidius Saxa, who was employed by Antony in the measurement of camps (Cicero, *Philippics*, xi. 12, xiv. 10). During the empire their number and reputation increased. The distribution of land amongst the veterans, the increase in the number of military colonies, the settlement of Italian peasants in the provinces, the general survey of the empire under Augustus, the separation of private and state domains, led to the establishment of a recognized professional corporation of surveyors. During later times they were in receipt of large salaries, and in some cases were even honoured with the title *clarissimus*. Their duties were not merely geometrical or mathematical, but required legal knowledge for consultations or the settlement of disputes. This led to the institution of special schools for the training of surveyors and a special literature, which lasted from the 1st to the 6th century A.D. The earliest of the gromatic writers was Frontinus (q.v.), whose *De agrorum qualitate*, dealing with the legal aspect of the art, was the subject of a commentary by Aggenus Urbicus, a Christian schoolmaster. Under Trajan a certain Balbus, who had accompanied the emperor on his Dacian campaign, wrote a still extant manual of geometry for land surveyors (*Expositio et ratio omnium formarum* or *mensurarum*, probably after a Greek original by Hero), dedicated to a certain Celsus who had invented an improvement in a gromatic instrument (perhaps the dioptra, resembling the modern theodolite); for the treatises of Hyginus see that name. Somewhat later than Trajan was Siculus Flaccus (*De condicionibus agrorum*, extant), while the most curious treatise on the subject, written in barbarous Latin and entitled *Casae litterarum* (long a school textbook) is the work of a certain Innocentius (4th–5th century). It is doubtful whether Boëtius is the author of the treatises attributed to him. The *Gromatici veteres* also contains extracts from official registers (probably belonging to the 5th century) of colonial and other land surveys, lists and descriptions of boundary stones, and extracts from the Theodosian Codex. According to Mommsen, the collection had its origin during the 5th century in the office of a *vicarius* (diocesan governor) of Rome, who had a number of surveyors under him. The surveyors were known by various names: *decempedator* (with reference to the instrument used), *finitor*, *metator* or *mensor castrorum* in republican times; *agrii Augustorum* as imperial civil officials; *professor*, *auctor* as professional instructors.

The best edition of the Gromatici is by C. Lachmann and others (1848) with supplementary volume, *Die Schriften der römischen Feldmesser* (1852); see also B. G. Niebuhr, *Roman History*, ii., appendix (Eng. trans.), who first revived interest in the subject; M. Cantor, *Die römischen Agrimensoren* (Leipzig, 1875); P. de Tissot, *La Condition des Agrimensores dans l'ancienne Rome* (1879); G. Rossi, *Groma e squadro* (Turin, 1877); articles by F. Hultsch in Ersch and Gruber's *Allgem. Encyklopädie*, and by G. Humbert in Daremberg and Saglio's *Dictionnaire des antiquités*; Teuffel-Schwabe, *Hist. of Roman Literature*, 58.

GRONINGEN, the most northerly province of Holland, bounded S. by Drente, W. by Friesland and the Lauwers Zee, N. and N.E. by the North Sea and the mouth of the Ems with the Dollart, and on the S.E. by the Prussian province of Hanover. It includes the islands of Boschplaat and Rottumeroog, belonging to the group of Frisian islands (*q.v.*). Area, 887 sq. m.; pop. (1900) 209,602. Groningen is connected with the Drente plateau by the sandy tongue of the Hondsrug which extends almost up to the capital. West, north and north-east of this the province is flat and consists of sea-clay or sand and clay mixed, except where patches of low and high fen occur on the Frisian borders. Low fen predominates on the east of the capital, between the Zuidlaardermeer and the Schildmeer or lakes. The south-eastern portion of the province consists of high fen resting on diluvial sand. A large part of this has been reclaimed and the sandy soil laid bare, but on the Drente and Prussian borders areas of fen still remain. The so-called Boertanger Morass on the Prussian border was long considered as the natural protection of the eastern frontier, and with the view of preserving its impassable condition neither agriculture nor cattle-rearing might be practised here until 1824, and it was only in 1868 that the building of houses was sanctioned and the work of reclamation begun. The gradual extension of the seaward boundaries of the province owing to the process of littoral deposits may be easily traced, a triple line of sea-dikes in places marking the successive stages in this advance. The rivers of Groningen descending from the Drente plateau meet at the capital, whence they are continued by the Reitdiep to the Lauwers Zee (being discharged through a lock), and by the Ems canal (1876) to Delfzyl. The south-eastern corner of the province is traversed by the Westerwolde Aa, which discharges into the Dollart. The railway system belongs to the northern section of the State railways, and affords communication with Germany via Winschoten. Steam-tramways also serve many parts of the province. Agriculture is the main industry. The proportion of landowners is a very large one, and the prosperous condition of the Groningen farmer is attested by the style of his home, his dress and his gig. As a result, however, partly of the usual want of work on the grass-lands in certain seasons, there has been a considerable emigration to America. The ancient custom called the *beklem-recht*, or

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lease-right, doubtless accounts for the extended ownership of the land. By this law a tenant-farmer is able to bequeath his farm, that is to say, he holds his lease in perpetuity.

The chief agricultural products are barley, oats, wheat, and in the north-east flax is also grown, and exported to South Holland and Belgium. On the higher clay grounds cattle-rearing and horse-breeding are also practised, together with butter and cheese making. The cultivation of potatoes on the sandgrounds in the south and the fen colonies along the Stads-Canal invite general comparison with the industries of Drente (*q.v.*). Hoogezand and Sappemeer, Veendam and Wildervank, New and Old Pekela, New and Old Stads-Canal are instances of villages which have extended until they overlap one another and are similar in this respect to the industrial villages of the Zaan Streek in North Holland. The coast fisheries are considerable. Groningen (*q.v.*) is the chief and only large town of the province. Delfzyl, which was formerly an important fortress for the protection of the ancient sluices on the little river Delf (hence its name), has greatly benefited by the construction of the Ems (Eems) ship-canal connecting it with Groningen, and has a good harbour with a considerable import trade in wood. Appingedam and Winschoten are very old towns, having important cattle and horse markets. The pretty wood at Winschoten was laid out by the Society for Public Welfare (*Tot Nut van het Algemeen*) in 1826.

GRONINGEN, a town of Holland, capital of the province of the same name, at the confluence of the two canalized rivers the Drentsche Aa and the Hunse (which are continued to the Lauwers Zee as the Reit Diep), 16 m. N. of Assen and 33 m. E. of Leeuwarden by rail. Pop. (1900) 67,563. Groningen is the centre from which several important canals radiate. Besides the Reit Diep, there are the Ems Canal and the Damster Diep, connecting it with Delfzyl and the Dollart, the Kolonel's Diep with Leeuwarden, the Nord Willem's Canal with Assen and the south and the Stads-Canal south-east with the Ems. Hence steamers ply in all directions, and there is a regular service to Emden and the island of Borkum via Delfzyl, and via the Lauwers Zee to the island of Schiermonnikoog. Groningen is the most important town in the north of Holland, with its fine shops and houses and wide clean streets, while brick houses of the 16th and 17th centuries help it to retain a certain old-world air. The ancient part of the town is still surrounded by the former moat, and in the centre lies a group of open places, of which the Groote Markt is one of the largest market-squares in Holland. Pleasant gardens and promenades extend on the north side of the town, together with a botanical garden. The chief church is the Martini-kerk, with a high tower (432 ft.) dating from 1477, and an organ constructed by the famous scholar and musician Rudolph Agricolo, who was born near Groningen in 1443. The Aa church dates from 1465, but was founded in 1253. The Roman Catholic Broederkerk (rebuilt at the end of the 19th century) contains some remarkable pictures of the Passion by L. Hendricx (1865). There is also a Jewish synagogue. The large town hall (in classical style), one of the finest public buildings, was built at the beginning of the 19th century and enlarged in 1873. The provincial government offices also occupy a fine building which received a splendid front in 1871. Other noteworthy buildings are the provincial museum of antiquities, containing interesting Germanic antiquities, as well as medieval and modern collections of porcelain, pictures, &c.; the courts of justice (transformed in the middle of the 18th century); the old Ommelanderhuis, formerly devoted to the administration of the surrounding district, built in 1500 and restored in 1899; the weigh-house (1874); the civil and military prison; the arsenal; the military hospital; and the concert hall.

The university of Groningen, founded in 1614, received its present fine buildings in classical style in 1850. Among its auxiliary establishments are a good natural history museum, an observatory, a laboratory, and a library which contains a copy of Erasmus' New Testament with marginal annotations by Luther. Other educational institutions are the deaf and dumb institution founded by Henri Daniel Guyot (d. 1828) in 1790, a gymnasium, and schools of navigation, art and music. There are learned societies for the study of law (1761) and natural science (1830); an academy of fine arts (1830); an archaeological society; and a central bureau for collecting information concerning the province.

As capital of the province, and on account of the advantages of its natural position, Groningen maintains a very considerable trade, chiefly in oil-seed, grain, wood, turf and cattle, with Great Britain, Germany, Scandinavia and Russia. The chief industries are flax-spinning, rope-making, sugar refining, book printing, wool combing and dyeing, and it also manufactures beer, tobacco and cigars, cotton and woollen stuffs, furniture, organs and pianos; besides which there are saw, oil and grain mills, machine works, and numerous goldsmiths and silversmiths.

History.—The town of Groningen belonged originally to the *pagus*, or *gouw*, of Triantha (Drente), the countship of which was bestowed by the emperor Henry II. on the bishop and chapter of Utrecht in 1024. In 1040 Henry III. gave the church of Utrecht the royal domain of Groningen, and in the deed of gift the "villa Cruoninga" is mentioned. Upon this charter the bishops of Utrecht based their claim to the overlordship of the town, a claim which the citizens hotly disputed. At the time of the donation, indeed, the town can hardly be said to have existed, but the royal "villa" rapidly developed into a community which strove to assert the rights of a free imperial city. At first the bishops were too strong for the townsmen; the defences built in 1110 were pulled down by the bishop's order two years later; and during the 12th and 13th centuries the see of Utrecht, in spite of frequent revolts, succeeded in maintaining its authority. Down to the 15th century an episcopal prefect, or burgrave, had his seat in the city, his authority extending over the neighbouring districts known as the Gorecht. In 1143 Heribert of Bierum, bishop of Utrecht, converted the office into an hereditary fief in favour of his brother Liffert, on the extinction of whose male line it was partitioned between the families of Koevorden (or Coevorden) and van den Hove. Gradually, however, the burghers, aided by the neighbouring Frisians, succeeded in freeing themselves from the episcopal yoke. The city was again walled in 1255; before 1284 it had become a member of the Hanseatic league; and by the end of the 14th century it was practically a powerful independent republic, which exercised an effective control over the Frisian Ommelande between the Ems and the Lauwers Zee. At the close of the 14th century the heirs of the Koevorden and van den Hove families sold their rights, first to the town, and then to the bishop. A struggle followed, in which the city was temporarily worsted; but in 1440 Bishop Dirk II. finally sold to the city the rights of the see of Utrecht over the Gorecht.

The medieval constitution of Groningen, unlike that of Utrecht, was aristocratic. Merchant gild there was none; and the craft gilds were without direct influence on the city government, which held them in subjection. Membership of the governing council, which selected from its own body the four *rationales* or burgomasters, was confined to men of approved "wisdom," and wisdom was measured in terms of money. This *Raad* of wealthy burghers gradually monopolized all power. The bishop's bailiff (*schout*), with his nominated assessors (*scabini*), continued to exercise jurisdiction, but members of the Raad sat on the bench with him, and an appeal lay from his court to the Raad itself. The council was, in fact, supreme in the city, and not in the city only. In 1439 it decreed that no one might trade in all the district between the Ems and the Lauwers Zee except burghers, and those who had purchased the *burwal* (right of residence in the city) and the freedom of the gilds. Maximilian I. assigned Groningen to Albert of Saxony, hereditary podestat of Friesland, but the citizens preferred to accept the protection of the bishop of Utrecht; and when Albert's son George attempted in 1505 to seize the town, they recognized the lordship of Edzart of East Frisia. On George's renewal of hostilities they transferred their allegiance to Duke Charles of Gelderland, in 1515. In 1536 the city passed into the

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hands of Charles V., and in the great wars of the 16th century suffered all the miseries of siege and military occupation. From 1581 onwards, Groningen still held by the Spaniards, was constantly at war with the "Ommelanden" which had declared against the king of Spain. This feud continued, in spite of the capture of the city in 1594 by Maurice of Nassau, and of a decree of the States in 1597 which was intended to set them at rest. In 1672 the town was besieged by the bishop of Münster, but it was successfully defended, and in 1698 its fortifications were improved under Coehoorn's direction. The French Republicans planted their tree of liberty in the Great Market on the 14th of February 1795, and they continued in authority till the 16th of November 1814. The fortifications of the city were doomed to destruction by the law of the 18th of April 1874.

See C. Hegel, *Städte und Gilden* (Leipzig, 1891); Stokvis, *Manuel d'histoire*, iii. 496 (Leiden, 1890–1893); also s.v. in Chevalier, *Répertoire des sources hist. du moyen âge* (*Topo-bibliographie*).

GRONLUND, LAURENCE (1846–1899), American socialist, was born in Copenhagen, Denmark, on the 13th of July 1846. He graduated from the university of Copenhagen in 1865, began the study of law, removed to the United States in 1867, taught German in Milwaukee, was admitted to the bar in 1869, and practised in Chicago. He became a writer and lecturer on socialism and was closely connected with the work of the Socialist Labor party from 1874 to 1884, then devoted himself almost exclusively to lecturing until his appointment to a post in the bureau of labour statistics. He again returned to the lecture field, and was an editorial writer for the New York and Chicago *American* from 1898 until his death in New York City on the 15th of October 1899. His principal works are: *The Coming Revolution* (1880); *The Co-operative Commonwealth in its Outlines, An Exposition of Modern Socialism* (1884); *Ça Ira, or Danton in the French Revolution* (1888), a rehabilitation of Danton; *Our Destiny, The Influence of Socialism on Morals and Religion* (1890); and *The New Economy* (1898).

GRONOVIUS (the latinized form of GRONOV), **JOHANN FRIEDRICH** (1611–1671), German classical scholar and critic, was born at Hamburg on the 8th of September 1611. Having studied at several universities, he travelled in England, France and Italy. In 1643 he was appointed professor of rhetoric and history at Deventer, and in 1658 to the Greek chair at Leiden, where he died on the 28th of December 1671. (See also FABRETTI, RAPHAEL.) Besides editing, with notes, Statius, Plautus, Livy, Tacitus, Aulus Gellius and Seneca's tragedies, Gronovius was the author, amongst numerous other works, of *Commentarius de sestertiis* (1643) and of an edition of Hugo Grotius' *De jure belli et pacis* (1660). His *Observationes* contain a number of brilliant emendations. His son, JAKOB GRONOVIUS (1643–1716), is chiefly known as the editor of the *Thesaurus antiquitatum Graecarum* (1697–1702, in 13 volumes).

See J. E. Sandys, *Hist. of Class. Schol.* ii. (1908); F. A. Eckstein in Ersch and Gruber's *Allgemeine Encyklopadie*.

GROOM, in modern usage a male servant attached to the stables, whose duties are to attend to the cleaning, feeding, currying and care generally of horses. The earliest meaning of the word appears to be that of a boy, and in 16th and 17th century literature it frequently occurs, in pastorals, for a shepherd lover. Later it is used for any male attendant, and thus survives in the name for several officials in the royal household, such as the grooms-in-waiting, and the grooms of the great chamber. The groom-porter, whose office was abolished by George III., saw to the preparation of the sovereign's apartment, and, during the 16th and 17th centuries, provided cards and dice for playing, and was the authority to whom were submitted all questions of gaming within the court. The origin of the word is obscure. The O. Fr. *gromet*, shop boy, is taken by French etymologists to be derived from the English. From the application of this word to a wine-taster in a wine merchant's shop, is derived *gourmet*, an epicure. According to the *New English Dictionary*, though there are no instances of groom in other Teutonic languages, the word may be ultimately connected with the root of "to grow." In "bridegroom," a newly married man, "grom" in the 16th century took the place of an older *gome*, a common old Teutonic word meaning "man," and connected with the Latin *homo*. The Old English word was *brydguma*, later *bridegome*. The word survives in the German *Bräutigam*.

GROOT, GERHARD (1340–1384), otherwise Gerrit or Geert Groet, in Latin Gerardus Magnus, a preacher and founder of the society of Brothers of Common Life (q.v.), was born in 1340 at Deventer in the diocese of Utrecht, where his father held a good civic position. He went to the university of Paris when only fifteen. Here he studied scholastic philosophy and theology under a pupil of Occam's, from whom he imbibed the nominalist conception of philosophy; in addition he studied canon law, medicine, astronomy and even magic, and apparently some Hebrew. After a brilliant course he graduated in 1358, and possibly became master in 1363. He pursued his studies still further in Cologne, and perhaps in Prague. In 1366 he visited the papal court at Avignon. About this time he was appointed to a canonry in Utrecht and to another in Aix-la-Chapelle, and the life of the brilliant young scholar was rapidly becoming luxurious, secular and selfish, when a great spiritual change passed over him which resulted in a final renunciation of every worldly enjoyment. This conversion, which took place in 1374, appears to have been due partly to the effects of a dangerous illness and partly to the influence of Henry de Calcar, the learned and pious prior of the Carthusian monastery at Munnikhuizen near Arnhem, who had remonstrated with him on the vanity of his life. About 1376 Gerhard retired to this monastery and there spent three years in meditation, prayer and study, without, however, becoming a Carthusian. In 1379, having received ordination as a deacon, he became missionary preacher throughout the diocese of Utrecht. The success which followed his labours not only in the town of Utrecht, but also in Zwolle, Deventer, Kampen, Amsterdam, Haarlem, Gouda, Leiden, Delft, Zütphen and elsewhere, was immense; according to Thomas à Kempis the people left their business and their meals to hear his sermons, so that the churches could not hold the crowds that flocked together wherever he came. The bishop of Utrecht supported him warmly, and got him to preach against concubinage in the presence of the clergy assembled in synod. The impartiality of his censures, which he directed not only against the prevailing sins of the laity, but also against heresy, simony, avarice, and impurity among the secular and regular clergy, provoked the hostility of the clergy, and accusations of heterodoxy were brought against him. It was in vain that Groot emitted a *Publica Protestatio*, in which he declared that Jesus Christ was the great subject of his discourses, that in all of them he believed himself to be in harmony with Catholic doctrine, and that he willingly subjected them to the candid judgment of the Roman Church. The bishop was induced to issue an edict which prohibited from preaching all who were not in priest's orders, and an appeal to Urban VI. was without effect. There is a difficulty as to the date of this prohibition; either it was only a few months before Groot's death, or else it must have been removed by the bishop, for Groot seems to have preached in public in the last year of his life. At some period (perhaps 1381, perhaps earlier) he paid a visit of some days' duration to the famous mystic Johann Ruysbroeck, prior of the Augustinian canons at Groenendael near Brussels; at this visit was formed Groot's attraction for the rule and life of the Augustinian canons which was destined to bear such notable fruit. At the close of his life he was asked by some of the clerics who attached themselves to him to form them into a religious order, and Groot resolved that they should be canons regular of St Augustine. No time was lost in the effort to carry out the project, but Groot died before a foundation could be made. In 1387, however, a site was secured at Windesheim, some 20 m. north of Deventer, and here was established the monastery that became the cradle of the Windesheim congregation of canons regular, embracing in course of time nearly one hundred houses, and leading the way in the series of reforms undertaken during the 15th century by all the religious orders in Germany. The initiation of this movement was the great achievement of Groot's

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life; he lived to preside over the birth and first days of his other creation, the society of Brothers of Common Life. He died of the plague at Deventer in 1384, at the age of 44.

The chief authority for Groot's life is Thomas à Kempis, *Vita Gerardi Magni* (translated into English by J. P. Arthur, *The Founders of the New Devotion*, 1905); also the *Chronicon Windesheimense* of Johann Busch (ed. K. Grube, 1886). An account, based on these sources, will be found in S. Kettlewell, *Thomas à Kempis and the Brothers of Common Life* (1882), i. c. 5; and a shorter account in F. R. Cruise, *Thomas à Kempis*, 1887, pt. ii. An excellent sketch, with an account of Groot's writings, is given by L. Schulze in Herzog-Hauck, *Realencyklopädie* (ed. 3); he insists on the fact that Groot's theological and ecclesiastical ideas were those commonly current in his day, and that the attempts to make him "a reformer before the Reformation" are unhistorical. (E. C. B.)

GROOVE-TOOTHED SQUIRREL, a large and brilliantly coloured Bornean squirrel, *Rhithrosciurus macrotis*, representing a genus by itself distinguished from all other members of the family *Sciuridae* by having numerous longitudinal grooves on the front surface of the incisor teeth; the molars being of a simpler type than in other members of the family. The tail is large and fox-like, and the ears are tufted and the flanks marked by black and white bands.

GROS, ANTOINE JEAN, BARON (1771–1835), French painter, was born at Paris in 1771. His father, who was a miniature painter, began to teach him to draw at the age of six, and showed himself from the first an exacting master. Towards the close of 1785 Gros, by his own choice, entered the studio of David, which he frequented assiduously, continuing at the same time to follow the classes of the Collège Mazarin. The death of his father, whose circumstances had been embarrassed by the Revolution, threw Gros, in 1791, upon his own resources. He now devoted himself wholly to his profession, and competed in 1792 for the *grand prix*, but unsuccessfully. About this time, however, on the recommendation of the École des Beaux Arts, he was employed on the execution of portraits of the members of the Convention, and when—disturbed by the development of the Revolution—Gros in 1793 left France for Italy, he supported himself at Genoa by the same means, producing a great quantity of miniatures and *fixés*. He visited Florence, but returning to Genoa made the acquaintance of Josephine, and followed her to Milan, where he was well received by her husband. On November 15, 1796, Gros was present with the army near Arcola when Bonaparte planted the tricolor on the bridge. Gros seized on this incident, and showed by his treatment of it that he had found his vocation. Bonaparte at once gave him the post of "inspecteur aux revues," which enabled him to follow the army, and in 1797 nominated him on the commission charged to select the spoils which should enrich the Louvre. In 1799, having escaped from the besieged city of Genoa, Gros made his way to Paris, and in the beginning of 1801 took up his quarters in the Capucins. His "esquisse" (Musée de Nantes) of the "Battle of Nazareth" gained the prize offered in 1802 by the consuls, but was not carried out, owing it is said to the jealousy of Junot felt by Napoleon; but he indemnified Gros by commissioning him to paint his own visit to the pest-house of Jaffa. "Les Pestiférés de Jaffa" (Louvre) was followed by the "Battle of Aboukir" 1806 (Versailles), and the "Battle of Eylau," 1808 (Louvre). These three subjects—the popular leader facing the pestilence unmoved, challenging the splendid instant of victory, heart-sick with the bitter cost of a hard-won field—gave to Gros his chief title to fame. As long as the military element remained bound up with French national life, Gros received from it a fresh and energetic inspiration which carried him to the very heart of the events which he depicted; but as the army and its general separated from the people, Gros, called on to illustrate episodes representative only of the fulfilment of personal ambition, ceased to find the nourishment necessary to his genius, and the defect of his artistic position became evident. Trained in the sect of the Classicists, he was shackled by their rules, even when—by his naturalistic treatment of types, and appeal to picturesque effect in colour and tone—he seemed to run counter to them. In 1810 his "Madrid" and "Napoleon at the Pyramids" (Versailles) show that his star had deserted him. His "Francis I." and "Charles V.," 1812 (Louvre), had considerable success; but the decoration of the dome of St Geneviève (begun in 1811 and completed in 1824) is the only work of Gros's later years which shows his early force and vigour, as well as his skill. The "Departure of Louis XVIII." (Versailles), the "Embarkation of Madame d'Angoulême" (Bordeaux), the plafond of the Egyptian room in the Louvre, and finally his "Hercules and Diomedes," exhibited in 1835, testify only that Gros's efforts—in accordance with the frequent counsels of his old master David—to stem the rising tide of Romanticism, served but to damage his once brilliant reputation. Exasperated by criticism and the consciousness of failure, Gros sought refuge in the grosser pleasures of life. On the 25th of June 1835 he was found drowned on the shores of the Seine near Sèvres. From a paper which he had placed in his hat it became known that "las de la vie, et trahi par les dernières facultés qui la lui rendaient supportable, il avait résolu de s'en défaire." The number of Gros's pupils was very great, and was considerably augmented when, in 1815, David quitted Paris and made over his own classes to him. Gros was decorated and named baron of the empire by Napoleon, after the Salon of 1808, at which he had exhibited the "Battle of Eylau." Under the Restoration he became a member of the Institute, professor at the École des Beaux Arts, and was named chevalier of the order of St Michel.

M. Delécluze gives a brief notice of his life in *Louis David et son temps*, and Julius Meyer's *Geschichte der modernen französischen Malerei* contains an excellent criticism on his works.

GROSART, ALEXANDER BALLOCH (1827–1899), Scottish divine and literary editor, the son of a building contractor, was born at Stirling on the 18th of June 1827. He was educated at Edinburgh University, and in 1856 became a Presbyterian minister at Kinross. In 1865 he went to Liverpool, and three years later to Blackburn. He resigned from the ministry in 1892, and died at Dublin on the 16th of March 1899. Dr Grosart is chiefly remembered for his exertions in reprinting much rare Elizabethan literature, a work which he undertook in the first instance from his strong interest in Puritan theology. Among the first writers whose works he edited were the Puritan divines, Richard Sibbes, Thomas Brooks and Herbert Palmer. Editions of Michael Bruce's *Poems* (1865) and Richard Gilpin's *Demonologia sacra* (1867) followed. In 1868 he brought out a bibliography of the writings of Richard Baxter, and from that year until 1876 he was occupied in reproducing for private subscribers the "Fuller Worthies Library," a series of thirty-nine volumes which included the works of Thomas Fuller, Sir John Davies, Fulke Greville, Henry Vaughan, Andrew Marvell, George Herbert, Richard Crashaw, John Donne and Sir Philip Sidney. The last four volumes of the series were devoted to the works of many little known and otherwise inaccessible authors. His *Occasional Issues of Unique and Very Rare Books* (1875–1881) is of the utmost interest to the book-lover. It included among other things the *Annalia Dubrensia* of Robert Dover. In 1876 still another series, known as the "Chertsey Worthies Library," was begun. It included editions of the works of Nicholas Breton, Francis Quarles, Dr Joseph Beaumont, Abraham Cowley, Henry More and John Davies of Hereford. Grosart was untiring in his enthusiasm and energy for this kind of work. The two last-named series were being produced simultaneously until 1881, and no sooner had they been completed than Grosart began the "Huth Library," so called from the bibliophile Henry Huth, who possessed the originals of many of the reprints. It included the works of Robert Greene, Thomas Nash, Gabriel Harvey, and the prose tracts of Thomas Dekker. He also edited the complete works of Edmund Spenser and Samuel Daniel. From the Townley Hall collection he reprinted several MSS. and edited Sir John Eliot's works, Sir Richard Boyle's *Lismore Papers*, and various publications for the Chetham Society, the Camden Society and the Roxburghe Club. Dr Grosart's faults of style and occasional inaccuracy do not seriously detract from the immense value of his work. He was unwearied in searching for rare books, and he brought to light much interesting literature, formerly almost inaccessible.

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GROSBEAK (Fr. *Grosbec*), a name very indefinitely applied to many birds belonging to the families *Fringillidae* and *Ploceidae* of modern ornithologists, and perhaps to some members of the *Emberisidae* and *Tanagridae*, but always to birds distinguished by the great size of their bill. Taken alone it is commonly a synonym of hawfinch (*q.v.*), but a prefix is usually added to indicate the species, as pine-grosbeak, cardinal-grosbeak and the like. By early writers the word was generally given as an equivalent of the Linnaean *Loxia*, but that genus has been found to include many forms not now placed in the same family.

The Pine-grosbeak (*Pinicola enucleator*) inhabits the coniferzone of both the Old and the New Worlds, seeking, in Europe and probably elsewhere, a lower latitude as winter approaches—often journeying in large flocks; stragglers have occasionally reached the British Islands (Yarrell, *Br. Birds*, ed. 4, ii. 177-179). In structure and some of its habits much resembling a bullfinch, but much exceeding that bird in size, it has the plumage of a crossbill and appears to undergo the same changes as do the members of the restricted genus *Loxia*—the young being of a dull greenish-grey streaked with brownish-black, the adult hens tinged with golden-green, and the cocks glowing with crimson-red on nearly all the body-feathers, this last colour being replaced after moulting in confinement by bright yellow. Nests of this species were found in 1821 by Johana Wilhelm Zetterstedt near Juckasjärwi in Swedish Lapland, but little was known concerning its nidification until 1855, when John Wolley, after two years' ineffectual search, succeeded in obtaining near the Finnish village Muonioniska, on the Swedish frontier, well-authenticated specimens with the eggs, both of which are like exaggerated bullfinches'. The food of this species seems to consist of the seeds and buds of many sorts of trees, though the staple may very possibly be those of some kind of pine.

Allied to the pine-grosbeak are a number of species of smaller size, but its equals in beauty of plumage.[1] They have been referred to several genera, such as *Carpodacus*, *Propasser*, *Bycanetes*, *Uragus* and others; but possibly *Carpodacus* is sufficient to contain all. Most of them are natives of the Old World, and chiefly of its eastern division, but several inhabit the western portion of North America, and one, *C. githagineus* (of which there seem to be at least two local races), is an especial native of the deserts, or their borders, of Arabia and North Africa, extending even to some of the Canary Islands—a singular modification in the *habitat* of a form which one would be apt to associate exclusively with forest trees, and especially conifers.

The cardinal grosbeak, or Virginian nightingale, *Cardinalis virginianus*, claims notice here, though doubts may be entertained as to the family to which it really belongs. It is no less remarkable for its bright carmine attire, and an elongated crest of the same colour, than for its fine song. Its ready adaptation to confinement has made it a popular cage-bird on both sides of the Atlantic. The hen is not so good a songster as the cock bird. Her plumage, with exception of the wings and tail, which are of a dull red, is light-olive above and brownish-yellow beneath. This species inhabits the eastern parts of the United States southward of 40° N. lat., and also occurs in the Bermudas. It is represented in the south-west of North America by other forms that by some writers are deemed species, and in the northern parts of South America by the *C. phoeniceus*, which would really seem entitled to distinction. Another kindred bird placed from its short and broad bill in a different genus, and known as *Pyrrhuloxia sinuata* or the Texan cardinal, is found on the southern borders of the United States and in Mexico; while among North American "grosbeaks" must also be named the birds belonging to the genera *Guiraca* and *Hedymeles*—the former especially exemplified by the beautiful blue *G. caerulea*, and the latter by the brilliant rose-breasted *H. ludovicianus*, which last extends its range into Canada.

[1] Many of them are described and illustrated in the *Monographie des loxiens* of Prince C. L. Bonaparte and Professor Schlegel (1850), though it excludes many birds which an English writer would call "grosbeaks."

The species of the Old World which, though commonly called "grosbeaks," certainly belong to the family *Ploceidae*, are treated under WEAVER-BIRD. (A. N.)

GROSE, FRANCIS (*c.* 1730–1791), English antiquary, was born at Greenford in Middlesex, about the year 1730. His father was a wealthy Swiss jeweller, settled at Richmond, Surrey. Grose early showed an interest in heraldry and antiquities, and his father procured him a position in the Heralds' College. In 1763, being then Richmond Herald, he sold his tabard, and shortly afterwards became adjutant and paymaster of the Hampshire militia, where, as he himself humorously observed, the only account-books he kept were his right and left pockets, into the one of which he received, and from the other of which he paid. This carelessness exposed him to serious financial difficulties; and after a vain attempt to repair them by accepting a captaincy in the Surrey militia, the fortune left him by his father being squandered, he began to turn to account his excellent education and his powers as a draughtsman. In 1757 he had been elected fellow of the Society of Antiquaries. In 1773 he began to publish his *Antiquities of England and Wales*, a work which brought him money as well as fame. This, with its supplementary parts relating to the Channel Islands, was not completed till 1787. In 1789 he set out on an antiquarian tour through Scotland, and in the course of this journey met Burns, who composed in his honour the famous song beginning "Ken ye aught o' Captain Grose," and in that other poem, still more famous, "Hear, land o' cakes, and brither Scots," warned all Scotsmen of this "chield amang them taking notes." In 1790 he began to publish the results of what Burns called "his peregrinations through Scotland;" but he had not finished the work when he bethought himself of going over to Ireland and doing for that country what he had already done for Great Britain. About a month after his arrival, while in Dublin, he died in an apoplectic fit at the dinner-table of a friend, on the 12th of June 1791.

Grose was a sort of antiquarian Falstaff—at least he possessed in a striking degree the knight's physical peculiarities; but he was a man of true honour and charity, a valuable friend, "overlooking little faults and seeking out greater virtues," and an inimitable boon companion. His humour, his varied knowledge and his good nature were all eminently calculated to make him a favourite in society. As Burns says of him—

> "But wad ye see him in his glee,
> For meikle glee and fun has he,
> Then set him down and twa or three
> Gude fellows wi' him;
> And *port, O port!* shine thou a wee,
> And THEN ye'll see him!"

Grose's works include *The Antiquities of England and Wales* (6 vols., 1773–1787); *Advice to the Officers of the British Army* (1782), a satire in the manner of Swift's *Directions to Servants*; *A Guide to Health, Beauty, Riches and Honour* (1783), a collection of advertisements of the period, with characteristic satiric preface; *A Classical Dictionary of the Vulgar Tongue* (1785); *A Treatise on Ancient Armour and Weapons* (1785–1789); Darrell's *History of Dover* (1786); *Military Antiquities* (2 vols., 1786–1788); *A Provincial Glossary* (1787); *Rules for Drawing Caricatures* (1788); *The Antiquities of Scotland* (2 vols., 1789–1791); *Antiquities of Ireland* (2 vols., 1791), edited and partly written by Ledwich. *The Grumbler*, sixteen humorous essays, appeared in 1791 after his death; and in 1793 *The Olio*, a collection of essays, jests and small pieces of poetry, highly characteristic of Grose, though certainly not all by him, was put together from his papers by his publisher, who was also his executor.

A capital full-length portrait of Grose by N. Dance is in the first volume of the *Antiquities of England and Wales*, and another is among Kay's *Portraits*. A versified sketch of him appeared in the *Gentleman's Magazine*, lxi. 650. See *Gentleman's Magazine*, lxi. 498, 582; Noble's *Hist. of the College of Arms*, p. 434; *Notes and Queries*, 1st ser., ix. 350; 3rd ser., i. 64, x. 280-281; 5th ser., xii. 148; 6th ser., ii. 47, 257, 291; Hone, *Every-day Book*, i. 655.

GROSS, properly thick, bulky, the meaning of the Late Lat. *grossus*. The Latin word has usually been taken as cognate with *crassus*, thick, but this is now doubted. It also appears not to be connected with the Ger. *gross*, a Teutonic word represented in English by "great." Apart from its direct meaning,,

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and such figurative senses as coarse, vulgar or flagrant, the chief uses are whole, entire, without deduction, as opposed to "net," or as applied to that which is sold in bulk as opposed to "retail" (cf. "grocer" and "engrossing"). As a unit of tale, "gross" equals 12 dozen, 144, sometimes known as "small gross," in contrast with "great gross," *i.e.* 12 gross, 144 dozen. As a technical expression in English common law, "in gross" is applied to an incorporeal hereditament attached to the person of an owner, in contradistinction to one which is appendant or appurtenant, that is, attached to the ownership of land (see COMMONS).

GROSSE, JULIUS WALDEMAR (1828–1902), German poet, the son of a military chaplain, was born at Erfurt on the 25th of April 1828. He received his early education at the gymnasium in Magdeburg, and on leaving school and showing disinclination for the ministry, entered an architect's office. But his mind was bent upon literature, and in 1840 he entered the university of Halle, where, although inscribed as a student of law, he devoted himself almost exclusively to letters. His first poetical essay was with the tragedy *Cola di Rienzi* (1851), followed in the same year by a comedy, *Eine Nachtpartie Shakespeares*, which was at once produced on the stage. The success of these first two pieces encouraged him to follow literature as a profession, and proceeding in 1852 to Munich, he joined the circle of young poets of whom Paul Heyse (*q.v.*) and Hermann Lingg (1820–1905) were the chief. For six years (1855–1861) he was dramatic critic of the *Neue Münchener Zeitung*, and was then for a while on the staff of the *Leipziger Illustrierte Zeitung*, but in 1862 he returned to Munich as editor of the *Bayrische Zeitung*, a post he retained until the paper ceased to exist in 1867. In 1869 Grosse was appointed secretary of the *Schiller-Stiftung*, and lived for the next few years alternately in Weimar, Dresden and Munich, until, in 1890, he took up his permanent residence in Weimar. He was made grand-ducal *Hofrat* and had the title of "professor." He died at Torbole on the Lago di Garda on the 9th of May 1902.

Grosse was a most prolific writer of novels, dramas and poems. As a lyric poet, especially in *Gedichte* (1857) and *Aus bewegten Tagen*, a volume of poems (1860), he showed himself more to advantage than in his novels, of which latter, however, *Untreu aus Milleid* (2 vols., 1868); *Vox populi, vox dei* (1869); *Maria Mancini* (1871); *Neue Erzählungen* (1875); *Sophie Monnier* (1876), and *Ein Frauenlos* (1888) are remarkable for a certain elegance of style. His tragedies, *Die Ynglinger* (1858); *Tiberius* (1876); *Johann von Schwaben*; and the comedy *Die steinerne Braut*, had considerable success on the stage.

Grosse's *Gesammelte dramatische Werke* appeared in 7 vols. in Leipzig (1870), while his *Erzählende Dichtungen* were published at Berlin (6 vols., 1871–1873). An edition of his selected works by A. Bartels is in preparation. See also his autobiography, *Literarische Ursachen und Wirkungen* (1896); R. Prutz, *Die Literatur der Gegenwart* (1859); J. Eckb, *J. Grosse als epischer Dichter* (1872).

GROSSENHAIN, a town in the kingdom of Saxony, 20 m. N. from Dresden, on the main line of railway (via Elsterwerda) to Berlin and at the junction of lines to Priestewitz and Frankfort-on-Oder. Pop. (1905) 12,015. It has an Evangelical church, a modern and a commercial school, a library and an extensive public park. The industries are very important, and embrace manufactures of woollen and cotton stuffs, buckskin, leather, glass and machinery. Grossenhain was originally a Sorb settlement. It was for a time occupied by the Bohemians, by whom it was strongly fortified. It afterwards came into the possession of the margraves of Meissen, from whom it was taken in 1312 by the margraves of Brandenburg. It suffered considerably in all the great German wars, and in 1744 was nearly destroyed by fire. On the 16th of May 1813, a battle took place here between the French and the Russians.

See G. W. Schuberth, *Chronik der Stadt Grossenhain* (Grossenhain, 1887–1892).

GROSSETESTE, ROBERT (*c.* 1175–1253), English statesman, theologian and bishop of Lincoln, was born of humble parents at Stradbrook in Suffolk. He received his education at Oxford where he became proficient in law, medicine and the natural sciences. Giraldus Cambrensis, whose acquaintance he had made, introduced him, before 1199, to William de Vere, bishop of Hereford. Grosseteste aspired to a post in the bishop's household, but being deprived by death of this patron betook himself to the study of theology. It is possible that he visited Paris for this purpose, but he finally settled in Oxford as a teacher. His first preferment of importance was the chancellorship of the university. He gained considerable distinction as a lecturer, and was the first rector of the school which the Franciscans established in Oxford about 1224. Grosseteste's learning is highly praised by Roger Bacon, who was a severe critic. According to Bacon, Grosseteste knew little Greek or Hebrew and paid slight attention to the works of Aristotle, but was pre-eminent among his contemporaries for his knowledge of the natural sciences. Between 1214 and 1231 Grosseteste held in succession the archdeaconries of Chester, Northampton and Leicester. In 1232, after a severe illness, he resigned all his benefices and preferments except one prebend which he held at Lincoln. His intention was to spend the rest of his life in contemplative piety. But he retained the office of chancellor, and in 1235 accepted the bishopric of Lincoln. He undertook without delay the reformation of morals and clerical discipline throughout his vast diocese. This scheme brought him into conflict with more than one privileged corporation, but in particular with his own chapter, who vigorously disputed his claim to exercise the right of visitation over their community. The dispute raged hotly from 1239 to 1245. It was conducted on both sides with unseemly violence, and those who most approved of Grosseteste's main purpose thought it needful to warn him against the mistake of over-zeal. But in 1245, by a personal visit to the papal court at Lyons, he secured a favourable verdict. In ecclesiastical politics the bishop belonged to the school of Becket. His zeal for reform led him to advance, on behalf of the courts-Christian, pretensions which it was impossible that the secular power should admit. He twice incurred a well-merited rebuke from Henry III. upon this subject; although it was left for Edward I. to settle the question of principle in favour of the state. The devotion of Grosseteste to the hierarchical theories of his age is attested by his correspondence with his chapter and the king. Against the former he upheld the prerogative of the bishops; against the latter he asserted that it was impossible for a bishop to disregard the commands of the Holy See. Where the liberties of the national church came into conflict with the pretensions of Rome he stood by his own countrymen. Thus in 1238 he demanded that the king should release certain Oxford scholars who had assaulted the legate Otho. But at least up to the year 1247 he submitted patiently to papal encroachments, contenting himself with the protection (by a special papal privilege) of his own diocese from alien clerks. Of royal exactions he was more impatient; and after the retirement of Archbishop Saint Edmund (*q.v.*) constituted himself the spokesman of the clerical estate in the Great Council. In 1244 he sat on a committee which was empanelled to consider a demand for a subsidy. The committee rejected the demand, and Grosseteste foiled an attempt on the king's part to separate the clergy from the baronage. "It is written," the bishop said, "that united we stand and divided we fall."

It was, however, soon made clear that the king and pope were in alliance to crush the independence of the English clergy; and from 1250 onwards Grosseteste openly criticized the new financial expedients to which Innocent IV. had been driven by his desperate conflict with the Empire. In the course of a visit which he made to Innocent in this year, the bishop laid before the pope and cardinals a written memorial in which he ascribed all the evils of the Church to the malignant influence of the Curia. It produced no effect, although the cardinals felt that Grosseteste was too influential to be punished for his audacity. Much discouraged by his failure the bishop thought of resigning. In the end, however, he decided to continue the unequal struggle. In 1251 he protested against a papal mandate enjoining the English clergy to pay Henry III. one-tenth of their revenues for a crusade; and called attention to the fact that, under the system of provisions, a sum of 70,000 marks was annually drawn

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from England by the alien nominees of Rome. In 1253, upon being commanded to provide in his own diocese for a papal nephew, he wrote a letter of expostulation and refusal, not to the pope himself but to the commissioner, Master Innocent, through whom he received the mandate. The text of the remonstrance, as given in the *Burton Annals* and in Matthew Paris, has possibly been altered by a forger who had less respect than Grosseteste for the papacy. The language is more violent than that which the bishop elsewhere employs. But the general argument, that the papacy may command obedience only so far as its commands are consonant with the teaching of Christ and the apostles, is only what should be expected from an ecclesiastical reformer of Grosseteste's time. There is much more reason for suspecting the letter addressed "to the nobles of England, the citizens of London, and the community of the whole realm," in which Grosseteste is represented as denouncing in unmeasured terms papal finance in all its branches. But even in this case allowance must be made for the difference between modern and medieval standards of decorum.

Grosseteste numbered among his most intimate friends the Franciscan teacher, Adam Marsh (*q.v.*). Through Adam he came into close relations with Simon de Montfort. From the Franciscan's letters it appears that the earl had studied a political tract by Grosseteste on the difference between a monarchy and a tyranny; and that he embraced with enthusiasm the bishop's projects of ecclesiastical reform. Their alliance began as early as 1230, when Grosseteste exerted himself to bring about a reconciliation between the king and the earl. But there is no reason to suppose that the political ideas of Montfort had matured before the death of Grosseteste; nor did Grosseteste busy himself overmuch with secular politics, except in so far as they touched the interest of the Church. Grosseteste realized that the misrule of Henry III. and his unprincipled compact with the papacy largely accounted for the degeneracy of the English hierarchy and the laxity of ecclesiastical discipline. But he can hardly be termed a constitutionalist.

Grosseteste died on the 9th of October 1253. He must then have been between seventy and eighty years of age. He was already an elderly man, with a firmly established reputation, when he became a bishop. As an ecclesiastical statesman he showed the same fiery zeal and versatility of which he had given proof in his academical career; but the general tendency of modern writers has been to exaggerate his political and ecclesiastical services, and to neglect his performances as a scientist and scholar. The opinion of his own age, as expressed by Matthew Paris and Roger Bacon, was very different. His contemporaries, while admiting the excellence of his intentions as a statesman, lay stress upon his defects of temper and discretion. But they see in him the pioneer of a literary and scientific movement; not merely a great ecclesiastic who patronized learning in his leisure hours, but the first mathematician and physicist of his age. It is certainly true that he anticipated, in these fields of thought, some of the most striking ideas to which Roger Bacon subsequently gave a wider currency.

See the *Epistolae Roberti Grosseteste* (Rolls Series, 1861) edited with a valuable introduction by H. R. Luard. Grosseteste's famous memorial to the pope is printed in the appendix to E. Brown's *Fasciculus rerum expetendarum et fugiendarum* (1690). A tract *De phisicis, lineis, angulis et figuris* was printed at Nuremberg in 1503. A French poem, *Le Chastel d'amour*, sometimes attributed to him, has been printed by the Caxton Society. Two curious tracts, the "De moribus pueri ad mensam" (printed by Wynkyn de Worde) and the "Statuta familiae Roberti Grosseteste" (printed by J. S. Brewer in *Monumenta Franciscana*, i. 582), may be from his pen; but the editor of the latter work ascribes it to Adam de Marsh. There is less doubt respecting the *Reules Seynt Robert*, a tract giving advice for the management of the household of the countess of Lincoln. For Grosseteste's life and work see Roger Bacon's *Opus majus* (ed. J. H. Bridges, 1897, 2 vols.) and *Opera quaedam inedita* (ed. J. S. Brewer, Rolls Series, 1859); M. Paris's *Chronica majora* (ed. H. R. Luard, Rolls Series, 1872–1883, 5 vols.); and the *Lives* by S. Pegge (1793) and F. S. Stevenson (1899). (H. W. C. D.)

GROSSETO, a town and episcopal see of Tuscany, capital of the province of Grosseto, 90 m. S.S.E. of Pisa by rail. Pop. (1901) 5856 (town), 8843 (commune). It is 58 ft. above sea-level, and is almost circular in shape; it is surrounded by fortifications, constructed by Francis I. (1574–1587) and Ferdinand I. (1587–1600), which form a hexagonal enceinte with projecting bastions, with two gates only. The small cathedral, begun in 1294, is built of red and white marble alternating, in the Italian Gothic style; it was restored in 1855. The citadel was built in 1311 by the Sienese. Grosseto is on the main line from Pisa to Rome, and is also the starting-point (Montepescali, 8 m. to the N., is the exact point of divergence) of a branch line to Asciano and Siena.

The town dates from the middle ages. In 1138 the episcopal see was transferred thither from Rusellae. In 1230 it, with the rest of the Maremma, of which it is the capital, came under the dominion of Siena. By the peace of 1550, however, it passed to Cosimo I. of Tuscany. In 1745 the malaria had grown to such an extent, owing to the neglect of the drainage works, that Grosseto had only 648 inhabitants, though in 1224 it had 3000 men who bore arms. Leopold I. renewed drainage operations, and by 1836 the population had risen to 2302. The malaria is not yet entirely conquered, however, and the official headquarters of the province are in summer transferred to Scansano (1837 ft.), 20 m. to the S.E. by road.

GROSSI, GIOVANNI FRANCESCO (?–1699), one of the greatest Italian singers of the age of *bel canto*, better known as Siface, was born at Pescia in Tuscany about the middle of the 17th century. He entered the papal chapel in 1675, and later sang at Venice. He derived his nickname of Siface from his impersonation of that character in an opera of Cavalli. It has generally been said that he appeared as Siface in Alessandro Scarlatti's *Mitridate*, but the confusion is due to his having sung the part of Mitridate in Scarlatti's *Pompeo* at Naples in 1683. In 1687 he was sent to London by the duke of Modena, to become a member of the chapel of James II. He probably did much for the introduction of Italian music into England, but soon left the country on account of the climate. Among Purcell's harpsichord music is an air entitled "Sefauchi's Farewell." He was murdered in 1699 on the road between Bologna and Ferrara, probably by the agents of a nobleman with whose wife he had a *liaison*.

See Corrado Ricci's *Vita Barocca* (Milan, 1904).

GROSSI, TOMMASO (1791–1853), Lombard poet and novelist, was born at Bellano, on the Lake of Como, on the 20th of January 1791. He took his degree in law at Pavia in 1810, and proceeded thence to Milan to exercise his profession; but the Austrian government, suspecting his loyalty, interfered with his prospects, and in consequence Grossi was a simple notary all his life. That the suspicion was well grounded he soon showed by writing in the Milanese dialect the battle poem *La Prineide*, in which he described with vivid colours the tragical death of Prina, chief treasurer during the empire, whom the people of Milan, instigated by Austrian agitators, had torn to pieces and dragged through the streets of the town (1814). The poem, being anonymous, was first attributed to the celebrated Porta, but Grossi of his own accord acknowledged himself the author. In 1816 he published other two poems, written likewise in Milanese—*The Golden Rain* (La Pioggia d' oro) and *The Fugitive* (La Fuggitiva). These compositions secured him the friendship of Porta and Manzoni, and the three poets came to form a sort of romantic literary triumvirate. Grossi took advantage of the popularity of his Milanese poems to try Italian verse, into which he sought to introduce the moving realism which had given such satisfaction in his earliest compositions; and in this he was entirely successful with his poem *Ildegonda* (1814). He next wrote an epic poem, entitled *The Lombards in the First Crusade*, a work of which Manzoni makes honourable mention in *I Promessi Sposi*. This composition, which was published by subscription (1826), attained a success unequalled by that of any other Italian poem within the century. The example of Manzoni induced Grossi to write an historical novel entitled *Marco Visconti* (1834)—a work which contains passages of fine description and deep pathos. A little later Grossi published a tale in verse, *Ulrico and Lida*, but with this publication his poetical activity ceased.

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After his marriage in 1838 he continued to employ himself as a notary in Milan till his death on the 10th of December 1853. His *Life* by Cantu appeared at Milan in 1854.

GROSSMITH, GEORGE (1847–), English comedian, was born on the 9th of December 1847, the son of a law reporter and entertainer of the same name. After some years of journalistic work he started about 1870 as a public entertainer, with songs and recitations; but in 1877 he began a long connexion with the Gilbert and Sullivan operas at the Savoy Theatre, London, in *The Sorcerer*. For twelve years he had the leading part, his capacity for "patter-songs," and his humorous acting, dancing and singing marking his creations of the chief characters in the Gilbert and Sullivan operas as the expression of a highly original individuality. In 1889 he left the Savoy, and again set up as an entertainer, visiting all the cities of Great Britain and the United States, but retiring in 1901. Among other books he wrote *The Reminiscences of a Society Clown* (1888); and, with his brother Weedon, *The Diary of a Nobody* (1894). His humorous songs and sketches numbered over six hundred. His younger brother, Weedon Grossmith, who was educated as a painter and exhibited at the Academy, also took to the stage, his first notable success being in the *Pantomime Rehearsal*; in 1894 he went into management on his own account, and had much success as a comedian. George Grossmith's two sons, Laurence Grossmith and George Grossmith, jun., were both actors, the latter becoming a well-known figure in the musical comedies at the Gaiety Theatre, London.

GROS VENTRES (Fr. for "Great Bellies"), or ATSINA, a tribe of North American Indians of Algonquian stock. The name is said to have reference to the greediness of the people, but more probably originated from their prominent tattooing. They are settled at Fort Belknap agency, Montana. The name has also been given to other tribes, *e.g.* the Hidatsa or Minitari, now at Fort Berthold, North Dakota.

GROTE, GEORGE (1794–1871), English historian of Greece, was born on the 17th of November 1794, at Clay Hill near Beckenham in Kent. His grandfather, Andreas, originally a Bremen merchant, was one of the founders (1st of January 1766) of the banking-house of Grote, Prescott & Company in Threadneedle Street, London (the name of Grote did not disappear from the firm till 1870). His father, also George, married (1793) Selina, daughter of Henry Peckwell (1747–1787), minister of the countess of Huntingdon's chapel in Westminster (descended from a Huguenot family, the de Blossets, who had left Touraine on the revocation of the Edict of Nantes), and had one daughter and ten sons, of whom the historian was the eldest. Educated at first by his mother, George Grote was sent to the Sevenoaks grammar school (1800–1804) and afterwards to Charterhouse (1804–1810), where he studied under Dr Raine in company with Connop Thirlwall, George and Horace Waddington and Henry Havelock. In spite of Grote's school successes, his father refused to send him to the university and put him in the bank in 1810. He spent all his spare time in the study of classics, history, metaphysics and political economy, and in learning German, French and Italian. Driven by his mother's Puritanism and his father's contempt for academic learning to outside society, he became intimate with Charles Hay Cameron, who strengthened him in his love of philosophy, and George W. Norman, through whom he met his wife, Miss Harriet Lewin (see below). After various difficulties the marriage took place on the 5th of March 1820, and was in all respects a happy union.

In the meanwhile Grote had finally derided his philosophic and political attitude. In 1817 he came under the influence of David Ricardo, and through him of James Mill and Jeremy Bentham. He settled in 1820 in a house attached to the bank in Threadneedle Street, where his only child died a week after its birth. During Mrs Grote's slow convalescence at Hampstead, he wrote his first published work, the *Statement of the Question of Parliamentary Reform* (1821), in reply to Sir James Mackintosh's article in the *Edinburgh Review*, advocating popular representation, vote by ballot and short parliaments. In 1822 he published in the *Morning Chronicle* (April) a letter against Canning's attack on Lord John Russell, and edited, or rather re-wrote, some discursive papers of Bentham, which he published under the title *Analysis of the Influence of Natural Religion on the Temporal Happiness of Mankind by Philip Beauchamp* (1822). The book was published in the name of Richard Carlile, then in gaol at Dorchester. Though not a member of J. S. Mill's Utilitarian Society (1822–1823), he took a great interest in a society for reading and discussion, which met (from 1823) in a room at the bank before business hours twice a week. From the *Posthumous Papers* (pp. 22, 24) it is clear that Mrs Grote was wrong in asserting that she first in 1823 (autumn) suggested the *History of Greece*; the book was already in preparation in 1822, though what was then written was subsequently reconstructed. In 1826 Grote published in the *Westminster Review* (April) a criticism of Mitford's *History of Greece*, which shows that his ideas were already in order. From 1826 to 1830 he was hard at work with J. S. Mill and Henry Brougham in the organization of the new "university" in Gower Street. He was a member of the council which organized the faculties and the curriculum; but in 1830, owing to a difference with Mill as to an appointment to one of the philosophical chairs, he resigned his position.

In 1830 he went abroad, and, attracted by the political crisis, spent some months in Paris in the society of the Liberal leaders. Recalled by his father's death (6th of July), he not only became manager of the bank, but took a leading position among the city Radicals. In 1831 he published his important *Essentials of Parliamentary Reform* (an elaboration of his previous *Statement*), and, after refusing to stand as parliamentary candidate for the city in 1831, changed his mind and was elected head of the poll, with three other Liberals, in December 1832. After serving in three parliaments, he resigned in 1841, by which time his party ("the philosophic Radicals") had dwindled away. During these years of active public life, his interest in Greek history and philosophy had increased, and after a trip to Italy in 1842, he severed his connexion with the bank and devoted himself to literature. In 1846 the first two volumes of the *History* appeared, and the remaining ten between 1847 and the spring of 1856. In 1845 with Molesworth and Raikes Currie he gave monetary assistance to Auguste Comte (*q.v.*), then in financial difficulties. The formation of the Sonderbund (20th of July 1847) led him to visit Switzerland and study for himself a condition of things in some sense analogous to that of the ancient Greek states. This visit resulted in the publication in the *Spectator* of seven weekly letters, collected in book form at the end of 1847 (see a letter to de Tocqueville in Mrs Grote's reprint of the *Seven Letters*, 1876).

In 1856 Grote began to prepare his works on Plato and Aristotle. *Plato and the Other Companions of Sokrates* (3 vols.) appeared in 1865, but the work on Aristotle he was not destined to complete. He had finished the *Organon* and was about to deal with the metaphysical and physical treatises when he died on the 18th of June 1871, and was buried in Westminster Abbey. He was a man of strong character and self-control, unfailing courtesy and unswerving devotion to what he considered the best interests of the nation. To colleagues and subordinates alike, he was considerate and tolerant; he was unassuming, trustworthy in the smallest detail, accurate and comprehensive in thought, energetic and conscientious in action. Yet, hidden under his calm exterior there was a burning enthusiasm and a depth of passion of which only his intimate friends were aware.

His work may best be considered under the following heads:

1. Grote's Services to Education.—He took, as already stated, an important part in the foundation and organization of the original university of London, which began its public work in Gower Street on the 28th of October 1828, and in 1836, on the incorporation of the university of London proper, became known as University College. In 1849 he was re-elected to the council, in 1860 he became treasurer, and on the death of Brougham (1868) president. He took a keen interest in all the work of the college, presented to it the *Marmor Homericum*, and finally bequeathed the reversion of £6000 for the endowment of a chair

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of philosophy of mind and logic. The emoluments of this sum were, however, to be held over and added to the principal if at any time the holder of the chair should be "a minister of the Church of England or of any other religious persuasion." In 1850 the senate of the university was reconstituted, and Grote was one of seven eminent men who were added to it. Eventually he became the strongest advocate for open examinations, for the claims not only of philosophy and classics but also of natural science, and, as vice-chancellor in 1862, for the admission of women to examinations. This latter reform was carried in 1868. He succeeded his friend Henry Hallam as a trustee of the British Museum in 1850, and took part in the reorganization of the departments of antiquities and natural science.

The honours which he received in recognition of these services were as follows: D.C.L. of Oxford (1853); LL.D. Cambridge (1861); F.R.S. (1857); honorary professor of ancient history in the Royal Academy (1850). By the French Academy of Moral and Political Sciences he was made correspondent (1857) and foreign associate (the first Englishman since Macaulay) (1864). In 1869 he refused Gladstone's offer of a peerage.

2. *Political Career.*—In politics Grote belonged to the "philosophic Radicals" of the school of J. S. Mill and Bentham, whose chief principles were representative government, vote by ballot, the abolition of a state church, frequent elections. He adhered to these principles throughout, and refused to countenance any reforms which were incompatible with them. By this uncompromising attitude, he gradually lost all his supporters save a few men of like rigidity. As a speaker, he was clear, logical and impressive, and on select committees his common sense was most valuable. For his speeches see A. Bain in the *Minor Works*; see also BALLOT.

3. *The History of Greece.*—It is on this work that Grote's reputation mainly rests. Though half a century has passed since its production, it is still in some sense the text-book. It consists of two parts, the "Legendary" and the "Historical" Greece. The former, owing to the development of comparative mythology, is now of little authority, and portions of part ii. are obsolete owing partly to the immense accumulations of epigraphic and archaeological research, partly to the subsequent discovery of the Aristotelian *Constitution of Athens*, and partly also to the more careful weighing of evidence which Grote himself misinterpreted. The interest of the work is twofold. In the first place it contains a wonderful mass of information carefully collected from all sources, arranged on a simple plan, and expressed in direct forcible language. It is in this respect one of the few great comprehensive histories in our possession, great in scope, conception and accomplishment. But more than this it is interesting as among the first works in which Greek history became a separate study, based on real evidence and governed by the criteria of modern historical science. Further Grote, a practical man, a rationalist and an enthusiast for democracy, was the first to consider Greek political development with a sympathetic interest (see GREECE: *History, Ancient*, section "Authorities"), in opposition to the Tory attitude of John Gillies and Mitford, who had written under the influence of horror at the French Revolution. On the whole his work was done with impartiality, and more recent study has only confirmed his general conclusions. Much has been made of his defective accounts of the tyrants and the Macedonian empire, and his opinion that Greek history ceased to be interesting or instructive after Chaeronea. It is true that he confined his interest to the fortunes of the city state and neglected the wider diffusion of the Greek culture, but this is after all merely a criticism of the title of the book. The value of the *History* consists to-day primarily in its examination of the Athenian democracy, its growth and decline, an examination which is still the most inspiring, and in general the most instructive, in any language. In the description of battles and military operations generally Grote was handicapped by the lack of personal knowledge of the country. In this respect he is inferior to men like Ernst Curtius and G. B. Grundy.

4. *In Philosophy* Grote was a follower of the Mills and Bentham. J. S. Mill paid a tribute to him in the preface to the third edition of his *Examination of Sir Wm. Hamilton's Philosophy*, and there is no doubt that the empirical school owed a great deal to his sound, accurate thinking, untrammelled by any reverence for authority, technique and convention. In dealing with Plato he was handicapped by this very common sense, which prevented him from appreciating the theory of ideas in its widest relations. His *Plato* is important in that it emphasizes the generally neglected passages of Plato in which he seems to indulge in mere Socratic dialectic rather than to seek knowledge; it is, therefore, to be read as a corrective to the ordinary criticism of Plato. The more congenial study of Aristotle, though incomplete, is more valuable in the positive sense, and has not received the attention it deserves. Perhaps Grote's most distinctive contribution to the study of Greek philosophy is his chapter in the *History of Greece* on the Sophists, of whom he took a view somewhat more favourable than has been accepted before or since.

His wife, HARRIET LEWIN (1792–1878), was the daughter of Thomas Lewin, a retired Indian civilian, settled in Southampton. After her marriage with Grote in 1820 she devoted herself to the subjects in which he was interested and was a prominent figure in the literary, political and philosophical circle in which he lived. She carefully read the proofs of his work and relieved him of anxiety in connexion with his property. Among her writings are: *Memoir of Ary Scheffer* (1860); *Collected Papers* (1862); and her biography of her husband (1873). Another publication, *The Philosophical Radicals of 1832* (privately circulated in 1866), is interesting for the light it throws on the Reform movement of 1832 to 1842, especially on Molesworth.

BIBLIOGRAPHY.—The *History of Greece* passed through five editions the fifth (10 vols., 1888) being final. An edition covering the period from Solon to 403, with new notes and excursuses, was published by J. M. Mitchell and M. O. B. Caspari in 1907. The *Plato* was finally edited by Alexander Bain in 4 vols. See Mrs Grote's *Personal Life of George Grote*, and article in *Dict. Nat. Biog.* by G. Croom Robertson. (J. M. M.)

GROTEFEND, GEORG FRIEDRICH (1775–1853), German epigraphist, was born at Münden in Hanover on the 9th of June 1775. He was educated partly in his native town, partly at Ilfeld, where he remained till 1795, when he entered the university of Göttingen, and there became the friend of Heyne, Tychsen and Heeren. Heyne's recommendation procured for him an assistant mastership in the Göttingen gymnasium in 1797. While there he published his work *De pasigraphia sive scriptura universali* (1799), which led to his appointment in 1803 as prorector of the gymnasium of Frankfort-on-Main, and shortly afterwards as conrector. Grotefend was best known during his lifetime as a Latin and Italian philologist, though the attention he paid to his own language is shown by his *Anfangsgründe der deutschen Poesie*, published in 1815, and his foundation of a society for investigating the German tongue in 1817. In 1821 he became director of the gymnasium at Hanover, a post which he retained till his retirement in 1849. In 1823–1824 appeared his revised edition of Wenck's Latin grammar, in two volumes, followed by a smaller grammar for the use of schools in 1826; in 1835–1838 a systematic attempt to explain the fragmentary remains of the Umbrian dialect, entitled *Rudimenta linguae Umbricae ex inscriptionibus antiquis enodata* (in eight parts); and in 1839 a work of similar character upon Oscan (*Rudimenta linguae Oscae*). In the same year he published an important memoir on the coins of Bactria, under the name of *Die Münzen der griechischen, parthischen, und indoskythischen Könige von Bactrien und den Ländern am Indus*. He soon, however, returned to his favourite subject, and brought out a work in five parts, *Zur Geographie und Geschichte von Altitalien* (1840–1842). Previously, in 1836, he had written a preface to Wagenfeld's translation of the spurious *Sanchoniathon* of Philo Byblius, which was alleged to have been discovered in the preceding year in the Portuguese convent of Santa Maria de Merinhao. But it was in the East rather than in the West that Grotefend did his greatest work. The cuneiform inscriptions of Persia had for some time been attracting attention in Europe; exact copies of them had been published by the elder Niebuhr, who lost his eyesight over the work; and Grotefend's friend, Tychsen of Rostock, believed

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that he had ascertained the characters in the column, now known to be Persian, to be alphabetic. At this point Grotefend took the matter up. His first discovery was communicated to the Royal Society of Göttingen in 1800, and reviewed by Tychsen two years afterwards. In 1815 he gave an account of it in Heeren's great work on ancient history, and in 1837 published his *Neue Beiträge zur Erläuterung der persepolitanischen Keilschrift*. Three years later appeared his *Neue Beiträge zur Erläuterung der babylonischen Keilschrift*. His discovery may be summed up as follows: (1) that the Persian inscriptions contain three different forms of cuneiform writing, so that the decipherment of the one would give the key to the decipherment of the others; (2) that the characters of the Persian column are alphabetic and not syllabic; (3) that they must be read from left to right; (4) that the alphabet consists of forty letters, including signs for long and short vowels; and (5) that the Persepolitan inscriptions are written in Zend (which, however, is not the case), and must be ascribed to the age of the Achaemenian princes. The process whereby Grotefend arrived at these conclusions is a prominent illustration of persevering genius (see CUNEIFORM). A solid basis had thus been laid for the interpretation of the Persian inscriptions, and all that remained was to work out the results of Grotefend's brilliant discovery, a task ably performed by Burnouf, Lassen and Rawlinson. Grotefend died on the 15th of December 1853.

GROTESQUE, strictly a form of decorative art, in painting or sculpture, consisting of fantastic shapes of human beings, animals and the like, joined together by wreaths of flowers, garlands or arabesques. The word is also applied to any whimsical design or decorative style, if characterized by unnatural distortion, and, generally, to anything ludicrous or extravagantly fanciful. "Grotesque" comes through the French from the Ital. *grottesco*, an adjective formed from *grotta*, which has been corrupted in English to "grotto." The commonly accepted explanation of the special use of the term "grotesque" is that this particular form of decorative art was most frequently found in the excavated ancient Roman and Greek dwellings found in Italy, to which was applied the name *grotte*. The derivation of *grotta* is through popular Lat. *crupta* or *grupta* (cf. "crypt"), from Gr. κρύπτη, a vault, κρύπτειν, to hide. Such a term would be applicable both to the buried dwellings of ancient Italy, and to a cavern, artificial or natural, the ordinary sense of the word. An interesting parallel with this origin of the word is found in that of "antic," now meaning a freak, a jest, absurd fancy, &c. This word is the same as "antique," and was, like "grotesque," first applied to the fanciful decorations of ancient art.

GROTH, KLAUS (1819–1899), Low German poet, was born at Heide in Schleswig-Holstein, on the 24th of April 1819. After studying at the seminary in Tondern (1838–1841), he became a teacher at the girls' school in his native village, but in 1847 went to Kiel to qualify for a higher educational post. Ill-health interrupted his studies and it was not until 1853 that he was able to resume them at Kiel. In 1856 he took the degree of doctor of philosophy at Bonn, and in 1858 settled as *privatdocent* in German literature and languages at Kiel, where, in 1866, he was made professor, and where he lived until his death on the 1st of June 1899. In his Low German (*Plattdeutsch*) lyric and epic poems, which reflect the influence of Johann Peter Hebel (*q.v.*), Groth gives poetic expression to the country life of his northern home; and though his descriptions may not always reflect the peculiar characteristics of the peasantry of Holstein as faithfully as those of F. Reuter (*q.v.*), yet Groth is a lyric poet of genuine inspiration. His chief works are *Quickborn, Volksleben in plattdeutschen Gedichten Ditmarscher Mundart* (1852; 25th ed. 1900; and in High German translations, notably by M. J. Berchem, Krefeld, 1896); and two volumes of stories, *Vertellin* (1855–1859, 3rd ed. 1881); also *Voer de Goern* (1858) and *Ut min Jungsparadies* (1875).

Groth's *Gesammelte Werke* appeared in 4 vols. (1893). His *Lebenserinnerungen* were edited by E. Wolff in 1891; see also K. Eggers, *K. Groth und die plattdeutsche Dichtung* (1885); and biographies by A. Bartels (1899) and H. Siercks (1899).

GROTH, PAUL HEINRICH VON (1843–), German mineralogist, was born at Magdeburg on the 23rd of June 1843. He was educated at Freiberg, Dresden and Berlin, and took the degree of Ph.D. in 1868. After holding from 1872 the chair of mineralogy at Strasburg, he was in 1883 appointed professor of mineralogy and curator of minerals in the state museum at Munich. He carried on extensive researches on crystals and minerals, and also on rocks; and published *Tabellarische Übersicht der einfachen Mineralien* (1874–1898), and *Physikalische Krystallographie* (1876–1895, ed. 4, 1905). He edited for some years the *Zeitschrift für Krystallographie und Mineralogie*.

GROTIUS, HUGO (1583–1645), in his native country Huig van Groot, but known to the rest of Europe by the latinized form of the name, Dutch publicist and statesman, was born at Delft on Easter day, the 10th of April 1583. The Groots were a branch of a family of distinction, which had been noble in France, but had removed to the Low Countries more than a century before. Their French name was de Cornets, and this cadet branch had taken the name of Groot on the marriage of Hugo's great-grandfather with a Dutch heiress. The father of Hugo was a lawyer in considerable practice, who had four times served the office of burgomaster of Leiden, and was one of the three curators of the university of that place.

In the annals of precocious genius there is no greater prodigy on record than Hugo Grotius, who was able to make good Latin verses at nine, was ripe for the university at twelve, and at fifteen edited the encyclopaedic work of Martianus Capella. At Leiden he was much noticed by J. J. Scaliger, whose habit it was to engage his young friends in the editing of some classical text. At fifteen Grotius accompanied Count Justin of Nassau, and the grand pensionary J. van Olden Barneveldt on their special embassy to the court of France. After a year spent in acquiring the language and making acquaintance with the leading men of France, Grotius returned home. He took the degree of doctor of law at Leiden, and entered on practice as an advocate.

Notwithstanding his successes in his profession, his inclination was to literature. In 1600 he edited the remains of Aratus, with the verslons of Cicero, Germanicus and Avienus. Of the *Germanicus* Scaliger says—"A better text than that which Grotius has given, it is impossible to give"; but it is probable that Scaliger had himself been the reviser. Grotius vied with the Latinists of his day in the composition of Latin verses. Some lines on the siege of Ostend spread his fame beyond the circle of the learned. He wrote three dramas in Latin:—*Christus patiens; Sophomphaneas*, on the story of Joseph and his brethren; and *Adamus exul*, a production still remembered as having given hints to Milton. The *Sophomphaneas* was translated into Dutch by Vondel, and into English by Francis Goldsmith (1652); the *Christus patiens* into English by George Sandys (1640).

In 1603 the United Provinces, desiring to transmit to posterity some account of their struggle with Spain, determined to appoint a historiographer. The choice of the states fell upon Grotius, though he was but twenty years of age, and had not offered himself for the post. There was some talk at this time in Paris of calling Grotius to be librarian of the royal library. But it was a ruse of the Jesuit party, who wished to persuade the public that the opposition to the appointment of Isaac Casaubon did not proceed from theological motives, since they were ready to appoint a Protestant in the person of Grotius.

His next preferment was that of advocate-general of the fisc for the provinces of Holland and Zeeland. This was followed by his marriage, in 1608, to Marie Reigersberg, a lady of family in Zeeland, a woman of great capacity and noble disposition.

Grotius had already passed from occupation with the classics to studies more immediately connected with his profession. In the winter of 1604 he composed (but did not publish) a treatise entitled *De jure praedae*. The MS. remained unknown till 1868, when it was brought to light, and printed at the Hague under the auspices of Professor Fruin. It shows that the principles and the plan of the celebrated *De jure belli*, which was not composed

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till 1625, more than twenty years after, had already been conceived by a youth of twenty-one. It has always been a question what it was that determined Grotius, when an exile in Paris in 1625, to that particular subject, and various explanations have been offered; among others a casual suggestion of Peiresc in a letter of early date. The discovery of the MS. of the *De jure praedae* discloses the whole history of Grotius's ideas, and shows that from youth upwards he had steadily read and meditated in one direction, that, namely, of which the famous *De jure belli* was the mature product. In the *De jure praedae* of 1604 there is much more than the germ of the later treatise *De jure belli*. Its main principles, and the whole system of thought implied in the later, are anticipated in the earlier work. The arrangement even is the same. The chief difference between the two treatises is one which twenty years' experience in affairs could not but bring—the substitution of more cautious and guarded language, less dogmatic affirmation, more allowance for exceptions and deviations. The *Jus pacis* was an addition introduced first in the later work, an insertion which is the cause of not a little of the confused arrangement which has been found fault with in the *De jure belli*.

The *De jure praedae* further demonstrates that Grotius was originally determined to this subject, not by any speculative intellectual interest, but by a special occasion presented by his professional engagements. He was retained by the Dutch East India Company as their advocate. One of their captains, Heemskirk, had captured a rich Portuguese galleon in the Straits of Malacca. The right of a private company to make prizes was hotly contested in Holland, and denied by the stricter religionists, especially the Mennonites, who considered all war unlawful. Grotius undertook to prove that Heemskirk's prize had been lawfully captured. In doing this he was led to investigate the grounds of the lawfulness of war in general. Such was the casual origin of a book which long enjoyed such celebrity that it used to be said, with some exaggeration indeed, that it had founded a new science.

A short treatise which was printed in 1609, Grotius says without his permission, under the title of *Mare liberum*, is nothing more than a chapter—the 12th—of the *De jure praedae*. It was necessary to Grotius's defence of Heemskirk that he should show that the Portuguese pretence that Eastern waters were their private property was untenable. Grotius maintains that the ocean is free to all nations. The occasional character of this piece explains the fact that at the time of its appearance it made no sensation. It was not till many years afterwards that the jealousies between England and Holland gave importance to the novel doctrine broached in the tract by Grotius, a doctrine which Selden set himself to refute in his *Mare clausum* (1632).

Equally due to the circumstances of the time was his small contribution to constitutional history entitled *De antiquitate reipublicae Batavae* (1610). In this he vindicates, on grounds of right, prescriptive and natural, the revolt of the United Provinces against the sovereignty of Spain.

Grotius, when he was only thirty, was made pensionary of the city of Rotterdam. In 1613 he formed one of a deputation to England, in an attempt to adjust those differences which gave rise afterwards to a naval struggle disastrous to Holland. He was received by James with every mark of distinction. He also cultivated the acquaintance of the Anglican ecclesiastics John Overall and L. Andrewes, and was much in the society of the celebrated scholar Isaac Casaubon, with whom he had been in correspondence by letter for many years. Though the mediating views in the great religious conflict between Catholic and Protestant, by which Grotius was afterwards known, had been arrived at by him by independent reflection, yet it could not but be that he would be confirmed in them by finding in England a developed school of thought of the same character already in existence. How highly Casaubon esteemed Grotius appears from a letter of his to Daniel Heinsius, dated London, 13th of April 1613. "I cannot say how happy I esteem myself in having seen so much of one so truly great as Grotius. A wonderful man! This I knew him to be before I had seen him; but the rare excellence of that divine genius no one can sufficiently feel who does not see his face, and hear him speak. Probity is stamped on his features; his conversation savours of true piety and profound learning. It is not only upon me that he has made this impression; all the pious and learned to whom he has been here introduced have felt the same towards him; the king especially so!"

After Grotius's return from England the exasperation of theological parties in Holland rose to such a pitch that it became clear that an appeal to force would be made. Grotius sought to find some mean term in which the two hostile parties of Remonstrants and Anti-remonstrants, or as they were subsequently called Arminians and Gomarists (see REMONSTRANTS), might agree. A form of edict drawn by Grotius was published by the states, recommending mutual toleration, and forbidding ministers in the pulpit from handling the disputed dogmas. To the orthodox Calvinists the word toleration was insupportable. They had the populace on their side. This fact determined the stadtholder, Maurice of Nassau, to support the orthodox party —a party to which he inclined the more readily that Olden Barneveldt, the grand pensionary, the man whose uprightness and abilities he most dreaded, sided with the Remonstrants.

In 1618 Prince Maurice set out on a sort of pacific campaign, disbanding the civic guards in the various cities of Guelders, Holland and Zeeland, and occupying the places with troops on whom he could rely. The states of Holland sent a commission, of which Grotius was chairman, to Utrecht, with the view of strengthening the hands of their friends, the Remonstrant party, in that city. Feeble plans were formed, but not carried into effect, for shutting the gates upon the stadtholder, who entered the city with troops on the night of the 26th of July 1618. There were conferences in which Grotius met Prince Maurice, and taught him that Olden Barneveldt was not the only man of capacity in the ranks of the Remonstrants whom he had to fear. On the early morning of the 31st of July the prince's *coup d'état* against the liberties of Utrecht and of Holland was carried out; the civic guard was disarmed—Grotius and his colleagues saving themselves by a precipitate flight. But it was only a reprieve. The grand pensionary, Olden Barneveldt, the leader of the Remonstrant party, Grotius and Hoogerbeets were arrested, brought to trial, and condemned—Olden Barneveldt to death, and Grotius to imprisonment for life and confiscation of his property. In June 1619 he was immured in the fortress of Louvestein near Gorcum. His confinement was rigorous, but after a time his wife obtained permission to share his captivity, on the condition that if she came out, she should not be suffered to return.

Grotius had now before him, at thirty-six, no prospect but that of a lifelong captivity. He did not abandon himself to despair, but sought refuge in returning to the classical pursuits of his youth. Several of his translations (into Latin) from the Greek tragedians and other writers, made at this time, have been printed. "The Muses," he writes to Voss, "were now his consolation, and appeared more amiable than ever."

The ingenuity of Madame Grotius at length devised a mode of escape. It had grown into a custom to send the books which he had done with in a chest along with his linen to be washed at Gorcum. After a time the warders began to let the chest pass without opening it. Madame Grotius, perceiving this, prevailed on her husband to allow himself to be shut up in it at the usual time. The two soldiers who carried the chest out complained that it was so heavy "there must be an Arminian in it." "There are indeed," said Madame Grotius, "Arminian books in it." The chest was carried to the house of a friend, where Grotius was released. He was then dressed like a mason with hod and trowel, and so conveyed over the frontier. His first place of refuge was Antwerp, from which he proceeded to Paris, where he arrived in April 1621. In October he was joined by his wife. There he was presented to the king, Louis XIII., and a pension of 3000 livres conferred upon him. French pensions were easily granted, all the more so as they were never paid. Grotius was now

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reduced to great straits. He looked about for any opening through which he might earn a living. There was talk of something in Denmark; or he would settle in Spires, and practise in the court there. Some little relief he got through the intervention of Étienne d'Aligre, the chancellor, who procured a royal mandate which enabled Grotius to draw, not all, but a large part of his pension. In 1623 the president Henri de Même lent him his château of Balagni near Senlis (dep. Oise), and there Grotius passed the spring and summer of that year. De Thou gave him facilities to borrow books from the superb library formed by his father.

In these circumstances the *De jure belli et pacis* was composed. That a work of such immense reading, consisting in great part of quotation, should have been written in little more than a year was a source of astonishment to his biographers. The achievement would have been impossible, but for the fact that Grotius had with him the first draft of the work made in 1604. He had also got his brother William, when reading his classics, to mark down all the passages which touched upon law, public or private. In March 1625 the printing of the *De jure belli*, which had taken four months, was completed, and the edition despatched to the fair at Frankfort. His own honorarium as author consisted of 200 copies, of which, however, he had to give away many to friends, to the king, the principal courtiers, the papal nuncio, &c. What remained he sold for his own profit at the price of a crown each, but the sale did not recoup him his outlay. But though his book brought him no profit it brought him reputation, so widely spread, and of such long endurance, as no other legal treatise has ever enjoyed.

Grotius hoped that his fame would soften the hostility of his foes, and that his country would recall him to her service. Theological rancour, however, prevailed over all other sentiments, and, after fruitless attempts to re-establish himself in Holland, Grotius accepted service under Sweden, in the capacity of ambassador to France. He was not very successful in negotiating the treaty on behalf of the Protestant interest in Germany, Richelieu having a special dislike to him. He never enjoyed the confidence of the court to which he was accredited, and frittered away his influence in disputes about precedence. In 1645 he demanded and obtained his recall. He was honourably received at Stockholm, but neither the climate nor the tone of the court suited him, and he asked permission to leave. He was driven by a storm on the coast near Dantzig. He got as far as Rostock, where he found himself very ill. Stockman, a Scottish physician who was sent for, thought it was only weakness, and that rest would restore the patient. But Grotius sank rapidly, and died on the 29th of August 1645.

Grotius combined a wide circle of general knowledge with a profound study of one branch of law. History, theology, jurisprudence, politics, classics, poetry,—all these fields he cultivated. His commentaries on the Scriptures were the first application on an extensive scale of the principle affirmed by Scaliger, that, namely, of interpretation by the rules of grammar without dogmatic assumptions. Grotius's philological skill, however, was not sufficient to enable him to work up to this ideal.

As in many other points Grotius inevitably recalls Erasmus, so he does in his attitude towards the great schism. Grotius was, however, animated by an ardent desire for peace and concord. He thought that a basis for reconciliation of Protestant and Catholic might be found in a common piety, combined with reticence upon discrepancies of doctrinal statement. His *De veritate religionis Christianae* (1627), a presentment of the evidences, is so written as to form a code of common Christianity, irrespective of sect. The little treatise became widely popular, gaining rather than losing popularity in the 18th century. It became the classical manual of apologetics in Protestant colleges, and was translated for missionary purposes into Arabic (by Pococke, 1660), Persian, Chinese, &c. His *Via et votum ad pacem ecclesiasticam* (1642) was a detailed proposal of a scheme of accommodation. Like all men of moderate and mediating views, he was charged by both sides with vacillation. An Amsterdam minister, James Laurent, published his *Grotius papisans* (1642), and it was continually being announced from Paris that Grotius had "gone over." Hallam, who has collected all the passages from Grotius's letters in which the prejudices and narrow tenets of the Reformed clergy are condemned, thought he had a "bias towards popery" (*Lit. of Europe*, ii. 312). The true interpretation of Grotius's mind appears to be an indifference to dogmatic propositions, produced by a profound sentiment of piety. He approached parties as a statesman approaches them, as facts which have to be dealt with, and governed, not suppressed in the interests of some one of their number.

His editions and translations of the classics were either juvenile exercises prescribed by Scaliger, or "lusus poetici," the amusement of vacant hours. Grotius read the classics as a humanist, for the sake of their contents, not as a professional scholar.

His *Annals of the Low Countries* was begun as an official duty while he held the appointment of historiographer, and was being continued and retouched by him to the last. It was not published till 1657, by his sons Peter and Cornelius.

Grotius was a great jurist, and his *De jure belli et pacis* (Paris, 1625), though not the first attempt in modern times to ascertain the principles of jurisprudence, went far more fundamentally into the discussion than any one had done before him. The title of the work was so far misleading that the *jus belli* was a very small part of his comprehensive scheme. In his treatment of this narrower question he had the works of Alberico Gentili and Ayala before him, and has acknowledged his obligations to them. But it is in the larger questions to which he opened the way that the merit of Grotius consists. His was the first attempt to obtain a principle of right, and a basis for society and government, outside the church or the Bible. The distinction between religion on the one hand and law and morality on the other is not indeed clearly conceived by Grotius, but he wrestles with it in such a way as to make it easy for those who followed him to seize it. The law of nature is unalterable; God Himself cannot alter it any more than He can alter a mathematical axiom. This law has its source in the nature of man as a social being; it would be valid even were there no God, or if God did not interfere in the government of the world. These positions, though Grotius's religious temper did not allow him to rely unreservedly upon them, yet, even in the partial application they find in his book, entitle him to the honour of being held the founder of the modern science of the law of nature and nations. The *De jure* exerted little influence on the practice of belligerents, yet its publication was an epoch in the science. De Quincey has said that the book is equally divided between "empty truisms and time-serving Dutch falsehoods." For a saner judgment and a brief abstract of the contents of the *De jure*, consult J. K. Bluntschli, *Geschichte des allgemeinen Staatsrechts* (Munich, 1864). A fuller analysis, and some notice of the predecessors of Grotius, will be found in Hély, *Étude sur le droit de la guerre de Grotius* (Paris, 1875). The writer, however, had never heard of the *De jure praedae*, published in 1868. Hallam, *Lit. of Europe*, ii. p. 543, has an abstract done with his usual conscientious pains. Dugald Stewart (*Collected Works*, i. 370) has dwelt upon the confusion and defects of Grotius's theory. Sir James Mackintosh (*Miscell. Works*, p. 166) has defended Grotius, affirming that his work "is perhaps the most complete that the world has yet owed, at so early a stage in the progress of any science, to the genius and learning of one man."

The chief writings of Grotius have been named. For a complete bibliography of his works, see Lehmann, *Hugonis Grotii manes vindicati* (Delft, 1727), which also contains a full biography. Of this Latin life De Burigny published a réchauffée in French (2 vols., 8vo, Paris, 1752). Other lives are: Van Brandt, *Historie van het Leven H. de Groot* (2 vols., 8vo, Dordrecht, 1727); Von Luden, *Hugo Grotius nach seinen Schicksalen und Schriften dargestellt* (8vo, Berlin, 1806); *Life of Hugo Grotius*, by Charles Butler of Lincoln's Inn (8vo, London, 1826). The work of the Abbé Hély contains a life of Grotius. See also *Hugo Grotius*, by L. Neumann (Berlin, 1884); *Opinions of Grotius*, by D. P. de Bruyn (London, 1894).

Grotius's theological works were collected in 3 vols. fol. at Amsterdam (1644–1646); reprinted London, 1660; Amsterdam, 1679; and again Amsterdam, 1698). His letters were printed first in a selection, *Epistolae ad Gallos* (12mo, Leiden, 1648), abounding, though an Elzevir, in errors of the press. They were collected in *H.*

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Grotii epistolae quotquot reperiri potuerunt (fol., Amsterdam, 1687). A few may be found scattered in other collections of *Epistolae*. Supplements to the large collection of 1687 were published at Haarlem, 1806; Leiden, 1809; and Haarlem, 1829. The *De jure belli* was translated into English by Whewell (3 vols., 8vo, Cambridge, 1853); into French by Barbeyrac (2 vols. 4to, Amsterdam, 1724); into German in Kirchmann's *Philosophische Bibliothek* (3 vols. 12mo, Leipzig, 1879). (M. P.)

GROTTAFERRATA, a village of Italy, in the province of Rome, from which it is 13 m. S.E. by electric tramway, and 2¾m. S. of Frascati, 1080 ft. above sea-level, in the Alban Hills. Pop. (1901) 2645. It is noticeable for the Greek monastery of Basilians founded by S. Nilus in 1002 under the Emperor Otho III., and which occupies the site of a large Roman villa, possibly that of Cicero. It was fortified at the end of the 15th century by Cardinal Giuliano della Rovere (afterwards Pope Julius II.), whose arms may be seen about it. The massive towers added by him give it a picturesque appearance. The church belongs to the 12th century, and the original portal, with a mosaic over it, is still preserved; the interior was restored in 1574 and in 1754, but there are some remains of frescoes of the 13th century. The chapel of S. Nilus contains frescoes by Domenico Zampieri (Domenichino) of 1610, illustrating the life of the saint, which are among his most important works. The abbot's palace has a fine Renaissance portico, and contains an interesting museum of local antiquities. The library contains valuable MSS., among them one from the hand of S. Nilus (965); and a palaeographical school, for the copying of MSS. in the ancient style, is maintained. An *omophorion* of the 11th or 12th century, with scenes from the Gospel in needlework, and a chalice of the 15th century with enamels, given by Cardinal Bessarion, the predecessor of Giuliano della Rovere as commendatory of the abbey, are among its treasures. An important exhibition of Italo-Byzantine art was held here in 1905–1906.

See A. Rocchi, *La Badia di Grottaferrata* (Rome, 1884); A. Muñoz, *L'Art byzantin à l'exposition de Grottaferrata* (Rome, 1905); T. Ashby in *Papers of the British School at Rome*, iv. (1907). (T. As.)

GROUCHY, EMMANUEL, MARQUIS DE (1766–1847), marshal of France, was born in Paris on the 23rd of October 1766. He entered the French artillery in 1779, transferred to the cavalry in 1782, and to the *Gardes du corps* in 1786. In spite of his aristocratic birth and his connexions with the court, he was a convinced supporter of the principles of the Revolution, and had in consequence to leave the Usuals. About the time of the outbreak of war in 1792 he became colonel of a cavalry regiment, and soon afterwards, as a *maréchal de camp*, he was sent to serve on the south-eastern frontier. In 1793 he distinguished himself in La Vendée, and was promoted general of division. Grouchy was shortly afterwards deprived of his rank as being of noble birth, but in 1795 he was again placed on the active list. He served on the staff of the Army of Ireland (1796–1797), and took a conspicuous part in the Irish expedition. In 1798 he administered the civil and military government of Piedmont at the time of the abdication of the king of Sardinia, and in 1799 he distinguished himself greatly as a divisional commander in the campaign against the Austrians and Russians. In covering the retreat of the French after the defeat of Novi, Grouchy received fourteen wounds and was taken prisoner. On his release he returned to France. In spite of his having protested against the *coup d'état* of the 18th of Brumaire he was at once re-employed by the First Consul, and distinguished himself again at Hohenlinden. It was not long before he accepted the new régime in France, and from 1801 onwards he was employed by Napoleon in military and political positions of importance. He served in Austria in 1805, in Prussia in 1806, Poland in 1807, Spain in 1808, and commanded the cavalry of the Army of Italy in 1809 in the Viceroy Eugène's advance to Vienna. In 1812 he was made commander of one of the four cavalry corps of the Grand Army, and during the retreat from Moscow Napoleon appointed him to command the escort squadron, which was composed entirely of picked officers. His almost continuous service with the cavalry led Napoleon to decline in 1813 to place Grouchy at the head of an army corps, and Grouchy thereupon retired to France. In 1814, however, he hastened to take part in the defensive campaign in France, and he was severely wounded at Craonne. At the Restoration he was deprived of the post of colonel-general of *chasseurs à cheval* and retired. He joined Napoleon on his return from Elba, and was made marshal and peer of France. In the campaign of Waterloo he commanded the reserve cavalry of the army, and after Ligny he was appointed to command the right wing to pursue the Prussians. The march on Wavre, its influence on the result of the campaign, and the controversy to which Grouchy's conduct on the day of Waterloo has given rise, are dealt with briefly in the article WATERLOO CAMPAIGN, and at length in nearly every work on the campaign of 1815. Here it is only necessary to say that on the 17th Grouchy was unable to close with the Prussians, and on the 18th, though urged to march towards the sound of the guns of Waterloo, he permitted himself, from whatever cause, to be held up by a Prussian rearguard while the Prussians and English united to crush Napoleon. On the 19th Grouchy won a smart victory over the Prussians at Wavre, but it was then too late. So far as resistance was possible after the great disaster, Grouchy made it. He gathered up the wrecks of Napoleon's army and retired, swiftly and unbroken, to Paris, where, after interposing his reorganized forces between the enemy and the capital, he resigned his command into the hands of Marshal Davout. The rest of his life was spent in defending himself. An attempt to have him condemned to death by a court-martial failed, but he was exiled and lived in America till amnestied in 1821. On his return to France he was reinstated as general, but not as marshal nor as peer of France. For many years thereafter he was equally an object of aversion to the court party, as a member of their own caste who had followed the Revolution and Napoleon, and to his comrades of the Grand Army as the supposed betrayer of Napoleon. In 1830 Louis Philippe gave him back the marshal's bâton and restored him to the Chamber of Peers. He died at St-Étienne on the 29th of May 1847.

See Marquis de Grouchy, *Mémoires du maréchal Marquis de Grouchy* (Paris, 1873–1874); General Marquis de Grouchy, *Le Général Grouchy en Irlande* (Paris, 1866), and *Le Maréchal Grouchy du 16 au 18 juin, 1815* (Paris, 1864); *Appel à l'histoire sur les fastes de l'aile droite de l'armée française* (Paris, n.d.); *Sévère Justice sur les faits . . du 28 juin au 3 juillet, 1815* (Paris, 1866); and the literature of the Waterloo campaign. Marshal Grouchy himself wrote the following: *Observations sur la relation de la campagne de 1815 par le général de Gourgaud* (Philadelphia and Paris, 1818); *Réfutation de quelques articles des mémoires de M. le Duc de Rovigo* (Paris, 1829); *Fragments historiques relatifs à la campagne et à la bataille de Waterloo* (Paris, 1829–1830, in reply to Barthélemy and Méry, and to Marshal Gérard); *Réclamation du maréchal de Grouchy* (Paris, 1834); *Plainte contre le général Baron Berthezène* (Berthezène, formerly a divisional commander under Gérard, stated in reply to this defence that he had no intention of accusing Grouchy of ill faith).

GROUND-ICE,[1] ice formed at the bottom of streams while the temperature of the water is above freezing-point. Everything points to radiation as the prime cause of the formation of ground-ice. It is formed only under a clear sky, never in cloudy weather; it is most readily formed on dark rocks, and never under any covering such as a bridge, and rarely under surface-ice. Professor Howard T. Barnes of McGill University concludes that the radiation from a river bed in cold and clear nights goes through the water in long rays that penetrate much more easily from below upwards than the sun's heat rays from above downwards, which are mostly absorbed by the first few feet of water. On a cold clear night, therefore, the radiation from the bottom is excessive, and loosely-grown spongy masses of anchor-ice form on the bottom, which on the following bright sunny day receive just sufficient heat from the sun to detach the mass of

[1] The Eng. word *ground*, ground, is common to Teutonic languages, cf. Du. *grond*, Ger. *Grund*, but has no cognates outside Teutonic. The suggestion that the origin is to be found in "grind," to crush small, reduce to powder, is plausible, but the primary meaning seems to be the lowest part or bottom of anything rather than grit, sand or gravel. The main branches in sense appear to be, first, bottom, as of the sea or a river, cf. the use, in the plural, for dregs; second, base or foundation, actual, as of the first or main surface of a painting, fabric, &c., or figurative, as of a principle or reason; third, the surface of the earth, or a particular part of that surface.

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ice, which rises to the surface with considerable force. It is probable that owing to surface tension a thin film of stationary water rests upon the boulders and sand over which a stream flows, and that this, becoming frozen owing to radiation, forms the foundation for the anchor-ice and produces a surface upon which the descending frazil-ice (see below) can lodge. The theory of radiation from the boulders is supported by the fact that as the ice is formed upon them in response to a sudden fall in the air temperature, it is only released under the influence of a strong rise of temperature during the morning. It may not rise for several days, but the advent of bright sunlight is followed by the appearance on the surface of masses of ground-ice. This ice has a spongy texture and frequently carries gravel with it when it rises. It is said that the bottom of Lake Erie is strewn with gravel that has been floated down in this way. This "anchor-ice," as it was called by Canadian trappers, frequently forms dams across narrow portions of the river where the floating masses are caught. Dr H. Landor pointed out that the Mackenzie and Mississippi rivers, which rise in the same region and flow in opposite directions, carry ground-ice from their head-waters for a considerable distance down stream, and suggested that here and in Siberia many forms of vegetable and animal life may be distributed from a centre by this agency, since the material carried by the floating ice would contain the seeds and eggs or larvae of many forms.

Besides ground-ice and anchor-ice this formation is called also bottom-ice, ground-gru and lappered ice, the two last names being Scottish. In France it is called *glace du fond*, in Germany *Grundeis*, and in French Canada *moutonne* from the appearance of sheep at rest, since the ice formed at the bottom grows in woolly, spongy masses upon boulders or other projections.

"Frazil-ice" is a Canadian term from the French for "forge-cinders." It is surface ice formed in spicules and carried downwards in water agitated by winds or rapids. The frazil-ice may render swiftly moving water turbid with ice crystals, it may be swirled downwards and accumulated upon the ground ice, or it may be swept under the sheet of surface-ice, coating the under surface of the sheet to a thickness as great as 80 ft. of loose spicular ice.

See W. G. Thompson, in *Nature*, i. 555 (1870); H. Landor, in *Geological Magazine*, decade II., vol. iii., p. 459 (1876); H. T. Barnes, *Ice Formation with special Reference to Anchor-ice and Frazil* (1906).

GROUND NUT (Earth Nut, Pistache de Terre, Monkey Nut, Pea Nut, Manilla Nut), in botany, the fruit or pod of *Arachis hypogaea* (nat. ord. Leguminosae). The plant is an annual of diffuse habit, with hairy stem, and two-paired, abruptly pinnate leaflets. The pods or legumes are stalked, oblong, cylindrical, about 1 in. in length, the thin reticulated shell containing one or two irregularly ovoid seeds. After the flower withers, the stalk of the ovary has the peculiarity of elongating and bending down, forcing the young pod underground, and thus the seeds become matured at some distance below the surface. Hence the specific and vernacular names of the plant. Originally a native of South America, it is extensively cultivated in all tropical and subtropical countries. The plant affects a light sandy soil, and is very prolific, yielding in some instances 30 to 38 bushels of nuts per acre. The pods when ripe are dug up and dried. The seeds when fresh are largely eaten in tropical countries, and in taste are almost equal to almonds; when roasted they are used as a substitute for chocolate. In America they are consumed in large quantities as the "pea-nut"; but are not much appreciated in England except by the poorer children, who know them as "monkey-nuts." By expression the seeds yield a large quantity of oil, which is used by natives for lamps, as a fish or curry oil and for medicinal purposes. The leaves form an excellent food for cattle, being very like clover.

Large quantities of seeds are imported to Europe, chiefly to Marseilles, London and Hamburg, for the sake of their contained oil. The seeds yield from 42 to 50% of oil by cold expression, but a larger quantity is obtained by heat, although of an inferior quality. The seeds being soft facilitate mechanical expression, and where bisulphide of carbon or other solvent is used, a very pure oil is obtained.

The expressed oil is limpid, of a light yellowish or straw colour, having a faint smell and bland taste; it forms an excellent substitute for olive oil, although in a slight degree more prone to rancidity than the latter. Its specific gravity is 0·916 to 0·918; it becomes turbid at 3° C., concretes at +3° to −4° C., and hardens at +7° C. It is a non-drying oil. Ground nut oil consists of (1) oleic acid ($C_{18}H_{34}O_2$); (2) hypogaeic acid ($C_{16}H_{30}O_2$), by some supposed to be identical with a fatty acid found in whale oil; (3) palmitic acid ($C_{16}H_{32}O_2$); and (4) arachic acid ($C_{20}H_{40}O_2$). The oil is used in the adulteration of gingelly oil.

GROUND-PEARL, the glassy secretion forming the pupacase of coccid insects of the genus *Margarodes*, belonging to the homopterous division of the Hemiptera.

GROUND RENT. In Roman law, ground rent (*solarium*) was an annual rent payable by the lessee of a *superficies* or perpetual lease of building land. In English law, it appears that the term was at one time popularly used for the houses and lands out of which ground rents issue as well as for the rents themselves (cf. *Maundy* v. *Maundy*, 2 Strange, 1020); and Lord Eldon observed in 1815 that the context in which the term occurred may materially vary its meaning (*Stewart* v. *Alliston*, 1 Mer. 26). But at the present time the accepted meaning of ground rent is the rent at which land is let for the purpose of improvement by building, *i.e.* a rent charged in respect of the land only and not in respect of the buildings to be placed thereon. It thus conveys the idea of something lower than a rack rent (see RENT); and accordingly if a vendor described property as property for which he paid a "ground rent," without any further explanation of the term, a purchaser would not be obliged to accept the property if it turned out to be held at a rack rent. But while a rack rent is generally higher in amount than a ground rent, the latter is usually better secured, as it carries with it the reversionary interest in buildings and improvements put on the ground *after* the date at which the ground rent was fixed, and accordingly ground rents have been regarded as a good investment. Trustees empowered to invest money on the security of freehold or copyhold hereditaments, may invest upon freehold ground rents reserved out of house property. In estimating the amount that may be so invested, account may be taken of the value of the houses, as, if the ground rents are not paid, the landlord can re-enter. Again, where a settlement authorizes trustees to purchase lands or hereditaments in fee-simple or possession, a purchase of freehold ground rents has been held to be proper. A devise of "ground rent" carries not only the rent but the reversion. Where a tenant is compelled, in order to protect himself in the enjoyment of the land in respect of which his rent is payable, to pay ground rent to a superior landlord (who is of course in a position to distrain on him for it), he is considered as having been authorized by his immediate landlord to apply his rent, due or accruing due, in this manner, and the payment of the ground rent will be held to be payment of the rent itself or part of it. A lodger should make any payment of this character under the Law of Distress Amendment Act 1908 (s. 3; and see RENT). Ground rents are apportionable (see APPORTIONMENT).

In Scots law, the term "ground rent" is not employed, but its place is taken, for practical purposes, by the "ground-annual," which bears a double meaning. (i.) At the time of the Reformation in Scotland, the lands of the Church were parcelled out by the crown into various lordships—the grantees being called Lords of Erection. In the 17th century these Lords of Erection resigned their superiorities to the crown, with the exception of the feu-duties, which were to be retained till a price agreed upon for their redemption had been paid. This reserved power of redemption was, however, resigned by the crown on the eve of the Union and the feu-duties became payable in perpetuity to the Lords of Erection as a "ground-annual." (ii.) Speculators in building ground usually grant sub-feus to builders at a high feu-duty. But where sub-feus are prohibited—as they might be, prior to the Conveyancing (Scotland) Act 1874—and there is much demand for building ground, the feuars frequently stipulate for an annual rent from the builders rather than for a price payable at once. This annual rent is called a "ground-annual." Interest is not

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due on arrears of ground-annuals. Like other real burdens, ground-annuals may now be freely assigned and conveyed (Conveyancing (Scotland) Act 1874, s. 30).

The term "ground rent" in the English sense does not seem to be generally used in the United States, but is applied in Pennsylvania to a kind of tenure, created by a grant in fee simple, the grantor reserving to himself and his heirs a certain rent, which is the interest of the money value of the land. These "ground rents" are real estate, and, in cases of intestacy, go to the heir. They are rent services, and not rent charges—the statute *Quia Emptores* never having been in force in Pennsylvania, and are subject to all the incidents of such rents (see RENT). The grantee of such a "ground rent" may mortgage, sell, or otherwise dispose of the grant as he pleases; and while the rent is paid the land cannot be sold or the value of the improvements lost.

A ground rent being a freehold estate, created by deed and perpetual in duration, no presumption could, at common law, arise from lapse of time, that it had been released. But now, by statute (Act of 27th of April 1855, s. 7), a presumption of release or extinguishment is created where no payment, claim or demand has been made for the rent, nor any declaration or acknowledgment of its existence made or given by the owner of the premises subject to it, for the period of 21 years. Ground rents were formerly irredeemable after a certain time. But the creation of irredeemable ground rents is now forbidden (Pennsylvania Act 7 Assembly, 22nd of April 1850).

For English Law see Foa, *Landlord and Tenant* (3rd ed., London, 1901); Scots Law, Bell's *Principles* (10th ed., Edinburgh, 1899); American Law, Bouvier, *Law Dict.* (Boston and London, 1897).
(A. W. R.)

GROUNDSEL (Ger. *Kreuzkraut*; Fr. *seneçon*), *Senecio vulgaris*, an annual, glabrous, or more or less woolly plant of the natural order Compositae, having a branched succulent stem 6 to 15 in. in height, pinnatifid irregularly and coarsely-toothed leaves, and small cylindrical heads of yellow tubular florets enveloped in an involucre of numerous narrow bracts; the ribbed fruit bears a soft, feathery, hoary tuft of hairs (*pappus*). The plant is indigenous to Europe, whence it has been introduced into all temperate climates. It is a troublesome weed, flowering throughout the year, and propagating itself rapidly by means of its light feathery fruits; it has its use, however, as a food for cage-birds. *Senecio Jacobaea*, ragwort, is a showy plant with heads of bright yellow flowers, common in pastures and by roadsides. The genus *Senecio* is a very large one, widely distributed in temperate and cold climates. The British species are all herbs, but the genus also includes shrubs and even arborescent forms, which are characteristic features of the vegetation of the higher levels on the mountains of tropical Africa. Many species of the genus are handsome florists' plants. The groundsel tree, *Baccharis halimifolia*, a native of the North American sea-coast from Massachusetts southward, is a Composite shrub, attaining 6 to 12 ft. in height, and having angular branches, obovate or oblong-cuneate, somewhat scurfy leaves, and flowers larger than but similar to those of common groundsel. The long white pappus of the female plant renders it a conspicuous object in autumn. The groundsel tree has been cultivated in British gardens since 1683.

The Old English word, represented by "groundsel," appears in two forms, *grundeswylge* and *gundaswelgæ*; of the first form the accepted derivation is from *grund*, ground, and *swelgan*, to swallow; a weed of such rapid growth would not inaptly be styled a "ground-swallower." If the form without the *r* be genuine, the word might mean "pus-absorber" (O.E. *gund*, filth, matter), with reference to its use in poultices for abscesses and the like.

GROUND-SQUIRREL, one of the names for a group of (chiefly) North American striped terrestrial squirrel-like rodents, more generally known as chipmunks. They are closely allied to squirrels, from which they are distinguished by the possession of cheek-pouches for the storage of food. The sides, or the sides and back, are marked with light stripes bordered by dark bands; the ears are small, and without tufts; and the tail is relatively short. With the exception of one Siberian species (*Tamias asiaticus*), ground-squirrels are confined to North America, where they are represented by a large number of species and races, all referable to the genus *Tamias*. In North America ground-squirrels are migratory, and may be abundant in a district one year, and absent the next. They feed on nuts, beechmast, corn and roots, and also on grubs. With the assistance of their cheek-pouches they accumulate large supplies of food for the winter, during which season they lie dormant in holes. Although generally keeping to the ground, when hunted they take to trees, which they climb in search of food. One of the longest known American species is *T. striatus*.

GROUPS,[1] **THEORY OF.** The conception of an operation to be carried out on some object or set of objects underlies all mathematical science. Thus in elementary arithmetic there are the fundamental operations of the addition and the multiplication of integers; in algebra a linear transformation is an operation which may be carried out on any set of variables; while in geometry a translation, a rotation, or a projective transformation are operations which may be carried out on any figure.

In speaking of an operation, an object or a set of objects to which it may be applied is postulated; and the operation may, and generally will, have no meaning except in regard to such a set of objects. If two operations, which can be performed on the same set of objects, are such that, when carried out in succession on any possible object, the result, whichever operation is performed first, is to produce no change in the object, then each of the operations is spoken of as a *definite* operation, and each of them is called the *inverse* of the other. Thus the operations which consist in replacing x by ns and by x/n respectively, in any rational function of x, are definite inverse operations, if n is any assigned number except zero. On the contrary, the operation of replacing x by an assigned number in any rational function of x is not, in the present sense, although it leads to a unique result, a definite operation; there is in fact no unique inverse operation corresponding to it. It is to be noticed that the question whether an operation is a definite operation or no may depend on the range of the objects on which it operates. For example, the operations of squaring and extracting the square root are definite inverse operations if the objects are restricted to be real positive numbers, but not otherwise.

If O, O′, O″, ... is the totality of the objects on which a definite operation S and its inverse S′ may be carried out, and if the result of carrying out S on O is represented by O.S, then O.S.S′, O.S′.S., and O are the same object whatever object of the set O may be. This will be represented by the equations $SS' = S'S = 1$. Now O.S.S′ has a meaning only if O.S is an object on which S′ may be performed. Hence whatever object of the set O may be, both O.S and O.S′ belong to the set. Similarly O.S.S, O.S.S.S, ... are objects of the set. These will be represented by O.S², O.S³, ... Suppose now that T is another definite operation with the same set of objects as S, and that T′ is its inverse operation. Then O.S.T is a definite operation of the set, and therefore the result of carrying out S and then T on the set of objects is some operation U with a unique result. Represent by U′ the result of carrying out T′ and then S′. Then O. UU′ = O.S.T.T′.S′ = O.SS′ = O, and O. U′U = O.T′.S′.S.T = O.TT′ = O, whatever object O may be. Hence $UU' = U'U = 1$; and U, U′ are definite inverse operations.

If S, U, V are definite operations, and if S′ is the inverse of S, then

	$S'S = SS' = 1$
implies	$S'SU = S'SV$,
or	$U = V$.
Similarly	$US = VS$
implies	$U = V$.

Let S, T, U, ... be a set of definite operations, capable of being carried out on a common object or set of objects, and let the set contain

(i.) the operation ST, S and T being any two operations of the set; *Definition of a group.*

(ii.) the inverse operation of S, S being any operation of the set;

the set of operations is then called a group.

The number of operations in a group may be either finite or infinite. When it is finite, the number is called the *order* of the group.

[1] The word "group," which appears first in English in the sense of an assemblage of figures in an artistic design, picture, &c., is adapted from the Fr. *groupe*, which is to be referred to the Teutonic word meaning "knot," "mass," "bunch," represented in English by "crop" (*q.v.*). The technical mathematical sense is not older than 1870.

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and the group is spoken of as a *group of finite order*. If the number of operations is infinite, there are three possible cases. When the group is represented by a set of geometrical operations, for the specification of an individual operation a number of measurements will be necessary. In more analytical language, each operation will be specified by the values of a set of parameters. If no one of these parameters is capable of continuous variation, the group is called a *discontinuous group*. If all the parameters are capable of continuous variation, the group is called a *continuous group*. If some of the parameters are capable of continuous variation and some are not, the group is called a *mixed group*.

If S′ is the inverse operation of S, a group which contains S must contain S^2, which produces no change on any possible object. This is called the *identical operation*, and will always be represented by 1. If $S^p = S^q$, where p and q are positive integers, and $S^q S^r = S^{p+r}$ while no meaning at present has been attached to S^n when q is negative, S′ may be consistently represented by S^{-1}. The set of operations . . . , S^{-2}, S^{-1}, 1, S, S^2, . . . obviously constitute a group. Such a group is called a *cyclical* group.

It will be convenient, before giving some illustrations of the general group idea, to add a number of further definitions and explanations which apply to all groups alike. If from among the operations of a group G, U, . . . , which constitute a group G, a smaller set S′, T′, U′, . . . can be chosen which themselves constitute a group H, the group H is called a *subgroup* of G. Thus, in particular, if S is an operation of G, the cyclical group constituted by . . . , S^{-2}, S^{-1}, 1, S, S^2, . . . is a subgroup of G, except in the special case when it coincides with G itself.

Subgroups conjugate operations, isomorphism, etc.

If S and T are any two operations of G, the two operations S and $T^{-1}ST$ are called *conjugate* operations, and $T^{-1}ST$ is spoken of as the result of *transforming* S by T. If T_1 is another operation of G, $T_1^{-1}ST_1$, $T_1^{-1}TT_1$, $T_1^{-1}ST_1$ and $T_1^{-1}TT_1$ are always conjugate operations in any group containing both S and T. If T transforms S into itself, that is, if $S = T^{-1}ST$ or TS = ST, S and T are called *permutable* operations. A group whose operations are all permutable with each other is called an *Abelian* group. If S is transformed into itself by every operation of G, or, in other words, if it is permutable with every operation of G, it is called a *self-conjugate* operation of G.

The conception of operations being conjugate to each other is extended to subgroups. If S', T', U', . . . are the operations of a subgroup H, and if R is any operation of G, then the operations $R^{-1}S'R$, $R^{-1}T'R$, $R^{-1}U'R$, . . . belong to G, and constitute a subgroup of G. For if $ST' = U'$, then $R^{-1}S'R\,R^{-1}T'R = R^{-1}ST'R = R^{-1}U'R$. This subgroup may be identical with H. In particular, it is necessarily the same as H if R belongs to H. If it is not identical with H, it is said to be *conjugate* to H; and it is in any case represented by the symbol $R^{-1}HR$. If $H = R^{-1}HR$, the operation R is said to be permutable with the subgroup H. It is to be noticed that this does not imply that R is permutable with each operation of H.)

If $H = R^{-1}HR$, when for R is taken in turn each of the operations of G, then H is called a *self-conjugate* subgroup of G.

A group is spoken of as *simple* when it has no self-conjugate subgroup other than that constituted by the identical operation alone. A group which has a self-conjugate subgroup is called *composite*.

Let G be a group constituted of the operations S, T, U, . . . , and g a second group constituted of s, t, u, . . . , and suppose that to each operation of G there corresponds a single operation of g in such a way that if ST = U, then $st = u$, where s, t, u are the operations corresponding to S, T, U respectively. The groups are then said to be *isomorphic*, and the correspondence between their operations is spoken of as an *isomorphism* between G and g. It is clear that there may be two distinct cases of such isomorphism. To a single operation of g there may correspond either a single operation of G or more than one. In the first case the isomorphism is spoken of as *simple*, in the second as *multiple*.

Two simply isomorphic groups considered abstractly—that is to say, in regard only to the way in which their operations combine among themselves, and apart from any concrete representation of the operations—are clearly indistinguishable.

If G is multiply isomorphic with g, let A, B, C, . . . be the operations of G which correspond to the identical operation of g. Then to the operations A^{-1} and AB of G there corresponds the identical operation of g; so that A, B, C, . . . constitute a subgroup H of G. Moreover, if R is any operation of G, the identical operation of g corresponds to every operation of $R^{-1}HR$, and therefore H is a self-conjugate subgroup of G. Since S corresponds to s, and every operation of H to the identical operation of g, therefore every operation of the set SA, SB, SC, . . . corresponds to s, which likewise corresponds to SH. Also these are the only operations that correspond to s. The operations of G may therefore be divided into sets, no two of which contain a common operation, such that the correspondence between the operations of G and g connects each of the sets H, SH, TH, UH, . . . with the single operations 1, s, t, u, . . . written below them. The sets into which the operations of G are thus divided combine among themselves by exactly the same laws as the operations of g. For if $st = u$, then SH.TH = UH, in the sense that any operation of the set SH followed by any operation of the set TH gives an operation of the set UH.

The group g, abstractly considered, is therefore completely defined by the division of the operations of G into sets in respect of the self-conjugate subgroup H. From this point of view it is spoken of as the *factor-group* of G in respect of H, and is represented by the symbol G/H. Any composite group in a similar way defines abstractly a factor-group in respect of each of its self-conjugate subgroups.

It follows from the definition of a group that it must always be possible to choose from its operations a set such that every operation of the group can be obtained by combining the operations of the set and their powers. If the set is the smallest possible, the operations belonging to it can be represented in terms of the others, it is called a set of *independent generating* operations. Such a set of generating operations may be either finite or infinite in number. If A, B, . . . , E are the generating operations of a group, the group generated by them is represented by the symbol [A, B, . . . , E]. The obvious extension of this symbol is used such that [A, H] represents the group generated by combining an operation A with every operation of a group H; $[H_1, H_2]$ represents the group obtained by combining in all possible ways the operations of the groups H_1 and H_2; and so on. The independent generating operations of a group may be subject to certain relations connecting them, but these must be such that it is impossible by combining them to obtain a relation expressing one operation in terms of the others. For instance, $AB = BA$ is a relation conditioning the group [A, B]; it does not, however, enable A to be expressed in terms of B, so that A and B are independent generating operations.

Generating operations.

If O, O′, O″, . . . be a set of objects which are interchanged among themselves by the operations of a group G, so that if S is any operation of the group, and O any one of the objects, then O.S is an object occurring in the set. If it is possible to find an operation S of the group such that O.S is any assigned one of the set of objects, the group is called *transitive* in respect to the set of objects. When this is not possible the group is called *intransitive* in respect of the set. If it is possible to find S so that any arbitrarily chosen n objects of the set, O_1, O_2, . . . , O_n are changed by S into O'_1, O'_2, . . . , O'_n respectively, the latter being also arbitrarily chosen, the group is said to be n-ply transitive.

Transitivity and primitivity.

If O, O′, O″, . . . is a set of objects in respect of which a group G is transitive, it may be possible to divide the set into a number of subsets, no two of which contain a common object, such that every operation of the group either interchanges the objects of a subset among themselves, or changes them all into the objects of some other subset. When this is the case the group is called *imprimitive* in respect of the set; otherwise the group is called *primitive*. A group which is doubly-transitive, in respect of a set of objects, obviously cannot be imprimitive.

The foregoing general definitions and explanations will now be illustrated by a consideration of certain particular groups. To begin with, as the operations involved are of the most familiar nature, the group of rational arithmetic may be considered.

Illustrations of the group idea.

The fundamental operations of elementary arithmetic consist in the addition and subtraction of integers, and multiplication and division by integers, division by zero alone excepted. Multiplication by zero is not a definite operation, and it must therefore be omitted in dealing with those operations of elementary arithmetic which form a group. The operation that results from carrying out additions, subtractions, multiplications and divisions of x and by integers a finite number of times, is represented by the relation $x' = ax + b$, where a and b are rational numbers of which a is not zero, x is the object of the operation, and x' is the result. The totality of operations of this form obviously constitutes a group, for if S and T represent respectively the operations $x' = ax + b$ and $x'' = cx + d$, then $T^{-1}ST$ represents $x'' = ax + d - ad + bc$. When a and b are given rational numbers, c and d may be chosen in ∞a infinite number of ways as rational numbers, so that $d - ad + bc$ shall be any assigned rational number. Hence the operations given by $x' = ax + b$, where b is any assigned rational number and b is any rational number are all conjugate; and no two such operations for which the a's are different can be conjugate. If a is unity and b zero, S is the identical operation which is necessarily self-conjugate. If a is unity and b different from zero, the operations $x' = x + b$ is an aniline. The totality of additions forms, therefore, a single conjugate set of operations. Moreover, the totality of additions with the identical operation, *i.e.* the totality of operations of the form $x' = x + b$, where b may be any rational number or zero, obviously constitutes a group. The operations of this group are interchanged among themselves when transformed by any operation of the original group. It is therefore a self-conjugate subgroup of the original group.

The totality of multiplications, with the identical operation, *i.e.* all operations of the form $x' = ax$, where a is any rational number other than zero, again obviously constitutes a group. This, however, is not a self-conjugate subgroup of the original group. In fact, if the operations $x' = ax$ are all transformed by $x' = cx + d$, they give rise to the set $x' = ax + d(1 - a)$. When d is a given rational number, the set constitutes a subgroup which is conjugate to the group of multiplications. It is to be noticed that the operations of this latter subgroup may be written in the form $x' - d = a(x - d)$.

The totality of rational numbers, including zero, forms a set of objects which are interchanged among themselves by all operations of the group.

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If x_1 and x_2 are any pair of distinct rational numbers, and y_1 and y_2 any other pair, there is just one operation of the group which changes x_1 and x_2 into y_1 and y_2 respectively. For the equations $y_1 = ax_1 + b$, $y_2 = ax_2 + b$ determine a and b uniquely. The group is therefore doubly transitive in respect of the set of rational numbers. If H is the subgroup that leaves unchanged a given rational number x_1, and S an operation changing x_1 into x_2, then every operation of S⁻¹HS leaves x_2 unchanged. The subgroups, each of which leaves a single rational number unchanged, therefore form a single conjugate set. The group of multiplications leaves zero unchanged; and, as has been seen, this is conjugate with the subgroup formed of all operations $x' = a(x - d) + d$, where d is a given rational number. This subgroup leaves d unchanged.

The group of multiplications is clearly generated by the operations $x' = px$, where for p negative unity and each prime is taken in turn. Every addition is obtained on transforming $x' = x + 1$ by the different operations of the group of multiplications. Hence $x' = x + 1$, and $x' = px$, ($p = -1, 3, 5, 7, \ldots$), form a set of independent generating operations of the group. It is a discontinuous group.

As a second example the group of motions in three-dimensional space will be considered. The totality of motions, *i.e.* of space displacements which leave the distance of every pair of points unaltered, obviously constitutes a set of operations which satisfies the group definition. From the elements of kinematics it is known that every motion is either (i.) a translation which leaves no point unaltered, but changes each of a set of parallel lines into itself; or (ii.) a rotation which leaves every point of one line unaltered and changes every other point and line; or (iii.) a twist which leaves no point and only one line (its axis) unaltered, and may be regarded as a translation along, combined with a rotation round, the axis. Let S be any motion consisting of a translation l along and a rotation a round a line AB, and let T be any other motion. There is some line CD into which T changes AB; and therefore T⁻¹ST leaves CD unchanged. Moreover, T⁻¹ST clearly effects the same translation along and rotation round CD that S effects on AB. Two motions, therefore, are conjugate if and only if the amplitudes of their translation and rotation components are respectively equal. In particular, all translations of equal amplitude are conjugate, as also are all rotations of equal amplitude. Any two translations are permutable with each other, and give when combined another translation. The totality of translations constitutes, therefore, a subgroup of the general group of motions; and this subgroup is a self-conjugate subgroup, since a translation is always conjugate to a translation.

All the points of space constitute a set of objects which are interchanged among themselves by all operations of the group of motions. So also do all the lines of space and all the planes. In respect of each of these sets the group is simply transitive. In fact, there is an infinite number of motions which change a point A to A', but no motion can change A and B to A' and B' respectively unless the distance AB is equal to the distance A'B'.

The totality of motions which leave a point A unchanged forms a subgroup. It is clearly constituted of all possible rotations about all possible axes through A, and is known as the group of rotations about a point. Every motion can be represented as a rotation about some axis through A followed by a translation. Hence if G is the group of motions and H the group of translations, G/H is simply isomorphic with the group of rotations about a point.

The totality of the motions which bring a given solid to congruence with itself again constitutes a subgroup of the group of motions. This will in general be the trivial subgroup formed of the identical operation alone, but may in the case of a symmetrical body be more extensive. For a sphere or a right circular cylinder the subgroups are those that leave the centre and the axis respectively unaltered. For a solid bounded by plane faces the subgroup is clearly one of finite order. In particular, to each of the regular solids there corresponds such a group. That for the tetrahedron has 12 for its order, for the cube (or octahedron) 24, and for the icosahedron (or dodecahedron) 60.

The determination of a particular operation of the group of motions involves six distinct measurements; namely, four to give the axis of the twist, one for the magnitude of the translation along the axis, and one for the magnitude of the rotation about it. Each of the six quantities involved may have any value whatever, and the group of motions is therefore a continuous group. On the other hand, a subgroup of the group of motions which leaves a line or a plane unaltered is a mixed group.

We shall now discuss (i.) continuous groups, (ii.) discontinuous groups whose order is not finite, and (iii.) groups of finite order. For proofs of the statements, and the general theorems, the reader is referred to the bibliography.

Continuous Groups.

The determination of a particular operation of a given continuous group depends on assigning special values to each one of a set of parameters which are capable of continuous variation. The first distinction regards the number of these parameters. If this number is finite, the group is called a ***finite*** continuous group; if infinite, it is called an ***infinite*** continuous group. In the latter case arbitrary functions must appear in the equations defining the operations of the group when these are reduced to an analytical form. The theory of infinite continuous groups is not yet so completely developed as that of finite continuous groups. The latter theory will mainly occupy us here.

Sophus Lie, to whom the foundation and a great part of the development of the theory of continuous groups are due, undoubtedly approached the subject from a geometrical standpoint. His conception of an operation is to regard it as a geometrical transformation, by means of which each point of (n-dimensional) space is changed into some other definite point.

The representation of such a transformation in analytical form involves a system of equations,

$$x'_s = f_s(x_1, x_2, \ldots, x_n), \quad (s = 1, 2, \ldots, n),$$

expressing $x'_1, x'_2, \ldots, x'_n$, the co-ordinates of the transformed point in terms of $x_1, x_2, \ldots, x_n$, the co-ordinates of the original point. In these equations the functions f_s are analytical functions of their arguments. Within a properly limited region they must be one-valued, and the equations must admit a unique solution with respect to $x_1, x_2, \ldots, x_n$, since the operation would not otherwise be a definite one.

From this point of view the operations of a continuous group, which depends on a set of r parameters, will be defined analytically by a system of equations of the form

$$x'_s = f_s(x_1, x_2, \ldots, x_n; a_1, a_2, \ldots, a_r), \quad (s = 1, 2, \ldots, n), \quad \text{(i.)}$$

where $a_1, a_2, \ldots, a_r$ represent the parameters. If this operation be represented by A, and that in which $b_1, b_2, \ldots, b_r$ are the parameters by B, then the operation AB is represented by the elimination (assumed to be possible) of $x'_1, x'_2, \ldots, x'_n$ between the equations (i.) and the equations

$$x''_s = f_s(x'_1, x'_2, \ldots, x'_n; b_1, b_2, \ldots, b_r), \quad (s = 1, 2, \ldots, n).$$

Since AB belongs to the group, the result of the elimination must be

$$x''_s = f_s(x_1, x_2, \ldots, x_n; c_1, c_2, \ldots, c_r),$$

where $c_1, c_2, \ldots, c_r$ represent another definite set of values of the parameters. Moreover, since A⁻¹ belongs to the group, the result of solving equations (i.) with respect to $x_1, x_2, \ldots, x_n$ must be

$$x_s = f_s(x'_1, x'_2, \ldots, x'_n; d_1, d_2, \ldots, d_r), \quad (s = 1, 2, \ldots, n).$$

Conversely, if equations (i.) are such that these two conditions are satisfied, they do in fact define a finite continuous group.

It will be assumed that the r parameters which enter in equations (i.) are independent, *i.e.* that it is impossible to choose r' ($< r$) quantities in terms of which $a_1, a_2, \ldots, a_r$ can be expressed. Where this is the case the group will *mal apres* be spoken of as a "group of order r." Lie uses the *tion of a* term "*r-gliedrige Gruppe.*" It is to be noticed that the ***continuous*** word order is used in quite a different sense from that ***group.*** given to it in connexion with groups of finite order.

In regard to equations (i.), which define the general operation of the group, it is to be noticed that, since the group contains the identical operation, these equations must for some definite set of values of the parameters reduce to $x'_1 = x_1, x'_2 = x_2, \ldots, x'_n = x_n$. This set of values may, without loss of generality, be assumed to be simultaneous zero values. For if $i_1, i_2, \ldots, i_r$ be the values of the parameters which give the identical operation, and if we write

$$a_s = i_s + a, \quad (s = 1, 2, \ldots, r),$$

then zero values of the new parameters $a_1, a_2, \ldots, a_r$ give the identical operation.

To infinitesimal values of the parameters, thus chosen, will correspond operations which cause an infinitesimal change in each of the variables. These are called infinitesimal operations. The most general infinitesimal operation of the group is that given by the system

$$x'_s - x_s = \delta x_s = \frac{\partial f_s}{\partial a_1}\delta a_1 + \frac{\partial f_s}{\partial a_2}\delta a_2 + \ldots + \frac{\partial f_s}{\partial a_r}\delta a_r, \quad (s = 1, 2, \ldots, n),$$

where, in $\partial f_s/\partial a_1$, zero values of the parameters are to be taken. Since $a_1, a_2, \ldots, a_r$ are independent, the ratios of $\delta a_1, \delta a_2, \ldots, \delta a_r$ are arbitrary. Hence the most general infinitesimal operation of the group may be written in the form

$$\delta x_s = \left(e_1\frac{\partial f_s}{\partial a_1} + e_2\frac{\partial f_s}{\partial a_2} + \ldots + e_r\frac{\partial f_s}{\partial a_r}\right)M, \quad (s = 1, 2, \ldots, n),$$

where $e_1, e_2, \ldots, e_r$ are arbitrary constants, and M is an infinitesimal.

If $F(x_1, x_2, \ldots, x_n)$ is any function of the variables, and if an infinitesimal operation of the group be carried out on the variables in F, the resulting increment of F will be

$$\frac{\partial F}{\partial x_1}\delta x_1 + \frac{\partial F}{\partial x_2}\delta x_2 + \ldots + \frac{\partial F}{\partial x_n}\delta x_n.$$

If the differential operator

$$\frac{\partial f_1}{\partial a_r}\frac{\partial}{\partial x_1} + \frac{\partial f_2}{\partial a_r}\frac{\partial}{\partial x_2} + \ldots + \frac{\partial f_n}{\partial a_r}\frac{\partial}{\partial x_n}$$

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be represented by X_i, $(i = 1, 2, \ldots, r)$, then the increment of F is given by

$$(e_1X_1 + e_2X_2 + \ldots + e_rX_r)F\delta t.$$

When the equations (i.) defining the general operation of the group are given, the coefficients $\partial f_s/\partial a_i$ which enter in these differential operators are functions of the variables which can be directly calculated.

The differential operator $e_1X_1 + e_2X_2 + \ldots + e_rX_r$ may then be regarded as defining the most general infinitesimal operation of the group. In fact, if it be for a moment represented by X, then $(1 + \delta t X)F$ is the result of carrying out the infinitesimal operation on F; and by putting $x_1, x_2, \ldots, x_n$ in turn for F, the actual infinitesimal operation is reproduced. By a very convenient, though perhaps hardly justifiable, phraseology this differential operator is itself spoken of as the general infinitesimal operation of the group. The sense in which this phraseology is to be understood will be made clear by the foregoing explanations.

We suppose now that the constants $e_1, e_2, \ldots, e_r$ have assigned values. Then the result of repeating the particular infinitesimal operation $e_1X_1 + e_2X_2 + \ldots + e_rX_r$ or X an infinite number of times is some finite operation of the group. The effect of this finite operation on F may be directly calculated. In fact, if δt is the infinitesimal already introduced, then

$$\frac{dF}{dt} = X.F, \quad \frac{d^2F}{dt^2} = X.X.F, \ldots$$

Hence

$$F' = F + t\frac{dF}{dt} + \frac{t^2}{1.2}\frac{d^2F}{dt^2} + \ldots$$
$$= F + tX.F + \frac{t^2}{1.2}X.X.F + \ldots$$

It must, of course, be understood that in this analytical representation of the effect of the finite operation on F it is implied that t is taken sufficiently small to ensure the convergence of the (in general) infinite series.

When $x_1, x_2, \ldots$ are written in turn for F, the system of equations

$$x'_s = (1 + tX + \frac{t^2}{1.2}X.X + \ldots)x_s \quad (s = 1, 2, \ldots, n) \qquad \text{(ii.)}$$

represent the finite operation completely. If t is here regarded as a parameter, this set of operations must in themselves constitute a group, since they arise by the repetition of a single infinitesimal operation. That this is really the case results immediately from noticing that the result of eliminating F' between

$$F' = F + tX.F + \frac{t^2}{1.2}X.X.F + \ldots$$

and

$$F''_{\cdot} = F' + t'X.F' + \frac{t'^2}{1.2}X.X.F' + \ldots$$

is

$$F'' = F + (t + t')X.F + \frac{(t + t')^2}{1.2}X.X.F + \ldots$$

The group thus generated by the repetition of an infinitesimal operation is called a *cyclical* group; so that a continuous group contains a cyclical subgroup corresponding to each of its infinitesimal operations.

The system of equations (ii.) represents an operation of the group whatever the constants $e_1, e_2, \ldots, e_r$ may be. Hence if $e_1, e_2, \ldots, e_r$ be replaced by $a_1, a_2, \ldots, a_r$ the equations (ii.) represent a set of operations, depending on r parameters and belonging to the group. They must therefore be a form of the general equations for any operation of the group, and are equivalent to the equations (i.). The determination of the finite equations of a cyclical group, when the infinitesimal operation which generates it is given, will always depend on the integration of a set of simultaneous ordinary differential equations. As a very simple example we may consider the case in which the infinitesimal operation is given by $X = x^2\partial/\partial x$, so that there is only a single variable. The relation between x' and t is given by $dx'/dt = x'^2$, with the condition that $x' = x$ when $t = 0$. This gives at once $x' = x/(1 - tx)$, which might also be obtained by the direct use of (ii.).

When the finite equations (i.) of a continuous group of order r are known, it has now been seen that the differential operator which defines the most general infinitesimal operation of the group can be directly constructed, and that it contains r arbitrary constants. This is equivalent to saying that the group contains r linearly independent infinitesimal operations; and that the most general infinitesimal operation is obtained by combining these linearly with constant coefficients. Moreover, when any r independent infinitesimal operations of the group are known, it has been seen how the general finite operation of the group may be calculated. This obviously suggests that it must be possible to define the group by means of its infinitesimal operations alone; and it is clear that such a definition would lend itself more readily to some applications (for instance, to the theory of differential equations) than the definition by means of the finite equations.

Relations between the infinitesimal operations of a finite continuous group.

On the other hand, r arbitrarily given linear differential operators will not, in general, give rise to a finite continuous group of order r; and the question arises as to what conditions such a set of operators must satisfy in order that they may, in fact, be the independent infinitesimal operations of such a group.

If X, Y are two linear differential operators, XY − YX is also a linear differential operator. It is called the "combinant" of X and Y (Lie uses the expression *Klammerausdruck*) and is denoted by (XY). The X, Y, Z are any three linear differential operators the identity (known as Jacobi's)

$$(X(YZ)) + (Y(ZX)) + (Z(XY)) = 0$$

holds between them. Now it may be shown that any continuous group of which X, Y are infinitesimal operations contains also (XY) among its infinitesimal operations. Hence if r linearly independent operations $X_1, X_2, \ldots, X_r$ give rise to a finite continuous group of order r, the combinant of each pair must be expressible linearly in terms of the r operations themselves: that is, there must be a system of relations

$$(X_iX_j) = \sum_{k=1}^{k=r} c_{ijk}X_k,$$

where the c's are constants. Moreover, from Jacobi's identity and the identity $(XY) + (YX) = 0$ it follows that the c's are subject to the relations

$$\left.\begin{aligned} &c_{ijl} + c_{jil} = 0, \\ \text{and} \quad &\sum_s (c_{ijs}c_{skl} + c_{kis}c_{sjl} + c_{jks}c_{sil}) = 0 \end{aligned}\right\} \qquad \text{(iii.)}$$

for all values of i, j, k and l.

The fundamental theorem of the theory of finite continuous groups is now that these conditions, which are necessary in order that $X_1, X_2, \ldots, X_r$ may generate, as infinitesimal operations, a continuous group of order r, are also sufficient.

Determination of the distinct types of continuous groups of a given order.

For the proof of this fundamental theorem see Lie's works (cf. Lie-Engel, i. chap. 9; iii. chap. 25).

If two continuous groups of order r are such that, for each, a set of linearly independent infinitesimal operations $X_1, X_2, \ldots, X_r$ and $Y_1, Y_2, \ldots, Y_r$ can be chosen, so that in the relations

$$(X_iX_j) = \Sigma c_{ijs}X_s, \quad (Y_iY_j) = \Sigma d_{ijs}Y_s,$$

the constants c_{ijs} and d_{ijs} are the same for all values of i, j and s, the two groups are simply isomorphic, X_s and Y_s being corresponding infinitesimal operations.

Two continuous groups of order r, whose infinitesimal operations obey the same system of equations (iii.), may be of very different *form*; for instance, the number of variables for the one may be different from that for the other. They are, however, said to be of the same *type*, in the sense that the laws according to which their operations combine are the same for both.

The problem of determining all distinct types of groups of order r is then contained in the purely algebraical problem of finding all the systems of r^3 quantities c_{ijs} which satisfy the relations

$$\left.\begin{aligned} &c_{ijl} + c_{jil} = 0, \\ &\sum_s (c_{ijs}c_{skl} + c_{jks}c_{sil} + c_{kis}c_{sjl}) = 0, \end{aligned}\right.$$

for all values of i, j, k and l. To two distinct solutions of the algebraical problem, however, two distinct types of group will not necessarily correspond. In fact, $X_1, X_2, \ldots, X_r$ may be replaced by any r independent linear functions of themselves, and the c's will then be transformed by a linear substitution containing r^2 independent parameters. This, however, does not alter the type of group considered.

For a single parameter there is, of course, only one type of group, which has been called cyclical.

For a group of order two there is a single relation

$$(X_1X_2) = \alpha X_1 + \beta X_2.$$

If α and β are not both zero, let α be finite. The relation may then be written $(\alpha X_1 + \beta X_2, \alpha^{-1}X_2) = \alpha X_1 + \beta X_2$. Hence if $\alpha X_1 + \beta X_2 = X_1$, and $\alpha^{-1}X_2 = X_2$, then $(X_1X_2) = X_1$. There are, therefore, just two types of group of order two, the one given by the relation last written, and the other by $(X_1X_2) = 0$.

Lie has determined all distinct types of continuous groups of orders three or four; and all types of non-integrable groups (a term which will be explained immediately) of orders five and six (cf. Lie-Engel, iii. 713-744).

Self-conjugate subgroups. Integrable groups.

A problem of fundamental importance in connexion with any given continuous group is the determination of the self-conjugate subgroups which it contains. If X is an infinitesimal operation of a group, and Y any other, the general form of the infinitesimal operations which are conjugate to X is

$$X + t(XY) + \frac{t^2}{1.2}((XY)Y) + \ldots$$

Any subgroup which contains all the operations conjugate to X must therefore contain all infinitesimal operations (XY), $((XY)Y)$, ..., where for Y each infinitesimal operation of the group is taken in turn. Hence if $X'_1, X'_2, \ldots, X'_s$ are s linearly independent operations of the group which generate a self-conjugate subgroup of order s, then for *every* infinitesimal operation Y of the group relations of the form

$$(X'_iY) = \sum_{\alpha=1}^{\alpha=s} a_{i\alpha}X'_\alpha \quad (i = 1, 2, \ldots, s).$$

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must be satisfied. Conversely, if such a set of relations is satisfied, $X'_1, X'_2, \ldots, X'_r$ generate a subgroup of order s, which contains every operation conjugate to each of the infinitesimal generating operations, and is therefore a self-conjugate subgroup.

A specially important self-conjugate subgroup is that generated by the combinants of the r infinitesimal generating operations. That these generate a self-conjugate subgroup follows from the relations (iii.). In fact,

$$(X_i, X_j)X_k = \sum_s c_{ijs}(X_s X_k).$$

Of the $\frac{1}{2}r(r-1)$ combinants not more than r can be linearly independent. When exactly r of them are linearly independent, the self-conjugate group generated by them coincides with the original group. If the number that are linearly independent is less than r, the self-conjugate subgroup generated by them is actually a subgroup; *i.e.* its order is less than that of the original group. This subgroup is known as the derived group, and Lie has called a group *perfect* when it coincides with its derived group. A simple group, since it contains no self-conjugate subgroup distinct from itself, is necessarily a perfect group.

If G is a given continuous group, G_1 the derived group of G, G_2 that of G_1, and so on, the series of groups G, G_1, G_2, . . will terminate either with the identical operation or with a perfect group; for the order of G_{s+1} is less than that of G_s unless G_s is a perfect group. When the series terminates with the identical operation, G is said to be an *integrable* group; in the contrary case G is called *non-integrable*.

If G is an integrable group of order r, the infinitesimal operations $X_1, X_2, \ldots, X_r$ which generate the group may be chosen so that $X_1, X_{p_1+1}, \ldots, X_{p_1}$ $(p_1 < r)$ generate the first derived group, $X_1, X_{p_2+1}, \ldots, X_{p_2}$ $(p_2 < p_1)$ the second derived group, and so on. When there are so chosen the constants c_{ijs} are clearly such that if $r_\rho \leqslant i \leqslant r_{\rho+1}$, $r_\sigma \leqslant j \leqslant r_{\sigma+1}$, $\rho \geqslant \sigma$, then c_{ijs} vanishes unless $s \leqslant r_{\rho+1}$.

In particular the generating operations may be chosen so that c_{ijs} vanishes unless s is equal to or less than the smaller of the two numbers i, j; and conversely, if the c's satisfy these relations, the group is integrable.

A simple group, as already defined, is one which has no self-conjugate subgroup. It is a remarkable fact that the determination of all distinct types of simple continuous groups has been made, for in the case of discontinuous groups and groups of finite order this is far from being the case. Lie has demonstrated the existence of four great classes of simple groups:—

Simple groups.

(i.) The groups simply isomorphic with the general projective group in space of n dimensions. Such a group is defined analytically as the totality of the transformations of the form

$$x'_s = \frac{a_{n+1}x_1 + a_{n+2}x_2 + \ldots + a_{n+1}x_n + a_{n+1}}{a_{n+1}x_1 + a_{n+1}x_2 + \ldots + a_{n+1}x_n + 1}, \quad (s = 1, 2, \ldots, n),$$

where the a's are parameters. The order of this group is clearly $n(n+2)$.

(ii.) The groups simply isomorphic with the totality of the projective transformations which transform a non-special linear complex in space of $2n-1$ dimensions with itself. The order of this group is $n(2n+1)$.

(iii.) and (iv.) The groups simply isomorphic with the totality of the projective transformations which change a quadric of non-vanishing discriminant into itself. These fall into two distinct classes of types according as n is even or odd. In either case the order is $\frac{1}{2}n(n+1)$. The case $n = 3$ forms an exception in which the corresponding group is not simple. It is also to be noticed that a cyclical group is a simply group since it has no continuous self-conjugate subgroup distinct from itself.

W. K. J. Killing and E. J. Cartan have separately proved that outside these four great classes there exist only five distinct types of simple groups, whose orders are 14, 52, 78, 133 and 248; thus completing the enumeration of all possible types.

To prevent any misapprehension as to the bearing of these very general results, it is well to point out explicitly that there are no limitations on the parameters of a continuous group as it has been defined above. They are to be regarded as taking in general complex values. If in the finite equations of a continuous group the imaginary symbol does not explicitly occur, the finite equations will usually define a group (in the general sense of the original definition) when both parameters and variables are limited to real values. Such a group is, in a certain sense, a continuous group; and such groups have been considered shortly by Lie (cf. Lie-Engel, iii. 360-392), who calls them *real* continuous groups. To these real continuous groups the above statements as to the totality of simple groups does not apply; and indeed, in all probability, the number of types of real simple continuous groups admits of no such complete enumeration. The effect of limitation to real transformations may be illustrated by considering the groups of projective transformations which change

$$x^2 + y^2 + z^2 - 1 = 0 \text{ and } x^2 + y^2 - z^2 - 1 = 0$$

respectively into themselves. Since one of these quadrics is changed into the other by the imaginary transformation

$$x' = x, \quad y' = y, \quad z' = z\sqrt{(-1)},$$

the general continuous groups which transform the two quadrics respectively into themselves are simply isomorphic. This is not, however, the case for the *real* continuous groups. In fact, the second quadric has two real sets of generators; and therefore the real group which transforms it into itself has two self-conjugate subgroups, either of which leaves unchanged each of one set of generators. The first quadric having imaginary generators, no such self-conjugate subgroups can exist for the real group which transforms it into itself; and this real group is in fact simple.

Among the groups isomorphic with a given continuous group there is one of special importance which is known as the *adjunct* group. This is a homogeneous linear group in a number of variables equal to the order of the group, whose infinitesimal operations are defined by the relations

The adjunct group.

$$X_i = \sum_{j,s} c_{ijs} x_s \frac{\partial}{\partial x_j}, \quad (j = 1, 2, \ldots, r),$$

where c_{ijs} are the often-used constants, which give the combinants of the infinitesimal operations in terms of the infinitesimal operations themselves.

That the r infinitesimal operations thus defined actually generate a group isomorphic with the given group is verified by forming their combinants. It is thus found that $(X_p X_q) = \sum c_{pqs} X_s$. The X's, however, are not necessarily linearly independent. In fact, the sufficient condition that $\sum_i a_i X_i$ should be identically zero is that $\sum_i a_i c_{ijs}$ should vanish for all values of i and s. Hence if the equations $\sum_i a_i c_{ijs} = 0$ for all values of i and s, have r' linearly independent solutions, only $r - r'$ of the X's are linearly independent, and the isomorphism of the two groups is multiple. If $Y_1, Y_2, \ldots, Y_r$ are the infinitesimal operations of the given group, the equations

$$\sum_i a_i c_{ijs} = 0, \ (s, i = 1, 2, \ldots, r)$$

express the condition that the operations of the cyclical group generated by $\sum a_i Y_i$ should be permutable with every operation of the group; in other words, that they should be self-conjugate operations. In the case supposed, therefore, the given group contains a subgroup of order r' each of whose operations is self-conjugate. The adjunct group of a given group will therefore be simply isomorphic with the group, unless the latter contains self-conjugate operations; and when this is the case the order of the adjunct will be less than that of the given group by the order of the subgroup formed of the self-conjugate operations.

We have seen thus far mainly how to deal with the abstract theory of continuous groups, in which no distinction is made between two simply isomorphic groups. We proceed to discuss the classification and theory of groups when their form is regarded as essential, and this is a return to a more geometrical point of view.

Continuous groups of the line of the plane, and of three-dimensional space.

It is natural to begin with the projective groups, which are the simplest in form and at the same time are of supreme importance in geometry. The general projective group of the straight line is the group of order three given by

$$x' = \frac{ax + b}{cx + d},$$

where the parameters are the ratios of a, b, c, d. Since

$$\frac{x'_1 - x'_2}{x'_3 - x'_1} \frac{x'_1 - x'_4}{x'_4 - x'_3} = \frac{x_1 - x_2}{x_2 - x_3} \frac{x_1 - x_4}{x_4 - x_3}$$

is an operation of the above form, the group is triply transitive. Every subgroup of order two leaves one point unchanged, and all such subgroups are conjugate. A cyclical subgroup leaves either two distinct points or two coincident points unchanged. A subgroup which either leaves two points unchanged or interchanges them is an example of a "mixed" group.

The analysis of the general projective group must obviously increase very rapidly in complexity, as the dimensions of the space to which it applies increase. This analysis has been completely carried out for the projective group of the plane, with the result of showing that there are thirty distinct types of subgroup. Excluding the general group itself, every one of these leaves either a point, a line, or a conic section unaltered. For space of three dimensions Lie has also carried out a similar investigation, but the results are extremely complicated. One general result of great importance at which Lie arrives in this connexion is that every projective group in space of three dimensions, other than the general group, leaves either a point, a curve, a surface or a linear complex unaltered.

Returning now to the case of a single variable, it can be shown that any finite continuous group in one variable is either cyclical or of order two or three, and that by a suitable transformation any such group may be changed into a projective group.

The genesis of an infinite as distinguished from a finite continuous group may be well illustrated by considering it in the case of a single variable. The infinitesimal operations of the projective group in one variable are $\frac{d}{dx}$, $x\frac{d}{dx}$, $x^2\frac{d}{dx}$. If these combined with $x^k\frac{d}{dx}$ be

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taken as infinitesimal operations from which to generate a continuous group among the infinitesimal operations of the group, there must occur the combinant of $x^2\frac{d}{dx}$ and $x^3\frac{d}{dx}$. This is $x^4\frac{d}{dx}$. The combinant of this and $x^2\frac{d}{dx}$ is $2x^3\frac{d}{dx}$ and so on. Hence $x^r\frac{d}{dx}$, where r is any positive integer, is an infinitesimal operation of the group. The general infinitesimal operation of the group is therefore $f(x)\frac{d}{dx}$, where $f(x)$ is an arbitrary integral function of x.

In the classification of the groups, projective or non-projective of two or more variables, the distinction between primitive and imprimitive groups immediately presents itself. For groups of the plane the following question arises. Is there or is there not a singly infinite family of curves $f(x, y) = C$, where C is an arbitrary constant such that every operation of the group interchanges the curves of the family among themselves? In accordance with the previously given definition of imprimitivity, the group is called imprimitive or primitive according as such a set exists or not. In space of three dimensions there are two possibilities; namely, there may either be a singly infinite system of surfaces $F(x, y, z) = C$, which are interchanged among themselves by the operations of the group; or there may be a doubly-infinite system of curves $G(x, y, z) = a$, $H(x, y, z) = b$, which are so interchanged.

In regard to primitive groups Lie has shown that any primitive group of the plane can, by a suitably chosen transformation, be transformed into one of three definite types of projective groups; and that any primitive group of space of three dimensions can be transformed into one of eight definite types, which, however, cannot all be represented as projective groups in three dimensions.

The results which have been arrived at for imprimitive groups in two and three variables do not admit of any such simple statement.

We shall now explain the conception of contact-transformations and groups of contact-transformations. This conception, like that of continuous groups, owes its origin to Lie.

Contact transformations.

From a purely analytical point of view a contact-transformation may be defined as a point-transformation in $2n+1$ variables, $z, x_1, x_2, \ldots, x_n, p_1, p_2, \ldots, p_n$ which leaves unaltered the equation $dz - p_1dx_1 - p_2dx_2 - \ldots - p_ndx_n = 0$. Such a definition as this, however, gives no direct clue to the geometrical properties of the transformation, nor does it explain the name given.

In dealing with contact-transformations we shall restrict ourselves to space of two or of three dimensions; and it will be necessary to begin with some purely geometrical considerations. An infinitesimal surface-element in space of three dimensions is completely specified, apart from its size, by its position and orientation. If x, y, z are the co-ordinates of some one point of the element, and if $p, q, -1$ give the ratios of the direction-cosines of the normal, x, y, z, p, q are the five quantities which completely specify the element. There are, therefore, ∞^5 surface elements in three-dimensional space. The surface-elements of a surface form a system of ∞^2 elements, for there are ∞^2 points on the surface, and at each a definite surface-element. The surface-elements of a curve form, again, a system of ∞^2 elements, for there are ∞^1 points on the curve, and at each ∞^1 surface-elements containing the tangent to the curve at the point. Similarly the surface-elements which contain a given point clearly form a system of ∞^2 elements. Now each of these systems of ∞^2 surface-elements has the property that if (x, y, z, p, q) and $(x+dx, y+dy, z+dz, p+dp, q+dq)$ are consecutive elements from any one of them, then $dz - pdx - qdy = 0$. In fact, for a system of the first kind dx, dy, dz are proportional to the direction-cosines of a tangent line at a point of the surface, and $p, q, -1$ are proportional to the direction-cosines of the normal. For a system of the second kind dx, dy, dz are proportional to the direction-cosines of a tangent to the curve, and $p, q, -1$ give the direction-cosines of the normal to a plane touching the curve; and for a system of the third kind dx, dy, dz are zero. Now the most general way in which a system of ∞^2 surface-elements can be given is by three independent equations between x, y, z, p and q. If these equations do not contain p, q, they determine one or more (a finite number in any case) surfaces in space, and the system of surface-elements consists of the elements containing these points; *i.e.* it consists of one or more systems of the third kind.

If the equations are such that two distinct equations independent of p and q can be derived from them, the points of the system of surface-elements lie on a curve. For such a system the equation $dz - pdx - qdy = 0$ will hold for each two consecutive elements only when the plane of each element touches the curve at its own point.

If the equations are such that only one equation independent of p and q can be derived from them, the system of the system of surface-elements lie on a surface. Again, for such a system the equation $dz - pdx - qdy = 0$ will hold for each two consecutive elements only when each element touches the surface at its own point. Hence, when all possible systems of ∞^2 surface-elements in space are considered, the equation $dz - pdx - qdy = 0$ is characteristic of the three special types in which the elements belong, in the sense explained above, to a point or a curve or a surface.

Let us consider now the geometrical bearing of any transformation $x' = f_1(x, y, z, p, q), \ldots, q' = f_5(x, y, z, p, q)$, of the five variables. It will interchange the surface-elements of space among themselves, and will change any system of ∞^2 elements into another system of ∞^2 elements. A special system, *i.e.* a system which belongs to a point, curve or surface, will not, however, in general be changed into another special system. The necessary and sufficient condition that a special system should always be changed into a special system is that the equation $dz' - p'dx' - q'dy' = 0$ should be a consequence of the equation $dz - pdx - qdy = 0$; or, in other words, that this latter equation should be invariant for the transformation.

When this condition is satisfied the transformation is such as to change the surface-elements of a surface in general into surface-elements of a surface, though in particular cases they may become the surface-elements of a curve or point; and similar statements may be made with respect to a curve or point. The transformation is therefore a veritable geometrical transformation in space of three dimensions. Moreover, two special systems of surface-elements which have an element in common are transformed into two new special systems with an element in common. Hence two curves or surfaces which touch each other are transformed into two new curves or surfaces which touch each other. It is this property which leads to the transformations in question being called contact-transformations. It will be noticed that an ordinary point-transformation is always a contact-transformation, but that a contact-transformation (in space of n dimensions) is not in general a point-transformation (in space of n dimensions), though it may always be regarded as a point-transformation in space of $2n+1$ dimensions. In the analogous theory for space of two dimensions a line-element, defined by (x, y, p), where $1 : p$ gives the direction-cosines of the line, takes the place of the surface-element; and a transformation of x, y and p which leaves the equation $dy - pdx = 0$ unchanged transforms the ∞^1 line-elements, which belong to a curve, into ∞^1 line-elements which again belong to a curve; while two curves which touch are transformed into two other curves which touch.

One of the simplest instances of a contact-transformation that can be given is the transformation by reciprocal polars. By this transformation a point P and a plane p passing through it are changed into a plane p' and a point P′ upon it; *i.e.* the surface-element defined by P, p is changed into a definite surface-element defined by P′, p'. The total number of surface-elements which belong to a (non-developable) surface is known from geometrical considerations to be changed into the totality which belongs to another (non-developable) surface. On the other hand, the totality of the surface-elements which belong to a curve is changed into another set which belong to a developable. The analytical formulae for this transformation, when the reciprocation is effected with respect to the paraboloid $x^2 + y^2 - 2z = 0$, are $x' = p,\ y' = q,\ z' = px + qy - z,\ p' = x,\ q' = y$. That this is, in fact, a contact-transformation is verified directly by noticing that

$$dz' - p'dx' - q'dy' = -\,d(z - px - qy) - xdp - ydq = -\,(dz - pdx - qdy).$$

A second simple example is that in which every surface-element is displaced, without change of orientation, normal to itself through a constant distance t. The analytical equations in this case are easily found in the form

$$x' = x + \frac{pt}{\sqrt{1+p^2+q^2}},\quad y' = y + \frac{qt}{\sqrt{1+p^2+q^2}},\quad z' = z - \frac{t}{\sqrt{1+p^2+q^2}},$$
$$p' = q,\ q' = q.$$

That this is a contact-transformation is seen geometrically by noticing that it changes a surface into a parallel surface. Every point is changed by it into a sphere of radius t, and when t is regarded as a parameter the equations define a cyclical group of contact-transformations.

The formal theory of continuous groups of contact-transformations, is, of course, in no way distinct from the formal theory of continuous groups in general. On what may be called the geometrical side, the theory of groups of contact-transformations has been developed with very considerable detail in the second volume of Lie-Engel.

The manifold application of the theory of continuous groups in various branches of pure and applied mathematics it is impossible here to refer in any detail. It must suffice to indicate a few of them very briefly. In some of the older theories a new point of view is obtained which presents the results in a fresh light, and suggests the natural generalization. As an example, the theory of the invariants of a binary form may be considered.

Applications of the theory of continuous groups.

If in the form $f = a_0x^n + n a_1x^{n-1}y + \ldots + a_ny^n$, the variables be subjected to a homogeneous substitution

$$x' = \alpha x + \beta y,\ y' = \gamma x + \delta y, \qquad \text{(i.)}$$

and if the coefficients in the new form be represented by accenting the old coefficients, then

$$\left.\begin{aligned} a'_0 &= a_0\alpha^n + a_1 n\alpha^{n-1}\gamma + \ldots + a_n\gamma^n, \\ a'_1 &= a_0\alpha^{n-1}\beta + a_1\{(n-1)\alpha^{n-2}\beta\gamma + \alpha^{n-1}\delta\} + \ldots + a_n\gamma^{n-1}\delta, \\ &\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots \\ a'_n &= a_0\beta^n + a_1 n\beta^{n-1}\delta + \ldots + a_n\delta^n; \end{aligned}\right\} \qquad \text{(ii.)}$$

and this is a homogeneous linear substitution performed on the coefficients. The totality of the substitutions, (i.), for which $\alpha\delta - \beta\gamma = 1$, constitutes a continuous group of order 3, which is generated by the two infinitesimal transformations $y\frac{\partial}{\partial x}$ and $x\frac{\partial}{\partial y}$. Hence with

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the same limitations on $\alpha, \beta, \gamma, \delta$ the totality of the substitutions (ii.) form a simply isomorphic continuous group of order 3, which is generated by the two infinitesimal transformations

$$a_0\frac{\partial}{\partial c_{01}}+2a_1\frac{\partial}{\partial c_{02}}+3a_2\frac{\partial}{\partial c_{03}}+\ldots+na_{n-1}\frac{\partial}{\partial c_{0n}},$$

and

$$na_1\frac{\partial}{\partial c_{01}}+(n-1)a_2\frac{\partial}{\partial c_{02}}+(n-2)a_3\frac{\partial}{\partial c_{03}}+\ldots+a_n\frac{\partial}{\partial c_{0n}}.$$

The invariants of the binary form, *i.e.* those functions of the coefficients which are unaltered by all homogeneous substitutions on x, y of determinant unity, are therefore identical with the functions of the coefficients which are invariant for the continuous group generated by the two infinitesimal operations last written. In other words, they are given by the common solutions of the differential equations

$$a_0\frac{\partial f}{\partial c_{01}}+2a_1\frac{\partial f}{\partial c_{02}}+3a_2\frac{\partial f}{\partial c_{03}}+\ldots=0,$$

$$na_1\frac{\partial f}{\partial c_{00}}+(n-1)a_2\frac{\partial f}{\partial c_{01}}+(n-2)a_3\frac{\partial f}{\partial c_{02}}+\ldots=0.$$

Both this result and the method by which it is arrived at are well known, but the point of view by which we pass from the transformation group of the variables to the isomorphic transformation group of the coefficients, and regard the invariants as invariants rather of the group than of the forms, is a new and a fruitful one.

The general theory of curvature of curves and surfaces may in a similar way be regarded as a theory of their invariants for the group of motions. That something more than a mere change of phraseology is here implied will be evident in dealing with minimum curves, *i.e.* with curves such that at every point of them $dx^2+dy^2+dz^2=0$. For such curves the ordinary theory of curvature has no meaning, but they nevertheless have invariant properties in regard to the group of motions.

The curvature and torsion of a curve, which are invariant for all transformations by the group of motions, are special instances of what are known as *differential invariants*. If $\xi\frac{\partial}{\partial x}+\eta\frac{\partial}{\partial y}$ is the general infinitesimal transformation of a group of point-transformations in the plane, and if $y_1, y_2, \ldots$ represent the successive differential coefficients of y, the infinitesimal transformation may be written in the extended form

$$\xi\frac{\partial}{\partial x}+\eta\frac{\partial}{\partial y}+\eta_1\frac{\partial}{\partial y_1}+\ldots$$

where $\eta_1\delta x, \eta_2\delta x, \ldots$ are the increments of $y_1, y_2, \ldots$. By including a sufficient number of these variables the group must be intransitive in them, and must therefore have one or more invariants. Such invariants are known as differential invariants of the original group, being necessarily functions of the differential coefficients of the original variables. For groups of the plane it may be shown that not more than two of these differential invariants are independent, all others being formed from these by algebraical processes and differentiation. For groups of point-transformations in more than two variables there will be more than two sets of differential invariants. For instance, with three variables, one may be regarded as independent and the other two as functions of it, or two as independent and the remaining one as a function. Corresponding to these two points of view, the differential invariants for a curve or for a surface will arise.

If a differential invariant of a continuous group of the plane be equated to zero, the resulting differential equation remains unaltered when the variables undergo any transformation of the group. Conversely, if an ordinary, differential equation $f(x, y, y_1, y_2, \ldots)=0$ admits the transformations of a continuous group, *i.e.* if the equation is unaltered when x and y undergo any transformation of the group, then $f(x, y, y_1, y_2, \ldots)$ or some multiple of it must be a differential invariant of the group. Hence it must be possible to find two independent differential invariants α, β of the group, such that when these are taken as variables the differential equation takes the form

$$F(\alpha, \beta\frac{d\beta}{d\alpha}, \frac{d^2\beta}{d\alpha^2}, \ldots)=0.$$ This equation in α, β will be of lower order than the original equation, and in general simpler to deal with. Supposing it solved in the form $\beta=\phi(\alpha)$, where for α, β their values in terms of $x, y, y_1, y_2, \ldots$ are written, this new equation, containing arbitrary constants, is necessarily again of lower order than the original equation. The integration of the original equation is thus divided into two steps. This will show how in the case of an ordinary differential equation, the fact that the equation admits a continuous group of transformations may be taken advantage of for its integration.

The most important of the applications of continuous groups are to the theory of systems of differential equations, both ordinary and partial; in fact, Lie states that it was with a view to systematizing and advancing the general theory of differential equations that he was led to the development of the theory of continuous groups. It is quite impossible here to give any account of all that Lie and his followers have done in this direction. An entirely new mode of regarding the problem of the integration of a differential equation has been opened up, and in the classification that arises from it all those apparently isolated types of equations which in the older sense are said to be integrable take their proper place. It may, for instance, be mentioned that the question as to whether Monge's method will apply to the integration of a partial differential equation of the second order is shown to depend on whether or not a contact-transformation can be found which will reduce the equation to either $\frac{\partial^2 z}{\partial x^2}=0$ or $\frac{\partial^2 z}{\partial x\partial y}=0$. It is in this direction that further advance in the theory of partial differential equations must be looked for. Lastly, it may be remarked that one of the most thorough discussions of the axioms of geometry hitherto undertaken is founded entirely upon the theory of continuous groups.

Discontinuous Groups.

We go on now to the consideration of discontinuous groups. Although groups of finite order are necessarily contained under this general head, it is convenient for many reasons to deal with them separately, and it will therefore be assumed in the present section that the number of operations in the group is not finite. Many large classes of discontinuous groups have formed the subject of detailed investigation, but a general formal theory of discontinuous groups can hardly be said to exist as yet. It will thus be obvious that in considering discontinuous groups it is necessary to proceed on different lines from those followed with continuous groups, and in fact to deal with the subject almost entirely by way of example.

The consideration of a discontinuous group as arising from a set of independent generating operations suggests a purely abstract point of view in which any two simply isomorphic groups are indistinguishable. The number of generating operations may be either finite or infinite, but the former case alone will be here considered. Suppose then that $S_1, S_2, \ldots, S_n$ is a set of independent operations from which a group G is generated. The general operation of the group will be represented by the symbol $S_a^{\alpha}S_b^{\beta}\ldots S_d^{\delta}$, or Σ, where $a, b, \ldots, d$ are chosen from $1, 2, \ldots, n$, and $\alpha, \beta, \ldots, \delta$ are any positive or negative integers. It may be assumed that no two successive suffixes in Σ are the same, for if $a=a$, then $S_a^{\alpha}S_a^{\beta}$ may be replaced by $S_a^{\alpha+\beta}$. If there are no relations connecting the generating operations and the identical operation, every distinct symbol Σ represents a distinct operation of the group. For if $\Sigma=S_1, \text{or } S_a^{\alpha}S_b^{\beta}\ldots S_d^{\delta}=S_1^{\alpha}S_a^{\beta_1}\ldots S_{d_1}^{\delta_1}$, then $S_a^{-\delta_1}\ldots S_b^{-\beta_1}S_a^{-\alpha}S_b^{\beta}\ldots S_d^{\delta}=1$; and unless $a=a_1, b=b_1, \ldots, a=a_1, \beta=\beta_1, \ldots$, this is a relation connecting the generating operations.

Suppose now that $T_1, T_2, \ldots$ are operations of G, and that H is that self-conjugate subgroup of G which is generated by $T_1, T_2, \ldots$ and the operations conjugate to them. Then all the operations that can be formed from $S_1, S_2, \ldots, S_n$, the set ΣH, and no others, reduce to the same operation Σ when the conditions $T_1=1, T_2=1, \ldots$ are satisfied by the generating operations. Hence the group which is generated by the given operations, when subjected to the conditions just written, is simply isomorphic with the factor-group G/H. Moreover, this is obviously true even when the conditions are such that the generating operations are no longer independent. Hence any discontinuous group may be defined abstractly, that is, in regard to the laws of combination of its operations apart from their actual form, by a set of generating operations and a system of relations connecting them. Conversely, when such a set of operations and system of relations are given arbitrarily they define in abstract form a single discontinuous group. It may, of course, happen that the group so defined is a group of finite order, or that it reduces to the identical operation only; but in regard to the general statement these will be particular and exceptional cases.

An operation of a discontinuous group is necessarily be specified analytically by a system of equations of the form

$$x'_s=f_s(x_1, x_2, \ldots, x_n; a_1, a_2, \ldots, a_r), \quad (s=1, 2, \ldots, n),$$

and the different operations of the group will be given by different sets of values of the parameters $a_1, a_2, \ldots, a_r$. No one of these parameters is susceptible of continuous variations, but at least one must be capable of taking a number of values which is not finite, if the group is not one of finite order. Among the sets of values of the parameters there must be one which gives the identical transformation. No other transformation makes each of the differences x'_1-x_1, $x'_2-x_2, \ldots, x'_n-x_n$ vanish. Let d be an arbitrary assigned positive quantity. Then if a transformation of the group can be found such that the modulus of each of these differences is less than d when the variables have arbitrary values within an assigned range of variation, however small d may be chosen, the group is said to be *improperly* discontinuous. In the contrary case the group is called *properly* discontinuous. The range within which the variables are allowed to vary may clearly affect the question whether a given group is properly or improperly discontinuous. For instance, the group

General-izing operations.

Properly and improperly discontinuous groups.

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defined by the equation $x' = ax+b$, where a and b are any rational numbers, is improperly discontinuous; and the group defined by $x' = x+a$, where a is an integer, is properly discontinuous, whatever the range of the variable. On the other hand, the group, to be later considered, defined by the equation $x' = \frac{ax+b}{cx+d}$, where a, b, c, d are integers satisfying the relation $ad-bc = 1$, is properly discontinuous when x may take any complex value, and improperly discontinuous when the range of x is limited to real values.

Among the discontinuous groups that occur in analysis, a large number may be regarded as arising by imposing limitations on the range of variation of the parameters of continuous groups. If $x'_s = f_s(x_1, x_2, \ldots, x_n; a_1, a_2, \ldots, a_r)$, $(s = 1, 2, \ldots, n)$, are the finite equations of a continuous group, and if the a with parameters $c_1, c_2, \ldots, c_r$ is the operation which results from carrying out A and B with corresponding parameters in succession, then the c's are determined uniquely by the a's and the b's. If the c's are rational functions of the a's and b's, and if the a's and b's are arbitrary rational numbers of a given corpus (see NUMBER), the c's will be rational numbers of the same corpus. If the c's are rational integral functions of the a's and b's, and the latter are arbitrarily chosen integers of a corpus, then the c's are integers of the same corpus. Hence in the first case the above equations, when the a's are limited to be rational numbers of a given corpus, will define a discontinuous group; and in the second case they will define such a group when the a's are further limited to be integers of the corpus.

Linear discontinuous groups.

A most important class of discontinuous groups are those that arise in this way from the general linear continuous group in a given set of variables. For n variables the finite equations of this continuous group are

$$x'_s = a_{s1}x_1 + a_{s2}x_2 + \ldots + a_{sn}x_n, \quad (s = 1, 2, \ldots, n),$$

where the determinant of the a's must not be zero. In this case the c's are clearly integral linear-linear functions of the a's and b's. Moreover, the determinant of the c's is the product of the determinant of the a's and the determinant of the b's. Hence equations (ii.), where the parameters are restricted to be integers of a given corpus, define a discontinuous group; and if the determinant of the coefficients is limited to the value unity, they define a discontinuous group which is a (self-conjugate) subgroup of the previous one.

The simplest case which thus presents itself is that in which there are two variables while the coefficients are rational integers. This is the group defined by the equations

$$\left.\begin{aligned} x' &= ax+by, \\ y' &= cx+dy, \end{aligned}\right\}$$

where a, b, c, d are integers such that $ad-bc = 1$. To every operation of this group there corresponds an operation of the set defined by

$$x' = \frac{ax+b}{cx+d},$$

in such a way that to the product of two operations of the group there corresponds the product of the two analogous operations of the set. The operations of the set (iv.), where $ad-bc = 1$, therefore constitute a group which is isomorphic with the previous group. The isomorphism is multiple, since to a single operation of the second set there correspond the two operations of the first for which a, b, c, d and $-a, -b, -c, -d$ are parameters. These two groups, which are of fundamental importance in the theory of quadratic forms and in the theory of modular functions, have been the object of very many investigations.

Discontinuous groups arising from geometrical operations.

Another large class of discontinuous groups, which have far-reaching applications in analysis, are those which arise in the first instance from purely geometrical considerations. By the combination and repetition of a finite number of geometrical operations such as displacements, projective transformations, inversion, &c., a discontinuous group of such operations will arise. Such a group, as regards the points of the plane (or of space), will in general be improperly discontinuous; but when the generating operations are suitably chosen, the group may be properly discontinuous. In the latter case the group may be represented in a graphical form by the division of the plane (or space) into regions such that no point of one region can be transformed into another point of the same region by any operation of the group, while any given region can be transformed into any other by a suitable transformation. Thus, let ABC be a triangle bounded by three circular arcs BC, CA, AB; and consider the figure produced from ABC by inversions in the three circles of which BC, CA, AB are part. By inversion at BC, ABC becomes an equiangular triangle A'BC. An inversion in AB changes ABC and A'BC into equiangular triangles ABC' and A'BC'. Successive inversions at AB and BC then will change ABC into a series of equiangular triangles with B for a common vertex. These will not overlap and will just fill in the space round B if the angle ABC is a submultiple of two right angles. If then the angles of ABC are submultiples of two right angles (or zero), the triangles formed by any number of inversions will never overlap, and to each operation consisting of a definite series of inversions at BC, CA and AB will correspond a distinct triangle into which ABC is changed by the operation. The network of triangles so formed gives a graphical representation of the group that arises from the three inversions in BC, CA, AB. The triangles may be divided into two sets, those, namely, like A'BC', which are derived from ABC by an even number of inversions, and those like A'BC or ABC' produced by an odd number. Each set are interchanged among themselves by any even number of inversions. Hence the operations consisting of an even number of inversions form a group by themselves. For this group the quadrilateral formed by ABC and A'BC constitutes a region, which is changed by every operation of the group into two others (formed of two adjacent triangles), and these regions clearly do not overlap. Their distribution presents in a graphical form the group that arises by pairs of inversions at BC, CA, AB; and this group is generated by the operations which consists of successive inversions at AB, BC and that which consists of successive inversions at BC, CA. The group defined thus geometrically is presented in many analytical forms. If x, y and x', y' are the rectangular coordinates of two points which are inverse to each other with respect to a given circle, x' and y' are rational functions of x and y, and conversely. Thus the group may be presented in a form in which each operation gives a birational transformation of two variables. If $x+iy = z$, $x'+iy' = z'$, and if x', y' is the point to which x, y is transformed by any *even* number of inversions, then z' and z are connected by a linear relation $z' = \frac{\alpha z+\beta}{\gamma z+\delta}$, where α, β, γ, δ are constants (in general complex) depending on the circles at which the inversions are taken. Hence the group may be presented in the form of a group of linear transformations of a single variable generated by the two linear transformations $z' = \frac{\alpha_1 z+\beta_1}{\gamma_1 z+\delta_1}$, $z' = \frac{\alpha_2 z+\beta_2}{\gamma_2 z+\delta_2}$, which correspond to pairs of inversions at AB, BC and BC, CA respectively. In particular, if the sides of the triangle are taken to be $x = 0$, $x^2+y^2-1 = 0$, $\sqrt{3}x+y-2x = 0$, the generating operations are found to be $z' = z+1$, $z' = -z^{-1}$; and the group is that consisting of all transformations of the form $z' = \frac{az+b}{cz+d}$, where $ad-bc = 1$, a, b, c, d being integers. This is the group already mentioned which underlies the theory of the elliptic modular functions; a modular function being a function of z which is invariant for some subgroup of finite index of the group in question.

The triangle ABC from which the above geometrical construction started may be replaced by a polygon whose sides are circles. If each angle is a submultiple of two right angles or zero, the construction is still effective to give a set of non-overlapping regions, which represent graphically the group which arises from pairs of inversions in the sides of the polygon. In their analytical form, as groups of linear transformations of a single variable, the groups are those on which the theory of automorphic functions depends. A similar construction in space, the polygons bounded by circular arcs being replaced by polyhedra bounded by spherical faces, has been used by F. Klein and Fricke to give a geometrical representation for groups which are improperly discontinuous when represented as groups of the plane.

Group of a linear differential equation.

The special classes of discontinuous groups that have been dealt with in the previous paragraphs arise directly from geometrical considerations. As a final example we shall refer briefly to a class of groups whose origin is essentially analytical. Let

$$\frac{d^n y}{dx^n} + P_1 \frac{d^{n-1}y}{dx^{n-1}} + \ldots + P_{n-1}\frac{dy}{dx} + P_n y = 0$$

be a linear differential equation, the coefficients in which are rational functions of x, and let $y_1, y_2, \ldots, y_n$ be a linearly independent set of integrals of the equation. In the neighbourhood of a finite value x_0 of x, which is not a singularity of any of the coefficients in the equation, these integrals are ordinary power-series in $x-x_0$. If the analytical continuations of $y_1, y_2, \ldots, y_n$ be formed for any closed path starting from and returning to x_0, the final values arrived at when x_0 is again reached will be another set of linearly independent integrals. When the closed path contains no singular point of the coefficients of the differential equation, the new set of integrals is identical with the original set. If, however, the closed path encloses one or more singular points, this will in general be the case. Let $y'_1, y'_2, \ldots, y'_n$ be the new integrals arrived at. Since in the neighbourhood of x_0 every integral can be represented linearly in terms of $y_1, y_2, \ldots, y_n$, there must be a system of equations

$$\left.\begin{aligned} y'_1 &= \alpha_{11}y_1 + \alpha_{12}y_2 + \ldots + \alpha_{1n}y_n, \\ y'_2 &= \alpha_{21}y_1 + \alpha_{22}y_2 + \ldots + \alpha_{2n}y_n, \\ &\cdots\cdots\cdots\cdots\cdots\cdots\cdots \\ y'_n &= \alpha_{n1}y_1 + \alpha_{n2}y_2 + \ldots + \alpha_{nn}y_n, \end{aligned}\right\}$$

where the α's are constants, expressing the new integrals in terms of the original ones. To each closed path described by x_0 there therefore corresponds a definite linear substitution performed on the y's. Further, if S_1 and S_2 are the substitutions that correspond to two closed paths L_1 and L_2, then to any closed path which can be continuously deformed, without crossing a singular point, into L_1 followed by L_2, there corresponds the substitution S_2S_1. Let $L_1, L_2, \ldots, L_n$ be arbitrarily chosen closed paths starting from and returning to the same point, and each of them enclosing a single one of the

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r) finite singular points of the equation. Every closed path in the plane can be formed by combinations of these r paths taken either in the positive or in the negative direction. Also a closed path which does not cut itself, and encloses all the r singular points within it, is equivalent to a path enclosing the point at infinity and no finite singular point. If $S_0, S_1, S_2, \ldots, S_r$ are the linear substitutions that correspond to these r paths, then the substitution corresponding to every possible path can be obtained by combination and repetition of these r substitutions, and they therefore generate a discontinuous group each of whose operations corresponds to a definite closed path. The group thus arrived at is called the group of the equation. For a given equation it is unique in type. In fact, the only effect of starting from another set of independent integrals is to transform every operation of the group by an arbitrary substitution, while choosing a different set of paths is equivalent to taking a new set of generating operations. The great importance of the group of the equation in connexion with the nature of its integrals cannot here be dealt with, but it may be pointed out that if all the integrals of the equation are algebraic functions, the group must be a group of finite order, since the set of quantities $y_1, y_2, \ldots, y_n$ can then only take a finite number of distinct values.

Groups of Finite Order.

We shall now pass on to groups of finite order. It is clear that here we must have to do with many properties which have no direct analogues in the theory of continuous groups or in that of discontinuous groups in general; those properties, namely, which depend on the fact that the number of distinct operations in the group is finite.

Let $S_1, S_2, S_3, \ldots, S_N$ denote the operations of a group G of finite order N, S_1 being the identical operation. The tableau

$$\begin{array}{llll} S_1, & S_2, & S_3, & \ldots, S_N, \\ S_1S_1, & S_1S_2, & S_1S_3, & \ldots, S_1S_N, \\ S_2S_1, & S_2S_2, & S_2S_3, & \ldots, S_2S_N, \\ \ldots & \ldots & \ldots & \ldots \\ S_NS_1, & S_NS_2, & S_NS_3, & \ldots, S_NS_N, \end{array}$$

when in it each compound symbol S_rS_s is replaced by the single symbol S_t that is equivalent to it, is called the multiplication table of the group. It indicates directly the result of multiplying together in an assigned sequence any number of operations of the group. In each line (and in each column) of the tableau every operation of the group occurs just once. If the letters in the tableau are regarded as mere symbols, the operation of replacing each symbol in the first line by the symbol which stands under it in the pth line is a permutation performed on the set of N symbols. Thus to the N lines of the tableau there corresponds a set of N permutations performed on the N symbols, which includes the identical permutation that leaves each unchanged. Moreover, if $S_rS_s = S_t$, then the result of carrying out in succession the permutations which correspond to the pth and qth lines gives the permutation which corresponds to the rth line. Hence the set of permutations constitutes a group which is simply isomorphic with the given group.

Every group of finite order N can therefore be represented in concrete form as a transitive group of permutations on N symbols.

The order of any subgroup or operation of G is necessarily finite. If $T_1(=S_1), T_2, \ldots, T_n$ are the operations of a subgroup H of G, and if Σ is any operation of G which is not contained in H, the set of operations $\Sigma T_1, \Sigma T_2, \ldots, \Sigma T_n$, or ΣH, are all distinct from each other and from the operations of H. If the sets H and ΣH do not exhaust the operations of G, and if Σ' is an operation not belonging to them, then the operations of the set Σ'H are distinct from each other and from those of H and ΣH. This process may be continued till the operations of G are exhausted. The order n of H must therefore be a factor of the order N of G. The ratio N/n is called the *index* of the subgroup H. By taking for H the cyclical subgroup generated by any operation S of G, it follows that the order of S must be a factor of the order of G.

Properties of a group which depend on the order.

Every operation S is permutable with its own powers. Hence there must be some subgroup H of G of greatest possible order, such that every operation of H is permutable with S. Every operation of H transforms S into itself, and every operation of the set HZ transforms S into the same operation. Hence, when S is transformed by every operation of G, just N/n distinct operations arise if n is the order of H. These operations, and no others, are conjugate to S within G; they are said to form a set of conjugate operations. The number of operations in every conjugate set is therefore a factor of the order of G. In the same way it may be shown that the number of subgroups which are conjugate to a given subgroup is a factor of the order of G. An operation which is permutable with every operation of the group is called a *self-conjugate* operation. The totality of the self-conjugate operations of a group forms a self-conjugate Abelian subgroup, each of whose operations is permutable with every operation of the group.

An Abelian group contains subgroups whose orders are any given factors of the order of the group. In fact, since every subgroup H of an Abelian group G and the corresponding factor groups G/H are Abelian, this result follows immediately by an induction from the case in which the order contains n prime factors to that in which it contains $n+1$. For a group which is not Abelian no general law can be stated as to the existence or non-existence of a subgroup whose order is an arbitrarily assigned factor of the order of the group. In this connexion the most important general result, which is independent of any supposition as to the order of the group, is known as Sylow's theorem, which states that if p^α is the highest power of the prime p which divides the order of a group G, then G contains a single conjugate set of subgroups of order p^α, the number in the set being of the form $1+kp$. Sylow's theorem may be extended to show that if $p^{\alpha'}$ is a factor of the order of a group, the number of subgroups of order $p^{\alpha'}$ is of the form $1+kp$. If, however, $p^{\alpha'}$ is not the highest power of p which divides the order, these groups do not in general form a single conjugate set. *Sylow's theorem.*

The importance of Sylow's theorem in discussing the structure of a group of given order need hardly be insisted on. Thus, as a very simple instance, a group whose order is the product p_1p_2 of two primes ($p_1 < p_2$) must have a self-conjugate subgroup of order p_2, since the order of the group contains no factor, other than unity, of the form $1+kp_2$. The same again is true for a group of order $p_1^2p_2$, unless $p_1 = 2$, and $p_2 = 3$.

There is one other numerical property of a group connected with its order which is quite general. If N is the order of G, and n a factor of N, the number of operations of G, whose orders are equal to or are factors of n, is a multiple of n.

As already defined, a composite group is a group which contains one or more self-conjugate subgroups, whose orders are greater than unity. If H is a self-conjugate subgroup of G, the factor-group G/H may be either simple or composite. In the former case G can contain no self-conjugate subgroup K which itself contains H; for if it did K/H would be a self-conjugate subgroup of G/H. When G/H is simple, H is said to be a maximum self-conjugate subgroup of G. Suppose now that G being a given composite group, $G, G_1, G_2, \ldots, G_{m-1}, 1$ is a series of subgroups of G, such that each is a maximum self-conjugate subgroup of the preceding; the last term of the series consisting of the identical operation only. Such a series is called a *composition-series* of G. In general it is not unique, since a group may have two or more maximum self-conjugate subgroups. A composition-series of a group, however it may be chosen, has the property that the number of terms of which it consists is always the same, while the factor-groups $G/G_1, G_1/G_2, \ldots$, are either only, in the sequence in which they occur. It should be noticed that though a group defines uniquely the set of factor-groups that occur in its composition-series, the set of factor-groups do not conversely in general define a single type of group. When the orders of all the factor-groups are primes the group is said to be *soluble*. *Composition-series of a group.*

If the series of subgroups G, H, K, ..., L, 1 is chosen so that each is the greatest self-conjugate subgroup of G contained in the previous one, the series is called a chief composition-series of G. All such series derived from a given group may be shown to consist of the same number of terms, and to give rise to the same set of factor-groups, except as regards sequence. The factor-groups of such a series will not, however, necessarily be simple groups. From any chief composition-series a composition-series may be obtained by interpolating between any two terms H and K of the series for which H/K is not a simple group, a number of terms $h_1, h_2, \ldots, h_r$; and it may be shown that the factor-groups $H/h_1, h_1/h_2, \ldots, h_r/K$ are all simply isomorphic with each other.

A group may be represented as isomorphic with itself by transforming all its operations by any one of them. In fact, if $S_rS_s = S_t$, then $S^{-1}S_rS_sS^{-1}=S^{-1}S_tS$. An isomorphism of the group with itself, established in this way, is called an *inner* isomorphism. It may be regarded as a transformation carried out on the symbols of the operations, being indeed a permutation performed on these symbols. The totality of these operations clearly constitutes a group isomorphic with the given group by the inner isomorphisms, such that if S' is the operation corresponding to S, then $S'_rS'_s = S'_t$, is a consequence of $S_rS_s = S_t$. The substitution on the symbols of the operations of a group resulting from such a correspondence is called an outer isomorphism. The totality of the isomorphisms of any finite group constitutes the group of isomorphisms of the given group, and within this the group of inner isomorphisms is a self-conjugate subgroup. Every set of conjugate operations of a group is necessarily transformed into itself by an inner isomorphism, but two or more sets may be interchanged by an outer isomorphism. *Isomorphism of a group with itself.*

A subgroup of a group G, which is transformed into itself by every isomorphism of G, is called a *characteristic* subgroup. A series of groups $G, G_1, G_2, \ldots, 1$, such that each is a maximum characteristic subgroup of G contained in the preceding, may be shown to have the same invariant properties as the subgroups of a composition series. A group which has no characteristic subgroup must be either a simple

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group or the direct product of a number of simply isomorphic simple groups.

It has been seen that every group of finite order can be represented as a group of permutations performed on a set of symbols whose number is equal to the order of the group. In general such a representation is possible with a smaller number of symbols. Let H be a subgroup of G, and let the operations of G be divided, in respect of H, into the sets H, S_2H, S_3H, . . . , S_nH. If S is any operation of G, the sets SH, SS_2H, SS_3H, . . . , SS_nH differ from the previous sets only in the sequence in which they occur. In fact, if SS_p belong to the set S_qH, then since H is a group, the set SS_pH is identical with the set S_qH. Hence, to each operation S of the group will correspond a permutation performed on the symbols of the m sets, and to the product of two operations corresponds the product of the two analogous permutations. The set of permutations, therefore, forms a group isomorphic with the given group. Moreover, the isomorphism is simple unless for one or more operations, other than identity, the sets all remain unaltered. This can only be the case for S, when every operation conjugate to S belongs to H. In this case H would contain a self-conjugate subgroup, and the isomorphism is multiple.

Permutation-groups.

The fact that every group of finite order can be represented, generally in several ways, as a group of permutations, gives special importance to such groups. The number of symbols involved in such a representation is called the *degree* of the group. In accordance with the general definitions already given, a permutation-group is called transitive or intransitive according as it does or does not contain permutations changing any one of the symbols into any other. It is called imprimitive or primitive according as the symbols can or cannot be arranged in sets, such that every permutation of the group changes the symbols of any one set either among themselves or into the symbols of another set. When a group is imprimitive the number of symbols in each set must clearly be the same.

The total number of permutations that can be performed on n symbols is $n!$, and these necessarily constitute a group. It is known as the *symmetric* group of degree n, the only rational functions of the symbols which are unaltered by all possible permutations being the symmetric functions. When any permutation is carried out on the product of the $n(n-1)/2$ differences of the n symbols, it must either remain unaltered or its sign must be changed. Those permutations which leave the product unaltered constitute a group of order $n!/2$, which is called the *alternating* group of degree n; it is a self-conjugate subgroup of the symmetric group. Except when $n=4$ the alternating group is a simple group. A group of degree n, which is not contained in the alternating group, must necessarily have a self-conjugate subgroup of index 2, consisting of those of its permutations which belong to the alternating group.

Among the various concrete forms in which a group of finite order can be presented the most important is that of a group of linear substitutions. Such groups have already been referred to in connexion with discontinuous groups. Here the number of distinct substitutions is necessarily finite; and to each operation S of a group G of finite order there will correspond a linear substitution s, viz.

Groups of linear substitutions.

$$x_i = \sum_{j=1}^{j=m} s_{ij}x_j \quad (i, j = 1, 2, \ldots, m),$$

on a set of m variables, such that if $ST = U$, then $st = u$. The linear substitutions $s, t, u, \ldots$ then constitute a group g with which G is isomorphic; and whether the isomorphism is simple or multiple g is said to give a "representation" of G as a group of linear substitutions. If all the substitutions of g are transformed by the same substitution on the m variables, the (in general) new group of linear substitutions so constituted is said to be "equivalent" with g as a representation of G; and two representations are called "non-equivalent," or "distinct," when one is not capable of being transformed into the other.

A group of linear substitutions on m variables is said to be "reducible" when it is possible to choose m' ($<m$) linear functions of the variables which are transformed among themselves by every substitution of the group. When this cannot be done the group is called "irreducible." It can be shown that a group of linear substitutions, of finite order, is always either irreducible, or such that the variables, when suitably chosen, may be divided into sets, each set being irreducibly transformed among themselves. This being so, it is clear that when the irreducible representations of a group of finite order are known, all representations may be built up.

It has been seen at the beginning of this section that every group of finite order N can be presented as a group of permutations (*i.e.* linear substitutions in a limited sense) on N symbols. This group is obviously reducible; in fact, the sum of the symbols remain unaltered by every substitution of the group. The fundamental theorem in connexion with the representations, as an irreducible group of linear substitutions, of a group of finite order N is the following.

If r is the number of different sets of conjugate operations in the group, then, when the group of N permutations is completely reduced,

(i.) just r distinct irreducible representations occur:

(ii.) each of these occurs a number of times equal to the number of symbols on which it operates:

(iii.) these irreducible representations exhaust all the distinct irreducible representations of the group.

Among these representations what is called the "identical" representation necessarily occurs, *i.e.* that in which each operation of the group corresponds to leaving a single symbol unchanged. If these representations are denoted by $\Gamma_1, \Gamma_2, \ldots, \Gamma_r$, then any representation of the group as a group of linear substitutions, or in particular as a group of permutations, may be uniquely represented by a symbol $\Sigma a_i\Gamma_i$, in the sense that the representation when completely reduced will contain the representation Γ_i just a_i times for each suffix i.

Group characteristics.

A representation of a group of finite order as an irreducible group of linear substitutions may be presented in an infinite number of equivalent forms. If

$$x'_i = \Sigma s_{ij}x_j \quad (i, j = 1, 2, \ldots, m),$$

is the linear substitution which, in a given irreducible representation of a group of finite order G, corresponds to the operation S, the determinant

$$\begin{vmatrix} s_{11}-\lambda & s_{12} & \ldots & s_{1m} \\ s_{21} & s_{22}-\lambda & \ldots & s_{2m} \\ \ldots & \ldots & \ldots & \ldots \\ s_{m1} & s_{m2} & \ldots & s_{mm}-\lambda \end{vmatrix}$$

is invariant for all equivalent representations, when written as a polynomial in λ. Moreover, it has the same value for S and S', if these are two conjugate operations in G. Of the various invariants that thus arise the most important is $s_{11}+s_{22}+\ldots+s_{mm}$, which is called the "characteristic" of S. If S is an operation of order p, its characteristic is the sum of m pth roots of unity; and in particular, if S i^{th} the identical operation its characteristic is m. If r is the number of sets of conjugate operations in G, there is, for each representation of G as an irreducible group, a set of r characteristics: $X_1, X_2, \ldots X_r$, one corresponding to each conjugate set; so that for the r irreducible representations just r such sets of characteristics arise. These are distinct, in the sense that if $\Psi_1, \Psi_2, \ldots, \Psi_r$ are the characteristics for a distinct representation from the above, then X_1 and Ψ_1 are not equal for all values of the suffix i. It may be the case that the r characteristics for a given representation are all real. If this is so the representation is said to be self-inverse. In the contrary case there is always another representation, called the "inverse" representation, for which each characteristic is the conjugate imaginary of the corresponding one in the original representation. The characteristics are subject to certain remarkable relations. If h_p denotes the number of operations in the pth conjugate set, while X'_p and Λ'_p are the characteristics of the pth conjugate set in Γ_i and Γ_j, then

$$\sum_{p=1}^{p=r} h_p X'_p \Lambda'_p = 0 \text{ or } n,$$

according to Γ_i and Γ_j are not or are inverse representations, n being the order of G.

Again

$$\sum_{i=1}^{i=r} X'_p X'_q = 0 \text{ or } n/h_p$$

according as the pth and qth conjugate sets are not or are inverse; the qth set being called the inverse of the pth if it consists of the inverses of the operations constituting the pth.

Linear homogeneous groups.

Another form in which every group of finite order can be represented is that known as a linear homogeneous group. If in the equations

$$x'_r = a_{r1}x_1 + a_{r2}x_2 + \ldots + a_{rn}x_n, \quad (r = 1, 2, \ldots, m),$$

which define a linear homogeneous substitution, the coefficients are integers, and if the equations are replaced by congruences to a finite modulus n, the system of congruences will give a definite operation, provided that the determinant of the coefficients is relatively prime to n. The product of two such operations is another operation of the same kind; and the total number of distinct operations is finite, since there is only a limited number of choices for the coefficients. The totality of these operations, therefore, constitutes a group of finite order; and such a group is known as a *linear homogeneous* group. If n is a prime the order of the group is

$$(n^m-1)(n^m-n)\ldots(n^m-n^{m-1}).$$

The totality of the operations of the linear homogeneous group for which the determinant of the coefficients is congruent to unity forms a subgroup. Other subgroups arise by considering those operations which leave a function of the variables unchanged (mod. n). All such subgroups are known as linear homogeneous groups.

When the ratios only of the variables are considered, there arises a *linear fractional* group, with which the corresponding linear homogeneous group is isomorphic. Thus, if p is a prime the totality of the congruences

$$s' \equiv \frac{\alpha s+b}{cs+d}, \quad ad-bc \not\equiv 0, \pmod{p}$$

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constitutes a group of order $p(p^2-1)$. This class of groups for various values of p is almost the only one which has been as yet exhaustively analysed. For all values of p except 3 it contains a simple self-conjugate subgroup of index 2.

A great extension of the theory of linear homogeneous groups has been made in recent years by considering systems of congruences of the form

$$x'_r \equiv a_{r1}x_1 + a_{r2}x_2 + \ldots + a_{rm}x_m, \quad (r = 1, 2, \ldots, m),$$

in which the coefficients a_{rs} are integral functions with real integral coefficients of a root of an irreducible congruence to a prime modulus. Such a system of congruences is obviously limited in numbers and defines a group which contains as a subgroup the group defined by the same congruences with ordinary integral coefficients.

The chief application of the theory of groups of finite order is to the theory of algebraic equations. The analogy of equations of the second, third and fourth degrees would give rise to the expectation that a root of an equation of any finite degree could be expressed in terms of the coefficients by a finite number of the operations of addition, subtraction, multiplication, division, and the extraction of roots; in other words, that the equation could be solved by radicals. This, however, as proved by Abel and Galois, is not the case: an equation of a higher degree than the fourth in general defines an algebraic irrationality which cannot be expressed by means of radicals, and the cases in which such an equation can be solved by radicals must be regarded as exceptional. The theory of groups affords a criterion of determining in what an equation comes under this exceptional case, and of solving the equation when it does. When it does not, the theory provides the means of reducing the problem presented by the equation to a normal form. From this point of view the theory of equations of the fifth degree has been extensively treated, and the problems presented by certain equations of the sixth and seventh degrees have actually been reduced to normal form.

Applications.

Galois (see EQUATION) showed that, corresponding to every irreducible equation of the nth degree, there exists a transitive substitution-group of degree n, such that every function of the roots, the numerical value of which is unaltered by all the substitutions of the group can be expressed rationally in terms of the coefficients, while conversely every rational function of the roots which is expressible rationally in terms of the coefficients is unaltered by the substitutions of the group. This group is called the group of the equation. In general, if the equation is given arbitrarily, the group will be the symmetric group. The two second and sufficient conditions that the equation may be soluble by radicals is that its group should be a soluble group. When the coefficients in an equation are rational integers, the determination of its group may be made by a finite number of processes each of which involves only rational arithmetical operations. These processes consist in forming resolvents of the equation corresponding to each distinct type of subgroup of the symmetric group whose degree is that of the equation. Each of the resolvents so formed is then examined to find whether it has rational roots. The group corresponding to any resolvent which has a rational root contains the group of the equation; and the least of the groups so found is the group of the equation. Thus, for an equation of the fifth degree the various transitive subgroups of the symmetric group of degree five have to be considered. These are (i.) the alternating group; (ii.) a soluble group of order 20; (iii.) a group of order 10, self-conjugate in the preceding; (iv.) a cyclical group of order 5, self-conjugate in both the preceding. If x_0, x_1, x_2, x_3, x_4 are the roots of the equation, the corresponding resolvents may be taken to be those which have for roots (i.) the square root of the discriminant; (ii.) the function $(x_0x_1+x_1x_2+x_2x_3+x_3x_4+x_4x_0)(x_0x_2+x_2x_4+x_4x_1+x_1x_3+x_3x_0)$; (iii.) the function $x_0x_1+x_1x_2+x_2x_3+x_3x_4+x_4x_0$; and (iv.) the function $x_0^2x_1+x_1^2x_2+x_2^2x_3+x_3^2x_4+x_4^2x_0$. Since the groups for which (iii.) and (iv.) are invariant are contained in that for which (ii.) is invariant, and since these are the only soluble groups of the set, the equation will be soluble by radicals only when the function (ii.) can be expressed rationally in terms of the coefficients. If

$$(x_0x_1+x_1x_2+x_2x_3+x_3x_4+x_4x_0)(x_0x_2+x_2x_4+x_4x_1+x_1x_3+x_3x_0)$$

is known, then clearly $x_0x_1+x_1x_2+x_2x_3+x_3x_4+x_4x_0$ can be determined by the solution of a quadratic equation. Moreover, the sum and product $(x_0+\epsilon x_1+\epsilon^2x_2+\epsilon^3x_3+\epsilon^4x_4)^5$ and $(x_0+\epsilon^2x_1+\epsilon^4x_2+\epsilon x_3+\epsilon^3x_4)^5$ can be expressed rationally in terms of $x_0x_1+x_1x_2+x_2x_3+x_3x_4+x_4x_0$, ϵ, and the symmetric functions; being a fifth root of unity. Hence $(x_0+\epsilon x_1+\epsilon^2x_2+\epsilon^3x_3+\epsilon^4x_4)^5$ can be determined by the solution of a quadratic equation. The roots of the original equation are then finally determined by the extraction of a fifth root. The problem of reducing the equation of the fifth degree when not soluble by radicals, to a normal form, forms the subject of Klein's *Vorlesungen über das Ikosaeder*. Another application of groups of finite order is to the theory of linear differential equations whose integrals are algebraic functions. It has been already seen, in the discussion of discontinuous groups in general, that the groups of such equations must be groups of finite order. To every group of finite order which can be represented as an irreducible group of linear substitutions on n variables will correspond a class of irreducible linear differential equations of the nth order whose integrals are algebraic. The complete determination of the class of linear differential equations of the second order with all their integrals algebraic, whose group has the greatest possible order, viz. 120, has been carried out by Klein.

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GROUSE, a word of uncertain origin,[1] now used generally by ornithologists to include all the "rough-footed" Gallinaceous birds, but in common speech applied almost exclusively, when used alone, to the *Tetrao scoticus* of Linnaeus, the *Lagopus scoticus* of modern systematists—more particularly called in English the red grouse, but till the end of the 18th century almost invariably spoken of as the Moor-fowl or Moor-game. The effect which this species is supposed to have had on the British legislature, and therefore on history, is well known, for it was the common belief that parliament always rose when the season for grouse-shooting began (August 12th); while according to the *Orkneyinga Saga* (ed. Jonaeus, p. 356; ed. Anderson, p. 168) events of some importance in the annals of North Britain followed from its pursuit in Caithness in the year 1157.

The red grouse is found on moors from Monmouthshire and Derbyshire northward to the Orkneys, as well as in most of the Hebrides. It inhabits similar situations throughout Wales and Ireland, but it does not naturally occur beyond the limits of the British Islands,[2] and is the only species among birds peculiar to them. The word "species" may in this case be used advisedly (since the red grouse invariably "breeds true," it admits of an easy diagnosis, and it has a definite geographical range); but scarcely any zoologist can doubt of its common origin with the willow-grouse, *Lagopus albus* (*L. subalpinus* or *L. saliceti* of some authors), that inhabits a subarctic zone from Norway across the

[1] It seems first to occur (O. Salusbury Brereton, *Archaeologia*, iii. 157) as "grows" in an ordinance for the regulation of the royal household dated "apud Eltham, mens. Jan. 22 Hen. VIII.," i.e. 1531, and considering the locality must refer to black game. It is found in the Statutes of Parliament 1 Jac. I. cap. 27, i.e. 1603, and, as reprinted in the *Statutes at Large*, stands as now commonly spelt, but by many writers or printers the final *e* was omitted in the 17th and 18th centuries. In 1611 Cotgrave had "Poule grieche. A Moore-hen or the hemale of the *Grice* [see *Grig*, "1] or Mooregame" (*Dictionarie of the French and English Tongues*, *s.v. Poule*). The most likely derivation seems to be from the old French word *griesche*, *greoche* or *griais* (meaning speckled, and cognate with *griseus*, grisly or grey), which was applied to some kind of partridge, or according to Bescherelle-Littré (*Dict.*, p. 211) to a quail, "parce que elle fu premiers trovée en Grece." The Oxford Dictionary repudiates the possibility of "grouse" being a spurious singular of an alleged plural "grice," and, with regard to the possibility of "grows" being a plural of "grow," refers to Giraldus Cambrensis (c. 1210), *Topogr. Hib. opera* (Rolls) v. 47: "gallinae campestres, quas vulgariter *grutas* vocant."

[2] It was successfully, though with much trouble, introduced by Mr Oscar Dickson on a tract of land near Gottenburg in Sweden (*Svenska Jägarförbundets Nya Tidskrift*, 1868, p. 64 *et alibi*).

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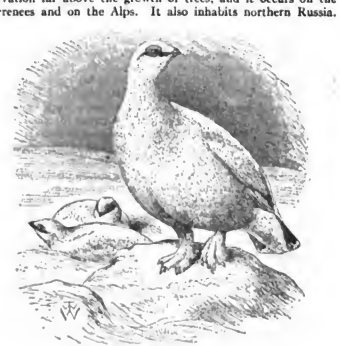
continents of Europe and Asia, as well as North America from the Aleutian Islands to Newfoundland. The red grouse indeed is rarely or never found away from the heather on which chiefly it subsists; while the willow-grouse in many parts of the Old World seems to prefer the shrubby growth of berry-bearing plants (*Vaccinium* and others) that, often thickly interspersed with willows and birches, clothes the higher levels or the lower mountain-slopes, and it flourishes in the New World where heather scarcely exists, and a "heath" in its strict sense is unknown. It is true that the willow-grouse always becomes white in winter, which the red grouse never does; but in summer there is a considerable resemblance between the two species, the cock willow-grouse having his head, neck and breast of nearly the same rich chestnut-brown as his British representative, and, though his back be lighter in colour, as is also the whole plumage of his mate, than is found in the red grouse, in other respects the two species are precisely alike. No distinction can be discovered

Red Grouse.

in their voice, their eggs, their build, nor in their anatomical details, so far as these have been investigated and compared.[1] Moreover, the red grouse, restricted as is its range, varies in colour not inconsiderably according to locality.

Though the red grouse does not, after the manner of other members of the genus *Lagopus*, become white in winter, Scotland possesses a species of the genus which does. This is the ptarmigan, *L. mutus* or *L. alpinus*, which differs far more in structure, station and habits from the red grouse than that does from the willow-grouse, and in Scotland is far less abundant, haunting only the highest and most barren mountains. It is said to have formerly inhabited both Wales and England, but there is no evidence of its appearance in Ireland. On the continent of Europe it is found most numerously in Norway, but at an elevation far above the growth of trees, and it occurs on the Pyrenees and on the Alps. It also inhabits northern Russia.



Ptarmigan.

In North America, Greenland and Iceland it is represented by a very nearly allied form—so much so indeed that it is only at certain seasons that the slight difference between them can be detected. This form is the *L. rupestris* of authors, and it would appear to be found also in Siberia (*Ibis*, 1879, p. 148). Spitzbergen is inhabited by a large form which has received recogni-

Blackcock.

tion as *L. hemileucurus*, and the northern end of the chain of the Rocky Mountains is tenanted by a very distinct species, the smallest and perhaps the most beautiful of the genus, *L. leucurus*, which has all the feathers of the tail white.

The bird, however, to which the name of grouse in all strictness belongs is probably the *Tetrao tetrix* of Linnaeus—the blackcock and greyhen, as the sexes are respectively called. It is distributed over most of the heath-country of England, except in East Anglia, where attempts to introduce it have been only partially successful. It also occurs in North Wales and very

[1] A very interesting subject for discussion would be whether *Lagopus scoticus* or *L. albus* has varied most from the common stock of both. Looking to the fact that the former is the only species of the genus which does not assume white clothing in winter, an evolutionist might at first deem the variation greatest in its case: but then it must be borne in mind that the species of *Lagopus* which turn white differ in that respect from all other groups of the family *Tetraonidae*. Furthermore every species of *Lagopus* (even *L. leucurus*, the whitest of all) has its first set of *remiges* coloured brown. These are dropped when the bird is about half-grown, and in all the species but *L. scoticus* white *remiges* are then produced. If therefore the successive phases assumed by any animal in the course of its progress to maturity indicate the phases through which the species has passed, there may have been a time when all the species of *Lagopus* wore a brown livery even when adult, and the white dress donned in winter has been imposed upon the wearers by causes that can be easily suggested. The white plumage of the birds of this group protects them from danger during the snows of a protracted winter. But the red grouse, instead of perpetuating directly the more ancient properties of an original *Lagopus* that underwent no great seasonal change of plumage, may derive its ancestry from the widely-ranging willow-grouse, which in an epoch comparatively recent (in the geological sense) may have stocked Britain, and left descendants that, under conditions in which the assumption of a white garb would be almost fatal to the preservation of the species, have reverted (though doubtless with some modifications) to a comparative immutability essentially the same as that of the primal *Lagopus*.

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generally throughout Scotland, though not in Orkney, Shetland or the Outer Hebrides, nor in Ireland. On the continent of Europe it has a very wide range, and it extends into Siberia. In Georgia its place is taken by a distinct species, on which a Polish naturalist (*Proc. Zool. Society*, 1875, p. 267) has conferred the name of *T. mlokosiewiczi*. Both these birds have much in common with their larger congener the capercally and its eastern representative.

The species of the genus *Bonasa*, of which the European *B. sylvestris* is the type, does not inhabit the British Islands. It is perhaps the most delicate game-bird that comes to table. It is the *gelinotte* of the French, the *Haselhuhn* of Germans, and *Hjerpe* of Scandinavians. Like its transatlantic congener *B. umbellus*, the ruffed grouse or birch-partridge (of which there are two other local forms, *B. umbelloides* and *B. sabinii*), it is purely a forest-bird. The same may be said of the species of *Canace*, of which two forms are found in America, *C. canadensis*, the spruce-partridge, and *C. franklini*, and also of the Siberian *C. falcipennis*. Nearly allied to these birds is the group known as *Dendragapus*, containing three large and fine forms *D. obscurus*, *D. fuliginosus*, and *D. richardsoni*—all peculiar to North America. Then there are *Centrocercus urophasianus*, the sage-cock of the plains of Columbia and California, and *Pedioecetes*, the sharp-tailed grouse, with its two forms, *P. phasianellus* and *P. columbianus*, while finally *Cupidonia*, the prairie-hen, also with two local forms, *C. cupido* and *C. pallidicincta*, is a bird that in the United States of America possesses considerable economic value, enormous numbers being consumed there, and also exported to Europe.

The various sorts of grouse are nearly all figured in Elliot's *Monograph of the Tetraoninae*, and an excellent account of the American species is given in Baird, Brewer and Ridgway's *North American Birds* (iii. 414-465). See also SHOOTING. (A. N.)

GROVE, SIR GEORGE (1820–1900), English writer on music, was born at Clapham on the 13th of August 1820. He was articled to a civil engineer, and worked for two years in a factory near Glasgow. In 1841 and 1845 he was employed in the West Indies, erecting lighthouses in Jamaica and Bermuda. In 1849 he became secretary to the Society of Arts, and in 1852 to the Crystal Palace. In this capacity his natural love of music and enthusiasm for the art found a splendid opening, and he threw all the weight of his influence into the task of promoting the best music of all schools in connexion with the weekly and daily concerts at Sydenham, which had a long and honourable career under the direction of Mr (afterwards Sir) August Manns. Without Sir George Grove that eminent conductor would hardly have succeeded in doing what he did to encourage young composers and to educate the British public in music. Grove's analyses of the Beethoven symphonies, and the other works presented at the concerts, set the pattern of what such things should be; and it was as a result of these, and of the fact that he was editor of *Macmillan's Magazine* from 1868 to 1883, that the scheme of his famous *Dictionary of Music and Musicians*, published from 1878 to 1889 (new edition, edited by J. A. Fuller Maitland, 1904–1907), was conceived and executed. His own articles in that work on Beethoven, Mendelssohn and Schubert are monuments of a special kind of learning, and that the rest of the book is a little thrown out of balance owing to their great length is hardly to be regretted. Long before this he had contributed to the *Dictionary of the Bible*, and had promoted the foundation of the Palestine Exploration Fund. On a journey to Vienna, undertaken in the company of his lifelong friend, Sir Arthur Sullivan, the important discovery of a large number of compositions by Schubert was made, including the music to *Rosamunde*. When the Royal College of Music was founded in 1882 he was appointed its first director, receiving the honour of knighthood. He brought the new institution into line with the most useful European conservatoriums. On the completion of the new buildings in 1894 he resigned the directorship, but retained an active interest in the institution to the end of his life. He died at Sydenham on the 28th of May 1900.

His life, a most interesting one, was written by Mr Charles Graves. (J. A. F. M.)

GROVE, SIR WILLIAM ROBERT (1811–1896), English judge and man of science, was born on the 11th of July 1811 at Swansea, South Wales. After being educated by private tutors, he went to Brasenose College, Oxford, where he took an ordinary degree in 1832. Three years later he was called to the bar at Lincoln's Inn. His health, however, did not allow him to devote himself strenuously to practice, and he occupied his leisure with scientific studies. About 1830 he constructed the platinum-zinc voltaic cell that bears his name, and with the aid of a number of these exhibited the electric arc light in the London Institution, Finsbury Circus. The result was that in 1840 the managers appointed him to the professorship of experimental philosophy, an office which he held for seven years. His researches dealt very largely with electro-chemistry and with the voltaic cell, of which he invented several varieties. One of these, the Grove gas-battery, which is of special interest both intrinsically and as the forerunner of the secondary batteries now in use for the "storage" of electricity, was based on his observation that a current is produced by a couple of platinum plates standing in acidulated water and immersed, the one in hydrogen, the other in oxygen. At one of his lectures at the Institution he anticipated the electric lighting of to-day by illuminating the theatre with incandescent electric lamps, the filaments being of platinum and the current supplied by a battery of his nitric acid cells. In 1846 he published his famous book on *The Correlation of Physical Forces*, the leading ideas of which he had already put forward in his lectures: its fundamental conception was that each of the forces of nature—light, heat, electricity, &c.—is definitely and equivalently convertible into any other, and that where experiment does not give the full equivalent, it is because the initial force has been dissipated, not lost, by conversion into other unrecognized forces. In the same year he received a Royal medal from the Royal Society for his Bakerian lecture on "Certain phenomena of voltaic ignition and the decomposition of water into its constituent gases." In 1866 he presided over the British Association at its Nottingham meeting and delivered an address on the continuity of natural phenomena. But while he was thus engaged in scientific research, his legal work was not neglected, and his practice increased so greatly that in 1853 he became a Q.C. One of the best-known cases in which he appeared as an advocate was that of William Palmer, the Rugeley poisoner, whom he defended. In 1871 he was made a judge of the Common Pleas in succession to Sir Robert Collier, and remained on the bench till 1887. He died in London on the 1st of August 1896.

A selection of his scientific papers is given in the sixth edition of *The Correlation of Physical Forces*, published in 1874.

GROVE (O.E. *graf*, cf. O.E. *grafa*, brushwood, later "greave"; the word does not appear in any other Teutonic language, and the *New English Dictionary* finds no Indo-European root to which it can be referred; Skeat considers it connected with "grave," to cut, and finds the original meaning to be a glade cut through a wood), a small group or cluster of trees, growing naturally and forming something smaller than a wood, or planted in particular shapes or for particular purposes, in a park, &c. Groves have been connected with religious worship from the earliest times, and in many parts of India every village has its sacred group of trees. For the connexion of religion with sacred groves see TREE-WORSHIP.

The word "grove" was used by the authors of the Authorized Version of the Bible to translate two Hebrew words: (1) *'ăshel*, as in Gen. xxi. 33, and 1 Sam. xxii. 6; this is rightly given in the Revised Version as "tamarisk"; (2) *asherah* in many places throughout the Old Testament. Here the translators followed the Septuagint ἄλσοι and the Vulgate *lucus*. The *'ăshērāh* was a wooden post erected at the Canaanitish places of worship, and also by the altars of Yahweh. It may have represented a tree.

GROZNYI, a fortress and town of Russia, North Caucasia, in the province of Terek, on the Zunzha river, 82 m. by rail N.E. of Vladikavkaz, on the railway to Petrovsk. There are naphtha wells close by. The fortifications were constructed in 1819. Pop. (1897) 15,509.

GRUB, the larva of an insect, a caterpillar, maggot. The word is formed from the verb "to grub," to dig, break up the

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surface of the ground, and clear of stumps, roots, weeds, &c. According to the *New English Dictionary*, "grub" may be referred to an ablaut variant of the Old Teutonic *grab-*, to dig, cf. "grave." Skeat (*Etym. Dict.* 1898) refers it rather to the root seen in "grope," "grab," &c., the original meaning "to search for." The earliest quotation of the slang use of the word in the sense of food in the *New English Dictionary* is dated 1650 from *Ancient Poems, Ballads*, &c., Percy Society Publications. "Grub-street," as a collective term for needy hack-writers, dates from the 17th century and is due to the name of a street near Moorfields, London, now Milton Street, which was as Johnson says "much inhabited by writers of small histories, dictionaries and temporary poems."

GRUBER, JOHANN GOTTFRIED (1774–1851), German critic and literary historian, was born at Naumburg on the Saale, on the 29th of November 1774. He received his education at the town school of Naumburg and the university of Leipzig, after which he resided successively at Göttingen, Leipzig, Jena and Weimar, occupying himself partly in teaching and partly in various literary enterprises, and enjoying in Weimar the friendship of Herder, Wieland and Goethe. In 1811 he was appointed professor at the university of Wittenberg, and after the division of Saxony he was sent by the senate to Berlin to negotiate the union of the university of Wittenberg with that of Halle. After the union was effected he became in 1815 professor of philosophy at Halle. He was associated with Johann Samuel Ersch in the editorship of the great work *Allgemeine Encyklopädie der Wissenschaften und Künste*; and after the death of Ersch he continued the first section from vol. xviii. to vol. liv. He also succeeded Ersch in the editorship of the *Allgemeine Literaturzeitung*. He died on the 7th of August 1851.

Gruber was the author of a large number of works, the principal of which are *Charakteristik Herders* (Leipzig, 1805), in conjunction with Johann T. L. Danz (1769–1851), afterwards professor of theology at Jena; *Geschichte des menschlichen Geschlechts* (2 vols., Leipzig, 1806); *Wörterbuch der altklassischen Mythologie* (3 vols., Weimar, 1810–1815); *Wielands Leben* (2 parts, Weimar, 1815–1816), and *Klopstocks Leben* (Weimar, 1832). He also edited Wieland's *Sämtliche Werke* (Leipzig, 1818–1828).

GRUMBACH, WILHELM VON (1503–1567), German adventurer, chiefly known through his connexion with the so-called "Grumbach feuds" (*Grumbachsche Händel*), the last attempt of the German knights to destroy the power of the territorial princes. A member of an old Franconian family, he was born on the 1st of June 1503, and having passed some time at the court of Casimir, prince of Bayreuth (d. 1527), fought against the peasants during the rising in 1524 and 1525. About 1540 Grumbach became associated with Albert Alcibiades, the turbulent prince of Bayreuth, whom he served both in peace and war. After the conclusion of the peace of Passau in 1552, Grumbach assisted Albert in his career of plunder in Franconia and was thus able to take some revenge upon his enemy, Melchior von Zobel, bishop of Würzburg. As a landholder Grumbach was a vassal of the bishops of Würzburg, and had held office at the court of Conrad of Bibra, who was bishop from 1540 to 1544. When, however, Zobel was chosen to succeed Conrad the harmonious relations between lord and vassal were quickly disturbed. Unable to free himself and his associates from the suzerainty of the bishop by appealing to the imperial courts he decided to adopt more violent measures, and his friendship with Albert was very serviceable in this connexion. Albert's career, however, was checked by his defeat at Sievershausen in July 1553 and his subsequent flight into France, and the bishop took advantage of this state of affairs to seize Grumbach's lands. The knight obtained an order of restitution from the imperial court of justice (*Reichskammergericht*), but he was unable to carry this into effect; and in April 1558 some of his partisans seized and killed the bishop. Grumbach declared he was innocent of this crime, but his story was not believed, and he fled to France. Returning to Germany he pleaded his cause in person before the diet at Augsburg in 1559, but without success. Meanwhile he had found a new patron in John Frederick, duke of Saxony, whose father, John Frederick, had been obliged to surrender the electoral dignity to the Albertine branch of his family. Chafing under this deprivation the duke listened readily to Grumbach's plans for recovering the lost dignity, including a general rising of the German knights and the deposition of Frederick II., king of Denmark. Magical charms were employed against the duke's enemies, and communications from angels were invented which helped to stir up the zeal of the people. In 1563 Grumbach attacked Würzburg, seized and plundered the city and compelled the chapter and the bishop to restore his lands. He was consequently placed under the imperial ban, but John Frederick refused to obey the order of the emperor Maximilian II. to withdraw his protection from him. Meanwhile Grumbach sought to compass the assassination of the Saxon elector, Augustus; proclamations were issued calling for assistance; and alliances both without and within Germany were concluded. In November 1566 John Frederick was placed under the ban, which had been renewed against Grumbach earlier in the year, and Augustus marched against Gotha. Assistance was not forthcoming, and a mutiny led to the capitulation of the town. Grumbach was delivered to his foes, and, after being tortured, was executed at Gotha on the 18th of April 1567.

See F. Ortloff, *Geschichte der Grumbachschen Händel* (Jena, 1868–1870), and J. Voigt, *Wilhelm von Grumbach und seine Handel* (Leipzig, 1846–1847).

GRUMENTUM, an ancient town in the centre of Lucania, 33 m. S. of Potentia by the direct road through Anxia, and 52 m. by the Via Herculia, at the point of divergence of a road eastward to Heraclea. It seems to have been a native Lucanian town, not a Greek settlement. In 215 B.C. the Carthaginian general Hanno was defeated under its walls, and in 207 B.C. Hannibal made it his headquarters. In the Social War it appears as a strong fortress, and seems to have been held by both sides at different times. It became a colony, perhaps in the time of Sulla, at latest under Augustus, and seems to have been of some importance. Its site, identified by Holste from the description of the martyrdom of St Laverius, is a ridge on the right bank of the Aciris (Agri) about 1060 ft. above sea-level, ½ m. below the modern Saponara, which lies much higher (2533 ft.). Its ruins (all of the Roman period) include those of a large amphitheatre (arena 205 by 107 ft.), the only one in Lucania, except that at Paestum. There are also remains of a theatre. Inscriptions record the repair of its town walls and the construction of *thermae* (of which remains were found) in 57–51 B.C., the construction in 43 B.C., of a portico, remains of which may be seen along an ancient road, at right angles to the main road, which traversed Grumentum from S. to N.

See F. P. Caputi in *Notizie degli scavi* (1877), 129, and G. Patroni, *ibid.* (1897) 180. (T. As.)

GRÜN. HANS BALDUNG (*c.* 1470–1545), commonly called Grün, a German painter of the age of Dürer, was born at Gmünd in Swabia, and spent the greater part of his life at Strassburg and Freiburg in Breisgau. The earliest pictures assigned to him are altarpieces with the monogram H. B. interlaced, and the date of 1496, in the monastery chapel of Lichtenthal near Baden. Another early work is a portrait of the emperor Maximilian, drawn in 1501 on a leaf of a sketch-book now in the print-room at Carlsruhe. The "Martyrdom of St Sebastian" and the "Epiphany" (Berlin Museum), fruits of his labour in 1507, were painted for the market-church of Halle in Saxony. In 1509 Grün purchased the freedom of the city of Strassburg, and resided there till 1513, when he moved to Freiburg in Breisgau. There he began a series of large compositions, which he finished in 1516, and placed on the high altar of the Freiburg cathedral. He purchased anew the freedom of Strassburg in 1517, resided in that city as his domicile, and died a member of its great town council in 1545.

Though nothing is known of Grün's youth and education, it may be inferred from his style that he was no stranger to the school of which Dürer was the chief. Gmünd is but 50 m. distant on either side from Augsburg and Nuremberg. Grün's prints were often mistaken for those of Dürer; and Dürer himself was well acquainted with Grün's woodcuts and

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copper-plates in which he traded during his trip to the Netherlands (1520). But Grün's prints, though Düreresque, are far below Dürer, and his paintings are below his prints. Without absolute correctness as a draughtsman, his conception of human form is often very unpleasant, whilst a questionable taste is shown in ornament equally profuse and "baroque." Nothing is more remarkable in his pictures than the pug-like shape of the faces, unless we except the coarseness of the extremities. No trace is apparent of any feeling for atmosphere or light and shade. Though Grün has been commonly called the Correggio of the north, his compositions are a curious medley of glaring and heterogeneous colours, in which pure black is contrasted with pale yellow, dirty grey, impure red and glowing green. Flesh is a mere glaze under which the features are indicated by lines. His works are mainly interesting because of the wild and fantastic strength which some of them display. We may pass lightly over the "Epiphany" of 1507, the "Crucifixion" of 1512, or the "Stoning of Stephen" of 1522, in the Berlin Museum. There is some force in the "Dance of Death" of 1517, in the museum of Basel, or the "Madonna" of 1530, in the Liechtenstein Gallery at Vienna. Grün's best effort is the altarpiece of Freiburg, where the "Coronation of the Virgin," and the "Twelve Apostles," the "Annunciation, Visitation, Nativity and Flight into Egypt," and the "Crucifixion," with portraits of donors, are executed with some of that fanciful power which Martin Schön bequeathed to the Swabian school. As a portrait painter he is well known. He drew the likeness of Charles V., as well as that of Maximilian; and his bust of Margrave Philip in the Munich Gallery tells us that he was connected with the reigning family of Baden as early as 1514. At a later period he had sittings from Margrave Christopher of Baden, Ottilia his wife, and all their children, and the picture containing these portraits is still in the grand-ducal gallery at Carlsruhe. Like Dürer and Cranach, Grün became a hearty supporter of the Reformation. He was present at the diet of Augsburg in 1518, and one of his woodcuts represents Luther under the protection of the Holy Ghost, which hovers over him in the shape of a dove.

GRÜNBERG, a town of Germany, in Prussian Silesia, beautifully situated between two hills on an affluent of the Oder, and on the railway from Breslau to Stettin via Küstrin, 36 m. N.N.W. of Glogau. Pop. (1905) 20,087. It has a Roman Catholic and two Evangelical churches, a modern school and a technical (textiles) school. There are manufactures of cloth, paper, machinery, straw hats, leather and tobacco. The prosperity of the town depends chiefly on the vine culture in the neighbourhood, from which, besides the exportation of a large quantity of grapes, about 700,000 gallons of wine are manufactured annually.

GRUNDTVIG, NIKOLAI FREDERIK SEVERIN (1783–1872), Danish poet, statesman and divine, was born at the parsonage of Udby in Zealand on the 8th of September 1783. In 1791 he was sent to live at the house of a priest in Jutland, and studied at the free school of Aarhuus until he went up to the university of Copenhagen in 1800. At the close of his university life he made Icelandic his special study, until in 1805 he took the position of tutor in a house on the island of Langeland. The next three years were spent in the study of Shakespeare, Schiller and Fichte. His cousin, the philosopher Henrik Steffens, had returned to Copenhagen in 1802 full of the teaching of Schelling and his lectures and the early poetry of Öhlenschläger opened the eyes of Grundtvig to the new era in literature. His first work, *On the Songs in the Edda*, attracted no attention. Returning to Copenhagen in 1808 he achieved greater success with his *Northern Mythology*, and again in 1809–1811 with a long epic poem, the *Decline of the Heroic Life in the North*. The boldness of the theological views expressed in his first sermon in 1810 offended the ecclesiastical authorities, and he retired to a country parish as his father's assistant for a while. From 1811 to 1817 he published five or six works, of which the *Rhyme of Roskilde* is the most remarkable. From 1816 to 1819 he was editor of a polemical journal entitled *Dannevirke*, and in 1818 to 1822 appeared his Danish paraphrases (6 vols.) of Saxo Grammaticus and Snorri. During these years he was preaching against rationalism to an enthusiastic congregation in Copenhagen, but he accepted in 1821 the country living of Praestö, only to return to the metropolis the year after. In 1825 he published a pamphlet, *The Church's Reply*, against H. N. Clausen, who was professor of theology in the university of Copenhagen. Grundtvig was publicly prosecuted and fined, and for seven years he was forbidden to preach, years which he spent in publishing a collection of his theological works, in paying two visits to England, and in studying Anglo-Saxon. In 1832 he obtained permission to preach again, and in 1839 he became priest of the workhouse church of Vartov hospital, Copenhagen, a post he continued to hold until his death. In 1837–1841 he published *Songs for the Danish Church*, a rich collection of sacred poetry; in 1838 he brought out a selection of early Scandinavian verse; in 1840 he edited the Anglo-Saxon poem of the *Phoenix*, with a Danish translation. He visited England a third time in 1843. From 1844 until after the first German war Grundtvig took a very prominent part in politics. In 1861 he received the titular rank of bishop, but without a see. He went on writing occasional poems till 1866, and preached in the Vartov every Sunday until a month before his death. His preaching attracted large congregations, and he soon had a following. His hymn-book effected a great change in Danish church services, substituting the hymns of the national poets for the slow measures of the orthodox Lutherans. The chief characteristic of his theology was the substitution of the authority of the "living word" for the apostolic commentaries, and he desired to see each congregation a practically independent community. His patriotism was almost a part of his religion, and he established popular schools where the national poetry and history should form an essential part of the instruction. His followers are known as Grundtvigians. He was married three times, the last time in his seventy-sixth year. He died on the 2nd of September 1872. Grundtvig holds a unique position in the literature of his country; he has been styled the Danish Carlyle. He was above all things a man of action, not an artist; and the formless vehemence of his writings, which have had a great influence over his own countrymen, is hardly agreeable or intelligible to a foreigner. The best of his poetical works were published in a selection (7 vols., 1880–1889) by his eldest son, Svend Hersleb Grundtvig (1824–1883), who was an authority on Scandinavian antiquities, and made an admirable collection of old Danish poetry (*Danmarks gamle Folkeviser*, 1853–1883, 5 vols.; completed in 1891 by A. Olrik).

His correspondence with Ingemann was edited by S. Grundtvig (1882); his correspondence with Christian Molbech by L. Schröder (1888); see also F. Winkel Horn, *Grundtvigs Liv og Gjerning* (1883); and an article by F. Nielsen in Bricka's *Dansk Biografisk Lexikon*.

GRUNDY, SYDNEY (1848–), English dramatist, was born at Manchester on the 23rd of March 1848, son of Alderman Charles Sydney Grundy. He was educated at Owens College, Manchester, and was called to the bar in 1869, practising in Manchester until 1876. His farce, *A Little Change*, was produced at the Haymarket Theatre in 1872. He became well known as an adapter of plays, among his early successes in this direction being *The Snowball* (Strand Theatre, 1879) from *Oscar, ou le mari qui trompe sa femme* by MM. Scribe and Duvergne, and *In Honour Bound* (1886) from Scribe's *Une Chaîne*. In 1887 he made a popular success with *The Bells of Haslemere*, written with Mr H. Pettitt and produced at the Adelphi. In 1889–1890 he produced two ingenious original comedies, *A White Lie* (Court Theatre) and *A Fool's Paradise* (Gaiety Theatre), which had been played two years earlier at Greenwich as *The Mouse-Trap*. These were followed by *Sowing the Wind* (Comedy, 1893), *An Old Jew* (Garrick, 1894), and by an adaptation of Octave Feuillet's *Montjoye* as *A Bunch of Violets* (Haymarket, 1894). In 1894 he produced *The New Woman* and *The Slaves of the Ring*; in 1895, *The Greatest of These*, played by Mr and Mrs Kendal at the Garrick Theatre; *The Degenerates* (Haymarket, 1899), and *A Debt of Honour* (St James's 1900). Among Mr Grundy's most successful adaptations were the charming *Pair of Spectacles* (Garrick, 1890) from *Les Petits Oiseaux* of MM. Labiche and

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Delacour. Others were *A Village Priest* (Haymarket, 1890) from *Le Secret de la terreuse*, a melodrama by MM. Busnach and Cauvin; *A Marriage of Convenience* (Haymarket, 1897) from *Un Mariage de Louis XV*, by Alex. Dumas, père, *The Silver Key* (Her Majesty's, 1897) from his *Mlle de Belle-isle*, and *The Musqueteers* (1890) from the same author's novel; *Frocks and Frills* (Haymarket, 1902) from the *Doigts de fées* of MM. Scribe and Legouvé; *The Garden of Lies* (St James's Theatre, 1904) from Mr Justus Miles Forman's novel; *Business is Business* (His Majesty's Theatre, 1905), a rather free adaptation from Octave Mirbeau's *Les Affaires sont les affaires*; and *The Diplomatists* (Royalty Theatre, 1905) from *La Poudre aux yeux*, by Labiche.

GRUNDY, MRS, the name of an imaginary English character, who typifies the disciplinary control of the conventional "proprieties" of society over conduct, the tyrannical pressure of the opinion of neighbours on the acts of others. The name appears in a play of Thomas Morton, *Speed the Plough* (1798), in which one of the characters, Dame Ashfield, continually refers to what her neighbour Mrs Grundy will say as the criterion of respectability. Mrs Grundy is not a character in the play, but is a kind of "Mrs Harris" to Dame Ashfield.

GRUNER, GOTTLIEB SIGMUND (1717–1778), the author of the first connected attempt to describe in detail the snowy mountains of Switzerland. His father, Johann Rudolf Gruner (1680–1761), was pastor of Trachselwald, in the Bernese Emmenthal (1705), and later (1725) of Burgdorf, and a great collector of information relating to historical and scientific matters; his great *Thesaurus topographico-historicus totius ditionis Bernensis* (4 vols. folio, 1729–1730) still remains in MS., but in 1732 he published a small work entitled *Deliciae urbis Bernae*, while he possessed an extensive cabinet of natural history objects. Naturally such tastes had a great influence on the mind of his son, who was born at Trachselwald, and educated by his father and at the Latin school at Burgdorf, not going to Berne much before 1736, when he published a dissertation on the use of fire by the heathen. In 1739 he qualified as a notary, in 1741 became the archivist of Hesse-Homburg, and in 1743 accompanied Prince Christian of Anhalt-Schaumburg to Silesia and the university of Halle. He returned to his native land before 1749, when he obtained a post at Thorberg, being transferred in 1764 to Landshut and Fraubrunnen. It was in 1760 that he published in 3 vols. at Berne his chief work, *Die Eisgebirge des Schweizerlandes* (bad French translation by M. de Kéralio, Paris, 1770). The first two volumes are filled by a detailed description of the snowy Swiss mountains, based not so much on personal experience as on older works, and a very large number of communications received by Gruner from numerous friends; the third volume deals with glaciers in general, and their various properties. Though in many respects imperfect, Gruner's book sums up all that was known on the subject in his day, and forms the starting-point for later writers. The illustrations are very curious and interesting. In 1778 he republished (nominally in London, really at Berne) much of the information contained in his larger work, but thrown into the form of letters, supposed to be written in 1776 from various spots, under the title of *Reisen durch die merkwürdigsten Gegenden Helvetiens* (2 vols.). (W. A. B. C.)

GRÜNEWALD, MATHIAS. The accounts which are given of this German painter, a native of Aschaffenburg, are curiously contradictory. Between 1518 and 1530, according to statements adopted by Waagen and Passavant, he was commissioned by Albert of Brandenburg, elector and archbishop of Mainz, to produce an altarpiece for the collegiate church of St Maurice and Mary Magdalen at Halle on the Saale; and he acquitted himself of this duty with such cleverness that the prelate in after years caused the picture to be rescued from the Reformers and brought back to Aschaffenburg. From one of the churches of that city it was taken to the Pinakothek of Munich in 1836. It represents St Maurice and Mary Magdalen between four saints, and displays a style so markedly characteristic, and so like that of Lucas Cranach, that Waagen was induced to call Grünewald Cranach's master. He also traced the same hand and technical execution in the great altarpieces of Annaberg and Heilbronn, and in various panels exhibited in the museums of Mainz, Darmstadt, Aschaffenburg, Vienna and Berlin. A later race of critics, declining to accept the statements of Waagen and Passavant, affirm that there is no documentary evidence to connect Grünewald with the pictures of Halle and Annaberg, and they quote Sandrart and Bernhard Jobin of Strassburg to show that Grünewald is the painter of pictures of a different class. They prove that he finished before 1516 the large altarpiece of Issenheim, at present in the museum of Colmar, and starting from these premises they connect the artist with Altdorfer and Dürer to the exclusion of Cranach. That a native of the Palatinate should have been asked to execute pictures for a church in Saxony can scarcely be accounted strange, since we observe that Hans Baldung (Grün) was entrusted with a commission of this kind. But that a painter of Aschaffenburg should display the style of Cranach is strange and indeed incredible, unless vouched for by first-class evidence. In this case documents are altogether wanting, whilst on the other hand it is beyond the possibility of doubt, even according to Waagen, that the altarpiece of Issenheim is the creation of a man whose teaching was altogether different from that of the painter of the pictures of Halle and Annaberg. The altarpiece of Issenheim is a fine and powerful work, completed as local records show before 1516 by a Swabian, whose distinguishing mark is that he followed the traditions of Martin Schongauer, and came under the influence of Altdorfer and Dürer. As a work of art the altarpiece is important, being a polyptych of eleven panels, a carved central shrine covered with a double set of wings, and two side pieces containing the Temptation of St Anthony, the hermits Anthony and Paul in converse, the Virgin adored by Angels, the Resurrection, the Annunciation, the Crucifixion, St Sebastian, St Anthony, and the Marys wailing over the dead body of Christ. The author of these compositions is also the painter of a series of monochromes described by Sandrart in the Dominican convent, and now in part in the Staalhof at Frankfort, and a Resurrection in the museum of Basel, registered in Amerbach's inventory as the work of Grünewald.

GRUTER (or GRUYTÈRE), **JAN** (1560–1627), a critic and scholar of Dutch parentage by his father's side and English by his mother's, was born at Antwerp on the 3rd of December 1560. To avoid religious persecution his parents while he was still young came to England; and for some years he prosecuted his studies at Cambridge, after which he went to Leiden, where he graduated M.A. In 1586 he was appointed professor of history at Wittenberg, but as he refused to subscribe the *formula concordiae* he was unable to retain his office. From 1589 to 1592 he taught at Rostock, after which he went to Heidelberg, where in 1602 he was appointed librarian to the university. He died at Heidelberg on the 20th of September 1627.

Gruter's chief works were his *Inscriptiones antiquae totius orbis Romani* (2 vols., Heidelberg, 1603), and *Lampas, sive fax artium liberalium* (7 vols., Frankfort, 1602–1634).

GRUYÈRE (Ger. *Greyerz*), a district in the south-eastern portion of the Swiss canton of Fribourg, famed for its cattle and its cheese, and the original home of the "Ranz des Vaches," the melody by which the herdsmen call their cows home at milking time. It is composed of the middle reach (from Montbovon to beyond Bulle) of the Sarine or Saane valley, with its tributary glens of the Hongrin (left), the Jogne (right) and the Trême (left), and is a delightful pastoral region (in 1901 it contained 17,364 cattle). It forms an administrative district of the canton of Fribourg, its population in 1900 being 23,111, mainly French-speaking and Romanists. From Montbovon (11 m. by rail from Bulle) there are mountain railways leading S.W. past Les Avants to Montreux (14 m.), and E. up the Sarine valley past Château d'Oex to Saanen or Gessenay (14 m.), and by a tunnel below a low pass to the Simme valley and Spiez on the Lake of Thun. The modern capital of the district is the small town of Bulle [Ger. *Boll*], with a 13th-century castle and in 1900 3330 inhabitants, French-speaking and Romanists. But

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the historical capital is the very picturesque little town of *Gruyères* (which keeps its final "s" in order to distinguish it from the district), perched on a steep hill (S.E. of Bulle) above the left bank of the Sarine, and at a height of 2713 ft. above the sea-level. It is only accessible by a rough carriage road, and boasts of a very fine old castle, at the foot of which is the solitary street of the town, which in 1900 had 1389 inhabitants.

The castle was the seat of the counts of the Gruyère, who are first mentioned in 1073. The name is said to come from the word *gruyer*, meaning the officer of woods and forests, but the counts bore the canting arms of a crane (*grue*), which are seen all over the castle and the town. That valiant family ended (in the legitimate line) with Count Michel (d. 1575) whose extravagance and consequent indebtedness compelled him in 1555 to sell his domains to Bern and Fribourg. Bern took the upper Sarine valley (it still keeps Saanen at its head, but in 1798 lost the Pays d'En-Haut to the canton du Léman, which in 1803 became the canton of Vaud). Fribourg took the rest of the county, which it added to Bulle and Albeuve (taken in 1537 from the bishop of Lausanne), and to the lordship of Jaun in the Jaun or Jogne valley (bought in 1502–1504 from its lords), in order to form the present administrative district of Gruyère, which is not co-extensive with the historical county of that name.

See the materials collected by J. J. Hisely and published in successive vols. of the *Mémoires et documents de la suisse romande . . . introd. à l'hist.* (1851); *Histoire* (2 vols., 1855–1857); and *Monuments de l'histoire* (2 vols., 1867–1869); K. V. von Bonstetten, *Briefe über ein schweiz. Hirtenland* (1791) (Eng. trans., 1784); J. Reichlen, *La Gruyère illustrée* (1890), seq.; H. Raemy, *La Gruyère* (1867); and *Les Alpes fribourgeoises*, by many authors (Lausanne, 1908). (W. A. B. C.)

GRYNAEUS (or GRYNER), **JOHANN JAKOB** (1540–1617), Swiss Protestant divine, was born on the 1st of October 1540 at Bern. His father, Thomas (1512–1564), was for a time professor of ancient languages at Basel and Bern, but afterwards became pastor of Rötteln in Baden. He was nephew of the more eminent Simon Grynaeus (*q.v.*). Johann was educated at Basel, and in 1559 received an appointment as curate to his father. In 1563 he proceeded to Tübingen for the purpose of completing his theological studies, and in 1565 he returned to Rötteln as successor to his father. Here he felt compelled to abjure the Lutheran doctrine of the Lord's Supper, and to renounce the *formula concordiae*. Called in 1575 to the chair of Old Testament exegesis at Basel, he became involved in unpleasant controversy with Simon Sulzer and other champions of Lutheran orthodoxy; and in 1584 he was glad to accept an invitation to assist in the restoration of the university of Heidelberg. Returning to Basel in 1586, after Simon Sulzer's death, as *antistes* or superintendent of the church there and as professor of the New Testament, he exerted for upwards of twenty-five years a considerable influence upon both the church and the state affairs of that community, and acquired a wide reputation as a skilful theologian of the school of Ulrich Zwingli. Amongst other labours he helped to reorganize the gymnasium in 1588. Five years before his death he became totally blind, but continued to preach and lecture till his death on the 13th of August 1617.

His many works include commentaries on various books of the Old and New Testament, *Theologica theoremata et problemata* (1588), and a collection of patristic literature entitled *Monumenta S. patrum orthodoxographa* (2 vols., fol., 1569).

GRYNAEUS, SIMON (1493–1541), German scholar and theologian of the Reformation, son of Jacob Gryner, a Swabian peasant, was born in 1493 at Vehringen, in Hohenzollern-Sigmaringen. He adopted the name Grynaeus from the epithet of Apollo in Virgil. He was a schoolfellow with Melanchthon at Pforzheim, whence he went to the university of Vienna, distinguishing himself there as a Latinist and Grecian. His appointment as rector of a school at Buda was of no long continuance; his views excited the zeal of the Dominicans and he was thrown into prison. Gaining his freedom at the instance of Hungarian magnates, he visited Melanchthon at Wittenberg, and in 1524 became professor of Greek at the university of Heidelberg, being in addition professor of Latin from 1526. His Zwinglian view of the Eucharist disturbed his relations with his Catholic colleagues. From 1526 he had corresponded with Oecolampadius, who in 1529 invited him to Basel, which Erasmus had just left. The university being disorganized, Grynaeus pursued his studies, and in 1531 visited England for research in libraries. A commendatory letter from Erasmus gained him the good offices of Sir Thomas More. He returned to Basel charged with the task of collecting the opinions of continental reformers on the subject of Henry VIII.'s divorce, and was present at the death of Oecolampadius (Nov. 24, 1531). He now, while holding the chair of Greek, was appointed extraordinary professor of theology, and gave exegetical lectures on the New Testament. In 1534 Duke Ulrich called him to Württemberg in aid of the reformation there, as well as for the reconstitution of the university of Tübingen, which he carried out in concert with Ambrosius Blarer of Constanz. Two years later he had an active hand in the so-called First Helvetic Confession (the work of Swiss divines at Basel in January 1536); also in the conferences which urged the Swiss acceptance of the Wittenberg Concord (1536). At the Worms conference (1540) between Catholics and Protestants he was the sole representative of the Swiss churches, being deputed by the authorities of Basel. He was carried off suddenly in his prime by the plague at Basel on the 1st of August 1541. A brilliant scholar, a mediating theologian, and personally of lovable temperament, his influence was great and wisely exercised. Erasmus and Calvin were among his correspondents. His chief works were Latin versions of Plutarch, Aristotle and Chrysostom.

His son SAMUEL (1539–1599) was professor of jurisprudence at Basel. His nephew THOMAS (1512?–1564) was professor at Basel and minister in Baden, and left four distinguished sons of whom JOHANN JAKOB (1540–1617) was a leader in the religious affairs of Basel. The last of the direct descendants of Simon Grynaeus was his namesake SIMON (1725–1799), translator into German of French and English anti-deistical works, and author of a version of the Bible in modern German (1776).

See Bayle's *Dictionnaire*; W. T. Streuber in Hauck's *Realencyklopädie* (1899); and for bibliography, Streuber's *S. Grynaei epistolae* (1847). (A. Go.*)

GRYPHIUS, ANDREAS (1616–1664), German lyric poet and dramatist, was born on the 11th of October 1616, at Grossglogau in Silesia, where his father was a clergyman. The family name was Greif, latinized, according to the prevailing fashion, as Gryphius. Left early an orphan and driven from his native town by the troubles of the Thirty Years' War, he received his schooling in various places, but notably at Fraustadt, where he enjoyed an excellent classical education. In 1634 he became tutor to the sons of the eminent jurist Georg von Schönborn (1579–1637), a man of wide culture and considerable wealth, who, after filling various administrative posts and writing many erudite volumes on law, had been rewarded by the emperor Ferdinand II. with the title and office of imperial count-palatine (*Pfalzgraf*). Schönborn, who recognized Gryphius's genius, crowned him *poeta laureatus*, gave him the diploma of master of philosophy, and bestowed on him a patent of nobility, though Gryphius never used the title. A month later, on the 23rd of December 1637, Schönborn died; and next year Gryphius went to continue his studies at Leiden, where he remained six years, both hearing and delivering lectures. Here he fell under the influence of the great Dutch dramatists, Pieter Cornelissen Hooft (1581–1647) and Joost van den Vondel (1587–1679), who largely determined the character of his later dramatic works. After travelling in France, Italy and South Germany, Gryphius settled in 1647 at Fraustadt, where he began his dramatic work, and in 1650 was appointed syndic of Glogau, a post he held until his death on the 16th of July 1664. A short time previously he had been admitted under the title of "The Immortal" into the *Fruchtbringende Gesellschaft*, a literary society, founded in 1617 by Ludwig, prince of Anhalt-Köthen on the model of the Italian academies.

Gryphius was a man of morbid disposition, and his melancholy temperament, fostered by the misfortunes of his childhood, is largely reflected in his lyrics, of which the most famous are the

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Kirchhofsgedanken (1656). His best works are his comedies, one of which, *Absurda Comica, oder Herr Peter Squentz* (1663), is evidently based on the comic episode of Pyramus and Thisbe in *The Midsummer Night's Dream*. *Die geliebte Dornrose* (1660), which is written in a Silesian dialect, contains many touches of natural simplicity and grace, and ranks high among the comparatively small number of German dramas of the 17th century. *Horribilicribrifax* (1663), founded on the *Miles gloriosus* of Plautus, is a rather laboured attack on pedantry. Besides these three comedies, Gryphius wrote five tragedies. In all of them his tendency is to become wild and bombastic, but he had the merit of at least attempting to work out artistically conceived plans, and there are occasional flashes both of passion and of imagination. His models seem to have been Seneca and Vondel. He had the courage, in *Carolus Stuardus* (1640) to deal with events of his own day; his other tragedies are *Leo Armenius* (1646); *Katharina von Georgien* (1657), *Cardenio und Celinde* (1657) and *Papinianus* (1663). No German dramatic writer before him had risen to so high a level, nor had he worthy successors until about the middle of the 18th century.

A complete edition of Gryphius's dramas and lyric poetry has been published by H. Palm in the series of the Stuttgart Literarische Verein (3 vols., 1878, 1882, 1884). Volumes of selected works will be found in W. Muller's *Bibliothek der deutschen Dichter des 17ten Jahrhunderts* (1822) and in J. Tittmann's *Deutsche Dichter des 17ten Jahrhunderts* (1870). There is also a good selection by H. Palm in Kurschner's *Deutsche Nationalliteratur*.

See O. Klopp, *Andreas Gryphius als Dramatiker* (1851); J. Hermann, *Über Andreas Gryphius* (1851); T. Wissowa, *Beitrage zur Kenntnis von Andreas Gryphius' Leben und Schriften* (1876); J. Wysocki, *Andreas Gryphius et la tragédie allemande au XVIIe siècle*; and V. Mannheimer, *Die Lyrik des Andreas Gryphius* (1904).

GUACHARO (said to be an obsolete Spanish word signifying one that cries, moans or laments loudly), the Spanish-American name of what English writers call the oil-bird, the *Steatornis caripensis* of ornithologists, a very remarkable bird, first described by Alexander von Humboldt (*Voy. aux rég. équinoxiales* i. 413, Eng. trans. iii. 119; *Obs. Zoologie* ii. 141, pl. xliv.) from his own observation and from examples obtained by Aimé J. A. Bonpland, on the visit of those two travellers, in September 1799, to a cave near Caripé (at that time a monastery of Aragonese Capuchins) some forty miles S.E. of Cumaná on the northern coast of South America. A few years later it was discovered, says Latham (*Gen. Hist. Birds*, 1823, vii. 365), to inhabit Trinidad, where it appears to bear the name of *Diablotin*,[1] but by the receipt of specimens procured at Sarayacu in Peru, Cajamarca in the Peruvian Andes, and Antioquia in Colombia (*Proc. Zool. Society*, 1878, pp. 130, 140; 1879, p. 532), its range has been shown to be much greater than had been supposed. The singularity of its structure, its curious habits, and its peculiar economical value have naturally attracted no little attention from zoologists. First referring it to the genus *Caprimulgus*, its original describer soon saw that it was no true goatsucker. It was subsequently separated as forming a subfamily, and has at last been regarded as the type of a distinct family, *Steatornithidae*—a view which, though not put forth till 1870 (*Zool. Record*, vi. 67), seems now to be generally deemed correct. Its systematic position, however, can scarcely be considered settled, for though on the whole its predominating alliance may be with the *Caprimulgidae*, nearly as much affinity may be traced to the *Strigidae*, while it possesses some characters in which it differs from both (*Proc. Zool. Society*, 1873, pp. 526-535). About as big as a crow, its plumage exhibits the blended tints of chocolate-colour and grey, barred and pencilled with dark-brown or black, and spotted in places with white, that prevail in the two families just named. The beak is hard, strong and deeply notched, the nostrils are prominent, and the gape is furnished with twelve long hairs on each side. The legs and toes are comparatively feeble, but the wings are large. In habits the guacharo is wholly nocturnal, slumbering by day in deep and dark caverns which it frequents in vast numbers. Towards evening it arouses itself, and, with croaking and clattering which has been likened to that of castanets, it approaches the exit of its retreat, whence at nightfall it issues in search of its food, which, so far as is known, consists entirely of oily nuts or fruits, belonging especially to the genera *Achras*, *Aiphanas*, *Laurus* and *Fsichotria*, some of them sought, it would seem, at a very great distance, for Funck (*Bull. Acad. Sc. Bruxelles* xi. pt. 2, pp. 371-377) states that in the stomach of one he obtained at Caripé he found the seed of a tree which he believed did not grow nearer than 80 leagues. The hard, indigestible seed swallowed by the guacharo are found in quantities on the floor and the ledges of the caverns it frequents, where many of them for a time vegetate, the plants thus growing being etiolated from want of light, and, according to travellers, forming a singular feature of the gloomy scene which these places present. The guacharo is said to build a bowl-like nest of clay, in which it lays from two to four white eggs, with a smooth but lustreless surface, resembling those of some owls. The young soon after they are hatched become a perfect mass of fat, and while yet in the nest are sought by the Indians, who at Caripé, and perhaps elsewhere, make a special business of taking them and extracting the oil they contain. This is done about midsummer, when by the aid of torches and long poles many thousands of the young birds are slaughtered, while their parents in alarm and rage hover over the destroyers' heads, uttering harsh and deafening cries. The grease is melted over fires kindled at the cave's mouth, run into earthen pots, and preserved for use in cooking as well as for the lighting of lamps. It is said to be pure and limpid, free from any disagreeable taste or smell, and capable of being kept for a year without turning rancid. In Trinidad the young are esteemed a great delicacy for the table by many, though some persons object to their peculiar scent, which resembles that of a cockroach (*Blatta*), and consequently refuse to eat them. The old birds also, according to E. C. Taylor (*Ibis*, 1864, p. 90), have a strong crow-like odour. But one species of the genus *Steatornis* is known.

In addition to the works above quoted valuable information about this curious bird may be found under the following references: L'Herminier, *Ann. Sc. Nat.* (1836), p. 60, and *Nouv. Ann. Mus.* (1838), p. 221; Hautessier, *Rev. Zool.* (1838), p. 164; J. Müller, *Monatsb. Berl. Acad.* (1841), p. 172, and *Archiv für Anat.* (1862), pp. 1-11; des Murs, *Rev. zool.* (1843), p. 32, and *Col. Orn.* pp. 260-263; Blanchard, *Ann. Mus.* (1859), xi. pl. 4, fig. 30; König-Warthausen, *Journ. für Orn.* (1868), pp. 384-387; Goering, *Verpaaia* (1869), pp. 124-128; Murie, *Ibis* (1873), pp. 81-86. (A. N.)

GUACO, Huaco or Guao, also Vejuco and Bejuco, terms applied to various Central and South American and West Indian plants, in repute for curative virtues. The Indians and negroes of Colombia believe the plants known to them as guaco to have been so named after a species of kite, thus designated in imitation of its cry, which they say attracts to it the snakes that serve it principally for food; they further hold the tradition that their antidotal qualities were discovered through the observation that the bird eats of their leaves, and even spreads the juice of the same on its wings, during contests with its prey. The disputes that have arisen as to what is "the true guaco" are to be attributed mainly to the fact that the names of the American Indians for all natural objects are generic, and their genera not always in coincidence with those of naturalists. Thus any twining plant with a heart-shaped leaf, white and green above and purple beneath, is called by them guaco (R. Spruce, in Howard's *Neueva Quinologia*, "Cinchona succirubra," p. 22, note). What is most commonly recognized in Colombia as guaco, or *Vejuco del guaco*, would appear to be *Mikania Guaco* (Humboldt and Bonpland, *Pl. équinox.* ii. 84, pl. 105, 1809), a climbing Composite plant of the tribe *Eupatoriaceae*, affecting moist and shady situations, and having a much-branched and deep-growing root, variegated, serrate, opposite leaves and dull-white flowers, in axillary clusters. The whole plant emits a disagreeable odour. It is stated that the Indians of Central America, after having "guaconized" themselves, *i.e.* taken guaco, catch with impunity the most dangerous snakes, which writhe in their hands as though touched by a hot iron (B. Seemann, *Hooker's Journ. of Bot.* v. 76, 1853). The odour alone of guaco

[1] Not to be confounded with the bird so called in the French Antilles, which is a petrel (*Oestrelata*).

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has been said to cause in snakes a state of stupor and torpidity; and Humboldt, who observed that the near approach of a rod steeped in guaco-juice was obnoxious to the venomous *Coluber corallinus*, was of opinion that inoculation with it imparts to the perspiration an odour which makes reptiles unwilling to bite. The drug is not used in modern therapeutics.

GUADALAJARA, an inland city of Mexico and capital of the state of Jalisco, 275 m. (direct) W.N.W. of the Federal capital, in lat. 20° 41′ 10″ N., long. 103° 21′ 15″ W. Pop. (1895) 83,934; (1900) 101,208. Guadalajara is served by a short branch of the Mexican Central railway from Irapuato. The city is in the Antemarac valley near the Rio Grande de Santiago, 5092 ft. above sea-level. Its climate is dry, mild and healthy, though subject to sudden changes. The city is well built, with straight and well-paved streets, numerous plazas, public gardens and shady promenades. Its public services include tramways and electric lighting, the Juanacatlán falls of the Rio Grande near the city furnishing the electric power. Guadalajara is an episcopal see, and its cathedral, built between 1571 and 1618, is one of the largest and most elaborately decorated churches in Mexico. The government palace, which like the cathedral faces upon the *plaza mayor*, is generally considered one of the finest specimens of Spanish architecture in Mexico. Other important edifices and institutions are the university, with its schools of law and medicine, the mint, built in 1811, the modern national college and high schools, a public library of over 28,000 volumes, an episcopal seminary, an academy of fine arts, the Teatro Degollado, and the large modern granite building of the penitentiary. There are many interesting churches and eleven conventual establishments in the city. Charitable institutions of a high character are also prominent, among which are the Hospicio, which includes an asylum for the aged, infirm, blind, deaf and dumb, foundlings and orphans, a primary school for both sexes, and a girls' training school, and the Hospital de San Miguel de Belen, which is a hospital, an insane asylum, and a school for little children. One of the most popular public resorts of the city is the *Paseo*, a beautiful drive and promenade extending along both banks of the Rio San Juan de Dios for 1½ m. and terminating in the *alameda*, or public garden. The city has a good water-supply, derived from springs and brought in through an aqueduct 8 m. long. Guadalajara is surrounded by a fertile agricultural district and is an important commercial town, but the city is chiefly distinguished as the centre of the iron, steel and glass industries of Mexico. It is also widely known for the artistic pottery manufactured by the Indians of the city and of its suburb, San Pedro. Among other prominent industries are the manufacture of cotton and woollen goods, leather, furniture, hats and sweetmeats. Guadalajara was founded in 1531 by Nuño de Guzman, and became the seat of a bishop in 1549. The Calderon bridge near the city was the scene of a serious defeat of the revolutionists under Hidalgo in January 1811. The severe earthquake of the 31st of May 1818 partially destroyed the two cathedral steeples; and that of the 11th of March 1875 damaged many of the larger buildings. The population includes large Indian and mestizo elements.

GUADALAJARA, a province of central Spain, formed in 1833 of districts taken from New Castile; bounded on the N. by Segovia, Soria and Saragossa, E. by Saragossa and Teruel, S. by Cuenca and W. by Madrid. Pop. (1900) 200,186; area, 4676 sq. m. Along the northern frontier of Guadalajara rise the lofty Guadarrama mountains, culminating in the peaks of La Cebollera (6055 ft.) and Ocejon (6775 ft.); the rest of the province, apart from several lower ranges in the east, belongs to the elevated plateau of New Castile, and has a level or slightly undulating surface, which forms the upper basin of the river Tagus, and is watered by its tributaries the Tajuña, Henares, Jarama and Gallo. The climate of this region, as of Castile generally, is marked by the extreme severity of its winter cold and summer heat; the soil varies very much in quality, but is fertile enough in many districts, notably the cornlands of the Alcarria, towards the south. Few of the cork and oak forests which formerly covered the mountains have escaped destruction; and the higher tracts of land are mainly pasture for the sheep and goats which form the principal wealth of the peasantry. Grain, olive oil, wine, saffron, silk and flax are produced, but agriculture makes little progress, owing to defective communications and unscientific farming. In 1903, the only minerals worked were common salt and silver, and the total output of the mines was valued at £25,000. Deposits of iron, lead and gold also exist and were worked by the Romans; but their exploitation proved unprofitable when renewed in the 19th century. Trade is stagnant and the local industries are those common to almost all Spanish towns and villages, such as the manufacture of coarse cloth and pottery. The Madrid-Saragossa railway traverses the province for 70 m.; the roads are ill-kept and insufficient. Guadalajara (11,144) is the capital, and the only town with more than 5000 inhabitants; Molina de Aragon, a fortified town built at the foot of the Parameras de Molina (2500–3500 ft.), and on the right bank of the Gallo, a tributary of the Tagus, is of some importance as an agricultural centre. Sigüenza, on the railway, is an episcopal city, with a fine Romanesque cathedral dating from the 11th century. It is probably the ancient *Segontia*, founded in 218 B.C. by refugees from Saguntum. The population of the province, which numbers only 42 per sq. m., decreased slightly between 1870 and 1900, and extreme poverty compels many families to emigrate (see also CASTILE).

GUADALAJARA, the capital of the Spanish province of Guadalajara, on the left bank of the river Henares, and on the Madrid-Saragossa railway, 35 m. E.N.E. of Madrid. Pop. (1900) 11,144. Guadalajara is a picturesque town, occupying a somewhat sterile plain, 2100 ft. above the sea. A Roman aqueduct and the Roman foundations of the bridge built in 1758 across the Henares bear witness to its antiquity. Under Roman and Visigothic rule it was known as *Arriaca* or *Caraca*; its present name, which sometimes appears in medieval chronicles as *Godelfare*, represents the *Wad-al-hajarah*, or "Valley of Stones," of the Moors, who occupied the town from 714 until 1081, when it was captured by Alvar Yañez de Minaya, a comrade of the more famous Cid. The church of Santa Maria contains the image of the "Virgin of Battles," which accompanied Alphonso VI. of Castile (1072–1109) on his campaigns against the Moors; and there are several other ancient and interesting churches in Guadalajara, besides two palaces, dating from the 15th century, and built with that blend of Christian and Moorish architecture which Spaniards call the *Mudéjar* style. The more important of these is the palace of the ducal house del Infantado, formerly owned by the Mendoza family, whose *panteon*, or mausoleum, added between 1696 and 1720 to the 13th-century church of San Francisco, is remarkable for the rich sculpture of its tombs. The town and provincial halls date from 1585, and the college of engineers was originally built by Philip V. early in the 18th century, as a cloth factory. Manufactures of soap, leather, woollen fabrics and bricks have superseded the original cloth-weaving industry for which Guadalajara was long celebrated; there is also a considerable trade in agricultural produce.

GUADALQUIVIR (ancient *Baetis*, Moorish *Wadi al Kebir*, "the Great River"), a river of southern Spain. What is regarded as the main stream rises 4475 ft. above sea-level between the Sierra de Cazorla and Sierra del Pozo, in the province of Jaen. It does not become a large river until it is joined by the Guadiana Menor (Guadianamenor) on the left, and the Guadalimar on the right. Lower down it receives many tributaries, the chief being the Genil or Jenil, from the left. The general direction of the river is west by south, but a few miles above Seville it changes to south by west. Below Coria it traverses the series of broad fens known as Las Marismas, the greatest area of swamp in the Iberian Peninsula. Here it forms two subsidiary channels, the western 31 M., the eastern 12 m. long, which rejoin the main stream on the borders of the province of Cadiz. Below Sanlúcar the river enters the Atlantic after a total course of 360 m. It drains an area of 21,865 sq. m. Though the shortest of the great rivers of the peninsula, it is the only one which flows at all seasons

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with a full stream, being fed in winter by the rains, in summer by the melted snows of the Sierra Nevada. In the time of the Moors it was navigable up to Cordova, but owing to the accumulation of silt in its lower reaches it is now only navigable up to Seville by vessels of 1200 to 1500 tons.

GUADELOUPE, a French colony in the West Indies, lying between the British islands of Montserrat on the N., and Dominica on the S., between 15° 50′ and 16° 20′ N. and 61° 31′ and 61° 50′ W. It consists of two entirely distinct islands, separated by a narrow arm of the sea, Rivière Salée (Salt river), varying from 100 ft. to 400 ft. in width and navigable for small vessels. The western island, a rugged mass of ridges, peaks and lofty uplands, is called Basse-Terre, while the eastern and smaller island, the real low-land, is known as Grande-Terre. A sinuous ridge runs through Basse-Terre from N. to S. In the north-west rises the peak of Grosse Montagne (2370 ft.), from which sharp spurs radiate in all directions; near the middle of the west coast are the twin heights of Les Mamelles (2536 ft. and 2368 ft.). Farther south the highest elevation is attained in La Soufrière (4900 ft.). In 1797 this volcano was active, and in 1843 its convulsions laid several towns in ruins; but a few thermal springs and solfataras emitting vapour are now its only signs of activity. The range terminates in the extreme south in the jagged peak of Caraibe (2300 ft.). Basse-Terre is supremely beautiful, its cloud-capped mountains being clothed with a mantle of luxuriant vegetation. On Grande-Terre the highest elevation is only 450 ft., and this island is the seat of extensive sugar plantations. It consists of a plain composed mainly of limestone and a conglomerate of sand and broken shells known as *maconne de bon dieu*, much used for building. The bay between the two sections of Guadeloupe on the north is called Grand Cul-de-Sac Marin, that on the south being Petit Cul-de-Sac Marin. Basse-Terre (364 sq. m.) is 28 m. long by 12 m. to 15 m. wide; Grande-Terre (255 sq. m.) is 22 m. long from N. to S., of irregular shape, with a long peninsula, Chateaux Point, stretching from the south-eastern extremity. Basse-Terre is watered by a considerable number of streams, most of which in the rainy season are liable to sudden floods (locally called *galions*), but Grande-Terre is practically destitute of springs, and the water-supply is derived almost entirely from ponds and cisterns.

The west half of the island consists of a foundation of old eruptive rocks upon which rest the recent accumulations of the great volcanic cones, together with mechanical deposits derived from the denudation of the older rocks. Grande-Terre on the other hand, consists chiefly of nearly horizontal limestones lying conformably upon a series of fine tuffs and ashes, the whole belonging to the early part of the Tertiary system (probably Eocene and Oligocene). Occasional deposits of marl and limestone of late Pliocene age rest unconformably upon these older beds; and near the coast there are raised coral reefs of modern date.

The mean annual temperature is 78° F., and the minimum 61° F., and the maximum 101° F. From July to November heavy rains fall, the annual average on the coast being 86 in., while in the interior it is much greater. Guadeloupe is subject to terrible storms. In 1825 a hurricane destroyed the town of Basse-Terre, and Grand Bourg in Marie Galante suffered a like fate in 1865. The soil is rich and fruitful, sugar having long been its staple product. The other crops include cereals, cocoa, cotton, manioc, yams and rubber; tobacco, vanilla, coffee and bananas are grown, but in smaller quantities. Over 30% of the total area is under cultivation, and of this more than 50% is under sugar. The centres of this industry are St Anne, Pointe-à-Pitre and Le Moule, where there are well-equipped *usines*, and there is also a large *usine* at Basse-Terre. The forests, confined to the island of Basse-Terre, are extensive and rich in valuable woods, but, being difficult of access, are not worked. Salt and sulphur are the only minerals extracted, and in addition to the sugar *usines*, there are factories for the making of rum, liqueurs, chocolate, besides fruit-canning works and tanneries. France takes most of the exports; and next to France, the United States, Great Britain and India are the countries most interested in the import trade.

The inhabitants of Guadeloupe consist of a few white officials and planters, a few East Indian immigrants from the French possessions in India, and the rest negroes and mulattoes. These mulattoes are famous for their grace and beauty of both form and feature. The women greatly outnumber the men, and there is a very large percentage of illegitimate births. Pop. (1900) 182,112.

The governor is assisted by a privy council, a director of the interior, a procurator-general and a paymaster, and there is also an elected legislative council of 30 members. The colony forms a department of France and is represented in the French parliament by a senator and two deputies. Political elections are very eagerly contested, the mulatto element always striving to gain the preponderance of power.

The seat of government, of the Apostolic administration and of the court of appeal is at Basse-Terre (7762), which is situated on the south-west coast of the island of that name. It is a picturesque, healthy town standing on an open roadstead. Pointe-à-Pitre (17,242), the largest town, lies in Grande-Terre near the mouth of the Rivière Salée. Its excellent harbour has made it the chief port and commercial capital of the colony. Le Moule (10,378) on the east coast of Grande-Terre does a considerable export trade in sugar, despite its poor harbour. Of the other towns, St Anne (9497), Morne à l'Eau (8442), Petit Canal (6748), St François (5265), Petit Bourg (5110) and Trois Rivières (5016), are the most important.

Round Guadeloupe are grouped its dependencies, namely, La Desirade, 6 m. E., a narrow rugged island 10 sq. m. in area; Marie Galante 16 m. S.E. Les Saintes, a group of seven small islands, 7 m. S., one of the strategic points of the Antilles, with a magnificent and strongly fortified naval harbour; St Martin, 142 m. N.N.W.; and St Bartholomew, 130 m. N.N.W.

History.—Guadeloupe was discovered by Columbus in 1493, and received its name in honour of the monastery of S. Maria de Guadalupe at Estremadura in Spain. In 1635 l'Olive and Duplessis took possession of it in the name of the French Company of the Islands of America, and l'Olive exterminated the Caribs with great cruelty. Four chartered companies were ruined in their attempts to colonize the island, and in 1674 it passed into the possession of the French crown and long remained a dependency of Martinique. After unsuccessful attempts in 1666, 1691 and 1703, the British captured the island in 1759, and held it for four years. Guadeloupe was finally separated from Martinique in 1775, but it remained under the governor of the French Windward Islands. In 1782 Rodney defeated the French fleet near the island, and the British again obtained possession in April 1794, but in the following summer they were driven out by Victor Hugues with the assistance of the slaves whom he had liberated for the purpose. In 1802 Bonaparte, then first consul, sent an expedition to the island in order to re-establish slavery, but, after a heroic defence, many of the negroes preferred suicide to submission. During the Hundred Days in 1810, the British once more occupied the island, but, in spite of its cession to Sweden by the treaty of 1813 and a French invasion in 1814, they did not withdraw till 1816. Between 1816 and 1825 the code of laws peculiar to the island was introduced. Municipal institutions were established in 1837; and slavery was finally abolished in 1848.

GUADET, MARGUERITE ÉLIE (1753–1794), French Revolutionist, was born at St Émilion near Bordeaux on the 20th of July 1758. When the Revolution broke out he had already gained a reputation as a brilliant advocate at Bordeaux. In 1790 he was made administrator of the Gironde and in 1791 president of the criminal tribunal. In this year he was elected to the Legislative Assembly as one of the brilliant group of deputies known subsequently as Girondins or Girondists. As a supporter of the constitution of 1791 he joined the Jacobin club, and here and in the Assembly became an eloquent advocate of all the measures directed against real or supposed traitors to the constitution. He bitterly attacked the ministers of Louis XVI., and was largely instrumental in forcing the king to accept the Girondist ministry of the 15th of March 1792. He was

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an ardent advocate of the policy of forcing Louis XVI. into harmony with the Revolution; moved (May 3) for the dismissal of the king's non-juring confessor, for the banishment of all non-juring priests (May 16), for the disbandment of the royal guard (May 30), and the formation in Paris of a camp of *fédérés* (June 4). He remained a royalist, however, and with Gensonné and Vergniaud even addressed a letter to the king soliciting a private interview. Whatever negotiations may have resulted, however, were cut short by the insurrection of the 10th of August. Guadet, who presided over the Assembly during part of this fateful day, put himself into vigorous opposition to the insurrectionary Commune of Paris, and it was on his motion that on the 30th of August the Assembly voted its dissolution—a decision reversed on the following day. In September Guadet was returned by a large majority as deputy to the Convention. At the trial of Louis XVI. he voted for an appeal to the people and for the death sentence, but with a respite pending appeal. In March 1793 he had several conferences with Danton, who was anxious to bring about a *rapprochement* between the Girondists and the Mountain during the war in La Vendée, but he unconditionally refused to join hands with the man whom he held responsible for the massacres of September. Involved in the fall of the Girondists, and his arrest being decreed on the 2nd of June 1793, he fled to Caen, and afterwards hid in his father's house at St Émilion. He was discovered and taken to Bordeaux, where, after his identity had been established, he was guillotined on the 17th of June 1794.

See J. Guadet, *Les Girondins* (Paris, 1889); and F. A. Aulard, *Les Orateurs de la législative et de la convention* (Paris, 2nd ed., 1906).

GUADIANA (anc. *Anas*, Moorish *Wadi Ana*), a river of Spain and Portugal. The Guadiana was long believed to rise in the lowland known as the Campo de Montiel, where a chain of small lakes, the Lagunas de Ruidera (partly in Ciudad Real, partly in Albacete), are linked together by the Guadiana Alto or Upper Guadiana. This stream flows north-westward from the last lake and vanishes underground within 3 m. of the river Zancara or Giguela. About 22 m. S.W. of the point of disappearance, the Guadiana Alto was believed to re-emerge in the form of several large springs, which form numerous lakes near the Zancara and are known as the "eyes of the Guadiana" (*los ojos de Guadiana*). The stream which connects them with the Zancara is called the Guadiana Bajo or Lower Guadiana. It is now known that the Guadiana Alto has no such course, but flows underground to the Zancara itself, which is the true "Upper Guadiana." The Zancara rises near the source of the Júcar, in the east of the tableland of La Mancha; thence it flows westward, assuming the name of Guadiana near Ciudad Real, and reaching the Portuguese frontier 6 m. S.W. of Badajoz. In piercing the Sierra Morena it forms a series of foaming rapids, and only begins to be navigable at Mertola, 42 m. from its mouth. From the neighbourhood of Badajoz it forms the boundary between Spain and Portugal as far as a point near Monsaraz, where it receives the small river Priega Muñoz on the left, and passes into Portuguese territory, with a southerly direction. At Pomarão it again becomes a frontier stream and forms a broad estuary 25 m. long. It enters the Gulf of Cadiz between the Portuguese town of Villa Real de Santo Antonio and the Spanish Ayamonte, after a total course of 510 m. Its mouth is divided by sandbanks into many channels. The Guadiana drains an area of 31,040 sq. m. Its principal tributaries are the Zujar, Jabalón, Matachel and Ardila from the left; the Bullaque, Ruecas, Botoa, Degebe and Cobres from the right.

The GUADIANA MENOR (or *Guadianamenor*, *i.e.* "Lesser Guadiana") rises in the Sierra Nevada, receives two large tributaries, the Fardes from the right and Barbata from the left, and enters the Guadalquivir near Ubeda, after a course of 95 m.

GUADIX, a city of southern Spain, in the province of Granada; on the left bank of the river Guadix, a subtributary of the Guadiana Menor, and on the Madrid-Valdepeñas-Almería railway. Pop. (1900) 12,652. Guadix occupies part of an elevated plateau among the northern foothills of the Sierra Nevada. It is surrounded by ancient walls, and was formerly dominated by a Moorish castle, now in ruins. It is an episcopal see of great antiquity, but its cathedral, built in the 18th century on the site of a mosque, possesses little architectural merit. The city was once famous for its cutlery; but its modern manufactures (chiefly earthenware, hempen goods, and hats) are inconsiderable. It has some trade in wool, cotton, flax, corn and liqueurs. The warm mineral springs of Graena, much frequented during the summer, are 6 m. W. Guadix el Viejo, 5 m. N.W., was the Roman *Acci*, and, according to tradition, the seat of the first Iberian bishopric, in the 2nd century. After 711 it rose to some importance as a Moorish fortress and trading station, and was renamed *Wad Ash*, "Water of Life." It was surrendered without a siege to the Spaniards, under Ferdinand and Isabella, in 1489.

GUADUAS, a town of the department of Cundinamarca, Colombia, 53 m. N.W. of Bogotá on the old road between that city and the Magdalena river port of Honda. Pop. (1900, estimate) 9000, chiefly Indians or of mixed blood. It stands in a narrow and picturesque valley formed by spurs of the Eastern Cordillera, and on a small stream bearing the same name, which is that of the South American bamboo (*guaduas*), found in great abundance along its banks. Sugar-cane and coffee are cultivated in the vicinity, and fruits of various kinds are produced in great abundance. The elevation of the town is 3353 ft. above the sea, and it has a remarkably uniform temperature throughout the whole year. Guaduas has a pretty church facing upon its *plaza*, and an old monastery now used for secular purposes. The importance of the town sprang from its position on the old *camino real* between Bogotá and Honda, an importance that has passed away with the completion of the railway from Girardot to the Bogotá plateau. Guaduas was founded in 1614.

GUAIACUM, a genus of trees of the natural order *Zygophyllaceae*. The guaiacum or lignum-vitae tree (Ger. *Guajakbaum*, *Franzosenbaum*, *Pockenholzbaum*; Fr. *Gayac*, *Galac*), *G. officinale*, is a native of the West Indies and the north coast of South America, where it attains a height of 20 to 30 ft. Its branches are numerous, flexuous and knotted; the leaves opposite and pinnate, with caducous (falling early) stipules, and entire, glabrous, obovate or oval leaflets, arranged in 2 or, more rarely, 3 pairs; the flowers are in axillary clusters (cymes), and have 5 oval pubescent sepals, 5 distinct pale-blue petals three times the length of the sepals, 10 stamens, and a 2-celled superior ovary. The fruit is about ¾ in. long, with a leathery pericarp, and contains in each of its two cells a single seed (see fig.). *G. sanctum* grows in the Bahamas and Cuba, and at Key West in Florida. It is distinguished from *G. officinale* by its smaller and narrow leaflets, which are in 4 to 5 pairs, by its shorter and glabrous sepals, and 5-celled and 5-winged fruit. *G. arboreum*, the guaiacum tree of Colombia, is found in the valley of the Magdalena up to altitudes 800 metres (2625 ft.) above sea-level, and reaches considerable dimensions. Its wood is of a yellow colour merging into green, and has an almost pulverulent fracture; the flowers are yellow and conspicuous; and the fruit is dry and 4-winged.

The lignum vitae of commerce, so named on account of its high repute as a medicinal agent in past times, when also it was known as *lignum sanctum* and *lignum Indicum*, *lignum guayacanum*, or simply *guayacan*, is procured from *G. officinale*, and in smaller amount from *G. sanctum*. It is exported in large logs or blocks, generally divested of bark, and presents in transverse section very slightly marked concentric rings of growth, and scarcely any traces of pith; with the aid of a magnifying glass the medullary rays are seen to be equidistant and very numerous. The outer wood, the sapwood or alburnum, is of a pale yellow hue, and devoid of resin; the inner, the heartwood or duramen, which is by far the larger proportion, is of a dark greenish-brown, contains in its pores 26% of resin, and has a specific gravity of 1·333, and therefore sinks in water on which the alburnum floats. Owing to the diagonal and oblique arrangement of the successive layers of its fibres, the wood cannot be split; and on account of its hardness, density and durability it is much valued for the manufacture of ships' pulleys, rulers, skittle-balls, mallets and other articles.

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Chips or turnings of the heartwood of *G. officinale* (*guaiaci lignum*) are employed in the preparation of the *liquor sarsae compositus concentratus* of British pharmacy. They may be recognized by being either yellow of greenish-brown in colour, and by turning bluish-green when treated with nitric acid, or when heated with corrosive sublimate, and green with solution of chloride of lime. They are occasionally adulterated with boxwood shavings. Lignum vitae is imported chiefly from St Domingo, the Bahamas and Jamaica.

From Bentley & Trimen's *Medicinal Plants*, by permission of J. & A. Churchill.

Guaiacum or Lignum Vitae. *Guaiacum officinale* shoot-bearing leaves and flowers. 1, Fruit; 2, Vertical section of fruit, showing the solitary pendulous seed in each chamber. All about ½ natural size.

The bark was formerly used in medicine; it contains much calcium oxalate, and yields on incineration 23% of ash. Guaiacum resin, the *guaiaci resina* of pharmacopoeias, is obtained from the wood as an exudation from natural fissures or from incisions; by heating billets about 3 ft. in length, bored to permit of the outflow of the resin; or by boiling chips and raspings in water to which salt has been added to raise the temperature of ebullition. It occurs in rounded or oval tears, commonly coated with a greyish-green dust, and supposed to be the produce of *G. sanctum*, or in large brownish or greenish-brown masses, translucent at the edges; fuses at 85° C.; is brittle, and has a vitreous fracture, and a slightly balsamic odour, increased by pulverization and by heat; and is at first tasteless when chewed, but produces subsequently a sense of heat in the throat. It is readily soluble in alcohol, ether, chloroform, creosote, oil of cloves and solutions of caustic alkalies; and its solution gives a blue colour with gluten, raw potato parings and the roots of horse-radish, carrot and various other plants. The alcoholic tincture becomes green with sodium hypochlorite, and with nitric acid turns in succession green, blue and brown. With glycerin it gives a clear solution, and with nitrous ether a bluish-green gelatinous mass. It is blued by various oxidizing agents, *e.g.* ozone, and, as Schönbein discovered, by the juice of certain fungi. The chief constituents are three distinct resins, *guaiaconic acid*, $C_{21}H_{26}O_5$ (70%), *guaiac acid*, which is closely allied to benzoic acid, and *guaiaretic acid*. Like all resins, these are insoluble in water, soluble in alkalies, but precipitated on neutralization of the alkaline solution.

Guaiacum wood was first introduced into Europe by the Spaniards in 1508, and Nicolaus Poll, writing in 1517 (see Lusinius, *De morbo gallico*, p. 210, Ven., 1566), states that some three thousand persons in Spain had already been restored to health by it. The virtues of the resin, however, were not known until a later period, and in Thomas Paynel's translation (*Of the Wood called Guaiacum*, &c., p. 9, ed. of 1540) of Ulrich von Hutten's treatise *De morbo gallici curatione per administrationem ligni guaiaci* (1519) we read of the wood: "There foloweth fro it, whan it bourneth a gomme, which we yet knowe not, for what pourpose it serueth." Flückiger and Hanbury (*Pharmacographia*, p. 95) state that the first edition of the *London Pharmacopoeia* in which they find the resin mentioned is that of 1677. The decoction of the wood was administered in gout, the stone, palsy, leprosy, dropsy, epilepsy, and other diseases, but principally in the "morbus gallicus," or syphilis, for which it was reckoned a certain specific, insomuch that at first "the physitions wolde not allowe it, perceyuynge that theyr profite wolde decay therby" (Paynel, *op. cit.* p. 8). Minute instructions are given in old works as to the mode of administering guaiacum. The patient was confined in a closed and heated chamber, was placed on the lowest possible diet, and, after liberal purgation, was made twice a day to drink a milk-warm decoction of the wood. The use of salt was specially to be avoided. A decoction of 1 lb of guaiacum was held to be sufficient for the first days of the treatment. The earlier opinions as to the efficacy of guaiacum came to be much modified in the course of time, and Dr Pearson (*Observations on the Effects of Various Articles of the Mat. Med. in the Cure of Lues Venerea*, c. 1., 2nd ed., 1807) says:—"I never saw one single instance in which the powers of this medicine eradicated the venereal virus." He found its beneficial effects to be most marked in cases of secondary symptoms. Guaiacum resin is given medicinally in doses of 5-15 grains. Its important preparations in the British Pharmacopoeia are the *mistura guaiaci* (dose ½-1 oz.), the ammoniated tincture of guaiacum (dose ½ drachm), in which the resin is dissolved by means of ammonia, and the trochiscus or lozenge, containing 3 grains of the resin. This lozenge is undoubtedly of value when given early in cases of sore throat, especially of rheumatic origin. Powdered guaiacum is also used.

Guaiacum resin differs pharmacologically from other resins in being less irritant, so that it is absorbed from the bowel and exerts remote stimulant actions, notably upon the skin and kidneys. It affects the bronchi but slightly, since it contains no volatile oil.

The drug is useful both in acute and chronic sore throat, the mixture, according to Sir Lauder Brunton, being more effective than the tincture. The aperient action, which it exerts less markedly than other members of its class, renders it useful in the treatment of chronic constipation. Sir Alfred Garrod has tried the claims of this drug in the treatment of chronic gout. Both in this disease and in other forms of chronic arthritis guaiacum may be given in combination with sodides, which it often enables the patient to tolerate. Guaiacum is not now used in the treatment of syphilis.

The tincture of guaiacum is universally used as a test for the presence of blood, or rather of haemoglobin, the red colouring matter of the blood, in urine or other secretions. This test was first suggested by Dr John Day of Geelong, Australia. A *single drop* of the tincture should be added to, say, an inch of urine in a test-tube. The resin is at once precipitated, yielding a milky fluid. If "ozonic ether"—an ethereal solution of hydrogen peroxide—be now poured gently into the test-tube, a deep blue colorration is produced along the line of contact if haemoglobin be present. The reaction is due to the oxidation of the resin by the peroxide of hydrogen—such oxidation occurring only if haemoglobin be present to act as an oxygen-carrier.

GUALDO TADINO (anc. *Tadinum*, 1 m. to the W.), a town and episcopal see of Umbria, Italy, 1755 ft. above sea-level, in the province of Perugia, 22 m. N. of Foligno by rail. Pop. (1901), town, 4430; commune, 10,756. The suffix Tadino distinguishes it from Gualdo in the province of Macerata, and Gualdo Cattaneo, S.W. of Foligno. The cathedral has a good rose-window and possesses, like several of the other churches, 15th-century paintings by Umbrian artists, especially works by Niccolò Alunno. The town is still surrounded by walls. The ancient Tadinum lay 1 m. to the W. of the modern town. It is mentioned in the Eugubine tablets (see Iguvium) as a hostile city against which imprecations are directed. In its neighbourhood Narses defeated and slew Totila in 552. No ruins are now visible, though they seem to have been extant in the 17th century. The new town seems to have been founded in 1237. It was at first independent, but passed under Perugia in 1292, and later became dependent on the duchy of Spoleto.

GUALEGUAY, a flourishing town and river port of the province of Entre Rios, Argentine Republic, on the Gualeguay river, 32 m. above its confluence with the Ibicuy branch of the Paraná, and about 120 m. N.N.W. of Buenos Aires. Pop. (1895) 7810. The Gualeguay is the largest of the Entre Rios rivers, traversing almost the whole length of the province from N. to S., but it is of but slight service in the transportation of produce except the few miles below Gualeguay, whose port, known as Puerto Ruiz, is 7 m. lower down stream. A steam tramway connects the town and port, and a branch line connects with Entre Rios railways at the station of Tala. The principal industry in this region is that of stock-raising, and there is a large exportation of cattle, jerked beef, hides, tallow, mutton, wool and sheep-skins. Wood and charcoal are also exported to Buenos Aires. The town was founded in 1783.

GUALEGUAYCHÚ, a prosperous commercial and industrial town and port of the province of Entre Rios, Argentine Republic, on the left bank of the Gualeguaychú river, 11 m. above its confluence with the Uruguay, and 120 m. N. of Buenos Aires. Pop. (1892, est.) 14,000. It is the chief town of a department of the same name, the largest in the province. A bar at the mouth of the river prevents the entrance of larger vessels and

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compels the transfer of cargoes to and from lighters. The town is surrounded by a rich grazing country, and exports cattle, jerked beef, mutton, hides, pelts, tallow, wool and various by-products. A branch line running N. connects with the Entre Rios railways at Basavilbaso. The town was founded in 1783.

GUALO, CARDINAL (fl. 1216), was sent to England by Pope Innocent III. in 1216. He supported John with all the weight of papal authority. After John's death he crowned the infant Henry III. and played an active part in organizing resistance to the rebels led by Louis of France, afterwards king Louis VIII. As representing the pope, the suzerain of Henry, he claimed the regency and actually divided the chief power with William Marshal, earl of Pembroke. He proclaimed a crusade against Louis and the French, and, after the peace of Lambeth, he forced Louis to make a public and humiliating profession of penitence (1217). He punished the rebellious clergy severely, and ruled the church with an absolute hand till his departure from England in 1218. Gualo's character has been severely criticized by English writers; but his chief offence seems to have been that of representing unpopular papal claims.

GUAM (Span. *Guajan; Guahan*, in the native Chamorro), the largest and most populous of the Ladrone or Mariana Islands, in the North Pacific, in 13° 26′ N. lat. and 144° 39′ E. long., about 1823 m. E. by S. of Hong Kong, and about 1450 m. E. of Manila. Pop. (1908) about 11,360, of whom 363 were foreigners, 140 being members of the U.S. naval force. Guam extends about 30 m. from N.N.E. to S.S.W., has an average width of about 6½ m., and has an area of 207 sq. m. The N. portion is a plateau from 300 to 600 ft. above the sea, lowest in the interior and highest along the E. and W. coast, where it terminates abruptly in bluffs and headlands; Mt Santa Rosa, toward the N. extremity, has an elevation of 840 ft. A range of hills from 700 to nearly 1300 ft. in height traverses the S. portion from N. to S. a little W. of the middle—Mt Jumullong Mangloc, the highest peak, has an elevation of 1274 ft. Between the foot of the steep W. slope of these hills and the sea is a belt of rolling lowlands and to the E. the surface is broken by the valleys of five rivers with a number of tributaries, has a general slope toward the sea, and terminates in a coast-line of bluffs. Apra (formerly San Luis d'Apra) on the middle W. coast is the only good harbour; it is about 3½ m. across, has a depth of 4-27 fathoms, and is divided into an inner and an outer harbour by a peninsula and an island. It serves as a naval station and as a port of transit between America and the Philippines, at which army transports call monthly. Deer, wild hog, duck, curlew, snipe and pigeon are abundant game, and several varieties of fish are caught. Some of the highest points of the island are nearly bare of vegetation, and the more elevated plateau surface is covered with sword grass, but in the valleys and on the lower portions of the plateaus there is valuable timber. The lowlands have a rich soil; in lower parts of the highlands raised coralliferous limestone with a light covering of soil appears, and in the higher parts the soil is entirely of clay and silt. The climate is agreeable and healthy. From December to June the N.E. trade winds prevail and the rainfall is relatively light; during the other six months the monsoon blows and produces the rainy season. Destructive typhoons and earthquakes sometimes visit Guam. The island is thought to possess little if any mineral wealth, with the possible exception of coal. Only a small part of Guam is under cultivation, and most of this lies along the S.W. coast, its chief products being cocoanuts, rice, sugar, coffee and cacao. A United States Agricultural Experiment Station in Guam (at Agaña) was provided for in 1908.

The inhabitants are of the Chamorro (Indonesian) stock, strongly intermixed with Philippine Tagals and Spaniards; their speech is a dialect of Malay, corrupted by Tagal and Spanish. There are very few full-blood Chamorros. The aboriginal native was of a very dark mahogany or chocolate colour. A majority of the total number of natives live in Agaña. The natives are nearly all farmers, and most of them are poor, but their condition has been improved under American rule. Public schools have been established; in 1908 the enrolment was 1700. On the island there is a small colony of lepers, segregated only after American occupation. Yangrosa is disease said to be peculiar to Guam and the neighbouring islands; it is due to a specific bacillus and usually destroys the nasal septum. The victims of this disease also are segregated. There is a good general hospital.

Agaña (or San Ignacio de Agaña) is the capital and principal town; under the Spanish régime it was the capital of the Ladrones. It is about 5 m. N.E. of Piti, the landing-place of Apra harbour and port of entry, with which it is connected by an excellent road. Agaña has paved streets and sewer and water systems. Other villages, all small, are Asan, Piti, Sumay, Umata, Merizo and Inarajan. Guam is governed by a "naval governor," an officer of the U.S. navy who is commandant of the naval station. The island is divided into four administrative districts, each with an executive head called a gobernadorcillo (commissioner), and there are a court of appeals, a court of first instance and courts of justices of the peace. Peonage was abolished in the island by the United States in February 1900. Telegraphic communication with the Caroline Islands was established in 1905; in 1908 there were four cables ending at the relay station at Sumay on the Shore of Apra harbour.

Guam was discovered by Magellan in 1521, was occupied by Spain in 1688, was captured by the United States cruiser "Charleston" in June 1899, and was ceded to the United States by the Treaty of Paris on the 10th of December 1898.

See *A List of Books (with References to Periodicals) on Samoa and Guam* (1901; issued by the Library of Congress); L. M. Cox, "The Island of Guam," in *Bulletin of the American Geographical Society*, vol. 36 (New York, 1904); Gen. Joseph Wheeler, *Report on the Island of Guam*, June 1900 (War Department, Document No. 123); A. Christian, *The Caroline Islands* (London, 1899); an account of the flora of Guam by W. E. Safford in the publications of the National Herbarium (Smithsonian Institution); and the reports of the naval governor.

GUAN, a word apparently first introduced into the ornithologist's vocabulary about 1743 by Edwards,[1] who said that a bird he figured (*Nat. Hist. Uncommon Birds*, pl. xiii.) was "so called in the West Indies," and the name has hence been generally applied to all the members of the subfamily *Penelopinae*, which are distinguished from the kindred subfamily *Cracinae* or curassows by the broad postacetabular area of the pelvis as pointed out by Huxley (*Proc. Zool. Society*, 1868, p. 297) as well as by their maxilla being wider than it is high, with its culmen depressed, the crown feathered, and the nostrils bare—the last two characters separating the *Penelopinae* from the *Oreophasinae*, which form the third subfamily of the *Cracidae*,[2] a family belonging to that taxonomer's division *Peristeropodes* of the order *Gallinae*.

The *Penelopinae* have been separated into seven genera, of which *Penelope* and *Ortalis*, containing respectively about sixteen and nineteen species, are the largest, the others numbering from one to three only. Into their minute differences it would be useless to enter: nearly all have the throat bare of feathers, and from that of many of them hangs a wattle; but one form, *Chamaepetes*, has neither of these features, and *Stegnolaema*, though wattled, has the throat clothed. With few exceptions the guans are confined to the South-American continent; one species of *Penelope* is however found in Mexico (*e.g.* at Mazatlan), *Pipile cumanensis* inhabits Trinidad as well as the mainland, while three species of *Ortalis* occur in Mexico or Texas, and one, which is also common to Venezuela, in Tobago. Like curassows, guans are in great measure of arboreal habit. They also readily

[1] Edwards also gives "quan" as an alternative spelling, and this may be nearer the original form, since we find Dampier in 1676 writing (*Voy.* ii. pt. 2, p. 66) of what was doubtless an allied if not the same bird as the "quam." The species represented by Edwards does not seem to have been identified.

[2] See the excellent *Synopsis* by Sclater and Salvin in the *Proceedings of the Zoological Society* for 1870 (pp. 504-544), while further information on the *Cracinae* was given by Sclater in the *Transactions* of the same society (ix. pp. 273-288, pls. xl.-lii.). Some additions have since been made to the knowledge of the family, but none of very great importance.

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become tame, but all attempts to domesticate them in the full sense of the word have wholly failed, and the cases in which they have even been induced to breed and the young have been reared in confinement are very few. Yet it would seem that guans and curassows will interbreed with poultry (*Ibis*, 1866, p. 24; *Bull. Soc. Imp. d'Acclimatation*, 1868, p. 559; 1869, p. 357), and what is more extraordinary is that in Texas the hybrids between the chiacalacca (*Ortalis vetula*) and the domestic fowl are asserted to be far superior to ordinary game-cocks for fighting purposes. (A. N.)

GUANABACOA (an Indian name meaning "site of the waters"), a town of Cuba, in Havana province, about 6 m. E. of Havana. Pop. (1907) 14,368. Guanabacoa is served by railway to Havana, with which it is connected by the Regla ferry across the bay. It is picturesquely situated amid woods, on high hills which furnish a fine view. There are medicinal springs in the town, and deposits of liquid bitumen in the neighbouring hills. The town is essentially a residence suburb of the capital, and has some rather pretty streets and squares and some old and interesting churches (including Nuestra Señora de la Asuncion, 1714–1721). Just outside the city is the church of Potosi with a famous "wonder-working" shrine and image. An Indian pueblo of the same name existed here before 1555, and a church was established in 1576. Already at the end of the 17th century Guanabacoa was the fashionable summer residence of Havana. It enjoyed its greatest popularity in this respect from the end of the 18th to the middle of the 19th century. It was created a *villa* with an *ayuntamiento* (city council) in 1743. In 1762 its fort, the Little Morro, on the N. shore near Cojimar (a bathing beach, where the Key West cable now lands), was taken by the English.

GUANACO, sometimes spelt Huanaca, the larger of the two wild representatives in South America of the camel tribe; the other being the vicuña. The guanaco (*Lama huanacus*), which stands nearly 4 ft. at the shoulder, is an elegant creature, with gracefully curved neck and long slender legs, the bind-pair of the latter bearing two naked patches or callosities. The head and body are covered with long soft hair of a fawn colour above and almost pure white beneath. Guanaco are found throughout the southern half of South America, from Peru in the north to Cape Horn in the south, but occur in greatest abundance in Patagonia. They live in herds usually of from six to thirty, although these occasionally contain several hundreds, while solitary individuals are sometimes met. They are exceedingly timid, and therefore wary and difficult of approach; like many other ruminants, however, their curiosity sometimes overcomes their timidity, so as to bring them within range of the hunter's rifle. Their cry is peculiar, being something between the belling of a deer and the neigh of a horse. The chief enemies of the guanaco are the Patagonian Indians and the puma, as it forms the principal food of both. Its flesh is palatable although wanting in fat, while its skin forms the chief clothing material of the Patagonians. Guanaco are readily domesticated, and in this state become very bold and will attack man, striking him from behind with both knees. In the wild state they never defend themselves, and if approached from different points, according to the Indian fashion of hunting, get completely bewildered and fall an easy prey. They take readily to the water, and have been observed swimming from one island to another, while they have been seen drinking salt-water. They have a habit of depositing their droppings during successive days on the same spot—a habit appreciated by the Peruvian Indians, who use those deposits for fuel. Guanaco also have favourite localities in which to die, as appears from the great heaps of their bones found in particular spots.

Head of Guanaco.

GUANAJAY, a town of western Cuba, in Pinar del Rio province, about 36 m. (by rail) S.W. of Havana. Pop. (1907) 6400. Guanajay is served by the W. branch of the United railways of Havana, of which it is the W. terminus. The town lies among hills, has an excellent climate, and in colonial times was (like Holguin) an acclimatization station for troops fresh from Spain; it now has considerable repute as a health resort. The surrounding country is a fertile sugar and tobacco region. Guanajay has always been important as a distributing point in the commerce of the western end of the island. It was an ancient pueblo, of considerable size and importance as early as the end of the 18th century.

GUANAJUATO, or GUANAXUATO, an inland state of Mexico, bounded N. by Zacatecas and San Luis Potosi, E. by Querétaro, S. by Michoacan and W. by Jalisco. Area, 11,370 sq. m. It is one of the most densely populated states of the republic; pop. (1895) 1,047,817; (1900) 1,061,724. The state lies wholly within the limits of the great central plateau of Mexico, and has an average elevation of about 6000 ft. The surface of its northern half is broken by the Sierra Gorda and Sierra de Guanajuato, but its southern half is covered by fertile plains largely devoted to agriculture. It is drained by the Rio Grande de Lerma and its tributaries, which in places flow through deeply eroded valleys. The climate is semi-tropical and healthy, and the rainfall is sufficient to insure good results in agriculture and stock-raising. In the warm valleys sugar-cane is grown, and at higher elevations Indian corn, beans, barley and wheat. The southern plains are largely devoted to stock-raising. Guanajuato has suffered much from the destruction of its forests, but there remain some small areas on the higher elevations of the north. The principal industry of the state is mining, the mineral wealth of the mountain ranges of the north being enormous. Among its mineral products are silver, gold, tin, lead, mercury, copper and opals. Silver has been extracted since the early days of the Spanish conquest, over $800,000,000 having been taken from the mines during the subsequent three and a half centuries. Some of the more productive of these mines, or groups of mines, are the Veta Madre (mother lode), the San Bernabé lode, and the Rayas mines of Guanajuato, and the La Valenciana mine, the output of which is said to have been $226,000,000 between 1766 and 1826. The manufacturing establishments include flour mills, tanneries and manufactories of leather, cotton and woollen mills, distilleries, foundries and potteries. The Mexican Central and the Mexican National railway lines cross the state from N. to S., and the former operates a short branch from Silao to the state capital and another westward from Irapuato to Guadalajara. The capital is Guanajuato, and other important cities and towns are León, or León de las Aldamas; Celaya (pop. 25,565 in 1900), an important railway junction 22 m. by rail W. from Querétaro, and known for its manufactures of broadcloth, saddlery, soap and sweetmeats; Irapuato (18,503 in 1900), a railway junction and commercial centre, 21 m. S. by W. of Guanajuato; Silao (15,355), a railway junction and manufacturing town (woollens and cottons), 14 m. S.W. of Guanajuato; Salamanca (13,583), on the Mexican Central railway and Lerma river, 25 m. S. by E. of Guanajuato, with manufactures of cottons and porcelain; Allende (10,547), a commercial town 30 m. E. by S. of Guanajuato, with mineral springs; Valle de Santiago (12,660), 50 m. W. by S. of Querétaro; Salvatierra (10,393), 60 m. S.E. of Guanajuato; Cortazar (8633); La Luz (8318), in a rich mining district; Pénjamo (8262); Santa Cruz (7230); San Francisco del Rincón (10,904), 30 m. W. of Guanajuato in a rich mining district; and Acambaro (8345), a prosperous town of the plain, 76 m. S.S.E. of Guanajuato.

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GUANAJUATO, or SANTA FÉ DE GUANAJUATO, a city of Mexico and capital of the above state, 155 m. (direct) N.W. of the Federal capital, on a small tributary of the Rio Grande de Lerma or Santiago. Pop. (1895) 39,404; (1900) 41,486. The city is built in the Cañada de Marfil at the junction of three ravines about 6500 ft. above the sea, and its narrow, tortuous streets rise steeply as they follow the ravines upward to the mining villages clustered about the opening of the mines in the hillsides. Guanajuato is sometimes described as a collection of mining villages; but in addition there is the central city with its crowded winding streets, its substantial old Spanish buildings, its fifty ore-crushing mills and busy factories and its bustling commercial life. Enclosing the city are the steep, barren mountain sides honeycombed with mines. The climate is semi-tropical and is considered healthy. The noteworthy public buildings and institutions are an interesting old Jesuit church with arches of pink stone and delicate carving, eight monasteries, the government palace, a mint dating from 1812, a national college, the fine Teatro Juárez, and the Pantheon, or public cemetery, with catacombs below. The Alhóndiga de Granaditas, originally a public granary, was used as a fort during the War of Independence, and is celebrated as the scene of the first battle (1810) in that long struggle. Among the manufactures are cottons, prints, soaps, chemicals, pottery and silverware, but mining is the principal interest and occupation of the population. The silver mines of the vicinity were long considered the richest in Mexico, the celebrated Veta Madre (mother lode) even being described as the richest in the world; and Guanajuato has the largest reduction works in Mexico. The railway outlet for the city consists of a short branch of the Mexican Central, which joins the trunk line at Silao. Guanajuato was founded in 1554. It attained the dignity of a city in 1741. It was celebrated for its vigorous resistance to the invaders at the time of the Spanish conquest, and was repeatedly sacked during that war.

GUANCHES, GUANCHIS or GUANCHOS (native Guanchinet; *Guan* = person, *Chinet* = Teneriffe,—"man of Teneriffe," corrupted, according to Nuñez de la Peña, by Spaniards into Guanchos), the aboriginal inhabitants of the Canary Islands. Strictly the Guanches were the primitive inhabitants of Teneriffe, where they seem to have preserved racial purity to the time of the Spanish conquest, but the name came to be applied to the indigenous populations of all the islands. The Guanches, now extinct as a distinct people, appear, from the study of skulls and bones discovered, to have resembled the Cro-Magnon race of the Quaternary age, and no real doubt is now entertained that they were an offshoot of the great race of Berbers which from the dawn of history has occupied northern Africa from Egypt to the Atlantic. Pliny the Elder, deriving his knowledge from the accounts of Juba, king of Mauretania, states that when visited by the Carthaginians under Hanno the archipelago was found by them to be uninhabited, but that they saw ruins of great buildings. This would suggest that the Guanches were not the first inhabitants, and from the absence of any trace of Mahommedanism among the peoples found in the archipelago by the Spaniards it would seem that this extreme westerly migration of Berbers took place between the time of which Pliny wrote and the conquest of northern Africa by the Arabs. Many of the Guanches fell in resisting the Spaniards, many were sold as slaves, and many conformed to the Roman Catholic faith and married Spaniards.

Such remains as there are of their language, a few expressions and the proper names of ancient chieftains still borne by certain families, connect it with the Berber dialects. In many of the islands signs are engraved on rocks. Domingo Vandewalle, a military governor of Las Palmas, was the first, in 1752, to investigate these; and it is due to the perseverance of D. Aquilino Padran, a priest of Las Palmas, that anything about the inscription on the island Hierro has been brought to light. In 1878 Dr R. Verneau discovered in the ravines of Las Balos some genuine Libyan inscriptions. Without exception the rock inscriptions have proved to be Numidic. In two of the islands (Teneriffe and Gomera) the Guanche type has been retained with more purity than in the others. No inscriptions have been found in these two islands, and therefore it would seem that the true Guanches did not know how to write. In the other islands numerous Semitic traces are found, and in all of them are the rock-signs. From these facts it would seem that the Numidians, travelling from the neighbourhood of Carthage and intermixing with the dominant Semitic race, landed in the Canary Islands, and that it is they who have written the inscriptions at Hierro and Grand Canary.

The political and social institutions of the Guanches varied. In some islands hereditary autocracy prevailed; in others the government was elective. In Teneriffe all the land belonged to the chiefs who leased it to their subjects. In Grand Canary suicide was regarded as honourable, and on a chief inheriting, one of his subjects willingly honoured the occasion by throwing himself over a precipice. In some islands polyandry was practised; in others the natives were monogamous. But everywhere the women appear to have been respected, an insult offered any woman by an armed man being a capital offence. Almost all the Guanches used to wear garments of goat-skins, and others of vegetable fibres, which have been found in the tombs of Grand Canary. They had a taste for ornaments, necklaces of wood, bone and shells, worked in different designs. Beads of baked earth, cylindrical and of all shapes, with smooth or polished surfaces, mostly black and red in colour, were chiefly in use. They painted their bodies; the *pintaderas*, baked clay objects like seals in shape, have been explained by Dr Verneau as having been used solely for painting the body in various colours. They manufactured rough pottery, mostly without decorations, or ornamented by means of the finger-nail. The Guanches' weapons were those of the ancient races of south Europe. The polished battle-axe was more used in Grand Canary, while stone and obsidian, roughly cut, were commoner in Teneriffe. They had, besides, the lance, the club, sometimes studded with pebbles, and the javelin, and they seem to have known the shield. They lived in natural or artificial caves in their mountains. In districts where cave-dwellings were impossible, they built small round houses and, according to the Spaniards, they even practised rude fortification. In Palma the old people were at their own wish left to die alone. After bidding their family farewell they were carried to the sepulchral cave, nothing but a bowl of milk being left them. The Guanches embalmed their dead; many mummies have been found in an extreme state of desiccation, each weighing not more than 6 or 7 lb. Two almost inaccessible caves in a vertical rock by the shore 3 m. from Santa Cruz (Teneriffe) are said still to contain bones. The process of embalming seems to have varied. In Teneriffe and Grand Canary the corpse was simply wrapped up in goat and sheep skins, while in other islands a resinous substance was used to preserve the body, which was then placed in a cave difficult of access, or buried under a tumulus. The work of embalming was reserved for a special class, women for female corpses, men for male. Embalming seems not to have been universal, and bodies were often simply hidden in caves or buried.

Little is known of the religion of the Guanches. They appear to have been a distinctly religious race. There was a general belief in a supreme being, called Acoran, in Grand Canary, Achihuran in Teneriffe, Eraoranhan in Hierro, and Abora in Palma. The women of Hierro worshipped a goddess called Moneiba. According to tradition the male and female gods lived in mountains whence they descended to hear the prayers of the people. In other islands the natives venerated the sun, moon, earth and stars. A belief in an evil spirit was general. The demon of Teneriffe was called Guayota and lived in the peak of Teyde, which was the hell called Echeyde. In times of drought the Guanches drove their flocks to consecrated grounds, where the lambs were separated from their mothers in the belief that their plaintive bleatings would melt the heart of the Great Spirit. During the religious feasts all war and even personal quarrels were stayed.

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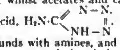
GUANIDINE, CN_3H_5 or $HN:C(NH_2)_2$, the amidine of amidocarbonic acid. It occurs in beet juice. It was first prepared in 1861 by A. Strecker, who oxidized guanine with hydrochloric acid and potassium chlorate. It may be obtained synthetically by the action of ammonium iodide on cyanamide, $CN\cdot NH_2+NH_4I=CN_3H_5\cdot HI$; by heating ortho-carbonic esters with ammonia to 150° C.; but best by heating ammonium thiocyanate to 180°-190° C., when the thiourea first formed is converted into guanidine thiocyanate, $2CS(NH_2)_2=HN:C(NH_2)_2\cdot HCNS+H_2S$. It is a colourless crystalline solid, readily soluble in water and alcohol; it deliquesces on exposure to air. It has strong basic properties, absorbs carbon dioxide readily, and forms well-defined crystalline salts. Baryta water hydrolyses it to urea. By direct union with glycocoll acid, it yields glycocyamine, $NH_2\cdot(HN):C\cdot NH\cdot CH_2\cdot CO_2H$, whilst with methyl glycocoll (sarcosine) it forms creatine, $NH_2\cdot(NH):C\cdot N(CH_3)\cdot CH_2\cdot CO_2H$.

Many derivatives of guanidine were obtained by J. Thiele (*Ann.*, 1892, 270, p. 1; 1893, 273, p. 133; *Ber.*, 1893, 26, pp. 2598, 2645). By the action of nitric acid on guanidine in the presence of sulphuric acid, nitroguanidine, $HN:C(NH_2)\cdot NH\cdot NO_2$ (a substance possessing acid properties) is obtained; from which, by reduction with zinc dust, amidoguanidine, $HN:C(NH_2)\cdot NH\cdot NH_2$, is formed. This amidoguanidine decomposes on hydrolysis with the formation of semicarbazide, $NH_2\cdot CO\cdot NH\cdot NH_2$, which, in its turn, breaks down into carbon dioxide, ammonia and hydrazine. Amidoguanidine is a body of hydrazine type, for it reduces gold and silver salts and yields a benzylidine derivative. On oxidation with potassium permanganate, it gives azodicarbondiamidine nitrate, $NH_2\cdot(HN):C\cdot N:N\cdot C:(NH)\cdot NH_2\cdot 2HNO_3$, which, when reduced by sulphuretted hydrogen, is converted into the corresponding hydrazodicarbondiamidine, $NH_2\cdot(HN):C\cdot NH\cdot NH\cdot C:(NH)\cdot NH_2$. By the action of nitrous acid on a nitric acid solution of amidoguanidine, diazoguanidine nitrate, $NH_2\cdot(HN):C\cdot NH\cdot N_2\cdot NO_3$, is obtained. This diazo compound is decomposed by caustic alkalis with the formation of cyanamide and hydrazoic acid, $CH_4N_6\cdot NO_3=N_3H+CN\cdot NH_2+HNO_3$, whilst acetates and carbonates convert it into amidotetrazotic acid,  . Amidotetrazotic acid yields addition compounds with amines, and by the further action of nitrous acid yields a very explosive derivative, diazotetrazol, CN_6. By fusing guanidine with urea, dicyandiamidine $H_2N\cdot(HN):C\cdot NH\cdot CO\cdot NH_2$, is formed.

GUANO (a Spanish word from the Peruvian *huanu*, dung), the excrement of birds, found as large deposits on certain islands off the coast of Peru, and on others situated in the Southern ocean and off the west coast of Africa. The large proportions of phosphorus in the form of phosphates and of nitrogen as ammonium oxalate and urate renders it a valuable fertilizer. Bat's guano, composed of the excrement of bats, is found in certain caves in New Zealand and elsewhere; it is similar in composition to Peruvian guano. (See MANURES AND MANURING.)

GUANTA, a port on the Caribbean coast of the state of Bermúdez, Venezuela, 12 m. N.E. of Barcelona, with which it is connected by rail. It dates from the completion of the railway to the coal mines of Naricual and Capiricual nearly 12 m. beyond Barcelona, and was created for the shipment of coal. The harbour is horseshoe-shaped, with its entrance, 1908 ft. wide, protected by an island less than 1 m. off the shore. The entrance is easy and safe, and the harbour affords secure anchorage for large vessels, with deep water alongside the iron railway wharf. These advantages have made Guanta the best port on this part of the coast, and the trade of Barcelona and that of a large inland district have been transferred to it. A prominent feature in its trade is the shipment of live cattle. Among its exports are sugar, coffee, cacáo, tobacco and fruit.

GUANTÁNAMO, the easternmost important town of the S. coast of Cuba, in the province of Santiago, about 40 m. E. of Santiago. Pop. (1907) 14,559. It is situated by the Guazo (or Guaso) river, on a little open plain between the mountains. The beautiful, land-locked harbour, 10 m. long from N. to S. and 4 m. wide in places, has an outer and an inner basin. The latter has a very narrow entrance, and 2 to 2·5 fathoms depth of water. From the port of Caimanera to the city of Guantánamo, 13 m. N., there is a railway, and the city has railway connexion with Santiago. Guantánamo is one of the two ports leased by Cuba to the United States for a naval station. It is the shipping-port and centre of a surrounding coffee-, sugar- and lime-growing district. In 1741 an English force under Admiral Edward Vernon and General Thomas Wentworth landed here to attack Santiago. They named the harbour Cumberland bay. After their retreat fortifications were begun. The history of the region practically dates, however, from the end of the 18th century, when it gained prosperity from the settlement of French refugees from Santo Domingo; the town, as such, dates only from 1822. Almost all the old families are of French descent, and French was the language locally most used as late as the last third of the 19th century. In recent years, especially since the Spanish-American War of 1898, the region has greatly changed socially and economically. Guantánamo was once a fashionable summer residence resort for wealthy Cubans.

GUARANA (so called from the Guaranis, an aboriginal American tribe), the plant *Paullinia Cupana* (or *P. sorbilis*) of the natural order *Sapindaceae*, indigenous to the north and west of Brazil. It has a smooth erect stem; large pinnate alternate leaves, composed of 5 oblong-oval leaflets; narrow panicles of short-stalked flowers; and ovoid or pyriform fruit about as large as a grape, and containing usually one seed only, which is shaped like a minute horse-chestnut. What is commonly known as guarana, guarana bread or Brazilian cocoa, is prepared from the seeds as follows. In October and November, at which time they become ripe, the seeds are removed from their capsules and sun-dried, so as to admit of the ready removal by hand of the white aril; they are next ground in a stone mortar or deep dish of hard sandstone; the powder, moistened by the addition of a small quantity of water, or by exposure to the dews, is then made into a paste with a certain proportion of whole or broken seeds, and worked up sometimes into balls, but usually into rolls not unlike German sausages, 5 to 8 in. in length, and 12 to 16 oz. in weight. After drying by artificial or solar heat, the guarana is packed between broad leaves in sacks or baskets. Thus prepared, it is of extreme hardness, and has a brown hue, a bitter astringent taste, and an odour faintly resembling that of roasted coffee. An inferior kind, softer and of a lighter colour, is manufactured by admixture of cocoa or cassava. Rasped or grated into sugar and water, guarana forms a beverage largely consumed in S. America. Its manufacture, originally confined to the Mauhés Indians, has spread into various parts of Brazil.

The properties of guarana as a nervous stimulant and restorative are due to the presence of what was originally described as a new principle and termed guaranine, but is now known to be identical with caffeine or theine. Besides this substance, which is stated to exist in it in the form of tannate, guarana yields on analysis the glucoside saponin, with tannin, starch, gum, three volatile oils, and an acrid green fixed oil (Fournier, *Journ. de Pharm.* vol. xxxix., 1861, p. 291).

GUARANIS, a tribe and stock of South American Indians, having their home in Paraguay, Uruguay and on the Brazilian coast. The Guaranis had developed some civilization before the arrival of the Spaniards, and being a peaceable people quickly submitted. They form to-day the chief element in the populations of Paraguay and Uruguay. Owing to its patronage by the Jesuit missionaries the Guarani language became a

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widespread medium of communication, and in a corrupted form is still the common language in Paraguay.

GUARANTEE (sometimes spelt "guarantie" or "guaranty"; an O. Fr. form of "warrant," from the Teutonic word which appears in German as *wahren*, to defend or make safe and binding), a term more comprehensive and of higher import than either "warrant" or "security," and designating either some international treaty whereby claims, rights or possessions are secured, or more commonly a mere private transaction, by means of which one person, to obtain some trust, confidence or credit for another, engages to be answerable for him.

In English law, a guarantee is a contract to answer for the payment of some debt, or the performance of some duty, by a third person who is *primarily* liable to such payment or performance. It is a *collateral* contract, which does not extinguish the original liability or obligation to which it is accessory, but on the contrary is itself rendered null and void should the latter fail, as without a principal there can be no accessory. The liabilities of a surety are in law dependent upon those of the principal debtor, and when the latter cease the former do so likewise (*per* Collins, L.J., in *Stacey* v. *Hill*, 1901, 1 K.B., at p. 666; see *per* Willes, J., in *Bateson* v. *Gosling*, 1871, L.R. 7 C.P., at p. 14), except in certain cases where the discharge of the principal debtor is by operation of law (see *In re Fitzgeorge—ex parte Robson*, 1905, 1 K.B. p. 462). If, therefore, persons wrongly suppose that a third person is liable to one of them, and a guarantee is given on that erroneous supposition, it is invalid *ab initio*, by virtue of the *lex contractûs*, because its foundation (which was that another was taken to be liable) has failed (*per* Willes, J., in *Mountstephen* v. *Lakeman*, L.R. 7 Q.B. p. 202). According to various existing codes civil, a suretyship, in respect of an obligation "non-valable," is null and void save where the invalidity is the result of personal incapacity of the principal debtor (Codes Civil, France and Belgium, 2012; Spain, 1824; Portugal, 822; Italy, 1890; Holland, 1858; Lower Canada, 1032). In some countries, however, the mere personal incapacity of a son under age to borrow suffices to vitiate the guarantee of a loan made to him (Spain, 1824; Portugal, 822, s. 2, 1535, 1536). The Egyptian codes sanction guarantees expressly entered into "in view of debtor's want of legal capacity" to contract a valid principal obligation (Egyptain Codes, Mixed Suits, 605; Native Tribunals, 496). The Portuguese code (art. 822, s. 1) retains the surety's liability, in respect of an invalid principal obligation, until the latter has been legally rescinded.

The giver of a guarantee is called "the surety," or "the guarantor"; the person to whom it is given "the creditor," or "the guarantee"; while the person whose payment or performance is secured thereby is termed "the principal debtor," or simply "the principal." In America, but not apparently elsewhere, there is a recognized distinction between "a surety" and "a guarantor"; the former being usually bound with the principal, at the same time and on the same consideration, while the contract of the latter is his own separate undertaking, in which the principal does not join, and in respect of which he is not to be held liable, until due diligence has been exerted to compel the principal debtor to make good his default. There is no privity of contract between the surety and the principal debtor, for the surety contracts with the creditor, and they do not constitute in law one person, and are not jointly liable to the creditor (*per* Baron Parke in *Buin* v. *Cooper*, 1 Dowl. R. (N.S.) 11, 14).

No special phraseology is necessary to the formation of a guarantee; and what really distinguishes such a contract from one of insurance is not any essential difference between the two forms of words *insurance* and *guarantee*, but the substance of the contract entered into by the parties in each particular case (*per* Romer, L.J., in *Seaton* v. *Heath—Seaton* v. *Burnand*, 1899, 1 Q.B. 782, 797, C.A.; *per* Vaughan Williams, L.J., in *In re Denton's Estate Licenses Insurance Corporation and Guarantee Fund Ltd.* v. *Denton*, 1904, 2 Ch., at p. 188; and see *Dane* v. *Mortgage Insurance Corporation*, 1894, 1 Q.B. 54 C.A.) In this connexion it may be mentioned that the different kinds of suretyships have been classified as follows: (1) Those in which there is an agreement to constitute, for a particular purpose, the relation of principal and surety, to which agreement the creditor thereby secured is a party; (2) those in which there is a similar agreement between the principal and surety only, to which the creditor is a stranger; and (3) those in which, without any such contract of suretyship, there is a primary and a secondary liability of two persons for one and the same debt, the debt being, as between the two, that of one of those persons only, and not equally of both, so that the other, if he should be compelled to pay it, would be entitled to reimbursement from the person by whom (as between the two) it ought to have been paid (*per* Earl of Selborne, L.C., in *Duncan Fox and Co.* v. *North and South Wales Bank*, 6 App. Cas., at p. 11). According to several codes civil sureties are made divisible into conventional, legal and judicial (Fr. and Bel., 2015, 2040 et seq.; Spain, 1823; Lower Canada, 1930), while the Spanish code further divides them into gratuitous and for valuable consideration (art. 1, 823).

In England the common-law requisites of a guarantee in no way differ from those essential to the formation of any other contract. That is to say, they comprise the mutual assent of two or more parties, competency to contract, and, unless the puarantee be under seal, valuable consideration. An offer to guarantee is not binding until it has been accepted, being revocable till then by the party making it. Unless, however, as sometimes happens, the offer contemplates an express acceptance, one may be implied, and it may be a question for a jury whether an offer of guarantee has in fact been accepted. Where the surety's assent to a guarantee has been procured by fraud of the person to whom it is given, there is no binding contract. Such fraud may consist of suppression or concealment or misrepresentation. There is some conflict of authorities as to what facts must be spontaneously disclosed to the surety by the creditor, but it may be taken that the rule on the subject is less stringent than that governing insurances upon marine, life and other risks (*The North British Insurance Co.* v. *Lloyd*, 10 Exch. 523), though formerly this was denied (*Owen* v. *Homan*, 3 Mac. & G. 378, 397). Moreover, even where the contract relied upon is in the form of a policy guaranteeing the solvency of a surety for another's debt, and is therefore governed by the doctrine of *uberrima fides*, only such facts as are really material to the risk undertaken need be spontaneously disclosed (*Seaton* v. *Burnand—Burnand* v. *Seaton*, 1900, A.C. 135). As regards the competency of the parties to enter into a contract of guarantee, this may be affected by insanity or intoxication of the surety, if known to the creditor, or by disability of any kind. The ordinary disabilities are those of infants and married women —now in England greatly mitigated as regards the latter by the Married Women's Property Acts, 1870 to 1893, which enable a married woman to contract, as a *feme sole*, to the extent of her separate property. Every guarantee not under seal must according to English law have a consideration to support it, though the least spark of one suffices (*per* Wilmot, J., in *Pillan* v. *van Mierop and Hopkins*, 3 Burr., at p. 1666; *Haigh* v. *Brooks*, 10 A. & E. 309; *Barrell* v. *Trussell*, 4 Taunt. 117), which, as in other cases, may consist either of some right, interest, profit or benefit accruing to the one party, or some forbearance, detriment, loss or responsibility given, suffered or undertaken by the other. In some guarantees the consideration is entire—as where, in consideration of a lease being granted, the surety becomes answerable for the performance of the covenants; in other cases it is fragmentary, *i.e.* supplied from time to time—as where a guarantee is given to secure the balance of a running account at a banker's, or a running account for goods supplied (*per* Lush, L.J., in *Lloyd's* v. *Harper*, 16 Ch. Div., at p. 319). In the former case, the moment the lease is granted there is nothing more for the lessor to do, and such a guarantee as that of necessity runs on throughout the duration of the lease and is irrevocable. In the latter case, however, unless the guarantee stipulates to the contrary, the surety may at any time terminate his liability under the guarantee as to *future*

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advances, &c. The consideration for a guarantee must not be *past* or *executed*, but on the other hand it need not comprise a direct benefit or advantage to either the surety or the creditor, but may solely consist of anything done, or any promise made, for the benefit of the principal debtor. It is more frequently *executory* than *concurrent*, taking the form either of forbearance to sue the principal debtor, or of a future advance of money or supply of goods to him.

By the Indian Contract Act 1872, sect. 127, it is provided that the consideration for a guarantee may consist of anything done or any promise made for the benefit of the principal debtor by the creditor. Total failure of the consideration stipulated for by the party giving a guarantee will prevent its being enforced, as will also the existence of an illegal consideration. Though in all countries the mutual assent of two or more parties is essential to the formation of any contract (see *e.g.* Codes Civil, Fr. and Bel. 1108; Port. 643, 647 et seq.; Spain, 1258, 1261; Italy, 1104; Holl. 1356; Lower Canada, 984), a consideration is not everywhere regarded as a necessary element (see Pothier's *Law of Obligations*, Evans's edition, vol. ii. p. 19). Thus in Scotland a contract may be binding without a consideration to support it (Stair i. 10. 7).

The statutory requisites of a guarantee are, in England, prescribed by (1) the Statute of Frauds, which, with reference to guarantees, provides that "no action shall be brought whereby to charge the defendant upon any special promise to answer for the debt, default or miscarriages of another person, unless the agreement upon which such action shall be brought, or some memorandum or note thereof, shall be in writing and signed by the party to be charged therewith, or some other person thereunto by him lawfully authorized," and (2) Lord Tenterden's Act (9 Geo. IV. c. 14), which by § 6 enacts that "no action shall be brought whereby to charge any person upon or by reason of any representation or assurance made or given concerning or relating to the character, conduct, credit, ability, trade or dealings of any other person, to the intent or purpose that such other person may obtain credit, money or goods upon" (*i.e.* "upon credit," see *per* Parke, B., in *Lyde* v. *Barnard*, 1 M. & W., at p. 104), "unless such representation or assurance be made in writing signed by the party to be charged therewith." This latter enactment, which applies to incorporated companies as well as to individual persons (*Hirst* v. *West Riding Union Banking Co.*, 1901, 2 K.B. 560 C.A.), was rendered necessary by an evasion of the 4th section of the Statute of Frauds, accomplished by treating the special promise to answer for another's debt, default or miscarriage, when *not* in writing, as required by that section, as a false and fraudulent representation concerning another's credit, solvency or honesty, in respect of which damages, as for a tort, were held to be recoverable (*Pasley* v. *Freeman*, 3 T.R. 51). In Scotland, where, it should be stated, a guarantee is called a "cautionary obligation," similar enactments to those just specified are contained in § 6 of the Mercantile Law Amendment Act (Scotland) 1856, while in the Irish Statute of Frauds (7 Will. III. c. 12) there is a provision (§ 2) identical with that found in the English Statute of Frauds. In India a guarantee may be either oral or written (Indian Contract Act, § 126), while in the Australian colonies, Jamaica and Ceylon it must be in writing. The German code civil requires the surety's promise to be verified by writing where he has not executed the principal obligation (art. 766), and the Portuguese code renders a guarantee provable by all the modes established by law for the proof of the principal contract (art. 826). According to most codes civil now in force a guarantee like any other contract can usually be made verbally in the presence of witnesses and in certain cases (where for instance considerable sums of money are involved) *sous signature privée* or else by judicial or notarial instrument (see Codes Civil, Fr. and Bel. 1341; Spain, 1244; Port. 2506, 2513; Italy, 1341 et seq.; Pothier's *Law of Obligations*, Evans's ed. i. 257; Burge on *Suretyship*, p. 19; van der Linden's *Institutes of Holland*, p. 120); the French and Belgian Codes, moreover, provide that suretyship is not to be presumed but must always be expressed (art. 2015).

The Statute of Frauds does not invalidate a verbal guarantee, but renders it unenforceable by action. It may therefore be available in support of a defence to an action, and money paid under it cannot be recovered. An indemnity is not a guarantee within the statute, unless it contemplates the primary liability of a third person. It need not, therefore, be in writing when it is a mere promise to become liable for a debt, whenever the person to whom the promise is made should become liable (*Wildes* v. *Dudlow*, L.R. 19 Eq. 198; *per* Vaughan Williams, L.J. in *Harburg India-Rubber Co.* v. *Martin*, 1902, 1 K.B. p. 786; *Guild* v. *Conrad*, 1894, 2 Q.B. 885 C.A.). Neither does the statute apply to the promise of a *del credere* agent, which binds him, in consideration of the higher commission he receives, to make no sales on behalf of his principal except to persons who are absolutely solvent, and renders him liable for any loss that may result from the non-fulfilment of his promise. A promise to *give* a guarantee is, however, within the statute, though not one to *procure* a guarantee.

The general principles which determine what are guarantees within the Statute of Frauds, as deduced from a multitude of decided cases, are briefly as follows: (1) the primary liability of a third person must exist or be contemplated as the foundation of the contract (*Birkmyr* v. *Darnell*, 1 Sm. L.C. 11th ed. p. 299; *Mountstephen* v. *Lakeman*, L.R. 7 Q.B. 196; L.R. 7 H.L. 17); (2) the promise must be made to the creditor; (3) there must be an absence of all liability on the part of the surety independently of his express promise of guarantee; (4) the main object of the transaction between the parties to the guarantee must be the fulfilment of a third party's obligation (see *Harburg India-rubber Comb Co.* v. *Martin*, 1902, 1 K.B. 778, 786); and (5) the contract entered into must not amount to a sale by the creditor to the promiser of a security for a debt or of the debt itself (see de Colyar's *Law of Guarantee and of Principal and Surety*, 3rd ed. pp. 65-161, where these principles are discussed in detail by the light of decided cases there cited).

As regards the kind of note or memorandum of the guarantee that will satisfy the Statute of Frauds, it is now provided by § 3 of the Mercantile Law Amendment Act 1856, that "no special promise to be made, by any person after the passing of this act, to answer for the debt, default or miscarriage of another person, being in writing and signed by the party to be charged therewith, or some other person by him thereunto lawfully authorized, shall be deemed invalid to support an action, suit or other proceeding, to charge the person by whom such promise shall have been made, by reason only that the consideration for such promise does not appear in writing or by necessary inference from a written document." Prior to this enactment, which is not retrospective in its operation, it was held in many cases that as the Statute of Frauds requires "the agreement" to be in writing, all parts thereof were required so to be, including the consideration moving to, as well as the promise by, the party to be charged (*Wain* v. *Walters*, 5 East, 10; *Saunders* v. *Wakefield*, 4 B. & Ald. 595). These decisions, however, proved to be burdensome to the mercantile community, especially in Scotland and the north of England, and ultimately led to the alteration of the law, so far as guarantees are concerned, by means of the enactment already specified. Any writing embodying the terms of the agreement between the parties, and signed by the party to be charged, is sufficient; and the idea of agreement need not be present to the mind of the person signing (*per* Lindley, L.J., in *In re* Hoyle—*Hoyle* v. *Hoyle*, 1893, 1 Ch., at p. 98). It is, however, necessary that the names of the contracting parties should appear somewhere in writing; that the party to be charged, or his agent, should sign the memorandum or note of agreement, or else should sign another paper referring thereto; and that, when the note or memorandum is made, a complete agreement shall exist. Moreover, the memorandum must have been made before action brought, though it need not be contemporaneous with the agreement itself. As regards the stamping of the memorandum or note of agreement, a guarantee cannot, in England, be given in evidence unless properly stamped (Stamp Act 1891). A guarantee for the payment of goods, however, requires no stamp, being

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within the exception contained in the first schedule of the act. Nor is it necessary to stamp a written representation or assurance as to character within 9 Geo. IV. c. 14, *supra*. If under seal, a guarantee requires sometimes an *ad valorem* stamp and sometimes a ten-shilling stamp; in other cases a sixpenny stamp generally suffices; and, on certain prescribed terms, the stamps can be affixed any time after execution (Stamp Act 1891, § 15, amended by § 15 of the Finance Act 1895).

Extent of surety's liability.

The liability incurred by a surety under his guarantee depends upon its terms, and is not necessarily coextensive with that of the principal debtor. It is, however, obvious that as the surety's obligation is merely accessory to that of the principal it cannot as such exceed it (de Colyar, *Law of Guarantees*, 3rd ed. p. 233; Burge, *Suretyship*, p. 5). By the Roman law, if there were any such excess the surety's obligation was rendered *wholly* void and not merely void *pro tanto*. By many existing codes civil, however, a guarantee which imposes on the surety a greater liability than that of the principal is not thereby invalidated, but the liability is merely reducible to that of the principal (Fr. and Bel. 2013; Port. 823; Spain, 1826; Italy, 1900; Holland, 1859; Lower Canada, 1933). By sec. 128 of the Indian Contract Act 1872 the liability of the surety is, unless otherwise provided by contract, coextensive with that of the principal. Where the liability of the surety is *less* extensive in amount than that of the principal debtor, difficult questions have arisen in England and America as to whether the surety is liable only for *part* of the debt equal to the limit of his liability, or, up to such limit, for the *whole* debt (*Ellis* v. *Emmanuel*, 1 Ex. Div. 157; *Hobson* v. *Bass*, 6 Ch. App. 792; Brandt, *Suretyship*, sec. 219). The surety cannot be made liable except for a loss sustained by reason of the default guaranteed against. Moreover, in the case of a joint and several guarantee by several sureties, unless all sign it none are liable thereunder (*National Pro. Bk. of England* v. *Brackenbury*, 1906, 22 *Times* L.R. 797). It was formerly considered in England to be the duty of the party taking a guarantee to see that it was couched in language enabling the party giving it to understand clearly to what extent he was binding himself (*Nicholson* v. *Paget*, 1 C. & M. 48, 52). This view, however, can no longer be sustained, it being now recognized that a guarantee, like any other contract, must, in cases of ambiguity, be construed against the party bound thereby and in favour of the party receiving it (*Mayer* v. *Isaac*, 6 M. & W. 605, 612; *Wood* v. *Priestner*, L.R. 2 Exch. 66, 71). The surety is not to be changed beyond the limits prescribed by his contract, which must be construed so as to give effect to what may fairly be inferred to have been the intention of the parties, from what they themselves have expressed in writing. In cases of doubtful import, recourse to parol evidence is permissible, to explain, but not to contradict, the written evidence of the guarantee. As a general rule, the surety is not liable if the principal debt cannot be enforced, because, as already explained, the obligation of the surety is merely accessory to that of the principal debtor. It has never been actually decided in England whether this rule holds good in cases where the principal debtor is an Infant, and on that account is not liable to the creditor. Probably in such a case the surety might be held liable by estoppel (see *Kimball* v. *Newell*, 7 Hill (N.Y.) 116). When directors guarantee the performance by their company of a contract which is *ultra vires*, and therefore not binding on the latter, the directors' suretyship liability is, nevertheless, enforceable against them (*Yorkshire Railway Waggon Co.* v. *Maclure*, 21 Ch. D. 309 C.A.).

It is not always easy to determine for how long a time liability under a guarantee endures. Sometimes a guarantee is limited to a single transaction, and is obviously intended to be security against one specific default only. On the other hand, it as often happens that it is not exhausted by one transaction on the faith of it, but extends to a series of transactions, and remains a standing security until it is revoked, either by the act of the parties or else by the death of the surety. It is then termed a continuing guarantee. No fixed rules of interpretation determine whether a guarantee is a continuing one or not, but each case must be judged on its individual merits; and frequently, in order to achieve a correct construction, it becomes necessary to examine the surrounding circumstances, which often reveal what was the subject-matter which the parties contemplated when the guarantee was given, and likewise what was the scope and object of the transaction between them. Most continuing guarantees are either ordinary mercantile securities, in respect of advances made or goods supplied to the principal debtor or else bonds for the good behaviour of persons in public or private offices or employments. With regard to the latter class of continuing guarantees, the surety's liability is, generally speaking, revoked by any change in the constitution of the persons to or for whom the guarantee is given. On this subject it is now provided by section 18 of the Partnership Act 1890, which applies to Scotland as well as England, that "a continuing guarantee or cautionary obligation given either to a firm or to a third person in respect of the transactions of a firm, is, in the absence of agreement to the contrary, revoked as to future transactions by any change in the constitution of the firm to which, or of the firm in respect of the transactions of which the guaranty or obligation was given." This section, like the enactment it replaces, namely, sec. 4 of the Mercantile Law Amendment Act 1856, is mainly declaratory of the English common law, as embodied in decided cases, which indicate that the changes in the persons to or for whom a guarantee is given may consist either of an increase in their number, of a diminution thereof caused by death or retirement from business, or of the incorporation or consolidation of the persons to whom the guarantee is given. In this connexion it may be stated that the Government Offices (Security) Act 1875, which has been amended by the Statute Law Revision Act 1881, contains certain provisions with regard to the acceptance by the heads of public departments of guarantees given by companies for the due performance of the duties of an office or employment in the public service, and enables the Commissioners of His Majesty's Treasury to vary the character of any security, for good behaviour by public servants, given after the passing of the act.

Before the surety can be rendered liable on his guarantee, the principal debtor must have made default. When, however, this has occurred, the creditor, in the absence of express agreement to the contrary, may sue the surety, without even informing him of such default having taken place, or requiring him to pay, and before proceeding against the principal debtor or resorting to securities for the debt received from the latter. In those countries where the municipal law is based on the Roman civil law, sureties usually possess the right (which may, however, be renounced by them) originally conferred by the Roman law, of compelling the creditor to insist on the goods, &c. (if any) of the principal debtor being first "discussed," *i.e.* appraised and sold, and appropriated to the liquidation of the debt guaranteed (see Codes Civil, Fr. and Bel. 2021 et seq.; Spain, 1830, 1831; Port. 830; Germany, 771, 772, 773; Holland, 1868; Italy, 1907; Lower Canada, 1041-1042; Egypt [mixed suits] 612; *ibid.* [native tribunals] 502), before having recourse to the sureties. This right, according to a great American jurist (Chancellor Kent in *Hayes* v. *Ward*, 4 Johns. New York, Ch. Cas. p. 132), "accords with a common sense of justice and the natural equity of mankind." In England this right has never been fully recognized. Neither does it prevail in America nor, since the passing of the Mercantile Law Amendment Act (Scotland) 1856, s. 8, is it any longer available in Scotland where, prior to the last-named enactment, the benefit of discussion, as it is termed, existed. In England, however, before any demand for payment has been made by the creditor on the surety, the latter can, as soon as the principal debtor has made default, compel the creditor, on giving him an indemnity against costs and expenses, to sue the principal debtor if the latter be solvent and able to pay (*per* A. L. Smith, L.J., in *Rouse* v. *Bradford Banking Company*, 1894, 2 Ch. 75; *per* Lord Eldon in *Wright* v. *Simpson*, 6 Ves., at p. 733), and a similar remedy is also open to the surety in America (see Brandt on *Suretyship*, par. 205,

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p. 290) though in neither of these countries nor in Scotland can one of several sureties, when sued for the whole guaranteed debt by the creditor, compel the latter to divide his claim amongst all the solvent sureties, and reduce it to the share and proportion of each surety. However, this *beneficium divisionis*, as it is called in Roman law, is recognized by many existing codes (Fr. and Bel. 2025-2027; Spain, 1837; Portugal, 835-836; Germany, 426; Holland, 1873-1874; Italy, 1911-1912; Lower Canada, 1946; Egypt [mixed suits], 615,616).

The usual mode in England of enforcing liability under a guarantee is by action in the High Court or in the county court. It is also permissible for the creditor to obtain redress by means of a set-off or counter-claim, in an action brought against him by the surety. On the other hand, the surety may now, in any court in which the action on the guarantee is pending, avail himself of any set-off which may exist between the principal debtor and the creditor. Moreover, if one of several sureties for the same debt is sued by the creditor or his guarantee, he can, by means of a proceeding termed a third-party notice, claim contribution from his co-surety towards the common liability. Independent proof of the surety's liability under his guarantee must always be given at the trial; as the creditor cannot rely either on admissions made by the principal debtor, or on a judgment or award obtained against him (*Ex parte Young In re Kitchin*, 17 Ch. Div. 668). Should the surety become bankrupt either before or after default has been made by the principal debtor, the creditor will have to prove against his estate. This right of proof is now in England regulated by the 37th section of the Bankruptcy Act, 1883, which is most comprehensive in its terms.

Rights of sureties.

A person liable as a surety for another under a guarantee possesses various rights against him, against the person to whom the guarantee is given, and also against those who may have become co-sureties in respect of the same debt, default or miscarriage. As regards the surety's rights against the principal debtor, the latter may, where the guarantee was made with his consent but not otherwise (see *Hodgson*, v. *Shaw*, 3 Myl. & K. at p. 190), after he has made default, be compelled by the surety to exonerate him from liability by payment of the guaranteed debt (*per* Sir W. Grant, M.R., in *Antrobus* v. *Davidson*, 3 Meriv. 569, 570; *per* Lindley, L.J., in *Johnston* v. *Salvage Association*, 19 Q.B.D. 460, 461; and see *Wolmershausen* v. *Gullick*, 1893, 2 Ch. 514). The moment, moreover, the surety has himself paid any portion of the guaranteed debt, he is entitled to rank as a creditor for the amount so paid, and to compel repayment thereof. In the event of the principal debtor's bankruptcy, the surety can in England, if the creditor has not already proved in respect of the guaranteed debt, prove against the bankrupt's estate, not only in respect of payments made before the bankruptcy of the principal debtor, but also, it seems, in respect of the contingent liability to pay under the guarantee (see *Ex parte Delmar re Herepath*, 1889, 38 W.R. 752), while if the creditor has already proved, the surety who has paid the guaranteed debt has a right to all dividends received by the creditor from the bankrupt in respect thereof, and to stand in the creditor's place as to future dividends. This right is, however, often waived by the guarantee stipulating that, until the creditor has received full payment of all sums over and above the guaranteed debt, due to him from the principal debtor, the surety shall not participate in any dividends distributed from the bankrupt's estate amongst his creditors. As regards the rights of the surety against the creditor, they are in England exercisable even by one who in the first instance was a principal debtor, but has since become a surety, by arrangement with his creditor, duly notified to the creditor, though not even sanctioned by him. This was decided by the House of Lords in the case of *Rouse* v. *The Bradford Banking Co.*, 1894, A.C. 586, removing a doubt created by the previous case of *Swire* v. *Redman*, 1 Q.B.D. 536, which must now be treated as overruled. The surety's principal right against the creditor entitles him, after payment of the guaranteed debt, to the benefit of all securities, whether known to him (the surety) or not, which the creditor held against the principal debtor; and where, by default or *laches* of the creditor, such securities have been lost, or rendered otherwise unavailable, the surety is discharged *pro tanto*. This right, which is *not* in abeyance till the surety is called on to pay (*Dixon* v. *Steel*, 1901, 2 Ch. 602), extends to all securities, whether satisfied or not, given before or after the contract of suretyship was entered into. On this subject the Mercantile Law Amendment Act, 1856, § 5, provides that "every person who being surety for the debt or duty of another, or being liable with another for any debt or duty, shall pay such debt or perform such duty, shall be entitled to have assigned to him, or to a trustee for him, every judgment, specialty, or other security, which shall be held by the creditor in respect of such debt or duty, whether such judgment, specialty, or other security shall or shall not be deemed at law to have been satisfied by the payment of the debt or performance of the duty, and such person shall be entitled to stand in the place of the creditor, and to use all the remedies, and, if need be, and upon a proper indemnity, to use the name of the creditor, in any action or other proceeding at law or in equity, in order to obtain from the principal debtor, or any co-surety, co-contractor, or co-debtor, as the case may be, indemnification for the advances made and loss sustained by the person who shall have so paid such debt or performed such duty; and such payment or performance so made by such surety shall not be pleadable in bar of any such action or other proceeding by him, provided always that no co-surety, co-contractor, or co-debtor shall be entitled to recover from any other co-surety, co-contractor, or co-debtor, by the means aforesaid, more than the just proportion to which, as between those parties themselves, such last-mentioned person shall be justly liable." This enactment is so far retrospective that it applies to a contract made before the act, where the breach thereof, and the payment by the surety, have taken place subsequently. The right of the surety to be subrogated, on payment by him of the guaranteed debt, to all the rights of the creditor against the principal debtor is recognized in America (*Tobin* v. *Kirk*, 80 New York S.C.R. 229), and many other countries (Codes Civil, Fr. and Bel. 2029; Spain, 1839; Port. 839; Germany, 774; Holland, 1877; Italy, 1916; Lower Canada, 2959; Egypt [mixed suits], 617; *ibid.* [native tribunals], 505).

As regards the rights of the surety against a co-surety, he is entitled to contribution from him in respect of their common liability. This particular right is not the result of any contract, but is derived from a general equity, on the ground of equality of burden and benefit, and exists whether the sureties be bound jointly, or jointly and severally, and by the same, or different, instruments. There is, however, no right of contribution where each surety is severally bound for a given portion only of the guaranteed debt; nor in the case of a surety for a surety; (see *In re Denton's Estate*, 1904, 2 Ch. 178 C.A.); nor where a person becomes a surety jointly with another and at the latter's request. Contribution may be enforced, either before payment, or as soon as the surety has paid more than his share of the common debt (*Wolmershausen* v. *Gullick*, 1893, 2 Ch. 514); and the amount recoverable is now always regulated by the number of solvent sureties, though formerly this rule only prevailed in equity. In the event of the bankruptcy of a surety, proof can be made against his estate by a co-surety for any excess over the latter's contributive share. The right of contribution is not the only right possessed by co-sureties against each other, but they are also entitled to the benefit of all securities which have been taken by any one of them as an indemnity against the liability incurred for the principal debtor. The Roman law did not recognize the right of contribution amongst sureties. It is, however, sanctioned by many existing codes (Fr. and Bel. 2033; Germany, 426,474; Italy, 1920; Holland, 1881; Spain, 1844; Port. 845; Lower Canada, 1955; Egypt [mixed suits], 618, *ibid.* [native tribunals], 506), and also by the Indian Contract Act 1872, ss. 146-147.

The discharge of a surety from liability under his guarantee

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may be accomplished in various ways, he being regarded, especially in England and America, as a "favoured debtor" (*per* Turner, L.J., in *Wheatley* v. *Bastow*, 7 De G. M. & G. 279, 280; *per* Earl of Selborne, L.C., in *In re Sherry—London and County Banking Co.* v. *Terry*, 25 Ch. D., at p. 703; and see Brandt on *Suretyship*, secs. 70, 80). Thus, fraud subsequent to the execution of the guarantee (as where, for example, the creditor connives at the principal debtor's default) will certainly discharge the surety. Again, a material alteration made by the creditor in the instrument of guarantee after its execution may also have this effect. The most prolific ground of discharge, however, is usually traceable to causes originating in the creditor's *laches* or conduct, the governing principle being that if the creditor violates any rights which the surety possessed when he entered into the suretyship, even though the damage be nominal only, the guarantee cannot be enforced. On this subject it suffices to state that the surety's discharge may be accomplished (1) by a variation of the terms of the contract between the creditor and the principal debtor, or of that subsisting between the creditor and the surety (see *Rickaby* v. *Lewis*, 22 T.L.R. 130); (2) by the creditor taking a new security from the principal debtor in lieu of the original one; (3) by the creditor discharging the principal debtor from liability; (4) by the creditor binding himself to give time to the principal debtor for payment of the guaranteed debt; or (5) by loss of securities received by the creditor in respect of the guaranteed debt.

In this connexion it may be stated in general terms that whatever extinguishes the principal obligation necessarily determines that of the surety (which is accessory thereto), not only in England but elsewhere also (Codes Civil, Fr. and Bel. 2034, 2038; Spain, 1847; Port. 848; Lower Canada, 1956, 1960; Egypt [mixed suits], 622, *ibid.* [native tribunals], 509; Indian Contract Act 1872, sec. 134), and that, by most of the codes civil now in force, the surety is discharged by *laches* or conduct of the creditor inconsistent with the surety's rights (see Fr. and Bel. 2037; Spain, 1852; Port. 853; Germany, 776; Italy, 1928; Egypt [mixed suits], 623), though it may be mentioned that the rule prevailing in England, Scotland, America and India which releases the surety from liability where the creditor, by binding contract with the principal, extends without the surety's consent the time for fulfilling the principal obligation, while recognized by two existing codes civil (Spain, 1851; Port. 852), is rejected by the majority of them (Fr. and Bel. 2030; Holland, 1887; Italy, 1930; Lower Canada, 1961; Egypt [mixed suits], 613; *ib.* [native tribunals], 503); and see Morice, *English and Dutch Law*, p. 96; van der Linden, *Institutes of Holland*, pp. 120-121). A revocation of the contract of suretyship by act of the parties, or in certain cases by the death of the surety, may also operate to discharge the surety. The death of a surety does not *per se* determine the guarantee, but, save where from its nature the guarantee is irrevocable by the surety himself, it can be revoked by express notice after his death, or, it would appear, by the creditor becoming affected with constructive notice thereof; except where, under the testator's will, the executor has the option of continuing the guarantee, in which case the executor should, it seems, specifically withdraw the guarantee in order to determine it. Where one of a number of joint and several sureties dies, the future liability of the survivors under the guarantee continues, at all events until it has been determined by express notice. Moreover, when three persons joined in a guarantee to a bank, and their liability thereunder was not expressed to be several, it was held that the death of one surety did not determine the liability of the survivors. In such a case, however, the estate of the deceased surety would be relieved from liability.

The Statutes of Limitation bar the right of action on guarantees under seal after twenty years, and on other guarantees after six years, from the date when the creditor might have sued the surety.

AUTHORITIES.—De Colyar, *Law of Guarantees and of Principal and Surety* (3rd ed., 1897); American edition, by J. A. Morgan (1875); Throop, *Validity of Verbal Agreements*; Fell, *Guarantees* (2nd ed.); Theobald, *Law of Principal and Surety*; Brandt, *Law of Suretyships and Guarantee*; article by de Colyar in *Journal of Comparative Legislation* (1905), on "Suretyship from the Standpoint of Comparative Jurisprudence." (H. A. de C.)

GUARATINGUETÁ, a city of Brazil in the eastern part of the state of São Paulo, 124 m. N.E. of the city of São Paulo. Pop. (1890) of the municipality, which includes a large rural district and the villages of Apparecida and Roseira, 30,690. The city, which was founded in 1651, stands on a fertile plain 3 m. from the Parahyba river, and is the commercial centre of one of the oldest agricultural districts of the state. The district produces large quantities of coffee, and some sugar, Indian corn and beans. Cattle and pigs are raised. The city dwellings are for the most part constructed of rough wooden frames covered with mud, called *taipa* by the natives, and roofed with curved tiles. The São Paulo branch of the Brazilian Central railway passes through the city, by which it is connected with Rio de Janeiro on one side and São Paulo and Santos on the other.

GUARDA, an episcopal city and the capital of an administrative district bearing the same name, and formerly in the province of Beira, Portugal; on the Guarda-Abrantes and Lisbon-Villar Formoso railways. Pop. (1900) 6124. Guarda is situated 3370 ft. above sea-level, at the north-eastern extremity of the Serra da Estrella, overlooking the fertile valley of the river Côa. It is surrounded by ancient walls, and contains a ruined castle, a fine 16th-century cathedral and a sanatorium for consumptives. Its industries comprise the manufacture of coarse cloth and the sale of grain, wine and live stock. In 1199 Guarda was founded, on the site of the Roman Lencia Oppidana, by Sancho I. of Portugal, who intended it, as its name implies, to be a "guard" against Moorish invasion. The administrative district of Guarda coincides with north-eastern Beira; pop. (1900), 261,630; area, 1061 sq. m.

GUARDI, FRANCESCO (1712–1793), Venetian painter, was a pupil of Canaletto, and followed his style so closely that his pictures are very frequently attributed to his more celebrated master. Nevertheless, the diversity, when once perceived, is sufficiently marked—Canaletto being more firm, solid, distinct, well-grounded, and on the whole the higher master, while Guardi is noticeable for spirited touch, sparkling colour and picturesquely sketched figures—in these respects being fully equal to Canaletto. Guardi sometimes coloured Canaletto's designs. He had extraordinary facility, three or four days being enough for producing an entire work. The number of his performances is large in proportion to this facility and to the love of gain which characterized him. Many of his works are to be found in England and seven in the Louvre.

GUARDIAN, one who guards or defends another, a protector. The O. Fr. *guarden*, *garden*, mod. *gardien*, from *guarder*, *garder*, is of Teutonic origin, from the base *war-*, to protect, cf. O.H. Ger. *warten*, and Eng. "ward"; thus "guardian" and "warden" are etymologically identical, as are "guard" and "ward"; cf. the use of the correlatives "guardian" and "ward," *i.e.* a minor, or person incapable of managing his affairs, under the protection or in the custody of a guardian. For the position of guardians of the poor see POOR LAW, and for the legal relations between a guardian and his ward see INFANT, MARRIAGE and ROMAN LAW.

GUARDS, AND HOUSEHOLD TROOPS. The word *guard* is an adaptation of the Fr. *guarde*, mod. *garde*, O. Ger. *ward*; see GUARDIAN. The practice of maintaining bodyguards is of great antiquity, and may indeed be considered the beginning of organized armies. Thus there is often no clear distinction between the inner ring of personal defenders and the select corps of trained combatants who are at the chief's entire disposal. Famous examples of corps that fell under one or both these headings are the "Immortals" of Xerxes, the Mamelukes, Janissaries, the *Huscarles* of the Anglo-Saxon kings, and the Russian Strelitz (*Strveltsi*). In modern times the distinction of function is better marked, and the fighting men who are more intimately connected with the sovereign than the bulk of the army can be classified as to duties into "Household Troops,"

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who are in a sense personal retainers, and "Guards," who are a *corps d'élite* of combatants. But the dividing line is not so clear as to any given body of troops. Thus the British Household Cavalry is part of the combatant army as well as the sovereign's escort.

The oldest of the household or bodyguard corps in the United Kingdom is the King's Bodyguard of the *Yeomen of the Guard* (*q.v.*), formed at his accession by Henry VII. The "nearest guard," the personal escort of the sovereign, is the "King's Bodyguard of the Honourable Corps of *Gentlemen-at-Arms*," created by Henry VIII. at his accession in 1509. Formed possibly on the pattern of the "Pensionnaires" of the French kings—retainers of noble birth who were the predecessors of the *Maison du Roi* (see below)—the new corps was originally called "the Pensioners." The importance of such guards regiments in the general development of organized armies is illustrated by a declaration of the House of Commons, made in 1674, that the militia, the pensioners and the Yeomen of the Guard were the only lawful armed forces in the realm. But with the rise of the professional soldier and the corresponding disuse of arms by the nobles and gentry, the Gentlemen-at-Arms (a title which came into use in James II.'s time, though it did not become that of the corps until William IV.'s) retaining their noble character, became less and less military. Burke attempted without success in 1782 to restrict membership to officers of the army and navy, but the necessity of giving the corps an effective military character became obvious when, on the occasion of a threatened Chartist riot, it was called upon to do duty as an armed body at St James's Palace. The corps was reconstituted on a purely military basis in 1862, and from that date only military officers of the regular services who have received a war decoration are eligible for appointment. The office of captain, however, is political, the holder (who is always a peer) vacating it on the resignation of the government of which he is a member. The corps consists at present of captain, lieutenant, standard bearer, clerk of the cheque (adjutant), sub-officer and 39 gentlemen-at-arms. The uniform consists of a scarlet swallow-tailed coat and blue overalls, with gold epaulettes, brass dragoon helmet with drooping white plume and brass box-spurs, these last contrasting rather forcibly with the partizan, an essentially infantry weapon, that they carry.

The Royal Company of Archers.—The king's bodyguard for Scotland was constituted in its present form in the year 1676, by an act of the privy council of Scotland. An earlier origin has been claimed for the company, some connecting it with a supposed archer guard of the kings of Scotland. In the above-mentioned year, 1676, the minutes of the Royal Company begin by stating, that owing to "the noble and useful recreation of archery being for many years much neglected, several noblemen and gentlemen did associate themselves in a company for encouragement thereof . . . and did apply to the privy council for their approbation . . . which was granted." For about twenty years at the end of the 17th century, perhaps owing to the adhesion of the majority to the Stuart cause, its existence seems to have been suspended. But in 1703 a new captain-general, Sir George Mackenzie, Viscount Tarbat, afterwards earl of Cromarty (1630–1714), was elected, and he procured for the company a new charter from Queen Anne. The rights and privileges renewed or conferred by this charter were to be out of the crown for the *reddendo* of a pair of barbed arrows. This *reddendo* was paid to George IV. at Holyrood in 1822, to Queen Victoria in 1842 and to King Edward VII. in 1903. The history of the Royal Company since 1703 has been one of great prosperity. Large parades were frequently held, and many distinguished men marched in the ranks. Several of the leading insurgents in 1745 were members, but the company was not at that time suspended in any way.

In 1822 when King George IV. visited Scotland, it was thought appropriate that the Royal Company should act as his majesty's bodyguard during his stay, especially as there was a tradition of a former archer bodyguard. They therefore performed the duties usually assigned to the gentlemen-at-arms. When Queen Victoria visited the Scottish capital in 1842, the Royal Company again did duty; the last time they were called out in her reign in their capacity of royal bodyguard was in 1860 on the occasion of the great volunteer review in the Queen's Park, Edinburgh. They acted in the same capacity when King Edward VII. reviewed the Scottish Volunteers there on the 18th of September 1905.

King George IV. authorized the company to take, in addition to their former name, that of "The King's Body Guard for Scotland," and presented to the captain-general a gold stick, thus constituting the company part of the royal household. In virtue of this stick the captain-general of the Royal Company takes his place at a coronation or similar pageant immediately behind the gold stick of England. The field lieutenant-general of the company have silver sticks; and the council, which is the executive body of the company, possess seven ebony ones. George IV. further appointed a full dress uniform to be worn by members of the company at court, when not on duty as guards, in which latter case the ordinary field dress is used. The court dress is green with green velvet facings, gold epaulettes and lace, crimson silk sash, and cocked hat with green plume. The officers wear a gold sash in place of a crimson one, and an *aiguillette* on the left shoulder. All ranks wear swords. The field dress at present consists of a dark-green tunic, shoulder-wings and gauntleted cuffs and trousers trimmed with black and crimson; a bow-case worn as a sash, of the same colour as the coat, black waistbelt with sword, and Balmoral bonnet with thistle ornament and eagle's feather. The officers of the company are the captain-general, 4 captains, 4 lieutenants, 4 ensigns, 12 brigadiers and adjutant.

Corps of the gentlemen-at-arms or yeoman type do not of course count as combatant troops—if for no other reason at least because they are armed with the weapons of bygone times. Colonel Clifford Walton states in his *History of the British Standing Army* that neither the Yeomen of the Guard nor the Pensioners were ever subject to martial law. The British guards and household troops that are armed, trained and organized as part of the army are the *Household Cavalry* and the *Foot Guards*.

The Household Cavalry consists at the present day of three regiments, and has its origin, as have certain of the Footguard regiments, in the ashes of the "New Model" army disbanded at the restoration of Charles II. in 1660. In that year the "1st or His Majesty's Own Troop of Guards" formed during the king's exile of his cavalier followers, was taken on the strength of the army. The 2nd troop was formerly in the Spanish service as the "Duke of York's Guards," and was also a cavalier unit. In 1670, on Monk's death, the original 3rd troop (Monk's Life Guards, renamed in 1660 the "Lord General's Troop of Guards") became the 2nd (the queen's) troop, and the duke of York's troop the 3rd. In 1685 the 1st and 2nd troops were styled Life Guards of Horse, and two years later the blue-uniformed "Royal Regiment of Horse," a New Model regiment that had been disbanded and at once re-raised in 1660, was made a household cavalry corps. Later under the colonelcy of the earl of Oxford it was popularly called "The Oxford Blues." There were also from time to time other troops (*e.g.* Scots troops 1700–1746) that have now disappeared. In 1746 the 2nd troop was disbanded, but it was revived in 1788, when the two senior corps were given their present title of 1st and 2nd Life Guards. From 1750 to 1819 the Blues bore the name of "Royal Horse Guards Blue," which in 1819 was changed to "Royal Horse Guards (The Blues)." The general distinction between the uniforms of the red Life Guard and the blue Horse Guard still exists. The 1st and the 2nd regiments of Life Guards wear scarlet tunics with blue collars and cuffs, and the Royal Horse Guards blue tunics with scarlet collars and cuffs. All three wear steel cuirasses on state occasions and on guard duty. The head-dress is a steel helmet with drooping horse-hair plume (white for Life Guards, red for Horse Guards). In full dress white buckskin pantaloons and long knee boots are worn. Amongst the peculiarities of these *corps d'élite* is the survival of the old custom of calling non-commissioned officers "corporal of horse" instead of sergeant, and corporal-major instead of sergeant-major, the wearing by trumpeters and bandsmen in full dress of a black velvet cap, a richly laced coat with a full skirt extending to the wearer's knees and long white gaiters. There is little distinction between the two Life Guards regiments' uniforms, the most obvious point being that the cord running through the white leather pouch belt is red for the 1st and blue for the 2nd.

The Foot Guards comprise the Grenadier Guards, the Coldstream Guards, the Scots Guards and the Irish Guards, each (except the last) of three battalions. The Grenadiers, originally the First Foot Guards, represent a royalist infantry regiment which served with the exiled princes in the Spanish army and returned at the Restoration in 1660. The Coldstream Guards

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are a New Model regiment, and were originally called the Lord General's (Monk's) regiment of Foot Guards. Their popular title, which became their official designation in 1670, is derived from the fact that the army with which Monk restored the monarchy crossed the Tweed into England at the village of Coldstream, and that his troops (which were afterwards, except the two units of horse and foot of which Monk himself was colonel, disbanded) were called the Coldstreamers. The two battalions of Scots Foot Guards, which regiment was separately raised and maintained in Scotland after the Restoration, marched to London in 1686 and 1688 and were brought on to the English Establishment in 1707. In George III.'s reign they were known as the Third Guards, and from 1831 to 1877 (when the present title was adopted) as the Scots Fusilier Guards.

The Irish Guards (one battalion) were formed in 1902, after the South African War, as a mark of Queen Victoria's appreciation of the services rendered by the various Irish regiments of the line.[1] The dress of the Foot Guards is generally similar in all four regiments, scarlet tunic with blue collars, cuffs and shoulder-straps, blue trousers and high, rounded bearskin cap. The regimental distinctions most easily noticed are these. The Grenadiers wear a small white plume in the bearskin, the Coldstreams a similar red one, the Scots none, the Irish a blue-green one. The buttons on the tunic are spaced evenly for the Grenadiers, by twos for the Coldstreams, by threes for the Scots and by fours for the Irish. The band of the modern cap is red for the Grenadiers, white for the Coldstreams, "diced" red and white (chequers) for the Scots and green for the Irish. Former privileges of foot guard regiments, such as higher brevet rank in the army for their regimental officers, are now abolished, but Guards are still subject exclusively to the command of their own officers, and the officers of the Foot Guards, like those of the Household Cavalry, have special duties at court. Neither the cavalry nor the infantry guards serve abroad in peace time as a rule, but in 1907 a battalion of the Guards, which it was at that time proposed to dishand, was sent to Egypt. "Guards' Brigades" served in the Napoleonic Wars, in the Crimea, in Egypt at various times from 1887 to 1808 and in South Africa 1899–1902. The last employment of the Household Cavalry as a brigade in war was at Waterloo, but composite regiments made up from officers and men of the Life Guards and Blues were employed in Egypt and in S. Africa.

The sovereigns of France had guards in their service in Merovingian times, and their household forces appear from time to time in the history of medieval wars. Louis XI. was, however, the first to regularize their somewhat loose organization, and he did so to such good purpose that Francis I. had no less than 8000 guardsmen organized, subdivided and permanently under arms. The senior unit of the *Gardes du Corps* was the famous company of Scottish archers (*Compagnie écossaise de la Garde du Corps du Roi*), which was originally formed (1418) from the Scottish contingents that assisted the French in the Hundred Years' War. Scott's *Quentin Durward* gives a picture of life in the corps as it was under Louis XI. In the following century, however, its regimental history becomes somewhat confused. Two French companies were added by Louis XI. and Francis I. and the *Gardes du Corps* came to consist exclusively of cavalry. About 1663 nearly all the Scots then serving went into the "regiment d'Hébron" and thence later into the British regular army (see HEPBURN, SIR JOHN). Thereafter, though the titles, distinctions and privileges of the original Archer Guard were continued, it was recruited from native Frenchmen, preference being (at any rate at first) given to those of Scottish descent. At its disbandment in 1791 along with the rest of the *Gardes du Corps*, it contained few, if any, native Scots. There was also, for a short time (1643–1660), an infantry regiment of *Gardes écossaises*.

In 1671 the title of *Maison Militaire du Roi* was applied to that portion of the household that was distinctively military. It came to consist of 4 companies of the *Gardes du Corps*, 2 companies of *Mousquetaires* (cavalry) (formed 1622 and 1660), 1 company of *Chevaux légers* (1550), 1 of *Gendarmes de la Maison Rouge*, and 1 of *Grenadiers à Cheval* (1676), with 1 company of *Gardes de la Porte* and one called the *Cent-Suisses*, the last two being semi-military. This large establishment, which did not include all the guard regiments, was considerably reduced by the Count of St Germain's reforms in 1775, all except the *Gardes du Corps* and the *Cent-Suisses* being disbanded. The whole of the *Maison du Roi*, with the exception of the semi-military bodies referred to, was cavalry.

The *Gardes françaises*, formed in 1563, did not form part of the *Maison*. They were an infantry regiment, as were the famous *Gardes suisses*, originally a Swiss mercenary regiment in the Wars of Religion, which was, for good conduct at the combat of Arques, incorporated in the permanent establishment by Henry IV. in 1589 and in the guards in 1615. At the Revolution, contrary to expectation, the French Guards sided openly with the Constitutional movement and were disbanded. The Swiss Guards, however, being foreigners, and therefore unaffected by civil troubles, retained their exact discipline and devotion to the court to the day on which they were sacrificed by their master to the bullets of the Marseillais and the pikes of the mob (August 10, 1792). Their tragic fate is commemorated by the well-known monument called the "Lion of Lucerne," the work of Thorvaldsen, erected near Lucerne in 1821. The "Constitutional," "Revolutionary" and other guards that were created after the abolition of the *Maison* and the slaughter of the Swiss are unimportant, but through the "Directory Guards" they form a nominal link between the household troops of the monarchy and the corps which is perhaps the most famous "Guard" in history, the Empire. was at first of about the strength of a division. As such it took part in the Austerlitz and Jena campaigns, but after the conquest of Prussia Napoleon augmented it, and divided it into the "Old Guard" and the "Young Guard." Subsequently the "Middle Guard" was created, and by successive augmentations the corps of the guard had grown to be 57,000 strong in 1811–1812 and 81,000 in 1813. It preserved its general character as a *corps d'élite* of veterans to the last, but from about 1813 the "Young Guard" was recruited directly from the best of the annual conscript contingents. The officers held a higher rank in the army than their regimental rank in the Guards. At the first Restoration an attempt was made to revive the *Maison du Roi*, but in the constitutional régime of the second Restoration this semi-medieval form of bodyguard was given up and replaced by the *Garde Royale*, a selected fighting corps. This took part in the short war with Spain and a portion of it fought in Algeria, but it was disbanded at the July Revolution. Louis Philippe had no real guard troops, but the memories of the Imperial Guard were revived by Napoleon III., who formed a large guard corps in 1853–1854. This, however, was open to an even greater degree than Napoleon I.'s guard to the objection that it took away the best soldiers from the line. Since the fall of the Empire in 1870 there have been no guard troops in France, the duty of watching over the safety of the president is taken in the ordinary roster of duty by the troops stationed in the capital. The "Republican Guard" is the Paris gendarmerie, recruited from old soldiers and armed and trained as a military body.

In *Austria-Hungary* there are only small bodies of household troops (Archer Body Guard, Trabant Guard, Hungarian Crown Guards, &c.) analogous to the British Gentlemen at Arms or Yeomen of the Guard. Similar forces, the "Noble Guard" and the "Swiss Guard," are maintained in the Vatican. The court troops of Spain are called "halberdiers" and armed with the halbert.

In *Russia* the Guard is organized as an army corps. It possesses special privileges, particularly as regards officers' advancement.

In *Germany* the distinction between armed retainers and "Guards" is well marked. The army is for practical purposes a unit under imperial control, while household troops ("Leib-regiments" as they are usually called) belong individually to the various sovereigns within the empire. The "Guards," as a combatant force in the army are those of the king of *Prussia* and constitute a strong army corps. This has grown gradually from a bodyguard of archers, and, as in Great Britain, the functions of the heavy cavalry regiments of the Guard preserve to some extent the name and character of a body guard (*Gardes du Corps*). The senior foot guard regiment is also personally connected with the royal family. The conversion of a palace-guard to a combatant force is due chiefly to Frederick William I., to whom drill was a ruling passion, and who substituted effective regiments for the ornamental "Trabant Guards" of his father. A further move was made by Frederick the Great in substituting for Frederick William's expensive "giant" regiment of grenadiers a larger number of ordinary soldiers, whom he subjected to the same rigorous training and made a *corps d'élite*. Frederick the Great also formed the Body Guard alluded to above. Nevertheless in 1806 the Guard still consisted only of two cavalry regiments and four infantry regiments, and it was the example of Napoleon's imperial guard which converted this force into a corps of all arms. In 1813 its strength was that of a weak division, but in 1860 by slight but frequent augmentations it had come to consist of an army corps, complete with all auxiliary services. A few guard

[1] The "Irish Guards" of the Stuarts took the side of James II., fought against William III. in Ireland and lost their regimental identity in the French service to which the officers and soldiers transferred themselves on the abandonment of the struggle.

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regiments belonging to the minor sovereigns are counted in the line of the German army. In war the Guard is employed as a unit, like other army corps. It is recruited by the assignment of selected young men of each annual contingent, and is thus free from the reproach of the French Imperial Guard, which took the best-trained soldiers from the regiments of the line.

GUARD-SHIP, a warship stationed at some port or harbour to act as a guard, and in former times in the British navy to receive the men impressed for service. She usually was the flagship of the admiral commanding on the coast. A guard-boat is a boat which goes the round of a fleet at anchor to see that due watch is kept at night.

GUÁRICO, a large inland state of Venezuela created by the territorial redivision of 1904, bounded by Aragua and Miranda on the N., Bermúdez on the E., Bolívar on the S., and Zamora on the W. Pop. (1905 estimate), 78,117. It extends across the northern *llanos* to the Orinoco and Apure rivers and is devoted almost wholly to pastoral pursuits, exporting cattle, horses and mules, hides and skins, cheese and some other products. The capital is Calabozo, and the other principal towns are Camaguán (pop. 3648) on the Portugueza river, Guayabal (pop. 3146), on a small tributary of the Guárico river, and Zaraza (pop. 14,546) on the Unare river, nearly 150 m. S.E. of Carácas.

GUARIENTO, sometimes incorrectly named GUERRIERO, the first Paduan painter who distinguished himself. The only date distinctly known in his career is 1365, when, having already acquired high renown in his native city, he was invited by the Venetian authorities to paint a Paradise, and some incidents of the war of Spoleto, in the great council-hall of Venice. These works were greatly admired at the time, but have long ago disappeared under repaintings. His works in Padua have suffered much. In the church of the Eremitani are allegories of the Planets, and, in its choir, some small sacred histories in dead colour, such as an Ecce Homo; also, on the upper walls, the life of St Augustine, with some other subjects. A few fragments of other paintings by Guariento are still extant in Padua. In the gallery of Bassano is a Crucifixion, carefully executed, and somewhat superior to a merely traditional method of handling, although on the whole Guariento must rather be classed in that school of art which preceded Cimabue than as having advanced in his vestiges; likewise two other works in Bassano, ascribed to the same hand. The painter is buried in the church of S. Bernardino, Padua.

GUARINI, CAMILLO-GUARINO (1624–1683), Italian monk, writer and architect, was born at Modena in 1624. He was at once a learned mathematician, professor of literature and philosophy at Messina, and, from the age of seventeen, was architect to Duke Philibert of Savoy. He designed a very large number of public and private buildings at Turin, including the palaces of the duke of Savoy and the prince of Cacignan, and many public buildings at Modena, Verona, Vienna, Prague, Lisbon and Paris. He died at Milan in 1683.

GUARINI, GIOVANNI BATTISTA (1537–1612), Italian poet, author of the *Pastor fido*, was born at Ferrara on the 10th of December 1537, just seven years before the birth of Tasso. He was descended from Guarino da Verona. The young Battista studied both at Pisa and Padua, whence he was called, when not yet twenty, to profess moral philosophy in the schools of his native city. He inherited considerable wealth, and was able early in life to marry Taddea de' Bendedei, a lady of good birth. In 1567 he entered the service of Alphonso II., duke of Ferrara, thus beginning the court career which was destined to prove a constant source of disappointment and annoyance to him. Though he cultivated poetry for pastime, Guarini aimed at state employment as the serious business of his life, and managed to be sent on various embassies and missions by his ducal master. There was, however, at the end of the 16th century no opportunity for a man of energy and intellectual ability to distinguish himself in the petty sphere of Italian diplomacy. The time too had passed when the profession of a courtier, painted in such glowing terms by Castiglione, could confer either profit or honour. It is true that the court of Alphonso presented a brilliant spectacle to Europe, with Tasso for titular poet, and an attractive circle of accomplished ladies. But the last duke of Ferrara was an illiberal patron, feeding his servants with promises, and ever ready to treat them with the brutality that condemned the author of the *Gerusalemme liberata* to a mad-house. Guarini spent his time and money to little purpose, suffered from the spite and ill-will of two successive secretaries,—Pigna and Montecatini,—quarrelled with his old friend Tasso, and at the end of fourteen years of service found himself half-ruined, with a large family and no prospects. When Tasso was condemned to S. Anna, the duke promoted Guarini to the vacant post of court poet. There is an interesting letter extant from the latter to his friend Cornelio Bentivoglio, describing the efforts he made to fill this place appropriately. "I strove to transform myself into another person, and, like a player, reassumed the character, costume and feelings of my youth. Advanced in manhood, I forced myself to look young; I turned my natural melancholy into artificial gaiety, affected loves I did not feel, exchanged wisdom for folly, and, in a word, passed from a philosopher into a poet." How ill-adapted he felt himself to this masquerade life may be gathered from the following sentence: "I am already in my forty-fourth year, the father of eight children, two of whom are old enough to be my censors, while my daughters are of an age to marry." Abandoning so uncongenial a strain upon his faculties, Guarini retired in 1582 to his ancestral farm, the Villa Guarina, in the lovely country that lies between the Adige and Po, where he gave himself up to the cares of his family, the nursing of his dilapidated fortunes and the composition of the *Pastor fido*. He was not happy in his domestic lot; for he had lost his wife young, and quarrelled with his elder sons about the division of his estate. Litigation seems to have been an inveterate vice with Guarini; nor was he ever free from legal troubles. After studying his biography, the conclusion is forced upon our minds that he was originally a man of robust and virile intellect, ambitious of greatness, confident in his own powers, and well qualified for serious affairs, whose energies found no proper scope for their exercise. Literary work offered but a poor sphere for such a character, while the enforced inactivity of court life soured a naturally capricious and choleric temper. Of poetry he spoke with a certain tone of condescension, professing to practise it only in his leisure moments; nor are his miscellaneous verses of a quality to secure for their author a very lasting reputation. It is therefore not a little remarkable that the fruit of his retirement—a disappointed courtier past the prime of early manhood—should have been a dramatic masterpiece worthy to be ranked with the classics of Italian literature. Deferring a further account of the *Pastor fido* for the present, the remaining incidents of Guarini's restless life may be briefly told. In 1585 he was at Turin superintending the first public performance of his drama, whence Alphonso recalled him to Ferrara, and gave him the office of secretary of state. This reconciliation between the poet and his patron did not last long. Guarini moved to Florence, then to Rome, and back again to Florence, where he established himself as the courtier of Ferdinand de' Medici. A dishonourable marriage, pressed upon his son Guarino by the grand-duke, roused the natural resentment of Guarini, always scrupulous upon the point of honour. He abandoned the Medicean court, and took refuge with Francesco Maria of Urbino, the last scion of the Montefeltro-della-Rovere house. Yet he found no satisfaction at Urbino. "The old court is a dead institution," he writes to a friend; "one may see a shadow of it, but not the substance in Italy of to-day. Ours is an age of appearances, and one goes a-masquerading all the year." This was true enough. Those dwindling deadly-lively little residence towns of Italian ducal families, whose day of glory was over, and who were waiting to be slowly absorbed by the capacious appetite of Austria, were no fit places for a man of energy and independence. Guarini finally took refuge in his native Ferrara, which, since the death of Alphonso, had now devolved to the papal see. Here, and at the Villa Guarina, his last years were passed in study, lawsuits, and polemical disputes with his contemporary critics, until 1612, when he died at Venice in his seventy-fifth year.

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The *Pastor fido* (first published in 1590) is a pastoral drama composed not without reminiscences of Tasso's *Aminta*. The scene is laid in Arcadia, where Guarini supposes it to have been the custom to sacrifice a maiden yearly to Diana. But an oracle has declared that when two scions of divine lineage are united in marriage, and a faithful shepherd has atoned for the ancient error of a faithless woman, this inhuman rite shall cease. The plot turns upon the unexpected fulfilment of this prophecy, contrary to all the schemes which had been devised for bringing it to accomplishment, and in despite of apparent improbabilities of divers kinds. It is extremely elaborate, and, regarded as a piece of cunning mechanism, leaves nothing to be desired. Each motive has been carefully prepared, each situation amply developed. Yet, considered as a play, the *Pastor fido* disappoints a reader trained in the school of Sophocles or Shakespeare. The action itself seems to take place off the stage, and only the results of action, stationary tableaux representing the movement of the drama, are put before us in the scenes. The art is lyrical, not merely in form but in spirit, and in adaptation to the requirements of music which demands stationary expressions of emotion for development. The characters have been well considered, and are exhibited with great truth and vividness; the cold and eager hunter Silvio contrasting with the tender and romantic Mirtillo, and Corisca's meretricious arts enhancing the pure affection of Amarilli. Dorinda presents another type of love so impulsive that it prevails over a maiden's sense of shame, while the courtier Tirsi brings the corruption of towns into comparison with the innocence of the country. In Carino the poet painted his own experience, and here his satire upon the court of Ferrara is none the less biting because it is gravely measured. In Corisca he delineated a woman vitiated by the same town life, and a very hideous portrait has he drawn. Though a satirical element was thus introduced into the *Pastor fido* in order to relieve its ideal picture of Arcadia, the whole play is but a study of contemporary feeling in Italian society. There is no true rusticity whatever in the drama. This correspondence with the spirit of the age secured its success during Guarini's lifetime; this made it so dangerously seductive that Cardinal Bellarmine told the poet he had done more harm to Christendom by his blandishments than Luther by his heresy. Without anywhere transgressing the limits of decorum, the *Pastor fido* is steeped in sensuousness; and the immodesty of its pictures is enhanced by rhetorical concealments more provocative than nudity. Moreover, the love described is effeminate and wanton, felt less as passion than as lust enveloped in a veil of sentiment. We divine the coming age of *cicisbei* and *castrati*. Of Guarini's style it would be difficult to speak in terms of too high praise. The thought and experience of a lifetime have been condensed in these five acts, and have found expression in language brilliant, classical, chiselled to perfection. Here and there the taste of the 17th century makes itself felt in frigid conceits and forced antitheses; nor does Guarini abstain from sententious maxims which reveal the moralist rather than the poet. Yet these are but minor blemishes in a masterpiece of diction, glittering and faultless like a polished bas-relief of hard Corinthian bronze. That a single pastoral should occupy so prominent a place in the history of literature seems astonishing, until we reflect that Italy, upon the close of the 16th century, expressed itself in the *Pastor fido*, and that the influence of this drama was felt through all the art of Europe till the epoch of the Revolution. It is not a mere play. The sensual refinement proper to an age of social decadence found in it the most exact embodiment, and made it the code of gallantry for the next two centuries.

The best edition of the *Pastor fido* is the 20th, published at Venice (Ciotti) in 1602. The most convenient is that of Barbéra (Florence, 1866). For Guarini's miscellaneous *Rime*, the Ferrara edition, in 4 vols., 1737, may be consulted. His polemical writings, *Verato primo* and *secondo*, and his prose comedy called *Idropica*, were published at Venice, Florence and Rome, between 1588 and 1614.

(J. A. S.)

GUARINO, also known as VARINUS, and surnamed from his birthplace FAVORINUS, PHAVORINUS or CAMERS (*c.* 1450–1537), Italian lexicographer and scholar, was born at Favera near Camerino, studied Greek and Latin at Florence under Politian, and afterwards became for a time the pupil of Lascaris. Having entered the Benedictine order, he now gave himself with great zeal to Greek lexicography; and in 1496 published his *Thesaurus cornucopiae et horti Adonidis*, a collection of thirty-four grammatical tracts in Greek. He for some time acted as tutor to Giovanni dei Medici (afterwards Leo X.), and also held the appointment of keeper of the Medicean library at Florence. In 1514 Leo appointed him bishop of Nocera. In 1517 he published a translation of the *Apophthegmata* of Joannes Stobaeus, and in 1523 appeared his *Etymologicum magnum, sive thesaurus universae linguae Graecae ex multis variisque autoribus collectus*, a compilation which has been frequently reprinted, and which has laid subsequent scholars under great though not always acknowledged obligations.

GUARINO [GUARINUS] DA VERONA (1370–1460), one of the Italian restorers of classical learning, was born in 1370 at Verona, and studied Greek at Constantinople, where for five years he was the pupil of Manuel Chrysoloras. When he set out on his return to Italy he was the happy possessor of two cases of precious Greek MSS. which he had been at great pains to collect; it is said that the loss of one of these by shipwreck caused him such distress that his hair turned grey in a single night. He supported himself as a teacher of Greek, first at Verona and afterwards in Venice and Florence; in 1436 he became, through the patronage of Lionel, marquis of Este, professor of Greek at Ferrara; and in 1438 and following years he acted as interpreter for the Greeks at the councils of Ferrara and Florence. He died at Ferrara on the 14th of December 1460.

His principal works are translations of Strabo and of some of the *Lives* of Plutarch, a compendium of the Greek grammar of Chrysoloras, and a series of commentaries on Persius, Juvenal, Martial and on some of the writings of Aristotle and Cicero. See Rosmini, *Vita e disciplina di Guarino* (1805–1806); Sabbadini, *Guarino Veronese* (1885); Sandys, *Hist. Class. Schol.* ii. (1908).

GUARNIERI, or GUARNERIUS, a celebrated family of violin-makers of Cremona. The first was Andreas (*c.* 1626–1698), who worked with Antonio Stradivari in the workshop of Nicolo Amati (son of Geronimo). Violins of a model original to him are dated from the sign of "St Theresa" in Cremona. His son Joseph (1666–*c.* 1739) made instruments at first like his father's, but later in a style of his own with a narrow waist; his son, Peter of Venice (b. 1695), was also a fine maker. Another son of Andreas, Peter (Pietro Giovanni), commonly known as "Peter of Cremona" (b. 1655), moved from Cremona and settled at Mantua, where he too worked "sub signo Sanctae Teresae." Peter's violins again showed considerable variations from those of the other Guarnieri. Hart, in his work on the violin, says, "There is increased breadth between the sound-holes; the sound-hole is rounder and more perpendicular; the middle bouts are more contracted, and the model is more raised."

The greatest of all the Guarnieri, however, was a nephew of Andreas, Joseph del Gesu (1687–1745), whose title originates in the I.H.S. inscribed on his tickets. His master was Gaspar di Salo. His conception follows that of the early Brescian makers in the boldness of outline and the massive construction which aim at the production of tone rather than visual perfection of form. The great variety of his work in size, model, &c., represents his various experiments in the direction of discovering this tone. A stain or sap-mark, parallel with the finger-board on both sides, appears on the bellies of most of his instruments. Since the middle of the 18th century a great many spurious instruments ascribed to this master have poured over Europe. It was not until Paganini played on a "Joseph" that the taste of amateurs turned from the sweetness of the Amati and the Stradivarius violins in favour of the robuster tone of the Joseph Guarnerius. See VIOLIN.

GUASTALLA, a town and episcopal see of Emilia, Italy, in the province of Reggio, from which it is 18 m. N. by road, on the S. bank of the Po, 79 ft. above sea-level. It is also connected by rail with Parma and Mantua (via Suzzara). Pop.

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(1901), 2658 (town); 11,091 (commune). It has 16th-century fortifications. The cathedral, dating from the 10th century, has been frequently restored. Guastalla was founded by the Lombards in the 7th century; in the church of the Pieve Pope Paschal II. held a council in 1106. In 1307 it was seized by Giberto da Correggio of Parma. In 1403 it passed to Guido Torello, cousin of Filippo Maria Visconti of Milan. In 1539 it was sold by the last female descendant of the Torelli to Ferrante Gonzaga. In 1621 it was made the seat of a duchy, but in 1748 it was added to those of Parma and Piacenza, whose history it subsequently followed.

GUATEMALA (sometimes incorrectly written GUATIMALA), a name now restricted to the republic of Guatemala and to its chief city, but formerly given to a captaincy-general of Spanish America, which included the fifteen provinces of Chiapas, Suchitepeques, Escuintla, Sonsonate, San Salvador, Vera Paz and Peten, Chiquimula, Honduras, Nicaragua, Costa Rica, Totonicapam, Quezaltenango, Sololá, Chimaltenango and Sacatepequez,—or, in other words, the whole of Central America (except Panama) and part of Mexico. The name is probably of Aztec origin, and is said by some authorities to mean in its native form Quauhtemallan, "Land of the Eagle," or "Land of Forest"; others, writing it Ti-ha-tez-ma-la, connect it with the volcano of Agua (*i.e.* "water"), and interpret it as "mountain vomiting water."

The republic of Guatemala is situated between 13° 42′ and 17° 49′ N., and 88° 10′ and 92° 30′ W. (For map, see CENTRAL AMERICA.) Pop. (1903), 1,842,134; area about 48,250 sq. m. Guatemala is bounded on the W. and N. by Mexico, N.E. by British Honduras, E. by the Gulf of Honduras, and the republic of Honduras, S.E. by Salvador and S. by the Pacific Ocean. The frontier towards Mexico was determined by conventions of the 27th of September 1882, the 17th of October 1883, the 1st of April 1895, and the 8th of May 1899. Starting from the Pacific, it ascends the river Suchiate, then follows an irregular line towards the north-east, till it reaches the parallel of 17° 49′ N., along which it runs to the frontier of British Honduras. This frontier, by the convention of the 9th of July 1893, coincides with the meridian of 89° 20′ W., till it meets the river Sarstoon or Sarstun, which it follows eastwards to the Gulf of Honduras.

Physical Description.—Guatemala is naturally divided into five regions—the lowlands of the Pacific coast, the volcanic mountains of the Sierra Madre, the so-called plateaus immediately north of these, the mountains of the Atlantic versant and the plain of Peten. (1) The coast-land plains extend along the entire southern seaboard with a mean breadth of 50 m., and link together the belts of similar territory in Salvador and the district of Soconusco in Chiapas. Owing to their tropical heat, low elevation above sea-level, and marshy soil, they are thinly peopled, and contain few important towns except the seaports. (2) The precipitous barrier of the Sierra Madre, which closes in the coastal plains on the north, is similarly prolonged into Salvador and Mexico. It is known near Guatemala city as the Sierra de las Nubes, and enters Mexico as the Sierra de Istatan. It forms the main watershed between the Pacific and Atlantic river systems. Its summit is not a well-defined crest, but is often rounded or flattened into a table-land. The direction of the great volcanic cones, which rise in an irregular line above it, is not identical with that of the Sierra or the axis of the range except near the Mexican frontier, but has a more southerly trend, especially towards Salvador; here the base of many of the igneous peaks rests among the southern foothills of the range. It is, however, impossible to subdivide the Sierra Madre into another line of volcanic chain; for the volcanoes are isolated by stretches of comparatively low country; at least thirteen considerable streams flow down between them, from the main watershed to the sea. Viewed from the coast, the volcanic cones seem to rise directly from the central heights of the Sierra Madre, above which they tower; but in reality their bases are, as a rule, farther south. East of Tacana, which marks the Mexican frontier, and is variously estimated at 13,976 ft. and 13,090 ft., and if the higher estimate be correct is the loftiest peak in Central America, the principal volcanoes are—Tajamulco or Tajumulco (13,517 ft.); Santa Maria (12,467 ft.), which was in eruption during 1902, after centuries of quiescence, in which its slopes had been overgrown by dense forests; Atitlan (11,719), overlooking the lake of that name; Acatenango (13,615), which shares the claim of Tacana to be the highest mountain of Central America; Fuego (*i.e.* "fire," variously estimated at 12,795 ft. and 12,582 ft.), which received its name from its activity at the time of the Spanish conquest; Agua (*i.e.* "water," 12,339 ft.), so named in 1541 because it destroyed the former capital of Guatemala with a deluge of water from its flooded crater; and Pacaya (8390), a group of igneous peaks which were in eruption in 1870. (3) The so-called plateaus which extend north of the Sierra Madre are in fact high valleys, rather than table-lands, enclosed by mountains. A better idea of this region is conveyed by the native name Altos, or highlands, although that term includes the northern declivity of the Sierra Madre. The mean elevation is greatest in the west (Altos of Quezaltenango) and least in the east (Altos of Guatemala). A few of the streams of the Pacific slope actually rise in the Altos, and force a way through the Sierra Madre at the bottom of deep ravines. One large river, the Chixoy, escapes northwards towards the Atlantic. (4) The north-west of the mountainous country which lies north of the Altos and drains into the Atlantic is varied by innumerable terraces, ridges and underfalls; but its general configuration is admirably compared by E. Reclus with the appearance of "a stormy sea breaking into parallel billows" (*Universal Geography*, ed. E. G. Ravenstein, etc. xxiii., p. 212). The parallel ranges extend east and west with a slight southerly curve towards their centres. A range called the Sierra de Chama, which, however, changes its name frequently from place to place, strikes westward towards British Honduras, and is connected by low hills with the Cockscomb Mountains; another similar range, the Sierra de Santa Cruz, continues east to Cape Cocoli between the Polochic and the Sarstoon; and a third, the Sierra de las Minas or, in its eastern portion, Sierra del Mico, stretches between the Polochic and the Motagua. Between Honduras and Guatemala the frontier is formed by the Sierra de Merendon. (5) The great plain of Peten, which comprises about one-third of the whole area of Guatemala, belongs geographically to the Yucatan Peninsula, and consists of level or undulating country covered with grass or forest. Its population numbers less than two per sq. m., although many districts have a wonderfully fertile soil and abundance of water. The greater part of this region is uncultivated, and only utilized as pasture by the Indians, who form the majority of its inhabitants.

Guatemala is richly watered. On the western side of the sierras the versant is short, and the streams, while very numerous, are consequently small and rapid; but on the eastern side a number of the rivers attain a very considerable development. The Motagua, whose principal head stream is called the Rio del Monte, has a course of about 250 m., and is navigable to within 90 m. of the capital, which is situated on one of its confluents, the Rio de las Vacas. It forms a delta on the south of the Gulf of Honduras. Of similar importance is the Polochic, which is about 180 m. in length, and navigable about 20 m. above the mouth of Peten. Before reaching the Golfo Amatique it passes through the Golfo Dulce, or Izabal Lake, and the Golfete Dulce. A vast number of streams, among which are the Chixoy, the Guadalupe, and the Rio de la Pasion, navigate to form the Usumacinta, whose noble current passes along the Mexican frontier, and flowing on through Chiapas and Tabasco, falls into the Bay of Campeche. The Chiapas follows a similar course.

There are several extensive lakes in Guatemala. The Lake of Peten or Laguna de Flores, in the centre of the department of Peten, is an irregular basin about 27 m. long, with an extreme breadth of 13 m. In an island in the western portion stands Flores, a town well known to American antiquaries for the number of ancient idols which have been recovered from its soil. On the shore of the lake is the stalactite cave of Johitsinal, of great local celebrity; and in its depths, according to the popular legend, may still be discerned the stone image of a horse that belonged to Cortes. The Golfo Dulce is, as its name implies, a fresh-water lake, although so near the Atlantic. It is about 36 m. long, and would be of considerable value as a harbour if the bar at the mouth of the Rio Dulce did not prevent the upward passage of seafaring vessels. As a contrast the Lake of Atitlan (*q.v.*) is a land-locked basin encompassed by lofty mountains. About 15 m. from the capital lies the Lake of Amatitlan (*q.v.*) with the town of the same name. On the borders of Salvador and Guatemala there is the Lake of Guija, about 20 m. long and 12 broad, at a height of 2100 ft. above the sea. It is connected by the river Paz-uma with the Lake of Ayarza which lies about 1000 ft. higher at the foot of the Sierra Madre.

The geology, fauna and flora of Guatemala are discussed under CENTRAL AMERICA. The bird-life of the country is remarkably rich; one bird of magnificent plumage, the quetzal, quijal or quesal (*Trogon resplendens*), has been chosen as the national emblem.

Climate.—The climate is healthy, except on the coasts, where malarial fever is prevalent. The rainy season in the interior lasts from May to October, but on the coast sometimes continues till December. The coldest month is January, and the warmest is May. The average temperatures for these months at places of different altitudes, as given by Dr Karl Sapper, are shown on the following page.

The average rainfall is very heavy, especially on the Atlantic slope, where the prevailing winds are charged with moisture from the Gulf of Mexico or the Caribbean Sea; at Tual, a high station on the Atlantic slope, it reaches 195 in.; in central Guatemala it is only 27 in. Towards the Atlantic rain often occurs in the dry season, and there is a local saying near the Golfo Dulce that "it rains thirteen months in the year." Fogs are not rare. In Guatemala,

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Locality.	Altitude (Feet).	Fahrenheit Degrees.	
		January.	May.
Puerto Barrios	6	74	81
Salamá	3020	68	77
Campur	3050	64	73
Chimax	4280	61	68
Guatemala	4870	60	67
Quezaltenango	7710	50	62

as in other parts of Central America (*q.v.*), each of the three climatic zones, cold, temperate and hot (*tierra fria, tierra templada, tierra caliente*) has its special characteristics, and it is not easy to generalize about the climate of the country as a whole.

Natural Products.—The minerals discovered in Guatemala include gold, silver, lead, tin, copper, mercury, antimony, coal, salt and sulphur; but it is uncertain if many of these exist in quantities sufficient to repay exploitation. Gold is obtained at Las Quebradas near Izabal, silver in the departments of Santa Rosa and Chiquimula, salt in those of Santa Rosa and Alta Vera Paz. During the 17th century gold-washing was carried on by English miners in the Motagua valley, and is said to have yielded rich profits; hence the name of "Gold Coast" was not infrequently given to the Atlantic littoral near the mouth of the Motagua.

The area of forest has only been seriously diminished in the west, and amounted to 2030 sq. m. in 1904. Besides rubber, it yields many valuable dye-woods and cabinet-woods, such as cedar, mahogany and logwood. Fruits, grain and medicinal plants are obtained in great abundance, especially where the soil is largely of volcanic origin, as in the Altos and Sierra Madre. Parts of the Peten district are equally fertile, maize in this region yielding two hundredfold from unmanured soil. The vegetable products of Guatemala include coffee, cocoa, sugar-cane, bananas, oranges, vanilla, aloes, agave, ipecacuanha, castor-oil, sarsaparilla, cinchona, tobacco, indigo and the wax-plant (*Myrica cerifera*).

Inhabitants.—The inhabitants of Guatemala, who tend to increase rapidly owing to the high birth-rate, low mortality, and low rate of emigration, numbered in 1903 1,842,134, or more than one-third of the entire population of Central America. Fully 60% are pure Indians, and the remainder, classed as *Ladinos* or "Latins" (*i.e.* Spaniards in speech and mode of life), comprise a large majority of half-castes (*mestizos*) and civilized Indians and a smaller proportion of whites. It includes a foreign population of about 12,000 Europeans and North Americans, among them being many Jews from the west of the United States. There are important German agricultural settlements, and many colonists from north Italy who are locally called *Tiroleses*, and despised by the Indians for their industry and thrift. About half the births among the Indians and one-third among the whites are illegitimate.

No part of Central America contains a greater diversity of tribes, and in 1883 Otto Stoll estimated the number of spoken languages as eighteen, although east of the meridian of Lake Amatitlán the native speech has almost entirely disappeared and been replaced by Spanish. The Indians belong chiefly to the Maya stock, which predominates throughout Peten, or to the allied Quiché race which is well represented in the Altos and central districts. The Itzas, Mopans, Lacandons, Chols, Pokonchi and the Pokomans who inhabit the large settlement of Mixco near the capital, all belong to the Maya family; but parts of central and eastern Guatemala are peopled by tribes distinct from the Mayas and not found in Mexico. In the 16th century the Mayas and Quichés had attained a high level of civilization (see CENTRAL AMERICA, *Archaeology*), and at least two of the Guatemalan languages, Quiché and Cakchiquel, possess the rudiments or the relics of a literature. The Quiché *Popol Vuh*, or "Book of History," which was translated into Spanish by the Dominican friar Ximenes, and edited with a French version by Brasseur de Bourbourg, is an important document for students of the local myths. In appearance the various Guatemalan tribes differ very little; in almost all the characteristic type of Indian is short but muscular, with low forehead, prominent cheek-bones and straight black hair. In character the Indians are, as a rule, peaceable, though conscious of their numerical superiority and at times driven to join in the revolutions which so often disturb the course of local politics; they are often intensely religious, but with a few exceptions are thriftless, indolent and inveterate gamblers. Their *confradias*, or brotherhoods, each with its patron saint and male and female chiefs, exist largely to organize public festivals, and to purchase wooden masks, costumes and decorations for the dances and dramas in which the Indians delight. These dramas, which deal with religious and historical subjects, are of Indian origin, and somewhat resemble the mystery-plays of medieval Europe, a resemblance heightened by the introduction, due to Spanish missionaries, of Christian saints and heroes such as Charlemagne. The Indians are devoted to bull-fighting and cock-fighting. Choral singing is a popular amusement, and is accompanied by the Spanish guitar and native wind-instruments. The Indians have a habit of consuming a yellowish edible earth containing sulphur; on pilgrimages they obtain images moulded of this earth at the shrines they visit, and eat the images as a prophylactic against disease. Maize, beans and bananas, varied occasionally with dried meat and fresh pork, form their staple diet; drunkenness is common on pay-days and festivals, when large quantities of a fiery brandy called *chicha* are consumed.

Chief Towns.—The capital of the republic, Guatemala or Guatemala la Nueva (pop. 1905 about 97,000) and the cities of Quezaltenango (31,000), Totonicapam (28,000), Coban (25,000), Solola (17,000), Escuintla (12,000), Huehuetanango (12,000), Amatitlán (10,000) and Atitlán (9000) are described under separate headings. All the chief towns except the seaports are situated within the mountainous region where the climate is temperate. Retalhuleu, among the southern foothills of the Sierra Madre, is one of the centres of coffee production, and is connected by rail with the Pacific port of Champerico, a very unhealthy place in the wet season. Both Retalhuleu and Champerico were, like Quezaltenango, Solola, and other towns, temporarily ruined by the earthquake of the 18th of April 1902. Santa Cruz Quiché, 25 m. N.E. of Totonicapam, was formerly the capital of the Quiché kings, but has now a Ladino population. Livingston, a seaport at the mouth of the Polochic (here called the Rio Dulce), was founded in 1806, and subsequently named after the author of a code of Guatemalan law; few vestiges remain of the Spanish settlement of Sevilla la Nueva, founded in 1844, and of the English colony of Abbotsville, founded in 1825,—both near Livingston. La Libertad, also called by its Indian name of Saclac, is the principal town of Peten.

Shipping and Communications.—The republic is in regular steam communication on the Atlantic side with New Orleans, New York and Hamburg, by vessels which visit the ports of Barrios (Santo Tomas) and Livingston. On the southern side the ports of San José, Champerico and Ocós are visited by the Pacific coast steamers, by the vessels of a Hamburg company and by those of the South American (Chilean) and the Pacific Steam Navigation Companies. Iztapa, formerly the principal harbour on the south coast, has been almost entirely abandoned since 1853. Gualan, on the Motagua, and Panzos, on the Polochic, are small river-ports. The principal towns are connected by wagon roads, towards the construction and maintenance of which each male inhabitant is required to pay two pesos or give four days' work a year. There are coach routes between the capital and Quezaltenango, but over a great portion of the country transport is still on mule-back. All the railway lines have been built since 1875. The main lines are the Southern, belonging to an American company and running from San José to the capital; the Northern, a government line from the capital to Puerto Barrios, which completes the interoceanic railroad; and the Western, from Champerico to Quezaltenango, belonging to a Guatemalan company, but largely under German management. For local traffic there are several lines; one from Iztapa, near San José, to Naranjo, and another from Ocós to the western coffee plantations. On the Atlantic slope transport is effected mainly by river tow-boats from Livingston along the Golfo Dulce and other lakes, and the Polochic river as far as Panzos. The narrow-gauge railway that serves the German plantations in the Vera Paz region is largely owned by Germans.

Guatemala joined the Postal Union in 1881; but its postal and telegraphic services have suffered greatly from financial difficulties. The telephone systems of Guatemala la Nueva, Quezaltenango and other cities are owned by private companies.

Commerce and Industry.—The natural resources of Guatemala are rich but undeveloped; and the capital necessary for their development is not easily obtained in a country where war, revolution and economic crises recur at frequent intervals, where the premium on gold has varied by no less than 500% in a single year, and where many of the wealthiest cities and agricultural districts have been destroyed by earthquake (as on one day (18th of April 1902). At the beginning of the 19th century, Guatemala had practically no export trade; but between 1825 and 1850 cochineal was largely exported, the centre of production being the Amatitlán district. This industry was ruined by the competition of chemical dyes, and a substitute was found in the cultivation of coffee.

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Guatemala is surpassed only by Brazil and the East Indies in the quantity of coffee it exports. The chief plantations are owned and managed by Germans; more than half of the crop is sent to Germany, while three-fifths of the remainder go to the United States and one-fifth to Great Britain. The average yearly product is about 70,000,000 lb, worth approximately £1,300,000, and subject to an export duty of one gold dollar (4s.) per quintal (101 lb). Sugar, bananas, tobacco and cocoa are also cultivated; but much of the sugar and bananas, most of the cocoa, and all the tobacco are consumed in the country. During the colonial period, the cocoa of western Guatemala and Soconusco was reserved on account of its fine flavour for the Spanish court. The indigo and cotton plantations yield little profit, owing to foreign competition, and have in most cases been converted to other uses. The cultivation of bananas tends to increase, though more slowly than in other Central American countries. Grain, sweet potatoes and beans are grown for home consumption. Cattle-farming is carried on in the high pasturelands and the plains of Peten; but the whole number of sheep (37,000 in 1900) and pigs (30,000) in the republic is inferior to the number kept in many single English counties. Much of the wool is sold, like the native cotton, to Indian and Ladino women, who manufacture coarse cloth and linen in their homes.

By the Land Act of 1894 the state domains, except on the coasts and frontiers, were divided into lots for sale. The largest holding tenable by one person under this act was fixed at 50 caballerias, or 5625 acres; the price varies from £40 to £80 per caballeria of 112½ acres. Free grants of uncultivated land are sometimes made to immigrants (including foreign companies), to persons who undertake to build roads or railways through their allotments, to towns, villages and schools. The condition of the Indians on the plantations is often akin to slavery, owing to the system adopted by some planters of making payments in advance for labour. The Indians soon spend their earnings, and thus contract debts which can only be repaid by long service.

In addition to the breweries, rum and brandy distilleries, sugar mills and tobacco factories, which are sometimes worked as adjuncts to the plantations, there are many purely urban industries, such as the manufacture of woollen and cotton goods on a large scale, and manufactures of building material and furniture; but these industries are far less important than agriculture.

During the five years 1900 to 1904 inclusive, the average value of Guatemalan imports, which consisted chiefly of textiles, iron and machinery, sacks, provisions, flour, beer, wine and spirits, amounted to £776,000; about one-half came from the United States, and nearly one-fourth from the United Kingdom. The exports during the same period had an average value of £1,528,000, and ranked as follows in order of value: coffee (£1,300,000), timber, hides, rubber, sugar, bananas, cocoa.

Finance.—Within the republic there are six banks of issue, to which the government is deeply indebted. There is practically neither gold nor silver in circulation, and the value of the banknotes is so fluctuating that trade is seriously hampered. On the 25th of June 1903, the issue of bank-notes without a guarantee was restricted; and thenceforward all banks were compelled to retain gold or silver to the value of 10% of the notes issued in 1904, 20% in 1905 and 30% in 1906. This reform has not, to any appreciable extent, rendered more stable the value of the notes issued. The silver peso, or dollar, of 100 centavos is the monetary unit, weighs 25 grammes ·900 fine, and has a nominal value of 4s. Being no longer current it has been replaced by the paper peso. The nickel coins include the real (nominal value 6d.), half-real and quarter-real. The metric system of weights and measures has been adopted, but the old Spanish standards remain in general use.

Of the revenue, about 64% is derived from customs and excise; 9% from property, road, military, slaughter and salt taxes; 1·7% from the gunpowder monopoly; and the remainder from various taxes, stamps, government lands, and postal and telegraph services. The estimated revenue for 1905–1906 was 23,000,000 pesos (about £328,500); the estimated expenditure was 27,317,659 pesos (£390,200), of which £142,800 were allotted to the public debt, £42,000 to internal development and justice, £49,000 to the army and the remainder largely to education. The gold value of the currency peso (75 = £1 in 1903, 70 = £1 in 1904, 58 = £1 in 1905) fluctuates between limits so wide that conversion into sterling (especially for a series of years), with any pretension to accuracy, is impracticable. In 1899 the rate of exchange moved between 710% and 206% premium on gold. According to the official statement, the gold debt, which runs chiefly at 4% and is held in Germany and England, amounted to £1,087,400 on the 1st of January 1905; the currency debt (note issues, internal loans, &c.) amounted to £704,730; total £1,692,635, a decrease since 1900 of about £300,000.

Government.—According to the constitution of December 1879 (modified in 1885, 1887, 1889 and 1903) the legislative power is vested in a national assembly of 69 deputies (1 for every 20,000 inhabitants) chosen for 4 years by direct popular vote, under universal manhood suffrage. The president of the republic is elected in a similar manner, but for 6 years, and he is theoretically not eligible for the following term. He is assisted by 6 ministers, heads of government departments, and by a council of state of 13 members, partly appointed by himself and partly by the national assembly.

Local Government.—Each of the twenty-two departments is administered by an official called a *jefe politico*, or political chief, appointed by the president, and each is subdivided into municipal districts. These districts are administered by one or more *alcaldes* or mayors, assisted by municipal councils, both alcaldes and councils being chosen by the people.

Justice.—The judicial power is vested in a supreme court, consisting of a chief justice and four associate justices elected by the people; six appeal courts, each with three judges, also elected by the people; and twenty-six courts of first instance, each consisting of one judge appointed by the president and two by the chief justice of the supreme court.

Religion and Instruction.—The prevailing form of religion is the Roman Catholic, but the state recognizes no distinction of creed. The establishment of conventual or monastic institutions is prohibited. Of the population in 1893, 90% could neither read nor write, 2% could only read, and 8% could read and write. Primary instruction is nominally compulsory, and, in government schools, is provided at the cost of the state. In 1903 there were 1064 government primary schools. There are besides about 128 private (occasionally aided) schools of similar character, owners of plantations on which there are more than ten children being obliged to provide school accommodation. Higher instruction is given in two national institutes at the capital, one for men with 500 pupils and one for women with 300. At Quezaltenango there are two similar institutes, and at Chiquimula there are other two. To each of the six there is a school for teachers attached, and within the republic there are four other schools for teachers. For professional instruction (law, medicine, engineering) there are schools supported by private funds, but aided occasionally by the government. Other educational establishments are a school of art, a national conservatory of music, a commercial college, four trades' schools with more than 600 pupils and a national library. There is a German school, endowed by the German government.

Defence.—For the white and mixed population military service is compulsory; from the eighteenth to the thirtieth year of age in the active army, and from the thirtieth to the fiftieth in the reserve. The effective force of the active army is 56,000, of the reserve 29,400. About 7000 officers and men are kept in regular service. Military training is given in all public and most private schools.

History.—Guatemala was conquered by the Spaniards under Pedro de Alvarado between 1522 and 1524. Up to the years 1837–1839 its history differs only in minor details from that of the neighbouring states of Central America (*q.v.*). The colonial period was marked by the destruction of the ancient Indian civilization, the extermination of many entire tribes, and the enslavement of the survivors, who were exploited to the utmost for the benefit of Spanish officials and adventurers. But although the administration was weak, corrupt and cruel, it succeeded in establishing the Roman Catholic religion, and in introducing the Spanish language among the Indians and Ladinos, who thus obtained a tincture of civilization and ultimately a desire for more liberal institutions. The Central American provinces revolted in 1821, were annexed to the Mexican empire of Iturbide from 1822 to 1823, and united to form a federal republic from 1823 to 1839. In Guatemala the Clerical, Conservative or anti-Federal party was supreme; after a protracted struggle it overthrew the Liberals or Federalists, and declared the country an independent republic, with Rafael Carrera (1814–1865) as president. In 1845 an attempt to restore the federal union failed; in 1851 Carrera defeated the Federalist forces of Honduras and Salvador at La Arada near Chiquimula, and was recognized as the pacificator of the republic. In 1851 a new constitution was promulgated, and Carrera was appointed president till 1856, a dignity which was in 1854 bestowed upon him for life. His

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rivalry with Gerardo Barrios (d. 1865), president of Salvador, resulted in open war in 1863. At Coatepeque the Guatemalans suffered a severe defeat, which was followed by a truce. Honduras now joined with Salvador, and Nicaragua and Costa Rica with Guatemala. The contest was finally settled in favour of Carrera, who besieged and occupied San Salvador and made himself dominant also in Honduras and Nicaragua. During the rest of his rule, which lasted till his death in April 1865, he continued to act in concert with the Clerical party, and endeavoured to maintain friendly relations with the European governments. Carrera's successor was General Cerna, who had been recommended by him for election. The Liberal party began to rise in influence about 1870, and in May 1871 Cerna was deposed. The archbishop of Guatemala and the Jesuits were driven into exile as intriguers in the interests of the Clericals. Pres. Rufino Barrios (1835–1885), elected in 1873, governed the country after the manner of a dictator; he expelled the Jesuits, confiscated their property and disestablished and disendowed the church. But though he encouraged education, promoted railway and other enterprises, and succeeded in settling difficulties as to the Mexican boundary, the general result of his policy was baneful. Conspiracies against him were rife, and in 1884 he narrowly escaped assassination. His ambition was to be the restorer of the federal union of the Central American states, and when his efforts towards this end by peaceful means failed he had recourse to the sword. Counting on the support of Honduras and Salvador, he proclaimed himself, in February 1885, the supreme military chief of Central America, and claimed the command of all the forces within the five states. President Zaldivar, of Salvador, had been his friend, but after the issue of the decree of union he entered into a defensive alliance with Costa Rica and Nicaragua. In March Barrios invaded Salvador, and on the 2nd of April a battle was fought, in which the Guatemalan president was killed. He was succeeded by General Manuel Barillas. No further effort was made to force on the union, and on the 16th of April the war was formally ended. Peace, however, only provided opportunity for domestic conspiracy, with assassination and revolution in view. In 1892 General José Maria Reina Barrios was elected president, and in 1897 he was re-elected; but on the 8th of February 1898 he was assassinated. Señor Morales, vice-president, succeeded him; but in the same year Don Manuel Estrada Cabrera (b. 1857) was elected president for the term ending 1905. Cabrera promoted education, commerce and the improvement of communications, but his re-election for the term 1905–1911 caused widespread discontent. He was charged with aiming at a dictatorship, with permitting or even encouraging the imprisonment, torture and execution without trial of political opponents, with maladministration of the finances and with aggression against the neighbouring states. A well-armed force, which included a body of adventurers from San Francisco (U.S.A.) was organized by General Barillas, the ex-president, and invaded Guatemala in March 1906 from Mexico, British Honduras and Salvador. Barillas (1845–1907) proclaimed his intention of establishing a silver currency, and gained, to a great extent, the sympathy of the German and British residents; he had been the sole Guatemalan president who had not sought to prolong his own tenure of office. Ocós was captured by his lieutenant, General Castillo, and the revolution speedily became a war, in which Honduras, Costa Rica and Salvador were openly involved against Guatemala, while Nicaragua was hostile. But Cabrera held his ground, and even gained several indecisive victories. The intervention of President Roosevelt and of President Diaz of Mexico brought about an armistice on the 19th of July, and the so-called "Marblehead Pact" was signed on the following day on board the United States cruiser "Marblehead." Its terms were embodied in a treaty signed (28th of September) by representatives of the four belligerent states. Nicaragua taking no part in the negotiations. The treaty included regulations for the improvement of commerce and navigation in the area affected by the war, and provided for the settlement of subsequent disputes by the arbitration of the United States and Mexico.

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GUATEMALA, or GUATEMALA LA NUEVA (*i.e.* "New Guatemala," sometimes written Nueva Guatemala, and formerly Santiago de los Caballeros de Guatemala), the capital of the republic of Guatemala, and until 1821 of the Spanish captaincy-general of Guatemala, which comprised Chiapas in Mexico and all Central America except Panama. Pop. (1903) about 97,000. Guatemala is built more than 5000 ft. above sea-level, in a wide table-land traversed by the Rio de las Vacas, or Cow River, so called from the cattle introduced here by Spanish colonists in the 16th century. Deep ravines mark the edge of the table-land, and beyond it lofty mountains rise on every side, the highest peaks being on the south, where the volcanic summits of the Sierra Madre exceed 12,000 ft. Guatemala has a station on the transcontinental railway from Puerto Barrios on the Atlantic (190 m. N.E.) to San José on the Pacific (75 m. S. by W.). It is thrice the size of any other city in the republic, and has a corresponding commercial superiority. Its archbishop is the primate of Central America (excluding Panama). Like most Spanish-American towns Guatemala is laid out in wide and regular streets, often planted with avenues of trees, and it has extensive suburbs. The houses, though usually of only one storey, are solidly and comfortably constructed; many of them are surrounded by large gardens and courts. Among the open spaces the chief are the Plaza Mayor, which contains the cathedral, erected in 1730, the archiepiscopal palace, the government buildings, the mint and other public offices; and the more modern Reforma Park and Plaza de la Concordia, now the favourite resorts of the inhabitants. There are many large schools for both sexes, besides hospitals and an orphanage. Many of the principal buildings, such as the military academy, were originally convents. The theatre, founded in 1858, is one of the best in Central America. A museum, founded in 1831, is maintained by the Sociedad Economica, which in various ways has done great service to the city and the country. There are two fortresses, the Castello Matamoros, built by Rafael Carrera (see GUATEMALA [republic] under *History*), and the Castello de San José. Water is brought from a distance of about 8 m. by two old aqueducts from the towns of Mixco and Pinula; fuel and provisions are largely supplied by the Pokoman Indians of Mixco. The general prosperity, and to some extent the appearance, of Guatemala have procured it the name of the Paris of Central America. It is lighted by electricity and has a good telephone service. Its trade is chiefly in coffee, but it also possesses cigar factories, wool and cotton factories, breweries, tanneries and other industrial establishments. The foreign trade is chiefly controlled by Germans.

The first city named Guatemala, now called Ciudad Vieja or "Old City," was founded in 1527 by Pedro de Alvarado, the conqueror of the country, on the banks of the Rio Pensativo, and at the foot of the volcano of Agua (*i.e.* "Water"). In 1541 it was overwhelmed by a deluge of water from the flooded

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crater of Agua; and in 1542 Alvarado founded Santiago de los Caballeros la Nueva, now Antigua. This city flourished greatly, and by the middle of the 18th century had become the most populous place in Central America, with 60,000 inhabitants and more than 100 churches and convents. But in 1773 it was ruined by an earthquake. It was rebuilt, and ultimately became capital of the department of Sacatepequez, and a health-resort locally celebrated for its thermal springs. But the Guatemalans determined to found a new capital on the site occupied by the hamlet of Ermita, 27 m. N.E. Here the third and last city of Guatemala was built, and became the seat of government in 1779. The remarkable regularity of the streets is due to the construction of the city on a uniform plan. The wide area covered, and the lowness of the houses, were similarly due to an ordinance which, in order to minimize the danger from earthquakes, forbade the erection of any building more than 20 ft. high. Many of the belfries of convents or churches, added after the ordinance had fallen into abeyance, were overthrown by the earthquake of 1874, which also destroyed a large part of Antigua.

GUATOS, a tribe of South American Indians of the upper Paraguay. They are of a European fairness and wear beards. They live almost entirely in canoes, building rough shelters in the swamps. They aided the Brazilians in the war with Paraguay 1865–70. Very few survive.

GUATUSOS, a tribe of American Indians of Costa Rica. They are an active, hardy people, who have always maintained hostility towards the Spaniards and retain their independence. From their language they appear to be a distinct stock. They were described by old writers as being very fair, with flaxen hair, and these reports led to a belief, since exploded, that they were European hybrids. There are very few surviving.

GUAVA (from the Mexican *guayaba*), the name applied to the fruits of species of *Psidium*, a genus belonging to the natural order *Myrtaceae*. The species which produces the bulk of the guava fruits of commerce is *Psidium Guajava*, a small tree from 15 to 20 ft. high, a native of the tropical parts of America and the West Indies. It bears short-stalked ovate or oblong leaves, with strongly marked veins, and covered with a soft tomentum or down. The flowers are borne on axillary stalks, and the fruits vary much in size, shape and colour, numerous forms and varieties being known and cultivated. The variety of which the fruits are most valued is that which is sometimes called the white guava (*P. Guajava*, var. *pyriferum*). The fruits are pear-shaped, about the size of a hen's egg, covered with a thin bright yellow or whitish skin filled with soft pulp, also of a light yellowish tinge, and having a pleasant sweet-acid and somewhat aromatic flavour. *P. Guajava*, var. *pomiferum*, produces a more globular or apple-shaped fruit, sometimes called the red guava. The pulp of this variety is mostly of a darker colour than the former and not of so fine a flavour, therefore the first named is most esteemed for eating in a raw state; both, however, are used in the preparation of two kinds of preserve known as guava jelly and guava cheese, which are made in the West Indies and imported thence to England; the fruits are of much too perishable a nature to allow of their importation in their natural state. Both varieties have been introduced into various parts of India, as well as in other countries of the East, where they have become perfectly naturalized. Though of course much too tender for outdoor planting in England, the guava thrives there in hothouses or stoves.

Psidium variabile (also known as *P. Cattleyanum*), a tree of from 10 to 20 ft. high, a native of Brazil (the Araçá or Araçá de Praya), is known as the purple guava. The fruit, which is very abundantly produced in the axils of the leaves, is large, spherical, of a fine deep claret colour; the rind is pitted, and the pulp is soft, fleshy, purplish, reddish next the skin, but becoming paler towards the middle and in the centre almost or quite white. It has a very agreeable acid-sweet flavour, which has been likened to that of a strawberry.

GUAYAMA, a small city and the capital of a municipal district and department of the same name, on the southern coast of Porto Rico, 53 m. S. of San Juan. Pop. (1899) of the city, 5334; (1910) 8321; (1900) of the district, 12,740. The district (156 sq. m.) includes Arroyo and Salinas. The city stands about 230 ft. above the sea and has a mild, healthy climate. It is connected with Ponce by railway (1910), and with the port of Arroyo by an excellent road, part of the military road extending to Cayey, and it exports sugar, rum, tobacco, coffee, cattle, fruit and other products of the department, which is very fertile. The city was founded in 1736, but was completely destroyed by fire in 1832. It was rebuilt on a rectangular plan and possesses several buildings of note. Drinking-water is brought in through an aqueduct.

GUAYAQUIL, or SANTIAGO DE GUAYAQUIL, a city and port of Ecuador, capital of the province of Guayas, on the right bank of the Guayas river, 33 m. above its entrance into the Gulf of Guayaquil, in 2° 12′ S., 79° 51′ W. Pop. (1890) 44,772; (1897, estimate) 51,000, mostly half-breeds. The city is built on a comparatively level *pajonal* or savanna, extending southward from the base of three low hills, called Los Cerros de la Cruz, between the river and the partially filled waters of the Estero Salado. It is about 30 ft. above sea-level, and the lower parts of the town are partially flooded in the rainy season. The old town is the upper or northern part, and is inhabited by the poorer classes, its streets being badly paved, crooked, undrained, dirty and pestilential. The great fire of 1896 destroyed a large part of the old town, and some of its insanitary conditions were improved in rebuilding. The new town, or southern part, is the business and residential quarter of the better classes, but the buildings are chiefly of wood and the streets are provided with surface drainage only. Among the public buildings are the governor's and bishop's palaces, town-hall, cathedral and 9 churches, national college, episcopal seminary and schools of law and medicine, theatre, two hospitals, custom-house, and several asylums and charitable institutions. Guayaquil is also the seat of a university corporation with faculties of law and medicine. A peculiarity of Guayaquil is that the upper floors in the business streets project over the walks, forming covered arcades. The year is divided into a wet and dry season, the former from January to June, when the hot days are followed by nights of drenching rain. The mean annual temperature is about 82° to 83° F.; malarial and bilious fevers are common, the latter being known as "Guayaquil fever," and epidemics of yellow fever are frequent. The dry or summer season is considered pleasant and healthy. The water-supply is now brought in through iron mains from the Cordilleras 53 m. distant. The mains pass under the Guayas river and discharge into a large distributing reservoir on one of the hills N. of the city. The city is provided with tramway and telephone services, the streets are lighted with gas and electricity, and telegraph communication with the outside world is maintained by means of the West Coast cable, which lands at the small port of Santa Elena, on the Pacific coast, about 65 m. W. of Guayaquil. Railway connexion with Quito (290 m.) was established in June 1908. There is also steamboat connexion with the producing districts of the province on the Guayas river and its tributaries, on which boats run regularly as far up as Bodegas (80 m.) in the dry season, and for a distance of 40 m. on the Daule. For smaller boats there are about 200 m. of navigation on this system of rivers. The exports of the province are almost wholly transported on these rivers, and are shipped either at Guayaquil, or at Puna, its deep-water port, 6½ m. outside the Guayas bar, on the E. end of Puna Island. The Guayas river is navigable up to Guayaquil for steamers drawing 22 ft. of water; larger vessels anchor at Puna, 40 m. from Guayaquil, where cargoes and passengers are transferred to lighters and tenders. There is a quay on the river front, but the depth alongside does not exceed 18 ft. The principal exports are cacao, rubber, coffee, tobacco, hides, cotton, Panama hats, cinchona bark and ivory nuts, the value of all exports for the year 1905 being 14,148,877 *sucres*, in a total of 18,565,668 *sucres* for the whole republic. In 1908 the exports were: cacao, about 64,000,000 lb, valued at $6,400,000; hides, valued at $135,000; rubber, valued at $235,000; coffee, valued at $273,000; and vegetable ivory, valued at $102,000.

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There are some small industries in the city, including a shipyard, saw-mills, foundry, sugar refineries, cotton and woollen mills, brewery, and manufactures of soap, cigars, chocolate, ice, soda-water and liqueurs.

Santiago de Guayaquil was founded on St James's day, the 25th of July 1535, by Sebastian de Benalcazar, but was twice abandoned before its permanent settlement in 1537 by Francesco de Orellana. It was captured and sacked several times in the 17th and 18th centuries by pirates and freebooters—by Jacob Clark in 1624, by French pirates in 1686, by English freebooters under Edward David in 1687, by William Dampier in 1707 and by Clapperton in 1709. Defensive works were erected in 1730, and in 1763, when the town was made a governor's residence, a castle and other fortifications were constructed. Owing to the flimsy construction of its buildings Guayaquil has been repeatedly burned, the greater fires occurring in 1707, 1764, 1865, 1896 and 1899. The city was made the see of a bishopric in 1837.

GUAYAS, or El Guayas, a coast province of Ecuador, bounded N. by Manabí and Pichincha, E. by Los Ríos, Cañar and Azuay, S. by El Oro and the Gulf of Guayaquil, and W. by the same gulf, the Pacific Ocean and the province of Manabí. Pop. (1893, estimate) 98,100; area, 11,504 sq. m. It is very irregular in form and comprises the low alluvial districts surrounding the Gulf of Guayaquil between the Western Cordilleras and the coast. It includes (since 1885) the Galápagos Islands, lying 600 m. off the coast. The province of Guayas is heavily forested and traversed by numerous rivers, for the most part tributaries of the Guayas river, which enters the gulf from the N. This river system has a drainage area of about 14,000 sq. m. and an aggregate of 700 m. of navigable channels in the rainy season. Its principal tributaries are the Daule and Babahoyo or Chimbo (also called Bodegas), and of the latter the Vinces and Yaguachi. The climate is hot, humid and unhealthy, bilious and malarial fevers being prevalent. The rainfall is abundant and the soil is deep and fertile. Agriculture and the collection of forest products are the chief industries. The staple products are cacao, coffee, sugar-cane, cotton, tobacco and rice. The cultivation of cacao is the principal industry, the exports forming about one-third the world's supply. Stock-raising is also carried on to a limited extent. Among forest products are rubber, cinchona bark, toquilla fibre and ivory nuts. The manufacture of so-called Panama hats from the fibre of the toquilla palm (commonly called *jipijapa*, after a town in Manabí famous for this industry) is a long-established domestic industry among the natives of this and other coast provinces, the humidity of the climate greatly facilitating the work of plaiting the delicate straws, which would be broken in a dry atmosphere. Guayas is the chief industrial and commercial province of the republic, about nineteen-twentieths of the commerce of Ecuador passing through the port of its capital, Guayaquil. There are no land transport routes in the province except the Quito & Guayaquil railway, which traverses its eastern half. The sluggish river channels which intersect the greater part of its territory afford excellent facilities for transporting produce, and a large number of small boats are regularly engaged in that traffic. There are no large towns in Guayas other than Guayaquil. Durán, on the Guayas river opposite Guayaquil, is the starting point of the Quito railway and contains the shops and offices of that line. The port of Santa Elena on a bay of the same name, about 65 m. W. of Guayaquil, is a landing-point of the West Coast cable, and a port of call for some of the regular steamship lines. Its exports are chiefly Panama hats and salt.

GUAYCURUS, a tribe of South American Indians on the Paraguay. The name has been used generally of all the mounted Indians of Gran Chaco. The Guaycurus are a wild, fierce people, who paint their bodies and go naked. They are fearless horsemen and are occupied chiefly in cattle rearing.

GUAYMAS, or San José de Guaymas, a seaport of Mexico, in the state of Sonora, on a small bay opening into the Gulf of California a few miles W. of the mouth of the Yaqui river, in lat. 27° 58′ N., long. 110° 58′ W. Pop. (1900) 8648. The harbour is one of the best on the W. coast of Mexico, and the port is a principal outlet for the products of the large state of Sonora. The town stands on a small, arid plain, nearly shut in by mountains, and has a very hot, dry climate. It is connected with the railways of the United States by a branch of the Southern Pacific from Benson, Arizona, and is 230 m. S. by W. of the frontier town of Nogales, where that line enters Mexico. The exports include gold, silver, hides and pearls.

GUBBIO (anc. *Iguvium, q.v.*; med. *Eugubium*), a town and episcopal see of Umbria, Italy, in the province of Perugia, from which it is 23 m. N.N.E. by road; by rail it is 13 m. N.W. of Fossato di Vico (on the line between Foligno and Ancona) and 70 m. E.S.E. of Arezzo. Pop. (1901) 5783 (town); 26,728 (commune). Gubbio is situated at the foot and on the steep slopes of Monte Calvo, from 1568 to 1735 ft. above sea-level, at the entrance to the gorge which ascends to Scheggia, probably on the site of the ancient Umbrian town. It presents a markedly medieval appearance. The most prominent building is the Palazzo dei Consoli, on the N. side of the Piazza della Signoria; it is a huge Gothic edifice with a tower, erected in 1332–1346, according to tradition, by Matteo di Giovanello of Gubbio, the name of Angelo da Orvieto occurs on the arch of the main door, but his work may be limited to the sculptures of this arch. It has two stories above the ground floor, and, being on the slope of the hill, is, like the whole piazza, raised on arched substructures. On the S. side of the piazza is the Palazzo Pretorio, or della Podestà, begun in 1340 and now the municipal palace. It contains the famous *Tabulae Iguvinae*, and a collection of paintings of the Umbrian school, of furniture and of majolica. On the E. side is the modern Palazzo Ranghiasci-Brancaleone, which until 1889 contained fine collections, now dispersed. Above the Piazza della Signoria, at the highest point of the town, is the Palazzo Ducale, erected by the dukes of Urbino in 1474–1480; the architect was, in all probability, Lucio da Laurana, to whom is due the palace at Urbino, which this palace resembles, especially in its fine colonnaded court. The Palazzo Beni, lower down, belongs to a somewhat earlier period of the 15th century. Pope Martin V. lodged here for a few days in 1420. The Palazzo Accoramboni, on the other hand, is a Renaissance structure, with a fine entrance arch. Here Vittoria Accoramboni was born in 1557. Opposite the Palazzo Ducale is the cathedral, dedicated to SS. Mariano e Jacopo, a structure of the 12th century, with a façade, adorned with contemporary sculptures, partly restored in 1514–1550. The interior contains some good pictures by Umbrian artists, a fine episcopal throne in carved wood, and a fine Flemish cope given by Pope Marcellus II. (1555) in the sacristy. The exterior of the Gothic church of S. Francesco, in the lower part of the town, built in 1259, preserves its original style, but the interior has been modernized; and the same fate has overtaken the Gothic churches of S. Maria Nuova and S. Pietro. S. Agostino, on the other hand, has its Gothic interior better preserved. The whole town is full of specimens of medieval architecture, the pointed arch of the 13th century being especially prevalent. A remarkable procession takes place in Gubbio on the 15th of May in each year, in honour of S. Ubaldo, when three colossal wooden pedestals, each over 30 ft. high, and crowned by statues of SS. Ubaldo, Antonio and Giorgio, are carried through the town, and then, in a wild race, up to the church of S. Ubaldo on the mountain-side (2690 ft.). See H. M. Bower, *The Elevation and Procession of the Ceri at Gubbio* (Folk-lore Society, London, 1897).

After its reconstruction with the help of Narses (see Iguvium) the town remained subject to the exarchs of Ravenna, and, after the destruction of the Lombard kingdom in 774, formed part of the donation of Charlemagne to the pope. In the 11th century the beginnings of its independence may be traced. In the struggles of that time it was generally on the Ghibelline side. In 1151 it repelled an attack of several neighbouring cities, and formed from this time a republic governed by consuls. In 1155 it was besieged by the emperor Frederick I., but saved by the intervention of its bishop, S. Ubaldo, and was granted privileges

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by the emperor. In 1203 it had its first podestà, and from this period dates the rise of its importance. In 1387, after various political changes, it surrendered to Antonio da Montefeltro of Urbino, and remained under the dominion of the dukes of Urbino until, in 1624, the whole duchy was ceded to the pope.

Gubbio was the birthplace of Oderisio, a famous miniature painter (1240–1299), mentioned by Dante as the honour of his native town (*Purg.* xi. 80 "*l' onor d' Agobbio*"), but no authentic works by him exist. In the 14th and 15th centuries a branch of the Umbrian school of painting flourished here, the most famous masters of which were Guido Palmerucci (1280–1345?) and several members of the Nelli family, particularly Ottaviano (d. 1444), whose best work is the "Madonna del Belvedere" in S. Maria Nuova at Gubbio (1404), extremely well preserved, with bright colouring and fine details. Another work by him is the group of frescoes including a large "Last Judgment," and scenes from the life of St Augustine, in the church of S. Agostino, discovered in 1902 under a coating of whitewash. These painters seem to have been influenced by the contemporary masters of the Sienese school.

Gubbio occupies a far more important place in the history of majolica. In a decree of 1438 a *vasarius vasorum pictorum* is mentioned, who probably was not the first of his trade. The art was brought to perfection by Giorgio Andreoli, whose father had emigrated hither from Pavia, and who in 1498 became a citizen of Gubbio. The works by his hand are remarkable for their ruby tint, with a beautiful metallic lustre; but only one small *tazza* remains in Gubbio itself. His art was carried on by his sons, Cencio and Ubaldo, but was afterwards lost, and only recovered in 1853 by Angelico Fabbri and Luigi Carocci.

Two miles outside Porta Metauro to the N.E. is the Bottaccione, a large water reservoir, constructed in the 12th or 14th century; the water is collected in the bed of a stream by a massive dam.

See A. Colasanti, *Gubbio* (Bergamo, 1905); L. McCracken, *Gubbio* (London, 1905). (T. As.)

GUBEN, a town of Germany, in the kingdom of Prussia, at the confluence of the Lubis with the Neisse, 28 m. S.S.E. of Frankfort-on-Oder, at the junction of railways to Breslau, Halle and Forst. Pop. (1875) 23,704; (1905) 36,666. It possesses three Evangelical churches, a Roman Catholic church, a synagogue, a gymnasium, a modern school, a museum and a theatre. The principal industries are the spinning and weaving of wool, dyeing, tanning, and the manufacture of pottery ware, hats, cloth, paper and machinery. The vine is cultivated in the neighbourhood to some extent, and there is also some trade in fruit and vegetables. Guben is of Wendish origin. It is mentioned in 1207 and received civic rights in 1235. It was surrounded by walls in 1311, about which time it came into the possession of the margrave of Brandenburg, from whom it passed to Bohemia in 1368. It was twice devastated by the Hussites, and in 1631 and 1642 it was occupied by the Swedes. By the peace of Prague in 1635 it came into the possession of the elector of Saxony, and in 1815 it was, with the rest of Lower Lusatia, united to Prussia.

GUBERNATIS, ANGELO DE, Count (1840–), Italian man of letters, was born at Turin and educated there and at Berlin, where he studied philology. In 1862 he was appointed professor of Sanskrit at Florence, but having married a cousin of the Socialist Bakunin and become interested in his views he resigned his appointment and spent some years in travel. He was reappointed, however, in 1867; and in 1891 he was transferred to the university of Rome. He became prominent both as an orientalist, a publicist and a poet. He founded the *Italia letteraria* (1862), the *Rivista orientale* (1867), the *Civiltà italiana* and *Rivista europea* (1869), the *Bollettino italiano degli studii orientali* (1876) and the *Revue internationale* (1883), and in 1887 became director of the *Giornale della società asiatica*. In 1878 he started the *Dizionario biografico degli scrittori contemporanei*. His Oriental and mythological works include the *Piccola enciclopedia indiana* (1867), the *Fonti vediche* (1868), a famous work on zoological mythology (1872), and another on plant mythology (1878). He also edited the encyclopaedic *Storia universale della letteratura* (1882–1885). His work in verse includes the dramas *Cato, Romolo, Il re Nala, Don Rodrigo, Savitri*, &c.

GUDBRANDSDAL, a district in the midlands of southern Norway, comprising the upper course of the river Lougen or Laagen from Lillehammer at the head of Lake Mjösen to its source in Lake Lesjekogen and tributary valleys. Lillehammer, the centre of a rich timber district, is 114 m. N. of Christiania by rail. The railway continues through the well-wooded and cultivated valley to Otta (70 m.). Several tracks run westward into the wild district of the Jotunheim. From Otta good driving routes run across the watershed and descend the western slope, where the scenery is incomparably finer than in Gudbrandsdal itself—(*a*) past Sörum, with the 13th-century churches of Vaagen and Lom (a fine specimen of the Stavekirke or timber-built church), Aanstad and Polfos, with beautiful falls of the Otta river, to Grotlid, whence roads diverge to Stryn on the Nordfjord, and to Marok on the Geirangerfjord; (*b*) past Domaas (with branch road north to Stören near Trondhjem, skirting the Dovrefjeld), over the watershed formed by Lesjekogen Lake, which drains in both directions, and down through the magnificent Romsdal.

GUDE (Gudius), **MARQUARD** (1635–1689), German archaeologist and classical scholar, was born at Rendsburg in Holstein on the 1st of February 1635. He was originally intended for the law, but from an early age showed a decided preference for classical studies. In 1658 he went to Holland in the hope of finding work as a teacher of classics, and in the following year, through the influence of J. F. Gronovius, he obtained the post of tutor and travelling companion to a wealthy young Dutchman, Samuel Schars. During his travels Gude seized the opportunity of copying inscriptions and MSS. At the earnest request of his pupil, who had become greatly attached to him, Gude refused more than one professional appointment, and it was not until 1671 that he accepted the post of librarian to Duke Christian Albert of Holstein-Gottorp. Schars, who had accompanied Gude, died in 1675, and left him the greater part of his property. In 1678 Gude, having quarrelled with the duke, retired into private life; but in 1682 he entered the service of Christian V. of Denmark as counsellor of the Schleswig-Holstein chancellery, and remained in it almost to the time of his death on the 26th of November 1689. Gude's great life-work, the collection of Greek and Latin inscriptions, was not published till 1731. Mention may also be made of his *editio princeps* (1661) of the treatise of Hippolytus the Martyr on Antichrist, and of his notes on Phaedrus (with four new fables discovered by him) published in P. Burmann's edition (1698).

His correspondence (ed. P. Burmann, 1697) is the most important authority for the events of Gude's life, besides containing valuable information on the learning of the times. See also J. Moller, *Cimbria literata*, iii., and C. Bursian in *Allgemeine deutsche Biographie*, x.

GUDEMAN, ALFRED (1862–), American classical scholar, was born in Atlanta, Georgia, on the 26th of August 1862. He graduated at Columbia University in 1883 and studied under Hermann Diels at the University of Berlin. From 1890 to 1893 he was reader in classical philology at Johns Hopkins University, from 1893 to 1902 professor in the University of Pennsylvania, and from 1902 to 1904 professor in Cornell University. In 1904 he became a member of the corps of scholars preparing the Wölfflin *Thesaurus linguae Latinae*—a unique distinction for an American Latinist, as was the publication of his critical edition, with German commentary, of Tacitus' *Agricola* in 1902 by the Weidmannsche Buchhandlung of Berlin. He wrote *Latin Literature of the Empire* (2 vols., *Prose* and *Poetry*, 1898–1899), a *History of Classical Philology* (1903) and *Sources of Plutarch's Life of Cicero* (1902); and edited Tacitus' *Dialogus de oratoribus* (text with commentary, 1894 and 1898) and *Agricola* (1899; with *Germania*, 1900), and Sallust's *Catiline* (1903).

GUDGEON (*Gobio fluviatilis*), a small fish of the Cyprinid family. It is nearly related to the barbel, and has a small barbel or fleshy appendage at each corner of the mouth. It is the

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gobione of Italy, *goujon* of France (whence adapted in M. English as *gojon*), and *Grässling* or *Gründling* of Germany. Gudgeons thrive in streams and lakes, keeping to the bottom, and seldom exceeding 8 in. in length. In China and Japan there are varieties differing only slightly from the common European type.

GUDRUN (KUDRUN), a Middle High German epic, written probably in the early years of the 13th century, not long after the *Nibelungenlied*, the influence of which may be traced upon it. It is preserved in a single MS. which was prepared at the command of Maximilian I., and was discovered as late as 1820 in the Castle of Ambras in Tirol. The author was an unnamed Austrian poet, but the story itself belongs to the cycle of sagas, which originated on the shores of the North Sea. The epic falls into three easily distinguishable parts—the adventures of King Hagen of Ireland, the romance of Hettel, king of the Hegelingen, who woos and wins Hagen's daughter Hilde, and lastly, the more or less parallel story of how Herwig, king of Seeland, wins, in opposition to her father's wishes, Gudrun, the daughter of Hettel and Hilde. Gudrun is carried off by a king of Normandy, and her kinsfolk, who are in pursuit, are defeated in a great battle on the island of Wülpensand off the Dutch coast. The finest parts of the epic are those in which Gudrun, a prisoner in the Norman castle, refuses to become the wife of her captor, and is condemned to do the most menial work of the household. Here, thirteen years later, Herwig and her brother Ortwin find her washing clothes by the sea; on the following day they attack the Norman castle with their army and carry out the long-delayed retribution.

The epic of *Gudrun* is not unworthy to stand beside the greater *Nibelungenlied*, and it has been aptly compared with it as the *Odyssey* to the *Iliad*. Like the *Odyssey*, Gudrun is an epic of the sea, a story of adventure; it does not turn solely round the conflict of human passions; nor is it built up round one all-absorbing, all-dominating idea like the *Nibelungenlied*. Scenery and incident are more varied, and the poet has an opportunity for a more lyric interpretation of motive and character. *Gudrun* is composed in stanzas similar to those of the *Nibelungenlied*, but with the essential difference that the last line of each stanza is identical with the others, and does not contain the extra accented syllable characteristic of the *Nibelungen* metre.

Gudrun was first edited by von der Hagen in vol. i. of his *Heldenbuch* (1820). Subsequent editions by A. Ziemann and A. J. Vollmer followed in 1837 and 1845. The best editions are those by K. Bartsch (4th ed., 1880), who has also edited the poem for Kürschner's *Deutsche Nationalliteratur* (vol. 6, 1885), by B. Symons (1883) and by E. Martin (2nd ed., 1901). L. Ettmüller first applied Lachmann's ballad-theory to the poem (1841), and K. Müllenhoff (*Kudrun, die echten Teile des Gedichts*, 1845) rejected more than three-quarters of the whole as "not genuine." There are many translations of the epic into modern German, the best known being that of K. Simrock (15th ed., 1884). A translation into English by M. P. Nichols appeared at Boston, U.S.A., in 1889.

See K. Bartsch, *Beiträge zur Geschichte und Kritik der Kudrun* (1865); H. Keck, *Die Gudrunsage* (1867); W. Wilmanns, *Die Entwickelung der Kudrundichtung* (1873); A. Fécamp, *Le Poème de Gudrun, ses origines, sa formation et son histoire* (1892); F. Panzer, *Hilde-Gudrun* (1901). For versions and adaptations of the saga see O. Benedict, *Die Gudrunsage in der neueren Literatur* (1902.)

GUÉBRIANT, JEAN BAPTISTE BUDES, COMTE DE (1602–1643), marshal of France, was born at Plessis-Budes, near St Brieuc, of an old Breton family. He served first in Holland, and in the Thirty Years' War he commanded from 1638 to 1639 the French contingent in the army of his friend Bernard of Saxe-Weimar, distinguishing himself particularly at the siege of Breisach in 1638. Upon the death of Bernard he received the command of his army, and tried, in conjunction with J. Baner (1596–1641), the Swedish general, a bold attack upon Regensburg (1640). His victories of Wolfenbüttel on the 20th of June 1641 and of Kempen in 1642 won for him the marshal's bâton. Having failed in an attempt to invade Bavaria in concert with Torstensson he seized Rottweil, but was mortally wounded there on the 17th of November 1643.

A biography was published by Le Laboureur, *Histoire du mareschal de Guébriant*, in 1656. See A. Brinzinger in *Württembergische Vierteljahrschrift für Landesgeschichte* (1902).

GUELDER ROSE, so called from Guelderland, its supposed source, termed also marsh elder, rose elder, water elder (Ger. *Wasserholder, Schneeball*; Fr. *viorne-obier, l'obier d'Europe*), known botanically as *Viburnum Opulus*, a shrub or small tree of the natural order Caprifoliaceae, a native of Britain, and widely distributed in the temperate and colder parts of Europe, Asia and North America. It is common in Ireland, but rare in Scotland. In height it is from 6 to 12 ft., and it thrives best in moist situations. The leaves are smooth, 2 to 3 in. broad, with 3 to 5 unequal serrate lobes, and glandular stipules adnate to the stalk. In autumn the leaves change their normal bright green for a pink or crimson hue. The flowers, which appear in June and July, are small, white, and arranged in cymes 2 to 4 in. in diameter. The outer blossoms in the wild plant have an enlarged corolla, ¾ in. in diameter, and are devoid of stamens or pistils; in the common cultivated variety all the flowers are sterile and the inflorescence is globular, hence the term "snowball tree" applied to the plant, the appearance of which at the time of flowering has been prettily described by Cowper in his *Winter Walk at Noon*. The guelder rose bears juicy, red, elliptical berries, ½ in. long, which ripen in September, and contain each a single compressed seed. In northern Europe these are eaten, and in Siberia, after fermentation with flour, they are distilled for spirit. The plant has, however, emetic, purgative and narcotic properties; and Taylor (*Med. Jurisp.* i. 448, 2nd ed., 1873) has recorded an instance of the fatal poisoning of a child by the berries. Both they and the bark contain valerianic acid. The woody shoots of the guelder rose are manufactured into various small articles in Sweden and Russia. Another member of the genus, *Viburnum, Lantana*, wayfaring tree, is found in dry copses and hedges in England, except in the north.

GUELPH, a city of Ontario, Canada, 45 m. W. of Toronto, on the river Speed and the Grand Trunk and Canadian Pacific railways. Pop. (1901) 11,496. It is the centre of a fine agricultural district, and exports grain, fruit and live-stock in large quantities. It contains, in addition to the county and municipal buildings, the Ontario Agricultural College, which draws students from all parts of North and South America. The river affords abundant water-power for flour-mills, saw-mills, woollen-mills and numerous factories, of which agricultural implements, sewing machines and musical instruments are the chief.

GUELPHS AND GHIBELLINES. These names are doubtless Italianized forms of the German words Welf and Waiblingen, although one tradition says that they are derived from Guelph and Gibel, two rival brothers of Pistoia. Another theory derives Ghibelline from Gibello, a word used by the Sicilian Arabs to translate Hohenstaufen. However, a more popular story tells how, during a fight around Weinsberg in December 1140 between the German king Conrad III. and Welf, count of Bavaria, a member of the powerful family to which Henry the Lion, duke of Saxony and Bavaria, belonged, the soldiers of the latter raised the cry "Hie Welf!" to which the king's troops replied with "Hie Waiblingen!" this being the name of one of Conrad's castles. But the rivalry between Welf and Hohenstaufen, of which family Conrad was a member, was anterior to this event, and had been for some years a prominent fact in the history of Swabia and Bavaria, although its introduction into Italy—in a slightly modified form, however—only dates from the time of the Italian expeditions of the emperor Frederick I. It is about this time that the German chronicler, Otto of Freising, says, "Duae in Romano orbe apud Galliae Germanieve fines famosae familiae actenus fuere, una Heinricorum de Gueibelinga, alia Guelforum de Aldorfo, altera imperatores, altera magnos duces producere solita." Chosen German king in 1152, Frederick was not only the nephew and the heir of Conrad, he was related also to the Welfs; yet, although his election abated to some extent the rivalry between Welf and Hohenstaufen in Germany, it opened it upon a larger and fiercer scale in Italy.

During the long and interesting period covered by Frederick's Italian campaigns, his enemies, prominent among whom were the cities of the Lombard League, became known as Welfs, or Guelphs, while his partisans seized upon the rival term of

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Waiblingen, or Ghibelline, and the contest between these two parties was carried on with a ferocity unknown even to the inhabitants of southern Germany. The distracted state of northern Italy, the jealousies between various pairs of towns, the savage hatred between family and family, were some of the causes which fed this feud, and it reached its height during the momentous struggle between Frederick II. and the Papacy in the 13th century. The story of the contest between Guelph and Ghibelline, however, is little less than the history of Italy in the middle ages. At the opening of the 13th century it was intensified by the fight for the German and imperial thrones between Philip, duke of Swabia, a son of Frederick I., and the Welf, Otto of Brunswick, afterwards the emperor Otto IV., a fight waged in Italy as well as in Germany. Then, as the heir of Philip of Swabia and the rival of Otto of Brunswick, Frederick II. was forced to throw himself into the arms of the Ghibellines, while his enemies, the popes, ranged themselves definitely among the Guelphs, and soon Guelph and Ghibelline became synonymous with supporter of pope and emperor.

After the death of Frederick II. in 1250 the Ghibellines looked for leadership to his son and successor, the German king, Conrad IV., and then to his natural son, Manfred, while the Guelphs called the French prince, Charles of Anjou, to their aid. But the combatants were nearing exhaustion, and after the execution of Conradin, the last of the Hohenstaufen, in 1268, this great struggle began to lose force and interest. Guelph and Ghibelline were soon found representing local and family rather than papal and imperial interests; the names were taken with little or no regard for their original significance, and in the 15th century they began to die out of current politics. However, when Louis XII. of France conquered Milan at the beginning of the 16th century the old names were revived, the French king's supporters were called Guelphs and the friends of the emperor Maximilian I. were referred to as Ghibellines.

The feud of Guelph and Ghibelline penetrated within the walls of almost every city of northern Italy, and the contest between the parties, which practically makes the history of Florence during the 13th century, is specially noteworthy. First one side and then the other was driven into exile; the Guelph defeat at the battle of Monte Aperto in 1260 was followed by the expulsion of the Ghibellines by Charles of Anjou in 1266, and on a smaller scale a similar story may be told of many other cities (see FLORENCE).

The Guelph cause was buttressed by an idea, yet very nebulous, of Italian patriotism. Dislike of the German and the foreigner rather than any strong affection for the Papacy was the feeling which bound the Guelph to the pope, and so enabled the latter to defy the arms of Frederick II. The Ghibelline cause, on the other hand, was aided by the dislike of the temporal power of the pope and the desire for a strong central authority. This made Dante a Ghibelline, but the hopes of this party, kindled anew by the journey of Henry VII. to Italy in 1310, were extinguished by his departure. J. A. Symonds thus describes the constituents of the two parties: "The Guelph party meant the burghers of the consular Communes, the men of industry and commerce, the upholders of civil liberty, the friends of democratic expansion. The Ghibelline party included the naturalized nobles, the men of arms and idleness, the advocates of feudalism, the politicians who regarded constitutional progress with disfavour. That the banner of the church floated over the one camp, while the standard of the empire rallied to itself the hostile party, was a matter of comparatively superficial moment." In another passage the same writer thus describes the sharp and universal division between Guelph and Ghibelline: "Ghibellines wore the feathers in their caps upon one side, Guelphs upon the other. Ghibellines cut fruit at table crosswise, Guelphs straight down . . . Ghibellines drank out of smooth and Guelphs out of chased goblets. Ghibellines wore white and Guelphs red roses." It is interesting to note that while Dante was a Ghibelline, Petrarch was a Guelph.

See J. A. Symonds, *The Renaissance in Italy*, vol. i. (1875).

GUENEVERE (Lat. *Guanhumara*; Welsh, *Gwenhwyfar*; O. Eng. *Gaynore*), In Arthurian romance the wife of King Arthur. Geoffrey of Monmouth, who calls her Guanhumara, makes her a Roman lady, but the general tradition is that she was of Cornish birth and daughter to King Leodegrance. Wace, who, while translating Geoffrey, evidently knew, and used, popular tradition, combines these two, asserting that she was of Roman parentage on the mother's side, but cousin to Cador of Cornwall by whom she was brought up. The tradition relating to Guenevere is decidedly confused and demands further study. The Welsh triads know no fewer than three Gwenhwyfars; Giraldus Cambrensis, relating the discovery of the royal tombs at Glastonbury, speaks of the body found as that of Arthur's second wife; the prose *Merlin* gives Guenevere a bastard half-sister of the same name, who strongly resembles her; and the *Lancelot* relates how this lady, trading on the likeness, persuaded Arthur that she was the true daughter of Leodegrance, and the queen the bastard Interloper. This episode of the false Guenevere is very perplexing.

To the majority of English readers Guenevere is best known in connexion with her liaison with Lancelot, a story which, in the hands of Malory and Tennyson, has assumed a form widely different from the original conception, and at once more picturesque and more convincing. In the French romances Lancelot is a late addition to the Arthurian cycle, his birth is not recorded till long after the marriage of Arthur and Guenevere, and he is at least twenty years the junior of the queen. The relations between them are of the most conventional and courtly character, and are entirely lacking in the genuine dramatic passion which marks the love story of Tristan and Iseult. The *Lancelot-Guenevere* romance took form and shape in the artificial atmosphere encouraged by such patronesses of literature as Eleanor of Aquitaine and her daughter Marie, Comtesse de Champagne (for whom Chrétien de Troyes wrote his *Chevalier de la Charrette*), and reflects the low social morality of a time when love between husband and wife was declared impossible. But though Guenevere has changed her lover, the tradition of her infidelity is of much earlier date and formed a part of the primitive Arthurian legend. Who the original lover was is doubtful; the *Vita Gildae* relates how she was carried off by Melwas, king of Aestiva Regis, to Glastonbury, whither Arthur, at the head of an army, pursued the ravisher. A fragment of a Welsh poem seems to confirm this tradition, which certainly lies at the root of her later abduction by Meleagaunt. In the *Lanzelet* of Ulrich von Zatzikhoven the abductor is Falerîn. The story in these forms represents an other-world abduction. A curious fragment of Welsh dialogues, printed by Professor Rhys in his *Studies on the Arthurian Legend*, appears to represent Kay as the abductor, In the pseudo-Chronicles and the romances based upon them the abductor is Mordred, and in the chronicles there is no doubt that the lady was no unwilling victim. On the final defeat of Mordred she retires to a nunnery, takes the veil, and is no more heard of. Wace says emphatically—

> *Ne fu oïe ne veüe,*
> *Ne fu trovée, ne séue*
> *Por la vergogne del mesfait*
> *Et del pecié qu'ele avoi fait* (11. 13627-30).

Layamon, who in his translation of Wace treats his original much as Wace treated Geoffrey, says that there was a tradition that she had drowned herself, and that her memory and that of Mordred were hateful in every land, so that none would offer prayer for their souls. On the other hand certain romances, *e.g.* the *Perceval*, give her an excellent character. The truth is probably that the tradition of his wife's adultery and treachery was a genuine part of the Arthurian story, which, neglected for a time, was brought again into prominence by the social conditions of the courts for which the later romances were composed; and it is in this later and conventionalized form that the tale has become familiar to us (see also LANCELOT).

See *Studies on the Arthurian Legend* by Professor Rhys; *The Legend of Sir Lancelot*, Grimm Library, xii., Jessie L. Weston; *Der Karrenritter*, ed. Professor Foerster. (J. L. W.)

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GUENON (from the French, = one who grimaces, hence an ape), the name applied by naturalists to the monkeys of the African genus *Cercopithecus*, the Ethiopian representative of the Asiatic macaques, from which they differ by the absence of a posterior heel to the last molar in the lower jaw.

GUÉRET, a town of central France, capital of the department of Creuse, situated on a mountain declivity 48 m. N.E. of Limoges on the Orleans railway. Pop. (1906), town, 6042; commune (including troops, &c.), 8058. Apart from the Hôtel des Monneyroux (used as prefecture), a picturesque mansion of the 15th and 16th centuries, with mansard roofs and mullioned windows, Guéret has little architectural interest. It is the seat of a prefect and a court of assizes, and has a tribunal of first instance, a chamber of commerce and lycées and training colleges, for both sexes. The industries include brewing, saw-milling, leather-making and the manufacture of basket-work and wooden shoes, and there is trade in agricultural produce and cattle. Guéret grew up round an abbey founded in the 7th century, and in later times became the capital of the district of Marche.

GUEREZA, the native name of a long-tailed, black and white Abyssinian monkey, *Colobus guereza* (or *C. abyssinicus*), characterized by the white hairs forming a long pendent mantle. Other east African monkeys with a similar type of colouring, which, together with the wholly black west African *C. satanas*, collectively constitute the subgenus *Guereza*, may be included under the same title; and the name may be further extended to embrace all the African thumbless monkeys of the genus *Colobus*. These monkeys are the African representatives of the Indo-Malay langurs (*Semnopithecus*), with which they agree in their slender build, long limbs and tail, and complex stomachs, although differing by the rudimentary thumb. The members of the subgenus *Guereza* present a transition from a wholly black animal (*C. satanas*) to one (*C. caudatus*) in which the sides of the face are white, and the whole flanks, as well as the tail, clothed with a long fringe of pure white hairs.

GUERICKE, HEINRICH ERNST FERDINAND (1803–1878), German theologian, was born at Wettin in Saxony on the 25th of February 1803 and studied theology at Halle, where he was appointed professor in 1829. He greatly disliked the union between the Lutheran and the Reformed churches, which had been accomplished by the Prussian government in 1817, and in 1833 he definitely threw in his lot with the Old Lutherans. In 1835 he lost his professorship, but he regained it in 1840. Among his works were a Life of *August Hermann Francke* (1827, Eng. trans. 1837), *Church History* (1833, Eng. trans. by W. T. Shedd, New York, 1857–1863), *Allgemeine christliche Symbolik* (1839). In 1840 he helped to found the *Zeitschrift fur die gesammte lutherische Theologie und Kirche*, and he died at Halle on the 4th of February 1878.

GUERICKE, OTTO VON (1602–1686), German experimental philosopher, was born at Magdeburg, in Prussian Saxony, on the 20th of November 1602. Having studied law at Leipzig, Helmstadt and Jena, and mathematics, especially geometry and mechanics, at Leiden, he visited France and England, and in 1636 became engineer-in-chief at Erfurt. In 1627 he was elected alderman of Magdeburg, and in 1646 mayor of that city and a magistrate of Brandenburg. His leisure was devoted to scientific pursuits, especially in pneumatics. Incited by the discoveries of Galileo, Pascal and Torricelli, he attempted the creation of a vacuum. He began by experimenting with a pump on water placed in a barrel, but found that when the water was drawn off the air permeated the wood. He then took a globe of copper fitted with pump and stopcock, and discovered that he could pump out air as well as water. Thus he became the inventor of the air-pump (1650). He illustrated his discovery before the emperor Ferdinand III. at the imperial diet which assembled at Regensburg in 1654, by the experiment of the "Magdeburg hemispheres." Taking two hollow hemispheres of copper, the edges of which fitted nicely together, he exhausted the air from between them by means of his pump, and it is recorded that thirty horses, fifteen back to back, were unable to pull them asunder until the air was readmitted. Besides investigating other phenomena connected with a vacuum, he constructed an electrical machine which depended on the excitation of a rotating ball of sulphur; and he made successful researches in astronomy, predicting the periodicity of the return of comets. In 1681 he gave up office, and retired to Hamburg, where he died on the 11th of May 1686.

His principal observations are given in his work, *Experimenta nova, ut vocant, Magdeburgica de vacuo spatio* (Amsterdam, 1672). He is also the author of a *Geschichte der Belagerung und Eroberung von Magdeburg*. See F. W. Hoffmann, *Otto von Guericke* (Magdeburg, 1874).

GUÉRIDON, a small table to hold a lamp or vase, supported by a tall column or a human or mythological figure. This piece of furniture, often very graceful and elegant, originated in France towards the middle of the 17th century. In the beginning the table was supported by a negro or other exotic figure, and there is some reason to believe that it took its name from the generic appellation of the young African groom or "tiger," who was generally called "Guéridon," or as we should say in English "Sambo." The swarthy figure and brilliant costume of the "Moor" when reproduced in wood and picked out in colours produced a very striking effect, and when a small table was supported on the head by the upraised hands the idea of passive service was suggested with completeness. The guéridon is still occasionally seen in something approaching its original form; but it had no sooner been introduced than the artistic instinct of the French designer and artificer converted it into a far worthier object. By the death of Louis XIV. there were several hundreds of them at Versailles, and within a generation or two they had taken an infinity of forms—columns, tripods, termini and mythological figures. Some of the simpler and more artistic forms were of wood carved with familiar decorative motives and gilded. Silver, enamel, and indeed almost any material from which furniture can be made, have been used for their construction. A variety of small "occasional" tables are now called in French *guéridons*.

GUÉRIN, JEAN BAPTISTE PAULIN (1783–1855), French painter, was born at Toulon, on the 25th of March 1783, of poor parents. He learnt, as a lad, his father's trade of a locksmith, whilst at the same time he followed the classes of the free school of art. Having sold some copies to a local amateur, Guérin started for Paris, where he came under the notice of Vincent, whose counsels were of material service. In 1810 Guérin made his first appearance at the Salon with some portraits, which had a certain success. In 1812 he exhibited "Cain after the murder of Abel" (formerly in Luxembourg), and, on the return of the Bourbons, was much employed in works of restoration and decoration at Versailles. His "Dead Christ" (Cathedral, Baltimore) obtained a medal in 1817, and this success was followed up by a long series of works, of which the following are the more noteworthy: "Christ on the knees of the Virgin" (1819); "Anchises and Venus" (1822) (formerly in Luxembourg); "Ulysses and Minerva" (1824) (Musée de Rennes); "the Holy Family" (1829) (Cathedral, Toulon); and "Saint Catherine" (1838)(St Roch). In his treatment of subject, Guérin attempted to realize rococo graces of conception, the liveliness of which was lost in the strenuous effort to be correct. His chief successes were attained by portraits, and those of Charles Nodier and the Abbé Lamennais became widely popular. He died on the 19th of January 1855.

GUÉRIN, PIERRE NARCISSE, Baron (1774–1833), French painter, was born at Paris on the 13th of May 1774. Becoming a pupil of Jean Baptiste Regnault, he carried off one of the three "grands prix" offered in 1796, in consequence of the competition not having taken place since 1793. The *pension* was not indeed re-established, but Guérin fulfilled at Paris the conditions imposed upon a *pensionnaire*, and produced various works, one of which brought him prominently before the public. This work, "Marcus Sextus" (Louvre), exhibited at the Salon of 1799, excited wild enthusiasm, partly due to the subject,—a victim of Sulla's proscription returning to Rome to find his wife dead and his house in mourning—in which an allusion was found to the actual

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situation of the *émigrés*. Guérin on this occasion was publicly crowned by the president of the Institute, and before his departure for Rome (on the re-establishment of the École under Suvée) a banquet was given to him by the most distinguished artists of Paris. In 1800, unable to remain in Rome on account of his health, he went to Naples, where he painted the "Grave of Amyntas." In 1802 Guérin produced "Phaedra and Hippolytus" (Louvre); in 1810, after his return to Paris, he again achieved a great success with "Andromache and Pyrrhus" (Louvre); and in the same year also exhibited "Cephalus and Aurora" (Collection Sommariva) and "Bonaparte and the Rebels of Cairo" (Versailles). The Restoration brought to Guérin fresh honours; he had received from the first consul in 1803 the cross of the Legion of Honour, and in 1815 Louis XVIII. named him Academician. The success of Guérin's "Hippolytus" of "Andromache," of "Phaedra" and of "Clytaemnestra" (Louvre) had been ensured by the skilful selection of highly melodramatic situations, treated with the strained and pompous dignity proper to the art of the first empire; in "Aeneas relating to Dido the disasters of Troy" (Louvre), which appeared side by side with "Clytaemnestra" at the Salon of 1817, the influence of the Restoration is plainly to be traced. In this work Guérin sought to captivate the public by an appeal to those sensuous charms which he had previously rejected, and by the introduction of picturesque elements of interest. But with this work Guérin's public successes came to a close. He was, indeed, commissioned to paint for the Madeleine a scene from the history of St Louis, but his health prevented him from accomplishing what he had begun, and in 1822 he accepted the post of director of the École de Rome, which in 1816 he had refused. On returning to Paris in 1828, Guérin, who had previously been made chevalier of the order of St Michel, was ennobled. He now attempted to complete "Pyrrhus and Priam," a work which he had begun at Rome, but in vain; his health had finally broken down, and in the hope of improvement he returned to Italy with Horace Vernet. Shortly after his arrival at Rome Baron Guérin died, on the 6th of July 1833, and was buried in the church of La Trinità de' Monti by the side of Claude Lorraine.

A careful analysis and criticism of his principal works will be found in Meyer's *Geschichte der französischen Malerei*.

GUÉRIN DU CAYLA, GEORGES MAURICE DE (1810–1839), French poet, descended from a noble but poor family, was born at the château of Le Cayla in Languedoc, on the 4th of August 1810. He was educated for the church at a religious seminary at Toulouse, and then at the Collège Stanislas, Paris, after which he entered the society at La Chesnaye in Brittany, founded by Lamennais. It was only after great hesitation, and without being satisfied as to his religious vocation, that under the influence of Lamennais he joined the new religious order in the autumn of 1832; and when, in September of the next year, Lamennais, who had come under the displeasure of Rome, severed connexion with the society, Maurice de Guérin soon followed his example. Early in the following year he went to Paris, where he was for a short time a teacher at the Collège Stanislas. In November 1838 he married a Creole lady of some fortune; but a few months afterwards he was attacked by consumption and died on the 19th of July 1839. In the *Revue des deux mondes* for May 15th, 1840, there appeared a notice of Maurice de Guérin by George Sand, to which she added two fragments of his writings—one a composition in prose entitled the *Centaur*, and the other a short poem. His *Reliquiae* (2 vols., 1861), including the *Centaur*, his journal, a number of his letters and several poems, was edited by G. S. Trébutien, and accompanied with a biographical and critical notice by Sainte-Beuve; a new edition, with the title *Journal, lettres et poèmes*, followed in 1862; and an English translation of it was published at New York in 1867. Though he was essentially a poet, his prose is more striking and original than his poetry. Its peculiar and unique charm arises from his strong and absorbing passion for nature, a passion whose intensity reached almost to adoration and worship, but in which the pagan was more prominent than the moral element. According to Sainte-Beuve, "no French poet or painter has rendered so well the feeling for nature—the feeling not so much for details as for the ensemble and the divine universality, the feeling for the origin of things and the sovereign principle of life."

The name of EUGÉNIE DE GUÉRIN (1805–1848), the sister of Maurice, cannot be omitted from any notice of him. Her *Journals* (1861, Eng. trans., 1863) and her *Lettres* (1864, Eng. trans., 1865) indicated the possession of gifts of as rare an order as those of her brother, though of a somewhat different kind. In her case mysticism assumed a form more strictly religious, and she continued to mourn her brother's loss of his early Catholic faith. Five years older than he, she cherished a love for him which was blended with a somewhat motherly anxiety. After his death she began the collection and publication of the scattered fragments of his writings. She died, however, on the 31st of May 1848, before her task was completed.

See the notices by George Sand and Sainte-Beuve referred to above; Sainte-Beuve, *Causeries du lundi* (vol. xii.) and *Nouveaux Lundis* (vol. iii.); G. Merlet, *Causeries sur les femmes et les livres* (Paris, 1865); Selden, *L'Esprit des femmes de notre temps* (Paris, 1864); Marelle, *Eugénie et Maurice de Guérin* (Berlin, 1869); Harriet Parr, *M. and E. de Guérin, a monograph* (London, 1870); and Matthew Arnold's essays on Maurice and Eugénie de Guérin, in his *Essays in Criticism*.

GUERNIERI, or WERNER, a celebrated mercenary captain who lived about the middle of the 14th century. He was a member of the family of the dukes of Urslingen, and probably a descendant of the dukes of Spoleto. From 1340 to 1343 he was in the service of the citizens of Pisa, but afterwards he collected a troop of adventurers which he called the Great Company, and with which he plundered Tuscany and Lombardy. He then entered the service of Louis I. the Great, king of Hungary and Poland, whom he assisted to obtain possession of Naples; but when dismissed from this service his ravages became more terrible than ever, culminating in the dreadful sack of Anagni in 1358, shortly after which Guernieri disappeared from history. He is said to have worn a breastplate with the inscription, "The enemy of God, of pity and of mercy."

GUERNSEY (Fr. *Guernesey*), one of the Channel Islands, belonging to Britain, the second in size and westernmost of the important members of the group. Its chief town, St Peter Port, on the east coast, is in 2° 33′ W., 49° 27′ N., 74 m. S. of Portland Bill on the English coast, and 30 m. from the nearest French coast to the east. The island, roughly triangular in form, is 9½ m. long from N.E. to S.W. and has an extreme breadth of 5¼ m. and an area of 15,601 acres or 24·5 sq. m. Pop. (1901), 40,446, the density being thus 162 per sq. m.

The surface of the island rises gradually from north to south, and reaches its greatest elevation at Haut Nez (340 ft.) above Point Icart on the south coast. The coast scenery, which forms one of the principal attractions to the numerous summer visitors to the island, is finest on the south. This coast, between Jerbourg and Pleinmont Points, respectively at the south-eastern and south-western corners of the island, is bold, rocky and indented with many exquisite little bays. Of these the most notable are Moulin Huet, Saint's, and Petit Bot, all in the eastern half of the south coast. The cliffs, however, culminate in the neighbourhood of Pleinmont. Picturesque caves occur at several points, such as the Creux Mahie. On the west coast there is a succession of larger bays—Rocquaine Perelle, Vazon, and Cobo. Off the first lies Lihou Island, the Hanois and other islets, and all three bays are sown with rocks. The coast, however, diminishes in height, until at the north-eastern extremity of the island the land is so low across the Vale or Braye du Val, from shore to shore, that the projection of L'Ancresse is within a few feet of being isolated. The east coast, on which, besides the town and harbour of St Peter Port, is that of St Sampson, presents no physical feature of note. The interior of the island is generally undulating, and gains in beauty from its rich vegetation. Picturesque glens descend upon some of the southern bays (the two converging upon Petit Bot are notable), and the high-banked paths, arched with foliage, which follow the small

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rills down to Moulin Huet Bay, are much admired under the name of water-lanes.

The soil is generally light sandy loam, overlying an angular gravel which rests upon the weathered granite. This soil requires much manure, and a large proportion of the total area (about three-fifths) is under careful cultivation, producing a considerable amount of grain, but more famous for market-gardening. Vegetables and potatoes are exported, with much fruit, including grapes and flowers. Granite is quarried and exported from St Sampson, and the fisheries form an important industry.

For administrative purposes Guernsey is united with Alderney, Sark, Herm and the adjacent islets to form the bailiwick of Guernsey, separate from Jersey. The peculiar constitution, machinery of administration and justice, finance, &c., are considered under the heading CHANNEL ISLANDS. Guernsey is divided into the ten parishes of St Peter Port, St Sampson, Vale, Câtel, St Saviour, St Andrew, St Martin, Forest, St Peter du Bois and Torteval. The population of St Peter Port in 1901 was 18,264; of the other parishes that of St Sampson was 5614 and that of Vale 5082. The population of the bailiwick of Guernsey nearly doubled between 1821 and 1901, and that of the island increased from 35,243 in 1891 to 40,446 in 1901. The island roads are excellent, Guernsey owing much in this respect to Sir John Doyle (d. 1834), the governor whose monument stands on the promontory of Jerbourg. Like Jersey and the neighbouring part of France, Guernsey retains considerable traces of early habitation in cromlechs and menhirs, of which the most notable is the cromlech in the north at L'Ancresse. As regards ecclesiastical architecture, all the parish churches retain some archaeological interest. There is good Norman work in the church of St Michael, Vale, and the church of St Peter Port is a notable building of various periods from the early 14th century. Small remains of monastic buildings are seen at Vale and on Lihou Island.

GUERRAZZI, FRANCESCO DOMENICO (1804–1873), Italian publicist, born at Leghorn, was educated for the law at Pisa, and began to practise in his native place. But he soon took to politics and literature, under the influence of Byron, and his novel, the *Battagli di Benevento*(1827), brought him into notice. Mazzini made his acquaintance, and with Carlo Bini they started a paper, the *Indicatore*, at Leghorn in 1829, which was quickly suppressed. Guerrazzi himself had to endure several terms of imprisonment for his activity in the cause of Young Italy, and it was in Portoferrato in 1834 that he wrote his most famous novel *Assidio di Firenze*. He was the most powerful Liberal leader at Leghorn, and in 1848 became a minister, with some idea of exercising a moderating influence in the difficulties with the grand-duke of Tuscany. In 1849, when the latter fled, he was first one of the triumvirate with Mazzini and Montanelli, and then dictator, but on the restoration he was arrested and imprisoned for three years. His *Apologia* was published in 1852. Released from prison, he was exiled to Corsica, but subsequently was restored and was for some time a deputy at Turin (1862–1870), dying of apoplexy at Leghorn on the 25th of September 1873. He wrote a number of other works besides the novels already mentioned, notably *Isabella Orsini* (1845) and *Beatrice Cenci* (1854), and his *Opere* were collected at Milan (1868).

See the *Life and Works* by Bosio (1877), and Carducci's edition of his letters (1880).

GUERRERO, a Pacific coast state of Mexico, bounded N.W. by Michoacan, N. by Mexico (state) and Morelos, N.E. and E. by Puebla and Oaxaca, and S. and W. by the Pacific. Area, 24,996 sq. m. Pop., largely composed of Indians and mestizos (1895), 417,886; (1900) 470,205. The state is roughly broken by the Sierra Madre and its spurs, which cover its entire surface with the exception of the low coastal plain (averaging about 20 m. in width) on the Pacific. The valleys are usually narrow, fertile and heavily forested, but difficult of access. The state is divided into two distinct zones—the *tierras calientes* of the coast and lower river courses where tropical conditions prevail, and the *tierras templadas* of the mountain region where the conditions are subtropical. The latter is celebrated for its agreeable and healthy climate, and for the variety and character of its products. The principal river of the state is the Rio de las Balsas or Mescala, which, having its source in Tlaxcala, flows entirely across the state from W. to E., and then southward to the Pacific on the frontier of Michoacan. This river is 420 m. long and receives many affluents from the mountainous region through which it passes, but its course is very precipitous and its mouth obstructed by sand bars. The agricultural products include cotton, coffee, tobacco and cereals, and the forests produce rubber, vanilla and various textile fibres. Mining is undeveloped, although the mineral resources of the state include silver, gold, mercury, lead, iron, coal, sulphur and precious stones. The capital, Chilpancingo, or Chilpancingo de los Bravos (pop. 7497 in 1900), is a small town in the Sierra Madre about 110 m. from the coast and 200 m. S. of the Federal capital. It is a healthy well-built town on the old Acapulco road, is lighted by electricity and is temporarily the western terminus of the Interoceanic railway from Vera Cruz. It is celebrated in the history of Mexico as the meeting-place of the revolutionary congress of 1813, which issued a declaration of independence. Chilpancingo was badly damaged by an earthquake in January 1902, and again on the 16th of April 1907. Other important towns of the state are Tixtla, or Tixtla de Guerrero, formerly the capital (pop. 6316 in 1900), 3 m. N.E. of Chilpancingo; Chilapa (8256 in 1895), the most populous town of the state, partially destroyed by a hurricane in 1889, and again by the earthquake of 1907; Iguala (6631 in 1895); and Acapulco. Guerrero was organized as a state in 1849, its territory being taken from the states of Mexico, Michoacan and Puebla.

GUERRILLA (erroneously written "guerilla," being the diminutive of the Span. *guerra*, war), a term currently used to denote war carried on by bands in any irregular and unorganized manner. At the Hague Conference of 1899 the position of irregular combatants was one of the subjects dealt with, and the rules there adopted were reaffirmed at the Conference of 1907. They provide that irregular bands in order to enjoy recognition as belligerent forces shall (*a*) have at their head a person responsible for his subordinates, (*b*) wear some fixed distinctive badge recognizable at a distance, (*c*) carry arms openly, and (*d*) conform in their operations to the laws and customs of war. The rules, however, also provide that in case of invasion the inhabitants of a territory who on the approach of the invading enemy spontaneously take up arms to resist it, shall be regarded as belligerent troops if they carry arms openly and respect the laws and customs of war, although they may not have had time to become organized in accordance with the above provisions. These rules were borrowed almost word for word from the project drawn up at the Brussels international conference of 1874, which, though never ratified, was practically incorporated in the army regulations issued by the Russian government in connexion with the war of 1877–78. (T. BA.)

GUERRINI, OLINDO (1845–), Italian poet, was born at Sant' Alberto, Ravenna, and after studying law took to a life of letters, becoming eventually librarian at Bologna University. In 1877 he published *Postuma*, a volume of *canzoniere*, under the name of Lorenzo Stechetti, following this with *Polemica* (1878), *Canti popolari romagnoli* (1880) and other poetical works, and becoming known as the leader of the "verist" school among Italian lyrical writers.

GUESDE, JULES BASILE (1845–), French socialist, was born in Paris on the 11th of November 1845. He had begun his career as a clerk in the French Home Office, but at the outbreak of the Franco-German War he was editing *Les Droits de l'homme* at Montpellier, and had to take refuge at Geneva in 1871 from a prosecution instituted on account of articles which had appeared in his paper in defence of the Commune. In 1876 he returned to France to become one of the chief French apostles of Marxian collectivism, and was imprisoned for six months in 1878 for taking part in the first Parisian International Congress. He edited at different times

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Les Droits de l'homme, *Le Cri du peuple*, *Le Socialiste*, but his best-known organ was the weekly *Égalité*. He had been in close association with Paul Lafargue, and through him with Karl Marx, whose daughter he married. It was in conjunction with Marx and Lafargue that he drew up the programme accepted by the national congress of the Labour party at Havre in 1880, which laid stress on the formation of an international labour party working by revolutionary methods. Next year at the Reims congress the orthodox Marxian programme of Guesde was opposed by the "possibilists," who rejected the intransigeant attitude of Guesde for the opportunist policy of Benoît Malon. At the congress of St-Étienne the difference developed into separation, those who refused all compromise with a capitalist government following Guesde, while the opportunists formed several groups. Guesde took his full share in the consequent discussion between the Guesdists, the Blanquists, the possibilists, &c. In 1893 he was returned to the Chamber of Deputies for Lille (7th circonscription) with a large majority over the Christian Socialist and Radical candidates. He brought forward various proposals in social legislation forming the programme of the Labour party, without reference to the divisions among the Socialists, and on the 20th of November 1894 succeeded in raising a two days' discussion of the collectivist principle in the Chamber. In 1902 he was not re-elected, but resumed his seat in 1906. In 1903 there was a formal reconciliation at the Reims congress of the sections of the party, which then took the name of the Socialist party of France. Guesde, nevertheless, continued to oppose the opportunist policy of Jaurès, whom he denounced for supporting one bourgeois party against another. His defence of the principle of freedom of association led him, incongruously enough, to support the religious Congregations against Émile Combes. Besides his numerous political and socialist pamphlets he published in 1901 two volumes of his speeches in the Chamber of Deputies entitled *Quatre ans de lutte de classe 1893–1898*.

GUEST, EDWIN (1800–1880), English antiquary, was born in 1800. He was educated at King Edward's school, Birmingham, and at Caius College, Cambridge, where he graduated as eleventh wrangler, subsequently becoming a fellow of his college. Called to the bar in 1828, he devoted himself, after some years of legal practice, to antiquarian and literary research. In 1838 he published his exhaustive *History of English Rhythms*. He also wrote a very large number of papers on Roman-British history, which, together with a mass of fresh material for a history of early Britain, were published posthumously under the editorship of Dr Stubbs under the title *Origines Celticae* (1883). In 1852 Guest was elected master of Caius College, becoming LL.D. in the following year, and in 1854–1855 he was vice-chancellor of Cambridge University. Guest was a fellow of the Royal Society, and an honorary member of the Society of Antiquaries. He died on the 23rd of November 1880.

GUEST (a word common to Teutonic languages; cf. Ger. *Gast*, and Swed. *gäst*; cognate with Lat. *hostis*, originally a stranger, hence enemy; cf. "host"), one who receives hospitality in the house of another, his "host"; hence applied to a parasite.

GUETTARD, JEAN ÉTIENNE (1715–1786), French naturalist and mineralogist, was born at Étampes, on the 22nd of September 1715. In boyhood he gained a knowledge of plants from his grandfather, who was an apothecary, and later he qualified as a doctor in medicine. Pursuing the study of botany in various parts of France and other countries, he began to take notice of the relation between the distribution of plants and the soils and subsoils. In this way his attention came to be directed to minerals and rocks. In 1746 he communicated to the Academy of Sciences in Paris a memoir on the distribution of minerals and rocks, and this was accompanied by a map on which he had recorded his observations. He thus, as remarked by W. D. Conybeare, "first carried into execution the idea, proposed by [Martin] Lister years before, of geological maps." In the course of his journeys he made a large collection of fossils and figured many of them, but he had no clear ideas about the sequence of strata. He made observations also on the degradation of mountains by rain, rivers and sea; and he was the first to ascertain the existence of former volcanoes in the district of Auvergne. He died in Paris on the 7th of January 1786.

His publications include: *Observations sur les plantes* (2 vols., 1747); *Histoire de la découverte faite en France de matières semblables à celles dont la porcelaine de la Chine est composée* (1765); *Mémoires sur différentes parties des sciences et arts* (5 vols., 1768–1783); *Mémoire sur la minéralogie du Dauphiné* (2 vols., 1779). See *The Founders of Geology*, by Sir A. Geikie (1897).

GUEUX, LES, or "THE BEGGARS," a name assumed by the confederacy of nobles and other malcontents, who in 1566 opposed Spanish tyranny in the Netherlands. The leaders of the nobles, who signed a solemn league known as "the Compromise," by which they bound themselves to assist in defending the rights and liberties of the Netherlands against the civil and religious despotism of Philip II., were Louis, count of Nassau, and Henry, count of Brederode. On the 5th of April 1566 permission was obtained for the confederates to present a petition of grievances, called "the Request," to the regent, Margaret, duchess of Parma. About 250 nobles marched to the palace accompanied by Louis of Nassau and Brederode. The regent was at first alarmed at the appearance of so large a body, but one of her councillors, Berlaymont by name, was heard to exclaim, "What, madam, is your highness afraid of these beggars (*ces gueux*)?" The appellation was not forgotten. At a great feast held by some 300 confederates at the Hôtel Culemburg three days later, Brederode in a speech declared that if need be they were all ready to become "beggars" in their country's cause. The words caught on, and the hall resounded with loud cries of "*Vivent les gueux!*" The name became henceforward a party appellation. The patriot party adopted the emblems of beggarhood, the wallet and the bowl, as trinkets to be worn on their hats or their girdles, and a medal was struck having on one side the head of Philip II., on the other two clasped hands with the motto "*Fidèle au roy, jusques à porter la besace.*" The original league of "Beggars" was short-lived, crushed by the iron hand of Alva, but its principles survived and were to be ultimately triumphant.

In the year 1569 the prince of Orange, who had now openly placed himself at the head of the party of revolt, granted letters of marque to a number of vessels manned by crews of desperadoes drawn from all nationalities. These fierce corsairs under the command of a succession of daring and reckless leaders—the best-known of whom is William de la Marck, lord of Lumey—were called "*Gueux de mer*," or "Sea Beggars." At first they were content with plundering both by sea and land and carrying their booty to the English ports where they were able to refit and replenish their stores. This went on till 1572, when Queen Elizabeth suddenly refused to admit them to her harbours. Having no longer any refuge, the Sea Beggars in desperation made an attack upon Brill, which they seized by surprise in the absence of the Spanish garrison on the 1st of April 1572. Encouraged by their unhoped-for success, they now sailed to Flushing, which was also taken by a *coup de main*. The capture of these two towns gave the signal for a general revolt of the northern Netherlands, and is regarded as the real beginning of the War of Dutch Independence.

GUEVARA, ANTONIO DE (*c.* 1490–1544), Spanish chronicler and moralist, was a native of the province of Alava, and passed some of his earlier years at the court of Isabella, queen of Castile. In 1528 he entered the Franciscan order, and afterwards accompanied the emperor Charles V. during his journeys to Italy and other parts of Europe. After having held successively the offices of court preacher, court historiographer, bishop of Guadix and bishop of Mondoñedo, he died in 1544. His earliest work, entitled *Reloj de príncipes*, published at Valladolid in 1520, and, according to its author, the fruit of eleven years' labour, is a didactic novel, designed, after the manner of Xenophon's *Cyropaedia*, to delineate, in a somewhat ideal way for the benefit of modern sovereigns, the life and character of an ancient prince, Marcus Aurelius, distinguished for wisdom and virtue. It was often reprinted in Spanish; and before the close of the century had also been translated into Latin, Italian, French and English,

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an English translation being by J. Bourchier (London, 1546) and another being by T. North. It is difficult now to account for its extraordinary popularity, its thought being neither just nor profound, while its style is stiff and affected. It gave rise to a literary controversy, however, of great bitterness and violence, the author having ventured without warrant to claim for it an historical character, appealing to an imaginary "manuscript in Florence." Other works of Guevara are the *Decada de los Cesares* (Valladolid, 1539), or "Lives of the Ten Roman Emperors," in imitation of the manner of Plutarch and Suetonius; and the *Epistolas familiares* (Valladolid, 1539–1545), sometimes called "The Golden Letters," often printed in Spain, and translated into all the principal languages of Europe. They are in reality a collection of stiff and formal essays which have long ago fallen into merited oblivion. Guevara, whose influence upon the Spanish prose of the 16th century was considerable, also wrote *Libro de los inventores del arte de marear* (Valladolid, 1539, and Madrid, 1805).

GUEVARA, LUIS VELEZ DE (1579–1644), Spanish dramatist and novelist, was born at Écija on the 1st of August 1579. After graduating as a sizar at the university of Osuna in 1596, he joined the household of Rodrigo de Castro, cardinal-archbishop of Seville, and celebrated the marriage of Philip II. in a poem signed "Velez de Santander," a name which he continued to use till some years later. He appears to have served as a soldier in Italy and Algiers, returning to Spain in 1602 when he entered the service of the count de Saldaña, and dedicated himself to writing for the stage. He died at Madrid on the 10th of November 1644. He was the author of over four hundred plays, of which the best are *Reinar despues de morir*, *Más pesa el rey que la sangre*, *La Luna de la Sierra* and *El Diablo cojo en Canillana*; but he is most widely known as the author of *El Diablo cojuelo* (1641), a fantastic novel which suggested to Le Sage the idea of his *Diable boiteux*.

GUGLIELMI, PIETRO (1727–1804), Italian composer, was born at Massa Carrara in May 1727, and died in Rome on the 19th of November 1804. He received his first musical education from his father, and afterwards studied under Durante at the Conservatorio di Santa Maria di Loreto at Naples. His first operatic work, produced at Turin in 1755, established his reputation, and soon his fame spread beyond the limits of his own country, so that in 1762 he was called to Dresden to conduct the opera there. He remained for some years in Germany, where his works met with much success, but the greatest triumphs were reserved for him in England. He went to London, according to Burney, in 1768, but according to Florimo in 1772, returning to Naples in 1777. He still continued to produce operas at an astounding rate, but was unable to compete successfully with the younger masters of the day. In 1793 he became *maestro di cappella* at St Peter's, Rome. He was a very prolific composer of Italian comic opera, and there is in most of his scores a vein of humour and natural gaiety not surpassed by Cimarosa himself. In serious opera he was less successful. But here also he shows himself the principles of a competent musician. Considering the enormous number of his works, his unequal workmanship and the frequent instances of mechanical and slip-shod writing in his music need not surprise us. The following are among the most celebrated of his operas: *I Due Gemelli*, *La Serva inamorata*, *La Pastorella nobile*, *La Bella Peccatrice*, *Rinaldo*, *Artaserse*, *Didone* and *Enea e Lavinia*. He also wrote oratorios and miscellaneous pieces of orchestral and chamber music. Of his eight sons two at least acquired fame as musicians—Pietro Carlo (1763–1827), a successful imitator of his father's operatic style, and Giacomo, an excellent singer.

GUIANA (*Guyana*, *Guayana*[1]), the general name given in its widest acceptation to the part of South America lying to the north-east from 8° 40′ N. to 3° 30′ S. and from 50° W. to 68° 30′ W. Its greatest length, from Cabo do Norte to the confluence of the Rio Xie and Rio Negro, is about 1250 m., its greatest breadth, from Barima Point in the mouth of the Orinoco to the confluence of the Rio Negro and Amazon, 800 m. Its area is roughly 600,000 sq. m. Comprised in this vast territory are Venezuela (formerly Spanish) Guiana, lying on both sides of the Orinoco and extending S. and S.W. to the Rio Negro and Brazilian settlements; British Guiana, extending from Venezuela to the left bank of the Corentyn river; Dutch Guiana

designated any section of it by the name of the people living on its banks. Many streams, therefore, had more than a dozen names. It is probable that no important river had one name alone throughout its course, prior to the time of the Conquest. The radical *wini*, *weini*, *weyni*, is found as a prefix, and very frequently as a termination, to the names of numerous rivers, not only throughout Guayanâ but all over the Orinoco and Amazon valleys. For instance, Paynary Indians called the portion of the Purús river which they occupied the *Waini*. It simply means water, or a fountain of water, or a river. The alternative suggestion that Guayanâ is an Indian word signifying "wild coast," I also think untenable. This term, applied to the north-east frontage of South America between the Orinoco and the Amazon, is found on the old Dutch map of Hartsinck, who calls it 'Guiana Caribania or de Wilde Kust,' a name which must have well described it when, in 1580, some Zealanders, of the Netherlands, sent a ship to cruise along it, from the mouth of Trinidad to that of the Orinoco, and formed the first settlement near the river Pomeroon. The map of Firnao Vaz Dourado, 1564, calls the northern part of South America, including the present British Guiana, 'Leste Peru.' An anonymous Spanish map, about 1566, gives Guayanâ as lying on the east side of the Orinoco just above its mouth. About 1660, Sebastien de Ruesta, cosmographer of the *Casa de Contractacion de Seville*, shows Guayanâ covering the British, French and Dutch Guayanâs. According to the map of Nicolas de Fer, 1719, a tribe of Guayanis (Guayanas) occupied the south side of the Amazon river, front of the island of Tupinambará, east of the mouth of the Madeira. Aristides Rojas, an eminent Venezuelan scholar, says that the Mariches Indians, near Caracas, inhabited a site called Guayanâ, long before the discovery of South America by the Spaniards. Coudreau in his *Chez nos Indiens* mentions that the *Roucouyennes* of Guayanâ take their name from a large tree in their forests,' which appears to be the origin of the name Guyanae.' According to Aristides Rojas, in their report to the Venezuelan government on their voyages in the basin of the Orinoco, 'Guyana derives its name from the Indians who live between the Caroni river and the Sierra de Imataca, called Guayanos.' My own studies of aboriginal South America lead me to support the statement of Michelana y Rojas, but with the following enlargement of it: The Portuguese, in the early part of the 16th century, found that the coast and mountain district of Rio de Janeiro, between Cape São Thome and Angra dos Reis, belonged to the formidable *Tamoyes*, south of these, for a distance of about 300 m. of the ocean slope of the coast range, were the *Guayanâ* tribes, called by the early writers *Guianás*, *Goyanâ*, *Guayanâ*, *Goanâ* and, plural, *Goayndzis*, *Goayandzes* and *Guayandzes*. They were constantly at feud with the *Tamoyes* and with their neighbours to the south, the *Carijos*, as well as with the vast Tapuya hordes of the Sertão of the interior. Long before the discovery, they had been forced to abandon their beautiful lands, but had recuperated their strength, returned and reconquered their ancient habitat. Meanwhile, however, many of them had migrated northward, some had settled in the *Sertão* back of Bahia and Pernambuco, others on the middle Amazon and in the valley of the Orinoco, but a large number had crossed the lower Amazon and occupied an extensive area of country to the north of it, about the sixes of Belgium, along the Tumucumaque range of highlands, and the upper Paron and Maroni rivers, as well as a large district on the northern slope of the above-named range. In their new home they became known as *Roucouyennes*, because, like the *Mundurucus* of the middle Amazon, they rubbed and painted themselves with *roucou* or *urucu* (Bixa Orellana); but other surrounding tribes called them Guayanâs, that is Guyanâs—the Gua, so common to the Guarani-Tupi tongue, having become corrupted into *Ua*. Porto Seguro says of the so-called Tupis, "at other times they gave themselves the name of *Guayaz* or *Guayanâ*, which probably means "brothers," from which comes *Guayases* and *Guayanases*. . . . The latter occupied the country just south of Rio de Janeiro. . . . The masters of the Capitania of St Vincente called themselves *Guianas*." Guinila, referring to north-eastern South America (1745), speaks of five missions being formed to civilize the '*Nacion Guayana*.' In view of the above, it may be thought reasonable to assume that the vast territory now known as *Guayanâ* (British, Dutch, French, Brazilian and Venezuelan) derives its name from its aborigines who were found there at the time of the discovery, and whose original home was the region I have indicated."

[1] The origin of the name is somewhat obscure, and has been variously interpreted. But the late Col. G. E. Church supplies the following note, which has the weight of his great authority: "I cannot confirm the suggestion of Schomburgk that Guayanâ 'received its name from a small river, a tributary of the Orinoco', supposed to be the Waini or Guainia. In South America, east of the Andes, it was the common custom of any tribe occupying a length of river to call it simply 'the river'; but the other tribes

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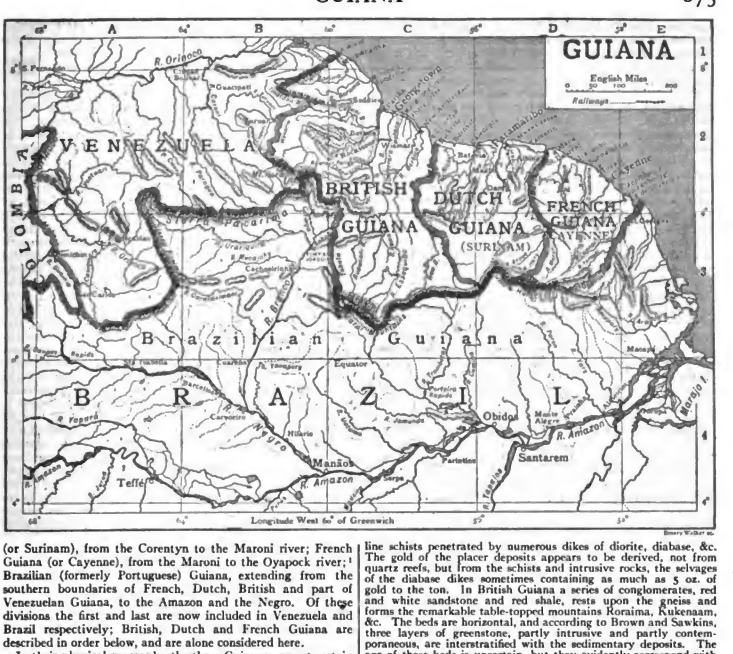

(or Surinam), from the Corentyn to the Maroni river; French Guiana (or Cayenne), from the Maroni to the Oyapock river;[1] Brazilian (formerly Portuguese) Guiana, extending from the southern boundaries of French, Dutch, British and part of Venezuelan Guiana, to the Amazon and the Negro. Of these divisions the first and last are now included in Venezuela and Brazil respectively; British, Dutch and French Guiana are described in order below, and are alone considered here.

In their physical geography the three Guianas present certain common characteristics. In each the principal features are the rivers and their branch streams. In each colony the northern portion consists of a fluviomarine deposit extending inland and gradually rising to a height of 10 to 15 ft. above the sea. This alluvial plain varies in width from 50 m. to 18 m. and is traversed by ridges of sand and shells, roughly parallel to what is now the coast, indicating the trend of former shore lines. By the draining and diking of these lands the plantations have been formed along the coast and up the rivers. These low lands are attached to a somewhat higher plateau, which towards the coast is traversed by numerous huge sand-dunes and inland by ranges of hills rising in places to as much as 2000 ft. The greater part of this belt of country, in which the auriferous districts principally occur, is covered with a dense growth of jungle and high forest, but savannahs, growing only a long wiry grass and poor shrubs, intrude here and there, being in the S.E. much nearer to the coast than in the N.W. The hinterlands consist of undulating open savannahs rising into hills and mountains, some grass-covered, some in dense forest.

Geology[2].—Guiana is formed almost entirely of gneiss and crystalline schists penetrated by numerous dikes of diorite, diabase, &c. The gold of the placer deposits appears to be derived, not from quartz reefs, but from the schists and intrusive rocks, the selvages of the diabase dikes sometimes containing as much as 5 oz. of gold to the ton. In British Guiana a series of conglomerates, red and white sandstone and red shale, rests upon the gneiss and forms the remarkable table-topped mountains Roraima, Kukenaam, &c. The beds are horizontal, and according to Brown and Sawkins, three layers of greenstone, partly intrusive and partly contemporaneous, are interstratified with the sedimentary deposits. The age of these beds is uncertain, but they evidently correspond with the similar series which occurs in Brazil, partly Palaeozoic and partly Cretaceous. In Dutch Guiana there are a few small patches supposed to belong to the Cretaceous period. Along the coast, and in the lower parts of the river valleys, are deposits which are mainly Quaternary but may also include beds of Tertiary age.

History.—The coast of Guiana was sighted by Columbus in 1498 when he discovered the island of Trinidad and the peninsula of Paria, and in the following year by Alonzo de Ojeda and Amerigo Vespucci; and in 1500 Vincente Yañez Pinzon ventured south of the equator, and sailing north-west along the coast discovered the Amazon; he is believed to have also entered some of the other rivers of Guiana, one of which, now called Oyapock, is marked on early maps as Rio Pinzon. Little, however, was known of Guiana until the fame of the fabled golden city Manoa or El Dorado tempted adventurers to explore its rivers and forests. From letters of these explorers found in

[1] This is the boundary generally accepted; but it is in dispute.

[2] See C. B. Brown and J. G. Sawkins, *Reports on the Physical, Descriptive and Economic Geology of British Guiana* (London, 1875); C. Velain, "Esquisse géologique de la Guyane française et des bassins du Parou et du Yari (affluents de l'Amazone) d'après les explorations du Dr Crevaux," *Bull. Soc. Géogr.* ser. 7, vol. vi. (Paris, 1885), pp. 453-492 (with geological map); E. Martin, *Geologische Studien über Niederländisch-West-Indien, auf Grund eigener Untersuchungsreisen* (Leiden, 1888); W. Bergt, "Zur Geologie des Coppename- und Nickerietales in Surinam (Hollandisch-Guyana)," *Samml. d. Geol. Reichsmus.* (Leiden), ser. 2, Bd. ii. Heft 2, pp. 93-163 (with 3 maps); and for British Guiana, the official reports on the geology of various districts, by J. B. Harrison, C. W. Anderson, H. I. Perkins, published at Georgetown.

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captured ships, Sir Walter Raleigh was induced to ascend the Orinoco in search of El Dorado in 1595, to send Lawrence Keymis on the same quest in the following year, and in 1617 to try once again, with the same intrepid lieutenant, an expedition fraught with disaster for both of them. As early as 1580 the Dutch had established a systematic trade with the Spanish main, but so far as is known their first voyage to Guiana was in 1598. By 1613 they had three or four settlements on the coast of Demerara and Essequibo, and in about 1616 some Zeelanders settled on a small island, called by them *Kyk over al* ("see over all"), in the confluence of the Cuyuni and Mazaruni rivers. While the Dutch traders were struggling for a footing in Essequibo and Demerara, English and French traders were endeavouring to form settlements on the Oyapock river, in Cayenne and in Surinam, and by 1632 the English had large interests in the latter and the French in Cayenne. In 1663 Charles II. issued letters patent to Lord Willoughby of Parham and Lawrence Hyde, second son of the earl of Clarendon, granting them the district between the Copenam and Maroni rivers, a province described as extending from E. to W. some 120 m. This colony was, however, formally ceded to the Netherlands in 1667 by the peace of Breda, Great Britain taking possession of New York. Meanwhile the Dutch West India Company, formed in 1621, had taken possession of Essequibo, over which colony it exercised sovereign rights until 1791. In 1624 a Dutch settlement was effected in the Berbice river, and from this grew Berbice, for a long time a separate and independent colony. In 1657 the Zeelanders firmly established themselves in the Pomeroon, Moruca and Demerara rivers, and by 1674 the Dutch were colonizing all the territory now known as British and Dutch Guiana. The New Dutch West Indian Company, founded in that year to replace the older company which had failed, received Guiana by charter from the states-general in 1682. In the following year the company sold one-third of their territory to the city of Amsterdam, and another third to Cornelis van Aerssens, lord of Sommelsdijk. The new owners and the company incorporated themselves as the Chartered Society of Surinam, and Sommelsdijk agreed to fill the post of governor of the colony at his own expense. The lucrative trade in slaves was retained by the West Indian Company, but the society could import them on its own account by paying a fine to the company. Sommelsdijk's rule was wise and energetic. He repressed and pacified the Indian tribes, erected forts and disciplined the soldiery, constructed the canal which bears his name, established a high court of justice and introduced the valuable cultivation of the cocoa-nut. But on the 17th of June 1688 he was massacred in a mutiny of the soldiers. The "third" which Sommelsdijk possessed was offered by his widow to William III. of England, but it was ultimately purchased by the city of Amsterdam for 700,000 fl. The settlements in Essequibo progressed somewhat slowly, and it was not until immigration was attracted in 1740 by offers to newcomers of free land and immunity for a decade from taxation that anything like a colony could be said to exist there. In 1732 Berbice placed itself under the protection of the states-general of Holland and was granted a constitution, and in 1773 Demerara, till then a dependency of Essequibo, was constituted as a separate colony. In 1781 the three colonies, Demerara, Essequibo and Berbice, were captured by British privateers, and were placed by Rodney under the governor of Barbados, but in 1782 they were taken by France, then an ally of the Netherlands, and retained until the peace of 1785, when they were restored to Holland. In 1784 Essequibo and Demerara were placed under one governor, and Georgetown—then called Stabroek—was fixed on as the seat of government. The next decade saw a series of struggles between the colonies and the Dutch West India company, which ended in the company being wound up and in the three colonies being governed directly by the states general. In 1796 the British again took possession, and retained the three colonies until the peace of Amiens in 1802, when they were once again restored to Holland, only to be recaptured by Great Britain in 1803, in which year the history proper of British Guiana began.

I. BRITISH GUIANA, the only British possession in S. America, was formally ceded in 1814–1815. The three colonies were in 1831 consolidated into one colony divided into three counties, Berbice extending from the Corentyn river to the Abary creek, Demerara from the Abary to the Boerasirie creek, Essequibo from the Boerasirie to the Venezuelan frontier. This boundary-line between British Guiana and Venezuela was for many years the subject of dispute. The Dutch, while British Guiana was in their possession, claimed the whole watershed of the Essequibo river, while the Venezuelans asserted that the Spanish province of Guayana had extended up to the left bank of the Essequibo. In 1840 Sir Robert Schomburgk had suggested a demarcation, afterwards known as the "Schomburgk line"; and subsequently, though no agreement was arrived at, certain modifications were made in this British claim. In 1886 the government of Great Britain declared that it would thenceforward exercise jurisdiction up to and within a boundary known as "the modified Schomburgk line." Outposts were located at points on this line, and for some years Guianese police and Venezuelan soldiers faced one another across the Amacura creek in the Orinoco mouth and at Yuruan up the Cuyuni river. In 1897 the dispute formed the subject of a message to congress from the president of the United States, and in consequence of this intervention the matter was submitted to an international commission, whose award was issued at Paris in 1899 (see VENEZUELA). By this decision neither party gained its extreme claim, the line laid down differing but little from the original Schomburgk line. The demarcation was at once undertaken by a joint commission appointed by Venezuela and British Guiana and was completed in 1904. It was not found practicable, owing to the impassable nature of the country, to lay down on earth that part of the boundary fixed by the Paris award between the head of the Wenamu creek and the summit of Mt. Roraima, and the boundary commissioners suggested a deviation to follow the watersheds of the Caroni, Cuyuni and Mazaruni rivers, a suggestion accepted by the two governments. In 1902 the delimitation of the boundary between British Guiana and Brazil was referred to the arbitration of the king of Italy, and by his reward, issued in June 1904, the substantial area in dispute was conceded to British Guiana. The work of demarcation has since been carried out.

British Guiana.

Towns, &c.—The capital of British Guiana is Georgetown, at the mouth of the Demerara river, on its right bank, with a population of about 50,000. New Amsterdam, on the right bank of the Berbice river, has a population of about 7500. Each possesses a mayor and town council, with statutory powers to impose rates. There are nineteen incorporated villages, and ten other locally governed areas known as country districts, the affairs of which are controlled by local authorities, known as village councils and country authorities respectively.

Population.—The census of 1891 gave the population of British Guiana as 278,328. There was no census taken in 1901. By official estimates the population at the end of 1904 was 301,023. Of these some 120,000 were negroes and 124,000 East Indians; 4300 were Europeans, other than Portuguese, estimated at about 11,600, and 50,000 of mixed race. The aborigines—Arawaks, Caribs, Wapisianas, Warraws, &c.—who numbered about 10,000 in 1891, are now estimated at about 6500. In 1904 the birth-rate for the whole colony was 30·3 per 1000 and the death-rate 28·8.

Physical Geography.—The surface features of British Guiana may be divided roughly into four regions: first, the alluvial seaboard, flat and below the level of high-water; secondly, the forest belt, swampy along the rivers but rising into undulating lands and hills between them: thirdly, the savannahs in and inland of the forest belt, elevated table-lands, grass-covered and practically treeless; and fourthly, the mountain ranges. The eastern portion of the colony, from the source of its two largest rivers, the Corentyn and Essequibo, is a rough inclined plain, starting at some 900 ft. above sea-level at the source of the Takutu in the west, but only some 400 at that of the Corentyn in the west, and sloping down gradually to the low alluvial flats about 3 ft. below high-water line. The eastern part is generally forested; the western is an almost level savannah, with woodlands along the rivers. The

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northern portion of British Guiana, the alluvial flats alluded to already, consists of a fluviomarine deposit extending inland from 25 m. to 30 m., gradually rising to about 12 ft. above high-water mark and ending against beds of sandy clay, the residua of igneous rocks decomposed *in situ*, which form an extensive undulating region rising to 150 ft. above the sea and stretching back to the forest-covered hills. Roughly parallel to the existing coast-line are narrow reefs of sand and sea-shells, which are dunes indicating the trend of former limits of the sea, and still farther back are the higher "sand hills," hills of granite or diabase with a thick covering of coarse white sand superimposed. From the coast-line seawards the ocean deepens very gradually, and at low tide extensive flats of sand and of mixed clay and sand (called locally "caddy") are left bare, these flats being at times covered with a deposit of thin drift mud.

Two great parallel mountain systems cross the colony from W. to E., the greater being that of the Pacaraima and Merumé Mts., and the lesser including the Kanuku Mts. (2000 ft.), while the Acarai Mts., a densely-wooded range rising to 2500 ft., form the southern boundary of British Guiana and the watershed between the Essequibo and the Amazon. These mountains rise generally in a succession of terraces and broad plateaus, with steep or even sheer sandstone escarpments. They are mostly flat-topped, and their average height is about 3500 ft. The Pacaraima Mts., however, reach 8635 ft. at Roraima, and the latter remarkable mountain rises as a perpendicular wall of red rock 1500 ft. in height springing out of the forest-clad slopes below its summit, and was considered inaccessible until in December 1884 Messrs. Thurn and Perkins found a ledge by which the top could be reached. The summit is a table-land some 12 sq. m. in area. Mt. Kukenaam is of similar structure and also rises above 8500 ft. Other conspicuous summits (about 7000 ft.) are Ayanganna, Eluwarin, Iliripai and Waiakapiapu. The southern portion of the Pacaraima range comprises rugged hills and rock-strewn valleys, but to the N., where the sandstone assumes the table-shaped form, there are dense forests, and the scenery is of extraordinary grandeur. Waterfalls frequently descend the cliffs from a great height (nearly 2000 ft. sheer at Roraima and Kukenaam). The sandstone formation can be traced from the northern Pacaraima range on the N.W. to the Corentyn in the S.E. It is traversed in places by dikes and sills of basalt or dolerite, while bosses of more or less altered gabbro rise through it. The surface of a large part of the colony is composed of gneiss, and of gneissose granite, which is seen in large water-worn bosses in the river beds. Intrusive granite is of somewhat rare occurrence; where found, it gives rise to long ranges of hilly country and to cataracts in the rivers. Extensive areas of the country consist of quartz-porphyry, porphyrites and felstone, and of more or less schistose rocks derived from them. These rocks are closely connected with the gneissose granites and gneiss, and are the reasons for believing that the latter are the deep-seated portions of them and are only visible where they have been exposed by denudation. Long ranges of hills, varying in elevation from a few hundreds to from 3000 ft. to 3000 ft., traverse the plains of the gneissose districts. These are caused either by old intrusions of diabase and gabbro which have undergone modifications, or by later ones of dolerite. These ranges are of high importance, as the rocks comprising them are the main source of gold in British Guiana.

Rivers.—The principal physical features of British Guiana are its rivers and their branches, which form one vast network of waterways all over it, and are the principal, indeed practically the only, highways inland from the coast. Chief among them are the Waini, the Essequibo, and its tributaries the Mazzaruni and Cuyuni, the Demerara, the Berbice and the Corentyn. The Essequibo rises in the Acarai Mts., in 0° 41′ N. and about 850 ft. above the sea, and flows northwards for about 600 m. until it discharges itself into the ocean by an estuary nearly 15 m. in width. In this estuary are several large and fertile islands, on four of which sugar used to be grown. Now but one, Wakenaam, can boast of a factory. The Essequibo can be entered only by craft drawing less than 20 ft. and is navigable for these vessels for not more than 70 m., its subsequent course upwards being frequently broken by cataracts and rapids. Some 7 m. below the first series of rapids it is joined by the Mazaruni, itself joined by the Cuyuni some 4 m. farther up. It has a remarkable course from its source in the Merume Mountains, about 2400 ft. above the sea. It flows first south, then west, northwest, north, and finally south-east to within 20 m. of its own source, forming many fine falls, and its course thereafter is still very tortuous. In 4° N. and 58° W., the Essequibo is joined by the Rupununi, which, rising in a swampy district at the foot of the Kanuku Mts., has a northerly and easterly course of fully 200 m. In 3° 37′ N. the Awaricura joins the Rupununi, and by this tributary the Pirara, a tributary of the Amazon, may be reached,—an example of the interesting series of *ítabot* connecting nearly all S. American rivers with one another. Another large tributary of the Essequibo is the Potaro, on which, at 1130 ft. above sea-level and in 5° 8′ N. and 59° 19′ W., is the celebrated Kaleteur fall, discovered in 1870 by Mr C. Barrington Brown while engaged on a geological survey. This fall is produced by the river flowing from a tableland of sandstone and conglomerate into a deep valley 822 ft. below. For the first 741 ft. the water falls as a perpendicular column, thence as a sloping cataract to the still reach below. The river 200 yds. above the fall is about 400 ft. wide, while the actual waterway of the fall itself varies from 120 ft. in dry weather to nearly 400 ft. in rainy seasons. The Kaieteur, which it took Mr Brown a fortnight to reach from the coast, can now be reached on the fifth day from Georgetown. Among other considerable tributaries of the Essequibo are the Siparuni, Burro-Burro, Rewa, Kuyuwini and Kassa-Kudji. The Demerara river, the head-waters of which are known only to Indians, rises probably near 5° N., and after a winding northerly course of some 200 m. enters the ocean in 6° 50′ N. and 58° 28′ W. A bar of mud and sand prevents the entrance of vessels drawing more than 19 ft. The river is from its mouth, which is nearly 2 m. wide, navigable for 70 m. to all vessels which can enter. The Berbice river rises in about 3° 40′ N., and in 3° 53′ N. is within 9 m. of the Essequibo. At its mouth it is about 4 m. wide, and is navigable for vessels drawing not more than 12 ft. for about 105 m. and for vessels drawing not more than 7 ft. for fully 175 m. Thence upwards it is broken by great cataracts. The Canje creek joins the Berbice river close to the sea. The Corentyn river rises in 1° 48′ 30″ N., about 140 m. E. of the Essequibo, and flowing northwards enters the Atlantic by an estuary some 14 m. wide. The divide between its head-waters and those of streams belonging to the Amazon system is only some 400 ft. in elevation. It is navigable for about 150 m., some of the reaches being of great width and beauty. The upper reaches are broken by a series of great cataracts, some of which, until the discovery of Kaieteur, were believed to be the grandest in British Guiana. Among other rivers are the Pomeroon, Moruca and Barima, while several large navigable creeks fall directly into the Atlantic, the largest being the Abary, Mahaicony and Mahaica, between Berbice and Demerara, and the Boerasirie between Demerara and Essequibo. The colour of the water of the rivers and creeks is in general that of dark brown, caused by the infusion of vegetable matter, but where the streams run for a long distance through savannahs they are of a milky colour.

Climate.—The climate is, as tropical countries go, not unhealthy. Malarial fevers are common but preventible, and phthisis is prevalent, not because the climate is unsuitable to sufferers from pulmonary complaints, but because of the ignorance of the common people of the elementary principles of hygiene, an ignorance which the state is endeavouring to lessen by including the teaching of hygiene in the syllabus of the primary schools. The temperature is uniform on the coast for the ten months from October to July, the regular N.E. trade winds keeping it down to an average of 80° F. In August and September the trades die away and the heat becomes oppressive. In the interior the nights are cold and damp. Hurricanes, indeed even strong gales, are unknown; a tidal wave is an impossibility; and the nature of the soil of the coast lands renders earthquakes practically harmless. Occasionally there are severe droughts, and the rains are sometimes unduly prolonged, but usually the year is clearly divided into two wet and two dry seasons. The long wet season begins in mid-April and lasts until mid-August. The long dry season is from September to the last week in November. December and January constitute the short rainy season, and February and March the short dry season. The rainfall varies greatly in different parts of the colony; on the coast it averages about 80 in. annually.

Flora.—The vegetation is most luxuriant and its growth perpetual. Indigenous trees and plants abound in the utmost variety, while many exotics have readily adapted themselves to local conditions. Along the coast is a belt of courida and mangrove—the bark of the latter being used for tanning—forming a natural barrier to the inroads of the sea, but one which every unwisely has been in parts almost ruined to allow of direct drainage. The vast forests afford an almost inexhaustible supply of valuable timbers; greenheart and mora, largely used in shipbuilding and for wharves and dock and lock gates; silverbally, yielding magnificent planks for all kinds of boats; and cabinet woods, such as cedar and crabwood. There may be seen great trees, struggling for life one with the other, covered with orchids—some of great beauty and value—and draped with falling *lianas* and vines. Immense forests line the riverbanks and break the monotony of the mass of smaller foliage. Many of the trees yield gums, oils and febrifuges, the bullet tree being bled extensively for *balata*, a gum used largely in the manufacture of belting. Valuable varieties of rubber have also been found in several districts, and the industry in 1905 first directed the attention of experts from abroad. On the coast plantains, bananas and mangoes grow readily and are largely used for food, while several districts are admirably adapted to the growth of limes. Oranges, pineapples, star-apples, grenadillas, guavas are among the fruits; Indian corn, cassava, yams, eddoes, tannias, sweet potatoes and ochroes are among the vegetables, while innumerable varieties of peppers are grown and used in large quantities by all classes. The dainty avocado pear, purple and green, grows readily. In the lagoons and trenches many varieties of water-lilies grow wild, the largest being the famous *Victoria regia*.

Fauna.—Guiana is full of wild animals, birds, insects and reptiles. Among the wild animals, one and all nocturnal, are the mipourrie or tapir, manatee, acouri and labba (both excellent eating), sloth, ant-eater, armadillo, several kinds of deer, baboons, monkeys and the puma and jaguar. The last is seen

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frequently down on the coast, attracted from the forest by the cattle grazing on the front and back pasture lands of the estates. Among the birds may be mentioned the carrion crow (an invaluable scavenger), vicissi and muscovy ducks, snipe, teal, plover, pigeon, the ubiquitous kiskadee or *qu'est que dit*, a species of shrike—his name derived from his shrill call—the canary and the twa-twa, both charming whistlers. These are all found on the coast. In the forest are maam (partridge), maroudi (wild turkey), the beautiful bell-bird with note like a silver gong, the quadrille bird with its tuneful oft-repeated bar, great flocks of macaws and parrots, and other birds of plumage of almost indescribable richness and variety. On the coast the trenches and canals are full of alligators, but the great cayman is found only in the rivers of the interior. Among the many varieties of snakes are huge constricting camoudies, deadly bushmasters, labarrias and rattlesnakes. Among other reptiles are the two large lizards, the salumpenta (an active enemy of the barn-door fowl), and the iguana, whose flesh when cooked resembles tender chicken. The rivers, streams and trenches abound with fishes, crabs and shrimps, the amount of the latter consumed being enormous, running into tons weekly as the coolies use them in their curries and the blacks in their foo-foo.

Government and Administration.—Executive power is vested in a governor, who is advised in all administrative matters by an executive council, consisting of five official and three unofficial members nominated by the crown. Legislative authority is vested in the Court of Policy, consisting of the governor, who presides and without whose permission no legislation can be initiated, seven other official members and eight elected members. This body has, however, no financial authority, all taxation and expenditure being dealt with by the Combined Court, consisting of the Court of Policy combined with six financial representatives. The elected members of the Court of Policy and the financial representatives are elected by their several constituencies for five years. Qualification for the Court of Policy is the ownership, or possession under lease for a term of twenty-one years, of eighty acres of land, of which at least forty acres are under cultivation, or of house property to the value of $7500. A financial representative must be similarly qualified or be in receipt of a clear income of not less than £300 per annum. Every male is entitled to be registered as a voter who (in addition to the usual formal qualifications) owns (during six months prior to registration) three acres of land in cultivation or a house of the annual rental or value of £20; or is a secured tenant for not less than three years of six acres of land in cultivation or for one year of a house of £40 rental; or has an income of not less than £100 per annum; or has during the previous twelve months paid £4, 3s. 4d. in direct taxation. Residence in the electoral district for six months prior to registration is coupled with the last two alternative qualifications. Plural voting is legal but no plumping is allowed. The combined court is by this constitution, which was granted in 1891, allowed the use of all revenues due to the crown in return for a civil list voted for a term now fixed at three years. English is the official and common language. The Roman-Dutch law, modified by orders-in-council and local statutes, governs actions in the civil courts, but the criminal law is founded on that of England. Magistrates have in civil cases jurisdiction up to £20, while an appeal lies from their decisions in any criminal or civil case. The supreme court consists of a chief justice and two puisne judges, and has various jurisdictions. The full court, consisting of the three judges or any two of them, has jurisdiction over all civil matters, but an appeal lies to His Majesty in privy council in cases involving £500 and upwards. A single judge sits in insolvency, in actions involving not over £520, and in appeals from magistrates' decisions. The appeal full court, consisting of three judges, sits to hear appeals from decisions of a single judge in the limited civil, appellate and insolvency courts. Criminal courts are held four times a year in each county, a single judge presiding in each court. A court of crown cases reserved is formed by the three judges, of whom two form a quorum provided the chief justice is one of the two. There are no imperial troops now stationed in British Guiana, but there is a semi-military police force, a small militia and two companies of volunteers. The Church of England and the Church of Scotland are both established, and grants-in-aid are also given to the Roman Catholic and Wesleyan churches and to several other denominations.

The revenue and expenditure now each amount annually to an average of a little over £500,000. About one-half of the revenue is produced by import duties, and about £90,000 by excise. The public debt on the 31st of March 1905 stood at £989,620.

The system of primary education is denominational and is mainly supported from the general revenue. During 1904–1905, 213 schools received grant-in-aid amounting to £23,800, the average cost per scholar being a little over £1. These grants are calculated on the results of examinations held annually, an allowance varying from 4s. 4½d. to 1s. 0½d. being made for each pass in reading, writing, arithmetic, school-garden work, nature study, singing and drill, English, geography, elementary hygiene and history. Secondary education is provided in Georgetown at some private establishments, and for boys at Queen's College, an undenominational government institution where the course of instruction is the same as at a public school in England, and the boys are prepared for the Cambridge local examinations, on the result of which annually depend the Guiana scholarship—open to boys and girls, and carrying a university or professional training in England—and two scholarships at Queen's College.

Industries and Trade.—At the end of the third decade of the 19th century the principal exports were sugar, rum, molasses, cotton and coffee. In 1830, 9,500,000 lb of coffee were sent abroad, but after the emancipation of the slaves it almost ceased as an export, and the little that is now grown is practically entirely consumed in the colony. The cultivation of cotton ceased in 1844, and, but for a short revival during the American civil war, has never prospered since. Efforts have been made to resuscitate its growth, but the experiments of the Board of Agriculture have only shown that Sea Island cotton is not adaptable to local conditions, and that no other known variety can as yet be recommended. To-day the principal exports are sugar, rum, molasses, molasuit—a cattle food made from molasses—gold, timber, balata, shingles and cattle. The annual value of the total exports is just under £2,000,000, of which about two-thirds go to Great Britain and British possessions. The cultivation of rice has made great strides in recent years, and, where difficulties of drainage and irrigation can be economically overcome, promises to increase rapidly. In 1873, 32,000,000 lb of rice were imported, whereas in 1904–1905, the quantity imported having fallen to 20,500,000 lb, there were over 18,000 acres under rice cultivation, and exportation, principally to the British West Indies, had commenced. The cultivation of the sugar-cane, and its manufacture into sugar and its by-products, still remains, in spite of numerous fluctuations, the staple industry. The provision of a trustworthy labour supply for the estates is of great importance, and local scarcity has made it necessary from time to time to import it under a system of indenture. In that year and until 1867, liberated Africans were brought from Rio de Janeiro, Havana, Sierra Leone and St Helena, and in 1845 systematic immigration from India commenced and has since been carried on annually save in 1849–1850. In 1853 immigration from China was tried, and was carried on by the government from 1859 to 1866, when it ceased owing to a convention arranged at Peking, stipulating that all immigrants should on the expiry of their terms of service be entitled to be sent back at the expense of the colony, a liability it could not afford to incur. To reduce the cost of supervision and kindred expenses, and consequently of the cane and its manufacture into sugar, the policy of centralization has been universally adopted, and forty-six estates now produce as much sugar as three times that number did in 1875. During recent years Canada has come forward as a large buyer of Guiana's sugar, and in 1904–1905 the same amount went there as to the United States, in each case over 44,000 tons, whereas in 1901–1902 the United States took 85,000 tons and Canada under 8000 tons. Practically all the rum and molasuit go to England, and the molasses to Holland and Portuguese possessions. The lands on the coast and on the river banks up to the sand hills are of marked fertility, and from them produce almost unequalled in quality for fruit. Cultivation, however, save on the sugar, coffee and cocoa estates, and by a few exceptional small farmers, is carried on in a haphazard and half-hearted manner, and the problem of agricultural development is one of great difficulty for the government. Much of the privately-owned land is not beneficially occupied, and in many cases it is not possible even to learn to whom it belongs, and though there are vast tracts of uncultivated crown land where a large farm or a small homestead can be easily and cheaply acquired, the difficulties involved in clearing, draining, and in some cases protecting it by dams, are prohibitive to all but the exceptionally determined.

Prospecting for gold began in 1880, and from 1884 to 1893–1894 the output, chiefly from alluvial workings, increased from 250 oz. to nearly 140,000 oz. annually. The industry then received a serious check by the failure of several mines, and for nearly a decade was almost entirely in the hands of the small tributor, known locally as a pork-knocker. There has been some revival, chiefly due to foreign enterprise. At Omai on the Essequibo river a German syndicate worked a large concession on the hydraulic process of placer mining with considerable success, and more recently took to dredging on its

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flats. In the Puruni (a tributary of the Mazaruni) American capitalists, working the Peters' mine, have established their workings to a considerable depth, besides constructing a road, 60 m. in length, from Kartabo point, at the confluence of the Cuyuni and Mazaruni, to the Puruni river opposite the mine. An English syndicate started dredging in the Conawaruok, a tributary of the Essequibo. The principal gold districts are on the Essequibo and its tributaries—the chief being the Cuyuni, Mazaruni, Potaro and Conawaruok—and on the Barima, Barama and Waini rivers in the north-west district. There have been placer workings, mostly unsuccessful, in the Demerara and Berbice rivers.

Diamonds and other precious stones have been found in small quantities, and since 1900 efforts have been made to extend the output, nearly 11,000 carats worth £8 of diamonds being exported in 1904. But though the small stones found were of good water, the cost of transport to the diamond fields, on the Mazaruni river, was heavy, and after 1904 the industry declined. Laws dealing with gold and precious stones passed in 1880, 1886 and 1887, and regulations in 1899, were codified in 1902 and amended in 1905.

Timber is cut, and balata and rubber collected, from crown lands by licences issued from the department of Lands and Mines. Woodcutting, save on concessions held by a local company owning an up-country line of railway connecting the Demerara and Essequibo rivers, is limited to those parts of the forest which are close to the lower stretches of the rivers and creeks, the overland haulage of the heavy logs being both difficult and costly, while transport through the upper reaches of the rivers is impossible on account of the many cataracts and rapids. The average annual value of imports is £1,500,000, of which about two-thirds are from Great Britain and British possessions. Of the vessels trading with the colony, most are under the British flag, the remainder being principally American and Norwegian.

The money of account is dollars and cents, but, with the exception of the notes of the two local banks, the currency is British sterling. The unit of land measure is the British rood, roughly equal to 12 ft. 4 in. A Rhynland acre contains 300 square roods.

Inland Communication, &c.—The public roads extend along the coast from the Corentyn river to some 20 m. N. of the Essequibo mouth on the Arabisci coast, and for a short distance up each of the principal rivers and creeks on the sea betweem these points. A line of railway 60½ m. in length runs from Georgetown to Rosignol on the left bank of the Berbice river opposite New Amsterdam; and another line 15 m. long starts from Vreed-en-hoop, on the left bank of the Demerara river opposite Georgetown, and runs to Greenwich Park on the right bank of the Essequibo river some 3 m. from its mouth. A light railway, metre gauge, 18½ m. in length, connects Wismar (on the left bank of the Demerara river some 70 m. from its mouth with Rockstone (on the right bank of the Essequibo, and above the first series of cataracts in that river). Steamers run daily to and from Georgetown and Wismar, and launches to and from Rockstone and Tumatumari. Fall on the Potaro, and all expeditions for the goldfields of the Essequibo and its tributaries above Rockstone travel by this route. Another steamer goes twice a week to Bartica at the confluence of the Essequibo and Mazaruni, and another weekly to Mt. Everard on the Barima, from which termini expeditions start to the other gold and diamond fields. Steamers run from Georgetown to New Amsterdam and up the Berbice river for about 100 m. Above the termini of these steamer routes all travelling is done in keelless *bateaux*, propelled by paddlers and steered when coming through the rapids at both bow and stern by experienced bowmen and steersmen. Owing to the extreme dangers of this inland travelling, stringent regulations have been framed as to the loading of boats, supply of ropes and qualifications of men in charge, and the shooting of certain falls is prohibited. Voyages up-country are of necessity slow, but the return journey is made with comparatively great rapidity, distances laboriously covered on the up-trip in three days being done easily in seven hours when coming back.

From England British Guiana is reached in sixteen days by the steamers of the Royal Mail Steam Packet Company, and in nineteen days by those of the direct line from London and Glasgow. There are also regular services from Canada, the United States, France and Holland.

History.—When taken over in 1803 the prospects of three British colonies were by no means promising, and during the next decade the situation became very critical. Owing to the increased output of sugar by conquered Dutch and French colonies the English market was glutted and the markets of the continent of Europe were not available, Bonaparte having closed the ports. The years 1811 and 1812 were peculiarly disastrous, especially to those engaged in the manufacture of sugar, and at a public meeting held in Georgetown early in the latter year it was stated that the produce of the colony ordinarily worth £1,860,000 had on account of deteriorated value decreased by fully one-third. At this meeting it was resolved to petition the imperial parliament to allow the interchange of produce with the United States; a resolution which was unfortunately rendered abortive by the outbreak of war between England and the States in 1812, the trade of British Guiana being instead actually harried by American privateers. In his address to the Combined Court on the 20th of October 1812 the governor (General Carmichael) stated that a vessel with government stores had been captured by an American privateer, and in February 1813 the imperial government sent H.M.S. "Peacock" to protect the coast. On the 23rd of that month in cruising along the east coast of Demerara the "Peacock" met the American privateer "Hornet," and though, after a gallant struggle, in which Captain Peake, R.N., was killed, the English ship was sunk with nearly all her crew, the colony did not suffer from any further depredations. In the following years news of the agitation in England in favour of emancipation gradually became known to the slaves and caused considerable unrest among them, culminating in 1823 in a serious outbreak on the estates on the east coast of Demerara. Negroes, demanding their freedom, attacked the houses of several managers, and although at most points these attacks were repulsed with but little loss on either side, the situation was so serious as to necessitate the calling out of the military. The ringleaders were arrested and promptly and vigorously dealt with, while a special court-martial was appointed to try the Rev. John Smith, of the London Missionary Society, who it was alleged had fostered the rising by his teachings to the slave congregation at his chapel in Le Ressouvenir. This trial was stigmatized as unfair by the missionary party in England, but on the whole appears to have been conducted decently by an undoubtedly unbiassed court. It is difficult now to form any very definite conclusion. Mr Smith certainly had great influence over the slaves, and while his teaching prior to the outbreak was at least ill-advised, he made no efforts while the disturbances were going on to use his influence on the side of law and order; indeed all he could say in his own defence was that he was ignorant of what was going on, a statement it is impossible to believe to have been strictly veracious. He was found guilty and sentenced to be hanged. It is obvious that it was never intended to carry out this sentence, and on the 29th of November the governor announced that he felt it imperative on him to transmit the findings of the court for His Majesty's consideration. The question of Smith's guilt or innocence created a great deal of feeling in England, the anti-slavery and missionary societies making it a basis for increased agitation in favour of the slaves; but the imperial government evidently agreed with the colonial executive in holding that he could not be exonerated of grave responsibility, as the order of the king was that while the sentence of death was remitted Mr Smith was to be dismissed from the colony and to enter into a recognizance in £2000 not to return to British Guiana or to reside in any other West Indian colony. This order reached Georgetown in April 1824, but Mr Smith had died in the city jail on the 6th of February of a pulmonary complaint from which he had been suffering for some time.

Sir Benjamin d'Urban was governor from April 1824 to May 1833, the principal event of his administration being the consolidation in 1831 of the three colonies into one colony divided into three counties, Berbice, Demerara and Essequibo.

Governor d'Urban was succeeded in June 1833 by Sir James Carmichael Smyth, who began his administration by a proclamation to the slaves stating that while the king intended to improve their condition, the details of his plans were not as yet completed, and warning them against impatience or insubordination. When the resolutions foreshadowing emancipation, passed by the House of Commons on the 12th of June 1833, reached the colony, the planters, to whom the governor's proclamation had been most distasteful, were thunderstruck and even the government was surprised. Naturally the slaves were wildly jubilant. Emancipation brought troublous times through which the governor steered the colony with great tact and firmness, serious troubles being nipped in the bud solely by his great personality, and the subsequent conflicts with the apprentices

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might have been obviated had he lived longer. He died at Camp House on the 4th of March 1838.

In the years following emancipation the colony was in a serious condition. The report of a commission in 1850 proved that it was virtually ruined, and only by the introduction of immigrants to provide a reliable labour supply were the sugar estates saved from total extinction. By 1853 the colony had begun to make headway, and Sir Henry Barkly, the then governor, was able to state in his speech to the Combined Court in January that its progress was in every way satisfactory. During Governor Barkly's administration the long series of struggles between the legislature and the executive terminated, and when he left in May 1853 he did so with the respect and good-will of all classes. The strengthening of the labour supply was not effected without troubles. In 1847 the negroes in Berbice attacked the persons and property of the Portuguese immigrants, the riots spreading to Demerara and Essequibo, and not until the military were called out were the disturbances quelled. Similar riots in 1862 were only stopped by the prompt and firm action of the new governor, Mr (afterwards Sir) Francis Hincks, while rows between negroes and Chinese and negroes and East Indians were frequent. Gradually, however, things quieted down, and until 1883 the estates as a whole did well. In 1884 the price of sugar fell so seriously as to make the prospects of the colony very gloomy, and for nearly two decades proprietors had to be content with a price kept artificially low by bounty-fed beet-sugar, many estates being ruined, while those that survived only did so by the application of every economy, and by their owners availing themselves of every new discovery in the sciences of cultivation and manufacture.

The year 1889 was marked by an outbreak on the part of a section of the negro population in Georgetown directed against the Portuguese residents there. A Portuguese had murdered his black paramour and had been convicted and sentenced to death. The governor commuted the sentence to penal servitude for life. Shortly after this a Portuguese stall-holder in the market assaulted a small black boy whom he suspected of pilfering, the latter having to be taken to a hospital, while the former, after being taken to a police station was, through some misunderstanding or informality, at once released. Almost immediately excitable and unreasoning negroes were rushing about loudly proclaiming that the boy was dead, that the Portuguese were allowed to kill black people and to go free, and calling on one another to take their own revenge. Mobs gathered quickly, attacked individual Portuguese and wrecked their shops and houses, and not until the city had been given up for two days to scenes of disgraceful disorder were the efforts of the police and special constables successful in quelling the disturbances. The damage done amounted to several thousands of dollars, the Portuguese owners being eventually compensated from general revenue.

In 1884 the dispute as to the boundary with Venezuela became acute. It was reported to the colonial government that the government of Venezuela had granted to an American syndicate a concession which covered much of the territory claimed by Great Britain, and although prompt investigation by an agent despatched by the governor did not then disclose any trace of interference with British claims, a further visit in January 1885, made in consequence of reports that servants of the Manoa Company had torn down notices posted by Mr McTurk on his former visit, discovered that the British notices had been covered over by Venezuelan ones and resulted in the government of Great Britain declaring that it would thenceforward exercise jurisdiction up to and within a boundary known as "the modified Schomburgk line." Outposts were located at points on this line, and for some years Guianese police and Venezuelan soldiers faced one another across the Amacura creek in the Orinoco mouth and at Yuruan up the Cuyuni river. Guianese officers were, however, presumably instructed not actively to oppose acts of aggression by the Venezuelan government, for in January 1895 Venezuelan soldiers arrested Messrs D. D. Barnes and A. H. Baker, inspectors of police in charge at Yuruan station, conveyed them through Venezuela to Caracas, eventually allowing them to take steamer to Trinidad. For this act compensation was demanded and was eventually paid by Venezuela. The diplomatic question as to the boundary—the results of which are stated above—was passed out of the hands of the colony; see the account of the arbitration under VENEZUELA.

The last two months of 1905 were marked by serious disturbances in Georgetown, and in a lesser degree on the east and west banks of the Demerara river. On the 29th of November the dock labourers employed on the wharves in Georgetown struck for higher wages, and large crowds invaded the principal stores in the city, compelling men willing to work to desist and in some cases assaulting those who opposed them. By the evening of the 30th of November they had got so far out of hand as to necessitate the reading of the Riot Act and a proclamation by the governor (Sir F. M. Hodgson) forbidding all assemblies. On the morning of the 1st of December serious disturbances broke out at Ruimvelt, a sugar estate directly south of Georgetown, where the cane-cutters had suddenly struck for higher pay, and the police were compelled to fire on the mob, killing some and wounding others. All through that day mobs in all parts of the city assaulted any white man they met, houses were invaded and windows smashed, and on two further occasions the police had to fire. At night torrential rains forced the rioters to shelter, and enabled the police to get rest, their places being taken by pickets of militiamen and special constables. On Saturday, the 2nd of December, the police had got the upper hand, and the arrival that night of H.M.S. "Sappho" and on Sunday of H.M.S. "Diamond" gave the government complete control of the situation. Threatened troubles on the sugar estates on the west bank were suppressed by the prompt action of the governor, and the arrest of large numbers of the rioters and their immediate trial by special courts restored thorough order.

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Dutch Guiana.

II. DUTCH GUIANA, or *Surinam*, has an area of about 57,000 sq. m. British Guiana bounds it on the west and French on the east (the long unsettled question of the French boundary is dealt with in section III., FRENCH GUIANA). The various peoples inhabiting Surinam are distributed according to the soil and the products. The Indians (Caribs, Arawaks, Warrous) live on the savannahs, or on the upper Nickerie, Coppename and Maroni, far from the plantations, cultivating their fields of manioc or cassava, and for the rest living by fishing and hunting. They number about 2000. The bush negroes (Marrons) dwell between 3° and 4° N., near the isles and cataracts. They are estimated at 10,000, and are employed in the transport of men and goods to the goldfields, the navigation of the rivers in trade with the Indians, and in the transport of wood to Paramaribo and the plantations. They are the descendants of runaway slaves, and before missionaries had worked among them their paganism retained curious traces of their former connexion with Christianity. Their chief god was Gran Gado (grand-god), his wife Maria, and his son Jesi Kist. Various minor deities were also worshipped, Ampuka the bush-god, Toni the water-god, &c. Their language was based on a bastard English, mingled with many Dutch, Portuguese and native elements. Their chiefs are called *granman* or grand man; but the authority of these men, and the peculiarities of language and religion, have in great measure died out owing to modern intercourse with the Dutch and others. The inhabitants of Paramaribo and the plantations comprise a variety

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of races, represented by Chinese, Javanese, coolies from India and the West Indies, negroes and about 2000 whites. Of non-Christian immigrants there are about 6000 Mahommedans and 12,000 Hindus; and Jews number about 1200. The total population was given in 1907 as 84,103, exclusive of Indians, &c., in the forests. Nearly one-half of this total are in Paramaribo and one-half in the districts. The population has shown a tendency to move from the districts to the town; thus in 1852 there were 6000 persons in the town and 32,000 in the districts.

The principal settlements have been made in the lower valley of the Surinam, or between that river and the Saramacca on the W. and the Commewyne on the E. The Surinam is the chief of a number of large rivers which rise in the Tumuc Humac range or the low hills between it and the sea, which they enter on the Dutch seaboard, between the Corentyn and the Maroni (Dutch *Corantijn* and *Marowijne*), which form the boundaries with British and French territories respectively. Between the rivers of Dutch Guiana there are remarkable cross channels available during the floods at least. As the Maroni communicates with the Cottica, which is in turn a tributary of the Commewyne, a boat can pass from the Maroni to Paramaribo; thence by the Sommelsdijk canal it can reach the Saramacca; and from the Saramacca it can proceed up the Coppename, and by means of the Nickerie find its way to the Corentyn. The rivers are not navigable inland to any considerable extent, as their courses are interrupted by rapids. The interior of the country consists for the most part of low hills, though an extreme height of 3800 ft. is known in the Wilhelmina Kette, in the west of the colony, about 3° 50′ to 4° N. The hinterland south of this latitude, and that part of the Tumuc Humac range along which the Dutch frontier runs, are, however, practically unexplored. Like the other territories of Guiana the Dutch colony is divided physically into a low coast-land, savannahs and almost impenetrable forest.

Meteorological observations have been carried on at five stations (Paramaribo, Coronie, Sommelsdijk, Nieuw-Nickerie and Groningen). The mean range of temperature for the day, month and year shows little variation, being respectively 77·54° – 88·38° F., 76·1° – 78·62° F. and 70·52° – 90·14° F. The north-east trade winds prevail throughout the year, but the rainfall varies considerably; for December and January the mean is respectively 8·58 and 9·57 in., for May and June 11·26 and 10·31 in., but for February and March 7·2 and 6·81 in., and for September 2·48 and 2·0 in. The seasons comprise a long and a short dry season, and a period of heavy and of slight rainfall.

Products and Trade.—It has been found exceedingly difficult to exploit the produce of the forests. The most important crops and those supplying the chief exports are cocoa, coffee and sugar, all cultivated on the larger plantations, with rice, maize and bananas on the smaller or coast lands. Most of the larger plantations are situated on the lower courses of the Surinam, Commewyne, Nickerie and Cottica, and on the coast lands, rarely in the upper parts. Goldfields lie in the older rocks (especially the slate) of the upper Surinam, Saramacca and Maroni. The first section of a railway designed to connect the goldfields with Paramaribo was opened in 1906. The annual production of gold and its value to inland £100,000, but has shown considerable fluctuation. Agriculture is the chief means of subsistence. About 42,000 acres are under cultivation. Of 30,000 persons whose occupation is given in official statistics, close upon 21,000 are engaged in agriculture or on the plantations, 2400 in gold-mining and only 1000 in trade. The exports increased in value from £200,800 in 1875 to £459,800 in 1899, and imports from £260,450 in 1875 to £510,180 in 1899; but the average value of exports over five years subsequently was only £414,000, while that of imports was £531,000.

Administration.—The colony is under a governor, who is president of an executive council, which also includes a vice-president and three members nominated by the crown. The legislative body is the states, the members of which are elected for six years by electors, of whom there is one for every 200 holders of the franchise. The colony is divided into sixteen districts. For the administration of justice there are three cantonal courts, two district courts, and the supreme court at Paramaribo, whose president and permanent members are nominated by the crown. The average local revenue (1901–1906) was about £276,000 and the expenditure about £317,000; both fluctuated considerably, and a varying subvention is necessary from the home government (£116,000 in 1902, £60,400 in 1906; the annual average is about £57,000). There are a civic guard of about 1800 men and a militia of 300, with a small garrison.

History.—The history of the Dutch in Guiana, and the compression of their influence within its present limits, belongs to the general history of Guiana (above). Surinam and the Dutch islands of the West Indies were placed under a common government in 1828, the governor residing at Paramaribo, but in 1845 they were separated. Slavery was abolished in 1863. Labour then became difficult to obtain, and in 1870 a convention was signed between Holland and England for the regulation of the coolie traffic, and a Dutch government agent for Surinam was appointed at Calcutta. The problem was never satisfactorily solved, but the interest of the mother-country in the colony greatly increased during the last twenty years of the 19th century, as shown by the establishment of the Surinam Association, of the Steam Navigation Company's service to Paramaribo, and by the formation of a botanical garden for experimental culture at that town, as also by geological and other scientific expeditions, and the exhibition at Haarlem in 1898.

AUTHORITIES.—Among the older works on Surinam the first rank is held by Jan Jacob Hartsinck's masterly *Beschryving van Guiana, of de Wilde Kust, in Zuid Amerika* (2 vols., Amsterdam, 1770). *Extracts* from this work, selected for their bearing upon British boundary questions, were translated and annotated by J. A. J. de Villiers (London, 1897). A valuable *Geschiedenis der Colonie Suriname*, by a number of "learned Jews," was published at Amsterdam in 1791; and it was supplemented and so far superseded by Wolbers, *Geschiedenis van Suriname* (Amsterdam, 1861). See further W. G. Palgrave, *Dutch Guiana* (London, 1876); A. Kappler, *Surinam, sein Land, &c.* (Stuttgart, 1887); Prince Roland Bonaparte, *Les Habitants de Surinam* (Paris, 1884); K. Martin, "Bericht über eine Reise ins Gebiet des Oberen-Surinam," *Bijdragen v. h. Inst. voor Taal Land en Volkenkunde*, 3rd series (The Hague); Westermann van Meeteren, *La Guyane néerlandaise* (Leiden, 1884); H. Ten Kate, "Een en ander over Suriname," *Gids* (1888); G. Verschuur, "Voyages aux trois Guyanes," *Tour du monde* (1893), pp. 1, 49, 65; W. L. Loth, *Beknopte Aardrijkskundige beschrijving van Suriname* (Amsterdam, 1898) and *Natuurkundig van het Aardrijkskundig Genootschap* (1878), 79, 93; Asch van Wyck, "La Colonie de Surinam," *Les Pays-Bas* (1898); L. Thompson, *Overzicht der Geschiedenis van Suriname* (The Hague, 1901); *Catalogus der Nederl. W. I. ten Toonstelling te Haarlem* (1899); *Guide à travers la section des Indes néerlandaises*, p. 323 (Amsterdam, 1899); *Surinaamsche Almanak* (Paramaribo, annually). For the language of the bush-negroes see Wullschlaegel, *Kurzgefasste neger-englische Grammatik* (Bautzen, 1854), and *Deutsch neger-englisches Wörterbuch* (Lobau, 1863).

III. FRENCH GUIANA (*Guyane*).—This colony is situated between Dutch Guiana and Brazil. A delimitation of the territory belonging to France and the Netherlands was arrived at in 1891, by decision of the emperor of Russia. This question originated in the arrangement of 1836, that the river Maroni should form the frontier. It opened on the claim of the Awa or the Tapanahoni to be recognized as the main head-stream of the Maroni, and the final decision, in indicating the Awa, favoured the Dutch. In 1905 certain territory lying between the upper Maroni and the Itany, the possession of which had not then been settled, was acquired by France by agreement between the French and Dutch governments. The question of the exploitation of gold in the Maroni was settled by attributing alternate reaches of the river to France and Holland; while France obtained the principal islands in the lower Maroni. The additional territory thus attached to the French colony amounted to 965 sq. m. In December 1900 the Swiss government as arbitrators fixed the boundary between French Guiana and Brazil as the river Oyapock and the watershed on the Tumuc Humac mountains, thus awarding to France about 3000 of the 100,000 sq. m. which she claimed. This dispute was of earlier origin than that with the Dutch; dissensions between the French and the Portuguese relative to territory north of the Amazon occurred in the 17th century. In 1700 the Treaty of Lisbon made the contested area (known as the Terres du Cap du Nord) neutral ground. The treaty of Utrecht in 1713 indicated as the French boundary a river which the French afterwards claimed to be the Araguary, but the Portuguese asserted that the Oyapock was intended. After

French Guiana.

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Brazil had become independent the question dragged on until in 1800–1805 there were collisions in the contested territory between French and Brazilian adventurers. This compelled serious action, and a treaty of arbitration, preliminary to the settlement, was signed at Rio de Janeiro in 1807. French Guiana, according to official estimate, has an area of about 51,000 sq. m. The population is estimated at about 30,000; its movement is not rapid. Of this total 12,350 live at Cayenne, 10,100 were in the communes, 5700 formed the penal population, 1500 were native Indians (Galibi, Emerillon, Oyampi) and 500 near Maroni were negroes. Apart from Cayenne, which was rebuilt after the great fire of 1888, the centres of population are unimportant: Sinnamarie with 1500 inhabitants, Mana with 1750, Roura with 1200 and Approuague with 1150. In 1892 French Guiana was divided into fourteen communes, exclusive of the Maroni district. Belonging to the colony are also the three Safety Islands (Royale, Joseph and Du Diable—the last notable as the island where Captain Dreyfus was imprisoned), the Enfant Perdu Island and the five Remire Islands.

A considerable portion of the low coast land is occupied by marshes, with a dense growth of mangroves or, in the drier parts, with the pinot or wassiy palm (*Euterpe oleracea*). Settlements are confined almost entirely to the littoral and alluvial districts. The forest-clad hills of the hinterland do not generally exceed 1500 ft. in elevation; that part of the Tumuc Humac range which forms the southern frontier may reach an extreme elevation of 2600 ft. But the dense tropical forests attract so much moisture from the ocean winds that the highlands are the birthplace of a large number of rivers which in the rainy season especially pour down vast volumes of water. Not less than 15 are counted between the Maroni and the Oyapock. South-eastward from the Maroni the first of importance is the Mana, which is navigable for large vessels 10 m. from its mouth, and for smaller vessels 27 m. farther. Passing the Sinnamary and the Kourou, the Oyock is next reached, near the mouth of which is Cayenne, the capital of the colony, and thereafter the Approuague. All these rivers take their rise in a somewhat elevated area about the middle of the colony; those streams which rise farther south, in the Tumuc Humac hills, are tributaries of the two frontier rivers, the Maroni on the one hand or the Oyapock on the other.

Climate and Products.—The rainy season begins in November or December, and lasts till the last part of June; but there are usually three or four weeks of good weather in March. During the rest of the year there is often hardly a drop of rain for months, but the air is always very moist. At Cayenne the average annual rainfall amounts to fully 130 in., and it is naturally heavier in the interior. During the hotter part of the year—August, September, October—the temperature usually rises to about 86° F., but it hardly ever exceeds 88°; in the colder season the mean is 79° and it seldom sinks so low as 70°. Between day and night there is very little thermometric difference. The prevailing winds are the N.E. and the S.E.; and the most violent are those of the N.E. During the rainy season the winds keep between N. and E., and during the dry season between S. and E. Hurricanes are unknown. In flora and fauna French Guiana resembles the rest of the Guianese region. Vegetation is excessively rich. Among leguminous trees, which are abundantly represented, the wacapou is the finest of many hardwood trees. Caoutchouc and various palms are also common. The manioc is a principal crop, and rice is an important object of cultivation; and maize, yams, arrowroot, bananas and the bread-fruit are also to be mentioned. Vanilla is one of the common wild plants of the country. The clove tree has been acclimatized, and in the latter years of the empire it formed a good source of wealth; the cinnamon tree also was successfully introduced in 1772, but like that of the pepper-tree and the nutmeg its cultivation is neglected. A very small portion of the territory indeed is devoted to agriculture, although France has paid some attention to the development of this branch of activity. In 1880 a colonial garden was created near Cayenne; since 1894 an experimental garden has been laid out at Baduel. About 8200 acres are cultivated, of which 5400 acres are under cereals and rice, the remaining being under coffee (introduced in 1716), cocoa, cane and other products. The low lands between Cayenne and Oyapock are capable of bearing colonial produce, and the savannahs might support large herds; cereals, root-crops and vegetables might easily be grown on the high grounds, and timber working in the interior should be profitable.

Gold-mining is the most important industry in the colony. Placers of great wealth have been discovered on the Awa, on the Dutch frontier and at Carsevenne in the territory which formed the subject of the Franco-Brazilian dispute. But wages are high and transport is costly, and the amount of gold declared at Cayenne did not average more than 130,550 oz. annually in 1900–1905. Silver and iron have been found in various districts; kaolin is extracted in the plains of Montsinéry; and phosphates have been discovered at several places. Besides gold-workings, the industrial establishments comprise saw-mills, distilleries, brick-works and sugar-works.

Trade and Communications.—The commerce in 1885 amounted to £356,000 for imports and to £144,000 for exports; in 1897 the values were respectively £373,350 and £286,400, but in 1903, while imports had increased in value only to £418,720, exports had risen to £493,213. The imports consist of wines, flour, clothes, &c.; the chief are gold, phosphates, timber, cocoa and rosewood essence. Cayenne is the only considerable port. One of the drawbacks to the development of the colony is the lack of labour. Native labour is most difficult to obtain, and attempts to utilize convict labour have not proved very successful. Efforts to supply the need by immigration have not done so completely. The land routes are not numerous. The most important are that from Cayenne to Mana by way of Kourou, Sinnamarie and Iracoubo, and that from Cayenne along the coast to Kaw and the mouth of the Approuague. Towards the interior there are only foot-paths, badly made. By water, Cayenne is in regular communication with the Safety Islands (35 m.), and the mouth of the Maroni (80 m.), with Fort de France in the island of Martinique, where travellers meet the mail packet for France, and with Boston (U.S.A.). There is a French cable between Cayenne and Brest.

Administration.—The colony is administered by a commissioner-general assisted by a privy council, including the secretary general and chief of the judicial service, the military, penitentiary and administrative departments. In 1880 an elective general council of sixteen members was constituted. There are a tribunal of first instance and a higher tribunal at Cayenne, besides four justices of peace, one of whom has extensive jurisdiction in other places. Of the £256,000 demanded for the colony in the colonial budget for 1906, £235,000 represented the estimated expenditure on the penal settlement, so that the cost of the colony was only about £21,000. The local budget for 1901 balanced at £93,000 and in 1905 at £116,450. Instruction is given in the college of Cayenne and in six primary schools. At the head of the clergy is an apostolic prefect. The armed force consists of two companies of marine infantry, half a battery of artillery, and a detachment of gendarmerie, and comprises about 380 men. The penal settlement was established by a decree of 1852. From that year until 1867 138,000 exiles had been sent to Guiana, but for the next twenty years New Caledonia became the chief penal settlement in the French colonies. But in 1885–1887 French Guiana was appointed as a place of banishment for confirmed criminals and convicts sentenced to more than eight years' hard labour. A large proportion of these men have been found unfit for employment upon public works.

History.—The Sieur La Revardière, sent out in 1604 by Henry IV. to reconnoitre the country, brought back a favourable report; but the death of the king put a stop to the projects of formal colonization. In 1626 a small body of traders from Rouen settled on the Sinnamary, and in 1635 a similar band founded Cayenne. The Compagnie du Cap Nord, founded by the people of Rouen in 1643 and conducted by Poncet de Brétigny, the Compagnie de la France Équinoxiale, established in 1645, and the second Compagnie de la France Équinoxiale, or Compagnie des Douze Seigneurs, established in 1652, were failures, the result of incompetence, mismanagement and misfortune. From 1654 the Dutch held the colony for a few years. The French Compagnie des Indes Occidentales, chartered in 1664 with a monopoly of Guiana commerce for forty years, proved hardly more successful than its predecessors; but in 1674 the colony passed under the direct control of the crown, and the able administration of Colbert began to tell favourably on its progress, although in 1686 an unsuccessful expedition against the Dutch in Surinam set back the advance of the French colony until the close of the century.

The year 1763 was marked by a terrible disaster. Choiseul, the prime minister, having obtained for himself and his cousin Praslin a concession of the country between the Kourou and the Maroni, sent out about 12,000 volunteer colonists, mainly from Alsace and Lorraine. They were landed at the mouth of the Kourou, where no preparation had been made for their reception, and where even water was not to be obtained. Mismanagement was complete; there was (for example) a shop for skates, whereas the necessary tools for tillage were wanting. By 1765 no more than 918 colonists remained alive, and these were a famished fever-stricken band. A long investigation in Paris resulted in the imprisonment of the incompetent leaders of the expedition. Several minor attempts at colonization in Guiana were made in the latter part of the century; but they

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all seemed to suffer from the same fatal prestige of failure. During the revolution band after band of political prisoners were transported to Guiana. The fate of the royalists, nearly 600 in number, who were exiled on the 18th Fructidor (1797), was especially sad. Landed on the Sinnamary without shelter or food, two-thirds of them perished miserably. In 1800 Victor Hugues was appointed governor, and he managed to put the colony in a better state; but in 1809 his work was brought to a close by the invasion of the Portuguese and British.

Though French Guiana was nominally restored to the French in 1814, it was not really surrendered by the Portuguese till 1817. Numerous efforts were now made to establish the colony firmly, although its past misfortunes had prejudiced the public mind in France against it. In 1822 the first steam sugar mills were introduced; in 1824 an agricultural colony (Nouvelle Angoulême) was attempted in the Mana district, which, after failure at first, became comparatively successful. The emancipation of slaves and the consequent dearth of labour almost ruined the development of agricultural resources about the middle of the century, but in 1853 a large body of African immigrants was introduced. The discovery of gold on the Approuague in 1855 caused feverish excitement, and seriously disturbed the economic condition of the country.

AUTHORITIES.—A detailed bibliography of French Guiana will be found in Ternaux-Compans, *Notice historique de la Guyane française* (Paris, 1843). Among more recent works, see E. Bassières, *Notice sur la Guyane*, issued on the occasion of the Paris Exhibition (1900); *Publications de la société d'études pour la colonisation de la Guyane française* (Paris, 1843–1844); H. A. Coudreau, *La France équinoxiale* (1887); *Dialectes indiens de Guyane* (1891), *Dix ans de Guyane* (1892), and *Chez nos Indiens* (1893), all at Paris; G. Brousseau, *Les Richesses de la Guyane française* (Paris, 1901); L. F. Viala, *Les Trois Guyanes* (Montpellier, 1893).

GUIART (or GUIARD), **GUILLAUME** (d. *c.* 1316), French chronicler and poet, was probably born at Orleans, and served in the French army in Flanders in 1304. Having been disabled by a wound he began to write, lived at Arras and then in Paris, thus being able to consult the large store of manuscripts in the abbey of St Denis, including the *Grandes chroniques de France*. Afterwards he appears as a *ménestrel de bouche*. Guiart's poem *Branche des royaulx lignages*, was written and then rewritten between 1304 and 1307, in honour of the French king Philip IV., and in answer to the aspersions of a Flemish poet. Comprising over 21,000 verses it deals with the history of the French kings from the time of Louis VIII.; but it is only really important for the period after 1206 and for the war in Flanders from 1301 to 1304, of which it gives a graphic account, and for which it is a high authority. It was first published by J. A. Buchon (Paris, 1828), and again in tome xxii. of the *Recueil des historiens des Gaules et de la France* (Paris, 1865).

See A. Molinier, *Les Sources de l'histoire de France*, tome iii. (Paris, 1903).

GUIBERT, or WIBERT (*c.* 1030–1100), of Ravenna, antipope under the title of Clement III. from the 25th of June 1080 until September 1100, was born at Parma between 1020 and 1030 of the noble imperialist family, Corregio. He entered the priesthood and was appointed by the empress Agnes, chancellor and, after the death of Pope Victor II. (1057), imperial vicar in Italy. He strove to uphold the imperial authority during Henry IV.'s minority, and presided over the synod at Basel (1061) which annulled the election of Alexander II. and created in the person of Cadalous, bishop of Parma, the antipope Honorius II. Guibert lost the chancellorship in 1062. In 1073, through the influence of Empress Agnes and the support of Cardinal Hildebrand, he obtained the archbishopric of Ravenna and swore fealty to Alexander II. and his successors. He seems to have been at first on friendly terms with Gregory VII., but soon quarrelled with him over the possession of the city of Imola, and henceforth was recognized as the soul of the imperial faction in the investiture contest. He allied himself with Cencius, Cardinal Candidus and other opponents of Gregory at Rome, and, on his refusal to furnish troops or to attend the Lenten synod of 1075, he was ecclesiastically suspended by the pope. He was probably excommunicated at the synod of Worms (1076) with other Lombard bishops who sided with Henry IV., and at the Lenten synod of 1078 he was banned by name. The emperor, having been excommunicated for the second time in March 1080, convened nineteen bishops of his party at Mainz on the 31st of May, who pronounced the deposition of Gregory; and on the 25th of June he caused Guibert to be elected pope by thirty bishops assembled at Brixen. Guibert, whilst retaining possession of his archbishopric, accompanied his imperial master on most of the latter's military expeditions. Having gained Rome, he was installed in the Lateran and consecrated as Clement III. on the 24th of March 1084. One week later, on Easter Sunday, he crowned Henry IV. and Bertha in St Peter's. Clement survived not only Gregory VII. but also Victor III. and Urban II., maintaining his title to the end and in great measure his power over Rome and the adjoining regions. Excommunication was pronounced against him by all his rivals. He was driven out of Rome finally by crusaders in 1097, and sought refuge in various fortresses on his own estates. St Angelo, the last Guibertist stronghold in Rome, fell to Urban II. on the 24th of August 1098. Clement, on the accession of Paschal II. in 1099, prepared to renew his struggle but was driven from Albano by Norman troops and died at Civita Castellana in September 1100. His ashes, which were said by his followers to have worked miracles, were thrown into the water by Paschal II.

See J. Langen, *Geschichte der römischen Kirche von Gregor VII. bis Innocens III.* (Bonn, 1893); Jaffé-Wattenbach, *Regesta pontif. Roman.* (2nd ed., 1885–1888); K. J. von Hefele, *Concilengeschichte*, vol. v. (2nd ed.); F. Gregorovius, *Rome in the Middle Ages*, vol. iv., trans. by Mrs G. W. Hamilton (London, 1900–1902); and O. Kolnicke, *Wibert von Ravenna* (Leipzig, 1886). (C. H. HA.)

GUIBERT (1053–1124), of Nogent, historian and theologian, was born of noble parents at Clermont-en-Beauvoisis, and dedicated from infancy to the church. He received his early education at the Benedictine abbey of Flavigny (Flaviacum) or St Germer, where he studied with great zeal, devoting himself at first to the secular poets, an experience which left its imprint on his works; later changing to theology, through the influence of Anselm of Bec, afterwards of Canterbury. In 1104, he was chosen to be head of the abbey of Notre Dame de Nogent and henceforth took a prominent part in ecclesiastical affairs. His autobiography (*De vita sua, sive monodiarum*), written towards the close of his life, gives many picturesque glimpses of his time and the customs of his country. The description of the commune of Laon is an historical document of the first order. The same local colour lends charm to his history of the first crusade (*Gesta Dei per Francos*) written about 1110. But the history is largely a paraphrase, in ornate style, of the *Gesta Francorum* of an anonymous Norman author (see CRUSADES); and when he comes to the end of his authority, he allows his book to degenerate into an undigested heap of notes and anecdotes. At the same time his high birth and his position in the church give his work an occasional value.

BIBLIOGRAPHY.—Guibert's works, edited by d'Achery, were first published in 1651, in 1 vol. folio, at Paris (*Venerabilis Guiberti abbatis B. Mariae de Novigento opera omnia*), and republished in Migne's *Patrologia Latina*, vols. clvi. and clxxiv. They include, besides minor works, a treatise on homiletics ("Liber quo ordine sermo fieri debeat"); ten books of *Moralia* on Genesis, begun in 1083, but not completed until 1116, composed on the model of Gregory the Great's *Moralia in Jobum*; three books of *Tropologiae* on Hosea, Amos and the Lamentations; a treatise on the *Incarnation*, against the Jews; four books *De pignoribus sanctorum*, a remarkably free criticism on the abuses of saint and relic worship; three books of autobiography, *De vita sua, sive monodiarum*; and eight books of the *Historia quae dicitur Gesta Dei per Francos, sive historia Hierosolymitana* (the ninth book is by another author). Separate editions exist of the last named, in J. Bongars, *Gesta Dei per Francos, i.*, and *Recueil des historiens des croisades, hist. Occid.*, iv. 115–263. It has been translated into French in Guizot's *Collection*, ix. 1–328. See H. von Sybel, *Geschichte des ersten Kreuzzuges* (Leipzig, 1881); B. Monod, *Le Moine Guibert et son temps* (Paris, 1905); and *Guibert de Nogent; histoire de sa vie*, edited by G. Bourgin (Paris, 1907).

GUIBERT, JACQUES ANTOINE HIPPOLYTE, COMTE DE (1743–1790), French general and military writer, was born at Montauban, and at the age of thirteen accompanied his father, Charles Bénoit, comte de Guibert (1715–1786), chief of staff to

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Marshal de Broglie, throughout the war in Germany, and won the cross of St Louis and the rank of colonel in the expedition to Corsica (1767). In 1770 he published his *Essai général de tactique* in London, and this celebrated work appeared in numerous subsequent editions and in English, German and even Persian translations (extracts also in Liskenne and Sauvan, *Bibl. historique et militaire*, Paris, 1845). Of this work (for a detailed critique of which see Max Jähns, *Gesch. d. Kriegswissenschaften*, vol. iii. pp. 2058–2070 and references therein) it may be said that it was the best essay on war produced by a soldier during a period in which tactics were discussed even in the salon and military literature was more abundant than at any time up to 1871. Apart from technical questions, in which Guibert's enlightened conservatism stands in marked contrast to the doctrinaire progressiveness of Menil Durand, Folard and others, the book is chiefly valued for its broad outlook on the state of Europe, especially of military Europe in the period 1763–1702. One quotation may be given as being a most remarkable prophecy of the impending revolution in the art of war, a revolution which the "advanced" tacticians themselves scarcely foresaw. "The standing armies, while a burden on the people, are inadequate for the achievement of great and decisive results in war, and meanwhile the mass of the people, untrained in arms, degenerates. . . . The hegemony over Europe will fall to that nation which . . . becomes possessed of manly virtues and *creates a national army*"—a prediction fulfilled almost to the letter within twenty years of Guibert's death. In 1773 he visited Germany and was present at the Prussian regimental drills and army manœuvres; Frederick the Great, recognizing Guibert's ability, showed great favour to the young colonel and freely discussed military questions with him. Guibert's *Journal d'un voyage en Allemagne* was published, with a memoir, by Toulongeon (Paris, 1803). His *Défense du système de guerre moderne*, a reply to his many critics (Neuchâtel, 1770) is a reasoned and scientific defence of the Prussian method of tactics, which formed the basis of his work when in 1775 he began to co-operate with the count de St Germain in a series of much-needed and successful reforms in the French army. In 1777, however, St Germain fell into disgrace, and his fall involved that of Guibert who was promoted to the rank of *maréchal de camp* and relegated to a provincial staff appointment. In his semi-retirement he vigorously defended his old chief St Germain against his detractors. On the eve of the Revolution he was recalled to the War Office, but in his turn he became the object of attack and he died, practically of disappointment, on the 6th of May 1790. Other works of Guibert, besides those mentioned, are: *Observations sur la constitution politique et militaire des armées de S. M. Prussienne* (Amsterdam, 1778), *Éloges* of Marshal Catinat (1775), of Michel de l'Hôpital (1778), and of Frederick the Great (1787). Guibert was a member of the Academy from 1786, and he also wrote a tragedy, *Le Connétable de Bourbon* (1775) and a journal of travels in France and Switzerland.

See Toulongeon, *Éloge véridique de Guibert* (Paris, 1790); Madame de Staël, *Éloge de Guibert*; Bardin, *Notice historique du général Guibert* (Paris, 1836); Flavian d'Aldeguier, *Discours sur la vie et les écrits du comte de Guibert* (Toulouse, 1855); Count Forestie, *Biographie du comte de Guibert* (Montauban, 1855); Count zur Lippe, "Friedr. der Grosse und Oberst Guibert" (*Militär-Wochenblatt*, 1873, 9 and 10).

GUICCIARDINI, FRANCESCO (1483–1540), the celebrated Italian historian and statesman, was born at Florence in the year 1483, when Marsilio Ficino held him at the font of baptism. His family was illustrious and noble; and his ancestors for many generations had held the highest posts of honour in the state, as may be seen in his own genealogical *Ricordi autobiografici e di famiglia* (*Op. ined.* vol. x.). After the usual education of a boy in grammar and elementary classical studies, his father, Piero, sent him to the universities of Ferrara and Padua, where he stayed until the year 1505. The death of an uncle, who had occupied the see of Cortona with great pomp, induced the young Guicciardini to hanker after an ecclesiastical career. He already saw the scarlet of a cardinal awaiting him, and to this eminence he would assuredly have risen. His father, however, checked this ambition, declaring that, though he had five sons, he would not suffer one of them to enter the church in its then state of corruption and debasement. Guicciardini, whose motives were confessedly ambitious (see *Ricordi*, *Op. ined.* x. 68), turned his attention to law, and at the age of twenty-three was appointed by the Signoria of Florence to read the *Institutes* in public. Shortly afterwards he engaged himself in marriage to Maria, daughter of Alamanno Salviati, prompted, as he frankly tells us, by the political support which an alliance with that great family would bring him (*ib.* x. 71). He was then practising at the bar, where he won so much distinction that the Signoria, in 1512, entrusted him with an embassy to the court of Ferdinand the Catholic. Thus he entered on the real work of his life as a diplomatist and statesman. His conduct upon that legation was afterwards severely criticized; for his political antagonists accused him of betraying the true interests of the commonwealth, and using his influence for the restoration of the exiled house of Medici to power. His Spanish correspondence with the Signoria (*Op. ined.* vol. vi.) reveals the extraordinary power of observation and analysis which was a chief quality of his mind; and in Ferdinand, hypocritical and profoundly dissimulative, he found a proper object for his scientific study. To suppose that the young statesman learned his frigid statecraft in Spain would be perhaps too simple a solution of the problem offered by his character, and scarcely fair to the Italian proficients in perfidy. It is clear from Guicciardini's autobiographical memoirs that he was ambitious, calculating, avaricious and power-loving from his earliest years; and in Spain he had no more than an opportunity of studying on a large scale those political vices which already ruled the minor potentates of Italy. Still the school was pregnant with instructions for so apt a pupil. Guicciardini issued from this first trial of his skill with an assured reputation for diplomatic ability, as that was understood in Italy. To unravel plots and weave counterplots; to meet treachery with fraud; to parry force with sleights of hand; to credit human nature with the basest motives, while the blackest crimes were contemplated with cold enthusiasm for their cleverness, was reckoned then the height of political sagacity. Guicciardini could play the game to perfection. In 1515 Leo X. took him into service, and made him governor of Reggio and Modena. In 1521 Parma was added to his rule, and in 1523 he was appointed viceregent of Romagna by Clement VII. These high offices rendered Guicciardini the virtual master of the papal states beyond the Apennines, during a period of great bewilderment and difficulty. The copious correspondence relating to his administration has recently been published (*Op. ined.* vols. vii., viii.). In 1526 Clement gave him still higher rank as lieutenant-general of the papal army. While holding this commission, he had the humiliation of witnessing from a distance the sack of Rome and the imprisonment of Clement, without being able to rouse the perfidious duke of Urbino into activity. The blame of Clement's downfall did not rest with him; for it was merely his duty to attend the camp, and keep his master informed of the proceedings of the generals (see the Correspondence, *Op. ined.* vols. iv., v.). Yet Guicciardini's conscience accused him, for he had previously counselled the pope to declare war, as he notes in a curious letter to himself written in 1527 (*Op. ined.*, x. 104). Clement did not, however, withdraw his confidence, and in 1531 Guicciardini was advanced to the governorship of Bologna, the most important of all the papal lord-lieutenancies (Correspondence, *Op. ined.* vol. ix.). This post he resigned in 1534 on the election of Paul III., preferring to follow the fortunes of the Medicean princes. It may here be noticed that though Guicciardini served three popes through a period of twenty years, or perhaps because of this, he hated the papacy with a deep and frozen bitterness, attributing the woes of Italy to the ambition of the church, and declaring he had seen enough of sacerdotal abominations to make him a Lutheran (see *Op. ined.* i. 27, 104, 96, and *Ist. d' It.*, ed. Ros., ii. 218). The same discord between his private opinions and his public actions may be traced in his conduct subsequent to 1534. As a

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political theorist, Guicciardini believed that the best form of government was a commonwealth administered upon the type of the Venetian constitution (*Op. ined.* i 6; ii. 130 sq.); and we have ample evidence to prove that he had judged the tyranny of the Medici at its true worth (*Op. ined.* i. 171, on the tyrant; the whole *Storia Fiorentina* and *Reggimento di Firenze*, *ib.* i. and iii., on the Medici). Yet he did not hesitate to place his powers at the disposal of the most vicious members of that house for the enslavement of Florence. In 1527 he had been declared a rebel by the Signoria on account of his well-known Medicean prejudices; and in 1530, deputed by Clement to punish the citizens after their revolt, he revenged himself with a cruelty and an avarice that were long and bitterly remembered. When, therefore, he returned to inhabit Florence in 1534, he did so as the creature of the dissolute Alessandro de' Medici. Guicciardini pushed his servility so far as to defend this infamous despot at Naples in 1535, before the bar of Charles V., from the accusations brought against him by the Florentine exiles (*Op. ined.* vol. ix.). He won his cause; but in the eyes of all posterity he justified the reproaches of his contemporaries, who describe him as a cruel, venal, grasping seeker after power, eager to support a despotism for the sake of honours, offices and emoluments secured for himself by a bargain with the oppressors of his country. Varchi, Nardi, Jacopo Pitti and Bernardo Segni are unanimous upon this point; but it is only the recent publication of Guicciardini's private MSS. that has made us understand the force of their invectives. To plead loyalty or honest political conviction in defence of his Medicean partianship is now impossible, face to face with the opinions expressed in the *Ricordi politici* and the *Storia Fiorentina*. Like Machiavelli, but on a lower level, Guicciardini was willing to "roll stones," or to do any dirty work for masters whom, in the depth of his soul, he detested and despised. After the murder of Duke Alessandro in 1537, Guicciardini espoused the cause of Cosimo de' Medici, a boy addicted to field sports, and unused to the game of statecraft. The wily old diplomatist hoped to rule Florence as grand vizier under this inexperienced princeling. He was mistaken, however, in his schemes, for Cosimo displayed the genius of his family for politics, and coldly dismissed his would-be lord-protector. Guicciardini retired in disgrace to his villa, where he spent his last years in the composition of the *Storia d'Italia*. He died in 1540 without male heirs.

Guicciardini was the product of a cynical and selfish age, and his life illustrated its sordid influences. Of a cold and worldly temperament, devoid of passion, blameless in his conduct as the father of a family, faithful as the servant of his papal patrons, severe in the administration of the provinces committed to his charge, and indisputably able in his conduct of affairs, he was at the same time, and in spite of these qualities, a man whose moral nature inspires a sentiment of liveliest repugnance. It is not merely that he was ambitious, cruel, revengeful and avaricious, for these vices have existed in men far less antipathetic than Guicciardini. Over and above those faults, which made him odious to his fellow-citizens, we trace in him a meanness that our century is less willing to condone. His phlegmatic and persistent egotism, his sacrifice of truth and honour to self-interest, his acquiescence in the worst conditions of the world, if only he could use them for his own advantage, combined with the glaring discord between his opinions and his practice, form a character which would be contemptible in our eyes were it not so sinister. The social and political decrepitude of Italy, where patriotism was unknown, and only selfishness survived of all the motives that rouse men to action, found its representative and exponent in Guicciardini. When we turn from the man to the author, the decadence of the age and race that could develop a political philosophy so arid in its cynical despair of any good in human nature forces itself vividly upon our notice. Guicciardini seems to glory in his disillusionment, and uses his vast intellectual ability for the analysis of the corruption he had helped to make incurable. If one single treatise of that century should be chosen to represent the spirit of the Italian people in the last phase of the Renaissance, the historian might hesitate between the *Principe* of Machiavelli and the *Ricordi politici* of Guicciardini. The latter is perhaps preferable to the former on the score of comprehensiveness. It is, moreover, more exactly adequate to the actual situation, for the *Principe* has a divine spark of patriotism yet lingering in the cinders of its frigid science, an idealistic enthusiasm surviving in its moral aberrations; whereas a great Italian critic of this decade has justly described the *Ricordi* as "Italian corruption codified and elevated to a rule of life." Guicciardini is, however, better known as the author of the *Storia d'Italia*, that vast and detailed picture of his country's sufferings between the years 1494 and 1532. Judging him by this masterpiece of scientific history, he deserves less commendation as a writer than as a thinker and an analyst. The style is wearisome and prolix, attaining to precision at the expense of circumlocution, and setting forth the smallest particulars with the same distinctness as the main features of the narrative. The whole tangled skein of Italian politics, in that involved and stormy period, is unravelled with a patience and an insight that are above praise. It is the crowning merit of the author that he never ceases to be an impartial spectator—a cold and curious critic. We might compare him to an anatomist, with knife and scalpel dissecting the dead body of Italy, and pointing out the symptoms of her manifold diseases with the indifferent analysis of one who has no moral sensibility. This want of feeling, while it renders Guicciardini a model for the scientific student, has impaired the interest of his history. Though he lived through that agony of the Italian people, he does not seem to be aware that he is writing a great historical tragedy. He takes as much pains in laying bare the trifling causes of a petty war with Pisa as in probing the deep-seated ulcer of the papacy. Nor is he capable of painting the events in which he took a part, in their totality as a drama. Whatever he touches, lies already dead on the dissecting table, and his skill is that of the analytical pathologist. Consequently, he fails to understand the essential magnitude of the task, or to appreciate the vital vigour of the forces contending in Europe for mastery. This is very noticeable in what he writes about the Reformation. Notwithstanding these defects, inevitable in a writer of Guicciardini's temperament, the *Storia d' Italia* was undoubtedly the greatest historical work that had appeared since the beginning of the modern era. It remains the most solid monument of the Italian reason in the 16th century, the final triumph of that Florentine school of philosophical historians which included Machiavelli, Segni, Pitti, Nardi, Varchi, Francesco Vettori and Donato Giannotti. Up to the year 1857 the fame of Guicciardini as a writer, and the estimation of him as a man, depended almost entirely upon the *History of Italy*, and on a few ill-edited extracts from his aphorisms. At that date his representatives, the counts Piero and Luigi Guicciardini, opened their family archives, and committed to Signor Giuseppe Canestrini the publication of his hitherto inedited MSS. in ten important volumes. The vast mass of documents and finished literary work thus given to the world has thrown a flood of light upon Guicciardini, whether we consider him as author or as citizen. It has raised his reputation as a political philosopher into the first rank, where he now disputes the place of intellectual supremacy with his friend Machiavelli; but it has coloured our moral judgment of his character and conduct with darker dyes. From the stores of valuable materials contained in those ten volumes, it will be enough here to cite (1) the *Ricordi politici*, already noticed, consisting of about 400 aphorisms on political and social topics; (2) the observations on Machiavelli's *Discorsi*, which bring into remarkable relief the views of Italy's two great theorists on statecraft in the 16th century, and show that Guicciardini regarded Machiavelli somewhat as an amiable visionary or political enthusiast; (3) the *Storia Fiorentina*, an early work of the author, distinguished by its animation of style, brilliancy of portraiture, and liberality of judgment; and (4) the *Dialogo del reggimento di Firenze*, also in all probability an early work, in which the various forms of government suited to an Italian

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commonwealth are discussed with infinite subtlety, contrasted, and illustrated from the vicissitudes of Florence up to the year 1494. To these may be added a series of short essays, entitled *Discorsi politici*, composed during Guicciardini's Spanish legation. It is only after a careful perusal of these minor works that the student of history may claim to have comprehended Guicciardini, and may feel that he brings with him to the consideration of the *Storia d' Italia* the requisite knowledge of the author's private thoughts and jealously guarded opinions. Indeed, it may be confidently affirmed that those who desire to gain an insight into the true principles and feelings of the men who made and wrote history in the 16th century will find it here far more than in the work designed for publication by the writer. Taken in combination with Machiavelli's treatises, the *Opere inedite* furnish a comprehensive body of Italian political philosophy anterior to the date of Fra Paolo Sarpi. (J. A. S.)

See Rosini's edition of the *Storia d' Italia* (10 vols., Pisa, 1819), and the *Opere inedite*, in 10 vols., published at Florence, 1857. A complete and initial edition of Guicciardini's works is now in preparation in the hands of Alessandro Gherardi of the Florence archives. Among the many studies on Guicciardini we may mention Agostino Rossi's *Francesco Guicciardini e il governo Fiorentino* (2 vols., Bologna, 1860), based on many new documents; F. de Sanctis's essay "L'Uomo del Guicciardini," in his *Nuovi Saggi critici* (Naples, 1879), and many passages in Professor P. Villari's *Machiavelli* (Eng. trans., 1892); E. Benoist's *Guichardin, historien et homme d'état italien au XVIe siècle* (Paris, 1862), and C. Goda's *Francesco Guicciardini e le sue opere inedite* (Bologna, 1880) are not without value, but the authors had not access to many important documents since published. See also Geoffroy's article "Une Autobiographie de Guichardin d'après ses œuvres inédites," in the *Revue des deux mondes* (1st of February 1874).

GUICHARD, KARL GOTTLIEB (1724–1775), soldier and military writer, known as QUINTUS ICILIUS, was born at Magdeburg in 1724, of a family of French refugees. He was educated for the Church, and at Leiden actually preached a sermon as a candidate for the pastorate. But he abandoned theology for more secular studies, especially that of ancient history, in which his learning attracted the notice of the prince of Orange, who promised him a vacant professorship at Utrecht. On his arrival, however, he found that another scholar had been elected by the local authorities, and he thereupon sought and obtained a commission in the Dutch army. He made the campaigns of 1747–48 in the Low Countries. In the peace which followed, his combined military and classical training turned his thoughts in the direction of ancient military history. His notes on this subject grew into a treatise, and in 1754 he went over to England in order to consult various libraries. In 1757 his *Mémoires militaires sur les Grecs et les Romains* appeared at the Hague, and when Carlyle wrote his *Frederick the Great* (t had reached its fifth edition. Coming back, with English introductions, to the Continent, he sought service with Ferdinand of Brunswick, who sent him on to Frederick the Great, whom he joined in January 1758 at Breslau. The king was very favourably impressed with Guichard and his works, and he remained for nearly 18 months in the royal suite. His Prussian official name of Quintus Icilius was the outcome of a friendly dispute with the king (see Nikolai, *Anekdoten*, vi. 129-145; Carlyle, *Frederick the Great*, viii. 113-114). Frederick in discussing the battle of Pharsalia spoke of a centurion Quintus Caecilius as Q. Icilius. Guichard ventured to correct him, whereupon the king said, "*You* shall be Quintus Icilius," and as Major Quintus Icilius he was forthwith gazetted to the command of a free battalion. This corps he commanded throughout the later stages of the Seven Years' War, his battalion, as time went on, becoming a regiment of three battalions, and Quintus himself recruited seven more battalions of the same kind of troops. His command was almost always with the king's own army in these campaigns, but for a short time it fought in the western theatre under Prince Henry. When not on the march he was always at the royal headquarters, and it was he who brought about the famous interview between the king and Gellert (see Carlyle, *Frederick the Great*, ix. 109; Gellert, *Briefwechsel mit Demoiselle Lucius*, ed. Ebert, Leipzig, 1823, pp 629-631) on the subject of national German literature. On 22nd January 1761 Quintus was ordered to sack the castle of Hubertusburg (a task which Major-General Saldern had point-blank refused to undertake, from motives of conscience), and carried out his task, it is said, to his own very considerable profit. The place cannot have been seriously injured, as it was soon afterwards the meeting-place of the diplomatists whose work ended in the peace of Hubertusburg, but the king never ceased to banter Quintus on his supposed depredations. The very day of Frederick's triumphant return from the war saw the disbanding of most of the free battalions, including that of Quintus, but the major to the end of his life remained with the king. He was made lieutenant-colonel in 1765, and in 1773, in recognition of his work *Mémoires critiques et historiques sur plusieurs points d'antiquités militaires*, dealing mainly with Caesar's campaigns in Spain (Berlin, 1773), was promoted colonel. He died at Potsdam, 1775.

GUICHEN, LUC URBAIN DE BOUËXIC, COMTE DE (1712–1790), French admiral, entered the navy in 1730 as "garde de la Marine," the first rank in the corps of royal officers. His promotion was not rapid. It was not till 1748 that he became "lieutenant de vaisseau," which was, however, a somewhat higher rank than the lieutenant in the British navy, since it carried with it the right to command a frigate. He was "capitaine de vaisseau," or post captain, in 1756. But his reputation must have been good, for he was made chevalier de Saint Louis in 1748. In 1775 he was appointed to the frigate "Terpsichore," attached to the training squadron, in which the duc de Chartres, afterwards notorious as the duc d'Orléans and as Philippe Égalité, was entered as volunteer. In the next year he was promoted chef d'escadre, or rear-admiral. When France had become the ally of the Americans in the War of Independence, he hoisted his flag in the Channel fleet, and was present at the battle of Ushant on the 27th of July 1779. In March of the following year he was sent to the West Indies with a strong squadron and was there opposed to Sir George Rodney. In the first meeting between them on the 17th of April to leeward of Martinique, Guichen escaped disaster only through the clumsy manner in which Sir George's orders were executed by his captains. Seeing that he had to deal with a formidable opponent, Guichen acted with extreme caution, and by keeping the weather gauge afforded the British admiral no chance of bringing him to close action. When the hurricane months approached (July to September) he left the West Indies, and his squadron, being in a bad state from want of repairs, returned home, reaching Brest in September. Throughout all this campaign Guichen had shown himself very skilful in handling a fleet, and if he had not gained any marked success, he had prevented the British admiral from doing any harm to the French islands in the Antilles. In December 1781 the comte de Guichen was chosen to command the force which was entrusted with the duty of carrying stores and reinforcements to the West Indies. On the 12th Admiral Kempenfelt, who had been sent out by the British Government with an unduly weak force to intercept him, sighted the French admiral in the Bay of Biscay through a temporary clearance in a fog, at a moment when Guichen's warships were to leeward of the convoy, and attacked the transports at once. The French admiral could not prevent his enemy from capturing twenty of the transports, and driving the others into a panic-stricken flight. They returned to port, and the mission entrusted to Guichen was entirely defeated. He therefore returned to port also. He had no opportunity to gain any counterbalancing success during the short remainder of the war, but he was present at the final relief of Gibraltar by Lord Howe. His death occurred on the 13th of January 1790. The comte de Guichen was, by the testimony of his contemporaries, a most accomplished and high-minded gentleman. It is probable that he had more scientific knowledge than any of his English contemporaries and opponents. But as a commander in war he was notable chiefly for his skill in directing the orderly movements of a fleet, and seems to have been satisfied with formal operations, which were possibly elegant but could lead to no substantial result. He had none of the combative instincts of his countryman Suffren, or of the average British admiral.

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See vicomte de Noailles, *Marins et soldats français en Amérique* (1903); and E. Chevalier, *Histoire de la marine française pendant la guerre de l'indépendence américaine* (1877). (D. H.)

GUIDE (in Mid. Eng. *gyde*, from the Fr. *guide*; the earlier French form was *guie*, English "guy," the *d* was due to the Italian form *guida*; the ultimate origin is probably Teutonic, the word being connected with the base seen in O. Eng. *witan*, to know), an agency for directing or showing the way, specifically a person who leads or directs a stranger over unknown or unmapped country, or conducts travellers and tourists through a town, or over buildings of interest. In European wars up to the time of the French Revolution, the absence of large scale detailed maps made local guides almost essential to the direction of military operations, and in the 18th century the general tendency to the stricter organization of military resources led in various countries to the special training of guide officers (called *Feldjäger*, and considered as general staff officers in the Prussian army), whose chief duty it was to find, and if necessary establish, routes across country for those parts of the army that had to move parallel to the main road and as nearly as possible at deploying interval from each other, for in those days armies were rarely spread out so far as to have the use of two or more made roads. But the necessity for such precautions died away when adequate surveys (in which guide officers were, at any rate in Prussia, freely employed) were carried out, and, as a definite term of military organization to-day, "guide" possesses no more essential peculiarity than fusilier, grenadier or rifleman. The genesis of the modern "Guide" regiments is perhaps to be found in a short-lived Corps of Guides formed by Napoleon in Italy in 1796, which appears to have been a personal escort or body guard composed of men who knew the country. In the Belgian army of to-day the Guide regiments correspond almost to the Guard cavalry of other nations; in the Swiss army the squadrons of "Guides" act as divisional cavalry, and in this rôle doubtless are called upon on occasion to lead columns. The "Queen's own Corps of Guides" of the Indian army consists of infantry companies and cavalry squadrons. In drill, a "guide" is an officer or non-commissioned officer told off to regulate the direction and pace of movements, the remainder of the unit maintaining their alignment and distances by him.

A particular class of guides are those employed in mountaineering; these are not merely to show the way but stand in the position of professional climbers with an expert knowledge of rock and snowcraft, which they impart to the amateur, at the same time assuring the safety of the climbing party in dangerous expeditions. This professional class of guides arose in the middle of the 19th century when Alpine climbing became recognized as a sport (see MOUNTAINEERING). It is thus natural to find that the Alpine guides have been requisitioned for mountaineering expeditions all over the world. In climbing in Switzerland, the central committee of the Swiss Alpine Club issues a guides' tariff which fixes the charges for guides and porters; there are three sections, for the Valais and Vaudois Alps, for the Bernese Oberland, and for central and eastern Switzerland. The names of many of the great guides have become historical. In Chamonix a statue has been raised to Jacques Balmat, who was the first to climb Mont Blanc in 1786. Of the more famous guides since the beginning of Alpine climbing may be mentioned Auguste Balmat, Michel Cros, Maquignay, J. A. Carrel, who went with E. Whymper to the Andes, the brothers Lauener, Christian Almer and Jakob and Melchior Anderegg.

"Guide" is also applied to a book, in the sense of an elementary primer on some subject, or of one giving full information for travellers of a country, district or town. In mechanical usage, the term "guide" is of wide application, being used of anything which steadies or directs the motion of an object, as of the "leading" screw of a screw-cutting lathe, of a loose pulley used to steady a driving-belt, or of the bars or rods in a steam-engine which keep the sliding blocks moving in a straight line. The doublet "guy" is thus used of a rope which steadies a sail when it is being raised or lowered, or of a rope, chain or stay supporting a funnel, mast, derrick, &c.

GUIDI, CARLO ALESSANDRO (1650–1712), Italian lyric poet, was born at Pavia in 1650. As chief founder of the well-known Roman academy called "L'Arcadia," he had a considerable share in the reform of Italian poetry, corrupted at that time by the extravagance and bad taste of the poets Marini and Achillini and their school. The poet Guidi and the critic and jurisconsult Gravina checked this evil by their influence and example. The genius of Guidi was lyric in the highest degree; his songs are written with singular force, and charm the reader, in spite of touches of bombast. His most celebrated song is that entitled *Alla Fortuna* (To Fortune), which certainly is one of the most beautiful pieces of poetry of the 17th century. Guldi was squint-eyed, humpbacked, and of a delicate constitution, but possessed undoubted literary ability. His poems were printed at Parma in 1671, and at Rome in 1704. In 1681 he published at Parma his lyric tragedy *Amalasunta in Italy*, and two pastoral dramas *Daphne* and *Endymion*. The last had the honour of being mentioned as a model by the critic Gravina, in his treatise on poetry. Less fortunate was Guidi's poetical version of the six homilies of Pope Clement XI., first as having been severely criticized by the satirist Settano, and next as having proved to be the indirect cause of the author's death. A splendid edition of this version had been printed in 1712, and, the pope being then in San Gandolfo, Guidi went there to present him with a copy. On the way he found out a serious typographical error, which he took so much to heart that he was seized with an apoplectic fit at Frascati and died on the spot. Guidi was honoured with the special protection of Ranuccio II., duke of Parma, and of Queen Christina of Sweden.

GUIDICCIONI, GIOVANNI (1480–1541), Italian poet, was born at Lucca in 1480, and died at Macerata in 1541. He occupied a high position, being bishop of Fossombrone and president of Romagna. The latter office nearly cost him his life; a murderer attempted to kill him, and had already touched his breast with his dagger when, conquered by the resolute calmness of the prelate, he threw away the weapon and fell at his feet, asking forgiveness. The *Rime* and *Letters* of Guidicciont are models of elegant and natural Italian style. The best editions are those of Genoa (1740), Bergamo (1753) and Florence (1878).

GUIDO OF AREZZO (possibly to be identified with Guido de St Maur des Fosses), a musician who lived in the 11th century. He has by many been called the father of modern music, and a portrait of him in the refectory of the monastery of Avellana bears the inscription *Beatus Guido, inventor musicae*. Of his life little is known, and that little is chiefly derived from the dedicatory letters prefixed to two of his treatises and addressed respectively to Bishop Theodald (not Theobald, as Burney writes the name) of Arezzo, and Michael, a monk of Pomposa and Guido's pupil and friend. Occasional references to the celebrated musician in the works of his contemporaries are, however, by no means rare, and from these it may be conjectured with all but absolute certainty that Guido was born in the last decade of the 10th century. The place of his birth is uncertain in spite of some evidence pointing to Arezzo; on the title-page of all his works he is styled *Guido Aretinus*, or simply *Aretinus*. At his first appearance in history Guido was a monk in the Benedictine monastery of Pomposa, and it was there that he taught singing and invented his educational method, by means of which, according to his own statement, a pupil might learn within five months what formerly it would have taken him ten years to acquire. Envy and jealousy, however, were his only reward, and by these he was compelled to leave his monastery—"inde est, quod me vides prolixis finibus exulatum," as he says himself in the second of the letters above referred to. According to one account, he travelled as far as Bremen, called there by Archbishop Hermann in order to reform the musical service. But this statement has been doubted. Certain it is that not long after his flight from Pomposa Guido was living at Arezzo, and it was here that, about 1030, he received an invitation to Rome from Pope John XIV. He obeyed the summons, and the

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pope himself became his first and apparently one of his most proficient pupils. But in spite of his success Guido could not be induced to remain in Rome, the insalubrious air of which seems to have affected his health. In Rome he met again his former superior, the abbot of Pomposa, who seems to have repented of his conduct, and to have induced Guido to return to Pomposa; and here all authentic records of Guido's life cease. We only know that he died, on the 17th of May 1050, as prior of Avellana, a monastery of the Camaldulians; such at least is the statement of the chroniclers of that order. It ought, however, to be added that the Camaldulians claim the celebrated musician as wholly their own, and altogether deny his connexion with the Benedictines.

The documents discovered by Dom Germain Morin, the Belgian Benedictine, about 1888, point to the conclusion that Guido was a Frenchman and lived from his youth upwards in the Benedictine monastery of St Maur des Fosses where he invented his novel system of notation and taught the brothers to sing by it. In codex 763 of the British Museum the composer of the "Micrologus" and other works by Guido of Arezzo is always described as Guido de Sancto Mauro.

There is no doubt that Guido's method shows considerable progress in the evolution of modern notation. It was he who for the first time systematically used the lines of the staff, and the intervals or *spatia* between them. There is also little doubt that the names of the first six notes of the scale, *ut, re, mi, fa, sol, la*, still in use among Romance nations, were introduced by Guido, although he seems to have used them in a relative rather than in an absolute sense. It is well known that these words are the first syllables of six lines of a hymn addressed to St John the Baptist, which may be given here:—

Ut queant laxis — *resonare* fibris
Mira gestorum — *famuli* tuorum,
Solve polluti — *labii* reatum,
Sancte Joannes.

In addition to this Guido is generally credited with the introduction of the F clef. But more important than all this, perhaps, is the thoroughly practical tone which Guido assumes in his theoretical writings, and which differs greatly from the clumsy scholasticism of his contemporaries and predecessors.

The most important of Guido's treatises, and those which are generally acknowledged to be authentic, are *Micrologus Guidonis de disciplina artis musicae*, dedicated to Bishop Theodald of Arezzo, and comprising a complete theory of music, in 20 chapters; *Musicae Guidonis regulae rhythmicae in antiphonarii sui prologum prolatae*, written in trochaic decasyllabics of anything but classical structure; *Aliae Guidonis regulae de ignoto cantu, identidem in antiphonarii sui prologum prolatae*; and the *Epistola Guidonis Michaeli monacho de ignoto cantu*, already referred to. These are published in the second volume of Gerbert's *Scriptores ecclesiastici de musica sacra*. A very important manuscript unknown to Gerbert (the *Codex bibliothecae Uticensis*, in the Paris library) contains, besides minor treatises, an antiphonarium and gradual undoubtedly belonging to Guido.

See also L. Angeloni, *G. d'Arezzo* (1811); Kiesewetter, *Guido von Arezzo* (1840); Kornmüller, "Leben und Werken Guidos von Arezzo," in Habert's *Jahrb.* (1876); Antonio Brandi, *G. Aretino* (1882); G. B. Ristori, *Biografia di Guido monaco d'Arezzo* (1868).

GUIDO OF SIENA. The name of this Italian painter is of considerable interest in the history of art, on the ground that, if certain assumptions regarding him could be accepted as true, he would be entitled to share with Cimabue, or rather indeed to supersede him in, the honour of having given the first onward impulse to the art of painting. The case stands thus. In the church of S. Domenico in Siena is a large painting of the "Virgin and Child Enthroned," with six angels above, and in the Benedictine convent of the same city is a triangular pinnacle, once a portion of the same composition, representing the Saviour in benediction, with two angels; the entire work was originally a triptych, but is not so now. The principal section of this picture has a rhymed Latin inscription, giving the painter's name as Gu . . . o de Senis, with the date 1221: the genuineness of the inscription is not, however, free from doubt, and especially it is maintained that the date really reads as 1281. In the general treatment of the picture there is nothing to distinguish it particularly from other work of the same early period; but the heads of the Virgin and Child are indisputably very superior, in natural character and graceful dignity, to anything to be found anterior to Cimabue. The question therefore arises, Are these heads really the work of a man who painted in 1221? Crowe and Cavalcaselle pronounce in the negative, concluding that the heads are repainted, and are, as they now stand, due to some artist of the 14th century, perhaps Ugolino da Siena; thus the claims of Cimabue would remain undisturbed and in their pristine vigour. Beyond this, little is known of Guido da Siena. There is in the Academy of Siena a picture assigned to him, a half-figure of the "Virgin and Child," with two angels, dating probably between 1250 and 1300; also in the church of S. Bernardino in the same city a Madonna dated 1262. Milanesi thinks that the work in S. Domenico is due to Guido Graziani, of whom no other record remains earlier than 1278, when he is mentioned as the painter of a banner. Guido da Siena appears always to have painted on panel, not in fresco on the wall. He has been termed, very dubiously, a pupil of Pietrolino, and the master of "Diotisalvi," Mino da Turrita and Berlinghieri da Lucca.

GUIDO RENI (1575–1642), a prime master in the Bolognese school of painting, and one of the most admired artists of the period of incipient decadence in Italy, was born at Calvenzano near Bologna on the 4th of November 1575. His father was a musician of repute, a player on the flageolet; he wished to bring the lad up to perform on the harpsichord. At a very childish age, however, Guido displayed a determined bent towards the art of form, scribbling some attempt at a drawing here, there and everywhere. He was only nine years of age when Denis Calvart took notice of him, received him into his academy of design by the father's permission, and rapidly brought him forward, so that by the age of thirteen Guido had already attained marked proficiency. Albani and Domenichino became soon afterwards pupils in the same academy. With Albani Guido was very intimate up to the earlier period of manhood, but they afterwards became rivals, both as painters and as heads of ateliers, with a good deal of asperity on Albani's part; Domenichino was also pitted against Reni by the policy of Annibale Caracci. Guido was still in the academy of Calvart when he began frequenting the opposition school kept by Lodovico Caracci, whose style, far in advance of that of the Flemish painter, he dallied with. This exasperated Calvart. Him Guido, not yet twenty years of age, cheerfully quitted, transferring himself openly to the Caracci academy, in which he soon became prominent, being equally skilful and ambitious. He had not been a year with the Caracci when a work of his excited the wonder of Agostino and the jealousy of Annibale. Lodovico cherished him, and frequently painted him as an angel, for the youthful Reni was extremely handsome. After a while, however, Lodovico also felt himself nettled, and he patronized the competing talents of Giovanni Barbiere. On one occasion Guido had made a copy of Annibale's "Descent from the Cross"; Annibale was asked to retouch it, and, finding nothing to do, exclaimed pettishly, "He knows more than enough" ("Costui ne sa troppo"). On another occasion Lodovico, consulted as umpire, lowered a price which Reni asked for an early picture. This slight determined the young man to be a pupil no more. He left the Caracci, and started on his own account as a competitor in the race for patronage and fame. A renowned work, the story of "Callisto and Diana," had been completed before he left.

Guido was faithful to the eclectic principle of the Bolognese school of painting. He had appropriated something from Calvart, much more from Lodovico Caracci; he studied with much zest after Albert Dürer; he adopted the massive, sombre and partly uncouth manner of Caravaggio. One day Annibale Caracci made the remark that a style might be formed reversing that of Caravaggio in such matters as the ponderous shadows and the gross common forms; this observation germinated in Guido's mind, and he endeavoured after some such style, aiming constantly at suavity. Towards 1602 he went to Rome with Albani, and Rome remained his headquarters for twenty years.

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Here, in the pontificate of Paul V. (Borghese), he was greatly noted and distinguished. In the garden-house of the Rospigliosi Palace he painted the vast fresco which is justly regarded as his masterpiece—"Phoebus and the Hours preceded by Aurora." This exhibits his second manner, in which he had deviated far indeed from the promptings of Caravaggio. He founded now chiefly upon the antique, more especially the Niobe group and the "Venus de' Medici," modified by suggestions from Raphael, Correggio, Parmigiano and Paul Veronese. Of this last painter, although on the whole he did not get much from him, Guido was a particular admirer; he used to say that he would rather have been Paul Veronese than any other master—Paul was more nature than art. The "Aurora" is beyond doubt a work of pre-eminent beauty and attainment; it is stamped with pleasurable dignity, and, without being effeminate, has a more uniform aim after graceful selectness than can readily be traced in previous painters, greatly superior though some of them had been in impulse and personal fervour of genius. The pontifical chapel of Montecavallo was assigned to Reni to paint; but, being straitened in payments by the ministers, the artist made off to Bologna. He was fetched back by Paul V. with ceremonious éclat, and lodging, living and equipage were supplied to him. At another time he migrated from Rome to Naples, having received a commission to paint the chapel of S. Gennaro. The notorious cabal of three painters resident in Naples—Corenzio, Caracciolo and Ribera—offered, however, as stiff an opposition to Guido as to some other interlopers who preceded and succeeded him. They gave his servant a beating by the hands of two unknown bullies, and sent by him a message to his master to depart or prepare for death; Guido waited for no second warning, and departed. He now returned to Rome; but he finally left that city abruptly, in the pontificate of Urban VIII., in consequence of an offensive reprimand administered to him by Cardinal Spinola. He had received an advance of 400 scudi on account of an altarpiece for St Peter's, but after some lapse of years had made no beginning with the work. A broad reminder from the cardinal put Reni on his mettle; he returned the 400 scudi, quitted Rome within a few days, and steadily resisted all attempts at recall. He now resettled in Bologna. He had taught as well as painted in Rome, and he left pupils behind him; but on the whole he did not stamp any great mark upon the Roman school of painting, apart from his own numerous works in the papal city.

In Bologna Guido lived in great splendour, and established a celebrated school, numbering more than two hundred scholars. He himself drew in it, even down to his latest years. On first returning to this city, he charged about £21 for a full-length figure (mere portraits are not here in question), half this sum for a half-length, and £5 for a head. These prices must be regarded as handsome, when we consider that Domenichino about the same time received only £10, 10s. for his very large and celebrated picture, the "Last Communion of St Jerome." But Guido's reputation was still on the increase, and in process of time he quintupled his prices. He now left Bologna hardly at all; in one instance, however, he went off to Ravenna, and, along with three pupils, he painted the chapel in the cathedral with his admired picture of the "Israelites gathering Manna." His shining prosperity was not to last till the end. Guido was dissipated, generously but indiscriminately profuse, and an inveterate gambler. The gambling propensity had been his from youth, but until he became elderly it did not noticeably damage his fortunes. It grew upon him, and in a couple of evenings he lost the enormous sum of 14,400 scudi. The vice told still more ruinously on his art than on his character. In his decline he sold his time at so much per hour to certain picture dealers; one of them, the Shylock of his craft, would stand by, watch in hand, and see him work. Half-heartedness, half-performance, blighted his product: self-repetition and mere mannerism, with affectation for sentiment and vapidity for beauty, became the art of Guido. Some of these trade-works, heads or half-figures, were turned out in three hours or even less. It is said that, tardily wise, Reni left off gambling for nearly two years; at last he relapsed, and his relapse was followed not long afterwards by his death, caused by malignant fever. This event took place in Bologna on the 18th of August 1642; he died in debt, but was buried with great pomp in the church of S. Domenico.

Guido was personally modest, although he valued himself on his position in the art, and would tolerate no slight in that relation; he was extremely upright, temperate in diet, nice in his person and his dress. He was fond of stately houses, but could feel also the charm of solitude. In his temper there was a large amount of suspiciousness; and the jealousy which his abilities and his successes excited, now from the Caracci, now from Albani, now from the long-impoverishing league of Neapolitan painters, may naturally have kept this feeling in active exercise. Of his numerous scholars, Simone Cantarini, named Il Pesarese, counts as the most distinguished; he painted an admirable head of Reni, now in the Bolognese Gallery. The portrait in the Uffizi Gallery of Florence is from Reni's own hand. Two other good scholars were Giacomo Semenza and Francesco Gessi.

The character of Guido's art is so well known as hardly to call for detailed analysis, beyond what we have already intimated. His most characteristic style exhibits a propense ideal, of form rather than character, with a slight mode of handling, and silvery, somewhat cold, colour. In working from the nude he aimed at perfection of form, especially marked in the hands and feet. But he was fain at times to go to choice nature for his model; the transmuted *ad libitum*, and painted, it is averred, a Magdalene of demonstrative charms from a vulgar-looking colour-grinder. His best works have beauty, great amenity, artistic feeling and high accomplishment of manner, all alloyed by a certain core of commonplace; in the worst pictures the commonplace swamps everything, and Guido has flooded European galleries with trashy and empty pretentiousness, all the more noxious in that its apparent grace of sentiment and form misleads the unwary into approval, and the dilettante dabbler into cheap raptures. Both in Rome and wherever else he worked he introduced increased softness of style, which was then designated as the modern method. His pictures are mostly Scriptural or mythologic in subject, and between two and three hundred of them are to be found in various European collections—more than a hundred of these containing life-sized figures. The portraits which he executed are few—those of Sixtus V., Cardinal Spada and the so-called Beatrice Cenci being among the most noticeable. The identity of the last-named portrait is very dubious; it certainly cannot have been painted direct from Beatrice, who had been executed in Rome before Guido ever resided there. Many etchings are attributed to him—some from his own works, and some after other masters; they are spirited, but rather negligent.

Of other works not already noticed, the following should be named:—in Rome (the Vatican), the "Crucifixion of St Peter," an example of the painter's earlier manner; in S. Lorenzo in Lucina, "Christ Crucified"; in Forlì, the "Conception"; in Bologna, the "Alms of St Roch" (early), the "Massacre of the Innocents," and the "Pietà, or Lament over the Body of Christ" (in the church of the Mendicanti), which is by many regarded as Guido's prime executive work; in the Dresden Gallery, an "Ecce Homo"; in Milan (Brera Gallery), "Saints Peter and Paul"; in Genoa (church of S. Ambrogio), the "Assumption of the Virgin"; in Berlin, "St Paul the Hermit and St Anthony in the Wilderness." The celebrated picture of "Fortune" (in the Capitol) is one of Reni's finest treatments of female form; as a specimen of male form, the "Samson Drinking from the Jawbone of an Ass" might be named beside it. One of his latest works of mark is the "Ariadne," which used to be in the Gallery of the Capitol. The Louvre contains twenty of his pictures, the National Gallery of London seven, and others were once there, now removed to other public collections. The most interesting of the seven is the small "Coronation of the Virgin," painted on copper, an elegantly finished work, more pretty than beautiful. It was probably painted before the master quitted Bologna for Rome.

For the life and works of Guido Reni, see Bolognini, *Vita di Guido Reni* (1839); Passeri, *Vite de' pittori*; and Malvasia, *Felsina Pittrice*; also Lanzi, *Storia pittorica*. (W. M. R.)

GUIENNE, an old French province which corresponded roughly to the *Aquitania Secunda* of the Romans and the archbishopric of Bordeaux. In the 12th century it formed with Gascony the duchy of Aquitaine, which passed under the dominion of the kings of England by the marriage of Eleanor of Aquitaine to Henry II.; but in the 13th, through the conquests of Philip Augustus, Louis VIII. and Louis IX., it was confined within the narrower limits fixed by the treaty of Paris (1250). It is at this point that Guienne becomes distinct from Aquitaine. It then comprised the Bordelais (the old countship of Bordeaux), the Bazadais, part of Périgord, Limousin, Quercy and Rouergue, the Agenais ceded by Philip III. (the Bold) to Edward I. (1279), and (still united with Gascony) formed a

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duchy extending from the Charente to the Pyrenees. This duchy was held on the terms of homage to the French kings, an onerous obligation; and both in 1296 and 1324 it was confiscated by the kings of France on the ground that there had been a failure in the feudal duties. At the treaty of Brétigny (1360) Edward III. acquired the full sovereignty of the duchy of Guienne, together with Aunis, Saintonge, Angoumois and Poitou. The victories of du Guesclin and Gaston Phœbus, count of Foix, restored the duchy soon after to its 13th-century limits. In 1451 it was conquered and finally united to the French crown by Charles VII. In 1469 Louis XI. gave it in exchange for Champagne and Brie to his brother Charles, duke of Berry, after whose death in 1472 it was again united to the royal dominion. Guienne then formed a government which from the 17th century onwards was united with Gascony. The government of Guienne and Gascony, with its capital at Bordeaux, lasted till the end of the *ancien régime*. Under the Revolution the departments formed from Guienne proper were those of Gironde, Lot-et-Garonne, Dordogne, Lot, Aveyron and the chief part of Tarn-et-Garonne.

GUIGNES, JOSEPH DE (1721–1800), French orientalist, was born at Pontoise on the 19th of October 1721. He succeeded Fourmont at the Royal Library as secretary interpreter of the Eastern languages. A *Mémoire historique sur l'origine des Huns et des Turcs*, published by de Guignes in 1748, obtained his admission to the Royal Society of London in 1752, and he became an associate of the French Academy of Inscriptions in 1754. Two years later he began to publish his learned and laborious *Histoire générale des Huns, des Mongoles, des Turcs et des autres Tartares occidentaux* (1756–1758); and in 1757 he was appointed to the chair of Syriac at the Collège de France. He maintained that the Chinese nation had originated in Egyptian colonization, an opinion to which, in spite of every argument, he obstinately clung. He died in Paris in 1800. The *Histoire* had been translated into German by Dähnert (1768–1771). De Guignes left a son, Christian Louis Joseph (1759–1845), who, after learning Chinese from his father, went as consul to Canton, where he spent seventeen years. On his return to France he was charged by the government with the work of preparing a Chinese-French-Latin dictionary (1813). He was also the author of a work of travels (*Voyages à Pékin, Manille, et l'île de France*, 1808).

See Quérard, *La France littéraire*, where a list of the memoirs contributed by de Guignes to the *Journal des savants* is given.

GUILBERT, YVETTE (1869–), French *diseuse*, was born in Paris. She served for two years until 1885 in the Magasin du Printemps, when, on the advice of the journalist, Edmond Stoullig, she trained for the stage under Landrol. She made her début at the Bouffes du Nord, then played at the Variétés, and in 1890 she received a regular engagement at the Eldorado to sing a couple of songs at the beginning of the performance. She also sang at the Ambassadeurs. She soon won an immense vogue by her rendering of songs drawn from Parisian lower-class life, or from the humours of the Latin Quarter, "*Quatre z'étudiants*" and the "*Hôtel du numéro trois*" being among her early triumphs. Her adoption of an habitual yellow dress and long black gloves, her studied simplicity of diction, and her ingenuous delivery of songs charged with *risqué* meaning, made her famous. She owed something to M. Xanrof, who for a long time composed songs especially for her, and perhaps still more to Aristide Bruant, who wrote many of her *arcot* songs. She made successful tours in England, Germany and America, and was in great request as an entertainer in private houses. In 1895 she married Dr M. Schiller. In later years she discarded something of her earlier manner, and sang songs of the "pompadour" and the "crinoline" period in costume. She published the novels *La Vedette* and *Les Demi-vieilles*, both in 1902.

GUILDFORD, a market town and municipal borough, and the county town of Surrey, England, in the Guildford parliamentary division, 29 m. S.W. of London by the London and South Western railway; served also by the London, Brighton, and South Coast and the South Eastern and Chatham railways. Pop. (1901) 15,938. It is beautifully situated on an acclivity of the northern chalk Downs and on the river Wey. Its older streets contain a number of picturesque gabled houses, with quaint lattices and curious doorways. The ruins of a Norman castle stand finely above the town and are well preserved; while the ground about them is laid out as a public garden. Beneath the Angel Inn and a house in the vicinity are extensive vaults, apparently of Early English date, and traditionally connected with the castle. The church of St Mary is Norman and Early English, with later additions and considerably restored; its aisles retain their eastward apses and it contains many interesting details. The church of St Nicholas is a modern building on an ancient site, and that of Holy Trinity is a brick structure of 1763, with later additions, also on the site of an earlier church, from which some of the monuments are preserved, including that of Archbishop Abbot (1640). The town hall dates from 1683 and contains a number of interesting pictures. Other public buildings are the county hall, corn-market and institute with museum and library. Abbot's Hospital, founded by Archbishop Abbot in 1619, is a beautiful Tudor brick building. The county hospital (1866) was erected as a memorial to Albert, Prince Consort. The Royal Free Grammar School, founded in 1509, and incorporated by Edward VI., is an important school for boys. At Cranleigh, 6 m. S.E., is a large middle-class county school. The town has flour mills, iron foundries and breweries, and a large trade in grain; while fairs are held for live stock. There is a manufacture of gunpowder in the neighbouring village of Chilworth. Guildford is a suffragan bishopric in the diocese of Winchester. The borough is under a mayor, 4 aldermen and 12 councillors. Area, 2601 acres.

Guildford (Gyldeford, Geldeford), occurs among the possessions of King Alfred, and was a royal borough throughout the middle ages. It probably owed its rise to its position at the junction of trade routes. It is first mentioned as a borough in 1131. Henry III. granted a charter to the men of Guildford in 1256, by which they obtained freedom from toll throughout the kingdom, and the privilege of having the county court held always in their town. Edward III. granted charters to Guildford in 1340, 1346 and 1367; Henry VI. in 1423; Henry VII. in 1488. Elizabeth in 1580 confirmed earlier charters, and other charters were granted in 1603, 1626 and 1686. The borough was incorporated in 1486 under the title of the mayor and good men of Guildford. During the middle ages the government of the town rested with a powerful merchant gild. Two members for Guildford sat in the parliament of 1295, and the borough continued to return two representatives until 1867 when the number was reduced to one. By the Redistribution Act of 1885 Guildford became merged in the county for electoral purposes. Edward II. granted to the town the right of having two fairs, at the feast of St Matthew (21st of September) and at Trinity respectively. Henry VII. granted fairs on the feast of St Martin (11th of November) and St George (23rd of April). Fairs in May for the sale of sheep and in November for the sale of cattle are still held. The market rights date at least from 1276, and three weekly markets are still held for the sale of corn, cattle and vegetables respectively. The cloth trade which formed the staple industry at Guildford in the middle ages is now extinct.

GUILDHALL, the hall of the corporation of the city of London, England. It faces a courtyard opening out of Gresham Street. The date of its original foundation is not known. An ancient crypt remains, but the hall has otherwise undergone much alteration. It was rebuilt in 1411, beautified by the munificence of successive officials, damaged in the Great Fire of 1666, and restored in 1789 by George Dance; while the hall was again restored, with a new roof, in 1870. This fine chamber, 152 ft. in length, is the scene of the state banquets and entertainments of the corporation, and of the municipal meetings "in common hall." The building also contains a council chamber and various court rooms, with a splendid library, open to the public, a museum and art gallery adjoining. The hall contains several monuments and two giant figures of wood,

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known as Gog and Magog. These were set up in 1708, but the appearance of giants in city pageants is of much earlier date.

GUILFORD, BARONS AND EARLS OF. FRANCIS NORTH, 1st Baron Guilford (1637–1685), was the third son of the 4th Baron North (see NORTH, BARONS), and was created Baron Guilford in 1683, after becoming lord keeper in succession to Lord Nottingham. He had been an eminent lawyer, solicitor-general (1671), attorney-general (1673), and chief-justice of the common pleas (1675), and in 1679 was made a member of the council of thirty and on its dissolution of the cabinet. He was a man of wide culture and a stanch royalist. In 1672 he married Lady Frances Pope, daughter and co-heiress of the earl of Downe, who inherited the Wroxton estate; and he was succeeded as 2nd baron by his son Francis (1673–1729), whose eldest son Francis (1704–1790), after inheriting first his father's title as 3rd baron, and then (in 1734) the barony of North from his kinsman the 6th Baron North, was in 1752 created 1st earl of Guilford. His first wife was a daughter of the earl of Halifax, and his son and successor Frederick was the English prime minister, commonly known as Lord North, his courtesy title while the 1st earl was alive.

FREDERICK NORTH, 2nd earl of Guilford, but better known by his courtesy title of Lord North (1732–1792), prime minister of England during the important years of the American War, was born on the 13th of April 1732, and after being educated at Eton and Christ Church, Oxford, was sent to make the grand tour of the continent. On his return he was, though only twenty-two years of age, at once elected M.P. for Banbury, of which town his father was high steward; and he sat for the same town in parliament for nearly forty years. In 1759 he was chosen by the duke of Newcastle to be a lord of the treasury, and continued in the same office under Lord Bute and George Grenville till 1765. He had shown himself such a ready debater that on the fall of the first Rockingham ministry in 1766 he was sworn of the privy council, and made paymaster-general by the duke of Grafton. His reputation for ability grew so high that in December 1767, on the death of the brilliant Charles Townshend, he was made chancellor of the exchequer. His popularity with both the House of Commons and the people continued to increase, for his temper was never ruffled, and his quiet humour perpetually displayed; and, when the retirement of the duke of Grafton was necessitated by the hatred he inspired and the attacks of Junius, no better successor could be found for the premiership than the chancellor of the exchequer. Lord North succeeded the duke in March 1770, and continued in office for twelve of the most eventful years in English history. George III. had at last overthrown the ascendancy of the great Whig families, under which he had so long groaned, and determined to govern as well as rule. He knew that he could only govern by obtaining a majority in parliament to carry out his wishes, and this he had at last obtained by a great expenditure of money in buying seats and by a careful exercise of his patronage. But in addition to a majority he must have a minister who would consent to act as his lieutenant, and such a minister he found in Lord North. How a man of undoubted ability such as Lord North was could allow himself to be thus used as a mere instrument cannot be explained; but the confidential tone of the king's letters seems to show that there was an unusual intimacy between them, which may account for North's compliance. The path of the minister in parliament was a hard one; he had to defend measures which he had not designed, and of which he had not approved, and this too in a House of Commons in which all the oratorical ability of Burke and Fox was against him, and when he had only the purchased help of Thurlow and Wedderburne to aid him. The most important events of his ministry were those of the American War of Independence. He cannot be accused of causing it, but one of his first acts was the retention of the tea-duty, and he it was also who introduced the Boston Port Bill in 1774. When the war had broken out he earnestly counselled peace, and it was only the earnest solicitations of the king not to leave his sovereign again at the mercy of the Whigs that induced him to defend a war which from 1779 he knew to be both hopeless and impolitic. At last, in March 1782, he insisted on resigning after the news of Cornwallis's surrender at Yorktown, and no man left office more blithely. He had been well rewarded for his assistance to the king: his children had good sinecures; his half-brother, Brownlow North (1741–1820), was bishop of Winchester; he himself was chancellor of the university of Oxford, lord-lieutenant of the county of Somerset, and had finally been made a knight of the Garter, an honour which has only been conferred on three other members of the House of Commons, Sir R. Walpole, Lord Castlereagh and Lord Palmerston. Lord North did not remain long out of office, but in April 1783 formed his famous coalition with his old subordinate, C. J. Fox (*q.v.*), and became secretary of state with him under the nominal premiership of the duke of Portland. He was probably urged to this coalition with his old opponent by a desire to show that he could act independently of the king, and was not a mere royal mouthpiece. The coalition ministry went out of office on Fox's India Bill in December 1783, and Lord North, who was losing his sight, then finally gave up political ambition. He played, when quite blind, a somewhat important part in the debates on the Regency Bill in 1789, and in the next year succeeded his father as earl of Guilford. He did not long survive his elevation, and died peacefully on the 5th of August 1792. It is impossible to consider Lord North a great statesman, but he was a most good-tempered and humorous member of the House of Commons. In a time of unexampled party feeling he won the esteem and almost the love of his most bitter opponents. Burke finely sums up his character in his *Letter to a Noble Lord*: "He was a man of admirable parts, of general knowledge, of a versatile understanding, fitted for every sort of business; of infinite wit and pleasantry, of a delightful temper, and with a mind most disinterested. But it would be only to degrade myself," he continues, "by a weak adulation, and not to honour the memory of a great man, to deny that he wanted something of the vigilance and spirit of command which the times required."

By his wife Anne (d. 1797), daughter of George Speke of White Lackington, Somerset, Guilford had four sons, the eldest of whom, George Augustus (1757–1802), became 3rd earl on his father's death. This earl was a member of parliament from 1778 to 1792 and was a member of his father's ministry and also of the royal household; he left no sons when he died on the 20th of April 1802 and was succeeded in the earldom by his brother Francis (1761–1817), who also left no sons. The youngest son, Frederick (1766–1827), who now became 5th earl of Guilford, was remarkable for his great knowledge and love of Greece and of the Greek language. He had a good deal to do with the foundation of the Ionian university at Corfu, of which he was the first chancellor and to which he was very liberal. Guilford, who was governor of Ceylon from 1798 to 1805, died unmarried on the 14th of October 1827. His cousin, Francis (1772–1861), a son of Brownlow North, bishop of Winchester from 1781 to 1820, was the 6th earl, and the latter's descendant, Frederick George (b. 1876), became 8th earl in 1886.

On the death of the 3rd earl of Guilford in 1802 the barony of North fell into abeyance between his three daughters, the survivor of whom, Susan (1707–1884), wife of John Sidney Doyle, who took the name of North, was declared by the House of Lords in 1841 to be Baroness North, and the title passed to her son, William Henry John North, the 11th baron (b. 1836) (see NORTH, BARONS).

For the Lord Keeper Guilford see the *Lives* by the Hon. R. North, edited by J. Jessopp (1890); and E. Foss, *The Judges of England*, vol. vii. (1848–1864). For the prime minister, Lord North, see *Correspondence of George III. with Lord North*, edited by W. B. Donne (1867); Horace Walpole, *Journal of the Reign of George III.* (1859), and *Memoirs of the Reign of George III.*, edited by G. F. R. Barker (1894); Lord Brougham, *Historical Sketches of Statesmen*, vol. i. (1839); Earl Stanhope, *History of England* (1858); Sir T. E. May, *Constitutional History of England* (1863–1865); and W. E. H. Lecky, *History of England in the 18th century* (1878–1890).

GUILFORD, a township, including a borough of the same name, in New Haven county, Connecticut, U.S.A., on Long Island Sound and at the mouth of the Menunkatuck or West

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river, about 16 m. E. by S. of New Haven. Pop. of the township, including the borough (1900), 2785, of whom 387 were foreign-born; (1910) 3001; pop. of the borough (1910), 1608. The borough is served by the New York, New Haven & Hartford railroad. On a plain is the borough green of nearly 12 acres, which is shaded by some fine old elms and other trees, and in which there is a soldiers' monument. About the green are several churches and some of the better residences. On an eminence commanding a fine view of the Sound is an old stone house, erected in 1639 for a parsonage, meeting-house and fortification; it was made a state museum in 1898, when extensive alterations were made to restore the interior to its original appearance. The Point of Rocks, in the harbour, is an attractive resort during the summer season. There are about 12 ft. of water on the harbour bar at high tide. The principal industries of Guilford are coastwise trade, the manufacture of iron castings, brass castings, wagon wheels and school furniture, and the canning of vegetables. Near the coast are quarries of fine granite; the stone for the pedestal of the Statue of Liberty on Bedloe's Island, in New York Harbour, was taken from them.

Guilford was founded in 1639 as an independent colony by a company of twenty-five or more families from Kent, Surrey and Sussex, England, under the leadership of Rev. Henry Whitfield (1597–1653). While still on shipboard twenty-five members of the company signed a plantation covenant whereby they agreed not to desert the plantation which they were about to establish. Arriving at New Haven early in July 1639, they soon began negotiations with the Indians for the purchase of land, and on the 29th of September a deed was signed by which the Indians conveyed to them the territory between East River and Stony Creek for "12 coates, 12 Fathoms of Wampam, 12 glasses (mirrors), 12 payer of shooes, 12 Hatchetts, 12 paire of Stockings, 12 Hooes, 4 kettles, 12 knives, 12 Hatts, 12 Porringers, 12 spoones, and 2 English coates." Other purchases of land from the Indians were made later. Before the close of the year the company removed from New Haven and established the new colony; it was known by the Indian name Menuncatuck for about four years and the name Guilford (from Guildford, England) was then substituted. As a provisional arrangement, civil power for the administration of justice and the preservation of the peace was vested in four persons until such time as a church should be organized. This was postponed until 1643 when considerations of safety demanded that the colony should become a member of the New Haven Jurisdiction, and then only to meet the requirements for admission in this union were the church and church state modelled after those of New Haven. Even then, though suffrage was restricted to church members, Guilford planters who were not church members were required to attend town meetings and were allowed to offer objections to any proposed order or law. From 1661 until the absorption of the members of the New Haven Jurisdiction by Connecticut, in 1664, William Leete (1611–1683), one of the founders of Guilford, was governor of the Jurisdiction, and under his leadership Guilford took a prominent part in furthering the submission to Connecticut, which did away with the church state and the restriction of suffrage to freemen. Guilford was the birthplace of Fitz-Greene Halleck (1790–1867), the poet; of Samuel Johnson (1696–1771), the first president of King's College (now Columbia University); of Abraham Baldwin (1754–1807), prominent as a statesman and the founder of the University of Georgia; and of Thomas Chittenden, the first governor of Vermont. The borough was incorporated in 1815.

See B. C. Steiner, *A History of the Plantation of Menunca-Tuck and of the Original Town of Guilford, Connecticut* (Baltimore, 1897), and *Proceedings at the Celebration of the 250th Anniversary of the Settlement of Guilford, Connecticut* (New Haven, 1889).

GUILLAUME, JEAN BAPTISTE CLAUDE EUGÈNE (1822–1905), French sculptor, was born at Montbard on the 4th of July 1822, and studied under Cavelier, Millet, and Barrias, at the École des Beaux-Arts, which he entered in 1841, and where he gained the *prix de Rome* in 1845 with "Theseus finding on a rock his Father's Sword." He became director of the École des Beaux-Arts in 1864, and director-general of Fine Arts from 1878 to 1879, when the office was suppressed. Many of his works have been bought for public galleries, and his monuments are to be found in the public squares of the chief cities of France. At Rheims there is his bronze statue of "Colbert," at Dijon his "Rameau" monument. The Luxembourg Museum has his "Anacreon" (1852), "Les Gracques" (1853), "Faucheur" (1855), and the marble bust of "Mgr Darboy"; the Versailles Museum the portrait of "Thiers"; the Sorbonne Library the marble bust of "Victor le Clerc, doyen de la faculté des lettres." Other works of his are at Trinity Church, St Germain l'Auxerrois, and the church of St Clotilde, Paris. Guillaume was a prolific writer, principally on sculpture and architecture of the Classic period and of the Italian Renaissance. He was elected member of the Académie Française in 1862, and in 1891 was sent to Rome as director of the Académie de France in that city. He was also elected an honorary member of the Royal Academy, London, 1869, on the institution of that class.

GUILLAUME DE LORRIS (fl. 1230), the author of the earlier section of the *Roman de la rose*, derives his surname from a small town about equidistant from Montargis and Gien, in the present department of Loiret. This and the fact of his authorship may be said to be the only things positively known about him. The rubric of the poem, where his own part finishes, attributes Jean de Meun's continuation to a period forty years later than William's death and the consequent interruption of the romance. Arguing backwards, this death used to be put at about 1260; but Jean de Meun's own work has recently been dated earlier, and so the composition of the first part has been thrown back to a period before 1240. The author represents himself as having dreamed the dream which furnished the substance of the poem in his twentieth year, and as having set to work to "rhyme it" five years later. The later and longer part of the *Roman* shows signs of greater intellectual vigour and wider knowledge than the earlier and shorter, but Guillaume de Lorris is to all appearance more original. The great features of his four or five thousand lines are, in the first place, the extraordinary vividness and beauty of his word-pictures, in which for colour, freshness and individuality he has not many rivals except in the greatest masters, and, secondly, the fashion of allegorical presentation, which, hackneyed and wearisome as it afterwards became, was evidently in his time new and striking. There are of course traces of it before, as in some romances, such as those of Raoul de Houdenc, in the troubadours, and in other writers; but it was unquestionably Guillaume de Lorris who fixed the style.

For an attempt to identify Guillaume de Lorris see L. Jarry, *Guillaume de Lorris et le testament d'Alphonse de Poitiers* (1881). Also Paulin Paris in the *Hist. litt. de la France*, vol. xxiii.

GUILLAUME DE PALERME (WILLIAM OF PALERNE), hero of romance. The French verse romance was written at the desire of a Countess Yolande, generally identified with Yolande, daughter of Baldwin IV., count of Flanders. The English poem in alliterative verse was written about 1350 by a poet called William, at the desire of Humphrey Bohun, earl of Hereford, (d. 1361). Guillaume, a foundling supposed to be of low degree, is brought up at the court of the emperor of Rome, and loves his daughter Melior who is destined for a Greek prince. The lovers flee into the woods disguised in bear-skins. Alfonso, who is Guillaume's cousin and a Spanish prince, has been changed into a wolf by his step-mother's enchantments. He provides food and protection for the fugitives, and Guillaume eventually triumphs over Alfonso's father, and wins back from him his kingdom. The benevolent werwolf is disenchanted, and marries Guillaume's sister.

See *Guillaume de Palerne*, ed. H. Michelant (Soc. d. anc. textes fr., 1876); *Hist. litt. de la France*, xxii. 829; *William of Palerne*, ed. Sir F. Madden (Roxburghe Club, 1832), and W. W. Skeat (E. E. Text Soc., extra series No. 1, 1867); M. Kaluza, in *Eng. Studien* (Heilbronn, iv. 109). The prose version of the French romance, printed by N. Bonfons, passed through several editions.

GUILLAUME D'ORANGE (d. 812), also known as Guillaume Fierabrace, St Guillaume de Gellone, and the Marquis au court

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nez, was the central figure of the southern cycle of French romance, called by the *trouvères* the *geste* of Garin de Monglane. The cycle of Guillaume has more unity than the other great cycles of Charlemagne or of Doon de Mayence, the various poems which compose it forming branches of the main story rather than independent epic poems. There exist numerous cyclic MSS. in which there is an attempt at presenting a continuous *histoire poétique* of Guillaume and his family. MS. Royal 20 D xi. in the British Museum contains eighteen *chansons* of the cycle. Guillaume, son of Thierry or Theodoric and of Aide, daughter of Charles Martel, was born in the north of France about the middle of the 8th century. He became one of the best soldiers and trusted counsellors of Charlemagne, and in 790 was made count of Toulouse, when Charles's son Louis the Pious was put under his charge. He subdued the Gascons, and defended Narbonne against the infidels. In 793 Hescham, the successor of Abd-al-Rahman II., proclaimed a holy war against the Christians, and collected an army of 100,000 men, half of which was directed against the kingdom of the Asturias, while the second invaded France, penetrating as far as Narbonne. Guillaume met the invaders near the river Orbieux, at Villedaigne, where he was defeated, but only after an obstinate resistance which so far exhausted the Saracens that they were compelled to retreat to Spain. He took Barcelona from the Saracens in 803, and in the next year founded the monastery of Gellone (now Saint Guilhem-le Désert), of which he became a member in 806. He died there in the odour of sanctity on the 28th of May 812.

No less than thirteen historical personages bearing the name of William (Guillaume) have been thought by various critics to have their share in the formation of the legend. William, count of Provence, son of Boso II., again delivered southern France from a Saracen invasion by his victory at Fraxinet in 973, and ended his life in a cloister. William Tow-head (*Tête d'étoupe*), duke of Aquitaine (d. 983), showed a fidelity to Louis IV. paralleled by Guillaume d'Orange's service to Louis the Pious. The cycle of twenty or more *chansons* which form the *geste* of Guillaume reposes on the traditions of the Arab invasions of the south of France, from the battle of Poitiers (732) under Charles Martel onwards, and on the French conquest of Catalonia from the Saracens. In the Norse version of the Carolingian epic Guillaume appears in his proper historical environment, as a chief under Charlemagne; but he plays a leading part in the *Couronnement Looys*, describing the formal associations of Louis the Pious in the empire at Aix (813, the year after Guillaume's death), and after the battle of Aliscans it is from the emperor Louis that he seeks reinforcements. This anachronism arises from the fusion of the epic Guillaume with the champion of Louis IV., and from the fact that he was the military and civil chief of Louis the Pious, who was titular king of Aquitaine under his father from the time when he was three years old. The inconsistencies between the real and the epic Guillaume are often left standing in the poems. The personages associated with Guillaume in his Spanish wars belong to Provence, and have names common in the south. The most famous of these are Beuves de Comarchis, Ernaud de Girone, Garin d'Ansèun, Aimer le chétif, so called from his long captivity with the Saracens. The separate existence of Aimer, who refused to sleep under a roof, and spent his whole life in warring against the infidel, is proved. He was Hadhemar, count of Narbonne, who in 809 and 810 was one of the leaders sent by Louis against Tortosa. No doubt the others had historical prototypes. In the hands of the *trouvères* they became all brothers of Guillaume, and sons of Aymeri de Narbonne,[1] the grandson of Garin de Monglane, and his wife Ermenjart. Nevertheless when Guillaume seeks help from Louis the emperor he finds all his relations in Laon, in accordance with his historic Frankish origin.

[1] The poem of *Aymeri de Narbonne* contains the account of the young Aymeri's brilliant capture of Narbonne, which he then receives as a fief from Charlemagne, of his marriage with Ermenjart, sister of Boniface, king of the Lombards, and of their children. The fifth daughter, Blanchefleur, is represented as the wife of Louis the Pious. The opening of this poem furnished, though indirectly, the matter of the *Aymerillot* of Victor Hugo's *Légende des siècles*.

The central fact of the *geste* of Guillaume is the battle of the Archamp or Aliscans, in which perished Guillaume's heroic nephew, Vezian or Vivien, a second Roland. At the eleventh hour he summoned Guillaume to his help against the overwhelming forces of the Saracens. Guillaume arrived too late to help Vivien, was himself defeated, and returned alone to his wife Guibourc, leaving his knights all dead or prisoners. This event is related in a Norman-French transcript of an old French *chanson de geste*, the *Chançun de Willame*—which only was brought to light in 1901 at the sale of the books of Sir Henry Hope Edwardes—in the *Covenant Vivien*, a recension of an older French chanson and in *Aliscans*. *Aliscans* continues the story, telling how Guillaume obtained reinforcements from Laon, and how, with the help of the comic hero, the scullion Rainouart or Rennewart, he avenged the defeat of Aliscans and his nephew's death. Rainouart turns out to be the brother of Guillaume's wife Guibourc, who was before her marriage the Saracen princess and enchantress Orable. Two other poems are consecrated to his later exploits, *La Bataille Loquifer*, the work of a French Sicilian poet, Jendeu de Bric (fl. 1170), and *Le Moniage Rainouart*. The staring-point of Herbert le duc d'Dammartin (fl. 1170) in *Foucon de Candie* (Candie = Gandia in Spain?) is the return of Guillaume from the battle; and the Italian compilation *I Nerbonesi*, based on these and other *chansons*, seems in some cases to represent an earlier tradition than the later of the French *chansons*, although its author Andrea di Barberino wrote towards the end of the 14th century. The minnesinger Wolfram von Eschenbach based his *Wilehalm* on a French original which must have differed from the versions we have. The variations in the story of the defeat of Aliscans or the Archamp, and the numerous inconsistencies of the narratives even when considered separately have occupied many critics. Aliscans (Aleschans, Alyscamps, Elysii Campi) was, however, generally taken to represent the battle of Villedaigne, and to take its name from the famous cemetery outside Arles. Wolfram von Eschenbach even mentions the tombs which studded the field of battle. Indications that this tradition was not unassailable were not lacking before the discovery of the *Chançun de Willame*, which, although preserved in a very corrupt form, represents the earliest recension we have of the story, dating at least from the beginning of the 12th century. It seems probable that the Archant was situated in Spain near Vivien's headquarters at Tortosa, and that Guillaume started from Barcelona, not from Orange, to his nephew's help. The account of the disaster was modified by successive *trouvères*, and the uncertainty of their methods may be judged by the fact that in the *Chançun de Willame* two consecutive accounts (11. 450-1326 and 11. 1326-2420) of the fight appear to be set side by side as if they were separate episodes. *Le Couronnement Looys*, already mentioned, *Le Charroi de Nimes* (12th century) in which Guillaume, who had been forgotten in the distribution of fiefs, enumerates his services to the terrified Louis, and *Aliscans* (12th century), with the earlier *Chançun*, are among the finest of the French epic poems. The figure of Vivien is among the most heroic elaborated by the *trouvères*, and the giant Rainouart has more than a touch of Rabelaisian humour.

The *chansons de geste* of the cycle of Guillaume are: *Enfances Garin de Monglane* (13th century) and *Garin de Monglane* (13th century), on which is founded the prose romance of *Garin de Monglane*, printed in the 15th century by Jehan Trepperel and often later; *Girars de Vienne* (13th century, by Bertrand de Barsur-Aube), ed. P. Tarbé (Reims, 1850); *Hernaut de Beaulande* (fragment 14th century); *Renier de Gennes*, which only survives in its prose form; *Aymeri de Narbonne* (c. 1210) by Bertrand de Bar-sur-Aube, ed. L. Demaison (Soc. des anc. textes fr., Paris, 2 vols., 1887); *Les Enfances Guillaume* (13th century); *Les Narbonnais*, ed. H. Suchier (Soc. des anc. textes fr., 2 vols., 1898), with a Latin fragment dating from the 11th century, preserved at the Hague; *Le Couronnement Looys* (ed. E. Langlois, 1888), *Le Charroi de Nimes*, *La Prise d'Orange*, *Le Covenont Vivien*, *Aliscans*, which were edited by W. J. A. Jonckbloet in vol. i. of his *Guillaume d'Orange* (The Hague, 1854); a critical text of *Aliscans* (Halle, 1903, vol. i.) is edited by E. Wienbeck, W. Hartnacke and P. Rasch; *Loquifer* and *Le Moniage Rainouart* (12th century); *Bovon de Commarchis* (13th century), recension of the earlier Siège de Barbastre, by Adenès li

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Rois, ed. A. Scheler (Brussels, 1874); *Guibert d'Andrenas* (13th century); *La Prise de Cordres* (13th century); *La Mort Aimeri de Narbonne*, ed. J. Couraye de Parc (Soc. des Anciens Textes français, Paris, 1884); *Foulque de Candie* (ed. P. Tarbé, Reims, 1860); *Le Moniage Guillaume* (12th century); *Les Enfances Vivien* (ed. C. Wahlund and H. v. Feilitzen, Upsala and Paris, 1895); *Chançun de Willame* (Chiswick Press, 1903), described by P. Meyer in *Romania* (xxxiii. 597-618). The ninth branch of the *Karlamagnus Saga* (ed. C. R. Unger, Christiania, 1860) deals with the *geste* of Guillaume. *I Nerbonesi* is edited by J. G. Isola (Bologna, 1877, &c.).

See C. Révillout, *Étude hist. et litt. sur la vita sancti Willelmi* (Montpellier, 1876); W. J. A. Jonckbloet, *Guillaume d'Orange* (2 vols., 1854, The Hague); L. Clarus (ps. for W. Volk), *Herzog Wilhelm von Aquitanien* (Münster, 1865); P. Paris, in *Hist. litt. de la France* (vol. xxii., 1852); L. Gautier, *Épopées françaises* (vol. iii., 2nd ed., 1882); R. Weeks, *The newly discovered Chançun de Willame* (Chicago, 1904); A. Thomas, *Études romanes* (Paris, 1891), on Vivien; L. Saltet, "S. Vivian de Martres-Tolosanes" in *Bull. de litt. eccles.* (Toulouse, 1902); P. Becker, *Die altfrz. Wilhelmsage u. ihre Beziehung zu Wilhelm dem Heiligen* (Halle, 1896), and *Der südfranzösische Sagenkreis und seine Probleme* (Halle, 1898); A. Jeanroy, "Études sur le cycle de Guillaume au court nez" (in *Romania*, vols. 25 and 26, 1896-1897); H. Suchier, "Recherches sur . . . Guillaume d'Orange" (in *Romania*, vol. 32, 1903). The conclusions arrived at by earlier writers are combated by Joseph Bédier in the first volume, "Le Cycle de Guillaume d'Orange" (1908), of his *Légendes épiques*, in which he constructs a theory that the cycle of Guillaume d'Orange grew up round the various shrines on the pilgrim route to Saint Gilles of Provence and Saint James of Compostella—that the *chansons de geste* were, in fact, the product of 11th and 12th century trouvères, exploiting local ecclesiastical traditions, and were not developed from earlier poems dating back perhaps to the lifetime of Guillaume of Toulouse, the saint of Gellone.

GUILLEMOT (Fr. *guillemot* [1]), the name accepted by nearly all modern authors for a sea-bird, the *Colymbus troile* of Linnaeus and the *Uria troile* of Latham, which nowadays it seems seldom if ever to bear among those who, from their vocation, are most conversant with it, though, according to Willughby and Ray his translator, it was in their time so called "by those of Northumberland and Durham." Around the coasts of Britain it is variously known as the frowl, kiddaw or skiddaw, langy (cf. Ice. *Langvia*), lavy, marrock, murre, scout (cf. Coot), scuttock, stray, tinker or tinkershire and willock. In former days the guillemot yearly frequented the cliffs on many parts of the British coasts in countless multitudes, and this is still the case in the northern parts of the United Kingdom; but more to the southward nearly all its smaller settlements have been rendered utterly desolate by the wanton and cruel destruction of their tenants during the breeding season, and even the inhabitants of those which were more crowded had become so thinned that, but for the intervention of the Sea Birds Preservation Act (32 & 33 Vict. cap. 17), which provided under penalty for the safety of this and certain other species at the time of year when they were most exposed to danger, they would unquestionably by this time have been exterminated so far as England is concerned.

Part of the guillemot's history is still little understood. We know that it arrives at its wonted breeding stations on its accustomed day in spring, that it remains there till, towards the end of the summer, its young are hatched and able, as they soon are, to encounter the perils of a seafaring life, when away go all, parents and progeny. After that time it commonly happens that a few examples are occasionally met with in bays and shallow waters. Tempestuous weather will drive ashore a large number in a state of utter destitution—many of them indeed are not unfrequently washed up dead—but what becomes of the bulk of the birds, not merely the comparatively few thousands that are natives of Britain, but the tens and hundreds of thousands, not to say millions, that are in summer denizens of more northern latitudes, no one can say. This mystery is not peculiar to the guillemot, but is shared by all the *Alcidae* that inhabit the Atlantic Ocean. Examples stray every season across the Bay of Biscay, are found off the coasts of Spain and Portugal, enter the Mediterranean and reach Italian waters, or, keeping farther south, may even touch the Madeiras, Canaries or Azores; but these bear no proportion whatever to the mighty hosts of whom they are literally the "scouts," and whose position and movements they no more reveal than do the vedettes of a well-appointed army. The common guillemot of both sides of the Atlantic is replaced farther northward by a species with a stouter bill, the *U. arra* or *U. bruennichi* of ornithologists, and on the west coast of North America by the *U. californica*. The habits of all these are essentially the same, and the structural resemblance between all of them and the Auks is so great that several systematists have relegated them to the genus *Alca*, confining the genus *Uria* to the guillemots of another group, of which the type is the *U. grylla*, the black guillemot of British authors, the dovekey or Greenland dove of sailors, the tysty of Shetlanders. This bird assumes in summer an entirely black plumage with the exception of a white patch on each wing, while in winter it is beautifully marbled with white and black. Allied to it as species or geographical races are the *U. mandti*, *U. columba* and *U. carbo*. All these differ from the larger guillemots by laying two or three eggs, which are generally placed in some secure niche, while the members of the other group lay but a single egg, which is invariably exposed on a bare ledge. (A. N.)

GUILLOCHE, a French word for an ornament, either painted or carved, which was one of the principal decorative bands employed by the Greeks in their temples as well as their vases. Guilloches are single, double or triple; they consist of a series of circles equidistant one from the other and enclosed in a band which winds round them and interlaces. This guilloche is of Asiatic origin and was largely employed in the decoration of the Assyrian palaces, where it was probably copied from Chaldaean work, as there is an early example at Erech which dates from the time of Gudea (2204 B.C.). The ornament as painted by the Greeks has almost entirely disappeared, but traces are found in the temple of Nemesis at Rhamnus; and on the terra-cotta slabs by which the timber roofs of Greek temples were protected, it is painted in colours which are almost as brilliant as when first produced, those of the Treasury of Gela at Olympia being of great beauty. These examples are double guilloches, with two rows of circles, each with an independent interlacing band and united by a small arc with palmette inside; in both the single and double guilloches of Greek work there is a flower in the centre of the circles. In the triple guilloche, the centre row of circles comes half-way between the others, and the enclosing band crosses diagonally both ways, interlacing alternately. The best example of the triple guilloche is that which is carved on the torus moulding of the base and on the small convex moulding above the echinus of the capitals of the columns of the Erechtheum at Athens. It was largely employed in Roman work, and the single guilloche is found almost universally as a border in mosaic pavements, not only in Italy but throughout Europe. In the Renaissance in Italy it was also a favourite enrichment for borders and occasionally in France and England.

GUILLON, MARIE NICOLAS SYLVESTRE (1760–1847), French ecclesiastic, was born in Paris on the 1st of January 1760. He was librarian and almoner in the household of the princess de Lamballe, and when in 1792 she was executed, he fled to the provinces, where under the name of Pastel he practised medicine. A man of facile conscience, he afterwards served in turn under Napoleon, the Bourbons and the Orleanists, and became canon of St Denis, bishop of Morocco and dean of the Sorbonne.

Among his many literary works are a *Collection des brefs du pape Pie VI* (1798), *Bibliothèque choisie des pères grecs et latins* (1822, 26 vols.) and a French translation of Cyprian with notes (1837, 2 vols.).

GUILLOTINE, the instrument for inflicting capital punishment by decapitation, introduced into France at the period of the Revolution. It consists of two upright posts surmounted by a cross beam, and grooved so as to guide an oblique-edged knife, the back of which is heavily weighted to make it fall swiftly and with force when the cord by which it is held aloft is let go. Some

[1] The word, however, seems to be cognate with or derived from the Welsh and Manx *Guillem*, or *Gwilym* as Pennant spells it. The association may have no real meaning, but one cannot help comparing the resemblance between the French *guillemot* and *Guillaume* with that between the English willock (another name for the bird) and William.

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ascribe the invention of the machine to the Persians; and previous to the period when it obtained notoriety under its present name it had been in use in Scotland, England and various parts of the continent. There is still preserved in the antiquarian museum of Edinburgh the rude guillotine called the "maiden" by which the regent Morton was decapitated in 1581. The last persons decapitated by the Scottish "maiden" were the marquis of Argyll in 1661 and his son the earl of Argyll in 1685. It would appear that no similar machine was ever in general use in England; but until 1650 there existed in the forest of Hardwick, which was coextensive with the parish of Halifax, West Riding, Yorkshire, a mode of trial and execution called the gibbet law, by which a felon convicted of theft within the liberty was sentenced to be decapitated by a machine called the Halifax gibbet. A print of it is contained in a small book called *Halifax and its Gibbet Law* (1708), and in Gibson's edition of Camden's *Britannia* (1722). In Germany the machine was in general use during the middle ages, under the name of the *Diele*, the *Hobel* or the *Dolabra*. Two old German engravings, the one by George Penez, who died in 1550, and the other by Heinrich Aldegrever, with the date 1553, represent the death of a son of Titus Manlius by a similar instrument, and its employment for the execution of a Spartan is the subject of the engraving of the eighteenth symbol in the volume entitled *Symbolicae quaestiones de universo genere*, by Achilles Bocchi (1555). From the 13th century it was used in Italy under the name of *Mannaia* for the execution of criminals of noble birth. The *Chronique de Jean d'Anton*, first published in 1835, gives minute details of an execution in which it was employed at Genoa in 1507; and it is elaborately described by Père Jean Baptiste Labat in his *Voyage en Espagne et en Italie en 1730*. It is mentioned by Jacques, viscomte de Puységur, in his *Mémoires* as in use in the south of France, and he describes the execution by it of Marshal Montmorency at Toulouse in 1632. For about a century it had, however, fallen into general disuse on the continent; and Dr Guillotine, who first suggested its use in modern times, is said to have obtained his information regarding it from the description of an execution that took place at Milan in 1702, contained in an anonymous work entitled *Voyage historique et politique de Suisse, d'Italie, et d'Allemagne*.

Guillotine, who was born at Saintes, May 28, 1738, and elected to the Constituent Assembly in 1789, brought forward on the 1st December of that year two propositions regarding capital punishment, the second of which was that, "in all cases of capital punishment it shall be of the same kind—that is, decapitation—and it shall be executed by means of a machine." The reasons urged in support of this proposition were that in cases of capital punishment the privilege of execution by decapitation should no longer be confined to the nobles, and that it was desirable to render the process of execution as swift and painless as possible. The debate was brought to a sudden termination in peals of laughter caused by an indiscreet reference of Dr Guillotine to his machine, but his ideas seem gradually to have leavened the minds of the Assembly, and after various debates decapitation was adopted as the method of execution in the penal code which became law on the 6th October 1791. At first it was intended that decapitation should be by the sword, but on account of a memorandum by M. Sanson, the executioner, pointing out the expense and certain other inconveniences attending that method, the Assembly referred the question to a committee, at whose request Dr Antoine Louis, secretary to the Academy of Surgeons, prepared a memorandum on the subject. Without mentioning the name of Guillotine, it recommended the adoption of an instrument similar to that which was formerly suggested by him. The Assembly decided in favour of the report, and the contract was offered to the person who usually provided the instruments of justice; but, as his terms were considered exorbitant, an agreement was ultimately come to with a German of the name of Schmidt, who, under the direction of M. Louis, furnished a machine for each of the French departments. After satisfactory experiments had been made with the machine on several dead bodies in the hospital of Bicêtre, it was erected on the Place de Grève for the execution of the highwayman Pelletier on the 25th April 1792. While the experiments regarding the machine were being carried on, it received the name *Louisette* or *La Petite Louison*, but the mind of the nation seems soon to have reverted to Guillotine, who first suggested its use; and in the *Journal des révolutions de Paris* for 28th April 1792 it is mentioned as *la guillotine*, a name which it thenceforth bore both popularly and officially. In 1795 the question was much debated as to whether or not death by the guillotine was instantaneous, and in support of the negative side the case of Charlotte Corday was adduced whose countenance, it is said, blushed as if with indignation when the executioner, holding up the head to the public gaze, struck it with his fist. The connexion of the instrument with the horrors of the Revolution has hindered its introduction into other countries, but in 1853 it was adopted under the name of *Fallschwert* or *Fallbeil* by the kingdom of Saxony; and it is used for the execution of sentences of death in France, Belgium and some parts of Germany. It has often been stated that Dr Guillotine perished by the instrument which bears his name, but it is beyond question that he survived the Revolution and died a natural death in 1814.

See Sédillot, *Réflexions historiques et physiologiques sur le supplice de la guillotine* (1795); Sue, *Opinion sur le supplice de la guillotine*, (1796); Réveillé-Parise, *Étude biographique sur Guillotine* (Paris, 1851); *Notice historique et physiologique sur le supplice de la guillotine* (Paris, 1830); Louis Dubois, *Recherches historiques et physiologiques sur la guillotine et détails sur Sanson* (Paris, 1843); and a paper by J. W. Croker in the *Quarterly Review* for December 1843, reprinted separately in 1850 under the title *The Guillotine, a historical Essay*.

GUILT, a lapse from duty, a crime, now usually the fact of wilful wrong-doing, the condition of being guilty of a crime, hence culpability, desert deserving of punishment. The O. Eng. form of the word is *gylt*. The *New English Dictionary* rejects for phonetic reasons the usually accepted connexion with the Teutonic root *gald-*, to pay, seen in Ger. *gelten*, to be of value, *Geld*, money, payment, English "yield."

GUIMARÃES (sometimes written *Guimaraens*), a town of northern Portugal, in the district of Braga, formerly included in the province of Entre-Minho-e-Douro; 36 m. N.E. of Oporto by the Trofa-Guimarães branch of the Oporto-Corunna railway. Pop. (1900) 9104. Guimarães is a very ancient town with Moorish fortifications; and even the quarters which are locally described as "new" date partly from the 15th century. It occupies a low hill, skirted on the north-west by a small tributary of the river Ave. The citadel, founded in the 11th century by Count Henry of Burgundy, was in 1094 the birthplace of his son Alphonso, the first king of Portugal. The font in which Alphonso was baptized is preserved, among other interesting relics, in the collegiate church of Santa Maria da Oliveira, "St Mary of the Olive," a Romanesque building of the 14th century, which occupies the site of an older foundation. This church owes its name to the legend that the Visigothic king Wamba (672–680) here declined the crown of Spain, until his olive wood spear-shaft blossomed as a sign that he should consent. The convent of São Domingos, now a museum of antiquities, has a fine 12th-13th century cloister; the town hall is built in the blend of Moorish and Gothic architecture known as Manoelline. Guimarães has a flourishing trade in wine and farm produce; it also manufactures cutlery, linen, leather and preserved fruits. Near the town are Citania, the ruins of a prehistoric Iberian city, and the hot sulphurous springs of Taipas, frequented since the 4th century, when Guimarães itself was founded.

GUIMARD, MARIE MADELEINE (1743–1816), French dancer, was born in Paris on the 10th of October 1743. For twenty-five years she was the star of the Paris Opéra. She made herself even more famous by her love affairs, especially by her long liaison with the prince de Soubise. She bought a magnificent house at Pantin, and built a private theatre connected with it, where Collé's *Partie de chasse de Henri IV* which was prohibited in public, and most of the *Proverbes* of Carmontelle (Louis Carrogis, 1717–1806), and similar licentious performances were given to the delight of high society. In 1772, in defiance of the

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archbishop of Paris, she opened a gorgeous house with a theatre seating five hundred spectators in the Chaussée d'Antin. In this Temple of Terpsichore, as she named it, the wildest orgies took place. In 1786 she was compelled to get rid of the property, and it was disposed of by lottery for her benefit for the sum of 300,000 francs. Soon after her retirement in 1789 she married Jean Etienne Despréaux (1748–1820), dancer, song-writer and playwright.

GUIMET, JEAN BAPTISTE (1795–1871), French industrial chemist, was born at Voiron on the 20th of July 1795. He studied at the École Polytechnique in Paris, and in 1817 entered the Administration des Poudres et Salpêtres. In 1828 he was awarded the prize offered by the Société d'Encouragement pour l'Industrie Nationale for a process of making artificial ultramarine with all the properties of the substance prepared from lapis lazuli; and six years later he resigned his official position in order to devote himself to the commercial production of that material, a factory for which he established at Fleurieux sur Saône. He died on the 8th of April 1871.

His son ÉMILE ÉTIENNE GUIMET, born at Lyons on the 26th of June 1836, succeeded him in the direction of the factory, and founded the Musée Guimet, which was first located at Lyons in 1879 and was handed over to the state and transferred to Paris in 1885. Devoted to travel, he was in 1876 commissioned by the minister of public instruction to study the religions of the Far East, and the museum contains many of the fruits of this expedition, including a fine collection of Japanese and Chinese porcelain and many objects relating not merely to the religions of the East but also to those of Ancient Egypt, Greece and Rome. He wrote *Lettres sur l'Algérie* (1877) and *Promenades japonaises* (1880), and also some musical compositions, including a grand opera, *Tai-Tsoung* (1894).

GUINEA, the general name applied by Europeans to part of the western coast region of equatorial Africa, and also to the gulf formed by the great bend of the coast line eastward and then southward. Like many other geographical designations the use of which is controlled neither by natural nor political boundaries, the name has been very differently employed by different writers and at different periods. In the widest acceptation of the term, the Guinea coast may be said to extend from 13° N. to 16° S., from the neighbourhood of the Gambia to Cape Negro. Southern or Lower Guinea comprises the coasts of Gabun and Loango (known also as French Congo) and the Portuguese possessions on the south-west coast, and Northern or Upper Guinea stretches from the river Casamance to and inclusive of the Niger delta, Cameroon occupying a middle position. In a narrower use of the name, Guinea is the coast only from Cape Palmas to the Gabun estuary. Originally, on the other hand, Guinea was supposed to begin as far north as Cape Nun, opposite the Canary Islands, and Gomes Azurara, a Portuguese historian of the 15th century, is said to be the first authority who brings the boundary south to the Senegal. The derivation of the name is uncertain, but is probably taken from Ghinea, Ginnie, Genni or Jenné, a town and kingdom in the basin of the Niger, famed for the enterprise of its merchants and dating from the 8th century A.D. The name Guinea is found on maps of the middle of the 14th century, but it did not come into general use in Europe till towards the close of the 15th century.[1]

[1] Guinea may, however, be derived from Ghana (or Ghanata) the name of the oldest known state in the western Sudan. Ghana dates, according to some authorities, from the 3rd century A.D. From the 7th to the 12th century it was a powerful empire, its dominions extending, apparently, from the Atlantic to the Niger bend. At one time Jenné was included within its borders. Ghana was finally conquered by the Mandingo kings of Melle in the 13th century. Its capital, also called Ghana, was west of the Niger, and is generally placed some 200 m. west of Jenné. In this district L. Desplagnes discovered in 1907 numerous remains of a once extensive city, which he identified as those of Ghana. The ruins lie 25 m. W. of the Niger, on both banks of a marigot, and are about 40 m. N. by E. of Kulikoro (see *La Géographie*, xvi. 329). By some writers Ghana city is, however, identified with Walata, which town is mentioned by Arab historians as the capital of Ghanata. The identification of Ghana city with Jenné is not justified, though Idrisi seems to be describing Jenné when writing of "Ghana the Great."

Although the term Gulf of Guinea is applied generally to that part of the coast south of Cape Palmas and north of the mouth of the Congo, particular indentations have their peculiar designations. The bay formed by the configuration of the land between Cape St Paul and the Nun mouth of the Niger is known as the Bight of Benin, the name being that of the once powerful native state whose territory formerly extended over the whole district. The Bight of Biafra, or Mafra (named after the town of Mafra in southern Portugal), between Capes Formosa and Lopez, is the most eastern part of the Gulf of Guinea; it contains the islands Fernando Po, Prince's and St Thomas's. The name Biafra—as indicating the country—fell into disuse in the later part of the 19th century.

The coast is generally so low as to be visible to navigators only within a very short distance, the mangrove trees being their only sailing marks. In the Bight of Biafra the coast forms an exception, being high and bold, with the Cameroon Mountains for background. At Sierra Leone also there is high land. The coast in many places maintains a dead level for 30 to 50 m. inland. Vegetation is exceedingly luxuriant and varied. The palm-oil tree is indigenous and abundant from the river Gambia to the Congo. The fauna comprises nearly all the more remarkable of African animals. The inhabitants are the true Negro stock.

By the early traders the coast of Upper Guinea was given names founded on the productions characteristic of the different parts. The Grain coast, that part of the Guinea coast extending for 500 m. from Sierra Leone eastward to Cape Palmas received its name from the export of the seeds of several plants of a peppery character, called variously grains of paradise, Guinea pepper and melegueta. The name Grain coast was first applied to this region in 1455. It was occasionally styled the Windy or Windward coast, from the frequency of short but furious tornadoes throughout the year. Towards the end of the 18th century, Guinea pepper was supplanted in Europe by peppers from the East Indies. The name now is seldom used, the Grain coast being divided between the British colony of Sierra Leone and the republic of Liberia. The Ivory coast extends from Cape Palmas to 3° W., and obtained its name from the quantity of ivory exported therefrom. It is now a French possession. Eastwards of the Ivory coast are the Gold and Slave coasts. The Niger delta was for long known as the Oil rivers. To two regions only of the coast is the name Guinea officially applied, the French and Portuguese colonies north of Sierra Leone being so styled.

Of the various names by which the divisions of Lower Guinea were known, Loango was applied to the country south of the Gabun and north of the Congo river. It is now chiefly included in French Congo. Congo was used to designate the country immediately south of the river of the same name, usually spoken of until the last half of the 19th century as the Zaire. Congo is now one of the subdivisions of Portuguese West Africa (see ANGOLA). It must not be confounded with the Belgian Congo.

Few questions in historical geography have been more keenly discussed than that of the first discovery of Guinea by the navigators of modern Europe. Lancelot Malocello, a Genoese, in 1270 reached at least as far as the Canaries. The first direct attempt to find a sea route to India was, it is said, also made by Genoese, Ugolino and Guido de Vivaldo, Tedisio Doria and others who equipped two galleys and sailed south along the African coast in 1291. Beyond the fact that they passed Cape Nun there is no trustworthy record of their voyage. In 1346 a Catalan expedition started for "the river of gold" on the Guinea coast; its fate is unknown. The French claim that between 1364 and 1410 the people of Dieppe sent out several expeditions to Guinea; and Jean de Béthencourt, who settled in the Canaries about 1402, made explorations towards the south. At length the consecutive efforts of the navigators employed by Prince Henry of Portugal—Gil Eannes, Diniz Diaz, Nuno Tristam, Alvaro Fernandez, Cadamosto, Usodimare and Diego Gomez—made known the coast as far as the Gambia, and by the end

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of the 15th century the whole region was familiar to Europeans.

For further information see SENEGAL, GOLD COAST, IVORY COAST, FRENCH GUINEA, PORTUGUESE GUINEA, LIBERIA, &c. For the history of European discoveries, consult G. E. de Azurara, *Chronica de descobrimento e conquista de Guiné*, published, with an introduction, by Barros de Santarem (Paris, 1841). English translation, *The Discovery and Conquest of Guinea*, by C. R. Beazley and E. Prestage (Hakluyt Society publications, 2 vols., London, 1896–1899), vol. ii. has an introduction on the early history of African exploration, &c. with full bibliographical notes). L. Estancelin, *Recherches sur les voyages et découvertes des navigateurs normands en Afrique* (Paris, 1832); Villault de Bellefond, *Relation des costes d'Afrique appellées Guinée* (Paris, 1669); Pere Labat, *Nouvelle Relation de l'Afrique occidentale* (Paris, 1728); Desmarquets, *Mém. chron. pour servir à l'hist. de Dieppe* (1785); Santarem, *Priorité de la découverte des pays situés sur la côte occidentale d'Afrique* (Paris, 1842); R. H. Major, *Life of Prince Henry the Navigator* (London, 1868); and the elaborate review of Major's work by M. Codine in the *Bulletin de la Soc. de Géog.* (1873); A. E. Nordenskiold, *Periplus* (Stockholm, 1897); *The Story of Africa*, vol. i. (London, 1892), edited by Dr Robert Brown.

GUINEA, a gold coin at one time current in the United Kingdom. It was first coined in 1663, in the reign of Charles II., from gold imported from the Guinea coast of West Africa by a company of merchants trading under charter from the British crown—hence the name. Many of the first guineas bore an elephant on one side, this being the stamp of the company; in 1675 a castle was added. Issued at the same time as the guinea were five-guinea, two-guinea and half-guinea pieces. The current value of the guinea on its first issue was twenty shillings. It was subsidiary to the silver coinage, but this latter was in such an unsatisfactory state that the guinea in course of time became over-valued in relation to silver, so much so that in 1694 it had risen in value to thirty shillings. The rehabilitation of the silver coinage in William III.'s reign brought down the value of the guinea to 21s. 6d. in 1698, at which it stood until 1717, when its value was fixed at twenty-one shillings. This value the guinea retained until its disappearance from the coinage. It was last coined in 1813, and was superseded in 1817 by the present principal gold coin, the sovereign. In 1718 the quarter-guinea was first coined. The third-guinea was first struck in George III.'s reign (1787). To George III.'s reign also belongs the "spade-guinea," a guinea having the shield on the reverse pointed at the base or spade-shaped. It is still customary to pay subscriptions, professional fees and honoraria of all kinds, in terms of "guineas," a guinea being twenty-one shillings.

GUINEA FOWL, a well-known domestic gallinaceous bird, so called from the country whence in modern times it was brought to Europe, the *Meleagris* and *Avis* or *Gallina Numidica* of ancient authors.[1] Little is positively known of the wild stock to which we owe our tame birds, nor can the period of its re-introduction (for there is apparently no evidence of its domestication being continuous from the time of the Romans) be assigned more than roughly to that of the African discoveries of the Portuguese. It does not seem to have been commonly known till the middle of the 16th century, when John Caius sent a description and figure, with the name *Gallus Mauritanus*, to Gesner, who published both in his *Paralipomena* in 1555, and in the same year Belon also gave a notice and woodcut under the name of *Poulle de la Guinée*; but while the former authors properly referred their bird to the ancient *Meleagris*, the latter confounded the *Meleagris* and the turkey.

The ordinary guinea fowl of the poultry-yard (see also POULTRY AND POULTRY-FARMING) is the *Numida meleagris* of ornithologists. The chief or only changes which domestication seems to have induced in its appearance are a tendency to albinism generally shown in the plumage of its lower parts, and frequently, though not always, the conversion of the colour of its legs and feet from dark greyish-brown to bright orange. That the home of this species is West Africa from the Gambia[2] to the Gaboon is certain, but its range in the interior is quite unknown. It appears to have been imported early into the Cape Verd Islands, where, as also in some of the Greater Antilles and in Ascension, it has run wild. Representing the species in South Africa we have the *N. coronata*, which is very numerous from the Cape Colony to Ovampoland, and the *N. cornuta* of Drs Finsch and Hartlaub, which replaces it in the west as far as the Zambesi. Madagascar also has its peculiar species, distinguishable by its red crown, the *N. mitrata* of Pallas, a name which has often been misapplied to the last. This bird has been introduced to Rodriguez, where it is now found wild. Abyssinia is inhabited by another species, the *N. ptilorhyncha*,[3] which differs from all the foregoing by the absence of any red colouring about the head. Very different from all of them, and the finest species known, is the *N. vulturina* of Zanzibar, conspicuous by the bright blue in its plumage, the hackles that adorn the lower part of its neck, and its long tail. By some writers it is thought to form a separate genus, *Acryllium*. All these guinea fowls except the last are characterized by having the crown bare of feathers and elevated into a bony "helmet," but there is another group (to which the name *Guttera* has been given) in which a thick tuft of feathers ornaments the top of the head. This contains four or five species, all inhabiting some part or other of Africa, the best known being the *N. cristata* from Sierra Leone and other places on the western coast. This bird, apparently mentioned by Marcgrave more than 200 years ago, but first described by Pallas, is remarkable for the structure—unique, if not possessed by its representative forms—of its *furcula*, where the head, instead of being the thin plate found in all other *Gallinae*, is a hollow cup opening upwards, into which the trachea dips, and then emerges on its way to the lungs. Allied to the genus *Numida*, but readily distinguished therefrom among other characters by the possession of spurs and the absence of a helmet, are two very rare forms, *Agelastes* and *Phasidus*, both from western Africa. Of their habits nothing is known. All these birds are beautifully figured in Elliot's *Monograph of the Phasianidae*, from drawings by Wolf. (A. N.)

GUINEA-WORM (*Dracontiasis*), a disease due to the *Filaria medinensis*, or *Dracunculus*, or Guinea-worm, a filarious nematode like a horse-hair, whose most frequent habitat is the subcutaneous and intramuscular tissues of the legs and feet. It is common on the Guinea coast, and in many other tropical and subtropical regions and has been familiarly known since ancient times. The condition of dracontiasis due to it is a very common one, and sometimes amounts to an epidemic. The black races are most liable, but Europeans of almost any social rank and of either sex are not altogether exempt. The worm lives in water, and, like the *Filaria sanguinis hominis*, appears to have an intermediate host for its larval stage. It is doubtful whether the worm penetrates the skin of the legs directly; it is not impossible that the intermediate host (a cyclops) which contains the larvae may be swallowed with the water, and that the larvae of the *Dracunculus* may be set free in the course of digestion.

GÜINES, a town in the interior of Havana province, Cuba, about 30 m. S.E. of Havana. Pop. (1907) 8653. It is situated on a plain, in the midst of a rich plantation district, chiefly devoted to the cultivation of tobacco. The first railway in Cuba was built from Havana to Güines between 1835 and 1838. One of the very few good highways of the island also connects Güines with the capital. The pueblo of Güines, which was built on a great private estate of the same name, dates back to about 1735. The church dates from 1850. Güines became a "villa" in 1814, and was destroyed by fire in 1817.

GUINGAMP, a town of north-western France, capital of an arrondissement in the department of Côtes-du-Nord, on the

[1] Columella (*De re rustica*, viii. cap. 2) distinguishes the *Meleagris* from the *Gallina Africana* or *Numidica*, the latter having, he says, a red wattle (*palea*, a reading obviously preferable to *galea*), while it was blue in the former. This would look as if the *Meleagris* had sprung from what is now called *Numida ptilorhyncha*, while the *Gallina Africana* originated in the *N. meleagris*, species which have a different range, and if so the fact would point to two distinct introductions—one by Greeks, the other by Latins.

[2] Specimens from the Gambia are said to be smaller, and have been described as distinct under the name of *N. rendalli*.

[3] Darwin (*Anim. and Pl. under Domestication*, i. 294), gives this as the original stock of the modern domestic birds, but obviously by an accidental error. As before observed, it may possibly have been the true μελεαγρὶς of the Greeks.

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right bank of the Trieux, 20 m. W.N.W. of St Brieuc on the railway to Brest. Pop. (1906), town 6937, commune 9212. Its chief church, Notre-Dame de Bon-Secours, dates from the 14th to the 16th centuries; two towers rise on each side of the richly sculptured western portal and a third surmounts the crossing. A famous statue of the Virgin, the object of one of the most important "pardons" or religious pilgrimages in Brittany, stands in one of the two northern porches. The central square is decorated by a graceful fountain in the Renaissance style, restored in 1743. Remains of the ramparts and of the château of the dukes of Penthièvre, which belong to the 15th century, still survive. Guingamp is the seat of a sub-prefect and of a tribunal of first instance. It is an important market for dairy-cattle, and its industries include flour-milling, tanning and leather-dressing. Guingamp was the chief town of the countship (subsequently the duchy) of Penthièvre. The Gothic chapel of Grâces, near Guingamp, contains fine sculptures.

GUINNESS, the name of a family of Irish brewers. The firm was founded by ARTHUR GUINNESS, who about the middle of the 18th century owned a modest brewing-plant at Leixlip, a village on the upper reaches of the river Liffey. In or about 1759 Arthur Guinness, seeking to extend his trade, purchased a small porter brewery belonging to a Mr Rainsford at St James's Gate, Dublin. By careful attention to the purity of his product, coupled with a shrewd perception of the public taste, he built up a considerable business. But his third son, BENJAMIN LEE GUINNESS (1798–1868), may be regarded as the real maker of the firm, into which he was taken at an early age, and of which about 1825 he was given sole control. Prior to that date the trade in Guinness's porter and stout had been confined to Ireland, but Benjamin Lee Guinness at once established agencies in the United Kingdom, on the continent, in the British colonies and in America. The export trade soon assumed huge proportions; the brewery was continually enlarged, and when in 1855 his father died, Benjamin Lee Guinness, who in 1851 was elected first lord mayor of Dublin, found himself sole proprietor of the business and the richest man in Ireland. Between 1860 and 1865 he devoted a portion of this wealth to the restoration of St Patrick's cathedral, Dublin. The work, the progress of which he regularly superintended himself, cost £160,000. Benjamin Lee Guinness represented the city of Dublin in parliament as a Conservative from 1865 till his death, and in 1867 was created a baronet. He died in 1868, and was succeeded in the control of the business by Sir Arthur Edward Guinness (b. 1840), his eldest, and Edward Cecil Guinness (b. 1847), his third, son. Sir ARTHUR EDWARD GUINNESS, who for some time represented Dublin in parliament, was in 1880 raised to the peerage as Baron Ardilaun, and about the same time disposed of his share in the brewery to his brother Edward Cecil Guinness. In 1886 EDWARD CECIL GUINNESS disposed of the brewery, the products of which were then being sent all over the world, to a limited company, in which he remained the largest shareholder. Edward Cecil Guinness was created a baronet in 1885, and in 1891 was raised to the peerage as Baron Iveagh.

The Guinness family have been distinguished for their philanthropy and public munificence. Lord Ardilaun gave a recreation ground to Dublin, and the famous Muckross estate at Killarney to the nation. Lord Iveagh set aside £250,000 for the creation of the Guinness trust (1889) for the erection and maintenance of buildings for the labouring poor in London and Dublin, and was a liberal benefactor to the funds of Dublin university.

GUINOBATAN, a town of the province of Albay, Luzon, Philippine Islands, on the Inaya river, 9 m. W. by N. of the town of Albay. Pop. (1903), 20,027. Its chief interest is in hemp, which is grown in large quantities in the neighbouring country.

GUIPÚZCOA, a maritime province of northern Spain, included among the Basque provinces, and bounded on the N. by the Bay of Biscay; W. by the province of Biscay (*Vizcaya*); S. and S.E. by Álava and Navarre: and N.E. by the river Bidassoa,[1] which separates it from France. Pop. (1900), 195,850; area, 728 sq. m. Situated on the northern slope of the great Cantabrian chain at its junction with the Pyrenees, the province has a great variety of surface in mountain, hill and valley; and its scenery is highly picturesque. The coast is much indented, and has numerous harbours, but none of very great importance; the chief are those of San Sebastian, Passjes, Guetaria, Deva and Fuenterrabia. The rivers (Deva, Urola, Oria, Urumea, Bidassoa) are all short, rapid and unnavigable. The mountains are for the most part covered with forests of oak, chestnut or pine; holly and arbutus are also common, with furze and heath in the poorer parts. The soil in the lower valleys is generally of hard clay and unfertile; it is cultivated with great care, but the grain raised falls considerably short of what is required for home consumption. The climate, though moist, is mild, pleasant and healthy; fruit is produced in considerable quantities, especially apples for manufacture into *saragua* or cider. The chief mineral products are iron, lignite, lead, copper, zinc and cement. Ferruginous and sulphurous springs are very common, and are much frequented every summer by visitors from all parts of the kingdom. There are excellent fisheries, which supply the neighbouring provinces with cod, tunny, sardines and oysters; and the average yearly value of the coasting trade exceeds £400,000. By Irun, Pasajes and the frontier roads £4,000,000 of imports and £3,000,000 of exports pass to and from France, partly in transit for the rest of Europe. Apart from the four Catalan provinces, no province has witnessed such a development of local industries as Guipúzcoa. The principal industrial centres are Irun, Renteria, Villabona, Vergara and Azpéitia for cotton and linen stuffs; Zumarraga for oxide; Eibar, Plasencia and Elgoilar for arms and cannon and gold incrustations; Irun for soap and carriages; San Sebastian, Irun and Onate for paper, glass, chemicals and saw-mills; Tolosa for paper, timber, cloths and furniture; and the banks of the bay of Pasajes for the manufacture of liqueurs of every kind, and the preparation of wines for export and for consumption in the interior of Spain. This last industry occupies several thousand French and Spanish workmen. An arsenal was established at Azpéitia during the Carlist rising of 1870–1874; but the manufacture of ordnance and gunpowder was subsequently discontinued. The main line of the northern railway from Madrid to France runs through the province, giving access, by a loop line, to the chief industrial centres. The custom-house through which it passes on the frontier is one of the most important in Spain. Despite the steep gradients, where traffic is hardly possible except by ox-carts, there are over 350 m. of admirably engineered roads, maintained solely by the local tax-payers. After San Sebastian, the capital (pop. 1900, 37,812), the chief towns are Fuenterrabia (4345) and Irun (9012). Other towns with more than 6000 inhabitants are Azpéitia (6066), Eibar (6583), Tolosa (8111) and Vergara (6196). Guipúzcoa is the smallest and one of the most densely peopled provinces of Spain; for its constant losses by emigration are counterbalanced by a high birth-rate and the influx of settlers from other districts who are attracted by its industrial prosperity.

For an account of its inhabitants and their customs, language and history, see BASQUES and BASQUE PROVINCES.

GUIRAUD, ERNEST (1837–1892), French composer, was born at New Orleans on the 26th of June 1837. He studied at the Paris Conservatoire, where he won the *grand prix de Rome*. His father had gained the same distinction many years previously, this being the only instance of both father and son obtaining this prize. Ernest Guiraud composed the following operas: *Sylvie* (1864), *Le Kobold* (1870), *Madame Turlupin* (1872), *Piccolino* (1876), *Galante Aventure* (1882), and also the ballet *Gretna Green*, given at the Opéra in 1873. His opera *Frédégonde* was left in an unfinished condition and was completed by Camille

[1] A small island in the Bidassoa, called La Isla de los Faisanes, or l'Isle de la Conférence, is celebrated as the place where the marriage of the duke of Guienne was arranged between Louis XI. and Henry IV. in 1463, where Francis I., the prisoner of Charles V., was exchanged for his two sons in 1526, and where in 1659 "the Peace of the Pyrenees" was concluded between D. Luis de Haro and Cardinal Mazarin.

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friend of Georges Bizet, was for some years professor of composition at the Conservatoire. He was the author of an excellent treatise on instrumentation. He died in Paris on the 6th of May 1892.

GUISBOROUGH, or GUISBROUGH, a market town in the Cleveland parliamentary division of the North Riding of Yorkshire, England, 10 m. E.S.E. of Middlesbrough by a branch of the North-Eastern railway. Pop. of urban district (1901), 5645. It is well situated in a narrow, fertile valley at the N. foot of the Cleveland Hills. The church of St Nicholas is Perpendicular, greatly restored. Other buildings are the town hall, and the modern buildings of the grammar school founded in 1561. Ruins of an Augustinian priory, founded in 1129, are beautifully situated near the eastern extremity of the town. The church contains some fine Decorated work, and the chapter house and parts of the conventual buildings may be traced. Considerable fragments of Norman and transitional work remain. Among the historic personages who were buried within its walls was Robert Bruce, lord of Annandale, the competitor for the throne of Scotland with John Baliol, and the grandfather of King Robert the Bruce. About 1 m. S.E. of the town there is a sulphurous spring discovered in 1822. The district neighbouring to Guisborough is rich in iron-stone. Its working forms the chief industry of the town, and there are also tanneries and breweries.

GUISE, a town of northern France, in the department of Aisne, on the Oise, 31 m. N. of Laon by rail. Pop. (1906), 7562. The town was formerly the capital of the district of Thiérache and afterwards of a countship (see below). There is a château dating in part from the middle of the 16th century. Camille Desmoulins was in 1762 born in the town, which has erected a statue to him. The chief industry is the manufacture of iron stoves and heating apparatus, carried on on the co-operative system in works founded by J. B. A. Godin, who built for his workpeople the huge buildings known as the *familistère*, in front of which stands his statue. A board of trade-arbitration is among the public institutions.

GUISE, HOUSE OF, a cadet branch of the house of Lorraine (*q.v.*). René II., duke of Lorraine (d. 1508), united the two branches of the house of Lorraine. From his paternal grandmother, Marie d'Harcourt, René inherited the countships of Aumale, Mayenne, Elbeuf, Lillebonne, Brionne and other French fiefs, in addition to the honours of the elder branch, which included the countship of Guise, the dowry of Marie of Blois on her marriage in 1333 with Rudolph or Raoul of Lorraine. René's eldest surviving son by his marriage with Philippa, daughter of Adolphus of Egmont, duke of Gelderland, was Anthony, who succeeded his father as duke of Lorraine (d. 1544), while the second, Claude, count and afterwards duke of Guise, received the French fiefs. The Guises, though naturalized in France, continued to interest themselves in the fortunes of Lorraine, and their enemies were always ready to designate them as foreigners. The partition between the brothers Anthony and Claude was ratified by a further agreement in 1530, reserving the lapsed honours of the kingdoms of Jerusalem, Sicily, Aragon, the duchy of Anjou and the countships of Provence and Maine to the duke of Lorraine. Of the other sons of René II., John (1498–1550) became the first cardinal of Lorraine, while Ferri, Louis and Francis fell fighting in the French armies at Marignano (1515), Naples (1528) and Pavia (1525) respectively.

CLAUDE OF LORRAINE, count and afterwards 1st duke of Guise (1496–1550), was born on the 20th of October 1496. He was educated at the French court, and at seventeen allied himself to the royal house of France by a marriage with Antoinette de Bourbon (1493–1583) daughter of François, Count of Vendôme. Guise distinguished himself at Marignano (1515), and was long in recovering from the twenty-two wounds he received in the battle; in 1521 he fought at Fuenterrabia, when Louise of Savoy ascribed the capture of the place to his efforts; in 1522 he defended northern France, and forced the English to raise the siege of Hesdin; and in 1523 he obtained the government of Champagne and Burgundy, defeating at Neufchâteau the imperial troops who had invaded his province. In 1525 he destroyed the Anabaptist peasant army, which was overrunning Lorraine, at Lupstein, near Saverne (Zabern). On the return of Francis I. from captivity, Guise was erected into a duchy in the peerage of France, though up to this time only princes of the royal house had held the title of duke and peer of France. The Guises, as cadets of the sovereign house of Lorraine and descendants of the house of Anjou, claimed precedence of the Bourbon princes. Their pretensions and ambitions inspired distrust in Francis I., although he rewarded Guise's services by substantial gifts in land and money. The duke distinguished himself in the Luxemburg campaign in 1542, but for some years before his death he effaced himself before the growing fortunes of his sons. He died on the 12th of April 1550.

He had been supported in all his undertakings and intrigues by his brother JOHN, cardinal of Lorraine (1498–1550), who had been made coadjutor of Metz at the age of three. The cardinal was archbishop of Reims, Lyons and Narbonne, bishop of Metz, Toul, Verdun, Thérouanne, Luçon, Albi, Valence, Nantes and Agen, and before he died had squandered most of the wealth which he had derived from these and other benefices. Part of his ecclesiastical preferments he gave up in favour of his nephews. He became a member of the royal council in 1530, and in 1536 was entrusted with an embassy to Charles V. Although a complaisant helper in Francis I.'s pleasures, he was disgraced in 1542, and retired to Rome. He died at Nogent-sur-Marne on the 18th of May 1550. He was extremely dissolute, but as an open-handed patron of art and learning, as the protector and friend of Erasmus, Marot and Rabelais he did something to counter-balance the general unpopularity of his calculating and avaricious brother.

Claude of Guise had twelve children, among them Francis, 2nd duke of Guise; Charles, 2nd cardinal of Lorraine (1524–1574), who became archbishop of Reims in 1538 and cardinal in 1547; Claude, marquis of Mayenne, duke of Aumale (1526–1573), governor of Burgundy, who married Louise de Brézé, daughter of Diane de Poitiers, thus securing a powerful ally for the family; Louis (1527–1578), bishop of Troyes, archbishop of Sens and cardinal of Guise; René, marquis of Elbeuf (1536–1566), from whom descended the families of Harcourt, Armagnac, Marsan and Lillebonne; Mary of Lorraine (*q.v.*), generally known as Mary of Guise, who after the death of her second husband, James V. of Scotland, acted as regent of Scotland for her daughter Mary, queen of Scots; and Francis (1534–1563), grand prior of the order of the Knights of Malta. The solidarity of this family, all the members of which through three generations cheerfully submitted to the authority of the head of the house, made it a formidable factor in French politics.

FRANCIS OF LORRAINE, 2nd duke of Guise (1519–1563), "le grand Guise," was born at Bar on the 17th of February 1519. As count of Aumale he served in the French army, and was nearly killed at the siege of Boulogne in 1545 by a wound which brought him the name of "Balafré." Aumale was made (1547) a peerage-duchy in his favour, and on the accession of Henry II. the young duke, who had paid assiduous court to Diane de Poitiers, shared the chief honours of the kingdom with the constable Anne de Montmorency. Both cherished ambitions for their families, but the Guises were more unscrupulous in subordinating the interests of France to their own. Montmorency's brutal manners, however, made enemies where Guise's grace and courtesy won him friends. Guise was a suitor for the hand of Jeanne d'Albret, princess of Navarre, who refused, however, to become a sister-in-law of a daughter of Diane de Poitiers and remained one of the most dangerous and persistent enemies of the Guises. He married in December 1548 Anne of Este, daughter of Ercole II., duke of Ferrara, and through her mother Renée, a granddaughter of Louis XII. of France. In the same year he had put down a peasant rising in Saintonge with a humanity that compared very favourably with the cruelty shown by Montmorency to the town of Bordeaux. He made preparations in Lorraine for the king's German campaign of 1551–52. He was already governor of Dauphiné, and now became grand chamberlain, prince of Joinville, and hereditary seneschal of Champagne, with large additions to his already considerable revenues. He was charged with the defence of Metz, which Henry II. had entered in 1551. He reached the

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city in August 1552, and rapidly gave proof of his great powers as a soldier and organizer by the skill with which the place, badly fortified and unprovided with artillery, was put in a state of defence. Metz was invested by the duke of Alva in October with an army of 60,000 men, and the emperor joined his forces in November. An army of brigands commanded by Albert of Brandenburg had also to be reckoned with. Charles was obliged to raise the siege on the 2nd of January 1553, having lost, it is said, 30,000 men before the walls. Guise used his victory with rare moderation and humanity, providing medical care for the sick and wounded left behind in the besiegers' camp. The subsequent operations were paralysed by the king's suspicion and carelessness, and the constable's inactivity, and a year later Guise was removed from the command. He followed the constable's army as a volunteer, and routed the army of Charles V. at the siege of Renty on the 12th of August 1554. Montmorency's inaction rendered the victory fruitless, and a bitter controversy followed between Guise and the constable's nephew Coligny, admiral of France, which widened a breach already existing.

The conclusion of a six years' truce at Vaucelles (1556) disappointed Guise's ambitions, and he was the main mover in the breach of the treaty in 1558, when he was sent at the head of a French army to Italy to the assistance of Pope Paul IV. against Spain. Guise, who perhaps had in view the restoration to his family of the Angevin dominion of Naples and Sicily, crossed the Alps early in 1557 and after a month's delay in Rome, where he failed to receive the promised support, marched on the kingdom of Naples, then occupied by the Spanish troops under Alva. He seized and sacked Campli (April 17th), but was compelled to raise the siege of Civitella. Meanwhile the pope had veered round to a Spanish alliance, and Guise, seeing that no honour was to be gained in the campaign, wisely spared his troops, so that his army was almost intact when, in August, he was hastily summoned home to repel the Spanish army which had invaded France from the north, and had taken St Quentin. On reaching Paris in October Guise was made lieutenant-general of the kingdom, and proceeded to prepare for the siege of Calais. The town was taken, after six days' fighting, on the 6th of January 1558, and this success was followed up by the capture of Guines, Thionville and Arlon, when the war was ended by the treaty of Câteau Cambrésis (1559). Although his brother, the cardinal of Lorraine, was one of the negotiators, this peace was concluded against the wishes of Guise, and was regarded as a triumph of the constable's party. The Guises were provided with a weapon against Montmorency by the bishop of Arras (afterwards Cardinal Granvella), who gave to the cardinal of Lorraine at an interview at Péronne in 1558 an intercepted letter proving the Huguenot leanings of the constable's nephews.

On the accession in 1559 of Francis II., their nephew by marriage with Mary Stuart, the royal authority was practically delegated to Guise and the cardinal, who found themselves beyond rivalry for the time being. They had, however, to cope with a new and dangerous force in Catherine de' Medici, who was now for the first time free to use her political ability. The incapacity, suspicion and cruelty of the cardinal, who controlled the internal administration, roused the smaller nobility against the Lorraine princes. A conspiracy to overturn their government was formed at Nantes, with a needy Périgord nobleman named La Renaudie as its nominal head, though the agitation had in the first instance been fostered by the agents of Louis I., prince of Condé. The Guises were warned of the conspiracy while the court was at Blois, and for greater security removed the king to Amboise. La Renaudie, nothing daunted, merely postponed his plans; and the conspirators assembled in small parties in the woods round Amboise. They had, however, been again betrayed and many of them were surrounded and taken before the *coup* could be delivered; one party, which had seized the château of Noizay, surrendered on a promise of amnesty given "on his faith as a prince" by James of Savoy, duke of Nemours, a promise which, in spite of the duke's protest, was disregarded. On the 19th of March 1560, La Renaudie and the rest of the conspirators openly attacked the château of Amboise. They were repelled; their leader was killed; and a large number were taken prisoners. The merciless vengeance of the Guises was the measure of their previous fears. For a whole week the torturings, quarterings and hangings went on, the bodies being cast into the Loire, the young king and queen witnessing the bloody spectacle day by day from a balcony of the château.

The cruel repression of this "conspiracy of Amboise" inspired bitter hatred of the Guises, since they were avenging a rising rather against their own than the royal authority. They now entrenched themselves with the king at Orleans, and the Bourbon princes, Anthony, king of Navarre, and his brother Condé, were summoned to court. The Guises convened a special commission to try Condé, who was condemned to death; but the affair was postponed by the chancellor, and the death of Francis II. in December saved Condé. Guise then made common cause with his old rival Montmorency and with the Marshal de Saint André against Catherine, the Bourbons and Coligny. This alliance, constituted on the 6th of April 1561, and known as the triumvirate, aimed at the annulment of the concessions made by Catherine to the Huguenots. The cardinal of Lorraine fomented the discord which appeared between the clergy of the two religions when they met at the colloquy of Poissy in 1561, but in spite of the extreme Catholic views he there professed, he was at the time in communication with the Lutheran princes of Germany, and in February 1562 met the duke of Württemberg at Zabern to discuss the possibility of a religious compromise.

The signal for civil war was given by an attack of Guise's escort on a Huguenot congregation at Vassy (1st of March 1562). Although Guise did not initiate the massacre, and although, when he learned what was going on, he even tried to restrain his soldiers, he did not disavow their action. When Catherine de' Medici forbade his entry into Paris, he accepted the challenge, and on the 16th of March he entered the city, where he was a popular hero, at the head of 2000 armed nobles. The provost of the merchants offered to put 20,000 men and two million livres at his disposal. In September he joined Montmorency in besieging Rouen, which was sacked as if it had been a foreign city, in spite of Guise's efforts to save it from the worst horrors. At the battle of Dreux (19th of December 1562) he commanded a reserve army, with which he saved Montmorency's forces from destruction and inflicted a crushing defeat on the Huguenots. The prince of Condé was his prisoner, while the capture of Montmorency by the Huguenots and the assassination of the Marshal de Saint-André after the battle left Guise the undisputed head of the Catholic party. He was appointed lieutenant-general of the kingdom, and on the 5th of February 1563 he appeared with his army before Orleans. On the 19th, however, he was shot by the Huguenot Jean Poltrot de Méré as he was returning to his quarters, and died on the 24th of the effects of the wound. Guise's splendid presence, his generosity and humanity and his almost unvarying success on the battlefield made him the idol of his soldiers. He attended personally to the minutest details, and Monluc complains that he even wrote out his own orders. The mistakes and cruelties associated with his name were partly due to the evil counsels of his brother Charles, the cardinal, whose cowardice and insincerity were the scorn of his contemporaries. The negotiations of the Guises with Spain dated from the interview with Granvella at Péronne, in 1558, and after the death of his brother the cardinal of Lorraine was constantly in communication with the Spanish court, offering, in the event of the failure of direct heirs to the Valois kings, to deliver up the frontier fortresses and to acknowledge Philip II. as king of France. His death in 1574 temporarily weakened the extreme Catholic party.

Of the children of Francis "le Balafré" five survived him: Henry, 3rd duke of Guise; Charles, duke of Mayenne (1554–1611) (*q.v.*), who consolidated the League; Catherine (1552–1596), who married Louis of Bourbon, duke of Montpensier, and encouraged the fanaticism of the Parisian leaguers; Louis, second cardinal of Guise, afterwards of Lorraine (1555–1588), who was assassinated with his brother Henry; and Francis (1558–1573).

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Henry of Lorraine, 3rd duke of Guise (1550–1588), born on the 31st of December 1550, was thirteen years old at the time of his father's death, and grew up under the domination of a passionate desire for revenge. Catherine de' Medici refused to take steps against Coligny, who was formally accused by the duchess of Guise and her brothers-in-law of having incited the murder. In 1566 she insisted on a formal reconciliation at Moulins between the Guises and Coligny, at which, however, none of the sons of the murdered man was present. Henry and his brothers were, however, compelled in 1572 to sign an ambiguous assent to this agreement. Guise's widow married James of Savoy, duke of Nemours, and the young duke at sixteen went to fight against the Turks in Hungary. On the fresh outbreak of civil war in 1567 he returned to France and served under his uncle Aumale. In the autumn of 1568 he received a considerable command, and speedily came into rivalry with Henry of Valois, duke of Anjou. He had not inherited his father's generalship, and his rashness and headstrong valour more than once brought disaster on his troops, but the showy quality of his fighting brought him great popularity in the army. In the defence of Poitiers in 1569 with his brother, the duke of Mayenne, he showed more solid abilities as a soldier. On the conclusion of peace in 1570 he returned to court, where he made no secret of his attachment to Margaret of Valois. His pretensions were violently resented by her brothers, who threatened his life, and he saved himself by a precipitate marriage with Catherine of Cleves (daughter of Francis of Cleves, duke of Nevers, and Margaret of Bourbon), the widow of a Huguenot nobleman, Antoine de Croy, prince of Porcien. Presently he ended his disgrace by an apparent reconciliation with Henry of Valois and an alliance with Catherine de' Medici. He was an accomplice in the first attack on Coligny's life, and when permission for the massacre of Saint Bartholomew had been extorted from Charles IX. he roused Paris against the Huguenots, and satisfied his personal vengeance by superintending the murder of Coligny. He was now the acknowledged chief of the Catholic party, and the power of his family was further increased by the marriage (1575) of Henry III. with Louise of Vaudémont, who belonged to the elder branch of the house of Lorraine. In a fight at Dormans (10th of October 1575), the only Catholic victory in a disastrous campaign, Guise received a face wound which won for him his father's name of Balafré and helped to secure the passionate attachment of the Parisians. He refused to acquiesce in the treaty of Beaulieu (5th of May 1576), and with the support of the Jesuits proceeded to form a "holy league" for the defence of the Roman Catholic Church. The terms of enrolment enjoined offensive action against all who refused to join. This association had been preceded by various provincial leagues among the Catholics, notably one at Péronne. Condé had been imposed on this town as governor by the terms of the peace, and the local nobility banded together to resist him. This, like the Holy League itself, was political as well as religious in its aims, and was partly inspired by revolt against the royal authority. In the direction of the League Guise was hampered by Philip of Spain, who subsidized the movement, while he also had to submit to the dictation of the Parisian democracy. Ulterior ambitions were freely ascribed to him. It was asserted that papers seized from his envoy to Rome, Jean David, revealed a definite design of substituting the Lorraines, who represented themselves as the successors of Charlemagne, for the Valois; but these papers were probably a Huguenot forgery. Henry III. eventually placed himself at the head of the League, and resumed the war against the Huguenots; but on the conclusion of peace (September 1577) he seized the opportunity of disbanding the Catholic associations. The king's jealousy of Guise increased with the duke's popularity, but he did not venture on an open attack, nor did he dare to avenge the murder by Guise's partisans of one of his personal favourites, Saint-Mégrin, who had been set on by the court to compromise the reputation of the duchess of Guise.[1]

Meanwhile the duke had entered on an equivocal alliance with Don John of Austria. He was also in constant correspondence with Mary of Lorraine, and meditated a descent on Scotland in support of the Catholic cause. But the great riches of the Guises were being rapidly dissipated, and in 1578 the duke became a pensioner of Philip II. When in 1584 the death of the duke of Anjou made Henry of Navarre the next heir to the throne, the prospect of a Huguenot dynasty roused the Catholics to forget their differences, and led to the formation of a new league of the Catholic nobles. At the end of the same year Guise and his brother, the duke of Mayenne, with the assent of other Catholic nobles, signed a treaty at Joinville with Philip II., fixing the succession to the crown on Charles, cardinal of Bourbon, to the exclusion of the Protestant princes of his house. In March 1585 the chiefs of the League issued the Declaration of Péronne, exposing their grievances against the government and announcing their intention to restore the dignity of religion by force of arms. On the refusal of Henry III. to accept Spanish help against his Huguenot subjects, war broke out. The chief cities of France declared for the League, and Guise, who had recruited his forces in Germany and Switzerland, took up his headquarters at Châlons, while Mayenne occupied Dijon, and his relatives, the dukes of Elbeuf, Aumale and Mercœur,[2] roused Normandy and Brittany. Henry III. accepted, or feigned to accept, the terms imposed by the Guises at Nemours (7th of July 1585). The edicts in favour of the Huguenots were immediately revoked. Guise added to his reputation as the Catholic champion by defeating the German auxiliaries of the Huguenots at Vimory (October 1587) and Auneau (November 1587). The protestations of loyalty to Henry III. which had marked the earlier manifestoes of the League were modified. Obedience to the king was now stated to depend on his giving proof of Catholic zeal and showing no favour to heresy. In April 1588 Guise arrived in Paris, where he put himself at the head of the Parisian mob, and on the 12th of May, known as the Day of the Barricades, he actually had the crown within his grasp. He refused to treat with Catherine de' Medici, who was prepared to make peace at any cost, but restrained the populace from revolution and permitted Henry to escape from Paris. Henry came to terms with the League in May, and made Guise lieutenant-general of the royal armies. The estates-general, which were assembled at Blois, were devoted to the Guise interest, and alarmed the king by giving voice to the political as well as the religious aspirations of the League. Guise remained at the court of Blois after receiving repeated warnings that Henry meditated treason. On the 25th of December he was summoned to the king's chamber during a sitting of the royal council, and was murdered by assassins carefully posted by Henry III. himself. The cardinal of Lorraine was murdered in prison on the next day. The history of the Guises thenceforward centres in the duke of Mayenne (*q.v.*).

By his wife, Catherine of Cleves, the third duke had fourteen children: among them Charles, 4th duke of Guise (1571–1640); Claude, duke of Chevreuse (1578–1657), whose wife, Marie de Rohan, duchess of Chevreuse, became famous for her intrigues; Louis (1585–1621), 3rd cardinal of Guise, archbishop of Reims, remembered for his liaison with Charlotte des Essarts, mistress of Henry IV.

Charles, 4th duke of Guise (1571–1640), was imprisoned for three years after his father's death. He married Henriette Catherine de Joyeuse, widow of the duke of Montpensier. His eldest son predeceased him, and he was succeeded by his second son **Henry** (1614–1664), who had been archbishop of Reims, but renounced the ecclesiastical estate and became 5th duke. He made an attempt (1647) on the crown of Naples, and was a prisoner in Spain from 1648 to 1652. A second expedition to Naples in 1654 was a fiasco. He was succeeded by his nephew, **Louis Joseph** (1650–1671), as 6th duke. With his son, **Francis Joseph** (1670–1675), the line failed; and the title and estates passed to his great-aunt, Marie of Lorraine, duchess of Guise

[1] This incident supplied Alexandre Dumas *père* with the subject of his *Henri III et sa cour* (1829).

[2] Philippe-Emmanuel of Lorraine, duke of Mercœur, a cadet of Lorraine and brother of Louise de Vaudémont, Henry III.'s queen. His wife, Mary of Luxemburg, descended from the dukes of Brittany, and he was made governor of the province in 1582. He aspired to separate sovereignty, and called his son prince and duke of Brittany.

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GENEALOGICAL TABLE OF THE HOUSE OF GUISE

René II. (who united the two branches of the house of Lorraine), duke of Lorraine, and Philippa of Gelderland,[1] had (besides two older boys who died in childhood), and four unmarried daughters)

- Antoine, duke of Lorraine, †1544. ancestor of the dukes of Lorraine and the house of Mercœur.
- Claude, 1st duke of Guise, †1550. =Antoinette of Bourbon.
  - Francis, 2nd duke of Guise, †1563. =Anne d'Este.
  - Charles, 2nd cardinal of Lorraine, †1574.
  - Claude, marquis of Mayenne and duke of Aumale, †1573. =Louise de Brézé.
    - Charles, duke of Aumale, †1631.
    - Henry, 3rd duke, †1588. =Catherine of Cleves (and had 14 children).
      - Charles, duke of Mayenne, †1611.
        - Henry, duke of Mayenne, †1621.
          - Charles, 4th duke of Guise, †1640.
            - Henry, archbishop of Reims, and 5th duke, †1664.[1]
            - Marie, called Mlle. de Guise, succeeded to the duchy in 1675 and sold it to Louis Augustus, duke of Maine.
          - Claude, duke of Chevreuse. =Marie de Rohan, widow of the duke of Luynes.
      - Louis, 2nd cardinal of Guise, †1588.
        - Louis, 3rd cardinal of Guise, †1621.
          - Louis, chevalier of Guise and duke of Joyeuse, †1654.
            - Louis-Joseph, 6th duke of Guise, †1671.
              - Francis-Joseph, 7th and last duke of Guise, †1675.
          - And eight more.
        - And eleven more.
      - And five others.
  - John, 1st cardinal of Lorraine.
  - Henri, killed at Marignano.
  - Louis, killed at Naples.
  - Francis, killed at Pavia.
- Francis, grand prior.
- René, marquis of Elbeuf, †1566.
  - Charles, duke of Elbeuf, †1605.
- Catherine = Louis de Bourbon, duke of Montpensier.
  - And five others.
- Marie = (1) duke of Longueville; (2) James V. of Scotland.
  - Mary Stuart, queen of Scots.
- And five others.

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(1615–1688), daughter of the 4th duke, and with her the title became extinct. The title is now vested in the family of the Bourbon-Orleans princes.

AUTHORITIES.—A number of contemporary documents relating to the Guises are included by L. Cimber and F. Danjou in their *Archives curieuses de l'histoire de France* (Paris, 1834, &c.). Vol. iii. contains a soldier's diary of the siege of Metz, first published in Italian (Lyons, 1553), accounts of the sieges of Calais (Tours, 1558), of Thionville (Paris, 1558); vol. iv. an account of the tumult of Amboise from the *Mémoires* of Condé, and four accounts of the affair of Vassy; vol. v. four accounts of the battle of Dreux, one dictated by Guise, and accounts of the murder of Guise; vol. xi. accounts of the Parisian revolution of 1558; and vol. xii. numerous pamphlets and pieces dealing with the murder of Henry of Guise and his brother. An account of the murder of Guise and of the subsequent measures taken by Maisonne, which was supplied by the Venetian ambassador, G. Mocenigo, to his government, is printed by H. Brown in the *Eng. Hist. Rev.* (April 1895). For the foreign policy of the Guises, and especially their relations with Scotland, there is abundant material in the English *Calendar of State Papers* of Queen Elizabeth (Foreign Series) and in the correspondence of Cardinal Granvella. The memoirs of Francis, duke of Guise, covering the years 1547 to 1563, were published by Michel and Poujoulat in series i. vol. iv. of their *Coll. de mémoires*. Among contemporary memoirs see especially those of the prince of Condé, of Blaise de Monluc and of Gaspard de Saulx-Tavannes. See also *La Vie de F. de Lorraine, duc de Guise* (Paris, 1681), by J. B. H. du Trousset de Valincourt; A. de Ruble, *L'Assassinat de F. de Lorraine, duc de Guise* (1897), where there is a list of the MS. sources available for a history of the house; R. de Bouillé, *Hist. des ducs de Guise* (4 vols., 1849); H. Forneron, *Les Guise et leur époque* (2 vols., 1887).

GUITAR (Fr. *guitarre*, Ger. *Guitarre*, Ital. *chitarra*, Span. *guitarra*), a musical instrument strung with gut strings twanged by the fingers, having a body with a flat back and graceful incurvations in complete contrast to the members of the family of lute (*q.v.*), whose back is vaulted. The construction of the instrument is of paramount importance in assigning to the guitar its true position in the history of musical instruments, midway between the cithara (*q.v.*) and the violin. The medieval stringed instruments with neck fall into two classes, characterized mainly by the construction of the body: (1) Those which, like their archetype the cithara, had a body composed of a flat or delicately arched back and soundboard joined by ribs. (2) Those which, like the lyre, had a body consisting of a vaulted back over which was glued a flat soundboard without the intermediary of ribs; this method of construction predominates among Oriental Instruments and is greatly inferior to the first. A striking proof of this inferiority is afforded by the fact that instruments with vaulted backs, such as the rebab or rebec, although extensively represented during the middle ages in all parts of Europe by numerous types, have shown but little or no development during the course of some twelve centuries, and have dropped out one by one from the realm of practical music without leaving a single survivor. The guitar must be referred to the first of these classes.

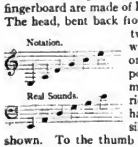
The back and ribs of the guitar are of maple, ash or cherry-wood, frequently inlaid with rose-wood, mother-of-pearl, tortoise-shell, &c., while the soundboard is of pine and has one large ornamental rose sound hole. The bridge, to which the strings are fastened, is of ebony with an ivory nut which determines the one end of the vibrating strings, while the nut at the end of the fingerboard determines the other. The neck and fingerboard are made of hard wood, such as ebony, beech or pear. The head, bent back from the neck at an obtuse angle contains two parallel barrels or long holes through which the pegs or metal screws pass, three on each side of the head. The correct positions for stopping the intervals are marked on the fingerboard by little metal ridges called frets. The modern guitar has six strings, three of gut and three of silk covered with silver wire, tuned as shown. To the thumb are assigned the three deepest strings, while the first, second and third fingers are used to twang the highest strings. It is generally stated that the sixth or lowest string was added in 1790 by Jacob August Otto of Jena, who was the first in Germany to take up the construction of guitars after their introduction from Italy in 1788 by the duchess Amalie of Weimar. Otto[1] states that it was Capellmeister Naumann of Dresden who requested him to make him a guitar with six strings by adding the low E, a spun wire string. The original guitar brought from Italy by the duchess Amalie had five strings,[2] the lowest A being the only one covered with wire. Otto also covered the D in order to increase the fulness of the tone. In Spain six-stringed guitars and vihuelas were known in the 16th century; they are described by Juan Bermudo[3] and others.[4] The lowest string was tuned to G. Other Spanish guitars of the same period had four, five or seven strings or courses of strings in pairs of unisons. They were always twanged by the fingers.

From Juan Bermudo.

FIG. 1.—Spanish Guitar with seven Strings. 1555. *Vihuela da Mano.*

The guitar is derived from the cithara[5] both structurally and etymologically. It is usually asserted that the guitar was introduced into Spain by the Arabs, but this statement is open to the gravest doubts. There is no trace among the instruments of the Arabs known to us of any similar to the guitar in construction or shape, although a guitar (fig. 2) with slight incurvations is known to the ancient Egyptians.[6] There is also extant a fine example of the guitar, with ribs and incurvations and a long neck provided with numerous frets, on a Hittite bas-relief on the dromos at Euyuk (*c.* 1000 B.C.) in Cappadocia.[7] Unless other monuments of much later date should come to light showing guitars with ribs, we shall be justified in assuming that the instrument, which required skill in construction, died out in Egypt and in Asia before the days of classic Greece, and had to be evolved anew from the cithara by the Greeks of Asia Minor. That the evolution should take place within the Byzantine Empire or in Syria would be quite consistent with the traditions of the Greeks and their veneration for the cithara, which would lead them to adapt the neck and other improvements to it, rather than to adopt the rebab, the tanbur or the barbiton from the Persians or Arabians. This is, in fact, what seems to have taken place. It is true that in the 14th century in an enumeration of musical instruments by the Archipreste de Hita, a *guitarra morisca* is mentioned and unfavourably compared with the *guitarra latina*; moreover, the Arabs of the present day still use an instrument called *kustra* (which in N. Africa would be guithara), but it has a vaulted back, the body being like half a pear with a long neck; the strings are twanged by means of a quill. The Arab instrument therefore belongs to a different class, and to admit the instrument as the ancestor of the Spanish guitar would be tantamount to deriving the guitar from the lute.[8]

By peering together various indications given by Spanish writers, we obtain a clue to the identity of the medieval instruments, which, in the absence of absolute proof, is entitled to serious consideration. From Bermudo's work, quoted above, we learn that the guitar and the *vihuela da mano* were practically identical, differing only in accordance and occasionally in the number of strings.[9] Three kinds of vihuelas were known in Spain during the middle ages, distinguished by the qualifying phrases *da arco* (with bow), *da mano* (by hand), *da penola* (with quill). Spanish scholars[10] who have inquired into this question of identity state that the *guitarra latina* was afterwards known as the *vihuela da mano*, a statement fully supported by



[1] *Über den Bau der Bogeninstrumente* (Jena, 1828), pp. 94 and 95.

[2] See Pietro Millioni, *Vero e facil modo d' imparare a sonare ei accordare da se medesimo la chitarra spagnola*, with illustration (Rome, 1637).

[3] *Declaracion de instrumentos musicales* (Ossuna, 1555), fol. xciii. *b* and fol. xci. *a*. See also illustration of *vihuela da mano*.

[4] See also G. G. Kapsperger, *Libro primo di Villanelle con l' intavolatura del chitarone et alfabeto per la chitarra spagnola* (three books, Rome, 1610–1623).

[5] See Kathleen Schlesinger, *The Instruments of the Orchestra*, part ii. "Precursors of the Violin Family," pp. 230–248.

[6] See Denon's *Voyage in Egypt* (London, 1802, pl. 55).

[7] Illustrated from a drawing in Perrot and Chipiez, "Judée Sardaigne, Syrie, Cappadoce." Vol. iv. of *Hist. de l'art dans l'antiquité*, Paris, 1887, p. 670. Also see plate from a photograph by Prof. John Garstang, in Kathleen Schlesinger, *op. cit.*

[8] See Biernath, *Die Guitarre* (1908).

[9] See also Luys Milan, *Libro de musica de vihuela da mano, Intitulado Il Maestro*, where the accordance is D, G, C, E, A, D from bass to treble.

[10] Mariano Soriano, *Fuertes Historia de la musica española* (Madrid, 1855), i. 105, and iv. 208, &c.

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other evidence. As the Arab *kuitra* was known to be played by means of a quill, we shall not be far wrong in identifying it with the *vihuela da penola*. The word *vihuela* or *viola* is connected with the Latin *fidicula* or *fides*, a stringed instrument mentioned by Cicero[1] as being made from the wood of the plane-tree and having many strings. The remaining link in the chain of identification is afforded by St Isidore, bishop of Seville in the 7th century, who states that fidicula was another name for cithara, "Veteres aut citharas fidicula vel fidice nominaverunt."[2] The fidicula therefore was the cithara, either in the original classical form or in one of the transitions which transformed it into the guitar. The existence of a superior *guitarra latina* side by side with the *guitarra morisca* is thus explained. It was derived directly from the classical cithara introduced by the Romans into Spain, the archetype of the structural beauty which formed the basis of the perfect proportions and delicate structure of the violin. In an inventory[3] made by Philip van Wilder of the musical instruments which had belonged to Henry VIII. is the following item bearing on the question: "foure gitternes with iiii. cases *they are called Spanishe Vialles*." *Vial* or *viol* was the English equivalent of *vihuela*. The transitions whereby the cithara acquired a neck and became a guitar are shown in the miniatures (fig. 3) of a single MS., the celebrated Utrecht Psalter, which gave rise to so many discussions. The Utrecht Psalter was executed in the monastery of Reims in the 9th century, and the miniatures, drawn by an Anglo-Saxon artist attached to the Reims school, are unique, and illustrate

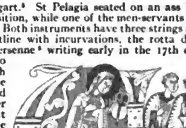
From Denon's *Voyage in Egypt.*

FIG. 2.—Ancient Egyptian Guitar. 1700 to 1200 B.C.

FIG. 3.—Instrumentalists from the Utrecht Psalter, 9th century: (*a*) The bass rotta, first transition of cithara in (*C*); (*b*, *c*, *d*), Transitions showing the addition of neck to the body of the cithara.

the Psalter, psalm by psalm. It is evident that the Anglo-Saxon artist, while endowed with extraordinary talent and vivid imagination, drew his inspiration from an older Greek illustrated Psalter from the Christian East,[4] where the evolution of the guitar took place.

One of the earliest representations (fig. 4) of a guitar in Western Europe occurs in a Passionale from Zwifalten A.D. 1180, now in the Royal Library at Stuttgart.[5] St Pelagia seated on an ass holds a rotta, or cithara in transition, while one of the men-servants leading her ass holds her guitar. Both instruments have three strings and the characteristic guitar outline with incurvations, the rotta differing in having no neck. Mersenne[6] writing early in the 17th century describes and figures two Spanish guitars, one with four, the other with five strings; the former had a cittern head, the latter had the head bent back at an obtuse angle from the neck, as in the modern instrument; he gives the Italian, French and Spanish tablatures which would seem to show that the guitar already enjoyed a certain vogue in France and Italy as well as in Spain. Mersenne states that the proportions of the guitar *Mateni*

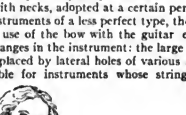


From Dr H. Janitschek's *Geschichte der deutschen Malerei.*

FIG. 4.—Representation of a European Guitar. A.D. 1180.

resembled that the length of the neck from shoulder to nut shall be equal to the length of the body from the centre of the rose to the tail end. From this time until the middle of the 19th century the guitar enjoyed great popularity on the continent, and became the fashionable instrument in England after the Peninsular War, mainly through the virtuosity of Ferdinand Sor, who also wrote compositions for it. This popularity of the guitar was due less to its merits as a solo instrument than to the ease with which it could be mastered sufficiently to accompany the voice. The advent of the Spanish guitar in England led to the wane in the popularity of the cittern, also known at that time in contradistinction as the English or wire-strung guitar, although the two instruments differed in many particulars. As further evidence of the great popularity of the guitar all over Europe may be instanced the extraordinary number of books extant on the instrument, giving instructions how to play the guitar and read the tablature.[7] (K. S.)

GUITAR FIDDLE (*Troubadour Fiddle*), a modern name bestowed retrospectively upon certain precursors of the violin possessing characteristics of both guitar and fiddle. The name "guitar fiddle" is intended to emphasize the fact that the instrument in the shape of the guitar, which during the middle ages represented the most perfect principle of construction for stringed instruments with neck, adopted at a certain period the use of the bow from instruments of a less perfect type, the rebab and its hybrids. The use of the bow with the guitar entailed certain constructive changes in the instrument: the large central rose sound-hole was replaced by lateral holes of various shapes; the flat bridge, suitable for instruments whose strings were plucked, gave place to the arched bridge required in order to enable the bow to vibrate each string separately; the arched bridge, by raising the strings higher above the soundboard, made the stopping of strings on the neck extremely difficult if not impossible; this matter was adjusted by the addition of a finger-board of suitable shape and dimensions (fig. 1). At this stage the guitar fiddle possesses the essential features of



From Ruhlmann's *Geschichte der Bogeninstrumente.*

FIG. 1.—Typical Alto Guitar Fiddle, 15th century (Finakothek, Munich).

Kathleen Schlesinger, *The Instruments of the Orchestra*, part ii. "The Precursors of the Violin Family," chap. viii. "The Question of the Origin of the Utrecht Psalter," pp. 352-382 (with illustrations), where all the foregoing are summarized.

[1] *De natura deorum*, ii. 8, 22.

[2] See *Etymologiarium*, lib. iii., cap. 21.

[3] See British Museum, Harleian MS. 1419, fol. 200.

[4] The literature of the Utrecht Psalter embraces a large number of books and pamphlets in many languages of which the principal are here given: Professor J. O. Westwood, *Facsimiles of the Miniatures and Ornaments of Anglo-Saxon and Irish MSS.* (London, 1868); Sir Thos. Duffus-Hardy, *Report on the Athanasian Creed in connection with the Utrecht Psalter* (London, 1872); *Report on the Utrecht Psalter*, addressed to the Trustees of the British Museum (London, 1874); Sir Thomas Duffus-Hardy, *Further Report on the Utrecht Psalter* (London, 1874); Walter de Gray Birch, *The History, Art and Palaeography of the MS. styled the Utrecht Psalter* (London, 1876); Anton Springer, "Die Psalterillustrationen im frühen Mittelalter mit besonderer Rücksicht auf den Utrecht Psalter." *Abhandlungen der kgl. sachs. Ges. d. Wissenschaften, phil.-hist. Klasse*. Bd. viii. pp. 187-296, with to facsimile plates; reprinted from the Mitt. des Inst. Adolf Goldschmidt, "Der Utrecht Psalter," in *Repertorium für Kunstwissenschaft*, Bd. xv. (Stuttgart, 1892), pp. 150-166; Franz Friedrich Leitschuh, *Geschichte der karolingischen Malerei, die Bilderkreis und seine Quellen* (Berlin, 1894), pp. 321-330; Adolf Goldschmidt, *Der Albani Psalter in Hildesheim*, &c. (Berlin, 1895); Paul Durrieu, *L'Origine du MS. célèbre dit le Psautier d' Utrecht* (Paris, 1895); Hans Graeven, "Die Vorlage des Utrecht Psalters," paper read before the XI. International Oriental Congress, Paris, 1897. See also *Repertorium für Kunstwissenschaft* (Stuttgart, 1898), Bd. xxi. pp. 28-35; J. J. Tikkanen, *Abendländische Psalter-Illustration im Mittelalter*, part iii. "Der Utrecht Psalter" (Helsingfors, 1900), 320 pp. and 77 ills. (Professor Tikkanen now accepts the Greek or Syrian origin of the Utrecht Psalter); Georg Swarzenski, "Die karolingische Malerei und Plastik in Reims," in *Jahrbuch d. kgl. preussischen Kunstsammlungen*, Bd. xxiii. (Berlin, 1902), pp. 81-100; Ormonde M. Dalton, "The Crystal of Lothair," in *Archaeologia*, vol. lix. (1904);

[5] See Dr H. Janitschek's *Geschichte der deutschen Malerei*, Bd. iii. of *Gesch. der deutschen Kunst* (Berlin, 1890), p. 118.

[6] *Harmonie universelle* (Paris, 1636), livre ii. prop. xiv.

[7] See C. F. Becker, *Darstellung der musik. Literatur* (Leipzig, 1836); and Wilhelm Tappert, "Zur Geschichte der Guitarre," in *Monatshefte für Musikgeschichte* (Berlin, 1882), No. 5. pp. 77-85).

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the violin, and may justly claim to be its immediate predecessor [1] not so much through the viols which were the outcome of the Minnesinger fiddle with sloping shoulders, as through the intermediary of the Italian *lyra*, a guitar-shaped bowed instrument with from 7 to 12 strings.

From such evidence as we now possess, it would seem that the evolution of the early guitar with a neck from the Greek cithara took place under Greek influence in the Christian East. The various stages of this transition have been definitely established by the remarkable miniatures of the Utrecht Psalter.[2] Two kinds of cithara are shown: the antique rectangular,[3] and the later design with rounded body having at the point where the arms are added indications of the waist or incurvations characteristic of the outline of the Spanish guitar.[4] The first stage in the transition is shown by a cithara or rota[5] in which arms and transverse bar are replaced by a kind of frame repeating the outline of the body and thus completing the second lobe of the Spanish guitar. The next stages in the transition are concerned with the addition of a neck[6] and of frets.[7] All these instruments are twanged by the fingers. One may conclude that the use of the bow was either unknown at this time (*c.* 6th century A.D.), or that it was still confined to instruments of the rebab type. The earliest known representation of a guitar fiddle complete with bow[8] (fig. 2) occurs in a Greek Psalter written and illuminated in Caesarea by the archpriest Theodorus in 1066 (British Museum, Add. MS. 19352). Instances of perfect guitar fiddles abound in the 13th century MSS. and monuments, as for instance in a picture by Cimabue (1240–1302), in the Pitti Gallery in Florence.[9]

From a Byzantine MS. in the British Museum.

FIG. 2.—Earliest example of the Guitar Fiddle. A.D. 1066.

An evolution on parallel lines appears also to have taken place from the antique rectangular cithara[10] of the *citharoedes*, which was a favourite in Roman-Christian art.[11] In this case examples illustrative of the transitions are found represented in great variety in Europe. The old German rotta[12] of the 6th century preserved in the Volker Museum, Berlin, and the instruments played by King David in two early Anglo-Saxon illuminated MSS., one a Psalter (Cotton MS. Vesp. A. i. British Museum) finished in A.D. 700, the other "A Commentary on the Psalms by Cassiodorus *marus Bedae*" of the 8th century preserved in the Cathedral Library at Durham[13] form examples of the first stage of transition. From such types as these the rectangular *crwth* or crowd was evolved by the addition of a finger-board and the reduction in the number of strings, which follows as a natural consequence as soon as an extended compass can be obtained by stopping the strings. By the addition of a neck we obtain the clue to the origin of rectangular citterns with rounded corners and of certain instruments played with the bow whose bodies or sound-chests have an outline based upon the rectangle with various modifications. We may not look upon this type of guitar fiddle as due entirely to western or occidental initiative; its origin like that of the type approximating to the violin is evidently Byzantine. It is found among the frescoes which cover walls and barrel vaults in the palace of Kosseir 'Amra,[14] believed to be that of Caliph Walid II. (A.D. 744) of the Omayyad dynasty, or of Prince Ahmad, the Abbasid (862–866). The instrument, a cittern with four strings, is being played by a bear. Other examples occur in the Stuttgart Carolingian Psalter[15] (10th century); in MS. 1260 (Bibl. Imp. Paris) *Tristan and Yseult*; as guitar fiddle in the Liber Regalis preserved in Westminster Abbey (14th century); in the Sforza Book[16] (1444–1476), the Book of Hours executed for Bona of Savoy, wife of Galeazzo Maria Sforza; on one of the carvings of the 13th century in the Cathedral of Amiens. It has also been painted by Italian artists of the 15th and 16th centuries. (K. S.)

GUITRY, LUCIEN GERMAIN (1860–), French actor, was born in Paris. He became prominent on the French stage at the Porte Saint-Martin theatre in 1900, and the Variétés in 1901, and then became a member of the Comédie Française, but he resigned very soon in order to become director of the Renaissance, where he was principally associated with the actress Marthe Brandès, who had also left the Comédie. Here he established his reputation, in a number of plays, as the greatest contemporary French actor in the drama of modern reality.

GUIZOT, FRANÇOIS PIERRE GUILLAUME (1787–1874), historian, orator and statesman, was born at Nîmes on the 4th of October 1787, of an honourable Protestant family belonging to the *bourgeoisie* of that city. It is characteristic of the cruel disabilities which still weighed upon the Protestants of France before the Revolution, that his parents, at the time of their union, could not be publicly or legally married by their own pastors, and that the ceremony was clandestine. The liberal opinions of his family did not, however, save it from the sanguinary intolerance of the Reign of Terror, and on the 8th April 1794 his father perished at Nîmes upon the scaffold. Thenceforth the education of the future minister devolved entirely upon his mother, a woman of slight appearance and of homely manners, but endowed with great strength of character and clearness of judgment. Madame Guizot was a living type of the Huguenots of the 16th century, stern in her principles and her faith, immovable in her convictions and her sense of duty. She formed the character of her illustrious son and shared every vicissitude of his life. In the days of his power her simple figure, always clad in deep mourning for her martyred husband, was not absent from the splendid circle of his political friends. In the days of his exile in 1848 she followed him to London, and there at a very advanced age closed her life and was buried at Kensal Green. Driven from Nîmes by the Revolution, Madame Guizot and her son repaired to Geneva, where he received his education. In spite of her decided Calvinistic opinions, the theories of Rousseau, then much in fashion, were not without their influence on Madame Guizot. She was a strong Liberal, and she even adopted the notion inculcated in the *Émile* that every man ought to learn a manual trade or craft. Young Guizot was taught to be a carpenter, and he so far succeeded in his work that he made a table with his own hands, which is still preserved. Of the progress of his graver studies little is known, for in the work which he entitled *Memoirs of my own Times* Guizot omitted all personal details of his earlier life. But his literary attainments must have been precocious and considerable, for when he arrived in Paris in 1805 to pursue his studies in the faculty of laws, he entered at eighteen as tutor into the family of M. Stapfer, formerly Swiss minister in France, and he soon began to write in a journal edited by M. Suard, the *Publiciste*. This connexion introduced him to the literary society of Paris. In October 1809, being then twenty-two, he wrote a review of M. de Chateaubriand's *Martyrs*, which procured for him the approbation and cordial thanks of that eminent person, and he continued to contribute largely to the periodical press. At Suard's he had made the acquaintance of Pauline Meulan, an accomplished lady of good family, some fourteen years older than himself, who had been forced by the hardships of the Revolution to earn her living by literature, and who also was engaged to contribute a series of articles to Suard's journal. These contributions were

[1] See "The Precursors of the Violin Family," by Kathleen Schlesinger, part ii. of *An Illustrated Handbook on the Instruments of the Orchestra* (London, 1908), chs. ii. and x.

[2] See Kathleen Schlesinger, *op. cit.* ch. ii., the "Utrecht Psalter," pp. 127, 135, and the "Question of the Origin of the Utrecht Psalter," pp. 136-166, where the subject is discussed and illustrated.

[3] *Idem*, see pl. vi. (2) to the right centre.

[4] *Idem*, see pl. iii. centre and figs. 118 and 119.

[5] *Idem*, see fig. 117, p. 341, and figs. 172 and 116.

[6] *Idem*, see fig. 121, p. 246, figs. 122, 123, 125 and 126 pl. iii. vi. (1) and (2).

[7] *Idem*, see fig. 126, p. 350, and pl. iii. right centre.

[8] *Idem*, see fig. 173, p. 448.

[9] *Idem*, see fig. 205, p. 480.

[10] See *Museo Pio Clementino*, by Visconti (Milan, 1818).

[11] See for example *Georgics*, iv. 471-475 in the Vatican Virgil (Cod. 3225), in facsimile (Rome, 1899) (British Museum press-mark 8, tab. f. vol. ii.).

[12] This rotta was found in an Alamannic tomb of the 4th to the 7th centuries at Oberflacht in the Black Forest. A facsimile is preserved in the collection of the Kgl. Hochschule, Berlin, illustrations in "Grabfunde um Berge Lupfen bei Oberflacht, 1846," *Jahresberichte d. Württemb. Altertums-Vereins*, iii. (Stuttgart, 1846), tab. viii. also Kathleen Schlesinger, *op. cit.* part ii. fig. 168 (drawing from the facsimile).

[13] Reproductions of both miniatures are to be found in Professor J. O. Westwood's *Facsimiles of the Miniatures and Ornaments of Anglo-Saxon and Irish MSS.* (London, 1868).

[14] An illustration occurs in the fine publication of the Austrian Academy of Sciences, *Kusejr 'Amra* (Vienna, 1907, pl. xxxiv.).

[15] See reproduction of some of the miniatures in Jacob and H. von Hefner-Alteneck, *Trachten des christlichen Mittelalters* (Darmstadt, 1840–1854, 3 vols.), and in *Trachten, Kunstwerke und Geräthschaften vom frühen Mittelalter* (Frankfort-on-Main, 1879–1890).

[16] Add. MS. 34294, British Museum, vol. ii. fol. 83. 161, vol. iii. fol. 402, vol. iv. fols. 534 and 667.

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interrupted by her illness, but immediately resumed and continued by an unknown hand. It was discovered that François Guizot had quietly supplied the deficiency on her behalf. The acquaintance thus begun ripened into friendship and love, and in 1812 Mademoiselle de Meulan consented to marry her youthful ally. She died in 1827; she was the author of many esteemed works on female education. An only son, born in 1810, died in 1837 of consumption. In 1828 Guizot married Elisa Dillon, niece of his first wife, and also an author. She died in 1833, leaving a son, Maurice Guillaume (1833–1892), who attained some reputation as a scholar and writer.

During the empire, Guizot, entirely devoted to literary pursuits, published a collection of French synonyms (1809), an essay on the fine arts (1811), and a translation of Gibbon with additional notes in 1812. These works recommended him to the notice of M. de Fontanes, then grand-master of the university of France, who selected Guizot for the chair of modern history at the Sorbonne in 1812. His first lecture (which is reprinted in his *Memoirs*) was delivered on the 11th of December of that year. The customary compliment to the all-powerful emperor he declined to insert in it, in spite of the hints given him by his patron, but the course which followed marks the beginning of the great revival of historical research in France in the 19th century. He had now acquired a considerable position in the society of Paris, and the friendship of Royer-Collard and the leading members of the liberal party, including the young duc de Broglie. Absent from Paris at the moment of the fall of Napoleon in 1814, he was at once selected, on the recommendation of Royer-Collard, to serve the government of Louis XVIII. in the capacity of secretary-general of the ministry of the interior, under the abbé de Montesquiou. Upon the return of Napoleon from Elba he immediately resigned, on the 25th of March 1815 (the statement that he retained office under General Carnot is incorrect), and returned to his literary pursuits. After the Hundred Days, he repaired to Ghent, where he saw Louis XVIII., and in the name of the liberal party pointed out to his majesty that a frank adoption of a liberal policy could alone secure the duration of the restored monarchy—advice which was ill-received by M. de Blacas and the king's confidential advisers. This visit to Ghent, at the time when France was a prey to a second invasion, was made a subject of bitter reproach to Guizot in after life by his political opponents, as an unpatriotic action. "The Man of Ghent" was one of the terms of insult frequently hurled against him in the days of his power. But the reproach appears to be wholly unfounded. The true interests of France were not in the defence of the falling empire, but in establishing a liberal policy on a monarchical basis and in combating the reactionary tendencies of the ultra-royalists. It is at any rate a remarkable circumstance that a young professor of twenty-seven, with none of the advantages of birth or political experience, should have been selected to convey so important a message to the ears of the king of France, and a proof, if any were wanting, that the Revolution had, as Guizot said, "done its work."

On the second restoration, Guizot was appointed secretary-general of the ministry of justice under M. de Barbé-Marbois, but resigned with his chief in 1816. Again in 1819 he was appointed general director of communes and departments in the ministry of the interior, but lost his office with the fall of Decazes in February 1820. During these years Guizot was one of the leaders of the *Doctrinaires*, a small party strongly attached to the charter and the crown, and advocating a policy which has become associated (especially by Faguet) with the name of Guizot, that of the *juste milieu*, a *via media* between absolutism and popular government. Their opinions had more of the rigour of a sect than the elasticity of a political party. Adhering to the great principles of liberty and toleration, they were sternly opposed to the anarchical traditions of the Revolution. They knew that the elements of anarchy were still fermenting in the country; these they hoped to subdue, not by reactionary measures, but by the firm application of the power of a limited constitution, based on the suffrages of the middle class and defended by the highest literary talent of the times. Their motives were honourable. Their views were philosophical. But they were opposed alike to the democratical spirit of the age, to the military traditions of the empire, and to the bigotry and absolutism of the court. The fate of such a party might be foreseen. They lived by a policy of resistance; they perished by another revolution (1830). They are remembered more for their constant opposition to popular demands than by the services they undoubtedly rendered to the cause of temperate freedom.

In 1820, when the reaction was at its height after the murder of the duc de Berri, and the fall of the ministry of the duc Decazes, Guizot was deprived of his offices, and in 1822 even his course of lectures were interdicted. During the succeeding years he played an important part among the leaders of the liberal opposition to the government of Charles X., although he had not yet entered parliament, and this was also the time of his greatest literary activity. In 1822 he had published his lectures on representative government (*Histoire des origines du gouvernement représentatif*, 1821–1822, 2 vols.; Eng. trans. 1852); also a work on capital punishment for political offences and several important political pamphlets. From 1822 to 1830 he published two important collections of historical sources, the memoirs of the history of England in 26 volumes, and the memoirs of the history of France in 31 volumes, and a revised translation of Shakespeare, and a volume of essays on the history of France. The most remarkable work from his own pen was the first part of his *Histoire de la révolution d'Angleterre depuis Charles Ier à Charles II.* (2 vols., 1826–1827; Eng. trans., 2 vols., Oxford, 1838), a book of great merit and impartiality, which he resumed and completed during his exile in England after 1848. The Martignac administration restored Guizot in 1828 to his professor's chair and to the council of state. Then it was that he delivered the celebrated courses of lectures which raised his reputation as an historian to the highest point of fame, and placed him amongst the best writers of France and of Europe. These lectures formed the basis of his general *Histoire de la civilisation en Europe* (1828; Eng. trans. by W. Hazlitt, 3 vols., 1846), and of his *Histoire de la civilisation en France* (4 vols., 1830), works which must ever be regarded as classics of modern historical research.

Hitherto Guizot's fame rested on his merits as a writer on public affairs and as a lecturer on modern history. He had attained the age of forty-three before he entered upon the full display of his oratorical strength. In January 1830 he was elected for the first time by the town of Lisieux to the chamber of deputies, and he retained that seat during the whole of his political life. Guizot immediately assumed an important position in the representative assembly, and the first speech he delivered was in defence of the celebrated address of the 221, in answer to the menacing speech from the throne, which was followed by the dissolution of the chamber, and was the precursor of another revolution. On his returning to Paris from Nîmes on the 27th of July, the fall of Charles X. was already imminent. Guizot was called upon by his friends Casimir-Périer, Laffitte, Villemain and Dupin to draw up the protest of the liberal deputies against the royal ordinances of July, whilst he applied himself with them to control the revolutionary character of the late contest. Personally, Guizot was always of opinion that it was a great misfortune for the cause of parliamentary government in France that the infatuation and ineptitude of Charles X. and Prince Polignac rendered a change in the hereditary line of succession inevitable. But, though convinced that it was inevitable, he became one of the most ardent supporters of Louis-Philippe. In August 1830 Guizot was made minister of the interior, but resigned in November. He had now passed into the ranks of the conservatives, and for the next eighteen years was the most determined foe of democracy, the unyielding champion of "a monarchy limited by a limited number of bourgeois."

In 1831 Casimir-Périer formed a more vigorous and compact administration, which was terminated in May 1832 by his death;

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the summer of that year was marked by a formidable republican rising in Paris, and it was not till the 11th of October 1832 that a stable government was formed, in which Marshal Soult was first minister, the duc de Broglie took the foreign office, Thiers the home department, and Guizot the department of public instruction. This ministry, which lasted for nearly four years, was by far the ablest that ever served Louis Philippe. Guizot, however, was already marked with the stigma of unpopularity by the more advanced liberal party. He remained unpopular all his life, "not," said he, "that I court unpopularity, but that I think nothing about it." Yet never were his great abilities more useful to his country than whilst he filled this office of secondary rank but of primary importance in the department of public instruction. The duties it imposed on him were entirely congenial to his literary tastes, and he was master of the subjects they concerned. He applied himself in the first instance to carry the law of the 28th of June 1833, and then for the next three years to put it into execution. In establishing and organizing primary education in France, this law marked a distinct epoch in French history. In fifteen years, under its influence, the number of primary schools rose from ten to twenty-three thousand; normal schools for teachers, and a general system of inspection, were introduced; and boards of education, under mixed lay and clerical authority, were created. The secondary class of schools and the university of France were equally the subject of his enlightened protection and care, and a prodigious impulse was given to philosophical study and historical research. The branch of the Institute of France known as the "Académie des Sciences Morales et Politiques," which had been suppressed by Napoleon, was revived by Guizot. Some of the old members of this learned body—Talleyrand, Siéyès, Roederer and Lakanal—again took their seats there, and a host of more recent celebrities were added by election for the free discussion of the great problems of political and social science. The "Société de l'Histoire de France" was founded for the publication of historical works; and a vast publication of medieval chronicles and diplomatic papers was undertaken at the expense of the state (see HISTORY; and FRANCE, *History*, section *Sources*).

The object of the cabinet of October 1832 was to organize a conservative party, and to carry on a policy of resistance to the republican faction which threatened the existence of the monarchy. It was their pride and their boast that their measures never exceeded the limits of the law, and by the exercise of legal power alone they put down an insurrection amounting to civil war in Lyons and a sanguinary revolt in Paris. The real strength of the ministry lay not in its nominal heads, but in the fact that in this government and this alone Guizot and Thiers acted in cordial co-operation. The two great rivals in French parliamentary eloquence followed for a time the same path; but neither of them could submit to the supremacy of the other, and circumstances threw Thiers almost continuously on a course of opposition, whilst Guizot bore the graver responsibilities of power.

Once again indeed, in 1830, they were united, but it was in opposition to M. Molé, who had formed an intermediate government, and this coalition between Guizot and the leaders of the left centre and the left, Thiers and Odilon Barrot, due to his ambition and jealousy of Molé, is justly regarded as one of the chief inconsistencies of his life. Victory was secured at the expense of principle, and Guizot's attack upon the government gave rise to a crisis and a republican insurrection. None of the three chiefs of that alliance took ministerial office, however, and Guizot was not sorry to accept the post of ambassador in London, which withdrew him for a time from parliamentary contests. This was in the spring of 1840, and Thiers succeeded shortly afterwards to the ministry of foreign affairs.

Guizot was received with marked distinction by the queen and by the society of London. His literary works were highly esteemed, his character was respected, and France was never more worthily represented abroad than by one of her greatest orators. He was known to be well versed in the history and the literature of England, and sincerely attached to the alliance of the two nations and the cause of peace. But, as he himself remarked, he was a stranger to England and a novice in diplomacy; and unhappily the embroiled state of the Syrian question, on which the French government had separated itself from the joint policy of Europe, and possibly the absence of entire confidence between the ambassador and the minister of foreign affairs, placed him in an embarrassing and even false position. The warnings he transmitted to Thiers were not believed. The warlike policy of Thiers was opposed to his own convictions. The treaty of the 15th of July was signed without his knowledge and executed in the teeth of his remonstrances. For some weeks Europe seemed to be on the brink of war, until the king put an end to the crisis by refusing his assent to the military preparations of Thiers, and by summoning Guizot from London to form a ministry and to aid his Majesty in what he termed "ma lutte tenace contre l'anarchie." Thus began, under dark and adverse circumstances, on the 29th of October 1840, the important administration in which Guizot remained the master-spirit for nearly eight years. He himself took the office of minister for foreign affairs, to which he added some years later, on the retirement of Marshal Soult, the ostensible rank of prime minister. His first care was the maintenance of peace and the restoration of amicable relations with the other powers of Europe. If he succeeded, as he did succeed, in calming the troubled elements and healing the wounded pride of France, the result was due mainly to the indomitable courage and splendid eloquence with which he faced a raging opposition, gave unity and strength to the conservative party, who now felt that they had a great leader at their head, and appealed to the thrift and prudence of the nation rather than to their vanity and their ambition. In his pacific task he was fortunately seconded by the formation of Sir Robert Peel's administration in England, in the autumn of 1841. Between Lord Palmerston and Guizot there existed an incompatibility of character exceedingly dangerous in the foreign ministers of two great and in some respects rival countries. With Lord Palmerston in office, Guizot felt that he had a bitter and active antagonist in every British agent throughout the world; the combative element was strong in his own disposition; and the result was a system of perpetual conflict and counter-intrigues. Lord Palmerston held (as it appears from his own letters) that war between England and France was, sooner or later, inevitable. Guizot held that such a war would be the greatest of all calamities, and certainly never contemplated it. In Lord Aberdeen, the foreign secretary of Sir Robert Peel, Guizot found a friend and an ally perfectly congenial to himself. Their acquaintance in London had been slight, but it soon ripened into mutual regard and confidence. They were both men of high principles and honour; the Scotch Presbyterianism which had moulded the faith of Lord Aberdeen was reflected in the Huguenot minister of France; both were men of extreme simplicity of taste, joined to the refinement of scholarship and culture; both had an intense aversion to war and felt themselves ill-qualified to carry on those adventurous operations which inflamed the imagination of their respective opponents. In the eyes of Lord Palmerston and Thiers their policy was mean and pitiful; but it was a policy which secured peace to the world, and united the two great and free nations of the West in what was termed the *entente cordiale*. Neither of them would have stooped to snatch an advantage at the expense of the other; they held the common interest of peace and friendship to be paramount; and when differences arose, as they did arise, in remote parts of the world,—in Tahiti, in Morocco, on the Gold Coast,—they were reduced by this principle to their proper insignificance. The opposition in France denounced Guizot's foreign policy as basely subservient to England. He replied in terms of unmeasured contempt,—"You may raise the pile of calumny as high as you will; vous n'arriverez jamais à la hauteur de mon dédain!" The opposition in England attacked Lord Aberdeen with the same reproaches, but in vain. King Louis Philippe visited Windsor. The queen of England (in 1843) stayed at the Château d'Eu. In 1845 British and

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French troops fought side by side for the first time in an expedition to the River Plate.

The fall of Sir Robert Peel's government in 1846 changed these intimate relations; and the return of Lord Palmerston to the foreign office led Guizot to believe that he was again exposed to the passionate rivalry of the British cabinet. A friendly understanding had been established at Eu between the two courts with reference to the future marriage of the young queen of Spain. The language of Lord Palmerston and the conduct of Sir Henry Bulwer (afterwards Lord Dalling) at Madrid led Guizot to believe that this understanding was broken, and that it was intended to place a Coburg on the throne of Spain. Determined to resist any such intrigue, Guizot and the king plunged headlong into a counter-intrigue, wholly inconsistent with their previous engagements to England, and fatal to the happiness of the queen of Spain. By their influence she was urged into a marriage with a despicable offset of the house of Bourbon, and her sister was at the same time married to the youngest son of the French king, in direct violation of Louis Philippe's promises. This transaction, although it was hailed at the time as a triumph of the policy of France, was in truth as fatal to the monarch as it was discreditable to the minister. It was accomplished by a mixture of secrecy and violence. It was defended by subterfuges. By the dispassionate judgment of history it has been universally condemned. Its immediate effect was to destroy the Anglo-French alliance, and to throw Guizot into closer relations with the reactionary policy of Metternich and the Northern courts.

The history of Guizot's administration, the longest and the last which existed under the constitutional monarchy of France, bears the stamp of the great qualities and the great defects of his political character, for he was throughout the master-spirit of that government. His first object was to unite and discipline the conservative party, which had been broken up by previous dissensions and ministerial changes. In this he entirely succeeded by his courage and eloquence as a parliamentary leader, and by the use of all those means of influence which France too liberally supplies to a dominant minister. No one ever doubted the purity and disinterestedness of Guizot's own conduct. He despised money; he lived and died poor; and though he encouraged the fever of money-getting in the French nation, his own habits retained their primitive simplicity. But he did not disdain to use in others the baser passions from which he was himself free. Some of his instruments were mean; he employed them to deal with meanness after its kind. Gross abuses and breaches of trust came to light even in the ranks of the government, and under an incorruptible minister the administration was denounced as corrupt. *Licet uti alieno vitio* is a proposition as false in politics as it is in divinity.

Of his parliamentary eloquence it is impossible to speak too highly. It was terse, austere, demonstrative and commanding, —not persuasive, not humorous, seldom adorned, but condensed with the force of a supreme authority in the fewest words. He was essentially a ministerial speaker, far more powerful in defence than in opposition. Like Pitt he was the type of authority and resistance, unmoved by the brilliant charges, the wit, the gaiety, the irony and the discursive power of his great rival. Nor was he less a master of parliamentary tactics and of those sudden changes and movements in debate which, as in a battle, sometimes change the fortune of the day. His confidence in himself, and in the majority of the chamber which he had moulded to his will, was unbounded; and long success and the habit of authority led him to forget that in a country like France there was a people outside the chamber elected by a small constituency, to which the minister and the king himself were held responsible.

A government based on the principle of resistance and repression and marked by dread and distrust of popular power, a system of diplomacy which sought to revive the traditions of the old French monarchy, a sovereign who largely exceeded the bounds of constitutional power and whose obstinacy augmented with years, a minister who, though far removed from the servility of the courtier, was too obsequious to the personal influence of the king, were all singularly at variance with the promises of the Revolution of July, and they narrowed the policy of the administration. Guizot's view of politics was essentially historical and philosophical. His tastes and his acquirements gave him little insight into the practical business of administrative government. Of finance he knew nothing; trade and commerce were strange to him; military and naval affairs were unfamiliar to him; all these subjects he dealt with by second hand through his friends, P. S. Dumon (1797–1870), Charles Marie Tanneguy, Comte Duchâtel (1803–1867), or Marshal Bugeaud. The consequence was that few measures of practical improvement were carried by his administration. Still less did the government lend an ear to the cry for parliamentary reform. On this subject the king's prejudices were insurmountable, and his ministers had the weakness to give way to them. It was impossible to defend a system which confined the suffrage to 200,000 citizens, and returned a chamber of whom half were placemen. Nothing would have been easier than to strengthen the conservative party by attaching the suffrage to the possession of land in France, but blank resistance was the sole answer of the government to the just and moderate demands of the opposition. Warning after warning was addressed to them in vain by friends and by foes alike; and they remained profoundly unconscious of their danger till the moment when it overwhelmed them. Strange to say, Guizot never acknowledged either at the time or to his dying day the nature of this error; and he speaks of himself in his memoirs as the much-enduring champion of liberal government and constitutional law. He utterly fails to perceive that a more enlarged view of the liberal destinies of France and a less intense confidence in his own specific theory might have preserved the constitutional monarchy and averted a vast series of calamities, which were in the end fatal to every principle he most cherished. But with the stubborn conviction of absolute truth he dauntlessly adhered to his own doctrines to the end.

The last scene of his political life was singularly characteristic of his inflexible adherence to a lost cause. In the afternoon of the 23rd of February 1848 the king summoned his minister from the chamber, which was then sitting, and informed him that the aspect of Paris and the country during the banquet agitation for reform, and the alarm and division of opinion in the royal family, led him to doubt whether he could retain his ministry. That doubt, replied Guizot, is decisive of the question, and instantly resigned, returning to the chamber only to announce that the administration was at an end and that Molé had been sent for by the king. Molé failed in the attempt to form a government, and between midnight and one in the morning Guizot, who had according to his custom retired early to rest, was again sent for to the Tuileries. The king asked his advice. "We are no longer the ministers of your Majesty," replied Guizot; "it rests with others to decide on the course to be pursued. But one thing appears to be evident: this street riot must be put down; these barricades must be taken; and for this purpose my opinion is that Marshal Bugeaud should be invested with full power, and ordered to take the necessary military measures, and as your Majesty has at this moment no minister, I am ready to draw up and countersign such an order." The marshal, who was present, undertook the task, saying, "I have never been beaten yet, and I shall not begin to-morrow. The barricades shall be carried before dawn." After this display of energy the king hesitated, and soon added: "I ought to tell you that M. Thiers and his friends are in the next room forming a government!" Upon this Guizot rejoined, "Then it rests with them to do what they think fit," and left the palace. Thiers and Barrot decided to withdraw the troops. The king and Guizot next met at Claremont. This was the most perilous conjuncture of Guizot's life, but fortunately he found a safe refuge in Paris for some days in the lodging of a humble miniature painter whom he had befriended, and shortly afterwards effected his escape across the Belgian frontier and thence to London, where he arrived on the 3rd of March. His mother and daughters

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had preceded him, and he was speedily installed in a modest habitation in Pelham Crescent, Brompton.

The society of England, though many persons disapproved of much of his recent policy, received the fallen statesman with as much distinction and respect as they had shown eight years before to the king's ambassador. Sums of money were placed at his disposal, which he declined. A professorship at Oxford was spoken of, which he was unable to accept. He stayed in England about a year, devoting himself again to history. He published two more volumes on the English revolution, and in 1854 his *Histoire de la république d'Angleterre et de Cromwell* (2 vols., 1854), then his *Histoire du protectorat de Cromwell et du rétablissement des Stuarts* (2 vols., 1856). He also published an essay on Peel, and amid many essays on religion, during the ten years 1858–1868, appeared the extensive *Mémoires pour servir à l'histoire de mon temps*, in nine volumes. His speeches were included in 1861 in his *Histoire parlementaire de la France* (5 vols. of parliamentary speeches, 1863).

Guizot survived the fall of the monarchy and the government he had served twenty-six years. He passed abruptly from the condition of one of the most powerful and active statesmen in Europe to the condition of a philosophical and patriotic spectator of human affairs. He was aware that the link between himself and public life was broken for ever; and he never made the slightest attempt to renew it. He was of no party, a member of no political body; no murmur of disappointed ambition, no language of asperity, ever passed his lips; it seemed as if the fever of oratorical debate and ministerial power had passed from him and left him a greater man than he had been before, in the pursuit of letters, in the conversation of his friends, and as head of the patriarchal circle of those he loved. The greater part of the year he spent at his residence at Val Richer, an Augustine monastery near Lisieux in Normandy, which had been sold at the time of the first Revolution. His two daughters, who married two descendants of the illustrious Dutch family of De Witt, so congenial in faith and manners to the Huguenots of France, kept his house. One of his sons-in-law farmed the estate. And here Guizot devoted his later years with undiminished energy to literary labour, which was in fact his chief means of subsistence. Proud, independent, simple and contented he remained to the last; and these years of retirement were perhaps the happiest and most serene portion of his life.

Two institutions may be said even under the second empire to have retained their freedom—the Institute of France and the Protestant Consistory. In both of these Guizot continued to the last to take an active part. He was a member of three of the five academies into which the Institute of France is divided. The Academy of Moral and Political Science owed its restoration to him, and he became in 1832 one of its first associates. The Academy of Inscriptions and Belles Lettres elected him in 1833 as the successor to M. Dacier; and in 1836 he was chosen a member of the French Academy, the highest literary distinction of the country. In these learned bodies Guizot continued for nearly forty years to take a lively interest and to exercise a powerful influence. He was the jealous champion of their independence. His voice had the greatest weight in the choice of new candidates; the younger generation of French writers never looked in vain to him for encouragement; and his constant aim was to maintain the dignity and purity of the profession of letters.

In the consistory of the Protestant church in Paris Guizot exercised a similar influence. His early education and his experience of life conspired to strengthen the convictions of a religious temperament. He remained through life a firm believer in the truths of revelation, and a volume of *Meditations on the Christian Religion* was one of his latest works. But though he adhered inflexibly to the church of his fathers and combated the rationalist tendencies of the age, which seemed to threaten it with destruction, he retained not a tinge of the intolerance or asperity of the Calvinistic creed. He respected in the Church of Rome the faith of the majority of his countrymen; and the writings of the great Catholic prelates, Bossuet and Bourdaloue, were as familiar and as dear to him as those of his own persuasion, and were commonly used by him in the daily exercises of family worship.

In these literary pursuits and in the retirement of Val Richer years passed smoothly and rapidly away; and as his grandchildren grew up around him, he began to direct their attention to the history of their country. From these lessons sprang his last and not his least work, the *Histoire de France racontée à mes petits enfants*, for although this publication assumed a popular form, it is not less complete and profound than it is simple and attractive. The history came down to 1789, and was continued to 1870 by his daughter Madame Guizot de Witt from her father's notes.

Down to the summer of 1874 Guizot's mental vigour and activity were unimpaired. His frame, temperate in all things, was blessed with a singular immunity from infirmity and disease; but the vital power ebbed away, and he passed gently away on the 12th of September 1874, reciting now and then a verse of Corneille or a text of Scripture.

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(H. R.; J. T. S.*)

GUJARAT or **GUZERAT**, a region of India, in the Bombay Presidency. In the widest sense of the name it includes the whole of the country where the Gujarati language is spoken, *i.e.* the northern districts and states of the Presidency from Palanpur to Damaun, with Kathiawar and Cutch. But it is more properly confined to the country north of the Nerbudda and east of the Rann of Cutch and Kathiawar. In this sense it has an area of 29,071 sq. m., with a population in 1901 of 4,708,504. It includes the states distributed among the agencies of Palanpur, Mahi Kantha, Rewa Kantha and Cambay, with most of Baroda and the British districts of Ahmedabad, Kaira, Panch Mahals and Broach. Less than one-fourth is British territory. The region takes its name from the Gujars, a tribe who passed into India from the north-west, established a kingdom in Rajputana, and spread south in A.D. 400–600. The ancient Hindu capital was Anhilvada; the Mahommedan dynasty, which ruled from 1306 to 1572, founded Ahmedabad, which is still the largest city; but Gujarat owed much of its historical importance to the seaports of Broach, Cambay and Surat. Its fertile plain, with a regular rainfall and numerous rivers, has caused it to be styled the "garden of India." It suffered, however, severely from the famine of 1899–1901. For an account of the history, geography, &c., of Gujarat see the articles on the various states and districts. Gujarat gives its name to the vernacular of northern Bombay, viz. Gujarati, one of the three great languages of that Presidency, spoken by more than 9 millions. It has an ancient literature and a peculiar character. As the language of the Parsis it is prominent in the Bombay press; and it is also the commercial language of Bombay city, which lies outside the territorial area of Gujarat.

See J. Campbell, *History of Gujarat* (Bombay, 1896); Sir E. C. Bayley, *The Muhammedan Kingdom of Gujarat* (1886); A. K. Forbes, *Ras Mala* (1856).

GUJARATI and **RAJASTHANI**, the names of two members of the western sub-group of the Intermediate Group of Indo-Aryan languages (*q.v.*). The remaining member of this sub-group is Panjabi or Punjabi (see HINDOSTANI). In 1901 the speakers of those now dealt with numbered: Gujarati, 9,430,925, and Rajasthani, 10,017,712. The two languages are closely connected and might almost be termed co-dialects of the same form of speech. Together they occupy an almost square block of country,

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some 400 m. broad, reaching from near Agra and Delhi on the river Jumna to the Arabian Sea. Gujarati (properly *Gujarāti*) is spoken in Gujarat, the northern maritime province of the Bombay Presidency, and also in Baroda and the native states adjoining. Rajasthani (properly *Rājasthāni*, from "*Rājasthān*," the native name for Rajputana) is spoken in Rajputana and the adjoining parts of Central India.

In the articles INDO-ARYAN LANGUAGES and PRAKRIT the history of the earlier stages of the Indo-Aryan vernaculars is given at some length. It is there shown that, from the most ancient times, there were two main groups of these forms of speech—one, the language of the Midland, spoken in the country near the Gangetic Doab, and the other, the so-called "Outer Band," containing the Midland on three sides, west, north and south. The country to the west and south-west of the Midland, in which this outer group of languages was spoken, included the modern Punjab, Rajputana and Gujarat. In process of time the population of the Midland expanded and carried its language to its new homes. It occupied the eastern and central Punjab, and the mixed (or "intermediate") language which there grew up became the modern Panjabi. To the west it spread into Rajputana, till its progress was stopped by the Indian desert, and in Rajputana another intermediate language took rise and became Rajasthani. As elsewhere explained, the language-wave of the Midland exercised less and less influence as it travelled farther from its home, so that, while in eastern Rajputana the local dialect is now almost a pure midland speech, in the west there are many evident traces of the old outer language still surviving. To the south-west of Rajputana there was no desert to stop the wave of Midland expansion, which therefore rolled on unobstructed into Gujarat, where it reached the sea. Here the survivals of the old outer language are stronger still. The old outer Prakrit of north Gujarat was known as "Saurāṣṭri," while the Prakrit of the Midland invaders was called "Śaurasēni," and we may therefore describe Gujarati as being an intermediate language derived (as explained in the articles PRAKRIT) from a mixture of the Apabhraṁśa forms of Saurāṣṭri and Śaurasēni, in which the latter predominated.

It will be observed that, at the present day, Gujarati breaks the continuity of the outer band of Indo-Aryan languages. To its north it has Sindhi and to its south Marathi, both outer languages with which it has only a slight connexion. On the other hand, on the east and north-east it has Rajasthani, into which it merges so gradually and imperceptibly that at the conventional border-line, in the state of Palanpur, the inhabitants of Rajputana say that the local dialect is a form of Gujarati, while the inhabitants of Gujarat say that it is Rajasthani.

Gujarati has no important local dialects, but there is considerable variation in the speeches of different classes of the com-
Language. munity. Parsees and Mussulmans (when the latter use the language—as a rule the Gujarat Mussulmans speak Hindostani) have some striking peculiarities of pronunciation, the most noticeable of which is the disregard by the latter of the distinction between cerebral and dental letters. The uneducated Hindus do not pronounce the language in the same way as their betters, and this difference is accentuated in northern Gujarat, where the lower classes substitute *ṭ* for *t*, *ḍ* for *k*, *ch* for *kh*, *s* for *ṣ* and *ch*, *h* for *s*, and drop *h* as readily as any cockney. There is also (as in the case of the Mussulmans) a tendency to confuse cerebral and dental consonants, to substitute *t* for *ḍ* and *l*, to double medial consonants, and to pronounce the letter *ā* as *â*, something like the *a* in "all." The Bhils of the hills east of Gujarat also speak a rude Gujarati, with special dialectic peculiarities of their own, probably due to the fact that the tribes are of Dravidian origin. These Bhil peculiarities are further mixed with corruptions of Marathi idioms in Nimar and Khandesh, where we have almost a new language.

Rajasthani has numerous dialects, each state claiming one or more of its own. Thus, in the state of Jaipur there have been catalogued no less than ten dialects among about 1,688,000 people. All Rajasthani dialects can, however, be easily classed in four well-defined groups, a north-eastern, a southern, a western and an east-central. The north-eastern (Mēwāti) is that form of Rajasthani which is merging into the Western Hindi of the Midland. It is a mixed form of speech, and need not detain us further. Similarly, the southern (Mālvi) is much mixed with the neighbouring Bundēli form of Western Hindi. The western (Mārwāri) spoken in Marwar and its neighbourhood, and the east-central (Jaipuri) spoken in Jaipur and its neighbourhood, may be taken as the typical Rajasthani dialects. In the following paragraphs we shall therefore confine ourselves to Gujarati, Marwari and Jaipuri.

We know more about the ancient history of Gujarati than we do about that of any other Indo-Aryan language. The one native grammar of Apabhraṁśa Prakrit which we possess in a printed edition, was written by Hēmacandra (12th century A.D.), who lived in what is now north Gujarat, and who naturally described most fully the particular vernacular with which he was personally familiar. It was known as the Nāgara Apabhraṁśa, closely connected (as above explained) with Śaurasēni, and was so named after the Nāgara Brahmans of the locality. These men carried on the tradition of learning inherited from Hēmacandra, and we see Gujarati almost in the act of taking birth in a work called the *Mugdhāvabōdhamauktika*, written by one of them only two hundred years after his death. Formal Gujarati literature is said to commence with the poet Narsingh Mēṭā in the 15th century. Rajasthani literature has received but small attention from European or native scholars, and we are as yet unable to say how far back the language goes.

Both Gujarati and Rajasthani are usually written in current scripts related to the well-known Nāgari alphabet (see SANSKRIT). The form employed in Rajputana is known all over northern India as the "Mahājani" alphabet, being used by bankers or *Muhājans*, most of whom are Marwaris. It is noteworthy as possessing two distinct characters for *ḍ* and *ṛ*. The Gujarati character closely resembles the Kaithi character of northern India (see BIHARI). The Nāgari character is also freely used in Rajputana, and to a less extent in Gujarat, where it is employed by the Nāgara Brahmans, who claim that their tribe has given the alphabet its name.

In the following description of the main features of our two languages, the reader is presumed to be familiar with the leading facts stated in the articles INDO-ARYAN LANGUAGES and PRAKRIT. The article HINDOSTANI may also be perused with advantage.

(Abbreviations. Skr. = Sanskrit. Pr. = Prakrit. Ap. = Apabhraṁśa. G. = Gujarāti. R. = Rājasthāni. H. = Hindōstāni.)

Vocabulary.—The vocabulary of both Gujarat and Rajasthani is very far from *tatsama* words. The great mass of both vocabularies is *tadbhava* (see INDO-ARYAN LANGUAGES). Rajputana was from an early period brought into close contact with the Mogul court at Agra and Delhi, and even in the 13th century A.D. official documents of the Rajput princes contained many borrowed Persian and Arabic words. Gujarati, under the influence of the learned Nāgara Brahmans, has perhaps more *tatsama* words than Rajasthani, but their employment is not excessive. On the other hand, Parsees and Mussulmans employ Persian and Arabic words with great freedom; while, owing to its maritime connexions, the language has also borrowed occasional words from other parts of Asia and from Europe. This is specially marked in the strange dialect of the Kathiawar boatmen who travel all over the world as lascars on the great steamships. Their language is a mixture of Hindostani and Gujarati with a heterogeneous vocabulary.

Phonetics.—With a few exceptions to be mentioned below, the sound-system of the two languages is the same as that of Sanskrit, and is represented in the same manner in the Nāgari character (see SANSKRIT). The simplest method for considering the subject in regard to Gujarati is to compare it with the phonetical system of Hindostani (*q.v.*). As a rule, Rajasthani closely follows Gujarati and need not be referred to except in special cases. G. invariably simplifies a medial Pr. double consonant, lengthening the preceding vowel in compensation. Thus Skr. *makṣanam*, Ap. *makkhaṇu*, H. *makkhan*, but G. *mākhaṇ*, butter. In H. this rule is generally observed, but in G. it is universal, while, on the other hand, in Panjabi the double consonant is never simplified, but is retained as in Ap. In G. (and sometimes in R.) when *a* is followed by *h* it is changed to *e*, as in H. *shahr*, G. *śeher*, a city. As in other outer languages H. *ai* and *au* are usually represented by a short *e* and by *ā* (sounded like the *a* in "all") respectively. Thus H. *baiṭhā*, G. *beṭhō*, seated; H. *cauthā*, G. *cāthō* (written *cōthō*), fourth. In R. this *e* is often further weakened to the sound of *a* in "man," a change

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which is also common in Bengali. Many words which have *i* in H. have in G. and R., thus, H. *likhnā*, G. *lakhvũ*, he writes; H. *din*, G. and R. *dan*, a day. Similarly we have *o* for *u*, as in H. *tum*, G., R. *tamẽ*, you. In colloquial G. *ũ* often becomes *ā*, and *i* becomes *e*; thus, *pāni* for *pāṇi*, water; *mārei* for *māri*, I shall strike. As in most Indo-Aryan vernaculars an *a* after an accented syllable very lightly pronounced, and is here represented by a small ˚ above the line.

The Vedic cerebral *ḷ* and the cerebral *ṛ* are very common as medial letters in both G. and R. (both being unknown to literary H.). The rule is, as elsewhere in western and southern intermediate and outer languages, that when *n* and *ḷ* represent a double ण्ण (or *ṇṇ*) or a double *ḷḷ* in Pr. they are dental, but when they represent single medial letters they are cerebralized. Thus Ap. *soṇṇaü*, G. *sonũ*, gold; Ap. *ghaṇṇā*, G. *ghanũ*, many; Ap. *calleü*, G. *calẽ*, he goes; Ap. *calai*, G. *cale*, he moves. In northern G. and in some caste dialects dental and cerebral letters are absolutely interchangeable, as in *ḍāḳ*˚*ḍo* or *ḍaḥāḍo*, a day; *tũ* or *ṭũ*, thou; *ḍiḥo* or *ḍiḍho*, given. In G. and R. medial *ḍ* is pronounced as a rough cerebral *ṛ*, and is then so transcribed. We have seen that in the Marwari alphabet there are actually distinct letters for these two sounds. In colloquial G. *c* and *ch* are pronounced *s*, especially in the north, as in *pās* for *pāc*, five; *pusyō* for *puchyō*, he asked. Similarly, in the north, *j* and *jh* become *z*, as in *zāḍ* for *jhāḍ*, a tree. In some localities (as in Marathi) we have *ts* and *dz* for these sounds, as in *Tsarōtar* (name of a tract of country for *Carōtar*. On the other hand, *k*, *kh* and *g*, especially when preceded or followed by *i*, *e* or *y*, become in the north *c*, *ch* and *j* respectively; thus, *dic*˚*ro* for *dik*˚*ro*, a son; *chetar* for *khētar*, a field; *lāiyo* for *lāgyō*, began. A similar change is found in dialectic Marathi, and is, of course, one of the commonplaces of the philology of the Romance languages. The sibilants *s* and *ś* are colloquially pronounced *h* (as in several other languages), especially in the north. Thus *dēh* for *dēś*, a country; *hũ* for *śũ*, what; *ham*˚*jāvyō* for *sam*˚*jāvyō*, he explained. An original aspirate is, however, often dropped, as in *ũ* for *hũ*, I; *ātē* for *hātē*, on the hand. Standard G. is at the same time fond of pronouncing an *h* where it is not written, as in *amē*, we, pronounced *ahmē*. In other respects both G. and R. closely agree in their phonetical systems with the Apabhraṁśa form of Saurasēni Prakrit from which the Midland language is derived.

Declension.—Gujarati agrees with Marathi (an outer language) as against Hindostani in retaining the neuter gender of Sanskrit and Prakrit. Moreover, the neuter gender is often employed to indicate living beings of which the sex is uncertain, as in the case of *dik*˚*ro*, a child, compared with *dik*˚*ri*, a son, and *dik*˚*ri*, a daughter. In R. there are only sporadic instances of the neuter, which grow more and more rare as we approach the Midland. Nouns in both G. and R. may be weak or strong, as is fully explained in the article HINDOSTANI. We have there seen that the strong form of masculine nouns in Western Hindi generally ends in *au*, the *au* of words like the Hindostani *ghōṛā*, a horse, being an accident due to the fact that the Hindostani dialect of Western Hindi borrows this termination from Panjabi. G. and R. follow Western Hindi, for their masculine strong forms end in *ō*. Feminine strong forms end in *ī* as elsewhere. Neuter strong forms in G. end in *ũ*, derived as follows: Skr, *marakatam*, Ap. *soṇṇaü*, G. *sonũ*, gold. In examples of the three genders of the same word we may take G. *chōk*˚*rō* (masc.), a boy; *chōk*˚*rī* (fem.), a girl; *chōk*˚*rũ* (neut.), a child. Long forms corresponding to the Eastern Hindi *ghoṛwā*, a horse, are not much used, but we not infrequently meet another long form made by suffixing the pleonastic termination *āḍ* or *rō* (fem. *ḍī* or *rī*; G. neut. *ḍũ* or *rũ*) which is directly descended from the Ap. pleonastic termination *ḍau*, *ḍai*, *ḍaü*. We come across this most often in R., where it is used contemptuously, as in *Turuk-rō*, a Turk.

In the article HINDOSTANI it is pointed out that all the oblique cases of each number in Sanskrit and Prakrit became melted down in the modern languages into one general oblique case, which, in the Midland, is derived in the singular from the Ap. termination *-hi* or *-hiṁ*, and that even this has survived only in the case of strong masculine nouns; thus, *ghōṛā*, obl. *ghōṛē*. In G. and R. this same termination has also survived, but for all nouns as the case sign of the agent and locative cases. The general oblique case is the same as the nominative, except in the case of strong masculine and feminine nouns in *ō* and *ī* respectively, where it ends in *ā*, not *ē*. This *ā*-termination is characteristic of the outer band of languages, and is one of the survivals already referred to. It is derived from the Apabhraṁśa genitive form in *-aha*, corresponding to the Māgadhī Pr. (an outer Prakrit) termination *-āha*. Thus, G. *chōk*˚*rō*, a son; *chōk*˚*rā*, a child; obl. sing. *chōk*˚*rā*.

In G. the nominative and oblique plural for all nouns are formed by adding *ō* to the oblique form singular, but in the neuter strong forms the oblique singular is nasalized. The real plural is the same in form as the oblique singular in the case of masculines, and as a nasalized oblique singular in the case of neuter strong forms, as in other modern Indo-Aryan vernaculars, and the added *ō* is a further plural termination (making a double plural, exactly as it does in the Ardhamāgadhī Prakrit *puttā-ō*, sons) which is often dropped. The nasalization of the strong neuter plurals is inherited from Ap., in which the neuter nom. plural of such nouns ended in *-aü*. In R. the nominative plural of masculine nouns is the same in form as the oblique case singular, and the oblique plural ends in *ā*. The feminine has *ā* both in the nominative and in the oblique plural. These are all explained in the article HINDOSTANI. We thus get the following paradigms of the declension of nouns.

		Apabhraṁśa.	Gujarati.	Rajasthani.
Strong Noun Masc.—				
" *A horse.*"	Sing. Nom.	*ghōḍau*	*ghoṛō*	*ghoṛō*
	Obl.	*ghōḍaha*	*ghoṛā*	*ghoṛā*
	Ag.-Loc.	*ghōḍahi*	*ghoṛē*, *ghōḍāē*	*ghoṛāi*
	Plur. Nom.	*ghōḍaü*	*ghoṛā-ō*	*ghoṛā*
	Obl.	*ghōḍaāhā*	*ghoṛā-ō*	*ghoṛā*
	Ag.-Loc.	*ghōḍaahi*	*ghoṛā-ō-ē*	*ghoṛā*
Strong Noun Neut.—				
" *Gold.*"	Sing. Nom.	*soṇṇaü*	*sonũ*	..
	Obl.	*soṇṇaaha*	*sonā*	..
	Ag.-Loc.	*soṇṇaahi*	*sonē*, *sonāē*	..
	Plur. Nom.	*soṇṇaāī*	*sonī*	..
	Obl.	*soṇṇaahā*	*sonā-ō*	..
	Ag.-Loc.	*soṇṇaahī*	*sonā-ō-ē*	..
Strong Noun Fem.—				
" *A mare.*"	Sing. Nom.	*ghōḍiā*	*ghoṛī*	*ghoṛī*
	Obl.	*ghōḍiahi*	*ghoṛī*	*ghoṛī*
	Ag.-Loc.	*ghōḍiae*	*ghoṛīē*	*ghoṛī*
	Plur. Nom.	*ghōḍiā-ō*	*ghoṛī-ō*	*ghoṛyā*
	Obl.	*ghōḍiahu*	*ghoṛī-ō*	*ghoṛyā*
	Ag.-Loc.	*ghōḍiahī*	*ghoṛī-ō-ē*	*ghoṛyā*
Weak Noun Masc. or Neut.—				
" *A house.*"	Sing. Nom.	*gharu* (neut.)	*ghar*	*ghar*
	Obl.	*gharaha*	*ghar*	*ghar*
	Ag.-Loc.	*gharahi*	*gharē*	*gharai*
	Plur. Nom.	*gharāī*	*ghar-ō*	*ghar*
	Obl.	*gharāhā*	*ghar-ō*	*gharā*
	Ag.-Loc.	*gharahī*	*ghar-ō-ē*	*gharā*
Weak Noun Fem.—				
" *A word.*"	Sing. Nom.	*vattā*	*vāt*	*bāt*
	Obl.	*vattahi*	*vāt*	*bāt*
	Ag.-Loc.	*vattae*	*vātē*	*bāt*
	Plur. Nom.	*vattā-ō*	*vāt-ō*	*bātā*
	Obl.	*vattahu*	*vāt-ō*	*bātā*
	Ag.-Loc.	*vattahī*	*vāt-ō-ē*	*bātā*

The general oblique case can be employed for any case except the nominative, but, in order to define the meaning, it is customary to add postpositions as in Hindostani. These are:

	Genitive.	Dative.	Ablative.	Locative.
Gujarati	*nō*	*nē*	*thī*	*mẽ*
Rajasthani	*rō*, *kō*	*naī*, *rāī*, *kaī*	*sũ*	*maī*

The suffix *nō* of the genitive is believed to be a contraction of *taṇō*, which is found in old Gujarati poetry, and which, under the form *taṇas* in Sanskrit and *taṇau* in Apabhraṁśa, mean " belonging to." It is an adjective, and agrees in gender, number and case with the thing possessed. Thus, *rājā-nō dik*˚*ro*, the king's son; *rājā-nī dik*˚*ri*, the king's daughter; *rājā-nũ ghar*, the king's house; *rājā-nō dik*˚*rā-nē*, to the king's son (*nā* is in the oblique case masculine to agree with *dik*˚*rā*); *rājā-nō gharē*, in the king's house. The *rō* and *kō* of R. are similarly treated, but, of course, have no neuter. The dative postpositions are simply locatives of the genitive ones, as in all modern Indo-Aryan languages (see HINDOSTANI). *Thī*, the postposition of the G. ablative, is connected with *thawũ*, to be, one of the verbs substantive in that language. The ablative suffix is made in this way in many modern Indo-Aryan languages (*e.g.* Bengali, *q.v.*). It means literally " having been " and is to be ultimately referred to the Sanskrit root, *sthā*, stand. The derivation of the other postpositions is discussed in the article HINDOSTANI.

Strong adjectives agree with the nouns they qualify in gender, number and case, as in the examples of the genitive above. Weak adjectives are immutable.

Pronouns closely agree with those found in Hindostani In the table on following page we give the first two personal pronouns, and the demonstrative pronoun " this."

Similarly are formed the remaining pronouns, viz. G. *ā*, R. *ū*, he, that; G. *ī*ẽ, R. *sō* (obl. sing. *ā*), that; G. *je*, R. *jō*, who; G. *kaṇ* (obl. *kāṇ*, *kō*, or *kē*), R. *kuṇ* (obl. *kuṇ*), who?; G. *śũ*, R. *kāī*, what?; G.,R. *kōī*, anyone, someone, *kāī* anything, something. G. has two other demonstratives, *pēlō* and *tēvō*, both meaning " that." The derivation of these and of *śũ* has been discussed without any decisive result. The rest are explained in the article HINDOSTANI. The

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			Apabhraṁśa.	Gujarati.	Rajasthani.
I	Nom.		*haũ*	*hũ*	*hũ, mhũ, maĩ*
	Obl.		*mai, mahu, majjhu*	*ma, maj*	*ma, mha, mũ*
MY			*mahārau*	*mārō*	*mārō, mhārō*
WE	Nom.		*amhe*	*amē*	*mhē*
	Obl.		*amhahā*	*am-ō*	*mhā*
OUR			*amhārau*	*amārō*	*mhā-rō, mhā-kō*
THOU	Nom.		*tuhũ*	*tũ*	*tũ*
	Obl.		*tai, tuha, tujjhu*	*ta, tuj*	*ta, tha, tũ*
THY			*tuhārau*	*tārō*	*thārō*
YOU	Nom.		*tumhe*	*tamē*	*thē, tamē*
	Obl.		*tumhahā*	*tam-ō*	*thā, tamā*
YOUR			*tumhārau*	*tamārō*	*thā-rō, thā-kō*
THIS, HE	Nom.		*ehu*	*ē*	*yō*
	Obl.		(?) *ehaha, imaha*	*ē*	*ē*
THESE, THEY	Nom.		*ei*	*ē-ō*	*ē, yē*
	Obl.		*ēammi, ēhāṇa*	*em*	*iṇā, yā.*

reflexive pronoun is G. *āp*-nē*, R. *āp*ā*. It is generally employed as a plural of the first personal pronoun including the person addressed; thus G. *āp*-ṇē*, we (including you), but *amē*, we (excluding you). In G. *pōtē*, obl. *pōtā*, is used to mean "self."

Conjugation.—The old present has survived as in Hindostani and other Indian languages. Taking the base *cāl* or *cal*, go, as our model, we have:

			Apabhraṁśa.	Gujarati.	Rajasthani.
Sing.	1	.	*callaũ*	*cālũ*	*cal̃ā*
	2	.	*callahi*	*cālē*	*calai*
	3	.	*callai*	*cālē*	*calai*
Plur.	1	.	*callahā*	*cālīē*	*cal̃ā*
	2	.	*callahu*	*cālō*	*calō*
	3	.	*callahĩ*	*cālē*	*calai*

The derivation of the G. 1 plural is unknown. That of the other G. and R. forms is manifest. The imperative closely follows this, but an usual has no termination in the second person singular.

In R. the future may be formed by adding *gō* (cf. Hindostani *gā*), *lō*, or *lā* to the old present. Thus, *cal̃-gō, cal̃-lō* or *cal̃-lā*. I shall go. The *gō* and *lō* agree in gender and number with the subject, but *lā* is immutable. The termination with *l* is also found in Bhojpuri (see BIHARI), in Marathi and in Nepali. For *gō* see HINDOSTANI. Another form of the future has *s* or *h* for its characteristic letter, and is the only one employed in G. Thus, Ap. *callisaũ* or *callihaũ*, G. *cālīś*, R. (Jaipur) *cal̃īsā̃*, (Marwar) *cal̃sā̃*. The other persons' terminations differ considerably from those of the old present, and closely follow Ap. Thus, Ap. 3 sing. *callisai* or *callihi*, G. *cālē'śē*, Marwar *cal̃sāi*.

The participles and infinitive are as follows:

	Apabhraṁśa.	Gujarati.	Rajasthani.
Pres. Part. Active	*callantau*	*cālt*ō*	*cal̃t*ō*
Past. Part. Passive	*callia*	*cāly*ō*	*cal̃y*ō*
Future Part. Passive	*callavvau*	*cāl*vō*	*cal̃*bō*
Infinitive	"	*cāl*vu*	*cal̃*bō*

In G. the infinitive is simply the neuter of the future passive participle. The participles are employed to form finite tenses; thus G. *hũ cāl*tō*, I used to go; *hũ cāly*ō*, I went. If the verb is transitive (see HINDOSTANI) the passive meaning of the past participle comes into force. The subject is put into the case of the agent, and the participle inflects to agree with the object, or, if there is no object, is employed impersonally in the neuter (in G.) or in the masculine (in R.). In Hindostani, if the object is expressed in the dative, the participle is also employed impersonally, in the masculine; thus *rājā-nē shēr*-nī-kō mār*, [masc., not *mārī*, (fem.), by-the-king, with reference-to-the-tigress, impersonal] was-killed, *i.e.* the king killed the tigress. But in G. and R., even if the object is in the dative, the past participle agrees with it; thus, G. *rājā*-ē *wāgh*an-*nē *mārī*, by-the-king, with-reference-to-the-tigress, she-was-killed. Other examples from G. of this passive construction are *mē *kahyũ*, by me it was said, I said; *tēṇē chōṭhī lakhī*, by him a letter was written, he wrote a letter; *ē *bāīē vag*aḍā-*mā̃*, *dahāḍā *khāḍyā*, by this lady, in the wilderness, days were passed, *i.e.* she passed her days in the wilderness; *rājā *vichāryā*, the king considered. The idiom of R. is exactly the same in these cases, except that the name must be used where G. has the neuter; thus, *rājāī *vicāryo*. The future passive participle is construed in much the same way, but (as in Latin) the subject may be put into the dative. Thus, *mārē ē cōṛ*ī *vāt*ō, *mihi ille liber (est) legendus*. I must read that book, but also *tēṇē* (agent case) *ē *bāt *kar*vī*, by him this business is to be done.

G. also forms a past participle in *ēlō* (*cālēlō*), which is one of the many survivals of the outer language. This *l*- participle is typical of most of the languages of the outer band, including Marathi, Oriya, Bengali, Bihari and Assamese. It is formed by the addition of the Prakrit pleonastic suffix *-illa-*, which was not used by the Prakrit of the Midland, but was common elsewhere. Compare, for instance, the Ardhamāgadhi past participle passive *āy-illa-*, produced.

The usual verbs substantive are as follows: G. *chũ*, R. *hũ* or *chā̃*, I am, which are conjugated regularly as old present, and G. *hatō*, R. *hō* or *chō*, was, which is a past participle, like the Hindostani (*q.v.*) *thā*. *Hā̃*, *hatō* and *hō* are explained in the article on that language. *Chũ* is for Skr. *ṛcchami*, Ap. *acchaũ*. The use of this base is one of the outer band survivals. Except in Prakrit, it is not found (so far as the present writer is aware) in the Saurasēnī of the Midland. Using these as auxiliaries the finite verb makes a whole series of periphrastic tenses. A present definite is formed by conjugating the old present tense (not the present participle) with the present tense of the verb substantive. Thus, G. *cālū chũ*, I am going. A similar idiom is found in some Western Hindi dialects, but Hindostani employs the present participle; thus, *calta hū*. In G. and R., however, the imperfect is formed with the present participle as in H. Thus, G. *hũ cāltō hatō*, I was going. So, as in H., we have a perfect *hũ cālyō* (or *cālēlō*) *chũ*, I have gone, and a pluperfect *hũ cālyō* (or *cālēlō*) *hatō*, I had gone. The R. periphrastic tenses are made on the same principles. With the genitive of the G. future passive participle, *cāl*vānō hatō*, we have a kind of equivalent, as in *hũ cāl*vānō hatō*, I am to be gone, *i.e.* I am about to go; *hũ cāl*vānō hatō*, I was about to go.

The same series of derivative verbs occurs in G. and R. as in H. Thus, we have a potential passive (a simple passive in G.) formed by adding *ā* to the base, as in G. *lakh*vā*, to write, *lakhāvā*, to be written; and a causal by adding *āv* or *ād*, as in *lakhāv*vũ*, to cause to write; *bes*vũ*, to sit, *besāḍ*vũ*, to seat. A new passive may be formed in G. from the causal, as in *tap*vũ*, to be hot; *tapāv*vũ*, to cause to be hot; to heat; *tapāvā*vũ*, to be heated.

Several verbs have irregular past participles. These must be learnt from the grammars. So also the numerous compound verbs, such as (G.) *cāl*i *lakh*vũ*, to be able to go; *cāl*i *cuk*vũ*, to have completed going; *cāly*ō *kar*vũ*, to be in the habit of going, and so on.

Very little is known about the literature of Rajputana, except that it is of large extent. It includes a number of bardic chronicles of which only one has been partially edited, but the contents of which have been described by *Tod* in his admired *Rajasthan*. It also includes a considerable religious literature, but the whole mass of this is still in MS. From those specimens which the present writer has examined, it would appear that most of the authors wrote in Braj Bhasha, a Hindu literary dialect of Hindostani (*q.v.*) In Marwar it is an acknowledged fact that the literature falls into two branches, one called *Pingal* and couched in Braj Bhasha, and the other called *Dingal* and couched in Rajasthani. The most admired work in Dingal is the *Raghunāth Rūpak* written by Mansā Rām in the beginning of the 19th century. It is nominally a treatise on prosody, but, like many other works of the same kind, it contrives to pay a double debt, for the examples of the metres are so arranged as to form a complete epic poem celebrating the deeds of the hero Rāma. *Literature.*

The earliest writer of importance in Gujarati, and its most admired poet, was Narsingh Mēṭā, who lived in the 15th century A.D. Before him there were writers on Sanskrit grammar, rhetoric and the like, who employed an old form of Gujarati for their explanations. Narsingh does not appear to have written any considerable work, his reputation depending on his short songs, many of which exhibit much felicity of diction. He had several successors, all admittedly his inferiors. Perhaps the most noteworthy of these was Rēwā Śankar, the translator of the *Mahābhārata* (see SANSKRIT: *Literature*). A more important side of Gujarati literature is its bardic chronicles, the contents of which have been utilized by Forbes in his *Rās Mālā*. Modern Gujarati literature mostly consists of translations or imitations of English works.

AUTHORITIES.—Volume ix. of the *Linguistic Survey of India* contains a full and complete account of Gujarati and Rajasthani, including their various dialectic forms.

For Rajasthani, see S. H. Kellogg, *Grammar of the Hindi Language* (2nd ed., London, 1893). In this are described several dialects of Rajasthani. See also Rām Karṇ Śarmā, *Mārwāṛī Vyākaraṇa* (Jodhpur, 1901) (a Marwari grammar written in that language), and G. Macalister, *Specimens of the Dialects spoken in the State of Jaipur* (contains specimens, vocabularies and grammars) (Allahabad, 1898).

For Gujarati, there are numerous grammars, amongst which we may note W. St C. Tisdall, *Simplified Grammar of the Gujarati Language* (London, 1892) and (the most complete) G. P. Taylor, *The Student's Gujarati Grammar* (2nd ed., Bombay, 1908). As for dictionaries, the most authoritative is the *Narmā-kōś* of Narmadā

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Śankar (Bhaunagar and Surat, 1873), in Gujarati throughout. For English readers we may mention Shahpurji Edalji's (2nd ed., Bombay, 1868), the introduction to which contains an account of Gujarati literature by J. Glasgow, Belsare's (Ahmedabad, 1895), and Karbhari's (Ahmedabad, 1899). (C. A. G.)

GUJRANWALA, a town and district of British India, in the Lahore division of the Punjab. The town is situated 40 m. N. of Lahore by rail. It is of modern growth, and owes its importance to the father and grandfather of Maharaja Ranjit Singh, whose capital it formed during the early period of the Sikh power. Pop. (1901) 29,224. There are manufactures of brassware, jewellery, and silk and cotton scarves.

The DISTRICT comprises an area of 3198 sq. m. In 1901 the population was 756,797, showing an increase of 29% in the decade. The district is divided between a low alluvial tract along the rivers Chenab and Degh and the upland between them, which forms the central portion of the Rechna Doab, intermediate between the fertile submontane plains of Sialkot and the desert expanses of Jhang. Part of the upland tract has been brought under cultivation by the Chenab canal. The country is very bare of trees, and the scenery throughout is tame and in the central plateau becomes monotonous. It seems likely that the district once contained the capital of the Punjab, at an epoch when Lahore had not begun to exist. We learn from the Chinese Buddhist pilgrim, Hsuan Tsang, that about the year 630 he visited a town known as Tse-kia (or Taki), the metropolis of the whole country of the five rivers. A mound near the modern village of Asarur has been identified as the site of the ancient capital. Until the Mahommedan invasions little is known of Gujranwala, except that Taki had fallen into oblivion and Lahore had become the chief city. Under Mahommedan rule the district flourished for a time; but a mysterious depopulation fell upon the tract, and the whole region seems to have been almost entirely abandoned. On the rise of Sikh power, the waste plains of Gujranwala were seized by various military adventurers. Charat Singh took possession of the village of Gujranwala, and here his grandson the great Maharaja Ranjit Singh was born. The Sikh rule, which was elsewhere so disastrous, appears to have been an unmitigated benefit to this district. Ranjit Singh settled large colonies in the various villages, and encouraged cultivation throughout the depopulated plain. In 1847 the district came under British influence in connexion with the regency at Lahore; and in 1840 it was included in the territory annexed after the second Sikh war. A large export trade is carried on in cotton, wheat and other grains. The district is served by the main line and branches of the North-Western railway.

GUJRAT, a town and district of British India, in the Rawalpindi division of the Punjab, lying on the south-western border of Kashmir. The town stands about 5 m. from the right bank of the river Chenab, 70 m. N. of Lahore by rail. Pop. (1901) 10,410. It is built upon an ancient site, formerly occupied, according to tradition, by two successive cities, the second of which is supposed to have been destroyed in 1303, the year of a Mongol invasion. More than 200 years later either Sher Shah or Akbar founded the existing town. Though standing in the midst of a Jat neighbourhood, the fort was first garrisoned by Gujars, and took the name of Gujrat. Akbar's fort, largely improved by Gujar Singh, stands in the centre of the town. The neighbouring shrine of the saint Shah Daula serves as a kind of native asylum for lunatics. The town has manufactures of furniture, inlaid work in gold and iron, brass-ware, boots, cotton goods and shawls.

The DISTRICT OF GUJRAT comprises a narrow wedge of sub-Himalayan plain country, possessing few natural advantages. From the basin of the Chenab on the south the general level rises rapidly towards the interior, which, owing to the great distance of the water beneath the surface, assumes a dreary and desert aspect. A range of low hills, known as the Pabbi, traverses the northern angle of Gujrat. They are composed of a friable Tertiary sandstone and conglomerate, destitute of vegetation, and presenting a mere barren chaos of naked rock, deeply scored with precipitous ravines. Immediately below the Pabbi stretches a high plateau, terminating abruptly in a precipitous bluff some 200 ft. in height. At the foot of this plateau is a plain, which forms the actual valley of the Chenab and participates in the irrigation from the river bed.

Numerous relics of antiquity stud the surface of the district. Mounds of ancient construction yield early coins, and bricks are found whose size and type prove them to belong to the prehistoric period. A mound now occupied by the village of Moga or Mong has been identified as the site of Nicaea, the city built by Alexander the Great on the field of his victory over Porus. The Delhi empire established its authority in this district under Bahlol Lodi (1451–1489). A century later it was visited by Akbar, who founded Gujrat as the seat of government. During the decay of the Mogul power, the Ghakkars of Rawalpindi overran this portion of the Punjab and established themselves in Gujrat about 1741. Meanwhile the Sikh power had been asserting itself in the eastern Punjab, and in 1765 the Ghakkar chief was defeated by Sirdar Gujar Singh, chief of the Bhangi confederacy. On his death, his son succeeded him, but after a few months' warfare, in 1798, he submitted himself as vassal to the Maharaja Ranjit Singh. In 1846 Gujrat first came under the supervision of British officials. Two years later the district became the theatre for the important engagements which decided the event of the second Sikh war. After several bloody battles in which the British were unsuccessful, the Sikh power was irretrievably broken at the engagement which took place at Gujrat on the 22nd of February 1849. The Punjab then passed by annexation under British rule.

The district comprises an area of 2051 sq. m. In 1901 the population was 750,548, showing a decrease of 1%, compared with an increase of 10% in the previous decade. The district has a large export trade in wheat and other grains, oil, wool, cotton and hides. The main line and the Sind-Sagar branch of the North-Western railway traverse it.

GULA, a Babylonian goddess, the consort of Ninib. She is identical with another goddess, known as Bau, though it would seem that the two were originally independent. The name Bau is more common in the oldest period and gives way in the post-Khammurabic age to Gula. Since it is probable that Ninib (*q.v.*) has absorbed the cults of minor sun-deities, the two names may represent consorts of different gods. However this may be, the qualities of both are alike, and the two occur as synonymous designations of Ninib's female consort. Other names borne by this goddess are Nin-Karrak, Ga-tum-dug and Nin-din-dug, the latter signifying "the lady who restores to life." The designation well emphasizes the chief trait of Bau-Gula which is that of healer. She is often spoken of as "the great physician," and accordingly plays a specially prominent rôle in incantations and incantation rituals intended to relieve those suffering from disease. She is, however, also invoked to curse those who trample upon the rights of rulers or those who do wrong with poisonous potions. As in the case of Ninib, the cult of Bau-Gula is prominent in Shirgulla and in Nippur. While generally in close association with her consort, she is also invoked by herself, and thus retains a larger measure of independence than most of the goddesses of Babylonia and Assyria. She appears in a prominent position on the designs accompanying the Kudurrus boundary-stone monuments of Babylonia, being represented by a statue, when other gods and goddesses are merely pictured by their shrines, by sacred animals or by weapons. In neo-Babylonian days her cult continues to occupy a prominent position, and Nebuchadrezzar II. speaks of no less than three chapels or shrines within the sacred precincts of E-Zida in the city of Borsippa, besides a temple in her honour at Babylon. (M. JA.)

GULBARGA, an ancient city of India, situated in the Nizam's dominions, 70 m. S.E. of Sholapur. Pop. (1901) 29,228. Originally a Hindu city, it was made the capital of the Bahmani kings when that dynasty established their independence in the Deccan in 1347, and it remained such until 1422. The palaces, mosques and tombs of these kings still stand half-ruined. The most notable building is a mosque modelled after that of Cordova

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in Spain, covering an area of 38,000 sq. ft., which is almost unique in India as being entirely covered in. Since the opening of a station on the Great India Peninsula railway, Gulbarga has become a centre of trade, with cotton-spinning and weaving mills. It is also the headquarters of a district and division of the same name. The district, as recently reconstituted, has an area of 6094 sq. m.; pop. (1901), 1,041,067.

GULF STREAM,[1] the name properly applied to the stream current which issues from the Gulf of Mexico and flows north-eastward, following the eastern coast of North America, and separated from it by a narrow strip of cold water (the *Cold Wall*), to a point east of the Grand Banks off Newfoundland. The Gulf Stream is a narrow, deep current, and its velocity is estimated at about 80 m. a day. It is joined by, and often indistinguishable from, a large body of water which comes from outside the West Indies and follows the same course. The term was formerly applied to the drift current which carries the mixed waters of the Gulf Stream and the Labrador current eastwards across the Atlantic. This is now usually known as the "Gulf Stream drift," although the name is not altogether appropriate. See ATLANTIC.

GULFWEED, in botany, a popular name for the seaweed *Sargassum bacciferum*, one of the brown seaweeds (Phaeophyceae), large quantities of which are found floating in the Gulf of Mexico, whence it is carried northwards by the Gulf Stream, small portions sometimes being borne as far as the coasts of the British Isles. It was observed by Columbus, and is remarkable among seaweeds for its form, which resembles branches bearing leaves and berries; the latter, to which the species-name *bacciferum* refers, are hollow floats answering the same purpose as the bladders in another brown seaweed, *Fucus vesiculosus*, which is common round the British Isles between high and low water.

GULL, SIR WILLIAM WITHEY, 1st Bart. (1816–1890), English physician, was the youngest son of John Gull, a barge-owner and wharfinger of Thorpe-le-Soken, Essex, and was born on the 31st of December 1816 at Colchester. He began life as a schoolmaster, but in 1837 Benjamin Harrison, the treasurer of Guy's Hospital, who had noticed his ability, brought him up to London from the school at Lewes where he was usher, and gave him employment at the hospital, where he also gained permission to attend the lectures. In 1843 he was made a lecturer in the medical school of the hospital, in 1851 he was chosen an assistant physician, and in 1856 he became full physician. In 1847 he was elected Fullerian professor of physiology in the Royal Institution, retaining the post for the usual three years, and in 1848 he delivered the Gulstonian Lectures at the College of Physicians, where he filled every office of honour but that of president. He died in London on the 29th of January 1890 after a series of paralytic strokes, the first of which had occurred nearly three years previously. He was created a baronet in 1872, in recognition of the skill and care he had shown in attending the prince of Wales during his attack of typhoid in 1871. Sir William Gull's fame rested mainly on his success as a clinical practitioner; as he said himself, he was "a clinical physician or nothing." This success must be largely ascribed to his remarkable powers of observation, and to the great opportunities he enjoyed for gaining experience of disease. He was sometimes accused of being a disbeliever in drugs. That was not the case, for he prescribed drugs like other physicians when he considered them likely to be beneficial. He felt, however, that their administration was only a part of the physician's duties, and his mental honesty and outspokenness prevented him from deluding either himself or his patients with unwarranted notions of what they can do. But though he regarded medicine as primarily an art for the relief of physical suffering, he was far from disregarding the scientific side of his profession, and he made some real contributions to medical science. His papers were printed chiefly in *Guy's Hospital Reports* and in the proceedings of learned societies: among the subjects he wrote about were cholera, rheumatic fever, taenia, paraplegia and abscess of the brain, while he distinguished for the first time (1873) the disease now known as myxoedema, describing it as a "cretinoid state in adults."

GULL (Welsh *gwylan*, Breton, *goelann*, whence Fr. *goéland*), the name commonly adopted, to the almost entire exclusion of the O. Eng. MEW (Icel. *máfur*, Dan. *maage*, Swedish *måse*, Ger. *Meve*, Dutch *meeuw*, Fr. *mouette*), for a group of sea-birds widely and commonly known, all belonging to the genus *Larus* of Linnaeus, which subsequent systematists have broken up in a very arbitrary and often absurd fashion. The family *Laridae* is composed of two chief groups, *Larinae* and *Sterninae*—the gulls and the terns, though two other subfamilies are frequently counted, the skuas (*Stercorariinae*), and that formed by the single genus *Rhynchops*, the skimmers; but there seems no strong reason why the former should not be referred to the *Larinae* and the latter to the *Sterninae*.

Taking the gulls in their restricted sense, Howard Saunders, who has subjected the group to a rigorous revision (*Proc. Zool. Society*, 1878, pp. 155-211), admits forty-nine species of them, which he places in five genera instead of the many which some prior investigators had sought to establish. Of the genera recognized by him, *Pagophila* and *Rhodostethia* have but one species each, *Rissa* and *Xema* two, while the rest belong to *Larus*. The *Pagophila* is the so-called ivory-gull, *P. eburnea*, names which hardly do justice to the extreme whiteness of its plumage, to which its jet-black legs offer a strong contrast. The young, however, are spotted with black. An inhabitant of the most northern seas, examples, most commonly young birds of the year, find their way in winter to more temperate shores. Its breeding-place has seldom been discovered, and the first of its eggs ever seen by ornithologists was brought home by Sir L. M'Clintock in 1853 from Cape Krabbe (*Journ. R. Dubl. Society*, i. 60, pl. 1); others were subsequently obtained by Dr Malmgren in Spitsbergen. Of the species of *Rissa*, one is the abundant and well-known kittiwake, *R. tridactyla*, of circumpolar range, breeding, however, also in comparatively low latitudes, as on the coasts of Britain, and in winter frequenting southern waters. The other is *R. brevirostris*, limited to the North Pacific, between Alaska and Kamchatka. The singular fact requires to be noticed that in both these species the hind toe is generally deficient, but that examples of each are occasionally found in which this functionless member has not wholly disappeared. We have then the genus *Larus*, which ornithologists have attempted most unsuccessfully to subdivide. It contains the largest as well as the smallest of gulls. In some species the adults assume a dark-coloured head every breeding-season, in others any trace of dark colour is the mark of immaturity. The larger species prey fiercely on other kinds of birds, while the smaller content themselves with a diet of small animals, often insects and worms. But however diverse be the appearance, structure or habits of the extremities of the series of species, they are so closely connected by intermediate forms that it is hard to find a gap between them that would justify a generic division. Forty-three species of this genus are recognized by Saunders. About fifteen belong to Europe and fourteen to North America, of which (excluding stragglers) some five only are common to both countries. Our knowledge of the geographical distribution of several of them is still incomplete. Some have a very wide range, others very much the reverse, as witness *L. fuliginosus*, believed to be confined to the Galapagos, and *L. scopulinus* and *L. bulleri* to New Zealand,—the last indeed perhaps only to the South Island. The largest species of the group are the glaucous gull and greater black-backed gull, *L. glaucus* and *L. marinus*, of which the former is circumpolar, and the latter nearly so—not being hitherto found between Labrador and Japan. The smallest species is the European *L. minutus*, though the North American *L. philadelphia* does not much exceed it in size. Many of the gulls congregate in vast numbers to breed, whether on rocky cliffs of the sea-coast

[1] The word "gulf," a portion of the sea partially enclosed by the coast-line, and usually taken as referring to a tract of water larger than a bay and smaller than a sea, is derived through the Fr. *golfe*, from Late Gr. κόλπος, class. Gr. κόλπος, bosom, hence bay, cf. Lat. *sinus*. In University slang, the term is used of the position of those who fail to obtain a place in the honours list at a public examination, but are allowed a "pass."

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or on healthy islands in inland waters. Some of the settlements of the black-headed or "peewit" gull, *L. ridibundus*, are a source of no small profit to their proprietors,—the eggs, which are rightly accounted a great delicacy, being taken on an orderly system up to a certain day, and the birds carefully protected. Ross's or the roseate gull, *Rhodostethia rosea*, forms a well-marked genus, distinguished not so much by the pink tint of its plumage (for that is found in other species) but by its small dove-like bill and wedge-shaped tail. It is an exceedingly scarce bird, and beyond its having an Arctic habitat, little has yet been ascertained about it. More rare still is one of the species of *Xema*, *X. furcatum*, of which only two specimens, both believed to have come from the Galapagos, have been seen. Its smaller congener Sabine's gull, *X. sabinii*, is more common, and has been found breeding both in Arctic America and in Siberia, and several examples, chiefly immature birds, have been obtained in the British islands. Both species of *Xema* are readily distinguished from all other gulls by their forked tails. (A. N.)

GULLY, JOHN (1783–1863), English sportsman and politician, was born at Wick, near Bath, on the 21st of August 1783, the son of an innkeeper. He came into prominence as a boxer, and in 1805 he was matched against Henry Pearce, the "Game Chicken," before the duke of Clarence (afterwards William IV.) and numerous other spectators, and after fighting sixty-four rounds, which occupied an hour and seventeen minutes, was beaten. In 1807 he twice fought Bob Gregson, the Lancashire giant, for two hundred guineas a side, winning on both occasions. As the landlord of the "Plough" tavern in Carey Street, London, he retired from the ring in 1808, and took to horse-racing. In 1827 he lost £40,000 by backing his horse "Mameluke" (for which he had paid four thousand guineas) for the St Leger. In partnership with Robert Ridsdale, in 1832, he made £85,000 by winning the Derby and St Leger with "St Giles" and "Margrave." In partnership with John Day he won the Two Thousand Guineas with "Ugly Buck" in 1844, and two years later he took the Derby and the Oaks with "Pyrrhus the First" and "Mendicant," in 1854 the Two Thousand Guineas with "Hermit," and in the same year, in partnership with Henry Padwick, the Derby with "Andover." Having bought Ackworth Park near Pontefract he was M.P. from December 1832 to July 1837. In 1862 he purchased the Wingate Grange estate and collieries. Gully was twice married and had twelve children by each wife. He died at Durham on the 9th of March 1863. He appears to have been the relation of the subsequent Speaker, Lord Selby.

GULPÁIGÁN (*Jerbádegán* of the Arab geographers), a district and city in Central Persia, situated N.W. of Isfahán and S.E. of Irák. Together with Khunsár it forms a small province, paying a yearly revenue of about £6000. The city of Gulpáigán is situated 87 m. N.W. of Isfahán, at an elevation of 5875 ft. in 33° 24′ N. and 50° 20′ E., and has a population of about 5000. The district is fertile and produces much grain and some opium. Sometimes it is under the governor-general of the Isfahán province, at others it forms part of the province of Irák, and at times, as in 1906, is under a governor appointed from Teheran.

GUM (Fr. *gomme*, Lat. *gummi*, Gr. κόμμι, possibly a Coptic word; distinguish "gum," the fleshy covering of the base of a tooth, in O. Eng. *gōma*, palate, cf. Ger. *Gaumen*, roof of the mouth; the ultimate origin is probably the root *gha*, to open wide, seen in Gr. χαίνειν, to gape, cf. "yawn"), the generic name given to a group of amorphous carbo-hydrates of the general formula $(C_6H_{10}O_5)_n$, which exist in the juices of almost all plants, and also occur as exudations from stems, branches and fruits of plants. They are entirely soluble or soften in water, and form with it a thick glutinous liquid or mucilage. They yield mucic and oxalic acids when treated with nitric acid. In structure the gums are quite amorphous, being neither organized like starch nor crystallized like sugar. They are odourless and tasteless, and some yield clear aqueous solutions—the real gums—while others swell up and will not percolate filter paper—the vegetable mucilages. The acacias and the Rosaceae yield their gums most abundantly when sickly and in an abnormal state, caused by a fulness of sap in the young tissues, whereby the new cells are softened and finally disorganized; the cavities thus formed fill with liquid, which exudes, dries and constitutes the gum.

Gum arabic may be taken as the type of the gums entirely soluble in water. Another variety, obtained from the *Prosopis dulcis*, a leguminous plant, is called gum mesquite or mezquite; it comes from western Texas and Mexico, and is yellowish in colour, very brittle and quite soluble in water.

Gum arabic occurs in pieces of varying size, and some kinds are full of minute cracks. The specific gravity of Turkey picked gum (the purest variety) is 1·487, or, when dried at 100° C., 1·525. It is soluble in water to an indefinite extent; boiled with dilute sulphuric acid it is converted into the sugar galactose. Moderately strong nitric acid changes it into mucic, saccharic, tartaric and oxalic acids. Under the influence of yeast it does not enter into the alcoholic fermentation, but M. P. E. Berthelot, by digesting with chalk and cheese, obtained from it 12% of its weight of alcohol, along with calcium lactate, but no appreciable quantity of sugar. Gum arabic may be regarded as a potassium and calcium salt of gummic or arabic acid. T. Graham (*Chemical and Physical Researches*) recommended dialysis as the best mode of preparing gummic acid, and stated that the power of gum to penetrate the parchment septum is 400 times less than that of sodium chloride, and, further, that by mixing the gum with substances of the crystalloid class the diffusibility is lowered, and may be even reduced to nothing. The mucilage must be acidulated with hydrochloric acid before dialysing, to set free the gummic acid; then adding alcohol to the solution, the acid is precipitated as a white amorphous mass, which becomes glassy at 100°. Its formula is $(C_{12}H_{20}O_{11})_2H_2O$, and it forms compounds with nearly all bases which are easily soluble in water. Gummic acid reddens litmus, its reaction being about equal to carbonic acid. When solutions of gum arabic and gelatin are mixed, oily drops of a compound of the two are precipitated, which on standing form a nearly colourless jelly, melting at 25° C., or by the heat of the hand. This substance can be washed without decomposition. Gummic acid is soluble in water; when well dried at 100° it becomes transformed into metagummic acid, which is insoluble, but swells up in water like gum tragacanth.

Gum arabic, when heated to 150° C. with two parts of acetic anhydride, swells up to a mass which, when washed with boiling water, and then with alcohol, gives a white amorphous insoluble powder called acetyl arabin $C_6H_8(C_2H_3O)_2O_4$. It is saponified by alkalies, with reproduction of soluble gum. Gum arabic is not precipitated from solution by alum, stannous chloride, sulphate or nitrate of copper, or neutral lead acetate; with basic lead acetate it forms a white jelly, with ferric chloride it yields a stiff clear gelatinoid mass, and its solutions are also precipitated by borax.

The finer varieties are used as an emollient and demulcent in medicine, and in the manufacture of confectionery; the commoner qualities are used as an adhesive paste, for giving lustre to crape, silk, &c., in cloth finishing to stiffen the fibres, and in calico-printing. For labels, &c., it is usual to mix sugar or glycerin with it to prevent it from cracking.

Gum senegal, a variety of gum arabic produced by *Acacia Verek*, occurs in pieces generally rounded, of the size of a pigeon's egg, and of a reddish or yellow colour, and specific gravity 1·4·31. It gives with water a somewhat stronger mucilage than gum arabic, from which it is distinguished by its clear interior, fewer cracks and greater toughness. It is imported from the river Gambia, and from Senegal and Bathurst.

Chagual gum, a variety brought from Santiago, Chile, resembles gum senegal. About 75% is soluble in water. Its solution is not thickened by borax, and is precipitated by neutral lead acetate; and dilute sulphuric acid converts it into *d*-glucose.

Gum tragacanth, familiarly called gum dragon, exudes from the stem, the lower part especially, of the various species of *Astragalus*, especially *A. gummifer*, and is collected in Asia Minor, the chief port of shipment being Smyrna. Formerly only what exuded spontaneously was gathered; this was often of a brownish colour; but now the flow of the gum is aided by incisions cut near the root, and the product is the fine, white, flaky variety so much valued in commerce. The chief flow of gum takes place during the night, and hot and dry weather is the most favourable for its production.

In colour gum tragacanth is of a dull white; it occurs in horny, flexible and tough, thin, twisted flakes, translucent, and with peculiar wavy lines on the surface. When dried at temperatures under 100° C. it loses about 14% of water, and is then easily powdered. Its specific gravity is 1·384. With water it swells by absorption, and

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with even fifty times its weight of that liquid forms a thick mucilage. Part of it only is soluble in water, and that resembles gummic acid in being precipitated by alcohol and ammonium oxalate, but differs from it in giving a precipitate with neutral lead acetate and none with borax. The insoluble part of the gum is a calcium salt of bassorin ($C_{12}H_{20}O_{10}$), which is devoid of taste and smell, forms a gelatinoid mass with water, but by continued boiling is rendered soluble.

Gum tragacanth is used in calico-printing as a thickener of colours and mordants; in medicine as a demulcent and vehicle for insoluble powders, and as an excipient in pills; and for setting and mending beetles and other insect specimens. It is medicinally superior to gum acacia, as it does not undergo acetous fermentation. The best pharmacopeial preparation is the *Mucilago Tragacanthae*. The compound powder is a useless preparation, as the starch it contains is very liable to ferment.

Gum kuteera resembles in appearance gum tragacanth, for which the attempt has occasionally been made to substitute it. It is said to be the product of *Sterculia urens*, a plant of the natural order Sterculiaceae.

Cherry tree gum is an exudation from trees of the genera *Prunus* and *Cerasus*. It occurs in shiny reddish lumps, resembling the commoner kinds of gum arabic. With water, in which it is only partially soluble, it forms a thick mucilage. Sulphuric acid converts it into *l*-arabinose; and nitric acid oxidizes it to oxalic acid (without the intermediate formation of mucic acid as in the case of gum arabic).

Gum of Bassora, from Bassora or Bussorah in Asia, is sometimes imported into the London market under the name of the hog tragacanth. It is insipid, crackles between the teeth, occurs in variable-sized pieces, is tough, of a yellowish-white colour, and opaque, and has properties similar to gum tragacanth. Its specific gravity is 1·36. It contains only 1% of soluble gum or arabin. Under the name of Caramania gum it is mixed with inferior kinds of gum tragacanth before exportation.

Mucilage.—Very many seeds, roots, &c., when infused in boiling water, yield mucilages which, for the most part, consist of bassorin. Linseed, quince seed and marshmallow root yield it in large quantity. In their reactions the different kinds of mucilage present differences; *e.g.* quince seed yields only oxalic acid when treated with nitric acid, and with a solution of iodine in zinc iodide it gives, after some time, a beautiful red tint. Linseed does not give the latter reaction; by treatment with boiling nitric acid it yields mucic and oxalic acids.

Gum Resins.—This term is applied to the inspissated milky juices of certain plants, which consist of gum soluble in water, resin and essential oil soluble in alcohol, other vegetable matter and a small amount of mineral matter. They are generally opaque and solid, and often brittle. When finely powdered and rubbed down with water they form emulsions, the undissolved resin being suspended in the gum solution. Their chief uses are in medicine. Examples are ammoniacum, asafetida, bdellium, euphorbium, gamboge, myrrh, sagapanum and scammony.

GÜMBEL, KARL WILHELM VON, Baron (1823–1898), German geologist, was born at Dannenfels, in the Palatinate of the Rhine, on the 11th of February 1823, and is known chiefly by his researches on the geology of Bavaria. He received a practical and scientific education in mining at Munich and Heidelberg, taking the degree of Ph.D. at Munich in 1862; and he was engaged for a time at the colliery of St Ingbert and as a surveyor in that district. In 1851, when the Geological Survey of Bavaria was instituted, Gümbel was appointed chief geologist; in 1863 he was made honorary professor of geognosy and surveying at the university of Munich, and in 1870, Oberberg director of the Bavarian mining department with which the Geological Survey was incorporated. His geological map of Bavaria appeared in 1858, and the official memoir descriptive of the detailed work, entitled *Geognostische Beschreibung des Königreichs Bayern* was issued in three parts (1861, 1868 and 1879). He subsequently published his *Geologie von Bayern* in 2 vols (1884–1894), an elaborate treatise on geology, with special reference to the geology of Bavaria. In the course of his long and active career he engaged in much palaeontological work: he studied the fauna of the Trias, and in 1861 introduced the term Rhaetic for the uppermost division of that system; he supported at first the view of the organic nature of *Eozoon* (1866 and 1876), he devoted special attention to Foraminifera, and described those of the Eocene strata of the northern Alps (1868); he dealt also with Receptaculites (1875) which he regarded as a genus belonging to the Foraminifera. He died on the 18th of June 1898.

GUMBINNEN, a town of Germany, in the Prussian province of East Prussia, on the Pissa, an affluent of the Pregel, 22 m. by rail S.W. of Eydtkuhnen on the line to Königsberg. Pop. (1905), 14,194. The surrounding country is pleasant and fruitful, and the town has spacious and regular streets shaded by linden trees. It has a Roman Catholic and three Evangelical churches, a synagogue, a gymnasium, two public schools, a public library, a hospital and an infirmary. In the market square there is a statue of the king of Prussia Frederick William I., who in 1724 raised Gumbinnen to the rank of a town, and in 1732 brought to it a number of persons who had been driven from Salzburg by religious persecution. On the bridge over the Pissa a monument has been erected to the soldiers from the neighbourhood who fell in the Franco-German war of 1870–71. Iron founding and the manufacture of machinery, wool, cotton, and linen weaving, stocking-making, tanning, brewing and distilling are the principal industries. There are horse and cattle markets, and some trade in corn and linseed.

See J. Schneider, *Aus Gumbinnens Vergangenheit* (Gumbinnen, 1904).

GUMBO, or Okra, termed also *Obro, Ochro, Ketmia, Gubbo* and Syrian mallow (Sans. *Tindisa*, Bengali *Dheras*, Pers. *Bámiyah*—the *Bammia* of Prosper Alpinus; Fr. *Gombaut*, or better *Gombo*, and *Ketmie comestible*), *Hibiscus esculentus*, a herbaceous hairy annual plant of the natural order *Malvaceae*, probably of African origin, and now naturalized or cultivated in all tropical countries. The leaves are cordate, and 3 to 5-lobed, and the flowers yellow, with a crimson centre; the fruit or pod, the *Bendi-Kai* of the Europeans of southern India, is a tapering, 10-angled capsule, 4 to 10 in. in length, except in the dwarf varieties of the plant, and contains numerous oval dark-coloured seeds, hairy at the base. Three distinct varieties of the gumbo (*Quiabo* and *Quimgombo*) in Brazil have been described by Pacheco. The unripe fruit is eaten either pickled or prepared like asparagus. It is also an ingredient in various dishes, *e.g.* the *gumbo* of the Southern United States and the *calalou* of Jamaica; and on account of the large amount of mucilage it contains, it is extensively consumed, both fresh and in the form of the prepared powder, for the thickening of broths and soups. For winter use it is salted or sliced and dried. The fruit is grown on a very large scale in the vicinity of Constantinople. It was one of the esculents of Egypt in the time of Abul-Abbas el-Nebâti, who journeyed to Alexandria in 1216 (Wüstenfeld, *Gesch. d. arab. Ärzte*, p. 118, Gött., 1840), and is still cultivated by the Egyptians, who called it *Bammeḥ*.

The seeds of the gumbo are used as a substitute for coffee. From their demulcent and emollient properties, the leaves and immature fruit have long been in repute in the East for the preparation of poultices and fomentations. Alpinus (1592) mentions the employment of their decoction in Egypt in ophthalmia and in uterine and other complaints.

The musk okra (Sans., *Latákasturiká*, cf. the Gr. *κἀστωρ*; Bengali, *Latakasturi*; Ger. *Bisamkörnerstrauch*; Fr. *Ketmie musquée*), *Hibiscus Abelmoschus* (*Abelmoschus moschatus*), indigenous to India, and cultivated in most warm regions of the globe, is a suffruticose plant, bearing a conical 5-ridged pod about 3 in. in length, within which are numerous brown reniform seeds, smaller than those of *H. esculentus*. The seeds possess a musky odour, due to an oleo-resin present in the integument, and are known to perfumers under the name of *ambrette* as a substitute for musk. They are said to be used by the Arabs for scenting coffee. The seeds (in the Fantee language, *Incromahom*) are used in Africa as beads; and powdered and steeped in rum they are valued in the West Indies as a remedy for snakebites. The plant yields an excellent fibre, and, being rich in mucilage, is employed in Upper India for the clarifying of sugar. The best-perfumed seeds are reported to come from Martinique.

See P. Alpinus, *De plantis Aegypti*, cap. xxvii. p. 38 (Venice, 1592); J. Sontheimer's *Abd Allah ibn Ahmad*, &c., i. 118 (Stuttgart,

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1840–1842); P. P. Pacheco, "La Ketmie potagère ou comestible," *La Belgique horticole*, iv. 63 (1853); Della Sudda, "De l'emploi à Constantinople de la racine de l'Hibiscus esculentus," *Répert. de pharm.*, January 1860, p. 29; E. J. Waring, *Pharm. of India*, p. 35 (1868); O. Popp, "Über die Aschenbestandteile der Samen von Acacia nilotica und Hibiscus esculentus in Ägypten," *Arch. der Pharm.* cxcv. p. 140 (1871); Drury, *The Useful Plants of India*, pp. 1, 2 (2nd ed., 1873); U. C. Dutt, *The Mat. Med. of the Hindus*, pp. 123, 321 (1877); Lanessan, *Hist. des drogues*, i. 181–184 (1878); G. Watt, *Dictionary of the Economic Products of India* (1890).

GUMTI, a river of northern India. It rises in a depression in the Pilibhit district of the United Provinces, and after a sinuous but generally south-easterly course of 500 m. past Lucknow and Jaunpur joins the Ganges in Ghazipur district. At Jaunpur it is a fine stream, spanned by a 16th-century bridge of sixteen arches, and is navigable by vessels of 17 tons burden. There is also a small river of the same name in the Tippera district of eastern Bengal and Assam.

GUMULJINA, or GÜMÜRDJINA, a town of European Turkey, in the vilayet of Adrianople. Pop. (1905), about 8000, of whom three-fourths are Turks and the remainder Greeks, Jews or Armenians. Gumuljina is situated on the river Karaja-Su, south of the eastern extremity of the Rhodope range of mountains and 13 m. inland from the Aegean Sea. It has a station on the railway between Salonica and Dédéagatch. The district produces wheat, maize, barley and tobacco; sericulture and viticulture are both practised on a limited scale. A cattle fair is held annually on Greek Palm Sunday. Copper and antimony are found in the neighbourhood.

GUMUS, or GUMZ, Negroes of the Shangalla group of tribes, dwelling in the mountainous district of Fazogli on the Sudan-Abyssinian frontier. They live in independent groups, some being mountaineers while others are settled on the banks of the Blue Nile. Gumz in the native tongue signifies "people," and the sub-tribes have distinctive names. The Gumus are nature-worshippers, God and the sun being synonymous. On ceremonial occasions they carry parasols of honour (see SHANGALLA).

GÜMÜSH-KHANEH, the chief town of a sanjak of the same name in the Trebizond vilayet of Asiatic Turkey, situated on high ground (4200 ft.) in the valley of the Kharshut Su, about ½ m. to south of the Trebizond-Erzerum *chaussée*. The silver mines from which the place takes its name were noted in ancient times and are mentioned by Marco Polo. Pop. about 3000, chiefly Greeks, who are in the habit of emigrating to great distances to work in mines. They practically supply the whole lead- and silver-mining labour in Asiatic Turkey, and in consequence the Greek bishop of Gümüsh-Khaneh has under his jurisdiction all the communities engaged in this particular class of mines.

GUN, a general term for a weapon, tubular in form, from which a projectile is discharged by means of an explosive. When applied to artillery the word is confined to those pieces of ordnance which have a direct as opposed to a high-angle fire, in which case the terms "howitzer" and "mortar" are used (see ORDNANCE and MACHINE-GUN). "Gun" as applied to firearms which are carried in the hand and fired from the shoulder, the old "hand gun," is now chiefly used of the sporting shot-gun, with which this article mainly deals; in military usage this type of weapon, whether rifle, carbine, &c., is known collectively as "small arms" (see RIFLE and PISTOL). The origin of the word, which in Mid. Eng. is *gonne* or *gunne*, is obscure, but it has been suggested by Professor W. W. Skeat that it conceals a female name, *Gunnilde* or *Gunhilda*. The names, *e.g.* Mons Meg at Edinburgh Castle and *faule Grete* (heavy Peg), known to readers of Carlyle's *Frederick the Great*, will be familiar parallelisms. "Gunne" would be a shortened "pet name" of Gunnhilde. The *New English Dictionary* finds support for the suggestion in the fact that in Old Norwegian *gunne* and *hilde* both mean "war," and quotes an inventory of war material at Windsor Castle in 1330–1331, where is mentioned "una magna balista de cornu quae vocatur Domina Gunilda." Another suggestion for the origin of the word is that the word represents a shortened form, *gonne*, of a supposed French *mangonne*, a mangonel, but the French word is *mangonneau*.

Firearms are said to have been first used in European warfare in the 14th century. The hand gun (see fig. 1) came into practical use in 1446 and was of very rude construction. It consisted of a simple iron or brass tube with a touch-hole at the top fixed in a straight stock of wood, the end of which passed under the right armpit when the "gonne" was about to be fired. A similar weapon (see fig. 2) was also used by the horse-soldier, with a ring at the end of the stock, by which it was suspended by a cord round the neck; a forked rest, fitted by a ring to the saddlebow, served to steady the gun. This rest, when not in use, hung down in front of the right leg. A match was made of cotton or hemp spun slack, and boiled in a strong solution of saltpetre or in the lees of wine. The touch-hole was first placed on the top of the barrel, but afterwards at the side, with a small pan underneath to hold the priming, and guarded by a cover moving on a pivot.

FIG. 1.—Hand Gun.

An improvement in firearms took place in the first year of the reign of Henry VII., or at the close of Edward IV., by fixing a cock (Fr. *serpentine*) on the hand gun to hold the match, which was brought down to the priming by a trigger, whence the term matchlock. This weapon is still in use among the Chinese, Tatars, Sikhs, Persians and Turks. An improvement in the stock was also made during this period by forming it with a wide butt end to be placed against the right breast. Subsequently the stock was bent, a German invention, and the arm was called a hackbutt or hagbut, and the smaller variety a demihague. The arquebus and hackbutt were about a yard in length, including barrel and stock, and the demihague was about half the size and weight, the forerunner of the pistol. The arquebus was the standard infantry firearm in Europe from the battle of Pavia to the introduction of the heavier and more powerful musket. It did not as a rule require a rest, as did the musket. The wheel-lock, an improvement on the match-lock, was invented in Nuremberg in 1517; was first used at the siege of Parma in 1521; was brought to England in 1530, and continued in partial use there until the time of Charles II. This wheel-lock consisted of a fluted or grooved steel wheel which protruded into the priming pan, and was connected with a strong spring. The cock, also regulated by a spring, was fitted with a piece of iron pyrites. In order to discharge the gun the

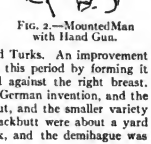

FIG. 2.—Mounted Man with Hand Gun.

From General Hardÿ de Périni's *Turenne et Condé 1626-1675*.

FIG. 3.—Musketeer, 1626.

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lock was wound up by a key, the cock was let down on the priming pan, the pyrites resting on the wheel; on the trigger being pressed the wheel was released and rapidly revolved, emitting sparks, which ignited the powder in the pan. The complicated and expensive nature of this lock, with its liability to injury, no doubt prevented its general adoption.

About 1540 the Spaniards constructed a larger and heavier firearm (matchlock), carrying a ball of 10 to the pound, called a musket. This weapon was introduced into England before the middle of the 16th century, and soon came into general use throughout Europe. The snaphance was invented about this period in Germany, and from its comparative cheapness was

From General Hardy de Périni's *Turenne et Condé, 1626-1675.*

FIGS. 4 and 5.—Musketeers, 1675.

much used in England, France and Holland. It held a flint instead of the pyrites of the wheel or firelock, which ignited the powder in the pan by striking on a piece of furrowed steel, when released by the trigger, and emitting sparks.

As a sporting weapon the gun may be said to date from the invention of the wheel-lock in the beginning of the 16th century, though firearms were used for sporting purposes in Italy, Spain, Germany, and to some extent in France, in the 15th century. Before that period the longbow in England and the crossbow on the Continent were the usual weapons of the chase. In Great Britain little use appears to have been made of firearms for game shooting until the latter half of the 17th century, and the arms then used for the purpose were entirely of foreign make.

The French gunmakers of St-Étienne claim for their town that it is the oldest centre of the firearms industry. They do not appear to have made more than the barrels of the finest sporting arms, and these even were sometimes made in Paris. The production of firearms by the artists of Paris reached its zenith about the middle of the 17th century. The Italian, German, Spanish and Russian gunsmiths also showed great skill in the elegance and design of their firearms, the Spaniards in particular being makers of fine barrels. The pistol (*q.v.*) is understood to have been made for the first time about 1540 at Pistoia in Italy. About 1635 the modern firelock or flint-lock was invented, which only differed from the snaphance by the cover of the pan forming part of the furrowed steel struck by the flint. Originally the priming was put into the pan from a flask containing a fine-grained powder called serpentine powder. Later the top of the cartridge was bitten off and the pan filled therefrom before loading. The mechanism of the flint-lock musket rendered all this unnecessary, as, in loading, a portion of the charge passed through the vent into the pan, where it was held by the cover or hammer. The matchlock, as a military weapon, gradually gave way to the firelock, which came into general use in the last half of the 17th century, and was the weapon of Marlborough's and Wellington's armies. This was the famous "Brown Bess" of the British army. The highest development of the flint-lock is found in the fowling-pieces of the end of the 18th and beginning of the 19th centuries, particularly those made by Joseph Manton, the celebrated English gunsmith and inventor. The Napoleonic wars afforded English gunmakers an opportunity, which they fully utilized, of gaining the supremacy over their foreign competitors in the gunmaking trade. English gunmakers reduced the weight, improved the shooting powers, and perfected the lock mechanism of the sporting gun, and increased the range and efficiency of the rifle. This transference of the gunmaking craft from the Continent to England was also assisted by the tyranny of the foreign gunmaking guilds. In 1637 the London gunmakers obtained their charter of incorporation. The important gunmaking industry of Birmingham dates from 1603, and soon rivalled that of London. Double shot-guns do not appear to have been generally used until the 19th century. The first successful double guns were built with the barrels over and under, and not side by side, and were invented about 1616 by one Guilliano Bossi of Rome. In 1784 double shot guns were described as a novelty. Joseph Manton patented the elevated rib which rested on the barrels. The general success of the double gun was eventually due to the light weight which the better material and workmanship of the best gunmakers made possible, and to the quickness and certainty of ignition of the modern cartridge.

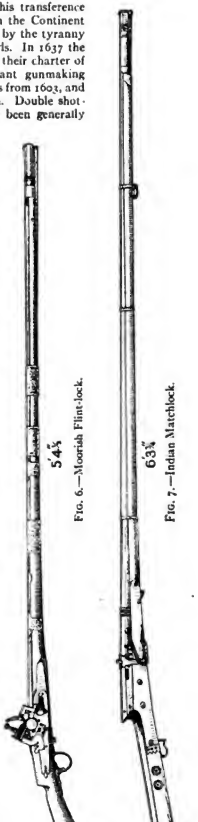

FIG. 6.—Moorish Flint-lock. 54¾"

FIG. 7.—Indian Matchlock. 63¾"

The objections to the flint-lock were that it did not entirely preserve the priming from wet, and that the flint sparks sometimes failed to ignite the charge. In 1807 the Rev. Alexander John Forsyth obtained a patent for priming with a fulminating powder made of chlorate of potash, sulphur and charcoal, which exploded by concussion. This important improvement in firearms was not recognized and adopted by the military authorities until more than thirty years later. In the meantime it was gradually developed, and the copper percussion cap invented, by various gunmakers and private individuals. Thomas Shaw of Philadelphia first used fulminate in a steel cap in 1814, which he changed to a copper cap in 1816. It was not until the introduction of the copper cap that the percussion gun could be considered in every way superior to the flint. In 1834, in the reign of William IV., Forsyth's invention was tested at Woolwich by firing 6000 rounds from six flint-lock muskets, and a similar number from six percussion muskets, in all weathers

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Fig. 8.

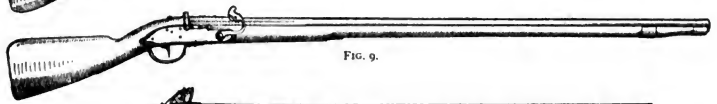

Fig. 9.

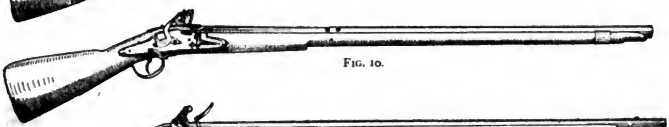

Fig. 10.

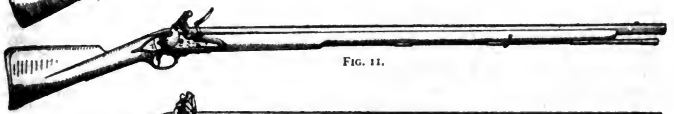

Fig. 11.

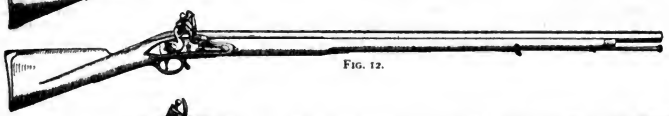

Fig. 12.

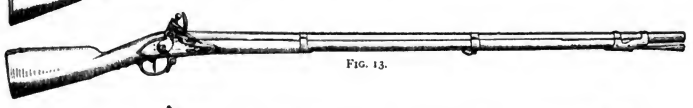

Fig. 13.

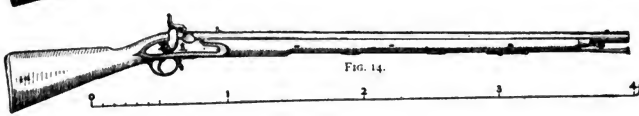

Fig. 14.

Fig. 15.

Fig. 16.

Fig. 17.

Fig. 18.

This trial established the percussion principle. The shooting was found to be more accurate, the recoil less, the charge of powder having been reduced from 6 to 4¼ drs., the rapidity of firing greater and the number of miss-fires much reduced, being as 1 to 26 nearly in favour of the percussion system. In consequence of this successful trial the military flint-lock in 1839 was altered to suit the percussion principle. This was easily accomplished by replacing the hammer and pan by a nipple with a hole through its centre to the vent or touch-hole, and by replacing the cock which held the flint by a smaller cock or hammer with a hollow to fit on the nipple when released by the trigger. On the nipple was placed the copper cap containing the detonating composition, now made of three parts of chlorate of potash, two of fulminate of mercury and one of powdered glass.

In 1840 the Austrian army was supplied with the percussion musket, and in 1842 a new model percussion musket with a block or back-sight for 150 yds. was issued to the British army, 11 lb 6 oz. in weight, 4 ft. 6¾ in. in length without bayonet, 6 ft. with bayonet and with a barrel 3 ft. 3 in. in length, firing a bullet of 14½ to the lb with 4½ drs. of powder. This musket was larger in bore than that of France, Belgium, Russia and Austria, and thus had the advantage of being able to fire their balls, while the English balls could not be fired from their barrels. But the greater weight and momentum of the English ball was counteracted by the excess of windage. This percussion musket of 1842, the latest development of the renowned Brown Bess, continued in use in the British army until partially superseded in 1851 by the Minié rifle, and altogether by the Enfield rifle

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in 1855. For further information as to the history and development of military, target and sporting rifles see RIFLE.

Illustrations are given herewith of a German carbine of the 16th century, with double wheel-lock (fig. 8); a snaphance (fig. 9); several forms of the Brown Bess or flint-lock military musket (English, William III., fig. 10; George II., fig. 11; George III., fig. 12; French, Napoleon, fig. 13); and of the percussion musket adopted in the British service in 1839 (fig. 14). Examples of non-European firearms are shown in figs. 6 and 7, representing a Moorish flint-lock and an Indian matchlock respectively. Figs. 15-18 represent various carbines, musketoons and blunderbusses, fig. 15 showing a small blunderbuss or musketoon of the early 18th century, fig. 16 a large blunderbuss of 1750, fig. 17 a flint-lock cavalry carbine of about 1825 and fig. 18 a percussion carbine of 1830. All these are drawn from arms in the museum of the Royal United Service Institution, London.

Modern Shot Guns.—The modern sporting breech-loaders may be said to have originated with the invention of the cartridge-case containing its own means of ignition. The breech-loading mechanism antedated the cartridge by many years, the earliest breech-loading hand guns dating back to 1537. Another distinct type of breech-loader was invented in France about the middle of the 17th century. During the 17th and 18th centuries breech-loading arms were very numerous and of considerable variety. The original cartridge, a charge of powder and bullet in a paper envelope, dates from 1586. These were used with muzzle-loaders, the base of the cartridge being ripped or bitten off by the soldier before placing in the barrel. It was only when the detonating cap came into use that the paper cartridge answered well in breech-loaders. The modern breech-loader has resulted from a gradual series of improvements, and not from any one great invention. Its essential feature is the prevention of all escape of gas at the breech when the gun is fired by means of an expansive cartridge-case containing its own means of ignition. The earlier breech-loaders were not gas-tight, because the cartridge-cases were either consumable or the load was placed in a strong non-expansive breech-plug. The earliest efficient modern cartridge-case was the pin-fire, patented by Houiller, a Paris gunsmith, in 1847, with a thin weak shell which expanded by the force of the explosion, fitted perfectly in the barrel, and thus formed an efficient gas check. Probably no invention connected with firearms has wrought such changes in the principle of gun-construction as those effected by the expansive cartridge-case. This invention has completely revolutionized the art of gun-making, has been successfully applied to all descriptions of firearms, and has produced a new and important industry—that of cartridge manufacture.

About 1836, C. Lefaucheux, a Paris gunsmith, improved the old Pauly system of breech-loading, but its breech action was a crude mechanism, with single grip worked by a bottom lever. The double grip for the barrels was the subsequent invention of a Birmingham gunmaker. The central-fire cartridge, practically as now in use, was introduced into England in 1861 by Daw. It is said to have been the invention of Pottet, of Paris, improved upon by Schneider, and gave rise to considerable litigation in respect of its patent rights. Daw, who controlled the English patents, was the only exhibitor of central-fire guns and cartridges at the International Exhibition of 1862. In his system the barrels work on a hinge joint, the bottom lever withdraws the holding-down bolt; the cartridge is of the modern type, the cap being detonated by a striker passing through the standing breech to the inner face. The cartridge-case is withdrawn by a sliding extractor fitted to the breech ends of the barrels. Daw was subsequently defeated in his control of the patents by Eley Bros., owing to the patent not having been kept in force in France. The modern breech-loading gun has been gradually and steadily improved since 1860. Westley Richards adopted and improved Matthews' top-lever mechanism. About 1866 the rebounding lock was introduced, and improved in 1869. The treble wedge-fast mechanism for holding down the barrels was originated by W. W. Greener in 1865, and perfected in 1873. A very important improvement was the introduction of the hammerless gun, in which the mechanism for firing is placed entirely within the gun. This was made possible by the introduction of the central-fire cartridge. In 1862 Daw, and in 1866 Green, introduced hammerless guns in which the cocking was effected by the under lever. These guns did not attain popularity. In 1871 T. Murcott patented a hammerless gun, the first to obtain distinct success. This also was a lever-cocking gun. About the same time Needham introduced the principle of utilizing the weight of the barrels to assist in cocking. In 1875 Anson and Deeley utilized the fore-end attached to the barrels to cock the locks. From this date hammerless guns became really popular. Subsequently minor improvements were made by many other gun-makers, including alternative movements introduced by Purdey and Rogers. Improvements were also introduced by Westley Richards, Purdey and others, including cocking by means of the mainspring. In 1874 J. Needham introduced the ejector mechanism, by which each empty cartridge-case is separately and automatically thrown out of the gun when the breech is opened, the necessary force being provided by the mainspring of the lock. W. W. Greener and some other gun-makers have since introduced minor modifications and improvements of this mechanism. Next in turn came Perks and other inventors, who separated the ejector mechanism from the lock work. This very decided improvement is universal to-day. A later innovation in the modern breech-loader is the single trigger mechanism introduced by some of the leading English gun-makers, by which both barrels can be fired in succession by a single trigger. This improvement enables both barrels to be rapidly fired without altering the grip of the right hand, but deprives the shooter of the power of selecting his barrel.

Repeating or magazine shot-guns on the principle of the repeating rifle, with a magazine below the single firing barrel, are also made by some American and continental gun-makers, but as yet have not come into general use, being comparatively cumbersome and not well balanced. The difficulty of a shifting balance as each cartridge is fired has also yet to be overcome. Several varieties of a combination rifle and shot-gun are also made, for a description of which see RIFLE.

The chief purposes for which modern shot-guns are required are game-shooting, trap-shooting at pigeons and wild-fowling. The game gun may be any bore from 32 to 10 gauge. The usual standard bore is 12 gauge unless it be for a boy, when it is 20 gauge. The usual weight of the 12-bore double-barrelled game gun is from 6 to 7 lb with barrels 30 in. long, there, however, being a present tendency to barrels of a shorter length. These barrels are made of steel, as being a stronger and more homogeneous material than the barrels formerly produced, which were mostly of Damascus pattern, a mixture of iron and steel. Steel barrels, drilled from the solid block, were originally produced by Whitworth. To-day the makers of steel for this purpose are many. The standard charge for the 12-bore is 42 grains of smokeless powder and 1 oz. to 1¼th oz. of shot. Powder of a lighter gravimetric density is occasionally employed, when the weight of the charge is reduced to 33 grains. This charge of powder corresponds to the 3 drams of black powder formerly used. The ordinary game gun should have a killing circle of 30 in. at 30 yds. with the first barrel and at 40 yds. with the second. Improved materials and methods of manufacture, and what is known as "choke" boring of the barrels, have enabled modern gun-makers to regulate the shooting of guns to a nicety. Choke-boring is the constriction of the diameter of the barrel near the muzzle, and was known in America in the early part of the 19th century. In 1875 Pape of Newcastle was awarded a prize for the invention of choke-boring, there being no other claimant. The methods of choke-boring have since been varied and improved by the leading English gun-makers. The pigeon gun is usually heavier than the game gun and more choked. It generally weighs from 7 to 8 lb. Its weight, by club rules, is frequently restricted to 7½ lb and its bore to 12 gauge. The standard wild-fowling gun is a double 8-bore with 30-in. barrels weighing 15 lb. and firing a charge of 7 drams of powder and 2½ to 3 oz. of shot. These guns are also made in both smaller and larger varieties, including a single barrel 4-bore, which is the largest gun that can be used from the shoulder, and single

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barrel punt guns of 1¾-in. bore, weighing 100 lb. While no conspicuous advance in improved gun-mechanism and invention has been made during the last few years, the materials and methods of manufacture, and the quality and exactitude of the gun-maker's work, have continued gradually and steadily to improve. English, and particularly London-made, guns stand pre-eminent all over the world. (H. S.-K.)

GUNA, a town and military station in Central India, in the state of Gwalior. Pop. (1901) 11,452. After the Mutiny, it became the headquarters of the Central India Horse, whose commanding officer acts as ex-officio assistant to the resident of Gwalior; and its trade has developed rapidly since the opening of a station on a branch of the Great Indian Peninsula railway in 1899.

GUNCOTTON, an explosive substance produced by the action of strong nitric acid on cellulose at the ordinary temperature; chemically it is a nitrate of cellulose, or a mixture of nitrates, according to some authorities. The first step in the history of guncotton was made by T. J. Pelouze in 1838, who observed that when paper or cotton was immersed in cold concentrated nitric acid the materials, though not altered in physical appearance, became heavier, and after washing and drying were possessed of self-explosive properties. At the time these products were thought to be related to the nitrated starch obtained a little previously by Henri Braconnot and called *xyloidin*; they are only related in so far as they are nitrates. C. F. Schönbein of Basel published his discovery of guncotton in 1846 (*Phil. Mag.* [3], 31, p. 7), and this was shortly after followed by investigations by R. R. Böttger of Frankfort and Otto and Knop, all of whom added to our knowledge of the subject, the last-named introducing the use of sulphuric along with nitric acid in the nitration process. The chemical composition and constitution of guncotton has been studied by a considerable number of chemists and many divergent views have been put forward on the subject. W. Crum was probably the first to recognize that some hydrogen atoms of the cellulose had been replaced by an oxide of nitrogen, and this view was supported more or less by other workers, especially Hadow, who appears to have distinctly recognized that at least three compounds were present, the most violently explosive of which constituted the main bulk of the product commonly obtained and known as guncotton. This particular product was insoluble in a mixture of ether and alcohol, and its composition could be expressed by the term tri-nitrocellulose. Other products were soluble in the ether-alcohol mixture: they were less highly nitrated, and constituted the so-called collodion guncotton.

The smallest empirical formula for cellulose (*q.v.*) may certainly be written $C_6H_{10}O_5$. How much of the hydrogen and oxygen are in the hydroxylic (OH) form cannot be absolutely stated, but from the study of the acetates at least three hydroxyl groups may be assumed. The oldest and perhaps most reasonable idea represents guncotton as cellulose trinitrate, but this has been much disputed, and various formulae, some based on cellulose as $C_{12}H_{20}O_{10}$, others on a still more complex molecule, have been proposed. The constitution of guncotton is a difficult matter to investigate, primarily on account of the very insoluble nature of cellulose itself, and also from the fact that comparatively slight variations in the concentration and temperature of the acids used produce considerable differences in the products. The nitrates are also very insoluble substances, all the so-called solvents merely converting them into jelly. No method has yet been devised by which the molecular weight can be ascertained.[1] The products of the action of nitric acid on cellulose are not nitro compounds in the sense that picric acid is, but are nitrates or nitric esters.

Guncotton is made by immersing cleaned and dried cotton waste in a mixture of strong nitric and sulphuric acids. The relative amounts of the acids in the mixture and the time of duration of treatment of the cotton varies somewhat in different works, but the underlying idea is the same, viz. employing such an excess of sulphuric over nitric that the latter will be rendered anhydrous or concentrated and maintained as such in solution in the sulphuric acid, and that the sulphuric acid shall still be sufficiently strong to absorb and combine with the water produced during the actual formation of the guncotton. In the recent methods the cotton remains in contact with the acids for two to four hours at the ordinary air temperature (15° C.), in which time it is almost fully nitrated, the main portion, say 90%, having a composition represented by the formula[2] $C_6H_7O_8(NO_3)_3$, the remainder consisting of lower nitrated products, some oxidation products and traces of unchanged cellulose and cellulose sulphates. The acid is then slowly run out by an opening in the bottom of the pan in which the operation is conducted, and water distributed carefully over its surface displaces it in the interstices of the cotton, which is finally subjected to a course of boiling and washing with water. This washing is a most important part of the process. On its thoroughness depends the removal of small quantities of products other than the nitrates, for instance, some sulphates and products from impurities contained in the original cellulose. Cellulose sulphates are one, and possibly the main, cause of instability in guncotton, and it is highly desirable that they should be completely hydrolysed and removed in the washing process. The nitrated product retains the outward form of the original cellulose. In the course of the washing, according to a method introduced by Sir F. Abel, the cotton is ground into a pulp, a process which greatly facilitates the complete removal of acids, &c. This pulp is finally drained, and is then either compressed, while still moist, into slabs or blocks when required for blasting purposes, or it is dried when required for the manufacture of propellants. Sometimes a small quantity of an alkali (*e.g.* sodium carbonate) is added to the final washing water, so that quantities of this alkaline substance ranging from 0·5% to a little over 1% are retained by the guncotton. The idea is that any traces of acid not washed away by the washing process or produced later by a slow decomposition of the substance will be thereby neutralized and rendered harmless. Guncotton in an air-dry state, whether in the original form or after grinding to pulp and compressing, burns with very great rapidity but does not detonate unless confined.

Immediately after the discovery of guncotton Schönbein proposed its employment as a substitute for gunpowder, and General von Lenk carried out a lengthy and laborious series of experiments intending to adapt it especially for artillery use. All these and many subsequent attempts to utilize it, either loose or mechanically compressed in any way, signally failed. However much compressed by mechanical means it is still a porous mass, and when it is confined as in a gun the flame and hot gases from the portion first ignited permeate the remainder, generally causing it actually to detonate, or to burn so rapidly that its action approaches detonation. The more closely it is confined the greater is the pressure set up by a small part of the charge burning, and the more completely will the explosion of the remainder assume the detonating form. The employment of guncotton as a propellant was possible only after the discovery that it could be gelatinized or made into a colloid by the action of so-called solvents, *e.g.* ethylacetate and other esters, acetone and a number of like substances (see CORDITE).

When quite dry guncotton is easily detonated by a blow on an anvil or hard surface. If dry and warm it is much more sensitive to percussion or friction, and also becomes electrified by friction under those conditions. The amount of contained moisture exerts a considerable effect on its sensitiveness. With about 2% of moisture it can still be detonated on an anvil, but the action is generally confined to the piece struck. As the quantity of contained water increases it becomes difficult or even impossible to detonate by an ordinary blow. Compressed dry guncotton is easily detonated by an initiative detonator such as mercuric fulminate. Guncotton containing more than 15% of water is uninflammable, may be compressed or worked without danger and is much more difficult to detonate by a fulminate

[1] The composition of the cellulose nitrates was reviewed by G. Lunge (*Jour. Amer. Chem. Soc.*, 1901, 23, p. 527), who, assuming the formula $C_{12}H_{20}O_{10}$ for cellulose, showed how the nitrocelluloses described by different chemists may be expressed by the formula $C_{24}H_{40-x}O_{20}(NO_3)_x$, where x has the values 4, 5, 6, . . . 12.

[2] This formula is retained mainly on account of its simplicity. It also expresses all that is necessary in this connexion.

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detonator than when dry.[1] A small charge of dry guncotton will, however, detonate the wet material, and this peculiarity is made use of in the employment of guncotton for blasting purposes. A charge of compressed wet guncotton may be exploded, even under water, by the detonation of a small primer of the dry and water-proofed material, which in turn can be started by a small fulminate detonator. The explosive wave from the dry guncotton primer is in fact better responded to by the wet compressed material than the dry, and its detonation is somewhat sharper than that of the dry. It is not necessary for the bulk of wet guncotton to be actually in contact if they be under water, and the peculiar explosive wave can also be conveyed a little distance by a piece of metal such as a railway rail. The more nearly the composition of guncotton approaches that represented by $C_{12}H_{14}O_4(NO_3)_6$, the more stable is it as regards storing at ordinary temperatures, and the higher the igniting temperature. Carefully prepared guncotton after washing with alcohol-ether until nothing more dissolves may require to be heated to 180–185° C. before inflaming. Ordinary commercial guncottons, containing from 10 to 13% of lower nitrated products, will ignite as a rule some 20-25° lower.

Assuming the above formula to represent guncotton, there is sufficient oxygen for internal combustion without any carbon being left. The gaseous mixture obtained by burning guncotton in a vacuum vessel contains steam, carbon monoxide, carbon dioxide, nitrogen, nitric oxide, and methane. When slowly heated in a vacuum vessel until ignition takes place, some nitrogen dioxide, NO_2, is also produced. When kept for some weeks at a temperature of 100° in steam, a considerable number of fatty acids, some bases, and glucose-like substances result. Under different pressures the relative amounts of the combustion products vary considerably. Under very great pressures carbon monoxide, steam and nitrogen are the main products, but nitric oxide is not quite absent.

Dilute mineral acids have little or no action on guncotton. Strong sulphuric acid in contact with it liberates first nitric acid and later oxides of nitrogen, leaving a charred residue or a brown solution according to the quantity of acid. Guncotton is not completely cold with strong sulphuric acid, especially when slightly warmed. The alkali hydroxides (*e.g.* sodium hydroxide) will in a solid state fire it on contact. Strong or weak solutions of these substances also decompose it, producing some alkali nitrate, and nitr. the cellulose molecule being only partially restored, some quantity undergoing oxidation. Ammonia is also active, but not quite in the same manner as the alkali hydroxides. Dry guncotton heated in ammonia gas detonates at about 70°, and ammonium hydroxide solutions of all strengths slowly decompose it, yielding somewhat complex products. Alkali sulphohydrates reduce guncotton, or other nitrated celluloses, completely to cellulose. The production of the so-called "artificial silk" depends on this action.

A characteristic difference between guncotton and collodion cotton is the insolubility of the former in ether or alcohol or a mixture of these liquids. The so-called collodion cottons are nitrated celluloses, but of a lower degree of nitration (as a rule) than guncotton. They are sometimes spoken of as "lower" or "soluble" cottons or nitrates. The solubility in ether-alcohol may be owing to a lower degree of nitration, or to the temperature conditions under which the process of manufacture has been carried on. If guncotton be correctly represented by the formula $C_{12}H_{14}O_4(NO_3)_6$, it should contain a little more than 14% of nitrogen. Guncottons are examined for degree of nitration by the nitrometer, in which apparatus they are decomposed by sulphuric acid in contact with mercury, and all the nitrogen as evolved as nitric oxide, NO, is measured and the weight of its contained nitrogen calculated. Ordinary guncottons seldom contain more than 13.3% of nitrogen, and in most cases the amount does not exceed 12·5%. Generally speaking, the lower the nitrogen content of a guncotton, as found by the nitrometer, the higher the percentage of matters soluble in a mixture of ether-alcohol. These soluble matters are usually considered as "lower" nitrates.

Guncottons are usually tested by the Abel heat test for stability (see Cordite). Another heat test, that of Will, consists in heating a weighed quantity of the guncotton in a stream of carbon dioxide to 130° C., passing the evolved gases over some red-hot copper, and finally collecting them over a solution of potassium hydroxide which retains the carbon dioxide and allows the nitrogen, arising from the guncotton decomposition, to be measured. This is done at definite time intervals so that the *rate* of decomposition can be followed. The relative stability is then judged by the amount of nitrogen gas collected in a certain time. Several modifications of this and of the Abel heat test are also in use. (See Explosives.) (W. R. E. H.)

GUNDULICH, IVAN (1588–1638), known also as Giovanni Gondola, Servian poet, was born at Ragusa on the 8th of January 1588. His father, Franco Gundulich, once the Ragusan envoy to Constantinople, and councillor of the republic, gave him an excellent education. He studied the "humanities" with the Jesuit, Father Muzzi, and philosophy with Father Ricasoli. After that he studied Roman law and jurisprudence in general. He was member of the Lower Council and once served as the chief magistrate of the republic. He died on the 8th of December 1638. A born poet, he admired much the Italian poets of his time, from whom he made many translations into Servian. It is believed that he so translated Tasso's *Gerusalemme liberata*. He is said to have written eighteen works, of which eleven were dramas, but of these only three have been fully preserved, others having perished during the great earthquake and fire in 1667. Most of those dramas were translations from the Italian, and were played, seemingly with great success, by the amateurs furnished by the noble families of Ragusa. But his greatest and justly celebrated work is an epic, entitled *Osman*, in twenty cantos. It is the first political epic on the Eastern Question, glorifying the victory of the Poles over Turks and Tatars in the campaign of 1621, and encouraging a league of the Christian nations, under the guidance of Vladislaus, the king of Poland, for the purpose of driving away the Turks from Europe. The fourteenth and fifteenth cantos are lost. It is generally believed that the Ragusan government suppressed them from consideration for the Sultan, the protector of the republic, those two cantos having been violently anti-Turkish.

Osman was printed for the first time in Ragusa in 1826, the two missing cantos being replaced by songs written by Pietro Sorgo (or Serkovichevich). From this edition the learned Italian, Francesco Appendini, made an Italian translation published in 1827. Since that time several other editions have been made. The best are considered to be the edition of the South Slavonic Academy in Agram (1877) and the edition published in Semlin (1889) by Professor Yovan Boshkovich. In the edition of 1844 (Agram) the last cantos, fourteen and fifteen, were replaced by very fine compositions of the Serbo-Croatian poet, Mazhuranich (Mažuranić). The complete works of Gundulich have been published in Agram, 1847, by V. Babukich and by the South Slavonic Academy of Agram in 1869. (C. M.)

GUNG'L, JOSEF (1810–1889), Hungarian composer and conductor, was born on the 1st of December 1810, at Zsámbék, in Hungary. After starting life as a school-teacher, and learning the elements of music from Ofen, the school-choirmaster, he became first oboist at Graz, and, at twenty-five, bandmaster of the 4th regiment of Austrian artillery. His first composition, a Hungarian march, written in 1836, attracted some notice, and in 1843 he was able to establish an orchestra in Berlin. With this band he travelled far, even (in 1840) to America. It is worth recording that Mendelssohn's complete *Midsummer Night's Dream* music is said to have been first played by Gung'l's band. In 1853 he became bandmaster to the 23rd Infantry Regiment at Brünn, but in 1864 he lived at Munich, and in 1876 at Frankfort, after (in 1873) having conducted with great success a series of promenade concerts at Covent Garden, London. From Frankfort Gung'l went to Weimar to live with his daughter, a well-known German opera singer and local prima donna. There he died, on the 31st of January 1889. Gung'l's dances number over 300, perhaps the most popular being the "Amor-etten," "Hydropaten," "Casino," "Dreams on the Ocean" waltzes: "In Stiller Mitternacht" polka, and "Blue Violets" mazurka. His Hungarian march was transcribed by Liszt. His music is characterized by the same easy flowing melodies and well-marked rhythm that distinguish the dances of Strauss, to whom alone he can be ranked second in this kind of composition.

GUNNER, or Master Gunner, in the navy, the warrant officer who has charge of the ordnance and ammunition, and of the training of the men at gun drill. His functions in this respect are of less relative importance than they were in former times, when specially trained corps of seamen gunners had not been formed.

GUNNING, PETER (1614–1684), English divine, was born at Hoo, in Kent, and educated at the King's School, Canterbury, and Clare College, Cambridge, where he became a fellow in 1633. Having taken orders, he advocated the royalist cause from the pulpit with much eloquence. In 1644 he retired to Oxford, and held a chaplaincy at New College until the city surrendered to the parliamentary forces in 1646. Subsequently he was chaplain, first to the royalist Sir Robert Shirley of Eatington (1629–1656), and then at the Exeter House chapel. After the

[1] Air-dried guncotton will contain 2°, or less of moisture.

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Restoration in 1660 he returned to Clare College as master, and was appointed Lady Margaret professor of divinity. He also received the livings of Cottesmore, Rutlandshire, and Stoke Bruerne, Northamptonshire. In 1661 he became head of St John's College, Cambridge, and was elected Regius professor of divinity. He was consecrated bishop of Chichester in 1660, and was translated to the see of Ely in 1674–1675. Holding moderate religious views, he deprecated alike the extremes represented by Puritanism and Roman Catholicism.

His works are chiefly reports of his disputations, such as that which appears in the *Scimus Unmasked* (Paris, 1658), in which the definition of a schism is discussed with two Romanist opponents.

GUNNY, a sort of cloth, the name of which is supposed to be derived from *ganga* or *ganis* of Rumphius, or from *gonia*, a vernacular name of the *Crotolaria juncea*—a plant common in Madras. One of the first notices of the term itself is to be found in Knox's *Ceylon*, in which he says: "The filaments at the bottom of the stem (coir from the coco-nut husk, *Cocos nucifera*) may be made into a coarse cloth called gunny, which is used for bags and similar purposes."

Warden, in *The Linen Trade*, says:

"A very large proportion of the jute grown in Bengal is made into cloth in the districts where it is cultivated, and this industry forms the grand domestic manufacture of all the populous eastern districts of Bengal. It pervades all classes, and penetrates into every household, almost every one, man, woman and child, being in some way engaged in it. Boatmen, husbandmen, palankeen carriers, domestic servants, every one, in fact, being Hindu—for Mussulmans spin cotton only—pass their leisure moments, distaff in hand, spinning gunny twist. It is spun by the takur and dhara, the former being a kind of spindle, which is turned upon the thigh or the sole of the foot, and the latter a reel, on which the thread, when sufficiently twisted, is wound up. Another kind of spinning machine, called a ghurcharra, is occasionally used. A bunch of the raw material is hung up in every farmer's house, or on the protruding stick of a thatched roof, and every one who has leisure forms with these spindles some coarse pack-thread, of which ropes are twisted for the use of the farm. The lower Hindu castes, from pack-thread, spin a finer thread for being made into cloth, and, there being a loom in nearly every house, very much of it is woven by the women of the lower class of people. It is especially the employment of the Hindu widow, as it enables her to earn her bread without being a burden on her family. The cloth thus made is of various qualities, such as clothing for the family (especially the women, a great proportion of whom on all the eastern frontier wear almost nothing else), coarse fabrics, bedding, rice and sugar bags, sacking, pack-sheet, &c. Much of it is woven into short lengths and very narrow widths, two or three of which are sometimes sewed into one piece before they are sold. That intended for rice and sugar bags is made about 6 feet long, and from 24 to 27 inches wide, and doubled. A considerable quantity of jute yarn is dyed and woven into cloth for various local purposes, some of it is also sent out of the district. The principal places where chotee, or jute cloth for gunny bags is made are within a radius of perhaps 150 to 200 miles around Dacca, and there both labour and land are remarkably cheap. The short, staple, common jute is generally consumed in the local manufacture, the finer and long stapled being reserved for the export trade. These causes enable gunny cloth and bags to be sold almost as cheaply as the raw material, which creates an immense demand for them in nearly every market of the world."

Such appeared to be the definition of gunny cloth at the time the above was written—between 1850 and 1860. Most of the Indian cloth for gunny bags is now made by power, and within about 20 m. of Calcutta. In many respects the term gunny cloth is still applied to all and sundry, but there is no doubt that the original name was intended for cloth which was similar to what is now known as "cotton bagging." This particular type of cloth is still largely made in the hand loom, even in Dundee, this method of manufacture being considered, for certain reasons, more satisfactory than the power loom method (see JUTE and BAGGING).

GUNPOWDER, an explosive composed of saltpetre, charcoal and sulphur. Very few substances have had a greater effect on civilization than gunpowder. Its employment altered the whole art of war, and its influence gradually and indirectly permeated and affected the whole fabric of society. Its direct effect on the arts of peace was but slight, and had but a limited range, which could not be compared to the modern extended employment of high explosives for blasting in mining and engineering work.

It is probably quite incorrect to speak of the *discovery* of gunpowder. From modern researches it seems more likely and more just to think of it as a thing that has developed, passing through many stages—mainly of improvement, but some undoubtedly retrograde. There really is not sufficient solid evidence on which to pin down its invention to one man. As Lieutenant-Colonel H. W. L. Hime (*Gunpowder and Ammunition*, 1904) says, the invention of gunpowder was impossible until the properties of nearly pure saltpetre had become known. The honour, however, has been associated with two names in particular, Berthold Schwartz, a German monk, and Friar Roger Bacon. Of the former Oscar Guttmann writes (*Monumenta pulveris pyrii*, 1904, p. 6): "Berthold Schwartz was generally considered to be the inventor of gunpowder, and only in England has Roger Bacon's claim been upheld, though there are English writers who have pleaded in favour of Schwartz. Most writers are agreed that Schwartz invented the first fire-arms, and as nothing was known of an inventor of gunpowder, it was perhaps considered justifiable to give Schwartz the credit thereof. There is some ambiguity as to when Schwartz lived. The year 1354 is sometimes mentioned as the date of his invention of powder, and this is also to be inferred from an inscription on the monument to him in Freiburg. But considering there can be no doubt as to the manufacture in England of gunpowder and cannon in 1344, that we have authentic information of guns in France in 1338 and in Florence in 1326, and that the Oxford MS. *De officiis regum* of 1325 gives an illustration of a gun, Berthold Schwartz must have lived long before 1354 to have been the inventor of gunpowder or guns." In Germany also there were powder-works at Augsburg in 1340, in Spandau in 1344, and Liegnitz in 1348.

Roger Bacon, in his *De mirabili potestate artis et naturae* (1242), makes the most important communication on the history of gunpowder. Reference is made to an explosive mixture as known before his time and employed for "diversion, producing a noise like thunder and flashes like lightning." In one passage Bacon speaks of saltpetre as a violent explosive, but there is no doubt that he knew it was not a self-explosive substance, but only so when mixed with other substances, as appears from the statement in *De secretis operibus artis et naturae*, printed at Hamburg in 1618, that "from saltpetre and other ingredients we are able to make a fire that shall burn at any distance we please." A great part of his three chapters, 9, 10, 11, long appeared without meaning until the anagrammatic nature of the sentences was realized. The words of this anagram are (chap. 11): "Item ponderis totum 30 sed tamen salis petrae *luru vopo vir can utri*[1] et sulphuris; et sic facies tonitruum et coruscationem, si scias artificium. Videas tamen utrum loquar aenigmate aut secundum veritatem." Hime, in his chapter on the origin of gunpowder, discusses these chapters at length, and gives, omitting the anagram, the translation: "Let the total weight of the ingredients be 30, however, of saltpetre . . . of sulphur; and with such a mixture you will produce a bright flash and a thundering noise, if you know the trick. You may find (by actual experiment) whether I am writing riddles to you or the plain truth." The anagram reads, according to Hime, "salis petrae r(ecipe) vii part(es), v nov(ellae) coru(li), v et sulphuris" (take seven parts of saltpetre, five of young hazel-wood, and five of sulphur). Hime then goes on to show that Bacon was in possession of an explosive which was a considerable advance on mere incendiary compositions. Bacon does not appear to have been aware of the projecting power of gunpowder. He knew that it exploded and that perhaps people might be blown up or frightened by it; more cannot be said. The behaviour of small quantities of any explosive is hardly ever indicative of its behaviour in large quantities and especially when under confinement. Hime is of opinion that Bacon blundered upon gunpowder whilst playing with some incendiary composition, such as those mentioned by Marcus Graecus and others, in which

[1] These words were emended by some authors to read *luru mope can ubre*, the letters of which can be arranged to give *pulvere carbonum*.

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he employed his comparatively pure saltpetre instead of crude nitrum. It has been suggested that Bacon derived his knowledge of these fiery mixtures from the MS. *Liber ignium*, ascribed to Marcus Graecus, in the National Library in Paris (Dutens, *Enquiry into Origin of Discoveries attributed to Moderns*). Certainly this Marcus Graecus appears to have known of some incendiary composition containing the gunpowder ingredients, but it was not gunpowder. Hime seems to doubt the existence of any such person as Marcus Graecus, as he says: "The *Liber ignium* was written from first to last in the period of literary forgeries and pseudographs . . . and we may reasonably conclude that Marcus Graecus is as unreal as the imaginary Greek original of the tract which bears his name." Albertus Magnus in the *De mirabilibus mundi* repeats some of the receipts given in Marcus Graecus, and several other writers give receipts for Greek fire, rockets, &c. Dutens gives many passages in his work, above-named, from old authors in support of his view that a composition of the nature of gunpowder was not unknown to the ancients. Hime's elaborate arguments go to show that these compositions could only have been of the incendiary type and not real explosives. His arguments seem to hold good as regards not only the Greeks but also the Arabs, Hindus and Chinese (see also FIREWORKS).

There seems no doubt that incendiary compositions, some perhaps containing nitre, mostly, however, simply combustible substances as sulphur, naphtha, resins, &c., were employed and projected both for defence and offence, but they were projected or blown by engines and not by themselves. It is quite inconceivable that a real propelling explosive should have been known in the time of Alexander or much later, and not have immediately taken its proper place. In a chapter discussing this question of explosives amongst the Hindus, Hime says: "It is needless to enlarge the list of quotations: incendiaries pursued much the same course in Upper India as in Greece and Arabia." No trustworthy evidence of an explosive in India is to be found until the 21st of April 1526, the date of the decisive battle of Panipat, in which Ibrahim, sultan of Delhi, was killed and his army routed by Baber the Mogul, who possessed both great and small fire-arms.

As regards also the crusader period (1097–1291), sc strange and deadly an agent of destruction as gunpowder could not possibly have been employed in the field without the full knowledge of both parties, yet no historian, Christian or Moslem, alludes to an explosive of any kind, while all of them carefully record the use of incendiaries. The employment of rockets and "wildfire" incendiary composition seems undoubtedly of very old date in India, but the names given to pieces of artillery under the Mogul conqueror of Hindustan point to a European, or at least to a Turkish origin, and it is quite certain that Europeans were retained in the service of Akbar and Aurangzeb. The composition of present day Chinese gunpowder is almost identical with that employed in Europe, so that in all probability the knowledge of it was obtained from Western sources.

In the writings of Bacon there is no mention of guns or the use of powder as a propellant, but merely as an explosive and destructive power. Owing perhaps to this obscurity hanging over the early history of gunpowder, its employment as a propelling agent has been ascribed to the Moors or Saracens. J. A. Conde (*Historia de la dominacion de los Arabes en España*) states that Ismail Ben Firaz, king of Granada, who in 1325 besieged Boza, had among his machines "some that cast globes of fire," but there is not the least evidence that these were guns. The first trustworthy document relative to the use of gunpowder in Europe, a document still in existence, and bearing date February 11, 1326, gives authority to the council of twelve of Florence and others to appoint persons to superintend the manufacture of cannons of brass and iron balls, for the defence of the territory, &c., of the republic. John Barbour, archdeacon of Aberdeen, writing in 1375, states that cannons (crakys of war) were employed in Edward III.'s invasion of Scotland in 1327. An indenture first published by Sir N. H. Nicolas in his *History of the Royal Navy* (London, 1846), and again by Lieutenant-Colonel H. Brackenbury (*Proc. R.A. Inst.*, 1865), stated to be 1338, contains references to small cannon as among the stores of the Tower, and also mentions "un petit barrell de gonpoudre le quart' plein." If authentic, this is possibly the first mention of gunpowder as such in England, but some doubts have been thrown upon the date of this MS. From a contemporary document in the National Library in Paris it seems that in the same year (1338) there existed in the marine arsenal at Rouen an iron weapon called *pot de feu*, for propelling bolts, together with some saltpetre and sulphur to make powder for the same. Preserved in the Record Office in London are trustworthy accounts from the years 1345 of the purchase of ingredients for making powder, and of the shipping of cannon to France. In 1346 Edward III. appears to have ordered all available saltpetre and sulphur to be bought up for him. In the first year of Richard II. (1377) Thomas Norbury was ordered to buy, amongst other munitions, sulphur, saltpetre and charcoal, to be sent to the castle of Brest. In 1414 Henry V. ordered that no gunpowder should be taken out of the kingdom without special licence, and in the same year ordered twenty pipes of willow charcoal and other articles for the use of the guns.

The manufacture of gunpowder seems to have been carried on as a crown monopoly about the time of Elizabeth, and regulations respecting gunpowder and nitre were made about 1623 (James I.). Powder-mills were probably in existence at Waltham Abbey about the middle or towards the end of the 16th century.

Ingredients and their Action.—Roger Bacon in his anagram gives the first real receipe for gunpowder, viz. (according to Hime, ch. xii.) saltpetre 41·2, charcoal 29·4, sulphur 29·4. Dr John Arderne of Newark, who began to practise about 1350 and was later surgeon to Henry IV., gives a receipe (Sloane MSS. 335, 795), saltpetre 66·6, charcoal 22·2, sulphur 11·1, "which are to be thoroughly mixed on a marble and then sifted through a cloth." This powder is nominally of the same composition as one given in a MS. of Marcus Graecus, but the saltpetre of this formula by Marcus Graecus was undoubtedly answerable for the difference in behaviour of the two compositions. Roger Bacon had not only refined and obtained pure nitre, but had appreciated the importance of thoroughly mixing the components of the powder. Most if not all the early powder was a "loose" mixture of the three ingredients, and the most important step in connexion with the development of gunpowder was undoubtedly the introduction of wet mixing or "incorporating." Whenever this was done, the improvement in the product must have been immediately evident. In the damp or wetted state pressure could be applied with comparative safety during the mixing. The loose powder mixture came to be called "serpentine"; after wet mixing it was more or less granulated or corned and was known as "corned" powder. Corned powder seems to have been gradually introduced. It is mentioned in the *Fire Book* of Conrad von Schönenau (in 1429), and was used for handguns in England long before 1560. It would seem that corned powder was used for hand-guns or small arms in the 15th century, but cannon were not made strong enough to withstand its explosion for quite another century (Hime). According to the same writer, in the period 1250–1450, when serpentine only was used, one powder could differ from another in the proportions of the ingredients; in the modern period—say 1700–1880—the powders in use (in each state) differed only as a general rule in the size of the grain, whilst during the transition period—1450–1700—they generally differed both in composition and size of grain.

Corned or grained powder was adopted in France in 1525, and in 1540 the French utilized an observation that large-grained powder was the best for cannon, and restricted the manufacture to three sizes of grain or corn, possibly of the same composition. Early in the 18th century two or three sizes of grain and powder of one composition appear to have become common. The composition of English powder seems to have settled down to 75 nitre, 15 charcoal, and 10 sulphur, somewhere about the middle of the 18th century.

The composition of gunpowders used in different countries at different times is illustrated in the following tables:—

English Powders (Hime).

	1250.	1350.	1560.	1647.	1670.	1742.	1781.
Saltpetre	41·2	66·6	50·0	66·6	71·4	75·0	75·0
Charcoal	29·4	22·2	33·3	16·6	14·3	12·5	15·0
Sulphur	29·4	11·1	16·6	16·6	14·3	12·5	10·0[1]

[1] This represents the composition of English powder at present, and no doubt it has remained the same for a longer time than the above date indicates.

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Foreign Powders (Hime).

	France.	Sweden.	Germany.	Denmark.	France.	Sweden.	Germany.
	1338.	1560.	1595.	1608.	1650.	1697.	1882.
Saltpetre .	50	66·6	52·2	68·3	75·6	73	78
Charcoal .	7	16·6	26·1	23·2	13·6	17	19
Sulphur .	25	16·6	21·7	8·5	10·8	10	3[1]

[1] Brown or coco-powder for large charges in guns. The charcoal is not burnt black but roasted until brown, and is made from some variety of straw, not wood.

When reasonably pure, none of the ingredients of gunpowder absorbs any material quantity of moisture from the atmosphere, and the only one in which this substance is appreciable is saltpetre. It seems extremely probable that for a long period the three substances were simply mixed dry, indeed sometimes kept separate and mixed just before being required; the consequence must have been that, with every care as to weighing out, the proportions of any given quantity would alter on carriage. Saltpetre is considerably heavier than sulphur or charcoal, and would tend to separate out towards the bottom of the containing vessel if subjected to jolting or vibration. When pure there can only be one kind of saltpetre or sulphur, because they are chemical individuals, but charcoal is not. Its composition, rate of burning, &c., depend not only on the nature of the woody material from which it is made, but quite as much on the temperature and time of heating employed in the making. The woods from which it is made contain carbon, hydrogen and oxygen, and the two latter are never thoroughly expelled in charcoal-making. If they were, the resulting substance would be of no use for gunpowder. 1-3% of hydrogen and 8-15% of oxygen generally remain in charcoals suitable for gunpowder. A good deal of the fierceness and violence of explosion of a gunpowder depends on the mode of burning of the charcoal as well as on the wood from which it is made.

Properties of Ingredients.—Charcoal is the chief combustible in powder. It must burn freely, leaving as little ash or residue as possible; it must be friable, and grind into a non-gritty powder. The sources from which powder charcoal is made are dogwood (*Rhamnus frangula*), willow (*Salix alba*), and alder (*Betula alnus*). Dogwood is mainly used for small-arm powders. Powders made from dogwood charcoal burn more rapidly than those from willow, &c. The wood after cutting is stripped of bark and allowed to season for two or three years. It is then picked to uniform size and charred in cylindrical iron cases or slips, the wood being introduced into slightly larger cylinders set in a furnace. The slips are provided with openings for the escape of gases. The rate of heating as well as the absolute temperature attained have an effect on the product, a slow rate of heating yielding more charcoal, and a high temperature reducing the hydrogen and oxygen in the final product. When heated for seven hours to about 800° C. to 900° C. the remaining hydrogen and oxygen amount to about 2% and 12% respectively. The time of charring is as a rule from 5 to 7 hours. The slips are then removed from the furnace and placed in a larger iron vessel, where they are kept comparatively air-tight until quite cold. The charcoal is then sorted, and stored for some time before grinding. The charcoal is ground, and the powder sifted on a rotating reel or cylinder of fine mesh copper-wire gauze. The sifted powder is again stored for some time before use in closed iron vessels.

Sicilian sulphur is most generally employed for gunpowder, and for complete purification is first distilled and then melted and cast into moulds. It is afterwards ground into a fine powder and sifted as in the case of the charcoal.

Potassium nitrate is eminently suitable as an oxygen-provider, not being deliquescent. Nitrates are continually being produced in surface soils, &c., by the oxidation of nitrogenous substances. Nitric and nitrous acids are also produced by electric discharges through the atmosphere, and these are found eventually as nitrates in soils, &c. Nitre is soluble in water, and much more so in hot than in cold. Crude nitre, obtained from soils or other sources, is purified by recrystallization. The crude material is dissolved almost to saturation in boiling water: on filtering and then cooling this liquor to about 30° C. almost pure nitre crystallizes out, most of the usual impurities still remaining in solution. By rapidly cooling and agitating the nitre solution crystals are obtained of sufficient fineness for the manufacture of powder without special grinding. Nitre contains nearly 48% of oxygen by weight, five-sixths of which is available for combustion purposes. Nearly all the gases of the powder explosion are derived from the nitre. The specific gravity of nitre is 2·2: 200 grams will therefore occupy about 100 cubic centimetres volume. This quantity on its decomposition by heat alone yields 28 grams or 22,400 c.c. of nitrogen, and 80 grams or 56,000 c.c. of oxygen as gases, and 94 grams of potassium oxide, a fusible solid which vaporizes at a very high temperature.

Incorporation.—The materials are weighed out separately, mixed by passing through a sieve, and then uniformly moistened with a certain quantity of water, whilst on the bed of the incorporating mill. This consists of two heavy iron wheels mounted so as to run in a circular bed. The incorporation requires about four hours. The mechanical action of rollers on the powder paste is a double one: not only crushing but mixing by pushing forwards and twisting sideways. The pasty mass is deflected so that it repeatedly comes under first one roller and then the next by scrapers, set at an angle to the bed, which follow each wheel.

Although the charge is wet it is possible for it to be fired either by the heat developed by roller friction, by sparks from foreign matters, as bits of stone, &c., or possibly by heat generated by oxidation of the materials. The mills are provided with a drenching apparatus so arranged that in case of fire the charge in the mill-bowls will be drowned by water from a cistern or tank immediately above the mill. The product from the incorporation is termed "mill-cake."

After this incorporation in the damp state the ingredients never completely separate on drying, however much shaken, because each particle of nitre is surrounded by a thin layer of water containing nitre in solution in which the particles of charcoal and sulphur are entangled and retained. After due incorporation, powders are pressed to a certain extent while still moist. The density to which a powder is pressed is an important matter in regard to the rate of burning. The effect of high density is to slow down the initial rate of burning. Less dense powders burn more rapidly from the first and tend to put a great strain on the gun. Fouling is usually less with denser powders; and, as would be expected, such powders bear transport better and give less dust than light powders. Up to a certain pressure, hardness, density, and size of grain of a powder have an effect on the rate of burning and therefore on pressure. Glazing or polishing powder grains also exerts a slight retarding action on burning and enables the powders to resist atmospheric moisture better. Excess of moisture in gunpowder has a marked effect in reducing the explosiveness. All powders are liable to absorb moisture, the quality and kind of charcoal being the main determinant in this respect; hard burnt black charcoal is least absorbent. The material employed in brown powders absorbs moisture somewhat readily. Powder kept in a very damp atmosphere, and especially in a charged state, spoils rapidly, as nitre-saltpetre coming to the surface in solution and then crystallizing out. The pieces also break up owing to the formation of large crystals of nitre in the mass. After the pressing of the incorporated powder into a "press-cake," it is broken up or granulated by suitable machines, and the resulting grains separated and sorted by sifting through sieves of determined sizes of mesh. Some dust is formed in this operation, which is sifted away and again worked up under the rollers (for sizes of grains see fig. 1). These grains, cubes, &c., are then further polished by rotating in drums alone or with graphite, which adheres to and coats the surfaces of the grains. This process is generally followed with powders intended for small-arms or moderately small ordnance.

Shot Powders.—Prisms or prismatic powder are made by breaking up the press-cake into a moderately fine state, whilst still moist, and pressing a certain quantity in a mould. The moulds generally employed consist of a thick plate of bronze in which are a number of hexagonal perforations. Accurately fitting plungers are so applied to these that one can enter at the top and the other at the bottom. The lower plunger being withdrawn to the bottom of the plate the hexagonal hole is charged with the powder and the two plungers set in motion, thus compressing the powder between them. After the desired pressure has been applied the top plunger is withdrawn, and the lower one pushed upward to eject the prism of powder. The axial perforations in prism powders are made by small bronze rods which pass through the lower plunger and fit into corresponding holes in the upper one. If these prisms are made by a steadily applied pressure a density throughout of about 1·78 may be obtained. Further to regulate the rate of burning so that it shall be slow at first and more rapid as the powder is consumed, another form of machine was devised, the cross-pin press, in which the pressure is applied very rapidly to the powder. It receives in fact one blow, which compresses the powder to the same dimensions, but the density of the outer layers of substance of the prism is much greater than in the interior.

The leading idea in connexion with all shaped powder grains, and with the very large sizes, was to regulate the rate of burning so as to avoid extreme pressure when first ignited and to keep up the pressure in the gun as more space was provided in the chamber or tube by the projectile moving. In order to prevent the muzzle of the perforated prismatic powder the ignition is intended to proceed through the perforations; since in a charge the faces of the prisms fit pretty closely together, it was thought that this arrangement would prevent unburnt cores or pieces of powder from being blown out. These larger grain powders necessitated a lengthened bore to take advantage of the slower production of gases and complete combustion of the powder. General T. J. Rodman first suggested and employed the perforated cake cartridge in 1860, the perforating nearly the diameter of the bore and a thickness of 1 to 2 in.

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with perforations running parallel with the gun axis. The burning would then start from the comparatively small surfaces of the perforations, which would become larger as the powder burnt away. Experiments bore out this theory perfectly. It was found that small prisms were more convenient to make than large disks, and as the prisms practically fit together into a disk the same result was obtained. This effect of mechanical density on rate of burning is good only up to a certain pressure, above which the gases are driven through the densest form of granular material. After granulating or pressing into shapes, all powders must be dried. This is done by heating in specially ventilated rooms heated by steam pipes. As a rule this drying is followed by the finishing or polishing process. Powders are finally blended, *i.e.* products from different batches or "makes" are mixed so that identical proof results are obtained.

Sizes and Shapes of Powders.—In fig. 1, *a* to *k* show the relative sizes and shapes of grain as formerly employed for military purposes, except that the three largest powders, *e-f-g* and *h* are figured half-size to save space, whereas the remainder indicate the actual dimensions of the grains. *a* is for small-arms, all the others are for cannon of various sizes.

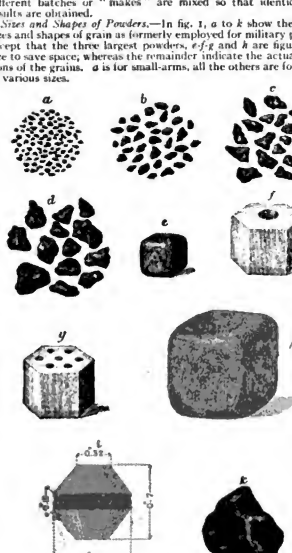

FIG. 1.

Proof of Powder.—In addition to chemical examination powder is passed through certain mechanical tests:—

1. *For colour, glaze, texture and freedom from dust.*
2. *For proper incorporation.*
3. *For shape, size and proportion of the grains.*—The first is judged by eye, and grains of the size required are obtained by the use of sieves of different sizes.
4. *Density.*—The density is generally obtained in some form of mercury densimeter, the powder being weighed in air and then under mercury. In some forms of the instrument the air can be pumped out so that the weighing takes place *in vacuo*.
5. *Moisture and absorption of moisture.*—The moisture and hygroscopic test consists in weighing a sample, drying at 100° C. for a certain time, weighing again, &c., until constant. The dried weighed sample can then be exposed to an artificial atmosphere of known moisture and temperature, and the gain in weight per hour similarly ascertained by periodic weighings.
6. *Firing proof.*—The nature of this depends upon the purpose for which the powder is intended. For sporting powders it consists in the "pattern" given by the shot upon a target at a given distance, or, if fired with a bullet, upon the "figure of merit," or mean radial deviation of a certain number of rounds; also upon the penetrative power. For military purposes the "muzzle" velocity produced by a powder is ascertained by a chronograph which measures the exact time the bullet or other projectile takes to traverse a known distance between two wire screens. By means of "crusher gauges" the exact pressure per square inch upon certain points in the interior of the gun can be found.

In the chemical examination of gunpowder the points to be ascertained are, in addition to moisture, freedom from chlorides or sulphates, and correct proportion of nitre and sulphur to charcoal.

Products of Fired Powder and Changes taking place on Explosion.—With a mixture of the complexity of gunpowder it is quite impossible to say beforehand what will be the relative amounts of products. The desired products are nitrogen and carbon dioxide as gases, and potassium sulphate and carbonate as solids. But the ingredients of the mixture are not in any simple chemical proportion. Burning in contact with air under one atmosphere pressure, and burning in a closed or partially closed vessel under a considerable number of atmospheres pressure, may produce quite different results. The temperature of a reaction always rises with increased pressure. Although the main function of the nitre is to give up oxygen and nitrogen, of the charcoal to produce carbon dioxide and most of the heat, and of the sulphur by vaporizing to accelerate the rate of burning, it is quite impossible to represent the actions taking place on explosion by any simple or single chemical equation. Roughly speaking, the gases from black powder burnt in a closed vessel have a volume at 0° C. and 760 mm. pressure of about 280 times that of the original powder. The temperature produced under one atmosphere is above 2000° C., and under greater pressures considerably higher.

Experiments have been made by Benjamin Robins (1743), Charles Hutton (1778), Count Rumford (1797), Gay-Lussac (1823), R. Bunsen and L. Schischoff (1857), T. J. Rodman (1861), C. Karolyi (1863), and later many researches by Sir Andrew Noble and Sir F. A. Abel, and by H. Debus and others, all with the idea of getting at the precise mechanism of the explosion. Debus (*Ann.*, 1882, vols. 212, 213; 1891, vol. 265) discussed at length the results of researches by Bunsen, Karolyi, Noble and Abel, and others on the combustion of powder in closed vessels in such manner that all the products could be collected and examined and the pressures registered. A Waltham Abbey powder, according to an experiment by Noble and Abel, gave when fired in a closed vessel the following quantities of products calculated from one gram of powder:—

	Fractions of a gram.	Fractions of a molecule or atom.
Potassium carbonate	·2615	·00189 molecule
Potassium sulphate	·1268	·0007 "
" thiosulphate	·1666	·00087 "
" sulphide	·0252	·00017 "
Sulphur	·0012	·00004 atom
Carbon dioxide	·2678	·00609 molecule
Carbon monoxide	·0339	·00121 "
Nitrogen	·1074	·00765 atom
Hydrogen	·0008	·0008 "
Hydrogen sulphide	·0080	·00023 molecule
Potassium thiocyanate	·0004	
Nitre	·0005	
Ammonium carbonate	·0002	

From this, and other results, Debus concluded that Waltham Abbey powder could be represented by the formula $16KNO_3+21{\cdot}18C+6{\cdot}68S$ and that on combustion in a closed vessel the end result could be fairly expressed (rounding off fractions) by $16KNO_3+21C+5S=5K_2CO_3+K_2SO_4+2K_2S_2+13CO_2+3CO+8N_2$. Some of the sulphur is lost, part combining with the metal of the apparatus and part with hydrogen in the charcoal. The military powders of most nations can be represented by the formula $16KNO_3+21{\cdot}2C+6{\cdot}6S$, proportions which are reasonably near to a theoretical mixture, that is one giving most complete combustion, greatest gas volume and temperature. The combustion of powder consists of two processes: (i.) oxidation, during which potassium carbonate and sulphate, carbon dioxide and nitrogen are mainly formed, and (ii.) a reduction process in which free carbon acts on the potassium sulphate and free sulphur on the potassium carbonate, producing potassium sulphide and carbon monoxide respectively. Most powders contain more carbon and sulphur than necessary, hence the second stage. In this second stage heat is lost. The potassium sulphide is also the most objectionable constituent as regards fouling.

The energy of a powder is given, according to Berthelot, by multiplying the gas volume by the heat (in calories) produced during burning; Debus shows that a powder composed of $16KNO_3$ to 8C and 8S would have the least, and one of composition $16KNO_3+24C+8S$ the greatest, when completely burnt, whereas the greatest capability with the lowest proportion of carbon and sulphur to nitre would be obtained from the mixture $+16KNO_3+22C+8S$.

Smokeless and even noiseless powders seem to have been sought for during the whole gunpowder period. In 1756 one was experimented with in France, but was abandoned owing to difficulties in manufacture. Modern smokeless powders are certainly less noisy than the black powders, mainly because of the absence of metallic salts which although they may be gaseous whilst in the gun are

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certainly ejected as solids or become solids at the moment of contact with air.

Brown Powders.—About the middle of the 19th century guns and projectiles were made much larger and heavier than previously, and it was soon found that the ordinary black powders of the most dense form burnt much too rapidly, straining or bursting the pieces. Powders were introduced containing about 3% sulphur and 17-19% of a special form of charcoal made from slightly charred straw, or similar material. This "brown charcoal" contains a considerable amount of the hydrogen and oxygen of the original plant substance. The mechanical processes of manufacture of these brown powders is the same as for black. They, however, differ from black by burning very slowly, even under considerable pressure. This comparative slowness is caused by (1) the presence of a small amount of water even when air-dry; (2) the fact that the brown charcoal is practically very slightly altered cellulose material, which before it will burn completely must undergo a little further resolution or charring at the expense of some heat from the portion of charge first ignited; and (3) the lower content of sulphur. An increase of a few per cent in the sulphur of black powder accelerates its rate of burning, and it may become almost a blasting powder. A decrease in sulphur has the reverse effect. It is really the sulphur vapour that in the early period of combustion spreads the flame through the charge.

Many other powders have been made or proposed in which nitrates or chlorates of the alkalies or of barium, &c., are the oxygen providers and substances as sugar, starch, and many other organic compounds as the combustible elements. Some of these compositions have found employment for blasting or even as sporting powders, but in most cases their objectionable properties of fouling, smoke and mode of exploding have prevented their use for military purposes. The adoption by the French government of the comparatively smokeless nitrocellulose explosive of Paul Vieille in 1887 practically put an end to the old forms of gunpowders. The first smokeless powder was made in 1865 by Colonel E. Schultze (*Ding. Pol. Jour.* 174, p. 323; 175, p. 453) by nitrating wood meal and adding potassium and barium nitrates. It is somewhat similar in composition to the E. C. sporting powder. F. Uchatius, in Austria, proposed a smokeless powder made from nitrated starch, but it was not adopted owing to its hygroscopic nature and also its tendency to detonate.

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(W. R. E. H.)

GUNPOWDER PLOT, the name given to a conspiracy for blowing up King James I. and the parliament on the 5th of November 1605.

To understand clearly the nature and origin of the famous conspiracy, it is necessary to recall the political situation and the attitude of the Roman Catholics towards the government at the accession of James I. The Elizabethan administration had successfully defended its own existence and the Protestant faith against able and powerful antagonists, but this had not been accomplished without enforcing severe measures of repression and punishment upon those of the opposite faith. The beginning of a happier era, however, was expected with the opening of the new reign. The right of James to the crown could be more readily acknowledged by the Romanists than that of Elizabeth: Pope Clement VIII. appeared willing to meet the king half-way. James himself was by nature favourable to the Roman Catholics and had treated the Roman Catholic lords in Scotland with great leniency, in spite of their constant plots and rebellions. Writing to Cecil before his accession he maintained, "I am so far from any intention of persecution as I protest to God I reverence their church as our mother church, although clogged with many infirmities and corruptions, besides that I did ever hold persecution as one of the infallible notes of a false church." He declared to Northumberland, the kinsman and master of Thomas Percy, the conspirator, "as for the Catholics, I will neither persecute any that will be quiet and but an outward obedience to the law, neither will I spare to advance any of them that will be of good service and worthily deserved." It is probable that these small but practical concessions would have satisfied the lay Roman Catholics and the secular priests, but they were very far from contenting the Jesuits, by whom the results of such leniency were especially feared: "What rigour of laws would not compass in so many years," wrote Henry Tichborne, the Jesuit, in 1598, "this liberty and lenity will effectuate in 20 days, to wit the disfurnishing of the seminaries, the disanimating of men to come and others to return, the expulsion of the society and confusion as in Germany, extinction of zeal and favour, disanimation of princes from the hot pursuit of the enterprise. . . . We shall be left as a prey to the wolves that will besides drive our greatest patron [the king of Spain] to stoop to a peace which will be the utter ruin of our edifice, this many years in building." Unfortunately, about this time the Jesuits, who thus thrived on political intrigue, and who were deeply implicated in treasonable correspondence with Spain, had obtained a complete ascendancy over the secular priests, who were for obeying the civil government as far as possible and keeping free from politics. The time, therefore, as far as the Roman Catholics themselves were concerned, was not a propitious one for introducing the moderate concessions which alone James had promised: James, too, on his side, found that religious toleration, though clearly sound in principle, was difficult in practice. During the first few months of the reign all went well. In July 1603 the fines for recusancy were remitted. In January 1604 peaceable Roman Catholics could live unmolested and "serve God according to their consciences without any danger." But James's expectations that the pope would prevent dangerous and seditious persons from entering the country were unfulfilled and the numbers of the Jesuits and the Roman Catholics greatly increased. Rumours of plots came to hand. Cecil, though like his master naturally in favour of toleration, with his experience gained in the reign of Elizabeth, was alarmed at the policy pursued and its results, and great anxiety was aroused in the government and nation, which was in the end shared by the king. It was determined finally to return to the earlier policy of repression. On the 22nd of February 1604 a proclamation was issued banishing priests; on the 28th of November 1604, recusancy fines were demanded from 13 wealthy persons, and on the 10th of February 1605 the penal laws were ordered to be executed. The plot, however, could not have been occasioned by these measures, for it had been already conceived in the mind of Robert Catesby. It was aimed at the repeal of the whole Elizabethan legislation against the Roman Catholics and perhaps derived some impulse at first from the leniency lately shown by the administration, afterwards gaining support from the opposite cause, the return of the government to the policy of repression.

It was in May 1603 that Catesby told Percy, in reply to the latter's declaration of his intention to kill the king, that he was "thinking of a most sure way." Subsequently, about the 1st of November 1603, Catesby sent a message to his cousin Robert Winter at Huddington, near Worcester, to come to London, which the latter refused. On the arrival of a second urgent summons shortly afterwards he obeyed, and was then at a house at Lambeth, probably in January 1604, initiated by Catesby together with John Wright into the plot to blow up the parliament house. Before putting this plan into execution, however,

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it was decided to try a "quiet way"; and Winter was sent over to Flanders to obtain the good offices of Juan de Velasco, duke of Frias and constable of Castile, who had arrived there to conduct the negotiations for a peace between England and Spain, in order to obtain the repeal of the penal laws. Winter, having secured nothing but vain promises from the constable, returned to England about the end of April, bringing with him Guy Fawkes, a man devoted to the Roman Catholic cause and recommended for undertaking perilous adventures. Subsequently the three and Thomas Percy, who joined the conspiracy in May, met in a house behind St Clement's and, having taken an oath of secrecy together, heard Mass and received the Sacrament in an adjoining apartment from a priest stated by Fawkes to have been Father Gerard. Later several other persons were included in the plot, viz. Winter's brother Thomas, John Grant, Ambrose Rokewood, Robert Keyes, Sir Everard Digby, Francis Tresham, a cousin of Catesby and Thomas Bates Catesby's servant, all, with the exception of the last, being men of good family and all Roman Catholics. Father Greenway and Father Garnet, the Jesuits, were both cognisant of the plot (see GARNET, HENRY). On the 24th of May 1604 a house was hired in Percy's name adjoining the House of Lords, from the cellar of which they proposed to work a mine. They began on the 11th of December 1604, and by about March had got half-way through the wall. They then discovered that a vault immediately under the House of Lords was available. This was at once hired by Percy, and 36 barrels of gunpowder, amounting to about 1 ton and 12 cwt., were brought in and concealed under coal and faggots. The preparations being completed in May the conspirators separated. Fawkes was despatched to Flanders, where he imparted the plot to Hugh Owen, a zealous Romanist intriguer. Sir Edmund Baynham was sent on a mission to Rome to be at hand when the news came to gain over the pope to the cause of the successful conspirators. An understanding was arrived at with several officers levied for the service of the archduke, that they should return at once to England when occasion arose of defending the Roman Catholic cause. A great hunting match was organized at Danchurch in Warwickshire by Digby, to which large numbers of the Roman Catholic gentry were invited, who were to join the plot after the successful accomplishment of the explosion of the 5th of November, the day fixed for the opening of parliament, and get possession of the princess Elizabeth, then residing in the neighbourhood; while Percy was to seize the infant prince Charles and bring him on horseback to their meeting-place. Guy Fawkes himself was to take ship immediately for Flanders, spread the news on the continent and get supporters. The conspirators imagined that a terrorized and helpless government would readily agree to all their demands. Hitherto the secret had been well kept and the preparations had been completed with extraordinary success and without a single drawback; but a very serious difficulty now confronted the conspirators as the time for action arrived, and disturbed their consciences. The feelings of ordinary humanity shrunk from the destruction of so many persons guiltless of any offence. But in addition, among the peers to be assassinated were included many Roman Catholics and some lords nearly connected in kinship or friendship with the plotters themselves. Several appeals, however, made to Catesby to allow warning to be given to certain individuals were firmly rejected.

On the 26th of October Lord Monteagle, a brother-in-law of Francis Tresham, who had formerly been closely connected with some of the other conspirators and had engaged in Romanist plots against the government, but who had given his support to the new king, unexpectedly ordered supper to be prepared at his house at Hoxton, from which he had been absent for more than a year. While at supper about 6 o'clock an anonymous letter was brought by an unknown messenger which, having glanced at, he handed to Ward, a gentleman of his service and an intimate friend of Winter, the conspirator, to be read aloud. The celebrated letter ran as follows:—

"My lord, out of the love I bear to some of your friends, I have a care for your preservation. Therefore I would advise you, as you tender your life, to devise some excuse to shift of your attendance of this Parliament, for God and man hath concurred to punish the wickedness of this time. And think not slightly of this advertisement, but retire yourself into your country, where you may expect the event in safety, for though there be no appearance of any stir, yet I say they shall receive a terrible blow the Parliament, and yet they shall not see who hurts them. This counsel is not to be contemned, because it may do you good and can do you no harm, for the danger is past as soon as you have burnt the letter: and I hope God will give you the grace to make good use of it, to whose holy protection I commend you."

The authorship of the letter has never been disclosed or proved, but all evidence seems to point to Tresham, and to the probability that he had some days before warned Monteagle and agreed with him as to the best means of making known the plot and preventing its execution, and at the same time of giving the conspirators time to escape (see TRESHAM, FRANCIS).

Monteagle at once started for Whitehall, found Salisbury and other ministers about to sit down to supper, and showed the letter, whereupon it was decided to search the cellar under the House of Lords before the meeting of parliament, but not too soon, so that the plot might be ripe and be fully disclosed. Meanwhile Ward, on the 27th of October, as had evidently been intended, informed Winter that the plot was known, and on the 28th Winter informed Catesby and begged him to give up the whole project. Catesby, however, after some hesitation, finding from Fawkes that nothing had been touched in the cellar, and prevailed upon by Percy, determined to stand firm, hoping that the government had put no credence in Monteagle's letter, and Fawkes returned to the cellar to keep guard as before. On the 4th the king, having been shown the letter, ordered the earl of Suffolk, as lord chamberlain, to examine the buildings. He was accompanied by Monteagle. On arriving at the cellar, the door was opened to him by Fawkes. Seeing the enormous piles of faggots he asked the name of their owner, to which Fawkes replied that they belonged to Percy. His name immediately aroused suspicions, and accordingly it was ordered that a further search should be made by Thomas Knyvett, a Westminster magistrate who, coming with his men at night, discovered the gunpowder and arrested Fawkes on the threshold.

The opinion that the whole plot was the work of Salisbury, that he acted as an *agent provocateur* and lured on his victims to destruction, repeated by some contemporary and later writers and recently formulated and urged with great ability, has no solid foundation. Nor is it even probable that he was aware of its existence till he received Monteagle's letter. Even after its reception complete belief was not placed in the warning. A search was made only to make sure that nothing was wrong and guided only by Monteagle's letter, while no attempt was made to seize the conspirators. The steps taken by Salisbury after the discovery of the gunpowder do not show the possession of any information of the plot or of the persons who were its chief agents outside Fawkes's first statement, and his knowledge is seen to develop according to the successive disclosures and confessions of the latter. Thus on the 7th of November he had no knowledge of the *mine*, and it is only after Fawkes's examination by torture on the 9th, when the names of the conspirators were drawn from him, that the government was able to classify them according to their guilt and extent of their participation. The inquiry was not conducted by Salisbury alone, but by several commissioners, some of whom were Roman Catholics, and many rivals and secret enemies. To conceal his intrigue from all these would have been impossible, and that he should have put himself in their power to such an extent is highly improbable. Again, the plan agreed upon for disclosing the plot was especially designed to allow the conspirators to escape, and therefore scarcely a method which would have been arranged with Salisbury. Not one of the conspirators, even when all hope of saving life was gone, made any accusation against Salisbury or the government and all died expressing contrition for their crime. Lastly Salisbury had no conceivable motive in concocting a plot of this description. His political power and position in the new reign had been already secured and by very different methods. He was now at the height of his influence, having been created Viscount Cranborne

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in August 1604 and earl of Salisbury in May 1605; and James had already, more than 16 months before the discovery of the plot, consented to return to the repressive measures against the Romanists. The success with which the conspirators concealed their plot from Salisbury's spies is indeed astonishing, but is probably explained by its very audacity and by the absence of incriminating correspondence, the medium through which the minister chiefly obtained his knowledge of the plans of his enemies.

On the arrest of Fawkes the other conspirators, except Tresham, fled in parties by different ways, rejoining each other in Warwickshire, as had been agreed in case the plot had been successful. Catesby, who with some others had covered the distance of 80 m. between London and his mother's house at Ashby St Legers in eight hours, informed his friends in Warwickshire, who had been awaiting the issue of the plot, of its failure, but succeeded in persuading Sir Everard Digby, by an unscrupulous falsehood, to further implicate himself in his hopeless cause by assuring him that both James and Salisbury were dead; and, according to Father Garnet, this was not the first time that Catesby had been guilty of lies in order to draw men into the plot. He pushed on the same day with his companions in the direction of Wales, where, it was hoped, they would be joined by bands of insurgents. They arrived at Huddington at 2 in the afternoon. On the morning of the 7th the band, numbering about 36 persons, confessed and heard Mass, and then rode away to Holbeche, 2 m. from Stourbridge, in Staffordshire, the house of Stephen Littleton, who had been present at the hunting at Danchurch (see DIGBY, EVERARD), where they arrived at 10 o'clock at night, having on their way broken into Lord Windsor's house at Hewell Grange and taken all the armour they found there. Their case was now desperate. None had joined them: "Not one came to take our part," said Sir Everard Digby, "though we had expected so many." They were being followed by the sheriff and all the forces of the county. All spurned them from their doors when they applied for succour. One by one their followers fled from the house in which the last scene was to be played out. They now began to feel themselves abandoned not only by man but by God; for an explosion of some of their gunpowder, on the morning of the 8th, by which Catesby and some others were scorched, struck terror into their hearts as a judgment from heaven. The assurance of innocence and of a just cause which till now had alone supported them was taken away. The greatness of their crime, its true nature, now struck home to them, and the few moments which remained to them of life were spent in prayer and in repentance. The supreme hour had now arrived. About 11 o'clock the sheriff and his men came up and immediately began firing into the house. Catesby, Percy and the two Wrights were killed, Winter and Rokewood wounded and taken prisoners with the men who still adhered to them. In all eight of the conspirators, including the two Winters, Digby, Fawkes, Rokewood, Keyes and Bates, were executed, while Tresham died in the Tower. Of the priests involved, Garnet was tried and executed, while Greenway and Gerard succeeded in escaping.

So ended the strange and famous Gunpowder Plot. However atrocious its conception and its aims, it is impossible not to feel, together with horror for the deed, some pity and admiration for the guilty persons who took part in it. "Theirs was a crime which it would never have entered into the heart of any man to commit who was not raised above the lowness of the ordinary criminal." They sinned not against the light but in the dark. They erred from ignorance, from a perverted moral sense rather than from any mean or selfish motive, and exhibited extraordinary courage and self-sacrifice in the pursuit of what seemed to them the cause of God and of their country. Their punishment was terrible. Not only had they risked and lost all in the attempt and drawn upon themselves the frightful vengeance of the state, but they saw themselves the means of injuring irretrievably the cause for which they felt such devotion. Nothing could have been more disastrous to the cause of the Roman Catholics than their crime. The laws against them were immediately increased in severity, and the gradual advance towards religious toleration was put back for centuries. In addition a new, increased and long-enduring hostility was aroused in the country against the adherents of the old faith, not unnatural in the circumstances, but unjust and undiscriminating, because while some of the Jesuits were no doubt implicated, the secular priests and Roman Catholic laity as a whole had taken no part in the conspiracy.

BIBLIOGRAPHY.—The recent controversy concerning the nature and origin of the plot can be followed in *What was the Gunpowder Plot?* by John Gerard, S.J. (1897); *What Gunpowder Plot was*, by S. R. Gardiner (a rejoinder) (1897); *The Gunpowder Plot . . . in reply to Professor Gardiner*, by John Gerard, S.J. (1897); *Thomas Winter's Confession and the Gunpowder Plot*, by John Gerard, S.J. (with facsimiles of his writing) (1898); *Eng. Hist. Rev.* iii. 510 and xii. 791; *Edinburgh Review*, clxxxv. 183; *Athenaeum* 1897, ii. 149, 788, 855; 1898, i. 23, ii. 352, 420; *Academy*, vol. 52 p. 84; *The Nation*, vol. 65 p. 400. A considerable portion of the controversy centres round the question of the authenticity of Thomas Winter's confession, the MS. of which is at Hatfield, supported by Professor Gardiner, but denied by Father Gerard principally on account of the document having been signed "Winter" instead of "Wintour," the latter apparently being the conspirator's usual style of signature. The document was deposited by the 3rd Marquess of Salisbury for inspection at the Record Office, and was pronounced by two experts, one from the British Museum and another from the Record Office, to be undoubtedly genuine. The cause of the variation in the signature still remains unexplained, but appears to be therefore any great historical importance. The bibliography of the contemporary controversy is given in the article on Henry Garnet in the *Dictionary of National Biography* and in *The Gunpowder Plot* by David Jardine (1857), the latter work still remaining the principal authority on the subject; add to these Lingard's *Hist. of England*, i., where an excellent account is given; *History of the Jesuits in England*, by Father Ethelred Taunton (1901); Father Gerard's Narrative in *Condition of the Catholics under James I.* (1872), and Father Greenway's Narrative in *Troubles of our Catholic Forefathers*, 1st series (1872), interesting as contemporary accounts, but not to be taken as complete or infallible authorities, of the same nature being *Historia Provinciae Anglicanae Societatis Jesu*, by Henry More, S.J. (1660), pp. 309 et seq.; also *History of Great Britain*, by John Speed (1614), pp. 839 et seq.; *Archaeologia*, xii. 200, xxviii. 422, xxix. 80; *Harleian Miscellany* (1809), iii. 119-135, or *Somers Tracts* (1809), ii. 97-117; M. A. Tierney's ed. of *Dodd's Church History*, vol. iv. (1841); *Treason and Plot*, by Martin Hume (1901); *Notes and Queries*, 7 ser. vi., 8 ser. x. 408, 497, x. 55, xii. 505, 515; *Add. MSS. Brit. Mus.* 6178; *State Trials*, ii.; *Calendar of State Pap. Dom.* (1603–1610), and the official account, *A True and Perfect Relation of the Whole Proceedings against the late most Barbarous Traitors* (1606), a neither true nor complete narrative however, now superseded as an authority, reprinted as *The Gunpowder Treason . . .* with additions in 1679 by Thomas Barlow, bishop of Lincoln. A large number of letters and papers in the State Paper Office relating to the plot were collected in one volume in 1860, called the *Gunpowder Plot Book*; these are noted in their proper place in the printed calendars of State Papers, Domestic Series; see also articles on FAWKES, GUY; TRESHAM, FRANCIS; MONTEAGLE, WILLIAM PARKER, 4TH BARON; PERCY, THOMAS; CATESBY, ROBERT; GARNET, HENRY; DIGBY, SIR EVERARD. (P. C. Y.)

GUN-ROOM, a ship cabin occupied by the officers below the rank of lieutenant, but who are not warrant officers of the class of the boatswain, gunner or carpenter. In the wooden sailing ships it was on the lower deck, and was originally the quarters of the gunner.

GUNTER, EDMUND (1581–1626), English mathematician, of Welsh extraction, was born in Hertfordshire in 1581. He was educated at Westminster school, and in 1599 was elected a student of Christ Church, Oxford. He took orders, became a preacher in 1614, and in 1615 proceeded to the degree of bachelor in divinity. Mathematics, however, which had been his favourite study in youth, continued to engross his attention, and on the 6th of March 1619 he was appointed professor of astronomy in Gresham College, London. This post he held till his death on the 10th of December 1626. With Gunter's name are associated several useful inventions, descriptions of which are given in his treatises on the *Sector, Cross-staff, Bow, Quadrant and other Instruments*. He contrived his sector about the year 1606, and wrote a description of it in Latin, but it was more than sixteen years afterwards before he allowed the book to appear in English. In 1620 he published his *Canon triangulorum* (see LOGARITHMS). There is reason to believe that Gunter was the first to discover (in 1622 or 1623) that the magnetic needle does not retain the same declination in the same place at all times. By desire of

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James I. he published in 1624 *The Description and Use of His Majestie's Dials in Whitehall Garden*, the only one of his works which has not been reprinted. He introduced the words cosine and cotangent, and he suggested to Henry Briggs, his friend and colleague, the use of the arithmetical complement (see Brigg's *Arithmetica Logarithmica*, cap. xv.). His practical inventions are briefly noticed below:

Gunter's Chain, the chain in common use for surveying, is 22 yds. long and is divided into 100 links. Its usefulness arises from its decimal or centesimal division, and the fact that to square chains make an acre.

Gunter's Line, a logarithmic line, usually laid down upon scales, sectors, &c. It is also called *the line of lines* and *the line of numbers*, being only the logarithms graduated upon a ruler, which therefore serves to solve problems instrumentally in the same manner as logarithms do arithmetically.

Gunter's Quadrant, an instrument made of wood, brass or other substance, containing a kind of stereographic projection of the sphere on the plane of the equinoctial, the eye being supposed to be placed in one of the poles, so that the tropic, ecliptic, and horizon form the arcs of circles, but the hour circles are other curves, drawn by means of several altitudes of the sun for some particular latitude every year. This instrument is used to find the hour of the day, the sun's azimuth, &c., and other common problems of the sphere or globe, and also to take the altitude of an object in degrees.

Gunter's Scale (generally called by seamen the *Gunter*) is a large plane scale, usually 2 ft. long by about 1¾ in. broad, and engraved with various lines of numbers. On one side are placed the natural lines (as the line of chords, the line of sines, tangents, rhumbs, &c.), and on the other side the corresponding artificial or logarithmic ones. By means of this instrument questions in navigation, trigonometry, &c., are solved with the aid of a pair of compasses.

GÜNTHER, JOHANN CHRISTIAN (1695–1723), German poet, was born at Striegau in Lower Silesia on the 8th of April 1695. After attending the gymnasium at Schweidnitz, he was sent in 1715 by his father, a country doctor, to study medicine at Wittenberg; but he was idle and dissipated, had no taste for the profession chosen for him, and came to a complete rupture with his family. In 1717 he went to Leipzig, where he was befriended by J. B. Mencke (1674–1732), who recognized his genius; and there he published a poem on the peace of Passarowitz (concluded between the German emperor and the Porte in 1718) which acquired him reputation. A recommendation from Mencke to Frederick Augustus II. of Saxony, king of Poland, proved worse than useless, as Günther appeared at the audience drunk. From that time he led an unsettled and dissipated life, sinking ever deeper into the slough of misery, until he died at Jena on the 15th of March 1723, when only in his 28th year. Goethe pronounces Günther to have been a poet in the fullest sense of the term. His lyric poems as a whole give evidence of deep and lively sensibility, fine imagination, clever wit, and a true ear for melody and rhythm; but an air of cynicism is more or less present in most of them, and dull or vulgar witticisms are not infrequently found side by side with the purest inspirations of his genius.

Günther's collected poems were published in four volumes (Breslau, 1723–1735). They are also included in vol. vi. of Tittmann's *Deutsche Dichter des 17ten Jahrh.* (Leipzig, 1874), and vol. xxxviii. of Kürschner's *Deutsche Nationalliteratur* (1883). A pretended autobiography of Günther appeared at Schweidnitz in 1732, and a life of him by Siebrand at Leipzig in 1738. See Hoffmann von Fallersleben, *J. Ch. Günther* (Breslau, 1833); O. Roquette, *Leben und Dichten J. Ch. Gunthers* (Stuttgart, 1860); M. Kalbeck, *Neue Beitrage zur Biographie des Dichters C. Günther* (Breslau, 1879).

GÜNTHER OF SCHWARZBURG (1304–1349), German king, was a descendant of the counts of Schwarzburg and the younger son of Henry VII., count of Blankenburg. He distinguished himself as a soldier, and rendered good service to the emperor Louis IV., on whose death in 1347 he was offered the German throne, after it had been refused by Edward III., king of England. He was elected German king at Frankfort on the 30th of January 1349 by four of the electors, who were partisans of the house of Wittelsbach and opponents of Charles of Luxemburg, afterwards the emperor Charles IV. Charles, however, won over many of Günther's adherents, defeated him at Eltville, and Günther, who was now seriously ill, renounced his claims for the sum of 20,000 marks of silver. He died three weeks afterwards at Frankfort, and was buried in the cathedral of that city, where a statue was erected to his memory in 1352.

See Graf L. Ütterodt zu Scharffenberg, *Günther, Graf von Schwarzburg, erwählter deutscher König* (Leipzig, 1862); and K. Janson, *Das Königtum Günthers von Schwarzburg* (Leipzig, 1880).

GUNTRAM, or GONTRAN (561–592), king of Burgundy, was one of the sons of Clotaire I. On the death of his father (561) he and his three brothers divided the Frankish realm between them, Guntram receiving as his share the valleys of the Saône and Rhone, together with Berry and the town of Orleans, which he made his capital. On the death of Charibert (567), he further obtained the *civitates* of Saintes, Angoulême and Périgueux. During the civil war which broke out between the kings of Neustria and Austrasia, his policy was to try to maintain a state of equilibrium. After the assassination of Sigebert (575), he took the youthful Childebert II. under his protection, and, thanks to his assistance against the intrigues of the great lords, the latter was able to maintain his position in Austrasia. After the death of Chilperic (584) he protected the young Clotaire II. in the same way, and prevented Childebert from seizing his dominions. His course was rendered easier by the fact that his own sons had died; consequently, having an inheritance at his disposal, he was able to offer it to whichever of his nephews he wished. The danger to the Frankish realm caused by the expedition of Gundobald (585), and the anxiety which was caused him by the revolts of the great lords in Austrasia finally decided him in favour of Childebert. He adopted him as his son, and recognized him as his heir at the treaty of Andelot (587); he also helped him to crush the great lords, especially Ursion and Berthefried, who were conquered in la Woëvre. From this time on he ceased to play a prominent part in the affairs of Austrasia. He died in 592, and Childebert received his inheritance without opposition. Gregory of Tours is very indulgent to Guntram, who showed himself on occasions generous towards the church; he almost always calls him "good king Guntram," and in his writings are to be found such phrases as "good king Guntram took as his servant a concubine Veneranda" (iv. 25); but Guntram was really no better than the other kings of his age; he was cruel and licentious, putting his *cubicularius* Condo to death, for instance, because he was suspected of having killed a buffalo in the Vosges. He was moreover a coward, and went in such constant terror of assassination that he always surrounded himself with a regular bodyguard.

See Krusch, "Zur Chronologie der merowingischen Könige," in the *Forschungen zur deutschen Geschichte*, xxii. 451-490; Ulysse Chevalier, *Bio-bibliographie* (2nd ed.), *s.v.* "Guntram." (C. PF.)

GUNTUR, a town and district of British India, in the Madras presidency. The town (pop. in 1901, 30,833) has a station on the Bellary-Bezwada branch of the Southern Mahratta railway. It is situated east of the Kondavid hills, and is very healthy. It appears to have been founded in the 18th century by the French. At the time of the cession of the Circars to the English in 1765, Guntur was specially exempted during the life of Basalat Jang, whose personal *jagir* it was. In 1788 it came into British possession, the cession being finally confirmed in 1823. It has an important trade in cotton, with presses and ginning factories. There is a second-grade college supported by the American Lutheran Mission. Until 1859, Guntur was the headquarters of a district of the same name, and in 1904 a new DISTRICT OF GUNTUR was constituted, covering territory which till then had been divided between Kistna and Nellore. Area, 5733 sq. m. The population on this area in 1901 was 1,400,635. The district is bounded on the E. and N. by the river Kistna; in the W. a considerable part of the boundary is formed by the Gundlakamma river. The greater part consists of a fertile plain irrigated by canals from the Kistna, and producing cotton, rice and other crops.

GUPTA, an empire and dynasty of northern India, which lasted from about A.D. 320 to 480. The dynasty was founded by Chandragupta I., who must not be confounded with his famous predecessor Chandragupta Maurya. He gave his name to the Gupta era, which continued in use for several centuries, dating

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from the 26th of February, A.D. 320. Chandragupta was succeeded by Samudragupta (*c.* A.D. 326–375), one of the greatest of Indian kings, who conquered nearly the whole of India, and whose alliances extended from the Oxus to Ceylon; but his name was at one time entirely lost to history, and has only been recovered of recent years from coins and inscriptions. His empire rivalled that of Asoka, extending from the Hugli on the east to the Jumna and Chambal on the west, and from the foot of the Himalayas on the north to the Nerbudda on the south. His son Chandragupta II. (*c.* A.D. 375–413) was also known as Vikra-Maditya (*q.v.*), and seems to have been the original of the mythical Hindu king of that name. About 388 he conquered the Saka satrap of Surashtra (Kathiawar) and penetrated to the Arabian Sea. His administration is described in the work of Fa-hien, the earliest Chinese pilgrim, who visited India in A.D. 405–411. Pataliputra was the capital of the dynasty, but Ajodhya seems to have been sometimes used by both Samudragupta and Chandragupta II. as the headquarters of government. The Gupta dynasty appears to have fostered a revival of Brahmanism at the expense of Buddhism, and to have given an impulse to art and literature. The golden age of the empire lasted from A.D. 330 to 455, beginning to decline after the latter date. When Skandagupta came to the throne in 455, India was threatened with an irruption of the White Huns, on whom he inflicted a severe defeat, thus saving his kingdom for a time; but about 470 the White Huns (see EPITHALITES) returned to the attack, and the empire was gradually destroyed by their repeated inroads. When Skandagupta died about 480, the Gupta empire came to an end, but the dynasty continued to rule in the eastern provinces for several generations. The last known prince of the imperial line of Guptas was Kamaragupta II. (*c.* 535), after whom it passed "by an obscure transition" into a dynasty of eleven Gupta princes, known as "the later Guptas of Magadha," who seem for the most part to have been merely local rulers of Magadha. One of them, however, Adityasena, after the death of the paramount sovereign in 648, asserted his independence. The last known Gupta king was Jivitagupta II., who reigned early in the 8th century. About the middle of the century Magadha passed under the sway of the Pal kings of Bengal.

See J. F. Fleet, *Gupta Inscriptions* (1888); and Vincent A. Smith, *The Early History of India* (2nd ed., Oxford, 1908), pp. 264–295.

GURA, EUGEN (1842–1906), German singer, was born near Saatz in Bohemia, and educated at first for the career of a painter at Vienna and Munich; but later, developing a fine baritone voice, he took up singing and studied it at the Munich Conservatorium. In 1865 he made his début at the Munich opera, and in the following years he gained the highest reputation in Germany, being engaged principally at Leipzig till 1876 and then at Hamburg till 1883. He sang in 1876 in the *Ring* at Bayreuth, and was famous for his Wagnerian rôles; and his Hans Sachs in *Meistersinger*, as performed in London in 1882, was magnificent. In later years he showed the perfection of art in his singing of German *Lieder*. He died in Bavaria on the 26th of August 1906.

GURDASPUR, a town and district of British India, in the Lahore division of the Punjab. The town had a population in 1901 of 5764. It has a fort (now containing a Brahman monastery) which was famous for the siege it sustained in 1712 from the Moguls. The Sikh leader, Banda, was only reduced by starvation, when he and his men were tortured to death after capitulating.

The DISTRICT comprises an area of 1889 sq. m. It is bounded on the N. by the native states of Kashmir and Chamba, on the E. by Kangra district and the river Beas, on the S.W. by Amritsar district, and on the W. by Sialkot, and occupies the submontane portion of the Bari Doab, or tract between the Beas and the Ravi. An intrusive spur of the British dominions runs northward into the lower Himalayan ranges, to include the mountain sanatorium of Dalhousie, 7687 ft. above sea-level. This station, which has a large fluctuating population during the warmer months, crowns the most westerly shoulder of a magnificent snowy range, the Dhaoladhar, between which and the plain two minor ranges intervene. Below the hills stretches a picturesque and undulating plateau covered with abundant timber, made green by a copious rainfall, and watered by the streams of the Bari Doab, which, diverted by dams and embankments, now empty their waters into the Beas directly, in order that their channels may not interfere with the Bari Doab canal. The district contains several large *jhils* or swampy lakes, and is famous for its snipe-shooting. It is historically important in connexion with the rise of the Sikh confederacy. The whole of the Punjab was then distributed among the Sikh chiefs who triumphed over the imperial governors. In the course of a few years, however, the maharaja Ranjit Singh acquired all the territory which those chiefs had held. Pathankot and the neighbouring villages in the plain, together with the whole hill portion of the district, formed part of the area ceded by the Sikhs to the British after the first Sikh war in 1846. In 1862, after receiving one or two additions, the district was brought into its present shape. In 1901 the population was 910,314, showing a slight decrease, compared with an increase of 15% in the previous decade. A branch of the North-Western railway runs through the district. The largest town and chief commercial centre is Batala. There are important woollen mills at Dhariwal, and besides their products the district exports cotton, sugar, grain and oil-seeds.

GURGAON, a town and district of British India, in the Delhi division of the Punjab. The town (pop. in 1901, 4765) is the headquarters of the district, but is otherwise unimportant. The district has an area of 1084 sq. m. It is bounded on the N. by Rohtak, on the W. and S.W. by portions of the Alwar, Nabha and Jind native states, on the S. by the Muttra district of the United Provinces, on the E. by the river Jumna and on the N.E. by Delhi. It comprises the southernmost corner of the Punjab province, stretching away from the level plain towards the hills of Rajputana. Two low rocky ranges enter its borders from the south and run northward in a bare and unshaded mass toward the plain country. East of the western ridge the valley is wide and open, extending to the banks of the Jumna. To the west lies the subdivision of Rewari, consisting of a sandy plain dotted with isolated hills. Numerous torrents carry off the drainage from the upland ranges, and the most important among them empty themselves at last into the Najafgarh *jhil*. This swampy lake lies to the east of the civil station of Gurgaon, and stretches long arms into the neighbouring districts of Delhi and Rohtak. Salt is manufactured in wells at several villages. The mineral products are iron ore, copper ore, plumbago and ochre.

In 1803 Gurgaon district passed into the hands of the British after Lord Lake's conquests. On the outbreak of the Mutiny in May 1857, the nawab of Farukhnagar, the principal feudatory of the district, rose in rebellion. The Meos and many Rajput families followed his example. A faithful native officer preserved the public buildings and records at Rewari from destruction; but with this exception, British authority became extinguished for a time throughout Gurgaon. After the fall of the rebel capital, a force marched into the district and either captured or dispersed the leaders of rebellion. The territory of the nawab was confiscated on account of his participation in the Mutiny. Civil administration was resumed under orders from the Punjab government, to which province the district was formally annexed on the final pacification of the country. The population in 1901 was 746,208, showing an increase of 11% in the decade. The largest town and chief trade centre is Rewari. The district is now traversed by several lines of railway, and irrigation is provided by the Agra canal. The chief trade is in cereals, but hardware is also exported.

GURKHA (pronounced *gŏorkŭ*; from Sans. *gāu*, a cow, and *rakṣ*, to protect), the ruling Hindu race in Nepal (*q.v.*). The Gurkhas, or Gurkhalis, claim descent from the rajas of Chitor in Rajputana. When driven out of their own country by the Mahommedan invasion, they took refuge in the hilly districts about Kumaon, whence they gradually invaded the country to the eastward as far as Gurkha, Noakote and ultimately to the valley of Nepal and even Sikkim. They were stopped by the English in an attempt to push south, and the treaty of Segauli,

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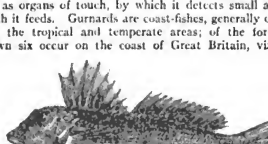
which ended the Gurkha War of 1814, definitely limited their territorial growth. The Gurkhas of the present day remain Hindus by religion, but show in their appearance a strong admixture of Mongolian blood. They make splendid infantry soldiers, and by agreement with their government about 20,000 have been recruited for the Gurkha regiments of the Indian army. As a rule they are bold, enduring, faithful, frank, independent and self-reliant. They despise other Orientals, but admire and fraternize with Europeans, whose tastes in sport and war they share. They strongly resemble the Japanese, but are of a sturdier build. Their national weapon is the *kukri*, a heavy curved knife, which they use for every possible purpose.

See Capt. Eden Vansittart, *Notes on the Gurkhas* (1898); and P. D. Bonarjee, *The Fighting Races of India* (1899).

GURNALL, WILLIAM (1617–1679), English author, was born in 1617 at King's Lynn, Norfolk. He was educated at the free grammar school of his native town, and in 1631 was nominated to the Lynn scholarship in Emmanuel College, Cambridge, where he graduated B.A. in 1635 and M.A. in 1639. He was made rector of Lavenham in Suffolk in 1644; and before he received that appointment he seems to have officiated, perhaps as curate, at Sudbury. At the Restoration he signed the declaration required by the Act of Uniformity, and on this account he was the subject of a libellous attack, published in 1665, entitled *Covenant-Renouncers Desperate Apostates*. He died on the 12th of October 1679. Gurnall is known by his *Christian in Complete Armour*, published in three volumes, dated 1655, 1658 and 1662. It consists of a series of sermons on the latter portion of the 6th chapter of Ephesians, and is described as a "magazine from whence the Christian is furnished with spiritual arms for the battle, helped on with his armour, and taught the use of his weapon; together with the happy issue of the whole war." The work is more practical than theological; and its quaint fancy, graphic and pointed style, and its fervent religious tone render it still popular with some readers.

See also *An Inquiry into the Life of the Rev. W. Gurnall*, by H. M'Keon (1830), and a biographical introduction by Bishop Ryle to the *Christian in Complete Armour* (1865).

GURNARD (*Trigla*), a genus of fishes forming a group of the family of "mailed cheeks" (*Triglidae*), and easily recognized by three detached finger-like appendages in front of the pectoral fins, and by their large, angular, bony head, the sides of which are protected by strong, hard and rough bones. The pectoral appendages are provided with strong nerves, and serve not only as organs of locomotion when the fish moves on the bottom, but also as organs of touch, by which it detects small animals on which it feeds. Gurnards are coast-fishes, generally distributed over the tropical and temperate areas; of the forty species known six occur on the coast of Great Britain, viz. the red



Trigla pleuracanthica.

gurnard (*T. pini*), the streaked gurnard (*T. lineata*), the sapphirine gurnard (*T. hirundo*), the grey gurnard (*T. gurnardus*), the piper (*T. lyra*) and the long-finned gurnard (*T. obscura* or *T. lucerna*). Although never found very far from the coast, gurnards descend to depths of several hundred fathoms; and as they are bottom-fish they are caught chiefly by means of the trawl. Not rarely, however, they may be seen floating on the surface of the water, with their broad, finely coloured pectoral fins spread out like fans. In very young fishes, which abound in certain localities on the coast in the months of August and September, the pectorals are comparatively much longer than in the adult, extending to the end of the body; they are beautifully coloured and kept expanded, the little fishes looking like butterflies. When caught and taken out of the water, gurnards emit a grunting noise, which is produced by the vibrations of a diaphragm situated transversely across the cavity of the bladder and perforated in the centre. This grunting noise gave rise to the name "gurnard," which is probably an adaptation or variation of the Fr. *grognard*, grumbler, cf. the Fr. *grondin*, gurnard, from *gronder*, and Ger. *Knurrfisch*. Their flesh is very white, firm and wholesome.

GURNEY, the name of a philanthropic English family of bankers and merchants, direct descendants of Hugh de Gournay, lord of Gournay, one of the Norman noblemen who accompanied William the Conqueror to England. Large grants of land were made to Hugh de Gournay in Norfolk and Suffolk, and Norwich has since that time been the headquarters of the family, the majority of whom were Quakers. Here in 1770 the brothers John and Henry Gurney founded a banking-house, the business passing in 1770 to Henry's son, Bartlett Gurney. On the death of Bartlett Gurney in 1802 the bank became the property of his three cousins, of whom JOHN GURNEY (1750–1809) was the most remarkable. One of his daughters was Elizabeth Fry; another married Sir Thomas Fowell Buxton. Of his sons one was JOSEPH JOHN GURNEY (1788–1847), a well-known philanthropist of the day; another, SAMUEL GURNEY (1786–1856) assumed on his father's death the control of the Norwich bank. Samuel Gurney also took over about the same time the control of the London bill-broking business of Richardson, Overend & Company, in which he was already a partner. This business had been founded in 1800 by Thomas Richardson, clerk to a London bill-discounter, and John Overend, chief clerk in the bank of Smith, Payne & Company at Nottingham, the Gurneys supplying the capital. At that time bill-discounting was carried on in a spasmodic fashion by the ordinary merchant in addition to his regular business, but Richardson considered that there was room for a London house which should devote itself entirely to the trade in bills. This, at that time, novel idea proved an instant success. The title of the firm was subsequently changed to Overend, Gurney & Company, and for forty years it was the greatest discounting-house in the world. During the financial crisis of 1825 Overend, Gurney & Company were able to make short loans to many other bankers. The house indeed became known as "the bankers' banker," and secured many of the previous clients of the Bank of England. Samuel Gurney died in 1856. He was a man of very charitable disposition, and during the latter years of his life charitable and philanthropic undertakings almost monopolized his attention. In 1865 the business of Overend, Gurney & Company, which had come under less competent control, was converted into a joint stock company, but in 1866 the firm suspended payment with liabilities amounting to eleven millions sterling.

GURNEY, EDMUND (1847–1888), English psychologist, was born at Hersham, near Walton-on-Thames, on the 23rd of March 1847. He was educated at Blackheath and at Trinity College, Cambridge, where he took a high place in the classical tripos and obtained a fellowship. His work for the schools was done, says his friend F. W. H. Myers, "in the intervals of his practice on the piano." Dissatisfied with his own executive skill as a musician, he wrote *The Power of Sound* (1880), an essay on the philosophy of music. He then studied medicine with no intention of practising, devoting himself to physics, chemistry and physiology. In 1880 he passed the second M.B. Cambridge examination in the science of the healing profession. These studies, and his great logical powers and patience in the investigation of evidence, he devoted to that outlying field of psychology which is called "Psychical Research." He asked whether, as universal tradition declares, there is an unexplored region of human faculty transcending the normal limitations of sensible knowledge. That there is such a region it was part of the system of Hegel to declare, and the subject had been metaphysically treated by Hartmann, Schopenhauer, Du Prel, Hamilton and others, as the philosophy

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of the Unconscious or Subconscious. But Gurney's purpose was to approach the subject by observation and experiment, especially in the hypnotic field, whereas vague and ill-attested anecdotes had hitherto been the staple of the evidence of metaphysicians. The tendency of his mind was to investigate whatever facts may give a colour of truth to the ancient belief in the persistence of the conscious human personality after the death of the body. Like Joseph Glanvill's, the natural bent of Gurney's mind was sceptical. Both thought the current and traditional reports of supernormal occurrences suggestive and worth investigating by the ordinary methods of scientific observation, and inquisition into evidence at first hand. But the method of Gurney was, of course, much more strict than that of the author of *Sadducismus Triumphatus*, and it included hypnotic and other experiments unknown to Glanvill. Gurney began at what he later saw was the wrong end by studying, with Myers, the "séances" of professed spiritualistic "mediums" (1874–1878). Little but detection of imposture came of this, but an impression was left that the subject ought not to be abandoned. In 1882 the Society for Psychical Research was founded. (See PSYCHICAL RESEARCH.) Paid mediums were discarded, at least for the time, and experiments were made in "thought-transference" and hypnotism. Personal evidence as to uninduced hallucinations was also collected. The first results are embodied in the volumes of *Phantasms of the Living*, a vast collection (Podmore, Myers and Gurney), and in Gurney's remarkable essay, *Hallucinations*. The chief consequence was to furnish evidence for the process called "telepathy," involving the provisional hypothesis that one human mind can affect another through no recognized channel of sense. The fact was supposed to be established by the experiments chronicled in the *Proceedings of the Society for Psychical Research*, and it was argued that similar experiences occurred spontaneously, as, for example, in the many recorded instances of "deathbed wraiths" among civilized and savage races. (Tylor, *Primitive Culture*, i. chapter xi., especially pp. 449-450, 1873. Lang, *Making of Religion*, pp. 120-124, 1898.) The dying man is supposed to convey the hallucination of his presence as one living person experimentally conveys his thought to another, by "thought-transference." Gurney's hypnotic experiments, marked by great exactness, patience and ingenuity, were undertaken in 1885–1888. Their tendency was, in Myers's words, "to prove—so far as any one operator's experience in this protean subject can be held to prove anything—that there *is* sometimes, in the induction of hypnotic phenomena, some agency at work which is neither ordinary nervous stimulation (monotonous or sudden) nor suggestion conveyed by any ordinary channel to the subject's mind." These results, if accepted, of course corroborate the idea of telepathy. (See Gurney, "Hypnotism and Telepathy," *Proceedings S.P.R.* vol. iv.) Experiments by MM. Gibert, Janet, Richet, Héricourt and others are cited as tending in the same direction. Other experiments "with" the relation of the memory in the hypnotic state to the memory in another hypnotic state, and of both to the normal or waking memory." The result of Gurney's labours, cut short by his early death, was to raise and strengthen the presumption that there exists an unexplored region of human faculty which ought not to be neglected by science as if the belief in it were a mere survival of savage superstition. Rather, it appears to have furnished the experiences which, misinterpreted, are expressed in traditional beliefs. That Gurney was credulous and easily imposed upon those who knew him, and knew his penetrating humour, cannot admit; nor is the theory likely to be maintained by those whom bias does not prevent from studying with care his writings. In controversy "he delighted in replying with easy courtesy to attacks envenomed with that *odium plus quam theologicum* which the very allusion to a ghost or the human soul seems in some philosophers to inspire." In discussion of themes unpopular and obscure Gurney displayed the highest tact, patience, good temper, humour and acuteness. There never was a more disinterested student. In addition to his work on music and his psychological writings, he was the author of *Tertium Quid* (1887), a collection of essays, on the whole a protest against one-sided ideas and methods of discussion. He died at Brighton on 23rd June 1888, from the effects of an overdose of narcotic medicine. (A. L.)

GURWOOD, JOHN (1790–1845), British soldier, began his career in a merchant's office, but soon obtained an ensigncy in the 52nd (1808). With his regiment he served in the "Light Division" of Wellington's army throughout the earlier Peninsular campaigns, and at Ciudad Rodrigo (19th Jan. 1812) he led one of the forlorn hopes and was severely wounded. For his gallant conduct on this occasion Wellington presented Gurwood with the sword of the French governor of Ciudad Rodrigo. A little later, transferring to the 9th Light Dragoons, he was made brigade-major to the Guards' cavalry which had just arrived in the Peninsula. In the latter part of the war he served as brigade-major to Lambert's brigade of the sixth infantry division, and was present at the various actions in which that division played a conspicuous part—the Nivelle, the Nive, Orthes and Toulouse. At Waterloo Captain Gurwood was for the third time severely wounded. In the first twelve years of the peace he was promoted up to the grade of lieut.-colonel, and in 1841 became brevet-colonel. He was for many years the duke of Wellington's private secretary, and was entrusted by him with the collection and editing of the *Wellington Despatches*, which occupied Gurwood from 1837 to the end of his life. This work is a monument of industrious skill, and earned its author a Civil List Pension of £200. But overwork and the effects of his wounds had broken his health, and he committed suicide on Christmas day 1845. He was a C.B. and deputy-lieutenant of the Tower.

GUSLA, or GUSLI, an ancient stringed instrument still in use among the Slavonic races. The modern Servian gusla is a kind of tanbur (see PANDURA), consisting of a round, concave body covered with a parchment soundboard; there is but one horse-hair string, and the peg for tuning it is inserted in oriental fashion in the back of the head. The gusla is played with a primitive bow called *goudalo*. The *gouslars* or blind bards of Servia and Croatia use it to accompany their chants. C. G. Anton[1] mentions an instrument of that name in the shape of a half-moon strung with eighteen strings in use among the Tatars. Prosper Merimée[2] has taken the *gusla* as the title for a book of Servian poems, which are supposed to have been collected by him among the peasants, but which are thought to have been inspired by the *Viaggio in Dalmazia* of Albarto Fortis.

Among the Russians, the gusli is an instrument of a different type, a kind of psaltery having five or more strings stretched across a flat, shallow sound-chest in the shape of a wing. In the gusli the strings, of graduated length, are attached to little nails or pins at one end, and at the other they are wound over a rod having screw attachments for increasing and slackening the tension. There is no bridge to determine the vibrating length of the strings. The body of the instrument is shaped roughly like the tail of the grand piano, following the line of the strings; the longest being at the left of the instrument. Matthew Guthrie gives an illustration of the gusli.[3] (K. S.)

GUSTAVUS I. ERIKSSON (1496–1560), king of Sweden, was born at his mother's estate at Lindholm on Ascension Day 1496. He came of a family which had shone conspicuously in 15th-century politics, though it generally took the anti-national side. His father, Erik Johansson of Rydboholm, "a merry and jocose gentleman," but, like all the Swedish Vasas, liable to sudden fierce gusts of temper, was one of the senators who voted for the deposition of Archbishop Trolle, at the *riksdag* of 1517 (see SWEDEN, *History*), for which act of patriotism he lost his head. Gustavus's mother, Cecilia Månsdåtter, was closely connected by marriage with the great Sture family. Gustavus's youthful experiences impressed him with a life-long distrust of everything Danish. In his eighteenth year he was sent to the court of his cousin Sten Sture. At the battle of Brännkyrka, when Sture

[1] *Erste Linien eines Versuchs über den Ursprung der alten Slaven* (Leipzig, 1783–1789), p. 145.

[2] *La Guzla, ou choix de poésies lyriques recueillies dans la Dalmatie, la Bosnie, la Croatie, &c.* (Paris, 1827).

[3] *Dissertations sur les antiquités de Russie* (St Petersburg, 1795), pl. ii. No. 9, p. 31.

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defeated Christian II. of Denmark, the young Gustavus bore the governor's standard, and in the same year (1518) he was delivered with five other noble youths as a hostage to King Christian, who treacherously carried him prisoner to Denmark. He was detained for twelve months in the island fortress of Kalö, on the east coast of Jutland, but contrived to escape to Lübeck in September 1519. There he found an asylum till the 20th of May 1520, when he chartered a ship to Kalmar, one of the few Swedish fortresses which held out against Christian II.

It was while hunting near Lake Mälar that the news of the Stockholm massacre was brought to him by a peasant fresh from the capital, who told him, at the same time, that a price had been set upon his head. In his extremity, Gustavus saw only one way of deliverance, an appeal for help to the sturdy yeomen of the dales. How the dalesmen set Gustavus on the throne and how he and they finally drove the Danes out of Sweden (1521–1523) is elsewhere recorded (see SWEDEN: *History*). But his worst troubles only began after his coronation on the 6th of June 1523. The financial position of the crown was the most important of all the problems demanding solution, for upon that everything else depended. By releasing his country from the tyranny of Denmark, Gustavus had made the free independent development of Sweden a possibility. It was for him to realize that possibility. First of all, order had to be evolved from the chaos in which Sweden had been plunged by the disruption of the Union; and the shortest, perhaps the only, way thereto was to restore the royal authority, which had been in abeyance during ninety years. But an effective reforming monarchy must stand upon a sound financial basis; and the usual revenues of the crown, always inadequate, were so diminished that they did not cover half the daily expenses of government. New taxes could only be imposed with extreme caution, while the country was still bleeding from the wounds of a long war. And men were wanted even more than money. The lack of capable, trustworthy administrators in Sweden was grievous. The whole burden of government weighed exclusively on the shoulders of the new king, a young man of seven and twenty. Half his time was taken up in travelling from one end of the kingdom to the other, and doing purely clerical work for want of competent assistance. We can form some idea of his difficulties when we learn that, in 1533, he could not send an ambassador to Lübeck because not a single man in his council, except himself, knew German. It was this lack of native talent which compelled Gustavus frequently to employ the services of foreign adventurers like Berent von Melhlen, John von Hoja, Konrad von Pyhy and others.

It was not the least of Gustavus's many anxieties that he had constantly to be on the watch lest a formidable democratic rival should encroach on his prerogative. That rival was the Swedish peasantry. He succeeded indeed in putting down the four formidable rebellions which convulsed the realm from 1525 to 1542, but the consequent strain upon his resources was very damaging, and more than once he was on the point of abdicating and emigrating, out of sheer weariness. Moreover he was in constant fear of the Danes. Necessity compelled him indeed (1534–1536) to take part in *Grevens fejde* (Counts' War) (see DENMARK, *History*), as the ally of Christian III., but his exaggerated distrust of the Danes was invincible. "We advise and exhort you," he wrote to the governor of Kalmar, "to put no hope or trust in the Danes, or in their sweet scribbling, inasmuch as they mean nothing at all by it except how best they may deceive and betray us Swedes." Such instructions were not calculated to promote confidence between Swedish and Danish negotiators. A fresh cause of dispute was generated in 1548, when Christian III.'s daughter was wedded to Duke Augustus of Saxony. On that occasion, apparently by way of protest against the decree of the diet of Vesterås (15th of January 1544), declaring the Swedish crown hereditary in Gustavus's family, the Danish king caused to be quartered on his daughter's shield not only the three Danish lions and the Norwegian lion with the axe of St Olaf, but also "the three crowns" of Sweden. Gustavus, naturally suspicious, was much perturbed by the innovation, and warned all his border officials to be watchful and prepare for the worst. In 1557 he even wrote to the Danish king protesting against the placing of "the three crowns" in the royal Danish seal beneath the arms of Denmark. Christian III. replied that "the three crowns" signified not Sweden in especial, but the three Scandinavian kingdoms, and that their insertion in the Danish shield was only a reminiscence of the union of Kalmar. But Gustavus was not satisfied, and this was the beginning of "the three crowns" dispute which did so much damage to both kingdoms.

The events which led to the rupture of Gustavus with the Holy See are set forth in the proper place (see SWEDEN: *History*). Here it need only be added that it was a purely political act, as Gustavus, personally, had no strong dogmatic leanings either way. He not unnaturally expressed his amazement when that very juvenile reformer Olavus Petri confidently informed him that the pope was antichrist. He consulted the older and graver Laurentius Andreae, who told him how "Doctor Martinus had clipped the wings of the pope, the cardinals and the big bishops," which could not fail to be pleasing intelligence to a monarch who was never an admirer of episcopacy, while the rich revenues of the Church, accumulated in the course of centuries, were a tempting object to the impecunious ruler of an impoverished people. Subsequently, when the Protestant hierarchy was forcibly established in Sweden, matters were much complicated by the absolutist tendencies of Gustavus. The incessant labour, the constant anxiety, which were the daily portion of Gustavus Vasa during the seven and thirty years of his reign, told at last even upon his magnificent constitution. In the spring of 1560, conscious of an ominous decline of his powers, Gustavus summoned his last diet, to give an account of his stewardship. On the 16th of June 1560 the assembly met at Stockholm. Ten days later, supported by his sons, Gustavus greeted the estates in the great hall of the palace, when he took a retrospect of his reign, reminding them of the misery of the kingdom during the union and its deliverance from "that unkind tyrant, King Christian." Four days later the diet passed a resolution confirming the hereditary right of Gustavus's son, Prince Eric, to the throne. The old king's last anxieties were now over and he could die in peace. He expired on the 29th of September 1560.

Gustavus was thrice married. His first wife, Catherine, daughter of Magnus I., duke of Saxe-Lauenburg, bore him in 1533 his eldest son Eric. This union was neither long nor happy, but the blame for its infelicity is generally attributed to the lady, whose abnormal character was reflected and accentuated in her unhappy son. Much more fortunate was Gustavus's second marriage, a year after the death of his first consort, with his own countrywoman, Margaret Lejonhufvud, who bore him five sons and five daughters, of whom three sons, John, Magnus and Charles, and one daughter, Cecilia, survived their childhood. Queen Margaret died in 1551; and a twelvemonth later Gustavus wedded her niece, Catharine Stenbock, a handsome girl of sixteen, who survived him more than sixty years.

Gustavus's outward appearance in the prime of life is thus described by a contemporary: "He was of the middle height, with a round head, light yellow hair, a fine long beard, sharp eyes, a ruddy countenance ... and a body as fitly and well proportioned as any painter could have painted it. He was of a sanguine-choleric temperament, and when untroubled and unvexed a bright and cheerful gentleman, easy to get on with, and however many people happened to be in the same room with him, he was never at a loss for an answer to every one of them." Learned he was not, but he had naturally bright and clear understanding, an unusually good memory, and a marvellous capacity for taking pains. He was also very devout, and his morals were irreproachable. On the other hand, Gustavus had his full share of the family failings of irritability and suspiciousness, the latter quality becoming almost morbid under the pressure of adverse circumstances. His energy too not infrequently degenerated into violence, and when crossed he was apt to be tyrannical.

See A. Alberg, *Gustavus Vasa and his Times* (London, 1882); R. N. Bain, *Scandinavia*, chaps. iii. and v. (Cambridge, 1905); P. B. Watson, *The Swedish Revolution under Gustavus Vasa* (London, 1889); O. Sjögren, *Gustaf Vasa* (Stockholm, 1896); C. M. Butler,

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The Reformation in Sweden (New York, 1883); *Sveriges Historia* (Stockholm, 1877–1881); J. Weidling, *Schwedische Geschichte im Zeitalter der Reformation* (Gotha, 1882). (R. N. B.)

GUSTAVUS II. ADOLPHUS (1594–1632), king of Sweden, the eldest son of Charles IX. and of Christina, daughter of Adolphus, duke of Holstein-Gottorp, was born at Stockholm castle on the 9th of December 1594. From the first he was carefully nurtured to be the future prop of Protestantism by his austere parents. Gustavus was well grounded in the classics, and his linguistic accomplishments were extraordinary. He may be said to have grown up with two mother-tongues, Swedish and German; at twelve he had mastered Latin, Italian and Dutch; and he learnt subsequently to express himself in Spanish, Russian and Polish. But his practical father took care that he should grow up a prince, not a pedant. So early as his ninth year he was introduced to public life; at thirteen he received petitions and conversed officially with the foreign ministers; at fifteen he administered his duchy of Vestmanland and opened the Örebro diet with a speech from the throne; indeed from 1610 he may be regarded as his father's co-regent. In all martial and chivalrous accomplishments he was already an adept; and when, a year later, he succeeded to supreme power, his superior ability was as uncontested as it was incontestable.

The first act of the young king was to terminate the fratricidal struggle with Denmark by the peace of Knäred (28th of January 1613). Simultaneously, another war, also an heritage from Charles IX., had been proceeding in the far distant regions round lakes Ilmen, Peipus and Ladoga, with Great Novgorod as its centre. It was not, however, like the Danish War, a national danger, but a political speculation meant to be remunerative and compensatory, and was concluded very advantageously for Sweden by the peace of Stolbova on the 27th of February 1617 (see SWEDEN: *History*). By this peace Gustavus succeeded in excluding Muscovy from the Baltic. "I hope to God," he declared to the Stockholm diet in 1617, when he announced the conclusion of peace, "that the Russians will feel it a bit difficult to skip over *that* little brook." The war with Poland which Gustavus resumed in 1621 was a much more difficult affair. It began with an attack upon Riga as the first step towards conquering Livonia. Riga was invested on the 13th of August and surrendered on the 15th of September; on the 3rd of October Mitau was occupied; but so great were the ravages of sickness during the campaign that the Swedish army had to be reinforced by no fewer than 10,000 men. A truce was thereupon concluded and hostilities were suspended till the summer of 1625, in the course of which Gustavus took Kokenhusen and invaded Lithuania. In January 1626 he attacked the Poles at Walhof and scattered the whole of their army after slaying a fifth part of it. This victory, remarkable besides as Gustavus's first pitched battle, completed the conquest of Livonia. As, however, it became every year more difficult to support an army in the Dvina district, Gustavus now resolved to transfer the war to the Prussian provinces of Poland with a view to securing the control of the Vistula, as he had already secured the control of the Dvina. At the end of 1626, the Swedish fleet, with 14,000 men on board, anchored in front of the chain of sand-dunes which separates the Frische-Haff from the Baltic. Pillau, the only Baltic port then accessible to ships of war, was at once occupied, and Königsberg shortly afterwards was scared into an unconditional neutrality. July was passed in conquering the bishopric of Ermeland. The surrender of Elbing and Marienburg placed Gustavus in possession of the fertile and easily defensible delta of the Vistula, which he treated as a permanent conquest, making Axel Oxenstjerna its first governor-general. Communications between Danzig and the sea were cut off by the erection of the first of Gustavus's famous entrenched camps at Dirschau. From the end of August 1626 the city was blockaded, and in the meantime Polish irregulars, under the capable Stanislaus Koniecpolski, began to harass the Swedes. But the object of the campaign, a convenient basis of operations, was won; and in October the king departed to Sweden to get reinforcements. He returned in May 1627 with 7000 men, which raised his forces to 14,000, against which Koniecpolski could only oppose 9000. But his superior strategy frustrated all the efforts of the Swedish king, who in the course of the year was twice dangerously wounded and so disabled that he could never wear armour again. Gustavus had made extensive preparations for the ensuing campaign and took the field with 32,000 men. But once again, though far outnumbered, and unsupported by his own government, the Polish grand-hetman proved more than a match for Gustavus, who, on the 10th of September, broke up his camp and returned to Prussia; the whole autumn campaign had proved a failure and cost him 5000 men. During the ensuing campaign of 1629 Gustavus had to contend against the combined forces of Koniecpolski and 10,000 of Wallenstein's mercenaries. The Polish commander now showed the Swedes what he could do with adequate forces. At Stuhm, on the 29th of June, he defeated Gustavus, who lost most of his artillery and narrowly escaped capture. The result of the campaign was the conclusion of the six years' truce of Altmark, which was very advantageous to Sweden.

And now Gustavus turned his attention to Germany. The motives which induced the Swedish king to intervene directly in the Thirty Years' War are told us by himself in his correspondence with Oxenstjerna. Here he says plainly that it was the fear lest the emperor should acquire the Baltic ports and proceed to build up a sea-power dangerous to Scandinavia. For the same reason, the king rejected the chancellor's alternative of waging a simply defensive war against the emperor by means of the fleet, with Stralsund as his base. He was convinced by the experience of Christian IV. of Denmark that the enemies' harbours could be wrested from them only by a successful offensive war on land; and, while quite alive to the risks of such an enterprise in the face of two large armies, Tilly's and Wallenstein's, each of them larger than his own, he argued that the vast extent of territory and the numerous garrisons which the enemy was obliged to maintain, more than neutralized his numerical superiority. Merely to blockade all the German ports with the Swedish fleet was equally impossible. The Swedish fleet was too weak for that; it would be safer to take and fortify the pick of them. In Germany itself, if he once got the upper hand, he would not find himself without resources. It is no enthusiastic crusader, but an anxious and farseeing if somewhat speculative statesman who thus opens his mind to us. No doubt religious considerations largely influenced Gustavus. He had the deepest sympathy for his fellow-Protestants in Germany; he regarded them as God's peculiar people, himself as their divinely appointed deliverer. But his first duty was to Sweden; and, naturally and rightly, he viewed the whole business from a predominantly Swedish point of view. Lutherans and Calvinists were to be delivered from a "soul-crushing tyranny"; but they were to be delivered by a foreign if friendly power; and that power claimed as her reward the hegemony of Protestant Europe and all the political privileges belonging to that exalted position.

On the 19th of May 1630 Gustavus solemnly took leave of the estates of the realm assembled at Stockholm. He appeared before them holding in his arms his only child and heiress, the little princess Christina, then in her fourth year, and tenderly committed her to the care of his loyal and devoted people. Then he solemnly took the estates to witness, as he stood there "in the sight of the Almighty," that he had begun hostilities "out of no lust for war, as many will certainly devise and imagine," but in self-defence and to deliver his fellow-Christians from oppression. On the 7th of June 1630 the Swedish fleet set sail, and two days after midsummer day, the whole army, 16,000 strong, was disembarked at Peenemünde. Gustavus's plan was to take possession of the mouths of the Oder Haff, and, resting upon Stralsund in the west and Prussia in the east, penetrate into Germany. In those days rivers were what railways now are, the great military routes; and Gustavus's German war was a war waged along river lines. The opening campaign was to be fought along the line of the Oder. Stettin, the capital of Pomerania, and the key of the Oder line, was occupied and converted into a first-class fortress. He then proceeded to clear Pomerania of the piebald imperial host composed of every nationality under

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heaven, and officered by Italians, Irishmen, Czechs, Croats, Danes, Spaniards and Walloons. Gustavus's army has often been described by German historians as an army of foreign invaders; in reality it was far more truly Teutonic than the official defenders of Germany at that period. Gustavus's political difficulties (see SWEDEN: *History*) chained him to his camp for the remainder of the year. But the dismissal of Wallenstein and the declaration in Gustavus's favour of Magdeburg, the greatest city in the Lower Saxon Circle, and strategically the strongest fortress of North Germany, encouraged him to advance boldly. But first, honour as well as expediency moved him to attempt to relieve Magdeburg, now closely invested by the imperialists, especially as his hands had now been considerably strengthened by a definite alliance with France (treaty of Bärwalde, 13th of January 1631). Magdeburg, therefore, became the focus of the whole campaign of 1631; but the obstructive timidity of the electors of Brandenburg and Saxony threw insuperable obstacles in his way, and, on the very day when John George I. of Saxony closed his gates against Gustavus the most populous and prosperous city in North Germany became a heap of smoking ruins (20th of May). Gustavus, still too weak to meet the foe, entrenched himself at Werben, at the confluence of the Havel and Elbe. Only on the 12th of September did the elector of Saxony, alarmed for the safety of his own states, now invaded by the emperor, place himself absolutely at the disposal of Gustavus; and, five days later, at the head of the combined Swedish-Saxon army, though the Swedes did all the fighting, Gustavus routed Tilly at the famous battle of Breitenfeld, north of Leipzig.

The question now was: In what way should Gustavus utilize his advantage? Should he invade the Austrian crown lands, and dictate peace to Ferdinand II. at the gates of Vienna? Or should he pursue Tilly westwards and crush the league at its own hearth and home? Oxenstjerna was the first alternative, but Gustavus decided in favour of the second. His decision has been greatly blamed. More than one modern historian has argued that if Gustavus had done in 1631 what Napoleon did in 1805 and 1809, there would have been a fifteen instead of a thirty years' war. But it should be borne in mind that, in the days of Gustavus, Vienna was by no means so essential to the existence of the Habsburg monarchy as it was in the days of Napoleon; and even Gustavus could not allow so dangerous an opponent as Tilly time to recover himself. Accordingly, he set out for the Rhine, taking Marienberg and Frankfort on his way, and on the 20th of December entered Mainz, where he remained throughout the winter of 1631–1632. At the beginning of 1632, in order to bring about the general peace he so earnestly desired, he proposed to take the field with an overwhelming numerical majority. The signal for Gustavus to break up from the Rhine was the sudden advance of Tilly from behind the Danube. Gustavus pursued Tilly into Bavaria, forced the passage of the Danube at Donauwörth and the passage of the Lech, in the face of Tilly's strongly entrenched camp at Rain, and pursued the flying foe to the fortress of Ingolstadt where Tilly died of his wounds a fortnight later. Gustavus then liberated and garrisoned the long-oppressed Protestant cities of Augsburg and Ulm, and in May occupied Munich. The same week Wallenstein chased John George from Prague and manœuvred the Saxons out of Bohemia. Then, armed as he was with plenipotentiary power, he offered the elector of Saxony peace on his own terms. Gustavus suddenly saw himself exposed to extreme peril. If Tilly had made John George such an offer as Wallenstein was now empowered to make, the elector would never have become Gustavus's ally; would he remain Gustavus's ally now? Hastily quitting his quarters in Upper Swabia, Gustavus hastened towards Nuremberg on his way to Saxony, but finding that Wallenstein and Maximilian of Bavaria had united their forces, he abandoned the attempt to reach Saxony, and both armies confronted each other at Nuremberg which furnished Gustavus with a point of support of the first order. He quickly converted the town into an entrenched and fortified camp. Wallenstein followed the king's example, and entrenched himself on the western bank of the Regnitz in a camp twelve English miles in circumference. His object was to pin Gustavus fast to Nuremberg and cut off his retreat northwards. Throughout July and August the two armies faced each other immovably. On the 24th of August, after an unsuccessful attempt to storm Alte Veste, the key of Wallenstein's position, the Swedish host retired southwards.

Towards the end of October, Wallenstein, after devastating Saxony, was preparing to go into winter quarters at Lützen, when the king surprised him as he was crossing the Rippach (1st of November) and a rearguard action favourable to the Swedes ensued. Indeed, but for nightfall, Wallenstein's scattered forces might have been routed. During the night, however, Wallenstein re-collected his host for a decisive action, and at daybreak on the 6th of November, while an autumn mist still lay over the field, the battle began. It was obviously Gustavus's plan to drive Wallenstein away from the Leipzig road, north of which he had posted himself, and thus, in case of success, to isolate, and subsequently, with the aid of the Saxons in the Elbe fortresses, annihilate him. The king, on the Swedish right wing, succeeded in driving the enemy from the trenches and capturing his cannon. What happened after that is mere conjecture, for a thick mist hitherto obscured the autumn sun, and the battle became a colossal mêlée the details of which are indistinguishable. It was in the midst of that awful obscurity that Gustavus met his death—how or where is not absolutely certain; but it would seem that he lost his way in the darkness while leading the Småland horse to the assistance of his infantry, and was despatched as he lay severely wounded on the ground by a hostile horseman.

By his wife, Marie Eleonora, a sister of the elector of Brandenburg, whom he married in 1620, Gustavus Adolphus had one daughter, Christina, who succeeded him on the throne of Sweden.

See *Sveriges Historia* (Stockholm, 1877, 81), vol. iv.; A. Oxenstjerna, *Skrifter och Brefvexling* (Stockholm, 1900, &c.); G. Björlen, *Gustaf Adolf* (Stockholm, 1890); R. N. Bain, *Scandinavia* (Cambridge, 1905); C. R. L. Fletcher, *Gustavus Adolphus* (London, 1892); J. L. Stevens, *History of Gustavus Adolphus* (London, 1885); J. Mankell, *Om Gustaf II. Adolfs politik* (Stockholm, 1881); E. Bluemel, *Gustav Adolf, König von Schweden* (Eisleben, 1894); A. Rydzer, *De diplomatiska förbindelserna mellan Sverige och England 1624–1630* (Upsala, 1890). (R. N. B.)

GUSTAVUS III. (1746–1792), king of Sweden, was the eldest son of Adolphus Frederick, king of Sweden, and Louisa Ulrica of Prussia, sister of Frederick the Great, and was born on the 24th of January 1746. Gustavus was educated under the care of two governors who were amongst the most eminent Swedish statesmen of the day, Carl Gustaf Tessin and Carl Scheffer; but he owed most perhaps to the poet and historian Olof von Dalin. The interference of the state with his education, when he was quite a child, was, however, doubly harmful, as his parents taught him to despise the preceptors imposed upon him by the diet, and the atmosphere of intrigue and duplicity in which he grew up made him precociously experienced in the art of dissimulation. But even his most hostile teachers were amazed by the brilliance of his natural gifts, and, while still a boy, he possessed that charm of manner which was to make him so fascinating and so dangerous in later life, coupled with the strong dramatic instinct which won for him his honourable place in Swedish literature. On the whole, Gustavus cannot be said to have been well educated, but he read very widely; there was scarce a French author of his day with whose works he was not intimately acquainted; while his enthusiasm for the new French ideas of enlightenment was as sincere as, if more critical than, his mother's. On the 4th of November 1766, Gustavus married Sophia Magdalena, daughter of Frederick V. of Denmark. The match was an unhappy one, owing partly to incompatibility of temper, but still more to the mischievous interference of the jealous queen-mother.

Gustavus first intervened actively in politics in 1768, at the time of his father's interregnum, when he compelled the dominant Cap faction to summon an extraordinary diet from which he hoped for the reform of the constitution in a monarchical direction. But the victorious Hats refused to redeem the pledges which they had given before the elections. "That we should have lost the

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constitutional battle does not distress us so much," wrote Gustavus, in the bitterness of his heart; "but what does dismay me is to see my poor nation so sunk in corruption as to place its own felicity in absolute anarchy." From the 4th of February to the 25th of March 1771, Gustavus was at Paris, where he carried both the court and the city by storm. The poets and the philosophers paid him enthusiastic homage, and all the distinguished women of the day testified to his superlative merits. With many of them he maintained a lifelong correspondence. But his visit to the French capital was no mere pleasure trip; it was also a political mission. Confidential agents from the Swedish court had already prepared the way for him, and the duc de Choiseul, weary of Swedish anarchy, had resolved to discuss with him the best method of bringing about a revolution in Sweden. Before he departed, the French government undertook to pay the outstanding subsidies to Sweden unconditionally, at the rate of one and a half million livres annually; and the comte de Vergennes, one of the great names of French diplomacy, was transferred from Constantinople to Stockholm. On his way home Gustavus paid a short visit to his uncle, Frederick the Great, at Potsdam. Frederick bluntly informed his nephew that, in concert with Russia and Denmark, he had guaranteed the integrity of the existing Swedish constitution, and significantly advised the young monarch to play the part of mediator and abstain from violence.

On his return to Sweden Gustavus made a sincere and earnest attempt to mediate between the Hats and Caps who were ruining the country between them (see SWEDEN: *History*). On the 21st of June 1771 he opened his first parliament in a speech which awakened strange and deep emotions in all who heard it. It was the first time for more than a century that a Swedish king had addressed a Swedish diet from the throne in its native tongue. The orator laid especial stress on the necessity of the sacrifice of all party animosities to the common weal, and volunteered, as "the first citizen of a free people," to be the mediator between the contending factions. A composition committee was actually formed, but it proved illusory from the first, the patriotism of neither of the factions being equal to the puniest act of self-denial. The subsequent attempts of the dominant Caps still further to limit the prerogative, and reduce Gustavus to the condition of a *roi fainéant*, induced him at last to consider the possibility of a revolution. Of its necessity there could be no doubt. Under the sway of the Cap faction, Sweden, already the vassal, could not fail to become the prey of Russia. She was on the point of being absorbed in that northern system, the invention of the Russian vice-chancellor, Count Nikita Panin, which that patient statesman had made it the ambition of his life to realize. Only a swift and sudden *coup d'état* could save the independence of a country isolated from the rest of Europe by a hostile league. At this juncture Gustavus was approached by Jakob Magnus Sprengtporten, a Finnish nobleman of determined character, who had incurred the enmity of the Caps, with the project of a revolution. He undertook to seize the fortress of Sveaborg by a *coup de main*, and, Finland once secured, Sprengtporten proposed to embark for Sweden, meet the king and his friends near Stockholm, and surprise the capital by a night attack, when the estates were to be forced, at the point of the bayonet, to accept a new constitution from the untrammelled king. The plotters were at this juncture reinforced by an ex-ranger from Scania (Skåne), Johan Kristoffer Toll, also a victim of Cap oppression. Toll proposed that a second revolt should break out in the province of Scania, to confuse the government still more, and undertook personally to secure the southern fortress of Kristianstad. After some debate, it was finally arranged that, a few days after the Finnish revolt had begun, Kristianstad should openly declare against the government. Prince Charles, the eldest of the king's brothers, was thereupon hastily to mobilize the garrisons of all the southern fortresses, for the ostensible purpose of crushing the revolt at Kristianstad; but on arriving before the fortress he was to make common cause with the rebels, and march upon the capital from the south, while Sprengtporten attacked it simultaneously from the east. On the 6th of August 1772 Toll succeeded, by sheer bluff, in winning the fortress of Kristianstad. On the 16th Sprengtporten succeeded in surprising Sveaborg. But contrary winds prevented him from crossing to Stockholm, and in the meanwhile events had occurred which made his presence there unnecessary.

On the 16th of August the Cap leader, Ture Rudbeck, arrived at Stockholm with the news of the insurrection in the south, and Gustavus found himself isolated in the midst of enemies. Sprengtporten lay weather-bound in Finland, Toll was five hundred miles away, the Hat leaders were in hiding. Gustavus thereupon resolved to strike the decisive blow without waiting for the arrival of Sprengtporten. He acted with military promptitude. On the evening of the 18th all the officers whom he thought he could trust received secret instructions to assemble in the great square facing the arsenal on the following morning. At ten o'clock on the 19th Gustavus mounted his horse and rode straight to the arsenal. On the way his adherents joined him in little groups, as if by accident, so that by the time he reached his destination he had about two hundred officers in his suite. After parade he reconducted them to the guard-room of the palace and unfolded his plans to them. He then dictated a new oath of allegiance, and every one signed it without hesitation. It absolved them from their allegiance to the estates, and bound them solely to obey their lawful king, Gustavus III. Meanwhile the senate and the governor-general, Rudbeck, had been arrested and the fleet secured. Then Gustavus made a tour of the city and was everywhere received by enthusiastic crowds, who hailed him as a deliverer. On the evening of the 20th heralds perambulated the streets proclaiming that the estates were to meet in the Rikssal on the following day; every deputy absenting himself would be regarded as the enemy of his country and his king. On the 21st, a few moments after the estates had assembled, the king in full regalia appeared, and taking his seat on the throne, delivered that famous philippic, one of the masterpieces of Swedish oratory, in which he reproached the estates for their unpatriotic venality and licence in the past. A new constitution was recited by the estates and accepted by them unanimously. The diet was then dissolved.

Gustavus was inspired by a burning enthusiasm for the greatness and welfare of Sweden, and worked in the same reformatory direction as the other contemporary sovereigns of the "age of enlightenment." He took an active part in every department of business, but relied far more on extra-official counsellors of his own choosing than upon the senate. The effort to remedy the frightful corruption which had been fostered by the Hats and Caps engaged a considerable share of his time and he even found it necessary to put the whole of a supreme court of justice (*Göta Hofrätt*) on its trial. Measures were also taken to reform the administration and the whole course of judicial procedure, and torture as an instrument of legal investigation was abolished. In 1774 an ordinance providing for the liberty of the press was even issued. The national defences were at the same time developed on a "Great Power" scale, and the navy was so enlarged as to become one of the most formidable in Europe. The dilapidated finances were set in good order by the "currency realization ordinance" of 1777. Gustavus also introduced new national economic principles. In 1775 free trade in corn was promoted and a number of oppressive export-tolls were abolished. The poor law was also amended, absolute religious liberty was proclaimed, and he even succeeded in inventing and popularizing a national costume which was in general use from 1778 till his death. His one great economic blunder was the attempt to make the sale of spirits a government monopoly, which was an obvious infringement upon the privileges of the estates. His foreign policy, on the other hand, was at first both wise and wary. Thus, when the king summoned the estates to assemble at Stockholm on the 3rd of September 1778, he could give a brilliant account of his six years' stewardship. Never was a parliament more obsequious or a king more gracious. "There was no room for a single No during the whole session." Yet, short as the session was, it was quite long enough to open the eyes of the deputies to the fact that their political supremacy had

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departed. They had changed places with the king. He was now indeed their sovereign lord; and, for all his gentleness, the jealousy with which he guarded, the vigour with which he enforced the prerogative, plainly showed that he meant to remain so. Even the few who were patriotic enough to acquiesce in the change by no means liked it. The diet of 1778 had been obsequious; the diet of 1786 was mutinous. The consequence was that nearly all the royal propositions were either rejected outright or so modified that Gustavus himself withdrew them.

The diet of 1786 marks a turning-point in Gustavus's history. Henceforth we observe a determination on his part to rule without a parliament; a passage, cautious and gradual, yet unflinching, from semi-constitutionalism to semi-absolutism. His opportunity came in 1788, when the political complications arising out of his war with Catherine II. of Russia enabled him by the Act of Unity and Security (on the 17th of February 1789) to override the opposition of the rebellious and grossly unpatriotic gentry, and, with the approbation of the three lower estates, establish a new and revolutionary constitution, in which, though the estates still held the power of the purse, the royal authority largely predominated. Throughout 1789 and 1790 Gustavus, in the national interests, gallantly conducted the unequal struggle with Russia, finally winning in the Svensksund (9th-10th July) the most glorious naval victory ever gained by the Swedish arms, the Russians losing one-third of their fleet and 7000 men. A month later, on the 14th of August 1790, peace was signed between Russia and Sweden at Värälä. Only eight months before, Catherine had haughtily declared that "the odious and revolting aggression" of the king of Sweden would be "forgiven" only if he "testified his repentance" by agreeing to a peace granting a general and unlimited amnesty to all his rebels, and consenting to a guarantee by the Swedish diet ("as it would be imprudent to confide in his good faith alone") for the observance of peace in the future. The peace of Värälä saved Sweden from any such humiliating concession, and in October 1791 Gustavus took the bold but by no means imprudent step of concluding an eight years' defensive alliance with the empress, who thereby bound herself to pay her new ally annual subsidies amounting to 300,000 roubles.

Gustavus now aimed at forming a league of princes against the Jacobins, and every other consideration was subordinated thereto. His profound knowledge of popular assemblies enabled him, alone among contemporary sovereigns, accurately to gauge from the first the scope and bearing of the French Revolution. But he was hampered by poverty and the jealousy of the other European Powers, and, after showing once more his unrivalled mastery over masses of men at the brief Gefle diet (22nd of January–24th of February 1792), he fell a victim to a widespread aristocratic conspiracy. Shot in the back by Ankarström at a midnight masquerade at the Stockholm opera-house, on the 16th of March 1792, he expired on the 29th.

Although he may be charged with many foibles and extravagances, Gustavus III. was indisputably one of the greatest sovereigns of the 18th century. Unfortunately his genius never had full scope, and his opportunity came too late. Gustavus was, moreover, a most distinguished author. He may be said to have created the Swedish theatre, and some of the best acting dramas in the literature are by his hand. His historical essays, notably the famous anonymous eulogy on Torstenson crowned by the Academy, are full of feeling and exquisite in style,—his letters to his friends are delightful. Every branch of literature and art interested him, every poet and artist of his day found in him a most liberal and sympathetic protector.

See R. N. Bain, *Gustavus III. and his Contemporaries* (London, 1894); E. G. Geijer, *Konung Gustaf III.'s efterlemnade papper* (Upsala, 1843–1845); C. T. Odhner, *Sveriges politiska historia under Konung Gustaf III.'s regering* (Stockholm, 1885–1896); B. von Beskow, *Om Gustaf III. såsom Konung och människa* (Stockholm, 1860–1861); O. Levertin, *Gustaf III som dramatisk författare* (Stockholm, 1893); *Gustaf III.'s brefvil G. M. Armfelt* (Fr.) (Stockholm, 1888); V. K. Orol, *Catharine II. and Gustavus III.* (Russ.) (St Petersburg, 1884). (R. N. B.)

GUSTAVUS IV. (1778–1837), king of Sweden, the son of Gustavus III. and Queen Sophia Magdalena, was born at Stockholm on the 1st of November 1778. Carefully educated under the direction of Nils von Rosenstein, he grew up serious and conscientious. In August 1796 his uncle the regent Charles, duke of Sudermania, visited St Petersburg for the purpose of arranging a marriage between the young king and Catherine II.'s grand-daughter, the grand-duchess Alexandra. The betrothal was actually fixed for the 22nd of September, when the whole arrangement foundered on the obstinate refusal of Gustavus to allow his destined bride liberty of worship according to the rites of the Greek Orthodox Church—a rebuff which undoubtedly accelerated the death of the Russian empress. Nobody seems to have even suspected at the time that serious mental derangement lay at the root of Gustavus's abnormal piety. On the contrary, there were many who prematurely congratulated themselves on the fact that Sweden had now no disturbing genius, but an economical, God-fearing, commonplace monarch to deal with. Gustavus's prompt dismissal of the generally detested Gustaf Reuterholm added still further to his popularity. On the 31st of October 1797 Gustavus married Frederica Dorothea, daughter of Charles Frederick, grand-duke of Baden, a marriage which might have led to a war with Russia but for the fanatical hatred of the French republic shared by the emperor Paul and Gustavus IV., which served as a bond of union between them. Indeed the king's horror of Jacobinism was morbid in its intensity, and drove him to adopt all sorts of reactionary measures and to postpone his coronation for some years, so as to avoid calling together a diet; but the disorder of the finances, caused partly by the continental war and partly by the almost total failure of the crops in 1798 and 1799, compelled him to summon the estates to Norrköping in March 1800, and on the 3rd of April Gustavus was crowned. The notable change which now took place in Sweden's foreign policy and its fatal consequences to the country are elsewhere set forth (see SWEDEN, *History*). By the end of 1808 it was obvious to every thinking Swede that the king was insane. His violence had alienated his most faithful supporters, while his obstinate incompetence paralysed the national efforts. To remove a madman by force was the one remaining expedient; and this was successfully accomplished by a conspiracy of officers of the western army, headed by Adlersparre, the Ankarsvärds, and Adlercreutz, who marched rapidly from Skåne to Stockholm. On the 13th of March 1809 seven of the conspirators broke into the royal apartments in the palace unannounced, seized the king, and conducted him to the château of Gripsholm; Duke Charles was easily persuaded to accept the leadership of a provisional government, which was proclaimed the same day; and a diet, hastily summoned, solemnly approved of the revolution. On the 29th of March Gustavus, in order to save the crown for his son, voluntarily abdicated; but on the 10th of May the estates, dominated by the army, declared that not merely Gustavus but his whole family had forfeited the throne. On the 5th of June the duke regent was proclaimed king under the title of Charles XIII., after accepting the new liberal constitution, which was ratified by the diet the same day. In December Gustavus and his family were transported to Germany. Gustavus now assumed the title of count of Gottorp, but subsequently called himself Colonel Gustafsson, under which pseudonym he wrote most of his works. He led, separated from his family, an erratic life for some years; was divorced from his consort in 1812; and finally settled at St Gall in Switzerland in great loneliness and indigence. He died on the 7th of February 1837, and, at the suggestion of King Oscar II. his body was brought to Sweden and interred in the Riddarholmskyrka. From him descend both the Baden and the Oldenburg princely houses on the female side.

See H. G. Trolle-Wachtmeister, *Anteckningar och minnen* (Stockholm, 1869); B. von Beskow, *Lefnadsminnen* (Stockholm, 1870); K. V. Key-Åberg, *De diplomatiska förbindelserna mellan Sverige och Storbritannien under Gustaf IV.'s Krig emot Napoleon* (Upsala, 1890); Colonel Gustafsson, *La Journée du treize mars*, &c. (St Gall, 1835); *Memorial des Obersten Gustafsson* (Leipzig, 1829). (R. N. B.)

GUSTAVUS V. (1858–), king of Sweden, son of Oscar II., king of Sweden and Norway, and Queen Sophia Wilhelmina, was

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born at Drottningholm on the 16th of June 1858. He entered the army, and was, like his father, a great traveller. As crown prince he held the title of duke of Värmland. He married in 1881 Victoria (b. 1862), daughter of Frederick William Louis, grand duke of Baden, and of Louise, princess of Prussia. The duchess of Baden was the granddaughter of Sophia, princess of Sweden, and the marriage of the crown prince thus effected a union between the Bernadotte dynasty and the ancient Swedish royal house of Vasa. During the absence or illness of his father Gustavus repeatedly acted as regent, and was therefore already thoroughly versed in public affairs when he succeeded to the Swedish throne on the 8th of December 1907, the crown of Norway having been separated from that of Sweden in 1905. He took as his motto "With the people for the Fatherland."

The crown prince, Oscar Frederick William Gustavus Adolphus, duke of Scania (b. 1882), married in 1905 Princess Margaret of Connaught (b. 1882), niece of King Edward VII. A son was born to them at Stockholm on the 22nd of April 1906, and another son in the following year. The king's two younger sons were William, duke of Sudermania (b. 1884), and Eric, duke of Westmanland (b. 1889).

GUSTAVUS ADOLPHUS UNION (GUSTAV-ADOLF-STIFTUNG, GUSTAV-ADOLF-VEREIN, EVANGELISCHER VEREIN DER GUSTAV-ADOLF-STIFTUNG), a society formed of members of the Evangelical Protestant churches of Germany, which has for its object the aid of feeble sister churches, especially in Roman Catholic countries. The project of forming such a society was first broached in connexion with the bicentennial celebration of the battle of Lützen on the 6th of November 1832; a proposal to collect funds for a monument to Gustavus Adolphus having been agreed to, it was suggested by Superintendent Grossmann that the best memorial to the great champion of Protestantism would be the formation of a union for propagating his ideas. For some years the society was limited in its area and its operations, being practically confined to Leipzig and Dresden, but at the Reformation festival in 1841 it received a new impulse through the energy and eloquence of Karl Zimmermann (1803–1877), court preacher at Darmstadt, and in 1843 a general meeting was held at Frankfort-on-the-Main, where no fewer than twenty-nine branch associations belonging to all parts of Germany except Bavaria and Austria were represented. The want of a positive creed tended to make many of the stricter Protestant churchmen doubtful of the usefulness of the union, and the stricter Lutherans have always held aloof from it. On the other hand, its negative attitude in relation to Roman Catholicism secured for it the sympathy of the masses. At a general convention held in Berlin in September 1846 a keen dispute arose about the admission of the Königsberg delegate, Julius Rupp (1809–1884), who in 1845 had been deprived for publicly repudiating the Athanasian Creed and became one of the founders of the "Free Congregations"; and at one time it seemed likely that the society would be completely broken up. Amid the political revolutions of the year 1848 the whole movement fell into stagnation; but in 1849 another general convention (the seventh), held at Breslau, showed that, although the society had lost both in membership and income, it was still possessed of considerable vitality. From that date the Gustav-Adolf-Verein has been more definitely "evangelical" in its tone than formerly; and under the direction of Karl Zimmermann it greatly increased both in numbers and in wealth. It has built over 2000 churches and assisted with some two million pounds over 5000 different communities. Apart from its influence in maintaining Protestantism in hostile areas, there can be no doubt that the union has had a great effect in helping the various Protestant churches of Germany to realize the number and importance of their common interests.

See K. Zimmermann, *Geschichte des Gustav-Adolf-Vereins* (Darmstadt, 1877).

GÜSTROW, a town of Germany, in the grand duchy of Mecklenburg-Schwerin, on the Nebel and the railway from Lübeck to Stettin, 20 m. S. of Rostock. Pop. (1875), 10,023; (1905) 17,163. The principal buildings are the castle, erected in the middle of the 16th century and now used as a workhouse; the cathedral, dating from the 13th century and restored in 1868, containing many fine monuments and possessing a square tower 100 ft. high; the Pfarrkirche, with fine altar-paintings; the town hall (Rathaus), dating from the 16th century; the music hall, and the theatre. Among the educational establishments are the ducal gymnasium, which possesses a library of 15,000 volumes, a modern and a commercial school. The town is one of the most prosperous in the duchy, and has machine works, foundries, tanneries, sawmills, breweries, distilleries, and manufactories of tobacco, glue, candles and soap. There is also a considerable trade in wool, corn, wood, butter and cattle, and an annual cattle show and horse races are held.

Güstrow, capital of the Mecklenburg duchy of that name, or of the Wend district, was a place of some importance as early as the 12th century, and in 1219 it became the residence of Henry Borwin II., prince of Mecklenburg, from whom it received Schwerin privileges. From 1316 to 1436 the town was the residence of the princes of the Wends, and from 1556 to 1695 of the dukes of Mecklenburg-Güstrow. In 1628 it was occupied by the imperial troops, and Wallenstein resided in it during part of the years 1628 and 1629.

GUTENBERG, JOHANN (*c.* 1398–1468), German printer, is supposed to have been born *c.* 1398–1399 at Mainz of well-to-do parents, his father being Friele zum Gensfleisch and his mother Elsgen Wyrich (or, from her birthplace, zu Gutenberg, the name he adopted). He is assumed to be mentioned under the name of "Henchen" in a copy of a document of 1420, and again in a document of *c.* 1427–1428, but it is not stated where he then resided. On January 16, 1430, his mother arranged with the city of Mainz about an annuity belonging to him; but when, in the same year, some families who had been expelled a few years before were permitted to return to Mainz, Gutenberg appears not to have availed himself of the privilege, as he is described in the act of reconciliation (dated March 28) as "not being in Mainz." It is therefore assumed that the family had taken refuge in Strassburg, where Gutenberg was residing later. There he is said to have been in 1434, and to have seized and imprisoned the town clerk of Mainz for a debt due to him by the corporation of that city, releasing him, however, at the representations of the mayor and councillors of Strassburg, and relinquishing at the same time all claims to the money (310 Rhenish guilders = about 2400 mark).[1] Between 1434 and 1439 certain documents connected with Gutenberg's early career afterwards but never undeceived the public. He enriched the Gutenberg literature with other fabrications. In fact Bodmann had trained himself for counterfeiting MSS. and documents; he openly boasted of his abilities in this respect, and used them, sometimes to amuse his friends who were searching for Gutenberg documents, sometimes for himself to fill up gaps in Gutenberg's life. (For two or three more specimens of his capacities see A. Wyss in *Zeitschr. für Allert. u. Gesch. Schlesiens*, xv. 9 sqq.) To one of his friends (Professor Gotthelf Fischer, who preceded him as librarian of Mainz) one or two other fabrications were actually ascribed. There are, moreover, serious misgivings as to documents said to have been *discovered* about 1740 (when the citizens of Strassburg claimed the honour of the invention for their city) by Jacob Wencker (the town's physician and historian of Strassburg) and J. D. Schoepflin (professor and canon of St Thomas's at Strassburg). For instance, of the above document of 1434 no original has ever come to light; while the draft of the transaction, alleged to have been written at the time in a register of contracts, and to have been found about 1740 by Wencker, has also disappeared with the register itself. The document (now only known from a copy said to have been taken by Wencker from the draft) is upheld as genuine by Schorbach, who favours an invention of printing at Strassburg, but Bockenheimer, though supporting Gutenberg and Mainz, declares it to be a fiction (*Gutenberg-Feier*, Mainz, 1900, pp. 24-33). Again, suspicions are justified

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represent him as having been engaged there in some experiments requiring money, with Andreas Dritzehn, a fellow-citizen, who became not only security for him but his partner to carry out Gutenberg's plan for polishing stones and the manufacture of looking-glasses, for which a lucrative sale was expected at the approaching pilgrimage of 1440 (subsequently postponed, according to the documents, although there is no evidence for this postponement) to Aix-la-Chapelle. Money was lent for this purpose by two other friends. In 1438 another partnership was arranged between Gutenberg, Andreas Dritzehn, and Andreas and Anton Heilmann, and that this had in view the art of printing has been inferred from the word "drucken" used by one of the witnesses in the law proceedings which soon after followed. An action was brought, after the death of Dritzehn, by his two brothers to force Gutenberg to accept them as partners in their brother's place, but the decision was in favour of the latter. In 1441 Gutenberg became surety to the St Thomas Chapter at Strassburg for Johann Karle, who borrowed 100 guilders (about £16) from the chapter, and on November 17, 1442, he himself borrowed 80 livres through Martin Brechter (or Brehter) from the same chapter. Of his whereabouts from the 12th of March 1444 (when he paid a tax at Strassburg) to the 17th of October 1448 nothing certain is known. But on the latter date we find him at Mainz, borrowing 150 gold guilders of his kinsman, Arnold Gelthus, against an annual interest of 7½ gold guilders. We do not know whether the interest on this debt has ever been paid, but the debt itself appears never to have been paid off, as the contract of this loan was renewed (*tidimused*) on August 23, 1503, for other parties. It is supposed that soon afterwards Gutenberg must have been able to show some convincing results of his work, for it appears that about 1450 Johann Fust (*q.v.*) advanced him 800 guilders to promote it, on no security except that of "tools" still to be made. Fust seems also to have undertaken to advance him 300 guilders a year for expenses, wages, house-rent, parchment, paper, ink, &c., but he does not appear to have ever done so. If at any time they disagreed, Gutenberg was to return the 800 guilders, and the "tools" were to cease to be security. It is not known to what purpose Gutenberg devoted the money advanced to him. In the minutes of the law-suit of 1455 he himself says that he had to make his "tools" with it. But he is presumed to have begun a large folio Latin Bible, and to have printed during its progress some smaller books[1] and likewise the Letter of Indulgence (granted on the 12th of April 1451 by Pope Nicholas V. in aid of John II., king of Cyprus, against the Turks), of 31 lines, having the earliest printed date 1454, of which several copies are preserved in various European libraries. A copy of the 1455 issue of the same Indulgence is in the Rylands Library at Manchester (from the Althorp Library).

It is not known whether any books were printed while this partnership between Gutenberg and Fust lasted. Trithemius (*Ann. Hirsaug.* ii. 421) says they first printed, from wooden blocks, a vocabulary called *Catholicon*, which cannot have been the *Catholicon* of Johannes de Janua, a folio of 748 pages in two columns of 66 lines each, printed in 1460, but was perhaps a small glossary now lost.[2] The Latin *Bible of 42 lines*, a folio of 1282 printed pages, in two columns with spaces left for illuminated initials (so called because each column contains 42 lines, and also known as the *Mazarin Bible*, because the first copy described was found in the library of Cardinal Mazarin), was finished before the 15th of August 1456;[3] German bibliographers now claim this Bible for Gutenberg, but, according to bibliographical rules, it must be ascribed to Peter Schöffer, perhaps in partnership with Fust. It is in smaller type than the *Bible of 36 lines*, which latter is called either (*a*) the *Bamberg Bible*, because nearly all the known copies were found in the neighbourhood of Bamberg, or (*b*) *Schelhorn's Bible*, because J. G. Schelhorn was the first who described it in 1760, or (*c*) *Pfister's Bible*, because its printing is ascribed to Albrecht Pfister of Bamberg, who used the same type for several small German books, the chief of which is Boner's *Edelstein* (1461, 4to), 88 leaves, with 85 woodcuts, a book of fables in German rhyme. Some bibliographers believe this 36-line Bible to have been begun, if not entirely printed, by Gutenberg during his partnership with Fust, as its type occurs in the 31-line Letters of Indulgence of 1454, was used for the 27-line Donatus (of 1451?), and, finally, when found in Pfister's possession in 1461, appears to be old and worn, except the additional letters *k*, *w*, *z* required for German, which are clear and sharp like the types used in the Bible. Again, others profess to prove (Dziatzko, *Gutenberg's früheste Druckerpraxis*) that B[36] was a reprint of B[42].

Gutenberg's work, whatever it may have been, was not a commercial success, and in 1452 Fust had to come forward with another 800 guilders to prevent a collapse. But some time before November 1455 the latter demanded repayment of his advances (see the Helmasperger Notarial Document of November 6, 1455, in Dziatzko's *Beiträge zur Gutenbergfrage*, Berlin, 1889), and took legal proceedings against Gutenberg. We do not know the end of these proceedings, but if Gutenberg had prepared any printing materials it would seem that he was compelled to yield up the whole of them to Fust; that the latter removed them to his own house at Mainz, and there, with the assistance of Peter Schöffer, issued various books until the sack of the city in 1462 by Adolphus II. caused a suspension of printing for three years, to be resumed again in 1465.

We have no information as to Gutenberg's activity, and very little of his whereabouts, after his separation from Fust. In a document dated June 21, 1457, he appears as witness on behalf of one of his relatives, which shows that he was then still at Mainz. Entries in the registers of the St Thomas Church at Strassburg make it clear that the annual interest on the money which Gutenberg on the 17th of November 1442 (see above) had borrowed from the chapter of that church was regularly paid till the 11th of November 1457, either by himself or by his

with respect to the documents recording Gutenberg's lawsuit of 1439 at Strassburg. Bockenheimer explains at great length (*l.c.* pp. 41-72) that they are forgeries. He even explains (*ibid.* pp. 97-107) that the so-called Helmasperger document of November 6, 1455, may be a fabrication of the Faust von Aschaffenburg family, who endeavoured to claim Johann Fust as their ancestor. There are also (1) a fragment of a fictitious "press," said to have been constructed by Gutenberg in 1441, and to have been discovered (!) at Mainz in 1856; (2) a forged imprint with the date 1458 in a copy of Pope Gregory's *Dialogues*, really printed at Strassburg about 1470; (3) a forged rubric in a copy of the *Tractatus de celebratione missarum*, from which it would appear that Johann Gutenberg and Johann Nummeister had presented it on June 19, 1463, to the Carthusian monastery near Mainz; (4) four forged copies of the Indulgence of 1455, in the Cuhmann Collection in the Kestner Museum at Hanover, &c. (see further, Hessels, "The so-called Gutenberg Documents," in *The Library*, 1901).

[1] Among these were perhaps (1) one or two editions of the work of Donatus, *De octo partibus orationis*, 27 lines to a page, of one of which two leaves, now in the Paris National Library, were discovered at Mainz in the original binding of an account book, one of them having, but in a later hand, the year 1451 (?); (2) the *Turk-Kalendar* for 1455 (preserved in the Hof-Bibliothek at Munich); (3) the *Cisianus* (preserved in the Cambridge Univ. Libr.), and perhaps others now lost.

[2] Ulric Zell states, in the Cologne Chronicle of 1499, that Gutenberg and Fust printed a Bible in large type like that used in missals. It has been said that this description applies to the 42-line Bible, as its type is as large as that of most missals printed before 1500, and that 36-line type, also called missal type (*Missalschrift*), was not used in missals until late in the 16th century. This is no doubt true of the smaller missals printed before 1500, some of which are in even smaller type than the 42-line Bible. But many of the large folio missals, as that printed at Mainz by Peter Schöffer in 1483, the Constance missal printed at Spires by Peter Drach about 1490, and the Dominican missal printed by Andrea de Torresanis at Venice in 1496, are in as large type as the 36-line Bible. Peter Schöffer (1425-1502) of Gernsheim, between Mainz and Mannheim, who was a copyist in Gutenberg's shop, and whom Fust called his servant (*famulus*), is said by Trithemius to have discovered an easier way of founding characters, whence Lambinet and others concluded that Schöffer invented the punch. Schöffer himself, in the colophon of the Psalter of 1457, a work which some suppose to have been planned and partly printed by Gutenberg, claims only the mode of printing rubrics and coloured capitals.

[3] The Leipzig copy of this Bible (which formerly belonged to Herr Klemm of Dresden) has at the end the MS. year 1453 in old Arabic numerals. But certain circumstances connected with this date make it look very suspicious.

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surety, Martin Brechter. But the payment due on the latter date appears to have been delayed, as an entry in the register of that year shows that the chapter had incurred expenses in taking steps to have both Gutenberg and Brechter arrested. This time the difficulties seem to have been removed, but on and after the 11th of November 1438 Gutenberg and Brechter remained in default. The chapter made various efforts, all recorded in their registers, to get their money, but in vain. Every year they recorded the arrears with the expenses to which they were put in their efforts to arrest the defaulters, till at last in 1474 (six years after Gutenberg's death) their names are no longer mentioned.

Meantime Gutenberg appears to have been *printing*, as we learn from a document dated February 26, 1468, that a syndic of Mainz, Dr Conrad Homery (who had formerly been in the service of the elector Count Diether of Ysenburg), had at one time supplied him, not with money, but with some formes, types, tools, implements and other things belonging to printing, which Gutenberg had left after his death, and which had, and still, belonged to him (Homery); this material had come into the hands of Adolf, the archbishop of Mainz, who handed or sent it back to Homery, the latter undertaking to use it in no other town but Mainz, nor to sell it to any person except a citizen of Mainz, even if a stranger should offer him a higher price for the things. This material has never yet been identified, so that we do not know what types Gutenberg may have had at his disposal; they could hardly have included the types of the *Catholicon* of 1460, as is suggested, this work being probably executed by Heinrich Bechtermünze (d. 1467), who afterwards removed to Eltville, or perhaps by Peter Schöffer, who, about 1470, advertises the book as his property (see K. Burger, *Buchhändler-Anzeigen*). It is uncertain whether Gutenberg remained in Mainz or removed to the neighbouring town of Eltville, where he may have been engaged for a while with the brothers Bechtermünze, who printed there for some time with the types of the 1460 *Catholicon*. On the 17th of January 1465 he accepted the post of salaried courtier from the archbishop Adolf, and in this capacity received annually a suit of livery together with a fixed allowance of corn and wine. Gutenberg seems to have died at Mainz at the beginning of 1468, and was, according to tradition, buried in the Franciscan church in that city. His relative Arnold Gelthus erected a monument to his memory near his supposed grave, and forty years afterwards Ivo Wittig set up a memorial tablet at the legal college at Mainz. No books bearing the name of Gutenberg as printer are known, nor is any genuine portrait of him known, those appearing upon medals, statues or engraved plates being all fictitious.

In 1898 the firm of L. Rosenthal, at Munich, acquired a *Missale speciale* on paper, which Otto Hupp, in two treatises published in 1898 and 1902, asserts to have been printed by Gutenberg about 1450, seven years before the 1457 Psalter. Various German bibliographers, however, think that it could not have been printed before 1480, and, judging from the facsimiles published by Hupp, this date seems to be approximately correct.

On the 24th of June 1900 the five-hundredth anniversary of Gutenberg's birth was celebrated in several German cities, notably in Mainz and Leipzig, and most of the recent literature on the invention of printing dates from that time.

So we may note that in 1902 a vellum fragment of an Astronomical Kalendar was discovered by the librarian of Wiesbaden, Dr G. Zedler (*Die älteste Gutenbergtype*, Mainz, 1902), apparently printed in the 36-line Bible type, and as the position of the sun, moon and other planets described in this document suits the years 1429, 1448 and 1467, he ascribes the printing of this Kalendar to the year 1447. A paper fragment of a poem in German, entitled *Weltgericht*, said to be printed in the 36-line Bible type, appears to have come into the possession of Herr Eduard Beck at Mainz in 1892, and was presented by him in 1903 to the Gutenberg Museum in that city. Zedler published a facsimile of it in 1904 (for the *Gutenberg Gesellschaft*), with a description, in which he places it before the 1447 *Kalendar*, *c.* 1444–1447. Moreover, fragments of two editions of Donatus different from that of 1451 (?) have recently been found; see Schwenke in *Centralbl. für Bibliothekswesen* (1908).

The recent literature upon Gutenberg's life and work and early printing in general includes the following: A. von der Linde, *Geschichte und Erdichtung* (Stuttgart, 1878); *id. Geschichte der Buchdruckerkunst* (Berlin, 1886); J. H. Hessels, *Gutenberg, Was he the Inventor of Printing?* (London, 1882); *id. Haarlem, the Birthplace of Printing, not Mentz* (London, 1886); G. Hartwig, *Festschrift zum fünfhundertjährigen Geburtstag von Johann Gutenberg* (Leipzig, 1900), which includes various treatises by Schenk zu Schweinsberg, K. Schorbach, &c.; P. Schwenke, *Untersuchungen zur Geschichte des ersten Buchdruckes* (Berlin, 1900); A. Bierbel, *Gutenberg, sein Leben, &c.* (Giessen, 1897); *id. Gutenberg und seine berühmten Nachfolger im ersten Jahrhundert der Typographie* (Frankfort, 1900); F. Schneider, *Mainz und seine Drucker* (1900); G. Zedler, *Gutenberg-Forschungen* (Leipzig, 1901); J. H. Hessels, *The so-called Gutenberg Documents* (London, 1910). For other works on the subject see TYPOGRAPHY.

(J. H. H.)

GÜTERSLOH, a town of Germany, in the Prussian province of Westphalia, 11 m. S.W. from Bielefeld by the railway to Dortmund. Pop. (1905), 7375. It is a seat of silk and cotton industries, and has a large trade in Westphalian hams and sausages. Printing, brewing and distilling are also carried on, and the town is famous for its rye-bread (*Pumpernickel*). Gütersloh has two Evangelical churches, a Roman Catholic church, a synagogue, a school and other educational establishments.

See Eickhoff, *Geschichte der Stadt und Gemeinde Gütersloh* (Gütersloh, 1904).

GUTHRIE, SIR JAMES (1859–), Scottish painter, and one of the leaders of the so-called Glasgow school of painters, was born at Greenock. Though in his youth he was influenced by John Pettie in London, and subsequently studied in Paris, his style, which is remarkable for grasp of character, breadth and spontaneity, is due to the lessons taught him by observation of nature, and to the example of Crawhall, by which he benefited in Lincolnshire in the early 'eighties of the last century. In his early works, such as "The Gipsy Fires are Burning, for Daylight is Past and Gone" (1882), and the "Funeral Service in the Highlands," he favoured a thick impasto, but with growing experience he used his colour with greater economy and reticence. Subsequently he devoted himself almost exclusively to portraiture. Sir James Guthrie, like so many of the Glasgow artists, achieved his first successes on the Continent, but soon found recognition in his native country. He was elected associate of the Royal Scottish Academy in 1888, and full member in 1892, succeeded Sir George Reid as president of the Royal Scottish Academy in 1902, and was knighted in 1903. His painting "Schoolmates" is at the Ghent Gallery. Among his most successful portraits are those of his mother, Mr R. Garroway, Major Hotchkiss, Mrs Fergus, Professor Jack, and Mrs Watson.

GUTHRIE, THOMAS (1803–1873), Scottish divine, was born at Brechin, Forfarshire, on the 12th of July 1803. He entered the university of Edinburgh at the early age of twelve, and continued to attend classes there for more than ten terms. On the 2nd of February 1825 the presbytery of Brechin licensed him as a preacher in connexion with the Church of Scotland, and in 1826 he was in Paris studying natural philosophy, chemistry, and comparative anatomy. For two years he acted as manager of his father's bank, and in 1830 was inducted to his first charge, Arbirlot, in Forfarshire, where he adopted a vivid dramatic style of preaching adapted to his congregation of peasants, farmers and weavers. In 1837 he became the colleague of John Sym in the pastorate of Old Greyfriars, Edinburgh, and at once attracted notice as a great pulpit orator. Towards the close of 1840 he became minister of St John's church, Victoria Street, Edinburgh. He declined invitations both from London and from India. He was an enthusiastic supporter of the movement which led to the Disruption of 1843; and his name is thenceforth associated with the Free Church, for which he collected £116,000 from July 1845 to June 1846 to provide manses for the seceding ministers. In 1844 he became a teetotaller. In 1847 he began the greatest work of his life by the publication of his first "Plea for Ragged Schools." This

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pamphlet elicited a beautiful and sympathetic letter from Lord Jeffrey. A Ragged School was opened on the Castle Hill, which has been the parent of many similar institutions elsewhere, though Guthrie's relation to the movement is best described as that of an apostle rather than a founder. He insisted on bringing up all the children in his school as Protestants; and he thus made his schools proselytizing as well as educational institutions. This interference with religious liberty led to some controversy; and ultimately those who differed from Guthrie founded the United Industrial School, giving combined secular and separate religious instruction. In April 1847 the degree of D.D. was conferred on Guthrie by the university of Edinburgh; and in 1850 William Hanna (1808–1882), the biographer and son-in-law of Thomas Chalmers, was inducted as his colleague in Free St John's Church.

In 1850 Guthrie published *A Plea on behalf of Drunkards and against Drunkenness*, which was followed by *The Gospel in Ezekiel* (1855); *The City: its Sins and Sorrows* (1857); *Christ and the Inheritance of the Saints* (1858); *Seedtime and Harvest of Ragged Schools* (1860), consisting of his three *Pleas for Ragged Schools*. These works had an enormous sale, and portions of them were translated into French and Dutch. His advocacy of temperance had much to do with securing the passing of the Forbes Mackenzie Act, which secured Sunday closing and shortened hours of sale for Scotland. Mr Gladstone specially quoted him in support of the Light Wines Bill (1860). In 1862 he was moderator of the Free Church General Assembly; but he seldom took a prominent part in the business of the church courts. His remarkable oratorical talents, rich humour, genuine pathos and inimitable power of story-telling, enabled him to do good service to the total abstinence movement. He was one of the vice-presidents of the Evangelical Alliance. In 1864, his health being seriously impaired, he resigned public work as pastor of Free St John's (May 17), although his nominal connexion with the congregation ceased only with his death. Guthrie had occasionally contributed papers to *Good Words*, and, about the time of his retirement from the ministry, he became first editor of the *Sunday Magazine*, himself contributing several series of papers which were afterwards published separately. In 1865 he was presented with £3000 as a mark of appreciation from the public. His closing years were spent mostly in retirement; and after an illness of several months' duration he died at St Leonards-on-Sea on the 24th of February 1873.

In addition to the books mentioned above he published a number of books which had a remarkable circulation in England and America, such as *Speaking to the Heart* (1862); *The Way to Life* (1862); *Man and the Gospel* (1865); *The Angel's Song* (1865); *The Parables* (1866); *Our Father's Business* (1867); *Out of Harness* (1867); *Early Piety* (1868); *Studies of Character from the Old Testament* (1868–1870); *Sundays Abroad* (1871).

See *Autobiography of Thomas Guthrie, D.D., and Memoir*, by his sons (2 vols., London, 1874–1875).

GUTHRIE, THOMAS ANSTEY (1856–), known by the pseudonym of F. Anstey, English novelist, was born in Kensington, London, on the 8th of August 1856. He was educated at King's College, London, and at Trinity Hall, Cambridge, and was called to the bar in 1880. But the popular success of his story *Vice-Versa* (1882) with its topsy-turvy substitution of a father for his schoolboy son, at once made his reputation as a humorist of an original type. He published in 1883 a serious novel, *The Giant's Robe*; but, in spite of its excellence, he discovered (and again in 1886 with *The Pariah*) that it was not as a serious novelist but as a humorist that the public insisted on regarding him. As such his reputation was further confirmed by *The Black Poodle* (1884), *The Tinted Venus* (1885), *A Fallen Idol* (1886), and other works. He became an important member of the staff of *Punch*, in which his "Voces populi" and his humorous parodies of a reciter's stock-piece ("Burglar Bill," &c.) represent his best work. In 1901 his successful farce *The Man from Blankley's*, based on a story which originally appeared in *Punch*, was first produced at the Prince of Wales's Theatre, in London.

GUTHRIE, the capital of Oklahoma, U.S.A., and the county-seat of Logan county, extending on both sides of Cottonwood creek, and lying one mile south of the Cimarron river. Pop. (1890) 5333, (1900) 10,006, (1907) 11,652 (2871 negroes); (1910) 11,654. It is served by the Atchison, Topeka & Santa Fé, the Chicago, Rock Island & Pacific, the Missouri, Kansas & Texas, the Fort Smith & Western, and the St Louis, El Reno & Western railways. The city is situated about 940 ft. above the sea, in a prairie region devoted largely to stock-raising and the cultivation of Indian corn, wheat, cotton and various fruits, particularly peaches. Guthrie is one of the headquarters of the Federal courts in the state, the other being Muskogee. The principal public buildings at Guthrie are the state Capitol, the Federal building, the City hall, the Carnegie library, the Methodist hospital and a large Masonic temple. Among the schools are St Joseph's Academy and a state school for the deaf and dumb. Guthrie has a considerable trade with the surrounding country and has cotton gins, a cotton compress, and foundries and machine shops; among its manufactures are cotton-seed oil, cotton goods, flour, cereals, lumber, cigars, brooms and furniture. The total value of the factory product in 1905 was $1,200,662. The municipality owns and operates the waterworks. The city was founded in 1889, when Oklahoma was opened for settlement; in 1890 it was made the capital of the Territory, and in 1907 when Oklahoma was made a state, it became the state capital.

GUTHRUM (GODRUM) (d. 890), king of East Anglia, first appears in the *English Annals* in the year 875, when he is mentioned as one of three Danish kings who went with the host to Cambridge. He was probably engaged in the campaigns of the next three years, and after Alfred's victory at Edington in 878, Guthrum met the king at Aller in Somersetshire and was baptized there under the name of Æthelstan. He stayed there for twelve days and was greatly honoured by his godfather Alfred. In 890 Guthrum-Æthelstan died: he is then spoken of as "se norðerna cyning" (probably) "the Norwegian king," referring to the ultimate origin of his family, and we are told that he was the first (Scandinavian) to settle East Anglia. Guthrum is perhaps to be identified with Gormr (= Guthrum) hinn heimski or hinn riki of the Scandinavian sagas, the foster-father of Hörðaknutr, the father of Gorm the old. There is a treaty known as the peace of Alfred and Guthrum.

GUTSCHMID, ALFRED, BARON VON (1835–1887), German historian and Orientalist, was born on the 1st of July at Loschwitz (Dresden). After holding chairs at Kiel (1860), Königsberg (1873), and Jena (1876), he was finally appointed professor of history at Tübingen, where he died on the 2nd of March 1887. He devoted himself to the study of Eastern language and history in its pre-Greek and Hellenistic periods and contributed largely to the literature of the subject.

WORKS.—*Über die Fragmente des Pompeius Trogus* (supplementary vol. of *Jahrbücher fur klass. Phil.*, 1857); *Die makedonische Anagraphe* (1864); *Beiträge zur Gesch. des alten Orients* (Leipzig, 1858); *Neue Beiträge zur Gesch. des alt. Or.*, vol. i., *Die Assyriologie in Deutschland* (Leipzig, 1876); *Die Glaubwürdigkeit der armenischen Gesch. des Moses von Khoren* (1877); *Untersuchungen uber die syrische Epitome des eusebischen Canones* (1886); *Untersuch. über die Gesch. des Königreichs Osroene* (1887); *Gesch. Irans* (Alexander the Great to the fall of the Arsacidae) (Tübingen, 1887). He wrote on Persia and Phoenicia in the 9th edition of the *Ency. Brit.* A collection of minor works entitled *Kleine Schriften* was published by F. Ruhl at Leipzig (1889–1894, 5 vols.), with complete list of his writings. See article by Rühl in *Allgemeine deutsche Biographie*, xlix. (1904).

GUTS-MUTHS, JOHANN CHRISTOPH FRIEDRICH (1759–1839), German teacher and the principal founder of the German school system of gymnastics, was born at Quedlinburg on the 9th of August 1759. He was educated at the gymnasium of his native town and at Halle University; and in 1785 he went to Schnepfenthal, where he taught geography and gymnastics. His method of teaching gymnastics was expounded by him in various handbooks; and it was chiefly through them that gymnastics very soon came to occupy such an important position in the school system of Germany. He also did much to introduce a better method of instruction in geography. He died on the 21st of May 1839.

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His principal works are *Gymnastik für die Jugend* (1793); *Spiele zur Übung und Erholung des Körpers und Geistes für die Jugend* (1796); *Turnbuch* (1817); *Handbuch der Geographie* (1810); and a number of books constituting a *Bibliothek für Pädagogik, Schulwesen, und die gesammte pädagogische Literatur Deutschlands*. He also contributed to the *Vollständiges Handbuch der neuesten Erdbeschreibung*, and along with Jacobi published *Deutsches Land und deutsches Volk*, the first part, *Deutsches Land*, being written by him.

GUTTA (Latin for "drop"), an architectural term given to the small frusta of conical or cylindrical form carved below the triglyph and under the regula of the entablature of the Doric Order. They are sometimes known as "trunnels," a corruption of "tree-nail," and resemble the wooden pins which in framed timber work or in joinery are employed to fasten together the pieces of wood; these are supposed to be derived from the original timber construction of the Doric temple, in which the pins, driven through the regula, secured the latter to the taenia, and, according to C. Chipiez and F. A. Choisy, passed through the taenia to hold the triglyphs in place. In the earliest examples of the Doric Order at Corinth and Selinus, the guttae are completely isolated from the architrave, and in Temple C. at Selinus the guttae are 3 or 4 in. in front of it, as if to enable the pin to be driven in more easily. In later examples they are partly attached to the architrave. Similar guttae are carved under the mutules of the Doric cornice, representing the pins driven through the mutules to secure the rafters. In the temples at Bassae, Paestum and Selinus, instances have been found where the guttae had been carved separately and sunk into holes cut in the soffit of the mutules and the regula. Their constant employment in the Doric temples suggests that, although originally of constructive origin, they were subsequently employed as decorative features.

GUTTA PERCHA, the name applied to the evaporated milky fluid or latex furnished by several trees chiefly found in the islands of the Malay Archipelago. The name is derived from two Malay words, *getah* meaning gum, and *perija* being the name of the tree—probably a *Bassia*—from which the gum was (erroneously) supposed to be obtained.

Botanical Origin and Distribution.—The actual tree is known to the Malays as *taban*, and the product as *getah taban*. The best gutta percha of Malaya is chiefly derived from two trees, and is known as *getah taban merah* (red) or *getah taban sutra* (silky). The trees in question, which belong to the natural order Sapotaceae, have now been definitely identified, the first as *Dichopsis gutta* (Bentham and Hooker), otherwise *Isonandra gutta* (Hooker) or *Palaquium gutta* (Burck), and the second as *Dichopsis oblongifolia* (Burck). Allied trees of the same genus and of the same natural order yield similar but usually inferior products. Among them may be mentioned species of *Payena* (*getah soondie*).

Gutta percha trees often attain a height of 70 to 100 ft. and the trunk has a diameter of from 2 to 3 ft. They are stated to be mature when about thirty years old. The leaves of *Dichopsis*, which are obovate-lanceolate, with a distinct pointed apex, occur in clusters at the end of the branches, and are bright green and smooth on the upper surface but on the lower surface are yellowish-brown and covered with silky hairs. The leaves are usually about 6 in. long and about 2 in. wide at the centre. The flowers are white, and the seeds are contained in an ovoid berry about 1 in. long.

The geographical distribution of the gutta percha tree is almost entirely confined to the Malay Peninsula and its immediate neighbourhood. It includes a region within 6 degrees north and south of the equator and 93°–119° longitude, where the temperature ranges from 66° to 90° F. and the atmosphere is exceedingly moist. The trees may be grown from seeds or from cuttings. Some planting has taken place in Malaya, but little has so far been done to acclimatize the plant in other regions. Recent information seems to point to the possibility of growing the tree in Ceylon and on the west coast of Africa.

Preparation of Gutta Percha.—The gutta is furnished by the greyish milky fluid known as the latex, which is chiefly secreted in cylindrical vessels or cells situated in the cortex, that is, between the bark and the wood (or cambium). Latex also occurs in the leaves of the tree to the extent of about 9% of the dried leaves, and this may be removed from the powdered leaves by the use of appropriate solvents, but the process is not practicable commercially. The latex flows slowly where an incision is made through the bark, but not nearly so freely, even in the rainy season, as the india-rubber latex. On this account the Malays usually fell the tree in order to collect the latex, which is done by chopping off the branches and removing circles of the bark, forming cylindrical channels about an inch wide at various points about a foot apart down the trunk. The latex exudes and fills these channels, from which it is removed and converted into gutta by boiling in open vessels over wood fires. The work is usually carried on in the wet season when the latex is more fluid and more abundant. Sometimes when the latex is thick water is added to it before boiling.

The best results are said to be obtained from mature trees about thirty years old, which furnish about 2 to 3 lb of gutta. Older trees do not appear to yield larger amounts of gutta, whilst younger trees are said to furnish less and of inferior quality. The trees have been so extensively felled for the gutta that there has been a great diminution in the total number during recent years, which has not been compensated for by the new plantations which have been established.

Uses of Gutta Percha.—The Chinese and Malays appear to have been acquainted with the characteristic property of gutta percha of softening in warm water and of regaining its hardness when cold, but this plastic property seems to have been only utilized for ornamental purposes, the construction of walking-sticks and of knife handles and whips, &c.

The brothers Tradescant brought samples of the curious material to Europe about the middle of the 17th century. It was then regarded as a form of wood, to which the name of "mazer" wood was given on account of its employment in making mazers or goblets. A description of it is given in a book published by John Tradescant in 1656 entitled *Musaeum Tradescantianum or a Collection of Rarities preserved at South Lambeth near London*. Many of the curiosities collected from all parts of the world by the Tradescants subsequently formed the nucleus of the Ashmolean Museum at Oxford which was opened in 1683, but the specimen of "mazer wood" no longer exists.

In 1843 samples of the material were sent to London by Dr William Montgomerie of Singapore, and were exhibited at the Society of Arts, and in the same year Dr José d'Almeida sent samples to the Royal Asiatic Society. Gutta percha was also exhibited at the Great Exhibition of 1851.

Dr Montgomerie's communication to the Society of Arts led to many experiments being made with the material. Casts of medals were successfully produced, and Sir William Siemens, in conjunction with Werner von Siemens, then made the first experiments with the material as an insulating covering for cable and telegraph wires, which led to the discovery of its important applications in this connexion and to a considerable commercial demand for the substance.

The value of gutta percha depends chiefly on its quality, that is its richness in true gutta and freedom from resin and other impurities which interfere with its physical characters, and especially its insulating power or inability to conduct electricity.

The chief use of gutta percha is now for electrical purposes. Other minor uses are in dentistry and as a means of taking impressions of medals, &c. It has also found application in the preparation of belting for machinery, as well as for the construction of the handles of knives and surgical instruments, whilst the inferior qualities are used for waterproofing.

Commercial Production.—The amount of gutta percha exported through Singapore from British and Dutch possessions in the East is subject to considerable fluctuation, depending chiefly on the demand for cable and telegraph construction. In 1886 the total export from Singapore was 40,411 cwt., of which Great Britain took 31,666 cwt.; in 1896 the export was 51,982 cwt. of which 29,722 cwt. came to Great Britain; while in 1905, 42,088 cwt. were exported (19,517 cwt. to Great Britain). It has to be remembered that the official returns include not only

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gutta percha of various grades of quality but also other inferior products sold under the name of gutta percha, some of which are referred to below under the head of substitutes. The value of gutta percha cannot therefore be correctly gauged from the value of the imports. In the ten years 1896–1906 the best qualities of gutta percha fetched from 4s. to about 7s. per lb. Gutta percha, however, is used for few and special purposes, and there is no free market, the price being chiefly a matter of arrangement between the chief producers and consumers.

Characters and Properties.—Gutta percha appears in commerce in the form of blocks or cakes of a dirty greyish appearance, often exhibiting a reddish tinge, and just soft enough to be indented by the nail. It is subject to considerable adulteration, various materials, such as coco-nut oil, being added by the Malays to improve its appearance. The solid, which is fibrous in texture, hard and inelastic but not brittle at ordinary temperature, becomes plastic when immersed in hot water or if otherwise raised to a temperature of about 65° C. In the case of gutta of the first quality, the temperature of softening being dependent on the quality of the gutta employed. In this condition it can be drawn out into threads, but is still inelastic. On cooling again the gutta resumes its hardness without becoming brittle. In this respect gutta percha differs from india-rubber or caoutchouc, which does not become plastic and unlike gutta percha is elastic. This property of softening on heating and solidifying when cooled again, without change in its original properties, enables gutta percha to be worked into various forms, whether into sheets or drawn into ropes. The specific gravity of the best gutta percha lies between 0·96 and 1. Gutta percha is not dissolved by most liquids, although some remove resinous constituents; the best solvents are oil of turpentine, coal-tar oil, carbon disulphide, chloroform, benzol and petroleum when hot. Gutta percha is not affected by alkaline solutions or by dilute acids. Strong sulphuric acid chars it when warm, and nitric acid effects complete oxidation.

When exposed to air and light, gutta percha rapidly deteriorates, oxygen being absorbed, producing a brittle resinous material.

Chemical Composition.—Chemically, gutta percha is not a single substance but a mixture of several constituents. As the proportions of these constituents in the crude material are not constant, the properties of gutta percha are subject to variation. For electrical purposes it should have a high insulating power and dielectric strength and a low inductive capacity; the possession of these properties is influenced by the resinous constituents present.

The principal constituent of the crude material is the pure gutta, a hydrocarbon of the empirical formula $C_{10}H_{16}$. It is therefore isomeric with the hydrocarbon of caoutchouc and with that of oil of turpentine. Accompanying this are at least two oxygenated resinous constituents—albane $C_{20}H_{32}O$ and fluavil $C_{20}H_{30}O$—which can be separated from the pure gutta by the use of solvents. Pure gutta is not dissolved by ether and light petroleum in the cold, whereas the resinous constituents are removed by these liquids. The true gutta exhibits in an enhanced degree the valuable properties of gutta percha, and the commercial value of the raw material is frequently determined by ascertaining the proportion of true gutta present, the higher the proportion of this the more valuable is the gutta percha. The following are the results of analyses of gutta percha from trees of the genus *Dichopsis* or *Palaquium*:—

		Gutta per cent.	Resin per cent.
Dichopsis (or Palaquium)	oblongifolia	88·8	11·2
,, ,,	gutta	82·0	18·0
,, ,,	polyantha	49·3	50·7
,, ,,	pustulata	47·8	52·2
,, ,,	Maingayi	24·4	75·6

The hydrocarbon of gutta percha, gutta, is closely related in chemical constitution to caoutchouc. When distilled at a high temperature both are resolved into a mixture of two simpler hydrocarbons, isoprene (C_5H_8) and caoutchoucine or dipentene ($C_{10}H_{16}$), and the latter by further heating can be resolved into isoprene, a hydrocarbon of known constitution which has been produced synthetically and spontaneously reverts to caoutchouc. The precise relationship of isoprene to gutta has not been ascertained, but recently Harries has further elucidated the connexion between gutta and caoutchouc by showing that under the action of ozone both break up into laevulinic aldehyde and hydrogen peroxide, but differ in the proportions of these products they furnish. The two materials must therefore be regarded as very closely related in chemical constitution. Like caoutchouc, gutta percha is able to combine with sulphur, and this vulcanized product has found some commercial applications.

Manufacture of Gutta Percha.—Among the earliest patents taken out for the manufacture of gutta percha were those of Charles Hancock, the first of which is dated 1843.

Before being used for technical purposes the raw gutta percha is cleaned by machinery whilst in the plastic state. The chopped or sliced material is washed by mechanical means in hot water and forced through a sieve or strainer of fine wire gauze to remove dirt. It is then kneaded or "masticated" by machinery to remove the enclosed water, and is finally transferred whilst still hot and plastic to the rolling-machine, from which it emerges in sheets of different thickness. Sometimes chemical treatment of the crude gutta percha is resorted to for the purpose of removing the resinous constituents by the action of alkaline solutions or of light petroleum.

Substitutes for Gutta Percha.—For technical purposes natural and artificial substitutes for gutta percha have been employed. The similar products furnished by other plants than those which yield gutta percha are among the more important of the natural substitutes, of which the material known as "balata" or "Surinam gutta percha" is the most valuable. This is derived from a tree, *Mimusops balata* (bullet tree), belonging to the same natural order as gutta percha trees, viz. Sapotaceae. It is a large tree, growing to a height of 80 to 100 ft. or more, which occurs in the West Indies, in South America, and is especially abundant in Dutch and British Guiana. The latex which furnishes balata is secreted in the cortex between the bark and wood of the tree. As the latex flows freely the trees are tapped by making incisions in the same fashion as in india-rubber trees, and the balata is obtained by evaporating the milky fluid. Crude balata varies in composition. It usually contains nearly equal proportions of resin and true gutta. The latter appears to be identical with the chief constituent of gutta percha. The properties of balata correspond with its composition, and it may therefore be classed as an inferior gutta percha. Balata fetches from 1s. 6d. to 2s. 8d. per lb.

Among the inferior substitutes for gutta percha may be mentioned the evaporated latices derived from *Butyrospermum Parkii* (shea-butter tree of West Africa or karite of the Sudan), *Calotropis gigantea* (Madar tree of India), and *Dyera costulata* of Malaya and Borneo, which furnishes the material known as "Pontianac." All these contain a small amount of gutta-like material associated with large quantities of resinous and other constituents. They fetch only a few pence per lb, and are utilized for waterproofing purposes.

Various artificial substitutes for gutta percha have been invented chiefly for use as insulating materials. These often consist of mixtures of bitumen with linseed and other oils, resins, &c., in some cases incorporated with inferior grades of gutta percha.

For further information respecting gutta percha, and for figures of the trees, the following works may be consulted: Jumelle, *Les Plantes à caoutchouc et à gutta* (Paris, Challamel, 1903); Obach, "Cantor Lectures on Gutta Percha," *Journal of the Society of Arts*, 1898.

(W. R. D.)

GUTTER (O. Fr. *goutiere*, mod. *goutlière*, from Lat. *gutta*, drop), in architecture, a horizontal channel or trough contrived to carry away the water from a flat or sloping roof to its discharge down a vertical pipe or through a spout or gargoyle; more specifically, but loosely, the similar channel at the side of a street, below the pavement. In Greek and Roman temples the cymatium of the cornice was the gutter, and the water was discharged through the mouths of lions, whose heads were carved on the same. Sometimes the cymatium was not carried along the flanks of a temple, in which case the rain fell off the lower edge of the roof tiles. In medieval work the gutter rested partly on the top of the wall and partly on corbel tables, and the water was discharged through gargoyles. Sometimes, however, a parapet or pierced balustrade was carried on the corbel table enclosing the gutter. In buildings of a more ordinary class the parapet is only a continuation of the wall below, and the gutter is set back and carried in a trough resting on the lower end of the roof timbers. The safest course is to have an eaves gutter which projects more or less in front of the wall and is secured to and carried by the rafters of the roof. In Renaissance architecture generally the pierced balustrade of the Gothic and transition work was replaced by a balustrade with vertical balusters. In France a compromise was effected, whereby instead of the horizontal coping of the ordinary balustrade a richly carved cresting was employed, of which the earliest example is in the first court of the Louvre by Pierre Lescot. This exists throughout the French Renaissance, and it is one of its chief characteristic features.

GUTZKOW, KARL FERDINAND (1811–1878), German novelist and dramatist, was born on the 17th of March 1811 at Berlin, where his father held a clerkship in the war office. After leaving school he studied theology and philosophy at the university of his native town, and while still a student, began his literary career by the publication in 1831 of a periodical entitled *Forum der Journalliteratur*. This brought him to the notice of Wolfgang

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Menzel, who invited him to Stuttgart to assist in the editorship of the *Literaturblatt*. At the same time he continued his university studies at Jena, Heidelberg and Munich. In 1832 he published anonymously at Hamburg *Briefe eines Narren an eine Närrin*, and in 1833 appeared at Stuttgart *Maha-Guru, Geschichte eines Gottes*, a fantastic and satirical romance. In 1835 he went to Frankfort, where he founded the *Deutsche Revue*. In the same year appeared *Wally, die Zweiflerin*, from the publication of which may be said to date the school of writers who, from their opposition to the literary, social and religious traditions of romanticism, received the name of "Young Germany." The work was directed specially against the institution of marriage and the belief in revelation; and whatever interest it might have attracted from its own merits was enhanced by the action of the German federal diet, which condemned Gutzkow to three months' imprisonment, decreed the suppression of all he had written or might yet write, and prohibited him from exercising the functions of editor within the German confederation. During his term of imprisonment at Mannheim, Gutzkow employed himself in the composition of his treatise *Zur Philosophie der Geschichte* (1836). On obtaining his freedom he returned to Frankfort, whence he went in 1837 to Hamburg. Here he inaugurated a new epoch of his literary activity by bringing out his tragedy *Richard Savage* (1839), which immediately made the round of all the German theatres. Of his numerous other plays the majority are now neglected; but a few have obtained an established place in the repertory of the German theatre—especially the comedies *Zopf und Schwert* (1844), *Das Urbild des Tartüffe* (1847), *Der Königsleutnant* (1849) and the blank verse tragedy, *Uriel Acosta* (1847). In 1847 Gutzkow went to Dresden, where he succeeded Tieck as literary adviser to the court theatre. Meanwhile he had not neglected the novel. *Seraphine* (1838) was followed by *Blasedow und seine Söhne*, a satire on the educational theories of the time. Between 1850 and 1852 appeared *Die Ritter vom Geiste*, which may be regarded as the starting-point for the modern German social novel. *Der Zauberer von Rom* is a powerful study of Roman Catholic life in southern Germany. The success of *Die Ritter vom Geiste* suggested to Gutzkow the establishment of a journal on the model of Dicken's *Household Words*, entitled *Unterhaltungen am häuslichen Herd*, which first appeared in 1852 and was continued till 1862. In 1864 he had an epileptic fit, and his productions show henceforth decided traces of failing powers. To this period belong the historical novels *Hohenschwangau* (1868) and *Fritz Ellrodt* (1872), *Lebensbilder* (1870–1872), consisting of autobiographic sketches, and *Die Söhne Pestalozzis* (1870), the plot of which is founded on the story of Kaspar Hauser. On account of a return of his nervous malady, Gutzkow in 1873 made a journey to Italy, and on his return took up his residence in the country near Heidelberg, whence he removed to Frankfort-on-Main, dying there on the 16th of December 1878. With the exception of one or two of his comedies, Gutzkow's writings have fallen into neglect. But he exerted a powerful influence on the opinions of modern Germany; and his works will always be of interest as the mirror in which the intellectual and social struggles of his time are best reflected.

An edition of Gutzkow's collected works appeared at Jena (1873–1876, new ed., 1879). E. Wolff has published critical editions of Gutzkow's *Meisterdramen* (1892) and *Wally die Zweiflerin* (1905). His more important novels have been frequently reprinted. For Gutzkow's life see his various autobiographical writings such as *Aus der Knabenzeit* (1852), *Rückblicke auf mein Leben* (1876), &c. For an estimate of his life and work see J. Froelss, *Das junge Deutschland* (1892); also H. H. Houben, *Studien über die Dramen Gutzkows* (1898) and *Gutzkow-Funde* (1901).

GÜTZLAFF, KARL FRIEDRICH AUGUST (1803–1851), German missionary to China, was born at Pyritz in Pomerania on the 8th of July 1803. When still apprenticed to a saddler in Stettin, he made known his missionary inclinations to the king of Prussia, through whom he went to the Pädagogium at Halle, and afterwards to the mission institute of Jänike in Berlin. In 1826, under the auspices of the Netherlands Missionary Society, he went to Java, where he was able to learn Chinese. Leaving the society in 1828, he went to Singapore, and in August of the same year removed to Bangkok, where he translated the Bible into Siamese. In 1829 he married an English lady, who aided him in the preparation of a dictionary of Cochin Chinese, but she died in August 1831 before its completion. Shortly after her death he sailed to Macao in China, where, and subsequently at Hong Kong, he worked at a translation of the Bible into Chinese, published a Chinese monthly magazine, and wrote in Chinese various books on subjects of useful knowledge. In 1834 he published at London a *Journal of Three Voyages along the Coast of China in 1831, 1832 and 1833*. He was appointed in 1835 joint Chinese secretary to the English commission, and during the opium war of 1840–42 and the negotiations connected with the peace that followed he rendered valuable service by his knowledge of the country and people. The Chinese authorities refusing to permit foreigners to penetrate into the interior, Gützlaff in 1844 founded an institute for training native missionaries, which was so successful that during the first four years as many as forty-eight Chinese were sent out from it to work among their fellow-countrymen. He died at Hong Kong on the 9th of August 1851.

Gützlaff also wrote *A Sketch of Chinese History, Ancient and Modern* (London, 1834), and a similar work published in German at Stuttgart in 1847; *China Opened* (1838); and the *Life of Täo-Kwang* (1851; German edition published at Leipzig in 1852). A complete collection of his Chinese writings is contained in the library at Munich.

GUY OF WARWICK, English hero of romance. Guy, son of Siward or Seguard of Wallingford, by his prowess in foreign wars wins in marriage Félice (the Phyllis of the well-known ballad), daughter and heiress of Roalt, earl of Warwick. Soon after his marriage he is seized with remorse for the violence of his past life, and, by way of penance, leaves his wife and fortune to make a pilgrimage to the Holy Land. After years of absence he returns in time to deliver Winchester for King Æthelstan from the invading northern kings, Anelaph (Anlaf or Olaf) and Gonelaph, by slaying in single fight their champion the giant Colbrand. Local tradition fixes the duel at Hyde Mead near Winchester. Making his way to Warwick he becomes one of his wife's bedesmen, and presently retires to a hermitage in Arden, only revealing his identity at the approach of death. The versions of the Middle English romance of Guy which we possess are adaptations from the French, and are cast in the form of a *roman d'aventures*, opening with a long recital of Guy's wars in Lombardy, Germany and Constantinople, and embellished with fights with dragons and surprising feats of arms. The kernel of the tradition evidently lies in the fight with Colbrand, which represents, or at least is symbolic[1] of an historical fact. The religious side of the legend finds parallels in the stories of St Eustachius and St Alexius,[2] and makes it probable that the Guy-legend, as we have it, has passed through monastic hands. Tradition seems to be at fault in putting Guy's adventures under Æthelstan. The Anlaf of the story is probably Olaf Tryggvason, who, with Sweyn of Denmark, harried the southern counties of England in 993 and pitched his winter quarters in Southampton. Winchester was saved, however, not by the valour of an English champion, but by the payment of money. This Olaf was not unnaturally confused with Anlaf Cuaran or Havelok (*q.v.*).

The name Guy (perhaps a Norman form of A.S. *wig* = war) may be fairly connected with the family of Wigod, lord of Wallingford under Edward the Confessor, and a Filicia, who belongs to the 12th century and was perhaps the Norman poet's patroness, occurs in the pedigree of the Ardens, descended from Thurkill of Warwick and his son Siward. Guy's Cliffe, near Warwick, where in the 14th century Richard de Beauchamp, earl of Warwick, erected a chantry, with a statue of the hero, does not correspond with the site of the hermitage as described in the

[1] Some writers have supposed that the fight with Colbrand symbolizes the victory of Brunanburh. Anelaph and Gonelaph would then represent the cousins Anlaf Sihtricson and Anlaf Godfreyson (see HAVELOK).

[2] See the English legends in C. Horstmann, *Altenglische Legenden*. Neue Folge (Heilbronn, 1881).

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romance. The bulk of the legend is obviously fiction, even though it may be vaguely connected with the family history of the Ardens and the Wallingford family, but it was accepted as authentic fact in the chronicle of Pierre de Langtoft (Peter of Langtoft) written at the end of the 13th century. The adventures of Reynbrun, son of Guy, and his tutor Heraud of Arden, who had also educated Guy, have much in common with his father's history, and form an interpolation sometimes treated as a separate romance. There is a certain connexion between Guy and Count Guido of Tours (fl. 800), and Alcuin's advice to the count is transferred to the English hero in the *Speculum Ey of Wareweyke* (*c.* 1327), edited for the Early English Text Society by G. L. Morrill, 1898.

The French romance (Brit. Mus. Harl. MS. 3775) has not been printed, but is described by Émile Littré in *Hist. litt. de la France* (xxii., 841-851, 1852). A French prose version was printed in Paris, 1525, and subsequently (see G. Brunet, *Manuel du libraire*, *s.v.* "Guy de Warvich"); the English metrical romance exists in four versions, dating from the early 14th century; the text was edited by J. Zupitza (1875-1876) for the E.E.T.S. from Cambridge University Lib. Paper MS. Ff. 2, 38, and again (3 pts. 1883-1891, extra series, Nos. 42, 49, 59), from the Auchinleck and Caius College MSS. The popularity of the legend is shown by the numerous versions in English: *Guy of Warwick*, translated from the Latin of Girardus Cornubiensis (fl. 1350) into English verse by John Lydgate between 1442 and 1468; *Guy of Warwick*, a poem written in 1617 and licensed, but not printed) by John Lane, the MS. of which (Brit. Mus.) contains a sonnet by John Milton, father of the poet; *The Famous Historie of Guy, Earl of Warwick* (*c.* 1607), by Samuel Rowlands; *The Booke of the Moste Victorious Prince Guy of Warwicke* (William Copland, no date); other editions by J. Cawood and C. Bates; chapbooks and ballads of the 17th and 18th centuries: *The Tragical History, Admirable Atchievements and Curious Events of Guy, Earl of Warwick*, a tragedy (1661) which may possibly be identical with a play on the subject written by John Day and Thomas Dekker, and entered at Stationers' Hall on the 15th of January 1618/19; three verse fragments are printed by Hales and Furnivall in their edition of the Percy Folio MS. vol. ii.; an early French MS. is described by J. A. Herbert (*An Early MS. of Gui de Warwick*, London, 1905).

See also M. Weyrauch *Die mittelengl: Fassungen der Sage von Guy* (2 pts., Breslau, 1899 and 1901); J. Zupitza in *Sitzungsber. d. phil.-hist. Kl. d. kgl. Akad. d. Wiss.* (vol. cxxvi., Vienna, 1892), and *Zur Literaturgeschichte des Guy von Warwick* (Vienna, 1873); a learned discussion of the whole subject by H. L. Ward, *Catalogue of Romances* (i. 471-501, 1883); and an article by S. L. Lee in the *Dictionary of National Biography*.

GUY, THOMAS (1644–1724), founder of Guy's Hospital, London, was the son of a lighterman and coal-dealer at Southwark. After serving an apprenticeship of eight years with a bookseller, he in 1668 began business on his own account. He dealt largely in Bibles, which had for many years been poorly and incorrectly printed in England. These he at first imported from Holland, but subsequently obtained from the university of Oxford the privilege of printing. Thus, and by an extremely thrifty mode of life, and more particularly by investment in government securities, the subscription of these into the South Sea Company, and the subsequent sale of his stock in 1720, he became master of an immense fortune. He died unmarried on the 17th of December 1724. In 1707 he built three wards of St Thomas's Hospital, which institution he otherwise subsequently benefited; and at a cost of £18,793, 16s. he erected Guy's Hospital, leaving for its endowment £219,490; he also endowed Christ's Hospital with £400 a year, and in 1678 endowed almshouses at Tamworth, his mother's birthplace, which was represented by him in parliament from 1695 to 1707. The residue of his estate, which went to distant relatives, amounted to about £80,000.

See *A True Copy of the Last Will and Testament of Thomas Guy, Esq.* (London, 1725); J. Noorthouck, *New Hist. of London*, bk. iii. ch. i. p. 684 (1773); Nichols, *Literary Anecdotes*, iii. 599 (1812); Charles Knight, *Shadows of the Old Booksellers*, pp. 3-23 (1865); and *A Biographical History of Guy's Hospital*, by S. Wilkes and G. T. Bettany (1892).

GUYON, JEANNE MARIE BOUVIER DE LA MOTHE (1648–1717), French quietist writer, was born at Montargis, where her family were persons of consequence, on the 13th of April 1648. If her somewhat hysterical autobiography may be trusted she was much neglected in her youth; most of her time was spent as a boarder in various convent schools. Here she went through all the religious experiences common to neurotic young women; these were turned in a definitely mystical direction by the duchesse de Béthune, daughter of the disgraced minister, Fouquet, who spent some years at Montargis after her father's fall. In 1664 Jeanne Marie was married to a rich invalid of the name of Guyon, many years her senior. Twelve years later he died, leaving his widow with three small children and a considerable fortune. All through her unhappy married life the mystical attraction had grown steadily in violence; it now attached itself to a certain Father Lacombe, a Barnabite monk of weak character and unstable intellect. In 1681 she left her family and joined him; for five years the two rambled about together in Savoy and the south-east of France, spreading their mystical ideas. At last they excited the suspicion of the authorities; in 1686 Lacombe was recalled to Paris, put under surveillance, and finally sent to the Bastille in the autumn of 1687. He was presently transferred to the castle of Lourdes, where he developed softening of the brain and died in 1715. Meanwhile Madame Guyon had been arrested in January 1688, and been shut up in a convent as a suspected heretic. Thence she was delivered in the following year by her old friend, the duchesse de Béthune, who had returned from exile to become a power in the devout court-circle presided over by Madame de Maintenon. Before long Madame Guyon herself was introduced into this pious assemblage. Its members were far from critical; they were intensely interested in religion; and even Madame Guyon's bitterest critics bear witness to her charm of manner, her imposing appearance, and the force and eloquence with which she explained her mystical ideas. So much was Madame de Maintenon impressed, that she often invited Madame Guyon to give lectures at her girls' school of St Cyr. But by far the greatest of her conquests was Fénelon, now a rising young director of consciences, much in favour with aristocratic ladies. Dissatisfied with the formalism of average Catholic piety, he was already thinking out a mystical theory of his own; and between 1689 and 1693 they corresponded regularly. But as soon as ugly reports about Lacombe began to spread, he broke off all connexion with her. Meanwhile the reports had reached the prudent ears of Madame de Maintenon. In May 1693 she asked Madame Guyon to go no more to St Cyr. In the hope of clearing her orthodoxy, Madame Guyon appealed to Bossuet, who decided that her books contained "much that was intolerable, alike in form and matter." To this judgment Madame Guyon submitted, promised to "dogmatize no more," and disappeared into the country (1693). In the next year she again petitioned for an inquiry, and was eventually sent, half as a prisoner, half as a penitent, to Bossuet's cathedral town of Meaux. Here she spent the first half of 1695; but in the summer she escaped without his leave, bearing with her a certificate of orthodoxy signed by him. Bossuet regarded this flight as a gross act of disobedience; in the winter Madame Guyon was arrested and shut up in the Bastille. There she remained till 1703. In that year she was liberated, on condition she went to live on her son's estate near Blois, under the eye of a stern bishop. Here the rest of her life was spent in charitable and pious exercises; she died on the 9th of June 1717. During these latter years her retreat at Blois became a regular place of pilgrimage for admirers, foreign quite as often as French. Indeed, she is one of the many prophetesses whose fame has stood highest out of their own country. French critics of all schools of thought have generally reckoned her an hysterical degenerate; in England and Germany she has as often roused enthusiastic admiration.

AUTHORITIES.—*Vie de Madame Guyon, écrite par elle-même* (really a compilation made from various fragments) (3 vols., Paris, 1791). There is a life in English by T. C. Upham (New York, 1854); and an elaborate study by L. Guerrier (Paris, 1881). For a remarkable review of this latter work see Brunetière, *Nouvelles Études critiques*, vol. ii. The complete edition of Madame Guyon's works, including the autobiography and five volumes of letters, runs to forty volumes (1767–1791); the most important works are published separately. *Opuscules spirituels* (2 vols., Paris, 1790). They have

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been several times translated into English. See also the literature of the article on QUIETISM; and H. Delacroix, *Études sur le mysticisme* (Paris, 1908). (ST C.)

GUYON, RICHARD DEBAUFRE (1803–1856), British soldier, general in the Hungarian revolutionary army and Turkish pasha, was born at Walcot, near Bath, in 1803. After receiving a military education in England and in Austria he entered the Hungarian hussars in 1823, in which he served until after his marriage with a daughter of Baron Spleny, a general officer in the imperial service. At the outbreak of the Hungarian War in 1848, he re-entered active service as an officer of the Hungarian Honvéds, and he won great distinction in the action of Sukoro (September 29, 1848) and the battle of Schwechat (October 30). He added to his reputation as a leader in various actions in the winter of 1848–1849, and after the battle of Kapolna was made a general officer. He served in important and sometimes independent commands to the end of the war, after which he escaped to Turkey. In 1852 he entered the service of the sultan. He was made a pasha and lieutenant-general without being required to change his faith, and rendered distinguished service in the campaign against the Russians in Asia Minor (1854–55). General Guyon died of cholera at Scutari on the 12th of October 1856.

See A. W. Kinglake, *The Patriot and the Hero General Guyon* (1856).

GUYOT, ARNOLD HENRY (1807–1884), Swiss-American geologist and geographer, was born at Boudevilliers, near Neuchâtel, Switzerland, on the 28th of September 1807. He studied at the college of Neuchâtel and in Germany, where he began a lifelong friendship with Louis Agassiz. He was professor of history and physical geography at the short-lived Neuchâtel "Academy" from 1830 to 1848, when he removed, at Agassiz's instance, to the United States, settling in Cambridge, Massachusetts. For several years he was a lecturer for the Massachusetts State Board of Education, and he was professor of geology and physical geography at Princeton from 1854 until his death there on the 8th of February 1884. He ranked high as a geologist and meteorologist. As early as 1838, he undertook, at Agassiz's suggestion, the study of glaciers, and was the first to announce, in a paper submitted to the Geological Society of France, certain important observations relating to glacial motion and structure. Among other things he noted the more rapid flow of the centre than of the sides, and the more rapid flow of the top than of the bottom of glaciers; described the laminated or "ribboned" structure of the glacial ice, and ascribed the movement of glaciers to a gradual molecular displacement rather than to a sliding of the ice mass as held by de Saussure. He subsequently collected important data concerning erratic boulders. His extensive meteorological observations in America led to the establishment of the United States Weather Bureau, and his *Meteorological and Physical Tables* (1853, revised ed. 1884) were long standard. His graded series of text-books and wall-maps were important aids in the extension and popularization of geological study in America. In addition to text-books, his principal publications were: *Earth and Man, Lectures on Comparative Physical Geography in its Relation to the History of Mankind* (translated by Professor C. C. Felton, 1849); *A Memoir of Louis Agassiz* (1883); and *Creation, or the Biblical Cosmogony in the Light of Modern Science* (1884).

See James D. Dana's "Memoir" in the *Biographical Memoirs of the National Academy of Science*, vol. ii. (Washington, 1886).

GUYOT, YVES (1843–), French politician and economist, was born at Dinan on the 6th of September 1843. Educated at Rennes, he took up the profession of journalism, coming to Paris in 1867. He was for a short period editor-in-chief of *L'Indépendant du midi* of Nîmes, but joined the staff of *La Rappel* on its foundation, and worked subsequently on other journals. He took an active part in municipal life, and waged a keen campaign against the prefecture of police, for which he suffered six months' imprisonment. He entered the chamber of deputies in 1885 as representative of the first arrondissement of Paris and was *rapporteur général* of the budget of 1888. He became minister of public works under the premiership of P. E. Tirard in 1889, retaining his portfolio in the cabinet of C. L. de Freycinet until 1892. Although of strong liberal views, he lost his seat in the election of 1893 owing to his militant attitude against socialism. An uncompromising free-trader, he published *La Comédie protectionniste* (1905; Eng. trans. *The Comedy of Protection*); *La Science économique* (1st ed. 1881; 3rd ed. 1907); *La Prostitution* (1882); *La Tyrannie socialiste* (1893), all three translated into English; *Les Conflits du travail et leur solution* (1903); *La Démocratie individualiste* (1907).

GUYTON DE MORVEAU, LOUIS BERNARD, BARON (1737–1816), French chemist, was born on the 4th of January 1737, at Dijon, where his father was professor of civil law at the university. As a boy he showed remarkable aptitude for practical mechanics, but on leaving school he studied law in the university of Dijon, and in his twenty-fourth year became advocate-general in the parlement of Dijon. This office he held till 1782. Devoting his leisure to the study of chemistry, he published in 1772 his *Digressions académiques*, in which he set forth his views on phlogiston, crystallization, &c., and two years later he established in his native town courses of lectures on materia medica, mineralogy and chemistry. An essay on chemical nomenclature, which he published in the *Journal de physique* for May 1782, was ultimately developed with the aid of A. L. Lavoisier, C. L. Berthollet and A. F. Fourcroy, into the *Méthode d'une nomenclature chimique*, published in 1787, the principles of which were speedily adopted by chemists throughout Europe. Constantly in communication with the leaders of the Lavoisierian school, he soon became a convert to the anti-phlogistic doctrine; and he published his reasons in the first volume of the section "Chymie, Pharmacie et Metallurgie" of the *Encyclopédie méthodique* (1786), the chemical articles in which were written by him, as well as some of those in the second volume (1792). In 1794 he was appointed to superintend the construction of balloons for military purposes, being known as the author of some aeronautical experiments carried out at Dijon some ten years previously. In 1791 he became a member of the Legislative Assembly, and in the following year of the National Convention, to which he was re-elected in 1795, but he retired from political life in 1797. In 1798 he acted as provisional director of the Polytechnic School, in the foundation of which he took an active part, and from 1800 to 1814 he held the appointment of master of the mint. In 1811 he was made a baron of the French Empire. He died in Paris on the 2nd of January 1816.

Besides being a diligent contributor to the scientific periodicals of the day, Guyton wrote *Mémoire sur l'éducation publique* (1762); a satirical poem entitled *Le Rat iconoclaste, ou le Jésuite croqué* (1763); *Discours publics et éloges* (1775–1782); *Plaidoyers sur plusieurs questions de droit* (1785); and *Traité des moyens de désinfecter l'air* (1801), describing the disinfecting powers of chlorine, and of hydrochloric acid gas which he had successfully used at Dijon in 1773. With Hugues Maret (1726–1785) and Jean François Durande (d. 1794) he also published the *Élémens de chymie théorique et pratique* (1776–1777).

GUZMICS, IZIDÓR (1786–1830), Hungarian theologian, was born on the 7th of April 1786 at Vámos-Család, in the county of Sopron. At Sopron (Oedenburg) he was instructed in the art of poetry by Paul Horváth. In October 1805 he entered the Benedictine order, but left it in August of the following year, only again to assume the monastic garb on the 10th of November 1806. At the monastery of Pannonhegy he applied himself to the study of Greek under Farkas Tóth and in 1812 he was sent to Pesth to study theology. Here he read the best German and Hungarian authors, and took part in the editorship of the *Nemzeti* (National) *Plutarkus*, and in the translation of Johann Hübner's *Lexicon*. On obtaining the degree of doctor of divinity in 1816, he returned to Pannonhegy, where he devoted himself to dogmatic theology and literature, and contributed largely to Hungarian periodicals. The most important of his theological works are: *A kath. anyasszentegyháznak hitbeli tanitása* (The Doctrinal Teaching of the Holy Catholic Church), and *A keresztényeknek vallásbeli egyesülésökről* (On Religious Unity among Christians), both published at Pesth in 1822; also a Latin treatise entitled *Theologia Christiana fundamentalis et theologia dogmatica* (4 vols., Györ, 1828–1829). His translation of

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Theocritus in hexameters was published in 1824. His versions of the *Oedipus* of Sophocles and of the *Iphigenia* of Euripides were rewarded by the Hungarian Academy, of which in 1838 he was elected honorary member. In 1832 he was appointed abbot of the wealthy Benedictine house at Bakonybél, a village in the county of Veszprém. There he built an asylum for 150 children, and founded a school of harmony and singing. He died on the 1st of September 1839.

GWADAR, a port on the Makran coast of Baluchistan, about 200 m. W. of Karachi. Pop. (1903), 4350. In the last half of the 18th century it was handed over by the khan of Kalat to the sultan of Muscat, who still exercises sovereignty over the port, together with about 300 sq. m. of the adjoining country. It is a place of call for the steamers of the British India Navigation Company.

GWALIOR, a native state of India, in the Central India agency, by far the largest of the numerous principalities comprised in that area. It is the dominion of the Sindhia family. The state consists of two well-defined parts which may roughly be called the northern and the southern. The former is a compact mass of territory, bounded N. and N.W. by the Chambal river, which separates it from the British districts of Agra and Etawah, and the native states of Dholpur, Karauli and Jaipur of Rajputana; E. by the British districts of Jalaun, Jhansi, Lalitpur and Saugor; S. by the states of Bhopal, Tonk, Khilchipur and Rajgarh; and W. by those of Jhalawar, Tonk and Kotah of Rajputana. The southern, or Malwa, portion is made up of detached or semi-detached districts, between which are interposed parts of other states, which again are mixed up with each other in bewildering intricacy. The two portions together have a total area of 25,041 sq. m. Pop.(1901), 2,933,001, showing a decrease of 13% in the decade.

The state may be naturally divided into plain, plateau and hilly country. The plain country extends from the Chambal river in the extreme southwards for about 80 m., with a maximum width from east to west of about 120 m. This plain, though broken in its southern portion by low hills, has generally an elevation of only a few hundred feet above sea-level. In the summer season the climate is very hot, the shade temperature rising frequently to 112° F., but in the winter months (from November to February inclusive) it is usually temperate and for short periods extremely cold. The average rainfall is 30 in., but the period 1891–1901 was a decade of low rainfall, and distress was caused by famine. South of this tract there is a gradual ascent to the Central India plateau, and at Sipri the general level is 1500 ft. above the sea. On this plateau lies the remainder of the state, with the exception of the small district of Amjhera in the extreme south. The elevation of this region gives it a moderate climate during the summer as compared with the plain country, while the winter is warmer and more equable. The average rainfall is 28 in. The remaining portion of the state, classed as hilly, comprises only the small district of Amjhera. This is known as the Bhil country, and lies among the Vindhya mountains with a mean elevation of about 1800 ft. The rainfall averages 23 in. In the two years 1899 and 1900 the monsoon was very weak, the result being a severe famine which caused great mortality among the Bhil population. Of these three natural divisions the plateau possesses the most fertile soil, generally of the kind known as "black cotton," but the low-lying plain has the densest population. The state is watered by numerous rivers. The Nerbudda, flowing west, forms the southern boundary. The greater part of the drainage is discharged into the Chambal, which forms the north-western and northern and eastern boundary. The Sind, with its tributaries the Kuwari, Asar and Sankh, flows through the northern division. The chief products are wheat, millets, pulses of various kinds, maize, rice, linseed and other oil-seeds; poppy, yielding the Malwa opium; sugar-cane, cotton, tobacco, indigo, garlic, turmeric and ginger. About 60% of the population are employed in agricultural and only 15% in industrial occupations, the great majority of the latter being home workers. There is a leather factory at Morar; cotton-presses at Morena, Baghana and Ujjain; ginning factories at Agar, Nalkhera, Shajapur and Sonkach; and a cotton-mill at Ujjain. The cotton industry alone shows possibilities of considerable development, there being 55,000 persons engaged in it at the time of the census of 1901.

The population is composed of many elements, among which Brahmans and Rajputs are specially numerous. The prevailing religion is Hinduism, 84% of the people being Hindus and only 6% Mahommedans. The revenue of the state is about one million sterling; and large reserves have been accumulated, from which two millions were lent to the government of India in 1887, and later on another million for the construction of the Gwalior-Agra and Indore-Neemuch railways. The railways undertaken by the state are: (1) from Bina on the Indian Midland to Goona; (2) an extension of this line to Baran, opened in 1899; (3) from Bhopal to Ujjain; (4) two light railways, from Gwalior to Sipri and Gwalior to Bhind, which were opened by the viceroy in November 1899. On the same occasion the viceroy opened the Victoria College, founded to commemorate the Diamond Jubilee; and the Memorial Hospital, built in memory of the maharaja's father. British currency has been introduced instead of Chandori rupees, which were much depreciated. The state maintains three regiments of Imperial Service cavalry, two battalions of infantry and a transport corps.

History.—The Sindhia family, the rulers of the Gwalior state, belong to the Mahratta nation and originally came from the neighbourhood of Poona. Their first appearance in Central India was early in the 18th century in the person of Ranoji (d. 1745), a scion of an impoverished branch of the family, who began his career as the peshwa's slipper-carrier and rose by his military abilities to be commander of his bodyguard. In 1726, together with Malhar Rao Holkar, the founder of the house of Indore, he was authorized by the peshwa to collect tribute (*chauth*) in the Malwa districts. He established his headquarters at Ujjain, which thus became the first capital of Sindhia's dominions.

Ranoji's son and successor, Jayapa Sindhia, was killed at Nagaur in 1759, and was in his turn succeeded by his son Jankoji Sindhia. But the real founder of the state of Gwalior was Mahadji Sindhia, a natural son of Ranoji, who, after narrowly escaping with his life from the terrible slaughter of Panipat in 1761 (when Jankoji was killed), obtained with some difficulty from the peshwa a re-grant of his father's possessions in Central India (1760). During the struggle which followed the death of Madhu Rao Peshwa in 1772 Mahadji seized every occasion for extending his power and possessions. In 1775, however, when Raghuba Peshwa threw himself on the protection of the British, the reverses which Mahadji encountered at their hands—Gwalior being taken by Major Popham in 1780—opened his eyes to their power. By the treaty of Salbai (1782) it was agreed that Mahadji should withdraw to Ujjain, and the British retire north of the Jumna. Mahadji, who undertook to open negotiations with the other belligerents, was recognized as an independent ruler, and a British resident was established at his court. Mahadji, aided by the British policy of neutrality, now set to work to establish his supremacy over Hindustan proper. Realizing the superiority of European methods of warfare, he availed himself of the services of a Savoyard soldier of fortune, Benoît de Boigne, whose genius for military organization and command in the field was mainly instrumental in establishing the Mahratta power. Mahadji's disciplined troops made him invincible. In 1785 he re-established Shah Alam on the imperial throne at Delhi, and as his reward obtained for the peshwa the title of *vakil-ul-mutlak* or vicegerent of the empire, contenting himself with that of his deputy. In 1788 he took advantage of the cruelties practised by Ghulam Kadir on Shah Alam, to occupy Delhi, where he established himself as the protector of the aged emperor. Though nominally a deputy of the peshwa he was now ruler of a vast territory, including the greater part of Central India and Hindustan proper, while his lieutenants exacted tribute from the chiefs of Rajputana. There can be no doubt that he looked with apprehension on the growing power of

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the British; but he wisely avoided any serious collision with them.

Mahadji died in 1794, and was succeeded by his adopted son, Daulat Rao Sindhia, a grandson of his brother Tukoji. When, during the period of unrest that followed the deaths of the peshwa, Madhu Rao II., in 1795 and of Tukoji Holkar in 1797, the Mahratta leaders fought over the question of supremacy, the peshwa, Baji Rao II., the titular head of the Mahratta confederation, fled from his capital and placed himself under British protection by the treaty of Bassein (December 31, 1802). This interposition of the British government was resented by the confederacy, and it brought on the Mahratta War of 1803. In the campaign that followed a combined Mahratta army, in which Daulat Rao's troops furnished the largest contingent, was defeated by General Arthur Wellesley at Assaye and Argaum in Central India; and Lord Lake routed Daulat Rao's European-trained battalions in Northern India at Agra, Aligarh and Laswari. Daulat Rao was then compelled to sign the treaty of Sarji Anjangaon (December 30, 1803), which stripped him of his territories between the Jumna and Ganges, the district of Broach in Gujarat and other lands in the south. By the same treaty he was deprived of the forts of Gwalior and Gohad; but these were restored by Lord Cornwallis in 1805, when the Chambal river was made the northern boundary of the state. By a treaty signed at Burhanpur in 1803 Daulat Rao further agreed to maintain a subsidiary force, to be paid out of the revenues of the territories ceded under the treaty of Sarji Anjangaon. When, however, in 1816 he was called upon to assist in the suppression of the Pindaris, though by the treaty of Gwalior (1817) he promised his co-operation, his conduct was so equivocal that in 1818 he was forced to sign a fresh treaty by which he ceded Ajmere and other lands.

Daulat Rao died without issue in 1827, and his widow, Baiza Bai (d. 1862), adopted Mukut Rao, a boy of eleven belonging to a distant branch of the family, who succeeded as Jankoji Rao Sindhia. His rule was weak; the state was distracted by interminable palace intrigues and military mutinies, and affairs went from bad to worse when, in 1843, Jankoji Rao, who left no heir, was succeeded by another boy, adopted by his widow, Tara Bai, under the name of Jayaji Rao Sindhia. The growth of turbulence and misrule now induced Lord Ellenborough to interpose, and a British force under Sir Hugh Gough advanced upon Gwalior (December 1843). The Mahratta troops were defeated simultaneously at Maharajpur and Punniar (December 29), with the result that the Gwalior government signed a treaty ceding territory with revenue sufficient for the maintenance of a contingent force to be stationed at the capital, and limiting the future strength of the Gwalior army, while a council of regency was appointed during the minority to act under the resident's advice. In 1857 the Gwalior contingent joined the mutineers; but the maharaja himself remained loyal to the British, and fled from his capital until the place was retaken and his authority restored by Sir Hugh Rose (Lord Strathnairn) on the 19th of June 1858. He was rewarded with the districts of Neemuch and Amjhera, but Gwalior fort was occupied by British troops and was only restored to his son in 1886 by Lord Dufferin. Jayajl Rao, who died in 1886, did much for the development of his state. He was created a G.C.S.I. in 1861, and subsequently became a counsellor of the empress, a G.C.B. and C.I.E.

His son, the maharaja, Madhava Rao Sindhia, G.C.S.I., was born in 1877. During his minority the state was administered for eight years by a council of regency. He was entrusted with ruling powers in 1894, and in all respects continued the reforming policy of the council, while paying personal attention to every department, being a keen soldier, an energetic administrator, and fully alive to the responsibilities attaching to his position. He was created an honorary aide-de-camp to the king-emperor and an honorary colonel in the British army. He went to China as orderly officer to General Gaselee in 1901, and provided the expedition with a hospital ship at his own expense, while his Imperial Service Transport Corps proved a useful auxiliary to the British army in the Chitral and Tirah expeditions.

The CITY OF GWALIOR is 76 m. by rail S. of Agra, and had a population in 1901 of 119,433. This total includes the new town of Lashkar or "the Camp" which is the modern capital of the state and old Gwalior. The old town has a threefold interest: first as a very ancient seat of Jain worship; secondly for its example of palace architecture of the best Hindu period (1486–1516); and thirdly as an historic fortress. There are several remarkable Hindu temples within the fort. One, known as the *Sas Bahu*, is beautifully adorned with bas-reliefs. It was finished in A.D. 1093, and, though much dilapidated, still forms a most picturesque fragment. An older Jain temple has been used as a mosque. Another temple in the fortress of Gwalior is called the *Teli-Mandir*, or "Oilman's Temple." This building was originally dedicated to Vishnu, but afterwards converted to the worship of Siva. The most striking part of the Jain remains at Gwalior is a series of caves or rock-cut sculptures, excavated in the rock on all sides, and numbering nearly a hundred, great and small. Most of them are mere niches to contain statues, though some are cells that may have been originally intended for residences. One curious fact regarding them is that, according to inscriptions, they were all excavated within the short period of about thirty-three years, between 1441 and 1474. Some of the figures are of colossal size; one, for instance, is 57 ft. high, which is taller than any other in northern India.

The palace built by Man Singh (1486–1516) forms the most interesting example of early Hindu work of its class in India. Another palace of even greater extent was added to this in 1516; both Jehangir and Shah Jahan added palaces to these two—the whole making a group of edifices unequalled for picturesqueness and interest by anything of their class in Central India. Among the apartments in the palace was the celebrated chamber, named the *Baradari*, supported on 12 columns, and 45 ft. square, with a stone roof, forming one of the most beautiful palace-halls in the world. It was, besides, singularly interesting from the expedients to which the Hindu architect was forced to resort to imitate the vaults of the Moslems. Of the buildings, however, which so excited the admiration of the emperor Baber, probably little now remains. The fort of Gwalior, within which the above buildings are situated, stands on an isolated rock. The face is perpendicular and where the rock is naturally less precipitous it has been scarped. Its greatest length from north-east to south-west is a mile and a half, and the greatest breadth 900 yds. The rock attains its maximum height of 342 ft. at the northern end. A rampart, accessible by a steep road, and farther up by huge steps cut out of the rock, surrounds the fort. The citadel stands at the north-eastern corner of the enclosure, and presents a very picturesque appearance. The old town of Gwalior, which is of considerable size, but irregularly built, and extremely dirty, lies at the eastern base of the rock. It contains the tomb of Mahommed Ghaus, erected during the early part of Akbar's reign. The fort of Gwalior was traditionally built by one Surya Sen, the raja of the neighbouring country. In 1196 Gwalior was captured by Mahommed Ghori; it then passed into the hands of several chiefs until in 1559 Akbar gained possession of it, and made it a state prison for captives of rank. On the dismemberment of the Delhi empire, Gwalior was seized by the Jat rana of Gohad. Subsequently it was garrisoned by Sindhia, from whom it was wrested in 1780 by the forces of the East India Company, and to whom it was finally restored by the British in 1886. The modern town contains the palace of the chief, a college, a high school, a girls' school, a service school to train officials, a law school, hospitals for men and for women, a museum, paper-mills, and a printing-press issuing a state gazette.

GWALIOR RESIDENCY, an administrative unit in the Central India agency, comprises Gwalior state and eleven smaller states and estates. Its total area is 17,825 sq. m., and its population in 1901 was 2,187,612. Of the area, 17,020 sq. m. belong to Gwalior State, and the agency also includes the small states of Raghugarh, Khaniadhana, Paron, Garha, Umri and Bhadaura, with the Chhabra *pargana* of Tonk.

GWEEDORE, a hamlet and tourist resort of Co. Donegal, Ireland, on the Londonderry & Lough Swilly & Letterkenny

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railway. The river Clady, running past the village from the Nacung Loughs, affords salmon and trout fishing. The fine surrounding scenery culminates to the east in the wild mountain Errigal (2466 ft.) at the upper end of the loughs. The place owes its popularity as a resort to Lord George Hill (d. 1870), who also laboured for the amelioration of the conditions of the peasantry on his estate, and combated the Rundale system of minute repartition of property. In 1889, during the troubles which arose out of evictions, Gweedore was the headquarters of the Irish constabulary, when District Inspector Martin was openly murdered on attempting to arrest a priest on his way to Mass.

GWILT, JOSEPH (1784–1863), English architect and writer, was the younger son of George Gwilt, architect surveyor to the county of Surrey, and was born at Southwark on the 11th of January 1784. He was educated at St Paul's school, and after a short course of instruction in his father's office was in 1801 admitted a student of the Royal Academy, where in the same year he gained the silver medal for his drawing of the tower and steeple of St Dunstan-in-the-East. In 1811 he published a *Treatise on the Equilibrium of Arches*, and in 1815 he was elected F.S.A. After a visit to Italy in 1816, he published in 1818 *Notitia architectonica italiana, or Concise Notices of the Buildings and Architects of Italy*. In 1825 he published an edition of Sir William Chambers's *Treatise on Civil Architecture*; and among his other principal contributions to the literature of his profession are a translation of the *Architecture of Vitruvius* (1826), a *Treatise on the Rudiments of Architecture, Practical and Theoretical* (1826), and his valuable *Encyclopaedia of Architecture* (1842), which was published with additions by Wyatt Papworth in 1867. In recognition of Gwilt's advocacy of the importance to architects of a knowledge of mathematics, he was in 1833 elected a member of the Royal Astronomical Society. He took a special interest in philology and music, and was the author of *Rudiments of the Anglo-Saxon Tongue* (1829), and of the article "Music" in the *Encyclopaedia metropolitana*. His principal works as a practical architect were Markree Castle near Sligo in Ireland, and St Thomas's church at Charlton in Kent. He died on the 14th of September 1863.

GWYN, NELL [ELEANOR] (1650–1687), English actress, and mistress of Charles II., was born on the 2nd of February 1650/1, probably in an alley off Drury Lane, London, although Hereford also claims to have been her birthplace. Her father, Thomas Gwyn, appears to have been a broken-down soldier of a family of Welsh origin. Of her mother little is known save that she lived for some time with her daughter, and that in 1670 she was drowned, apparently when intoxicated, in a pond at Chelsea. Nell Gwyn, who sold oranges in the precincts of Drury Lane Theatre, passed, at the age of fifteen, to the boards, through the influence of the actor Charles Hart and of Robert Duncan or Dungan, an officer of the guards who had interest with the management. Her first recorded appearance on the stage was in 1665 as Cydaria, Montezuma's daughter, in Dryden's *Indian Emperor*, a serious part ill-suited to her. In the following year she was Lady Wealthy in the Hon. James Howard's comedy *The English Monsieur*. Pepys was delighted with the playing of "pretty, witty Nell," but when he saw her as Florimel in Dryden's *Secret Love, or the Maiden Queen*, he wrote "so great a performance of a comical part was never, I believe, in the world before" and, "so done by Nell her merry part as cannot be better done in nature" (*Diary*, March 25, 1667). Her success brought her other leading rôles—Bellario, in Beaumont and Fletcher's *Philaster*; Flora, in Rhodes's *Flora's Vagaries*; Samira, in Sir Robert Howard's *Surprisal*; and she remained a member of the Drury Lane company until 1669, playing continuously save for a brief absence in the summer of 1667 when she lived at Epsom as the mistress of Lord Buckhurst, afterwards 6th earl of Dorset (q.v.). Her last appearance was as Almahide in the Almanzor of Hart, in Dryden's *The Conquest of Granada* (1670), the production of which had been postponed some months for her return to the stage after the birth of her first son by the king.

As an actress Nell Gwyn was largely indebted to Dryden, who seems to have made a special study of her airy, irresponsible personality, and who kept her supplied with parts which suited her. She excelled in the delivery of the risky prologues and epilogues which were the fashion, and the poet wrote for her some specially daring examples. It was, however, as the mistress of Charles II. that she endeared herself to the public. Partly, no doubt, her popularity was due to the disgust inspired by her rival, Louise de Kérouaille, duchess of Portsmouth, and to the fact that, while the Frenchwoman was a Catholic, she was a Protestant. But very largely it was the result of exactly those personal qualities that appealed to the monarch himself. She was *piquante* rather than pretty, short of stature, and her chief beauty was her reddish-brown hair. She was illiterate, and with difficulty scrawled an awkward E. G. at the bottom of her letters, written for her by others. But her frank recklessness, her generosity, her invariable good temper, her ready wit, her infectious high spirits and amazing indiscretions appealed irresistibly to a generation which welcomed in her the living antithesis of Puritanism. "A true child of the London streets," she never pretended to be superior to what she was, nor to interfere in matters outside the special sphere assigned her; she made no ministers, she appointed to no bishoprics, and for the high issues of international politics she had no concern. She never forgot her old friends, and, as far as is known, remained faithful to her royal lover from the beginning of their intimacy to his death, and, after his death, to his memory.

Of her two sons by the king, the elder was created Baron Hedington and earl of Burford and subsequently duke of St Albans; the younger, James, Lord Beauclerk, died in 1680, while still a boy. The king's death-bed request to his brother, "Let not poor Nelly starve," was faithfully carried out by James II., who paid her debts from the Secret Service fund, provided her with other moneys, and settled on her an estate with reversion to the duke of St Albans. But she did not long survive her lover's death. She died in November 1687, and was buried on the 17th, according to her own request, in the church of St Martin-in-the-Fields, her funeral sermon being preached by the vicar, Thomas Tenison, afterwards archbishop of Canterbury, who said "much to her praise." Tradition credits the foundation of Chelsea Hospital to her influence over the king.

See Peter Cunningham, *The Story of Nell Gwyn*, edited by Gordon Goodwin (1903); Waldron's edition of John Downes's *Roscius Anglicanus* (1789); Osmund Airy, *Charles II.* (1904); Pepys, *Diary*; Evelyn, *Diary and Correspondence*; *Origin and Early History of the Royal Hospital at Chelsea*, edited by Major-General G. Hutt (1872); *Memoirs of the Life of Eleanor Gwinn* (1752); Burnet, *History of My Own Time*, part i., edited by Osmund Airy (Oxford, 1897); *Louise de Kérouaille, Duchess of Portsmouth*, by H. Forneron, translated by Mrs Crawford (1887).

GWYNIAD, the name given to a fish of the genus *Coregonus* or White fish (*C. clupeoides*), inhabiting the large lakes of North Wales and the north of England. At Ullswater it is known by the name of "schelly," at Loch Lomond by that of "powen." It is tolerably abundant in Lake Bala, keeping to the deepest portion of the lake for the greater part of the year, but appearing in shoals near the shores at certain seasons. It is well flavoured, like all the species of *Coregonus*, but scarcely attains to the weight of a pound. The name gwyniad is a Welsh word, and signifies "shining"; and it is singular that a similar fish in British Columbia, also belonging to the family of Salmonoids, is called by the natives "quinnat," from the silvery lustre of its scales, the word having in their language the same meaning as the Welsh "gwyniad."

GYANTSE, one of the large towns of Tibet. It lies S.E. of Shigatse, 130 m. from the Indian frontier and 145 m. from Lhasa. Its central position at the junction of the roads from India and Bhutan with those from Ladakh and Central Asia leading to Lhasa makes it a considerable distributing trade centre. Its market is the third largest in Tibet, coming after Lhasa and Shigatse, and is especially celebrated for its woollen cloth and carpet manufactures. Here caravans come from Ladakh, Nepal and upper Tibet, bringing gold, borax, salt, wool, musk and furs, to exchange for tea, tobacco, sugar, cotton goods,

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broadcloth and hardware. The town is compactly built of stone houses, with wooden balconies facing the main street, whence narrow lanes strike off into uninviting slums, and contains a fort and monastery. In the British expedition of 1004 Gyantse formed the first objective of the advance, and the force was besieged here in the mission post of Changlo for some time. The Tibetans made a night attack on the post, and were beaten off with some difficulty, but subsequently the British attacked and stormed the fort or jong. Under the treaty of 1004 a British trade agent is stationed at Gyantse.

GYGES, founder of the third or Mermnad dynasty of Lydian kings, he reigned 687–652 B.C. according to H. Gelzer, 600–657 B.C. according to H. Winckler. The chronology of the Lydian kings given by Herodotus has been shown by the Assyrian inscriptions to be about twenty years in excess. Gyges was the son of Dascylus, who, when recalled from banishment in Cappadocia by the Lydian king Sadyattes—called Candaules "the Dog-strangler" (a title of the Lydian Hermes) by the Greeks—sent his son back to Lydia instead of himself. Gyges soon became a favourite of Sadyattes and was despatched by him to fetch Tudo, the daughter of Arnossus of Mysia, whom the Lydian king wished to make his queen. On the way Gyges fell in love with Tudo, who complained to Sadyattes of his conduct. Forewarned that the king intended to punish him with death, Gyges assassinated Sadyattes in the night and seized the throne with the help of Arselis of Mylasa, the captain of the Carian bodyguard, whom he had won over to his cause. Civil war ensued, which was finally ended by an appeal to the oracle of Delphi and the confirmation of the right of Gyges to the crown by the Delphian god. Further to secure his title he married Tudo. Many legends were told among the Greeks about his rise to power. That found in Herodotus, which may be traced to the poet Archilochus of Paros, described how "Candaules" insisted upon showing Gyges his wife when unrobed, which so enraged her that she gave Gyges the choice of murdering her husband and making himself king, or of being put to death himself. Plato made Gyges a shepherd, who discovered a magic ring by means of which he murdered his master and won the affection of his wife (Hdt. i. 8–14; Plato, *Rep.* 359; Justin i. 7; Cicero, *De off.* iii. 9). Once established on the throne Gyges devoted himself to consolidating his kingdom and making it a military power. The Troad was conquered, Colophon captured from the Greeks, Smyrna besieged and alliances entered into with Ephesus and Miletus. The Cimmerii, who had ravaged Asia Minor, were beaten back, and an embassy was sent to Assur-bani-pal at Nineveh (about 650 B.C.) in the hope of obtaining his help against the barbarians. The Assyrians, however, were otherwise engaged, and Gyges turned to Egypt, sending his faithful Carian troops along with Ionian mercenaries to assist Psammetichus in shaking off the Assyrian yoke (660 B.C.). A few years later he fell in battle against the Cimmerii under Dugdammē (called Lygdamis by Strabo i. 3. 21), who took the lower town of Sardis. Gyges was succeeded by his son Ardys.

See Nicolaus Damascenus, quoting from the Lydian historian Xanthus, in C. Müller, *Fragmenta historicorum Graecorum*, iii.; R. Schubert, *Geschichte der Könige von Lydien* (1884); M. G. Radet, *La Lydie et le monde grec au temps de Mermnades* (1892–1893); H. Gelzer, "Das Zeitalter des Gyges," (*Rhein. Mus.*, 1875); H. Winckler, *Altorientalische Forschungen*, i. (1893); Macan's edition of Herodotus. (A. H. S.)

GYLIPPUS, a Spartan general of the 5th century B.C.; he was the son of Cleandridas, who had been expelled from Sparta for accepting Athenian bribes (446 B.C.) and had settled at Thurii. His mother was probably a helot, for Gylippus is said to have been, like Lysander and Callicratidas, a *mothax* (see HELOT). When Alcibiades urged the Spartans to send a general to lead the Syracusan resistance against the Athenian expedition, Gylippus was appointed, and his arrival was undoubtedly the turning point of the struggle (414–413). Though at first his long hair, his threadbare cloak and his staff furnished the subject of many a jest, and his harsh and overbearing manner caused grave discontent, yet the rapidity and decisiveness of his movements, won the sympathy and respect of the Syracusans. Diodorus (xiii. 28-32), probably following Timaeus, represents him as inducing the Syracusans to pass sentence of death on the captive Athenian generals, but we need have no hesitation in accepting the statement of Philistus (Plutarch, *Nicias*, 28), a Syracusan who himself took part in the defence, and Thucydides (vii. 86), that he tried, though without success, to save their lives, wishing to take them to Sparta as a signal proof of his success. Gylippus fell, as his father had done, through avarice; entrusted by Lysander with an immense sum which he was to deliver to the ephors at Sparta, he could not resist the temptation to enrich himself and, on the discovery of his guilt, went into exile.

Thucydides vi. 93. 104. vii.; Plutarch, *Nicias*, 19. 21. 27. 28. *Lysander*, 16, 17; Diodorus xiii. 7. 8. 28-32; Polyaenus i. 39. 42). See SYRACUSE (for the siege operations), commentaries on Thucydides and the Greek histories.

GYLLEMBOURG-EHRENSVÄRD, THOMASINE CHRISTINE, BARONESS (1773–1856), Danish author, was born on the 9th of November 1773, at Copenhagen. Her maiden name was Buntzen. Her great beauty early attracted notice, and before she was seventeen she married the famous writer Peter Andreas Heiberg. To him she bore in the following year a son, afterwards illustrious as the poet and critic Johan Ludvig Heiberg. In 1800 her husband was exiled, and she obtained a divorce, marrying in December 1801 the Swedish Baron K. F. Ehrensvärd, himself a political fugitive. Her second husband, who presently adopted the name of Gyllembourg, died in 1815. In 1822 she followed her son to Kiel, where he was appointed professor, and in 1825 she returned with him to Copenhagen. In 1827 she first appeared as an author by publishing her romance of *The Polonius Family* in her son's newspaper *Flyvende Post*. In 1828 the same journal contained *The Magic Ring*, which was immediately followed by *En Hverdags historie* (*An Everyday Story*). The success of this anonymous work was so great that the author adopted until the end of her career the name of "The Author of *An Everyday Story*." In 1833–1834 she published three volumes of *Old and New Novels*. *New Stories* followed in 1835 and 1836. In 1839 appeared two novels, *Montanus the Younger* and *Ricida*; in 1840, *One in All*; in 1841, *Near and Far*; in 1843, *A Correspondence*; in 1844, *The Cross Ways*; in 1845, *Two Generations*. From 1849 to 1851 the Baroness Ehrensvärd-Gyllembourg was engaged in bringing out a library edition of her collected works in twelve volumes. On the 2nd of July 1856 she died in her son's house at Copenhagen. Not until then did the secret of her authorship transpire; for throughout her life she had preserved the closest reticence on the subject even with her nearest friends. The style of Madame Ehrensvärd-Gyllembourg is clear and sparkling; for English readers no closer analogy can be found than between her and Mrs Gaskell, and *Cranford* might well have been written by the witty Danish authoress.

See J. L. Heiberg, *Peter Andreas Heiberg og Thomasine Gyllembourg* (Copenhagen, 1882), and L. Kornelius-Hybel, *Nogle Bemærkninger om P. A. Heiberg og Fru Gyllembourg* (Copenhagen, 1883).

GYLLENSTJERNA, JOHAN, COUNT (1635–1680), Swedish statesman, completed his studies at Upsala and then visited most of the European states and laid the foundations of that deep insight into international politics which afterwards distinguished him. On his return home he met King Charles X. in the Danish islands and was in close attendance upon him till the monarch's death in 1660. He began his political career at the diet which assembled in the autumn of the same year. An aristocrat by birth and inclination, he was nevertheless a true patriot and demanded the greatest sacrifices from his own order in the national interests. He was therefore one of those who laboured most zealously for the recovery of the crown lands. In the Upper House he was the spokesman of the gentry against the magnates, whose inordinate privileges he would have curtailed or abolished. His adversaries vainly endeavoured to gain him by favour, for as court-marshal and senator he was still more hostile to the dominant patricians who followed the adventurous policy of Magnus de la Gardie. Thus he opposed the French alliance which de la Gardie carried through in 1672, and consistently advocated economy in domestic and neutrality in foreign affairs. On the outbreak of the war in 1675 he was the

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most loyal and energetic supporter of the young Charles XI., and finally his indispensable counsellor. Indeed, it may be said, that the political principles which he instilled into the youthful monarch were faithfully followed by Charles during the whole of his reign. In 1679 Gyllenstjerna was appointed the Swedish plenipotentiary at the peace congress of Lund. The alliance which he then concluded with Denmark bound the two northern realms together in a common foreign policy, and he sought besides to facilitate their harmonious co-operation by every means in his power. In 1680, after bringing home Charles XI.'s Danish bride from Copenhagen, he was appointed governor-general of Scania (Skåne), but expired a few weeks later.

See M. Hojer, *Öfversigt af Sveriges yttre politik under åren 1676–1680* (Upsala, 1875). (R. N. B.)

GYMKHANA, a display of miscellaneous sports, originally at the military stations of India. The word would seem to be a colloquial remodelling of the Hindustani *gend-khana*, ball-house or racquet-court, by substituting for *gend* the first syllable of the English word "gymnastics." The definition given in Yule's *Glossary* is as follows: "A place of public resort at a station, where the needful facilities for athletics and games . . . are provided." The name of the place was afterwards applied to the games themselves, and the word is now used almost exclusively in this sense. According to Yule the first use of it that can be traced was, on the authority of Major John Trotter, at Rurki in the year 1861, when a gymkhana was instituted there. Gymkhana sports were invented to relieve the monotony of Indian station life, and both officers and men from the ranks took part in them. The first meetings consisted of promiscuous horse and pony races at catch weights. To these were soon added a second variety, originally called the *pāgōl* (funny races), the one generally known outside India, which consisted of miscellaneous races and competitions of all kinds, some serious and some amusing, on horseback, on foot and on bicycles. Among these may be mentioned the usual military sports; such as tent-pegging, lemon-cutting and obstacle racing; rickshaw racing; tilting at the ring sack, pillion, hurdle, egg-and-spoon, blindfold, threading-the-needle and many other kinds of races depending upon the inventive powers of the committees in charge.

GYMNASTICS AND GYMNASIUM, terms signifying respectively a system of physical exercises practised either for recreation or for the purpose of promoting the health and development of the body, and the building where such exercises are carried on. The gymnasium of the Greeks was originally the school where competitors in the public games received their training, and was so named from the circumstance that these competitors exercised naked (*γυμνός*). The gymnasium was a public institution as distinguished from the palaestra, which was a private school where boys were trained in physical exercises, though the term palaestra is also often used for the part of a gymnasium specially devoted to wrestling and boxing. The athletic contests for which the gymnasium supplied the means of training and practice formed part of the social life of the Greeks from the earliest times. They were held in honour of heroes and gods; sometimes forming part of a periodic festival, sometimes of the funeral rites of a deceased chief. In course of time the Greeks grew more attached to such sports; their free active life, spent to a great extent in the open air, fostered the liking almost into a passion. The victor in any athletic contest, though he gained no money prize, was rewarded with the honour and respect of his fellow citizens; and a victory in the great religious festivals was counted an honour for the whole state. In these circumstances the training of competitors for the greater contests became a matter of public concern; and accordingly special buildings were provided by the state, and their management entrusted to public officials. The regulation of the gymnasium at Athens is attributed by Pausanias (i. 39. 3) to Theseus. Solon made several laws on the subject; but according to Galen it was reduced to a system in the time of Cleisthenes. Ten *gymnasiarchs*, one from each tribe, were appointed annually. These performed in rotation the duties of their office, which were to maintain and pay the persons who were training for public contests, to conduct the games at the great Athenian festivals, to exercise general supervision over the morals of the youths, and to adorn and keep up the gymnasium. This office was one of the ordinary *λειτουργίαι* (public services), and great expense was entailed on the holders. Under them were ten *sophronistae*, whose duty was to watch the conduct of the youths at all times, and especially to be present at all their games. The practical teaching and selecting of the suitable exercises for each youth were in the hands of the *paedotribae* and *gymnastae*, the latter of whom also superintended the effect on the constitution of the pupils, and prescribed for them when they were unwell. The *aleiptae* oiled and rubbed dust on the bodies of the youths, acted as surgeons, and administered the drugs prescribed. According to Galen there was also a teacher of the various games of ball. The gymnasia built to suit these various purposes were large buildings, which contained not merely places for each kind of exercise, but also a stadium, baths, covered porticos for practice in bad weather, and outer porticos where the philosophers and men of letters read public lectures and held disputations.

The gymnasium of the Greeks did not long remain an institution exclusively devoted to athletic exercises. It soon began to be applied to other uses even more important. The development arose naturally through the recognition by the Greeks of the important place in education occupied by physical culture, and of the relation between exercise and health. The gymnasium accordingly became connected with education on the one hand and with medicine on the other. Due training of the body and maintenance of the health and strength of children were the chief part of earlier Greek education. Except the time devoted to letters and music, the education of boys was conducted in the gymnasia, where provision was made, as already mentioned, for their moral as well as their physical training. As they grew older, conversation and social intercourse took the place of the more systematic discipline. Philosophers and sophists assembled to talk and to lecture in the gymnasia, which thus became places of general resort for the purpose of all less systematic intellectual pursuits, as well as for physical exercises. In Athens there were three great public gymnasia—Academy, Lyceum and Cynosarges—each of which was consecrated to a special deity with whose statue it was adorned; and each was rendered famous by association with a celebrated school of philosophy. Plato's teaching in the Academy has given immortality to that gymnasium; Aristotle conferred lustre on the Lyceum; and the Cynosarges was the resort of the Cynics. Plato when treating of education devotes much consideration to gymnastics (see especially *Rep.* iii. and various parts of *Laws*); and according to Plato it was the sophist Prodicus who first pointed out the connexion between gymnastics and health. Having found such exercises beneficial to his own weak health, he formulated a method which was adopted generally, and which was improved by Hippocrates. Galen lays the greatest stress on the proper use of gymnastics, and throughout ancient medical writers we find that special exercises are prescribed *as* the cure for special diseases.

The Greek institution of the gymnasium never became popular with the Romans, who regarded the training of boys in gymnastics with contempt as conducive to idleness and immorality, and of little use from a military point of view; though at Sparta gymnastic training had been chiefly valued as encouraging warlike tastes and promoting the bodily strength needed for the use of weapons and the endurance of hardship. Among the Romans of the republic, the games in the Campus Martius, the duties of camp life, and the enforced marches and other hardships of actual warfare, served to take the place of the gymnastic exercises required by the Greeks. The first public gymnasium at Rome was built by Nero and another by Commodus. In the middle ages, though jousts and feats of horsemanship and field sports of various kinds were popular, the more systematic training of the body which the Greeks had associated with the gymnasium fell into neglect; while the therapeutic value of special exercises as understood by Hippocrates and Galen appears to have been lost sight of. Rousseau, in his *Émile*, was the first in modern times to call attention to the injurious consequences of such

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indifference, and he insisted on the importance of physical culture as an essential part of education. It was probably due in some measure to his influence that F. L. Jahn and his followers in Germany, encouraged by the Prussian minister Stein, established the *Turnplätze*, or gymnastic schools, which played an important part during the War of Liberation, and in the political agitations which followed the establishment of the German confederation by the Congress of Vienna. The educational reformers Pestalozzi and Froebel emphasized the need for systematic physical training in any complete scheme of education.

The later development of the classical gymnasium (when it had become the school of intellectual culture rather than of exclusively physical exercise), and not the original idea, has been perpetuated in the modern use of the word in Germany, where the name "gymnasium" is given to the highest grade of secondary school, and the association of the word with athleticism has been entirely abandoned. On the other hand, in England, France and elsewhere in Europe, as well as in America, the history of the word has been precisely the reverse; the connexion of the gymnasium with philosophy and mental culture has been dropped, and it indicates a building exclusively intended for the practice of physical exercises. But whereas the Greeks received training in the gymnasium for contests which are now designated as *athletic sports* (*q.v.*), gymnastics in the modern sense is a term restricted to such exercises as are usually practised indoors, with or without the aid of mechanical appliances, as distinguished from sports or games practised in the open air.

It was not until near the end of the 19th century that gymnastics were recognized in England as anything more than a recreation; their value as a specifically therapeutic agent, or as an article in the curriculum of elementary schools, was not realized. More recently, however, educationists have urged with increasing insistence the need for systematic physical training, and their views received greater attention when evidence of deterioration in the physique of the people began to accumulate. During the first decade of the 20th century more than one commission reported to parliament in England in favour of more systematic and general physical training being encouraged or even made compulsory by public authority. Voluntary associations were formed for encouraging such training and providing facilities for it. Gymnastics had already for several years been an essential part of the training of army recruits with exceedingly beneficial results, and gymnasia had been established at Aldershot and other military centres. Physical exercises, although not compulsory, obtained a permanent place in the code for elementary schools in Great Britain; and much care has been taken to provide a syllabus of exercises adapted for the improvement of the physique of the children. These exercises are partly gymnastic and partly of the nature of drill; they do not in most cases require the use of appliances, and are on that account known as "free movements," which numbers of children go through together, accompanied whenever possible by music. On the other hand at the larger public schools and universities there are elaborate gymnasia equipped with a great variety of apparatus, the skilful use of which demands assiduous practice; and this is encouraged by annual contests between teams of gymnasts representing rival institutions.

Gymnastic apparatus.

The appliances vary to some extent in different gymnasia, some of the more complicated requiring a greater amount of space and involving a larger cost than is often practicable. But where these considerations are negligible, substantial uniformity is to be found in the equipment of gymnasia not designed for specifically medical purposes. The simplest, and in many respects the most generally useful, of all gymnastic apparatus is the dumb-bell. It was in use in England as early as the time of Elizabeth, and it has the advantage that it admits of being exactly proportioned to the individual strength of each learner, and can be adjusted in weight as his strength increases. The exercises that may be performed with the dumb-bell, combined with a few simple drill-like movements, give employment to all parts of the body and to both sides equally. Dumb-bell exercises, therefore, when arranged judiciously and with knowledge, are admirably suited for developing the physique, and are extensively employed in schools both for boys and girls. The bar-bell is merely a two-handed dumb-bell, and its use is similar in principle. The Indian club is also in use in most gymnasia; but the risk of overstraining the body by its unskilful handling makes it less generally popular than the dumb-bell. All these appliances may be, and often are, used either in ordinary schoolrooms or elsewhere outside the gymnasium. The usual fixed sorts of apparatus, the presence of which (or of some of them) in a building may be said to constitute it a gymnasium, are the following: a leaping-rope; a leaping-pole; a vaulting-horse; a horizontal bar, so mounted between two upright posts that its height from the ground may be adjusted as desired; parallel bars, used for exercises to develop the muscles of the trunk and arms; the trapeze consisting of a horizontal bar suspended by ropes at a height of 4 to 5 ft. from the ground; the bridge ladder; the plank; the inclined plane; the mast; swinging rings; the prepared wall; the horizontal beam.

Before the end of the 19th century the therapeutic value of gymnastics was fully realized by the medical profession; and a number of medical or surgical gymnasia came into existence, provided with specially devised apparatus for the treatment of different physical defects or weaknesses. The exercises practised in them are arranged upon scientific principles based on anatomical and physiological knowledge; and these principles have spread thence to influence largely the practice of gymnastics in schools and in the army. A French medical writer enumerates seven distinct groups of maladies, each including a number of different complaints, for which gymnastic exercises are a recognized form of treatment; and there are many malformations of the human body, formerly believed to be incurable, which are capable of being greatly remedied if not entirely corrected by regular gymnastic exercises practised under medical direction.

The value of gymnastics both for curing defects, and still more for promoting health and the development of normal physique, is recognized even more clearly on the continent of Europe than in Great Britain. In Germany the government not only controls the practice of gymnastics but makes it compulsory for every child and adult to undergo a prescribed amount of such physical training. In France also, physical training by gymnastics is under state control; in Sweden, Denmark, Switzerland, Italy, Russia, systems more or less distinct enjoy a wide popularity; and in Finland gymnastics are practised on lines that exhibit national peculiarities. The Finns introduce an exceptional degree of variety into their exercises as well as into the appliances devised to assist them; women are scarcely less expert than men in the performance of them; and the enthusiasm with which the system is supported produces the most beneficial results in the physique of the people. International gymnastic contests have become a feature of the revived Olympic Games (see ATHLETIC SPORTS), and in those held at Athens in 1906 a team of Danish ladies took part in the competition and proved by their skilful performance that gymnastics may be practised with as much success by women as by men.

The chief work on the ancient gymnastics is Krause, *Gymnastik und Agonistik der Hellenen* (1841); of more recent works mention may be made of Jäger, *Gymnastik der Hellenen* (1881); L. Grasberger, *Erziehung und Unterricht im klassischen Altertum* (1881); J. P. Mahaffy, *Old Greek Education* (1883); A. S. Wilkins, *National Education in Greece* (1873); E. Paz, *Histoire de la gymnastique* (1886); Wickenhagen, *Antike und moderne Gymnastik* (1891); Becker-Goll, *Charicles* ii.; Brugama, *Gymnasiorum apud Graecos descriptio* (1855); Petersen, *Das Gymnasium der Griechen* (1858). See also N. Laisné, *Gymnastique pratique* (Paris, 1879); Collineau, *La Gymnastique* (Paris, 1884); *L'Hygiène à l'école* (Paris, 1889); P. de Coubertin, *La Gymnastique utilitaire* (Paris, 1905); H. Nissen, *Rational Home Gymnastics* (Boston, 1903). (R. J. M.)

GYMNOSOPHISTS (Lat. *gymnosophistae*, from Gr. *γυμνός*, *σοφιστής*, "naked philosophers"), the name given by the Greeks to certain ancient Hindu philosophers who pursued asceticism to the point of regarding food and clothing as detrimental to purity of thought. From the fact that they often

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lived as hermits in forests, the Greeks also called them *Hylobioi* (cf. the *Vâna-prasthâs* in Sanskrit writings). Diogenes Laërtius (ix. 61 and 63) refers to them, and asserts that Pyrrho of Elis, the founder of pure scepticism, came under their influence, and on his return to Elis imitated their habits of life, to what extent does not appear. Strabo (xv. 711, 714) divides them into Brahmans and Sarmans (or Shamans). See JAINS.

GYMNOSPERMS, in Botany. The Gymnosperms, with the Angiosperms, constitute the existing groups of seed-bearing plants or Phanerogams: the importance of the seed as a distinguishing feature in the plant kingdom may be emphasized by the use of the designation Spermophyta for these two groups, in contrast to the Pteridophyta and Bryophyta in which true seeds are unknown. Recent discoveries have, however, established the fact that there existed in the Palaeozoic era fern-like plants which produced true seeds of a highly specialized type; this group, for which Oliver and Scott proposed the term Pteridospermae in 1904, must also be included in the Spermophyta. Another instance of the production of seeds in an extinct plant which further reduces the importance of this character as a distinguishing feature is afforded by the Palaeozoic genus *Lepidocarpon* described by Scott in 1901; this lycopodiaceous type possessed an integumented megaspore, to which the designation seed may be legitimately applied (see PALAEOBOTANY: *Palaeozoic*).

As the name Gymnosperm (Gr. *γυμνός*, naked, *σπέρμα*, seed) implies, one characteristic of this group is the absence of an ovary or closed chamber containing the ovules. It was the English botanist Robert Brown who first recognized this important distinguishing feature in conifers and cycads in 1825; he established the gymnospermy of these seed-bearing classes as distinct from the angiospermy of the monocotyledons and dicotyledons. As Sachs says in his history of botany, "no more important discovery was ever made in the domain of comparative morphology and systematic botany." As Coulter and Chamberlain express it, "the habitats of the Gymnosperms to-day indicate that they either are not at home in the more genial conditions affected by Angiosperms, or have not been able to maintain themselves in competition with this group of plants."

These naked-seeded plants are of special interest on account of their great antiquity, which far exceeds that of the Angiosperms, and as comprising different types which carry us back to the Palaeozoic era and to the forests of the coal period. The best known and by far the largest division of the Gymnosperms is that of the cone-bearing trees (pines, firs, cedars, larches, &c.), which play a prominent part in the vegetation of the present day, especially in the higher latitudes of the northern hemisphere; certain members of this class are of considerable antiquity, but the conifers as a whole are still vigorous and show but little sign of decadence. The division known as the Cycadophyta is represented by a few living genera of limited geographical range and by a large number of extinct types which in the Mesozoic era (see PALAEOBOTANY: *Mesozoic*) played a conspicuous part in the vegetation of the world. Among existing Cycadophyta we find surviving types which, in their present isolation, their close resemblance to fossil forms, and in certain morphological features, constitute links with the past that not only connect the present with former periods in the earth's history, but serve as sign-posts pointing the way back along one of the many lines which evolution has followed.

It is needless to discuss at length the origin of the Gymnosperms. The two views which find most favour in regard to the Coniferales and Cycadophyta are: (1) that both have been derived from remote filicinean ancestors; (2) that the cycads are the descendants of a fern-like stock, while conifers have been evolved from lycopodiaceous ancestors. The line of descent of recent cycads is comparatively clear in so far as they have undoubted affinity with Palaeozoic plants which combined cycadean and filicinean features; but opinion is much more divided as to the nature of the phylum from which the conifers are derived. The Cordaitales (see PALAEOBOTANY: *Palaeozoic*) are represented by extinct forms only, which occupied a prominent position in the Palaeozoic period; these plants exhibit certain features in common with the living Araucarias, and others which invite a comparison with the maidenhair tree (*Ginkgo biloba*), the solitary survivor of another class of Gymnosperms, the Ginkgoales (see PALAEOBOTANY: *Mesozoic*). The Gnetales are a class apart, including three living genera, of which we know next to nothing as regards their past history or line of descent. Although there are several morphological features in the three genera of Gnetales which might seem to bring them into line with the Angiosperms, it is usual to regard these resemblances as parallel developments along distinct lines rather than to interpret them as evidence of direct relationship.

Gymnospermae.—Trees or shrubs; leaves vary considerably in size and form. Flowers unisexual, except in a few cases (Gnetales) without a perianth. Monoecious or dioecious. Ovules naked, rarely without carpellary leaves, usually borne on carpophylls, which assume various forms. The single megaspore enclosed in the nucellus is filled with tissue (prothallus) before fertilization, and contains two or more archegonia, consisting usually of a large egg-cell and a small neck, rarely of an egg-cell only and no neck (*Gnetum* and *Welwitschia*). Microspore spherical or oval, with or without a bladder-like extension of the exine, containing a prothallus of two or more cells, one of which produces two non-motile or motile male cells. Cotyledons two or several. Secondary xylem and phloem produced by a single cambium, or by successive cambial zones; no true vessels (except in the Gnetales) in the wood, and no companion-cells in the phloem.

I. *Pteridospermae* (see PALAEOBOTANY, PALAEOZOIC).
II. *Cycadophyta.*
  A. Cycadales (recent and extinct).
  B. Bennettitales (see PALAEOBOTANY: *Mesozoic*).
III. *Cordaitales* (see PALAEOBOTANY: *Palaeozoic*).
IV. *Ginkgoales* (recent and extinct).
V. *Coniferales.*
  A. Taxaceae.
  B. Pinaceae.

There is no doubt that the result of recent research and of work now in progress will be to modify considerably the grouping of the conifers. The family *Araucariaceae*, represented by *Araucaria* and *Agathis*, should perhaps be separated as a special class and a rearrangement of other genera more in accord with a natural system of classification will soon be possible; but for the present its twofold subdivision may be retained.

VI. *Gnetales.*
  A. Ephedroideae.
  B. Gnetoideae.
  C. Welwitschioideae (Tumboideae).

CYCADOPHYTA.—A. *Cycadales.*—Stems tuberous or columnar, not infrequently branched, rarely epiphytic (Peruvian species of *Zamia*); fronds pinnate, bi-pinnate in the Australian genus *Bowenia*. Dioecious; flowers in the form of cones, except the female flowers of *Cycas*, which consist of a rosette of leaf-like carpels at the apex of the stem. Seeds albuminous, with one integument; the single embryo, usually bearing two partially fused cotyledons, is attached to a long tangled suspensor. Stems and roots increase in diameter by secondary thickening, the secondary wood being produced by one cambium or developed from successive cambium-rings.

The cycads constitute a homogeneous group of a few living members confined to tropical and sub-tropical regions. As a fairly typical and well-known example of the Cycadaceae, a species of the genus *Cycas* (e.g. *C. circinalis*, *C. revoluta*, &c.) is briefly described. The stout columnar stem may reach a height of 20 metres, and a diameter of half a metre; it remains either unbranched or divides near the summit into several short and thick branches, each branch terminating in a crown of long pinnate leaves. The surface of the stem is covered with rhomboidal areas, which represent the persistent bases of foliage- and scale-leaves. In some species of *Cycas* there is a well-defined alternation of transverse zones on the stem, consisting of larger areas representing foliage-leaf bases, and similar but smaller areas formed by the bases of scale-leaves (*F* and *S*, fig. 1). The scale-leaves clothing the terminal bud are linear-lanceolate in form, and of a brown or yellow colour; they are pushed aside as the stem-axis elongates and becomes shrivelled, finally falling off, leaving projecting bases which are eventually cut off at a still lower level. Similarly, the dead fronds fall off, leaving a ragged petiole, which is afterwards separated from the stem by an absciss-layer a short distance above the base. In some species of *Cycas* the leaf-bases do not persist as a permanent covering to the stem, but the surface

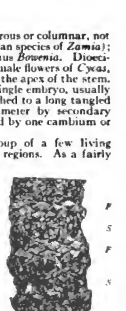

FIG. 1.—Stem of *Cycas*. *F*, foliage-leaf bases; *S*, scale-leaf bases.

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is covered with a wrinkled bark, as in *Cycas siamensis*, which has a stem of unusual form (fig. 2). Small tuberous shoots, comparable on a large scale with the bulbils of *Lycopodium Selago*, are occasionally produced in the axils of some of the persistent leaf-bases; these are characteristic of sickly plants, and serve as a means of vegetative reproduction. In the genus *Cycas* the female flower is peculiar among cycads in consisting of a terminal crown of separate leaf-like carpels several inches in length; the apical portion of each carpellary leaf may be broadly triangular in form, and deeply dissected on the margins into narrow woolly appendages like rudimentary pinnae.

FIG. 2.—*Cycas siamensis*.

From the lower part of a carpel are produced several laterally placed ovules, which become bright red or orange on ripening; the bright fleshy seeds, which in some species are as large as a goose's egg, and the tawny spreading carpels produce a pleasing combination of colour in the midst of the long dark-green fronds, which curve gracefully upwards and outwards from the summit of the columnar stem. In *Cycas* the stem apex, after producing a cluster of carpellary leaves, continues to elongate and produces more bud-scales, which are afterwards pushed aside as a fresh crown of fronds is developed.

The young leaves of *Cycas* consist of a straight rachis bearing numerous linear pinnae, traversed by a single midrib; the pinnae are circinately coiled like the leaf of a fern (fig. 3). The male flower of *Cycas* conforms to the type of structure characteristic of the cycads, and consists of a long cone of numerous sporophylls bearing many oval pollen-sacs on their lower faces. The type described serves as a convenient representative of its class. There are eight other living genera, which may be classified as follows:—

Classification.—A. *Cycadeae*.—Characterized by (*a*) the alternation of scale- and foliage-leaves (fig. 1) on the branched or unbranched stem; (*b*) the growth of the main stem through the female flower; (*c*) the presence of a prominent single vein in the linear pinnae; (*d*) the structure of the female flower, which is peculiar in not having the form of a cone, but consists of numerous independent carpels, each of which bears two or more lateral ovules. Represented by a single genus, *Cycas*. (Tropical Asia, Australia, &c.).

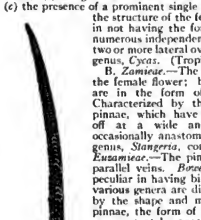

FIG. 3.—*Cycas*, Young Frond.

B. *Zamieae*.—The stem does not grow through the female flower; both male and female flowers are in the form of cones. (a) *Stangerieae*.—Characterized by the fern-like venation of the pinnae, which have a prominent midrib, giving off at a wide angle simple or forked and occasionally anastomosing lateral veins. A single genus, *Stangeria*, confined to South Africa. (b) *Euzamieae*.—The pinnae are traversed by several parallel veins. *Boweniа*, an Australian cycad, is peculiar in having bi-pinnate fronds (fig. 5). The various genera are distinguished from one another by the shape and manner of attachment of the pinnae, the form of the carpellary scales, and to some extent by anatomical characters. *Encephalartos* (South and Tropical Africa).—Large cones; the carpellary scales terminate in a peltate distal expansion. *Macrozamia* (Australia).—Similar to *Encephalartos* except in the presence of a spinous projection from the swollen distal end of the carpels. *Zamia* (South America, Florida, &c.).—Stem short and often divided into several columnar branches. Each carpel terminates in a peltate head. *Ceratozamia* (Mexico).—Similar in habit to *Macrozamia*, but distinguished by the presence of two horn-like spinous processes on the apex of the carpels. *Microcycas* (Cuba).—Like *Zamia*, except that the ends of the stamens are flat, while the apices of the carpels are peltate. *Dioon* (Mexico) (fig. 4).—Characterized by the woolly scale-leaves and carpels; the latter terminate in a thick laminar expansion of triangular form, bearing two placental cushions, on which the ovules are situated. *Bowenia* (Australia).—Bi-pinnate fronds; stem short and tuberous (fig. 5).

Stem and leaf.

The stems of cycads are often described as unbranched; it is true that in comparison with conifers, in which the numerous branches, springing from the main stem, give a characteristic form to the tree, the tuberous or columnar stem of the Cycadaceae constitutes a striking distinguishing feature. Branching, however, occurs not infrequently; in *Cycas* the tall stem often produces several candelabra-like arms; in *Zamia* the main axis may break up near the base into several cylindrical branches; in species of *Dioon* (fig. 4) lateral branches are occasionally produced. The South African *Encephalartos* frequently produces several branches. Probably the oldest example of this genus in cultivation is in the Botanic Garden of Amsterdam, its age is considered by Professor de Vries to be about two thousand years; although an accurate determination of age is impossible, there is no doubt that many cycads grow very slowly and are remarkable for longevity. The thick armour of petiole-bases enveloping the stem is a characteristic Cycadean feature; in *Cycas* the alternation of scale-leaves and fronds is more clearly shown than in other cycads; in *Encephalartos*, *Dioon*, &c., the persistent scale-leaf bases are almost equal in size to those of the foliage-leaves, and there is no regular alternation of zones such as characterizes some species of *Cycas*. Another type of stem is illustrated by *Stangeria* and *Zamia*, also by a few forms of *Cycas* (fig. 2), in which the fronds fall off completely, leaving a comparatively smooth stem. The *Cyas* type of frond, except as regards the presence of a midrib in each pinna, characterizes the cycads generally, except *Bowenia* and *Stangeria*. In the monotypic genus *Bowenia* the large fronds, borne singly on the short and thick stem, are bi-pinnate (fig. 5); the segments, which are broadly ovate or rhomboidal, have several forked spreading veins, and resemble the large pinnules of some species of *Adiantum*. In *Stangeria*, also a genus represented by one species (*S. paradoxa* of South Africa), the long and comparatively broad pinnae, with an entire or irregularly incised margin, are very fern-like, a circumstance which led Kunze to describe the plant in 1835 as a species of the fern *Lomaria*. In rare cases the pinnae of cycads are lobed or branched: in *Dioon spinulosum* (Central America) the margin of the segments bears numerous spinous processes; in some species of *Encephalartis*, *e.g. E. horridus*, the lamina is deeply lobed; and in a species of the Australian genus *Macrozamia*, *M. heteromera*, the narrow pinnae are dichotomously branched almost to the base (fig. 6), and resemble the frond of some species of the fern *Schizaea*, or the fossil genus *Baiera* (Ginkgoales). An interesting species of *Cycas*, *C. Micheliisi*, has recently been described by Sir William Thiselton-Dyer from Annam, where it was collected by one of Messrs Sanders & Son's collectors, in which the pinnae instead of being of the usual simple type are

From a photograph of a plant in the Peradeniya Gardens, Ceylon, by Professor R. H. Yapp.

FIG. 4.—*Dioon edule*.

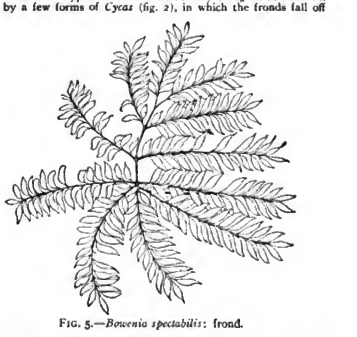

FIG. 5.—*Bowenia spectabilis*: frond.

FIG. 6.—*Macrozamia heteromera*. *A*, part of frond; *B*, single pinna.

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dichotomously branched as in *Macrozamia heteromera*. In *Ceratozamia* the broad petiole-base is characterized by the presence of two lateral spinous processes, suggesting stipular appendages, comparable, on a reduced scale, with the large stipules of the Marattiaceae among Ferns. The vernation varies in different genera; in *Cycas* the rachis is straight and the pinnae circinately coiled (fig. 3); in *Encephalartos*, *Dioon*, &c., both rachis and segments are straight; in *Zamia* the rachis is bent or slightly coiled, bearing straight pinnae. The young leaves arise on the stem-apex as conical protuberances with valvate borders, on which the pinnae appear as rounded lateral lobes, usually in basipetal order; the scale-leaves in their young condition resemble fronds, but the lamina remains undeveloped. A feature of interest in connexion with the phylogeny of cycads is the presence of long hairs clothing the scale-leaves, and forming a cap on the apex of the stem-apex or attached to the bases of petioles; on some fossil cycadean plants these outgrowths have the form of scales, and are identical in structure with the ramenta (paleae) of the majority of ferns.

Flower.

The male flowers or cycads are constructed on a uniform plan, and in all cases consist of an axis bearing crowded, spirally disposed sporophylls. These are often wedge-shaped and angular; in some cases they consist of a short, thick stalk, terminating in a peltate expansion, or prolonged upwards in the form of a triangular lamina. The sporangia (pollen-sacs), which occur on the under-side of the stamens, are often arranged in more or less definite groups or sori, interspersed with hairs (paraphyses); dehiscence takes place along a line marked out by the occurrence of smaller and thinner-walled cells bounded by larger and thicker-walled elements, which form a fairly prominent cap-like "annulus" near the apex of the sporangium, not unlike the annulus characteristic of the Schizaeaceae among ferns. The sporangial wall, consisting of several layers of cells, encloses a cavity containing numerous larval spores (pollen-grains). In structure a cycadean sporangium recalls those of certain ferns (Marattiaceae, Osmundaceae and Schizaeaceae), but in the development of the spores there are certain peculiarities not met with among the Vascular Cryptogams. With the exception of *Cycas*, the female flowers are also in the form of cones, bearing numerous carpellary scales. In *Cycas revoluta* and *C. circinalis* each leaf-like carpel may produce several laterally attached ovules, but in *C. Normanbyana* the carpel is shorter and the ovules are reduced to two; this latter type brings us nearer to the carpels of *Dioon*, in which the flower has the form of a cone, and the distal end of the carpels is longer and more leaf-like than in the other genera of the *Zamiae*, which are characterized by shorter carpels with thick peltate heads bearing two ovules on the morphologically lower surface. The cones of cycads attain in some cases (*e.g. Encephalartos*) a considerable size, reaching a length of more than a foot. Cases have been recorded (by Thiselton-Dyer in *Encephalartos* and by Wieland in *Zamia*) in which the short cone-scales exhibit a foliaceous form. It is interesting that no monstrous cycadean cone has been described in which ovuliferous and staminate appendages are borne on the same axis: in the Bennettitales (see PALAEOBOTANY: *Mesozoic*) flowers were produced bearing on the same axis both androecium and gynoecium.

Micro-spores and mega-spores.

The pollen-grains when mature consist of three cells, two small and one large cell; the latter grows into the pollen-tube, as in the Coniferales, and forms one of the small cells two large ciliated spermatozoids are eventually produced. A remarkable exception to this rule has recently been recorded by Caldwell, who found that in *Microcycas Calocoma* the body-cells may be eight or even ten in number and the sperm-cells twice as numerous. One of the most important discoveries made during the latter part of the 19th century was that by Ikeno, a Japanese botanist, who first demonstrated the existence of motile male cells in the genus *Cycas*. Similar spermatozoids were observed in some species of *Zamia* by H. J. Webber, and more recent work enables us to assume that all cycads produce ciliated male gametes. Before following the growth of the pollen-grain after pollination, we will briefly describe the structure of a cycadean ovule. An ovule consists of a conical nucellus surrounded by a single integument. At an early stage of development a large cell makes its appearance in the central region of the nucellus; this increases in size and eventually forms three cells; the lowest of these grows downwards and constitutes the megaspore (embryo-sac), which ultimately absorbs the greater part of the nucellus. The megaspore-nucleus divides repeatedly, and cells are produced from the peripheral region inwards, which eventually fill the sporecavity with a homogeneous tissue (prothallus); some of the superficial cells at the micropylar end of the megaspore increase in size and divide by a tangential wall into two, an upper cell which gives rise to the short two-celled neck of the archegonium, and a lower cell which develops into a large egg-cell. Each megaspore may contain 2 to 6 archegonia. During the growth of the ovum nourishment is supplied from the contents of the cells immediately surrounding the egg-cell, as in the development of the ovum of *Pinus* and other conifers. Meanwhile the tissue in the apical region of the nucellus has been undergoing disorganization, which results in the formation of a pollen-chamber (fig. 7, *C*) immediately above the megaspore. Pollination in cycads has always been described as anemophilous, but according to recent observations by Pearson on South African species it seems probable that, at least in some cases, the pollen is conveyed to the ovules by animal agency. The pollen-grains find their way between the carpophylls, which at the time of pollination are slightly apart owing to the elongation of the internodes of the flower-axis, and pass into the pollen-chamber; the large cell of the pollen-grain grows out into a tube (*Pt*), which penetrates the nucellar tissue and often branches repeatedly; the pollen-grain itself, with the prothallus-cells, projects freely into the pollen-chamber (fig. 7). The nucleus of the outermost (second small cell (fig. 7, *G*) divides, and one of the daughter-nuclei passes into the cell, and may enter the lowest (first) small cell. The outermost cell, by the division of the remaining nucleus, produces two large spermatozoids (fig. 8, *a*, *a*). In *Microcycas* the sperm-cells are produced. In the course of division two bodies appear in the cytoplasm, and behave as centrosomes during the karyokinesis; they gradually become threadlike and coil round each daughter nucleus. This thread gives rise to a spiral ciliated band lying in a depression on the body of each spermatozoid; the large spermatozoids eventually escape from the pollen-tube, and are able to perform ciliary movements in the watery liquid which occurs between the thin papery remnant of nucellar tissue and the archegonial necks.

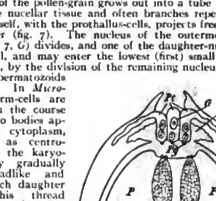

FIG. 7.—*Zamia*. Part of Ovule in longitudinal section. (After Webber.)
P, Prothallus. *Pt*, Pollen-tube.
A, Archegonia. *Pg*, Pollen-grain.
N, Nucellus. *G*, Generative cell (second cell of pollen-tube).
C, Pollen-chamber.

Before fertilization a neck-canal cell is formed by the division of the ovum-nucleus. After the body of a spermatozoid has coalesced with the egg-nucleus the latter divides repeatedly and forms a mass of tissue which grows more vigorously in the lower part of the fertilized ovum, and extends upwards towards the apex of the ovum as a peripheral layer of parenchyma surrounding a central space. By further growth this tissue gives rise to a proembryo, which consists, at the micropylar end, of a sac; the tissue at the chalazal end grows into a long and tangled suspensor, terminating in a mass of cells, which is eventually differentiated into a radicle, plumule and two cotyledons. In the ripe seed the integument assumes the form of a fleshy envelope, succeeded externally by a hard woody shell, internal to which is a thin papery membrane—the apical portion of the nucellus—which is easily dissected out as a conical cap covering the apex of the endosperm. A thorough examination of cycadean seeds has recently been made by Miss Stopes, more particularly with a view to a comparison of their vascular supply with that in Palaeozoic gymnospermous seeds (*Flora*, 1904). The first leaves to appear on the seedling axis are often scale-like, and these are followed by two or more larger laminae, which foreshadow the pinnae of the adult frond.

Anatomy.

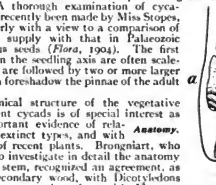

FIG. 8.—*Zamia*. Proximal end of Pollen-tube. *a*, *a*, Spermatozoids from *G* of fig. 7; *Pg*, pollen-grain; *c*, proximal cell (first cell). (After Webber.)

The anatomical structure of the vegetative organs of recent cycads is of special interest as affording important evidence of relationship with extinct types, and with other groups of recent plants. Brongniart, who was the first to investigate in detail the anatomy of a cycadean stem, recognized an agreement, as regards the secondary wood, with Dicotyledons and Gymnosperms, rather than with Monocotyledons. He drew attention also to certain structural similarities between *Cycas* and *Ginkgo*. The main anatomical features of a cycad stem may be summarized as follows: the centre is occupied by a large parenchymatous pith traversed by numerous secretory canals, and in some cases by cauline vascular bundles (*e.g. Encephalartos* and *Macrozamia*). In addition to these cauline strands (confined to the stem and not connected with the leaves), collateral bundles are often met with in the pith, which form the vascular supply of terminal flowers borne at intervals on the apex of the stem. These latter bundles may be seen in sections of old stems to pursue a more or less horizontal course, passing outwards through the main woody cylinder. This lateral course is due to the more vigorous growth of the axillary branch formed near the base of each flower, which is a terminal structure, and, except in the female flower of *Cycas*, puts a limit to the apical growth of the stem. The vigorous lateral branch therefore continues the line of the main axis. The pith is encircled by a cylinder of secondary wood, consisting of single or multiple radial rows of tracheids separated by broad medullary rays composed of large parenchymatous cells; the tracheids bear numerous bordered

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pits on the radial walls. The large medullary rays give to the wood a characteristic parenchymatous or lax appearance, which is in marked contrast to the more compact wood of a conifer. The protoxylem-elements are situated at the extreme inner edge of the secondary wood, and may occur as small groups of narrow, spirally-pitted elements scattered among the parenchyma which abuts on the main mass of wood. Short and reticulately-pitted tracheal cells, similar to tracheids, often occur in the circummedullary region of cycadean stems. In an old stem of *Cycas*, *Encephalartus* or *Macrozamia* the secondary wood consists of several rather unevenly concentric zones, while in some other genera it forms a continuous mass as in conifers and normal dicotyledons. These concentric rings of secondary xylem and phloem (fig. 9) afford a characteristic cycadean feature. After the cambium has been active for some time producing secondary xylem and phloem, the latter consisting of sieve-tubes, phloem-parenchyma and frequently thick-walled fibres, a second cambium is developed in the pericycle; this produces a second vascular zone, which is in turn followed by a third cambium, and so on, until several hollow cylinders are developed. It has been recently shown that several cambium-zones may remain in a state of activity, so that the formation of a new cambium does not necessarily imply cessation of growth in the more internal meristematic rings. It occasionally happens that groups of xylem and phloem are developed internally to some of the vascular rings; these are characterized by an inverse orientation of the tissues, the xylem being centrifugal and the phloem centripetal in its development. The broad cortical region, which contains many secretory canals, is traversed by numerous vascular bundles (fig. 9, *c*) some of which pursue a more or less vertical course, and by frequent anastomoses with one another form a loose reticulum of vascular strands; others are leaf-traces on their way from the stele of the stem to the leaves. Most of these cortical bundles are collateral in structure, but in some the xylem and phloem are concentrically arranged; the secondary origin of these bundles from procambium-strands was described by Treub in his classical paper of 1860. During the increase in thickness of a cycadean stem successive layers of cork-tissue are formed by phellogens in the persistent bases of leaves (fig. 9, *pd*), which increase in size to adapt themselves to the growth of the vascular zones. The leaf-traces of cycads are remarkable both on account of their course and their anatomy. In a transverse section of a stem (fig. 9) one sees some vascular bundles following a horizontal or slightly oblique course in the cortex, stretching for a longer or shorter distance in a direction concentric with the woody cylinder. From each leaf-base two main bundles spread right and left through the cortex of the stem (fig. 9, *ll*), and as they curve gradually towards the vascular ring they present the appearance of two rather flat ogee curves, usually spoken of as the leaf-trace girdles (fig. 9, *ld*). The distal ends of these girdles give off several branches, which traverse the petiole and rachis as numerous collateral bundles. The complicated girdle-like course is characteristic of the leaf-traces of most recent cycads, but in some cases, *e.g.* in *Zamia floridana*, the traces are described by Wieland in his recent monograph on American fossil cycads (*Carnegie Institution Publications*, 1906) as possessing a more direct course similar to that in Mesozoic genera. A leaf-trace, as it passes through the cortex, has a collateral structure, the protoxylem being situated at the inner edge of the xylem; when it reaches the leaf-base the position of the spiral tracheids is gradually altered, and the endarch arrangement (protoxylem internan) gives place to a mesarch structure (protoxylem more or less central and not on the edge of the xylem strand). In a bundle examined in the basal portion of a leaf the bulk of the xylem is found to be centrifugal in position, but internally to the protoxylem there is a group of centripetal tracheids; higher up in the petiole the xylem is mainly centripetal, the centrifugal wood being represented by a small arc of tracheids external to the protoxylem and separated from it by a few parenchymatous elements. Finally, in the pinnae of the frond the centrifugal xylem may disappear, the protoxylem being now exarch in position and abutting on the phloem. Similarly in the sporophylls of some cycads the bundles are endarch near the base and mesarch near the distal end of the stamen or carpel. The vascular system of cycadean seedlings presents some features worthy of note; centripetal xylem occurs in the cotyledonary bundles associated with transfusion-tracheids. The bundles from the cotyledons pursue a direct course to the stele of the main axis, and do not assume the girdle-form characteristic of the adult plant. This is of interest from the point of view of the comparison of recent cycads with extinct species (*Bennettites*), in which the leaf-traces follow a much more direct course than in modern cycads. The mesarch structure of the leaf-bundles is met with in a less pronounced form in the flower peduncles of some cycads. This fact is of importance as showing that the type of vascular structure, which characterized the stems of many Palaeozoic genera, has not entirely disappeared from the stems of modern cycads; but the mesarch bundle is now confined to the leaves and peduncles. The roots of some cycads resemble the stems in producing several cambium-rings; they possess 2 to 8 protoxylem-groups, and are characterized by a broad pericyclic zone. A common phenomenon in cycads is the production of roots which grow upwards (apogeotropic), and appear as coralline branched structures above the level of the ground; some of the cortical cells of these roots are hypertrophied, and contain numerous filaments of blue-green Algae (Nostocaceae), which live as endoparasites in the cell-cavities.

FIG. 9.—*Macrozamia*. Diagrammatic transverse section of part of Stem. (After Worsdell.) *pd*, Petioleram in leaf-bases. *ll*, Leaf-traces in cortex. *ph*, Phloem. *x*, Xylem. *m*, Medullary bundles. *c*, Cortical bundles.

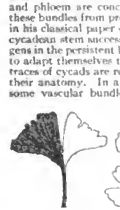

FIG. 10.—*Ginkgo biloba*. Leaves.

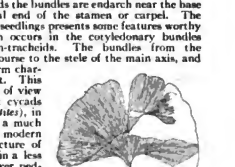

FIG. 11.—*Ginkgo adiantoides*. Fossil (Eocene) leaf from the Island of Mull.

GINKGOALES.—This class-designation has been recently proposed to give emphasis to the isolated position of the genus *Ginkgo* (*Salisburia*) among the Gymnosperms. *Ginkgo biloba*, the maidenhair tree, has usually been placed by botanists in the Taxeae in the neighbourhood of the yew (*Taxus*), but the proposal by Eichler in 1852 to institute a special family, the *Salisburieae*, indicated a recognition of the existence of special characteristics which distinguish the genus from other members of the Coniferae. The discovery by the Japanese botanist Hirase of the development of ciliated spermatozoids in the pollen-tube of *Ginkgo*, in place of the non-motile male cells of typical conifers, served as a cogent argument in favour of separating the genus from the Coniferales and placing it in a class of its own. In 1712 Kaempfer published a drawing of a Japanese tree, which he described under the name *Ginkgo*; this term was adopted in 1771 by Linnaeus, who spoke of Kaempfer's plant as *Ginkgo biloba*. In 1797 Smith proposed to use the name *Salisburia adiantifolia* in preference to the "uncouth" genus *Ginkgo* and the "incorrect" specific term *biloba*. Both names are still in common use. On account of the resemblance of the leaves to those of some species of *Adiantum*, the appellation maiden-hair tree has long been given to *Ginkgo biloba*. *Ginkgo* is of special interest on account of its isolated position among existing plants, its restricted geographical distribution, and its great antiquity (see PALAEOBOTANY: *Mesozoic*). This solitary survivor of an ancient stock is almost extinct, but a few old and presumably wild trees are recorded by travellers in parts of China. *Ginkgo* is common as a sacred tree in the gardens of temples in the Far East, and often cultivated in North America and Europe. *Ginkgo biloba*, which may reach a height of over 30 metres, forms a tree of pyramidal shape with a smooth grey bark. The leaves (figs. 10 and 11) have a long, slender petiole terminating in a fan-shaped lamina, which may be entire, divided by a median incision into two wedge-shaped lobes, or subdivided into several narrow segments. The venation is like that of many ferns, *e.g. Adiantum*; the lowest vein in each half of the lamina follows a course parallel to the edge, and gives off numerous branches, which fork repeatedly as they spread in a palmate manner towards the leaf margin. The foliage-leaves occur either scattered on long shoots of unlimited growth, or at the apex of short shoots (spurs), which may eventually elongate into long shoots.

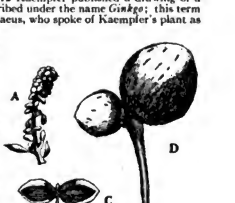

FIG. 12.—*Ginkgo biloba*. *A*, Male flower; *B*, *C*, single stamens; *D*, female flower.

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The flowers are dioecious. The male flowers (fig. 12), borne in the axil of scale-leaves, consist of a stalked central axis bearing loosely disposed stamens; each stamen consists of a slender filament terminating in a small apical scale, which bears usually two, but not infrequently three or four pollen-sacs (fig. 12, *C*). The axis of the flower is a shoot bearing leaves in the form of stamens. A mature pollen-grain contains a prothallus of 3 to 5 cells (Fig. 13, *Pg*); the exine extends over two-thirds of the circumference, leaving a thin portion at the summit, which on collapsing produces a longitudinal groove similar to the median depression on the pollen-grain of a cycad. The ordinary type of female flower has the form of a long, naked peduncle bearing a single ovule on either side of the apex (fig. 12). the base of each being enclosed by a small, collar-like rim, the nature of which has been variously interpreted. A young ovule consists of a conical nucellus surrounded by a single integument terminating as a two-lipped micropyle. A large pollen-chamber occupies the greater breadth of the nucellus; immediately below this, two or more archegonia (fig. 13, *a*) are developed in the upper region of the megaspore, each consisting of a large egg-cell surmounted by two neck-cells and a canal-cell which is cut off shortly before fertilization. After the entrance of the pollen-grain the pollen-chamber becomes roofed over by a blunt protuberance of nucellar tissue. The megaspore (embryo-sac) continues to grow after pollination until the greater part of the nucellus is gradually destroyed; it also gives rise to a vertical outgrowth, which projects from the apex of the megaspore as a short, thick column (fig. 13, *c*) supporting the remains of the nucellar tissue which forms the roof of the pollen-chamber (fig. 13, *c*). Surrounding the pitted wall of the ovum there is a definite layer of large cells, no doubt representing a tapetum, which, as in cycads and conifers, plays an important part in nourishing the growing egg-cell. The endosperm detached from a large *Ginkgo* ovule after fertilization bears a close resemblance to that of a cycad; the apex is occupied by a depression, on the floor of which two small holes mark the position of the archegonia, and the outgrowth from the megaspore apex projects from the centre as a short peg. After pollination the pollen-tube grows into the nucellar tissue, as in cycads, and the pollen-grain itself (fig. 13, *Pg*) hangs down into the pollen-chamber; two large spirally ciliated spermatozoids are produced, their mode of development agreeing very closely with that of the corresponding cells in *Cycas* and *Zamia*. After fertilization the ovum-nucleus divides and cell-formation proceeds rapidly, especially in the lower part of the ovum, in which the cotyledon and axis of the embryo are differentiated; the long, tangled suspensor of the cycadean embryo is not found in *Ginkgo*. It is often stated that fertilization occurs after the ovules have fallen, but it has been demonstrated by Hirase that this occurs while the ovules are still attached to the tree. The ripe seed, which grows as large as a rather small plum, is enclosed by a thick, fleshy envelope covering a hard woody shell with two or rarely three longitudinal keels. A papery remnant of nucellus lines the inner face of the woody shell, and, as to cycadean seeds, the apical portion is readily penetrated as a cap covering the summit of the archegonium.

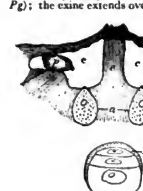

FIG. 13.—*Ginkgo*. Apex of Ovule, and Pollen-grain. (After Hirase.)
p, Pollen-tube (proximal end).
c, Pollen-chamber.
c, Upward prolongation of megaspore.
a, Archegonia.
Pg, Pollen-grain.
Ex, Exine.

The morphology of the female flowers has been variously interpreted by botanists; the peduncle bearing the ovules has been described as homologous with the petiole of a foliage-leaf and as a shoot-structure, the collar-like envelope at the base of the ovule being referred to as a second integument or arillus, or as the representative of a carpel. The evidence afforded by normal and abnormal flowers appears to be in favour of the following interpretation: The peduncle is a shoot bearing two or more carpels. Each ovule is enclosed at the base by an envelope or cup, the homologous with the lamina of a leaf; the fleshy and hard coats of the nucellus constitute a single integument. The stalk of an ovule, considerably reduced in normal flowers and much larger in some abnormal flowers, is homologous with a leaf-stalk, with which it agrees in the structure and number of vascular bundles. The facts on which this description is based are derived partly from anatomical evidence, and in part from an account given by a Japanese botanist, Fujii, of several abnormal female flowers; in some cases the collar at the base of an ovule, often described as an arillus, is found to pass gradually into the lamina of a leaf bearing marginal ovules (fig. 14, *B*). The occurrence of more than two ovules on one peduncle is by no means rare; a particularly striking example is described by Fujii, in which an unusually thick peduncle bearing several stalked ovules terminates in a scaly bud (fig. 14, *A*, *b*). The frequent occurrence of more than two pollen-sacs and the equally common occurrence of additional ovules have been regarded by some authors as evidence in favour of the view that ancestral types normally possessed a greater number of these organs than are usually found in the recent species. This view receives support from fossil evidence. Close to the apex of the shoot the vascular bundles of a leaf make their appearance as double strands, and the leaf-traces in the upper part of a shoot have the form of distinct bundles, which in the older part of the shoot form a continuous ring. Each double leaf-trace passes through four internodes before becoming a part of the stele; the double nature of the trace is a characteristic feature. Secretory sacs occur abundantly in the leaf-lamina, where they appear as short lines between the veins; they are abundant also in the cortex and pith of the shoot, in the fleshy integument of the ovule, and elsewhere. The secondary wood of the shoot and root conforms in the main to the coniferous type; in the short shoots the greater breadth of the medullary rays in the more internal part of the xylem recalls the cycadean type. The secondary phloem coatains numerous thick-walled fibres, parenchymatous cells, and large sieve-tubes with plates on the radial walls; swollen parenchymatous cells coataining crystals are commonly met with in the cortex, pith and medullary-ray tissues. The wood consists of tracheids, with circular bordered pits on their radial walls, and in the late summer wood pits are unusually abundant on the tangential walls. A point of anatomical interest is the occurrence in the vascular bundles of the cotyledons, scale-leaves, and elsewhere of a few centripetally developed tracheids, which give to the xylem-strands a mesarch structure such as characterizes the foliar bundles of cycads. The root is diarch in structure, but additional protoxylem-strands may be present at the base of the main root, the pericycle consists of several layers of cells.

Anatomy.

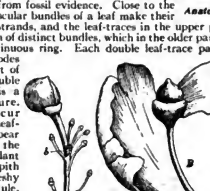

FIG. 14.—*Ginkgo*. Abnormal female of Fujii.) Flowers. *A*, Peduncle; *b*, scaly bud; *B*, leaf bearing marginal ovule. (After

This is not the place to discuss in detail the past history of *Ginkgo* (see PALAEOBOTANY: *Mesozoic*). Among Palaeozoic genera there are some which bear a close resemblance to the recent type in the form of the leaves; and petrified Palaeozoic seeds, almost identical with those of the maidenhair tree, have been described from French and English localities. During the Triassic and Jurassic periods the genus *Baiera*—no doubt a representative of the Ginkgoales—was widely spread throughout Europe and in other regions; *Ginkgo* itself occurs abundantly in Mesozoic and Tertiary rocks, and was a common plant in the Arctic regions as elsewhere during the Jurassic and Lower Cretaceous periods. Some unusually perfect *Ginkgo* leaves have been found in the Eocene leaf-beds between the lava-flows exposed in the cliffs of Mull (fig. 15). From an evolutionary point of view, it is of interest to note the occurrence of filicinean and cycadean characters in the maidenhair tree. The leaves at once invite a comparison with ferns; the numerous long hairs which form a delicate woolly covering on young leaves recall the hairs of certain ferns, but agree more closely with the long filamentous hairs of recent cycads. The spermatozoids constitute the most striking link with both cycads and ferns. The structure of the seed, the presence of two neck-cells in the archegonia, the late development of the embryo, the two large cotyledons and certain anatomical characters, are features common to *Ginkgo* and the cycads. The maidenhair tree is one of the most interesting survivals from the past; it represents a type which, in the Palaeozoic era, may have been merged into the ancient class Cordaitales. Through the succeeding ages the Ginkgoales were represented by numerous forms, which gradually became more restricted in their distribution and fewer in number during the Cretaceous and Tertiary periods, terminating at the present day in one solitary survivor.

Geological history.

CONIFERALES.—Trees and shrubs characterized by a copious branching of the stem and frequently by a regular pyramidal form. Leaves simple, small, linear or short and scale-like, usually persisting for more than one year. Flowers monoecious or dioecious, unisexual, without a perianth, often in the form of cones, but never terminal on the main stem.

External features.

The plants usually included in the Coniferae constitute a less homogeneous class than the Cycadaceae. Some authors use the term Coniferae in a restricted sense as including those genera which have the female flowers in the form of cones, the other genera, characterized by flowers of a different type, being placed in the Taxaceae, and often spoken of as Taxads.

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In order to avoid confusion in the use of the term Coniferae, we may adopt as a class-designation the name Coniferales, including both the Coniferae—using the term in a restricted sense—and the Taxaceae. The most striking characteristic of the majority of the Coniferales is the regular manner of the monopodial branching and the pyramidal shape. *Araucaria imbricata*, the Monkey-puzzle tree, *A. excelsa*, the Norfolk Island pine, many pines and firs, cedars and other genera illustrate the pyramidal form. The mammoth redwood tree of California, *Sequoia* (*Wellingtonia*) *gigantea*, which reputedly is the tallest Gymnosperm, is a good example of the regular tapering main stem and narrow pyramidal form. The cypresses afford instances of tall and narrow trees similar in habit to Lombardy poplars. The common cypress (*Cupressus sempervirens*), as found wild in the mountains of Crete and Cyprus, is characterized by long and spreading branches, which give it a cedar-like habit. A pendulous or weeping habit is assumed by some conifers, *e.g. Picea excelsa* var. *virgata* represents a form in which the branches are given a considerable horizontal extension, and trail themselves like snakes along the ground. Certain species of *Pinus*, the yews (*Taxus*) and some other genera grow as bushes, which in place of a main mast-like stem possess several repeatedly-branched leading shoots. The unfavourable conditions in Arctic regions have produced a dwarf form, in which the main shoots grow close to the ground. Artificially induced dwarfed plants of *Pinus*, *Cupressus*, *Sciadopitys* (umbrella pine) and other genera are commonly cultivated by the Japanese. The dying off of older branches and the vigorous growth of shoots near the base of the stem produce a form of tree illustrated by the stone pine of the Mediterranean region (*Pinus Pinea*), which Turner has rendered familiar in his "Childe Harold's Pilgrimage" and other pictures of Italian scenery. Conifers are frequently seen in which a lateral branch has bent sharply upwards to take the place of the injured main trunk. An upward tendency of all the main lateral branches, known as fastigiation, is common in some species, producing well-marked varieties, *e.g. Cephalotaxus fastigiata* var. *fastigiata*; this fastigiate habit may arise as a sport on a tree with spreading branches. Another departure from the normal is that in which the juvenile or seedling form of shoot persists in the adult tree; the numerous coniferous plants known as species of *Retinospora* are examples of this. The genus *Retinospora*, therefore, does not stand for a true genus, but denotes persistent young forms of *Juniperus*, *Thuja*, *Cupressus*, &c., in which the small scaly leaves of ordinary species are replaced by the slender, needle-like leaves, which stand out more or less at right angles from the branch. The flat branchlets of *Cupressus*, *Thuja* (arbor vitae), *Thujopsis dolabrata* (Japanese arbor vitae) are characteristic of certain types of conifers; in some cases the horizontal extension of the branches induces a dorsiventral structure. A characteristic habit, due to the persistence of the Kauri pine of New Zealand, is the deciduous habit of the branches; these become detached from the main trunk leaving a well-defined abscisic-surface, which appears as a depressed circular scar on the stem. A new genus of conifers, *Tarrayo*, has recently been described from the island of Formosa; it is said to agree in habit with the Japanese *Cryptomeria*, but the cones appear to have a structure which distinguishes them from those of any other genus.

Leaves.

With a few exceptions conifers are evergreen, and retain the leaves for several years (to twelve years in *Araucaria*). But in *Picea excelsa*, 5 in *Taxus baccata*; in *Pinus* the needles usually fall in October of their third year). The larch (*Larix*) sheds its leaves in the autumn, in the Chinese larch (*Pseudolarix Kaempferi*) the leaves turn a bright yellow colour before falling. In the swamp cypress (*Taxodium distichum*) the tree assumes a rich brown colour in the autumn, and sheds its leaves together with the branchlets which bear them; deciduous branches occur also in some other species, *e.g. Juniperus sabina* (red cedar), *Thuja occidentalis*, &c. The leaves of conifers are characterized by their small size, *e.g.* the needle-form represented by *Pinus*, *Cedrus*, *Larix*, &c., the linear flat or angular leaves, appressed to the branches, of *Thuja*, *Cupressus*, *Libocedrus*, &c., the flat and relatively broad leaves of *Araucaria imbricata*, *A. Bidwillii*, and some species of the southern genus *Podocarpus* are traversed by several parallel veins, as are also the still larger leaves of *Agathis*, which may reach a length of several inches. In addition to the foliage-leaves several genera also possess scale-leaves of various kinds, represented by bud-scales in *Pinus*, *Picea*, &c., which frequently persist for a time at the base of a young shoot which has pushed its way through the yielding cap of protecting scales, while in some conifers the bud-scales adhere together, and after being torn near the base are carried up by the growing axis as a thin brown cap. The cypresses, araucarias and some other genera have no true bud-scales; in some species, *e.g. Araucaria Bidwillii*, the occurrence of small foliage-leaves, which have functioned as bud-scales, at intervals on the shoot affords a measure of seasonal growth. The occurrence of long and short shoots is a characteristic feature of many conifers. In *Pinus* the needles occur in pairs, or in clusters of 3 or 5 at the apex of a small and inconspicuous short shoot of limited growth (spur), which is enclosed at its base by a few scale-leaves, and borne on a branch of unlimited growth in the axil of a scale-leaf. In the Californian *Pinus monophylla* each spur bears usually one needle, but two are not uncommon; it would seem that rudiments of two needles are always produced, but, as a rule, only one develops into a needle. In *Sciadopitys* similar spurs occur, each bearing a single needle, which in its grooved surface and in the possession of a double vascular bundle bears traces of an origin from two needle-leaves. A peculiarity of these leaves is the inverse orientation of the vascular tissue; each of the two veins has its phloem next the upper and the xylem towards the lower surface of the leaf; this unusual position of the xylem and phloem may be explained by regarding the needle of *Sciadopitys* as being composed of a pair of leaves borne on a short axillary shoot and fused by their margins (fig. 15, A). Long and short shoots occur also in *Cedrus* and *Larix*, but in these genera the spurs are longer and stouter, and are not shed with the leaves; this kind of short shoot, by accelerated apical growth, often passes into the condition of a long shoot on which the leaves are scattered and separated by comparatively long internodes, instead of being crowded into tufts such as are borne on the ends of the spurs. In the genus *Phyllocladus* (New Zealand, &c.) there are no green foliage-leaves, but in their place flattened branches (phylloclades) are borne in the axils of small scale-leaves. The cotyledons are often two in number, but sometimes (*e.g. Pinus*) as many as fifteen; these leaves are usually succeeded by foliage-leaves in the form of delicate spreading needles, and these primordial leaves are followed, sooner or later, by the adult type of leaf, generally a scale-leaf in Retinospora, which resembles the juvenile foliage. In addition to the first foliage-leaves and the adult type of leaf, there are often produced leaves which are intermediate both in shape and structure between the seedling and adult foliage. Dimorphism or heteromorphy is fairly common in the case of the best known examples is the Chinese juniper (*Juniperus chinensis*), in which branches with spinous leaves, longer and more spreading than the ordinary adult leaf, are often found associated with the normal type of branch. In some cases, *e.g. Sequoia sempervirens*, the fertile branches bear leaves which are less spreading than those on the vegetative shoots. Certain species of the southern hemisphere genus *Ducrydium* afford particularly striking instances of heterophylly, *e.g. D. Kirkii* of New Zealand, in which the juvenile branches bear small, closely-pressed leaves, while in others the leaves are much longer and more spreading. A well-known fossil conifer from Triassic strata—*Voltzia heterophylla*—also illustrates a marked dissimilarity in the leaves of the same shoot. The variation in leaf-form and the tendency of leaves to arrange themselves in various ways on different parts of the axes of the same plant are features which it is important to bear in mind in the identification of fossil conifers. In this connexion we may note the striking resemblance between some of the New Zealand Alpine Veronicas, *e.g. Veronica salicifolia* (*Hebe*), *V. cupressoides*, &c., false *Polydala* (Order, a Composite), and some of the cypresses and other conifers with small appressed leaves. The long linear leaves of some species of *Podocarpus*, in which the lamina is traversed by a single vein, recall the grasses and *Cyrus*; the branches of some Podocarpus and other forms closely resemble those of lycopods; these superficial resemblances, both between different genera of conifers and between conifers and other plants, coupled with the usual occurrence of fossil vegetation in a fragmentary condition, and not as entire plants, render determination of extinct types a very unsatisfactory and frequently an impossible task.

Flowers.

A typical male flower consists of a central axis bearing numerous spirally-arranged sporophylls (stamens), each of which consists of a slender stalk (filament) terminating usually in a more or less prominent knob or triangular scale, and bearing two or more pollen-sacs (microsporangia) on its lower surface. The pollen-grains of some genera (*e.g. Pinus*) are furnished with bladder-like extensions of the outer wall, which serve as aids to wind-dispersal. The stamens of *Araucaria* and *Agathis* are peculiar in bearing several long and narrow free pollen-sacs; these may be compared with the sporangiophores of the horsetails (*Equisetum*); in *Taxus* (yew) the filament is attached to the centre of a large circular distal expansion, which bears several pollen-sacs on its under surface. In the conifers proper the female reproductive organs have the form of cones, which may be styled flowers or inflorescences according to different interpretations of their morphology. In the Taxaceae the flowers have a simpler structure. The female flowers of the *Abietineae* may be taken as representing a common type. A pine cone reaches maturity in two years; a single year suffices for the full development in *Larix* and several other genera. The axis of the cone bears numerous spirally-disposed flat scales (cone-scales), each of which, if examined in a young cone, is found to be double, and to consist of a lower and an upper portion. The latter is a thin flat scale bearing a median ridge or keel (*e.g. Abies*), on each side of which is situated an inverted ovule, consisting of a nucellus surrounded by a single integument. As the cone grows in size and becomes woody the lower half of the cone-scale, which we may call the carpellary scale, may remain small, and in so far outgrown by the upper half (seminiferous scale) that it is hardly recognizable in the mature cone. In many species of *Abies* (*e.g. Abies pectinata*, &c.) the ripe cone differs from those of *Pinus*, *Picea* and *Cedrus* in the large size of the carpellary scales, which project as conspicuous thin appendages beyond the distal margins of the broader and more woody seminiferous scales; the long carpellary scale is a prominent feature also in the cone of the Douglas pine (*Pseudotsuga Douglasii*). The female flowers (cones) vary considerably in size; the largest are the more or less spherical cones of *Araucaria*—a single cone of *A. imbricata* may produce as many as 300 seeds, one seed to each fertile cone-scale—and the long pendent

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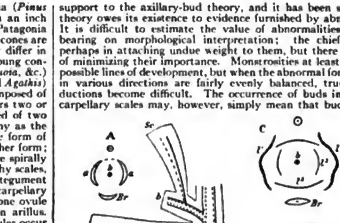
cones, 1 to 2 ft. in length, of the sugar pine of California (*Pinus Lambertiana*) and other species. Smaller cones, less than an inch long, occur in the larch, *Athrotaxis* (Tasmania), *Fitzroya* (Patagonia and Tasmania), &c. In the *Taxodieae* and *Araucariae* the cones are similar in appearance to those of the *Abietineae*, but they differ in the fact that the scales appear to be single, even in the young condition; each cone-scale in a genus of the *Taxodiinae* (*Sequoia*, &c.) bears several seeds, while in the *Araucarinae* (*Araucaria* and *Agathis*) each scale has one seed. The *Cupressineae* have cones composed of a few scales arranged in alternate whorls; each scale bears two or more seeds, and shows no external sign of being composed of two distinct portions. In the junipers the scales become fleshy as the seeds ripen, and the individual scales fuse together in the form of a berry. The female flowers of the Taxaceae assume another form; in *Microcachrys* (Tasmania) the reproductive structures are spirally disposed, and form small globular cones made up of red fleshy scales, to each of which is attached a single ovule enclosed by an integument and partially invested by an arillus; in *Dacrydium* the carpellary leaves are very similar to the foliage leaves—each bears one ovule with two integuments, the outer of which constitutes an arillus. Finally in the yew, as a type of the family Taxeae, the ovules occur singly at the apex of a lateral branch, enclosed when ripe by a conspicuous red or yellow fleshy arillus, which serves as an attraction to animals, and thus aids in the dispersal of the seeds.

It is important to draw attention to some structural features exhibited by certain cone-scales, in which there is no external sign indicative of the presence of a carpellary and a seminiferous scale. In *Araucaria Cookii* and some allied species each scale has a small pointed projection from its upper face near the distal end; the scales of *Cunninghamia* (China) are characterized by a somewhat ragged membranous projection extending across the upper face between the seeds and the distal end of the scale; in the scales of *Athrotaxis* (Tasmania) a prominent rounded ridge occupies a corresponding position. These projections and ridges may be homologous with the seminiferous scale of the pines, firs, cedars, &c. The simplest interpretation of the cone of the *Abietineae* is that which regards it as a flower consisting of an axis bearing several open carpels, which in the adult cone may be very small or large and prominent, the scale bearing the ovules being regarded as a placental outgrowth from the flat and open carpel. In *Araucaria* the cone-scale is regarded as consisting of a flat carpel, of which the placenta has not grown out into the scale-like structure. The seminiferous scale of *Pinus*, &c., is also spoken of sometimes as a ligular outgrowth from the carpellary leaf. Robert Brown (1827) was first to give a clear description of the morphology of the Abietineous cone in which carpels bear naked ovules; he recognized gymnospermy as an important distinguishing feature in conifers as well as in cycads. Another view is to regard the cone as an inflorescence, each carpellary scale being a bract bearing in its axil a shoot the axis of which has not been developed; the seminiferous scale is believed to represent either a single leaf or a fused pair of leaves belonging to the partially suppressed axillary shoot. In 1860 van Tieghem laid stress on anatomical evidence as a key to the morphology of the cone-scales; he drew attention to the fact that the collateral vascular bundles of the seminiferous scale are inversely orientated as compared with those of the carpellary scale; in the latter the xylem of each bundle is next the upper surface, while in the seminiferous scale the phloem occupies that position. The conclusion drawn from this was that the seminiferous scale (fig. 15, B, *Sc*) is the first and only leaf of an axillary shoot (*b*) borne on that side of the shoot, the axis of which is suppressed, opposite the subtending bract (fig. 15, B, C, *Br*). Another view is to apply to the seminiferous scale an explanation similar to that suggested by von Mohl in the case of the double needle of *Sciadopitys*, and to consider the seed-bearing scale as being made up of a pair of leaves (fig. 15, A, *a*, *a*) of an axillary shoot (*b*) fused into one by their posterior margins (fig. 15, A). The latter view receives support from abnormal cones in which carpellary scales subtend axillary shoots, of which the first two leaves (fig. 15, C, *P*, *P*) are often harder and browner than the others; forms have been described transitional between ordinary shoots, in which the leaves are separate, and others in which two of the leaves are more or less completely fused. In a young cone the seminiferous scale appears as a hump of tissue at the base or in the axil of the carpellary scale, but Celakovsky, a strong supporter of the axillary-bud theory, attaches little or no importance to this kind of evidence regarding the ultimate manner of development as being merely an example of a short cut adopted in the course of evolution, and replacing the original production of a branch in the axil of each carpellary scale. Eichler, one of the chief supporters of the axillary-bud theory, does not regard the inverse orientation of the vascular bundles an argument in support of the axillary-bud theory, but points out that the seminiferous scale, being an outgrowth from the surface of the carpellary scale, would, like outgrowths from an ordinary leaf, naturally have its bundles inversely orientated. In such cone-scales as show little or no external indication of being double in origin, *e.g. Araucaria* (fig. 15, D) *Sequoia*, &c., there are always two sets of bundles; the upper set, having the phloem uppermost, as in the seminiferous scale of *Abies* or *Pinus*, are regarded as belonging to the outgrowth of the carpellary scale and specially developed to supply the ovules. Monstrous cones are fairly common; these in some instances lend support to the axillary-bud theory, and it has been said that this theory owes its existence to evidence furnished by abnormal cones. It is difficult to estimate the value of abnormalities as evidence bearing on morphological interpretation; the chief danger lies perhaps in attaching undue weight to them, but there is also a risk of minimizing their importance. Monstrosities at least demonstrate possible lines of development, but when the abnormal forms of growth in various directions are fairly evenly balanced, trustworthy deductions become difficult. The occurrence of buds in the axils of carpellary scales may, however, simply mean that buds, which are

Morphology of female flower.



(C and D after Worsdell.)

FIG. 15.—Diagrammatic treatment of:
A, Double needle of *Sciadopitys* (*a*, *a*, leaves; *b*, shoot; *Br*, bract).
B, seminiferous scale as leaf of axillary shoot (*b*, shoot; *Sc*, seminiferous scale; *Br*, bract).
C, seminiferous scale as fused pair of leaves (*P*, *P*, *P*, first, second and third leaves; *b*, shoot; *Br*, bract).
D, cone-scale of *Araucaria* (*n*, nucellus; *i*, integument; *x*, xylem).

usually undeveloped in the axils of sporophylls, occasionally afford evidence of their existence. Some monstrous cones lend no support to the axillary-bud theory. In *Larix* the axis of the cone often continues its growth; similarly in *Cephalotaxus* the cones are often proliferous. (In rare cases the proliferated portion produces male flowers in the leaf-axils.) In *Larix* the carpellary scale may become leafy, and the seminiferous scale may disappear. Androgynous cones may be produced, as in the cone of *Pinus rigida* (fig. 16), in which the lower part bears stamens and the upper portion carpellary and seminiferous scales. An interesting case has been figured by Masters, in which scales of a cone of *Cupressus Lawsoniana* bear ovules on the upper surface and stamens on the lower face. One argument that has been adduced in support of the axillary bud theory is derived from the Palaeozoic type *Cordaites*, in which each ovule occurs on an axis borne in the axil of a bract. The whole question is still unsolved, and perhaps insoluble. It may be that the interpretation of the female cone of the *Abietineae* as an inflorescence, which finds favour with many botanists, cannot be applied to the cones of *Agathis* and *Araucaria*. Without expressing any decided opinion as to the morphology of the double cone-scale of the *Abietineae*, preference may be felt in favour of regarding the cone-scale of the *Araucariae* as a simple carpellary leaf bearing a single ovule. A discussion of this question may be found in a paper on the *Araucariae* by Seward and Ford, published in the *Transactions* of the Royal Society of London (1906). *Cordaites* is an extinct type which in certain respects resembles *Ginkgo*, cycads and the *Araucariae*, but its agreement with true conifers is probably too remote to justify our attributing much weight to the bearing of the morphology of its female flowers on the interpretation of that of the Coniferae. The greater simplicity of the Eichler theory may prejudice us in its favour; but, on the other hand, the arguments advanced in favour of the axillary-bud theories are perhaps not sufficiently cogent to lead us to accept an explanation based chiefly on the uncertain evidence of monstrosities.

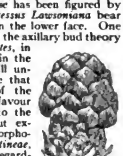


FIG. 16—Abnormal Cone of *Pinus rigida*. (After Masters.)

A pollen-grain when first formed from its mother-cell consists of a single cell; in this condition it may be carried to the nucellus of the ovule (*Taxus*, *Cupressus*, &c.), or more usually (*Pinus*, *Larix*, &c.) it reaches maturity before the dehiscence of the microsporangium. The nucleus of the microspore divides and gives rise to a small cell within the large cell, a second small cell is then produced; this is the structure of the ripe pollen-grain in some conifers (*Taxus*, &c.). The large cell grows out as a pollen-tube; the second of the two small cells (body-cell) wanders into the tube, followed by the nucleus of the first small cell (stalk-cell). In *Taxus* the body-cell eventually divides into two, in which the products of division are of unequal size, the larger constituting the male generative cell, which fuses with the nucleus of the egg-cell. In *Juniperus* the products of division of the

Microspores and megaspores.

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body-cell are equal, and both function as male generative cells. In the *Abietineae* cell-formation in the pollen-grain is carried farther. Three small cells occur inside the cavity of the microspore; two of them collapse and the third divides into two, forming a stalk-cell and a larger body-cell. The latter ultimately divides in the apex of the pollen-tube into two non-motile generative cells. Evidence has lately been adduced of the existence of numerous nuclei in the pollen-tubes of the *Araucarieae*, and it seems probable that in this as in several other respects this family is distinguished from other members of the Coniferae. The previous work by Strasburger (1892) on the Pine was followed by V. H. Blackman, who also succeeded in showing that the nuclei of the sporophyte generation contain twice as many chromosomes as the nuclei of the gametophyte. Other observers have in most cases demonstrated a similar relation in the germ-cells between the number of chromosomes in the nuclei of the two generations. The ovule is usually surrounded by one integument, which projects beyond the tip of the nucellus as a wide-open lobed funnel, which at the time of pollination folds inwards, and so assists in bringing the pollen-grains on to the nucellus. In some conifers (*e.g. Taxus, Cephalotaxus, Dacrydium*, &c.) the ordinary integument is partially enclosed by an arillus or second integument. It is held by some botanists (Celakovsk(?) that the seminiferous scale of the *Abietineae* is homologous with the arillus or second integument of the Taxaceae, but this view is too strained to gain general acceptance. In *Araucaria* and *Saxegothaea* the nucellus itself projects beyond the open micropyle and receives the pollen-grains direct. During the growth of the cell which forms the megaspore the greater part of the nucellus is absorbed, except the apical portion, which persists as a cone above the megaspore; the partial disorganization of some of the cells in the centre of the nucellar cone forms an irregular cavity, which may be compared with the large embryo-sac characteristic of *Ginkgo* and cycads. In each ovule one megaspore comes to maturity, but, exceptionally, two may be present (*e.g. Pinus sylvestris*). It has been shown by Lawson that in *Sequoia sempervirens* (*Annals of Botany*, 1904) and by other workers in *Pinus* that several megaspores may attain a fairly large size in one prothallus. The megaspore becomes filled with tissue (prothallus), and from some of the superficial cells archegonia are produced, usually three to five in number, but in rare cases ten to twenty or even sixty may be present. In the genus *Sequoia* there may be as many as six archegonia (Arnold and Lawson) in one megaspore; these occur either separately or in some parts of the prothallus they may form groups as in the *Cupressineae*; they are scattered through the prothallus instead of being confined to the apical region as in the majority of the conifers. Similarly in the *Araucarieae* and in *Widdringtonia* the archegonia are numerous and scattered and often sunk in the prothallus tissue. In *Libocedrus decurrens* (Cupressineae) Lawson describes the archegonia as varying in number from 2 to 24 (*Annals of Botany*, 1907). An archegonium consists of a large oval egg-cell surmounted by a short neck composed of one or more tiers of cells, six to eight cells in each tier. Before fertilization the nucleus of the egg-cell divides and cuts off a ventral canal-cell; this cell may represent a second egg-cell. The egg-cells of the archegonia may be in lateral contact (*e.g. Cupressineae*) or separated from one another by a few cells of the prothallus, each ovum being immediately surrounded by a layer of cells distinguished by their granular contents and large nuclei. During the development of the egg-cell, fluid material is conducted from the apex through the pitted wall of the ovum. The tissue at the apex of the megaspore grows slightly above the level of the archegonia, so that the latter come to lie in a shallow depression. In the process of fertilization the two male generative nuclei, accompanied by the pollen-tube nucleus and that of the stalk-cell, pass through an open pit at the apex of the pollen-tube into the protoplasm of the ovum. After fertilization the nucleus of the egg divides, the first stages of karyokinesis being apparent even before complete fusion of the egg- and female nuclei has occurred. The result of this is the production of four nuclei, which eventually take up a position at the bottom of the ovum and become separated from one another by vertical cell-walls; these nuclei divide again, and finally three tiers of cells are produced, four in each tier. In the *Abietineae* the cells of the middle tier elongate and push the lowest tier deeper into the endosperm; the cells of the bottom tier may remain in lateral contact and produce together one embryo, or they may separate (*Pinus, Juniperus*, &c.) and form four potential embryos. The fully albuminous seed contains a single embryo with two or more cotyledons. The seeds of many conifers are provided with large thin wings, consisting in some genera (*e.g. Pinus*) of the upper cell-layers of the seminiferous scale, which have become detached and, in some cases, adhere loosely to the seed as a thin membrane; the loose attachment may be of use to the seeds when they are blown against the branches of trees, in enabling them to fall away from the wing and drop to the ground. The seeds of some genera depend on animals for dispersal, the carpellary scale (*Sciadopitys*) of the outer integument being brightly coloured and attractive. In some *Abietineae* (*e.g. Pinus* and *Picea*)—in which the cone-scales persist for some time after the seeds are ripe—the cones hang down and so facilitate the fall of the seeds; in *Cedrus, Araucaria* and *Abies* the scales become detached and fall with the seeds, leaving the bare vertical axis of the cone on the tree. In all cases, except some species of *Araucaria* (sect. *Colymbea*) the germination is epigean. The seedling plants of some Conifers (*e.g. Araucaria imbricata*) are characterized by a carrot-shaped hypocotyl which doubtless serves as a food-reservoir.

The roots of many conifers possess a narrow band of primary xylem-tracheids with a group of narrow spiral protoxylem-elements at each end (triarch). A striking feature in the roots of several genera, excluding the *Abietineae*, is the occurrence of thick and somewhat irregular bands of thickening on the cell-walls of the cortical layer next to the endodermis. These bands, which may serve to strengthen the central cylinder, have been compared with the netting surrounding the delicate wall of an inflated balloon. It is not always easy to distinguish a root from a stem; in some cases (*e.g. Sequoia*) the primary tetrarch structure is easily identified in the centre of an old root, but in other cases the primary elements are very difficult to recognize. The sudden transition of the secondary tracheids against the pith-cells may afford evidence of root-structure as distinct from stem-structure, in which the radial rows of secondary tracheids pass into the irregularly-arranged primary elements next the pith. The annual rings in a root are often less clearly marked than in the stem, and the xylem-elements are frequently larger and thinner. The primary vascular bundles in a young conifer stem are collateral, and, like those of a Dicotyledon, they are arranged in a circle round a central pith and enclosed by a common endodermis. It is in the nature of the secondary xylem that the Coniferales are most readily distinguished from the Dicotyledons and Cycadaceae; the wood is homogeneous in structure, consisting almost entirely of tracheids with circular or polygonal bordered pits on the radial walls, more particularly in the late-summer wood. In many genera xylem-parenchyma is present, but never in great abundance. A few Dicotyledons, *e.g. Drimys* (Magnoliaceae) closely resemble conifers in the homogeneous character of the wood, but in most cases the presence of large vessels, wood-fibres and abundant parenchyma affords an obvious distinguishing feature.

The abundance of petrified coniferous wood in rocks of various ages has led many botanists to investigate the structure of modern genera with a view to determining how far anatomical characters may be used as evidence of generic distinctions. There are a few well-marked types of wood which serve as convenient standards of comparison, but these cannot be used except in a few cases to distinguish individual genera. The genus *Pinus* serves as an illustration of wood of the distinct type characterized by the absence of xylem-parenchyma, except such as is associated with the numerous resin-canals that occur abundantly in the wood, cortex and medullary rays; the medullary rays are composed of parenchyma and of horizontal resin-tracheids with irregularly thickened end-walls. In a radial section of a pine stem each ray is seen to consist in the median part of a few rows of parenchymatous cells with large oval simple pits in their walls, accompanied above and below by horizontal tracheids with bordered pits. Pits in the radial walls of the ordinary xylem-tracheids occur in a single row or in a double row, of which the pits are not in contact, and those of the two rows are placed on the same level. The medullary rays usually consist of a single tier of cells, but in the *Pinus* group of wood broader medullary rays also occur and are traversed by horizontal resin-canals. In the wood of *Cypressus, Cedrus, Abies* and several other genera, parenchymatous cells occur in association with the xylem-tracheids and take the place of the resin-canals of other types. In the Araucarian type of wood (*Araucaria* and *Agathis*) the bordered pits, which occur in two or three rows on the radial walls of the tracheids, are in mutual contact and polygonal in shape, the pits of the different rows are alternate and not on the same level; in this type of wood the annual rings are often much less distinct than in *Cupressus, Pinus* and other genera. In *Taxus, Torreya* (California and the Far East) and *Cephalotaxus* the absence of resin-canals and the presence of spiral thickening-bands on the tracheids constitute well-marked characteristics. An examination of the wood of *Podocarpus* and several of the same species or individual usually reveals a fairly wide variation in some of the characters, such as the abundance and size of the medullary rays, the size and arrangement of pits, the presence of wood-parenchyma—characters to which undue importance has often been attached in systematic anatomical work. The phloem consists of sieve-tubes, with pitted areas on the lateral as well as on the inclined terminal walls, phloem-parenchyma and, in some genera, fibres. In the *Abietineae* the phloem consists of parenchyma and sieve-tubes only, but in most other forms tangential rows of fibres occur in regular alternation with the parenchyma and sieve-tubes. The characteristic companion-cells of Angiosperms are represented by phloem-parenchyma cells with albuminous contents; other parenchymatous elements of the bast contain starch or crystals of calcium oxalate. When tracheids occur in the medullary rays of the xylem these are replaced in the phloem-region by irregular parenchymatous cells known as albuminous cells. Resin-canals, which occur abundantly in the xylem, phloem or cortex, are not found in the wood of the yew. *Cephalotaxus* (*Taxeae*) is also peculiar in having resin-canals in the pith (cf. *Ginkgo*). One form of *Cephalotaxus* is characterized by the presence of short tracheids in the pith, in shape like ordinary parenchyma, but in the possession of bordered pits and lignified walls agreeing with ordinary xylem-tracheids; it is probable that these short tracheids serve as reservoirs for storing rather than for conducting water. The vascular bundle entering the stem from a leaf with a single vein passes by a more or less direct course into the

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central cylinder of the stem, and does not assume the girdle-like form characteristic of the cycadean leaf-trace. In species of which the leaves have more than one vein (*e.g. Araucaria imbricata*, &c.) the leaf-trace leaves the stele of the stem as a single bundle which splits up into several strands in its course through the cortex. In the wood of some conifers, *e.g. Araucaria*, the leaf-traces persist for a considerable time, perhaps indefinitely, and may be seen in tangential sections of the wood of old stems. The leaf-trace in the Coniferales is simple in its course through the cortex, differing in this respect from the double leaf-trace of *Ginkgo*. A detailed account of the anatomical characters of conifers has been published by Professor D. P. Penhallow of Montreal and Dr. Gothan of Berlin which will be found useful for diagnostic purposes. The structure of leaves most useful for diagnostic purposes are the position of the stomata, the presence and arrangement of resin-canals, the structure of the mesophyll and vascular bundles. The presence of hypodermal fibres is another feature worthy of note, but the occurrence of these elements is too closely connected with external conditions to be of much systematic value. A pine needle grown in continuous light differs from one grown under ordinary conditions in the absence of hypodermal fibres, in the absence of the characteristic infoldings of the mesophyll cell-walls, in the smaller size of the resin-canals, &c. The endodermis in *Pinus*, *Picea* and many other genera is usually a well-defined layer of cells enclosing the vascular bundles, and separated from them by a tissue consisting in part of ordinary parenchyma and to some extent of isodiametric tracheids; but this tissue, usually spoken of as the pericycle, is in direct continuity with other stem-tissues as well as the pericycle. The occurrence of short tracheids in close proximity to the veins is a characteristic of coniferous leaves; these elements assume two distinct forms—(1) the short isodiametric tracheids (transfusion-tracheids) closely associated with the veins; (2) longer tracheids extending across the mesophyll at right angles to the veins, and no doubt functioning as representatives of lateral veins. It has been suggested that transfusion-tracheids represent, in part at least, the tracheidal system, which forms a distinctive feature of cycadean leaf-bundles; these short tracheids form conspicuous groups laterally attached to the veins in *Cunninghamia*, abundantly represented in a similar position in the leaves of *Sequoia*, and scattered through the so-called pericycle in *Pinus*, *Picea*, &c. It is of interest to note the occurrence of precisely similar elements in the mesophyll of *Lepidodendron* leaves. An anatomical peculiarity in the veins of *Pinus* and several other genera is the continuity of the medullary rays, which extend as continuous plates from one end of the leaf to the other. The mesophyll of *Pinus* and *Cedrus* is characterized by its homogeneous character and by the presence of infoldings of the cell-walls. In many leaves, *e.g. Abies*, *Tsuga*, *Larix*, &c., the mesophyll is heterogeneous, consisting of palisade and spongy parenchyma. In the leaves of *Araucaria imbricata*, in which palisade-tissue occurs in both the upper and lower part of the mesophyll, the resin-canals are placed between the veins; in some species of *Podocarpus* (sect. *Nageia*) a canal occurs below each vein; in *Tsuga*, *Torreya*, *Cephalotaxus*, *Sequoia*, &c., a single canal occurs below the midrib; in *Larix*, *Abies*, &c., two canals run through the leaf parallel to the margins. The stomata are frequently arranged in rows, their position being marked by two white bands of wax on the leaf-surface.

Distribution.

The chief home of the Coniferales is in the northern hemisphere, where certain species occasionally extend into the Arctic circle and penetrate beyond the northern limit of dicotyledonous trees. Wide areas are often exclusively occupied by conifers, which give the landscape a sombre aspect, suggesting a comparison with the forest vegetation of the Coal period. South of the tree-limit a belt of conifers stretches across north Europe, Siberia and Canada. In northern Europe this belt is characterized by such species as *Picea excelsa* (spruce), which extends south to the mountains of the Mediterranean region; *Pinus sylvestris* (Scottish fir), reaching from the far north to western Spain, Persia and Asia Minor; *Juniperus communis*, &c. In north-Siberia *Pinus Cembra* (Cembra or Arolla Pine) has a wide range; also *Abies sibirica* (Siberian silver fir), *Larix sibirica* and *Juniperus Sabina* (savin). In the North American area *Picea alba*, *P. nigra*, *Larix americana*, *Abies balsamea* (balsam fir), *Tsuga canadensis* (hemlock spruce), *Pinus Strobus* (Weymouth pine), *Juniperus Sabina* (savin), *Taxus canadensis* are characteristic species. In the Mediterranean region occur *Cupressus sempervirens*, *Pinus Pinea* (stone pine), species of juniper, *Cedrus atlantica*, *C. Libani*, *Callitris quadrivalvis*, *Pinus maritima*, &c. Several species of economic importance are abundant on the Atlantic side of North America—*Juniperus virginiana* (red cedar, used in the manufacture of lead pencils, and extending as far south as Florida), *Taxodium distichum* (swamp cypress), *Pinus rigida* (pitch pine), *P. mitis* (yellow pine), *P. tæda*, *P. palustris*, &c. On the west side of the North American continent conifers play a still more striking rôle; among them are *Chamaecyparis nutkaensis*, *Picea sitchensis*, *Libocedrus decurrens*, *Pseudotsuga Douglasii* (Douglas fir), *Sequoia sempervirens*, *S. gigantea* (the only two surviving species of this generic type are now confined to a few localities in California, but were formerly widely spread in Europe and elsewhere), *Pinus Coulteri*, *P. Lambertiana*, &c. Farther south, a few representatives of such genera as *Abies*, *Cupressus*, *Pinus* and juniper are found in the Mexican Highlands, tropical America and the West Indies. In the far East conifers are richly represented; among them occur *Pinus densiflora*, *Cryptomeria japonica*, *Cephalotaxus*, species of *Abies*, *Larix*, *Thujopsis*, *Sciadopitys verticillata*, *Pseudolarix Kaempferi*, &c. In the Himalaya occur *Cedrus deodara*, *Taxus*, species of *Cupressus*, *Pinus excelsa*, *Abies Webbiana*, &c. The continent of Africa is singularly poor in conifers. *Cedrus atlantica*, a variety of *Abies Pinsapo*, *Juniperus thurifera*, *Callitris quadrivalvis*, occur in the north-west region, which may be regarded as the southern limit of the Mediterranean region. The greater part of Africa north of the equator is without any representatives of the conifers; *Juniperus procera* flourishes in Somaliland and on the mountains of Abyssinia; a species of *Podocarpus* occurs on the Cameroon mountains, and *P. milanjianus* is widely distributed in east tropical Africa. *Widdringtonia Whytei*, a species closely allied to *W. juniperoides* of the Cedarberg mountains of Cape Colony, is recorded from Nyassaland and from N.E. Rhodesia; while a third species, *W. cupressoides*, occurs in Cape Colony. *Podocarpus dongata* and *P. Thunbergii* (yellowwood) form the principal timber trees in the belt of forest which stretches from the coast mountains of Cape Colony to the north-east of the Transvaal. *Libocedrus tetragona*, *Fitzroya patagonica*, *Araucaria brasiliensis*, *A. imbricata*, *Saxegothaea* and others are met with in the Andes and other mountains in South America and *Microcachrys* are characteristic Australian types. *Phyllocladus* occurs also in New Zealand, and species of *Dacrydium*, *Araucaria*, *Agathis* and *Podocarpus* are represented in Australia, New Zealand and the Malay regions.

GNETALES.—These are trees or shrubs with simple leaves. The flowers are dioecious, rarely monoecious, provided with one or two perianths. The wood is characterized by the presence of vessels in addition to tracheids. There are no resin-canals. The three existing genera, usually spoken of as members of the Gnetales, differ from one another more than is consistent with their inclusion in a single family; we may therefore better express their diverse characters by regarding them as types of three separate families—(1) *Ephedroideae*, genus *Ephedra*; (2) *Welwitschioideae*, genus *Welwitschia*; (3) *Gnetoideae*, genus *Gnetum*. Our knowledge of the Gnetales leaves much to be desired, but such facts as we possess would seem to indicate that this group is of special importance as foreshadowing, more than any other Gymnosperms, the Angiosperms. In the more heterogeneous structure of the wood and in the possession of true vessels the Gnetales agree closely with the higher flowering plants. It is of interest to note that the leaves of *Gnetum*, while typically dicotyledonous in venation, possess a monocotyledonous character in the continuous and plate-like medullary rays of their vascular bundles. The presence of a perianth is a feature suggestive of an approach to the floral structure of Angiosperms; the prolongation of the integument (nucellus) beyond the ovule to form a stigma and style. The genus *Ephedra*, with its prothallus and archegonia, which are similar to those of other Gymnosperms, may be safely regarded as the most primitive of the Gnetales. In *Welwitschia* also the megaspore is filled with prothallus-tissue, but single egg-cells take the place of archegonia. The development of *Gnetum* is described by Karsten the megaspore contains a peripheral layer of protoplasm, in which scattered nuclei represent the female reproductive cells; in *Gnetum Gnemon* a similar state of things exists in the upper half of the megasporangium, while the lower half agrees with the megaspore of *Welwitschia* in being full of prothallus-tissue, which serves merely as a reservoir of food. Lotsy has described the occurrence of special cells at the apex of the prothallus of *Gnetum Gnemon*, which he regards as imperfect archegonia (fig. 17, C, a); he suggests they may represent vestigial structures pointing back to some ancestral form beyond the limits of the present group. The Gnetales probably had a separate origin from the other Gymnosperms; they carry us nearer to the Angiosperms, but we have no satisfactory evidence that they represent a stage in the direct line of Angiosperm evolution. It is not improbable that the three genera of this ancient phylum survive as types of a blindly-ending branch of the Gymnosperms; but be that as it may, it is in the Gnetales more than in any other Gymnosperms that we find features which help us to obtain a dim prospect of the lines along which the Angiosperms may have been evolved.

Ephedra.—This genus is the only member of the Gnetales represented in Europe. Its species, which are characteristic of warm temperate and tropical latitudes, usually are shrubs. The fine branches are green, and bear a close resemblance to the stems of *Equisetum* and to the slender twigs of *Casuarina*; the surface of the long internodes is marked by fine longitudinal ribs, and at the nodes are leaves reduced to membranous sheaths. The flowers are small, and borne on axillary shoots. A single male flower consists of an axis enclosed at the base by an inconspicuous perianth formed of two concrescent leaves and terminating in two, or as many as eight, shortly stalked or sessile anthers. The female flower is enveloped in a loose, ill-fitting sac-like investment, which must be looked as a perianth; within this is an orthotropous ovule surrounded by a single integument prolonged upwards as a beak-like micropyle. The flower may be described as a bud bearing a pair of leaves which become fused and constitute a perianth, the apex of the shoot forming an ovule. In function the perianth may be compared with a unilocular ovary containing a single ovule; the projecting integument, which at the time of pollination secretes a drop of liquid, serves the same purpose as the style and stigma of an angiosperm. The megaspore

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is filled with tissue as in typical Gymnosperms, and from some of the superficial cells 3 to 5 archegonia are developed, characterized by long multicellular necks. The archegonia are separated from one another, as in *Pinus*, by some of the prothallus-tissue, and the cells next the egg-cells (tapetal layer) contribute food-material to their development. After fertilization, some of the uppermost bracts below each flower become red and fleshy; the perianth develops into a woody shell, while the integument remains membranous. In some species of *Ephedra*, *e.g. E. altissima*, the fertilized eggs grow into tubular proembryos, from the tip of each of which embryos begin to be developed, but one only comes to maturity. In *Ephedra helvetica*, as described by Jaccard, no proembryo or suspensor is formed; but the most vigorous fertilized egg, after undergoing several divisions, becomes attached to a tissue, termed the columella, which serves the purpose of a primary suspensor; the columella appears to be formed by the lignification of certain cells in the central region of the embryo-sac. At a later stage some of the cells in the upper (micropylar) end of the embryo divide and undergo considerable elongation, serving the purpose of a secondary suspensor. The secondary wood of *Ephedra* consists of tracheids, vessels and parenchyma; the vessels are characterized by their wide lumen and by the large simple or slightly-bordered pits on their oblique end-walls.

Gnetum.—This genus is represented by several species, most of which are climbing plants, both in tropical America and in warm regions of the Old World. The leaves, which are borne in pairs at the tumid nodes, are oval in form and have a Dicotyledonous type of venation. The male and female inflorescences have the form of simple or paniculate spikes. The spike of an inflorescence bears whorls of flowers at each node in the axils of concrescent bracts accompanied by numerous sterile hairs (paraphyses); in a male inflorescence numerous flowers occur at each node, while in a female inflorescence the number of flowers at each node is much smaller. A male flower consists of a single angular perianth, through the open apex of which the flower-axis projects as a slender column terminating in two anthers. The female flowers, which are more complex in

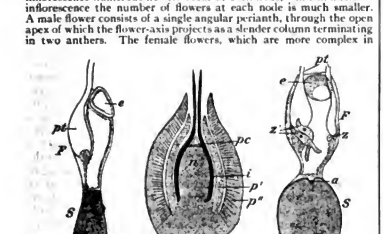

FIG. 17.—*Gnetum Gnemon*. (After Karsten.)

A, Female flower.
n, Nucellus.
pc, Pollen-chamber.
s, Integument.
p', Inner Perianth.
p'', Outer Perianth.
B, C, Megaspore.
e, Imperfect Archegonia.
c, Partially developed Megaspore.
F, Fertile half.
S, Sterile half.
pl, Pollen-tube.
z, Zygote.
z', Prothallus.

structure, are of two types, complete and incomplete; the latter occur in association with male flowers in a male inflorescence. A complete female flower consists of a nucellus (fig. 17, A, *n*), surrounded by a single integument (fig. 17, A, *i*), prolonged upwards as a narrow tube and succeeded by an inner and an outer perianth (fig. 17, A, *p'* and *p''*). The whole flower may be looked upon as an adventitious bud bearing two pairs of leaves; each pair becomes concrescent and forms a perianth, the apex of the shoot being converted into an orthotropous ovule. The incomplete female flowers are characterized by the almost complete suppression of the inner perianth. Several embryo-sacs (megaspores) are present in the nucellus of a young ovule, but one only attains full size, the smaller and partially developed megaspores (fig. 17, B and C, *c*) being usually found in close association with the surviving and fully-grown megaspore. In *Gnetum Gnemon*, as described by Lotsy, a mature embryo-sac contains in the upper part a large central vacuole and a peripheral layer of protoplasm, including several nuclei, which take the place of the archegonia of *Ephedra*; the lower part of the embryo-sac, separated from the upper by a constriction, is full of parenchyma. The upper part of the megaspore may be spoken of as the fertile half (fig. 17, B and C, *F*), and the lower part, which serves only as food-reservoir for the growing embryo, may be termed the sterile half (fig. 17, B and C, *S*). (Coulter, *Bot. Gazette*, xlvi., 1908, regards this tissue as belonging to the nucellus.) At the time of pollination the long tubular integument secretes a drop of fluid at its apex, which holds the pollen-grains, brought by the wind, or possibly to some extent by insect agency, and by evaporation these are drawn on to the top of the nucellus, where partial disorganization of the cells has given rise to an irregular pollen-chamber (fig. 17, A, *pc*). The pollen-tube, containing two generative and one vegetative nucleus, pierces the wall of the megaspore and then becomes swollen (fig. 17, B and C, *pl*); finally the two generative nuclei pass out *pl* the tube and fuse with two of the nuclei in the fertile half of the megaspore. As the result of fertilization, the fertilized nuclei of the megaspore become surrounded by a cell-wall, and constitute zygotes, which attach themselves either to the wall of the megaspore or to the end of a pollen-tube (fig. 17, *C*, *z* and *z'*); they then grow into long tubes or proembryos, which make their way towards the prothallus (C, *z'*), and eventually embryos are formed from the ends of the proembryo tubes. Only one embryo only comes to maturity. Fruits of *Gnetum* forms an out-growth from the hypocotyl, which serves as a feeder and draws nourishment from the prothallus. The fleshy outer portion of the seed is formed from the outer perianth, the woody shell being derived from the inner perianth. The climbing species of *Gnetum* are characterized by the production of several concentric cylinders of secondary wood and bast, the additional cambium-rings being products of the pericycle, as in *Cycas* and *Macrozamia*. The structure of the wood agrees in the main with that of *Ephedra*.

Welwitschia (*Tumboa*).—This is by far the most remarkable member of the Gnetales, both as regards habit and the form of its flowers. In a supplement to the systematic work of Engler and Prantl the well-known name *Welwitschia*, instituted by Hooker in 1862 in honour of Welwitsch, the discoverer of the plant, is superseded by that of *Tumboa*, originally suggested by Welwitsch. The genus is confined to certain localities in Damaraland and adjoining territory on the west coast of tropical South Africa. A well-grown specimen is less than a foot above the surface of the ground; the stem, which may have a circumference of more than 12 ft., terminates in a depressed crown resembling a circular table with a median groove across the centre and prominent broad ridges concentric with the margin. The thick tuberous stem becomes rapidly narrower, and passes gradually downwards into a tap-root. A pair of small strap-shaped leaves succeed the two cotyledons of the seedling, and persist as the only leaves during the life of the plant; they retain the power of growth in their basal portion, which is sunk in a narrow groove near the edge of the crown, and the tough lamina, 6 ft. in length, becomes split into narrow strap-shaped or thong-like strips which trail on the ground. Numerous circular pits occur on the concentric ridges of the depressed and wrinkled crown, marking the position of former inflorescences borne in the leaf-axil at different stages in the growth of the plant. An inflorescence has the form of a dichotomously-branched cyme bearing small erect cones; those containing the female flowers attain the size of a fir-cone, and are scarlet in colour. Each cone consists of an axis, on which numerous broad and thin bracts are arranged in regular rows; in the axil of each bract occurs a single flower; a male flower is enclosed by two opposite pairs of leaves, forming a perianth surrounding a central sterile ovule encircled by a ring of stamens united below, but free distally as short filaments, each of which terminates in a reticular anther. The integument of the sterile ovule is prolonged above the nucellus as a spirally-twisted tube expanded at its apex into a flat stigma-like organ. A complete and functional female flower consists of a single ovule with two integuments, the inner of which is prolonged into a narrow tubular micropyle, like that in the flower of *Gnetum*. The megaspore of *Welwitschia* is filled with a prothallus-tissue before fertilization, and some of the prothallus-cells function as egg-cells; these grow upwards as long tubes into the apical region of the nucellus, where they come into contact with the pollen-tubes. After the egg-cells have been fertilized by the non-motile male cells they grow into tubular proembryos, producing terminal embryos. The stem is traversed by numerous collateral bundles, which have a limited growth, and are constantly replaced by new bundles developed from strands of secondary meristem. One of the best-known anatomical characteristics of the genus is the occurrence of numerous spindle-shaped or branched fibres with enormously-thickened walls studded with crystals of calcium oxalate. Additional information has been published by Professor Pearson of Cape Town based on material collected in Damaraland in 1904 and 1906–1907. In 1906 he gave an account of the early stages of development of the male and female organs and, among other interesting statements in regard to the general biology of *Welwitschia*, he expressed the opinion that, as Hooker suspected, the ovules are pollinated by insect-agency. In a later paper Pearson considerably extended our knowledge of the reproduction and gametophyte of this genus.

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GYMNOSTOMACEAE, an order of Ciliate Infusoria (*q.v.*), characterized by a closed mouth, which only opens to swallow food actively, and body cilia forming a general or partial investment (rarely represented by a girdle of membranellae), but not differentiated in different regions. With the Aspirotrochaceae (*q.v.*) it formed the Holotricha of Stein.

GYMPIE, a mining town of March county, Queensland, Australia, 107 m. N. of Brisbane and 10 m. S. of Maryborough by rail. Pop. (1901) 11,050. Numerous gold mines were worked in the district, which also abounds in copper, silver, antimony, cinnabar, bismuth and nickel. Extensive undeveloped coal-beds lie 40 m. N. at Miva. Gympie became a municipality in 1880.

GYNAECEUM (Gr. γυναικεῖον, from γυνή, woman), that part in a Greek house which was specially reserved for the women, in contradistinction to the "andron," the men's quarters; in the larger houses there was an open court with peristyles round, and as a rule all the rooms were on the same level; in smaller houses the servants were placed in an upper storey, and this seems to have been the case to a certain extent in the Homeric house of the Odyssey. "Gynaeconitis" is the term given by Procopius to the space reserved for women in the Eastern Church, and this separation of the sexes was maintained in the early Christian churches where there were separate entrances and accommodation for the men and women, the latter being placed in the triforium gallery, or, in its absence, either on one side of the church, the men being on the other, or occasionally in the aisles, the nave being occupied by the men.

GYNAECOLOGY (from Gr. γυνή, γυναικός, a woman, and λόγος, discourse), the name given to that branch of medicine which concerns the pathology and treatment of affections peculiar to the female sex.

Gynaecology may be said to be one of the most ancient branches of medicine. The papyrus of Ebers, which is one of the oldest known works on medicine and dates from 1550 B.C., contains references to diseases of women, and it is recorded that specialism in this branch was known amongst Egyptian medical practitioners. The Vedas contain a list of therapeutic agents used in the treatment of gynaecological diseases. The treatises on gynaecology formerly attributed to Hippocrates (460 B.C.) are now said to be spurious, but the wording of the famous oath shows that he was at least familiar with the use of gynaecological instruments. Diocles Carystius, of the Alexandrian school (4th century B.C.), practised this branch, and Praxagoras of Cos, who lived shortly after, opened the abdomen by laparotomy. While the Alexandrine school represented Greek medicine, Greeks began to practise in Rome, and in the first years of the Christian era gynaecologists were much in demand (Häser). A speculum for gynaecological purposes has been found in the ruins of Pompeii, and votive offerings of anatomical parts found in the temples show that various gynaecological malformations were known to the ancients. Writers who have treated of this branch are Celsus (50 B.C.–A.D. 7) and Soranus of Ephesus (A.D. 98–138), who refers in his works to the fact that the Roman midwives frequently called to their aid practitioners who made a special study of diseases of women. These midwives attended the simpler gynaecological ailments. This was no innovation, as in Athens, as mentioned by Hyginus, we find one Agnodice, a midwife, disguising herself in man's attire so that she might attend lectures on medicine and diseases of women. After instruction she practised as a gynaecologist. This being contrary to Athenian law she was prosecuted, but was saved by the wives of some of the chief men testifying on her behalf. Besides Agnodice we have Sotira, who wrote a work on menstruation which is preserved in the library at Florence, while Aspasia is mentioned by Aetius as the author of several chapters of his work. It is evident that during the Roman period much of the gynaecological work was in the hands of women. Martial alludes to the "*feminae medicae*" in his epigram on Leda. These women must not be confounded with the midwives who on monuments are always described as "obstetrices." Galen devotes the sixth chapter of his work *De locis affectis* to gynaecological ailments. During the Byzantine period may be mentioned the work of Oribasius (A.D. 325) and Moschion (2nd century A.D.) who wrote a book in Latin for the use of matrons and midwives ignorant of Greek.

In modern times James Parsons (1705–1770) published his *Elenchus gynaicopathologicus et obstetricarius*, and in 1755 Charles Perry published his *Mechanical account and explication of the hysterical passion and of all other nervous disorders incident to the sex, with an appendix on cancers*. In the early part of the 19th century fresh interest in diseases of women awakened. Joseph Récamier (1774–1852) by his writings and teachings advocated the use of the speculum and sound. This was followed in 1840 by the writings of Simpson in England and Huguier in France. In 1845 John Hughes Bennett published his great work on inflammation of the uterus, and in 1850 Tilt published his book on ovarian inflammation. The credit of being the first to perform the operation of ovariotomy is now credited to McDowell of Kentucky in 1809, and to Robert Lawson Tait (1845–1899) in 1883 the first operation for ruptured ectopic gestation.

Menstruation.—Normal menstruation comprises the escape of from 4 to 6 oz. of blood together with mucus from the uterus at intervals of twenty-eight days (more or less). The flow begins at the age of puberty, the average age of which in England is between fourteen and sixteen years. It ceases between forty-five and fifty years of age, and this is called the menopause or climacteric period, commonly spoken of as "the change of life." Both the age of puberty and that of the menopause may supervene earlier or later according to local conditions. At both times the menstrual flow may be replaced by haemorrhage from distant organs (epistaxis, haematemesis, haemoptysis); this is called *vicarious menstruation*. Menstruation is usually but not necessarily coincident with ovulation. The usual

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disorders of menstruation are: (1) *amenorrhœa* (absence of flow), (2) *dysmenorrhœa* (painful flow), (3) *menorrhagia* (excessive flow), (4) *metrorrhagia* (excessive and irregular flow). Amenorrhœa may arise from physiological causes, such as pregnancy, lactation, the menopause; constitutional causes, such as phthisis, anaemia and chlorosis, febrile disorders, some chronic intoxications, such as morphinomania, and some forms of cerebral disease; local causes, which include malformations or absence of one or more of the genital parts, such as absence of ovaries, uterus or vagina, atresia of vagina, imperforate cervix, disease of the ovaries or Fallopian tubes; (2) obstructive, due to some obstacle to the flow, as stenosis, flexions and malpositions of the uterus, or malformations; (3) congestive, due to subinvolution, chronic inflammation of the uterus or its lining membrane, fibroid growths and polypi of the uterus, cardiac or hepatic disease; (4) neuralgic; (5) membranous. The foremost place in the treatment of dysmenorrhœa must be given to aperients and purgatives administered a day or two before the period is expected. By this means congestion is reduced. Hot baths are useful, and various drugs such as hyoscyanus, cannabis indica, phenalgin, ammonol or phenacetin have been prescribed. Medicinal treatment is, however, only palliative, and flexions and malpositions of the uterus must be corrected, stenosis treated by dilatation, fibroid growths if present removed, and subinvolution of the uterus must be treated by local applications or curetting according to its severity. Menorrhagia signifies excessive bleeding at the menstrual periods. Constitutional causes are purpura, haemophilia, excessive food and alcoholic drinks and warm climates; while local causes are congestion and displacements of the uterus, endometritis, subinvolution, retention of the products of conception, new growths in the uterus such as mucous and fibroid polypi, malignant growths, tubo-ovarian inflammation and tumour or ovarian tumour. Metrorrhagia is the flooding of blood from the uterus, independent of menstruation. It always arises from disease of the uterus or its appendages. Local causes are polypi, retention of the products of conception, extra uterine gestation, haemorrhages in connexion with pregnancy, and new growths in the uterus. In the treatment of both menorrhagia and metrorrhagia the local condition must be carefully ascertained. When pregnancy has been excluded, and constitutional causes treated, efforts should be made to relieve congestion. Uterine haemostatics, as ergot, ergotin, tincture of hydrastis and hamamelis are of use, together with rest in bed. Fibroid polypi and other new growths must be removed. Irregular bleeding in women over forty years of age is frequently a sign of early malignant disease, and should on no account be neglected.

Diseases of the External Genital Organs.—The vulva comprises several organs and structures grouped together for convenience of description (see REPRODUCTIVE SYSTEM). The affections to which these structures are liable may be considered as follows: (1) Injuries to the vulva, either accidental or occurring during parturition; these are generally rupture of the perinaeum. (2) *Vulvitis*. Simple vulvitis is due to want of cleanliness, or irritating discharges, and in children may result from threadworms. The symptoms are heat, itching and throbbing, and the parts are red and swollen. The treatment consists of rest, thorough cleanliness and fomentations. Infective vulvitis is nearly always due to gonorrhœa. The symptoms are the same as in simple vulvitis, with the addition of mucopurulent yellow discharge and scalding pain on micturition if neglected, extension of the disease may result. The treatment consists of rest in bed, warm medicated baths several times a day or fomentations of boracic acid. The parts must be kept thoroughly clean and discharges swabbed away. Diphtheritic vulvitis is rare, but erysipelas of the vulva may follow wounds, but since the use of antiseptics is rarely seen. (3) Vascular disturbances may occur in the vulva, including varix, haematoma, oedema and gangrene; the treatment is the same as for the same disease in other parts. (4) The vulva is likely to be affected by a number of cutaneous affections, the most important being erythema, eczema, herpes, lichen, tubercle, elephantiasis, vulvitis pruriginosa, syphilis and kraurosis. These affections present the same characters as in other parts of the body. *Kraurosis vulvae*, first described by Breisky in 1875, is an atrophic change accompanied by pain and a yellowish discharge; the cause is unknown. Pruritis vulvae is due to parasites, or to irritating discharges, as leucorrhoea, and is frequent in diabetic subjects. The hymen may be occasionally imperforate and require incision. Cysts and painful carunculae may occur on the clitoris. Any part of the vulva may be the seat of new growths, simple or malignant.

Diseases of the Vagina.—(1) Malformations. The vagina may be absent in whole or in part or may present a septum. Stenosis of the vagina may be a barrier to menstruation. (2) Displacements of the vagina; (*a*) cystocele, which is a hernia of the bladder into the vagina; (*b*) rectocele, a hernia of the rectum into the vagina. The cause of these conditions is relaxation of the tissues due to parturition. The palliative treatment consists in keeping up the parts by the insertion of a pessary; when this fails operative interference is called for. (3) Fistulae may form between the vagina and bladder or vagina and rectum; they are generally caused by injuries during parturition or the late stages of carcinoma. Persistent fistulae require operative treatment. The vagina normally secretes a thin opalescent acid fluid derived from the lymph serum and the shedding of squamous epithelium. This fluid normally contains the vagina bacillus. In pathological conditions the character of the secretion undergoes changes. For practical purposes three varieties of *vaginitis* may be described: (*a*) simple catarrhal vaginitis is due to the same causes as simple vulvitis, and occasionally in children is important from a medico-legal aspect when it is complicated by vulvitis. The symptoms are heat and discomfort with copious mucopurulent discharge. The only treatment required is rest, with vaginal douches of warm unirritating lotions such as boracic acid or subacetate of lead. (*b*) Gonorrhoeal vaginitis is most common in adults. The patient complains of pain and burning, pain on passing water and discharge which is generally green or yellow. The results of untreated gonorrhoeal vaginitis are serious and far-reaching. The disease may spread up the genital passages, causing endometritis, salpingitis and septic peritonitis, or may extend into the bladder, causing cystitis. Strict rest should be enjoined, douches of carbolic acid (1 in 40) or of perchloride of mercury (1 in 2000) should be ordered morning and evening, the vagina being packed with tampons of iodiform gauze. Saline purgatives and alkaline diuretics should be given. (*c*) Chronic vaginitis (leucorrhoea or "the whites") may follow acute conditions and persist indefinitely. The vagina is rarely the seat of tumours, but cysts are common.

Diseases of the Uterus.—The uterus undergoes important changes during life, chiefly at puberty and at the menopause. At puberty it assumes the pear shape characteristic of the mature uterus. At the menopause it shares in the general atrophy of the reproductive organs. It is subject to various disorders and misplacements. (*a*) *Displacements of the Uterus.*—The normal position of the uterus, when the bladder is empty, is that of anteversion. We have therefore to consider the following conditions as pathological: anteflexion, retroflexion, retroversion, inversion, prolapse and procidentia. Slight anteflexion or forward bending of the uterus when exaggerated it gives rise to dysmenorrhœa, sterility and reflex nervous phenomena. This condition is usually congenital and is often associated with under-development of the uterus, from which the sterility results. The treatment is by dilatation of the canal or by a plastic operation. Retroflexion is a bending over of the uterus backwards, and occurs as a complication of retroversion (or displacement backwards). The causes are (1) any cause tending to make the fundus or upper part of the uterus extra heavy, such as tumour or congestion, (2) loss of tone in the uterine walls, (3) adhesions formed after cellulitis, (4) violent muscular efforts, (4) weakening of the uterine supports from parturition. The symptoms are dysmenorrhœa, pain on defaecation and constipation from the pressure of the fundus on the rectum; the patient is often sterile. The treatment is the replacing of the uterus in position, where it can be kept by the insertion of a pessary; failing this, operative treatment may be required. Retroversion when pathological is rarer than retroflexion. It may be congenital or is caused by or associated with pregnancy or a fibroid. The symptoms are those of retroflexion with feeling of pain and weight in the pelvis and desire to micturate followed by retention of urine due to the pressure of the cervix against the base of the bladder. The uterus must be skilfully replaced in position; when pessaries fail to keep it there the operation of hysteropexy gives excellent results.

Inversion occurs when the uterus is turned inside out. It is only possible when the cavity is dilated, either after pregnancy or by a polypus. The greater number of cases follow delivery and are acute. Chronic inversions are generally due to the weight of a polypus. The symptoms are menorrhagia, metrorrhagia and bladder troubles; on examination a tumour-like mass occupies the vagina. Reduction of the condition is sometimes difficult, especially when the condition has lasted for a long time. The tumour which has caused the inversion must be excised. Prolapse and procidentia are different degrees of the same variety of displacement. When the uterus lies in the vagina it is spoken of as prolapse, when it protrudes through the vulva it is procidentia. The condition is generally due to increased intra-abdominal pressure, increased weight of the uterus by fibroids, violent straining, chronic cough and weakening of the supporting structures of the pelvic floor, such as laceration of the vagina and perinaeum. Traction on the uterus from below (as cervical tumour) may be a cause; advanced age, laborious occupations and frequent pregnancies are indirect causes. The symptoms are a "bearing down" feeling, pain and fatigue in walking, trouble with micturition and defaecation. The condition is generally obvious on examination. As a rule the uterus is easy to replace in position. A rubber ring pessary will often serve to keep it there. If the perinaeum is very much torn it may be necessary to repair it. Various operations for retaining the uterus in position are described. (*b*) *Enlargements of the Uterus* (hypertrophy or hyperplasia). This condition may sometimes involve the uterus as a whole or may be most marked in the body or in the cervix. It follows chronic congestion or inflammatory

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prolapse, or any condition interfering with the circulation. The symptoms comprise local discomfort and sometimes dysmenorrhœa, leucorrhœa or menorrhagia. When the elongation occurs in the cervical portion the only possible treatment is amputation of the cervix. Atrophy of the uterus is normal after the menopause. It may follow the removal of the tubes and ovaries. Some constitutional diseases produce the same result, as tuberculosis, chlorosis, chronic morphinism and certain diseases of the central nervous system.

(c) *Injuries and Diseases resultant from Pregnancy.*—The most frequent of these injuries is laceration of the cervix uteri, which is frequent in precipitate labour. Once the cervix is torn the raw surfaces become covered by granulations and later by cicatrical tissue, but as a rule they do not unite. The torn lips readily become unhealthy, and the congestion and oedema spread to the body of the uterus. A lacerated cervix does not usually give rise to symptoms; these depend on the accompanying endometritis, and include leucorrhœa, aching and a feeling of weight. Lacerations are to be felt digitally. As lacerations predispose to abortion the operation of trachelorraphy or repair of the cervix is indicated. Perforation of the uterus may occur from the use of the sound in diseased conditions of the uterine walls. Superinvolution means premature atrophy following parturition. Subinvolution is a condition in which the uterus fails to return to its normal size and remains enlarged. Retention of the products of conception may cause irregular haemorrhages and may lead to a diagnosis of tumour. The uterus should be carefully explored.

(d) *Inflammations Acute and Chronic.*—The mucous membrane lining the cervical canal and body of the uterus is called the endometrium. Acute inflammation or endometritis may attack it. The chief causes are septic following labour or abortion, extension of a gonorrhœal vaginitis, or gangrene or infection of a uterine myoma. The puerperal endometritis following labour is an avoidable disease due to lack of scrupulous aseptic precautions.

Gonorrhœal endometritis is an acute form associated with copious purulent discharge and well-marked constitutional disturbance. The temperature ranges from 99° to 105° F., associated with pelvic pain, and rigors are not uncommon. The tendency is to recovery with more or less protracted convalescence. The most serious complications are extension of the disease and later sterility. Rest in bed and intrauterine irrigation, followed by the introduction of iodoform pencils into the uterine cavity, should be resorted to, while pain is relieved by hot fomentations and sitz baths. Chronic endometritis may be the sequela of the acute form, or may be septic in origin, or the result of chronic congestion, acute retroflection or subinvolution following delivery or abortion. The varieties are glandular, interstitial, haemorrhagic and senile. The symptoms are disturbance of the menstrual function, backache, pain and pelvic discomfort, and more or less profuse thick leucorrhœal discharge. The treatment consists in attention to the general health, with suitable laxatives and local injections, and in obstinate cases curettage is the most effectual measure. The disease is frequently associated with adenomatous disease of the cervix, forming cervical polypus. In this disease there is a new formation of glandular elements, which enlarge and multiply, forming a soft velvety areola dotted with pink spots. This was formerly erroneously termed ulceration. The cause is unknown. It occurs in virgins as well as in married women, it often accompanies lacerations of the cervix. The symptoms are indefinite pain and leucorrhœa. The condition is visible on inspection with a speculum. The treatment is swabbing with iodized phenol or curettage. The body of the uterus may also be the seat of adenomatous disease. Tuberculosis may attack the uterus; this usually forms part of a general tuberculosis.

(e) *New Growths in the Uterus.*—The uterus is the most common seat of new growths. A table of researches of von Gurlt, compiled from the Vienna Hospital *Reports*, embracing 15,880 cases of tumour, females exceed males in the proportion of seven to three, and of this large majority uterine growths account for 25%. When we consider its periodic monthly engorgements and the alternate hypertrophy and involution it undergoes in connexion with pregnancy, we can anticipate the special proneness of the uterus to new growths. Tumours of the uterus are divided into benign and malignant. The benign tumours known as fibroids or myomata are very common. They are stated by Bayle to occur in 50% of women over 35 years of age, but happily in a great number of cases they are small and give rise to no symptoms. They are definitely associated with the period of sexual activity and occur more frequently in married women than in single, in the proportion of two to one (Winckel). It is doubtful if they ever originate after the menopause. Indeed if uncomplicated by changes in them they share in the general atrophy of the sexual organs which then takes place. They are divided according to their position in the tissues into intramural, subserous and submucous (the last when it has a pedicle forms a polypus), or as to the part of the uterus in which they develop into fibroids of the cervix and fibroids of the body. Intramural and submucous fibroids give rise to haemorrhage. The menses may be so increased that the patient is scarcely ever free from haemorrhage. The pressure of the growth may cause dysmenorrhœa, or pressure on the bladder and rectum may cause dysuria, retention or rectal tenesmus. The uterus may be displaced by the weight of the tumour. Secondary changes take place in fibroids, such as mucous degeneration, fatty metamorphosis, calcification, septic infection (sloughing fibroid) and malignant (sarcomatous) degeneration.

The modes in which fibroids imperil life are haemorrhage (the commonest of all), septic infection, which is one of the most dangerous, impaction when it fits the true pelvis so tightly that the tumour cannot rise, twisting of the pedicle by rotation, leading to sloughing and intestinal and urinary obstruction. When fibroids are complicated by pregnancy, impaction and consequent abortion may take place, or a cervical myoma may offer a mechanical obstacle to delivery or lead to serious post partem haemorrhage. In the treatment of fibroids various drugs (ergot, hamamelis, hydrastis canadensis) may be tried to control the haemorrhage, and repose and the injection of hot water (120° F.) are sometimes successful, together with electrical treatment. Surgical measures are needed, however, in severe recurrent haemorrhage, intestinal obstruction, sloughing and the co-existence of pregnancy. An endeavour must be made if possible to enucleate the fibroid, or hysterectomy (removal of the uterus) may be required. The operation of removal of the ovaries to precipitate the menopause has fallen into disuse.

(f) *Malignant Disease of the Uterus.*—The varieties of malignant disease met with in the uterus are sarcoma, carcinoma and chorion-epithelioma malignum. Sarcomata may occur in the body and in the neck. They occur at an earlier age than carcinomata. Marked enlargement and haemorrhage are the symptoms. The differential diagnosis is microscopic. Extirpation of the uterus is the only chance of prolonging life. The age at which women are most subject to carcinoma (cancer) of the uterus is towards the decline of sexual life. Of 3385 collected cases of cancer of the uterus 1169 occurred between 40 and 50, and 856 between 50 and 60. In contradistinction to fibroids malignant disease is frequently after the menopause. It may be divided into cancer of the body and cancer of the neck (cervix). Cancer of the neck of the uterus is almost exclusively confined to women who have been pregnant (Bland-Sutton). Predisposing causes may be injuries during delivery. The symptoms which induce women to seek medical aid are haemorrhage, foetid discharge, and later pain and cachexia. An unfortunate belief amongst the public that the menopause is associated with irregular bleeding and offensive discharges has prevented many women from seeking medical advice until too late. It cannot be too much emphasized that cancer of the cervix is in its early stages a purely local disease, and if removed in this stage usually results in cure. So important is the recognition of this fact in the saving of human life that at the meeting of the British Medical Association in April 1909 the council issued for publication a special appeal to medical practitioners, midwives and nurses, and directed it to be published in British and colonial medical and nursing journals. It will be useful to quote here a part of the appeal addressed to midwives and nurses: "Cancer may occur at any age and in a woman who looks quite well, and who may have no pain, no wasting, no foul discharge and no profuse bleeding. To wait for pain, wasting, foul discharge or profuse bleeding is to throw away the chance of successful treatment. The early symptoms of cancer of the womb are:—(1) Irregular bleeding which occurs after change of life, (2) bleeding after sexual intercourse or after a vaginal douche, (3) bleeding, slight or abundant, even in young women, if occurring between the usual monthly periods, and especially when accompanied by a back-dragging or watery-like discharge, (4) thin watery discharge occurring at any age." On examination the cervix presents certain characteristic signs, though these may be modified according to the variety of cancer present. Hard nodules or definite loss of substance, extreme friability and bleeding after slight manipulation, are suspicious. Epithelial cancer of the cervix may assume a proliferating ulcerative type, forming the well-known "cauliflower" excrescence. The treatment of cancer of the cervix is free removal at the earliest possible moment. Cancer of the body of the uterus is rare before the 45th year. It is most frequent at or subsequent to the menopause. The majority of the patients are nulliparae (Bland-Sutton). The signs are fitful haemorrhages after the menopause, followed by profuse and offensive discharges.

Examination often feels rather than sees the uterus on examination per vaginam. Even when diagnosis being made, hysterectomy (removal of the uterus) is the only treatment. Cancer of the body of the uterus may complicate fibroids. Chorion-epithelioma malignum (deciduoma) was first described in 1889 by Sänger and Pfeiffer. It is a malignant disease presenting microscopic characters resembling decidual tissue. It occurs in connexion with recent pregnancy, and particularly with the variety of abortion termed hydatid mole. In many cases it destroys life with a rapidity unequalled by any other kind of growth. It quickly ulcerates and infiltrates the uterine tissues, forming metastatic growths in the lung and vagina. Clinically it is recognized by the occurrence after pregnancy of violent haemorrhages, progressive cachexia and fever with rigors. Recent suggestions have been made as to chorion-epithelioma being the result of pathological changes in the chorin tissue of the ovary. The growth is usually primary in the uterus, but may be so in the Fallopian tubes and in the vagina. A few cases have been recorded unconnected with pregnancy. The virulence of chorion-epithelioma varies, but in the present state of our knowledge immediate removal of the primary growth along with the affected organ is the only treatment.

Diseases of the Fallopian Tubes.—The Fallopian tubes or oviducts

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are liable to inflammatory affections, tuberculosis, sarcomata, cancer, chorion-epithelioma and tubal pregnancy. Salpingitis (inflammation of the oviducts) is nearly always secondary to septic infection of the genital tract. The chief causes are septic endometritis following labour or abortion, gangrene of a myoma, gonorrhoea, tuberculosis and cancer of the uterus; it sometimes follows the specific fevers. When the pus escapes from the tubes into the coelom it sets up pelvic peritonitis. When the inflammation is adjacent to the ostium it leads to the matting together of the tubal fimbriae and glues them to an adjacent organ. This seals the ostium. The occluded tube may then form an accumulation of pus or mucus (pyosalpinx). When in consequence of the sealing of the ostium the tube becomes distended with serous fluid it is termed hydrosalpinx. Haematosalpinx is a term applied to the non-gravid tube distended with blood; later the tubes may become sclerosed. Acute septic salpingitis is ushered in by a rigor, the temperature rising to 103°, 104° F., with severe pain and constitutional disturbance. The symptoms may become merged in those of general peritonitis. In chronic disease there is a history of puerperal trouble followed by sterility, with excessive and painful menstruation. Acute salpingitis requires absolute rest, opium suppositories and hot fomentations. With urgent symptoms removal of the inflamed adnexa must be resorted to. Chronic salpingitis often renders a woman an invalid. Permanent relief can only be afforded by surgical intervention. Tuberculous salpingitis is usually secondary to other tuberculous infections. The Fallopian tubes may be the seat of malignant disease. This is rarely primary. By far the most important of the conditions of the Fallopian tubes is tubal pregnancy (ectopic gestation). It is now known that fertilization of the human ovum by the spermatozoon may take place even when the ovum is in its follicle in the ovary, for oosperms have been found in the ovary and Fallopian tubes as well as in the uterus. Relief in ovarian pregnancy is of old standing, and has been described under that name, however, no case of an early embryo in its membranes in the sac of an ovary being forthcoming, until the remarkable case published by Dr Catherine van Tussenbroek of Amsterdam in 1899 (Bland-Sutton). Tubal pregnancy is most frequent in the left tube; it sometimes complicates uterine pregnancy; rarely both tubes are pregnant. When the oosperm lodges in the ampulla or isthmus it is called tubal gestation; when it is retained in the portion traversing the uterine wall it is called tubo-uterine gestation. Whenever the embryo dies and remains and implants its villi the tube becomes turgid and swollen, and the abdominal ostium gradually closes. The ovum in this situation is liable to apoplexy, forming tubal mole. When the abdominal ostium remains pervious the ovum may escape into the coelomic cavity (tubal abdominal gestation) and clot and haemorrhage into the abdominal cavity may result. When neither of these occurrences has taken place the ovum continues to grow inside the tube, the rupture of the distended tube usually taking place between the sixth and the tenth week. The rupture of the tube may be intraperitoneal or extraperitoneal. The danger is death from haemorrhage occurring during the rupture, or adhesions may form, the retained blood forming a haematocele. The ovum may be destroyed or may continue to develop. In rare cases abortion may occur, the tube bulging into the peritoneal cavity; and the foetus may break through the membranes and lie free among the intestines, where it may die, becoming encysted or calcified. The tubal placenta possesses foetal structures, the decidua forming in the uterus. The signs suggestive of tubal pregnancy before rupture are missed periods, pelvic pains and the presence of an enlarged tube. When rupture takes place it is attended in both varieties with sudden and severe pain and more or less marked collapse, and a tumour may or may not be felt according to the situation of the rupture. There is a general "feeling of something having given way." If diagnosed before rupture, the sac must be removed by abdominal section. In intraperitoneal rupture immediate operation affords the only chance of saving life. In extraperitoneal rupture the ovum may occasionally remain alive until full term and be resected by abdominal section, if the condition is recognized, or a false labour may take place, accompanied by death of the foetus.

Diseases of the Ovaries and Parovarium.—The ovaries undergo striking changes at puberty, and again at the menopause, after which there is a gradual shrinkage. One or both may be absent or malformed, or they are subject to displacements, being either undescended, contained in a hernia or prolapsed. Either of these conditions, if a source of pain, may necessitate their removal. The ovary is also subject to haemorrhage or apoplexy. Acute inflammations (oophorites) are constantly associated with salpingitis or other septic conditions of the genital tract or with an attack of mumps. The relation of oophoritis to mumps is at present unknown. Acute oophoritis may culminate in abscess but more usually adhesions are formed. The surgical treatment is that of pyosalpinx. Chronic inflammation may follow acute or be consequent on pelvic cellulitis. Its constant features are more or less pain followed by sterility. The ovary may be the seat of tuberculosis, which is generally secondary to other lesions. Suppuration and abscess of the ovary also occur. Perioöphoritis, or chronic inflammation in the neighborhood, may also involve the gland. The cause of cirrhosis of the ovaries is unknown, though it may be associated with cirrhotic liver. The change is met with in women between 20 and 40 years of age, the ovaries being in a shrunken, hard, wrinkled condition. Under ovarian neuralgia are grouped indefinite painful symptoms occurring frequently in neurotic and alcoholic subjects, and often worse during menstruation. The treatment, whether local or operative, is usually unsatisfactory. The ovary is frequently the seat of tumours, dermoids and cysts. Cysts may be simple, unilocular or multilocular, and may attain an enormous size. The largest on record was removed by Dr Elizabeth Reifsnyder of Shanghai, and contained 100 litres of fluid, and the patient recovered. The operation is termed ovariotomy. Dermoid cysts containing skin, bones, teeth and hair, are of frequent growth in the ovary, and have attained the weight of from 20 to 40 kilogrammes. In one case a girl weighed 27 kilogrammes and her tumour 44 kilogrammes (Keen). Papillomatous cysts also occur in the ovary. Parovarian and Gärtnerian cysts are found, and adenomata form 20% of all ovarian cysts. Occasionally the tunic of peritoneum surrounding the ovary becomes distended with serous fluid. This is termed ovarian hydrocele. Ovarian fibroids occur, and malignant disease (sarcoma and carcinoma) is fairly frequent, sarcoma being the most usual malignant tumour occurring before puberty. Carcinoma of the ovary is rarely primary, but it is a common situation for secondary cancer to that of the breast, gall-bladder or gastro-intestinal tract. The treatment of all rapidly-growing tumours of the ovary is removal.

Diseases of the Pelvic Peritoneum and Connective Tissue.—Women are excessively liable to peritoneal infections. (1) Septic infection often follows acute salpingitis and may give rise to pelvic peritonitis (perimetritis), which may be adhesive, serous or purulent. It may follow the rupture of ovarian or dermoid cysts, rupture of the uterus, extra uterine pregnancy or extension from pyosalpinx. The symptoms are severe pain, fever, 103° F. and higher, marked constitutional disturbances, vomiting, restlessness, even delirium. The abdomen is full and tympanitic. Treatment is as the formation of adhesions causing abnormal positions of the organs, or chronic peritonitis may follow. The treatment is rest in bed, opium, hot stupes to the abdomen and quinine. (2) Epithelial infections take place in the peritoneum in connexion with other malignant growths. (3) Hydroperitoneum, a collection of free fluid in the abdominal cavity, may be due to tumours of the abdominal viscera or to tuberculosis of the peritoneum. (4) Pelvic cellulitis (parametritis) signifies the inflammation of the connective tissue between the folds of the broad ligament (mesometrium). The general causes are septic changes following abortion, delivery at term (especially instrumental delivery), following operations on the uterus or salpingitis. The symptoms are chill followed by severe intrapelvic pain and tension, fever, 100°–102° F. There may be also vomiting, diarrhoea, rectal tenesmus and dysuria. If consequent on parturition the lochia cease or become offensive. On examination there is tenderness and swelling in one flank and the uterus becomes fixed and immovable in the exudate as if embedded in plaster of Paris. The illness may go to resolution if treated by rest, opium, hot stupes or icebags and glycerine tampons, or may go on to suppuration forming pelvic abscess, which signifies a collection of pus between the layers of the broad ligament. The pus in a pelvic abscess may point and escape through the walls of the vagina, rectum or bladder. It occasionally points in the groin. If the pus can be localized an incision should be made and the abscess drained. The tumours which arise in the broad ligament are haematocele, solid tumours (as myomata, lipomata and sarcomata), and echinococcus colonies (hydatids).

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GYÖNGYÖSI, ISTVÁN [STEPHEN] (1620–1704), Hungarian poet, was born of poor but noble parents in 1620. His abilities early attracted the notice of Count Ferencz Wesselényi, who in 1640 appointed him to a post of confidence in Fülek castle. Here he remained till 1653, when he married and became an assessor of the judicial board. In 1681 he was elected as a representative of his county at the diet held at Soprony (Oedenburg). From 1686 to 1693, and again from 1700 to his death in 1704, he was deputy lord-lieutenant of the county of Gömör. Of his literary works the most famous is the epic poem *Murányi Venus* (Caschau, 1664), in honour of his benefactor's wife Maria Szécsi, the heroine of Murány. Among his later productions the best known are *Rózsa-Koszorú*, or Rose-Wreath (1690), *Kemény-János* (1693), *Cupido* (1695), *Palinodia* (1695) and *Chariklia* (1700).

The earliest edition of his collected poetical works is by Dugonics (Pressburg and Pest, 1796); the best modern selection is that of Toldy, entitled *Gyöngyösi István válogatott költ. munkái* (Select poetical works of Stephen Gyöngyösi, 2 vols., 1864–1865).

GYÖR (Ger. *Raab*), a town of Hungary, capital of a county of the same name, 88 m. W. of Budapest by rail. Pop. (1900)

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27,758. It is situated at the confluence of the Raab with the Danube, and is composed of the inner town and three suburbs. Győr is a well-built town, and is the seat of a Roman Catholic bishop. Amongst its principal buildings are the cathedral, dating from the 12th century, and rebuilt in 1630–1654; the bishop's palace; the town hall; the Roman Catholic seminary for priests and several churches. There are manufactures of cloth, machinery and tobacco, and an active trade in grain and horses. Twenty miles by rail W.S.W. of the town is situated Csorna, a village with a Premonstratensian abbey, whose archives contain numerous valuable historical documents.

Győr is one of the oldest towns in Hungary and occupies the site of the Roman *Arabona*. It was already a place of some importance in the 10th century, and its bishopric was created in the 11th century. It was a strongly fortified town which resisted successfully the attacks of the Turks, into whose hands it fell by treachery in 1594, but they retained possession of it only for four years. Montecucculi made Győr a first-class fortress, and it remained so until 1783, when it was abandoned. At the beginning of the 19th century, the fortifications were re-erected, but were easily taken by the French in 1809, and were again stormed by the Austrians on the 28th of June 1849.

About 11 m. S.E. of Győr on a spur of the Bakony Forest lies the famous Benedictine abbey of Pannonhalma (Ger. *St Martinsberg*; Lat. *Mons Sancti Martini*), one of the oldest and wealthiest abbeys of Hungary. It was founded by King St Stephen, and the original deed from 1001 is preserved in the archives of the abbey. The present building is a block of palaces, containing a beautiful church, some of its parts dating from the 12th century, and lies on a hill 1200 ft. high. The church has a tower 130 ft. high. In the convent there are a seminary for priests, a normal school, a gymnasium and a library of 120,000 vols. The chief abbot has the rank of a bishop, and is a member of the Upper House of the Hungarian parliament, while in spiritual matters he is subordinate immediately to the Roman curia.

GYP, the pen name of SIBYLLE GABRIELLE MARIE ANTOINETTE RIQUETI DE MIRABEAU, Comtesse de Martel de Janville (1850–) French writer, who was born at the château of Koetsal in the Morbihan. Her father, who was the grandson of the vicomte de Mirabeau and great-nephew of the orator, served in the Papal Zouaves, and died during the campaign of 1860. Her mother, the comtesse de Mirabeau, in addition to some graver compositions, contributed to the *Figaro* and the *Vie parisienne*, under various pseudonyms, papers in the manner successfully developed by her daughter. Under the pseudonym of "Gyp" Madame de Martel, who was married in 1869, sent to the *Vie parisienne*, and later to the *Revue des deux mondes*, a large number of social sketches and dialogues, afterwards reprinted in volumes. Her later work includes stories of a more formal sort, essentially differing but little from the shorter studies. The following list includes some of the best known of Madame de Martel's publications, nearly seventy in number: *Petit Bob* (1882); *Autour du mariage* (1883); *Ce que femme veut* (1883); *Le Monde à côté* (1884), *Sans voiles* (1885); *Autour du divorce* (1886); *Dans le train* (1886); *Mademoiselle Loulou* (1888); *Bob au salon* (1888–1889); *L'Éducation d'un prince* (1890); *Passionette* (1891); *Ohé! la grande vie* (1891); *Une Élection à Tigre-sur-mer* (1890), an account of "Gyp's" experiences in support of a Boulangist candidate; *Mariage civil* (1892); *Ces bons docteurs* (1892); *Du haut en bas* (1893); *Mariage de chiffon* (1894); *Leurs âmes* (1895); *Le Cœur d'Ariane* (1895); *Le Bonheur de Ginette* (1896); *Totote* (1897); *Lune de miel* (1898); *Israël* (1898); *L'Entretue* (1899); *Le Pays des champs* (1900); *Trop de chic* (1900); *Le Friquet* (1901); *La Fête* (1902); *Un Mariage chic* (1903); *Un Ménage dernier cri* (1903); *Maman* (1904); *Le Cœur de Pierrette* (1905). From the first "Gyp," writing of a society to which she belonged, displayed all the qualities which have given her a distinct, if not pre-eminent, position among writers of her class. Those qualities included an intense faculty of observation, much skill in innuendo, a mordant wit combined with some breadth of humour, and a singular power of animating ordinary dialogues without destroying the appearance of reality. Her Parisian types of the spoiled child, of the precocious schoolgirl, of the young bride, and of various masculine figures in the gay world, have become almost classical, and may probably survive as faithful pictures of luxurious manners in the 19th century. Some later productions, inspired by a violent anti-Semitic and Nationalist bias, deserve little consideration. An earlier attempt to dramatize *Autour du mariage* was a failure, not owing to the audacities which it shares with most of its author's works, but from lack of cohesion and incident. More successful was *Mademoiselle Ève* (1895), but indeed "Gyp's" successes are all achieved without a trace of dramatic faculty. In 1901 Madame de Martel furnished a sensational incident in the Nationalist campaign during the municipal elections in Paris. She was said to have been the victim of a kidnapping outrage or piece of horseplay provoked by her political attitude, but though a most circumstantial account of the outrages committed on her and of her adventurous escape was published, the affair was never clearly explained or verified.

GYPSUM, a common mineral consisting of hydrous calcium sulphate, named from the Gr. γύψος, a word used by Theophrastus to denote not only the raw mineral but also the product of its calcination, which was employed in ancient times, as it still is, as a plaster. When crystallized, gypsum is often called selenite, the σελήνιτης of Dioscorides, so named from σελήνη, "the moon," probably in allusion to the soft moon-like reflection of light from some of its faces, or, according to a legend, because it is found at night when the moon is on the increase. The granular, marble-like gypsum is termed alabaster (*q.v.*).

Gypsum crystallizes in the monoclinic system, the habit of the crystals being usually either prismatic or tabular; in the latter case the broad planes are parallel to the faces of the clinopinacoid. The crystals may become lenticular by curvature of certain faces. In the characteristic type represented in fig. 1, *f* represents the prism, *l* the hemi-pyramid and *P* the clinopinacoid. Twins are common, as in fig. 2, forming in some cases arrow-headed and swallow-tailed crystals. Cleavage is perfect parallel to the clinopinacoid, yielding thin plates, often diamond-shaped, with pearly lustre; these flakes are usually flexible, but may be brittle, as in the gypsum of Montmartre. Two other cleavages are recognized, but they are imperfect. Crystals of gypsum, when occurring in clay, may enclose much muddy matter; in other cases a large proportion of sand may be mechanically entangled in the crystals without serious disturbance of form; whilst certain crystals occasionally enclose cavities with liquid and an air-bubble. Gypsum not infrequently becomes fibrous. This variety occurs in veins, often running through gypseous marls, with the fibres disposed at right angles to the direction of the vein. Such gypsum when cut and polished has a pearly opalescence, or satiny sheen, whence it is called satin-spar (*q.v.*).

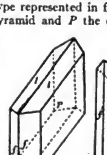

FIG. 1.

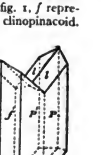

FIG. 2.

Gypsum is so soft as to be scratched even by the finger-nail (H = 1·5 to 2). Its specific gravity is about 2·3. The mineral is slightly soluble in water, one part of gypsum being soluble, according to G. K. Cameron, in 372 parts of pure water at 26° C. Waters percolating through gypseous strata, like the Keuper marls, dissolve the calcium sulphate and thus become permanently hard or "selenitic." Such water has special value for brewing pale ale, and the water used by the Burton breweries is of this character; hence the artificial dissolving of gypsum in water for brewing purposes is known as "burtonization." Deposits of gypsum are formed in boilers using selenitic water.

Pure gypsum is colourless or white, but it is often tinted, especially in the alabaster variety, grey, yellow or pink. Gypsum crystallizes with two molecules of water, equal to about 21 % by

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weight, and consequently has the formula $CaSO_4 \cdot 2H_2O$. By exposure to strong heat all the water may be expelled, and the substance then has the composition of anhydrite (*q.v.*). When the calcination, however, is conducted at such a temperature that only about 75% of the water is lost, it yields a white pulverulent substance, known as "plaster of Paris," which may readily be caused to recombine with water, forming a hard cement. The gypsum quarries of Montmartre, in the north of Paris, were worked in Tertiary strata, rich in fossils. Gypsum is largely quarried in England for conversion into plaster of Paris, whence it is sometimes known as "plaster stone," and since much is sent to the Staffordshire potteries for making moulds it is also termed "potter's stone." The chief workings are in the Keuper marls near Newark in Nottinghamshire, Fauld in Staffordshire and Chellaston in Derbyshire. It is also worked in Permian beds in Cumberland and Westmorland, and in Purbeck strata near Battle in Sussex.

Gypsum frequently occurs in association with rock-salt, having been deposited in shallow basins of salt water. Much of the calcium in sea-water exists as sulphate; and on evaporation of a drop of sea-water under the microscope this sulphate is deposited as acicular crystals of gypsum. In salt-lagoons the deposition of the gypsum is probably effected in most cases by means of micro-organisms. Waters containing sulphuretted hydrogen, on exposure to the air in the presence of limestone, may yield gypsum by the formation of sulphuric acid and its interaction with the calcium carbonate. In volcanic districts gypsum is produced by the action of sulphuric acid, resulting from the oxidation of sulphurous vapours, on lime-bearing minerals, like labradorite and augite, in the volcanic rocks: hence gypsum is common around solfataras. Again, by the oxidation of iron-pyrites and the action of the resulting sulphuric acid on limestone or on shells, gypsum may be formed; whence its origin in most clays. Gypsum is also formed in some cases by the hydration of anhydrite, the change being accompanied by an increase of volume to the extent of about 60%. Conversely gypsum may, under certain conditions, be dehydrated or reduced to anhydrite.

Some of the largest known crystals of selenite have been found in southern Utah, where they occur in huge geodes, or crystal-lined cavities, in deposits from the old salt-lakes. Fine crystals, sometimes curiously bent, occur in the Permian rocks of Friedrichroda, near Gotha, where there is a grotto called the Marienglashöhle, close to Rheinhardsbrunn. Many of the best localities for selenite are in the New Red Sandstone formation (Trias and Permian), notably the salt-mines of Hall and Hallein, near Salzburg, and of Bex in Switzerland. Excellent crystals, usually of a brownish colour arranged in groups, are often found in the brine-chambers and the launders used in salt-works. Selenite also occurs in fine crystals in the sulphur-bearing marls of Girgenti and other Sicilian localities; whilst in Britain very bold crystals are yielded by the Kimeridge clay of Shotover Hill near Oxford. Twisted crystals and rosettes of gypsum found in the Mammoth Cave, Kentucky, have been called "oulopholites" (οὖλος, "woolly"; φωλεός, "cave").

In addition to the use of gypsum in cement-making, the mineral finds application as an agricultural agent in dressing land, and it has also been used in the manufacture of porcelain and glass. Formerly it was employed, in the form of thin cleavage-plates, for glazing windows, and seems to have been, with mica, called *lapis specularis*. It is still known in Germany as *Marienglas* and *Fraueneis*. Delicate cleavage-plates of gypsum are used in microscopic petrography for the determination of certain optical constants in the rock-forming minerals. (F. W. R.*)

GYROSCOPE AND GYROSTAT. These are scientific models or instruments designed to illustrate experimentally the dynamics of a rotating body such as the spinning-top, hoop and bicycle, and also the precession of the equinox and the rotation of the earth.

The gyroscope (Gr. γῦρος, ring, σκοπεῖν, to see) may be distinguished from the gyrostat (γῦρος, and στατικός, stationary) as an instrument in which the rotating wheel or disk is mounted in gimbals so that the principal axis of rotation always passes through a fixed point (fig. 1). It can be made to imitate the motion of a spinning-top of which the point is placed in a smooth agate cup as in Maxwell's dynamical top (figs. 2, 3). (*Collected Works*, i. 248.) A bicycle wheel, with a prolongation of the axle placed in a cup, can also be made to serve (fig. 4).

The gyrostat is an instrument designed by Lord Kelvin (*Natural Philosophy*, § 345) to illustrate the more com-

Fig. 1.

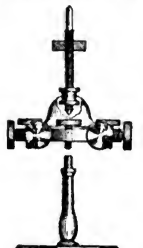

Fig. 2.

plicated state of motion of a spinning body when free to wander about on a horizontal plane, like a top spun on the pavement, or a hoop or bicycle on the road. It consists essentially of a massive fly-wheel concealed in a metal casing, and its behaviour on a table, or with various modes of suspension or support, described in Thomson and Tait, *Natural Philosophy*, serves to illustrate the curious reversal of the ordinary laws of statical equilibrium due to the *gyrostatic domination* of the interior invisible fly-wheel, when rotated rapidly (fig. 5).

The toy shown in figs. 6 and 7, which can be bought for a shilling, is acting as a gyroscope in fig. 6 and a gyrostat in fig. 7.

The gyroscope, as represented in figs. 2 and 3 by Maxwell's dynamical top, is provided with screws by which the centre of gravity can be brought into coincidence with the point of support. It can

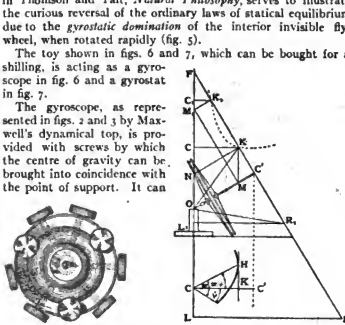

Fig. 3.

Fig. 4.

then be used to illustrate Poinsot's theory of the motion of a body under no force, the gyroscope being made kinetically unsymmetrical by a setting of the screws. The discussion of this movement is required for Jacobi's theorems on the allied motion of a top and of a body under no force (Poinsot, *Théorie nouvelle de la rotation des corps*, Paris, 1857; Jacobi, *Werke*, ii. Note B, p. 476).

To imitate the movement of the top the centre of gravity is displaced from the point of support so as to give a preponderance. When the motion takes place in the neighbourhood of the downward vertical, the bicycle wheel can be made to serve again

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mounted as in fig. 8 by a stalk in the prolongation of the axle, suspended from a universal joint at O; it can then be spun by hand and projected in any manner.

The first practical application of the gyroscopic principle was invented and carried out (1744) by Serson, with a spinning top

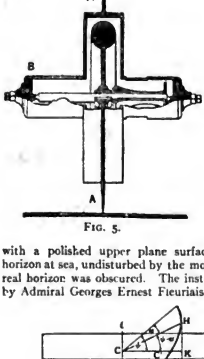

FIG. 5.

FIG. 6.

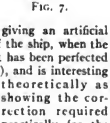

FIG. 7.

with a polished upper plane surface for giving an artificial horizon at sea, undisturbed by the motion of the ship, when the real horizon was obscured. The instrument has been perfected by Admiral Georges Ernest Fleuriais (fig. 9), and is interesting theoretically as showing the correction required practically for the rotation of the earth. Gilbert's barogyroscope is devised for the same purpose of showing the earth's rotation; a description of it, and of the latest form employed by Föppl, is given in the *Ency. d. math. Wiss.*, 1904, with bibliographical references in the article "Mechanics of Physical Apparatus." The rotation of the fly-wheel is maintained here by an electric motor, as devised by G.M. Hopkins, and described in the *Scientific American*, 1878. To demonstrate the rotation of the earth by the constancy in direction of the axis of a gyroscope is a suggestion that has often been made; by E. Sang in 1836, and others. The experiment was first carried out with success by Foucault in 1851, by a simple pendulum swung in the dome of the Pantheon, Paris, and it has been repeated frequently (*Mémoires sur le pendule*, 1886).

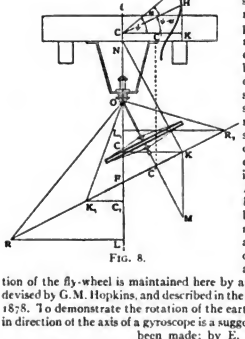

FIG. 8.

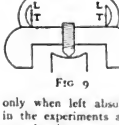

FIG 9

A gyroscopic fly-wheel will preserve its original direction in space only when left absolutely free in all directions, as required in the experiments above. If employed in steering, as of a torpedo, the gyroscope must act through the intermediary of a light relay; but if direct-acting, the reaction will cause precession of the axis, and the original direction is lost.

The gyrostatic principle, in which one degree of freedom is suppressed in the axis, is useful for imparting steadiness and stability in a moving body; it is employed by Schlick to mitigate the rolling of a ship and to maintain the upright position of Brennan's monorail car.

Lastly, as an application of gyroscopic theory, a stretched chain of fly-wheels in rotation was employed by Kelvin as a mechanical model of the rotary polarization of light in an electromagnetic field; the apparatus may be constructed of bicycle wheels connected by short links, and suspended vertically.

Theory of the Symmetrical Top.

1. The physical constants of a given symmetrical top, expressed in C.G.S. units, which are employed in the subsequent formulae, are denoted by M, *h*, C and A. M is the weight in grammes (*g*) as given by the number of gramme weights which equilibrate the top when weighed in a balance; *h* is the distance OG in centimetres (cm.) between G the centre of gravity and O the point of support, and Mh may be called the preponderance in g.-cm.; Mh and M can be measured by a spring balance holding up in a horizontal position the axis OC in fig. 8 suspended at O. Then gMh (dyne-cm. or ergs) is the moment of gravity about O when the axis OG is horizontal, gMh sin θ being the moment when the axis OG makes an angle θ with the vertical, and $g = 981$ (cm./s²) on the average; C is the moment of inertia of the top about OG, and A about any axis through O at right angles to OG, both measured in g-cm².

To measure A experimentally, swing the top freely about O in small plane oscillation, and determine the length, *l* cm., of the equivalent simple pendulum; then

(1) $$l = A/Mh, \quad A = Mhl.$$

Next make the top, or this simple pendulum, perform small conical revolutions, nearly coincident with the downward vertical position of equilibrium, and measure *n*, the mean angular velocity of the conical pendulum in radians / second; and T its period in seconds; then

(2) $$4\pi^2/T^2 = n^2 = g/l = gMh/A;$$

and $f = n/2\pi$ is the number of revolutions per second, called the *frequency*, $T = 2\pi/n$ is the period of a revolution, in seconds.

2. In the simple explanation of the steady movement of the top at a constant inclination to the vertical, depending on the composition of angular velocity, such as given in Perry's *Spinning Tops*, or Worthington's *Dynamics of Rotation*, it is asserted that the moment of gravity is always generating an angular velocity about an axis OB perpendicular to the vertical plane COC′ through the axis of the top OC′; and this angular velocity, compounded with the resultant angular velocity about an axis OI, nearly coincident with OC′, causes the axes OI and OC′ to keep taking up a new position by moving at right angles to the plane COC′, at a constant precessional angular velocity, say μ rad./sec., round the vertical OC (fig. 4).

Steady motion of the top.

If, however, the axis OC′ is prevented from taking up this precessional velocity, the top at once falls down; thence all the ingenious attempts—for instance, in the swinging cabin of the Bessemer ship—to utilise the gyroscope as a mechanical directive agency have always resulted in failure (*Engineer*, October 1874), unless restricted to actuate a light relay, which guides the mechanism, as in steering a torpedo.

An experimental verification can be carried out with the gyroscope in fig. 1; so long as the vertical spindle is free to rotate in its socket, the rapidly rotating wheel will resist the impulse of tapping on the gimbal by moving to one side; but when the pinch screw prevents the rotation of the vertical spindle in the massive pedestal, this resistance to the tapping at once disappears, provided the friction of the table prevents the movement of the pedestal; and if the wheel has any perpendicular, it falls below.

Familiar instances of the same principles are observable in the movement of a hoop, or in the steering of a bicycle; it is essential that the handle of the bicycle should be free to rotate to secure the stability of the movement.

The bicycle wheel, employed as a spinning top, in fig. 4, can also be held by the stalk, and will thus, when rotated rapidly, convey a distinct muscular impression of resistance to change of direction, if brandished.

3. A demonstration, depending on the elementary principles of dynamics, of the exact conditions required for the axis OC′ of a spinning top to spin steadily at a constant inclination θ to the vertical OC, is given here before proceeding to the more complicated question of the general motion, when θ, the inclination of the axis, is varying.

Elementary demonstration of the condition of steady motion.

It is a fundamental principle in dynamics that if OH is a vector representing to scale the angular momentum of a system, and if Oh is the vector representing the axis of the impressed couple or torque, then OH will vary so that the velocity of H is represented to scale by the impressed couple Oh, and if the top is moving freely about O, Oh is at right angles to the vertical plane COC′, and

(1) $$Oh = gMh \sin\theta.$$

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In the case of the steady motion of the top, the vector OH lies in the vertical plane COC′, in OK suppose (fig. 4), and has a component OC = G about the vertical and a component OC′ = G′, suppose, about the axis OC; and G′ = CR, if R denotes the angular velocity of the top with which it is spun about OC′.

If μ denotes the constant precessional angular velocity of the vertical plane COC′, the components of angular velocity and momentum about OA are $\mu \sin\theta$ and $A\mu \sin\theta$, OA being perpendicular to OC′ in the plane COC′; so that the vector OK has the components

(2) $\quad OC' = G', \text{ and } C'K = A\mu \sin\theta,$

and the horizontal component

(3) $\quad CK = CC' \sin\theta - C'K \cos\theta$
$\qquad = G' \sin\theta - A\mu \sin\theta \cos\theta.$

The velocity of K being equal to the impressed couple Oh,

(4) $\quad gMh \sin\theta = \mu.CK = \sin\theta\,(G'\mu - A\mu^2 \cos\theta),$

and dropping the factor $\sin\theta$,

(5) $\quad A\mu^2 \cos\theta - G'\mu + gMh = 0,$ or $A\mu^2 \cos\theta - CR\mu + A\nu^2 = 0,$

the condition for steady motion.

Solving this as a quadratic in μ, the roots μ_1, μ_2 are given by

(6) $\quad \mu_1, \mu_2 = \frac{G'}{2A}\sec\theta\left[1 \mp \sqrt{\left(1 - \frac{4A^2\nu^2}{G'^2}\cos\theta\right)}\right];$

and the minimum value of $G' = CR$ for real values of μ is given by

(7) $\quad \frac{G'^2}{4A^2\nu^2} = \cos\theta, \frac{CR}{A\nu} = 2\sqrt{(\cos\theta)};$

for a smaller value of R the top cannot spin steadily at the inclination θ to the upward vertical.

Interpreted geometrically in fig. 4

(8) $\quad \mu = gMh \sin\theta/CK = A\nu^2.KN,$ and $\mu = C'K/A \sin\theta = KM/A,$

(9) $\quad KM.KN = A\nu^2,$

so that K lies on a hyperbola with OC, OC′ as asymptotes.

Constrained motion of the gyroscope.

4. Suppose the top or gyroscope, instead of moving freely about the point O, is held in a ring or frame which is compelled to rotate about the vertical axis OC with constant angular velocity μ; then if N denotes the couple of reaction of the frame keeping the top from falling, acting in the plane COC′, equation (4) § 3 becomes modified into

(1) $\quad gMh \sin\theta - N = \mu.CK = \sin\theta\,(G'\mu - A\mu^2 \cos\theta),$

(2) $\quad N = \sin\theta\,(A\mu^2 \cos\theta - G'\mu + gMh)$
$\qquad = A \sin\theta \cos\theta(\mu - \mu_1)\,(\mu - \mu_2);$

and hence, as μ increases through μ_2 and μ_1, the sign of N can be determined, positive or negative, according as the tendency of the axis is to fall or rise.

When $G' = CR$ is large, μ_2 is large, and

(3) $\quad \mu_1 \approx gMh/G' = A\nu^2/CR,$

the same for all inclinations, and this is the precession observed in the spinning top and centrifugal machine of fig. 1c. This is true accurately when the axis OC′ is horizontal, and then it agrees with the result of the popular explanation of § 2.

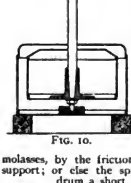

FIG. 10.

Centrifugal machine.

If the axis of the top OC′ is pointing upward, the precession is in the same direction as the rotation, and an increase of μ from μ_1 makes N negative, and the top rises; conversely a decrease of the procession μ causes the axis to fall (Perry, *Spinning Top*, p. 48).

If the axis points downward, as in the centrifugal machine with upper support, the precession is in the opposite direction to the rotation, and to make the axis approach the vertical position the precession must be reduced.

This is effected automatically in the Weston centrifugal machine (fig. 10) used for the separation of water and molasses, by the friction of the indiarubber cushions above the support; or else the spindle is produced downwards below the drum a short distance, and turns in a hole in a weight resting on the bottom of the case, which weight is dragged round until the spindle is upright; this second arrangement is more effective when a liquid is treated in the drum, and wave action is set up (*The Centrifugal Machine*, C. A. Matthey).

Similar considerations apply to the stability of the whirling bowl in a cream-separating machine.

We can write equation (1)

(4) $\quad N = (A\nu^2 \sin\theta - \mu.CK = (A\cdot\nu^2 - KM.KN) \sin\theta/A,$

so that N is negative or positive, and the axis tends to rise or fall according as K moves to the inside or outside of the hyperbola of free motion. Thus a tap on the axis tending to hurry the precession is equivalent to an impulse couple giving an increase to C′K, and will make K move to the interior of the hyperbola and cause the axis to rise: the steering of a bicycle may be explained in this way; but K will move to the exterior of the hyperbola, and so the axis will fall in this second more violent motion.

Friction on the point of the top may be supposed to act like a tap in the direction opposite to the precession; and so the axis of a top spun violently rises at first and up to the vertical position, but falls away again as the motion dies out. Friction considered as acting in retarding the rotation may be compared to an impulse couple tending to reduce OC′, and so make K and K, both move to the exterior of the hyperbola, and the axis falls in both cases. The axis may rise or fall according to the direction of the frictional couple, depending on the shape of the point; an analytical treatment of the varying motion is very intractable; a memoir by E. G. Gallop may be consulted in the *Trans. Camb. Phil. Soc.*, 1903.

The earth behaves in precession like a large spinning top, of which the axis describes a circle round the pole of the ecliptic of mean angular radius θ, about 23½°, in a period of 26,000 years, so that $R/\mu = 26000 \times 365$; and the mean couple producing precession is

(5) $\quad CR_0 \sin\theta = CR^0 \sin 23\tfrac{1}{2}° / 26000 \times 365,$

one 12 millionth part of ½CR, the rotation energy of the earth.

5. If the perpendicularse is absent, by making the C.G coincide with O, and if $A\mu$ is insensible compared with G′,

(1) $\quad N = -G'\mu \sin\theta,$

the formula which suffices to explain most gyroscopic action.

Thus a carriage running round a curve experiences, in consequence of the rotation of the wheels, an increase of pressure Z on the outer track, and a diminution Z on the inner, giving a couple, if a is the gauge,

Gyroscopic action of railway wheels.

(2) $\quad Za = G'\mu,$

tending to help the centrifugal force to upset the train; and if c is the radius of the curve, b of the wheels, C their moment of inertia, and v the velocity of the train,

(3) $\quad \mu = v/c, \; G' = Cv/b,$

(4) $\quad Z = Cv^2/abc$ (dynes),

so that Z is the fraction C/*Mab* of the centrifugal force Mv^2/*c*, or the fraction C/*Mh* of its transference of weight, with *h* the height of the centre of gravity of the carriage above the road. A Brennan carriage on a monorail would lean over to the inside of the curve at an angle a, given by

(6) $\quad \tan a = G'\mu/gMh = G'v/gMhc.$

The gyroscopic action of a dynamo, turbine, and other rotating machinery on a steamer, paddle or screw, due to its rolling and pitching, can be evaluated in a similar elementary manner (Worthington, *Dynamics of Rotation*), and Schlick's gyroscopic apparatus is intended to mitigate the oscillation.

6. If the axis OC in fig. 4 is inclined at an angle a to the vertical, the equation (2) § 4 becomes

(1) $\quad N = \sin\theta\,(A\mu^2 \cos\theta - G'\mu) + gMh \sin(a - \theta),$

Suppose, for instance, that OC is parallel to the earth's axis, and that the frame is fixed in the meridian; then a is the co-latitude, and μ is the angular velocity of the earth, the square of which may be neglected; so that, putting $N = 0$, $a - \theta = E$,

(2) $\quad gMh \sin E - G'\mu \sin(a - E) = 0,$

(3) $\quad \tan E = \frac{G'\mu \sin a}{gMh + G'\mu \cos a} \approx \frac{G'\mu}{gMh} \sin a.$

The barogyroscope.

This is the theory of Gilbert's barogyroscope, described in Appell's *Mécanique rationnelle*, ii. 387: it consists essentially of a rapidly rotating flywheel, mounted on knife-edges by an axis perpendicular to its axis of rotation and pointing east and west; spun with considerable angular momentum G′, and provided with a slight preponderance *Mh*, it should tilt to an angle E with the vertical, and thus demonstrate experimentally the rotation of the earth.

Foucault's gyroscope.

In Foucault's gyroscope (*Comptes rendus*, 1852; Perry, p. 105) the preponderance is made zero, and the axis points to the pole, when free to move in the meridian.

Gyroscopic horizon.

Generally, if constrained to move in any other plane, the axis seeks the position nearest to the polar axis, like a dipping needle with respect to the magnetic pole. (*A gyrostatic working model of the magnetic compass*, by Sir W. Thomson, British Association Report, Montreal, 1884. A. S. Chessin, St Louis Academy of Science, January 1902.)

A spinning top with a polished upper plane surface will provide an artificial horizon at sea, when the real horizon is obscured. The first instrument of this kind was constructed by Serson, and is described in the *Gentleman's Magazine*, vol. xxiv., 1754; also by Segner in his *Specimen theoriae turbinum* (Halae, 1755). The inventor was sent to sea by the Admiralty to test his instrument, but he was lost in the wreck of the "Victory," 1744. A copy of the Serson top, from the royal collection, is now in the Museum of King's College, London. Troughton's Nautical Top (1819) is intended for the same purpose.

The instrument is in favour with French navigators, perfected by

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Admiral Fleuriais (fig. 9); but it must be noticed that the horizon given by the top is inclined to the true horizon at the angle E given by equation (3) above; and if μ_1 is the precessional angular velocity as given by (3) § 4, and $T = 2\pi/\mu$, its period in seconds,

$$(4) \qquad \tan E = \frac{\mu}{\mu_1}\cos lat = \frac{T \cos lat}{86400}, \text{ or } E = \frac{T \cos lat}{8\pi},$$

if E is expressed in minutes, taking $\mu = 2\pi/86400$; thus making the true latitude E nautical miles to the south of that given by the top (*Revue maritime*, 1890; *Comptes rendus*, 1896).

This can be seen by elementary consideration of the theory above, for the velocity of the vector OC′ of the top due to the rotation of the earth is

$$(5) \qquad \mu . OC' \cos lat = g M\lambda \sin E = \mu_1 . OC' \sin E,$$

$$\sin E = \frac{\mu}{\mu_1}\cos lat, E = \frac{T \cos lat}{8\pi},$$

in which 8π can be replaced by 25, in practice; so that the Fleuriais gyroscopic horizon is an illustration of the influence of the rotation of the earth and of the need for its allowance.

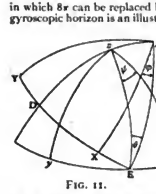

FIG. 11.

Euler's coordinate angles.

7. In the ordinary treatment of the general theory of the gyroscope, the motion is referred to two sets of rectangular axes; the one Ox, Oy, Oz fixed in space, with Oz vertically upward; and the other OX, OY, OZ fixed in the rotating wheel with OZ in the axis of figure OC.

The relative motion of the two sets of axes is given by means of Euler's unsymmetrical angles θ, ϕ, ψ, such that the successive turning of the axes Ox, Oy, Oz through the angles (i.) ψ about Oz, (ii.) θ about OE, (iii.) ϕ about OZ, brings them into coincidence with OX, OY, OZ, as shown in fig. 11, representing the *concave* side of a spherical surface.

The component angular velocities about OD, OE, OZ are

$$(1) \qquad \dot\psi \sin\theta, \dot\theta, \dot\phi + \dot\psi\cos\theta;$$

so that, denoting the components about OX, OY, OZ by P, Q, R,

$$(2) \qquad \begin{aligned} P &= \dot\theta\cos\phi + \dot\psi\sin\theta\sin\phi, \\ Q &= -\dot\theta\sin\phi + \dot\psi\sin\theta\cos\phi, \\ R &= \dot\phi + \dot\psi\cos\theta. \end{aligned}$$

Consider, for instance, the motion of a fly-wheel of preponderance $M\lambda$, and equatorial moment of inertia A, of which the axis OC is held in a light ring ZCX at a constant angle γ with OZ, while OZ is held by another ring zZ, which constrains it to move round the vertical Oz at a constant inclination θ with constant angular velocity μ, so that

$$(3) \qquad \dot\theta = 0, \dot\psi = \mu;$$

$$(4) \qquad P = \mu\sin\theta\sin\phi, Q = \mu\sin\theta\cos\phi, R = \dot\phi + \mu\cos\theta.$$

With CXF a quadrant, the components of angular velocity and momentum about OE, OY, are

$$(5) \qquad P\cos\gamma - R\sin\gamma, Q, \text{ and } A(P\cos\gamma - R\sin\gamma), AQ,$$

so that, denoting the components of angular momentum of the fly-wheel about OC, OX, OY, OZ by K or G′, h_1, h_2, h_3,

$$(6) \qquad h_1 = A(P\cos\gamma - R\sin\gamma)\cos\gamma + K\sin\gamma,$$

$$(7) \qquad h_2 = AQ,$$

$$(8) \qquad h_3 = -A(P\cos\gamma - R\sin\gamma)\sin\gamma + K\cos\gamma;$$

and the dynamical equation

$$(9) \qquad \frac{dh_3}{dt} - h_1 Q + h_2 P = N,$$

with K constant, and with preponderance downward

$$(10) \qquad N = gM\lambda\cos\theta\,\overline{s}Y \sin\gamma = gM\lambda\sin\gamma\sin\theta\cos\phi,$$

reduces to

$$(11) \qquad A\frac{d^2\phi}{dt^2}\sin\gamma + A\mu^2\sin\gamma\sin^2\theta\sin\phi\cos\phi + A\mu^2\cos\gamma\sin\theta\cos\theta\cos\phi - (K\mu + gM\lambda)\sin\theta\cos\phi = 0.$$

The position of relative equilibrium is given by

$$(12) \qquad \cos\phi = 0, \text{ and sin } \phi = \frac{K\mu + gM\lambda - A\mu^2\cos\gamma\cos\theta}{A\mu^2\sin\gamma\sin\theta}.$$

For small values of μ the equation becomes

$$(13) \qquad A\frac{d^2\phi}{dt^2}\sin\gamma - (K\mu + gM\lambda)\sin\theta\cos\phi = 0,$$

so that $\phi = \frac{1}{2}\pi$ gives the position of stable equilibrium, and the period of a small oscillation is $2\pi\sqrt{[A\sin\gamma/(K\mu + gM\lambda)\sin\theta]}$.

In the general case, denoting the periods of vibration about $\phi = \frac{1}{2}\pi, -\frac{1}{2}\pi$, and the sidelong position of equilibrium by $2\pi/(n_1, n_2,$ or $n_3)$, we shall find

$$(14) \qquad n_1^2 = \frac{\sin\theta}{A\sin\gamma}[\ gM\lambda + K\mu - A\mu^2\cos(\gamma - \theta)],$$

$$(15) \qquad n_2^2 = \frac{\sin\theta}{A\sin\gamma}[-gM\lambda - K\mu + A\mu^2\cos(\gamma + \theta)],$$

$$(16) \qquad n_3 = n_1 \cdot n_2/\mu\sin\theta.$$

The first integral of (11) gives

$$(17) \qquad \tfrac{1}{2}A\left(\frac{d\phi}{dt}\right)^2\sin\gamma + \tfrac{1}{2}A\mu^2\sin\gamma\cos^2\theta\sin^2\phi - A\mu^2\cos\gamma\sin\theta\cos\theta\sin\phi + (K\mu + gM\lambda)\sin\theta\sin\phi - H = 0,$$

and putting tan $(\frac{1}{2}\pi + \frac{1}{2}\phi) = z$, this reduces to

$$(18) \qquad \frac{dz}{dt} = n\sqrt{Z}$$

where Z is a quadratic in z^2, so that z is a Jacobian elliptic function of t, and we have

$$(19) \qquad \tan\left(\tfrac{1}{2}\pi + \tfrac{1}{2}\phi\right) = C(\text{tn, dn, nc, or cn})nt,$$

according as the ring ZC performs complete revolutions, or oscillates about a sidelong position of equilibrium, or oscillates about the stable position of equilibrium $\phi = \frac{1}{2}\pi$.

Suppose Oz is parallel to the earth's axis, and μ is the diurnal rotation, the square of which may be neglected, then if Gilbert's barogyroscope of § 6 has the knife-edges turned in azimuth to make an angle β with E. and W., so that OZ lies in the horizon at an angle E.δ.N., we must put $\gamma = \frac{1}{2}\pi$, $\cos\theta = \sin\alpha\sin\beta$; and putting $\phi = \frac{1}{2}\pi - \delta + E$, where δ denotes the angle between Zs and the vertical plane Zs′ through the zenith s′,

$$(20) \qquad \sin\theta\cos\delta = \cos\alpha, \sin\theta\sin\delta = \sin\alpha\cos\beta;$$

so that equations (9) and (10) for relative equilibrium reduce to

$$(21) \qquad gM\lambda\sin E = KQ = K\mu\sin\theta\cos\phi = K\mu\sin\theta\sin(\delta - E),$$

and will change (3) § 6 into

$$(22) \qquad \tan E = \frac{K\mu\sin\alpha\cos\beta}{gM\lambda - K\mu\cos\alpha} = \frac{F\sin\alpha\cos\beta}{86400\ A/T^2C - F\cos\alpha},$$

a multiplication of (3) § 6 by $\cos\beta$ (Gilbert, *Comptes rendus*, 1882).

Changing the sign of K or h and E and denoting the revolutions/second of the gyroscope wheel by F, then in the preceding notation, T denoting the period of vibration as a simple pendulum,

so that the gyroscope would reverse if it were possible to make F $\cos\alpha > 86400\ A/T^2C$ (Föppl, *Munch. Ber.*, 1904).

A gyroscopic pendulum is made by the addition to it of a fly-wheel, balanced and mounted, as in Gilbert's barogyroscope, in a ring movable about an axis fixed in the pendulum, in the vertical plane of motion.

As the pendulum falls away to an angle θ with the upward vertical, and the axis of the fly-wheel makes an angle ϕ with the vertical plane of motion, the three components of angular momentum are

$$(24) \qquad h_1 = K\cos\phi, h_2 = A\dot\theta + K\sin\phi, h_3 = A\dot\phi,$$

where h_1 is the component about the axis of the ring and K of the fly-wheel about its axis; and if L, M′, N denote the components of the couple of reaction of the ring, L may be ignored, while N is zero, with $P = o$, $Q = \dot\theta$, $R = o$, so that

$$(25) \qquad M' = h_2 = A\ddot\theta + K\dot\phi\cos\phi,$$

$$(26) \qquad o = h_3 - h_1\dot\theta = A\dot\phi - K\dot\theta\cos\phi.$$

For the motion of the pendulum, including the fly-wheel,

$$(27) \qquad \begin{aligned} MK^2\ddot\theta &= gMH\sin\theta - M', \\ &= gMH\sin\theta - A\ddot\theta - K\dot\phi\cos\phi. \end{aligned}$$

If θ and ϕ remain small,

$$(28) \qquad A\ddot\theta + K\dot\phi, A\dot\phi = K(\theta - \alpha),$$

$$(29) \qquad (MK^2 + A)\ddot\theta + (K^2/A)(\theta - \alpha) - gMH\theta = O;$$

so that the upright position will be stable if $K^2 > gMHA$, or the rotation energy of the wheel greater than $\frac{1}{2}A/C$ times the energy acquired by the pendulum in falling between the vertical and horizontal position; and the vibration will synchronize with a simple pendulum of length

$$(30) \qquad (MK^2 + A)/(K^2/gA) - MH.$$

This gyroscopic pendulum may be supposed to represent a ship among waves, or a carriage on a monorail, and so affords an explanation of the gyroscopic action essential in the apparatus of Schlick and Brennan.

General motion of the top.

8. Careful scrutiny shows that the steady motion of a top is not steady absolutely; it reveals a small nutation superposed, so that a complete investigation requires a return to the equations of unsteady motion, and for the small oscillation to consider them in a penultimate form.

In the general motion of the top the vector OH of resultant angular momentum is no longer compelled to lie in the vertical plane COC″ (fig. 4), but since the axis OK of the gravity couple is always horizontal, H will describe a curve in a fixed horizontal plane through C. The vector OC′ of angular momentum about the axis will be constant in length, but vary in direction; and OK will be the component angular momentum in the vertical plane COC′, if the planes through C and C′ perpendicular to the lines OC and OC′ intersect in the line KH: and if KH is the component angular momentum perpendicular to the plane COC′, the resultant angular momentum OH has the three components OC′, C′K, KH, represented in Euler's angles by

$$(1) \qquad KH = A\dot\alpha\dot\theta/\dot\phi, C'K = A\sin\theta\dot\phi/\dot\phi, OC' = G'.$$

Drawing KM vertical and KN parallel to OC′, then

$$(2) \qquad KM = A\dot\alpha\dot\phi/\dot\phi, KN = CR = A\cos\theta\dot\phi/\dot\phi, (C - A)R + A\dot\alpha\dot\phi/\dot\phi$$

so that in the spherical top, with $C = A$, $KN = A\dot\alpha\dot\phi/\dot\phi$.

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The velocity of H is in the direction KH perpendicular to the plane COC′, and equal to $gMh\sin\theta$ or $An^2\sin\theta$, so that if a point in the axis OC′ at a distance An^2 from O is projected on the horizontal plane through C in the point P on CK, the curve described by P, turned forwards through a right angle, will be the hodograph of H; this is expressed by

$$(3)\qquad An^2\sin\theta e^{(\psi+\frac{1}{2}\pi)i} = iAn^2\sin\theta e^{\psi i} = \frac{d}{dt}(\rho e^{\varpi i})$$

where $\rho e^{\varpi i}$ is the vector CH; and so the curve described by P and the motion of the axis of the top is derived from the curve described by H by a differentiation.

Resolving the velocity of H in the direction CH,

$$(4)\qquad d.\,\mathrm{CH}/dt = An^2\sin\theta\,\sin\mathrm{KCH} = An^2\sin\theta\ \mathrm{KH}/\mathrm{CH},$$

$$(5)\qquad d.\,\tfrac{1}{2}\mathrm{CH}^2/dt = An^2\sin\theta\,d\theta/dt.$$

and integrating

$$(6)\qquad \tfrac{1}{2}\mathrm{CH}^2 = An^2(\mathrm{E}-\cos\theta),$$

$$(7)\qquad \tfrac{1}{2}\mathrm{OH}^2 = An^2(\mathrm{F}-\cos\theta),$$

$$(8)\qquad \tfrac{1}{2}\mathrm{C'H}^2 = An^2(\mathrm{D}-\cos\theta).$$

where D, E, F are constants, connected by

$$(9)\qquad \mathrm{F} = \mathrm{E} + G^2/2A^2n^2 = \mathrm{D} + G'^2/2A^2n^2.$$

Then

$$(10)\qquad \mathrm{KH}^2 = \mathrm{OH}^2 - \mathrm{OK}^2,$$

$$(11)\qquad \mathrm{OK}^2\sin^2\theta = \mathrm{CC'}^2 = G^2 + 2GG'\cos\theta + G'^2,$$

$$(12)\quad An^2\sin^2\theta\,d\theta^2/dt^2 = 2A^2n^2(\mathrm{F}-\cos\theta)\,\sin^2\theta - G^2 + 2GG'\cos\theta - G'^2;$$

and putting $\cos\theta = z$,

$$(13)\quad \left(\frac{dz}{dt}\right)^2 = 2n^2(\mathrm{F}-z)\,(1-z^2) - (G^2 - 2GG'z + G'^2)/A^2$$
$$= 2n^2(\mathrm{E}-z)\,(1-z^2) - (G'-Gz)^2/A^2$$
$$= 2n^2(\mathrm{D}-z)\,(1-z^2) + (G-G'z)^2/A^2,$$
$$= 2n^2.Z \text{ suppose.}$$

Denoting the roots of $Z = 0$ by z_1, z_2, z_3, we shall have them arranged in the order

$$(14)\qquad z_1 > 1 > z_2 > z > z_3 > -1.$$

$$(15)\qquad (dz/dt)^2 = 2n^2(z_1-z)\,(z_2-z)\,(z-z_3).$$

$$(16)\qquad nt = \int_{z_3}^{z} dz/\sqrt{(2Z)},$$

an elliptic integral of the first kind, which with

$$(17)\qquad m = \pi\sqrt{\frac{z_1-z_3}{2}},\quad \epsilon^2 = \frac{z_2-z_3}{z_1-z_3}$$

can be expressed, when normalized by the factor $\sqrt{(z_1-z_3)}/2$, by the trigonometrical integral

$$(18)\qquad mt = \int_{z_3}^{z} \frac{\sqrt{(z_1-z_3)}\,dz}{z_3\sqrt{4\,(z_1-z)\,(z_2-z)\,(z-z_3)}}$$
$$= \mathrm{sn}^{-1}\sqrt{\frac{z-z_3}{z_2-z_3}} = \mathrm{cn}^{-1}\sqrt{\frac{z_2-z}{z_2-z_3}} = \mathrm{dn}^{-1}\sqrt{\frac{z_1-z}{z_1-z_3}},$$

$$(19)\quad z - z_3 = (z_2-z_3)\,\mathrm{sn}^2mt,\quad z_2 - z = (z_2-z_3)\,\mathrm{cn}^2mt,$$
$$z_1 - z = (z_1-z_3)\,\mathrm{dn}^2mt.$$

$$(20)\qquad z = z_3\,\mathrm{sn}^2mt + z_2\,\mathrm{cn}^2mt.$$

Interpreted dynamically, the axis of the top keeps time with the beats of a simple pendulum of length

$$(21)\qquad \mathrm{L} = l/\tfrac{1}{2}(z_1-z_3),$$

suspended from a point at a height $\frac{1}{2}(z_1+z_3)l$ above O, in such a manner that a point on the pendulum at a distance

$$(22)\qquad \tfrac{1}{2}(z_1-z_3)l = P/\mathrm{L}$$

from the point of suspension moves so as to be always at the same level as the centre of oscillation of the top.

The polar co-ordinates of H are denoted by ρ, ϖ in the horizontal plane through C; and, resolving the velocity of H perpendicular to CH,

$$(23)\qquad \rho d\varpi/dt = An^2\sin\theta\cos\mathrm{KCH}.$$

$$(24)\qquad \rho^2 d\varpi/dt = An^2\sin\theta.\mathrm{CK}$$
$$= An^2(\mathrm{G'}-\mathrm{G}\cos\theta)$$

$$(25)\qquad \varpi = \int\frac{\mathrm{G'}-\mathrm{G}z}{\mathrm{E}-z}\frac{dt}{\mathrm{A}} = \int\frac{(\mathrm{G'}-\mathrm{G}z)/2An}{\mathrm{E}-z}\frac{dz}{\sqrt{(2Z)}}$$

an elliptic integral, of the third kind, with pole at $z = \mathrm{E}$; and then

$$(26)\qquad \varpi - \psi = \mathrm{KCH} = \tan^{-1}\mathrm{KH}/\mathrm{CH}$$
$$= \tan^{-1}\frac{\mathrm{A}\,\sin\theta\,d\theta/dt}{\mathrm{G'}-\mathrm{G}\cos\theta} = \tan^{-1}\frac{\sqrt{(2Z)}}{(\mathrm{G'}-\mathrm{G}z)/\mathrm{A}n^2},$$

which determines ψ.

Otherwise, from the geometry of fig. 4,

$$(27)\qquad \mathrm{C'K}\sin\theta = \mathrm{OC}-\mathrm{OC'}\cos\theta,$$

$$(28)\qquad \mathrm{A}\sin^2\theta\,d\psi/dt = \mathrm{G}-\mathrm{G'}\cos\theta,$$

$$(29)\qquad \psi = \int\frac{\mathrm{G}-\mathrm{G'}z}{1-z^2}\frac{dt}{\mathrm{A}} = \frac{1}{2}\int\frac{\mathrm{G}-\mathrm{G'}}{1-z}\frac{dt}{\mathrm{A}} + \frac{1}{2}\int\frac{\mathrm{G}+\mathrm{G'}}{1+z}\frac{dt}{\mathrm{A}},$$

the sum of two elliptic integrals of the third kind, with pole at $z = \pm 1$; and the relation in (25) (26) shows the addition of these two integrals into a single integral, with pole at $z = \mathrm{E}$.

The motion of a sphere, rolling and spinning in the interior of a spherical bowl, or on the top of a sphere, is found to be of the same character as the motion of the axis of a spinning top about a fixed point.

The curve described by H can be identified as a Poinsot herpolhode, that is, the curve traced out by rolling a quadric surface with centre fixed at O on the horizontal plane through C; and Darboux has shown also that a deformable hyperboloid made of the generating lines, with O and H at opposite ends of a diameter and one generator fixed in OC, can be moved so as to describe the curve H; the tangent plane of the hyperboloid at H being normal to the curve of H; and then the other generator through O will coincide in the movement with OC′, the axis of the top; thus the Poinsot herpolhode curve H is also the trace made by rolling a line of curvature on an ellipsoid confocal to the hyperboloid of one sheet, on the plane through C.

Kirchhoff's *Kinetic Analogue* asserts also that the curve of H is the projection of a tortuous elastica, and that the spherical curve of C′ is a hodograph of the elastica described with constant velocity.

Writing the equation of the focal ellipse of the Darboux hyperboloid through H, enlarged to double scale so that O is the centre,

$$(30)\qquad x^2/a^2 + y^2/\beta^2 + z^2/\alpha = 1,$$

with $a^2+\lambda$, $\beta^2+\lambda$, λ denoting the squares of the semiaxes of a confocal ellipsoid, and λ changed into μ and ν for a confocal hyperboloid of one sheet and of two sheets,

$$(31)\qquad \lambda > 0 > \mu > -\beta^2 > \nu > -a^2,$$

then in the deformation of the hyperboloid, λ and ν remain constant at H; and utilizing the theorems of solid geometry on confocal quadrics, the magnitudes may be chosen so that

$$(32)\qquad a^2+\lambda+\beta^2+\lambda+\nu = \mathrm{OH}^2 = \tfrac{1}{4}k^2(\mathrm{F}-z) = \rho^2+\mathrm{OC}^2,$$

$$(33)\qquad a^2+\mu = \tfrac{1}{4}k^2(z_1-z) = \rho^2-\rho_1^2,$$

$$(34)\qquad \beta^2+\mu = \tfrac{1}{4}k^2(z_2-z) = \rho^2-\rho_2^2,$$

$$(35)\qquad \mu = \tfrac{1}{4}k^2(z_3-z) = \rho^2-\rho_3^2,$$

$$(36)\qquad \rho_1^2 < 0 < \rho^2 < \rho_2^2 < \rho_3^2,$$

$$(37)\qquad \mathrm{F} = z_1 + z_2 + z_3.$$

$$(38)\qquad \lambda - 2\mu + \nu = k^2z,\ \lambda - \nu = k^2,$$

$$(39)\qquad \frac{\lambda-\mu}{\lambda-\nu} = \frac{1+z}{2},\quad \frac{\mu-\nu}{\lambda-\nu} = \frac{1-z}{2}$$

with $z = \cos\theta$, θ denoting the angle between the generating lines through H; and with $\mathrm{OC} = \mathfrak{h}$, $\mathrm{OC'} = \mathfrak{h}'$, the length k has been chosen so that in the preceding equations

$$(40)\qquad \mathfrak{h}/k = \mathrm{G}/2An,\ \mathfrak{h}'/k = \mathrm{G'}/2An;$$

and $\mathfrak{h}$, $\mathfrak{h}'$, k may replace G, G′, $2An$; then

$$(41)\qquad \frac{2Z}{1-z^2} = \frac{1}{n^2}\left(\frac{d\rho}{dt}\right)^2 = \frac{4\mathrm{KH}^2}{k^2},$$

while from (33-39)

$$(42)\qquad \frac{2Z}{1-z^2} = \frac{4(a^2+\mu)(\beta^2+\mu)\mu}{k^2(\mu-\lambda)\,(\mu-\nu)},$$

which verifies that KH is the perpendicular from O on the tangent plane of the hyperboloid at H, and so proves Darboux's theorem.

Planes through O perpendicular to the generating lines cut off a constant length $\mathrm{HQ} = \mathfrak{h}$, $\mathrm{HQ'} = \mathfrak{h}'$, so the line of curvature described by H in the deformation of the hyperboloid, the intersection of the fixed confocal ellipsoid λ and hyperboloid of two sheets ν, rolls on a horizontal plane through C and at the same time on a plane through C′ perpendicular to OC′.

Introduce the generating line HQ to meet the principal planes of the confocal system in V, T, P; these will also be fixed points on the generator; and putting

$$(43)\qquad (\mathrm{HV},\mathrm{HT},\mathrm{HP},)/\mathrm{HQ} = \mathrm{D}/(\mathrm{A},\mathrm{B},\mathrm{C}),$$

then

$$(44)\qquad Ax^2 + By^2 + Cz^2 = \mathrm{D}\mathfrak{h}^2$$

is a quadric surface with the squares of the semiaxes given by HV.HQ, HT.HQ, HP.HQ, and with HQ the normal line at H, and so touching the horizontal plane through C; and the direction cosines of the normal being

$$(45)\qquad x/\mathrm{HV},\ y/\mathrm{HT},\ z/\mathrm{HP},$$

$$(46)\qquad Ax^2 + By^2 + Cz^2 = \mathrm{D}^2\mathfrak{h}^2,$$

the line of curvature, called the polhode curve by Poinsot, being the intersection of the quadric surface (44) with the ellipsoid (46).

There is a second surface associated with (44), which rolls on the plane through C′, corresponding to the other generating line HQ′ through H, so that the same line of curvature rolls on two planes at a constant distance from O, δ and δ'; and the motion of the top is made up of the combination. This completes the statement of Jacobi's theorem (*Werke*, ii. 480) that the motion of a top can be resolved into two movements of a body under no force.

Conversely, starting with Poinsot's polhode and herpolhode given in (44) (46), the normal plane is drawn at H, cutting the principal axes of the rolling quadric in X, Y, Z; and then

$$(47)\qquad a^2+\mu = x.\mathrm{OX},\ \beta^2+\mu = y.\mathrm{OY},\ \mu = z.\mathrm{OZ},$$

this determines the deformable hyperboloid of which one generator through H is a normal to the plane through C; and the other generator is inclined at an angle θ, the inclination of the axis of the top, while the normal plane or the parallel plane through O revolves with angular velocity $d\psi/dt$.

The curvature is useful in drawing a curve of H; the diameter of curvature D is given by

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(48) $\mathrm{D}=\frac{d\rho^2}{d\rho}=\frac{\frac{1}{2}k^2\sin^2\theta}{\delta-b'\cos\theta}$, $\frac{1}{\rho}\mathrm{D}=\frac{\frac{1}{2}k^2}{\mathrm{KM}\cdot\mathrm{KN}}$.

The curvature is zero and H passes through a point of inflexion when C′ comes into the horizontal plane through C; ψ will then be stationary and the curve described by C′ will be looped.

In a state of steady motion, z oscillates between two limits z_0 and z_1 which are close together; so putting $z_0=z_1$ the coefficient of z in Z is

(49) $2z_1z_1+z_1^2=-1+\frac{\mathrm{GG}'}{A^2n^2}=-1+\frac{(\mathrm{OM}\cos\theta+\mathrm{ON})(\mathrm{OM}+\mathrm{ON}\cos\theta)}{\mathrm{OM}\cdot\mathrm{ON}}$,

(50) $2z_1z_2=\frac{\mathrm{OM}^2+\mathrm{ON}^2}{\mathrm{OM}\cdot\mathrm{ON}}-2\cos\theta,\quad z_1=\frac{\mathrm{OM}^2+\mathrm{ON}^2}{2\mathrm{OM}\cdot\mathrm{ON}}$,

(51) $2(z_1-z_2)=\frac{\mathrm{OM}^2-2\mathrm{OM}\cdot\mathrm{ON}\cos\theta+\mathrm{ON}^2}{\mathrm{OM}\cdot\mathrm{ON}}=\frac{\mathrm{MN}^2}{\mathrm{OM}\cdot\mathrm{ON}}$.

With $z_0=z_1$, $\kappa=0$, $\mathrm{K}=\frac{1}{2}\pi$; and the number of beats per second of the axis is

(52) $\frac{m}{s}=\frac{n}{\pi}\sqrt{\frac{z_1-z_2}{2}}=\frac{\mathrm{MN}}{\sqrt{(\mathrm{OM}\cdot\mathrm{ON})}}\frac{n}{2\pi}$,

beating time with a pendulum of length

(53) $\mathrm{L}=\frac{l}{\frac{1}{2}(z_1-z_2)}=\frac{4\mathrm{OM}\cdot\mathrm{ON}}{\mathrm{MN}^2}l$.

The wheel making R/2π revolutions per second,

(54) $\frac{\text{beats/second}}{\text{revolutions/second}}=\frac{\mathrm{MN}}{\sqrt{(\mathrm{OM}\cdot\mathrm{ON})}}\frac{n}{\mathrm{R}}=\frac{\mathrm{C}}{\mathrm{A}}\cdot\frac{\mathrm{MN}}{\mathrm{OC}}$,

from (8) (9) § 3; and the apsidal angle is

(55) $\mu\frac{\frac{1}{2}\pi}{m}=\frac{\mathrm{A}\mu}{\mathrm{A}n}\frac{n}{m}\cdot\frac{1}{2}\pi=\frac{\mathrm{ON}}{\sqrt{(\mathrm{OM}\cdot\mathrm{ON})}}\frac{2\sqrt{(\mathrm{OM}\cdot\mathrm{ON})}}{\mathrm{MN}}\cdot\frac{1}{2}\pi=\frac{\mathrm{ON}}{\mathrm{MN}}\pi$,

and the height of the equivalent conical pendulum λ is given by

(56) $\frac{\lambda}{l}=\frac{\frac{g}{\mu^2}}{\frac{g}{n^2}}=\frac{n^2}{\mu^2}=\frac{\mathrm{OM}\cdot\mathrm{KC}}{\mathrm{ON}\cdot\mathrm{KC}}=\frac{\mathrm{OL}}{\mathrm{OC}}$,

if OR drawn at right angles to OK cuts KC′ in R, and RL is drawn horizontal to cut the vertical CO in L; thus if OC′ represents l to scale, then OL will represent λ.

9. The gyroscope motion in fig. 4 comes to a stop when the rim of the wheel touches the ground; and to realize the motion when the axis is inclined at a greater angle with the upward vertical, the stalk is pivoted in fig. 8 in a lug screwed to the axle of a bicycle hub, fastened vertically in a bracket bolted to a beam. The wheel can now be spun by hand, and projected in any manner so as to produce a desired gyroscopic motion, undulating, looped, or with cusps if the stalk of the wheel is dropped from rest.

As the principal part of the motion takes place now in the neighbourhood of the lowest position, it is convenient to measure the angle θ from the downward vertical, and to change the sign of τ and G.

Equation (18) § 8 must be changed to

(1) $ml=nl\sqrt{\frac{z_1-z_2}{2}}=\int_{\alpha}^{\beta}\frac{\sqrt{(z_1-z_2)}dz}{\sqrt{(4Z)}}$,

(2) $\mathrm{Z}=(\mathrm{g}-\mathrm{F})(z-g')-(\mathrm{G}^2-2\mathrm{GG}'z+\mathrm{G}'^2)/2\mathrm{A}^2n^2$
$=(z-\mathrm{D})(z-g')-(\mathrm{G}-\mathrm{G}'z)^2/2\mathrm{A}^2n^2$
$=(z-\mathrm{E})(z-g')-(z'-\mathrm{G}z)^2/2\mathrm{A}^2n^2$
$=(z_1-z)(z-z_2)$,

(3) $1>z_1>z>z_2>-1,\mathrm{D},\mathrm{E}>z_1$,

(4) $z_1+z_2+z_3=\mathrm{F}=\mathrm{D}-\mathrm{G}'^2/2\mathrm{A}^2n^2=\mathrm{E}-\mathrm{G}^2/2\mathrm{A}^2n^2$,

and expressed by the inverse elliptic function

(5) $ml=\mathrm{sn}^{-1}\sqrt{\frac{z_1-z}{z_1-z_2}}=\mathrm{cn}^{-1}\sqrt{\frac{z-z_2}{z_1-z_2}}=\mathrm{dn}^{-1}\sqrt{\frac{z-z_1}{z_2-z_1}}$,

(6) $z=z_0\mathrm{sn}^2ml+z_2\mathrm{cn}^2ml,\ z^2=(z_1-z_2)/(z_1-z_2)$.

Equation (25) and (29) § 8 is changed to

(7) $\varpi=\frac{1}{2}\int\frac{\mathrm{G}'-\mathrm{G}z\,dt}{z-\mathrm{E}}=\frac{1}{2}\int\frac{\mathrm{G}'-\mathrm{GE}}{z-\mathrm{E}}\frac{dt}{\mathrm{A}}-\frac{\mathrm{G}t}{2\mathrm{A}}$,

(8) $\psi=\int\frac{\mathrm{G}'z-\mathrm{G}}{1-z^2}\frac{dt}{\mathrm{A}}=\frac{1}{2}\int\frac{\mathrm{G}'+\mathrm{G}}{1-z}\frac{dt}{\mathrm{A}}-\frac{1}{2}\int\frac{\mathrm{G}'-\mathrm{G}}{1+z}\frac{dt}{\mathrm{A}}$,

while ϖ and ϖ change places in (26).

The Jacobian elliptic parameter of the third elliptic integral in (7) can be given by τ, where

(9) $\tau=\int_{\alpha}^{\beta}\frac{z\sqrt{(z_1-z_2)}}{\mathrm{E}-z}\frac{dz}{\sqrt{(4Z)}}=\int_{z_2}^{z_1}\frac{z\,dz}{\mathrm{E}}=\mathrm{K}+(t-f)\mathrm{K}i'$,

where f is a real fraction,

(10) $(t-f)\mathrm{K}'=\int_{z_2}^{z_1}\frac{z\sqrt{(z_1-z_2)}}{\mathrm{E}\sqrt{(-4Z)}}dz$,

(11) $f\mathrm{K}'=\int_{z_1}^{\mathrm{E}}\frac{\sqrt{(z_1-z_2)}}{z\sqrt{(-4Z)}}dz$,
$=\mathrm{sn}^{-1}\sqrt{\frac{\mathrm{E}-z_2}{z_1-z_2}}=\mathrm{cn}^{-1}\sqrt{\frac{z_1-\mathrm{E}}{z_1-z_2}}=\mathrm{dn}^{-1}\sqrt{\frac{z_1-\mathrm{E}}{z_1-z_2}}$,

with respect to the comodulus κ'.

Then, with $z=\mathrm{E}$, and

(12) $2Ly=-\frac{1}{2}(\mathrm{G}'-\mathrm{GE})/\mathrm{A}n^2$,

if Π denotes the apsidal angle of ϖ, and T the time of a single beat of the axle, up or down,

(13) $\Pi+\frac{\mathrm{G}t}{2\mathrm{A}}=\int_{z_1}^{z_2}\frac{\sqrt{(-2z_{\mathrm{E}})}}{z-\mathrm{E}}\frac{dz}{\sqrt{(4Z)}}$,
$=\frac{1}{2}\pi f+\mathrm{K}z\mathrm{n}\mathrm{K}'i$,

in accordance with the theory of the complete elliptic integral of the third kind.

Interpreted geometrically on the deformable hyperboloia, flattened in the plane of the focal ellipse, if OQ is the perpendicular from the centre on the tangent HP, $\mathrm{AOQ}=\mathrm{am}f\mathrm{K}'$, and the eccentric angle of P, measured from the minor axis, is $\mathrm{am}(t-f)\mathrm{K}'$, the eccentricity of the focal ellipse being the comodulus κ'.

A point L is taken in QP such that

(14) $\mathrm{QL}/\mathrm{OA}=z\mathrm{n}f\mathrm{K}'$,

(15) QV, QT, QP = OA(zs, zc, zd)$f\mathrm{K}'$;

and with

(16) $m\mathrm{T}=\mathrm{K},\ m/n=\sqrt{(z_1-z_2)/2}=\mathrm{OA}/k$,

(17) $\frac{\mathrm{G}t}{2\mathrm{A}}=\frac{\mathrm{G}}{2\mathrm{A}n}\frac{k}{\mathrm{OA}}\mathrm{K}=\frac{\mathrm{OH}}{\mathrm{OA}}\mathrm{K}$,

(18) $\Pi=\frac{1}{2}\pi f+\frac{\mathrm{QL}+\mathrm{QH}}{\mathrm{OA}}\mathrm{K}=\frac{1}{2}\pi f+\frac{\mathrm{HL}}{\mathrm{OA}}\mathrm{K}$.

By choosing for f a simple rational fraction, such as $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, . . . an algebraical case of motion can be constructed (*Annals of Mathematics*, 1904).

Thus with G′−GE=0, we have E=z_1 or z_2, never z_3; $f=0$ or 1; and P is at A or B on the focal ellipse; and then

(19) $\varpi=-pt,\ p=\mathrm{G}/2\mathrm{A}$,

(20) $\psi+p\mathrm{t}=\tan^{-1}\frac{n\sqrt{(2Z)}}{2p(z-\mathrm{E})}$,

(21) $\sin\theta\exp(\psi+p\mathrm{t})i=i\sqrt{[(z_2-z_1)(z-z_1)]}+\sqrt{[(z_1-z)\ (z-z_2)]}$,
$z_1=\frac{\mathrm{t}+z_1z_2}{z_2+\mathrm{t}},\ \sqrt{\frac{z_2-z_1}{2}}=\frac{\mathrm{G}}{2\lambda n}=\frac{p}{n}=\frac{\mathrm{G}'}{2\lambda n z_1}$; or

(22) $\sin\theta\exp(\psi+p\mathrm{t})i=i\sqrt{[(z_1-z_2)(z-z_2)]}+\sqrt{[(z-z_1)(z-z_2)]}$,
$z_2=\frac{\mathrm{t}+z_1z_2}{z_1+z_2},\ \sqrt{\frac{z_1-z_2}{2}}=\frac{\mathrm{G}}{2\lambda n}=\frac{p}{n}=\frac{\mathrm{G}'}{2\lambda n z_2}$.

Thus $z_2=0$ in (22) makes G′=0; so that if the stalk is held out horizontally and projected with angular velocity $2p$ about the vertical axis OC without giving any spin to the wheel, the resulting motion of the stalk is like that of a spherical pendulum, and given by

(23) $\sin\theta\exp(\psi+p\mathrm{t})i=i\sqrt{\left(\frac{2p^2}{n^2}\cos\theta\right)}+\sqrt{\left(\sin^2\theta-2\frac{p^2}{n^2}\cos\theta\right)}$,
$=i\sin\alpha\sqrt{(\sec\alpha\cos\theta)}+\sqrt{[(\sec\alpha+\cos\theta)(\cos\alpha-\cos\theta)]}$,

if the axis falls in the lowest position to an angle α with the downward vertical.

With $z_1=0$ in (21) and $z_2=-\cos\beta$, and changing to the upward vertical measurement, the motion is given by

(24) $\sin\theta\,e^{\mathrm{t}i}=e^{mi}\sqrt{1^{mi}\beta}\sqrt{(1-\cos\beta\cos\theta)}+i\sqrt{(\cos\beta\cos\theta-\cos^2\theta)}$,

and the axis rises from the horizontal position to a series of cusps; and the mean precessional motion is the same as in steady motion with the same rotation and the axis horizontal.

The special case of $f=\frac{1}{3}$ may be stated here; it is found that

(25) $\frac{p}{a}(\varpi-pt)i=\sqrt{\frac{(t+x)(\kappa-x)}{2}}+i\sqrt{\frac{(t-x)(\kappa+x)}{2}}$,

(26) $\rho^2=a^2(\kappa-x^2)$,

(27) $\frac{1}{2}\lambda^2\sin\theta\exp(\psi-p\mathrm{t})i=(\mathrm{L}-1+\kappa-x)\sqrt{\frac{(t-x)(\kappa+x)}{2}}$
$+i(\mathrm{L}-1+\kappa+x)\sqrt{\frac{(t+x)(\kappa-x)}{2}}$,

(28) $\mathrm{L}=\frac{1}{3}(1-\kappa)+\lambda p/n$,

so that $p=0$ and the motion is made algebraical by taking $\mathrm{L}=\frac{1}{3}(1-\kappa)$.

The stereoscopic diagram of fig. 12 drawn by T. I. Dewar shows these curves for $\kappa=\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{4}$ (cusps).

10. So far the motion of the axis OC′ of the top has alone been considered; for the specification of any point of the body, Euler's third angle ϕ must be introduced, representing the angular displacement of the wheel with respect to the stalk. This is given by

(1) $\frac{d\phi}{dt}+\cos\theta\frac{d\psi}{dt}=\mathrm{R}$,

(2) $\frac{d(\psi+\phi)}{dt}=\left(1-\frac{\mathrm{C}}{\mathrm{A}}\right)\mathrm{R}+\frac{\mathrm{G}'+\mathrm{G}}{\mathrm{A}(1+\cos\theta)}$,
$\frac{d(\psi-\phi)}{dt}=\left(1-\frac{\mathrm{C}}{\mathrm{A}}\right)\mathrm{R}+\frac{\mathrm{G}'-\mathrm{G}}{\mathrm{A}(1-\cos\theta)}$.

It will simplify the formulas by cancelling a secular term if we make C=A, and the top is then called a *spherical top*; OH becomes the axis of instantaneous angular velocity, as well as of resultant angular momentum.

When this secular term is restored in the general case, the axis OI of angular velocity is obtained by producing Q′H to I, making

(3) $\frac{\mathrm{HI}}{\mathrm{Q'H}}=\frac{\mathrm{A-C}}{\mathrm{C}}\cdot\frac{\mathrm{HI}}{\mathrm{Q'I}}=\frac{\mathrm{A-C}}{\mathrm{A}}$,

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and then the four vector components OC′, C′K, KH, HI give a resultant vector OI, representing the angular velocity ω, such that

(4) $\quad OI/Q'I=\omega/K.$

The point I is then fixed on the generating line Q′H of the deformable hyperboloid, and the other generator through I will cut the fixed generator OC of the opposite system in a fixed point O′.

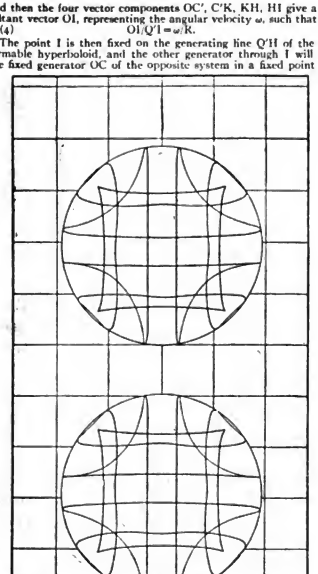

FIG. 12.

such that IO′ is of constant length, and may be joined up by a link, which constrains I to move on a sphere.

In the spherical top then,

$$(5)\qquad \tfrac{1}{2}(\phi+\psi)=\int\frac{C'+G}{1+\varepsilon}\frac{dt}{2A},\quad \tfrac{1}{2}(\phi-\psi)=\int\frac{C'-G}{1-\varepsilon}\frac{dt}{2A}$$

depending on the two elliptic integrals of the third kind, with pole at $z=\infty$ 1; and measuring θ from the downward vertical, their elliptic parameters are:—

$$(6)\qquad v_1=\int_1^{\infty}\frac{\sqrt{(z_2-z_1)dz}}{\sqrt{(4Z)}}=f_1K'i,$$

$$(7)\qquad v_2=\int_{-\infty}^{-1}\frac{\sqrt{(z_2-z_1)dz}}{\sqrt{(4Z)}}=K+(1-f_2)K'i,$$

$$(8)\qquad f_1K'=\int_1^{\infty}\frac{\sqrt{(z_2-z_1)dz}}{\sqrt{(-4Z)}}$$
$$=\operatorname{sn}^{-1}\sqrt{\frac{z_2-z_1}{1-z_1}}=\operatorname{cn}^{-1}\sqrt{\frac{z_2-z_1}{1-z_1}}=\operatorname{dn}^{-1}\sqrt{\frac{z_2-z_1}{1-z_1}},$$

$$(9)\qquad (1-f_2)K'=\int_{z_1}^{-1}\frac{\sqrt{(z_2-z_1)dz}}{\sqrt{(-4Z)}}$$
$$=\operatorname{sn}^{-1}\sqrt{\frac{-1-z_1}{z_2-z_1}}=\operatorname{cn}^{-1}\sqrt{\frac{1+z_2}{z_2-z_1}}$$
$$=\operatorname{dn}^{-1}\sqrt{\frac{1+z_2}{z_2-z_1}}.$$

Then if $v'=K+(1-f')K'i$ is the parameter corresponding to $z=D$, we find

$$(10)\qquad f=f_2-f_1,\quad f'=f_2+f_1,$$
$$(11)\qquad v=v_1+v_2,\quad v'=v_1-v_2.$$

The most symmetrical treatment of the motion of any point fixed in the top will be found in Klein and Sommerfeld, *Theorie des Kreisels*, to which the reader is referred for details; four new functions, α, β, γ, δ, are introduced, defined in terms of Euler's angles, θ, ψ, ϕ, by

$$(12)\qquad \alpha=\cos\tfrac{1}{2}\theta\exp\tfrac{1}{2}(-\phi+\psi)i,$$
$$(13)\qquad \beta=i\sin\tfrac{1}{2}\theta\exp\tfrac{1}{2}(-\phi+\psi)i,$$
$$(14)\qquad \gamma=i\sin\tfrac{1}{2}\theta\exp\tfrac{1}{2}(\phi-\psi)i,$$
$$(15)\qquad \delta=\cos\tfrac{1}{2}\theta\exp\tfrac{1}{2}(-\phi-\psi)i.$$

Next Klein takes two functions or co-ordinates λ and Λ, defined by

$$(16)\qquad \lambda=\frac{x+yi}{r-z}=\frac{r+z}{x-yi},$$

and Λ the same function of X, Y, Z, so that λ, Λ play the part of stereographic representations of the same point (x, y, z) or (X, Y, Z) on a sphere of radius r, with respect to poles in which the sphere is intersected by Os and OZ.

These new functions are shown to be connected by the bilinear relation

$$(17)\qquad \lambda=\frac{a\Lambda+\beta}{\gamma\Lambda+\delta},\quad a\delta-\beta\gamma=1,$$

in accordance with the annexed scheme of transformation of co-ordinates—

	Ξ	H	Z
ξ	α^2	β^2	$2\alpha\beta$
η	γ^2	δ^2	$2\gamma\delta$
ζ	$\alpha\gamma$	$\beta\delta$	$\alpha\delta+\beta\gamma$

where

$$(18)\qquad \xi=x+yi,\quad \eta=-x+yi,\quad \zeta=-z,$$
$$\Xi=X+Yi,\quad H=-X+Yi,\quad Z=-Z;$$

and thus the motion in space of any point fixed in the body defined by Λ is determined completely by means of α, β, γ, δ; and in the case of the symmetrical top these functions are elliptic transcendants, to which Klein has given the name of *multiplicative elliptic functions*; and

$$(19)\qquad \begin{aligned}&\alpha\delta=\cos^2\tfrac{1}{2}\theta,\quad \beta\gamma=-\sin^2\tfrac{1}{2}\theta,\\ &\alpha\delta-\beta\gamma=1,\ \alpha\delta+\beta\gamma=\cos\theta,\\ &\sqrt{(-4\alpha\beta\gamma\delta)}=\sin\theta;\end{aligned}$$

while, for the motion of a point on the axis, putting $\Lambda=0$, or ∞,

$$(20)\qquad \lambda=\beta/\delta=i\tan\tfrac{1}{2}\theta e^{\phi i},\text{ or }\lambda=\alpha/\gamma=-i\cot\tfrac{1}{2}\theta e^{\phi i},$$

and

$$(21)\qquad \alpha\beta=\tfrac{1}{2}i\sin\theta e^{\phi i},\ \alpha\gamma=\tfrac{1}{2}i\sin\theta e^{\phi i},$$

giving orthogonal projections on the planes GKH, CHK; and

$$(22)\qquad \frac{d\beta}{dt}\frac{d\alpha}{dt}\beta=n\frac{p}{k}e^{\phi i},$$

the vectorial equation in the plane GKH of the herpolhode of H for a spherical top.

When f_1 and f_2 in (9) are rational fractions, these multiplicative elliptic functions can be replaced by algebraical functions, qualified by factors which are exponential functions of the time t; a series of quasi-algebraical cases of motion can thus be constructed, which become purely algebraical when the exponential factors are cancelled by a suitable arrangement of the constants.

Thus, for example, with $f=0$, $f'=1$, $f_1=\frac{1}{2}$, $f_2=\frac{1}{2}$, as in (24) § 9, where P and P′ are at A and B on the focal ellipse, we have for the spherical top

$$(23)\qquad \begin{aligned}&(1+\cos\theta)\exp(\phi+\psi-qt)i\\ &=\sqrt{(\sec\beta-\cos\theta)}\sqrt{(\cos\beta-\cos\theta)}+i(\sqrt{\sec\beta}+\sqrt{\cos\beta})\sqrt{\cos\theta},\end{aligned}$$

$$(24)\qquad \begin{aligned}&(1-\cos\theta)\exp(\phi-\psi-q't)i\\ &=\sqrt{(\sec\beta-\cos\theta)}\sqrt{(\cos\beta-\cos\theta)}+i(\sqrt{\sec\beta}-\sqrt{\cos\beta})\sqrt{\cos\theta},\end{aligned}$$

$$(25)\qquad q,\ q'=n\sqrt{(2\sec\beta)}=n\sqrt{(2\cos\beta)};$$

and thence α, β, γ, δ can be inferred.

The physical constants of a given symmetrical top have been denoted in § 1 by M, h, A, C, and l, n, T; to specify a given state of general motion we have G, G′ or CR, D, E, or F, which may be called the dynamical constants; or κ, ε, w, v_1, v_2, or f, f', f_1, f_2, the analytical constants; or the geometrical constants, such as α, β, δ, δ', k of a given articulated hyperboloid.

There is thus a triply infinite series of a state of motion; the choice of a typical state can be made geometrically on the hyperboloid, flattened in the plane of the focal ellipse, of which κ is the ratio of the semiaxes α and β, and $\operatorname{am}(1-f)K'$ is the eccentric angle from the minor axis of the point of contact P of the generator HQ, so that two analytical constants are settled thereby; and the point H may be taken arbitrarily on the tangent line PQ, and HQ′ is then the other tangent of the focal ellipse: in which case θ_1 and θ_2 are the angles between the tangents HQ, HQ′, and between the focal distances HS, HS′, and k^2 will be HS.HS′, while HQ.HQ′ are δ, δ'

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As H is moved along the tangent line HQ, a series of states of motion can be determined, and drawn with accuracy.

11. Equation (5) § 3 with slight modification will serve with the same notation for the steady rolling motion at a constant inclination α to the vertical of a body of revolution, such as a disk, hoop, wheel, cask, wine-glass, plate, dish, bowl, spinning top, gyrostat, or bicycle, on a horizontal plane, or a surface of revolution, as a coin in a conical lamp-shade.

The point O is now the intersection of the axis GC′ with the vertical through the centre B of the horizontal circle described by the centre of gravity, and through the centre M of the horizontal circle described by P, the point of contact (fig. 13). Collected into a particle at G, the body swings round the vertical OB as a conical pendulum, of height AB or GL equal to $g/n^2 = \lambda$, and GA would be the direction of the thread, of tension $gM(GA/GL)$ dyn. The reaction with the plane at P will be an equal parallel force; and its moment round G will provide the couple which causes the velocity of the vector of angular momentum appropriate to the steady motion; and this moment will be $gM.Gm$ dyne-cm. or ergs, if the reaction at P cuts GB in m.

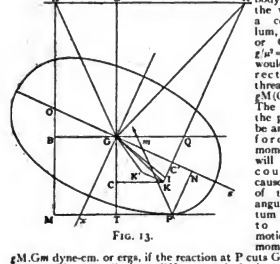

FIG. 13.

Draw GR perpendicular to GK to meet the horizontal AL in R, and draw RQC′K perpendicular to the axis GL and KC perpendicular to LG.

The velocity of the vector GK of angular momentum is μ times the horizontal component, and

(1) horizontal component $/A\mu \sin\alpha = KC/KC'$,

so that

(2) $$\frac{gM.Gm}{A\mu^2} = A\mu^2 \sin\alpha (KC/KC'),$$

(3) $$\frac{A}{M}\frac{KC'}{AC'}\frac{g}{\mu^2 \sin\alpha} = Gm \approx GQ.Gm.$$

The instantaneous axis of rotation of the case of a gyrostat would be OP′; drawing GI parallel to OP′, and KK′ parallel to OG, making tan K′GC′ = (A/C) tan IGC′; then if GK represents the resultant angular momentum, K′K will represent the part of it due to the rotation of the fly-wheel. Thus in the figure for the body rolling as a solid, with the fly-wheel clamped, the points m and Q move to the other side of G. The gyrostat may be supposed swung round the vertical at the end of a thread PA′ fastened at A′ where P′m produced cuts the vertical AB, and again at the point where it crosses the axis GO. The discussion of the small oscillation superposed on the state of steady motion requisite for stability is given in the next paragraph.

General motion of a gyrostat rolling on a plane.

12. In the theoretical discussion of the general motion of a gyrostat rolling on a horizontal plane the safe and shortest plan apparently is to write down the most general equations of motion, and afterwards to introduce any special condition.

Drawing through G the centre of gravity any three rectangular axes Gx, Gy, Gz, the notation employed is

u, v, w, the components of linear velocity of G;
p, q, r, the components of angular velocity about the axes,
h_1, h_2, h_3, the components of angular momentum;
$\theta_1, \theta_2, \theta'_3$, the components of angular velocity of the co-ordinate axes;
x, y, z, the co-ordinates of the point of contact with the horizontal plane;
X, Y, Z, the components of the reaction of the plane;
α, β, γ, the direction cosines of the downward vertical.

The geometrical equations, expressing that the point of contact is at rest on the plane, are

(1) $$u - ry + qz = 0,$$
(2) $$v - pz + rx = 0,$$
(3) $$w - qx + py = 0.$$

The dynamical equations are

(4) $$du/dt - \theta_3 v + \theta_2 w = g\alpha + X/M,$$
(5) $$dv/dt - \theta_1 w + \theta_3 u = g\beta + Y/M,$$
(6) $$dw/dt - \theta_2 u + \theta_1 v = g\gamma + Z/M,$$

and

(7) $$dh_1/dt - \theta_3 h_2 + \theta_2 h_3 = \gamma Z - zY,$$
(8) $$dh_2/dt - \theta_1 h_3 + \theta_3 h_1 = zX - xZ,$$
(9) $$dh_3/dt - \theta_2 h_1 + \theta_1 h_2 = xY - yX.$$

In the special case of the gyrostat where the surface is of revolution round Gz, and the body is kinetically symmetrical about Gz, we take Gy horizontal and Gzx through the point of contact so that $y = 0$; and denoting the angle between Gz and the downward vertical by θ (fig. 13)

(10) $$\alpha = \sin\theta,\ \beta = 0,\ \gamma = \cos\theta.$$

The components of angular momentum are

(11) $$h_1 = Ap,\ h_2 = A\sigma,\ h_3 = Cr + K,$$

where A, C denote the moment of inertia about Gx, Gz, and K is the angular momentum of a fly-wheel fixed in the interior with its axis parallel to Gz; K is taken as constant during the motion.

The axis Gz being fixed in the body,

(12) $$\theta_1 = p,\ \theta_2 = q = -d\theta/dt,\ \theta_3 = p\cot\theta.$$

With $y = 0$, (1), (2), (3) reduce to

(13) $$u = -qz,\ v = pz - rx,\ w = qx;$$

and, denoting the radius of curvature of the meridian curve of the rolling surface by ρ,

(14) $$\frac{dx}{dt} = \rho\cos\theta\frac{dq}{dt} = -q\rho\cos\theta,\ \frac{dz}{dt} = -\rho\sin\theta\frac{dq}{dt} = q\rho\sin\theta;$$

so that

(15) $$\frac{du}{dt} = -\frac{dq}{dt}z - q^2\rho\sin\theta,$$

(16) $$\frac{dv}{dt} = \frac{dp}{dt}z - \frac{dr}{dt}x + pq\rho\sin\theta + qr\rho\sin\theta,$$

(17) $$\frac{dw}{dt} = \frac{dq}{dt}x - q^2\rho\cos\theta.$$

The dynamical equations (4) . . . (9) can now be reduced to

(18) $$\frac{X}{M} = -\frac{dq}{dt}z - p^2 z\cot\theta + q^2(x - \rho\sin\theta) + prx\cot\theta - g\sin\theta,$$

(19) $$\frac{Y}{M} = \frac{dp}{dt}z - \frac{dr}{dt}x - pq(x + z\cot\theta - \rho\sin\theta) + qr\rho\cos\theta,$$

(20) $$\frac{Z}{M} = \frac{dq}{dt}x + q^2(z - \rho\cos\theta) + p^2 x - prx - g\cos\theta,$$

(21) $$-zY = A\frac{dp}{dt} - Apq\cot\theta + qh_3,$$

(22) $$-zX - xZ = A\frac{dq}{dt} + Ap^2\cot\theta - ph_3,$$

(23) $$xY = \frac{dh_3}{dt} = C\frac{dr}{dt} - Cq\frac{d}{d\theta}$$

Eliminating Y between (19) and (23),

(24) $$\left(\frac{C}{M}+x^2\right)\frac{dr}{dt} - xz\frac{dp}{dt} + pqx(x + z\cot\theta - \rho\sin\theta) - qrx\rho\cos\theta = 0,$$

(A) $$\left(\frac{C}{M}+x^2\right)\frac{dr}{d\theta} - xz\frac{dp}{d\theta} - px(x + z\cot\theta - \rho\sin\theta) + rx\rho\cos\theta = 0.$$

Eliminating Y between (19) and (21)

(25) $$\left(\frac{A}{M}+x^2\right)\frac{dp}{dt} - xz\frac{dr}{dt} + \frac{A}{M}pq\cot\theta + \frac{h_3}{M}rx - pqz(x + z\cot\theta - \rho\sin\theta) + qrx\rho\cos\theta = 0,$$

(B) $$-xz\frac{dr}{d\theta} + \left(\frac{A}{M}+x^2\right)\frac{dp}{d\theta} + \frac{A}{M}p\cot\theta - \frac{h_3}{M}p + pz(x + z\cot\theta - \rho\sin\theta) - rz\rho\cos\theta = 0.$$

In the special case of a gyrostat rolling on the sharp edge of a circle passing through G, $z = 0$, $\rho = 0$, (A) and (B) reduce to

(26) $$p = \left(\frac{C}{Mx^2}+1\right)\frac{dr}{d\theta} = \left(\frac{1}{Mx^2}+\frac{1}{C}\right)\frac{dh_3}{d\theta},$$

(27) $$\frac{dp}{d\theta} + p\cot\theta = \frac{h_3}{A}\cdot\frac{d}{d\theta}\frac{p\sin\theta}{\sin\theta} = \frac{h_3}{A}\sin\theta;$$

(28) $$\frac{d^2h_3}{d\theta^2} + \frac{dh_3}{d\theta}\cot\theta = \frac{CMx^2}{A(Mx^2+C)}h_3,$$

a differential equation of a hypergeometric series, of the form of Legendre's zonal harmonic of fractional order n, given by

(29) $$n(n+1) = CMx^2/A(Mx^2+C).$$

For a sharp point, $x = 0$, $\rho = 0$, and the previous equations are obtained of a spinning top.

The elimination of X and Z between (18) (20) (22), expressed symbolically as

(30) $$(22) - x(18) + x(20) = 0,$$

gives

(C) $$\left(\frac{A}{M}+x^2+z^2\right)\frac{dq}{dt} - \frac{h_3}{M}r + \left(\frac{A}{M}+x^2\right)p^2\cot\theta + p^2 xz + q^2\rho(x\cot\theta - z\sin\theta) - prx(x + z\cot\theta) - g(x\cot\theta - z\sin\theta) = 0,$$

and this combined with (A) and (B) will lead to an equation the integral of which is the equation of energy.

13. The equations (A) (B) (C) are intractable in this general form; but the restricted case may be considered when the axis moves in steady motion at a constant inclination α to the vertical; and the stability is secured if a small nutation of the axis can be superposed.

It is convenient to put $p = \Omega\sin\theta$, so that Ω is the angular velocity of the plane Gzx about the vertical; (A) (B) (C) become

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$$(A^{**})\quad \left(\frac{C}{M}+x^2\right)\frac{dr}{d\theta}-xs\sin\theta\frac{d\Omega}{d\theta}$$
$$-\Omega x(x\sin\theta-2z\cos\theta-\rho\sin^2\theta)+rs\rho\cos\theta=0,$$

$$(B^{**})\quad -xz\frac{dr}{d\theta}+\left(\frac{A}{M}+s^2\right)\sin\theta\frac{d\Omega}{d\theta}\frac{h_3}{M}+2\Omega\left(\frac{A}{M}+s^2\right)\cos\theta$$
$$+\Omega z\sin\theta(x-\rho\sin\theta)-rs\rho\cos\theta=0,$$

$$(C^{**})\quad \left(\frac{A}{M}+x^2+s^2\right)\frac{dq}{dt}+q^2\rho(x\cos\theta-s\sin\theta)-\Omega^2\frac{h_3}{M}\sin\theta$$
$$+\Omega^2\left(\frac{A}{M}+s^2\right)\sin\theta\cos\theta+\Omega rxz\sin^2\theta$$
$$-\Omega rx(x\sin\theta+z\cos\theta)-g(x\cos\theta-s\sin\theta)=0.$$

The steady motion and nutation superposed may be expressed by

(1) $\theta=\alpha+L_1$, $\sin\theta=\sin\alpha+L\cos\alpha$, $\cos\theta=\cos\alpha-L\sin\alpha$, $\Omega=\mu+N$, $r=R+N_1$,

where L, N, Q are small terms, involving a factor $e^{\kappa t}$, to express the periodic nature of the nutation; and then if a, c denote the mean value of x, z, at the point of contact

(2) $x=a+L\rho\cos\alpha$, $z=c-L\rho\sin\alpha$,
(3) $x\sin\theta+z\cos\theta=a\sin\alpha+c\cos\alpha+L(a\cos\alpha-c\sin\alpha)$,
(4) $x\cos\theta-z\sin\theta=a\cos\alpha-c\sin\alpha-L(a\sin\alpha+c\cos\alpha-\rho)$.

Substituting these values in (C*) with $dq/dt=-d^2\theta/dt^2=n^2L$, and ignoring products of the small terms, such as L^2, LN, . . .

$$(C^{**})\quad \left(\frac{A}{M}+a^2+c^2\right)Ln^2-(\mu+N)\left(\frac{CR+K}{M}+\frac{CQ}{M}\right)(\sin\alpha+L\cos\alpha)$$
$$+(\mu^2+2\mu N)\left(\frac{A}{M}+c^2-2L\rho c\sin\alpha\right)(\sin\alpha\cos\alpha+L\cos^2\alpha)$$
$$+(\mu^2+2\mu N)[ac-L\rho(a\sin\alpha-c\sin\alpha)](\sin^2\alpha+L\sin2\alpha)$$
$$-(\mu+N)(R+Q)(a+L\rho\cos\alpha)[a\sin\alpha+c\cos\alpha+L(a\cos\alpha-c\sin\alpha)]$$
$$-g(a\cos\alpha-c\sin\alpha)+gL(a\sin\alpha+c\cos\alpha-\rho)=0,$$

which is equivalent to

(5) $-\mu\dfrac{CR+K}{M}\sin\alpha+\mu^2\left(\dfrac{A}{M}+c^2\right)\sin\alpha\cos\alpha$
$$+\mu^2ac\sin^2\alpha-\mu Ra(a\sin\alpha+c\cos\alpha)-g(a\cos\alpha-c\sin\alpha)=0,$$

the condition of steady motion: and

(6) $\qquad DL+EQ+FN=0$,

where

$$(7)\quad D=\left(\frac{A}{M}+a^2+c^2\right)n^2-\mu\frac{CR+K}{M}\cos\alpha-2\mu^2ac\sin^2\alpha\cos\alpha$$
$$+\mu^2\left(\frac{A}{M}+c^2\right)\cos\alpha-\mu^2\rho(a\sin\alpha-c\cos\alpha)\sin^2\alpha$$
$$+\mu^2ac\sin2\alpha-\mu R\rho\cos\alpha(a\sin\alpha+c\cos\alpha)$$
$$-\mu Ra(a\cos\alpha-c\sin\alpha)+g(a\sin\alpha+c\cos\alpha-\rho),$$

$$(8)\quad E=-\mu\frac{C}{M}\sin\alpha-\mu a(a\sin\alpha+c\cos\alpha),$$

$$(9)\quad F=-\frac{CR+K}{M}\sin\alpha+2\mu\left(\frac{A}{M}+c^2\right)\sin\alpha\cos\alpha$$
$$+2\mu ac\sin^2\alpha-Ra(a\sin\alpha+c\cos\alpha).$$

With the same approximation (A^*) and (B^*) are equivalent to

$$(A^{**})\quad \left(\frac{A}{M}+a^2\right)\frac{Q}{L}-ac\sin\alpha\frac{N}{L}-\mu a(a\sin\alpha+2c\cos\alpha-\rho\sin^2\alpha)$$
$$+R\alpha\rho\cos\alpha=0,$$

$$(B^{**})\quad -ac\frac{Q}{L}+\left(\frac{A}{M}+c^2\right)\sin\alpha\frac{N}{L}-\frac{CR+K}{M}+2\mu\left(\frac{A}{M}+c^2\right)\cos\alpha$$
$$+\mu c\sin\alpha(a-\rho\sin\alpha)-Rc\rho\cos\alpha=0.$$

The elimination of L, Q, N will lead to an equation for the determination of n^2, and n^2 must be positive for the motion to be stable.

If b is the radius of the horizontal circle described by G in steady motion round the centre B,

(10) $\qquad b=\mu=\mu(P-\alpha R)/\mu=c\sin\alpha-aR/\mu$,

and drawing GL vertically upward of length $\lambda=g/n^2$, the height of the equivalent conical pendulum, the steady motion condition may be written

$$(11)\quad (CR+K)\mu\sin\alpha-\mu^2\sin\alpha\cos\alpha=-gM(a\cos\alpha-c\sin\alpha)$$
$$+M(\mu^2c\sin\alpha-\mu Ra)(a\sin\alpha+c\cos\alpha)$$
$$=gM[b\lambda^{-1}(a\sin\alpha+c\cos\alpha)-a\cos\alpha+c\sin\alpha]$$
$$=gM.PT,$$

LG produced cuts the plane in T.

Interpreted dynamically, the left-hand side of this equation represents the velocity of the vector of angular momentum about G, so that the right-hand side represents the moment of the applied force about G, in this case the reaction of the plane, which is parallel to GA, and equal to $gM.GA/GL$; and so the angle AGL must be less than the angle of friction, or slipping will take place.

Spinning upright, with $a=0$, $\alpha=0$, we find $F=0$, $Q=0$, and

$$(12)\quad -\frac{CR+K}{M}+2\mu\left(\frac{A}{M}+c^2\right)-Rc\rho=0,$$

$$(13)\quad \left(\frac{A}{M}+c^2\right)n^2=\mu\frac{CR+K}{M}-\mu^2\left(\frac{A}{M}+c^2\right)+\mu R\rho c-g(c-\rho).$$

$$(14)\quad \left(\frac{A}{M}+c^2\right)^2n^2=\tfrac{1}{4}\left(\frac{CR+K}{M}+R\rho\right)^2-g\left(\frac{A}{M}+c^2\right)(c-\rho).$$

Thus for a top spinning upright on a rounded point, with $K=0$, the stability requires that

$$(15)\quad R>2k'\sqrt{g(c-\rho)}/(k^2+c\rho),$$

where k, k' are the radii of gyration about the axis Gz, and a perpendicular axis at a distance c from G; this reduces to the preceding case of § 3 (7) when $\rho=0$.

Generally, with $a=0$, but $a\neq0$, the condition (A) and (B) becomes

$$(16)\quad \left(\frac{C}{M}+a^2\right)\frac{Q}{L}=2\mu ac-Ra\rho,$$
$$-ac\frac{Q}{L}-\frac{CR+K}{M}+Rc\rho-2\mu\left(\frac{A}{M}+a^2\right),$$

so that, eliminating Q/L,

$$(17)\quad 2\left[\left(\frac{A}{M}+c^2\right)\left(\frac{C}{M}+a^2\right)-a^2c^2\right]\mu=\left(\frac{C}{M}+a^2\right)\left(\frac{CR+K}{M}\right)+\frac{C}{M}Rc\rho,$$

the condition when a coin or platter is rolling nearly flat on the table.

Rolling along in a straight path, with $a=\frac{1}{2}r$, $c=0$, $\mu=0$, $E=0$; and

$$(18)\quad N/L=(CR+K)/A,$$

$$(19)\quad D=\left(\frac{A}{M}+a^2\right)n^2+g(a-\rho),$$
$$F=-\frac{CR+K}{M}-Ra^2,$$

$$(20)\quad \frac{N}{L}=-\frac{D}{F}=\frac{\left(\frac{A}{M}+a^2\right)n^2+g(a-\rho)}{\left(\frac{C}{M}+a^2\right)R+\frac{K}{M}},$$

$$(21)\quad \left(\frac{A}{M}+a^2\right)n^2=\frac{(CR+K)}{A}\left[\left(\frac{C}{M}+a^2\right)R+\frac{K}{M}\right]-g(a-\rho).$$

Thus with $K=0$, and rolling with velocity $V=Ra$, stability requires

$$(22)\quad \frac{V^2}{2g}>\frac{a-\rho}{2\frac{C}{A}\left(\frac{C}{Ma^2}+1\right)}>\frac{1}{2}\frac{A}{C}\frac{a-\rho}{\frac{C}{Ma^2}+1},$$

or the body must have acquired velocity greater than attained by rolling down a plane through a vertical height $\frac{1}{2}(a-\rho)A/C$.

On a sharp edge, with $\rho=0$, a thin uniform disk or a thin ring requires

$$(23)\quad V^2/2g>a/6 \text{ or } a/8.$$

The gyrostat can hold itself upright on the plane without advance when $K=0$, provided

$$(24)\quad K^2/AM-g(a-\rho) \text{ is positive.}$$

For the stability of the monorail carriage of § 5 (6), ignoring the rotary inertia of the wheels by putting $C=0$, and replacing K by G' the theory above would require

$$(25)\quad \frac{G'}{A}\left(aV+\frac{G'}{A}\right)>gh.$$

For further theory and experiments consult Routh, *Advanced Rigid Dynamics*, chap. v., and Thomson and Tait, *Natural Philosophy*, § 345; also Bourlet, *Traité des bicycles* (analysed in Appell, *Mécanique rationnelle*, ii. 297, and Carvallo, *Journal de l'école polytechnique*, 1900); Whipple, *Quarterly Journal of Mathematics*, vol. xxx., for mathematical theories of the bicycle, and other bodies.

Gyrostatic chain.

14. Lord Kelvin has studied theoretically and experimentally the vibration of a chain of stretched gyrostats (*Proc. London Math. Soc.*, 1875; J. Perry, *Spinning Tops*, fig. for a diagram). Suppose each gyrostat to be equivalent dynamically to a fly-wheel of axial length $2a$, and that each connecting link is a light cord or steel wire of length $2l$, stretched to a tension T.

Denote by x, y the components of the slight displacement from the central straight line of the centre of a fly-wheel; and let p, q, t denote the direction cosines of the axis of a fly-wheel, and r, s, t the direction cosines of a link, distinguishing the different bodies by a suffix.

Then with the previous notation and to the order of approximation required,

$$(1)\quad \theta_1=-dq/dt, \theta_2=dp/dt,$$
$$(2)\quad h_1=Ap_1, h_2=Aq_2, h_3=K,$$

to be employed in the dynamical equations

$$(3)\quad \frac{dh_1}{dt}-\theta_2h_3+\theta_3h_2=L, \ldots$$

in which θ_2h_1 and θ_3h_2 can be omitted.

For the kth fly-wheel

$$(4)\quad -A\dot{q}_k+K\dot{p}_k=Ta(q_k\quad -z_k)+Ta(q_k-z_{k+1}),$$
$$(5)\quad A\dot{p}_k+K\dot{q}_k=-Ta(p_k-r_k)-Ta(p_k-r_{k+1});$$

and for the motion of translation

$$(6)\quad M\ddot{x}_k=T(r_{k+1}-r_k), M\ddot{y}_k=T(s_{k+1}-s_k);$$

while the geometrical relations are

$$(7)\quad x_{k+1}-x_k=a(p_{k+1}+p_k)+2lr_{k+1},$$
$$(8)\quad y_{k+1}-y_k=a(q_{k+1}+q_k)+2ls_{k+1}.$$

Putting

$$(9)\quad x+yi=w, p+qi=\alpha, r+si=\sigma,$$

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these three pairs of equations may be replaced by the three equations

$$A\ddot{\alpha}_s - K\dot{\alpha}_s i + 2T\alpha\dot{\alpha}_s - Ta(\sigma_{s+1} + \sigma_s) = 0, \tag{10}$$

$$M\ddot{\alpha}_s - T(\sigma_{s+1} - \sigma_s) = 0, \tag{11}$$

$$w_{s+1} - w_s - a(2\alpha_s i + 2\dot{\alpha}_s) - 2l\sigma_{s+1} = 0. \tag{12}$$

For a vibration of circular polarization assume a solution

$$w_s, \dot{\alpha}_s, \sigma_s = (L, P, Q) \exp(nt + kc)i, \tag{13}$$

so that c/n is the time-lag between the vibration of one fly-wheel and the next; and the wave velocity is

$$U = 2(a+l)n/c. \tag{14}$$

Then

$$P(-An^2 + Kni + 2T\alpha) - QTa(e^{c} + 1) = 0, \tag{15}$$

$$-LMn^2 - QT(e^{c} - 1) = 0, \tag{16}$$

$$L(e^{c} - 1) - Pa(e^{c} + 1) - 2Qle^{c} = 0, \tag{17}$$

leading, on elimination of L, P, Q, to

$$\cos c = \frac{(2Ta + Kni - An^2)(1 - Mn^2 l/T) - Mna^2}{2Ta + Kni - An^2 + Mna^2}, \tag{18}$$

$$2\sin^2\tfrac{1}{2}c = \frac{Mn^2 \cdot 2Ta(a+l) + Knl \cdot An^2 l}{2Ta + Kni - An^2 + Mna^2}. \tag{19}$$

With $K = 0$, $A = 0$, this reduces to Lagrange's condition in the vibration of a string of beads.

Putting

$$\rho = M/2(a+l), \quad \text{the mass per unit length of the chain,} \tag{20}$$

$$\epsilon = K/2(a+l), \quad \text{the gyrostatic angular momentum per unit length,} \tag{21}$$

$$\alpha = A/2(a+l), \quad \text{the transverse moment of inertia per unit length.} \tag{22}$$

$$\tfrac{1}{2}c = (a+l)n/U, \tag{23}$$

equation (19) can be written

$$\left.\begin{aligned} &\sin(a+l)n/U\}^2 \\ &= (a+l)^2 n^2 \frac{\rho}{T} \end{aligned}\right\} \frac{Ta + \epsilon nl - \alpha n^2 l}{1 - Ta + \epsilon n(a+l) - \alpha n^2(a+l) + \rho n^2 a^2(a+l)^2}. \tag{24}$$

$$\left\{\frac{(a+l)n}{\sin(a+l)n/U}\right\}^2 = \frac{T}{\rho} \cdot \frac{T + (\epsilon n - \alpha n^2)(1 + l/a) + \rho n^2 a(a+l)}{T + (\epsilon n - \alpha n^2)l/a}. \tag{25}$$

In a continuous chain of such gyrostatic links, with a and l infinitesimal,

$$U^2 = \frac{T}{\rho}\left\{1 + \frac{\epsilon n - \alpha n^2}{T + (\epsilon n - \alpha n^2)l/a}\right\} \tag{26}$$

for the vibration of helical nature like circular polarization.

Changing the sign of n for circular polarization in the opposite direction

$$U'^2 = \frac{T}{\rho}\left\{1 - \frac{\epsilon n + \alpha n^2}{T - (\epsilon n + \alpha n^2)l/a}\right\}. \tag{27}$$

In this way a mechanical model is obtained of the action of a magnetized medium on polarized light, ϵ representing the equivalent of the magnetic field, while α may be ignored as insensible (J. Larmor, *Proc. Lond. Math. Soc.*, 1893; *Aether and Matter*, Appendix E).

We notice that U^2 in (26) can be positive, and the gyrostatic chain stable, even when T is negative, and the chain is supporting a thrust, provided ϵn is large enough, and the thrust does not exceed

$$(\epsilon n - \alpha n^2)(1 + l/a); \tag{28}$$

while U'^2 in (27) will not be positive and the straight chain will be unstable unless the tension exceeds

$$(\epsilon n + \alpha n^2)(1 + l/a). \tag{29}$$

15. *Gyrostat suspended by a Thread.*—In the discussion of the small vibration of a single gyrostat fly-wheel about the vertical position when suspended by a single thread of length $2l = b$, the suffix s can be omitted in the preceding equations of § 14, and we can write

$$A\ddot{\alpha} - K\dot{\alpha}i + Ta\alpha - Ta\sigma = 0, \tag{1}$$

$$M\ddot{\alpha} + T\alpha = 0, \text{ with } T = gM, \tag{2}$$

$$w - a\alpha - b\sigma = 0. \tag{3}$$

Assuming a periodic solution of these equations

$$w, \alpha, \sigma = (L, P, Q) \exp nti, \tag{4}$$

and eliminating L, P, Q, we obtain

$$(-An^2 + Kni + gMa)(g - n^2 b) - gMn^2 a^2 = 0, \tag{5}$$

and the frequency of a vibration in double beats per second is $n \div 2\pi$, where n is a root of this equation.

For upright spinning on a smooth horizontal plane, take $b = \infty$ and change the sign of a, then

$$An^2 - Kni + gMa = 0, \tag{6}$$

so that the stability requires

$$K^2 > 4gAMa. \tag{7}$$

Here A denotes the moment of inertia about a diametral axis through the centre of gravity; when the point of the fly-wheel is held in a small smooth cup, $b = 0$, and the condition becomes

$$(A + Ma^2)n^2 - Kn + gMa = 0. \tag{8}$$

requiring for stability, as before in § 3,

$$K^2 > 4g(A + Ma^2)Ma. \tag{9}$$

For upright spinning inside a spherical surface of radius b, the sign of a must be changed to obtain the condition at the lowest point, as in the gyroscopic horizon of Fleurials.

For a gyrostat spinning upright on the summit of a sphere of radius b, the signs of a and b must be changed in (5), or else the sign of g, which amounts to the same thing.

Denoting the components of horizontal displacement of the point of the fly-wheel by ξ, η, then

$$b\pi = \xi, \quad b\iota = \eta, \quad b\omega = \xi + \eta i = \lambda \text{ (suppose)}, \tag{10}$$

$$w = a\alpha + \lambda. \tag{11}$$

If the point is forced to take the motion (ξ, η, ζ') by components of force X, Y, Z, the equations of motion become

$$-A\ddot{\alpha} + K\dot{\rho} = Ya - Zaq, \tag{12}$$

$$A\ddot{\rho} + K\dot{\alpha} = -Xa + Zap, \tag{13}$$

$$M\ddot{\alpha} = X, \quad M\ddot{\eta} = Y, \quad M(\ddot{\zeta} - g) = Z; \tag{14}$$

so that

$$A\ddot{\omega} - K\dot{\omega}i + gM\omega\dot{\omega} + Ma\ddot{\omega} = Ma\ddot{\omega}\ddot{\zeta}, \tag{15}$$

or

$$(A + Ma^2)\ddot{\omega} - K\dot{\omega}i + gMa\dot{\omega} + Ma\lambda = Ma\ddot{\omega}\ddot{\zeta}. \tag{16}$$

Thus if the point of the gyrostat is made to take the periodic motion given by $\lambda = K \exp nti$, $\zeta = 0$, the forced vibration of the axis is given by $\omega = P \exp nti$, where

$$P\{-(A + Ma^2)n^2 + Kn + gMa\} - RMn^2 a = 0; \tag{17}$$

and so the effect may be investigated on the Fleurials gyroscopic horizon of the motion of the ship.

Suppose the motion λ is due to the suspension of the gyrostat from a point on the axis of a second gyrostat suspended from a fixed point.

Distinguishing the second gyrostat by a suffix, then $\lambda = b\ddot{\omega}$, if b denotes the distance between the points of suspension of the two gyrostats; and the motion of the second gyrostat influenced by the reaction of the first, is given by

$$\left.\begin{aligned} (A_1 + M_1 b_1^2)\ddot{\omega}_1 - K_1\dot{\omega}_1 i \\ = -g(M_1 b_1 + Mb)\omega_1 - b(X + Yi) \\ = -g(M_1 b_1 + Mb)\omega_1 - Mb(a\ddot{\omega} + \ddot{\lambda}); \end{aligned}\right\} \tag{18}$$

so that, in the small vibration,

$$\left.\begin{aligned} &R\{-(A_1 + M_1 b_1^2)n^2 + K_1 ni + g(M_1 b_1 + Mb)\} \\ &= Mn^2 b(aP + R), \end{aligned}\right\} \tag{19}$$

$$P\{-(A_1 + M_1 b_1^2 + Mb^2)n^2 + K_1 ni + g(M_1 b_1 + Mb)\} - PMn^2 ab^2 = 0. \tag{20}$$

Eliminating the ratio of P to R, we obtain

$$\left.\begin{aligned} &[-(A_1 + M_1 b_1^2 + Mb^2)n^2 + K_1 ni + g(M_1 b_1 + Mb)] \\ &\times [-(A_1 + M_1 b_1^2 + Mb^2)n^2 + K_1 ni + g(M_1 b_1 + Mb)] - M^2 n^4 a^2 b^2 = 0, \end{aligned}\right\} \tag{21}$$

a quartic for n, giving the frequency $n/2\pi$ of a fundamental vibration.

Change the sign of g for the case of the gyrostats spinning upright, one on the top of the other, and so realize the gyrostat on the top of a gyrostat described by Maxwell.

In the gyrostatic chain of § 14, the tension T may change to a limited pressure, and U^2 may still be positive, and the motion stable; and so a motion is realized of a number of spinning tops, superposed in a column.

16. *The Flexure Joint.*—In Lord Kelvin's experiment the gyrostats are joined up by equal light rods and short lengths of elastic wire with rigid attachment to the rod and case of a gyrostat, so as to keep the system still, and free from entanglement and twisting due to pivot friction of the fly-wheels.

When this gyrostatic chain is made to revolve with angular velocity n in relative equilibrium as a plane polygon passing through Oz the axis of rotation, each gyrostatic case moves as if its axis produced was attached to Oz by a flexure joint. The instantaneous axis of resultant angular velocity bisects the angle $\pi - \theta$, if the axis of the case makes an angle θ with Oz, and, the components of angular velocity being n about Oz, and $-n$ about the axis, the resultant angular velocity is $2n \cos\frac{1}{2}(\pi - \theta) = 2n \sin\frac{1}{2}\theta$; and the components of this angular velocity are

(1) $-2n \sin\frac{1}{2}\theta \sin\frac{1}{2}\theta = -n(1 - \cos\theta)$, along the axis, and

(2) $-2n \sin\frac{1}{2}\theta \cos\frac{1}{2}\theta = -n \sin\theta$, perpendicular to the axis of the case. The flexure joint behaves like a pair of equal bevel wheels engaging.

The component angular momentum in the direction Ox is therefore

$$L = -An \sin\theta \cos\theta - Cn(1 - \cos\theta) \sin\theta + K \sin\theta, \tag{3}$$

and Ln is therefore the couple acting on the gyrostat.

If a denotes the angle which a connecting link makes with Oz, and T denotes the constant component of the tension of a link parallel to Oz, the couple acting is

$$Ta \cos\theta_s(\tan\alpha_{s+1} + \tan\alpha_s) - 2Ta \sin\theta_s, \tag{4}$$

which is to be equated to l.n. so that

$$-An^2 \sin\theta_s \cos\theta_s - Cn^2(1 - \cos\theta_s) \sin\theta_s + Kn \sin\theta_s - Ta \cos\theta_s(\tan\alpha_{s+1} + \tan\alpha_s) + 2Ta \sin\theta_s = 0. \tag{5}$$

In addition

$$Mn^2 x_s + T(\tan\alpha_{s+1} - \tan\alpha_s) = 0, \tag{6}$$

with the geometrical relation

$$x_{s+1} - x_s - a(\sin\theta_{s+1} + \sin\theta_s) - 2l \sin\alpha_{s+1} = 0. \tag{7}$$

When the polygon is nearly coincident with Oz, these equations can be replaced by

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$$(8) \quad (-An^2+Kn+2Ta)\theta_0=Ta(a_{n+1}+a_n)=0,$$
$$(9) \quad -Mn^2x_0+T(a_{n+1}-a_n)=0,$$
$$(10) \quad x_{n+1}-x_n-a(\theta_{n+1}+\theta_n)-2la_n=0,$$

and the rest of the solution proceeds as before in § 14, putting

$$(11) \quad x_n\theta_n\ a_n=(L,\ P,\ Q)\ \exp ckt.$$

A half wave length of the curve of gyrostats is covered when $ck=\pi$, so that π/c is the number of gyrostats in a half wave, which is therefore of wave length $2\pi(a+l)/c$.

A plane polarized wave is given when $\exp ckt$ is replaced by $\exp(nt+ckt)$, and a wave circularly polarized when w, π, σ of § 14 replace this x, θ, a.

Gyroscopic Pendulum.—The elastic flexure joint is useful for supporting a rod, carrying a fly-wheel, like a gyroscopic pendulum. Expressed by Euler's angles, θ, ϕ, ψ, the kinetic energy is

$$(12) \quad T=\tfrac{1}{2}A(\dot\theta^2+\sin^2\theta\dot\psi^2)+\tfrac{1}{2}C'(-\cos\theta\dot\psi)^2+\tfrac{1}{2}C(\phi+\dot\psi\cos\theta)^2,$$

where A refers to rod and gyroscope about the transverse axis at the point of support, C' refers to rod about its axis of length, and C refers to the revolving fly-wheel.

The elimination of $\dot\psi$ between the equation of conservation of angular momentum about the vertical, viz.

$$(13) \quad A\sin^2\theta\dot\phi-C'(-\cos\theta)\cos\theta\dot\phi+C(\dot\phi+\dot\psi\cos\theta)\cos\theta=G,$$

a constant, and the equation of energy, viz.

$$(14) \quad T-gM\dot k\cos\theta=H,$$

a constant, with θ measured from the downward vertical, and

$$(15) \quad \dot\phi+\dot\psi\cos\theta=K,$$

a constant, will lead to an equation for $d\theta/dt$, or dc/dt, in terms of $\cos\theta$ or z, the integral of which is of hyper-elliptic character, except when $A=C'$.

In the suspension of fig. 8, the motion given by $\dot\phi$ is suppressed in the stalk, and for the fly-wheel ϕ gives the rubbing angular velocity of the wheel on the stalk; the equations are now

$$(16) \quad T=\tfrac{1}{2}A(\dot\theta^2+\sin^2\theta\dot\phi^2)+\tfrac{1}{2}C'\cos^2\theta\dot\phi^2+\tfrac{1}{2}CR^2=H+gM\dot k\cos\theta,$$
$$(17) \quad A\sin^2\theta\dot\phi+C'\cos^2\theta\dot\phi+CR\cos\theta=G,$$

and the motion is again of hyperelliptic character, except when $A=C'$, or $C'=0$. To realize a motion given completely by the elliptic function, the suspension of the stalk must be made by a smooth ball and socket, or else a Hooke universal joint.

Finally, there is the case of the general motion of a top with a spherical rounded point on a smooth plane, in which the centre of gravity may be supposed to rise and fall in a vertical line. Here

$$(18) \quad T=\tfrac{1}{2}(A+Mk^2)\sin^2\theta\dot\phi^2+\tfrac{1}{2}A\sin^2\theta\dot\psi^2+\tfrac{1}{2}CR^2=H-gMk\cos\theta,$$

with θ measured from the upward vertical, and

$$(19) \quad A\sin^2\theta\dot\phi+CR\cos\theta=G,$$

where A now refers to a transverse axis through the centre of gravity. The elimination of $\dot\psi$ leads to an equation for $z_1=\cos\theta$, of the form

$$(20) \quad \left(\frac{dz}{dt}\right)^2=2\frac{g}{h}\frac{Z}{1-z^2+A/Mk^2}=2\frac{g}{h}\frac{(z_1-z)\ (z_2-z)\ (z_1-z)}{(z_4-z)\ (z-z_3)},$$

with the arrangement

$$(21) \quad z_1,\ z_4>/>z_2>z>z_3>-/>z_3;$$

so that the motion is hyperelliptic.

AUTHORITIES.—In addition to the references in the text the following will be found useful:—*Ast. Notices*, vol. i.; *Comptes rendus*, Sept. 1852; Paper by Professor Magnus translated in Taylor's *Foreign Scientific Memoirs*, n.s., pt. 3, p. 210; *Ast. Notices*, xiii. 221-248; *Theory of Foucault's Gyroscope Experiments*, by the Rev. Baden Powell, F.R.S.; *Ast. Notices*, vol. xv.; articles by Major J. G. Barnard in *Sullivan's Journal*, 2nd ser., vols. xxiv. and xxv.; E. Hunt on "Rotatory Motion," *Proc. Phil. Soc. Glasgow*, vol. iv.; J. Clerk Maxwell, "On a Dynamical Top," *Trans. R.S.E.* vol. xxi.; *Phil. Mag.* 4th ser. vols. 7, 13, 14; *Proc. Royal Irish Academy*, vol. viii.; Sir William Thomson on "Gyrostat," *Nature*, xv. 297; G. T. Walker, "The Motion of a Celt," *Quar. Jour. Math.*, 1896; G. T. Walker, *Math. Enc.* iv. 1, xi. 1; Gallop, *Proc. Camb. Phil. Soc.* xii. 82, pt. 2, 1903, "Rise of a Top"; Price's *Infinitesimal Calculus*, vol. iv.; Worms, *The Earth and its Mechanism*; Routh, *Rigid Dynamics*; A. G. Webster, *Dynamics* (1904); H. Crabtree, *Spinning Tops and Gyroscopic Motion* (1909). For a complete list of the mathematical works on the subject of the Gyroscope and Gyrostat from the outset, Professor Cayley's Report to the British Association (1862) on the *Progress of Dynamics* should be consulted. Modern authors will be found cited in Klein and Sommerfeld, *Theorie des Kreisels* (1897), and in the *Encyclopädie der mathematischen Wissenschaften*. (G. G.)

GYTHIUM, the harbour and arsenal of Sparta, from which it was some 30 m. distant. The town lay at the N.W. extremity of the Laconian Gulf, in a small but fertile plain at the mouth of the Gythius. Its reputed founders were Heracles and Apollo, who frequently appear on its coins: the former of these names may point to the influence of Phoenician traders, who, we know, visited the Laconian shores at a very early period. In classical times it was a community of *perioeci*, politically dependent on Sparta, though doubtless with a municipal life of its own. In 455 B.C., during the first Peloponnesian War, it was "burned by the Athenian admiral Tolmides. In 370 B.C. Epaminondas besieged it unsuccessfully for three days. Its fortifications were strengthened by the tyrant Nabis, but in 195 B.C. it was invested and taken by Titus and Lucius Quintius Flamininus, and, though recovered by Nabis two or three years later, was recaptured immediately after his murder (192 B.C.) by Philopoemen and Aulus Atilius and remained in the Achaean League until its dissolution in 146 B.C. Subsequently it formed the first confederate town of the Eleutherolaconian towns, a group of twenty-four, later eighteen, communities leagued together to maintain their autonomy against Sparta and declared free by Augustus. The highest officer of the confederacy was the general (*στρατηγός*), who was assisted by a treasurer (*ταμίας*), while the chief magistrates of the several communities bore the title of ephors (*ἔφοροι*).

Pausanias (iii. 21 f.) has left us a description of the town as it existed in the reign of Marcus Aurelius, the agora, the Acropolis, the island of Cranae (Marathonisi) where Paris celebrated his nuptials with Helen, the Migonium or precinct of Aphrodite Migonitis (occupied by the modern town of Marathonisi or Gythium), and the hill Larysium (Koumaro) rising above it. The numerous remains extant, of which the theatre and the buildings partially submerged by the sea are the most noteworthy, all belong to the Roman period.

The modern town is a busy and flourishing port with a good harbour protected by Cranae, now connected by a mole with the mainland: it is the capital of the prefecture (*νομός*) of *Λακωνική* with a population in 1907 of 61,522.

See G. Weber, *De Gytheo et Lacedaemoniorum rebus navalibus* (Heidelberg, 1833); W. M. Leake, *Travels in the Morea*, i. 244 foll.; E. Curtius, *Peloponnesos*, ii. 267 foll. Inscriptions: Le Bas-Foucart, *Voyage archéologique*, ii. Nos. 238-248 f.; Collitz-Bechtel, *Sammlung d. griech. Dialekt-Inschriften*, iii. Nos. 4562-4573; *British School Annual*, x. 179 foll. Excavations: Α. Σκιᾶς, *Πρακτικὰ τῆς Ἀρχ. Ἑταιρείας*, 1891, 69 foll. (M. N. T.)

GYULA-FEHÉRVÁR (Ger. *Karlsburg*), a town of Hungary, in Transylvania, in the county of Alsó-Fehér, 73 m. S. of Kolozsvár by rail. Pop. (1900) 11,507. It is situated on the right bank of the Maros, on the outskirts of the Transylvanian Erzgebirge or Ore Mountains, and consists of the upper town, or citadel, and the lower town. Gyula-Fehérvár is the seat of a Roman Catholic bishop, and has a fine Roman Catholic cathedral, built in the 11th century in Romanesque style, and rebuilt in 1443 by John Hunyady in Gothic style. It contains among other tombs that of John Hunyady. Near the cathedral is the episcopal palace, and in the same part of the town is the Batthyaneum, founded by Bishop Count Batthyány in 1794. It contains a valuable library with many incunabula and old manuscripts, amongst which is one of the *Nibelungenlied*, an astronomical observatory, a collection of antiquities, and a mineral collection. Gyula-Fehérvár carries on an active trade in cereals, wine and cattle.

Gyula-Fehérvár occupies the site of the Roman colony *Apulum*. Many Roman relics found here, and in the vicinity, are preserved in the museum of the town. The bishopric was founded in the 11th century by King Ladislaus I. (1078–1095). In the 16th century, when Transylvania separated from Hungary, the town became the residence of the Transylvanian princes. From this period dates the castle, and also the buildings of the university, founded by Gabriel Bethlen, and now used as barracks. After the reversion of Transylvania in 1713 to the Habsburg monarchy the actual strong fortress was built in 1716–1735 by the emperor Charles VI., whence the German name of the town.

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H The eighth symbol in the Phoenician alphabet, as in its descendants, has altered less in the course of ages than most alphabetic symbols. From the beginning of Phoenician records it has consisted of two uprights connected by transverse bars, at first either two or three in number. The uprights are rarely perpendicular and the cross bars are not so precisely arranged as they are in early Greek and Latin inscriptions. In these the symbol takes the form of two rectangles ⊟ out of which the ordinary H develops by the omission of the cross bars at top and bottom. It is very exceptional for this letter to have more than three cross bars, though as many as five are occasionally found in N.W. Greece. Within the same inscription the appearance of the letter often varies considerably as regards the space between and the length of the uprights. When only one bar is found it regularly crosses the uprights about the middle. In a few cases the rectangle is closed at top and bottom but has no middle cross bar □. The Phoenician name for the letter was Heth (Hêt). According to Semitic scholars it had two values, (1) a glottal spirant, a very strong *h*, (2) an unvoiced velar spirant like the German *ch* in *ach*. The Greeks borrowed it with the value of the ordinary aspirate and with the name ἧτα. Very early in their history, however, most of the Greeks of Asia Minor lost the aspirate altogether, and having then no further use for the symbol with this value they adopted it to represent the long *e*-sound, which was not originally distinguished by a different symbol from the short sound (see E). With this value its name has always been ἦτα in Greek. The alphabet of the Asiatic Greeks was gradually adopted elsewhere. In official documents at Athens H represented the rough breathing or aspirate ' till 403 B.C.; henceforth it was used for *η*. The Western Greeks, however, from whom the Romans obtained their alphabet, retained their aspirate longer than those of Asia Minor, and hence the symbol came to the Romans with the value not of a long vowel but of the aspirate, which it still preserves. The Greek aspirate was itself the first or left-hand half of this letter Ⱶ, while the smooth breathing ' was the right-hand portion ⊣. At Tarentum Ⱶ is found for H in inscriptions. The Roman aspirate was, however, a very slight sound which in some words where it was etymologically correct disappeared at an early date. Thus the cognate words of kindred languages show that the Lat. *anser* "goose" ought to begin with *h*, but nowhere is it so found. In none of the Romance languages is there any trace of initial or medial *h*, which shows that vulgar Latin had ceased to have the aspirate by 240 B.C. The Roman grammarians were guided to its presence by the Sabine forms where *f* occurred; as the Sabines said *fasena* (sand), it was recognised that the Roman form ought to be *harena*, and so for *haedus* (goat), *hordeum* (barley), &c. Between vowels *h* was lost very early, for *ne-hemo* (no man) is throughout the literature *nemo*, *bi-himus* (two winters old) *bimus*. In the Ciceronian age greater attention was paid to reproducing the Greek aspirates in borrowed words, and this led to absurd mistakes in Latin words, mistakes which were satirized by Catullus in his epigram (84) upon Arrius, who said *chommoda* for *commoda* and *hinsidias* for *insidias*. In Umbrian *h* was often lost, and also used without etymological value to mark length, as in *comohota* (= Lat. *commota*), a practice to which there are some doubtful parallels in Latin.

In English the history of *h* is very similar to that in Latin. While the parts above the glottis are in position to produce a vowel, an aspirate is produced without vibration of the vocal chords, sometimes, like the pronunciation of Arrius, with considerable effort as a reaction against the tendency to "drop the h's." Though *h* survives in Scotland, Ireland and America as well as in the speech of cultivated persons, the sound in most of the vulgar dialects is entirely lost. Where it is not ordinarily lost, it disappears in unaccented syllables, as "*Give it 'im*" and the like. Where it is lost, conscious attempts to restore it on the part of uneducated speakers lead to absurd misplacements of *h* and to its restoration in Romance words when it never was pronounced, as *humble* (now recognized as standard English), *humour* and even *honour*. (P. Gi.)

HAAG, CARL (1820–), a naturalized British painter, court painter to the duke of Saxe-Coburg and Gotha, was born in Bavaria, and was trained in the academies at Nuremburg and Munich. He practised first as an illustrator and as a painter, in oil, of portraits and architectural subjects; but after he settled in England, in 1847, he devoted himself to water colours, and was elected associate of the Royal Society of Painters in Water Colours in 1850 and member in 1853. He travelled much, especially in the East, and made a considerable reputation by his firmly drawn and carefully elaborated paintings of Eastern subjects. Towards the end of his professional career Carl Haag quitted England and returned to Germany.

See *A History of the "Old Water-Colour" Society, now the Royal Society of Painters in Water Colours*, by John Lewis Roget (2 vols., London, 1891).

HAAKON (Old Norse *Hákon*), the name of several kings of Norway, of whom the most important are the following:—

Haakon I., surnamed "the Good" (d. 961), was the youngest son of Harald Haarfager. He was fostered by King Aethelstan of England, who brought him up in the Christian religion, and on the news of his father's death in 933 provided him with ships and men for an expedition against his half-brother Erik, who had been proclaimed king. On his arrival in Norway Haakon gained the support of the landowners by promising to give up the rights of taxation claimed by his father over inherited real property. Erik fled, and was killed a few years later in England. His sons allied themselves with the Danes, but were invariably defeated by Haakon, who was successful in everything he undertook except in his attempt to introduce Christianity, which aroused an opposition he did not feel strong enough to face. He was killed at the battle of Fitje in 961, after a final victory over Erik's sons. So entirely did even his immediate circle ignore his religion that a court skald composed a poem on his death representing his welcome by the heathen gods into Valhalla.

Haakon IV., surnamed "the Old" (1204–1263), was declared to be the son of Haakon III., who died shortly before the former's birth in 1204. A year later the child was placed under the protection of King Inge, after whose death in 1217 he was chosen king; though until 1223 the church refused to recognize him, on the ground of illegitimacy, and the Pope's dispensation for his coronation was not gained until much later. In the earlier part of his reign much of the royal power was in the hands of Earl Skule, who intrigued against the king until 1239, when he proceeded to open hostility and was put to death. From this time onward Haakon's reign was marked by more peace and prosperity than Norway had known for many years, until in 1263 a dispute with the Scottish king concerning the Hebrides, a Norwegian possession, induced Haakon to undertake an expedition to the west of Scotland. A division of his army seems to have repulsed a large Scottish force at Largs (though the later Scottish accounts claim this battle as a victory), and, having won back the Norwegian possessions in Scotland, Haakon was wintering in the Orkneys, when he was taken ill and died on the 15th of December 1263. A great part of his fleet had been scattered and destroyed by storms. The most important event in his reign was the voluntary submission of the Icelandic commonwealth. Worn out by internal strife fostered by Haakon's emissaries, the Icelandic chiefs acknowledged the Norwegian king as overlord in 1262. Their example was followed by the colony of Greenland.

Haakon VII. (1872–), the second son of Frederick VIII., king of Denmark, was born on the 3rd of August 1872, and was usually known as Prince Charles of Denmark. When in 1905 Norway decided to separate herself from Sweden the Norwegians

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offered their crown to Charles, who accepted it and took the name of Haakon VII., being crowned at Trondhjem in June 1906. The king married Maud, youngest daughter of Edward VII., king of Great Britain, their son, Prince Olav, being born in 1903.

HAARLEM, a town of Holland in the province of North Holland, on the Spaarne, having a junction station 11 m. by rail W. of Amsterdam. It is connected by electric and steam tramways with Zandvoort, Leiden, Amsterdam and Alkmaar. Pop. (1900) 65,189. Haarlem is the seat of the governor of the province of North Holland, and of a Roman Catholic and a Jansenist bishopric. In appearance it is a typical Dutch town, with numerous narrow canals and quaintly gabled houses. Of the ancient city gates the Spaarnewouder or Amsterdam gate alone remains. Gardens and promenades have taken the place of the old ramparts, and on the south the city is bounded by the Frederiks and the Flora parks, between which runs the fine avenue called the Dreef, leading to the Haarlemmer Hout or wood. In the Frederiks Park is a pump-room supplied with a powerful chalybeate water from a spring, the Wilhelmina-bron, in the Haarlemmer Polder not far distant, and in connexion with this there is an orthopaedic institution adjoining. In the great market place in the centre of the city are gathered together the larger number of the most interesting buildings, including the quaint old Fleshers' Hall, built by Lieven de Key in 1603, and now containing the archives; the town hall; the old Stadsdoelen, where the burgesses met in arms; the Groote Kerk, or Great Church; and the statue erected in 1856 to Laurenz Janszoon Koster, the printer. The Great Church, dedicated to St Bavo, with a lofty tower (255 ft.), is one of the most famous in Holland, and dates from the end of the 15th and the beginning of the 16th centuries. Its great length (460 ft.) and the height and steepness of its vaulted cedar-wood roof (c. 1538) are very impressive. The choir-stalls and screen (1510) are finely carved, and of further interest are the ancient pulpit sounding-board (1432), some old stained glass, and the small models of ships, copies dating from 1638 of yet earlier models originally presented by the Dutch-Swedish Trading Company. The church organ was long considered the largest and finest in existence. It was constructed by Christian Müller in 1738, and has 4 keyboards, 64 registers and 5000 pipes, the largest of which is 15 in. in diameter and 32 ft. long. Among the monuments in the church are those of the poet Willem Bilderdyk (d. 1831) and the engineer Frederik Willem Conrad (d. 1808), who designed the sea-sluices at Katwyk. In the belfry are the *damiaatjes*, small bells presented to the town, according to tradition, by William I., count of Holland (d. 1222), the crusader. The town hall was originally a palace of the counts of Holland, begun in the 12th century, and some old 13th-century beams still remain; but the building was remodelled in the beginning of the 17th century. It contains a collection of antiquities (including some beautiful goblets) and a picture gallery which, though small, is celebrated for its fine collection of paintings by Frans Hals. The town library contains several *incunabula* and an interesting collection of early Dutch literature. At the head of the scientific institutions of Haarlem may be placed the Dutch Society of Sciences (*Hollandsche Maatschappij van Wetenschappen*), founded in 1752, which possesses valuable collections in botany, natural history and geology. Teyler's Stichting (*i.e.* foundation), enlarged in modern times, was instituted by the will of Pieter Teyler van der Hulst (d. 1778), a wealthy merchant, for the study of theology, natural science and art, and has lecture-theatres, a large library, and a museum containing a physical and a geological cabinet, as well as a collection of paintings, including many modern pictures, and a valuable collection of drawings and engravings by old masters. The Dutch Society for the Promotion of Industry (*Nederlaandsche Maatschappij ter Bevordering van Nijverheid*), founded in 1777, has its seat in the Pavilion Welgelegen, a villa on the south side of the Frederiks Park, built by the Amsterdam banker John Hope in 1778, and afterwards acquired by Louis Bonaparte, king of Holland. The colonial museum and the museum of industrial art were established in this villa by the society in 1871 and 1877 respectively. Besides these there are a museum of ecclesiastical antiquities, chiefly relating to the bishopric of Haarlem; the old weigh-house (1598) and the orphanage for girls (1608), originally an almshouse for old men, both built by the architect Lieven de Key of Ghent.

The staple industries of Haarlem have been greatly modified in the course of time. Cloth weaving and brewing, which once flourished exceedingly, declined in the beginning of the 16th century. A century later, silk, lace and damask weaving were introduced by French refugees, and became very important industries. But about the close of the 18th century this remarkable prosperity had also come to an end, and it was not till after the Belgian revolution of 1830–1831 that Haarlem began to develop the manufactures in which it is now chiefly engaged. Cotton manufacture, dyeing, printing, bleaching, brewing, type-founding, and the manufacture of tram and railway carriages are among the more important of its industries. One of the printing establishments has the reputation of being the oldest in the Netherlands, and publishes the oldest Dutch paper, *De Oprogte Haarlemmer Courant*. Market-gardening, especially horticulture, is extensively practised in the vicinity, so that Haarlem is the seat of a large trade in Dutch bulbs, especially hyacinths, tulips, fritillaries, spiraeas and japonicas.

Haarlem, which was a prosperous place in the middle of the 12th century, received its first town charter from William II., count of Holland and king of the Romans, in 1245. It played a considerable part in the wars of Holland with the Frisians. In 1492 it was captured by the insurgent peasants of North Holland, was re-taken by the duke of Saxony, the imperial stadholder, and deprived of its privileges. In 1572 Haarlem joined the revolt of the Netherlands against Spain, but on the 13th of July 1573, after a seven months' siege, was forced to surrender to Alva's son Frederick, who exacted terrible vengeance. In 1577 it was again captured by William of Orange and permanently incorporated in the United Netherlands.

See Karl Hegel, *Städte und Gilden* (Leipzig, 1891); Allan, *Geschiedenis en beschrijving van Haarlem* (Haarlem, 1871–1888).

HAARLEM LAKE (Dutch *Harlemmer Meer*), a commune of the province of North Holland, constituted by the law of the 16th of July 1855. It has an area of about 46,000 acres, and its population increased from 7237 in 1860 to 16,621 in 1900. As its name indicates, the commune was formerly a lake, which is said to have been a relic of a northern arm of the Rhine which passed through the district in the time of the Romans. In 1531 the Haarlemmer Meer had an area of 6430 acres, and in its vicinity were three smaller sheets of water—the Leidsche Meer or Leiden Lake, the Spiering Meer, and the Oude Meer or Old Lake, with a united area of about 7600 acres. The four lakes were formed into one by successive inundations, whole villages disappearing in the process, and by 1647 the new Haarlem Lake had an area of about 37,000 acres, which a century later had increased to over 42,000 acres. As early as 1643 Jan Adriaanszoon Leeghwater proposed to endike and drain the lake; and similar schemes, among which those of Nikolaas Samuel Cruquius in 1742 and of Baron van Lijnden van Hemmen in 1820 are worthy of special mention, were brought forward from time to time. But it was not till a furious hurricane in November 1836 drove the waters as far as the gates of Amsterdam, and another on Christmas Day sent them in the opposite direction to submerge the streets of Leiden, that the mind of the nation was seriously turned to the matter. In August 1837 the king appointed a royal commission of inquiry; the scheme proposed by the commission received the sanction of the Second Chamber in March 1839, and in the following May the work was begun. A canal was first dug round the lake for the reception of the water and the accommodation of the great traffic which had previously been carried on. This canal was 38 m. in length, 123–146 ft. wide, and 8 ft. deep, and the earth which was taken out of it was used to build a dike from 30 to 54 yds. broad containing the lake. The area enclosed by the canal was rather more than 70 sq. m., and the average depth of the lake 13 ft. 1½ in., and as the water had no natural outfall it was calculated that probably 1000 million tons would have to be raised by mechanical means.

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This amount was 200 million tons in excess of that actually discharged. Pumping by steam-engines began in 1848, and the lake was dry by the 1st of July 1852. At the first sale of the highest lands along the banks on the 16th of August 1853, about £28 per acre was paid; but the average price afterwards was less. The whole area of 42,096 acres recovered from the waters brought in 9,400,000 florins, or about £780,000, exactly covering the cost of the enterprise; so that the actual cost to the nation was only the amount of the interest on the capital, or about £368,000. The soil is of various kinds, loam, clay, sand and peat; most of it is sufficiently fertile, though in the lower portions there are barren patches where the scanty vegetation is covered with an ochreous deposit. Mineral springs occur containing a very high percentage (3·245 grams per litre) of common salt; and in 1803 a company was formed for working them. Corn, seeds, cattle, butter and cheese are the principal produce. The roads which traverse the commune are bordered by pleasant-looking farm-houses built after the various styles of Holland, Friesland or Brabant. Hoofddorp, Venneperdorp or Nieuw Vennep, Ablenes and the vicinities of the pumping-stations are the spots where the population has clustered most thickly. The first church was built in 1855; in 1877 there were seven. In 1854 the city of Leiden laid claim to the possession of the new territory, but the courts decided in favour of the nation.

HAASE, FRIEDRICH (1827–), German actor, was born on the 1st of November 1827, in Berlin, the son of a valet to King Frederick William IV., who became his godfather. He was educated for the stage under Ludwig Tieck and made his first appearance in 1846 in Weimar, afterwards acting at Prague (1849–1851) and Karlsruhe (1852–1855). From 1860 to 1866 he played in St Petersburg, then was manager of the court theatre in Coburg, and in 1869 (and again in 1882–1883) visited the United States. He was manager of the Stadt Theater in Leipzig from 1870 to 1876, when he removed to Berlin, where he devoted his energies to the foundation and management of the Deutsches Theater. He finally retired from the stage in 1898. Haase's aristocratic appearance and elegant manner fitted him specially to play high comedy parts. His chief rôles were those of Rochefertrier in the *Partie Piquet*; Richelieu; Savigny in *Der feiner Diplomat*, and der Fürst in *Der geheime Agent*. He is the author of *Ungeschminkte Briefe* and *Was ich erlebte 1846–1898* (Berlin, 1898).

See Simon, *Friedrich Haase* (Berlin, 1898).

HAASE, FRIEDRICH GOTTLOB (1808–1867), German classical scholar, was born at Magdeburg on the 4th of January 1808. Having studied at Halle, Greifswald and Berlin, he obtained in 1834 an appointment at Schulpforta, from which he was suspended and sentenced to six years' imprisonment for identifying himself with the *Burschenschaften* (students' associations). Having been released after serving one year of his sentence, he visited Paris, and on his return in 1840 he was appointed professor at Breslau, where he remained till his death on the 16th of August 1867. He was undoubtedly one of the most successful teachers of his day in Germany, and exercised great influence upon all his pupils.

He edited several classic authors: Xenophon (*Λακεδαιμονίων πολιτεία*, 1833); Thucydides (1840); Velleius Paterculus (1858); Seneca the philosopher (2nd ed., 1872, not yet superseded); and Tacitus (1855), the introduction to which is a masterpiece of Latinity. His *Vorlesungen über lateinische Sprachwissenschaft* was published after his death by F. A. Eckstein and H. Peter (1874–1880). See C. Bursian, *Geschichte der klassischen Philologie in Deutschland* (1883); G. Eickert, *Friderici Haasii memoria* (1868), with a list of works; T. Oelsner in *Rübezahl* (*Schlesische Provinzialblätter*), vii. Heft 3 (Breslau, 1868).

HAAST, SIR JOHANN FRANZ JULIUS VON (1824–1887), German and British geologist, was born at Bonn on the 1st of May 1824. He received his early education partly in that town and partly in Cologne, and then entered the university at Bonn, where he made a special study of geology and mineralogy. In 1858 he started for New Zealand to report on the suitability of the colony for German emigrants. He then became acquainted with Dr von Hochstetter, and rendered assistance to him in the preliminary geological survey which von Hochstetter had undertaken. Afterwards Dr Haast accepted offers from the governments of Nelson and Canterbury to investigate the geology of those districts, and the results of his detailed labours greatly enriched our knowledge with regard to the rocky structure, the glacial phenomena and the economic products. He discovered gold and coal in Nelson, and he carried on important researches with reference to the occurrence of *Dinornis* and other extinct wingless birds (Moas). His *Geology of the Provinces of Canterbury and Westland, N.Z.*, was published in 1879. He was the founder of the Canterbury museum at Christchurch, of which he became director, and which he endeavoured to render the finest collection in the southern hemisphere. He was surveyor-general of Canterbury from 1861 to 1871, and professor of geology at Canterbury College. He was elected F.R.S. in 1867; and he was knighted for his services at the time of the colonial exhibition in London in 1887. He died at Wellington, N.Z., on the 15th of August 1887.

HABABS (Az-Hibbehs), a nomadic pastoral people of Hamitic stock, living in the coast region north-west of Massawa. Physically they are Beja, by language and traditions Abyssinians. They were Christians until the 19th century, but are now Mahommedans. Their sole wealth consists in cattle.

HABAKKUK, the name borne by the eighth book of the Old Testament "Minor Prophets." It occurs twice in the book itself (i. 1, iii. 1) in titles, but nowhere else in the Old Testament. The meaning of the name is uncertain. If Hebrew, it might be derived from the root חבק (to embrace) as an intensive term of affection. It has also been connected more plausibly with an Assyrian plant name, *ḥambakûku* (Delitzsch, *Assyrisches Handwörterbuch*, p. 281). The Septuagint has *Ἀμβακούμ*. Of the person designated, no more is known than may be inferred from the writing which bears his name. Various legends are connected with him, of which the best known is given in the Apocryphal story of "Bel and the Dragon" (v. 33-39); but none of these has any historic value.[1]

The book itself falls into three obvious parts, viz. (1) a dialogue between the prophet and God (i. 2–ii. 4); (2) a series of five woes pronounced on wickedness (ii. 5–ii. 20); (3) a poem describing the triumphant manifestation of God (iii.). There is considerable difficulty in regard to the interpretation of (1), on which that of (2) will turn; while (3) forms an independent section, to be considered separately.

In the dialogue, the prophet cries to God against continued violence and injustice, though it is not clear whether this is done *within* or *to* Israel (i. 2-4). The divine answer declares that God raises up the Chaldaeans, whose formidable resources are invincible (i. 5-11). The prophet thereupon calls God's attention to the tyranny which He apparently allows to triumph, and declares his purpose to wait till an answer is given to his complaint (i. 12–ii. 2). God answers by demanding patience, and by declaring that the righteous shall live by his faithfulness (ii. 3-4).

The interpretation of this dialogue which first suggests itself is that the prophet is referring to wickedness *within* the nation, which is to be punished by the Chaldaeans as a divine instrument; in the process, the tyranny of the instrument itself calls for punishment, which the prophet is bidden to await in patient fidelity. On this view of the dialogue, the subsequent woes will be pronounced against the Chaldaeans, and the date assigned to the prophecy will be about 600 B.C., *i.e.* soon after the battle of Carchemish (605 B.C.), when the Chaldaean victory over Egypt inaugurated a period of Chaldaean supremacy which lasted till the Chaldaeans themselves were overthrown by Cyrus in 538 B.C. Grave objections, however, confront this interpretation, as is admitted even by such recent defenders of it as Davidson and Driver. Is it likely that a prophet would begin a complaint against Chaldaean tyranny (admittedly central in the prophecy) by complaining of that wickedness of his fellow-countrymen which seems partly to justify it? Are not the terms of reference in

[1] These legends are collected in Hastings, *D. B.* vol. ii. p. 272. He is the watchman of Is. xxi. 6 (cf. Hab. ii. 1); the son of the Shunammite (2 Kings iv. 16); and is miraculously lifted by his hair to carry his own dinner to Daniel in the lions' den (*supra*).

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i. 2 f. and i. 12 f. too similar for the supposition that two distinct, even contradictory, complaints are being made (cf. "wicked" and "righteous" in i. 4 and i. 13, interchanged in regard to Israel, on above theory)? And if i. 5-11 is a genuine *prophecy* of the raising up of the Chaldaeans, whence comes that long experience of their rule required to explain the *detailed* denunciation of their tyranny? To meet the last objection, Davidson supposes i. 5-11 to be really a reference to the past, prophetic in form only, and brings down the whole section to a later period of Chaldaean rule, "hardly one would think, before the deportation of the people under Jehoiachin in 597" (p. 49). Driver prefers to bisect the dialogue by supposing i. 2-11 to be written at an earlier period than i. 12 f. (p. 57). The other objections, however, remain, and have provoked a variety of theories from Old Testament scholars, of which three call for special notice. (1) The first of these, represented by Giesebrecht,[1] Nowack and Wellhausen, refers i. 2-4 to Chaldaean oppression of Israel, the same subject being continued in i. 12 f. Obviously, the reference to the Chaldaeans as a divine instrument could not then stand in its present place, and it is accordingly regarded as a misplaced earlier prophecy. This is the minimum of critical procedure required to do justice to the facts. (2) Budde, followed by Cornill, also regards i. 2-4 as referring to the oppression of Israel by a foreign tyrant, whom, however, he holds to be Assyria. He also removes i. 5-11 from its present place, but makes it part of the divine answer, following ii. 4. On this view, the Chaldaeans are the divine instrument for punishing the tyranny of the Assyrians, to whom the following woes will therefore refer. The date would fall between Josiah's reformation (621) and his death (609). This is a plausible and even attractive theory; its weakness seems to lie in the absence of any positive evidence in the prophecy itself, as is illustrated by the fact that even G. A. Smith, who follows it, suggests "Egypt from 608–605" as an alternative to Assyria (p. 124). (3) Marti (1904) abandons the attempt to explain the prophecy as a unity, and analyses it into three elements, viz. (*a*) The original prophecy by Habakkuk, consisting of i. 5-10, 14 f., belonging to the year 605, and representing the emergent power of the Chaldaeans as a divine scourge of the faithless people; (*b*) Woes against the Chaldaeans, presupposing not only tyrannous rule over many peoples, but the beginning of their decline and fall, and therefore of date about 540 B.C. (ii. 5-19); (*c*) A psalm of post-exilic origin, whose fragments, i. 2-4, 12 a, 13, ii. 1-4, have been incorporated into the present text from the margins on which they were written, its subject being the suffering of the righteous. Each of these three theories[2] encounters difficulties of detail; none can be said to have secured a dominant position. The great variety of views amongst competent critics is significant of the difficulty of the problem, which can hardly be regarded as yet solved; this divergence of opinion perhaps points to the impossibility of maintaining the unity of chs. i. and ii., and throws the balance of probability towards some such analysis as that of Marti, which is therefore accepted in the present article.

In regard to the poem which forms the third and closing chapter of the present book of Habakkuk, there is much more general agreement. Its most striking characteristic lies in the superscription ("A prayer of Habakkuk the prophet, set to Shigionoth"), the subscription ("For the chief musician, on my stringed instruments"), and the insertion of the musical term "Selah" in three places (v. 3, 9, 13). These liturgical notes make extremely probable the supposition that the poem has been taken from some collection like that of our present book of Psalms, probably on the ground of the authorship asserted by the superscription there attached to it. It cannot, however, be said that the poem itself supports this assertion, which carries no more intrinsic weight than the Davidic titles of the Psalms. The poem begins with a prayer that God will renew the historic manifestation of the exodus, which inaugurated the national history and faith; a thunderstorm moving up from the south is then described, in which God is revealed (3-7); it is asked whether this manifestation, whose course is further described, is against nature only (8-11); the answer is given that it is for the salvation of Israel against its wicked foes (12-15); the poet describes the effect in terror upon himself (16) and declares his confidence in God, even in utter agricultural adversity (17-19). As Wellhausen says (p. 171): "The poet appears to believe that in the very act of describing enthusiastically the ancient deed of deliverance, he brings home to us the new; we are left sometimes in doubt whether he speaks of the past to suggest the new by analogy, or whether he is concerned directly with the future, and simply paints it with the colours of the past." In any case, there is nothing in this fine poem to connect it with the conception of the Chaldaeans as a divine instrument. It is the nation that speaks through the poet (cf. v. 14), but at what period of its post-exilic history we have no means of inferring.

Our estimate of the theological teaching of this book will naturally be influenced by the particular critical theory which is adopted. The reduction of the book to four originally independent sections requires that the point of each be stated separately. When this is done, it will, however, be found that there is a broad unity of subject, and of natural development in its treatment, such as to some extent justifies the instinct or the judgment of those who were instrumental in effecting the combination of the separate parts. (1) The poem (iii.), though possibly latest in date,[3] claims first consideration, because it avowedly moves in the circle of primitive ideas, and supplicates a divine intervention, a direct and immediate manifestation of the transcendent God. He is conceived as controlling or overcoming the forces of nature; and though an earlier mythology has supplied some of the ideas, yet, as with the opening chapters of Genesis, they are transfigured by the moral purpose which animates them, the purpose to subdue all things that could frustrate the destiny of God's anointed (v. 13). The closing verses strike that deep note of absolute dependence on God, which is the glory of the religion of the Old Testament and its chief contribution to the spirit of the Gospels. (2) The prophecy of the Chaldaeans as the instruments of the divine purpose involves a different, yet related, conception of the divine providence. The philosophy of history, by which Hebrew prophets could read a deep moral significance into national disaster and turn the flank of resistless attack, became one of the most important elements in the nation's faith. If the world-powers were hard as flint in their dealings with Israel, the people of God were steeled to such moral endurance that each clash of their successive onsets kindled some new flame of devotion. Through the Chaldaeans God worked a work which required centuries of life and literature to disclose its fulness (i. 5). (3) When we turn from this view of the Chaldaeans to the denunciation of their tyranny in "taunt songs" (ii. 5-20), we have simply a practical application of the doctrine of divine government. God being what He is, at once moral and all-powerful, the immoral life is doomed to overthrow, whether the immorality consist in grasping rapacity, proud self-aggrandizement, cruel exaction, exulting triumph or senseless idolatry. (4) Yet, because the doom so often tarries, there arises the problem of the suffering of the innocent and the upright. How can God look down with tolerance that seems favour on so much that conflicts with His declared will and character? This is the great problem of Israel, finding its supreme expression for all time in the book of Job (*q.v.*). In that book the solution of the problem of innocent suffering lies hidden from the sufferer, even to the end, for he is not admitted with the reader to the secret of the prologue; it is the practical solution of faithfulness resting on faith which is offered to us. So here, with the principle of ii. 4, "the righteous shall live by his faithfulness." The different application of these words in the New Testament to "faith"

[1] Followed by Peake in *The Problem of Suffering*, pp. 4 f., 151 f., to whose appendix (A) reference may be made for further details of recent criticism.

[2] For the less probable theories of Rothstein, Lauterburg, Happel and Peiser (amongst others), cf. Marti's *Commentary*, pp. 328 f. and 332. Stevenson (*The Expositor*, 1902) states clearly the difficulties for those who regard ch. i. as a unity. He sees two independent sections, 2-4+12-13, and 5-11+14-17.

[3] Earlier, however, than Ps. lxxvii. 17-20, which is drawn from it.

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is well known (Rom. i. 17; Gal. iii. 11; Heb. x. 38) though the difference is apt to be exaggerated by those who forget how much of the element of πίστις lies in Paul's conception of δίκαιος. In G. A. Smith's words, "as Paul's adaptation, 'the just shall live by faith,' has become the motto of evangelical Christianity, so we may say that Habakkuk's original of it has been the motto and the fame of Judaism: 'the righteous shall live by his faithfulness.'"

The Hebrew text of this impressive and varied book is unfortunately corrupt in many places; even so cautious a critic as Driver accepts or favourably notices eighteen textual emendations in the three chapters, and suspects the text in at least seven other cases. For the interpretation of the book in detail, the English reader will find Driver's commentary (1906) the most useful.

References to earlier literature will be found in the following noteworthy studies of recent date: Davidson, "Nahum, Habakkuk and Zephaniah," in *Cambridge Bible* (1896); Nowack, *Die kleinen Propheten* (Hdkr.) (1897); Wellhausen, *Die kleinen Propheten*[3] (1898); G. A. Smith, "The Book of the Twelve Prophets," in *The Expositor's Bible*, vol. ii. (1898); Driver, article "Habakkuk" in Hastings' *Dictionary of the Bible*, vol. ii. pp. 269-272 (1900); Budde, article "Habakkuk" in *Ency. Biblica*, vol. ii., c. 1921-1928 (1901); Stevenson, "The Interpretation of Habakkuk," in *The Expositor* (1902), pp. 388-401; Peake, *The Problem of Suffering in the Old Testament* (1904), pp. 4-11 and app. A, "Recent Criticism of Habakkuk"; Marti, *Dodekapropheton* (K. H. C.) (1904); Driver, "Minor Prophets," vol. ii., in *Century Bible* (1906); Duhm, *Das Buch Habakuk* (Text, Übersetzung und Erklärung), 1906 (regards the book as a unity belonging to the time of Alexander the Great). Max L. Margolis discusses the anonymous Greek version of Habakkuk iii. in a volume of *Old Test. and Semitic Studies: in Memory of William Rainey Harper* (Chicago, 1908).

(H. W. R.*)

HABDALA (lit. "separation"), a Hebrew term chiefly appropriated to ceremonies at the conclusion of Sabbath and festivals, marking the separation between times sacred and secular. On the Saturday night the ceremony consists of three items: (*a*) benediction over a cup of wine (common to many other Jewish functions); (*b*) benediction over a lighted taper, of which possibly the origin is militarian, as no light might be kindled on the Sabbath day, but the rite may be symbolical; and (*c*) benediction over a box of sweet-smelling spices. The origin of the latter has been traced to the bowl of burning spice which in Talmudic times was introduced after each meal. But here too symbolic ideas must be taken into account. Both the light and the spices would readily fit into the conception of the Sabbath "Over-soul" of the mystics. (I. A.)

HABEAS CORPUS, in English law, a writ issued out of the High Court of Justice commanding the person to whom it is directed to bring the body of a person in his custody before that or some other court for a specified purpose.

There are various forms of the writ, of which the most famous is that known as *habeas corpus ad subjiciendum*, the well-established remedy for violation of personal liberty. From the earliest records of the English law no free man could be detained in custody except on a criminal charge or conviction or for a civil debt. That right is expressed in the Great Charter in the words: "*Nullus liber homo capiatur vel imprisonetur aut dissaisietur aut ullagetur, aut exuletur aut aliquo modo destruatur nec super eum ibimus nec super eum mittemus, nisi per legale judicium parium suorum, vel per legem terrae.*"[1] The writ is a remedial mandatory writ of right existing by the common law, *i.e.* it is one of the extraordinary remedies—such as *mandamus*, *certiorari* and prohibitions, which the superior courts may grant. While "of right," it is not "of course," and is granted only on application to the High Court or a judge thereof, supported by a sworn statement of facts setting up at least a probable case of illegal confinement. It is addressed to the person in whose custody another is detained, and commands him to bring his prisoner before the court immediately after the receipt of the writ, together with the day and cause of his being taken and detained, to undergo and receive (*ad subjiciendum et recipiendum*) whatsoever the court awarding the writ "may consider of concerning him in that behalf."

It is often stated that the writ is founded on the article of the Great Charter already quoted; but there are extant instances

[1] See Hallam, *Const. Hist.* vol. i., c. vii. (12th ed.) p. 384.

of the issue of writs of *habeas corpus* before the charter. Other writs having somewhat similar effect were in use at an early date, *e.g.* the writ *de odio et alia*, used as early as the 12th century to prevent imprisonment on vexatious appeals of felony, and the writ of mainprise (*de manucaptione*), long obsolete if not abolished in England but which it was attempted to use in India so late as 1870. In the case of imprisonment on accusation of crime the writ issued from the court of king's bench (or from the chancery), and on its return the court judged of the legality of the imprisonment, and discharged the prisoner or admitted him to bail or remanded him to his former custody according to the result of the examination.

By the time of Charles I. the writ was fully established as the appropriate process for checking illegal imprisonment by inferior courts or by public officials. But it acquired its full and present constitutional importance by legislation.

In Darnel's case (1627) the judges held that the command of the king was a sufficient answer to a writ of *habeas corpus*. The House of Commons thereupon passed resolutions to the contrary, and after a conference with the House of Lords the measure known as the Petition of Right was passed (1627, 3 Car. I. c. i.) which, *inter alia*, recited (s. 5) that, contrary to the Great Charter and the good laws and statutes of the realm, divers of the king's subjects had of late been imprisoned without any cause shown, and when they were brought up on *habeas corpus ad subjiciendum*, and no cause was shown other than the special command of the king signified by the privy council, were nevertheless remanded to prison, and enacted "that no freeman in any such manner as is before mentioned be imprisoned or detained." The Petition of Right was disregarded in Selden's case (1629), when it was successfully returned to a *habeas corpus* that Selden and others were committed by the king's special command "for notable contempts against the king and his government and for stirring up sedition against him."[2] This led to legislation in 1640 by which, after abolishing the Star Chamber, the right to a *habeas corpus* was given to test the legality of commitments by command or warrant of the king or the privy council.[3]

The reign of Charles II. was marked by further progress towards securing the freedom of the subject from wrongful imprisonment. Lord Clarendon was impeached, *inter alia*, for causing many persons to be imprisoned against law and to be conveyed in custody to places outside England. In 1668 a writ of *habeas corpus* was issued to test the legality of an imprisonment in Jersey. Though the authority of the courts had been strengthened by the Petition of Right and the act of 1640, it was still rendered insufficient by reason of the insecurity of judicial tenure, the fact that only the chancellor (a political as well as a legal officer) and the court of king's bench had undoubted right to issue the writ, and the inability or hesitation of the competent judges to issue the writ except during the legal term, which did not cover more than half the year. A series of bills was passed through the Commons between 1668 and 1675, only to be rejected by the other House. In Jenkes's case (1676) Lord Chancellor Nottingham refused to issue the writ in vacation in a case in which a man had been committed by the king in council for a speech at Guildhall, and could get neither bail nor trial. In 1679, but rather in consequence of Lord Clarendon's arbitrary proceedings[4] than of Jenkes's case, a fresh bill was introduced which passed both Houses (it is said the upper House by the counting of one stout peer as ten) and became the famous Habeas Corpus Act of 1679 (31 Car. II. c. 2). The passing of the act was largely due to the experience and energy of Lord Shaftesbury, after whom it was for some time called. The act, while a most important landmark in the constitutional history of England, in no sense creates any right to personal freedom, but is essentially a procedure act for improving the legal mechanism by means of which that acknowledged right may be enforced.[5]

[2] Hallam, *Const. Hist.* vol. ii., c. viii. (12th ed.) p. 2.
[3] *Ibid.* c. ix. (12th ed.) p. 98.
[4] *Ibid.* vol. iii., c. xiii. (12th ed.) p. 12.
[5] Dicey, *Law of the Constitution* (6th ed.), p. 217.

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It declares no principles and defines no rights, but is for practical purposes worth a hundred articles guaranteeing constitutional liberty.[1]

In the manner characteristic of English legislation the act is limited to the particular grievances immediately in view and is limited to imprisonment for criminal or supposed criminal matters, leaving untouched imprisonment on civil process or by private persons. It recites that great delays have been used by sheriffs and gaolers in making returns of writs of *habeas corpus* directed to them; and for the prevention thereof, and the more speedy relief of all persons imprisoned for criminal or supposed criminal matters, it enacts in substance as follows: (1) When a writ of *habeas corpus* is directed to a sheriff or other person in charge of a prisoner, he must within 3, 10 or 20 days, according to the distance of the place of commitment, bring the body of his prisoner to the court, with the true cause of his detainer or imprisonment—unless the commitment was for treason or felony plainly expressed in the warrant of commitment. (2) If any person be committed for any crime—unless for treason or felony plainly expressed in the warrant—it shall be lawful for such person or persons (other than persons convicted or in execution by legal process) *in time of vacation*, to appeal to the lord chancellor as a judge, who shall issue a *habeas corpus* returnable immediately, and on the return thereof shall discharge the prisoner on giving security for his appearance before the proper court—unless the party so committed is detained upon a legal process or under a justice's warrant for a non-bailable offence. Persons neglecting for two terms to pray for a *habeas corpus* shall have none in vacation. (3) Persons set at large on *habeas corpus* shall not be recommitted for the same offence unless by the legal order and process of the court having cognizance of the case. (4) A person committed to prison for treason or felony shall, if he requires it, in the first week of the next term or the first day of the next session of oyer and terminer, be indicted in that term or session or else admitted to bail, unless it appears on affidavit that the witnesses for the crown are not ready; and if he is not indicted and tried in the second term or session after commitment, or if after trial he is acquitted, he shall be discharged from imprisonment. (5) No inhabitant of England (except persons contracting, or, after conviction for felony, electing to be transported) shall be sent prisoner to Scotland, Ireland, Jersey, &c., or any place beyond the seas. Stringent penalties are provided for offences against the act. A judge delaying *habeas corpus* forfeits £500 to the party aggrieved. Illegal imprisonment beyond seas renders the offender liable in an action by the injured party to treble costs and damages to the extent of not less than £500, besides subjecting him to the penalties of *praemunire* and to other disabilities. "The great rank of those who were likely to offend against this part of the statute was," says Hallam, "the cause of this unusual severity." Indeed as early as 1591 the judges had complained of the difficulty of enforcing the writ in the case of imprisonment at the instance of magnates of the realm. The effect of the act was to impose upon the judges under severe sanction the duty of protecting personal liberty in the case of criminal charges and of securing speedy trial upon such charges when legally framed; and the improvement of their tenure of office at the revolution, coupled with the veto put by the Bill of Rights on excessive bail, gave the judicature the independence and authority necessary to enable them to keep the executive within the law and to restrain administrative development of the scope or penalties of the criminal law; and this power of the judiciary to control the executive, coupled with the limitations on the right to set up "act of state" as an excuse for infringing individual liberty is the special characteristic of English constitutional law.

It is to be observed that neither at common law nor under the act of 1679 was the writ the appropriate remedy in the case of a person convicted either on indictment or summarily. It properly applied to persons detained before or without trial or sentence; and for convicted persons the proper remedy was by writs of error or *certiorari* to which a writ of *habeas corpus* might be used as ancillary.

As regards persons imprisoned for debt or on civil process the writ was available at common law to test the legality of the detention: but the practice in these cases is unaffected by the act of 1679, and is of no present interest, since imprisonment on civil process is almost abolished. As regards persons in private custody, *e.g.* persons not *sui juris* detained by those not entitled to their guardianship or lunatics, or persons kidnapped, *habeas corpus ad subjiciendum* seems not to have been the ordinary common law remedy. The appropriate writ for such cases was that known as *de homine replegiando*. The use of this writ in most if not all criminal cases was forbidden in 1553; but it was used in the 17th century in a case of kidnapping (Designy's case, 1682), and against Lord Grey for abducting his wife's sister (1682), and in the earl of Banbury's case to recover his wife (1704). The latest recorded instance of its use is Trebilcock's case (1736), in which a ward sought to free himself from the custody of his guardian.

Since that date the *habeas corpus ad subjiciendum* has been used in cases of illegal detention in private custody. In 1758 questions arose as to its application to persons in naval or military custody, including pressed men, which led to the introduction of a bill in parliament and to the consultation by the House of Lords of the judges (see Wilmot's *Opinions*, p. 77). In the same year the writ was used to release the wife of Earl Ferrers from his custody and maltreatment, and was unsuccessfully applied for by John Wilkes to get back his wife, who was separated from him by mutual agreement. But perhaps the most interesting instances of that period are the case of the negro Somerset (1771), who was released from a claim to hold him as a slave in England: and that of the Hottentot Venus (1810), where an alien woman on exhibition in England was brought before the court by Zachary Macaulay in order to ascertain whether she was detained against her will.

The experience of the 18th century disclosed defects in the procedure for obtaining liberty in cases not covered by the act of 1679. But it was not till 1816 that further legislation was passed for more effectually securing the liberty of the subject. The act of 1816 (56 Geo. III. c. 100), does not touch cases covered by the act of 1679. It enacts (1) that a writ of *habeas corpus* shall be issued in vacation time in favour of a person restrained of his liberty otherwise than for some criminal or supposed criminal matter (except persons imprisoned for debt or by civil process); (2) that though the return to the writ be good and sufficient in law, the judge shall examine into the truth of the facts set forth in such return, and if they appear doubtful the prisoner shall be bailed; (3) that the writ shall run to any port, harbour, road, creek or bay on the coast of England, although not within the body of any county. The last clause was intended to meet doubts on the applicability of *habeas corpus* in cases of illegal detention on board ship, which had been raised owing to a case of detention on a foreign ship in an English port.

It will appear from the foregoing statement that the issue and enforcement of the writ rests on the common law as strengthened by the acts of 1627, 1640, 1679 and 1816, and subject also to the regulations as to procedure contained in the *Crown Office Rules*, 1906. The effect of the statutes is to keep the courts always open for the issue of the writ. It is available to put an end to all forms of illegal detention in public or private custody. In the case of the Canadian prisoners (1839) it was used to obtain the release of persons sentenced in Canada for participating in the rebellion of 1837, who were being conveyed throughout England in custody on their way to imprisonment in another part of the empire, and it is matter of frequent experience for the courts to review the legality of commitments under the Extradition Acts and the Fugitive Offenders Act 1881, of fugitives from the justice of a foreign state or parts of the king's dominions outside the British Islands.

In times of public danger it has occasionally been thought necessary to "suspend" the Habeas Corpus Act 1679 by special and temporary legislation. This was done in 1794 (by an act

[1] Dicey, *Law of the Constitution* (6th ed.), p. 195.

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annually renewed until 1801) and again in 1817, as to persons arrested and detained by his majesty for conspiring against his person and government. The same course was adopted in Ireland in 1866 during a Fenian rising. It has been the practice to make such acts annual and to follow their expiration by an act of indemnity. In cases where martial law exists the use of the writ is *ex hypothesi* suspended during conditions amounting to a state of war within the realm or the British possession affected (*e.g.* the Cape Colony and Natal during the South African War), and it would seem that the acts of courts martial during the period are not the subject of review by the ordinary courts. The so-called "suspension of the Habeas Corpus Act" bears a certain similarity to what is called in Europe "suspending the constitutional guarantees" or "proclaiming a state of siege," but "is not in reality more than suspension of one particular remedy for the protection of personal freedom."

There are various other forms of the writ according to the purpose for which it is granted. Thus *habeas corpus ad respondendum* is used to bring up a prisoner confined by the process of an inferior court in order to charge him in another proceeding (civil or criminal) in the superior court or some other court. As regards civil proceedings, this form of the writ is now rarely used, owing to the abolition of arrest on mesne process and the restriction of imprisonment for debt, or in execution of a civil judgment. The right to issue the writ depends on the common law, supplemented by an act of 1802. It is occasionally used for the purpose of bringing a person in custody for debt or on a criminal charge before a criminal court to be charged in respect of a criminal proceeding; but the same result may be obtained by means of an order of a secretary of state, made under s. 11 of the Prison Act 1898, or by the written order of a court of criminal jurisdiction before which he is required to take his trial on indictment (Criminal Law Amendment Act 30 & 31 Vict. c. 35, s. 10).

Other forms are *ad satisfaciendum; ad faciendum et recipiendum*, to remove into a superior court proceedings under which the defendant is in custody; *ad testificandum*, where a prisoner is required as a witness, issued under Act of 1861, s. 9, which is in practice now replaced by orders under s. 11 of the Prison Act 1898 (*supra*) or the order of a judge under s. 9 of the Criminal Procedure Act 1853; and *ad deliberandum et recipias*, to authorise the transfer from one custody to another for judicial trial, which is in practice superseded by the provisions of the Prison Acts 1865, 1871 and 1898, and the Criminal Law Amendment Act 1867 (*supra*).

The above forms are now of little or no importance; but the procedure for obtaining them and the forms of writ are included in the *Crown Office Rules* 1906.

Ireland.—The common law of Ireland as to the writs of *habeas corpus* is the same as that in England. The writ has in past times been issued from the English court of king's bench into Ireland, but does not now so issue. The acts of 1803 and 1816 already mentioned apply to Ireland. The Petition of Right is not in terms applicable to Ireland. The Habeas Corpus Act 1679 does not apply to Ireland; but its equivalent is supplied by an act of 1781–1782 of the Irish parliament (21 & 22 Geo. III. c. 11). Sec. 16 contains a provision empowering the chief governor and privy council of Ireland by a proclamation under the great seal of Ireland to suspend the act during such time only as there shall be an actual invasion or rebellion in Ireland; and it is enacted that during the currency of the proclamation no judge or justices shall bail or try any person charged with being concerned in the rebellion or invasion without an order from the lord lieutenant or lord deputy and senior of the privy council. In Ireland by an act of 1881 the Irish executive was given an absolute power of arbitrary and preventive arrest on suspicion of treason or of an act tending to interfere with the maintenance of law and order: but the warrant of arrest was made conclusive. This act continued by annual renewal until 1906, when it expired.

Scotland.—The writ of *habeas corpus* is unknown to Scots law, nor will it issue from English courts into Scotland. Under a Scots act of 1701 (c. 6) provision is made for preventing wrongous imprisonment and against undue delay in trials. It was applied to treason felony in 1848. The right to speedy trial is now regulated by s. 43 of the Criminal Procedure Scotland Act 1887. These enactments are as to Scotland equivalent to the English Act of 1679. Under the Court of Exchequer Scotland Act 1856 (19 & 20 V. c. 56) provision is made for bringing before the court of session persons and their proceedings before inferior courts and public officers—which is analogous to the powers to issue *habeas corpus* in such cases out of the English court of exchequer (now the revenue side of the king's bench division).

British Possessions.—The act of 1679 expressly applies to Wales, Berwick-on-Tweed, Jersey and Guernsey, and the act of 1816 also extends to the Isle of Man. The court of king's bench has also issued the writ to the king's foreign dominions beyond seas, *e.g.* to St Helena, and so late as 1861 to Canada (Anderson's case 1861, 30 L.J.Q.B. 129). In consequence of the last decision it was provided by the Habeas Corpus Act 1862 that no writ of *habeas corpus* should issue out of England by authority of any court or judge "into any colony or foreign dominion of the crown where the crown has a lawfully established court of justice having authority to grant or issue the writ and to ensure in its due execution in the 'colony' or dominion" (25 & 26 V. c. 20). The expression "foreign dominion" is meant to apply to places outside the British Islands, and does not include the Isle of Man or the Channel Islands (see *re Brown* [1864], 33 L.J.Q.B. 193).

In Australasia and Canada and in most if not all the British possessions whose law is based on the common law, the power to issue and enforce the writ is possessed and is freely exercised by colonial courts, under the charters or statutes creating and regulating the courts. The writ is freely resorted to in Canada, and in 1905, 1906, two appeals came to the privy council from the dominion, one with reference to an extradition case, the other with respect to the right to expel aliens.

Under the Roman-Dutch law as applied in British Guiana the writ was unknown and no similar process existed (2nd report of West Indian law commissioners). But by the Supreme Court Ordinance of 1893 that court possesses (*inter alia*) all the authorities, powers and functions belonging to or incident to a superior court of record in England, which appears to include the power to issue the writ of *habeas corpus*. Under the Roman-Dutch law as applied to South Africa free persons appear to have a right to release under a writ *de libero homine exhibendo*, which closely resembles the writ of *habeas corpus*, and the procedure described as "manifestation" used in the kingdom of Aragon (Hallam, *Middle Ages*, vol. ii., c. iv.). The writ of *habeas corpus* has not been formally adopted or the Habeas Corpus Acts formally extended to South Africa; but in the Cape Colony, under the charter of justice and colonial legislation, the supreme court on petition grants a remedy equivalent to that obtained in England by writ of *habeas corpus*; and the remedy is sometimes so described (*Koke v. Balse*, 1879, 9 Buchanan, 45, 64, and *Ex parte* Scot of a rising in Griqualand). During and after the South African War of 1899–1902 many attempts were made by this procedure to challenge or review the sentences of courts martial; see *re Fourie* (1900), 18 *Cape Rep.* 8.

The laws of Ceylon being derived from the Roman-Dutch law, the writ of *habeas corpus* is not indigenous: but, under s. 49 of the Supreme Court Ordinance 1889, the court or a judge has power to grant and issue "mandates in the nature of writs of *habeas corpus*." The chartered high courts in India have power to issue and enforce the writ of *habeas corpus*. The earliest record of its use was in 1775, when it was directed to Warren Hastings. It has been used to test the question whether Roman Catholic religious orders could enter India, and in 1870 an attempt was made thereby to challenge the validity of a warrant in the nature of a *lettre de cachet* issued by the viceroy (Ind. L. Rep. 6 Bengal, 392, 456, 498), and it has also been applied to settle controversies between Hindus and missionaries as to the custody of a young convert (*R. v. Vaughan*, 1870, 5 Bengal, 418), and between a Mahommedan husband and his mother-in-law as to the custody of a girl-wife (*Khatija Bibi*, 1870, 5 Bengal, 557).

United States.—Before the Declaration of Independence some of the North American colonies had adopted the act of 1679; and the federal and the other state legislatures of the United States have founded their procedure on that act. The common law as to the writ of *habeas corpus* has been inherited from England, and has been generally made to apply to commitments and detentions of all kinds. Difficult questions, unknown to English law, have arisen from the peculiar features of the American state-system. Thus the constitution provides that "the privilege of the writ of *habeas corpus* shall not be suspended unless when, in cases of rebellion or invasion, the public safety may require it"; and it has been the subject of much dispute whether the power of suspension under this provision is vested in the president or the congress. The weight of opinion seems to lean to the latter alternative. Again, conflicts have arisen between the courts of individual states and the courts of the union. It seems that a state court has no right to issue a *habeas corpus* for the discharge of a person held under the authority of the federal government. On the other hand, the courts of the union issue the writ only in those cases in which the power is expressly conferred on them by the constitution.

AUTHORITIES.—Paterson, *Liberty of the Subject* (1877); Short and Mellor, *Crown Practice* (1890); American: Church on *Habeas Corpus* (2nd ed. 1893). (W. F. C.)

HABERDASHER, a name for a tradesman who sells by retail small articles used in the making or wearing of dress, such as sewing cottons or silks, tapes, buttons, pins and needles and the like. The sale of such articles is not generally carried on alone, and a "haberdashery counter" usually forms a department of

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drapers' shops. The word, found in Chaucer, and even earlier (1311), is of obscure origin; the suggestion that it is connected with an Icelandic *haptrask*, "haversack," is, according to the *New English Dictionary*, impossible. *Hapertas* occurs in an early Anglo-French customs list, which includes articles such as were sold by haberdashers, but this word may itself have been a misspelling of "haberdash." The obscurity of origin has left room for many conjectures such as that of Minsheu that "haberdasher" was perhaps merely a corruption of the German *Habt ihr das?* "Have you that?" or *Habe das, Herr,* "Have that, sir," used descriptively for a general dealer in miscellaneous wares. The Haberdashers' Company is one of the greater Livery Companies of the City of London. Originally a branch of the mercers, the fraternity took over the selling of "small wares," which included not only articles similar to those sold as "haberdashery" now, but such things as gloves, daggers, glass, pens, lanterns, mousetraps and the like. They were thus on this side connected with the Milliners. On the other hand there was early a fusion with the old gild of the "Hurers," or cap makers, and the hatters, and by the reign of Henry VII. the amalgamation was complete. There were long recognized two branches of the haberdashers, the haberdashers of "small wares," and the haberdashers of hats (see further LIVERY COMPANIES). The haberdashers are named, side by side with the *capellarii*, in the White Book (*Liber Albus*) of the city of London (see *Munimenta Gildhallae Londiniensis*, ed. H. T. Riley, Rolls Series, 12, 1859–1862), and a haberdasher forms one of the company of pilgrims in the *Canterbury Tales* (Prologue, 361).

HABINGTON, WILLIAM (1605–1654), English poet, was born at Hendlip Hall, Worcestershire, on the 4th of November 1605. He belonged to a well-known Catholic family. His father, Thomas Habington (1560–1647), an antiquary and historical scholar, had been implicated in the plots on behalf of Mary queen of Scots; his uncle, Edward Habington, was hanged in 1586 on the charge of conspiring against Elizabeth in connexion with Anthony Babington; while to his mother, Mary Habington, was attributed the revelation of the Gunpowder Plot. The poet was sent to the college at St Omer, but, pressure being brought to bear on him to induce him to become a Jesuit, he removed to Paris. He married about 1632 Lucy, second daughter of Sir William Herbert, first Baron Powys. This lady he had addressed in the volume of lyrical poems arranged in two parts and entitled *Castara*, published anonymously in 1634. In 1635 appeared a second edition enlarged by three prose characters, fourteen new lyrics and eight touching elegies on his friend and kinsman, George Talbot. The third edition (1640) contains a third part consisting of a prose character of "A Holy Man" and twenty-two devotional poems. Habington's lyrics are full of the far-fetched "conceits" which were fashionable at court, but his verse is quite free from the prevailing looseness of morals. Indeed his reiterated praises of Castara's virtue grow wearisome. He is at his best in his reflective poems on the uncertainty of human life and kindred topics. He also wrote a *Historie of Edward the Fourth* (1640), based on notes provided by his father; a tragi-comedy, *The Queene of Arragon* (1640), published without his consent by his kinsman, the earl of Pembroke, and revived at the Restoration; and six essays on events in modern history, *Observations upon History* (1641). Anthony à Wood insinuated that during the Commonwealth the poet "did run with the times, and was not unknown to Oliver the usurper." He died on the 30th of November 1654.

The works of Habington have not been collected. *The Queene of Arragon* was reprinted in Dodsley's "Old Plays," vol ix. (1825); *Castara* was edited by Charles Elton (1812), and by E. Arber with a compact and comprehensive introduction (1870) for his "English Reprints."

HABIT (through the French from Lat. *habitus*, from *habere*, to have, hold, or, in a reflective sense, to be in a certain condition; in many of the English senses the French use *habitude*, not *habit*), condition of body or mind, especially one that has become permanent or settled by custom or persistent repetition, hence custom, usage. In botany and zoology the term is used both in the above sense of instinctive action of animals and tendencies of plants, and also of the manner of growth or external appearance of a plant or animal. From the use of the word for external appearances comes its use for fashion in dress, and hence as a term for a lady's riding dress and for the particular form of garment adopted by the members of a religious order, like "cowl" applied as the mark of a monk or nun.

HABITAT (a French word derived from *habiter*, Lat. *habitare*, to dwell), in botany and zoology, the term for the locality in which a particular species of plants or animals thrives.

HABSBURG, or HAPSBURG, the name of the famous family from which have sprung the dukes and archdukes of Austria from 1282, kings of Hungary and Bohemia from 1526, and emperors of Austria from 1804. They were also Roman emperors and German kings from 1438 to 1806, and kings of Spain from 1516 to 1700, while the minor dignities held by them at different times are too numerous to mention.

The name Habsburg, a variant of an older form, Habichtsburg (hawk's castle), was taken from the castle of Habsburg, which was situated on the river Aar not far from its junction with the Rhine. The castle was built about 1020 by Werner, bishop of Strassburg, and his brother, Radbot, the founder of the abbey of Muri. These men were grandsons of a certain Guntram, who, according to some authorities, is identical with a Count Guntram who flourished during the reign of the emperor Otto the Great, and whose ancestry can be traced back to the time of the Merovingian kings. This conjecture, however, is extremely problematical. Among Radbot's sons was one Werner, and Werner and his son Otto were called counts of Habsburg, Otto being probably made landgrave of upper Alsace late in the 11th or early in the 12th century. At all events Otto's son Werner (d. 1167), and the latter's son Albert (d. 1199), held this dignity, and both landgraves increased the area of the Habsburg lands. Albert became count of Zürich and protector of the monastery of Säckingen, and obtained lands in the cantons of Unterwalden and Lucerne; his son Rudolph, having assisted Frederick of Hohenstaufen, afterwards the emperor Frederick II., against the emperor Otto IV., received the county of Aargau. Both counts largely increased their possessions in the districts now known as Switzerland and Alsace, and Rudolph held an influential place among the Swabian nobility. After his death in 1232 his two sons, Albert and Rudolph, divided his lands and founded the lines of Habsburg-Habsburg and Habsburg-Laufenburg. Rudolph's descendants, counts of Habsburg-Laufenburg, were soon divided into two branches, one of which became extinct in 1408 and the other seven years later. Before this date, however, Laufenburg and some other districts had been sold to the senior branch of the family, who thus managed to retain the greater part of the Habsburg lands.

Rudolph's brother Albert (d. 1239), landgrave of Alsace, married Hedwig of Kyburg (d. 1260), and from this union there was born in 1218 Rudolph, the founder of the greatness of the house of Habsburg, and the first of the family to ascend the German throne. Through his mother he inherited a large part of the lands of the extinct family of Zähringen; he added in other ways to his possessions, and was chosen German king in September 1273. Acting vigorously in his new office, he defeated and killed his most formidable adversary, Ottakar II., king of Bohemia, in 1278, and in December 1282 he invested his sons, Albert and Rudolph, with the duchies of Austria and Styria, which with other lands had been taken from Ottakar. This was an event of supreme moment in the history of the Habsburgs, and was the first and most important stage in the process of transferring the centre of their authority from western to eastern Europe, from the Rhine to the Danube. On Rudolph's death in July 1291 the German crown passed for a time away from the Habsburgs, but in July 1298 it was secured by his son, Albert, whose reign, however, was short and uneventful. But before 1308, the year of Albert's death, the long and troubled connexion of the Habsburgs with Bohemia had already begun. In 1306 Wenceslas III., the last Bohemian king of the Přemyslide dynasty, was murdered. Seizing the opportunity and declaring that the vacant kingdom was an imperial fief, King Albert

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bestowed it upon his eldest son, Rudolph, and married this prince to Elizabeth, widow of Wenceslas II. and stepmother of Wenceslas III. But Rudolph died in 1307, and his father's attempt to keep the country in his own hands was ended by his murder in 1308.

Albert's successor as German king was Henry of Luxemburg (the emperor Henry VII.), and this election may be said to initiate the long rivalry between the houses of Habsburg and Luxemburg. But the immediate enemy of the Habsburgs was not a Luxemburg but a Wittelsbach. Without making any definite partition, Albert's five remaining sons spent their time in governing their lands until 1314, when one of them, Frederick called the Fair, forsook this comparatively uneventful occupation and was chosen by a minority of the electors German king in succession to Henry VII. At the same time the Wittelsbach duke of Bavaria, Louis, known to history as the emperor Louis the Bavarian, was also chosen. War was inevitable, and the battle of Mühldorf, fought in September 1322, sealed the fate of Frederick. Louis was victorious: his rival went into an honourable captivity, and the rising Habsburg sun underwent a temporary eclipse.

For more than a century after Frederick's death in 1330 the Habsburgs were exiles from the German throne. But they were not inactive. In 1335 his two surviving brothers, Albert and Otto, inherited Carinthia and part of Carniola by right of their mother, Elizabeth; in 1363 Albert's son Rudolph received Tirol; and during the same century part of Istria, Trieste and other districts were acquired. All King Albert's six sons had died without leaving male issue save Otto, whose family became extinct in 1344, and Albert, the ancestor of all the later Habsburgs. Of Albert's four sons two also left no male heirs, but the remaining two, Albert III. and Leopold III., were responsible for a division of the family which is of some importance. By virtue of a partition made upon their brother Rudolph's death in 1365 Albert and his descendants ruled over Austria, while Leopold and his sons took Styria, Carinthia and Tirol, Alsace remaining undivided as heretofore.

Towards the middle of the 15th century the German throne had been occupied for nearly a hundred years by members of the Luxemburg family. The reigning emperor Sigismund, who was also king of Hungary and Bohemia, was without sons, and his daughter Elizabeth was the wife of Albert of Habsburg, the grandson and heir of Duke Albert III., who had died in 1395. Sigismund died in December 1437, leaving his two kingdoms to his son-in-law, who was crowned king of Hungary in January 1438 and king of Bohemia in the following June. Albert was also chosen and crowned German king in succession to Sigismund, thus beginning the long and uninterrupted connexion of his family with the imperial throne, a connexion which lasted until the dissolution of the Holy Roman Empire in 1806. He did not, however, enjoy his new dignities for long, as he died in October 1439 while engaged in a struggle with the Turks. Albert left no sons, but soon after his death one was born to him, called Ladislaus, who became duke of Austria and king of Hungary and Bohemia. Under the guardianship of his kinsman, the emperor Frederick III., the young prince's reign was a troubled one, and when he died unmarried in 1457 his branch of the family became extinct, and Hungary and Bohemia passed away from the Habsburgs, who managed, however, to retain Austria.

Leopold III., duke of Carinthia and Styria, who was killed in 1386 at the battle of Sempach, had four sons, of whom two only, Frederick and Ernest, left male issue. Frederick and his only son, Sigismund, confined their attention mainly to Tirol and Alsace, leaving the larger destinies of the family in the hands of Ernest of Carinthia and Styria (d. 1424) and his sons, Frederick and Albert and after the death of King Ladislaus in 1457 these two princes and their cousin Sigismund were the only representatives of the Habsburgs. In February 1440 Frederick of Styria was chosen German king in succession to his kinsman Albert. He was a weak and incompetent ruler, but a stronger and abler man might have shrunk from the task of administering his heterogeneous and unruly realm. Although very important in the history of the house of Habsburg, Frederick's long reign was a period of misfortune, and the motto which he assumed, A.E.I.O.U. (*Austriae est imperare orbi universo*), seemed at the time a particularly foolish boast. He acted as guardian both to Ladislaus of Hungary, Bohemia and Austria, and to Sigismund of Tirol, and in all these countries his difficulties were increased by the hostility of his brother Albert. Having disgusted the Tirolese he gave up the guardianship of their prince in 1446, while in Hungary and Bohemia he did absolutely nothing to establish the authority of his ward; in 1452 the Austrians besieged him in Vienna Neustadt and compelled him to surrender the person of Ladislaus, thus ending even his nominal authority. When the young king died in 1457 the Habsburgs lost Hungary and Bohemia, but they retained Austria, which, after some disputing, Frederick and Albert divided between themselves, the former taking lower and the latter upper Austria. This arrangement was of short duration. In 1461 Albert made war upon his brother and forced him to resign lower Austria, which, however, he recovered after Albert's death in December 1463. Still more unfortunate was the German king in Switzerland. For many years the Swiss had chafed under the rule of the Habsburgs; during the reign of Rudolph I. they had shown signs of resentment as the kingly power increased; and the struggle which had been carried on for nearly two centuries had been almost uniformly in their favour. It was marked by the victory of Morgarten over Duke Leopold I. in 1315, and by that of Sempach over Leopold III. in 1386, by the conquest of Aargau at the instigation of the emperor Sigismund early in the 15th century, and by the final struggle for freedom against Frederick III. and Sigismund of Tirol. Taking advantage of some dissensions among the Swiss, the king saw an opportunity to recover his lost lands, and in 1443 war broke out. But his allies, the men of Zürich, were defeated, and when in August 1444 some French mercenaries, who had advanced to his aid, suffered the same fate at St Jakob, he was compelled to give up the struggle. A few years later Sigismund became involved in a war with the same formidable foemen; he too was worsted, and the "Perpetual Peace" of 1474 ended the rule of the Habsburgs in Switzerland. This humiliation was the second great step in the process of removing the Habsburgs from western to eastern Europe. In 1453, just after his coronation as emperor at Rome, Frederick legalized the use of the title archduke, which had been claimed spasmodically by the Habsburgs since 1361. This title is now peculiar to the house of Habsburg.

The reverses suffered by the Habsburgs during the reign of Frederick III. were many and serious, but an improvement was at hand. The emperor died in August 1493, and was followed on the imperial throne by his son Maximilian I., perhaps the most versatile and interesting member of the family. Before his father's death Maximilian had been chosen German king, or king of the Romans, and had begun to repair the fortunes of his house. He had married Mary, daughter and heiress of Charles the Bold, duke of Burgundy; he had driven the Hungarians from Vienna and the Austrian archduchies, which Frederick had, perforce, allowed them to occupy; and he had received Tirol on the abdication of Sigismund in 1490. True it is that upon Mary's death in 1482 part of her inheritance, the rich and prosperous Netherlands, held that her husband's authority was at an end, while another part, the two Burgundies and Artois, had been seized by the king of France; nevertheless, after a protracted struggle the German king secured almost the whole of Charles the Bold's lands for his son, the archduke Philip, the duchy of Burgundy alone remaining in the power of France after the conclusion of the peace of Senlis in 1493. Maximilian completed his work by adding a piece of Bavaria, Görz and then Gradiska to the Habsburg lands.

After Sigismund's death in 1496 Maximilian and Philip were the only living male members of the family. Philip married Joanna, daughter of Ferdinand and Isabella of Spain, and died in 1506 leaving two sons, Charles and Ferdinand. Charles succeeded his father in the Netherlands; he followed one grandfather, Ferdinand, as king of Spain in 1516, and when the other,

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Maximilian, died in 1519 he became the emperor Charles V., and succeeded to all the hereditary lands of the Habsburgs. But provision had to be made for Ferdinand, and in 1521 this prince was given the Austrian archduchies, Austria, Styria, Carinthia and Carniola; in the same year he married Anne, daughter of Wladislaus, king of Hungary and Bohemia, and when his childless brother-in-law, King Louis, was killed at the battle of Mohacs in August 1526 he claimed the two kingdoms, both by right of his wife and by treaty. After a little trouble Bohemia passed under his rule, but Hungary was more recalcitrant. A long war took place between Ferdinand and John Zapolya, who was also crowned king of Hungary, but in 1538 a treaty was made and the country was divided, the Habsburg prince receiving the western and smaller portion. However, he was soon confronted with a more formidable foe, and he spent a large part of his subsequent life in defending his lands from the attacks of the Turks.

The Habsburgs had now reached the summit of their power. The prestige which belonged to Charles as head of the Holy Roman Empire was backed by the wealth and commerce of the Netherlands and of Spain, and by the riches of the Spanish colonies in America. In Italy he ruled over Sardinia, Naples and Sicily, which had passed to him with Spain, and the duchy of Milan, which he had annexed in 1535; to the Netherlands he had added Friesland, the bishopric of Utrecht, Gröningen and Gelderland, and he still possessed Franche-Comté and the fragments of the Habsburg lands in Alsace and the neighbourhood. Add to this Ferdinand's inheritance, the Austrian archduchies and Tirol, Bohemia with her dependent provinces, and a strip of Hungary, and the two brothers had under their sway a part of Europe the extent of which was great, but the wealth and importance of which were immeasurably greater. Able to scorn the rivalry of the other princely houses of Germany, the Habsburgs saw in the kings of the house of Valois the only foemen worthy of their regard.

When Charles V. abdicated he was succeeded as emperor, not by his son Philip, but by his brother Ferdinand. Philip became king of Spain, ruling also the Netherlands, Franche-Comté, Naples, Sicily, Milan and Sardinia, and the family was definitely divided into the Spanish and Austrian branches. For Spain and the Spanish Habsburgs the 17th century was a period of loss and decay, the seeds of which were sown during the reign of Philip II. The northern provinces of the Netherlands were lost practically in 1609 and definitely by the treaty of Westphalia in 1648; Roussillon and Artois were annexed to France by the treaty of the Pyrenees in 1659, while Franche-Comté and a number of towns in the Spanish Netherlands suffered a similar fate by the treaty of Nijmwegen in 1678. Finally Charles II., the last Habsburg king of Spain, died childless in November 1700, and his lands were the prize of the War of the Spanish Succession. The Austrian Habsburgs fought long and valiantly for the kingdom of their kinsman, but Louis XIV. was too strong for them, and by the peace of Rastatt Spain passed from the Habsburgs to the Bourbons. However, the Austrian branch of the family received in 1714 the Italian possessions of Charles II., except Sicily, which was given to the duke of Savoy, and also the southern Netherlands, which are thus often referred to as the Austrian Netherlands; and retained the duchy of Mantua, which it had seized in 1708.

Ferdinand I., the founder of the line of the Austrian Habsburgs, arranged a division of his lands among his three sons before his death in 1564. The eldest, Maximilian II., received Austria, Bohemia and Hungary, and succeeded his father as emperor; he married Maria, a daughter of Charles V., and though he had a large family his male line became extinct in 1619. The younger sons were Ferdinand, ruler of Tirol, and Charles, archduke of Styria. The emperor Maximilian II. left five sons, two of whom, Rudolph and Matthias, succeeded in turn to the imperial throne, but, as all the brothers were without male issue, the family was early in the 17th century threatened with a serious crisis. Rudolph died in 1612, the reigning emperor Matthias was old and ill, and the question of the succession to the Empire, to the kingdoms of Hungary and Bohemia, and to the hereditary lands of the Habsburgs became acute. Turning to the collateral branches of the family, the sons of the archduke Ferdinand were debarred from the succession owing to their father's morganatic marriage with Philippine Welser, and the only hope of the house was in the sons of Charles of Styria. To prevent the Habsburg monarchy from falling to pieces the emperor's two surviving brothers renounced their rights, and it was decided that Ferdinand, a son of Charles of Styria, should succeed his cousin Matthias. The difficulties which impeded the completion of this scheme were gradually overcome, and the result was that when Matthias died in 1619 the whole of the lands of the Austrian Habsburgs was united under the rule of the emperor Ferdinand II. Tirol, indeed, a few years later was separated from the rest of the monarchy and given to the emperor's brother, the archduke Leopold, but this separation was ended when Leopold's son died in 1665.

The arbitrary measures which followed Ferdinand's acquisition of the Bohemian crown contributed to the outbreak of the Thirty Years' War, but in a short time the Bohemians were subdued, and in 1627, following a precedent set in 1547, the emperor declared the throne hereditary in the house of Habsburg. The treaty of Westphalia which ended this war took comparatively little from the Habsburgs, though they ceded Alsace to France; but the Empire was greatly weakened, and its ruler was more than ever compelled to make his hereditary lands in the east of Europe the base of his authority, finding that he derived more strength from his position as archduke of Austria than from that of emperor. Ferdinand III. succeeded his father Ferdinand II., and during the long reign of the former's son, Leopold I., the Austrian, like the Spanish, Habsburgs were on the defensive against the aggressive policy of Louis XIV., and in addition they had to withstand the assaults of the Turks. In two ways they sought to strengthen their position. The unity of the Austrian lands was strictly maintained, and several marriages kept up a close and friendly connexion with Spain. A series of victories over the sultan during the later part of the 17th century rolled back the tide of the Turkish advance, and the peace of Karlowitz made in 1699 gave nearly the whole of Hungary to the Habsburgs. Against France Austria was less successful, and a number of humiliations culminated in 1714 in the failure to secure Spain, to which reference has already been made.

The hostility of Austria and France, or rather of Habsburg and Bourbon, outlived the War of the Spanish Succession. In 1717 Spain conquered Sardinia, which was soon exchanged by Austria for Sicily; other struggles and other groupings of the European powers followed, and in 1735, by the treaty of Vienna, Austria gave up Naples and Sicily and received the duchies of Parma and Piacenza. These surrenders were doubtless inevitable, but they shook the position of the house of Habsburg in Italy. However, a domestic crisis was approaching which threw Italian affairs into the shade. Charles VI., who had succeeded his brother, Joseph I., as emperor in 1711, was without sons, and his prime object in life was to secure the succession of his elder daughter, Maria Theresa, to the whole of his lands and dignities. But in 1713, four years before the birth of Maria Theresa, he had first issued the famous *Pragmatic Sanction*, which declared that the Habsburg monarchy was indivisible and that in default of male heirs a female could succeed to it. Then after the death of his only son and the birth of Maria Theresa the emperor bent all his energies to securing the acceptance of the Pragmatic Sanction. Promulgated anew in 1724, it was formally accepted by the estates of the different Habsburg lands; in 1731 it was guaranteed by the imperial diet. By subordinating every other interest to this, Charles at length procured the assent of the various powers of Europe to the proposed arrangement; he married the young princess to Francis Stephen, duke of Lorraine, afterwards grand-duke of Tuscany, and when he died on the 20th of October 1740 he appeared to have realized his great ambition. With the emperor's death the house of Habsburg, strictly speaking, became extinct, its place being taken by the house of Habsburg-Lorraine, which sprang from the union of

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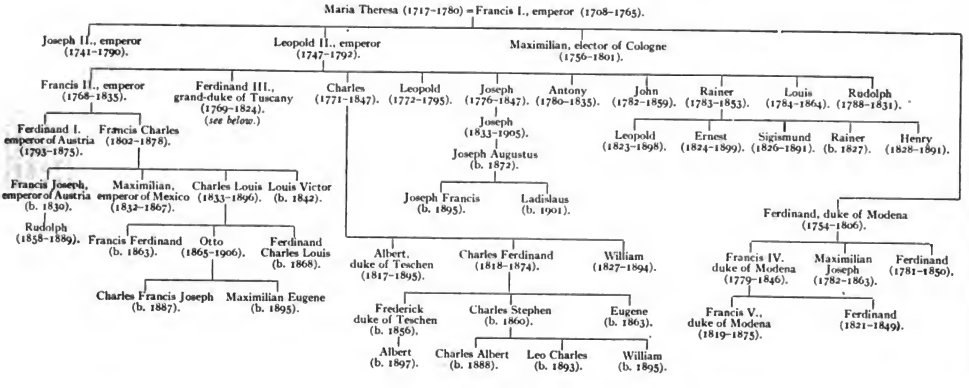
GENEALOGICAL TABLE OF THE HOUSE OF HABSBURG-LORRAINE.



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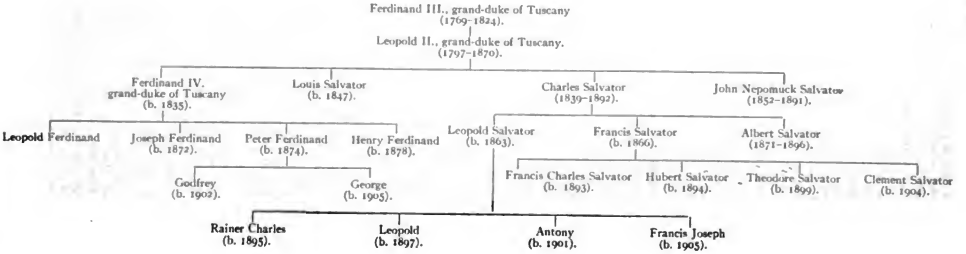

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Maria Theresa and Francis Stephen; and it is interesting to note that the present Habsburgs are only descended in the female line from Rudolph I. and Maximilian I.

Immediately after the death of Charles the Pragmatic Sanction was forgotten. A crowd of claimants called for various parts of the Habsburg lands; Frederick the Great, talking less but acting more, invaded and conquered Silesia, and it seemed likely that the dissolution of the Habsburg monarchy would at no long interval follow the extinction of the Habsburg race. A Wittelsbach prince, Charles Albert, elector of Bavaria, the emperor Charles VII., and not Francis Stephen, was chosen emperor in January 1742, and by the treaty of Breslau, made later in the same year, nearly all Silesia was formally surrendered to Prussia. But the worst was now over, and when in 1748 the peace of Aix-la-Chapelle, which practically confirmed the treaty of Breslau, had cleared away the dust of war, Maria Theresa and her consort were found to occupy a strong position in Europe. In the first place, in September 1745, Francis had been chosen emperor; then the imperial pair ruled Hungary and Bohemia, although the latter kingdom was shorn of Silesia; in spite of French conquests the Austrian Netherlands remained in their hands; and in Italy Francis had added Tuscany to his wife's heritage, although Parma and Piacenza had been surrendered to Spain and part of Milan to the king of Sardinia. The diplomatic *volte-face* and the futile attempts of Maria Theresa to recover Silesia which followed this treaty belong to the general history of Europe.

The emperor Francis I. died in 1765 and was succeeded by his son Joseph II., an ambitious and able prince, whose aim was to restore the Habsburgs and the Empire to their former great positions in Europe, and whose pride did not prevent him from learning from Frederick the Great, the despoiler of his house. His projects, however, including one of uniting Bavaria with Austria, which was especially cherished, failed completely, and when he died in February 1790 he left his lands in a state of turbulence which reflected the general condition of Europe. The Netherlands had risen against the Austrians, and in January 1790 had declared themselves independent; Hungary, angered by Joseph's despotic measures, was in revolt, and the other parts of the monarchy were hardly more contented. But the 18th century saw a few successes for the Habsburgs. In 1718 a successful war with Turkey was ended by the peace of Passarowitz, which advanced the Austrian boundary very considerably to the east, and although by the treaty of Belgrade, signed twenty-one years later, a large part of this territory was surrendered, yet a residuum, the banate of Temesvar, was permanently incorporated with Hungary. The struggle over the succession to Bavaria, which was concluded in 1779 by the treaty of Teschen, was responsible for adding Innviertel, or the quarter of the Inn, to Austria; the first partition of Poland brought eastern Galicia and Lodomeria, and in 1777 the sultan ceded Bukovina. Joseph II. was followed by his brother, Leopold II., who restored the Austrian authority in the Netherlands, and the latter by his son Francis II., who resigned the crown of the Holy Roman Empire in August 1806, having two years before taken the title of emperor of Austria as Francis I.

Before the abdication of the emperor Francis in 1806 Austria had met and suffered from the fury of revolutionary France, but the cessions of territory made by her at the treaties of Campo Formio (1797), of Lunéville (1801) and of Pressburg (1805) were of no enduring importance. This, however, cannot be said for the treaties of Paris and of Vienna, which in 1814 and 1815 arranged the map of Europe upon the conclusion of the Napoleonic wars. These were highly favourable to the Habsburgs. In eastern and central Europe Austria regained her former position, the lands ceded to Bavaria and also eastern Galicia, which had been in the hands of Russia since 1809, being restored; she gave up the Austrian Netherlands, soon to be known as Belgium, to the new kingdom of the Netherlands, and acquiesced in the arrangement which had taken from her the Breisgau and the remnant of the Habsburg lands upon the Rhine. In return for these losses Austria became the dominant power in Italy. A mass of northern Italy, including her former possessions in Milan and the neighbourhood, and also the lands recently forming the republic of Venice, was made into the kingdom of Lombardy-Venetia, and this owned the emperor of Austria as king. Across the Adriatic Dalmatia was added to the Habsburg monarchy, the population of which, it has been estimated, was increased at this time by over four millions.

The illiberal and oppressive character of the Austrian rule in Italy made it very unpopular; it was hardly less so in Hungary and Bohemia, and the advent of the year 1848 found the subject kingdoms eager to throw off the Habsburg yoke. The whole monarchy was quickly in a state of revolution, in the midst of which the emperor Ferdinand, who had succeeded his father Francis in 1835, abdicated, and his place was taken by his young nephew Francis Joseph. The position of the Habsburg monarchy now seemed desperate. But it was strong in its immemorial tradition, which was enough to make the efforts of the Frankfort parliament to establish German unity under Prussian hegemony abortive; it was strong also in the general loyalty to the throne of the imperial army; and its counsels were directed by statesmen who knew well how to exploit in the interests of the central power the national rivalries within the monarchy. With the crushing of the Hungarian revolt by the emperor Nicholas I. of Russia in 1849 the monarchy was freed from the most formidable of its internal troubles; in 1850 the convention of Olmütz restored its influence in Germany.

Though the *status quo* was thus outwardly re-established, the revolutions of 1848 had really unchained forces which made its maintenance impossible. In Germany Prussia was steadily preparing for the inevitable struggle with Austria for the mastery; in France Napoleon III. was preparing to pose as the champion of the oppressed nationalities which had once more settled down sullenly under the Habsburg yoke. The alliance of the French emperor and the king of Sardinia, and the Italian war of 1859 ended in the loss of Lombardy to the Habsburgs. Seven years later the crushing defeat of Königgrätz not only ended their long rule in Italy, based on the tradition of the medieval empire, by leading to the cession of Venetia to the new Italian kingdom, but led to their final exclusion from the German confederation, soon to become, under the headship of Prussia, the German empire.

By the loss of the predominance in Germany conceded to it by the treaties of Vienna, and by the shifting of its "centre of gravity" eastward, the Habsburg monarchy, however, perhaps gained more than it lost. One necessary result, indeed, was the composition (*Ausgleich*) with Hungary in 1867, by which the latter became an independent state (Francis Joseph being crowned king at Pest in June 1867) bound to the rest of the monarchy only by the machinery necessary for the carrying out of a common policy in matters of common interest. This at least restored the loyalty of the Hungarians to the Habsburg dynasty; it is too soon yet to say that it secured permanently the essential unity of the Habsburg monarchy. By the system of the Dual Monarchy the rest of the Austrian emperor's dominions (Cis-Leithan) were consolidated under a single central government, the history of which has been mainly that of the rival races within the empire struggling for political predominance. Since the development of the constitution has been consistently in a democratic direction and the Slavs are in a great majority, the tendency has been for the German element—strong in its social status and tradition of predominance—to be swamped by what it regards as an inferior race; and a considerable number of Austrian "Germans" have learned to look not to their Habsburg rulers, but to the power of the German empire for political salvation. The tendency eastwards of the monarchy was increased when in 1878 the congress of Berlin placed Bosnia and Herzegovina under Austrian rule. Old ambitions were now revived at the expense of the Ottoman empire, the goal of which was the port of Salonica; and not the least menacing aspect of the question of the near East has been that the rivalry of Italy and the Habsburg monarchy has been transferred to the Balkan peninsula. Yet, in spite of internal

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dissensions arising out of questions fundamentally insoluble, and in spite of the constant threat of external complications that may lead to war, the Habsburg monarchy as the result of the changes in the 19th and 20th centuries is seemingly stronger than ever. The shadow of universal claims to empire and sonorous but empty titles have vanished, but so have the manifold rivalries and entanglements which accompanied the Habsburg rule in Italy and the Netherlands and Habsburg preponderance in Germany. The monarchy is stronger because its sphere is more defined; because as preserving the *pax Romana* among the jostling races of eastern Europe, it is more than ever recognized as an essential element in the maintenance of European peace, and is recognized as necessary and beneficial even by the ambitious and restless nationalities that chafe under its rule.

A few words must be said about the cadet branches of the Habsburg family. When, in 1765, Francis I. died and Joseph II. became emperor, the grand-duchy of Tuscany passed by special arrangement not to Joseph, but to his younger brother Leopold. Then in 1791, after Leopold had succeeded Joseph as emperor, he handed over the grand-duchy to his second son, Ferdinand (1769–1824). In 1801 this prince was deposed by Napoleon and Tuscany was seized by France. Restored to the Habsburgs in the person of Ferdinand in 1814, it remained under his rule, and then under that of his son Leopold (1797–1870), until the rising of 1859, when the Austrians were driven out and the grand-duchy was added to the kingdom of Sardinia. A similar fate attended the duchy of Modena, which had passed to the Habsburgs through the marriage of its heiress Mary Beatrice of Este (d. 1829) with the archduke Ferdinand (1754–1806), brother of the emperor Leopold II. From 1814 to 1836 this duchy was governed by Ferdinand's son, Duke Francis IV., and from 1846 to 1859 by his grandson, Francis V. This family became extinct on the death of Francis V. in 1875.

In addition to his successor Francis II., and to Ferdinand, grand-duke of Tuscany, the emperor Leopold II. had eight sons, five of whom, including the archduke John (1782–1850), who saw a good deal of service during the Napoleonic Wars and was chosen regent (*Reichsverweser*) of Germany in 1848, have now no living male descendants. Thus the existing branches of the family are descended from Leopold's five other sons. The descendants of Leopold, the dispossessed grand-duke of Tuscany, were in 1909 represented by his son, Ferdinand (b. 1835), who still claimed the title of grand-duke of Tuscany, and his son and grandsons; by the numerous descendants of the archduke Charles Salvator (1830–1892); and by the archduke Louis Salvator (b. 1847), a great traveller and a voluminous writer. The grand-duke's fourth son was the archduke John Nepomuck Salvator, who, after serving in the Austrian army, resigned all his rights and titles and under the name of Johann Orth took command of a sailing vessel. He is supposed to have been drowned off the coast of South America in 1891, but reports of his continued existence were circulated from time to time after that date. Of the emperor Leopold's other sons the archduke Charles, perhaps the most distinguished soldier of the family, left four sons, including Albert, duke of Teschen (1817–1895), who inherited some of his father's military ability. Charles's family was in 1909 represented by his grandsons, the sons of the archduke Charles Ferdinand (1818–1874). The archduke Joseph (1776–1847), palatine of Hungary, was represented by a grandson, Joseph Augustus (b. 1872), and the archduke Rainer (1783–1853), viceroy of Lombardy-Venetia, by a son Rainer (b. 1827), and by several grandsons.

The eldest and reigning branch of the family was in 1909 represented by the emperor Francis Joseph, whose father was the archduke Francis Charles (1802–1878), and whose grandfather was the emperor Francis II. Francis Joseph's only son Rudolph died in 1889; consequently the heir to the Habsburg monarchy was the emperor's nephew Francis Ferdinand (b. 1863), the eldest of the three sons of his brother Charles Louis (1833–1896). In 1875 Francis Ferdinand inherited the wealth of the Este family and took the title of archduke of Austria-Este; in 1900 he contracted a morganatic marriage with Sophia, countess of Chotek, renouncing for his sons the succession to the monarchy. Thus after Francis Ferdinand this would pass to the sons of his brother, the archduke Otto (1865–1906). One of the emperor's three brothers was Maximilian, emperor of Mexico from 1863 to 1867.

With the exception of Charles V. the Habsburgs have produced no statesmen of great ability, while several members of the family have displayed marked traces of insanity. Nevertheless they secured, and for over 350 years they kept, the first place among the potentates of Europe; a dignity in origin and theory elective becoming in practice hereditary in their house. This position they owe to some extent to the tenacity with which they have clung to the various lands and dignities which have passed into their possession, but they owe it much more to a series of fortunate marriages and opportune deaths. The union of Maximilian and Mary of Burgundy, of Philip the Handsome and Joanna of Spain, of Ferdinand and Anna of Hungary and Bohemia; the death of Ottakar of Bohemia, of John, the only son of Ferdinand and Isabella of Spain, of Louis of Hungary and Bohemia—these are the corner-stones upon which the Habsburg monarchy has been built.

For the origin and early history of the Habsburgs see G. de Roo, *Annales rerum ab Austriacis Habsburgicae gentis principibus a Rudolpho I. usque ad Carolum V. gestarum* (Innsbruck, 1592, fol.); M. Herrgott, *Genealogia diplomatica augustae gentis Habsburgicae* (Vienna, 1737–1738); E. M. Fürst von Lichnowsky, *Geschichte des Hauses Habsburg* (Vienna, 1836–1844); A. Schulte, *Geschichte der Habsburger in den ersten drei Jahrhunderten* (Innsbruck, 1887); T. von Liebenau, *Die Anfänge des Hauses Habsburg* (Vienna, 1883); W. Merz, *Die Habsburg* (Aarau, 1896); W. Gisi, *Der Ursprung der Häuser Zähringen und Habsburg* (1888); and F. Weihrich, *Stammtafel zur Geschichte des Hauses Habsburg* (Vienna, 1893). For the history of the Habsburg monarchy see Langl, *Die Habsburg und die denkwürdigen Stätten ihrer Umgebung* (Vienna, 1895); and E. A. Freeman, *Historical Geography of Europe* (1881). Two English books on the subject are J. Gilbart-Smith, *The Cradle of the Hapsburgs* (1907); and A. R. and E. Colquhoun, *The Whirlpool of Europe, Austria-Hungary and the Hapsburgs* (1906). (A. W. H.*)

HACHETTE, JEAN NICOLAS PIERRE (1769–1834), French mathematician, was born at Mézières, where his father was a bookseller, on the 6th of May 1769. For his early education he proceeded first to the college of Charleville, and afterwards to that of Reims. In 1788 he returned to Mézières, where he was attached to the school of engineering as draughtsman to the professors of physics and chemistry. In 1793 he became professor of hydrography at Collioure and Port-Vendre. While there he sent several papers, in which some questions of navigation were treated geometrically, to Gaspard Monge, at that time minister of marine, through whose influence he obtained an appointment in Paris. Towards the close of 1794, when the École Polytechnique was established, he was appointed along with Monge over the department of descriptive geometry. There he instructed some of the ablest Frenchmen of the day, among them S. D. Poisson, F. Arago and A. Fresnel. Accompanying Guyton de Morveau in his expedition, earlier in the year, he was present at the battle of Fleurus, and entered Brussels with the French army. In 1816, on the accession of Louis XVIII., he was expelled from his chair by government. He retained, however, till his death the office of professor in the faculty of sciences in the École Normale, to which he had been appointed in 1810. The necessary royal assent in 1823 refused to the election of Hachette to the Académie des Sciences, and it was not till 1831, after the Revolution, that he obtained that honour. He died at Paris on the 16th of January 1834. Hachette was held in high esteem for his private worth, as well as for his scientific attainments and great public services. His labours were chiefly in the field of descriptive geometry, with its application to the arts and mechanical engineering. It was left to him to develop the geometry of Monge, and to him also is due in great measure the rapid advancement which France made soon after the establishment of the École Polytechnique in the construction of machinery.

Hachette's principal works are his *Deux Suppléments à la Géométrie descriptive de Monge* (1811 and 1818); *Éléments de géométrie à trois dimensions* (1817); *Collection des épures de géométrie*, &c.

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(1795 and 1817); *Applications de géométrie descriptive* (1817); *Traité de géométrie descriptive*, &c. (1822); *Traité élémentaire des machines* (1811); *Correspondance sur l'École Polytechnique* (1804–1813). He also contributed many valuable papers to the leading scientific journals of his time.

For a list of Hachette's writings see the *Catalogue of Scientific Papers of the Royal Society of London*; also F. Arago, *Œuvres* (1855); and Silvestre, *Notice sur J. N. P. Hachette* (Bruxelles, 1836).

HACHETTE, JEANNE, French heroine. Jeanne Lainé, or Fourquet, called Jeanne Hachette, was born about 1454. We have no precise information about her family or origin. She is known solely for her act of heroism which on the 27th of June 1472 saved Beauvais when it was on the point of being taken by the troops of Charles the Bold, duke of Burgundy. The town was defended by only 300 men-at-arms, commanded by Louis de Balagny. The Burgundians were making an assault, and one of their number had actually planted a flag upon the battlements, when Jeanne, axe in hand, flung herself upon him, hurled him into the moat, tore down the flag, and revived the drooping courage of the garrison. In gratitude for this heroic deed, Louis XI. instituted a procession in Beauvais called the Procession of the Assault, and married Jeanne to her chosen lover Colin Pilon, loading them with favours.

See Georges Vallat, *Jeanne Hachette* (Abbeville, 1898).

HACHETTE, LOUIS CHRISTOPHE FRANÇOIS (1800–1864), French publisher, was born at Rethel in the Ardennes on the 5th of May 1800. After studying three years at a normal school with the view of becoming a teacher, he was in 1822 on political grounds expelled from the seminary. He then studied law, but in 1826 he established in Paris a publishing business for the issue of works adapted to improve the system of school instruction, or to promote the general culture of the community. He published manuals in various departments of knowledge, dictionaries of modern and ancient languages, educational journals, and French, Latin and Greek classics annotated with great care by the most eminent authorities. Subsequently to 1850 he, in conjunction with other partners, published a cheap railway library, scientific and miscellaneous libraries, an illustrated library for the young, libraries of ancient literature, of modern foreign literature, and of modern foreign romance, a series of guide-books and a series of dictionaries of universal reference. In 1855 he also founded *Le Journal pour tous*, a publication with a circulation of 150,000 weekly. Hachette also manifested great interest in the formation of mutual friendly societies among the working classes, in the establishment of benevolent institutions, and in other questions relating to the amelioration of the poor, on which subjects he wrote various pamphlets; and he lent the weight of his influence towards a just settlement of the question of international literary copyright. He died on the 31st of July 1864.

HACHURE (French for "hatching"), the term for the conventional lines used in hill or mountain shading upon a map (*q.v.*) to indicate the slope of the surface, the depth of shading being greatest where the slope is steepest. The method is less accurate than that of contour lines, but gives an indication of the trend and extent of a range or mountain system, especially upon small-scale maps.

HACIENDA (O. Span. *facienda*, from the Latin, meaning "things to be done"), a Spanish term for a landed estate. It is commonly applied in Spanish America to a country estate, on which stock-raising, manufacturing or mining may be carried on, usually with a dwelling-house for the owner's residence upon it. It is thus used loosely for a country house.

HACKBERRY, a name given to the fruit of *Celtis occidentalis*, belonging to the natural botanical order *Ulmaceae*, to which also belongs the elm (*Ulmus*). It is also known under the name of "sugar-berry," "beaver-wood" and "nettle-tree." The hackberry tree is of middle size, attaining from 60 to 80 ft. in height (though sometimes reaching 130 ft.), and with the aspect of an elm. The leaves are ovate in shape, with a very long taper point, rounded and usually very oblique at the base, usually glabrous above and soft-pubescent beneath. The soft filmy flowers appear early in the spring before the expansion of the leaves. The fruit is oblong, about half to three-quarters of an inch long, of a reddish or yellowish colour when young, turning to a dark purple in autumn. This tree is distributed through the deep shady forests bordering river banks from Canada (where it is very rare) to the southern states. The fruit has a sweetish and slightly astringent taste, and is largely eaten in the United States. The seeds contain an oil like that of almonds. The bark is tough and fibrous like hemp, and the wood is heavy, soft, fragile and coarse-grained, and is used for making fences and furniture. The root has been used as a dye for linens.

HACKENSACK, a town and the county-seat of Bergen county, New Jersey, U.S.A., on the Hackensack river, 13 m. N. of Jersey City. Pop. (1890) 6004; (1900) 9443, of whom 2009 were foreign-born and 515 were negroes; (1905) 11,008; (1910) 14,050. It is served by the New York, Susquehanna & Western, and the New Jersey & New York railways, both being controlled by the Erie Company; and indirectly by the West Shore (at Bogota, ½ m. S.E.). Electric lines connect Hackensack with Newark, Passaic and Paterson, and with New York ferries. The town extends from the low bank of the river W. to the top of a ridge, about 40 ft. higher up, from which there are good views to the S. and E. Hackensack is principally a residential town, though there are a number of manufacturing establishments in and near it. Silk and silk goods and wall-paper are the principal manufactures. In 1905 the value of the town's factory product was $1,488,358, an increase of 90·3% since 1900. There are an historic mansion-house and an interesting old Dutch church, both erected during the 18th century; and a monument marks the grave of General Enoch Poor (1736–1780), an officer in the War of Independence, who was born at Andover, Mass., entered the Continental Army from New Hampshire, and took part in the campaign against Burgoyne, in the battle of Monmouth and in General Sullivan's expedition against the Iroquois. Hackensack was settled by the Dutch about 1640, and was named after the Hackensack Indians, a division of the Unami Delawares, who lived in the valleys of the Hackensack and Passaic rivers, and whose best-known chief was Oritany, a friend of the whites. Hackensack is coextensive with the township of New Barbadoes, first incorporated with considerably larger territory in 1693.

HACKET, JOHN (1592–1670), bishop of Lichfield and Coventry, was born in London and educated at Westminster and Trinity College, Cambridge. On taking his degree he was elected a fellow of his college, and soon afterwards wrote the comedy of *Loiola* (London, 1648), which was twice performed before James I. He was ordained in 1618, and through the influence of John Williams (1582–1650) became rector in 1621 of Stoke Hammond, Bucks, and Kirkby Underwood, Lincolnshire. In 1623 he was chaplain to James, and in 1624 Williams presented him to the livings of St Andrew's, Holborn, and Cheam, Surrey. When the so-called "root-and-branch bill" was before parliament in 1641, Hacket was selected to plead in the House of Commons for the continuance of cathedral establishments. In 1645 his living of St Andrew's was sequestered, but he was allowed to retain the rectory of Cheam. On the accession of Charles II. his fortunes improved; he frequently preached before the king, and in 1661 was consecrated bishop of Lichfield and Coventry. His best-known book is the excellent biography of his patron, Archbishop Williams, entitled *Scrinia reserata: a Memorial offered to the great Deservings of John Williams, D.D.* (London, 1693).

HACKETT, HORATIO BALCH (1808–1875), American biblical scholar, was born in Salisbury, Massachusetts, on the 27th of December 1808. He was educated at Phillips-Andover Academy, at Amherst College, where he graduated as valedictorian in 1830, and at Andover Theological Seminary, where he graduated in 1834. He was adjunct professor of Latin and Greek Languages and Literature at Brown University in 1835–1838 and professor of Hebrew Literature there in 1838–1839, was ordained to the Baptist ministry in 1839—he had become a Baptist at Andover as the result of preparing a paper on baptism in the New Testament and the Fathers—and in 1839–1868 he was professor of

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Biblical literature and interpretation in Newton Theological Institution where his most important work was the introduction of the modern German methods of Biblical criticism, which he had learned from Moses Stuart at Andover and with which he made himself more familiar in Germany (especially under Tholuck at Halle) in 1841. He travelled in Egypt and Palestine in 1852, and in 1858–1859 in Greece, becoming proficient in modern Greek. From 1870 until his death in Rochester, New York, on the 2nd of November 1875, he was professor of Biblical literature and New Testament exegesis in the Rochester Theological Seminary. He was a great teacher but a greater critical and exegetical scholar.

He wrote *Christian Memorials of the War* (1864); an English version of Winer's *Grammar of the Chaldee Language* (1844); *Exercises in Hebrew Grammar* (1847); and various articles on the Semitic language and literature in periodicals; but his best-known work was in general commentary on the Bible and translation, and in the special text study of the New Testament. Under these two headings fall: *Illustrations of Scripture; suggested by a Tour through the Holy Land* (1855); the American revision, with Ezra Abbot, of Smith's *Dictionary of the Bible*, to the British edition of which he had contributed about thirty articles; *Commentary on the Original Text of the Acts of the Apostles* (1852; 2nd edition, 1858), for many years the best English commentary; *Notes on the Greek Text of the Epistle of Paul to Philemon*, and a *Revised Version* of Philemon, both published in 1860; the English versions, in Schaff's edition of Lange's *Commentaries*, of Van Oosterzee's *Philemon* and Brunne's *Philippians*; and for the American Bible Union Version of the Bible he translated the books of Ruth and Judges, and aided T. J. Conant in editorial revision; and he was one of the American translators for the English Bible revision.

See *Memorials of Horatio Balch Hackett* (Rochester, N.Y., 1876), edited by G. H. Whittemore.

HACKETT, JAMES HENRY (1800–1871), American actor, was born in New York. After an unsuccessful entry into business, in 1826 he went on the stage, where he soon established a reputation as a player of eccentric character parts. As Falstaff he was no less successful in England than in America. At various times he went into management, and he was the author of *Notes and Comments on Shakespeare* (1863).

His son, JAMES KETELTAS HACKETT (1869–), born at Wolfe Island, Ontario, and educated at the College of the City of New York, also became an actor. He came into prominence at the Lyceum in Daniel Frohman's company, and afterwards had considerable success in romantic parts. As a manager he stood outside the American syndicate of theatres, and organized several companies to play throughout the United States. In 1897 he married Mary Mannering, the Anglo-American actress.

HACKLÄNDER, FRIEDRICH WILHELM VON (1816–1877), German novelist and dramatist, was born at Burtscheid near Aix-la-Chapelle on the 1st of November 1816. Having served an apprenticeship in a commercial house, he entered the Prussian artillery, but, disappointed at not finding advancement, returned to business. A soldier's life had a fascination for him, and he made his début as an author with *Bilder aus dem Soldatenleben im Frieden* (1841). After a journey to the east, he was appointed secretary to the crown prince of Württemberg, whom he accompanied on his travels. *Wachtstubenabenteuer*, a continuation of his first work, appeared in 1845, and it was followed by *Bilder aus dem Soldatenleben im Kriege* (1849–1850). As a result of a tour in Spain in 1854, appeared *Ein Winter in Spanien* (1855). In 1857 he founded, in conjunction with Edmund von Zoller, the illustrated weekly, *Über Land und Meer*. In 1859 Hackländer was appointed director of royal parks and public gardens at Stuttgart, and in this post did much towards the embellishment of the city. In 1859 he was attached to the headquarters staff of the Austrian army during the Italian war; in 1861 he was raised to an hereditary knighthood in Austria; in 1863 he retired into private life, and died on the 6th of July 1877. Hackländer's literary talent is confined within narrow limits. There is much in his works of lively, adventurous and even romantic description, but the character-drawing is feeble and superficial.

Hackländer was a voluminous writer; the most complete edition of his works is the third, published at Stuttgart in 1876, in 60 volumes. There is also a good selection in 20 volumes (1881). Among his novels, *Namenlose Geschichten* (1851); *Eugen Stillfried* (1852); *Krieg und Frieden* (1859), and the comedies *Der geheime Agent* (1850) and *Magnetische Kuren* (1851) may be specially mentioned. His autobiography appeared in 1878 under the title, *Der Roman meines Lebens* (2 vols.). See H. Morning, *Erinnerungen an F. W. Hackländer* (1878).

HACKNEY, a north-eastern metropolitan borough of London, England, bounded W. by Stoke Newington and Islington, and S. by Shoreditch, Bethnal Green and Poplar, and extending N. and E. to the boundary of the county of London. Pop. (1901), 210,272. It is a poor and populous district, in which the main thoroughfares are Kingsland Road, continued N. as Stoke Newington Road and Stamford Hill; Mare Street, continued N.W. as Clapton Road to join Stamford Hill; and Lea Bridge Road running N.E. towards Walthamstow and Low Leyton. The borough includes the districts of Clapton in the north, Homerton in the east, and Dalston and part of Kingsland in the west. On the east lies the open flat valley of the Lea, which flows in several branches, and is bordered, immediately outside the confines of the borough, by the extensive reservoirs of the East London water-works. In these low lands lie the Hackney Marshes (338 acres; among several so-called marshes in the Lea valley), and the borough also contains part of Victoria Park and a number of open spaces collectively called the Hackney Commons, including Mill Fields, Hackney Downs, London Fields, &c. The total area of open spaces exceeds 500 acres. The tower of the ancient parish church of St Augustine, with the chapel of the Rowe family, still stands, and is the only historic building of importance. Among institutions are the German hospital, Dalston, Metropolitan hospital, Kingsland Road, and Eastern Fever hospital, Homerton; and the Hackney polytechnic institute, with which is incorporated the Sir John Cass institute. Cass (1666–1718), a merchant of the city of London, also a member of parliament and sheriff, bequeathed £1000 for the foundation of a free school; in 1732 the bequest was increased in accordance with an unfinished codicil to his will; and the income provided from it is now about £6000, some 250 boys and girls being educated. The parliamentary borough of Hackney comprises north, central and south divisions, each returning one member; and the northern division includes the metropolitan borough of Stoke Newington. The metropolitan borough of Hackney includes part of the Hornsey parliamentary division of Middlesex. The borough council consists of a mayor, 10 aldermen and 60 councillors. Area, 3288·9 acres.

In the 13th century the name appears as *Hackenaye* or *Hacquenye*, but no certain derivation is advanced. Roman and other remains have been found in Hackney Marshes. In 1290 the bishop of London was lord of the manor, which was so held until 1550, when it was granted to Thomas, Lord Wentworth. In 1607 it came into the hands of the Tyssen family. Extensive property in the parish also belonged to the priory of the Knights Hospitallers of St John of Jerusalem at Clerkenwell. From the 16th to the early 19th century there were many fine residences in Hackney. The neighbourhood of Hackney had at one time an evil reputation as the haunt of highwaymen.

HACKNEY (from Fr. *haquenée*, Lat. *equus*, an ambling horse or mare, especially for ladies to ride; the English "hack" is simply an abbreviation), originally a riding-horse. At the present day, however, the hackney (as opposed to a thoroughbred) is bred for driving as well as riding (see HORSE: *Breeds*). From the hiring-out of hackneys, the word came to be associated with employment for hire (so "a hack," as a general term for "drudge"), especially in combination, *e.g.* hackney-chair, hackney-coach, hackney-boat. The hackney-coach, a coach with four wheels and two horses, was a form of hired public conveyance (see CARRIAGE).

HADAD, the name of a Syrian deity, is met with in the Old Testament as the name of several human persons; it also occurs in compound forms like Benhadad and Hadadezer. The divinity primarily denoted by it is the storm-god who was known also as Ramman, Bir and Dadda. The Syrian kings of Damascus seem to have habitually assumed the title of Benhadad, or son of Hadad (three of this name are mentioned in Scripture), just as a series of Egyptian monarchs are known to have been

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accustomed to call themselves sons of Amon-Ra. The word Hadadrimmon, for which the inferior reading Hadarrimmon is found in some MSS. in the phrase "the mourning of (or at) Hadadrimmon" (Zech. xii. 11), has been a subject of much discussion. According to Jerome and all the older Christian interpreters, the mourning for something that occurred at a place called Hadadrimmon (Maximianopolis) in the valley of Megiddo is meant, the event alluded to being generally held to be the death of Josiah (or, as in the Targum, the death of Ahab at the hands of Hadadrimmon); but more recently the opinion has been gaining ground that Hadadrimmon is merely another name for Adonis (*q.v.*) or Tammuz, the allusion being to the mournings by which the Adonis festivals were usually accompanied (Hitzig on Zech. xii. 11, Isa. xvii. 8; Movers, *Phönizier*, i. 196). T. K. Cheyne (*Encycl. Bibl.* s.v.) points out that the Septuagint reads simply Rimmon, and argues that this may be a corruption of Migdon (Megiddo), in itself a corruption of Tammuz-Adon. He would render the verse, "In that day there shall be a great mourning in Jerusalem, as the mourning of the women who weep for Tammuz-Adon" (*Adon* means lord).

HADDINGTON, EARL OF, a Scottish title bestowed in 1627 upon Thomas Hamilton, earl of Melrose (1563–1637). Thomas, who was a member of the great family of Hamilton, being a son of Thomas Hamilton of Priesthield, was a lawyer who became a lord of session as Lord Drumcairn in 1592. He was on very friendly terms with James VI., his legal talents being useful to the king, and he was one of the eight men who, called the Octavians, were appointed to manage the finances of Scotland in 1596. Having also become king's advocate in 1596, Hamilton was entrusted with a large share in the government of his country when James went to London in 1603; in 1612 he was appointed secretary of state for Scotland, and in 1613 he was created Lord Binning and Byres. In 1616 he became lord president of the court of session, and three years later was created earl of Melrose, a title which he exchanged in 1627 for that of earl of Haddington. After the death of James I. the earl resigned his offices of president of the court of session and secretary of state, but he served Charles I. as lord privy seal. He died on the 20th of May 1637. Haddington, who was both scholarly and wealthy, left a large and valuable collection of papers, which is now in the Advocates' library at Edinburgh. James referred familiarly to his friend as *Tam o' the Cowgate*, his Edinburgh residence being in this street.

The earl's eldest son THOMAS, the 2nd earl (1600–1640), was a covenanter and a soldier, being killed by an explosion at Dunglass castle on the 30th of August 1640. His sons, THOMAS (d. 1645) and JOHN (d. 1669), became respectively the 3rd and 4th earls of Haddington, and John's grandson THOMAS (1679–1735) succeeded his father CHARLES (*c.* 1650–1685), as 6th earl in 1685, although he was not the eldest but the second son. This curious circumstance arose from the fact that when Charles married Margaret (d. 1700), the heiress of the earldom of Rothes, it was agreed that the two earldoms should be left separate; thus the eldest son John became earl of Rothes while Thomas became earl of Haddington. Thomas was a supporter of George I. during the rising of 1715, and was a representative peer for Scotland from 1716 to 1734. He died on the 28th of November 1735.

The 6th earl was a writer, but in this direction his elder son, CHARLES, Lord Binning (1697–1732), is perhaps more celebrated. After fighting by his father's side at Sheriffmuir in 1715 and serving as member of parliament for St Germans, Binning died at Naples on the 27th of December 1732. His eldest son, THOMAS (*c.* 1720–1794), became the 7th earl in 1735, and the latter's grandson THOMAS (1780–1858) became the 9th earl in 1828. The 9th earl had been a member of parliament from 1802 to 1827, when he was made a peer of the United Kingdom as Baron Melros of Tyninghame, a title which became extinct upon his death. In 1834 he became lord-lieutenant of Ireland under Sir Robert Peel, leaving office in the following year, and in Peel's second administration (1841–1846) he served as first lord of the admiralty and then as lord privy seal. When he died without sons on the 1st of December 1858 the earldom passed to his kinsman, GEORGE BAILLIE (1802–1870), a descendant of the 6th earl. This nobleman took the name of Baillie-Hamilton, and his son GEORGE (b. 1827) became 11th earl of Haddington in 1870.

See *State Papers of Thomas, Earl of Melrose*, published by the Abbotsford Club in 1837, and Sir W. Fraser, *Memorials of the Earls of Haddington* (1889).

HADDINGTON, a royal, municipal and police burgh, and county town of Haddingtonshire, Scotland. Pop. (1901), 3093. It is situated on the Tyne, 18 m. E. of Edinburgh by the North British railway, being the terminus of a branch line from Longniddry Junction. Five bridges cross the river, on the right bank of which lies the old and somewhat decayed suburb of Nungate, interesting as having contained the Giffordgate, where John Knox was born, and where also are the ruins of the pre-Reformation chapel of St Martin. The principal building in the town is St Mary's church, a cruciform Decorated edifice in red sandstone, probably dating from the 13th century. It is 210 ft. long, and is surmounted by a square tower 90 ft. high. The nave, restored in 1892, is used as the parish church, but the choir and transepts are roofless, though otherwise kept in repair. In a vault is a fine monument in alabaster, consisting of the recumbent figures of John, Lord Maitland of Thirlestane (1545–1595), chancellor of Scotland, and his wife. The laudatory sonnet composed by James VI. is inscribed on the tomb. In the same vault John, duke of Lauderdale (1616–1682), is buried. In the choir is the tombstone which Carlyle erected over the grave of his wife, Jane Baillie Welsh (1801–1866), a native of the town. Other public edifices include the county buildings in the Tudor style, in front of which stands the monument to George, 8th marquess of Tweeddale (1787–1876), who was such an expert and enthusiastic coachman that he once drove the mail from London to Haddington without taking rest; the corn exchange, next to that of Edinburgh the largest in Scotland; the town house, with a spire 150 ft. high, in front of which is a monument to John Home, the author of *Douglas*; the district asylum to the north of the burgh; the western district hospital; the Tenterfield home for children; the free library and the Knox Memorial Institute. This last-named building was erected in 1879 to replace the old and famous grammar school, where John Knox, William Dunbar, John Major and possibly George Buchanan and Sir David Lindsay were educated. John Brown (1722–1787), a once celebrated dissenting divine, author of the *Self-Interpreting Bible*, ministered in the burgh for 36 years and is buried there; his son John the theologian (1754–1832), and his grandson Samuel (1817–1856), the chemist, noted for his inquiries into the atomic theory, were natives. Samuel Smiles (1812–1904), author of *Character*, *Self-Help* and other works, was also born there, and Edward Irving was for years mathematical master in the grammar school. In Hardgate Street is "Bothwell Castle," the town house of the earl of Bothwell, where Mary Queen of Scots rested on her way to Dunbar. The ancient market cross has been restored. The leading industries are the making of agricultural implements, manufactures of woollens and sacking, brewing, tanning and coach-building, besides corn mills and engineering works.

The burgh is the retail centre for a large district, and its grain markets, once the largest in Scotland, are still of considerable importance. Haddington was created a royal burgh by David I. It also received charters from Robert Bruce, Robert II. and James VI. In 1139 it was given as a dowry to Ada, daughter of William de Warenne, earl of Surrey, on her marriage to Prince Henry, the only son of David I. It was occasionally the residence of royalty, and Alexander II. was born there in 1198. Lying in the direct road of the English invaders, the town was often ravaged. It was burned by King John in 1216 and by Henry III. in 1244. Fortified in 1548 by Lord Grey of Wilton, the English commander, it was besieged next year by the Scots and French, who forced the garrison to withdraw. So much slaughter had gone on during that period of storm and stress that it was long impossible to excavate in any direction without coming

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on human remains. The town has suffered much periodically from floods. One of the most memorable of these occurred on the 4th of October 1775, when the Tyne rose 8 ft. 9 in. above its bed and inundated a great part of the burgh. An inscription in the centre of the town records the event and marks the point to which the water rose.

There are many interesting places within a few miles of Haddington. Five miles E. is Whittingehame House, and 5 m. N.E. is the thriving village of East Linton (pop. 919). About 2½ m. N. lies Athelstaneford (locally, Elshinford), so named from the victory of Hungus, king of the Picts, in the 8th century over the Northumbrian Athelstane. On a hill near Drem, 3½ m. N. by W., are traces of a Romano-British settlement, and the remains of the priest's house of the Knights Templars, to whom the barony once belonged. On the coast is the pretty village of Aberlady on a fine bay, and in the neighbourhood are some of the finest golf links in Scotland, such as Luffness, Gullane, Archerfield and Muirfield. On Gosford Bay is Gosford House, an 18th-century mansion, the seat of the earl of Wemyss. At Gladsmuir, 3½ m. W. of Haddington, alleged by some to have been the birthplace of George Heriot, Principal Robertson was minister and wrote most of his *History of Scotland*. Of the old seat of the Douglases at Longniddry few traces remain, and in the chapel, now in ruins, at the eastern end of the village, John Knox is said to have preached occasionally. At Gifford, 4 m. to the S., John Witherspoon (1722–1794), president of the College of New Jersey (Princeton), and Charles Nisbet (1736–1804), president of Dickinson College, Carlisle, Pennsylvania, were born. A little to the south of Gifford are Yester House, a seat of the marquess of Tweeddale, finely situated in a park of old trees, and the ruins of Yester Castle. The cavern locally known as Hobgoblin Hall is described in *Marmion*, and is associated with all kinds of manifestations of the black art. Leinnodowe, 1½ m. to the S., a seat of Lord Blantyre, originally called Lethington, and for a few centuries was associated with the Maitlands. Amisfield, adjoining Haddington on the N.E., is another seat of the earl of Wemyss.

HADDINGTONSHIRE, or EAST LOTHIAN, a south-eastern county of Scotland, bounded N. by the Firth of Forth, N.E. by the North Sea, E., S.E. and S. by Berwickshire, and S.W. and W. by Edinburghshire. It covers an area of 171,011 acres, or 267 sq. m. Its sea-coast measures 41 m. The Bass Rock and Fidra Isle belong to the shire, and there are numerous rocks and reefs off the shore, especially between Dunbar and Gullane Bay. Broadly speaking, the northern half of the shire slopes gently to the coast, and the southern half is hilly. Several of the peaks of the Lammermuirs exceed 1500 ft., and the more level ground is broken by Traprain Law (724) in the parish of Prestonkirk, North Berwick Law (612), and Garleton Hill (590) to the north of the county town. The only important river is the Tyne, which rises to the south-east of Borthwick in Mid-Lothian, and, taking a generally north-easterly direction, reaches the sea just beyond the park of Tynninghame House, after a course of 28 m., for the first 7 m. of which it belongs to its parent shire. It is noted for a very fine variety of trout, and salmon are sometimes taken below the linn at East Linton. The Whiteadder rises in the parish of Whittingehame, but, flowing towards the south-east, leaves the shire and at last joins the Tweed near Berwick. There are no natural lakes, but in the parish of Stenton is found Pressmennan Loch, an artificial sheet of water of somewhat serpentine shape, about 2 m. in length, with a width of some 400 yds., which was constructed in 1819 by damming up the ravine in which it lies. The banks are wooded and picturesque, and the water abounds with trout.

Geology.—The higher ground in the south, including the Lammermuir Hills, is formed of shales, greywackes and grits of Ordovician and Silurian age; a narrow belt of the former lying on the south-western side of the latter, the strike being S.W. to N.E. The granitic mass of Priestlaw and other felsitic rocks have been intruded into these strata. The lower Old Red Sandstone has not been observed in this county, but the younger sandstones and conglomerates fill up ancient depressions in the Silurian and Ordovician, such as that running northward from Oldhamstocks towards Dunbar and the valley of Lauderdale. A faulted-in tract of the same formation, about 1 m. in breadth, runs west-north-west from Dunbar to near Gifford. Carboniferous rocks form the remainder of the county. The Calciferous Sandstone series, shales, thin limestones and sandstones, is exposed on the south-eastern coast; but between Gifford and North Berwick and from Aberlady to Dunbar it is represented by a great thickness of volcanic rocks consisting of tuffs and coarse breccias in the lower beds, and of porphyritic and andesitic lavas above. These rocks are well exposed on the coast, in the Garleton Hills and Traprain Law; the latter and North Berwick Law are volcanic necks or vents. The Carboniferous Limestone series which succeeds the Calciferous Sandstone consists of a middle group of sandstones, shales, coals and ironstones, with a limestone group above and below. The coal-field is synclinal in structure, Port Seton being about the centre; it contains ten seams of coal, and the area covered by it is some 30 sq. m. Glacial boulder clay lies over much of the lower ground, and ridges of gravel and sand flank the hills and form extensive sheets. Traces of old raised sea-beaches are found at several points along the coast. At North Berwick, Tynninghame and elsewhere there are stretches of blown sand. Limestone is worked at many places, and hematite was formerly obtained from the Garleton Hills.

Climate and Agriculture.—Though the county is exposed to the full sweep of the east wind during March, April and May, the climate is on the whole mild and equable. The rainfall is far below the average of Great Britain, the mean for the year being 25 in., highest in midsummer and lowest in spring. The average temperature for the year is 47°·5 F., for January 38° and for July 59°. Throughout nearly the whole of the 19th century East Lothian agriculture was held to be the best in Scotland, not so much in consequence of the natural fertility of the soil as because of the enterprise of the cultivators, several of whom, like George Hope of Fenton Barns (1811–1876), brought scientific farming almost to perfection. Mechanical appliances were adopted with exceptional alacrity, and indeed some that afterwards came into general use were first employed in Haddington. Drill sowing of turnips dates from 1734. The threshing machine was introduced by Andrew Meikle (1719–1811) in 1787, the steam plough in 1862, and the reaping machine soon after its invention, while tile draining was first extensively used in the county. East Lothian is famous for the richness of its grain and green crops, the size of its holdings (average 200 acres) and the good housing of its labourers. The soils vary. Much of the Lammermuirs is necessarily unproductive, though the lower slopes are cultivated, a considerable tract of the land being very good. In the centre of the shire occurs a belt of tenacious yellow clay on a tilly subsoil which is not adapted for agriculture. Along the coast the soil is sandy, but farther inland it is composed of rich loam and is very fertile. The land about Dunbar is the most productive, yielding a potato—the "Dunbar red"—which is highly esteemed in the markets. Of the grain crops oats and barley are the principal, and their acreage is almost a constant, but wheat, after a prolonged decline, has experienced a revival. Turnips and potatoes are cultivated extensively, and with marked success, and constitute nearly all the green crops raised. Although pasture-land is below the average, live-stock are reared profitably. About one-sixteenth of the total area is under wood.

Other Industries.—Fisheries are conducted from Dunbar, North Berwick, Port Seton and Prestonpans, the catch consisting chiefly of cod, haddock, whiting and shellfish. Fireclay as well as limestone is worked, and there are some stone quarries, but the manufactures are mainly agricultural implements, pottery, woollens, artificial manures, feeding-stuffs and salt, besides brewing. Coal of a very fair quality is extensively worked at Tranent, Ormiston, Macmerry and near Prestonpans, the coal-field having an area of about 30 sq. m. Limestone is found throughout the greater part of the shire. A vein of hematite of a peculiarly fine character was discovered in 1866 at Garleton Hill, and wrought for some years. Ironstone has been mined at Macmerry.

The North British Company possess the sole running powers in the county, through which is laid their main line to Berwick and the south. Branches are sent off at Drem to North Berwick, at Longniddry to Haddington and also to Gullane, at Smeaton (in Mid-Lothian) to Macmerry, and at Ormiston to Gifford.

Population and Government.—The population was 37,377 in 1801, and 38,665 in 1901, when 450 persons spoke Gaelic and English, and 7 spoke Gaelic only. The chief towns are Dunbar (pop. in 1901, 3581), Haddington (3093), North Berwick (2899), Prestonpans (2614) and Tranent (2584). The county, which returns one member to Parliament, forms part of the sheriffdom of the Lothians and Peebles, and there is a resident sheriff-substitute at Haddington, who sits also at Dunbar, Tranent

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and North Berwick. The shire is under school-board jurisdiction, and besides high schools at Haddington and North Berwick, some of the elementary schools earn grants for higher education. The county council spends a proportion of the "residue" grant in supporting short courses of instruction in technical subjects (chiefly agriculture), in experiments in the feeding of cattle and the growing of crops, and in defraying the travelling expenses of technical students.

History.—Of the Celts, who were probably the earliest inhabitants, traces are found in a few place names and circular camps (in the parishes of Garvald and Whittinghame) and hill forts (in the parish of Bolton). After the Roman occupation, of which few traces remain, the district formed part of the Saxon kingdom of Northumbria until 1018, when it was joined to Scotland by Malcolm II. It was comparatively prosperous till the wars of Bruce and Baliol, but from that period down to the union of the kingdoms it suffered from its nearness to the Border and from civil strife. The last battles fought in the county were those of Dunbar (1650) and Prestonpans (1745).

See J. Miller, *History of Haddington* (1844); D. Croal, *Sketches of East Lothian* (Haddington, 1873); John Martine, *Reminiscences of the County of Haddington* (Haddington, 1890, 1894); Dr Wallace James, *Writs and Charters of Haddington* (Haddington, 1898).

HADDOCK (*Gadus aeglefinus*), a fish which differs from the cod in having the mental barbel very short, the first anal fin with 22 to 25 rays, instead of 17 to 20, and the lateral line dark instead of whitish; it has a large blackish spot above each pectoral fin—associated in legend with the marks of St Peter's finger and thumb, the haddock being supposed to be the fish from whose mouth he took the tribute-money. It attains to a weight of 15 lb. and is one of the most valuable food fishes of Europe, both fresh and smoked, the "finnan haddie" of Scotland being famous. It is common round the British and Irish coasts, and generally distributed along the shores of the North Sea, extending across the Atlantic to the coast of North America.

HADDON HALL, one of the most famous ancient mansions in England. It lies on the left bank of the river Wye, 2 m. S.E. of Bakewell in Derbyshire. It is not now used as a residence, but the fabric is maintained in order. The building is of stone and oblong in form, and encloses two quadrangles separated by the great banqueting-hall and adjoining chambers. The greater part is of two storeys, and surmounted by battlements. To the south and south-east lie terraced gardens, and the south front of the eastern quadrangle is occupied by the splendid ball-room or long gallery. At the south-west corner of the mansion is the chapel; at the north-east the Peveril tower. The periods of building represented are as follows. Norman work appears in the chapel (which also served as a church for the neighbouring villagers), also in certain fundamental parts of the fabric, notably the Peveril tower. There are Early English and later additions to the chapel; the banqueting-hall, with the great kitchen adjacent to it, and part of the Peveril tower are of the 14th century. The eastern range of rooms, including the state-room, are of the 15th century; the western and north-western parts were built shortly after 1500. The ball-room is of early 17th-century construction, and the terraces and gardens were laid out at this time. A large number of interesting contemporary fittings are preserved, especially in the banqueting-hall and kitchen; and many of the rooms are adorned with tapestries of the 16th and 17th centuries, some of which came from the famous works at Mortlake in Surrey.

A Roman altar was found and is preserved here, but no trace of Roman inhabitants has been discovered. Haddon was a manor which before the Conquest and at the time of the Domesday Survey belonged to the king, but was granted by William the Conqueror to William Peverel, whose son, another William Peverel, forfeited it for treason on the accession of Henry II. Before that time, however, the manor of Haddon had been granted to the family of Avenell, who continued to hold it until one William Avenell died without male issue and his property was divided between his two daughters and heirs, one of whom married Richard Vernon, whose successors acquired the other half of the manor in the reign of Edward III. Sir George Vernon, who died in 1561, was known as the "King of the Peak" on account of his hospitality. His daughter Dorothy married John Manners, second son of the earl of Rutland, who is said to have lived for some time in the woods round Haddon Hall, disguised as a gamekeeper, until he persuaded Dorothy to elope with him. On Sir George's death without male issue Haddon passed to John Manners and Dorothy, who lived in the Hall. Their grandson John Manners succeeded to the title of earl of Rutland in 1641, and the duke of Rutland is still lord of the manor.

See *Victoria County History, Derbyshire*; S. Rayner, *History and Antiquities of Haddon Hall* (1836–1837); Haddon Hall, *History and Antiquities of Haddon Hall* (1867); G. le Blanc Smith, *Haddon, the Manor, the Hall, its Lords and Traditions* (London, 1906).

HADEN, SIR FRANCIS SEYMOUR (1818–1910), English surgeon and etcher, was born in London on the 16th of September 1818, his father, Charles Thomas Haden, being a well-known doctor and amateur of music. He was educated at University College school and University College, London, and also studied at the Sorbonne, Paris, where he took his degree in 1840. He was admitted as a member of the College of Surgeons in London in 1842. Besides his many-sided activities in the scientific world, during a busy and distinguished career as a surgeon, he followed the art of original etching with such vigour that he became not only the foremost British exponent of that art but was the principal cause of its revival in England. By his strenuous efforts and perseverance, aided by the secretarial ability of Sir W. R. Drake, he founded the Royal Society of Painter-Etchers and Engravers. As president he ruled the destinies of that society with a strong hand from its first beginnings in 1880. In 1843–1844, with his friends Duval, Le Cannes and Col. Guibout, he had travelled in Italy and made his first sketches from nature. Haden attended no art school and had no art teachers, but in 1845, 1846, 1847 and 1848 he studied portfolios of prints belonging to an old second-hand dealer named Love, who had a shop in Bunhill Row, the old Quaker quarter of London. These portfolios he would carry home, and arranging the prints in chronological order, he studied the works of the great original engravers, Dürer, Lucas van Leyden and Rembrandt. These studies, besides influencing his original work, led to his important monograph on the etched work of Rembrandt. By lecture and book, and with the aid of the memorable exhibition at the Burlington Fine Arts Club in 1877, he endeavoured to give a just idea of Rembrandt's work, separating the true from the false, and giving altogether a nobler idea of the master's mind by taking away from the list of his works many dull and unseemly plates that had long been included in the lists. His reasons are founded upon the results of a study of the master's works in chronological order, and are clearly expressed in his monograph, *The Etched Work of Rembrandt critically reconsidered*, privately printed in 1877, and in *The Etched Work of Rembrandt True and False* (1895). Notwithstanding all this study of the old masters of his art, Haden's own plates are perhaps more individual than any artist's, and are particularly noticeable for a fine original treatment of landscape subjects, free and open in line, clear and well divided in mass, and full of a noble and dignified style of his own. Even when working from a picture his personality dominates the plate, as for example in the large plate he etched after J. M. W. Turner's "Calais Pier," which is a classical example of what interpretative work can do in black and white. Of his original plates, more than 250 in number, one of the most notable was the large "Breaking up of the Agamemnon." An early plate, rare and most beautiful, is "Thames Fisherman." "Mytton Hall" is broad in treatment, and a fine rendering of a shady avenue of yew trees leading to an old manor-house in sunlight. "Sub Tegmine" was etched in Greenwich Park in 1859; and "Early Morning—Richmond," full of the poetry and freshness of the hour, was done, the artist has said, actually at sunrise. One of the rarest and most beautiful of his plates is "A By-Road in Tipperary"; "Combe Bottom" is another; and "Shere Mill Pond" (both the small study and the larger plate), "Sunset in

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Ireland," "Penton Hook," "Grim Spain" and "Evening Fishing, Longparish," are also notable examples of his genius. A catalogue of his works was begun by Sir William Drake and completed by Mr N. Harrington (1880). During later years Haden began to practise the sister art of mezzotint engraving, with a measure of the same success that he had already achieved in pure etching and in dry-point. Some of his mezzotints are: "An Early Riser," a stag seen through the morning mists, "Grayling Fishing" and "A Salmon Pool on the Spey." He also produced some remarkable drawings of trees and park-like country in charcoal.

Other books by Haden not already mentioned are—*Études à l'eau forte* (Paris, 1865); *About Etching* (London, 1878–1879); *The Art of the Painter-Etcher* (London, 1880); *The Relative Claims of Etching and Engraving to rank as Fine Arts and to be represented in the Royal Academy* (London, 1883); *Address to Students of Winchester School of Art* (Winchester, 1888); *Cremation: a Pamphlet* (London, 1875); and *The Disposal of the Dead, a Plea for Legislation* (London, 1888). As the last two indicate, he was an ardent champion of a system of "earth to earth" burial.

Among numerous distinctions he received the Grand Prix, Paris, in 1889 and 1900, and was made a member of the Institut de France, Académie des Beaux-Arts and Société des Artistes Français. He was knighted in 1894, and died on the 1st of June 1910. He married in 1847 a sister of the artist J. A. M. Whistler; and his elder son, Francis Seymour Haden (b. 1850), had a distinguished career as a member of the government in Natal from 1881 to 1893, being made a C.M.G. in 1890. (C.H.*)

HADENDOA (from Beja *Hada*, chief, and *endowa*, people), a nomad tribe of Africans of "Hamitic" origin. They inhabit that part of the eastern Sudan extending from the Abyssinian frontier northward nearly to Suakin. They belong to the Beja people, of which, with the Bisharin and the Ababda, they are the modern representatives. They are a pastoral people, ruled by a hereditary chief who is directly responsible to the (Anglo-Egyptian) Sudan government. Although the official capital of the Hadendoa country is Miktinab, the town of Fillik on an affluent of the Atbara is really their headquarters. A third of the total population is settled in the Suakin country. Osman Digna, one of the best-known chiefs during the Madhia, was a Hadendoa, and the tribe contributed some of the fiercest of the dervish warriors in the wars of 1883–98. So determined were they in their opposition to the Anglo-Egyptian forces that the name Hadendoa grew to be nearly synonymous with "rebel." But this was the result of Egyptian misgovernment rather than religious enthusiasm; for the Hadendoa are true Beja, and Mahommedans only in name. Their elaborate hairdressing gained them the name of "Fuzzy-wuzzies" among the British troops. They earned an unenviable reputation during the wars by their hideous mutilations of the dead on the battlefields. After the reconquest of the Egyptian Sudan (1896–98) the Hadendoa accepted the new order without demur.

See *Anglo-Egyptian Sudan*, edited by Count Gleichen (London, 1905); Sir F. R. Wingate, *Mahdism and the Egyptian Sudan* (London, 1891); G. Sergi, *Africa: Anthropology of the Hamitic Race* (1897); A. H. Keane, *Ethnology of the Egyptian Sudan* (1884).

HADERSLEBEN (Dan. *Hadersler*), a town of Germany, in the Prussian province of Schleswig-Holstein, 31 m. N. from Flensburg. Pop. (1905) 9289. It lies in a pleasant valley on the Hadersleben fjord, which is about 9 m. in length, and communicates with the Little Belt, and at the junction of the main line of railway from Woyens with three vicinal lines. The principal buildings are the beautiful church of St Mary, dating from the 13th century, the theological seminary established in 1870, the gymnasium and the hospital. The industries include iron-founding, tanning, and the manufacture of machines, tobacco and gloves. The harbour is only accessible to small vessels.

Hadersleben is first mentioned in 1228, and received municipal rights from Duke Waldemar II. in 1292. It suffered considerably during the wars between Schleswig and Holstein in the 15th century. In November 1864 it passed with Schleswig to Prussia. Two Danish kings, Frederick II. and Frederick III., were born at Hadersleben.

See A. Sach, *Der Ursprung der Stadt Hadersleben* (Hadersleben, 1892).

HADING, JANE (1850–), French actress, whose real name was Jeanne Alfrédine Tréfouret, was born on the 25th of November 1850 at Marseilles, where her father was an actor at the Gymnase. She was trained at the local Conservatoire and was engaged in 1873 for the theatre at Algiers, and afterwards for the Khedivial theatre at Cairo, where she played, in turn, coquette, soubrette and *ingénue* parts. Expectations had been raised by her voice, and when she returned to Marseilles she sang in operetta, besides acting in *Ruy Blas*. Her Paris début was in *La Chaste Suzanne* at the Palais Royal, and she was again heard in operetta at the Renaissance. In 1883 she had a great success at the Gymnase in *Le Maître de forges*. In 1884 she married Victor Koning (1842–1894), the manager of that theatre, but divorced him in 1887. In 1888 she toured America with Coquelin, and on her return helped to give success to Lavedan's *Prince d'Aurec*, at the Vaudeville. Her reputation as one of the leading actresses of the day was now established not only in France but in America and England. Her later répertoire included *Le Demi-monde*, Capus's *La Châtelaine*, Maurice Donnay's *Retour de Jérusalem*, *La Princesse Georges* by Dumas *fils*, and Émile Bergerat's *Plus que reine*.

HADLEIGH, a market town in the Sudbury parliamentary division of Suffolk, England; 70 m. N.E. from London, the terminus of a branch of the Great Eastern railway. Pop. of urban district (1901), 3245. It lies pleasantly in a well-wooded country on the small river Brett, a tributary of the Stour. The church of St Mary is of good Perpendicular work, with Early English tower and Decorated spire. The Rectory Tower, a turreted gate-house of brick, dates from *c.* 1405. The gild-hall is a Tudor building, and there are other examples of this period. There are a town-hall and corn exchange, and an industry in the manufacture of matting and in malting. Hadleigh was one of the towns in which the woollen industry was started by Flemings, and survived until the 18th century. Among the rectors of Hadleigh several notable names appear, such as Rowland Taylor, the martyr, who was burned at the stake outside the town in 1555, and Hugh James Rose, during whose tenancy of the rectory an initiatory meeting of the leaders of the Oxford Movement took place here in 1833.

Hadleigh, called by the Saxons Heapde-leag, appears in Domesday Book as Hetlega. About 885 Æthelflæd, lady of the Mercians, with the consent of Æthelred her husband, gave Hadleigh to Christ Church, Canterbury. The dean and chapter of Canterbury have held possession of it ever since the Dissolution. In the 17th century Hadleigh was famous for the manufacture of cloth, and in 1618 was sufficiently important to receive incorporation. It was constituted a free borough under the title of the mayor, aldermen and burgesses of Hadleigh. In 1635, in a list of the corporate towns of Suffolk to be assessed for ship money, Hadleigh is named as third in importance. In 1636, owing to a serious visitation of the plague, 200 families were thrown out of work, and in 1687 so much had its importance declined that it was deprived of its charter. An unsuccessful attempt to recover it was made in 1701. There is evidence of the existence of a market here as early as the 13th century. James I., in his charter of incorporation, granted fairs on Monday and Tuesday in Whitsun week, and confirmed an ancient fair at Michaelmas and a market on Monday.

HADLEY, ARTHUR TWINING (1856–), American political economist and educationist, president of Yale University, was born in New Haven, Connecticut, on the 23rd of April 1856. He was the son of James Hadley, the philologist, from whom, as from his mother—whose brother, Alexander Catlin Twining (1801–1884), was an astronomer and authority on constitutional law—he inherited unusual mathematical ability. He graduated at Yale in 1876 as valedictorian, having taken prizes in English, classics and astronomy; studied political

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science at Yale (1876–1877) and at Berlin (1878–1879); was a tutor at Yale in 1879–1883, instructor in political science in 1883–1886, professor of political science in 1886–1891, professor of political economy in 1891–1899, and dean of the Graduate School in 1892–1895; and in 1899 became president of Yale University—the first layman to hold that office. He was commissioner of the Connecticut bureau of labour statistics in 1885–1887. As an economist he first became widely known through his investigation of the railway question and his study of railway rates, which antedated the popular excitement as to rebates. His *Railroad Transportation, its History and Laws* (1885) became a standard work, and appeared in Russian (1886) and French (1887); he testified as an expert on transportation before the Senate committee which drew up the Interstate Commerce Law; and wrote on railways and transportation for the Ninth and Tenth Editions (of which he was one of the editors) of the *Encyclopaedia Britannica*, for Lalor's *Cyclopaedia of Political Science, Political Economy, and Political History of the United States* (3 vols., 1881–1884), for *The American Railway* (1888), and for *The Railroad Gazette* in 1884–1891, and for other periodicals. His idea of the broad scope of economic science, especially of the place of ethics in relation to political economy and business, is expressed in his writings and public addresses. In 1907–1908 he was Theodore Roosevelt professor of American History and Institutions in the university of Berlin.

Among his other publications are: *Economics: an Account of the Relations between Private Property and Public Welfare* (1896); *The Education of the American Citizen* (1901); *The Relations between Freedom and Responsibility in the Evolution of Democratic Government* (1903, in Yale Lectures on the Responsibilities of Citizenship); *Baccalaureate Addresses* (1907); and *Standards of Public Morality* (1907), being the Kennedy Lectures for 1906.

HADLEY, JAMES (1821–1872), American scholar, was born on the 30th of March 1821 in Fairfield, Herkimer county, New York, where his father was professor of chemistry in Fairfield Medical College. At the age of nine an accident lamed him for life. He graduated from Yale in 1842, having entered the Junior class in 1840; studied in the Theological Department of Yale, and in 1844–1845 was a tutor in Middlebury College. He was tutor at Yale in 1845–1848, assistant professor of Greek in 1848–1851, and professor of Greek, succeeding President Woolsey, from 1851 until his death in New Haven on the 14th of November 1872. As an undergraduate he showed himself an able mathematician, but the influence of Edward Elbridge Salisbury, under whom Hadley and W. D. Whitney studied Sanskrit together, turned his attention toward the study of language. He knew Greek, Latin, Sanskrit, Hebrew, Arabic, Armenian, several Celtic languages and the languages of modern Europe; but he published little, and his scholarship found scant outlet in the college class-room. His most original written work was an essay on Greek accent, published in a German version in Curtius's *Studien zur griechischen und lateinischen Grammatik*. Hadley's *Greek Grammar* (1860; revised by Frederic de Forest Allen, 1884) was based on Curtius's *Schulgrammatik* (1852, 1855, 1857, 1859), and long held its place in American schools. Hadley was a member of the American Committee for the revision of the New Testament, was president of the American Oriental Society (1871–1872), and contributed to Webster's dictionary an essay on the *History of the English Language*. In 1873 were published his *Introduction to Roman Law* (edited by T. D. Woolsey) and his *Essays, Philological and Critical* (edited by W. D. Whitney).

See the memorial by Noah Porter in *The New Englander*, vol. xxxii. (Jan. 1873), pp. 35-55; and the sketch by his son, A. T. Hadley, in *Biographical Memoirs* of the National Academy of Sciences, vol. v. (1905), pp. 247-254.

HADLEY, a township of Hampshire county, Massachusetts, U.S.A., on the Connecticut river, about 20 m. N. of Springfield, served by the Boston & Maine railway. Pop. (1900), 1789; (1905, state census), 1895; (1910) 1999. Area, about 20 sq. m. The principal villages are Hadley (or Hadley Center) and North Hadley. The level country along the river is well adapted to tobacco culture, and the villages are engaged in the manufacture of tobacco and brooms. Hadley was settled in 1659 by members of the churches in Hartford and Wethersfield, Connecticut, who were styled "Strict Congregationalists" and withdrew from these Connecticut congregations because of ecclesiastical and doctrinal laxity there. At first the town was called Norwottuck, but within a year or two it was named after Hadleigh in England, and was incorporated under this name in 1661. Hopkins Academy (1815) developed from Hopkins school, founded here in 1664. The English regicides Edward Whalley and his son-in-law William Goffe found a refuge at Hadley from 1664 apparently until their deaths, and there is a tradition that Goffe or Whalley in 1675 led the people in repelling an Indian attack. From 1675 to 1713 Hadley, being in almost constant danger of attack from the Indians, was protected by a palisade enclosure and by stockades around the meeting-house. From Hadley, Hatfield was set apart in 1670, South Hadley in 1753, and Amherst in 1759.

See Alice M. Walker, *Historic Hadley* (New York, 1906); and Sylvester Judd, *History of Hadley* (Northampton, 1863; new ed., 1905).

HADRAMUT, a district on the south coast of Arabia, bounded W. by Yemen, E. by Oman and N. by the Dahna desert. The modern Arabs restrict the name to the coast between Balhâf and Sihut, and the valley of the Wadi Hadramut in the interior; in its wider and commonly accepted signification it includes also the Mahra and Gâra coasts extending eastwards to Mirbat; thus defined, its limits are between 14° and 18° N. and 47° 30′ to 55° E., with a total length of 550 m. and a breadth of 150 m.

The coastal plain is narrow, rarely exceeding 10 m. in width, and in places the hills extend to the seashore. The principal ports are Mukalla and Shihr, both considerable towns, and Kusair and Raida, small fishing villages; inland there are a few villages near the foot of the hills, with a limited area of cultivation irrigated by springs or wells in the bill torrent beds. Behind the littoral plain a range of mountains, or rather a high plateau, falling steeply to the south and more gently to the north, extends continuously from the Yemen highlands on the west to the mouth of the Hadramut valley, from which a similar range extends with hardly a break to the border of Oman. Its crest-line is generally some 30 m. from the coast, and its average height between 4000 and 5000 ft. A number of wadis or ravines cut deeply into the plateau run southwards to the main Wadi Hadramut, a broad valley lying nearly east and west, with a total length from its extreme western heads on the Yemen highlands to its mouth near Sihut of over 500 m. Beyond the valley and steadily encroaching on it lies the great desert extending for 300 m. to the borders of Nejd. The most westerly village in the main valley is Shabwa, in ancient days the capital, but now almost buried by the advancing desert. Lower down the first large villages are Henân and Ajlania, near which the wadis 'Amd, Duwân and el 'Ain unite, and turn sharply W. Kasr. In the W. Duwân and its branches are the villages of Haura, el Hajrên, Kaidun and al Khurêba. Below Haura for some 60 m. there is a succession of villages with fields, gardens and date groves; several tributaries join on either side, among which the W. bin Ali and W. Adim from the south contain numerous villages. The principal towns are Shibâm, al Ghurfa, Saiyun, Tariba, el Ghuraf, Tarim, formerly the chief place, 'Ainat and el Kasm. Below the last-named place there is little cultivation or practically no population. The shrines at Kabr Shâh and Kabr Hud are looked on as specially sacred, and are visited by numbers of pilgrims. The former, which is in the Wadi Ser about 20 m. N.W. of Shibâm, was explored by Theodore Bent in 1894; the tomb itself is of no interest, but in the neighbourhood there are extensive ruins with Himyaritic inscriptions on the stones. Kabr Hud is in the main valley some distance east of Kasm; not far from it is Bir Borhut, a natural grotto, where fumes of burning sulphur issue from a number of volcanic vents; al-Masudi mentions it in the 10th century as an active volcano. Except after heavy rain, there is no running water in the Hadramut valley, the cultivation therefore depends on artificial irrigation from wells. The principal crops are wheat, millet, indigo, dates and tobacco; this latter, known as Hamumi tobacco, is of excellent quality.

Hadramut has preserved its name from the earliest times; it occurs in Genesis as Hazarmaveth and Hadoram, sons of Joktan; and the old Greek geographers mention Adramytta and Chadramotites in their accounts of the frankincense country. The numerous ruins discovered in the W. Duwân and Adim, as well as in the main valley, are evidences of its former prosperity and civilization.

The people, known as Hadrami (plural Hadârim), belong generally to the south Arabian stock, claiming descent from Ya'rab bin Kahtân. There is, however, a large number of

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Seyyids or descendants of the Prophet, and of townsmen of northern origin, besides a considerable class of African or mixed descent. Van den Berg estimates the total population of Hadramut (excluding the Mahra and Gâra) at 150,000, of which he locates 50,000 in the valley between Shibâm and Tarim, 25,000 in the W. Duwân and its tributaries, and 25,000 in Mukalla, Shihr and the coast villages, leaving 50,000 for the non-agricultural population scattered over the rest of the country, probably an excessive estimate.

The Seyyids, descendants of Hosain, grandson of Mahomet, form a numerous and highly respected aristocracy. They are divided into families, the chiefs of which are known as Munsibs, who are looked on as the religious leaders of the people, and are even in some cases venerated as saints. Among the leading families are the Sheikh Abu Bakr of Ainât, the el-Aidrus of Shihr and the Sakkâf of Saiyun. They do not bear arms, nor occupy themselves in trade or manual labour or even agriculture; though owning a large proportion of the land, they employ slaves or hired labourers to cultivate it. As compared with the other classes, they are well educated, and are strict in their observance of religious duties, and owing to the respect due to their descent, they exercise a strong influence both in temporal and spiritual affairs.

The tribesmen, as in Arabia generally, are the predominant class in the population; all the adults carry arms; some of the tribes have settled towns and villages, others lead a nomadic life, keeping, however, within the territory which is recognized as belonging to the tribe. They are divided into sections or families, each headed by a chief or abu (lit. father), while the head of the tribe is called the mukaddam or sultan; the authority of the chief depends largely on his personality: he is the leader in peace and in war, but the tribesmen are not his subjects; he can only rule with their support. The most powerful tribe at present in Hadramut is the Kaiti, a branch of the Yâfa tribe whose settlements lie farther west. Originally invited by the Seyyids to protect the settled districts from the attacks of marauding tribes, they have established themselves as practically the rulers of the country, and now possess the coast district with the towns of Shihr and Mukalla, as well as Haura, Hajrên and Shibâm in the interior. The head of the family has accumulated great wealth, and risen to the highest position in the service of the nizam of Hyderabad in India, as Jamadar, or commander of an Arab levy composed of his tribesmen, numbers of whom go abroad to seek their fortune. The Kathiri tribe was formerly the most powerful; they occupy the towns of Saiyun, Tarim and el-Ghuraf in the richest part of the main Hadramut valley. The chiefs of both the Kaiti and Kathiri are in political relations with the British government, through the resident at Aden (*q.v.*). The 'Amudi in the W. Duwân, and the Nahdi, Awâmir and Tamimi in the main valley, are the principal tribes possessing permanent villages; the Saibân, Hamumi and Manâhil occupy the mountains between the main valley and coast.

The townsmen are the free inhabitants of the towns and villages as distinguished from the Seyyids and the tribesmen: they do not carry arms, but are the working members of the community, merchants, artificers, cultivators and servants, and are entirely dependent on the tribes and chiefs under whose protection they live. The servile class contains a large African element, brought over formerly when the slave trade flourished on this coast; as in all Mahommedan countries they are well treated, and often rise to positions of trust.

As already mentioned, a large number of Arabs from Hadramut go abroad; the Kaiti tribesmen take service in India in the irregular troops of Hyderabad; emigration on a large scale has also gone on, to the Dutch colonies in Java and Sumatra, since the beginning of the 19th century. According to the census of 1885, quoted by Van den Berg in his *Report* published by the government of the Dutch East Indies in 1886, the number of Arabs in those colonies actually born in Arabia was 2500, while those born in the colonies exceeded 20,000; nearly all of the former are from the towns in the Hadramut valley between Shibâm and Tarim. Mukalla and Shihr have a considerable trade with the Red Sea and Persian Gulf ports, as well as with the ports of Aden, Dhafar and Muscat; a large share of this is in the hands of Parsee and other British Indian traders who have established themselves in the Hadramut ports. The principal imports are wheat, rice, sugar, piece goods and hardware. The exports are small; the chief items are honey, tobacco and sharks' fins. In the towns in the interior the principal industries are weaving and dyeing.

The Mahra country adjoins the Hadramut proper, and extends along the coast from Sihut eastwards to the east of Kamar Bay, where the Gâra coast begins and stretches to Mirbat. The sultan of the Mahra, to whom Sokotra also belongs, lives at Kishin, a poor village consisting of a few scattered houses about 30 m. west of Râs Fartak. Sihut is a similar village 20 m. farther west. The mountains rise to a height of 4000 ft. within a short distance of the coast, covered in places with trees, among which are the myrrh- and frankincense-bearing shrubs. These gums, for which the coast was celebrated in ancient days, are still produced; the best quality is obtained in the Gâra country, on the northern slope of the mountains. Dhafar and the mountains behind it were visited and surveyed by Mr Bent's party in 1894. There are several thriving villages on the coast, of which el-Hafa is the principal port of export for frankincense; 9000 cwt. is exported annually to Bombay.

Ruins of Sabaean buildings were found by J. T. Bent in the neighbourhood of Dhafar, and a remarkable cove or small harbour was discovered at Khor Rori, which he identified with the ancient port of Moscha.

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HADRIA [mod. *Atri* (*q.v.*)], perhaps the original terminal point of the Via Caecilia, Italy. It belonged to the Praetutii. It became a colony of Rome in 290 B.C. and remained faithful to Rome. The coins which it issued (probably during the Punic Wars), are remarkable. The crypt of the cathedral of the modern town was originally a large Roman cistern; another forms the foundation of the ducal palace; and in the eastern portion of the town there is a complicated system of underground passages for collecting and storing water.

See *Notizie degli scavi* (1902), 3. (T. As.)

HADRIAN (PUBLIUS AELIUS HADRIANUS), Roman emperor A.D. 117–138, was born on the 24th of January A.D. 76, at Italica in Hispania Baetica (according to others, at Rome), where his ancestors, originally from Hadria in Picenum, had been settled since the time of the Scipios. On his father's death in 85 or 86 he was placed under the guardianship of two fellow-countrymen, his kinsman Ulpius Trajanus (afterwards the emperor Trajan), and Caelius Atilianus (afterwards prefect of the praetorian guard). He spent the next five years at Rome, but at the age of fifteen he returned to his native place and entered upon a military career. He was soon, however, recalled to Rome by Trajan, and appointed to the offices of *decemvir stlitibus judicandis*, *praefectus feriarum Latinarum*, and *sevir turmae equitum Romanorum*. About 95 he was military tribune in lower Moesia. In 97 he was sent to upper Germany to convey the congratulations of the army to Trajan on his adoption by Nerva; and, in January of the following year, he hastened to announce the death of Nerva to Trajan at Cologne. Trajan, who had been set against Hadrian by reports of his extravagance, soon took him into favour again, chiefly owing to the goodwill of the empress Plotina, who brought about the marriage of Hadrian with (Vibia) Sabina, Trajan's great-niece. In 101 Hadrian was quaestor, in 105 tribune of the people, in 106 praetor. He served with distinction in both Dacian campaigns: in the second Trajan presented him with a valuable ring which he himself had received from Nerva, a token of regard which seemed to designate Hadrian as his successor. In 107 Hadrian was *legatus praetorius* of lower Pannonia, in 108 *consul suffectus*, in 112 *archon* at Athens, *legatus* in the Parthian campaign (113–117), in 117 *consul designatus* for the following year, in 119 consul for the third and last time only for four months. When Trajan, owing to a severe illness, decided to return home from the East, he left Hadrian in command of the army and governor of Syria. On the 9th of August 117, Hadrian, at Antioch, was informed

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of his adoption by Trajan, and, on the 11th, of the death of the latter at Selinus in Cilicia. According to Dio Cassius (lxix. 1) the adoption was entirely fictitious, the work of Plotina and Attianus, by whom Trajan's death was concealed for a few days in order to facilitate the elevation of Hadrian. Whichever may have been the truth, his succession was confirmed by the army and the senate. He hastened to propitiate the former by a donative of twice the usual amount, and excused his hasty acceptance of the throne to the senate by alleging the impatient zeal of the soldiers and the necessity of an imperator for the welfare of the state.

Hadrian's first important act was to abandon as untenable the conquests of Trajan beyond the Euphrates (Assyria, Mesopotamia and Armenia), a recurrence to the traditional policy of Augustus. The provinces were unsettled, the barbarians on the borders restless and menacing, and Hadrian wisely judged that the old limits of Augustus afforded the most defensible frontier. Mesopotamia and Assyria were given back to the Parthians, and the Armenians were allowed a king of their own. From Antioch Hadrian set out for Dacia to punish the Roxolani, who, incensed by a reduction of the tribute hitherto paid them, had invaded the Danubian provinces. An arrangement was patched up, and while Hadrian was still in Dacia he received news of a conspiracy against his life. Four citizens of consular rank were accused of being concerned in it, and were put to death by order of the senate before he could interfere. Hurrying back to Rome, Hadrian endeavoured to remove the unfavourable impression produced by the whole affair and to gain the goodwill of senate and people. He threw the responsibility for the executions upon the prefect of the praetorian guard, and swore that he would never punish a senator without the assent of the entire body, to which he expressed the utmost deference and consideration. Large sums of money and games and shows were provided for the people, and, in addition, all the arrears of taxation for the last fifteen years (about £10,000,000) were cancelled and the bonds burnt in the Forum of Trajan. Trajan's scheme for the "alimentation" of poor children was carried out upon a larger scale under the superintendence of a special official called *praefectus alimentorum*.

The record of Hadrian's journeys[1] through all parts of the empire forms the chief authority for the events of his life down to his final settlement in the capital during his last years. They can only be briefly touched upon here. His first great journey probably lasted from 121 to 126. After traversing Gaul he visited the Germanic provinces on the Rhine, and crossed over to Britain (spring, 122), where he built the great rampart from the Tyne to the Solway, which bears his name (see BRITAIN: *Roman*). He returned through Gaul into Spain, and then proceeded to Mauretania, where he suppressed an insurrection. A war with the Parthians was averted by a personal interview with their king (123). From the Parthian frontier he travelled through Asia Minor and the islands of the Aegean to Athens (autumn, 125), where he introduced various political and commercial changes, was initiated at the Eleusinia, and presided at the celebration of the greater Dionysia. After visiting Central Greece and Peloponnesus, he returned by way of Sicily to Rome (end of 126). The next year was spent at Rome, and, after a visit to Africa, he set out on his second great journey (September 128). He travelled by way of Athens, where he completed and dedicated the buildings (see ATHENS) begun during his first visit, chief of which was the Olympieum or temple of Olympian Zeus, on which occasion Hadrian himself assumed the name of Olympius. In the spring of 129 he visited Asia Minor and Syria, where he invited the kings and princes of the East to a meeting (probably at Samosata). Having passed the winter at Antioch, he set out for the south (spring, 130). He ordered Jerusalem to be rebuilt (see JERUSALEM) under the name of Aelia Capitolina, and made his way through Arabia to Egypt, where he restored the tomb of Pompey at Pelusium with great magnificence. After a short stay at Alexandria he took an excursion up the Nile, during which he lost his favourite Antinous. On the 21st of November 130, Hadrian (or at any rate his wife Sabina) heard the music which issued at sunrise from the statue of Memnon at Thebes (see MEMNON). From Egypt Hadrian returned through Syria to Europe (his movements are obscure), but was obliged to hurry back to Palestine (spring, 133) to give his personal attention (this is denied by some historians) to the revolt of the Jews, which had broken out (autumn, 131, or spring, 132) after he had left Syria. The founding of a Roman colony on the site of Jerusalem (Dio Cass. lxix. 12) and the prohibition of circumcision (Spartianus, *Hadrianus*, 14) are said to have been the causes of the war, but authorities differ considerably as to this and as to the measures which followed the revolt (see art. JEWS; also E. Schürer, *Hist. of the Jewish People*, Eng. tr., div. 1, vol. ii. p. 288; and S. Krauss in *Jewish Encyc. s.v.* "Hadrian"), which lasted till 135. Leaving the conduct of affairs in the hands of his most capable general, Julius Severus, in the spring of 134 Hadrian returned to Rome. The remaining years of his life were spent partly in the capital, partly in his villa at Tibur. His health now began to fail, and it became necessary for him to choose a successor, as he had no children of his own. Against the advice of his relatives and friends he adopted L. Ceionius Commodus under the name of L. Aelius Caesar, who was in a feeble state of health and died on the 1st of January 138, before he had an opportunity of proving his capabilities. Hadrian then adopted Arrius Antoninus (see ANTONINUS PIUS) on condition that he should adopt M. Annius Verus (afterwards the emperor Marcus Aurelius) and the son of L. Aelius Caesar, L. Ceionius Commodus (afterwards the emperor Commodus). Hadrian died at Baiae on the 10th of July 138.

He was without doubt one of the most capable emperors who ever occupied the throne, and devoted his great and varied talents to the interests of the state. One of his chief objects was the abolition of distinctions between the provinces and the mother country, finally carried out by Caracalla, while at the same time he did not neglect reforms that were urgently called for in Italy. Provincial governors were kept under strict supervision; extortion was practically unheard of; the *jus Latii* was bestowed upon several communities; special officials were instituted for the control of the finances; and the emperor's interest in provincial affairs was shown by his personal assumption of various municipal offices. New towns were founded and old ones restored; new streets were laid out, and aqueducts, temples and magnificent buildings constructed. In Italy itself the administration of justice and the finances required special attention. Four *legati juridici* (or simply *juridici*) of consular rank were appointed for Italy, who took over certain important judicial functions formerly exercised by local magistrates (cases of *fideicommissa*, the nomination of guardians). The judicial council (*consiliarii Augusti*, later called *consistorium*), composed of persons of the highest rank (especially jurists), became a permanent body of advisers, although merely consultative. Roman law owes much to Hadrian, who instructed Salvius Julianus to draw up an *edictum perpetuum*, to a great extent the basis of Justinian's *Corpus juris* (see M. Schanz, *Geschichte der römischen Literatur*, iii. p. 167). In the administration of finance, in addition to the remission of arrears already mentioned, a revision of claims was ordered to be made every fifteen years, thereby anticipating the "indictions" (see CALENDAR; CHRONOLOGY). Direct collection of taxes by imperial procurators was substituted for the system of farming, and a special official (*advocatus fisci*) was instituted to look after the interests of the imperial treasury. The gift of "coronary gold" (*aurum coronarium*), presented to the emperor on certain occasions, was entirely remitted in the case of Italy, and partly in the case of the provinces. The administration of the postal service throughout the empire was taken over by the state, and municipal officials were relieved from the burden of maintaining the imperial posts. Humane regulations as to the treatment of slaves were strictly

[1] The chronology of Hadrian's journeys—indeed, of the whole reign—is confused and obscure. In the above the article by von Rohden in Pauly-Wissowa's *Realencyclopädie* has been followed. Weber's (see Bibliog.) is the most important discussion.

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enforced; the master was forbidden to put his slave to death, but was obliged to bring him before a court of justice; if he ill-treated him it was a penal offence. The sale of slaves (male and female) for immoral and gladiatorial purposes was forbidden; the custom of putting all the household to death when their master was murdered was modified. The public baths were kept under strict supervision; the toga was ordered to be worn in public by senators and equites on solemn occasions; extravagant banquets were prohibited; rules were made to prevent the congestion of traffic in the streets. In military matters Hadrian was a strict disciplinarian, but his generosity and readiness to share their hardships endeared him to the soldiers. He effected a material and moral improvement in the conditions of service and mode of life, but in other respects he does not appear to have introduced any important military reforms. During his reign an advance was made in the direction of creating an organized body of servants at the disposal of the emperor by the appointment of equites to important administrative posts, without their having performed the *militiae equestres* (see EQUITES). Among these posts were various procuratorships (chief of which was that of the imperial fisc), and the offices *ab epistulis*, *a rationibus* and *a libellis* (secretary, accountant, receiver of petitions). The prefect of the praetorian guard was now the most important person in the state next to the emperor, and subsequently became a supreme judge of appeal. Among the magnificent buildings erected by Hadrian mention may be made of the following: In the capital, the temple of Venus and Roma; his splendid mausoleum, which formed the groundwork of the castle of St Angelo; the pantheon of Agrippa; the Basilica Neptuni; at Tibur the great villa 8 m. in extent, a kind of epitome of the world, with miniatures of the most celebrated places in the provinces. Athens, however, was the favourite site of his architectural labours; here he built the temple of Olympian Zeus, the Panhellenion, the Pantheon, the library, a gymnasium and a temple of Hera.

Hadrian was fond of the society of learned men—poets, scholars, rhetoricians and philosophers—whom he alternately humoured and ridiculed. In painting, sculpture and music he considered himself the equal of specialists. The architect Apollodorus of Damascus owed his banishment and death to his outspoken criticism of the emperor's plans. The sophist Favorinus was more politic; when reproached for yielding too readily to the emperor in some grammatical discussion, he replied that it was unwise to contradict the master of thirty legions. The Athenaeum (*q.v.*) owed its foundation to Hadrian. He was a man of considerable intellectual attainments, of prodigious memory, master of both Latin and Greek, and wrote prose and verse with equal facility. His taste, however, was curious; he preferred Cato the elder, Ennius and Caelius Antipater to Cicero, Virgil and Sallust, the obscure poet Antimachus to Homer and Plato. As a writer he displayed great versatility. He composed an autobiography, published under the name of his freedman Phlegon; wrote speeches, fragments of two of which are preserved in inscriptions (a panegyric on his mother-in-law Matidia, and an address to the soldiers at Lambaesis in Africa). In imitation of Antimachus he wrote a work called *Catachannae*, probably a kind of miscellanea. The Latin and Greek anthologies contain about a dozen epigrams under his name. The letter of Hadrian to the consul Servianus (in Vopiscus, *Vita Saturnini*, 8) is no longer considered genuine. Hadrian's celebrated dying address to his soul may here be quoted:—

> "Animula vagula, blandula,
> Hospes comesque corporis,
> Quae nunc abibis in loca
> Pallidula, rigida, nudula;
> Nec, ut soles, dabis jocos?"

The character of Hadrian exhibits a mass of contradictions, well summed up by Spartianus (14, 11). He was grave and gay, affable and dignified, cruel and gentle, mean and generous, eager for fame yet not vain, impulsive and cautious, secretive and open. He hated eminent qualities in others, but gathered round him the most distinguished men of the state, at one time affectionate towards his friends, at another he mistrusted and put them to death. In fact, he was only consistent in his inconsistency (*semper in omnibus varius*). Although he endeavoured to win the popular favour, he was more feared than loved. A man of unnatural passions and grossly superstitious, he was an ardent lover of nature. But, with all his faults, he devoted himself so indefatigably to the service of the state, that the period of his reign could be characterized as a " golden age."

The chief ancient authorities for the reign of Hadrian are: the life by Aelius Spartianus in the *Scriptores historiae Augustae* (see AUGUSTAN HISTORY and bibliography); the epitome of Dio Cassius (lxix.) by Xiphilinus; Aurelius Victor, *Epit.* 14, probably based on Marius Maximus; Eutropius viii. 6; Zonaras xi. 23; Suidas, *s.v.* 'Αδριανός; and numerous inscriptions and coins. The autobiography was used by both Dio Cassius and Marius Maximus. Modern authorities: C. Merivale, *Hist. of the Romans under the Empire*, ch. lxvi.; H. Schiller, *Geschichte der römischen Kaiserzeit*, i. 2, p. 602 (1883); J. B. Bury, *The Student's Roman Empire* (1893), where a concise table of the journeys is given; P. von Rohden, *s.v.* " Aelius " in Pauly-Wissowa's *Realencyclopädie*, i. 1 (1894); J. Dürr, *Die Reisen des Kaisers Hadrian* (1881); F. Gregorovius, *The Emperor Hadrian* (Eng. tr. by Mary E. Robinson, 1898); A. Hausrath, *Neutestamentliche Zeitgeschichte*, iii. (1874); W. Schurz, *De mutationibus in imperio ordinando ab imp. Hadr. factis*, i. Bonn, 1883); J. Plew, *Quellenuntersuchungen zur Geschichte des Kaisers Hadrian* (Strassburg, 1890); O. T. Schulz, " Leben des Kaisers Hadrian," *Quellenanalysen* [of Spartianus' *Vita*] (1904); E. Kornemann, *Kaiser Hadrian und der letzte grosse Historiker von Rom* (1905); W. Weber, *Untersuchungen zur Geschichte des Kaisers Hadrianus* (1908); H. F. Hitzig, *Die Stellung Kaiser Hadrians in der römischen Rechtsgeschichte* (1892); C. Schultess, *Bauten des Kaisers Hadrian* (1868); G. Doublet, *Notes sur les œuvres littéraires de l'empereur Hadrien* (Toulouse, 1893); J. B. Lightfoot, *Apostolic Fathers*, ii. 1, 476 seq.; Sir W. M. Ramsay, *Church in the Roman Empire*, pp. 320 seq.; V. Schultze, in Herzog-Hauck's *Realencyklopadie*, vii. 315; histories of Roman literature by Teuffel-Schwabe and Schanz. On Aelius Caesar, see *Class. Quart.*, 1908, i. (T. K.; J. H. F.)

HADRIAN'S WALL, the name usually given to the remains of the Roman fortifications which defended the northern frontier of the Roman province of Britain, between the Tyne and the Solway. The works consisted of (1) a continuous defensive rampart with a ditch in front and a road behind; (2) various forts, blockhouses and towers along the rampart; and (3) an earthwork to the south of it, generally called the Vallum, of uncertain use. The defensive wall was probably first erected by Hadrian about A.D. 122 as a turf wall, and rebuilt in stone by Septimius Severus about A.D. 208. See further BRITAIN: *Roman*.

HADRUMETUM, a town of ancient Africa on the southern extremity of the *sinus Neapolitanus* (mod. Gulf of Hammamet) on the east coast of Tunisia. The site is partly occupied by the modern town of Susa (*q.v.*). The form of the name Hadrumetum varied much in antiquity; the Greeks called it 'Αδρύμης, 'Αδρύμητος, 'Αδραμύτης, 'Αδράμητος; the Romans *Adrumetum*, *Adrimetum*, *Hadrumetum*, *Hadrymetum*, &c.; inscriptions and coins gave *Hadrumetum*. The town was originally a Phoenician colony founded by Tyrians long before Carthage (Sallust, *Jug.* 19). It became subject to Carthage, but lost none of its prosperity. Often mentioned during the Punic Wars, it was captured by Agathocles in 310, and was the refuge of Hannibal and the remnants of his army after the battle of Zama in 202. During the last Punic War it gave assistance to the Romans; after the fall of Carthage in 146 it received an accession of territory and the title of *civitas libera* (Appian, *Punica*, xciv.; *C.I.L.* i. p. 84). Caesar landed there in 46 B.C. on his way to the victory of Thapsus (*De bello Afric.* iii.; Suetonius, *Div. Jul.* lix.).

In the organization of the African provinces Hadrumetum became a capital of the province of Byzacena. Its harbour was extremely busy and the surrounding country unusually fertile. Trajan made it a Latin colony under the title of *Colonia Concordia Ulpia Trajana Augusta Frugifera Hadrumetina*; a dedication to the emperor Gordian the Good, found by M. Cagnat at Susa in 1883 gives these titles to the town, and at the same time identifies it with Susa. Quarrels arose between Hadrumetum and its neighbour Thysdrus in connexion with the temple of Minerva situated on the borders of their respective territories (Frontinus, *Gromatici*, ed. Lachmannus, p. 57); Vespasian

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when pro-consul of Africa had to repress a sedition among its inhabitants (Suetonius, *Vesp.* iv.; Tissot, *Fastes de la prov. d'Afrique*, p. 66); it was the birthplace of the emperor Albinus. At this period the metropolis of Byzacena was after Carthage the most important town in Roman Africa. It was the seat of a bishopric, and its bishops are mentioned at the councils of 258, 348, 393 and even later. Destroyed by the Vandals in 433 it was rebuilt by Justinian and renamed Justinianopolis (Procop. *De aedif.* vi. 6). The Arabic invasion at the end of the 7th century destroyed the Byzantine towns, and the place became the haunt of pirates, protected by the Kasbah (citadel); it was built on the substructions of the Punic, Roman and Byzantine acropolis, and is used by the French for military purposes. The Arabic geographer Bakri gave a description of the chief Roman buildings which were standing in his time (Bakri, *Descr. de l'Afrique*, tr. by de Slane, p. 83 et seq.). The modern town of Susa, despite its commercial prosperity, occupies only a third of the old site.

In 1863 the French engineer, A. Daux, discovered the jetties and the moles of the commercial harbour, and the line of the military harbour (Cothon); both harbours, which were mainly artificial, are entirely silted up. There remains a fragment of the fortifications of the Punic town, which had a total length of 6410 metres, and remains of the substructions of the Byzantine acropolis, of the circus, the theatre, the water cisterns, and of other buildings, notably the interesting Byzantine basilica which is now used as an Arab café (Kahwat-el-Kubba). In the ruins there have been found numerous columns of Punic inscriptions, Roman inscriptions and mosaic, among which is one representing Virgil seated, holding the *Aeneid* in his hand; another represents the Cretan labyrinth with Theseus and the Minotaur (Héron de Villefosse, *Revue de l'Afrique française*, v., December 1883, pp. 384 and 394; *Comptes rendus de l'Acad. des Inscr. et Belles-Lettres*, 1894, p. 318; other mosaics, *ibid.*, 1896, p. 578; *Revue archéol.*, 1897). In 1904 Dr Carton and the abbé Leynaud discovered huge Christian catacombs with several miles of subterranean galleries to which access is obtained by a small vaulted chamber. In these catacombs we find numerous sarcophagi and inscriptions painted or engraved of the Roman and Byzantine periods (*Comptes rendus de l'Acad. des Inscr. et Belles-Lettres*, 1904–1907; Carton and Leynaud, *Les Catacombes d'Hadrumète*, Susa, 1905). We can recognize also the Punic and Pagan-Roman cemeteries (*C. R. de l'Acad. des Inscr. et Belles-Lettres*, 1887; *Bull. archéol. du Comité*, 1885, p. 149; 1903, p. 157). The town had no Punic coins, but under the Roman domination there were coins from the time of the Republic. These are of bronze and bear the name of the city in abbreviations, HADR or HADRVM accompanying the head of Neptune or the Sun. We find also the names of local duumvirs. Under Augustus the coins have on the obverse the imperial effigy, and on the reverse the names and often the effigies of the pro-consuls who governed the province, P. Quintilius Varus, L. Volusius Saturninus and Q. Fabius Maximus Africanus. After Augustus the mint was finally closed.

AUTHORITIES.—A. Daux, *Recherches sur l'origine et l'emplacement des emporia phéniciens dans le Zeugis et le Byzacium* (Paris, 1869); Ch. Tissot, *Géographie comparée de la province romaine d'Afrique*, ii. p. 149; Cagnat, *Explorations archéol. en Tunisie* (2nd and 3rd fasc., 1885); Lud. Müller, *Numismatique de l'Afrique ancienne*, ii. p. 51; M. Palat, in the *Bulletin arch. du Comité des travaux historiques* (1885), pp. 121 and 150; *Revue archéologique* (1884 and 1897); *Bulletin des antiquités africaines* (1884 and 1885); *Bulletin de la Société archéologique de Sousse* (first published in 1903); *Atlas archéol. de Tunisie* (4th fascicule, with the plan of Hadrumetum). (E. B.*)

HAECKEL, ERNST HEINRICH (1834–), German biologist, was born at Potsdam on the 16th of February 1834. He studied medicine and science at Würzburg, Berlin and Vienna, having for his masters such men as Johannes Müller, R. Virchow and R. A. Kölliker, and in 1857 graduated at Berlin as M.D. and M.Ch. At the wish of his father he began to practise as a doctor in that city, but his patients were few in number, one reason being that he did not wish them to be many, and after a short time he turned to more congenial pursuits. In 1861, at the instance of Carl Gegenbaur, he became *Privatdozent* at Jena in the succeeding year he was chosen extraordinary professor of comparative anatomy and director of the Zoological Institute in the same university; in 1865 he was appointed to a chair of zoology which was specially established for his benefit. This last position he retained for 43 years, in spite of repeated invitations to migrate to more important centres, such as Strassburg or Vienna, and at Jena he spent his life, with the exception of the time he devoted to travelling in various parts of the world, whence in every case he brought back a rich zoological harvest.

As a field naturalist Haeckel displayed extraordinary power and industry. Among his monographs may be mentioned those on *Radiolaria* (1862), *Siphonophora* (1869), *Monera* (1870) and *Calcareous Sponges* (1872), as well as several *Challenger* reports, viz. *Deep-Sea Medusae* (1881), *Siphonophora* (1888), *Deep-Sea Keratosa* (1889) and *Radiolaria* (1887), the last being accompanied by 140 plates and enumerating over four thousand new species. This output of systematic and descriptive work would alone have constituted a good life's work, but Haeckel in addition wrote copiously on biological theory. It happened that just when he was beginning his scientific career Darwin's *Origin of Species* was published (1859), and such was the influence it exercised over him that he became the apostle of Darwinism in Germany. He was, indeed, the first German biologist to give a whole-hearted adherence to the doctrine of organic evolution and to treat it as the cardinal conception of modern biology. It was he who first brought it prominently before the notice of German men of science in his first memoir on the *Radiolaria*, which was completely pervaded with its spirit, and later at the congress of naturalists at Stettin in 1863. Darwin himself has placed on record the conviction that Haeckel's enthusiastic propagandism of the doctrine was the chief factor of its success in Germany. His book on *General Morphology* (1866), published when he was only thirty-two years old, was called by Huxley a suggestive attempt to work out the practical application of evolution to its final results; and if it does not take rank as a classic, it will at least stand out as a landmark in the history of biological doctrine in the 19th century. Although it contains a statement of most of the views with which Haeckel's name is associated, it did not attract much attention on its first appearance, and accordingly its author rewrote much of its substance in a more popular style and published it a year or two later as the *Natural History of Creation* (*Natürliche Schöpfungsgeschichte*), which was far more successful. In it he divided morphology into two sections—tectology, the science of organic individuality; and promorphology, which aims at establishing a crystallography of organic forms. Among other matters, he laid particular stress on the "fundamental biogenetic law" that ontogeny recapitulates phylogeny, that the individual organism in its development is to a great extent an epitome of the form-modifications undergone by the successive ancestors of the species in the course of their historic evolution. His well-known "gastraea" theory is an outcome of this generalization. He divided the whole animal creation into two categories—the Protozoa or unicellular animals, and the Metazoa or multicellular animals, and he pointed out that while the former remain single-celled throughout their existence, the latter are only so at the beginning, and are subsequently built up of innumerable cells, the single primitive egg-cell (*ovum*) being transformed by cleavage into a globular mass of cells (*morula*), which first becomes a hollow vesicle and then changes into the *gastrula*. The simplest multicellular animal he conceived to resemble this gastrula with its two primary layers, ectoderm and endoderm, and the earliest hypothetical form of this kind, from which the higher animals might be supposed to be actually descended, he called the "gastraea." This theory was first put forward in the memoir on the calcareous sponges, which in its sub-title was described as an attempt at an analytical solution of the problem of the origin of species, and was subsequently elaborated in various *Studies on the Gastraea Theory* (1873–1884). Haeckel, again, was the first to attempt to draw up a genealogical tree (*Stammbaum*) exhibiting the relationship between the various orders of animals

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with regard both to one another and their common origin. His earliest attempt in the *General Morphology* was succeeded by many others, and his efforts in this direction may perhaps be held to culminate in the paper he read before the fourth International Zoological Congress, held at Cambridge in 1898, when he traced the descent of the human race in twenty-six stages from organisms like the still-existing *Monera*, simple structureless masses of protoplasm, and the unicellular *Protista*, through the chimpanzees and the *Pithecanthropus erectus*, of which a few fossil bones were discovered in Java in 1894, and which he held to be undoubtedly an intermediate form connecting primitive man with the anthropoid apes.

Not content with the study of the doctrine of evolution in its zoological aspects, Haeckel also applied it to some of the oldest problems of philosophy and religion. What he termed the integration of his views on these subjects he published under the title of *Die Welträtsel* (1890), which in 1901 appeared in English as *The Riddle of the Universe*. In this book, adopting an uncompromising monistic attitude, he asserted the essential unity of organic and inorganic nature. According to his "carbon-theory," which has been far from achieving general acceptance, the chemico-physical properties of carbon in its complex albuminoid compounds are the sole and the mechanical cause of the specific phenomena of movement which distinguish organic from inorganic substances, and the first development of living protoplasm, as seen in the *Monera*, arises from such nitrogenous carbon-compounds by a process of spontaneous generation. Psychology he regarded as merely a branch of physiology, and psychical activity as a group of vital phenomena which depend solely on physiological actions and material changes taking place in the protoplasm of the organism in which it is manifested. Every living cell has psychic properties, and the psychic life of multicellular organisms is the sum-total of the psychic functions of the cells of which they are composed. Moreover, just as the highest animals have been evolved from the simplest forms of life, so the highest faculties of the human mind have been evolved from the soul of the brute-beasts, and more remotely from the simple cell-soul of the unicellular Protozoa. As a consequence of these views Haeckel was led to deny the immortality of the soul, the freedom of the will, and the existence of a personal God.

Haeckel's literary output was enormous, and at the time of the celebration of his sixtieth birthday at Jena in 1894 he had produced 42 works with 13,000 pages, besides numerous scientific memoirs. In addition to the works already mentioned, he wrote *Freie Wissenschaft und freie Lehre* (1877) in reply to a speech in which Virchow objected to the teaching of the doctrine of evolution in schools, on the ground that it was an unproved hypothesis; *Die systematische Phylogenie* (1894), which has been pronounced his best book; *Anthropogenie* (1874, 5th and enlarged edition 1903), dealing with the evolution of man; *Über unsere gegenwärtige Kenntnis vom Ursprung des Menschen* (1898, translated into English as *The Last Link*, 1898); *Der Kampf um den Entwickelungsgedanken* (1905, English version, *Last Words on Evolution*, 1906); *Die Lebenswunder* (1904), a supplement to the *Riddle of the Universe*; books of travel, such as *Indische Reisebriefe* (1882) and *Aus Insulinde* (1901), the fruits of journeys to Ceylon and to Java; *Kunstformen der Natur* (1904), with plates representing beautiful marine animal forms; and *Wanderbilder* (1905), reproductions of his oil-paintings and water-colour landscapes.

There are biographies by W. Bölsche (Dresden, 1900, translated into English by Joseph McCabe, with additions, London, 1906) and by Breitenbach (Odenkirchen, 1904). See also Walther May, *Ernst Haeckel; Versuch einer Chronik seines Lebens und Werkens* (Leipzig, 1909).

HAEMATITE, or HEMATITE, a mineral consisting of ferric oxide (Fe_2O_3), named from the Greek word αἷμα, "blood," in allusion to its typical colour, whence it is called also red iron ore. When crystallized, however, haematite often presents a dark colour, even iron-black; but on scratching the surface, the powder of the streak shows the colour of dried blood. Haematite crystallizes in the rhombohedral system, and is isomorphous with corundum (Al_2O_3). The habit of the crystals may be rhombohedral, pyramidal or tabular, rarely prismatic. In fig. 1 the crystal, from Elba, shows a combination of the fundamental rhombohedron (R), an obtuse rhombohedron (*s*), and the hexagonal bipyramid (*n*). Fig. 2 is a tabular crystal in which the basal pinacoid (*o*) predominates. Haematite has no distinct cleavage, but may show, in consequence of a lamellar structure, a tendency to parting along certain planes.

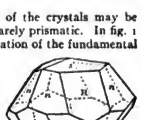

FIG. 1.

Crystallized haematite, such as that from the iron-mines of Elba, presents a steel-grey or iron-black colour, with a brilliant metallic lustre, sometimes beautifully iridescent. The splendent surface has suggested for this mineral such names as specular iron ore, looking-glass ore, and iron glance (*fer oligiste* of French writers). The hardness of the crystallized haematite is about 6, and the specific gravity 5·2. The so-called "iron roses" (*Eisenrosen*) of Switzerland are rosette-like aggregates of hexagonal tabular crystals, from fissures in the gneissose rocks of the Alps. Specular iron ore occurs in the form of brilliant metallic scales on many lavas, as at Vesuvius and Etna, in the Auvergne and the Eifel, and notably in the Island of Ascension, where the mineral forms beautiful tabular crystals. It seems to be a sublimation-product formed in volcanoes by the interaction of the vapour of ferric chloride and steam.

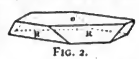

FIG. 2.

Specular haematite forms a constituent of certain schistose rocks, such as the Brazilian itabirite. In the Marquette district of Michigan (Lake Superior) schistose specular ore occurs in important deposits, associated with a jasper rock, in which the ore alternates with bands of red quartzite. Micaceous iron ore consists of delicate steel-grey scales of specular haematite, unctuous to the touch, used as a lubricant and also as a pigment. It is worked in Devonshire under the name of shining ore. Very thin laminae of haematite, blood-red by transmitted light, occur as microscopic enclosures in certain minerals, such as carnallite and sun-stone, to which they impart colour and lustre.

Much haematite occurs in a compact or massive form, often mammillary, and presenting on fracture a fibrous structure. The reniform masses are known as kidney ore. Such red ore is generally neither so dense nor so hard as the crystals. It often passes into an earthy form, termed soft red ore, and when mixed with more or less clay constitutes red ochre, ruddle or reddle (Ger. *Rötel*).

The hard haematite is occasionally cut and polished as an ornamental stone, and certain kinds have been made into beads simulating black pearls. It was worked by the Assyrians for their engraved cylinder-seals, and was used by the gnostics for amulets. Some of the native tribes in the Congo basin employ it as a material for axes. The hard fibrous ore of Cumberland is known as pencil ore, and is employed for the burnishers used by bookbinders and others. Santiago de Compostela in Spain furnishes a considerable supply of haematite burnishers.

Haematite is an important ore of iron (*q.v.*), and is extensively worked in Elba, Spain (Bilbao), Scandinavia, the Lake Superior region and elsewhere. In England valuable deposits occur in the Carboniferous Limestone of west Cumberland (Whitehaven district) and north Lancashire (Ulverston district). The hard ore is siliceous, and fine crystallized specimens occur in association with smoky quartz. The ore is remarkably free from phosphorus, and is consequently valued for the production of pig-iron to be converted into Bessemer steel. (F. W. R.*)

HAEMATOCELE (Gr. αἷμα, blood, and κήλη, tumour), the medical term for a localized collection of blood in the tunica vaginalis or cord. It is usually the result of a sudden blow or severe strain, but may arise from disease. At first it forms a smooth, fluctuating, opaque swelling, but later becomes hard and firm. In chronic cases the walls of the tunica vaginalis

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undergo changes. The treatment of a case seen soon after the injury is directed towards keeping the patient at rest, elevating the parts, and applying an evaporating lotion or ice-bag. In chronic cases it may be necessary to lay open the cavity and remove the coagulum.

HAEMOPHILIA, the medical term for a condition of the vascular system, often running in families, the members of which are known as "bleeders," characterized by a disposition towards bleeding, whether with or without the provocation of an injury to the tissue. When this bleeding is spontaneous it comes from the mucous membranes, especially from the nose, but also from the mouth, bowel and bronchial tubes. Slight bruises are apt to be followed by extravasations of blood into the tissues; the swollen joints (knee especially) of a bleeder are probably due, in the first instance, to the escape of blood into the joint cavity or synovial membrane. It is always from the smallest vessels that the blood escapes, and may do so in such quantities as to cause death in a few hours.

HAEMORRHAGE (Gr. *αἷμα*, blood, and *ῥηγνύναι*, to burst), a general term for any escape of blood from a blood-vessel (see BLOOD). It commonly results from injury, as the tearing or cutting of a blood-vessel, but certain forms result from disease, as in scurvy and purpura. The chief varieties of haemorrhage are *arterial*, *venous* and *capillary*. Bleeding from an artery is of a bright red colour, and escapes from the end of the vessel nearest the heart in jets synchronous with the heart's beat. Bleeding from a vein is of a darker colour; the flow is steady, and the bleeding is from the distal end of the vessel. Capillary bleeding is a general oozing from a raw surface. By *extravasation of blood* is meant the pouring out of blood into the areolar tissues, which become boggy. This is termed a *bruise* or *ecchymosis*. *Epistaxis* is a term given to bleeding from the nose. *Haematemesis* is vomiting of blood, the colour of which may be altered by digestion, as is also the case in *melaena*, or passage of blood with the faeces, in which the blood becomes dark and tarry-looking from the action of the intestinal fluids. *Haemoptysis* denotes an escape of blood from the air-passages, which is usually bright red and frothy from admixture with air. *Haematuria* means passage of blood with the urine.

Cessation of bleeding may take place from natural or from artificial means. Natural arrest of haemorrhage arises from (1) the coagulation of the blood itself, (2) the diminution of the heart's action as in fainting, (3) changes taking place in the cut vessel causing its retraction and contraction. In the surgical treatment of haemorrhage minor means of arresting bleeding are: cold, which is most valuable in general oozing and local extravasations; very hot water, 130° to 160° F., a powerful haemostatic; position, such as elevation of the limb, valuable in bleeding from the extremities; styptics or astringents, applied locally, as perchloride of iron, tannic acid and others, the most valuable being suprarenal extract. In arresting haemorrhage temporarily the chief thing is to press directly on the bleeding part. The pressure to be effectual need not be severe, but must be accurately applied. If the bleeding point cannot be reached, the pressure should be applied to the main artery between the bleeding point and the heart. In small blood-vessels pressure will be sufficient to arrest haemorrhage permanently. In large vessels it is usual to pass a ligature round the vessel and tie it with a reef-knot. Apply the ligature, if possible, at the bleeding point, tying both ends of the cut vessel. If this cannot be done, the main artery of the limb must be exposed by dissection at the most accessible point between the wound and the heart, and there ligatured.

Haemorrhage has been classified as—(1) primary, occurring at the time of the injury; (2) reactionary, or within twenty-four hours of the accident, during the stage of reaction; (3) secondary, occurring at a later period and caused by faulty application of a ligature or septic condition of the wound. In severe haemorrhage, as from the division of a large artery, the patient may collapse and death ensue from syncope. In this case stimulants and strychnine may be given, but they should be avoided until it is certain the bleeding has been properly controlled, as they tend to increase it. Transfusion of blood directly from the vein of a healthy person to the blood-vessels of the patient, and infusion of saline solution into a vein, may be practised (see SHOCK). In a congenital condition known as *haemophylia* (*q.v.*) it is difficult to stop the flow of blood.

The surgical procedure for the treatment of an open wound is—(1) arrest of haemorrhage; (2) cleansing of the wound and removal of any foreign bodies; (3) careful apposition of its edges and surfaces—the edges being best brought in contact by sutures of aseptic silk or catgut, the surfaces by carefully applied pressure; (4) free drainage, if necessary, to prevent accumulation either of blood or serous effusion; (5) avoidance of sepsis; (6) perfect rest of the part. These methods of treatment require to be modified for wounds in special situations and for those in which there is much contusion and laceration. When a special poison has entered the wound at the time of its infliction or at some subsequent date, it is necessary to provide against septic conditions of the wound itself and blood-poisoning of the general circulation.

HAEMORRHOIDS, or HEMORRHOIDS (from Gr. *αἷμα*, blood, and *ῥεῖν*, to flow), commonly called *piles*, swellings formed by the dilatation of veins of the lowest part of the bowel, or of those just outside the margin of its aperture. The former, *internal piles*, are covered by mucous membrane; the latter, *external piles*, are just beneath the skin. As the veins of the lining of the bowel become dilated they form definite bulgings within the bowel, and, at last increasing in size, escape through the anus when a motion is being passed. Growing still larger, they may come down spontaneously when the individual is standing or walking, and they are apt to be a grave source of pain or annoyance. Eventually they may remain constantly protruded—nevertheless, they are still *internal* piles because they arise from the interior of the bowel. Though a pile is sometimes solitary, there are usually several of them. They are apt to become inflamed, and the inflammation is associated with heat, pain, discharge and general uneasiness; ulceration and bleeding are also common symptoms, hence the term "bleeding piles." The *external pile* is covered by the thin dark-coloured skin of the anal margin. Severe pressure upon the large abdominal veins may retard the upward flow of blood to the heart and so give rise to piles; this is apt to happen in the case of disease of the liver, malignant and other tumours, and pregnancy. General weakness of the constitution or of the blood-vessels and habitual constipation may be predisposing causes of piles. The exciting cause may be vigorous straining at stool or exposure to damp, as from sitting on the wet ground. Piles are often only a symptom, and in their treatment this fact should be kept in view; if the cause is removed the piles may disappear. But in some cases it may be impossible to remove the cause, as when a widely-spreading cancerous growth of the rectum, or of the interior of the pelvis or abdomen, is blocking the upward flow of blood in the veins. Sometimes when a pile has been protruded, as during defaecation, it is tightly grasped by spasmodic contraction of the circular muscular fibres which guard the outlet of the bowel, and it then becomes swollen, engorged and extremely painful; the strangulation may be so severe that the blood in the vessels coagulates and the pile mortifies. This, indeed, is nature's attempt at curing a pile, but it is distressing, and, as a rule, it is not entirely successful.

The palliative treatment of piles consists in obtaining a daily and easy action of the bowels, in rest, cold bathing, astringent injections, lotions and ointments. The radical treatment consists in their removal by operation, but this should not be contemplated until palliative treatment has failed. The operation consists in drawing the pile well down, and strangling the vessels entering and leaving its base, either by a strong ligature tightly applied, by crushing, or by cautery. Before dealing with the pile the anus is vigorously dilated in order that the pile may be dealt with with greater precision, and also that the temporary paralysis of the sphincter muscle, which follows the stretching, may prevent the occurrence of painful and spasmodic contractions subsequently. The ligatures by which the base of the piles are strangulated

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slough off with the pile in about ten days, and in about ten days more the individual is, as a rule, well enough to return to his work. If, for one reason or another, no operation is to be undertaken, and the piles are troublesome, relief may be afforded by warm sponging and by sitz-baths, the pile being gently dried afterwards by a piece of soft linen, smeared with vaseline, and carefully returned into the bowel. Under surgical advice, cocaine or morphia may be brought in contact with the tender parts, either in the form of lotion, suppository or ointment. In operating upon internal piles it is undesirable to remove all the external piles around the anus, lest the contraction of the circumferential scar should cause permanent narrowing of the orifice. If, as often happens, blood clots in the vein of an external pile, the small, hard, tender swelling may be treated with anodyne fomentations, or it may be rendered insensitive by the ether spray and opened by a small incision, the clot being turned out. (E. O.*)

HAEMOSPORIDIA, in zoology, an order of Ectospora, which although comparatively few in number and very inconspicuous in size and appearance, have of late years probably attracted greater attention and been more generally studied than any other Sporozoa; the reason being that they include the organisms well known as malarial parasites. In spite, however, of much and careful recent research—to a certain extent, rather, as a result of it—it remains the case that the Haemosporidia are, in some respects, the group of the Ectospora about which our knowledge is, for the time being, in the most unsatisfactory condition. Such important questions, indeed, as the scope and boundaries of the group, its exact origin and affinities, the rank and interclassification of the forms admittedly included in it, are answered quite differently by different workers. For example, one well-known Sporozoan authority (M. Lühe) has recently united the two groups, Haemosporidia and Haemoflagellates, bodily into one, while others (*e.g.* Novy and McNeal) deny that there is any connexion whatever between "Cytozoa" and Trypanosomes. Again, the inclusion or exclusion of forms like *Piroplasma* and *Halteridium* is also the subject of much discussion. The present writer accepts here the view that the Haemosporidia are derived from Haemoflagellates which have developed a gregariniform (Sporozoan) phase at the expense, largely or entirely, of the flagelliform one. The not inconsiderable differences met with among different types are capable of explanation on the ground that certain forms have advanced farther than others along this particular line of evolution. In other words, it is most probable that the Haemosporidia are to be regarded as comprising various parasites which represent different stages intermediate between, on the one side, a Flagellate, and on the other, a typical chlamydospore-forming Ectosporan parasite. While, however, it is easy enough sharply to separate off all Haemosporidia from other Ectospora, it is a very difficult matter to define their limits on the former side. Two principal criteria which a doubtful haemal parasite might very well be required to satisfy in order to be considered as a Haemosporidian rather than a Haemoflagellate are (*a*) the occurrence of schizogony during the "corpuscular" phase in the Vertebrate host, and (*b*) the formation of many germs ("sporozoites") from the zygote; so long as these conditions were complied with, the present writer, at all events, would not feel he was countenancing any protozoological heresy in allowing for the possibility of a Flagellate (perhaps trypaniform) phase or features being present at some period or other in the life-cycle.[1] To render this article complete, however, one or two well-known parasites, hitherto referred to this order, must also be mentioned, which, judged by the above (arbitrary) standard, are, it may be, on the Haemoflagellate side of the dividing line (*e.g. Halteridium*, according to Schaudinn).

The chief characters which distinguish the Haemosporidia from other Ectospora are the following. They are invariably blood parasites, and for part or all of the trophic period come into intimate relation with the cellular elements in the blood. There is always an alternation of hosts and of generations, an Invertebrate being the definitive host, in which sexual conjugation is undergone and which is to be regarded as the primary one, a Vertebrate being the intermediate or secondary one. The zygote or sporont is at first capable of movement and known as an ookinete. No resistant spores (chlamydospores) are formed, the ultimate germs or sporozoites always being free in the oocyst and not enclosed by sporocysts.

To Sir E. Ray Lankester is due the honour of discovering the first Haemosporidian, a discovery which did not take place until after most of the other kinds of Sporozoa were known. In 1871 this author described the parasite of the frog, which he later termed *Drepanidium ranarum*. The next discovery was the great and far-reaching one of Laveran, who in 1883 described all the characteristic phases of the malarial parasite which are met with in human blood. While regarding the organism as the cause of the disease, Laveran did not at once recognize its animal and Sporozoan nature, but considered it rather as a vegetable, and termed it *Oscillaria malariae*. As in the case of the Trypanosomes, we owe to Danilewsky (1885–1889) the first serious attempts to study the comparative anatomy and life-history of these parasites, from a zoological point of view. Danilewsky first named them Haemosporidia, and distinguished between *Haemocytozoa* and *Leucocytozoa*. To the brilliant researches of R. Ross and Grassi in the closing years of the 19th century is due the realization of the essential part played by the gnat or mosquito in the life-cycle and transmission of the parasites; and to MacCallum belongs the credit of first observing the true sexual conjugation, in the case of a *Halteridium*. Since then, thanks to the labours of Argutinsky and Schaudinn, our knowledge of the malarial parasites has steadily increased. Until quite recently, however, very little was known about the Haemosporidia of cold-blooded Vertebrates; but in 1903 Siegel and Schaudinn demonstrated that the same rôle is performed in their case by a leech or a tick, and since then many new forms have been described.

Occurrence: habitat; effects on host.

The Haemosporidia are widely distributed and of very general occurrence among the chief classes of Vertebrates. Among Invertebrates they are apparently limited to blood-sucking insects, ticks and leeches.[1] As already stated, the universal habitat of the parasites in the Vertebrate is the blood; as a result, of course, they are to be met with in the capillaries of practically all the important organs of the body; and it is to be noted that while certain phases (*e.g.* growing trophozoites, mature gametocytes) are found in the peripheral circulation, others (*e.g.* schizogonous "rosettes," young gametocytes) occur in the internal organs, liver, kidneys, &c., where the circulation is sluggish. The relation of the parasites to the blood-cells varies greatly. Most attack, probably exclusively, the red blood corpuscles (haematids); a few, however, select the leucocytes, and are therefore known as Leucocytozoa. In the case of Mammalian and Avian forms (malarial parasites) Schaudinn and Argutinsky have shown that the trophic and schizogonic phases are not really endoglobular but closely attached to the corpuscle, hollowing out a depression or space into which they nestle; the gametocytes, on the other hand, are actually intercellular. Forms parasitic in cold-blooded Vertebrates, on the contrary, are always, so far as is known, endoglobular when in relation with the corpuscles; and the same is apparently the case with the Mammalian parasite, *Piroplasma*. Although in no instance so far described is the parasite actually intranuclear (as certain Coccidia are), in one or two cases (*e.g. Karyolysus* of lizards and certain species of *Haemogregarina*) it reacts markedly upon the nucleus and soon causes its disintegration. While many Haemosporidia (*e.g.* malarial parasites, with the exception of *Halteridium*) remain in connexion with the same corpuscle throughout the whole period of growth and schizogony, the new generation of merozoites first being set free from the broken-down cell, others (the Haemo-

[1] Compare, for example, the flagellated granules of certain Coccidia, which point unmistakably to a Flagellate ancestry.

[1] A possible exception is a doubtful species of *Haemogregarina*, which has been described from the walls of the blood-vessels of an Annelid.

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gregarines, broadly speaking, and also *Halteridium*) leave one corpuscle after a short time, wander about free in the plasma, and then seek out another; and this may be repeated until the parasite is ready for schizogony, which generally occurs in the corpuscle.

As in the case of Trypanosomes (*q.v.*), normally—that is to say, when in an accustomed, tolerant host, and under natural conditions—Haemosporidia are non-pathogenic and do not give rise to any ill-effects in the animals harbouring them. When, however, the parasites gain an entry into the blood of man or other unadapted animals,[1] they produce, as is well known, harmful and often very serious effects. There are three recognized types of malarial fever, each caused by a distinct form and characterised by the mode of manifestation. Two, the so-called benign fevers, are intermittent; namely, tertian and quartan fever, in which the fever recurs every second and third day respectively. This is due to the fact that schizogony takes different lengths of time in the two cases, 48 hours in the one, 72 in the other; the height of the fever-period coincides with the break-down of the corpuscle at the completion of the process, and the liberation of great numbers of merozoites in the blood. The third type is the dangerous aestivo-autumnal or pernicious malaria, in which the fever is irregular or continuous during long periods.

A very general symptom is anaemia, which is sometimes present to a marked extent, when it may lead to a fatal termination. This is the result of the very considerable destruction of the blood-corpuscles which takes place, the haemoglobin of which is absorbed by the parasites as nutriment. A universal feature connected with this mode of nutrition is the production, in the cytoplasm of the parasite, of a brown pigment, termed melanin; this does not represent reserve material, but is an excreted bye-product derived from the haemoglobin. These pigment-grains are at length liberated into the blood-stream and become deposited in the various organs, spleen, liver, kidneys, brain, causing pronounced pigmentation.

Another type of fever, more acute and more generally fatal, is that produced by forms belonging to the genus *Piroplasma*, in cattle, dogs, horses and other domestic animals in different regions of the globe; and recently Wilson and Chowning have stated that the "spotted fever of the Rockies" is a human piroplasmosis caused by *P. hominis*. The disease of cattle is known variously as Texas-fever, Tristeza, Red-water, Southern cattle-fever, &c. In this type of illness the endogenous multiplication of the parasites is very great and rapid, and brings about an enormous diminution in the number of healthy red blood corpuscles. Their sudden destruction results in the liberation of large quantities of haemoglobin in the plasma, which turns deep-red in colour; and hence haemoglobinuria, which occurs only rarely in malaria, is a constant symptom in piroplasmosis.

Example of the life-history.

The parasite of pernicious malaria, here termed *Laveranía malariae*, will serve very well as a type of the general life-cycle (fig. 1). Slight differences shown by the other malarial parasites (*Plasmodium*) will be mentioned in passing, but the main divergences which other Haemosporidian types exhibit are best considered separately. With the bite of an infected mosquito, the minute sickle-like sporozoites are injected into the blood. They rapidly penetrate into the blood corpuscles, in which they appear as small irregular, more or less amoeboid trophozoites. A vacuole next arises in the cytoplasm, which increases greatly in size, and gives rise to the well-known, much discussed ring-form of the parasite, in which it resembles a signet-ring, the nucleus forming a little thickening to one side. Some authorities (*e.g.* Argutinsky) have regarded this structure as being really a greatly distended vesicular nucleus, and, to a large extent, indeed, an artifact, resulting from imperfect fixation; but Schaudinn considers it is a true vacuole, and explains it on the ground of the rapid nutrition and growth. Later on this vacuole disappears, and the grains of pigment make their appearance. The trophozoite is now large and full-grown, and has become rounded and ready for schizogony. The nucleus of the schizont divides several times (more or less directly, by simple or multiple fission) to form a number of daughter-nuclei, which take up a regular position near the periphery. Around these the cytoplasm becomes segmented, giving rise to the well-known *corps en rosace*. Eventually the merozoites, in the form of little round uninuclear bodies, are liberated from the now broken-down corpuscle, leaving behind a certain amount of residual cytoplasm containing the pigment grains. Besides the difference in the time taken by the complete process of schizogony in the various species (see above), there are distinctions in the composition of the rosettes. Thus, in *Laverania*, the number of merozoites formed is very variable; in *Plasmodium vivax* (the tertian parasite) there are only few (9 to 12) merozoites, but in *P. malariae* (the quartan form) they are more numerous, from 12 to 24. The liberated merozoites proceed to infect fresh blood corpuscles and a new endogenous cycle is started.

After asexual multiplication has gone on for some time, sexual forms become developed. According to Schaudinn, the stimulus which determines the production of gametocytes instead of schizonts is the reaction of the host (at the height of a fever period) upon the parasites. A young trophozoite which is becoming a gametocyte is distinguished from one which gives rise to a schizont by its much slower rate of growth, and the absence of any vacuoles in its cytoplasm. The gametocytes themselves are characterized by their peculiar shape, like that of a sausage, whence they are very generally known as "crescents." Male and female gametocytes are distinguished (roughly) by the arrangement of the pigment-grains; in the former, they are fairly evenly scattered throughout the cytoplasm, but in the megagametocytes the pigment tends to be aggregated centrally, around the nucleus. As they become full-grown and mature, however, the gametocytes lose their crescentic form and assume that of an oval, and finally of a sphere. At the same time, they are set free from the remains of the blood corpuscle. The spherical stage is practically the limit of development in the Vertebrate host, although, sometimes, the nucleus of the microgametocyte may proceed to division. The "crescents" of the pernicious parasite afford a very important diagnostic difference from the gametocytes of both species of *Plasmodium*, which have the ordinary, rounded shape of the schizonts. In the case of the latter, points such as their slower growth, their less amoeboid character, and their size furnish the means of distinction.

When a gnat or mosquito sucks blood, all phases of the parasite in the peripheral circulation at that point may succeed in passing into the insect. If this occurs all trophic and schizogonic phases are forthwith digested, and the survival of the sexual phases depends entirely upon whether the insect is a gnat or mosquito. Only in the latter case can further development of the gametocytes go on; in other words, only the genus *Anopheles*, and not the genus *Culex*, furnishes specific hosts for the malarial parasites. This is a biological fact of considerable importance in connexion with the prophylactic measures against malaria. In the stomach of an *Anopheles*, the gametocytes quickly proceed to gamete-formation. The nucleus of the microgametocyte divides up, and the daughter-nuclei pass to the periphery. The surface of the body grows out into long, whip-like processes, of which there are usually 6 to 8 (probably the typical number is 8); each is very motile, in this respect strongly resembling a flagellum. This phase may also develop in drawn blood, which has, of course, become suddenly cooled by the exposure; and it seems evident that it is the change in temperature, from the warm to the cold-blooded host, which brings about the development of the actual sexual elements. Earlier observers regarded the phase just described as representing another parasite altogether, of a Flagellate nature—whence the well-known term, *Polymitus*-form; and even more recent workers, such as Labbé who connected it with the malarial parasite,

[1] For an interesting account of the biological relations between parasites and their hosts, and the penalty Man pays for his roving propensities, the reader should see Lankester's article in the *Quarterly Review*, July 1904.

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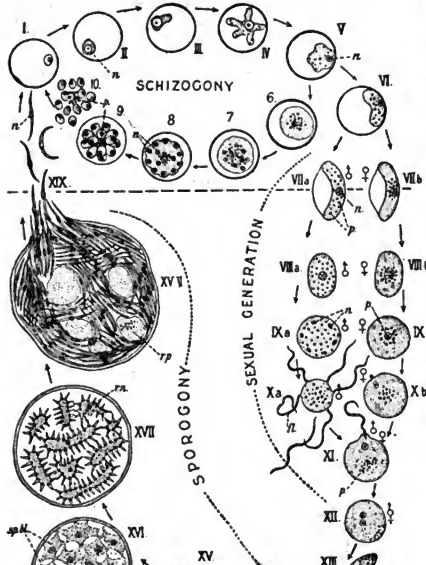

From Lankester's *Treatise on Zoology*.

FIG. 1.—Diagram of the complete life-cycle of the parasite of pernicious malaria, *Laverania malariae*, Gr. et Fel. The stages on the upper side of the dotted line are those found in human blood; below the dotted line are seen the phases through which the parasite passes in the intermediate host, the mosquito. Plan and arrangement chiefly after Neveu-Lemaire; details of the figures founded on those of Grassi, Schaudinn (Leuckart's *Zoologische Wandtafeln*), Ross and others.

I.-V. and 6-10 show the schizogony.
VI.-XII., The sexual generation.
XIII., The motile zygote.
XIV.-XIX., Sporogony.
I.-III., Young amoebulae in blood-corpuscles.
IV., Older, actively amoeboid trophozoite.
V., Still older, less amoeboid trophozoite.
6, Mature schizont.
7, Schizont, with nucleus dividing up.
8, Young rosette stage.
9, Fully formed rosette stage.
10, Merozoites free in the blood by breaking down of the corpuscle.
VI., Young indifferent gametocyte.
VII., *a*, Male crescent.
VII., *b*, Female crescent.
VIII., *a* and *b*, The gametocytes becoming oval.
IX., *a* and *b*, Spherical gametocytes; in the male (IX. *a*) the nucleus has divided up.
X., *a* and *b*, Formation of gametes; in the male (X. *a*) the so-called flagella or male gametes (*fl*) are thrown out, one of them is seen detached; in the female (X. *b*) a portion of the nucleus has been expelled.
XI., A male gamete penetrating a female gamete at a cone of reception formed near the nucleus.
XII., Zygote with two pronuclei in proximity.
XIII., Zygote in the motile stage (vermicule or ookinete).
XIV., Encysted zygote (oocyst).
XV., Commencing multiplication of the nuclei in the oocyst.
XVI., Oocyst with numerous sporoblasts.
XVII., Commencing formation of sporozoites.
XVIII., Full-grown oocyst crammed with ripe sporozoites; on one side the cyst has burst and the sporozoites are escaping.
XIX., Free sporozoites, showing their changes of form.
n, Nucleus of the parasite.
p, Melanin pigment.
fl, "Flagella.
sp. bl., Sporoblasts.
r. n., Residual nuclei.
r. p., Residual protoplasm.

failed to appreciate its true significance, and considered it rather as a degeneration-appearance. The micro-gametes soon liberate themselves from the residual cytoplasm of the parent and swim away in search of a megagamete; each is a very slender, wavy filament, composed largely of chromatic substance. The finer details of structure of the microgamete of a malarial parasite cannot be said, however, to be thoroughly known, and it is by no means impossible that its structure is really trypaniform, as, according to Schaudinn's great work, is the case with the merozoites and sporozoites.

The megagametocyte becomes a megagamete directly after a process of maturation, which consists in the expulsion of a certain amount of nuclear substance. The actual conjugation is quite similar to the process in Coccidia, and the resulting zygote perfectly homologous. In the present case, however, the zygote does not at once secrete an oocyst, with a thick resistant wall; on the contrary, it changes its shape, and becomes markedly gregariniform and active, and is known for this reason as an ookinete. The ookinete passes through the epithelial layer of the stomach, the thinner and more pointed end leading the way, and comes to rest in the connective tissue forming the outer layer of the stomach-wall (fig. 2). Here it becomes rounded and cyst-like, and grows considerably; for only a thin, delicate cyst-membrane is secreted, which does not impede the absorption of nutriment. Meanwhile, the nucleus has divided into several,

From Lankester's *Treatise on Zoology*.

FIG. 2.—Stomach of a mosquito, with cysts of Haemosporidia. (After Ross.)

oes, Oesophagus. *Mt*, Malpighian
st, Stomach. tubules.
cy, Cysts. *int*, Intestine.

around each of which the cytoplasm becomes segmented. Each of these segments ("blastophores," "zoidophores") is entirely comparable to a sporoblast in the Coccidian oocyst, the chief difference being that it never forms a spore; moreover the segments or sporoblasts in the oocyst of a malarial parasite are irregular in shape and do not become completely separated from one another, but remain connected by thin cytoplasmic strands. Repeated multiplication of the sporoblast-nuclei next takes place, with the result that a great number of little nuclei are found all round the periphery. A corresponding number of fine cytoplasmic processes grow out from the surface, each carrying a nucleus with it, and in this manner a

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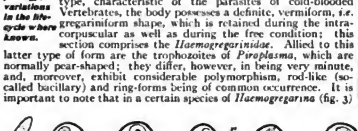
huge number of slender, slightly sickle-shaped germs or sporozoites ("blasts," "zoids," &c.) are formed. Each oocyst may contain from hundreds to thousands of sporozoites.

When the sporogony (which lasts about 10 days) is completed, the oocyst ruptures and the sporozoites are set free into the body-cavity, leaving behind a large quantity of residual cytoplasm, including pigment grains, &c. The sporozoites are carried about by the blood-stream; ultimately, however, apparently by virtue of some chemotactic attraction, they practically all collect in the salivary glands, filling the secretory cells and also invading the ducts. When the mosquito next bites a man, numbers of them are injected, together with the minute drop of saliva, into his blood, where they begin a fresh endogenous cycle.

There is only one other point with regard to the life-history that need be mentioned. With the lapse of time all trophic and schizogonic (asexual) phases of the parasite in the blood die off. But it has long been known that malarial patients, apparently quite cured, may suddenly exhibit all the symptoms again, without having incurred a fresh infection. Schaudinn has investigated the cause of this recurrence, and finds that it is due to the power of the megagametocytes, which are very resistant and long-lived, to undergo a kind of parthenogenesis under favourable conditions and give rise to the ordinary asexual schizonts, which in turn can repopulate the host with all the other phases. Microgametocytes, on the other hand, die off in time if they cannot pass into a mosquito.

Comparative Morphology: variations in the life-cycle where known.

Various types of form are to be met with among the Haemosporidia. In one, characteristic of most (though not of absolutely all) parasites of warm-blooded Vertebrates, the trophozoites are of irregular amoeboid shape; hence this section is generally known as the *Haemamoebidae*. In another type, characteristic of the parasites of cold-blooded Vertebrates, the body possesses a definite, vermiform, *i.e.* gregariniform shape, which is retained during the intracorpuscular as well as during the free condition; this section comprises the *Haemogregariinidae*. Allied to this latter type of form are the trophozoites of *Piroplasma*, which are normally pear-shaped; they differ, however, in being very minute, and, moreover, exhibit considerable polymorphism, rod-like (so-called bacillary) and ring-forms being of common occurrence. It is important to note that in a certain species of *Haemogregarina* (fig. 3)



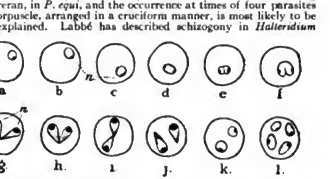
From Lankester's *Treatise on Zoology*.

FIG. 3.—*Haemogregarina bigemina*, Laveran, from the blood of blennies. (After Laveran, magnified about 1800 diameters.)

a, The form of the parasite found free in the blood-plasma.
b, Parasite within a blood-corpuscle, preparing for division; the nucleus has already divided.
c, The parasite has divided into two rounded corpuscles, which assume the form of the free parasite, as seen in *d*, *e* and *f*.
N, Nucleus of the blood-corpuscle.
n, Nucleus of the parasite. The outline of the blood-corpuscle is indicated by a thick black line.

the young trophozoites markedly resemble *Piroplasma* in their pyriform appearance; and a further point of agreement between the two forms is mentioned below. Lastly there is the Avian genus *Halteridium*, the trophozoites of which are characteristically bean-shaped or reniform. True Haemogregarines also differ in other slight points from "Haemamoebae." Thus the young endoglobular trophozoite does not exhibit a ring (vacuolar) phase; and the cytoplasm never contains, at any period, the characteristic melanin pigment above noted. In some species of *Haemogregarina* the parasite, while intracorpuscular, becomes surrounded by a delicate membrane, the cytocyst; on entering upon an active, "free" period, the cytocyst is ruptured and left behind with the remains of the corpuscle. A very interesting cytological feature is the occurrence, in one or two Haemosporidia, of nuclear dimorphism, *i.e.* of a larger and smaller chromatic body, probably comparable to the trophic and kinetic nuclei of a Trypanosome, or of the "Leishman-Donovan" bodies. Schaudinn was the first to notice this character, in *Piroplasma canis*, and his observation has since been confirmed by Lühe.[1] Moreover, Brumpt has also noticed nuclear dimorphism in the ookinete of a species of *Haemogregarina* in a leech (as the Invertebrate host)—a highly important observation.

As regards the life-history, the endogenous (schizogonous) cycle is known in many cases. Sometimes schizogony takes the primitive form of simple binary (probably) longitudinal fission; this is the case in *Piroplasma* (fig. 4) and also in *Haemogregarina bigemina* just referred to. From this result the pairs of individuals ("twins") so often found in the corpuscles. In addition, however, at any rate in *Piroplasma*, it is probable that multiple division (more allied to ordinary schizogony) also takes place; such is the case, according to Laveran, in *P. equi*, and the occurrence at times of four parasites in a corpuscle, arranged in a cruciform manner, is most likely to be thus explained. Labbé has described schizogony in *Halteridium*



From Lankester's *Treatise on Zoology*.

FIG. 4.—Development and schizogony of *Piroplasma bigeminum* in the blood-corpuscles of the ox. (After Laveran and Nicolle.)

a, Youngest form.
b, Slightly older.
c and *d*, Division of the nucleus.
e and *f*, Division of the body of the parasite.
g, *h*, *i*, *j*, Various forms of the twin parasite.
k and *l*, Doubly infected corpuscles.

danilewskyi as taking place in a rather peculiar manner; the parasite becomes much drawn-out and halter-like, and the actual division is restricted to its two ends, two clumps of merozoites being formed, at first connected by a narrow strand of unused cytoplasm, which subsequently disappears. Some doubt, however, attaches to this account, as no one else appears to have seen the process. For the rest, schizogony takes place more or less in the customary way, allowing for variations in the mode of arrangement of the merozoites. It remains to be noted that in *Karyolysus lacertarum*, according to Labbé, two kinds of schizont are developed, which give rise, respectively, to micromerozoites and megamerozoites, in either case enclosed in a delicate cytocyst. This probably corresponds to an early sexual differentiation (such as is found among certain Coccidia (*q.v.*), the micromerozoites producing eventually microgametocytes, the others megagametocytes.

It has now been recognized for some time that the sexual (exogenous) part of the life-cycle of all the *Haemamoebidae* takes place in an Invertebrate (Insectan) host, and is fundamentally similar to that above described in those cases where it has been followed. In contradistinction to the malarial parasites, this host, in the Avian forms (*Haemoproteus* and *Halteridium*),[2] is a species of *Culex* and not of *Anopheles*; in other words, gamete-formation, conjugation and subsequent sporozoite-formation in these cases will only go on in the former. On the other hand, in the case of the Haemogregarines, it was thought until quite lately that the entire life-history, including conjugation and sporogony, went on in the Vertebrate host; and only in 1902 Hintze asserted the contrary, and to be the complete life-history of *Lankesterella* (*Drepanidium*) *ranarum* undergone in the frog. This view was rendered obsolete by the work of Siegel and Schaudinn, who demonstrated the occurrence of an alternation of hosts and of generations in the case of *Haemogregarina stepanovi*, parasitic in a tortoise, and in *Karyolysus lacertarum*; the Invertebrate hosts, in which, in both cases, the sexual process is undergone, being respectively a leech (*Placobdella*) and a tick (*Ixodes*). With this discovery the main distinction (as supposed) between the Haemosporidia of warm and of cold-blooded Vertebrates vanished. It was further acknowledged by Schaudinn (under whom Hintze

[1] This does away with one of the principal reasons on account of which some authorities consider *Piroplasma* (*Leishmania*) *donovani* as quite distinct from other *Piroplasmata* (see TRYPANOSOMES).

[2] It must not be forgotten that one species of *Halteridium* (*H.* [*Trypanosoma*] *noctuae*) is said to have well-marked trypaniform phases in its life-cycle; these are preferably considered under Trypanosomes (*q.v.*), and therefore, to avoid repetition, are only thus alluded to here. Whether *H. danilewskyi* also becomes trypaniform in certain phases, and how far it really agrees with the criteria of a Haemosporidian above postulated, are matters which are not yet definitely known.

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had worked) that the latter had been misled by Coccidian cysts and spores, which he took for those of *Lankesterella*. The gametogony and sporogony of *Haemogregarina stepanovi* in the leech agree in essential particulars with the process above described. The microgametes are extremely minute, and the sporozoites, which are developed in the salivary glands, where the motile colonites finally come to rest, are extremely spirochaetiform ?—the full significance of this latter fact being, perhaps, not appreciated.

Christophers recently described some remarkable phases which he regarded as belonging to the cycle of *Haemogregarina gerbilli* (one of the few Mammalian Haemogregarines known) in a louse (*Haematopinus*). In a private communication, however, the author states that he has probably mistaken phases in the development of an ordinary gregarine parasite in the louse for part of the life-cycle of this Haemogregarine.

The Mammalian parasite *Piroplasma* is the one about whose life-history our knowledge is most vague. Besides the typical and generally occurring forms, others have also been observed in the blood, but it is doubtful how far these are to be looked upon as normal; for instance, Bowhill and Le Roux have described, in various species, a phase in which a long, slender pseudopodial-like outgrowth is present, with a swelling at the distal end. It is, moreover, quite uncertain which are the sexual forms, comparable to gametocytes. Doflein regards large pear-shaped forms as such (megagametocytes ?), which become spherical when maturing; and Nocard and Motas have figured amoeboid, irregular forms, with the nucleus fragmented, and possessing flagella-like processes (possibly microgametes ?). The invertebrate host is well known to be, in the case of all species, a tick; thus bovine piroplasmosis (*P. bigeminum*) in America is conveyed by *Rhipicephalus annulatus* (*Boophilus bovis*), canine piroplasmosis (*P. canis*) in South Africa by *Haemaphysalis leachi* (and perhaps *Dermacentor reticulatus*), and so on. The manner in which the infection is transmitted by the tick varies greatly. In some cases (*e.g. P. bigeminum* and *P. canis*) only the generation subsequent to that which receives the infection (by feeding on an infected ox) can transmit it back again to another ox; in other words, true hereditary infection of the ova in the mother-tick is found to occur. The actual period in the life of the daughter-tick at which it can convey the infection apparently varies. On the other hand, in the case of East African coast fever, Theiler found that hereditary infection does not occur, the same generation transmitting the parasite (*P. parvum*) at different periods of life. Little is certainly known regarding the phases of the parasite which are passed through in the tick. Lignières has observed a kind of multiple fission in the stomach, several very minute bodies, consisting mostly of chromatin, being formed, which may serve for endogenous reproduction. Koch has published an account of certain curious forms of *P. bigeminum*, in which the body is produced into many stiff, ray-like processes, giving the appearance of a star; according to him fusion of such forms takes place, and the resulting zygote becomes rounded, perhaps transitional to the pear-shaped forms.

Classification.

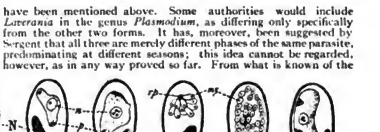
The classification and nomenclature of the Haemosporidia are in a very unsettled condition. For an account of the various systems and modifications hitherto adopted, the article of Minchin (see under SPOROZOA: *Bibliography*) should be consulted. With the realization that the life-history in the case of the "Haemamoebae" and the Haemogregarines is fundamentally similar in type, the chief reason for grouping them as distinct suborders has disappeared. It is most convenient to regard them as separate, but closely allied families, the *Haemodidae* ("*Haemamoebidae*") and the *Haemogregarinidae*. The *Piroplasmata*, on the other hand, constitute another family, which is better placed in a distinct section or sub-order. In addition there are, as already noted, two or three genera whose systematic position must be considered as quite uncertain. One is the well-known *Haltridium* of Labbé, parasitic in various birds; the type-species is *H. danilewskyi* (Gr. and Fel.). Another is the much-debated parasite of white blood-corpuscles (leucocytes), originally described in birds by Danilewsky under the name *Leucocytozoon*, a form of which has been recently observed in Mammals.

In conclusion, the chief members of the above-mentioned families may be enumerated.

Fam. *Haemodidae* (" *Haemamoebidae* ").

Genus *Laverania*, Gr. and Fel. (syn. *Haemamoenas*, Ross), for *L. malariae*, Gr. and Fel. (syn. *L. s. Plasmodium*, s. " *Haemamoeba*," &c., *praecox s. immaculatum*, &c.), the parasite of pernicious malaria. Genus *Plasmodium*, March. and Celli (syn. " *Haemamoeba* ") for *P. vivax* and *P. malariae*, the tertian and quartan parasite, respectively. There is also a form known in apes, *P. kochi*. Genus *Haemoproteus*, Kruse (syn. *Proteosoma*), for *H. danilewskyi* (syn. *Proteosoma grassi*, *Plasmodium praecox*, &c.), parasitic in numerous birds. Recently, another form has been described from reptiles which Castellani and Willey have termed *Haemocystidium simondi*.

Remarks.—The distinguishing characters of the malarial parasites have been mentioned above. Some authorities would include *Laverania* in the genus *Plasmodium*, as differing only specifically from the other two forms. It has, moreover, been suggested by Sergent that all three are merely different phases of the same parasite, predominating at different seasons; this idea cannot be regarded, however, as in any way proved so far. From what is known of the morphology and mode of manifestation of these forms, the differences between *Laverania* and the two species of *Plasmodium* are considerably more pronounced than those between *P. vivax* and *P. malariae*; if the latter are to be considered as distinct species, the first-named is probably generically distinct. Lühe, it may be noted, in his recent comprehensive account of the Haematozoa, also takes this view. Lastly, whatever be the correct solution of the above problem, there is certainly not sufficient justification for including the Avian genus *Haemoproteus*, as also only a species of *Plasmodium*, which is done by some. Its different Vertebrate habitat, and also the fact that its Insectan definitive host is *Culex* and not *Anopheles*, differentiate it sharply from *Laverania* and *Plasmodium*.



From Lankester's *Treatise on Zoology*.

FIG. 5.—*Haemoproteus danilewskyi*, Kruse (parasite of various birds). × about 1200. *a*, *b*, *c* and *f* from the chaffinch; *d* and *e* from the lark. (After Labbé.)

a, Young trophozoite in a blood-corpuscle.
b and *c*, Older trophozoite.
d and *e*, Sporulation.
d, Precocious sporulation with few merozoites.
e, Sporulation of a full-grown schizont, with numerous merozoites.
f, Gametocyte.
N, Nucleus of blood-corpuscle.
n, Nucleus of parasite.
p, Pigment.
mz, Merozoites.
r.p, Residual protoplasm.

Fam. *Haemogregarinidae*.—The different genera are characterized

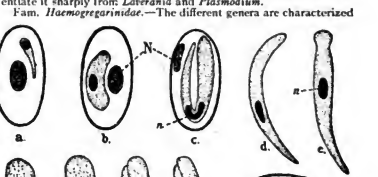


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FIG. 6.—*Haemogregarina stepanovi*, Danilewsky (par. *Emys* and *Cistudo*), phases of the schizogony. (*a-e* and *j* after Laveran; *f-i* after Börner.) × 1000 to 1200 diameters.

a, Blood-corpuscle with young trophozoite.
b, Older trophozoite.
c, Full-grown trophozoite, ready to leave the corpuscle.
d and *e*, Trophozoites free in the blood-plasma, showing changes of form.
f-i, Trophozoites, still within the blood-corpuscle (not drawn), showing the structure of the nucleus, the coarse chromatoid granules in the protoplasm and the manner in which the parasite grows into the U-shaped Haemogregarine without increase of body-mass.
j, Commencement of sporulation; the nucleus has divided into eight nuclei, and the body of the parasite is beginning to divide up into as many merozoites within a blood-corpuscle.
N, Nucleus of the blood-corpuscle.
n, Nucleus of the parasite.

chiefly by their size relative to the blood-corpuscles, and their disposition in the latter. Here, again, it has been suggested to unite the various types all in one genus, *Haemogregarina*, but this seems at least premature when it is remembered how little is known in most cases of the life-cycle, which may prove to exhibit important divergences.

Genus *Haemogregarina*, Danilewsky (syn. *Danilewskya*, Labbé).

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The body of the parasite exceeds the blood-corpuscle in length, when adult, and is bent upon itself, like a U. A very great number of species are known, mostly from reptiles and fishes; among them may be mentioned *H. stepanovi* (fig. 6), from *Emys* and *Cistudo*, whose sexual-cycle in a leech has been worked out by Siegel (see above), *H. dalagei*, from *Raja*, *H. bigemina*, from blennies, and *H. simondi*, from soles. Recently one or two Mammalian forms have been observed, *H. gerbilli*, from an Indian rat (*Gerbillus*), and *H. jaculi*, from the jerboa.

Genus *Lankesterella*, Labbé (syn. *Drepanidium*, Lankester). The parasite is not more than three-quarters the length of the corpuscle, *L. ranarum* from *Rana* is the type-species; another, recently described by Fantham, is *L. tritonis*, from the newt.

Genus *Karyolysus*, Labbé.' The parasite does not exceed the corpuscle in length; the forms included in this genus, moreover,

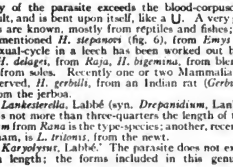

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FIG. 7.—*Karyolysus lacertarum* (Danil.), in the blood-corpuscles of *Lacerta muralis*, showing the effects of the parasite upon the nucleus of the corpuscle. In *c* and *d* the nucleus is broken up. N, Nucleus of the corpuscle; *n*, nucleus of the parasite, seen as a number of masses of chromatin, not enclosed by a distinct membrane. (After Marceau.)

although not actually intranuclear, have a marked karyolytic and disintegrating action upon the nucleus of the corpuscle. The type-species is the well-known *K. lacertarum*, of lizards; another is *K. (Haemogregarina) viperini*, from *Tropidonotus*.

In the section of the *Piroplasmata* there is only the genus *Piroplasma*, Patton (syn. *Babesia*, Starcovici, *Pyrosoma*, Smith and Kilborne), the principal species of which are as follows: *P. bigeminum*, the cause of Texas cattle-fever, tick-fever (Rinder-malaria) of South Africa, and *P. bovis*, causing haemoglobinuria of cattle in Southern Europe; there is some uncertainty as to whether these two are really distinct; *P. canis*, *P. ovis* and *P. equi* associated, respectively, with those animals. Lately, a very small form, *P. parvum*, has been described by Theiler in Rhodesia, which causes East-African coast-fever; and another, *P. muris*, has been observed in white rats by Fantham.

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(H. M. Wo.)

HAETZER, or **HETZER**, **LUDWIG** (d. 1529), Swiss divine, was born in Switzerland, at Bischofszell, in Thurgau. He studied at Freiburg-im-Breisgau, and began his career in a chaplaincy at Wadenswil, on the Lake of Zürich. At this time his attachment to the old faith was tempered by a mystical turn, and by a devotion to the prophetical writings of the Old Testament, which he studied in the original. By 1523 we find him in Zürich, where he published, at first anonymously and in Latin (*Judicium Dei*), later with his name and in German (Sept. 24, 1523), a small tract against the religious use of images, and bearing the motto attached to all his subsequent works, "Gott erlöst die (or dein) Gefangnen" ("O God, set the prisoners free"). An attempt to give effect to the teaching of this (frequently reprinted) tract was followed by a public religious disputation, of which Haetzer drew up the official account. In 1524 he brought out a tract on the conversion of the Jews, and published a German version of Johann Bugenhagen's brief exposition of the epistles of St Paul (Ephesians to Hebrews); in the dedication (dated Zürich, June 29, 1524) he undertakes to translate Bugenhagen's comment on the Psalter. He then went to Augsburg, bearing Zwingli's introduction to Johann Frosch. Here he came for a time under the influence of Urbanus Regius, and was for a short time the guest of Georg Regel. Returning to Zürich, he was in intercourse with leading Anabaptists (though his own position was simply the disuse of infant baptism) till their expulsion in January 1525. Again resorting to Augsburg, and resuming work as corrector of the press for his printer Silvan Ottmar, he pushed his views to the extreme of rejecting all sacraments, reaching something like the mystical standpoint of the early Quakers. He was expelled from Augsburg in the autumn of 1525, and made his way through Constance to Basel, where Oecolampadius received him kindly. He translated into German the first treatise of Oecolampadius on the Lord's Supper (in which the words of institution are taken figuratively), and proceeding to Zürich in November, published

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his version there in February 1526, with a preface disclaiming connexion with the Anabaptists. His relations with Zwingli were difficult; returning to Basel he published (July 18, 1526) his translation of Malachi, with Oecolampadius's exposition, and with a preface reflecting on Zwingli. This he followed by a version of Isaiah xxxvi.–xxxvii. He next went to Strassburg, and was received by Wolfgang Capito. At Strassburg in the late autumn of 1526 he fell in with Hans Dengk or Denck, who collaborated with him in the production of his *opus magnum*, the translation of the Hebrew Prophets, *Alle Propheten nach hebraischer Sprach vertuetscht*. The preface is dated Worms, 3 April 1527; and there are editions, Worms, 13 April 1527, folio; Augsburg, 22 June 1527, folio; Worms, 7 Sept. 1527, 16°; and Augsburg, 1528, folio. It was the first Protestant version of the prophets in German, preceding Luther's by five years, and highly spoken of by him. Haetzer and Denck now entered on a propagandist mission from place to place, with some success, but of short duration. Denck died at Basel in November 1527. Haetzer was arrested at Constance in the summer of 1528. After long imprisonment and many examinations he was condemned on the 3rd of February 1529 to die by the sword, and the sentence was executed on the following day. His demeanour on the scaffold impressed impartial witnesses, Hans Zwick and Thomas Blaurer, who speak warmly of his fervour and courage. The Dutch Baptist Martyrology describes him as "a servant of Jesus Christ." The Moravian Chronicle says "he was condemned for the sake of divine truth." His papers included an unpublished treatise against the essential deity of Christ, which was suppressed by Zwingli; the only extant evidence of his anti-trinitarian views being contained in eight quaint lines of German verse preserved in Sebastian Frank's *Chronica*. The discovery of his heterodox Christology (which has led modern Unitarians to regard him as their proto-martyr) was followed by charges of loose living, never heard of in his lifetime, and destitute of evidence or probability.

See Breitinger, "Anecdota quaedam de L. H." in *Museum Helveticum* (1746), parts 21 and 23; Wallace, *Antitrinitarian Biography* (1850); *Dutch Martyrology* (Hanserd Knollys Society) (1856); Th. Keim, in Hauck's *Realencyklopädie* (1899). (A. Go.*)

HÄFIZ. Shams-ud-din Mahommed, better known by his *takhallus* or *nom de plume* of Häfiz, was one of the most celebrated writers of Persian lyrical poetry. He was born at Shiraz, the capital of Fars, in the early part of the 8th century of the Mahommedan era, that is to say, in the 14th of our own. The exact date of his birth is uncertain, but he attained a ripe old age and died in 791 A.H. (A.D. 1388). This is the date given in the chronogram which is engraved on his tomb, although several Persian biographers give a different year. Very little is actually known about his life, which appears to have been passed in retirement in Shiraz, of which he always speaks in terms of affectionate admiration. He was a subject of the Muzaffar princes, who ruled in Shiraz, Yazd, Kirman and Ispahan, until the dynasty was overthrown by Timur (Tamerlane). Of these princes his especial patrons were Shah Shujä' and Shah Mansür. He early devoted himself to the study of poetry and theology, and also became learned in mystic philosophy, which he studied under Shaik Mahmüd 'Aṭṭär, chief of an order of dervishes. Häfiz afterwards enrolled himself in the same order and became a professor of Koranic exegesis in a college which his friend and patron Haji Kiwam-ud-din, the vizier, specially founded for him. This was probably the reason of his adopting the sobriquet of Häfiz ("one who remembers"), which is technically applied to any person who has learned the Koran by heart. The restraints of an ascetic life seem to have been very little to Häfiz's taste, and his loose conduct and wine-bibbing propensities drew upon him the severe censure of his monastic colleagues. In revenge he satirizes them unmercifully in his verses, and seldom loses an opportunity of alluding to their hypocrisy. Häfiz's fame as a poet was soon rapidly spread throughout the Mahommedan world, and several powerful monarchs sent him presents and pressing invitations to visit them. Amongst others he was invited by Mahmüd Shah Bahmani, who reigned in the south of India. After crossing the Indus and passing through Lahore he reached Hurmuz, and embarked on board a vessel sent for him by the Indian prince. He seems, however, to have been a bad sailor, and, having invented an excuse for being put ashore, made the best of his way back to Shiraz. Some biographies narrate a story of an interview between Häfiz and the invader Timur. The latter sent for him and asked angrily, "Art thou he who was so bold as to offer my two great cities Samarkand and Bokhara for the black mole on thy mistress's cheek?" alluding to a well-known verse in one of his odes. "Yes, sire," replied Häfiz, "and it is by such acts of generosity that I have brought myself to such a state of destitution that I have now to solicit your bounty." Timur was so pleased at his ready wit that he dismissed the poet with a handsome present. Unfortunately for the truth of this story Timur did not capture Shiraz till A.D. 1393, while the latest date that can be assigned to Häfiz's death is 1391. Of his private life little or nothing is known. One of his poems is said to record the death of his wife, another that of a favourite unmarried son, and several others speak of his love for a girl called *Shäkh i Nabat*, "Sugar-cane branch," and this is almost all of his personal history that can be gathered from his writings. He was, like most Persians, a Shi'ite by religion, believing in the transmission of the office of Imäm (head of the Moslem Church) in the family of Ali, cousin of the prophet, and rejecting the *Hadith* (traditional sayings) of Mahomet, which form the Sunna or supplementary code of Mahommedan ceremonial law. One of his odes which contains a verse in praise of Ali is engraved on the poet's tomb, but is omitted by Sudi, the Turkish editor and commentator, who was himself a rigid Sunnite. Häfiz's heretical opinions and dissipated life caused difficulties to be raised by the ecclesiastical authorities on his death as to his interment in consecrated ground. The question was at length settled by Häfiz's own works, which had then already begun to be used, as they are now throughout the East, for the purposes of divination, in the same manner as Virgil was employed in the middle ages for the divination called *Sortes Virgilianae*. Opening the book at random after pronouncing the customary formula asking for inspiration, the objectors hit upon the following verse—"Turn not away thy foot from the bier of Häfiz, for though immersed in sin, he will be admitted into Paradise." He was accordingly buried in the centre of a small cemetery at Shiraz, now included in an enclosure called the Häfiziyeh.

His principal work is the *Diwän*, that is, a collection of short odes or sonnets called *ghazals*, and consisting of from five to sixteen *baits* or couplets each, all the couplets in each ode having the same rhyme in the last hemistich, and the last couplet always introducing the poet's own *nom de plume*. The whole of these are arranged in alphabetical order, an arrangement which certainly facilitates reference but makes it absolutely impossible to ascertain their chronological order, and therefore detracts from their value as a means of throwing light upon the growth and development of his genius or the incidents of his career. They are often held together by a very slender thread of continuous thought, and few editions agree exactly in the order of the couplets. Still, a careful study of them, especially from the point of view indicated by the Sufistic system of philosophy, will always show that a single idea does run throughout the whole. The nature of these poems has been the subject of much discussion in the West, some scholars seeing in their anacreontic utterances nothing but sensuality and materialism, while others, following the Oriental school, maintain that they are wholly and entirely mystic and philosophic. Something between the two would probably be nearer the truth. It must be remembered that Häfiz was a professed dervish and Süfi, and that his *ghazals* were in all probability published from a *takia*, and arranged with at least a view to Sufistic interpretation. At the same time it is ridiculous to suppose that the glowing imagery, the gorgeous and often tender descriptions of natural beauties, the fervent love passages, and the roystering drinking songs were composed in cool blood or with deliberate ascetic purpose. The beauty of Häfiz's poetry is that it is natural. It is the outcome

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of a fervent soul and a lofty genius delighting in nature and enjoying life; and it is the poet's misfortune that he lived in an age and amongst a people where rigid conventionality demanded that his free and spontaneous thoughts should be recast in an artificial mould.

Besides the *Dīwān*, Hāfiz wrote a number of other poems: the Leipzig edition of his works contains 573 *ghazals* (forming the *Diwān*), 42 *kifʿas* or fragments, 69 *rubāʿiyāt* or tetrastichs, 6 *masnawis* or poems in rhyming couplets, 2 *kasīd*, idylls or panegyrics, and 1 *mukhammas* or poem in five-line strophes. Other editions contain several *tarjīʿ-band* or poems with a refrain. The whole *Diwān* was translated into English prose by H. Wilberforce Clarke in 1891, with introduction and exhaustive commentary and bibliography; a few rhyming versions of single poems by Sir William Jones, J. Nott, J. Hindley, Falconer, &c., are to be found scattered through the pages of the *Oriental Miscellany* and other periodicals, and a first edition containing a verse rendering of the principal poems by H. Bicknell appeared in 1875. Other selections by S. Robinson (1875), A. Rogers (1889), J. H. M'Carthy (1893), and Gertrude L. Bell (1897). The principal German versions are by von Hammer Purgstall (1812), which gave the first impulse to Goethe's *Westöstlicher Diwan*; a rhyming and rhythmical translation of a large portion of Hāfiz's works by Vincenz von Rosenzweig of Vienna (Vienna, 1858), which contains also the Persian text and notes; *Der Diwan des Schemseddin Muhammed Hafis*, by G. H. F. Nesselmann (Berlin, 1865), in which the rhyming system of the original is imitated. Besides these, the reader may consult d'Herbelot, *Bibliothèque orientale*, article "Hafiz"; Sir William Ouseley's *Oriental Collections* (1797–1798); *A Specimen of Persian Poetry, or Hafiz*, by John Richardson (London, 1802); *Biographical Notices of Persian Poets*, by Sir Gore Ouseley (Oriental Translation Fund, 1846); and an excellent article by Professor E. B. Cowell in *Macmillan's Magazine* (No. 177, July 1874); J. A. Vullers, *Vitae poetarum Persicorum* (1839, translated from Daulatshah); S. Robinson, *Persian Poetry for English Readers* (1883). The best edition of the text is perhaps that edited by Hermann Brockhaus of Leipzig (1854–1856), which is based on the recension of the Turkish editor Sudi, and contains his commentary in English on the first eighty *ghazals*. See also H. Ethé in *Grundriss der iranischen Philologie*, ii. (Strassburg, 1896); P. Horn, *Geschichte der persischen Literatur* (Leipzig, 1901). (E. H. P.)

HAG. (1) (Probably a shortened form of the O. Eng. *hæglesse*, *hegles*, cognate with Ger. *Hexe*, wicht, Dutch *hecse*), a word common during the 16th and 17th centuries for a female demon or evil spirit, and so particularly applied to such supernatural beings as the harpies and fairies of classical mythology, and also to witches. In modern usage the word is generally used of a hideous old woman whose repulsive exterior is accompanied by malice or wickedness. The name is also used of an eel-like parasitic fish, *Myxine glutinosa*, allied to the lamprey.

(2) A word common in Scottish and northern English dialects for an enclosed piece of wood, a copse. This is the same word as "hedge" (see HEDGES) and "haw." "Hag" also means "to cut," and is used in Scotland of an extent of woodland marked out for felling, and of a quantity of felled wood. This word is also used of a cutting in the peat of a "moss" or "bog," and hence applied to the small plots of firm ground or heather in a bog; it is common in the form "moss-hags."

HAGEDORN, FRIEDRICH VON (1708–1754), German poet, was born on the 23rd of April 1708 at Hamburg, where his father, a man of scientific and literary taste, was Danish minister. He was educated at the gymnasium of Hamburg, and later (1726) became a student of law at Jena. Returning to Hamburg in 1729, he obtained the appointment of unpaid private secretary to the Danish ambassador in London, where he lived till 1731. Hagedorn's return to Hamburg was followed by a period of great poverty and hardship, but in 1733 he was appointed secretary to the so-called "English Court" (*Englischer Hof*) in Hamburg, a trading company founded in the 13th century. He shortly afterwards married, and from this time had sufficient leisure to pursue his literary occupations till his death on the 28th of October 1754. Hagedorn is the first German poet who bears unmistakable testimony to the nation's recovery from the devastation wrought by the Thirty Years' War. He is eminently a social poet. His light and graceful love-songs and anacreontics, with their undisguised *joie de vivre*, introduced a new note into the German lyric; his fables and tales in verse are hardly inferior in form and in delicate persiflage to those of his master La Fontaine, and his moralizing poetry re-echoes the philosophy of Horace. He exerted a dominant influence on the German lyric until late in the 18th century.

The first collection of Hagedorn's poems was published at Hamburg shortly after his return from Jena in 1729, under the title *Versuch einiger Gedichte* (reprinted by A. Sauer, Heilbronn, 1883). In 1738 appeared *Versuch in poetischen Fabeln und Erzählungen*; in 1742 a collection of his lyric poems, under the title *Sammlung neuer Oden und Lieder*; and his *Moralische Gedichte* in 1750. A collection of his entire works was published at Hamburg after his death in 1757. The best is J. J. Eschenburg's edition (5 vols., Hamburg, 1800). Selections of his poetry with an excellent introduction in F. Muncker's *Anakreontiker und preussisch-patriotische Lyriker* (Stuttgart, 1894). See also H. Schuster, F. von *Hagedorn und seine Bedeutung für die deutsche Literatur* (Leipzig, 1882); W. Eigenbrodt, *Hagedorn und die Erzählung in Reimversen* (Berlin, 1884).

HAGEN, FRIEDRICH HEINRICH VON DER (1780–1856), German philologist, chiefly distinguished for his researches in Old German literature, was born at Schmiedeberg in Brandenburg on the 19th of February 1780. After studying law at the university of Halle, he obtained a legal appointment in the state service at Berlin, but in 1806 resigned this office in order to devote himself exclusively to letters. In 1810 he was appointed *professor extraordinarius* of German literature in the university of Berlin; in the following year he was transferred in a similar capacity to Breslau, and in 1821 returned to Berlin as *professor ordinarius*. He died at Berlin on the 11th of June 1856. Although von der Hagen's critical work is now entirely out of date, the chief merit of awakening an interest in old German poetry belongs to him.

His principal publications are the *Nibelungenlied*, of which he issued four editions, the first in 1810 and the last in 1842; the *Minnesinger* (Leipzig, 1838–1856, 4 vols. in 5 parts); *Lieder der ältern Edda* (Berlin, 1812); *Gottfried von Strassburg* (Berlin, 1823); a collection of Old German tales under the title *Gesamtabenteuer* (Stuttgart, 1850, 3 vols.) and *Das Heldenbuch* (Leipzig, 1855). He also published *Über die ältesten Darstellungen der Faustsage* (Berlin, 1844); and from 1835 he edited *Das neue Jahrbuch der Berlinischen Gesellschaft für deutsche Sprache und Alterthumskunde*. His correspondence with C. G. Heyne and G. F. Benecke was published by K. Dziatzko (Leipzig, 1893).

HAGEN, a town of Germany, in the Prussian province of Westphalia. Pop. (1905), 77,498. It lies amid well-wooded hills at the confluence of the Ennepe with the Volme, 15 m. N.E. of Elberfeld, on the main line to Brunswick and Berlin, and at the junction of important lines of railway, connecting it with the principal towns of the Westphalian iron district. It has five Evangelical churches, a Roman Catholic church, an Old Catholic church, a synagogue, a gymnasium, realgymnasium, and a technical school with special classes for machine-building. There are also a museum, a theatre, and a prettily arranged municipal park. Hagen is one of the most flourishing commercial towns in Westphalia, and possesses extensive iron and steel works, large cotton print works, woollen and cotton factories, manufactures of leather, paper, tobacco, and iron and steel wares, breweries and distilleries. There are large limestone quarries in the vicinity and also an alabaster quarry.

HAGENAU, a town of Germany, in the imperial province of Alsace-Lorraine, situated in the middle of the Hagenau Forest, on the Moder, and on the railway from Strassburg to Weissenburg, 10 m. N.N.E. of the former city. Pop. (1905), 18,500. It has two Evangelical and two ancient Catholic churches (one dating from the 12th, the other from the 13th century), a gymnasium, a public library, a hospital, and a theatre. The principal industries are wool and cotton spinning, and the manufacture of porcelain, earthenware, boots, soap, oil, sparkling wines and beer. There is also considerable trade in hops and vegetables. Hagenau is an important military centre and has a large garrison, including three artillery battalions.

Hagenau dates from the beginning of the 12th century, and owes its origin to the erection of a hunting lodge by the dukes of Swabia. The emperor Frederick I. surrounded it with walls and gave it town rights in 1154. On the site of the hunting lodge he founded an imperial palace, in which were preserved the jewelled imperial crown, sceptre, imperial globe, and sword of Charlemagne. Subsequently it became the seat of the *Landvogt*

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of Hagenau, the imperial *advocatus* in Lower Alsace. Richard of Cornwall, king of the Romans, made it an imperial city in 1257. In 1648 it came into the possession of France, and in 1673 Louis XIV. caused the fortifications to be razed. In 1675 it was captured by imperial troops, but in 1677 it was taken by the French and nearly all destroyed by fire. In 1871 it fell, with the rest of Alsace-Lorraine, into the possession of Germany.

HAGENBACH, KARL RUDOLF (1801–1874), German church historian, was born on the 4th of March 1801 at Basel, where his father was a practising physician. His preliminary education was received at a Pestalozzian school, and afterwards at the gymnasium, whence in due course he passed to the newly reorganized local university. He early devoted himself to theological studies and the service of the church, while at the same time cherishing and developing broad "humanistic" tendencies which found expression in many ways and especially in an enthusiastic admiration for the writings of Herder. The years 1820–1823 were spent first at Bonn, where G. C. F. Lücke (1791–1855) exerted a powerful influence on his thought, and afterwards at Berlin, where Schleiermacher and Neander became his masters. Returning in 1823 to Basel, where W. M. L. de Wette had recently been appointed to a theological chair, he distinguished himself greatly by his trial-dissertation, *Observationes historico-hermeneuticae circa Origenis methodum inierpretandae sacrae Scripturae*; in 1824 he became professor extraordinarius, and in 1829 professor ordinarius of theology. Apart from his academic labours in connexion with the history of dogma and of the church, he lived a life of great and varied usefulness as a theologian, a preacher and a citizen; and at his "Jubilee" in 1873, not only the university and town of Basel but also the various churches of Switzerland united to do him honour. He died at Basel on the 7th of June 1874.

Hagenbach was a voluminous author in many departments, but he is specially distinguished as a writer on church history. Though neither so learned and condensed as the contributions of Gieseler, nor so original and profound as those of Neander, his lectures are clear, attractive and free from narrow sectarian prejudice. In dogmatics, while avowedly a champion of the "mediation theology" (*Vermittelungstheologie*), based upon the fundamental conceptions of Herder and Schleiermacher, he was much less revolutionary than were many others of his school. He sought to maintain the old confessional documents, and to make the objective prevail over the purely subjective manner of viewing theological questions. But he himself was aware that in the endeavour to do so he was not always successful, and that his delineations of Christian dogma often betrayed a vacillating and uncertain hand.

His works include *Tabellarische Übersicht der Dogmengeschichte* (1828); *Encyclopadie u. Methodologie der theol. Wissenschaften* (1833); *Vorlesungen über Wesen u. Geschichte der Reformation u. des Protestantismus* (1834–1843); *Lehrbuch der Dogmengeschichte* (1840–1841, 5th ed., 1867; English transl., 1850); *Vorlesungen über die Geschichte der alten Kirche* (1853–1855); *Vorlesungen über die Kirchengeschichte des Mittelalters* (1860–1861); *Grundlinien der Homiletik u. Liturgik* (1863); biographies of Johannes Oecolampadius (1482–1564) and Oswald Myconius (1488–1552) and a *Geschichte der theol. Schule Basels* (1860); his *Predigten* (1858–1875), two volumes of poems entitled *Luther u. seine Zeit* (1858), and *Gedichte u.* (1876). The lectures on church history under the general title *Vorlesungen über die Kirchengeschichte von der ältesten Zeit bis zum 19ten Jahrhundert* were reissued in seven volumes (1868–1872).

See especially the article in Herzog-Hauck, *Realencyklopädie*.

HAGENBECK, CARL (1844–), wild-animal collector and dealer, was born at Hamburg in 1844. In 1848 his father purchased some seals and a Polar bear brought to Hamburg by a whaler, and subsequently acquired many other wild animals. At the age of twenty-one Carl Hagenbeck was given the whole collection, and before long had greatly extended the business, so that in 1873 he had to erect large buildings in Hamburg to house his animals. In 1875 he began to exhibit a collection of the representative animals of many countries, accompanied by troupes of the natives of the respective countries, throughout all the large cities of Europe. The educational value of these exhibitions was officially recognized by the French government, which in 1891 awarded Hagenbeck the diploma of the Academy. Most of the wild animals exhibited in music-halls and other popular places of entertainment throughout the world have come from Hagenbeck's collection at Stellingen, near Hamburg.

HAGERSTOWN, a city and the county-seat of Washington county, Maryland, U.S.A., near Antietam Creek, about 86 m. by rail W.N.W. from Baltimore. Pop. (1890), 10,118; (1900), 13,591, of whom 1277 were negroes; (1910, census), 16,507. Hagerstown is served by the Baltimore & Ohio, the Western Maryland, the Norfolk & Western, and the Cumberland Valley railways, and by an interurban electric line. It lies in a fertile valley overlooked by South Mountain to the E. and North Mountain, more distant, to the W. The city is the seat of Kee Mar College (1852; non-sectarian) for women. Hagerstown is a business centre for the surrounding agricultural district, has good water power, and as a manufacturing centre ranked third in the state in 1905, its factory products being valued in that year at $3,026,901, an increase of 66·3% over their value in 1900. Among the manufactures are flour, shirts, hosiery, gloves, bicycles, automobiles, agricultural implements, print paper, fertilizers, sash, doors and blinds, furniture, carriages, spokes and wheels. The municipality owns and operates its electric lighting plant. Hagerstown was laid out as a town in 1762 by Captain Jonathan Hager (who had received a patent to 200 acres here from Lord Baltimore in 1739), and was incorporated in 1791. It was an important station on the old National (or Cumberland) Road. General R. E. Lee concentrated his forces at Hagerstown before the battle of Gettysburg.

HAG-FISH, Gluttinous Hag, or Borer (*Myxine*), a marine fish which forms with the lampreys one of the lowest orders of vertebrates (*Cyclostomata*). Similar in form to a lamprey, it is usually found within the body of dead cod or haddock, on the flesh of which it feeds after having buried itself in the abdomen. When caught, it secretes a thick glutinous slime in such quantity that it is commonly believed to have the power of converting water into glue. It is found in the North Atlantic and other temperate seas of the globe, being taken in some localities in large numbers, *e.g.* off the east coast of Scotland and the west coast of California (see Cyclostomata).

HAGGADA, or 'Agada (literally "narrative"), includes the more homiletic elements of rabbinic teaching. It is not logically distinguishable from the halakha (*q.v.*), for the latter or forensic element makes up with the haggada the Midrash (*q.v.*), but, being more popular than the halakha, is often itself styled the Midrash. It may be described as the poetical and ethical element as contrasted with the legal element in the Talmud (*q.v.*), but the two elements are always closely connected. From one point of view the haggada, amplifying and developing the contents of Hebrew scripture in response to a popular religious need, may be termed a rabbinical commentary on the Old Testament, containing traditional stories and legends, sometimes amusing, sometimes trivial, and often beautiful. The haggada abounds in parables. The haggadic passages of the Talmud were collected in the *Eye of Jacob*, a very popular compilation completed by Jakob ibn Habib in the 16th century.

HAGGAI, in the Bible, the tenth in order of the "minor prophets," whose writings are preserved in the Old Testament. The name Haggai (חַגַּי, Gr. Ἀγγαῖος, whence Aggeus in the English version of the Apocrypha) perhaps means "born on the feast day," "festive." But Wellhausen[1] is probably right in taking the word as a contraction for Hagarian ("Yahweh hath girded"), just as Zaccai (Zacchaeus) is known to be a contraction of Zechariah.

The book of Haggai contains four short prophecies delivered between the first day of the sixth month and the twenty-fourth day of the ninth month—that is, between September and December—of the second year of Darius the king. The king in question must be Darius Hystaspis (521–485 B.C.). The language of the prophet in ii. 3 suggests the probability that he was himself one of those whose memories reached across the seventy years of the captivity, and that his prophetic work began in extreme

[1] In Bleek's *Einleitung*, 4th ed., p. 434.

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old age. This supposition agrees well with the shortness of the period covered by his book, and with the fact that Zechariah, who began to prophesy in the same autumn and was associated with Haggai's labours (Ezra v. 1), afterwards appears as the leading prophet in Jerusalem (Zech. vii. 1-4). We know nothing further of the personal history of Haggai from the Bible. Later traditions may be read in Carpzov's *Introductio*, pars 3, cap. xvi. Epiphanius (*Vitae prophetarum*) says that he came up from Babylon while still young, prophesied the return, witnessed the building of the temple and received an honoured burial near the priests. Haggai's name is mentioned in the titles of several psalms in the Septuagint (Psalms cxxxvii., cxlv.-cxlviii.) and other versions, but these titles are without value, and moreover vary in MSS. Eusebius did not find them in the Hexaplar Septuagint.[1]

In his first prophecy (i. 1-11) Haggai addresses Zerubbabel and Joshua, rebuking the people for leaving the temple unbuilt while they are busy in providing panelled houses for themselves. The prevalent famine and distress are due to Yahweh's indignation at such remissness. Let them build the house, and Yahweh will take pleasure in it and acknowledge the honour paid to Him. The rebuke took effect, and the people began to work at the temple, strengthened by the prophet's assurance that the Lord was with them (i. 12-15). In a second prophecy (ii. 1-9) delivered in the following month, Haggai forbids the people to be disheartened by the apparent meanness of the new temple. The silver and gold are the Lord's. He will soon shake all nations and their choicest gifts will be brought to adorn His house. Its glory shall be greater than that of the former temple, and in this place He will give peace. A third prophecy (ii. 10-19) contains a promise, enforced by a figure drawn from the priestly ritual, that God will remove famine and bless the land from the day of the foundation of the temple onwards. Finally, in ii. 20-23, Zerubbabel is assured of God's special love and protection in the impending catastrophe of kingdoms and nations to which the prophet had formerly pointed as preceding the glorification of God's house on Zion. In thus looking forward to a shaking of all nations Haggai agrees with earlier prophecies, especially Isa. xxiv.-xxvii., while his picture of the glory and peace of the new Zion and its temple is drawn from the great anonymous prophet who penned Isa. lx and lxvi. The characteristic features of the book are the importance assigned to the personality of Zerubbabel, who, though a living contemporary, is marked out as the Messiah; and the almost sacramental significance attached to the temple. The hopes fixed on Zerubbabel, the chosen of the Lord, dear to Him as His signet ring (cf. Jer. xxii. 24), are a last echo in Old Testament prophecy of the theocratic importance of the house of David. In the book of Zechariah Zerubbabel has already fallen into the background and the high priest is the leading figure of the Judean community.[2] The stem of David is superseded by the house of Zadok, the kingship has yielded to the priesthood, and the extinction of national hopes gives new importance to that strict organization of the hierarchy for which Ezekiel had prepared the way by his sentence of disfranchisement against the non-Zadokite priests.

The indifference of the Jews to the desolate conditions of their sanctuary opens up a problem of some difficulty. It is strange that neither Haggai nor his contemporary Zechariah mentions or implies any return of exiles from Babylon, and the suggestion has accordingly been made that the return under Cyrus described in Ezra i.-iv. is unhistorical, and that the community addressed by Haggai consisted of the remnant that had been left in Jerusalem and its neighbourhood after the majority had gone into exile or fled to Egypt (Jer. xliii.). Such a remnant, amongst whom might be members of the priestly and royal families, would gather strength and boldness as the troubles of Babylon increased and her vigilance was relaxed, and might receive from Babylon and other lands both refugees and some account at least of the writings of Ezekiel and the Second Isaiah. Stimulated by such causes and obtaining formal permission from the Persian government, they would arise as a new Israel and enter on a new phase of national life and divine revelation.

In spite, however, of the plausibility of this theory, it seems preferable to adhere to the story of Ezra i.-iv. Apart from the weighty objections that the Edomites would have frustrated such a recrudescence of the remnant Jews as has been described, it must be remembered that the main stream of Jewish life and thought had been diverted to Babylon. Thence, when the opportunity came under Cyrus, some 50,000 Jews, the spiritual heirs of the best elements of the old Israel, returned to found the new community. With them were all the resources, and the only people they found at Jerusalem were hostile gentiles and Samaritans. Full of enthusiasm, they set about rebuilding the temple and realizing the glowing promises about the prosperity and dominance of Zion that had fallen from the lips of the Second Isaiah (xlix. 14-26, xlv. 14). Bitter disappointment, however, soon overcame them, the Samaritans were strong enough to thwart and hinder their temple-building, and it seemed as though the divine favour was withdrawn. Apathy took the place of enthusiasm, and sordid worries succeeded to high hopes. "The like collapse has often been experienced in history when bands of religious men, going forth, as they thought, to freedom and the immediate erection of a holy commonwealth, have found their unity wrecked and their enthusiasm dissipated by a few inclement seasons on a barren and hostile shore."[3]

From this torpor they were roused by tidings which might well be interpreted as the restoration of divine favour. Away in the East Cyrus had been succeeded in 529 B.C. by Cambyses, who had annexed Egypt and on whose death in 522 a Magian impostor, Gaumata, had seized the throne. The fraud was short-lived, and Darius I. became king and the founder of a new dynasty. These events shook the whole Persian empire; Babylon and other subject states rose in revolt, and to the Jews it seemed that Persia was tottering and that the Messianic era was nigh. It was therefore natural that Haggai and Zechariah should urge the speedy building of the temple, in order that the great king might be fittingly received.

It is sometimes levied as a reproach against Haggai that he makes no direct reference to moral duties. But it is hardly fair to contrast his practical counsel with the more ethical and spiritual teaching of the earlier Hebrew prophets. One thing was needful—the temple. "Without a sanctuary Yahweh would have seemed a foreigner to Israel. The Jews would have thought that He had returned to Sinai, the holy mountain; and that they were deprived of the temporal blessings which were the gifts of a God who literally dwelt in the midst of his people." Haggai argued that material prosperity was conditioned by zeal in worship; the prevailing distress was an indication of divine anger due to the people's religious apathy. Haggai's reproofs touched the conscience of the Jews, and the book of Zechariah enables us in some measure to follow the course of a religious revival which, starting with the restoration of the temple, did not confine itself to matters of ceremony and ritual worship. On the other hand, Haggai's treatment of his theme, practical and effective as it was for the purpose in hand, moves on a far lower level than the aspirations of the prophet who wrote the closing chapters of Isaiah. To the latter the material temple is no more than a detail in the picture of a work of restoration eminently ideal and spiritual, and he expressly warns his hearers against attaching intrinsic importance to it (Isa. lxvi. 1). To Haggai the temple appears so essential that he teaches that while it lay waste, the people and all their works and offerings were unclean (Hag. ii. 14). In this he betrays his affinity with Ezekiel, who taught that it is by the possession of the sanctuary that Israel is sanctified (Ezek. xxxvii. 28). In truth the new movement of religious thought and feeling which started from the fall of the Hebrew state took two distinct lines, of which Ezekiel and the anonymous

[1] See the note on Ps. cxlv. 1 in Field's *Hexapla*; Köhler, *Weissagungen Haggai's*, 32; Wright, *Zechariah and his Prophecies*, xix.

[2] After the foundation of the temple Zerubbabel disappears from history and lives only in legend, which continued to busy itself with his story, as we see from the apocryphal book of Esdras (cf. Derenbourg, *Hist. de la Palestine*, chap. i.).

[3] G. A. Smith, *Minor Prophets*, ii. 235.

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authors of Isa. xl.-lxvi. are the respective representatives. While the latter developed their great picture of Israel the mediatorial nation, the systematic and priestly mind of Ezekiel had shaped a more material conception of the religious vocation of Israel in that picture of the new theocracy where the temple and its ritual occupy the largest place, with a sanctity which is set in express contrast to the older conception of the holiness of the city of Jerusalem (cf. Ezek. xliii. 7 seq. with Jer. xxxi. 40, Isa. iv. 5), and with a supreme significance for the religious life of the people which is expressed in the figure of the living waters issuing from under the threshold of the house (Ezek. xlvii.). It was the conception of Ezekiel which permanently influenced the citizens of the new Jerusalem, and took final shape in the institutions of Ezra. To this consummation, with its necessary accompaniment in the extinction of prophecy, the book of Haggai already points.

AUTHORITIES.—The elaborate and valuable German commentary of A. Köhler (Erlangen, 1860) forms the first part of his work on the *Nachexilische Prophetien*. Reinke's *Commentars* (Münster, 1868) is the work of a scholarly Roman Catholic. Haggai has generally been treated in works on all the prophets, as by Ewald (2nd ed., 1868; Eng. trans., vol. iii., 1878); or along with the other minor prophets, as by Hitzig (3rd ed., by H. Steiner, Leipzig, 1881); Keil (1866, 3rd ed., 1888, Eng. trans., Edinburgh, 1868), and Pusey (1875), S. R. Driver (1906), W. Nowack (2nd ed., 1903), K. Marti (1904), J. Wellhausen (3rd ed., 1898); or with the other post-exile prophets, as by Kohler, Pressel (Gotha, 1870), Dods (1879) and others. The older literature will be found in books of introduction or in Rosenmüller's *Scholia*. The learned commentary of Marckius may be specially mentioned. On the place of Haggai in the history of Old Testament prophecy, see Bleek, *Theologie der Propheten* (Bonn, 1838); A. B. Davidson, *The Theology of the Old Testament* (1904); A. F. Kirkpatrick, *The Doctrine of the Prophets*; G. A. Smith, *The Book of the Twelve Prophets*, vol. 2 (1903); Tony Andrée, *Le Prophète Aggée*; Ed. Meyer, *Entstehung des Judentums* (1896).

(W. R. S.; A. J. G.)

HAGGARD, HENRY RIDER (1856–), English novelist, was born at Bradenham Hall, Norfolk, on the 22nd of June 1856. When he was nineteen he went to South Africa as secretary to Sir Henry Bulwer, governor of Natal. At the time of the first annexation of the Transvaal (1877), he was on the staff of the special commissioner, Sir Theophilus Shepstone; and he subsequently became a master of the high court of the Transvaal. He married in 1879 a Norfolk heiress, Miss Margitson, but returned to the Transvaal in time to witness its surrender to the Boers and the overthrow of the policy of his former chief. He returned to England and read for the bar, but soon took to literary work; he published *Cetywayo and his White Neighbours* (1882), written in defence of Sir T. Shepstone's policy. This was followed by the novels *Dawn* (1884), *The Witch's Head* (1885), which contains an account of the British defeat at Isandhlwana; and in 1886 *King Solomon's Mines*, suggested by the Zimbabwe ruins, which first made him popular. *She* (1887), another fantastic African story, was also very successful, a sequel, *Ayesha, or the Return of She*, being published in 1905. The scene of *Jess* (1887) and of *Allan Quatermain* (1888) was also laid in Africa. In 1895 he unsuccessfully contested the East Norfolk parliamentary division in the Unionist interest; he showed great interest in rural and agricultural questions, being a practical gardener and farmer on his estate in Norfolk. In his *Rural England* (2 vols., 1902) he exposed the evils of depopulation in country districts. In 1905 he was commissioned by the colonial office to inquire into the Salvation Army settlements at Fort Romie, S. California, and Fort Amity, Colorado, with a view to the establishment of similar colonies in South Africa. His report on the subject was first published as a blue book, and afterwards, in an enlarged form, as *The Poor and the Land* (1905), with suggestions for a scheme of national land settlement in Great Britain itself.

His other books include *Maiwa's Revenge* (1888), *Mr Meeson's Will* (1888), *Colonel Quaritch, V.C.* (1888), *Cleopatra* (1889), *Eric Brighteyes* (1891), *The World's Desire* (1890), a romance of Helen of Troy, written with Mr Andrew Lang; *Nada the Lily* (1892), *Montezuma's Daughter* (1894), *The People of the Mist* (1894), *Joan Haste* (1895), *Heart of the World* (1896), *Dr Therne* (1898), *A Farmer's Year* (1899), *The New South Africa* (1900), *Lysbeth, A Tale of the Dutch* (1901), *Stella Fregelius* (1903), *A Gardener's Year* (1905), *A Farmer's Year* (1899, revised ed., 1906), *The Way of the Spirit* (1906).

HAGGIS, a dish consisting of a calf's, sheep's or other animal's heart, liver and lungs, and also sometimes of the smaller intestines, boiled in the stomach of the animal with seasoning of pepper, salt, onions, &c., chopped fine with suet and oatmeal. It is considered peculiarly a Scottish dish, but was common in England till the 18th century. The derivation of the word is obscure. The Fr. *hachis*, English "hash," is of later appearance than "haggis." It may be connected with a verb "to hag," meaning to cut in small pieces, and would then be cognate ultimately with "hash."

HAGIOLOGY (from Gr. ἅγιος, saint, λόγος, discourse), that branch of the historical sciences which is concerned with the lives of the saints. If hagiology be considered merely in the sense in which the term has come to be understood in the later stages of its development, *i.e.* the critical study of hagiographic remains, there would be no such science before the 17th century. But the bases of hagiology may fairly be said to have been laid at the time when hagiographic documents, hitherto dispersed, were first brought together into collections. The oldest collection of this kind, the *συναγωγὴ τῶν ἁγγελικῶν μαρτύρων* of Eusebius, to which the author refers in several passages in his writings (*Hist. Eccl.*, v. proem 2; v. 20, 5), and which has left more than one trace in Christian literature, is unfortunately lost in its entirety. The *Martyrs of Palestine*, as also the writings of Theodoret, Palladius and others, on the origins of the monastic life, and, similarly, the *Dialogues* of St Gregory (Pope Gregory I.), belong to the category of sources rather than to that of hagiologic collections. The *In gloria martyrum* and *In gloria confessorum* of Gregory of Tours are valuable for the sources used in their compilation. The most important collections are those which comprise the Acts of the Martyrs and the lives of saints, arranged in the order of the calendar. In the Greek Church these are called menologies (from Gr. μήν, month, λόγος, discourse), and their existence can be traced back with certainty to the 9th century (Theodore of Studium, *Epist.* i. 2). One of them, the menology of Metaphrastes, compiled in the second half of the 10th century, enjoyed a universal vogue (see SYMEON METAPHRASTES). The corresponding works in the Western Church are the *passionaries* or *legendaries*, varieties of which are dispersed in libraries and have not been studied collectively. They generally draw from a common source, the Roman legendary, and the lives of the local saints, *i.e.* those specially honoured in a church, a province or a country. One of the best known is the Austrian legendary (*De magno legendario Austriaco* in the *Analecta Bollandiana*, xvii. 24-264). From the menologies and legendaries various compilations were made: in the Greek Church, the Synaxaria (see SYNAXARIUM); in the Western Church, abridgments and extracts such as the *Speculum historiale* of Vincent de Beauvais; the *Legenda aurea* of Jacobus de Voragine; the *Sanctorale* of Bernard Guy [d. 1331] (see L. Delisle, *Notice sur les manuscrits de Bernard Guy*, Paris, 1879); the *Sanctilogium* of John of Tynemouth (*c.* 1366), utilized by John Capgrave, and published in 1516 under the name of *Nova legenda Angliae* (new edition by C. Horstman, Oxford, 1901); and the *Catalogus sanctorum* of Petrus de Natalibus (*c.* 1375), published at Vicenza in 1493, and many times reprinted. The *Sanctuarium* of B. Mombritius, published at Milan about 1480, is particularly valuable because it gives a faithful reproduction of the ancient texts according to the manuscripts. One of the most zealous collectors of lives of saints was John Gielemans of Brabant (d. 1487), whose work is of great value (Bollandists, *De codicibus hagiographicis Johannis Gielemans*, Brussels, 1895), and with him must be associated Anton Geens, or Gentius, of Groenendael, who died in 1543 (*Analecta Bollandiana*, vi. 31-34).

Hagiology entered on a new development with the publication of the *Sanctorum priscorum patrum vitae* (Venice and Rome, 1551–1560) of Aloysius Lipomanus (Lippomano), bishop of Verona. As a result of the co-operation of humanist scholars a great number of Greek hagiographic texts became for the first time accessible to the West in a Latin translation. The Carthusian, Laurentius Surius, carried on the work of Lippomano, completed it, and arranged the materials strictly in the order

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of the calendar (*De probatis sanctorum historiis*, Cologne, 1570–1575). What prevents the work of Surius from being regarded as an improvement upon Lippomano's is that Surius thought it necessary to retouch the style of those documents which appeared to him badly written, without troubling himself about the consequent loss of their documentary value.

The actual founder of hagiologic criticism was the Flemish Jesuit, Heribert Rosweyde (d. 1629), who, besides his important works on the martyrologies (see MARTYROLOGY), published the celebrated collection of the *Vitae patrum* (Antwerp, 1615), a veritable masterpiece for the time at which it appeared. It was he, too, who conceived the plan of a great collection of lives of saints, compiled from the manuscripts and augmented with notes, from which resulted the collection of the *Acta sanctorum* (see BOLLANDISTS). This last enterprise gave rise to others of a similar character but less extensive in scope.

Dom T. Ruinart collected the best *Acta* of the martyrs in his *Acta martyrum sincera* (Paris, 1689). The various religious orders collected the *Acta* of their saints, often increasing the lists beyond measure. The best publication of this kind, the *Acta sanctorum ordinis S. Benedicti* (Paris, 1668–1701) of d'Achery and Mabillon, does not entirely escape this reproach. Countries, provinces and dioceses also had their special hagiographic collections, conceived according to various plans and executed with more or less historical sense. Of these, the most important collections are those of O. Caietanus, *Vitae sanctorum Siculorum* (Palermo, 1657); G. A. Lobinenu, *Vie des saints de Bretagne* (Paris, 1725); and J. H. Ghesquière, *Acta sanctorum Belgii* (Brussels and Tongerloo, 1783–1794). The principal lives of the German saints are published in the *Monumenta Germaniae*, and a special section of the *Scriptores rerum Merovingicarum* is devoted to the lives of the saints. For Scotland and Ireland mention must be made of T. Messingham's *Florilegium insulae sanctorum* (Paris, 1624); I. Colgan's *Acta sanctorum veteris et maioris Scotiae seu Hiberniae* (Louvain, 1645–1647); John Pinkerton's *Vitae antiquae sanctorum* . . . (London, 1789, of which a revised and enlarged edition was published by W. M. Metcalfe in Paisley in 1889, under the title of *Lives of the Scottish Saints*); W. J. Rees's *Lives of the Cambro-British Saints* (Llandovery, 1853); *Acta sanctorum Hiberniae* (Edinburgh, 1888); Whitley Stokes's *Lives of Saints from the Book of Lismore* (Oxford, 1890); and J. O'Hanlon's *Lives of the Irish Saints* (Dublin, 1875–1904). Towards the 13th century vernacular collections of lives of saints began to increase. This literature is more interesting from the linguistic than from the hagiologic point of view, and comes rather within the domain of the philologist.

The hagiography of the Eastern and the Greek church also has been the subject of important publications. The Greek texts are very much scattered. Of them, however, may be mentioned J. B. Malou's "Synaxis Metaphrastae operis omnia" (*Patrologia Graeca*, 114, 115, 116) and Theophilos Ioannu, Μηναῖα ἁγιολογικά (Venice, 1884). For Syriac, there are S. E. Assemani's *Acta sanctorum martyrum orientalium* (Rome, 1748) and P. Bedjan's *Acta martyrum et sanctorum* (Paris, 1890–1897); for Armenian, the *Martyrs* of martyrs and lives of saints, published in two volumes by the Mechitharist community of Venice in 1874; for Coptic, Hyvernat's *Les Actes des martyrs de l'Égypte* (Paris, 1886); for Ethiopian, K. Conti Rossini's *Scriptores Aethiopici, vitae sanctorum* (Paris, 1904 seq.); and for Georgian, Sabinin's *Paradise of the Georgian Church* (St Petersburg, 1882).

In addition to the principal collections must be mentioned the innumerable works in which the hagiographic texts have been subjected to detailed critical study.

To realize the present state of hagiology, the *Bibliotheca hagiographica*, both Latin and Greek, published by the Bollandists, and the *Bulletin hagiographique*, which appears in each number of the *Analecta Bollandiana* (see BOLLANDISTS), must be consulted. Thanks to the combined efforts of a great number of scholars, the classification of the hagiographic texts has in recent years made notable progress. The criticism of the sources, the study of literary styles, and the knowledge of local history now render it easier to discriminate in this literature between what is really historical and what is merely the invention of the genius of the people or of the imagination of pious writers (see H. Delchaye, *Les Légendes hagiographiques*, 2nd ed., pp. 121-141, Brussels, 1906). "Though the lives of saints," says a recent historian, "are filled with miracles and incredible stories, they form a rich mine of information concerning the life and customs of the people. Some of them are 'memorials of the best men of the time written by the best scholars of the time,'" (C. Gross, *The Sources and Literature of English History*, p. 34, London, 1900).

(H. DE.)

HAGIOSCOPE (from Gr. ἅγιος, holy, and σκοπεῖν, to see), in architecture, an opening through the wall of a church in an oblique direction, to enable the worshippers in the transepts or other parts of the church, from which the altar was not visible, to see the elevation of the Host. As a rule these hagioscopes, or "squints" as they are sometimes called, are found on one or both sides of the chancel arch. In some cases a series of openings has been cut in the walls in an oblique line to enable a person standing in the porch (as in Bridgewater church, Somerset) to see the altar; in this case and in other instances such openings were sometimes provided for an attendant, who had to ring the Sanctus bell when the Host was elevated. Though rarely met with on the continent of Europe, there are occasions where they are found, so as to enable a monk in one of the vestries to follow the service and communicate with the bell-ringers.

HAGONOY, a town of the province of Bulacan, Luzon, Philippine Islands, on Manila Bay and on the W. branch and the delta of the Pampanga Grande river, about 25 m. N.W. of Manila. Pop. (1903), 21,304. Hagonoy is situated in a rich agricultural region, producing rice, Indian corn, sugar and a little coffee. Alcohol is made in considerable quantities from the fermented juice of the nipa palm, which grows in the neighbouring swamps, and from the leaves of which the nipa thatch is manufactured. There is good fishing. The women of the town are very skilful in weaving the native fabrics. The language is Tagalog. Hagonoy was founded in 1581.

HAGUE, THE (in Dutch, *'s Gravenhage*, or, abbreviated, *den Haag*; in Fr. *La Haye*; and in Late Lat. *Haga Comitis*), the chief town of the province of South Holland, about 2¾ m. from the sea, with a junction station 0¾ m. by rail S.W. by S. of Leiden. Steam tramways connect it with the seaside villages of Scheveningen, Kykduin and 's Gravenzande, as well as with Delft, Wassenaar and Leiden, and it is situated on a branch of the main canal from Rotterdam to Amsterdam. Pop. (1900), 212,211. The Hague is the chief town of the province, the usual residence of the court and diplomatic bodies, and the seat of the government, the states-general, the high council of the Netherlands, the council of state, the chamber of accounts and various other administrative bodies. The characteristics of the town are quite in keeping with its political position; it is as handsome as it is fashionable, and was rightly described by de Amicis in his *Olanda* as half Dutch, half French. The Hague has grown very largely in modern times, especially on its western side, which is situated on the higher and more sandy soil, the south-eastern half of the town comprising the poorer and the business quarters. The main features in a plan of the town are its fine streets and houses and extensive avenues and well-planted squares; while, as a city, the neighbourhood of an attractive seaside resort, combined with the advantages and importance of a large town, and the possession of beautiful and wooded surroundings, give it a distinction all its own.

The medieval-looking group of government buildings situated in the Binnenhof (or "inner court"), their backs reflected in the pretty sheet of water called the Vyver, represent both historically and topographically the centre of the Hague. On the opposite side of the Vyver lies the parallelogram formed by the fine houses and magnificent avenue of trees of the Lange Voorhout, the Kneuterdyk and the Vyverburg, representing the fashionable kernel of the city. Close by lies the entrance to the Haagsche Bosch, or the wood, on one side of which is situated the deer-park, and a little beyond on the other the zoological gardens (1862). Away from the Lange Voorhout the fine Park Straat stretches to the "1813 Plein" or square, in the centre of which rises the large monument (1869) by Jaquet commemorating the jubilee of the restoration of Dutch independence in 1813. Beyond this is the Alexander Veld, used as a military drill ground, and close by is the entrance to the beautiful road called the Scheveningensche Weg, which leads through the "little woods" to Scheveningen. Parallel to the Park Straat is the busy Noordeinde, in which is situated the royal palace. The palace was purchased by the States in 1595, rebuilt by the stadtholder William III., and extended by King William I. in the beginning of the 19th century. In front of the building is an equestrian statue of William I. of Orange by Count Nieuerkerke (1845), and behind are the gardens and extensive stables. The Binnenhof, which has been already mentioned, was once surrounded by

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a moat, and is still entered through ancient gateways. The oldest portion was founded in 1249 by William II., count of Holland, whose son, Florens V., enlarged it and made it his residence. Several centuries later the stadtholders also lived here. The fine old hall of the knights, built by Florens, and now containing the archives of the home office, is the historic chamber in which the states of the Netherlands abjured their allegiance to Philip II. of Spain, and in front of which the grey-headed statesman Johan van Oldenbarneveldt was executed in 1619. Close by on the one side are the courts of justice, and on the other the first and second chambers of the states-general, containing some richly painted ceilings and the portraits of various stadtholders. Government offices occupy the remainder of the buildings, and in the middle of the court is a fountain surmounted by a statuette of William II., count of Holland (1227–1256). In the adjoining Buitenhof, or "outer court," is a statue of King William II. (d. 1849), and the old Gevangen Poort, or prison gate (restored 1875), consisting of a tower and gateway. It was here that the brothers Cornelis and Jan de Witt were killed by the mob in 1672. On the opposite side of the Binnenhof is the busy square called the Plein, where all the tram-lines meet. Round about it are the buildings of the ministry of justice and other government buildings, including one to contain the state archives, the large club-house of the Witte Societeit, and the Mauritshuis. The Mauritshuis was built in 1633–1644 by Count John Maurice of Nassau, governor of Brazil, and contains the famous picture gallery of the Hague. The nucleus of this collection was formed by the princes of Orange, notably by the stadtholder William V. (1748–1806). King William I. did much to restore the losses caused by the removal of many of the pictures during the French occupation. Other artistic collections in the Hague are the municipal museum (*Gemeente* Museum), containing paintings by both ancient and modern Dutch artists, and some antiquities; the fine collection of pictures in the Steengracht gallery, belonging to Jonkheer Steengracht; the museum Meermanno-Westreenianum, named after Count Meermann and Baron Westreenen (d. 1850), containing some interesting MSS. and specimens of early typography and other curiosities; and the Mesdag Museum, containing the collection of the painter H. W. Mesdag (b. 1831) presented by him to the state. The royal library (1798) contains upwards of 500,000 volumes, including some early illuminated MSS., a valuable collection of coins and medals and some fine antique gems. In addition to the royal palace already mentioned, there are the palaces of the queen-dowager, of the prince of Orange (founded about 1720 by Count Unico of Wassenaar Twickels) and of the prince von Wied, dating from 1825, and containing some good early Dutch and Flemish masters. There are numerous churches of various denominations in the Hague as well as an English church, a Russian chapel and two synagogues, one of which is Portuguese. The Groote Kerk of St James (15th and 16th centuries) has a fine vaulted interior, and contains some old stained glass, a carved wooden pulpit (1550), a large organ and interesting sepulchral monuments, and some escutcheons of the knights of the Golden Fleece, placed here after the chapter of 1456. The Nieuwe Kerk, or new church (first half 17th century), contains the tombs of the brothers De Witt and of the philosopher Spinoza. Spinoza is further commemorated by a monument in front of the house in which he died in 1677. The picturesque town hall (built in 1565 and restored and enlarged in 1882) contains a historical picture gallery. The principal other buildings are the provincial government offices, the royal school of music, the college of art, the large building (1874) of the society for arts and sciences, the ethnographical institute of the Netherlands Indies with fine library, the theatres, civil and military hospitals, orphanage, lunatic asylum and other charitable institutions; the fine modern railway station (1892), the cavalry and artillery and the infantry barracks, and the cannon foundry. The chief industries of the town are iron casting, copper and lead smelting, cannon founding, the manufacture of furniture and carriages, liqueur distilling, lithographing and printing.

The Hague wood has been described as the city's finest ornament. It is composed chiefly of oaks and alders and magnificent avenues of gigantic beech-trees. Together with the Haarlem wood it is thought to be a remnant of the immense forest which once extended along the coast. At the end of one of the avenues which penetrates into it from the town is the large summer club-house of the Witte Societeit, under whose auspices concerts are given here in summer. Farther into the wood are some pretty little lakes, and the famous royal villa called the Huis ten Bosch, or "house in the wood." This villa was built by Pieter Post for the Princess Amelia of Solms, in memory of her husband the stadtholder, Frederick Henry of Orange (d. 1647), and wings were added to it by Prince William IV. in 1748. The chief room is the Orange Saloon, an octagonal hall 50 ft. high, covered with paintings by Dutch and Flemish artists, chiefly of incidents in the life of Prince Frederick. In this room the International Peace Conference had its sittings in the summer of 1899. The collections in the Chinese and Japanese rooms, and the grisailles in the dining-room painted by Jacobus de Wit (1695–1754), are also noteworthy.

The history of the Hague is in some respects singular. In the 13th century it was no more than a hunting-lodge of the counts of Holland, and though Count Floris V. (b. 1254–1296) made it his residence and it thus became the seat of the supreme court of justice of Holland and the centre of the administration, and from the time of William of Orange onward the meeting-place of the states-general, it only received the status of a town, from King Louis Bonaparte, early in the 19th century.

In the latter part of the 17th and the first half of the 18th century the Hague was the centre of European diplomacy. Among the many treaties and conventions signed here may be mentioned the treaty of the Triple Alliance (January 23, 1688) between England, Sweden and the Netherlands; the concert of the Hague (March 31, 1710) between the Emperor, England and Holland, for the maintenance of the neutrality of the Swedish provinces in Germany during the war of the northern powers against Sweden; the Triple Alliance (January 4, 1717) between France, England and Holland for the guarantee of the treaty of Utrecht; the treaty of peace (Feb. 17, 1717) between Spain, Savoy and Austria, by which the first-named acceded to the principles of the Triple Alliance; the treaty of peace between Holland and France (May 16, 1795); the first "Hague Convention," the outcome of the "peace conference" assembled on the initiative of the emperor Nicholas II. of Russia (July 27, 1899), and the series of conventions, the results of the second peace conference (June 15–October 18, 1907). The international court of arbitration or Hague Tribunal was established in 1899 (see EUROPE: *History*; ARBITRATION, INTERNATIONAL). The Palace of Peace designed to be completed in 1913 as the seat of the tribunal, on the Scheveningen avenue, is by a French architect, L. M. Cordonnier, and A. Carnegie contributed £300,000 towards its cost.

HAHN, AUGUST (1792–1863), German Protestant theologian, was born on the 27th of March 1792 at Grossosterhausen near Eisleben, and studied theology at the university of Leipzig. In 1819 he was nominated *professor extraordinarius* of theology and pastor of Altstadt in Königsberg, and in 1820 received a superintendency in that city. In 1822 he became *professor ordinarius*. In 1826 he removed as professor of theology to Leipzig, where, hitherto distinguished only as editor of Bardesanes, Marcion (*Marcion's Evangelium in seiner ursprünglichen Gestalt*, 1823), and Ephraem Syrus, and the joint editor of a *Syrische Chrestomathie* (1824), he came into great prominence as the author of a treatise, *De rationalismi qui dicitur vera indole et qua cum naturalismo contineatur ratione* (1827), and also of an *Offene Erklärung an die Evangelische Kirche zunächst in Sachsen u. Preussen* (1827), in which, as a member of the school of E. W. Hengstenberg, he endeavoured to convince the rationalists that it was their duty voluntarily and at once to withdraw from the national church. In 1833 Hahn's pamphlet against K. G. Bretschneider (*Über die Lage des Christenthums in unserer Zeit*, 1832) having attracted the notice of Friedrich Wilhelm III., he was called to Breslau as theological professor and consistorial councillor, and in 1843 became "general superintendent" of

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the province of Silesia. He died at Breslau on the 13th of May 1863. Though uncompromising in his "supra-naturalism," he did not altogether satisfy the men of his own school by his own doctrinal system. The first edition of his *Lehrbuch des christlichen Glaubens* (1828) was freely characterized as lacking in consistency and as detracting from the strength of the old positions in many important points. Many of these defects, however, he is considered to have remedied in his second edition (1857). Among his other works are his edition of the Hebrew Bible (1833), his *Bibliothek der Symbole und Glaubensregeln der apostolisch-katholischen Kirche* (1842; 2nd ed. 1877) and *Predigten* (1852).

His eldest son, HEINRICH AUGUST HAHN (1821–1861), after studying theology at Breslau and Berlin, became successively *Privatdozent* at Breslau (1845), professor *ad interim* (1846) at Königsberg on the death of Heinrich Hävernick, professor extraordinarius (1851) and professor ordinarius (1860) at Greifswald. Amongst his published works were a commentary on the Book of Job (1850), a translation of the Song of Songs (1852), an exposition of Isaiah xl.-lxvi. (1857) and a commentary on the Book of Ecclesiastes (1860).

See the articles in Herzog-Hauck, *Realencyklopädie*, and the *Allgemeine deutsche Biographie*.

HAHNEMANN, SAMUEL CHRISTIAN FRIEDRICH (1755–1843), German physician and founder of "homoeopathy," was born at Meissen in Saxony on the 10th of April 1755. He was educated at the "elector's school" of Meissen, and studied medicine at Leipzig and Vienna, taking the degree of M.D. at Erlangen in 1779. After practising in various places, he settled in Dresden in 1784, and thence removed to Leipzig in 1789. In the following year, while translating W. Cullen's *Materia medica* into German, he was struck by the fact that the symptoms produced by quinine on the healthy body were similar to those of the disordered states it was used to cure. He had previously felt dissatisfied with the state of the science of medicine, and this observation led him to assert the truth of the "law of similars," *similia similibus curantur* or *curentur*—*i.e.* diseases are cured (or should be treated) by those drugs which produce symptoms similar to them in the healthy. He promulgated his new principle in a paper published in 1796 in C. W. Hufeland's *Journal*, and four years later, convinced that drugs in much smaller doses than were generally employed effectually exerted their curative powers, he advanced his doctrine of their potentization or dynamization. In 1810 he published his chief work, *Organon der rationellen Heilkunde*, containing an exposition of his system, which he called homoeopathy (*q.v.*), and in the following years appeared the six volumes of his *Reine Arzneimittellehre*, which detailed the symptoms produced by "proving" a large number of drugs, *i.e.* by systematically administering them to healthy subjects. In 1821 the hostility of established interests, and especially of the apothecaries, whose services were not required under his system, forced him to leave Leipzig, and at the invitation of the grand-duke of Anhalt-Cöthen he went to live at Cöthen. Fourteen years later he removed to Paris, where he practised with great success until his death on the and of July 1843. Statues were erected to his memory at Leipzig in 1851 and at Cöthen in 1855. He also wrote, in addition to the works already mentioned, *Fragmenta de viribus medicamentorum positivis* (1805) and *Die chronischen Krankheiten* (1828–1830).

See the article HOMOEOPATHY; also Albrecht, *Hahnemann's Leben und Werken* (Leipzig, 1875); Bradford, *Hahnemann's Life and Letters* (Philadelphia, 1895).

HAHN-HAHN, IDA, COUNTESS VON (1805–1880), German author, was born at Tressow, in Mecklenburg-Schwerin, on the 22nd of June 1805, daughter of Graf (Count) Karl Friedrich von Hahn (1782–1857), well known for his enthusiasm for the stage, upon which he squandered a large portion of his fortune. She married in 1826 her wealthy cousin Count Adolf von Hahn-Hahn. With him she had an extremely unhappy life, and in 1829 her husband's irregularities led to a divorce. The countess travelled, produced some volumes of poetry indicating true lyrical feeling, and in 1838 appeared as a novelist with *Aus der Gesellschaft*, a title which, proving equally applicable to her subsequent novels, was retained as that of a series, the book originally so entitled being renamed *Ida Schönholm*. For several years the countess continued to produce novels bearing a certain subjective resemblance to those of George Sand, but less hostile to social institutions, and dealing almost exclusively with aristocratic society. The author's patrician affectations at length drew upon her the merciless ridicule of Fanny Lewald in a parody of her style entitled *Diogena* (1847), and this and the revolution of 1848 together seem to have co-operated in inducing her to embrace the Roman Catholic religion in 1850. She justified her step in a polemical work entitled *l'on Babylon nach Jerusalem* (1851), which elicited a vigorous reply from H. Abeken. In 1852 she retired into a convent at Angers, which she, however, soon left, taking up her residence at Mainz where she founded a nunnery, in which she lived without joining the order, and continued her literary labours. For many years her novels were the most popular works of fiction in aristocratic circles; many of her later publications, however, passed unnoticed as mere party manifestoes. Her earlier works do not deserve the neglect into which they have fallen. If their sentimentalism is sometimes wearisome, it is grounded on genuine feeling and expressed with passionate eloquence. *Ulrich* and *Gräfin Faustine*, both published in 1841, mark the culmination of her power; but *Sigismund Forster* (1843), *Cecil* (1844), *Sibylle* (1846) and *Maria Regina* (1860) also obtained considerable popularity. She died at Mainz on the 12th of January 1880.

Her collected works, *Gesammelte Werke*, with an introduction by O. Schücking, were published in two series, 45 volumes in all (Regensburg, 1903–1904). See H. Keiter, *Gräfin Hahn-Hahn* (Würzburg, undated); P. Haffner, *Gräfin Ida Hahn-Hahn, eine psychologische Studie* (Frankfort, 1880); A. Jacoby, *Ida Gräfin Hahn-Hahn* (Mainz, 1894).

HAI (939–1038), Jewish Talmudical scholar, was born in 939. He was educated by his father Sherira, gaon of Pombeditha (Pumbedita), whom he afterwards assisted in his work. They were cast into prison for a short time by the caliph Qadir, and subsequently on Sherira's death Hai was appointed gaon in his place (998). This office he held till his death on the 28th of March 1038. He is famous chiefly for his answers to problems of ritual and civil law. He composed important treatises on Talmudic law and the *Mishnah*; many poems are also attributed to him on doubtful authority. In his *responsa* he laid stress on custom and tradition provided no infringement of the law were involved, and was essentially conservative in theology. He had considerable knowledge not only of religious movements within the Jewish body, but also of Mahommedan theology and controversial method, and frequently consulted theologians of other beliefs.

See Steinschneider, *Hebr. Übersetz.* p. 910, and article in *Jewish Encyclopedia*, vi. 153.

HAIBAK, a town and khanate of Afghan Turkestan. The valley of Haibak, which is 3100 ft. above sea level, is fertile and richly cultivated. The town, which is famed in Persian legend, consists now of only a couple of streets, containing many Hindu shops and a small garrison. The inhabitants call themselves Jagatais, a Turki race, though now generally mixed with Tajiks and speaking Persian. In the neighbourhood of Haibak are some very typical Buddhist ruins. Haibak derives its importance from its position on the main line of communication between Kabul and Afghan Turkestan.

HAIDA, a tribe of North American Indians of Skittagetan stock. They still occupy their original home, the Queen Charlotte islands, British Columbia. They are skilful seamen, making long fishing expeditions in cedarwood canoes. They are noted for their carving and basket-work. They formerly made raids on the coast tribes. Slavery was hereditary, the slaves being prisoners of war. The population, some 7000 in the middle of the 19th century, is now reduced to a few hundreds.

See *Handbook of American Indians* (Washington, 1907). For "Haida Texts and Myths," see *Bull. 29 Smithsonian Institution Bureau Amer. Ethnol.* (1905).

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HAIDINGER, WILHELM KARL, RITTER VON (1795–1871), Austrian mineralogist, geologist and physicist, was born at Vienna on the 5th of February 1795. His father, Karl Haidinger, contributed largely to the development of mineralogical science in the latter half of the 18th century. Having studied at the normal school of St Anne, and attended classes at the university, Wilhelm, at the age of seventeen, joined Professor F. Mohs at Gratz, and five years later accompanied the professor to Freiberg on the transfer of his labours to the mining academy of that town.

In 1822 Haidinger visited France and England with Count Breunner, and, journeying northward, took up his abode in Edinburgh. He translated into English, with additions of his own, Mohs's *Grundriss der Mineralogie*, published at Edinburgh in three volumes under the title *Treatise on Mineralogy* (1825). After a tour in northern Europe, including the Scandinavian mining districts, he undertook the scientific direction of the porcelain works at Elbogen, belonging to his brothers. In 1840 he was appointed counsellor of mines (Bergrat) at Vienna in the place of Professor Mohs, a post which included the charge of the imperial cabinet of minerals. He devoted himself to the re-arrangement and enrichment of the collections, and the museum became the first in Europe. Shortly after (1843) Haidinger commenced a series of lectures on mineralogy, which was given to the world under the title *Handbuch der bestimmenden Mineralogie* (Vienna, 1845; tables, 1846). On the establishment of the imperial geological institute, he was chosen director (1849); and in this important position he occupied for seventeen years. He was elected a member of the imperial board of agriculture and mines, and a member of the imperial academy of sciences of Vienna. He organized the society of the Freunde der Naturwissenschaften. As a physicist Haidinger ranked high, and he was one of the most active promoters of scientific progress in Austria. He was the discoverer of the interesting optical appearances which have been called after him "Haidinger's brushes." Knighted in 1865, the following year he retired to his estate at Dornbach near Vienna, where he died on the 19th of March 1871.

In addition to the works already named, Haidinger published *Anfangsgründe der Mineralogie* (Leipzig, 1829); *Geognostische Übersichtskarte der österreich. Monarchie* (Vienna, 1847); *Bemerkungen über die Anordnung der körnigen Theilchen in Christallen* (Vienna, 1853); *Interferenzlinien am Glimmer* (Vienna, 1855); *Vergleichungen von Augit und Amphibol* (Vienna, 1855). He also edited the *Naturwissenschaftliche Abhandlungen* (Vienna, 1847); the *Berichte über die Mittheilungen von Freunden der Naturwissenschaften in Wien* (Vienna, 1847–1851); and the *Jahrbuch* of the Vienna K. K. Geologische Reichsanstalt (1850), &c. Some of his papers will be found in the *Transactions* of the Royal Society of Edinburgh (vol. x.) and of the Wernerian Society (1822–1823), *Edinburgh Phil. Journal*, *Brewster's Journal of Science*, and *Poggendorff's Annalen*. (H. B. WO.)

HAIDUK (also written *Heyduk*, *Heiduc*, *Heyduke* and *Heyduque*), a term which appears originally to have meant "robber" or "brigand," a sense it retains in Servia and some other parts of the Balkan Peninsula. It is probably derived from the Turkish *haïdûd*, "marauder," but its origin is not absolutely certain. Most of the European races with which the Turks came into close contact during the 15th and 16th centuries seem to have adopted it as a loan-word, and it appears in Magyar as *hajdú* (plural *hajdúk*), in Serbo-Croatian, Rumanian, Polish and Čech as *hajduk*, in Bulgarian as *hajdutin* and in Greek as χαϊντούτης. By the beginning of the 17th century its use had spread north and west as far as Sweden and Great Britain. In Hungary it was applied to a class of mercenary foot-soldiers of Magyar stock. In 1605 these haiduks were rewarded for their fidelity to the Protestant party (see HUNGARY: *History*) with titles of nobility and territorial rights over a district situated on the left bank of the river Theiss, known thenceforward as the Haiduk region. This was enlarged in 1876 and converted into the county of Hajdú (Ger. *Hajduken*). *Hajdú* is also a common prefix in Hungarian place-names, *e.g.* Hajdú-Szoboszló, Hajdú-Námás. In Austria-Hungary, Germany, Poland, Sweden and some other countries, *haiduk* came to mean an attendant in a court of law, or a male servant, dressed in Hungarian semi-military costume. It is also occasionally used as a synonym for "footman" or "lackey."

HAIFA, a town of Palestine at the foot of Mt. Carmel, on the south of the Bay of Acre. It represents the classical Sycaminum, but the present town is entirely modern. It has developed since about 1890 into an important port, and is connected by railway with Damascus. The population is estimated at 12,000 (Moslems 6000, Christians 4000, Jews 1500, Germans 500; the last belong for the greater part to the Unitarian sect of the "Templars," who have colonies also at Jaffa and Jerusalem). The exports (grain and oil) were valued at £178,738 in 1900. Much of the trade that formerly went to Acre has been attracted to Haifa. This port is the best natural harbour on the Palestine coast.

HAIK (an Arabic word, from *hak*, to weave), a piece of cloth, usually of coarse hand-woven wool, worn by Arabs, Moors and other Mahommedan peoples. It is generally 6 to 6½ yds. long, and about 2 broad. It is either striped or plain, and is worn equally by both sexes, usually as an outer covering; but it is often the only garment of the poorer classes. By women the "haik" is arranged to cover the head and, in the presence of men, is held so as to conceal the face. A thin "haik" of silk, like a veil, is used by brides at their marriage.

HAIL (O. Eng. *hagl* and *hagol*,[1] cf. the cognate Teutonic *hagel*, as in German, Dutch, Swedish, &c.; the Gr. κάχληξ, pebble, is probably 'allied), the name for rounded masses or single pellets of ice falling from the clouds in a shower. True hail has a concentric structure caused by the frozen particles of moisture first descending into a warm cloud, whence they are carried upwards on an ascending current of heated air into a cold stratum where the fresh coating of water vapour deposited in the cloud is frozen. The hailstone descends again, receives a fresh coating, is carried up once more, refrozen, and again descends. Thus the hailstone grows until the current is no longer strong enough to support it when it falls to the ground. At times masses of hail are frozen together, and a very sudden cooling will sometimes result in the formation of ragged masses of ice that fall with disastrous results. Hail must be distinguished from the frozen snow, "soft-hail" or "graupel," that often falls at the rear of a spring cyclone, since true hail is almost entirely a summer phenomenon, and falls most frequently in thunderstorms which are produced under the conditions that are favourable to the formation of hail, *i.e.* great heat, a still atmosphere, the production of strong local convection currents in consequence, and the passage of a cold upper drift.

HAILES, DAVID DALRYMPLE, LORD (1726–1792), Scottish lawyer and historian, was born at Edinburgh on the 28th of October 1726. His father, Sir James Dalrymple, Bart., of Hailes, in the county of Haddington, auditor-general of the exchequer of Scotland, was a grandson of James, first Viscount Stair; and his mother, Lady Christian Hamilton, was a daughter of Thomas, 6th earl of Haddington. David was the eldest of sixteen children. He was educated at Eton, and studied law at Utrecht, being intended for the Scottish bar, to which he was admitted shortly after his return to Scotland in 1748. As a pleader he attained neither high distinction nor very extensive practice, but he rapidly established a well-deserved reputation for sound knowledge, unwearied application and strict probity; and in 1766 he was elevated to the bench, when he assumed the title of Lord Hailes. Ten years later he was appointed a lord of justiciary. He died on the 29th of November 1792. He was twice married, and had a daughter by each wife. The baronetcy to which he had succeeded passed to the son of his brother John, provost of Edinburgh. Another brother was Alexander Dalrymple (1737–1808), the first admiralty hydrographer, who distinguished himself in the East India Company's service and as a geographer. Lord Hailes's younger daughter married Sir

[1] "Hail," a call of greeting or salutation, a shout to attract attention, must, of course, be distinguished. This word represents the Old Norwegian *heil*, prosperity, cognate with O. Eng. *hál*, whence "hale," "whole," and *hál*, whence "health," "heal."

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James Fergusson; and their grandson, Sir Charles Dalrymple, 1st Bart. (cr. 1887), M.P. for Bute from 1868 to 1885, afterwards came into Lord Hailes's estate and took his family name.

Lord Hailes's most important contribution to literature was the *Annals of Scotland*, of which the first volume, "From the accession of Malcolm III., surnamed Canmore, to the accession of Robert I.," appeared in 1776; and the second, "From the accession of Robert I., surnamed Bruce, to the accession of the house of Stewart," in 1779. It is, as Dr Johnson justly described this work at the time of its appearance, a "Dictionary" of carefully sifted facts, which tells all that is wanted and all that is known, but without any laboured splendour of language or affected subtlety of conjecture. The other works of Lord Hailes include *Historical Memoirs concerning the Provincial Councils of the Scottish Clergy* (1769); *An Examination of some of the Arguments for the High Antiquity of Regium Majestatem* (1769); three volumes entitled *Remains of Christian Antiquity* ("Account of the Martyrs of Smyrna and Lyons in the Second Century," 1776; "The Trials of Justin Martyr, Cyprian, &c.," 1778; "The History of the Martyrs of Palestine, translated from Eusebius," 1780); *Disquisitions concerning the Antiquities of the Christian Church* (1783); and editions or translations of portions of Lactantius, Tertullian and Minucius Felix. In 1786 he published *An Inquiry into the Secondary Causes which Mr Gibbon has assigned for the Rapid Growth of Christianity* (Dutch translation, Utrecht, 1793), one of the most respectable of the very many replies which were made to the famous 15th and 16th chapters of the *Decline and Fall of the Roman Empire*.

A "Memoir" of Lord Hailes is prefixed to the 1808 reprint of his *Inquiry into the Secondary Causes*.

HAILSHAM, a market-town in the Eastbourne parliamentary division of Sussex, England, 54 m. S.S.E. from London by the London, Brighton & South Coast railway. Pop. (1901), 4197. The church of St Mary is Perpendicular. The picturesque Augustinian priory of Michelham lies 2 m. W. by the Cuckmere river; it is altered into a dwelling house, but retains a gate-house, crypt and other portions of Early English date. There was also a Premonstratensian house at Otham, 3 m. S., but the remains are scanty. Hailsham has a considerable agricultural trade, and manufactures of rope and matting are carried on.

HAINAN, or, as it is usually called in Chinese, *K'iung-chow-fu*, a large island belonging to the Chinese province of Kwang-tung, and situated between the Chinese Sea and the Gulf of Tong-king from 20° 8′ to 17° 52′ N., and from 108° 32′ to 111° 15′ E. It measures 160 m. from N.E. to S.W., and the average breadth is about 90 m. The area is estimated at from 1200 to 1400 sq. m., or two-thirds the size of Sicily. From the peninsula of Leichow on the north it is separated by the straits of Hainan, which have a breadth of 15 or 20 m.

With the exception of a considerable area in the north, and broad tracts on the north-east and north-west sides, the whole island is occupied by jungle-covered mountains, with rich valleys between. The central range bears the name of Li-mou shan or Wu-tchi shan (the Five-Finger Mountain), and attains a height of 6000 or 7000 ft. Its praises are celebrated in a glowing ode by Ch'iu, a native poet. The island appears to be well watered, and some of its rivers are not without importance as possible highways of commerce; but the details of its hydrography are very partially ascertained. A navigable channel extends in an irregular curve from the bay of Hoi-how (Hai-K'ow) in the north to Tan-chow on the west coast. Being exposed to the winter monsoon, the northern parts of the island enjoy much the same sort of temperate climate as the neighbouring provinces of the mainland, but in the southern parts, protected from the monsoon by the mountain ranges, the climate is almost or entirely tropical. Snow falls so rarely that its appearance in 1684 is reported in the native chronicles as a remarkable event. Earthquakes are a much more familiar phenomenon, having occurred, according to the same authority, in 1523, 1526, 1605, 1652, 1677, 1681, 1684, 1702, 1704, 1725, 1742, 1816, 1817 and 1822. Excellent timber of various kinds—eagle-wood, rose-wood, liquidambar, &c.—is one of the principal products of the island, and has even been specially transported to Peking for imperial purposes. The coco palm flourishes freely even in the north, and is to be found growing in clumps with the *Pinus sinensis*. Rice, cotton, sugar, indigo, cinnamon, betel-nuts, sweet potatoes, ground-nuts and tobacco are all cultivated in varying quantities. The aboriginal inhabitants collect a kind of tea called t'ien ch'a, or celestial tea, which looks like the leaves of a wild camellia, and has an earthy taste when infused. Lead, silver, copper and iron occur in the Shi-lu shan or "stone-green-hill"; the silver at least was worked till 1850. Gold and lapis lazuli are found in other parts of the island.

The ordinary cattle of Hainan are apparently a cross between the little yellow cow of south China and the zebu of India. Buffaloes are common, and in the neighbourhood of Nanlu at least they are frequently albinos. Horses are numerous but small. Hogs and deer are both common wild animals, and of the latter there are three species, *Cervus Eldi*, *Cervus hippelaphus* and *Cervus vaginalis*. Among the birds, of which 172 species are described by Mr Swinhoe in his paper in *The Ibis* (1870), there are eagles, notably a new species *Spilornis Rutherfordi*, buzzards, harriers, kites, owls, goatsuckers and woodpeckers. The *Upupa ceylonensis* is familiar to the natives as the "bird of the Li matrons," and the *Palaeornis javanica* as the "sugar-cane bird."

Hainan forms a fu or department of the province of Kwang-tung, though strictly it is only a portion of the island that is under Chinese administration, the remainder being still occupied by unsubjugated aborigines. The department contains three *chow* and ten *hien* districts. K'iung-chow-hien, in which the capital is situated; Ting-an-hien, the only inland district; Wen-ch'ang-hien, in the north-east of the island; Hui-t'ung-hien, Lo-hui-hien, Ling-shu-hien, Wan-chow, Yai-chow (the southmost of all), Kan-ên-hien Ch'ang-hwa-hien, Tan-chow, Lin-kao-hien and Ch'êng-mai-hien. The capital K'iung-chow-fu is situated in the north about 10 li (or 3 m.) from the coast on the river. It is a well-built compact city, and its temples and examination halls are in good preservation. Carved articles in coco-nuts and scented woods are its principal industrial product. In 1630 it was made the seat of a Roman Catholic mission by Benoit de Mathos, a Portuguese Jesuit, and the old cemetery still contains about 113 Christian graves. The port of K'iung-chow-fu at the mouth of the river, which is nearly dry at low water, is called simply Hoi-how, or in the court dialect Hai-K'ow, *i.e.* seaport. The two towns are united by a good road, along which a large traffic is maintained partly by coolie porters but more frequently by means of wheel-barrows, which serve the purpose of cabs and carts. The value of the trade of the port has risen from £670,600 in 1899 to £719,333 in 1904. In the same year 424 vessels, representing a tonnage of 312,554, visited the port. This trade is almost entirely with the British colony of Hong-Kong, with which the port is connected by small coasting steamers, but since 1803 it has had regular steamboat communication with Haiphong in Tongking. The population of K'iung-chow, including its shipping port of Hoi-how, is estimated at 52,000. The number of foreign residents in 1900 was about 30, most of them officials or missionaries.

The inhabitants of Hainan may be divided into three classes, the Chinese immigrants, the civilized aborigines or Shu-li and the wild aborigines or Sheng-li. The Chinese were for the most part originally from Kwang-si and the neighbouring provinces, and they speak a peculiar dialect, of which a detailed account by Mr Swinhoe was given in *The Phoenix, a Monthly Magazine for China, &c.* (1870). The Shu-li as described by Mr Taintor are almost of the same stature as the Chinese, but have a more decided copper colour, higher cheek-bones and more angular features, while their eyes are not oblique. Their hair is long, straight and black, and their beards, if they have any, are very scanty. They till the soil and bring rice, fuel, timber, grass-cloth, &c., to the Chinese markets. The Sheng-li or Li proper, called also La, Le or Lauy, are probably connected with the Laos of Siam and the Lolos of China. Though not gratuitously aggressive, they are highly intractable, and have given great trouble to the Chinese authorities. Among themselves they carry on

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deadly feuds, and revenge is a duty and an inheritance. Though they are mainly dependent on the chase for food, their weapons are still the spear and the bow, the latter being made of wood and strung with bamboo. In marriage no avoidance of similarity of name is required. The bride's face is tattooed according to a pattern furnished by the bridegroom. Their funeral mourning consists of abstaining from drink and eating raw beef, and they use a wooden log for a coffin. When sick they sacrifice oxen. In the spring-time there is a festival in which the men and women from neighbouring settlements move about in gay clothing hand in hand and singing songs. The whole population of the island is estimated at about 2½ millions. At its first conquest 23,000 families were introduced from the mainland. In 1300 the Chinese authorities assign 166,257 inhabitants; in 1370, 291,000; in 1617, 250,524; and in 1835, 1,350,000.

It was in 111 B.C. that Lu-Po-Teh, general of the emperor Wu-ti, first made the island of Hainan subject to the Chinese, who divided it into the two prefectures, Tan-urh or Drooping Ear in the south, so-called from the long ears of the native "king," and Chu-yai or Pearl Shore in the north. During the decadence of the elder branch of the Han dynasty the Chinese supremacy was weakened, but in A.D. 43 the natives were led by the success of Ma-yuan in Tong-king to make a new tender of their allegiance. About this time the whole island took the name of Chu-yai. In A.D. 627 the name of K'iung-chow came into use. On its conquest by the generals of Kublai Khan in 1278 the island was incorporated with the western part of the province of Kwang-tung in a new satrapy, Hai-peh Hai-nan Tao, *i.e.* the circuit north of the sea and south of the sea. It was thus that Hai-nan-Tao, or district south of the sea or strait, came into use as the name of the island, which, however, has borne the official title of K'iung-chow-fu, probably derived from the Kiung shan or Jade Mountains, ever since 1370, the date of its erection into a department of Kwang-tung. For a long time Hainan was the refuge of the turbulent classes of China and the place of deportation for delinquent officials. It was there, for example, that Su-She or Su-Tung-po was banished in 1097. From the 15th to the 19th century pirates made the intercourse with the mainland dangerous, and in the 17th they were considered so formidable that merchants were allowed to convey their goods only across the narrow Hainan Strait. Since 1863 the presence of English men-of-war has put an end to this evil. According to the treaty of Tientsin, the capital K'iung-chow and the harbour Hoi-how (Hai-Kow) were opened to European commerce; but it was not till 1876 that advantage was taken of the permission.

HAINAU (officially HAYNAU), a town of Germany, in the Prussian province of Silesia, on the Schnelle Deichsa and the railway from Breslau to Dresden, 12 m. N.W. of Liegnitz. Pop. 10,500. It has an Evangelical and a Roman Catholic church, manufactories of gloves, patent leather, paper, metal ware and artificial manures, and a considerable trade in cereals. Near Hainau the Prussian cavalry under Blücher inflicted a defeat on the French rearguard on the 26th of May 1813.

HAINAUT (Flem. *Henegouwen*, Ger. *Hennegau*), a province of Belgium formed out of the ancient county of Hainaut. Modern Hainaut is famous as containing the chief coal and iron mines of Belgium. There are about 150,000 men and women employed in the mines, and about as many more in the iron and steel works of the province. About 1880 these numbers were not more than half their present totals. The principal towns of Hainaut are Mons, the capital, Charleroi, Tournai, Jumet and La Louvière. The province is watered by both the Scheldt and the Sambre, and is connected with Flanders by the Charleroi-Ghent canal. The area of the province is computed at 930,405 acres or 1453 sq. m. In 1904 the population was 1,102,967, showing an average of 821 per square mile.

Under the successors of Clovis Hainaut formed part, first of the kingdom of Metz, and then of that of Lotharingia. It afterwards became part of the duchy of Lorraine. The first to bear the title of count of Hainaut was Reginar "Long-Neck" (*c.* 875), who, later on, made himself master of the duchy of Lorraine and died in 916. His eldest son inherited Lower Lorraine, the younger, Reginar II., the countship of Hainaut, which remained in the male line of his descendants, all named Reginar, until the death of Reginar V. in 1036. His heiress, Richildis, married *en secondes noces* Baldwin VI. of Flanders, and, by him, became the ancestress of the Baldwin (VI. of Hainaut) who in 1204 was raised by the Crusaders to the empire of Constantinople. The emperor Baldwin's elder daughter Jeanne brought the countship of Hainaut to her husbands Ferdinand of Portugal (d. 1233) and Thomas of Savoy (d. 1259). On her death in 1244, however, it passed to her sister Margaret, on whose death in 1279 it was inherited by her grandson, John of Avesnes, count of Holland (d. 1304). The countship of Hainaut remained united with that of Holland during the 14th and 15th centuries. It was under the counts William I. "the Good" (1304–1337), whose daughter Philippa married Edward III. of England, and William II. (1337–1345) that the communes of Hainaut attained great political importance. Margaret, who succeeded her brother William II. in 1345, by her marriage with the emperor Louis IV. brought Hainaut with the rest of her dominions to the house of Wittelsbach. Finally, early in the 15th century, the countess Jacqueline was dispossessed by Philip the Good of Burgundy, and Hainaut henceforward shared the fate of the rest of the Netherlands.

AUTHORITIES.—The *Chronicon Hanoniense* or *Chronica Honnoniae* of Gislebert of Mons (d. 1223–1225), chancellor of Count Baldwin V., covering the period between 1040 and 1195, is published in Pertz, *Monum. Germ.* (Hanover, 1840, &c.). The *Chronicon Hanonense*, ascribed to Baldwin, count of Avesnes (d. 1289), and written between 1278 and 1281, was published under the title *Hist. genealogica comitum Hannoniae*, &c., at Antwerp (1691 and 1693) and Brussels (1722). The Annals of Jacques de Guise (b. 1334; d. 1399) were published by de Fortia d'Urban under the title, *Histoire de Hainault par Jacques de Guyze*, in 19 vols. (Paris, 1826–1838); C. Delacourt, "Bibliographie de l'hist. du Hainaut," in the *Annales du cercle archéologique de Mons*, vol. v. (Mons, 1864); T. Bernier, *Dict. géograph. historique, &c., de Hainault* (Mons, 1891). See also Ulysse Chevalier, *Répertoire des sources* s.v.

HAINBURG, or HAIMBURG, town of Austria, in Lower Austria, 38 m. E.S.E of Vienna by rail. Pop. (1900), 5134. It is situated on the Danube, only 2½ m. from the Hungarian frontier, and since the fire of 1827 Hainburg has been much improved, being now a handsomely built town. It has one of the largest tobacco manufactories in Austria, employing about 2000 hands, and a large needle factory. It occupies part of the site of the old Celtic town Carnuntum (*q.v.*). It is still surrounded by ancient walls, and has a gate guarded by two old towers. There are numerous Roman remains, among which may be mentioned the altar and tower at the town-house, on the latter of which is a statue, said to be of Attila. A Roman aqueduct is still used to bring water to the town. On the neighbouring Hainberg is an old castle, built of Roman remains, which appears in German tradition under the name of Heimburc; it was wrested from the Hungarians in 1042 by the emperor Henry III. At the foot of the same hill is a castle of the 12th century, where Ottakar of Bohemia was married to Margaret of Austria in 1252; earlier it was the residence of the dukes of Babenberg. Outside the town, on an island in the Danube, is the ruined castle of Röthelstein or Rothenstein, held by the Knights Templars. Hainburg was besieged by the Hungarians in 1477, was captured by Matthias Corvinus in 1482, and was sacked and its inhabitants massacred by the Turks in 1683.

HAINICHEN, a town of Germany, in the kingdom of Saxony, on the Kleine Striegis, 15 m. N.E. of Chemnitz, on the railway to Rosswein. Pop. (1905), 7752. It has two Evangelical churches, a park, and commercial and technical schools. Hainichen is a place of considerable industry. Its chief manufacture is that of flannels, baize, and similar fabrics; indeed it may be called the centre of this industry in Germany. The special whiteness and excellence of the flannel made in Hainichen are due to the peculiar nature of the water used in the manufacture. There are also large dye-works and bleaching establishments. Hainichen is the birthplace of Gellert, to whose memory a bronze statue was erected in the market-place in 1865. The Gellert institution for the poor was erected in 1815.

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HAI-PHONG, a seaport of Tongking, French Indo-China, on the Cua-Cam, a branch of the Song-koi (Red river) delta. The population numbers between 21,000 and 22,000, of whom 12,500 are Annamese, 7500 Chinese (attracted by the rice trade of the port) and 1200 Europeans. It is situated about 20 m. from the Gulf of Tongking and 58 m. E. by S. of Hanoi, with which it communicates by river and canal and by railway. It is the second commercial port of French Indo-China, is a naval station, and has government and private ship-building yards. The harbour is accessible at all times to vessels drawing 19 to 20 ft., but is obstructed by a bar. Hai-phong is the seat of a resident who performs the functions of mayor, and the residency is the chief building of the town. A civil tribunal, a tribunal of commerce and a branch of the Bank of Indo-China are also among its institutions. It is the headquarters of the river steamboat service (*Messageries fluviales*) of Tongking, which plies as far as Lao-kay on the Song-koi, to the other chief towns of Tongking and northern Annam, and also to Hong-kong. Cotton-spinning and the manufacture of cement are carried on.

HAIR (a word common to Teutonic languages), the general term for the characteristic outgrowth of the epidermis forming the coat of mammals. The word is also applied by analogy to the filamentous outgrowths from the body of insects, &c., plants, and metaphorically to anything of like appearance.

For anatomy, &c. of animal hair see SKIN AND EXOSKELETON; FIBRES and allied articles; FUR, and LEATHER.

Anthropology.—The human hair has an important place among the physical criteria of race. While its general structure and quantity vary comparatively little, its length in individuals and relatively in the two sexes, its form, its colour, its general consistency and the appearance under the microscope of its transverse section show persistent differences in the various races. It is the persistence of these differences and specially in regard to its colour and texture, which has given to hair its ethnological importance. So obvious a racial differentiation had naturally long ago attracted the attention of anthropologists. But it was not until the 19th century that microscopic examination showed the profound difference in structure between the hair characteristic of the great divisions of mankind. It was in 1863 that Dr Pruner-Bey read a paper before the Paris Anthropological Society entitled "On the Human Hair as a Race Character, examined by aid of the Microscope." This address established the importance of hair as a racial criterion. He demonstrated that the structure of the hair is threefold:—

(1) Short and crisp, generally termed "woolly," elliptical or kidney-shaped in section, with no distinguishable medulla or pith. Its colour is almost always jet black, and it is characteristic of all the black races except the Australians and aborigines of India. This type of hair has two varieties. When the hairs are relatively long and the spiral of the curls large, the head has the appearance of being completely covered, as with some of the Melanesian races and most of the negroes. Haeckel has called this "*eriocomous*" or "woolly" proper. In some negroid peoples, however, such as the Hottentots and Bushmen, the hair grows in very short curls with narrow spirals and forms little tufts separated by spaces which appear bare. The head looks as if it were dotted over with pepper-seed, and thus this hair has gained the name of "peppercorn-growth." Haeckel has called it "*lophocomous*" or "crested." Most negroes have this type of hair in childhood and, even when fully grown, signs of it around the temples. The space between each tuft is not bald, as was at one time generally assumed. The hair grows uniformly over the head, as in all races.

2. Straight, lank, long and coarse, round or nearly so in section, with the medulla or pith easily distinguishable, and almost without exception black. This is the hair of the yellow races, the Chinese, Mongols and Indians of the Americas.

3. Wavy and curly, or smooth and silky, oval in section, with medullary tube but no pith. This is the hair of Europeans, and is mainly fair, though black, brown, red or towy varieties are found.

There is a fourth type of hair describable as "frizzy." It is easily distinguishable from the Asiatic and European types, but not from the negroid wool. It is always thick and black, and is characteristic of the Australians, Nubians, and certain of the Mulattos. Generally hair curls in proportion to its flatness. The rounder it is the stiffer and lanker. These extremes are respectively represented by the Papuans and the Japanese. Of all hair the woolly type is found to be the most persistent, as in the case of the Brazilian Cafusos, negro and native hybrids. Quatrefages quotes the case of a triple hybrid, "half negro, quarter Cherokee, quarter English," who had short crisp furry-looking hair.

Wavy types of hair vary most in colour: almost the deepest hue of black being found side by side with the most flaxen and towy. Colour varies less in the lank type, and scarcely at all in the woolly. The only important exception to the uniform blackness of the negroid wool is to be found among the Wochuas, a tribe of African pigmies whose hair is described by Wilhelm Junker (*Travels in Africa*, iii. p. 82) as "of a dark, rusty brown hue." Fair hair in all its shades is frequent among the populations of northern Europe, but much rarer in the south. According to Dr John Beddoe there are sixteen blonds out of every hundred Scotch, thirteen out of every hundred English, and two only out of a hundred Italians. The percentage of brown hair is 75% among Spaniards, 30 among French and 16 only in Scandinavia. Among the straight-haired races fair hair is far rarer; it is, however, found among the western Finns. Among these races with frizzy hair, red is almost as common as among those with wavy hair. Red hair, however, is an individual anomaly associated ordinarily with freckles. There are no red-haired races.

A certain correlation appears to exist between the nature of hair and its absolute or relative length in the two sexes. Thus straight hair is the longest (Chinese, Red Indians), while woolly is shortest. Wavy hair holds an intermediate position. In the two extremes the difference of length in man and woman is scarcely noticeable. In some lank-haired races, men's tresses are as long as women's, *e.g.* the Chinese pigtail, and the hair of Redskins which grows to the length sometimes of upwards of 9 ft. In the frizzy-haired peoples, men and women have equally short growths. Bushwomen, the female Hottentot and negresses have hair no longer than men's. It is only in the wavy, and now and again in the frizzy types, that the difference in the sexes is marked. Among European men the length rarely exceeds 12 to 16 in., while with women the mean length is between 25 and 30 in. and in some cases has been known to reach 6 ft. or more.

The growth of hair on the body corresponds in general with that on the head. The hairiest races are the Australians and Tasmanians, whose heads are veritable mops in the thickness and unkempt luxuriance of the locks. Next to them are the Todas, and other hill-tribesmen of India, and the Hairy Ainu of Japan. Traces, too, of the markedly hairy race, now extinct, supposed to be the ancestor of Toda and Ainu alike, are to be found here and there in Europe, especially among the Russian peasantry. The least hairy peoples are the yellow races, the men often scarcely having rudimentary beards, *e.g.* Indians of America and the Mongols. Negroid peoples may be said to be intermediate, but usually incline to hairlessness. The wavy-haired populations hold also an intermediate position, but somewhat incline to hairiness. Among negroes especially no rule can be formulated. Bare types such as the Bushmen and western negroes are found contiguous to hairy types such as the inhabitants of Ashantee. Neither is there any rule as to baldness. From statistics taken in America it would seem that it is ten times less frequent among negroes than among whites between the ages of thirty-three and forty-five years, and thirty times less between twenty-one and thirty-two years. Among Mulattos it is more frequent than among negroes but less than among whites. It is rarer among Redskins than among negroes. The *lanugo* or downy hairs, with which the human foetus is covered for some time before birth and which is mostly shed in the womb, and the minute hairs which cover nearly every part of the adult human body, may be regarded as rudimentary remains of a complete hairy covering in the ancestors of mankind. The Pliocene, or

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at all events Miocene precursor of man, was a furred creature. The discovery of Egyptian mummies six thousand years old or more has proved that this physical criterion remains unchanged, and that it is to-day what it was so many scores of centuries back. Perhaps, then, the primary divisions of mankind were distinguished by hair the same in texture and colour as that which characterizes to-day the great ethnical groups. The wavy type bridges the gulf between the lank and woolly types, all in turn derived from a common hair-covered being. In this connexion it is worth mention, as pointed out by P. Topinard, that though the regions occupied by the negroid races are the habitat of the anthropoid apes, the hair of the latter is real hair, not wool. Further in the eastern section of the dark domain, while the Papuan is still black and dolichocephalic, his presumed progenitor, the orang-utan, is brachycephalic with decidedly red hair. Thus the white races are seen to come nearest the higher apes in this respect, yellow next, and black farthest removed.

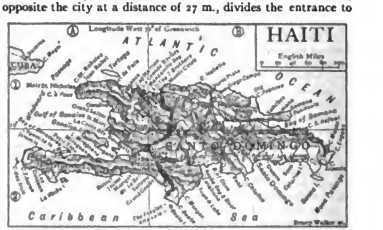
No test has proved, on repeated examination, to be a safer one of racial purity than the quality of hair, and Pruner-Bey goes so far as to suggest that "a single hair presenting the average form characteristic of the race might serve to define it." At any rate a hair of an individual bears the stamp of his origin.

See Dr Pruner-Bey in *Mémoires de la société d'anthropologie*, ii. P. A. Brown, *Classification of Mankind by the Hair*; P. Topinard, *L'Homme dans la nature* (1891), chap. vi.

Commerce.—Hair enters into a considerable variety of manufactures. Bristles are the stout elastic hairs obtained from the backs of certain breeds of pigs. The finest qualities, and the greatest quantities as well, are obtained from Russia, where a variety of pig is reared principally on account of its bristles. The best and most costly bristles are used by shoemakers, secondary qualities being employed for toilet and clothes-brushes, while inferior qualities are worked up into the commoner kinds of brushes used by painters and for many mechanical purposes. For artists' use and for decorative painting, brushes or pencils of hair from the sable, camel, badger, polecat, &c., are prepared. The hair of various animals which is too short for spinning into yarn is utilized for the manufacture of felt. For this use the hair of rabbits, hares, beavers and of several other rodents is largely employed, especially in France, in making the finer qualities of felt hats. Cow hair, obtained from tanneries, is used in the preparation of roofing felts, and felt for covering boilers of steam-pipes, and for other similar purposes. It is also largely used by plasterers for binding the mortar of the walls and roofs of houses; and it is to some extent being woven up into coarse friezes, horse-cloths, railway rugs and inferior blankets. The tail hair of oxen is also of value for stuffing cushions and other upholstery work, for which purpose, as well as for making the official wigs of law officers, barristers, &c, the tail and body hair of the yak or Tibet ox is also sometimes imported into Europe. The tail and mane hair of horses is in great demand for various purposes. The long tail hair is especially valuable for weaving into hair-cloth, mane hair and the short tail hair being, on the other hand, principally prepared and curled for stuffing the chairs, sofas and couches which are covered with the cloth manufactured from the long hair. The horse hair used in Great Britain is principally obtained from South America, Germany and Russia, and its sorting, cleaning and working up into the various manufactures dependent on the material are industries of some importance. In addition to the purposes already alluded to, horse hair is woven into crinoline for ladies' bonnets, plaited into fishing lines, woven into bags for oil and cider pressers, and into straining cloths for brewers, &c., and for numerous other minor uses. The manufactures which arise in connexion with human hair are more peculiar than important, although occasionally fashions arise which cause a large demand for human hair. The fluctuations of such fashions determine the value of hair; but at all times long tresses are of considerable value. Grey, light, pale and auburn hair are distinguished as extra colours, and command much higher prices than the common shades. The light-coloured hair is chiefly obtained in Germany and Austria, and the south of France is the principal source of the darker shades. In the south of France the cultivation and sale of heads of hair by peasant girls is a common practice; and hawkers attend fairs for the special purpose of engaging in this traffic. Hair 5 and even 6 ft. long is sometimes obtained. Scarcely any of the "raw material" is obtained in the United Kingdom except in the form of ladies' "combings." Bleaching of hair by means of peroxide of hydrogen is extensively practised, with the view of obtaining a supply of golden locks, or of preparing white hair for mixing to match grey shades; but in neither case is the result very successful. Human hair is worked up into a great variety of wigs, scalps, artificial fronts, frizzets and curls, all for supplementing the scanty or failing resources of nature. The plaiting of human hair into articles of jewellery, watch-guards, &c., forms a distinct branch of trade.

HAIR-TAIL (*Trichiurus*), a marine fish belonging to the *Acanthopterygii scombriformes*, with a long band-like body terminating in a thread-like tail, and with strong prominent teeth in both jaws. Several species are known, of which one, common in the tropical Atlantic, not rarely reaches the British Islands.

HAITI [HAÏTI, HAYTI, SAN DOMINGO, or HISPANIOLA], an island in the West Indies. It lies almost in the centre of the chain and, with the exception of Cuba, is the largest of the group. Its greatest length between Cape Engano on the east and Cape des Irois on the west is 407 m., and its greatest breadth between Cape Beata on the south and Cape Isabella on the north 160 m. The area is 28,000 sq. m., being rather less than that of Ireland. From Cuba, 70 m. W.N.W., and from Jamaica, 130 m. W.S.W., it is separated by the Windward Passage; and from Porto Rico, 60 m. E., by the Mona Passage. It lies between 17° 37′ and 20° 0′ N. and 68° 20′ and 74° 28′ W. From the west coast project two peninsulas. The south-western, of which Cape Tiburon forms the extremity, is the larger. It is 150 m. long and its width varies from 20 to 40 m. Columbus landed at Mole St Nicholas at the point of the north-western peninsula, which is 50 m. long, with an average breadth of 40 m. Between these lies the Gulf of Gonaïve, a triangular bay, at the apex of which stands the city of Port-au-Prince. The island of Gonaïve, opposite the city at a distance of 27 m., divides the entrance to



Port-au-Prince into two fine channels, and forms an excellent harbour, 200 sq. m. in extent, the coral reefs along the coast being its only defect. On the north-east coast is the magnificent Bay of Samana, formed by the peninsula of that name, a mountain range projecting into the sea; its mouth is protected by a coral reef stretching 8½m. from the south coast. There is however, a good passage for ships, and within lies a safe and beautiful expanse of water 300 sq. m. in extent. Beyond Samana, with the exception of the poor harbour of Santo Domingo, there are no inlets on the east and south coasts until the Bays of Ocoa and Neyba are reached. The south coast of the Tiburon peninsula has good harbours at Jacmel, Bainet, Aquin and Les Cayes or Aux Cayes. The only inlets of any importance between Aux Cayes and Port-au-Prince are Jeremie and the Bay of Baraderes. The coast line is estimated at 1250 m.

Haiti is essentially a mountainous island. Steep escarpments, leading to the rugged uplands of the interior, reach almost everywhere down to the shores, leaving only here and there a few strips of beach. There are three fairly distinct mountain ranges, the northern, central and southern, with parallel axes from E. to W.; while extensive and fertile plains lie between them. The northern range usually called the Sierra de Monti Cristi, extends from Cape Samana on the east to Cape Fragata on the west. It has a mean elevation of 3000 ft., culminating in the Loma Diego Campo (3855 ft.), near the centre of the range. The central range runs from Cape Engano to Cape St Nicholas, some 400 m. in an oblique direction from E. to W. Towards the centre of the island it broadens and forms two distinct chains; the northern, the Sierra del Cibao, constituting the backbone of Haiti; the southern curving first S.W., then N.W., and reaching the sea near St Marc. In addition to these there are a number of secondary crests, difficult to trace to the backbone of the system, since the loftiest peaks are usually on some lateral ridge. Such for instance is Loma Tina (10,300 ft.) the highest

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elevation on the island, which rises as a spur N.W. of the city of Santo Domingo. In the Sierra del Cibao, the highest summit is the Pico del Yaqui (9700 ft.). The southern range runs from the Bay of Neyba inline W., to Cape Tiburon. Its highest points are La Selle (8900 ft.) and La Hotte (7400 ft.). The plain of Seybo or Los Llanos is the largest of the Haitian plains. It stretches eastwards from the river Ozama for 95 m. and has an average width of 16 m. It is perfectly level, abundantly watered, and admirably adapted for the rearing of cattle. But perhaps the grandest is the Vega Real, or Royal Plain, as it was called by Columbus, which lies between the Cibao and Monti Cristi ranges. It stretches from Samana Bay to Manzanillo Bay, a distance of 150 m., and is interrupted in the centre by a range of hills in which rise the rivers which drain it. The northern part of this plain, however, is usually known as the Valley of Santiago. Most of the large valleys are in a state of nature, in part savanna, in part wooded, and all very fertile.

There are four large rivers. The Yaqui, rising in the Pico del Yaqui, falls, after a tortuous north-westerly course through the valley of Santiago, into Manzanillo Bay; its mouth is obstructed by shallows, and it is navigable only for canoes. The Neyba, or South Yaqui, also rises in the Pico del Yaqui and flows S. into the Bay of Neyba. In the mountains within a few miles from the sources of these rivers, rise the Yuna and the Artibonite. The Yuna drains the Vega Real, flows into Samana Bay, and is navigable by light-draught vessels for some distance from its mouth. The Artibonite flows through the valley of its name into the Gulf of Gonaive. Of the smaller rivers the Ozama, on which the city of Santo Domingo stands, is the most important. The greatest lake is that of Enriquillo or Xaragua, at a height of 300 ft. above the sea level. It is 25 m. long by 8 m. broad and very deep. Though 25 m. from the sea its waters are salt, and the Haitian negroes call it Etang Salé. After heavy rains it occasionally forms a continuous sheet of water with another lake called Azuey, or Etang Saumatre, which is 16 m. long by 4 m. broad; on these occasions the united lake has a total length of 40 m., and is larger than the Lake of Geneva. Farther S. is the Iceten de Limon, 5 m. long by 2 m. broad, a fresh-water lake with no visible outlet. Smaller lakes are Rincon and Miragoane. There are no active volcanoes, but earthquakes are frequent.

Geology.—The geology of Haiti is still very imperfectly known, and large tracts of the island have never been examined by a geologist. It is possible that the schists that have been observed in some parts of the island may be of Pre-cretaceous age, but the oldest rocks in which fossils have yet been found belong to the Cretaceous System, and the geological sequence is very similar to that of Jamaica. Excluding the schists of doubtful age, the series begins with sandstones and conglomerates, containing pebbles of syenite, granite, diorite, &c.; and these are overlaid by marls, clays and limestones containing *Hippurites*. Then follows a series of sandstones, clays and limestones with occasional seams of lignite, evidently of shallow-water origin. These are referred by R. T. Hill to the Eocene, and they are succeeded by chalky beds which were laid down in a deeper sea and which probably correspond with the Montpelier beds of Jamaica (Oligocene). Finally, there are limestones and marls composed largely of corals and molluscs, which are probably of very late Tertiary or Post-tertiary age. Hill, however, who the island has been more thoroughly examined, the correlation of the various Tertiary and Post-tertiary deposits must remain doubtful. Some of the beds which Hill has placed in the Eocene have been referred by earlier writers to the Miocene. Tippenhauer describes extensive eruptions of basalt of Post-pliocene age.

Fauna and Flora.—The fauna is not extensive. The agouti is the largest wild mammal. Birds are few, excepting water-fowl and pigeons. Snakes abound, though few are venomous. Lizards are numerous, and insects swarm in a low parts, with tarantulas, scorpions and centipedes. Caymans are found in the lakes and rivers, and the waters teem with fish and other sea food. Wild cattle, hogs and dogs, descendants of those brought from Europe, roam at large on the plains and in the forests. The wild hogs furnish much sport to the natives, who hunt them with dogs trained for the purpose.

In richness and variety of vegetable products Haiti is not excelled by any other country in the world. All tropical plants and trees grow in perfection, and nearly all the vegetables and fruits of temperate climates may be successfully cultivated in the highlands. Among indigenous products are cotton, rice, maize, tobacco, cocoa, ginger, native indigo (*indigo marron* or *sauvage*), arrowroot, manioc or cassava, pimento, banana, plantain, pine-apple, artichoke, yam and sweet potato. Among the important plants and fruits are sugar-cane, coffee, indigo (called *indigo franc*, to distinguish it from the native), melons, cabbage, lucerne, guinea grass and the breadfruit, mango, cainito, orange, alligator pear, grape, mulberry and fig. Most of the imported fruits have degenerated from want of care, but the mango, now spread over nearly the whole island, has become almost a necessary article of food; the bread-fruit has likewise become common, but is not so much esteemed. Haiti is also rich in woods, especially in cabinet and dye woods; among the former are mahogany, manchineel, satinwood, rosewood, cinnamon wood (*Canella alba*), yellow acoma (*Sideroxylon mastichodendron*) and gri-gri; and among the latter are Brazil wood, logwood, fustic and sassafras. On the mountains are extensive forests of pine and a species of oak; and in various parts occur the locust, ironwood, cypress or Bermuda cedar, palmetto and many kinds of palms.

Climate.—Owing to the great diversity of its relief Haiti presents a wider range of climate than any other part of the Antilles. The yearly rainfall is abundant, averaging about 120 in., but the wet and dry seasons are clearly divided. At Port-au-Prince the rainy season lasts from April to October, but varies in other parts of the island, so that there is never a season when rain is general. The mountain districts are constantly bathed in dense mists and heavy dews, while other districts are almost rainless. Owing to its sheltered position the heat at Port-au-Prince is greater than elsewhere. In summer the temperature there ranges between 80° and 95° F. and in winter between 70° and 80° F. Even in the highlands the mercury never falls below 45° F. Hurricanes are not so frequent as in the Windward Isles, but violent gales often occur. The prevailing winds are from the east.

The Republic of Haiti.—Haiti is divided into two parts, the negro republic of Haiti owning the western third of the island, while the remainder belongs to Santo Domingo (*q.v.*) or the Dominican Republic. Between these two governments there exists the strongest political antipathy.

Although but a small state, with an area of only 10,204 sq. m., the republic of Haiti is, in many respects, one of the most interesting communities in the world, as it is the earliest and most successful example of a state peopled, and governed on a constitutional model, by negroes. At its head is a president assisted by two chambers, the members of which are elected and hold office under a constitution of 1889. This constitution, thoroughly republican in form, is French in origin, as are also the laws, language, traditions and customs of Haiti. In practice, however, the government resolves itself into a military despotism, the power being concentrated in the hands of the president. The Haitians seem to possess everything that a progressive and civilized nation can desire, but corruption is spread through every portion and branch of the government. Justice is venal, and the police are brutal and inefficient. Since 1860 the Roman Catholic has been the state religion, but all classes of society seem to be permeated with a thinly disguised adherence to the horrid rites of *Voodoo* (*q.v.*), although this has been strenuously denied. The country is divided into 5 *départements*, 23 *arrondissements* and 67 *communes*. Each *département* and *arrondissement* is governed by a general in the army. The army numbers about 7000 men, and the navy consists of a few small vessels. Elementary education is free, and there are some 400 primary schools; secondary education is mainly in the hands of the church. The Sisters of Charity and the Christian Brothers have schools at Port-au-Prince, where there is also a lyceum, a medical and a law school. The children of the wealthier classes are usually sent to France for their education. The unit of money is the *gourde*, the nominal value of which is the same as the American dollar, but it is subject to great fluctuations. The revenue is almost entirely derived from customs, paid both on imports and exports. There being a lack of capital and enterprise, the excessive customs dues produce a very depressed condition of trade. Imports are consequently confined to bare necessaries, the cheapest sorts of dry and fancy goods, matches, flour, salt beef and pork, codfish, lard, butter and similar provisions. The exports are coffee, cocoa, logwood, cotton, gum, honey, tobacco and sugar. The island is one of the most fertile in the world, and if it had an enlightened and stable government, an energetic people, and a little capital, its agricultural possibilities would seem to be endless. Communications are bad; the roads constructed during the French occupation have degenerated into mere bridle tracks. There is a coast service of steamers, maintained since 1863, and 26 ports are regularly visited every ten days. Foreign communication is excellent, more foreign steamships visiting this island than any other in the West Indies. A railway from Port-au-Prince runs through the Plain of Cul de Sac for 28 m. to Manneville on the Etang Saumatre, another runs from Cap Haitien to La Grande Rivière, 15 m. distant.

The people are almost entirely pure-blooded negroes, the mulattoes, who form about 10% of the population, being a rapidly diminishing and much-hated class. The negroes are a kindly, hospitable people, but ignorant and lazy. They have

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a passion for dancing weird African dances to the accompaniment of the tom-tom. Marriage is neither frequent nor legally prescribed, since children of looser unions are regarded by the state as legitimate. In the interior polygamy is frequent. The people generally speak a curious but not unattractive *patois* of French origin, known as Creole. French is the official language, and by a few of the educated natives it is written and spoken in its purity. On the whole it must be owned that, after a century of independence and self-government, the Haitian people have made no progress, if they have not actually shown signs of retrogression. The chief towns are Port-au-Prince (pop. 75,000), Cap Haitien (29,000), Les Cayes (25,000), Gonaïve (18,000), and Port de Paix (10,000). Jeremie was the birthplace of the elder Dumas. The ruins of the wonderful palace of Sans-Souci and of the fortress of La Ferrière, built by King Henri Christophe (1807–1825), can be seen near Millot, a town 9 m. inland from Cap Haitien. Plaisance (25,000), Gros Morne (22,000) and La Croix des Bouquets (20,000) are the largest towns in the interior. The entire population of the republic is about 1,500,000.

History.—The history of Haiti begins with its discovery by Columbus, who landed from Cuba at Mole St Nicholas on the 6th of December 1492. The natives called the country Haiti (mountainous country), and Quisquica (vast country). Columbus named it Espagnola (Little Spain), which was latinized into Hispaniola. At the time of its discovery, the island was inhabited by about 2,000,000 Indians, who are described by the Spaniards as feeble in intellect and physically defective. They were, however, soon exterminated, and their place was supplied (as early as 1512) by slaves imported from Africa, the descendants of whom now possess the land. Six years after its discovery Columbus had explored the interior of the island, founded the present capital, and had established flourishing settlements at Isabella, Santiago, La Vega, Porto Plata and Bonao. Mines had been opened up, and advances made in agriculture. Sugar was introduced in 1506, and in a few years became the staple product. About 1630, a mixed company of French and English, driven by the Spaniards from St Kitts, settled on the island of Tortuga, where they became formidable under the name of Buccaneers. They soon obtained a footing on the mainland of Haiti, and by the treaty of Ryswick, 1697, the part they occupied was ceded to France. This new colony, named Saint Dominique, subsequently attained a high degree of prosperity, and was in a flourishing state when the French Revolution broke out in 1789. The population was then composed of whites, free coloured people (mostly mulattoes) and negro slaves. The mulattoes demanded civil rights, up to that time enjoyed only by the whites; and in 1791 the National Convention conferred on them all the privileges of French citizens. The whites at once adopted the most violent measures, and petitioned the home government to reverse the decree, which was accordingly revoked. In August 1791, the plantation slaves broke out into insurrection, and the mulattoes threw in their lot with them. A period of turmoil followed, lasting for several years, during which both parties were responsible for acts of the most revolting cruelty. Commissioners were sent out from France with full powers to settle the dispute, but although in 1793 they proclaimed the abolition of slavery, they could effect nothing. To add further to the troubles of the colony, it was invaded by a British force, which, in spite of the climate and the opposition of the colonists, succeeded in maintaining itself until driven out in 1798 by Toussaint l'Ouverture. By treaty with Spain, in 1795, France had acquired the title to the entire island.

By 1801, Toussaint l'Ouverture, an accomplished negro of remarkable military genius, had succeeded in restoring order. He then published, subject to the approval of France, a form of constitutional government, under which he was to be governor for life. This step, however, roused the suspicions of Bonaparte, then first consul, who determined to reduce the colony and restore slavery. He sent out his brother-in-law, General Leclerc, with 25,000 troops; but the colonists offered a determined, and often ferocious, resistance. At length, wearied of the struggle, Leclerc proposed terms, and Toussaint, induced by the most solemn guarantees on the part of the French, laid down his arms. He was seized and sent to France, where he died in prison in 1803. The blacks, infuriated by this act of treachery, renewed the struggle, under Jean Jacques Dessalines (1758–1806), with a barbarity unequalled in previous contests. The French, further embarrassed by the appearance of a British fleet, were only too glad to evacuate the island in November 1803.

The opening of the following year saw the declaration of independence, and the restoration of the aboriginal name of Haiti. Dessalines, made governor for life, inaugurated his rule with a bloodthirsty massacre of all the whites. In October 1804, he proclaimed himself emperor and was crowned with great pomp; but in 1806 his subjects, growing tired of his tyranny, assassinated him. His position was now contended for by several chiefs, one of whom, Henri Christophe (1767–1820), established himself in the north, while Alexandre Sabes Pétion (1770–1818) took possession of the southern part. The Spaniards re-established themselves in the eastern part of the island, retaining the French name, modified to Santo Domingo. Civil war now raged between the adherents of Christophe and Pétion, but in 1810 hostilities were suspended. Christophe declared himself king of Haiti under the title of Henry I.; but his cruelty caused an insurrection, and in 1820 he committed suicide. Pétion was succeeded in 1818 by General Jean Pierre Boyer (1776–1850), who, after Christophe's death, made himself master of all the French part of the island. In 1821 the eastern end of the island proclaimed its independence of Spain, and Boyer, taking advantage of dissensions there, invaded it, and in 1822 the dominion of the whole island fell into his hands. Boyer held the presidency of the new government, which was called the republic of Haiti, until 1843, when he was driven from the island by a revolution. In 1844 the people at the eastern end of the island again asserted their independence. The republic of Santo Domingo was established, and from that time the two political divisions have been maintained. Meanwhile in Haiti revolution followed revolution, and president succeeded president, in rapid succession. Order, however, was established in 1849, when Soulouque, who had previously obtained the presidency, proclaimed himself emperor, under the title of Faustin I. After a reign of nine years he was deposed and exiled, the republic being restored under the mulatto president Fabre Geffrard. His firm and enlightened rule rendered him so unpopular that in 1867 he was forced to flee to Jamaica. He was succeeded by Sylvestre Salnave, who, after a presidency of two years, was shot. Nissage-Saget (1870), Dominique (1874), and Boisrond-Canal (1876) followed, each to be driven into exile by revolution. The next president, Salomon, maintained himself in office for ten years, but he too was driven from the country and died in exile. Civil war raged in 1888–1889 between Generals Légitime and Hippolyte, and the latter succeeded in obtaining the vacant presidency. He ruled with the most absolute authority till his death in 1896. General Tiresias Simon Sam followed and ruled till his flight to Paris in 1902. The usual civil war ensued, and after nine months of turmoil, order was restored by the election of Nord Alexis in December 1902.

Alexis' administration was unsuccessful, and was marked by many disturbances, culminating in his expulsion. In 1904 there was an attack by native soldiery on the French and German representatives, and punishment was exacted by these powers. In December 1904 ex-president Sam, his wife and members of his ministry were sentenced to long terms of imprisonment for fraudulently issuing bonds. In December 1907 a conspiracy against the government was reported and the ringleaders were sentenced to death. But in January 1908 the revolution spread, and Gonaïve and St Marc and other places were reported to be in the hands of the insurgents. Prompt measures were taken, the rising was checked, and Alexis announced the pardon of the revolutionaries. In March, however, this pacific policy was reversed by a new ministry; some suspects were summarily executed, and the attitude of the government was only modified when the powers sent war-ships to Port-au-Prince. In September

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the criminal court at the capital sentenced to death, by default, a large number of persons implicated in the risings earlier in the year, and in November a revolution broke out again. General Antoine Simon raised his standard at Aux Cayes. Disaffection was rife among the government troops, who deserted to him in great numbers. On the 2nd of December Port-au-Prince was occupied without bloodshed by the revolutionaries, and Alexis took to flight, escaping violence with some difficulty, and finding refuge on a French ship. General Simon then assumed the presidency. At the end of April 1910 Alexis died in Jamaica, in circumstances of some obscurity; it had just been discovered that a plot was on foot to depose Simon, and further trouble was threatened.

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HAJIPUR, a town of British India, in the Muzaffarpur district of Bengal, on the Gandak, just above its confluence with the Ganges opposite Patna. Pop. (1901), 21,308. Hajipur figures conspicuously in the history of the struggles between Akbar and his rebellious Afghan governors of Bengal, being twice besieged and captured by the imperial troops, in 1572 and 1574. Within the limits of the old fort is a small stone mosque, very plain, but of peculiar architecture, and attributed to Hājī Ilyās, its traditional founder (*c.* 1350). Its command of water traffic in three directions makes the town a place of considerable commercial importance. Hajipur has a station on the main line of the Bengal and North-western railway.

HAJJ or HADJ, the Arabic word, meaning literally a "setting out," for the greater pilgrimage of Mahommedans to Mecca, which takes place from the 8th to the 10th of the twelfth month of the Mahommedan year; the lesser pilgrimage, called *umrah* or *omra*, may be made to the mosque at Mecca at any time other than that of the hajj proper, and is also a meritorious act. The term *hajji* or *hadji* is given to those who have performed the greater pilgrimage. The word *hajj* is sometimes loosely used of any Mahommedan pilgrimage to a sacred place or shrine, and is also applied to the pilgrimages of Christians of the East to the Holy Sepulchre at Jerusalem (see MECCA; MAHOMMEDAN RELIGION).

HĀJJĪ KHALĪFA [in full Muṣṭafā ibn 'Abdallāh Kātib Chelebī Hājjī Khalīfa] (*ca.* 1590–1658), Arabic and Turkish author, was born at Constantinople. He became secretary to the commissariat department of the Turkish army in Anatolia, was with the army in Bagdad in 1625, was present at the siege of Erzerum, and returned to Constantinople in 1628. In the following year he was again in Bagdad and Hamadān, and in 1633 at Aleppo, whence he made the pilgrimage to Mecca (hence his title Hājjī). The following year he was in Erivān and then returned to Constantinople. Here he obtained a post in the head office of the commissariat department, which afforded him time for study. He seems to have attended the lectures of great teachers up to the time of his death, and made a practice of visiting bookshops and noting the titles and contents of all books he found there. His largest work is the *Bibliographical Encyclopaedia* written in Arabic. In this work, after five chapters dealing with the sciences generally, the titles of Arabian, Persian and Turkish books written up to his own time are arranged in alphabetical order. With the titles are given, where possible, short notes on the author, his date, and sometimes the introductory words of his work. It was edited by G. Flügel with Latin translation and a useful appendix (7 vols. Leipzig, 1835–1858). The text alone of this edition has been reproduced at Constantinople (1893).

Hājjī Khalīfa also wrote in Turkish: a chronological conspectus of general history (translated into Italian by G. R. Carli, Venice, 1697); a history of the Turkish empire from 1594 to 1655 (Constantinople, 1870); a history of the naval wars of the Turks (Constantinople, 1729; chapters 1-4 translated by J. Mitchell, London, 1831); a general geography published at Constantinople, 1732 (Latin trans. by M. Norberg, London and Gotha, 1818; German trans. of part by J. von Hammer, Vienna, 1812; French trans. of part by V. de St Martin in his *Geography of Asia Minor*, vol. 1).

For his life see the preface to Flügel's edition; list of his works in G. Brockelmann's *Gesch. d. arabischen Literatur* (Berlin, 1902), vol. ii., pp. 428-429. (G. W. T.)

HAKE, EDWARD (fl. 1579), English satirist, was educated under John Hopkins, the part-author of the metrical version of the Psalms. He resided in Gray's Inn and Barnard's Inn, London. In the address "To the Gentle Reader" prefixed to his *Newes out of Poules Churchyard . . . Otherwise entitled Syr Nummus* (2nd ed., 1579) he mentions the "first three yeeres which I spent in the Innes of Channcery, being now about a dosen of yeeres passed." In 1585 and 1586 he was mayor of New Windsor, and in 1588 he represented the borough in parliament. His last work was published in 1604. He was protected by the earl of Leicester, whose policy it was to support the Puritan party, and who no doubt found a valuable ally in so vigorous a satirist of error in clerical places as was Hake. *Newes out of Paules Churchyarde, A Trappe for Syr Monye*, first appeared in 1567, but no copy of this impression is known, and it was re-issued in 1579 with the title quoted above. The book takes the form of a dialogue between Bertulph and Paul, who meet in the aisles of the cathedral, and is divided into eight "satyrs," dealing with the corruption of the higher clergy and of judges, the greed of attorneys, the tricks of physicians and apothecaries, the sumptuary laws, extravagant living, Sunday sports, the abuse of St Paul's cathedral as a meeting-place for business and conversation, usury, &c. It is written in rhymed fourteen-syllable metre, which is often more comic than the author intended. It contains, amid much prefatory matter, a note to the "carping and scornefull Sicophant," in which he attacks his enemies with small courtesy and much alliteration. One is described as a "carping careless cankerd churle."

He also wrote a translation from Thomas à Kempis, *The Imitation, or Following of Christ* (1567, 1568); *A Touchstone for this Time Present* (1574), a scurrilous attack on the Roman Catholic Church, followed by a treatise on education; *A Commemoration of the . . . Reigne of . . . Elizabeth* (1575), enlarged in 1578 to *A Joyfull Continuance of the Commemoration, &c.*; and of *Gold's Kingdom, and this Unhelping Age* (1604), a collection of pieces in prose and verse, in which the author inveighs against the power of gold. A bibliography of these and of Hake's other works was compiled by Mr Charles Edmonds for his edition in 1872 of the *Newes* (Isham Reprints, No. 2, 1872).

HAKE, THOMAS GORDON (1809–1895), English poet, was born at Leeds, of an old Devonshire family, on the 10th of March 1809. His mother was a Gordon of the Huntly branch. He studied medicine at St George's hospital and at Edinburgh and Glasgow, but had given up practice for many years before his death, and had devoted himself to a literary life. In 1839 he published a prose epic *Vates*, republished in Ainsworth's magazine as *Valdarno*, which attracted the attention of D. G. Rossetti. In after years he became an intimate member of the circle of friends and followers gathered round Rossetti, who so far departed from his usual custom as to review Hake's poems in the *Academy* and in the *Fortnightly Review*. In 1871 he published *Madeline*; 1872, *Parables and Tales*; 1883, *The Serpent Play*; 1890, *New Day Sonnets*; and in 1892 his *Memoirs of Eighty Years*. Dr Hake's works had much subtlety and felicity of expression, and were warmly appreciated in a somewhat restricted literary circle. In his last published verse, the sonnets, he shows an advance in facility on the occasional harshness of his earlier work. He was given a Civil List literary pension in 1893, and died on the 11th of January 1895.

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HAKE (*Merluccius vulgaris*), a fish which differs from the cod in having only two dorsal fins and one anal. It is very common on the coasts of Europe and eastern North America, but its flesh is much less esteemed than that of the true *Gadi*. Specimens 4 ft. in length are not scarce. There are local variations in the use of "hake" as a name; in America the "silver hake" (*Merluccius bilinearis*), sometimes called "whiting," and "Pacific hake" (*Merluccius productus*) are also food-fishes of inferior quality.

HAKKAS ("Guests," or "Strangers"), a people of S.W. China, chiefly found in Kwang-Tung, Fu-Kien and Formosa. Their origin is doubtful, but there is some ground for believing that they may be a cross between the aboriginal Mongolic element of northern China and the Chinese proper. According to their tradition, they were in Shantung and northern China as early as the 3rd century B.C. In disposition, appearance and customs they differ from the true Chinese. They speak a distinct dialect. Their women, who are prettier than the pure Chinese, do not compress their feet, and move freely about in public. The Hakkas are a most industrious people and furnish at Canton nearly all the coolie labour employed by Europeans. Their intelligence is great, and many noted scholars have been of Hakka birth. Hung Sin-tsuan, the leader in the Taiping rebellion, was a Hakka. In Formosa they serve as intermediaries between the Chinese and European traders and the natives. From time immemorial they seem to have been persecuted by the Chinese, whom they regard as "foreigners," and with whom their means of communication is usually "pidgin English." The earliest persecution occurred under the "first universal emperor" of China, Shi-Hwang-ti (246–210 B.C.). From this time the Hakkas appear to have become wanderers. Sometimes for generations they were permitted to live unmolested, as under the Han dynasty, when some of them held high official posts. During the Tang dynasty (7th, 8th, and 9th centuries) they settled in the mountains of Fu-kien and on the frontiers of Kwang-Tung. On the invasion of Kublai Khan, the Hakkas distinguished themselves by their bravery on the Chinese side. In the 14th century further persecutions drove them into Kwang-Tung.

See "An Outline History of the Hakkas," *China Review* (London, 1873–1874), vol. ii.; Pitou, "On the Origin and History of the Hakkas," ib.; Dyer Ball, *Easy Lessons in the Hakka Dialect* (1888), *Things Chinese* (London, 1893); Schaub, "Proverbs in Daily Use among the Hakkas," in *China Review* (London, 1894–1895), vol. xxi.; Rev. J. Edkins, *China's Place in Philology*; Girard de Rialle, *Rev. d. anthrop.* (Jan. and April, 1888); G. Taylor, "The Aborigines of Formosa," *China Review*, xiv. p. 198 seq., also xvi. No. 3, "A Ramble through Southern Formosa."

HAKLUYT, RICHARD (*c.* 1553–1616), British geographer, was born of good family in or near London about 1553. The Hakluyts were of Welsh extraction, not Dutch as has been supposed. They appear to have settled in Herefordshire as early as the 13th century. The family seat was Eaton, 2 m. S.E. of Leominster. Hugo Hakelute was returned M.P. for that borough in 1304/5. Richard went to school at Westminster, where he was a queen's scholar; while there his future bent was determined by a visit to his cousin and namesake, Richard Hakluyt of the Middle Temple. His cousin's discourse, illustrated by "certain bookes of cosmographie, an universall mappe, and the Bible," made young Hakluyt resolve to "prosecute that knowledge and kind of literature." Entering Christ Church, Oxford, in 1570, "his exercises of duty first performed," he fell to his intended course of reading, and by degrees perused all the printed or written voyages and discoveries that he could find. He took his B.A. in 1573/4. It is probable that, shortly after taking his M.A. (1577), he began at Oxford the first public lectures in geography that "shewed both the old imperfectly composed and the new lately reformed mappes, globes, spheares, and other instruments of this art." That this was not in London is certain, as we know that the first lecture of the kind was delivered in the metropolis on the 4th of November 1588 by Thomas Hood.

Hakluyt's first published work was his *Divers Voyages touching the Discoverie of America* (London, 1582, 4to.). This brought him to the notice of Lord Howard of Effingham, and so to that of Sir Edward Stafford, Lord Howard's brother-in-law; accordingly at the age of thirty, being acquainted with "the chiefest captaines at sea, the greatest merchants, and the best mariners of our nation," he was selected as chaplain to accompany Stafford, now English ambassador at the French court, to Paris (1583). In accordance with the instructions of Secretary Walsingham, he occupied himself chiefly in collecting information of the Spanish and French movements, and "making diligent inquirie of such things as might yield any light unto our westerne discoverie in America." The first-fruits of Hakluyt's labours in Paris are embodied in his important work entitled *A particuler discourse concerning Westerne discoveries written in the yere 1584, by Richarde Hackluyt of Oxforde, at the requeste and direction of the righte worshipfull Mr Walter Raghly before the comynge home of his twoo barkes*. This long-lost MS. was at last printed in 1877. Its object was to recommend the enterprise of planting the English race in the unsettled parts of North America. Hakluyt's other works consist mainly of translations and compilations, relieved by his dedications and prefaces, which last, with a few letters, are the only material we possess out of which a biography of him can be framed. Hakluyt revisited England in 1584, laid before Queen Elizabeth a copy of the *Discourse*" along with one in Latin upon Aristotle's *Politicks*," and obtained, two days before his return to Paris, the grant of the next vacant prebend at Bristol, to which he was admitted in 1586 and held with his other preferments till his death.

While in Paris Hakluyt interested himself in the publication of the MS. journal of Laudonnière, the *Histoire notable de la Florida*, edited by Bassanier (Paris, 1586, 8vo.). This was translated by Hakluyt and published in London under the title of *A notable historie containing foure voyages made by certayne French captaynes into Florida* (London, 1587, 4to.). The same year *De orbe novo Petri Martyris Anglerii decades octo illustratae labore et industria Richardi Hackluyti* saw the light at Paris. This work contains the exceedingly rare copperplate map dedicated to Hakluyt and signed F. G. (supposed to be Francis Gualle); it is the first on which the name of "Virginia" appears.

In 1588 Hakluyt finally returned to England with Lady Stafford, after a residence in France of nearly five years. In 1589 he published the first edition of his chief work, *The Principall Navigations, Voiages and Discoveries of the English Nation* (fol., London, 1 vol.). In the preface to this we have the announcement of the intended publication of the first terrestrial globe made in England by Molyneux. In 1598–1600 appeared the final, reconstructed and greatly enlarged edition of *The Principal Navigations, Voyages, Traffiques and Discoveries of the English Nation* (fol., 3 vols.). Some few copies contain an exceedingly rare map, the first on the Mercator projection made in England according to the true principles laid down by Edward Wright. Hakluyt's great collection, though but little read, has been truly called the "prose epic of the modern English nation." It is an invaluable treasure of material for the history of geographical discovery and colonization, which has secured for its editor a lasting reputation. In 1601 Hakluyt edited a translation from the Portuguese of Antonio Galvano, *The Discoveries of the World* (4to., London). In the same year his name occurs as an adviser to the East India Company, supplying them with maps, and informing them as to markets. Meantime in 1590 (April 20th) he had been instituted to the rectory of Witherington-sett-cum-Brockford, Suffolk. In 1602, on the 4th of May, he was installed prebendary of Westminster, and in the following year he was elected archdeacon of Westminster. In the licence of his second marriage (30th of March 1604) he is also described as one of the chaplains of the Savoy, and his will contains a reference to chambers occupied by him there up to the time of his death; in another official document he is styled D.D. In 1605 he secured the prospective living of James Town, the intended capital of the intended colony of Virginia. This benefice he supplied, when the colony was at last established in 1607, by a curate, one Robert Hunt. In 1606 he appears as one

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of the chief promoters of the petition to the king for patents to colonize Virginia. He was also a leading adventurer in the London or South Virginia Company. His last publication was a translation of Fernando de Soto's discoveries in Florida, entitled *Virginia richly valued by the description of Florida her next neighbour* (London, 1609, 4to). This work was intended to encourage the young colony of Virginia; to Hakluyt, it has been said, "England is more indebted for its American possession than to any man of that age." We may notice that it was at Hakluyt's suggestion that Robert Parke translated Mendoza's *History of China* (London, 1588–1589) and John Pory made his version of *Leo Africanus* (*A Geographical History of Africa*, London, 1600). Hakluyt died in 1616 (November 23rd) and was buried in Westminster Abbey (November 26th); by an error in the abbey register his burial is recorded under the year 1626. Out of his various emoluments and preferments (of which the last was Gedney rectory, Lincolnshire, in 1612) he amassed a small fortune, which was squandered by a son. A number of his MSS., sufficient to form a fourth volume of his collections of 1598–1600, fell into the hands of Samuel Purchas, who inserted them in an abridged form in his *Pilgrimes* (1625–1626, fol.). Others are preserved at Oxford (Bib. Bod. MS. Seld. B. 8). which consist chiefly of notes gathered from contemporary authors.

Besides the MSS. or editions noticed in the text (*Divers Voyages* (1582); *Particuler Discourse* (1584); Laudonnière's *Florida* (1587); Peter Martyr; *Decades* (1587); *Principal Navigations* (1589 and 1598–1600); Galvano's *Discoveries* (1601); De Soto's Florida record, the *Virginia richly valued* (1609, &c.), we may notice the Hakluyt Society's London edition of the *Divers Voyages* in 1850, the edition of the *Particuler Discourse*, by Charles Deane in the *Collections of the Maine Historical Society* (Cambridge, Mass., 1877), with an introduction by Leonard Woods); also, among modern issues of the *Principal Navigations*, those of 1809 (5 vols., with much additional matter), and of 1903–1905 (Glasgow, 12 vols.). The new title-page issued for the first volume of the final edition of the *Principal Navigations*, in 1599, merely cancelled the former 1598 title with its reference to the Cadiz expedition of 1596; but from this has arisen the mistaken supposition that a new *edition* was then (1599) published. Hakluyt's Galvano was edited for the Hakluyt Society by Admiral C. R. D. Bethune in 1862. This Society, which was founded in 1846 for printing rare and unpublished voyages and travels, includes the Glasgow edition of the *Principal Navigations* in its *extra series*, as well as C. R. Beazley's edition of *Carpini, Rubruquis*, and other medieval texts from Hakluyt (Cambridge, 1903, 1 vol.). Reckoning in these and an issue of Purchas's *Pilgrimes* by the Glasgow publisher of the Hakluyt of 1903–1905, the society has now published or "fathered" 150 vols. See also *Voyages of the Elizabethan Seamen to America, being Select Narratives from the Principal Navigations*, by E. J. Payne (Oxford, 1880; 1893; new edition by C. R. Beazley, 1907).

For Hakluyt's life the dedications of the 1589 and 1598 editions of the *Principal Navigations* should be especially consulted; also Winter Jones's introduction to the Hakluyt Society edition of the *Divers Voyages*; Fuller's *Worthies of England*, "Herefordshire"; *Oxford Univ. Reg.* (Oxford Hist. Soc.), ii., iii. 39; *Historical MSS. Commission, 4th report, appendix*, p. 614, the last giving us the Towneley MSS. referring to payments (prior?) awarded to Hakluyt when at Oxford, May 12th and June 4th, 1575. (C. H. C.; C. R. B.)

HAKODATE, a town on the south of the island of Yezo, Japan, for many years regarded as the capital of the island until Sapporo was officially raised to that rank. Pop. (1903) 84,746. Its position, as has been frequently remarked, is not unlike that of Gibraltar, as the town is built along the north-western base of a rocky promontory (1157 ft. in height) which forms the eastern boundary of a spacious bay, and is united to the mainland by a narrow sandy isthmus. The summit of the rock, called the Peak, is crowned by a fort. Hakodate is one of the ports originally opened to foreign trade. The Bay of Hakodate, an inlet of Tsugaru Strait, is completely land-locked, easy of access and spacious, with deep water almost up to the shore, and good holding-ground. The Russians formerly used Hakodate as a winter port. The staple exports are beans, pulse and peas, marine products, sulphur, furs and timber; the staple imports, comestibles (especially salted fish), kerosene and oil-cake. The town is not situated so as to profit largely by the development of the resources of Yezo, and as a port of foreign trade its outlook is indifferent. Frequent steamers connect Hakodate and Yokohama and other ports, and there is daily communication with Aomori, 56 m. distant, whence there is rail-connexion with Tokyo. Hakodate was opened to American commerce in 1854. In the civil war of 1868 the town was taken by the rebel fleet, but it was recovered by the mikado in 1869.

HAL, a town of Brabant, Belgium, about 9 m. S.W. of Brussels, situated on the river Senne and the Charleroi canal. Pop. (1904) 13,541. The place is interesting chiefly on account of its fine church of Notre Dame, formerly dedicated to St Martin. This church, a good example of pure Gothic, was begun in 1341 and finished in 1409. Its principal ornament is the alabaster altar, by J. Mone, completed in 1533. The bronze font dates from 1446. Among the monuments is one in black marble to the dauphin Joachim, son of Louis XI., who died in 1460. In the treasury of the church are many costly objects presented by illustrious personages, among others by the emperor Charles V., King Henry VIII. of England, Charles the Bold of Burgundy, and several popes. The church is chiefly celebrated, however, for its miraculous image of the Virgin. Legend says that during a siege the bullets fired into the town were caught by her in the folds of her dress. Some of these are still shown in a chest that stands in a side chapel. In consequence of this belief a great pilgrimage, attended by many thousands from all parts of Belgium, is paid annually to this church. The hôtel de ville dates from 1616 and has been restored with more than ordinary good taste.

HALA, or HALLA (formerly known as Murtazabad), a town of British India in Hyderabad district, Sind. Pop. (1901) 4985. It has long been famous for its glazed pottery and tiles, made from a fine clay obtained from the Indus, mixed with powdered flints. The town has also a manufacture of *susis* or striped trouser-cloths.

HALAESA, an ancient town on the north coast of Sicily, about 14 m. E. of Cephaloedium [Cefalu], to the east of the modern Castel di Tusa, founded in 403 B.C. by Archonides, tyrant of Herbita, whose name it sometimes bore: we find, *e.g. Halaisa Archonida* on a coin of the time of Augustus (*Corp. inscrip. Lat.* x., Berlin, 1883, p. 768). It was the first town to surrender to the Romans in the first Punic War, and was granted freedom and immunity from tithe. It became a place of some importance in Roman days, especially as a port, and entirely outstripped its mother city. Halaesa is the only place in Sicily where an inscription dedicated to a Roman governor of the republican period (perhaps in 93 B.C.) has come to light. (T. As.)

HALAKHA, or HALACHA (literally "rule of conduct"), the rabbinical development of the Mosaic law; with the haggada it makes up the Talmud and Midrash (*q.v.*). As the haggada is the poetic, so the halakha is the legal element of the Talmud (*q.v.*), and arose out of the faction between the Sadducees, who disputed the traditions, and the Pharisees, who strove to prove their derivation from scripture. Among the chief attempts to codify the halakha were the *Great Rules* (*Halakhoth Gedoloth*) of Simon Kayyara (9th century), based on the letters written by the Gaonim, the heads of the Babylonian schools, to Jewish inquirers in many lands, the work of Jacob Alfassi (1013–1103), the *Strong Hand of* Maimonides (1180), and the *Table Prepared* (*Shulhan Aruch*) of Joseph Qaro (1565), which from its practical scope and its clarity as a work of general reference became the universal handbook of Jewish life in many of its phases. (I. A.)

HALBERSTADT, a town of Germany, in the Prussian province of Saxony, 56 m. by rail N.W. of Halle, and 29 S.W. of Magdeburg. It lies in a fertile country to the north of the Harz Mountains, on the Holzemme, at the junction of railways to Halle, Goslar and Thale. Pop. (1905) 45,534. The town has a medieval appearance, many old houses decorated with beautiful wood-carving still surviving. The Gothic cathedral (now Protestant), dating from the 13th and 14th centuries, is remarkable for the majestic impression made by the great height of the interior, with its slender columns and lofty, narrow aisles. The treasure, preserved in the former chapter-house, is rich in reliquaries, vestments and other objects of medieval church art. The beautiful spires, which had become unsafe, were rebuilt in 1890–1895. Among the other churches the only one of special interest is the Liebfrauenkirche (Church of Our Lady).

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a basilica, with four towers, in the later Romanesque style, dating from the 12th and 13th centuries and restored in 1848, containing old mural frescoes and carved figures. Remarkable among the other old buildings are the town-hall, of the 14th century and restored in the 17th century, with a crypt, and the Petershof, formerly the episcopal palace, but now utilized as law courts and a prison. The principal educational establishment is the gymnasium, with a library of 40,000 volumes. Close to the cathedral lies the house of the poet Gleim (*q.v.*), since 1899 the property of the municipality and converted into a museum. It contains a collection of the portraits of the friends of the poet-scholar and some valuable manuscripts. The principal manufactures of the town are sugar, cigars, paper, gloves, chemical products, beer and machinery. About a mile and a half distant are the Spiegelsberge, from which a fine view of the surrounding country is obtained, and the Klusberge, with prehistoric cave-dwellings cut out in the sandstone rocks.

The history of Halberstadt begins with the transfer to it, by Bishop Hildegrim I., in 820 of the see founded by Charlemagne at Seligenstadt. At the end of the 10th century the bishops were granted by the emperors the right to exercise temporal jurisdiction over their see, which became one of the most considerable of the ecclesiastical principalities of the Empire. As such it survived the introduction of the Reformation in 1542; but in 1566, on the death of Sigismund of Brandenburg (also archbishop of Madgeburg from 1552 to 1566), the last Catholic bishop, the chapter from motives of economy elected the infant Henry Julius of Brunswick-Lüneburg. In 1589 he became duke of Brunswick, and two years later he abolished the Catholic rites in Halberstadt. The see was governed by lay bishops until 1648, when it was formally converted by the treaty of Westphalia into a secular principality for the elector of Brandenburg. By the treaty of Tilsit in 1807 it was annexed to the kingdom of Westphalia, but came again to Prussia on the downfall of Napoleon.

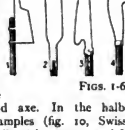
The town received a charter from Bishop Arnulf in 998. In 1113 it was burnt by the emperor Henry V., and in 1179 by Henry the Lion. During the Thirty Years' War it was occupied alternately by the Imperialists and the Swedes, the latter of whom handed it over to Brandenburg.

See Lucanus, *Der Dom zu Halberstadt* (1837), *Wegweiser durch Halberstadt* (2nd ed., 1866) and *Die Liebfrauenkirche zu Halberstadt* (1872); Schiefer, *Inschriften und Legenden halberstädtischer Bauten* (1864); Schmidt, *Urkundenbuch der Stadt Halberstadt* (Halle, 1878); and Zschiesche, *Halberstadt, sonst und jetzt* (1330).

HALBERT, HALBERD or HALBARD, a weapon consisting of an axe-blade balanced by a pick and having an elongated pike-head at the end of the staff, which was usually about 5 or 6 ft. in length. The utility of such a weapon in the wars of the later middle ages lay in this, that it gave the foot soldier the means of dealing with an armoured man on horseback. The pike could do no more than keep the horseman at a distance. This ensured security for the foot soldier but did not enable him to strike a mortal blow, for which firstly a long-handled and secondly a powerful weapon, capable of striking a heavy cleaving blow, was required. Several different forms of weapon responding to these requirements are described and illustrated below; it will be noticed that the thrusting pike is almost always combined with the cutting-bill hook or axe-head, so that the individual billman or halberdier should not be at a disadvantage if caught alone by a mounted opponent, or if his first descending blow missed its object. It will be noticed further that, concurrently with the disuse of complete armour and the development of firearms, the pike or thrusting element gradually displaces the axe or cleaving element in these weapons, till at last we arrive at the court halberts and partizans of the late 16th and early 17th centuries and the so-called "halbert" of the infantry officer and sergeant in the 18th, which can scarcely be classed even as partizans.

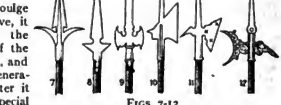
Figs. 1-6 represent types of these long cutting, cut and thrust weapons of the middle ages, details being omitted for the sake of clearness. The most primitive is the *voulge* (fig. 1), which is simply a heavy cleaver on a pole, with a point added. The next form, the *gisarme* or *guisarme* (fig. 2), appears in infinite variety but is always distinguished from voulges, &c. by the hook, which was used to pull down mounted men, and generally resembles the agricultural bill-hook of to-day. The *glaive* (fig. 3 is late German) is a broad, heavy, slightly curved sword-blade on a stave; it is often combined with the hooked gisarme as a *glaive-gisarme* (fig. 4, Burgundian, about 1480). A *gisarme-voulge* is shown in fig. 5 (Swiss, 14th century).

The weapon best known to Englishmen is the *bill*, which was originally a sort of scythe-blade, sharp on the concave side (whereas the glaive has the cutting edge on the convex side), but in its best-known form it should be called a bill-gisarme (fig. 6). The *partizans*, *ranseurs* and *halberts* proper developed naturally from the earlier types. The feature common to all, as has been said, is the combination of spear and axe. In the halberts the axe predominates, as the examples (fig. 10, Swiss, early 15th century; fig. 11, Swiss, middle 16th century; and fig. 12, German court halbert of the same period as fig. 11) show. In the *partizan* the pike is the more important, the axe-heads being reduced to little more than an ornamental feature. A south German specimen (fig. 9, 1615) shows how this was compensated by the broadening of the spear-head, the edges of which in such weapons were sharpened. Fig. 8, a service weapon of simple form, merely has projections on either side, and from this developed the *ranseur* (fig. 7), a partizan with a very long and narrow point, like the blade of a rapier, and with fork-like projections intended to act as "sword-breakers," instead of the atrophied axe-heads of the partizan proper.



FIGS. 1-6.

The halbert played almost as conspicuous a part in the military history of Middle Europe during the 15th and early 16th centuries as the pike. But, even in a form distinguishable from the voulge and the glaive, it dates from the early part of the 13th century, and for many generations thereafter it was the special weapon of the Swiss. Fauchet, in his *Origines des dignites*, printed in 1600, states that Louis XI. of France ordered certain new weapons of war called *hallebardes* to be made at Angers and other places in 1475. The Swiss had a mixed armament of pikes and halberts at the battle of Morat in 1476. In the 15th and 16th centuries the halberts became larger, and the blades were formed in many varieties of shape, often engraved, inlaid, or pierced in open work, and exquisitely finished as works of art. This weapon was in use in England from the reign of Henry VII. to the reign of George III., when it was still carried (though in shape it had certainly lost its original characteristics, and had become half partizan and half pike) by sergeants in the guards and other infantry regiments. It is still retained as the symbol of authority borne before the magistrates on public occasions in some of the burghs of Scotland. The Lochaber axe may be called a species of halbert furnished with a hook on the end of the staff at the back of the blade. The godendag (Fr. *godendart*) is the Flemish name of the halbert in its original form.



FIGS. 7-12.

The derivation of the word is as follows. The O. Fr. *hallebarde*, of which the English "halberd," "halbert," is an adaptation, was itself adapted from the M.H.G. *helmbarde*, mod. *Hellebarde*; the second part is the O.H.G. *barta* or *parta*, broad-axe, probably the same word as *Bart*, beard, and so called from its shape; the first part is either *helm*, handle, cf. "helm," tiller of a ship, the word meaning "hafted axe," or else *helm*, helmet, an axe for smiting the helmet. A common derivation was to take the word as representing a Ger. *halb-barde*, half-axe; the early German form shows this to be an erroneous guess.

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HALDANE, JAMES ALEXANDER (1768–1851), Scottish divine, the younger son of Captain James Haldane of Airthrey House, Stirlingshire, was born at Dundee on the 14th of July 1768. Educated first at Dundee and afterwards at the high school and university of Edinburgh, at the age of seventeen he joined the "Duke of Montrose" East Indiaman as a midshipman. After four voyages to India he was nominated to the command of the "Melville Castle" in the summer of 1793; but having during a long and unexpected detention of his ship begun a careful study of the Bible, and also come under the evangelical influence of David Bogue of Gosport, one of the founders of the London Missionary Society, he abruptly resolved to quit the naval profession for a religious life, and returned to Scotland before his ship had sailed. About the year 1796 he became acquainted with the celebrated evangelical divine, Charles Simeon of Cambridge, in whose society he made several tours through Scotland, endeavouring by tract-distribution and other means to awaken others to some of that interest in religious subjects which he himself so strongly felt. In May 1797 he preached his first sermon, at Gilmerton near Edinburgh, with encouraging success. In the same year he established a non-sectarian organization for tract distribution and lay preaching called the "Society for the Propagation of the Gospel at Home." During the next few years he made repeated missionary journeys, preaching wherever he could obtain hearers, and generally in the open air. Not originally disloyal to the Church of Scotland, he was gradually driven by the hostility of the Assembly and the exigencies of his position into separation. In 1799 he was ordained as pastor of a large Independent congregation in Edinburgh. This was the first congregational church known by that name in Scotland. In 1801 a permanent building replaced the circus in which the congregation had at first met. To this church he continued to minister gratuitously for more than fifty years. In 1808 he made public avowal of his conversion to Baptist views. As advancing years compelled him to withdraw from the more exhausting labours of itineracy and open-air preaching, he sought more and more to influence the discussion of current religious and theological questions by means of the press. He died on the 8th of February 1851.

His son, DANIEL RUTHERFORD HALDANE (1824–1887), by his second wife, a daughter of Professor Daniel Rutherford, was a prominent Scottish physician, who became president of the Edinburgh College of Physicians.

Among J. A. Haldane's numerous contributions to current theological discussions were: *The Duty of Christian Forbearance in Regard to Points of Church Order*; *Strictures on a Publication upon Primitive Christianity by Mr John Walker* (1819); *Refutation of Edward Irving's Heretical Doctrines respecting the Person and Atonement of Jesus Christ*. His *Observations on Universal Pardon*, &c., was a contribution to the controversy regarding the views of Thomas Erskine of Linlathen and Campbell of Row; *Man's Responsibility* (1842) is a reply to Howard Hinton on the nature and extent of the Atonement. He also published: *Journal of a Tour in the North*; *Early Instruction Commended* (1801); *Views of the Social Worship of the First Churches* (1805); *The Doctrine and Duty of Self-Examination* (1806); *The Doctrine of the Atonement* (1845); *Exposition of the Epistle to the Galatians* (1848).

HALDANE, RICHARD BURDON (1856–), British statesman and philosopher, was the third son of Robert Haldane of Cloanden, Perthshire, a writer to the signet, and nephew of J. S. Burdon-Sanderson. He was a grand-nephew of the Scottish divines J. A. and Robert Haldane. He was educated at Edinburgh Academy and the universities of Edinburgh and Göttingen, where he studied philosophy under Lotze. He took first-class honours in philosophy at Edinburgh, and was Gray scholar and Ferguson scholar in philosophy of the four Scottish Universities (1876). He was called to the bar in 1879, and so early as 1890 became a queen's counsel. In 1885 he entered parliament as liberal member for Haddingtonshire, for which he was re-elected continuously up to and including 1910. He was included in 1905 in Sir H. Campbell-Bannerman's cabinet as secretary for war, and was the author of the important scheme for the reorganization of the British army, by which the militia and the volunteer forces were replaced by a single territorial force. Though always known as one of the ablest men of the Liberal party and conspicuous during the Boer War of 1899–1902 as a Liberal Imperialist, the choice of Mr Haldane for the task of thinking out a new army organization on business lines had struck many people as curious. Besides being a chancery lawyer, he was more particularly a philosopher, conspicuous for his knowledge of Hegelian metaphysics. But with German philosophy he had also the German sense of thoroughness and system, and his scheme, while it was much criticized, was recognized as the best that could be done with a voluntary army. Mr Haldane's chief literary publications were: *Life of Adam Smith* (1887); *Education and Empire* (1902); *The Pathway to Reality* (1903). He also translated, jointly with J. Kemp, Schopenhauer's *Die Welt als Wille und Vorstellung* (*The World as Will and Idea*, 3 vols., 1883–1886).

HALDANE, ROBERT (1764–1842), Scottish divine, elder brother of J. A. Haldane (*q.v.*), was born in London on the 28th of February 1764. After attending classes in the Dundee grammar school and in the high school and university of Edinburgh in 1780, he joined H.M.S. "Monarch," of which his uncle Lord Duncan was at that time in command, and in the following year was transferred to the "Foudroyant," on board of which, during the night engagement with the "Pegase," he greatly distinguished himself. Haldane was afterwards present at the relief of Gibraltar, but at the peace of 1783 he finally left the navy, and soon afterwards settled on his estate of Airthrey, near Stirling. He put himself under the tuition of David Bogue of Gosport and carried away deep impressions from his academy. The earlier phases of the French Revolution excited his deepest sympathy, a sympathy which induced him to avow his strong disapproval of the war with France. As his over-sanguine visions of a new order of things to be ushered in by political change disappeared, he began to direct his thoughts to religious subjects. Resolving to devote himself and his means wholly to the advancement of Christianity, his first proposal for that end, made in 1796, was to organize a vast mission to Bengal, of which he was to provide the entire expense; with this view the greater part of his estate was sold, but the East India Company refused to sanction the scheme, which therefore had to be abandoned. In December 1797 he joined his brother and some others in the formation of the "Society for the Propagation of the Gospel at Home," in building chapels or "tabernacles" for congregations, in supporting missionaries, and in maintaining institutions for the education of young men to carry on the work of evangelization. He is said to have spent more than £70,000 in the course of the following twelve years (1798–1810). He also initiated a plan for evangelizing Africa by bringing over native children to be trained as Christian teachers to their own countrymen. In 1816 he visited the continent, and first at Geneva and afterwards in Montauban (1817) he lectured and interviewed large numbers of theological students with remarkable effect; among them were Malan, Monod and Merle d'Aubigné. Returning to Scotland in 1819, he lived partly on his estate of Auchengray and partly in Edinburgh, and like his brother took an active part, chiefly through the press, in many of the religious controversies of the time. He died on the 12th of December 1842.

In 1816 he published a work on the *Evidences and Authority of Divine Revelation*, and in 1819 the substance of his theological prelections in a *Commentaire sur l'Épître aux Romains*. Among his later writings, besides numerous pamphlets on what was known as "the Apocrypha controversy," are a treatise *On the Inspiration of Scripture* (1828), which has passed through many editions, and a later *Exposition of the Epistle to the Romans* (1835), which has been frequently reprinted, and has been translated into French and German.

See *Memoirs of R. and J. A. Haldane*, by Alexander Haldane (1852).

HALDEMAN, SAMUEL STEHMAN (1812–1880), American naturalist and philologist, was born on the 12th of August 1812 at Locust Grove, Pa. He was educated at Dickinson College, and in 1851 was appointed professor of the natural sciences in the university of Pennsylvania. In 1855 he went to Delaware College, where he filled the same position, but in 1869 he returned to the university of Pennsylvania as professor of

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comparative philology and remained there till his death, which occurred at Chickies, Pa., on the 10th of September 1880. His writings include *Freshwater Univalve Mollusca of the United States* (1840); *Zoological Contributions* (1842–1843); *Analytic Orthography* (1860); *Tours of a Chess Knight* (1864); *Pennsylvania Dutch, a Dialect of South German with an Infusion of English* (1872); *Outlines of Etymology* (1877); and *Word-Building* (1881).

HALDIMAND, SIR FREDERICK (1718–1791), British general and administrator, was born at Yverdun, Neuchâtel, Switzerland, on the 11th of August 1718, of Huguenot descent. After serving in the armies of Sardinia, Russia and Holland, he entered British service in 1754, and subsequently naturalized as an English citizen. During the Seven Years' War he served in America, was wounded at Ticonderoga (1758) and was present at the taking of Montreal (1760). After filling with credit several administrative positions in Canada, Florida and New York, in 1778 he succeeded Sir Guy Carleton (afterwards Lord Dorchester) as governor-general of Canada. His measures against French sympathizers with the Americans have incurred extravagant strictures from French-Canadian historians, but he really showed moderation as well as energy. In 1785 he returned to London. He died at his birthplace on the 5th of June 1791.

His life has been well written by Jean McIlwraith in the "Makers of Canada" series (Toronto, 1904). His Correspondence and Diary fill 262 volumes in the Canadian Archives, and are catalogued in the Annual Reports (1884–1889).

HALE, EDWARD EVERETT (1822–1909), American author, was born in Boston on the 3rd of April 1822, son of Nathan Hale (1784–1863), proprietor and editor of the Boston *Daily Advertiser*, nephew of Edward Everett, the orator and statesman, and grandnephew of Nathan Hale, the martyr spy. He graduated from Harvard in 1839; was pastor of the church of the Unity, Worcester, Massachusetts, in 1846–1856, and of the South Congregational (Unitarian) church, Boston, in 1856–1899; and in 1903 became chaplain of the United States Senate. He died at Roxbury (Boston), Massachusetts, on the 10th of June 1909. His forceful personality, organizing genius, and liberal practical theology, together with his deep interest in the anti-slavery movement (especially in Kansas), popular education (especially Chautauqua work), and the working-man's home, were active in raising the tone of American life for half a century. He was a constant and voluminous contributor to the newspapers and magazines. He was an assistant editor of the Boston *Daily Advertiser*, and edited the *Christian Examiner, Old and New* (which he assisted in founding in 1869; in 1875 it was merged in *Scribner's Magazine*), *Lend a Hand* (founded by him in 1886 and merged in the *Charities Review* in 1897), and the *Lend a Hand Record*; and he was the author or editor of more than sixty books—fiction, travel, sermons, biography and history.

He first came into notice as a writer in 1850, when he contributed the short story "My Double and How He Undid Me" to the *Atlantic Monthly*. He soon published in the same periodical other stories, the best known of which was "The Man Without a Country" (1863), which did much to strengthen the Union cause in the North, and in which, as in some of his other non-romantic tales, he employed a minute realism which has led his readers to suppose the narrative a record of fact. The two stories mentioned, and such others as "The Rag-Man and the Rag-Woman" and "The Skeleton in the Closet," gave him a prominent position among the short-story writers of America. The story *Ten Times One is Ten* (1870), with its hero Harry Wadsworth, and its motto, first enunciated in 1869 in his Lowell Institute lectures, "Look up and not down, look forward and not back, look out and not in, and lend a hand," led to the formation among young people of "Lend-a-Hand Clubs," "Look up Legions" and "Harry Wadsworth Clubs." Out of the romantic Waldensian story *In His Name* (1873) there similarly grew several other organizations for religious work, such as "King's Daughters," and "King's Sons."

Among his other books are *Kansas and Nebraska* (1854); *The Ingham Papers* (1869); *His Level Best, and Other Stories* (1870); *Sybaris and Other Homes* (1871); *Philip Nolan's Friends* (1876), his best-known novel, and a sequel to *The Man Without a Country*; *The Kingdom of God* (1880); *Christmas at Narragansett* (1883); *East and West*, a novel (1892); *For Fifty Years*, poems, 1893; *Ralph Waldo Emerson* (1899); *We, the People* (1903); *Prayers Offered in the Senate of the United States* (1904), and *Tarry-at-Home Travels* (1906). He edited Lingard's *History of England* (1853), and contributed to Winsor's *Memorial History of Boston* (1880–1881), and to his *Narrative and Critical History of America* (1886–1889). With his son, Edward Everett Hale, Jr., he published *Franklin in France* (2 vols., 1887–1888), based largely on original research. The most charming books of his later years were *A New England Boyhood* (1893), *James Russell Lowell and His Friends* (1899), and *Memories of a Hundred Years* (1902)

A uniform and revised edition of his principal writings, in ten volumes, appeared in 1899–1901.

HALE, HORATIO (1817–1896), American ethnologist, was born in Newport, New Hampshire, on the 3rd of May 1817. He was the son of David Hale, a lawyer, and of Sarah Josepha Hale (1790–1879), a popular poet, who, besides editing *Godey's Lady's Magazine* for many years and publishing some ephemeral books, is supposed to have written the verses "Mary had a little lamb," and to have been the first to suggest the national observance of Thanksgiving Day. The son graduated in 1837 at Harvard, and during 1838–1842 was philologist to the United States Exploring Expedition, which under Captain Charles Wilkes sailed around the world. Of the reports of that expedition Hale prepared the sixth volume, *Ethnography and Philology* (1846), which is said to have "laid the foundations of the ethnography of Polynesia." He was admitted to the Chicago bar in 1855, and in the following year removed to Clinton, Ontario, Canada, where he practised his profession, and where on the 28th of December 1896 he died. He made many valuable contributions to the science of ethnology, attracting attention particularly by his theory of the origin of the diversities of human languages and dialects—a theory suggested by his study of "child-languages," or the languages invented by little children. He also emphasized the importance of languages as tests of mental capacity and as "criteria for the classification of human groups." He was, moreover, the first to discover that the Tutelos of Virginia belonged to the Siouan family, and to identify the Cherokee as a member of the Iroquoian family of speech. Besides writing numerous magazine articles, he read a number of valuable papers before learned societies. These include: *Indian Migrations as Evidenced by Language* (1882); *The Origin of Languages and the Antiquity of Speaking Man* (1886); *The Development of Language* (1888); and *Language as a Test of Mental Capacity: Being an Attempt to Demonstrate the True Basis of Anthropology* (1891). He also edited for Brinton's "Library of Aboriginal Literature," the *Iroquois Book of Rites* (1883).

HALE, JOHN PARKER (1806–1873), American statesman, was born at Rochester, New Hampshire, on the 31st of March 1806. He graduated at Bowdoin College in 1827, was admitted to the New Hampshire bar in 1830, was a member of the state House of Representatives in 1832, and from 1834 to 1841 was United States district attorney for New Hampshire. In 1843–1845 he was a Democratic member of the national House of Representatives, and, though his earnest co-operation with John Quincy Adams in securing the repeal of the "gag rule" directed against the presentation to Congress of anti-slavery petitions estranged him from the leaders of his party, he was renominated without opposition. In January 1845, however, he refused in a public statement to obey a resolution (28th of December 1844) of the state legislature directing him and his New Hampshire associates in Congress to support the cause of the annexation of Texas, a Democratic measure which Hale regarded as being distinctively in the interest of slavery. The Democratic State convention was at once reassembled, Hale was denounced, and his nomination withdrawn. In the election which followed Hale ran independently, and, although the Democratic candidates were elected in the other three congressional districts of the state, his vote was large enough to prevent any choice (for which a majority was necessary) in his own. Hale then set out in the face of apparently hopeless odds to win over his state to the anti-slavery cause. The remarkable canvass which he conducted

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is known in the history of New Hampshire as the "Hale Storm of 1845." The election resulted in the choice of a legislature controlled by the Whigs and the independent Democrats, he himself being chosen as a member of the state House of Representatives, of which in 1846 he was speaker. He is remembered, however, chiefly for his long service in the United States Senate, of which he was a member from 1847 to 1853 and again from 1855 to 1865. At first he was the only out-and-out anti-slavery senator,—he alone prevented the vote of thanks to General Taylor and General Scott for their Mexican war victories from being made unanimous in the Senate (February 1848)—but in 1849 Salmon P. Chase and William H. Seward, and in 1851 Charles Sumner joined him, and the anti-slavery cause became for the first time a force to be reckoned with in that body. In October 1847 he had been nominated for president by the Liberty party, but he withdrew in favour of Martin Van Buren, the Free Soil candidate, in 1848. In 1851 he was senior counsel for the rescuers of the slave Shadrach in Boston. In 1852 he was the Free Soil candidate for the presidency, but received only 156,149 votes. In 1850 he secured the abolition of flogging in the U.S. navy, and through his efforts in 1862 the spirit ration in the navy was abolished. He was one of the organizers of the Republican party, and during the Civil War was an eloquent supporter of the Union and chairman of the Senate naval committee. From 1865 to 1869 he was United States minister to Spain. He died at Dover, New Hampshire, on the 19th of December 1873. A statue of Hale, presented by his son-in-law William Eaton Chandler (b. 1835), U.S. senator from New Hampshire in 1887–1901, was erected in front of the Capitol in Concord, New Hampshire, in 1892.

HALE, SIR MATTHEW (1609–1676), lord chief justice of England, was born on the 1st of November 1609 at Alderley in Gloucestershire, where his father, a retired barrister, had a small estate. His paternal grandfather was a rich clothier of Wotton-under-Edge; on his mother's side he was connected with the noble family of the Poyntzes of Acton. Left an orphan when five years old, he was placed by his guardian under the care of the Puritan vicar of Wotton-under-Edge, with whom he remained till he attained his sixteenth year, when he entered Magdalen Hall, Oxford. At Oxford, Hale studied for several terms with a view to holy orders, but suddenly there came a change. The diligent student, at first attracted by a company of strolling players, threw aside his studies, and plunged carelessly into gay society. He soon decided to change his profession; and resolved to trail a pike as a soldier under the prince of Orange in the Low Countries. Before going abroad, however, Hale found himself obliged to proceed to London in order to give instructions for his defence in a legal action which threatened to deprive him of his patrimony. His leading counsel was the celebrated Serjeant Glanville (1586–1661), who, perceiving in the acuteness and sagacity of his youthful client a peculiar fitness for the legal profession, succeeded, with much difficulty, in inducing him to renounce his military for a legal career, and on the 8th of November 1629 Hale became a member of the honourable society of Lincoln's Inn.

He immediately resumed his habits of intense application. The rules which he laid down for himself, and which are still extant in his handwriting, prescribe sixteen hours a day of close application, and prove, not only the great mental power, but also the extraordinary physical strength he must have possessed, and for which indeed, during his residence at the university, he had been remarkable. During the period allotted to his preliminary studies, he read over and over again all the year-books, reports, and law treatises in print, and at the Tower of London and other antiquarian repositories examined and carefully studied the records from the foundation of the English monarchy down to his own time. But Hale did not confine himself to law. He dedicated no small portion of his time to the study of pure mathematics, to investigations in physics and chemistry, and even to anatomy and architecture; and there can be no doubt that this varied learning enhanced considerably the value of many of his judicial decisions.

Hale was called to the bar in 1637, and almost at once found himself in full practice. Though neither a fluent speaker nor bold pleader, in a very few years he was at the head of his profession. He entered public life at perhaps the most critical period of English history. Two parties were contending in the state, and their obstinacy could not fail to produce a most direful collision. But amidst the confusion Hale steered a middle course, rising in reputation, and an object of solicitation from both parties. Taking Pomponius Atticus as his political model, he was persuaded that a man, a lawyer and a judge could best serve his country and benefit his countrymen by holding aloof from partisanship and its violent prejudices, which are so apt to distort and confuse the judgment. But he is best vindicated from the charges of selfishness and cowardice by the thoughts and meditations contained in his private diaries and papers, where the purity and honour of his motives are clearly seen. It has been said, but without certainty, that Hale was engaged as counsel for the earl of Strafford; he certainly acted for Archbishop Laud, Lord Maguire, Christopher Love, the duke of Hamilton and others. It is also said that he was ready to plead on the side of Charles I. had that monarch submitted to the court. The parliament having gained the ascendancy, Hale signed the Solemn League and Covenant, and was a member of the famous assembly of divines at Westminster in 1644; but although he would undoubtedly have preferred a Presbyterian form of church government, he had no serious objection to the system of modified Episcopacy proposed by Usher. Consistently with his desire to remain neutral, Hale took the engagement to the Commonwealth as he had done to the king, and in 1653, already serjeant, he became a judge in the court of common pleas. Two years afterwards he sat in Cromwell's parliament as one of the members for Gloucestershire. After the death of the protector, however, he declined to act as a judge under Richard Cromwell, although he represented Oxford in Richard's parliament. At the Restoration in 1660 Hale was very graciously received by Charles II., and in the same year was appointed chief baron of the exchequer, and accepted, with extreme reluctance, the honour of knighthood. After holding the office of chief baron for eleven years he was raised to the higher dignity of lord chief justice, which he held till February 1676, when his failing health compelled him to resign. He retired to his native Alderley, where he died on the 25th of December of the same year. He was twice married and survived all his ten children save two.

As a judge Sir Matthew Hale discharged his duties with resolute independence and careful diligence. His sincere piety made him the intimate friend of Isaac Barrow, Archbishop Tillotson, Bishop Wilkins and Bishop Stillingfleet, as well as of the Nonconformist leader, Richard Baxter. He is chargeable, however, with the condemnation and execution of two poor women tried before him for witchcraft in 1664, a kind of judicial murder then falling under disuse. He is also reproached with having hastened the execution of a soldier for whom he had reason to believe a pardon was preparing.

Of Hale's legal works the only two of importance are his *Historia placitorum coronae*, or *History of the Pleas of the Crown* (1736); and the *History of the Common Law of England, with an Analysis of the Law*, &c. (1713). Among his numerous religious writings the *Contemplations, Moral and Divine*, occupy the first place. Others are *The Primitive Origination of Man* (1677); *Of the Nature of True Religion*, &c. (1684); *A Brief Abstract of the Christian Religion* (1688). One of his most popular works is the collection of *Letters of Advice to his Children and Grandchildren*. He also wrote an *Essay touching the Gravitation or Nongravitation of Fluid Bodies* (1673); *Difficiles Nugae, or Observations touching the Torricellian Experiment*, &c. (1675); and a translation of the *Life of Pomponius Atticus*, by Cornelius Nepos (1677). His efforts in poetry were inauspicious. He left his valuable collection of MSS. and records to the library of Lincoln's Inn. His life has been written by G. Burnet (1682); by J. B. Williams (1835); by H. Roscoe, in his *Lives of Eminent Lawyers*, in 1838; by Lord Campbell, in his *Lives of the Chief Justices*, in 1849; and by E. Foss in his *Lives of the Judges* (1848–1870).

HALE, NATHAN (1756–1776), American hero of the War of Independence, was born at Coventry, Conn., and educated

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at Yale, then becoming a school teacher. He joined a Connecticut regiment after the breaking out of the war, and served in the siege of Boston, being commissioned a captain at the opening of 1776. When Heath's brigade departed for New York he went with them, and the tradition is that he was one of a small and daring band who captured an English provision sloop from under the very guns of a man-of-war. But on the 21st of September, having volunteered to enter the British lines to obtain information concerning the enemy, he was captured in his disguise of a Dutch school-teacher and on the 22nd was hanged. The penalty was in accordance with military law, but young Hale's act was a brave one, and he has always been glorified as a martyr. Tradition attributes to him the saying that he only regretted that he had but one life to lose for his country; and it is said that his request for a Bible and the services of a minister was refused by his captors. There is a fine statue of Hale by Macmonnies in New York.

See H. P. Johnston, *Nathan Hale* (1901).

HALE, WILLIAM GARDNER (1849–), American classical scholar, was born on the 9th of February 1849 in Savannah, Georgia. He graduated at Harvard University in 1870, and took a post-graduate course in philosophy there in 1874–1876; studied classical philology at Leipzig and Göttingen in 1876–1877; was tutor in Latin at Harvard from 1877 to 1880, and professor of Latin in Cornell University from 1880 to 1892, when he became professor of Latin and head of the Latin department of the University of Chicago. From 1894 to 1899 he was chairman and in 1895–1896 first director of the American School of Classical Studies at Rome. He is best known as an original teacher on questions of syntax. In *The Cum-Constructions: Their History and Functions*, which appeared in *Cornell University Studies in Classical Philology* (1888–1889; and in German version by Neizert in 1891), he attacked Hoffmann's distinction between absolute and relative temporal clauses as published in *Lateinische Zeitpartikeln* (1874); Hoffmann replied in 1891, and the best summary of the controversy is in Wetzel's *Der Streit zwischen Hoffmann und Hale* (1892). Hale wrote also *The Sequence of Tenses in Latin* (1887–1888), *The Anticipatory Subjunctive in Greek and Latin* (1894), and a *Latin Grammar* (1903), to which the parts on sounds, inflection and word-formation were contributed by Carl Darling Buck.

HALEBID, a village in Mysore state, southern India; pop. (1901), 1524. The name means "old capital," being the site of Dorasamudra, the capital of the Hoysala dynasty founded early in the 11th century. In 1310 and again in 1326 it was taken and plundered by the first Mahommedan invader of southern India. Two temples, still standing, though never completed and greatly ruined, are regarded as the finest examples of the elaborately carved Chalukyan style of architecture.

HALES, or HAYLES, **JOHN** (d. 1571), English writer and politician, was a son of Thomas Hales of Hales Place, Halden, Kent. He wrote his *Highway to Nobility* about 1543, and was the founder of a free school at Coventry for which he wrote *Introductiones ad grammaticam*. In political life Hales, who was member of parliament for Preston, was specially concerned with opposing the enclosure of land, being the most active of the commissioners appointed in 1548 to redress this evil; but he failed to carry several remedial measures through parliament. When the protector, the duke of Somerset, was deprived of his authority in 1550, Hales left England and lived for some time at Strassburg and Frankfort, returning to his own country on the accession of Elizabeth. However he soon lost the royal favour by writing a pamphlet, *A Declaration of the Succession of the Crowne Imperiall of Englande*, which declared that the recent marriage between Lady Catherine Grey and Edward Seymour, earl of Hertford, was legitimate, and asserted that, failing direct heirs to Elizabeth, the English crown should come to Lady Catherine as the descendant of Mary, daughter of Henry VII. The author was imprisoned, but was quickly released, and died on the 28th of December 1571. The *Discourse of the Common Weal*, described as "one of the most informing documents of the age," and written about 1549, has been attributed to Hales. This has been edited by E. Lamond (Cambridge, 1893).

Hales is often confused with another John Hales, who was clerk of the hanaper under Henry VIII. and his three immediate successors.

HALES, JOHN (1584–1656), English scholar, frequently referred to as "the ever memorable," was born at Bath on the 19th of April 1584, and was educated at Corpus Christi College, Oxford. He was elected a fellow of Merton in 1605, and in 1612 he was appointed public lecturer on Greek. In 1613 he was made a fellow of Eton. Five years later he went to Holland, as chaplain to the English ambassador, Sir Dudley Carleton, who despatched him to Dort to report upon the proceedings of the synod then sitting. In 1619 he returned to Eton and spent his time among his books and in the company of literary men, among whom he was highly reputed for his common sense, his erudition and his genial charity. Andrew Marvell called him "one of the clearest heads and best-prepared breasts in Christendom." His eirenical tract entitled *Schism and Schismaticks* (1636) fell into the hands of Archbishop Laud, and Hales, hearing that he had disapproved of it, is said to have written to the prelate a vindication of his position. This led to a meeting, and in 1639 Hales was made one of Laud's chaplains and also a canon of Windsor. In 1642 he was deprived of his canonry by the parliamentary committee, and two years later was obliged to hide in Eton with the college documents and keys. In 1649 he refused to take the "Engagement" and was ejected from his fellowship. He then retired to Buckinghamshire, where he found a home with Mrs Salter, the sister of the bishop of Salisbury (Brian Duppa), and acted as tutor to her son. The issue of the order against harbouring malignants led him to return to Eton. Here, having sold his valuable library at great sacrifice, he lived in poverty until his death on the 19th of May 1656.

His collected works (3 vols.) were edited by Lord Hailes, and published in 1765.

HALES, STEPHEN (1677–1761), English physiologist, chemist and inventor, was born at Bekesbourne in Kent on the 7th or 17th of September 1677, the fifth (or sixth) son of Thomas Hales, whose father, Sir Robert Hales, was created a baronet by Charles II. in 1670. In June 1696 he was entered as a pensioner of Benet (now Corpus Christi) College, Cambridge, with the view of taking holy orders, and in February 1703 was admitted to a fellowship. He received the degree of master of arts in 1703 and of bachelor of divinity in 1711. One of his most intimate friends was William Stukeley (1687–1765) with whom he studied anatomy, chemistry, &c. In 1708–1709 Hales was presented to the perpetual curacy of Teddington in Middlesex, where he remained all his life, notwithstanding that he was subsequently appointed rector of Porlock in Somerset, and later of Faringdon in Hampshire. In 1717 he was elected fellow of the Royal Society, which awarded him the Copley medal in 1739. In 1732 he was named one of a committee for establishing a colony in Georgia, and the next year he received the degree of doctor of divinity from Oxford. He was appointed almoner to the princess-dowager of Wales in 1750. On the death of Sir Hans Sloane in 1753, Hales was chosen foreign associate of the French Academy of Sciences. He died at Teddington on the 4th of January 1761.

Hales is best known for his *Statical Essays*. The first volume, *Vegetable Staticks* (1727), contains an account of numerous experiments in plant-physiology—the loss of water in plants by evaporation, the rate of growth of shoots and leaves, variations in root-force at different times of the day, &c. Considering it very probable that plants draw "through their leaves some part of their nourishment from the air," he undertook experiments to show in "how great a proportion air is wrought into the composition of animal, vegetable and mineral substances"; though this "analysis of the air" did not lead him to any very clear ideas about the composition of the atmosphere, in the course of his inquiries he collected gases over water in vessels separate from those in which they were generated, and thus used what was to all intents and purposes a "pneumatic trough." The second volume (1733) on *Haemostaticks*, containing experiments

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on the "force of the blood" in various animals, its rate of flow, the capacity of the different vessels, &c., entitles him to be regarded as one of the originators of experimental physiology. But he did not confine his attention to abstract inquiries. The quest of a solvent for calculus in the bladder and kidneys was pursued by him as by others at the period, and he devised a form of forceps which, on the testimony of John Ranby (1703–1773), sergeant-surgeon to George II., extracted stones with "great ease and readiness." His observations of the evil effect of vitiated air caused him to devise a "ventilator" (a modified organ-bellows) by which fresh air could be conveyed into gaols, hospitals, ships'-holds, &c.; this apparatus was successful in reducing the mortality in the Savoy prison, and it was introduced into France by the aid of H. L. Duhamel du Monceau. Among other things Hales invented a "sea-gauge" for sounding, and processes for distilling fresh from sea water, for preserving corn from weevils by fumigation with brimstone, and for salting animals whole by passing brine into their arteries. His *Admonition to the Drinkers of Gin, Brandy, &c.*, published anonymously in 1734, has been several times reprinted.

HALESOWEN, a market town in the Oldbury parliamentary division of Worcestershire, England, on a branch line of the Great Western and Midland railways, 6¾ m. W.S.W. of Birmingham. Pop. (1901), 4057. It lies in a pleasant country among the eastern foothills of the Lickey Hills. There are extensive iron and steel manufactures. The church of SS Mary and John the Baptist has rude Norman portions; and the poet William Shenstone, buried in 1763 in the churchyard, has a memorial in the church. His delight in landscape gardening is exemplified in the neighbouring estate of the Leasowes, which was his property. There is a grammar school founded in 1652, and in the neighbourhood is the Methodist foundation of Bourne College (1883). Close to the town, on the river Stour, which rises in the vicinity, are slight ruins of a Premonstratensian abbey of Early English date. Within the parish and 2 m. N.W. of Halesowen is Cradley, with iron and steel works, fire-clay works and a large nail and chain industry.

HALEVI, JUDAH BEN SAMUEL (*c.* 1085–*c.* 1140), the greatest Hebrew poet of the middle ages, was born in Toledo *c.* 1085, and died in Palestine after 1140. In his youth he wrote Hebrew love poems of exquisite fancy, and several of his Wedding Odes are included in the liturgy of the Synagogue. The mystical connexion between marital affection and the love of God had, in the view of older exegesis, already expressed itself in the scriptural *Song of Songs* and Judah Halevi used this book as his model. In this aspect of his work he found inspiration also in Arabic predecessors. The second period of his literary career was devoted to more serious pursuits. He wrote a philosophical dialogue in five books, called the *Cusari*, which has been translated into English by Hirschfeld. This book bases itself on the historical fact that the Crimean Kingdom of the Khazars adopted Judaism, and the Hebrew poet-philosopher describes what he conceives to be the steps by which the Khazar king satisfied himself as to the claims of Judaism. Like many other medieval Jewish authors, Judah Halevi was a physician. His real fame depends on his liturgical hymns, which are the finest written in Hebrew since the Psalter, and are extensively used in the Septardic rite. A striking feature of his thought was his devotion to Jerusalem. To the love of the Holy City he devoted his noblest genius, and he wrote some memorable Odes to Zion, which have been commemorated by Heine, and doubly appreciated recently under the impulse of Zionism (*q.v.*). He started for Jerusalem, was in Damascus in 1140, and soon afterwards died. Legend has it that he was slain by an Arab horseman just as he arrived within sight of what Heine called his "Woebegone poor darling, Desolation's very image,—Jerusalem."

Excellent English renderings of some of Judah Halevi's poems may be read in Mrs H. Lucas's *The Jewish Year*, and Mrs R. N. Solomon's *Songs of Exile*. (I. A.)

HALÉVY, JACQUES FRANÇOIS FROMENTAL ÉLIE (1799–1862), French composer, was born on the 27th of May 1799, at Paris, of a Jewish family. He studied at the Paris Conservatoire under Berton and Cherubini, and in 1819 gained the grand prix de Rome with his cantata *Herminie*. In accordance with the conditions of his scholarship he started for Rome, where he devoted himself to the study of Italian music, and wrote an opera and various minor works. In 1827 his opera *L'Artisan* was performed at the Théâtre Feydeau in Paris, apparently without much success. Other works of minor importance, and now forgotten, followed, amongst which *Manon Lescaut*, a ballet, produced in 1830, deserves mention. In 1834 the Opéra-Comique produced *Ludovic*, the score of which had been begun by Hérold and had been completed by Halévy. In 1835 Halévy composed the tragic opera *La Juive* and the comic opera *L'Éclair*, and on these works his fame is mainly founded. The famous air of Eléazar and the anathema of the cardinal in *La Juive* soon became popular all over France. *L'Éclair* is a curiosity of musical literature. It is written for two tenors and two soprani, without a chorus, and displays the composer's mastery over the most refined effects of instrumentation and vocalization in a favourable light. After these two works he wrote numerous operas of various *genres*, amongst which only *La Reine de Chypre*, a spectacular piece analyzed by Wagner in one of his Paris letters (1841), and *La Tempesta*, in three acts, written for Her Majesty's theatre, London (1850), need be mentioned. In addition to his productive work Halévy also rendered valuable services as a teacher. He was professor at the Conservatoire from 1827 till his death—some of the most successful amongst the younger composers in France, such as Gounod, Victor Massé and Georges Bizet, the author of *Carmen*, being amongst his pupils. He was *maestro al cembalo* at the Théâtre Italien from 1827 to 1829; then director of singing at the Opera House in Paris until 1845, and in 1836 he succeeded Reicha at the Institut de France. Halévy also tried his hand at literature. In 1857 he became permanent secretary to the Académie des Beaux Arts, and there exists an agreeable volume of *Souvenirs et portraits* from his pen. He died at Nice, on the 17th of March 1862.

HALÉVY, LUDOVIC (1834–1908), French author, was born in Paris on the 1st of January 1834. His father, Léon Halévy (1802–1883), was a clever and versatile writer, who tried almost every branch of literature—prose and verse, vaudeville, drama, history—without, however, achieving decisive success in any. His uncle, J. F. Fromental E. Halévy (*q.v.*), was for many years associated with the opéra; hence the double and early connexion of Ludovic Halévy with the Parisian stage. At the age of six he might have been seen playing in that *Foyer de la danse* with which he was to make his readers so familiar, and, when a boy of twelve, he would often, of a Sunday night, on his way back to the College Louis le Grand, look in at the Odéon, where he had free admittance, and see the first act of the new play. At eighteen he joined the ranks of the French administration and occupied various posts, the last being that of secrétaire-rédacteur to the Corps Législatif. In that capacity he enjoyed the special favour and friendship of the famous duke of Morny, then president of that assembly. In 1865 Ludovic Halévy's increasing popularity as an author enabled him to retire from the public service. Ten years earlier he had become acquainted with the musician Offenbach, who was about to start a small theatre of his own in the Champs Élysées, and he wrote a sort of prologue, *Entrez, messieurs, mesdames*, for the opening night. Other little productions followed, *Ba-ta-clan* being the most noticeable among them. They were produced under the pseudonym of Jules Servières. The name of Ludovic Halévy appeared for the first time on the bills on the 1st of January 1856. Soon afterwards the unprecedented run of *Orphée aux enfers*, a musical parody, written in collaboration with Hector Crémieux, made his name famous. In the spring of 1860 he was commissioned to write a play for the manager of the Variétés in conjunction with another vaudevillist, Lambert Thibout. The latter having abruptly retired from the collaboration, Halévy was at a loss how to carry out the contract, when on the steps of the theatre he met Henri Meilhac (1831–1897), then comparatively a stranger to him. He proposed to Meilhac the task rejected by Lambert Thibout, and the proposal was immediately accepted. Thus

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began a connexion which was to last over twenty years, and which proved most fruitful both for the reputation of the two authors and the prosperity of the minor Paris theatres. Their joint works may be divided into three classes: the *opérettes*, the farces, the comedies. The *opérettes* afforded excellent opportunities to a gifted musician for the display of his peculiar humour. They were broad and lively libels against the society of the time, but savoured strongly of the vices and follies they were supposed to satirize. Amongst the most celebrated works of the joint authors were *La Belle Hélène* (1864), *Barbe Bleue* (1866), *La Grande Duchesse de Gerolstein* (1867), and *La Périchole* (1868). After 1870 the vogue of Parody rapidly declined. The decadence became still more apparent when Offenbach was no longer at hand to assist the two authors with his quaint musical irony, and when they had to deal with interpreters almost destitute of singing powers. They wrote farces of the old type, consisting of complicated intrigues, with which they cleverly interwove the representation of contemporary whims and social oddities. They generally failed when they attempted comedies of a more serious character and tried to introduce a higher sort of emotion. A solitary exception must be made in the case of *Frou-frou* (1869), which, owing perhaps to the admirable talent of Aimée Desclée, remains their unique *succès de larmes*.

Meilhac and Halévy will be found at their best in light sketches of Parisian life, *Les Sonnettes*, *Le Roi Candaule*, *Madame attend Monsieur*, *Toto chez Tata*. In that intimate association between the two men who had met so opportunely on the *perron des variétés*, it was often asked who was the leading partner. The question was not answered until the connexion was finally severed and they stood before the public, each to answer for his own work. It was then apparent that they had many gifts in common. Both had wit, humour, observation of character. Meilhac had a ready imagination, a rich and whimsical fancy; Halévy had taste, refinement and pathos of a certain kind. Not less clever than his brilliant comrade, he was more human. Of this he gave evidence in two delightful books, *Monsieur et Madame Cardinal* (1873) and *Les Petites Cardinal*, in which the lowest orders of the Parisian middle class are faithfully described. The pompous, pedantic, venomous Monsieur Cardinal will long survive as the true image of sententious and self-glorifying immorality. M. Halévy's peculiar qualities are even more visible in the simple and striking scenes of the *Invasion*, published soon after the conclusion of the Franco-German War, in *Criquette* (1883) and *L'Abbé Constantin* (1882), two novels, the latter of which went through innumerable editions. Zola had presented to the public an almost exclusive combination of bad men and women; in *L'Abbé Constantin* all are kind and good, and the change was eagerly welcomed by the public. Some enthusiasts still maintain that the *Abbé* will rank permanently in literature by the side of the equally chimerical *Vicar of Wakefield*. At any rate, it opened for M. Ludovic Halévy the doors of the French Academy, to which he was elected in 1884.

Halévy remained an assiduous frequenter of the Academy, the Conservatoire, the Comédie Française, and the Society of Dramatic Authors, but, when he died in Paris on the 8th of May 1908, he had produced practically nothing new for many years. His last romance, *Kari Kari*, appeared in 1892.

The *Théâtre* of MM. Meilhac and Halévy was published in 8 vols. (1900–1902).

HALFPENNY, WILLIAM, English 18th-century architectural designer—he described himself as "architect and carpenter." He was also known as Michael Hoare; but whether his real name was William Halfpenny or Michael Hoare is uncertain. His books, of which he published a score, deal almost entirely with domestic architecture, and especially with country houses in those Gothic and Chinese fashions which were so greatly in vogue in the middle of the 18th century. His most important publications, from the point of view of their effect upon taste, were *New Designs for Chinese Temples*, in four parts (1750–1752); *Rural Architecture in the Gothic Taste* (1752); *Chinese and Gothic Architecture Properly Ornamented* (1752); and *Rural Architecture in the Chinese Taste* (1750–1752). These four books were produced in collaboration with John Halfpenny, who is said to have been his son. *New Designs for Chinese Temples* is a volume of some significance in the history of furniture, since, having been published some years before the books of Thomas Chippendale and Sir Thomas Chambers, it disproves the statement so often made that those designers introduced the Chinese taste into this country. Halfpenny states distinctly that "the Chinese manner" had been "already introduced here with success." The work of the Halfpennys was by no means all contemptible. It is sometimes distinctly graceful, but is marked by little originality.

HALF-TIMBER WORK, an architectural term given to those buildings in which the framework is of timber with vertical studs and cross pieces filled in between with brickwork, rubble masonry or plaster work on oak laths; in the first two, brick nogging or nogging are the terms occasionally employed (see CARPENTRY). Sometimes the timber structure is raised on a stone or brick foundation, as at Ledbury town hall in Herefordshire, where the lower storey is open on all sides; but more often it is raised on a ground storey, either in brick or stone, and in order to give additional size to the upper rooms projects forward, being carried on the floor joists. Sometimes the masonry or brickwork rises through two or three storeys and the half-brick work is confined to the gables. There seems to be some difference of opinion as to whether the term applies to the mixture of solid walling with the timber structure or to the alternation of wood posts and the filling in, but the latter definition is that which is generally understood. The half-timber throughout England is of the most picturesque description, and the earliest examples date from towards the close of the 15th century. In the earliest example, Newgate House, York (*c.* 1450), the timber framing is raised over the ground floor. The finest specimen is perhaps that of Moreton Old Hall, Cheshire (1570), where there is only a stone foundation about 12 in. high, and the same applies to Bramall Hall, near Manchester, portions of which are very early. Among other examples are Speke Hall, Lancashire; Park Hall, Shropshire (1553–1558); Hall i' th' Wood, Lancashire (1501); St Peter's Hospital, Bristol (1607); the Ludlow Feather's Inn (1610); many of the streets at Chester and Shrewsbury; the Sparrowe's Home, Ipswich; and Staple Inn, Holborn, from which in recent years the plaster coat which was put on many years ago has been removed, displaying the ancient woodwork. A similar fate has overtaken a very large number of half-timber buildings to keep out the driving winds; thus in Lewes nearly all the half-timbered houses have had slates hung on the timbers, others tiles, the greater number having been covered with plaster or stucco. Although there are probably many more half-timber houses in England than on the continent of Europe, in the north of France and in Germany are examples in many of the principal towns, and in some cases in better preservation than in England. They are also enriched with carving of a purer and better type, especially in France; thus at Chartres, Angers, Rouen, Caen, Lisieux, Bayeux, St Lô and Beauvais, are many extremely fine examples of late Flamboyant and early Transitional examples. Again on the borders of the Rhine in all the small towns most of the houses are in half-timber work, the best examples being at Bacharach, Rhense and Boppart. Far more elaborate examples, however, are found in the vicinity of the Harz Mountains; the supply of timber from the forests there being very abundant; thus at Goslar, Wernigerode and Quedlingburg there is an endless variety, as also farther on at Gelnhausen and Hameln, the finest series of all being at Hildesheim. In Bavaria at Nuremberg, Rothenburg and Dinkelsbühl, half-timber houses dating from the 16th century are still well preserved; and throughout Switzerland the houses constructed in timber and plaster are the most characteristic features of the country.

HALFWAY COVENANT, an expedient adopted in the Congregational churches of New England between 1657 and 1662. Under its terms baptized persons of moral life and orthodox belief might receive the privilege of baptism for their children and other church benefits, without the full enrolment in membership which admitted them to the communion of the Lord's Supper.

See CONGREGATIONALISM: *American*.

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HALHED, NATHANIEL BRASSEY (1751–1830), English Orientalist and philologist, was born at Westminster on the 25th of May 1751. He was educated at Harrow, where he began his intimacy with Richard Brinsley Sheridan (see SHERIDAN FAMILY) continued after he entered Christ Church, Oxford, where, also, he made the acquaintance of Sir William Jones, the famous Orientalist, who induced him to study Arabic. Accepting a writership in the service of the East India Company, Halhed went out to India, and here, at the suggestion of Warren Hastings, by whose orders it had been compiled, translated the Gentoo code from a Persian version of the original Sanskrit. This translation was published in 1776 under the title *A Code of Gentoo Laws*. In 1778 he published a Bengali grammar, to print which he set up, at Hugli, the first press in India. It is claimed for him that he was the first writer to call attention to the philological connexion of Sanskrit with Persian, Arabic, Greek and Latin. In 1785 he returned to England, and from 1790–1795 was M.P. for Lymington, Hants. For some time he was a disciple of Richard Brothers (*q.v.*), and his unwise speech in parliament in defence of Brothers made it impossible for him to remain in the House, from which he resigned in 1795. He subsequently obtained a home appointment under the East India Company. He died in London on the 18th of February 1830.

His collection of Oriental manuscripts was purchased by the British Museum, and there is an unfinished translation by him of the *Mahâbhârata* in the library of the Asiatic Society of Bengal.

HALIBURTON, THOMAS CHANDLER (1796–1865), British writer, long a judge of Nova Scotia, was born at Windsor, Nova Scotia, in 1796, and received his education there, at King's College. He was called to the bar in 1820, and became a member of the House of Assembly. He distinguished himself as a barrister, and in 1828 was promoted to the bench as a chief-justice of the common pleas. In 1829 he published *An Historical and Statistical Account of Nova Scotia*. But it is as a brilliant humourist and satirist that he is remembered, in connexion with his fictitious character "Sam Slick." In 1835 he contributed anonymously to a local paper a series of letters professedly depicting the peculiarities of the genuine Yankee. These sketches, which abounded in clever picturings of national and individual character, drawn with great satirical humour, were collected in 1837, and published under the title of *The Clockmaker, or Sayings and Doings of Samuel Slick of Slickville*. A second series followed in 1838, and a third in 1840. *The Attaché, or Sam Slick in England* (1843–1844), was the result of a visit there in 1841. His other works include: *The Old Judge, or Life in a Colony* (1843); *The Letter Bag of the Great Western* (1839); *Rule and Misrule of the English in America* (1851); *Traits of American Humour* (1852); and *Nature and Human Nature* (1855).

Meanwhile he continued to secure popular esteem in his judicial capacity. In 1840 he was promoted to be a judge of the supreme court; but within two years he resigned his seat on the bench, removed to England, and in 1859 entered parliament as the representative of Launceston, in the Conservative interest. But the tenure of his seat for Launceston was brought to an end by the dissolution of the parliament in 1865, and he did not again offer himself to the constituency. He died on the 27th of August of the same year, at Gordon House, Isleworth, Middlesex.

A memoir of Haliburton, by F. Blake Crofton, appeared in 1889.

HALIBUT, or HOLIBUT (*Hippoglossus vulgaris*), the largest of all flat-fishes, growing to a length of 10 ft. or more, specimens of 5 ft. in length and of 100 lb. in weight being frequently exposed for sale in the markets. Indeed, specimens under 2 ft. in length are very rarely caught, and singularly enough, no instance is known of a very young specimen having been obtained. Small ones are commonly called "chicken halibut." The halibut is much more frequent in the higher latitudes of the temperate zone than in its southern portion; it is a circumpolar species, being found on the northern coasts of America, Europe and Asia, extending in the Pacific southwards to California. On the British coasts it keeps at some distance from the shore, and is generally caught in from 50 to 150 fathoms. Its flesh is generally considered coarse, but it is white and firm, and when properly served is excellent for the table. The name is derived from "holy" (M.E. *haly*), and recalls its use for food on holy days.

HALICARNASSUS (mod. *Budrum*), an ancient Greek city on the S.W. coast of Caria, Asia Minor, on a picturesque and advantageous site on the Ceramic Gulf or Gulf of Cos. It originally occupied only the small island of Zephyria close to the shore, now occupied by the great castle of St Peter, built by the Knights of Rhodes in 1404; but in course of time this island was united to the mainland and the city extended so as to incorporate Salmacis, an older town of the Leleges and Carians.

About the foundation of Halicarnassus various traditions were current; but they agree in the main point as to its being a Dorian colony, and the figures on its coins, such as the head of Medusa, Athena and Poseidon, or the trident, support the statement that the mother cities were Troezen and Argos. The inhabitants appear to have accepted as their legendary founder Anthes, mentioned by Strabo, and were proud of the title of Antheadae. At an early period Halicarnassus was a member of the Doric Hexapolis, which included Cos, Cnidus, Lindus, Camirus and Ialysus; but one of the citizens, Agasicles, having taken home the prize tripod which he had won in the Triopian games instead of dedicating it according to custom to the Triopian Apollo, the city was cut off from the league. In the early 5th century Halicarnassus was under the sway of Artemisia, who made herself famous at the battle of Salamis. Of Pisindalis, her son and successor, little is known; but Lygdamis, who next attained to power, is notorious for having put to death the poet Panyasis and caused Herodotus, the greatest of Halicarnassians, to leave his native city (*c.* 457 B.C.). In the 5th century B.C. Halicarnassus and other Dorian cities of Asia were to some extent absorbed by the Delian League, but the peace of Antalcidas in 387 made them subservient to Persia; and it was under Mausolus, a Persian satrap who assumed independent authority, that Halicarnassus attained its highest prosperity. Struck by the natural strength and beauty of its position, Mausolus removed to Halicarnassus from Mylasa, increasing the population of the city by the inhabitants of six towns of the Leleges. He was succeeded by Artemisia, whose military ability was shown in the stratagem by which she captured the Rhodian vessels attacking her city, and whose magnificence and taste have been perpetuated by the "Mausoleum," the monument she erected to her husband's memory (see MAUSOLUS). One of her successors, Pixodarus, tried to ally himself with the rising power of Macedon, and is said to have gained the momentary consent of the young Alexander to wed his daughter. The marriage, however, was forbidden by Philip. Alexander, as soon as he had reduced Ionia, summoned Halicarnassus, where Memnon, the paramount satrap of Asia Minor, had taken refuge with the Persian fleet, to surrender; and on its refusal took the city after hard fighting and devastated it, but not being able to reduce the citadel, was forced to leave it blockaded. He handed the government of the city back to the family of Mausolus, as represented by Ada, sister of the latter. Not long afterwards we find the citizens receiving the present of a gymnasium from Ptolemy, and building in his honour a stoa or portico; but the city never recovered altogether from the disasters of the siege, and Cicero describes it as almost deserted. The site is now occupied in part by the town of Budrum; but the ancient walls can still be traced round nearly all their circuit, and the position of several of the temples, the theatre, and other public buildings can be fixed with certainty.

From the ruins of the Mausoleum sufficient has been recovered by the excavations carried out in 1857 by C. T. Newton to enable a fairly complete restoration of its design to be made. The building consisted of five parts—a basement or podium, a pteron or enclosure of columns, a pyramid, a pedestal and a chariot group. The basement, covering an area of 114 ft. by 92, was built of blocks of greenstone and cased with marble. Round the base of it were probably disposed groups of statuary. The

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pteron consisted (according to Pliny) of thirty-six columns of the Ionic order, enclosing a square *cella*. Between the columns probably stood single statues. From the portions that have been recovered, it appears that the principal frieze of the pteron represented combats of Greeks and Amazons. In addition to these, there are also many life-size fragments of animals, horsemen, &c., belonging probably to pedimental sculptures, but formerly supposed to be parts of minor friezes. Above the pteron rose the pyramid, mounting by 24 steps to an apex or pedestal. On this apex stood the chariot with the figure of Mausolus himself and an attendant. The height of the statue of Mausolus in the British Museum is 9 ft. 9½ in. without the plinth. The hair rising from the forehead falls in thick waves on each side of the face and descends nearly to the shoulder; the beard is short and close, the face square and massive, the eyes deep set under overhanging brows, the mouth well formed with settled calm about the lips. The drapery is grandly composed. All sorts of restorations of this famous monument have been proposed. The original one, made by Newton and Pullan, is obviously in error in many respects; and that of Oldfield, though to be preferred for its lightness (the Mausoleum was said anciently to be "suspended in mid-air"), does not satisfy the conditions postulated by the remains. The best on the whole is that of the veteran German architect, F. Adler, published in 1900; but fresh studies have since been made (see below).

See C. T. Newton and R. P. Pullan, *History of Discoveries at Halicarnassus* (1862–1863); J. Fergusson, *The Mausoleum at Halicarnassus restored* (1862); E. Oldfield, "The Mausoleum," in *Archaeologia* (1895); F. Adler, *Mausoleum zu Halikarnass* (1900); J. P. Six in *Journ. Hell. Studies* (1905); W. B. Dinsmoor, in *Amer. Journ. of Arch.* (1908); J. J. Stevenson, *A Restoration of the Mausoleum of Halicarnassus* (1909); J. K. Preedy, "The Chariot Group of the Mausoleum," in *Journ. Hell. Stud.*, 1910. (D. G. H.)

HALICZ, a town of Austria, in Galicia, 70 m. by rail S.S.E. of Lemberg. Pop. (1900), 4809. It is situated at the confluence of the Luckow with the Dniester and its principal resources are the recovery of salt from the neighbouring brine wells, soap-making and the trade in timber. In the neighbourhood are the ruins of the old castle, the seat of the ruler of the former kingdom from which Galicia derived its Polish name. Halicz, which is mentioned in annals as early as 1113, was from 1141 to 1255 the residence of the princes of that name, one of the principalities into which western Russia was then divided. The town was then much larger, as is shown by excavations in the neighbourhood made during the 19th century, and probably met its doom during the Mongol invasion of 1240. In 1349 it was incorporated in the kingdom of Poland.

HALIFAX, CHARLES MONTAGUE, EARL OF (1661–1715), English statesman and poet, fourth son of the Hon. George Montague, fifth son of the first earl of Manchester, was born at Horton, Northamptonshire, on the 16th of April 1661. In his fourteenth year he was sent to Westminster school, where he was chosen king's scholar in 1677, and distinguished himself in the composition of extempore epigrams made according to custom upon theses appointed for king's scholars at the time of election. In 1679 he entered Trinity College, Cambridge, where he acquired a solid knowledge of the classics and surpassed all his contemporaries at the university in logic and ethics. Latterly, however, he preferred to the abstractions of Descartes the practical philosophy of Sir Isaac Newton; and he was one of the small band of students who assisted Newton in forming the Philosophical Society of Cambridge. But it was his facility in verse-writing, and neither his scholarship nor his practical ability, that first opened up to him the way to fortune. His clever but absurdly panegyrical poem on the death of Charles II. secured for him the notice of the earl of Dorset, who invited him to town and introduced him to the principal wits of the time; and in 1687 his joint authorship with Prior of the *Hind and Panther transversed to the Story of the Country Mouse and the City Mouse*, a parody of Dryden's political poem, not only increased his literary reputation but directly helped him to political influence.

In 1689, through the patronage of the earl of Dorset, he entered parliament as member for Maldon, and sat in the convention which resolved that William and Mary should be declared king and queen of England. About this time he married the countess-dowager of Manchester, and it would appear, according to Johnson, that it was still his intention to take orders; but after the coronation he purchased a clerkship to the council. On being introduced by Earl Dorset to King William, after the publication of his poetical *Epistle occasioned by his Majesty's Victory in Ireland*, he was ordered to receive an immediate pension of £500 per annum, until an opportunity should present itself of "making a man of him." In 1691 he was chosen chairman of the committee of the House of Commons appointed to confer with a committee of the Lords in regard to the bill for regulating trials in cases of high treason; and he displayed in these conferences such tact and debating power that he was made one of the commissioners of the treasury and called to the privy council. But his success as a politician was less due to his oratorical gifts than to his skill in finance, and in this respect he soon began to manifest such brilliant talents as completely eclipsed the painstaking abilities of Godolphin. Indeed it may be affirmed that no other statesman has initiated schemes which have left a more permanent mark on the financial history of England. Although perhaps it was inevitable that England should sooner or later adopt the continental custom of lightening the annual taxation in times of war by contracting a national debt, the actual introduction of the expedient was due to Montague, who on the 15th of December 1692 proposed to raise a million of money by way of loan. Previous to this the Scotsman William Paterson (q.v.) had submitted to the government his plan of a national bank, and when in the spring of 1694 the prolonged contest with France had rendered another large loan absolutely necessary, Montague introduced a bill for the incorporation of the Bank of England. The bill after some opposition passed the House of Lords in May, and immediately after the prorogation of parliament Montague was rewarded by the chancellorship of the exchequer. In 1695 he was triumphantly returned for the borough of Westminster to the new parliament, and succeeded in passing his celebrated measure to remedy the depreciation which had taken place in the currency on account of dishonest manipulations. To provide for the expense of recoinage, Montague, instead of reviving the old tax of hearth money, introduced the window tax, and the difficulties caused by the temporary absence of a metallic currency were avoided by the issue for the first time of exchequer bills. His other expedients for meeting the emergencies of the financial crisis were equally successful, and the rapid restoration of public credit secured him a commanding influence both in the House of Commons and at the board of the treasury; but although Godolphin resigned office in October 1696, the king hesitated for some time between Montague and Sir Stephen Fox as his successor, and it was not till 1697 that the former was appointed first lord. In 1697 he was accused by Charles Duncombe, and in 1698 by a Col. Granville, of fraud, but both charges broke down, and Duncombe was shown to have been guilty of extreme dishonesty himself. In 1698 and 1699 he acted as one of the council of regency during the king's absence from England. With the accumulation of his political successes his vanity and arrogance became, however, so offensive that latterly they utterly lost him the influence he had acquired by his administrative ability and his masterly eloquence; and when his power began to be on the wane he set the seal to his political overthrow by conferring the lucrative sinecure office of auditor of the exchequer on his brother in trust for himself should he be compelled to retire from power. This action earned him the offensive nickname of "Filcher," and for some time afterwards, in attempting to lead the House of Commons, he had to submit to constant mortifications, often verging on personal insults. After the return of the king in 1699 he resigned his offices in the government and succeeded his brother in the auditorship.

On the accession of the Tories to power he was removed in 1701 to the House of Lords by the title of Lord Halifax. In the same year he was impeached for malpractices along with Lord

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Somers and the earls of Portland and Oxford, but all the charges were dismissed by the Lords; and in 1703 a second attempt to impeach him was still more unsuccessful. He continued out of office during the reign of Queen Anne, but in 1706 he was named one of the commissioners to negotiate the union with Scotland; and after the passing of the Act of Settlement in favour of the house of Hanover, he was appointed ambassador to the elector's court to convey the insignia of order of the garter to George I. On the death of Anne (1714) he was appointed one of the council of regency until the arrival of the king from Hanover; and after the coronation he received the office of first lord of the treasury in the new ministry, being at the same time created earl of Halifax and Viscount Sunbury. He died on the 19th of May 1715 and left no issue. He was buried in the vault of the Allemarle family in Westminster Abbey. His nephew George (d. 1739) succeeded to the barony, and was created Viscount Sunbury and earl of Halifax in 1715.

Montague's association with Prior in the travesty of Dryden's *Hind and Panther* has no doubt largely aided in preserving his literary reputation; but he is perhaps indebted for it chiefly to his subsequent influential position and to the fulsome flattery of the men of letters who enjoyed his friendship, and who, in return for his liberal donations and the splendid banqueting which they occasionally enjoyed at his villa on the Thames, "fed him," as Pope says, "all day long with dedications." Swift says he gave them nothing but "good words, and good dinners." That, however, his beneficence to needy talent, if sometimes attributable to an itching ear for adulation, was at others prompted by a sincere appreciation of intellectual merit, is sufficiently attested by the manner in which he procured from Godolphin a commissionership for Addison, and also by his life-long intimacy with Newton, for whom he obtained the mastership of the mint. The small fragments of poetry which he left behind him, and which were almost solely the composition of his early years, display a certain facility and vigour of diction, but their thought and fancy are never more than commonplace, and not unfrequently in striving to be eloquent and impressive he is only grotesquely and extravagantly absurd. In administrative talent he was the superior of all his contemporaries, and his only rival in parliamentary eloquence was Somers; but the skill with which he managed measures was superior to his tact in dealing with men, and the effect of his brilliant financial successes on his reputation was gradually almost nullified by the affected arrogance of his manner and by the eccentricities of his sensitive vanity. So eager latterly was his thirst for fame and power that perhaps Marlborough did not exaggerate when he said that "he had no other principle but his ambition, so that he would put all in distraction rather than not gain his point."

Among the numerous notices of Halifax by contemporaries may be mentioned the eulogistic reference which concludes Addison's account of the "greatest of English poets"; the dedications by Steel to the second volume of the *Spectator* and to the fourth of the *Tatler*; Pope's laudatory mention of him in the epilogue to his *Satires* and in the preface to the *Iliad*, and his portrait of him as "Full-blown Bufo" in the *Epistle to Arbuthnot*. Various allusions to him are to be found in Swift's works and in Marlborough's *Letters*. See also Burnet's *History of his Own Times*; *The Parliamentary History*; Howell's *State Trials*; Johnson's *Lives of the Poets*; and Macaulay's *History of England*. His *Miscellaneous Works* were published at London in 1704; his *Life and Miscellaneous Works* in 1715; and his *Poetical Works*, to which also his "Life" is attached, in 1716. His poems were reprinted in the 9th volume of Johnson's *English Poets*.

HALIFAX, GEORGE MONTAGU DUNK, 2ND EARL OF (1716–1771), son of George Montagu, 1st earl of Halifax (of the second creation), was born on the 5th or 6th of October 1716, becoming earl of Halifax on his father's death in 1739. Educated at Eton and at Trinity College, Cambridge, he was married in 1741 to Anne Richards (d. 1753), a lady who had inherited a great fortune from Sir Thomas Dunk, whose name was taken by Halifax. After having been an official in the household of Frederick, prince of Wales, the earl was made master of the buckhounds, and in 1748 he became president of the Board of Trade. While filling this position he helped to found Halifax, the capital of Nova Scotia, which was named after him, and in several ways he rendered good service to trade, especially with North America. About this time he sought to became a secretary of state, but in vain, although he was allowed to enter the cabinet in 1757. In March 1761 Halifax was appointed lord-lieutenant of Ireland, and during part of the time which he held this office he was also first lord of the admiralty. He became secretary of state for the northern department under the earl of Bute in October 1762, retaining this post under George Grenville and being one of the three ministers to whom George III. entrusted the direction of affairs. He signed the general warrant under which Wilkes was arrested in 1763, for which action he was mulcted in damages by the courts of law in 1769, and he was mainly responsible for the exclusion of the name of the king's mother, Augusta, princess of Wales, from the Regency Bill of 1765. With his colleagues the earl left office in July 1765, returning to the cabinet as lord privy seal under his nephew, Lord North, in January 1770. He had just been transferred to his former position of secretary of state when he died on the 8th of June 1771. Halifax, who was lord-lieutenant of Northamptonshire and a lieutenant-general in the army, showed some disinterestedness in money matters, but was very extravagant. He left no children, and his titles became extinct on his death Horace Walpole speaks slightingly of the earl, and says he and his mistress, Mary Anne Faulkner, "had sold every employment in his gift."

See the *Memoirs* of his secretary, Richard Cumberland (1807).

HALIFAX, GEORGE SAVILE, 1ST MARQUESS OF (1633–1695), English statesman and writer, great-grandson of Sir George Savile of Lupset and Thornhill in Yorkshire (created baronet in 1611), was the eldest son of Sir William Savile, 3rd baronet, who distinguished himself in the civil war in the royalist cause and who died in 1644, and of Anne, eldest daughter of Lord Keeper Coventry. He was thus nephew of Sir William Coventry, who is said to have influenced his political opinions, and of Lord Shaftesbury, afterwards his most bitter opponent, and great-nephew of the earl of Strafford; by his marriage with the Lady Dorothy Spencer, he was brother-in-law to Lord Sunderland. He entered public life with all the advantages of lineage, political connexions, great wealth and estates, and uncommon abilities. He was elected member of the Convention parliament for Pontefract in 1660, and this was his only appearance in the Lower House. A peerage was sought for him by the duke of York in 1665, but was successfully opposed by Clarendon, on the ground of his "ill-reputation amongst men of piety and religion," the real motives of the chancellor's hostile attitude being probably Savile's connexion with Buckingham and Coventry. The honours were, however, only deferred for a short time and were obtained after the fall of Clarendon on the 31st of December 1667,[1] when Savile was created Baron Savile of Eland and Viscount Halifax.

He supported zealously the anti-French policy formulated in the Triple Alliance of January 1668. He was at this time in favour at court, was created a privy councillor in 1672, and, while ignorant of the disgraceful secret clauses in the treaty of Dover, was chosen envoy to negotiate terms of peace with Louis XIV. and the Dutch at Utrecht. His mission was still further deprived of importance by Arlington and Buckingham, who were in the king's counsels, and who anticipated his arrival and took the negotiations out of his hands; and though he signed the compact, he had no share in the harsh terms imposed upon the Dutch, and henceforth became a bitter opponent of the policy of subservience to French interests and of the Roman Catholic claims.

He took an active part in passing through parliament the great Test Act of 1673[2] and forfeited in consequence his friendship with James. In 1674 he brought forward a motion for

[1] *Cal. State Papers, Dom.* (Nov. 1667–Sep. 1668), p. 106.

[2] *Lords' Journals*, 12, p. 867; *Savile Correspondence*, ed. by W. D. Cooper, p. 136; "Character of a Trimmer," in *Life of Sir G. Savile*, by H. C. Foxcroft, ii. 316.

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disarming "popish recusants," and supported one by Lord Carlisle for restricting the marriages in the royal family to Protestants; but he opposed the bill introduced by Lord Danby (see LEEDS, 1ST DUKE OF) in 1675, which imposed a test oath on officials and members of parliament, speaking "with that quickness, learning and elegance that are inseparable from all his discourses," and ridiculing the multiplication of oaths, since "no man would ever sleep with open doors . . . should all the town be sworn not to rob." He was now on bad terms with Danby, and a witty sally at that minister's expense caused his dismissal from the council in January 1676. In 1678 he took an active part in the investigation of the "Popish Plot," to which he appears to have given excessive credence, but opposed the bill which was passed on the 30th of October 1678, to exclude Roman Catholics from the House of Lords.

In 1679, as a consequence of the fall of Danby, he became a member of the newly constituted privy council. With Charles, who had at first "kicked at his appointment," he quickly became a favourite, his lively and "libertine" (*i.e.* free or sceptical) conversation being named by Bishop Burnet as his chief attraction for the king. His dislike of the duke of York and of the Romanist tendencies of the court did not induce him to support the rash attempt of Lord Shaftesbury to substitute the illegitimate duke of Monmouth for James in the succession. He feared Shaftesbury's ascendancy in the national councils and foresaw nothing but civil war and confusion as a result of his scheme. He declared against the exclusion of James, was made an earl in 1679, and was one of the "Triumvirate" which now directed public affairs. He assisted in passing into law the Habeas Corpus Bill. According to Sir. W. Temple he showed great severity in putting into force the laws against the Roman Catholics, but this statement is considered a misrepresentation.[1] In 1680 he voted against the execution of Lord Stafford.

Meanwhile (1679) his whole policy had been successfully directed towards uniting all parties with the object of frustrating Shaftesbury's plans. Communications were opened with the prince of Orange, and the illness of the king was made the occasion for summoning James from Brussels. Monmouth was compelled to retire to Holland, and Shaftesbury was dismissed. On the other hand, while Halifax was so far successful, James was given an opportunity of establishing a new influence at the court. It was with great difficulty that his retirement to Scotland was at last effected; the ministers lost the confidence and support of the "country party," and Halifax, fatigued and ill, at the close of this year, retired to Rufford Abbey, the country home of the Saviles since the destruction of Thornhill Hall in 1648, and for some time took little part in affairs. He returned in September 1680 on the occasion of the introduction of the Exclusion Bill in the Lords. The debate which followed, one of the most famous in the whole annals of parliament, became a duel of oratory between Halifax and his uncle Shaftesbury, the finest two speakers of the day, watched by the Lords, the Commons at the bar, and the king, who was present. It lasted seven hours. Halifax spoke sixteen times, and at last, regardless of the menaces of the more violent supporters of the bill, who closed round him, vanquished his opponent. The rejection of the bill by a majority of 33 was attributed by all parties entirely to the eloquence of Halifax. His conduct transformed the allegiance to him of the Whigs into bitter hostility, the Commons immediately petitioning the king to remove him from his councils for ever, while any favour which he might have regained with James was forfeited by his subsequent approval of the regency scheme.

He retired to Rufford again in January 1681, but was present at the Oxford parliament, and in May returned suddenly to public life and held for a year the chief control of affairs. The arrest of Shaftesbury on the 2nd of July was attributed to his influence, but in general, during the period of Tory reaction, he seems to have urged a policy of conciliation and moderation upon the king. He opposed James's return from Scotland and, about this time (Sept.), made a characteristic but futile attempt to persuade the duke to attend the services of the Church of England and thus to end all difficulties. He renewed relations with the prince of Orange, who in July paid a visit to England to seek support against the French designs upon Luxemburg. The influence of Halifax procured for the Dutch a formal assurance from Charles of his support; but the king informed the French ambassador that he had no intention of fulfilling his engagements, and made another secret treaty with Louis. Halifax opposed in 1682 James's vindictive prosecution of the earl of Argyll, arousing further hostility in the duke, while the same year he was challenged to a duel by Monmouth, who attributed to him his disgrace.

His short tenure of power ended with the return of James in May. Outwardly he still retained the king's favour and was advanced to a marquisate (Aug. 17) and to the office of lord privy seal (Oct. 25). Being still a member of the administration he must share responsibility for the attack now made upon the municipal franchises, a violation of the whole system of representative government, especially as the new charters passed his office. In January 1684 he was one of the commissioners "who supervise all things concerning the city and have turned out those persons who are whiggishly inclined" (N. Luttrell's *Diary*, i. 295). He made honourable but vain endeavours to save Algernon Sidney and Lord Russell. "My Lord Halifax," declared Tillotson in his evidence before the later inquiry, "showed a very compassionate concern for my Lord Russell and all the readiness to serve them that could be wished."[2] The Rye-House Plot, in which it was sought to implicate them, was a disastrous blow to his policy, and in order to counteract its consequences he entered into somewhat perilous negotiations with Monmouth, and endeavoured to effect his reconciliation with the king. On the 12th of February 1684, he procured the release of his old antagonist, Lord Danby. Shortly afterwards his influence at the court revived. Charles was no longer in receipt of his French pension and was beginning to tire of James and Rochester. The latter, instead of becoming lord treasurer, was, according to the epigram of Halifax which has become proverbial, "kicked upstairs," to the office of lord president of the council. Halifax now worked to establish intimate relations between Charles and the prince of Orange and opposed the abrogation of the recusancy laws. In a debate in the cabinet of November 1684, on the question of the grant of a fresh constitution to the New England colonies, he urged with great warmth "that there could be no doubt whatever but that the same laws which are in force in England should also be established in a country inhabited by Englishmen and that an absolute government is neither so happy nor so safe as that which is tempered by laws and which sets bounds to the authority of the prince," and declared that he could not "live under a king who should have it in his power to take, whenever he thought proper, the money he has in his pocket." The opinions thus expressed were opposed by all the other ministers and highly censured by Louis XIV., James and Judge Jeffreys.

At the accession of James he was immediately deprived of all power and relegated to the presidency of the council. He showed no compliance, like other Lords, with James's Roman Catholic preferences. He was opposed to the parliamentary grant to the king of a revenue for life; he promoted the treaty of alliance with the Dutch in August 1685; he expostulated with the king on the subject of the illegal commissions in the army given to Roman Catholics; and finally, on his firm refusal to support the repeal of the Test and Habeas Corpus Acts, he was dismissed, and his name was struck out of the list of the privy council (Oct. 1685). He corresponded with the prince of Orange, conferred with Dykveldt, the latter's envoy, but held aloof from plans which aimed at the prince's personal interference in English affairs. In 1687 he published the famous *Letter to a Dissenter*, in which he warns the Nonconformists against being beguiled by the "Indulgence" into joining the court party, sets in a clear light the fatal results of such a step, and reminds them that under their next sovereign their grievances would in

[1] Foxcroft i. 160, where Hallam is quoted to this effect.

[2] *Hist. MSS. Comm. House of Lords MSS.* 1689–1690, p. 287.

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all probability be satisfied by the law. The tract, which has received general and unqualified admiration, must be classed amongst the few known writings which have actually and immediately altered the course of history. Copies to the number of 20,000 were circulated through the kingdom, and a great party was convinced of the wisdom of remaining faithful to the national traditions and liberties. He took the popular side on the occasion of the trial of the bishops in June 1688, visited them in the Tower, and led the cheers with which the verdict of "not guilty" was received in court; but the same month he refrained from signing the invitation to William, and publicly repudiated any share in the prince's plans. On the contrary he attended the court and refused any credence to the report that the prince born to James was suppositious. After the landing of William he was present at the council called by James on the 27th of November. He urged the king to grant large concessions, but his speech, in contrast to the harsh and overbearing attitude of the Hydes, was "the most tender and obliging . . . that ever was heard." He accepted the mission with Nottingham and Godolphin to treat with William at Hungerford, and succeeded in obtaining moderate terms from the prince. The negotiations, however, were abortive, for James had from the first resolved on flight. In the crisis which ensued, when the country was left without a government, Halifax took the lead. He presided over the council of Lords which assembled and took immediate measures to maintain public order. On the return of James to London on the 26th of November, after his capture at Faversham, Halifax repaired to William's camp and henceforth attached himself unremittingly to his cause. On the 17th he carried with Lords Delamere and Shrewsbury a message from William to the king advising his departure from London, and, after the king's second flight, directed the proceedings of the executive. On the meeting of the convention on the 22nd of January 1688, he was formally elected speaker of the House of Lords. He voted against the motion for a regency (Jan. 29), which was only defeated by two votes. The moderate and comprehensive character of the settlement at the revolution plainly shows his guiding hand, and it was finally through his persuasion that the Lords yielded to the Commons and agreed to the compromise whereby William and Mary were declared joint sovereigns. On the 13th of February in the Banqueting House at Whitehall, he tendered the crown to them in the name of the nation, and conducted the proclamation of their accession in the city.

At the opening of the new reign he had considerable influence, was made lord privy seal, while Danby his rival was obliged to content himself with the presidency of the council, and controlled the appointments to the new cabinet which were made on a "trimming" or comprehensive basis. His views on religious toleration were as wide as those of the new king. He championed the claims of the Nonconformists as against the high or rigid Church party, and he was bitterly disappointed at the miscarriage of the Comprehension Bill. He thoroughly approved also at first of William's foreign policy; but, having excited the hostility of both the Whig and Tory parties, he now became exposed to a series of attacks in parliament which finally drove him from power. He was severely censured, as it seems quite unjustly, for the disorder in Ireland, and an attempt was made to impeach him for his conduct with regard to the sentences on the Whig leaders. The inquiry resulted in his favour; but notwithstanding, and in spite of the king's continued support, he determined to retire. He had already resigned the speakership of the House of Lords, and he now (Feb. 8, 1690) quitted his place in the cabinet. He still nominally retained his seat in the privy council, but in parliament he became a bitter critic of the administration; and the rivalry of Halifax (the Black Marquess) with Danby, now marquess of Carmarthen (the White Marquess) threw the former at this time into determined opposition. He disapproved of William's total absorption in European politics, and his open partiality for his countrymen. In January 1691 Halifax had an interview with Henry Bulkeley, the Jacobite agent, and is said to have promised "to do everything that lay in his power to serve the king." This was probably merely a measure of precaution, for he had no serious Jacobite leanings. He entered bail for Lord Marlborough, accused wrongfully of complicity in a Jacobite plot in May 1692, and in June, during the absence of the king from England, his name was struck off the privy council.

He spoke in favour of the Triennial Bill (Jan. 12, 1693) which passed the legislature but was vetoed by William, suggested a proviso in the Licensing Act, which restricted its operation to anonymous works, approved the Place Bill (1694), but opposed, probably on account of the large sums he had engaged in the traffic of annuities, the establishment of the bank of England in 1694. Early in 1695 he delivered a strong attack on the administration in the House of Lords, and, after a short illness arising from a neglected complaint, he died on the 5th of April at the age of sixty-one. He was buried in Henry VII.'s chapel in Westminster Abbey.

The influence of Halifax, both as orator and as writer, on the public opinion of his day was probably unrivalled. His intellectual powers, his high character, his urbanity, vivacity and satirical humour made a great impression on his contemporaries, and many of his witty sayings have been recorded. But the superiority of his statesmanship could not be appreciated till later times. Maintaining throughout his career a complete detachment from party, he never acted permanently or continuously with either of the two great factions, and exasperated both in turn by deserting their cause at the moment when their hopes seemed on the point of realization. To them he appeared weak, inconstant, untrustworthy. They could not see what to us now is plain and clear, that Halifax was as consistent in his principles as the most rabid Whig or Tory. But the principle which chiefly influenced his political action, that of compromise, differed essentially from those of both parties, and his attitude with regard to the Whigs or Tories was thus by necessity continually changing. Measures, too, which in certain circumstances appeared to him advisable, when the political scene had changed became unwise or dangerous. Thus the regency scheme, which Halifax had supported while Charles still reigned, was opposed by him with perfect consistency at the revolution. He readily accepted for himself the character of a "trimmer," desiring, he said, to keep the boat steady, while others attempted to weigh it down perilously on one side or the other; and he concluded his tract with these assertions: "that our climate is a Trimmer between that part of the world where men are roasted and the other where they are frozen; that our Church is a Trimmer between the frenzy of fanatic visions and the lethargic ignorance of Popish dreams; that our laws are Trimmers between the excesses of unbounded power and the extravagance of liberty not enough restrained; that true virtue hath ever been thought a Trimmer, and to have its dwelling in the middle between two extremes; that even God Almighty Himself is divided between His two great attributes, His Mercy and His Justice. In such company, our Trimmer is not ashamed of his name. . . ."[1]

His powerful mind enabled him to regard the various political problems of his time from a height and from a point of view similar to that from which distance from the events enables us to consider them at the present day; and the superiority of his vision appears sufficiently from the fact that his opinions and judgments on the political questions of his time are those which for the most part have ultimately triumphed and found general acceptance. His attitude of mind was curiously modern.[2] Reading, writing and arithmetic, he thinks, should be taught to all and at the expense of the state. His opinions again on the constitutional relations of the colonies to the mother country, already cited, were completely opposed to those of his own period. For that view of his character which while allowing him the merit of a brilliant political theorist denies him the qualities of a man of action and of a practical politician, there is no solid basis. The truth is that while his political ideas are founded upon great moral or philosophical generalizations, often vividly

[1] *Character of a Trimmer*, conclusion.
[2] Saviliana quoted by Foxcroft i. 115.

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recalling and sometimes anticipating the broad conceptions of Burke, they are at the same time imbued with precisely those practical qualities which have ever been characteristic of English statesmenship, and were always capable of application to actual conditions. He was no star-gazing philosopher, with thoughts superior to the contemplation of mundane affairs. He had no taste for abstract political dogma. He seems to venture no further than to think that "men should live in some competent state of freedom," and that the limited monarchical and aristocratic government was the best adapted for his country. "Circumstances," he writes in the *Rough Draft of a New Model at Sea*, "must come in and are to be made a part of the matter of which we are to judge; positive decisions are always dangerous, more especially in politics." Nor was he the mere literary student buried in books and in contemplative ease. He had none of the "indgisiveness which commonly renders literary men of no use in the world" (Sir John Dalrymple). The incidents of his career show that there was no backwardness or hesitation in acting when occasion required. The constant tendency of his mind towards antithesis and the balancing of opinions did not lead to paralysis in time of action. He did not shrink from responsibility, nor show on any occasion lack of courage. At various times of crisis he proved himself a great leader. He returned to public life to defeat the Exclusion Bill. At the revolution it was Halifax who seized the reins of government, flung away by James, and maintained public security. His subsequent failure in collaborating with William is, it is true, disappointing. But the cause was one that has not perhaps received sufficient attention. Party government had come to the birth during the struggles over the Exclusion Bill, and there had been unconsciously introduced into politics a novel element of which the nature and importance were not understood or suspected. Halifax had consistently ignored and neglected party; and it now had its revenge. Detested by the Whigs and by the Tories alike, and defended by neither, the favour alone of the king and his own transcendent abilities proved insufficient to withstand the constant and violent attacks made upon him in parliament, and he yielded to the superior force. He seems indeed himself to have been at last convinced of the necessity in English political life of party government, for though in his *Cautions* to electors he warns them against men "tied to a party," yet in his last words he declares "If there are two parties a man ought to adhere to that which he disliked least though in the whole he doth not approve it; for whilst he doth not list himself in one or the other party, he is looked upon as such a straggler that he is fallen upon by both. . . . Happy those that are convinced so as to be of the general opinions" (*Political Thoughts and Reflections of Parties*).

The private character of Lord Halifax was in harmony with the greatness of his public career. He was by no means the "voluptuary" described by Macaulay. He was on the contrary free from self-indulgence; his manner of life was decent and frugal, and his dress proverbially simple. He was an affectionate father and husband. "His heart," says Burnet (i. 402-403, ed. 1833), "was much set on raising his family"—his last concern even while on his deathbed was the remarriage of his son Lord Eland to perpetuate his name; and this is probably the cause of his acceptance of so many titles for which he himself affected a philosophical indifference. He was estimable in his social relations and habits. He showed throughout his career an honourable independence, and was never seen to worship the rising sun. In a period when even great men stooped to accept bribes, Halifax was known to be incorruptible; at a time when animosities were especially bitter, he was too great a man to harbour resentments. "Not only from policy," says Reresby (*Mem.* p. 231), "(which teaches that we ought to let no man be our enemy when we can help it), but from his disposition I never saw any man more ready to forgive than himself." Few were insensible to his personal charm and gaiety. He excelled especially in quick repartee, in "exquisite nonsense," and in spontaneous humour. When quite a young man, just entering upon political life he is described by Evelyn as "a witty gentleman, if not a little too prompt and daring." The latter characteristic was not moderated by time but remained through life. He was incapable of controlling his spirit of raillery, from jests on Siamese missionaries to sarcasms at the expense of the heir to the throne and ridicule of hereditary monarchy, and his brilliant paradoxes, his pungent and often profane epigrams were received by graver persons as his real opinions and as evidences of atheism. This latter charge he repudiated, assuring Burnet that he was "a Christian in submission," but that he could not digest iron like an ostrich nor swallow all that the divines sought to impose upon the world.

The speeches of Halifax have not been preserved, and his political writings on this account have all the greater value. *The Character of a Trimmer* (1684 or 1685), the authorship of which, long doubtful, is now established, was his most ambitious production, written seemingly as advice to the king and as a manifesto of his own opinions. In it he discusses the political problems of the time and their solution on broad principles. He supports the Test Act and, while opposing the Indulgence, is not hostile to the repeal of the penal laws against the Roman Catholics by parliament. Turning to foreign affairs he contemplates with consternation the growing power of France and the humiliation of England, exclaiming indignantly at the sight of the "Roses blasted and discoloured while lilies triumph and grow insolent upon the comparison." The whole is a masterly and comprehensive summary of the actual political situation and its exigencies; while, when he treats such themes as liberty, or discusses the balance to be maintained between freedom and government in the constitution, he rises to the political idealism of Bolingbroke and Burke. *The Character of King Charles II.* (printed 1750), to be compared with his earlier sketch of the king in the *Character of a Trimmer*, is perhaps from the literary point of view the most admirable of his writings. The famous *Letter to a Dissenter* (1687) was thought by Sir James Mackintosh to be unrivalled as a political pamphlet. *The Lady's New Year's Gift: or Advice to a Daughter*, refers to his daughter Elizabeth, afterwards wife of the 3rd and mother of the celebrated 4th earl of Chesterfield (1688). In *The Anatomy of an Equivalent* (1688) he treats with keen wit and power of analysis the proposal to grant a "perpetual edict" in favour of the Established Church in return for the repeal of the test and penal laws. *Maxims of State* appeared about 1692. *The Rough Draft of a New Model at Sea* (c. 1694), though apparently only a fragment, is one of the most interesting and characteristic of his writings. It opens with the question: "'What shall we do to be saved in this world?' There is no other answer but this, 'Look to your moat.' The first article of an Englishman's political creed must be that he believeth in the sea." He discusses the naval establishment, not from the naval point of view alone, but from the general aspect of the constitution of which it is a detail, and is thus led on to consider the nature of the constitution itself, and to show that it is not an artificial structure but a growth and product of the natural character. We may also mention *Some Cautions* to the electors of the parliament (1694), and *Political, Moral and Miscellaneous Thoughts and Reflections* (n.d.), a collection of aphorisms in the style of the maxims of La Rochefoucauld, inferior in style—but greatly excelling the French author in breadth of view and in moderation. (For other writings attributed to Halifax, see Foxcroft, *Life of Sir G. Savile*, ii. 529 seqq.).

Halifax was twice married, first in 1656 to the Lady Dorothy Spencer—daughter of the 1st earl of Sunderland and of Dorothy Sidney, "Sacharissa"—who died in 1670, leaving a family; and secondly, in 1672, to Gertrude, daughter of William Pierrepont of Thoresby, who survived him, and by whom he had one daughter, Elizabeth, Lady Chesterfield, who seems to have inherited a considerable portion of her father's intellectual abilities. On the death of his son William, 2nd marquess of Halifax, in August 1700 without male issue, the peerage became extinct, and the baronetcy passed to the Saviles of Lupset, the whole

[1] Foxcroft, ii. 273 et seq., and *Hist. MSS. Comm. MSS.* of F. W. Leyborne-Popham, p. 264.

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male line of the Savile family ending in the person of Sir George Savile, 8th baronet, in 1784. Henry Savile, British envoy at Versailles, who died unmarried in 1687, was a younger brother of the first marquess. Halifax has been generally supposed to have been the father of the illegitimate Henry Carey, the poet, but this is doubtful.

See *Life and Letters of Sir George Savile, 1st Marquis of Halifax* (2 vols., 1898), by Miss H. C. Foxcroft, who has collected and made excellent use of all the material available at that date, including hitherto unexplored Savile MSS., at Devonshire House, in the Spencer Archives, in the Longleat and other collections, and who has edited the works of Halifax and printed a memorandum of conversations with King William of 1688–1690, left in MS. by Halifax. Macaulay, in his *History of England*, misjudged Halifax on some points, but nevertheless understood and did justice to the greatness of his statesmanship, and pronounced on him a well-merited and eloquent eulogy (iv. 545). Contemporary characters of Halifax which must be accepted with caution are Burnet's in the *History of His Own Times* (ed. 1833, vol. i. pp. 489–493, and iv. 268), that by the author of "Saviliana," identified as William Mompesson, and "Sacellum Apollinare," a panegyric in verse by Elkanah Settle (1695). (P. C. Y.)

HALIFAX, a city and port of entry, capital of the province of Nova Scotia, Canada. It is situated in 44° 50′ N. and 63° 35′ W., on the south-east coast of the province, on a fortified hill, 225 ft. in height, which slopes down to the waters of Chebucto Bay, now known as Halifax Harbour. The harbour, which is open all the year, is about 6 m. long by 1 m. in width, and has excellent anchorage in all parts; to the north a narrow passage connects it with Bedford Basin, 6 m. in length by 4 m., and deep enough for the largest men-of-war. At the harbour mouth lies McNab's Island, thus forming two entrances; the eastern passage is only employed by small vessels, though in 1862 the Confederate cruiser, "Tallahassee," slipped through by night, and escaped the northern vessels which were watching off the western entrance. The population in 1901 was 40,832.

The town was originally built of wood, plastered or stuccoed, but though the wooden houses largely remain, the public buildings are of stone. Inferior in natural strength to Quebec alone, the city and its approaches have been fortified till it has become the strongest position in Canada, and one of the strongest in the British Empire. Till 1906 it was garrisoned by British troops, but in that year, with Esquimalt, on the Pacific coast, it was taken over by the Canadian government, an operation necessitating a large increase in the Canadian permanent military force. At the same time, the royal dockyard, containing a dry-dock 610 ft. in length, and the residences in connexion, were also taken over for the use of the department of marine and fisheries. Till 1905 Halifax was the summer station of the British North American squadron. In that year, in consequence of a redistribution of the fleet, the permanent North American squadron was withdrawn; but Halifax is still visited periodically by powerful squadrons of cruisers.

Though, owing to the growth of Sydney and other outports, it no longer monopolizes the foreign trade of the province, Halifax is still a thriving town, and has the largest export trade of the Dominion in fish and fish products, the export of fish alone, in 1904, amounting to over three-fifths that of the entire Dominion. Lumber (chiefly spruce deals) and agricultural products (especially apples) are also exported in large quantities. The chief imports are manufactures from Great Britain and the United States, and sugar, molasses, rum and fruit from the West Indies. Its industrial establishments include foundries, sugar refineries, manufactures of furniture and other articles of wood, a skate factory and rope and cordage works, the produce of which are all exported. It is the Atlantic terminus of the Intercolonial, Canadian Pacific and several provincial railways, and the chief winter port of Canada, numerous steamship lines connecting it with Great Britain, Europe, the West Indies and the United States. The public gardens, covering 14 acres, and Point Pleasant Park, left to a great extent in its natural state, are extremely beautiful. Behind the city is an arm of the sea (known as the North-West Arm), 5 m. in length and 1 m. in breadth, with high, well-wooded shores, and covered in summer with canoes and sailing craft. The educational institutions include a ladies' college, several convents, a Presbyterian theological college and Dalhousie University, with faculties of arts, law, medicine and science. Established by charter in 1818 by the earl of Dalhousie, then lieutenant governor, and reorganized in 1863, it has since become much the most important seat of learning in the maritime provinces. Other prominent buildings are Government House, the provincial parliament and library, and the Roman Catholic cathedral. St Paul's church (Anglican) dates from 1750, and though not striking architecturally, is interesting from the memorial tablets and the graves of celebrated Nova Scotians which it contains. The city is the seat of the Anglican bishop of Nova Scotia and Prince Edward Island, and of the Roman Catholic bishop of Halifax.

Founded in 1749 by the Hon. Edward Cornwallis as a rival to the French town of Louisburg in Cape Breton, it was named after the 2nd earl of Halifax, president of the board of trade and plantations. In the following year it superseded Annapolis as capital of the province. Its privateers played a prominent part in the war of 1812–15 with the United States, and during the American Civil War it was a favourite base of operations for Confederate blockade-runners. The federation of the North American provinces in 1867 lessened its relative importance, but its merchants have gradually adapted themselves to the altered conditions.

HALIFAX, a municipal, county and parliamentary borough in the West Riding of Yorkshire, England, 194 m. N.N.W. from London and 7 m. S.W. from Bradford, on the Great Northern and the Lancashire & Yorkshire railways. Pop. (1891), 97,714; (1901) 104,036. It lies in a bare hilly district on and above the small river Hebble near its junction with the Calder. Its appearance is in the main modern, though a few picturesque old houses remain. The North Bridge, a fine iron structure, spans the valley, giving connexion between the opposite higher parts of the town. The principal public building is the town hall, completed in 1863 after the designs of Sir Charles Barry; it is a handsome Palladian building with a tower. Of churches the most noteworthy is that of St John the Baptist, the parish church, a Perpendicular building with lofty western tower. Two earlier churches are traceable on this side, the first perhaps pre-Norman, the second of the Early English period. The old woodwork is fine, part being Perpendicular, but the greater portion dates from 1621. All Souls' church was built in 1859 from the designs of Sir Gilbert Scott, of whose work it is a good example, at the expense of Mr Edward Akroyd. The style is early Decorated, and a rich ornamentation is carried out in Italian marble, serpentine and alabaster. A graceful tower and spire 236 ft. high rise at the north-west angle. The Square chapel, erected by the Congregationalists in 1857, is a striking cruciform building with a tower and elaborate crocketed spire. Both the central library and museum and the Akroyd museum and art gallery occupy buildings which were formerly residences, the one of Sir Francis Crossley (1817–1872) and the other of Mr Edward Akroyd. Among charitable institutions the principal is the handsome royal infirmary, a Renaissance building. The Heath grammar school was founded in 1585 under royal charter for instruction in classical languages. It possesses close scholarships at Oxford and Cambridge universities. The Waterhouse charity school occupies a handsome set of buildings forming three sides of a quadrangle, erected in 1855. The Crossley almshouses were erected and endowed by Sir Francis and Mr Joseph Crossley, who also endowed the Crossley orphan home and school. Technical schools are maintained by the corporation. Among other public buildings may be noted the Piece-Hall, erected in 1799 for the lodgment and sale of piece goods, now used as a market, a great quadrangular structure occupying more than two acres; the bonding warehouse, court-house, and mechanics' institute. There are six parks, of which the People's Park of 12½ acres, presented by Sir Francis Crossley in 1858, is laid out in ornate style from designs by Sir Joseph Paxton.

Halifax ranks with Leeds, Bradford and Huddersfield as a seat of the woollen and worsted manufacture. The manufacture of carpets is a large industry, one establishment employing some

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5000 hands. The worsted, woollen and cotton industries, and the iron, steel and machinery manufactures are very extensive. There are collieries and freestone quarries in the neighbourhood.

The parliamentary borough returns two members. The county borough was created in 1888. The municipal borough is under a mayor, 15 aldermen and 45 councillors. Area, 13,967 acres.

At the time of the Conquest Halifax formed part of the extensive manor of Wakefield, which belonged to the king, but in the 13th century was in the hands of John, earl Warrenne (*c.* 1245–1305). The prosperity of the town began with the introduction of the cloth trade in the 15th century, when there are said to have been only thirteen houses, which before the end of the 16th century had increased to 520. Camden, about the end of the 17th century, wrote that "the people are very industrious, so that though the soil about it be barren and improfitable, not fit to live on, they have so flourished . . . by the clothing trade that they are very rich and have gained a reputation for it above their neighbours." The trade is said to have been increased by the arrival of certain merchants driven from the Netherlands by the persecution of the duke of Alva. Among the curious customs of Halifax was the Gibbet Law, which was probably established by a prescriptive right to protect the wool trade, and gave the inhabitants the power of executing any one taken within their liberty, who, when tried by a jury of sixteen of the frith-burgesses, was found guilty of the theft of any goods of the value of more than 13d. The executions took place on market days on a hill outside the town, the gibbet somewhat resembling a guillotine. The first execution recorded under this law took place in 1541, and the right was exercised in Halifax longer than in any other town, the last execution taking place in 1650. In 1635 the king granted the inhabitants of Halifax licence to found a workhouse in a large house given to them for that purpose by Nathaniel Waterhouse, and incorporated them under the name of the master and governors. Nathaniel Waterhouse was appointed the first master, his successors being elected every year by the twelve governors from among themselves. Halifax was a borough by prescription, its privileges growing up with the increased prosperity brought by the cloth trade, but it was not incorporated until 1848. Since the Reform Act of 1832 the burgesses have returned two members to parliament. In 1607 David Waterhouse, lord of the manor of Halifax, obtained a grant of two markets there every week on Friday and Saturday and two fairs every year, each lasting three days, one beginning on the 24th of June, the other on the 11th of November. Later these fairs and markets were confirmed with the addition of an extra market on Thursday to Sir William Aylosse, baronet, who had succeeded David Waterhouse as lord of the manor. The market rights were sold to the Markets Company in 1810 and purchased from them by the corporation in 1853.

During the Civil War Halifax was garrisoned by parliament, and a field near it is still called the Bloody Field on account of an engagement which took place there between the forces of parliament and the Royalists.

See *Victoria County History*, "Yorkshire"; T. Wright, *The Antiquities of the Town of Halifax* (Leeds, 1738); John Watson, *The History and Antiquities of the Parish of Halifax* (London, 1775); John Crabtree, *A Concise History of the Parish and Vicarage of Halifax* (Halifax and London, 1836).

ḤALIṢAH (Hebrew, חליצה "untying"), the ceremony by which a Jewish widow releases her brother-in-law from the obligation to marry her in accordance with Deuteronomy xxv. 5-10, and obtains her own freedom to remarry. By the law of Moses it became obligatory upon the brother of a man dying childless to take his widow as wife. If he refused, "then shall his brother's wife come unto him in the presence of the elders and loose his shoe from off his foot, and spit in his face, and shall answer and say, So shall it be done unto that man that will not build up his brother's house." By Rabbinical law the ceremony was later made more complex. The parties appear before a court of three elders with two assessors. The place is usually the synagogue house, or that of the Rabbi, sometimes that of the widow. After inquiry as to the relationship of the parties and their status (for if either be a minor or deformed, ḥaliṣah cannot take place), the shoe is produced. It is usually the property of the community and made entirely of leather from the skin of a "clean" animal. It is of two pieces, the upper part and the sole, sewn together with leathern threads. It has three small straps in front, and two white straps to bind it on the leg. After it is strapped on, the man must walk four cubits in the presence of the court. The widow then loosens and removes the shoe, throwing it some distance, and spits on the ground, repeating thrice the Biblical formula "So shall it be done," &c. Ḥaliṣah, which is still common among orthodox Jews, must not take place on the Sabbath, a holiday, or the eve of either, or in the evening. To prevent brothers-in-law from extorting money from a widow as a price for releasing her from perpetual widowhood, Jewish law obliges all brothers at the time of a marriage to sign a document pledging themselves to submit to ḥaliṣah without payment. (Compare LEVIRATE).

HALKETT, HUGH, FREIHERR VON (1783–1863), British soldier and general of infantry in the Hanoverian service, was the second son of Major-General F. G. Halkett, who had served many years in the army, and whose ancestors had for several generations distinguished themselves in foreign services. With the "Scotch Brigade" which his father had been largely instrumental in raising, Hugh Halkett served in India from 1798 to 1801. In 1803 his elder brother Colin was appointed to command a battalion of the newly formed King's German Legion, and in this he became senior captain and then major. Under his brother's command he served with Cathcart's expeditions to Hanover, Rügen and Copenhagen, where his bold initiative on outpost duty won commendation. He was in the Peninsula in 1808–1809, and at Walcheren. At Albuera, Salamanca, &c., he commanded the 2nd Light Infantry Battalion, K.G.L., in succession to his brother, and at Venta del Pozo in the Burgos retreat he greatly distinguished himself. In 1813 he left the Peninsula and was subsequently employed in the organization of the new Hanoverian army. He led a brigade of these troops in Count Wallmoden's army, and bore a marked part in the battle of Göhrde and the action of Schestedt, where he took with his own hand a Danish standard. In the Waterloo campaign he commanded two brigades of Hanoverian militia which were sent to the front with the regulars, and during the fight with the Old Guard captured General Cambronne. After the fall of Napoleon he elected to stay in the Hanoverian service, though he retained his half-pay lieutenant-colonelcy in the English army. He rose to be general and inspector-general of infantry. In his old age he led the Xth Federal Army Corps in the Danish War of 1848, and defeated the Danes at Oversee. He had the G.C.H., the C.B. and many foreign orders, including the Prussian order of the Black Eagle and *pour le Mérite* and the Russian St Anne.

See Knesebeck, *Leben des Freiherrn Hugh von Halkett* (Stuttgart, 1865).

His brother, SIR COLIN HALKETT (1774–1856), British soldier, began his military career in the Dutch Guards and served in various "companies" for three years, leaving as a captain in 1795. From 1800 to the peace of Amiens he served with the Dutch troops in English pay in Guernsey. In August 1803 Halkett was one of the first officers assigned to the service of raising the King's German Legion, and he became major, and later lieutenant-colonel, commanding the 2nd Light Infantry Battalion. His battalion was employed in the various expeditions mentioned above, from Hanover to Walcheren, and in 1811 Colin Halkett succeeded Charles Alten in the command of the Light Brigade, K.G.L., which he held throughout the Peninsula War from Albuera to Toulouse. In 1815 Major-General Sir Colin Halkett commanded the 5th British Brigade of Alten's division, and at Waterloo he received four wounds. Unlike his brother, he remained in the British service, in which he rose to general. At the time of his death he was governor of Chelsea

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hospital. He had honorary general's rank in the Hanoverian service, the G.C.B. and G.C.H., as well as numerous foreign orders.

For information about both the Halketts, see Beamish, *History of the King's German Legion* (1832).

HALL, BASIL (1788–1844), British naval officer, traveller and miscellaneous writer, was born at Edinburgh on the 31st of December 1788. His father was Sir James Hall of Dunglass, the geologist. Basil Hall was educated at the High School, Edinburgh, and in 1802 entered the navy, where he rose to the rank of post-captain in 1817, after seeing active service in several fields. By observing the ethnological as well as the physical peculiarities of the countries he visited, he collected the materials for a very large number of scientific papers. In 1816 he commanded the sloop "Lyra," which accompanied Lord Amherst's embassy to China; and he described his cruise in *An Account of a Voyage of Discovery to the West Coast of Corea and the Great Loo-choo Island in the Japan Sea* (London, 1818). In 1820 he held a command on the Pacific coast of America, and in 1824 published two volumes of *Extracts from a Journal written on the Coasts of Chili, Peru and Mexico in the Years 1820–21–22*. Retiring on half-pay in 1824, Hall in 1825 married Margaret, daughter of Sir John Hunter, and in her company travelled (1827–1828) through the United States. In 1829 he published his *Travels in North America in the Years 1827 and 1828*, which was assailed by the American press for its views of American society. *Schloss Hainfeld, or a Winter in Lower Styria* (1836), is partly a romance, partly a description of a visit paid by the author to the castle of the countess Purgstall. *Spain and the Seat of War in Spain* appeared in 1837. The *Fragments of Voyages and Travels* (9 vols.) were issued in three detachments between 1831 and 1840. Captain Hall was a fellow of the Royal Societies of London and Edinburgh, and of the Royal Astronomical, Royal Geographical and Geological Societies. His last work, a collection of sketches and tales under the name of *Patchwork* (1841), had not been long published before its author became insane, and he died in Haslar hospital, Portsmouth, on the 11th of September 1844.

HALL, CARL CHRISTIAN (1812–1888), Danish statesman, son of the highly respected artisan and train-band colonel Mads Hall, was born at Christianshavn on the 25th of February 1812. After a distinguished career at school and college, he adopted the law as his profession, and in 1837 married the highly gifted but eccentric Augusta Marie, daughter of the philologist Peter Olaf Bröndsted. A natural conservatism indisposed Hall at first to take any part in the popular movement of 1848, to which almost all his friends had already adhered; but the moment he was convinced of the inevitability of popular government, he resolutely and sympathetically followed in the new paths. Sent to the *Rigsforsamling* of 1848 as member for the first district of Copenhagen, a constituency he continued to represent in the *Folketing* till 1881, he immediately took his place in the front rank of Danish politicians. From the first he displayed rare ability as a debater, his inspiring and yet amiable personality attracted hosts of admirers, while his extraordinary tact and temper disarmed opposition and enabled him to mediate between extremes without ever sacrificing principles.

Hall was not altogether satisfied with the fundamental law of June; but he considered it expedient to make the best use possible of the existing constitution and to unite the best conservative elements of the nation in its defence. The aloofness and sulkiness of the aristocrats and landed proprietors he deeply deplored. Failing to rally them to the good cause he determined anyhow to organize the great cultivated middle class into a political party. Hence the "June Union," whose programme was progress and reform in the spirit of the constitution, and at the same time opposition to the one-sided democratism and party-tyranny of the *Bondevenner* or peasant party. The "Union" exercised an essential influence on the elections of 1852, and was, in fact, the beginning of the national Liberal party, which found its natural leader in Hall. During the years 1852–1854 the burning question of the day was the connexion between the various parts of the monarchy. Hall was "eider-dansk" by conviction. He saw in the closest possible union between the kingdom and a Schleswig freed from all risk of German interference the essential condition for Denmark's independence; but he did not think that Denmark was strong enough to carry such a policy through unsupported, and he was therefore inclined to promote it by diplomatic means and international combinations, and strongly opposed to the Conventions of 1851–1852 (See DENMARK: *History*), though he was among the first, subsequently, to accept them as an established fact and the future basis for Denmark's policy.

Hall first took office in the Bang administration (12th of December 1854) as minister of public worship. In May 1857 he became president of the council after Andrae, Bang's successor, had retired, and in July 1858 he exchanged the ministry of public worship for the ministry of foreign affairs, while still retaining the premiership.

Hall's programme, "den Konstitutionelle Helstat," *i.e.* a single state with a common constitution, was difficult enough in a monarchy which included two nationalities, one of which, to a great extent, belonged to a foreign and hostile jurisdiction. But as this political monstrosity had already been guaranteed by the Conventions of 1851–1852, Hall could not rid himself of it, and the attempt to establish this "Helstat" was made accordingly by the Constitution of the 13th of November 1863. The failure of the attempt and its disastrous consequences for Denmark are described elsewhere. Here it need only be said that Hall himself soon became aware of the impossibility of the "Helstat," and his whole policy aimed at making its absurdity patent to Europe, and substituting for it a constitutional Denmark to the Eider which would be in a position to come to terms with an independent Holstein. That this was the best thing possible for Denmark is absolutely indisputable, and "the diplomatic Seven Years' War" which Hall in the meantime conducted with all the powers interested in the question is the most striking proof of his superior statesmanship. Hall knew that in the last resort the question must be decided not by the pen but by the sword. But he relied, ultimately, on the protection of the powers which had guaranteed the integrity of Denmark by the treaty of London, and if words have any meaning at all he had the right to expect at the very least the armed support of Great Britain.[1] But the great German powers and the force of circumstances proved too strong for him. On the accession of the new king, Christian IX., Hall resigned rather than repeal the November Constitution, which gave Denmark something to negotiate upon in case of need. But he made matters as easy as he could for his successors in the Monrad administration, and the ultimate catastrophe need not have been as serious as it was had his advice, frankly given, been intelligently followed.

After 1864 Hall bore more than his fair share of the odium and condemnation which weighed so heavily upon the national Liberal party, making no attempt to repudiate responsibility and refraining altogether from attacking patently unscrupulous opponents. But his personal popularity suffered not the slightest diminution, while his clear, almost intuitive, outlook and his unconquerable faith in the future of his country made him, during those difficult years, a factor of incalculable importance in the public life of Denmark. In 1870 he joined the Holstein-Holsteinborg ministry as minister of public worship, and in that capacity passed many useful educational reforms, but on the fall of the administration, in 1873, he retired altogether from public life. In the summer of 1879 Hall was struck down by apoplexy, and for the remaining nine years of his life he was practically bedridden. He died on the 14th of August 1888. In politics Hall was a practical, sagacious "opportunist," in the best sense of that much abused word, with an eye rather for things than for persons. Moreover, he had no very pronounced political ambition, and was an utter stranger to that longing for power, which drives so many men of talent to adopt extreme expedients. His urbanity and perfect

[1] On this head see the 3rd marquess of Salisbury's *Political Essays*, reprinted from the *Quarterly Review*.

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equilibrium at the very outset incited sympathy, while his wit and humour made him the centre of every circle within which he moved.

See Vilhelm Christian Sigurd Topsöe, *Polit. Portraetstudier* (Copenhagen, 1878); Scholler Parelius Vilhelm Birkedal, *Personlige Oplevelser* (Copenhagen, 1890–1891). (R. N. B.)

HALL, CHARLES FRANCIS (1821–1871), American Arctic explorer, was born at Rochester, New Hampshire. After following the trade of blacksmith he became a journalist in Cincinnati; but his enthusiasm for Arctic exploration led him in 1859 to volunteer to the American Geographical Society to "go in search for the bones of Franklin." With the proceeds of a public subscription he was equipped for his expedition and sailed in May 1860 on board a whaling vessel. The whaler being ice-bound, Hall took up his abode in the regions to the north of Hudson Bay, where he found relics of Frobisher's 16th-century voyages, and living with the Eskimo for two years he acquired a considerable knowledge of their habits and language. He published an account of these experiences under the title of *Arctic Researches, and Life among the Esquimaux* (1864). Determined, however, to learn more about the fate of the Franklin expedition he returned to the same regions in 1864, and passing five years among the Eskimo was successful in obtaining a number of Franklin relics, as well as information pointing to the exact fate of 76 of the crew, whilst also performing some geographical work of interest. In 1871 he was given command of the North Polar expedition fitted out by the United States Government in the "Polaris." Making a remarkably rapid passage up Smith Sound at the head of Baffin Bay, which was found to be ice-free, the "Polaris" reached on the 30th of August the lat. of 82° 11′, at that time, and until the English expedition of 1876 the highest northern latitude attained by vessel. The expedition went into winter quarters in a sheltered cove on the Greenland coast. On the 24th of October, Hall on his return from a successful sledge expedition to the north was suddenly seized by an illness of which he died on the 8th of November. Capt. S. O. Buddington (1823–1888) assumed command, and although the "Polaris" was subsequently lost after breaking out of the ice, with only part of the crew aboard, the whole were ultimately rescued, and the scientific results of the expedition proved to be of considerable importance.

HALL, CHRISTOPHER NEWMAN (1816–1902), English Nonconformist divine, was born at Maidstone on the 22nd of May 1816. His father was John Vine Hall, proprietor and printer of the *Maidstone Journal*, and the author of a popular evangelical work called *The Sinner's Friend*. Christopher was educated at University College, London, and took the London B.A. degree. His theological training was gained at Highbury College, whence he was called in 1842 to his first pastorate at the Albion Congregational Church, Hull. During the twelve years of his ministry there the membership was greatly increased, and a branch chapel and school were opened. At Hull Newman Hall first began his active work in temperance reform, and in defence of his position wrote *The Scriptural Claims of Teetotalism*. In 1854 he accepted a call to Surrey chapel, London, founded in 1783 by the Rev. Rowland Hill. A considerable sum had been bequeathed by Hill for the perpetuation of his work on the expiration of the lease; but, owing to some legal flaw in the will, the money was not available, and Newman Hall undertook to raise the necessary funds for a new church. By weekly offertories and donations the money for the beautiful building called Christ Church at the junction of the Kennington and Westminster Bridge Roads was collected, and within four years of opening (1876) the total cost (£63,000) was cleared. In 1897 Newman Hall resigned his charge and devoted himself to general evangelical work. Most of his writings are small booklets or tracts of a distinctly evangelical character. The best known of these is *Come to Jesus*, of which over four million copies have been circulated in forty different languages. Newman Hall visited the United States during the Civil War, and did much to promote a friendly understanding between England and America. A Liberal in politics, and a keen admirer of John Bright, few preachers of any denomination have exercised so far-reaching an influence as the "Dissenters' Bishop," as he came to be termed. He died on the 18th of February 1902.

See his *Autobiography* (1898); obituary notice in *The Congregational Year Book* for 1903.

HALL, EDWARD (*c.* 1498–1547), English chronicler and lawyer, was born about the end of the 15th century, being a son of John Hall of Northall, Shropshire. Educated at Eton and King's College, Cambridge, he became a barrister and afterwards filled the offices of common sergeant of the city of London and judge of the sheriff's court. He was also member of parliament for Bridgnorth. Hall's great work, *The Union of the Noble and Illustre Famelies of Lancastre and York*, commonly called *Hall's Chronicle*, was first published in 1542. Another edition was issued by Richard Grafton in 1548, the year after Hall's death, and another in 1550; these include a continuation from 1532 compiled by Grafton from the author's notes. In 1809 an edition was published under the supervision of Sir Henry Ellis, and in 1904 the part dealing with the reign of Henry VIII. was edited by C. Whibley. The *Chronicle* begins with the accession of Henry IV. to the English throne in 1399; it follows the strife between the houses of Lancaster and York, and with Grafton's continuation carries the story down to the death of Henry VIII. in 1547. Hall presents the policy of this king in a very favourable light and shows his own sympathy with the Protestants. For all kinds of ceremonial he has all a lawyer's respect, and his pages are often adorned and encumbered with the pageantry and material garniture of the story. The value of the *Chronicle* in its early stages is not great, but this increases when dealing with the reign of Henry VII. and is very considerable for the reign of Henry VIII. Moreover, the work is not only valuable, it is attractive. To the historian it furnishes what is evidently the testimony of an eye-witness on several matters of importance which are neglected by other narrators; and to the student of literature it has the exceptional interest of being one of the prime sources of Shakespeare's historical plays.

See J. Gairdner, *Early Chroniclers of Europe; England* (1879).

HALL, FITZEDWARD (1825–1901), American Orientalist, was born in Troy, New York, on the 21st of March 1825. He graduated with the degree of civil engineer from the Rensselaer Polytechnic Institute at Troy in 1842, and entered Harvard in the class of 1846; just before his class graduated he left college and went to India in search of a runaway brother. In January 1850 he was appointed tutor, and in 1853 professor of Sanskrit and English, in the government college at Benares; and in 1855 was made inspector of public instruction in Ajmere-Merwara and in 1856 in the Central Provinces. He settled in England in 1862 and received the appointment to the chair of Sanskrit, Hindustani and Indian jurisprudence in King's College, London, and to the librarianship of the India Office. He died at Marlesford, Suffolk, on the 1st of February 1901. Hall was the first American to edit a Sanskrit text, the *Vishnupurāna*; his library of a thousand Oriental MSS. he gave to Harvard University.

His works include: in Sanskrit, *Atmabodha* (1852), *Sānkhyapravachana* (1856), *Sārvasiddhānta* (1859), *Vāsavadattā* (1859), *Sānkhyasāra* (1862) and *Dasarūpa* (1865); in Hindi, Ballantynes' *Hindi Grammar* (1868) and a *Reader* (1870); on English philology, *Recent Exemplifications of False Philology* (1872), attacking Richard Grant White, *Modern English* (1873), "On English Adjectives in -able, with Special Reference to Reliable" (*Am. Jour. Philology*, 1977), *Doctor Indoctus* (1880).

HALL, ISAAC HOLLISTER (1837–1896), American Orientalist, was born in Norwalk, Connecticut, on the 12th of December 1837. He graduated at Hamilton College in 1859, was a tutor there in 1859–1863, graduated at the Columbia Law School in 1865, practised law in New York City until 1875, and in 1875–1877 taught in the Syrian Protestant College at Beirut, where he discovered a valuable Syriac manuscript of the Philoxenian version of a large part of the New Testament, which he published in part in facsimile in 1884. He worked with General di Cesnola in classifying the famous Cypriote collection in the Metropolitan Museum of New York City, and was a curator of that museum from 1885 until his death in Mount Vernon, New York, on the

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2nd of July 1896. He was an eminent authority on Oriental inscriptions. Following the scanty clues given by George Smith and Samuel Birch, and working on the data furnished by the di Cesnola collection, he succeeded about 1874 in deciphering an entire Cypriote inscription, and in establishing the Hellenic character of the dialect and the syllabic nature of the script.

His work in Cypriote epigraphy is described in his articles in *Scribner's Magazine*, vol. 20 (June, 1880), pp. 205-211 and in the *Journal of the American Oriental Society*, vol. 10, No. 2 (1880), pp. 201-218. He published in facsimile the Antilegomena epistles (1886), which he deciphered from the W. F. Williams manuscript, and edited *A Critical Bibliography of the Greek New Testament as Published in America* (1884).

HALL, SIR JAMES (1761–1832), Scottish geologist and physicist, eldest son of Sir John Hall, Bart., was born at Dunglass on the 17th of January 1761; and became distinguished as the first to establish experimental research as an aid to geological investigation. He was intimately acquainted with James Hutton and John Playfair, and having studied rocks in various parts of Europe he was eventually led to accept and to demonstrate the truth of Hutton's views with regard to intrusive rocks. He commenced a series of experiments to illustrate the fusion of rocks, their vitreous and crystalline characters, and the influence of molten rocks in altering adjacent strata. He thus assisted in proving that granitic veins had been injected into overlying deposits after their consolidation. He studied the volcanic rocks in Italy and recognized that the old lava flows and the numerous dikes in Scotland must have had a similar origin. He made further experiments to illustrate the contortions of rocks. The results were brought before the Royal Society of Edinburgh. He died at Edinburgh on the 23rd of June 1832. He represented in parliament (1807–1812) the old borough of Michael in Cornwall; he also wrote an *Essay on the Origin, History and Principles of Gothic Architecture* (1813).

His eldest son, John Hall (1787–1860), who succeeded him, was a Fellow of the Royal Society; the second son, Captain Basil Hall (*q.v.*), was the distinguished traveller; the third son, James Hall (1800–1854), was a painter, art-patron, and a friend of Sir David Wilkie.

HALL, JAMES (1793–1868), American judge and man of letters, was born at Philadelphia on the 19th of August 1793. After for some time prosecuting the study of law, he in 1812 joined the army, and in the war with Great Britain distinguished himself in engagements at Lundy's Lane, Niagara and Fort Erie. At the conclusion of the war he accompanied an expedition against Algiers, but in 1818 he resigned his commission, and continued the study of law at Pittsburg. In 1820 he removed to Shawneetown, Illinois, where he commenced practice at the bar and also edited the *Illinois Gazette*. Soon after he was appointed public prosecutor of the circuit, and in 1824 state circuit judge. In 1827 he became state treasurer, and held that office till 1831, but he continued at the same time his legal practice and also edited the *Illinois Intelligencer*. Subsequently he became editor of the *Western Souvenir*, an annual publication, and of the *Illinois Monthly Magazine*, afterwards the *Western Monthly Magazine*. He died near Cincinnati on the 5th of July 1868.

The following are his principal works:—*Letters from the West*, originally contributed to the *Portfolio*, and collected and published in London in 1828; *Legends of the West* (1832); *The Soldier's Bride and other Tales* (1832); *The Harpe's Head, a Legend of Kentucky* (1833); *Sketches of the West* (2 vols., 1835); *Tales of the Border* (1835); *Notes on the Western States* (1838); *History of the Indian Tribes*, in conjunction with T. L. McKenney (3 vols., 1838–1844); *The Wilderness and the War-Path* (1845); *Romance of Western History* (1857).

HALL, JAMES (1811–1898), American geologist and palaeontologist, was born at Hingham, Massachusetts, on the 12th of September 1811. In early life he became attached to the study of natural history, and he completed his education at the polytechnic Institute at Troy in New York, where he graduated in 1832, and afterwards became professor of chemistry and natural science, and subsequently of geology. In 1836 he was appointed one of the geologists on the Geological Survey of the state of New York, and he was before long charged with the palaeontological work. Eventually he became state geologist and director of the museum of natural history at Albany. His published papers date from 1836, and include numerous reports on the geology and palaeontology of various portions of the United States and Canada. He dealt likewise with physical geology, and in 1850 discussed the connexion between the accumulation of sedimentary deposits and the elevation of mountain-chains. His chief work was the description of the invertebrate fossils of New York—in which he dealt with the graptolites, brachiopods, mollusca, trilobites, echini and crinoids of the Palaeozoic formations. The results were published in a series of quarto volumes entitled *Palaeontology of New York* (1847–1894), in which he was assisted in course of time by R. P. Whitfield and J. M. Clarke. He published also reports on the geology of Oregon and California (1845), Utah (1852), Iowa (1859) and Wisconsin (1862). He received the Wollaston medal from the Geological Society of London in 1858. He was a man of great energy and untiring industry, and in 1897, when in his eighty-sixth year, he journeyed to St Petersburg to take part in the International Geological Congress, and then joined the excursion to the Ural mountains. He died at Albany on the 7th of August 1898.

See *Life and Work of James Hall*, by H. C. Hovey, *Amer. Geol.* xxiii., 1899, p. 137 (portraits).

HALL, JOSEPH (1574–1656), English bishop and satirist, was born at Bristow park, near Ashby de la Zouch, Leicestershire, on the 1st of July 1574. His father, John Hall, was agent in the town for Henry, earl of Huntingdon, and his mother, Winifred Bambridge, was a pious lady, whom her son compared to St Monica. Joseph Hall received his early education at the local school, and was sent (1589) to Emmanuel College, Cambridge. Hall was chosen for two years in succession to read the public lecture on rhetoric in the schools, and in 1595 became fellow of his college. During his residence at Cambridge he wrote his *Virgidemiarum* (1597), satires written after Latin models. The claim he put forward in the prologue to be the earliest English satirist:—

> "I first adventure, follow me who list
> And be the second English satirist"—

gave bitter offence to John Marston, who attacks him in the satires published in 1598. The archbishop of Canterbury gave an order (1599) that Hall's satires should be burnt with works of John Marston, Marlowe, Sir John Davies and others on the ground of licentiousness, but shortly afterwards Hall's book, certainly unjustly condemned, was ordered to be "staied at the press," which may be interpreted as reprieved (see *Notes and Queries*, 3rd series, xii. 436). Having taken holy orders, Hall was offered the mastership of Blundell's school, Tiverton, but he refused it in favour of the living of Halsted, Essex, to which he was presented (1601) by Sir Robert Drury. In his parish he had an opponent in a Mr Lilly, whom he describes as "a witty and bold atheist." In 1603 he married; and in 1605 he accompanied Sir Edmund Bacon to Spa, with the special aim, he says, of acquainting himself with the state and practice of the Romish Church. At Brussels he disputed at the Jesuit College on the authentic character of modern miracles, and his inquiring and argumentative disposition more than once threatened to produce serious results, so that his patron at length requested him to abstain from further discussion. His devotional writings had attracted the notice of Henry, prince of Wales, who made him one of his chaplains (1608). In 1612 Lord Denny, afterwards earl of Norwich, gave him the curacy of Waltham-Holy-Cross, Essex, and in the same year he received the degree of D.D. Later he received the prebend of Willenhall in the collegiate church of Wolverhampton, and in 1616 he accompanied James Hay, Lord Doncaster, afterwards earl of Carlisle, to France, where he was sent to congratulate Louis XIII. on his marriage, but Hall was compelled by illness to return. In his absence the king nominated him dean of Worcester, and in 1617 he accompanied James to Scotland, where he defended the five points of ceremonial which the king desired to impose upon the Scots. In the next year he was one of the English

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deputies at the synod of Dort. In 1624 he refused the see of Gloucester, but in 1627 became bishop of Exeter.

He took an active part in the Arminian and Calvinist controversy in the English church. He did his best in his *Via media, The Way of Peace*, to persuade the two parties to accept a compromise. In spite of his Calvinistic opinions he maintained that to acknowledge the errors which had arisen in the Catholic Church did not necessarily imply disbelief in her catholicity, and that the Church of England having repudiated these errors should not deny the claims of the Roman Catholic Church on that account. This view commended itself to Charles I. and his episcopal advisers, but at the same time Archbishop Laud sent spies into Hall's diocese to report on the Calvinistic tendencies of the bishop and his lenience to the Puritan and low-church clergy. Hall says he was thrice down on his knees to the King to answer Laud's accusations and at length threatened to "cast up his rochet" rather than submit to them. He was, however, amenable to criticism, and his defence of the English Church, entitled *Episcopacy by Divine Right* (1640), was twice revised at Laud's dictation. This was followed by *An Humble Remonstrance to the High Court of Parliament* (1640 and 1641), an eloquent and forceful defence of his order, which produced a retort from the syndicate of Puritan divines, who wrote under the name of "Smectymnuus," and was followed by a long controversy to which Milton contributed five pamphlets, virulently attacking Hall and his early satires.

In 1641 Hall was translated to the see of Norwich, and in the same year sat on the Lords' Committee on religion. On the 30th of December he was, with other bishops, brought before the bar of the House of Lords to answer a charge of high treason of which the Commons had voted them guilty. They were finally convicted of an offence against the Statute of Praemunire, and condemned to forfeit their estates, receiving a small maintenance from the parliament. They were immured in the Tower from New Year to Whitsuntide, when they were released on finding bail for £5000 each. On his release Hall proceeded to his new diocese at Norwich, the revenues of which he seems for a time to have received, but in 1643, when the property of the "malignants" was sequestrated, Hall was mentioned by name. Mrs Hall had difficulty in securing a fifth of the maintenance (£400) assigned to the bishop by the parliament; they were eventually ejected from the palace, and the cathedral was dismantled. Hall retired to the village of Higham, near Norwich, where he spent the time preaching and writing until "he was first forbidden by man, and at last disabled by God." He bore his many troubles and the additional burden of much bodily suffering with sweetness and patience, dying on the 8th of September 1656. Thomas Fuller says: "He was commonly called our English Seneca, for the pureness, plainness, and fulness of his style. Not unhappy at *Controversies*, more happy at *Comments*, very good in his *Characters*, better in his *Sermons*, best of all in his *Meditations*."

Bishop Hall's polemical writings, although vigorous and effective, were chiefly of ephemeral interest, but many of his devotional writings have been often reprinted. It is by his early work as the censor of morals and the unsparing critic of contemporary literary extravagance and affectation that he is best known. *Virgidemiarum. Sixe Bookes. First three Bookes. Of Toothiesse Satyrs.* (1) *Poeticall.* (2) *Academicall*, (3) *Morall* (1597) was followed by an amended edition in 1598, and in the same year by *Virgidemiarum. The three last bookes. Of byting Satyres* (reprinted 1599). His claim to be reckoned the earliest English satirist, even in the formal sense, cannot be justified. Thomas Lodge, in his *Fig for Momus* (1593), had written four satires in the manner of Horace, and John Marston and John Donne both wrote satires about the same time, although the publication was in both cases later than that of *Virgidemiae*. But if he was not the earliest, Hall was certainly one of the best. He writes in the heroic couplet, which he manœuvres with great ease and smoothness. In the first book of his satires (*Poeticall*) he attacks the writers whose verses were devoted to licentious subjects, the bombast of *Tamburlaine* and tragedies built on similar lines, the laments of the ghosts of the *Mirror for Magistrates*, the metrical eccentricities of Gabriel Harvey and Richard Stanyhurst, the extravagances of the sonneteers, and the sacred poets (Southwell is aimed at in "Now good St Peter weeps pure Helicon, And both the Mary's make a music moan"). In Book II. Satire 6 occurs the well-known description of the trencher-chaplain, who is tutor and hanger-on in a country manor. Among his other satirical portraits is that of the famished gallant, the guest of "Duke Humfrey,"[1] Book VI. consists of one long satire on the various vices and follies dealt with in the earlier books. If his prose is sometimes antithetical and obscure, his verse is remarkably free from the quips and conceits which mar so much contemporary poetry.

He also wrote *The King's Prophecie; or Weeping Joy* (1603), a gratulatory poem on the accession of James I.; *Epistles*, both the first and second volumes of which appeared in 1608 and a third in 1611; *Characters of Virtues and Vices* (1608), versified by Nahum Tate (1693); *Solomons Divine Arts* . . . (1609); and, probably *Mundus alter et idem sive Terra Australis antehac semper incognita . . . Iustrata* (1605? and 1607), by "Mercurius Britannicus," translated into English by John Healy (1608) as *The Discovery of a New World or A Description of the South Indies*, hitherto *an English Mercury*. *Mundus alter* is an excuse for a satirical description of London, with some criticism of the Romish church, its manners and customs, and is said to have furnished Swift with hints for *Gulliver's Travels*. It was not ascribed to him by name until 1674, when Thomas Hyde, the librarian of the Bodleian, identified "Mercurius Britannicus" with Joseph Hall. For the question of the authorship of this pamphlet, and the arguments that may be advanced in favour of the suggestion that it was written by Albericus Gentili, see E. A. Petherick, *Mundus alter et idem*, reprinted from the *Gentleman's Magazine* (July 1896). His controversial writings, not already mentioned, include:—*A Common Apology . . . against the Brownists* (1610), in answer to John Robinson's *Censorious Apologie*; *The Olde Religion: A Treatise, wherein is laid downe the true state of the difference betwixt the Reformed and the Romane Church; and the blame of this schisme is cast upon the true Authors* . . . (1628); *Columba Noae olivam adferens* . . . , a sermon preached at St Paul's in 1632; *Remedies against the Plague* (1640); *A Short Answer to the Vindication of Smectymnuus* (1641); *A Modest Confutation of* . . . (*Milton's*) *Animadversions* (1642).

His devotional works include:—*Holy Observations Lib. I. Some few of David's Psalmes Metaphrased* (1607 and 1609); three centuries of *Meditations and Vowes, Diuine and Morall* (1606, 1607, 1609), edited by Charles Sayle (1901); *The Arte of Diuine Meditation* (1607); *Heaven upon Earth, or of True Peace and Tranquillitie of Mind* (1606), reprinted with some of his letters in John Wesley's *Christian Library*, vol. xiv.; (1608); *Occasional Meditations* . . . (1633), edited by his son Robert Hall; *Henochisme; or a Treatise showing how to walk with God* (1639), translated from Bishop Hall's Latin by Moses Wall; *The Devout Soul; or Rules of Heavenly Devotion* (1644), often since reprinted; *The Balm of Gilead, Divine and Morall* (1646); *Christ Mystical; or the blessed union of Christ and his Members* (1647), of which General Gordon was a student (reprinted from Gordon's copy, 1893); *Susurrium cum Deo* (1659); *The Great Mysterie of Godliness* (1630); *Resolutions and Decisions of Divers Practicall cases of Conscience* (1649, 1650, 1654).

AUTHORITIES.—The chief authority for Hall's biography is to be found in his autobiographical tracts: *Observations of some Specialities of Divine Providence in the Life of Joseph Hall, Bishop of Norwich, Written with his own hand*; and his *Hard Measure*, a tract of which may be consulted in Dr Christopher Wordsworth's *Ecclesiastical Biography*. The best criticism of his satires is to be found in Thomas Warton's *History of English Poetry*, vol. iv. pp. 363-409 (ed. Hazlitt, 1871), where a comparison is instituted between Marston and Hall. In 1615 Hall published *A Recollection of such treatises as have been . . . published* . . . (1615, 1617, 1621); in 1625 appeared his *Works* (reprinted 1627, 1628, 1634, 1662). The first complete *Works* appeared in 1808, edited by the Rev. Josiah Pratt. Other editions are by Peter Hall (1837) and by Philip Wynter (1863). See also *Bishop Hall, his Life and Times* (1826), by Rev. John Jones; *Life of Joseph Hall*, by Rev. George Lewis (1886); A. B. Grosart, *The Complete Poems of Joseph Hall . . . with introductions, &c.* (1879); *Satires, &c. Chiefly English Poets*, ed. S. W. Singer, 1824). Many of Hall's works were translated into French, and some into Dutch, and there have been numerous selections from his devotional works.

HALL, MARSHALL (1790–1857), English physiologist, was born on the 18th of February 1790, at Basford, near Nottingham, where his father, Robert Hall, was a cotton manufacturer. Having attended the Rev. J. Blanchard's academy at Nottingham, he entered a chemist's shop at Newark, and in 1809 began to study medicine at Edinburgh University. In 1811 he was elected senior president of the Royal Medical Society; the following year he took the M.D. degree, and was immediately appointed resident house physician to the Royal Infirmary, Edinburgh. This appointment he resigned after two years, when he visited Paris and its medical schools, and, on a walking

[1] The tomb of Sir John Beauchamp (d. 1358) in old St Paul's was commonly known, in error, as that of Duke Humphrey of Gloucester. "To dine with Duke Humphrey" was to go hungry among the debtors and beggars who frequented "Duke Humphrey's Walk" in the cathedral.

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tour, those also of Berlin and Göttingen. In 1817, when he settled at Nottingham, he published his *Diagnosis*, and in 1818 he wrote the *Mimoses*, a work on the affections denominated bilious, nervous, &c. The next year he was elected a fellow of the Royal Society of Edinburgh, and in 1825 he became physician to the Nottingham general hospital. In 1826 he removed to London, and in the following year he published his *Commentaries* on the more important diseases of females. In 1830 he issued his *Observations on Blood-letting, founded on researches on the morbid and curative effects of loss of blood*, which were acknowledged by the medical profession to be of vast practical value, and in 1831 his *Experimental Essay on the Circulation of the Blood in the Capillary Vessels*, in which he showed that the blood-channels intermediate between arteries and veins serve the office of bringing the fluid blood into contact with the material tissues of the system. In the following year he read before the Royal Society a paper "On the inverse ratio which subsists between Respiration and Irritability in the Animal Kingdom." His most important work in physiology was concerned with the theory of reflex action, embodied in a paper "On the reflex Function of the Medulla Oblongata and the Medulla Spinalis" (1832), which was supplemented in 1837 by another "On the True Spinal Marrow, and the Excito-motor System of Nerves." The "reflex function" excited great attention on the continent of Europe, though in England some of his papers were refused publication by the Royal Society. Hall thus became the authority on the multiform deranged states of health referable to an abnormal condition of the nervous system, and he gained a large practice. His "ready method" for resuscitation in drowning and other forms of suspended respiration has been the means of saving innumerable lives. He died at Brighton of a throat affection, aggravated by lecturing, on the 11th of August 1857.

A list of his works and details of his "ready method," &c., are given in his *Memoirs* by his widow (London, 1861).

HALL, ROBERT (1764–1831), English Baptist divine, was born on the 2nd of May 1764, at Arnesby near Leicester, where his father, Robert Hall (1728–1791), a man whose cast of mind in some respects resembled closely that of the son, was pastor of a Baptist congregation. Robert was the youngest of a family of fourteen. While still at the dame's school his passion for books absorbed the greater part of his time, and in the summer it was his custom after school hours to retire to the churchyard with a volume, which he continued to peruse there till nightfall, making out the meaning of the more difficult words with the help of a pocket dictionary. From his sixth to his eleventh year he attended the school of Mr Simmons at Wigston, a village four miles from Arnesby. There his precocity assumed the exceptional form of an intense interest in metaphysics, partly perhaps on account of the restricted character of his father's library; and before he was nine years of age he had read and re-read Jonathan Edwards's *Treatise on the Will* and Butler's *Analogy*. This incessant study at such an early period of life seems, however, to have had an injurious influence on his health. After he left Mr Simmons's school his appearance was so sickly as to awaken fears of the presence of phthisis. In order, therefore, to obtain the benefit of a change of air, he stayed for some time in the house of a gentleman near Kettering, who with an impropriety which Hall himself afterwards referred to as "egregious," prevailed upon the boy of eleven to give occasional addresses at prayer meetings. As his health seemed rapidly to recover, he was sent to a school at Northampton conducted by the Rev. John Ryland, where he remained a year and a half, and "made great progress in Latin and Greek." On leaving school he for some time studied divinity under the direction of his father, and in October 1778 he entered the Bristol academy for the preparation of students for the Baptist ministry. Here the self-possession which had enabled him in his twelfth year to address unfalteringly various audiences of grown-up people seems to have strangely forsaken him; for when, in accordance with the arrangements of the academy, his turn came to deliver an address in the vestry of Broadmead chapel, he broke down on two separate occasions and was unable to finish his discourse. On the 13th of August 1780 he was set apart to the ministry, but he still continued his studies at the academy; and in 1781, in accordance with the provisions of an exhibition which he held, he entered King's College, Aberdeen, where he took the degree of master of arts in March 1785. At the university he was without a rival of his own standing in any of the classes, distinguishing himself alike in classics, philosophy and mathematics. He there formed the acquaintance of Mackintosh (afterwards Sir James), who, though a year his junior in age, was a year his senior as a student. While they remained at Aberdeen the two were inseparable, reading together the best Greek authors, especially Plato, and discussing, either during their walks by the sea-shore and the banks of the Don or in their rooms until early morning, the most perplexed questions in philosophy and religion.

During the vacation between his last two sessions at Aberdeen, Hall acted as assistant pastor to Dr Evans at Broadmead chapel, Bristol, and three months after leaving the university he was appointed classical tutor in the Bristol academy, an office which he held for more than five years. Even at this period his extraordinary eloquence had excited an interest beyond the bounds of the denomination to which he belonged, and when he preached the chapel was generally crowded to excess, the audience including many persons of intellectual tastes. Suspicions in regard to his orthodoxy having in 1789 led to a misunderstanding with his colleague and a part of the congregation, he in July 1790 accepted an invitation to make trial of a congregation at Cambridge, of which he became pastor in July of the following year. From a statement of his opinions contained in a letter to the congregation which he left, it would appear that, while a firm believer in the proper divinity of Christ, he had at this time disowned the cardinal principles of Calvinism—the federal headship of Adam, and the doctrine of absolute election and reprobation; and that he was so far a materialist as to "hold that man's thinking powers and faculties are the result of a certain organization of matter, and that after death he ceases to be conscious till the resurrection." It was during his Cambridge ministry, which extended over a period of fifteen years, that his oratory was most brilliant and most immediately powerful. At Cambridge the intellectual character of a large part of the audience supplied a stimulus which was wanting at Leicester and Bristol.

His first published compositions had a political origin. In 1791 appeared *Christianity consistent with the Love of Freedom*, in which he defended the political conduct of dissenters against the attacks of the Rev. John Clayton, minister of Weighhouse, and gave eloquent expression to his hopes of great political and social ameliorations as destined to result nearly or remotely from the subversion of old ideas and institutions in the maelstrom of the French Revolution. In 1793 he expounded his political sentiments in a powerful and more extended pamphlet entitled an *Apology for the Freedom of the Press*. On account, however, of certain asperities into which the warmth of his feelings had betrayed him, and his conviction that he had treated his subject in too superficial a manner, he refused to permit the publication of the pamphlet beyond the third edition, until the references of political opponents and the circulation of copies without his sanction induced him in 1821 to prepare a new edition, from which he omitted the attack on Bishop Horsley, and to which he prefixed an advertisement stating that his political opinions had undergone no substantial change. His other publications while at Cambridge were three sermons—*On Modern Infidelity* (1801), *Reflections on War* (1802), and *Sentiments proper to the present Crisis* (1803). He began, however, to suffer from mental derangement in November 1804. He recovered so speedily that he was able to resume his duties in April 1805, but a recurrence of the malady rendered it advisable for him on his second recovery to resign his pastoral office in March 1806.

On leaving Cambridge he paid a visit to his relatives in Leicestershire, and then for some time resided at Enderby, preaching occasionally in some of the neighbouring villages.

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Latterly he ministered to a small congregation in Harvey Lane, Leicester, from whom at the close of 1806 he accepted a call to be their stated pastor. In the autumn of 1807 he changed his residence from Enderby to Leicester, and in 1808 he married the servant of a brother minister. His proposal of marriage had been made after an almost momentary acquaintance, and, according to the traditionary account, in very abrupt and peculiar terms; but, judging from his subsequent domestic life, his choice did sufficient credit to his penetration and sagacity. His writings at Leicester embraced various tracts printed for private circulation; a number of contributions to the *Eclectic Review*, among which may be mentioned his articles on "Foster's Essays" and on "Zeal without Innovation"; several sermons, including those *On the Advantages of Knowledge to the Lower Classes* (1810), *On the Death of the Princess Charlotte* (1817), and *On the Death of Dr Ryland* (1825); and his pamphlet on *Terms of Communion*, in which he advocated intercommunion with all those who acknowledged the "essentials" of Christianity. In 1819 he published an edition in one volume of his sermons formerly printed. On the death of Dr Ryland, Hall was invited to return to the pastorate of Broadmead chapel, Bristol, and as the peace of the congregation at Leicester had been to some degree disturbed by a controversy regarding several cases of discipline, he resolved to accept the invitation, and removed there in April 1826. The malady of renal calculus had for many years rendered his life an almost continual martyrdom, and henceforth increasing infirmities and sufferings afflicted him. Gradually the inability to take proper exercise, by inducing a plethoric habit of body and impeding the circulation, led to a diseased condition of the heart, which resulted in his death on the 21st of February 1831. He is remembered as a great pulpit orator, of a somewhat laboured, rhetorical style in his written works, but of undeniable vigour in his spoken sermons.

See *Works of Robert Hall, A.M., with a Brief Memoir of his Life, by Olinthus Gregory, LL.D., and Observations on his Character as Preacher by John Foster*, originally published in 6 vols. (London, 1832); *Reminiscences of the Rev. Robert Hall, A.M.*, by John Greene, (London, 1832); *Biographical Recollections of the Rev. Robert Hall*, by J. W. Morris (1838); *Fifty Sermons of Robert Hall from Notes taken at the time of their Delivery*, by the Rev. Thomas Grinfield, M.A. (1843); *Reminiscences of College Life in Bristol during the Ministry of the Rev. Robert Hall, A.M.*, by Frederick Trestrail (1879).

HALL, SAMUEL CARTER (1800–1889), English journalist, was born at Waterford on the 9th of May 1800, the son of an army officer. In 1821 he went to London, and in 1823 became a parliamentary reporter. From 1826 to 1837 he was editor of a great number and variety of public prints, and in 1830 he founded and edited *The Art Journal*. His exposure of the trade in bogus "Old Masters" earned for this publication a considerable reputation. Hall resigned the editorship in 1880, and was granted a Civil List pension "for his long and valuable services to literature and art." He died in London on the 16th of March 1889. His wife, Anna Maria Fielding (1800–1881), became well known as Mrs S. C. Hall, for her numerous novels, sketches of Irish life, and plays. Two of the last, *The Groves of Blarney* and *The French Refugee*, were produced in London with success. She also wrote a number of children's books, and was practically interested in various London charities, several of which she helped to found.

HALL, WILLIAM EDWARD (1833–1894), English writer on international law, was the only child of William Hall, M.D., a descendant of a junior branch of the Halls of Dunglass, and of Charlotte, daughter of William Cotton, F.S.A. He was born on the 22nd of August 1833, at Leatherhead, Surrey, but passed his childhood abroad. Dr Hall having acted as physician to the king of Hanover, and subsequently to the British legation at Naples. Hence, perhaps, the son's taste in after life for art and modern languages. He was educated privately till, at the early age of seventeen, he matriculated at Oxford, where in 1856 he took his degree with a first class in the then recently instituted school of law and history, gaining, three years afterwards, the chancellor's prize for an essay upon "the effect upon Spain of the discovery of the precious metals in America." In 1861 he was called to the bar at Lincoln's Inn, but devoted his time less to any serious attempt to obtain practice than to the study of Italian art, and to travelling over a great part of Europe, always bringing home admirable water-colour drawings of buildings and scenery. He was an early and enthusiastic member of the Alpine Club, making several first ascents, notably that of the Lyskamm. He was always much interested in military matters, and was under fire, on the Danish side, in the war of 1864. In 1867 he published a pamphlet entitled "A Plan for the Reorganization of the Army," and, many years afterwards, he saw as much as he was permitted to see of the expedition sent for the rescue of Gordon. He would undoubtedly have made his mark in the army, but in later life his ideal, which he realized, with much success, first at Llanfihangel in Monmouthshire, and then at Coker Court in Somersetshire, was, as has been said, "the English country gentleman, with cosmopolitan experiences, encyclopaedic knowledge, and artistic feeling." His travels took him to Lapland, Egypt, South America and India. He had done good work for several government offices, in 1871 as inspector of returns under the Elementary Education Act, in 1877 by reports to the Board of Trade upon Oyster Fisheries, in France as well as in England; and all the time was amassing materials for ambitious undertakings upon the history of civilization, and of the colonies. His title to lasting remembrance rests, however, on his strenuous labours in the realm of international law, recognized by his election as *associé* in 1875, and as *membre* in 1882, of the *Institut de Droit International*. In 1874 he published a thin 8vo upon the *Rights and Duties of Neutrals*, and followed it up in 1880 by his *magnum opus*, the *Treatise on International Law*, unquestionably the best book upon the subject in the English language. It is well planned, free from the rhetorical vagueness which has been the besetting vice of older books of a similar character, full of information, and everywhere bearing traces of the sound judgment and statesmanlike views of its author. In 1894 Hall published a useful monograph upon a little-explored topic, "the Foreign Jurisdictions of the British Crown," but on the 30th of November of the same year, while apparently in the fullest enjoyment of bodily as well as mental vigour, he suddenly died. He married, in 1866, Imogen, daughter of Mr (afterwards Mr Justice) Grove, who died in 1886; and in 1891, Alice, daughter of Colonel Hill of Court Hill, Shropshire, but left no issue.

See T. E. Holland in *Law Quarterly Review*, vol. xi. p. 113; and in *Studies in International Law*, p. 302. (T. E. H.)

HALL, or BAD-HALL, a market-place and spa of Austria, in Upper Austria, 25 m. S. of Linz by rail. Pop. (1900) 984. It is renowned for its saline springs, strongly impregnated with iodine and bromine, which are considered very efficacious in scrofulous affections and venereal skin diseases. Although the springs are known since the 8th century, Hall attained its actual importance only since 1855, when the springs became the property of the government. The number of visitors in 1901 was 4300.

HALL (generally known as SCHWÄBISCH-HALL, to distinguish it from the small town of Hall in Tirol and Bad-Hall, a health resort in Upper Austria), a town of Germany, in the kingdom of Württemberg, situated in a deep valley on both sides of the Kocher, and on the railway from Heilbronn to Krailsheim, 35 m. N.E. of Stuttgart. Pop. (1905) 9400. It possesses four Evangelical churches (of which the Michaeliskirche dates from the 15th century and has fine medieval carving), a Roman Catholic church, a handsome town hall and classical and modern schools. A short distance south from the town is the royal castle of Komburg, formerly a Benedictine abbey and now used as a garrison for invalid soldiers, with a church dating from the 12th century. The town is chiefly known for its production of salt, which is converted into brine and piped from Wilhelmsglück mine, 5 m. distant. Connected with the salt-works there is a salt-bath and whey-diet establishment. The industries of the town also include cotton-spinning, iron founding, tanning, and the manufacture of soap, starch, brushes, machines, carriages and metal ware.

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Hall was early of importance on account of its salt-mines, which were held as a fief of the Empire by the so-called *Saltzgrafen* (Salt-graves), of whom the earliest known, the counts of Westheim, had their seat in the castle of Hall. Later the town belonged to the Knights Templars. It was made a free imperial city in 1276 by Rudolph of Habsburg. In 1802 it came into the possession of Württemberg.

HALL (O.E. *heall*, a common Teutonic word, cf. Ger. *Halle*), a term which has two significations in England and is applied sometimes to the manor house, the residence of the lord of the manor, which implied a territorial possession, but more often to the entrance hall of a mansion. In the latter case it was the one large room in the feudal castle up to the middle of the 15th century, when it served as audience chamber, dining-room, and dormitory. The hall was generally a parallelogram on plan, with a raised dais at the farther end, a large bow window on one side, and in one or two cases on both sides. At the entrance end was a passage, which was separated from the hall by a partition screen often elaborately decorated, and over which was provided a minstrels' gallery; on the opposite side of the passage were the hatches communicating with the serveries. This arrangement is still found in some of the colleges at Oxford and Cambridge, such as those of New College, Christchurch, Wadham and Magdalen, Oxford, and in Trinity College, Cambridge. In private mansions, however, the kitchen and offices have been removed to a greater distance, and the great hall is only used for banquets. Among the more remarkable examples are the halls of Audley End; Hatfield; Brougham Castle; Hardwick; Knole Stanway in Gloucestershire; Wollaton, where it is situated in the centre of the mansion and lighted by clerestory windows; Burton Agnes in Yorkshire; Canons Ashley, Northamptonshire; Westwood Park, Worcestershire; Fountains, Yorkshire; Sydenham House, Devonshire; Cobham, Kent; Montacute, Somersetshire; Bolsover Castle, Derbyshire (vaulted and with two columns in the centre of the hall to carry the vault); Longford Castle, Wiltshire; Barlborough, Derbyshire; Rushton Hall, Northamptonshire, with a bow window at each end of the dais and a third bow window at the other end; Knole, Kent; and at Mayfield, Sussex (with stone arches across to carry the roof), now converted into a Roman Catholic chapel. Many of these halls have hammer-beam roofs, the most remarkable of which is found in the Middle Temple Hall, London, where both the tie and collar beams have hammer-beams. Of other halls, Westminster is the largest, being 238 ft. long; followed by the Banqueting Hall, Whitehall, 110 ft; Wolsey's Hall, Hampton Court, 106 ft; the Egyptian Hall at the Mansion House; the hall at Lambeth, now the library; Crosby Hall; Gray's Inn Hall; the Guildhall; Charterhouse; and the following halls of the London City Companies—Clothworkers, Brewers, Goldsmiths, Fishmongers. The term hall is also given to the following English mansions:—Haddon, Hardwick, Apethorpe, Aston, Blickling, Brereton, Burton Agnes, Cobham, Dingley, Rushton, Kirby, Litford and Wollaton; and it was the name of some of the earlier colleges at Oxford and Cambridge, most of which have now been absorbed in other colleges, so that there remain only St Edmund's Hall, Oxford, and Trinity Hall, Cambridge.

HALLAM, HENRY (1777–1859), English historian, was the only son of John Hallam, canon of Windsor and dean of Bristol, and was born on the 9th of July 1777. He was educated at Eton and Christ Church, Oxford, where he graduated in 1799. Called to the bar, he practised for some years on the Oxford circuit; but his tastes were literary, and when, on the death of his father in 1812, he inherited a small estate in Lincolnshire, he gave himself up wholly to the studies of his life. He had early become connected with the brilliant band of authors and politicians who then led the Whig party, a connexion to which he owed his appointment to the well-paid and easy post of commissioner of stamps; but in practical politics, for which he was by nature unsuited, he took no active share. But he was an active supporter of many popular movements—particularly of that which ended in the abolition of the slave trade; and he was throughout his entire life sincerely and profoundly attached to the political principles of the Whigs, both in their popular and in their aristocratic aspect.

Hallam's earliest literary work was undertaken in connexion with the great organ of the Whig party, the *Edinburgh Review*, where his review of Scott's *Dryden* attracted much notice. His first great work, *The View of the State of Europe during the Middle Ages*, was produced in 1818, and was followed nine years later by the *Constitutional History of England*. In 1838–1839 appeared the *Introduction to the Literature of Europe in the 15th, 16th and 17th Centuries*. These are the three works on which the fame of Hallam rests. They at once took a place in English literature which has never been seriously challenged. A volume of supplemental notes to his *Middle Ages* was published in 1848. These facts and dates represent nearly all the events of Hallam's career. The strongest personal interest in his life was the affliction which befell him in the loss of his children, one after another. His eldest son, Arthur Henry Hallam,—the "A.H.H." of Tennyson's *In Memoriam*, and by the testimony of his contemporaries a man of the most brilliant promise,—died in 1833 at the age of twenty-two. Seventeen years later, his second son, Henry Fitzmaurice Hallam, was cut off like his brother at the very threshold of what might have been a great career. The premature death and high talents of these young men, and the association of one of them with the most popular poem of the age, have made Hallam's family afflictions better known than any other incidents of his life. He survived wife, daughter and sons by many years. In 1834 Hallam published *The Remains in Prose and Verse of Arthur Henry Hallam, with a Sketch of his Life*. In 1852 a selection of *Literary Essays and Characters* from the *Literature of Europe* was published. Hallam was a fellow of the Royal Society, and a trustee of the British Museum, and enjoyed many other appropriate distinctions. In 1830 he received the gold medal for history, founded by George IV. He died on the 21st of January 1859.

The *Middle Ages* is described by Hallam himself as a series of historical dissertations, a comprehensive survey of the chief circumstances that can interest a philosophical inquirer during the period from the 5th to the 15th century. The work consists of nine long chapters, each of which is a complete treatise in itself. The history of France, of Italy, of Spain, of Germany, and of the Greek and Saracenic empires, sketched in rapid and general terms, is the subject of five separate chapters. Others deal with the great institutional features of medieval society—the development of the feudal system, of the ecclesiastical system, and of the free political system of England. The last chapter sketches the general state of society, the growth of commerce, manners, and literature in the middle ages. The book may be regarded as a general view of early modern history, preparatory to the more detailed treatment of special lines of inquiry carried out in his subsequent works, although Hallam's original intention was to continue the work on the scale on which it had been begun.

The *Constitutional History of England* takes up the subject at the point at which it had been dropped in the *View of the Middle Ages*, viz. the accession of Henry VII.,[1] and carries it down to the accession of George III. Hallam stopped here for a characteristic reason, which it is impossible not to respect and to regret. He was unwilling to excite the prejudices of modern politics which seemed to him to run back through the whole period of the reign of George III. As a matter of fact they ran back much farther, as Hallam soon found. The sensitive impartiality which withheld him from touching perhaps the most interesting period in the history of the constitution did not save him from the charge of partisanship. The *Quarterly Review* for 1828 contains an article on the *Constitutional History*, written by Southey, full of railing and reproach. The work, he says, is the "production of a decided partisan," who "rakes in the ashes of long-forgotten and a thousand times buried slanders,

[1] Lord Brougham, overlooking the constitutional chapter in the *Middle Ages*, censured Hallam for making an arbitrary beginning at this point, and proposed to write a more complete history himself.

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for the means of heaping obloquy on all who supported the established institutions of the country." No accusation made by a critic ever fell so wide of the mark. Absolute justice is the standard which Hallam set himself and maintained. His view of constitutional history was that it should contain only so much of the political and general history of the time as bears directly on specific changes in the organization of the state, including therein judicial as well as ecclesiastical institutions. But while abstaining from irrelevant historical discussions, Hallam dealt with statesmen and policies with the calm and fearless impartiality of a judge. It was his cool treatment of such sanctified names as Charles, Cranmer and Laud that provoked the indignation of Southey and the *Quarterly*, who forgot that the same impartial measure was extended to statesmen on the other side. If Hallam can ever be said to have deviated from perfect fairness, it was in the tacit assumption that the 19th-century theory of the constitution was the right theory in previous centuries, and that those who departed from it on one side or the other were in the wrong. He did unconsciously antedate the constitution, and it is clear from incidental allusions in his last work that he did not regard with favour the democratic changes which he thought to be impending. Hallam, like Macaulay, ultimately referred all political questions to the standard of Whig constitutionalism. But though his work is thus, like that of many historians, coloured by his opinions, this was not the outcome of a conscious purpose, and he was scrupulously conscientious in collecting and weighing his materials. In this he was helped by his legal training, and it was doubtless this fact which made the *Constitutional History* one of the text-books of English politics, to which men of all parties appealed, and which, in spite of all the work of later writers, still leaves it a standard authority.

Like the *Constitutional History*, the *Introduction to the Literature of Europe* continues one of the branches of inquiry which had been opened in the *View of the Middle Ages*. In the first chapter of the *Literature*, which is to a great extent supplementary to the last chapter of the *Middle Ages*, Hallam sketches the state of literature in Europe down to the end of the 14th century: the extinction of ancient learning which followed the fall of the Roman empire and the rise of Christianity; the preservation of the Latin language in the services of the church; and the slow revival of letters, which began to show itself soon after the 7th century—"the *nadir* of the human mind"—had been passed. For the first century and a half of his special period he is mainly occupied with a review of classical learning, and he adopts the plan of taking short decennial periods and noticing the most remarkable works which they produced. The rapid growth of literature in the 16th century compels him to resort to a classification of subjects. Thus in the period 1520–1550 we have separate chapters on ancient literature, theology, speculative philosophy and jurisprudence, the literature of taste, and scientific and miscellaneous literature; and the subdivisions of subjects is carried further of course in the later periods. Thus poetry, the drama and polite literature form the subjects of separate chapters. One inconvenient result of this arrangement is that the same author is scattered over many chapters, according as his works fall within this category or that period of time. Names like Shakespeare, Grotius, Bacon, Hobbes appear in half a dozen different places. The individuality of great authors is thus dissipated except when it has been preserved by an occasional sacrifice of the arrangement—and this defect, if it is to be esteemed a defect, is increased by the very sparing references to personal history and character with which Hallam was obliged to content himself. His plan excluded biographical history, nor is the work, he tells us, to be regarded as one of reference. It is rigidly an account of the books which would make a complete library of the period,[1] arranged according to the date of their publication and the nature of their subjects. The history of institutions like universities and academies, and that of great popular movements like the Reformation, are of course noticed in their immediate connexion with literary results; but Hallam had little taste for the spacious generalization which such subjects suggest. The great qualities displayed in this work have been universally acknowledged—conscientiousness, accuracy, judgment and enormous reading. Not the least striking testimony to Hallam's powers is his mastery over so many diverse forms of intellectual activity. In science and theology, mathematics and poetry, metaphysics and law, he is a competent and always a fair if not a profound critic. The bent of his own mind is manifest in his treatment of pure literature and of political speculation—which seems to be inspired with stronger personal interest and a higher sense of power than other parts of his work display. Not less worthy of notice in a literary history is the good sense by which both his learning and his tastes have been held in control. Probably no writer ever possessed a juster view of the relative importance of men and things. The labour devoted to an investigation is with Hallam no excuse for dwelling on the result, unless that is in itself important. He turns away contemptuously from the mere curiosities of literature, and is never tempted to make a display of trivial erudition. Nor do we find that his interest in special studies leads him to assign them a disproportionate place in his general view of the literature of a period.

Hallam is generally described as a "philosophical historian." The description is justified not so much by any philosophical quality in his method as by the nature of his subject and his own temper. Hallam is a philosopher to this extent that both in political and in literary history he fixed his attention on results rather than on persons. His conception of history embraced the whole movement of society. Beside that conception the issue of battles and the fate of kings fall into comparative insignificance. "We can trace the pedigree of princes," he reflects, "fill up the catalogue of towns besieged and provinces desolated, describe even the whole pageantry of coronations and festivals, but we cannot recover the genuine history of mankind." But, on the other hand, there is no trace in Hallam of anything like a philosophy of history or society. Wise and generally melancholy reflections on human nature and political society are not infrequent in his writings, and they arise naturally and incidentally out of the subject he is discussing. His object is the attainment of truth in matters of fact. Sweeping theories of the movement of society, and broad characterizations of particular periods of history seem to have no attraction for him. The view of mankind on which such generalizations are usually based, taking little account of individual character, was highly distasteful to him. Thus he objects to the use of statistics because they favour that tendency to regard all men as mentally and morally equal which is so unhappily strong in modern times. At the same time Hallam by no means assumes the tone of the mere scholar. He is even solicitous to show that his point of view is that of the cultivated gentleman and not of the specialist of any order. Thus he tells us that Montaigne is the first French author whom an English gentleman is ashamed not to have read. In fact, allusions to the necessary studies of a gentleman meet us constantly, reminding us of the unlikely erudition of the schoolboy in Macaulay. Hallam's prejudices, so far as he had any, belong to the same character. His criticism is apt to assume a tone of moral censure when he has to deal with certain extremes of human thought—scepticism in philosophy, atheism in religion and democracy in politics.

Hallam's style is singularly uniform throughout all his writings. It is sincere and straightforward, and obviously innocent of any motive beyond that of clearly expressing the writer's meaning. In the *Literature of Europe* there are many passages of great imaginative beauty. (E. R.)

HALLAM, ROBERT (d. 1417), bishop of Salisbury and English representative at the council of Constance, was educated at Oxford, and was chancellor of the university from 1403 to 1405. In the latter year the pope nominated him to be archbishop of York, but the king objected. However, in 1407 he was consecrated by Gregory XII. at Siena as bishop of Salisbury. At the council of Pisa in 1409 he was one of the English

[1] Technical subjects like painting or English law have been excluded by Hallam, and history and theology only partially treated.

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representatives. On the 6th of June 1411 Pope John XXIII. made Hallam a cardinal, but there was some irregularity, and his title was not recognized. At the council of Constance (q.v.), which met in November 1414, Hallam was the chief English envoy. There he at once took a prominent position, as an advocate of the cause of Church reform, and of the superiority of the council to the pope. In the discussions which led up to the deposition of John XXIII. on the 29th of May 1415 he had a leading share. With the trials of John Hus and Jerome of Prague he had less concern. The emperor Sigismund, through whose influence the council had been assembled, was absent during the whole of 1416 on a diplomatic mission in France and England; but when he returned to Constance in January 1417, as the open ally of the English king, Hallam as Henry's trusted representative obtained increased importance. Hallam contrived skilfully to emphasize English prestige by delivering the address of welcome to Sigismund on his formal reception. Afterwards, under his master's direction, he gave the emperor vigorous support in the endeavour to secure a reform of the Church, before the council proceeded to the election of a new pope. This matter was still undecided when Hallam died suddenly, on the 4th of September 1417. After his death the direction of the English nation fell into less skilful hands, with the result that the cardinals were able to secure the immediate election of a new pope (Martin V., elected on the 11th of November). It has been supposed that the abandonment of the reformers by the English was due entirely to Hallam's death; but it is more likely that Henry V., foreseeing the possible need for a change of front, had given Hallam discretionary powers which the bishop's successors used with too little judgment. Hallam himself, who had the confidence of Sigismund and was generally respected for his straightforward independence, might have achieved a better result. Hallam was buried in the cathedral at Constance, where his tomb near the high altar is marked by a brass of English workmanship.

For the acts of the council of Constance see H. von der Hardt's *Concilium Constantiense*, and H. Finke's *Acta concilii Constantiensis*. For a modern account see Mandell Creighton's *History of the Papacy* (6 vols., London, 1897). (C. L. K.)

HALLÉ, SIR CHARLES (originally KARL HALLE) (1819–1895), English pianist and conductor, German by nationality, was born at Hagen, in Westphalia, on the 11th of April 1819. He studied under Kink at Darmstadt in 1835, and as early as 1836 went to Paris, where for twelve years he lived in constant intercourse with Cherubini, Chopin, Liszt and other musicians, and enjoyed the friendship of such great literary figures as Alfred de Musset and George Sand. He had started a set of chamber concerts with Alard and Franchomme with great success, and had completed one series of them when the revolution of 1848 drove him from Paris, and he settled, with his wife and two children, in London. His pianoforte recitals, given at first from 1850 in his own house, and from 1861 in St James's Hall, were an important feature of London musical life, and it was due in great measure to them that a knowledge of Beethoven's pianoforte sonatas became general in English society. At the Musical Union founded by John Ella, and at the Popular Concerts from their beginning, Hallé was a frequent performer, and from 1853 was director of the Gentlemen's Concerts in Manchester, where, in 1857, he started a series of concerts of his own, raising the orchestra to a pitch of perfection quite unknown at that time in England. In 1888 he married Madame Norman Neruda (b. 1839), the violinist, widow of Ludwig Norman, and daughter of Josef Neruda, members of whose family had long been famous for musical talent. In the same year he was knighted; and in 1890 and 1891 he toured with his wife in Australia and elsewhere. He died at Manchester on the 25th of October 1895. Hallé exercised an important influence in the musical education of England; if his pianoforte-playing, by which he was mainly known to the public in London, seemed remarkable rather for precision than for depth, for crystal clearness rather than for warmth, and for perfect realization of the written text rather than for strong individuality, it was at least of immense value as giving the composer's idea with the utmost fidelity. Those who were privileged to hear him play in private, like those who could appreciate the power, beauty and imaginative warmth of his conducting, would have given a very different verdict; and they were not wrong in judging Hallé to be a man of the widest and keenest artistic sympathies, with an extraordinary gift of insight into music of every school, as well as a strong sense of humour. He fought a long and arduous battle for the best music, and never forgot the dignity of his art. In spite of the fact that his technique was that of his youth, of the period before Liszt, the ease and certainty he attained in the most modern music was not the less wonderful because he concealed the mechanical means so completely.

Lady Hallé, who from 1864 onwards had been one of the leading solo violinists of the time, was constantly associated with her husband on the concert stage till his death; and in 1896 a public subscription was organized in her behalf, under royal patronage. She continued to appear occasionally in public, notably as late as 1907, when she played at the Joachim memorial concert. In 1901 she was given by Queen Alexandra the title of "violinist to the queen." A fine classical player and artist, frequently associated with Joachim, Lady Hallé was the first of the women violinists who could stand comparison with men.

HALLE (known as HALLE-AN-DER-SAALE, to distinguish it from the small town of Halle in Westphalia), a town of Germany, in the Prussian province of Saxony, situated in a sandy plain on the right bank of the Saale, which here divides into several arms, 21 m. N.W. from Leipzig by the railway to Magdeburg. Pop. (1875), 60,503; (1885) 81,982; (1895) 116,304; (1905) 160,031. Owing to its situation at the junction of six important lines of railway, bringing it into direct communication with Berlin, Breslau, Leipzig, Frankfort-on-Main, the Harz country and Hanover, it has greatly developed in size and in commercial and industrial importance. It consists of the old, or inner, town surrounded by promenades, which occupy the site of the former fortifications, and beyond these of two small towns, Glaucha in the south and Neumarkt in the north, and five rapidly increasing suburbs. The inner town is irregularly built and presents a somewhat unattractive appearance, but it has been much improved and modernized by the laying out of new streets.

The centre of the town proper is occupied by the imposing market square, on which stand the fine medieval town hall (restored in 1883) and the handsome Gothic Marienkirche, dating mainly from the 16th century, with two towers connected by a bridge. In the middle of the square are a clock-tower (*Der rote Turm*) 276 ft. in height, and a bronze statue of Handel, the composer, a native of Halle. West of the market-square lies the Halle, or the Tal, where the brine springs (see below) issue. Among the eleven churches, nine Protestant and two Roman Catholic, may also be mentioned the St Moritzkirche, dating from the 12th century, with fine wood carvings and sculptures, and the cathedral (belonging since 1689 to the Reformed or Calvinistic church), built in the 16th century and containing an altar-piece representing Duke Augustus of Saxony and his family. Of secular buildings the most noticeable are the ruins of the castle of Moritzburg, formerly a citadel and the residence of the archbishops of Magdeburg, destroyed by fire in the Thirty Years' War, with the exception of the left wing now used for military purposes, the university buildings, the theatre and the new railway station. The famous university was founded by the elector Frederick III. of Brandenburg (afterwards king of Prussia), in 1604, on behalf of the jurist, Christian Thomasius (1655–1728), whom many students followed to Halle, when he was expelled from Leipzig through the enmity of his fellow professors. It was closed by Napoleon in 1806 and again in 1813, but in 1815 was re-established and augmented by the removal to it of the university of Wittenberg, with which it thus became united. It has faculties of theology, law, medicine and philosophy. From the first it has been recognized as one of the principal seats of Protestant theology, originally of the pietistic and latterly of the rationalistic and critical school. In connexion with the university there are a botanical garden, a theological seminary,

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anatomical, pathological and physical institutes, hospitals, an agricultural institute—one of the foremost institutions of the kind in Germany—a meteorological institute, an observatory and a library of 180,000 printed volumes and 800 manuscripts. Among other educational establishments must be mentioned the Francke'sche Stiftungen, founded in 1691 by August Hermann Francke (1663–1727), a bronze statue of whom by Rauch was erected in 1829 in the inner court of the building. They embrace an orphanage, a laboratory where medicines are prepared and distributed, a Bible press from which Bibles are issued at a cheap rate, and eight schools of various grades, attended in all by over 3000 pupils. The other principal institutions are the city gymnasium, the provincial lunatic asylum, the prison, the town hospital and infirmary, and the deaf and dumb institute. The salt-springs of Halle have been known from a very early period. Some rise within the town and others on an island in the Saale; and together their annual yield of salt is about 8500 tons.

The workmen employed at the salt-works are of a peculiar race and are known as the *Halloren*. They have been usually regarded as descendants of the original Wendish inhabitants, or as Celtic immigrants, with an admixture of Frankish elements. They wear a distinct dress, the ordinary costume of about 1700, observe several ancient customs, and enjoy certain exemptions and privileges derived from those of the ancient *Pfannerschaft* (community of the salt-panners).

Among the other industries of Halle are sugar refining, machine building, the manufacture of spirits, malt, chocolate, cocoa, confectionery, cement, paper, chicory, lubricating and illuminating oil, wagon grease, carriages and playing cards, printing, dyeing and coal mining (soft brown coal). The trade, which is supervised by a chamber of commerce, is very considerable, the principal exports being machinery, raw sugar and petroleum. Halle is also noted as the seat of several important publishing firms. The Bibelanstalt (Bible institution) of von Castein is the central authority for the revision of Luther's Bible, of which it sells annually from 60,000 to 70,000 copies.

Halle is first mentioned as a fortress erected on the Saale in 806 by Charles, son of Charlemagne, during his expedition against the Sorbs. The place was, however, known before, and even its origin as well as its name to the salt springs (*Halsi*). In 968 Halle, with the valuable salt works, was given by the emperor Otto I. to the newly founded archdiocese of Magdeburg, and in 981 Otto II. gave it a charter as a town. The interests of the archbishops were watched over by a *Vogt* (*advocatus*) and a burgrave, and from the first there were separate jurisdictions for the Halloren and the German settlers in the town, the former being under that of the *Sulzgraf* (comes salis), the latter of a *Schultheiss* or bailiff, both subordinate to the burgrave. The conflict of interests and jurisdictions led to the usual internecine strife during the middle ages. The panners (*Pfanner*) of the Tal, feudatories or officials, became a close hereditary aristocracy in perpetual rivalry with the gilds in the town; and both resisted the pretensions of the archbishops. At the beginning of the 12th century Halle had attained considerable importance, and in the 13th and 14th centuries as a member of the Hanseatic League it carried on successful wars with the archbishops of Magdeburg; and in 1435 it resisted an army of 30,000 men under the elector of Saxony. Its liberty perished, however, as a result of the internal feud between the democratic gilds and the patrician panners. On the 20th of September 1478 a demagogue and cobbler named Jakob Weissak, a member of the town council, with the confederates opened the gates to the soldiers of the archbishop. The townsmen were subdued, and to hold them in check the archbishop, Ernest of Saxony, built the castle of Moritzburg. Notwithstanding the efforts of the archbishops of Mainz and Magdeburg, the Reformation found an entrance into the city in 1522; and in 1541 a Lutheran superintendent was appointed. After the peace of Westphalia in 1648 the city came into the possession of the house of Brandenburg. In 1806 it was stormed and taken by the French, after which, at the peace of Tilsit, it was united to the new kingdom of Westphalia. After the battle between the Prussians and French, in May 1813, it was taken by the Prussians. The rise of Leipzig was for a long time hurtful to the prosperity of Halle, and its present rapid increase in population and trade is principally due to its position as the centre of a network of railways.

See Dreyhaupt, *Ausführliche Beschreibung des Saalkreises* (Halle, 2 vols., 1755; 3rd edition, 1842–1844); Hoffhauer, *Geschichte der Universität zu Halle* (1860); *Halle in Vergani und Gegenwart* (1881); Knauth, *Kurze Geschichte und Beschreibung der Stadt Halle* (3rd ed., 1861); vom Hagen, *Die Stadt Halle* (1866–1867); Hertzberg, *Geschichte der Vereinigung der Universitäten von Wittenberg und Halle* (1867); Voss, *Zur Geschichte der Autonomie der Stadt Halle* (1874); Schrader, *Geschichte der Friedrichs-Universität zu Halle* (Berlin, 1894); Karl Hegel, *Städte und Gilden der germanischen Völker* (Leipzig, 1891), ii. 444-449.

HALLECK, FITZ-GREENE (1790–1867), American poet, was born at Guilford, Connecticut, on the 8th of July 1790. By his mother he was descended from John Eliot, the "Apostle to the Indians." At an early age he became clerk in a store at Guilford, and in 1811 he entered a banking-house in New York. Having made the acquaintance of Joseph Rodman Drake, in 1819 he assisted him under the signature of "Croaker junior" in contributing to the New York *Evening Post* the humorous series of "Croaker Papers." In 1821 he published his longest poem, *Fanny*, a satire on local politics and fashions in the measure of Byron's *Don Juan*. He visited Europe in 1822–1823, and after his return published anonymously in 1827 *Alnwick Castle, with other Poems*. From 1833 to 1841 he was confidential agent of John Jacob Astor, who named him one of the trustees of the Astor library. In 1864 he published in the *New York Ledger* a poem of 300 lines entitled "Young America." He died at Guilford, on the 19th of November 1867. The poems of Halleck are written with great care and finish, and manifest the possession of a fine sense of harmony and of genial and elevated sentiments.

His *Life and Letters*, by James Grant Wilson, appeared in 1869. His *Poetical Writings*, together with extracts from those of Joseph Rodman Drake, were edited by Wilson in the same year.

HALLECK, HENRY WAGER (1815–1872), American general and jurist, was born at Westernville, Oneida county, N.Y., in 1815, entered the West Point military academy at the age of twenty, and on graduating in 1839 was appointed to the engineers, becoming at the same time assistant professor of engineering at the academy. In the following year he was made an assistant to the Board of Engineers at Washington, from 1841 to 1846 he was employed on the defence works at New York, and in 1845 he was sent by the government to visit the principal military establishments of Europe. After his return, Halleck delivered a course of lectures on the science of war, published in 1846 under the title *Elements of Military Art and Science*. A later edition of this work was widely used as a text-book by volunteer officers during the Civil War. On the outbreak of the Mexican War in 1846, he served with the expedition to California and the Pacific coast, in which he distinguished himself not only as an engineer, but by his skill in civil administration and by his good conduct before the enemy. He served for several years in California as a staff officer, and as secretary of state under the military government, and in 1849 he helped to frame the state constitution of California, on its being admitted into the Union. In 1852 he was appointed inspector and engineer of lighthouses, and in 1853 was employed in the fortification of the Pacific coast. In 1854 Captain Halleck resigned his commission and took up the practice of law with great success. He was also director of a quicksilver mine, and in 1855 he became president of the Pacific & Atlantic railway. On the outbreak of the Civil War he returned to the army as a major-general, and in November 1861 he was charged with the supreme command in the western theatre of war. There can be no question that his administrative skill was mainly instrumental in bringing order out of chaos in the hurried formation of large volunteer armies in 1861, but the strategical and tactical successes of the following spring were due rather to the skill and activity of his subordinate generals Grant, Buell and Pope, than to the plans of the supreme commander, and when he assumed command of the united forces of these three generals before Corinth, the methodical slowness of his advance aroused much criticism. In July, however, he was called to Washington as general-in-chief of the armies. At headquarters his administrative powers were conspicuous, but he proved to be utterly wanting in any large grasp of the military problem; the successive reverses of Generals McClellan, Pope, Burnside and Hooker in Virginia were not infrequently traceable to the defects of the general-in-chief. No co-ordination of the military efforts of the Union was seriously undertaken by Halleck, and eventually in March 1864 Grant was appointed to

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replace him, Major-General Halleck becoming chief of staff at Washington. This post he occupied with credit until the end of the war. In April 1865 he held the command of the military division of the James and in August of the same year of the military division of the Pacific, which he retained till June 1869, when he was transferred to that of the South, a position he held till his death at Louisville, Ky., on the 9th of January 1872. Halleck's position as a soldier is easily defined by his uniform success as an administrative official, his equally uniform want of success as an officer at the head of large armies in the field, and the popularity of his theoretical writings on war. His influence, for good or evil, on the course of the greatest war of modern times was greater than that of any soldier on either side save Grant and Lee, and whilst his interference with the dispositions of the commanders in the field was often disastrous, his services in organizing and instructing the Union forces were always of the highest value, and in this respect he was indispensable.

Besides *Military Art and Science*, Halleck wrote *Bitumen, its Varieties, Properties and Uses* (1841); *The Mining Laws of Spain and Mexico* (1859); *International Law* (1861; new edition, 1908); and *Treatise on International Law and the Laws of War, prepared for the use of Schools and Colleges*, abridged from the larger work. He translated Jomini's *Vie politique et militaire de Napoléon* (1864) and de Foox *On the Law of Mines* (1860). The works on international law mentioned above entitle General Halleck to be considered as one of the great jurists of the 19th century.

HÄLLEFLINTA (a Swedish word meaning rock-flint), a white, grey, yellow, greenish or pink, fine-grained rock consisting of an intimate mixture of quartz and felspar. Many examples are banded or striated; others contain porphyritic crystals of quartz which resemble those of the felsites and porphyries. Mica, iron oxides, apatite, zircon, epidote and hornblende may also be present in small amount. The more micaceous varieties form transitions to granulite and gneiss. Hälleflinta under the microscope is very finely crystalline, or even cryptocrystalline, resembling the felsitic matrix of many acid rocks. It is essentially metamorphic and occurs with gneisses, schists and granulites, especially in the Scandinavian peninsula, where it is regarded as being very characteristic of certain horizons. Of its original nature there is some doubt, but its chemical composition and the occasional presence of porphyritic crystals indicate that it has affinities to the fine-grained acid intrusive rocks. In this group there may also have been placed metamorphosed acid tuffs and a certain number of adinoles (shales, contact altered by intrusions of diabase). The assemblage is not a perfectly homogeneous one but includes both igneous and sedimentary rocks, but the former preponderate. Rocks very similiar to the typical Swedish hälleflintas occur in Tirol, in Galicia and eastern Bohemia.

HALLEL (Heb. הלל *hillel*, "to praise"), a term in synagogal liturgy for (*a*) Psalms cxiii.-cxviii., often called "the Egyptian Hallel" because of its recitation during the paschal meal on the night of the Passover, (*b*) Psalm cxxxvi. "the Great Hallel." C. A. Briggs[1] points out that the term "Hallelujah" (Praise ye Yah) is found at the close of Pss. civ., cv., cxv., cxvi., cxvii., at the beginning of Pss. cxi., cxii. and at both ends of Pss. cvi., cxiii., cxxxv., cxlvi. to cl. The Septuagint also gives it at the beginning of Pss. cv., cvii., cxiv., cxvi. to cxix., cxxxvi. There are thus four groups of Hallel psalms:—civ.-cvii. (a tetralogy on creation, the patriarchal age, the Exodus, and the Restoration); cxi.-cxvii. which includes most of the "Egyptian Hallel"; cxxxv.-cxxxvi.; cxlvi.-cl. All of these Hallels (except cxlvii. and cxlix. which are Maccabean) belong to the Greek period, forming a collection of sixteen psalms composed for public use by the choirs, especially at the great feasts. Their distribution into four groups was the work of the final editor of the psalter. Later liturgical use regarded Pss. cxviii. and even cxix. as Hallels, as well as Pss. cxx. to cxxxiv.

It will be observed that the extent of the official Hallel varied from time to time. It would appear that in the time of Gamaliel (*Pesahim* x. 5) the custom of its recitation at the paschal meal was still of recent innovation. While the school of Shammai advised only Ps. cxiii., the school of Hillel favoured Pss. cxiii. and cxiv.[2] The further extension so as to include Pss. cxv. to cxviii. probably dates from the first half of the 2nd century A.D., and these four psalms were recited after the pouring out of the fourth cup, the two earlier ones being taken at the beginning of the meal. From the 3rd century the use of the Hallel was extended to other occasions, and was gradually incorporated into the liturgy of eighteen festal days.

The "Great Hallel" (Ps. cxxxvi. and its later extension to cxx.-cxxxvi.) always served the wider purpose of a more general thanksgiving. According to Rabbi Johanan it derived its name from the allusion in v. 25 to the Holy One who sits in heaven and thence distributes food to all his creatures.

HALLER, ALBRECHT VON (1708–1777), Swiss anatomist and physiologist, was born of an old Swiss family at Bern, on the 16th of October 1708. Prevented by long-continued ill-health from taking part in boyish sports, he had the more opportunity for the development of his precocious mind. At the age of four, it is said, he used to read and expound the Bible to his father's servants; before he was ten he had sketched a Chaldee grammar, prepared a Greek and a Hebrew vocabulary, compiled a collection of two thousand biographies of famous men and women on the model of the great works of Bayle and Moreri, and written in Latin verse a satire on his tutor, who had warned him against a too great excursiveness. When still hardly fifteen he was already the author of numerous metrical translations from Ovid, Horace and Virgil, as well as of original lyrics, dramas, and an epic of four thousand lines on the origin of the Swiss confederations, writings which he is said on one occasion to have rescued from a fire at the risk of his life, only, however, to burn them a little later (1729) with his own hand. Haller's attention had been directed to the profession of medicine while he was residing in the house of a physician at Biel after his father's death in 1721; and, following the choice then made, he while still a sickly and excessively shy youth went in his sixteenth year to the university of Tübingen (December 1723), where he studied under Camerarius and Duvernoy. Dissatisfied with his progress, he in 1725 exchanged Tübingen for Leiden, where Boerhaave was in the zenith of his fame, and where Albinus had already begun to lecture in anatomy. At that university he graduated in May 1727, undertaking successfully in his thesis to prove that the so-called salivary duct, claimed as a recent discovery by Coschwitz, was nothing more than a blood-vessel. Haller then visited London, making the acquaintance of Sir Hans Sloane, Cheselden, Pringle, Douglas and other scientific men; next, after a short stay in Oxford, he visited Paris, where he studied under Ledran and Winslöw; and in 1728 he proceeded to Basel, where he devoted himself to the study of the higher mathematics under John Bernoulli. It was during his stay there also that his first great interest in botany was awakened; and, in the course of a tour (July–August, 1828), through Savoy, Baden and several of the Swiss cantons, he began a collection of plants which was afterwards the basis of his great work on the flora of Switzerland. From a literary point of view the main result of this, the first of his many journeys through the Alps, was his poem entitled *Die Alpen*, which was finished in March 1729, and appeared in the first edition (1732) of his *Gedichte*. This poem of 490 hexameters is historically important as one of the earliest signs of the awakening appreciation of the mountains (hitherto generally regarded as horrible monstrosities), though it is chiefly designed to contrast the simple and idyllic life of the inhabitants of the Alps with the corrupt and decadent existence of the dwellers in the plains.

In 1729 he returned to Bern and began to practise as a physician; his best energies, however, were devoted to the botanical and anatomical researches which rapidly gave him a European reputation, and procured for him from George II.

[1] *International Critical Commentary*, "Psalms," Intro. lxxviii.

[2] The reference to a hymn at the institution of the Eucharist (Matt. xxvi. 30, Mark xiv. 26) must be interpreted in the light of this inceptive stage of the Hallel.

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in 1736 a call to the chair of medicine, anatomy, botany and surgery in the newly founded university of Göttingen. He became F.R.S. in 1743, and was ennobled in 1749. The quantity of work achieved by Haller in the seventeen years during which he occupied his Göttingen professorship was immense. Apart from the ordinary work of his classes, which entailed upon him the task of newly organizing a botanical garden, an anatomical theatre and museum, an obstetrical school, and similar institutions, he carried on without interruption those original investigations in botany and physiology, the results of which are preserved in the numerous works associated with his name; he continued also to persevere in his youthful habit of poetical composition, while at the same time he conducted a monthly journal (the *Göttingische gelehrte Anzeigen*), to which he is said to have contributed twelve thousand articles relating to almost every branch of human knowledge. He also warmly interested himself in most of the religious questions, both ephemeral and permanent, of his day; and the erection of the Reformed church in Göttingen was mainly due to his unwearied energy. Notwithstanding all this variety of absorbing interests he never felt at home in Göttingen; his untravelled heart kept ever turning towards his native Bern (where he had been elected a member of the great council in 1745), and in 1753 he resolved to resign his chair and return to Switzerland.

The twenty-one years of his life which followed were largely occupied in the discharge of his duties in the minor political post of a *Rathhausammann* which he had obtained by lot, and in the preparation of his *Bibliotheca medica*, the botanical, surgical and anatomical parts of which he lived to complete; but he also found time to write the three philosophical romances—*Usong* (1771), *Alfred* (1773) and *Fabius und Cato* (1774),—in which his views as to the respective merits of despotism, of limited monarchy and of aristocratic republican government are fully set forth. About 1773 the state of his health rendered necessary his entire withdrawal from public business; for some time he supported his failing strength by means of opium, on the use of which he communicated a paper to the *Proceedings* of the Göttingen Royal Society in 1776; the excessive use of the drug is believed, however, to have hastened his death, which occurred on the 17th of December 1777. Haller, who had been three times married, left eight children, the eldest of whom, Gottlieb Emanuel, attained to some distinction as a botanist, and as a writer on Swiss historical bibliography (1785–1788, 7 vols.).

Subjoined is a classified but by no means an exhaustive list of his very numerous works in various branches of science and literature (a complete list, up to 1775, numbering 576 items, including various editions, was published by Haller himself, in 1775, at the end of vol. 6 of the correspondence addressed to him by various learned friends):—(1) Anatomical:—*Icones anatomicae* (1743–1754); *Disputationes anatomicae selectiores* (1746–1752); and *Opera acad. minora anatomici argumenti* (1762–1768). (2) Physiological:—*De respiratione experimenta anatomica* (1747); *Primae lineae physiologiae* (1747); and *Elementa physiologiae corporis humani* (1757–1760). (3) Pathological and surgical:—*Opuscula pathologica* (1754); *Disputationum chirurg. collectio* (1777); also careful editions of Boerhaave's *Praelectiones academicae in suas institutiones rei medicae* (1739), and of the *Artis medicae principia* of the same author (1769–1774). (4) Botanical:—*Enumeratio methodica stirpium Helveticarum* (1742); *Opuscula botanica* (1749); *Bibliotheca botanica* (1771). (5) Theological:—*Briefe über die wichtigsten Wahrheiten der Offenbarung* (1772); and *Briefe zur Vertheidigung der Offenbarung* (1775–1777). (6) Poetical:—*Gedichte* (1732, 12th ed., 1777). His three romances have been already mentioned. Several volumes of lectures and "Tagebücher" or journals were published posthumously.

See J. C. Zimmermann, *Das Leben des Herrn von Haller* (1755), and the articles by Förster and Seiler in Ersch and Gruber's *Encyclopädie*, and particularly the detailed biography (over 500 pages) by L. Hirzel, printed at the head of his elaborate edition (Frauenfeld, 1882) of Haller's *Gedichte*.

HALLER, BERTHOLD (1490–1536), Swiss reformer, was born at Aldingen in Württemberg, and after studying at Pforzheim, where he met Melanchthon, and at Cologne, taught in the gymnasium at Bern. He was appointed assistant preacher at the church of St Vincent in 1515 and people's priest in 1520. Even before his acquaintance with Zwingli in 1521 he had begun to preach the Reformation, his sympathetic character and his eloquence making him a great force. In 1526 he was at the abortive conference of Baden, and in January 1528 drafted and defended the ten theses for the conference of Bern which established the new religion in that city. He left no writings except a few letters which are preserved in Zwingli's works. He died on the 25th of February 1536.

Life by Pestalozzi (Elberfeld, 1861).

HALLEY, EDMUND (1656–1742), English astronomer, was born at Haggerston, London, on the 29th of October 1656. His father, a wealthy soapboiler, placed him at St Paul's school, where he was equally distinguished for classical and mathematical ability. Before leaving it for Queen's College, Oxford, in 1673, he had observed the change in the variation of the compass, and at the age of nineteen, he supplied a new and improved method of determining the elements of the planetary orbits (*Phil. Trans.* xi. 683). His detection of considerable errors in the tables then in use led him to the conclusion that a more accurate ascertainment of the places of the fixed stars was indispensable to the progress of astronomy; and, finding that Flamsteed and Hevelius had already undertaken to catalogue those visible in northern latitudes, he assumed to himself the task of making observations in the southern hemisphere. A recommendation from Charles II. to the East India Company procured for him an apparently suitable, though, as it proved, ill-chosen station, and in November 1676 he embarked for St Helena. On the voyage he noticed the retardation of the pendulum in approaching the equator; and during his stay on the island he observed, on the 7th of November 1677, a transit of Mercury, which suggested to him the important idea of employing similar phenomena for determining the sun's distance. He returned to England in November 1678, having by the registration of 341 stars won the title of the "Southern Tycho," and by the translation to the heavens of the "Royal Oak," earned a degree of master of arts, conferred at Oxford by the king's command on the 3rd of December 1678, almost simultaneously with his election as fellow of the Royal Society. Six months later, the indefatigable astronomer started for Danzig to set at rest a dispute of long standing between Hooke and Hevelius as to the respective merits of plain or telescopic sights; and towards the end of 1680 he proceeded on a continental tour. In Paris he observed, with G. D. Cassini, the great comet of 1680 after its perihelion passage; and having returned to England, he married in 1682 Mary, daughter of Mr Tooke, auditor of the exchequer, with whom he lived harmoniously for fifty-five years. He now fixed his residence at Islington, engaged chiefly upon lunar observations, with a view to the great desideratum of a method of finding the longitude at sea. His mind, however, was also busy with the momentous problem of gravity. Having reached so far as to perceive that the central force of the solar system must decrease inversely as the square of the distance, and applied vainly to Wren and Hooke for further elucidation, he made in August 1684 that journey to Cambridge for the purpose of consulting Newton, which resulted in the publication of the *Principia*. The labour and expense of passing this great work through the press devolved upon Halley, who also wrote the prefixed hexameters ending with the well-known line—

Nec fas est propius mortali attingere divos.

In 1696 he was, although a zealous Tory, appointed deputy comptroller of the mint at Chester, and (August 19, 1698) he received a commission as captain of the "Paramour Pink" for the purpose of making extensive observations on the conditions of terrestrial magnetism. This task he accomplished in a voyage which lasted two years, and extended to the 52nd degree of S. latitude. The results were published in a *General Chart of the Variation of the Compass* in 1701; and immediately afterwards he executed by royal command a careful survey of the tides and coasts of the British Channel, an elaborate map of which he produced in 1702. On his return from a journey to Dalmatia, for the purpose of selecting and fortifying the port of Trieste, he was nominated, November 1703, Savilian professor of geometry at Oxford, and received an honorary degree of

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doctor of laws in 1710. Between 1713 and 1721 he acted as secretary to the Royal Society, and early in 1720 he succeeded Flamsteed as astronomer-royal. Although in his sixty-fourth year, he undertook to observe the moon through an entire revolution of her nodes (eighteen years), and actually carried out his purpose. He died on the 14th of January 1742. His tomb is in the old graveyard of St Margaret's church, Lee, Kent.

Halley's most notable scientific achievements were—his detection of the "long inequality" of Jupiter and Saturn, and of the acceleration of the moon's mean motion (1693), his discovery of the proper motions of the fixed stars (1718), his theory of variation (1683), including the hypothesis of four magnetic poles, revived by C. Hansteen in 1819, and his suggestion of the magnetic origin of the aurora borealis; his calculation of the orbit of the 1682 comet (the first ever attempted), coupled with a prediction of its return, strikingly verified in 1759; and his indication (first in 1679, and again in 1716, *Phil. Trans.*, No. 348) of a method extensively used in the 18th and 19th centuries for determining the solar parallax by means of the transits of Venus.

His principal works are *Catalogus stellarum australium* (London, 1679), the substance of which was embodied in vol. iii. of Flamsteed's *Historia coelestis* (1725); *Synopsis astronomiae cometicae* (Oxford, 1705); *Astronomical Tables* (London, 1752); also eighty-one miscellaneous papers of considerable interest, scattered through the *Philosophical Transactions*. To these should be added his version from the Arabic (which language he studied for the purpose) of the treatise of Apollonius *De sectione rationis*, with a restoration of his two lost books *De sectione spatii*, both published at Oxford in 1706; also his fine edition of the *Conics* of Apollonius, with the treatise by Serenus *De sectione cylindri et coni* (Oxford, 1710, folio). His edition of the *Spherics* of Menelaus was published by his friend Dr Costard in 1758. See also *Biographia Britannica*, vol. iv. (1757); *Gent. Mag.* xvii. 455, 503; A. Wood, *Athenae Oxon.* (Bliss), iv. 536; J. Aubrey, *Lives*, ii. 365; F. Baily, *Account of Flamsteed*; Sir D. Brewster, *Life of Newton*; R. Grant, *History of Astronomy*, p. 477 and *passim*; A. J. Rudolph, *Bulletin of Bibliography*, No. 14 (Boston, 1904); E. F. McPike, "Bibliography of Halley's Comet," *Smithsonian Misc. Collections*, vol. lxviii. pt. i. (1905); *Notes and Queries*, 9th series, vols. x. xi. xii., 10th series, vol. ii. (E. F. McPike). A collection of manuscripts regarding Halley is preserved among the Rigaud papers in the Bodleian library, Oxford; and many of his unpublished letters exist at the Record Office and in the library of the Royal Society. (A. M. C.)

HALLGRÍMSSON, JÓNAS (1807–1844), the chief lyrical poet of Iceland, was born in 1807 at Steinsstaðir in Eyjafjarðarsýsla in the north of that island, and educated at the famous school of Bessastaðr. In 1832 he went to the university of Copenhagen, and shortly afterwards turned his attention to the natural sciences, especially geology. Having obtained pecuniary assistance from the Danish government, he travelled through all Iceland for scientific purposes in the years 1837–1842, and made many interesting geological observations. Most of his writings on geology are in Danish. His renown was, however, not acquired by his writings in that language, but by his Icelandic poems and short stories. He was well read in German literature, Heine and Schiller being his favourites, and the study of the German masters and the old classical writers of Iceland opened his eyes to the corrupt state of Icelandic poetry and showed him the way to make it better. The misuse of the Eddic metaphors made the lyrical and epical poetry of the day hardly intelligible, and, to make matters worse, the language of the poets was mixed up with words of German and Danish origin. The great Danish philologist and friend of Iceland, Rasmus Rask, and the poet Bjarni Thórarensen had done much to purify the language, but Jónas Hallgrímsson completed their work by his poems and tales, in a purer language than ever had been written in Iceland since the days of Snorri Sturlason. The excesses of Icelandic poetry were specially seen in the so-called *rímur*, ballads of heroes, &c., which were fiercely attacked by Jónas Hallgrímsson, who at last succeeded in converting the educated to his view. Most of the principal poems, tales and essays of Jónas Hallgrímseon appeared in the periodical *Fjölnir*, which he began publishing at Copenhagen in 1835, together with Konráð Gíslason, a well-known philologist, and the patriotic Thómas Saemundsson. *Fjölnir* had in the beginning a hard struggle against old prejudices, but as the years went by its influence became enormous; and when it at last ceased, its programme and spirit still lived in *Ný Félagsrit* and other patriotic periodicals which took its place. Jónas Hallgrímsson, who died in 1844, is the father of a separate school in Icelandic lyric poetry. He introduced foreign thoughts and metres, but at the same time revived the metres of the Icelandic classical poets. Although his poetical works are all comprised in one small volume, he strikes every string of the old harp of Iceland. (S. BL.)

HALLIDAY, ANDREW [ANDREW HALLIDAY DUFF] (1830–1877), British journalist and dramatist, was born at Marnoch, Banffshire, in 1830. He was educated at Marischal College, Aberdeen, and in 1840 he came to London, and discarding the name of Duff, devoted himself to literature. His first engagement was with the daily papers, and his work having attracted the notice of Thackeray, he was invited to write for the *Cornhill Magazine*. From 1861 he contributed largely to *All the Year Round*, and many of his articles were republished in collected form. He was also the author, alone and with others, of a great number of farces, burlesques and melodramas and a peculiarly successful adapter of popular novels for the stage. Of these *Little Em'ly* (1869), his adaptation of *David Copperfield*, was warmly approved by Dickens himself, and enjoyed a long run at Drury Lane. Halliday died in London on the 10th of April 1877.

HALLIWELL-PHILLIPPS, JAMES ORCHARD (1820–1889), English Shakespearian scholar, son of Thomas Halliwell, was born in London, on the 21st of June 1820. He was educated privately and at Jesus College, Cambridge. He devoted himself to antiquarian research, particularly in early English literature. In 1839 he edited Sir John Mandeville's *Travels*; in 1842 published an *Account of the European MSS. in the Chetham Library*, besides a newly discovered metrical romance of the 15th century (*Torrent of Portugal*). He became best known, however, as a Shakespearian editor and collector. In 1848 he brought out his *Life of Shakespeare*, which passed through several editions; in 1853–1865 a sumptuous edition, limited to 150 copies, of Shakespeare in folio, with full critical notes; in 1863 a *Calendar of the Records at Stratford-on-Avon*; in 1864 a *History of New Place*. After 1870 he entirely gave up textual criticism, and devoted his attention to elucidating the particulars of Shakespeare's life. He collated all the available facts and documents in relation to it, and exhausted the information to be found in local records in his *Outlines of the Life of Shakespeare*. He was mainly instrumental in the purchase of New Place for the corporation of Stratford-on-Avon, and in the formation there of the Shakespeare museum. His publications in all numbered more than sixty volumes. He assumed the name of Phillipps in 1872, under the will of the grandfather of his first wife, a daughter of Sir Thomas Phillipps the antiquary. He took an active interest in the Camden Society, the Percy Society and the Shakespeare Society, for which he edited many early English and Elizabethan works. From 1845 Halliwell was excluded from the library of the British Museum on account of the suspicion attaching to his possession of some manuscripts which had been removed from the library of Trinity College, Cambridge. He published privately an explanation of the matter in 1845. His house, Hollingbury Copse, near Brighton, was full of rare and curious works, and he generously gave many of them to the Chetham library, Manchester, to the town library of Penzance, to the Smithsonian Institute, Washington, and to the library of Edinburgh university. He died on the 3rd of January 1889.

HALLOWE'EN, or ALL HALLOWS EVE, the name given to the 31st of October as the vigil of Hallowmas or All Saints' Day. Though now known as little else but the eve of the Christian festival, Hallowe'en and its formerly attendant ceremonies long antedate Christianity. The two chief characteristics of ancient Hallowe'en were the lighting of bonfires and the belief that of all nights in the year this is the one during which ghosts and witches are most likely to wander abroad. Now on or about the 1st of November the Druids held their great autumn festival and lighted fires in honour of the Sun-god in thanksgiving for the harvest. Further, it was a Druidic belief that on the eve of

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this festival Saman, lord of death, called together the wicked souls that within the past twelve months had been condemned to inhabit the bodies of animals. Thus it is clear that the main celebrations of Hallowe'en were purely Druidical, and this is further proved by the fact that in parts of Ireland the 31st of October was, and even still is, known as *Oidhche Shamhna*, "Vigil of Saman." On the Druidic ceremonies were grafted some of the characteristics of the Roman festival in honour of Pomona held about the 1st of November, in which nuts and apples, as representing the winter store of fruits, played an important part. Thus the roasting of nuts and the sport known as "apple-ducking"—attempting to seize with the teeth an apple floating in a tub of water,—were once the universal occupation of the young folk in medieval England on the 31st of October. The custom of lighting Hallowe'en fires survived until recent years in the highlands of Scotland and Wales. In the dying embers it was usual to place as many small stones as there were persons around, and next morning a search was made. If any of the pebbles were displaced it was regarded as certain that the person represented would die within the twelve months.

For details of the Hallowe'en games and bonfires see Brand's *Antiquities of Great Britain*; Chambers's *Book of Days*; Grimm's *Deutsche Mythologie*, ch. xx. (*Elemente*) and ch. xxxiv. (*Aberglaube*); and J. G. Frazer's *Golden Bough*, vol. iii. Compare also BELTANE and BONFIRE.

HALLSTATT, a market-place of Austria, in Upper Austria, 67 m. S.S.W. of Linz by rail. Pop. (1900) 737. It is situated on the shore of the Hallstatter-see and at the foot of the Hallstatter Salzberg, and is built in amphitheatre with its houses clinging to the mountain side. The salt mine of Hallstatt, which is one of the oldest in existence, was rediscovered in the 14th century. In the neighbourhood is the celebrated Celtic burial ground, where a great number of very interesting antiquities have been found. Most of these have been removed to the museums at Vienna and Linz, but some are kept in the local museum.

The excavations (1847–1864) revealed a form of culture hitherto unknown, and accordingly the name Hallstatt has been applied to objects of like form and decoration since found in Styria, Carniola, Bosnia (at Glasinatz and Jezerin), Epirus, north Italy, France, Spain and Britain (see CELT). Everywhere else the change from iron weapons to bronze is immediate, but at Hallstatt iron is seen gradually superseding bronze, first for ornament, then for edging cutting instruments, then replacing fully the old bronze types, and finally taking new forms of its own. There can be no doubt that the use of iron first developed in the Hallstatt area, and that thence it spread southwards into Italy, Greece, the Aegean, Egypt and Asia, and northwards and westwards in Europe. At Noreia, which gave its name to Noricum (*q.v.*) less than 40 m. from Hallstatt, were the most famous iron mines of antiquity, which produced the Noric iron and Noric swords so prized and dreaded by the Romans (Pliny, *Hist. Nat.* xxxiv. 145; Horace, *Epod.* 17. 71). This iron needed no tempering, and the Celts had probably found it ready smelted by nature, just as the Eskimo had learned of themselves to use telluric iron embedded in basalt. The graves at Hallstatt were partly inhumation partly cremation; they contained swords, daggers, spears, javelins, axes, helmets, bosses and plates of shields and haubcrks, brooches, various forms of jewelry, amber and glass beads, many of the objects being decorated with animals and geometrical designs. Silver was practically unknown. The weapons and axes are mostly iron, a few being bronze. The swords are leaf-shaped, with blunt points intended for cutting, not for thrusting; the hilts differ essentially from those of the Bronze Age, being shaped like a crescent to grasp the blade, with large pommels, or sometimes with antennae (the latter found also in Bavaria, Württemberg, Baden, Switzerland, the Pyrenees, Spain, north Italy): only six arrowheads (bronze) were found. Both flanged and socketed celts occurred, the iron being much more numerous than the bronze. The flat axes are distinguished by the side stops and in some cases the transition from palstave to socketed axe can be seen. The shields were round as in the early Iron Age of north Italy (see VILLANOVA). Greaves were found at Glasinatz and Jezerin, though not at Hallstatt; two helmets were found at Hallstatt and others in Bosnia; broad bronze belts were numerous, adorned in *repoussé* with beast and geometric ornament. Brooches are found in great numbers, both those derived from the primitive safety-pin ("Peschiera" type) and the "spectacle" or "Hallstatt" type found all down the Balkans and in Greece. The latter are formed of two spirals of wire, sometimes four such spirals being used, whilst there were also brooches in animal forms, one of the latter being found with a bronze sword. The Hallstatt culture is that of the Homeric Achaeans (see ACHAEANS), but as the brooch (along with iron, cremation of the dead, the round shield and the geometric ornament) passed down into Greece from central Europe, and as brooches are found in the lower town at Mycenae, 1350 B.C., they must have been invented long before that date in central Europe. But as they are found in the late Bronze Age and early Iron Age, the early iron culture of Hallstatt must have originated long before 1350 B.C., a conclusion in accord with the absence of silver at Hallstatt itself.

See Baron von Sacken, *Das Grabfeld von Hallstatt*; Bertrand and S. Reinach, *Les Celtes dans les vallées du Pô et du Danube*; W. Ridgeway, *Early Age of Greece*; ARCHAEOLOGY (plate). (W. RI.)

HALLUCINATION (from Lat. *alucinari* or *allucinari*, to wander in mind, Gr. ἀλύσσειν or ἀλύειν, from ἄλη, wandering), a psychological term which has been the subject of much controversy, and to which, although there is now fair agreement as to its denotation, it is still impossible to give a precise and entirely satisfactory definition. Hallucinations constitute one of the two great classes of all false sense-perceptions, the other class consisting of the "illusions," and the difficulty of definition is clearly to mark the boundary between the two classes. *Illusion* may be defined as the misinterpretation of sense-impression, while *hallucination*, in its typical instances, is the experiencing of a sensory presentation, *i.e.* a presentation having the sensory vividness that distinguishes perceptions from representative imagery, at a time when no stimulus is acting on the corresponding sense-organ. There is, however, good reason to think that in many cases, possibly in all cases, some stimulation of the sense-organ, coming either from without or from within the body, plays a part in the genesis of the hallucination. This being so, we must be content to leave the boundary between illusions and hallucinations ill-defined, and to regard as illusions *those false perceptions in which impressions made on the sense-organ play a leading part in determining the character of the percept*, and as hallucinations *those in which any such impression is lacking, or plays but a subsidiary part and bears no obvious relation to the character of the false percept*.

As in the case of illusion, hallucination may or may not involve delusion, or belief in the reality of the object falsely perceived. Among the sane the hallucinatory object is frequently recognized at once as unreal or at least as but quasi-real; and it is only the insane, or persons in abnormal states, such as hypnosis, who, when an hallucination persists or recurs, fail to recognize that it corresponds to no physical impression from, or object in, the outer world. Hallucinations of all the senses occur, but the most commonly reported are the auditory and the visual, while those of the other senses seem to be comparatively rare. This apparent difference of frequency is no doubt largely due to the more striking character of visual and auditory hallucinations, and to the relative difficulty of ascertaining, in the case of perceptions of the lower senses, *e.g.* of taste and smell, that no impression adequate to the genesis of the percept has been made upon the sense-organ; but, in so far as it is real, it is probably due in part to the more constant use of the higher senses and the greater strain consequently thrown upon them, in part also to their more intimate connexion with the life of ideas.

The hallucinatory perception may involve two or more senses, *e.g.*, the subject may seem to see a human being, to hear his voice and to feel the touch of his hand. This is rarely the case in spontaneous hallucination, but in hypnotic hallucination the

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subject is apt to develop the object suggested to him, as present to one of his senses, and to perceive it also through other senses.

Among visual hallucinations the human figure, and among auditory hallucinations human voices, are the objects most commonly perceived. The figure seen always appears localized more or less definitely in the outer world. In many cases it appears related to the objects truly seen in just the same way as a real object; *e.g.* it is no longer seen if the eyes are closed or turned away, it does not move with the movements of the eyes, and it may hide objects lying behind it, or be bidden by objects coming between the place that it appears to occupy and the eye of the percipient. Visual hallucinations are most often experienced when the eyes are open and the surrounding space is well or even brightly illuminated. Less frequently the visual hallucination takes the form of a self-luminous figure in a dark place or appears in a luminous globe or mist which shuts out from view the real objects of the part of the field of view in which it appears.

Auditory hallucinations, especially voices, seem to fall into two distinct classes—(1) those which are heard as coming from without, and are more or less definitely localized in outer space, (2) those which seem to be within the head or, in some cases, within the chest, and to have less definite auditory quality. It seems probable that the latter are hallucinations involving principally kinaesthetic sensations, sensations of movement of the organs of speech.

Hallucinations occur under a great variety of bodily and mental conditions, which may conveniently be classified as follows.

I. *Conditions which imply normal waking Consciousness and no distinct Departure from bodily and mental Sanity.*

a. It would seem that a considerable number of perfectly healthy persons occasionally experience, while in a fully waking state, hallucinations for which no cause can be assigned. The census of hallucinations conducted by the Society for Psychical Research showed that about 10 % of all sane persons can remember having experienced at least one hallucination while they believed themselves to be fully awake and in normal health. These sporadic hallucinations of waking healthy persons are far more frequently visual than auditory, and they usually take the form of some familiar person in ordinary attire. The figure in many cases is seen, on turning the gaze in some new direction, fully developed and lifelike, and its hallucinatory character may be revealed only by its noiseless movements, or by its fading away *in situ*. A special interest attaches to hallucinations of this type, owing to the occasional coincidence of the death of the person with his hallucinatory appearance. The question raised by these coincidences will be discussed in a separate paragraph below.

b. A few persons, otherwise normal in mind and body, seem to experience repeatedly some particular kind of hallucination. The voice (*δαιμόνιον*) so frequently heard by Socrates, warning or advising him, is the most celebrated example of this type.

II. *Conditions more or less unusual or abnormal but not implying distinct Departure from Health.*

a. A kind of hallucination to which perhaps every normal person is liable is that known technically as "recurrent sensation." This kind is experienced only when some sense-organ has been continuously or repeatedly subjected to some one kind of impression or stimulation for a considerable period; *e.g.* the microscopist, after examining for some hours one particular kind of object or structure, may suddenly perceive the object faithfully reproduced in form and colour, and lying, as it were, upon any surface to which his gaze is directed. Perhaps the commonest experience of this type is the recurrence of the sensations of movement at intervals in the period following a sea voyage or long railway journey.

b. A considerable proportion of healthy sane persons can induce hallucinations of vision by gazing fixedly at a polished surface or into some dark translucent mass; or of hearing, by applying a large shell or similar object to the ear. These methods of inducing hallucinations, especially the former, have long been practised in many countries as modes of divination, various objects being used, *e.g.* a drop of ink in the palm of the hand, or a polished finger-nail. The object now most commonly used is a polished sphere of clear glass or crystal (see CRYSTAL-GAZING). Hence such hallucinations go by the name of *crystal visions*. The crystal vision often appears as a picture of some distant or unknown scene lying, as it were, in the crystal; and in the picture figures may come and go, and move to and fro, in a perfectly natural manner. In other cases, written or printed words or sentences appear. The percipient, seer or scryer, commonly seems to be in a fully waking state as he observes the objects thus presented. He is usually able to describe and discuss the appearances, successively discriminating details by attentive observation, just as when observing an objective scene; and he usually has no power of controlling them, and no sense of having produced them by his own activity. In some cases these visions have brought back to the mind of the scryer facts or incidents which he could not voluntarily recollect. In other cases they are asserted by credible witnesses to have given to the scryer information, about events distant in time or place, that had not come to his knowledge by normal means. These cases have been claimed as evidence of telepathic communication or even of clairvoyance. But at present the number of well-attested cases of this sort is too small to justify acceptance of this conclusion by those who have only secondhand knowledge of them.

c. Prolonged deprivation of food predisposes to hallucinations, and it would seem that, under this condition, a large proportion of otherwise healthy persons become liable to them, especially to auditory hallucinations.

d. Certain drugs, notably opium, Indian hemp, and mescal predispose to hallucinations, each tending to produce a peculiar type. Thus Indian hemp and mescal, especially the latter, produce in many cases visual hallucinations in the form of a brilliant play of colours, sometimes a mere succession of patches of brilliant colour, sometimes in architectural or other definite spatial arrangement.

e. The states of transition from sleep to waking, and from waking to sleep, seem to be peculiarly favourable to the appearance of hallucinations. The recurrent sensations mentioned above are especially prone to appear at such times, and a considerable proportion of the sporadic hallucinations of persons in good health are reported to have been experienced under these conditions. The name "hypnagogic" hallucinations, first applied by Alfred Maury, is commonly given to those experienced in these transition states.

f. The presentations, predominantly visual, that constitute the principal content of most dreams, are generally described as hallucinatory, but the propriety of so classing them is very questionable. The present writer is confident that his own dream-presentations lack the sensory vividness which is the essential mark of the percept, whether normal or hallucinatory, and which is the principal, though not the only, character in which it differs from the representation or memory-image. It is true that the dream-presentation, like the percept, differs from the representative imagery of waking life in that it is relatively independent of volition; but that seems to be merely because the will is in abeyance or very ineffective during sleep. The wide currency of the doctrine that classes dream-images with hallucinations seems to be due to this independence of volitional control, and to the fact that during sleep the representative imagery appears without that rich setting of undiscriminated or marginal sensation which always accompanies waking imagery, and which by contrast accentuates for introspective reflection the lack of sensory vividness of such imagery.

g. Many of the subjects who pass into the deeper stages of hypnosis (see HYPNOTISM) show themselves, while in that condition, extremely liable to hallucination, perceiving whatever object is suggested to them as present, and failing to perceive

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any object of which it is asserted by the operator that it is no longer present. The reality of these positive and negative hallucinations of the hypnotized subject has been recently questioned, it being maintained that the subject merely gives verbal assent to the suggestions of the operator. But that the hypnotized subject does really experience hallucinations seems to be proved by the cases in which it is possible to make the hallucination, positive or negative, persist for some time after the termination of hypnosis, and by the fact that in some of these cases the subject, who in the post-hypnotic state seems in every other respect normal and wide awake, may find it difficult to distinguish between the hallucinatory and real objects. Further proof is afforded by experiments such as those by which Alfred Binet showed that a visual hallucination may behave for its percipient in many respects like a real object, *e.g.* that it may appear reflected in a mirror, displaced by a prism and coloured when a coloured glass is placed before the patient's eyes. It was by means of experiments of this kind that Binet showed that hypnotic hallucinations may approximate to the type of the illusion, *i.e.* that some real object affecting the sense-organ (in the case of a visual hallucination some detail of the surface upon which it is projected) may provide a nucleus of peripherally excited sensation around which the false percept is built up. An object playing a part of this sort in the genesis of an hallucination is known as a "*point de repère.*" It has been maintained that all hallucinations involve some such *point de repère* or objective nucleus; but there are good reasons for rejecting this view.

b. In states of ecstasy, or intense emotional concentration of attention upon some one ideal object, the object contemplated seems at times to take on sensory vividness, and so to acquire the character of an hallucination. In these cases the state of mind of the subject is probably similar in many respects to that of the deeply hypnotized subject, and these two classes of hallucination may be regarded as very closely allied.

III. *Hallucinations which occur as symptoms of both bodily and mental diseases.*

a. Dr H. Head has the credit of having shown for the first time, in the year 1901, that many patients, suffering from more or less painful visceral diseases, disorders of heart, lungs, abdominal viscera, &c., are liable to experience hallucinations of a peculiar kind. These "visceral" hallucinations, which are constantly accompanied by headache of the reflected visceral type, are most commonly visual, more rarely auditory. In all Dr Head's cases the visual hallucination took the form of a shrouded human figure, colourless and vague, often incomplete, generally seen by the patient standing by his bed when he wakes in a dimly lit room. The auditory "visceral" hallucination was in no instance vocal, but took such forms as sounds of tapping, scratching or rumbling, and were heard only in the absence of objective noises. In a few cases the "visceral" hallucination was bisensory, *i.e.* both auditory and visual.

In all these respects the "visceral" hallucination differs markedly from the commoner types of the sporadic hallucination of healthy persons.

b. Hallucinations are constant symptoms of certain general disorders in which the nervous system is involved, notably of the *delirium tremens*, which results from chronic alcohol poisoning, and of the delirium of the acute specific fevers. The hallucinations of these states are generally of a distressing or even terrifying character. Especially is this the rule with those of *delirium tremens*, and in the hallucinations of this disease certain kinds of objects, *e.g.* rats and snakes, occur with curious frequency.

c. Hallucinations occasionally occur as symptoms of certain nervous diseases that are not usually classed with the insanities, notably in cases of epilepsy and severe forms of hysteria. In the former disorder, the sensory aura that so often precedes the epileptic convulsion may take the form of an hallucinatory object, which in some cases is very constant in character. Unilateral hallucinations, an especially interesting class, occur in severe cases of hysteria, and are usually accompanied by hemi-anaesthesia of the body on the side on which the hallucinatory object is perceived.

d. Hallucinations occur in a large, but not accurately definable, proportion of all cases of mental disease proper. Two classes are recognized: (1) those that are intimately connected with the dominant emotional state or with some dominant delusion; (2) those that occur sporadically and have no such obvious relation to the other symptoms of disease. Hallucinations of the former class tend to accentuate, and in turn to be confirmed by, the congruent emotional or delusional state; but whether these are to be regarded as primary symptoms and as the cause of the hallucinations, or *vice versa*, it is generally impossible to say. Patients who suffer delusions of persecution are very apt to develop later in the course of their disease hallucinations of the voices of their persecutors; while in other cases hallucinatory voices, which are at first recognized as such, come to be regarded as real and in these cases seem to be factors of primary importance in the genesis of further delusions. Hallucinations occur in almost every variety of mental disease, but are commonest in the forms characterized by a cloudy dream-like condition of consciousness, and in extreme cases of this sort the patient (as in the delirium of chronic alcohol-poisoning) seems to move waking through a world consisting largely of the images of his own creation, set upon a background of real objects.

In some cases hallucinations are frequently experienced for long periods in the absence of any other symptom of mental disorder, but these no doubt usually imply some morbid condition of the brain.

Physiology of Hallucination.—There has been much discussion as to the nature of the neural process in hallucination. It is generally and rightly assumed that the hallucinatory perception of any object has for its immediate neural correlate a state of excitement which, as regards its characters and its distribution in the elements of the brain, is entirely similar to the neural correlate of the normal perception of the same object. The hallucination is a perception, though a false perception. In the perception of an object and in the representation of it, introspective analysis discovers a number of presentative elements. In the case of the representation these elements are memory images only (except perhaps in so far as actual kinaesthetic sensations enter into its composition); whereas, in the case of the percept, some of these elements are sensations, sensations which differ from images in having the attribute of sensory vividness; and the sensory vividness of these elements lends to the whole complex the sensory vividness or reality, the possession of which character by the percept constitutes its principal difference from the representation. Normally, sensory vividness attaches only to those presentative elements which are excited through stimulations of the sense-organs. The normal percept, then, owes its character of sensory reality to the fact that a certain number of its presentative elements are sensations peripherally excited by impressions made upon a sense-organ. The problem is, then, to account for the fact that the hallucination contains presentative elements that have sensory vividness, that are sensations, although they are not excited by impressions from the external world falling upon a sense-organ. Most of the discussions of this subject suffer from the neglect of this preliminary definition of the problem. Many authors, notably W. Wundt and his disciples, have been content to assume that the sensation differs from the memory-image only in having a higher degree of intensity; from which they infer that its neural correlate in the brain cortex also differs from that of the image only in having a higher degree of intensity. For them an hallucination is therefore merely a representation whose neural correlate involves an intensity of excitement of certain brain-elements such as is normally produced only by peripheral stimulation of sensory nerves in the sense-organs. But this view, so attractively simple, ignores an insuperable objection. Sensory vividness is not to be identified with superior intensity; for while the least intense sensation has it, the memory image of the most intense sensation lacks it completely.

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And, since intensity of sensation is a function of the intensity of the underlying neural excitement, we may not assume that sensory vividness is also the expression in consciousness of that intensity of excitement. If Wundt's view were true a progressive diminution of the intensity of a sensory stimulus should bring the sensation to a point in the scale of diminishing intensity at which it ceases to be sensation, ceases to have sensory vividness and becomes an image merely. But this is not the case; with diminishing intensity of stimulation, the sensation declines to a minimal intensity and then disappears from consciousness. This objection applies not only to Wundt's view of hallucinations, but also to H. Taine's explanation of them by the aid of his doctrine of "reductives," for this too identifies sensory vividness with intensity. (H. Taine, *De l'intelligence*, tome i. p. 108.)

Another widely current explanation is based on the view that the representation and the percept have their anatomical bases in different element-groups or "centres" of the brain, the "centre" of the representation being assigned to a higher level of the brain than that of the percept (the latter being sometimes assigned to the basal ganglia of the brain, the former to the cortex). It is then assumed that while the lower perceptual centre is normally excited only through the sense-organ, it may occasionally be excited by impulses playing down upon it from the corresponding centre of representation, when hallucination results.

This view also is far from satisfactory, because the great additions recently made to our knowledge of the brain tend very strongly to show that both sensations and memory-images have their anatomical bases in the same sensory areas of the cerebral cortex; and many considerations converge to show that their anatomical bases must be, in part at least, identical.

The views based on the assumptions of complete identity, and of complete separateness, of the anatomical bases of the percept and of the representation are then alike untenable; and the alternative—that their anatomical bases are in part identical, in part different, which is indicated by this conclusion—renders possible a far more satisfactory doctrine. We have good reason to believe that the neural correlate of sensation is the transmission of the nervous impulse through a sensori-motor arc of the cortex, made up of a chain of neurones; and the view suggests itself that the neural correlate of the corresponding memory-image is the transmission of the impulse through a part only of this chain of cortical elements, either the efferent motor part of this chain or the afferent sensory part of it. Professor W. James's theory of hallucinations is based on the latter assumption. He suggests that the sensory vividness of sensation and of the percept is due to the discharge of the excitement of the chain of elements in the forward or motor direction; and that, in the case of the image and of the representation, the discharge takes place, not in this direction through the efferent channel of the centre, but laterally into other centres of the cortex. Hallucination may then be conceived as caused by obstruction, or abnormally increased resistance, of the paths connecting such a cortical centre with others, so that, when it becomes excited in any way, the tension or potential of its charge rises, until discharge takes place in the motor direction through the efferent limbs of the sensori-motor arcs which constitute the centre.

It is a serious objection to this view that, as James himself, in common with most modern authors, maintains, every idea has its motor tendency which commonly, perhaps always, finds expression in some change of tension of muscles, and in many cases issues in actual movements. Now if we accept James's theory of hallucination, we should expect to find that whenever a representation issues in bodily action it should assume the sensory vividness of an hallucination; and this, of course, is not the case.

The alternative form of the view that assumes partial identity of the anatomical bases of the percept and the representation of an object, would regard the neural correlate of the sensation as the transmission of the nervous impulse throughout the length of the sensori-motor arc of the cortex, from sensory inlet to motor outlet; and that of the image as its transmission through the efferent part of this arc only; that is to say, in the case of the image, it would regard the excitement of the arc as being initiated at some point between its afferent inlet and its motor outlet, and as spreading, in accordance with the law of forward conduction, towards the motor outlet only, so that only the part of the arc distal or efferent to this point becomes excited.

This view of the neural basis of sensory vividness, which correlates the difference between the sensation and the image with the only known difference between their physiological conditions, namely the peripheral initiation of the one and the central initiation of the other, enables us to formulate a satisfactory theory of the physiology of hallucinations.

The anatomical basis of the perception and of the representation of any object is a functional system of nervous elements, comprising a number of sensori-motor arcs, whose excitement by impulses ascending to them by the sensory paths from the sense-organs determines sensations, and whose excitement in their efferent parts only determires the corresponding images. In the case of perception, some of these arcs are excited by impulses ascending from the sense-organs, others only by the spread of the excitement through the system from these peripherally excited arcs; while, in the case of the representation, all alike are excited by impulses that reach the system from other parts of the cortex and spread throughout its efferent parts only to its motor outlets.

If then impulses enter this system by any of the afferent limbs of its sensori-motor arcs, the presentation that accompanies its excitement will have sensory vividness and will be a true perception, an illusion, or an hallucination, according as these impulses have followed the normal course from the sense-organ, or have been diverted, to a lesser or greater degree, from their normal paths. If any such neural system becomes abnormally excitable, or becomes excited in any way with abnormal intensity, it is thereby rendered a path of exceptionally low-resistance capable of diverting to itself, from their normal path, any streams of impulses ascending from the sense-organ; which ascending impulses, entering the system by its afferent inlets, excite sensations that impart to the presentation the character of sensory vividness; the presentation thus acquires the character of a percept in spite of the absence of the appropriate impression on the sense-organ, and we call it an hallucination.

This view renders intelligible the *modus operandi* of many of the predisposing causes of hallucination; *e.g.* the pre-occupation with certain representations of the ecstatic, or of the sufferer from delusions of persecution; the intense expectation of a particular sense impression, the generally increased excitability of the cortex in states of delirium; in all these conditions the abnormally intense excitement of the cortical systems may be supposed to give them an undue directive and attractive influence upon the streams of impulses ascending from the sense-organs, so that sensory impulses may be diverted from their normal paths. Again, it renders intelligible the part played by chronic irritation of a sense-organ, as when chronic irritation of the internal ear leads on to hallucinations of hearing; perhaps also the chronic irritation of sensory nerves that must accompany the states of visceral disease, shown by Head to be so frequently accompanied by a liability to hallucinations; for any such chronic irritation supplies a stream of disorderly impulses rising constantly from the sense-organ, for the reception of which the brain has no appropriate system, and which, therefore, readily enters any organized cortical system that at any moment constitutes a path of low-resistance. A similar explanation applies to the influence of fixed gazing upon a crystal, or the placing of a shell over the ear, in inducing visual and auditory hallucinations. The "recurrent sensations" experienced after prolonged occupation with some one kind of sensory object may be regarded as due to an abnormal excitability of the cortical system concerned, resulting from its unduly prolonged exercise. The hypothesis renders intelligible also the liability to hallucination of persons in the hysterical and hypnotic states, in whose brains

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the cortical neural systems are in a state of partial dissociation, which renders possible an unduly intense and prolonged excitement of some one system at the expense of all other systems (cf. HYPNOTISM).

Coincidental Hallucinations.—It would seem that, in well-nigh all countries and in all ages, apparitions of persons known to be in distant places have been occasionally observed. Such appearances have usually been regarded as due to the presence, before the bodily eye of the seer, of the ghost, wraith, double or soul of the person who thus appears; and, since the soul has been very commonly supposed to leave the body, permanently at death and temporarily during sleep, trance or any period of unconsciousness, however induced, it was natural to regard such an appearance as evidence that the person whose wraith was thus seen was in some such condition. Such apparitions have probably played a part, second only to that of dreams, in generating the almost universal belief in the separability of soul and body.

In many parts of the world traditional belief has connected such apparitions more especially with the death of the person so appearing, the apparition being regarded as an indication that the person so appearing has recently died, is dying or is about to die. Since death is so much less common an event than sleep, trance, or other form of temporary unconsciousness, the wide extension of this belief suggests that such apparitions may coincide in time with death, with disproportionate frequency. The belief in the significance of such apparitions still survives in civilized communities, and stories of apparitions coinciding with the death of the person appearing are occasionally reported in the newspapers, or related as having recently occurred. The Society for Psychical Research has sought to find grounds for an answer to the question "Is there any sufficient justification for the belief in a causal relation between the apparition of a person at a place distant from his body and his death or other exceptional and momentous event in his experience?" The problem was attacked in a thoroughly scientific spirit, an extensive inquiry was made, and the results were presented and fully discussed in two large volumes, *Phantasms of the Living*, published in the year 1886, bearing on the title-page the names of Edmund Gurney, F. W. H. Myers and F. Podmore. Of the three collaborators Gurney took the largest share in the planning of the work, in the collection of evidence, and in the elaboration and discussion of it.

Gurney set out with the presumption that apparitions, whether coincidental or not, are hallucinations in the sense defined above; that *they are false perceptions* and are not excited by any object or process of the external world acting upon the sense-organs of the percipient in normal fashion; that they do not imply the presence, in the place apparently occupied by them, of any wraith or any form of existence emanating from, or specially connected with, the person whose phantasm appears. This initial assumption was abundantly justified by an examination of a large number of cases for it, which showed that, in all important respects, most of these apparitions of persons at a distance, whether coincidental or not, were similar to other forms of hallucination.

The acceptance of this conclusion does not, however, imply a negative answer to the question formulated above. The Society for Psychical Research had accumulated an impressive and, to almost all those who had first-hand acquaintance with it, a convincing mass of experimental evidence of the reality of telepathy (*q.v.*), the influence of mind on mind otherwise than through the recognized channels of sense. The successful experiments had for the most part been made between persons in close proximity, in the same room or in adjoining rooms; but they seemed to show that the state of consciousness of one person may induce directly (*i.e.* without the mediation of the organs of expression and sense-perception) a similar state of consciousness in another person, especially if the former, usually called the "agent," strongly desired or "willed" that this effect should be produced on the other person, the "percipient."

The question formulated above thus resolved itself for Gurney into the more definite form, "Can we find any good reason for believing that coincidental hallucinations are sometimes veridical, that the state of mind of a person at some great crisis of his experience may telepathically induce in the mind of some distant relative or friend an hallucinatory perception of himself?" It was at once obvious that, if coincidental apparitions can be proved to occur, this question can only be answered by a statistical inquiry; for each such coincidental hallucination, considered alone, may always be regarded as most educated persons of the present time have regarded them, namely, as merely accidental coincidences. That the coincidences are not merely accidental can only be proved by showing that they occur more frequently than the doctrine of chances would justify us in expecting. Now, the death of any person is a unique event, and the probability of its occurrence upon any particular day may be very simply calculated from the mortality statistics, if we assume that nothing is known of the individual's vitality. On the other hand, hallucinatory perceptions of persons, occurring to sane and healthy individuals in the fully waking state, are comparatively rare occurrences, whose frequency we may hope to determine by a statistical inquiry. If, then, we can obtain figures expressing the frequency of such hallucinations, we can deduce, by the help of the laws of chance, the proportion of such hallucinations that may be expected to coincide with (or, for the purposes of the inquiry, to fall within twelve hours of) the death of the person whose apparition appears, if no causal relation obtains between the coinciding events. If, then, it appears that the proportion of such coincidental hallucinations is greater than the laws of probability will account for, a certain presumption of a causal relation between the coinciding events is thereby established; and the greater the excess of such coincidences, the stronger does this presumption become. Gurney attempted a census of hallucinations in order to obtain data for this statistical treatment, and the results of it, embodied in *Phantasms of the Living*, were considered by the authors of that work to justify the belief that some coincidental hallucinations are veridical. In the year 1889 the Society for Psychical Research appointed a committee, under the chairmanship of the late Henry Sidgwick, to make a second census of hallucinations on a more extensive and systematic plan than the first, in order that the important conclusion reached by the authors of *Phantasms of the Living* might be put to the severer test rendered possible by a larger and more carefully collected mass of data. Seventeen thousand adults returned answers to the question, "Have you ever, when believing yourself to be completely awake, had a vivid impression of seeing or being touched by a living being or inanimate object, or of hearing a voice; which impression, so far as you could discover, was not due to any external physical cause?" Rather more than two thousand persons answered affirmatively, and to each of these were addressed careful inquiries concerning their hallucinatory experiences. In this way it was found that of the total number, 381 apparitions of persons living at the moment (or not more than twelve hours dead) had been recognized by the percipients, and that, of these, 80 were alleged to have been experienced within twelve hours of the death of the person whose apparition had appeared. A careful review of all the facts, conditions and probabilities, led the committee to estimate that the former number should be enlarged to 1300 in order to make ample allowance for forgetfulness and for all other causes that might have tended to prevent the registration of apparitions of this class. On the other hand, a severe criticism of the alleged death-coincidences led them to reduce the number, admitted by them for the purposes of their calculation, to 30. The making of these adjustments gives us about 1 in 43 as the proportion of coincidental death-apparitions to the total number of recognized apparitions among the 17,000 persons reached by the census. Now the death-rate being just over 19 per thousand, the probability that any person taken at random will die on a given day is about 1 in 19,000; or, more strictly speaking, the average probability that any person will die within any given period of twenty-four hours duration

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is about 1 in 10,000. Hence the probability that any other particular event, having no causal relation to his death, but occurring during his lifetime (or not later than twelve hours after his death) will fall within the same twenty-four hours as his death is 1 in 10,000; *i.e.* if an apparition of any individual is seen and recognized by any other person, the probability of its being experienced within twelve hours of that individual's death is 1 in 10,000, if no causal relation obtains between the two events. Therefore, of all recognized apparitions of living persons, 1 only in 10,000 may be expected to be a death-coincidence of this sort. But the census shows that of 1300 recognized apparitions of living persons 30 are death-coincidences and that is equivalent to 410 in 10,000. Hence, of recognized hallucinations, those coinciding with death are 440 times more numerous than we should expect, if no causal relation obtained; therefore, if neither the data nor the reasoning can be destructively criticized, we are compelled to believe that some causal relation obtains; and, since good evidence of telepathic communication has been experimentally obtained, the least improbable explanation of these death-apparitions is that the dying person exerts upon his distant friend some telepathic influence which generates an hallucinatory perception of himself.

These death-coincidences constitute the main feature of the argument in favour of telepathic communication between distant persons, but the census of hallucinations afforded other data from which a variety of arguments, tending to support this conclusion, were drawn by the committee; of these the most important are the cases in which the hallucinatory percept embodied details that were connected with the person perceived and which could not have become known to the percipient by any normal means. The committee could not find in the results of the census any evidence sufficient to justify a belief that hallucinations may be due to telepathic influence exerted by personalities surviving the death of the body.

The critical handling of the cases by the committee seems to be above reproach. Those who do not accept their conclusion based on the death-coincidences must direct their criticism to the question of the reliability of the reports of these cases. It is to be noted that, although only those cases are reckoned in which the percipient had no cause to expect the death of the person whose apparition he experienced, and although, in nearly all the accepted cases, some record or communication of the hallucination was made before hearing of the death, yet in very few cases was any contemporary written record of the event forthcoming for the inspection of the committee. (W. McD.)

HALLUIN, a frontier town of northern France, in the department of Nord, near the right bank of the Lys, 14 m. N. by E. of Lille by rail. Pop. (1906) town, 11,670; commune, 16,158. Its church is of Gothic architecture. The manufactures comprise linen and cotton goods, chairs and rubber goods, and brewing and tanning are carried on; there is a board of trade arbitration. The family of Halluin is mentioned as early as the 13th century. In 1587 the title of duke and peer of the realm was granted to it, but in the succeeding century it became extinct.

HALM, CARL FELIX (1809–1882), German classical scholar and critic, was born at Munich on the 5th of April 1809. In 1840, after having held appointments at Spires and Hadamar, he became rector of the newly founded Maximiliansgymnasium at Munich, and in 1856 director of the royal library and professor in the university. These posts he held till his death on the 5th of October 1882. It is chiefly as the editor of Cicero and other Latin prose authors that Halm is known, although in early years he also devoted considerable attention to Greek. After the death of J. C. Orelli, he joined J. G. Baiter in the preparation of a revised critical edition of the rhetorical and philosophical writings of Cicero (1854–1862). His school editions of some of the speeches of Cicero in the Haupt and Sauppe series, with notes and introductions, were very successful. He also edited a number of classical texts for the Teubner series, the most important of which are Tacitus (4th ed., 1883); *Rhetores Latini minores* (1863); Quintilian (1868); Sulpicius Severus (1866); Minucius Felix together with Firmicus Maternus *De errore* (1867); Salvianus (1877) and Victor Vitensis's *Historia persecutionis Africanae provinciae* (1878). He was also an enthusiastic collector of autographs.

See articles by W. Christ and G. Laubmann in *Allgemeine deutsche Biographie* and by C. Bursian in *Biographisches Jahrbuch*; and J. E. Sandys, *Hist. of Classical Scholarship*, iii. 195 (1908).

HALMA (Greek for "jump"), a table game, a form of which was known to the ancient Greeks, played on a board divided into 256 squares with wooden *men*, resembling chess pawns. In the two-handed game 19 men are employed on each side, coloured respectively black and white; in the four-handed each player has 13, the men being coloured white, black, red and green. At the beginning of the game the men are drawn up in triangular formation in the enclosures, or *yards*, diagonally opposite each other in the corners of the board. The object of each player is to get all his men into his enemy's yard, the player winning who first accomplishes this. The moves are made alternately, the mode of progression being by a *step*, from one square to another immediately adjacent, or by a jump (whence the name), which is the jumping of a man from a square in front of it into an empty square on the other side of it. This corresponds to jumping in draughts, except that, in halma, the hop may be in any direction, over friendly as well as hostile men, and the men jumped over are not taken but remain on the board.

In the four-handed game either each player plays for himself, or two adjacent players play against the other two.

See *Card and Table Games*, by Professor Hoffmann (London, 1903).

HALMAHERA ["great land"; also Jilolo or Gilolo], an island of the Dutch East Indies, belonging to the residency of Ternate, lying under the equator and about 128° E. Its shape is extremely irregular, resembling that of the island of Celebes. It consists of four peninsulas so arranged as to enclose three great bays (Kayu, Bicholi, Weda), all opening towards the east, the northern peninsula being connected with the others by an isthmus only 5 m. wide. On the western side of the isthmus lies another bay, that of Dodinga, in the mouth of which are situated the two islands Ternate and Tidore, whose political importance exceeds that of the larger island (see these articles). Of the four peninsulas of Halmahera the northern and the southern are reckoned to the sultanate of Ternate, the north-eastern and south-eastern to that of Tidore; the former having eleven, the latter three districts. The distance between the extremities of the northern and southern peninsulas, measured along the curve of the west coast, is about 240 m.; and the total area of the island is 6700 sq. m. Knowledge of the island is very incomplete. It appears that the four peninsulas are traversed in the direction of their longitudinal axis by mountain chains 3000 to 4000 ft. high, covered with forest, without a central chain at the nucleus of the island whence the peninsulas diverge. The mountain chains are frequently interrupted by plains, such as those of Weda and Kobi. The northern part of the mountain chain of the northern peninsula is volcanic, its volcanoes continuing the line of those of Makian, Ternate and Tidore. Coral formations on heights in the interior would indicate oscillations of the land in several periods, but a detailed geology of the island is wanting. To the north-east of the northern peninsula is the considerable island of Morotai (635 sq. m.), and to the west of the southern peninsula the more important island of Bachian (*q.v.*) among others. Galela is a considerable settlement, situated on a bay of the same name on the north-east coast, in a well cultivated plain which extends southward and inland. Vegetation is prolific. Rice is grown by the natives, but the sago tree is of far greater importance to them. Dammar and coco-nuts are also grown. The sea yields trepang and pearl shells. A little trade is carried on by the Chinese and Macassars of Ternate, who, crossing the narrow isthmus of Dodinga, enter the bay of Kayu on the east coast. The total population is estimated at 100,000.

The inhabitants are mostly of immigrant Malayan stock. In the northern peninsula are found people of Papuan type, probably representing the aborigines, and a tribe around Galela,

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who are Polynesian in physique, possibly remnants, much mixed by subsequent crossings with the Papuan indigenes, of the Caucasian hordes emigrating in prehistoric times across the Pacific. M. Achille Raffray gives a description of them in *Tour du monde* (1879) where photographs will be found. "They are as unlike the Malays as we are, excelling them in tallness of stature and elegance of shape, and being perfectly distinguished by their oval face, with a fairly high and open brow, their aquiline nose and their horizontally placed eyes. Their beards are sometimes thick; their limbs are muscular; the colour of their skins is cinnamon brown. Spears of iron-wood, abundantly barbed, and small bows and bamboo arrows free from poison are their principal weapons." They are further described as having temples (*sabuaz*) in which they suspend images of serpents and other monsters as well as the trophies procured by war. They believe in a better life hereafter, but have no idea of a hell or a devil, their evil spirits only tormenting them in the present state.

The Portuguese and Spaniards were better acquainted with Halmahera than with many other parts of the archipelago; they called it sometimes Batu China and sometimes Moro. It was circumnavigated by one of their vessels in 1525, and the general outline of the coasts is correctly given in their maps at a time when separate portions of Celebes, such as Macassar and Menado, are represented as distinct islands. The name (Jilolo) was really that of a native state, the sultan of which had the chief rank among the princes of the Moluccas before he was supplanted by the sultan of Ternate about 1380. His capital, Jilolo, lay on the west coast on the first bay to the north of that of Dodinga. In 1876 Danu Hassan, a descendant of the sultans of Jilolo, raised an insurrection in the island for the purpose of throwing off the authority of the sultans of Tidore and Ternate; and his efforts would probably have been successful but for the intervention of the Dutch. In 1878 a Dutch expedition was directed against the pirates of Tobalai, and they were virtually extirpated. Slavery remains in the interior. Missionary work, carried on in the northern peninsula of Halmahera since 1866, has been fairly successful among the heathen natives, but less so among the Mahommedans, who have often incited the others against the missionaries and their converts.

HALMSTAD, a seaport of Sweden, chief town of the district (*län*) of Halland, on the E. shore of the Cattegat, 76 m. S.S.E. of Gothenburg by the railway to Helsingborg. Pop. (1900), 15,362. It lies at the mouth of the river Nissa, having an inner harbour (15 ft. depth), an outer harbour, and roads giving anchorage (24 to 36 ft.) exposed to S. and N.W. winds. In the neighbourhood there are quarries of granite, which is exported chiefly to Germany. Other industries are engineering, ship-building and brewing, and there are cloth, jute, hat, wood-pulp and paper factories. The principal exports are granite, timber and hats; and butter through Helsingborg and Gothenburg. The imports are coal, machinery and grain. Potatoes are largely grown in the district, and the salmon fisheries are valuable. The castle is the residence of the governor of the province. There are both mineral and sea-water baths in the neighbourhood.

Mention of the church of Halmstad occurs as early as 1462, and the fortifications are mentioned first in 1225. The latter were demolished in 1734. There were formerly Dominican and Franciscan monasteries in the town. The oldest town-privileges date from 1307. During the revolt of the miner Engelbrekt, it twice fell into the hands of the rebels—in 1434 and 1436. The town appears to have been frequently chosen as the meeting-place of the rulers and delegates of the three northern kingdoms; and under the union of Kalmar it was appointed to be the place for the election of a new Scandinavian monarch whenever necessary. The *län* of Halland formed part of the territory of Denmark in Sweden, and accordingly, in 1534, during his war with the Danes, Gustavus Vasa assaulted and took its chief town. In 1660, by the treaty of Copenhagen, the whole district was ceded to Sweden. In 1676 Charles XII. defeated near Halmstad a Danish army which was attempting to retake the district, and since that time Halland has formed part of Sweden.

HALO, a word derived from the Gr. ἅλως, a threshing-floor, and afterwards applied to denote the disk of the sun or moon, probably on account of the circular path traced out by the oxen threshing the corn. It was thence applied to denote any luminous ring, such as that viewed around the sun or moon, or portrayed about the heads of saints.

In physical science, a halo is a luminous circle, surrounding the sun or moon, with various auxiliary phenomena, and formed by the reflection and refraction of light by ice-crystals suspended in the atmosphere. The optical phenomena produced by atmospheric water and ice may be divided into two classes, according to the relative position of the luminous ring and the source of light. In the first class we have *halos*, and *coronae*, or "glories," which encircle the luminary; the second class includes *rainbows*, *fog-bows*, *mist-halos*, *anthelia* and *mountain-spectres*, whose centres are at the anti-solar point. Here it is only necessary to distinguish halos from coronae. Halos are at definite distances (22° and 46°) from the sun, and are coloured red on the *inside*, being due to refraction; coronae closely surround the sun at variable distances, and are coloured red on the *outside*, being due to diffraction.

The phenomenon of a solar (or lunar) halo as seen from the earth is represented in fig. 1; fig. 2 is a diagrammatic sketch showing the appearance as viewed from the zenith; but it is only in exceptional circumstances that all the parts are seen. Encircling the sun or moon (S), there are two circles, known as

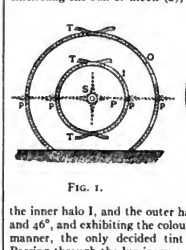

FIG. 1.

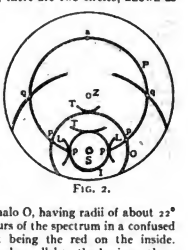

FIG. 2.

the inner halo I, and the outer halo O, having radii of about 22° and 46°, and exhibiting the colours of the spectrum in a confused manner, the only decided tint being the red on the inside. Passing through the luminary and parallel to the horizon, there is a white luminous circle, the *parhelic circle* (P), on which a number of images of the luminary appear. The most brilliant are situated at the intersections of the inner halo and the parhelic circle; these are known as *parhelia* (denoted by the letter *p* in the figures) (from the Gr. παρά, beside, and ἥλιος, the sun) or "mock-suns," in the case of the sun, and as *paraselenae* (from παρά and σελήνη, the moon) or "mock-moons," in the case of the moon. Less brilliant are the parhelia of the outer halo. The parhelia are most brilliant when the sun is near the horizon. As the sun rises, they pass a little beyond the halo and exhibit flaming tails. The other images on the parhelic circle are the *paranthelia* (*q*) and the *antihelion* (*a*) (from the Greek ἀντί, opposite, and ἥλιος, the sun). The former are situated at from 90° to 140° from the sun; the latter is a white patch of light situated at the anti-solar point and often exceeding in size the apparent diameter of the luminary. A vertical circle passing through the sun may also be seen. From the parhelia of the inner halo two oblique curves (L) proceed. These are known as the "arcs of Lowitz," having been first described in 1794 by Johann Tobias Lowitz (1757–1804). Luminous arcs (T), tangential to the upper and lower parts of each halo, also occur, and in the case of the inner halo, the arcs may be prolonged to form a quasi-elliptic halo.[1]

The physical explanation of halos originated with René Descartes, who ascribed their formation to the presence of ice-crystals in the atmosphere. This theory was adopted by Edmé Mariotte, Sir Isaac Newton and Thomas Young; and, although

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certain of their assumptions were somewhat arbitrary, yet the general validity of the theory has been demonstrated by the researches of J. G. Galle and A. Bravais. The memoir of the last-named, published in the *Journal de l'École royale polytechnique* for 1847 (xviii., 1–270), ranks as a classic on the subject; it is replete with examples and illustrations, and discusses the various phenomena in minute detail.

The usual form of ice-crystals in clouds is a right hexagonal prism, which may be elongated as a needle or foreshortened like a thin plate. There are three refracting angles possible, one of 120° between two adjacent prism faces, one of 60° between two alternate prism faces, and one of 90° between a prism face and the base. If innumerable numbers of such crystals fall in any manner between the observer and the sun, light falling upon these crystals will be refracted, and the refracted rays will be crowded together in the position of minimum deviation (see REFRACTION OF LIGHT). Mariotte explained the inner halo as being due to refraction through a pair of alternate faces, since the minimum deviation of an ice-prism whose refracting angle is 60° is about 22°. Since the minimum deviation is least for the least refrangible rays, it follows that the red rays will be the least refracted, and the violet the more refracted, and therefore the halo will be coloured red on the inside. Similarly, as explained by Henry Cavendish, the halo of 46° is due to refraction by faces inclined at 90°. The impurity of the colours (due partly to the sun's diameter, but still more to oblique refraction) is more marked in halos than in rainbows; in fact, only the red is at all pure, and as a rule, only a mere trace of green or blue is seen, the external portion of each halo being nearly white.

The two halos are the only phenomena which admit of explanation without assigning any particular distribution to the ice-crystals. But it is obvious that certain distributions will predominate, for the crystals will tend to fall so as to offer the least resistance to their motion; a needle-shaped crystal tending to keep its axis vertical, a plate-shaped crystal to keep its axis horizontal. Thomas Young explained the parhelic circle (P) as due to reflection from the vertical faces of the long prisms and the bases of the short ones. If these vertical faces become very numerous, the eye will perceive a colourless horizontal circle. Reflection from an excess of horizontal prisms gives rise to a vertical circle passing through the sun.

The parhelia (*p*) were explained by Mariotte as due to refraction through a pair of alternate faces of a vertical prism. When the sun is near the horizon the rays fall upon the principal section of the prisms; the minimum deviation for such rays is 22°, and consequently the parhelia are not only on the inner halo, but also on the parhelic circle. As the sun rises, the rays enter the prisms more and more obliquely, and the angle of minimum deviation increases; but since the emergent ray makes the same angle with the refracting edge as the incident ray, it follows that the parhelia will remain on the parhelic circle, while receding from the inner halo. The different values of the angle of minimum deviation for rays of different refrangibilities give rise to spectral colours, the red being nearest the sun, while farther away the overlapping of the spectra forms a flaming colourless tail sometimes extending over as much as 10° to 20°. The "arcs of Lowitz" (L) are probably due to small oscillations of the vertical prisms.

The "tangential arcs" (T) were explained by Young as being caused by the thin plates with their axes horizontal, refraction taking place through alternate faces. The axes will take up any position, and consequently give rise to a continuous series of parhelia which touch externally the inner halo, both above and below, and under certain conditions (such as the requisite altitude of the sun) form two closed elliptical curves; generally, however, only the upper and lower portions are seen. Similarly, the tangential arcs to the halo of 46° are due to refraction through faces inclined at 90°.

The paranthelia (*q*) may be due to two internal or two external reflections. A pair of triangular prisms having a common face, or a stellate crystal formed by the symmetrical interpenetration of two triangular prisms admits of two internal reflections by faces inclined at 120°, and so give rise to two colourless images each at an angular distance of 120° from the sun. Double internal reflection by a triangular prism would form a single coloured image on the parhelic circle at about 98° from the sun. These angular distances are attained only when the sun is on the horizon, and they increase as it rises.

The anthelion (*a*) may be explained as caused by two internal reflections of the solar rays by a hexagonal lamellar crystal, having its axis horizontal and one of the diagonals of its base vertical. The emerging rays are parallel to their original direction and form a colourless image on the parhelic circle opposite the sun.

REFERENCES.—Auguste Bravais's celebrated memoir, "Sur les halos et les phénomènes optiques qui les accompagnent" (*Journ. École poly.* vol. xviii., 1847), contains a full account of the geometrical theory. See also E. Mascart, *Traité d'optique*; J. Pernter, *Meteorologische Optik* (1902–1903); and R. S. Heath, *Geometrical Optics*.

HALOGENS. The word halogen is derived from the Greek ἅλς (sea-salt) and γενᾶν (to produce), and consequently means the sea-salt producer. The term is applied to the four elements fluorine, chlorine, bromine and iodine, on account of the great similarity of their sodium salts to ordinary sea-salt. These four elements show a great resemblance to one another in their general chemical behaviour, and in that of their compounds, whilst their physical properties show a gradual transition. Thus, as the atomic weight increases, the state of aggregation changes from that of a gas in the case of fluorine and chlorine, to that of a liquid (bromine) and finally to that of the solid (iodine); at the same time the melting and boiling points rise with increasing atomic weights. The halogen of lower atomic weight can displace one of higher atomic weight from its hydrogen compound, or from the salt derived from such hydrogen compound, while, on the other hand, the halogen of higher atomic weight can displace that of lower atomic weight, from the halogen oxy-acids and their salts; thus iodine will liberate chlorine from potassium chlorate and also from perchloric acid. All four of the halogens unite with hydrogen, but the affinity for hydrogen decreases as the atomic weight increases, hydrogen and fluorine uniting explosively at very low temperatures and in the dark, whilst hydrogen and iodine unite only at high temperatures, and even then the resulting compound is very readily decomposed by heat. The hydrides of the halogens are all colourless, strongly fuming gases, readily soluble in water and possessing a strong acid reaction; they react readily with basic oxides, forming in most cases well defined crystalline salts which resemble one another very strongly. On the other hand the stability of the known oxygen compounds increases with the atomic weight, thus iodine pentoxide is, at ordinary temperatures, a well-defined crystalline solid, which is only decomposed on heating strongly, whilst chlorine monoxide, chlorine peroxide, and chlorine heptoxide are very unstable, even at ordinary temperatures, decomposing at the slightest shock. Compounds of fluorine and oxygen, and of bromine and oxygen, have not yet been isolated. In some respects there is a very marked difference between fluorine and the other members of the group, for, whilst sodium chloride, bromide and iodide are readily soluble in water, sodium fluoride is much less soluble; again, silver chloride, bromide and iodide are practically insoluble in water, whilst, on the other hand, silver fluoride is appreciably soluble in water. Again, fluorine shows a great tendency to form double salts, which have no counterpart among the compounds formed by the other members of the family.

HALS, FRANS (1580?–1666), Dutch painter, was born at Antwerp according to the most recent authorities in 1580 or 1581, and died at Haarlem in 1666. As a portrait painter second only to Rembrandt in Holland, he displayed extraordinary talent and quickness in the exercise of his art coupled with improvidence in the use of the means which that art secured to him. At a time when the Dutch nation fought for independence and won it, Hals appears in the ranks of its military gilds. He was also a member of the Chamber of Rhetoric, and (1644) chairman of the Painters' Corporation at Haarlem. But as a man he had failings. He so ill-treated his first wife, Anneke Hermansz,

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that she died prematurely in 1616; and he barely saved the character of his second, Lysbeth Reyniers, by marrying her in 1617. Another defect was partiality to drink, which led him into low company. Still he brought up and supported a family of ten children with success till 1652, when the forced sale of his pictures and furniture, at the suit of a baker to whom he was indebted for bread and money, brought him to absolute penury. The inventory of the property seized on this occasion only mentions three mattresses and bolsters, an armoire, a table and five pictures. This humble list represents all his worldly possessions at the time of his bankruptcy. Subsequently to this he was reduced to still greater straits, and his rent and firing were paid by the municipality, which afterwards gave him (1664) an annuity of 200 florins. We may admire the spirit which enabled him to produce some of his most striking works in his unhappy circumstances: we find his widow seeking outdoor relief from the guardians of the poor, and dying obscurely in a hospital.

Hals's pictures illustrate the various strata of society into which his misfortunes led him. His banquets or meetings of officers, of sharpshooters, and gildsmen are the most interesting of his works. But they are not more characteristic than his low-life pictures of itinerant players and singers. His portraits of gentlefolk are true and noble, but hardly so expressive as those of fishwives and tavern heroes.

His first master at Antwerp was probably van Noort, as has been suggested by M. G. S. Davies, but on his removal to Haarlem Frans Hals entered the atelier of van Mander, the painter and historian, of whom he possessed some pictures which went to pay the debt of the baker already alluded to. But he soon improved upon the practice of the time, illustrated by J. van Schoreel and Antonio Moro, and, emancipating himself gradually from tradition, produced pictures remarkable for truth and dexterity of hand. We prize in Rembrandt the golden glow of effects based upon artificial contrasts of low light in immeasurable gloom. Hals was fond of daylight of silvery sheen. Both men were painters of touch, but of touch on different keys—Rembrandt was the bass, Hals the treble. The latter is perhaps more expressive than the former. He seizes with rare intuition a moment in the life of his sitters. What nature displays in that moment he reproduces thoroughly in a very delicate scale of colour, and with a perfect mastery over every form of expression. He becomes so clever at last that exact tone, light and shade, and modelling are all obtained with a few marked and fluid strokes of the brush.

In every form of his art we can distinguish his earlier style from that of later years. It is curious that we have no record of any work produced by him in the first decade of his independent activity, save an engraving by Jan van de Velde after a lost portrait of "The Minister Johannes Bogardus," who died in 1614. The earliest works by Frans Hals that have come down to us, "Two Boys Playing and Singing" in the gallery of Cassel, and a "Banquet of the officers of the 'St Joris Doele'" or Arquebusiers of St George (1616) in the museum of Haarlem, exhibit him as a careful draughtsman capable of great finish, yet spirited withal. His flesh, less clear than it afterwards becomes, is pastose and burnished. Later he becomes more effective, displays more freedom of hand, and a greater command of effect. At this period we note the beautiful full-length of "Madame van Beresteyn" at the Louvre in Paris, and a splendid full-length portrait of "Willem van Heythuysen" leaning on a sword in the Liechtenstein collection at Vienna. Both these pictures are equalled by the other "Banquet of the officers of the Arquebusiers of St George" (with different portraits) and the "Banquet of the officers of the 'Cloveniers Doelen'" or Arquebusiers of St Andrew of 1627 and an "Assembly of the officers of the Arquebusiers of St Andrew" of 1633 in the Haarlem Museum. A picture of the same kind in the town hall of Amsterdam, with the date of 1637, suggests some study of the masterpieces of Rembrandt, and a similar influence is apparent in a picture of 1641 at Haarlem, representing the "Regents of the Company of St Elizabeth" and in the portrait of "Maria Voogt" at Amsterdam. But Rembrandt's example did not create a lasting impression on Hals. He gradually dropped more and more into grey and silvery harmonies of tone; and two of his canvases, executed in 1664, "The Regents and Regentesses of the Oudemannenhuis" at Haarlem, are masterpieces of colour, though in substance all but monochromes. In fact, ever since 1641 Hals had shown a tendency to restrict the gamut of his palette, and to suggest colour rather than express it. This is particularly noticeable in his flesh tints which from year to year became more grey, until finally the shadows were painted in almost absolute black, as in the "Tymane Oosdorp," of the Berlin Gallery. As this tendency coincides with the period of his poverty, it has been suggested that one of the reasons, if not the only reason, of his predilection for black and white pigment was the cheapness of these colours as compared with the costly lakes and carmines.

As a portrait painter Frans Hals had scarcely the psychological insight of a Rembrandt or Velazquez, though in a few works, like the "Admiral de Ruyter," in Earl Spencer's collection, the "Jacob Olycan" at the Hague Gallery, and the "Albert van der Meer" at Haarlem town hall, he reveals a searching analysis of character which has little in common with the instantaneous expression of his so-called "character" portraits. In these he generally sets upon the canvas the fleeting aspect of the various stages of merriment, from the subtle, half ironic smile that quivers round the lips of the curiously misnamed "Laughing Cavalier" in the Wallace Collection to the imbecile grin of the "Hille Bobbe" in the Berlin Museum. To this group of pictures belong Baron Gustav Rothschild's "Jester," the "*Bakhuisenne*" at the Louvre, and the "Fisher Boy" at Antwerp, whilst the "Portrait of the Artist with his second Wife" at the Ryks Museum in Amsterdam, and the somewhat confused group of the "Beresteyn Family" at the Louvre show a similar tendency. Far less scattered in arrangement than this Beresteyn group, and in every respect one of the most masterly of Frans Hals's achievements is the group called "The Painter and his Family" in the possession of Colonel Warde, which was almost unknown until it appeared at the winter exhibition at the Royal Academy in 1906.

Though a visit to Haarlem town hall, which contains the five enormous Doelen groups and the two Regenten pictures, is as necessary for the student of Hals's art as a visit to the Prado in Madrid is for the student of Velazquez, good examples of the Dutch master have found their way into most of the leading public and private collections. In the British Isles, besides the works already mentioned, portraits from his brush are to be found at the National Gallery, the Edinburgh Gallery, the Glasgow Corporation Gallery, Hampton Court, Buckingham Palace, Devonshire House, and the collections of Lord Northbrooke, Lord Ellesmere, Lord Iveagh and Lord Spencer.

At Amsterdam is the celebrated "Flute Player," once in the Dupper collection at Dort; at Brussels, the patrician "Heythuysen"; at the Louvre, "Descartes"; at Dresden, the painter "Van der Vinne." Hals's sitters were taken from every class of society—admirals, generals and burgomasters pairing with merchants, lawyers, clerks. To register all that we find in public galleries would involve much space. There are eight portraits at Berlin, six at Cassel, five at St Petersburg, six at the Louvre, two at Brussels, five at Dresden, two at Gotha. In private collections, chiefly in Paris, Haarlem and Vienna, we find an equally important number. Amongst the painter's most successful representations of fishwives and termagants we should distinguish the "Hille Bobbe" of the Berlin Museum, and the "Hille Bobbe with her Son" in the Dresden Gallery. Itinerant players are best illustrated in the Neville-Goldsmith collection at the Hague, and the Six collection at Amsterdam. Boys and girls singing, playing or laughing, or men drinking, are to be found in the gallery of Schwerin, in the Arenberg collection, and in the royal palace at Brussels.

For two centuries after his death Frans Hals was held in such poor esteem that some of his paintings, which are now among the proudest possessions of public galleries, were sold at auction

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for a few pounds or even shillings. The portrait of "Johannes Acronius," now at the Berlin Museum, realized five shillings at the Enschede sale in 1786. The splendid portrait of the man with the sword at the Liechtenstein gallery was sold in 1800 for £4, 5s. With his rehabilitation in public esteem came the enormous rise in values, and, at the Secretan sale in 1889, the portrait of "Pieter van de Broecke d'Anvers" was bid up to £4420, while in 1908 the National Gallery paid £25,000 for the large group from the collection of Lord Talbot de Malahide.

Of the master's numerous family none has left a name except FRANS HALS THE YOUNGER, born about 1622, who died in 1669. His pictures represent cottages and poultry; and the "Vanitas" at Berlin, a table laden with gold and silver dishes, cups, glasses and books, is one of his finest works and deserving of a passing glance.

Quite in another form, and with much of the freedom of the elder Hals, DIRK HALS, his brother (born at Haarlem, died 1656), is a painter of festivals and ball-rooms. But Dirk had too much of the freedom and too little of the skill in drawing which characterized his brother. He remains second on his own ground to Palamedes. A fair specimen of his art is a "Lady playing a Harpsichord to a Young Girl and her Lover" in the van der Hoop collection at Amsterdam, now in the Ryks Museum. More characteristic, but not better, is a large company of gentle-folk rising from dinner, in the Academy at Vienna.

LITERATURE.—See W. Bode, *Frans Hals und seine Schule* (Leipzig, 1871); W. Unger and W. Vosmaer, *Etchings after Frans Hals* (Leyden, 1873); Percy Rendell Head, *Sir Anthony Van Dyck and Frans Hals* (London, 1879); D. Knackfuss, *Frans Hals* (Leipzig, 1896); G. S. Davies, *Frans Hals* (London, 1902). (P. G. K.)

HALSBURY, HARDINGE STANLEY GIFFARD, 1ST EARL OF (1825–), English lord chancellor, son of Stanley Lees Giffard, LL.D., was born in London on the 3rd of September 1825. He was educated at Merton College, Oxford, and was called to the bar at the Inner Temple in 1850, joining the North Wales and Chester circuit. Afterwards he had a large practice at the central criminal court and the Middlesex sessions, and he was for several years junior prosecuting counsel to the treasury. He was engaged in most of the celebrated trials of his time, including the Overend and Gurney and the Tichborne cases. He became queen's counsel in 1865, and a bencher of the Inner Temple. Mr Giffard twice contested Cardiff in the Conservative interest, in 1868 and 1874, but he was still without a seat in the House of Commons when he was appointed solicitor-general by Disraeli in 1875 and received the honour of knighthood. In 1877 he succeeded in obtaining a seat, when he was returned for Launceston, which borough he continued to represent until his elevation to the peerage in 1885. He was then created Baron Halsbury and appointed lord chancellor, thus forming a remarkable exception to the rule that no criminal lawyer ever reaches the woolsack. Lord Halsbury resumed the position in 1886 and held it until 1892 and again from 1895 to 1905, his tenure of the office, broken only by the brief Liberal ministries of 1886 and 1892–1895, being longer than that of any lord chancellor since Lord Eldon. In 1898 he was created earl of Halsbury and Viscount Tiverton. Among Conservative lord chancellors Lord Halsbury must always hold a high place, his grasp of legal principles and mastery in applying them being pre-eminent among the judges of his day.

HALSTEAD, a market-town in the Maldon parliamentary division of Essex, England, on the Colne, 17 m. N.N.E. from Chelmsford; served by the Colne Valley railway from Chappel Junction on the Great Eastern railway. Pop. of urban district (1901), 6073. It lies on a hill in a pleasant wooded district. The church of St Andrew is mainly Perpendicular. It contains a monument supposed to commemorate Sir Robert Bourchier (d. 1349), lord chancellor to Edward III. The Lady Mary Ramsay grammar school dates from 1594. There are large silk and crape works. Two miles N. of Halstead is Little Maplestead, where the church is the latest in date of the four churches with round naves extant in England, being perhaps of 12th-century foundation, but showing early Decorated work in the main. The chancel, which is without aisles, terminates in an apse. Three miles N.W. from Halstead are the large villages of Sible Hedingham (pop. 1701) and Castle Hedingham (pop. 1097). At the second is the Norman keep of the de Veres, of whom Aubrey de Vere held the lordship from William I. The keep dates from the end of the 11th century, and exhibits much fine Norman work. The church of St Nicholas, Castle Hedingham, has fine Norman, Transitional and Early English details, and there is a black marble tomb of John de Vere, 15th earl of Oxford (d. 1540), with his countess.

There are signs of settlement at Halstead (Halsteda, Halgusted, Halsted) in the Bronze Age; but there is no evidence of the causes of its growth in historic times. Probably its situation on the river Colne made it to some extent a local centre. Throughout the middle ages Halstead was unimportant, and never rose to the rank of a borough.

HALT. (1) An adjective common to Teutonic languages and still appearing in Swedish and Danish, meaning lame, crippled. It is also used as a verb, meaning to limp, and as a substantive, especially in the term "string-halt" or "spring-halt," a nervous disorder affecting the muscles of the hind legs of horses. (2) A pause or stoppage made on a march or a journey. The word came into English in the form "to make alto" or "alt," and was taken from the French *faire alte* or Italian *far alto*. The origin is a German military term, *Halt machen*, *Halt* meaning "hold."

HALUNTIUM (Gr. Ἅλοντιον, mod. S. Marco d'Alunzio), an ancient city of Sicily, 6 m. from the north coast and 25 m. E.N.E. of Halaesa. It was probably of Sicel origin, though its foundation was ascribed to some of the companions of Aeneas. It appears first in Roman times as a place of some importance, and suffered considerably at the hands of Verres. The abandoned church of S. Mark, just outside the modern town, is built into the *cella* of an ancient Greek temple, which measures 62 ft. by 18. A number of ancient inscriptions have been found there.

HALYBURTON, JAMES (1518–1580), Scottish reformer, was born in 1518, and was educated at St Andrews, where he graduated M.A. in 1538. From 1553 to 1586 he was provost of St Andrews and a prominent figure in the national life. He was chosen as one of the lords of the congregation in 1557, and commanded the contingents sent by Forfar and Fife against the queen regent in 1559. He took part in the defense of Edinburgh, and in the battles of Langside (1568) and Restalrig (1571). He had stoutly opposed the marriage of Mary with Darnley, and when, after Restalrig, he was captured by the queen's troops, he narrowly escaped execution. He represented Morton at the conference of 1578, and was one of the royal commissioners to the General Assembly in 1582 and again in 1588. He died in February 1580.

HALYBURTON, THOMAS (1674–1712), Scottish divine, was born at Dupplin, near Perth, on the 25th of December 1674. His father, one of the ejected ministers, having died in 1682, he was taken by his mother in 1685 to Rotterdam to escape persecution, where he for some time attended the school founded by Erasmus. On his return to his native country in 1687 he completed his elementary education at Perth and Edinburgh, and in 1696 graduated at the university of St Andrews. In 1700 he was ordained minister of the parish of Ceres, and in 1710 he was recommended by the synod of Fife for the chair of theology in St Leonard's College, St Andrews, to which accordingly he was appointed by Queen Anne. After a brief term of active professorial life he died from the effects of overwork in 1712.

The works by which he continues to be known were all of them published after his death. Wesley and Whitefield were accustomed to commend them to their followers. They were published as follows: *Natural Religion Insufficient, and Revealed Religion Necessary, to Man's Happiness in his Present State* (1714), an able statement of the orthodox Calvinistic criticism of the deism of Lord Herbert of Cherbury and Charles Blount; *Memoirs of the Life of Mr Thomas Halyburton* (1715), three parts by his own hand, the fourth from his diary by another hand; *The Great Concern of Salvation* (1721), with a word of commendation by I. Watts; *Ten Sermons Preached Before and After the Lord's Supper* (1722); *The Unpardonable Sin Against the Holy Ghost* (1784). See Halyburton's *Memoirs* (1714).

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HAM, in the Bible. (1) חָם, *Ḥām*, in Gen. v. 32, vi. 10, vii. 13, ix. 18, x. 5, 1 Chron. i. 4, the *second* son of Noah; in Gen. ix. 24, the *youngest* son (but cf. below); and in Gen. x. 6, 1 Chron. i. 8, the father of Cush (Ethiopia), Mizraim (Egypt), Phut and Canaan. Genesis x. exhibits in the form of genealogies the political, racial and geographical relations of the peoples known to Israel; as it was compiled from various sources and has been more than once edited, it does not exactly represent the situation at any given date,[1] but Ham seems to stand roughly for the south-western division of the world as known to Israel, which division was regarded as the natural sphere of influence of Egypt. Ham is held to be the Egyptian word *Khem* (black) which was the native name of Egypt; thus in Pss. lxxviii. 51, cv. 23, 27, cvi. 22, Ham = Egypt. In Gen. ix. 20-26 Canaan was originally the third son of Noah and the villain of the story. Ham is a later addition to harmonize with other passages.

(2) חָם, *Ḥām*, 1 Chron. iv. 40, apparently the name of a place or tribe. It can hardly be identical with (1); nothing else is known of this second Ham, which may be a scribe's error; the Syriac version rejects the name.

(3) חָם, *Ḥam*, Gen. xiv. 5; the place where Chedorlaomer defeated the Zuzim, apparently in eastern Palestine. The place is unknown, and the name may be a scribe's error, perhaps for Ammon. (W. H. Bɪ.)

HAM, a small town of northern France, in the department of Somme, 36 m. E.S.E. of Amiens on the Northern railway between that city and Laon. Pop. (1906), 2057. It stands on the Somme in a marshy district where market-gardening is carried on. From the 9th century onwards it appears as the seat of a lordship which, after the extinction of its hereditary line, passed in succession to the houses of Coucy, Enghien, Luxembourg, Rohan, Vendôme and Navarre, and was finally united to the French crown on the accession of Henry IV. Notre-Dame, the church of an abbey of canons regular of St Augustin, dates from the 12th and 13th centuries, but in 1760 all the inflammable portions of the building were destroyed by a conflagration caused by lightning, and a process of restoration was subsequently carried out. Of special note are the bas-reliefs of the nave and choir, executed in the 17th and 18th centuries, and the crypt of the 12th century, which contains the sepulchral effigies of Odo IV. of Ham and his wife Isabella of Béthencourt. The castle, founded before the 10th century, was rebuilt early in the 13th, and extended in the 14th; its present appearance is mainly due to the constable Louis of Luxembourg, count of St Pol, who between 1436 and 1470 not only furnished it with outworks, but gave such a thickness to the towers and curtains, and more especially to the great tower or donjon which still bears his motto *Mon Myeulx*, that the great engineer and architect Viollet-le-Duc considered them, even in the 19th century, capable of resisting artillery. It forms a rectangle 305 ft. long by 263 ft. broad, with a round tower at each angle and two square towers protecting the curtains. The eastern and western sides are each defended by a demi-lune. The Constable's Tower, for so the great tower is usually called in memory of St Pol, has a height of about 100 ft., and the thickness of the walls is 36 ft.; the interior is occupied by three large hexagonal chambers in as many stories. The castle of Ham, which now serves as barracks, has frequently been used as a state prison both in ancient and modern times, and the list of those who have sojourned there is an interesting one, including as it does Joan of Arc, Louis of Bourbon, the ministers of Charles X., Louis Napoleon, and Generals Cavaignac and Lamoricière. Louis Napoleon was there for six years, and at last effected his escape in the disguise of a workman. During 1870–1871 Ham was several times captured and recaptured by the belligerents. A statue commemorates the birth in the town of General Foy (1775–1825).

See J. G. Cappot, *Le Château de Ham* (Paris, 1842); and Ch. Gomart, *Ham, son château et ses prisonniers* (Ham, 1864).

[1] A. Jeremias, *Das A.T. im Lichte des alten Orients*, p. 145, holds that it represents the situation in the 8th century B.C.

HAMADĀN, a province and town of Persia. The province is bounded N. by Gerrūs and Khamseh, W. by Kermanshah, S. by Malāyir and Irāk, E. by Savah and Kazvin. It has many well-watered, fertile plains and more than four hundred flourishing villages producing much grain, and its population, estimated at 350,000—more than half being Turks of the Karaguzlu (black-eyed) and Shāmlu (Syrian) tribes—supplies several battalions of infantry to the army, and pays, besides, a yearly revenue of about £18,000.

Hamadān, the capital of the province, is situated 188 m. W.S.W. of Teheran, at an elevation of 5930 ft., near the foot of Mount Elvend (old Persian *Arvand*, Gr. *Orontes*), whose granite peak rises W. of it to an altitude of 11,000 ft. It is a busy trade centre with about 40,000 inhabitants (comprising 4000 Jews and 300 Armenians), has extensive and well-stocked bazzars and fourteen large and many small caravanserais. The principal industries are tanning leather and the manufacture of saddles, harnesses, trunks, and other leather goods, felts and copper utensils. The leather of Hamadān is much esteemed throughout the country and exported to other provinces in great quantities. The streets are narrow, and by a system called Kūcheh-bandi (street-closing) established long ago for impeding the circulation of crowds and increasing general security, every quarter of the town, or block of buildings, is shut off from its neighbours by gates which are closed during local disorders and regularly at night. Hamadān has post and telegraph offices and two churches, one Armenian, the other Protestant (of the American Presbyterian Mission).

Among objects of interest are the alleged tombs of Esther and Mordecai in an insignificant domed building in the centre of the town. There are two wooden sarcophagi carved all over with Hebrew inscriptions. That ascribed to Mordecai has the verses Isaiah lix. 8; Esther ii. 5; Ps. xvi. 9, 10, 11, and the date of its erection A.M. 4318 (A.D. 557). The inscriptions on the other sarcophagus consist of the verses Esther ix. 29, 32, x. 1; and the statement that it was placed there A.M. 4602 (A.D. 841) by "the pious and righteous woman Gemal Setan." A tablet let into the wall states that the building was repaired A.M. 4474 (A.D. 713). Hamadān also has the grave of the celebrated physician and philosopher Abu Ali ibn Sina, better known as Avicenna (d. 1036). It is now generally admitted that Hamadān is the Hagmatana (of the inscriptions), Agbatana or Ecbatana (*q.v.*, of the Greek writers), the "treasure city" of the Achaemenian kings which was taken and plundered by Alexander the Great, but very few ancient remains have been discovered. A rudely carved stone lion, which lies on the roadside close to the southern extremity of the city, and by some is supposed to have formed part of a building of the ancient city, is locally regarded as a talisman against famine, plague, cold, &c., placed there by Pliny, who is popularly known as the sorcerer Balinās (a corruption of Plinius).

Five miles S.W. from the city in a mountain gorge of Mount Elvend is the so-called Ganjnāma (treasure-deed), which consists of two tablets with trilingual cuneiform inscriptions cut into the rock and relating the names and titles of Darius I. (521–485 B.C.) and his son Xerxes I. (485–465 B.C.). (A. H.-S.)

HAMADHĀNĪ, in full Abū-l Faḍl Aḥmad ibn ul-Ḥusain ul-Hamadhānī (967–1007), Arabian writer, known as Badī' uz-Zamān (the wonder of the age), was born and educated at Hamadhān. In 990 he went to Jorjān, where he remained two years; then passing to Nishapūr, where he rivalled and surpassed the learned Khwārizmī. After journeying through Khorasan and Sijistān, he finally settled in Herāt under the protection of the vizir of Mahmūd, the Ghaznevid sultan. There he died at the age of forty. He was renowned for a remarkable memory and for fluency of speech, as well as for the purity of his language. He was one of the first to renew the use of rhymed prose both in letters and *maqāmas* (see Arabia: *Literature*, section "Belles Lettres").

His letters were published at Constantinople (1881), and with commentary at Beirut (1890); his *maqāmas* at Constantinople (1881), and with commentary at Beirut (1889). A good idea of the

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latter may be obtained from S. de Sacy's edition of six of the *maqâmas* with French translation and notes in his *Chrestomathie arabe*, vol. iii. (2nd ed., Paris, 1827). A specimen of the letters is translated into German in A. von Kremer's *Culturgeschichte des Orients*, ii. 470 sqq. (Vienna, 1877). (G. W. T.)

HAMAH, the Hamath of the Bible, a Hittite royal city, situated in the narrow valley of the Orontes, 110 English miles N. (by E.) of Damascus. It finds a place in the northern boundaries of Israel under David, Solomon and Jeroboam II. (2 Sam. viii. 9; 1 Kings viii. 65; 2 Kings xiv. 25). The Orontes flows winding past the city and is spanned by four bridges. On the south-east the houses rise 150 ft. above the river, and there are four other hills, that of the *Kalah* or castle being to the north 100 ft. high. Twenty-four minarets rise from the various mosques. The houses are principally of mud, and the town stands amid poplar gardens with a fertile plain to the west. The castle is ruined, the streets are narrow and dirty, but the bazaars are good, and the trade with the Bedouins considerable. The numerous water-wheels (*nâûrah*,) of enormous dimension, raising water from the Orontes are the most remarkable features of the view. Silk, woollen and cotton goods are manufactured. The population is about 40,000.

In the year 854 B.C. Hamath was taken by Shalmaneser II., king of Assyria, who defeated a large army of allied Hamathites, Syrians and Israelites at Karkor and slew 14,000 of them. In 738 B.C. Tiglath Pileser III. reduced the city to tribute, and another rebellion was crushed by Sargon in 720 B.C. The downfall of so ancient a state made a great impression at Jerusalem (Isa. x. 9). According to 2 Kings xvii. 24, 30, some of its people were transported to the land of N. Israel, where they made images of Ashima or Eshmun (probably Ishtar). After the Macedonian conquest of Syria Hamath was called Epiphania by the Greeks in honour of Antiochus IV., Epiphanes, and in the early Byzantine period it was known by both its Hebrew and its Greek name. In A.D. 630 the town surrendered to Abu 'Obeida, one of Omar's generals, and the church was turned into a mosque. In A.D. 1108 Tancred captured the city and massacred the Ism'ailieh defenders. In 1115 it was retaken by the Moslems, and in 1178 was occupied by Saladin. Abulfeda, prince of Hamah in the early part of the 14th century, is well known as an authority on Arab geography.

HAMANN, JOHANN GEORG (1730–1788), German writer on philosophical and theological subjects, was born at Königsberg in Prussia on the 27th of August 1730. His parents were of humble rank and small means. The education he received was comprehensive but unsystematic, and the want of definiteness in this early training doubtless tended to aggravate the peculiar instability of character which troubled Hamann's after life. In 1746 he began theological studies, but speedily deserted them and turned his attention to law. That too was taken up in a desultory fashion and quickly relinquished. Hamann seems at this time to have thought that any strenuous devotion to "bread-and-butter" studies was lowering, and accordingly gave himself entirely to reading, criticism and philological inquiries. Such studies, however, were pursued without any definite aim or systematic arrangement, and consequently were productive of nothing. In 1752, constrained to secure some position in the world, he accepted a tutorship in a family resident in Livonia, but only retained it a few months. A similar situation in Courland he also resigned after about a year. In both cases apparently the rupture might be traced to the curious and unsatisfactory character of Hamann himself. After leaving his second post he was received into the house of a merchant at Riga named Johann Christoph Behrens, who contracted a great friendship for him and selected him as his companion for a tour through Danzig, Berlin, Hamburg, Amsterdam and London. Hamann, however, was quite unfitted for business, and when left in London, gave himself up entirely to his fancies, and was quickly reduced to a state of extreme poverty and want. It was at this period of his life, when his inner troubles of spirit harmonized with the unhappy external conditions of his lot, that he began an earnest and prolonged study of the Bible; and from this time dates the tone of extreme pietism which is characteristic of his writings, and which undoubtedly alienated many of his friends. He returned to Riga, and was well received by the Behrens family, in whose house he resided for some time. A quarrel, the precise nature of which is not very clear though the occasion is evident, led to an entire separation from these friends. In 1750 Hamann returned to Königsberg, and lived for several years with his father, filling occasional posts in Königsberg and Mitau. In 1767 he obtained a situation as translator in the excise office, and ten years later a post as storekeeper in a mercantile house. During this period of comparative rest Hamann was able to indulge in the long correspondence with learned friends which seems to have been his greatest pleasure. In 1784 the failure of some commercial speculations greatly reduced his means, and about the same time he was dismissed with a small pension from his situation. The kindness of friends, however, supplied provision for his children, and enabled him to carry out the long-cherished wish of visiting some of his philosophical allies. He spent some time with Jacobi at Pempelfort and with Buchholz at Walbergen. At the latter place he was seized with illness, and died on the 21st of June 1788.

Hamann's works resemble his life and character. They are entirely unsystematic so far as matter is concerned, chaotic and disjointed in style. To a reader not acquainted with the peculiar nature of the man, which led him to regard what commended itself to him as therefore objectively true, they must be, moreover, entirely unintelligible and, from their peculiar, pietistic tone and scriptural jargon, probably offensive. A place in the history of philosophy can be yielded to Hamann only because he expresses in paroxysm, with barbarous fashion an idea to which other writers have given more effective shape. The fundamental thought is with him the unsatisfactoriness of abstraction or one-sidedness. The *Aufklärung*, with its rational theology, was to him the type of abstraction. Even Epicureanism, which might appear concrete, was by him rightly designated abstract. Quite naturally, then, Hamann is led to object strongly to much of the Kantian philosophy. The separation of sense and understanding is for him unjustifiable, and only paralleled by the extraordinary blunder of severing matter and form. Concreteness, therefore, is the one principle which Hamann expresses, and as representing his own thought he used to refer to Giordano Bruno's conception (previously held by Nicolaus Cusanus) of the identity of contraries. The demand, however, remains but a demand. Nothing that Hamann has given us can be regarded as in the slightest degree a response to it. His hatred of system, incapacity for abstract thinking, and intense personality rendered it impossible for him to do more than utter the disjointed, oracular, obscure dicta which gained for him among his friends the name of "Magus of the North." Two results only appear throughout his writings—first, the accentuation of belief; and secondly, the transference of many philosophical difficulties to language. Belief is, according to Hamann, the groundwork of knowledge, and he accepts all security Hume's analysis of experience as being most helpful in constructing a theological view. In language, which he appears to regard as somehow acquired, he finds a solution for the problems of reason which Kant had discussed in the *Kritik der reinen Vernunft*. On the application of these thoughts to the Christian theology one need not enter.

None of Hamann's writings is of great bulk; most are mere pamphlets of some thirty or forty pages. A complete collection has been published by F. Roth (*Schriften*, 8vo, 1821–1842), and by C. H. Gildemeister (*Leben und Schriften*, 6 vols., 1851–1873). See also M. Petri, *Hamanns Schriften u. Briefe*, 4 vols., 1872–1873); J. Poel, *Hamann, der Magus im Norden, sein Leben u. Mitteilungen aus seinen Schriften* (2 vols., 1874–1876); J. Claassen, *Hamann's Leben und Werke* (1885). Also H. Weber, *Neue Hamanniana* (1905). A very comprehensive essay on Hamann is to be found in Hegel's *Vermischte Schriften*, ii. (*Werke*, Bd. xvii.). On Hamann's influence on German literature, see J. Minor, *J. G. Hamann in seiner Bedeutung für die Sturm- und Drang-Periode* (1881).

HAMAR, or STOREHAMMER (GREAT HAMAR), a town of Norway in Hedemarken *amt* (county), 78 m. by rail N. of Christiania. Pop. (1900), 6003. It is pleasantly situated between two bays of the great Lake Mjösen, and is the junction of the railways to Trondhjem (N.) and to Otta in Gudbrandsdal (N.W.). The existing town was laid out in 1849, and made a bishop's see in 1864. Near the same site there stood an older town, which, together with a bishop's see, was founded in 1152 by the Englishman Nicholas Breakspeare (afterwards Pope Adrian IV.); but both town and cathedral were destroyed by the Swedes in 1567. Remains of the latter include a nave-arcade with rounded arches. The town is a centre for the local agricultural and timber trade.

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ḤAMĀSA (ḤAMĀSAH), the name of a famous Arabian anthology compiled by Ḥabīb ibn Aus aṭ-Ṭā'ī, surnamed Abū Tammām (see ABŪ TAMMĀM). The collection is so called from the title of its first book, containing poems descriptive of constancy and valour in battle, patient endurance of calamity, steadfastness in seeking vengeance, manfulness under reproach and temptation, all which qualities make up the attribute called by the Arabs *ḥamāsah* (briefly paraphrased by at-Tibrīzī as *ash-shiddah fi-l-amr*). It consists of ten books or parts, containing in all 884 poems or fragments of poems, and named respectively—(1) *al-Ḥamāsa*, 261 pieces; (2) *al-Marāthī*, "Dirges," 169 pieces; (3) *al-Adab*, "Manners," 54 pieces; (4) *an-Nasīb*, "The Beauty and Love of Women," 139 pieces; (5) *al-Hijā*, "Satires," 80 pieces; (6) *al-Aḍyāf wa-l-Madīḥ*, "Hospitality and Panegyric," 143 pieces; (7) *aṣ-Ṣifāt*, "Miscellaneous Descriptions," 3 pieces; (8) *as-Sair wa-n-Nu'ās*, "Journeying and Drowsiness," 9 pieces; (9) *al-Mulaḥ*, "Pleasantries," 38 pieces; and (10) *Madhammat-an-nisā*, "Dispraise of Women," 18 pieces. Of these books the first is by far the longest, both in the number and extent of its poems, and the first two together make up more than half the bulk of the work. The poems are for the most part fragments selected from longer compositions, though a considerable number are probably entire. They are taken from the works of Arab poets of all periods down to that of Abū Tammām himself (the latest ascertainable date being A.D. 832), but chiefly of the poets of the Ante-Islamic time (*Jāhiliyyūn*), those of the early days of Al-Islām (*Mukhaḍramūn*), and those who flourished during the reigns of the Omayyad caliphs, A.D. 660–749 (*Islāmiyyūn*). Perhaps the oldest in the collection are those relating to the war of Basūs, a famous legendary strife which arose out of the murder of Kulaib, chief of the combined clans of Bakr and Taghlib, and lasted for forty years, ending with the peace of Dhu-l-Majāz, about A.D. 534. Of the period of the Abbasid caliphs, under whom Abū Tammām himself lived, there are probably not more than sixteen fragments.

Most of the poems belong to the class of extempore or occasional utterances, as distinguished from *qaṣīdas*, or elaborately finished odes. While the latter abound with comparisons and long descriptions, in which the skill of the poet is exhibited with much art and ingenuity, the poems of the *Ḥamāsa* are short, direct and for the most part free from comparisons; the transitions are easy, the metaphors simple, and the purpose of the poem clearly indicated. It is due probably to the fact that this style of composition was chiefly sought by Abū Tammām in compiling his collection that he has chosen hardly anything from the works of the most famous poets of antiquity. Not a single piece from Imra 'al-Qais (Amru-ul-Qais) occurs in the *Ḥamāsa*, nor are there any from 'Alqama, Zuhair or A'shā; Nābigha is represented only by two pieces (pp. 408 and 742 of Freytag's edition) of four and three verses respectively; 'Antara by two pieces of four verses each (*id.* pp. 206, 209); Ṭarafa by one piece of five verses (*id.* p. 632); Labīd by one piece of three verses (*id.* p. 468); and 'Amr ibn Kulthūm by one piece of four verses (*id.* p. 236). The compilation is thus essentially an anthology of minor poets, and exhibits (so far at least as the more ancient poems are concerned) the general average of poetic utterance at a time when to speak in verse was the daily habit of every warrior of the desert.

To this description, however, there is an important exception in the book entitled *an-Nasīb*, containing verses relating to women and love. In the classical age of Arab poetry it was the established rule that all *qaṣīdas*, or finished odes, whatever their purpose, must begin with the mention of women and their charms (*tashbīb*), in order, as the old critics said, that the hearts of the hearers might be softened and inclined to regard kindly the theme which the poet proposed to unfold. The fragments included in this part of the work are therefore generally taken from the opening verses of *qaṣīdas*; where this is not the case, they are chiefly compositions of the early Islamic period, when the school of exclusively erotic poetry (of which the greatest representative was 'Omar ibn Abī Rabī'a) arose.

The compiler was himself a distinguished poet in the style of his day, and wandered through many provinces of the Moslem empire earning money and fame by his skill in panegyric. About 220 A.H. he betook himself to Khorasan, then ruled by 'Abdallah ibn Ṭāhir, whom he praised and by whom he was rewarded; on his journey home to 'Irāk he passed through Hamadhān, and was there detained for many months a guest of Abu-l-Wafā, son of Salama, the road onward being blocked by heavy falls of snow. During his residence at Hamadhān, Abū Tammām is said to have compiled or composed, from the materials which he found in Abu-l-Wafā's library, five poetical works, of which one was the *Ḥamāsa*. This collection remained as a precious heirloom in the family of Abu-l-Wafā until their fortunes decayed, when it fell into the hands of a man of Dinawar named Abu-l-'Awāthil, who carried it to Iṣfahān and made it known to the learned of that city.

The worth of the *Ḥamāsa* as a store-house of ancient legend, of faithful detail regarding the usages of the pagan time and early simplicity of the Arab race, can hardly be exaggerated. The high level of excellence which is found in its selections, both as to form and matter, is remarkable, and caused it to be said that Abū Tammām displayed higher qualities as a poet in his choice of extracts from the ancients than in his own compositions. What strikes us chiefly in the class of poetry of which the *Ḥamāsa* is a specimen, is its exceeding truth and reality, its freedom from artificiality and hearsay, the evident first-hand experience which the singers possessed of all of which they sang. For historical purposes the value of the collection is not small; but most of all there shines forth from it a complete portraiture of the hardy and manful nature, the strenuous life of passion and battle, the lofty contempt of cowardice, niggardliness and servility, which marked the valiant stock who bore Islām abroad in a flood of new life over the outworn civilizations of Persia, Egypt and Byzantium. It has the true stamp of the heroic time, of its cruelty and wantonness as of its strength and beauty.

No fewer than twenty commentaries are enumerated by Ḥājjī Khalīfa. Of these the earliest was by Abū Riyāsh (otherwise ar-Riyāshī), who died in 257 A.H.; excerpts from it, chiefly in elucidation of the circumstances in which the poems were composed, are frequently given by at-Tibrīzī (Tabrizi). He was followed by the famous grammarian Abu-l-Fatḥ ibn al-Jinnī (d. 392 A.H.), and later by Shihāb ad-Dīn Aḥmad al-Marzūqī of Iṣfahān (d. 421 A.H.). Upon al-Marzūqī's commentary is chiefly founded that of Abu Zakariyā Yaḥyā at-Tibrīzī (b. 421 A.H., d. 502), which has been published by the late Professor G. W. Freytag of Bonn, together with a Latin translation and notes (1828–1851). This monumental work, the labour of a life, is a treasure of information regarding the classical age of Arab literature which has not perhaps its equal for extent, accuracy, and minuteness of detail in Europe. No other complete edition of the *Ḥamāsa* has been printed in the West; but in 1856 one appeared at Calcutta under the names of Maulavī Ghulām Rabbānī and Kabīru-d-dīn Aḥmad. Though no acknowledgment of the fact is contained in this edition, it is a simple reprint of Professor Freytag's text (without at-Tibrīzī's commentary), and follows its original even in the misprints (corrected by Freytag at the end of the second volume, which being in Latin the Calcutta editors do not seem to have consulted). It contains in an appendix of 12 pages a collection of verses (and some entire fragments) not found in at-Tibrīzī's recension, but stated to exist in some copies consulted by the editors; these are, however, very carelessly edited and printed, and in many places unintelligible. Freytag's text, with at-Tibrīzī's commentary, has been reprinted at Būlāq (1870). In 1882 an edition of the text, with a marginal commentary by Munshī 'Abdul-Qādir ibn Shaikh Luqmān, was published at Bombay.

The *Ḥamāsa* has been rendered with remarkable skill and spirit into German verse by the illustrious Friedrich Rückert (Stuttgart, 1846), who has not only given translations of almost all the poems proper to the work, but has added numerous fragments drawn from other sources, especially those occurring in the *scholia* of at-Tibrīzī, as well as the *Mu'allaqas* of Zuhair and 'Antara, the *Lāmiyya* of Ash-Shanfarā, and the *Bānat Su'ād* of Ka'b, son of Zuhair. A small collection of translations, chiefly in metres imitating those of the original, was published in London by Sir Charles Lyall in 1885.

When the *Ḥamāsa* is spoken of, that of Abū Tammām, as the first and most famous of the name, is meant; but several collections of a similar kind, also called *Ḥamāsa*, exist. The best-known and earliest of these is the *Ḥamāsa* of Buḥturī (d. 284 A.H.), of which the unique MS. now in the Leiden University Library, has been reproduced by photo-lithography (1909); a critical edition has been

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prepared by Professor Chlikho at Beyreuth. Four other works of the same name, formed on the model of Abū Tammām's compilation, are mentioned by Ḥājjī Khalīfa. Besides these, a work entitled *Ḥamasat ar-Roh* ("the Ḥamāsa of wine") was composed of Abu-l-'Alā al-Ma'arrī (d. 429 A.H.). (C. J. L.)

HAMBURG, a state of the German empire, on the lower Elbe, bounded by the Prussian provinces of Schleswig-Holstein and Hanover. The whole territory has an area of 160 sq. m., and consists of the city of Hamburg with its incorporated suburbs and the surrounding district, including several islands in the Elbe, five small enclaves in Holstein; the communes of Moorburg in the Lüneburg district of the Prussian province of Hanover and Cuxhaven-Ritzebüttel at the mouth of the Elbe, the island of Neuwerk about 5 m. from the coast, and the bailiwick (*amt*) of Bergedorf, which down to 1867 was held in common by Lübeck and Hamburg. Administratively the state is divided into the city, or metropolitan district, and four rural domains (or *Landherrenschaften*), each under a senator as *praeses*, viz. the domain of the Geestlande, of the Marschlande, of Bergedorf and of Ritzebüttel with Cuxhaven. Cuxhaven-Ritzebüttel and Bergedorf are the only towns besides the capital. The Geestlande comprise the suburban districts encircling the city on the north and west; the Marschlande includes various islands in the Elbe and the fertile tract of land lying between the northern and southern arms of the Elbe, and with its pastures and market gardens supplying Hamburg with large quantities of country produce. In the Bergedorf district lies the Vierlande, or Four Districts (Neuengamme, Kirchwärder, Altengamme and Curslack), celebrated for its fruit gardens and the picturesque dress of the inhabitants. Ritzebüttel with Cuxhaven, also a watering-place, have mostly a seafaring population. Two rivers, the Alster and the Bille, flow through the city of Hamburg into the Elbe, the mouth of which, at Cuxhaven, is 75 m. below the city.

Government.—As a state of the empire, Hamburg is represented in the federal council (*Bundesrat*) by one plenipotentiary, and in the imperial diet (*Reichstag*) by three deputies. Its present constitution came into force on the 1st of January 1861, and was revised in 1879 and again in 1906. According to this Hamburg is a republic, the government (*Staatsgewalt*) residing in two chambers, the Senate and the House of Burgesses. The Senate, which exercises the greater part of the executive power, is composed of eighteen members, one half of whom must have studied law or finance, while at least seven of the remainder must belong to the class of merchants. The members of the Senate are elected for life by the House of Burgesses; but a senator is free to retire from office at the expiry of six years. A chief (*ober-*) and second (*zweiter-*) burgomaster, the first of whom bears the title of "Magnificence," chosen annually in secret ballot, preside over the meetings of the Senate, and are usually jurists. No burgomaster can be in office for longer than two years consecutively, and no member of the Senate may hold any other public office. The House of Burgesses consists of 160 members, of whom 80 are elected in secret ballot by the direct suffrages of all tax-paying citizens, 40 by the owners of house-property within the city (also by ballot), and the remaining 40, by ballot also, by the so-called "notables," *i.e.* active and former members of the law courts and administrative boards. They are elected for a period of six years, but as half of each class retire at the end of three years, new elections for one half the number take place at the end of that time. The House of Burgesses is represented by a *Bürgerausschuss* (committee of the house) of twenty deputies whose duty it is to watch over the proceedings of the Senate and the constitution generally. The Senate can interpose a veto in all matters of legislation, saving taxation, and where there is a collision between the two bodies, provision is made for reference to a court of arbitration, consisting of members of both houses in equal numbers, and also to the supreme court of the empire (*Reichsgericht*) sitting at Leipzig. The law administered is that of the civil and penal codes of the German empire, and the court of appeal for all three Hanse towns is the common *Oberlandesgericht*, which has its seat in Hamburg. There is also a special court of arbitration in commercial disputes and another for such as arise under accident insurance.

Religion.—The church in Hamburg is completely separated from the state and manages its affairs independently. The ecclesiastical arrangements of Hamburg have undergone great modifications since the general constitution of 1860. From the Reformation to the French occupation in the beginning of the 19th century, Hamburg was a purely Lutheran state; according to the "Recess" of 1529, re-enacted in 1603, non-Lutherans were subject to legal punishment and expulsion from the country. Exceptions were gradually made in favour of foreign residents; but it was not till 1785 that regular inhabitants were allowed to exercise the religious rites of other denominations, and it was not till after the war of freedom that they were allowed to have buildings in the style of churches. In 1860 full religious liberty was guaranteed, and the identification of church and state abolished. By the new constitution of the Lutheran Church, published at first in 1870 for the city only, but in 1876 extended to the rest of the Hamburg territory, the parishes or communes are divided into three church-districts, and the general affairs of the whole community are entrusted to a synod of 53 members and to an ecclesiastical council of 9 members which acts as an executive. Since 1887 a church rate has been levied on the Evangelical-Lutheran communities, and since 1904 upon the Roman Catholics also. The German Reformed Church, the French Reformed, the English Episcopal, the English Reformed, the Roman Catholic, and the Baptist are all recognized by the state. Civil marriages have been permissible in Hamburg since 1866, and since the introduction of the imperial law in January 1876 the number of such marriages has greatly increased.

Finance.—The jurisdiction of the Free Port was on the 1st of January 1882 restricted to the city and port by the extension of the Zollverein to the lower Elbe, and in 1888 the whole of the state of Hamburg, with the exception of the so-called "Free Harbour" (which comprises the port proper and some large warehouses, set apart for goods in bond), was taken into the Zollverein.

Population.—The population increased from 453,000 in 1880 to 622,530 in 1890, and in 1905 amounted to 874,878. The population of the country districts (exclusive of the city of Hamburg) was 72,085 in 1905. The crops raised in the country districts are principally vegetables and fruit, potatoes, hay, oats, rye and wheat. For manufactures and trade statistics see HAMBURG (city).

The military organization of Hamburg was arranged by convention with Prussia. The state furnishes three battalions of the 2nd Hanseatic regiment, under Prussian officers. The soldiers swear the oath of allegiance to the senate.

HAMBURG, a seaport of Germany, capital of the free state of Hamburg, on the right bank of the northern arm of the Elbe, 75 m. from its mouth at Cuxhaven and 178 m. N.W. from Berlin by rail. It is the largest and most important seaport on the continent of Europe and (after London and New York) the third largest in the world. Were it not for political and municipal boundaries Hamburg might be considered as forming with Altona and Ottensen (which lie within Prussian territory) one town. The view of the three from the south, presenting a continuous river frontage of six miles, the river crowded with shipping and the densely packed houses surmounted by church towers—of which three are higher than the dome of St Paul's in London—is one of great magnificence.

The city proper lies on both sides of the little river Alster, which, dammed up a short distance from its mouth, forms a lake, of which the southern portion within the line of the former fortifications bears the name of the Inner Alster (*Binnen Alster*), and the other and larger portion (2500 yards long and 1300 yards at the widest) that of the Outer Alster (*Aussen Alster*). The fortifications as such were removed in 1815, but they have left their trace in a fine girdle of green round the city, though too many inroads on its completeness have been made by railways and roadways. The oldest portion of the city is that which lies

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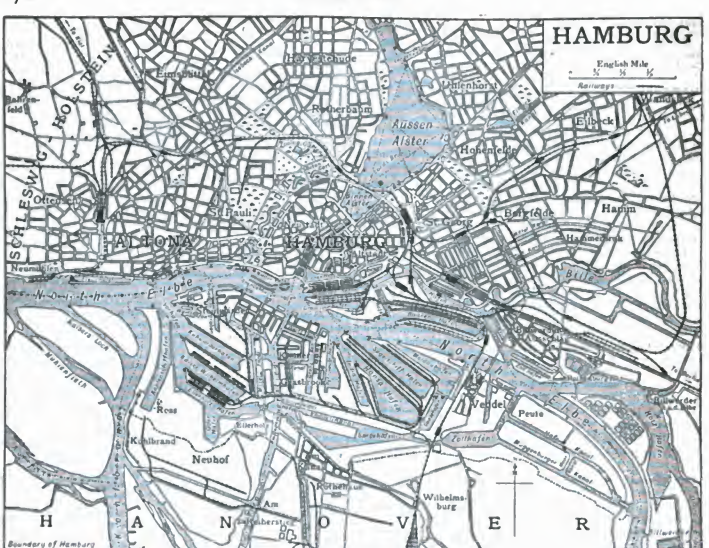

to the east of the Alster; but, though it still retains the name of Altstadt, nearly all trace of its antiquity has disappeared, as it was rebuilt after the great fire of 1842. To the west lies the new town (Neustadt), incorporated in 1678; beyond this and contiguous to Altona is the former suburb of St Pauli, incorporated in 1876, and towards the north-east that of St Georg, which arose in the 13th century but was not incorporated till 1868.

The old town lies low, and it is traversed by a great number of narrow canals or "fleets" (*Fleeten*)—for the same word which has left its trace in London nomenclature is used in the Low German city—which add considerably to the picturesqueness of the meaner quarters, and serve as convenient channels for the transport of goods. They generally form what may be called the back streets, and they are bordered by warehouses, cellars and the lower class of dwelling-houses. As they are subject to the ebb and flow of the Elbe, at certain times they run almost dry. As soon as the telegram at Cuxhaven announces high tide three shots are fired from the harbour to warn the inhabitants of the "fleets"; and if the progress of the tide up the river gives indication of danger, other three shots follow. The "fleets" with their quaint medieval warehouses, which come sheer down to the water, and are navigated by barges, have gained for Hamburg the name of "Northern Venice." They are, however, though antique and interesting, somewhat dismal and unsavoury. In fine contrast to them is the bright appearance of the Binnen Alster, which is enclosed on three sides by handsome rows of buildings, the Alsterdamm in the east, the Alter Jungfernstieg in the south, and the Neuer Jungfernstieg in the west, while it is separated from the Aussen Alster by part of the rampart gardens traversed by the railway uniting Hamburg with Altona and crossing the lakes by a beautiful bridge—the Lombards-Brücke. Around the outer lake are grouped the suburbs Harvestehude and Pösseldorf on the western shore, and Uhlenhorst on the eastern, with park-like promenades and villas surrounded by well-kept gardens. Along the southern end of the Binnen Alster runs the Jungfernstieg with fine shops, hotels and restaurants facing the water. A fleet of shallow-draught screw steamers provides a favourite means of communication between the business centre of the city and the outlying colonies of villas.

The streets enclosing the Binnen Alster are fashionable promenades, and leading directly from this quarter are the main business thoroughfares, the Neuer-Wall, the Grosse Bleichen and the Hermannstrasse. The largest of the public squares in Hamburg is the Hopfenmarkt, which contains the church of St Nicholas (Nikolaikirche) and is the principal market for vegetables and fruit. Others of importance are the Gänsemarkt, the Zeughausmarkt and the Grossneumarkt. Of the thirty-five churches existing in Hamburg (the old cathedral had to be taken down in 1805), the St Petrikirche, Nikolaikirche, St Katharinenkirche, St Jakobikirche and St Michaeliskirche are those that

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give their names to the five old city parishes. The Nikolaikirche is especially remarkable for its spire, which is 473 ft. high and ranks, after those of Ulm and Cologne, as the third highest ecclesiastical edifice in the world. The old church was destroyed in the great fire of 1842, and the new building, designed by Sir George Gilbert Scott in 13th century Gothic, was erected 1845–1874. The exterior and interior are elaborately adorned with sculptures. Sandstone from Osterwald near Hildesheim was used for the outside, and for the inner work a softer variety from Postelwitz near Dresden. The Michaeliskirche, which is built on the highest point in the city and has a tower 428 ft. high, was erected (1750–1762) by Ernst G. Sonnin on the site of the older building of the 17th century destroyed by lightning; the interior, which can contain 3000 people, is remarkable for its bold construction, there being no pillars. The St Petrikirche, originally consecrated in the 12th century and rebuilt in the 14th, was the oldest church in Hamburg; it was burnt in 1842 and rebuilt in its old form in 1844–1849. It has a graceful tapering spire 402 ft. in height (completed 1878); the granite columns from the old cathedral, the stained glass windows by Kellner of Nuremberg, and H. Schubert's fine relief of the entombment of Christ are worthy of notice. The St Katharinenkirche and the St Jakobikirche are the only surviving medieval churches, but neither is of special interest. Of the numerous other churches, Evangelical, Roman Catholic and Anglican, none are of special interest. The new synagogue was built by Rosengarten between 1857 and 1859, and to the same architect is due the sepulchral chapel built for the Hamburg merchant prince Johann Heinrich, Freiherr von Schröder (1784–1883), in the churchyard of the Petrikirche. The beautiful chapel of St Gertrude was unfortunately destroyed in 1842.

Hamburg has comparatively few secular buildings of great architectural interest, but first among them is the new Rathaus, a huge German Renaissance building, constructed of sandstone in 1886–1897, richly adorned with sculptures and with a spire 330 ft. in height. It is the place of meeting of the municipal council and of the senate and contains the city archives. Immediately adjoining it and connected with it by two wings is the exchange. It was erected in 1836–1841 on the site of the convent of St Mary Magdalen and escaped the conflagration of 1842. It was restored and enlarged in 1904, and shelters the commercial library of nearly 100,000 vols. During the business hours (1–3 p.m.) the exchange is crowded by some 5000 merchants and brokers. In the same neighbourhood is the Johanneum, erected in 1834 and in which are preserved the town library of about 600,000 printed books and 5000 MSS. and the collection of Hamburg antiquities. In the courtyard is a statue (1885) of the reformer Johann Bugenhagen. In the Fischmarkt, immediately south of the Johanneum, a handsome fountain was erected in 1890. Directly west of the town hall is the new Stadthaus, the chief police station of the town, in front of which is a bronze statue of the burgomaster Karl Friedrich Petersen (1809–1892), erected in 1897. A little farther away are the headquarters of the Patriotic Society (*Patriotische Gesellschaft*), founded in 1765, with fine rooms for the meetings of artistic and learned societies. Several new public buildings have been erected along the circuit of the former walls. Near the west extremity, abutting upon the Elbe, the moat was filled in in 1894–1897, and some good streets were built along the site, while the Kersten Miles-Brücke, adorned with statues of four Hamburg heroes, was thrown across the Helgoländer Allee. Farther north, along the line of the former town wall, are the criminal law courts (1879–1882, enlarged 1893) and the civil law courts (finished in 1901). Close to the latter stand the new supreme court, the old age and accident state insurance offices, the chief custom house, and the concert hall, founded by Karl Laeisz, a former Hamburg wharfinger. Farther on are the chemical and the physical laboratories and the Hygienic Institute. Facing the botanical gardens a new central post-office, in the Renaissance style, was built in 1887. At the west end of the Lombards-Brücke there is a monument by Schilling, commemorating the war of 1870–71. A few streets south of that is a monument to Lessing (1881); while occupying a commanding site on the promenades towards Altona is the gigantic statue of Bismarck which was unveiled in June 1906. The Kunst-Halle (the picture gallery), containing some good works by modern masters, faces the east end of Lombards-Brücke. The new Natural History Museum, completed in 1891, stands a little distance farther south. To the east of it comes the Museum for Art and Industry, founded in 1878, now one of the most important institutions of the kind in Germany, with which is connected a trades school. Close by is the Hansa-fountain (65 ft. high), erected in 1878. On the north-east side of the suburb of St Georg a botanical museum and laboratory have been established. There is a new general hospital at Eppendorf, outside the town on the north, built on the pavilion principle, and one of the finest structures of the kind in Europe; and at Ohlsdorf, in the same direction, a crematorium was built in 1891 in conjunction with the town cemeteries (370 acres). There must also be mentioned the fine public zoological gardens, Hagenbeck's private zoological gardens in the vicinity, the schools of music and navigation, and the school of commerce. In 1900 a high school for shipbuilding was founded, and in 1901 an institute for seamen's and tropical diseases, with a laboratory for their physiological study, was opened, and also the first public free library in the city. The river is spanned just above the Frei Hafen by a triple-arched railway bridge, 1339 ft. long, erected in 1868–1873 and doubled in width in 1894. Some 270 yds. higher up is a magnificent iron bridge (1888) for vehicles and foot passengers. The southern arm of the Elbe, on the south side of the island of Wilhelmsburg, is crossed by another railway bridge of four arches and 2050 ft. in length.

Railways.—The through railway traffic of Hamburg is practically confined to that proceeding northwards—to Kiel and Jutland—and for the accommodation of such trains the central (terminus) station at Altona is the chief gathering point. The Hamburg stations, connected with the other by the Verbindungs-Bahn (or metropolitan railway) crossing the Lombards-Brücke, are those of the Venloer (or Hanoverian, as it is often called) Bahnhof on the south-east, in close proximity to the harbour, into which converge the lines from Cologne and Bremen, Hanover and Frankfort-on-Main, and from Berlin, via Nelzen; the Klostertor-Bahnhof (on the metropolitan line) which temporarily superseded the old Berlin station, and the Lübeck station a little to the north-east, during the erection of the new central station, which occupies a site between the Klostertor-Bahnhof and the Lombards-Brücke. Between this central station and Altona terminus runs the metropolitan railway, which has been raised several feet so as to bridge over the streets, and on which lie the important stations Dammtor and Sternschanze. An excellent service of electric trams interconnect the towns of Hamburg, Altona and the adjacent suburbs, and steamboats provide communication on the Elbe with the riparian towns and villages; and so with Blankenese and Harburg, with Stade, Glückstadt and Cuxhaven.

Trade and Shipping.—Probably there is no place which during the last thirty years of the 19th century grew faster commercially than Hamburg. Its commerce is, however, almost entirely of the nature of transit trade, for it is not only the chief distributing centre for the middle of Europe of the products of all other parts of the world, but is also the chief outlet for German, Austrian, and even to some extent Russian (Polish) raw products and manufactures. Its principal imports are coffee (of which it is the greatest continental market), tea, sugar, spices, rice, wine (especially from Bordeaux), lard (from Chicago), cereals, sago, dried fruits, herrings, wax (from Morocco and Mozambique), tobacco, hemp, cotton (which of late years shows a large increase), wool, skins, leather, oils, dyewoods, indigo, nitrates, phosphates and coal. Of the total importations of all kinds of coal to Hamburg, that of British coal, particularly from Northumberland and Durham, occupies the first place, and despite some falling off in late years, owing to the competition made by Westphalian coal, amounts to more than half the total import. The increase of the trade of Hamburg is most strikingly shown by that of

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the shipping belonging to the port. Between 1876 and 1880 there were 475 sailing vessels with a tonnage of 230,691, and 110 steam-ships with a tonnage of 87,050. In 1907 there were (exclusive of fishing vessels) 470 sailing ships with a tonnage of 271,661, and 610 steamers with a tonnage of 1,256,440. In 1870 the crews numbered 6900 men, in 1907 they numbered 29,536.

Industries.—The development of manufacturing industries at Hamburg and its immediate vicinity since 1880, though not so rapid as that of its trade and shipping, has been very remarkable, and more especially has this been the case since the year 1888, when Hamburg joined the German customs union, and the barriers which prevented goods manufactured at Hamburg from entering into other parts of Germany were removed. Among the chief industries are those for the production of articles of food and drink. The import trade of various cereals by sea to Hamburg is very large, and a considerable portion of this corn is converted into flour at Hamburg itself. There are also, in this connexion, numerous bakeries for biscuit, rice-peeling mills and spice mills. Besides the foregoing there are cocoa, chocolate, confectionery and baking-powder factories, coffee-roasting and ham-curing and smoking establishments, lard refineries, margarine manufactories and fish-curing, preserving and packing factories. There are numerous breweries, producing annually about 24,000,000 gallons of beer, spirit distilleries and factories of artificial waters. Yarns, textile goods and weaving industries generally have not attained any great dimensions, but there are large jute-spinning mills and factories for cotton-wool and cotton driving-belts. Among other important articles of domestic industry are tobacco and cigars (manufactured mainly in bond, within the free harbour precincts), hydraulic machinery, electro-technical machinery, chemical products (including artificial manures), oils, soaps, india-rubber, ivory and celluloid articles and the manufacture of leather.

Shipbuilding has made very important progress, and there are at present in Hamburg eleven large shipbuilding yards, employing nearly 10,000 hands. Of these, however, only three are of any great extent, and one, where the largest class of ocean-going steamers and of war vessels for the German navy are built, employs about 5000 persons. There are also two yards for the building of pleasure yachts and rowing-boats (in both which branches of sport Hamburg takes a leading place in Germany). Art industries, particularly those which appeal to the luxurious taste of the inhabitants in fitting their houses, such as wall-papers and furniture, and those which are included in the equipment of ocean-going steamers, have of late years made rapid strides and are among the best productions of this character of any German city.

Harbour.—It was the accession of Hamburg to the customs union in 1888 which gave such a vigorous impulse to her more recent commercial development. At the same time a portion of the port was set apart as a free harbour, altogether an area of 750 acres of water and 1750 acres of dry land. In anticipation of this event a gigantic system of docks, basins and quays was constructed, at a total cost of some £7,000,000 (of which the imperial treasury contributed £2,000,000), between the confluence of the Alster and the railway bridge (1888–1873), an entire quarter of the town inhabited by some 24,000 people being cleared away to make room for these accessories of a great port. On the north side of the Elbe there are the Sandtor basin (3380 ft. long, 295 to 427 ft. wide), in which British and Indian steamboats and steamboats of the Sloman (Mediterranean) line anchor. South of this lies the Grasbrook basin (quayage of 2100 ft. and 1693 ft. alongside), which is used by French, Swedish and transatlantic steamers. At the quay point between these two basins there are vast state granaries. In the outer (*i.e.* river) side of the Grasbrook dock is the quay at which the emigrants for South America embark, and from which the mail boats for East Africa, the boats of the Woermann (West Africa) line, and the Norwegian tourist boats depart. To the east of these two is the small Magdeburg basin, penetrating north, and the Baaken basin, penetrating east, *i.e.* parallel to the river. The latter affords accommodation to the transatlantic steamers, including the emigrant ships of the Hamburg-America line, though their "ocean mail boats" generally load and unload at Cuxhaven. On the south bank of the stream there follow in succession, going from east to west, the Moldau dock for river craft, the sailing vessel dock (Segelschiff Hafen, 3937 ft. long, 459 to 886 ft. wide, 26½ ft. deep), the Hansa dock, India dock, petroleum dock, several swimming and dry docks; and in the west of the free port area three other large docks, one of 77 acres for river craft, the others each 56 acres in extent, and one 23¼ ft. deep, the other 26½ ft. deep, at low water, constructed in 1900–1901. In 1897 Hamburg was provided with a huge floating dock, 558 ft. long and 84 ft. in maximum breadth, capable of holding a vessel of 17,500 tons and draught not exceeding 29 ft., so constructed and equipped that in time of need (war) it could be floated down to Cuxhaven. During the last 25 years of the 19th century the channel of the Elbe was greatly improved and deepened, and during the last quarter of the 19th century some £360,000 was spent by Hamburg alone in regulating and correcting this lower course of the river. The new Kuhwärder-basin, on the left bank of the river, as well as two other large dock basins (now leased to the Hamburg-American Company), raise the number of basins to twelve in all.

Emigration.—Hamburg is one of the principal continental ports for the embarkation of emigrants. In 1881–1890, on an average they numbered 90,000 a year (of whom 60,000 proceeded to the United States). In 1900 the number was 87,234 (of which to the United States 64,137). The number of emigrant Germans has enormously decreased of late years, Russia and Austria-Hungary now being most largely represented. For the accommodation of such passengers large and convenient emigrant shelters have been recently erected close to the wharf of embarkation.

Health and Population.—The health of the city of Hamburg and the adjoining district may be described as generally good, no epidemic diseases having recently appeared in any serious degree. The malady causing the greatest number of deaths is that of pulmonary consumption; but better housing accommodation has of late years reduced the mortality from this disease very considerably. The results of the census of 1905 showed the population of the city (not including the rural districts belonging to the state of Hamburg) to be 802,793.

Hamburg is well supplied with places of amusement, especially of the more popular kind. Its Stadt-Theater, rebuilt in 1874, has room for 1750 spectators and is particularly devoted to operatic performances; the Thalia-Theater dates from 1841, and holds 1700 to 1800 people, and the Schauspielhaus (for drama) from 1900 people, and there are some seven or eight minor establishments. Theatrical performances were introduced into the city in the 17th century, and 1678 is the date of the first opera, which was played in a house in the Gänsemarkt. Under Schröder and Lessing the Hamburg stage rose into importance. Though contributing few poets of the highest rank to German literature, the city has been intimately associated with the literary movement. The historian Lappenberg and Friedrich von Hagedorn were born in Hamburg; and not only Lessing, but Heine and Klopstock lived there for some time.

History.—Hamburg probably had its origin in a fortress erected in 808 by Charlemagne, on an elevation between the Elbe and Alster, as a defence against the Slavs, and called Hammaburg because of the surrounding forest (*Hamme*). In 811 Charlemagne founded a church here, perhaps on the site of a Saxon place of sacrifice, and this became a great centre for the evangelization of the north of Europe, missionaries from Hamburg introducing Christianity into Jutland and the Danish islands and even into Sweden and Norway. In 834 Hamburg became an archbishopric, St Ansgar, a monk of Corbie and known as the apostle of the North, being the first metropolitan. In 845 church, monastery and town were burnt down by the Norsemen, and two years later the see of Hamburg was united with that of Bremen and its seat transferred to the latter city. The town, rebuilt after this disaster, was again more than once devastated by invading Danes and Slavs. Archbishop Unwan of Hamburg-Bremen (1013–1029) substituted a chapter of canons for the monastery, and in 1037 Archbishop Bezelin (or Alebrand) built a stone cathedral and a palace on the Elbe. In 1110 Hamburg, with Holstein, passed into the hands of Adolph I., count of Schauenburg, and it is with the building of the Neustadt (the present parish of St Nicholas) by his grandson, Adolph III. of Holstein, that the history of the commercial city actually begins. In return for a contribution to the costs of a crusade, he obtained from the emperor Frederick I. in 1189 a charter granting Hamburg considerable franchises, including exemption from tolls, a separate court and jurisdiction, and the rights of fishery on the Elbe from the city to the sea. The city council (*Rath*), first mentioned in 1100, had jurisdiction over both the episcopal and the new town. Craft gilds were already in existence, but these had no share in the government; for, though the Lübeck rule excluding craftsmen from the *Rath* did not obtain, they were excluded in practice. The counts, of

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course, as over-lords, had their *Vogt* (*advocatus*) in the town, but this official, as the city grew in power, became subordinate to the *Rath*, as at Lübeck.

The wealth of the town was increased in 1189 by the destruction of the flourishing trading centre of Bardowieck by Henry the Lion; from this time it began to be much frequented by Flemish merchants. In 1201 the city submitted to Valdemar of Schleswig, after his victory over the count of Holstein, but in 1225, owing to the capture of King Valdemar II. of Denmark by Henry of Schwerin, it once more exchanged the Danish over-lordship for that of the counts of Schauenburg, who established themselves here and in 1231 built a strong castle to hold it in check. The defensive alliance of the city with Lübeck in 1241, extended for other purpose by the treaty of 1255, practically laid the foundations of the Hanseatic League (*q.v.*), of which Hamburg continued to be one of the principal members. The internal organization of the city, too, was rendered more stable by the new constitution of 1270, and the recognition in 1292 of the complete internal autonomy of the city by the count of Schauenburg. The exclusion of the handicraftsmen from the *Rath* led, early in the 15th century, to a rising of the craft gilds against the patrician merchants, and in 1410 they forced the latter to recognize the authority of a committee of 48 burghers, which concluded with the senate the so-called First Recess; there were, however, fresh outbursts in 1458 and 1483, which were settled by further compromises. In 1461 Hamburg did homage to Christian I. of Denmark, as heir of the Schauenburg counts; but the suzerainty of Denmark was merely nominal and soon repudiated altogether; in 1510 Hamburg was made a free imperial city by the emperor Maximilian I.

In 1529 the Reformation was definitively established in Hamburg by the Great Recess of the 19th of February, which at the same time vested the government of the city in the *Rath*, together with the three colleges of the *Oberalten*, the Forty-eight (increased to 60 in 1685) and the Hundred and Forty-four (increased to 180). The ordinary burgesses consisted of the freeholders and the master-workmen of the gilds. In 1536 Hamburg joined the league of Schmalkalden, for which error it had to pay a heavy fine in 1547 when the league had been defeated. During the same period the Lutheran zeal of the citizens led to the expulsion of the Mennonites and other Protestant sects, who founded Altona. The loss this brought to the city was, however, compensated for by the immigration of Protestant refugees from the Low Countries and Jews from Spain and Portugal. In 1549, too, the English merchant adventurers removed their staple from Antwerp to Hamburg.

The 17th century saw notable developments. Hamburg had established, so early as the 16th century, a regular postal service with certain cities in the interior of Germany, *e.g.* Leipzig and Breslau; in 1615 it was included in the postal system of Turn and Taxis. In 1603 Hamburg received a code of laws regulating exchange, and in 1619 the bank was established. In 1615 the Neustadt was included within the city walls. During the Thirty Years' War the city received no direct harm; but the ruin of Germany reacted upon its prosperity, and the misery of the lower orders led to an agitation against the *Rath*. In 1685, at the invitation of the popular leaders, the Danes appeared before Hamburg demanding the traditional homage; they were repulsed, but the internal troubles continued, culminating in 1708 in the victory of the democratic factions. The imperial government, however, intervened, and in 1712 the "Great Recess" established durable good relations between the *Rath* and the commonalty. Frederick IV. of Denmark, who had seized the opportunity to threaten the city (1712), was bought off with a ransom of 246,000 *Reichsthaler*. Denmark, however, only finally renounced her claims by the treaty of Gottorp in 1768, and in 1770 Hamburg was admitted for the first time to a representation in the diet of the empire.

The trade of Hamburg received its first great impulse in 1783, when the United States, by the treaty of Paris, became an independent power. From this time dates its first direct maritime communication with America. Its commerce was further extended and developed by the French occupation of Holland in 1795, when the Dutch trade was largely directed to its port. The French Revolution and the insecurity of the political situation, however, exercised a depressing and retarding effect. The wars which ensued, the closing of continental ports against English trade, the occupation of the city after the disastrous battle of Jena, and pestilence within its walls brought about a severe commercial crisis and caused a serious decline in its prosperity. Moreover, the great contributions levied by Napoleon on the city, the plundering of its bank by Davoust, and the burning of its prosperous suburbs inflicted wounds from which the city but slowly recovered. Under the long peace which followed the close of the Napoleonic wars, its trade gradually revived, fostered by the declaration of independence of South and Central America, with both of which it energetically opened close commercial relations, and by the introduction of steam navigation. The first steamboat was seen on the Elbe on the 17th of June 1816; in 1826 a regular steam communication was opened with London; and in 1856 the first direct steamship line linked the port with the United States. The great fire of 1842 (5th-8th of May) laid in waste the greatest part of the business quarter of the city and caused a temporary interruption of its commerce. The city, however, soon rose from its ashes, the churches were rebuilt and new streets laid out on a scale of considerable magnificence. In 1866 Hamburg joined the North German Confederation, and in 1871, while remaining outside the Zollverein, became a constituent state of the German empire. In 1883–1888 the works for the Free Harbour were completed, and on the 18th of October 1888 Hamburg joined the Customs Union (Zollverein). In 1892 the cholera raged within its walls, carried off 8500 of its inhabitants, and caused considerable losses to its commerce and industry; but the visitation was not without its salutary fruits, for an improved drainage system, better hospital accommodation, and a purer water-supply have since combined to make it one of the healthiest commercial cities of Europe.

Further details about Hamburg will be found in the following works: O. C. Gaedechens, *Historische Topographie der Freien und Hansestadt Hamburg* (1860); E. H. Wichmann, *Denkmäler von Hamburg* (1863); W. Melhop, *Historische Topographie der Freien und Hansestadt Hamburg von 1880–1895* (1896); Wulff, *Hamburgische Gesetze und Verordnungen* (1889–1896); and W. von Melle, *Das hamburgische Staatsrecht* (1891). There are many valuable official publications which may be consulted, among these being: *Statistik des hamburgischen Staates* (1867–1904); *Hamburgs Handel und Schiffahrt* (1847–1903); the yearly *Hamburgischer Staatskalender*; and *Jahrbuch der Hamburger wissenschaftlichen Anstalten*. See also *Hamburg und seine Bauten* (1890); H. Benrath, *Lotsführer durch Hamburg und Umgebungen* (1904); and the consular reports by Sir William Ward, H.B.M.'s consul-general at Hamburg, to whom the author is indebted for great assistance in compiling this article. For the history of Hamburg see the *Zeitschrift des Vereins für hamburgische Geschichte* (1841, fol.); G. Dehio, *Geschichte des Erzbistums Hamburg-Bremen* (Berlin, 1877); the *Hamburgisches Urkundenbuch* (1842), the *Hamburgische Chroniken* (1852–1861), and the *Chronica der Stadt Hamburg bis 1537* of Adam Tratziger (1865), all three edited by J. M. Lappenberg; the *Briefsammlung des hamburgischen Superintendenten Joachim Westphal 1530–1575*, edited by C. H. W. Sillem (1903); Gallois, *Geschichte der Stadt Hamburg* (1853–1856); K. Koppmann, *Aus Hamburgs Vergangenheit* (1885), and *Kämmereirechnungen der Stadt Hamburg* (1869–1894); H. W. C. Hubbe, *Beiträge zur Geschichte der Stadt Hamburg* (1897); C. Mönckeberg, *Geschichte der Freien und Hansestadt Hamburg* (1885); E. H. Wichmann, *Hamburgische Geschichte in Darstellungen aus alter und neuer Zeit* (1889); and R. Boltheimer, *Zeittafeln der hamburgischen Geschichte* (1895).

HAMDĀNĪ, in full ABŪ MUḤAMMED UL-ḤASAN IBN AḤMAD IBN YA'ḲŪB UL-HAMDĀNĪ (d. 945), Arabian geographer, also known as Ibn ul-Ḥā'ik. Little is known of him except that he belonged to a family of Yemen, was held in repute as a grammarian in his own country, wrote much poetry, compiled astronomical tables, devoted most of his life to the study of the ancient history and geography of Arabia, and died in prison at San'a in 945. His *Geography of the Arabian Peninsula* (*Kitāb Jazirat ul-'Arab*) is by far the most important work on the subject. After being used in manuscript by A. Sprenger in his *Post- und Reiserouten des Orients* (Leipzig, 1864) and further

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in his *Alte Geographie Arabiens* (Bern, 1875), it was edited by D. H. Müller (Leiden, 1884; cf. A. Sprenger's criticism in *Zeitschrift der deutschen morgenländischen Gesellschaft*, vol. 45, pp. 301-304). Much has also been written on this work by E. Glaser in his various publications on ancient Arabia. The other great work of Hamdānī is the *Iklīl* (Crown) concerning the genealogies of the Himyarites and the wars of their kings in ten volumes. Of this, part 8, on the citadels and castles of south Arabia, has been edited and annotated by D. H. Müller in *Die Burgen und Schlösser Südarabiens* (Vienna, 1879–1881).

For other works said to have been written by Hamdānī cf. G. Flügel's *Die grammatischen Schulen der Araber* (Leipzig, 1862), pp. 220–221. (G. W. T.)

HAMELIN, FRANÇOIS ALPHONSE (1796–1864), French admiral, was born at Pont l'Évêque on the 2nd of September 1796. He went to sea with his uncle, J. F. E. Hamelin, in the "Vénus" frigate in 1806 as cabin boy. The "Vénus" was part of the French squadron in the Indian Ocean, and young Hamelin had an opportunity of seeing much active service. She, in company with another and a smaller vessel, captured the English frigate "Ceylon" in 1810, but was immediately afterwards captured herself by the "Boadicéa," under Commodore Rowley (1763–1842). Young Hamelin was a prisoner of war for a short time. He returned to France in 1811. On the fall of the Empire he had better fortune than most of the Napoleonic officers who were turned ashore. In 1821 he became lieutenant, and in 1823 took part in the French expedition under the duke of Angoulême into Spain. In 1828 he was appointed captain of the "Actéon," and was engaged till 1831 on the coast of Algiers and in the conquest of the town and country. His first command as flag officer was in the Pacific, where he showed much tact during the dispute over the Marquesas Islands with England in 1844. He was promoted vice-admiral in 1848. During the Crimean War he commanded in the Black Sea, and co-operated with Admiral Dundas in the bombardment of Sevastopol 17th of October 1854. His relations with his English colleague were not very cordial. On the 7th of December 1854 he was promoted admiral. Shortly afterwards he was recalled to France, and was named minister of marine. His administration lasted till 1860, and was remarkable for the expeditions to Italy and China organized under his directions; but it was even more notable for the energy shown in adopting and developing the use of armour. The launch of the "Gloire" in 1859 set the example of constructing sea-going ironclads. The first English ironclad, the "Warrior," was designed as an answer to the "Gloire." When Napoleon III. made his first concession to Liberal opposition, Admiral Hamelin was one of the ministers sacrificed. He held no further command, and died on the 10th of January 1864.

HAMELN, a town of Germany, in the Prussian province of Hanover, at the confluence of the Weser and Hamel, 33 m. S.W. of Hanover, on the line to Altenbeken, which here effects a junction with railways to Löhne and Brunswick. Pop. (1905) 20,736. It has a venerable appearance and has many interesting and picturesque houses. The chief public buildings of interest are the minster, dedicated to St Boniface and restored in 1870–1875; the town hall; the so-called Rattenfängerhaus (rat-catcher's house) with mural frescoes illustrating the legend (see below); and the Hochzeitshaus (wedding house) with beautiful gables. There are classical, modern and commercial schools. The principal industries are the manufacture of paper, leather, chemicals and tobacco, sugar refining, shipbuilding and salmon fishing. By the steamboats on the Weser there is communication with Karlshafen and Minden. In order to avoid the dangerous part of the river near the town a channel was cut in 1734, the repairing and deepening of which, begun in 1868, was completed in 1873. The Weser is here crossed by an iron suspension bridge 830 ft. in length, supported by a pier erected on an island in the middle of the river.

The older name of Hameln was Hameloa or Hamelowe, and the town owes its origin to an abbey. It existed as a town as early as the 11th century, and in 1259 it was sold by the abbot of Fulda to the bishop of Minden, afterwards passing under the protection of the dukes of Brunswick. About 1540 the Reformation gained an entrance into the town, which was taken by both parties during the Thirty Years' War. In 1757 it capitulated to the French, who, however, vacated it in the following year. Its fortifications were strengthened in 1766 by the erection of Fort George, on an eminence to the west of the town, across the river. On the capitulation of the Hanoverian army in 1803 Hameln fell into the hands of the French; it was retaken by the Prussians in 1806, but, after the battle of Jena, again passed to the French, who dismantled the fortifications and incorporated the town in the kingdom of Westphalia. In 1814 it again became Hanoverian, but in 1866 fell with that kingdom to Prussia.

Legend of the Pied Piper.—Hameln is famed as the scene of the myth of the piper of Hameln. According to the legend, the town in the year 1284 was infested by a terrible plague of rats. One day there appeared upon the scene a piper clad in a fantastic suit, who offered for a certain sum of money to charm all the vermin into the Weser. His conditions were agreed to, but after he had fulfilled his promise the inhabitants, on the ground that he was a sorcerer, declined to fulfil their part of the bargain, whereupon on the 26th of June he reappeared in the streets of the town, and putting his pipe to his lips began a soft and curious strain. This drew all the children after him and he led them out of the town to the Koppelberg hill, in the side of which a door suddenly opened, by which he entered and the children after him, all but one who was lame and could not follow fast enough to reach the door before it shut again. Some trace the origin of the legend to the Children's Crusade of 1212; others to an abduction of children; and others to a dancing mania which seized upon some of the young people of Hameln who left the town on a mad pilgrimage from which they never returned. For a considerable time the town dated its public documents from the event. The story is the subject of a poem by Robert Browning, and also of one by Julius Wolff. Curious evidence that the story rests on a basis of truth is given by the fact that the Koppelberg is not one of the imposing hills by which Hameln is surrounded, but no more than a slight elevation of the ground, barely high enough to hide the children from view as they left the town.

See C. Langhanz, *Geschichte der Stadt Hameln* (Hameln, 1888 fol.); Sprenger, *Geschichte der Stadt Hameln* (1861); O. Meinardus, *Der historische Kern der Rattenfängersage* (Hameln, 1882); Jostes, *Der Rattenfänger von Hameln* (Bonn, 1885); and S. Baring-Gould, *Curious Myths of the Middle Ages* (1868).

HAMERLING, ROBERT (1830–1889), Austrian poet, was born at Kirchenberg-am-Walde in Lower Austria, on the 24th of March 1830, of humble parentage. He early displayed a genius for poetry and his youthful attempts at drama excited the interest and admiration of some influential persons. Owing to their assistance young Hamerling was enabled to attend the gymnasium in Vienna and subsequently the university. In 1848 he joined the student's legion, which played so conspicuous a part in the revolutions of the capital, and in 1849 shared in the defence of Vienna against the imperialist troops of Prince Windischgrätz, and after the collapse of the revolutionary movement he was obliged to hide for a long time to escape arrest. For the next few years he diligently pursued his studies in natural science and philosophy, and in 1855 was appointed master at the gymnasium at Trieste. For many years he battled with ill-health, and in 1866 retired on a pension, which in acknowledgment of his literary labours was increased by the government to a sum sufficient to enable him to live without care until his death at his villa in Stiftingstal near Graz, on the 13th of July 1889. Hamerling was one of the most remarkable of the poets of the modern Austrian school; his imagination was rich and his poems are full of life and colour. His most popular poem, *Ahasver in Rom* (1866), of which the emperor Nero is the central figure, shows at its best the author's brilliant talent for description. Among his other works may be mentioned *Venus im Exil* (1858); *Der König von Sion* (1869), which is generally regarded as his masterpiece; *Die sieben Todsünden* (1872); *Blätter im Winde* (1887); *Homunculus* (1888); *Amor und*

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Psyche (1882). His novel, *Aspasia* (1876) gives a finely-drawn description of the Periclean age, but like his tragedy *Danton und Robespierre* (1870), is somewhat stilted, showing that Hamerling's genius, though rich in imagination, was ill-suited for the realistic presentation of character.

A popular edition of Hamerling's works in four volumes was published by M. M. Rabenlechner (Hamburg, 1900). For the poet's life, see his autobiographical writings, *Stationen meiner Lebenspilgerschaft* (1889) and *Lehrjahre der Liebe* (1890); also M. M. Rabenlechner, *Hamerling, sein Leben und seine Werke*, i. (Hamburg, 1896); a short biography by the same (Dresden, 1901); R. H. Kleinert, *R. Hamerling, ein Dichter der Schönheit* (Hamburg, 1889); A. Polzer, *Hamerling, sein Wesen und Wirken* (Hamburg, 1890).

HAMERTON, PHILIP GILBERT (1834–1894), English artist and author, was born at Laneside, near Shaw, close to Oldham, on the 10th of September 1834. His mother died at his birth, and having lost his father ten years afterwards, he was educated privately under the direction of his guardians. His first literary attempt, a volume of poems, proving unsuccessful, he devoted himself for a time entirely to landscape painting, encamping out of doors in the Highlands, where he eventually rented the island of Innistrynych, upon which he settled with his wife, a French lady, in 1858. Discovering after a time that his qualifications were rather those of an art critic than of a painter he removed to the neighbourhood of his wife's relatives in France, where he produced his *Painter's Camp in the Highlands* (1863), which obtained a great success and prepared the way for his standard work on *Etching and Etchers* (1866). In the following year he published a book, entitled *Contemporary French Painters*, and in 1868 a continuation, *Painting in France after the Decline of Classicism*. He had meanwhile become art critic to the *Saturday Review*, a position which, from the burden it laid upon him of frequent visits to England, he did not long retain. He proceeded (1870) to establish an art journal of his own, *The Portfolio*, a monthly periodical, each number of which consisted of a monograph upon some artist or group of artists, frequently written and always edited by him. The discontinuance of his active work as a painter gave him time for more general literary composition, and he successively produced *The Intellectual Life* (1873), perhaps the best known and most valuable of his writings; *Round my House* (1876), notes on French society by a resident; and *Modern Frenchmen* (1879), admirable short biographies. He also wrote two novels, *Wenderholme* (1870) and *Marmorne* (1878). In 1884 *Human Intercourse*, another valuable volume of essays, was published, and shortly afterwards Hamerton began to write his autobiography, which he brought down to 1858. In 1882 he issued a finely illustrated work on the technique of the great masters of various arts, under the title of *The Graphic Arts*, and three years later another splendidly illustrated volume, *Landscape*, which traces the influence of landscape upon the mind of man. His last books were: *Portfolio Papers* (1889) and *French and English* (1889). In 1891 he removed to the neighbourhood of Paris, and died suddenly on the 4th of November 1894, occupied to the last with his labours on *The Portfolio* and other writings on art.

In 1896 was published *Philip Gilbert Hamerton: an Autobiography, 1834–1858*; and a *Memoir by his Wife, 1858–1894*.

HAMI, a town in Chinese Turkestan, otherwise called KAMIL, KOMUL or KAMUL, situated on the southern slope of the Tian-Shan mountains, and on the northern verge of the Great Gobi desert, in 42° 48′ N., 93° 28′ E., at a height above sea-level of 3150 ft. The town is first mentioned in Chinese history in the 1st century, under the name I-wu-lu, and said to be situated 1000 lis north of the fortress Yü-men-kuan, and to be the key to the western countries. This evidently referred to its advantageous position, lying as it did in a fertile tract, at the point of convergence of two main routes running north and south of the Tian-Shan and connecting China with the west. It was taken by the Chinese in A.D. 73 from the Hiungnu (the ancient inhabitants of Mongolia), and made a military station. It next fell into the hands of the Uighurs or Eastern Turks, who made it one of their chief towns and held it for several centuries, and whose descendants are said to live there now. From the 7th to the 11th century I-wu-lu is said to have borne the name of Igu or I-chu, under the former of which names it is spoken of by the Chinese pilgrim, Hsüan tsang, who passed through it in the 7th century. The name Hami is first met in the Chinese *Yüan-shi* or "History of the Mongol Dynasty," but the name more generally used there is Homi-li or Komi-li. Marco Polo, describing it apparently from hearsay, calls it Camul, and speaks of it as a fruitful place inhabited by a Buddhist people of idolatrous and wanton habits. It was visited in 1341 by Giovanni de Marignolli, who baptized a number of both sexes there, and by the envoys of Shah Rukh (1420), who found a magnificent mosque and a convent of dervishes, in juxtaposition with a fine Buddhist temple. Hadji Mahommed (Ramusio's friend) speaks of Kamul as being in his time (*c.* 1550) the first Mahommedan city met with in travelling from China. When Benedict Goes travelled through the country at the beginning of the 17th century, the power of the king Mahommed Khan of Kashgar extended over nearly the whole country at the base of the Tian-Shan to the Chinese frontier, including Kamil. It fell under the sway of the Chinese in 1720, was lost to them in 1865 during the great Mahommedan rebellion, and the trade route through it was consequently closed, but was regained in 1873. Owing to its commanding position on the principal route to the west, and its exceptional fertility, it has very frequently changed hands in the wars between China and her western neighbours. Hami is now a small town of about 6000 inhabitants, and is a busy trading centre. The Mahommedan population consists of immigrants from Kashgaria, Bokhara and Samarkand, and of descendants of the Uighurs.

HAMILCAR BARCA, or BARCAS (Heb. *barak* "lightning"), Carthaginian general and statesman, father of Hannibal, was born soon after 270 B.C. He distinguished himself during the First Punic War in 247, when he took over the chief command in Sicily, which at this time was almost entirely in the hands of the Romans. Landing suddenly on the north-west of the island with a small mercenary force he seized a strong position on Mt. Ercte (Monte Pellegrino, near Palermo), and not only maintained himself against all attacks, but carried his raids as far as the coast of south Italy. In 244 he transferred his army to a similar position on the slopes of Mt. Eryx (Monte Giuliano), from which he was able to lend support to the besieged garrison in the neighbouring town of Drepanum (Trapani). By a provision of the peace of 241 Hamilcar's unbeaten force was allowed to depart from Sicily without any token of submission. On returning to Africa his troops, which had been kept together only by his personal authority and by the promise of good pay, broke out into open mutiny when their rewards were withheld by Hamilcar's opponents among the governing aristocracy. The serious danger into which Carthage was brought by the failure of the aristocratic generals was averted by Hamilcar, whom the government in this crisis could not but reinstate. By the power of his personal influence among the mercenaries and the surrounding African peoples, and by superior strategy, he speedily crushed the revolt (237). After this success Hamilcar enjoyed such influence among the popular and patriotic party that his opponents could not prevent him being raised to a virtual dictatorship. After recruiting and training a new army in some Numidian forays he led on his own responsibility an expedition into Spain, where he hoped to gain a new empire to compensate Carthage for the loss of Sicily and Sardinia, and to serve as a basis for a campaign of vengeance against the Romans (236). In eight years by force of arms and diplomacy he secured an extensive territory in Spain, but his premature death in battle (228) prevented him from completing the conquest. Hamilcar stood out far above the Carthaginians of his age in military and diplomatic skill and in strength of patriotism; in these qualities he was surpassed only by his son Hannibal, whom he had imbued with his own deep hatred of Rome and trained to be his successor in the conflict.

This Hamilcar has been confused with another general who succeeded to the command of the Carthaginians in the First Punic War, and after successes at Therma and Drepanum was defeated at

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Economus (256 B. C.). Subsequently, apart from unskilful operations against Regulus, nothing is certainly known of him. For others of the name see CARTHAGE, SICILY, Smith's *Classical Dictionary*. So far as the name itself is concerned, *Mâcar* is perhaps the same as *Melkarth*, the lord of Tyre.

See Polybius i.-iii.; Cornelius Nepos, *Vita Hamilcaris*; Appian, *Res Hispanicae*, chs. 4, 5; Diodorus, *Excerpta*, xxiv., xxv.; Meltzer, *Geschichte der Karthager* (Berlin, 1877), ii. also PUNIC WARS. (M. O. B. C.)

HAMILTON, the name of a famous Scottish family. Chief among the legends still clinging to this important family is that which gives a descent from the house of Beaumont, a branch of which is stated to have held the manor of Hamilton in Leicestershire; and it is argued that the three cinquefoils of the Hamilton shield bear some resemblance to the single cinquefoil of the Beaumonts. In face of this it has been recently shown that the single cinquefoil was also borne by the Umfravilles of Northumberland, who appear to have owned a place called Hamilton in that county. It may be pointed out that Simon de Montfort, the great earl of Leicester, in whose veins flowed the blood of the Beaumonts, obtained about 1245 the wardship of Gilbert de Umfraville, second earl of Angus, and it is conceivable that this name Gilbert may somehow be responsible for the legend of the Beaumont descent, seeing that the first authentic ancestor of the Hamiltons is one Walter FitzGilbert. He first appears in 1294–1295 as one of the witnesses to a charter by James, the high steward of Scotland, to the monks of Paisley; and in 1296 his name appears in the Homage Roll as Walter FitzGilbert of "Hameldone." Who this Gilbert of "Hameldone" may have been is uncertain," but the fact must be faced," Mr John Anderson points out (*Scots Peerage*, iv. 340) "that in a charter of the 12th of December 1272 by Thomas of Cragyn or Craigie to the monks of Paisley of his church of Craigie in Kyle, there appears as witness a certain 'Gilbert de Hameldun *clericus*,' whose name occurs along with the local clergy of Inverkip, Blackhall, Paisley and Dunoon. He was therefore probably also a cleric of the same neighbourhood, and it is significant that 'Walter FitzGilbert' appears first in that district in 1294 and in 1296 is described as son of Gilbert de Hameldone. . . ." Walter FitzGilbert took some part in the affairs of his time. At first he joined the English party but after Bannockburn went over to Bruce, was knighted and subsequently received the barony of Cadzow. His younger son John was father of Alexander Hamilton who acquired the lands of Innerwick by marriage, and from him descended a certain Thomas Hamilton, who acquired the lands of Priestfield early in the 16th century. Another Thomas, grandson of this last, who had with others of his house followed Queen Mary and with them had been restored to royal favour, became a lord of session as Lord Priestfield. Two of his younger sons enjoyed also this legal distinction, while the eldest, Thomas, was made an ordinary lord of session as early as 1592 and was eventually created earl of Haddington (*q.v.*). It is interesting to note that the 5th earl of Haddington by his marriage with Lady Margaret Leslie brought for a time the earldom of Rothes to the Hamiltons to be added to their already numerous titles.

Sir "David FitzWalter FitzGilbert," who carried on the main line of the Hamiltons, was taken prisoner at the battle of Neville's Cross (1346) and treated as of great importance, being ransomed, it is stated, for a large sum of money; in 1371 and 1373 he was one of the barons in the parliament. Of the four sons attributed to him David succeeded in the representation of the family. Sir John Hamilton of Fingaltoun was ancestor of the Hamiltons of Preston, and Walter is stated to have been progenitor of the Hamiltons of Cambuskeith and Sanquhar in Ayrshire.

David Hamilton, the first apparently to describe himself as lord of Cadzow, died before 1302, leaving four or five sons, from whom descended the Hamiltons of Bathgate and of Bardowie, and perhaps also of Udstown, to which last belong the lords Belhaven.

Sir John Hamilton of Cadzow, the eldest son, was twice a prisoner in England, but beyond this little is known of him; even the date of his death is uncertain. His two younger sons are stated to have been founders of the houses of Dalserf and Raploch. His eldest son, James Hamilton of Cadzow, like his father and great-grandfather, visited England as a prisoner, being one of the hostages for the king's ransom. From him the Hamiltons of Silvertonhill and the lords Hamilton of Dalzell claim descent, among the more distinguished members of the former branch being General Sir Ian Hamilton, K.C.B. James Hamilton was succeeded by his eldest son Sir James Hamilton of Cadzow, who was created in 1445 an hereditary lord of parliament, and was thereafter known as Lord Hamilton. He had allied himself some years before with the great house of Douglas by marriage with Euphemia, widow of the 5th earl of Douglas, and was at first one of its most powerful supporters in the struggle with James II. Later, however, he obtained the royal favour and married about 1474 Mary, sister of James III. and widow of Thomas Boyd, earl of Arran. Of this marriage was born James, second Lord Hamilton, who as a near relative took an active part in the arrangements at the marriage of James IV. with Margaret Tudor; being rewarded on the same day (the 8th of August 1503) with the earldom of Arran. A champion in the lists he was scarcely so successful as a leader of men, his struggle with the Douglases being destitute of any great martial achievement. Of his many illegitimate children Sir James Hamilton of Finnart, beheaded in 1540, was ancestor of the Hamiltons of Gilkerscleugh; and John, archbishop of St Andrews, hanged by his Protestant enemies, was ancestor of the Hamiltons of Blair, and is said also to have been ancestor of Hamilton of London, baronet. James, second earl of Arran, son of the first earl by his second wife Janet Beaton, was chosen governor to the little Queen Mary, being nearest of kin to the throne through his grandmother, though the question of the validity of his mother's marriage was by no means settled. He held the governorship till 1554, having in 1549 been granted the duchy of Châtellerault in France. In his policy he was vacillating and eventually he retired to France, being absent during the three momentous years prior to the deposition of Mary. On his return he headed the queen's party, his property suffering in consequence. He was succeeded in the title in 1579 by his eldest son James, whose qualities were such that he was even proposed as a husband for Queen Elizabeth, but unfortunately he soon after became insane, his brother John, afterwards first marquess of Hamilton, administering the estates. From the third son, Claud, descends the duke of Abercorn, heir male of the house of Hamilton.

The first marquess of Hamilton had a natural son, Sir John Hamilton of Lettrick, who was legitimated in 1600 and was ancestor of the lords Bargany. His two legitimate sons were James, 3rd marquess and first duke of Hamilton, and William, who succeeded his brother as 2nd duke and was in turn succeeded under the special remainder contained in the patent of dukedom, by his niece Anne, duchess of Hamilton, who was married in 1656 to William Douglas, earl of Selkirk. The history of the descendants of this marriage belongs to the great house of Douglas, the 7th duke of Hamilton becoming the male representative and chief of the house of Douglas, earls of Angus.

The above mentioned Claud Hamilton, who with his brother, the first marquess, had taken so large a part in the cause of Queen Mary, was created a lord of parliament as Lord Paisley in 1587. He had five sons, of whom three settled in Ireland. Sir Claud being ancestor of the Hamiltons of Beltrim and Sir Frederick, distinguished in early life in the Swedish wars, being ancestor of the viscounts Boyne.

James, the eldest son of Lord Paisley, found favour with James VI. and was created in 1603 Lord of Abercorn, and three years later was advanced in the peerage as earl of Abercorn and lord of Paisley, Hamilton, Mountcastell and Kilpatrick. His eldest son James, 2nd earl of Abercorn, eventually heir male of the house of Hamilton and successor to the dukedom of Châtellerault, was created in his father's lifetime lord of Strabane in Ireland, but he resigned this title in 1633 in favour of his brother Claud, whose grandson, Claud, 5th Lord Strabane, succeeded

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eventually as 4th earl of Abercorn.. This earl, taking the side of James II., was with him in Ireland, his estate and title being afterwards forfeited, while his kinsman Gustavus Hamilton, afterwards first Lord Boyne, raised several regiments for William III., and greatly distinguished himself in the service of that monarch. His brother Charles, 5th earl of Abercorn, who obtained a reversal of the attainder, died without issue surviving in 1701 when the titles passed to his kinsman James Hamilton, grandson of Sir George Hamilton of Donalong in Ireland and great-grandson of the first earl. This branch, most faithful to the house of Stuart, counted among its many members distinguished in military annals Count Anthony Hamilton, author of the *Mémoires du comte de Gramont* and brother of "la belle Hamilton." James, 6th earl of Abercorn (whose brother William was ancestor of Hamilton of the Mount, baronet), was a partizan of William III., and obtained in 1701 the additional Irish titles of lord of Mountcastle and viscount of Strabane.

The 8th earl of Abercorn, who was summoned to the Irish house of peers in his father's lifetime as Lord Mountcastle, was created a peer of Great Britain in 1786 as Viscount Hamilton of Hamilton in Leicestershire, and renewed the family's connexion with Scotland by repurchasing the barony of Duddingston and later the lordship of Paisley. His nephew and successor was created marquess of Abercorn in 1790, and was father of James, 1st duke of Abercorn.

See the article Hamilton and other articles on the different branches of the family (*e.g.* Haddington and Belhaven) in Sir J. B. Paul's edition of Sir R. Douglas's *Peerage of Scotland*; and also G. Marshall, *Guide to Heraldry and Genealogy*.

HAMILTON, MARQUESSES AND DUKES OF. The holders of these titles descended from Sir James Hamilton of Cadzow, who was made an hereditary lord of parliament in 1445, his lands and baronies at the same time being erected into the "lordship" of Hamilton. His first wife Euphemia, widow of the 5th earl of Douglas, died in 1468, and probably early in 1474 he married Mary, daughter of King James II. and widow of Thomas Boyd, earl of Arran; the consequent nearness of the Hamiltons to the Scottish crowne gave them very great weight in Scottish affairs. The first Lord Hamilton has been frequently confused with his father, James Hamilton of Cadzow, who was one of the hostages in England for the payment of James I.'s ransom, and is sometimes represented as surviving until 1451 or even 1479, whereas he certainly died, according to evidence brought forward by J. Anderson in *The Scots Peerage*, before May 1441. James, 2nd Lord Hamilton, son of the 1st lord and Princess Mary, was created earl of Arran in 1503; and his son James, who was regent of Scotland from 1542 to 1554, received in February 1549 a grant of the duchy of Châtellerault in Poitou.

JOHN, 1st marquess of Hamilton (*c.* 1542–1604), third son of James Hamilton, 2nd earl of Arran (*q.v.*) and duke of Châtellerault, was given the abbey of Arbroath in 1551. In politics he was largely under the influence of his energetic and unscrupulous younger brother Claud, afterwards Baron Paisley (*c.* 1543–1622), ancestor of the dukes of Abercorn. The brothers were the real heads of the house of Hamilton, their elder brother Arran being insane. At first hostile to Mary, they later became her devoted partisans. Their uncle, John Hamilton, archbishop of St Andrews, natural son of the 1st earl of Arran, was restored to his consistorial jurisdiction by Mary in 1566, and in May of the next year he divorced Bothwell from his wife. Lord Claud met Mary on her escape from Lochleven and escorted her to Hamilton palace. John appears to have been in France in 1568 when the battle of Langside was fought, and it was probably Claud who commanded Mary's vanguard in the battle. With others of the queen's party they were forfeited by the parliament and sought their revenge on the regent Murray. Although the Hamiltons disavowed all connexion with Murray's murderer, James Hamilton of Bothwellhaugh, he had been provided with horse and weapons by the abbot of Arbroath, and it was at Hamilton that he sought refuge after the deed. Archbishop Hamilton was hanged at Stirling in 1571 for alleged complicity in the murder of Darnley, and is said to have admitted that he was a party to the murder of Murray. At the pacification of Perth in 1573 the Hamiltons abandoned Mary's cause, and a reconciliation with the Douglases was sealed by Lord John's marriage with Margaret, daughter of the 7th Lord Glamis, a cousin of the regent Morton. Sir William Douglas of Lochleven, however, persistently sought his life in revenge for the murder of Murray until, on his refusal to keep the peace, he was imprisoned. On the uncertain evidence extracted from the assassin by torture, the Hamiltons had been credited with a share in the murder of the regent Lennox in 1571. In 1579 proceedings against them for these two crimes were resumed, and when they escaped to England their lands and titles were seized by their political enemies, James Stewart becoming earl of Arran. John Hamilton presently dissociated himself from the policy of his brother Claud, who continued to plot for Spanish intervention on behalf of Mary; and Catholic plotters are even said to have suggested his murder to procure the succession of his brother. Hamilton had at one time been credited with the hope of marrying Mary; his desires now centred on the peaceful enjoyment of his estates. With other Scottish exiles he crossed the border in 1585 and marched on Stirling; he was admitted on the 4th of November and formally reconciled with James VI., with whom he was thenceforward on the friendliest terms. Claud returned to Scotland in 1586, and the abbey of Paisley was erected into a temporal barony in his favour in 1587. Much of his later years was spent in strict retirement, his son being authorized to act for him in 1598. John was created marquess of Hamilton and Lord Evan in 1590, and died on the 6th of April 1604.

His eldest surviving son JAMES, 2nd marquess of Hamilton (*c.* 1589–1625), was created baron of Innerdale and earl of Cambridge in the peerage of England in 1619, and these honours descended to his son James, who in 1643 was created duke of Hamilton (*q.v.*). William, 2nd duke of Hamilton (1616–1651), succeeded to the dukedom on his brother's execution in 1649. He was created earl of Lanark in 1639, and in the next year became secretary of state in Scotland. Arrested at Oxford by the king's orders in 1643 for "concurrence" with Hamilton, he effected his escape and was temporarily reconciled with the Presbyterian party. He was sent by the Scottish committee of estates to treat with Charles I. at Newcastle in 1646, when he sought in vain to persuade the king to consent to the establishment of Presbyterianism in England. On the 26th of September 1647 he signed on behalf of the Scots the treaty with Charles known as the "Engagement" at Carisbrooke Castle, and helped to organize the second Civil War. In 1648 he fled to Holland, his succession in the next year to his brother's dukedom making him an important personage among the Royalist exiles. He returned to Scotland with Prince Charles in 1650, but, finding a reconciliation with Argyll impossible, he refused to prejudice Charles's cause by pushing his claims, and lived in retirement chiefly until the Scottish invasion of England, when he acted as colonel of a body of his dependants. He died on the 12th of September 1651 from the effects of wounds received at Worcester. He left no male heirs, and the title devolved on the 1st duke's eldest surviving daughter Anne, duchess of Hamilton in her own right.

Anne married in 1656 William Douglas, earl of Selkirk (1635–1694), who was created duke of Hamilton in 1660 on his wife's petition, receiving also several of the other Hamilton peerages, but for his life only. The Hamilton estates had been declared forfeit by Cromwell, and he himself had been fined £1000. He supported Lauderdale in the early stages of his Scottish policy, in which he adopted a moderate attitude towards the Presbyterians, but the two were soon alienated, through the influence of the countess of Dysart, according to Gilbert Burnet, who spent much time at Hamilton Palace in arranging the Hamilton papers. With other Scottish noblemen who resisted Lauderdale's measures Hamilton was twice summoned to London to present his case at court, but without obtaining any result. He was dismissed from the privy council in 1676, and on a subsequent visit to London Charles refused to receive him. On the accession

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of James II. he received numerous honours, but he was one of the first to enter into communication with the prince of Orange. He presided over the convention of Edinburgh, summoned at his request, which offered the Scottish crown to William and Mary in March 1689. His death took place at Holyrood on the 18th of April 1694. His wife survived until 1716.

JAMES DOUGLAS, 4th duke of Hamilton (1658–1712), eldest son of the preceding and of Duchess Anne, succeeded his mother, who resigned the dukedom to him in 1698, and at the accession of Queen Anne he was regarded as leader of the Scottish national party. He was an opponent of the union with England, but his lack of decision rendered his political conduct ineffective. He was created duke of Brandon in the peerage of Great Britain in 1711; and on the 15th of November in the following year he fought the celebrated duel with Charles Lord Mohun, narrated in Thackeray's *Esmond*, in which both the principals were killed. His son, James (1703–1743), became 5th duke, and his grandson James, 6th duke of Hamilton and Brandon (1724–1758), married the famous beauty, Elizabeth Gunning, afterwards duchess of Argyll. James George, 7th duke (1755–1760), became head of the house of Douglas on the death in 1761 of Archibald, duke of Douglas, whose titles but not his estates then devolved on the duke of Hamilton as heir-male. Archibald's brother Douglas (1756–1790) was the 8th duke, and when he died childless the titles passed to his uncle Archibald (1740–1819). His son Alexander, 10th duke (1767–1852), who as marquess of Douglas was a great collector and connoisseur of books and pictures (his collections realized £397,562 in 1882), was ambassador at St Petersburg in 1806–1807. His sister, Lady Anne Hamilton, was lady-in-waiting and a faithful friend to Queen Caroline, wife of George IV.; she did not write the *Secret History of the Court of England* . . . (1832) to which her name was attached. William Alexander, 11th duke of Hamilton (1811–1863), married Princess Marie Amélie, daughter of Charles, grand-duke of Baden, and, on her mother's side, a cousin of Napoleon III. The title of duke of Châtellerault, granted to his remote ancestor in 1548, and claimed at different times by various branches of the Hamilton family, was conferred on the 11th duke's son, William Alexander, 12th duke of Hamilton (1845–1895), by the emperor of the French in 1864. His sister, Lady Mary Douglas-Hamilton, married in 1869 Albert, prince of Monaco, but their marriage was declared invalid in 1880. She subsequently married Count Tassilo Festetics, a Hungarian noble. The 12th duke left no male issue and was succeeded in 1895 by his kinsman, Alfred Douglas, a descendant of the 4th duke. Claud Hamilton, 1st Baron Paisley, brother of the 1st marquess of Hamilton, was, as mentioned above, ancestor of the Abercorn branch of the Hamiltons. His son, who became earl of Abercorn in 1606, received among a number of other titles that of Lord Hamilton. This title, and also that of Viscount Hamilton, in the peerage of Great Britain, conferred on the 8th earl of Abercorn in 1786, are borne by the dukes of Abercorn, whose eldest son is usually styled by courtesy marquess of Hamilton, a title which was added to the other family honours when the 2nd marquess of Abercorn was raised to the dukedom in 1868.

See John Anderson, *The House of Hamilton* (1825); *Hamilton Papers*, ed. J. Bain (2 vols., Edinburgh, 1890–1892); Gilbert Burnet, *Lives of James and William, dukes of Hamilton* (1677); *The Hamilton Papers relative to 1638–1650*, ed. S. R. Gardiner for the Camden Society (1880); G. E. Cokayne], *Complete Peerage* (1887–1898); an article by the Rev. J. Anderson in Sir J. B. Paul's edition of the *Scots Peerage*, vol. iv. (1907).

HAMILTON, ALEXANDER (1757–1804), American statesman and economist, was born, as a British subject, on the island of Nevis in the West Indies on the 11th of January 1757. He came of good family on both sides. His father, James Hamilton, a Scottish merchant of St Christopher, was a younger son of Alexander Hamilton of Grange, Lanarkshire, by Elizabeth, daughter of Sir R. Pollock. His mother, Rachael Fawcett (Faucette), of French Huguenot descent, married when very young a Danish proprietor of St Croix, John Michael Levine, with whom she lived unhappily and whom she soon left, subsequently living with James Hamilton; her husband procured a divorce in 1759, but the court forbade her remarriage.[1] Such unions as hers with James Hamilton were long not uncommon in the West Indies. By her James Hamilton had two sons, Alexander and James. Business misfortunes having caused his father's bankruptcy, and his mother dying in 1768, young Hamilton was thrown upon the care of maternal relatives at St Croix, where, in his twelfth year, he entered the counting-house of Nicholas Cruger. Shortly afterward Mr Cruger, going abroad, left the boy in charge of the business. The extraordinary specimens we possess of his mercantile correspondence and friendly letters, written at this time, attest an astonishing poise and maturity of mind, and self-conscious ambition. His opportunities for regular schooling must have been very scant; but he had cultivated friends who discerned his talents and encouraged their development, and he early formed the habits of wide reading and industrious study that were to persist through his life. An accomplishment later of great service to Hamilton, common enough in the Antilles, but very rare in the English continental colonies, was a familiar command of French. In 1772 some friends, impressed by a description by him of the terrible West Indian hurricane in that year, made it possible for him to go to New York to complete his education. Arriving in the autumn of 1772, he prepared for college at Elizabethtown, N.J., and in 1774 entered King's College (now Columbia University) in New York City. His studies, however, were interrupted by the War of American Independence.

A visit to Boston seems to have thoroughly confirmed the conclusion, to which reason had already led him, that he should cast in his fortunes with the colonists. Into their cause he threw himself with ardour. In 1774–1775 he wrote two influential anonymous pamphlets, which were attributed to John Jay; they show remarkable maturity and controversial ability, and rank high among the political arguments of the time.[2] He organized an artillery company, was awarded its captaincy on examination, won the interest of Nathanael Greene and Washington by the proficiency and bravery he displayed in the campaign of 1776 around New York City, joined Washington's staff in March 1777 with the rank of lieutenant-colonel, and during four years served as his private secretary and confidential aide. The important duties with which he was entrusted attest Washington's entire confidence in his abilities and character; then and afterwards, indeed, reciprocal confidence and respect took the place, in their relations, of personal attachment.[3] But Hamilton was ambitious for military glory—it was an ambition he never lost; he became impatient of detention in what he regarded as a position of unpleasant dependence, and (Feb. 1781) he seized a slight reprimand administered by Washington as an excuse for abandoning his staff position.[4] Later he secured a field command, through Washington, and won laurels at Yorktown, where he led the American column in the

[1] These facts were first definitely determined by Mrs Gertrude Atherton from the Danish Archives in Denmark and the West Indies; see article in *North American Review*, Aug. 1902, vol. 175, p. 229; and preface to her *A Few of Hamilton's Letters* (New York, 1903).

[2] These were written in answer to the widely read pamphlets published over the *nom de plume* of "A Westchester Farmer," and now known to have been written by Samuel Seabury (q.v.). Hamilton's pamphlets were entitled "A Full Vindication of the Measures of the Congress from the Calumnies of their Enemies," and "The Farmer Refuted." Concerning them George Ticknor Curtis (*Constitutional History of the United States*, i. 274) has said, "There are displayed in these papers a power of reasoning and sarcasm, a knowledge of the principles of government and of the English constitution, and a grasp of the merits of the whole controversy, that would have done honour to any man at any age. To say that they evince precocity of intellect gives no idea of their main characteristics. They show great maturity—a more remarkable maturity than has ever been exhibited by any other person, at so early an age, in the same department of thought."

[3] George Bancroft was the first to point out that there is small evidence that Hamilton ever really appreciated Washington's great qualities; but on the score of personal and Federalist indebtedness he left explicit recognition.

[4] For Hamilton's letter to General Schuyler on this episode—one of the most important letters, in some ways, that he ever wrote—see the *Works*, ix. 232 (8 : 35).

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final assault on the British works. In 1780 he married Elizabeth, daughter of General Philip Schuyler, and thus became allied with one of the most distinguished families in New York.

Meanwhile, he had begun the political efforts upon which his fame principally rests. In letters of 1779–1780[1] he correctly diagnoses the ills of the Confederation, and suggests with admirable prescience the necessity of centralization in its governmental powers; he was, indeed, one of the first, if not to conceive, at least to suggest adequate checks on the anarchic tendencies of the time. After a year's service in Congress in 1782–1783, in which he experienced the futility of endeavouring to attain through that decrepit body the ends he sought, he settled down to legal practice in New York.[2] The call for the Annapolis Convention (1786) was Hamilton's opportunity. A delegate from New York, he supported Madison in inducing the Convention to exceed its delegated powers and summon the Federal Convention of 1787 at Philadelphia (himself drafting the call); he secured a place on the New York delegation; and, when his anti-Federal colleagues withdrew from the Convention, he signed the Constitution for his state. So long as his colleagues were present his own vote was useless, and he absented himself for some time from the debates after making one remarkable speech (June 18th, 1787). In this he held up the British government as the best model in the world.[3] Though fully conscious that monarchy in America was impossible, he wished to obtain the next best solution in an aristocratic, strongly centralized, coercive, but representative union, with devices to give weight to the influence of class and property.[4] His plan had no chance of success; but though unable to obtain what he wished, he used his great talents to secure the adoption of the Constitution.

To this struggle was due the greatest of his writings, and the greatest individual contribution to the adoption of the new government, *The Federalist*, which remains a classic commentary on American constitutional law and the principles of government, and of which Guizot said that "in the application of elementary principles of government to practical administration" it was the greatest work known to him. Its inception, and much more than half its contents were Hamilton's (the rest Madison's and Jay's).[5] Sheer will and reasoning could hardly be more brilliantly and effectively exhibited than they were by Hamilton in the New York convention of 1788, whose vote he won, against the greatest odds, for the ratification of the Constitution. It was the judgment of Chancellor James Kent, the justice of which can hardly be disputed, that "all the documentary proof and the current observation of the time lead us to the conclusion that he surpassed all his contemporaries in his exertions to create, recommend, adopt and defend the Constitution of the United States."

When the new government was inaugurated, Hamilton became secretary of the treasury in Washington's cabinet.[6] Congress immediately referred to him a press of queries and problems, and there came from his pen a succession of papers that have left the strongest imprint on the administrative organization of the national government—two reports on public credit, upholding an ideal of national honour higher than the prevalent popular principles; a report on manufactures, advocating their encouragement (*e.g.* by bounties paid from surplus revenues amassed by tariff duties)—a famous report that has served ever since as a storehouse of arguments for a national protective policy;[7] a report favouring the establishment of a national bank, the argument being based on the doctrine of "implied powers" in the Constitution, and on the application that Congress may do anything that can be made, through the medium of money, to subserve the "general welfare" of the United States—doctrines that, through judicial interpretation, have revolutionized the Constitution; and, finally, a vast mass of detailed work by which order and efficiency were given to the national finances. In 1793 he put to confusion his opponents who had brought about a congressional investigation of his official accounts. The success of his financial measures was immediate and remarkable. They did not, as is often but loosely said, create economic prosperity; but they did prop it, in an all-important field, with order, hope and confidence. His ultimate purpose was always the strengthening of the union; but before particularizing his political theories, and the political import of his financial measures, the remaining events of his life may be traced.

His activity in the cabinet was by no means confined to the finances. He regarded himself, apparently, as premier, and sometimes overstepped the limits of his office in interfering with other departments. The heterogeneous character of the duties placed upon his department by Congress seemed in fact to reflect the English idea of its primacy. Hamilton's influence was in fact predominant with Washington (so far as any man could have predominant influence). Thus it happens that in foreign affairs, whatever credit properly belongs to the Federalists as a party (see also the article FEDERALIST PARTY) for the adoption of that principle of neutrality which became the traditional policy of the United States must be regarded as largely due to Hamilton. But allowance must be made for the mere advantage of initiative which belonged to any party that organized the government—the differences between Hamilton and Jefferson, in this question of neutrality, being almost purely factitious.[8] On domestic policy their differences were vital, candour, simplicity, and elegance, with which its truths are uttered and recommended."

[6] The position was offered first to Robert Morris, who declined it, expressing the opinion that Hamilton was the man best fitted to meet its problems.

[7] Hamilton's *Report on Manufactures* (1791) by itself entitles him to the place of an epoch-maker in economics. It was the first great revolt from Adam Smith, on whose *Wealth of Nations* (1776) he is said to have already written a commentary which is lost. In his criticism on Adam Smith, and his arguments for a system of moderate protective duties associated with the deliberate policy of promoting national interests, his work was the inspiration of Friedrich List, and so the foundation of the economic system of Germany in a later day, and again, still later, of the policy of Tariff Reform and Colonial Preference in England, as advocated by Mr Chamberlain and his supporters. See the detailed account given in the article PROTECTION.

[8] That is, while Jefferson hated British aristocracy and sympathized with French democracy, Hamilton hated French democracy and sympathized with British aristocracy and order; but

[1] Especially the letter of September 1780 to James Duane, *Works*, i. 213 (1: 203) also the "Continentalist" papers of 1781.

[2] His most famous case at this time (*Rutgers v. Waddington*) was one that well illustrated his moral courage. Under a "Trespass Law" of New York, Elizabeth Rutgers, a widow, brought suit against one Joshua Waddington, a Loyalist, who during the war of American Independence, when New York was occupied by the British, had made use of some of her property. In face of popular clamour, Hamilton, who advocated a conciliatory treatment of the Loyalists, represented Waddington, who won the case, decided in 1784.

[3] As Mr Oliver points out (*Alexander Hamilton*, p. 156), Hamilton's idea of the British constitution was not a correct picture of the British constitution in 1787, and still less of that of the 20th century. "What he had in mind was the British constitution as George III. had tried to make it." Hamilton's ideal was an elective monarchy, and his guiding principle a proper balance of authority.

[4] Briefly, he proposed a governor and two chambers—an Assembly elected by the people for three years, and a Senate—the governor and senate holding office for life or during good behaviour, and chosen, through electors, by voters qualified by property; the governor to have an unqualified veto on federal legislation; state governors to have a similar veto on state legislation, and to be appointed by the federal government; the federal government to control all militia. See *Works*, i. 347 (1: 331); and cf. his correspondence, which is scanty, *passim* in later years, notably x. 446, 431, 329 (8: 606, 596, 517), and references below.

[5] Nearly all the papers in *The Federalist* first appeared (between October 1787 and April 1788) in New York journals, over the signature "Publius." Jay wrote only five. The authorship of twelve of them is uncertain, and has been the subject of much controversy between partisans of Hamilton and Madison. Concerning *The Federalist* Chancellor James Kent (*Commentaries*, i. 241) said: "There is no work on the subject of the Constitution, and on republican and federal government generally, that deserves to be more thoroughly studied. I know not indeed of any work on the principles of free government that is to be compared, in instruction and intrinsic value, to this small and unpretending volume. . . . It is equally admirable in the depth of its wisdom, the comprehensiveness of its views, the sagacity of its reflections, and the fearlessness, patriotism,

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and in their conflicts over Hamilton's financial measures they organized, on the basis of varying tenets and ideals which have never ceased to conflict in American politics, the two great parties of Federalists and Democrats (or Democratic-Republicans). On the 31st of January 1795 Hamilton resigned his position as secretary of the treasury and returned to the practice of law in New York, leaving it for public service only in 1798–1800, when he was the active head, under Washington (who insisted that Hamilton should be second only to himself), of the army organized for war against France. But though in private life he remained the continual and chief adviser of Washington—notably in the serious crisis of the Jay Treaty, of which Hamilton approved. Washington's *Farewell Address* (1796) was written for him by Hamilton.

After Washington's death the Federalist leadership was divided (and disputed) between John Adams, who had the prestige of a varied and great career, and greater strength than any other Federalist with the people, and Hamilton, who controlled practically all the leaders of lesser rank, including much the greater part of the most distinguished men of the country, so that it has been very justly said that "the roll of his followers is enough of itself to establish his position in American history" (Lodge). But Hamilton was not essentially a popular leader. When his passions were not involved, or when they were repressed by a crisis, he was far-sighted, and his judgment of men was excellent.[1] But as Hamilton himself once said, his heart was ever the master of his judgment. He was, indeed, not above intrigue,[2] but he was unsuccessful in it. He was a fighter through and through, and his courage was superb; but he was indiscreet in utterance, impolitic in management, opinionated, self-confident, and uncompromising in nature and methods. His faults are nowhere better shown than in his quarrel with John Adams. Three times, in order to accomplish ends deemed by him, personally, to be desirable, Hamilton used the political fortunes of John Adams, in presidential elections, as a mere hazard in his manœuvres; moreover, after Adams became president, and so the official head of the party, Hamilton constantly advised the members of the president's cabinet, and through them endeavoured to control Adams's policy; and finally, on the eve of the crucial election of 1800, he wrote a bitter personal attack on the president (containing much confidential cabinet information), which was intended for private circulation, but which was secured and published by Aaron Burr, his legal and political rival.

The mention of Burr leads us to the fatal end of another great political antipathy of Hamilton's life. He read Burr's character correctly from the beginning; deemed it a patriotic duty to thwart him in his ambitions; defeated his hopes successively of a foreign mission, the presidency, and the governorship of New York; and in his conversations and letters repeatedly and unsparingly denounced him. If these denunciations were known to Burr they were ignored by him until his last defeat. After that he forced a quarrel on a trivial bit of hearsay (that Hamilton had said he had a "despicable" opinion of Burr); and Hamilton, believing as he explained in a letter he left before going to his death—that a compliance with the duelling prejudices of the time was inseparable from the ability to be in future useful in public affairs, accepted a challenge from him. The duel was fought at Weehawken on the Jersey shore of the Hudson opposite the City of New York. At the first fire Hamilton fell, mortally wounded, and he died on the following day, the 12th of July 1804. Hamilton himself did not intend to fire, but his pistol went off as he fell. The tragic close of his career appeased for the moment the fierce hatred of politics, and his death was very generally deplored as a national calamity.[3]

No emphasis, however strong, upon the mere consecutive personal successes of Hamilton's life is sufficient to show the measure of his importance in American history. That importance lies, to a large extent, in the political ideas for which he stood. His mind was eminently "legal." He was the unrivalled controversialist of the time. His writings, which are distinguished by clarity, vigour and rigid reasoning, rather than by any show of scholarship—in the extent of which, however solid in character Hamilton's might have been, he was surpassed by several of his contemporaries—are in general strikingly empirical in basis. He drew his theories from his experiences of the Revolutionary period, and he modified them hardly at all through life. In his earliest pamphlets (1774–1775) he started out with the ordinary pre-Revolutionary Whig doctrines of natural rights and liberty; but the first experience of semi-anarchic states'-rights and individualism ended his fervour for ideas so essentially alien to his practical, logical mind, and they have no place in his later writings. The feeble inadequacy of conception, infirmity of power, factional jealousy, disintegrating particularism, and vicious finance of the Confederation were realized by many others; but none other saw so clearly (the concrete nationalistic remedies for these concrete ills, or pursued remedial ends so constantly, so ably, and so consistently. An immigrant, Hamilton had no particularistic ties; he was by instinct a "continentalist" or federalist. He wanted a strong union and energetic government that should "rest as much as possible on the shoulders of the people and as little as possible on those of the state legislatures"; that should have the support of wealth and class; and that should curb the states to such an "entire subordination" as nowise to be hindered by those bodies. At these ends he aimed with extraordinary skill in all his financial measures. As early as 1776 he urged the direct collection of federal taxes by federal agents. From 1779 onward we trace the idea of supporting government by the interest of the propertied classes; from 1781 onward the idea that a not-excessive public debt would be a blessing[4] in giving cohesiveness to the union: hence his device by which the federal government, assuming the war debts of the states, secured greater resources, based itself on a high ideal of nationalism, strengthened its hold on the individual citizen, and gained the support of property. In his report on manufactures his chief avowed motive was to strengthen the union. To the same end he conceived the constitutional doctrines of liberal construction, "implied powers," and the "general welfare," which were later embodied in the decisions of John Marshall. The idea of nationalism pervaded and quickened all his life and works. With one great exception, the dictum of Guizot is hardly an exaggeration, that "there is not in the Constitution of the United States an element of order, of force, of duration, which he did not powerfully contribute to introduce into it and to cause to predominate."

neither wanted war; and indeed Jefferson, throughout life, was the more peaceful of the two. Neutrality was in the line of commonplace American thinking of that time, as may be seen in the writings of all the leading men of the day. The cry of "British Hamilton" had no good excuse whatever.

[1] *e.g.* his prediction in 1789 of the course of the French Revolution, his judgments of Burr from 1792 onward, and of Burr and Jefferson in 1800.

[2] After the Democrats won New York in 1799, Hamilton proposed to Governor John Jay to call together the out-going Federalist legislature, in order to choose Federalist presidential electors, a suggestion which Jay simply endorsed: "Proposing a measure for party purposes which it would not become me to adopt."—*Works*, x. 371 (8 : 349). Compare also with later developments of ward politics in New York City, Hamilton's curious suggestions as to Federalist charities, &c., in connexion with the Christian Constitutional Society proposed by him in 1802 to combat irreligion and democracy (*Works*, x. 432 (8 : 396).

[3] Hamilton's widow, who survived him for half a century, dying at the age of ninety-seven, was left with four sons and four daughters. He had been an affectionate husband and father, though his devotion to his wife had been consistent with occasional lapses from strict marital fidelity. One intrigue into which he drifted in 1791, with a Mrs Reynolds, led to the blackmailing of Hamilton by her husband; and when this rascal, shortly afterwards, got into trouble for fraud, his relations with Hamilton were unscrupulously misrepresented for political purposes by some of Hamilton's opponents. But Hamilton faced the necessity of revealing the true state of things with conspicuous courage, and the scandal only reacted on his accusers. One of them was Monroe, whose reputation comes very badly out of this unsavoury affair.

[4] In later years he said no debt should be incurred without providing simultaneously for its payment.

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" The exception, as American history showed, was American democracy. The loose and barren rule of the Confederation seemed to conservative minds such as Hamilton's to presage, in its strengthening of individualism, a fatal looseness of social restraints, and led him on to a dread of democracy that he never overcame. Liberty, he reminded his fellows, in the New York Convention of 1788, seemed to be alone considered in government, but there was another thing equally important: " a principle of strength and stability in the organization . . . and of vigour in its operation." But Hamilton's governmental system was in fact repressive.[1] He wanted a system strong enough, he would have said, to overcome the anarchic tendencies loosed by war, and represented by those notions of natural rights which he had himself once championed; strong enough to overbear all local, state and sectional prejudices, powers or influence, and to control—not, as Jefferson would have it, to be controlled by—the people. Confidence in the integrity, the self-control, and the good judgment of the people, which was the content of Jefferson's political faith, had almost no place in Hamilton's theories. " Men," said he, " are reasoning rather than reasonable animals." The charge that he laboured to introduce monarchy by intrigue is an under-estimate of his good sense.[2] Hamilton's thinking, however, did carry him foul of current democratic philosophy; as he said, he presented his plan in 1787 " not as attainable, but as a model to which we ought to approach as far as possible "; moreover, he held through life his belief in its principles, and in its superiority over the government actually created; and though its inconsistency with American tendencies was yearly more apparent, he never ceased to avow on all occasions his aristocratic-monarchical partialities. Moreover, his preferences for at least an aristocratic republic were shared by many other men of talent. When it is added that Jefferson's assertions, alike as regards Hamilton's talk[3] and the intent and tendency of his political measures, were, to the extent of the underlying facts—but distorted by Jefferson's somewhat intemperate interpretations—unquestionably true,[4] it cannot be accounted strange that Hamilton's Democratic opponents mistook his theoretic predilections for positive designs. Nor would it be a strained inference from much that he said, to believe that he hoped and expected that in the " crisis " he foresaw, when democracy should have caused the ruin of the country, a new government might be formed that should approximate to his own ideals.[5] From the beginning of the excesses of the French Revolution he was possessed by the persuasion that American democracy, likewise, might at any moment crush the restraints of the Constitution to enter on a career of licence and anarchy. To this obsession he sacrificed his life.[6] After the Democratic victory of 1800, his letters, full of retrospective judgments and interesting outlooks, are but rarely relieved in their sombre pessimism by flashes of hope and courage. His last letter on politics, written two days before his death, illustrates the two sides of his thinking already emphasized: in this letter he warns his New England friends against dismemberment of the union as " a clear sacrifice of great positive advantages, without any counterbalancing good; administering no relief to our real disease, which is democracy, the poison of which; by a subdivision, will only be more concentrated in each part, and consequently the more virulent." To the end he never lost his fear of the states, nor gained faith in the future of the country. He laboured still, in mingled hope and apprehension, " to prop the frail and worthless fabric,"[7] but for its spiritual content of democracy he had no understanding, and even in its nationalism he had little hope. Yet probably to no one man, except perhaps to Washington, does American nationalism owe so much as to Hamilton.

In the development of the United States the influence of Hamiltonian nationalism and Jeffersonian democracy has been a reactive union; but changed conditions since Hamilton's time, and particularly since the Civil War, are likely to create misconceptions as to Hamilton's position in his own day. Great constructive statesman as he was, he was also, from the American point of view, essentially a reactionary. He was the leader of reactionary forces—constructive forces, as it happened—in the critical period after the War of American Independence, and in the period of Federalist supremacy. He was in sympathy with the dominant forces of public life only while they took, during the war, the predominant impress of an imperfect nationalism.[8] Jeffersonian democracy came into power in 1800 in direct line with colonial development; Hamiltonian Federalism was a break in that development; and this alone can explain how Jefferson could organize the Democratic Party in face of the brilliant success of the Federalists in constructing the government. Hamilton stigmatized his great opponent as a political fanatic; but actualist as he claimed to be,[9] Hamilton could not see, or would not concede, the predominating forces in American life, and would uncompromisingly have minimized the two great political conquests of the colonial period—local self-government and democracy.

Few Americans have received higher tributes from foreign authorities. Talleyrand, personally impressed when in America with Hamilton's brilliant qualities, declared that he had the power of divining without reasoning, and compared him to Fox and Napoleon because he had " deviné l'Europe." Of the judgments rendered by his countrymen, Washington's confidence in his ability and integrity is perhaps the most significant. Chancellor James Kent, and others only less competent, paid remarkable testimony to his legal abilities. Chief-justice Marshall ranked him second to Washington alone. No judgment

[4] He dreamed of saving the country with an army in this crisis of blood and iron, and wished to preserve unweakened the public confidence in his personal bravery.

[5] His own words in 1802. In justification of the above statements see the correspondence of 1800–1804 *passim*—*Works*, vol. ix.–x. (or 7–8); especially x. 363, 425, 434, 440, 445 (or 8:543, 591, 596, 602, 605).

[6] Cf. Anson D. Morse, article cited below, pp. 4, 18-21.

[7] Chancellor Kent tells us (*Memoirs and Letters*, p. 32) that in 1804 Hamilton was planning a co-operative *Federalist* work on the history and science of government on an inductive basis. Kent always speaks of Hamilton's legal thinking as deductive, however (ibid, p. 290, 329), and such seems to have been in fact all his political reasoning; *i.e.* underlying them were such maxims as that of Hume, that in erecting a stable government every citizen must be assumed a knave, and be bound by self-interest to co-operation for the public good. Hamilton always seems to be reasoning deductively from such principles. He went too far and fast for even such a Federalist disbeliever in democracy as Gouverneur Morris; who, to Hamilton's assertion that democracy must be cast out to save the country, replied that " such necessity cannot be shown by a political ratiocination. Luckily, or, to speak with a reverence proper to the occasion, providentially, mankind are not disposed to embark the blessings they enjoy on a voyage of syllogistic adventure to obtain something more beautiful in exchange. They must feel before they will act " (*op. cit.* ii. 531).

[1] He warmly supported the Alien and Sedition Laws of 1798 (in their final form).

[2] The idea, he wrote to Washington, was " one of those visionary things none but madmen could undertake, and that no wise man will believe " (1792). And see his comments on Burr's ambitions, *Works*, x. 417, 450 (8:585, 610). We may accept as just, and applicable to his entire career, the statement made by himself in 1803 of his principles in 1787: " (1) That the political powers of the people of this continent would endure nothing but a representative form of government. (2) That, in the actual situation of the country, it was itself right and proper that the representative system should have a full and fair trial. (3) That to such a trial it was essential that the government should be so constructed as to give it all the energy and the stability reconcilable with the principles of that theory."

[3] Cf. Gouverneur Morris, *Diary and Letters*, ii. 455, 526, 531.

[4] Cf. even Mr Lodge's judgments, pp. 90-92, 115-116, 122, 130, 140. When he says (p. 140) that " In Hamilton's successful policy there were certainly germs of an aristocratic republic, there were certainly limitations and possibly dangers to pure democracy," this is practically Jefferson's assertion (1792) that " His system flowed from principles adverse to liberty "; but Jefferson goes on to add: " and was calculated to undermine and demolish the republic." As to the intent of Hamilton to secure through his financial measures the political support of property, his own words are honest and clear; and in fact he succeeded. Jefferson merely had exaggerated fears of a moneyed political engine, and seeing that Hamilton's measures of funding and assumption did make the national debt politically useful to the Federalists in the beginning he concluded that they would seek to fasten the debt on the country for ever.

[5] Cf. Gouv. Morris, *op. cit.* ii. 474.

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is more justly measured than Madison's (in 1831): "That he possessed intellectual powers of the first order, and the moral qualities of integrity and honour in a captivating degree, has been awarded him by a suffrage now universal. If his theory of government deviated from the republican standard he had the candour to avow it, and the greater merit of co-operating faithfully in maturing and supporting a system which was not his choice."

In person Hamilton was rather short and slender; in carriage, erect, dignified and graceful. Deep-set, changeable, dark eyes vivified his mobile features, and set off his light hair and fair, ruddy complexion. His head in the famous Trumbull portrait is boldly poised and very striking. The captivating charm of his manners and conversation is attested by all who knew him, and in familiar life he was artlessly simple. Friends he won readily, and he held them in devoted attachment by the solid worth of a frank, ardent, generous, warm-hearted and high-minded character. Versatile as were his intellectual powers, his nature seems comparatively simple. A firm will, tireless energy, aggressive courage and bold self-confidence were its leading qualities; the word "intensity" perhaps best sums up his character. His Scotch and Gallic strains of ancestry are evident; his countenance was decidedly Scotch; his nervous speech and bearing and vehement temperament rather French; in his mind, agility, clarity and penetration were matched with logical solidity. The remarkable quality of his mind lay in the rare combination of acute analysis and grasp of detail with great comprehensiveness of thought. So far as his writings show, he was almost wholly lacking in humour, and in imagination little less so. He certainly had wit, but it is hard to believe he could have had any touch of fancy. In public speaking he often combined a rhetorical effectiveness and emotional intensity that might take the place of imagination, and enabled him, on the coldest theme, to move deeply the feelings of his auditors.

BIBLIOGRAPHY.—Hamilton's *Works* have been edited by H. C. Lodge (New York, 9 vols., 1885–1886, and 12 vols., 1904); all references above are first to the latter edition, secondly (in brackets) to the former. There are various additional editions of *The Federalist*, notably those of H. B. Dawson (1863), H. C. Lodge (1888), and —the most scholarly—P. L. Ford (1898); cf. *American Historical Review*, ii. 413, 675. See also James Bryce, "Predictions of Hamilton and de Tocqueville," in *Johns Hopkins University Studies*, vol. 5 (Baltimore, 1887); and the capital essay of Anson D. Morse in the *Political Science Quarterly*, v. (1890), pp. 1–23. For a bibliography of the period see the *Cambridge Modern History*, vol. vii. pp. 780–810. The unfinished *Life of Alexander Hamilton, by his Son*, J. C. Hamilton, going only to 1787 (New York, 2 vols., 1834–1840), was superseded by the same author's valuable, but partisan and uncritical *History of the Republic . . . as traced in the Writings of Alexander Hamilton* (New York, 7 vols., 1857–1864; also in Boston, 1879). Professor W. G. Sumner's *Alexander Hamilton* (Makers of America series, New York, 1890) is appreciative, and important for its criticism from the point of view of an American free-trader; see also, on Hamilton's finance and economic views, Prof. C. F. Dunbar, *Quarterly Journal of Economics*, iii. (1889), p. 32; E. G. Bourne in *ibid.* x. (1894), p. 328; E. C. Lunt in *Journal of Political Economy*, iii. (1895), p. 289. Among modern studies must also be mentioned J. T. Morse's able *Life* (1876); H. C. Lodge's (in the American Statesmen series, 1882); and G. Shea's two books, his *Historical Study* (1877) and *Life and Epoch* (1879). C. J. Riethmüller's *Hamilton and his Contemporaries* (1864), written during the Civil War, is sympathetic, but rather speculative. The most vivid account of Hamilton is in Mrs Gertrude Atherton's historical romance, *The Conqueror* (New York, 1902), for the writing of which the author made new investigations into the biographical details, and elucidated some points previously obscure; see also her *A Few of Hamilton's Letters* (1903). F. S. Oliver's brilliant *Alexander Hamilton: An Essay on American Union* (London, 1906), which uses its subject to illustrate the necessity of British imperial federation, is strongly anti-Jeffersonian, but no other work by a non-American author brings out so well the various issues involved in Hamilton's economic policy. (F. S. P.; H. Cu.)

HAMILTON, ANTHONY, or ANTOINE (1646–1720), French classical author, was born about 1646. He is especially noteworthy from the fact that, though by birth he was a foreigner, his literary characteristics are more decidedly French than those of many of the most indubitable Frenchmen. His father was George Hamilton, younger brother of James, 2nd earl of Abercorn, and head of the family of Hamilton in the peerage of Scotland, and 6th duke of Châtellerault in the peerage of France; and his mother was Mary Butler, sister of the 1st duke of Ormonde. According to some authorities he was born at Drogheda, but according to the London edition of his works in 1811 his birthplace was Roscrea, Tipperary. From the age of four till he was fourteen the boy was brought up in France, whither his family had removed after the execution of Charles I. The fact that, like his father, he was a Roman Catholic, prevented his receiving the political promotion he might otherwise have expected on the Restoration, but he became a distinguished member of that brilliant band of courtiers whose chronicler he was to become. He took service in the French army, and the marriage of his sister Elizabeth, "la belle Hamilton," to Philibert, comte de Gramont (*q.v.*) rendered his connexion with France more intimate, if possible, than before. On the accession of James II. he obtained an infantry regiment in Ireland, and was appointed governor of Limerick and a member of the privy council. But the battle of the Boyne, at which he was present, brought disaster on all who were attached to the cause of the Stuarts, and before long he was again in France—an exile, but at home. The rest of his life was spent for the most part at the court of St Germain and in the *châteaux* of his friends. With Ludovise, duchesse du Maine, he became an especial favourite, and it was at her seat at Sceaux that he wrote the *Mémoires* that made him famous. He died at St Germain-en-Laye on the 21st of April 1720.

It is mainly by the *Mémoires du comte de Gramont* that Hamilton takes rank with the most classical writers of France. It was said to have been written at Gramont's dictation, but it is very evident that Hamilton's share is the most considerable. The work was first published anonymously in 1713 under the rubric of Cologne, but it was really printed in Holland, at that time the great patroness of all questionable authors. An English translation by Boyer appeared in 1714. Upwards of thirty editions have since appeared, the best of the French being Renouard's (1812), forming part of a collected edition of Hamilton's works, and Gustave Brunet's (1850), and the best of the English, Edwards's (1793), with 78 engravings from portraits in the royal collections at Windsor and elsewhere, A. F. Bertrand de Moleville's (2 vols., 1811), with 64 portraits by E. Scriven and others, and Gordon Goodwin's (2 vols., 1903). The original edition was reprinted by Benjamin Pifteau in 1876. In imitation and satiric parody of the romantic tales which Antoine Galland's translation of *The Thousand and One Nights* had brought into favour in France, Hamilton wrote, partly for the amusement of Henrietta Bulkley, sister of the duchess of Berwick, to whom he was much attached, four ironical and extravagant *contes*, *Le Bélier*, *Fleur d'épine*, *Zénéyde* and *Les Quatre Facardins*. The saying in *Le Bélier*" "Bélier, mon ami, tu me ferais plaisir si tu voulais commencer par le commencement," has passed into a proverb. These tales were circulated privately during Hamilton's lifetime, and the first three appeared in Paris in 1730, ten years after the death of the author; a collection of his *Œuvres diverses* in 1731 contained the unfinished *Zénéyde*. Hamilton was also the author of some songs as exquisite in their way as his prose, and interchanged amusing verses with the duke of Berwick. In the name of his niece, the countess of Stafford, Hamilton maintained a witty correspondence with Lady Mary Wortley Montagu.

See notices of Hamilton in Lescure's edition (1873) of the *Contes*, Sainte-Beuve's *Causeries du lundi*, tome i., Sayou's *Histoire de la littérature française à l'étranger* (1853), and by L. S. Auger in the *Œuvres complètes* (1804).

HAMILTON, ELIZABETH (1758–1816), British author, was born at Belfast, of Scottish extraction, on the 21st of July 1758. Her father's death in 1759 left his wife so embarrassed that Elizabeth was adopted in 1762 by her paternal aunt, Mrs Marshall, who lived in Scotland, near Stirling. In 1788 Miss Hamilton went to live with her brother Captain Charles Hamilton (1753–1792), who was engaged on his translation of the *Hedaya*. Prompted by her brother's associations, she produced her

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Letters of a Hindoo Rajah in 1796. Soon after, with her sister Mrs Blake, she settled at Bath, where she published in 1800 the *Memoirs of Modern Philosophers*, a satire on the admirers of the French Revolution. In 1801–1802 appeared her *Letters on Education*. After travelling through Wales and Scotland for nearly two years, the sisters took up their abode in 1803 at Edinburgh. In 1804 Mrs Hamilton, as she then preferred to be called, published her *Life of Agrippina, wife of Germanicus*; and in the same year she received a pension from government. *The Cottagers of Glenburnie* (1808), which is her best-known work, was described by Sir Walter Scott as "a picture of the rural habits of Scotland, of striking and impressive fidelity." She also published *Popular Essays on the Elementary Principles of the Human Mind* (1812), and *Hints addressed to the Patrons and Directors of Public Schools* (1815). She died at Harrogate on the 23rd of July 1816.

Memoirs of Mrs Elizabeth Hamilton, by Miss Benger, were published in 1818.

HAMILTON, EMMA, LADY (*c.* 1765–1815), wife of Sir William Hamilton (q.v.), the British envoy at Naples, and famous as the mistress of Nelson, was the daughter of Henry Lyon, a blacksmith of Great Neston in Cheshire. The date of her birth cannot be fixed with certainty, but she was baptized at Great Neston on the 12th of May 1765, and it is not improbable that she was born in that year. Her baptismal name was Emily. As her father died soon after her birth, the mother, who was dependent on parish relief, had to remove to her native village, Hawarden in Flintshire. Emma's early life is very obscure. She was certainly illiterate, and it appears that she had a child in 1780, a fact which has led some of her biographers to place her birth before 1765. It has been said that she was first the mistress of Captain Willet Payne, an officer in the navy, and that she was employed in some doubtful capacity by a notorious quack of the time, Dr Graham. In 1781 she was the mistress of a country gentleman, Sir Harry Featherstonhaugh, who turned her out in December of that year. She was then pregnant, and in her distress she applied to the Hon. Charles Greville, to whom she was already known. At this time she called herself Emily Hart. Greville, a gentleman of artistic tastes and well known in society, entertained her as his mistress, her mother, known as Mrs Cadogan, acting as housekeeper and partly as servant. Under the protection of Greville, whose means were narrowed by debt, she acquired some education, and was taught to sing, dance and act with professional skill. In 1782 he introduced her to his friend Romney the portrait painter, who had been established for several years in London, and who admired her beauty with enthusiasm. The numerous famous portraits of her from his brush may have somewhat idealised her apparently robust and brilliantly coloured beauty, but her vivacity and powers of fascination cannot be doubted. She had the temperament of an artist, and seems to have been sincerely attached to Greville. In 1784 she was seen by his uncle, Sir William Hamilton, who admired her greatly. Two years later she was sent on a visit to him at Naples, as the result of an understanding between Hamilton and Greville—the uncle paying his nephew's debts and the nephew ceding his mistress. Emma at first resented, but then submitted to the arrangement. Her beauty, her artistic capacity, and her high spirits soon made her a great favourite in the easy-going society of Naples, and Queen Maria Carolina became closely attached to her. She became famous for her "attitudes," a series of *poses plastiques* in which she represented classical and other figures. On the 6th of September 1791, during a visit to England, she was married to Sir W. Hamilton. The ceremony was required in order to justify her public reception at the court of Naples, where Lady Hamilton played an important part as the agent through whom the queen communicated with the British minister—sometimes in opposition to the will and the policy of the king. The revolutionary wars and disturbances which began after 1792 made the services of Lady Hamilton always useful and sometimes necessary to the British government. It was claimed by her, and on her behalf, that she secured valuable information in 1796, and was of essential service to the British fleet in 1798 during the Nile campaign, by enabling it to obtain stores and water in Sicily. These claims have been denied on the rather irrelevant ground that they are wanting in official confirmation, which was only to be expected since they were *ex hypothesi* unofficial and secret, but it is not improbable that they were considerably exaggerated, and it is certain that her stories cannot always be reconciled with one another or with the accepted facts. When Nelson returned from the Nile in September 1798 Lady Hamilton made him her hero, and he became entirely devoted to her. Her influence over him indeed became notorious, and brought him much official displeasure. Lady Hamilton undoubtedly used her influence to draw Nelson into a most unhappy participation in the domestic troubles of Naples, and when Sir W. Hamilton was recalled in 1800 she travelled with him and Nelson ostentatiously across Europe. In England Lady Hamilton insisted on making a parade of her hold over Nelson. Their child, Horatia Nelson Thompson, was born on the 30th of January 1801. The profuse habits which Emma Hamilton had contracted in Naples, together with a passion for gambling which grew on her, led her into debt, and also into extravagant ways of living, against which her husband feebly protested. On his death in 1803 she received by his will a liferent of £800, and the furniture of his house in Piccadilly. She then lived openly with Nelson at his house at Merton. Nelson tried repeatedly to secure her a pension for the services rendered at Naples, but did not succeed. On his death she received Merton, and an annuity of £500, as well as the control of the interest of the £4000 he left to his daughter. But gambling and extravagance kept her poor. In 1808 her friends endeavoured to arrange her affairs, but in 1813 she was put in prison for debt and remained there for a year. A certain Alderman Smith having aided her to get out, she went over to Calais for refuge from her creditors, and she died there in distress if not in want on the 15th of January 1815.

AUTHORITIES.—*The Memoirs of Lady Hamilton* (London, 1815) were the work of an ill-disposed but well-informed and shrewd observer whose name is not given. *Lady Hamilton and Lord Nelson*, by J. C. Jefferson (London, 1888) is based on authentic papers. It is corrected in some particulars by the detailed recent life written by Walter Sichel, *Emma, Lady Hamilton* (London, 1905). See also the authorities given in the article NELSON. (D. H.)

HAMILTON, JAMES (1769–1831), English educationist, and author of the Hamiltonian system of teaching languages, was born in 1769. The first part of his life was spent in mercantile pursuits. Having settled in Hamburg and become free of the city, he was anxious to become acquainted with German and accepted the tuition of a French emigré, General d'Angelis. In twelve lessons he found himself able to read an easy German book, his master having discarded the use of a grammar and translated to him short stories word for word into French. As a citizen of Hamburg Hamilton started a business in Paris, and during the peace of Amiens maintained a lucrative trade with England; but at the rupture of the treaty he was made a prisoner of war, and though the protection of Hamburg was enough to get the words *effacé de la liste des prisonniers de guerre* inscribed upon his passport, he was detained in custody till the close of hostilities. His business being thus ruined, he went in 1814 to America, intending to become a farmer and manufacturer of potash; but, changing his plan before he reached his "location," he started as a teacher in New York. Adopting his old tutor's method, he attained remarkable success in New York, Baltimore, Washington, Boston, Montreal and Quebec. Returning to England in July 1823, he was equally fortunate in Manchester and elsewhere. The two master principles of his method were that the language should be presented to the scholar as a living organism, and that its laws should be learned from observation and not by rules. His system attracted general attention, and was vigorously attacked and defended. In 1826 Sydney Smith devoted an article to its elucidation in the *Edinburgh Review*. As textbooks for his pupils Hamilton printed interlinear translations of the Gospel of John, of an *Epitome historiae sacrae*, of Aesop's *Fables*, Eutropius, Aurelius Victor, Phaedrus, &c., and many books were issued as Hamiltonian with which he

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had nothing personally to do. He died on the 31st of October 1831.

See Hamilton's own account, *The History, Principles, Practice and Results of the Hamiltonian System* (Manchester, 1829; new ed., 1831); Alberte, *Über die Hamilton'sche Methode*; C. F. Wurm, *Hamilton und Jacotot* (1831).

HAMILTON, JAMES HAMILTON, 1ST DUKE OF (1606–1649), Scottish nobleman, son of James, 2nd marquess of Hamilton, and of the Lady Anne Cunningham, daughter of the earl of Glencairn, was born on the 19th of June 1606. As the descendant and representative of James Hamilton, 1st earl of Arran, he was the heir to the throne of Scotland after the descendants of James VI.[1] He married in his fourteenth year May Feilding, aged seven, daughter of Lord Feilding, afterwards 1st earl of Denbigh, and was educated at Exeter College, Oxford, where he matriculated on the 14th of December 1621. He succeeded to his father's titles on the latter's death in 1625. In 1628 he was made master of the horse and was also appointed gentleman of the bedchamber and a privy councillor. In 1631 Hamilton took over a force of 6000 men to assist Gustavus Adolphus in Germany. He guarded the fortresses on the Oder while Gustavus fought Tilly at Breitenfeld, and afterwards occupied Magdeburg, but his army was destroyed by disease and starvation, and after the complete failure of the expedition Hamilton returned to England in September 1634. He now became Charles I.'s chief adviser in Scottish affairs. In May 1638, after the outbreak of the revolt against the English Prayer-Book, he was appointed commissioner for Scotland to appease the discontents. He described the Scots as being "possessed by the devil," and instead of doing his utmost to support the king's interests was easily intimidated by the covenanting leaders and persuaded of the impossibility of resisting their demands, finally returning to Charles to urge him to give way. It is said that he so far forgot his trust as to encourage the Scottish leaders in their resistance in order to gain their favour.[2] On the 27th of July Charles sent him back with new proposals for the election of an assembly and a parliament, episcopacy being safeguarded but bishops being made responsible to future assemblies. After a wrangle concerning the mode of election he again returned to Charles. Having been sent back to Edinburgh on the 17th of September, he brought with him a revocation of the prayer-book and canons and another covenant to be substituted for the national covenant. On the 21st of November Hamilton presided over the first meeting of the assembly in Glasgow cathedral, but dissolved it on the 28th on its declaring the bishops responsible to its authority. The assembly, however, continued to sit notwithstanding, and Hamilton returned to England to give an account of his failure, leaving the enemy triumphant and in possession. War was now decided upon, and Hamilton was chosen to command an expedition to the Forth to menace the rear of the Scots. On arrival on the 1st of May 1639 he found the plan impossible, despaired of success, and was recalled in June. On the 8th of July, after a hostile reception at Edinburgh, he resigned his commissionership. He supported Strafford's proposal to call the Short Parliament, but otherwise opposed him as strongly as he could, as the chief adversary of the Scots; and he aided the elder Vane, it was believed, in accomplishing Strafford's destruction by sending for him to the Long Parliament. Hamilton now supported the parliamentary party, desired an alliance with his nation, and persuaded Charles in February 1641 to admit some of their leaders into the council. On the death of Strafford Hamilton was confronted by a new antagonist in Montrose, who detested both his character and policy and repudiated his supremacy in Scotland. On the 10th of August 1641 he accompanied Charles on his last visit to Scotland. His aim now was to effect an alliance between the king and Argyll, the former accepting Presbyterianism and receiving the help of the Scots against the English parliament, and when this failed he abandoned Charles and adhered to Argyll. In consequence he received a challenge from Lord Ker, of which he gave the king information, and obtained from Ker an apology. Montrose wrote to Charles declaring he could prove Hamilton to be a traitor. The king himself spoke of him as being "very active in his own preservation." Shortly afterwards the plot—known as the "Incident"—to seize Argyll, Hamilton and the latter's brother, the earl of Lanark, was discovered, and on the 12th of October they fled from Edinburgh. Hamilton returned not long afterwards, and notwithstanding all that had occurred still retained Charles's favour and confidence. He returned with him to London and accompanied him on the 5th of January 1642 when he went to the city after the failure to secure the five members. In July Hamilton went to Scotland on a hopeless mission to prevent the intervention of the Scots in the war, and a breach then took place between him and Argyll. When in February 1643 proposals of mediation between Charles and the parliament came from Scotland, Hamilton instigated the "cross petition" which demanded from Charles the surrender of the annuities of tithes in order to embarrass Loudoun, the chief promoter of the project, to whom they had already been granted. This failing, he promoted a scheme for overwhelming the influence and votes of Argyll and his party by sending to Scotland all the Scottish peers then with the king, thereby preventing any assistance to the parliament coming from that quarter, while Charles was to guarantee the establishment of Presbyterianism in Scotland only. This foolish intrigue was strongly opposed by Montrose, who was eager to strike a sudden blow and anticipate and annihilate the plans of the Covenanters. Hamilton, however, gained over the queen for his project, and in September was made a duke, while Montrose was condemned to inaction. Hamilton's scheme, however, completely failed. He had no control over the parliament. He was unable to hinder the meeting of the convention of the estates which assembled without the king's authority, and his supporters found themselves in a minority. Finally, on refusing to take the Covenant, Hamilton and Lanark were obliged to leave Scotland. They arrived at Oxford on the 16th of December. Hamilton's conduct had at last incurred Charles's resentment and he was sent, in January 1644, a prisoner to Pendennis Castle, in 1645 being removed to St Michael's Mount, where he was liberated by Fairfax's troops on the 23rd of April 1646. Subsequently he showed great activity in the futile negotiations between the Scots and Charles at Newcastle. In 1648, in consequence of the seizure of Charles by the army in 1647, Hamilton obtained a temporary influence and authority in the Scottish parliament over Argyll, and led a large force into England in support of the king on the 8th of July. He showed complete incapacity in military command; was kept in check for some time by Lambert; and though outnumbering the enemy by 24,000 to about 9000 men, allowed his troops to disperse over the country and to be defeated in detail by Cromwell during the three days August 17th–19th at the so-called battle of Preston, being himself taken prisoner on the 25th. He was tried on the 6th of February 1649, condemned to death on the 6th of March and executed on the 9th.

Hamilton, during his unfortunate career, had often been suspected of betraying the king's cause, and, as an heir to the Scottish throne, of intentionally playing into the hands of the Covenanters with a view of procuring the crown for himself. The charge was brought against him as early as 1631 when he was

James, Lord Hamilton = Princess Mary Stuart,
(d. 1479). | daughter of James II.

James, Lord Hamilton and 1st earl of Arran
(d. c. 1529).

James, duke of Chatelherault, and 2nd earl of Arran
(d. 1575).

James, 3rd earl of Arran
(d. 1609).

John, 1st marquess of Hamilton
(d. 1604).

James, 2nd marquess of Hamilton
(d. 1625).

James, 3rd marquess and 1st duke of Hamilton.

[1] See S. R. Gardiner in the *Dict. of Nat. Biography*.

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levying men in Scotland for the German expedition, but Charles gave no credence to it and showed his trust in Hamilton by causing him to share his own room. The charge, however, always clung to him, and his intriguing character and hopeless management of the king's affairs in Scotland gave colour to the accusation. There seems, however, to be no real foundation for it. His career is sufficiently explained by his thoroughly weak and egotistical character. He took no interest whatever in the great questions at issue, was neither loyal nor patriotic, and only desired peace and compromise to avoid personal losses. "He was devoid of intellectual or moral strength, and was therefore easily brought to fancy all future tasks easy and all present obstacles insuperable."[1] A worse choice than Hamilton could not possibly have been made in such a crisis, and his want of principle, of firmness and resolution, brought irretrievable ruin upon the royal cause.

Hamilton's three sons died young, and the dukedom passed by special remainder to his brother William, earl of Lanark. On the latter's death in 1651 the Scottish titles reverted to the 1st duke's daughter, Anne, whose husband, William Douglas, was created (third) duke of Hamilton.

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HAMILTON, JOHN (*c.* 1511–1571), Scottish prelate and politician, was a natural son of James Hamilton, 1st earl of Arran. At a very early age he became a monk and abbot of Paisley, and after studying in Paris he returned to Scotland, where he soon rose to a position of power and influence under his half-brother, the regent Arran. He was made keeper of the privy seal in 1543 and bishop of Dunkeld two years later; in 1546 he followed David Beaton as archbishop of St Andrews, and about the same time he became treasurer of the kingdom. He made vigorous efforts to stay the growth of Protestantism, but with one or two exceptions "persecution was not the policy of Archbishop Hamilton," and in the interests of the Roman Catholic religion a catechism called *Hamilton's Catechism* (published with an introduction by T. G. Law in 1884) was drawn up and printed, possibly at his instigation. Having incurred the displeasure of the Protestants, now the dominant party in Scotland, the archbishop was imprisoned in 1563. After his release he was an active partisan of Mary queen of Scots; he baptized the infant James, afterwards King James VI., and pronounced the divorce of the queen from Bothwell. He was present at the battle of Langside, and some time later took refuge in Dumbarton Castle. Here he was seized, and on the charge of being concerned in the murders of Lord Darnley and the regent Murray he was tried, and hanged on the 6th of April 1571. The archbishop had three children by his mistress, Grizzel Sempill.

HAMILTON, PATRICK (1504–1528), Scottish divine, second son of Sir Patrick Hamilton, well known in Scottish chivalry, and of Catherine Stewart, daughter of Alexander, duke of Albany, second son of James II. of Scotland, was born in the diocese of Glasgow, probably at his father's estate of Stanehouse in Lanarkshire. He was educated probably at Linlithgow. In 1517 he was appointed titular abbot of Ferne, Ross-shire; and it was probably about the same year that he went to study at Paris, for his name is found in an ancient list of those who graduated there in 1520. It was doubtless in Paris, where Luther's writings were already exciting much discussion, that he received the germs of the doctrines he was afterwards to uphold. From Alexander Ales we learn that Hamilton subsequently went to Louvain, attracted probably by the fame of Erasmus, who in 1521 had his headquarters there. Returning to Scotland, the young scholar naturally selected St Andrews, the capital of the church and of learning, as his residence. On the 9th of June 1523 he became a member of the university of St Andrews, and on the 3rd of October 1524 he was admitted to its faculty of arts. There Hamilton attained such influence that he was permitted to conduct as precentor a musical mass of his own composition in the cathedral. But the reformed doctrines had now obtained a firm hold on the young abbot, and he was eager to communicate them to his fellow-countrymen. Early in 1527 the attention of James Beaton, archbishop of St Andrews, was directed to the heretical preaching of the young priest, whereupon he ordered that Hamilton should be formally summoned and accused. Hamilton fled to Germany, first visiting Luther at Wittenberg, and afterwards enrolling himself as a student, under Franz Lambert of Avignon, in the new university of Marburg, opened on the 30th of May 1527 by Philip, landgrave of Hesse. Hermann von dem Busche, one of the contributors to the *Epistolae obscurorum virorum*, John Frith and Tyndale were among those whom he met there. Late in the autumn of 1527 Hamilton returned to Scotland, bold in the conviction of the truth of his principles. He went first to his brother's house at Kincavel, near Linlithgow, in which town he preached frequently, and soon afterwards he married a young lady of noble rank, whose name has not come down to us. Beaton, avoiding open violence through fear of Hamilton's high connexions, invited him to a conference at St Andrews. The reformer, predicting that he was going to confirm the pious in the true doctrine by his death, resolutely accepted the invitation, and for nearly a month was permitted to preach and dispute, perhaps in order to provide material for accusation. At length, however, he was summoned before a council of bishops and clergy presided over by the archbishop; there were thirteen charges, seven of which were based on the doctrines affirmed in the *Loci communes*. On examination Hamilton maintained that these were undoubtedly true. The council condemned him as a heretic on the whole thirteen charges. Hamilton was seized, and, it is said, surrendered to the soldiery on an assurance that he would be restored to his friends without injury. The council convicted him, after a sham disputation with Friar Campbell, and handed him over to the secular power. The sentence was carried out on the same day (February 29, 1528) lest he should be rescued by his friends, and he was burned at the stake as a heretic. His courageous bearing attracted more attention than ever to the doctrines for which he suffered, and greatly helped to spread the Reformation in Scotland. The "reek of Patrick Hamilton infected all it blew on." His martyrdom is singular in this respect, that he represented in Scotland almost alone the Lutheran stage of the Reformation. His only book was entitled *Loci communes*, known as "Patrick's Places." It set forth the doctrine of justification by faith and the contrast between the gospel and the law in a series of clear-cut propositions. It is to be found in Foxe's *Acts and Monuments*.

HAMILTON, ROBERT (1743–1829), Scottish economist and mathematician, was born at Pilrig, Edinburgh, on the 11th of June 1743. His grandfather, William Hamilton, principal of Edinburgh University, had been a professor of divinity. Having completed his education at the university of Edinburgh, where he was distinguished in mathematics, Robert was induced to enter a banking-house in order to acquire a practical knowledge of business, but his ambition was really academic. In 1769 he gave up business pursuits and accepted the rectorship of Perth academy. In 1779 he was presented to the chair of natural philosophy at Aberdeen University. For many years, however, by private arrangement with his colleague Professor Copland, Hamilton taught the class of mathematics. In 1817 he was presented to the latter chair.

Hamilton's most important work is the *Essay on the National Debt*, which appeared in 1813 and was undoubtedly the first to expose the economic fallacies involved in Pitt's policy of a sinking fund. It is still of value. A posthumous volume published in 1830, *The Progress of Society*, is also of great ability, and is a very effective treatment of economical principles by tracing their natural origin and position in the development of social life. Some minor works of a practical character (*Introduction to Merchandize*, 1777; *Essay on War and Peace*, 1790) are now forgotten.

[1] See S. R. Gardiner in the *Dict. of Nat. Biography*.

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HAMILTON, THOMAS (1789–1842), Scottish writer, younger brother of the philosopher, Sir William Hamilton, Bart., was born in 1789. He was educated at Glasgow University, where he made a close friend of Michael Scott, the author of *Tom Cringle's Log*. He entered the army in 1810, and served throughout the Peninsular and American campaigns, but continued to cultivate his literary tastes. On the conclusion of peace he withdrew, with the rank of captain, from active service. He contributed both prose and verse to *Blackwood's Magazine*, in which appeared his vigorous and popular military novel, *Cyril Thornton* (1827). His *Annals of the Peninsular Campaign*, published originally in 1829, and republished in 1849 with additions by Frederick Hardman, is written with great clearness and impartiality. His only other work, *Men and Manners in America*, published originally in 1833, is somewhat coloured by British prejudice, and by the author's aristocratic dislike of a democracy. Hamilton died at Pisa on the 7th of December 1842.

HAMILTON, WILLIAM (1704–1754), Scottish poet, the author of "The Braes of Yarrow," was born in 1704 at Bangour in Linlithgowshire, the son of James Hamilton of Bangour, a member of the Scottish bar. As early as 1724 we find him contributing to Allan Ramsay's *Tea Table Miscellany*. In 1745 Hamilton joined the cause of Prince Charles, and though it is doubtful whether he actually bore arms, he celebrated the battle of Prestonpans in verse. After the disaster of Culloden he lurked for several months in the Highlands and escaped to France; but in 1749 the influence of his friends procured him permission to return to Scotland, and in the following year he obtained possession of the family estate of Bangour. The state of his health compelled him, however, to live abroad, and he died at Lyons on the 25th of March 1754. He was buried in the Abbey Church of Holyroodhouse, Edinburgh. He was twice married—"into families of distinction" says the preface of the authorized edition of his poems.

Hamilton left behind him a considerable number of poems, none of them except "The Braes of Yarrow" of striking originality. The collection is composed of odes, epitaphs, short pieces of translation, songs, and occasional verses. The longest is "Contemplation, or the Triumph of Love" (about 500 lines). The first edition was published without his permission by Foulis (Glasgow, 1748), and introduced by a preface from the pen of Adam Smith. Another edition with corrections by himself was brought out by his friends in 1760, and to this was prefixed a portrait engraved by Robert Strange.

In 1850 James Paterson edited *The Poems and Songs of William Hamilton*. This volume contains several poems till then unpublished, and gives a life of the author.

HAMILTON, SIR WILLIAM (1730–1803), British diplomatist and archaeologist, son of Lord Archibald Hamilton, governor of Greenwich hospital and of Jamaica, was born in Scotland on the 13th of December 1730, and served in the 3rd Regiment of Foot Guards from 1747 to 1758. He left the army after his marriage with Miss Barlow, a Welsh heiress from whom he inherited an estate near Swansea upon her death in 1782. Their only child, a daughter, died in 1775. From 1761 to 1764 he was member of parliament for Midhurst, but in the latter year he was appointed envoy to the court of Naples, a post which he held for thirty-six years—until his recall in 1800. During the greater part of this time the official duties of the minister were of small importance. It was enough that the representative of the British crown should be a man of the world whose means enabled him to entertain on a handsome scale. Hamilton was admirably qualified for these duties, being an amiable and accomplished man, who took an intelligent interest in science and art. In 1766 he became a member of the Royal Society, and between that year and 1780 he contributed to its Philosophical Transactions a series of observations on the action of volcanoes, which he had made, or caused to be made, at Vesuvius and Etna. He employed a draftsman named Fabris to make studies of the eruption of 1775 and 1776, and a Dominican, Resina, to make observations at a later period. He published several treatises on earthquakes and volcanoes between 1776 and 1783. He was a fellow of the Society of Antiquaries and of the Dilettanti, and a notable collector. Many of his treasures went to enrich the British Museum. In 1772 he was made a knight of the Bath. The last ten years of his life presented a curious contrast to the elegant peace of those which had preceded them. In 1791 he married Emma Lyon (see the separate article on Lady Hamilton). The outbreak of the French Revolution and the rapid extension of the revolutionary movement in Western Europe soon overwhelmed Naples. It was a misfortune for Sir William that he was left to meet the very trying political and diplomatic conditions which arose after 1793. His health had begun to break down, and he suffered from bilious fevers. Sir William was in fact in a state approaching dotage before his recall, a fact which, combined with his senile devotion to Lady Hamilton, has to be considered in accounting for his extraordinary complaisance in her relations with Nelson. He died on the 6th of April 1803.

See E. Edwards, *Lives of the Founders of the British Museum* (London, 1870); and the authorities given in the article on Emma, Lady Hamilton.

HAMILTON, SIR WILLIAM, Bart. (1788–1856), Scottish metaphysician, was born in Glasgow on the 8th of March 1788. His father, Dr William Hamilton, had in 1781, on the strong recommendation of the celebrated William Hunter, been appointed to succeed *his* father, Dr Thomas Hamilton, as professor of anatomy in the university of Glasgow; and when he died in 1790, in his thirty-second year, he had already gained a great reputation. William Hamilton and a younger brother (afterwards Captain Thomas Hamilton, *q.v.*) were thus brought up under the sole care of their mother. William received his early education in Scotland, except during two years which he spent in a private school near London, and went in 1807, as a Snell exhibitioner, to Balliol College, Oxford. He obtained a first-class *in literis humanioribus* and took the degree of B.A. in 1811, M.A. in 1814. He had been intended for the medical profession, but soon after leaving Oxford he gave up this idea, and in 1813 became a member of the Scottish bar. His life, however, was mainly that of a student; and the following years, marked by little of outward incident, were filled by researches of all kinds, through which he daily added to his stores of learning, while at the same time he was gradually forming his philosophic system. Investigation enabled him to make good his claim to represent the ancient family of Hamilton of Preston, and in 1816 he took up the baronetcy, which had been in abeyance since the death of Sir Robert Hamilton of Preston (1650–1701), well known in his day as a Covenanting leader.

Two visits to Germany in 1817 and 1820 led to his taking up the study of German and later on that of contemporary German philosophy, which was then almost entirely neglected in the British universities. In 1820 he was a candidate for the chair of moral philosophy in the university of Edinburgh, which had fallen vacant on the death of Thomas Brown, colleague of Dugald Stewart, and the latter's consequent resignation, but was defeated on political grounds by John Wilson (1785–1854), the "Christopher North" of *Blackwood's Magazine*. Soon afterwards (1821) he was appointed professor of civil history, and as such delivered several courses of lectures on the history of modern Europe and the history of literature. The salary was £100 a year, derived from a local beer tax, and was discontinued after a time. No pupils were compelled to attend, the class dwindled, and Hamilton gave it up when the salary ceased. In January 1827 he suffered a severe loss in the death of his mother, to whom he had been a devoted son. In March 1828 he married his cousin Janet Marshall.

In 1820 his career of authorship began with the appearance of the well-known essay on the "Philosophy of the Unconditioned" (a critique of Comte's *Cours de philosophie*)—the first of a series of articles contributed by him to the *Edinburgh Review*. He was elected in 1836 to the Edinburgh chair of logic and metaphysics, and from this time dates the influence which, during the next twenty years, he exerted over the thought of the younger

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generation in Scotland. Much about the same time he began the preparation of an annotated edition of Reid's works, intending to annex to it a number of dissertations. Before, however, this design had been carried out, he was struck (1844) with paralysis of the right side, which seriously crippled his bodily powers, though it left his mind wholly unimpaired. The edition of Reid appeared in 1846, but with only seven of the intended dissertations—the last, too, unfinished. It was his distinct purpose to complete the work, but this purpose remained at his death unfulfilled, and all that could be done afterwards was to print such materials for the remainder, or such notes on the subjects to be discussed, as were found among his MSS. Considerably before this time he had formed his theory of logic, the leading principles of which were indicated in the prospectus of "an essay on a new analytic of logical forms" prefixed to his edition of Reid. But the elaboration of the scheme in its details and applications continued during the next few years to occupy much of his leisure. Out of this arose a sharp controversy with Augustus de Morgan. The essay did not appear, but the results of the labour gone through are contained in the appendices to his *Lectures on Logic*. Another occupation of these years was the preparation of extensive materials for a publication which he designed on the personal history, influence and opinions of Luther. Here he advanced so far as to have planned and partially carried out the arrangement of the work; but it did not go further, and still remains in MS. In 1852–1853 appeared the first and second editions of his *Discussions in Philosophy, Literature and Education*, a reprint, with large additions, of his contributions to the *Edinburgh Review*. Soon after, his general health began to fail. Still, however, aided now as ever by his devoted wife, he persevered in literary labour; and during 1854–1855 he brought out nine volumes of a new edition of Stewart's works. The only remaining volume was to have contained a memoir of Stewart, but this he did not live to write. He taught his class for the last time in the winter of 1855–1856. Shortly after the close of the session he was taken ill, and on the 6th of May 1856 he died in Edinburgh.

Hamilton's positive contribution to the progress of thought is comparatively slight, and his writings, even where reinforced by the copious lecture notes taken by his pupils, cannot be said to present a comprehensive philosophic system. None the less he did considerable service by stimulating a spirit of criticism in his pupils, by insisting on the great importance of psychology as opposed to the older metaphysical method, and not least by his recognition of the importance of German philosophy, especially that of Kant. By far his most important work was his "Philosophy of the Unconditioned," the development of the principle that for the human finite mind there can be no knowledge of the Infinite. The bases of his whole argument in the thesis, "To think is to condition." Deeply impressed with Kant's antithesis between subject and object, the knowing and the known, Hamilton laid down the principle that every object is known only in virtue of its relations to other objects (see RELATIVITY OF KNOWLEDGE). From this it follows limitless time, space, power and so forth are humanly speaking inconceivable. The fact, however, that all thought seems to demand the idea of the infinite or absolute provides a sphere for faith, which is thus the specific faculty of theology. It is a weakness characteristic of the human mind that it cannot conceive any phenomenon without a beginning: hence the conception of the causal relation, according to which every phenomenon has its cause in preceding phenomena, and its effect in subsequent phenomena. The causal concept is, therefore, only one of the ordinary necessary forms of the cognitive consciousness limited, as we have seen, by being confined to that which is relative or conditioned. As regards the problem of the nature of objectivity, Hamilton simply accepts the evidence of consciousness as to the separate existence of the object: "the root of our nature cannot be a lie." In virtue of this assumption Hamilton's philosophy becomes a "natural realism." In fact his whole position is a strange compound of Kant and Reid. Its chief practical corollary is the denial of philosophy as a method of attaining absolute knowledge and its relegation to the academic sphere of mental training. The transition from philosophy to theology, i.e. to the sphere of faith, is presented by Hamilton under the analogous relation between the mind and the body. As the mind is to the body, so is the unconditioned Absolute or God to the world of the conditioned. Consciousness, itself a conditioned phenomenon, must derive from or depend on some different thing prior to or behind material phenomena. Curiously enough, however, Hamilton does not explain how it comes about that God, who in the terms of the analogy bears to the conditioned mind the relation which the conditioned mind bears to its objects, can Himself be unconditioned. He can be regarded only as related to consciousness, and in so far is, therefore, not absolute or unconditioned. Thus the very principles of Hamilton's philosophy are apparently violated in his theological argument.

Hamilton regarded logic as a purely formal science; it seemed to him an unscientific mixing together of heterogeneous elements to treat as parts of the same science the formal and the material conditions of knowledge. He was quite ready to allow that on this view logic cannot be used as a means of discovering or guaranteeing facts, even the most general, and adopted the standard that it has to do, not with the objective validity, but only with the mutual relations, of judgments. He further held that induction and deduction are correlative processes of formal logic, each resting on the necessities of thought and deriving thence its several laws. The only logical laws which he recognized were the three axioms of identity, non-contradiction, and excluded middle, which he regarded as severally phases of one general condition of the possibility of existence and, therefore, of thought. The law of reason and consequent he considered not as different, but merely as expressing metaphysically what these express logically. He added as a postulate—which in his theory was of importance—"that logic be allowed to state explicitly what is thought implicitly."

In logic, Hamilton is known chiefly as the inventor of the doctrine of the "quantification of the predicate," *i.e.* that the judgment "All A is B" should really mean "All A is *all* B," whereas the ordinary universal proposition should be stated "All A is *some* B." This view, which was supported by Stanley Jevons, is fundamentally at fault since it implies that the predicate is thought of in its extension; in point of fact when a judgment is made, *e.g.* about men, that they are mortal ("All men are mortal"), the intention is to *attribute* mortality (*i.e.* the predicate is used in connotation). In other words, we are not considering the question "what kind are men among the various things which must die?" (as is implied in the form "all men are some mortals") but "what is the fact about men?" We are not stating a mere identity (see further, *e.g.*, H. W. B. Joseph, *Introduction to Logic*, 1906, pp. 198 foll.).

The philosopher to whom above all others Hamilton professed allegiance was Aristotle. His works were the object of his profound and constant study, and supplied in fact the mould in which his whole philosophy was cast. With the commentators on the Aristotelian writings, ancient, medieval and modern, he was also familiar; and the scholastic philosophy he studied with care and appreciation at a time when it had hardly yet begun to attract attention in his country. His wide reading enabled him to trace many a doctrine to the writings of forgotten thinkers; and nothing gave him greater pleasure than to draw forth such from their obscurity, and to give due acknowledgment, even if it chanced to be of the privilege of possession of a view or argument that he had thought out for himself. Of modern German philosophy he was a diligent, if not always a sympathetic, student. How profoundly his thinking was modified by that of Kant is evident from the tenor of his speculations; nor was this less the case because, on fundamental points, he came to widely different conclusions.

Any account of Hamilton would be incomplete which regarded him only as a philosopher, for his knowledge and his interests embraced all subjects related to that of the human mind. Physical and mathematical science had, indeed, been distasteful to him; but his study of anatomy and physiology was minute and experimental. In literature alike ancient and modern he was widely and deeply read; and, from his unusual powers of memory, the stores which he had acquired were always at command. If there was one period with the literature of which he was more particularly familiar, it was the 16th and 17th centuries. Here in every department he was at home. He had gathered a vast amount of its theological lore, had a critical knowledge especially of Latin poetry, and was minutely acquainted with the history of the actors in its varied scenes, not only as narrated in professed records, but as revealed in the letters, table-talk, and casual effusions of themselves or their contemporaries (cf. his article on the *Epistolae obscurorum virorum*, and his pamphlet on the Disruption of the Church of Scotland in 1843). Among his literary projects were editions of the works of George Buchanan and Julius Caesar Scaliger. His general scholarship found expression in his library, which, though mainly, was far from being exclusively, a philosophical collection. It now forms a distinct portion of the library of the university of Glasgow.

His chief practical interest was in education—an interest which he manifested alike as a teacher and as a writer, and which had led him long before he was either to be called to the subject both theoretical and historical. He thence adopted views as to the ends and methods of education that, when afterwards carried out or advocated by him, met with general recognition; but he also expressed in one of his articles an unfavourable view of the study of mathematics as a mental gymnastic, which excited much opposition, but which he never saw reason to alter. As a teacher, he was zealous and successful, and his writings on university organization and reform had, at the time of their appearance, a decisive practical effect, and contain much that is of permanent value.

His posthumous works are his *Lectures on Metaphysics and Logic*, 4 vols., edited by H. L. Mansel, Oxford, and John Veitch (*Metaphysics*,

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1858; *Logic*, 1860); and *Additional Notes to Reid's Works*, from Sir W. Hamilton's MSS., under the editorship of H. L. Mansel, D.D. (1862). *A Memoir of Sir W. Hamilton*, by Veitch, appeared in 1869.

HAMILTON, WILLIAM GERARD (1729–1796), English statesman, popularly known as "Single Speech Hamilton," was born in London on the 28th of January 1729, the son of a Scottish bencher of Lincoln's Inn. He was educated at Winchester and at Oriel College, Oxford. Inheriting his father's fortune he entered political life and became M.P. for Petersfield, Hampshire. His maiden speech, delivered on the 13th of November 1755, during the debate on the address, which excited Walpole's admiration, is generally supposed to have been his only effort in the House of Commons. But the nickname "Single Speech" is undoubtedly misleading, and Hamilton is known to have spoken with success on other occasions, both in the House of Commons and in the Irish parliament. In 1756 he was appointed one of the commissioners for trade and plantations, and in 1761 he became chief secretary to Lord Halifax, the lord-lieutenant of Ireland, as well as Irish M. P. for Killebegs and English M. P. for Pontefract. He was chancellor of the exchequer in Ireland in 1763, and subsequently filled various other administrative offices. Hamilton was thought very highly of by Dr Johnson, and it is certain that he was strongly opposed to the British taxation of America. He died in London on the 16th of July 1796, and was buried in the chancel vault of St Martin's-in-the-fields.

Two of his speeches in the Irish House of Commons, and some other miscellaneous works, were published after his death under the title *Parliamentary Logick*.

HAMILTON, SIR WILLIAM ROWAN (1805–1865), Scottish mathematician, was born in Dublin on the 4th of August 1805. His father, Archibald Hamilton, who was a solicitor, and his uncle, James Hamilton (curate of Trim), migrated from Scotland in youth. A branch of the Scottish family to which they belonged had settled in the north of Ireland in the time of James I., and this fact seems to have given rise to the common impression that Hamilton was an Irishman.

His genius first displayed itself in the form of a wonderful power of acquiring languages. At the age of seven he had already made very considerable progress in Hebrew, and before he was thirteen he had acquired, under the care of his uncle, who was an extraordinary linguist, almost as many languages as he had years of age. Among these, besides the classical and the modern European languages, were included Persian, Arabic, Hindustani, Sanskrit and even Malay. But though to the very end of his life he retained much of the singular learning of his childhood and youth, often reading Persian and Arabic in the intervals of sterner pursuits, he had long abandoned them as a study, and employed them merely as a relaxation.

His mathematical studies seem to have been undertaken and carried to their full development without any assistance whatever, and the result is that his writings belong to no particular "school," unless indeed we consider them to form, as they are well entitled to do, a school by themselves. As an arithmetical calculator he was not only wonderfully expert, but he seems to have occasionally found a positive delight in working out to an enormous number of places of decimals the result of some irksome calculation. At the age of twelve he engaged Zerah Colburn, the American "calculating boy," who was then being exhibited as a curiosity in Dublin, and he had not always the worst of the encounter. But, two years before, he had accidentally fallen in with a Latin copy of *Euclid*, which he eagerly devoured; and at twelve he attacked Newton's *Arithmetica universalis*. This was his introduction to modern analysis. He soon commenced to read the *Principia*, and at sixteen he had mastered a great part of that work, besides some more modern works on analytical geometry and the differential calculus.

About this period he was also engaged in preparation for entrance at Trinity College, Dublin, and had therefore to devote a portion of his time to classics. In the summer of 1822, in his seventeenth year, he began a systematic study of Laplace's *Mécanique Céleste*. Nothing could be better fitted to call forth such mathematical powers as those of Hamilton; for Laplace's great work, rich to profusion in analytical processes alike novel and powerful, demands from the most gifted student careful and often laborious study. It was in the successful effort to open this treasure-house that Hamilton's mind received its final temper, "Dès-lors il commença à marcher seul," to use the words of the biographer of another great mathematician. From that time he appears to have devoted himself almost wholly to original investigation (so far at least as regards mathematics), though he ever kept himself well acquainted with the progress of science both in Britain and abroad.

Having detected an important defect in one of Laplace's demonstrations, he was induced by a friend to write out his remarks, that they might be shown to Dr John Brinkley (1763–1835), afterwards bishop of Cloyne, but who was then the first royal astronomer for Ireland, and an accomplished mathematician. Brinkley seems at once to have perceived the vast talents of young Hamilton, and to have encouraged him in the kindest manner. He is said to have remarked in 1823 of this lad of eighteen: "This young man, I do not say *will be*, but *is*, the first mathematician of his age."

Hamilton's career at College was perhaps unexampled. Amongst a number of competitors of more than ordinary merit, he was first in every subject and at every examination. He achieved the rare distinction of obtaining an *optime* for both Greek and for physics. How many more such honours he might have attained it is impossible to say; but he was expected to win both the gold medals at the degree examination, had his career as a student not been cut short by an unprecedented event. This was his appointment to the Andrews professorship of astronomy in the university of Dublin, vacated by Dr Brinkley in 1827. The chair was not exactly offered to him, as has been sometimes asserted, but the electors, having met and talked over the subject, authorized one of their number, who was Hamilton's personal friend, to urge him to become a candidate, a step which his modesty had prevented him from taking. Thus, when barely twenty-two, he was established at the Observatory, Dunsink, near Dublin. He was not specially fitted for the post, for although he had a profound acquaintance with theoretical astronomy, he had paid but little attention to the regular work of the practical astronomer. And it must be said that his time was better employed in original investigations than it would have been had he spent it in observations made even with the best of instruments,—infinitely better than if he had spent it on those of the observatory, which, however good originally, were then totally unfit for the delicate requirements of modern astronomy. Indeed there can be little doubt that Hamilton was intended by the university authorities who elected him to the professorship of astronomy to spend his time as he best could for the advancement of science, without being tied down to any particular branch. Had he devoted himself to practical astronomy they would assuredly have furnished him with modern instruments and an adequate staff of assistants.

In 1835, being secretary to the meeting of the British Association which was held that year in Dublin, he was knighted by the lord-lieutenant. But far higher honours rapidly succeeded, among which we may merely mention his election in 1837 to the president's chair in the Royal Irish Academy, and the rare distinction of being made corresponding member of the academy of St Petersburg. These are the few salient points (other, of course, than the epochs of his more important discoveries and inventions presently to be considered) in the uneventful life of this great man. He retained his wonderful faculties unimpaired to the very last, and steadily continued till within a day or two of his death, which occurred on the 2nd of September 1865, the task (his *Elements of Quaternions*) which had occupied the last six years of his life.

The germ of his first great discovery was contained in one of those early papers which in 1823 he communicated to Dr Brinkley, by whom, under the title of "Caustics," it was presented in 1824 to the Royal Irish Academy. It was referred as usual to a committee. Their report, while acknowledging the novelty and value of its

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contents, and the great mathematical skill of its author, recommended that, before being published, it should be still further developed and simplified. During the next three years the paper grew to an immense bulk, principally by the additional details which had been inserted at the desire of the committee. But it also assumed a much more intelligible form, and the grand features of the new method were now easily to be seen. Hamilton himself seems not till this period to have fully understood either the nature or the importance of his discovery, for it is only now that we find him announcing his intention of applying his method to dynamics. The paper was finally entitled "Theory of Systems of Rays," and the first part was printed in 1828 in the *Transactions of the Royal Irish Academy*. It is understood that the more important contents of the second and third parts appeared in the three voluminous supplements (to the first part) which were published in the same *Transactions*, and in the last paper "On a General Method in Dynamics," which was presented in the *Philosophical Transactions* in 1834–1835. The principle of "Varying Action" is the great feature of these papers; and it is strange, indeed, that the one particular result of this theory which, perhaps more than anything else that Hamilton has done, has rendered his name known beyond the little world of true philosophers, should have been easily within the reach of Augustin Fresnel and others for many years before, and in no way required Hamilton's new conceptions or methods, although it was by them that he was led to its discovery. This singular result is still known by the name "conical refraction," which he proposed for it when he first predicted its existence in the third supplement to his "Systems of Rays," read in 1832.

The step from optics to dynamics in the application of the method of "Varying Action" was made in 1827, and communicated to the Royal Society, in whose *Philosophical Transactions* for 1834 and 1835 there are two papers on the subject. These display, like the "Systems of Rays," a mastery over symbols and a flow of mathematical language almost unequalled. But they contain what is far more valuable still, the greatest addition which dynamical science had received since the great discoveries made by Sir Isaac Newton and Joseph Louis Lagrange. C. G. J. Jacobi and other mathematicians have developed to a great extent, and as a question of pure mathematics only, Hamilton's processes, and have thus made extensive additions to our knowledge of differential equations. But there can be little doubt that we have as yet obtained only a mere glimpse of the vast physical results of which they contain the germ. And though this is of course by far the more valuable aspect in which any such contribution to science can be looked at, the other must not be despised. It is characteristic of most of Hamilton's, as of nearly all great discoveries, that even their indirect consequences are of high value.

The other great contribution made by Hamilton to mathematical science, the invention of Quaternions, is treated under that heading. The following characteristic extract from a letter shows Hamilton's own opinion of his mathematical work, and also gives a hint of the devices which he employed to render written language as expressive as actual speech. His first great book, *Lectures on Quaternions* (Dublin, 1852), is almost painful to read in consequence of the frequent use of italics and capitals.

"I hope that it may not be considered as unpardonable vanity or presumption on my part, if, in my own taste has always led me to feel a greater interest in *methods* than in *results*, so it is by METHODS, rather than by *any* THEOREMS, which *can* be separately *quoted*, that I desire and hope to be remembered. Nevertheless it is only human nature, to derive *some* pleasure from being cited, now and then, even about a 'Theorem'; especially where . . . the quoter can enrich the subject, by combining it with researches of *his own*."

The discoveries, papers and treatises we have mentioned might well have formed the whole work of a long and laborious life. But not to speak of his enormous collection of MS. books, full to overflowing with new and original matter, which have been handed over to Trinity College, Dublin, the works we have already called attention to barely form the greater portion of what he has published. His extraordinary investigations connected with the solution of algebraic equations of the fifth degree, and his examination of the results arrived at by N. H. Abel, G. B. Jerrard, and others in their researches on this subject, form another grand contribution to science. There is next his great paper on *Fluctuating Functions*, a subject which, since the time of J. Fourier, has been of immense and ever increasing value in physical applications of mathematics. There is also the extremely ingenious invention of the hodograph. Of his extensive investigations into the solution (especially by numerical approximation) of certain classes of differential equations which constantly occur in the treatment of physical questions, only a few items have been published, at intervals, in the *Philosophical Magazine*. Besides all this, Hamilton was a voluminous correspondent. Often a single letter of his occupied from fifty to a hundred or more closely written pages, all devoted to the minute consideration of every feature of some particular problem; for it was one of the peculiar characteristics of his mind never to be satisfied with a general understanding of a question; he pursued it until he knew it in all its details. He was ever courteous and kind in answering applications for assistance in the study of his works, even when his compliance must have cost him much time. He was excessively precise and hard to please with reference to the final polish of his own works for publication; and it was probably for this reason that he published so little compared with the extent of his investigations.

Like most men of great originality, Hamilton generally matured his ideas before putting pen to paper. "He used to carry on," says his elder son, William Edwin Hamilton, "long trains of algebraical and arithmetical calculations in his mind, during which he was unconscious of the earthly necessity of eating; we used to bring in a 'snack' and leave it in his study, but a brief nod of recognition of the intrusion of the chop or cutlet was often the only result, and his thoughts went on soaring upwards."

For further details about Hamilton (his poetry and his association with poets, for instance) the reader is referred to the *Dublin University Magazine* (Jan. 1842), the *Gentleman's Magazine* (Jan. 1866), and the *Monthly Notices of the Royal Astronomical Society* (Feb. 1866); and also to an article by the present writer in the *North British Review* (Sept. 1866), from which much of the above sketch has been taken. His works have been collected and published by R. P. Graves, *Life of Sir W. R. Hamilton* (3 vols., 1882, 1885, 1889).

(P. G. T.)

HAMILTON, a town of Dundas and Normanby counties, Victoria, Australia, on the Grange Burne Creek, 107½ m. by rail W. of Melbourne. Pop. (1901) 4026. Hamilton has a number of educational institutions, chief among which are the Hamilton and Western District College, one of the finest buildings of its kind in Victoria, the Hamilton Academy, and the Alexandra ladies' college, a state school, and a Catholic college. It has a fine racecourse, and pastoral and agricultural exhibitions are held annually, as the surrounding district is mainly devoted to sheep-farming. Mutton is frozen and exported. Hamilton became a borough in 1859.

HAMILTON (GRAND or ASHUANIPI), the chief river of Labrador, Canada. It rises in the Labrador highlands at an elevation of 1700 ft., its chief sources being Lakes Attikonak and Ashuanipi, between 65° and 66° W. and 52° and 53° N. After a powerful south course of 600 m. it empties into Melville Lake (90 m. long and 18 wide), an extension of Hamilton inlet, on the Atlantic. About 220 m. from its mouth occur the Grand Falls of Labrador. Here in a distance of 12 m. the river drops 760 ft., culminating in a final vertical fall of 316 ft. Below the falls are violent rapids, and the river sweeps through a deep and narrow canyon. The country through which it passes is for the most part a wilderness of barren rock, full of lakes and lacustrine rivers, many of which are its tributaries. In certain portions of the valley spruce and poplars grow to a moderate size. From the head of Lake Attikonak a steep and rocky portage of less than a mile leads to Burnt Lake, which is drained into the St Lawrence by the Romaine river.

HAMILTON, one of the chief cities of Canada, capital of Wentworth county, Ontario. It occupies a highly picturesque situation upon the shore of a spacious land-locked bay at the western end of Lake Ontario. It covers the plain stretching between the water-front and the escarpment (called "The Mountain"), this latter being a continuation of that over which the Falls of Niagara plunge 40 m. to the west. Founded about 1778 by one Robert Land, the growth of Hamilton has been steady and substantial, and, owing to its remarkable industrial development, it has come to be called "the Birmingham of Canada." This development is largely due to the use of electrical energy generated by water-power, in regard to which Hamilton stands first among Canadian cities. The electricity has not, however, been obtained from Niagara Falls, but from De Cew Falls, 35 m. S.E. of the city. The entire electrical railway system, the lighting of the city, and the majority of the factories are operated by power obtained from this source. The manufacturing interests of Hamilton are varied, and some of the establishments are of vast size, employing many thousands of hands each, such as the International Harvester Co. and the Canadian Westinghouse Co. In addition Hamilton is the centre of one of the finest fruit-growing districts on the continent, and its open-air market is a remarkable sight. The municipal matters are managed by a mayor and board of aldermen. Six steam railroads and three electric radial roads afford Hamilton ample facilities for transport by land, while during the season of navigation

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a number of steamboat lines supply daily services to Toronto and other lake ports. Entrance into the broad bay is obtained through a short canal intersecting Burlington Beach, which is crossed by two swing bridges, whereof one—that of the Grand Trunk railway—is among the largest of its kind in the world. Burlington Beach is lined with cottages occupied by the city residents during the hot summer months. Hamilton is rich in public institutions. The educational equipment comprises a normal college, collegiate institute, model school and more than a score of public schools, for the most part housed in handsome stone and brick buildings. There are four hospitals, and the asylum for the insane is the largest in Canada. There is an excellent public library, and in the same building with it a good art school. Hamilton boasts of a number of parks, Dundurn Castle Park, containing several interesting relics of the war of 1812, being the finest, and, as it is practically within the city limits, it is a great boon to the people. Gore Park, in the centre of the city, is used for concerts, given by various bands, one of which has gained an international reputation. Since its incorporation in 1833 the history of Hamilton has shown continuous growth. In 1836 the population was 2846; in 1851, 10,248; in 1861, 19,096; in 1871, 26,880; in 1881, 36,661; in 1891, 48,959; and in 1901, 52,634. The Anglican bishop of Niagara has his seat here, and also a Roman Catholic bishop. Hamilton returns two members to the Provincial parliament and two to the Dominion.

HAMILTON, a municipal and police burgh of Lanarkshire, Scotland. Pop. (1891), 24,850; (1901), 32,775. It is situated about 1 m. from the junction of the Avon with the Clyde, 10¼ m. S.E. of Glasgow by road, and has stations on the Caledonian and North British railways. The town hall in the Scottish Baronial style has a clock-tower 130 ft. high, and the county buildings are in the Grecian style. Among the subjects of antiquarian interest are Queenzie Neuk, the spot where Queen Mary rested on her journey to Langside, the old steeple and pillory built in the reign of Charles I., the Mote Hill, the old Runic cross, and the carved gateway in the palace park. In the churchyard there is a monument to four covenanters who suffered at Edinburgh, on the 7th of December 1600, whose heads were buried here. Among the industries are manufactures of cotton, lace and embroidered muslins, and carriage-building, and there are also large market gardens, the district being famed especially for its apples, and some dairy-farming; but the prosperity of the town depends chiefly upon the coal and ironstone of the surrounding country, which is the richest mineral field in Scotland. Hamilton originated in the 15th century under the protecting influence of the lords of Hamilton, and became a burgh of barony in 1456 and a royal burgh in 1548. The latter rights were afterwards surrendered and it was made the chief burgh of the regality and dukedom of Hamilton in 1668, the third marquess having been created duke in 1643. It unites with Airdrie, Falkirk, Lanark and Linlithgow to form the Falkirk district of burghs, which returns one member to parliament.

Immediately east of the town is Hamilton palace, the seat of the duke of Hamilton and Brandon, premier peer of Scotland. It occupies most of the site of the original burgh of Netherton. The first mansion was erected at the end of the 16th century and rebuilt about 1710, to be succeeded in 1827–1829 by the present palace, a magnificent building in the classical style. Its front is a specimen of the enriched Corinthian architecture, with a projecting pillared portico after the style of the temple of Jupiter Stator at Rome, 264 ft. in length and 60 ft. in height. Each of the twelve pillars of the portico is a single block of stone, quarried at Dalserf, midway between Hamilton and Lanark, and required thirty horses to draw it to its site. The interior is richly decorated and once contained the finest collection of paintings in Scotland, most of which, together with the Hamilton and Beckford libraries, were sold in 1882. Within the grounds, which comprise nearly 1500 acres, is the mausoleum erected by the 10th duke, a structure resembling in general design that of the emperor Hadrian at Rome, being a circular building springing from a square basement, and enclosing a decorated octagonal chapel, the door of which is a copy in bronze of Ghiberti's gates at Florence. At Barncluith, 1 m. S.E. of the town, may be seen the Dutch gardens which were laid down in terraces on the steep banks of the Avon. Their quaint shrubbery and old-fashioned setting render them attractive. They were planned in 1583 by John Hamilton, an ancestor of Lord Belhaven, and now belong to Lord Ruthven. About 2 m. S.E. of Hamilton, within the western High Park, on the summit of a precipitous rock 200 ft. in height, the foot of which is washed by the Avon, stand the ruins of Cadzow Castle, the subject of a spirited ballad by Sir Walter Scott. The castle had been a royal residence for at least two centuries before Bannockburn (1314), but immediately after the battle Robert Bruce granted it to Sir Walter FitzGilbert Hamilton, the son of the founder of the family, in return for the fealty. Near it is the noble chase with its ancient oaks, the remains of the Caledonian Forest, where are still preserved some of the aboriginal breed of wild cattle. Opposite Cadzow Castle, in the eastern High Park, on the right bank of the Avon, is Chatelherault, consisting of stables and offices, and imitating in outline the palace of that name in France.

HAMILTON, a village of Madison county, New York, U.S.A., about 29 m. S.W. of Utica. Pop. (1890), 1744; (1900), 1627; (1905) 1522; (1910) 1689. It is served by the New York, Ontario & Western railway. Hamilton is situated in a productive agricultural region, and has a large trade in hops; among its manufactures are canned vegetables, lumber and knit goods. There are several valuable stone quarries in the vicinity. The village owns and operates its water-supply and electric-lighting system. Hamilton is the seat of Colgate University, which was founded in 1819, under the name of the Hamilton Literary and Theological Institution, as a training school for the Baptist ministry, was chartered as Madison University in 1846, and was renamed in 1890 in honour of the Colgate family, several of whom, especially William (1783–1857), the soap manufacturer, and his sons, James Boorman (1818–1904), and Samuel (1822–1897), were its liberal benefactors. In 1908–1909 it had a university faculty of 33 members, 307 students in the college, 60 in the theological department, and 134 in the preparatory department, and a library of 54,000 volumes, including the Baptist Historical collection (about 5000 vols.) given by Samuel Colgate. The township in which the village is situated and which bears the same name (pop. in 1910, 3825) was settled about 1790 and was separated from the township of Paris in 1795. The village was incorporated in 1812.

HAMILTON, a city and the county-seat of Butler county, Ohio, U.S.A., on both sides of the Great Miami river, 25 m. N. of Cincinnati. Pop. (1890), 17,565; (1900), 23,914, of whom 2949 were foreign-born; (1910 census), 35,279. It is served by the Cincinnati, Hamilton & Dayton, and the Pittsburg, Cincinnati, Chicago & St Louis railways, and by interurban electric lines connecting with Cincinnati, Dayton and Toledo. The valley in which Hamilton is situated is noted for its fertility. The city has a fine public square and the Lane free library (1866); the court house is its most prominent public building. A hydraulic canal provides the city with good water power, and in 1905, in the value of its factory products ($13,092,574, being 31·3% more than in 1900), Hamilton ranked tenth among the cities of the state. Its most distinctive manufactures are paper and wood pulp; more valuable are foundry and machine shop products; other manufactures are safes, malt liquors, flour, woollens, Corliss engines, carriages and wagons and agricultural implements. The municipality owns and operates the water-works, electric-lighting plant and gas plant. A stockade fort was built here in 1791 by General Arthur Saint Clair, but it was abandoned in 1796, two years after the place had been laid out as a town and named Fairfield. The town was renamed, in honour of Alexander Hamilton, about 1796. In 1803 Hamilton was made the county-seat; in 1810 it was incorporated as a village; in 1854 it annexed the town of Rossville on the opposite side of the river; and in 1857 it was made a city. In 1908, by the annexation of suburbs, the area and the population of Hamilton were considerably increased. Hamilton was the early home of William Dean Howells, whose recollections of it are to be found in his *A Boy's Town*; his father's anti-slavery sentiments made it necessary for him to sell his printing office, where the son had learned to set type in his teens, and to remove to Dayton.

HAMIRPUR, a town and district of British India, in the Allahabad division of the United Provinces. The town stands on a tongue of land near the confluence of the Betwa and Jumna,

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110 m. N.W. of Allahabad. Pop. (1901), 6721. It was founded, according to tradition, in the 11th century by Hamir Deo, a Karchuli Rajput expelled from Alwar by the Mahommedans.

The district has an area of 2289 sq. m., and encloses the native states of Sarila, Jigni and Bihat, besides portions of Charkhari and Garrauli. Hamirpur forms part of the great plain of Bundelkhand, which stretches from the banks of the Jumna to the central Vindhyan plateau. The district is in shape an irregular parallelogram, with a general slope northward from the low hills on the southern boundary. The scenery is rendered picturesque by the artificial lakes of Mahoba. These magnificent reservoirs were constructed by the Chandel rajas before the Mahommedan conquest, for purposes of irrigation and as sheets of ornamental water. Many of them enclose craggy islets or peninsulas, crowned by the ruins of granite temples, exquisitely carved and decorated. From the base of this hill and lake country the general plain of the district spreads northward in an arid and treeless level towards the broken banks of the rivers. Of these the principal are the Betwa and its tributary the Dhasan, both of which are unnavigable. There is little waste land, except in the ravines by the river sides. The deep black soil of Bundelkhand, known as *mâr*, retains the moisture under a dried and rifted surface, and renders the district fertile. The staple produce is grain of various sorts, the most important being gram. Cotton is also a valuable crop. Agriculture suffers much from the spread of the *kâns* grass, a noxious weed which overruns the fields and is found to be almost ineradicable wherever it has once obtained a footing. Droughts and famine are unhappily common. The climate is dry and hot, owing to the absence of shade and the bareness of soil, except in the neighbourhood of the Mahoba lakes, which cool and moisten the atmosphere.

In 1901 the pop. was 458,542, showing a decrease of 11% in the decade, due to the famine of 1895–1897. Export trade is chiefly in agricultural produce and cotton cloth. Rath is the principal commercial centre. The Midland branch of the Great Indian Peninsula railway passes through the south of the district.

From the 9th to the 11th century this district was the centre of the Chandel kingdom, with its capital at Mahoba. The rajas adorned the town with many splendid edifices, remains of which still exist, besides constructing the noble artificial lakes already described. At the end of the 12th century Mahoba fell into the hands of the Mussulmans. In 1680 the district was conquered by Chhatar Sal, the hero of the Bundelas, who assigned at his death one-third of his dominions to his ally the peshwa of the Mahrattas. Until Bundelkhand became British territory in 1803 there was constant warfare between the Bundela princes and the Mahratta chieftains. On the outbreak of the Mutiny in 1857, Hamirpur was the scene of a fierce rebellion, and all the principal towns were plundered by the surrounding chiefs. After a short period of desultory guerrilla warfare the rebels were effectually quelled and the work of reorganization began. The district has since been subject to cycles of varying agricultural prosperity.

HAMITIC RACES AND LANGUAGES. The questions involved in a consideration of Hamitic races and Hamitic languages are independent of one another and call for separate treatment.

I. *Hamitic Races.*—The term Hamitic as applied to race is not only extremely vague but has been much abused by anthropological writers. Of the few who have attempted a precise definition the most prominent is Sergi,[1] and his classification may be taken as representing one point of view with regard to this difficult question.

Sergi considers the Hamites, using the term in the racial sense, as a branch of his "Mediterranean Race"; and divides them as follows:—

1. *Eastern Branch*—
   (*a*) Ancient and Modern Egyptian (excluding the Arabs).
   (*b*) Nubians, Beja.
   (*c*) Abyssinians.
   (*d*) Galla, Danakil, Somali.
   (*e*) Masai.
   (*f*) Wahuma or Watusi.
2. *Northern Branch*—
   (*a*) Berbers of the Mediterranean, Atlantic and Sahara.
   (*b*) Tibbu.
   (*c*) Fula.
   (*d*) Guanches (extinct).

With regard to this classification the following conclusions may be regarded as comparatively certain: that the members of groups *d*, *e* and *f* of the first branch appear to be closely inter-connected by admixture of blood, and also the members of the second branch. The Abyssinians in the south have absorbed a certain amount of Galla blood, but the majority are Semitic or Semito-Negroid. The question of the racial affinities of the Ancient Egyptians and the Beja are still a matter of doubt, and the relation of the two groups to each other is still controversial. Sergi, it is true, arguing from physical data believes that a close connexion exists; but the data are so extremely scanty that the finality of his conclusion may well be doubted. His "Northern Branch" corresponds with the more satisfactory term "Libyan Race," represented in fair purity by the Berbers, and, mixed with Negro elements, by the Fula and Tibbu. This Libyan race is distinctively a white race, with dark curly hair; the Eastern Hamites are equally distinctively a brown people with frizzy hair. If, as Sergi believes, these brown people are themselves a race, and not a cross between white and black in varying proportions, they are found in their greatest purity among the Somali and Galla, and mixed with Bantu blood among the Ba-Hima (Wahuma) and Watusi. The Masai seem to be as much Nilotic Negro as Hamite. This Galla type does not seem to appear farther north than the southern portion of Abyssinia, and it is not unlikely that the Beja are very early Semitic immigrants with an aboriginal Negroid admixture. It is also possible that they and the Ancient Egyptians may contain a common element. The Nubians appear akin to the Egyptians but with a strong Negroid element.

To return to Sergi's two branches, besides the differences in skin colour and hair-texture there is also a cultural difference of great importance. The Eastern Hamites are essentially a pastoral people and therefore nomadic or semi-nomadic; the Berbers, who, as said above, are the purest representatives of the Libyans, are agriculturists. The pastoral habits of the Eastern Hamites are of importance, since they show the utmost reluctance to abandon them. Even the Ba-Hima and Watussi, for long settled and partly intermixed with the agricultural Bantu, regard any pursuit but that of cattle-herding as absolutely beneath their dignity.

It would seem therefore that, while sufficient data have not been collected to decide whether, on the evidence of exact anthropological measurements, the Libyans are connected racially with the Eastern Hamites, the testimony derived from broad "descriptive characteristics" and general culture is against such a connexion. To regard the Libyans as Hamites solely on the ground that the languages spoken by the two groups show affinities would be as rash and might be as false as to aver that the present-day Hungarians are Mongolians because Magyar is an Asiatic tongue. Regarding the present state of knowledge it would be safer therefore to restrict the term "Hamites" to Sergi's first group; and call the second by the name "Libyans." The difficult question of the origin of the ancient Egyptians is discussed elsewhere.

As to the question whether the Hamites in this restricted sense are a definite race or a blend, no discussion can, in view of the paucity of evidence, as yet lead to a satisfactory conclusion, but it might be suggested very tentatively that further researches may possibly connect them with the Dravidian peoples of India. It is sufficient for present purposes that the term Hamite, using it as coextensive with Sergi's Eastern Hamite, has a definite connotation. By the term is meant a brown people with frizzy hair, a tall and sinewy physique, with slender but muscular arms and legs, a thin straight or even aquiline nose with delicate nostrils, thin lips and no trace of prognathism. (T. A. J.)

II. *Hamitic Languages.*—The whole north of Africa was once inhabited by tribes of the Caucasian race, speaking languages which are now generally called, after Genesis x., Hamitic, a term introduced principally by Friedrich Müller. The linguistic coherence of that race has been broken up especially by the intrusion of Arabs, whose language has exercised a powerful influence on all those nations. This splitting up, and the immense distances over which those tribes were spread, have made those languages diverge more widely than do the various tongues of the Indo-European stock, but still their affinity can easily be traced by the linguist, and is, perhaps, greater than the corresponding anthropologic similarity between the white Libyan, red Galla and swarthy Somali. The relationship of these languages to Semitic has long been noticed, but was at first taken for descent from Semitic (cf. the name "Syro-Arabian" proposed by Prichard). Now linguists are agreed that the

[1] G. Sergi, *The Mediterranean Race. A Study of the Origin of European Peoples* (London, 1901); *idem, Africa, Antropologia della stirpe camitica* (Turin, 1897).

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Proto-Semites and Proto-Hamites once formed a unity, probably in Arabia. That original unity has been demonstrated especially by Friedrich Müller (*Reise der österreichischen Fregatte Novara*, p. 51, more fully, *Grundriss der Sprachwissenschaft*, vol. iii. fasc. 2, p. 226); cf. also A. H. Sayce, *Science of Language*, ii. 178; R. N. Cust, *The Modern Languages of Africa*, i. 94, &c. The comparative grammars of Semitic (W. Wright, 1890, and especially H. Zimmern, 1898) demonstrate this now to everybody by comparative tables of the grammatical elements.

The classification of Hamitic languages is as follows:[1]—

1. *The Libyan Dialects* (mostly misnamed "Berber languages," after an unfortunate, vague Arabic designation, *barbâra*, "people of foreign language"). The representatives of this large group extend from the Senegal river (where they are called Zenaga) to Siwa. A perfect *Grammaire* by L. Faidherbe, 1877) and from Timbuktu (dialect of the Auelimmiden, sketched by Heinrich Barth, *Travels*, vol. v., 1857) to the oases of Aujila (Bengazi) and of Siwa on the western border of Egypt. Consequently, these "dialects" differ more strongly from each other than, *e.g.* the Semitic languages do between themselves. The purest representative seems to be the language of the Algerian mountaineers (Kabyles), especially that of the *Zuawa* (Zouaves) tribe, described by A. Hanoteau, *Essai de grammaire kabyle* (1858); Ben Sedira, *Cours de langue kab.* (1887); *Dictionnaire* by Olivier (1878). The learned little *Manuel de langue kabyle*, by R. Basset (1887) is an introduction to the study of the many dialects with full Bibliography, cf. also Basset's *Notes de lexicographie berbère* (1883 foll.). Nearly as purely Hamitic is the Ghat Venture de Paradis are imperfect.) The best now described is Shilh(a), a Moroccan dialect (H. Stumme, *Handbuch des Schilhischen*, 1899), but it is an inferior dialect. That of Ghat in Tripoli underlies the *Grammar* of H. W. Schottky (1845) and the *Grammaire Tamashek* of Hanoteau (1860); cf. also the *Dictionnaire* of Cid Kaoui (1900). Neither medieval reports on the language spoken by the Guanches of the Canary Islands (fullest in A. Berthelot, *Antiquités canariennes*, 1879; also to Shilha; by no means identical with Libyan untouched by Arabic), nor the modern dialect of Siwa (still little known; tentative grammar by Basset, 1890), have justified hopes of finding a pure Libyan dialect. Of a few literary attempts in Arabic letters the religious hymn *de Cubi* (ed. Basset, *Journ. asiatique*, vii. 476) is the most remarkable. The imperfect native writing (named *tifinaghen*), a derivation from the Sabaean alphabet (not, as Halévy claimed, from the Punic), still in use among the Sahara tribes, can be traced to the 2nd century B.C. (bilingual inscription of Tucca, &c.; cf. J. Halévy, *Essai d'épigraphie libyque*, 1875), but hardly ever served for literary uses.

2. *The Cushitic or Ethiopian Family.*—The nearest relative of Libyan is not Ancient Egyptian but the language of the nomadic Bisharin or Beja of the Nubian Desert (cf. H. Almkvist, *Die Bischari Sprache*, 1881 [the northern dialect], and L. Reinisch, *Die Bedauye Sprache*, 1893, *Wörterbuch*, 1895). The speech of the peoples occupying the lowland east of Abyssinia, the Saho (Reinisch, grammar in *Zeitschrift d. deutschen morgenländ. Gesellschaft*, 32, 1878; *Texte*, 1889; *Wörterbuch*, 1890; cf. also Reinisch, *Die Sprache der Irob Saho*, 1878), and the Afar or Danakil (Reinisch, *Die Afar Sprache*, 1887; G. Colizza, *Lingua Afar*, 1887), merely dialects of one language, form the connecting link with the southern Hamitic group, i.e. Somali (Reinisch, *Somali Sprache*, 1900–1903, 3 vols.; Larajasse und de Sampont, *Practical Grammar of the Somali Language*, 1897; imperfect sketches by Hunter, 1880, and Schleicher, 1890), and Galla (L. Tutschek, *Grammar*, 1845, *Dictionary*, 1844; Massaja, *Lectures*, 1877; G. F. F. Praetorius, *Zur Grammatik der Gallasprache*, 1893, &c.). All these Cushitic languages, extending from Egypt to the equator, are separated by Reinisch as *Lower Cushitic* from the *High Cushitic* group, *i.e.* the many dialects spoken by tribes dwelling in the Abyssinian highlands or south of Abyssinia. Of the original inhabitants of Abyssinia, called collectively Agâu (or Agâu) by the Abyssinians, or Falashas (this name principally for Jewish tribes), Reinisch considers the Bilin or Bogos tribe as preserving the most archaic dialect (*Die Bilin Sprache*, Texts, 1883; *Grammatik*, 1882; *Worterbuch*, 1887); the same scholar gave sketches of the Khamir (1884) and Quara (1885) dialects. On other dialects, struggling against the spreading Semitic tongues (Tigré, Amharic, &c.), see Conti Rossini, "Appunti sulla lingua Khamta," in *Giorn. soc. orient.* (1905); Waldmeyer, *Wortersammlung* (1868); J. Halévy, "Essai sur la langue Agaou" (*Actes soc. philologique*, 1873), &c. Similar dialects are those of the Sid(d)ama tribes, south of Abyssinia, of which only Kaf(f)a (Reinisch, *Die Kafa Sprache*, 1888) is known at all fully. Of the various other dialects (Kullo, Tambaro, &c.), vocabularies only are known; cf. Borelli, *Ethiopie méridionale* (1890). (On Hausa see below.)

There is no question that the northernmost Hamitic languages have preserved best the original wealth of inflections which reminds us so strongly of the formal riches of southern Semitic. Libyan and Beja are the best-preserved types, and the latter especially may be called the Sanskrit of Hamitic. The other Cushitic tongues exhibit increasing agglutinative tendencies the farther we go south, although single archaisms are found even in Somali. The early isolated High Cushitic tongues (originally branched off from a stock common with Galla and Somali) diverge most strongly from the original type. Already the Agâu dialects are full of very peculiar developments; the Hamitic character of the Sid(d)ama languages can be traced only by lengthy comparisons.

The Hausa and pretty (Haus(a)na language, the commercial language of the whole Niger region and beyond (Schoen, *Grammar*, 1862, *Dictionary*, 1876; Charles H. Robinson, 1897, in Robinson and Brooke's *Dictionary*) has fairly well preserved its Hamitic grammar, though its vocabulary was much influenced by the surrounding Negro languages. It is no relative of Libyan (though it has experienced some Libyan influences), but comes from the (High ?) Cushitic family; its exact place in this family remains to be determined. Various languages of the Niger region were once Hamitic like Haus(a)a, or at least under some Hamitic influence, but have now lost that character too far to be classified as Hamitic, *e.g.* the Muzuk or Musgu language (F. Müller, 1886). The often-raised question of some (very remote) relationship between Hamitic and the great Bantu family is still undecided; more doubtful is that with the interesting Ful (a) language in the western Sudan, but a relationship with the Nilotic branch of negro languages is impossible (though a few of these, *e.g.* Nuba, have borrowed some words from neighbouring Hamitic peoples). The development of a grammatical gender, this principal characteristic of Semito-Hamitic, in Bari and Masai, may be rather accidental than borrowed; certainly, the same phenomenon in Hottentot does not justify the attempt often made to classify this with Hamitic.

3. *Ancient Egyptian*, as we have seen, does not form the connecting link between Libyan and Cushitic which its geographical position would lead us to expect. It represents a third independent branch, or rather a second one, Libyan and Cushitic forming one division of Hamitic. A few resemblances with Libyan (M. de Rochemonteix in *Mémoires du congrès internat. des orientalistes*, Paris, 1873; elementary) are less due to original relationship than to the general better preservation of the ancient idioms (see above). Frequent attempts to detach Egyptian from Hamitic and to attribute it to a Semitic immigration later than that of the other Hamites cannot be proved. Egyptian is, in many respects, more remote from Semitic than the Libyan-Cushitic division, being more agglutinative than the better types of its sister branch, having lost the most characteristic verbal flection (the Hamito-Semitic imperfect), forming the nominal plural in its own peculiar fashion, &c. The advantage of Egyptian, that it is represented in texts of 3000 B.C., while the sister tongues exist only in forms 3000 years later, allows us, *e.g.* to trace the Semitic principle of triliteral roots more clearly in Egyptian; but still the latter tongue is hardly more characteristically archaic or nearer Semitic than Beja or Kabylic.

All this is said principally of the grammar. Of the vocabulary it must not be forgotten that none of the Hamitic tongues remained untouched by Semitic influences after the separation of the Hamites and Semites, say 4000 or 5000 B.C. Repeated Semitic immigrations and influences have brought so many layers of loan-words that it is questionable if any modern Hamitic language has now more than 10% of original Hamitic words. Which Semitic resemblances are due to original affinity, which come from pre-Christian influences, which from later influences, are difficult questions not yet faced by science; *e.g.* the half-Arabic numerals of Libyan have often been quoted as a proof of primitive Hamito-Semitic kinship, but they are probably only a gift of ancient, pre-historic Semites to us. Arab tribes seem to have repeatedly swept over the whole area of the Hamites, long before the time of Mahomet, and to have left deep impressions on races and languages, but none of these migrations stands in the full light of history (not even that of the Himyarite tribes of Abyssinia). Egyptian exhibits constant influences from its Canaanitish neighbours; it is crammed with such loan-words already in 3000 B.C.; new affluxes can be traced, especially *c.* 1600. (The Punic influence on Libyan are, fortunately, very slight, limited to the latin.) Hence the relations of Semitic and Hamitic still require many investigations in detail, for which the works of Reinisch and Basset have merely built up a basis. (W. M. M.)

HAMLET, the hero of Shakespeare's tragedy, a striking figure in Scandinavian romance.

The chief authority for the legend of Hamlet is Saxo Grammaticus, who devotes to it parts of the third and fourth books of his *Historia Danica*, written at the beginning of the 13th century. It is supposed that the story of Hamlet, Amleth or Amlôði,[2] was contained in the lost Skjöldunga saga, but we have no means of determining whether Saxo derived his information in this case from oral or written sources. The close parallels between the

[1] Only works of higher linguistic standing are quoted here; many vocabularies and imperfect attempts of travellers cannot be enumerated.

[2] The word is used in modern Icelandic metaphorically of an imbecile or weak-minded person (see Cleasby and Vigfússon, *Icelandic-English Dictionary*, 1869).

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tale of Hamlet and the English romances of Havelok, Horn and Bevis of Hampton make it not unlikely that Hamlet is of British rather than of Scandinavian origin. His name does in fact occur in the Irish *Annals of the Four Masters* (ed. O'Donovan, 1851) in a stanza attributed to the Irish Queen Gormflaith, who laments the death of her husband, Niall Glundubh, at the hands of Amhlaíḋe in 919 at the battle of Ath-Cliath. The slayer of Niall Glundubh is by other authorities stated to have been Sihtric. Now Sihtric was the father of that Olaf or Anlaf Cuaran who was the prototype of the English Havelok, but nowhere else does he receive the nickname of Amhlaíḋe. If Amhlaíḋe may really be identified with Sihtric, who first went to Dublin in 888, the relations between the tales of Havelok and Hamlet are readily explicable, since nothing was more likely than that the exploits of father and son should be confounded (see HAVELOK). But, whoever the historic Hamlet may have been, it is quite certain that much was added that was extraneous to Scandinavian tradition. Later in the 10th century there is evidence of the existence of an Icelandic saga of Amlóði or Amleth in a passage from the poet Snaebjorn in the second part of the prose *Edda*.[1] According to Saxo,[2] Hamlet's history is briefly as follows. In the days of Rorik, king of Denmark, Gervendill was governor of Jutland, and was succeeded by his sons Horvendill and Feng. Horvendill, on his return from a Viking expedition in which he had slain Koll, king of Norway, married Gerutha, Rorik's daughter, who bore him a son Amleth. But Feng, out of jealousy, murdered Horvendill, and persuaded Gerutha to become his wife, on the plea that he had committed the crime for no other reason than to avenge her of a husband by whom she had been hated. Amleth, afraid of sharing his father's fate, pretended to be imbecile, but the suspicion of Feng put him to various tests which are related in detail. Among other things they sought to entangle him with a young girl, his foster-sister, but his cunning saved him. When, however, Amleth slew the eavesdropper hidden, like Polonius, in his mother's room, and destroyed all trace of the deed, Feng was assured that the young man's madness was feigned. Accordingly he despatched him to England in company with two attendants, who bore a letter enjoining the king of the country to put him to death. Amleth surmised the purport of their instructions, and secretly altered the message on their wooden tablets to the effect that the king should put the attendants to death and give Amleth his daughter in marriage. After marrying the princess Amleth returned at the end of a year to Denmark. Of the wealth he had accumulated he took with him only certain hollow sticks filled with gold. He arrived in time for a funeral feast, held to celebrate his supposed death. During the feast he plied the courtiers with wine, and executed his vengeance during their drunken sleep by fastening down over them the woollen hangings of the hall with pegs he had sharpened during his feigned madness, and then setting fire to the palace. Feng he slew with his own sword. After a long harangue to the people he was proclaimed king. Returning to England for his wife he found that his father-in-law and Feng had been pledged each to avenge the other's death. The English king, unwilling personally to carry out his pledge, sent Amleth as proxy wooer for the hand of a terrible Scottish queen Hermuthruda, who had put all former wooers to death, but fell in love with Amleth. On his return to England his first wife, whose love proved stronger than her resentment, told him of her father's intended revenge. In the battle which followed Amleth won the day by setting up the dead men of the day before with stakes, and thus terrifying the enemy. He then returned with his two wives to Jutland, where he had to encounter the enmity of Wiglek, Rorik's successor. He was slain in a battle against Wiglek, and Hermuthruda, although she had engaged to die with him, married the victor.

The other Scandinavian versions of the tale are: the *Hrolfssaga Kraka*,[3] where the brothers Helgi and Hroar take the place of the hero; the tale of Harald and Halfdan, as related in the 7th book of Saxo Grammaticus; the modern Icelandic *Ambales Saga*,[4] a romantic tale the earliest MS. of which dates from the 17th century; and the folk-tale of Bjárm[5] which was put in writing in 1707. Helgi and Hroar, like Harald and Halfdan, avenge their father's death on their uncle by burning him in his palace. Harald and Halfdan escape after their father's death by being brought up, with dogs' names, in a hollow oak, and subsequently by feigned madness; and in the case of the other brothers there are traces of a similar motive, since the boys are called by dogs' names. The methods of Hamlet's madness, as related by Saxo, seem to point to cynanthropy. In the *Ambales Saga*, which perhaps is collateral to, rather than derived from, Saxo's version, there are, besides romantic additions, some traits which point to an earlier version of the tale.

Saxo Grammaticus was certainly familiar with the Latin historians, and it is most probable that, recognizing the similarity between the northern Hamlet legend and the classical tale of Lucius Junius Brutus as told by Livy, by Valerius Maximus, and by Dionysius of Halicarnassus (with which he was probably acquainted through a Latin epitome), he deliberately added circumstances from the classical story. The incident of the gold-filled sticks could hardly appear fortuitously in both, and a comparison of the harangues of Amleth (Saxo, Book iv.) and of Brutus (Dionysius iv. 77) shows marked similarities. In both tales the usurping uncle is ultimately succeeded by the nephew who has escaped notice during his youth by a feigned madness. But the parts played by the personages who in Shakespeare became Ophelia and Polonius, the method of revenge, and the whole narrative of Amleth's adventure in England, have no parallels in the Latin story.

Dr. O. L. Jiriczek[6] first pointed out the striking similarities existing between the story of Amleth in Saxo and the other northern versions, and that of Kei Chosro in the *Shahnameh* (Book of the King) of the Persian poet Firdausi. The comparison was carried farther by R. Zenker (*Boeve Amlethus*, pp. 207-268, Berlin and Leipzig, 1904), who even concluded that the northern saga rested on an earlier version of Firdausi's story, in which indeed nearly all the individual elements of the various northern versions are to be found. Further resemblances exist in the *Ambales Saga* with the tales of Bellerophon, of Heracles, and of Servius Tullius. That Oriental tales through Byzantine and Arabian channels did find their way to the west is well known, and there is nothing very surprising in their being attached to a local hero.

The tale of Hamlet's adventures in Britain forms an episode so distinct that it was at one time referred to a separate hero. The traitorous letter, the purport of which is changed by Hermuthruda, occurs in the popular *Dit de l'empereur Constant*,[7] and in Arabian and Indian tales. Hermuthruda's cruelty to her wooers is common in northern and German mythology, and close

[1] "'Tis said that far out, off yonder ness, the Nine Maids of the Island Mill stir amain the host—cruel skerry-quern—they who in ages past ground Hamlet's meal. The good Chieftain furrows the hull's lair with his ship's beaked prow." This passage may be compared with some examples of Hamlet's cryptic sayings quoted by Saxo: "Again, as he passed along the beach, his companions found the rudder of a ship which had been wrecked, and said they had discovered a huge knife. 'This,' said he, 'was the right thing to carve such a huge ham . . . .' Also, as they passed the sand-hills, and bade him look at the meal, meaning the sand, he replied that it had been ground small by the hoary tempests of the ocean."

[2] Books iii. and iv., chaps. 86-106, Eng. trans. by O. Elton (London, 1894).

[3] Printed in Fornaldar Sögur Norðrlanda (vol. i. Copenhagen, 1829), analysed by F. Detter in *Zeitschr. fur deutsches Alterthum* (vol. 36, Berlin, 1892).

[4] Printed with English translation and with other texts germane to the subject by I. Gollancz (*Hamlet in Iceland*, London, 1898).

[5] Professor I. Gollancz points out (p. lxix.) that Bjárm is a variation of the Irish Brian, that the relations between Ireland and the Norsemen were very close, and that, curiously enough, Brian Boroimhe was the hero of that very battle of Clontarf (1014) where the device (which occurs in Havelok and Hamlet) of bluffing the enemy by tying the wounded to stakes to represent active soldiers was used.

[6] "Hamlet in Iran," in *Zeitschrift des Vereins für Volkskunde*, x. (Berlin, 1900).

[7] See A. B. Gough, *The Constance Saga* (Berlin, 1902).

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parallels are afforded by Thrytho, the terrible bride of Offa I., who figures in *Beowulf*, and by Brunhilda in the *Nibelungenlied*.

The story of Hamlet was known to the Elizabethans in François de Belleforest's *Histoires tragiques* (1559), and found its supreme expression in Shakespeare's tragedy. That as early as 1587 or 1589 Hamlet had appeared on the English stage is shown by Nash's preface to Greene's *Menaphon*: "He will afford you whole Hamlets, I should say, handfulls of tragical speeches." The Shakespearian Hamlet owes, however, little but the outline of his story to Saxo. In character he is diametrically opposed to his prototype. Amleth's madness was certainly altogether feigned; he prepared his vengeance a year beforehand, and carried it out deliberately and ruthlessly at every point. His riddling speech has little more than an outward similarity to the words of Hamlet, who resembles him, however, in his disconcerting penetration into his enemies' plans. For a discussion of Shakespeare's play and its immediate sources see SHAKESPEARE.

See an appendix to Elton's trans. of Saxo Grammaticus; I. Gollancz, *Hamlet in Iceland* (London, 1898); H. L. Ward, *Catalogue of Romances*, under "Havelok," vol. i. pp. 423 seq.; *English Historical Review*, x. (1895); F. Detter, "Die Hamletsage," *Zeitschr. f. deut. Alter.* vol. 36 (Berlin, 1892); O. L. Jiriczek, "Die Amlethsage auf Island," in *Germanistische Abhandlungen*, vol. xii. (Breslau), and "Hamlet in Iran," in *Zeitschr. des Vereins für Volkskunde*, x. (Berlin, 1900); A. Ulrik, *Kilderne til Sakses Oldhistorie* (Copenhagen, 2 vols., 1892–1894).

HAMLEY, SIR EDWARD BRUCE (1824–1893), British general and military writer, youngest son of Vice-Admiral William Hamley, was born on the 27th of April 1824 at Bodmin, Cornwall, and entered the Royal Artillery in 1843. He was promoted captain in 1850, and in 1851 went to Gibraltar, where he commenced his literary career by contributing articles to magazines. He served throughout the Crimean campaign as aide-de-camp to Sir Richard Dacres, commanding the artillery, taking part in all the operations with distinction, and becoming successively major and lieutenant-colonel by brevet. He also received the C.B. and French and Turkish orders. During the war he contributed to *Blackwood's Magazine* an admirable account of the progress of the campaign, which was afterwards republished. The combination in Hamley of literary and military ability secured for him in 1859 the professorship of military history at the new Staff College at Sandhurst, from which in 1866 he went to the council of military education, returning in 1870 to the Staff College as commandant. From 1879 to 1881 he was British commissioner successively for the delimitation of the frontiers of Turkey and Bulgaria, Turkey in Asia and Russia, and Turkey and Greece, and was rewarded with the K.C.M.G. Promoted colonel in 1863, he became a lieutenant-general in 1882, when he commanded the 2nd division of the expedition to Egypt under Lord Wolseley, and led his troops in the battle of Tell-el-Kebir, for which he received the K.C.B., the thanks of parliament, and 2nd class of Osmanieh. Hamley considered that his services in Egypt had been insufficiently recognized in Lord Wolseley's despatches, and expressed his indignation freely, but he had no sufficient ground for supposing that there was any intention to belittle his services. From 1885 until his death on the 12th of August 1893 he represented Birkenhead in parliament in the Conservative interest.

Hamley was a clever and versatile writer. His principal work, *The Operations of War*, published in 1867, became a text-book of military instruction. He published some pamphlets on national defence, was a frequent contributor to magazines, and the author of several novels, of which perhaps the best known is *Lady Lee's Widowhood*.

HAMLIN, HANNIBAL (1809–1891), vice-president of the United States (1861–1865), was born at Paris, Maine, on the 27th of August 1809. After studying in Hebron Academy, he conducted his father's farm for a time, became schoolmaster, and later managed a weekly newspaper at Paris. He then studied law, was admitted to the bar in 1833, and rapidly acquired a reputation as an able lawyer and a good public speaker. Entering politics as an anti-slavery Democrat, he was a member of the state House of Representatives in 1836–1840, serving as its presiding officer during the last four years. He was a representative in Congress from 1843 to 1847, and was a member of the United States Senate from 1848 to 1856. From the very beginning of his service in Congress he was prominent as an opponent of the extension of slavery; he was a conspicuous supporter of the Wilmot Proviso, spoke against the Compromise Measures of 1850, and in 1856, chiefly because of the passage in 1854 of the Kansas-Nebraska Bill, which repealed the Missouri Compromise, and his party's endorsement of that repeal at the Cincinnati Convention two years later, he withdrew from the Democrats and joined the newly organized Republican party. The Republicans of Maine nominated him for governor in the same year, and having carried the election by a large majority he was inaugurated in this office on the 8th of January 1857. In the latter part of February, however, he resigned the governorship, and was again a member of the Senate from 1857 to January 1861. From 1861 to 1865, during the Civil War, he was Vice-President of the United States. While in this office he was one of the chief advisers of President Lincoln, and urged both the Emancipation Proclamation and the arming of the negroes. After the war he again served in the Senate (1869–1881), was minister to Spain (1881–1883), and then retired from public life. He died at Bangor, Maine, on the 4th of July 1891.

See *Life and Times of Hannibal Hamlin* (Cambridge, Mass., 1899), by C. E. Hamlin, his grandson.

HAMM, a town of Germany, in the Prussian province of Westphalia, on the Lippe, 19 m. by rail N.E. from Dortmund on the main line Cologne-Hanover. Pop. (1905) 38,430. It is surrounded by pleasant promenades occupying the site of the former engirdling fortifications. The principal buildings are four Roman Catholic and three Evangelical churches, several schools and an infirmary. The town is flourishing and rapidly increasing, and possesses very extensive wire factories (in connexion with which there are puddling and rolling works), machine works, and manufactories of gloves, baskets, leather, starch, chemicals, varnish, oil and beer. Near the town are some thermal baths.

Hamm, which became a town about the end of the 12th century, was originally the capital of the countship of Mark, and was fortified in 1226. It became a member of the Hanseatic League. In 1614 it was besieged by the Dutch, and it was several times taken and retaken during the Thirty Years' War. In 1666 it came into the possession of Brandenburg. In 1761 and 1762 it was bombarded by the French, and in 1763 its fortifications were dismantled.

HAMMĀD AR-RĀWIYA [Abū-l-Qāsim Ḥammād ibn Abī Laila Sāpūr (or ibn Maisara)] (8th century A.D.), Arabic scholar, was of Dailamite descent, but was born in Kufa. The date of his birth is given by some as 694, by others as 714. He was reputed to be the most learned man of his time in regard to the "days of the Arabs" (*i.e.* their chief battles), their stories, poems, genealogies and dialects. He is said to have boasted that he could recite a hundred long *qasidas* for each letter of the alphabet (*i.e.* rhyming in each letter) and these all from pre-Islamic times, apart from shorter pieces and later verses. Hence his name *Hammad ar-Rawiya*, "the reciter of verses from memory." The Omayyad caliph Walid is said to have tested him, the result being that he recited 2900 qasidas of pre-Islamic date and Walid gave him 100,000 dirhems. He was favoured by Yazid II. and his successor Hishām, who brought him up from Irak to Damascus. Arabian critics, however, say that in spite of his learning he lacked a true insight into the genius of the Arabic language, and that he made more than thirty—some say three hundred—mistakes of pronunciation in reciting the Koran. To him is ascribed the collecting of the *Mo'allakāt* (*q.v.*). No diwan of his is extant, though he composed verse of his own and probably a good deal of what he ascribed to earlier poets.

Biography in McG. de Slane's trans. of Ibn Khallikān, vol. i. pp. 470–474, and many stories are told of him in the *Kitāb ul-Aghāni*, vol. v. pp. 164–175. (G. W. T.)

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HAMMER, FRIEDRICH JULIUS (1810–1862), German poet, was born on the 7th of June 1810 at Dresden. In 1831 he went to Leipzig to study law, but devoted himself mainly to philosophy and belles lettres. Returning to Dresden in 1834 a small comedy, *Das seltsame Frühstück*, introduced him to the literary society of the capital, notably to Ludwig Tieck, and from this time he devoted himself entirely to writing. In 1837 he returned to Leipzig, and, coming again to Dresden, from 1851 to 1859 edited the feuilleton of *Sächsische konstitutionelle Zeitung*, and took the lead in the foundation in 1855 of the Schiller Institute in Dresden. His marriage in 1851 had made him independent, and he bought a small property at Pillnitz, on which, soon after his return from a residence of several years at Nuremberg, he died, on the 23rd of August 1862.

Hammer wrote, besides several comedies, a drama *Die Brüder* (1836), a number of unimportant romances, and the novel *Einkehr und Umkehr* (Leipzig, 1856); but his reputation rests upon his epigrammatic and didactic poems. His *Schau' un dich, und schau' in dich* (1851), which made his name, has passed through more than thirty editions. It was followed by *Zu allen guten Stunden* (1854), *Fester Grund* (1857), *Auf stillen Wegen* (1859), and *Lerne, liebe, lebe* (1862). Besides these he wrote a book of Turkish songs, *Unter dem Halbmond* (Leipzig, 1860), and rhymed versions of the psalms (1861), and compiled the popular religious anthology *Leben und Heimat in Gott*, of which a 14th edition was published in 1900.

See C. G. E. Am Ende, *Julius Hammer* (Nuremberg, 1872).

HAMMER, an implement consisting of a shaft or handle with head fixed transversely to it. The head, usually of metal, has one flat face, the other may be shaped to serve various purposes, *e.g.* with a claw, a pick, &c. The implement is used for breaking, beating, driving nails, rivets, &c., and the word is applied to heavy masses of metal moved by machinery, and used for similar purposes. (See TOOL.) "Hammer" is a word common to Teutonic languages. It appears in the same form in German and Danish, and in Dutch as *hamer*, in Swedish as *hammare*. The ultimate origin is unknown. It has been connected with the root seen in the Greek κάμπτειν, to bend; the word would mean, therefore, something crooked or bent. A more illuminating suggestion connects the word with the Slavonic *kamy*, a stone, cf. Russian *kamen*, and ultimately with Sanskrit *açman*, a pointed stone, a thunderbolt. The legend of Thor's hammer, the thunderbolt, and the probability of the primitive hammer being a stone, adds plausibility to this derivation. The word is applied to many objects resembling a hammer in shape or function. Thus the "striker" in a clock, or in a bell, when it is sounded by an independent lever and not by the swinging of the "tongue," is called a "hammer"; similarly, in the "action" of a pianoforte the word is used of a wooden shank with felt-covered head attached to a key, the striking of which throws the "hammer" against the strings. In the mechanism of a fire-arm, the "hammer" is that part which by its impact on the cap or primer explodes the charge. (See GUN.) The hammer, more usually known by its French name of *martel de fer*, was a medieval hand-weapon. With a long shaft it was used by infantry, especially when acting against mounted troops. With a short handle and usually made altogether of metal, it was also used by horse-soldiers. The *martel* had one part of the head with a blunted face, the other pointed, but occasionally both sides were pointed. There are 16th century examples in which a hand-gun forms the handle. The name of "hammer," in Latin *malleus*, has been frequently applied to men, and also to books, with reference to destructive power. Thus on the tomb of Edward I. in Westminster Abbey is inscribed his name of *Scotorum Malleus*, the "Hammer of the Scots." The title of "Hammer of Heretics," *Malleus Haereticorum*, has been given to St Augustine and to Johann Faber, whose tract against Luther is also known by the name. Thomas Cromwell was styled *Malleus Monachorum*. The famous text-book of procedure in cases of witchcraft, published by Sprenger and Krämer in 1489, was called *Hexenhammer* or *Malleus Maleficarum* (see WITCHCRAFT).

The origin of the word "hammer-cloth," an ornamental cloth covering the box-seat on a state-coach, has been often explained from the hammer and other tools carried in the box-seat by the coachman for repairs, &c. The *New English Dictionary* points out that while the word occurs as early as 1465, the use of a box-seat is not known before the 17th century. Other suggestions are that it is a corruption of "hamper-cloth," or of "hammock-cloth," which is used in this sense, probably owing to a mistake. Neither of these supposed corruptions helps very much. Skeat connects the word with a Dutch word *hemel*, meaning a canopy. In the name of the bird, the yellow-hammer, the latter part should be "ammer." This appears in the German name, *Emmerling*, and the word probably means the "chirper," cf. the Ger. *jammern*, to wail, lament.

HAMMERBEAM ROOF, in architecture, the name given to a Gothic open timber roof, of which the finest example is that over Westminster Hall (1395–1399). In order to give greater height in the centre, the ordinary tie beam is cut through, and the portions remaining, known as hammerbeams, are supported by curved braces from the wall; in Westminster Hall, in order to give greater strength to the framing, a large arched piece of timber is carried across the hall, rising from the bottom of the wall piece to the centre of the collar beam, the latter being also supported by curved braces rising from the end of the hammer-beam. The span of Westminster Hall is 68 ft. 4 in., and the opening between the ends of the hammerbeams 25 ft. 6 in. The height from the paving of the hall to the hammerbeam is 40 ft., and to the underside of the collar beam 63 ft. 6 in., so that an additional height in the centre of 23 ft. 6 in. has been gained. Other important examples of hammerbeam roofs exist over the halls of Hampton Court and Eltham palaces, and there are numerous examples of smaller dimensions in churches throughout England and particularly in the eastern counties. The ends of the hammerbeams are usually decorated with winged angels holding shields; the curved braces and beams are richly moulded, and the spandrils in the larger examples filled in with tracery, as in Westminster Hall. Sometimes, but rarely, the collar beam is similarly treated, or cut through and supported by additional curved braces, as in the hall of the Middle Temple, London.

HAMMERFEST, the most northern town in Europe. Pop. (1900) 2300. It is situated on an island (Kvalö) off the N.W. coast of Norway, in Finmarken *amt* (county), in 70° 40′ 11″ N., the latitude being that of the extreme north of Alaska. Its position affords the best illustration of the warm climatic influence of the north-eastward Atlantic drift, the mean annual temperature being 36° F. (January 31°, July 57°). Hammerfest is 674 m. by sea N.E. of Trondhjem, and 78 S.W. from the North Cape. The character of this coast differs from the southern, the islands being fewer and larger, and of table shape. The narrow strait Strömmen separates Kvalö from the larger Seiland, whose snow-covered hills with several glaciers rise above 3500 ft., while an insular rampart of mountains, Sorö, protects the strait and harbour from the open sea. The town is timber-built and modern; and the Protestant church, town-hall, and schools were all rebuilt after fire in 1890. There is also a Roman Catholic church. The sun does not set at Hammerfest from the 13th of May to the 29th of July. This is the busy season of the townsfolk. Vessels set out to the fisheries, as far as Spitsbergen and the Kara Sea; and trade is brisk, not only Norwegian and Danish but British, German and particularly Russian vessels engaging in it. Cod-liver oil and salted fish are exported with some reindeer-skins, fox-skins and eiderdown; and coal and salt for curing are imported. In the spring the great herds of tame reindeer are driven out to swim Strömmen and graze in the summer pastures of Seiland; towards winter they are called home again. From the 18th of November to the 23rd of January the sun is not seen, and the enforced quiet of winter prevails. Electric light was introduced in the town in 1891. On the Fuglenaes or Birds' Cape, which protects the harbour on the north, there stands a column with an inscription in Norse and Latin, stating that Hammerfest was one of the stations of the

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expedition for the measurement of the arc of the meridian in 1816–1852. Nor is this its only association with science; for it was one of the spots chosen by Sir Edward Sabine for his series of pendulum experiments in 1823. The ascent of the Sadlen or the Tyven in the neighbourhood is usually undertaken by travellers for the view of the barren, snow-clad Arctic landscape, the bluff indented coast, and the vast expanse of the Arctic Ocean.

HAMMER-KOP, or HAMMERHEAD, an African bird, which has been regarded as a stork and as a heron, the *Scopus umbretta* of ornithologists, called the "Umbre" by T. Pennant, now placed in a separate family *Scopidae* between the herons and storks. It was discovered by M. Adanson, the French traveller, in Senegal about the middle of the 19th century, and was described by M. J. Brisson in 1760. It has since been found to inhabit nearly the whole of Africa and Madagascar, and is the "hammerkop" (hammerhead) of the Cape colonists. Though not larger than a raven, it builds an enormous nest, some six feet in diameter, with a flat-topped roof and a small hole for entrance and exit, and placed either on a tree or a rocky ledge. The bird, of an almost uniform brown colour, slightly glossed with purple and its tail barred with black, has a long occipital crest, generally borne horizontally, so as to give rise to its common name. It is somewhat sluggish by day, but displays much activity at dusk, when it will go through a series of strange performances. (A. N.)

HAMMER-PURGSTALL, JOSEPH, FREIHERR VON (1774–1856), Austrian orientalist, was born at Graz on the 9th of June 1774, the son of Joseph Johann von Hammer, and received his early education mainly in Vienna. Entering the diplomatic service in 1796, he was appointed in 1799 to a position in the Austrian embassy in Constantinople, and in this capacity he took part in the expedition under Admiral Sir William Sidney Smith and General Sir John Hely Hutchinson against the French. In 1807 he returned home from the East, after which he was made a privy councillor, and, on inheriting in 1835 the estates of the countess Purgstall in Styria, was given the title of "freiherr." In 1847 he was elected president of the newly-founded academy, and he died at Vienna on the 23rd of November 1856.

For fifty years Hammer-Purgstall wrote incessantly on the most diverse subjects and published numerous texts and translations of Arabic, Persian and Turkish authors. It was natural that a scholar who traversed so large a field should lay himself open to the criticism of specialists, and he was severely handled by Friedrich Christian Diez (1794–1876), who, in his *Urfus und Betrug* (1815), devoted to him nearly 600 pages of abuse. Von Hammer-Purgstall did for Germany the same work that Sir William Jones (q.v.) did for England and Silvestre de Sacy for France. He was, like his younger but greater English contemporary, Edward William Lane, with whom he came into friendly conflict on the subject of the origin of *The Thousand and One Nights*, an assiduous worker, and in spite of many faults did more for oriental studies than most of his critics put together.

Von Hammer's principal work is his *Geschichte des osmanischen Reiches* (10 vols., Pesth, 1827–1835). Another edition of this was published at Pesth in 1834–1835, and it has been translated into French by J. J. Hellert (1835–1843). Among his other works are *Constantinopolis und der Bosporos* (1822); *Sur les origines russes* (St Petersburg, 1825); *Geschichte der osmanischen Dichtkunst* (1836); *Geschichte der Goldenen Horde in Kiptschak* (1840); *Geschichte der Chane der Krim* (1856); and an unfinished *Litteraturgeschichte der Araber* (1850–1856). His *Geschichte der Assassinen* (1818) has been translated into English by O. C. Wood (1835). Texts and translations—*Ein-Thadlabi*, Arab. and Ger. (1829); *Ibn Wahshiyah, History of the Mongols*, Arab. and Eng. (1806); *Ed-Wardiff*, Pers. and Ger. (1836); *Esch-Schirasi's Rosenflor des Geheimnisses*, Pers. and Ger. (1838); *Es-Zamakhshari, Goldene Halsbänder*, Arab. and Germ. (1835); *El-Ghazzáli, Hujjet-el-Islám*, Arab. and Ger. (1838); *El-Hamawi, Das arab. Hohe Lied der Liebe*, Arab. and Ger. (1854). Translations of—*El-Mutanebbi's Poems*; *Er-Reimi's Account of his Embassy* (1809); *Contes inédits des 1001 nuits* (1828). Besides these and smaller works, von Hammer contributed numerous essays and criticisms to the *Fundgruben des Orients*, which he edited; to the *Journal asiatique*; and to many other learned journals; above all to the *Transactions* of the "Akademie der Wissenschaften" of Vienna, of which he was mainly the founder; and he translated Evliya Effendi's *Travels in Europe*, for the English Oriental Translation Fund. For a fuller list of his works, which amount in all to nearly 100 volumes, see *Comptes rendus* of the Acad. des Inscr. et des Belles-Lettres (1857). See also Schlottman, *Joseph von Hammer-Purgstall* (Zurich, 1857).

HAMMERSMITH, a western metropolitan borough of London, England, bounded E. by Kensington and S. by Fulham and the river Thames, and extending N. and W. to the boundary of the county of London. Pop. (1901) 112,239. The name appears in the early forms of *Hermodesmede* and *Hamersmith*; the derivation is probably from the Anglo-Saxon, signifying the place with a haven (*hythe*). Hammersmith is mentioned with Fulham as a winter camp of Danish invaders in 879, when they occupied the island of Hame, which may be identified with Chiswick Eyot. Hammersmith consists of residential streets of various classes. There are many good houses in the districts of Brook Green in the south-east, and Ravenscourt Park and Starch Green in the west. Shepherd's Bush in the east is a populous and poorer quarter. Boat-building yards, lead-mills, oil mills, distilleries, coach factories, motor works, and other industrial establishments are found along the river and elsewhere in the borough. The main thoroughfares are Uxbridge Road and Goldhawk Road, from Acton on the west, converging at Shepherd's Bush and continuing towards Notting Hill; King Street from Chiswick on the south-west, continued as Hammersmith Broadway and Road to Kensington Road; Bridge Road from Hammersmith Bridge over the Thames, and Fulham Palace Road from Fulham, converging at the Broadway. Old Hammersmith Bridge, designed by Tierney Clark (1824), was the earliest suspension bridge erected near London. This bridge was found insecure and replaced in 1884–1887. Until 1834 Hammersmith formed part of Fulham parish. Its church of St Paul was built as a chapel of ease to Fulham, and consecrated by Laud in 1631. The existing building dates from 1890. Among the old monuments preserved is that of Sir Nicholas Crispe (d. 1665), a prominent royalist during the civil wars and a benefactor of the parish. Schools and religious houses are numerous. St Paul's school is one of the principal public schools in England. It was founded in or about 1509 by John Colet, dean of St Paul's, under the shadow of the cathedral church. But it appears that Colet actually refounded and reorganized a school which had been attached to the cathedral of St Paul from very early times; the first mention of such a school dates from the early part of the 12th century (see an article in *The Times*, London, July 7, 1909, on the occasion of the celebration of the quatercentenary of Colet's foundation). The school was moved to its present site in Hammersmith Road in 1883. The number of foundation scholars, that is, the number for which Colet's endowment provided, is 153, according to the number of fishes taken in the miraculous draught. The total number of pupils is about 600. The school governors are appointed by the Mercers' Company (by which body the new site was acquired), and the universities of Oxford, Cambridge and London. Close to the school is St Paul's preparatory school, and at Brook Green is a girls' school in connexion with the main school. There are, besides, the Edward Latymer foundation school for boys (1624), part of the income of which is devoted to general charitable purposes; the Godolphin school, founded in the 16th century and remodelled as a grammar school in 1861; Nazareth House of Little Sisters of the Poor, the Convent of the Sacred Heart, and other convents. The town hall, the West London hospital with its post-graduate college, and Wormwood Scrubbs prison are noteworthy buildings. Other institutions are the Hammersmith school of art and a Roman Catholic training college. Besides the picturesque Ravenscourt Park (31 acres) there are extensive recreation grounds in the north of the borough at Wormwood Scrubbs (103 acres), and others of lesser extent. An important place of entertainment is Olympia, near Hammersmith Road and the Addison Road station on the West London railway, which includes a vast arena under a glass roof; while at Shepherd's Bush are the extensive grounds and buildings first occupied by the Franco-British Exhibition of 1908, including

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a huge stadium for athletic displays. In the extreme north of the borough is the Kensal Green Roman Catholic cemetery, in which Cardinal Manning and many other prominent members of this faith are buried. In the neighbourhood of the Mall, bordering the river, are the house where Thomson wrote his poem "The Seasons," and Kelmscott House, the residence of William Morris. The parliamentary borough of Hammersmith returns one member. The borough council consists of a mayor, 5 aldermen, and 30 councillors. Area, 2286·3 acres.

HAMMER-THROWING, a branch of field athletics which consists of hurling to the greatest possible distance an instrument with a heavy head and slender handle called the hammer. Throwing the hammer is in all probability of Keltic origin, as it has been popular in Ireland and Scotland for many centuries. The missile was, however, not a hammer, but the wheel of a chariot attached to a fixed axle, by which it was whirled round the head and cast for distance. Such a sport was undoubtedly cultivated in the old Irish games, a large stone being substituted for the wheel at the beginning of the Christian era. In the Scottish highlands the missile took the form of a smith's sledge-hammer, and in this form the sport became popular in England in early days. Edward II. is said to have fostered it, and Henry VIII. is known to have been proficient. At the beginning of the 19th century two standard hammers were generally recognized in Scotland, the heavy hammer, weighing about 21 lb, and the light hammer, weighing about 16 lb. These were in general use until about 1885, although the light hammer gradually attained popularity at the expense of the heavy. Although originally an ordinary blacksmith's sledge with a handle about 3 ft. long, the form of the head was gradually modified until it acquired its present spherical shape, and the stiff wooden handle gave place to one of flexible whalebone about ⅛ in. in diameter. The Scottish style of throwing, which also obtained in America, was to stand on a mark, swing the hammer round the head several times and hurl it backwards over the shoulder, the length being measured from the mark made by the falling hammer to the nearest foot of the thrower, no run or follow being allowed. Such men as Donald Dinnie, G. Davidson and Kenneth McRae threw the light hammer over 110 ft., and Dinnie's record was 132 ft. 8 in., made, however, from a raised mound. Meanwhile the English Amateur Athletic Association had early fixed the weight of the hammer at 16 lb, but the length of the handle and the run varied widely, the restrictions being few. Under these conditions S. S. Brown, of Oxford, made in 1873 a throw of 120 ft., which was considered extraordinary at the time. In 1875 the throw was made from a 7-ft. circle without run, head and handle of the missile weighing together exactly 16 lb. In 1887 the circle was enlarged to 9 ft., and in 1896 a handle of flexible metal was legalized. The throw was made after a few rapid revolutions of the body, which added an impetus that greatly added to the distance attained. It thus happened that the Scottish competitors at the English games, who clung to their standing style of throwing, were, although athletes of the very first class, repeatedly beaten; the result being that the Scottish association was forced to introduce the English rules. This was also the case in America, where the throw from the 7-ft. circle, any motions being allowed within it, was adopted in 1888, and still obtains. The Americans still further modified the handle, which now consists of steel wire with two skeleton loops for the hands, the wire being joined to the head by means of a ball-bearing swivel. Thus the greatest mechanical advantage, that of having the entire weight of the missile at the end, as well as the least friction, is obtained. In England the Amateur Athletic Association in 1908 enacted that "the head and handle may be of any size, shape and material, provided that the complete implement shall not be more than 4 ft. and its weight not less than 16 lb. The competitor may assume any position he chooses, and use either one or both hands. All throws shall be made from a circle 7 ft. in diameter." The modern hammer-thrower, if right-handed, begins by placing the head on the ground at his right side. He then lifts and swings it round his head with increasing rapidity, his whole body finally revolving with outstretched arms twice, in some cases three times, as rapidly as possible, the hammer being released in the desired direction. During the "spinning," or revolving of the body, the athlete must be constantly, "ahead of the hammer," *i.e.* he must be drawing it after him with continually increased pressure up to the very moment of delivery. The muscles chiefly called into play are those of the shoulders, back and loins. The adoption of the hand-loops has given the thrower greater control over the hammer and has thus rendered the sport much less dangerous than it once was.

With a wooden handle the longest throw made in Great Britain from a 9-ft. circle was that of W. J. M. Barry in 1892, who won the championship in that year with 133 ft. 3 in. With the flexible handle, "unlimited run and follow" being permitted, the record was held in 1909 by M. J. McGrath with 175 ft. 8 in., made in 1907; a Scottish amateur, T. R. Nicholson, held the British record of 169 ft. 8 in. The world's record for throw from a 7-ft. circle was 172 ft. 11 in. by J. Flanagan in 1904 in America; the British record from 9-ft. circle being also held by Flanagan with a throw of 163 ft. 1 in. made in 1900. Flanagan's Olympic record (London, 1908) was 170 ft. 4½ in.

See *Athletics* in the Badminton library; *Athletes' Guide* in Spalding's Athletic library; "Hammer-Throwing" in vol. xx. of *Outing*.

HAMMER-TOE, a painful condition in which a toe is rigidly bent and the salient angle on its upper aspect is constantly irritated by the boot. It is treated surgically, not as formerly by amputation of the toe, but the toe is made permanently to lie flat by the simple excision of the small digital joint. Even in extremely bad cases of hammer-toe the operation of resection of the head of the metatarsal phalanx is to be recommended rather than amputation.

HAMMOCK, a bed or couch slung from each end. The word is said to have been derived from the hamack tree, the bark of which was used by the aboriginal natives of Brazil to form the nets, suspended from trees, in which they slept. The hammock may be of matting, skin or textiles, lined with cushions or filled with bedding. It is much used in hot climates.

HAMMOND, HENRY (1605–1660), English divine, was born at Chertsey in Surrey on the 18th of August 1605. He was educated at Eton and at Magdalen College, Oxford, becoming demy or scholar in 1619, and fellow in 1625. He took orders in 1629, and in 1633 in preaching before the court so won the approval of the earl of Leicester that he presented him to the living of Penshurst in Kent. In 1643 he was made archdeacon of Chichester. He was a member of the convocation of 1640, and was nominated one of the Westminster Assembly of divines. Instead of sitting at Westminster he took part in the unsuccessful rising at Tunbridge in favour of King Charles I., and was obliged to flee in disguise to Oxford, then the royal headquarters. There he spent much of his time in writing, though he accompanied the king's commissioners to London, and afterwards to the ineffectual convention at Uxbridge in 1645, where he disputed with Richard Vines, one of the parliamentary envoys. In his absence he was appointed canon of Christ Church and public orator of the university. These dignities he relinquished for a time in order to attend the king as chaplain during his captivity in the hands of the parliament. When Charles was deprived of all his loyal attendants at Christmas 1647, Hammond returned to Oxford and was made subdean of Christ Church, only, however, to be removed from all his offices by the parliamentary visitors, who imprisoned him for ten weeks. Afterwards he was permitted, though still under quasi-confinement, to retire to the house of Philip Warwick at Clapham in Bedfordshire. In 1650, having regained his full liberty, Hammond betook himself to the friendly mansion of Sir John Pakington, at Westwood, in Worcestershire, where he died on the 25th of April 1660, just on the eve of his preferment to the see of Worcester. Hammond was held in high esteem even by his opponents. He was handsome in person and benevolent in disposition. He was an excellent preacher; Charles I. pronounced him the most natural orator he had ever heard. His range of reading was extensive, and he was a most diligent scholar and writer.

His writings, published in 4 vols. fol. (1674–1684), consist for the most part of controversial sermons and tracts. The *Anglo-Catholic*

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Library contains four volumes of his *Miscellaneous Theological Works* (1847–1850). The best of them are his *Practical Catechism*, first published in 1644; his *Paraphrase and Annotations on the New Testament*; and an incomplete work of a similar nature on the Old Testament. His *Life*, a delightful piece of biography, written by Bishop Fell, and prefixed to the collected *Works*, has been reprinted in vol. iv. of Wordsworth's *Ecclesiastical Biography*. See also *Life of Henry Hammond*, by G. G. Perry.

HAMMOND, a city of Lake county, Indiana, U.S.A., about 18 m. S.E. of the business centre of Chicago, on the Grand Calumet river. Pop. (1890), 5428; (1900) 12,376, of whom 1156 were foreign-born; (1910, census) 20,925. It is served by no fewer than eight railways approaching Chicago from the east, and by several belt lines. As far as its industries are concerned, it is a part of Chicago, to which fact it owes its rapid growth and its extensive manufacturing establishments, which include slaughtering and packing houses, iron and steel works, chemical works, piano, wagon and carriage factories, printing establishments, flour and starch mills, glue works, breweries and distilleries. In 1900 Hammond was the principal slaughtering and meat-packing centre of the state, but subsequently a large establishment removed from the city, and Hammond's total factory product (all industries) decreased from $25,070,551 in 1900 to $7,671,203 in 1905; after 1905 there was renewed growth in the city's manufacturing interests. It has a good water-supply system which is owned by the city. Hammond was first settled about 1868, was named in honour of Abram A. Hammond (acting governor of the state in 1860–1861) and was chartered as a city in 1884.

HAMON, JEAN LOUIS (1821–1874), French painter, was born at Plouha on the 5th of May 1821. At an early age he was intended for the priesthood, and placed under the care of the brothers Lamennais, but his strong desire to become a painter finally triumphed over family opposition, and in 1840 he courageously left Plouha for Paris—his sole resources being a pension of five hundred francs, granted him for one year only by the municipality of his native town. At Paris Hamon received valuable counsels and encouragement from Delaroche and Gleyre, and in 1848 he made his appearance at the Salon with "Le Tombeau du Christ" (Musée de Marseille), and a decorative work, "Dessus de Porte." The works which he exhibited in 1849—"Une Affiche romaine," "L'Égalité au sérail," and "Perroquet jasant avec deux jeunes filles"—obtained no marked success. Hamon was therefore content to accept a place in the manufactory of Sèvres, but an enamelled casket by his hand having attracted notice at the London International Exhibition of 1851, he received a medal, and, reinspired by success, left his post to try his chances again at the Salon of 1852. "La Comédie humaine," which he then exhibited, turned the tide of his fortune, and "Ma sœur n'y est pas" (purchased by the emperor) obtained for its author a third-class medal in 1853. At the Paris International Exhibition of 1855, when Hamon re-exhibited the casket of 1851, together with several vases and pictures of which "L'Amour et son troupeau," "Ce n'est pas moi," and "Une Gardeuse d'enfants" were the chief, he received a medal of the second class, and the ribbon of the legion of honour. In the following year he was absent in the East, but in 1857 he reappeared with "Boutique à quatre sous," "Papillon enchaîné," "Cantharide esclave," "Dévideuses," &c., in all ten pictures; "L'Amour en visite" was contributed to the Salon of 1859, and "Vierge de Lesbos," "Tutelle," "La Volière," "L'Escamoteur" and "La Sœur aînée" were all seen in 1861. Hamon now spent some time in Italy, chiefly at Capri, whence in 1864 he sent to Paris "L'Aurore" and "Un Jour de fiançailles." The influence of Italy was also evident in "Les Muses à Pompéi," his sole contribution to the Salon of 1866, a work which enjoyed great popularity and was re-exhibited at the International Exhibition of 1867, together with "La Promenade" and six other pictures of previous years. His last work, "Le Triste Rivage," appeared at the Salon of 1873. It was painted at St Raphael, where Hamon had finally settled in a little house on the shores of the Mediterranean, close by Alphonse Karr's famous garden. In this house he died on the 29th of May 1874.

HAMPDEN, HENRY BOUVERIE WILLIAM BRAND, 1ST VISCOUNT[1] (1812–1892), speaker of the House of Commons, was the second son of the 21st Baron Dacre, and descended from John Hampden, the patriot, in the female line; the barony of Dacre devolved on him in 1890, after he had been created Viscount Hampden in 1884. He entered parliament as a Liberal in 1852, and for some time was chief whip of his party. In 1872 he was elected speaker, and retained this post till February 1884. It fell to him to deal with the systematic obstruction of the Irish Nationalist party, and his speakership is memorable for his action on the 2nd of February 1881 in refusing further debate on W. E. Forster's Coercion Bill—a step which led to the formal introduction of the closure into parliamentary procedure. He died on the 14th of March 1892, being succeeded as 2nd viscount by his son (*b.* 1841), who was governor of New South Wales, 1895–1899.

HAMPDEN, JOHN (*c.* 1595–1643), English statesman, the eldest son of William Hampden, of Great Hampden in Buckinghamshire, a descendant of a very ancient family of that place, said to have been established there before the Conquest, and of Elizabeth, second daughter of Sir Henry Cromwell, and aunt of Oliver, the future protector, was born about the year 1595. By his father's death, when he was but a child, he became the owner of a good estate and a ward of the crown. He was educated at the grammar school at Thame, and on the 30th of March 1610 became a commoner of Magdalen College at Oxford. In 1613 he was admitted a student of the Inner Temple. He first sat in parliament for the borough of Grampound in 1621, representing later Wendover in the first three parliaments of Charles I., Buckinghamshire in the Short Parliament of 1640, and Wendover again in the Long Parliament. In the early days of his parliamentary career he was content to be overshadowed by Eliot, as in its later days he was content to be overshadowed by Pym and to be commanded by Essex. Yet it is Hampden, and not Eliot or Pym, who lives in the popular imagination as the central figure of the English revolution in its earlier stages. It is Hampden whose statue rather than that of Eliot or Pym has been selected to take its place in St Stephen's Hall as the noblest type of the parliamentary opposition, as Falkland's has been selected as the noblest type of parliamentary royalism.

Something of Hampden's fame no doubt is owing to the position which he took up as the opponent of ship-money. But it is hardly possible that even resistance to ship-money would have so distinguished him but for the mingled massiveness and modesty of his character, his dislike of all pretences in himself or others, his brave contempt of danger, and his charitable readiness to shield others as far as possible from the evil consequences of their actions. Nor was he wanting in that skill which enabled him to influence men towards the ends at which he aimed, and which was spoken of as subtlety by those who disliked his ends.

During these first parliaments Hampden did not, so far as we know, open his lips in public debate, but he was increasingly employed in committee work, for which he seems to have had a special aptitude. In 1626 he took an active part in the preparation of the charges against Buckingham. In January 1627 he was bound over to answer at the council board for his refusal to pay the forced loan. Later in the year he was committed to the gatehouse, and then sent into confinement in Hampshire, from which he was liberated just before the meeting of the third parliament of the reign, in which he once more rendered useful but unobtrusive assistance to his leaders.

When the breach came in 1629 Hampden is found in epistolary correspondence with the imprisoned Eliot, discussing with him the prospects of the Massachusetts colony,[2] or rendering

[1] An earlier viscountcy was bestowed in 1776 on Robert Hampden-Trevor, 4th Baron Trevor (1706–1783), a great-grandson of the daughter of John Hampden, the patriot; it became extinct in 1824 by the death of the 3rd viscount.

[2] Hampden was one of the persons to whom the earl of Warwick granted land in Connecticut, but for the anecdote which relates his attempted emigration with Cromwell there is no foundation (*v.* under JOHN PYM).

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hospitality and giving counsel to the patriot's sons now that they were deprived of a father's personal care. It was not till 1637, however, that his resistance to the payment of ship-money gained for his name the lustre which it has never since lost. (See SHIP-MONEY.) Seven out of the twelve judges sided against him, but the connexion between the rights of property and the parliamentary system was firmly established in the popular mind. The tax had been justified, says Clarendon, who expresses his admiration at Hampden's "rare temper and modesty" at this crisis, "upon such grounds and reasons as every standerby was able to swear was not law" (*Hist.* i. 150, vii. 82).

In the Short Parliament of 1640 Hampden stood forth amongst the leaders. He guided the House in the debate on the 4th of May in its opposition to the grant of twelve subsidies in return for the surrender of ship-money. Parliament was dissolved the next day, and on the 6th an unsuccessful search was made among the papers of Hampden and of other chiefs of the party to discover incriminating correspondence with the Scots. During the eventful months which followed, when Strafford was striving in vain to force England, in spite of its visible reluctance, to support the king in his Scottish war, rumour has much to tell of Hampden's activity in rousing opposition. It is likely enough that the rumour is in the main true, but we are not possessed of any satisfactory evidence on the subject.

In the Long Parliament, though Hampden was by no means a frequent speaker, it is possible to trace his course with sufficient distinctness. His power consisted in his personal influence, and as a debater rather than as an orator. "He was not a man of many words," says Clarendon, "and rarely began the discourse or made the first entrance upon any business that was assumed, but a very weighty speaker, and after he had heard a full debate and observed how the House was likely to be inclined, took up the argument and shortly and clearly and craftily so stated it that he commonly conducted it to the conclusion he desired; and if he found he could not do that, he never was without the dexterity to divert the debate to another time, and to prevent the determining anything in the negative which might prove inconvenient in the future" (*Hist.* iii. 31). Unwearied in attendance upon committees, he was in all things ready to second Pym, whom he plainly regarded as his leader. Hampden was one of the eight managers of Strafford's prosecution. Like Pym, he was in favour of the more legal and regular procedure by impeachment rather than by attainder, which at the later stage was supported by the majority of the Commons; and through his influence a compromise was effected by which, while an attainder was subsequently adopted, Strafford's counsel were heard as in the case of an impeachment, and thus a serious breach between the two Houses, which threatened to cause the breakdown of the whole proceedings, was averted.

There was another point on which there was no agreement. A large minority wished to retain Episcopacy, and to keep the common Prayer Book unaltered, whilst the majority were at least willing to consider the question of abolishing the one and modifying the other. On this subject the parties which ultimately divided the House and the country itself were fully formed as early as the 8th of February 1641. It is enough to say that (*v.* under PYM) Hampden fully shared in the counsels of the opponents of Episcopacy. It is not that he was a theoretical Presbyterian, but the bishops had been in his days so fully engaged in the imposition of obnoxious ceremonies that it was difficult, if not impossible, to dissociate them from the cause in which they were embarked. Closely connected with Hampden's distrust of the bishops was his distrust of monarchy as it then existed. The dispute about the church therefore soon attained the form of an attack upon monarchy, and, when the majority of the House of Lords arrayed itself on the side of Episcopacy and the Prayer Book, of an attack upon the House of Lords as well.

No serious importance therefore can be attached to the offers of advancement made from time to time to Hampden and his friends. Charles would gladly have given them office if they had been ready to desert their principles. Every day Hampden's conviction grew stronger that Charles would never abandon the position which he had taken up. In August 1640 Hampden was one of the four commissioners who attended Charles in Scotland, and the king's conduct there, connected with such events as the "Incident," must have proved to a man far less sagacious than Hampden that the time for compromise had gone by. He was therefore a warm supporter of the Grand Remonstrance, and was marked out as one of the five impeached members whose attempted arrest brought at last the opposing parties into open collision (see also PYM, STRODE, HOLLES and LENTHALL). In the angry scene which arose on the proposal to print the Grand Remonstrance, it was Hampden's personal intervention which prevented an actual conflict, and it was after the impeachment had been attempted that Hampden laid down the two conditions under which resistance to the king became the duty of a good subject. Those conditions were an attack upon religion and an attack upon the fundamental laws. There can be no doubt that Hampden fully believed that both those conditions were fulfilled at the opening of 1642.

When the Civil War began, Hampden was appointed a member of the committee for safety, levied a regiment of Buckinghamshire men for the parliamentary cause, and in his capacity of deputy-lieutenant carried out the parliamentary militia ordinance in the county. In the earlier operations of the war he bore himself gallantly and well. He took no actual part in the battle of Edgehill. His troops in the rear, however, arrested Rupert's charge at Kineton, and he urged Essex to renew the attack here, and also after the disaster at Brentford. In 1643 he was present at the siege and capture of Reading. But it is not on his skill as a regimental officer that Hampden's fame rests. In war as in peace his distinction lay in his power of disentangling the essential part from the non-essential. In the previous constitutional struggle he had seen that the one thing necessary was to establish the supremacy of the House of Commons. In the military struggle which followed he saw, as Cromwell saw afterwards, that the one thing necessary was to beat the enemy. He protested at once against Essex's hesitations and compromises. In the formation of the confederacy of the six associated counties, which was to supply a basis for Cromwell's operations, he took an active part. His influence was felt alike in parliament and in the field. But he was not in supreme command, and he had none of that impatience which often leads able men to fail in the execution of orders of which they disapprove. His precious life was a sacrifice to his unselfish devotion to the call of discipline and duty. On the 18th of June 1643, when he was holding out on Chalgrove Field against the superior numbers of Rupert till reinforcements arrived, he received two carbine balls in the shoulder. Leaving the field he reached Thame, survived six days, and died on the 24th.

Hampden married (1) in 1619 Elizabeth, daughter of Edmund Symeon of Pyrton, Oxfordshire, and (2) Letitia, daughter of Sir Francis Knollys and widow of Sir Thomas Vachell. By his first wife he had nine children, one of whom, Richard (1632–1695) was chancellor of the exchequer in William III.'s reign; from two of his daughters are descended the families of Trevor-Hampden and Hobart-Hampden, the descent in the male line becoming apparently extinct in 1754 in the person of John Hampden.

JOHN HAMPDEN the younger (*c.* 1656–1696), the second son of Richard Hampden, returned to England after residing for about two years in France, and joined himself to Lord William Russell and Algernon Sidney and the party opposed to the arbitrary government of Charles II. With Russell and Sidney he was arrested in 1683 for alleged complicity in the Rye House Plot, but more fortunate than his colleagues his life was spared, although as he was unable to pay the fine of £40,000 which was imposed upon him he remained in prison. Then in 1685, after the failure of Monmouth's rising, Hampden was again brought to trial, and on a charge of high treason was condemned to death. But the sentence was not carried out, and having paid £6000 he was set at liberty. In the Convention parliament of 1689 he represented Wendover, but in the subsequent parliaments he

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failed to secure a seat. He died by his own hand on the 12th of December 1666. Hampden wrote numerous pamphlets, and Bishop Burnet described him as "one of the learnedest gentlemen I ever knew."

See S. R. Gardiner's *Hist. of England* and *of the Great Civil War*; the article on Hampden in the *Dict. of Nat. Biography*, by C. H. Firth, with authorities there collected; Clarendon's *Hist. of the Rebellion*; Sir Philip Warwick's *Mems.* p. 239; Wood's *Ath. Oxon.* iii. 59; Lord Nugent's *Memorials of John Hampden* (1831); Macaulay's *Essay on Hampden* (1831). The printed pamphlet announcing his capture of Reading in December 1642 is shown by Mr Firth to be spurious, and the account in *Mercurius Aulicus*, January 27 and 29, 1643, of Hampden commanding an attack at Brill, to be also false, while the published speech supposed to be spoken by Hampden on the 4th of January 1642, and reproduced by Forster in the *Arrest of the Five Members* (1860), has been proved by Gardiner to be a forgery (*Hist. of England*, x. 135). Mr Firth has also shown in *The Academy* for 1889, November 2 and 9, that "the belief that we possess the words of Hampden's last prayer must be abandoned."

HAMPDEN, RENN DICKSON (1793–1868), English divine, was born in Barbados, where his father was colonel of militia, in 1793, and was educated at Oriel College, Oxford. Having taken his B.A. degree with first-class honours in both classics and mathematics in 1813, he next year obtained the chancellor's prize for a Latin essay, and shortly afterwards was elected to a fellowship in his college, Keble, Newman and Arnold being among his contemporaries. Having left the university in 1816 he held successively a number of curacies, and in 1827 he published *Essays on the Philosophical Evidence of Christianity*, followed by a volume of *Parochial Sermons illustrative of the Importance of the Revelation of God in Jesus Christ* (1828). In 1829 he returned to Oxford and was Bampton lecturer in 1832. Notwithstanding a charge of Arianism now brought against him by the Tractarian party, he in 1834 passed from a fellowship at Oriel to the principalship of St Mary's Hall. In 1834 he was appointed professor of moral philosophy, and despite much university opposition, Regius professor of divinity in 1836. There resulted a widespread and violent though ephemeral controversy, after the subsidence of which he published a *Lecture on Tradition*, which passed through several editions, and a volume on *The Thirty-nine Articles of the Church of England*. His nomination by Lord John Russell to the vacant see of Hereford in December 1847 was again the signal for a violent and organized opposition; and his consecration in March 1848 took place in spite of a remonstrance by many of the bishops and the resistance of Dr John Merewether, the dean of Hereford, who went so far as to vote against the election when the *congé d'élire* reached the chapter. As bishop of Hereford Dr Hampden made no change in his long-formed habits of studious seclusion, and though he showed no special ecclesiastical activity or zeal, the diocese certainly prospered in his charge. Among the more important of his later writings were the articles on Aristotle, Plato and Socrates, contributed to the eighth edition of the *Encyclopaedia Britannica*, and afterwards reprinted with additions under the title of *The Fathers of Greek Philosophy* (Edinburgh, 1862). In 1866 he had a paralytic seizure, and died in London on the 23rd of April 1868.

His daughter, Henrietta Hampden, published *Some Memorials of R. D. Hampden* in 1871.

HAMPDEN-SIDNEY, a village of Prince Edward county, Virginia, U.S.A., about 70 m. S.W. of Richmond. Pop. about 350. Daily stages connect the village with Farmville (pop. in 1910, 2071), the county-seat, 6 m. N.E., which is served by the Norfolk & Western and the Tidewater & Western railways. Hampden-Sidney is the seat of Hampden-Sidney College, founded by the presbytery of Hanover county as Hampden-Sidney Academy in 1776, and named in honour of John Hampden and Algernon Sidney. It was incorporated as Hampden-Sidney College in 1783. The incorporators included James Madison, Patrick Henry (who is believed to have drafted the college charter), Paul Carrington, William Cabell, Sen., and Nathaniel Venable. The Union Theological School was established in connexion with the college in 1812, but in 1898 was removed to Richmond, Virginia. In 1907–1908 the college had 8 instructors, 125 students, and a library of 11,000 volumes. The college has maintained a high standard of instruction, and many of its former students have been prominent as public men, educationalists and preachers. Among them were President William Henry Harrison, William H. Cabell (1772–1853), president of the Virginia Court of Appeals; George M. Bibb (1772–1850), secretary of the treasury (1844–1845) in President Tyler's cabinet; William B. Preston (1805–1862), secretary of the navy in 1849–1850; William Cabell Rives and General Sterling Price (1809–1867).

HAMPSHIRE (or COUNTY OF SOUTHAMPTON, abbreviated HANTS), a southern county of England, bounded N. by Berkshire, E. by Surrey and Sussex, S. by the English Channel, and W. by Dorsetshire and Wiltshire. The area is 1623·5 sq. m. From the coast of the mainland, which is for the most part low and irregular, a strait, known in its western part as the Solent, and in its eastern as Spithead, separates the Isle of Wight. This island is included in the county. The inlet of Southampton Water opens from this strait, penetrating inland in a north-westerly direction for 12 m. The easterly part of the coast forms a large shallow bay containing Hayling and Portsea Islands, which divide it into Chichester Harbour, Langston Harbour and Portsmouth Harbour. The westerly part forms the more regular indentations of Christchurch Bay and part of Poole Bay. In its general aspect Hampshire presents a beautiful variety of gently rising hills and fruitful valleys, adorned with numerous mansions and pleasant villages, and interspersed with extensive tracts of woodland. Low ranges of hills, included in the system to which the general name of the Western Downs is given, reach their greatest elevation in the northern and eastern parts of the county, where there are many picturesque eminences, of which Beacon Hill, 974 ft., near Highclere in the north-west, each exceeding 850 ft., are the highest. The portion of the county west of Southampton Water is almost wholly included in the New Forest, a sequestered district, one of the few remaining examples of an ancient afforested tract. The river Avon in the south-west rises in Wiltshire, and passing Fordingbridge and Ringwood falls into Christchurch Bay below Christchurch, being joined close to its mouth by the Stour. The Lymington or Boldre river rises in the New Forest, and after collecting the waters of several brooks falls into the Solent through Lymington Creek. The Beaulieu in the eastern part of the forest also enters the Solent by way of a long and picturesque estuary. The Test rises near Overton in the north, and after its junction with the Anton at Fullerton passes Stockbridge and Romsey, and enters the head of Southampton Water. The Itchen rises near Alresford, and flowing by Winchester and Eastleigh falls into Southampton Water east of Southampton. The Hamble rises near Bishops Waltham, and soon forms a narrow estuary opening into Southampton Water. The Wey, the Loddon and the Blackwater, rising in the north-eastern part of the county, bring that part into the basin of the Thames. The streams from the chalk hills run clear and swift, and the trout-fishing in the county is famous. Salmon are taken in the Avon.

Geology.—Somewhat to the north of the centre of the county is a broad expanse of hilly chalk country about 21 m. wide; the whole of it has been bent up into a great fold so that the strata on the north dip northward steeply in places, while those on the south dip in the opposite direction more gently. In the north the chalk disappears beneath Tertiary strata of the "London Basin," and some little distance south of Winchester it runs in a similar manner beneath the Tertiaries of the "Hampshire Basin." Scattered here and there over the chalk are small outlying remnants which remain to show that the two Tertiary areas were once continuous, before the agencies of denudation had removed them from the chalk. These same agencies have exposed the strata beneath the chalk over a small area on the eastern border.

The oldest formation in Hampshire is the Lower Greensand in the neighbourhood of Woolmer Forest and Petersfield; it is represented by the Hythe beds, sandstones and limestones which form the high ridge which runs on towards Hind Head, then by the sands and clays of the Sandgate beds which lie in the low ground west of the ridge, and finally by the Folkestone beds; all these dip westward beneath the Gault. The last-named formation, a clay, worked here and there for bricks, crops out as a narrow band from Fareham through Worldham and Stroud common to Petersfield.

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Between the Gault and the chalk is the Upper Greensand with a hard bed of calcareous sandstone, the Malm rock, which stands up in places as a prominent escarpment. The Upper Greensand is also exposed at Burghclere as an inlier; the rocks are bent into a sharp anticline and the chalk, having been denuded from its crest, the older sandy strata are brought to light. A much more gentle anticline brings up the chalk through the Tertiary rocks in the neighbourhood of Fareham. Besides occupying the central region already mentioned, which includes Basingstoke, Whitchurch, Andover, Alresford and Winchester, the chalk appears also in a small patch round Rockbourne. The Tertiary rocks of the north (London basin) about Farnborough, Aldershot and Kingsclere, comprise the Reading beds, London clay and the more sandy Bagshot beds which cover the latter in many places, giving rise to heathy commons. The southern Tertiary rocks of the Hampshire basin include the Lower Eocene Reading beds exposed for brick-making—and the London clay which extend from the boundary of the chalk by Romsey, Bishop's Waltham, to Havant. These are succeeded towards the south by the Upper Eocene beds, the Bracklesham beds and the Barton clay. The Barton clays are noted for their abundant fossils and the Bagshot beds at Bournemouth contain numerous remains of subtropical plants. A series of clays and sands of Oligocene age (unknown in the London basin) are found in the vicinity of Lymington, Brockenhurst and Beaulieu; they include the Headon beds, with a fluvio-marine fauna, well exposed at Hordwell cliffs, and the marine beds of Brockenhurst. Numerous small outliers of Tertiary rocks are scattered over the chalk area, and many of the chalk and Tertiary areas are obscured by patches of Pleistocene deposits of Drift, gravel and alluvium.

Agriculture and Industries.—Nearly seven-tenths of the total area is under cultivation (an amount below the average of English counties) and of this area about two-fifths is in permanent pasture. The acreage under oats is roughly equal to that under wheat and barley. Small quantities of rye and hops are cultivated. Barley is usually sown after turnips, and is more grown in the uplands than in the lower levels. Beans, pease and potatoes are only grown to a small extent. On account of the number of deer preserved on the uplands there is a acreage of turnips is grown. Rotation grasses are grown chiefly in the uplands, and their acreage is greater than in any other of the southern counties of England. Sanfoin is the grass most largely grown, as it is best adapted to land with a calcareous subsoil. On the lower levels no sanfoin and scarcely any clover is grown, the hay being supplied from the rich water meadows, which are managed with great skill and attention, and give the best money return of any lands in the county. When the expansion of water can be passed over them during the winter it seldom becomes frozen, and the grasses grow during the cold weather so as to be fit for pasture before any traces of vegetation appear in the surrounding fields. Hops are grown in the eastern part of the county bordering on Surrey. Gardening is generally conducted on the best modern principles, but owing to the varieties of soil there is perhaps no county in England in which the rotation observed is more diversified, or the processes and methods more varied. Most of the farms are large, and there are a number of model farms. The waste land has been mostly brought under tillage, but a very large acreage of the ancient forests is still occupied by wood. In addition to the New Forest there are in the east Woolmer Forest and Alice Holt, in the south-east the Forest of Bere and Waltham Chase, and in the Isle of Wight Parkhurst Forest. The honey of the county is especially celebrated. Much attention is paid to the rearing of sheep and cattle. The original breed of sheep was white-faced with horns, but most of the flocks are now of a Southdown variety which have acquired certain distinct peculiarities, and are known as "short wools" or "Hampshire downs." Cattle are of no distinctive breed, and are kept largely for dairy purposes, especially for the supply of milk. The breeding and rearing of horses is widely practised, and the fattening of pigs has long been an important industry. The original breed of pigs is crossed with Berkshire, Essex and Chinese pigs. In the vicinity of the forest the pigs are fed on acorns and beechmast, and the flesh of those so reared is considered the best, though the reputation of Hampshire bacon depends chiefly on the skilful manner in which it is cured.

The manufactures are unimportant, except those carried on at Portsmouth and Gosport in connexion with the royal navy. Southampton is one of the principal ports in the kingdom. In many of the towns there are breweries and tanneries, and paper is manufactured at several places. Fancy pottery and terra-cotta are made at Fareham and Bishop's Waltham; and Ringwood is celebrated for its knitted gloves. At most of the coast towns fishing is carried on, and there are oyster beds at Havling Island. Cowes in the Isle of Wight is the station of the Royal Yacht Squadron, and has building yards for yachts and large vessels. The principal seaside resorts besides those in the Isle of Wight are Bournemouth, Milford, Lee-on-the-Solent, Southsea and South Hayling. Aldershot is the principal military training centre in the British Isles.

Communications.—Communications are provided mainly by the lines of the London & South-Western railway company, which also owns the docks at Southampton. The main line serves Farnborough, Basingstoke, Whitchurch and Andover, and a branch diverges southward from Basingstoke for Winchester, Southampton and the New Forest and Bournemouth. An alternative line from eastward to Winchester serves Aldershot, Alton and Alresford. The main Portsmouth line skirts the south-eastern border by Petersfield to Havant, where it joins the Portsmouth line of the London, Brighton & South Coast railway. The South-Western system also connects Portsmouth and Gosport with Southampton, has numerous branches in the Southampton and south-western districts, and large work shops at Eastleigh near Southampton. The Great Western company serves Basingstoke from Reading and Whitchurch, Winchester and Southampton from Didcot (working the Didcot, Newbury & Southampton line); the Midland & South-Western Junction line connects Andover with Cheltenham; and the Somerset & Dorset (also a Midland & South-Western joint line) connects Bournemouth with Bath—all these affording through communications between Southampton, Bournemouth, and the midlands and north of England. None of the rivers, except in the estuarine parts, is navigable.

Population and Administration.—The area of the ancient county is 1,039,031 acres, including the Isle of Wight. The population was 690,097 in 1891 and 797,634 in 1901. The area of the administrative county of Southampton is 958,742 acres, and that of the administrative county of the Isle of Wight 94,068 acres. The county is divided for parliamentary purposes into the following divisions: Northern or Basingstoke, Western or Andover, Eastern or Petersfield, Southern or Fareham, New Forest, and Isle of Wight, each returning one member. It also includes the parliamentary boroughs of Portsmouth and Southampton, each returning two members, and of Christchurch and Winchester, each returning one. There are 11 municipal boroughs: Andover (pop. 6509), Basingstoke (9793), Bournemouth (59,762), Christchurch (4204), Lymington (4165), Portsmouth (188,133), Romsey (4365), Southampton (104,874), Winchester (20,929), and in the Isle of Wight, Newport (10,911) and Ryde (11,043). Bournemouth, Portsmouth and Southampton are county boroughs. The following are urban districts: Aldershot (30,974), Alton (5479), Eastleigh and Bishopstoke (9317), Fareham (8246), Farnborough (11,500), Gosport and Alverstoke (28,884), Havant (3837), Itchen (13,097), Petersfield (3265), Warblington (3639); and in the Isle of Wight, Cowes (8652), East Cowes (3190), St Helen's (4652), Sandown (5006), Shanklin (4533), Ventnor (5866). The county is in the western circuit, and assizes are held at Winchester. It has one court of quarter sessions, and is divided into 14 petty sessional divisions. The boroughs of Andover, Basingstoke, Bournemouth, Lymington, Newport, Portsmouth, Romsey, Ryde, Southampton (a county in itself) and Winchester have separate commissions of the peace, and the boroughs of Andover, Bournemouth, Portsmouth, Southampton and Winchester have in addition separate courts of quarter sessions. There are 164 civil parishes. Hampshire is in the diocese of Winchester, excepting small parts in those of Oxford and Salisbury, and contains 411 ecclesiastical parishes or districts wholly or in part.

History.—The earliest English settlers in the district which is now Hampshire were a Jutish tribe who occupied the northern parts of the Isle of Wight and the valleys of the Meon and the Hamble. Their settlements were, however, unimportant, and soon became absorbed in the territory of the West Saxons who in 495 landed at the mouth of the Itchen under the leadership of Cerdic and Cynric, and in 508 slew 5000 Britons and their king. But it was not until after another decisive victory at Charford in 519 that the district was definitely organized as West Saxon territory under the rule of Cerdic and Cynric, thus becoming the nucleus of the vast later kingdom of Wessex. The Isle of Wight was subjugated in 530 and bestowed on Stuf and Wihtgar, the nephews of Cerdic. The Northmen made their first attack on the Hampshire coast in 835, and for the two centuries following the district was the scene of perpetual devastations by the Danish pirates, who made their headquarters in the Isle of Wight, from which they plundered the opposite coast. Hampshire suffered less from the Conquest than almost any English county, and was a favourite resort of the Norman kings. The alleged destruction of property for the formation of the New Forest is refuted by the Domesday record, which shows that this district had never been under cultivation.

In the civil war of Stephen's reign Baldwin de Redvers, lord of the Isle of Wight, supported the empress Matilda, and Winchester Castle was secured in her behalf by Robert of Gloucester, while the neighbouring fortress of Wolvesey was held for Stephen by Bishop Henry de Blois. In 1216 Louis of France, having arrived in the county by invitation of the barons, occupied Winchester Castle, and only met with resistance at Odiham Castle, which made a brave stand against him for fifteen days. During the Wars of the Roses Anthony Woodville, 2nd earl Rivers, defeated the duke of Clarence at Southampton, and in 1471, after the battle of Barnet, the countess of Warwick took

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sanctuary at Beaulieu Abbey. The chief events connected with Hampshire in the Civil War of the 17th century were the gallant resistance of the cavalier garrisons at Winchester and Basing House; a skirmish near Cheriton in 1644 notable as the last battle fought on Hampshire soil; and the concealment of Charles at Titchfield in 1647 before his removal to Carisbrooke. The duke of Monmouth, whose rebellion met with considerable support in Hampshire, was captured in 1685 near Ringwood.

Hampshire was among the earliest shires to be created, and must have received its name before the revival of Winchester in the latter half of the 7th century. It is first mentioned in the Saxon chronicle in 755, at which date the boundaries were practically those of the present day. The Domesday Survey mentions 44 hundreds in Hampshire, but by the 14th century the number had been reduced to 37. The hundreds of East Medina and West Medina in the Isle of Wight are mentioned in 1316. Constables of the hundreds were first appointed by the Statute of Winchester in 1285, and the hundred court continued to elect a high constable for Fordingbridge until 1878. The chief court of the Isle of Wight was the Knighten court held at Newport every three weeks. The sheriff's court and the assizes and quarter sessions for the county were formerly held at Winchester, but in 1831 the county was divided into 14 petty sessional divisions; the quarter sessions for the county were held at Andover; and Portsmouth, Southampton and Winchester had separate jurisdiction. Southampton was made a county by itself with a separate sheriff in 1447.

In the middle of the 7th century Hampshire formed part of the West Saxon bishopric of Dorchester-on-Thames. On the transference of the episcopal seat to Winchester in 676 it was included in that diocese in which it has remained ever since. In 1291 the archdeaconry of Winchester was coextensive with the county and comprised the ten rural deaneries of Alresford, Alton, Andover, Basingstoke, Drokinsford, Fordingbridge, Isle of Wight, Sombourne, Southampton and Winchester. In 1850 the Isle of Wight was subdivided into the deaneries of East Medina and West Medina. In 1856 the deaneries were increased to 24. In 1871 the archdeaconry of the Isle of Wight was constituted, and about the same time the deaneries were reduced to 21. In 1892 the deaneries were reconstituted and made 18 in number, and the archdeaconry of the Isle of Wight was divided into the deaneries of East Wight and West Wight.

After the Conquest the most powerful Hampshire baron was William Fitz-Osbern, who in addition to the lordship of the Isle of Wight held considerable estates on the mainland. At the time of the Domesday Survey the chief landholders were Hugh de Port, ancestor of the Fitz-Johns; Ralf de Mortimer; William Mauduit whose name is preserved in Hartley Mauditt; and Waleran, called the Huntsman, ancestor of the Waleraund family. Hursley near Winchester was the seat of Richard Cromwell; and Gilbert White, the naturalist, was curate of Farringdon near Selborne.

Apart from the valuable foreign and shipbuilding trade which grew up with the development of its ports, Hampshire has always been mainly an agricultural county, the only important manufacture being that of wool and cloth, which prospered at Winchester in the 12th century and survived till within recent years. Salt-making and the manufacture of iron from native ironstone also flourished in Hampshire from pre-Norman times until within the 19th century. In the 14th century Southampton had a valuable trade with Venice, and from the 15th to the 18th century many famous warships were constructed in its docks. Silk-weaving was formerly carried on at Winchester, Andover, Odiham, Alton, Whitchurch and Overton, the first mills being set up in 1684 at Southampton by French refugees. The paper manufacture at Laverstoke was started by the Portals, a family of Huguenot refugees, in 1685, and a few years later Henri de Portal obtained the privilege of supplying the bank-note paper to the Bank of England.

Hampshire returned four members to parliament in 1295, when the boroughs of New Alresford, Alton, Andover, Basingstoke, Overton, Portsmouth, Southampton, Winchester, Yarmouth and Newport were also represented. After this date the county was represented by two members, but most of the boroughs ceased to make returns. Odiham and the Isle of Wight were represented in 1300, Fareham in 1306, and Petersfield in 1307. From 1311 to 1547 Southampton, Portsmouth, and Winchester were the only boroughs represented. By the end of the 16th century Petersfield, Newport, Yarmouth, and Andover had regained representation, and Stockbridge, Christchurch, Lymington, Newtown and Whitchurch returned two members each, giving the county with its boroughs a total representation of 26 members. Under the Reform Act of 1832 the county returned four members in four divisions; Christchurch and Petersfield lost one member each; and Newtown, Yarmouth, Stockbridge and Whitchurch were disfranchised. By the act of 1868 Andover, Lymington and Newport were deprived of one member each.

Antiquities.—Hampshire is rich in monastic remains. Those considered under separate headings include the monastery of Hyde near Winchester, the magnificent churches at Christchurch and Romsey, the ruins of Netley Abbey, and of Beaulieu Abbey in the New Forest, the fragments of the priory of St Denys, Southampton, the church at Porchester and the slight ruins at Titchfield, near Fareham, and Quarr Abbey in the Isle of Wight. Other foundations, of which the remains are slight, were the Augustinian priory of Southwick near Fareham, founded by William of Wykeham; that of Breamore, founded by Baldwin de Redvers, and that of Mottisfont near Romsey, endowed soon after the Conquest. There are many churches of interest, apart from the cathedral church of Winchester and those in some of the towns in the Isle of Wight, or already mentioned in connexion with monastic foundations. Pre-Conquest work is well shown in the churches of Corhampton and Breamore, and very early masonry is also found in Headbourne Worthy church, where is also a brass of the 15th century to a scholar of Winchester College in collegiate dress. The most noteworthy Norman churches are at Chilcombe and Kingsclere and (with Early English additions) at Brockenhurst, Upper Clatford, which has the unusual arrangement of a double chancel arch, Hambledon, Milford and East Meon. Principally Early English are the churches of Cheriton, Grately, which retains some excellent contemporary stained glass from Salisbury cathedral; Sopley, which is partly Perpendicular; and Thruxton, which contains a brass to Sir John Lisle (d. 1407), affording a very early example of complete plate armour. Specimens of the later styles are generally less remarkable. The frescoes in Bramley church, ranging in date from the 13th to the 15th century, include a representation of the murder of Thomas à Beckett. A fine series of Norman fonts in black marble should be mentioned; they occur in Winchester cathedral and the churches of St Michael, Southampton, East Meon and St Mary Bourne.

The most notable old castles are Carisbrooke in the Isle of Wight; Porchester, a fine Norman stronghold embodying Roman remains, on Portsmouth Harbour; and Hurst, guarding the mouth of the Solent, where for a short time Charles I. was imprisoned. Henry VIII. built several forts to guard the Solent, Spithead and Southampton Water; Hurst Castle was one, and others remaining, but adapted to various purposes, are at Cowes, Calshot and Netley. Fine mansions are unusually numerous. That of Stratfieldsaye or Strathfieldsaye, which belonged to the Pitt family, was purchased by parliament for presentation to the duke of Wellington in 1817, his descendants holding the estate from the Crown in consideration of the annual tribute of a flag to the guard-room at Windsor. A statue of the duke stands in the grounds, and his war-horse "Copenhagen" is buried here. The name of Tichborne Park, near Alresford, is well known in connexion with the famous claimant of the estates whose case was heard in 1871. Among ancient mansions the Jacobean Bramshill is conspicuous, lying near Stratfieldsaye in the north of the county. It is built of stone and is highly decorated, and though the complete original design was not carried out the house is among the finest of its type in England. At Bishops Waltham, a small town 10 m. S.S.E. of Winchester,

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Henry de Blois, bishop of Winchester, erected a palace, which received additions from William of Wykeham, who died here in 1404, and from other bishops. The ruins are picturesque but not extensive.

See *Victoria County History*, "Hampshire," R. Warner, *Collections for the History of Hampshire*; &c. (London, 1789); H. Moody, *Hampshire in 1688* (1862), and the same author's *Antiquarian and Topographical Sketches* (1846), and *Notes and Essays relating to the Counties of Hants and Wilts* (1851); R. Mudie, *Hampshire*, &c. (3 vols., Winchester, 1838); B. B. Woodward, T. C. Wilks and C. Lockhart, *General History of Hampshire* (1861–1869); G. N. Godwin, *The Civil War in Hampshire, 1642–1645* (London, 1882); H. M. Gilbert and G. N. Godwin, *Bibliotheca Hantonensis* (Southampton, 1891). See also various papers in *Hampshire Notes and Queries* (Winchester, 1883 et seq.).

HAMPSTEAD, a north-western metropolitan borough of London, England, bounded E. by St Pancras and S. by St Marylebone, and extending N. and W. to the boundary of the county of London. Pop. (1901), 81,942. The name, *Hamstede*, is synonymous with "homestead," and the manor is first named in a charter of Edgar (957–975), and was granted to the abbey of Westminster by Ethelred in 1086. It reverted to the Crown in 1550, and had various owners until the close of the 18th century, when it came to Sir Thomas Spencer Wilson, whose descendants retain it. The borough includes the sub-manor of Belsize and part of the hamlet of Kilburn.

The surface of the ground is sharply undulating, an elevated spur extending south-west from the neighbourhood of Highgate, and turning south through Hampstead. It reaches a height of 443 ft. above the level of the Thames. The Edgware Road bounds Hampstead on the west; and the borough is intersected, parallel to this thoroughfare, by Finchley Road, and by Haverstock Hill, which, continued under the names of Rosslyn Hill, High Street, Heath Street, and North End, crosses the Heath for which Hampstead is chiefly celebrated. This is a fine open space of about 240 acres, including in its bounds the summit of Hampstead Hill. It is a sandy tract, in parts well wooded, diversified with several small sheets of water, and on a great extent preserves its natural characteristics unaltered. Beautiful views, both near and distant, are commanded from many points. Of all the public grounds within London this is the most valuable to the populace at large; the number of visitors on a Bank holiday in August is generally, under favourable conditions, about 100,000; and strenuous efforts are always forthcoming from either public or private bodies when the integrity of the Heath is in any way menaced. As early as 1829 attempts to save it from the builder are recorded. In 1871 its preservation as an open space was insured after several years' dispute, when the lord of the manor gave up his rights. An act of parliament transferred the ownership to the Metropolitan Board of Works, to which body the London County Council succeeded. The Heath is continued eastward in Parliament Hill (borough of St Pancras), acquired for the public in 1890; and westward outside the county boundary in Golders Hill, owned by Sir Spenser Wells, Bart., until 1898. A Protection Society guards the preservation of the natural beauty and interests of the Heath. It is not the interests of visitors alone that must be consulted, for Hampstead, adding to its other attractions a singularly healthy climate, has long been a favourite residential quarter, especially for lawyers, artists and men of letters. Among famous residents are found the first earl of Chatham, John Constable, George Romney, George du Maurier, Joseph Butler, author of the *Analogy*, Sir Richard Steele, John Keats, the sisters Joanna and Agnes Baillie, Leigh Hunt and many others. The parish church of St John (1747) has several monuments of eminent persons. Chatham's residence was at North End, a picturesque quarter yet preserving characteristics of a rural village; here also Wilkie Collins was born. Three old-established inns, the Bull and Bush, the Spaniards, and Jack Straw's Castle (the name of which has no historical significance), claim many great names among former visitors; while the Upper Flask Inn, now a private house, was the meeting-place of the Kit-Cat Club. Chalybeate springs were discovered at Hampstead in the 17th century, and early in the 18th rivalled those of Tunbridge Wells and Epsom. The name of Well Walk recalls them, but their fame is lost. There are others at Kilburn.

In the south-east Hampstead includes the greater part of Primrose Hill, a public ground adjacent to the north side of Regent's Park. The borough has in all about 350 acres of open spaces. The name of the sub-manor of Belsize is preserved in several streets in the central part. Kilburn, which as a district extends outside the borough, takes name from a stream which, as the Westbourne, entered the Thames at Chelsea. Fleet Road similarly recalls the more famous stream which washed the walls of the City of London on the west. Hampstead has numerous charitable institutions, amongst which are the North London consumptive hospital, the Orphan Working School, Haverstock Hill (1758), the general hospital and the north-western fever hospital. In Finchley Road are the New and Hackney Colleges, both Congregational. The parliamentary borough of Hampstead returns one member. The borough council consists of a mayor, 7 aldermen and 42 councillors. Area, 2265 acres.

HAMPTON, WADE (1818–1902), American cavalry leader was born on the 28th of March 1818 at Columbia, South Carolina, the son of Wade Hampton (1791–1858), one of the wealthiest planters in the South, and the grandson of Wade Hampton (1754–1835), a captain in the War of Independence and a brigadier-general in the War of 1812. He graduated (1836) at South Carolina College, and was trained for the law. He devoted himself, however, to the management of his great plantations in South Carolina and in Mississippi, and took part in state politics and legislation. Though his own views were opposed to the prevailing state-rights tone of South Carolinian opinion, he threw himself heartily into the Southern cause in 1861, raising a mixed command known as "Hampton's Legion," which he led at the first battle of Bull Run. During the Civil War he served in the main with the Army of Northern Virginia in Stuart's cavalry corps. After Stuart's death Hampton distinguished himself greatly in opposing Sheridan in the Shenandoah Valley, and was made lieutenant-general to command Lee's whole force of cavalry. In 1865 he assisted Joseph Johnston in the attempt to prevent Sherman's advance through the Carolinas. After the war his attitude was conciliatory and he recommended a frank acceptance by the South of the war's political consequences. He was governor of his state in 1876–1879, being installed after a memorable contest; he served in the United States Senate in 1879–1891, and was United States commissioner of Pacific railways in 1893–1897. He died on the 11th of April 1902.

See E. L. Wells, *Hampton and Reconstruction* (Columbia, S. C., 1907).

HAMPTON, an urban district in the Uxbridge parliamentary division of Middlesex, England, 15 m. S.W. of St Paul's cathedral, London, on the river Thames, served by the London & South Western railway. Pop. (1901), 6813. Close to the river, a mile below the town, stands Hampton Court Palace, one of the finest extant specimens of Tudor architecture, and formerly a royal residence. It was erected by Cardinal Wolsey, who in 1515 received a lease of the old mansion and grounds for 99 years. As the splendour of the building seemed to awaken the cupidity of Henry VIII., Wolsey in 1526 thought it prudent to make him a present of it. It became Henry's favourite residence, and he made several additions to the building, including the great hall and chapel in the Gothic style. Of the original five quadrangles only two now remain, but a third was erected by Sir Christopher Wren for William III. In 1649 a great sale of the effects of the palace took place by order of parliament, and later the manor itself was sold to a private owner but immediately after came into the hands of Cromwell; and Hampton Court continued to be one of the principal residences of the English sovereigns until the time of George II. It was the birthplace of Edward VI., and the meeting-place (1604) of the conference held in the reign of James I. to settle the dispute between the Presbyterians and the state clergy. William III., riding in the grounds, met with the accident which resulted in his death. It is now partly occupied by persons of rank in reduced circumstances; but the state apartments and picture

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galleries are open to the public, as is the home park. The gardens, with their ornamental waters, are beautifully laid out in the Dutch style favoured by William III., and contain a magnificent vine planted in 1768. In the enclosure north of the palace, called the Wilderness, is the Maze, a favourite resort. North again lies Bushey Park, a royal demesne exceeding 1000 acres in extent. It is much frequented, especially in early summer, when its triple avenue of horse-chestnut trees is in blossom.

Among several residences in the vicinity of Hampton is Garrick Villa, once, under the name of Hampton House, the residence of David Garrick the actor. Sir Christopher Wren and Sir Richard Steele are among famous former residents. HAMPTON WICK, on the river E. of Bushey Park, is an urban district with a population (1901) of 2666.

See E. Law, *History of Hampton Court Palace* (London, 1890).

HAMPTON, a city and the county-seat of Elizabeth City county, Virginia, U.S.A., at the mouth of the James river, on Hampton Roads, about 15 m. N.W. of Norfolk. Pop. (1890), 2513; (1900) 2764, including 1240 negroes; (1910) 5505. It is served by the Chesapeake & Ohio railway, and by trolley lines to Old Point Comfort and Newport News. Hampton is an agricultural shipping point, ships fish, oysters and canned crabs, and manufactures fish oil and brick. In the city are St John's church, built in 1727; a national cemetery, a national soldiers' home (between Phoebus and Hampton), which in 1907–1908 cared for 4093 veterans and had an average attendance of 2261; and the Hampton Normal and Agricultural Institute (co-educational), which was opened by the American Missionary Association in 1868 for the education of negroes. This last was chartered and became independent of any denominational control in 1870, and was superintended by Samuel Chapman Armstrong (q.v.) from 1868 to 1893. The school was opened in 1878 to Indians, whose presence has been of distinct advantage to the negro, showing him, says Booker T. Washington, the most famous graduate of the school, that the negro race is not alone in its struggle for improvement. The National government pays $167 a year for the support of each of the Indian students. The underlying idea of the Institute is such industrial training as will make the pupil a willing and a good workman, able to teach his trade to others; and the school's graduates include the heads of other successful negro industrial schools, the organizers of agricultural and industrial departments in Southern public schools and teachers in graded negro schools. The mechanism of the school includes three schemes: that of "work students," who work during the day throughout the year and attend night school for eight months; that of day school students, who attend school for four or five days and do manual work for one or two days each week; and that of trade students, who receive trade instruction in their daily eight-hours' work and study in night school as well. Agriculture in one or more of its branches is taught to all, including the four or five hundred children of the Whittier school, a practice school with kindergarten and primary classes. Graduate courses are given in agriculture, business, domestic art and science, library methods, "matrons'" training, and public school teaching. The girl students are trained in every branch of housekeeping, cooking, dairying and gardening. The institute publishes *The Southern Workman*, a monthly magazine devoted to the interests of the Negro and the Indian and other backward races. In 1908 the Institute had more than 100 buildings and 188 acres of land S.W. of the national cemetery and on Hampton river and Jones Creek, and 600 acres at Shellbanks, a stock farm 6 m. away; the enrolment was 21 in graduate classes, 372 in day school, 480 in night school and 524 in the Whittier school. Of the total, 88 were Indians.

Hampton was settled in 1610 on the site of an Indian village, Kecoughtan, a name it long retained, and was represented at the first meeting (1619) of the Virginia House of Burgesses. It was fired by the British during the War of 1812 and by the Confederates under General J. B. Magruder in August 1861. During the Civil War there was a large Union hospital here, the building of the Chesapeake Female College, erected in 1857, being used for this purpose. Hampton was incorporated as a town in 1887, and in 1908 became a city of the second class.

HAMPTON ROADS, a channel through which the waters of the James, Nansemond and Elizabeth rivers of Virginia, U.S.A., pass (between Old Point Comfort to the N. and Sewell's Point to the S.) into Chesapeake Bay. It is an important highway of commerce, especially for the cities of Norfolk, Portsmouth and Newport News, and is the chief rendezvous of the United States navy. For a width of 500 ft. the Federal government during 1902–1905 increased its minimum depth at low water from 25½ ft. to 30 ft. The entrance from Chesapeake Bay is defended by Fortress Monroe on Old Point Comfort and by Fort Wood on a small island called the Rip Raps near the middle of the channel; and at Portsmouth, a few miles up the Elizabeth river, is an important United States navy-yard.

Hampton Roads is famous in history as the scene of the first engagement between iron-clad vessels. In the spring of 1861 the Federals set fire to several war vessels in the Gosport navy yard on the Elizabeth river and abandoned the place. In June the Confederates set to work to raise one of these abandoned vessels, the frigate "Merrimac" of 3500 tons and 40 guns, and to rebuild it as an iron-clad. The vessel (renamed the "Virginia" though it is generally known in history by its original name) was first cut down to the water-line and upon her hull was built a rectangular casemate, constructed of heavy timber (24 in. in thickness), covered with bar-iron 4 in. thick, and rising from the water on each side at an angle of about 35°. The iron plating extended 2 ft. below the water line; and beyond the casemate, toward the bow, was a cast-iron pilot house, extending 3 ft. above the deck. The reconstruction of the vessel was completed on the 5th of March 1862. The vessel drew 22 ft. of water, was equipped with poor engines, so that it could not make more than 5 knots, and was so unwieldy that it could not be turned in less than 30 minutes. It was armed with 10 guns—7 (rifled) 7 in., 2 (rifled) 6 in., and 6 (smooth bore Dahlgren) 9 in. Her most powerful equipment, however, was her 18 in. cast-iron ram. In October 1861 Captain John Ericsson, an engineer, and a Troy (N.Y.) firm, as builders, began the construction of the iron-clad "Monitor" for the Federals, at Greenpoint, Long Island. With a view to enable this vessel to carry at good speed the thickest possible armour compatible with buoyancy, Ericsson reduced the exposed surface to the least possible area. Accordingly, the vessel was built so low in the water that the waves glided easily over its deck except at the middle, where was constructed a revolving turret[1] for the guns, and though the vessel's iron armour had a thickness of 1 in. on the deck, 5 in. on the side, and 8 in. on the turret, its draft was only 10 ft. 6 in., or less than one-half that of the "Merrimac." Its turret, 9 ft. high and 20 ft. in inside diameter, seemed small for its length of 172 ft. and its breadth of 41 ft. 6 in., and this, with the lowness of its freeboard, caused the vessel to be called the "Yankee cheese-box on a raft." Forward of the turret was the iron pilot house, square in shape, and rising about 4 ft. above the deck. The "Monitor's" displacement was about 1200 tons and her armament was two 11 in. Dahlgren guns; her crew numbered 58, while that of the "Merrimac" numbered about 300. She was seaworthy in the shallow waters off the southern coasts and steered fairly well. The "Monitor" was launched at Greenpoint, Long Island, on the 30th of January, and was turned over to the government on the 19th of the following month. The building of the two vessels was practically a race between the two combatants.

On the 8th of March about 1 p.m., the "Merrimac," commanded by Commodore Franklin Buchanan (1795–1871), steamed down the Elizabeth accompanied by two one-gun gun-boats, to engage the wooden fleet of the Federals, consisting of the frigate "Congress," 50 guns, and the sloop "Cumberland," 30 guns, both sailing vessels, anchored off Newport News, and

[1] For the idea of the low free-board and the revolving turret Ericsson was indebted to Theodore R. Timby (1819–1909), who in 1843 had filed a caveat for revolving towers for offensive or defensive warfare whether placed on land or water, and to whom the company building the "Monitor" paid $5000 royalty for each turret.

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the steam frigates "Minnesota," and "Roanoke," the sailing frigate "St Lawrence," and several gun-boats, anchored off Fortress Monroe. Actual firing began about 2 o'clock, when the "Merrimac" was nearly a mile from the "Congress" and the "Cumberland." Passing the first of these vessels with terrific broadsides, the "Merrimac" rammed the "Cumberland" and then turned her fire again on the "Congress," which in an attempt to escape ran aground and was there under fire from three other Confederate gun-boats which had meanwhile joined the "Merrimac." About 3.30 p.m. the "Cumberland," which, while it steadily careened, had been keeping up a heavy fire at the Confederate vessels, sank, with "her pennant still flying from the topmast above the waves." Between 4 and 4.30 the "Congress," having been raked fore and aft for nearly an hour by the "Merrimac," was forced to surrender. While directing a fire of hot shot to burn the "Congress," Commodore Buchanan of the "Merrimac" was severely wounded and was succeeded in the command by Lieutenant Catesby ap Roger Jones. The Federal steam frigates, "Roanoke," "St Lawrence" and "Minnesota" had all gone aground in their trip from Old Point Comfort toward the scene of battle, and only the "Minnesota" was near enough (about 1 m.) to take any part in the fight. She was in such shallow water that the Confederate iron-clad ram could not get near her at ebb tide, and about 5 o'clock the Confederates postponed her capture until the next day and anchored off Sewell's Point.

The "Monitor," under Lieut. John Lorimer Worden (1818–1897), had left New York on the morning of the 6th of March; after a dangerous passage in which she twice narrowly escaped sinking, she arrived at Hampton Roads during the night of the 8th, and early in the morning of the 9th anchored near the "Minnesota." When the "Merrimac" advanced to attack the "Minnesota," the "Monitor" went out to meet her, and the battle between the iron-clads began about 9 a.m. on the 9th. Neither vessel was able seriously to injure the other, and not a single shot penetrated the armour of either. The "Monitor" had the advantage of being able to out-manœuvre her heavier and more unwieldy adversary; but the revolving turret made firing difficult and communications were none too good with the pilot house, the position of which on the forward deck lessened the range of the two turret-guns. The machinery worked so badly that the revolution of the turret was stopped. After two hours' fighting, the "Monitor" was drawn off, so that more ammunition could be placed in her turret. When the battle was renewed (about 11.30) the "Merrimac" began firing at the "Monitor's" pilot house; and a little after noon a shot struck the sight-hole of the pilot house and blinded Lieut. Worden. The "Monitor" withdrew in the confusion consequent upon the wounding of her commanding officer; and the "Merrimac" after a short wait for her adversary steamed back to Norfolk. There were virtually no casualties on either side. After the evacuation of Norfolk by the Confederates on the 9th of May Commodore Josiah Tattnall, then in command of the "Merrimac," being unable to take her up the James, sank her. The "Monitor" was lost in a gale off Cape Hatteras on the 31st of December 1862.

Though the battle between the two vessels was indecisive, its effect was to "neutralize" the "Merrimac," which had caused great alarm in Washington, and to prevent the breaking of the Federal blockade at Hampton Roads; in the history of naval warfare it may be regarded as marking the opening of a new era—the era of the armoured warship. On the 3rd of February 1865 near Fortress Monroe on board a steamer occurred the meeting of President Lincoln and Secretary Seward with Confederate commissioners which is known as the Hampton Roads Conference (see LINCOLN, ABRAHAM). At Sewell's Point, on Hampton Roads, in 1907 was held the Jamestown Tercentennial Exposition.

See James R. Soley, *The Blockade and the Cruisers* (New York, 1883); *Battles and Leaders of the Civil War*, vol. i. (New York, 1887); chap. ii. of Frank M. Bennett's *The Monitor and the Navy under Steam* (Boston, 1900); and William Swinton, *Twelve Decisive Battles of the War* (New York, 1867).

HAMSTER, a European mammal of the order Rodentia, scientifically known as *Cricetus frumentarius* (or *C. cricetus*), and belonging to the mouse tribe, *Muridae*, in which it typifies the sub-family *Cricetinae*. The essential characteristic of the Cricetines is to be found in the upper cheek-teeth, which (as shown in the figure of those of *Cricetus* in the article RODENTIA) have their cusps arranged in two longitudinal rows separated by a groove. The hamsters, of which there are several kinds, are short-tailed rodents, with large cheek-pouches, of which the largest is the common *C. frumentarius*. Their geographical distribution comprises a large portion of Europe and Asia north of the Himalaya. All the European hamsters show more or less black on the under-parts, but the small species from Central Asia, which constitute distinct subgenera, are uniformly grey. The common species is specially interesting on account of its habits. It constructs elaborate burrows containing several chambers, one of which is employed as a granary, and filled with corn, frequently of several kinds, for winter use. As a rule, the males, females, and young of the first year occupy separate burrows. During the winter these animals retire to their burrows, sleeping the greater part of the time, but awakening about February or March, when they feed on the garnered grain. They are very prolific, the female producing several litters in the year, each consisting of over a dozen blind young; and these, when not more than three weeks old, are turned out of the parental burrow to form underground homes for themselves. The burrow of the young hamster is only about a foot in depth, while that of the adult descends 4 or 5 ft. beneath the surface. On retiring for the winter the hamster closes the various entrances to its burrow, and becomes torpid during the coldest period. Although feeding chiefly on roots, fruits and grain, it is also to some extent carnivorous, attacking and eating small quadrupeds, lizards and birds. It is exceedingly fierce and pugnacious, the males especially fighting with each other for possession of the females. The numbers of these destructive rodents are kept in check by foxes, dogs, cats and pole-cats, which feed upon them. The skin of the hamster is of some value, and its flesh is used as food. Its burrows are sought after in the countries where it abounds, both for capturing the animal and for rifling its store. America, especially North America, is the home of by far the great majority of *Cricetinae*, several of which are called white-footed or deer-mice. They are divided into numerous genera and the number of species is very large indeed. Both in size and form considerable variability is displayed, the species of *Holochilus* being some of the largest, while the common white-footed mouse (*Eligmodon leucopus*) of North America is one of the smaller forms. Some kinds, such as *Oryzomys* and *Peromyscus* have long, rat-like tails, while others, like *Acodon*, are short-tailed and more vole-like in appearance. In habits some are partially arboreal, others wholly terrestrial, and a few more or less aquatic. Among the latter, the most remarkable are the fish-eating rats (*Ichthyomys*) of North-western South America, which frequent streams and feed on small fish. The Florida rice-rat (*Sigmodon hispidus*) is another well-known representative of the group. In the Old World the group is represented by the Persian *Calomyscus*, a near relative of *Peromyscus*. (R. L.*)

HANAPER, properly a case or basket to contain a "hanap" (O. Eng. *knæp*: cf. Dutch *nap*), a drinking vessel, a goblet with a foot or stem; the term which is still used by antiquaries for medieval stemmed cups. The famous Royal Gold Cup in the British Museum is called a "hanap" in the inventory of Charles VI. of France. The word "hanaper" (Med. Lat. *hanaperium*) was used particularly in the English chancery of a wicker basket in which were kept writs and other documents, and hence it became the name of a department of the chancery, now abolished, under an officer known as the clerk or warden of the hanaper, into which were paid fees and other moneys for the sealing of charters, patents, writs, &c., and from which issued certain writs under the great seal (S. R. Scargill-Bird, *Guide to the Public Records* (1908). In Ireland it still survives in the office of the clerk of the crown and hanaper, from which are issued writs for the return of members of parliament for Ireland.

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From "hanaper" is derived the modern "hamper," a wicker or rush basket used for the carriage of game, fish, wine, &c. The verb "to hamper," to entangle, obstruct, hinder, especially used of disturbing the mechanism of a lock or other fastening so as to prevent its proper working, is of doubtful origin. It is probably connected with a root seen in the Icel. *hemja*, to restrain, and Ger. *hemmen*, to clog.

HANAU, a town of Germany, in the Prussian province of Hesse-Nassau, on the right bank of the Main, 14 m. by rail E. from Frankfort and at the junction of lines to Friedberg, Bebra and Aschaffenburg. Pop. (1905) 31,637. It consists of an old and a new town. The streets of the former are narrow and irregular, but the latter, founded at the end of the 16th century by fugitive Walloons and Netherlanders, is built in the form of a pentagon with broad streets crossing at right angles, and possesses several fine squares, among which may be mentioned the market-place, adorned with handsome fountains at the four corners. Among the principal buildings are the ancient castle, formerly the residence of the counts of Hanau; the church of St John, dating from the 17th century, with a handsome tower; the old church of St Mary, containing the burial vault of the counts of Hanau; the church in the new town, built by the Walloons in the beginning of the 17th century in the form of two intersecting circles; the Roman Catholic church, the synagogue, the theatre, the barracks, the arsenal and the hospital. Its educational establishments include a classical school, and a school of industrial art. There is a society of natural history and an historical society, both of which possess considerable libraries and collections. Hanau is the birthplace of the brothers Grimm, to whom a monument was erected here in 1896. In the neighbourhood of the town are the palace of Philippsruhe, with an extensive park and large orangeries, and the spa of Wilhelmsbad.

Hanau is the principal commercial and manufacturing town in the province, and stands next to Cassel in point of population. It manufactures ornaments of various kinds, cigars, leather, paper, playing cards, silver and platina wares, chocolate, soap, woollen cloth, hats, silk, gloves, stockings, ropes and matches. Diamond cutting is carried on and the town has also foundries, breweries, and in the neighborhood extensive powder-mills. It carries on a large trade in wood, wine and corn, in addition to its articles of manufacture.

From the number of urns, coins and other antiquities found near Hanau it would appear that it owes its origin to a Roman settlement. It received municipal rights in 1303, and in 1528 it was fortified by Count Philip III. who rebuilt the castle. At the end of the 16th century its prosperity received considerable impulse from the accession of the Walloons and Netherlanders. During the Thirty Years' War it was in 1631 taken by the Swedes, and in 1636 it was besieged by the imperial troops, but was relieved on the 13th of June by Landgrave William V. of Hesse-Cassel, on account of which the day is still commemorated by the inhabitants. Napoleon on his retreat from Leipzig defeated the Germans under Marshal Wrede at Hanau, on the 30th of October 1813; and on the following day the allies vacated the town, when it was entered by the French. Early in the 15th century Hanau became the capital of a principality of the Empire, which on the death of Count Reinhard in 1451 was partitioned between the Hanau-Münzenberg and Hanau-Lichtenberg lines, but was reunited in 1642 when the elder line became extinct. The younger line received princely rank in 1696, but as it became extinct in 1736 Hanau-Münzenberg was joined to Hesse-Cassel and Hanau-Lichtenberg to Hesse-Darmstadt. In 1785 the whole province was united to Hesse-Cassel, and in 1803 it became an independent principality. In 1815 it again came into the possession of Hesse-Cassel, and in 1866 it was joined to Prussia.

See R. Wille, *Hanau im dreissigjährigen Krieg* (Hanau, 1886); and Junghaus, *Geschichte der Stadt und des Kreises Hanau* (1887).

HANBURY WILLIAMS, SIR CHARLES (1708–1759), English diplomatist and author, was a son of Major John Hanbury (1664–1734), of Pontypool, Monmouthshire, and a scion of an ancient Worcestershire family. His great-great-great-grandfather, Capel Hanbury, bought property at Pontypool and began the family iron-works there in 1565. His father John Hanbury was a wealthy iron-master and member of parliament, who inherited another fortune from his friend Charles Williams of Caerleon, his son's godfather, with which he bought the Coldbrook estate, Monmouthshire. Charles accordingly took the name of Williams in 1729. He went to Eton, and there made friends with Henry Fielding, the novelist, and, after marrying in 1732 the heiress of Earl Coningsby, was elected M.P. for Monmouthshire (1734–1747) and subsequently for Leominster (1754–1759). He became known as one of the prominent gallants and wits about town, and following Pope he wrote a great deal of satirical light verse, including *Isabella, or the Morning* (1740), satires on Ruth Darlington and Pulleney (1741–1742), *The Country Girl* (1742), *Lessons for the Day* (1742), *Letter to Mr Dodsley* (1743), &c. A collection of his poems was published in 1763 and of his *Works* in 1822. In 1746 he was sent on a diplomatic mission to Dresden, which led to further employment in this capacity; and through Henry Fox's influence he was sent as envoy to Berlin (1750), Dresden (1751), Vienna (1753), Dresden (1754) and St Petersburg (1755–1757); in the latter case he was the instrument for a plan for the alliance between England, Russia and Austria, which finally broke down, to his embarrassment. He returned to England, and committed suicide on the 2nd of November 1759, being buried in Westminster Abbey. He had two daughters, the elder of whom married William Capel, 4th earl of Essex, and was the mother of the 5th earl. The Coldbrook estates went to Charles's brother, George Hanbury-Williams, to whose heirs it descended.

See William Coxe's *Historical Tour in Monmouthshire* (1801), and T. Seccombe's article in the *Dict. Nat. Biog.* with bibliography.

HANCOCK, JOHN (1737–1793), American Revolutionary statesman, was born in that part of Braintree, Massachusetts, now known as Quincy, on the 23rd of January 1737. After graduating from Harvard in 1754, he entered the mercantile house of his uncle, Thomas Hancock of Boston, who had adopted him, and on whose death, in 1764, he fell heir to a large fortune and a prosperous business. In 1765 he became a selectman of Boston, and from 1766 to 1772 was a member of the Massachusetts general court. An event which is thought to have greatly influenced Hancock's subsequent career was the seizure of the sloop "Liberty" in 1768 by the customs officers for discharging, without paying the duties, a cargo of Madeira wine consigned to Hancock. Many suits were thereupon entered against Hancock, which, if successful, would have caused the confiscation of his estate, but which undoubtedly enhanced his popularity with the Whig element and increased his resentment against the British government. He was a member of the committee appointed in a Boston town meeting immediately after the "Boston Massacre" in 1770 to demand the removal of British troops from the town. In 1774 and 1775 he was president of the first and second Provincial Congresses respectively, and he shared with Samuel Adams the leadership of the Massachusetts Whigs in all the irregular measures preceding the War of American Independence. The famous expedition sent by General Thomas Gage of Massachusetts to Lexington and Concord on the 18th–19th of April 1775 had for its object, besides the destruction of materials of war at Concord, the capture of Hancock and Adams, who were temporarily staying at Lexington, and these two leaders were expressly excepted in the proclamation of pardon issued on the 12th of June by Gage, their offences, it was said, being "of too flagitious a nature to admit of any other consideration than that of condign punishment." Hancock was a member of the Continental Congress from 1775 to 1780, was president of it from May 1775 to October 1777, being the first to sign the Declaration of Independence, and was a member of the Confederation Congress in 1785–1786. In 1778 he commanded, as major-general of militia, the Massachusetts troops who participated in the Rhode Island expedition. He was a member of the Massachusetts Constitutional Convention of 1779–1780, became the first governor of the state, and served from 1780 to 1785 and again from 1787 until his death. Although

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at first unfriendly to the Federal Constitution as drafted by the convention at Philadelphia, he was finally won over to its support, and in 1788 he presided over the Massachusetts convention which ratified the instrument. Hancock was not by nature a leader, but he wielded great influence on account of his wealth and social position, and was liberal, public-spirited, and, as his repeated election—the elections were annual—to the governorship attests, exceedingly popular. He died at Quincy, Mass., on the 8th of October 1793.

See Abram E. Brown, *John Hancock, His Book* (Boston, 1898), a work consisting largely of extracts from Hancock's letters.

HANCOCK, WINFIELD SCOTT (1824–1886), American general, was born on the 14th of February 1824, in Montgomery county, Pa. He graduated in 1844 at the United States Military Academy, where his career was creditable but not distinguished. On the 1st of July 1844 he was breveted, and on the 18th of June 1846 commissioned second lieutenant. He took part in the later movements under Winfield Scott against the city of Mexico, and was breveted first lieutenant for "gallant and meritorious conduct." After the Mexican war he served in the West, in Florida and elsewhere; was married in 1850 to Miss Almira Russell of St Louis; became first lieutenant in 1853, and assistant-quartermaster with the rank of captain in 1855. The outbreak of the Civil War found him in California. At his own request he was ordered east, and on the 23rd of September 1861 was made brigadier-general of volunteers and assigned to command a brigade in the Army of the Potomac. He took part in the Peninsula campaign, and the handling of his troops in the engagement at Williamsburg on the 5th of May 1862, was so brilliant that McClellan reported "Hancock was superb," an epithet always afterwards applied to him. At the battle of Antietam he was placed in command of the first division of the II. corps, and in November he was made major-general of volunteers, and about the same time was promoted major in the regular army. In the disastrous battle of Fredericksburg (*q.v.*), Hancock's division was on the right among the troops that were ordered to storm Marye's Heights. Out of the 5006 men in his division 2013 fell. At Chancellorsville his division received both on the 2nd and the 3rd of May the brunt of the attack of Lee's main army. Soon after the battle he was appointed commander of the II. corps.

The battle of Gettysburg (*q.v.*) began on the 1st of July with the defeat of the left wing of the Army of the Potomac and the death of General Reynolds. About the middle of the afternoon Hancock arrived on the field with orders from Meade to assume command and to decide whether to continue the fight there or to fall back. He decided to stay, rallied the retreating troops, and held Cemetery Hill and Ridge until the arrival of the main body of the Federal army. During the second day's battle he commanded the left centre of the Union army, and after General Sickles had been wounded, the whole of the left wing. In the third day's battle he commanded the left centre, upon which fell the full brunt of Pickett's charge, one of the most famous incidents of the war. Hancock's superb presence and power over men never shone more clearly than when, as the 150 guns of the Confederate army opened the attack he calmly rode along the front of his line to show his soldiers that he shared the dangers of the cannonade with them. His corps lost in the battle 4350 out of less than 10,000 fighting men. But it had captured twenty-seven Confederate battle flags and as many prisoners as it had men when the fighting ceased. Just as the Confederate troops reached the Union line Hancock was struck in the groin by a bullet, but continued in command until the repulse of the attack, and as he was at last borne off the field earnestly recommended Meade to make a general attack on the beaten Confederates. The wound proved a severe one, so that some six months passed before he resumed command.

In the battles of the year 1864 Hancock's part was as important and striking as in those of 1863. At the Wilderness he commanded, during the second day's fighting, half of the Union army; at Spottsylvania he had charge of the fierce and successful attack on the "salient"; at Cold Harbor his corps formed the left wing in the unsuccessful assault on the Confederate lines. In August he was promoted to brigadier-general in the regular army. In November, his old wound troubling him, he obtained a short leave of absence, expecting to return to his corps in the near future. He was, however, detailed to raise a new corps, and later was placed in charge of the "Middle Division." It was expected that he would move towards Lynchburg, as part of a combined movement against Lee's communications. But before he could take the field Richmond had fallen and Lee had surrendered. It thus happened that Hancock, who for three years had been one of the most conspicuous figures in the Army of the Potomac did not take part in its final triumph.

After the assassination of Lincoln, Hancock was placed in charge of Washington, and it was under his command that Booth's accomplices were tried and executed. In July 1866 he was appointed major-general in the regular army. A little later he was placed in command of the department of the Missouri, and the year following assumed command of the fifth military division, comprising Louisiana and Texas. His policy, however, of discountenancing military trials and conciliating the conquered did not meet with approval at Washington, and he was at his own request transferred. Hancock had all his life been a Democrat. His splendid war record and his personal popularity caused his name to be considered as a candidate for the Presidency as early as 1868, and in 1880 he was nominated for that office by the Democrats; but he was defeated by his Republican opponent, General Garfield, though by the small popular plurality of seven thousand votes. He died at Governor's Island, near New York, on the 9th of February 1886. Hancock was in many respects the ideal soldier of the Northern armies. He was quick, energetic and resourceful, reckless of his own safety, a strict disciplinarian, a painstaking and hard-working officer. It was on the field of battle, and when the fighting was fiercest, that his best qualities came to the front. He was a born commander of men, and it is doubtful if any other officer in the Northern army could get more fighting and more marching out of his men. Grant said of him, "Hancock stands the most conspicuous figure of all the general officers who did not exercise a separate command. He commanded a corps longer than any other, and his name was never mentioned as having committed in battle a blunder for which he was responsible."

A biography of him has been written by General Francis A. Walker (New York, 1894). See also *History of the Second Corps*, by the same author (1886). (F. H. H.)

HANCOCK, a city of Houghton county, Michigan, U.S.A., on Portage Lake, opposite Houghton. Pop. (1890) 1772; (1900) 4050, of whom 1409 were foreign-born; (1904) 6037; (1910) 8081. Hancock is served by the Mineral Range, the Copper Range, the Chicago, Milwaukee & St Paul, and the Duluth, South Shore & Atlantic railways (the last two send their trains in over the Mineral Range tracks), and by steamboats through the Portage Lake Canal which connects with Lake Superior. Hancock is connected by a bridge and an electric line with the village of Houghton (pop. in 1910, 5113), the county-seat of Houghton county and the seat of the Michigan College of Mines (opened in 1886). Hancock has three parks, and a marine and general hospital. The city is the seat of a Finnish Lutheran Seminary—there are many Finns in and near Hancock, and a Finnish newspaper is published here. Hancock is in the Michigan copper region—the Quincy, Franklin and Hancock mines are in or near the city—and the mining, working and shipping of copper are the leading industries; among the city's manufactures are mining machinery, lumber, bricks and beer. The municipality owns and operates the waterworks. The electric-lighting plant, the gas plant and the street railway are owned by private corporations. Hancock was settled in 1859, was incorporated as a village in 1875, and was chartered as a city in 1903.

HAND, FERDINAND GOTTHELF (1786–1851), German classical scholar, was born at Plauen in Saxony on the 15th of February 1786. He studied at Leipzig, in 1810 became professor

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at the Weimar gymnasium, and in 1817 professor of philosophy and Greek literature in the university of Jena, where he remained till his death on the 14th of March 1851. The work by which Hand is chiefly known is his (unfinished) edition of the treatise of Horatius Tursellinus (Orazio Torsellino, 1545–1599) on the Latin particles (*Tursellinus, seu de particulis Latinis commentarii*, 1829–1845). Like his treatise on Latin style (*Lehrbuch des lateinischen Stils*, 3rd ed. by H. L. Schmitt, 1880), it is too abstruse and philosophical for the use of the ordinary student. Hand was also an enthusiastic musician, and in his *Ästhetik der Tonkunst* (1837–1841) he was the first to introduce the subject of musical aesthetics.

The first part of the last-named work has been translated into English by W. E. Lawson (*Aesthetics of Musical Art*, or *The Beautiful in Music*, 1880), and B. Sears's *Classical Studies* (1849) contains a "History of the Origin and Progress of the Latin Language," abridged from Hand's work on the subject. There is a memoir of his life and work by G. Queck (Jena, 1852).

HAND (a word common to Teutonic languages; cf. Ger. *Hand*, Goth. *handus*), the terminal part of the human arm from below the wrist, and consisting of the fingers and the palm. The word is also used of the prehensile termination of the limbs in certain other animals (see ANATOMY: *Superficial and artistic*; SKELETON: *Appendicular*, and such articles as MUSCULAR SYSTEM and NERVOUS SYSTEM). There are many transferred applications of "hand," both as a substantive and in various adverbial phrases. The following may be mentioned: charge or authority, agency, source, chiefly in such expressions as "in the hands of," "by hand," "at first hand." From the position of the hands at the side of the body, the word means "direction," *e.g.*, on the right, left hand, cf. "at hand." The hand as given in betrothal or marriage has been from early times the symbol of marriage as it also is of oaths. Other applications are to labourers engaged in manual occupations, the members of the crew of a ship, to a person who has some special skill, as in the phrase, "old parliamentary hand," and to the pointers of a clock or watch and to the number of cards dealt to each player in a card game. As a measure of length the term "hand" is now only used in the measurement of horses, it is equal to 4 in. The name "hand of glory," is given to a hand cut from the corpse of a hanged criminal, dried in smoke, and used as a charm or talisman, for the finding of treasures, &c. The expression is the translation of the Fr. *main de gloire*, a corruption of the O. Fr. *mandegloire, mandegoire*, i.e. *mandragore*, mandragora, the mandrake, to the root of which many magical properties are attributed.

HANDEL, GEORGE FREDERICK (1685–1759), English musical composer, German by origin, was born at Halle in Lower Saxony, on the 23rd of February 1685. His name was Handel, but, like most 18th-century musicians who travelled, he compromised with its pronunciation by foreigners, and when in Italy spelt it Hendel, and in England (where he became naturalized) accepted the version Handel, which is therefore correct for English writers, while Händel remains the correct version in Germany. His father was a barber-surgeon, who disapproved of music, and wished George Frederick to become a lawyer. A friend smuggled a clavichord into the attic, and on this instrument, which is inaudible behind a closed door, the little boy practised secretly. Before he was eight his father went to visit a son by a former marriage who was a valet-de-chambre to the duke of Saxe-Weissenfels. The little boy begged in vain to go also, and at last ran after the carriage on foot so far that he had to be taken. He made acquaintance with the court musicians and contrived to practise on the organ when he could be overheard by the duke, who, immediately recognizing his talent, spoke seriously to the father, who had to yield to his arguments. On returning to Halle Handel became a pupil of Zachau, the cathedral organist, who gave him a thorough training as a composer and as a performer on keyed instruments, the oboe and the violin. Six very good trios for two oboes and bass, which Handel wrote at the age of ten, are extant, and when he himself was shown them by an English admirer who had discovered them, he was much amused and remarked, "I wrote like the devil in those days, and chiefly for the oboe, which was my favourite instrument." His master also of course made him write an enormous amount of vocal music, and he had to produce a motet every week. By the time he was twelve Zachau thought he could teach him no more, and accordingly the boy was sent to Berlin, where he made a great impression at the court.

His father, however, thought fit to decline the proposal of the elector of Brandenburg, afterwards King Frederick I. of Prussia, to send the boy to Italy in order afterwards to attach him to the court at Berlin. German court musicians, as late as the time of Mozart, had hardly enough freedom to satisfy a man of independent character, and the elder Händel had not yet given up hope of his son's becoming a lawyer. Young Handel, therefore, returned to Halle and resumed his work with Zachau. In 1697 his father died, but the boy showed great filial piety in finishing the ordinary course of his education, both general and musical, and even entering the university of Halle in 1702 as a law student. But in that year he succeeded to the post of organist at the cathedral, and after his "probation" year in that capacity he departed to Hamburg, where the only German opera worthy of the name was flourishing under the direction of its founder, Reinhold Keiser. Here he became friends with Matheson, a prolific composer and writer on music. On one occasion they set out together to go to Lübeck, where a successor was to be appointed to the post left vacant by the great organist Buxtehude, who was retiring on account of his extreme age. Handel and Matheson made much music on this occasion, but did not compete, because they found that the successful candidate was required to accept the hand of the elderly daughter of the retiring organist.

Another adventure might have had still more serious consequences. At a performance of Matheson's opera *Cleopatra* at Hamburg, Handel refused to give up the conductor's seat to the composer when the latter returned to his usual post at the harpsichord after singing the part of Antony on the stage. The dispute led to a duel outside the theatre, and, but for a large button on Handel's coat which intercepted Matheson's sword, there would have been no *Messiah* or *Israel in Egypt*. But the young men remained friends, and Matheson's writings are full of the most valuable facts for Handel's biography. He relates in his *Ehrenpforte* that his friend at that time used to compose "interminable cantatas" of no great merit; but of these no traces now remain, unless we assume that a *Passion according to St John*, the manuscript of which is in the royal library at Berlin, is among the works alluded to. But its authenticity, while strongly upheld by Chrysander, has recently been as strongly assailed on internal evidence.

On the 8th of January 1705, Handel's first opera, *Almira*, was performed at Hamburg with great success, and was followed a few weeks later by another work, entitled *Nero*. *Nero* is lost, but *Almira*, with its mixture of Italian and German language and form, remains as a valuable example of the tendencies of the time and of Handel's eclectic methods. It contains many themes used by Handel in well-known later works; but the current statement that the famous aria in *Rinaldo*, "Lascia ch'io pianga," comes from a saraband in *Almira*, is based upon nothing more definite than the inevitable resemblance between the simplest possible forms of saraband-rhythm.

In 1706 Handel left Hamburg for Italy, where he remained for three years, rapidly acquiring the smooth Italian vocal style which hereafter always characterized his work. He had before this refused offers from noble patrons to send him there, but had now saved enough money, not only to support his mother at home, but to travel as his own master. He divided his time in Italy between Florence, Rome, Naples and Venice; and many anecdotes are preserved of his meetings with Corelli, Lotti, Alessandro Scarlatti and Domenico Scarlatti, whose wonderful harpsichord technique still has a direct bearing on some of the most modern features of pianoforte style. Handel soon became famous as *Il Sassone* ("the Saxon"), and it is said that Domenico on first hearing him play incognito exclaimed,

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"It is either the devil or the Saxon!" Then there is a story of Corelli's coming to grief over a passage in Handel's overture to *Il Trionfo del tempo*, in which the violins went up to A in altissimo. Handel impatiently snatched the violin to show Corelli how the passage ought to be played, and Corelli, who had never written or played beyond the third position in his life (this passage being in the seventh), said gently, "My dear Saxon, this music is in the French style, which I do not understand." In Italy Handel produced two operas, *Rodrigo* and *Agrippina*, the latter a very important work, of which the splendid overture was remodelled forty-four years afterwards as that of his last original oratorio, *Jephtha*. He also produced two oratorios, *La Resurrezione*, and *Il Trionfo del tempo*. This, forty-six years afterwards, formed the basis of his last work. *The Triumph of Time and Truth*, which contains no original matter. All Handel's early works contain material that he used often with very little alteration later on, and, though the famous "Lascia ch'io pianga" does not occur in *Almira*, it occurs note for note in *Agrippina* and the two Italian oratorios. On the other hand the cantata *Aci, Galattea e Polifemo* has nothing in common with *Acis and Galatea*. Besides these larger works there are several choral and solo cantatas of which the earliest, such as the great *Dixit Dominus*, show in their extravagant vocal difficulty how radical was the change which Handel's Italian experience so rapidly effected in his methods.

Handel's success in Italy established his fame and led to his receiving at Venice in 1709 the offer of the post of Kapellmeister to the elector of Hanover, transmitted to him by Baron Kielmansegge, his patron and staunch friend of later years. Handel at the time contemplated a visit to England, and he accepted this offer on condition of leave of absence being granted to him for that purpose. To England accordingly Handel journeyed after a short stay at Hanover, arriving in London towards the close of 1710. He came as a composer of Italian opera, and earned his first success at the Haymarket with *Rinaldo*, composed, to the consternation of the hurried librettist, in a fortnight, and first performed on the 24th of February 1711. In this opera the aria "Lascia ch'io pianga" found its final home. The work was produced with the utmost magnificence, and Addison's delightful reviews of it in the *Spectator* poked fun at it from an unmusical point of view in a way that sometimes curiously foreshadows the criticisms that Gluck might have made on such things at a later period. The success was so great, especially for Walsh the publisher, that Handel proposed that Walsh should compose the next opera, and that he should publish it. He returned to Hanover at the close of the opera season, and composed a good deal of vocal chamber music for the princess Caroline, the step-daughter of the elector, besides the instrumental works known to us as the oboe concertos. In 1712 Handel returned to London and spent a year with Andrews, a rich musical amateur, in Barn Elms, Surrey. Three more years were spent in Burlington, in the neighbourhood of London. He evidently was but little inclined to return to Hanover, in spite of his duties to the court there. Two Italian operas and the *Utrecht Te Deum* written by the command of Queen Anne are the principal works of this period. It was somewhat awkward for the composer when his deserted master came to London in 1714 as George I. of England. For some time Handel did not venture to appear at court, and it was only at the intercession of Baron Kielmansegge that his pardon was obtained. By his advice Handel wrote the *Water Music* which was performed at a royal water party on the Thames, and it so pleased the king that he at once received the composer into his good graces and granted him a salary of £400 a year. Later Handel became music master to the little princesses and was given an additional £200 by the princess Caroline. In 1716 he followed the king to Germany, where he wrote a second German Passion to the popular poem of Brockes, a text which, divested of its worst features, forms the basis of several of the arias in Bach's *Passion according to St John*. This was Handel's last work to a German text.

On his return to England he entered the service of the duke of Chandos as conductor of his concerts, receiving a thousand pounds for his first oratorio *Esther*. The music which Handel wrote for performance at "Cannons," the duke of Chandos's residence at Edgware, is comprised in the first version of *Esther*, *Acis and Galatea*, and the twelve *Chandos Anthems*, which are compositions approximately in the same form as Bach's church cantatas but without any systematic use of chorale tunes. The fashionable Londoner would travel 9 miles in those days to the little chapel of Whitchurch to hear Handel's music, and all that now remains of the magnificent scene of these visits is the church, which is the parish church of Edgware. In 1720 Handel appeared again in a public capacity as impresario of the Italian opera at the Haymarket theatre, which he managed for the institution called the Royal Academy of Music. Senesino, a famous singer, to engage whom Handel especially journeyed to Dresden, was the mainstay of the enterprise, which opened with a highly successful performance of Handel's opera *Radamisto*. To this time belongs the famous rivalry between Handel and Buononcini, a melodious Italian composer whom many thought to be the greater of the two. The controversy has been perpetuated in John Byrom's lines:

> "Some say, compared to Buononcini
> That Mynheer Handel's but a ninny;
> Others aver that he to Handel
> Is scarcely fit to hold a candle.
> Strange all this difference should be
> Twixt tweedle-dum and tweedle-dee."

It must be remembered that at this time Handel had not yet asserted his greatness as a choral writer; the fashionable ideas of music and musicianship were based entirely upon success in Italian opera, and the contest between the rival composers was waged on the basis of works which have fallen into almost as complete an oblivion in Handel's case as in Buononcini's. None of Handel's forty-odd Italian operas can be said to survive, except in some two or three detached arias out of each opera; arias which reveal their essential qualities far better in isolation than when performed in groups of between twenty and thirty on the stage, as interruptions to the action of a classical drama to which nobody paid the slightest attention. But even within these limits Handel's artistic resources were too great to leave the issue in doubt; and when Handel wrote the third act of an opera *Muzio Scevola*, of which Buononcini and Ariosti[1] wrote the other two, his triumph was decisive, especially as Buononcini soon got into discredit by failing to defend himself against the charge of producing as a prize-madrigal of his own a composition which proved to be by Lotti. At all events Buononcini left London, and Handel for the next ten years was without a rival in his ventures as an operatic composer. He was not, however, without a rival as an impresario; and the hostile competition of a rival company which obtained the services of the great Farinelli and also induced Senesino to desert him, led to his bankruptcy in 1737, and to an attack of paralysis caused by anxiety and overwork. The rival company also had to be dissolved from want of support, so that Handel's misfortunes must not be attributed to any failure to maintain his position in the musical world. Handel's artistic conscience was that of the most easy-going opportunist, or he would never have continued till 1741 to work in a field that gave so little scope for his genius. But the public seemed to want operas, and, if opera had no scope for his genius, at all events he could supply better operas with greater rapidity and ease than any three other living composers working together. And this he naturally continued to do so long as it seemed to be the best way to keep up his reputation. But with all this artistic opportunism he was not a man of tact, and there are numerous stories of the type of his holding the great prima donna Cuzzoni at arm's-length out of a window and threatening to drop her unless she consented to sing a song which she had declared unsuitable to her style.

Already before his last opera, *Deidamia*, produced in 1741, Handel had been making a growing impression with his oratorios.

[1] Chrysander says Mattei instead of Ariosti.

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In these, freed from the restrictions of the stage, he was able to give scope to his genius for choral writing, and so to develop, or rather revive, that art of chorus singing which is the normal outlet for English musical talent. In 1726 Handel had become a naturalized Englishman, and in 1733 he began his public career as a composer of English texts by producing the second and larger version of *Esther* at the King's theatre. This was followed early in the same year by *Deborah*, in which the share of the chorus is much greater. In July he produced *Athalia* at Oxford, the first work in which his characteristic double choruses appear. The share of the chorus increases in *Saul* (1738); and *Israel in Egypt* (also 1738) is practically entirely a choral work, the solo movements, in spite of their fame, being as perfunctory in character as they are few in number. It was not unnatural that the public, who still considered Italian opera the highest, because the most modern form of musical art, obliged Handel at subsequent performances of this gigantic work to insert more solos.

The *Messiah* was produced at Dublin on the 13th of April 1742. *Samson* (which Handel preferred to the *Messiah*) appeared at Covent Garden on the 2nd of March 1743; *Belshazzar* at the King's theatre, 27th of March 1745; the *Occasional Oratorio* (chiefly a compilation of the earlier oratorios, but with a few important new numbers), on the 14th of February 1746 at Covent Garden, where all his later oratorios were produced; *Judas Maccabaeus* on the 1st of April 1747; *Joshua* on the 9th of March 1748; *Alexander Balus* on the 23rd of March 1748; *Solomon* on the 17th of March 1749; *Susanna*, spring of 1749; *Theodora*, a great favourite of Handel's, who was much disappointed by its cold reception, on the 16th of March 1750; *Jephtha* (strictly speaking, his last work) on the 26th of February 1752, and *The Triumph of Time and Truth* (transcribed from *Il Trionfo del tempo* with the addition of many later favourite numbers), 1757. Other important works, indistinguishable in artistic form from oratorios, but on secular subjects, are *Alexander's Feast*, 1736; *Ode for St Cecilia's Day* (words by Dryden); *L'Allegro, il pensieroso ed il moderato* (the words of the third part by Jennens), 1740; *Semele*, 1744; *Hercules*, 1745; and *The Choice of Hercules*, 1751.

By degrees the enmity against Handel died away, though he had many troubles. In 1745 he had again become bankrupt; for, although he had no rival as a composer of choral music it was possible for his enemies to give balls and banquets on the nights of his oratorio performances. As with his first bankruptcy, so in his later years, he showed scrupulous sense of honour in discharging his debts, and he continued to work hard to the end of his life. He had not only completely recovered his financial position by the year 1750, but he must have made a good deal of money, for he then presented an organ to the Foundling Hospital, and opened it with a performance of the *Messiah* on the 15th of May. In 1751 his sight began to trouble him; and the autograph of *Jephtha*, published in facsimile by the *Händelgesellschaft*, shows pathetic traces of this in his handwriting,[1] and so affords a most valuable evidence of his methods of composition, all the accompaniments, recitatives, and less essential portions of the work being evidently filled in long after the rest. He underwent unsuccessful operations, one of them by the same surgeon who had operated on Bach's eyes. There is evidence that he was able to see at intervals during his last years, but his sight practically never returned after May 1752. He continued superintending performances of his works and writing new arias for them, or inserting revised old ones, and he attended a performance of the *Messiah* a week before his death, which took place, according to the *Public Advertiser* of the 16th of April, not on Good Friday, the 13th of April, according to his own pious wish and according to common report, but on the 14th of April 1759. He was buried in Westminster Abbey; and his monument is by L. F. Roubilliac, the same sculptor who modelled the marble statue erected in 1739 in Vauxhall Gardens, where his works had been frequently performed.

Handel was a man of high character and intelligence, and his interest was not confined to his own art exclusively. He liked the society of politicians and literary men, and he was also a collector of pictures and articles of *virtu*. His power of work was enormous, and the *Handelgesellschaft's* edition of his complete works fills one hundred volumes, forming a total bulk almost equal to the works of Bach and Beethoven together.
(F. H.; D. F. T.)

Handel as composer.

No one has more successfully popularized the greatest artistic ideals than Handel; no artist is more disconcerting to critics who imagine that a great man's mental development is easy to follow. Not even Wagner effected a greater transformation in the possibilities of dramatic music than Handel effected in oratorio, yet we have seen that Handel was the very opposite of a reformer. He was not even conservative, and he hardly took the pains to ascertain what an art-form was, so long as something externally like it would convey his idea. But he never failed to convey his idea, and, if the hybrid forms in which he conveyed it had no historic influence and no typical character, they were none the less accurate in each individual case. The same aptness and the same absence of method are conspicuous in his style. The popular idea that Handel's style is easily recognizable comes from the fact that he overshadows all his predecessors and contemporaries, except Bach, and so makes us regard typical 18th-century Italian and English style as Handelian, instead of regarding Handel's style as typical Italian 18th-century. Nothing in music requires more minute expert knowledge than the sifting of the real peculiarities of Handel's style from the mass of contemporary formulae which in his inspired pages he absorbed, and which in his uninspired pages absorbed him.

His easy mastery was acquired, like Mozart's, in childhood. The later sonatas for two oboes and bass which he wrote in his eleventh year are, except in their diffuseness and an occasional slip in grammar, indistinguishable from his later works, and they show a boyish inventiveness worthy of Mozart's work at the same age. Such early choral works, as the *Dixit Dominus* (1707), show the ill-regulated power of his choral writing before he assimilated Italian influences. Its practical difficulties are at least as extravagant as Bach's, while they are not accounted for by any corresponding originality and necessity of idea; but the grandeur of the scheme and nobility of thought is already that for which Handel so often in later years found the simplest and easiest adequate means of expression that music has ever attained. His eminently practical genius soon formed his vocal style, and long before the period of his great oratorios, such works as *The Birthday Ode for Queen Anne* (1713) and the *Utrecht Te Deum* show not a trace of German extravagance. The only drawback to his practical genius was that it led him to bury perhaps half of his finest melodies, and nearly all the secular features of interest in his treatment of instruments and of the aria forms, in that deplorable limbo of vanity, the 18th-century Italian opera. It is not true, as has been alleged against him, that his operas are in no way superior to those of his contemporaries; but neither is it true that he stirred a finger to improve the condition of dramatic musical art. He was no slave to singers, as is amply testified by many anecdotes. Nor was he bound by the operatic conventions of the time. In *Teseo* he not only wrote an opera in five acts when custom prescribed three, but also broke a much more plausible rule in arranging that each character should have two arias in succession. He also showed a feeling for expression and style which led him to write arias of types which singers might not expect. But he never made any innovation which had the slightest bearing upon the stage-craft of opera, for he never concerned himself with any artistic question beyond the matter in hand; and the matter in hand was not to make dramatic music, or to make the story interesting or intelligible, but simply to provide a concert of between some twenty and thirty Italian arias and duets, wherein singers could display their abilities and spectators find distraction from the monotony of so large a dose of the aria form (which

[1] By a dramatic coincidence Handel's blindness interrupted him during the writing of the chorus, "How dark, oh Lord, are Thy decrees, ... all our joys to sorrow turning ... as the night succeeds the day."

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was then the only possibility for solo vocal music) in the gorgeousness of the dresses and scenery.

When the question arose how a musical entertainment of this kind could be managed in Lent without protests from the bishop of London, Handelian oratorio came into being as a matter of course. But though Handel was an opportunist he was not shallow. His artistic sense seized upon the natural possibilities which arose as soon as the music was transferred from the stage to the concert platform; and his first English oratorio, *Esther* (1720), beautifully shows the transition. The subject is as nearly secular as any that can be extracted from the Bible, and the treatment was based on Racine's *Esther*, which was much discussed at the time. Handel's oratorio was reproduced in an enlarged version in 1732 at the King's theatre: the princess royal wished for scenery and action, but the bishop of London protested. And the choruses, of which in the first version there are already no less than ten, are on the one hand operatic and unecclesiastical in expression, until the last, where polyphonic work on a large scale first appears; but on the other hand they are all much too long to be sung by heart, as is necessary in operas. In fact, the turning-point in Handel's development is the emancipation of the chorus from theatrical limitations. This had as great effect upon his few but important secular English works as upon his other oratorios. *Acis and Galatea*, *Semele* and *Hercules*, are in fact secular oratorios; the choral music in them is not ecclesiastical, but it is large, independent and polyphonic.

We must remember, then, that Handel's scheme of oratorio is operatic in its origin and has no historic connexion with such principles as might have been generalized from the practice of the German Passion music of the time; and it is sufficiently astonishing that the chorus should have so readily assumed its proper place in a scheme which the public certainly regarded as a sort of Lenten biblical opera. And, although the chorus owes its freedom of development to the disappearance of theatrical necessities, it becomes no less powerful as a means of dramatic expression (as opposed to dramatic action) than as a purely musical resource. Already in *Athalia* the "Hallelujah" chorus at the end of the first act is a marvel of dramatic truth. It is sung by Israelites almost in despair beneath usurping tyranny; and accordingly it is a severe double fugue in a minor key, expressive of devout courage at a moment of depression. On purely musical grounds it is no less powerful in throwing into the highest possible relief the ecstatic solemnity of the psalm with which the second act opens. Now this sombre "Hallelujah" chorus is a very convenient illustration of Handel's originality, and the point in which his creative power really lies. It was not originally written for its situation in *Athalia*, but it was chosen for it. It was originally the last chorus of the second version of the anthem, *As pants the Hart*, from the autograph of which it is missing because Handel cut out the last pages in order to insert them into the manuscript of *Athalia*. The inspiration in *Athalia* thus lies not in the creation of the chorus itself, but in the choice of it.

In choral music Handel made no more innovation than he made in arias. His sense of fitness in expression was of little use to him in opera, because opera could not become dramatic until musical form became capable of developing and blending emotions in all degrees of climax in a way that may be described as pictorial and not merely decorative (see MUSIC; SONATA-FORMS; and INSTRUMENTATION). But in oratorio there was not the least necessity for reforming any art-forms. The ordinary choral resources of the time had perfect expressive possibilities where there were no actors to keep waiting, and where no dresses and scenery need distract the attention of the listener. When lastly, ordinary decorum dictated an attitude of reverent attention towards the subject of the oratorio, then the man of genius could find such a scope for his real sense of dramatic fitness as would make his work immortal.

In estimating Handel's greatness we must think away all orthodox musical and progressive prejudices, and learn to apply the lessons critics of architecture and some critics of literature seem to know by nature. Originality, in music as in other arts, lies in the whole, and in a sense of the true meaning of every part. When Handel wrote a normal double fugue in a minor key on the word "Hallelujah" he showed that he at all events knew what a vigorous and dignified thing an 18th-century double fugue could be. In putting it at the end of a melancholy psalm he showed his sense of the value of the minor mode. When he put it in its situation in *Athalia* he showed as perfect a sense of dramatic and musical fitness as could well be found in art. Now it is obvious that in works like oratorios (which are dramatic schemes vigorously but loosely organized by the putting together of some twenty or thirty complete pieces of music) the proper conception of originality will be very different from that which animates the composer of modern lyric, operatic or symphonic music. When we add to this the characteristics of a method like Handel's, in which musical technique has become a masterly automatism, it becomes evident that our conception of originality must be at least as broad as that which we would apply in the criticism of architecture. The disadvantages of the want of such a conception have been aggravated by the dearth of general knowledge of the structure of musical art; a knowledge which shows that the parallel we have suggested between music and architecture, as regards the nature of originality, is no mere figure of speech.

In every art there is an antithesis between form and matter, which becomes reconciled only when the work of art is perfect in its execution. And, whatever this perfection, the antithesis must always remain in the mind of the artist and critic to this extent, that some part of the material seems to be the special subject of technical rule rather than another. In the plastic and literary arts one type of this antithesis is more or less permanently maintained in the relation between subject and treatment. The mere fact that these arts express themselves by representing things that have some previous independent existence, helps us to look for originality rather in the things that make for perfection of treatment than in novelty of subject. But in music we have no permanent means of deciding which of many aspects we shall call the subject and which the treatment. In the 16th century the a priori form existed mainly in the practice of basing almost every melodic detail of the work on phrases of Gregorian chant or popular song, treated for the most part in terms of very definitely regulated polyphonic design, and on harmonic principles regulated in almost every detail by the relation between the melodic aspects of the church modes and the necessity for occasional alterations of the strict mode to secure finality at the close. In modern music such a relation between form and matter, prescribing as it does for every aspect at every moment both of the shape and the texture of the music, would exclude the element of invention altogether. In 16th-century music it by no means had that effect. An inventive 16th-century composer is as clearly distinguishable from a dull one as a good architect from a bad. The originality of the composer resides, in 16th-century music as in all art, in his whole work; but naturally his conception of property and ideas will not extend to themes or isolated passages. That man is entitled to an idea who can show what it means, or who can make it mean what he likes. Let him wear the giant's robe if it fits him. And it is merely a local difference in point of view which makes us think that there is property in themes and no property in forms. Nowadays we happen to regard the shape of a whole composition as its form, and its theme as its matter. And, as artistic organization becomes more complex and heterogeneous, the need of the broadest and most forcible possible outline of design is more pressingly felt; so that in what we choose to call form we are willing to sacrifice all conception of originality for the sake of general intelligibility, while we insist upon complete originality in those thematic details which we are pleased to call matter. But, if this explains, it does not excuse our setting up a criterion for musical originality which can be accepted by no intelligent critics of other arts, and which is completely upset by the study of any music earlier than the beginning of the 19th century.

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The difficulty many writers have found in explaining the subject of Handel's "plagiarisms" is not entirely accounted for by mere lack of these considerations; but the grossest confusion of ideas as to the difference between cases in point prevails to this day, and many discussions which have been raised in regard to the ethical aspect of the question are frankly absurd.[1] It has been argued, for instance, that great injustice was done to Buononcini over his unfortunate affair with the prize madrigal, while his great rival was allowed the credit of *Israel in Egypt*, which contains a considerable number of entire choruses (besides bosts of themes) by earlier Italian and German writers. But the very idea of Handelian oratorio is that of some three hours of music, religious or secular, arranged, like opera, in the form of a colossal entertainment, and with high dramatic and emotional interest imparted to it, if not by the telling of a story, at all events by the nature and development of the subject. It seems, moreover, to be entirely overlooked that the age was an age of *pasticcios*. Nothing was more common than the organization of some such solemn entertainment by the skilful grouping of favourite pieces. Handel himself never revived one of his oratorios without inserting in it favourite pieces from his other works as well as several new numbers; and the story is well known that the turning point in Gluck's career was his perception of the true possibilities of dramatic music from the failure of a *pasticcio* in which he had reset some rather definitely expressive music to situations for which it was not originally designed. The success of an oratorio was due to the appropriateness of its contrasts, together of course with the mastery of its detail, whether that detail were new or old; and there are many gradations between a réchauffé of an early work like *The Triumph of Time and Truth*, or a *pasticcio* with a few original numbers like the *Occasional Oratorio*, and such works as *Samson*, which was entirely new except that the "Dead March" first written for it was immediately replaced by the more famous one imported from *Saul*. That the idea of the *pasticcio* was extremely familiar to the age is shown by the practice of announcing an oratorio as "new and original," a term which would obviously be meaningless if it were as much a matter of course as it is at the present day, and which, if used at all, must obviously so apply to the whole work without forbidding the composer from gratifying the public with the reproduction of one or two favourite arias. But of course the question of originality becomes more serious when the imported numbers are not the composer's own. And here it is very noticeable that Handel derived no credit, either with his own public or with us, from whole movements that are not of his own designing. In *Israel in Egypt*, the choruses "Egypt was glad when they departed," "And I will exalt Him," "Thou sentest forth Thy Wrath" and "The Earth swallowed them," are without exception the most colourless and unattractive pieces of severe counterpoint to be found among Handel's works; and it is very difficult to fathom his motive in copying them from obscure pieces by Erba and Kaspar Kerl, unless it he that he wished to train his audiences to a better understanding of a polyphonic style. He certainly felt that the greatest possibilities of music lay in the higher choral polyphony, and so in *Israel in Egypt* he designed a work consisting almost entirely of choruses, and may have wished in these instances for severe contrapuntal movements which he had not time to write, though he could have done them far better himself. Be this as it may, these choruses have certainly added nothing to the popularity of a work of which the public from the outset complained that there was not enough solo music; and what effect they have is merely to throw Handel's own style into relief. To draw any parallel between the theft of such unattractive details in the grand and intensely Handelian scheme of *Israel in Egypt* and Buononcini's alleged theft of a prize madrigal is merely ridiculous. Handel himself, if he had any suspicion that contemporaries did not take a sane architect's view of the originality of large musical schemes,[2] probably gave himself no more trouble about their scruples on this matter than about other forms of musical banality.

The *History of Music* by Burney, the cleverest and most refined musical critic of the age, shows in the very freshness of its musical scholarship how completely unscholarly were the musical ideas of the time. Burney was incapable of regarding choral music as other than a highly improving academic exercise in which he himself was proficient; and for him Handel is the great opera-writer whose choral music will reward the study of the curious. If Handel had attempted to explain his methods to the musicians of his age, he would probably have found himself alone in his opinions as to the property of musical ideas. He did not trouble to explain, but he made no concealment of his sources. He left his whole musical library to his copyist, and it was from this that the sources of his work were discovered. And when the whole series of plagiarisms is studied, the fact forces itself upon us that nothing except themes and forms which are common property in all 18th-century music, has yet been discovered as the source of any work of Handel's which is not felt as part of a larger design. Operatic arias were never felt as parts of a whole. The opera was a concert on the stage, and it stood or fell, not by a dramatic propriety which it notoriously neglected to consider at all, but by the popularity of its arias. There is no aria in Handel's operas which is traceable to another composer. Even in the oratorios there is no solo number in which more than the themes are pillered, for in oratorios the solo work still appealed to the popular criterion of novelty and individual attractiveness. And when we leave the question of copying of whole movements and come to that of the adaptation of passages, and still more of themes, Handel shows himself to be simply on a line with Mozart. Jahn compares the opening of Mozart's *Requiem* with that of the first chorus in Handel's *Funeral Anthem*. Mozart recreates at least as much from Handel's already perfect framework as Handel ever idealized from the inorganic fragments of earlier writers. The double counterpoint of the Kyrie in Mozart's *Requiem* is still more indisputably identical with that of the last chorus of Handel's *Joseph*, and if the themes are common property their combination certainly is not. But the true plagiarist is the man who does not know the meaning of the ideas he copies, and the true creator is he in whose hands they remain or become true ideas. The theme "He led them forth like sheep" in the chorus "But as for his people" is one of the most beautiful in Handel's works, and the bare statement that it comes from a serenata by Stradella seems at first rather shocking. But, to any one who knew Stradella's treatment of it first, Handel's would come as a revelation actually greater than if he had never heard the theme before. Stradella makes nothing more of it, and therefore presumably sees nothing more in it than an agreeable and essentially frivolous little tune which lends itself to comic dramatic purpose by a wearisome repetition throughout eight pages of patchy aria and instrumental ritornello at an ever-increasing pace. What Handel sees in it is what he makes of it, one of the most solemn and poetic things in music. Again, it may be very shocking to discover that the famous opening of the "Hailstone chorus" comes from the patchy and facetious overture to this same serenata, with which it is identical for ten bars all in the tonic chord (representing, according to Stradella, someone knocking at a door). And it is no doubt yet more shocking that the chorus "He spake the word, and

[1] The "moral" question has been raised afresh in reviews of Mr Sedley Taylor's admirable volume of analysed illustrations (*The Indebtedness of Handel to works of other Composers*, Cambridge, 1906). The latest argument is that Handel shows moral obliquity in borrowing "regretfully" from sources no one could know at the time. This reasoning makes it mysterious that a man of such moral obliquity should ever have written a note of his own music in England when he could have stolen the complete choral works of Bach and most of the hundred operas of Alessandro Scarlatti with the certainty that the sources would not be printed for a century after his death, even if his own name did not then check curiosity among antiquarians. Of course Handel's plagiarisms would have damaged his reputation if contemporaries had known of them. His polyphonic scholarship was more "antiquated" in the 18th century than it is in the 20th.

[2] Much light would be thrown on the subject if some one sufficiently ignorant of architecture were to make researches into Sir Christopher Wren's indebtedness to Italian architects!

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there came all manner of flies" contains no idea of Handel's own except the realistic swarming violin-passages, the general structure, and the vocal colouring; whereas the rhythmic and melodic figures of the volce parts come from an equally patchy *sinfonia concertata* in Stradella's work. The real interest of these things ought not to be denied either by the misstatement that the materials adapted are mere common property, nor by the calumny that Handel was uninventive.

The effects of Handel's original inspiration upon foreign material are really the best indication of the range of his style. The comic meaning of the broken rhythm of Stradella's overture becomes indeed Handel's inspiration in the light of the gigantic tone-picture of the "Hailstone chorus." In the theme of "He led them forth like sheep" we have already cited a particular case where Handel perceived great solemnity in a theme originally intended to be frivolous. The converse process is equally instructive. In the short Carillon choruses in *Saul* where the Israelitish women welcome David after his victory over Goliath, Handel uses a delightful instrumental tune which stands at the beginning of a *Te Deum* by Urio, from which he borrowed an enormous amount of material in *Saul*, *L'Allegro*, the *Dettingen Te Deum* and other works. Urio's idea is first to make a jubilant and melodious noise from the lower register of the strings, and then to bring out a flourish of high trumpets as a contrast. He has no other use for his beautiful tune, which indeed would not bear more elaborate treatment than he gives it. The ritornello falls into statement and counterstatement, and the counterstatement secures one repetition of the tune, after which no more is heard of it. It has none of the solemnity of church music, and its value as a contrast to the flourish of trumpets depends, not upon itself, but upon its position in the orchestra. Handel did not see in it a fine opening for a great ecclesiastical work, but he saw in it an admirable expression of popular jubilation, and he understood how to bring out its character with the liveliest sense of climax and dramatic interest by taking it at its own value as a popular tune. So he uses it as an instrumental interlude accompanied with a jingle of carillons, while the daughters of Israel sing to a square-cut tune those praises of David which aroused the jealousy of Saul. But now turn to the opening of the *Dettingen Te Deum* and see what splendid use is made of the other side of Urio's idea, the contrast between a jubilant noise in the lowest part of the scale and the blaze of trumpets at an extreme height. In the fourth bar of the *Dettingen Te Deum* we find the same florid trumpet figures as we find in the fifth bar of Urio's, but at the first moment they are on oboes. The first four bars beat a tattoo on the tonic and dominant, with the whole orchestra, including trumpets and drums, in the lowest possible position and in a stirring rhythm with a boldness and simplicity characteristic only of a stroke of genius. Then the oboes appear with Urio's trumpet flourishes; the momentary contrast is at least as brilliant as Urio's; and as the oboes are immediately followed by the same figures on the trumpets themselves the contrast gains incalculably in subtlety and climax. Moreover, these flourishes are more melodious than the broad and massive opening, instead of being, as in Urio's scheme, incomparably less so. Lastly, Handel's primitive opening rhythmic figures inevitably underlie every subsequent inner part and bass that occurs at every half close and full close throughout the movement, especially where the trumpets are used. And thus every detail of his scheme is rendered alive with a rhythmic significance which the elementary nature of the theme prevents from ever becoming obtrusive.

No other great composer has ever so overcrowded his life with occasional and mechanical work as Handel, and in no other artist are the qualities that make the difference between inspired and uninspired pages more difficult to analyse. The libretti of his oratorios are full of absurdities, except when they are derived in every detail from Scripture, as in the *Messiah* and *Israel in Egypt*, or from the classics of English literature, as in *Samson* and *L'Allegro*. These absurdities, and the obvious fact that in every oratorio Handel writes many more numbers than are desirable for one performance, and that he was continually in later performances adding, transferring and cutting out solo numbers and often choruses as well—all this may seem at first sight to militate seriously against the view that Handel's originality and greatness consists in his grasp of the works as wholes, but in reality it strengthens that view. These things militate against the perfection of the whole, but they would have been absolutely fatal to a work of which the whole is not (as in all true art) greater than the sum of its parts. That they are felt as absurdities and defects already shows that Handel created in English oratorio a true art-form on the largest possible scale.

There never has been a time when Handel has been overrated, except in so far as other composers have been neglected. But no composer has suffered so much from pious misinterpretation and the popular admiration of misleading externals. It is not the place here to dilate upon the burial of Handel's art beneath the "mammoth" performances of the Handel Festivals at the Crystal Palace; nor can we give more than a passing reference to the effects of "additional accompaniments" in the style of an altogether later age, started most unfortunately by Mozart (whose share in the work has been very much misinterpreted and corrupted) and continued in the middle of the 19th century by musicians of every degree of intelligence and refinement, until all sense of unity of style has been lost and does not seem likely to be recovered as a general element in the popular appreciation of Handel for some time to come. But in spite of this, Handel will never cease to be revered and loved as one of the greatest of composers, if we value the criteria of architectonic power, a perfect sense of style, and the power to rise to the most sublime height of musical climax by the simplest means.

Handel's important works have all been mentioned above with their dates, and a separate detailed list does not seem necessary. He was an extremely rapid worker, and his later works are dated almost day by day as they proceed. From this we learn that the *Messiah* was sketched and scored within twenty-one days, and that when *Athalia*, with an interruption of nearly four months between several other delays caused by Handel's failing sight, was begun and finished within seven months, representing hardly five weeks' actual writing. Handel's extant works may be roughly summarized from the edition of the *Händelgesellschaft* as 41 Italian operas, 2 Italian oratorios, 2 German Passions, 18 English oratorios, 4 English secular oratorios, 4 English secular cantatas, and a few other small works, English and Italian, of the type of oratorio or incidental dramatic music; 3 Latin settings of the *Te Deum*; 2 (English) *Dettingen Te Deum* and *Utrecht Te Drum and Jubilate*; 4 coronation anthems; 3 volumes of English anthems (*Chandos Anthems*); 1 volume of Latin church music; 3 volumes of Italian vocal chamber-music; 1 volume of clavier works; 3 instrumental duets and trios (sonatas), and 4 volumes of orchestral music and organ concertos (about 40 works). Precise figures are impossible as there is no means of drawing the line between *pasticcios* and original works. The instrumental pieces especially are used again and again as overtures to operas and oratorios and anthems.

The complete edition of the German *Händelgesellschaft* suffers from being the work of one man who would not recognize that his task was beyond any single man's power. The best arrangements of the vocal scores are undoubtedly those published by Novello that are not based on "additional accompaniments." None is absolutely trustworthy, and those of the editor of the German *Handelgesellschaft* are sad proofs of the uselessness of expert library-scholarship without a sound musical training. Yet Chrysander's services in the restoration of Handel are beyond praise. We need only mention his discovery of authentic trombone parts in *Israel in Egypt* as one among many of his priceless contributions to musical history and aesthetics. (D. F. T.)

HANDFASTING (A.S. *handfæstnung*, pledging one's hand), primarily the O. Eng. synonym for *betrothal* (*q.v.*), and later a peculiar form of temporary marriage at one time common in Scotland, the only necessary ceremony being the verbal pledge of the couple while holding hands. The pair thus handfasted were, in accordance with Scotch law, entitled to live together for a year and a day. If then they so wished, the temporary marriage could be made permanent; if not, they could go their several ways without reproach, the child, if any, being supported by the party who objected to further cohabitation.

HANDICAP (from the expression *hand in cap*, referring to drawing lots), a disadvantageous condition imposed upon the

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superior competitor in sports and games, or an advantage allowed the inferior, in order to equalize the chances of both. The character of the handicap depends upon the nature of the sport. Thus in horse-racing the better horse must carry the heavier weight. In foot races the inferior runners are allowed to start at certain distances in advance of the best (or "scratch") man, according to their previous records. In distance competitions (weights, fly-casting, jumping, &c.) the inferior contestants add certain distances to their scores. In time contests (yachting, canoe-racing, &c.) the weaker or smaller competitors subtract certain periods of time from that actually made, reckoned by the mile. In stroke contests (*e.g.* golf) a certain number of strokes are subtracted from or added to the scores, according to the strength of the players. In chess and draughts the stronger competitor may play without one or more pieces. In court games (tennis, lawn-tennis, racquets, &c.) and in billiards certain points, or percentage of points, are accorded the weaker players.

Handicapping was applied to horse-racing as early as 1680, though the word was not used in this connexion much before the middle of the 18th century. A "Post and Handy-Cap Match" is described in *Pond's Racing Calendar* for 1754. A reference to something similar in Germany and Scandinavia, called *Freimarkt*, may be found in *Germania*, vol. xix.

Competitions in which handicaps are given are called *handicap-events* or *handicaps*. There are many systems which depend upon the whim of the individual competitors. Thus a tennis player may offer to play against his inferior with a selzer-bottle instead of a racquet; or a golfer to play with only one club; or a chess-player to make his moves without seeing the board.

The name "handicap" was taken from an ancient English game, to which Pepys, in his *Diary* under the date of the 18th of September 1660, thus refers: "Here some of us fell to handicap, a sport that I never knew before, which was very good." This game, which became obsolete in the 19th century, was described as early as the 14th in *Piers the Plowman* under the name of "New Faire." It was originally played by three persons, one of whom proposed to "challenge," or exchange, some piece of property belonging to another for something of his own. The challenge being accepted an umpire was chosen, and all three put up a sum of money as a forfeit. The two players then placed their right hands in a cap, or in their pockets, in which there was loose money, while the umpire proceeded to describe the two objects of exchange, and to declare what sum of money the owner of the inferior article should pay as a bonus to the other. This declaration was made as rapidly as possible and ended with the invitation, "Draw, gentlemen!" Each player then withdrew and held out his hand, which he opened. If both hands contained money the exchange was effected according to the conditions laid down by the umpire, who then took the forfeit money for himself. If neither hand contained money the exchange was declined and the umpire took the forfeit money. If only one player signified his acceptance of the exchange by holding money in his hand, he was entitled to the forfeit-money, though the exchange was not made.

Handicap was also the name of an old game at cards, now obsolete. It resembled the game of Loo, and probably derived its name from the ancient sport described above.

HANDSEL, the O. Eng. term for earnest money; especially in Scotland the first money taken at a market or fair. The termination *sel* is the modern "sell." "Hand" indicates, not a bargain by shaking hands, but the actual putting of the money into the hand. Handsels were also presents or earnests of goodwill in the North; thus Handsel Monday, the first Monday in the year, an occasion for universal tipping, is the equivalent of the English Boxing day.

HANDSWORTH. (1) An urban district in the Handsworth parliamentary division of Staffordshire, England, suburban to Birmingham on the north-west. Pop. (1891), 32,756; (1901) 57,921. (See BIRMINGHAM.) (2) An urban district in the Hallamshire parliamentary division of Yorkshire, 4 m. S.E. of Sheffield. Pop. (1901), 13,404. In this neighbourhood are extensive collieries and quarries.

HANDWRITING. Under PALAEOGRAPHY and WRITING, the history of handwriting is dealt with. Questions of handwriting come before legal tribunals mainly in connexion with the law of evidence. In Roman law, the authenticity of documents was proved first by the attesting witnesses; in the second place, if they were dead, by comparison of handwritings. It was necessary, however, that the document to be used for purposes of comparison either should have been executed with the formalities of a public document, or should have its genuineness proved by three attesting witnesses. The determination was apparently, in the latter case, left to experts, who were sworn to give an impartial opinion (Code 4, 21. 20). Proof by comparison of handwritings, with a reference if necessary to three experts as to the handwriting which is to be used for the purposes of comparison, is provided for in the French Code of Civil Procedure (arts. 193 et seq.); and in Quebec (Code Proc. Civ. arts. 302 et seq.) and St Lucia (Code Civ. Proc. arts. 286 et seq.), the French system has been adopted with modifications. Comparison by witnesses of disputed writings with any writing proved to the satisfaction of the judge to be genuine is accepted in England and Ireland in all legal proceedings whether criminal or civil, including proceedings before arbitrators (Denman Act, 28 & 29 Vict. c. 18, §§. 1, 8); and such writings and the evidence of witnesses respecting the same may be submitted to the court and jury as evidence of the genuineness or otherwise of the writing in dispute. It is admitted in Scotland (where the term *comparatio literarum* is in use) and in most of the American states, subject to the same conditions. In England, prior to the Common Law Procedure Act of 1854 (now superseded by the act of 1866), documents irrelevant to the matter in issue were not admissible for the sole purpose of comparison, and this rule has been adopted, and is still adhered to, in some of the states in America. In England, as in the United States, and in most legal systems, the primary and best evidence of handwriting is that of the writer himself. Witnesses who saw him write the writing in question, or who are familiar with his handwriting either from having seen him write or from having corresponded with him, or otherwise, may be called. In cases of disputed handwriting the court will accept the evidence of experts in handwriting, *i.e.* persons who have an adequate knowledge of handwriting, whether acquired in the way of their business or not, such as solicitors or bank cashiers (*R.* v. *Silverlock*, 1894, 2 Q.B. 766). In such cases the witness is required to compare the admitted handwriting of the person whose writing is in question with the disputed document, and to state in detail the similarities or differences as to the formation of words and letters, on which he bases his opinion as to the genuineness or otherwise of the disputed document. By the use of the magnifying glass, or, as in the Parnell case, by enlarged photographs of the letters alleged to have been written by Mr Parnell, the court and jury are much assisted to appreciate the grounds on which the conclusions of the expert are founded. Evidence of this kind, being based on opinion and theory, needs to be very carefully weighed, and the dangers of implicit reliance on it have been illustrated in many cases (*e.g.* the Beck case in 1904; and see *Seaman* v. *Netherclift*, 1876, 1 C.P.D. 540). Evidence by comparison of handwriting comes in principally either in default, or in corroboration, of the other modes of proof.

Where attestation is necessary to the validity of a document, *e.g.* wills and bills of sale, the execution must be proved by one or more of the attesting witnesses, unless they are dead or cannot be produced, when it is sufficient to prove the signature of one of them to the attesting clause (28 & 29 Vict. c. 18, s. 7). Signatures to certain public and official documents need not in general be proved (see *e.g.* Evidence Act, 1845, ss. 1, 2).

See Taylor, *Law of Evidence* (10th ed., London, 1906); Erskine, *Principles of the Law of Scotland* (20th ed., Edinburgh, 1903); Bouvier, *Law Dictv.* (Boston and London, 1897); Harris, *Identification* (Albany, 1892); Hagan, *Disputed Handwriting* (New York, 1894); also the article IDENTIFICATION. (A. W. R.)

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HANG-CHOW-FU, a city of China, in the province of Chen-Kiang, 2 m. N.W. of the Tsien-tang-Kiang, at the southern terminus of the Grand canal, by which it communicates with Peking. It lies about 100 m. S.W. of Shanghai, in 30° 20′ 20″ N., 120° 7′ 27″ E. Towards the west is the Si-hu or Western Lake, a beautiful sheet of water, with its banks and islands studded with villas, monuments and gardens, and its surface traversed by gaily-painted pleasure boats. Exclusive of extensive and flourishing suburbs, the city has a circuit of 12 m.; its streets are well paved and clean; and it possesses a large number of arches, public monuments, temples, hospitals and colleges. It has long ranked as one of the great centres of Chinese commerce and Chinese learning. In 1869 the silk manufactures alone were said to give employment to 60,000 persons within its walls, and it has an extensive production of gold and silver work and tinsel paper. On one of the islands in the lake is the great Wên-lan-ko or pavilion of literary assemblies, and it is said that at the examinations for the second degree, twice every three years, from 10,000 to 15,000 candidates come together. In the north-east corner of the city is the Nestorian church which was noted by Marco Polo, the façade being "elaborately carved and the gates covered with elegantly wrought iron." There is a Roman Catholic mission in Hang-chow, and the Church Missionary Society, the American Presbyterians, and the Baptists have stations. The local dialect differs from the Mandarin mainly in pronunciation. The population, which is remarkable for gaiety of clothing, was formerly reckoned at 2,000,000, but is now variously estimated at 300,000, 400,000 or 800,000. Hang-chow-fu was declared open to foreign trade in 1896, in pursuance of the Japanese treaty of Shimonoseki. It is connected with Shanghai by inland canal, which is navigable for boats drawing up to 4 ft. of water, and which might be greatly improved by dredging. The cities of Shanghai, Hang-chow and Suchow form the three points of a triangle, each being connected with the other by canal, and trade is now open by steam between all three under the inland navigation rules. These canals pass through the richest and most populous districts of China, and in particular lead into the great silk-producing districts. They have for many centuries been the highway of commerce, and afford a cheap and economical means of transport. Hangchow lies at the head of the large estuary of that name, which is, however, too shallow for navigation by steamers. The estuary or bay is funnel-shaped, and its configuration produces at spring tides a "bore" or tidal wave, which at its maximum reaches a height of 15 to 20 ft. The value of trade passing through the customs in 1899 was £1,729,000; in 1904 these figures had risen to £3,543,831.

Hang-chow-fu is the Kinsai of Marco Polo, who describes it as the finest and noblest city in the world, and speaks enthusiastically of the number and splendour of its mansions and the wealth and luxuriance of its inhabitants. According to this authority it had a circuit of 100 m., and no fewer than 12,000 bridges and 3000 baths. The name Kinsai, which appears in Wassaf as Khanzai, in Ibn Batuta as Khansa, in Odoric of Pordenone as Camsay, and elsewhere as Campsay and Cassay, is really a corruption of the Chinese *King-sze*, capital, the same word which is still applied to Peking. From the 10th to the 13th century (960–1272) the city, whose real name was then Ling-nan, was the capital of southern China and the seat of the Sung dynasty, which was dethroned by the Mongolians shortly before Marco Polo's visit. Up to 1861, when it was laid in ruins by the Taip'ings, Hangchow continued to maintain its position as one of the most flourishing cities in the empire.

HANGING, one of the modes of execution under Roman law (*ad furcam damnatio*), and in England and some other countries the usual form of capital punishment. It was derived by the Anglo-Saxons from their German ancestors (Tacitus, *Germ.* 12). Under William the Conqueror this mode of punishment is said to have been disused in favour of mutilation: but Henry I. decreed that all thieves taken should be hanged (*i.e.* summarily without trial), and by the time of Henry II. hanging was fully established as a punishment for homicide; the "right of pit and gallows" was ordinarily included in the royal grants of jurisdiction to lords of manors and to ecclesiastical[1] and municipal corporations. In the middle ages every town, abbey, and nearly all the more important manorial lords had the right of hanging. The clergy had rights, too, in respect to the gallows. Thus William the Conqueror invested the abbot of Battle Abbey with authority to save the life of any criminal. From the end of the 12th century the jurisdiction of the royal courts gradually became exclusive; as early as 1212 the king's justices sentenced offenders to be hanged (*Seld. Soc. Publ.* vol. i.; *Select Pleas of the Crown*, p. 111), and in the Gloucester eyre of 1221 instances of this sentence are numerous (Maitland, pl. 72, 101, 228). In 1241 a nobleman's son, William Marise, was hanged for piracy. In the reign of Edward I. the abbot of Peterborough set up a gallows at Collingham, Notts, and hanged a thief. In 1279 two hundred and eighty Jews were hanged for clipping coin. The mayor and the porter of the South Gate of Exeter were hanged for their neglect in leaving the city gate open at night, thereby aiding the escape of a murderer. Hanging in time superseded all other forms of capital punishment for felony. It was substituted in 1790 for burning as a punishment of female traitors and in 1814 for beheading as a punishment for male traitors. The older and more primitive modes of carrying out the sentence were by hanging from the bough of a tree ("the father to the bough, the son to the plough") or from a gallows. Formerly in the worst cases of murder it was customary after execution to hang the criminal's body in chains near the scene of his crime. This was known as "gibbeting," and, though by no means rare in the earliest times, was, according to Blackstone, no part of the legal sentence. Holinshed is the authority for the statement that sometimes culprits were gibbeted alive, but this is doubtful. It was not until 1752 that gibbeting was recognized by statute. The act (25 Geo. II. c. 37) empowered the judges to direct that the dead body of a murderer should be hung in chains, in the manner practised for the most atrocious offences, or given over to surgeons to be dissected and anatomized, and forbade burial except after dissection (see Foster, Crown Law, 107, Earl Ferrers' case, 1760). The hanging in chains was usually on the spot where the murder took place. Pirates were gibbeted on the sea shore or river bank. The act of 1752 was repealed in 1828, but the alternatives of dissection or hanging in chains were re-enacted and continued in use until abolished as to dissection by the Anatomy Act in 1832, and as to hanging in chains in 1834. The last murderer hung in chains seems to have been James Cook, executed at Leicester on the 10th of August 1832. The irons used on that occasion are preserved in Leicester prison. Instead of chains, gibbet irons, a framework to hold the limbs together, were sometimes used. At the town hall, Rye, Sussex, are preserved the irons used in 1742 for one John Breeds who murdered the mayor.

The earlier modes of hanging were gradually disused, and the present system of hanging by use of the drop is said to have been inaugurated at the execution of the fourth Earl Ferrers in 1760. The form of scaffold now in use[2] has under the gallows a drop constructed on the principle of the trap-doors on a theatrical stage, upon which the convict is placed under the gallows, a white cap is placed over his head, and when the halter has been properly adjusted the drop is withdrawn by a mechanical contrivance worked by a lever, much like those in use on railways for moving points and signals. The convict falls into a pit,

[1] See Pollock and Maitland vol. i. 563. The sole survival of these grants is the jurisdiction of the justices of the Soke of Peterborough to try for capital offences at their quarter sessions.

[2] In most counties in Ireland the scaffold used (in 1852) to consist in an iron balcony permanently fixed outside the gaol wall. There was a small door in the wall commanding the balcony and opening out upon it. The bottom of the iron balcony or cage was so constructed that on the withdrawal of a pin or bolt which could be managed from within the gaol, the trap-door upon which the culprit stood dropped from under his feet. The upper end of the rope was fastened to a strong iron bar, which projected over the trap-door. There were usually two or three trap-doors on the same balcony, so that, if required, two or more men could be hanged simultaneously. (Trench, *Realities of Irish Life* (1869), 280.)

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the length of the fall being regulated by his height and weight. Death results not from real hanging and strangulation, but from a fracture of the cervical vertebrae. Compression of the windpipe by the rope and the obstruction of the circulation aid in the fatal result. Recently the noose has had imbedded in its fibre a metal eyelet which is adjusted tightly beneath the ear and considerably expedites death. The convict is left hanging until life is extinct.

It was long considered essential that executions, like trials, should be public, and be carried out in a manner calculated to impress evil-doers. Partly to this idea, partly to notions of revenge and temporal punishment of sin, is probably due the rigour of the administration of the English law. But the methods of execution were unseemly, as delineated in Hogarth's print of the execution of the idle apprentice, and were ineffectual in reducing the bulk of crime, which was augmented by the inefficiency of the police and the uncertainty and severity of the law, which rendered persons tempted to commit crime either reckless or confident of escape. The scandals attending public executions led to an attempt to alter the law in 1841, although many protests had been made long before, among them those of the novelist Fielding. But perhaps the most forcible and effectual was that of Charles Dickens in his letters to *The Times* written after mixing in the crowd gathered to witness the execution of the Mannings at Horsemonger Lane gaol in 1840. After his experiences he came to the conclusion that public executions attracted the depraved and those affected by morbid curiosity; and that the spectacle had neither the solemnity nor the salutary effect which should attend the execution of public justice. His views were strongly resisted in some quarters; and it was not until 1868 (31 & 32 Vict. c. 24) that they were accepted. The last public hanging in England was that of Michael Barrett for murder by causing an explosion at Clerkenwell prison with the object of releasing persons confined there for treason and felony (Ann. Reg., 1868, p. 63). Under the act of 1868 (31 & 32 Vict. c. 24), which was adapted from similar legislation already in force in the Australian colonies, convicted murderers are hanged within the walls of a prison. The sentence of the court is that the convict "be hanged by the neck until he is dead." The execution of the sentence devolves on the sheriff of the county (Sheriffs Act 1887, s. 13). As a general rule the sentence is carried out in England and Ireland at 8 A.M. on a week-day (not being Monday), in the week following the third Sunday after sentence was passed. In old times prisoners were often hanged on the day after sentence was passed; and under the act of 1752 this was made the rule in cases of murder. A public notice of the date and hour of execution must be posted on the prison walls not less than twelve hours before the execution and must remain until the inquest is over. The persons required to be present are the sheriff, the gaoler, chaplain and surgeon of the prison, and such other officers of the prison as the sheriff requires; justices of the peace for the jurisdiction to which the prison belongs, and such of the relatives, or such other persons as the sheriff or visiting justices allow, may also attend. It is usual to allow the attendance of some representatives of the press. The death of the prisoner is certified by the prison surgeon, and a declaration that judgment of death has been executed is signed by the sheriff. An inquest is then held on the body by the coroner for the jurisdiction and a jury from which prison officers are excluded. The certificate and declaration, and a duplicate of the coroner's inquiry also, are sent to the home office, or in Ireland to the lord-lieutenant, and the body of the prisoner is interred in quicklime within the prison walls if space is available. It is also the practice to toll the bell of the parish or other neighbouring church, for fifteen minutes before and fifteen minutes after the execution. The hoisting of the black flag at the moment of execution was abolished in 1902. The regulations as to execution are printed in the Statutory Rules and Orders, Revised ed. 1904, vol. x. (tits. Prison E. and Prison I). The act of 1868 applies only to executions for murder; but since the passing of the act there have been no executions for any other crime within the United Kingdom. (See further CAPITAL PUNISHMENT.)

In Scotland execution by hanging is carried out in the same manner as in England and Ireland, but under the supervision of the magistrates of the burgh in which it is decreed to take place, and in lieu of the inquest required in England and Ireland an inquiry is held at the instance of the procurator-fiscal before a sheriff or sheriff substitute (act of 1868, s. 13). The procedure at the execution is governed by the act of 1868 and the Scottish Prison Rules, rr. 465–469 (Stat. Rules and Orders, Revised ed. 1904, tit. Prison S).

British Dominions beyond the Seas.—Throughout the King's dominions hanging is the regular method of executing sentence of death. In India the Penal Code superseded the modes of punishment under Mahommedan law, and s. 368 of the Criminal Procedure Code of 1898 provides that sentence of death is to be executed by hanging by the neck.

In Canada the sentence is executed within a prison under conditions very similar to those in England (Criminal Code, 1892; ss. 936–945). In Australia the execution takes place within the prison walls, at a time and place appointed by the governor of the state. See Queensland Code, 1899, s. 664; Western Australia Code, 1901, s. 663; in these states no inquest is held. In Western Australia the governor may cause an aboriginal native to be executed outside a prison. In New Zealand the only mode of execution is by hanging within a prison (Act of 1883).

United States.—In all the states except New York, Massachusetts, New Jersey, North Carolina, Mississippi, Virginia, and Ohio (see ELECTROCUTION) persons sentenced to death are hanged. In Utah the criminal may elect to be shot instead.

The only countries, whose law is not of direct English origin, which inflict capital punishment by hanging are Japan, Austria, Hungary and Russia. (W. F. C.)

HANGÖ, a port and sea-bathing resort situated on the promontory of Hangöudd, to the extreme south-west of Finland. Hangö owes its commercial importance to the fact that it is practically the only winter ice-free port in Finland, and is thus of value both to the Finnish and the Russian sea-borne trade. When incorporated in 1874 it had only a few hundred inhabitants; in 1900 it had 2501 and it has now over six thousand (5986 in 1904). It is connected by railway with Helsingfors and Tammerfors, and is the centre of the Finnish butter export, which now amounts to over £1,000,000 yearly. There is a considerable import of coal, cotton, iron and breadstuffs, the chief exports being butter, fish, timber and wood pulp. During the period of emigration, owing to political troubles with Russia, over 12,000 Finns sailed from Hangö in a single year (1901), mostly for the United States and Canada. Hangö now takes front rank as a fashionable watering-place, especially for wealthy Russians, having a dry climate and a fine strand.

HANKA, WENCESLAUS (1791–1861), Bohemian philologist, was born at Horeniowes, a hamlet of eastern Bohemia, on the 10th of June 1791. He was sent in 1807 to school at Königgrätz, to escape the conscription, then to the university of Prague, where he founded a society for the cultivation of the Czech language. At Vienna, where he afterwards studied law, he established a Czech periodical; and in 1813 he made the acquaintance of Joseph Dobrowsky, the eminent philologist. On the 16th of September 1817 Hanka alleged that he had discovered some ancient Bohemian manuscript poems (the Königinhof MS.) of the 13th and 14th century in the church tower of the village of Kralodwor, or Königinhof. These were published in 1818, under the title *Kralodworsky Rukopis*, with a German translation by Swoboda. Great doubt, however, was felt as to their genuineness, and Dobrowsky, by pronouncing *The Judgment of Libussa*, another manuscript found by Hanka, an "obvious fraud," confirmed the suspicion. Some years afterwards Dobrowsky saw fit to modify his decision, but by modern Czech scholars the MS. is regarded as a forgery. A translation into English, *The Manuscript of the Queen's Court*, was made by Wratislaw in 1852. The originals were presented by the discoverer to the Bohemian museum at Prague, of which he was appointed librarian in 1818. In 1848 Hanka, who was an ardent Panslavist, took part in the Slavonic congress and

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other peaceful national demonstrations, being the founder of the political society Slovanska Lipa. He was elected to the imperial diet at Vienna, but declined to take his seat. In the winter of 1848 he became lecturer and in 1849 professor of Slavonic languages in the university of Prague, where he died on the 12th of January 1861.

His chief works and editions are the following: *Hankowy Pjsne* (Prague, 1815), a volume of poems; *Starobyla Skladani* (1817–1826), in 5 vols.—a collection of old Bohemian poems, chiefly from unpublished manuscripts; *A Short History of the Slavonic Peoples* (1818); *A Bohemian Grammar* (1822) and *A Polish Grammar* (1839) —these grammars were composed on a plan suggested by Dobrowsky; *Igor* (1821), an ancient Russian epic, with a translation into Bohemian; a part of the Gospels from the Reims manuscript in the Glagolitic character (1836); the old Bohemian Chronicles of *Dalimil* (1848) and the *History of Charles IV.*, by Procop Lupáč (1848); *Evangelium Ostromis* (1853).

HANKOW ("Mouth of the Han"), the great commercial centre of the middle portion of the Chinese empire, and since 1858 one of the principal places opened to foreign trade. It is situated on the northern side of the Yangtsze-kiang at its junction with the Han river, about 600 m. W. of Shanghai in 30° 32′ 51″ N., 114° 19′ 55″ E., at a height of 150 ft. By the Chinese it is not considered a separate city, but as a suburb of the now decadent city of Hanyang; and it may almost be said to stand in a similar relation to Wu-chang the capital of the province of Hupeh, which lies immediately opposite on the southern bank of the Yangtsze-kiang. Hankow extends for about a mile along the main river and about two and a half along the Han. It is protected by a wall 18 ft. high, which was erected in 1863 and has a circuit of about 4 m. Within recent years the port has made rapid advance in wealth and importance. The opening up of the upper waters of the Yangtsze to steam navigation has made it a commercial *entrepôt* second only to Shanghai. It is the terminus of a railway between Peking and the Yangtsze, the northern half of the trunk line from Peking to Canton. There is daily communication by regular lines of steamers with Shanghai, and smaller steamers ply on the upper section of the river between Hankow and Ich'ang. The principal article of export continues to be black tea, of which staple Hankow has always been the central market. The bulk of the leaf tea, however, now goes to Russia by direct steamers to Odessa instead of to London as formerly, and a large quantity goes overland via Tientsin and Siberia in the form of brick tea. The quantity of brick tea thus exported in 1904 was upwards of 10 million lb. The exports which come next in value are opium, wood-oil, hides, beans, cotton yarn and raw silk. The population of Hankow, together with the city of Wuchang on the opposite bank, is estimated at 800,000, and the number of foreign residents is about 500. Large iron-works have been erected by the Chinese authorities at Hanyang, a couple of miles higher up the river, and at Wuchang there are two official cotton mills. The British concession, on which the business part of the foreign settlement is built, was obtained in 1861 by a lease in perpetuity from the Chinese authorities in favour of the crown. By 1863 a great embankment and a roadway were completed along the river, which may rise as much as 50 ft. or more above its ordinary levels, and not infrequently, as in 1849 and 1866, lays a large part of the town under water. On the former occasion little was left uncovered but the roofs of the houses. In 1864 a public assay office was established. Sub-leases for a term of years are granted by the crown to private individuals; local control, including the policing of the settlement, is managed by a municipal council elected under regulations promulgated by the British minister in China, acting by authority of the sovereign's orders in council. Foreigners, *i.e.* non-British, are admitted to become lease-holders on their submitting to be bound by the municipal regulations. The concession, however, gives no territorial jurisdiction. All foreigners, of whatever nationality, are justiciable only before their own consular authorities by virtue of the extra-territorial clauses of their treaties with China. In 1895 a concession, on similar terms to that under which the British is held, was obtained by Germany, and this was followed by concessions to France and Russia. These three concessions all lie on the north bank of the river and immediately below the British. An extension of the British concession backwards was granted in 1898. The Roman Catholics, the London Missionary Society and the Wesleyans have all missions in the town; and there are two missionary hospitals. The total trade in 1904 was valued at £15,401,076 (£9,042,190 being exports and £6,358,886 imports) as compared with a total of £17,183,400 in 1891 and £11,028,000 in 1880.

HANLEY, a market town and parliamentary borough of Staffordshire, England, in the Potteries district, 148 m. N.W. from London, on the North Staffordshire railway. Pop. (1891) 54,946; (1901) 61,590. The parliamentary borough includes the adjoining town of Burslem. The town, which lies on high ground, has handsome municipal buildings, free library, technical and art museum, elementary, science and art schools, and a large park. Its manufactures include porcelain, encaustic tiles, and earthenware, and give employment to the greater part of the population, women and children being employed almost as largely as men. In the neighbourhood coal and iron are obtained. Hanley is of modern development. Its municipal constitution dates from 1857, the parliamentary borough from 1885, and the county borough from 1888. Shelton, Hope, Northwood and Wellington are populous ecclesiastical parishes included within its boundaries. That of Etruria, adjoining on the west, originated in the Ridge House pottery works of Josiah Wedgwood and Thomas Bentley, who founded them in 1769, naming them after the country of the Etruscans in Italy. Etruria Hall was the scene of Wedgwood's experiments. The parliamentary borough of Hanley returns one member. The town was governed by a mayor, 6 aldermen, and 18 councillors until under the "Potteries federation" scheme (1908) it became part of the borough of Stoke-on-Trent (*q.v.*) in 1910.

HANNA, MARCUS ALONZO (1837–1904), American politician, was born at New Lisbon (now Lisbon) Columbiana county, Ohio, on the 24th of September 1837. In 1852 he removed with his father to Cleveland, where the latter established himself in the wholesale grocery business, and the son received his education in the public schools of that city, and at the Western Reserve University. Leaving college before the completion of his course, he became associated with his father in business, and on his father's death (1862) became a member of the firm. In 1867 he entered into partnership with his father-in-law, Daniel P. Rhodes, in the coal and iron business. It was largely due to Hanna's progressive methods that the business of the firm, which became M. A. Hanna & Company in 1877, was extended to include the ownership of a fleet of lake steamships constructed in their own shipyards, and the control and operation of valuable coal and iron mines. Subsequently he became largely interested in street railway properties in Cleveland and elsewhere, and in various banking institutions. In early life he had little time for politics, but after 1880 he became prominent in the affairs of the Republican party in Cleveland, and in 1884 and 1888 was a delegate to the Republican National Convention, in the latter year being associated with William McKinley in the management of the John Sherman canvass. It was not, however, until 1896, when he personally managed the canvass that resulted in securing the Republican presidential nomination for William McKinley at the St Louis Convention (at which he was a delegate), that he became known throughout the United States as a political manager of great adroitness, tact and resourcefulness. Subsequently he became chairman of the Republican National Committee, and managed with consummate skill the campaign of 1896 against William Jennings Bryan and "free-silver." In March 1897 he was appointed, by Governor Asa S. Bushnell (1834–1904) United States senator from Ohio, to succeed John Sherman. In the senate, to which in January 1898 he was elected for the short term ending on the 3rd of March 1899 and for the succeeding full term, he took little part in the debates, but was recognized as one of the principal advisers of the McKinley administration, and his influence was large in consequence. Apart from politics he took a deep and active interest in the problems of capital and labour, was one of the

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organizers (1901) and the first president of the National Civic Federation, whose purpose was to solve social and industrial problems, and in December 1901 became chairman of a permanent board of conciliation and arbitration established by the Federation. After President Roosevelt's policies became defined, Senator Hanna came to be regarded as the leader of the conservative branch of the Republican party and a possible presidential candidate in 1904. He died at Washington on the 15th of February 1904.

HANNAY, JAMES (1827–1873), Scottish critic, novelist and publicist, was born at Dumfries on the 17th of February 1827. He came of the Hannays of Sorbie, an ancient Galloway family. He entered the navy in 1840 and served till 1845, when he adopted literature as his profession. He acted as reporter on the *Morning Chronicle* and gradually obtained a connexion, writing for the quarterly and monthly journals. In 1857 Hannay contested the Dumfries burghs in the Conservative interest, but without success. He edited the *Edinburgh Courant* from 1860 till 1864, when he removed to London. From 1868 till his death on the 8th of January 1873 he was British consul at Barcelona. His letters to the *Pall Mall Gazette* "From an Englishman in Spain" were highly appreciated. Hannay's best books are his two naval novels, *Singleton Fontenoy* (1850) and *Eustace Conyers* (1855); *Satire and Satirists* (1854); and *Essays from the Quarterly Review* (1861). *Satire* not only shows loving appreciation of the great satirists of the past, but is itself instinct with wit and fine satiric power. The book sparkles with epigrams and apposite classical allusions, and contains admirable critical estimates of Horace (Hannay's favourite author), Juvenal, Erasmus, Sir David Lindsay, George Buchanan, Boileau, Butler, Dryden, Swift, Pope, Churchill, Burns, Byron and Moore.

Among his other works are *Biscuits and Grog*, *Claret Cup*, and *Hearts are Trumps* (1848); *King Dollis* (1849); *Sketches in Ultramarine* (1853); an edition of the *Poems* of Edgar Allan Poe, to which he prefixed an essay on the poet's life and genius (1852); *Characters and Criticism*, consisting mainly of his contributions to the *Edinburgh Courant* (1865); *A Course of English Literature* (1866); *Studies on Thackeray* (1869); and a family history entitled *Three Hundred Years of a Norman House* (the Gurneys) (1867).

HANNEN, JAMES HANNEN, Baron (1821–1894), English judge, son of a London merchant, was born at Peckham in 1821. He was educated at St Paul's school and at Heidelberg University, which was famous as a school of law. Called to the bar at the Middle Temple in 1848, he joined the home circuit. At this time he also wrote for the press, and supplied special reports for the *Morning Chronicle*. Though not eloquent in speech, he was clear, accurate and painstaking, and soon advanced in his profession, passing many more brilliant competitors. He appeared for the claimant in the Shrewsbury peerage case in 1858, when the 3rd Earl Talbot was declared to be entitled to the earldom of Shrewsbury as the descendant of the 2nd earl; was principal agent for Great Britain on the mixed British and American commission for the settlement of outstanding claims, 1853–1855; and assisted in the prosecution of the Fenian prisoners at Manchester. In 1868 Hannen was appointed a judge of the Court of Queen's Bench. In many cases he took a strong position of his own, notably in that of *Farrar* v. *Close* (1869), which materially affected the legal status of trade unions and was regarded by unionists as a severe blow to their interests. Hannen became judge of the Probate and Divorce Court in 1872, and in 1875 he was appointed president of the probate and admiralty division of the High Court of Justice. Here he showed himself a worthy successor to Cresswell and Penzance. Many important causes came before him, but he will chiefly be remembered for the manner in which he presided over the Parnell special commission. His influence pervaded the whole proceedings, and it is understood that he personally penned a large part of the voluminous report. Hannen's last public service was in connexion with the Bering Sea inquiry at Paris, when he acted as one of the British arbitrators. In January 1878 he was appointed a lord of appeal in ordinary (with the dignity of a life peerage), but in that capacity he had few opportunities for displaying his powers, and he retired at the close of the session of 1893. He died in London, after a prolonged illness, on the 29th of March 1894.

HANNIBAL ("mercy" or "favour of Baal"), Carthaginian general and statesman, son of Hamilcar Barca (*q.v.*), was born in 249 or 247 B.C. Destined by his father to succeed him in the work of vengeance against Rome, he was taken to Spain, and while yet a boy gave ample evidence of his military aptitude. Upon the death of his brother-in-law Hasdrubal (221) he was acclaimed commander-in-chief by the soldiers and confirmed in his appointment by the Carthaginian government. After two years spent in completing the conquest of Spain south of the Ebro, he set himself to begin what he felt to be his life's task, the conquest and humiliation of Rome. Accordingly in 219 he seized some pretext for attacking the town of Saguntum (mod. Murviedro), which stood under the special protection of Rome, and disregarding the protests of Roman envoys, stormed it after an eight months' siege. As the home government, in view of Hannibal's great popularity, did not venture to repudiate this action, the declaration of war which he desired took place at the end of the year.

Of the large army of Libyan and Spanish mercenaries which he had at his disposal Hannibal selected the most trustworthy and devoted contingents, and with these determined to execute the daring plan of carrying the war into the heart of Italy by a rapid march through Spain and Gaul. Starting in the spring of 218 he easily fought his way through the northern tribes to the Pyrenees, and by conciliating the Gaulish chiefs on his passage contrived to reach the Rhone before the Romans could take any measures to bar his advance. After outmanœuvring the natives, who endeavoured to prevent his crossing, Hannibal evaded a Roman force sent to operate against him in Gaul; he proceeded up the valley of one of the tributaries of the Rhone (Isère or, more probably, Durance), and by autumn arrived at the foot of the Alps. His passage over the mountain-chain, at a point which cannot be determined with certainty, though the balance of the available evidence inclines to the Mt Genèvre pass, and fair cases can be made out for the Col d'Argentière and for Mt Cenis, was one of the most memorable achievements of any military force of ancient times. Though the opposition of the natives and the difficulties of ground and climate cost Hannibal half his army, his perilous march brought him directly into Roman territory and entirely frustrated the attempts of the enemy to fight out the main issue on foreign ground. His sudden appearance among the Gauls, moreover, enabled him to detach most of the tribes from their new allegiance to the Romans before the latter could take steps to check rebellion. After allowing his soldiers a brief rest to recover from their exertions Hannibal first secured his rear by subduing the hostile tribe of the Taurini (mod. Turin), and moving down the Po valley forced the Romans by virtue of his superior cavalry to evacuate the plain of Lombardy. In December of the same year he had an opportunity of showing his superior military skill when the Roman commander attacked him on the river Trebia (near Placentia); after wearing down the excellent Roman infantry he cut it to pieces by a surprise attack from an ambush in the flank. Having secured his position in north Italy by this victory, he quartered his troops for the winter on the Gauls, whose zeal in his cause thereupon began to abate. Accordingly in spring 217 Hannibal decided to find a more trustworthy base of operations farther south; he crossed the Apennines without opposition, but in the marshy lowlands of the Arno he lost a large part of his force through disease and himself became blind in one eye. Advancing through the uplands of Etruria he provoked the main Roman army to a hasty pursuit, and catching it in a defile on the shore of Lake Trasimenus destroyed it in the waters or on the adjoining slopes (see Trasimene). He had now disposed of the only field force which could check his advance upon Rome, but realizing that without siege engines he could not hope to take the capital, he preferred to utilize his victory by passing into central and southern Italy and exciting a general revolt against the sovereign power. Though closely watched

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by a force under Fabius Maximus Cunctator, he was able to carry his ravages far and wide through Italy: on one occasion he was entrapped in the lowlands of Campania, but set himself free by a stratagem which completely deluded his opponent. For the winter he found comfortable quarters in the Apulian plain, into which the enemy dared not descend. In the campaign of 217 Hannibal had failed to obtain a following among the Italians; in the following year he had an opportunity of turning the tide in his favour. A large Roman army advanced into Apulia in order to crush him, and accepted battle on the site of Cannae. Thanks mainly to brilliant cavalry tactics, Hannibal, with much inferior numbers, managed to surround and cut to pieces the whole of this force; moreover, the moral effect of this victory was such that all the south of Italy joined his cause. Had Hannibal now received proper material reinforcements from his countrymen at Carthage he might have made a direct attack upon Rome; for the present he had to content himself with subduing the fortresses which still held out against him, and the only other notable event of 216 was the defection of Capua, the second largest city of Italy, which Hannibal made his new base.

In the next few years Hannibal was reduced to minor operations which centred mainly round the cities of Campania. He failed to draw his opponents into a pitched battle, and in some slighter engagements suffered reverses. As the forces detached under his lieutenants were generally unable to hold their own, and neither his home government nor his new ally Philip V. of Macedon helped to make good his losses, his position in south Italy became increasingly difficult and his chance of ultimately conquering Rome grew ever more remote. In 212 he gained an important success by capturing Tarentum, but in the same year he lost his hold upon Campania, where he failed to prevent the concentration of three Roman armies round Capua. Hannibal attacked the besieging armies with his full force in 211, and attempted to entice them away by a sudden march through Samnium which brought him within 3 m. of Rome, but caused more alarm than real danger to the city. But the siege continued, and the town fell in the same year. In 210 Hannibal again proved his superiority in tactics by a severe defeat inflicted at Herdoniae (mod. Ordona) in Apulia upon a proconsular army, and in 208 destroyed a Roman force engaged in the siege of Locri Epizephyrii. But with the loss of Tarentum in 209 and the gradual reconquest by the Romans of Samnium and Lucania his hold on south Italy was almost lost. In 207 he succeeded in making his way again into Apulia, where he waited to concert measures for a combined march upon Rome with his brother Hasdrubal (*q.v.*). On hearing, however, of his brother's defeat and death at the Metaurus he retired into the mountain fastnesses of Bruttium, where he maintained himself for the ensuing years. With the failure of his brother Mago (*q.v.*) in Liguria (205–203) and of his own negotiations with Philip of Macedon, the last hope of recovering his ascendancy in Italy was lost. In 203, when Scipio was carrying all before him in Africa and the Carthaginian peace-party were arranging an armistice, Hannibal was recalled from Italy by the "patriot" party at Carthage. After leaving a record of his expedition, engraved in Punic and Greek upon brazen tablets, in the temple of Juno at Crotona, he sailed back to Africa. His arrival immediately restored the predominance of the war-party, who placed him in command of a combined force of African levies and of his mercenaries from Italy. In 202 Hannibal, after meeting Scipio in a fruitless peace conference, engaged him in a decisive battle at Zama. Unable to cope with his indifferent troops against the well-trained and confident Roman soldiers, he experienced a crushing defeat which put an end to all resistance on the part of Carthage.

Hannibal was still only in his forty-sixth year. He soon showed that he could be a statesman as well as a soldier. Peace having been concluded, he was appointed chief magistrate (*suffetes, sofet*). The office had become rather insignificant, but Hannibal restored its power and authority. The oligarchy, always jealous of him, had even charged him with having betrayed the interests of his country while in Italy, and neglected to take Rome when he might have done so. The dishonesty and incompetence of these men had brought the finances of Carthage into grievous disorder. So effectively did Hannibal reform abuses that the heavy tribute imposed by Rome could be paid by instalments without additional and extraordinary taxation.

Seven years after the victory of Zama, the Romans, alarmed at this new prosperity, demanded Hannibal's surrender. Hannibal thereupon went into voluntary exile. First he journeyed to Tyre, the mother-city of Carthage, and thence to Ephesus, where he was honourably received by Antiochus III. of Syria, who was then preparing for war with Rome. Hannibal soon saw that the king's army was no match for the Romans. He advised him to equip a fleet and throw a body of troops on the south of Italy, adding that he would himself take the command. But he could not make much impression on Antiochus, who listened more willingly to courtiers and flatterers, and would not entrust Hannibal with any important charge. In 190 he was placed in command of a Phoenician fleet, but was defeated in a battle off the river Eurymedon.

From the court of Antiochus, who seemed prepared to surrender him to the Romans, Hannibal fled to Crete, but he soon went back to Asia, and sought refuge with Prusias, king of Bithynia. Once more the Romans were determined to hunt him out, and they sent Flaminius to insist on his surrender. Prusias agreed to give him up, but Hannibal did not choose to fall into his enemies' hands. At Libyssa, on the eastern shore of the Sea of Marmora, he took poison, which, it was said, he had long carried about with him in a ring. The precise year of his death was a matter of controversy. If, as Livy seems to imply, it was 183, he died in the same year as Scipio Africanus.

As to the transcendent military genius of Hannibal there cannot be two opinions. The man who for fifteen years could hold his ground in a hostile country against several powerful armies and a succession of able generals must have been a commander and a tactician of supreme capacity. In the use of stratagems and ambuscades he certainly surpassed all other generals of antiquity. Wonderful as his achievements were, we must marvel the more when we take into account the grudging support he received from Carthage. As his veterans melted away, he had to organize fresh levies on the spot. We never hear of a mutiny in his army, composed though it was of Africans, Spaniards and Gauls. Again, all we know of him comes for the most part from hostile sources. The Romans feared and hated him so much that they could not do him justice. Livy speaks of his great qualities, but he adds that his vices were equally great, among which he singles out his "more than Punic perfidy" and "an inhuman cruelty." For the first there would seem to be no further justification than that he was consummately skilful in the use of ambuscades. For the latter there is, we believe, no more ground than that at certain crises he acted in the general spirit of ancient warfare. Sometimes he contrasts most favourably with his enemy. No such brutality stains his name as that perpetrated by Claudius Nero on the vanquished Hasdrubal. Polybius merely says that he was accused of cruelty by the Romans and of avarice by the Carthaginians. He had indeed bitter enemies, and his life was one continuous struggle against destiny. For steadfastness of purpose, for organizing capacity and a mastery of military science he has perhaps never had an equal.

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HANNIBAL, a city of Marion county, Missouri, U.S.A., on the Mississippi river, about 120 m. N.W. of Saint Louis. Pop. (1890), 12,857; (1900), 12,780, including 920 foreign-born and 1836 negroes; (1910) 18,341. It is served by the Wabash, the Missouri, Kansas & Texas, the Chicago, Burlington & Quincy, and the St Louis & Hannibal railways, and by boat lines to Saint Louis, Saint Paul and intermediate points. The business section is in the level bottom-lands of the river, while the residential portion spreads up the banks, which afford fine building sites with beautiful views. Mark Twain's boyhood was spent at Hannibal, which is the setting of *Life on the Mississippi*, *Huckleberry Finn* and *Tom Sawyer*; Hannibal Cave, described in *Tom Sawyer*, extends for miles beneath the river and its bluffs. Hannibal has a good public library (1889; the first in Missouri); other prominent buildings are the Federal building, the court house, a city hospital and the high school. The river is here spanned by a long iron and steel bridge connecting with East Hannibal, Ill. Hannibal is the trade centre of a rich agricultural region, and has an important lumber trade, railway shops, and manufactories of lumber, shoes, stoves, flour, cigars, lime, Portland cement and pearl buttons (made from mussel shells); the value of the city's factory products increased from $2,698,720 in 1900 to $4,442,009 in 1905, or 64·6%. In the vicinity are valuable deposits of crinoid limestone, a coarse white building stone which takes a good polish. The electric-lighting plant is owned and operated by the municipality. Hannibal was laid out as a town in 1819 (its origin going back to Spanish land grants, which gave rise to much litigation) and was first chartered as a city in 1839. The town of South Hannibal was annexed to it in 1843.

HANNINGTON, JAMES (1847–1885), English missionary, was born at Hurstpierpoint, in Sussex, on the 3rd of September 1847. From earliest childhood he displayed a love of adventure and natural history. At school he made little progress, and left at the age of fifteen for his father's counting-house at Brighton. He had no taste for office work, and much of his time was occupied in commanding a battery of volunteers and in charge of a steam launch. At twenty-one he decided on a clerical career and entered St Mary's Hall, Oxford, where he exercised a remarkable influence over his fellow-undergraduates. He was, however, a desultory student, and in 1870 was advised to go to the little village of Martinhoe, in Devon, for quiet reading, but distinguished himself more by his daring climbs after seagulls' eggs and his engineering skill in cutting a pathway along precipitous cliffs to some caves. In 1872 the death of his mother made a deep impression upon him. He began to read hard, took his B.A. degree, and in 1873 was ordained deacon and placed in charge of the small country parish of Trentishoe in Devon. Whilst curate in charge at Hurstpierpoint, his thoughts were turned by the murder of two missionaries on the shores of Victoria Nyanza to mission work. He offered himself to the Church Missionary Society and sailed on the 17th of May 1882, at the head of a party of six, for Zanzibar, and thence set out for Uganda; but, prostrated by fever and dysentery, he was obliged to return to England in 1883. On his recovery he was consecrated bishop of Eastern Equatorial Africa (June 1884), and in January 1885 started again for the scene of his mission, and visited Palestine on the way. On his arrival at Freretown, near Mombasa, he visited many stations in the neighbourhood. Then, filled with the idea of opening a new route to Uganda, he set out and reached a spot near Victoria Nyanza in safety. His arrival, however, roused the suspicion of the natives, and under King Mwanga's orders he was lodged in a filthy hut swarming with rats and vermin. After eight days his men were murdered, and on the 29th of October 1885 he himself was speared in both sides, his last words to the soldiers appointed to kill him being, "Go, tell Mwanga I have purchased the road to Uganda with my blood."

His *Last Journals* were edited in 1888. See also *Life* by E. C. Dawson (1887); and W. G. Berry, *Bishop Hannington* (1908).

HANNINGTON, a lake of British East Africa in the eastern rift-valley just south of the equator and in the shadow of the Laikipia escarpment. It is 7 m. long by 2 m. broad. The water is shallow and brackish. Standing in the lake and along its shores are numbers of dead trees, the remains of an ancient forest, which serve as eyries for storks, herons and eagles. The banks and flats at the north end of the lake are the resort of hundreds of thousands of flamingoes. The places where they cluster are dazzling white with guano deposits. The lake is named after Bishop James Hannington.

HANNO, the name of a large number of Carthaginian soldiers and statesmen. Of the majority little is known; the most important are the following[1]:—

1. HANNO, Carthaginian navigator, who probably flourished about 500 B.C. It has been conjectured that he was the son of the Hamilcar who was killed at Himera (480), but there is nothing to prove this. He was the author of an account of a coasting voyage on the west coast of Africa, undertaken for the purpose of exploration and colonization. The original, inscribed on a tablet in the Phoenician language, was hung up in the temple of Melkarth on his return to Carthage. What is generally supposed to be a Greek translation of this is still extant, under the title of *Periplus*, although its authenticity has been questioned. Hanno appears to have advanced beyond Sierra Leone as far as Cape Palmas. On the island which formed the terminus of his voyage the explorer found a number of hairy women, whom the interpreters called Gorillas (Γορίλλαι).

Valuable editions by T. Falconer (1797, with translation and defence of its authenticity) and C. W. Müller in *Geographici Graeci minores*, i.; see also E. H. Bunbury, *History of Ancient Geography*, i., and treatise by C. T. Fischer (1893), with bibliography.

2. HANNO (3rd century B.C.), called "the Great," Carthaginian statesman and general, leader of the aristocratic party and the chief opponent of Hamilcar and Hannibal. He appears to have gained his title from military successes in Africa, but of these nothing is known. In 240 B.C. he drove Hamilcar's veteran mercenaries to rebellion by withholding their pay, and when invested with the command against them was so unsuccessful that Carthage might have been lost but for the exertions of his enemy Hamilcar (*q.v.*). Hanno subsequently remained at Carthage, exerting all his influence against the democratic party, which, however, had now definitely won the upper hand. During the Second Punic War he advocated peace with Rome, and according to Livy even advised that Hannibal should be given up to the Romans. After the battle of Zama (202) he was one of the ambassadors sent to Scipio to sue for peace. Remarkably little is known of him, considering the great influence he undoubtedly exercised amongst his countrymen.

Livy xxi. 3 ff., xxiii. 12; Polybius i. 67 ff.; Appian, *Res Hispanicae*, 4, 5, *Res Punicae*, 34, 49, 68.

HANOI, capital of Tongking and of French Indo-China, on the right bank of the Song-koi or Red river, about 80 m. from its mouth in the Gulf of Tongking. Taking in the suburban population the inhabitants numbered in 1905 about 110,000, including 103,000 Annamese, 2289 Chinese and 2665 *French*, exclusive of troops. Hanoi resembles a European city in the possession of wide well-paved streets and promenades, systems of electric light and drainage and a good water-supply. A crowded native quarter built round a picturesque lake lies close to the river with the European quarter to the south of it. The public buildings include the palace of the governor-general, situated in a spacious botanical and zoological garden, the large military hospital, the cathedral of St Joseph, the Paul Bert college, and the theatre. The barracks and other military buildings occupy the site of the old citadel, an area of over 300 acres, to the west of the native town. The so-called pagoda of the Great Buddha is the chief native building. The river is embanked and is crossed by the Pont Doumer, a fine railway bridge over 1 m. long. Vessels drawing 8 or 9 ft. can reach the town. Hanoi is

[1] For others of the name see CARTHAGE; HANNIBAL; PUNIC WARS. Smith's *Classical Dictionary* has notices of some thirty of the name.

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the seat of the general government of Indo-China, of the resident-superior of Tongking, and of a bishop, who is vicar-apostolic of central Tongking. It is administered by an elective municipal council with a civil service administrator as mayor. It has a chamber of commerce, the president of which has a seat on the superior council of Indo-China; a chamber of the court of appeal of Indo-China, a civil tribunal of the first order, and is the seat of the chamber of agriculture of Tongking. Its industries include cotton-spinning, brewing, distilling, and the manufacture of tobacco, earthenware and matches: native industry produces carved and inlaid furniture, bronzes and artistic metal-work, silk embroidery, &c. Hanoi is the junction of railways to Hai-Phong, its seaport, Lao-Kay, Vinh, and the Chinese frontier via Lang-Son. It is in frequent communication with Hai-Phong by steamboat.

See C. Madrolle, *Tonkin du sud: Hanoi* (Paris, 1907).

HANOTAUX, ALBERT AUGUSTE GABRIEL (1853–), French statesman and historian, was born at Beaurevoir in the department of Aisne. He received his historical training in the École des Chartes, and became *maître de conférences* in the École des Hautes Études. His political career was rather that of a civil servant than of a party politician. In 1879 he entered the ministry of foreign affairs as a secretary, and rose step by step through the diplomatic service. In 1886 he was elected deputy for Aisne, but, defeated in 1889, he returned to his diplomatic career, and on the 31st of May 1894 was chosen by Charles Dupuy to be minister of foreign affairs. With one interruption (during the Ribot ministry, from the 26th of January to the 2nd of November 1895) he held this portfolio until the 14th of June 1898. During his ministry he developed the *rapprochement* of France with Russia—visiting St Petersburg with the president, Felix Faure—and sent expeditions to delimit the French colonies in Africa. The Fashoda incident of July 1898 was a result of this policy, and Hanotaux's distrust of England is frankly stated in his literary works. As an historian he published *Origines de l'institution des intendants de provinces* (1884), which is the authoritative study on the intendants; *Études historiques sur les XVIe et XVIIe siècles en France* (1886); *Histoire de Richelieu* (2 vols., 1888); and *Histoire de la Troisième République* (1904, &c.), the standard history of contemporary France. He also edited the *Instructions des ambassadeurs de France à Rome, depuis les traités de Westphalie* (1888). He was elected a member of the French Academy on the 1st of April 1897.

HANOVER (Ger. *Hannover*), formerly an independent kingdom of Germany, but since 1866 a province of Prussia. It is bounded on the N. by the North Sea, Holstein, Hamburg and Mecklenburg-Schwerin, E. and S.E. by Prussian Saxony and the duchy of Brunswick, S.W. by the Prussian provinces of Hesse-Nassau and Westphalia, and W. by Holland. These boundaries include the grand-duchy of Oldenburg and the free state of Bremen, the former stretching southward from the North Sea nearly to the southern boundary of Hanover. A small portion of the province in the south is separated from Hanover proper by the interposition of part of Brunswick. On the 23rd of March 1873 the province was increased by the addition of the Jade territory (purchased by Prussia from Oldenburg), lying south-west of the Elbe and containing the great naval station and arsenal of Wilhelmshaven. The area of the province is 14,870 sq. m.

Physical Features.—The greater part of Hanover is a plain with sandhills, heath and moor. The most fertile districts lie on the banks of the Elbe and near the North Sea, where, as in Holland, rich meadows are preserved from encroachment of the sea by broad dikes and deep ditches, kept in repair at great expense. The main feature of the northern plain is the so-called *Lüneburger Heide*, a vast expanse of moor and fen, mainly covered with low brushwood (though here and there are oases of fine beech and oak woods) and intersected by shallow valleys, and extending almost due north from the city of Hanover to the southern arm of the Elbe at Harburg. The southern portion of the province is hilly, and in the district of Klausenburg, containing the Harz, mountainous. The higher elevations are covered by dense forests of fir and larch, and the lower slopes with deciduous trees. The eastern portion of the northern plain is covered with forests of fir. The whole of Hanover dips from the Harz Mountains to the north, and the rivers consequently flow in that direction. The three chief rivers of the province are the Elbe in the north-east, where it mainly forms the boundary and receives the navigable tributaries Jeetze, Ilmenau, Seve, Este, Lühe, Schwinge and Medem; the Weser in the centre, with its important tributary the Aller (navigable from it's Celle downwards); and in the west the Ems, with its tributaries the Aa and the Leda. Still farther west is the Vecht, which, rising in Westphalia, flows to the Zuider Zee. Canals are numerous and connect the various river systems.

The principal lakes are the Steinhuder Meer, about 4 m. long and 2 m. broad, and 20 fathoms deep, on the borders of Schaumburg-Lippe; the Dümmersee, on the borders of Oldenburg, about 12 m. in circuit; the lakes of Bederkesa and some others in the moorlands of the north; the Seeburger See, near Duderstadt; and the Oderteich, in the Harz, 2100 ft. above the level of the sea.

Climate.—The climate in the low-lying districts near the coast is moist and foggy, in the plains mild, on the Harz mountains severe and variable. In spring the prevailing winds blow from the N.E. and E., in summer from the S.W. The mean annual temperature is about 46° Fahr.; in the town of Hanover it is higher. The average annual rainfall is about 23·5 in.; but this varies greatly in different districts. In the west the Ibrauch, a thick fog arising from the burning of the moors, is a plague of frequent occurrence.

Population; Divisions.—The province contains an area of 14,869 sq. m., and the total population, according to the census of 1905, was 2,759,699 (1,384,161 males and 1,375,538 females). In this connexion it is noticeable that in Hanover, almost alone among German states and provinces, there is a considerable proportion of male births over female. The density of the population is 175 to the sq. m. (English), and the proportion of urban to rural population, roughly, as 1 to 3 of the inhabitants. The province is divided into the six *Regierungsbezirke* (or departments) of Hanover, Hildesheim, Lüneburg, Stade, Osnabrück and Aurich, and these again into *Kreise* (circles, or local government districts)—76 in all. The chief towns—containing more than 10,000 inhabitants—are Hanover, Linden, Osnabrück, Hildesheim, Clausthal, Wilhelmshaven, Harburg, Lüneburg, Celle, Göttingen and Emden. Religious statistics show that 84% of the inhabitants belong to the Evangelical-Lutheran Church, 17 to the Roman Catholic and less than 1% to the Jewish communities. The Roman Catholics are mostly gathered around the episcopal sees of Hildesheim and Osnabrück and close to Münster (in Westphalia) on the western border, and the Jews in the towns. A court of appeal for the whole province sits at Celle, and there are eight superior courts. The province returns 19 members to the *Reichstag* (imperial diet) and 36 to the *Abgeordnetenhaus* (lower house) of the Prussian parliament (*Landtag*).

Education.—Among the educational institutions of the province the university of Göttingen stands first, with an average yearly attendance of 1500 students. There are, besides a technical college in Hanover, an academy of forestry in Münden, a mining college in Clausthal, a military school and a veterinary college (both in Hanover), 26 gymnasia (classical schools), 18 semi-classical, and 14 commercial schools. There are also two naval academies, asylums for the deaf and dumb, and numerous charitable institutions.

Agriculture.—Though agriculture constitutes the most important branch of industry in the province, it is still in a very backward state. The greater part of the soil is of inferior quality, and much that is susceptible of cultivation is still lying waste. Of the entire area of the country 28·6% is arable, 16·2 in meadow or pasture land, 14% in forests, 37·2% in uncultivated moors, heaths, &c.; from 17 to 18% is in possession of the state. The best agriculture is to be found in the districts of Hildesheim, Calenberg, Göttingen and Grubenhagen, on the banks of the Weser and Elbe, and in East Friesland. Rye is generally grown for bread. Flax, for which much of the soil is admirably adapted, is extensively cultivated, and forms an important article of export, chiefly, however, in the form of yarn. Potatoes, hemp, turnips, hops, tobacco and beet are also extensively grown, the latter, in connexion with the sugar industry, showing each year a larger return. Apples, pears, plums and cherries are the principal kinds of fruit cultivated, while the wild red cranberries from the Harz and the black bilberries from the Lüneburger Heide form an important article of export.

Live Stock.—Hanover is remarkable for its cattle and live stock generally. Of these there were counted in 1900 1,115,022 head of horned cattle, 824,000 sheep, 1,556,000 pigs, and 230,000 goats. The Lüneburger Heide yields an excellent breed of sheep, the *Heidschnucken*, which equal the Southdowns of England in delicacy of flavour. Horses famous for their size and quality are reared in the marshes of Aurich and Stade, in Hildesheim and Hanover; and, for breeding purposes, in the stud farm of Celle. Bees are principally kept on the Lüneburger Heide, and the annual yield of honey is very considerable. Large flocks of geese are kept in the moist lowlands; their flesh is salted for domestic consumption during the winter, and their feathers are prepared for sale. The rivers yield trout, salmon (on the Weser) and crayfish. The sea fisheries are important and have their chief centre at Geestemünde.

Mining.—Minerals occur in great variety and abundance. The Harz Mountains are rich in silver, lead, iron and copper; coal is found around Osnabrück, on the Deister, at Osterwald, &c., lignite in various places; salt-springs of great richness exist at Egestorfshall

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and Neuhall near Hanover, and at Lüneburg; and petroleum may be obtained south of Celle. In the cold regions of the northern lowlands peat occurs in beds of immense thickness.

Manufactures.—Works for the manufacture of iron, copper, silver, lead, vitriol and sulphuric acid are carried on to a large extent. The iron works are very important: smelting is carried on in the Harz and near Osnabrück; there are extensive foundries and machine factories at Hanover, Linden, Osnabrück, Hameln, Geestemünde, Harburg, Osterode, &c.; and manufactories of arms at Herzberg, and of cutlery in the towns of the Harz and in the Sollinger Forest. The textile industries are prosecuted chiefly in the towns. Linen yarn and cloth are largely manufactured, especially in the south about Osnabrück and Hildesheim. Bleaching is engaged in extensively; woollen cloths are made to a considerable extent in the south about Einbeck, Göttingen and Hameln; cotton-spinning and weaving have their principal seats at Hanover and Linden. Glass houses, paper-mills, potteries, tile works and tobacco-pipe works are numerous. Wax is bleached to a considerable extent, and there are numerous tobacco factories, tanneries, breweries, vinegar works and brandy distilleries. Shipbuilding is an important industry, especially at Wilhelmshaven, Papenburg, Leer, Stade and Harburg; and at Münden river-barges are built.

Commerce.—Although the carrying trade of Hanover is to a great extent absorbed by Hamburg and Bremen, the shipping of the province counted, in 1903, 780 sailing vessels and 86 steamers of, together, 55,498 registered tons. The natural port is Bremen-Geestemünde and to it is directed the river traffic down the Weser, which practically forms the chief commercial artery of the province.

Communications.—The roads throughout are, on the whole, well laid, and those connecting the principal towns macadamized. Hanover is intersected by important trunk lines of railway; notably the lines from Berlin to Cologne, from Hamburg to Frankfort-on-Main, from Hamburg to Bremen and Cologne, and from Berlin to Amsterdam.

History.—The name Hanover (*Hohenufer* = high bank), originally confined to the town which became the capital of the duchy of Lüneburg-Calenberg, came gradually into use to designate, first, the duchy itself, and secondly, the electorate of Brunswick-Lüneburg; and it was officially recognized as the name of the state when in 1814 the electorate was raised to the rank of a kingdom.

The early history of Hanover is merged in that of the duchy of Brunswick (*q.v.*), from which the duchy of Brunswick-Lüneburg and its offshoots, the duchies of Lüneburg-Celle and Lüneburg-Calenberg have sprung. Ernest I. (1497–1546), duke of Brunswick-Lüneburg, who introduced the reformed doctrines into Lüneburg, obtained the whole of this duchy in 1530; and in 1569 his two surviving sons made an arrangement which was afterwards responsible for the birth of the kingdom of Hanover. By this agreement the greater part of the duchy, with its capital at Celle, came to William (1535–1592), the younger of the brothers, who gave laws to his land and added to its area; and this duchy of Lüneburg-Celle was subsequently ruled in turn by four of his sons: Ernest II. (1564–1611), Christian (1566–1633), Augustus (d. 1636) and Frederick (d. 1648). In addition to these four princes Duke William left three other sons, and in 1610 the seven brothers entered into a compact that the duchy should not be divided, and that only one of them should marry and continue the family. Casting lots to determine this question, the lot fell upon the sixth brother, George (1582–1641), who was a prominent soldier during the period of the Thirty Years' War and saw service in almost all parts of Europe, fighting successively for Christian IV. of Denmark, the emperor Ferdinand II., and for the Swedes both before and after the death of Gustavus Adolphus. In 1617 he aided his brother, Duke Christian, to add Grubenhagen to Lüneburg, and after the extinction of the family of Brunswick-Wolfenbüttel in 1634, he obtained Calenberg for himself, making Hanover the capital of his small dukedom. In 1648, on Duke Frederick's death, George's eldest son, Christian Louis (d. 1665), became duke of Lüneburg-Celle; and at this time he handed over Calenberg, which he had ruled since his father's death, to his second brother, George William (d. 1705). When Christian Louis died George William succeeded him in Lüneburg-Celle; but the duchy was also claimed by a younger brother, John Frederick, a cultured and enlightened prince who had forsaken the Lutheran faith of his family and had become a Roman Catholic. Soon, however, by an arrangement John Frederick received Calenberg and Grubenhagen, which he ruled in absolute fashion, creating a standing army and modelling his court after that of Louis XIV., and which came on his death in 1679 to his youngest brother, Ernest Augustus (1630–1698), the Protestant bishop of Osnabrück. During the French wars of aggression the Lüneburg princes were eagerly courted by Louis XIV. and by his opponents; and after some hesitation George William, influenced by Ernest Augustus, fought among the Imperialists, while John Frederick was ranged on the side of France. In 1689 George William was one of the claimants for the duchy of Saxe-Lauenburg, which was left without a ruler in that year; and after a struggle with John George III., elector of Saxony, and other rivals, he was invested with the duchy by the emperor Leopold I. It was, however, his more ambitious brother, Ernest Augustus, who did most for the prestige and advancement of the house. Having introduced the principle of primogeniture into Calenberg in 1682, Ernest determined to secure for himself the position of an elector, and the condition of Europe and the exigencies of the emperor favoured his pretensions. He made skilful use of Leopold's difficulties; and in 1692, in return for lavish promises of assistance to the Empire and the Habsburgs, the emperor granted him the rank and title of elector of Brunswick-Lüneburg with the office of standard-bearer in the Holy Roman Empire. Indignant protests followed this proceeding. A league was formed to prevent any addition to the electoral college; France and Sweden were called upon for assistance; and the constitution of the Empire was reduced to a state of chaos. This agitation, however, soon died away; and in 1708 George Louis, the son and successor of Ernest Augustus, was recognized as an elector by the imperial diet. George Louis married his cousin Sophia Dorothea, the only child of George William of Lüneburg-Celle; and on his uncle's death in 1705 he united this duchy, together with Saxe-Lauenburg, with his paternal inheritance of Calenberg or Hanover. His father, Ernest Augustus, had taken a step of great importance in the history of Hanover when he married Sophia, daughter of the elector palatine, Frederick V., and grand-daughter of James I. of England, for, through his mother, the elector George Louis became, by the terms of the Act of Settlement of 1701, king of Great Britain and Ireland in 1714.

From this time until the death of William IV. in 1837, Lüneburg or Hanover, was ruled by the same sovereign as Great Britain, and this personal union was not without important results for both countries. Under George I. Hanover joined the alliance against Charles XII. of Sweden in 1715; and by the peace of Stockholm in November 1719 the elector received the duchies of Bremen and Verden, which formed an important addition to the electorate. His son and successor, George II., who founded the university of Göttingen in 1737, was on bad terms with his brother-in-law Frederick William I. of Prussia, and his nephew Frederick the Great; and in 1729 war between Prussia and Hanover was only just avoided. In 1743 George took up arms on behalf of the empress Maria Theresa; but in August 1745 the danger in England from the Jacobites led him to sign the convention of Hanover with Frederick the Great, although the struggle with France raged around his electorate until the peace of Aix-la-Chapelle in 1748. Induced by political exigencies George allied himself with Frederick the Great when the Seven Years' War broke out in 1756; but in September 1757 his son William Augustus, duke of Cumberland, was compelled after his defeat at Hastenbeck to sign the convention of Kloster-zeven and to abandon Hanover to the French. English money, however, came to the rescue; in 1758 Ferdinand, duke of Brunswick, cleared the electorate of the invader; and Hanover suffered no loss of territory at the peace of 1763. Both George I. and George II. preferred Hanover to England as a place of residence, and it was a frequent and perhaps justifiable cause of complaint that the interests of Great Britain were sacrificed to those of the smaller country. But George III. was more British than either his grandfather or his great-grandfather, and owing to a variety of causes the foreign policies of the two countries began to diverge in the later years of his reign. Two

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main considerations dominated the fortunes of Hanover during the period of the Napoleonic wars, the jealousy felt by Prussia at the increasing strength and prestige of the electorate, and its position as a vulnerable outpost of Great Britain. From 1703 the Hanoverian troops fought for the Allies against France, until the treaty of Basel between France and Prussia in 1795 imposed a forced neutrality upon Hanover. At the instigation of Bonaparte Hanover was occupied by the Prussians for a few months in 1801, but at the settlement which followed the peace of Lunéville the secularized bishopric of Osnabrück was added to the electorate. Again tempting the fortune of war after the rupture of the peace of Amiens, the Hanoverians found that the odds against them were too great; and in June 1803 by the convention of Sulingen their territory was occupied by the French. The formation of the third coalition against France in 1805 induced Napoleon to purchase the support of Prussia by allowing her troops to seize Hanover; but in 1807, after the defeat of Prussia at Jena, he incorporated the southern part of the electorate in the kingdom of Westphalia, adding the northern portion to France in 1810. The French occupation was costly and aggressive; and the Hanoverians, many of whom were found in the allied armies, welcomed the fall of Napoleon and the return of the old order. Represented at the congress of Vienna by Ernest, Count Münster, the elector was granted the title of king; but the British ministers wished to keep the interests of Great Britain distinct from those of Hanover. The result of the congress, however, was not unfavourable to the new kingdom, which received East Friesland, the secularized bishopric of Hildesheim, the city of Goslar, and some smaller additions of territory, in return for the surrender of the greater part of the duchy of Saxe-Lauenburg to Prussia.

Like those of the other districts of Germany, the estates of the different provinces which formed the kingdom of Hanover had met for many years in an irregular fashion to exercise their varying and ill-defined authority; and, although the elector Ernest Augustus introduced a system of administrative councils into Celle, these estates, consisting of the three orders of prelates, nobles and towns, together with a body somewhat resembling the English privy council, were the only constitution which the country possessed, and the only check upon the power of its ruler. When the elector George Louis became king of Great Britain in 1714 he appointed a representative, or *statthalter*, to govern the electorate, and thus the union of the two countries was attended with constitutional changes in Hanover as well as in Great Britain. Responsible of course to the elector, the Statthalter, aided by the privy council, conducted the internal affairs of the electorate, generally in a peaceful and satisfactory fashion, until the welter of the Napoleonic wars. On the conclusion of peace in 1814 the estates of the several provinces of the kingdom were fused into one body, consisting of eighty-five members, but the chief power was exercised as before by the members of a few noble families. In 1819, however, this feudal relic was supplanted by a new constitution. Two chambers were established, the one formed of nobles and the other of elected representatives; but although they were authorized to control the finances, their power with regard to legislation was very circumscribed. This constitution was sanctioned by the prince regent, afterwards King George IV.; but it was out of harmony with the new and liberal ideas which prevailed in Europe, and it hardly survived George's decease in 1830. The revolution of that year compelled George's brother and successor, William, to dismiss Count Münster, who had been the actual ruler of the country, and to name his own brother, Adolphus Frederick, duke of Cambridge, a viceroy of Hanover; one of the viceroy's earliest duties being to appoint a commission to draw up a new constitution. This was done, and after William had insisted upon certain alterations, it was accepted and promulgated in 1833. Representation was granted to the peasants; the two chambers were empowered to initiate legislation; ministers were made responsible for all acts of government; a civil list was given to the king in return for the surrender of the crown lands; and, in short, the new constitution was similar to that of Great Britain. These liberal arrangements, however, did not entirely allay the discontent. A strong and energetic party endeavoured to thwart the working of the new order, and matters came to a climax on the death of William IV. in 1837.

By the law of Hanover a woman could not ascend the throne, and accordingly Ernest Augustus, duke of Cumberland, the fifth son of George III., and not Victoria, succeeded William as sovereign in 1837, thus separating the crowns of Great Britain and Hanover after a union of 123 years. Ernest, a prince with very autocratic ideas, had disapproved of the constitution of 1833, and his first important act as king was to declare it invalid. He appears to have been especially chagrined because the crown lands were not his personal property, but the whole of the new arrangements were repugnant to him. Seven Göttingen professors who protested against this proceeding were deprived of their chairs; and some of them, including F. C. Dahlmann and Jakob Grimm, were banished from the country for publishing their protest. To save the constitution an appeal was made to the German Confederation, which Hanover had joined in 1815; but the federal diet declined to interfere, and in 1840 Ernest altered the constitution to suit his own illiberal views. Recovering the crown lands, he abolished the principle of ministerial responsibility, the legislative power of the two chambers, and other reforms, virtually restoring affairs to their condition before 1833. The inevitable crisis was delayed until the stormy year 1848, when the king probably saved his crown by hastily giving back the constitution of 1833. Order, however, having been restored, in 1850 he dismissed the Liberal ministry and attempted to evade his concessions; a bitter struggle had just broken out when Ernest Augustus died in November 1851. During this reign the foreign policy of Hanover both within and without Germany had been coloured by jealousy of Prussia and by the king's autocratic ideas. Refusing to join the Prussian *Zollverein*, Hanover had become a member of the rival commercial union, the *Steuerverein*, three years before Ernest's accession; but as this union was not a great success the *Zollverein* was joined in 1851. In 1849, after the failure of the German parliament at Frankfort, the king had joined with the sovereigns of Prussia and Saxony to form the "three kings' alliance"; but this union with Prussia was unreal, and with the king of Saxony he soon transferred his support to Austria and became a member of the "four kings' alliance."

George V., the new king of Hanover, who was unfortunately blind, sharing his father's political ideas, at once appointed a ministry whose aim was to sweep away the constitution of 1848. This project, however, was resisted by the second chamber of the *Landtag*, or parliament; and after several changes of government a new ministry advised the king in 1855 to appeal to the diet of the German Confederation. This was done, and the diet declared the constitution of 1848 to be invalid. Acting on this verdict, not only was a ministry formed to restore the constitution of 1840, but after some trouble a body of members fully in sympathy with this object was returned to parliament in 1857. But these members were so far from representing the opinions of the people that popular resentment compelled George to dismiss his advisers in 1862. But the more liberal government which succeeded did not enjoy his complete confidence, and in 1865 a ministry was once more formed which was more in accord with his own ideas. This contest soon lost both interest and importance owing to the condition of affairs in Germany. Bismarck, the director of the policy of Prussia, was devising methods for the realization of his schemes, and it became clear after the war over the duchies of Schleswig and Holstein that the smaller German states would soon be obliged to decide definitely between Austria and Prussia. After a period of vacillation Hanover threw in her lot with Austria, the decisive step being taken when the question of the mobilization of the federal army was voted upon in the diet on the 14th of June 1866. At once Prussia requested Hanover to remain unarmed and neutral during the war, and with equal promptness King George refused to assent to these demands. Prussian troops then crossed his frontier and took possession of his capital.

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The Hanoverians, however, were victorious at the battle of Langensalza on the 27th of June 1866, but the advance of fresh bodies of the enemy compelled them to capitulate two days later. By the terms of this surrender the king was not to reside in Hanover, his officers were to take no further part in the war, and his ammunition and stores became the property of Prussia. The decree of the 20th of September 1866 formally annexed Hanover to Prussia, when it became a province of that kingdom, while King George from his retreat at Hietzing appealed in vain to the powers of Europe. Many of the Hanoverians remained loyal to their sovereign; some of them serving in the Guelph Legion, which was maintained largely at his expense in France, where a paper, *La Situation*, was founded by Oskar Meding (1820–1903) and conducted in his interests. These and other elaborate efforts, however, failed to bring about the return of the king to Hanover, though the Guelph party continued to agitate and to hope even after the Franco-German War had immensely increased the power and the prestige of Prussia. George died in June 1878. His son, Ernest Augustus, duke of Cumberland, continued to maintain his claim to the crown of Hanover, and refused to be reconciled with Prussia. Owing to this attitude the German imperial government refused to allow him to take possession of the duchy of Brunswick, which he inherited on the extinction of the elder branch of his family in 1884, and again in 1906 when the same subject came up for settlement on the death of the regent, Prince Albert of Prussia.

In 1867 King George had agreed to accept Prussian bonds to the value of about £1,600,000 as compensation for the confiscation of his estates in Hanover. In 1868, however, on account of his continued hostility to Prussia, the Prussian government sequestrated this property; and, known as the *Welfenfonds*, or *Reptilienfonds*, it was employed as a secret service fund to combat the intrigues of the Guelphs in various parts of Europe; until in 1892 it was arranged that the interest should be paid to the duke of Cumberland. In 1885 measures were taken to incorporate the province of Hanover more thoroughly in the kingdom of Prussia, and there is little doubt but that the great majority of the Hanoverians have submitted to the inevitable, and are loyal subjects of the king of Prussia.

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HANOVER, the capital of the Prussian province of the same name, situated in a sandy but fertile plain on the Leine, which here receives the Ihme, 38 m. N.W. from Brunswick, 78 S.E. of Bremen, and at the crossing of the main lines of railway, Berlin to Cologne and Hamburg to Frankfort-on-Main. Pop. (1885) 130,731; (1900) 235,066; (1905) 250,032. On the north and east the town is half encircled by the beautiful woods and groves of the Eilenriede and the List which form the public park. The Leine flows through the city, having the old town on its right and the quaint Calenberger quarter between its left bank and the Ihme. The old town is irregularly built, with narrow streets and old-fashioned gabled houses. In its centre lies the Markt Kirche, a red-brick edifice of the 14th century, containing interesting monuments and some fine stained-glass windows, and with a steeple 310 ft. in height (the highest in Hanover). Its interior was restored in 1855. Close by, on the market square, is the red-brick medieval town-hall (Rathaus), with an historical wine cellar beneath. It has been superseded for municipal business by a new building, and now contains the civic archives and museum. The new town, surrounding the old on the north and east, and lying between it and the woods referred to, has wide streets, handsome buildings and beautiful squares. Among the last-mentioned are the square at the railway station—the Ernst August-Platz—with an equestrian statue of King Ernest Augustus in bronze; the triangular Theater-Platz, with statues of the composer Marschner and others; and the Georgs-Platz, with a statue of Schiller. To the south of the old town, on the banks of the Ihme, lies the Waterloo-Platz, with a column of victory, 154 ft. high, having inscribed on it the names of 800 Hanoverians who fell at Waterloo. In the adjacent gardens an open rotunda encloses a marble bust of the philosopher Leibnitz, and near it is a monument to General Count von Alten, the commander of the Hanoverian troops at Waterloo. Among the other churches the most noticeable are the Neustädterkirche, with a graceful shrine containing the tomb of Leibnitz, the Kreuzkirche, built about 1300, with a curious steeple, and the Aegidienkirche among ancient edifices, and among modern ones the Christuskirche, a gift of King George V., the Lukaskirche, the Lutherkirche, and the Roman Catholic church of St Mary, with a tower 300 ft. high, containing the grave of Ludwig Windthorst, "his little excellency," for many years leader of the Ultramontane (Centre) party in the imperial diet. Of secular buildings the most remarkable is the royal palace—Schloss—built 1636–1640, with a grand portal and handsome quadrangle. In its chapel are preserved the relics of saints which Henry the Lion brought from Palestine. The new provincial museum built in 1897–1902 contains the Cumberland Gallery and the Guelph Museum; and the Kestner Museum also contains interesting and valuable collections of works of art. The other principal public buildings are the royal archives and library, containing a library of 200,000 volumes and 3500 manuscripts; the old provincial museum, which houses a variety of collections, such as natural, historical and ethnographical, and a collection of modern paintings; the theatre (built 1845–1852), one of the largest in Germany, the archaeological museum, the railway station, and, in the west, close to Herrenhausen (see below), the magnificent Welfenschloss (Guelph-palace). The last, begun in 1859, was almost completed in 1866, but was never occupied by the Hanoverian royal family. Since 1875 it has been occupied by the technical high school, an academy with university privileges. Close to it lies the famous Herrenhausen, the summer palace of the former kings of Hanover, with fine gardens, an open-air theatre, a museum and an orangery, and approached by a grand avenue over a mile in length.

Hanover has a number of colleges and schools, and is the seat of several learned societies. It is largely frequented by foreign students, especially English, attracted by the educational facilities it offers and by the reputed purity of the German spoken. Hanover is the headquarters of the X. Prussian army corps, has a large garrison of nearly all arms and a famous military riding school. It occupies a leading position among the industrial and commercial towns of the empire, and of recent years has made rapid progress in prosperity. It is connected by railway with Berlin, Hamburg, Bremen, Hameln, Cologne, Altenbeken and Cassel, and the facilities of intercourse have, under the fostering care of the Prussian government, enormously developed its trade and manufactures. Almost all industries are represented; chief among them are machine-building, the manufacture of india-rubber, linen, cloth, hardware, chemicals, tobacco, pianos, furniture and groceries. The commerce consists principally in wine, hides, horses, coal, wood and cereals. There are extensive printing establishments. Hanover was the first German town that was lighted with gas. It is the birthplace of Sir William Herschel, the astronomer, of the brothers Schlegel, of Iffland and of the historian Pertz. The philosopher Leibnitz died there in 1716.

Close by, on the left bank of the Leine, lies the manufacturing town of Linden, which, though practically forming one town with Hanover, is treated under a separate heading.

The town of Hanover is first mentioned during the 12th century. It belonged to the family of Welf, then to the bishops of Hildesheim, and then, in 1369, it came again into the possession

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of the Welfs, now dukes of Brunswick. It joined the Hanseatic League, and was later the residence of the branch of the ducal house, which received the title of elector of Hanover and ascended the British throne in the person of George I. One or two important treaties were signed in Hanover, which from 1810 to 1813 was part of the kingdom of Westphalia, and in 1866 was annexed by Prussia, after having been the capital of the kingdom of Hanover since its foundation in 1815.

See O. Ulrich, *Bilder aus Hannovers Vergangenheit* (1891); Hoppe, *Geschichte der Stadt Hannover* (1845); Hirschfeld, *Hannovers Grossindustrie und Grosshandel* (Leipzig, 1891); Frensdorff, *Die Stadtverfassung Hannovers in alter und neuer Zeit* (Leipzig, 1883); W. Bahrdt, *Geschichte der Reformation der Stadt Hannover* (1891); Harimann, *Geschichte von Hannover mit besonderer Rucksichtnahme auf die Entwickelung der Residenzstadt Hannover* (1886); *Hannover und Umgegend, Entwickelung und Zustände seiner Industrie und Gewerbe* (1874); and the *Urkundenbuch der Stadt Hannover* (1860, fol.).

HANOVER, a town of Jefferson county, Indiana, U.S.A., on the Ohio river, about 5 m. below Madison. Pop. (1900) 377; (1910) 356. It is served by boats on the Ohio river and by stages to Madison, the nearest railway station. Along the border of the town and on a bluff rising about 500 ft. above the river is Hanover College, an institution under Presbyterian control, embracing a college and a preparatory department, and offering classical and scientific courses and instruction in music; there is no charge for tuition. In 1908–1909 there were 211 students, 75 being in the Academy. The institution was opened in a log cabin in 1827, was incorporated as Hanover Academy in 1828, was adopted as a synodical school by the Presbyterian Synod of Indiana in 1829 on condition that a Theological department be added, and in 1833 was incorporated under its present name. In 1840, however, the theological department became a separate institution and was removed to New Albany, whence in 1859 it was removed to Chicago, where it was named, first, the Presbyterian Theological Seminary of the North-west, and, in 1886, the McCormick Theological Seminary. In the years immediately after its incorporation in 1833 Hanover College introduced the "manual labor system" and was for a time very prosperous, but the system was not a success, the college ran into debt, and in 1843 the trustees attempted to surrender the charter and to acquire the charter of a university at Madison. This effort was opposed by a strong party, which secured a more liberal charter for the college. In 1880 the college became coeducational.

HANOVER, a township of Grafton county, New Hampshire, U.S.A., on the Connecticut river, 75 m. by rail N.W. of Concord. Pop. (1900) 1884; (1910) 2075. No railway enters this township; the Ledyard Free Bridge (the first free bridge across the Connecticut) connects it with Norwich, Vt., which is served by the Boston & Maine railway. Ranges of rugged hills, broken by deep narrow gorges and by the wider valley of Mink Brook, rise near the river and culminate in the E. section in Moose Mountain, 2326 ft. above the sea. Near the foot of Moose Mountain is the birthplace of Laura D. Bridgman. Agriculture, dairying and lumbering are the chief pursuits of the inhabitants. The village of Hanover, the principal settlement of the township, occupies Hanover Plain in the S.W. corner, and is the seat of Dartmouth College (*q.v.*), which has a strikingly beautiful campus, and among its buildings several excellent examples of the colonial style, notably Dartmouth Hall. The Mary Hitchcock memorial hospital, a cottage hospital of 36 beds, was erected in 1890–1893 by Hiram Hitchcock in memory of his wife. The charter of the township was granted by Gov. Benning Wentworth on the 4th of July 1761, and the first settlement was made in May 1765. The records of the town meetings and selectmen, 1761–1818, have been published by E. P. Storrs (Hanover, 1905).

See Frederick Chase, *A History of Dartmouth College and the Town of Hanover* (Cambridge, 1891).

HANOVER, a borough of York county, Pennsylvania, U.S.A., 36 m. S. by W. of Harrisburg, and 6 m. from the S. border of the state. Pop. (1890) 3746; (1900) 5302, (133 foreign-born); (1910) 7057. It is served by the Northern Central and the Western Maryland railways. The borough is built on nearly level ground in the fertile valley of the Conewago, at the point of intersection of the turnpike roads leading to Baltimore, Carlisle, York and Frederick, from which places the principal streets—sections of these roads—are named. Among its manufactures are foundry and machine-shop products, flour, silk, waggons, shoes, gloves, furniture, wire cloth and cigars. The settlement of the place was begun mostly by Germans during the middle of the 18th century. Hanover was laid out in 1763 or 1764 by Col. Richard MacAllister; and in 1815 it was incorporated. On the 30th of June 1863 there was a cavalry engagement in and near Hanover between the forces of Generals H. J. Kilpatrick (Union) and J. E. B. Stuart (Confederate) preliminary to the battle of Gettysburg. This engagement is commemorated by an equestrian statue erected in Hanover by the state.

HANRIOT, FRANÇOIS (1761–1794), French revolutionist, was born at Nanterre (Seine) of poor parentage. Having lost his first employment—with a *procureur*—through dishonesty, he obtained a clerkship in the Paris *octroi* in 1789, but was dismissed for abandoning his post when the Parisians burned the *octroi* barriers on the night of the 12th–13th of July 1789. After leading a hand-to-mouth existence for some time, he became one of the orators of the section of the *sans-culottes*, and commanded the armed force of that section during the insurrection on the 10th of August 1792 and the massacres of September. But he did not come into prominence until the night of the 30th–31st of May 1793, when he was provisionally appointed commandant-general of the armed forces of Paris by the council general of the Commune. On the 31st of May he was one of the delegates from the Commune to the Convention demanding the dissolution of the Commission of Twelve and the proscription of the Girondists (*q.v.*), and he was in command of the insurrectionary forces of the Commune during the *émeute* of the 2nd of June (see FRENCH REVOLUTION). On the 11th of June he resigned his command, declaring that order had been restored. On the 13th he was impeached in the Convention; but the motion was not carried, and on the 1st of July he was elected by the Commune permanent commander of the armed forces of Paris. This position, which gave him enormous power, he retained until the revolution of the 9th Thermidor (July 27, 1794). His arrest was decreed; but he had the *générale* sounded and the tocsin rung, and tried to rescue Robespierre, who was under arrest in the hall of the *Comité de Sûreté Générale*. Hanriot was himself arrested, but was rescued by his adherents, and hastened to the Hôtel de Ville. After a vain attempt to organize resistance he fled and hid in a secluded yard, where he was discovered the next day. He was arrested, sentenced to death, and guillotined with Robespierre and his friends on the 10th Thermidor of the year II. (the 28th of July 1794).

HANSARD, LUKE (1752–1828), English printer, was born on the 5th of July 1752 in St Mary's parish, Norwich. He was educated at Boston grammar school, and was apprenticed to Stephen White, a Norwich printer. As soon as his apprenticeship had expired Hansard started for London with only a guinea in his pocket, and became a compositor in the office of John Hughs (1703–1771), printer to the House of Commons. In 1774 he was made a partner, and undertook almost the entire conduct of the business, which in 1800 came completely into his hands. On the admission of his sons the firm became Luke Hansard & Sons. Among those whose friendship Hansard won in the exercise of his profession were Robert Orme, Burke and Dr Johnson; while Porson praised him as the most accurate printer of Greek. He printed the *Journals of the House of Commons* from 1774 till his death. The promptitude and accuracy with which Hansard printed parliamentary papers were often of the greatest service to government—notably on one occasion when the proof-sheets of the report of the Secret Committee on the French Revolution were submitted to Pitt twenty-four hours after the draft had left his hands. On the union with Ireland in 1801, the increase of parliamentary printing compelled Hansard to give up all private printing except when parliament was not sitting. He devised numerous expedients for reducing the expense of publishing the reports; and in 1805, when his workmen struck at a time

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of great pressure, he and his sons themselves set to work as compositors. Luke Hansard died on the 29th of October 1828.

His son, THOMAS CURSON HANSARD (1776–1833), established a press of his own in Paternoster Row, and began in 1803 to print the *Parliamentary Debates*, which were not at first independent reports, but were taken from the newspapers. After 1889 the debates were published by the Hansard Publishing Union Limited. T. C. Hansard was the author of *Typographia, an Historical Sketch of the Origin and Progress of the Art of Printing* (1825). The original business remained in the hands of his younger brothers, James and Luke Graves Hansard (1777–1851). The firm was prosecuted in 1837 by John Joseph Stockwell for printing by order of the House of Commons, in an official report of the inspector of prisons, statements regarded by the plaintiff as libellous. Hansard sheltered himself on the ground of privilege, but it was not until after much litigation that the security of the printers of government reports was guaranteed by statute in 1840.

HANSEATIC LEAGUE. It is impossible to assign any precise date for the beginning of the Hanseatic League or to name any single factor which explains the origin of that loose but effective federation of North German towns. Associated action and partial union among these towns can be traced back to the 13th century. In 1241 we find Lübeck and Hamburg agreeing to safeguard the important road connecting the Baltic and the North Sea. The first known meeting of the "maritime towns," later known as the Wendish group and including Lübeck, Hamburg, Lüneburg, Wismar, Rostock and Stralsund, took place in 1256. The Saxon towns, during the following century, were joining to protect their common interests, and indeed at this period town confederacies in Germany, both North and South, were so considerable as to call for the declaration against them in the Golden Bull of 1356. The decline of the imperial power and the growing opposition between the towns and the territorial princes justified these defensive town alliances, which in South Germany took on a peculiarly political character. The relative weakness of territorial power in the North, after the fall of Henry the Lion of Saxony, diminished without however removing this motive for union, but the comparative immunity from princely aggression on land left the towns freer to combine in a stronger and more permanent union for the defence of their commerce by sea and for the control of the Baltic.

While the political element in the development of the Hanseatic League must not be underestimated, it was not so formative as the economic. The foundation was laid for the growth of German towns along the southern shore of the Baltic by the great movement of German colonization of Slavic territory east of the Elbe. This movement, extending in time from about the middle of the 11th to the middle of the 13th century and carrying a stream of settlers and traders from the Northwest, resulted not only in the Germanization of a wide territory but in the extension of German influence along the sea-coast far to the east of actual territorial settlement. The German trading towns, at the mouths of the numerous streams which drain the North European plain, were stimulated or created by the unifying impulse of a common and long-continued advance of conquest and colonization.

The impetus of this remarkable movement of expansion not only carried German trade to the East and North within the Baltic basin, but reanimated the older trade from the lower Rhine region to Flanders and England in the West. Cologne and the Westphalian towns, the most important of which were Dortmund, Soest and Münster, had long controlled this commerce but now began to feel the competition of the active traders of the Baltic, opening up that direct communication by sea from the Baltic to western Europe which became the essential feature in the history of the League. The necessity of seeking protection from the sea-rovers and pirates who infested these waters during the whole period of Hanseatic supremacy, the legal customs, substantially alike in the towns of North Germany, which governed the groups of traders in the outlying trading posts, the establishment of common factories, or "counters "(Komtors) at these points, with aldermen to administer justice and to secure trading privileges for the community of German merchants —such were some of the unifying influences which preceded the gradual formation of the League. In the century of energetic commercial development before 1350 the German merchants abroad led the way.

Germans were early pushing as permanent settlers into the Scandinavian towns, and in Wisby, on the island of Gothland, the Scandinavian centre of Baltic trade, equal rights as citizens in the town government were possessed by the German settlers as early as the beginning of the 13th century. There also came into existence at Wisby the first association of German traders abroad, which united the merchants of over thirty towns, from Cologne and Utrecht in the West to Reval in the East. We find the Gothland association making in 1220 a treaty with a Russian prince and securing privileges for their branch trading station at Novgorod. According to the "Skra," the by-laws of the Novgorod branch, the four aldermen of the community of Germans, who among other duties held the keys of the common chest, deposited in Wisby, were to be chosen from the merchants of the Gothland association and of the towns of Lübeck, Soest and Dortmund. The Gothland association received in 1237 trading rights in England, and shortly after the middle of the century it also secured privileges in Flanders. It legislated on matters relating to common trade interests, and, in the case of the regulation of 1287 concerning shipwrecked goods, we find it imposing this legislation on the towns under the penalty of exclusion from the association. But with the extension of the East and West trade beyond the confines of the Baltic, this association by the end of the century was losing its position of leadership. Its inheritance passed to the gradually forming union of towns, chiefly those known as Wendish, which looked to Lübeck as their head. In 1293 the Saxon and Wendish merchants at Rostock decided that all appeals from Novgorod be taken to Lübeck instead of to Wisby, and six years later the Wendish and Westphalian towns, meeting at Lübeck, ordered that the Gothland association should no longer use a common seal. Though Lübeck's right as court of appeal from the Hanseatic counter at Novgorod was not recognized by the general assembly of the League until 1373, the long-existing practice had simply accorded with the actual shifting of commercial power. The union of merchants abroad was beginning to come under the control of the partial union of towns at home.

A similar and contemporary extension of the influence of the Baltic traders under Lübeck's leadership may be witnessed in the West. As a consequence of the close commercial relations early existing between England and the Rhenish-Westphalian towns, the merchants of Cologne were the first to possess a gild-hall in London and to form a "hansa" with the right of admitting other German merchants on payment of a fee. The charter of 1226, however, by which Emperor Frederick II. created Lübeck a free imperial city, expressly declared that Lübeck citizens trading in England should be free from the dues imposed by the merchants of Cologne and should enjoy equal rights and privileges. In 1266 and 1267 the merchants of Hamburg and Lübeck received from Henry III. the right to establish their own hansas in London, like that of Cologne. The situation thus created led by 1282 to the coalescence of the rival associations in the "Gild-hall of the Germans," but though the Baltic traders had secured a recognized foothold in the enlarged and unified organization, Cologne retained the controlling interest in the London settlement until 1476. Lübeck and Hamburg, however, dominated the German trade in the ports of the east coast, notably in Lynn and Boston, while they were strong in the organized trading settlements at York, Hull, Ipswich, Norwich, Yarmouth and Bristol. The counter at London, first called the Steelyard in a parliamentary petition of 1422, claimed jurisdiction over the other factories in England.

In Flanders, also, the German merchants from the West had long been trading, but here had later to endure not only the rivalry but the pre-eminence of those from the East. In 1252 the first treaty privileges for German trade in Flanders show

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two men of Lübeck and Hamburg heading the "Merchants of the Roman Empire," and in the later organization of the counter at Bruges four or five of the six aldermen were chosen from towns east of the Elbe, with Lübeck steadily predominant. The Germans recognized the staple rights of Bruges for a number of commodities, such as wool, wax, furs, copper and grain, and in return for this material contribution to the growing commercial importance of the town, they received in 1309 freedom from the compulsory brokerage which Bruges imposed on foreign merchants. The importance and independence of the German trading settlements abroad was exemplified in the statutes of the "Company of German merchants at Bruges," drawn up in 1347, where for the first time appears the grouping of towns in three sections (the "Drittel"), the Wendish-Saxon, the Prussian-Westphalian, and those of Gothland and Livland. Even more important than the assistance which the concentration of the German trade at Bruges gave to that leading mart of European commerce was the service rendered by the German counter of Bruges to the cause of Hanseatic unity. Not merely because of its central commercial position, but because of its width of view, its political insight, and its constant insistence on the necessity of union, this counter played a leading part in Hanseatic policy. It was more Hanse than the Hanse towns.

The last of the chief trading settlements, both in importance and in date of organization, was that at Bergen in Norway, where in 1343 the Hanseatics obtained special trade privileges. Scandinavia had early been sought for its copper and iron, its forest products and its valuable fisheries, especially of herring at Schonen, but it was backward in its industrial development and its own commerce had seriously declined in the 14th century. It had come to depend largely upon the Germans for the importation of all its luxuries and of many of its necessities, as well as for the exportation of its products, but regular trade with the three kingdoms was confined for the most part to the Wendish towns, with Lübeck steadily asserting an exclusive ascendancy. The fishing centre at Schonen was important as a market, though, like Novgorod, its trade was seasonal, but it did not acquire the position of a regularly organized counter, reserved alone, in the North, for Bergen. The commercial relations with the North cannot be regarded as an important element in the union of the Hanse towns, but the geographical position of the Scandinavian countries, especially that of Denmark, commanding the Sound which gives access to the Baltic, compelled a close attention to Scandinavian politics on the part of Lübeck and the League and thus by necessitating combined political action in defence of Hanseatic sea-power exercised a unifying influence.

Energetic and successful though the scattered trading settlements had been in establishing German trade connexions and in securing valuable trade privileges, the middle of the 14th century found them powerless to meet difficulties arising from internal dissension and still more from the political rivalries and trade jealousies of nascent nationalities. Flanders became a battle-field in the great struggle between France and England, and the war of trade prohibitions led to infractions of the German privileges in Bruges. An embargo on trade with Flanders, voted in 1358 by a general assembly, resulted by 1360 in the full restoration of German privileges in Flanders, but reduced the counter at Bruges to an executive organ of a united town policy. It is worth noting that in a document connected with this action the union of towns, borrowing the term from English usage, was first called the "German Hansa." In 1361 representatives from Lübeck and Wisby visited Novgorod to recodify the by-laws of the counter and to admonish it that new statutes required the consent of Lübeck, Wisby, Riga, Dorpat and Reval. This action was confirmed in 1366 by an assembly of the Hansa which at the same time, on the occasion of a regulation made by the Bruges counter and of statutes drawn up by the young Bergen counter, ordered that in future the approval of the towns must be obtained for all new regulations.

The counter at London was soon forced to follow the example of the other counters at Bruges, Novgorod and Bergen. After the failure of the Italians, the Hanseatics remained the strongest group of alien merchants in England, and, as such, claimed the exclusive enjoyment of the privileges granted by the *Carta Mercatoria* of 1303. Their highly favoured position in England, contrasting markedly with their refusal of trade facilities to the English in some of the Baltic towns and their evident policy of monopoly in the Baltic trade, incensed the English mercantile classes, and doubtless influenced the increases in customs-duties which were regarded by the Germans as contrary to their treaty rights. Unsuccessful in obtaining redress from the English government, the German merchants finally, in 1374, appealed for aid to the home towns, especially to Lübeck. The result of Hanseatic representations was the confirmation by Richard II. in 1377 of all their privileges, which accorded them the preferential treatment they had claimed and became the foundation of the Hanseatic position in England.

In the meanwhile, the conquest of Wisby by Waldemar IV. of Denmark in 1361 had disclosed his ambition for the political control of the Baltic. He was promptly opposed by an alliance of Hanse towns, led by Lübeck. The defeat of the Germans at Helsingborg only called into being the stronger town and territorial alliance of 1367, known as the Cologne Confederation, and its final victory, with the peace of Stralsund in 1370, which gave for a limited period the four chief castles on the Sound into the hands of the Hanseatic towns, greatly enhanced the prestige of the League.

The assertion of Hanseatic influence in the two decades, 1356 to 1377, marks the zenith of the League's power and the completion of the long process of unification. Under the pressure of commercial and political necessity, authority was definitely transferred from the Hansas of merchants abroad to the Hansa of towns at home, and the sense of unity had become such that in 1380 a Lübeck official could declare that "whatever touches one town touches all." But even at the time when union was most important, this statement went further than the facts would warrant, and in the course of the following century it became less and less true. Dortmund held aloof from the Cologne Confederation on the ground that it had no concern in Scandinavian politics. It became, indeed, increasingly difficult to obtain the support of the inland towns for a policy of sea-power in the Baltic. Cologne sent no representatives to the regular Hanseatic assemblies until 1383, and during the 15th century its independence was frequently manifested. It rebelled at the authority of the counter at Bruges, and at the time of the war with England (1469–1474) openly defied the League. In the East, the German Order, while enjoying Hanseatic privileges, frequently opposed the policy of the League abroad, and was only prevented by domestic troubles and its Hinterland enemies from playing its own hand in the Baltic. After the fall of the order in 1467, the towns of Prussia and Livland, especially Danzig and Riga, pursued an exclusive trade policy even against their Hanseatic confederates. Lübeck, however, supported by the Bruges counter, despite the disaffection and jealousy on all sides hampering and sometimes thwarting its efforts, stood steadfastly for union and the necessity of obedience to the decrees of the assemblies. Its headship of the League, hitherto tacitly accepted, was definitely recognized in 1418.

The governing body of the Hansa was the assembly of town representatives, the "Hansetage," held irregularly as occasion required at the summons of Lübeck, and, with few exceptions, attended but scantily. The delegates were bound by instructions from their towns and had to report home the decisions of the assembly for acceptance or rejection. In 1469 the League declared that the English use of the terms "societas," "collegium" and "universitas" was inappropriate to so loose an organization. It preferred to call itself a "firma confederatio" for trade purposes only. It had no common seal, though that of Lübeck was accepted, particularly by foreigners, in behalf of the League. Disputes between the confederate towns were brought for adjudication before the general assembly, but the League had no recognized federal judiciary. Lübeck, with the counters abroad, watched over the execution of the measures voted by the assembly, but there was no regular administrative

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organization. Money for common purposes was raised from time to time, as necessity demanded, by the imposition on Hanse merchandise of poundage dues, introduced in 1361, while the counters relied upon a small levy of like nature and upon fines to meet current needs. Even this slender financial provision met with opposition. The German Order in 1398 converted the Hanseatic poundage to a territorial tax for its own purposes, and one of the chief causes for Cologne's disaffection a half-century later was the extension from Flanders to other parts of the Netherlands of the levy made by the counter at Bruges. Since the authority of the League rested primarily on the moral support of its members, allied in common trade interests and acquiescing in the able leadership of Lübeck, its only means of compulsion was the "Verhansung," or exclusion of a recalcitrant town from the benefits of the trade privileges of the League. A conspicuous instance was the exclusion of Cologne from 1471 until its obedience in 1476, but the penalty had been earlier imposed, as in the case of Brunswick, on towns which overthrew their patrician governments. It was obviously, however, a measure to be used only in the last resort and with extreme reluctance.

The decisive factor in determining membership in the League was the historical right of the citizens of a town to participate in Hanseatic privileges abroad. At first the merchant Hansas had shared these privileges with almost any German merchant, and thus many little villages, notably those in Westphalia, ultimately claimed membership. Later, under the Hansa of the towns, the struggle for the maintenance of a coveted position abroad led to a more exclusive policy. A few new members were admitted, mainly from the westernmost sphere of Hanseatic influence, but membership was refused to some important applicants. In 1447 it was voted that admission be granted only by unanimous consent. No complete list of members was ever drawn up, despite frequent requests from foreign powers. Contemporaries usually spoke of 70, 72, 73 or 77 members, and perhaps the list is complete with Daenell's recent count of 72, but the obscurity on so vital a point is significant of the amorphous character of the organization.

The towns of the League, stretching from Thorn and Krakow on the East to the towns of the Zuider Zee on the West, and from Wisby and Reval in the North to Göttingen in the South, were arranged in groups, following in the main the territorial divisions. Separate assemblies were held in the groups for the discussion both of local and Hanseatic affairs, and gradually, but not fully until the 16th century, the groups became recognized as the lowest stage of Hanse organization. The further grouping into "Thirds," later "Quarters," under head-towns, was also more emphasized in that century.

In the 15th century the League, with increasing difficulty, held a defensive position against the competition of strong rivals and new trade-routes. In England the inevitable conflict of interests between the new mercantile power, growing conscious of its national strength, and the old, standing insistant on the letter of its privileges, was postponed by the factional discord out of which the Hansa in 1474 dexterously snatched a renewal of its rights. Under Elizabeth, however, the English Merchant Adventurers could finally rejoice at the withdrawal of privileges from the Hanseatics and their concession to England, in return for the retention of the Steelyard, of a factory in Hamburg. In the Netherlands the Hanseatics clung to their position in Bruges until 1540, while trade was migrating to the ports of Antwerp and Amsterdam. By the peace of Copenhagen in 1441, after the unsuccessful war of the League with Holland, the attempted monopoly of the Baltic was broken, and, though the Hanseatic trade regulations were maintained on paper, the Dutch with their larger ships increased their hold on the herring fisheries, the French salt trade, and the Baltic grain trade. For the Russian trade new competitors were emerging in southern Germany. The Hanseatic embargo against Bruges from 1451 to 1457, its later war and embargo against England, the Turkish advance closing the Italian Black Sea trade with southern Russia, all were utilized by Nuremberg and its fellows to secure a land-trade outside the sphere of Hanseatic influence. The fairs of Leipzig and Frankfort-on-Main rose in importance as Novgorod, the stronghold of Hanse trade in the East, was weakened by the attacks of Ivan III. The closing of the Novgorod counter in 1494 was due not only to the development of the Russian state but to the exclusive Hanseatic policy which had stimulated the opening of competing trade routes.

Within the League itself increasing restiveness was shown under the restrictions of its trade policy. At the Hanseatic assembly of 1469, Duntzig, Hamburg and Breslau opposed the maintenance of a compulsory staple at Bruges in the face of the new conditions produced by a widening commerce and more advantageous markets. Complaint was made of South German competition in the Netherlands. "Those in the Hansa," protested Breslau, "are fettered and must decline and those outside the Hansa are free and prosper." By 1477 even Lübeck had become convinced that a continuance of the effort to maintain the compulsory staple against Holland was futile and should be abandoned. But while it was found impossible to enforce the staple or to close the Sound against the Dutch, other features of the monopolistic system of trade regulations were still upheld. It was forbidden to admit an outsider to partnership or to co-ownership of ships, to trade in non-Hanseatic goods, to buy or sell on credit in a foreign mart or to enter into contracts for future delivery. The trade of foreigners outside the gates of Hanse towns or with others than Hanseatics was forbidden in 1417, and in the Eastern towns the retail trade of strangers was strictly limited. The whole system was designed to suppress the competition of outsiders, but the divergent interests of individuals and towns, the pressure of competition and changing commercial conditions, in part the reactionary character of the legislation, made enforcement difficult. The measures were those of the late-medieval town economy applied to the wide region of the German Baltic trade, but not supported, as was the analogous mercantilist system, by a strong central government.

Among the factors, economic, geographic, political and social, which combined to bring about the decline of the Hanseatic League, none was probably more influential than the absence of a German political power comparable in unity and energy with those of France and England, which could quell particularism at home, and abroad maintain in its vigour the trade which these towns had developed and defended with their imperfect union. Nothing was to be expected from the declining Empire. Still less was any co-operation possible between the towns and the territorial princes. The fatal result of conflict between town autonomy and territorial power had been taught in Flanders. The Hanseatics regarded the princes with a growing and exaggerated fear and found some relief in the formation in 1418 of a thrice-renewed alliance, known as the "Tohopesate," against princely aggression. But no territorial power had as yet arisen in North Germany capable of subjugating and utilizing the towns, though it could detach the inland towns from the League. The last wars of the League with the Scandinavian powers in the 16th century, which left it shorn of many of its privileges and of any pretension to control of the Baltic basin eliminated it as a factor in the later struggle of the Thirty Years' War for that control. At an assembly of 1629, Lübeck, Bremen and Hamburg were entrusted with the task of safeguarding the general welfare, and after an effort to revive the League in the last general assembly of 1669, these three towns were left alone to preserve the name and small inheritance of the Hansa which in Germany's disunion had upheld the honour of her commerce. Under their protection, the three remaining counters lingered on until their buildings were sold at Bergen in 1775, at London in 1852 and at Antwerp in 1863.

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(E. F. G.)

HANSEN, PETER ANDREAS (1795–1874), Danish astronomer, was born on the 8th of December 1795, at Tondern, in the duchy of Schleswig. The son of a goldsmith, he learned the trade of a watchmaker at Flensburg, and exercised it at Berlin and Tondern, 1818–1820. He had, however, long been a student of science; and Dr Dircks, a physician practising at Tondern, prevailed with his father to send him in 1820 to Copenhagen, where he won the patronage of H. C. Schumacher, and attracted the personal notice of King Frederick VI. The Danish survey was then in progress, and he acted as Schumacher's assistant in work connected with it, chiefly at the new observatory of Altona, 1821–1825. Thence he passed on to Gotha as director of the Seeberg observatory; but could he be tempted to relinquish the post by successive invitations to replace F. G. W. Struve at Dorpat in 1829, and F. W. Bessel at Königsberg in 1847. The problems of gravitational astronomy engaged the chief part of Hansen's attention. A research into the mutual perturbations of Jupiter and Saturn secured for him the prize of the Berlin Academy in 1830, and a memoir on cometary disturbances was crowned by the Paris Academy in 1850. In 1838 he published a revision of the lunar theory, entitled *Fundamenta nova investigationis*, &c., and the improved Tables of the Moon based upon it were printed in 1857, at the expense of the British government, their merit being further recognized by a grant of £1000, and by their immediate adoption in the *Nautical Almanac*, and other Ephemerides. A theoretical discussion of the disturbances embodied in them (still familiarly known to lunar experts as the *Darlegung*) appeared in the *Abhandlungen* of the Saxon Academy of Sciences in 1862–1864. Hansen twice visited England and was twice (in 1842 and 1860) the recipient of the Royal Astronomical Society's gold medal. He communicated to that society in 1847 an able paper on a long-period lunar inequality (*Memoirs Roy. Astr. Society*, xvi. 465), and in 1854 one on the moon's figure, advocating the mistaken hypothesis of its deformation by a huge elevation directed towards the earth (*Ib.* xxiv. 29). He was awarded the Copley medal by the Royal Society in 1850, and his Solar Tables, compiled with the assistance of Christian Olufsen, appeared in 1854. Hansen gave in 1854 the first intimation that the accepted distance of the sun was too great by some millions of miles (*Month. Notices Roy. Astr. Soc.* xv. 9), the error of J. F. Encke's result having been rendered evident through his investigation of a lunar inequality. He died on the 28th of March 1874, at the new observatory in the town of Gotha, erected under his care in 1857.

See *Vierteljahrsschrift astr. Gesellschaft*, x. 133; *Month. Notices Roy. Astr. Society*, xxxv. 168; *Proc. Roy. Society*, xxv. p. v.; R. Wolf, *Geschichte der Astronomie*, p. 526; *Wochenschrift für Astronomie*, xvii. 207 (account of early years by E. Heis); *Allgemeine deutsche Biographie* (C. Bruhns).

(A. M. C.)

HANSI, a town of British India, in the Hissar district of the Punjab, on a branch of the Western Jumna canal, with a station on the Rewari-Ferozepore railway, 16 m. E. of Hissar. Pop. (1901) 16,523. Hansi is one of the most ancient towns in northern India, the former capital of the tract called Hariana. At the end of the 18th century it was the headquarters of the famous Irish adventurer George Thomas; from 1803 to 1857 it was a British cantonment, and it became the scene of a murderous outbreak during the Mutiny. A ruined fort overlooks the town, which is still surrounded by a high brick wall, with bastions and loop holes. It is a centre of local trade, with factories for ginning and pressing cotton.

HANSOM, JOSEPH ALOYSIUS (1803–1882), English architect and inventor, was born in York on the 26th of October 1803. Showing an aptitude for designing and construction, he was taken from his father's joinery shop and apprenticed to an architect in York, and, by 1831, his designs for the Birmingham town hall were accepted and followed—to his financial undoing, as he had become bond for the builders. In 1834 he registered the design of a "Patent Safety Cab," and subsequently sold the patent to a company for £10,000, which, however, owing to the company's financial difficulties, was never paid. The hansom cab as improved by subsequent alterations, nevertheless, took and held the fancy of the public. There was no back seat for the driver in the original design, and there is little beside the suspended axle and large wheels in the modern hansom to recall the early ones. In 1834 Hansom founded the *Builder* newspaper, but was compelled to retire from this enterprise owing to insufficient capital. Between 1854 and 1879 he devoted himself to architecture, designing and erecting a great number of important buildings, private and public, including churches, schools and convents for the Roman Catholic church to which he belonged. Buildings from his designs are scattered all over the United Kingdom, and were even erected in Australia and South America. He died in London on the 29th of June 1882.

HANSON, SIR RICHARD DAVIES (1805–1876), chief justice of South Australia, was born in London on the 6th of December 1805. Admitted a solicitor in 1828, he practised for some time in London. In 1838 he went with Lord Durham to Canada as assistant-commissioner of inquiry into crown lands and immigration. In 1840, on the death of Lord Durham, whose private secretary he had been, he settled in Wellington, New Zealand. He there acted as crown prosecutor, but in 1846 removed to South Australia. In 1851 he was appointed advocate-general of that colony and took an active share in the passing of many important measures, such as the first Education Act, the District Councils Act of 1852, and the Act of 1856 which granted constitutional government to the colony. In 1856 and again from 1857 to 1860 he was attorney-general and leader of the government. In 1861 he was appointed chief justice of the supreme court of South Australia and was knighted in 1869. He died in Australia on the 4th of March 1876.

HANSTEEN, CHRISTOPHER (1784–1873), Norwegian astronomer and physicist, was born at Christiania, on the 26th of September 1784. From the cathedral school he went to the university at Copenhagen, where first law and afterwards mathematics formed his main study. In 1806 he taught mathematics in the gymnasium of Frederiksborg, Zeeland, and in the following year he began the inquiries in terrestrial magnetism with which his name is especially associated. He took in 1812 the prize of the Danish Royal Academy of Sciences for his reply to a question on the magnetic axes. Appointed lecturer in 1814, he was in 1816 raised to the chair of astronomy and applied mathematics in the university of Christiania. In 1819 he published a volume of researches on terrestrial magnetism, which was translated into German by P. T. Hanson, under the title of *Untersuchungen über den Magnetismus der Erde*, with a supplement containing *Beobachtungen der Abweichung und Neigung der Magnetnadel* and an atlas. By the rules there framed for the observation of magnetical phenomena Hansteen hoped to accumulate analyses for determining the number and position of the magnetic poles of the earth. In prosecution of his researches he travelled over Finland and the greater part of his own country; and in 1828–1830 he undertook, in company with G. A. Erman, and with the co-operation of Russia, a government mission to Western Siberia. A narrative of the expedition soon appeared (*Reise-Erinnerungen aus Sibirien*, 1854; *Souvenirs*

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d' un voyage en Sibérie, 1857); but the chief work was not issued till 1863 (*Resultate magnetischer Beobachtungen*, &c.). Shortly after the return of the mission, an observatory was erected in the park of Christiania (1833), and Hansteen was appointed director. On his representation a magnetic observatory was added in 1830. In 1835–1838 he published text-books on geometry and mechanics; and in 1842 he wrote his *Disquisitiones de mutationibus quas patitur momentum actus magneticae*, &c. He also contributed various papers to different scientific journals, especially the *Magazin for Naturvidenskaberne*, of which he became joint-editor in 1823. He superintended the trigonometrical and topographical survey of Norway, begun in 1837. In 1861 he retired from active work, but still pursued his studies, his *Observations de l'inclination magnétique* and *Sur les variations séculaires du magnétisme* appearing in 1865. He died at Christiania on the 11th of April 1873.

HANTHAWADDY, a district in the Pegu division of Lower Burma, the home district of Rangoon, from which the town was detached to make a separate district in 1880. It has an area of 3023 sq. m., with a population in 1901 of 284,811, showing an increase of 22% in the decade. Hanthawaddy and Henzada are the two most densely populated districts in the province. It consists of a vast plain stretching up from the sea between the To or China Bakir mouth of the Irrawaddy and the Pegu Yomas. Except the tract lying between the Pegu Yomas on the east and the Hlaing river, the country is intersected by numerous tidal creeks, many navigable by large boats and some by steamers. The headquarters of the district are in Rangoon, which is also the sub-divisional headquarters. The second sub-division has its headquarters at Insein, where there are large railway works. Cultivation is almost wholly confined to rice, but there are many vegetable and fruit gardens.

HANUKKAH, a Jewish festival, the "Feast of Dedication" (cf. John x. 22) or the "Feast of the Maccabees," beginning on the 25th day of the ninth month *Kisley* (December), of the Hebrew ecclesiastical year, and lasting eight days. It was instituted in 165 B.C. in commemoration of, and thanksgiving for, the purification of the temple at Jerusalem on this day by Judas Maccabaeus after its pollution by Antiochus Epiphanes, king of Syria, who in 168 B.C. set up a pagan altar to Zeus Olympius. The Talmudic sources say that when the perpetual lamp of the temple was to be relighted only one flask of holy oil sufficient for the day remained, but this miraculously lasted for the eight days (cf. the legend in 2 Macc. i. 18). In memory of this the Jews burn both in synagogues and in houses on the first night of the festival one light, on the second two, and so on to the end (so the Hillelites), or vice versa eight lights on the first, and one less on each succeeding night (so the Shammaites). From the prominence of the lights the festival is also known as the "Festival of Lights" or "Illumination" (*Talmud*). It is said that the day chosen by Judas for the setting up of the new altar was the anniversary of that on which Antiochus had set up the pagan altar; hence it is suggested (*e.g.* by Wellhausen) that the 25th of Kisley was an old pagan festival, perhaps the day of the winter solstice.

For further details and illustrations of Hanukkah lamps see *Jewish Encyc.*, s.v.

HANUMAN, in Hindu mythology, a monkey-god, who forms a central figure in the *Ramayana*. He was the child of a nymph by the god of the wind. His exploits, as the ally of Rama (incarnation of Vishnu) in the latter's recovery of his wife Sita from the clutches of the demon Ravana, include the bridging of the straits between India and Ceylon with huge boulders carried away from the Himalayas. He is the leader of a host of monkeys who aid in these supernatural deeds. Temples in his honour are frequent throughout India.

HANWAY, JONAS (1712–1786), English traveller and philanthropist, was born at Portsmouth in 1712. While still a child, his father, a victualler, died, and the family moved to London. In 1720 Jonas was apprenticed to a merchant in Lisbon. In 1743, after he had been some time in business for himself in London, he became a partner with Mr Dingley, a merchant in St Petersburg, and in this way was led to travel in Russia and Persia. Leaving St Petersburg on the 10th of September 1743, and passing south by Moscow, Tsaritsyn and Astrakhan, he embarked on the Caspian on the 22nd of November, and arrived at Astrabad on the 18th of December. Here his goods were seized by Mohammed Hassan Beg, and it was only after great privations that he reached the camp of Nadir Shah, under whose protection he recovered most (85%) of his property. His return journey was embarrassed by sickness (at Resht), by attacks from pirates, and by six weeks' quarantine; and he only reappeared at St Petersburg on the 1st of January 1745. He again left the Russian capital on the 9th of July 1750 and travelled through Germany and Holland to England (28th of October). The rest of his life was mostly spent in London, where the narrative of his travels (published in 1753) soon made him a man of note, and where he devoted himself to philanthropy and good citizenship. In 1756 he founded the Marine Society, to keep up the supply of British seamen; in 1758 he became a governor of the Foundling, and established the Magdalen, hospital; in 1761 he procured a better system of parochial birth-registration in London; and in 1762 he was appointed a commissioner for victualling the navy (10th of July); this office he held till October 1783. He died, unmarried, on the 5th of September 1786. He was the first Londoner, it is said, to carry an umbrella, and he lived to triumph over all the hackney coachmen who tried to hoot and hustle him down. He attacked "vail-giving," or tipping, with some temporary success; by his onslaught upon tea-drinking he became involved in controversy with Johnson and Goldsmith. His last efforts were on behalf of little chimney-sweeps. His advocacy of solitary confinement for prisoners and opposition to Jewish naturalization were more questionable instances of his activity in social matters.

Hanway left seventy-four printed works, mostly pamphlets; the only one of literary importance is the "*Historical Account of British Trade over the Caspian Sea, with a Journal of Travels*, &c. (London, 1753). On his life, see also Pugh, *Remarkable Occurrences in the Life of Jonas Hanway* (London, 1787); *Gentleman's Magazine*, vol. xxxii. p. 342; vol. lvi. pt. ii. pp. 812–813, 1090, 1143–1144; vol. lxv. pt. ii. pp. 721–722, 834–835; *Notes and Queries*, 1st series, i. 436, ii. 25; 3rd series, vii. 311; 4th series, viii. 416.

HANWELL, an urban district in the Brentford parliamentary division of Middlesex, England, 10½ m. W. of St Paul's cathedral, London, on the river Brent and the Great Western railway. Pop. (1891) 6130; (1901) 10,438. It ranks as an outer residential suburb of London. The Hanwell lunatic asylum of the county of London has been greatly extended since its erection 1831, and can accommodate over 2500 inmates. The extensive cemeteries of St Mary Abbots, Kensington, and St George, Hanover Square, London, are here. In the churchyard of St Mary's church was buried Jonas Hanway (d. 1786), traveller, philanthropist, and by repute, introducer of the umbrella into England. The Roman Catholic Convalescent Home for women and children was erected in 1865. Before the Norman period the manor of Hanwell belonged to Westminster Abbey.

HAPARANDA (Finnish *Haaparanta*, "Aspen Shore"), a town of Sweden in the district (*län*) of Norbotten, at the head of the Gulf of Bothnia. Pop. (1900) 1568. It lies about 1¼ m. from the mouth of the Torne river, on the frontier with Russia (Finland), opposite the town of Torneå which has belonged to Russia since 1809. The towns are divided by a marshy channel, formerly the bed of the Torne, but the main stream is now east of the Russian town. Haparanda was founded in 1812, and at first bore the name of Karljohannstad. It received its municipal constitution in 1842. Shipbuilding is prosecuted. Sea-going vessels load and unload at Salmio, 7 m. from Haparanda. Since 1850 the town has been the seat of an important meteorological station. Annual mean temperature, 32·4° Fahr.; February 10·5°; July 58·8°. Rainfall, 16·5 in. annually. Up the Torne valley (54 m.) is the hill Avasaxa, whither pilgrimages were formerly made in order to stand in the light of the sun at midnight on St John's day (June 24).

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HAPLODRILI (so called by Lankester), often called Archiannelida (Hatschek), the name provisionally given to a number of

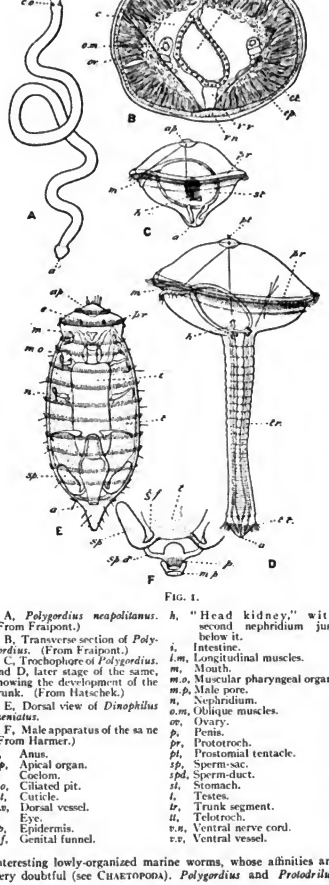

FIG. 1.

A, *Polygordius neapolitanus*. (From Fraipont.)
B, Transverse section of *Polygordius*. (From Fraipont.)
C, Trochophore of *Polygordius*, and D, later stage of the same, showing the development of the trunk. (From Hatschek.)
E, Dorsal view of *Dinophilus taeniatus*.
F, Male apparatus of the same. (From Harmer.)

a, Anus.
ap, Apical organ.
c, Coelom.
c.o, Ciliated pit.
cu, Cuticle.
d.v, Dorsal vessel.
e, Eye.
ep, Epidermis.
g.f, Genital funnel.
h, "Head kidney," with second nephridium just below it.
i, Intestine.
l.m, Longitudinal muscles.
m, Mouth.
m.o, Muscular pharyngeal organ.
m.p, Male pore.
n, Nephridium.
o.m, Oblique muscles.
ov, Ovary.
p, Penis.
pr, Prototroch.
pt, Prostomial tentacle.
sp, Sperm-sac.
spd, Sperm-duct.
st, Stomach.
t, Testes.
tr, Trunk segment.
tl, Telotroch.
v.n, Ventral nerve cord.
v.v, Ventral vessel.

interesting lowly-organized marine worms, whose affinities are very doubtful (see CHAETOPODA). *Polygordius* and *Protodrilus* live in sand, but while the former moves by means of the contraction of its body-wall muscles, *Protodrilus* can progress by the action of the bands of cilia surrounding its segments, and of the longitudinal ciliated ventral groove. *Saccocirrus*, which also lives in sand, and more closely resembles the Polychaeta, has throughout the greater length of its body on each segment a pair of small uniramous parapodia bearing a bunch of simple setae. No other member of the group is known to have any trace of setae or parapodia at any stage of development.

These three genera have the following characters in common. The body is composed of a large number of segments; the prostomium bears a pair of tentacles; the nervous system consists of a brain and longitudinal ventral nerve cords closely connected with the epidermis (without distinct ganglia), widely separated in *Saccocirrus*, closely approximated in *Protodrilus*, fused together in *Polygordius*; the coelom is well developed, the septa are distinct, and the dorsal and ventral longitudinal mesenteries are complete; the nephridia are simple, and open into the coelom. *Polygordius* differs from *Protodrilus* and *Saccocirrus* in the absence of a distinct suboesophageal muscular pouch, and in the absence of a peculiar closed cavity in the head region, which is especially well developed in *Saccocirrus*, and probably represents the specialized coelom of the first segment. Moreover, in *Saccocirrus* the genital organs,

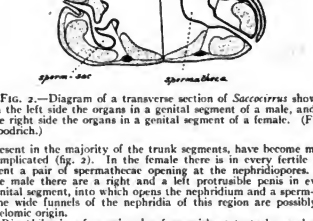

FIG. 2.—Diagram of a transverse section of *Saccocirrus* showing on the left side the organs in a genital segment of a male, and on the right side the organs in a genital segment of a female. (From Goodrich.)

present in the majority of the trunk segments, have become much complicated (fig. 2). In the female there is in every fertile segment a pair of spermathecae opening at the nephridiopores. In the male there are a right and a left protrusible penis in every genital segment, into which opens the nephridium and a sperm-sac. The wide funnels of the nephridia of this region are possibly of coelomic origin.

Dinophilus is a free-swimming form without tentacles, and with segmental bands of cilia (fig. 1). The parasitic *Histriodrilus* (Histriobdella) feeds on the eggs of the lobster. It resembles *Dinophilus* in the possession of a ventral pharyngeal pouch (which bears teeth in *Histriodrilus* only), the small number of segments, and absence of distinct septa, the absence of a vascular system, the presence of distinct ganglia on the ventral nerve cords, and of small nephridia which do not appear to open internally. *Histriodrilus* resembles *Saccocirrus* in the possession of two posterior adhesive processes, and to some extent in the structure of the complex genital organs, which, however, are restricted to a single segment. In *Dinophilus*, there is also only a single pair of genital ducts behind; and in the male there are sperm-sacs and a median penis. In some species of *Dinophilus* there is pronounced sexual dimorphism (the male being small and without gut) as in the Rotifera. The resemblance of *Dinophilus* to the Rotifera is, however, quite superficial, and the general structure of this genus with distinct traces of segmentation, especially in the embryo, points to its close affinity, if not to *Polygordius* in particular, at all events to the Annelida.

That *Polygordius*, *Protodrilus* and *Saccocirrus* are on the whole primitive forms, and related to each other, there can be little doubt, but their place amongst the Annelida is difficult to determine. The development of *Polygordius* alone is well known, having been studied by Hatschek, Fraipont and others. The larva (fig. 1, C and D) is a typical but very specialized form of trochophore, provided with a branching nephridium bearing solenocytes. The trunk develops on the lower surface of the disk-like larva, which undergoes a more or less sudden metamorphosis into the young worm (fig. 1). There appears to be little either in the development or in the structure of the Haplodrili to warrant the view held by Hatschek and Fraipont that *Polygordius* and *Protodrilus* are exceedingly primitive forms, ancestral to the whole group of seta-bearing Annelids (Oligochaeta, Polychaeta, Hirudinea and Echiuroidea).

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Whatever may be the conclusion as to the position of *Dinophilus* and *Histriodrilus*, it seems only reasonable to suppose that *Polygordius* and *Protodrilus*, so far from representing a stage in the phylogeny of the Annelida before setae were developed, have lost the setae, which are already in a reduced state in *Saccocirrus*.

AUTHORITIES.—Hatschek, "Studien z. Entw. der Anneliden," *Arb. Zool. Inst. Wien*, vol. i., 1878; "Protodrilus," *ibid.* vol. iii, (1881); Fraipont, "Le Genre Polygordius," *Fauna u. Flora d. Golfes v. Neapel.*, xiv., 1887; Weldon, "Dinophilus gigas," *Quart. Journ. Micr. Sci.* vol. xxvii., 1886; Harmer, "Dinophilus," *Journ. Mar. Biol.* N.S. vol. i., 1889; Schimkewitsch, "Entwickl. des *Dinophilus*," *Zeit. f. wiss. Zool.* vol. lix., 1895; Korschelt, "Uber Bau u. Entw. des *Dinophilus*," *Zeit. f. wiss. Zool.* vol. xxxvii., 1882; Foettinger, "Histriobdella," *Arch. Biol.* vol. v., 1884; Goodrich, "On Saccocirrus," *Quart. Journ. Micr. Sci.* vol. xliv., 1901. (E. S. G.)

HAPTARA (lit. *conclusion*), the Hebrew title given to the prophetic lessons with which the ancient Synagogue service concluded. In the time of Christ these prophetic lessons were already in vogue, and Christ himself read the lessons and discoursed on them in the synagogues of Galilee. In the modern synagogue these readings from the prophets are regularly included in the ritual of Sabbaths, festivals and some other occasions.

A list of the current lessons is given in the *Jewish Encyclopedia*, vol. vi. pp. 136-137.

HAPUR, a town of British India in the Meerut district of the United Provinces, 18 m. S. of Meerut. Pop. (1901) 17,796. It is said to have been founded in the 10th century, and was granted by Sindhia to his French general Perron at the end of the 18th century. Several fine groves surround the town, but the wall and ditch have fallen out of repair, and only the names of the five gates remain. Considerable trade is carried on in sugar, grain, cotton, timber, bamboos and brass utensils.

HARA-KIRI (Japanese *hara*, belly, and *kiri*, cutting), self-disembowelment, primarily the method of suicide permitted to offenders of the noble class in feudal Japan, and later the national form of honourable suicide. Hara-kiri has been often translated as "the happy dispatch" in confusion with a native euphemism for the act. More usually the Japanese themselves speak of hara-kiri by its Chinese synonym, *Seppuku*. Hara-kiri is not an aboriginal Japanese custom. It was a growth of medieval militarism, the act probably at first being prompted by the desire of the noble to escape the humiliation of falling into an enemy's hands. By the end of the 14th century the custom had become a much valued privilege, being formally established as such under the Ashi-Kaga dynasty. Hara-kiri was of two kinds, obligatory and voluntary. The first is the more ancient. An official or noble, who had broken the law or been disloyal, received a message from the emperor, couched always in sympathetic and gracious tones, courteously intimating that he must die. The mikado usually sent a jewelled dagger with which the deed might be done. The suicide had so many days allotted to him by immemorial custom in which to make dignified preparations for the ceremony, which was attended by the utmost formality. In his own baronial hall or in a temple a dais 3 or 4 in. from the ground was constructed. Upon this was laid a rug of red felt. The suicide, clothed in his ceremonial dress as an hereditary noble, and accompanied by his second or "Kaishaku," took his place on the mat, the officials and his friends ranging themselves in a semicircle round the dais. After a minute's prayer the weapon was handed to him with many obeisances by the mikado's representative, and he then made a public confession of his fault. He then stripped to the waist. Every movement in the grim ceremony was governed by precedent, and he had to tuck his wide sleeves under his knees to prevent himself falling backwards, for a Japanese noble must die falling forward. A moment later he plunged the dagger into his stomach below the waist on the left side, drew it across to the right and, turning it, gave a slight cut upward. At the same moment the Kaishaku who crouched at his friend's side, leaping up, brought his sword down on the outstretched neck. At the conclusion of the ceremony the bloodstained dagger was taken to the mikado as a proof of the consummation of the heroic act. The performance of hara-kiri carried with it certain privileges. If it was by order of the mikado half only of a traitor's property was forfeited to the state. If the gnawings of conscience drove the disloyal noble to voluntary suicide, his dishonour was wiped out, and his family inherited all his fortune.

Voluntary hara-kiri was the refuge of men rendered desperate by private misfortunes, or was committed from loyalty to a dead superior, or as a protest against what was deemed a false national policy. This voluntary suicide still survives, a characteristic case being that of Lieutenant Takeyoshi who in 1891 gave himself the "belly-cut" in front of the graves of his ancestors at Tōkyo as a protest against what he considered the criminal lethargy of the government in not taking precautions against possible Russian encroachments to the north of Japan. In the Russo-Japanese War, when faced by defeat at Vladivostock, the officer in command of the troops on the transport "Kinshu Maru" committed hara-kiri. Hara-kiri has not been uncommon among women, but in their case the mode is by cutting the throat. The popularity of this self-immolation is testified to by the fact that for centuries no fewer than 1500 hara-kiris are said to have taken place annually, at least half being entirely voluntary. Stories of amazing heroism are told in connexion with the performance of the act. One noble, barely out of his teens, not content with giving himself the customary cuts, slashed himself thrice horizontally and twice vertically. Then he stabbed himself in the throat until the dirk protruded on the other side with the sharp edge to the front, and with a supreme effort drove the knife forward with both hands through his neck. Obligatory hara-kiri was obsolete in the middle of the 19th century, and was actually abolished in 1868.

See A. B. Mitford, *Tales of Old Japan*; Basil Hall Chamberlain, *Things Japanese* (1898).

HARALD, the name of four kings of Norway.

HARALD I. (850–933), surnamed Haarfager (of the beautiful hair), first king over Norway, succeeded on the death of his father Halfdan the Black in A.D. 860 to the sovereignty of several small and somewhat scattered kingdoms, which had come into his father's hands through conquest and inheritance and lay chiefly in south-east Norway (see NORWAY). The tale goes that the scorn of the daughter of a neighbouring king induced Harald to take a vow not to cut nor comb his hair until he was sole king of Norway, and that ten years later he was justified in trimming it; whereupon he exchanged the epithet "Shockhead" for the one by which he is usually known. In 866 he made the first of a series of conquests over the many petty kingdoms which then composed Norway; and in 872, after a great victory at Hafrsfjord near Stavanger, he found himself king over the whole country. His realm was, however, threatened by dangers from without, as large numbers of his opponents had taken refuge, not only in Iceland, then recently discovered, but also in the Orkneys, Shetlands, Hebrides and Faeroes, and in Scotland itself; and from these winter quarters sallied forth to harry Norway as well as the rest of northern Europe. Their numbers were increased by malcontents from Norway, who resented Harald's claim of rights of taxation over lands which the possessors appear to have previously held in absolute ownership. At last Harald was forced to make an expedition to the west to clear the islands and Scottish mainland of Vikings. Numbers of them fled to Iceland, which grew into an independent commonwealth, while the Scottish isles fell under Norwegian rule. The latter part of Harald's reign was disturbed by the strife of his many sons. He gave them all the royal title and assigned lands to them which they were to govern as his representatives; but this arrangement did not put an end to the discord, which continued into the next reign. When he grew old he handed over the supreme power to his favourite son Erik "Bloody Axe," whom he intended to be his successor. Harald died in 933, in his eighty-fourth year.

HARALD II., surnamed Graafeld, a grandson of Harald I., became, with his brothers, ruler of the western part of Norway in 961; he was murdered in Denmark in 969.

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HARALD III. (1015–1066), king of Norway, surnamed Haar-draade, which might be translated "ruthless," was the son of King Sigurd and half-brother of King Olaf the Saint. At the age of fifteen he was obliged to flee from Norway, having taken part in the battle of Stiklestad (1030), at which King Olaf met his death. He took refuge for a short time with Prince Yaroslav of Novgorod (a kingdom founded by Scandinavians), and thence went to Constantinople, where he took service under the empress Zoe, whose Varangian guard he led to frequent victory in Italy, Sicily and North Africa, also penetrating to Jerusalem. In the year 1042 he left Constantinople, the story says because he was refused the hand of a princess, and on his way back to his own country he married Ellisif or Elizabeth, daughter of Yaroslav of Novgorod. In Sweden he allied himself with the defeated Sven of Denmark against his nephew Magnus, now king of Norway, but soon broke faith with Sven and accepted an offer from Magnus of half his kingdom. In return for this gift Harald is said to have shared with Magnus the enormous treasure which he had amassed in the East. The death of Magnus in 1047 put an end to the growing jealousies between the two kings, and Harald turned all his attention to the task of subjugating Denmark, which he ravaged year after year; but he met with such stubborn resistance from Sven that in 1064 he gave up the attempt and made peace. Two years afterwards, possibly instigated by the banished Earl Tostig of Northumbria, he attempted the conquest of England, to the sovereignty of which his predecessor had advanced a claim as successor of Harthacnut. In September 1066 he landed in Yorkshire with a large army, reinforced from Scotland, Ireland and the Orkneys; took Scarborough by casting flaming brands into the town from the high ground above it; defeated the Northumbrian forces at Fulford; and entered York on the 24th of September. But the following day the English Harold arrived from the south, and the end of the long day's fight at Stamford Bridge saw the rout of the Norwegian forces after the fall of their king (25th of September 1066). He was only fifty years old, but he was the first of the six kings who had ruled Norway since the death of Harald Haarfager to reach that age. As a king he was unpopular on account of his harshness and want of good faith, but his many victories in the face of great odds prove him to have been a remarkable general, of never-failing resourcefulness and indomitable courage.

HARALD IV. (d. 1136), king of Norway, surnamed Gylle (probably from *Gylle Krist, i.e.* servant of Christ), was born in Ireland about 1103. About 1127 he went to Norway and declared he was a son of King Magnus III. (Barefoot), who had visited Ireland just before his death in 1103, and consequently a half-brother of the reigning king, Sigurd. He appears to have submitted successfully to the ordeal of fire, and the alleged relationship was acknowledged by Sigurd on condition that Harald did not claim any share in the government of the kingdom during his lifetime or that of his son Magnus. Living on friendly terms with the king, Harald kept this agreement until Sigurd's death in 1130. Then war broke out between himself and Magnus, and after several battles the latter was captured in 1134, his eyes were put out, and he was thrown into prison. Harald now ruled the country until 1136, when he was murdered by Sigurd Slembi-Diakn, another bastard son of Magnus Barefoot. Four of Harald's sons, Sigurd, Ingi, Eysteinn and Magnus, were subsequently kings of Norway.

HARBIN, or KHARBIN, town of Manchuria, on the right bank of the river Sungari. Pop. about 20,000. Till 1896 there was only a small village here, but in that year the town was founded in connexion with surveys for the Chinese Eastern railway company, at a point which subsequently became the junction of the main line of the Manchurian railway with the branch line southward to Port Arthur. Occupying such a position, Harbin became an important Russian military centre during the Russo-Japanese War. The portion of the town founded in 1896 is called Old Harbin, but the centre has shifted to New Harbin, where the chief public buildings and offices of the railway administration are situated. The river-port forms a third division of the town, industrially the most important; here are railway workshops, factories and mercantile establishments. Trade is chiefly in the hands of the Chinese.

HARBINGER, originally one who provides a shelter or lodging for an army. The word is derived from the M.E. and O.Fr. *herbergere*, through the Late Lat. *heribergator*, formed from the O.H.Ger. *heri*, mod. Ger. *Heer*, an army, and *bergen*, shelter or defence, cf. "harbour." The meaning was soon enlarged to include any place where travellers could be lodged or entertained, and also by transference the person who provided lodgings, and so one who goes on before a party to secure suitable lodgings in advance. A herald sent forward to announce the coming of a king. A Knight Harbinger was an officer in the royal household till 1846. In these senses the word is now obsolete. It is used chiefly in poetry and literature for one who announces the immediate approach of something, a forerunner. This is illustrated in the "harbinger of spring," a name given to a small plant belonging to the Umbelliferae, which has a tuberous root, and small white flowers; it is found in the central states of North America, and blossoms in March.

HARBOUR (from M.E. *hereberge*, *here*, an army; cf. Ger. *Heer* and *-beorg*, protection or shelter. Other early forms in English were *herberwe* and *harborow*, as seen in various place names, such as Market Harborough. The French *auberge*, an inn, derived through *heberger*, is thus the same word), a place of refuge or shelter. It is thus used for an asylum for criminals, and particularly for a place of shelter for ships.

Sheltered sites along exposed sea-coasts are essential for purposes of trade, and very valuable as refuges for vessels from storms. In a few places, natural shelter is found in combination with ample depth, as in the Bay of Rio de Janeiro, New York Harbour (protected by Long Island), Portsmouth Harbour and Southampton Water (sheltered by the Isle of Wight), and the land-locked creeks of Milford Haven and Kiel Harbour. At various places there are large enclosed areas which have openings into the sea; but these lagoons for the most part are very shallow except in the main channels and at their outlets. Access to them is generally obstructed by a bar as at the lagoon harbour of Venice (fig. 1), and similar harbours, like those of Poole and Wexford; and such harbours usually require works to prevent their deterioration, and to increase the depth near their outlet. Generally, however, harbours are formed where shelter is provided to a certain extent by a bay, creek or projecting headland, but requires to be rendered complete by one or more breakwaters (see BREAKWATER), or where the approach to a river, a ship-canal or a seaport, needs protection. A refuge harbour is occasionally constructed where a long length of stormy coast, near the ordinary track of vessels, is entirely devoid of natural shelter. Naval harbours are required by maritime powers as stations for their fleets, and dockyards for construction and repairs, and also in some cases as places of shelter from the night attacks of torpedoes. Commercial harbours have to be provided for the formation of ports within their shelter on important trade routes, or for the protection of the approaches from the sea of ports near the sea-coast, or maritime waterways running inland, in some cases at points on the coast devoid of all natural shelter. A greater latitude in the selection of suitable sites is, indeed, possible for refuge and naval harbours than for commercial harbours; but these three classes of harbours are very similar in their general outline and the works protecting them, only differing in size and internal arrangements according to the purpose for which they have been constructed, the chief differences being due to the local conditions.

Harbours may be divided into three distinct groups, namely, lagoon harbours, jetty harbours and sea-coast harbours, protected by breakwaters, including refuge, naval and commercial harbours.

Lagoon Harbours.—A lagoon, consisting of a sort of large shallow lake separated from the sea by a narrow belt of coast, formed of deposit from a deltaic river or of sand dunes heaped up by on-shore winds along a sandy shore, possesses good natural shelter; and, owing to the large expanse which is filled and emptied at each tide, even when the tidal range is quite small, together with the discharge

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from any rivers flowing into the lagoon, one or more fairly deep outlets are maintained through the fringe of coast, which afford navigable access to the lagoon; whilst channels formed inside by

FIG. 1.—Venetian Lagoon Harbour.

the currents lead to ports on its banks. Lagoons, however, are liable to be gradually silted up, if rivers flowing into them bring down considerable quantities of alluvium, which is readily deposited in their fairly still waters; and their outlet channels are in danger of becoming shallower, by the sea in storms forming additional outlets by breaking through the narrow barrier separating them from the sea. Moreover, the approach from the sea to these channels through the fringe of coast is generally impeded by a bar, owing to the scour of the issuing current through these outlet channels becoming gradually too enfeebled, on entering the open sea, to overcome the heaping-up action of the waves along the shore, which tends to form a continuous beach across these openings. Rivers, accordingly, whose discharge is very valuable in maintaining a lagoon if their waters are free from silt, must, if possible, be diverted from a lagoon if they bring down large amounts of silt; whilst the narrow belt of land in front of the lagoon must be protected from erosion by the waves, on its sea face, by groynes or revetments. The depth over the bar in front of an outlet can be improved by concentrating the current through the outlet by jetties on each side, and prolonging the jetties, and consequently the scour, out to the bar so as to lower it, and by supplementing the scouring action, if necessary, by dredging.

Jetty Harbours.—Several small ports were formed on the sea-coast long ago at points where flat marshy ground lying below the level of high-water, and shut off from the sandy beach by dikes or sand dunes, was connected with the sea by a small creek or river. Such ports presented in their original condition a slight resemblance to lagoons on a very small scale. Several examples are to be found on the sandy shores of the English Channel and North Sea, such as Dieppe, Boulogne, Calais, Dunkirk, Newport and Ostend, where the influx and efflux of the water from these enclosed tide-covered areas, through a narrow opening, sufficed to maintain a shallow channel to the sea across the beach, deep enough near high-water for vessels of small draught. When the increase in draught necessitated the provision of an improved channel, the scour of the issuing current was concentrated and prolonged by erecting parallel jetties across the beach, raised solid to a little above low water of neap tides, with open timber-work above to indicate the channel and guide the vessels. Even this low obstruction, however, to the littoral drift of sand caused an advance of the low water line as the jetties were carried out, so that further extensions of the jetties had eventually to be abandoned, as occurred at Dunkirk (see DOCK). Moreover, reclamation of the low-lying areas was gradually effected, thus reducing the tidal scour; and sluicing basins were excavated in part of the low ground, into which the tide flowed through the entrance channel, and the water being shut in at high tide by gates at the outlet of the basin, was released at low water, producing a rapid current through the channel as a compensation for the loss of the former natural scour. The current, however, from the sluicing basin gradually lost its velocity in passing down the channel, and besides, being most effective near the outlet of the basin, could in this way scour the channel down to a moderate depth below low water, on account of the increase in the volume of still water in the channel at low tide as its deepening progressed. Lastly, about 1880, improvements in suction dredgers (see DREDGE AND DREDGING) led to the adoption of sand-pump dredging in the outer part of the channel, and across the foreshore in front to deep water; and at Dunkirk, docks were formed on the site of the sluicing basin; whilst at Calais sluicing was abandoned in favour of dredging. Ostend is the only jetty harbour in which a large sluicing basin has been recently constructed, but it can only provide for the maintenance of deep-water quays in its vicinity; and dredging is relied upon to an increasing extent, both for the maintenance and further deepening of the outer portion of the approach channel, and for maintaining the direct channel dredged to deep water across the Stroombank extending in front of Ostend (fig. 2).

Similar methods of improving the entrance channel to ports possessing an extensive backwater have been adopted on a large scale in the United States. For instance at Charleston, converging jetties, about 2¼ m. long, have been extended across the bar to concentrate the scour due to a small tidal range expanding over the enclosed backwater, 15 sq. m. in extent, and to protect the channel from littoral drift; but these jetties have caused an advance of the foreshore, and a progression seawards of the bar, necessitating dredging beyond the ends of the jetties to maintain the requisite depth.

Parallel jetties, moreover, across the beach, combined with extensive sand-pump dredging, have been employed with success at some of the ports situated at the outlet of rivers, enclosed bays, or lagoons, on the sandy shores of

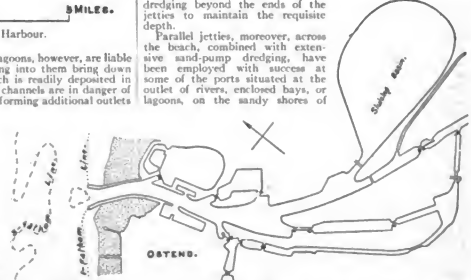

FIG. 2.—Ostend Harbour and Jetty Channel.

south-east Africa, for improving the access to them across encumbering shoals, where the littoral drift is too great to allow of the projection of breakwaters from the shore to shelter an approach channel.

Harbours Protected by Breakwaters.—The design for a harbour on

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the sea-coast must depend on the configuration of the adjacent coast-line, the extent and direction of the exposure, the amount of sheltered area required and the depth obtainable, the prospect of the accumulation of drift or the occurrence of scour from the proposed works, and the best position for an entrance in respect of shelter and depth of approach.

Completion of Shelter of Harbours in Bays.—In the case of a deep, fairly landlocked bay, a detached breakwater across the outlet completes the necessary shelter, leaving an entrance between each extremity and the shore, provided there is deep enough water near the shore, as effected at Plymouth harbour, and also across the wider but shallower bay forming Cherbourg harbour. A breakwater may a slight curve or bend inwards near its outer end, suffices to afford the necessary shelter. As examples of this form of harbour construction may be mentioned Newhaven breakwater, protecting the approach to the port from the west, and somewhat sheltered from the moderate easterly storms by Beachy Head, and Table Bay breakwater, which shelters the harbour from the north-east, and is somewhat protected on the opposite side by the wide sweep of the coast-line known as Table Bay. Generally, however, some partial embayment, or abrupt projection from the coast, is utilized as providing shelter from one quarter, which is completed by breakwaters enclosing the site, of which Dover and Colombo (fig. 5) harbours furnish typical and somewhat similar examples.

FIG. 3.—Genoa Harbour and Extensions.

Harbours formed on quite Open Seacoasts.—Occasionally harbours have to be constructed for some special purpose where no natural shelter exists, and where on an open, sandy shore considerable littoral drift may occur. Breakwaters, carried out from the shore at some distance apart, and converging to a central entrance of suitable width, provide the requisite shelter, as for instance the harbour constructed to form a sheltered approach to the river Wear and the Sunderland docks (fig. 6). If there is little littoral drift from the most exposed quarter, the amount of sand brought in during storms, which is smaller in proportion to the depth into which the entrance is carried, can be readily removed by dredging; whilst the scour across the projecting ends of the breakwaters tends to keep the outlet free from deposit. Where there is littoral drift in both directions on an open, sandy coast, due to winds blowing alternately from opposite quarters, sand accumulates in the sheltered angles outside the harbour between each converging breakwater and the shore. This has happened at Ymuiden harbour at the entrance to the Amsterdam ship-canal on the North Sea, but there the advance of the shore appears to have reached its limit only a short distance out from the old shore-line on each side; and the only evidence of drift consists in the advance seawards of the lines of soundings alongside, and in the considerable amount of sand which enters the harbour and has to be removed by dredging. The worst results occur where the littoral drift is almost wholly in one direction, so that the projection of a solid breakwater out from the shore causes a very large accretion on the side facing the exposed quarter; whilst, owing to the arrest of the travel of sand, erosion of the beach occurs beyond the second breakwater enclosing the harbour on its comparatively sheltered side. These effects have been produced at Port Said harbour at the entrance to the Suez Canal from the Mediterranean, formed by two converging breakwaters, where, owing to the prevalent north-westerly winds, the drift is from west to east, and is augmented by the alluvium issuing from the Nile. Accordingly, the shore has advanced considerably against the outer face of the western breakwater; and erosion of the beach has occurred at the shore end of the eastern breakwater, cutting it off from the land.

instead be extended across the outlet from each shore, leaving a single central entrance between the ends of the breakwaters; and if one breakwater placed somewhat farther out is made to overlap an inner one, a more sheltered entrance is obtained. This arrangement has been adopted at the existing Genoa harbour within the bay (fig. 3), and for the harbour at the mouth of the Nervion (see RIVER ENGINEERING). The adoption of a bay will deep water for a harbour does not merely reduce the shelter to be provided artificially, but it also secures a site not exposed to silting up, and where the sheltering works do not interfere with any littoral drift along the open coast. A third method of sheltering a deep bay is that

FIG. 4.—Peterhead Harbour of Refuge.

adopted for forming a refuge harbour at Peterhead (fig. 4), where a single breakwater is extended out from one shore for 3250 ft. across the outlet of the bay, leaving a single entrance between its extremity and the opposite shore and enclosing an area of about 250 acres at low tide, half of which has a depth of over 5 fathoms.

Harbours possessing partial Natural Shelter.—The most common form of harbour is that in which one or more breakwaters supplement a certain amount of natural shelter. Sometimes, where the exposure is from one direction only, approximately parallel with the coast-line at the site, and there is more or less shelter from a projecting headland or a curve of the coast in the opposite direction, a single breakwater extending out at right angles to the shore, with

FIG. 5.—Colombo Harbour.

The advance of the shore-line, however, has been much slower during recent years; and though the progress seawards of the lines of soundings close to and in front of the harbour continues, the advance is checked by the sand and silt coming from the west passing through some apertures purposely left in the western breakwater, and falling into the approach channel, from which it is readily dredged and taken away. Madras harbour, begun in 1875, consists of two breakwaters, 3000 ft. apart, carried straight out to sea at right angles to the shore for 3000 ft., and completed by two return

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arms inclined slightly seawards, enclosing an area of 220 acres and leaving a central entrance, 550 ft. wide, facing the Indian Ocean in a depth of about 8 fathoms. The great drift, however, of sand along the coast from south to north soon produced an advance of the shore against the outside of the south breakwater, and erosion beyond the north breakwater; and the progression of the foreshore has extended so far seawards as to produce shoaling at the entrance. Accordingly, the closing of the entrance, and the formation of a new entrance through the outer part of the main north breakwater, facing north and sheltered by an arm starting from the angle of the northern breakwater arm and running north parallel to the shore, round the end of which vessels would turn to enter, have been recommended, to provide a deep entrance beyond the influence of the advancing foreshore.

FIG. 6.—Sunderland Harbour.

Proposals have been made from time to time to evade this advance of the foreshore against a solid obstacle, by extending an open viaduct across the zone of littoral drift, and forming a closed harbour, or a sheltering breakwater against which vessels can lie, beyond the influence of accretion. This principle was carried out on a large scale at the port of call and shelter in front of the entrance to the Bruges ship-canal, at Zeebrugge on the sandy North Sea coast, where a solid breakwater, provided with a wide quay furnished with sidings and sheds, and curving round so as to overlap thoroughly the entrance to the canal and shelter a certain water-area, is approached by an open metal viaduct extending out 1007 ft. from low water into a depth of 20 ft. (fig. 7). It is hoped that by thus avoiding interference with the littoral drift close to the shore, coming mainly from the west, the accumulation of silt to the west of the harbour, and also in the harbour itself, will be prevented; and though it appears probable that some accretion will occur within the area sheltered by the breakwater, it will to some extent be disturbed by the wash of the steamers approaching and leaving the quays, and can readily be removed under shelter by dredging.

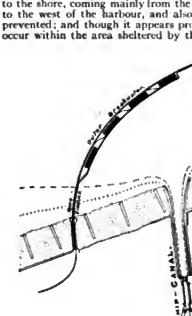

FIG. 7.—Zeebrugge Harbour.

Entrances to Harbours.—Though captains of vessels always wish for wide entrances to harbours as affording greater facility of safe access, it is important to keep the width as narrow as practicable, consistent with easy access, to exclude waves and swell as much as possible and secure tranquillity inside. At Madras, the width of 550 ft. proved excessive for the great exposure of the entrance, and moderate size of the harbour, which does not allow of the adequate expansion of the entering swell. Where an adequately easy and safe approach can be secured, it is advantageous to make the entrance face a somewhat sheltered quarter by the overlapping of the end of one of the breakwaters, as accomplished at Bilbao and Genoa harbours (fig. 3), and at the southern entrance to Dover harbour. Occasionally, owing to the comparative shelter afforded by a bend in the adjacent coast-line, a very wide entrance can be left between a breakwater and the shore; typical examples are furnished by the former open northern entrance to Portland harbour, now closed against torpedoes, and the wide entrances at Holyhead and Zeebrugge (fig. 7). With a large harbour and the adoption of a detached breakwater, it is possible to gain the advantage of two entrances facing different quarters, as effected at Dover and Colombo, which doubles vessels to select their entrance according to the state of the wind and weather; where there is a large tidal rise they reduce the current through the entrances, and they may, under favourable conditions, create a circulation of the water in the harbour, tending to check the deposit of silt.

(L. F. V.-H.)

HARBURG, a seaport town of Germany, in the Prussian province of Hanover, on the left bank of the southern arm of the Elbe, 6 m. by rail S. of Hamburg. Pop. (1885), 26,320; (1905)—the area of the town having been increased since 1895—55,676. It is pleasantly situated at the foot of a lofty range of hills, which here dip down to the river, at the junction of the main lines of railway from Bremen and Hanover to Hamburg, which are carried to the latter city over two grand bridges crossing the southern and the northern arms of the Elbe. It possesses a Roman Catholic and two Protestant churches, a palace, which from 1524 to 1642 was the residence of the Harburg line of the house of Brunswick, a high-grade modern school, a commercial school and a theatre. The leading industries are the crushing of palm-kernels and linseed and the manufacture of india-rubber, phosphates, starch, nitrate and jute. Machines are manufactured here; beer is brewed, and, shipbuilding is carried on. The port is accessible to vessels drawing 18 ft. of water, and, despite its proximity to Hamburg, its trade has of late years shown a remarkable development. It is the chief mart in the empire for resin and palm-oil. The Prussian government proposes establishing here a free port, on the lines of the *Freihafen* in Hamburg.

Harburg belonged originally to the bishopric of Bremen, and received municipal rights in 1297. In 1376 it was united to the principality of Lüneburg, along with which it fell in 1705 to Hanover, and in 1806 to Prussia. In 1813 and 1814 it suffered considerably from the French, who then held Hamburg, and who built a bridge between the two towns, which remained standing till 1816.

See Ludewig, *Geschichte des Schlosses und der Stadt Harburg* (Harburg, 1843); and Hoffmeyer, *Harburg und die nächste Umgegend* (1885).

HARCOURT, a village in Normandy, now a commune in the department of Eure, arrondissement of Bernay and canton of Brionne, which gives its name to a noble family distinguished in French history, a branch of which was early established in England. Of the lords of Harcourt, whose genealogy can be traced back to the 11th century, the first to distinguish himself was Jean II. (d. 1302) who was marshal and admiral of France. Godefroi d'Harcourt, seigneur of Saint Sauveur le Vicomte, surnamed "Le boiteux" (the lame), was a marshal in the English army and was killed near Coutances in 1356. The fief of Harcourt was raised to the rank of a countship by Philip of Valois, in favour of Jean IV., who was killed at the battle of Crecy (1346). His son, Jean V. (d. 1355) married Blanche, heiress of Jean II., count of Aumale, and the countship of Harcourt passed with that of Aumale until, in 1424, Jean VIII., count of Aumale and Mortain and lieutenant-general of Normandy, was killed at the battle of Verneuil, and with him the elder branch became extinct in the male line. The heiress, Marie, by her marriage with Anthony of Lorraine, count of Vaudémont, brought the countship of Harcourt into the house of Lorraine. The title of count of Harcourt was borne by several princes of this house. The most famous instance was Henry of Lorraine, count of Harcourt, Brionne, and Armagnac, and nicknamed "Cadet la perle" (1601–1666). He distinguished himself in several campaigns against Spain, and later played an active part in the civil wars of the Fronde. He took the side of the princes, and fought against the

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government in Alsace; but was defeated by Marshal de la Ferté, and made his submission in 1654.

The most distinguished among the younger branches of the family are those of Montgomery and of Beuvron. To the former belonged Jean d'Harcourt, bishop of Amiens and Tournai, archbishop of Narbonne and patriarch of Antioch, who died in 1452; and Guillaume d'Harcourt, count of Tancarville, and viscount of Melun, who was head of the administration of the woods and forests in the royal domain (*souverain maître et réformateur des eaux et forêts de France*) and died in 1487.

From the branch of the marquises of Beuvron sprang Henri d'Harcourt, marshal of France, and ambassador at the Spanish court, who was made duke of Harcourt (1700) and a peer of France (1709); also François Eugène Gabriel, count, and afterwards duke, of Harcourt, who was ambassador first in Spain, and later at Rome, and died in 1865. This branch of the family is still in existence.

See G. A. de la Roque, *Histoire généalogique de la maison d'Harcourt* (4 vols., Paris, 1662); P. Anselme, *Histoire généalogique de la maison de France*, v. 114, &c.; and Dom le Noir, *Preuves généalogiques et historiques de la maison de Harcourt* (Paris, 1907).

(M. P.*)

HARCOURT, SIMON HARCOURT, 1ST VISCOUNT (*c.* 1661–1727), lord chancellor of England, only son of Sir Philip Harcourt of Stanton Harcourt, Oxfordshire, by his first wife, Anne, daughter of Sir William Waller, was born about 1661 at Stanton Harcourt, and was educated at a school at Shilton, Oxfordshire, and at Pembroke College, Oxford. He was called to the bar in 1683, and soon afterwards was appointed recorder of Abingdon, which borough he represented as a Tory in parliament from 1690 to 1705. In 1701 he was nominated by the Commons to conduct the impeachment of Lord Somers; and in 1702 he became solicitor-general and was knighted by Queen Anne. He was elected member for Bossiney in 1705, and as commissioner for arranging the union with Scotland was largely instrumental in promoting that measure. Harcourt was appointed attorney-general in 1707, but resigned office in the following year when his friend Robert Harley, afterwards earl of Oxford, was dismissed. He defended Sacheverell at the bar of the House of Lords in 1710, being then without a seat in parliament; but in the same year was returned for Cardigan, and in September again became attorney-general. In October he was appointed lord keeper of the great seal, and in virtue of this office he presided in the House of Lords for some months without a peerage, until, on the 3rd of September 1711, he was created Baron Harcourt of Stanton Harcourt; but it was not till April 1713 that he received the appointment of lord chancellor. In 1710 he had purchased the Nuneham-Courtney estate in Oxfordshire, but his usual place of residence continued to be at Cokethorpe near Stanton Harcourt, where he received a visit in state from Queen Anne. In the negotiations preceding the peace of Utrecht, Harcourt took an important part. There is no sufficient evidence for the allegations of the Whigs that Harcourt entered into treasonable relations with the Pretender. On the accession of George I. he was deprived of office and retired to Cokethorpe, where he enjoyed the society of men of letters, Swift, Pope, Prior and other famous writers being among his frequent guests. With Swift, however, he had occasional quarrels, during one of which the great satirist bestowed on him the sobriquet of "Trimming Harcourt." He exerted himself to defeat the impeachment of Lord Oxford in 1717, and in 1723 he was active in obtaining a pardon for another old political friend, Lord Bolingbroke. In 1721 Harcourt was created a viscount and returned to the privy councils; and on several occasions during the king's absences from England he was on the council of regency. He died in London on the 23rd of July 1727. Harcourt was not a great lawyer, but he enjoyed the reputation of being a brilliant orator; Speaker Onslow going so far as to say that Harcourt "had the greatest skill and power of speech of any man I ever knew in a public assembly." He was a member of the famous Saturday Club, frequented by the chief *literati* and wits of the period, with several of whom he corresponded. Some letters to him from Pope are preserved in the *Harcourt Papers*. His portrait by Kneller is at Nuneham.

Harcourt married, first, Rebecca, daughter of Thomas Clark, his father's chaplain, by whom he had five children; secondly, Elizabeth, daughter of Richard Spencer; and thirdly, Elizabeth, daughter of Sir Thomas Vernon. He left issue by his first wife only. His son, Simon (1684–1720), married Elizabeth, sister of Sir John Evelyn of Wotton, by whom he had one son and four daughters, one of whom married George Venables Vernon, afterwards Lord Vernon (see HARCOURT, SIR WILLIAM—footnote). Simon Harcourt predeceased his father, the lord chancellor, in 1720, leaving a son SIMON HARCOURT (1714–1777), 1st Earl Harcourt, who succeeded his grandfather in the title of viscount in 1727. He was educated at Westminster school. In 1745, having raised a regiment, he received a commission as a colonel in the army; and in 1749 he was created Earl Harcourt of Stanton Harcourt. He was appointed governor to the prince of Wales, afterwards George III., in 1751; and after the accession of the latter to the throne he was appointed, in 1761, special ambassador to Mecklenburg-Strelitz to negotiate a marriage between King George and the princess Charlotte, whom he conducted to England. After holding a number of appointments at court and in the diplomatic service, he was promoted to the rank of general in 1772; and in October of the same year he succeeded Lord Townsend as lord lieutenant of Ireland, an office which he held till 1777. His proposal to impose a tax of 10% on the rents of absentee landlords had to be abandoned owing to opposition in England; but he succeeded in conciliating the leaders of opposition in Ireland, and he persuaded Henry Flood to accept office in the government. Resigning in January 1777, he retired to Nuneham, where he died in the following September. He married, in 1735, Rebecca, daughter and heiress of Charles Samborne Le Bas, of Pipewell Abbey, Northamptonshire, by whom he had two daughters and two sons, George Simon and William, who succeeded him as 2nd and 3rd earl respectively.

See Lord Campbell, *Lives of the Lord Chancellors*, vol. v. (London, 1846); Edward Foss, *The Judges of England*, vol. viii. (London, 1848); Gilbert Burnet, *Hist. of his own Time* (with notes by earls Dartmouth and Hardwicke, &c., Oxford, 1833); Earl Stanhope, *Hist. of England, comprising the reign of Queen Anne until the Peace of Utrecht* (London, 1870). In addition to the above-mentioned authorities many particulars concerning the 1st Viscount Harcourt, and also of his grandson, the 1st earl, will be found in the *Harcourt Papers*. For the earl, see also Horace Walpole, *Memoirs of the Reign of George II.* (3 vols., 2nd ed., London, 1847), *Memoirs of the Reign of George III.* (4 vols., London, 1845, 1894); also, for his viceroyalty of Ireland, see Henry Grattan, *Memoirs of the Life and Times of the Right Hon. H. Grattan* (5 vols., London, 1839–1846); Francis Hardy, *Memoirs of J. Caulfield, Earl of Charlemont* (2 vols., London, 1812); and for his genealogy, see Sir John Bernard Burke, *Genealogical History of Dormant and Extinct Peerages* (London, 1883).

(R. J. M.)

HARCOURT, SIR WILLIAM GEORGE GRANVILLE VENABLES VERNON (1827–1904), English statesman, second son of the Rev. Canon William Vernon Harcourt (*q.v.*), of Nuneham Park, Oxford, was born on the 14th of October 1827. Canon Harcourt was the fourth son and eventually heir of Edward Harcourt (1757–1847), archbishop of York, who was the son of the 1st Lord Vernon (d. 1780), and who took the name of Harcourt alone instead of Vernon on succeeding to the property of his cousin, the last Earl Harcourt, in 1831.[1] The subject

[1] William, 3rd and last Earl Harcourt (1743–1830), who succeeded his brother in the title, was a soldier who distinguished himself in the American War of Independence by capturing General Charles Lee, and commanded the British forces in Flanders in 1794, eventually becoming a field-marshal. He was a son of Simon, 1st earl (1714–1777), created viscount and earl in 1749, a soldier, and, from 1772 to 1777 viceroy of Ireland, who was grandson and heir of Simon, 1st Viscount Harcourt (1661–1727), lord chancellor—the "trimming Harcourt" of Swift—the purchaser of the Nuneham-Courtney estates in Oxfordshire, and son of Sir Philip Harcourt of Stanton Harcourt. The knights of Stanton Harcourt, from the 13th century onwards, traced their descent to the Norman de Harcourts, a branch of that family having come over with the Conqueror; and the pedigree claims to go back to Bernard of Saxony, who in 876 acquired the lordships of Harcourt, Castleville and Beaufiel in Normandy. Viscount Harcourt's second son Simon, who was father of the 1st earl, was also father of Martha, who married George

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of this biography was therefore born a Vernon, and by his connexion with the old families of Vernon and Harcourt was related to many of the great English houses, a fact which gave him no little pride. Indeed, in later life his descent from the Plantagenets[1] was a subject of some banter on the part of his political opponents. He was educated at Trinity College, Cambridge, graduating with first-class honours in the classical tripos in 1851. He was called to the bar in 1854, became a Q.C. in 1866, and was appointed Whewell professor of international law, Cambridge, 1869. He quickly made his mark in London society as a brilliant talker; he contributed largely to the *Saturday Review*, and wrote some famous letters (1862) to *The Times* over the signature of "Historicus," in opposition to the recognition of the Southern States as belligerents in the American Civil War. He entered parliament as Liberal member for Oxford, and sat from 1868 to 1880, when, upon seeking re-election after acceptance of office, he was defeated by Mr Hall. A seat was, however, found for him at Derby, by the voluntary retirement of Mr Plimsoll, and he continued to represent that constituency until 1895, when, having been defeated at the general election, he found a seat in West Monmouthshire. He was appointed solicitor-general and knighted in 1873; and, although he had not shown himself a very strenuous supporter of Mr Gladstone during that statesman's exclusion from power, he became secretary of state for the home department on the return of the Liberals to office in 1880. His name was connected at that time with the passing of the Ground Game Act (1880), the Arms (Ireland) Act (1881), and the Explosives Act (1883). As home secretary at the time of the dynamite outrages he had to take up a firm attitude, and the Explosives Act was passed through all its stages in the shortest time on record. Moreover, as champion of law and order against the attacks of the Parnellites, his vigorous speeches brought him constantly into conflict with the Irish members. In 1884 he introduced an abortive bill for unifying the municipal administration of London. He was indeed at that time recognized as one of the ablest and most effective leaders of the Liberal party; and when, after a brief interval in 1885, Mr Gladstone returned to office in 1886, he was made chancellor of the exchequer, an office which he again filled from 1892 to 1895.

Between 1880 and 1892 Sir William Harcourt acted as Mr Gladstone's loyal and indefatigable lieutenant in political life. A first-rate party fighter, his services were of inestimable value; but in spite of his great success as a platform speaker, he was generally felt to be speaking from an advocate's brief, and did not impress the country as possessing much depth of conviction. It was he who coined the phrase about "stewing in Parnellite juice," and, when the split came in the Liberal party on the Irish question, even those who gave Mr Gladstone and Mr Morley the credit of being convinced Home Rulers could not be persuaded that Sir William had followed anything but the line of party expediency. In 1894 he introduced and carried a memorable budget, which equalized the death duties on real and personal property. After Mr Gladstone's retirement in 1894 and Lord Rosebery's selection as prime minister Sir William became the leader of the Liberal party in the House of Commons, but it was never probable that he would work comfortably in the new conditions. His title to be regarded as Mr Gladstone's successor had been too lightly ignored, and from the first it was evident that Lord Rosebery's ideas of Liberalism and of the policy of the Liberal party were not those of Sir William Harcourt. Their differences were patched up from time to time, but the combination could not last. At the general election of 1895 it was clear that there were divisions as to what issue the Liberals were fighting for, and the effect of Sir William Harcourt's abortive Local Veto Bill on the election was seen not only in his defeat at Derby, which gave the signal for the Liberal rout, but in the set-back it gave to temperance legislation. Though returned for West Monmouthshire (1895, 1900), his speeches in debate only occasionally showed his characteristic spirit, and it was evident that for the hard work of Opposition he no longer had the same motive as of old. In December 1898 the crisis arrived, and with Mr John Morley he definitely retired from the counsels of the party and resigned his leadership of the Opposition, alleging as his reason, in letters exchanged between Mr Morley and himself, the cross-currents of opinion among his old supporters and former colleagues. The split excited considerable comment, and resulted in much heart-burning and a more or less open division between the section of the Liberal party following Lord Rosebery (*q.v.*) and those who disliked that statesman's Imperialistic views.

Though now a private member, Sir William Harcourt still continued to vindicate his opinions in his independent position, and his attacks on the government were no longer restrained by even the semblance of deference to Liberal Imperialism. He actively intervened in 1899 and 1900, strongly condemning the government's financial policy and their attitude towards the Transvaal; and throughout the Boer War he lost no opportunity of criticizing the South African developments in a pessimistic vein. One of the readiest parliamentary debaters, he savoured his speeches with humour of that broad and familiar order which appeals particularly to political audiences. In 1898–1900 he was conspicuous, both on the platform and in letters written to *The Times*, in demanding active measures against the Ritualistic party in the Church of England; but his attitude on that subject could not be dissociated from his political advocacy of Disestablishment. In March 1904, just after he had announced his intention not to seek election again to parliament, he succeeded, by the death of his nephew, to the family estates at Nuneham. But he died suddenly there on the 1st of October in the same year. He married, first, in 1859, Thérèse (d. 1863), daughter of Mr T. H. Lister, by whom he had one son, Lewis Vernon Harcourt (b. 1863), afterwards first commissioner of works both in Sir Henry Campbell-Bannerman's 1905 ministry (included in the cabinet in 1907) and in Mr Asquith's cabinet (1908); and secondly, in 1876, Elizabeth, widow of Mr T. Ives and daughter of Mr. J. L. Motley, the historian, by whom he had another son, Robert (b. 1878).

Sir William Harcourt was one of the great parliamentary figures of the Gladstonian Liberal period. He was essentially an aristocratic type of late 19th century Whig, with a remarkable capacity for popular campaign fighting. He had been, and remained, a brilliant journalist in the non-professional sense. He was one of those who really made the *Saturday Review* in its palmy days, and in the period of his own most ebullient vigour, while Mr Gladstone was alive, his sense of political expediency and platform effectiveness in controversy was very acute. But though he played the game of public life with keen zest, he never really touched either the country or his own party with the faith which creates a personal following, and in later years he found himself somewhat isolated and disappointed, though he was free to express his deeper objections to the new developments in church and state. A tall, fine man, with the grand manner, he was, throughout a long career, a great personality in the life of his time. (H. Cu.)

HARCOURT, WILLIAM VERNON (1789–1871), founder of the British Association, was born at Sudbury, Derbyshire, in 1789, a younger son of Edward Vernon [Harcourt], archbishop of York (see above). Having served for five years in the navy he went up to Christ Church, Oxford, with a view to taking holy orders. He began his clerical duties at Bishopthorpe, Yorkshire, in 1811, and having developed a great interest in science while at the university, he took an active part in the foundation of the Yorkshire Philosophical Society, of which he

[1] Venables Vernon, of Sudbury, created 1st Baron Vernon in 1762. The latter was a descendant of Sir Richard Vernon (d. 1451), speaker of the Leicester parliament (1425) and treasurer of Calais, a member of a Norman family which came over with the Conqueror.

[1] The Plantagenet descent (see *The Blood Royal of Britain*, by the marquis of Ruvigny, 1903, for tables) could be traced through Lady Anna Leveson Gower (wife of Archbishop Harcourt) to Lady Frances Stanley, the wife of the 1st earl of Bridgewater (1579–1649), and so to Lady Eleanor Brandon, wife of the earl of Cumberland (1517–1570), and daughter of Mary Tudor (wife of Charles Brandon, duke of Suffolk, 1484–1545), the daughter of Henry VII. and granddaughter of Edward IV.

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was the first president. The laws and the plan of proceedings for the British Association for the Advancement of Science were drawn up by him; and Harcourt was elected president in 1839. In 1824 he became canon of York and rector of Wheldrake in Yorkshire, and in 1837 rector of Bolton Percy. The Yorkshire school for the blind and the Castle Howard reformatory both owe their existence to his energies. His spare time until quite late in life was occupied with scientific experiments. Inheriting the Harcourt estates in Oxfordshire from his brother in 1861, he removed to Nuneham, where he died in April 1871.

HARDANGER FJORD, an inlet on the west coast of Norway, penetrating the mainland for 70 m. apart from the deep fringe of islands off its mouth, the total distance from the open sea to the head of the fjord being 114 m. Its extreme depth is about 350 fathoms. The entrance at Torö is 50 m. by water south of Bergen, 60° N., and the general direction is N.E. from that point. The fjord is flanked by magnificent mountains, from which many waterfalls pour into it. The main fjord is divided into parts under different names, and there are many fine branch fjords. The fjord is frequented by tourists, and the principal stations have hotels. The outer fjord is called the Kvindherreds-fjord, flanked by the Melderskin (4680 ft.); then follow Sildefjord and Bonde Sund, separated by Varalds island. Here Mauranger-fjord opens on the east; from Sundal on this inlet the great Folgefond snowfield may be crossed, and a fine glacier (Bondhusbrae) visited. Bakke and Vikingnaes are stations on Hisfjord, Nordheimsund and Östensö on Ytre Samlen, which throws off a fine narrow branch northward, the Fiksensund. There follow Indre Samlen and Utnefjord, with the station of Utne opposite Ozen (4120 ft.), and its northward branch, Gravenfjord, with the beautiful station of Eide at its head, whence a road runs north-west to Vossevangen. From the Utne terminal branches of the fjord run south and east; the Sörfjord, steeply walled by the heights of the Folgefond, with the frequented resort of Odde at its head; and the Eidfjord, with its branch Osefjord, terminating beneath a tremendous rampart of mountains, through which the sombre Simodal penetrates, the river flowing from Daemmevand, a beautiful lake among the fields, and forming with its tributaries the fine falls of Skykje and Rembesdal. Vik is the principal station on Eidfjord, and Ulvik on a branch of the Ose, with a road to Vossevangen. At Vik is the mouth of the Björeia river, which, in forming the Vöringfos, plunges 520 ft. into a magnificent rock-bound basin. A small stream entering Sörfjord forms in its upper course the Skjaeggedalsfos, of equal height with the Vöringfos, and hardly less beautiful. The natives of Hardanger have an especially picturesque local costume.

HARDEE, WILLIAM JOSEPH (1815–1873), American soldier, was born in Savannah, Georgia, on the 10th of November 1815 and graduated from West Point in 1838. As a subaltern of cavalry he was employed on a special mission to Europe to study the cavalry methods in vogue (1839). He was promoted captain in 1844 and served under Generals Taylor and Scott in the Mexican War, winning the brevet of major for gallantry in action in March 1847 and subsequently that of lieut.-colonel. After the war he served as a substantive major under Colonel Sidney Johnston and Lieut.-Colonel Robert Lee in the 2nd U.S. cavalry, and for some time before 1856 he was engaged in compiling the official manual of infantry drill and tactics which, familiarly called "Hardee's Tactics," afterwards formed the text-book for the infantry arm in both the Federal and the Confederate armies. From 1856 to 1861 he was commandant of West Point, resigning his commission on the secession of his state in the latter year. Entering the Confederate service as a colonel, he was shortly promoted brigadier-general. He distinguished himself very greatly by his tactical leadership on the field of Shiloh, and was immediately promoted major-general. As a corps commander he fought under General Bragg at Perryville and Stone River, and for his distinguished services in these battles was promoted lieutenant-general. He served in the latter part of the campaign of 1863 under Bragg and in that of 1864 under J. E. Johnston. When the latter officer was superseded by Hood, Hardee was relieved at his own request, and for the remainder of the war he served in the Carolinas. When the Civil War came to an end in 1865 he retired to his plantation near Selma, Alabama. He died at Wytheville, Virginia, on the 6th of November 1873.

HARDENBERG, KARL AUGUST VON, PRINCE (1750–1822), Prussian statesman, was born at Essenroda in Hanover on the 31st of May 1750. After studying at Leipzig and Göttingen he entered the Hanoverian civil service in 1770 as councillor of the board of domains (*Kammerrat*); but, finding his advancement slow, he set out—on the advice of King George III.—on a course of travels, spending some time at Wetzlar, Regensburg (where he studied the mechanism of the Imperial government), Vienna and Berlin. He also visited France, Holland and England, where he was kindly received by the king. On his return he married, by his father's desire, the countess Reventlow. In 1778 he was raised to the rank of privy councillor and created a count. He now again went to England, in the hope of obtaining the post of Hanoverian envoy in London; but, his wife becoming entangled in an *amour* with the prince of Wales, so great a scandal was created that he was forced to leave the Hanoverian service. In 1782 he entered that of the duke of Brunswick, and as president of the board of domains displayed a zeal for reform, in the manner approved by the enlightened despots of the century, that rendered him very unpopular with the orthodox clergy and the conservative estates. In Brunswick, too, his position was in the end made untenable by the conduct of his wife, whom he now divorced; he himself, shortly afterwards, marrying a divorced woman. Fortunately for him, this coincided with the lapsing of the principalities of Ansbach and Bayreuth to Prussia, owing to the resignation of the last margrave, Charles Alexander, in 1791. Hardenberg, who happened to be in Berlin at the time, was on the recommendation of Herzberg appointed administrator of the principalities (1792). The position, owing to the singular overlapping of territorial claims in the old Empire, was one of considerable delicacy, and Hardenberg filled it with great skill, doing much to reform traditional anomalies and to develop the country, and at the same time labouring to expand the influence of Prussia in South Germany. After the outbreak of the revolutionary wars his diplomatic ability led to his appointment as Prussian envoy, with a roving commission to visit the Rhenish courts and win them over to Prussia's views; and ultimately, when the necessity for making peace with the French Republic had been recognized, he was appointed to succeed Count Goltz as Prussian plenipotentiary at Basel (February 28, 1795), where he signed the treaty of peace.

In 1797, on the accession of King Frederick William III., Hardenberg was summoned to Berlin, where he received an important position in the cabinet and was appointed chief of the departments of Magdeburg and Halberstadt, for Westphalia, and for the principality of Neuchâtel. In 1803 Hardenberg had struck up a friendship with Count Haugwitz, the influential minister for foreign affairs, and when in 1803 the latter went away on leave (August-October) he appointed Hardenberg his *locum tenens*. It was a critical period. Napoleon had just occupied Hanover, and Haugwitz had urged upon the king the necessity for strong measures and the expediency of a Russian alliance. During his absence, however, the king's irresolution continued; he clung to the policy of neutrality which had so far seemed to have served Prussia so well; and Hardenberg contented himself with adapting himself to the royal will. By the time Haugwitz returned, the unyielding attitude of Napoleon had caused the king to make advances to Russia; but the mutual declarations of the 3rd and 25th of May 1804 only pledged the two powers to take up arms in the event of a French attack upon Prussia or of further aggressions in North Germany. Finally, Haugwitz, unable to persuade the cabinet to a more vigorous policy, resigned, and on the 14th of April 1804 Hardenberg succeeded him as foreign minister.

If there was to be war, Hardenberg would have preferred the French alliance, which was the price Napoleon demanded for the cession of Hanover to Prussia; for the Eastern powers would

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scarcely have conceded, of their free will, so great an augmentation of Prussian power. But he still hoped to gain the coveted prize by diplomacy, backed by the veiled threat of an armed neutrality. Then occurred Napoleon's contemptuous violation of Prussian territory by marching three French corps through Ansbach; King Frederick William's pride overcame his weakness, and on the 3rd of November he signed with the tsar Alexander the terms of an ultimatum to be laid before the French emperor. Haugwitz was despatched to Vienna with the document; but before he arrived the battle of Austerlitz had been fought, and the Prussian plenipotentiary had to make the best terms he could with the conqueror. Prussia, indeed, by the treaty signed at Schönbrunn on the 15th of December 1805, received Hanover, but in return for all her territories in South Germany. One condition of the arrangement was the retirement of Hardenberg, whom Napoleon disliked. He was again foreign minister for a few months after the crisis of 1806 (April-July 1807); but Napoleon's resentment was implacable, and one of the conditions of the terms granted to Prussia by the treaty of Tilsit was Hardenberg's dismissal.

After the enforced retirement of Stein in 1810 and the unsatisfactory interlude of the feeble Altenstein ministry, Hardenberg was again summoned to Berlin, this time as chancellor (June 6, 1810). The campaign of Jena and its consequences had had a profound effect upon him; and in his mind the traditions of the old diplomacy had given place to the new sentiment of nationality characteristic of the coming age, which in him found expression in a passionate desire to restore the position of Prussia and crush her oppressors. During his retirement at Riga he had worked out an elaborate plan for reconstructing the monarchy on Liberal lines; and when he came into power, though the circumstances of the time did not admit of his pursuing an independent foreign policy, he steadily prepared for the struggle with France by carrying out Stein's far-reaching schemes of social and political reorganization. The military system was completely reformed, serfdom was abolished, municipal institutions were fostered, the civil service was thrown open to all classes, and great attention was devoted to the educational needs of every section of the community.

When at last the time came to put these reforms to the test, after the Moscow campaign of 1812, it was Hardenberg who, supported by the influence of the noble Queen Louise, determined Frederick William to take advantage of General Yorck's loyal disloyalty and declare against France. He was rightly regarded by German patriots as the statesman who had done most to encourage the spirit of national independence; and immediately after he had signed the first peace of Paris he was raised to the rank of prince (June 3, 1814) in recognition of the part he had played in the War of Liberation.

Hardenberg now had an assured position in that close corporation of sovereigns and statesmen by whom Europe, during the next few years, was to be governed. He accompanied the allied sovereigns to England, and at the congress of Vienna (1814–1815) was the chief plenipotentiary of Prussia. But from this time the zenith of his influence, if not of his fame, was passed. In diplomacy he was no match for Metternich, whose influence soon overshadowed his own in the councils of Europe, of Germany, and ultimately even of Prussia itself. At Vienna, in spite of the powerful backing of Alexander of Russia, he failed to secure the annexation of the whole of Saxony to Prussia; at Paris, after Waterloo, he failed to carry through his views as to the further dismemberment of France; he had weakly allowed Metternich to forestall him in making terms with the states of the Confederation of the Rhine, which secured to Austria the preponderance in the German federal diet; on the eve of the conference of Carlsbad (1819) he signed a convention with Metternich, by which—to quote the historian Treitschke—" like a penitent sinner, without any formal *quid pro quo*, the monarchy of Frederick the Great yielded to a foreign power a voice in her internal affairs. " At the congresses of Aix-la-Chapelle, Troppau, Laibach and Verona the voice of Hardenberg was but an echo of that of Metternich.

The cause lay partly in the difficult circumstances of the loosely-knit Prussian monarchy, but partly in Hardenberg's character, which, never well balanced, had deteriorated with age. He continued amiable, charming and enlightened as ever; but the excesses which had been pardonable in a young diplomatist were a scandal in an elderly chancellor, and could not but weaken his influence with so pious a *Landesvater* as Frederick William III. To overcome the king's terror of Liberal experiments would have needed all the powers of an adviser at once wise and in character wholly trustworthy. Hardenberg was wise enough; he saw the necessity for constitutional reform; but he clung with almost senile tenacity to the sweets of office, and when the tide turned strongly against Liberalism he allowed himself to drift with it. In the privacy of royal commissions he continued to elaborate schemes for constitutions that never saw the light; but Germany, disillusioned, saw only the faithful henchman of Metternich, an accomplice in the policy of the Carlsbad Decrees and the Troppau Protocol. He died, soon after the closing of the congress of Verona, at Genoa, on the 26th of November 1822.

See L. v. Ranke, *Denkwürdigkeiten des Staatskanzlers Fürsten von Hardenberg* (5 vols., Leipzig, 1877); J. R. Seeley, *The Life and Times of Stein* (3 vols., Cambridge, 1878); E. Meier, *Reform der Verwaltungsorganisation unter Stein und Hardenberg* (ib., 1881); Chr. Meyer, *Hardenberg und seine Verwaltung der Fürstentümer Ansbach und Bayreuth* (Breslau, 1892); Koser, *Die Neuordnung des preussischen Archivwesens durch den Staatskanzler Fürsten v. Hardenberg* (Leipzig, 1904).

HARDERWYK, a seaport in the province of Gelderland, Holland, on the shores of the Zuider Zee, 17 m. by rail N.N.E. of Amersfoort. Pop. (1900) 7425. It is a quaint old town, approached by a fine avenue of trees, and standing in the midst of a patch of fertile ground. Harderwyk is chiefly important as being the depot for recruits for the Dutch colonial army. It contains a small fort and large barracks. The principal buildings are the town hall, with some ancient furniture, a large 15th century church with a notable square tower, a municipal orphanage, and the Nassau-Veluwe gymnasium. Agriculture, fishing, and a few domestic industries form the only employment of the inhabitants. As a seaport its trade is now confined exclusively to the Zuider Zee.

HARDICANUTE [more correctly HARDACNUT] (*c.* 1019–1042), son of Canute, king of England, by his wife Ælfgifu or Emma, was born about 1019. In the contest for the English crown which followed the death of Canute in 1035 the claims of Hardicanute were supported by Emma and her ally, Godwine, earl of the West Saxons, in opposition to those of Harold, Canute's illegitimate son, who was backed by the Mercian earl Leofric and the chief men of the north. At a meeting of the witan at Oxford a compromise was ultimately arranged by which Harold was temporarily elected regent of all England, pending the final settlement of the question on the return of Hardicanute from Denmark. The compromise was strongly opposed by Godwine and Emma, who for a time forcibly held Wessex in Hardicanute's behalf. But Harold's party rapidly increased; and early in 1037 he was definitely elected king. Emma was driven out and took refuge at Bruges. In 1039 Hardicanute joined her, and together they concerted an attack on England. But next year Harold died; and Hardicanute peacefully succeeded. His short reign was marked by great oppression and cruelty. He caused the dead body of Harold to be dug up and thrown into a fen; he exacted so heavy a geld for the support of his foreign fleet that great discontent was created throughout the kingdom, and in Worcestershire a general uprising took place against those sent to collect the tax, whereupon he burned the city of Worcester to the ground and devastated the surrounding country; in 1041 he permitted Edwulf, earl of Northumbria, to be treacherously murdered after having granted him a safe-conduct. While " he stood at his drink " at the marriage feast of one of his flegns he was suddenly seized with a fit, from which he died a few days afterwards on the 8th of June 1042.

HARDING, CHESTER (1792–1866). American portrait painter, was born at Conway, Massachusetts, on the 1st of September 1792. Brought up in the wilderness of New York state, Harding,

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as a lad of splendid physique, standing over 6 ft. 3 in., marched as a drummer with the militia to the St Lawrence in 1813. He became subsequently chairmaker, peddler, inn-keeper, and house-painter, painting signs in Pittsburg, Pa., and eventually going on the road, self-taught, as an itinerant portrait painter. He made enough money to take him to the schools at the Philadelphia Academy of Design, and he soon became proficient enough to gain a competency, so that later he went to England and set up a studio in London. There he met with great success, painting royalty and the nobility, and, despite the lackings of an early education and social experience, he became a favourite in all circles. Returning to the United States, he settled in Boston and painted portraits of many of the prominent men and women of his time. He died on the 1st of April 1866.

HARDING, JAMES DUFFIELD (1798–1863), English landscape painter, was the son of an artist, and took to the same vocation at an early age, although he had originally been destined for the law. He was in the main a water-colour painter and a lithographer, but he produced various oil-paintings both at the beginning and towards the end of his career. He frequently contributed to the exhibitions of the Water-Colour Society, of which he became an associate in 1821, and a full member in 1822. He was also very largely engaged in teaching, and published several books developing his views of art—amongst others, *The Tourist in Italy* (1831); *The Tourist in France* (1834); *The Park and the Forest* (1841); *The Principles and the Practice of Art* (1845); *Elementary Art* (1846); *Scotland Delineated in a Series of Views* (1847); *Lessons on Art* (1849). He died at Barnes on the 4th of December 1863. Harding was noted for facility, sureness of hand, nicety of touch, and the various qualities which go to make up an elegant, highly trained, and accomplished sketcher from nature, and composer of picturesque landscape material; he was particularly skilful in the treatment of foliage.

HARDINGE, HENRY HARDINGE, VISCOUNT (1785–1856), British field marshal and governor-general of India, was born at Wrotham in Kent on the 30th of March 1785. After being at Eton, he entered the army in 1799 as an ensign in the Queen's Rangers, a corps then stationed in Upper Canada. His first active service was at the battle of Vimiera, where he was wounded; and at Corunna he was by the side of Sir John Moore when he received his death-wound. Subsequently he received an appointment as deputy-quartermaster-general in the Portuguese army from Marshal Beresford, and was present at nearly all the battles of the Peninsular War, being wounded again at Vittoria. At Albuera he saved the day for the British by taking the responsibility at a critical moment of strongly urging General Cole's division to advance. When peace was again broken in 1815 by Napoleon's escape from Elba, Hardinge hastened into active service, and was appointed to the important post of commissioner at the Prussian headquarters. In this capacity he was present at the battle of Ligny on the 16th of June 1815, where he lost his left hand by a shot, and thus was not present at Waterloo, fought two days later. For the loss of his hand he received a pension of £300; he had already been made a K.C.B., and Wellington presented him with a sword that had belonged to Napoleon. In 1820 and 1826 Sir Henry Hardinge was returned to parliament as member for Durham; and in 1828 he accepted the office of secretary at war in Wellington's ministry, a post which he also filled in Peel's cabinet in 1841–1844. In 1830 and 1834–1835 he was chief secretary for Ireland. In 1844 he succeeded Lord Ellenborough as governor-general of India. During his term of office the first Sikh War broke out; and Hardinge, waiving his right to the supreme command, magnanimously offered to serve as second in command under Sir Hugh Gough; but disagreeing with the latter's plan of campaign at Ferozeshah, he temporarily reasserted his authority as governor-general (see SIKH WARS). After the successful termination of the campaign at Sobraon he was created Viscount Hardinge of Lahore and of King's Newton in Derbyshire, with a pension of £3000 for three lives; while the East India Company voted him an annuity of £5000, which he declined to accept. Hardinge's term of office in India was marked by many social and educational reforms. He returned to England in 1848, and in 1852 succeeded the duke of Wellington as commander-in-chief of the British army. While in this position he had the home management of the Crimean War, which he endeavoured to conduct on Wellington's principles—a system not altogether suited to the changed mode of warfare. In 1855 he was promoted to the rank of field marshal. Viscount Hardinge resigned his office of commander-in-chief in July 1856, owing to failing health, and died on the 24th of September of the same year at South Park near Tunbridge Wells. His elder son, Charles Stewart (1822–1894), who had been his private secretary in India, was the 2nd Viscount Hardinge; and the latter's eldest son succeeded to the title. The younger son of the 2nd Viscount, Charles Hardinge (b. 1858), became a prominent diplomatist (see EDWARD VII.), and was appointed governor-general of India in 1910, being created Baron Hardinge of Penshurst.

See C. Hardinge, *Viscount Hardinge* (Rulers of India series, 1891); and R. S. Rait, *Life and Campaigns of Viscount Gough* (1903).

HARDOI, a town and district of British India, in the Lucknow division of the United Provinces. The town is 63 m. N.E. of Lucknow by rail. Pop. (1901) 17,174. It has a wood-carving industry, saltpetre works, and an export trade in grain.

The DISTRICT OF HARDOI has an area of 2331 sq. m. It is a level district watered by the Ganges, Ramganga, Deoha or Garra, Sukheta, Sai, Baita and Gumti—the three rivers first named being navigable by country boats. Towards the Ganges the land is uneven, and often rises in hillocks of sand cultivated at the base, and their slopes covered with lofty *munj* grass. Several large *jhils* or swamps are scattered throughout the district, the largest being that of Sāndi, which is 3 m. long by from 1 to 2 m. broad. These *jhils* are largely used for irrigation. Large tracts of forest jungle still exist. Leopards, black buck, spotted deer, and *nilgai* are common; the mallard, teal, grey duck, common goose, and all kinds of waterfowl abound. In 1901 the population of the district was 1,092,834, showing a decrease of nearly 2% in the decade. The district contains a larger urban population than any other in Oudh, the largest town being Shahabad, 20,036 in 1901. It is traversed by the Oudh and Rohilkhand railway from Lucknow to Shahjahanpur, and its branches. The chief exports are grain, sugar, hides, tobacco and saltpetre.

The first authentic records of Hardoi are connected with the Mussulman colonization. Bāwan was occupied by Sayyid Sālār Masāūd in 1028, but the permanent Moslem occupation did not begin till 1217. Owing to the situation of the district, Hardoi formed the scene of many sanguinary battles between the rival Afghan and Mogul empires. Between Bilgrām and Sāndi was fought the great battle between Humāyun and Sher Shāh, in which the former was utterly defeated. Hardoi, along with the rest of Oudh, became British territory under Lord Dalhousie's proclamation of February 1856.

HARDOUIN, JEAN (1646–1729), French classical scholar, was born at Quimper in Brittany. Having acquired a taste for literature in his father's book-shop, he sought and obtained about his sixteenth year admission into the order of the Jesuits. In Paris, where he went to study theology, he ultimately became librarian of the Collège Louis le Grand in 1683, and he died there on the 3rd of September 1729. His first published work was an edition of Themistius (1684), which included no fewer than thirteen new orations. On the advice of Jean Sarnier (1612–1681) he undertook to edit the *Natural History* of Pliny for the Delphin series, a task which he completed in five years. His attention having been turned to numismatics as auxiliary to his great editorial labours, he published several learned works in that department, marred, however, as almost everything he did was marred, by a determination to be at all hazards different from other interpreters. It is sufficient to mention his *Nummi antiqui populorum et urbium illustrati* (1684), *Antirrheticus de nummis antiquis coloniarum et municipiorum* (1689), and *Chronologia Veteris Testamenti ad vulgatam versionem exacta et nummis illustrata* (1696). By the ecclesiastical authorities Hardouin was appointed to supervise the *Conciliorum collectio regia maxima*

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(1715); but he was accused of suppressing important documents and foisting in apocryphal matter, and by the order of the parlement of Paris (then at war with the Jesuits) the publication of the work was delayed. It is really a valuable collection, much cited by scholars. Hardouin declared that all the councils supposed to have taken place before the council of Trent were fictitious. It is, however, as the originator of a variety of paradoxical theories that Hardouin is now best remembered. The most remarkable, contained in his *Chronologiae ex nummis antiquis restitutae* (1696) and *Prolegomena ad censuram veterum scriptorum*, was to the effect that, with the exception of the works of Homer, Herodotus and Cicero, the *Natural History* of Pliny, the *Georgics* of Virgil, and the *Satires and Epistles of Horace*, all the ancient classics of Greece and Rome were spurious, having been manufactured by monks of the 13th century, under the direction of a certain Severus Archontius. He denied the genuineness of most ancient works of art, coins and inscriptions, and declared that the New Testament was originally written in Latin.

See A. Debacker, *Bibliothèque des écrivains de la Compagnie de Jésus* (1853).

HARDT, HERMANN VON DER (1660–1746), German historian and orientalist, was born at Melle, in Westphalia, on the 15th of November 1660. He studied oriental languages in Jena and in Leipzig, and in 1690 he was called to the chair of oriental languages at Helmstedt. He resigned his position in 1727, but lived at Helmstedt until his death on the 28th of February 1746. Among his numerous writings the following deserve mention: *Autographa Lutheri aliorumque celebrium virorum, ab anno 1517 ad annum 1546, Reformationis aetatem et historiam egregie illustrantia* (1690–1691); *Magnum oecumenicum Constantiense concilium* (1697–1700) *Hebraeae linguae fundamenta* (1694); *Syriacae linguae fundamenta* (1694); *Elementa Chaldaica* (1693); *Historia litteraria reformationis* (1717); *Enigmata prisci orbis* (1723). Hardt left in manuscript a history of the Reformation which is preserved in the Helmstedt Juleum.

See F. Lamey, *Hermann von der Hardt in seinen Briefen* (Karlsruhe, 1891).

HARDT, THE, a mountainous district of Germany, in the Bavarian palatinate, forming the northern end of the Vosges range. It is, in the main, an undulating high plateau of sandstone formation, of a mean elevation of 1300 ft., and reaching its highest point in the Donnersberg (2254 ft.). The eastern slope, which descends gently towards the Rhine, is diversified by deep and well-wooded valleys, such as those of the Lauter and the Queich, and by conical hills surmounted by the ruins of frequent feudal castles and monasteries. Noticeable among these are the Madenburg near Eschbach, the Trifels (long the dungeon of Richard I. of England), and the Maxburg near Neustadt. Three-fifths of the whole area is occupied by forests, principally oak, beech and fir. The lower eastern slope is highly cultivated and produces excellent wine.

HARDWAR, or HURDWAR, an ancient town of British India, and Hindu place of pilgrimage, in the Saharanpur district of the United Provinces, on the right bank of the Ganges, 17 m. N.E. of Rurki, with a railway station. The Ganges canal here takes off from the river. A branch railway to Dehra was opened in 1900. Pop. (1901), 25,597. The town is of great antiquity, and has borne many names. It was originally known as Kapila from the sage Kapila. Hsüan Tsang, the Chinese Buddhist pilgrim, in the 7th century visited a city which he calls Mo-yu-lo, the remains of which still exist at Mayapur, a little to the south of the modern town. Among the ruins are a fort and three temples, decorated with broken stone sculptures. The great object of attraction at present is the Hari-ka-charan, or bathing *ghat*, with the adjoining temple of Gangadwara. The *charan* or foot-mark of Vishnu, imprinted on a stone let into the upper wall of the *ghat*, forms an object of special reverence. A great assemblage of people takes place annually, at the beginning of the Hindu solar year, when the sun enters Aries; and every twelfth year a feast of peculiar sanctity occurs, known as a *Kumbh-mela*. The ordinary number of pilgrims at the annual fair amounts to 100,000, and at the Kumbh-mela to 300,000; in 1903 there were 400,000 present. Since 1892 many sanitary improvements have been made for the benefit of the annual concourse of pilgrims. In early days riots and also outbreaks of cholera were of common occurrence. The Hardwar meeting also possesses mercantile importance, being one of the principal horse-fairs in Upper India. Commodities of all kinds, Indian and European, find a ready sale, and the trade in grain and food-stuffs forms a lucrative traffic.

HARDWICKE, PHILIP YORKE, 1ST EARL OF (1690–1764), English lord chancellor, son of Philip Yorke, an attorney, was born at Dover, on the 1st of December 1690. Through his mother, Elizabeth, daughter and co-heiress of Richard Gibbon of Rolvenden, Kent, he was connected with the family of Gibbon the historian. At the age of fourteen, after a not very thorough education at a private school at Bethnal Green, where, however, he showed exceptional promise, he entered an attorney's office in London. Here he gave some attention to literature and the classics as well as to law; but in the latter he made such progress that his employer, Salkeld, impressed by Yorke's powers, entered him at the Middle Temple in November 1708; and soon afterwards recommended him to Lord Chief Justice Parker (afterwards earl of Macclesfield) as law tutor to his sons. In 1715 he was called to the bar, where his progress was, says Lord Campbell, "more rapid than that of any other débutant in the annals of our profession," his advancement being greatly furthered by the patronage of Macclesfield, who became lord chancellor in 1718, when Yorke transferred his practice from the king's bench to the court of chancery, though he continued to go on the western circuit. In the following year he established his reputation as an equity lawyer in a case in which Sir Robert Walpole's family was interested, by an argument displaying profound learning and research concerning the jurisdiction of the chancellor, on lines which he afterwards more fully developed in a celebrated letter to Lord Kames on the distinction between law and equity. Through Macclesfield's influence with the duke of Newcastle Yorke entered parliament in 1719 as member for Lewes, and was appointed solicitor-general, with a knighthood, in 1720, although he was then a barrister of only four years' standing. His conduct of the prosecution of Christopher Layer in that year for treason as a Jacobite further raised Sir Philip Yorke's reputation as a forensic orator; and in 1723, having already become attorney-general, he passed through the House of Commons the bill of pains and penalties against Bishop Atterbury. He was excused, on the ground of his personal friendship, from acting for the crown in the impeachment of Macclesfield in 1725, though he did not exert himself to save his patron from disgrace largely brought about by Macclesfield's partiality for Yorke himself. He soon found a new and still more influential patron in the duke of Newcastle, to whom he henceforth gave his political support. He rendered valuable service to Walpole's government by his support of the bill for prohibiting loans to foreign powers (1730), of the increase of the army (1732) and of the excise bill (1733). In 1733 Yorke was appointed lord chief justice of the king's bench, with the title of Lord Hardwicke, and was sworn of the privy council; and in 1737 he succeeded Talbot as lord chancellor, thus becoming a member of Sir Robert Walpole's cabinet. One of his first official acts was to deprive the poet Thomson of a small office conferred on him by Talbot.

Hardwicke's political importance was greatly increased by his removal to the House of Lords, where the incompetency of Newcastle threw on the chancellor the duty of defending the measures of the government. He resisted Carteret's motion to reduce the army in 1738, and the resolutions hostile to Spain over the affair of Captain Jenkins's ears. But when Walpole bent before the storm and declared war against Spain, Hardwicke advocated energetic measures for its conduct; and he tried to keep the peace between Newcastle and Walpole. There is no sufficient ground for Horace Walpole's charge that the fall of Sir Robert was brought about by Hardwicke's treachery. No one was more surprised than himself when he retained the

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chancellorship in the following administration, and he resisted the proposal to indemnify witnesses against Walpole in one of his finest speeches in May 1742. He exercised a leading influence in the Wilmington Cabinet; and when Wilmington died in August 1743, it was Hardwicke who put forward Henry Pelham for the vacant office against the claims of Pulteney. For many years from this time he was the controlling power in the government. During the king's absences on the continent Hardwicke was left at the head of the council of regency; it thus fell to him to concert measures for dealing with the Jacobite rising in 1745. He took a just view of the crisis, and his policy for meeting it was on the whole statesmanlike. After Culloden he presided at the trial of the Scottish Jacobite peers, his conduct of which, though judicially impartial, was neither dignified nor generous; and he must be held partly responsible for the unnecessary severity meted out to the rebels, and especially for the cruel, though not illegal, executions on obsolete attainders of Charles Radclife and (in 1753) of Archibald Cameron. He carried, however, a great reform in 1746, of incalculable benefit to Scotland, which swept away the grave abuses of feudal power surviving in that country in the form of private heritable jurisdictions in the hands of the landed gentry. On the other hand his legislation in 1748 for disarming the Highlanders and prohibiting the use of the tartan in their dress was vexatious without being effective. Hardwicke supported Chesterfield's reform of the calendar in 1751; in 1753 his bill for legalizing the naturalization of Jews in England had to be dropped on account of the popular clamour it excited; but he successfully carried a salutary reform of the marriage law, which became the basis of all subsequent legislation on the subject.

On the death of Pelham in 1754 Hardwicke obtained for Newcastle the post of prime minister, and for reward was created earl of Hardwicke and Viscount Royston; and when in November 1756 the weakness of the ministry and the threatening aspect of foreign affairs compelled Newcastle to resign, Hardwicke retired with him. He played an important and disinterested part in negotiating the coalition between Newcastle and Pitt in 1757, when he accepted a seat in Pitt's cabinet without returning to the woolsack. After the accession of George III. Hardwicke opposed the ministry of Lord Bute on the peace with France in 1762, and on the cider tax in the following year. In the Wilkes case Hardwicke condemned general warrants, and also the doctrine that seditious libels published by members of parliament were protected by parliamentary privilege. He died in London on the 6th of March 1764.

Although for a lengthy period Hardwicke was an influential minister, he was not a statesman of the first rank. On the other hand he was one of the greatest judges who ever sat on the English bench. He did not, indeed, by his three years' tenure of the chief-justiceship of the king's bench leave any impress on the common law; but Lord Campbell pronounces him "the most consummate judge who ever sat in the court of chancery, being distinguished not only for his rapid and satisfactory decision of the causes which came before him, but for the profound and enlightened principles which he laid down, and for perfecting English equity into a systematic science." He held the office of lord chancellor longer than any of his predecessors, with a single exception; and the same high authority quoted above asserts that as an equity judge Lord Hardwicke's fame "has not been exceeded by that of any man in ancient or modern times. His decisions have been, and ever will continue to be, appealed to as fixing the limits and establishing the principles of the great juridical system called Equity, which now not only in this country and in our colonies, but over the whole extent of the United States of America, regulates property and personal rights more than the ancient common law."[1] Hardwicke had prepared himself for this great and enduring service to English jurisprudence by study of the historical foundations of the chancellor's equitable jurisdiction, combined with profound insight into legal principle, and a thorough knowledge of the Roman civil law, the principles of which he scientifically incorporated into his administration of English equity in the absence of precedents bearing on the causes submitted to his judgment. His decisions on particular points in dispute were based on general principles, which were neither so wide as to prove inapplicable to future circumstances, nor too restricted to serve as the foundation for a coherent and scientific system. His recorded judgments—which, as Lord Campbell observes, "certainly do come up to every idea we can form of judicial excellence"—combine luminous method of arrangement with elegance and lucidity of language.

Nor was the creation of modern English equity Lord Hardwicke's only service to the administration of justice. Born within two years of the death of Judge Jeffreys his influence was powerful in obliterating the evil traditions of the judicial bench under the Stuart monarchy, and in establishing the modern conception of the duties and demeanour of English judges. While still at the bar Lord Chesterfield praised his conduct of crown prosecutions as a contrast to the former "bloodhounds of the crown"; and he described Sir Philip Yorke as "naturally humane, moderate and decent." On the bench he had complete control over his temper; he was always urbane and decorous and usually dignified. His exercise of legal patronage deserves unmixed praise. As a public man he was upright and, in comparison with most of his contemporaries, consistent. His domestic life was happy and virtuous. His chief fault was avarice, which perhaps makes it the more creditable that, though a colleague of Walpole, he was never suspected of corruption. But he had a keen and steady eye to his own advantage, and he was said to be jealous of all who might become his rivals for power. His manners, too, were arrogant. Lord Waldegrave said of Hardwicke that "he might have been thought a great man had he been less avaricious, less proud, less unlike a gentleman." Although in his youth he contributed to the *Spectator* over the signature "Philip Homebred," he seems early to have abandoned all care for literature, and he has been reproached by Lord Campbell and others with his neglect of art and letters. He married, on the 16th of May 1719, Margaret, daughter of Charles Cocks (by his wife Mary, sister of Lord Chancellor Somers), and widow of John Lygon, by whom he had five sons and two daughters. His eldest daughter, Elizabeth, married Lord Anson; and the second, Margaret, married Sir Gilbert Heathcote. Three of his younger sons attained some distinction. Charles Yorke (*q.v.*), the second son, became like his father lord chancellor; the third, Joseph, was a diplomatist, and was created Lord Dover; while James, the fifth son, became bishop of Ely.

Hardwicke was succeeded in the earldom by his eldest son, PHILIP YORKE (1720–1795), 2nd earl of Hardwicke, born on the 19th of March 1720, and educated at Cambridge. In 1741 he became a fellow of the Royal Society. With his brother, Charles Yorke, he was one of the chief contributors to *Athenian Letters; or the Epistolary Correspondence of an agent of the King of Persia residing at Athens during the Peloponnesian War* (4 vols., London, 1741), a work that for many years had a considerable vogue and went through several editions. He sat in the House of Commons as member for Reigate (1741–1747), and afterwards for Cambridgeshire; and he kept notes of the debates which were afterwards embodied in Cobbett's *Parliamentary History*. He was styled Viscount Royston from 1754 till 1764, when he succeeded to the earldom. In politics he supported the Rockingham Whigs. He held the office of teller of the exchequer, and was lord-lieutenant of Cambridgeshire and high steward of Cambridge University. He edited a quantity of miscellaneous state papers and correspondence, to be found in MSS. collections in the British Museum. He died in London, on the 16th of May 1790. He married Jemima Campbell, only daughter of John, 3rd earl of Breadalbane, and granddaughter and heiress of Henry de Grey, duke of Kent, who became in her own right marchioness de Grey.

In default of sons, the title devolved on his nephew, PHILIP

[1] Lord Campbell, *Lives of the Lord Chancellors*, v. 43 (London, 1846).

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YORKE (1757–1834), 3rd earl of Hardwicke, eldest son of Charles Yorke, lord chancellor, by his first wife, Catherine Freman, who was born on the 31st of May 1757 and was educated at Cambridge. He was M.P. for Cambridgeshire, following the Whig traditions of his family; but after his succession to the earldom in 1790 he supported Pitt, and took office in 1801 as lord lieutenant of Ireland (1801–1806), where he supported Catholic emancipation. He was created K.G. in 1803, and was a fellow of the Royal Society. He married Elizabeth, daughter of James Lindsay, 5th earl of Balcarres, in 1782, but left no son.

He was succeeded in the peerage by his nephew, CHARLES PHILIP YORKE (1790–1873), 4th earl of Hardwicke, English admiral, eldest son of Admiral Sir Joseph Sydney Yorke (1768–1831), who was second son of Charles Yorke, lord chancellor, by his second wife, Agneta Johnson. Charles Philip was born at Southampton on the 2nd of April 1790 and was educated at Harrow. He entered the royal navy in 1815, and served on the North American station and in the Mediterranean, attaining the rank of captain in 1825. He represented Reigate (1831) and Cambridgeshire (1832–1834) in the House of Commons; and after succeeding to the earldom in 1834, was appointed a lord in waiting by Sir Robert Peel in 1841. In 1858 he retired from the active list with the rank of rear-admiral, becoming vice-admiral in the same year, and admiral in 1863. He was a member of Lord Derby's cabinet in 1852 as postmaster-general and lord privy seal in 1858. In 1833 he married Susan, daughter of the 1st Lord Ravensworth, by whom he had five sons and three daughters. His eldest son, CHARLES PHILIP YORKE (1836–1897), 5th earl of Hardwicke, was comptroller of the household of Queen Victoria (1866–1868) and master of the buckhounds 1874–1880). He married in 1863, Sophia Georgiana, daughter of the 1st Earl Cowley. He was succeeded by his only son ALBERT EDWARD PHILIP HENRY YORKE (1867–1904), 6th earl of Hardwicke, who, after holding the posts of under-secretary of state for India (1900–1903) and for war (1902–1903), died unmarried on the 29th of November 1904; the title then went to his uncle, JOHN MANNERS YORKE (1840–1909), 7th earl of Hardwicke, second son of Charles Philip, the 4th earl, who joined the royal navy and served in the Baltic and in the Crimea (1854–1855). This earl died on the 13th of March 1909 and was succeeded by his son Charles Alexander (b. 1869) as 8th earl.

The contemporary authorities for the life of Lord Chancellor Hardwicke are voluminous, being contained in the memoirs of the period and in numerous collections of correspondence in the British Museum. See, especially, the *Hardwicke Papers*; the *Stowe MSS.*; *Hist. MSS. Commission* Reports, 2, 4, 5, 6, 9, 10, 11); Horace Walpole, *Letters* (ed. by P. Cunningham, 9 vols., London, 1857–1859); *Letters to Sir H. Mann* (ed. by Lord Dover, 4 vols., London, 1833–1844), *Memoirs of the Reign of George II.* (ed. by Lord Holland, 2nd ed. revised, London, 1847); *Memoirs of the Reign of George III.* (ed. by G. F. R. Barker, 4 vols., London, 1894); *Catalogue of Royal and Noble Authors of England, Scotland and Ireland* (ed. by T. Park, 5 vols., London, 1806). Horace Walpole was violently hostile to Hardwicke, and his criticism, therefore, must be taken with extreme reserve. See also the earl Waldegrave, *Memoirs 1754–1758* (London, 1821); Lord Chesterfield, *Letters* (ed. by Lord Mahon, 5 vols., London, 1892); Richard Cooksey, *Essay on John, Lord Somers, and Philip, Earl of Hardwicke* (Worcester, 1792); William Coxe, *Memoirs of Sir R. Walpole* (4 vols., London, 1816); *Memoirs of the Administration of Henry Pelham* (2 vols., London, 1829); Lord Campbell, *Lives of the Lord Chancellors*, vol. v. (8 vols., London, 1845); Edward Foss, *The Judges of England*, vols. viii. and ix. (9 vols., London, 1848–1864); George Harris, *Life of Lord Chancellor Hardwicke, with Selections from his Correspondence, Diaries, Speeches and Judgments* (3 vols., London, 1847). The last-named work may be consulted for the lives of the 2nd and 3rd earls. For the 3rd earl see also the duke of Buckingham, *Memoirs of the Court and Cabinets of George III.* (4 vols., London, 1853–1855). For the 4th earl see *Charles Philip Yorke*, by his daughter, Lady Biddulph of Ledbury (1910). (R. J. M.)

HARDY, ALEXANDRE (1569?–1631), French dramatist, was born in Paris. He was one of the most fertile of all dramatic authors, and himself claimed to have written some six hundred plays, of which, however, only thirty-four are preserved. He seems to have been connected all his life with a troupe of actors headed by a clever comedian named Valleran-Lecomte, whom he provided with plays. Hardy toured the provinces with this company, which gave some representations in Paris in 1599 at the Hôtel de Bourgogne. Valleran-Lecomte occupied the same theatre in 1600–1603, and again in 1607, apparently for some years. In consequence of disputes with the Confrérie de la Passion, who owned the privilege of the theatre, they played elsewhere in Paris and in the provinces for some years; but in 1628, when they had long borne the title of "royal," they were definitely established at the Hôtel de Bourgogne. Hardy's numerous dedications never seem to have brought him riches or patrons. His most powerful friend was Isaac de Laffemas (d. 1657), one of Richelieu's most unscrupulous agents, and he was on friendly terms with the poet Théophile, who addressed him in some verses placed at the head of his *Théâtre* (1632), and Tristan l'Hermite had a similar admiration for him. Hardy's plays were written for the stage, not to be read; and it was in the interest of the company that they should not be printed and thus fall into the common stock. But in 1623 he published *Les Chastes et loyales amours de Théagène et Cariclée*, a tragi-comedy in eight "days" or dramatic poems; and in 1624 he began a collected edition of his works, *Le Théâtre d'Alexandre Hardy, parisien*, of which five volumes (1624–1628) were published, one at Rouen and the rest in Paris. These comprise eleven tragedies: *Dison se sacrifiant, Scédase ou l'hospitalité violée, Panthée, Méléagre, La Mort d'Achille, Coriolan, Marianne*, a trilogy on the history of Alexander, *Alcméon, ou la vengeance féminine*; five mythological pieces; thirteen tragi-comedies, among them *Gésippe*, drawn from Boccaccio; *Phraarte*, taken from Giraldi's *Cent excellentes nouvelles* (Paris, 1584); *Cornélie, La Force du sang, Félismène, La Belle Égyptienne*, taken from Spanish subjects; and five pastorals, of which the best is *Alphée, ou la justice d'amour*. Hardy's importance in the history of the French theatre can hardly be over-estimated. Up to the end of the 16th century medieval farce and spectacle kept their hold on the stage in Paris. The French classical tragedy of Étienne Jodelle and his followers had been written for the learned, and in 1628 when Hardy's work was nearly over and Rotrou was on the threshold of his career, very few literary dramas by any other author are known to have been publicly represented. Hardy educated the popular taste, and made possible the dramatic activity of the 17th century. He had abundant practical experience of the stage, and modified tragedy accordingly, suppressing chorus and monologue, and providing the action and variety which was denied to the literary drama. He was the father in France of tragi-comedy, but cannot fairly be called a disciple of the romantic school of England and Spain. It is impossible to know how much later dramatists were indebted to him in detail, since only a fraction of his work is preserved, but their general obligation is amply established. He died in 1631 or 1632.

The sources for Hardy's biography are extremely limited. The account given by the brothers Parfaict in their *Hist. du théâtre français* (1745, &c., vol. iv. pp. 2-4) must be received with caution, and no documents are forthcoming. Many writers have identified him with the provincial playwright picturesquely described in chap. xi. of *Le Page disgracié* (1643), the autobiography of Tristan l'Hermite, but if the portrait is drawn from life at all, it is more probably drawn from Théophile. See *Le Théâtre d'Alexandre Hardy*, edited by E. Stengel (Marburg and Paris, 1883–1884, 5 vols.); E. Lombard, "Étude sur Alexandre Hardy," in *Zeitschr. für neufrans. Spr. u. Lit.* (Berlin and Leipzig, 1911, vol. i. and ii.); 1880–1884, K. Nagel, *A. Hardy's Einfluss auf Pierre Corneille* (Marburg, 1884); and especially E. Rigal, *Alexandre Hardy . . .* (Paris, 1889) and *Le Théâtre français avant la période classique* (Paris, 1901.)

HARDY, THOMAS (1840–), English novelist, was born in Dorsetshire on the 2nd of June 1840. His family was one of the branches of the Dorset Hardys, formerly of influence in and near the valley of the Frome, claiming descent from John Le Hardy of Jersey (son of Clement Le Hardy, lieutenant-governor of that island in 1488), who settled in the west of England. His maternal ancestors were the Swetman, Childs or Child, and kindred families, who before and after 1635 were small landed proprietors in Melbury Osmond, Dorset, and adjoining parishes. He was educated at local schools, 1848–1854, and afterwards privately, and in 1856 was articled to Mr John Hicks, an

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ecclesiastical architect of Dorchester. In 1859 he began writing verse and essays, but in 1861 was compelled to apply himself more strictly to architecture, sketching and measuring many old Dorset churches with a view to their restoration. In 1862 he went to London (which he had first visited at the age of nine) and became assistant to the late Sir Arthur Blomfield, R.A. In 1863 he won the medal of the Royal Institute of British Architects for an essay on *Coloured Brick and Terra-cotta Architecture*, and in the same year won the prize of the Architectural Association for design. In March 1865 his first short story was published in *Chambers's Journal*, and during the next two or three years he wrote a good deal of verse, being somewhat uncertain whether to take to architecture or to literature as a profession. In 1867 he left London for Weymouth, and during that and the following year wrote a "purpose" story, which in 1869 was accepted by Messrs Chapman and Hall. The manuscript had been read by Mr George Meredith, who asked the writer to call on him, and advised him not to print it, but to try another, with more plot. The manuscript was withdrawn and re-written, but never published. In 1870 Mr Hardy took Mr Meredith's advice too literally, and constructed a novel that was all plot, which was published in 1871 under the title *Desperate Remedies*. In 1872 appeared *Under the Greenwood Tree*, a "rural painting of the Dutch school," in which Mr Hardy had already "found himself," and which he has never surpassed in happy and delicate perfection of art. *A Pair of Blue Eyes*, in which tragedy and irony come into his work together, was published in 1873. In 1874 Mr Hardy married Emma Lavinia, daughter of the late T. Attersoll Gifford of Plymouth. His first popular success was made by *Far from the Madding Crowd* (1874), which, on its appearance anonymously in the *Cornhill Magazine*, was attributed by many to George Eliot. Then came *The Hand of Ethelberta* (1876), described, not inaptly, as "a comedy in chapters"; *The Return of the Native* (1878), the most sombre and, in some ways, the most powerful and characteristic of Mr Hardy's novels; *The Trumpet-Major* (1880); *A Laodicean* (1881); *Two on a Tower* (1882), a long excursion in constructive irony; *The Mayor of Casterbridge* (1886); *The Woodlanders* (1887); *Wessex Tales* (1888); *A Group of Noble Dames* (1891); *Tess of the D'Urbervilles* (1891), Mr Hardy's most famous novel; *Life's Little Ironies* (1894); *Jude the Obscure* (1895), his most thoughtful and least popular book; *The Well-Beloved*, a reprint, with some revision, of a story originally published in the *Illustrated London News* in 1892 (1897); *Wessex Poems*, written during the previous thirty years, with illustrations by the author (1898); and *The Dynasts* (3 parts, 1904–1906). In 1909 appeared *Time's Laughing-stocks and other Verses*. In all his work Mr Hardy is concerned with one thing, seen under two aspects; not civilization, nor manners, but the principle of life itself, invisibly realized in humanity as sex, seen visibly in the world as what we call nature. He is a fatalist, perhaps rather a determinist, and he studies the workings of fate or law (ruling through inexorable moods or humours), in the chief vivifying and disturbing influence in life, women. His view of women is more French than English; it is subtle, a little cruel, not as tolerant as it seems, thoroughly a man's point of view, and not, as with Mr Meredith, man's and woman's at once. He sees all that is irresponsible for good and evil in a woman's character, all that is untrustworthy in her brain and will, all that is alluring in her variability. He is her apologist, but always with a reserve of private judgment. No one has created more attractive women of a certain class, women whom a man would have been more likely to love or to regret loving. In his earlier books he is somewhat careful over the reputation of his heroines; gradually he allows them more liberty, with a franker treatment of instinct and its consequences. *Jude the Obscure* is perhaps the most unbiassed consideration in English fiction of the more complicated questions of sex. There is almost no passion in his work, neither the author nor his characters ever seeming able to pass beyond the state of curiosity, the most intellectually interesting of limitations, under the influence of any emotion. In his feeling for nature, curiosity sometimes seems to broaden into a more intimate communion. The heath, the village with its peasants, the change of every hour among the fields and on the roads of that English countryside which he has made his own—the Dorsetshire and Wiltshire "Wessex"—mean more to him, in a sense, than even the spectacle of man and woman in their blind and painful and absorbing struggle for existence. His knowledge of woman confirms him in a suspension of judgment; his knowledge of nature brings him nearer to the unchanging and consoling element in the world. All the entertainment which he gets out of life comes to him from his contemplation of the peasant, as himself a rooted part of the earth, translating the dumbness of the fields into humour. His peasants have been compared with Shakespeare's; he has the Shakespearean sense of their placid vegetation by the side of hurrying animal life, to which they act the part of chorus, with an unconscious wisdom in their close, narrow and undistracted view of things. The order of merit was conferred upon Mr Hardy in July 1910.

See Annie Macdonell, *Thomas Hardy* (London, 1894); Lionel P. Johnson, *The Art of Thomas Hardy* (London, 1894). (A. Sy.)

HARDY, SIR THOMAS DUFFUS (1804–1878), English antiquary, was the third son of Major Thomas Bartholomew Price Hardy, and belonged to a family several members of which had distinguished themselves in the British navy. Born at Port Royal in Jamaica on the 22nd of May 1804, he crossed over to England and in 1819 entered the Record Office in the Tower of London. Trained under Henry Petrie (1768–1842) he gained a sound knowledge of palaeography, and soon began to edit selections of the public records. From 1861 until his death on the 15th of June 1878 he was deputy-keeper of the Record Office, which just before his appointment had been transferred to its new London headquarters in Chancery Lane. Hardy, who was knighted in 1873, had much to do with the appointment of the Historical Manuscripts Commission in 1869.

Sir T. Hardy edited the Close Rolls, *Rotuli litterarum clausarum, 1204–1227* (2 vols., 1833–1844), with an introduction entitled "A Description of the Close Rolls, with an Account of the early Courts of Law and Equity"; and the Patent Rolls, *Rotuli litterarum patentium, 1201–1216* (1835), with introduction, "A Description of the Patent Rolls, to which is added an Itinerary of King John." He also edited the *Rotuli de oblatis et finibus* (1835), which deal also with the time of King John; the *Rotuli Normanniae, 1200–1205*, and *1417–1418* (1835), containing letters and grants of the English kings concerning the duchy of Normandy; the Charter Rolls, *Rotuli chartarum, 1199–1216* (1837), giving with this work an account of the structure of charters; the Liberate Rolls, *Rotuli de liberate ac de misis et praestitis regnante Johanne* (1844); and the *Modus tenendi parliamentum*, with a translation (1846). He wrote *A Catalogue of Lords Chancellors, Keepers of the Great Seal, Masters of the Rolls and Officers of the Court of Chancery* (1843); the preface to Henry Petrie's *Monumenta historica Britannica* (1848); and *Descriptive Catalogue of Materials relating to the History of Great Britain and Ireland* (3 vols., 1862–1871). He edited William of Malmesbury's *De gestis regum anglorum* (2 vols., 1840); he continued and corrected John le Neve's *Fasti ecclesiae Anglicanae* (3 vols., Oxford, 1854); and with C. T. Martin he edited and translated *L'Estorie des Engles* of Geoffrey Gaimar (1888–1889). He wrote *Syllabus in English of Documents in Rymer's Foedera* (3 vols., 1869–1885), and gave an account of the history of the public records from 1837 to 1851 in his *Memoirs of the Life of Henry, Lord Langdale* (1852), Lord Langdale (1783–1851), master of the rolls from 1836 to 1851, being largely responsible for the erection of the new Record Office. Hardy took part in the controversy about the date of the Athanasian creed, writing *The Athanasian Creed in connection with the Utrecht Psalter* (1872); and *Further Report on the Utrecht Psalter* (1874).

His younger brother, SIR WILLIAM HARDY (1807–1887), was also an antiquary. He entered the Record Office in 1823, leaving it in 1830 to become keeper of the records of the duchy of Lancaster. In 1868, when these records were presented by Queen Victoria to the nation, he returned to the Record Office as an assistant keeper, and in 1878 he succeeded his brother Sir Thomas as deputy-keeper, resigning in 1886. He died on the 17th of March 1887.

Sir W. Hardy edited Jehan de Waurin's *Recueil des croniques et anchiennes istories de la Grant Bretaigne* (5 vols., 1864–1891); and he translated and edited the *Charters of the Duchy of Lancaster* (1845).

HARDY, SIR THOMAS MASTERMAN, Bart. (1769–1839), British vice-admiral, of the Portisham (Dorsetshire) family of Hardy, was born on the 5th of April 1769, and in 1781 began

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his career as a sailor. He became lieutenant in 1793, and in 1796, being then attached to the "Minerve" frigate, attracted the attention of Nelson by his gallant conduct. He continued to serve with distinction, and in 1798 was promoted to be captain of the "Vanguard," Nelson's flagship. In the "St George" he did valuable work before the battle of Copenhagen in 1801, and his association with Nelson was crowned by his appointment in 1803 to the "Victory" as flag-captain, in which capacity he was engaged at the battle of Trafalgar in 1805, witnessed Nelson's will, and was in close attendance on him at his death. Hardy was created a baronet in 1806. He was then employed on the North American station, and later (1819), was made commodore and commander-in-chief on the South American station, where his able conduct came prominently into notice. In 1825 he became rear-admiral, and in December 1826 escorted the expeditionary force to Lisbon. In 1830 he was made first sea lord of the admiralty, being created G.C.B. in 1831. In 1834 he was appointed governor of Greenwich hospital, where thenceforward he devoted himself with conspicuous success to the charge of the naval pensioners; in 1837 he became vice-admiral. He died at Greenwich on the 20th of September 1839. In 1807 he had married Anne Louisa Emily, daughter of Sir George Cranfield Berkeley, under whom he had served on the North American station, and by her he had three daughters, the baronetcy becoming extinct.

See Marshall, *Royal Naval Biography*, ii. and iii.; Nicolas, *Despatches of Lord Nelson*; Broadley and Bartelot, *The Three Dorset Captains at Trafalgar* (1906), and *Nelson's Hardy, his Life, Letters and Friends* (1909).

HARDYNG or **HARDING, JOHN** (1378–1465), English chronicler, was born in the north, and as a boy entered the service of Sir Henry Percy (Hotspur), with whom he was present at the battle of Shrewsbury (1403). He then passed into the service of Sir Robert Umfraville, under whom he was constable of Warkworth Castle, and served in the campaign of Agincourt in 1415 and in the sea-fight before Harfleur in 1416. In 1424 he was on a diplomatic mission at Rome, where at the instance of Cardinal Beaufort he consulted the chronicle of Trogus Pompeius. Umfraville, who died in 1436, had made Hardyng constable of Kyme in Lincolnshire, where he probably lived till his death about 1465. Hardyng was a man of antiquarian knowledge, and under Henry V. was employed to investigate the feudal relations of Scotland to the English crown. For this purpose he visited Scotland, at much expense and hardship. For his services he says that Henry V. promised him the manor of Geddington in Northamptonshire. Many years after, in 1439, he had a grant of £10 a year for similar services. In 1457 there is a record of the delivery of documents relating to Scotland by Hardyng to the earl of Shrewsbury, and his reward by a further pension of £20. It is clear that Hardyng was well acquainted with Scotland, and James I. is said to have offered him a bribe to surrender his papers. But the documents, which are still preserved in the Record Office, have been shown to be forgeries, and were probably manufactured by Hardyng himself. Hardyng spent many years on the composition of a rhyming chronicle of England. His services under the Percies and Umfravilles gave him opportunity to obtain much information of value for 15th century history. As literature the chronicle has no merit. It was written and rewritten to suit his various patrons. The original edition ending in 1436 had a Lancastrian bias and was dedicated to Henry VI. Afterwards he prepared a version for Richard, duke of York (d. 1460), and the chronicle in its final form was presented to Edward IV. after his marriage to Elizabeth Woodville in 1464.

The version of 1436 is preserved in Lansdowne MS. 204, and the best of the later versions in Harley MS. 661, both in the British Museum. Richard Grafton printed two editions in January 1543, which differ much from one another and from the now extant manuscripts. Stow, who was acquainted with a different version, censured Grafton on this point somewhat unjustly. Sir Henry Ellis published the longer version of Grafton with some additions from the Harley MS. in 1812.

See Ellis' preface to Hardyng's *Chronicle*, and Sir F. Palgrave's *Documents illustrating the History of Scotland* (for an account of Hardyng's forgeries). (C. L. K.)

HARE, AUGUSTUS JOHN CUTHBERT (1834–1903), English writer and traveller, was born at Rome in 1834. He was educated at Harrow school and at University College, Oxford. His name is familiar as the author of a large number of guide-books to the principal countries and towns of Europe, most of which were written to order for John Murray. They were made up partly of the author's own notes of travel, partly of quotations from others' books taken with a frankness of appropriation that disarmed criticism. He also wrote *Memorials of a Quiet Life*—that of his aunt by whom he had been adopted when a baby (1872), and a tediously long autobiography in six volumes, *The Story of My Life*. He died at St Leonards-on-Sea on the 22nd of January 1903.

HARE, SIR JOHN (1844–), English actor and manager, was born in Yorkshire on the 16th of May 1844, and was educated at Giggleswick school, Yorkshire. He made his first appearance on the stage at Liverpool in 1864, coming to London in 1865, and acting for ten years with the Bancrofts. He soon made his mark, particularly in T. W. Robertson's comedies, and in 1875 became manager of the Court theatre. But it was in association with Mr and Mrs Kendal at the St James's theatre from 1879 to 1888 that he established his popularity in London, in important "character" and "men of the world" parts, the joint management of Hare and Kendal making this theatre one of the chief centres of the dramatic world for a decade. In 1889 he became lessee and manager of the Garrick theatre, where (though he was often out of the cast) he produced several important plays, such as Pinero's *The Profligate* and *The Notorious Mrs Ebbsmith*, and had a remarkable personal success in the chief part in Sydney Grundy's *A Pair of Spectacles*. In 1897 he took the Globe theatre, where his acting in Pinero's *Gay Lord Quex* was another personal triumph. He became almost as well known in the United States as in England, his last tour in America being in 1900 and 1901. He was knighted in 1907.

HARE, JULIUS CHARLES (1795–1855), English theological writer, was born at Valdagno, near Vicenza, in Italy, on the 13th of September 1795. He came to England with his parents in 1799, but in 1804–1805 spent a winter with them at Weimar, where he met Goethe and Schiller, and received a bias to German literature which influenced his style and sentiments throughout his whole career. On the death of his mother in 1806, Julius was sent home to the Charterhouse in London, where he remained till 1812, when he entered Trinity College, Cambridge. There he became fellow in 1818, and during this time spent abroad he began to read law in London in the following years. From 1822 to 1832 he was assistant-tutor at Trinity College. Turning his attention from law to divinity, Hare took priest's orders in 1826; and, on the death of his uncle in 1832, he succeeded to the rich family living of Hurstmonceaux in Sussex, where he accumulated a library of some 12,000 volumes, especially rich in German literature. Before taking up residence in his parish he once more went abroad, and made in Rome the acquaintance of the Chevalier Bunsen, who afterwards dedicated to him part of his work, *Hippolytus and his Age*. In 1840 Hare was appointed archdeacon of Lewes, and in the same year preached a course of sermons at Cambridge (*The Victory of Faith*), followed in 1846 by a second, *The Mission of the Comforter*. Neither series when published attained any great popularity. Archdeacon Hare married in 1844 Esther, a sister of his friend Frederick Maurice. In 1851 he was collated to a prebend in Chichester; and in 1853 he became one of Queen Victoria's chaplains. He died on the 23rd of January 1855.

Julius Hare belonged to what has been called the "Broad Church party," though some of his opinions approach very closely to those of the Evangelical Arminian school, while others again seem vague and undecided. He was one of the first of his countrymen to recognize and come under the influence of German thought and speculation, and, amidst an exaggerated alarm of German heresy, did much to vindicate the authority of the sounder German critics. His writings, which are chiefly theological and controversial, are largely formed of charges to his clergy, and sermons on different topics; but, though valuable and full of thought, they lose some of their force by the cumbrous German structure of the sentences, and by certain orthographical peculiarities in which the author

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indulged. In 1827 *Guesses at Truth by Two Brothers*[1] appeared. Hare assisted Thirlwall, afterwards bishop of St David's, in the translation of the 1st and 2nd volumes of Niebuhr's *History of Rome* (1828 and 1832), and published a *Vindication of Niebuhr's History* in 1829. He wrote many similar works, among which is a *Vindication of Luther against his recent English Assailants* (1854). In 1865 he edited the *Remains of John Sterling*, who had formerly been his curate. Carlyle's *Life of John Sterling* was written through dissatisfaction with the "Life" prefixed to Archdeacon Hare's book. *Memorials of a Quiet Life*, published in 1872, contain accounts of the Hare family.

HARE, the name of the well-known English rodent now designated *Lepus europaeus* (although formerly termed, incorrectly, *L. timidus*). In a wider sense the name includes all the numerous allied species which do not come under the designation of rabbits (see RABBIT). Over the greater part of Europe, where the ordinary species (fig. 1) does not occur, its place is taken by the closely allied Alpine, or mountain hare (fig. 2), the true *L. timidus* of Linnaeus, and the type of the genus *Lepus* and the family *Leporidae* (see RODENTIA). The second is a smaller animal than the first, with a more rounded and relatively smaller head, and the ears, hind-legs and tail shorter. In Ireland and the southern districts of Sweden it is permanently of a light fulvous grey colour, with black tips to the ears, but in more northerly districts the fur—except the black ear-tips—changes to white in winter, and still farther north the animal appears to be white at all seasons of the year. The range of the common or brown hare, inclusive of its local races, extends from England across southern and central Europe to the Caucasus; while that of the blue or mountain species, likewise inclusive of local races, reaches from Ireland, Scotland and Scandinavia through northern Europe and Asia to Japan and Kamchatka, and thence to Alaska.

The brown hare is a night-feeding animal, remaining during the day on its "form," as the slight depression is called which it makes in the open field, usually among grass. This it leaves at nightfall to seek fields of young wheat and other cereals whose tender herbage forms its favourite food. It is also fond of gnawing the bark of young trees, and thus often does great damage to plantations. In the morning it returns to its form, where it finds protection in the close approach which the colour of its fur makes to that of its surroundings; should it thus fail, however, to elude observation it depends for safety on its extra-

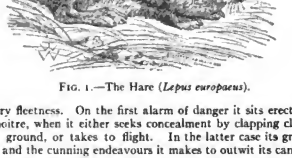

FIG. 1.—The Hare (*Lepus europaeus*).

ordinary fleetness. On the first alarm of danger it sits erect to reconnoitre, when it either seeks concealment by clapping close to the ground, or takes to flight. In the latter case its great speed, and the cunning endeavours it makes to outwit its canine pursuers, form the chief attractions of coursing. The hare takes readily to the water, where it swims well; an instance having been recorded in which one was observed crossing an arm of the sea about a mile in width. Hares are remarkably prolific, pairing when scarcely a year old, and the female bringing forth several broods in the year, each consisting of from two to five leverets (from the Fr. *lièvre*), as the young are called. These are born covered with hair and with the eyes open, and after being suckled for a month are able to look after themselves. In Europe this species has seldom bred in confinement, although an instance has recently been recorded. It will interbreed with the blue hare. Hares (and rabbits) have a cosmopolitan distribution with the exception of Madagascar and Australasia; and are now divided into numerous genera and subgenera, mentioned in the article

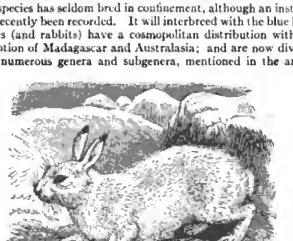

FIG. 2.—The Blue or Mountain Hare (*Lepus timidus*) in winter dress.

RODENTIA. Reference may here be made to a few species. Asia is the home of numerous species, of which the common Indian *L. ruficaudatus* and the black-necked hare *L. nigricollis*, are inhabitants of the plains of India; the latter taking its name from a black patch on the neck. In Assam there is a small spiny hare (*Caprolagus hispidus*), with the habits of a rabbit; and an allied species (*Nesolagus nitscheri*) inhabits Sumatra, and a third (*Pentalagus furnessi*) the Liu-kiu Islands. The plateau of Tibet is very rich in species, among which *L. hypsibius* is very common.

Of African species, the Egyptian Hare (*L. aegyptius*) is a small animal, with long ears and pale fur; and in the south there are the Cape hare (*L. capensis*), the long-eared rock-hare (*L. saxatilis*) and the diminutive *Pronolagus crassicaudatus*, characterized by its thick red tail.

North America is the home of numerous hares, some of which are locally known as "cotton-tails" and others as "jack-rabbits." The most northern are the Polar hare (*L. arcticus*), the Greenland hare (*L. groenlandicus*) and the Alaska hare (*L. timidus tschuktschorum*), all allied to the blue hare. Of the others, two, namely the large prairie-hare (*L. campestris*) and the smaller varying hare (*L. [Poecilolagus] americanus*), turn white in winter; the former having long ears and the whole tail white, whereas in the latter the ears are shorter and the upper surface of the tail is dark. Of those which do not change colour, the wood-hare, grey-rabbit or cotton-tail, *Sylvilagus floridanus*, is a southern form, with numerous allied kinds. Distantly allied to the prairie-hare or white-tailed jack-rabbit, are several forms distinguished by having a more or less distinct black stripe on the upper surface of the tail. These include a buff-bellied species found in California, N. Mexico and S.W. Oregon (*L. [Macrolagus] californicus*), a large, long-legged form from S. Arizona and Sonora (*L. [M.] alleni*), the Texan jack-rabbit (*L. [M.] texanus*) and the black-eared hare (*L. [M.] melanotis*) of the Great Plains, which differs from the third only by its shorter ears and richer coloration. In S. America, the small tapiti or Brazilian hare (*Sylvilagus brasiliensis*) is nearly allied to the wood-hare, but has a yellowish brown under surface to the tail.

See also COURSING. (R. L.*)

HAREBELL (sometimes wrongly written HAIRBELL), known also as the blue-bell of Scotland, and witches' thimbles, a well-known perennial wild flower, *Campanula rotundifolia*, a

[1] Julius Hare's co-worker in this book was his brother Augustus William Hare (1792–1834), who, after a distinguished career at Oxford, was appointed rector of Alton Barnes, Wiltshire. He died prematurely at Rome in 1834. He was the author of *Sermons to a Country Congregation*, published in 1837.

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member of the natural order Campanulaceae. The harebell has a very slender slightly creeping root-stock, and a wiry, erect stem. The radical leaves, that is, those at the base of the stem, to which the specific name *rotundifolia* refers, have long stalks, and are roundish or heart-shaped with crenate or serrate margin; the lower stem leaves are ovate or lanceolate, and the upper ones linear, subsessile, acute and entire, rarely pubescent. The flowers are slightly drooping, arranged in a panicle, or in small specimens single, having a smooth calyx, with narrow pointed erect segments, the corolla bell-shaped, with slightly recurved segments, and the capsule nodding, and opening by pores at the base. There are two varieties:—(*a*) *genuina*, with slender stem leaves, and (*b*) *montana*, in which the lower stem-leaves are broader and somewhat elliptical in shape. The plant is found on heaths and pastures throughout Great Britain and flowers in late summer and in autumn; it is widely spread in the north temperate zone. The harebell has ever been a great favourite with poets, and on account of its delicate blue colour has been considered as an emblem of purity.

Harebell (*Campanula rotundifolia*).

HAREM, less frequently HARAM or HARIM (Arab *harim*—commonly but wrongly pronounced hārēm— "that which is illegal or prohibited"), the name generally applied to that part of a house in Oriental countries which is set apart for the women; it is also used collectively for the women themselves. Strictly the women's quarters are the *haremlik* (*lik*, belonging to), as opposed to *selamlik* the men's quarters, from which they are in large houses separated by the *mabein*, the private apartments of the householder. The word *harem* is strictly applicable to Mahommedan households only, but the system is common in greater or less degree to all Oriental communities, especially where polygamy is permitted. Other names for the women's quarters are Seraglio (Ital. *serraglio*, literally an enclosure, from Lat. *sera*, a bar; wrongly narrowed down to the sense of harem through confusion with Turkish *serāi* or *sarāi*, palace or large building, cf. *caravan-serai*); Zenana (strictly *zanana*, from Persian *zan*, woman, allied with Gr. γυνή), used specifically of Hindu harems; Andarūn (or Anderoun), the Persian word for the "inner part" (*sc.* of a house). The Indian harem system is also commonly known as *purdah* or *purdah*, literally the name of the thick curtains or blinds which are used instead of doors to separate the women's quarters from the rest of the house. A male doctor attending a zenana lady would put his hand between the *purdah* to feel her pulse.

The seclusion of women in the household is fundamental to the Oriental conception of the sex relation, and its origin must, therefore, be sought far earlier than the precepts of Islam as set forth in the Koran, which merely regulate a practically universal Eastern custom.[1] It is inferred from the remains of many ancient Oriental palaces (Babylonian, Persian, &c.) that kings and wealthy nobles devoted a special part of the palace to their womankind. Though in comparatively early times there were not wanting men who regarded polygamy as wrong (*e.g.* the prophets of Israel), nevertheless in the East generally there has never been any real movement against the conception of woman as a chattel of her male relatives. A man may have as many wives and concubines as he can support, but each of these women must be his exclusive property. The object of this insistence upon female chastity is partly the maintenance of the purity of the family with special reference to property, and partly to protect women from marauders, as was the case with the people of India when the Mahommedans invaded the country and sought for women to fill their harems. In Mahommedan countries theoretically a woman must veil her face to all men except her father, her brother and her husband; any violation of this rule is still regarded by strict Mahommedans as the gravest possible offence, though among certain Moslem communities (*e.g.* in parts of Albania) women of the poorer classes may appear in public unveiled. If any other man make his way into a harem he may lose his life; the attempted escape of a harem woman is a capital offence, the husband having absolute power of life and death, to such an extent that, especially in the less civilized parts of the Moslem world, no one would think of questioning a man's right to mutilate or kill a disobedient wife or concubine.

Turkish Harems.—A good deal of misapprehension, due to ignorance combined with strong prejudice against the whole system, exists in regard to the system in Turkey. It is often assumed, for example, that the sultan's seraglio is typical, though on a uniquely large scale, of all Turkish households, and as a consequence that every Turk is a polygamist. This is far from being the case, for though the Koran permits four wives, and etiquette allows the sultan seven, the man of average possessions is perforce content with one, and a small number of female servants. It is, therefore, necessary to take the imperial seraglio separately.

Though the sultan's household in modern times is by no means as numerous as it used to be, it is said that the harem of Abdul Hamid contained about 1000 women, all of whom were of slave origin. This body of women form an elaborately organized community with a complete system of officers, disciplinary and administrative, and strict distinctions of status. The real ruler of this society is the sultan's mother, the *Sultana Validé*, who exercises her authority through a female superintendent, the *Kyahya Khatun*. She has also a large retinue of subordinate officials (*Kalfas*) ranging downwards from the *Hasnadar ousta* ("Lady of the Treasury") to the "Mistress of the Sherbets" and the "Chief Coffee Server." Each of these officials has under her a number of pupil-slaves (*alaiks*), whom she trains to succeed her if need be, and from whom the service is recruited. After the sultana validé (who frequently enjoys considerable political power and is a mistress of intrigue) ranks the mother of the heir-apparent; she is called the *Bash Kadin Effendi* ("Her excellency the Chief Lady"), and also *hasseki* or *hasseky*, and is distinguished from the other three chief wives who only bear the title *Kadin Effendi*. Next come the ladies who have borne the younger children of the sultan, the *Hanum Effendis*, and after them the so-called Odalisks or Odaliasques (a perversion of *odalik*, from *odah*, chamber). These are subdivided, according to the degree of favour in which they stand with the sultan or padishah, into *Ikbals* ("Favourites") and *Geuzdés* (literally the "Eyed" ones), those whom the sultan has favourably noticed in the course of his visits to the apartments of his wives or his mother. All the women are at the disposal of the sultan, though it is contrary to etiquette for him actually to select recruits for his harem. The numbers are kept up by his female relatives and state officials, the latter of whom present girls annually on the evening before the 15th of Ramadan.

Every odalisk who has been promoted to the royal couch receives a *deira*, consisting of an allowance of money, a suite of apartments, and a retinue, in proportion to her status. It should be noted that, since all the harem women are slaves, the sultans, with practically no exceptions, have never entered into legal marriage contracts. Any slave, in however menial a position, may be promoted to the position of a kadin effendi. Hence all the slaves who have any pretension to beauty are carefully trained, from the time they enter the harem, in deportment, dancing, music and the arts of the toilette: they are instructed in the Moslem religion and learn the daily prayers (*namaz*); a certain number are specially trained in reading and writing

[1] In Africa also, among the non-Mahommedan negroes of the west coast and the Bahima of the Victoria Nyanza, the seclusion of women of the upper classes has been practised in states (*e.g.* Ashanti and Huganda) possessing a considerable degree of civilization.

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for secretarial work. Discipline is strict, and continued disobedience leads to corporal punishment by the eunuchs. All the women of the harem are absolutely under the control of the sultana validé (who alone of the harem of her dead husband is not sent away to an older palace when her son succeeds), and owe her the most profound respect, even to the point of having to obtain permission to leave their own apartments. Her financial secretary, the *Haznadar Ousta*, succeeds to her power if she dies. The sultan's foster-mother also is a person of importance, and is known as the *Taia Kadin*.

The security of the harem is in the hands of a body of eunuchs both black and white. The white eunuchs have charge of the outer gates of the seraglio, but they are not allowed to approach the women's apartments, and obtain no posts of distinction. their chief, however, the *kapu aghasi* ("master of the gates") has part control over the ecclesiastical possessions, and even the vizier cannot enter the royal apartments without his permission. The black eunuchs have the right of entering the gardens and chambers of the harem. Their chief, usually called the *kislar aghasi* ("master of the maidens"), though his true title is *darus skadet aga* ("chief of the abode of felicity"), is an official of high importance. His appointment is for life. If he is deprived of his post he receives his freedom; and if he resigns of his own accord he is generally sent to Egypt with a pension of 100 francs a day. His secretary keeps count of the revenues of the mosques built by the sultans. He is usually succeeded by the second eunuch, who bears the title of treasurer, and has charge of the jewels, &c., of the women. The number of eunuchs is always a large one. The sultana validé and the sultana hasseki have each fifty at their service, and others are assigned to the kadins and the favourite odalisks.

The ordinary middle-class household is naturally on a very different scale. The *selamlik* is on the ground floor with a separate entrance, and there the master of the house receives his male guests; the rest of the ground floor is occupied by the kitchen and perhaps the stables. The *haremlik* is generally (in towns at least) on the upper floor fronting on and slightly overhanging the street; it has a separate entrance, courtyard and garden. The windows are guarded by lattices pierced with circular holes through which the women may watch without being seen. Communication with the *haremlik* is effected by a locked door, of which the Effendi keeps the key and also by a sort of revolving cupboard (*dutap*) for the conveyance of meals. The furniture, of the old-fashioned harems at least, is confined to divans, rugs, carpets and mirrors. For heating purposes the old brass tray of charcoal and wood ash is giving way to American stoves, and there is a tendency to import French furniture and decoration without regard to their suitability.

The presence of a second wife is the exception, and is generally attributable to the absence of children by the first wife. The expense of marrying a free woman leads many Turks to prefer a slave woman who is much more likely to be an amenable partner. If a slave woman bears a child she is often set free and then the marriage ceremony is gone through.

The harem system is, of course, wholly inconsistent with any high ideal of womanhood. Certain misapprehensions, however, should be noticed. The depravity of the system and the vapid idleness of harem life are much exaggerated by observers whose sympathies are wholly against the system. In point of fact much depends on the individuals. In many households there exists a very high degree of mutual consideration and the standard of conduct is by no means degraded. Though a woman may not be seen in the streets without the *yashmak* which covers her face except for her eyes, and does not leave her house except by her husband's permission, none the less in ordinary households the harem ladies frequently drive into the country and visit the shops and public baths. Their seclusion has very considerable compensations, and legally they stand on a far better basis in relation to their husbands than do the women of monogamous Christian communities. From the moment when a woman, free or slave, enters into any kind of wifely relation with a man, she has a legally enforceable right against him both for her own and for her children's maintenance. She has absolute control over her personal property whether in money, slaves or goods; and, if divorce is far easier in Islam than in Christendom, still the marriage settlement must be of such amount as will provide suitable maintenance in that event.

On the other hand, of course, the system is open to the gravest abuse, and in countries like Persia, Morocco and India, the life of Moslem women and slaves is often far different from that of middle class women of European Turkey, where law is strict and culture advanced. The early age at which girls are secluded, the dulness of their surroundings, and the low moral standard which the system produces react unfavourably not only upon their moral and intellectual growth but also upon their capacity for motherhood and their general physique. A harem woman is soon passée, and the lot of a woman past her youth, if she is divorced or a widow, is monotonous and empty. This is true especially of child-widows.

Since the middle of the 19th century familiarity with European customs and the direct influence of European administrators has brought about a certain change in the attitude of Orientals to the harem system. This movement is, however, only in its infancy, and the impression is still strong that the time is not ripe for reform. The Oriental women are in general so accustomed to their condition that few have any inclination to change it, while men as a rule are emphatically opposed to any alteration of the system. The Young Turkish party, the upper classes in Egypt, as also the Babists in Persia, have to some extent progressed beyond the orthodox conception of the status of women, but no radical reform has been set on foot.

In India various attempts have been made by societies, missionary and other, as well as by private individuals, to improve the lot of the zenana women. Zenana schools and hospitals have been founded, and a few women have been trained as doctors and lawyers for the special purposes of protecting the women against their own ignorance and inertia. Thus in 1905 a Parsee Christian lady, Cornelia Sorabjee, was appointed by the Bengal government as legal adviser to the court of wards, so that she might give advice to the widowed mothers of minors within the harem walls. Similarly trained medical women are introduced into zenanas and harems by the Lady Dufferin Association for medical aid to Indian women. Gradually native Christian churches are making provision for the attendance of women at their services, though the sexes are rigorously kept apart. In India, as in Turkey, the introduction of Western dress and education has begun to create new ideas and ambitions, and not a few Eastern women have induced English women to enter the harems as companions, nurses and governesses. But training and environment are extremely powerful, and in some parts of the Mahommedan world, the supply of Asiatic, European and even American girls is so steady, that reform has touched only the fringe of the system.

Among the principal societies which have been formed to better the condition of Indian and Chinese women in general with special reference to the zenana system are the Church of England Zenana Missionary Society and the Zenana Bible and Medical Mission. Much information as to the medical, industrial and educational work done by these societies will be found in their annual reports and other publications. Among these are J. K. H. Denny's *Toward the Uprising*; Irene H. Barnes, *Behind the Purdah* (1897), an account of the former society's work; the general condition of Indian women is described in Mrs Marcus B. Fuller's *Wrongs of Indian Womanhood* (1900), and Maud Dover's *The Englishwoman in India* (1909); see also article MISSIONS.

AUTHORITIES.—The literature of the subject is very large, though a great deal of it is naturally based on insufficient evidence, and coloured by Western preposessions. Among useful works are A. van Sommer and Zwerner, *Our Moslem Sisters* (1907), a collection of essays by authors acquainted with various parts of the Mahommedan world and strongly opposed to the whole harem system; Mrs W. M. Ramsay, *Everyday Life in Turkey* (1897), cc. iv. and v., containing an account of a day in a harem near Afium-Kara-Hissar; cf. *e.g.* art. "Harem" in Hughes, *Dictionary of Islam*; Mrs S. Harvey's *Turkish Harems and Circassian Homes* (1871); for

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Mahomet's regulations, see R. Bosworth Smith's *Mohammed and Mohammedanism* (1889); for Egypt, Lane, *Manners and Customs of the Modern Egyptians* (1837); and E. Lott, *Harem Life in Egypt and Constantinople* (1869); for the sultan's household in the 18th century, Lady Wortley Montagu's *Letters*, with which may be compared S. Lane-Poole, *Turkey* (ed. 1909); G. Doryx, *La Femme turque* (1902); especially Lucy M. J. Garnett (with J. S. Stuart-Glennie), *The Women of Turkey* (London, 1901), and *The Turkish People* (London, 1909). For the attempts which have been made to modify and improve the Indian zenana system, see *e.g.* the report of the Dufferin Association and other official publications. Other information will be found in Hoffman's article in Ersch and Gruber's *Encyclopadie*; Flandin in *Revue des deux mondes* (1852) on the harem of the Persian prince Malik Kasim Mirza; the count de Beauvoir, in *Voyage round the World* (1870), on Javanese and Siamese harems; Hantzsche in *Zeitschrift für allgemeine Erdkunde* (Berlin, 1864). (J. M. M.)

HARFLEUR, a port of France in the department of Seine-Inférieure, about 6 m. E. of Havre by rail. Pop. (1906) 2864. It lies in the fertile valley of the Lézarde, at the foot of wooded hills not far from the north bank of the estuary of the Seine. The port, which had been rendered almost inaccessible owing to the deposits of the Lézarde, again became available on the opening of the Tancarville canal (1887) connecting it with the port of Havre and with the Seine. Vessels drawing 18 ft. can moor alongside the quays of the new port, which is on a branch of the canal, has some trade in coal and timber, and carries on fishing. The church of St Martin is the most remarkable building in the town, and its lofty stone steeple forms a landmark for the pilots of the river. It dates from the 15th and 16th centuries, but the great portal is the work of the 17th, and the whole has undergone modern restoration. Of the old castle there are only insignificant ruins, near which, in a fine park, stands the present castle, a building of the 17th century. The old ramparts of the town are now replaced by manufactories, and the fosses are transformed into vegetable gardens. There is a statue of Jean de Grouchy, lord of Montérollier, under whose leadership the English were expelled from the town in 1435. The industries include distilling, metal founding and the manufacture of oil and grease.

Harfleur is identified with *Caracotinum*, the principal port of the ancient Calates. In the middle ages, when its name, Herosfloth, Harofluet or Hareflot, was still sufficiently uncorrupted to indicate its Norman derivation, it was the principal seaport of north-western France. In 1415 it was captured by Henry V. of England, but when in 1435 the people of the district of Caux rose against the English, 104 of the inhabitants opened the gates of the town to the insurgents, and thus got rid of the foreign yoke. The memory of the deed was long perpetuated by the bells of St Martin's tolling 104 strokes. Between 1445 and 1449 the English were again in possession; but the town was recovered for the French by Dunois. In the 16th century the port began to dwindle in importance owing to the silting up of the Seine estuary and the rise of Havre. In 1562 the Huguenots put Harfleur to pillage, and its registers and charters perished in the confusion; but its privileges were restored by Charles IX. in 1568, and it was not till 1710 that it was subjected to the "taille."

HARIANA, a tract of country in the Punjab, India, once the seat of a flourishing Hindu civilization. It consists of a level upland plain, interspersed with patches of sandy soil, and largely overgrown with brushwood. The Western Jumna canal irrigates the fields of a large number of its villages. Since the 14th century Hissar has been the local capital. During the troubled period which followed on the decline of the Mogul empire, Hariana formed the battlefield where the Mahrattas, Bhattis and Sikhs met to settle their territorial quarrels. The whole country was devastated by the famine of 1783. In 1707–1708 Hariana was overrun by the famous Irish adventurer George Thomas, who established his capital at Hansi; in 1801 he was dispossessed by Sindhia's French general Perron; in 1803 Hariana passed under British rule. On the conquest of the Punjab Hariana was broken up into the districts of Hissar, Rohtak and Sirsa, which last has in its turn been divided between Hissar and Ferozepore.

HARINGTON, SIR JOHN (1561–1612), English writer, was born at Kelston, near Bath, in 1561. His father, John Harington, acquired considerable estates by marrying Etheldreda, a natural daughter of Henry VIII., and after his wife's death he was attached to the service of the Princess Elizabeth. He married Isabella Markham, one of her ladies, and on Mary's accession he and his wife were imprisoned in the Tower with the princess. John, the son of the second marriage, was Elizabeth's godson. He studied at Eton and at Christ's College, Cambridge, where he took the degree of M.A., his tutor being John Still, afterwards bishop of Bath and Wells, formerly reputed to be the author of *Gammer Gurton's Needle*. He came up to London about 1583 and was entered at Lincoln's Inn, but his talents marked him out for success at court rather than for a legal career. Tradition relates that he translated the story of Giocondo from Ariosto and was reproved by the queen for acquainting her ladies with so indiscreet a selection. He was to retire to his seat at Kelston until he completed the translation of the entire work. *Orlando Furioso* in English heroical verse was published in 1591 and reprinted in 1607 and 1634. Harington was high sheriff of Somerset in 1592 and received Elizabeth at his house during her western progress of 1591. In 1596 he published in succession *The Metamorphosis of Ajax*, *An Anatomie of the Metamorphosed Ajax*, and *Ulysses upon Ajax*, the three forming collectively a very absurd and indecorous work of a Pantagruelistic kind. An allusion to Leicester in this book threw the writer into temporary disgrace, but in 1598 he received a commission to serve in Ireland under Essex. He was knighted on the field, to the annoyance of Elizabeth. Harington saved himself from being involved in Essex's disgrace by writing an account of the Irish campaign which increased Elizabeth's anger against the unfortunate earl. Among some papers found in the chapter library at York was a *Tract on the Succession to the Crown* (1602), written by Harington to secure the favour of the new king, to whom he sent the gift of a lantern constructed to symbolize the waning glory of the late queen and James's own splendour. This pamphlet, which contains many details of great interest about Elizabeth and gives an unprejudiced sketch of the religious question, was edited for the Roxburghe Club in 1880 by Sir Clements Markham. Harington's efforts to win favour at the new court were unsuccessful. In 1605 he even asked for the office of chancellor of Ireland and proposed himself as archbishop. The document in which he preferred this extraordinary request was published in 1879 with the title of *A Short View of the State of Ireland written in 1605*. Harington was before his time in advocating a policy of generosity and conciliation towards that country. He eventually succeeded in obtaining a position as one of the tutors of Prince Henry, for whom he annotated Francis Godwin's *De praesulibus Angliae*. Harington's grandson, John Chetwind, found in this somewhat scandalous production an argument for the Presbyterian side, and published it in 1653, under the title of *A Briefe View of the State of the Church, &c.*

Harington died at Kelston on the 20th of November 1612. His *Epigrams* were printed in a collection entitled *Alcilia* in 1613, and separately in 1615. The translation of the *Orlando Furioso* was carried out with skill and perseverance. It is not to be supposed that Harington failed to realize the ironic quality of his original, but he treated it as a serious allegory to suit the temper of Queen Elizabeth's court. He was neither a very exact scholar nor a very poetical translator, and he cannot be named in the same breath with Fairfax. The *Orlando Furioso* was sumptuously illustrated, and to it was prefixed an *Apologie of Poetrie*, justifying the subject matter of the poem, and, among other technical matters, the author's use of disyllabic and trisyllabic rhymes, also a life of Ariosto compiled by Harington from various Italian sources. Harington's Rabelaisian pamphlets show that he was almost equally endowed with wit and indelicacy, and his epigrams are sometimes smart and always easy. His works include *The Englishman's Doctor, Or the School of Salerne* (1608), and *Nugæ antiquæ*, miscellaneous papers collected in 1779.

A biographical account of Harington is prefixed to the Roxburghe Club edition of his tract on the succession mentioned above.

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HARÎRÎ [Abû Mahommed ul-Qâsim ibn 'Ali ibn Mahommed al-Harîri, *i.e.* "the manufacturer or seller of silk"] (1054–1122), Arabian writer, was born at Basra. He owned a large estate with 18,000 date-palms at Mashân, a village near Basra. He is said to have occupied a government position, but devoted his life to the study of the niceties of the Arabic language. On this subject he wrote a grammatical poem the *Mulhat ul-'Irâb* (French trans. *Les Récréations grammaticales* with notes by L. Pinto, Paris 1885–1889; extracts in S. de Sacy's *Anthologie arabe*, pp. 143–151, Paris, 1829); a work on the faults of the educated called *Durrat ul-Ghawwâs* (ed. H. Thorbecke, Leipzig, 1871), and some smaller treatises such as the two letters on words containing the letters *sin* and *shin* (ed. in Arnold's *Chrestomathy*, pp. 202-9). But his fame rests chiefly on his fifty *maqâmas* (see ARABIA: *Literature*, section "Belles Lettres"). These were written in rhymed prose like those of Hamadhâni, and are full of allusions to Arabian history, poetry and tradition, and discussions of difficult points of Arabic grammar and rhetoric.

The Maqâmas have been edited with Arabic commentary by S. de Sacy (Paris, 1822, 2nd ed. with French notes by Reinaud and J. Derenbourg, Paris, 1853); with English notes by F. Steingass (London, 1896). An English translation with notes was made by T. Preston (London, 1850), and another by T. Chenery and F. Steingass (London, 1867 and 1898). Many editions have been published in the East with commentaries, especially with that of Sharishi (d. 1222). (G. W. T.)

HARI-RUD, a river of Afghanistan. It rises in the northern slopes of the Koh-i-Baba to the west of Kabul, and finally loses itself in the Tejend oasis north of the Trans-Caspian railway and west of Merv. It runs a remarkably straight course westward through a narrow trough from Daolatyar to Obeh, amidst the bleak wind-swept uplands of the highest central elevations in Afghanistan. From Obeh to Kuhsan 50 m. west of Herat, it forms a valley of great fertility, densely populated and highly cultivated; practically all its waters being drawn off for purposes of irrigation. It is the contrast between the cultivated aspect of the valley of Herat and the surrounding desert that has given Herat its great reputation for fertility. Three miles to the south of Herat the Kandahar road crosses the river by a masonry bridge of 26 arches now in ruins. A few miles below Herat the river begins to turn north-west, and after passing through a rich country to Kuhsan, it turns due north and breaks through the Paropamisan hills. Below Kuhsan it receives fresh tributaries from the west. Between Kuhsan and Zulfikar it forms the boundary between Afghanistan and Persia, and from Zulfikar to Sarakhs between Russia and Persia. North of Sarakhs it diminishes rapidly in volume till it is lost in the sands of the Turkman desert. The Hari-Rud marks the only important break existing in the continuity of the great central water-parting of Asia. It is the ancient Arius. (T. H. H.*)

HARISCHANDRA, in Hindu mythology, the 28th king of the Solar race. He was renowned for his piety and justice. He is the central figure of legends in the Aitareyabrahmana, Mahabharata and the Markandeyapurana. In the first he is represented as so desirous of a son that he vows to Varuna that if his prayer is granted the boy shall be eventually sacrificed to the latter. The child is born, but Harischandra, after many delays, arranges to purchase another's son and make a vicarious sacrifice. According to the Mahabharata he is at last promoted to Paradise as the reward for his munificent charity.

HARITH IBN HILLIZA UL-YASHKURÎ, pre-Islamic Arabian poet of the tribe of Bakr, famous as the author of one of the poems generally received among the *Mo'allakât* (*q.v.*). Nothing is known of the details of his life.

HARIZI, JUDAH BEN SOLOMON (13th cent.), called also AL-HARIZI, a Spanish Hebrew poet and traveller. He translated from the Arabic to Hebrew some of the works of Maimonides (*q.v.*) and also of the Arab poet Hariri. His own most considerable work was the *Tahkemoni*, composed between 1218 and 1220. This is written in Hebrew in unmetrical rhymes, in what is commonly termed "rhymed prose." It is a series of humorous episodes, witty verses, and quaint applications of Scriptural texts. The episodes are bound together by the presence of the hero and of the narrator, who is also the author. Harizi not only brought to perfection the art of applying Hebrew to secular satire, but he was also a brilliant literary critic and his *makame* on the Andalusian Hebrew poets is a fruitful source of information.

See, on the *Tahkemoni*, Kaempf, *Nicht-andalusische Poesie andalusischer Dichter* (Prague, 1858). In that work a considerable section of the *Tahkemoni* is translated into German. (I. A.)

HARKNESS, ALBERT (1822–1907), American classical scholar, was born at Mendon, Massachusetts, on the 6th of October 1822. He graduated at Brown University in 1842, taught in the Providence high school in 1843–1853, studied in Berlin, Bonn (where in 1854 he was the first American to receive the degree of Ph.D.) and Göttingen, and was professor of Greek language and literature in Brown University from 1855 to 1892, when he became professor emeritus. He was one of the founders in 1869 of the American Philological Association, of which he was president in 1875–1876, and to whose *Transactions* he made various contributions; was a member of the Archaeological Institute's committee on founding the American School of Classical Studies at Athens, and served as the second director of that school in 1883–1884. He studied English and German university methods during trips to Europe in 1870 and 1883, and introduced a new scholarly spirit into American teaching of Latin in secondary schools with a series of Latin text-books, which began in 1851 with a *First Latin Book* and continued for more than fifty years. His *Latin Grammar* (1864, 1881) and *Complete Latin Grammar* (1898) are his best-known books. He was a member of the board of fellows of Brown University from 1904 until his death, and in 1904–1905 was president of the Rhode Island Historical Society. He died in Providence, Rhode Island, on the 27th of May 1907.

His son, ALBERT GRANGER HARKNESS (1857–), also a classical scholar, was born in Providence, Rhode Island, on the 19th of November 1857. He graduated at Brown University in 1879, studied in Germany in 1879–1883, and was professor of German and Latin at Madison (now Colgate) University from 1883 to 1889, and associate professor of Latin at Brown from 1889 to 1893, when he was appointed to the chair of Roman literature and history there. He was director of the American School of Classical Studies in Rome in 1902–1903.

HARKNESS, ROBERT (1816–1878), English geologist, was born at Ormskirk, Lancashire, on the 28th of July 1816. He was educated at the high school, Dumfries, and afterwards (1833–1834) at the university of Edinburgh where he acquired an interest in geology from the teachings of Robert Jameson and J. D. Forbes. Returning to Ormskirk he worked zealously at the local geology, especially on the Coal-measures and New Red Sandstone, his first paper (read before the Manchester Geol. Soc. in 1843) being on *The Climate of the Coal Epoch*. In 1848 his family went to reside in Dumfries and there he commenced to work on the Silurian rocks of the S.W. of Scotland, and in 1849 he carried his investigations into Cumberland. In these regions during the next few years he added much to our knowledge of the strata and their fossils, especially graptolites, in papers read before the Geological Society of London. He wrote also on the New Red rocks of the north of England and Scotland. In 1853 he was appointed professor of geology in Queen's College, Cork, and in 1856 he was elected F.R.S. During this period he wrote some articles on the geology of parts of Ireland, and exercised much influence as a teacher, but he returned to England during his vacations and devoted himself assiduously to the geology of the Lake district. He was also a constant attendant at the meetings of the British Association. In 1876 the syllabus for the Queen's Colleges in Ireland was altered, and Professor Harkness was required to lecture not only on geology, palaeontology, mineralogy and physical geography, but also on zoology and botany. The strain of the extra work proved too much, he decided to relinquish his post, and had retired but a short time when he died, on the 4th of October 1878.

"Memoir," by J. G. Goodchild, in *Trans. Cumberland Assoc.* No.

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viii. (with portrait). In memory of Professor Harkness his sister established two Harkness scholarships. One scholarship (of the value of about £35 a year, tenable for three years) for women, tenable at either Girton or Newnham College, Cambridge, is awarded triennially to the best candidate in an examination in geology and palaeontology, provided that proficiency be shown; the other, for men, is vested in the hands of the university of Cambridge, and is awarded annually, any member of the university being eligible who has graduated as a B.A., "provided that not more than three years have elapsed since the 19th day of December next following his final examination for the degree of bachelor of arts."

HARLAN, JAMES (1820–1899), American politician, was born in Clark county, Illinois, on the 26th of August 1820. He graduated from Indiana Asbury (now De Pauw) University in 1845, was president (1846–1847) of the newly founded and short-lived Iowa City College, studied law, was first superintendent of public instruction in Iowa in 1847–1848, and was president of Iowa Wesleyan University in 1853–1855. He took a prominent part in organizing the Republican party in Iowa, and was a member of the United States Senate from 1855 to 1865, when he became secretary of the interior. He had been a delegate to the peace convention in 1861, and from 1861 to 1865 was chairman of the Senate committee on public lands. He disapproved of President Johnson's conservative reconstruction policy, retired from the cabinet in August 1866, and from 1867 to 1873 was again a member of the United States Senate. In 1866 he was a delegate to the loyalists' convention at Philadelphia. One of his principal speeches in the Senate was that which he made in March 1871 in reply to Sumner's and Schurz's attack on President Grant's Santo Domingan policy. He was presiding judge of the court of commissioners of Alabama claims (1882–1885). He died in Mount Pleasant, Iowa, on the 5th of October 1899.

HARLAN, JOHN MARSHALL (1833–), American jurist, was born in Boyle county, Kentucky, on the 1st of June 1833. He graduated at Centre College, Danville, Ky., in 1850, and at the law department of Transylvania University, Lexington, in 1853. He was county judge of Franklin county in 1858–1859, was an unsuccessful candidate for Congress on the Whig ticket in 1859, and was elector on the Constitutional Union ticket in 1860. On the outbreak of the Civil War he recruited and organized the Tenth Kentucky United States Volunteer Infantry, and in 1861–1863 served as colonel. Retiring from the army in 1863, he was elected by the Union party attorney-general of the state, and was re-elected in 1865, serving from 1863 to 1867, when he removed to Louisville to practise law. He was the Republican candidate for governor in 1871 and in 1875, and was a member of the commission which was appointed by President Hayes early in 1877 to accomplish the recognition of one or other of the existing state governments of Louisiana (*q.v.*); and he was a member of the Bering Sea tribunal which met in Paris in 1893. On the 29th of November 1877 he became an associate justice of the United States Supreme Court. In this position he showed himself a liberal constructionist. In opinions on the Civil Rights cases and in the interpretation of the 13th, 14th and 15th Amendments to the Constitution, he dissented from the majority of the court and advocated increasing the power of the Federal government. He supported the constitutionality of the income tax clause in the Wilson Tariff Bill of 1894, and he drafted the decision of the court in the Northern Securities Company Case, which applied to railways the provisions of the Sherman Anti-Trust Law. In 1889 he became a professor in the Law School of the Columbian University (afterwards George Washington University) in Washington, D.C.

HARLAND, HENRY (1861–1905), American novelist, was born in St Petersburg, Russia, in March 1861, and was educated in New York and at Harvard. He went to Europe as a journalist, and, after publishing several novels, mainly of American-Jewish life (under the name of Sidney Luska), first made his literary reputation in London as editor of the *Yellow Book* in 1894. His association with this clever publication, and his own contributions to it, brought his name into prominence, but it was not till he published *The Cardinal's Snuff-box* (1900), followed by *The Lady Paramount* (1902), that his lightly humorous touch and picturesque style as a novelist brought him any real success. His health was always delicate, and he died at San Remo on the 20th of December 1905.

HARLAY DE CHAMPVALLON, FRANÇOIS DE (1625–1695), 5th archbishop of Paris, was born in that city on the 14th of August 1625. Nephew of François de Harlay, archbishop of Rouen, he was presented to the abbey of Jumièges immediately on leaving the Collège de Navarre, and he was only twenty-six when he succeeded his uncle in the archiepiscopal see. He was transferred to the see of Paris in 1671, he was nominated by the king for the cardinalate in 1690, and the domain of St Cloud was erected into a duchy in his favour. He was commander of the order of the Saint Esprit and a member of the French Academy. During the early part of his political career he was a firm adherent of Mazarin, and is said to have helped to procure his return from exile. His private life gave rise to much scandal, but he had a great capacity for business, considerable learning, and was an eloquent and persuasive speaker. He definitely secured the favour of Louis XIV. by his support of the claims of the Gallican Church formulated by the declaration made by the clergy in assembly on the 19th of March 1682, when Bossuet accused him of truckling to the court like a valet. One of the three witnesses of the king's marriage with Madame de Maintenon, he was hated by her for using his influence with the king to keep the matter secret. He had a weekly audience of Louis XIV. in company with Père la Chaise on the affairs of the Church in Paris, but his influence gradually declined, and Saint-Simon, who bore him no good will for his harsh attitude to the Jansenists, says that his friends deserted him as the royal favour waned, until at last most of his time was spent at Conflans in company with the duchess of Lesdiguières, who alone was faithful to him. He urged the revocation of the edict of Nantes, and showed great severity to the Huguenots at Dieppe, of which he was temporal and spiritual lord. He died suddenly, without having received the sacraments, on the 6th of August 1695. His funeral discourse was delivered by the Père Gaillard, and Mme de Sévigné made on the occasion the severe comment that there were only two trifles to make this a difficult matter—his life and his death.

See Abbé Legendre, *Vita Francisci de Harlay* (Paris, 1720) and *Éloge de Harlay* (1695); Saint-Simon, *Mémoires* (vol. ii., ed. A. de Boislisle, 1879), and numerous references in the *Lettres* of Mme de Sévigné.

HARLECH (perhaps for *Hardd lech*, fair slate, or *Harleigh*, an Anglicized variant), a town of Merionethshire, Wales, 38 m. from Aberystwyth, and 29 from Carnarvon on the Cambrian railway. Pop. 900. Ruins of a fortress crown the rock of Harlech, about half a mile from the sea. Discovery of Roman coins makes it probable that it was once occupied by the Romans. In the 3rd century Bronwen (white bosom), daughter of Bran Fendigaid (the blessed), is said to have stayed here, perhaps by force; and there was here a tower, called Twr Bronwen, and replaced about A.D. 550 by the building of Maelgwyn Gwynedd, prince of North Wales. In the early 10th century, Harlech castle was, apparently, repaired by Colwyn, lord of Ardudwy, founder of one of the fifteen North Wales tribes, and thence called Caer Colwyn. The present structure dates, like many others in the principality, from Edward I., perhaps even from the plans of the architect of Carnarvon and Conway castles, but with the retention of old portions. It is thought to have been square, each side measuring some 210 ft., with towers and turrets. Glendower held it for four years. Here, in 1460, Margaret, wife of Henry VI., defeated at Northampton, took refuge. Dafydd ap Ieuan ap Einion held it for the Lancastrians, until famine, rather than Edward IV., made him surrender. From this time is said to date the air "March of the men of Harlech" (*Rhyfelgerdd gwyr Harlech*). The castle was alternately Roundhead and Cavalier in the civil war. Edward I. made Harlech a free borough, and it was formerly the county town. It is in the parish of Llandanwg (pop. in 1901, 931). Though interesting from an antiquarian point of view, the district around, especially Dyffryn Ardudwy (the valley), is dreary and desolate,

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e.g. Drws (the door of) Ardudwy, Rhinog fawr and Rhinog fach (cliffs); an exception is the verdant Cwm bychan (little coralbe or hollow). The Meini gwyr Ardudwy (stones of the men of Ardudwy) possibly mark the site of a fight.

HARLEQUIN, in modern pantomime, the posturing and acrobatic character who gives his name to the "harlequinade," attired in mask and parti-coloured and spangled tights, and provided with a sword like a bat, by which, himself invisible, he works wonders. It has generally been assumed that Harlequin was transferred to France from the "Arlecchino" of Italian medieval and Renaissance popular comedy; but Dr Driesen in his *Ursprung des Harlekins* (Berlin, 1904) shows that this is incorrect. An old French "Harlekin" (Herlekin, Hellequin and other variants) is found in folk-literature as early as 1100; he had already become proverbial as a ragamuffin of a demoniacal appearance and character; in 1262 a number of harlekins appear in a play by Adam de la Halle as the intermediaries of King Hellekin, prince of Fairyland, in courting Morgan le Fay; and it was not till much later that the French Harlekin was transformed into the Italian Arlecchino. In his typical French form down to the time of Gottsched, he was a spirit of the air, deriving thence his invisibility and his characteristically light and acry whirlings. Subsequently he returned from the Italian to the French stage, being imported by Marivaux into light comedy; and his various attributes gradually became amalgamated into the latter form taken in pantomime.

HARLESS (originally HARLES), **GOTTLIEB CHRISTOPH** (1738–1815). German classical scholar and bibliographer, was born at Culmbach in Bavaria on the 21st of June 1738. He studied at Halle, Erlangen and Jena. In 1765 he was appointed professor of oriental languages and eloquence at the Gymnasium Casimirianum in Coburg, in 1770 professor of poetry and eloquence at Erlangen, and in 1776 librarian of the university. He held his professorship for forty-five years till his death on the 2nd of November 1815. Harless was an extremely prolific writer. His numerous editions of classical authors, deficient in originality and critical judgment, although valuable at the time as giving the student the results of the labours of earlier scholars, are now entirely superseded. But he will always be remembered for his meritorious work in connexion with the great *Bibliotheca Graeca* of J. A. Fabricius, of which he published a new and revised edition (12 vols., 1790–1809, not quite completed),—a task for which he was peculiarly qualified. He also wrote much on the history and bibliography of Greek and Latin literature.

His life was written by his son, Johann Christian Friedrich Harless (1818).

HARLESS, GOTTLIEB CHRISTOPH ADOLF VON (1806–1879), German divine, was born at Nuremberg on the 21st of November 1806, and was educated at the universities of Erlangen and Halle. He was appointed professor of theology at Erlangen in 1836 and at Leipzig in 1845. He was a strong Lutheran and exercised a powerful influence in that direction as court preacher in Dresden and as president of the Protestant consistory at Munich. His chief works were *Theologische Encyklopädie und Methodologie* (1837) and *Die christliche Ethik* (1842, Eng. trans. 1868). He died on the 5th of September 1879, having, a few years earlier, written an autobiography under the title *Bruchstücke aus dem Leben eines süddeutschen Theologen*.

HARLINGEN, a seaport in the province of Friesland, Holland, on the Zuider Zee, and the terminus of the railway and canal from Leeuwarden (13½ M. E.). It is connected by steam tramway by way of Bolsward with Sneek. Pop. (1900) 10,448. Harlingen has become the most considerable seaport of Friesland since the construction of the large outer harbour in 1870–1877, and in addition to railway and steamship connexion with Bremen, Amsterdam, and the southern provinces there are regular sailings to Hull and London. Powerful sluices protect the inner harbour from the high tides. The only noteworthy buildings are the town hall (1730–1733), the West church, which consists of a part of the former castle of Harlingen, the Roman Catholic church, the Jewish synagogue and the schools of navigation and of design. The chief trade of Harlingen is the exportation of Frisian produce, namely, butter and cheese, cattle, sheep, fish, potatoes, flax, &c. There is also a considerable import trade in timber, coal, raw cotton, hemp and jute for the Twente factories. The local industries are unimportant, consisting of saw-mills, rope-yards, salt refineries, and sail-cloth and margarine factories.

HARMATTAN, the name of a hot dry parching wind that blows during December, January and February on the coast of Upper Guinea, bringing a high dense haze of red dust which darkens the air. The natives smear their bodies with oil or fat while this parching wind is blowing.

HARMODIUS, a handsome Athenian youth, and the intimate friend of Aristogeiton. Hipparchus, the younger brother of the tyrant Hippias, endeavoured to supplant Aristogeiton in the good graces of Harmodius, but, failing in the attempt, revenged himself by putting a public affront on Harmodius's sister at a solemn festival. Thereupon the two friends conspired with a few others to murder both the tyrants during the armed procession at the Panathenaic festival (514 B.C.), when the people were allowed to carry arms (this licence is denied by Aristotle in *Ath. Pol.*). Seeing one of their accomplices speaking to Hippias, and imagining that they were being betrayed, they prematurely attacked and slew Hipparchus alone. Harmodius was cut down on the spot by the guards, and Aristogeiton was soon captured and tortured to death. When Hippias was expelled (510), Harmodius and Aristogeiton became the most popular of Athenian heroes; their descendants were exempted from public burdens, and had the right of public entertainment in the Prytaneum, and their names were celebrated in popular songs and scolia (after-dinner songs) as the deliverers of Athens. One of these songs, attributed to a certain Callistratus, is preserved in Athenaeus (p. 695). Their statues by Antenor in the agora were carried off by Xerxes and replaced by new ones by Critius and Nesiotes. Alexander the Great afterwards sent back the originals to Athens. It is not agreed which of these was the original of the marble tyrannicide group in the museum at Naples, for which see article GREEK ART, Pl. I. fig. 50.

See Köpp in *Neue Jahrb. f. klass. Altert.* (1902), p. 609.

HARMONIA, in Greek mythology, according to one account the daughter of Ares and Aphrodite, and wife of Cadmus. When the government of Thebes was bestowed upon Cadmus by Athena, Zeus gave him Harmonia to wife. All the gods honoured the wedding with their presence. Cadmus (or one of the gods) presented the bride with a robe and necklace, the work of Hephaestus. This necklace brought misfortune to all who possessed it. With it Polynices bribed Eriphyle to persuade her husband Amphiaraus to undertake the expedition against Thebes. It led to the death of Eriphyle, of Alcmaeon, of Phegeus and his sons. Even after it had been deposited in the temple of Athena Pronoia at Delphi, its baleful influence continued. Phayllus, one of the Phocian leaders in the Sacred War (352 B.C.) carried it off and gave it to his mistress. After she had worn it for a time, her son was seized with madness and set fire to the house, and she perished in the flames. According to another account, Harmonia belonged to Samothrace and was the daughter of Zeus and Electra, her brother Iasion being the founder of the mystic rites celebrated on the island (Diod. Sic. v. 48). Finally, Harmonia is rationalized as closely allied to Aphrodite Pandemos, the love that unites all people, the personification of order and civic unity, corresponding to the Roman Concordia.

Apollodorus iii. 4-7; Diod. Sic. iv. 65, 66; Parthenius, *Erotica*, 25; L. Preller, *Griech. Mythol.*; Crusius in Roscher's *Lexikon*.

HARMONIC. In acoustics, a harmonic is a secondary tone which accompanies the fundamental or primary tone of a vibrating string, reed, &c.; the more important are the 3rd, 5th, 7th, and octave (see SOUND; HARMONY). A harmonic proportion in arithmetic and algebra is such that the reciprocals of the proportionals are in arithmetical proportion; thus, if a, b, c be in harmonic proportion then $1/a$, $1/b$, $1/c$ are in arithmetical proportion; this leads to the relation $2/b = a/(a+c)$. A harmonic progression or series consists of terms whose reciprocals form an arithmetical progression; the simplest example is:

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$1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \ldots$ (see ALGEBRA and ARITHMETIC). The occurrence of a similar proportion between segments of lines is the foundation of such phrases as harmonic section, harmonic ratio, harmonic conjugates, &c. (see GEOMETRY: II. *Projective*). The connexion between acoustical and mathematical harmonicals is most probably to be found in the Pythagorean discovery that a vibrating string when stopped at $\frac{1}{2}$ and $\frac{2}{3}$ of its length yielded the octave and 5th of the original tone, the numbers, 1, $\frac{1}{2}$, $\frac{2}{3}$ being said to be, probably first by Archytas, in harmonic proportion. The mathematical investigation of the form of a vibrating string led to such phrases as harmonic curve, harmonic motion, harmonic function, harmonic analysis, &c. (see MECHANICS and SPHERICAL HARMONICS).

HARMONICA, a generic term applied to musical instruments in which sound is produced by friction upon glass bells. The word is also used to designate instruments of percussion of the Glockenspiel type, made of steel and struck by hammers (Ger. *Stahlharmonika*).

The origin of the glass-harmonica tribe is to be found in the fashionable 18th century instrument known as musical glasses (Fr. *verrillon*), the principle of which was known already in the 17th century.[1] The invention of musical glasses is generally ascribed to an Irishman, Richard Pockrich, who first played the instrument in public in Dublin in 1743 and the next year in England, but Eisel[2] described the *verrillon* and gave an illustration of it in 1738. The *verrillon* or *Glassspiel* consisted of 18 beer glasses arranged on a board covered with cloth, water being poured in when necessary to alter the pitch. The glasses were struck on both sides gently with two long wooden sticks in the shape of a spoon, the bowl being covered with silk or cloth. Eisel states that the instrument was used for church and other solemn music. Gluck gave a concert at the "little theatre in the Haymarket" (London) in April 1746, at which he performed on musical glasses a concerto of his composition with full orchestral accompaniment. E. H. Delaval is also credited with the invention. When Benjamin Franklin visited London in 1757, he was so much struck by the beauty of tone elicited by Delaval and Pockrich, and with the possibilities of the glasses as musical instruments, that he set to work on a mechanical application of the principle involved, the eminently successful result being the glass harmonica finished in 1762. In this the glass bowls were mounted on a rotating spindle, the largest to the left, and their under-edges passed during each revolution through a water-trough. By applying the fingers to the moistened edges, sound was produced varying in intensity with the pressure, so that a certain amount of expression was at the command of a good player. It is said that the timbre was extremely enervating, and, together with the vibration caused by the friction on the finger-tips, exercised a highly deleterious effect on the nervous system. The instrument was for many years in great vogue, not only in England but on the Continent of Europe, and more especially in Saxony, where it was accorded a place in the court orchestra. Mozart, Beethoven, Naumann and Hasse composed music for it. Marianne Davies and Marianna Kirchgessner were celebrated virtuosi on it. The curious vogue of the instrument, as sudden as it was ephemeral, produced emulation in a generation unsurpassed for zeal in the invention of musical instruments. The most notable of its offspring were Carl Leopold Röllig's improved harmonica with a keyboard in 1786, Chladni's euphon in 1701 and clavicylinder in 1709, Ruffelsen's melodicon in 1800 and 1803, Franz Leppich's panmelodicon 1810, Buschmann's uranion in the same year, &c. Of most of these nothing now remains but the name and a description in the *Allgemeine musikalische Zeitung*, but there are numerous specimens of the Franklin type in the museums for musical instruments of Europe. One specimen by Emanuel Pohl, a Bohemian maker, is preserved in the Victoria and Albert Museum, London.

For the steel harmonica see GLOCKENSPIEL. (K. S.)

[1] See G. P. Harsdörfer, *Math. und philos. Erquickstunden* (Nuremberg, 1677), ii. 147.

[2] *Musicus autodidactos* (Erfurt, 1738), p. 70.

HARMONIC ANALYSIS, in mathematics, the name given by Sir William Thomson (Lord Kelvin) and P. G. Tait in their treatise on *Natural Philosophy* to a general method of investigating physical questions, the earliest applications of which seem to have been suggested by the study of the vibrations of strings and the analysis of these vibrations into their fundamental tone and its harmonics or overtones.

The motion of a uniform stretched string fixed at both ends is a periodic motion; that is to say, after a certain interval of time, called the fundamental period of the motion, the form of the string and the velocity of every part of it are the same as before, provided that the energy of the motion has not been sensibly dissipated during the period.

There are two distinct methods of investigating the motion of a uniform stretched string. One of these may be called the wave method, and the other the harmonic method. The wave method is founded on the theorem that in a stretched string of infinite length a wave of any form may be propagated in either direction with a certain velocity, V, which we may define as the "velocity of propagation." If a wave of any form travelling in the positive direction meets another travelling in the opposite direction, the form of which is such that the lines joining corresponding points of the two waves are all bisected in a fixed point in the line of the string, then the point of the string corresponding to this point will remain fixed, while the two waves pass it in opposite directions. If we now suppose that the form of the waves travelling in the positive direction is periodic, that is to say, that after the wave has travelled forward a distance *l*, the position of every particle of the string is the same as it was at first, then *l* is called the wave-length, and the time of travelling a wave-length is called the periodic time, which we shall denote by T, so that $l = VT$.

If we now suppose a set of waves similar to these, but reversed in position, to be travelling in the opposite direction, there will be a series of points, distant $\frac{1}{2}l$ from each other, at which there will be no motion of the string; it will therefore make no difference to the motion of the string if we suppose the string fastened to fixed supports at any two of these points, and we may then suppose the parts of the string beyond these points to be removed, as it will not affect the motion of the part which is between them. We have thus arrived at the case of a uniform string stretched between two fixed supports, and we conclude that the motion of the string may be completely represented as the resultant of two sets of periodic waves travelling in opposite directions, their wave-lengths being either twice the distance between the fixed points or a submultiple of this wave-length, and the form of these waves, subject to this condition, being perfectly arbitrary.

To make the problem a definite one, we may suppose the initial displacement and velocity of every particle of the string given in terms of its distance from one end of the string, and from these data it is easy to calculate the form which is common to all the travelling waves. The form of the string at any subsequent time may then be found by calculating the positions of the two sets of waves at that time, and compounding their displacements.

Thus in the wave method the actual motion of the string is considered as the resultant of two wave motions, neither of which is of its own accord without the other, consistent with the condition that the ends of the string are fixed. Each of the wave motions is periodic with a wave-length equal to twice the distance between the fixed points, and the one set of waves is the reverse of the other in respect of direction of movement and velocity and direction of motion; but, subject to these conditions, the form of the wave is perfectly arbitrary. The motion of a particle of the string, being determined by the two waves which pass over it in opposite directions, is of an equally arbitrary type.

In the harmonic method, on the other hand, the motion of the string is regarded as compounded of a series of vibratory motions (*normal modes* of vibration), which may be infinite in number, but each of which is perfectly definite in type, and is in fact a particular solution of the problem of the motion of a string with its ends fixed.

A simple harmonic motion is thus defined by Thomson and Tait (§ 53):—When a point Q moves uniformly in a circle, the perpendicular QP, drawn from its position at any instant to a fixed diameter AA' of the circle, intersects the diameter in a point P whose position changes by a *simple harmonic motion*.

The amplitude of a simple harmonic motion is the range on one side or the other of the middle point of the course.

The period of a simple harmonic motion is the time which elapses from any instant until the moving-point again moves in the same direction through the same position.

The phase of a simple harmonic motion at any instant is the fraction of the whole period which has elapsed since the moving-point last passed through its middle position in the positive direction.

In the case of the stretched string, it is only in certain particular cases that the motion of a particle of the string is a simple harmonic motion. In these particular cases the form of the string at any instant is that of a curve of sines having the line joining the fixed

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points for its axis, and passing through these two points, and therefore having for its wave-length either twice the length of the string or some submultiple of this wave-length. The amplitude of the curve of sines is a simple harmonic function of the time, the period being either the fundamental period or some submultiple of the fundamental period. Every one of these modes of vibration is dynamically possible by itself, and any number of them may coexist independently of each other.

By a proper adjustment of the initial amplitude and phase of each of these modes of vibration, so that their resultant shall represent the initial state of the string, we obtain a new representation of the whole motion of the string, in which it is seen to be the resultant of a series of simple harmonic vibrations whose periods are the fundamental period and its submultiples. The determination of the amplitudes and phases of the several simple harmonic vibrations so as to satisfy the initial conditions is an example of harmonic analysis.

We have thus two methods of solving the partial differential equation of the motion of a string. The first, which we have called the wave method, exhibits the solution in the form containing an arbitrary function, the nature of which must be determined from the initial conditions. The second, or harmonic method, leads to a series of terms involving sines and cosines, the coefficients of which have to be determined. The harmonic method may be defined in a more general manner as a method by which the solution of any actual problem may be obtained as the sum or resultant of a number of terms, each of which is a solution of a particular case of the problem. The nature of these particular cases is defined by the condition that any one of them must be conjugate to any other.

The mathematical test of conjugacy is that the energy of the system arising from a two of the harmonics existing together is equal to the sum of the energy arising from the two harmonics taken separately. In other words, no part of the energy depends on the product of the amplitudes of two different harmonics. When two modes of motion of the same system are conjugate to each other, the existence of one of them does not affect the other.

The simplest case of harmonic analysis, that of which the treatment of the vibrating string is an example, is completely investigated in what is known as Fourier's theorem.

Fourier's theorem asserts that any periodic function of a single variable period p, which does not become infinite at any phase, can be expanded in the form of a series consisting of a constant term, together with a double series of terms, one set involving cosines and the other sines of multiples of the phase.

Thus if $\phi(\xi)$ is a periodic function of the variable ξ having a period p, then it may be expanded as follows:

$$\phi(\xi) = A_0 + \sum_1^\infty A_i \cos\frac{2i\pi\xi}{p} + \sum_1^\infty B_i \sin\frac{2i\pi\xi}{p}. \qquad (1)$$

The part of the theorem which is most frequently required, and which also is the easiest to investigate, is the determination of the values of the coefficients A_0, A_1, B_1. These are

$$A_0 = \frac{1}{p}\int_0^p \phi(\xi)\,d\xi; \quad A_i = \frac{2}{p}\int_0^p \phi(\xi)\cos\frac{2i\pi\xi}{p}\,d\xi; \quad B_i = \frac{2}{p}\int_0^p \phi(\xi)\sin\frac{2i\pi\xi}{p}\,d\xi.$$

This part of the theorem may be verified at once by multiplying both sides of (1) by $d\xi$, by $\cos(2i\pi\xi/p)\,d\xi$ or by $\sin(2i\pi\xi/p)\,d\xi$, and in each case integrating from 0 to p.

The series is evidently single-valued for any given value of ξ. It cannot therefore represent a function of ξ which has more than one value, or which becomes imaginary for any value of ξ. It is convergent, approaching to the true value of $\phi(\xi)$ for all values of ξ such that if ξ varies infinitesimally the function also varies infinitesimally.

Lord Kelvin, availing himself of the disk, globe and cylinder integrating machine invented by his brother, Professor James Thomson, constructed a machine by which eight of the integrals required for the expression of Fourier's series can be obtained simultaneously from the recorded trace of any periodically variable quantity, such as the height of the tide, the temperature or pressure of the atmosphere, or the intensity of the different components of terrestrial magnetism. If it were not on account of the waste of time, instead of having a curve drawn by the action of the tide, and the curve afterwards acted on by the machine, the time axis of the machine itself might be driven by a clock, and the tide itself might work the second variable of the machine, but this would involve the constant presence of an expensive machine at every tidal station. (J. C. M.)

For a discussion of the restrictions under which the expansion of a periodic function of ξ in the form (1) is valid, see FOURIER'S SERIES. An account of the contrivances for mechanical calculation of the coefficients A_i, B_i . . . is given under CALCULATING MACHINES.

A more general form of the problem of harmonic analysis presents itself in astronomy, in the theory of the tides, and in various magnetic and meteorological investigations. It may happen, for instance, that a variable quantity $f(t)$ is known theoretically to be of the form

$$f(t) = A_0 - A_1\cos n_1 t + B_1 \sin n_1 t + A_2\cos n_2 t + B_2 \sin n_2 t + \ldots \qquad (2)$$

where the periods $2\pi/n_1$, $2\pi/n_2$ . . . of the various simple-harmonic constituents are already known with sufficient accuracy, although they may have no very simple relations to one another. The problem of determining the most probable values of the constants A_0, A_1, B_1, A_2, B_2, . . . by means of a series of recorded values of the function $f(t)$ is then in principle a fairly simple one, although the actual numerical work may be laborious (see TIDE). A much more difficult and delicate question arises when, as in various questions of meteorology and terrestrial magnetism, the periods $2\pi/n_1$, $2\pi/n_2$ . . . are themselves unknown to begin with, or are at most conjectural. Thus, it may be desired to ascertain whether the magnetic declination contains a periodic element synchronous with the sun's rotation on its axis, whether any periodicities can be detected in the records of the prevalence of sun-spots, and so on. From a strictly mathematical standpoint the problem is, indeed, indeterminate, for when all the symbols are at our disposal, the representation of the observed values of a function, over a finite range of time, by means of a series of the type (2), can be effected in an infinite variety of ways. Plausible inferences can, however, be drawn, provided the proper precautions are observed. This question has been treated most systematically by Professor A. Schuster, who has devised a remarkable mathematical method, in which the action of a diffraction-grating in sorting out the various periodic constituents of a heterogeneous beam of light is closely imitated. He has further applied the method to the study of the variations of the magnetic declination, and of sun-spot records.

The question so far chiefly considered has been that of the representation of an arbitrary function of the *time* in terms of functions of a special type, viz. the circular functions cos *nt*, sin *nt*. This is important on dynamical grounds; but when we proceed to consider the problem of expressing an arbitrary function of *space-co-ordinates* in terms of functions of specified types, it appears that the preceding is only one out of an infinite variety of modes of representation which are equally entitled to consideration. Every problem of mathematical physics which leads to a linear differential equation supplies an instance. For purposes of illustration we will here take the simplest of all, viz. that of the transversal vibrations of a tense string. The equation of motion is of the form

$$\frac{\partial^2 y}{\partial t^2} = T\frac{\partial^2 y}{\partial x^2}, \qquad (3)$$

where T is the tension, and ρ the line-density. In a "normal mode" of vibration y will vary as e^{ikt}, so that

$$\frac{\partial^2 y}{\partial x^2} + k^2 y = 0, \qquad (4)$$

where

$$k^2 = n^2\rho/T. \qquad (5)$$

If ρ, and therefore k, is constant, the solution of (4) subject to the condition that $y = 0$ for $x = 0$ and $x = l$ is

$$y = B\sin kx \qquad (6)$$

provided

$$kl = s\pi, \ [s = 1, 2, 3, \ldots]. \qquad (7)$$

This determines the various *normal modes* of free vibration, the corresponding periods $(2\pi/n)$ being given by (5) and (7). By analogy with the theory of the free vibrations of a system of *finite* freedom it is inferred that the most general free motions of the string can be obtained by superposition of the various normal modes, with suitable amplitudes and phases; and in particular that any arbitrary initial form of the string, say $y = f(x)$, can be reproduced by a series of the type

$$f(x) = B_1\sin\frac{\pi x}{l} + B_2\sin\frac{2\pi x}{l} + B_3\sin\frac{3\pi x}{l} + \ldots \qquad (8)$$

So far, this is merely a restatement, in mathematical language, of an argument given in the first part of this article. The series (8) may, moreover, be arrived at otherwise, as a particular case of Fourier's theorem. But if we no longer assume the density ρ of the string to be uniform, we obtain an endless variety of new expansions, corresponding to the various laws of density which may be prescribed. The normal modes are in any case of the type

$$y = Cu(x)e^{ikt} \qquad (9)$$

where u is a solution of the equation

$$\frac{d^2u}{dx^2} + \frac{n^2\rho}{T}u = 0. \qquad (10)$$

The condition that $u(x)$ is to vanish for $x = 0$ and $x = l$ leads to a transcendental equation in n (corresponding to sin $kl = 0$ in the previous case). If the forms of $u(x)$ which correspond to the various roots of this be distinguished by suffixes, we infer, on physical grounds alone, the possibility of the expansion of an arbitrary initial form of the string in a series

$$f(x) = C_1u_1(x) + C_2u_2(x) + C_3u_3(x) + \ldots \qquad (11)$$

It may be shown further that if r and s are different we have the *conjugate* or *orthogonal* relation

$$\int_0^l \rho u_r(x)u_s(x)\,dx = 0. \qquad (12)$$

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This enables us to determine the coefficients, thus

$$C_r = \int_0^l \rho f(x) u_r(x)\,dx \div \int_0^l \rho [u_r(x)]^2 dx. \qquad (13)$$

The extension to spaces of two or three dimensions, or to cases where there is more than one dependent variable, must be passed over. The mathematical theories of acoustics, heat-conduction, elasticity, induction of electric currents, and so on, furnish an indefinite supply of examples, and have suggested in some cases methods which have a very wide application. Thus the transverse vibrations of a circular membrane lead to the theory of Bessel's Functions; the oscillations of a spherical sheet of air suggest the theory of expansions in spherical harmonics, and so forth. The physical, or intuitional, theory of such methods has naturally always been in advance of the mathematical. From the latter point of view only a few isolated questions of the kind had, until quite recently, been treated in a rigorous and satisfactory manner. A more general and comprehensive method, which seems to derive some of its inspiration from physical considerations, has, however, at length been inaugurated, and has been vigorously cultivated in recent years by D. Hilbert, H. Poincaré, E. Fredholm, E. Picard and others.

REFERENCES.—Schuster's method for detecting hidden periodicities is explained in *Terrestrial Magnetism* (Chicago, 1898), 3, p. 13; *Camb. Trans.* (1900), 18, p. 107; *Proc. Roy. Soc.* (1900), 77, p. 136. The general question of expanding an arbitrary function in a series of functions of special types is treated most fully from the physical point of view in Lord Rayleigh's *Theory of Sound* (2nd ed., London, 1894–1896). An excellent detailed historical account of the matter from the mathematical side is given by H. Burkhardt, *Entwicklungen nach oscillirenden Funktionen* (Leipzig, 1901). A sketch of the more recent mathematical developments is given by H. Bateman, *Proc. Lond. Math. Soc.* (2), 4, p. 90, with copious references.

(H. Lb.)

HARMONICHORD, an ingenious kind of upright piano, in which the strings were set in vibration not by the blow of the hammer but by indirectly transmitted friction. The harmonichord, one of the many attempts to fuse piano and violin, was invented by Johann Gottfried and Johann Friedrich Kaufmann (father and son) in Saxony at the beginning of the 19th century, when the craze for new and ingenious musical instruments was at its height. The case was of the variety known as *giraffe*. The space under the keyboard was enclosed, a knee-hold being left in which were two pedals used to set in rotation a large wooden cylinder fixed just behind the keyboard over the levers, and covered with a roll-top similar to those of modern office desks. The cylinder (in some specimens covered with chamois leather) tapered towards the treble-end. When a key was depressed, a little tongue of wood, one end of which stopped the string, was pressed against the revolving cylinder, and the vibrations produced by friction were transmitted to the string and reinforced as in piano and violin by the soundboard. The adjustment of the parts and the velocity of the cylinder required delicacy and great nicety, for if the little wooden tongues rested too lightly upon the cylinder or the strings, harmonics were produced, and the note jumped to the octave or twelfth. Sometimes when chords were played the touch became so heavy that two performers were required, as in the early medieval organistrum, the prototype of the harmonichord. Carl Maria von Weber must have had some opinion of the possibilities of the harmonichord, which in tone resembled the glass harmonica, since he composed for it a concerto with orchestral accompaniment.

(K. S.)

HARMONIUM (Fr. *harmonium, orgue expressif*; Ger. *Physharmonika, Harmonium*), a wind keyboard instrument, a small organ without pipes, furnished with free reeds. Both the harmonium and its later development, the American organ, are known as free-reed instruments, the musical tones being produced by tongues of brass, technically termed "vibrators" (Fr. *anche libre*; Ger. *durchschlagende Zunge*; Ital. *ancia or lingua libera*). The vibrator is fixed over an oblong, rectangular frame, through which it swings freely backwards and forwards like a pendulum while vibrating, whereas the beating reeds (similar to those of the clarinet family), used in church organs, cover the entire orifice, beating against the sides at each vibration. A reed or vibrator, set in periodic motion by impact of a current of air, produces a corresponding succession of air puffs, the rapidity of which determines the pitch of the musical note. There is an essential difference between the harmonium and the American organ in the direction of this current; in the former the wind apparatus forces the current upwards, and in the latter sucks it downwards, whence it becomes desirable to separate in description these varieties of free-reed instruments.

The *harmonium* has a keyboard of five octaves compass when complete, C to f^3, and a simple action controlling the valves, &c. The necessary pressure of wind is generated by bellows worked by the feet of the performer upon foot-boards or treadles. The air is then forced into the wind-chests into an air-chamber called the wind-chest, the pressure of it being equalized by a reservoir, which receives the excess of wind through an aperture, and permits escape, when above a certain pressure, by a discharge valve or pallet. The aperture admitting air to the reservoir may be closed by a drawstop named "expression." The air being thus cut off, the performer depends for his supply entirely upon the management of the bellows worked by the treadles, whereby he regulates the compression of the wind. The character of the instrument is then entirely changed from a mechanical response to the player's touch to an expressive one, rendering what emotion may be communicated from the player by increase or diminution of sound through the greater or less pressure of wind to which the reeds may be submitted. The drawstops bearing the names of the different registers in imitation of the organ, admit, when drawn, the wind from the wind-chest to the corresponding reed compartments, shutting them off when closed. These compartments are of about two octaves and a half each, there being a division in the middle of the keyboard scale dividing the stops into bass and treble. A stop being drawn and a key pressed down, wind is admitted by a corresponding valve to a reed or vibrator (fig. 1). Above each reed in the so-called sound-board or pan is a channel, a small air-chamber or cavity, the shape and capacity of which have greatly to do with the colour of tone of the note it reinforces. The air in this resonator is highly compressed at an even or a varying pressure as the expression-stop may not be or may be drawn. The wind finally escapes by a small pallet-hole opened by pressing down the corresponding key. In Mustel and other good harmoniums the reed compartments that form the scheme of the instrument are eight in number, four bass and four treble, of three different pitches of octave and double octave diapason. The front bass and treble rows are the "diapason" of the pitch known as 8 ft., and the bourdon (double diapason), 16 ft. These may be regarded as the foundation stops, and are technically the front organ. The back organ has Vibrator, Alexandre solo and combination stops, the principal of 4 Harmonium. ft. (octave higher than diapason), and bassoon (bass) and oboe (treble), 8 ft. These may be mechanically combined by a stop called full organ. The French maker, Mustel, added other registers for much-admired effects of tone, viz. "harpe éolienne," two bass rows of 2 ft. pitch, the one tuned a beat too sharp, the other a beat too flat, to produce a waving tremulous tone that has a certain charm; "musette," and "vox celeste," 16 ft.; and "baryton," a treble stop 32 ft., or two octaves lower than the normal note of the key. The "back organ" is usually covered by a swell box, containing louvres or shutters similar to a Venetian blind, and divided into four sections corresponding with the bass and treble division of the registers. The fortes are governed by knee pedals which act by pneumatic pressure. Tuning the reeds is effected by scraping them at the point to sharpen them, or near the shoulder or heel to flatten them in pitch. Any pressure affects the pitch but slightly, being noticeable only in the larger reeds, and harmoniums long retain their tuning, a decided advantage over the organ and the pianoforte. Mechanical contrivances in the harmonium, of frequent or occasional employment, besides those already referred to, are the "percussion," a small pianoforte action of hammer and escapement which, acting upon the reeds of the diapason rows at the moment air is admitted to them, gives prompter response to the depression of the key, or quicker speech; the "double expression," a pneumatic balance of great delicacy in the wind reservoir, exactly maintaining by gradation equal pressure of the wind; and the "double touch," by which the back organ registers speak sooner than those of the front that are called upon by deeper pressure of the key, thus allowing prominence or accentuation of certain parts by an expert performer. "Prolongement" permits selected notes to be sustained after the fingers have quitted

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FIG. 1.—Free Reed

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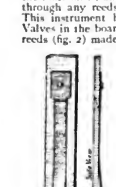
their keys. Dawes's "melody attachment" is to give prominence to an air or treble part by shutting off in certain registers all notes below it. This notion has been adapted by inversion to a pedal substitute "to strengthen the lowest bass notes. The "tremolo" affects the wind in the vicinity of the reeds by means of small bellows which increase the velocity of the pulsation according to pressure; and the "sourdine" diminishes the supply of wind by controlling its admission to the reeds.

The *American Organ* acts by wind exhaustion. A vacuum is practically created in the air-chamber by the exhausting power of the footboards, and a current of air thus drawn downwards passes through any reeds that are left open, setting them in vibration. This instrument has therefore exhaust instead of force bellows. Valves in the board above the air-chamber give communication to reeds (fig. 2) made more slender than those of the harmonium and more or less bent, while the frames in which they are fixed are also differently shaped, being hollowed rather in spoon fashion. The channels, the resonators above the reeds, are not varied in size or shape as in the harmonium, but are exactly corresponding with the reeds, and are collectively known as the "tube-board." The swell "fortes" are in front of the openings of these tubes, rails that open or close by the action of the knees upon what may be called knee pedals. The American organ has a softer tone than the harmonium; this is sometimes aided by the use of extra resonators, termed pipes or qualifying tubes, as, for instance, by Clough & Warren (of Detroit, Michigan, U.S.). The blowing being also easier, ladies find it much less fatiguing. The expression stop can have little power in the American organ, and is generally absent; the "automatic swell" in the instruments of Mason & Hamlin (of Boston, U.S.) is a contrivance that comes the nearest to it, though far inferior. By it a swell-box or rail is kept in constant movement, proportioned to the force of the air-current. Another very clever improvement introduced by these makers, who are large organizators of the instrument itself, is the "vox humana," a smaller rail or fan, made to revolve rapidly by wind pressure; its rotation, disturbing the air near the reeds, causes interference of vibration that produces a tremulous effect, not unlike the beatings heard from combined voices, whence the name. The arrangement of reed compartments in American organs does not essentially differ from that of harmoniums; but there are often two keyboards, and then the solo and combination stops are divided, the upper manual having a diapason treble register is known as "melodia"; different makers occasionally vary the use of fancy names for other stops. The "sub-bass," however, an octave of 16 ft. pitch and always apart from the other reeds, is of great advantage for pedal effects on the manual, the compass of American organs being usually down to F (FF, 5 octaves). In large instruments there are sometimes foot pedals as in an organ, with their own reed boxes of 8 and 16 ft., the lowest note being then CC. Blowing for pedal instruments has to be done by hand, a lever being attached for that purpose. The "celeste" stop is managed as in the harmonium, by rows of reeds tuned not quite in unison, or by a shade valve that alters the air-current and flattens one row of reeds thereby.



By courtesy of Metzler & Co.

FIG. 2.—Free Reed Vibrator, Mason & Hamlin American Organ.

Harmoniums and American organs are the result of many experiments in the application of free reeds to keyboard instruments. The principle of the free reed became widely known in Europe through the introduction of the Chinese cheng[1] during the second half of the 18th century, and culminated in the invention of the harmonium and kindred instruments. The first step in the invention of the harmonium is due to Professor Christian Gottlieb Kratzenstein of Copenhagen, who had had the opportunity of examining a cheng sent to his native city and of testing its merits.[2] In 1779 the Academy of Science of St Petersburg had offered a prize for an essay on the formation of the vowel sounds on an instrument similar to the "vox humana" in the organ, which should be capable of reproducing these sounds faithfully. Kratzenstein made as a demonstration of his invention a small pneumatic organ fitted with free reeds, and presented it to the Academy of St Petersburg.[3] His essay was crowned and was republished with diagrams in Paris[4] in 1782. Meanwhile, in 1780, a countryman of Kratzenstein's, an organ-builder named Kirsnick, established in St Petersburg, adapted these reed pipes to some of his organs and to an instrument of his invention called organochordium, an organ combined with piano. When Abt Vogler visited St Petersburg in 1788, he was so delighted with these reeds that in 1790 he induced Rackwitz, an assistant of Kirsnick's, to come to him and adapt some to an organ he was having built in Rotterdam. Three years later Abt Vogler's orchestrion, a chamber organ containing some pipe-reeds, was completed, and, according to Rackwitz,[5] was fitted with free-reed pipes. Vogler himself, however, does not mention the free reed when describing this wonderful instrument and his system of "simplification" for church organs.[6] To Abt Vogler, who travelled all over Germany, Scandinavia and the Netherlands, exhibiting his skill on his orchestrion and reconstructing many organs, is due the credit of making Kratzenstein's invention known and inducing the musical world to appreciate the capabilities of the free reed. The introduction of free-reed stops into the organ, however, took a secondary place in his scheme for reform.[7] Friedrich Kaufmann[8] of Dresden states that Vogler told him he had imparted to J. N. Mälzel of Vienna particulars as to the construction of free-reed pipes, and that the latter used them in his panharmonicon,[9] which he exhibited during his stay in Paris from 1805 to 1807. Kaufmann suggests that it was through him that G. J. Grenié obtained the knowledge which led to his experiments with free reeds in organs. It is more likely that Grenié had read Kratzenstein's essay and had experimented independently with free reeds. In 1812 his first *orgue expressif* was finished. It was a small organ with one register of free reeds—the expression stop, in fact, added to the pipe organ and having a separate soundboard and bellows. It would seem from his description of the orchestrion in *Data zur Akustik* that Vogler knew of no such device. He used the swell shutter borrowed from England and a threefold screen of canvas covered with a blanket arranged *outside the instrument*, neither of which is capable of increasing the volume of sound from the organ, or at least only after having first damped the sound to a pianissimo. Vogler explains minutely the apparatus used to conceal the working of the screen from the eyes of the public.[10] The credit of discovering in the free reed the capability of dynamic expression was undoubtedly due to Grenié, although Abt Vogler claims to have used compression in 1796,[11] and Kaufmann in his choraulodion in 1816. A larger *orgue expressif* was begun by Grenié for the Conservatoire of Paris in 1812, the construction of which was interrupted and then continued in 1816. Descriptions of Grenié's instrument have been published in French and German.[12] The organ of the Conservatoire had a pedal free-reed stop of 16 ft., with vibrators 0·240 m. long, 0·031 m. wide, and 0·003 m. thick.[13] Two compressors, one for the treble and the other for the bass, worked by treadles, enabled the performer to regulate the pressure of wind on the reeds and therefore to obtain the gradations of forte and piano which gained for his instrument the name of *orgue expressif*. Grenié's instrument was a pipe organ, the pipes terminating in a cone with a hemispherical cap in the top of which was a small hole. There were eight registers including the pedal, and the positive on the first keyboard had reed stops furnished with

[1] See "Über die Erfindung der Rohrwerke mit durchschlagenden Zungen," by Wilke, in *Allg. musik. Ztg.* (Leipzig, 1823), Bd. xxv. pp. 152-153 and Bd. xxvii. p. 263; also Thos. Ant. Kunz, "Orchestrion," *id.*, Bd. i. p. 88 and Bd. ii. pp. 514, 542; and Dr Karl Emil von Schafhäutl, *Abt Georg Joseph Vogler* (Augsburg, 1888), p. 37.

[2] *Data zur Akustik, eine Abhandlung vorgelesen bey der Sitzung der naturforschenden Freunde in Berlin, den 15ten December 1800* (Berlinisch, 1801); also published in *Allg. musik. Ztg.* (1801), Bd. iii. pp. 517, 533, 565. See also an excellent article by the Rev. J. H. Mee on Vogler in Grove's *Dictionary of Music and Musicians*.

[3] See *Data zur Akustik*, and a pamphlet by Vogler, "Über die Umschaffung der St Marien Orgel in Berlin nach dem Voglerschen Simplifikations-System, eine Nachahmung des Orchestrion" (Berlin); also "Kurze Beschreibung der in der Stadtpfarrkirche zu St Peter zu München nach dem Voglerschen Simplifikations-System neuerbauten Orgel" (Munich, 1809).

[4] See *Allg. musik. Ztg.* (1823), Bd. xxv. pp. 153 and 154 note, and 117-118 note.

[5] A description of Mälzel's panharmonicon before the addition of the clarinet and oboe stops with free reeds is to be found in the *Allg. musik. Ztg.* (1800), Bd. ii. pp. 414-415.

[6] In the article in Grove's *Dictionary* the screen is said to have been in the wind-trunk.

[7] See *Allg. musik. Ztg.* Bd. iii. p. 523.

[8] See J. B. Biot, *Précis élémentaire de physique expérimentale* (Paris, 1817), tome i. p. 386, and his *Traité de physique* (Paris, 1816), tome ii. p. 172 et seq., pl. ii.; "Über die Crescendo und Diminuendo Züge an Orgeln," by Wilke and Kaufmann, *Allg. musik. Ztg.* (1823), Bd. xxv. pp. 113-122; and *Allg. musik. Ztg.* Bd. xxiii. pp. 133-139 and 149-154, with diagrams on p. 167 which are not absolutely correct in small details.

[9] J. B. Biot, *Traité*, tome ii. p. 174.

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beating reeds. Biot insists on the importance of the regulating wires (Fr. *rasettes*; Ger. *Kruchen*) for determining the vibrating length of the reed tongue and maintaining it invariable. These are clearly shown in his diagram (see article FREE REED VIBRATOR, fig. 1); they do not essentially differ from those used with the beating-reed stops in his organ (fig. 76, pl. II.), or indeed from those figured by Praetorius.

Isolated specimens of the cheng must have found their way to Europe during the 15th and 16th centuries, for Mersenne[1] depicts part of one showing the free reed. It would seem that still earlier in the 17th century there was an organ in a monastery in Hesse with free reeds for the *Posaune* stop, for Praetorius gives a description of the "extraordinary" reed (p. 169); there is no record of the inventor in this case.

During the first half of the 19th century various tentative efforts in France and Germany, and subsequently in England, were made to produce new keyboard instruments with free reeds, the most notable of these being the physharmonica[2] of Anton Häckel, invented in Vienna in 1818, which, improved and enlarged, has retained its hold on the German people. The modern physharmonica is a harmonium without stops or percussion action; it does not therefore speak readily or clearly. It has a range of five to six octaves. Other instruments of similar type are the French melophone and the English seraphine, a keyboard harmonica with bellows but no channels for the tongues, for which a patent was granted to Myers and Storer in 1839; the aeoline or aelodicon[3] of Eschenbach; the melodicon[4] of Dietz; the melodica[5] of Rieffelson; the apollonicon;[6] the new cheng[7] of Reichstein; the terpodion[8] of Buschmann, &c. None of these has survived to the present day.

The inventor of the harmonium was indubitably Alexandre Debain, who took out a patent for it in Paris in 1840. He produced varied timbre registers by modifying reed channels, and brought these registers on to one keyboard. Unfortunately he patented too much, for he secured even the name *harmonium*, obliging contemporary and future experimenters to shelter their improvements under other names, and the venerable name of organ becoming impressed into connexion with an inferior instrument, we have now to distinguish between reed and pipe organs. The compromise of reed organ for the harmonium class of instruments must therefore be accepted. Debain's harmonium was at first quite mechanical; it gained expression by the expression-stop already described. The Alexandres, well-known French makers, by the ingenuity of one of their workmen, P. A. Martin, added the percussion and the prolongement. The melody attachment was the invention of an English engineer; the introduction of the double touch, now used in the harmoniums of Mustel, Bauer and others—also in American organs—was due to Tamplin, an English professor.

The principle of the American organ originated with the Alexandres, whose earliest experiments are said to have been made with the view of constructing an instrument to exhaust air. The realization of the idea proving to be more in consonance with the genius of the American people, to whom what we may call the devotional tone of the instrument appealed, the introduction of it by Messrs Mason and Hamlin in 1861 was followed by remarkable success. They made it generally known in Europe by exhibiting it at Paris in 1867, and from that time instruments have been exported in large numbers by different makers. (A. J. H.; K. S.)

[1] *Harmonie universelle* (Paris, 1636), livre v., prop. xxxv.
[2] *Wien. musik. Zig.* Bd. v. Nos. 30 and 87.
[3] *Allg. musik. Zig.* Bd. xxii. p. 505, and Bd. xxxv. p. 354.
[4] Id. Bd. viii. pp. 526 and 715.
[5] Id. Bd. xi. p. 625.
[6] *Allg. musik. Zig.* Bd. ii. p. 767, and *Wien. musik. Zig.* Bd. i. No. 501.
[7] Id. Bd. xxxi. p. 489.
[8] Id. Bd. xxxiv. pp. 856 and 858; and *Cäcilia*, Bd. xiv. p. 259.

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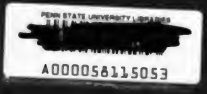

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